



# Introduction to the ENSAR2 JRA2 - PSeGe (R&D on Position-Sensitive Germanium Detectors for Nuclear Structure and Applications)

A.Gadea (IFIC-Valencia) for the PSeGe Collaboration

1st PSeGe Workshop, IPNO & CSNSM Orsay 3<sup>rd</sup> -4<sup>th</sup> October 2016



# ENSAR2 JRA2 – PSeGe

## Goals:

- The present project will contribute to the R&D of detector technology for position-sensitive HPGe detector arrays. R&D on key areas as detector technology, the basic characteristics of the novel detectors, electronic instrumentation and software developments.
- We are strongly committed to the development of new applications especially in the field of high-resolution gamma-ray imaging. The networking activity associated with this JRA will be an important tool

# **Task 1: New technologies on passivation and segmentation (INFN-LNL)**

Aiming to improvement of the present technologies for passivation and segmentation in HPGe detectors and to investigate the problem of the intrinsic instabilities of the Ge surface.

R&D of segmented contacts in HPGe detectors and of the passivation of the boundary regions between contacts, charge collection and electric-field exploration via 2D scans.

# **Task 2: R&D on novel Ge-detector geometries for ultimate position resolution and efficiency (Coordination GSI)**

Aiming develop a prototype of a 3D position-sensitive Ge gamma-detector with 1-2 mm position resolution and maximal active/total volume ratio. Investigation of novel contact technologies for planar and quasi-planar “point contact” detectors in collaboration with industrial companies.

Modeling and simulation of electrical-field distributions, evaluation of the 3D position resolution obtainable, production of a prototype detector in cooperation with the industrial partner, experimental determination of the performance figures with the produced prototype.

## **Task 3: R&D on segmented p-type coaxial detectors (Coordination CSIC)**

The goals of this task include: R&D on basic properties of the material producing high hole-barrier n-contacts, evaluation of the barrier and stability of amorphous germanium and yttrium contacts, alternative materials for n-contacts and a feasibility study of segmentation with these materials.

# **Task 4: Network activity: Demonstration of imaging applications and associated detector technologies (Uni. Liverpool)**

Network Activity on Position Sensitive Ge Detector Technologies and applications

- Subtask 4.1: Demonstration of imaging applications
- Subtask 4.2: Detector encapsulation techniques
- Subtask 4.3: Low-power pre-amplifiers & cryostat R&D / BSD, HV, LV distribution
- Subtask 4.4: Pulse-Shape Analysis and neutron-gamma discrimination

# PSeGe Organization

- Coordinators A.Gadea, D.R.Napoli, P.Reiter
- Management board: A.Boston (Uni.Liverpool), G.Duchêne (CNRS), A.Gadea (IFIC-CSIC), J.Gerl (GSI), D.R.Napoli (INFN-LNL), P.Reiter (IKP-Köln). G.Duchêne (IPHC).
- General Assembly with representatives of institutions participating and associated: CSIC (IFIC, CNM), INFN(LNL, Milano), University of Cologne, GSI, University of Liverpool, CNRS, CEA, KTH, University of Uppsala, University of Milan, STFC, University of Salamanca, University of Valencia, ELI-NP.

# PSeGe funding

- 292 k€ for personnel (6 men/year –postdoc-)
- 84 k€ for organization of Workshops and meetings

Only a kick-off for the R&D on detectors collaboration and extra efforts welcome!



**PSeGe (R&D on Position-Sensitive Germanium  
Detectors for Nuclear Structure and Applications)  
Goals of this first Workshop**

- Spread the knowledge of the present status of the technology and the needs of the collaborations.
- Build Teams corresponding to the different tasks and sub-task
- Spread the knowledge on the capabilities of the participating and associated institutions

## Monday, 3 October 2016

- 14:00 - 14:10      Welcome 10'  
Speaker: Amel Korichi (CSNSM Orsay)
- 14:10 - 14:30      Introduction to the 1st Position Sensitive Ge detectors workshop 20'  
Speaker: Andres GADEA
- 14:30 - 15:30      PSeGe: New technologies on passivation and segmentation  
Convener: Coordinated by INFN-LNL & IKP-Köln  
Location: Bat 100 ( Amphithéâtre Irène Joliot-Curie )
- 14:30      **From Ge(Li) detectors to Gamma-Ray Tracking arrays: on the history of Ge spectrometers** 1h0'  
Speaker: Juergen Eberth
- 15:30 - 16:00      Coffee break
- 16:00 - 18:00      PSeGe: New technologies on passivation and segmentation  
Location: Bat 100 ( Amphithéâtre Irène Joliot-Curie )
- 16:00      **Passivations and dead layers** 45'  
Speaker: Gianluigi Maggioni (INFN-LNL-Padova)
- 16:45      **Scanning of HPGe surfaces** 20'  
Speaker: Serena Riccetto (INFN-Perugia)
- 17:05      **Discussion on the operation and maintenance of Miniball and AGATA** 30'  
Speaker: TBD (IKP-Köln)

Tuesday, 4 October 2016

- 09:00 - 10:40      **PSeGe: R&D on novel Ge-detector geometries for ultimate resolution and efficiency**  
Convener: Coordinated by GSI-Darmstadt  
Location: Bat 100 ( Amphithéâtre Irène Joliot-Curie )
- 09:00      **Novel Ge-detector geometry with imaging capability for DEGAS 25'**  
Speaker: Ivan Kojouharov (GSI Germany)
- 09:25      **Recent developements on HPGe at Berkeley : Exploring the limits of Noise, Count Rate and Position Sensitivity 25'**  
Speaker: Ross Barnowski (LBNL, USA)
- 09:50      **Recent HPGe developments at CANBERRA (Mirion Technologies) 25'**  
Speaker: Benoit Pirard (Mirion (canberra), France)
- 10:15      **SIGMA, a new detector for gamma-ray spectroscopy and tracking 25'**  
Speaker: Laura Harkness-Brennan (University of Liverpool, UK)
- 10:40 - 11:00      Coffee Break
- 11:00 - 13:00      **PSeGe: R&D on segmented p-type detectors**  
Convener: Coordinated by IFIC-Valencia  
Location: Bat 100 ( Amphithéâtre Irène Joliot-Curie )
- 11:00      **Advanced Strategies for Junction Formation in Germanium 40'**  
Speaker: Davide De Salvador (INFN-LNL &University of Padova)
- 11:40      **New developments in n-type junction for Ge detectors 30'**  
Speaker: Virginia Boldrini (University of Padova)
- 12:10      **Presentation of the CNM facility 15'**  
Speaker: David Quirion (Instituto de Microelectrónica de Barcelona)
- 12:25      **Discussion and Working Group Kick-off 30'**
- 13:00 - 14:00      Lunch

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| 13:00 - 14:00 | Lunch   |
| 14:00 - 15:30 | <p>PSeGe: Demonstration of imaging applications and associated detector technologies</p> <p>Convener: Coordinated by University of Liverpool</p> <p>Location: Bat 100 ( Amphithéâtre Irène Joliot-Curie )</p> <p>14:00     <b>Demonstration of imaging applications and Compton Imaging 20'</b></p> <p>14:20     <b>Detector encapsulation techniques 20'</b></p> |
| 15:30 - 16:00 | Coffee Break  |
| 16:00 - 17:30 | <p>PSeGe: Demonstration of imaging applications and associated detector technologies -continuation</p> <p>Location: Bat 100 ( Amphithéâtre Irène Joliot-Curie )</p> <p>16:00     <b>Low-power pre-amplifiers &amp; cryostat R&amp;D / BSD, HV, LV distribution 20'</b></p> <p>16:20     <b>Pulse-Shape Analysis and neutron-gamma discrimination 20'</b></p>      |
| 17:30 - 18:30 | <p>PSeGe: Concluding Remarks &amp; General Assembly</p> <p>Location: Amphithéâtre Irène Joliot-Curie</p> <p>17:30     <b>Concluding remarks 15'</b></p> <p>17:45     <b>General Assembly 30'</b></p>  |

**Thanks' to the IPNO and CSNSM Orsay  
for the Local Organization  
and to all you for participating**