

AGATA POSTDOCTORAL RESEARCH POSITION

The Group of Research on Physics and Technology in Nuclear Structure and Applications, embracing the Spanish AGATA groups (USAL, UV, CSIC-IFIC, CSIC-IEM), invites application from candidates for a fixed-term (two years) postdoctoral position preferably to start January 1st, 2021 at the University of Salamanca (USAL).

Introduction

The position resolution in segmented contact Ge detectors depends strongly on the capability to obtain a database of charge and image (induced) pulses for our detectors. Nowadays, the experimental pulse shapes are being compared with simulated ones and there is actually an opened question about the adequacy of the simulated databases to exploit fully the performance of the Ge position sensitive detectors, given the fact that they are built by first approach to the solution of the electric field and charge carriers drift phenomena within the crystal volume. The improvement of the detector position performance requires to experimentally characterizing the detector response as a function of position. To do so, it is required a system capable to perform a 3D scan of the segmented Ge crystal.

Fundamental questions to be answered are: what is the limit on spatial resolution reachable with the AGATA crystals? Could AGATA peak efficiency and peak-to-total coefficient improve by using an experimental pulse database for PSA? What is the real active volume of each segment? Could crystal passivation be improved? Passivation determines dead layer size in each segment [Eberth J. and Simpson J., Prog. Part. Nucl. Phys. 60 (2008) 283]. Therefore, its determination can help the ongoing developments, within the AGATA collaboration, on passivation techniques.

Description

The main aim of the fellowship is to perform the commissioning and validation of the characterization setup SALSA (*), i.e. the scanning system fully based on the Pulse Shape Comparison Scanning technique (PSCS) for the characterization of position sensitive AGATA segmented crystals. This characterization setup uses the active collimation of gamma rays, produced in positron annihilation, impinging on the segmented Ge detector being scanned and on a LISO-based gamma camera, pixelated in 256 channels. The interaction position is deduced using the gamma camera data and a novel PSCS technique.

The tasks involve going on with the code developments, experimental measurements and data analysis. Work on the optimization of position determination algorithms in SALSA and on the improvement of Pulse Shape Analysis algorithms, including Machine Learning techniques, is expected as well. The successful candidate will conduct the activities supporting also the training of a Ph. D. student. She/he will work in straight collaboration with the AGATA detector characterization team, working group committed to establish the specific objectives to cover with the AGATA scanning systems.

(*) Publications:

Characterization of a high spatial resolution gamma camera for scanning HPGe segmented detectors. A. Prieto and B. Quintana, IEEE Transactions for Nuclear Science 60(6) 4719-4726 (2013)

Study of accuracy in the position determination with SALSA, a γ -scanning system for the characterization of segmented HPGe detectors. A. Hernández-Prieto, B. Quintana, S. Martín, C. Domingo-Pardo, Nuclear Instruments and Methods A 823 (2016) 98-106

Wilcoxon signed-rank-based technique for the pulse-shape analysis of HPGe detectors. S. Martín, B. Quintana, D. Barrientos, Nuclear Instruments and Methods A 823 (2016), 32-40

Skills

- PhD in Nuclear Physics or related fields.
- Solid knowledge of standards analysis tools used in Nuclear Physics (ROOT, Go4, GEANT 4)
- Experience with electronics and computer programming for data acquisition. Knowledge of the MBS GSI acquisition system would be appreciated but not required
- Proficiency in English is essential. Good communications skills are required to communicate with the collaboration.

Workplace

The position will be held at the University of Salamanca, 200 km west from Madrid, in the Laboratory of Ionizing Radiation and Dating, placed at the R&D Building, where laboratories of other science fields are located. Therefore, environment is lively and enlightening. The postdoctoral fellow will be expected to undertake international working trips within the collaboration institutions, mainly to UK, France and Germany.

Further information

Interested candidates should send a CV, with a list of publications, to Begoña Quintana (quintana@usal.es)

