

Subject: Harvard chamber proposal
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Date: 10/25/12 2:58 PM
To: Ven Polychronakos <Venetios.Polychronakos@cern.ch>

Dear Vinnie

Here is a draft proposal for MicroMegas work we are doing at Harvard.

Personnel: 1 research associate paid for by the University
4 graduate students
2 undergraduates
1 Technician 10% time – Steve Sansone (also our machinist)
+ Melissa Franklin and starting next year Joao Guimaraes da Costa

The university has also provided a new 1000 sq. ft. R&D lab outfit with gas system and clean room.

The scope of this request is for Harvard to be actively involved in the micromega design for the SW replacement taking advantage of the great interest shown by our many graduate and undergraduate students for detector development.

These are our goals and activities for the present fiscal year\\

- a) We have one standard and one resistive mM of size $10 \times 10 \text{ cm}^2$ working.
We are presently reading out with all strips as a single channel.
The sustained costs are listed at the end of this document.
With this setup we are studying the pro's and con's of the two different chambers.
We are comparing gains, uniformity of response, resolution of the energy response.
We have also started investigating the dead time of chamber+amplifier for normal pulses and sparks.
We are also studying gas mixtures other than A+CO₂ which provide larger gain and better spark protection
- b) We are working on the Garfield simulation of these chambers.
- c) As a next step, we would like to read out each strips with the VMM1 or VMM2 front end and the corresponding read-out system. The costs are listed at the end.
The purpose is to learn and eventually improve the read-out software as well as study the chamber response – gain, noise, uniformity– when combining the signals of different channels. Costs are listed at the end.
- d) We would like to build a cosmic ray telescope to measure the accuracy of the x–y determination over the chamber.
We want to study the TOF resolution as well as the resolution of the track–angle determination using the strip signals
The costs are listed at the end.
- e) We would like to refurbish our clean room that was used to make the MDT's and to ensure air control and a flat granite table.
Costs are listed below.

Sustained costs of step a)

Gas system

| | | |
|------------------------------------|------|------|
| 2 digital flowmeters | | 2900 |
| 2 Matheson flowmeters E910 | 1800 | |
| 4 pressure regulators | | 6000 |
| Valves, fittings, bubblers | | 5000 |
| 10 gas bottles (Ar,ethane,methane) | 4000 | |

Power supplies, electronics

| | | |
|------------------------|------|--------------|
| 1 4-ch HV power supply | 1500 | |
| 1 NIM crate | | 4000 |
| 2 ORTEC preamplifiers | 3000 | |
| 2 ORTEC amplifiers | 3000 | |
| 1 MCA | | 3500 |
| Total | | 33700 |

Cost of step c)

| | | |
|---|-------|-------|
| 1000 vmm1 amp+adc | 50000 | |
| (this money does not need to be allocated to us, we need the amp+adc) | | |
| DAQ system | | 10000 |

Cost of step d)

| | | |
|---------------------------------|------|---------------|
| 1 HV power supply (gamma) | 4000 | |
| 1 HV voltage distributor (CAEN) | 3000 | both for PM's |
| 1 NIM crates | | 4000 |
| 1 16 CH discriminators | | 1500 |
| 1 coincidence units | | 1500 |
| 1 nim/ttl converter | | 1500 |
| 1 gate generator | | 1500 |
| 1 ratemeter | | 1500 |
| 1 TAC | | 1500 |
| 30 shv connectors | 1200 | |
| 15 HV cables | | 900 |
| 50 BNC&lemo cables | 2500 | |
| 25 bnc&lemo connectors | 750 | |
| Lemo&bnc Crimping tools | 2000 | |
| 6 PM emi 9954 | | 2500 |
| 5 pm voltage divider +shields | 2500 | |
| 3 scintillators + light pipes | 3000 | |
| Total | | 35,500 |

Clean room fixes are approximately 20000 which includes part of S. Sansoni salary

All the work we have done so far is stand alone. We will need to confer with others working on MICromegas and so we will need 3 trips to CERN at a cost of roughly \$6k 6000

The overall total is 84,700\$

Melissa