

10. Collaborations

Area and Subject	Collaboration
New Materials and Compounds:	
• Nuclear Solid State Physics Using Ion Beams	
SiC/SiCf composites (E. Alves)	ICMSE, Universidad de Sevilla-CSIC (J.A. Odriozola) Dep. de Física, Universidade do Minho (L.Rebouta) Association EURATOM-ENEA. (A. La Barbera)
Electrical and Optical doping of GaN (E. Alves)	Physics Department, Univ. of Bonn (R. Vianden) Dept. of Elect. and Computer Engineering and Comp. Science, Nanoelectronics Laboratory (A. J. Steckl) Dept. de Física, Univ. de Aveiro (T. Monteiro) Hig. Pressure Res. Center, Warszawa (W. Lojkowski)
Nanoprecipitates in α -Al ₂ O ₃ and TiO ₂ (E. Alves)	Univ. of Tennessee (C. MacHargue) Dept. Física, Univ. Lisboa (M. Cruz)
Electrical Resistivity of Be Pebbles (E. Alves)	Forschungszentrum Karlsruhe - IKET (F. Scaffidi- Argentina)
Amorphization of GeSi Multilayers (E. Alves)	Dept. de Física, Univ. Aveiro (N. Sobolev)
Nuclear Microprobe Applications (L.C. Alves)	Physics Department, University of Surrey (M.B.H.Breese)
Advanced metallurgy of light alloys (R.C. da Silva)	Dep. Eng. ^a Materiais, IST (R. Vilar) Dep. Física, FC-UL (O. Conde)
Advanced glass coatings (R.C. da Silva)	Dep. Química, ITN (P. Matos)
Multi-layered systems (R.C. da Silva)	INPG/ENSP Grenoble (J.-P. Sénateur)
• Condensed Matter Physics	
Nuclear Instrumentation Instruments and methods for neutron beam work (A.N. Falcão)	Lab. Léon-Brillouin, CEA/CNRS (Dr.J. Teixeira and Dr.Gilles Koskas) Physics Dept., Risø National Laboratory (Dr. Kell Mortensen and Dr.J.S. Pederson)
Microstructure of new materials Organic-inorganic hybrids (F.M.A. Margaça)	Glass and Ceramics Engineering Dept., Aveiro University (Prof.I.Miranda Salvado) Lab. Léon-Brillouin, CEA/CNRS (Dr.J. Teixeira)
Positron Annihilation (F.M.A. Margaça)	Faculty of Sciences, Sofia Univ. (Prof.M. Misheva)
Radiation induced defects Color centres in topaz (A.N. Falcão)	Physics Dept., Aveiro University (Prof.Lucília Santos) Institute of Advanced Materials, JRC - Petten, The Netherlands (Dr. Johan Bressers and Dr. Stathis Peteves)
High Temperature Materials	
Overlay and Thermal Barrier Coatings (António Sequeira)	
Reconstruction of aeronautical high-temperature components (António Sequeira)	Dept. of Materials, IST, Lisbon Technical University (Prof. Rui Vilar)
Single crystalline superalloys	Inst. of Applied Physics, Swiss Federal Institute of Technology Zürich (Prof. Gernot Kostorz)

• **Solid State
Physics and
Chemistry**

X-ray diffraction and TEM	Max Planck Institute for Metals Research Stuttgart, Germany (Prof. E. Mittemeijer)
Transmission Electron Microscopy of solids	Dep. Cerâmica e do Vidro, Universidade de Aveiro (Prof. Joaquim Vieira)
Decomposition in alloys	Dep. Ing. Metalurgica, ESQIE - IPN, Mexico (Prof. Hector Calderon)
Small angle neutron scattering	Dept. of Solid State Physics, Risø Nat. Laboratory, Denmark (Dr. Jan Skov Pedersen)
Development of high temperature and high vacuum mechanical components	Nuclear Physics Centre, Lisbon University (Prof. M. Ribeiro da Silva)
Mössbauer Spectroscopy Materials for Selective Oxygen Separation membranes (J. C. Waerenborgh)	Unidade de Investigação em Materiais Cerâmicos da Universidade de Aveiro. (J. R. Frade).
Mössbauer Spectroscopy Mineral characterization (J.C.Waerenborgh).	Dept. Geologia da Faculdade de Ciências da Univ. Lisboa. (A. Mateus e J. Figueiras)
Mössbauer Spectroscopy Fe-complexes of tetraazamacrocycles (J. C. Waerenborgh)	Instituto de Tecnologia Química e Biológica da Univ. Nova de Lisboa. (R. Delgado)
Molecular Magnetic Materials High Spin Molecules for Organic Magnets (V. Gama)	Instituto Superior Técnico (M. C. B. L. Sohoji)
Molecular Materials X-Ray structure analysis (V. Gama, M. Almeida)	Instituto Superior Técnico (M. T. Duarte)
Molecular Conductors (M. Almeida)	Instituto Superior Técnico (L.Alcacer, J. Morgado)
Molecular Conductors, electronic structure calculations (M. Almeida)	Instituto Superior Técnico (L.Veiros)
Solid State Physics Superconducting thin films (G. Bonfait)	Physics Department, Sciences Faculty of Lisbon (M. Godinho)
Magnetic properties of Intermetallics (M. Almeida)	
Solid State Physics Superconducting thin films (G. Bonfait)	Laboratoire de Materiaux et de Génie Physique, Grenoble, France (J. P. Senateur)
Solid State Physics Superconducting thin films (G. Bonfait)	LEPES, Grenoble, France (D. Feinberg, C. Schlenker)
Molecular Materials, Polisulfurated molecules (M. Almeida)	Instut de Ciênciea de Materials de Barcelona, CSIC (C. Rovira, J. Veciana)
Intermetallics Neutron diffraction, (M. Almeida)	Physics Department, Coimbra University (J.A. Paixão)
Solid State Chemistry, Uranium intermetallics (A.P. Gonçalves)	Laboratoire de Chimie du Solide et Inorganique Moléculaire, Rennes, France (Henri Noel)

Environmental Sciences:

• Health and Environmental Studies Using Ion Beam Techniques	Biomedical studies	Sta. Maria Hospital, Pneumology and Anatomopathology Dept. (A. Bugalho de Almeida, M. João Palhano) INETI -LAACQ (M. Alexandra Barreiros)
	Ecotoxicology - Terrestrial ecosystems - Marine ecosystems Microanalysis of Toxic Elements in Human Teeth by SRXRF (T. Pinheiro)	CBA - Environmental Biology Centre-UL (Ana Maria Crespo) Zoology and Anthropology Dept., FC-UL (Mário Reis) CFA-UL (M.L. Carvalho) LURE (P. Chevallier)
	Monitoring and biomonitoring of atmospheric dispersion of elements Study of dispersion of air pollutants in Sado region Study of dispersion of air pollutants in Sado region Monitoring of trace elements in CTRU	Foundation of Lisbon University, Delft Technical University (Adelaide de Jesus, H.Th. Wolterbeek) IAEA, Delft Technical University and other CRP laboratories /universities (B. Smadis, H.Th. Wolterbeek, other CRP participants) Departamento de Ambiente e Ordenamento/Univ. Aveiro (Casimiro Pio)
• Atmospheric Elemental Dispersion	Development Prototype of a automatic system for air particulate matter sampling (S.A.R.A.) PIGE and other Ion Beam Analysis Developments	Foundation of Lisbon University (Adelaide de Jesus, Prof. Pires Ribeiro) ITN, CFNUL (Adelaide de Jesus, Prof. Pires Ribeiro)
	Applications Archaeology Roman marbles in Portugal	
	Paleobiology of transition of mesolithic-neolithic	Universidade de Évora, Universidade Nova de Lisboa (J.M. Peixoto Cabral, L. Lopes, M.J. Maciel) Universidade de Coimbra (J.M. Peixoto Cabral, Eugénia Cunha)
	Reference Materials PERM	DSM N.V., IRMM, BASF A.G., other EU Laboratories/Universities (W. van Borm, J. Pauwels, H. Endriss) IAEA (Borut Smadis)
	Intercomparisons	
• Environmental Analytical Chemistry	Environmental Geochemistry Heavy Metal Pollution in the Trancão Basin - Soils, Sediments and Water Resources (M.F. Araújo)	Dept. Physics, ITN (Teresa Pinheiro, L.C. Alves) SMCM Loures (Ana da Mata, Arménio Figueiredo)
	Hydrogeology Management of Coastal Aquifers in Europe. Palaeowaters, Natural Controls and Human Influence - Palaeaux (P.M. Carreira)	Several European partners
	Environmental Isotopes and Noble Gas Palaeothermometers in the Study of Climatic Change Encoded in the Palaeowaters of the Aveiro Aquifer (P.M. Carreira)	Universidade de Aveiro (Marques da Silva)

Hydrological Study of the "Sete Cidades" Massive – Azores (P.M. Carreira)	Universidade dos Açores (Rui Catarino) Faculdade Ciências da UL (Costa Almeida)
Study of Gaso-Carbonic Cold Waters from "Vilarelho da Raia", "Vidago" and "Pedras Salgadas" (P.M. Carreira)	Laboratório de Mineralogia e Petrologia, IST (Aires de Barros)
Flumire - "Fluid migration-reaction model of Hydromineral systems traced by isotopic composition ($^{37}\text{Cl}/^{35}\text{Cl}$ and $^{87}\text{Sr}/^{86}\text{Sr}$) of mineral waters and altered wall-rocks" (P.M. Carreira)	Laboratório de Mineralogia e Petrologia, IST (Aires de Barros)
Marine Geochemistry Ocean Margin Exchange (OMEX II) (M.F. Araújo)	Universidade do Algarve (J. Alveirinho Dias)
The Use of Fine Grain Sediments (Silts and Clays) in the Understanding of Sedimentary Dynamics and Recent Evolution of the West Portuguese Continental Margin (M.F. Araújo)	Museu Nacional de História Natural (Galopim de Carvalho)
Enregistrement Géochimique de L'Impact Anthropique dans la Sédimentation Fine de la Marge Nord Portugaise (M.F. Araújo)	Université Bordeaux I, France (J.-M. Jouaneau)

Inorganic Chemistry, Radiochemistry and Radiopharmacy:

• <i>Inorganic and Organometallic Chemistry</i>	Energetics of Molecules in the Gas-Phase (J. P. Leal)	Faculdade de Ciências da Universidade de Lisboa (J.A. Martinho Simões, M. Tereza Fernandez)
	Gas Phase Ion Chemistry (A. Pires de Matos)	National High Magnetic Field Laboratory, Florida (A.G. Marshall, M.A. Freitas)
	Gas Phase Ion Chemistry (J. Marçalo)	Mass Spectrometry Center of the University of Lisbon (M.A. Almoester Ferreira, M.C. Oliveira)
	Lanthanide Compounds with Macrocyclic Ligands (I. Santos, M. P. Campello, A. Domingos)	Instituto de Tecnologia Química e Biológica (R. Delgado)
	Rhenium Complexes with Nitrogen Donor Ligands (I. Santos, A. Paulo, A. \)	Instituto de Tecnologia Química e Biológica (C. Romão)
	X-ray Diffraction Studies and Theoretical Calculations (I. Santos, N. Marques, A. Domingos)	Instituto Superior Técnico (Adelino Galvão) Faculdade de Ciências da Universidade de Lisboa (M. José Calhorda)

<ul style="list-style-type: none"> • Radiopharmaceutical Development 	Biochemistry Endocrinology and Metabolism (F. Marques)	Laboratório de Genética/ Centro de Metabolismo e Endocrinologia da Faculdade de Medicina de Lisboa (M. P. Bicho)
	Biochemistry Receptor Binding Assays	Inst. Biomédico de Inv. Da Luz e Imagem (IBILI) Coimbra (J.J. Pedroso de Lima)
	Gama camera imaging (A.C. Santos)	Service Hospitalier Frédéric Joliot, CEA, Orsay, France (B. Maziere)
	Organic Chemistry Synthesis of Steroid Derivatives	Institut of Advanced Material Study, Kyushu University, Fukuoka Japan (T. Thiemann)
	Synthesis of Bisphosphonates	INETI - Departamento de Tecnologias e Industrias Químicas (M.Céu Costa, M. Rute Costa)
	Synthesis of Hydroxy-pyridinones Baboon Imaging	Centro de Química Estrutural, Complexo I, Instituto Superior Técnico, Lisbon, Portugal (M. A. Santos) Institute of Life Sciences, Pretoria University, South Africa (I. Dormehl)
	Clinical Trials of Radiopharmaceuticals (L. Gano)	Instituto de Medicina Nuclear, Faculdade de Medicina da Universidade de Lisboa (G. Cantinho)
	Molecular Modelling (M. Neves)	Departamento de Química, FCT, Universidade de Coimbra (R. Fausto)
	Neuroendocrine Regulation of Growth Hormone Secretion (P. Raposinho)	Division de Biologie de la Croissance et de la Reproduction, Hôpital Cantonal Universitaire, Genève (M.L. Aubert)
<u>Nuclear Engineering:</u>		
<ul style="list-style-type: none"> • RPI Dosimetry 	Boron Neutron Capture Therapy Portuguese-Hungarian collaboration in the use of research reactors for BNCT (I.C.Gonçalves)	Technical University of Budapest (E.Zsolnay) KFKI (I. Vidovszky) and Oncology Institute of Budapest (O.Csuka)
	Exchange of Finnish Portuguese experience in BNCT (I.C.Gonçalves)	Helsinki University (S.Savolainen) VTT Chemical Technology (I.Auterinen)
	Boron determination in samples by the PGNA technique (I.C.Gonçalves)	Nuclear Physics Institute of Academy of Sciences of the Czech Republic (I.Tomandl)
	Induced effects in biological samples by the neutron capture in boron (I.C.Gonçalves)	Universidade de Valência (J.Pertusa, A.Irles)
	Genetic effects in melanoma cells due to the neutron capture in boron (I.C.Gonçalves)	Faculties of Pharmacy and Medicine, Univ. Lisboa (M.Castro, J.Toscano Rico) Faculty of Medical Sciences, Univ. Nova de Lisboa (J.Rueff, N.G. Oliveira)
<ul style="list-style-type: none"> • Operation and Exploitation, RPI Dosimetry 	Radiation Effects on Electronic Components Fast Neutron Irradiation of Electronic Components for LHC (A.J.G. Ramalho, J.G. Marques)	Univ. Complutense Madrid (J.A. Agapito) CERN/LHC (J. Casas)
<ul style="list-style-type: none"> • Applied Dynamics 	Remote Impact Identification	CEA Département de Mécanique et Technologie, France (L. Borsoi, P. Izquierdo, Ph. Piteau, T. Grunenwald) Instituto Superior de Engenharia de Lisboa (M. Paulino) Universidade Nova de Lisboa (A. Urgueira)

Simulation and Identification of Complex Systems Experimental Modal Identification	Instituto Politécnico de Setúbal (M. Moreira) IST (H. Pina) EDP/Companhia Portuguesa de Produção de Electricidade, (J. Soares) Université Technologique de Compiègne, France (P. de Araújo)
Nonlinear Modelling and Dynamics	Instituto Politécnico do Porto (L. Henrique) CEA Département de Mécanique et Technologie, France (L. Borsoi) Ecole Nationale Supérieure de Physique et Chimie de Paris (V. Gibiat)
Analysis of Structures Subject to Flow-Induced Vibrations	CEA Département de Mécanique et Technologie, France (Ph. Piteau) Ecole Nationale Supérieure des Techniques Avancées France, (F. Axisa) Trinity College, Dublin, (J. Fitzpatrick, C. Meskell)
Optimisation of Rotor Balancing	EDP/Companhia Portuguesa de Produção de Electricidade (J. Soares) Instituto Superior de Engenharia de Lisboa (M. Paulino)
Identification of Machinery Under Working Conditions	INESC (C. Martins, M. Piedade) INETI (E. Ataíde) ENIDH (R. Sampaio)
Modelling of Vibration-Generated Droplets	PROENOL (M. Fátima) Instituto Politécnico de Setúbal (M. Moreira) ENIDH (R. Sampaio)
Industrial Technologies:	
• Nuclear Instruments and Methods	Computational physics Dosimetry for medical applications (C. Oliveira)
	Portuguese Institute of Cancer Center of Coimbra (Maria do Carmo Lopes) LIP (Luís Peralta) Portuguese Institute of Cancer Center of Lisbon (Nuno Teixeira)
	Boltzmann equation methods (N. Pinhão) Glow discharges (N. Pinhão)
	Centro de Física dos Plasmas. IST (M. Pinheiro) SZFKI, Hungria (Z. Donkó) Centro de Física dos Plasmas. IST (M. Pinheiro) SZFKI, Hungria (Z. Donkó)
• Radiation Technologies: Processes and Products	Advanced Detectors Superconductors (C. Oliveira)
	Advanced Detector Group, Centro de Física Nuclear, University of Lisbon (T. A. Girard, M. J. Gomes, P. Valkol) GPS-CNRS, France (J. Collar, V. Jeudy, G. Waysand, D. Limagne) Negeev University, Israel (G. Jung) Bar-Ilan University, Israel (B. Ya. Shapiro) Escola Universitaria Politecnica de Barcelona, Spain (L. Ramirez-Piscina, A. Penaranda)
	Radiation Sterilisation Biochemical and Molecular Studies and Radiation Sterilisation (M. Luisa Botelho, ITN)
	Dep. of Vegetal Biology, Faculty of Sciences, University of Lisbon (R. Tenreiro) Dep. of Vegetal Biology, Faculty of Sciences University of Lisbon (M. Carolino)
Auditing Environmental Conditions of Atmosphere Controlled Facilities (M. Luisa Botelho, ITN)	Portuguese Institute of Quality (IPQ) (N. Duarte) INSA (M. A. Peça Gomes)

Standardisation of Healthcare Products (M. Luisa Botelho, ITN)	ONS/APORMED (C. Rainho)
Microbiological Validation of Radiation Sterilisation (M. Luisa Botelho, ITN)	JABA (E. Rojo, I Carvalhosa)
Control Critical Points in the line production (M. Luisa Botelho, ITN)	EMPOA (A. Marques)
Polymers	
Study of Gamma Sterilisation Effects onto Stach Based Polymers (L.M.Ferreira, ITN)	R. Reis, University of Minho
Graft-copolymerisation and Modification of Natural Based Chitin/Chitosan Polymers (L.M.Ferreira, ITN)	M. H. Gil, University of Coimbra
Study of Thermal and Mechanical Properties versus Gamma Irradiation in Industrial LDPE Films (L.M.Ferreira, ITN)	E. Cunha, FIBOPE
Elimination of 2,4,6-Trichloroanisole in Cork Stoppers with Gamma Radiation (L.M.Ferreira, ITN)	A. C. Mesquita, Cork Supply
Irradiation geometries & dosimetry	
Assay of electronic circuits under low gamma radiation flow (L.M.Ferreira, ITN)	Prof. Agapito, University Complutense of Madrid
Gamma irradiation of optical fibbers (L.M.Ferreira, ITN)	G. Rego, Polytechnic Institute of Viana do Castelo / Technical University of Porto
Food Irradiation	
Irradiation of Food Stable Foods (M. E. Andrade, ITN)	Estação Agronómica Nacional, INIA (M. J. Trigo)
Detection of Irradiated Spices and Dried Fruits (M. E. Andrade, ITN)	Dept. Biotecnologia, INETI (M.P. Esteves)
Detection of Irradiated Food (M. E. Andrade, ITN)	Dept. Química Biotecnológica, IST (J. Empis)
Alanine/EPR Dosimeters (M. E. Andrade, ITN)	University of Marseilles, France (J. Raffi) Institute of Catalisys, Bulgarian Academy of Sciences, Bulgaria (N.D. Yordanov)
Gamma Dosimetry (M. E. Andrade, ITN)	NPL, UK (P. Sharpe) Risø Laboratorie, Denmark (A. Miller)

Cultural Heritage and Sciences

• Cultural Heritage and Sciences

Archaeometry: ancient ceramics characterisation / ITN-IPA protocol (M.I. Prudêncio, M.A. Gouveia & M.I. Dias)	Archaeologists responsible for the 8 projects approved by the protocol commission (Portugal)
Archaeometry: ancient ceramics production and provenance (M.I. Prudêncio, M.I. Dias, & M.A. Gouveia)	Dept. of Min. Cryst. And Agric. Chemistry, Univ. of Seville, Spain (Angel Polvorinos del Rio) Gab. Archaeology of Fornos de Algodres, Portugal (António Valera) CCA/CT, Univ. of Minho, Portugal, (M.A. Sequeira Braga) UA/ Univ. of Minho, Portugal (M.M. Martins) CMVNF- Archaeological Museum Sector, Portugal

**Radiological
Protection,
Environmental
Radioactivity
and Nuclear
Safety**

	(F. Oliveira) Dept. Geology, University of Lisbon, Portugal (César Freire de Andrade)
Conservation of the built patrimony (M.I. Prudêncio, M.A. Gouveia, J.C. Waerenborgh, M. Nasraoui, M.J. Trindade & M. Gonçalves)	Dept. of Geochemistry of the “École de Mines” of Saint-Étienne, France (Essaid Bilal) LNEC, Portugal (José Delgado Rodrigues) CCA/CT, Univ. of Minho (M.A. Sequeira Braga) IICT, Portugal (M. Ondina Figueiredo) CECRA, Azores, Portugal (P. Romão)
Radiological Studies in Tejo River (Carolina Carreiro)	University of Extremadura, Dept. Physics, Caceres, Spain (António Baeza) Partially funding: Regional Programme of R&TD of Extremadura Commission (Spain)
Radiation Dosimetry Study of thermoluminescent materials for dosimetry (J.G. Alves)	CIEMAT, Madrid, Spain (A. Delgado)
Environmental toxicology and contaminants cycling in lagoons (F.P. Carvalho)	University of Coimbra, Zoology Department (V. Marques) Universidad Nacional Autonoma de Mexico (J. Rendón)