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## STATUS REPORT

### HYDE ARRAY FOR LOW ENERGY NUCLEAR REACTIONS

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October 25, 2006

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#### 1) FUNDING

A small funding has been given by Spanish MEC for year 2007 (47 k€). The budget covers trips and some equipment: mainly samples for detector materials and some basic electronics. In addition we got an extension of the actual contract of an engineer for one more year.

New application to Spanish MEC for a longer period (3 years) must be submitted before end of October 2006 (ie, next week!).

Some funding for exchange of scientists has been also requested using bilateral agreements between Spain-Italy, under the FAZIA collaboration. This is a good solution for future collaborations.

Funding has also been requested to Andalusian government to organize a Pulse Shape Analysis conference (originally in Huelva, but I guess anywhere in Andalusia is also possible).

#### 2) COLLABORATION WITH SPIRAL2

There are two other charged particle arrays (FAZIA and GASPARD) being build at SPIRAL2 with different levels of overlap with HYDE array. Right now there are several institutions which participate at the same time in HYDE, FAZIA & GASPARD:

GASPARD: physics area and conceptual design is similar to HYDE.

FAZIA: technical developments have a direct overlap with the construction of HYDE.

The HYDE working group “Solid state detectors and particle Identification” (see below) collaborate already with FAZIA in the following items: neural network approach for pulse shape analysis, data base for PSA, strip detectors, detector tests, PSA for CsI material. There is also a discussion regarding participation in building of a first demonstrator.

In GASPARD there is not much activity yet; the Lol was just presented last week at GANIL. Here we can identify common institutions GASPARD/HYDE: GSI, Huelva, Sevilla, Surrey and Warsaw... There is a preliminary division of tasks and working groups where we could perform common developments in nearest future.

### 3) MEMORANDUM OF UNDERSTANDING (MoU)

A MoU between local groups at the University of Huelva for the R&D related to HYDE array is in the process of signature. Right now the following groups have agreed to sign the MoU: Nuclear Physics (I. Martel), Electrical Power Engineering (P. Salmeron), Electronic Engineering (R. Jiménez), System and Control Engineering (J.M. Andujar). The basic idea is to give a more formal status to the HYDE collaboration; this is to make easier future applications for research contracts and funding programs. I will circulate our “Huelva” MoU to the full HYDE collaboration.

### 4) WORKING GROUPS

There are 5 working groups just starting activity. The initial “seed” of this WG are some teams of engineers and physicists of UHU. I would be very grateful to the rest of the collaboration if some more people get involved and can lead or contribute to the different activities. Contributions can be from real man power/responsibilities or just discussion of the present ideas or to suggest new ones. Please send an e-mail either to me and/or the contact persons. Here I include a preliminary list of contacts and a brief summary of activity 2006:

#### WG1: Mechanical design and integration.

Contact: I. Martel ([imartel@uhu.es](mailto:imartel@uhu.es))

Participants: F. Pizarro ([fpiza@uhu.es](mailto:fpiza@uhu.es)), J.A. Labrador ([labrador@us.es](mailto:labrador@us.es))

So far only a conceptual design based on exagonal/barrel like structures has been done. However we are thinking of going for a hybrid “mosaic” kind of structure using smaller DSSSD detectors (maybe 3 x 3 strips) to increase solid angle. This will be more expensive in terms of electronics. This design will be more similar to ISIS, CHIMERA, HYNDRA or FAZIA detectors. We are working

in optimization of solid angle and angular resolution. Part of the array should fit into AGATA chamber.

#### WG2: Montecarlo simulations

Contact: D. Rodriguez ([rodriguez@lpccaen.in2p3.fr](mailto:rodriguez@lpccaen.in2p3.fr))

Participants: I. Martel ([imartel@uhu.es](mailto:imartel@uhu.es)), M. Carvajal ([miguel.carvajal@dfa.uhu.es](mailto:miguel.carvajal@dfa.uhu.es))

Simulations for scattering of light ions beams at 5-10 MeV/u with realistic LEB scenario has been

performed using Geant4. As a result: particle identification using standard dE/E technique looks

promising and a reasonable energy resolution can be achieved with standard silicon detectors,

using a suitable tracking device (about 100ps time resolution).

- Next:
- simulation of HYDE demonstrator
  - couple Geant4 simulation with MOCADI output
  - add focussing element on target
  - new layout for experimental hall.

#### WG3: Solid state detectors and particle identification.

Contact: I. Martel ([imartel@uhu.es](mailto:imartel@uhu.es))

Participants: R. Berjillos ([rafa.berjillos@us.es](mailto:rafa.berjillos@us.es)), J.M. Andujar ([andujar@uhu.es](mailto:andujar@uhu.es)),

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Alejandro Pérez ([aperez@uhu.es](mailto:aperez@uhu.es)),

Juan Antonio Gómez-Galán ([jgalan@diesia.uhu.es](mailto:jgalan@diesia.uhu.es)), D. Rodriguez ([rodriguez@lpccaen.in2p3.fr](mailto:rodriguez@lpccaen.in2p3.fr))

- Test of diamond detectors (CVC poly-crystal and single-crystal) has been performed at the “Centro Nacional de Aceleradores” Tandem in Sevilla (Spain, June 2006). Real “diamond particle telescopes” has been build and tested. Energy resolution around 30keV, time resolution < 100ps, limited by electronics. Participants from Huelva/Sevilla/GSI/Dubna.
- There is a strong collaboration with FAZIA groups concerning a common data base on PSA for particle identification. Experiments are foreseen at INFN- LNL (Legnaro, Italy), CNA (Sevilla, Spain), CMAM (Madrid, Spain) and Warsaw Cyclotron.

- It would be important to get an idea of detectors and electronics available from collaboration. The plan is to see the possibility to borrow them for tests so to save money and efforts.
- A detector lab for PSA is being set-up at the University of Huelva; the idea is to test setups and new electronics before real experiments are performed. Some samples of NTD detectors arrived from FAZIA/Florence collaboration; 10 DSSSD 40 um and 6 DSSSD 1mm available from Huelva, 8 channels of MATAcq (flash ADC, 12 bits, 12 GHz), PACI and DBA preamps, under VME system; full DACQ chain operative with GPIB.
- Particle Identification. First models has been applied using neural networks. Training of networks has been done with low energy Ar and Kr isotopes from a recent experiment at CIME/GANIL facility-FAZIA collaboration. The data is still under process but preliminary results are very good.
- We are discussing with FAZIA the participation of HYDE in building of the first FAZIA demonstrator. The detector will be composed of two silicon detectors plus a Csl(Tl) part. With some minor changes I believe it is very good option for HYDE!
- Next:
  - o ordering new detectors: diamond, monolithic silicon, NTD silicon and Csl(Tl) samples
  - o experiment at Legnaro/tests, data base.
  - o experiment at Sevilla/tests, data base.
  - o setup of VME readout using National Instruments package
  - o setup of VME readout using MBS+Go4 (GSI)
  - o full test of MLP with a multidimensional space
  - o alternative PID methods

#### WG4: Front End Electronics (FEE)

Contact: Raul Jiménez ([naharro@uhu.es](mailto:naharro@uhu.es))

Participants : Juan Manuel Enrique Gómez ([juanm.enrique@diesia.uhu.es](mailto:juanm.enrique@diesia.uhu.es)), Miguel Ángel Martínez Bohórquez ([bohorquez@uhu.es](mailto:bohorquez@uhu.es)), R. Berjillos ([rafa.berjillos@us.es](mailto:rafa.berjillos@us.es))

- First prototypes are being simulated using SPICE. Initial design based on PACI/FAZIA preamps.
- DBA option from GSI is also in the program of study (better pulse resolution?).

- Fast timing layer should be included (< 100 ps)
- First modules using discrete elements, before March 2007.
- FPGA implementation of neural network.

Close collaboration with electronics groups of GSI/CEA-Saclay/FAZIA/Daresbury is foreseen for nearest future.

#### WG5: Web page

Contact: F. Pérez-Bernal ([francisco.perez@dfaie.uhu.es](mailto:francisco.perez@dfaie.uhu.es))

Participants: J.E. García Ramos ( [enrique.ramos@dfaie.uhu.es](mailto:enrique.ramos@dfaie.uhu.es))

A web page for the HYDE detector is available at: [www.uhu.es/gem/proyectos/hyde/index.php](http://www.uhu.es/gem/proyectos/hyde/index.php).

There you can find last talks, meetings, etc...The group is working at present in a web page for the whole HISPEC-DESPEC collaboration. Please send your comments to contact person.

#### 6) INSTITUTIONS

List of institutions involved and contact persons.

- C. Angulo, CRC-Université Catholique de Louvain, Louvain la Neuve, Belgium
- M.J.G. Borge, CSIC-IEM, Madrid, Spain
- W. Catford, Univ. Surrey, UK.
- P. Van Duppen, IKS-University of Leuven, Belgium
- A. Fomichev, DUBNA, Russia
- J. Gerl, GSI-Darmstadt, Germany
- J. Gómez-Camacho, Univ. Sevilla, Spain
- I. Martel, Univ. Huelva, Spain
- K. Rusek, The A. Soltan Institute for Nuclear Studies, Warsaw, Poland
- R. Wolsky, The H. Niewodniczanski Inst. of Nuclear Physics PAN, Krakov, Poland