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RD51 Common Project 2012:

MPGDs technology laboratory for training, development, fabrication, applications and innovation

Universidad Antonio Nariño, Bogotá, Colombia

October 1^{th,} *2012*
Stony Brook, NY, USA

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Request for Project Funding from the RD51 Common Fund
October 10, 2011

Title of project: MPGDs technology laboratory for training, development, fabrication, applications and innovation

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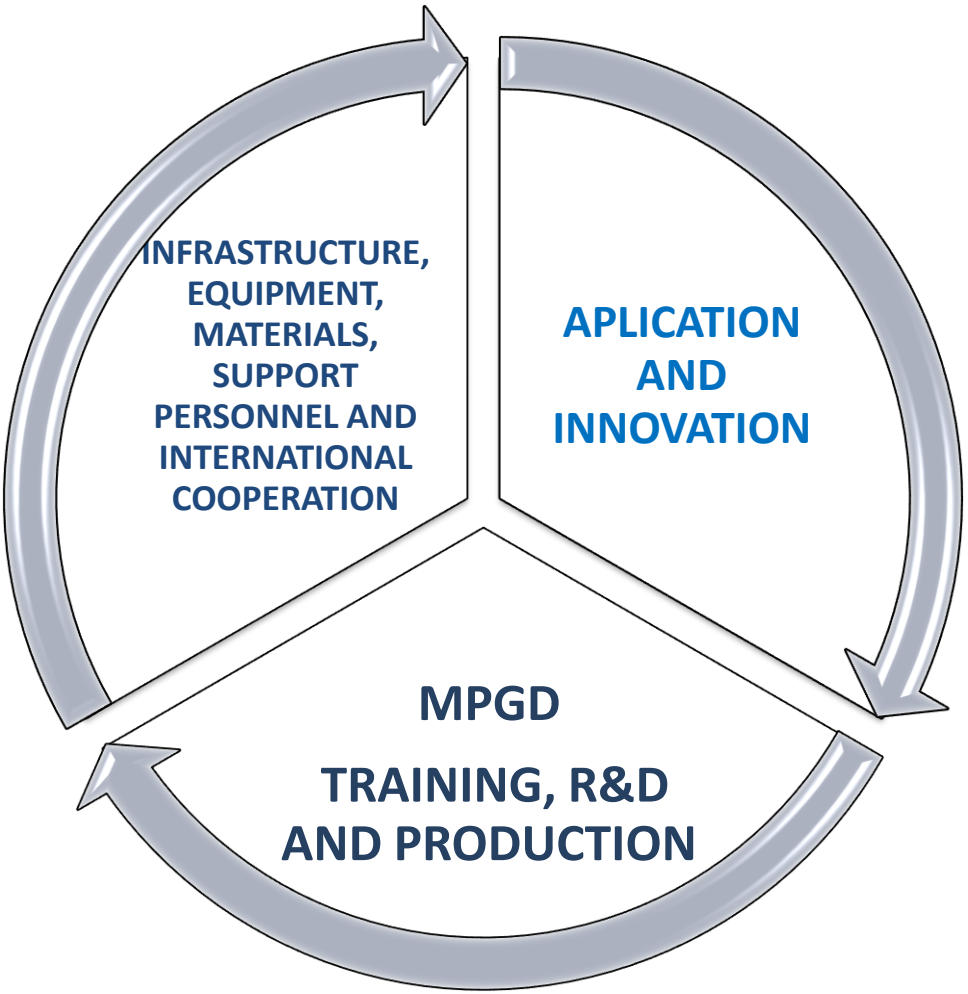
RD51 Institutes:

1. Universidad Antonio Nariño, Rafael M Gutiérrez
2. Brookhaven National Laboratory, Venetios Polychronakos
3. Helsinki Institute of Physics, Francisco Garcia
4. HEPTech, Hartmut Hillemanns
5. GSI Helmholtzzentrum für Schwerionenforschung GmbH, Bernd Voss

Request to RD51: 10.000 CHF
Total project cost: 92.000 CHF

Project Description and Goals



The goal of this project is to create a new lab-facility of MPGDs and related technologies for the development of new applications and the generation of new capacities of innovation with comparatively low-cost and highly qualified manpower. Its development will be supported by a new PhD program in applied science at the UAN and the RD51 program, in particular by the cited collaborating institutions. The MPGD community in general, the experiments at CERN and RD51 will benefit with a new source of applications and innovations provided by the increase and stimulus of the critical masses around MPGDs.

Time Table

Month/ Activity	1	2	3	4	5	6	7	8	9	10	11	12
Space planning and assignation	X	X	X									
Planning, design and execution of space adaptation		X	X	X	X	X	X					
Advice and support for equipment and material planning		X	X	X	X	X	X	X				
Price quote and purchase of equipment and lab-materials						X	X	X	X	X	X	X
Equipment and materials acquisition							X	X	X	X	X	X
Personnel assignment	X	X									X	X
Organization, tests and trials									X	X	X	X
Reports and documents											X	X
Final adjustments and future planning and development										X	X	X

Budget

ITEM	UAN (k CHF)	RD51 (k CHF)	Other Institutions	Subtotals (k CHF)
Infrastructure: assignation and adaptation of space (minimum 100 m^2)	30	0	0	30
Preparation of the laboratory	5	0	0	5
Basic MPGD equipment, components and samples	5	7	5*	17
Other equipment: Computers, Monitors, printers, Accessories	5	0	0	5
Software	5	0	5*	10
Electronics	4	3	3*	10
Consumables (cables, pipes, gas, chemicals, connectors…)	5	0	0	5
Miscellanea	5	0	5*	10
TOTALS	**64**	**10**	**18***	**92**

*These items correspond to materials and technical services provided in kind.

Initial works

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- Installation and functioning of 3 triple GEM detectors (kit version)

- GEM *foils characterization*:
  - Electric characterization, EC, (*Leakage Current*,…)
  - Optical characterization, OC, (image analysis, hole-rim characteristics)
  - EC and OC correlations → model: gain as a function of hole-rim "geometrical parameters" of the GEM *foil* .

- GEM *foils* production (cooperation with *Printed Circuit Boards*, PCBs, production company).

- Studies (chromatography and simulations for kapton *out-gassing* and other alternative materials such as Liquid Cristal polymer (LCP).

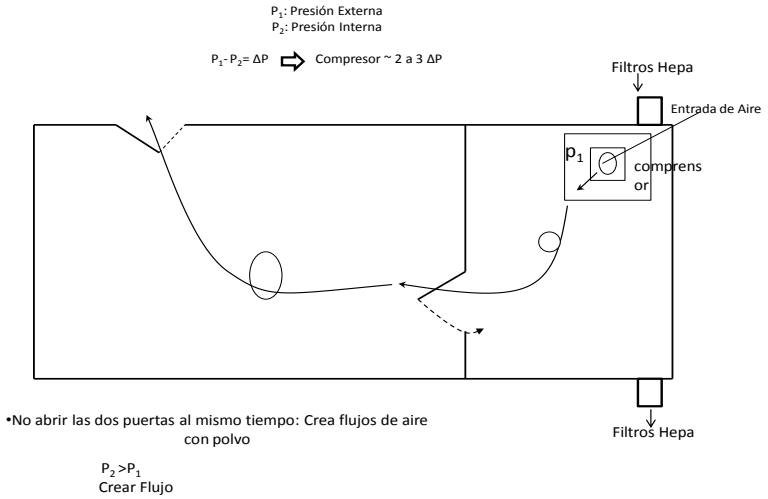
- Applications: medical and industrial images.

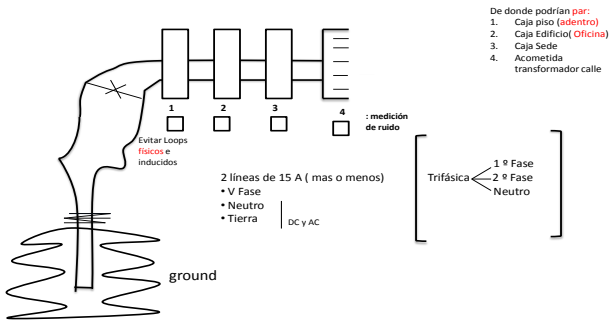
Progress

1-Space planning, assignation, design and execution of space adaptation: completed!

- 111 m^2: 1/3 clean and restricted access area, 2/3 working and training area.

- Electrical network: 3 electrical independent circuits for setups noise minimization (independent ground).





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CENTRO DE INVESTIGACIONES EN CIENCIAS BASICAS Y APLICADAS

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BEFORE

NOW

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Progress

2-Advice and support for equipment and material planning:

- Francisco García, HIP: 21-26/05/2012 Bogotá, Colombia.
- Frequent communication with Francisco and Bernd Voss, GSI, and some communication with Venetios Polychronakos, BNL, and Hartmut Hillemanns, HEPTech
- Meetings: RD51 mini-week, CERN June 13-15/2012 and Academia-Industry Matching MPGD Event, Annecy, April 26-27/2012

MPGDs Lab.

Progress

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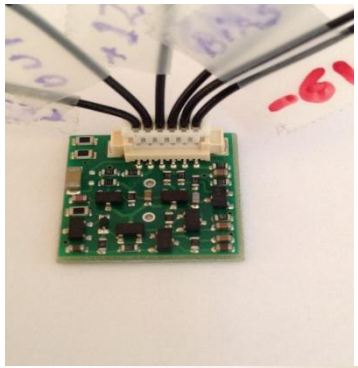
3-Price quote and purchase of equipment and lab-materials:

- RD51 Common Found: 3 triple GEM detector (kit version) with X/Y read-out, 0.4mm pitch, and 4 GEMs 100mm x 100mm.
- Francisco García HIP: pre-amplifier and voltage divider
- Bernd Voss, GSI: high voltage cables and connectors
- Venetios Polychronakos, BNL: VMM1 first prototype of a 64-channel front-end ASIC designed to operate with MPGDs
- Hartmut Hillemanns, HEPTech: information and documents



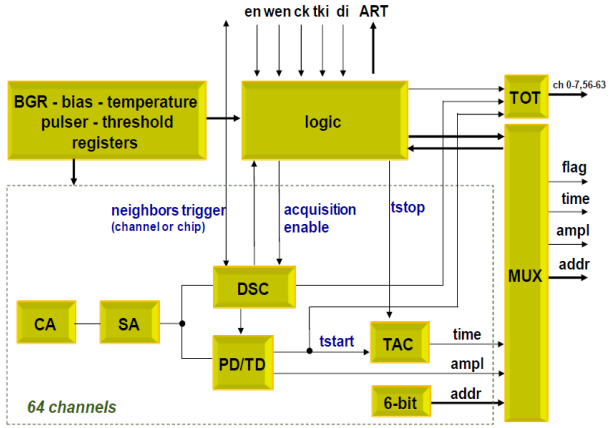
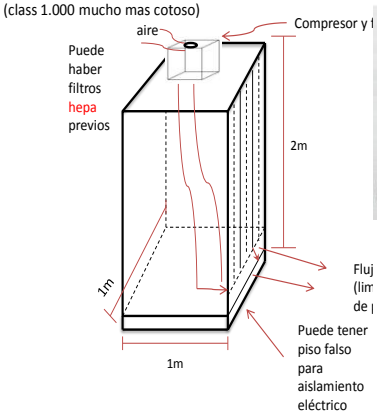


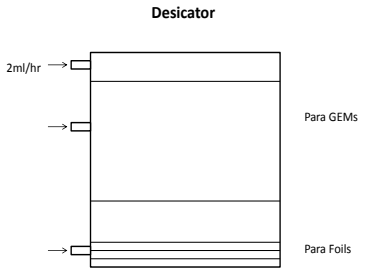
Fig. 1 - ASIC block diagram

Progress

4-Equipment and materials acquisition

- Oscilloscope
- Source Meter
- Wave form generator
- Clean room, desicator, materials and furniture
- Software: Labview and Matlab , open source software for simulation…





Progress

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5-Personnel assignment :

• January 2012: 1 physicists and 1 electronic engineer (pt)

• September 2012: 1 physicists and 2 engineers (electronic and computation)

•2013: PhD students, DCA

• PhD in Applied Science (Doctorado en Ciencia Aplicada, DCA): will provide qualified manpower to cooperate on MPGDs R&D problems of interests for RD51 institutions

• Two projects have been presented for funding to *Colciencias* (National Science Foundation of Colombia), to continuo the development of the MPGD Lab.

Conclusion

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Developing procedures:

GEM *foils fabrication*
GEM *foils characterization , optical and electrical*
GEM *foils* manipulation protocol
Introduction course on detectors and MPGDs in particular based on *Radiation detection systems in HEP, by Francisco García*.
For PhD DCA students, technicians, engineers and physicist, practice and training at HIP, GSI, SB, RD51-CERN, etc.