

Annual Report
2021-2022



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Foreword

C²TN - Radiation for Science and Society

Centro de Ciências e Tecnologias Nucleares (C²TN) is a multi- and interdisciplinary Research Unit of Instituto Superior Técnico (IST), Universidade de Lisboa, recognized as a major National and International player in the scientific and technological areas related to Nuclear Sciences and Technologies and applications of Ionizing Radiation. It manages a set of unique facilities, equipment and expertise, grouping several tens of researchers and students from different disciplines (physicists, chemists, pharmacists, biologists, geologists, among others) to deliver scientific excellence, advanced training, and high level of consulting and services. Its motto, "Radiation for Science and Society", reflects the high quality of C²TN's scientific activities and the contribution to address societal challenges within the scope of its areas of competence, namely, Life and Health Sciences, Radiological Protection, Earth Sciences, Environment, Cultural Heritage, and Material Sciences. Under modern governance rules and promoting gender balance, the five Research Groups – Radiopharmaceutical Sciences, Radiation Protection and Safety, Solid State, Nuclear Engineering and Techniques, and Radiation, Elements and Isotopes – carried out RD&I activities within the scope of three Thematic Strands: Advanced Materials, Radiopharmaceutical Sciences and Health Physics, and Earth Systems, Radioactivity and Cultural Heritage.

The activities of C²TN during the 2021 - 2022 biennium clearly reflect such reality, and it is with great pleasure that we bring you the Highlights of this period. The 2021 and 2022 years were still very challenging, with the actions implemented evidencing the national pandemic and post-pandemic situation, and the stabilization in a new paradigm. However, with the efforts of all members, it was possible to continue and further strengthen the C²TN research activities towards excellence.

The high quality of C²TN's research activities has resulted in the participation in numerous projects, either as a leader or as a partner institution. Using nuclear and non-nuclear techniques, research projects have continued or started within the three Thematic Strands, and the participation in international networks was reinforced and expanded. Examples of H2020 and Horizon Europe projects active in 2021 - 2022 are the *AHEAD2020 – Integrated Activities for the High Energy Astrophysics Domain*, *ECF4CLIM – A European Competence Framework for a Low Carbon Economy and Sustainability through Education*, *EURAD – European Joint Programme on Radioactive Waste Management: Strategic Studies Project PRISMAP – The European Medical Isotope Programme: Production of High Purity Isotopes by Mass Separation*, *ROUTES – Waste Management Routes in Europe from Cradle-to-grave*, *SANDA – Supplying Accurate Nuclear Data for Energy and non-Energy Applications*, and

InChildHealth – Identifying Determinants for Indoor Air Quality and their Health Impact in Environments for Children: Measures to Improve Air Quality and Reduce Disease Burden. C²TN researchers are actively involved in many IAEA projects as well as in a large number of projects funded by the national Foundation for Science and Technology (FCT). New contracts with industry, mainly on dating and microbiological analysis, were also established. All this engagements resulted in a C²TN funding of 3.078 M€ for the 2021 - 2022 biennium.

The successful application of C²TN's expertise in new key subjects was reflected in the attribution of the “2022 Portuguese Armed Forces Innovation Award” to a C²TN PhD student, in collaboration with the Portuguese Air Force Academy, and the 1st place in the competitive “Portugal Space call for doctoral scholarships” call, obtained by a C²TN member.

The high-level of C²TN research activities is also reflected in the scientific outputs, such as the number of articles published in international journals (247) with high impact factor, including a paper accepted by Nature, number of communications in international scientific meetings (286), organization of seminars and conferences (28) and number of completed PhD (10) and MSc (45) thesis.

A fruitful cooperation with the Department of Nuclear Sciences and Engineering (DECN) allowed the joint acquisition of equipment of vital importance (X-ray diffractometer and SEM/EDS), which are now available for all C²TN members. Furthermore, and profiting from the new Teaching Model and Pedagogical Practices of IST, it was possible to strongly increase the involvement of C²TN members in teaching activities, particularly in the supervision of internships, small projects and master thesis, which are seeds for future PhD applications.

C²TN 2021-2022 outreach activities were also expanded and consolidated. We renewed the corporative image of C²TN, organized the 2nd and 3rd editions of the CARISMA summer school, participated in events, such as the European Researchers' night and the IST Open Days, promoted the C²TN workshops, received students for Summer Internships and promoted the Journal Club Initiative.

The Executive Committee is proud of all these accomplishments and wants to acknowledge and thank C²TN members for their contributions, efforts and attainments that made possible this journey.

The C²TN Executive Commission

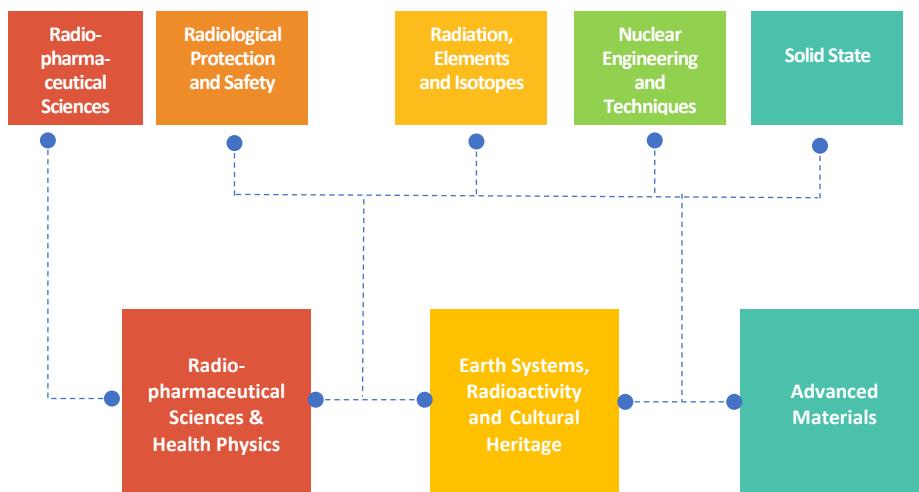
António Pereira Gonçalves – President
Marta Almeida – Vice-President
Lurdes Gano - Vogal

C²TN Organization and Coordination

Considering the complementary know-how, common interests and facilities, C²TN members are organized in five Research Groups: Radiopharmaceutical Sciences (RS), Radiological Protection and Safety (RPS), Radiation, Elements and Isotopes (REI), Nuclear Engineering and Techniques (NET), and Solid State (SS). The 5 groups converge and collaborate on 3 main Thematic Strands (TS):



RESEARCH GROUPS



THEMATIC STRANDS

Research Group Coordinators are:

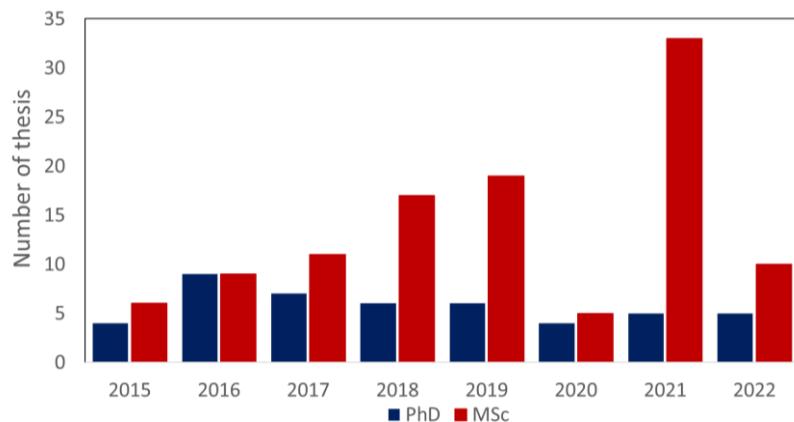
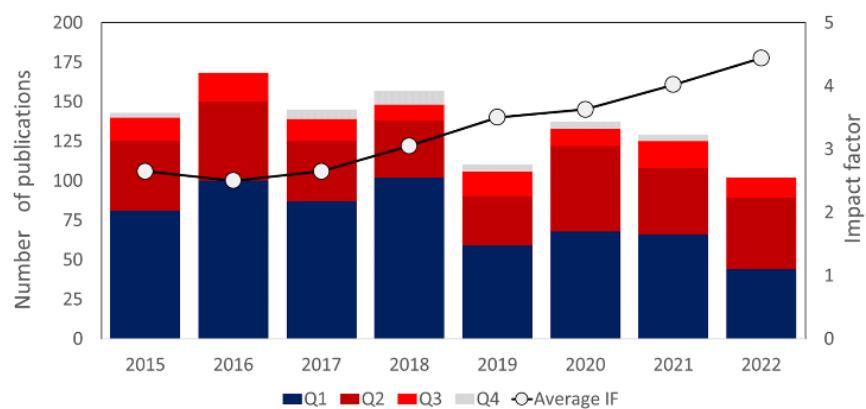
RS – João Galamba Correia; RPS – Octávia Monteiro Gil; REI – Fernanda Margaça; NET – Maria Isabel Dias; SS – Laura Pereira

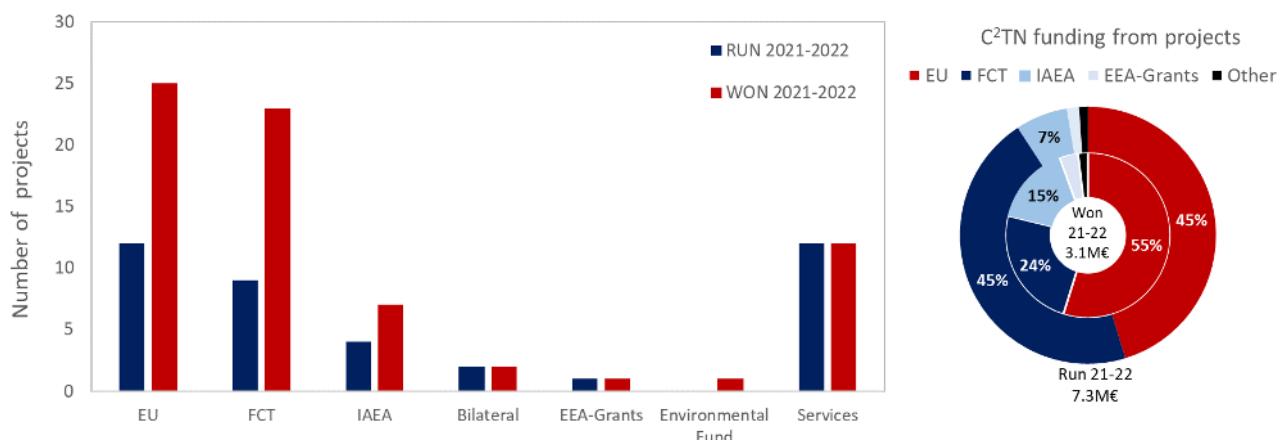
The Thematic Strands Coordinators are:

RSHP – Filipa Mendes; ESRCH – Maria Isabel Prudêncio/Paula Carreira; AM – Manuel Leite de Almeida (until 7 July 2022) / Luís Ferreira

C²TN in Numbers

Information on peer – reviewed publications and the corresponding impact factor, completed PhD and MSc theses, number of projects and respective budget.





THEMATIC STRANDS SCIENTIFIC REPORT 2021 – 2022

Radiopharmaceutical Sciences and Health Physics (RSHP)

C²TN continued and further strengthened its research program on Radiopharmaceutical Sciences and Health Physics (RSHP), and on the application of ionizing radiation in different aspects of Human Health. The multidisciplinary team of researchers of the RSHP thematic strand applied its know-how, techniques and infrastructures to carry out research on Radiopharmaceutical Sciences, Radiation Protection, Dosimetry, Biological Effects of Radiation and Metrology aiming to contribute to the following major topics: Theranostics, Personalized Medicine and Medical Physics.

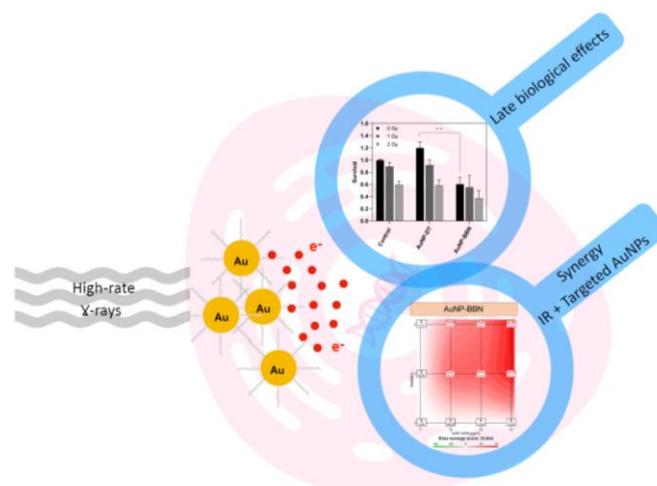
The scientific activity of this team resulted in: 78 articles in international peer-reviewed journals, 2 book chapters, 25 lectures in conferences, 3 PhD and 23 MSc theses. The team has participated also in the organization of 1 international conference and summer schools.

The research work was supported by European and FCT competitive funding, and a high degree of internationalization of the activities was accomplished with participation on several EU Technology Platforms and Networks, namely MELODI, EURADOS, EURAMET, RENEB and the Euro-BioImaging platform. Additionally, further international collaborations were established within COST actions and in the H2020 project PRISMAP, which provides access to innovative medical radioisotopes to the C²TN's research community. Also during this period, researchers from the Health Area engaged actively in the "Health Thematic Network" from the Universidade de Lisboa, a strategic network of partnerships in the area of Health, in the interfaces of Science, Innovation and Public Policy. Brought together, these activities will allow C²TN to further develop its research program on molecular imaging tools, theranostics, personalized medicine and medical physics.

Highlights of the R&D activities performed during 2021-2022 are presented below.

Selective nano-radiosensitizers for improved cancer radiotherapy

Molecularly targeted gold nanoparticle (AuNP)-based radiosensitizers were designed to selectively increase the dose at the tumor site and enhance radiotherapy efficacy. The presence of AuNPs led to an enhanced and selective radiocytotoxicity in prostate cancer and glioblastoma cancer cells upon irradiation (IR), with increased production of Reactive Oxygen Species (ROS) and apoptosis.



Development of voxel phantoms from clinical images

Image segmentation is a fundamental step in nuclear medicine dosimetry protocols, since it allows to quantify radiopharmaceutical distribution in patients. In the framework of Targeted Radiopharmaceutical Therapy, anatomical and functional images from SPECT/CT were accurately segmented using a state-of-the-art software (3D-Slicer) in order to perform dosimetry, both in target and non-target tissues, with Monte Carlo simulations.

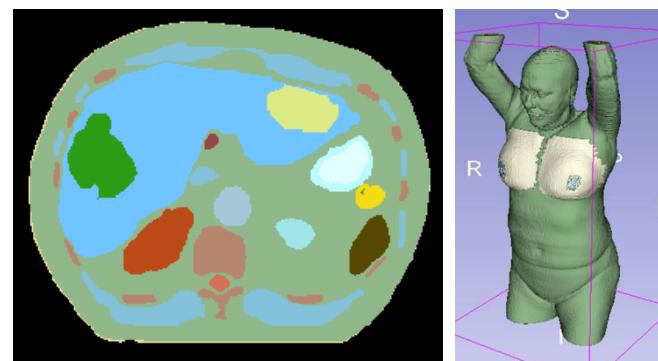
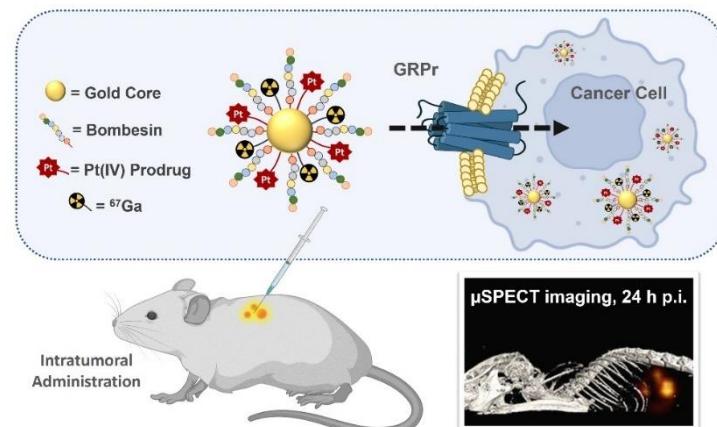


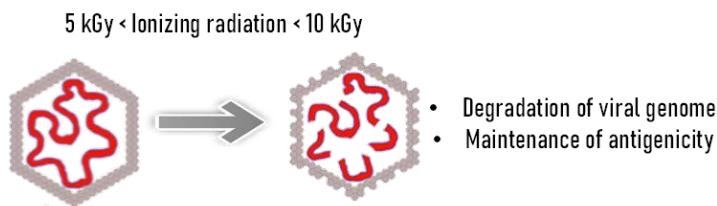
Image-guided nano-delivery of Pt(IV) prodrugs to GRP-receptor positive tumors

Newly designed GRPR-targeted gold nanoparticles (AuNPs) carrying Pt(IV) prodrugs were able to selectively release their cytotoxic payload in GRPR+ prostate cancer PC3 cells, within a SPECT image-guided drug delivery approach. Simultaneous delivery of cytotoxic drugs and therapeutic radionuclides using the designed AuNPs is expected to circumvent chemo- and radioresistance issues.



Inactivation of enteric viruses by ionizing radiation

Enteric viruses may survive extended periods outside host cells, resisting to physical and chemical agents. Studies were performed to understand the biological effects of ionizing radiation on enteric virus to develop alternative mitigation strategies. Importantly, these insights into virucidal activity are relevant to the evaluation of inactivated viruses as therapeutic platforms, for vaccine development and drug delivery.



Earth Systems, Radioactivity and Cultural Heritage (ESRCH)

The ESRCH thematic strand applied its infrastructures to increase knowledge and develop robust tools for responding to the challenges posed by modern society through multi- and inter-disciplinary innovative research. During this period, the researchers continued and reinforced their goals in a sustainable management of the environment (air – public health), protection of the natural resources (water and soils) and cultural heritage. The goals were achieved through an interdisciplinary team of researchers and postgraduates with national and international recognition in the scientific community through the organization and participation in scientific committees in relevant international conferences, technical committees and through the numerous publications in book chapters and in peer-reviewed journals.

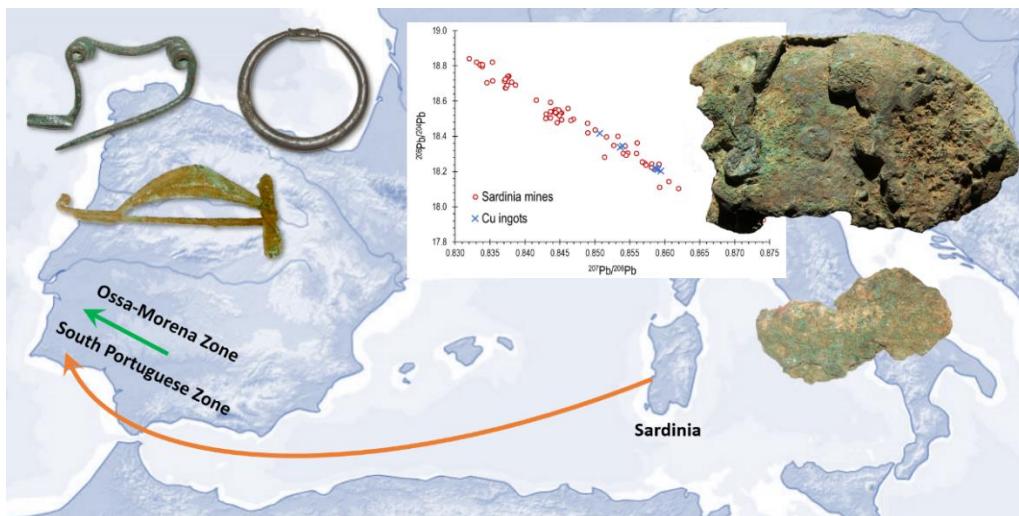
The scientific output of ESRCH team included the publication of 95 papers in peer-reviewed journals, 4 books, 7 book chapters, 54 international conference extended proceedings, 22 invited lectures, 54 oral presentations and 48 posters in international meetings. Members of the ESRCH team were editors of 6 international scientific journals. During this period the completion of 3 PhD and 13 MSc theses were accomplished.

The ESRCH research work was supported mainly by European and National funding obtained through the participation in competitive calls. The team prepared and submitted common national and international projects. These I&D projects were approved and financed under calls of the European Union, FCT (National Foundation for Science and Technology), Horizon 2020 and IAEA (International Atomic Energy Agency), and 11 contracts were also established with private companies.

The main highlights of the ESRCH were focused on climate change issues related with the assessment of evolution and impacts on ecosystems and natural resources such as air, soil and water management and protection. Among these achievements the highlights of the R&D activities performed during 2021-2022 are presented below.

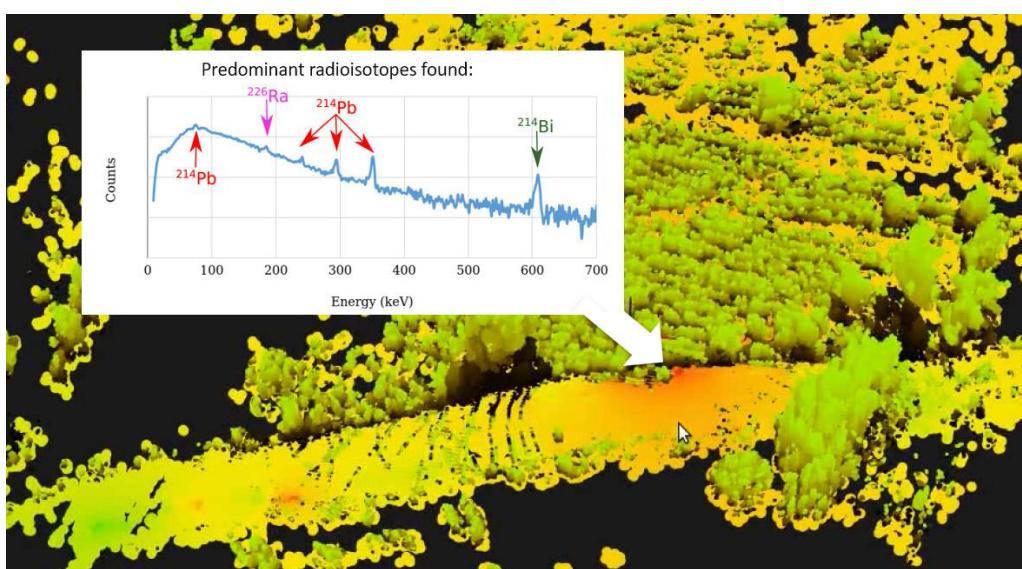
The Copper Road: metal trade to southwestern Iberia from the Chalcolithic to the Iron Age

Pb isotope signatures and trace element contents of ingots and artefacts suggested the use of mines from the South Portuguese Zone and the Ossa-Morena Zone during the 3rd millennium BC. These regions were also exploited during the 1st millennium BC, but Sardinia also seems to have been an important source of copper during such period.



Follow up and closure of project Fleet of drones for radiological inspection and rescue (FRIENDS)

The FRIENDS team achieved the main goal of concretizing the proof-of-concept by demonstrating in the field, the capability of a drone fleet. The latter were equipped with portable radiation detection systems (Geiger-Muller, gamma spectrometer CZT) and a LASER scanner (LiDAR), which allowed the production of georeferenced 3D mapping radiological data of terrestrial areas with increased natural radioactivity, related to the existence of uranium mine tailings from abandoned mines activities.



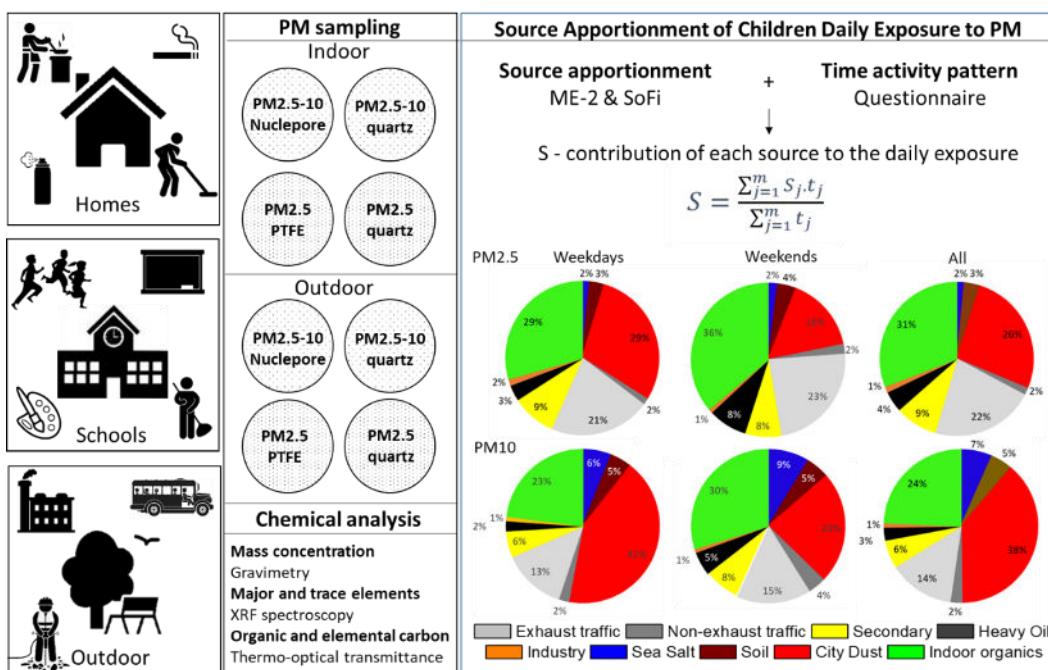
Groundwater assessment at Santiago Island, Republic of Cape Verde

Brackish groundwater for agriculture and human consumption is being provided to several areas on Santiago Island as the only available water. Isotopic data combined with the water chemistry provided an identification of salinization processes (seawater intrusion and marine aerosols dissolution). In the eastern part of Santiago, ¹⁴C data indicate apparent groundwater ages between 3.5 and 5.1 ka BP, infiltrated under a different climate conditions.



Source apportionment of children daily exposure to air particulate matter

C²TN coordinated the European Project LIFE Index-Air that investigated the sources of air particulate pollution in indoor and outdoor environments, with focus on determining their contribution to the exposure of children, and on supporting the identification of actions to reduce the associated health impacts. Receptor models showed that the major sources contributing to exposure are related with the emission of organic carbon in indoor environments, from cooking, cleaning, smoking, biomass burning, candles and occupation; resuspension of mineral particles in schools and traffic.



Advanced Materials (AM)

Discovery, refining and tuning materials and their properties are at the core of all major scientific and technological advances with societal impact. In ancient times, the mastering of materials shaped the historical periods which are naturally classified as, e.g., stone age, copper age, iron age. Nowadays, the establishment of quantum physics, with its consequent new characterization and atomic scale manufacturing techniques, leads the very small world to shape a new age of technologic breakthroughs. The understanding, development and tuning of new materials is indissociable from the mastering of multiple interdisciplinary skills and advanced preparation and characterization methods.

C²TN is a unique national research unit, internationally recognized, combining expertise and facilities used for emerging topics with areas such as Chemistry, Physics, Materials Science and Engineering. It surpasses the classical wet chemistry to synthesize materials with electrochemical methods, irradiation resources and high-temperature techniques, allowing the synthesis of organic or organometallic systems, from molecular materials to modified polymers, and the preparation of inorganic materials, from metallic glasses and nanocrystalline materials to single crystals.

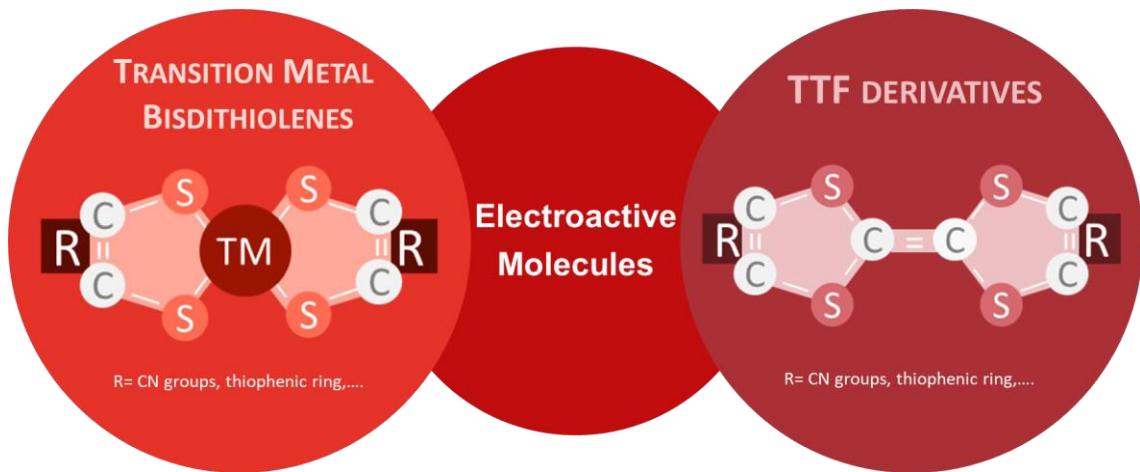
Those materials can be characterized at C²TN by using not only conventional methods, as X-ray diffraction or scanning electron microscopy, but also by nuclear techniques, such as Mössbauer spectroscopy, Rutherford backscattering spectrometry or particle-induced X-ray emission, in macro or micro scale, which originate fundamental and complementary data. Electrical transport and magnetization measurements can be performed under extreme conditions, at very low temperatures and high magnetic fields, essential environments to reveal most of the quantum behaviors.

C²TN operates several international reference facilities, like the *Portuguese experimental infrastructure at CERN/ISOLDE*, which has state-of-the-art Perturbed Angular Correlation and Emission Channeling capabilities, and the X-ray Advanced HiREDS Research and Metrology Laboratory, which makes available High Resolution Energy Dispersive Spectrometry and Total Ion-beam Analysis.

Denoting the vibrant activity of C²TN members in this thematic strand, during the 2021-2022 period were published 69 articles in international peer-reviewed journals, 1 book chapter, 67 lectures were presented in conferences, and 4 PhD and 7 MSc theses were presented. 11 international and national conferences were also organized or co-organized. Selected highlights are presented and briefly discussed below.

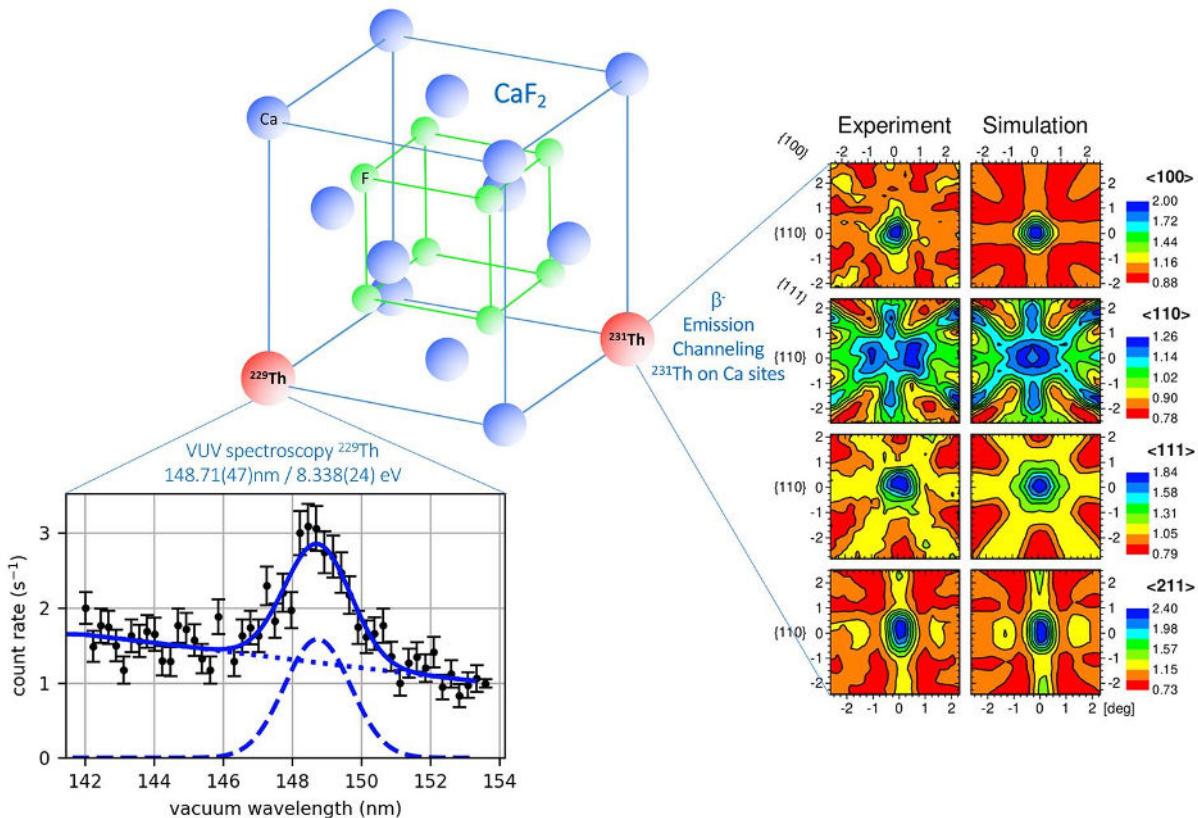
Molecular materials for future applications

Molecular materials have physical properties strongly correlated with their molecular and crystallographic structures. International reference studies were performed on materials prepared from electroactive tetrathiofulvalene derivatives and transition metal bisdithiolene complexes, showing unconventional magnetic and electric properties. These materials have potential for applications as battery cathodes, sensor components, or therapeutic drugs.



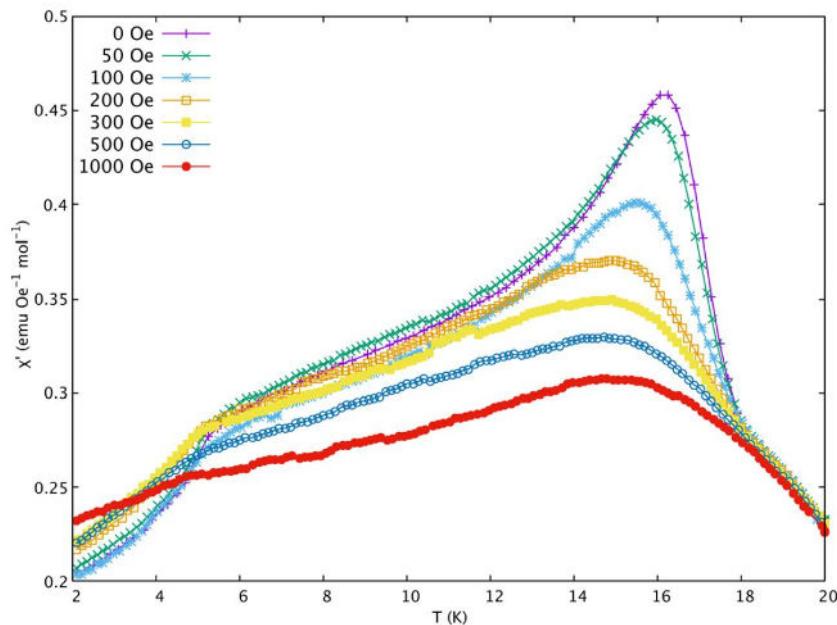
The radiative decay of the ^{229}Th nuclear clock isomer

Of all nuclei, ^{229}Th possesses the lowest known excitation energy. At ISOLDE, VUV spectroscopy using a KU Leuven setup discovered the photons emitted from $^{229\text{m}}\text{Th}$ in CaF_2 (left), while ^{231}Th emission channeling (right) using the EC-SLI (C^2TN) setup established that these result from Th on substitutional Ca sites (accepted by [Nature](#)).



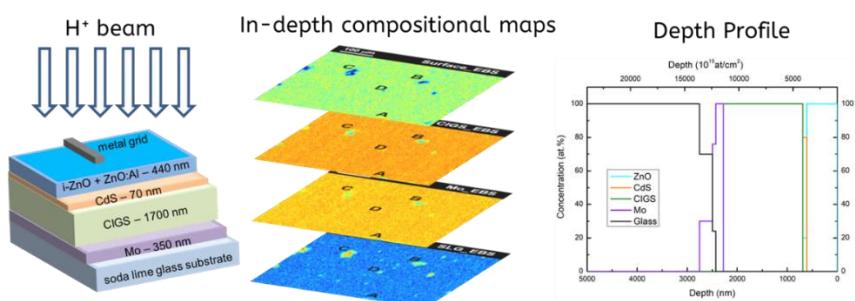
Chalcogenide and uranium carbide advanced materials

Profiting of unique preparation and characterization facilities, like the High Temperature Synthesis and Crystal Growth the Low Temperature and High Magnetic Field laboratories, chalcogenides and uranium carbides were prepared and studied. They present a range of unusual properties, having potential as quantum materials, for thermoelectrics or spallation targets.



In-depth elemental characterization of advanced materials

The nuclear microprobe setup, jointly with the combination of ion beam analysis techniques such as RBS and PIXE, allows the characterization of a vast type of materials and final devices in a non-destructive way. The active layer of CIGS solar cells was analyzed and the in-depth elemental inhomogeneities found could be related to the manufacturing processes.



RESEARCH GROUPS SCIENTIFIC REPORT 2021 - 2022

Radiopharmaceutical Sciences Group



TEAM

Name	Category	R&D (%)
António Manuel Rocha Paulo	Principal Researcher (with Habilitation)	100
João Domingos Galamba Correia	Principal Researcher (with Habilitation)	100
Maria Lurdes Barrela Patrício Gano	Principal Researcher	100
Célia Maria da Cruz Fernandes	Auxiliary Researcher	100
Fernanda Marujo Marques	Auxiliary Researcher	100
Filipa Fernandes Mendes	Auxiliary Researcher	100
Maria Cristina das Neves Oliveira	Auxiliary Researcher	100
Maria Paula Cabral Campello	Auxiliary Researcher	100
Paula Dolores Galhofas Raposinho	Auxiliary Researcher	100
Alice D'Onofrio	Researcher (<i>until Sept 2022</i>)	100
Ana Sofia Cavalheiro Gama	Researcher (<i>since Nov 2022</i>)	100
Cristina Pereira de Matos	Researcher (<i>until Aug 2022</i>)	100
Elisa Vaz Palma	Junior Researcher (DL 57)	100
Francisco França A. Conceição Silva	Researcher (<i>until Dec 2021</i>)	100
Joana Filipa Fernandes Guerreiro	Researcher (<i>until Dec 2021</i>)	100
Maria de La Salete Jesus Baptista	Researcher (<i>until Sept 2021</i>)	100
Rita Lourenço Paiva Melo Galvão	Junior Researcher (DL 57)	100
Elisabete Correia	Technician	100
Catarina Isabel Guilherme Pinto	Grant Holder (<i>until Apr 2021</i>) / PhD Student (<i>since May 2021</i>)	100
João Miguel Franco Machado ¹	PhD Student	50
Rúben Diogo Marques da Silva	PhD Student	100
Afonso André Morais Belchior	Master Student	100
Ana Catarina Ramos Pires Pedrosa	Master Student	100
Ana Rita Julião	Master Student	100
Andreia Filipa Fidalgo de Sousa	Master Student	100
Cátia Filipa Gouveia Rosa	Master Student (<i>until Nov 2021</i>) / Grant holder (<i>since Nov 2022</i>)	100
Denise Bravo do Rosário ²	Master Student	50
Diogo Figueiredo ³	Master Student	50
Diogo Miguel Gonçalves Engrácia	Master Student	100
Fabien Barrois ⁴	Master Student	50
Francisco Marques Lucas	Master Student	100
Inês Teodósio Vicente	Master Student	100
Joana Filipa da Silva Santos	Master Student (<i>until Nov 2021</i>) / Grant holder (<i>since Jan 2022</i>)	100
Joana Neves Duarte	Master Student	100
Joana Pinto dos Santos	Master Student	100

Kyle Manuel Ferreira Gonçalves	Master Student	100
Lucija Marinkovic ⁵	Master Student	50
Maria dos Santos Martins	Master Student	100
Maria Teresa Braz	Master Student	100
Miguel Tarita	Master Student	100
Rafael José Cartaxo Travassos	Master Student	100
Sara Batalha Celestino Perdigão	Master Student	100
Sofia Albuquerque Martins	Master Student	100
Tamara Teles	Master Student	100
Vital Cruvinel Ferreira Filho ⁶	Master student	50
Marco Alexandre Pina de Sá ¹	Grant holder	50

¹ 50% dedication at the CQE; ² 50% dedication at IMM; ³ 50% dedication at the GPSR; ⁴ in collaboration with “Transition Metals in Molecular Chemistry (T2MC), Université Bourgogne, France. ⁵ 50% dedication at iMED; ⁶ in collaboration with Laura Pereira (SS Group).

MISSION AND OBJECTIVES

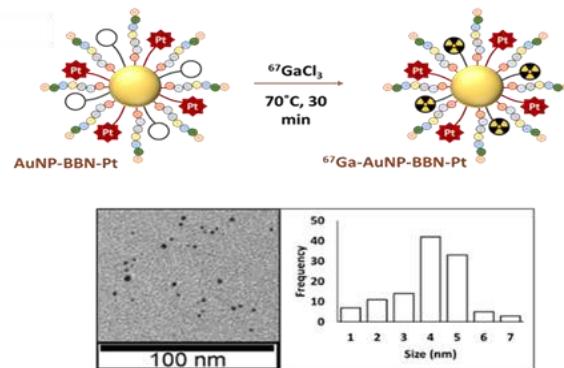
The Radiopharmaceutical Sciences Group (RSG) aims at exploring the application of ionizing radiation from artificial sources to human health, more specifically to the design and development of innovative molecules and nanoparticles containing radioactive isotopes for Molecular Imaging (PET and SPECT), Targeted Radionuclide Therapy and Cancer Theranostics. Those activities, with a strong multidisciplinary character, are undertaken by a team of scientists with expertise in various scientific disciplines, including chemistry, radiochemistry, biology and pharmaceutical sciences; supported by a set of dedicated facilities for i) chemical synthesis (including solid phase peptide synthesis); ii) radiosynthesis; iii) biochemical, molecular biology and cellular studies; and iv) animal studies and preclinical imaging.

This research area, with valuable translational potential, is relevant for the diagnosis and treatment of oncological, cardiovascular or neurodegenerative diseases, and might contribute to the rise of molecular and personalized medicine. To tackle this goal, the RSG is mainly involved in the design of innovative target-specific radiopharmaceuticals, based on a plethora of imaging or therapeutic radionuclides, to image/interfere with different disease-associated molecular and biological pathways. This includes the development and evaluation of molecular/nanosized tools for a Theranostic approach to cancer, based on PET (e.g. ⁶⁴Cu and ⁶⁸Ga) and SPECT (^{99m}Tc, ⁶⁷Ga and ¹¹¹In) radiometals, and on β^- (e.g. ¹⁸⁸Re and ¹⁷⁷Lu) or Auger-emitting (e.g. ¹²⁵I and ¹⁶¹Tb) therapeutic radionuclides. Owing to the rare combination of radiopharmaceutical chemistry expertise with facilities for preclinical evaluation, the RSG is a key partner of renowned national/international institutions involved in radionuclide production, nuclear medicine and biomedical research (e.g. ICNAS, CNC, Fundação Champalimaud, IMM-Lisbon Medical School, IRCM, CERN, SCK-CEN, KU Leuven, MDACC-UT Austin). Moreover, within the framework of national and international cooperation projects, including with biotech companies, the RSG also collaborates with research groups engaged in the discovery/development and biological evaluation of novel (metallo)drugs and antibody-based biopharmaceuticals.

MAIN ACHIEVEMENTS

Multifunctional inorganic nanoparticles for diagnostic imaging and therapeutic applications

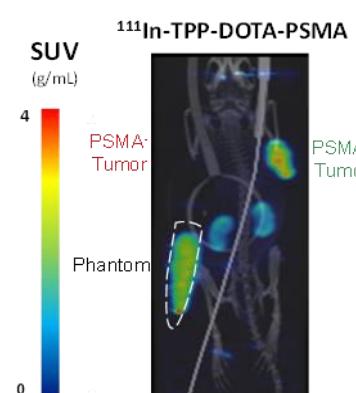
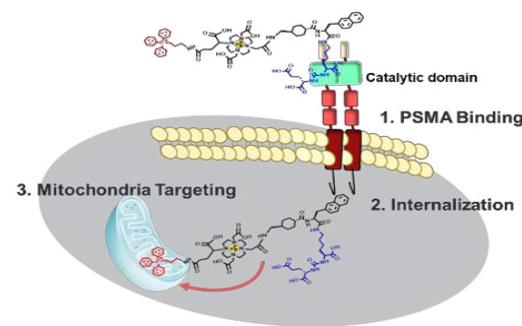
Inorganic nanoparticles have been sparking interest in biomedical research because of their favorable features for diagnostic and therapeutic applications. In this field, we have designed new gold nanoparticles (AuNPs) and gold coated superparamagnetic iron oxide nanoparticles (SPION), aiming at their use in the delivery of cytotoxic compounds, imaging (e.g., ⁶⁷Ga) and therapeutic radionuclides (e.g., ¹⁷⁷Lu) to tumor tissues, as well as MRI contrast agents, hyperthermia enhancers or radiosensitizers. In particular, spherical and small-sized (ca. 4 nm gold core) AuNPs functionalized with a bombesin (BBN) derivative performed as selective and effective radiosensitizers for prostate cancer PC3 cells overexpressing the gastrin releasing peptide receptor (GRPR), following their exposure to γ -photon irradiation. These GRPR-targeted AuNPs also allowed the specific delivery of Pt(IV) prodrugs to PC3 cells with significant cytotoxic activity and favorable selective index, within an image-guided approach upon their labeling with ⁶⁷Ga for SPECT imaging. Overall, these results show the potential of these targeted AuNPs loaded with Pt(IV) prodrugs for prostate cancer theranostics.



Dual-targeted ¹¹¹In and ¹⁶¹Tb radiocomplexes for prostate cancer theranostics

Auger electron radiopharmaceutical therapy (AE-RPT) is expected to have similar efficacy as alpha therapy for oncological small disease, with estimated lower risks of unwanted normal tissue toxicity. Owing to the short range of AEs, AE-emitting radiopharmaceuticals must target specific subcellular structure, such as the nucleus or other radiosensitive organelle (e.g. cell membrane or mitochondria) to obtain high cell killing efficiency. Thus,

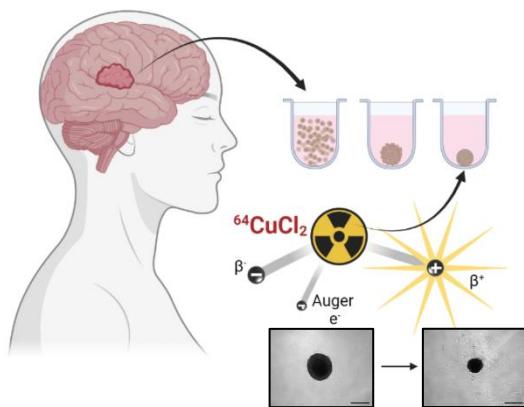
we designed DOTA-based complexes of the AE-emitters ¹⁶¹Tb and ¹¹¹In, carrying a prostate-specific membrane antigen (PSMA) inhibitor and a triphenyl phosphonium (TPP) group to promote a selective accumulation in the mitochondria of prostate cancer (PCa) cells. The complex ¹⁶¹Tb-TPP-DOTA-PSMA displayed high and specific cellular internalization in PSMA+ PCa cells, together with a significant dose dependent radiotoxicity. MicroSpect/CT imaging studies showed an excellent pharmacokinetics for the ¹¹¹In congener, with high uptake and retention in PSMA+ tumors. These favorable features corroborate the potential of these radiocomplexes for AE-RPT of PCa.



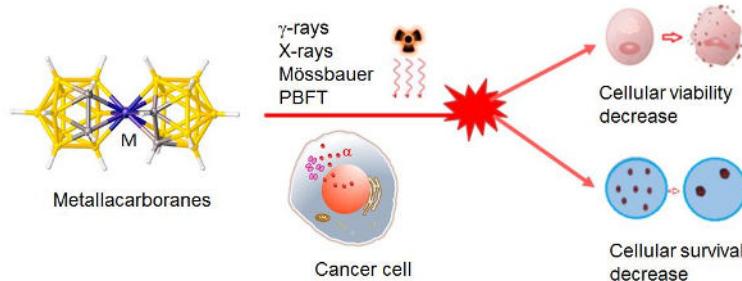
Theranostic potential of ⁶⁴CuCl₂ in 3D models of glioblastoma

Glioblastoma is the most common primary brain cancer in adults, being characterized by an extremely aggressive behavior that leads to a very poor prognosis. To support the diagnosis of this disease, ⁶⁴CuCl₂ has been studied as a simple Positron Emission Tomography (PET) agent that accumulates in this type of tumor. Considering that besides the β^+ emission, ⁶⁴Cu also decays by β^- emission and electron capture, releasing Auger electrons, this isotope is suitable for a theranostic approach. In the present

work we aimed at evaluating the therapeutic effects of ⁶⁴CuCl₂ in glioblastoma, using advanced 3D culture models, namely spheroids, known for having an improved predictive value. Results obtained revealed that ⁶⁴CuCl₂ is able to significantly reduce the spheroids' growth and viability, while also affecting the reproductive capacity of spheroid-derived cells, reinforcing the promising potential of ⁶⁴CuCl₂ as a theranostic agent for glioblastoma.



Boron clusters as radiosensitizers for multimodal radiotherapies



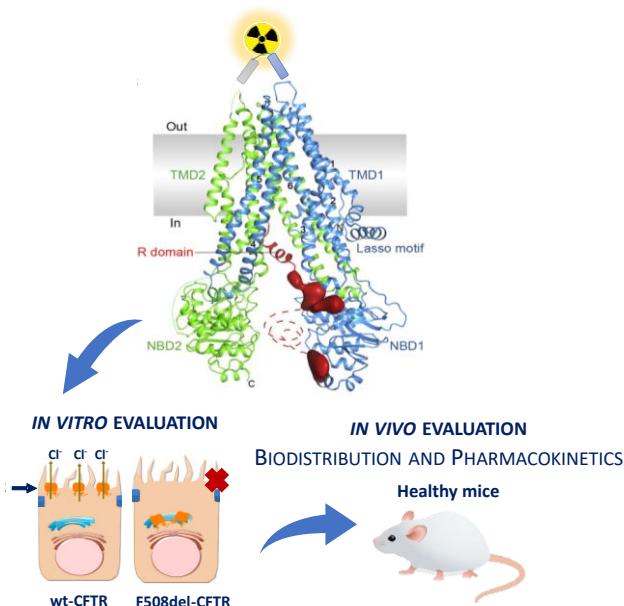
In collaboration with the ICMAB-CSIC Barcelona, Spain, metallacarboranes have been evaluated for multimodal clinical applications. These small 3D aromatic molecules share the versatility of carboranes, while the metal center introduces additional properties in their redox potentials

and overall charge. The main characteristics of these small anionic molecules are their chemical and thermal stability. For therapeutic applications, metallacarboranes can act as multimodal anticancer agents by enabling a simultaneous approach to chemotherapy, radiotherapy and imaging. Studies were performed aiming to explore the potential of these boronated compounds as radiosensitizers using cancer cell models. The biological effects induced by electromagnetic radiation γ - and X-rays and Mössbauer absorption (in collaboration with the SS group) in cancer cell models were evaluated. In collaboration with other research groups at the microprobe facility of CTN/IST Van de Graaff accelerator a proton-boron nuclear fusion reaction was assayed using these molecules in cancer cell models. The promising results obtained provide new hope for the research of metallacarboranes as radiosensitizers for multimodal applications (chemo/radio/PBFT).

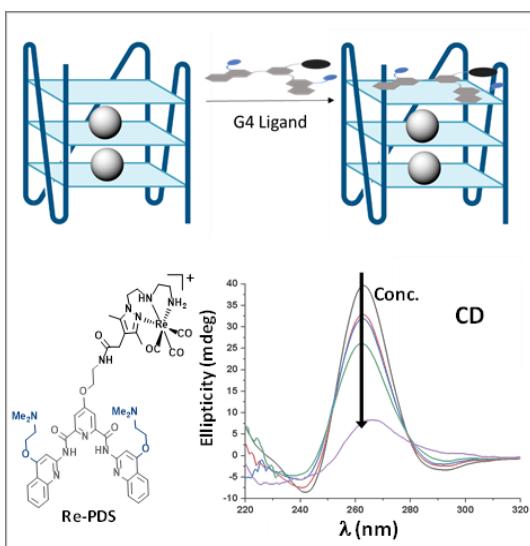
Novel Molecular Imaging tools for Cystic Fibrosis

The aim of this project was to bring forward a novel molecular imaging approach to the managing of Cystic Fibrosis (CF), with probes able to detect CFTR, the protein that when mutated originates the disease. We intended to develop probes that would be a potentially useful tool for evaluation of

pharmacological correction by allowing the imaging of the presence of CFTR at the plasma membrane of epithelia of patients undergoing clinical trials. Innovative CFTR-targeting biomolecules – antibody (Ab) fragments – were selected from Ab fragment libraries, produced and validated, and then radiolabelled and pre-clinically evaluated in normal and mutant (F508del) epithelial cells and in animal models. Promising results were obtained both in the *in vitro* and (preliminary) *in vivo* studies, encouraging the further optimization of these Ab fragments, e.g., with modulation of the pharmacokinetic profile and evaluation of targeting ability in animal models of CF disease.



(Radio)mётallated pyridostatin derivatives for the targeting of non-canonical DNA structures

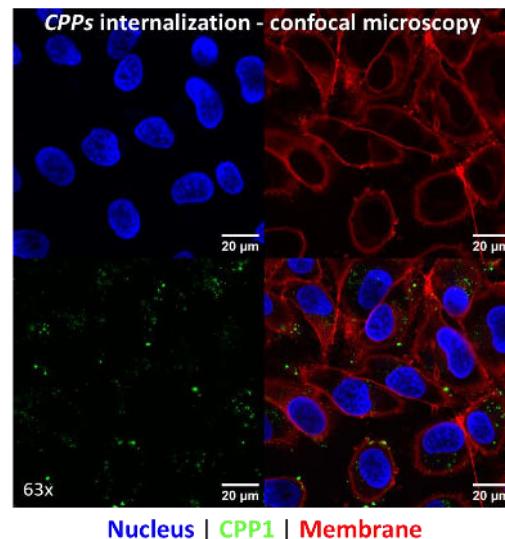


G-quadruplexes are non-canonical secondary structures, adopted by guanine-rich DNA and RNA sequences frequently found in telomeres and regulatory regions of oncogenes. Therefore, G-quadruplex DNA or RNA (qDNA/qRNA) play an important role in cancer biology. Aiming to introduce novel metal-based G-quadruplex binders, we have focused on isostructural ^{99m}Tc(I) and Re(I) tricarbonyl complexes carrying a pendant pyridostatin (PDS) fragment. The ^{99m}Tc complexes will be used as SPECT probes to assess *in vivo* the biodistribution of the compounds, while the Re congeners will act as anticancer drugs. In a first screening, the interaction of the compounds with several human telomeric qDNA and qRNA sequences

was studied by FRET-melting assays and CD experiments. The results showed that the complex Re-PDS seems to bind selectively with telomeric qRNA (TERRA sequence). Further studies in TERRA-overexpressing tumor cells are underway to assess the usefulness of these novel PDS-containing complexes as cancer theranostic agents.

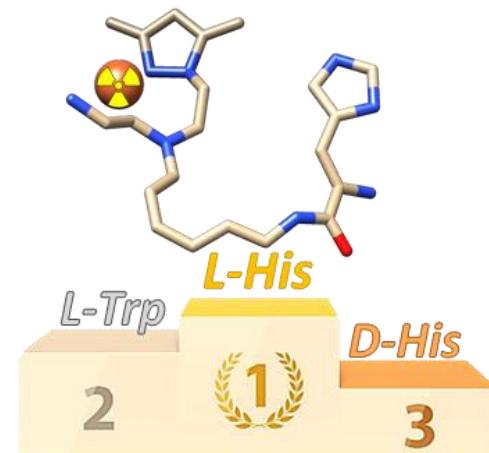
Targeting the RANK-TRAF6 interface for diagnosis and therapy of bone metastases

The project aims at the design and evaluation of multifunctional, cathepsin-K sensitive, bone-seeking peptides that interfere with the RANK/TRAF6 interface, and lead to decreased osteoclastogenesis and cancer cell migration/invasion in bone metastatic disease. The peptides comprise a bisphosphonate (BP) unit, a cathepsin K-cleavable linker, a cell penetrating peptide (*CPP*) and TRAF6-binding peptides derived from RANK. Therefore, we synthesized and characterized (RP-HPLC and ESI-MS) two *CPP* sequences and nine peptides encompassing those sequences and a native/mutant TRAF6 binding sequence. After validation of TRAF-6 expression levels in various breast and bone cancer cell lines, we have assessed the ability of the two *CPP* sequences to be internalized by flow cytometry and concluded that both have a high internalization ability. Moreover, the binding affinity towards TRAF6 protein was assessed by Surface Plasmon Resonance, and the results demonstrated that peptides with the native TRAF6 binding sequence have a high binding affinity regardless of the conjugated *CPPs*.



Amino acid transporters-specific radioactive probes for cancer theranostics

Radiotracers targeting transporters of amino acids hold great potential as agents for cancer theranostics. Aimed at addressing unmet needs in the clinical setting we designed a family of radiometallated amino acid derivatives (*fac*-[M(CO)₃(k³-Pz(L-^{Or}/D-Aa))]⁺, M = Re, ^{99m}Tc; Aa = Arg, Lys, His and Trp). The His- and Trp-containing ^{99m}Tc-complexes showed relevant uptake levels in all cancer cell models studied. A correlation between cell uptake of *fac*-[M(CO)₃(k³-Pz(L-His))]⁺ and the amino acid transporter ATB^{0,+} expression level was found. This pattern was not observed for *fac*-[M(CO)₃(k³-Pz(D-His))]⁺, suggesting involvement of a different transporter in the uptake mechanism. The neutral amino acids-containing complexes (His and Trp) display higher uptake levels than the cationic amino acids-containing complexes (Arg and Lys) at physiological pH, highlighting the importance of ATB^{0,+} and LAT1 transporters. Biodistribution studies of *fac*-[^{99m}Tc(CO)₃(k³-Pz(L-His))]⁺ in MCF7 xenografts revealed that the compound accumulates predominantly in the excretory organs with low tumor uptake. Further studies are underway.



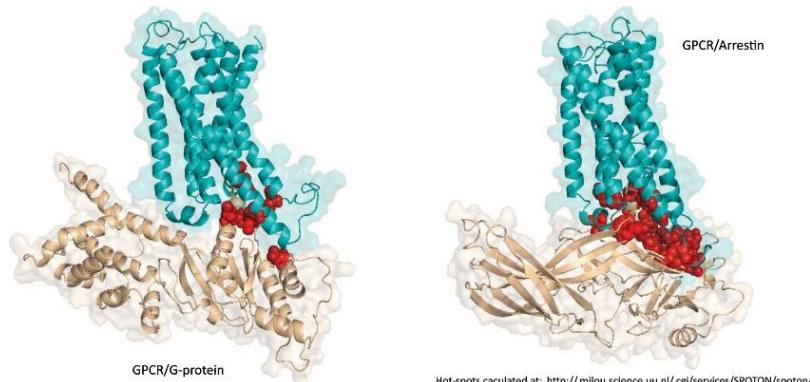
Development of new computational approaches and its application to G-Protein Coupled Receptors (GPCRs)

The mechanisms of GPCRs multidimensional signaling and complex formation remain largely unknown, thereby hindering efforts to create new effective drugs.

The MEMBRANEPROT project (PTDC/QUI-OUT/32243/2017)

allowed us to develop new computational approaches for modeling molecular systems that can consistently and accurately predict protein-protein interfaces and thus build their 3D structure. We also developed protocols that used quantitative

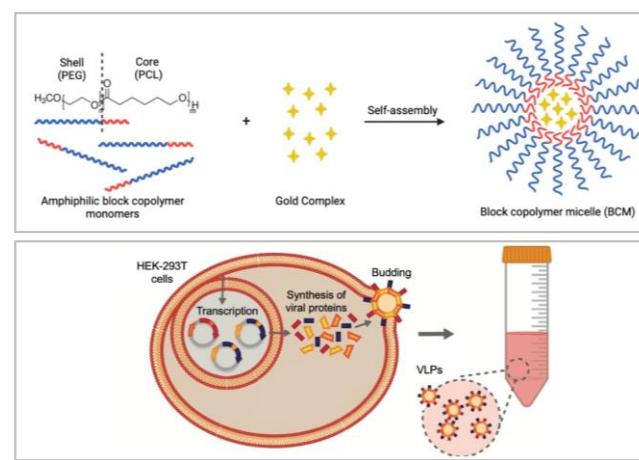
and strictly reproducible measurements. This is especially relevant for membrane systems (such as GPCR), as their size and interactions with the surrounding microenvironment (water and lipids) make them particularly challenging. One of our main achievements was the construction of an easy-access public platform that enables the structural characterization of GPCR complexes without an available structure (available at www.moreiralab.com/resources/dxr).



Hot-spots calculated at: <http://milou.science.uu.nl/cgi/services/SPOTON/spoton/>

Organic Nanoparticles as platforms for targeted delivery of drugs and imaging agents

Nanomedicine has emerged in recent years as a field aimed at surpassing the shortcomings of standard medicine. Among the different types of nanoparticles (NPs), virus-like particles (VLPs) and block copolymer micelles (BCMs) are two of the NPs we are exploring. These NPs are characterized by being modifiable, biocompatible, capable of self-assembly, and able to cross cell membranes, and can therefore be exploited as vaccines, drug delivery systems and carriers of imaging agents. Our group constructed and characterized a human immunodeficiency virus type 1 (HIV-1) VLP modified with a fragment derived from trastuzumab, an anti-human epidermal growth factor receptor 2 (HER2) antibody, aiming to provide a proof-of-concept approach for targeted delivery. We have also developed BCMs for drug delivery of hydrophobic drugs, improving their bioavailability and circulation time in blood, namely of several gold(III) complexes that have been reported as antimicrobial, antitumoral and antiplasmodial agents.



Radiological Protection and Safety Group



TEAM

Name	Category	R&D (%)
Pedro Vaz	Coordinator Researcher	80
Maria José Madruga	Principal Researcher	40 (until June 2021)
Octávia Monteiro Gil	Auxiliary (until September 2021) /Principal Researcher	70
Isabel Paiva	Auxiliary Researcher	80
José Alberto Gil Corisco	Auxiliary Researcher	50
Mário Reis	Auxiliary Researcher	50
Ana Cravo Sá ¹	Researcher	50
Joana Santos ²	Researcher	30
Nuno Teixeira ¹	Researcher	30
Pedro Teles ³	Researcher	10
Ana Belchior	Junior Researcher (DL57)	100
Salvatore Di Maria	Junior Researcher (DL57)	100
Javier Garcia Rivas	Post-Doc fellow ² (until February 2021)	50 ²
Eva Andrade	TS ¹ (MSc)	30
Margarida Caldeira	TS ¹ (PhD)	30
Marta Guimarães Santos	TS ¹ (PhD)	30
Telma Silva Marques	TS ¹ (PhD)	30
Yuriy Romanets	TS ¹ (PhD)	40
João Canhoto	PhD Student	100
Jorge Borbinha	PhD Student	100
Khaled Katmah	PhD Student	100
Luís Cabeça Marques ⁴	PhD Student	30
Victor Merza	PhD Student	100
Ana Marques	Master Student	100
Carla Pedra	Master Student	100
Diogo Figueiredo	Master Student	100
Mafalda Ferreira	Master Student	50
Stefano Puggioni	Master Student	100
Susana Valente	Master Student	100

TS¹= Graduated Technician;

²The remaining 50% with the NET Group of C²TN

Main affiliation: ¹Escola Superior de Tecnologia de Saúde de Lisboa; ²Escola Superior de Tecnologia de Saúde de Coimbra; ³Universidade do Porto; ⁴ Air Force Academy.

MISSION AND OBJECTIVES

The RPS Group activities consisted on the deployment of unique scientific and technical expertise, skills and competence in radiological protection and radiation safety in Portugal; keeping abreast of the state-of-art in scientific and technical topics and in international regulations and safety standards in modern radiological protection and radiation safety; education, training and supervision of students and professionals in Masters and Doctoral programmes and thesis; the provision of scientific advice and support to the Portuguese competent authorities and stakeholders in the execution of policies in radiological protection and in areas involving application of ionizing radiations (IR) and radioisotopes; contribute to raise the awareness of Portuguese and international stakeholders about hot topics, emerging, leading edge and multidisciplinary scientific issues associated to the biological effects arising from the medical, industrial and environmental exposures to IR of workers, patients and members of the public.

To achieve such objectives, the RPSG was involved in fundamental and applied research activities addressing multidisciplinary, cross-cutting and leading edge topics in: Dosimetry and Radiobiology; Environmental Radioactivity and Radioecology; Radioactive Waste Management; Metrology of IR; Emergency preparedness and management of radiological & nuclear accidents; Defence and Security applications.

The Group's activities were sustained by the participation in R&D projects funded by the European Union (EU) Framework Programmes and HORIZON 2020, by the FCT, by organizations such as EURADOS and EURAMET, in collaboration with CERN and other research centers in European countries. This included the participation in the activities of the EU Research Platforms MELODI, EURADOS, IGD-TP, NERIS, Alliance and RENE. The RPSG fostered collaborative links with Portuguese research groups, academia, hospitals and other stakeholders in Radiation Protection, in the context of scientific projects and academic, education and training activities.

The RPSG participates in PIANOFORTE (the European Partnership for Radiation Protection Research), fulfilling the duties of Program Manager for Portugal assigned to IST by FCT.

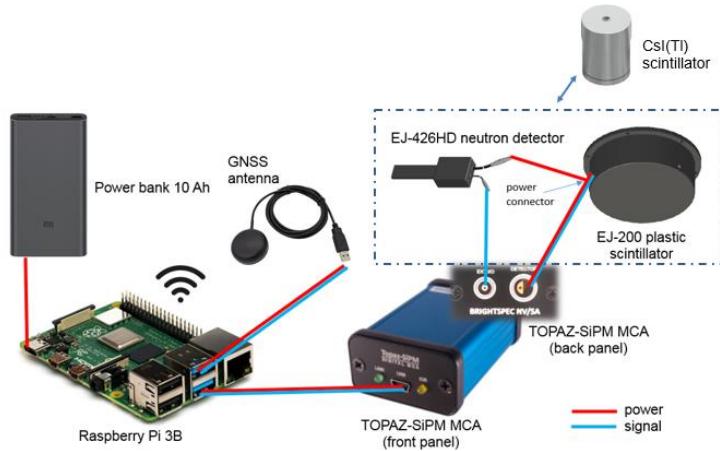
MAIN ACHIEVEMENTS

Innovation prize in the Armed Forces 2022 (1st place)

The developed radiation detection system consist on the use of plastic scintillators in combination with silicon photomultiplier sensors for the detection and localization of gamma, beta and neutron sources in Defence and Security applications. The high geometric detection efficiency, low consumption and low cost of this detection system facilitates the reproduction of multiple instances of programmable detection systems aiming at autonomous operations of surveillance/inspection using unmanned vehicles.

This prize was organized for the first time by the General Staff of the Portuguese Armed Forces and it was awarded to: PhD student Major Luís Marques (C²TN collaborator researcher and Portuguese Air Force Academy research center (CIAFA)), Profs. Pedro Vaz (C²TN/IST) and Alberto Vale (IPFN/DEEC/IST) and elements from CIAFA, namely Luís Félix, Gonçalo Cruz, Vasco Coelho, João Caetano.

More information at: [SIC notícias television program](#), [Exame-Informática website](#) and Exame-Informática magazine (n. 330, December 2022).

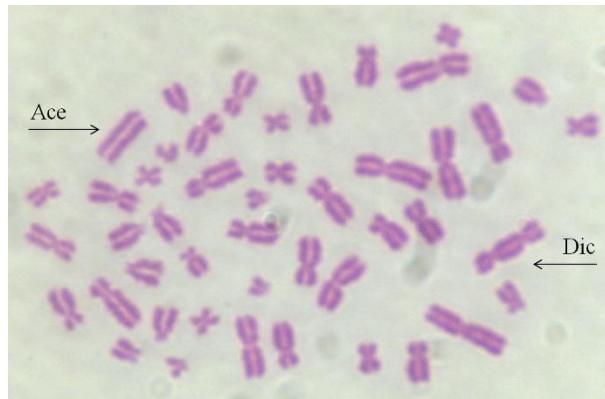


Biological dosimetry methods applied for radiation protection, individual dose reconstruction and emergency preparedness

Biological dosimetry, based on the analysis of dicentric chromosome, provides useful information to assess the biological radiation dose to check suspected or true overexposure, of workers and individuals of the general population. Also, in the event of possible exposure to ionizing radiation due to an accident or an incident, a malicious act involving radioactive material or in a war situation, we need to quickly categorize the possible exposed victims in different groups. Cytogenetic dosimetry is recognized as a valuable method that fills a gap in dosimetry techniques.

Participation in interlaboratory comparisons of simulated real-life exposure scenario are very important and are regularly performed in the frame of the European legal association RENEb (Running the European Network of Biological and Physical retrospective Dosimetry), to optimize international

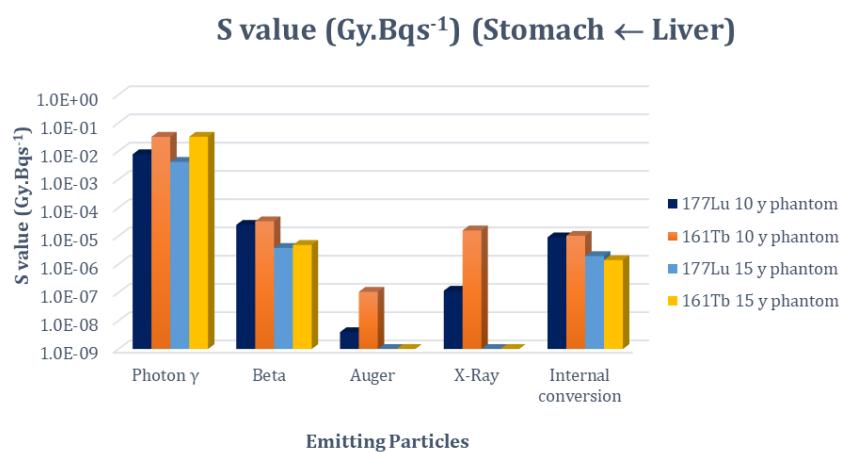
networking for retrospective dosimetry in case of large-scale events. These interlaboratory comparisons are a central tool to validate and improve the performance of methods and laboratories.



Age-dependent dose assessment for ^{177}Lu and ^{161}Tb in paediatric Targeted Radiopharmaceutical Therapy

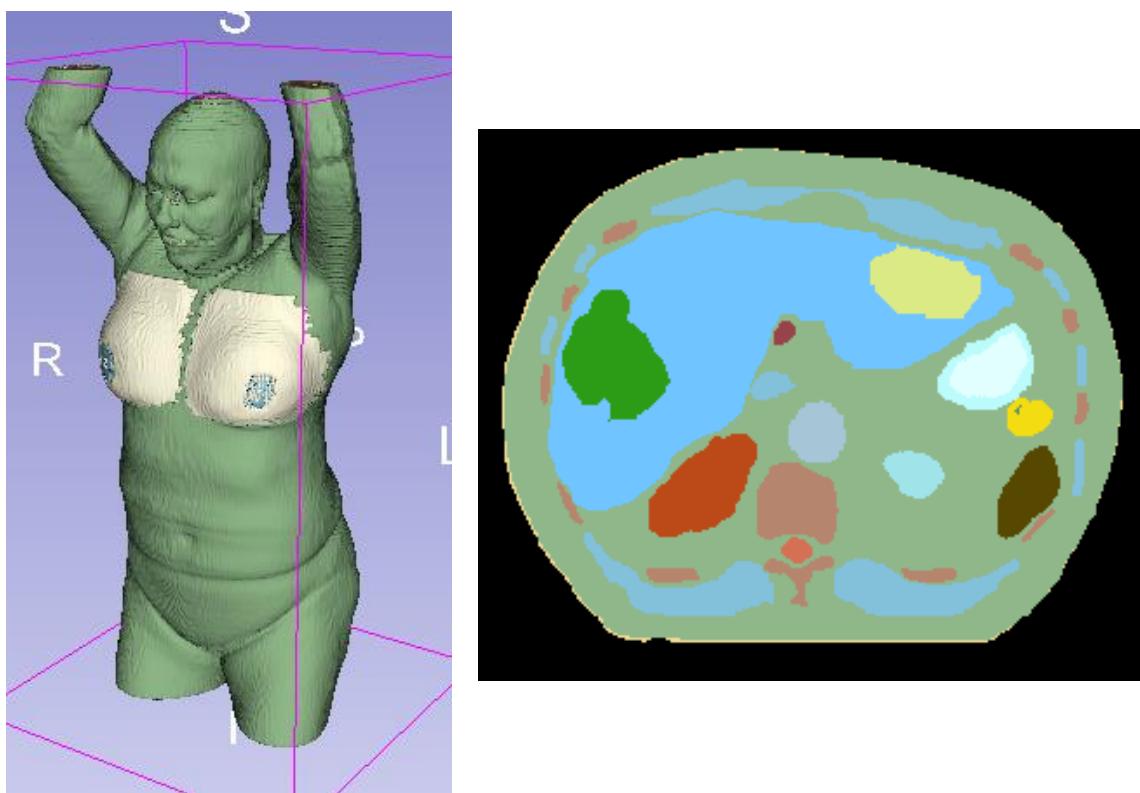
Targeted Radiopharmaceutical Therapy (TRT) is one of the most promising therapeutic techniques in nuclear medicine. Although nowadays TRT has a limited therapeutic role in the management of paediatric cancers, it is envisaged that it could have a major role in the future. The impact of the variable anatomy from different paediatric patients on the organ absorbed doses was evaluated, considering treatment with ^{177}Lu and ^{161}Tb (which also have imaging capabilities). For this purpose, a dosimetric assessment was performed through Monte Carlo (MC) simulations, with the paediatric ICRP reference computational phantoms, namely the 10 and 15 years female phantoms. Dosimetric results highlight the potential benefit of ^{161}Tb . The β - S-value of ^{161}Tb was slightly superior comparatively to ^{177}Lu , in self and cross-irradiation assessment, due to the higher energy emissions, on average, of ^{161}Tb .

In conclusion, ^{161}Tb represents a promising candidate for paediatric TRT, that may lead to a better therapeutic outcome.



Development of voxel phantom from clinical patient images

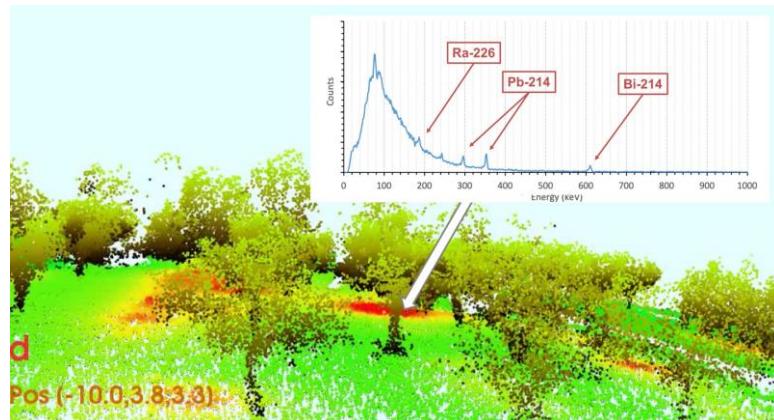
In the frame of Targeted Radiopharmaceutical Therapy (TRT), anatomical and functional images were acquired (i.e. PET/CT and SPECT/CT) and segmented (i.e. delineation of the organs and structures inside the body, including tumor sub-volumes/phenotypes), using a specialized state-of-the-art software (3D-Slicer). Furthermore, a python software was developed, employing a data science framework and libraries, aiming to further analyze the image data and produce the computational phantom able to be used for Monte Carlo (MC) dosimetric calculations. This computational phantom will permit accurate, image-based and patient-specific dosimetry calculations in organs and other substructures of the body, according to the real radiopharmaceutical distribution. Patient-specific dosimetry is essential to: i) minimize radiotoxicity to healthy tissue, improving therapeutic outcome; ii) reliably unify and combine TRT with brachytherapy, external radiotherapy or chemotherapy; iii) mitigate uncertainties in clinical trials, decreasing the amount of time necessary for the approval of novel radiopharmaceuticals.



Fleet of drones for radiological Inspection and rescue (FRIENDS)

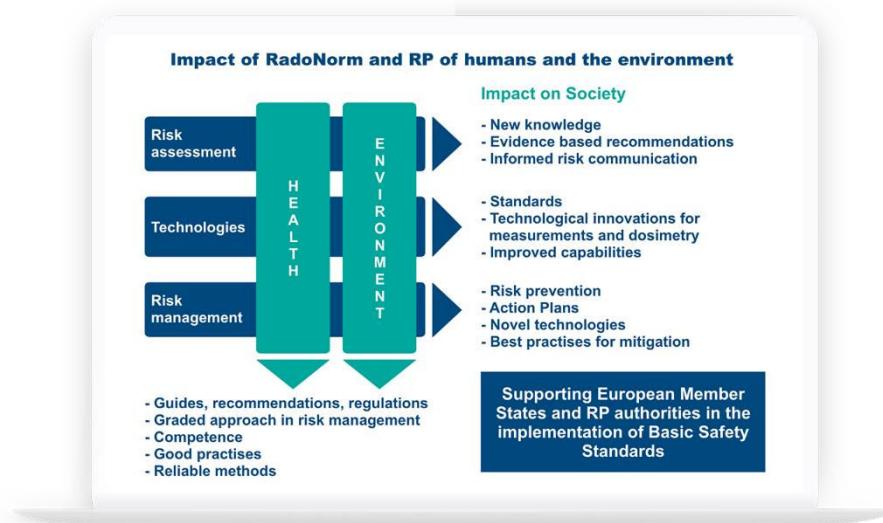
This project (<https://www.ipfn.tecnico.ulisboa.pt/FRIENDS/index.html>) ran from 1/10/2018 to 30/06/2022 and was supported by the FCT, Compete 2020 and Lisboa 2020 under the PORTUGAL 2020 Partnership Agreement, through the European Regional Development Fund (ERDF), with a total funding of 229k€. Initial participant entities were the Association of Instituto Superior Técnico for Research and Development (IST-ID), through its research units IPFN, ISR and C²TN and the Institute of Telecommunications from Aveiro University. During the biennium 2021-2022 the FRIENDS team achieved the main goal of concretizing the proof-of-concept, by demonstrating in the field, the

capability of the drone fleet in producing georeferenced 3D mapping radiological data of terrestrial areas with increased natural radioactivity, related to the existence of uranium mine tailings.



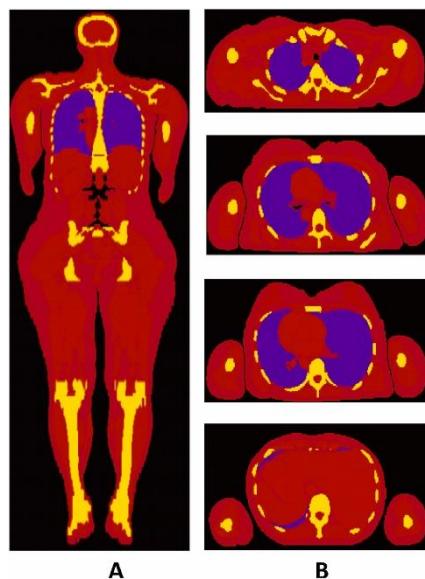
Characterization of the exposure of humans (public and workers) to radon risk

Characterizing exposure is a key step of radon risk management. Within the RadoNorm project, research activities are launched to develop new measurement techniques and protocols to reduce uncertainties in radon measurements, fill gaps of knowledge on factors and processes impacting indoor and outdoor Rn transfer. Task 2.3 of WP2 is mainly focused on exposure to radon in buildings, in order to better estimate the indoor exposure to radon of public and workers by considering the specificity of different types of workplaces. This aims to identify typologies of workplaces where radon concentration behavior is significantly different from that in dwellings and set up workplace type specific measurement protocols for realistic assessment of the exposure of the workers.



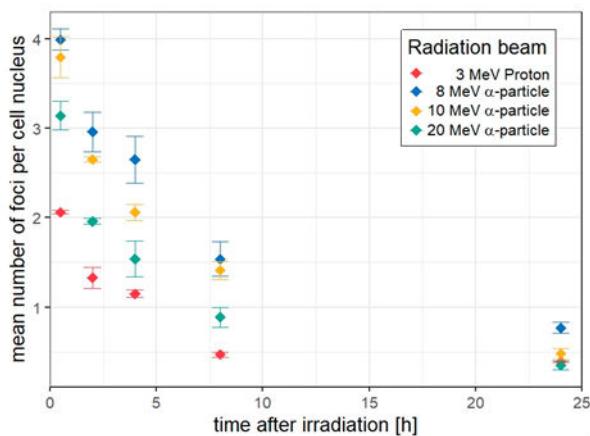
Patients' organ dose and risk assessment in interventional cardiology procedures

Interventional cardiology (IC) procedures can be complex, leading to long exposure times to ionizing radiation (IR) that may cause deterministic effects and an increased risk of stochastic effects. Hence, there is a growing need for studies correlating the patient effective dose and the radiological cancer risk. A female voxel phantom, LAURA, was implemented using a Monte Carlo program, PENELOPE, to assess organ doses per unit kerma-area-product (KAP). The effective doses calculated highlight the importance of accurately assessing the risk of cancer incidence and mortality. Furthermore, for the sake of reducing the risk of stochastic effects, as low as possible, lower peak voltages of the X-ray equipment should be used, as long as the resulting image quality does not jeopardize the clinical result of the intended IC procedure.



Repair kinetics of DSB-foci induced by proton and α -particle microbeams of different energies

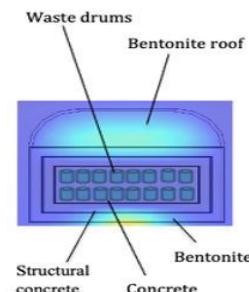
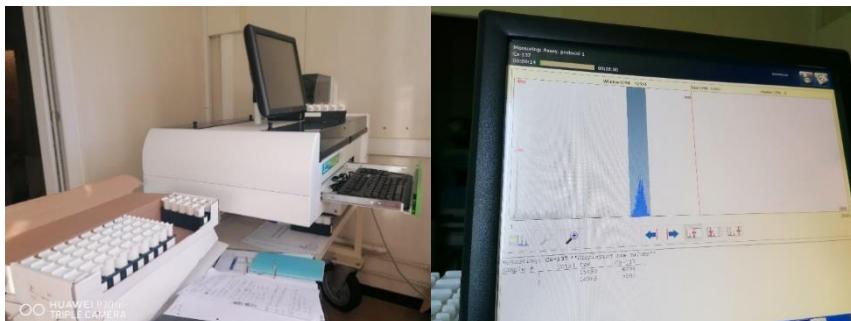
The induction and repair of radiation-induced 53BP1 foci were studied in human umbilical vein endothelial cells irradiated at the PTB microbeam with protons and α -particles of different energies. The data were analyzed in terms of the mean number of 53BP1 foci induced by the different ion beams. The number of 53BP1 foci found at different times post-irradiation suggests that the disappearance of foci follows first order kinetics. The mean number of initially produced foci shows the expected increase with LET. The most interesting finding of this work is that the absolute number of persistent foci increases with LET but not their fraction. Furthermore, protons seem to produce more persistent foci as compared to α -particles of even higher LET. This



may be seen as experimental evidence that protons may be more effective in producing severe DNA lesions and that LET may not be the best suited parameter to characterize radiation quality.

R&D on radwaste management – Project EURAD/ROUTES. ¹³⁷Cs adsorption on clay and COMSOL Multiphysics applications

IST-ID continued its work as Research Entity (RE) in the WP9/ROUTES, “Waste management routes in Europe from cradle to grave”, a strategic study of the EURAD EJP. Three main deliverables were finished while others are in progress: D9.4: Overview of existing work on categorization/classification of RWs in participating states; D9.12: A review of past and present studies and plans for developing shared solutions for radioactive waste management in Europe; D9.5: Overview of issues related to challenging wastes. Study of a selection of best available and new technologies for SIMS’ challenging to improving safety of radwaste storage, predisposal and disposal, have already started. The work with applications of COMSOL Multiphysics to the modelling of LILW disposal, has continued with the collaboration of REI and CERENA. Work was presented in conferences and a paper is being prepared. Previous work on the adsorption/desorption of ¹³⁷Cs in Portuguese clayed materials, is in progress.



Radiation, Elements and Isotopes Group



TEAM

Name	Category	R&D (%)
Fernanda Maria Amaro Margaça	Principal Researcher	100
António Manuel Monge Soares*	Principal Researcher	50
António Nazareth Falcão*	Principal Researcher	20
Maria de Fátima Duarte Araújo	Principal Researcher	100
Paula Maria Mimo Carreira Paquete	Principal Researcher	90
Luís Manuel Cerqueira Alves	Auxiliary Researcher	70
Luís Miguel Mota Ferreira	Auxiliary Researcher	100
Pedro Manuel Francisco Valério	Auxiliary Researcher	90
Sandra Cabo Verde	Auxiliary Researcher	100
Victoria Corregidor	Auxiliary Researcher	100
Maria Helena Casimiro	Researcher DL 57	100
Pedro M. Cunha Catalão P. Santos	Researcher DL 57 IST	100
Susana Sousa Gomes	PhD (2021-Mar 2022) Researcher CEEC (Since May 2022)	100 100
Dina André	Graduated Technician	100
António Amaro	Senior Technician	100
Helena Marcos	Senior Technician	100
Manuela Correia	Senior Technician	100
Rute Pinheiro	Senior Technician	100
Ana Monteiro	PhD Student (teacher ESTeSL)	collaborator
Joana Madureira	PhD Student	100
Salma Barkaoui	PhD Student	50
Paula Alexandra Rodrigues	PhD Student	50
Rute Flávia Chaves	PhD Student	50
Rita Mariana Atanásio de Carvalho	Master Student	50
Bárbara Pinheiro	Master Student	100
Catarina Neves	Master Student	100
Miguel Furtado	Master Student	50
Cláudia Dias	Master Student	50

*Retired

MISSION AND OBJECTIVES

REI Group is an interdisciplinary group with expertise on nuclear related analytical techniques and ionizing radiation dedicated to R&D on Environmental Processes, Cultural Heritage & Materials Processing.

The group operates an Ionizing Radiation Facility with gamma and e-beam sources, laboratory facilities and equipment to perform: elemental, isotopic and tritium determinations and radiocarbon dating; microbiological and chemical analysis of radiation effects in products; and MeV ion microbeam analytical techniques.

Research on Environmental Processes focus on the ionizing radiation effects on the degradation and extractability of industrial wastes' pollutants, to develop strategies to remediate their environmental impact or promote its reuse. Inactivation mechanisms of water and food-borne virus and bacteria by ionizing radiation is studied to improve effective disinfection processes. Water resources management studies to evaluate the impact of groundwater over exploitation in coastal areas in Portugal and semi-arid and arid coastal regions in Africa. Anthropogenic impacts, pollutant sources of materials on diverse environments (aerosols, sediments, soils, plants and waters) and climatic patterns investigations based on elemental and isotopic compositions and radiocarbon dating.

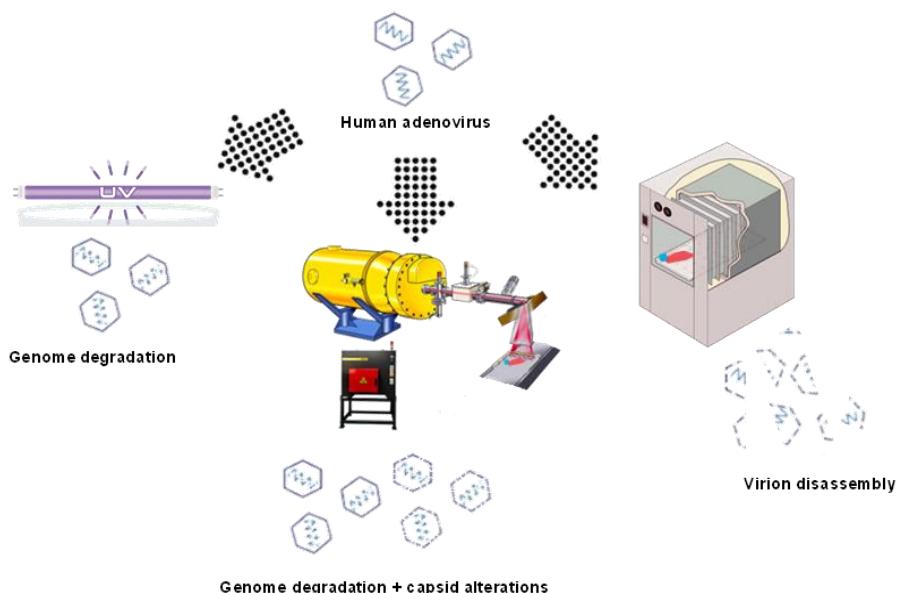
Research on Cultural Heritage aims to assess sources, production technologies and circulation of ancient raw materials and artefacts (metals, glazes and glasses) from Prehistory to Early Modern Period from all over the Portuguese territory. Collections are characterized by elemental, isotopic and structural microanalytical techniques to establish raw materials origin, the chronological evolution of different matrices and the operations applied in the manufacture of artefacts of distinct types.

Research on Materials Processing focuses on macromolecular materials using ionizing radiation for processing or modification, to obtain new properties optimized for biomedical applications (e.g. skin scaffolds) and conservation of cultural artefacts (roman mosaics).

MAIN ACHIEVEMENTS

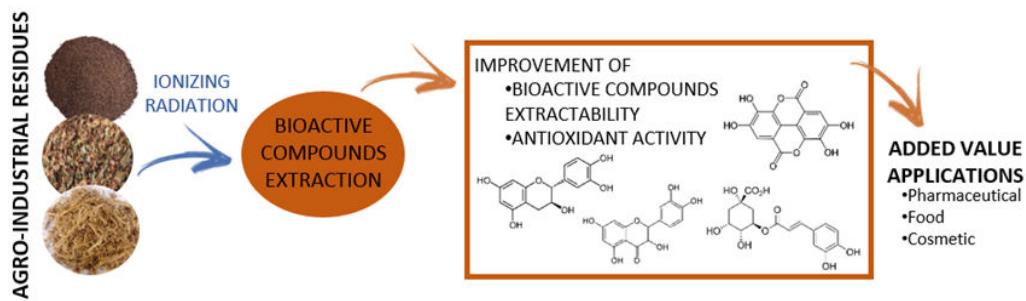
Inactivation mechanisms of human adenovirus by e-beam irradiation in water environments

Adenoviruses may survive extended periods outside host cells, resisting to physical and chemical agents. This study aimed to study the kinetics and mechanisms of human adenovirus inactivation by electron beam as an alternative treatment. The e-beam irradiation demonstrated virucidal action against the human adenovirus HAdV-5 with an inactivation efficiency of 99.99% (4 Log titre reduction) at a dose of 13 kGy, comparing to a 99% efficiency of UV radiation (used as tertiary treatment in wastewater treatment plants). Regarding the inactivation mechanism/s of human adenovirus by e-beam irradiation, it was proposed an additive effect of genome and capsid protein degradation. Overall, e-beam may be an effective tool to guarantee the reduction of waterborne viral pathogens and to contribute to public health and sustainable water supplies.



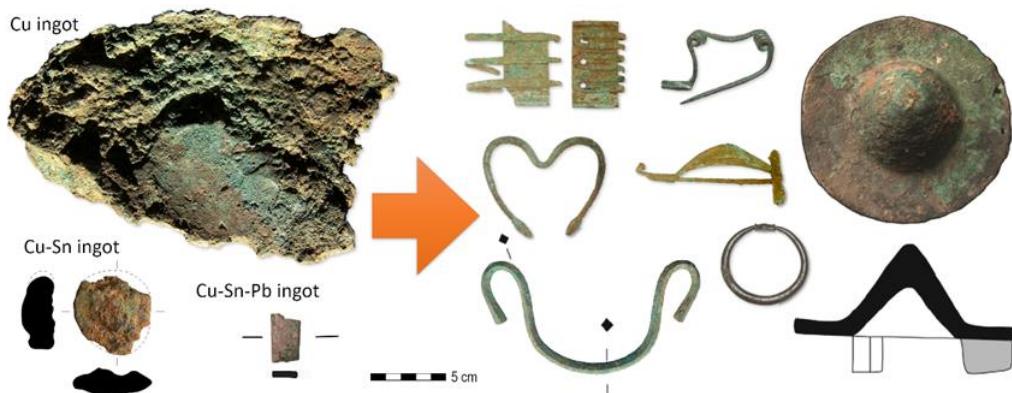
Applications of bioactive compounds extracted from olive industry wastes

The wastes generated during the olive oil extraction process, even if presenting a negative impact for the environment, contain several bioactive compounds that have considerable health benefits. After suitable extraction and purification, these compounds can be used as food antioxidants or as active ingredients in nutraceutical and cosmetic products due to their interesting technological and pharmaceutical properties. Hydroxytyrosol, tyrosol, oleuropein, oleuropein aglycone, and verbascoside are the most abundant bioactive compounds present in olive pomace. Besides their antioxidant activity, these compounds also demonstrated other biological properties such as antimicrobial, anticancer, or anti-inflammatory, thus being used in formulations to produce pharmaceutical and cosmetic products or in the fortification of food. Nevertheless, it is mandatory to involve both industries and researchers to create strategies to valorize these byproducts while maintaining environmental sustainability.



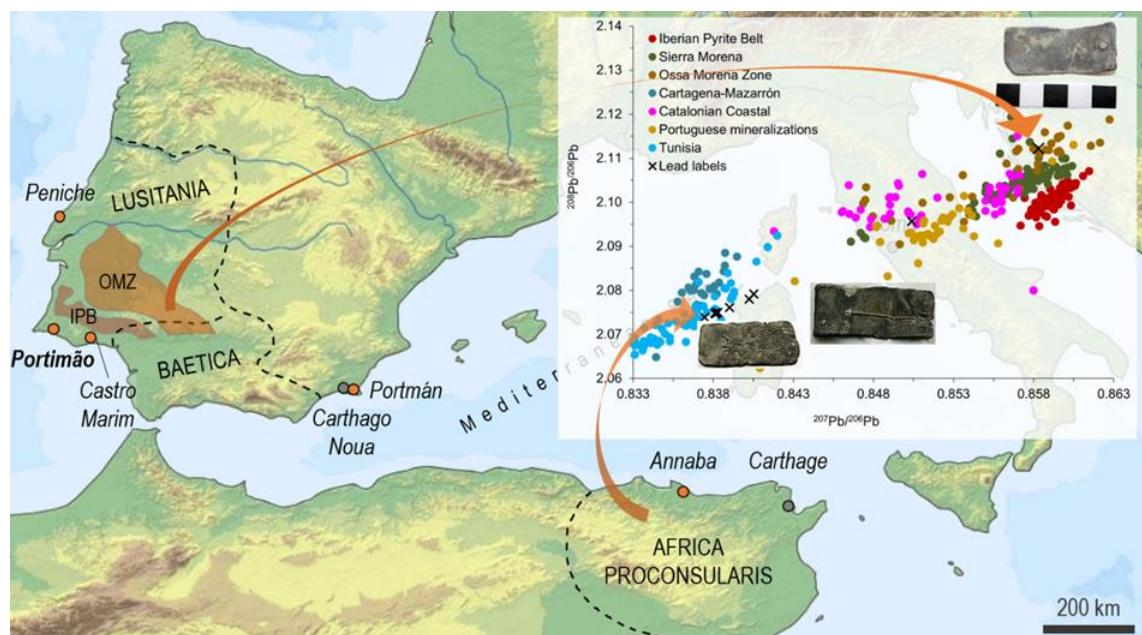
From ingots to artefacts: the Iron Age bronze metallurgy in southern Portugal

The elemental and microstructural characterisation of metal debris (ingots, lumps and small prills) and artefacts (ornaments, tools and weapons) from the 6-5th century BC monumental building of Cabeço Redondo disclosed different activities, such as the alloying of bronze and the casting of copper, bronze and, perhaps, leaded bronze artefacts. Moreover, a huge copper ingot likely produced in a slag tapping furnace evidenced the importation of copper from outside the Iberian Peninsula. Apart from some copper examples, artefacts mainly showed low-tin bronze and leaded bronze. Moreover, the manufacture of copper and bronze artefacts included hammering and annealing, while leaded bronzes were usually left as-cast. Additionally, funerary items of 7-6th century BC necropolises of Esfola and Monte do Bolor 1/2 corroborated the preference for low-tin bronze, while only a handful was perceived as having a distinct colour, showing that the use of different compositions for colouring reasons was uncommon during this period.



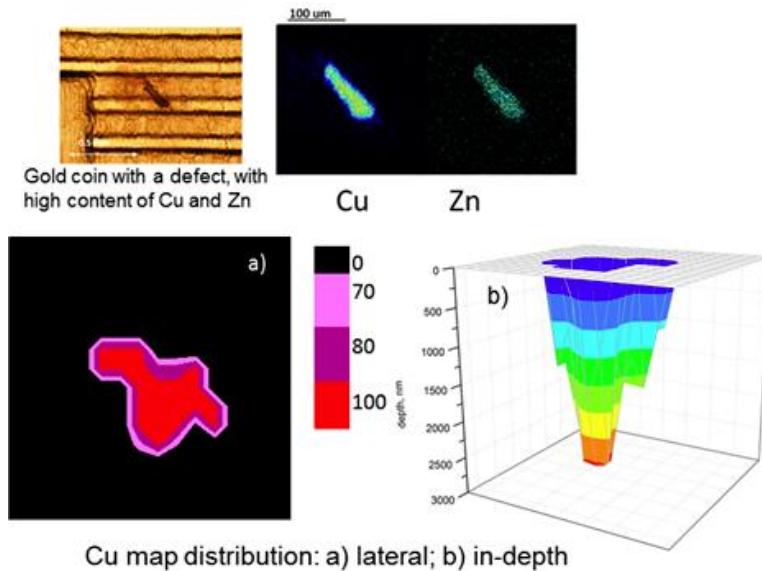
Provenance studies on Roman lead labels recovered at the Arade River, Portimão (Portugal)

Pb isotope ratios and minor and trace elements content of lead labels together with typological studies allow to establish trade fluxes and cultural exchanges during the Late Roman Empire. Artefacts were uncovered by dredging works at the Arade Estuary in Portimão (Lusitania province), a city with a high commercial activity evidenced by several fish-processing factories. Among different artefacts, a set of rectangular plaques with decorations in relief such as tridents and fishes, an iconography usually displayed in labels of amphora handles. Additionally, there were small plaques with one perforation and incised Roman numerals, probably related with textile products. Elemental characterisation indicates different raw materials, namely lead obtained by the reduction of litharge or the smelting of non-argentiferous galena. Pb isotope signatures pointed to long distance trade with Africa Proconsularis, nowadays Tunisia (North Africa). However, plaques with Roman numerals (Ossa Morena Zone) suggested a trade of textile products within the Iberian Peninsula.



Artificial neural networks and ion beams for 3D imaging

The nuclear microprobe (NM) together with Ion Beam Analysis (IBA) techniques allows obtaining 2D elemental distribution maps, also providing elemental depth profile along the ion path. Typically, each scanned area by the NM is acquired as a 256x256 pixel map, each pixel containing all the IBA spectra recorded during the experiment. To analyze each spectrum the use of artificial neural networks (ANNs), once trained, can be very important because they can handle the analysis of large data sets instantaneously. From the results obtained, it is possible to visualize the composition variations in a 3D environment as shown in the figure below, where it is possible to visualize a copper inclusion in a gold matrix from results obtained using ANNs.



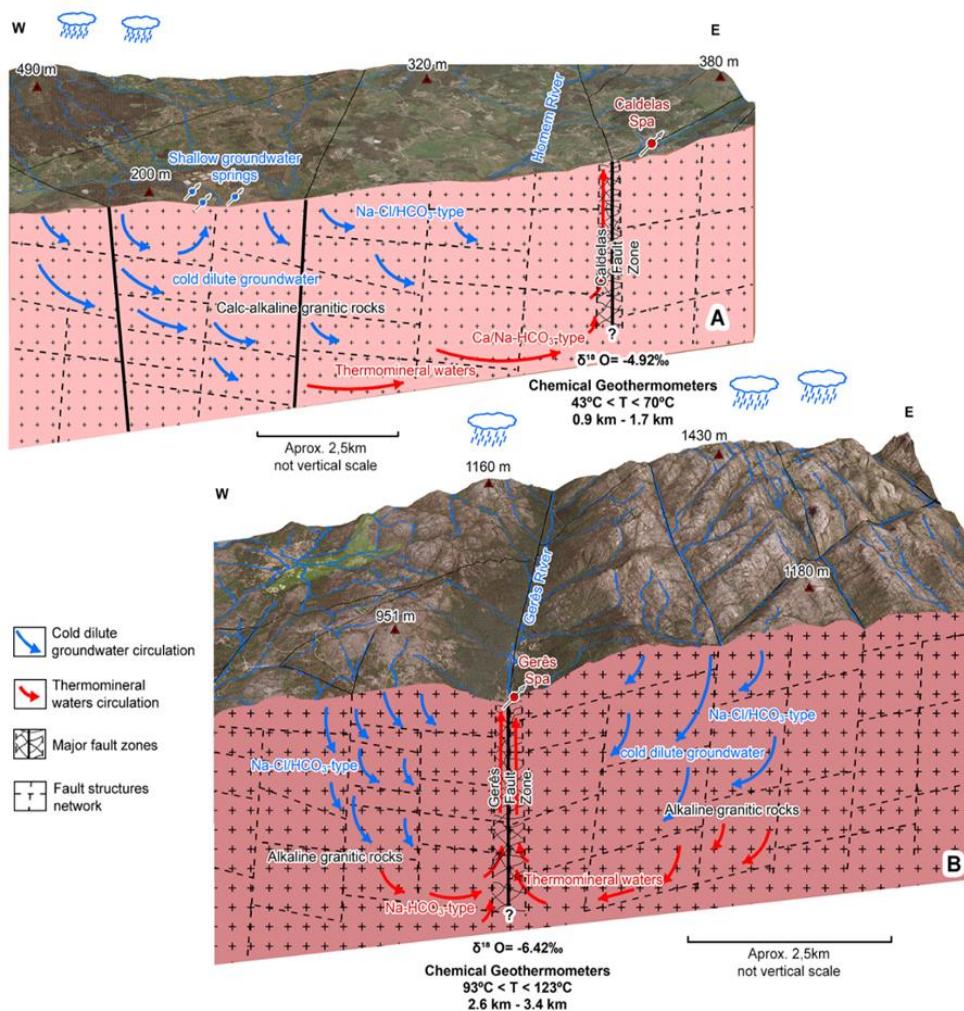
Composition studies of cultural heritage objects

Knowing the composition of cultural heritage objects is critical for their preservation, authentication, restoration, research, and exhibition. This knowledge is vital in ensuring that these objects are protected and can continue to be appreciated and studied for generations to come. In this sense, and through collaboration with different Museums and Universities multiple objects made of different type of materials were characterized by means of PIXE and XRF techniques to know the composition. In some cases, very well known samples were characterized and considered as standards in order to trace the provenance of the objects. Examples of materials characterized are cannel coal, jet, golden silver salvers, stained glass or grisaille.



Isotopes as a diagnostic tool in water resources management and protection

Water quantity and water quality are two fundamental issues in terms of water resources protection and management, particularly in regions where climate change is restraining the renewal of surface and groundwater systems. Environmental isotopes can provide vital information in the characterization of these resources, namely in the access of freshwater as one of the United Nations Sustainable Development Goals, under the population growth acceleration, the changes in the land-use and fertilizers load, all these factors are contributing to an increase of water demand. The impact in the groundwater systems was investigated in different regions in Portugal namely in Serra da Estrela Natural Park, S. Pedro do Sul and in Caldelas – Gerês hydromineral systems. Results obtained in Serra da Estrela point out to: (i) the contribution of de-icing to the groundwater systems and alpine ponds (ii) contribution of the shallow groundwater flow towards the alpine ponds. At S. Pedro do Sul hydromineral aquifer, the isotopic composition put the preferential recharge area located around 1000 m a.s.l (Freita /Arada mountains), with a mean maximum circulation around 3.18 km. In Caldelas – Gerês hydromineral aquifers the isotopic signatures indicate different preferential recharge altitude, and different mean residence time based on the ³H content.

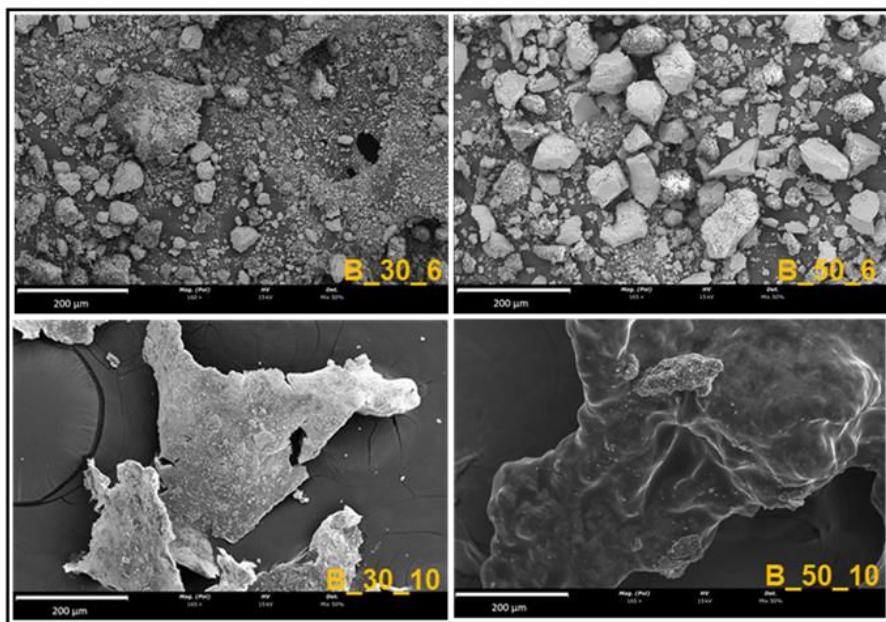


Nano-magnetic bioadsorbents for recovery of REEs, prepared through γ -irradiation assisted by ionic liquids (IL)

The increasing use of Rare earth elements (REEs) resulted in an increase in environmental discharges receiving widespread attention as important pollutants. Despite these concerns, REEs are also becoming a geopolitical issue attending to the fact that a unique country (China) controls near 90% of the total market of REEs used in high-tech manufacturing.

Efforts are being made to integrate magnetic nano-particles (MNPs) in natural polymers through gamma-irradiation assisted by ILs, for the preparation of effective nano-magnetic bioadsorbents for recovery of REEs mainly from industrial and mining waste waters. The use of materials with magnetic properties makes the process of removing the adsorbents from the liquid medium an easy task without great added costs, by dragging them with the aid of a magnet.

Chitosan, magnetite (Fe_3O_4) and the IL 1-butyl-3-methylimidazolium acetate ([BMIM][Ac]) are being used as precursors for preparation of the nano-magnetic bioadsorbents by gamma irradiation at doses of 6 kGy and 10 kGy using a dose rate of 0.5 kGy.h⁻¹.



Materials prepared showed to be stable and presenting good recovery rates, mainly for Europium ($23.5 \pm 5.5\%$) and Yttrium ($20.4 \pm 1.6\%$) as so for the *brilliant green dye* ($17.5 \pm 7.5\%$), a high hazardous pollutant of freshwater resources. These results have an added importance if it is considered that it was a first attempt in the preparation of this type of materials, highlighting the important role of IL-assisted irradiation processes for the preparation of sensitive and high performance materials.

Nuclear Engineering and Techniques Group



TEAM

Name	Category	R&D (%)
Maria Isabel Dias	Coordinator Researcher	55
José Marques	Coordinator Researcher	30
Maria Isabel Prudêncio	Coordinator Researcher	80
Marta Almeida	Principal Researcher	70
Ulrich Wahl	Principal Researcher (with Habilitation)	100
Nuno Barradas	Principal Researcher (with Habilitation)	10
João Guilherme Martins Correia	Principal Researcher	100
José Antunes	Principal Researcher	90
Andreas Kling	Auxiliary Researcher (with Habilitation)	30
Miguel A. Reis	Auxiliary Researcher (with Habilitation)	100
Augusto D. Oliveira	Auxiliary Researcher	30
João Henrique Garcia Alves	Auxiliary Researcher	30
Rosa Marques	Auxiliary Researcher	90
Miguel Felizardo	Auxiliary Researcher (Invited)	30
Raquel Crespo	Auxiliary Professor (with Habilitation)	60
Ana Cristina Fernandes	Research Contract	100
Joana Lage	Researcher	100
Nuno Canha	Researcher	100
Paula Cristina Chaves	Researcher	100
Vânia Martins	Researcher	100
Tomoko Morlat	Researcher	100
Ana Luísa Rodrigues	Post-Doc (FCT)	100
Javier García Rivas	Post-Doc (IST-ID)	50 ¹
Dulce Russo Franco	Graduated Technician	100
Joana Pinto dos Santos	Graduated Technician	50
Luis Belot Fernandes	Graduated Technician	100
Carolina Correia	PhD Student	100
Eric Bosne	PhD Student	50
Estela Vicente	PhD Student	40
Inês Cunha Lopes	PhD Student	100
Tiago Faria	PhD Student	100
Vitor Manteigas	PhD Student	50
Filipe Soares	PhD Student (IST)	100
Andrés Cardenas	PhD Student (IST)	100
Cynthia Obregón	PhD Student (IST)	100
Chaima Boussellaa	PhD Student (ENIS, Tunisia)	50

Vincent Debut	External researcher	50
Carla Gamelas	Coordinator Professor (IPSetúbal)	50
Afonso Lamelas	Master Student	100
Ana Rita Justino	Master Student	100
Bernardo Matroca	Master Student	100
Filipa Garcia	Master Student	100
Flávia Ferreira	Master Student	100
Gonçalo Batalha	Master Student	100
João Ascenção	Master Student	100
João Correia	Master Student	100
Marco Dionisi	Master Student	100
Maria Leonor Abecassis	Master Student	100
Rita Carvalho	Master Student	100
Teresa Batista	Master Student	100

¹ The remaining 50% with the RPS Group at C²TN

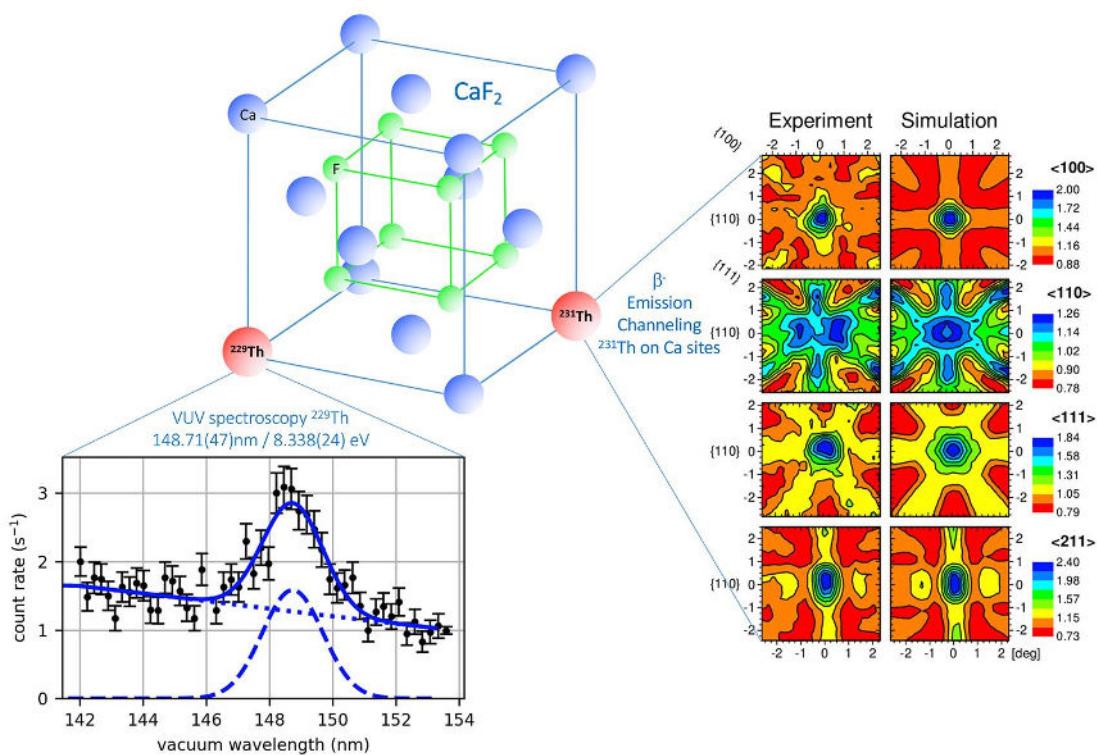
MISSION AND OBJECTIVES

The NET group is a multidisciplinary team that investigates the applications of nuclear and related techniques in a wide range of scientific fields. The group play a crucial role in nuclear physics, engineering, and nuclear analytical techniques. The group operates an experimental infrastructure at ISOLDE-CERN that uses short-lived isotopes, and has access to other international laboratories such as GSI, GANIL, RIKEN, and BNC for complementary activities. The group focus on understanding nuclear interactions through neutron diffraction, PGAA, and other specialized techniques, including gamma and alpha spectroscopy, ion-beam based techniques, particle-induced X-ray emission, and X-ray diffraction. Additionally, the group conducts research on vibratory modeling, acoustic behavior, and neutron transport simulation via the Monte Carlo method. The group also makes significant contributions to radiobiology, dosimetry, software development, and instrumental speciation methods, mainly for PIXE. Furthermore, we also study earth sciences, geo/bio-environmental and cultural heritage fields using neutrons, radioactive nuclei, ion beams, and luminescence dating techniques. NET is also involved in research on low activity samples of long-lived isotopes, air pollution assessment, and the transition to a low carbon economy. NET is committed to education and training and offers several PhD and MSc programs. Our research is aimed at benefiting society and we work closely with industry, public and private entities, hospitals, schools, museums, municipalities, and other C²TN groups to contribute to policy-making at various levels of scientific intervention.

MAIN ACHIEVEMENTS

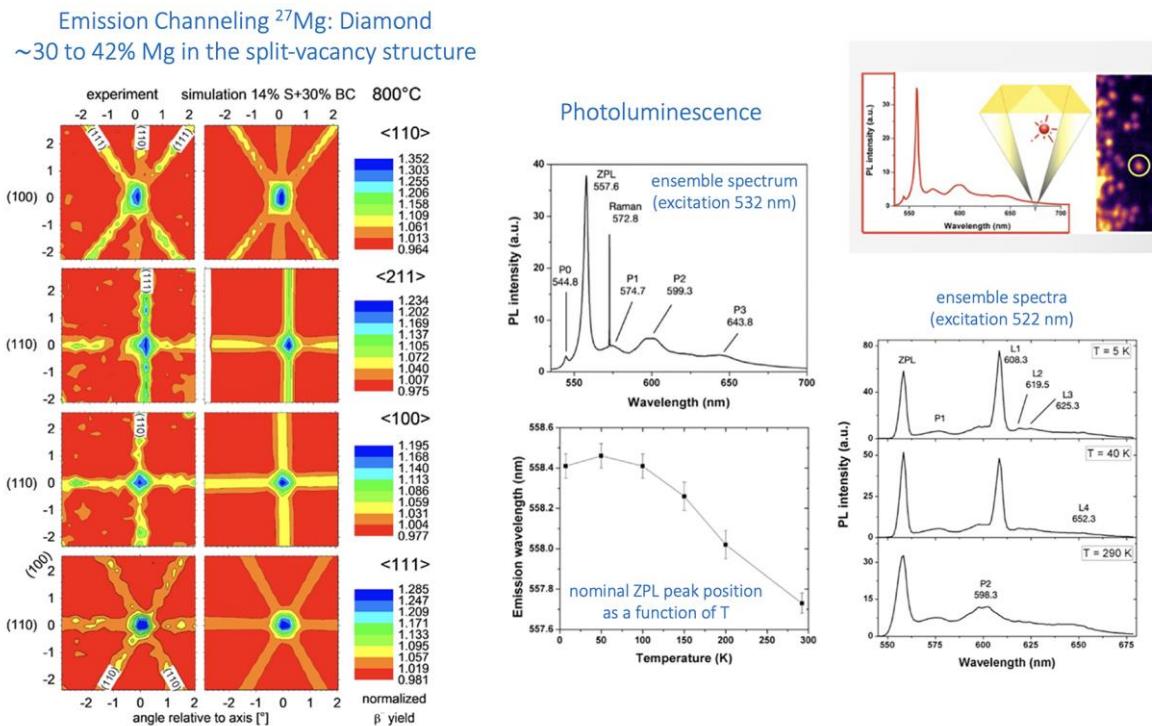
Observation of the radiative decay of the ^{229}Th nuclear clock isomer

^{229}Th has a unique isomer with exceptionally low excitation energy, proposed as a candidate for future nuclear clocks outperforming the accuracy of current atomic clocks by an order of magnitude. The development of a nuclear clock requires knowledge of the isomer excitation energy at least an order of magnitude more precise than previously achieved by spectroscopic experiments. We used ^{229}Fr , ^{229}Ra and ^{229}Ac precursor isotopes produced online at the ISOLDE facility and implanted into large band-gap crystals to suppress the electron conversion decay channel of the $^{229\text{m}}\text{Th}$ isomer. In 2021 a setup developed at KU Leuven performed vacuum-ultraviolet spectroscopy of the emitted photons after implantation of mass 229 into CaF_2 and MgF_2 . In parallel, emission channeling lattice site studies of ^{229}Ac and ^{231}Th were performed on the same type of samples at the EC-SLI setup. The combined results were conclusive, and a publication has been accepted by [Nature](#).



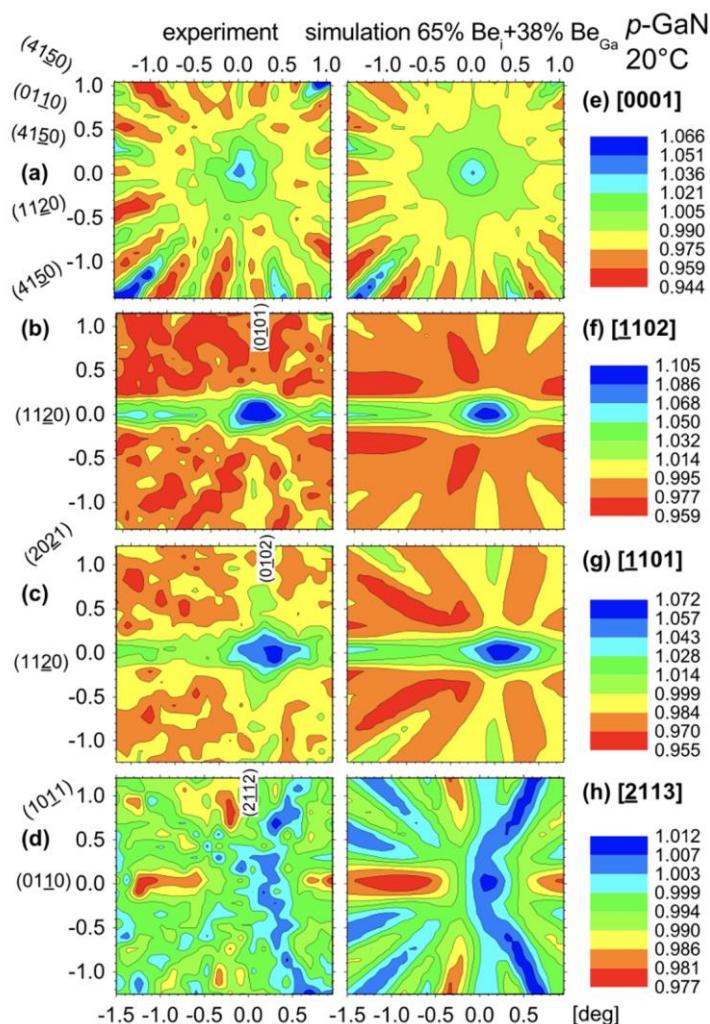
Magnesium-vacancy optical centers in diamond

We published the first systematic characterization of structural and photoluminescence properties of optically active MgV centers fabricated upon implantation of 30–100 keV Mg⁺ ions in synthetic diamond. The structural configurations of Mg-related defects were studied by electron emission channeling with short-lived, radioactive ²⁷Mg implanted at the ISOLDE facility that allowed identifying a major fraction of Mg atoms (~30 to 42%) in the split-vacancy structure of the MgV complex in diamond, with only a smaller fraction (~13 to 17%) on substitutional sites. The photoluminescence emission was investigated in the 5–300 K temperature range, offering a detailed picture of the MgV-related emission properties, and revealing previously unreported spectral features. The optical excitability of the MgV center was also studied as a function of wavelength to identify optimal conditions for photostable and intense emission, with appealing perspectives for utilization of the tunable properties of the MgV center for quantum information processing applications.



Direct evidence of Be as an amphoteric dopant in GaN

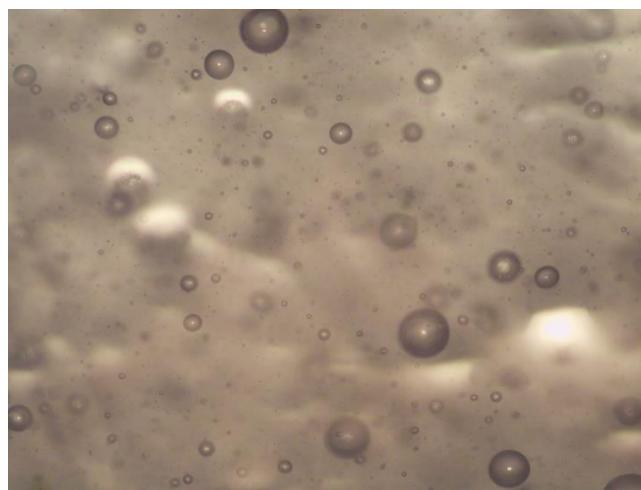
The interest in the Be-impurity in GaN stems from the challenge to understand why GaN can be doped *p*-type with Mg, but not with Be. While theory has predicted a shallower acceptor level for Be than for Mg, it was also argued that Be is not a suitable acceptor because of its amphoteric nature, i.e., its tendency to occupy substitutional Ga and interstitial sites. Using the emission channeling technique at the ISOLDE facility, we studied the lattice location of ¹¹Be ($t_{1/2}=13.8$ s) in different doping types of GaN as a function of implantation temperature. The room temperature interstitial fraction of ¹¹Be was correlated with the GaN doping type, being highest (~80%) in *p*-type and lowest in *n*-GaN, thus giving direct evidence for the amphoteric character of Be with generally much higher interstitial ¹¹Be fractions than for Mg, which confirms that, indeed, self-compensation should be significantly more pronounced for Be.



Alpha spectroscopy with superheated droplet detectors

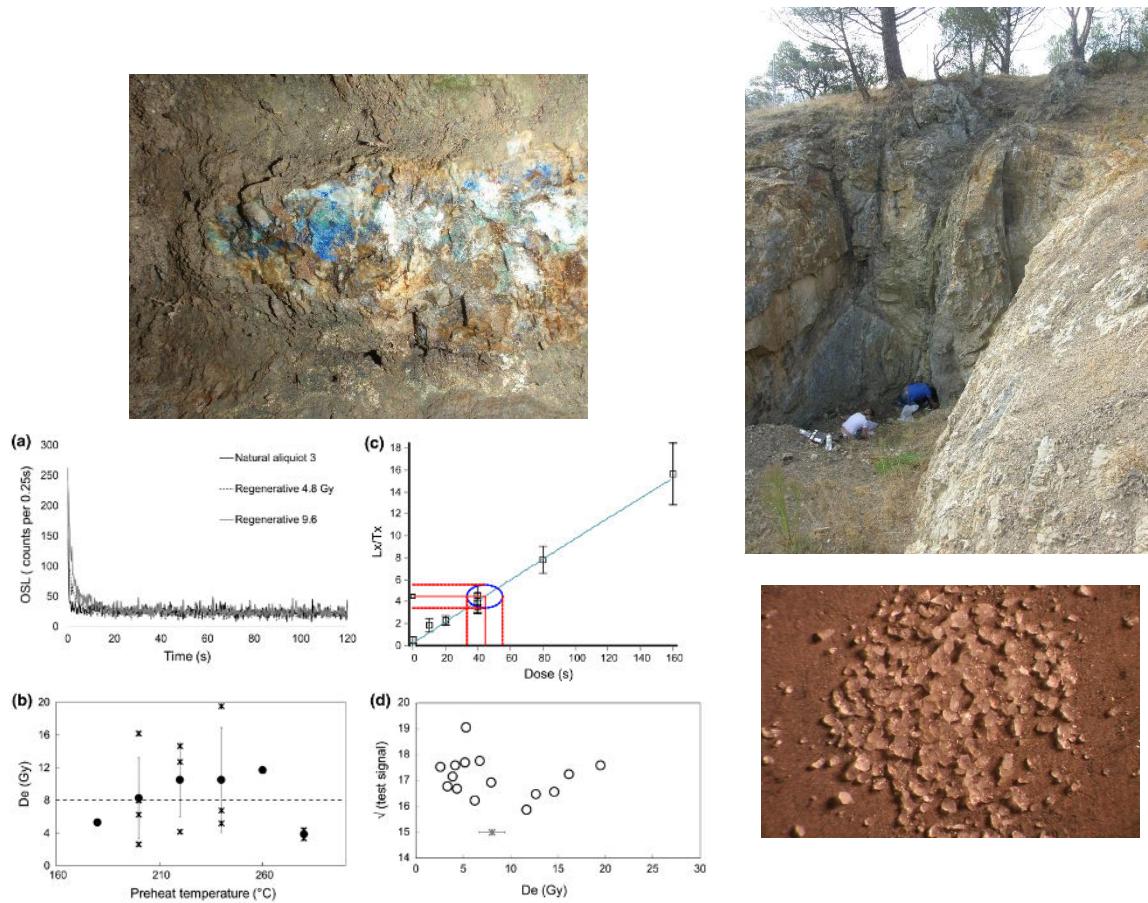
Superheated Emulsion Detectors (SED) consist essentially of millions of micrometer-sized droplets in a superheated state embedded inside a gel matrix. Particles with an energy and a linear energy transfer above a certain critical limit passing through a droplet cause it to evaporate and grow into a gas bubble. The acoustic signal that accompanies the explosive growth of the bubble can be detected with a microphone. Further, acoustic signals arising from alpha-particles and nuclear recoils caused by fast neutron scattering can be distinguished.

For the first time, it was demonstrated that SEDs have the capacity to be used in α -spectroscopy of liquid sources with very low activities. Experimental data for three different Th radionuclides with α energies ranging from 4 to 6 MeV could be clearly distinguished by ramping up the operational temperature of the SEDs.



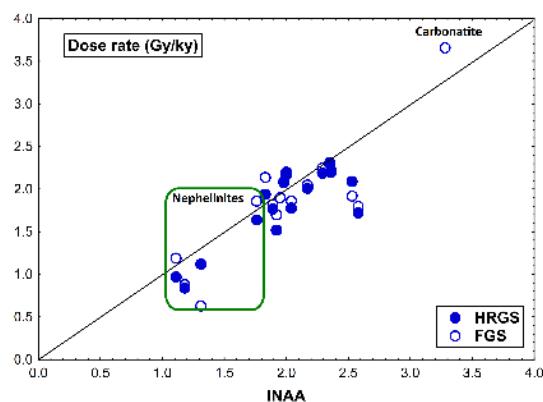
Luminescence and compositional studies for the identification of “fire-setting” features at prehistoric mine la turquesa (Catalonia, Spain)

Modern mining activities often lead to destruction of archaeological records, making it difficult to date the contexts and tools. In this work, a prehistoric mine with “fire-setting” techniques evidences was used to demonstrate the relevance of luminescence protocols to identify and date ancient mining activities. Chemical and mineralogical studies complemented dosimetric studies by means of luminescence protocols. One of the samples showed lower absorbed dose suggesting heating procedures, like “fire-setting” and its luminescence age, determined by SAROSL, pointed to copper exploitation during the Middle/Late Bronze Age at La Turquesa mine, in accordance with archaeological records.



Evaluation of naturally occurring radionuclides (K, Th and U) in volcanic soils from Fogo Island, Cape Verde

Natural radionuclides K, Th and U were evaluated for the first time on volcanic soils of Fogo Island (Cape Verde) aiming to contribute for the characterization of the background concentration of radiogenic elements in these soils, assessing radiation risk, and allowing accurate chronological luminescence studies. Potassium and particularly U appear to be more mobilized in the older soils, with a high radon loss when compared to recent ones. External dose rate varies between 0.97 and 3.47 Gy/y. The results obtained in this work are a benchmark for further studies, particularly for the evaluation of modifications due to the 2014–2015 volcanic episode on Fogo Island.



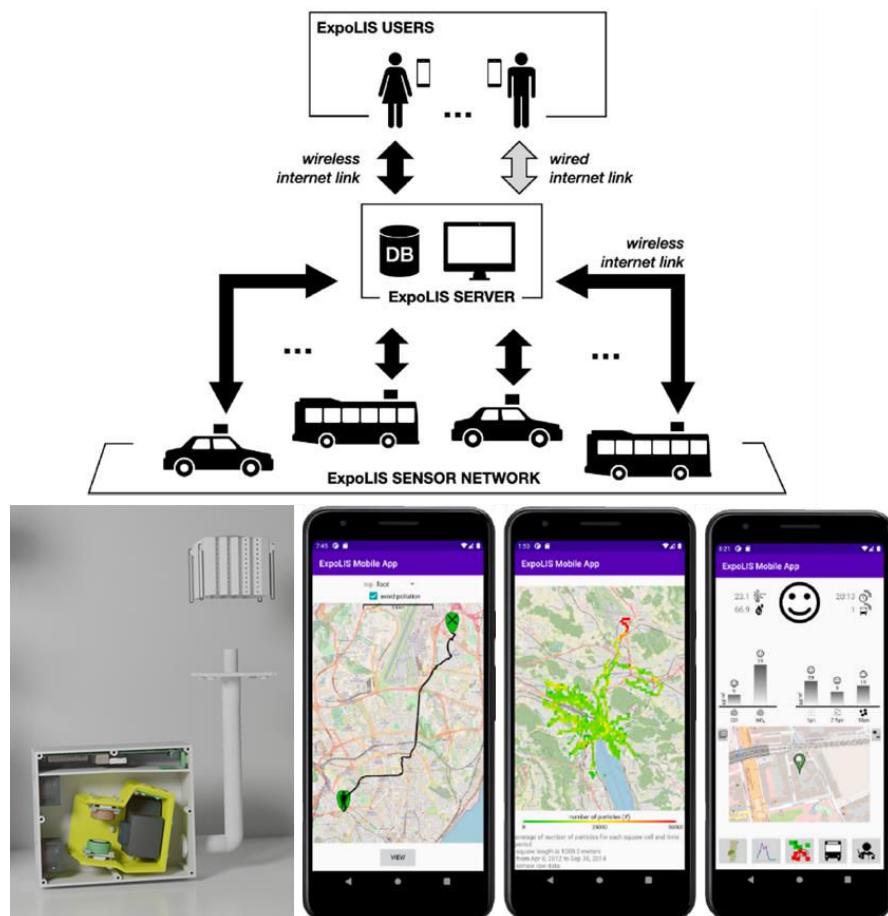
The integrated exposure of citizens to air pollutants – strategies to minimize the impacts of air pollution

Understanding the anthropogenic pollution sources affecting human exposure is a strategy to provide reliable information for policy makers to promote measures to mitigate those sources and minimize their impact upon human health, on the environment and on climate change. ETN has developed and implemented several national and international research projects targeting those goals. From assessing the daily integrated exposure of children to PM_{2.5} and design of a management tool for reduction of particulate matter in air (LIFE Index-Air) to assessing the exposure in specific micro-environments, such as schools (Horizon Europe InChildHealth and Interreg Sudoe 3SqAir), hospitals (Interreg Hospital Sudoe 4.0) and bedrooms (FCT HypnosAir), to the design of new strategies to evaluate the exposure when commuting (FCT Expolis) or assessing outdoor sources (IAEA), the work developed has provided valuable new inputs to improve the assessment of the citizens' exposure to air pollutants and to identify the best strategies to minimize it. Simultaneously, a strong effort on promoting the implementation of measures to tackle climate change has been done throughout the projects ECF4CLIM (H2020), targeting the scholar population and behavior change, and Loures PAB_LivingLab (EEA Grants), that created a living lab on an urban park to show the possible strategies to promote decarbonization and, therefore, mitigation of climate change.



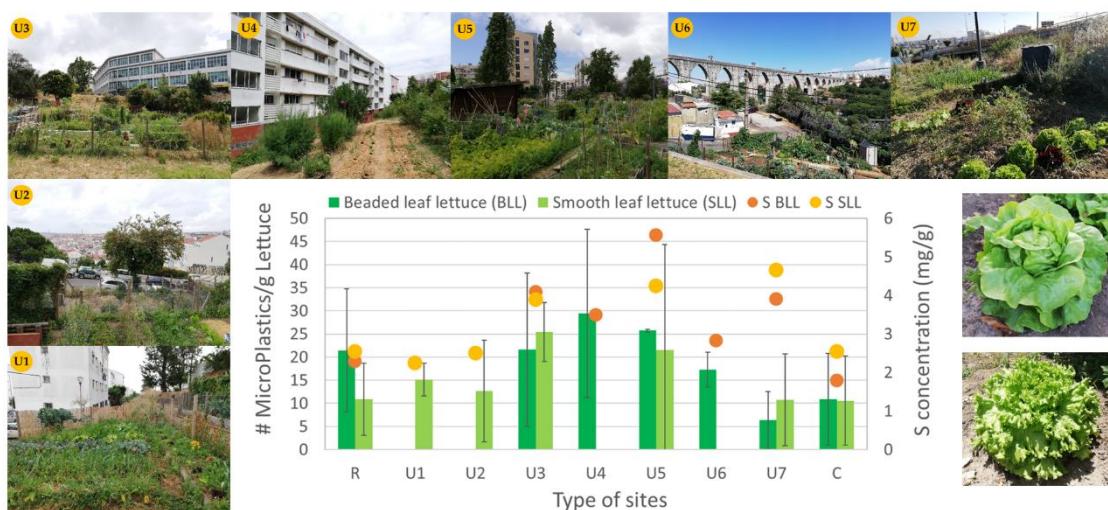
Assessment of human exposure to air pollution to change the way people move in cities

Citizens spend a considerable amount of time commuting. Depending on air pollutant and mode of travel, the exposure while commuting may constitute a substantial fraction of the daily exposure. Our research showed that the exposure to particles of Fe is particularly important in metro, derived from abrasion of rail-wheel-brake interfaces, while enhanced exposure to Zn and Cu is observed in cars and buses due to brake and tyre wear particles. ExpoLIS project developed an air quality exposure sensing system, composed by a network of sensor nodes to be deployed on transports to obtain the real-time air pollution distribution in urban areas and provide a health-optimal routing service to the citizens of Lisbon. The project took advantage of concepts like big data analytics and IoT, and was a step forward into the smart city ideology.

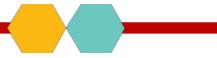


Atmospheric contamination on lettuces produced in Lisbon urban vegetable gardens

Urban vegetable gardens are very often cities' features that target to provide to their citizens a more sustainable lifestyle, by producing their own food products. However, cities may have considerable pollution levels (or hot spots of pollution) due to specific pollution sources, such as traffic. Moreover, the consumption of such products, if contaminated, may contribute to increase the human exposure to those contaminants due to the dietary uptake and, consequently, to promote a human health impact. To understand the level of contamination by air pollution on the lettuces produce in Lisbon urban vegetable gardens, sampling of lettuces and soil was done in seven vegetable urban gardens of Lisbon. The chemical characterization of all samples was conducted by Particle Induced X-Ray Emission (PIXE), in a collaboration with the REI research group. Contamination levels of microplastics in lettuce leaves were also assumed, in collaboration with the University of Sienna (Italy).



Solid State Group



TEAM

Name	Category	R&D (%)
Manuel Almeida*	Coordinator Researcher	100
António Gonçalves	Coordinator Researcher	100
João C. Waerenborgh	Principal Researcher	100
Vasco Gama	Principal Researcher	100
Laura C. J. Pereira	Principal Researcher	100
Isabel C. Santos	Auxiliary Researcher	100
Elsa B. Lopes	Auxiliary Researcher	100
Dulce Belo	Auxiliary Researcher	100
Bruno José Cardoso Vieira	Researcher	100
Sandra Rabaça	Researcher	100
Rafaela A. L. Silva	Researcher (until July 2022)	100
Graça Brotas	Researcher (until June 2021)	100
Ana C. P. Cerdeira	Post-Doc	100
Joana Capinha de Matos	PhD Student (until March 2022)	50
Patrícia da Silva Ferreira	PhD Student	50
Daniel Alves Barcelos	PhD Student	50
Inês Morais da Costa	PhD Student	50
Juliana Gonçalves Araújo	PhD Student	50
Gonçalo Lopes	PhD Student	50
José Malta	PhD Student	50
Duarte Moço	PhD Student	100
Rodrigo Coelho	PhD Student	100
Beatriz Santos	Grant Holder	100
Vital Ferreira Filho	MSc Student (Feb 2022 – Dec 2022)	100
Iker Salas	Erasmus Student (Feb 2022-July 2022)	50
Carlos Pais	Senior Technician	
Leonel Vieira	Senior Technician	

*Retired in July 2022.

MISSION AND OBJECTIVES

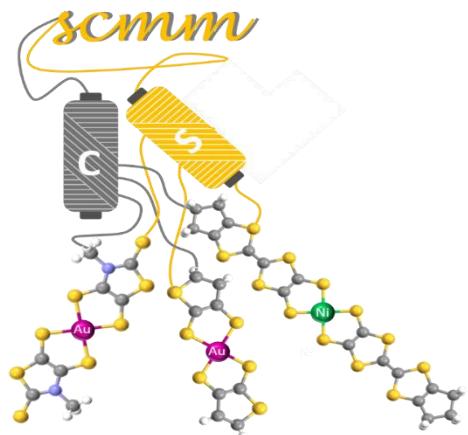
The Solid State Group (SSG) is an interdisciplinary research group that aims at developing new functional and nanostructured materials with unconventional electrical and magnetic properties with relevance in emerging scientific and technological research areas, with potential applications on sensors, electronic and optoelectronics, new alternative energy sources, health, environment, and nuclear technologies. The group combines a wide range of expertise in materials science research, from synthetic chemistry and crystal engineering of new electro-active organic molecules with transition metals, high temperature synthesis and crystal growth of intermetallics and oxides, to many different specialized physical characterisation techniques, thus contributing to the establishment of detailed correlations between the structure and the physical properties.

To undertake these activities the group operates and develops several infrastructures and research tools, rare or even unique at national level. The Electrococrystallization Laboratory allows performing electrochemical studies, at low and room temperature, to control the growth processes of single crystal molecule-based materials. The High Temperature Synthesis and Crystal Growth Laboratory (HTSCGL) is focused on the synthesis and crystal growth of a wide range of nanostructured and metallic glasses, including nuclear materials (U and Th), by different methods, such as splat-cooling, melt-spinning, induction and arc melting, Czochralski, Bridgman, flux or melting zone. The Low Temperature and High Magnetic Field Laboratory (LTHMFL) is supported by a He liquefier with 2 kl capacity and hosts different equipments for a complete characterization of natural and synthetic materials down to 0.3 K and under high magnetic fields up to 18 T. This includes several magnetometers (SQUID, VSM, extraction, and AC susceptibility) electronic transport and magnetotransport, and Mössbauer spectroscopy. This facility is opened at the benefit of a large external community through an extensive network of scientific collaborations and is included in the European roadmap of science infrastructures.

MAIN ACHIEVEMENTS

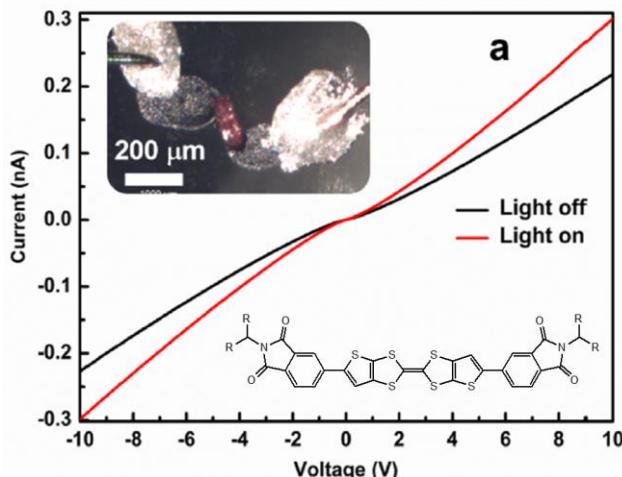
Our quest for single component molecular metals

In 2001 the molecular materials community accomplished a major breakthrough with the report of the first single component molecular metal (SCMM). Previously it was believed that molecular metals had to be composed of a pair of partially oxidized species, a condition necessary to guarantee the formation of the conduction band and the generation of charge carriers. However, by the turn of the millennium a new paradigm arose with the discovery of metallic behavior in two neutral complexes, $[\text{Ni}(\text{tmdt})_2]$ (tmdt : trimethylenetetra-thiafulvalenedithiolate) and $[\text{Au}(\alpha\text{-tpdt})_2]$ ($\alpha\text{-tpdt}$: 2,3-thiophenedithiolate). Our group not only led this study, but has since maintained a research line dedicated to this topic, in particular focus in the design, synthesis, and properties of neutral bis(1,2-dithiolene) and bis(1,2-diselenolene) transition metal complexes, since by their nature, they are the best candidates to obtain a SCMM.



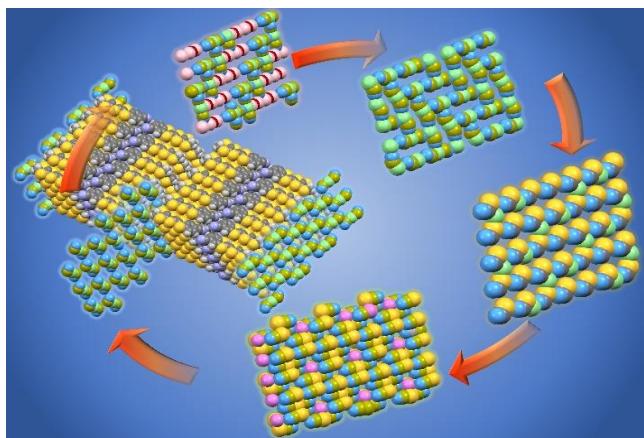
α -DT-TTF derivatives as potential photosensors

Recently it was possible to prepare and study a set of small all-organic molecules in an acceptor-donor-acceptor arrangement, where the π electronic donor molecule is covalently linked to the peripheral π electronic acceptor molecules. The donor molecule is α -dithiophenetetrathiafulvalene, a TTF derivative comprising a thiophene ring, while the acceptor moieties explored were alkylated phthalimide or thieno[3,4-c]pyrrole-4,6-dione derivatives. Some of the new compounds revealed potential for applications as organic photodetectors in optoelectronic devices, since displaying photoconductivity from the ultraviolet to the visible region (550 nm).



Bilayer conducting salts with polymeric anions

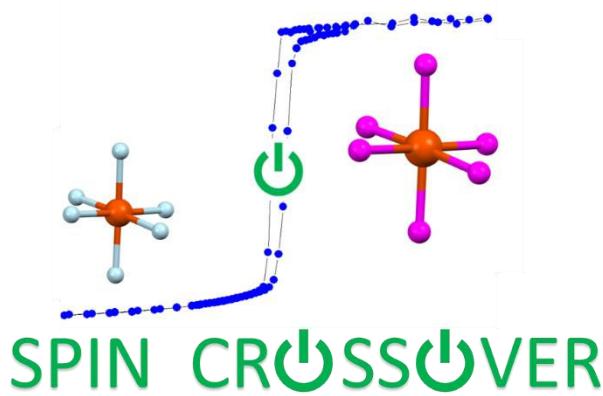
Five new compounds with anions based on silver and mercury with cyanate and thiocyanate ligands



are reported, they significantly extend the range of bilayer compounds with metallic properties into CNB-EDT-TTF salts with polymeric anions, opening the possibility to further explore the use of similar polymeric anions to obtain new 2D metals. The donor β'' -packing pattern typical of metallic bilayer systems and the two-dimensional metallic properties are comparable to those of the metallic bilayer salts with small discrete anions are observed.

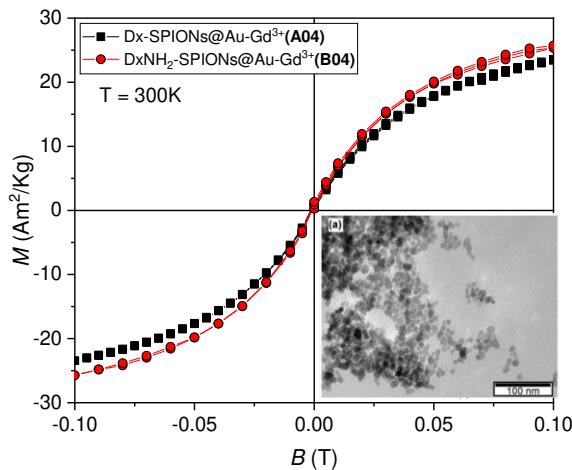
Unveiling the key structural parameters that enable the Spincrossover behavior in materials

The study of SpinCrossOver (SCO) materials always aimed for the identification of all parameters that enable and control the occurrence of SCO transition. Some parameters such as the nature of intra- and inter-molecular interactions, that often revealed to be responsible for “switching” on and off the SCO behavior, in compounds with similar composition and structure, proved to be difficult to rationalize. We were able to establish how these interactions enable or disable the SCO transition in FeIII materials prone to exhibit this behavior. This was achieved through comprehensive structural and magnetic characterization of a series of materials prone to show SCO transitions and by the subsequent identification of the specific intra- and inter-molecular interactions necessary for the emergence of SCO behavior. This study enables the intelligent design of SCO materials, which contributes for the reduction of unwanted synthesized compounds and overall optimization of research in this field.



SPIONs as multifunctional magnetic thermal systems

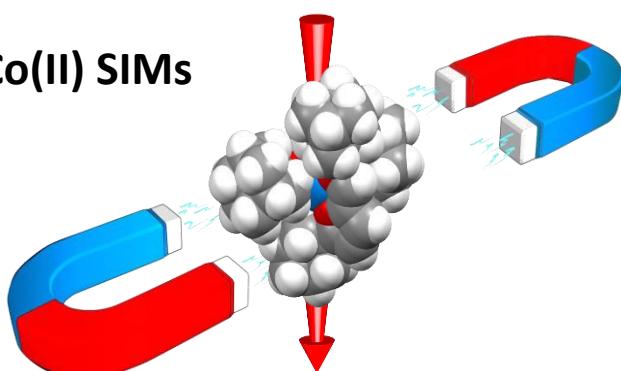
Superparamagnetic iron oxide nanoparticles (SPIONs) can be used as smart nanoplatforms for drug delivery, therapy, and imaging. The great advantage of such magnetic nano systems is to allow the possibility to acquire real-time information about the delivery and eventually the effects of therapeutic agents when guided under a magnetic field to target sites in the human body and hyperthermia therapies. A new and original approach in the systematic preparation of SPIONs cores was designed by systematic synthetic procedures and coating with dextran, and gold nanoparticles functionalized with a chelating agent, TDOTA, for the complexation of Gd³⁺ in order to improve their potential biomedical applications. Viability *in vitro* tests were done revealing a good morphological and magnetic performance for future MRI and magnetic hyperthermia assays.



Single-Ion-Magnet (SIM) behavior in cobalt molecular complexes

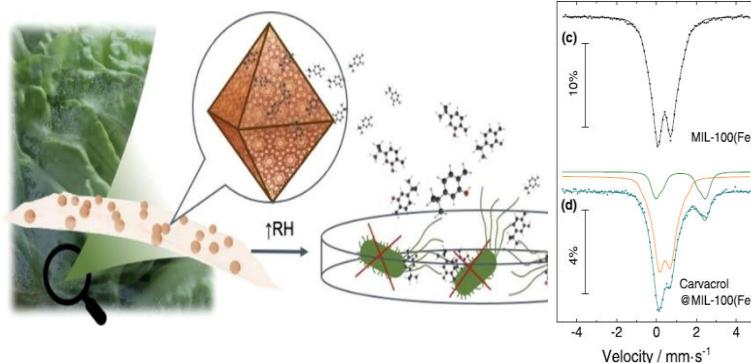
The study of new homoleptic Co(II) complexes bearing monoanionic N,N'-bidentate 2-iminopirrolyl ligands as Single-Ion Magnets demonstrated very interesting magnetic properties related with their different steric and electronic properties. In fact, the design of the ligand precursors (bulkiness, asymmetry, and electron-donor ability) revealed to be of great importance, as it determines the geometry thus, enabling the control and enhancement of the SIM behavior. All these studies provided an insight into the correlation between the structure and the magnetic properties, concluding that changes from a distorted tetrahedral to a distorted trigonal pyramidal geometry enhances SIM behavior not only by improving the values of D, but also by displaying slow relaxation of the magnetization at zero DC field with some of the largest values for the spin-reversal energy barrier ($U_{\text{eff}} = 135 \text{ cm}^{-1}$), so far reported for a tetrahedral Co(II)-N4 complex.

Co(II) SIMs



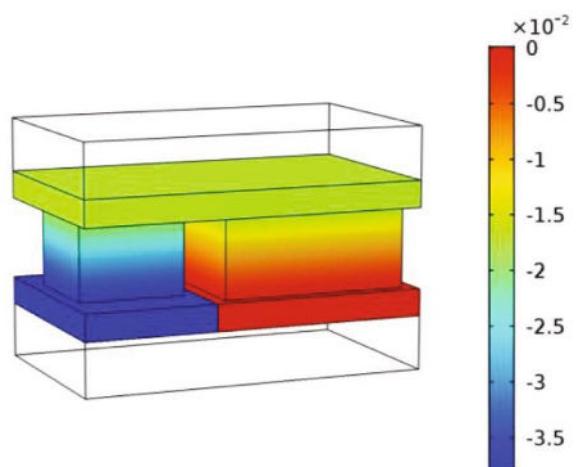
Mössbauer spectroscopy in materials science

Owing to the expertise in Mössbauer Spectroscopy the group is often called on to contribute to the characterization of advanced materials by national and international collaborators. An example is the characterization of a smart composite metal-organic framework (MOF)-based material, studied by the University of Valencia, Spain which fosters a unique prolonged antibacterial activity. The composite is obtained by entrapping a natural food preserving molecule, carvacrol, into a mesoporous MIL-100(Fe) material following a direct biocompatible impregnation method. By exploiting the intrinsic redox nature of the MIL-100(Fe) material, a prolonged activity against *Escherichia coli* and *Listeria innocua* is achieved due to a triggered two-step carvacrol release from films containing the carvacrol@MOF composite. Based on the underlying chemical interaction between MIL-100(Fe) and carvacrol, it is possible to undergo a reversible charge-transfer process between the MOF counterpart and carvacrol upon specific chemical stimuli.



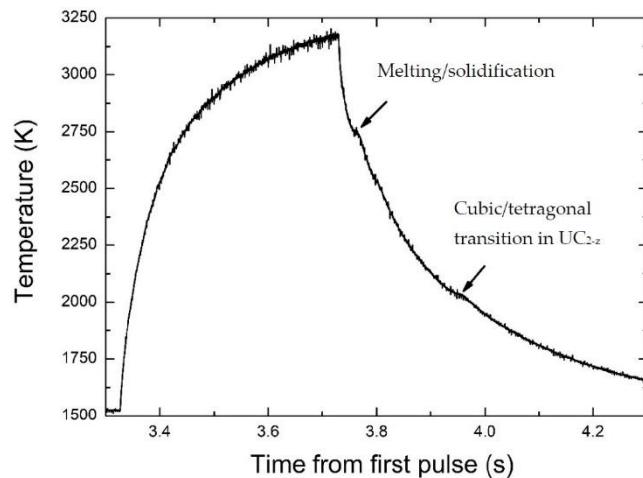
Novel thermoelectric materials and devices

Thermoelectric technology can directly convert a temperature gradient into electricity, being seen as very promising to produce green energy. However, the development of novel thermoelectric materials and devices still have critical points that hinder their wider use. Our group has been involved in the development of original thermoelectric systems for quite a long time now. In the sequence of this work, the study of new materials, like tetrahedrite co-doped with Ni and Se or synthetic bulk pyrite, was carried out and thermoelectric performances superior to those previously verified were obtained. In parallel, studies essential for the progress of thermoelectric devices, such as elaboration of effective protective coatings and electrical contacts or optimizations of the design, analysis, and test of new thermoelectric generators, have been performed, confirming these devices as good candidates to be part of the solution to the current energy crisis.



Spallation targets

The ISOL method for producing radioisotopes is based on the use of high-intensity/high-power particle beams that hit a spallation target, promoting nuclear reactions. The radioisotopes then diffuse to the surface of the target where they are evaporated/sublimated before being separated and directed to applications.

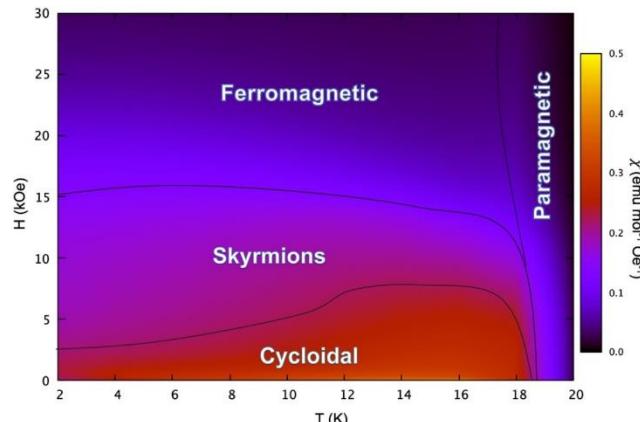


At ISOLDE, CERN, bulk micrometer UCx-based targets are the current benchmark due to their high temperature stability, high melting point and thermal conductivity, and low reactivity. However, the increase in world demand for radioisotopes has driven the exploration of new targets, with the aim of increasing the production efficiency. In this context, a new methodology to produce nanograin composite UCx fibers was developed in our laboratory. This work continued by studying their melting

temperatures, which do not change. The composite grain size persisted at the nanoscale, pointing to an effective role for carbon in preventing grain growth.

New chiral and topological magnets

Skyrmions are swirling spin structures carrying a topological quantum number and, as topological objects, they are important in emerging technologies like spintronics. Following previous works on the development of new chiral compounds with skyrmionic behavior, pure polycrystalline GaMo₄S₈ was prepared by the solid-state route. The magnetic properties of this material were studied, with the obtained results showing not only the presence of a skyrmionic phase, but also a cluster spin-glass phase. GaMo₄S₈ evidences a complex competition between the Heisenberg ferromagnetic exchange and Dzyaloshinskii-Moriya interactions in non-centrosymmetric structures, as well as a presence of a Jahn-Teller transition that leads to ferroelectric order below the distortion.



OUTREACH ACTIVITIES

Outreach Activities

① Development of a new graphical identity to C²TN



② Launch of the C²TN Academy



01 Seminars

- Coupling Atom-Like Spins in Semiconductors: Towards Scalable Quantum Computing, Frederico Martins - Hitachi Cambridge Laboratory, UK - 11 March 2021.
- *High performing organic field-effect transistors for sensing applications*, Marta Mas - Institute of Materials Science of Barcelona, SPAIN - 16 September 2021.

- Gamma radiation as a tool for remedial conservation: 50 years' experience in ARC-Nucléart, Grenoble, France, Laurent Costella - ARC-Nucléart, Grenoble, FRANCE - 21 October 2021.
- *Sustainable management of Natural Mineral Waters*, M. Antunes da Silva Hydrogeology Consultant Water Sommelier - 25 November 2021.
- *Small probes to nanoparticles: targeted multimodal imaging & theranostic applications*, Sara Lacerda - Centre de Biophysique Moléculaire, CNRS, Orléans, France - 4 November 2021.
- *Layered organic metals in high magnetic fields*, Mark V. Kartsovnik - Walther-Meissner-Institute for Low Temperature Research, Bavarian Academy of Sciences and Humanities, GERMANY - 15 November 2021.
- *Life's ubiquitous solution for iron managing and oxidative stress protection*, Pedro Tavares - UCIBIO, Lisbon, Portugal, 20 May 2022

02 Workshops

- Workshop 2021 of the Thematic Strand Radiopharmaceutical Sciences and Health Physics, CTN, Bobadela, 8 July 2021.
- Advanced Materials & ChemMat Doctoral Programme Workshop, CTN, Bobadela, 11-12 November 2021.
- Preparing for Horizon Europe - Research and Innovation Funding Program, 2021-2027, Marta Candeias - IST-ID, Universidade de Lisboa - 8 April 2021.
- *Tips for Successful Horizon Europe proposals preparation*, Marta Candeias - IST-ID, Universidade de Lisboa - 14 October 2021.
- *Functional Molecular Materials Insights*, Workshop in honour of Professor Manuel Almeida on the occasion of his 70th anniversary, CTN, Bobadela, 21 October 2022.

03 Courses and Internships

- *2nd Summer School of C²TN (CARISMA)*, CTN, Bobadela, 6-9 September 2021.
- *Summer Internships for students from secondary schools and universities*, CTN, Bobadela, June-September 2021.
- *3rd Summer School of C²TN (CARISMA)*, CTN, Bobadela, 5-7 September 2022.
- *Summer Internships for students from secondary schools and universities*, CTN, Bobadela, June-September 2022.

04 Round Tables

- *Thinking the strategy of C²TN, CTN, Bobadela, 7 December 2022.*

05 Events

- *European Researchers' Night 2022, Museu Nacional de História Natural e da Ciência e Pavilhão do Conhecimento – Centro Ciência Viva, 30 September 2022.*
- *Tecnico Open Day 2022, Campus da Alameda do Instituto Superior Técnico, 23 May 2022.*
- *European Researchers' Night 2021, Museu Nacional de História Natural e da Ciência e Pavilhão do Conhecimento – Centro Ciência Viva, 24 September 2021.*

③ Journal Club Initiative

The "Journal Club" brings together the master and PhD students of the center. This program is aimed at stimulating the development of the student's soft skills, amongst their peers and in an informal and less intimidating environment, without the intervention of their supervisors. These meetings also allow the students to improve their presentation skills, to share their work and their experiences, to learn how to give and reply to constructive criticism, while learning from others and expanding their knowledge in diverse scientific areas.

SCIENTIFIC INDICATORS

1 SCIENTIFIC OUTPUT 2021-2022

1.1 Books and chapters of books of international distribution

2021

Abrefah, R., Akortia, C., Ames, C., Andreeva, S., Beatty, R., Bennett, P., Budu, M., Daniska, V., Dennis, H., Dimitrovski, L., Domingo, X., Fuentes Solis, N.O., Gastl, C., Geupel, S., Harrison, T., Ipatov, V., Ivanov, K., Jinchuk, D., Kling, A., Marshall, F., Mayer, S., Mostert, J., Muhammad Nor, A., Odoi, H.C., Ramanathan, L., Russo, D., Schneider, E., Talbi, A., Valery, J.-F., Van Marcke, P., Vargas, E., Varvayanni, M., Vo Van, V., Zachar, M., & Zakaria, N. (2021). *Research Reactor Spent Fuel Management: Options and Support to Decision Making*. International Atomic Energy Agency, Vienna, 2021, IAEA Nuclear Energy Series No. NF-T-3.9, STI/PUB/1954, 138 pp., ISBN 978-92-0-120121-8 (pdf). Contributors to Drafting and Review. https://www-pub.iaea.org/MTCD/publications/PDF/PUB1954_web.pdf

Canha, N., Belo, J., & Cruz, M.M. (2021). Sono, Ambiente e Qualidade do Ar. In: *Medicina Oral no Sono*, M.M. Cruz, L.C. Giannasi and M.A.C. Machado (eds.), Santos Publicações Ltda., São Paulo, Brasil, ISBN: 9786586699890. Chapter 4.5., pp. 53-63. <https://www.santospub.com.br/produto/247/medicina-oral-no-sono>

Canha, N., Diapouli, E., & Almeida, S.M. (2021) *Integrated Human Exposure to Air Pollution*. MDPI Books. Basel, Switzerland, ISBN: 978-3-0365-1082-8, 265 pages. doi: [10.3390/books978-3-0365-1083-5](https://doi.org/10.3390/books978-3-0365-1083-5).

Preto, A.J., Marques-Pereira, C., Baptista, S.J., Bueschbell, B., Barreto, C.A.V., Gaspar, A.T., Pinheiro, I., Pereira, N., Pires, M., Ramalhão, D., Silvério, D., Rosário-Ferreira, N., Melo, R., Mourão, J., & Moreira, I.S. (2021) Targeting GPCRs Via Multi-Platforms Arrays and AI. In: *Reference Module in Biomedical Sciences*, Elsevier. doi: [10.1016/B978-0-12-820472-6.00048-7](https://doi.org/10.1016/B978-0-12-820472-6.00048-7).

Savdie, J., Canha, N., Buitrago, N., & Almeida, S.M., (2021). Passive Exposure to Pollutants from a New Generation of Cigarettes in Real Life Scenarios. In: *Integrated Human Exposure to Air Pollution*. MDPI Books. Basel, Switzerland, ISBN: 978-3-0365-1082-8, doi: [10.3390/books978-3-0365-1083-5](https://doi.org/10.3390/books978-3-0365-1083-5), pp. 163-181.

Silva, A.V., Oliveira, C.M., Canha, N., Miranda, A.I., & Almeida, S.M., (2021). Long-Term Assessment of Air Quality and Identification of Aerosol Sources at Setúbal, Portugal. In: *Integrated Human Exposure to Air Pollution*. MDPI Books. Basel, Switzerland, ISBN: 978-3-0365-1082-8, doi: [10.3390/books978-3-0365-1083-5](https://doi.org/10.3390/books978-3-0365-1083-5), pp. 87-107.

Soares, A.M.M., Valério, P., & Valera, A.C. (2021). O Lingote de Cobre Calcolítico da Folha do Ouro 1 (Serpa) – Análise Química, Microestrutural e Isotópica. In: *Terra e Sal*, Victor S. Gonçalves (Ed.), UNIARQ/FL-UL, ISBN: 978-989-53453-1-1. doi:[10.51427/10451/50508](https://doi.org/10.51427/10451/50508), pp. 219-230.

Valente, A., Morais, T.S.; Teixeira, R.G., Matos, C.P., Tomaz, A.I., & Garcia, M.H. (2021). Ruthenium and iron metallodrugs: new inorganic and organometallic complexes as prospective anticancer

agents. In: *Synthetic Inorganic Chemistry: New Perspectives*, Ewan J.M. Hamilton (Ed.), Elsevier Inc., Chapter 6, pp. 223-276. [doi: 10.1016/b978-0-12-818429-5.00010-7](https://doi.org/10.1016/b978-0-12-818429-5.00010-7).

Zilhão, J., Gonçalves, A.P., Alves, L.C., & Soares, A.M.M. (2021). Uma conta vidrada proto-histórica da Gruta do Caldeirão (Tomar, Portugal). In "Terra e Sal", Victor S. Gonçalves (Ed.), UNIARQ/FL-UL, ISBN: 978-989-53453-1-1. [doi:10.51427/10451/50508](https://doi.org/10.51427/10451/50508), pp. 313-324.

2022

Almeida, S.M. & Martins, V. (2022). Exposure to Air Pollutants in Ground Transport Microenvironments. In: *Handbook of Indoor Air Quality*, Zhang, Y, Hopke, P.K., Mandin, C. (eds.), Springer, ISBN 978-981-16-7679-6, ISBN 978-981-16-7680-2 (eBook), [doi: 10.1007/978-981-16-7680-2](https://doi.org/10.1007/978-981-16-7680-2), Chapter 68, pp. 2023-2044.

Aprilliani, D., ... Alves, J.G., ... et al. (2022). Preparedness and Response for a Nuclear or Radiological Emergency Involving the Transport of Radioactive Material. IAEA, Specific Safety Guide No. SSG-65, STI/PUB/1960, 91 pp.. ISBN:978-92-0-127521-9. http://www-pub.iaea.org/MTCD/Publications/PDF/PUB1960_web.pdf. Contributors to drafting and review.

Cabral Pinto, M., Dinis, P.A., Groz, D.P., Marques, R., Prudêncio, M.I., Moura, R., Rocha, F.T. & Silva, E.F. (2022). Weathering on volcanic edifices under semiarid climates: insights from a regional assessment of the composition of Fogo Island regoliths (Cape Verde). In: *Volcanic Processes in the Sedimentary Record: when Volcanoes meet the Environment*, Edited by A. Di Capua, R. De Rosa, G. Kereszturi, E. Le Pera, M. Rosi and S.F.L. Watt, Geological Society, London, Special Publications, 520. [doi:10.1144/SP520-2021-61](https://doi.org/10.1144/SP520-2021-61).

Lizana, J., Chacartegui Ramírez, R., Almeida, S.M., & Manteigas, V. (eds.) (2022). The pathway towards low carbon schools: criteria, targets and solutions. Nova Science Publishers, 140 pp., ISBN: 978-1-68507-778-5. [doi: 10.52305/XVSQ6757](https://doi.org/10.52305/XVSQ6757).

Madureira, J., Barros, L., Margaça, F.M.A., Santos-Buelga, C., Ferreira, I.C.F.R., Cabo Verde, S. (2022). Effects of Irradiation on Food Bioactives. In: Jafari, S.M., Capanoglu, E. (eds) Retention of Bioactives in Food Processing. Food Bioactive Ingredients, Springer, Cham., pp. 429–465. [doi: 10.1007/978-3-030-96885-4_14](https://doi.org/10.1007/978-3-030-96885-4_14).

Sanjuán, L.G. Medialdea, A., Nieto, V.B., Athanassas, C., Pike, A., Standish, C.D., Dias, M.I., Rodrigues, A.L., Toledo, J.L.C., Wheatley, D.W., Peña, M.C. (2022). Nuevas aportaciones a la cronología numérica del dolmen de Menga. In: *Dolmen de Menga. Intervención de 2005-2006 - Investigando la génesis de un monumento neolítico excepcional*. Ed. Sanjuán, L.G. Editorial Universidad de Aevilla, Almuzara Universidad, Cap. 15, 439 – 454. ISBN: 978-84-11312-94-3.

1.2 Edited special issues of journals

2021

Almeida, M. (2021), Member of the Editorial Board of *Magnetochemistry* – MDPI.

Canha, N. (2021), Associate Editor of *Environmental Analytical Methods*, section of the journal *Frontiers in Environmental Chemistry* - Frontiers.

Correia J.D. G. (2021), Co-Editor of the special issue Target-Specific Delivery of Gold and Ruthenium Complexes to Cancer Cells: Where Are We?, *Molecules* – MDPI.

Gonçalves, A.P. (2019-), Editor of *PeerJ Materials* – PeerJ.

Gonçalves, A.P. (2019-), Editor of *PeerJ Physical Chemistry* – PeerJ.

Gonçalves, A.P. (2020-2022), Topic Editor of *Nanomaterials* – MDPI.

Gonçalves, A.P. (2021-), Topic Editor of *Materials* – MDPI.

Martins, V. (2021), Guest editor of special issue *Indoor and Outdoor Air Particulate Matter of Environments journal* – MDPI.

Mendes, F., Paulo, A. (2021) Co-Editors of the special issue *New Advances in Radiopharmaceutical Sciences: Chemistry and Applications of Molecules* – MDPI.

Pereira, L.C.J. (2021) Guest Editor of the Special Issues *Magnetochemistry and Applied Sciences: Photofunctional Molecular Magnets: Development and Their Potential Applications* – MDPI.

Pereira, L.C.J. (2021) Member of the Editorial Board of *Magnetochemistry*, Section: *Magnetism and Magnetic Materials* – MDPI.

Vaz, P. (2021), Associate Editor of the Journal *Radiation Physics and Chemistry*, section: *Radiation Physics* – Elsevier.

Vaz, P. (2021), Editor of the *European Journal of Radiology*, section: *Radiation Protection and Physics* – Elsevier.

Waerenborgh, J.C. (2021), Member of the Editorial Board of *Magnetochemistry* – MDPI.

2022

Canha, N., Almeida, & M., Diapouli, E. (2022), Guest editors of the Special Issue *2nd Edition of the Special Issue "Integrated Human Exposure to Air Pollution*, International Journal of Environmental Research and Public Health - MDPI.

Canha, N., & Gamelas, C.A. (2022), Co-Guest Editors of the Special issue *Air Quality in Urban-Industrial Areas: Monitoring, Source Apportionment and Management*, Atmosphere - MDPI.

Carreira, P.M. (2022), Co-Editor of the Special issue *The Use of Environmental Isotopes in Hydrogeology* – WATER – MDPI.

Casimiro, M.H. & Ferreira, L.M. (2022), Guest Editors of Special issue *Biocompatible Membranes*, section "Membrane Applications", Membranes — MDPI.
https://www.mdpi.com/journal/membranes/special_issues/Bio_Membranes.

Casimiro, M.H. & Monteiro, B. (2022), Guest editors of Special Issue on *Functionalization and Characterization of Polymeric and Hybrid Materials - Series II*, Materials — MDPI.
https://www.mdpi.com/journal/materials/special_issues/Polymeric_Hybrid_Materials_Series_II.

Martins, V., Relvas, H., & Miranda, A.I. (2022) Guest editor of special issue *Modelling & Impacts Assessments of Air Quality of Toxics journal*, MDPI.

Mendes F (2002) Editor of Special Research Topic *3D Models of Disease as Diagnostics and Therapeutic Tools* in *Frontiers in Molecular Biosciences- Molecular Diagnostics and Therapeutics*.

Pereira, L.C.J. (2022) Member of the Editorial Board of *Magnetochemistry*. Section: *Magnetism and Magnetic Materials* – MDPI.

Pereira, L.C.J. (2022). Guest Editor of the Special Issues in *Magnetochemistry and Applied Sciences: Photofunctional Molecular Magnets: Development and Their Potential Applications* – MDPI.

Pereira, L.C.J. & Belo, D. (2022/2023). Guest Editors of Special Issue *Functional Molecular Materials Insights—a Themed Issue in Honor of Professor Manuel Almeida on the Occasion of His 70th Birthday*, to be published in *Magnetochemistry* – MDPI.

1.3 Publications in peer review international journals

2021

- Aguiar, A., Farinhas, J., da Silva, W., Santos, I.C., Alcácer, L., Brett, C.M.A., Morgado, J., & Sobral, A. (2021). New series of BODIPY dyes: Synthesis, characterization and applications in photovoltaic cells and light-emitting diodes. *Dyes and Pigments*, 193, 109517. [doi:10.1016/j.dyepig.2021.109517](https://doi.org/10.1016/j.dyepig.2021.109517). WOS:000669427600003. **I.F. 4.889/Q1**
- Aguiar, S.I., Dias, J.N.R., André, A.S., Silva, M.L., Martins, D., Carrapico, B., Castanho, M., Carriço, J., Cavaco, M., Gaspar, M.M., Nobre, R.J., de Almeida, L.P., Oliveira, S., Gano, L., Correia, J.D.G., Barbas, C., Gonçalves, J., Neves, V., & Aires-da-Silva, F. (2021). Highly Specific Blood-Brain Barrier Transmigrating Single-Domain Antibodies Selected by an In Vivo Phage Display Screening. *Pharmaceutics*, 13(10), 1598. [doi:10.3390/pharmaceutics13101598](https://doi.org/10.3390/pharmaceutics13101598). WOS:000711900100001. **I.F. 6.321/Q1**
- Almeida, A.V., Jacinto, J.P., Guerra, J.P.L., Vieira, B.J.C., Waerenborgh, J.C., Jones, N.C., Hoffmann, S.V., Pereira, A.S., & Tavares, P. (2021). Structural features and stability of apo- and holo-forms of a simple iron-sulfur protein. *European Biophysics Journal with Biophysics Letters*, 50, 561-570. [doi:10.1007/s00249-021-01546-0](https://doi.org/10.1007/s00249-021-01546-0). WOS:000652131300002. **I.F. 1.733/Q4**
- Almeida, N.J., Basílio, A.C., Silva, C., Soares, A.M., & Borges, N. (2021). Faunal remains manipulation during the Chalcolithic in pits 13, 16 and 54 from Monte das Cabeceiras 2 (Beja, Southern Portugal). *Zephyrus-Revista De Prehistoria Y Arqueologia*, 88, 41-64. [doi:10.14201/zephyrus2021884164](https://doi.org/10.14201/zephyrus2021884164). WOS:000751069600001. **I.F. 0.13/Q4**
- Almeida, S.M., & Sousa, J. (2021). Modelling the Contribution of Factors Influencing the Risk of SARS-CoV-2 Infection in Indoor Environments. *Acta Medica Portuguesa*, 34(12), 815-825. [doi:10.20344/amp.15982](https://doi.org/10.20344/amp.15982). WOS:000719924400001. **I.F. 1.698/Q3**
- Alves, E., Lorenz, K., Catarino, N., Peres, M., Dias, M., Mateus, R., Alves, L.C., Corregidor, V., Barradas, N.P., Fonseca, M., Cruz, J., & Jesus, A. (2021). An insider view of the Portuguese ion beam laboratory. *European Physical Journal Plus*, 136(6), 684. [doi:10.1140/epjp/s13360-021-01629-z](https://doi.org/10.1140/epjp/s13360-021-01629-z). WOS:000665861800003. **I.F. 3.911/Q1**
- Amaducci, S., ...Vaz, P., ... et al. & n_TOF Collaboration (2021). First Results of the ^{140}Ce (n,γ) ^{141}Ce Cross-Section Measurement at n_TOF. *Universe*, 7(6), 200. [doi:10.3390/universe7060200](https://doi.org/10.3390/universe7060200). WOS:000665969800001. **I.F. 2.278/Q3**
- Babiano-Suarez, ...Vaz, P., ... et al. (2021). Imaging neutron capture cross sections: i-TED proof-of-concept and future prospects based on Machine-Learning techniques. *European Physical Journal A*, 57(6), 197. [doi:10.1140/epja/s10050-021-00507-7](https://doi.org/10.1140/epja/s10050-021-00507-7). WOS:000662881100001. **I.F. 3.043/Q2**
- Bahir, M., El Mountassir, O., Ouazar, D., Chehbouni, A., & Carreira, P. M. (2021). Stable isotope and quality of groundwater around Ksob sub-basin, Essaouira, Morocco. *Sustainable Water*

Resources Management, 7(5), 73. [doi:10.1007/s40899-021-00553-5](https://doi.org/10.1007/s40899-021-00553-5). WOS:000683725000001. **I.F. 0.48/Q3**

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1.4 Publications in International Conference Proceedings

1.4.1 Articles

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1.4.2 Abstracts and Extended Abstracts

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Soares, R.M., Melo, L., Valério, P., & Soares, A.M.M. (2021). O sítio do Monte de Mata Bodes 2 (Beja) - um exemplo de diacronia de um provável "campo de hoyos". XI Encontro de Arqueologia do Sudoeste Peninsular. Município de Loulé, Loulé, 21-23 October 2021.

2022

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Carreira, P.M., Carvalho, M.R. Marques, J.M., Grassa, F., Capasso, G.; & Nunes, J.C. (2022). Isotopic and geochemical approaches to update the conceptual model of thermal waters from Graciosa Island – Azores, Portugal. MinWat 2020 – 3rd International Multidisciplinary Conference on Mineral and Thermal Waters. Caserta, Italy. 26-30 June 2022. pp.28

Carvalho, M.R., Sá, H., Freitas, A., Nunes, J.C., Carreira, P.M., Marques, J.M., & Carvalho, J.M. (2022). Hydrothermal basal aquifer of Angra do Heroísmo (Terceira Island, Azores): Chemical, isotopic and hydraulic characterisation. MinWat 2020 – 3rd International Multidisciplinary Conference on Mineral and Thermal Waters, Caserta, Italy. 26-30 June 2022. pp.61

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Sá, AC., Fernandes, P., Campos, G., & Serra, F. (2022). Avaliação das doses fora dos campos em doentes de pâncreas tratados com radioterapia estereotáxica. *Abstract book of Fórum ART 2022*.

1.5 Other publications

2021

Carreira, P.M., Cabo Verde, S., Madureira, J., Figueiredo, P., Marques, J.M., Ferrão, E., Dias, D. & Nunes D. (2021). Avaliação de impacto ambiental nas reservas hídricas (superficiais e subterrâneas) no Campo Militar de Santa Margarida através da composição isotópica e detecção de vírus humanos. *PROELIUM, Série VIII*, Número 7. 331-350. ISSN:1645-8826

Correia, V.H., Valério, P., Araújo, M.F. & Alves R. (2021). Caracterização das actividades metalúrgicas na casa atribuída a Cantaber (Conimbriga, Prov. Lusitânia, Portugal). *Estudos Arqueológicos de Oeiras*, 29, 49-56.

Godinho, I., Alves-Sousa, J., Pires, C., Saraiva, F., Dias, F., Lóio, I., Spohr, I., Alves, J.G., Ribeiro, L., Pellegrino, O. (2021). *Sistema Internacional de Unidades*. Tradução luso-brasileira autorizada pelo BIPM da 9ª edição de 2019 da publicação bilingue Le Système International d'Unités conhecido como Brochure sur le SI em francês, ou The International System of Units, conhecida como SI brochure em inglês. Publicada pelo Inmetro e IRD do Brasil e pelo IPQ e IST-LPSR-LMRI de Portugal. ISBN: PT 978-972-763-181-0.

Soares, A.M.M., Baptista, L., Mataloto, R., Melo, L., Silva, A.M., Soares, R.M. & Valério, P. (2021). The Bronze Age of Southwestern Iberian Peninsula: endogenous evolution versus migration stimuli. *Revista Portuguesa de Arqueologia*, 24, 59-82.

Soares, A.M.M., Carvalho, J., Ferreira, C., Mendes, C. Miguel, L., Soares, R.G.M., Serra, M., Valente, M. & Valério, P. (2021). O sítio do Monte do Guedelha (Pias, Serpa): contributos para uma melhor caracterização do Bronze Final do Sudoeste. *Estudos Arqueológicos de Oeiras*, 28, 199-256.

2022

Senna-Martinez, J.C., Luís, E., Mendes, C., Valério, P., Araújo, M.F. & Soares A.M.M. (2022). The materialization of an iconography: A LBA/EIA metallic representation of an “anchoriform” or “anchor idol” (?) from the Fraga dos Corvos habitat site (Eastern Trás-os-Montes, Portugal). *Ophiussa*, 6, 69-83. [doi: 10.51679/ophiussa.2022.98](https://doi.org/10.51679/ophiussa.2022.98).

Soares, A.M.M., Soares, S.M., & Soares, R.M.G.M. (2022). As Minas Pré-Históricas do Concelho de Moura. *Lacant*, 2, 6-26.

Soares, A.M.M., Valério, P., Gomes, S.S. & Araújo, M.F. (2022). A proveniência do metal utilizado nos povoados calcolíticos da bacia do Guadiana Médio: as razões isotópicas do chumbo de prováveis lingotes de cobre. *Revista Portuguesa de Arqueologia*, 25, 59-79.

1.6 Talks in Conferences

1.6.1 Invited

2021

Almeida, S.M. (2021) *Implementation of the LIFE Index-Air Exposure - Dose Management Tool in 5 European Cities*. International Conference on Air Pollution, Hungary, 9-10 November.

Almeida, S.M. (2021) *Indoor pollution. The hidden enemy*. XXVII Jornadas de Pediatria, Centro Hospitalar Universitário Lisboa Norte, 24-25 February.

Almeida, S.M. (2021) *LIFE Index-Air decision support tool for reducing population exposure to atmospheric particles*. "Ecology and Health", VIII Portuguese Healthy Municipality Network Forum, 19 March.

Almeida, S.M. (2021) *The air I breathe...indoors*. Workshop promoted by ABAE for the portuguese Eco-Schools, 22 February. <https://www.youtube.com/watch?v=CgICCySf0mQ>

Alves, J.G. (2021). *Experiência na participação de Projetos de I&D no âmbito das Radiações Ionizantes enquanto ID in Call 2021*. European Partnership on Metrology of EURAMET, Workshop online, IPQ, 27 January.

Canha, N. (2021). *A qualidade do ar enquanto dormimos*. III Congresso Português de Cronobiologia e Medicina do Sono, 19 March. online participation of 76 participants from 4 countries.

Casimiro, M.H., Ferreira, L.M., et al. (2021). *Radiation Effect on 3D Printed Medical Implants for Customized Tissue*. 1st IAEA Research Coordination Meeting on Radiation Effects on Polymer Materials Commonly Used in Medical Devices, IAEA, Vienna, Austria, 15 November.

Correia, J.D.G. (2021). *Anticorpos para Imagiologia e Radioterapia Molecular*, Seminário no âmbito da UC Novas Tecnologias em Diagnóstico e Terapia com Radiação do mestrado de Engenharia Biomédica e Biofísica da FCUL, Universidade de Lisboa, 8 March.

Cravo Sá, A. (2021). *Avaliação das doses fora dos campos de tratamento de radioterapia em doentes pediátricos*, Webinar Medicina Precisão - Rede Saúde Universidade de Lisboa, 10 December.

Cravo Sá, A. (2021). *Out-of-field doses in radiotherapy treatments of paediatric patients*. First LaPMET Workshop, 23-24 September. Online.

Ferreira, L.M., Casimiro, M.H., et al. (2021). *Nanostructured Hybrid Materials by Radiation Processing Assisted by Ionic Liquids*. 2nd IAEA Research Coordination Meeting on Enhancing the Beneficial Effects of Radiation Processing in Nanochemistry, virtual meeting organized by Université de Reims Champagne-Ardenne, URCA Institut de Chimie Moléculaire de Reims (ICMR) (Reims, France), 14 September.

- Ferreira, L.M., Casimiro, M.H., et al. (2021). *Overview of Radiation Technologies for Cultural Heritage Preservation and Consolidation in Portugal*. Technical Meeting on Recent Achievements in the Preservation and Consolidation of Cultural Heritage, CEA – ArcNucléart, Grenoble, France, 23 November.
- Gano, L. (2021). *Utilização de Radionuclídos em ensaios in vitro*, Seminário no âmbito da UC "Metodologias Analíticas" do mestrado em Análises Clínicas, Faculdade de Farmácia, Universidade de Lisboa, 29 January.
- Gonçalves, A.P. (2021). *Effects of composition on the UFe_xSb₂ system*. Cracow Colloquium on f-electron systems (CCFES2021), 18-21 April. Online edition.
- Gonçalves, A.P. (2021). *On the U-Fe-Ge system and its compounds*. The Kumatori Meeting, Kyoto University, Japan, (Online edition), 10 February.
- Gonçalves, A.P. (2021). *The synthesis of actinide-based materials*. 13th School on the Physics and Chemistry of the Actinides, (Online edition), 22 March.
- Gonçalves, A.P. (2021). *Thermoelectric tetrahedrites: from materials to devices*. Solid Compounds of Transition Elements 2021, (SCTE) Conference, Wrocław, Poland, (Online edition), 12-15 April.
- Lage, J. (2021). *Monitorização e avaliação da qualidade do ar*. Seminar held at Universidade Lusófona de Humanidades e Tecnologias de Lisboa, May 2021. Online.
- Malta, J.F. (2021). *Development of Novel Chiral and Topological Magnets*. Magnetism in Portugal 2021 – Núcleo Português de Magnetismo, 14 - 15 September, Online edition.
- Malta, J.F. (2021). *Magnetic Skyrmions*. Dia de Investigação do Departamento de Física, Coimbra, 26 May.
- Monteiro Gil, O. (2021). *Efeitos biológicos induzidos por exposição a radiação ionizante. Dosimetria Biológica*. Seminário no âmbito da disciplina Efeitos Biológicos da Radiação da Faculdade de Ciências e Tecnologia da Universidade NOVA de Lisboa (FCT /UNL), Campus da Caparica, 3 May.
- Paulo, A. (2021). *Investigação em Ciências Radiofarmacêuticas no C²TN/IST*. Seminário no âmbito da UC "Seminário 1" do mestrado em Engenharia Biomédica, ISEL/ESTeSL, Instituto Politécnico de Lisboa, 11 November.
- Paulo, A. (2021). *Química Radiofarmacêutica e Radiofármacos*. Seminário no âmbito da UC "Química Inorgânica Medicinal" do mestrado em Ciências Farmacêuticas, Universidade Lusófona (Lisboa), 5 January.
- Rodrigues, A.L., Marques, R., Dias, M.I., Prudêncio, M.I., Martins, A., Diniz, M., Neves, C., Arnaud, J.M. (2021). *SYMBOLART – abordagem metodológica não invasiva para a caracterização de artefactos simbólicos de VNSP*. Vila Nova de São Pedro - 1971/2021: Cinquenta Anos de Investigação sobre o Calcolítico, no Ocidente Peninsular, Faculdade de Letras da Universidade de Lisboa, 22-24 November.

Valério, P. (2021). *A metalurgia do Bronze Final no Alentejo Interior*. Colóquio "Projeto Arqueológico Outeiro do Circo 2008-2021", Museu Regional de Beja, Beja, 16 October.

Vaz, P. (2021) *Radiation Protection and Dosimetry in the applications of ionizing radiation*. Colóquio do Departamento de Física do IST, Lisboa, 19 May.

Vaz, P. (2021). *State-of-the-art of Radiation Protection and Dosimetry in the medical applications of radiation - hot topics and emerging issues*. 15th International Symposium on Radiation Physics (ISRP-15), Kuala Lumpur, Malaysia, 6-10 December.

Vieira, B.J.C. (2021). *Molecular Magnetism in Fe(III) Spin Crossover Materials*. Magnetism in Portugal 2021 – Núcleo Português de Magnetismo, 14 - 15 September, Online edition.

Vieira, B.J.C., Santos, I.C., Pereira, L.C.J, Gama, V., Waerenborgh, J.C. (2021). *Correlations between structure and magnetic behavior in Iron(III) SCO materials*. Advanced Materials Annual Workshop, Lisbon, Portugal, 11 February.

2022

Almeida, S.M. (2022). *The energy efficiency and indoor air quality dilemma in school buildings*. IX Jornadas EcoZarco, Funchal, Madeira, 4 November.

Almeida, S.M. (2022). *Together, towards a sustainable school*. IX Jornadas EcoZarco, Funchal, Madeira, 4 November.

Belo, D. (2022). *Our Quest for Single Component Molecular Metals*. in 14th International Symposium on Crystalline Organic Metals, Superconductors and Magnets (ISCOM 2022), Le Pouliguen, France, 25-30 September.

Cabo Verde, S. (2022). *Bioactivity of Irradiated Foods treated by Low Energy E-Beam*. 2nd Research Coordination Meeting of Coordinate Research Project D61025 on Innovating Radiation Processing of Food with Low Energy Beams from Machine Sources, IAEA Headquarters in Vienna, Austria, 12 October.

Cabo Verde, S. (2022). *Virucidal effects of ionizing radiation on Hepatitis A virus*. Final Research Coordination Meeting of Coordinate Research Project on “Radiation Inactivation of Bio-Hazards using High Powered Electron Beam Accelerators”, 2 February, Online.

Campello, Maria Paula Cabral (2022). Nanoparticles and their Biomedical applications. Seminário no âmbito do Mestrado de Engenharia dos Materiais, UC Materiais Funcionais, IST, Universidade de Lisboa, 4 January.

Campello, Maria Paula Cabral (2022). Nanoparticles as Multimodal Platform for Cancer Theranostic. Seminário no âmbito do Mestrado de Engenharia dos Materiais, UC Materiais Funcionais, IST, Universidade de Lisboa, 5 December.

- Canha, N. (2022). *Integrated human exposure to air pollutants - the role of sleeping environments.* Seminário de 1 hora no DiSTeBA - Dipartimento di Scienze e Tecnologie Biologiche e Ambientali da Università del Salento, Lecce, Italy, 25 May.
- Canha, N., & Meira e Cruz, M. (2022). *Qualidade do ar e sono: quando o ambiente se impõe na saúde.* Webinar Dia Nacional do Ar promovido pelo ISEL e ESTESL, 12 April, Online, com um total de 44 participantes de Portugal de diferentes sectores da sociedade.
- Carreira, P.M. (2022). *Coastal Aquifers – case studies implementation.* 2nd Regional Coordination Meeting. RER7013 - Evaluating Groundwater Resources and Groundwater-Surface-Water Interactions in the Context of Adapting to Climate Change, Krakow, Poland, 16-20 May.
- Casimiro, M.H., Ferreira, L.M., et al. (2022). *C²TN Recent Experience in Polysaccharide Irradiation for Energy and Environment.* IAEA Technical Meeting on Natural Polymers for Energy and Environment, Cidade de Quezon, Filipinas, 13-17 June.
- Casimiro, M.H., Ferreira, L.M., et al. (2022). *The Biomaterials Development Experience at C²TN using Radiation Technology.* IAEA Technical Meeting on Biomaterial for Sustainable Development, Viena, Áustria, 29 Agosto – 2 September.
- Corregidor, V., Alves, L.C., Salomé, P., Teixeira, J., & Barreiros, M.A. (2022). *Nuclear microprobe in materials for solar cells devices.* International Conference on Nuclear Microprobe Technology and applications, ICNMTA2022, 11-16 September.
- Cravo Sá, A. (2022). *A proteção e segurança radiológica em Portugal: Qual o impacto nos serviços e profissionais.* promovido pela Associação Portuguesa dos Radioterapeutas, Santarém.
- Di Maria, S. (2022). Tutorial lecture on *Dosimetry in X-ray breast Dosimetry.* European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Ferreira, L.M., Casimiro, M.H., Monteiro, B., Santos, P.M.P., Leal, J.P. Gonçalves, A.P. & Pereira, L. (2022). *Challenging Applications of Nanostructured Hybrid Materials Processed by Ionizing Radiation.* Technical Meeting on Recent Developments in Nanomaterials and Nanotechnology Using Radiation Technology, IAEA Headquarters, Vienna, Austria, 29 August – 02 September.
- Gano, L. (2022). *Utilização de Radionuclídos em ensaios in vitro.* Seminário no âmbito da UC "Metodologias Analíticas" do mestrado em Análises Clínicas, Faculdade de Farmácia, Universidade de Lisboa, 1 February.
- Gonçalves, A.P. (2022). *Revealing the Beauty of Uranium Compounds: the UMB4 (M=V, Cr, Fe, Co, Mo, W, Re, Os) and UFe_xSb₂ Cases.* AVS 68th International Symposium & Exhibition Overview, Pittsburgh, PA, USA, 6-11 November.
- Lage, J (2022). *Air pollution: What it is? How to control it? How to measure it?.* ERASMUS⁺, 1st Learning Training, Teaching activities - The Key Global Life, Digital Change of Nature, Universidade Lusófona (ULHT), Lisbon, 9 March.

- Lage, J. (2022). *A importância da qualidade do ar*. Webinar Eco-Escolas Faculdade de Engenharia, 6 June.
- Lage, J. (2022). *How to integrate the sustainability at the university*. Palestra sobre a Sustentabilidade Ambiental, para um grupo de alunos internacionais envolvidos no projeto ERASMUS + "Many Cultures, 1 Planet", 4 April.
- Lopes, G., Gama, V., Santos, I.C., Lopes, E.B., Pereira, L.C.J., Rabaça, S., Paixão, J.A., Almeida, M. (2022). *The Development of Molecular Bilayers Systems*. The 73rd Yamada Conference "International Conference on Molecular Spintronics Based on Coordination Compounds: Toward Quantum Computer and Quantum Memory Devices, Sakura Hall, Katahira Campus, Tohoku University, Sendai, Japan, 8th -11th October.
- Mendes, F (2022). *Lecture on Preclinical Evaluation of Radiopharmaceuticals*. PRISMAP young scientists event, Padova, Italy. November.
- Monteiro Gil, O. (2022). *Efeitos biológicos induzidos por exposição a radiação ionizante. Dosimetria Biológica*. Seminário no âmbito da UC Efeitos Biológicos da Radiação da Faculdade de Ciências e Tecnologia da Universidade NOVA de Lisboa (FCT NOVA), Campus da Caparica, 6 June.
- Paulo, A. (2022). *Desenvolvimento de radiofármacos para oncologia*. 7^a Escola de Inverno de Radiofarmácia e Radioquímica (1^a VIRTUAL) USP, São Paulo/Brasil, 29 June.
- Paulo, A. (2022). *Investigação em Ciências Radiofarmacêuticas no C²TN/IST*. Seminário no âmbito da UC "Seminário 1" do mestrado em Engenharia Biomédica, ISEL/ESTeSL, Instituto Politécnico de Lisboa, 3 November.
- Paulo, A. (2022). *Química Radiofarmacêutica e Radiofármacos*, Seminário no âmbito da UC "Química Inorgânica Medicinal" do mestrado em Ciências Farmacêuticas, Universidade Lusófona (Lisboa), 7 January.
- Rabaça, S., Santos, I.C., Lopes, G., da Gama, V., Lopes, E.B., Pereira, L.C.J., Veiros, L.F., Nogueira, F., Paixão, J.A., & Almeida, M. (2022). *The Role of C-H...N≡C Bonding in Bilayer Conductors*, Second International Conference on Noncovalent Interactions, University of Strasbourg, France, 18-22 July. Livro de resumos comunicação, IL6.
- Reis, M. (2022). *Contaminação ambiental na sequência de um acidente ou evento nuclear*. Palestras em Toxicologia e Ecotoxicologia (TOXECO-2022), Departamento de Biologia da Universidade de Aveiro, 22 June (via zoom).
- Reis, M. (2022). *Técnicas de medição do gás radão por detetores passivos*. Workshop Mitigação do radão em edifícios, Ordem dos Engenheiros, Lisbon, 26-27 October.
- Vaz P. (2022). *Nuclear reactor safety, Security and source terms in case of accidents*. Webinar TOXECO-2022, subordinated to the theme "Ameaças e Emergências Radiológicas e Nucleares: origem, resposta e consequências", MSc in "Ecotoxicologia e Análise de Risco" of Universidade de Aveiro, 22 June, online presentation.

Vieira B.J.C., Waerenborgh J.C., (2022). *Mössbauer spectroscopy in Campus Tecnológico e Nuclear.* Instituto Superior Técnico, Portugal – IBERMÖSS 2022, Coimbra, Portugal, 9 - 11 February.

Vieira B.J.C., Waerenborgh J.C., Pereira L.C.J., Santos I.C., Gama V., (2022). *Mössbauer Spectroscopy: A powerfull tool in the study of Iron(III) spin crossover systems.* IBERMÖSS 2022, Coimbra, Portugal, 9 - 11 February.

1.6.2 Contributed

1.6.2.1 Oral

2021

Abecasis, L., Gamelas, C., Canha, N., & Almeida, S.M. (2021). *The impact of COVID-19 confinement measures in the Air Quality in an urban-industrial zone in Portugal.* 25th International Clean Air and Environment Conference (CASANZ), Australia (online conference), 17-21 May 2021.

Almeida, S.M., Martins, V., Garcia, F., Batalha, G., Dionísio, I., Gonçalves, C., Lucarelli, F., & Alves, C. (2021). *COVID-19 lockdown effects on air quality in the surroundings of Lisbon Airport.* European Aerosol Conference (EAC). Interactive Live Virtual Event, 30 August - 3 September 2021.

Braz, T. (2021). *Mitochondrial-targeted 111In-radiocomplexes for Auger therapy of prostate cancer.* Workshop 2021 Thematic Strand Radiopharmaceutical Sciences and Health Physics/C²TN, 8 July 2021, online edition

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- Canha, N., Ramos, J., Belo, J., Silva, D., Diogo, C., & Almeida, S.M. (2022). *Influence of indoor air quality on sleep quality of university students in Lisbon*. Session SES-D4: Sleep quality and performance, Indoor Air 2022 - 17th International Conference of the International Society of Indoor Air Quality & Climate, Kuopio, Finlândia, 14 June 2022.
- Coelho, R., De Abreu, Y., Carvalho, F., Lopes, E.B., & Gonçalves, A.P. (2022). *Electrical Contacts Characterization of Tetrahedrite based Devices*. EMRS Spring Meeting, 31 May 2022, online.
- Coelho, R., De Abreu, Y., Carvalho, F., Lopes, E.B., & Gonçalves, A.P. (2022). *Tetrahedrite Based Thermoelectric Generators: Study and Characterization of electrical Contacts*, SACT 2022, 7 December 2022, online.
- Coelho, R., Lopes, E.B., Brito, F.C., & Gonçalves, A.P. (2022). *Computer Simulations of Tetrahedrite-based Thermoelectric Generators*. Virtual Conference on Thermoelectrics, 20-22 July 2022 (online).
- Corregidor, V., & Alves, L.C. (2022). *Characterization of Cultural Heritage Using a Micro-beam*, International Conference on Accelerators for Research and Sustainable Development from Good Practices Towards Socioeconomic Impact, 23-27 May 2022.
- Corregidor, V., Dias, M.I., Prudêncio, M.I., & Alves, L.C. (2022). *Ceramic body of tiles characterization by means of Ion beam analytical techniques*. 43th International Symposium on Archaeometry (ISA2020/2022), Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022.
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D'Onofrio, A., Silva, F., Gano, L., Raposinho, P., Sikora, A., Orzełowska, M., Mikołajczak, R., Garnuszek, P., & Paulo, A. (2022). *Bioorthogonal Chemistry Approach for Theranostics of GRPR-expressing Cancers*. The Fourth International Symposium on Technetium and Other Radiometals in Chemistry and Medicine, TERACHEM 2022, Bressanone, Itália, 14 -17 September 2022.

Esteves, D.M., Peres, M., Rodrigues, A.L., Biquard, X., Zanoni, J., Rodrigues, J., Ben Sedrine, N., Teixeira, B.M.S., Alves, L.C., Dias, M.I., Alves, E., Jia, Z., Mu, W., Sobolev, N.A., Correia, M.R., Monteiro, T., & Lorenz, K. (2022). *Activation of the Cr³⁺ luminescence in β-Ga₂O₃ by irradiation-induced defects*. NANO2022, Sevilla, Spain, 6 - 10 June 2022.

Ferreira Filho, V.C., Vieira, B.J.C., Waerenborgh, J.C., Soares, P.I.P., Borges, J.P., Marques, F., Casteletti, L.C., Campello, M.P.C.C., & Pereira, L.C.J., (2022). *Multifunctional Gadolinium Bearing Gold Coated Dextran SPIONs for Theranostic Application*. Magnetism in Portugal 2022, Fac. Sciences Univ. Porto, 12-13 September 2022.

Ferreira, L.M., Monteiro, B., Santos, P.M.P., Leal, J.P., & Casimiro, M.H. (2022). *Use of Ionic Liquids in the Radiation Processing of Nanostructured Hybrid Materials*. ICARST-2022 - Second International Conference on Applications of Radiation Science and Technology; IAEA Headquarters, Vienna, Austria, 22-26 August 2022.

Flor, P., Dias, M.I., Rodrigues, A.L., & Prudêncio, M.I. (2022). *'To be or not to be Della Robbia that is the question': methods of analysis in art history and archaeometry in the study of 16th century italian sculptures*. 43th International Symposium on Archaeometry (ISA2020/2022), Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022.

Gameiro, C., Aubry, T., Zilhão, J., Zambaldi, M., Matias, H., Almeida, F., Pinto, A. Maurício, J., Carvalho, V., Gomes, T., Lucena, A., Rodrigues, A.L. (2022). *Are we missing the point? New data on the production of Vale Comprido points at Portela 2 (Leiria) and Calvaria 2 (Porto de Mós)*. Facing the Last Glacial Maximum: fresh insights into the Gravettian-Solutrean transition in Southwestern Europe, FLUL, Lisboa, September 30th 2022.

Gamelas, C.A., Canha, N., Vicente, A., Alves, C., Kertesz, Z., Almeida, S.M. (2022). *Chemical characterization of atmospheric particulate matter and source apportionment in an urban-industrial area of the Lisbon Metropolitan Area, Portugal*. 11th International Aerosol Conference (IAC2022), Athens, Greece, 4-9 September 2022.

Kraemer, S., Athanasakis, M., Bara, S., Beeks, K., Chhetri, P., Claessens, A., Correia, J.G.M., Pereira, L.M.C., De Witte, H., Ferrer, R., Geldhof, S., Hosseini, N., Huyse, M., Kudryavtsev, Y., Laatiaoui, M., Lica, R., Magchiels, G., Moens, J., Raeder, S., Schumm, T., Sels, S., Thirolf, P.G., Tunhuma, S.M., Van Den Bergh, P., Van Duppen, P., Vantomme, A., Villarreal, R., & Wahl, U. (2022). *Ultraviolet Spectroscopy of the Actinium-229 beta decay: On the way to the first observation of 229mTh's radiative decay*. Workshop on "100 Years of Nuclear Isomers", Berlin, Germany, 2-4 May 2022,

Kraemer, S., van Duppen, P., Athanasakis, M., Bara, S., Beeks, K., Chhetri, P., Claessens, A., Correia, J.G.M., Pereira, L.M.C., De Witte, H., Ferrer, R., Geldhof, S., Hosseini, N., Huyse, M., Kudryavtsev, Y., Laatiaoui, M., Lica, R., Magchiels, G., Moens, J., Raeder, S., Schumm, T., Sels,

S., Thirolf, P.G., Tunhuma, S.M., van Den Bergh, P., Vantomme, A., Villarreal, R., & Wahl, U. (2022). *Ultraviolet Spectroscopy of the ²²⁹Actinium beta decay: the first observation of the radiative decay of the ²²⁹Th low-energy isomer.* 19th International Conference on Electromagnetic Isotope Separators and Related Topics (EMIS 2022), Daejeon, Korea, 3.-7 October 2022.

Lamelas, A., Rodrigues, J., Pereira, L., Correia, J.G., Wahl, U., Monteiro, T. and Amaral, V. (2022). *Ca colour centres in diamond: optical and computation study.* 45th WOCSDICE - Workshop on Compound Semiconductor Devices and Integrated Circuits held in Europe & 16th EXMATEC - Expert Evaluation and Control of Compound Semiconductor Materials and Technologies, Ponta Delgada, Portugal, 3-6 May 2022.

Lopes, G., Gama, G., Rabaça, S., Santos, I.C., Cerdeira, A.C., Pereira, L.C.J., Lopes, E.B., Paixão, J.A., & Almeida, M. (2022). *Bilayer Molecular Conductors with Polymeric Anions.* 14th International Symposium on Crystalline Organic Metals, Superconductors and Magnets (ISCOM2022), Le Pouliguen, France, 25-30 September 2022.

Lourenço, J.P., Seco, J., Marques, J.G., & Baltasar, F. (2022) *Beam Angle Optimization for Combined IMRT and FLASH Radiotherapy,* 4th European Congress of Medical Physics, Dublin, Ireland, 17-20 August 2022.

Madureira, J., Dias, M.I., Pinela, J., Calhelha, R.C., Barros, L., Santos-Buelga, C., Margaça, F.M.A., Ferreira, I.C.F.R., Cabo Verde, S. (2022). *Improving bioactive compounds extraction from olive wastes using gamma radiation.* Second International Conference on Applications of Radiation Science and Technology (ICARST-2022), Vienna, Austria, 22-26 August, 2022.

Mariano, P., Almeida, S.M., Almeida, A., Correia, C., Martins, V., Moura, J., Brandão, T., Santana, P. (2022). *An Information System for Air Quality Monitoring using Mobile Sensor Networks.* 19th International Conference on Informatics in Control, Automation and Robotics, ICINCO 2022. Lisbon, Portugal. 14-16 July 2022.

Marques, F., Pereira, L.C.J., Vieira, J. C., Waerenborgh, J.C., Pinheiro, T., Pinto, C.I.G., Mendes, F., Crich, S.G., Buades, A.B., Teixidor, F., & Viñas, C. (2022). *Metallocarboranes (Co, Fe) as multifunctional molecules for multimodal cancer treatment.* 9th European Conference on Boron Chemistry, Barcelona, Spain, 3-7 July 2022.

Marques, F., Silva, F., Mendes, C., D'Onofrio, A., Campello, M.P.C., Pinheiro, T., Gonçalves, K., Figueiredo, S., Gano, L., Ravera, M., Paulo, A., (2022). *Image-Guided Nanodelivery of Pt(IV) Prodrugs for Gastrin-Releasing Peptide Receptors in prostate PC3 cells.* 6th Cancer World Congress, Lisbon, Portugal, 28-30 September 2022.

Marques, L., Vale, A., Vaz, P. (2022). *A novel mobile radiation detection system for security and defense applications* [Conference presentation abstract]. In Proceedings of the 3rd World Conference on Advanced Materials for Defense (AuxDefense), Guimarães, Portugal. 6–8 July 2022.

- Marques, L., Vale, A., Vaz, P. (2022). *Development of a portable neutron detection system for Security and Defense applications*. Multidisciplinary International Conference of Research Applied to Defense and Security (MICRADS) Conference, Barranquilha, Colombia, 11–13 July 2022.
- Marques, L., Vale, A., Vaz, P. (2022). *Use of plastic scintillators with silicon photomultipliers in mobile radiation detectors for the detection and localization of nuclear and radiological threats*. International Society of Military Sciences Conference, Lisbon, Portugal, 11–13 October 2022.
- Martins V., Correia C., Cunha-Lopes I., Faria T., Diapouli E., Manousakas M.I., Eleftheriadis, K., Almeida S.M. (2022) *Factors affecting personal exposure to aerosol particles in transport microenvironments*. 11th International Aerosol Conference (IAC 2022), Athens, Greece. 4-9 September.
- Martins, V., Ascenção, J., Correia, C., Mendes, L., Gamelas, C.A., & Almeida, S.M. (2022). *Aerosol particle emissions from residential biomass burning: influence of different combustion appliances and firewood*. 11th International Aerosol Conference (IAC2022), Athens, Greece, 4-9 September 2022.
- Matos, C., Melo, L., Soares, R.M., Valério, P., Alves, L.C., Silva, A.M., & Soares, A.M.M. (2022). Uma sepultura sidérica de incineração no Cerro da Mina, Castro Verde (Alentejo, Portugal). *XII Encuentro de Arqueología del Suroeste Peninsular*, Huelva, Espanha, 20-22 October 2022.
- Melo, A.R., Paiva, I., Reis, M., Monteiro Gil, O., Palma-Oliveira, J.M., Martins, D.R., Silva, R.M.C. (2022). *Radiation risk perception during uranium mining, decommissioning and remediation: the case study of Urgeiriça*. 10th International Symposium on Naturally Occurring Radioactive Material. Ricomet 2022. Utrecht, the Netherlands, 10-12 May 2022.
- Moço, D., Lopes, E.B., Santos, L., Gonçalves, A.P. *The effects of co-doping tetrahedrite with Nickel and Selenium on the thermoelectric properties*. Materiais 2022, Centre for Rapid and Sustainable Product Development, Polytechnic of Leiria, Marinha Grande, Portugal, 10-13 April 2022.
- Moço, D., Lopes, E.B., Santos, L., Gonçalves, A.P. *Thermoelectric Optimization of Tetrahedrite – co-doping with Nickel and Selenium*. Virtual Conference in Thermoelectrics 2022 (VCT2022), 20-22 July 2022.
- Moço, D., Lopes, E.B., Santos, L., Gonçalves, A.P. *Thermoelectric properties of co-doped Tetrahedrite with Se and Ni*. Spring Meeting 2022 by EMRS, 30 May- 3 June 2022.
- Oliveira, B., Cravo Sá, A., Campos, G., Fernandes, P. (2022) *Development of a software for radiobiological calculations*. Fórum ART 2022, Coimbra, Portugal, 12 November 2022.
- Oliveira, B., Cravo Sá, A., Campos, G., Fernandes, P. (2022) *Development of a toolkit software for radiobiological calculations: AlphaBetaCalc*. European Radiation Protection Week 2022, Estoril, Portugal, 9-14 October 2022.
- Pereira, D.R., Díaz-Guerra, C., Peres, M., Magalhães, S., Correia, J.G., Alves, E., Cardoso, S., Freitas, P., Lorenz, K. (2022). *Electrical and structural changes induced by ion implantation in MoO₃ lamellar crystals*. VÁCUO 2021 SOPORVAC Workshop, Instituto Pedro Nunes, Coimbra, Portugal, 9 November 2021.

- Pinheiro, T., Alves, L.C., Corregidor, V., Teixidor, F., Viñas, C., & Marques, F. (2022). *Metallacarboranes for proton therapy using research accelerators: a pilot study.* International Conference on Accelerators for Research and Sustainable Development: From Good Practices Towards Socioeconomic Impact, Vienna, Austria, 23–27 May 2022.
- Pinto, C.I.G., Bucar, S., Alves, V., Fonseca, A., Abrunhosa, A., Silva, C.L., Guerreiro, J.F., Mendes, F. (2022). *⁶⁴CuCl₂ – a promising tool for prostate and brain cancer theranostics agent.* Workshop "New modalities in cancer imaging and therapy", Erquy, France, 5-8 October 2022.
- Pinto, C.I.G., Silva, F., Guerreiro, J.F. Campello, M. P. C., Santos, P., Mendes, F., & Paulo, A. (2022). *Evaluation of Gold Nanoparticles as Radiosensitizers in Glioblastoma Tumors.* European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Rabaça, S., Lopes, G., Santos, I.C., da Gama, V., Veiros, L.F., Lopes, E.B., Pereira, L.C.J., & Almeida, M. (2022). *Conducting bilayer salts (CNBEDTTTF)4A,* NInTecScienceDays, IST, Lisbon, Portugal, 6-7 October 2022.
- Raposinho, P.D., Silva, F., D'Onofrio, A., Mendes, C., Campello, M.P.C., Oliveira, M.C., Belchior, A., Marques, F., & Paulo, A. (2022). *Radiolabeled Gold Nanoseeds containing Substance P Peptides: Synthesis, Characterization and Evaluation in Glioblastoma Cells.* The Fourth International Symposium on Technetium and Other Radiometals in Chemistry and Medicine, TERACHEM 2022, Bressanone, Itália, 14-17 September 2022.
- Reis, A.R., Realista, S., Gomes, C.S.B., Viana, A.S., Corregidor, V., Alves, L.C., & Martinho, P.N. (2022). *Electrochemical growth of Fe-MOF-74-type films.* 2nd Chem & BioChem Students Meeting, Lisbon, Portugal, 15 July 2022.
- Relvas, H., Lopes, D., Ferreira, J., Rafael, S., Almeida, S.M., Martins, V., Diapouli, E., Hänninen, O., Lazaridis, M., & Miranda, A.I. (2022). *Characterizing human exposure, dose, and burden of disease linked to particulate matter: Lisbon case study.* 10th International Symposium on Atmospheric Sciences. ATMOS'22. Istanbul, Turkey. 18-21 October 2022.
- Rocha-Rodrigues, P.M., Santos, S.S.M., Santos, M.L.M., Oliveira, G.N.P., Miranda, I.P., Assali, L.V.C., Petrilli, H.M., Correia, J.G.M., Araújo, J.P.E., & Lopes, A.M.L. (2022). *Local probing the nature of structural phase transitions in the Ruddlesden-Popper CaO(CaMnO₃)_n family.* XX SBPMat Brazil-MRS Meeting, Iguaçu Falls, Brazil, 25-29 September 2022.
- Rodrigues, A.L., Dias, M.I., Valera, A.C., Rocha, F., Prudêncio, M.I., Marques, R., & Russo, D. (2022). *Luminescence and geochemistry applied to chronology and fill dynamic studies of negative archaeological structures.* 43th International Symposium on Archaeometry (ISA2020/2022), Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022.
- Rodrigues, A.L., Fonte, J., Dias, M.I., Russo, D., & Oltean, I. (2022). *Datação absoluta de recintos militares romanos temporários no norte de Portugal.* XIV Congresso Ibérico de Arqueometria, Tarragona, Espanha, 26-28 October 2022.
- Rodrigues, A.L., Medes da Silva, I., Alves, L.C., Catarino, N., Marques, R., & Corregidor, V. (2022). *Unravelling the past of glazed beads using accelerator-based techniques.* IAEA Workshop on

Innovative Approaches of Accelerator Science and Technology for Sustainable Heritage Management, Vienna, Austria, 13-16 June 2022.

Rodrigues, C., & Gonçalves, A.P. (2022). *An Advanced Method to Produce Micro/Nano Polymer Fibers*. CARISMA, 3^a Escola de Verão do C²TN, 5-7 September 2022, C2TN, Bobadela, Portugal, 5 – 7 September 2022.

Rodrigues, C., Saraiva, J. G., Peralta, L., & Gonçalves, A.P. (2022). *Development of microdosimetric detectors for radiobiology in hadron therapy facilities*. 1st Edition of the ProtoTera PhD Students Workshop, Universidade de Coimbra, Coimbra, Portugal, 28 – 29 November 2022.

Rodrigues, C., Saraiva, J. G., Peralta, L., & Gonçalves, A.P. (2022). *Development of microdosimetric detectors for radiobiology in hadron therapy facilities*. 7th IDPASC/LIP PhD Students Workshop, Universidade de Coimbra, Coimbra, Portugal, 6 – 7 July 2022.

Sá, AC., Fernandes, P., Campos, G., & Serra, F. (2022). *Monte Carlo study of out-of-field organ doses in stereotactic body radiation therapy of pancreatic patients*. Book of abstracts of the European Radiation Protection Week (ERPW2022), Estoril, Portugal. 9-14 October 2022.

Sá, AC., Fernandes, P., Campos, G., Serra, Fábio. (2022) *Avaliação das doses fora dos campos em doentes de pâncreas tratados com radioterapia estereotáxica*. Fórum ART 2022, Coimbra, Portugal, 12 November 2022.

Santos B., & Coelho R., (2022). *Thermoelectricity, A New Pathway Towards Sustainability: From Materials to Devices*, CARISMA III, 3^a Escola de Verão C²TN, Bobadela, Portugal, 5-7 September 2022.

Santos, J.F., Braz, M.T., Silva, F., Raposinho, P., Guerreiro, J.F., Cleeren, F., Cassels, I., Mendes, F., Fernandes, C., & Paulo, A. (2022). *Novel Radioconjugates for Auger Electron Therapy of Prostate Cancer*. NInTec Science Days, Instituto Superior Técnico, Lisbon, Portugal, 6-7 October 2022. (<https://nintec.pt/ScienceDays2022Files/NInTecScienceDaysBookofAbstract.pdf>).

Silveira, R.P., Urbano, A.M., Oliveira, P.J., Paulo, A., Fernandes, C., Santos, J.F., Julião, A.R., & Mota, S.I. (2022). *Radiocomplexos dirigidos a organelos celulares para terapia Auger do cancro*. 4^º Encontro Nacional de Jovens Investigadores em Oncologia (ENJIO), Porto, Portugal, 24 September 2022.

Vantomme, A., Moens, J., Kraemer, S., Correia, J.G., Wahl, U., Magchiels, G., Tunhuma, M., Villarreal, R., Van Duppen, P., & Pereira, L.M.C. (2022). *Towards an ion-implanted nuclear clock*. 22nd International Conference on Ion Beam Modification of Materials (IBMM), Lisbon, Portugal, 10-15 July 2022.

Vaz, P. (2022). *Monte Carlo calculations in different tumor phenotypes for Radiopharmaceutical Therapy using Auger electron emitting radionuclides*. 14th International Conference on Radiation Shielding and 21st Topical Meeting of the Radiation Protection and Shielding Division (ICRS14/RPSD2022), Seattle, USA, 25 - 29 September 2022.

Wahl, U., Corte, E., Andrini, G., Costa, A., Moens, J., Magchiels, G., Villarreal, R., Tunhuma, S.M., Nieto Hernández, E., Pugliese, V., Vantomme, A., Bernardi, E., Moreva, E., Degiovanni, I.P., Traina, P., Genovese, M., Ditalia Tchernij, S., Olivero, P., Correia, J.G., Forneris, J., & Pereira, L.M.C. (2022). *Magnesium-vacancy quantum defects in diamond*. 2022 ISOLDE Workshop and Users Meeting, CERN, Geneva, Switzerland (mixed in person and on-line), 30 November -2 December 2022.

Wahl, U., Costa, A.R.G., Magchiels, G., Moens, J., Tunhuma, S.M., Villarreal, R., Correia, J.G., Andrini, G., Pugliese, V., Nieto Hernández, E., Corte, E., Ditalia Tchernij, S., Bernardi, E., Degiovanni, I.P., Traina, P., Genovese, M., Olivero, P., Forneris, J., Johnston, K., Pereira, L.M.C., & Vantomme, A. (2022). *Fabrication of diamond quantum colour centres in “split-vacancy” configuration using ion implantation*. 22nd International Conference on Ion Beam Modification of Materials (IBMM), Lisbon, Portugal, 10-15 July 2022.

Wahl, U., Pereira, L.M.C., & Correia, J.G.M. (2022). *Prospects for implementation of emission channeling and perturbed angular correlation techniques at ISOL@MYRRHA*. ISOL@MYRRHA Workshop, SCK-CEN, Mol, Belgium 22-24 June 2022.

Zambaldi, M., Dimuccio, L., Angelucci, D., Gameiro, C., Almeida, F., Pinto, F., Maurício, J., Carvalho, V., Gomes, T., Lucena, A., & Rodrigues, A.L. (2022). *Revisiting the Portela 2 open air archaeological site: new insights from a geoarchaeological perspective*. Facing the Last Glacial Maximum: fresh insights into the Gravettian-Solutrean transition in Southwestern Europe. FLUL, Lisboa, 30 September 2022.

1.6.2.2 Posters

2021

- Antunes, J., Mendes, F., Paulo, A., & Sampaio, J. (2021). *Modeling the radiobiological effects of gold nanoparticles in proton therapy of glioblastomas*. PANIC 2021 – 22nd Particles and Nuclei International Conference, 5-10 September 2021, Virtual Meeting.
- Araújo, J.G., Pereira, L.C.J., & Sobral, A.J.F.N. (2021). *New Biomaterials Based in Metal Organic Frameworks (BioMOFs) for Cancer Photodiagnostic and Cancer Magnetic Hyperthermia Therapy*. ChemMat Doctoral Programme Workshop – IST/CTN, Bobadela, Portugal, 12 November 2021.
- Barcelos D.A., Gonçalves M.C., & Pereira L.C.J. (2022). *Glass and Glass-ceramics embedded with Semiconductor and Semiconductor-metal Nanoparticles*. ChemMat Doctoral Programme Workshop – IST/CTN, Bobadela, Portugal, 12 November 2021.
- Correia, C., Martins, V., Santana, P., Mariano, P., & Almeida, S.M. (2021). *ExpoLis: Assessment of Human Exposure to Air Pollution to Change the Way People Move in Cities*. European Aerosol Conference (EAC), Interactive Live Virtual Event, 30 August - 3 September 2021.
- Costa, I.F.M., Kirillov, A.M., & Pereira, L.C.J. (2021). *Heterometallic Metal-Organic and Supramolecular Networks for Magnetically-Driven Applications*. ChemMat Doctoral Programme Workshop – IST/CTN, Bobadela, Portugal, 12 November 2021.
- Cravo Sá, A., Vaz, P., Almeida, P. (2021). *Out-of-field doses in paediatric patients*. 5^a Conferência Anual da rede SAÚDE “A Health Research Agenda towards 2030”, Reitoria da Universidade de Lisboa, 30 November 2021.
- Cravo, Sá, A., Vaz, P., & Almeida, P. (2021). *Doses fora dos campos de tratamento em doentes pediátricos submetidos a radioterapia*. Encontros da Primavera, online, 20-22 May 2021.
- Cunha-Lopes, I., Casotti Rienda, I., Lucarelli, F., Alves, C.A. and Almeida, S.M. (2021). *Characterization of vehicle emissions in a road tunnel in Lisbon*. European Aerosol Conference (EAC), Interactive Live Virtual Event, 30 August - 3 September 2021.
- Di Maria S. (2021). *Poster Presentation on the activities of the Radiation Dosimetry and Radiobiology in the Radiation Protection and Safety Group (RPSG)* at the 1st open meeting of the COST action CA191114, Gothenburg, 9-11 May 2021.
- Fernandes C., Raposinho P., Belchior A., Palma E., Silva F., Guerreiro J.F., Mendes F., & Paulo A. (2021). *Organelle-Targeted Radioconjugates for Cancer Theranostics*. First Workshop of the Laboratory for Physics of Materials and Emerging Technologies (LaPMET), On-line Event, 23-24 September, 2021.
- Franco Machado, J., Machuqueiro, M., Marques, F., Garcia, M.H., Correia, J.D.G., & Morais, T.S. (2021). *Targeting FGFR(+) breast cancer cells with half-sandwich ruthenium(II)-cyclopentadienyl*

peptide conjugates. 7th Portuguese Young Chemists Meeting, Bragança, Portugal (online edition), 19-21 May 2021, ISBN: 978-989-8124-31-9.

García-Rivas, J., Dias, I., & Paiva, I. (2021). *Adsorción de Cs-137 en bentonitas: influencia de la textura.* XXVII Reunión de la Sociedad Española de Arcillas, Madrid, Spain, 19 November 2021.

García-Rivas, J., Paiva, I., & Dias, I. (2021). *Sorption of Cs-137 onto Portuguese bentonites: a preliminary study.* 3rd European Mineralogical Conference (EMC 2020), Krakow, Poland, 30 August - 2 September 2021.

Gonçalves, A.P., Chowdhury, S., Dieste-Blanco, O., Robba, D., & Manara, D. (2021). *Laser melting study of nanograined uranium carbides.* 50^{èmes} Journées des Actinides, on-line, 22-25 March 2021.

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Guerra, J.P.L., Vieira, B.C.J., Waerenborgh, J.C., Tavares P., & Pereira, A.S. (2022). *Spectroscopic detection of an iron-binding site in the N-terminal tail of a mini-ferritin*. 2nd Iberian Meeting on Mössbauer Spectroscopy (IBERMÖSS-2022), Coimbra, Portugal, 9-11 February 2022.

Guerreiro, J.F., Ferreira, V.F.C., Gonçalves, J., Farinha, C.M., & Mendes, F. (2022). *Development of molecular imaging biomarkers for assessment of CFTR localization in vivo*. 17th European Cystic Fibrosis Basic Science Conference, Albufeira, Portugal, 30 March-2 April 2022.

Janela, D., Mártilres, D., Fernandes, P., & Cravo Sá, A. (2022). *Comparison of dosimetric calculations with VMAT and proton radiotherapy in glioblastoma multiforme*. Fórum ART 2022, Associação Portuguesa dos Radioterapeutas, Santarém, Portugal, 12 November 2022.

Kraemer, S., Athanasakis, M., Bara, S., Beeks, K., Chhetri, P., Claessens, A., Cocolios, T., Correia, J.G.M., Cottenier, S., De Witte, H., Ferrer, R., Geldhof, S., Hosseini, N., Köster, U., Laatiaoui, M., Lica, R., Magchiels, G., Manea, V., Moens, J., Moore, I., Pereira, L.M.C., Raeder, S., Rothe, S., Schumm, T., Sels, S., Thirolf, P.G., Tunhuma, S.M., Van Den Bergh, P., Van Duppen, P., Vantomme, A., Villarreal, R., Verlinde, M., & Wahl, U. (2022). *Vacuum-ultraviolet spectroscopy of thorium-229m: En route towards a solid-state nuclear clock*. 2022 ISOLDE Workshop and Users Meeting, CERN, Geneva, Switzerland (mixed in person and on-line), 30 November-2 December 2022.

Lage, J., Santana, P., & Almeida, S.M. (2022) *Optimizing air quality monitoring methodologies using UAV systems*. 11th International Aerosol Conference (IAC2022), Athens, Greece, 4-9 September 2022.

Lamelas, A., Rodrigues, J., Pereira, L.M.C., Correia, J.G., Wahl, U., Monteiro, T., & Amaral, V.S. (2022). *Search for Ca color centers in diamond*. 32nd International Conference on Diamond and Carbon Materials, Lisbon, Portugal, 4-8 September 2022.

Leal, J.P., Carretas, J.M., Ferreira, L.M., & Santos, P. (2022). *Can we turn wastewater in a new source of valuable metals?*. EuChemS – Chemistry Congress, Lisbon, Portugal, 28 August - 1 September 2022.

Marouani, Y., Benali, A., Vieira, B.J.C., Waerenborgh, J.C., Dhari, E., & Costa B.F.O. (2022). *Influence of Sr doping on structural and magnetic properties of M-type Barium hexagonal ferrites*. 2nd Iberian Meeting on Mössbauer Spectroscopy (IBERMÖSS-2022), Coimbra, Portugal, 9-11 February 2022.

Marques, F., Cravo Sá, A., & Fernandes, P. (2022). *Interobserver variability in the delimitation of organs at risk for breast cancer radiotherapy planning*. Fórum ART 2022, Associação Portuguesa dos Radioterapeutas, Santarém, Portugal, 12 November 2022.

Marques, L. (2022). *Radiation detection system coupled to a multirotor for the inspection of shipping container cargo*. Promotion of the "Industry day" with the NATO Industrial Advisory Group at quartel da Serra do Pilar, Vila Nova de Gaia, Portugal, 28 November 2022.

Marques, L., Vaz, P., & Gonçalves, A.P. (2022). Promotion of the "Inovação e Modernização Tecnológica no Exército" at the Quartel de Paço de Arcos with a poster presentation and a radiation detection system coupled to a drone exhibition, Paço de Arcos, Portugal, 20 October 2022.

Marques, R., Rodrigues, A. L., Prudêncio, M.I., Dias, M.I., Russo, D., Valera, A.C., Basílio, A.C., Ramos, R., Kasztovszky, Zs., Harsányi, I., Szilágyi, V., Kovács, I., & Szőkefalvi-Nagy, Z. (2022). *Cerâmica campaniforme e do tipo Penha da Necrópole Megalítica das Motas (NO Ibérico): caracterização, proveniência e circulação*. XIV Congresso Ibérico de Arqueometria, Tarragona, Espanha, 26-28 October 2022.

- Marques, T.S., Gomes, A.R., Dias, S., Madruga, M.J., & Reis, M. (2022). *Evaluation of tritium in surface and rain waters during the last decade (2010-2020)*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Marques, T.S., Smiatek, M.A., Golding, J., Raposo, M., Eden, S., Mason, N.J., & Reis, M. (2022). *Nd:YAG laser and gold nanoparticles in DNA induced-damage*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Melo, A.R., Paiva, I., Reis, M., Monteiro Gil, O., Palma-Oliveira, J.M., Martins, D., Silva, R.M.C. (2022). *X-ray's risk perception in Portugal from late 19th century*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Mendez, S., Almeida, S.M., Belo, J., Canha, N. (2022). *Strategy of HypnosAIR - Understanding the impact of air quality on sleep quality considering an integrated human exposure approach*. 5th Meeting of Colégio de Química da Universidade de Lisboa (CQUL) - "Forging bonds", Lisboa, Portugal, 12-14 July 2022.
- Moço, D., Lopes, E.B., Santos, L., & Gonçalves, A.P. (2022). *Tetrahedrite Doping– Optimization of thermoelectric performance with Nickel and Selenium*. 18th European Conference on Thermoelectric (ECT22), 14-16 September 2022.
- Moens, J., Kraemer, S., Correia, J.G.M., Wahl, U., Magchiels, G., Tunhuma, S.M., Villarreal, R., Schumm, T., Van Duppen, P., Vantomme, A., & Pereira, L.M.C. (2022). *Lattice Location of Th in CaF₂ Using Channeling Techniques: Towards a Nuclear Clock*. Workshop on “100 Years of Nuclear Isomers”, Berlin, Germany, 2-4 May 2022.
- Monge Soares, A.M., Gonçalves, A.P., Alves, L.C., Valério, P. (2022). *Nondestructive analysis of Egyptian faience beads from Late Bronze Age and Early Iron Age necropolises in Alentejo (Southern Portugal)*. International Symposium on Archaeometry (ISA2020/2022), Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022, p.243.
- Monteiro Gil, O., Esteves, E., Madeira, P., Rodrigues, M., Proença, F., & Rodrigues, A.S. (2022). *Assessment of genetic damage in oral mucosa cells induced by exposure to low-dose ionizing radiation*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Nunes, M., Corregidor, V., Alves, L.C., Vieira, B.J.C., Waerenborgh, J.C., Mitchell, S.G., Claro, A., & Ferreira T. (2022). *Revealing the iron-gall ink composition and degradation process in a 17th century Portuguese Jesuit manuscript through microscopic and spectroscopic techniques*. 5th International Conference on Innovation in Art Research and Technology (inArt 2022), Paris, France, 28 June-1 July 2022.
- Nunes, M., Corregidor, V., Alves, L.C., Vieira, B.J.C., Waerenborgh, J.C., Mitchell, S.G., Claro, A., & Ferreira, T. (2022). *Revealing iron gall ink in a 17th century Portuguese Jesuit manuscript*. 5th International Conference on Innovation in Art Research and Technology (inArt 2022), Paris, France, 28 June-1 July 2022.

- Paiva, I., Baptista, A. Reis, M., Alves, J., & Vaz, P. (2022). *The importance of EJP EURAD/WP9 ROUTES in strengthening radioactive waste management in Portugal*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Paiva, I., Reis, M., Monteiro Gil, O., & Vaz, P. (2022). *MPSR: A Unique Master's Course on "Radiation Protection and Safety" in Portugal. Lessons Learnt and Recommendations for the Future*. 6th European Congress on Radiation Protection (IRPA 2022), Budapest, Hungary, 30 May – 3 June 2022, Hybrid event.
- Paninho, A.B., Rodrigues, T., Bernardo, M., Matos, I., Casimiro, M.H., Santos, P., Ferreira, L., Ventura, M.G. (2022). *New functionalized alginate aerogel materials as potential removal agents of diclofenac in water*. XXVI Encontro Galego-Portugués de Química, Galiza, Spain, 16-18 November 2022.
- Ramos, B. Serôdio, M., Cravo Sá, A., & Fernandes, P. (2022). *Variabilidade Intra-Observador na Segmentação de Volumes de Interesse no Planeamento Dosimétrico*. Fórum ART 2022, Associação Portuguesa dos Radioterapeutas, Santarém, Portugal, 12 November 2022.
- Reis, A.R., Realista, S., Gomes, C.S.B., Ferreira, A.M., Martinho, P.A., Alves, L., & Corregidor, V., (2022). *Depth distribution of Fe in Fe-MOF-74 thin films*. International Conference on Nuclear Microprobe Technology and applications (ICNMTA2022), Ljubljana, Slovenia, 11-16 September 2022.
- Reis, M., Santos, M., Andrade, E., & Dias, S. (2022). *Radioactive aerosols monitoring in Lisbon and Azores - an overview*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Rodrigues, A.L., Dias, M.I., Prudêncio, M.I., Valera, A.C., Kasztovszky, Zs., Harsányi, I., Szilágyi, V., Kovács, I., Szőkefalvi-Nagy, Z. (2022). *Nuclear analytical techniques applied to the study of Ivory artefacts*. 43th International Symposium on Archaeometry (ISA2020/2022), Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022.
- Rodrigues, A.L., Marques, R., Dias, M.I. Prudêncio, M.I., Valera, A. C., Kasztovszky, Zs., Harsányi, I., Szilágyi, V., Kovács, I., & Szőkefalvi-Nagy, Z. (2022). *Addressing mobility of people, ideas, and artefacts between Chalcolithic Iberic enclosures by non-destructive methods*. 6th International Congress Chemistry for Cultural Heritage (ChemCH), Ravenna, Italy, 4-8 July 2022.
- Rodrigues, A.L., Marques, R., Dias, M.I., Prudêncio, M.I., Russo, D., Valera, A.C., Kasztovszky, Zs., Harsányi, I., Szilágyi, V., Kovács, I., & Szőkefalvi-Nagy, Z. (2022). *Técnicas analíticas não destrutivas aplicadas ao estudo de artefatos de marfim dos Perdigões (Alentejo, Portugal)*. XIV Congresso Ibérico de Arqueometria, Tarragona, Spain, 26-28 October 2022.
- Rodrigues, A.L., Mendes da Silva, I., Alves, L.C., Marques, R., & Corregidor, V. (2022). *Mineral Glazed beads: similar composition but different colour*. 18th International Conference on Nuclear Microprobe Technology and Applications (ICNMTA2022). Ljubljana, Slovenia, 11-16 September 2022.

- Rodrigues, C., Saraiva, J.G., Peralta, L., Gonçalves, A.P., Sampaio, J., Guerreiro, D., & Salgueiro, D. (2022). *Development of microdosimetric detectors for radiobiology in hadron therapy facilities*. 7th IDPASC/LIP PhD Students Workshop, Universidade de Coimbra, Coimbra, Portugal, 6 – 7 July 2022.
- Rodrigues, F., Cravo Sá, A., & Fernandes, P. (2022). *Creation of a voxelized thorax phantom*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Romanets, Y., Vale, A., Ventura, R., Corisco, J., Catarino, N., Veiga, N., & Sargent, S. (2022). *Using a fleet of drones for radiological monitoring of terrestrial areas*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Santos, J.F., Braz, M.T., Silva, F., Raposo, P., Guerreiro, J.F., Cleeren, F., Mendes, F., Fernandes, C., & Paulo, A. (2021). *Mitotropic Radiocomplexes for Auger Therapy of Prostate Cancer*. 2nd Chem & BioChem Students Meeting, Lisbon, Portugal, 15 July 2022.
- Santos, M., Dias, S., & Reis, M. (2022). *Challenges in measuring NORM samples by HPGe*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022, p.310.
- Schuderer, F., Correia, J.D.G., & Casini, A. (2022). *Blood-Brain-Barrier Penetrating Peptide-Based Radioligands Targeting the EGFR/EGFRvIII Receptors for the Treatment of Glioblastoma Multiforme*. Metals in Medicine, Advancing the Use of Metal-Based Compounds and Nanotheranostics for Personalized Medicine, Proctor Academy, 204 Main Street Andover, NH, USA, 26 June – 1 July 2022.
- Silva, F., D'Onofrio, A., Gano, L., Raposo, P., Sikora, A., Orzełowska, M., Mikołajczak, R., Garnuszek, P., & Paulo, A. (2022). *Biological evaluation of ¹¹¹In-clickable complexes for cancer theranostics*. International Symposium on Radiopharmaceutical Sciences, Nantes, France, 29 May – 2 June 2022.
- Sousa, P.A., Cesário, A., Lora da Silva, E., Lekshmi, P.N., Rocha Rodrigues, P., Correia, J.G., Araújo, J.P., & Lopes, A.M.L. (2022). *Local probe studies and combined ab-initio calculations in CsNdNb₂O₇*, 23^a Conferência Nacional de Física, Porto, Portugal, 7-10 September 2022.
- Valente, S., Borbinha, J., Vaz, P., & Di Maria, S. (2022). *Influence of interpatient variability in organ dose assessment for pediatric Nuclear Medicine procedures*. European Radiation Protection Week (ERPW2022), Estoril, Portugal, 9-14 October 2022.
- Valério, P., Oliveira, C., Silva, R.J.C., Costa, M., Gonçalves, M.J., Soares, R., Costa, F., Gonçalves, A.P., & Soares, A.M.M. (2022). *Um possível algaraviz almóada da Rua da Sé, Silves - notícia preliminar*. 10^º Encontro de Arqueologia do Algarve, Câmara Municipal de Silves, Silves, 10-12 November 2022.
- Valério, P., Soares, J., Alves, L.C., Silva, R.J.C., Araújo, M.F., & Tavares da Silva, C. (2022). *Copper production and use during the third millennium BC in the western end of Iberian Peninsula: the testimony of Castro de Chibanes (Portugal)*. 43th International Symposium on Archaeometry (ISA2020/2022), Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022, pp. 276.

Valério, P., Soares, R.M., Soares, A.M.M., Gomes, S.S., & Araújo, M.F. (2022). *The Iron Age bronze workshop of Cabeço Redondo (Portugal): preliminary evaluation of copper sources using lead isotopes*. 43th International Symposium on Archaeometry (ISA2020/2022), Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022, pp. 295.

Wahl, U., Correia, J.G., Costa, A.R.G., David-Bosne, E., Kappers, M.J., Lima, T.A.L., Lippertz, G., da Silva, M.R., Villarreal, R., Vantomme, A., & Pereira, L.M.C. (2022). *Fluence and doping dependence of lattice location of ion implanted Mg in GaN*. 22nd International Conference on Ion Beam Modification of Materials (IBMM), Lisbon, Portugal, 10-15 July 2022.

Wahl, U., Correia, J.G., Costa, A.R.G., Magchiels, G., Moens, J., Tunhuma, S.M., Villarreal, R., Pereira, L.M.C., & Vantomme, A. (2022). *Structure of ion implanted Xe colour centres in diamond*. 32nd International Conference on Diamond and Carbon Materials, Lisbon, Portugal, 4-8 September 2022.

2 SEMINARS

2021

Belo, D., *How science really works*, seminar at CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Belo, D., *How science really works, Seminar in the scope of the GO activities*, at Real Colégio de Portugal, Lisbon, 24 May 2021.

Canha, N., & Almeida-Silva, M., *Exposure to air pollutants during COVID-19 pandemic – better or worse than before?*, Webinar promoted by International Society of Exposure Science - ISES, online, 23 February 2021.

Casimiro, M.H., *Ionizing radiation: a versatile tool to functionalize (and sterilize) polymeric materials*, Seminar of discipline Advanced Materials of the Bologna Master in Materials Engineering from IST/ULisboa, 14th December 2021.

Casimiro M.H., *Polymer functionalization by irradiation techniques*, seminar at CARISMA II-the Summer school of C²TN, Campus Tecnológico e Nuclear of IST, 6-9 September 2021.

Cerdeira, A. C., *Lecture on Magnetic Properties of Materials – Fundamentals and Characterization Methods*, CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Gano, L., *Radiopharmaceuticals and Nuclear Medicine*, Seminar at CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Gomes, S.S., *A distribuição isotópica do Pb em estudos de proveniência: As canalizações de chumbo na Lusitânia em Época Romana*, MSc in Conservation and Restoration at NOVA School of Science and Technology, Lisbon, 30 March 2021.

Gomes, S.S., *Lead it be! Lead isotopes and provenance studies in cultural heritage*, CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Gomes, S.S., *Preliminary results on lead sources of roman amphora labels recovered at Rio Arade (Portimão)*, Workshop of C²TN thematic strand Earth Systems, Radioactivity and Cultural Heritage (ESRCH), Lisboa, 19 November 2021.

Gonçalves, A.P., *Lecture on High temperature synthesis methods*, CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Marques, L., *Overview of recent developments in mobile radiation detection systems for different scenarios - challenges and opportunities*, Instituto Superior Técnico, Lisboa, Portugal, 24 March 2021.

Marques, R, *Soil background composition. What is the purpose?*, CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Mendes, F., *Innovative agents for Nuclear Imaging and/or Systemic Radiotherapy of cancer*, Webinar "A Universidade de Lisboa à Procura de Respostas para o Cancro", organized by the Oncology working group, Rede Saúde da Universidade de Lisboa, October 21, 2021

Paiva, I., *Confidence in radioactive waste solutions*, CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Rabaça, S., *Lecture on Multifunctional Materials*, CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Rodrigues A.L., *Once upon a time... A quartz grain life*, CARISMA II – 2nd Summer School of C²TN, CTN, IST, Bobadela, Portugal, 6-9 September 2021.

Valério, P., *A datação por radiocarbono: teoria e casos de estudo em Portugal*. MSc seminar at Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, 30 April 2021.

Valério, P., *My dagger is better than yours! The chronology and composition of prehistoric metals and alloys in southern Portugal*, Seminar at CARISMA II – 2nd Summer School of C²TN, CTN-IST, 7 September 2021.

Vaz, P., *Radiation Protection and Dosimetry in the applications of ionizing radiation*, Colóquio do Departamento de Física do IST, Lisboa, 19th May 2021.

2022

Belo, D., *Single Component Molecular Conductors for molecular Electronics*, CARISMA III - 3rd Summer school of C²TN, CTN- IST, Bobadela, Portugal, 5-7 September 2022.

Belo, D., & Rabaça, S., *Crystalline Molecular Conductors*, within the scope of the Curricular Unit "Functional Materials", of the Master in Engineering Sciences-Materials Engineering.

Belo, D., *How science really works*, CARISMA III - 3rd Summer school of C²TN, CTN- IST, Bobadela, Portugal, 5-7 September 2022.

Canha, N., & Mendez, S., *How nuclear techniques can be used for the assessment and management of air quality?*, CARISMA III - 3rd Summer school of C²TN, CTN- IST, Bobadela, Portugal, 5-7 September 2022.

Corisco, J. (2022). *Drones being FRIENDS in radioactive scenarios*. CARISMA III - 3rd Summer school of C²TN, CTN- IST, Bobadela, Portugal, 5-7 September 2022.

Corregidor, V., & Alves, L.C., *Técnicas de haces de iones y Oro: desde semiconductores hasta patrimonio cultural*. Laboratório Cero, Comisión Nacional de Energía Atómica de Argentina, 14 May 2022.

Gomes, S.S., *A aplicação dos isótopos do Pb em estudos de proveniência nos artefactos metálicos da Época Romana*, MSc in Conservation and Restoration at NOVA School of Science and Technology, Lisbon, March 2022.

Gomes, S.S., *A vision from the sea: Provenance studies applied to Roman lead artefacts*, CARISMA III - 3rd Summer school of C²TN, CTN- IST, Bobadela, Portugal, 5-7 September 2022.

Marques, L., *Radiation detection system coupled to a multirotor for the inspection of shipping container cargo*, seminar at International Atomic Energy Agency (IAEA) Technical Meeting on the Use of Uncrewed Aerial Systems for Radiation Detection and Surveillance, Brno, Czech Republic. 26–30 September 2022.

Paiva, I., *Consequences of an Incorrect Management of sealed sources*, CARISMA III - 3rd Summer school of C²TN, CTN- IST, Bobadela, Portugal, 5-7 September 2022.

Reis, M., *Lecture on Radioatividade Ambiental e Proteção Radiológica*, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Monte da Caparica, 16 May 2022.

Rodrigues A.L., *Once upon a time... A quartz grain life*, CARISMA III - 3rd Summer school of C²TN, CTN- IST, Bobadela, Portugal, 5-7 September 2022.

Rodrigues, A.L., *Proveniência, tecnologias de produção, autenticidade e datação absoluta de artefactos e contextos históricos e arqueológicos - Aplicação de métodos de análise química, mineralógica e de dosimetria por luminescência*, Seminário na disciplina de Arqueometria, 3º ano da Licenciatura em Arqueologia – Faculdade de Letras da Universidade de Lisboa – 27 September 2022.

Valério, P., *Datação por Radiocarbono: teoria e exemplos de aplicação*, MSc seminar at Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, 22 March 2022.

Vieira B.J.C., *Research in a “Radioactive” Laboratory*, seminar at Faculdade de Ciências eTecnologia da Universidade NOVA de Lisboa (FCT/UNL), 30 May 2022.

3 PERFORMANCES AND EXHIBITIONS

2021

Almeida, M., Lopes, E.B., Vieira, B.J.C., Brotas, G., & Cerdeira A.C. (2021). Promotion of the "XXIV Semana da Física" event of NFIST with online presentations performed in the Solid State group's laboratories and related to the Solid State group of C²TN and its research activities, Bobadela, Portugal, 25, 26, 27 and 31 de May 2021.

Almeida, S.M., Martins, V., Correia, C., Cunha-Lopes, I., Faria, T., Canha, N., & Lage, J. (2021). Promotion of the activity of "O ar é de todos - conhecer para agir" on behalf of C²TN/IST on the European Researchers' Night 2021 held at Museu da Ciência and Pavilhão do Conhecimento, Lisbon, Portugal, 24 September 2021.

Caldeira, M., Santos, L., & Alves, J. (2021). Video on calibration of a radiotherapy ionization chamber for IPQ Webinar: Dia Mundial da Metrologia – Medição para a Saúde, online, 20 May 2021. <https://www.youtube.com/watch?v=li1KPC7ugz0>.

Canha, N (2021). Seminar "O ar é de todos" to students of 12th grade at Escola Secundária de Camarate (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 6 January 2021.

Canha, N. (2021). Two Seminars "O ar é de todos" to students of 11th grade (two classes) at Escola Secundária de São João da Talha (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 7 January 2021.

Canha, N. (2021). Two Seminars "O ar é de todos" to students of 5th at Escola Básica de Camarate (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 13 January 2021.

Correia, C. (2021). Three webinars "O ar é de todos" to students of Escola Básica do Prior Velho (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 6 January 2021.

Cunha-Lopes, I. (2021). Seminar "O ar é de todos" to students of 7th grade at Escola General Humberto Delgado (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 6 January 2021.

Cunha-Lopes, I. (2021). Seminar "O ar é de todos" to students of 7th grade at Escola Básica Luís Sttau Monteiro (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 13 January 2021.

Dias, M.I., & Prudêncio, M.I., (2021). Permanent Exhibition in Museu Arqueológico de Fornos de Algodes: Caracterização Química e Mineralógica de Cerâmicas: Proveniências e Tecnologias de Produção, Portugal.

Faria, T. (2021). Seminar “O ar é de todos” to students of 8th grade at Escola General Humberto Delgado (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 6 January 2021.

Faria, T. (2021). Seminar “O ar é de todos” to students of 8th grade at Escola Básica Luís Sttau Monteiro (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 13 January 2021.

Gomes, S.S. (2021). Promotion of the “Science Dating” event at the European Researchers' Night 2021 with researchers from C²TN, Lisbon, Portugal, 24 September 2021.

Martins, V. (2021). Three webinars "O ar é de todos" to students of Escola Básica do Prior Velho (Loures, Portugal) in the framework of the project A·Tu·Ar promoted by Câmara Municipal de Loures and funded by Fundo Ambiental, 6 January 2021.

Melo, R., Rosário-Ferreira, N., & Moreira, I.S. (2021). "Pick yoUR bRain" - Born from Knowledge 2021.

Rabaça S. (2021). NEBLetter, entrevista dada aos alunos do Núcleo de Engenharia Biológica, October 2021. https://issuu.com/nebletter/docs/nebletter_outubro.

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Marques, L. (2022), Promotion of the PhD open days at Instituto Superior Técnico with an oral and poster presentation "Development of a Radiation Detection System Coupled to an Unmanned Aerial Vehicle for Security and Defense Applications", Instituto Superior Técnico, 14-16 November 2022.

Marques, L. (2022). Promotion of the "Industry day" with the NATO Industrial Advisory Group at quartel da Serra do Pilar . Poster presentation "Radiation detection system coupled to a multirotor for the inspection of shipping container cargo" , Vila Nova de Gaia, Portugal, 28 November 2022.

Marques, L., Vaz, P., & Gonçalves, A.P. (2022). Promotion of the "Inovação e Modernização Tecnológica no Exército" at the Quartel de Paço de Arcos with a poster presentation and a radiation detection system coupled to a drone exhibition, Paço de Arcos, Portugal, 20 October 2022.

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4 RESEARCH CONTRACTS

4.1 Industrial Research Contracts

- *Dating an unexpected Roman military site in northern Portugal and southern Galicia (Northwest Iberia)*, The Roman Research Trust & The Roman Society, The Audrey Barrie Brown Memorial Fund and Donal Atkinson Fund (2021), IST Budget: 1800 €, Coordinators: A.L. Rodrigues & M.I. Dias.
- *Datação por Luminescência de materiais acumulados no sítio Portela 2 – Leiria, no âmbito do projeto PALEORESCUE (PTDC/HAR-ARQ/30779/2017) - Upper Palaeolithic and Preventive Archaeology in Portugal: challenges and opportunities*. Coordinator: C. Gameiro, UNIARQ Faculdade de Letras da Universidade de Lisboa (2021-2022), IST Budget: 1 800 €. Coordinators at IST: A.L. Rodrigues & M.I. Dias.
- *Datação por luminescência e estudos composicionais de sedimentos e cerâmicas de contexto pré-histórico, no âmbito do projeto de extensão da Linha Amarela de Sto Ovídeo a Vila d'Este, nos trabalhos arqueológicos desenvolvidos na Quinta do Cisne, pila 5 do viaduto de Sto. Ovídeo*, Coordinators: T. Braga & I. Botelho, Metro do Porto, SA e João Marques - Palimpsesto – Arqueologia e Património (2021-2022), IST Budget: 2 400 €, Coordinators at IST: A.L. Rodrigues & M.I. Dias.
- *Datação por Luminescência de materiais acumulados no sítio Abric de l'Hedra-Valencia no âmbito do projeto Síntesis del Paleolítico medio y superior en Valencia y Murcia: aspectos cronológicos, paleoambientales, económicos y culturales (HAR2017-85153-P)*, Coordinators: V. Villaverde Bonillada, C. Real & M. Vadillo, Universidade de Valéncia (2021-2022), IST Budget: 600 €, Coordinators at IST: A.L. Rodrigues & M.I. Dias.
- *Datação por Luminescência de materiais acumulados no sítio de As Muradellas (Baltar, Ourense, Espanha)*, no âmbito do projeto: Intervención arqueológica no xacemento de As Muradellas, Coordinator: E. Meunier, Casa de Velázquez – EHEHI (2021-2022), IST Budget: 1 200 €, Coordinators at IST: A.L. Rodrigues & M.I. Dias.
- *Datação por Luminescência de materiais acumulados no sítio de no de Alto da Raia (Montalegre, Vila Real, Portugal e Calvos de Randín, Ourense, Espanha)*, âmbito do projeto: Finisterrae – Negotiating and Contesting Marginal Landscapes on the Western Fringes of the Roman Empire (Marie Skłodowska Curie Individual Fellowship, Grant Agreement 794048), Coordinator: J. Fonte, Universidade Exeter (2021-2022), IST Budget: 1 800 €. Coordinators at IST: A.L. Rodrigues & M.I. Dias.
- *Testes iniciais e datação de parede de alvenaria*, (2021), IST Budget: 1 200 €, Coordinators at IST: A.L. Rodrigues & M.I. Dias.
- *Datação por luminescência de Dunas Fósseis*, Coordinators: A.C. Araújo, A.M. Costas & S. Costas Otero, Direção geral do Património cultural, Center for Marine and Environmental Research (CIMA) da Universidade do Algarve (2022-2023), IST Budget: 3 600 € Coordinator at IST: A.L. Rodrigues.

- *Análise química e mineralógica de cerâmicas do sítio de villa Cardílio.* Coordinator: V. Filipe (2022), IST Budget: 2 755 €, Coordinator at IST: R. Marques.
- *Microbiological analysis for Indoor Air Quality in clean rooms,* Stechcomply (2022), IST Budget: 17 900 €, Supervisor: S. Cabo Verde.
- *Determinação do conteúdo biogénico em amostras de PCC,* The Navigator Company (2021), IST Budget: 7 380 €, Coordinators: P. Valério & M.F. Araújo.
- *Determinação do conteúdo biogénico em amostras de PCC,* The Navigator Company (2022), IST Budget: 8 856 €, Coordinators: P. Valério & M.F. Araújo.

4.2 European Research Contracts

- 17RPT01 DOSEtrace. EURAMET - EMPIR programme – H2020 (2018-2021). Total Budget: 406 600- €, IST Budget: 16 500 €, Coordinator at IST: J.G. Alves.
- 19NET03 – support BSS. Support for a European Metrology Network on reliable radiation protection regulation. EURAMET - EMPIR programme – H2020 (2020-2023). Total Budget: 476 460 €, IST Budget: 36 750 €, Coordinator: Physikalisch-Technische Bundesanstalt, Coordinator at IST: J.G. Alves.
- 3SqAIR: Sustainable Smart Strategy for Air Quality Assurance in Classrooms. European Union - Interreg Sudoe (2020-2023), Total budget: 1 328 000 €, IST Budget: 168 000 €, Coordinator at IST: S.M. Almeida.
- AHEAD2020 - Integrated Activities for the High Energy Astrophysics Domain, European Union - H2020 (2020-2024), Total Budget: 9 977 472,50 €, IST Budget: 185,000.00 €, Coordinator at IST: M.A. Reis.
- CA19120 - WATSON – Water Isotopes in the critical zone: from groundwater recharge to plant transpiration, European Union – COST (2021-2024). Coordinator at IST: P.M. Carreira.
- CHALCLOOM - multi-analytical approach on Chalcolithic loom weights from Vila Nova de São Pedro (Portugal) and experimental replicas to establish provenance and production technologies, European Union - IPERION HS (2022-2023), Coordinator: R. Marques.
- Colossal - Chemical on-line composition and source apportionment of fine aerosol, European Union – Cost (2017-2021), Coordinator at IST: S.M. Almeida.
- COST Action CA17136 – IndAir Pollnet - Indoor Air Pollution Network, European Commission – Cost (2018-2022), Coordinator at IST: N. Canha.
- ECF4CLIM - A European Competence Framework for a Low Carbon Economy and Sustainability through Education, European Union - H2020 (2021-2025), Total Budget: 4 896 000,00 €, IST Budget: 796 000 €, Coordinator at IST: S.M. Almeida.

- *ENEN2 PLUS - Building European Nuclear Competence through continuous Advanced and Structured Education and Training Actions*, call: HORIZON-EURATOM-2021-NRT-01. European Union (2022-2026), Total Budget: 6 999 459 €, IST Budget: 73 750 €. Coordinator at IST: A.R. Paulo.
- *EURAD - European Joint Programme on Radioactive Waste Management: Strategic Studies Project ROUTES - Waste management routes in Europe from cradle-to-grave*. IST-ID (RE). European Union - H2020-COFUND-EJP (Started: September 2019-2024, Grant 847593), Total Budget: 1 700 000 €, IST Budget: 49 000 €, Coordinator at IST: I. Paiva.
- *EURAD Joint Programme on Radioactive Waste Management: PREDIS-Pre-Disposal Management of Radioactive Waste*, European Union - H2020 (Started: September 2019- 2024, Grant 945098), Total Budget 237 000 €, IST Budget: Presential Meetings, Coordinator at IST: I. Paiva.
- *EXPLORSCHIST - Exploring exchanges routes of schist artefacts in Iberian Chalcolithic by micro and non-destructive analytical methods*, European Union - IPERION HS (2022-2023) Coordinator at IST: A.L. Rodrigues.
- *FINGERCHALC - Fingerprinting Chalcolithic artefacts from ditched enclosures*, European Union - IPERION HS (2021-2022), Coordinator: R. Marques.
- *Hospital Sudoe 4.0: Smart management of energy in hospital facilities*, European Union - Interreg Sudoe (2019-2022), Total Budget: 1 406 800 €, IST Budget: 131 800 €, Coordinator at IST: S.M. Almeida.
- *INCHILDHEALTH - Identifying determinants for indoor air quality and their health impact in environments for children: measures to improve indoor air quality and reduce disease burdens*, European Union - Horizon Europe (2021-2026), Total Budget: 8 310 000,00 €, IST Budget: 433 000,00 €, Coordinator at IST: S.M. Almeida.
- *IVORIST – provenance and circulation issues of pre-historic ivory and schist remarkable artefacts*, European Union - IPERION HS (2021-2022) Coordinator: A.L. Rodrigues.
- *LIFE Index-Air – Development of an integrated exposure – dose management tool for reduction of particulate matter in air*, European Union – LIFE (2016-2021), Total Budget: 1 369 000 €, IST Budget: 487 000 €, Coordinator: S.M. Almeida.
- *NFRAIA-01-2018-19 – Project “FINGERCHALC - Fingerprinting Chalcolithic artefacts from ditched enclosures, BNC Budapest Neutron Centre*, European Commission - IPERION-H2020 (2021) Coordinator: R. Marques.
- *NFRAIA-01-2018-19 – Project “IVORIST – provenance and circulation issues of pre-historic ivory and schist remarkable artefacts”*, BNC Budapest Neutron Centre, European Commission - IPERION-H2020 (2021), Coordinator: A.L. Rodrigues.
- *PANORAMA – EuroPean trAining NetwOrk on Rare eArth elements environMental trAnsfer: from rock to human*, Call MARIE SKŁODOWSKA-CURIE ACTIONS, Innovative Training Networks (ITN), Call: H2020-MSCA-ITN-2019, European Commission - H2020 (2020-2024), Total Budget: 4 173 709,68 €, IST Budget: 496 712,72 €, Coordinator at IST: M.I. Prudêncio.

- *PRISMAP - The European medical isotope programme: Production of high purity isotopes by mass separation* European Union - INFRAIA-02-2020: Integrating Activities for Starting Communities (2021-2025), Total Budget: 4 995 257,50 €, IST Budget: 100 206 €, Coordinator at IST: A. Paulo.
- *RadoNorm - Towards effective radiation protection based on improved scientific evidence and social considerations - focus on radon and NORM*, Grant 900009, European Union - RIA - Research and Innovation Action (2020-2025), Total Budget: 18 000 000 € 17 805 €, Coordinator at IST: M.Reis.
- *RADOV - RADiation harvesting of bioactive peptides from egg prOteins and their integration in advAnced functional products*, European Union – EURATOM (2022-2026), Total Budget: 1 863 709 €, IST Budget: 285 000 €, Coordinator at IST: S. Cabo Verde.
- *Supplying Accurate Nuclear Data for Energy and non-Energy Applications*, European Union – Horizon 2020 EURATOM (2019-2023), Total Budget: 4 000 000 €, IST Budget 25 000 €, Coordinator at IST: P. Vaz.

4.3 Bilateral Projects

- *COVIDair - The impact of the lockdown due to the COVID-19 pandemic on air quality*, FCT - Bilateral project between Portugal and Poland (2022-2023), Total Budget: 4 000 €, IST Budget: 4 000 €, Coordinator: V. Martins.
- *Targeted radiotherapy of radioresistant cancers – a radiobiological study with advanced cell models*, FCT/Campus France, FCT -Bilateral (2022-2024), Total Budget: 4 000 €, IST Budget: 4 000 €, Coordinator: F. Mendes.

4.4 FCT-funded Projects

- *ADC1.1 - Development of a novel class of antibody-drug conjugates molecules for cancer treatment*. PTDC/BTM-SAL/32085/2017, FCT - FCT - IC&DT (2018-2022), Total Budget: 239 638 €, IST Budget: 7.500 €, Coordinator at IST: J.D.G. Correia.
- *Arrows2cancer - Ruthenium-peptide conjugates: arrows for selectively targeting breast cancer*, PTDC/QUI-QIN/0146/2020, FCT - FCT - IC&DT (2021-2024), Total Budget: 249 985 €, IST Budget: 56 395 €, Coordinator at IST: J.D.G. Correia.
- *AugerTher - Organelle-targeted Radiocomplexes for Auger Therapy of Cancer*, FCT, FCT - IC&DT (2021-2025), Total Budget: 234 949 € IST Budget: 193 074 €, Coordinator: A. Paulo.
- *BILMET - 2D Molecular Metals and Superconductors; Coherence and Anisotropy in Bilayer Systems*, FCT Research contract PTDC/FIS-MAC/29666/2017, FCT - Concurso de Projetos em todos os Domínios Científicos (2018-2022), Total Budget: 229 391 €, IST Budget: 186 841 €, Coordinator at IST: M. Almeida.

- *CATARG – Targeting the transporters of cationic amino acids for cancer radiotheranostics: experimental and computational chemistry approach, PTDC/QUINUC/30147/2017*, FCT, FCT - IC&DT (2018-2022), Total Budget: 231 078 €, IST Budget: 224 579 €, Coordinator: J.D.G. Correia.
- *CFMOLIM – Novel Molecular Imaging tools for Cystic Fibrosis, PTDC/BTM-TEC/29256/2017*, FCT - FCT - IC&DT (2018-2022), Total Budget: 233 315 €, IST Budget: 188 315 €, Coordinator: F. Mendes.
- *Development of potent and broadly neutralizing antibodies fragments for COVID-19 derived from domestic cats naturally infected with SARS-CoV-2*, FCT - FCT - IC&DT (2022-2024), Total Budget: 249.328 €, IST Budget: 10.000 €, Coordinator at IST: L. Gano.
- *ExpoLIS - Assessment of human exposure to air pollution to change the way people move in cities*, FCT - FCT/ PO-Lisboa (2018-2020), Total Budget: 240 000 €, IST Budget: 168 000 €, Coordinator: S.M. Almeida.
- *FRIENDS: Fleet of dRones for radiological inspEction, commuNication anD reScue*, FCT - Compete 2020 and Lisboa 2020 under the PORTUGAL 2020 Partnership Agreement, through the European Regional Development Fund (ERDF), Projetos de IC&DT em todos os Domínios Científicos 2017 (2018-2022), Total Budget: 290 014 €, IST Budget: 192 680 €, Coordinator at C²TN: J. Corisco.
- *HypnosAir - Understanding the impact of air quality on sleep quality considering an integrated human exposure approach*, FCT - FCT - IC&DT (2022-2024), Total Budget: 249 998 €, IST Budget: 144 877 €, Coordinator: N. Canha.
- *LocalEnergy – Local Resources for Multifunctional Tetrahedrite-based Energy-Harvesting Applications*, FCT Research contract PTDC/EAM-PEC/29905/2017, FCT - Concurso de Projetos em todos os Domínios Científicos (2018-2022), Total Budget: 238 425 €, IST Budget: 40 887 €, Coordinator at IST: A.P. Gonçalves.
- *MEMBRANEPROT – Membrane proteins – development of new computational approaches and its application to G-Protein Coupled Receptors - PTDC/QUI-OUT/32243/2017*, FCT - FCT - IC&DT (2018-2022), Total Budget: 237 267 € IST Budget: 158 419 €, Coordinator: R. Melo.
- *MolNanoBone - A molecular and nano approach to target the RANK-TRAF6 interface for bone metastases treatment*, FCT - FCT - IC&DT (2022-2024), Total Budget: 248.329 €, IST Budget: 163.329 €, Coordinator: J.D.G. Correia.
- *NANOGLIO – Multifunctional Nanoseeds for Chemoradiotherapy of Glioblastoma, PTDC/MED-QUI/29649/2017*, FCT - FCT - IC&DT (2018-2022), Total Budget: 237 211 €, IST Budget: 220 212 €, Coordinator: A. Paulo.
- *NanoHQMeI -A novel nanoplatform for melanoma targeting with hydroxyquinoline metal complexes, PTDC/QUI-QIN/0586/2020*, FCT - FCT - IC&DT (2021-2024), Total Budget: 244 696 €, IST Budget: 17 500 €, Coordinator at IST: F. Mendes.
- *Network of Extreme Conditions Laboratories, “LTHMFL-NECL; Low Temperature and High Magnetic Field Laboratory- Network of Extreme conditions”* FCT ROTEIRO/0068/2013 -LISBOA-01-0145-

FEDER-022096 -Projeto FCT 022096 do aviso 01/SAICT/2016, FCT - Infraestruturas de Investigação (2018-2021), Total Budget: 3 543 639 €, IST Budget: 501 000 €, Coordinator: M. Almeida.

- *NEUROAbetaCLEAR -Engineering of Smart Exosomes for Amyloid-beta Clearance in Alzheimer disease-* PTDC/BTM-SAL/31057/2017, FCT - FCT - IC&DT, Total Budget: 237 854 €, IST Budget: 20 000 €, Coordinator at IST: J.D.G. Correia.
- *Neutrability: Soluble Neutral Materials for Molecular Electronics*, FCT Research contract, PTDC/QUI-QIN/29834/2017, FCT - Concurso de Projetos em todos os Domínios Científicos (2018-2022), Total Budget: 239 493 € IST Budget: 200 593 €, Coordinator: D. Belo.
- *Portuguese participation in the n_TOF experiments at CERN (2020-2021)*, FCT - Concurso de Projetos em todos os Domínios Científicos, Total Budget: 45 000 €, IST Budget: 45 000 €, Coordinator: P. Vaz.
- *SPINCROSSOVER - Switching magnetic materials based on molecular iron (III) compounds*, Projeto FCT Nº 032240 do aviso 02/SAICT/2017, FCT - Concurso de Projetos em todos os Domínios Científicos (2018-2022), Total Budget: 239 787 €, IST Budget: 239 787 €, Coordinator: B.J.C. Vieira.
- *THER-PBCT -Theranostic Strategy for Proton Boron Capture Therapy of Pancreatic Cancer. UTAP-EXPL/FMT/0020/2021*, FCT - FCT- UTAustin (2021-2023), Total Budget: 91.508 €, IST Budget: 49 635 €, Coordinator: A. Paulo.
- *TOF-PET FOR PROTON THERAPY (TPPT) - In-beam Time-of-Flight (TOF) Positron Emission Tomography (PET) for proton radiation therapy, Research contract 045904*, FCT/ANI - FCT- UTAustin (2020-2022), Total Budget: 1 253 180 €, IST Budget: 229 604 €, Coordinator at IST: A. Paulo.

4.5 Others

4.5.1 Projects involving C²TN's participation in experiments at CERN

- *Material's Research with Radioactive Isotopes and Nuclear Techniques at ISOLDE-CERN*, FCT/Projectos CERN, CERN/FIS-TEC/0003/2019 (2021-2022), Total Budget: 170 000 €, IST Budget: 58 087 €, Coordinator: J.G. Correia.

4.5.2 IAEA Projects

- *Bioactivity of irradiated foods by low energy e-beam*, IAEA Coordinated Research Project D61025 (2021-2026), Total Budget: 30 000 €, IST Budget: 30 000 €, Coordinator: S. Cabo Verde.
- *Evaluating Groundwater Resources and Groundwater-Surface-Water Interactions in the Context of Adapting to Climate Change – Algarve Basin Faro –Tavira Sector*, IAEA Regional Project RER 7013 (2020-2023), Coordinator at IST: P.M. Carreira.

- *Improving efficiency in water and soil management*, IAEA Regional Project RER 5028 (2022-2025), Coordinator at IST: P.M. Carreira.
- *Long term time trends of air pollution source tracers determined by nuclear techniques*, IAEA (2020-2021), Coordinator at IST: S.M. Almeida.
- *Mitigating nitrate contamination in the groundwater and surface water Resources in the Vouga River Basin*, IAEA National Project POR 7004 (2022-2026), Total Budget: 450 000 €, IST Budget: 450 000 €, Coordinator: P.M. Carreira.
- *NanoRadHIL-Nanostructured Hybrid Materials by Radiation Processing Assisted by Ionic Liquids*, IAEA Coordinated Research Project - RC 23186 (2019-2024), Total Budget: 22 000 €, Coordinator: L.M. Ferreira.
- *Radiation Effect on 3D Printed Medical Implants for Customized Tissue Repair*, IAEA Coordinated Research Project RC 24415 – DEDICATE (2021-2026), Total Budget: 20 000 €, Coordinator: M.H. Casimiro.

4.5.3 Other Projects

- *PAB_LivingLab – Vive a descarbonização no Parque Adão Barata*, EEA-Grants (2021-2024), Total Budget: 1 110 000 €, IST Budget: 113 000 €, Coordinator at IST: S.M. Almeida.
- A.tu.Ar para uma melhor qualidade do ar, Fundo Ambiental, IST Budget: 21 000 €, Coordinator at IST: S.M. Almeida.

5 EDUCATION

5.1 Concluded PhD Theses

2021

Chowdhury, Sanjib (2021). *Nuclear Spallation target: preparation and characterization of nano-grained materials for radioactive ion beam production at CERN-MEDICIS facility*, Dotoramento em Engenharia de Materiais, Instituto Superior Técnico, Universidade de Lisboa. Supervisor: A.P. Gonçalves (C²TN/IST). Discussion: 21 January 2021.

Jakob, Christian (2021). *Histidine derived Au(I)-bis-NHC-Complexes for cancer theranostics*. Doutoramento em Química, Universidade Técnica de Munique (TUM), Munique, Alemanha. Supervisors: Fritz Elmar Kühn & J.D.G. Correia (C²TN/IST).

Sá, Ana Maria Morais Cravo de (2021). *Out-of-field doses in radiotherapy treatments of paediatric patients*. Doutoramento em Engenharia Biomédica e Biofísica, Faculdade de Ciências da Universidade de Lisboa. Supervisors: Pedro Almeida (FCUL/IBEB) & Pedro Vaz (C²TN/IST). Discussion: 29 de March 2021.

Schlagintweit, Jonas Felix (2021). *Transition metal NHC complexes in oxidation catalysis and medicinal chemistry*, Doutoramento em Química. Universidade Técnica de Munique (TUM), Munique, Alemanha. Supervisors: Fritz Elmar Kühn, J.D.G. Correia (C²TN/IST) & Klaus Köhler.

Vicente, Estela Alexandra Domingos (2021). *Chemical characteristics and toxicity of particles from residential biomass combustion*. PhD in Environmental Sciences and Engineering, Universidade de Aveiro. Supervisors: C. Alves (UA), S.M. Almeida (C²TN/IST) & T. Pinheiro (DECN/IST). Discussion: 31 March 2021.

2022

Barkaoui, Salma (2022). *Tracing strawberries functionalization thought non-thermal process*. PhD in Food Industries, Ecole Supérieure des Industries Alimentaires de Tunis, Tunísia. Supervisors: Nourhene Boudhrioua Mihoubi (ISBST, Université de Manouba, Tunísia) & Sandra Cabo Verde (C²TN/IST). Discussion: December 2022.

Faria, Tiago Alexandre Ferreira Paes de (2022). *Children exposure to inorganic and organic chemical compounds in particulate matter: characterization and source identification*. PhD in Environmental Engineering, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Marta Almeida (C²TN/IST), Célia Alves (Universidade de Aveiro) & Christos Housiadas (NCSR "Demokritos"). Discussion: 23 June 2022

Ferreira, Patrícia da Silva (2022). *New Transition Metal Complexes of Cobalt(II) and Nickel(II) as Single-Ion Magnets and Spin Equilibrium Molecules*. PhD in Chemistry, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Pedro Teixeira Gomes (DEQ/CQE/IST), Laura C.J. Pereira (C²TN/IST) & Manuel Leite de Almeida (C²TN/IST). Discussion: 1 September 2022.

Matos, Joana Catarina Capinha de (2022). *Nanoplatforms Development for Biomedical Applications*. PhD in Chemistry, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Maria Clara Gonçalves (CQE/IST), Laura C.J. Pereira (C²TN/IST) & João C. Waerenborgh (C²TN/IST). Discussion: 4 March 2022.

Velho, Mariana (2022). *Thiophene-based building blocks for functional materials in electronic devices*, PhD in Chemistry, IST-UL, Supervisors: Dulce Belo (C²TN/IST), Ana Charas (IT/IST) & Manuel Almeida (C²TN/IST). Discussion: 20 October 2022.

5.2 Concluded MSc Theses

2021

Abecassis, Maria Leonor Rente (2021). *Avaliação temporal e espacial da Qualidade do Ar numa zona urbano-industrial*. Mestrado integrado em Engenharia do Ambiente, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Carla Reis (IPS) & Susana Marta Almeida (C²TN/IST). Discussion: 27 January 2021.

Ascenção, João Eduardo Antunes (2021). *Impacte da queima de diferentes tipos de biomassa na qualidade do ar interior*. Mestrado integrado em Engenharia do Ambiente, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Susana Marta Almeida (C²TN/IST) & Vânia Martins (C²TN/IST). Discussion: 30 November 2021.

Baptista, Luísa Alexandra Teixeira Nunes (2021). *PALS – Setup optimisation and application to macromolecular materials characterization*. Mestrado em Engenharia Física, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Luís Ferreira (DECN/C²TN) & Rodrigo Mateus (DECN/IPFN). Discussion: 9 December 2021.

Barrois, Fabien (2021) *Development of innovative vectorized aza-BODIPY-based monomolecular multimodal probe*. Master 1 Transition Metals in Molecular Chemistry (T2MC), Université Bourgogne, France. Supervisor: Maria Paula Cabral Campello (C²TN/IST). Discussion: 28 July 2021.

Batalha, Gonçalo Abranches (2021). *Partículas atmosféricas no ambiente circundante do aeroporto de Lisboa: características, fontes e impactes*. Mestrado integrado em Engenharia do Ambiente, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Susana Marta Almeida (C²TN/IST) & Vânia Martins (C²TN/IST). Discussion: 6 December 2021.

Braz, Maria Teresa de Noronha Walenta (2021). *Mitochondria-Targeted ¹¹¹In-Radiocomplexes for Auger Therapy of Prostate Cancer*. Mestrado em Bioengenharia e Nanossistemas, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: António Paulo (C²TN/IST) & Célia Fernandes (C²TN/IST). Discussion: 3 December 2021.

Burihan, Juliana (2021). *Avaliação da qualidade do ar interior em escolas*. Mestrado em Engenharia do Ambiente, Faculdade de Engenharia, Universidade Lusófona de Humanidades e Tecnologias de Lisboa. Supervisor: Joana Lage (C²TN/IST). Discussion: 27 July 2021.

Fenocchio, Lorenzo (2021). *Synthesis, Structural and Magnetic Characterization of Ternary Intermetallic Compounds of the Series R_2PdGe_3 (R = rare earth element)*”. University of Genoa, Italy. Supervisors: S. De Negri (Univ. Genova) & Laura C.J. Pereira (C²TN/IST).

Figueiredo, Isabel (2021). *Redução das emissões de COVs e partículas numa instalação de extração de óleo vegetal – um caso de estudo*. Mestrado em Engenharia do Ambiente, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Nuno Canha (C²TN/IST) & Renato Carvalho (Iberol). Discussion: 19 November 2021.

Garcia, Filipa (2021). *Aerosol atmosférico na zona Norte de Lisboa: composição, fontes e tendências* (*Atmospheric aerosol in the North of Lisbon: composition, sources and trends*). MSc in Environmental Engineering, Instituto Superior Técnico. Supervisor: S.M. Almeida (C²TN/IST); Co-supervisor: C. Alves (UA). Discussion: 12 October 2021.

Gonçalves, Inês Isabel Fialho (2021). *Antimicrobial properties of residues from olive industry treated by ionizing radiation*. Mestrado em Microbiologia Aplicada, Faculdade de Ciências, Universidade de Lisboa. Supervisors: Sandra Cabo Verde (C²TN/IST). Discussion: 20 October 2021.

Julião, Ana Rita Mosquito (2021). *Dual-Targeted Radiocomplexes for Prostate Cancer Theranostics*. Mestrado Integrado em Engenharia Química Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Francisco Silva (C²TN/IST) & Célia Fernandes (C²TN/IST). Discussion: 7 December 2021.

Justino, Ana Rita Rosa (2021). *Envolvimento dos cidadãos na avaliação da contaminação atmosférica numa zona urbano-industrial*. Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Susana Marta Almeida (C²TN/IST) & Nuno Canha (C²TN/IST). Discussion: 21 January 2021.

Lamelas, Afonso Xavier de Matos, Three-pronged approach to color centers in diamond: a case study for calcium, MSc in Physics Engineering, Universidade de Aveiro. Supervisors: V.B.S. do Amaral (Univ. Aveiro) & U. Wahl (C²TN/IST). Discussion: 30 November 2021.

Marques, Ana Sofia (2021). *Evaluation of the Radiosensitizing Capabilities of Target-Specific Gold Nanoparticles in the Radiotherapy of Prostate Cancer*. Mestrado Integrado em Engenharia Física Tecnológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: M.T. Pinheiro (DECN/IST) & A. Belchior (C²TN/IST). Discussion: 25 January 2021.

Martins, Miguel António Seromenho (2021). *Study of maximum and minimum dose of ionizing radiation for the sterilization of Active Pharmaceutical Ingredients*. Mestrado em Engenharia Farmacêutica. Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Sandra Cabo Verde (C²TN/IST) & Daniel Filipe Arranca (Laboratório Edol). Discussion: 3 December 2021.

Matroca, Bernardo Carvalho (2021). *Desenvolvimento de sistema de avaliação da qualidade do ar em autocarros para a identificação de rotas saudáveis*. Mestrado integrado em Engenharia do Ambiente, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Susana Marta Almeida (C²TN/IST) & Vânia Martins (C²TN/IST). Discussion: 16 December 2021.

Monteiro, Mara (2021) *Transition to a low carbon economy in schools: an evolutionary study*. Mestrado em Engenharia do Ambiente, Faculdade de Engenharia, Universidade Lusófona de

Humanidades e Tecnologias de Lisboa. Supervisor: Joana Lage (C²TN/IST). Discussion: 27 July 2021.

Paulino, Luís (2021). *Effect of Gamma Irradiation on the Functional Properties of Different Resins for a Carbon-Fiber Reinforced Composite Material*. Mestrado Integrado em Aeronáutica Militar - Piloto Aviador (Master), Academia da Força Aérea (AFA, Sintra. Supervisors: Major Luís Pereira (AFA) & Luís Ferreira (C²TN/IST). Discussion: 8 July 2022.

Perdigão, Sara Batalha Galhofo Celestino (2021). *In silico design of novel peptides for treating cancer through inhibition of the RANK-TRAF6 interaction*. Mestrado Bolonha em Engenharia Farmacêutica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Rita Melo (C²TN/IST) & João D.G. Correia (C²TN/IST). Discussion: 19 de November 2021.

Rosa, Cátia Filipa Gouveia (2021). *Inhibition of protein-protein interactions in G-Protein Coupled Receptors with novel peptides towards pharmacological activity*. Mestrado Engenharia Farmacêutica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Rita Lourenço Paiva de Melo (C²TN/IST) & João Domingos Galamba Correia (C²TN/IST). Discussion: 26 November 2021.

Russo, Andrea (2021). *Synthesis, characterization and thermoelectric properties of selected ternary intermetallics: RCu_{9+x}Sn_{4-x} (R = Nd, Pr, La, Y), CeMSn (M = Cu, Ni) and CeCuT₂ (T = Sn, Sb)*, Erasmus +, Mestrado em Engenharia de Materiais na Università degli studi di Genova, Genova, Itália, Supervisor: António P. Gonçalves (C²TN/IST).

Santos, Joana Filipa da Silva (2021). *Block copolymer micelles for targeted delivery of anticancer drugs and radioisotopes*. Mestrado Integrado em Engenharia Química Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Francisco Silva (C²TN/IST) & Célia Fernandes (C²TN/IST). Discussion: 29 November 2021.

Santos, Joana Pinto dos (2021). *Design of HER2-specific virus-like particles: the next step in targeted therapy*, Mestrado em Engenharia Biomédica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Rita Melo (C²TN/IST) & Sandra Cabo Verde (C²TN/IST). Discussion: 21 September 2021.

Silva, Pedro António Freitas (2021). *3D Printed model organs and patient-specific dosimetry for children with heart diseases*. Instituto Superior Técnico, Universidade de Lisboa. Supervisors: T. Pinheiro (DECN/IST) & P. Teles (Faculdade de Ciências, Universidade do Porto).: Discussion: 20 January 2021.

Soares, Jorge M.A. Alexandre (2021). *Enhancement of functional properties of carbon-epoxy composites by ionizing radiation*. Mestrado Integrado em Aeronáutica Militar - Piloto Aviador (Master), Academia da Força Aérea (AFA), Sintra. Supervisors: Major Luís Pereira (AFA) & Luís Ferreira (C²TN/IST). Discussion: 25 June 2021.

Sousa, Andreia Filipa Fidalgo de (2021). *Block Copolymer Micelles for Drug Delivery*. Mestrado Integrado em Engenharia Química, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Célia Fernandes (C²TN/IST) & Francisco Silva (C²TN/IST). Discussion: 26 January 2021.

Master Degree in Radiation Protection and Safety

Belo, Rita Alexandra Candeias (2021). *As exposições potenciais na classificação de trabalhadores e de locais de trabalho em práticas industriais.* Mestrado em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Louis Castelo Branco (ISQ) & Nuno Rombert Pinhão (DECN/IST). Discussion: 15 December 2021.

Ferreira, Flávia Andreia Manuel (2021). *Caracterização de campos de radiação gama e de neutrões no bunker dos ciclotrões do ICNAS por simulação e medidas.* Mestrado em Proteção e Segurança Radiológica. Instituto Superior Técnico, Universidade de Lisboa. Supervisors: José Joaquim Gonçalves Marques (C²TN/IST) e Francisco Alves (U.Coimbra/ICNAS e ESTeSL). Discussion: 28 January 2021.

Ferreira, Vasco Eduardo de Almeida (2021). *Industrial Radiography: Film Radiography vs Digital Radiography - a Radiation Protection Approach.* Mestrado em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Nuno Matela (FC/UL) & Pedro Vaz (C²TN/IST). Discussion: 26 January 2021.

Figueiredo, Diogo Loureiro (2021). *Dual-Targeted ^{99m}Tc-radioconjugates for Prostate Cancer Theranostics.* Mestrado Bolonha em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Ana Belchior (C²TN/IST) & Paula Raposinho (C²TN/IST). Discussion: 21 December 2021.

Maduro, Ana Margarida Simões (2021). *Dual-energy computed tomography for the treatment of pediatric patients with proton therapy.* Mestrado Bolonha em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Isabel Augusta Pinheiro de Almeida (Collaborator C²TN) & José Joaquim Gonçalves Marques (C²TN/IST). Discussion: 27 January 2021.

2022

Baptista, Teresa (2022) *Indoor Air quality Assessment in Grocery Stores. MSc Segurança e Higiene do trabalho,* Escola Superior de Tecnologia da Saúde de Lisboa. Supervisor: Nuno Canha (C²TN/IST). Discussion: 21 November 2022.

Belchior, Afonso André Morais (2022). *Development of new molecular probes for imaging of cancer.* Mestrado em Química Bioorgânica, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa. Supervisors: Ana Salomé Veiga (IMM) & João D.G. Correia (C²TN/IST). Discussion: 20 December 2022.

Correia, João Guilherme Monteiro (2022). *Indium Implanted α – MoO₃: an atomic study - Combined studies of Hyperfine Interactions, X-Ray Diffraction and Electric Measurements.* Mestrado Bolonha em Engenharia de Materiais, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Katharina Lorenz (IST/DECN) & João Guilherme Martins Correia (C²TN/IST). Discussion: 7 July 2022.

Ferreira, Mafalda (2022). *Determinação da eficácia biológica relativa do Lutécio-177 em tumores com diferentes fenótipos*. Mestrado em Imagem e Radiação, Universidade de Coimbra. Supervisors, Ana Lúcia Belchior (C²TN/IST) & Lourenço, Ana Salomé dos Santos Pires (Univ. Coimbra). Discussion: 30 September 2022.

Filho, Vital Cruvinel Ferreira (2022). *Multifunctional Gadolinium Bearing Gold Coated Dextran SPIONs for Theranostic Application*, Master of Science Degree in Materials Engineering, Instituto Superior Técnico, Universidade de Lisboa. Supervisor: Laura Pereira (C²TN/IST). Discussion: 2 December 2022.

Lucas, Francisco Marques (2022). *Inhibition of protein-protein interactions in dopamine receptors with peptides towards pharmacological activity*. Mestrado em Engenharia Biológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Rita Melo (C²TN/IST) & João D.G. Correia (C²TN/IST) 24 de novembro de 2022

Martins, Sofia Alexandra de Albuquerque (2022). *HIV-based virus-like particles: the next step in targeted therapy*, Mestrado em Biotecnologia, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa. Rita Melo (C²TN/IST) & João D. G. Correia (C²TN/IST). Discussion: 23 November 2022.

Pedra, Carla Sofia (2022). *Efeitos biológicos induzidos por Ressonância Magnética*. Mestrado em Radiações Aplicadas às Ciências da Saúde (RaTES), Escola Superior de Tecnologias da Saúde de Lisboa. Supervisors: Ana Belchior (C²TN/IST) & Sofia Nolasco (ISEL). Discussion: September 2022.

Pedrosa, Ana Catarina Ramos Pires (2022). *Design de novos péptidos dirigidos ao receptor de androgénio no cancro da mama triplo negativo: uma abordagem in silico*. Mestrado Bolonha em Engenharia Química, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Maria Cristina das Neves Oliveira (C²TN/IST) & João Domingos Galamba Correia (C²TN/IST). Discussion: 29 July 2022.

Master Degree in Radiation Protection and Safety

Valente, Susana Catarina Monteiro (2022). *Age-dependent dose assessment for ¹⁷⁷Lu and ¹⁶¹Tb in Paediatric Targeted Radiopharmaceutical Therapy*. Mestrado em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Salvatore di Maria (C²TN/IST) & Octávia Monteiro Gil (C²TN/IST). Discussion: 20 December 2022.

5.3 Concluded Graduations Theses

2021

Clérigo, Fabiana (2021). *Chemical and microbiological pollutants in the Portuguese pilot hospital Sudoe 4.0. Internship in Environmental Health*. Escola Superior de Tecnologia da Saúde de Lisboa. Supervisor: S.M. Almeida (C²TN/IST).

de Abreu, Yassine (2021), *Preparation and study of thermal/electrical contacts through different methods and conditions*, Projecto Final de Curso em Engenharia, CESI, École d'Ingénieurs, Lyon, France, Supervisor: António Pereira Gonçalves (C²TN/IST).

Miguel, Flipa (2021). *Exposição à radiação na Via Verde do AVC, curricular unit Research Appleid to Medical Imaging and Radiotherapy*. Coimbra Health School-IPC, Supervisor: Joana Santos (C²TN/IST).

Moreira, J. (2019). *Emissão de poluentes pelo tráfego em Portugal*, Internship in Environmental Health II, Licenciatura em Saúde Ambiental, Escola Superior de Tecnologia da Saúde de Lisboa, IPL. Supervisors: S.M. Almeida (C²TN/IST), C. Correia, I. Lopes.

Pinto, C. (2019). *Avaliação da exposição humana a poluição do ar para mudar a forma como as pessoas se movem nas cidades*, Internship in Environmental Health II, Licenciatura em Saúde Ambiental, Escola Superior de Tecnologia da Saúde de Lisboa, IPL. Supervisors: S.M. Almeida (C²TN/IST), C. Correia, I. Lopes.

Sá, Marco Alexandre Pina de (2021). *Novos Complexos Organometálicos de Ruténio para o Tratamento do Cancro da Mama*, relatório final de projeto da Licenciatura em Química, Faculdade de Ciências da Universidade de Lisboa, Supervisors: Tânia Morais (CQE, FCUL) & João Franco Machado (C²TN/IST). Discussion: 23 June 2021.

Santos, Sara Rita Martins dos (2021). *Implementação de uma ferramenta de gestão da qualidade do ar no Porto*, curricular unit "Estágio em Saúde Ambiental II" of Degree in Environmental Health, Escola Superior de Tecnologia da Saúde de Lisboa, Supervisors: S.M. Almeida (C²TN, IST) & Vânia Martins (C²TN/IST).

Silva, Beatriz; Beco, Patrícia; Selorindo, Joana (2021). *Assessment of VMAT Plans in Different Treatment Plan Systems*, curricular unit “Investigação em Imagem Médica e Radioterapia” of Degree in Medical Imaging and Radiotherapy, Escola Superior de Tecnologia da Saúde de Lisboa, Supervisors: Ana Cravo Sá (C²TN/IST; ESTeSL-IPL), Marco Caetano (ESTeSL-IPL).

Tomás, Silvia, (2021). *Otimização de protocolos em Tomografia Computorizada de Planeamento em Radioterapia – Estudo experimental*, curricular unit Research Appleid to Medical Imaging and Radiotherapy, Coimbra Health School-IPC, Supervisor: Joana Santos (C²TN/IST).

2022

Çomruk, Kaan (2022), *Development and implementation of a simple Seebeck coefficient measurements system*, Estágio IAESTE, Projecto Final de Curso, Electrical and Electronics Engineering, Engineering Faculty, Istanbul University, Cerrahpasa, Turkey, Supervisor: António Pereira Gonçalves (C²TN/IST).

Marques, Francisca (2022). *Variabilidade inter-observador na delimitação de órgãos de risco no planeamento de radioterapia do cancro da mama*, curricular unit “Investigação em Imagem Médica e Radioterapia” of Degree in Medical Imaging and Radiotherapy, Escola Superior de Saúde Drº Lopes Dias, Supervisors: Ana Cravo Sá (C²TN/IST; ESTeSL-IPL), Paulo Fernandes (ESTeSL-IPL, ESALD-IPCB, Joaquim Chaves Saúde).

Mártires, David; Janela Diogo (2022). *Comparação de cálculos dosimétricos com VMAT e radioterapia com protões em glioblastoma multiforme*, curricular unit “Investigação em Imagem Médica e Radioterapia” of Degree in Medical Imaging and Radiotherapy, Escola Superior de Tecnologia

da Saúde de Lisboa, Supervisors: Ana Cravo Sá (C²TN/IST; ESTeSL-IPL), Paulo Fernandes (ESTeSL-IPL, ESALD-IPCB, Joaquim Chaves Saúde).

Oliveira, Bruno (2022). *Development of a toolkit software for radiobiological calculations AlphaBetaCalc*, curricular unit “Investigação em Imagem Médica e Radioterapia” of Degree in Medical Imaging and Radiotherapy, Escola Superior de Saúde Drº Lopes Dias, Supervisors: Ana Cravo Sá (C²TN/IST; ESTeSL-IPL), Paulo Fernandes (ESTeSL-IPL, ESALD-IPCB, Joaquim Chaves Saúde).

Ramos, Bárbara; Serôdio, Mariana (2022). *Variabilidade intra-observador na segmentação de volumes de interesse no planeamento dosimétrico*, curricular unit “Investigação em Imagem Médica e Radioterapia” of Degree in Medical Imaging and Radiotherapy, Escola Superior de Tecnologia da Saúde de Lisboa, Supervisors: Ana Cravo Sá (C²TN/IST; ESTeSL-IPL), Paulo Fernandes (ESTeSL-IPL, ESALD-IPCB, Joaquim Chaves Saúde).

Rodrigues, Francisca (2022). *Creation of a voxelized thorax phantom*, curricular unit “Investigação em Imagem Médica e Radioterapia” of Degree in Medical Imaging and Radiotherapy, Escola Superior de Saúde Drº Lopes Dias, Supervisors: Ana Cravo Sá (C²TN/IST; ESTeSL-IPL), Guilherme Campos (Júlio Teixeira, SA), Paulo Fernandes (ESTeSL-IPL, ESALD-IPCB, Joaquim Chaves Saúde).

5.4 Courses given in Universities and Polytechnic Schools

Alves, L.C., Systems and Techniques of Radiation Detection, Nuno Pinhão (senior lecturer) and Luís Cerqueira Alves, Bologna Master Degree in Radiation Protection and Safety, Dept. de Ciências e Engenharias Nucleares, Instituto Superior Técnico (1st semester 2021-2022; 2022-2023).

Araújo, M.F., Invited Lecturer, Curriculae Unit "Examination and Analysis Methods I", MSc's in "Conservation and Restoration", DCR, FCT, UNL, January – February 2021.

Belchior, A., Collaboration as lecturer in the Curricular Unit “Radiation Dosimetry and Shielding”, Master’s degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Belchior, A., Responsible for the Curricular Unit “Efeitos Biológicos das Radiações”, Master’s degree in Radiations Applied to Health Technologies, ESTESL (2nd semester 2020/2021).

Belo, D., Química Geral, Degree in Engenharia Electrotécnica e de Computadores, Dept. Engenharia Química, Instituto Superior Técnico Universidade de Lisboa, (1st quarter 2022-2023).

Cabo Verde, S., Collaboration as lecturer in the Curricular Unit “Fundamentos de Protecção Radiológica”, Master’s degree in Radiation Protection and Safety, IST (1st semester 2022/2023).

Cabo Verde. S., Collaboration as lecturer in the Curricular Unit “Biotecnologia Microbiana”, Degree in Biology, FCUL (1st semester 2022/2023).

Caldeira, M., Collaboration as lecturer in the Curricular Unit "Metrology of Ionizing Radiation in Health and Industry", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Caldeira, M., Collaboration as lecturer in the Curricular Unit "Metrology of Ionizing Radiation in Health and Industry", Master's degree in Radiation Protection and Safety, IST (1st semester 2022/2023).

Casimiro, M.H. (2021/2022) Teaching activity at IST: Química Geral (4h/week; componente laboratorial), Licenciatura em Engenharia Electrotécnica e de Computadores do IST/ULisboa.

Casimiro, M.H. (2022/2023) Teaching activity at IST: Química Geral (4h/week; componente laboratorial), Licenciatura em Engenharia Electrotécnica e de Computadores do IST/ULisboa.

Corisco, J., Collaboration as lecturer in the Curricular Unit "Environmental Radioactivity", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Cravo Sá, A., Collaboration as lecturer in the Curricular Unit "Radiation Protection and Safety in Radiotherapy", Master's degree in Radiation Protection and Safety, IST (2nd semester 2021/2022)

Cravo Sá, A., Invited lecture of medical imaging and radiotherapy department, Escola Superior Tecnologia da Saúde de Lisboa, Instituto Politécnico de Lisboa. Curricular units: technologies in medical imaging and radiotherapy I and II, Image processing in medical imaging and radiotherapy, clinical dosimetry I and II (2021/2022).

Cravo Sá, A., Invited lecture of medical imaging and radiotherapy department, Escola Superior de Saúde Drº Lopes Dias, Instituto Politécnico de Castelo Branco. Curricular units: oncology, methods and techniques in medical imaging and radiotherapy III and IV, care for the cancer patient, research applied to medical imaging and radiotherapy and internship in radiotherapy.

Cravo Sá, A., Invited lecture of medical imaging and radiotherapy department, Escola Superior de Saúde Cruz Vermelha Portuguesa. Curricular units: dosimetry, radiation protection and safety; Internships in medical imaging and radiotherapy I, II, III and IV, Methods and Techniques in radiotherapi II, Quality in medical imaging and radiotherapy.

Cravo Sá, A., Invited lecture of medical imaging and radiotherapy department, Escola Superior Tecnologia da Saúde de Lisboa, Instituto Politécnico de Lisboa. Curricular units: technologies in medical imaging and radiotherapy I and II, Image processing in medical imaging and radiotherapy, clinical dosimetry I and II (2021/2022).

Di Maria, S., Collaboration as lecturer in the Curricular Unit "Radiation Dosimetry and Shielding", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Fernandes, A., Lecturer in the Curricular Unit "Risk and Safety in the Application of Ionizing Radiation, Master's Degree Radiation Protection and Safety, IST (1st semester 2021/2022 and 1st semester 2022/2023).

Fernandes, C. (2021), Aulas laboratoriais (L1-L3) da unidade de Radioquímica, Master's degree in Radiation Protection and Safety, IST (2nd semester 2020/2021).

Gomes, S.S., Invited Professor in *Métodos de Análises Ambientais laboratory session* (Licenciatura Tecnologias do Mar e Ambiente) at Escola Superior de Tecnologia de Setúbal, Instituto Politécnico de Setúbal (1st semester 2021/2022).

Gonçalves, A.P., Functional Materials, Year 1-P2, UC Coordinator, Master of Materials Engineering, Instituto Superior Técnico, Universidade de Lisboa, 2021-2022.

Kling, A., Responsible and lecturer in the Curricular Unit "Risk and Safety in the Application of Ionizing Radiation", Master's Degree Radiation Protection and Safety, IST (1st semester 2021/2022 and 1st semester 2022/2023).

Madruga, M.J., Collaboration as lecturer in the Curricular Unit "Environmental Radioactivity", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Mendes, F., Department of Bioengineering, IST. Curricular Unit "Molecular Biotechnology". MSc Biotechnology, MSc Microbiology and MSc Radiation Protection and Safety (2021).

Monteiro Gil, O., "Efeitos biológicos induzidos por exposição a radiação ionizante. Dosimetria Biológica", Faculdade de Ciências e Tecnologia UNL- Campus da Caparica, 3 May 2021.

Monteiro Gil, O., Responsible for the Curricular Unit "Biological Effects of Radiation", Master's degree in Radiation Protection and Safety, IST (2nd semester 2020/2021).

Monteiro Gil, O., Responsible for the Curricular Unit "Biological Effects of Radiation", Master's degree in Radiation Protection and Safety, IST (2nd semester 2021/2022).

Paiva, I., Lecture given on "Radioactive Sources, Radiological Accidents & Contaminated Goods". Programme for Education, Training and Research on Underground Storage, European Master Science on the framework of the PETRUS III project, IST, June 2021 (by videoconference).

Paiva, I., Responsible for the Curricular Unit "Fundamentals of Radiation Protection and Safety ", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Paiva, I., Responsible for the Curricular Unit "Fundamentals of Radiation Protection and Safety ", Master's degree in Radiation Protection and Safety, IST (1st semester 2022/2023).

Paiva, I., Responsible for the Curricular Unit "Radioactive Waste", Master's degree in Radiation Protection and Safety, IST (2nd semester 2020/2021).

Paiva, I., Responsible for the Curricular Unit "Radioactive Waste", Master's degree in Radiation Protection and Safety, IST (2nd semester 2021/2022).

Paulo, A., Invited Coordinator Professor at ESTeSL -Radiopharmacy I and Radiopharmacy II (2021).

Paulo, A. (2021). Responsible for the Curricular Unit "Radiochemistry", Master's degree in Radiation Protection and Safety, IST (2nd semester 2020/2021).

Pereira, L.C.J., Functional Materials, Module Magnetism and Magnetic Materials, Sem1-P2, Master of Materials Engineering, Instituto Superior Técnico, Universidade de Lisboa, 2021-2022.

Pereira, L.C.J., Materials for electronics and optoelectronics, Module Magnetic Properties and Superconductivity, Sem2-P4; Master of Materials Eng., Instituto Superior Técnico, 2º Período, 2º semestre, 2021-2022; 2022-2023.

Reis, M., Lecture given on "Protecção Radiológica - A Radioactividade no Ambiente", 1st cycle Environmental Engineering, IST, March 2021.

Reis, M., Lecture given on "Radiation Protection of the Environment", Programme for Education, Training and Research on Underground Storage, European Master Science on the framework of the PETRUS III project, IST, June 2021 (by videoconference).

Reis, M., Responsible for the Curricular Unit "Environmental Radioactivity", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Reis, M., Responsible for the Curricular Unit "Environmental Radioactivity", Master's degree in Radiation Protection and Safety, IST (1st semester 2022/2023).

Reis, M., Responsible for the Curricular Unit "Metrology of Ionizing Radiation in Health and Industry", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Reis, M., Responsible for the Curricular Unit "Metrology of Ionizing Radiation in Health and Industry", Master's degree in Radiation Protection and Safety, IST (1st semester 2022/2023).

Romanets, Y., Collaboration as lecturer in the Curricular Unit "Radiation Protection and Safety in Radiotherapy", Master's degree in Radiation Protection and Safety, IST (2nd semester 2020/2021).

Romanets, Y., Collaboration as lecturer in the Curricular Unit "Radiation Protection and Safety in Radiotherapy", Master's degree in Radiation Protection and Safety, IST (2nd semester 2021/2022).

Santos, I.C., Collaboration as lecturer in 7th European Crystallographic School, Lisbon, Portugal, 10 - 15 July 2022.

Vaz, P. Responsible for the Curricular Unit "Radiation Dosimetry and Shielding", Master's degree in Radiation Protection and Safety, and Master's Degree in Engineering Physics of IST (1st semester 2020/2021).

Vaz, P., Responsible (from IST) for the Curricular Unit "Project in Radiation Protection and Safety", Master's degree in Radiation Protection and Safety, IST (1st semester 2020/2021).

Vaz, P., Responsible (from IST) for the Curricular Unit "Project in Radiation Protection and Safety", Master's degree in Radiation Protection and Safety, IST (1st semester 2021/2022).

Vaz, P., Responsible (from IST) for the Curricular Unit "Radiation Protection and Dosimetry in Radiology & Nuclear Medicine" (2nd semester 2020/2021). The Curricular Unit is taught at the Service of

Radiology of IPOLFG (Portuguese Oncology Institute) and at Hospital Santa Maria by medical staff (medical doctors, medical physicists, radiographers, etc.).

Vaz, P., Responsible (from IST) for the Curricular Unit "Radiation Protection and Dosimetry in Radiology & Nuclear Medicine" (2nd semester 2021/2022). The Curricular Unit is taught at the Service of Radiology of IPOLFG (Portuguese Oncology Institute) and at Hospital Santa Maria by medical staff (medical doctors, medical physicists, radiographers, etc.).

Vaz, P., Responsible for the Curricular Unit "Radiation Dosimetry and Shielding", Master's degree in Radiation Protection and Safety, and Master's Degree in Engineering Physics of IST (1st semester 2021/2022).

Vaz, P., Responsible for the Curricular Unit "Radiation Protection and Safety in Radiotherapy", Master's degree in Radiation Protection and Safety, IST (2nd semester 2020/2021). The Curricular Unit is taught at the Service of Radiotherapy of IPOLFG (Portuguese Oncology Institute) and "Centro Oncológico Natália Chaves" (Grupo Joaquim Chaves Saúde) by medical staff (medical physicists, radiographers, etc.) and by experts in radiotherapy-related topics from academia and research centers.

Vaz, P., Responsible for the Curricular Unit "Radiation Protection and Safety in Radiotherapy", Master's degree in Radiation Protection and Safety, IST (2nd semester 2021/2022). The Curricular Unit is taught at the Service of Radiotherapy of IPOLFG (Portuguese Oncology Institute) and "Centro Oncológico Natália Chaves" (Grupo Joaquim Chaves Saúde) by medical staff (medical physicists, radiographers, etc.) and by experts in radiotherapy-related topics from academia and research centers.

5.5 Participation in Juries and examination Committees of PhD and MSc Theses

2021

Almeida, M. (2021). Jury of Habilitation tests in Chemistry, no IST de João Domingos Galamba Correia, 13-14 January 2021.

Almeida, M.(2021). Jury of Habilitation tests in Chemistry, no IST de António Manuel Rocha Paulo, 13-14 Janurary 2021.

Almeida, M. (2021). Júri of Habilitation test in Chemistry, Universidade de Trás os Montes e Alto Douro, de Pedro Tavares, 26-27 July 2021.

Almeida, S.M. (2021). Jury of MSc Thesis. Maria do Carmo Monteiro, Transition to a low carbon economy in schools: an evolutionary study, MSc in Environmental Engineering, Universidade Lusófona de Humanidades e Tecnologia, 27 July.

- Almeida, S.M. (2021). Member of the committee of external evaluators of Carlos del Blanco Alegre. Influence of precipitation microstructure on the characteristics of atmospheric aerosol, Department of Applied Chemistry and Physics, Universidad de Léon.
- Alves, L.C. (2021). Jury member of the MSc Thesis of Duarte Alencastre de Matos Ramos, Development and optimization of a replicable process to produce light trapping substrates for ultra-thin CIGS solar cells, Microelectronics Engineering and Nanotechnologies, Dept. of Materials Science from the NOVA University.
- Belchior, A. (2021). Jury member of PhD Thesis in Physics da Universidade da Beira Interior, of Joaquim Pedro Kessongo, O potencial da concentração de radão na água do Município da Bibala: Implicações no consumo público, Departamento de Física, Universidade da Beira Interior, Covilhã, 21 May 2021.
- Belo, D. (2021). Evaluator of the PhD Thesis in Chemical Engineering of Mariangela Oggianu, Development of luminescent sensing platforms for metal ions detection, Università degli Studi di Cagliari, Cagliari, Italy, May 2021.
- Canha, N. (2021). Jury Member of PhD Thesis - Liao, C. "Associations between Bedroom Ventilation and Sleep Quality", Doctorate in Engineering, Faculty of Engineering and Architecture of University of Ghent, 20 December 2021.
- Canha, N (2021). Jury of MSc Thesis (Arguente) of the Master's Thesis of Inês Silva Pina (2021) "Emissão de partículas na produção tradicional de carvão vegetal e o seu impacto na saúde", MSc Engenharia do Ambiente, Departamento de Ambiente e Ordenamento da Universidade de Aveiro, 17 December 2021.
- Canha, N (2021). Jury of MSc Thesis (Arguente) of the Master's Thesis of Juliana Burihan (2021) "Avaliação da qualidade do ar em escolas portuguesas". MSc Engenharia do Ambiente, Faculdade de Engenharia da Universidade Lusófona de Humanidades e Tecnologias de Lisboa, 27 April 2021.
- Correia, J.D.G. (2021). Jury Member of PhD Thesis - Hofmann, B.J. "High Valen Rhenium Compounds in Catalysis: Synthesis, Reactivity and Decomposition Pathways" Doktors der Naturwissenschaften, Dr. rer. nat. Technische Universität München, Fakultät für Chemie, Professur für Molekulare Katalyse, 12 March 2021. Supervisor: Prof. Dr. Fritz. E. Kühn.
- Correia, J.D.G. (2021). Jury Member of PhD Thesis - Jakob, C.H.G."Synthesis and Characterization of Au(I) bis-NHC Complexes as Potential Anticancer Drugs" Doktors der Naturwissenschaften, Dr. rer. nat. Technische Universität München, Fakultät für Chemie, Professur für Molekulare Katalyse, 12 April 2021. Supervisor: Prof. Dr. Fritz. E. Kühn.
- Correia, J.D.G. (2021). Jury Member of PhD Thesis - Schlagintweit, J.F. "Transition Metal NHC Complexes in Oxidation Catalysis and Medicinal Chemistry" Doktors der Naturwissenschaften, Dr. rer. nat. Technische Universität München, Fakultät für Chemie, Professur für Molekulare Katalyse, 17 May 2021. Supervisor: Prof. Dr. Fritz. E. Kühn.

Correia, J.D.G. (2021). Jury of MSc Thesis (Arguente) - Fraga, Patrícia A.B. "Development of a brain metastasis co-culture cellular model for drug testing" Master in Biopharmaceutical Sciences, Faculdade de Farmácia, Universidade de Lisboa, 12 November 2021.

Fernandes, C. (2021) .Jury Member of MSc Thesis - Andreia Sousa "Block Copolymer Micelles for Drug Delivery". Master of Science Degree in Chemical Engineering, Instituto Superior Técnico, Universidade de Lisboa, January 2021.

Fernandes, C. (2021). Juri Member of MSc Thesis - Maria Teresa de Noronha Walenta Braz, "Mitochondria-Targeted 111In-Radiocomplexes for Auger Therapy of Prostate Cancer". MSc Thesis, Bioengenharia e Nanossistemas (MBioNano), IST/UL. December 2021.

Fernandes, C. (2021). Jury Member of MSc Thesis - Ana Rita Mosquito Julião "Dual-Targeted Radiocomplexes for Prostate Cancer Theranostics". Master of Science Degree in Chemical Engineering, Instituto Superior Técnico, Universidade de Lisboa, December 2021.

Fernandes, C. (2021). Jury of MSc Thesis (Arguente) - Cátia Filipa Gouveia Rosa, "Design of novel peptides that interact with G-protein coupled receptors". Mestrado Engenharia Farmacêutica, IST/UL, Main arguer, November 2021.

Fernandes, C. (2021). President of the CAT/PhD Thesis - Mariana Ribeiro, "assessement of mercury-selenium interaction in fish and associated human dietary exposure", PhD Programme IST/UL, April 2021.

Ferreira, L.M. (2021). Jury member of the academic degree (Master) of Jorge M.A. Alexandre Soares; Thesis title: Effect of Gamma Irradiation on the Functional Properties of Epoxy Carbon-Fiber Reinforced Composite Material, Air Force Academy (AFA), Sintra, Portugal, 25 June 2021.

Ferreira, L.M. (2021). Jury member of the academic degree (Master) of Luísa Nunes Baptista; Thesis title: PALS - Setup optimisation and application to macromolecular materials characterisation, IST, Lisbon, Portugal, 19 December 2021.

Mendes, F. (2021) Reviewer of MSc Thesis- Alves Silva C "RA-223 no tratamento do carcinoma da próstata metastático" Master in Biomedical Engineering, Faculty of Sciences and Technology, University of Coimbra, 15 November 2021

Marques, R. (2021). Jury member of MsC Thesis of Denise Pitta Gróz, Universidade de Aveiro.

Monteiro Gil, O. (2021). Jury member (examiner/"arguente") of the Master Thesis of Inês Carolina Fernandes Gomes "Estratificação do risco na resposta à radiação ionizante na Síndrome Hereditária para Cancro da Mama e do Ovário associada aos genes BRCA1 e BRCA2". Mestrado Integrado em Engenharia Biomédica, Departamento de Física da Faculdade de Ciências e Tecnologia, Universidade de Coimbra, 19 November 2021.

Monteiro Gil, O. (2021). Jury member (examiner/"arguente") of the Master Thesis of Lúcia de Fátima Mendes Monteiro "Sensibilidade à radiação ionizante de portadores de variantes causais nos genes BRCA1/2". Mestrado em Investigação Biomédica, Oncobiology, Faculdade de Medicina da Universidade de Coimbra, 10 December 2021.

Monteiro Gil, O. (2021). Jury member of PhD Thesis in Ciências Biomédicas do Instituto de Ciências Biomédicas Abel Salazar, of Luís Filipe de Sepúlveda Silva Santos, "DNA repair SNPs as genetic modulators of individual susceptibility to differentiated thyroid cancer and response to radioiodine therapy", Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, Porto, 29 June 2021.

Paiva, I. (2021). Jury member of Master Thesis of Vasco Eduardo de Almeida Ferreira, "Industrial Radiography: Film Radiography vs Digital Radiography - a Radiation Protection Approach", IST, Lisbon, Portugal, 26 January 2021.

Pereira, L.C.J. (2021). Jury member of Master Thesis of Lorenzo Fenocchio, "Synthesis, Structural and Magnetic Characterization of Ternary Intermetallic Compounds of the Series R₂PdGe₃ (R = rare earth element), University of Genoa, Italy, 26 March 2021.

Reis, M. (2021). President of the Jury of the Master Thesis of Vasco Eduardo de Almeida Ferreira, "Industrial Radiography: Film Radiography vs Digital Radiography - a Radiation Protection Approach", Instituto Superior Técnico, 26 January 2021.

Vaz P. (2021). Jury member (examiner/"arguente") of the Master's thesis of Lourival Beltrão Martins Jr., "Preliminary research on machine learning for X-ray CT calibration in proton therapy", Mestrado em Física Médica, Faculdade de Ciências da Universidade do Porto, July 2021.

Vaz, P. (2021). President of the jury of the Master's Thesis of Ana Margarida Simões Maduro, "Dual-energy computed tomography for the treatment of pediatric patients with proton therapy", Mestrado em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa, 27 January 2021.

Vaz, P. (2021). President of the jury of the Master's Thesis of Diogo Loureiro Figueiredo, "Dual-Targeted 99mTc-radioconjugates for Prostate Cancer Theranostics", Mestrado em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa, 21 December 2021.

Vaz, P. (2021). President of the jury of the Master's Thesis of Flávia Andreia Manuel Ferreira, "Caracterização de campos de radiação gama e de neutrões no bunker dos ciclotrões do ICNAS por simulação e medidas", em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa, 28 January 2021.

Vaz, P. (2021). President of the jury of the Master's Thesis of Rita Alexandra Candeias Belo, "As exposições potenciais na classificação de trabalhadores e de locais de trabalho em práticas industriais", Mestrado Bolonha em Proteção e Segurança Radiológica, Instituto Superior Técnico, Universidade de Lisboa, 15 December 2021.

2022

Cabo Verde, S., (2022). Jury of MSc Thesis (Arguente) - Carolina de Brito Santos, "Explore light emitting diodes and photocatalytic surfaces to prevent biofilm formation in food industry", Mestrado em Microbiologia Aplicada da Faculdade de Ciências da Universidade de Lisboa, 6 December 2022

Cabo Verde, S. (2022). Jury of MSc Thesis (Arguente) - Sara Ibrahim, "Novel applications of vaporized hydrogen peroxide on contaminated materials and surfaces", Mestrado em Microbiologia Aplicada da Faculdade de Ciências da Universidade de Lisboa, 24 March 2022

Canha, N. (2022). Jury of MSc Thesis (Arguente) of the Master's Thesis of Sweekruth Mysore Sriram, "Standardization of BigOxy method for e-fuel like Methanol, Gasoline, and their blends", MSc in Energy Engineering and Management, Instituto Superior Técnico, Universidade de Lisboa, 7 December 2022.

Canha, N. (2022). Jury of MSc Thesis (Arguente) of the Master's Thesis of Luísa Nogueira (2022) "Analysis and Interpretation of Air Quality Data using Low-Rank Modelling", MSc Engenharia Electrotécnica e de Computadores, Instituto Superior Técnico, Universidade de Lisboa, 29 June 2022.

Fernandes, C. (2022). Jury of MSc Thesis (Arguente) - Francisco Lucas, "Inhibition of protein-protein interactions in dopamine receptors with peptides towards pharmacological activity" Master of Science Degree in Biological Engineering, IST/UL, October 2022.

Ferreira, L.M. (2022). Jury member of the academic degree (Master) of Luís Filipe da Costa Paulino; Thesis title: Effect of Radiation-Assisted Cure on the Functional Properties of Carbon-Epoxy Composites, Air Force Academy (AFA), Sintra, Portugal, 8/07/2022.

Marques, R. (2022). Jury member of MsC Thesis of Tiago Abreu Pinto, Universidade de Aveiro.

Mendes, F. (2022). Reviewer of MSc Thesis- Diana Gonçalves "RA-223 no tratamento do carcinoma da próstata metastático" Master in Biomedical Engineering, Faculty of Sciences and Technology, University of Coimbra.

Mendes, F. (2022). Reviewer of MSc Thesis - Lima W "Biological impact of magnetic nanoparticles" MSc Biochemistry, FCUL.

Paulo, A. (2022). Jury member of PhD thesis- Neves. A., "Advanced Microwave Technology in Radiopharmaceutical Synthesis", Faculdade de Farmácia, Universidade de Coimbra, 20 March 2022.

Paulo A. (2022). Member of CAT/PhD Thesis - Teixeira, A.R. "Efeitos radiobiológicos de fotões e protões no glioblastoma multiforme: estudos pré-clínicos e o uso de nanopartículas de ouro como potenciais radiosensibilizadores", PhD program in Biomedical Engineering, Universidade de Coimbra, 26 September 2022.

Pereira L.C.J. (2022). Jury Member of PhD Thesis- Mariana Velho, Thiophene-based building blocks for functional materials in electronic devices, Doutoramento em Química, IST-UL.

Pereira L.C.J. (2022). Jury Member of MSc Thesis, Vital Cruvinel Filho, Multifunctional Gadolinium Bearing Gold Coated Dextran SPIONs for Cancer Theranostic Applications, Materials Eng., IST-UL.

Vaz P. (2022). Jury member (examiner/"arguente") of the PhD thesis in "Energía Sostenible, Nuclear y Renovable", of Gonzalo Felipe Garcia Fernandez, "Contribuciones a la protección radiológica operacional y la dosimetría de neutrones en centros compactos de protonterapia", Universitat Politècnica de Madrid – Escuela Técnica Superior de Inginieros Industriales, December 2022.

Vaz P. (2022). Jury member (examiner/"arguente") of the PhD thesis in "Ingeniería y Producción Industrial", of Aina Noverques Medina, "Estudio del comportamiento del gas radón (222Rn) en los procesos de transferencia en agua y en aire", Universitat Politècnica de València, July 2022.

Vieira, B.J.C. (2022). Jury member of PhD Thesis in Radiation Biology and Biophysics - Physical Biochemistry of Ana Cláudia Viana de Almeida, "Functional Characterization and Design of Proteins Nanocages", Faculdade de Ciências e Tecnologia (FCT/UNL), Universidade NOVA de Lisboa, Almada, 22 November 2022.

Waerenborgh, J.C. (2022). Jury Member of PhD Thesis in Radiation Biology and Biophysics, Dept. Chemistry, Universidade Nova de Lisboa, of João Pedro Leitão Guerra, "Biophysical and biochemical characterization of proteins involved in transition metals homeostasis" 29 July 2022.

5.6 Short-term Internships

2021

Abreu, João L.G. (2021). *Magnetic Ionic Fluids based on Metal Complexes*, Summer Internship IST Supervisor: Ana C. Cerdeira (C²TN/IST)

Canhoto, Mariana (2021). *E se as moléculas falassem?*, Summer Internship IST Supervisors: Rafaela Silva, Dulce Belo (C²TN/IST).

Costa, Joana (2021). *Prostate cancer theranostics: (radio)biological evaluation of organelle-targeted complexes*, Summer Internship IST Supervisor: Joana Guerreiro e Filipa Mendes (C²TN/IST)

Góis, Maria Francisca Marques Reis Warden (2021). *Single-molecule magnets based on lanthanides as candidates for memory devices*, Summer Internship IST Supervisor: Laura C.J. Pereira (C²TN/IST).

Lucas, Francisco (2021) *Desenvolvimento e optimização de metodologias para a síntese de novos péptidos* no âmbito do projecto PTDC/QUI-OUT/32243/2017. AE4 – Estágio de investigação não remunerado, Mestrado em Engenharia Biológica, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Rita Melo (C²TN/IST) & João D.G. Correia (C²TN/IST).

Matos, Beatriz (2021). *Plano de Gestão de Resíduos do Parque Adão Barata*, Summer Internship IST Supervisor: Susana Marta Almeida (C²TN/IST).

Máximo, Tatiana (2021). *Plano de Gestão de Resíduos do Parque Adão Barata*, Summer Internship IST Supervisor: Susana Marta Almeida (C²TN/IST).

Pedro, Guilherme Oliveira (2021). *Síntese de Materiais Moleculares*, Summer Internship IST Supervisor: Sandra Rabaça (C²TN/IST).

Pereira de Carvalho, Francisco Alberto Cavaco de Sousa (2021). *Magnetic and thermoelectric systems*, Summer Internship IST Supervisor: António P. Gonçalves (C²TN/IST).

Pinto, Elisabete Maria Tangerino (2021). *Síntese de Materiais Moleculares*, Summer Internship IST Supervisor: Sandra Rabaça (C²TN/IST).

Ramos, Diana Maria Rodrigues (2021). *Síntese de Materiais Moleculares*, Summer Internship IST Supervisor: Sandra Rabaça (C²TN/IST).

Rocha, André Pequito Gonçalves (2021). *Nanopartículas multifuncionais para aplicação teranóstica*, Estágio Curricular da Disciplina de Engenharia de Micro e Nanotecnologias da Faculdade de Ciências e Tecnologias da Universidade Nova de Lisboa (FCT/UNL), Supervisor: Maria Paula Cabral Campello, Laura Cristina de Jesus Pereira, Ana Cristina Gomes Ferreira; Francisco França Alcântara Conceição Silva (C²TN/IST; CQE, IST-Ulisboa).

Silva, Eva (2021). *E se as moléculas falassem?*, Summer Internship IST Supervisors: Rafaela Silva, Dulce Belo (C²TN, IST).

Soares, Joana (2021). *Guidelines for good air quality in public buildings, homes and cities*, Summer Internship IST, Supervisor: Susana Marta Almeida (C²TN, IST).

Sousa, Inês Filipa Morais de (2021). *Magnetic and thermoelectric systems*, Summer Internship IST Supervisor: António P. Gonçalves (C²TN, IST).

Stupar, Milica (2021). Researche in personal and ambient dose equivalent dosimetry, Estágio no Laboratório de Metrologia das Radiações Ionizantes no âmbito do projeto EURAMET DOSETrace 17RPT01. EURAMET Research Mobility Grant 17RPT01-RMG3, 1 September - 26 November 2021. Supervisors: J. Alves & G. Carvalhal (C²TN/IST; IST-LPSR-LMRI).

Zambujeiro, Maria Madalena Valente (2021). *Síntese de Materiais Moleculares*, Summer Internship IST Supervisor: Sandra Rabaça (C²TN/IST).

2022

Baptista, Teresa (2022) *Avaliação de bioacumulação em produtos hortícolas cultivados em hortas urbanas*. Bolsa de iniciação científica no âmbito do programa “Verão com Ciência” da FCT, Setembro de 2022. Supervisor: Nuno Canha (C²TN/IST).

Bolzon, Francesca, (2022). *Evaluation of the extractability by e-beam irradiation of bioactive compounds from lettuce extracts*, Health Biotechnology Course, Bio-Technological Institute "Elena di savoia" in Bari, September 2022; Supervisor: Sandra Cabo Verde (C²TN, IST).

Branco, Carolina Lebre (2022). Estudante do 2ºano do curso de Engenharia Química, (2022)“Polímeros de coordenação baseados em ditiolatos de metais de transição e o estudo das suas

propriedades óticas, magnéticas e elétricas”, Bolsa BII Verão FCT, Supervisor: Sandra Rabaça (C²TN/IST).

Curado, Maria Beatriz (2022) AE4 – Estágio de investigação não remunerado, Mestrado em Biotecnologia, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Filipa Mendes & Catarina Pinto (C²TN/IST).

Ferreira, António (2022) Eficiência energética e ambiental nas escolas piloto do projeto EFC4CLIM, Estágio Curricular da Disciplina de Saúde Ambiental da Escola Superior de Tecnologia da Saúde de Lisboa. Supervisors: Tiago Faria & Joana Lage (C²TN/IST).

Filipe, Vanessa Yevdokymenko (2022), Estudante do 2ºano do curso de Engenharia Química, (2022) “Novos materiais híbridos multifuncionais”, Bolsa BII Verão FCT, Supervisor: Sandra Rabaça (C²TN/IST).

Gonçalves, Sara (2022). *Avaliação da bioactividade de matrizes alimentares por diferentes metodologias*. Supervisão da unidade curricular Estágio II,, Licenciatura Saúde Ambiental, Escola Superior de Tecnologias de Saúde de Lisboa, 2022, Supervisor: Sandra Cabo Verde (C²TN/IST).

Jurková, Lenka (2022). Intermetallic samples preparation by high temperature techniques and their basic characterization, Estágio Erasmus +, University of Presov, Presov, Slovakia, Supervisor: António P. Gonçalves (C²TN/IST).

Monteiro, Beatriz (2022) AE4 – Estágio de investigação não remunerado, Mestrado em Biotecnologia, Instituto Superior Técnico, Universidade de Lisboa. Supervisors: Filipa Mendes & Catarina Pinto (C²TN/IST).

Nunes, Tânia (2022) Compras verdes pelos comerciantes do Parque Adão Barata em Loures, Estágio Curricular da Disciplina de Saúde Ambiental da Escola Superior de Tecnologia da Saúde de Lisboa. Supervisors: Tiago Faria & Nuno Canha (C²TN/IST).

Pereira Pires, Tomás (2022). *Preparação e estudo do telureto UTe₃*, Summer Internship IST Supervisor: António P. Gonçalves (C²TN/IST).

Ribeiro, Teresa (2022). Estágios de Verão IST, Supervisor: Filipa Mendes & Catarina Pinto (C²TN/IST).

Rodrigues, Ana (2022). Aluna da licenciatura em Química, da Universidade do Minho, no âmbito dos Estágios de Verão do DEQ 2022, Sandra Rabaça (C²TN/IST).

Salas, Iker (2022). Estudante de mestrado Erasmus. Colaboração com CENIMAT/NOVA; Síntese caracterização magnética de nanopartículas de óxidos de ferro. (Feb-July 2022). Supervisor: Laura C. J. Pereira & P. Campello (C²TN/IST).

Silva, Carolina (2022). *E se as moléculas falassem?*, Summer Internship IST Supervisor: Dulce Belo (C²TN/IST).

Sousa, Diogo (2022) *Avaliação do potencial oxidativo de aerossóis de diferentes fontes*. Bolsa de iniciação científica no âmbito do programa “Verão com Ciência” da FCT, September 2022. Supervisor: Nuno Canha (C²TN/IST).

Ribeiro, Susana (2022) aluna da Licenciatura em Bioquímica da FCUL, no âmbito dos Estágios de Verão do DEQ 2022, Sandra Rabaça (C²TN/IST).

Silva, Bernardo (2022). *Materiais Funcionais*, Mestrado em Engenharia de Materiais, Supervisor: António Pereira Gonçalves (C²TN, IST-ULisboa)

Vieira, Catarina (2022). *Materiais Funcionais*, Mestrado em Engenharia de Materiais, Supervisor: António Pereira Gonçalves (C²TN, IST-ULisboa)

Benedita Silva, Maria (2022). *Materiais Funcionais*, Mestrado em Engenharia de Materiais, Supervisor: António Pereira Gonçalves (C²TN, IST-ULisboa)

Campos, Rita (2022). *Materiais Funcionais*, Mestrado em Engenharia de Materiais, Supervisor: António Pereira Gonçalves (C²TN, IST-ULisboa)

Marta Cabral, Ana (2022). *Materiais Funcionais*, Mestrado em Engenharia de Materiais, Supervisor: Laura Pereira (C²TN, IST-ULisboa)

Baleia, Catarina (2022). *Materiais Funcionais*, Mestrado em Engenharia de Materiais, Supervisor: Laura Pereira (C²TN, IST-ULisboa)

Filho, Vital (2022). *Materiais Funcionais*, Mestrado em Engenharia de Materiais, Supervisor: Laura Pereira (C²TN, IST-ULisboa)

PIC

Ribeiro, Teresa (2022). PIC 1 - Eng Biomédica Supervisor: Filipa Mendes e Catarina Pinto (C²TN/IST).

Rosa, César (2022). PIC 1 - Eng Biomédica Supervisor: Célia Fernandes, António Paulo (C²TN/IST).

6 SCIENTIFIC COMMITTEES

6.1 Representatives in Scientific Committees under the auspices of international organizations and institutions

- Fernandes, C. (2022), Invited Adviser *IAEA Future Activities on Tc-99m Kits and Radiopharmaceuticals*, IAEA consultant meeting, Online, 25-28 April 2022.
- Paiva, I. (2021), Article 37 Group of Experts of the EURATOM Treaty. Portuguese delegate since 2013.
- Paulo A. (2021-2022), Representative of IST in the MEDICIS/CERN collaboration board.
- Paulo A. (2022) External expert, "Technical Meeting on Auger Electron Emitters for Radiopharmaceutical Developments", IAEA meeting, Viena, Áustria, 5-9 de Setembro, 2022.
- Paulo, A. (2021), External expert, "Technical Meeting on The Preclinical Testing of Radiopharmaceuticals", IAEA meeting, Coimbra, Portugal, 15-19 Novembro, 2021.
- Paulo, A. (2021), External expert, "Strategic Agenda for Medical Ionising Radiation Applications" (SAMIRA), EURAMED rocc-n-roll (Horizon 2020).
- Paulo, A. (2021-2022), Member of the management committee of COST CA19114 ("Network for Optimized Astatine labeled Radiopharmaceuticals").
- Vaz, P. (2020-2025), Nominated (by FCT) member of the Group of Experts (GoE) under the Article 31 of the EURATOM Treaty of the European Union.
- Vaz, P. (2021), Nominated (by the Portuguese Government) expert at the EURATOM Programme Committee - Fission of the European Union.
- Vaz, P. (2022), IST representative in the General Assembly of the European Union EURADOS platform.
- Vaz, P. (2022), IST representative in the General Assembly of the European Union MELODI research platform.
- Vaz, P. (2022), Nominated (by the Portuguese Government) expert at the EURATOM Programme Committee - Fission (CCE-FISSION) of the European Union.
- Vaz, P. (2022), Nominated (by the Portuguese Government) member of the Group of Experts (GoE) under the Article 31 of the EURATOM Treaty.
- Vaz, P. (2022), Nominated representative of IST (Programme Manager (POM) for Portugal, as recognized by the FCT) in the European Partnership PIANOFORTE.

6.2 Representatives in international institutions, associations and European platforms

- Corisco, J. (2021/2022), European Alliance for Radioecology , IST delegate since 2021.
- Monteiro Gil, O. (2021/2022), Running the European Network of Biological Dosimetry and Retrospective Physical Dosimetry, RENEb (IST delegate) since 2018.
- Paiva, I. (2021), Implementing Geological Disposal of radioactive waste Technology Platform, IGD-TP (IST delegate) since 2010.
- Paiva, I. (2022), Implementing Geological Disposal of radioactive waste Technology Platform, IGD-TP (IST delegate) since 2010.
- Paiva, I. (2022), Member of the Social Sciences and Humanities in Ionizing Radiation Research Platform, SHARE.
- Reis, M. (2021), European Platform on Preparedness for Nuclear and Radiological Emergency Response and Recovery, NERIS (IST delegate) since 2014.
- Reis, M. (2022), representative of IST in the General Assembly of the European Platform on Preparedness for Nuclear and Radiological Emergency Response and Recovery (NERIS) since 2014.
- Vaz, P. (2021), representative of IST in the General Assembly of the MELODI (Multidisciplinary European Low Dose Initiative) research platform.
- Vaz, P. (2021), representative of IST in the General Assembly of the EURADOS (European Radiation Dosimetry Group) research platform.
- Vaz, P. (2022), representative of IST in the General Assembly of the MELODI (Multidisciplinary European Low Dose Initiative) research platform.
- Vaz, P. (2022), representative of IST in the General Assembly of the EURADOS (European Radiation Dosimetry Group) research platform.
- Waerenborgh, J.C. (2021), International Board on the Applications of the Mössbauer Effect, IBAME (Portuguese delegate) since 2017.

6.3 Members of Scientific or Organizing Committees of National and International Conferences

- Almeida, M. (2021), Member of the International Advisory Board of the biennial conference series International Symposium on Crystalline Organic Metals.
- Almeida, M. (2021), Presidente Adjunto para a Investigação do Colégio da Química, University of Lisbon.

- Corisco, J.A.G (2021), Member of the Scientific Committee and session chair person of Congresso Ibérico Solo e Desenvolvimento Sustentável: Desafios e Soluções. 17-18 junho 2021, Faculdade de Ciências, Universidade do Porto, Portugal (online congress).
- Corisco, J.A.G. (2022), Member of the Scientific Committee of the European Radiation Protection Week, Estoril, Portugal, 9-14 October 2022.
- Cravo Sá, A. (2022), Member of the Scientific Committee of the ERPW 2022 (European Radiation Protection Week 2022), Estoril, Portugal, 9-14 October 2022.
- Di Maria, S. (2022), Member of the Scientific Committee of the European Radiation Protection Week, Estoril, Portugal, 9-14 October 2022.
- Gonçalves, A.P. (2021), Member of the *Consulting Scientific Committee of the Materials Growth and Characterization Laboratory*, Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic.
- Gonçalves, A.P. (2021), Member of the International Scientific Committee of the International Conference European Conference on Thermoelectrics.
- Gonçalves, A.P. (2021), Member of the International Scientific Committee of the International Conference Journées des Actinides.
- Gonçalves, A.P. (2021), Member of the International Scientific Committee of the International Conference on Solid Compounds of Transition Elements.
- Monteiro Gil, O. (2022), Member of the Scientific Committee of the European Radiation Protection Week, Estoril, Portugal, 9-14 October 2022.
- Paiva, I. (2022), Member of the Extended Scientific Committee of the 6th European Congress on Radiation Protection, IRPA2022.
- Paiva, I. (2022), Member of the Scientific Committee of the European Radiation Protection Week, Estoril, Portugal, 9-14 October 2022.
- Paiva, I. (2022), Member of the Social Sciences and Humanities in Ionizing Radiation Research Platform, SHARE.
- Pereira L.C.J. (2021), Member of the Organizing Committee of Núcleo Português de Magnetismo, Sociedade Portuguesa de Física (Condensed Matter Physics section).
- Pereira L.C.J. (2022), Member of the Organizing Committee of Núcleo Português de Magnetismo, Sociedade Portuguesa de Física (Condensed Matter Physics section).
- Reis, M. (2022), Member of the Scientific Committee of the European Radiation Protection Week (ERPW2022), Estoril, 9-14 October 2022.
- Reis, M.A. (2010 - on going), Chairman of the International Advisory Committee of the International Conference on Particle Induced X-ray Emission (PIXE)".

- Romanets, Y. (2022), Member of the Scientific Committee of the European Radiation Protection Week (ERPW2022), Estoril, 9-14 October 2022.
- Vaz, P. (2021) Member of the Scientific Committee of ANIMMA 2021 ("7th International Conference on Advancements in Nuclear Instrumentation Measurement Methods and their Applications"), Prague, Czech Republic. 21-25 June 2021.
- Vaz, P. (2021) Member of the Scientific Committee of ISRP-15 ("15th International Symposium on Radiation Physics 2021"), Kuala Lumpur, Malaysia, 6-10 December 2021.
- Vaz, P. (2022), representative of IST in the General Assembly of the MELODI (Multidisciplinary European Low Dose Initiative) research platform.
- Vaz, P. (2022), representative of IST in the General Assembly of the EURADOS (European Radiation Dosimetry Group) research platform.
- Waerenborgh, J.C. (2021), Member of the International Advisory Committee of the International Conference on the Applications of the Mössbauer Effect 5-10 September 2021, Brasov, Romania

6.4 Member of committees for the evaluation of scientific programs

- Almeida, S.M. (2021). Research projects in the panel mathematics, natural sciences and engineering (Division 2), Swiss National Science Foundation, Switzerland, 2021.
- Almeida, S.M. (2021). Research projects "PRIN 2020" MIUR, Italian Ministry for Education, University and Research, Italy, 2021.
- Almeida, S.M. (2021). Research proposals in the field of Atmospheric Sciences, Call: Funding for Postdoctoral researchers, Academy of Finland, Finland, 2021.
- Almeida, S.M. (2021). Research proposals in the field of Atmospheric Sciences, Call: Funding for Academy Research Fellows, Academy of Finland, Finland, 2021.
- Almeida, S.M. (2021). Research proposals in the field of Atmospheric Sciences, Call: Funding for Academy projects, Academy of Finland, Finland, 2021.

6.5 Evaluation Panels

- Mendes, F (2021), FWO Research Foundation Flanders, Bélgica.
- Mendes, F (2022) CIVIS3i - Marie Skłodowska-Curie Actions COFUND.
- Paulo, A. (2021), Reviewer (Chemistry area), PRELUDIUM 20 call, "National Science Centre", Poland.
- Pereira L.C.J. (2021) FNSNF- Swiss National Science Foundation, Switzerland.

6.6 Conferences and Workshops Organization

2021

Almeida, M., Belo, D., Casimiro, M.L., & Rabaça, S. (2021). Organizers of the *C²TN Workshop on Advanced Materials*, 11 November 2021.

Almeida, M., & Rabaça, S. (2021). Organizers of the *C²TN Workshop of ChemMat PhD Programme*, 12 November 2021.

Belo, D. (2021). Organizing member of *CARISMA II, the Summer School of C²TN*, 6-9 September 2021.

Gonçalves, A.P. (2021). Organizing member of the *Second Virtual Conference on Thermoelectrics (VCT 2021)*, <https://vct2022.mines.edu/home-2021/>, 20-22 July 2021.

Marques, J.G. (2021). Member of Program Committee of *European Research Reactor Conference 2021*, Helsinki, Finland, 24 – 29 September 2021.

- Mendes, F. & Gonçalves, A.P. (2021). Organizer members of the *First Workshop of the Laboratory for Physics of Materials and Emerging Technologies (LaPMET)* 23-24 September 2021, online.
- Mendes, F., Guerreiro, J.F., & Silva, F. (2021), Organizers of the *C²TN Workshop on Thematic Strand Radiopharmaceutical Sciences and Health Physics*, July 2021 – Online edition.
- Pereira, L.C.J. (2021). Organizer member of the *Virtual meeting, Magnetism in Portugal 2021*, 14-15 September 2021.
- Valério, P. (2021) Organizing member of the *C²TN Workshop on Earth Systems, Radioactivity and Cultural Heritage*, 19 November 2021.

2022

- Alves, L.C., Corregidor, V. (2022). Local organizing committee of the *22nd International Conference on Ion Beam Modification of Materials (IBMM 2022)*, Lisbon, Portugal, 10-15 July 2022.
- Belchior, A., Borbinha, J., Cravo Sá, A., Corisco, J., Di Maria, S., Falcão, A., Monteiro Gil, O., Paiva, I., Reis, M., Romanets, Y. & Vaz, P. (2022). Organizer members of the *European Radiation Protection Week (ERPW 2022)*, Estoril, Portugal, 9-14 october 2022.
- Belo, D. (2022) Organizer member of *CARISMA III, the Summer School of C²TN*, 5-7 September 2022.
- Belo, D., & Rabaça, S. (2022). *Functional Molecular Materials Insights*, in honour of Prof. Manuel Almeida on the occasion of his 70th Anniversary, 21 October 2022.
- Gonçalves, A.P. (2022). Member of the International Scientific Committee of the conference *7th Southeast Asia Conference on Thermoelectrics (SACT2022)*, Hybrid Conference, Sakon Nakhon Rajabhat University, Sakon Nakhon, Thailand, 7 - 8 December 2022.
- Gonçalves, A.P. (2022). Organizer member of the Third Virtual Conference on Thermoelectrics (VCT 2022), <https://its.org/2022/05/17/vct-2022-virtual-conference-on-thermoelectric/> , 20-22 July 2022.
- Marques, J.G. (2022) Member of Program Commitee of *European Research Reactor Conference 2022*, Budapest, Hungary, 6-10 June 2022.
- Marques, R. (2022). Local Organizing Committee of the *43th International Symposium on Archaeometry (ISA2020/2022)*, Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022.
- Pereira L.C.J. (2022). Organizer member of the Conference, *Magnetism in Portugal 2022 – Young Researchers meeting*, 12-13 September 2022, Univ. Porto, Portugal.
- Rodrigues, A.L. (2022). Scientific Secretariat of the *43th International Symposium on Archaeometry (ISA2020/2022)*, Instituto Superior Técnico, Lisbon, Portugal, 16- 20 May 2022.
- Santos, I.C. (2022). Organizer member of the *2nd National Crystallographic Meeting*, Lisboa, 15-16 July 2022.

Vaz, P. (2022) Chairperson of *ERPW 2022 (European Radiation Protection Week 2022)*, Estoril, 9-14 October 2022.

Vaz, P. (2022) Chairperson of the *Technical Program Committee of ICRS 14/RPSD-2022 (14th International Conference on Radiation Shielding and 21st Topical Meeting of the Radiation Protection and Shielding Division)*, Seattle, Washington, USA, 25-29 September 2022.

7 Prizes

Belo, D. (2021/2022). Diploma of "Excellence in Teaching" awarded by the Pedagogical Council of Instituto Superior Técnico.

Canha, N. (2021). Diploma of "Excellence in Teaching" awarded by the Pedagogical Council of Instituto Superior Técnico, for having been considered an "Excellent Teacher" by students in teaching the curricular unit Chemistry (LEBiol21) in the 1st Semester of 2021/2022, in accordance with the Quality Assurance System of Curricular Units at IST.

Canha, N. (2021). Diploma of "Excellence in Teaching" awarded by the Pedagogical Council of Instituto Superior Técnico, for having been considered an "Excellent Teacher" by students in teaching the curricular Chemical Engineering Sciences I (MEQ) in the 2nd Semester of 2020/2021, in accordance with the Quality Assurance System of Curricular Units at IST.

Canha, N., Mendez, S., Almeida, S.M., Belo, J. (2022). Award ULisboa - Colégio de Química – 2022, best poster presentation at 5º Encontro do Colégio de Química da Universidade de Lisboa, 12-14 July 2022.

Marques, L. (2022). Innovation prize in the Armed Forces 2022 (1st place), Portugal.

Oliveira, B., Cravo Sá, A., Campos, G., Fernandes, P. (2022). Development of a software for radiobiological calculations. Best oral presentation, Fórum ART 2022, Santarém.

Rodrigues, F., Cravo Sá, A. Fernandes, P. (2022). Creation of a thorax voxel phantom. Best Poster presentation, Fórum ART 2022, Santarém.

