

Nuclear Instruments and Methods

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The strategy of the group involves activities in the following lines:

1. Modelling of radiation fields, calculation of neutron physic parameters, measurement of neutron cross-sections;
2. Application of electrical discharges in materials and environmental areas;
3. Design of electronic instrumentation for nuclear applications;
4. Technical assistance in nuclear instrumentation.

Modelling of radiation fields, calculation of neutron physic parameters

The presence of a sample in the neutron field of a nuclear reactor creates a perturbation of the local neutron fluxes. The MCNP code is being used to calculate the perturbation of the neutron thermal flux by a sample in the presence of a moderator

Monte Carlo calculations have been carried out in the field of the projects PDCT/FP/FNU/50276/2003” Participação do ITN na Experiência n_TOF (PS213) no CERN (Terceiro ano)”, and Preliminary design of an Accelerator Driven System- PDS-XADS_FIS-2001-00089, which will be reported elsewhere in this Progress Report.

Measurement of neutron cross-sections

Campaigns for the measurement of cross-sections in the TOF spectrometer installed at the CERN were carried out and the analysis of the taken data was performed. This activity will be reported elsewhere in this Progress Report.

Electrical Discharges on Environment and Material Processing Applications

Cold plasmas have a significant impact in material processing and environment applications. The activity on this area has been divided between numerical simulation and experimental research.

Numerical modeling: Comparison of different kinetic calculation techniques for the analysis of electron swarm transport. Extension of Boltzmann code to include electron-electron interactions and a chemical kinetic software library to include the treatment of the energy transfer in reactions.

Experimental results: development of a client-server application for the remote control of a mass spectrometer. Study of the decomposition of plastic waste in a chemical reactor by mass spectrometry.

Design of electronic instrumentation

Some electronic modules have been designed and produced for the neutron spectrometers installed at the RPI.

Construction and calibration of a set of voltage dividers, for a barium fluoride calorimeter, for the CERN TOF spectrometer.

Test of cryogenic security valves for the “CERN Large Hadron Collider”.

Instrumentation and Technical Assistance

The main objectives are the development of equipment for internal groups, fabrication of equipment for specific applications and assistance to industrial companies and scientific institutions as well as technical consulting.

The technical assistance takes mainly the forms of specialised consultant engineering advice, installation of nuclear gauges, including calibration maintenance and repair and recharging of gauges with imported radioactive sources.

Co-operation with other institutions

The Group is involved in the following collaborations:

1. n_TOF collaboration, a consortium of 40 laboratories in Europe and USA;
2. VELAN Portuguese – valves constructor;
3. Accelerator Driven System (PDS-XADS – FIS5-2001-00089);
4. Sociedade Ponto Verde
5. Research Laboratory for Materials and Environmental Chemistry, CRC, Hungarian Academy of Sciences;
6. Institute of Fluid-Flow Machinery, Poland.

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Research Team

Researchers

- J. MANTEIGAS, Auxiliary Researcher, Group leader
- J. SALGADO, Coord. Researcher
- F. G. CARVALHO, Coord. Researcher (15%)
- I. F. GONÇALVES, Auxiliary Researcher
- N. PINHÃO, Auxiliary Researcher
- J. NEVES, Auxiliary Researcher
- C. CRUZ, Auxiliary Researcher

Students

- L.C. MARQUES, undergraduate, Physics degree, FCT/UNL
- C.M. CARRAPIÇO, undergraduate, Physics Engineering degree, FC/UA
- A. CARRILLO TRIGO, BIC/FCT

Technical Personnel

- T. JESUS, Electronic Technician
- N. INÁCIO, Electronic Technician
- M. CABAÇA, Mechanical Technician

Funding (€)

Research Projects:	0
Services:	27.827,50
Total:	27.827,50

Publications

Journals:	11 and 3 in press
Proceedings:	9 and 3 in press
Internal reports:	1
Other publications:	1
Theses:	3 Sc 1