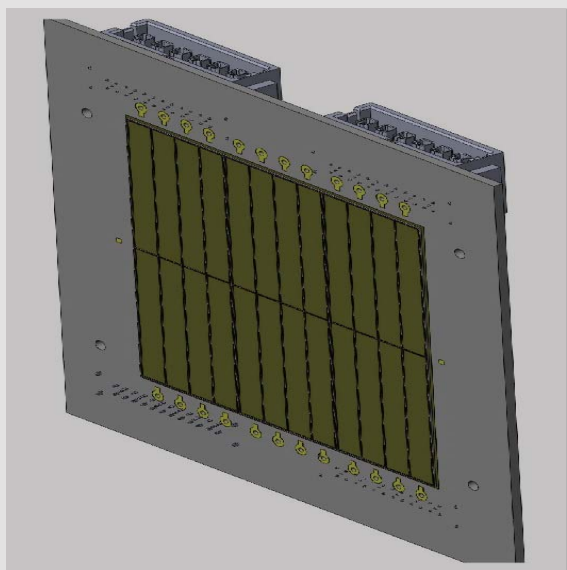


Recent work related to pcCVD diamond based large area timing detector for HISPEC program

New Design



York: *B.S. Nara Singh*
L. Scruton (PhD Thesis)
M. Bentley S. P. Fox



Surrey: A. Lohstroh
F. Schirru A.W. Davies
P.J. Sellin

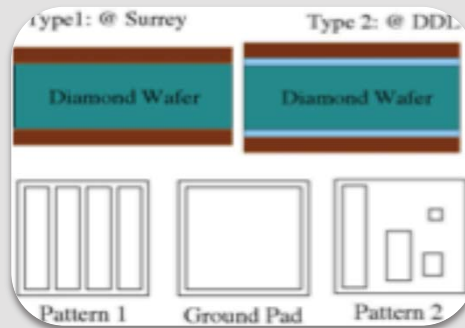


Lund + Cologne + Birmingham
+Texas + GSI ..
Thanks to DDL

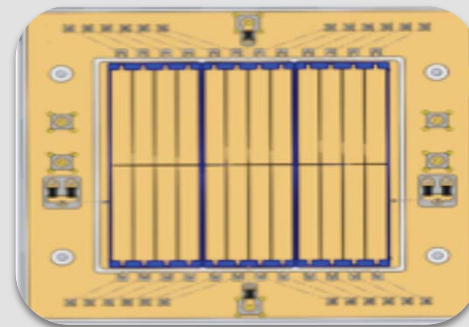
Outline



Motivation and
previous results



Recent Work



New Design

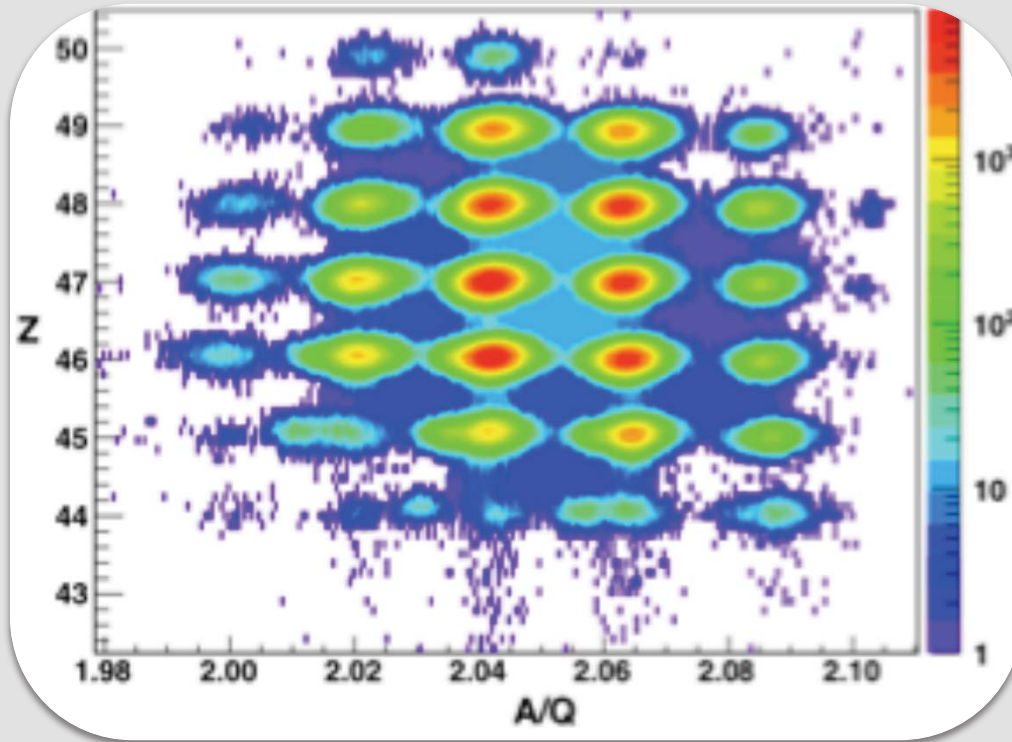


Future

Physics Motivation

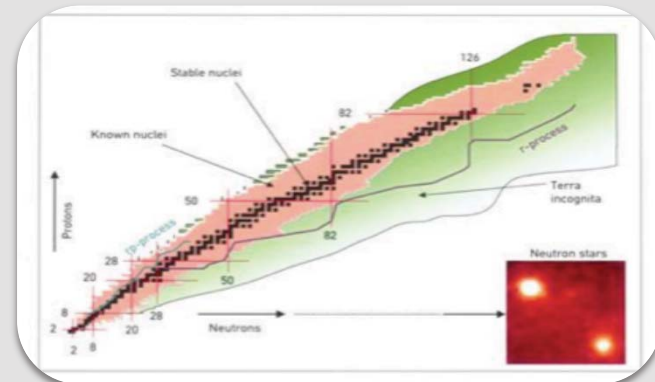
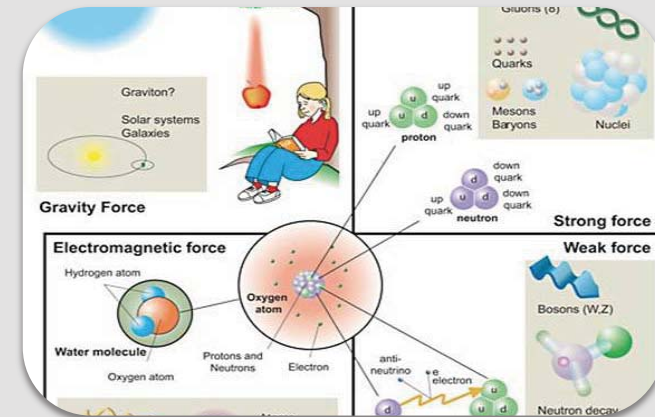
-for example exotic nuclei

One of the four
fundamental forces –
nuclear



^{96}Cd identification @ FRS GSI, Timing
B. S. Nara Singh et al. Phys. Rev. Lett. 107,
172502 (2011)

3rd CARAT Workshop, GSI, Darmstadt, Dec 11 -13, 2011

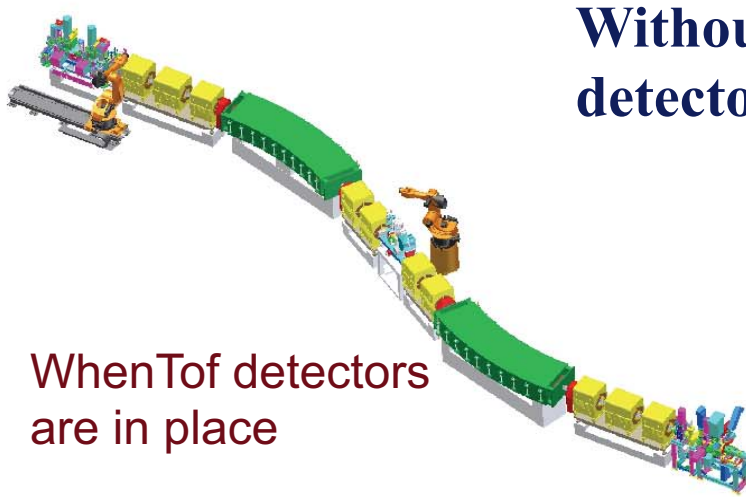


**Astrophysically
relevant**

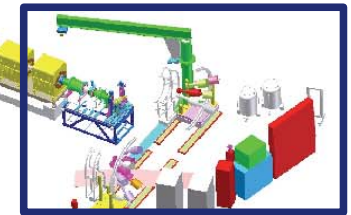
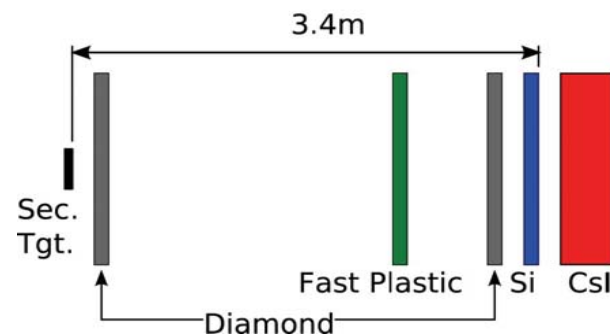
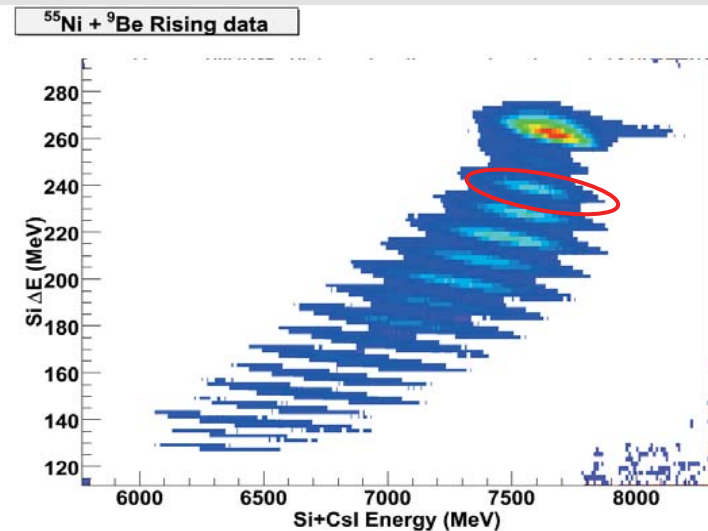
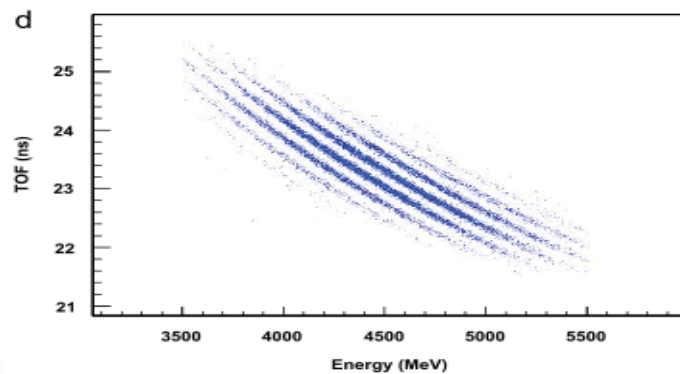
B.S. Nara Singh

The Need..

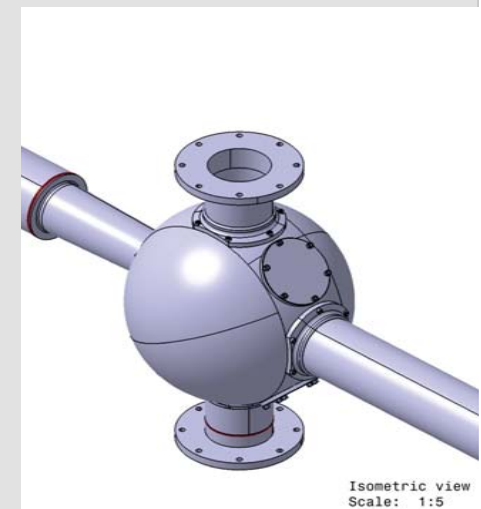
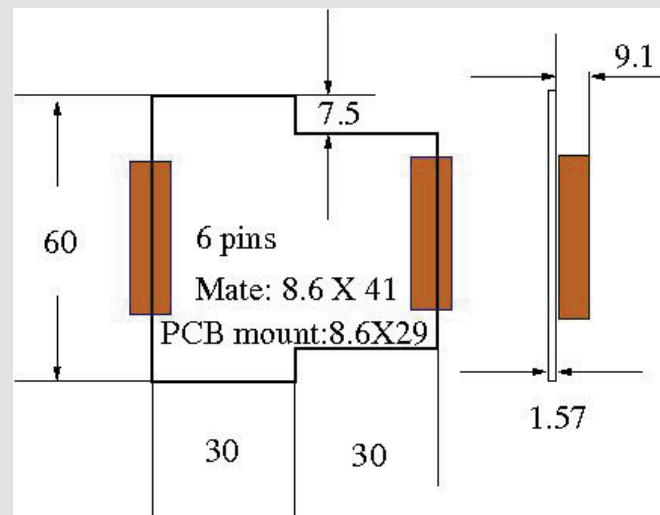
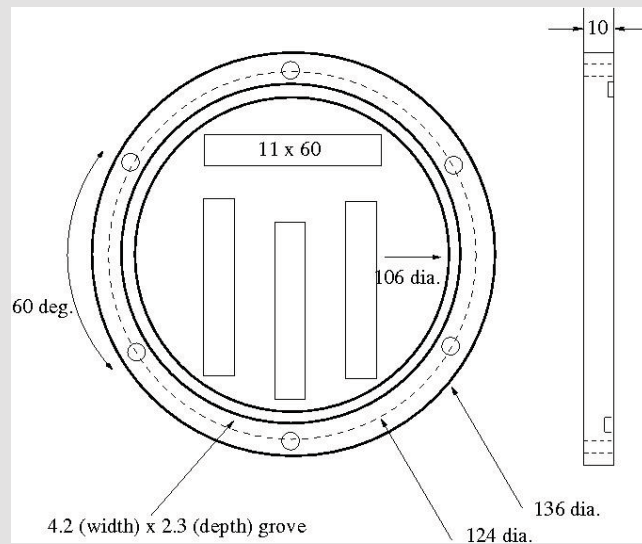
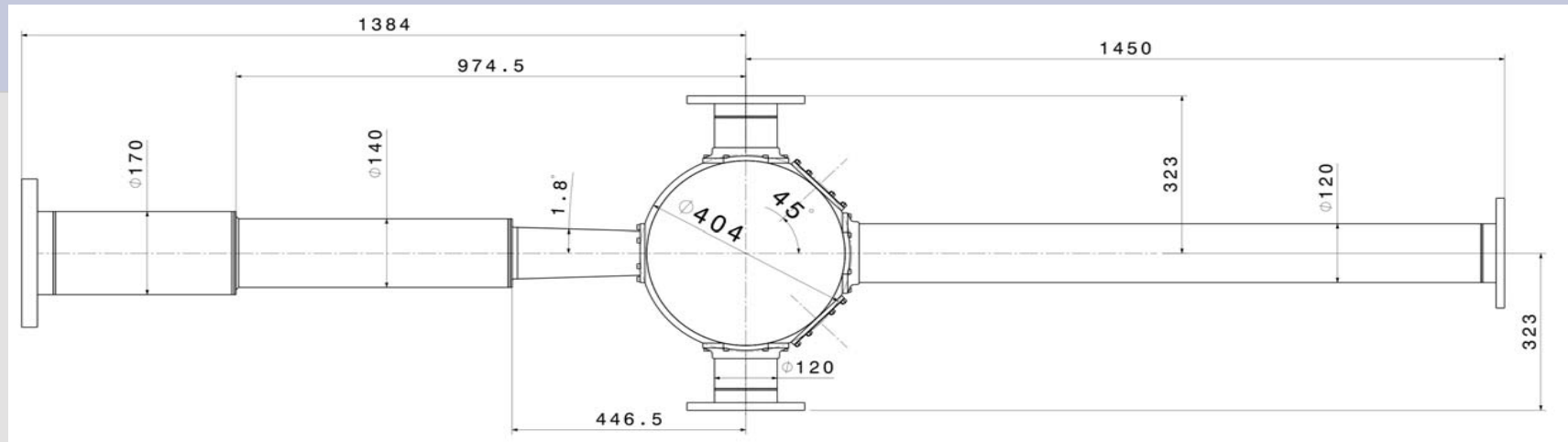
TOF detectors of 20 -40 ps time resolution at ~3 m with each other
900 cm² large Area!



When ToF detectors are in place

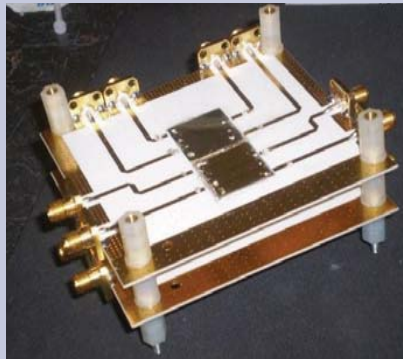


The Need..



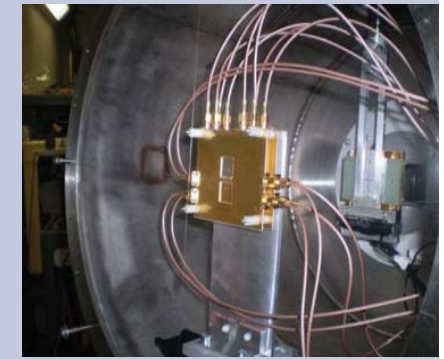
Previous results





^{40}Ar beam, $\Delta E \sim 600 \text{ MeV}$

50 ps per strip is a typical value

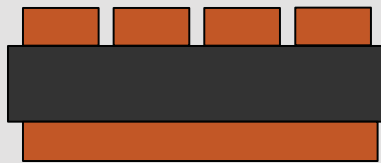


F. Schirru, B.S. Nara Singh, L. Scruton et al. to be submitted.

Signal pad: $18.0 \times 4.5 \text{ mm}^2$

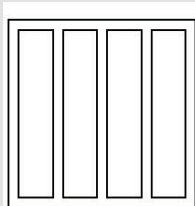
Gnd pad: $18.0 \times 18.0 \text{ mm}^2$

100nm Au/50nm Al

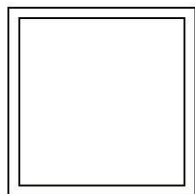


$2.0 \times 2.0 \times 0.03 \text{ cm}^3$

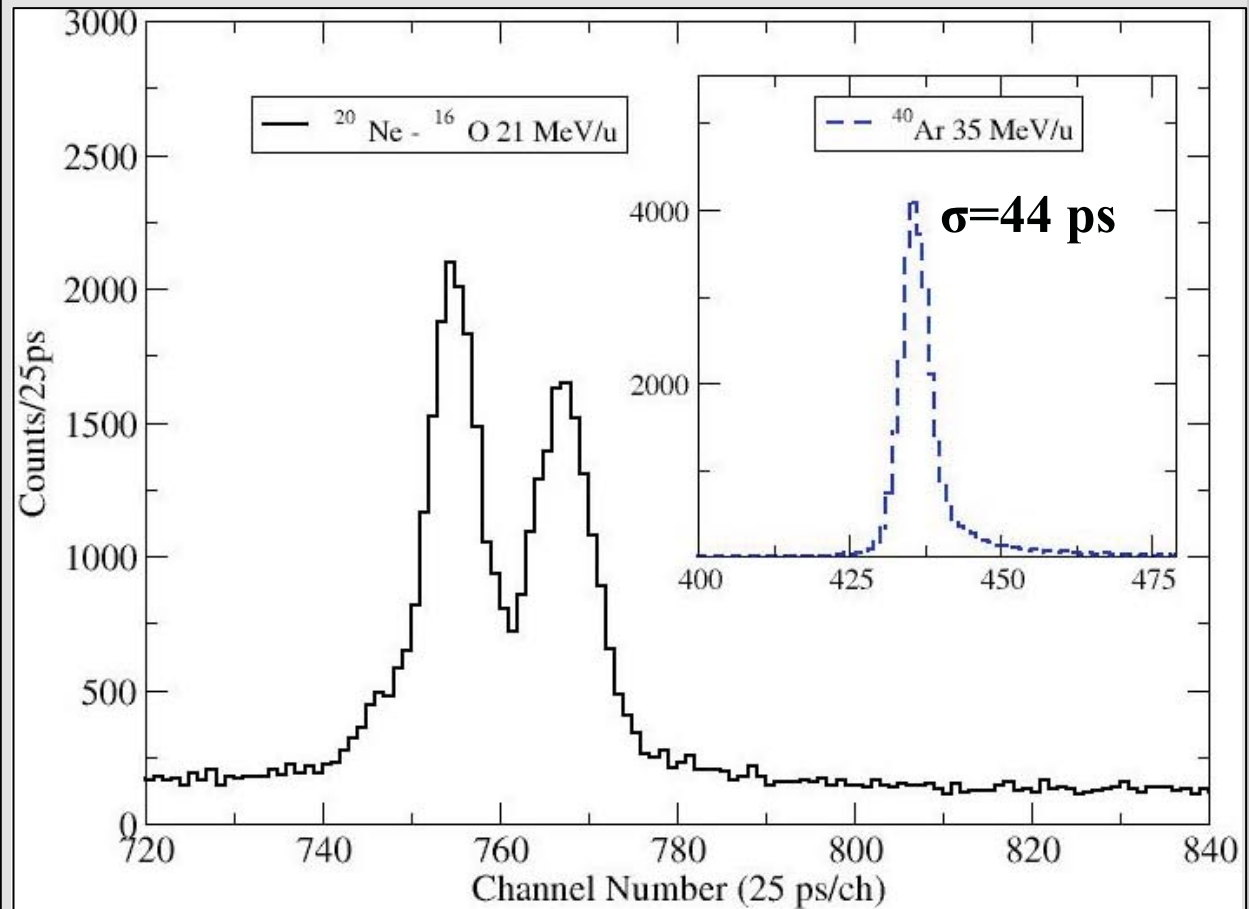
Diamond wafer



Pattern 1

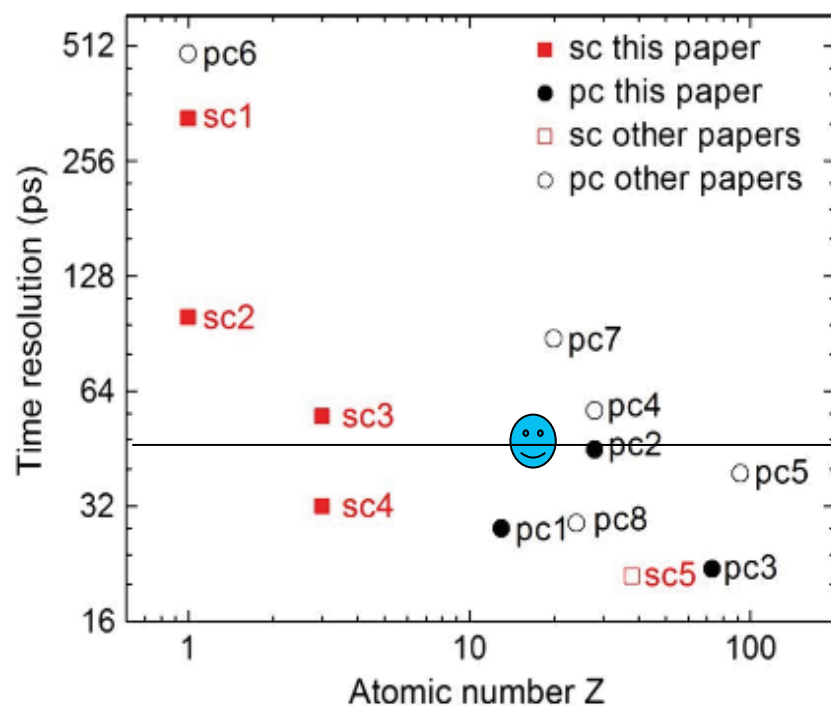


Ground Pad

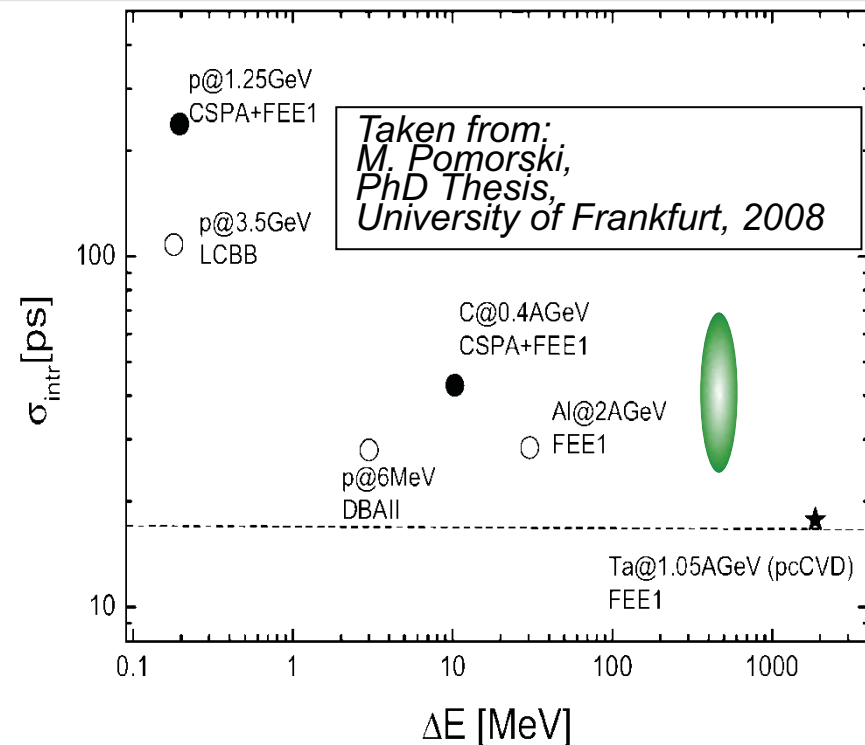


^{40}Ar beam, $\Delta E \sim 600 \text{ MeV}$

M.Ciobanu et. al. IEEE
58, 2073, 2011



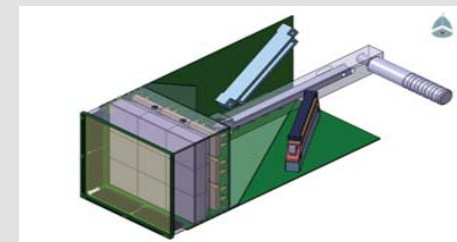
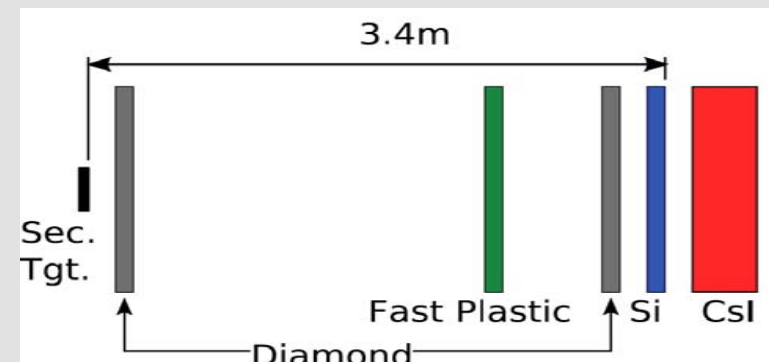
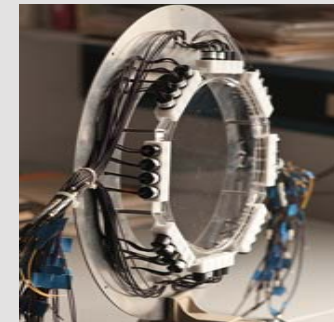
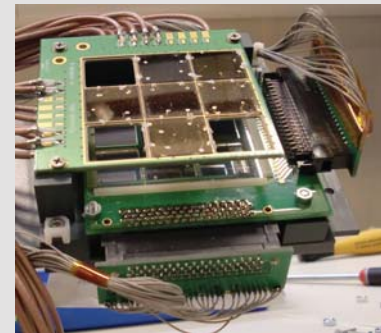
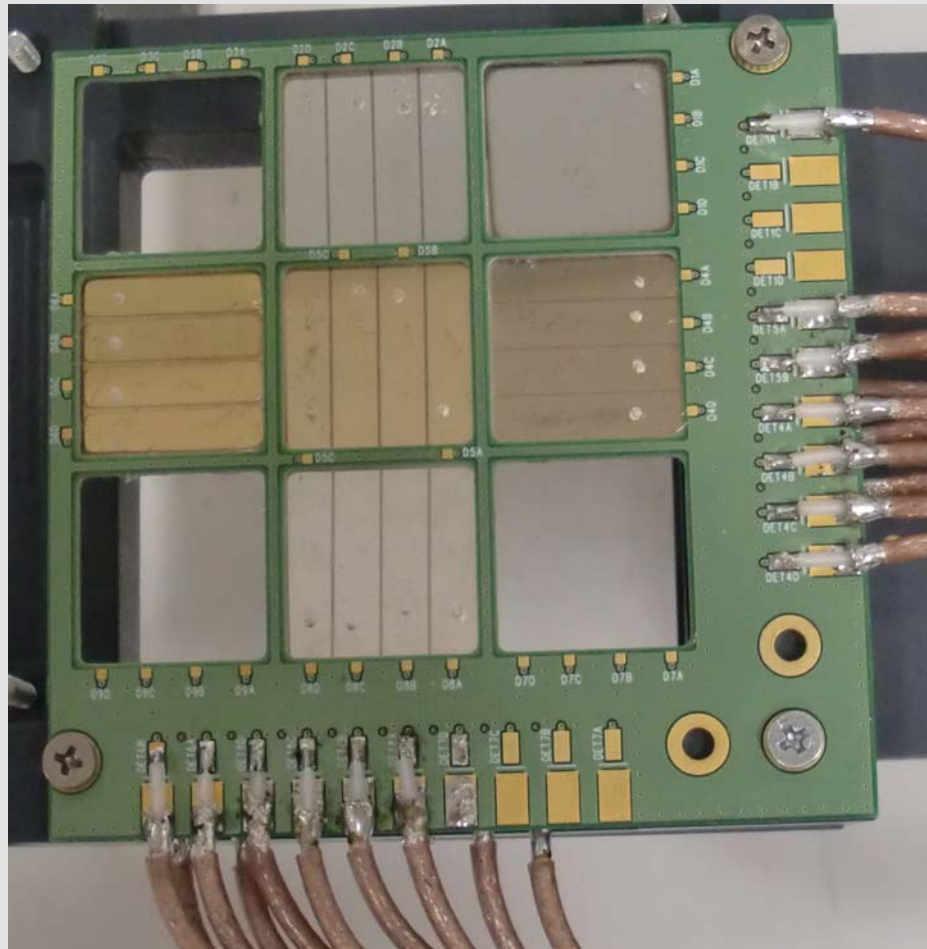
Warning: Time resolution
depends on ΔE



Taken from:
M. Pomorski,
PhD Thesis,
University of Frankfurt, 2008

Commissioning - GSI Sep-Oct'10

Coulex of ^{63}Co on Au

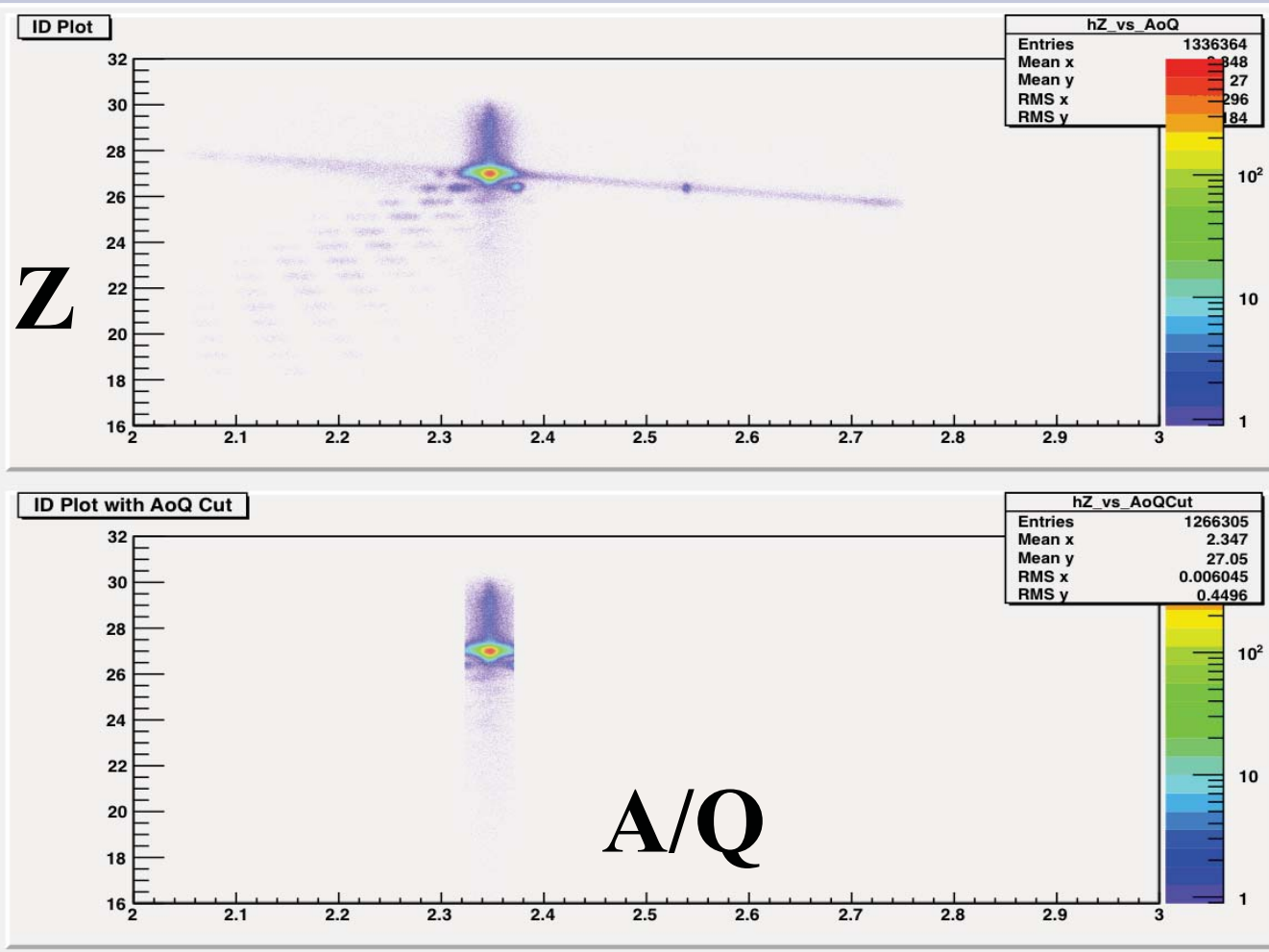


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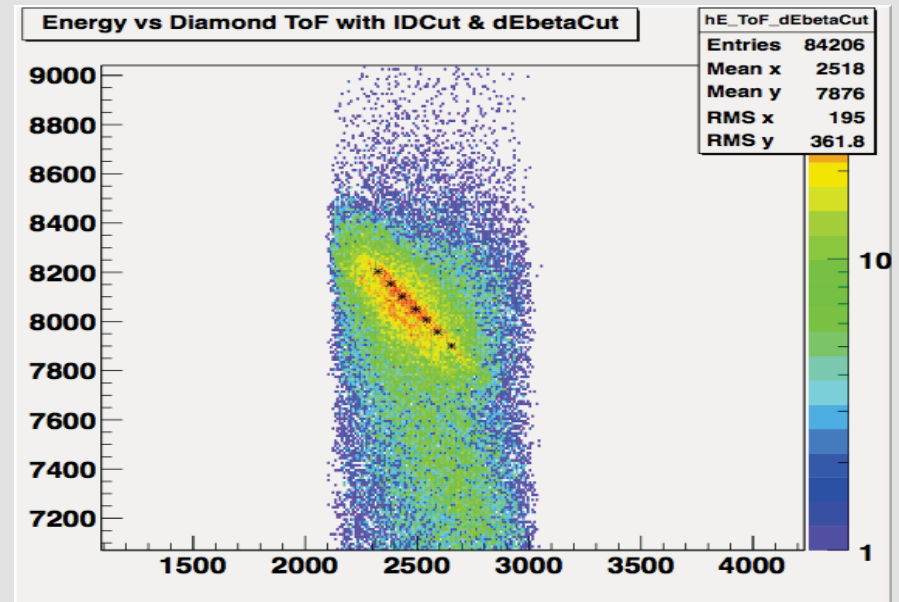
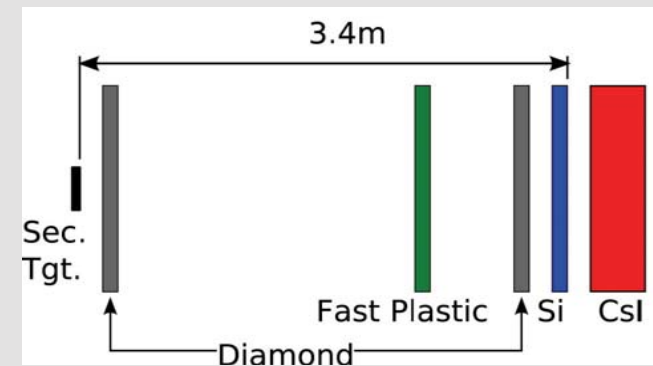
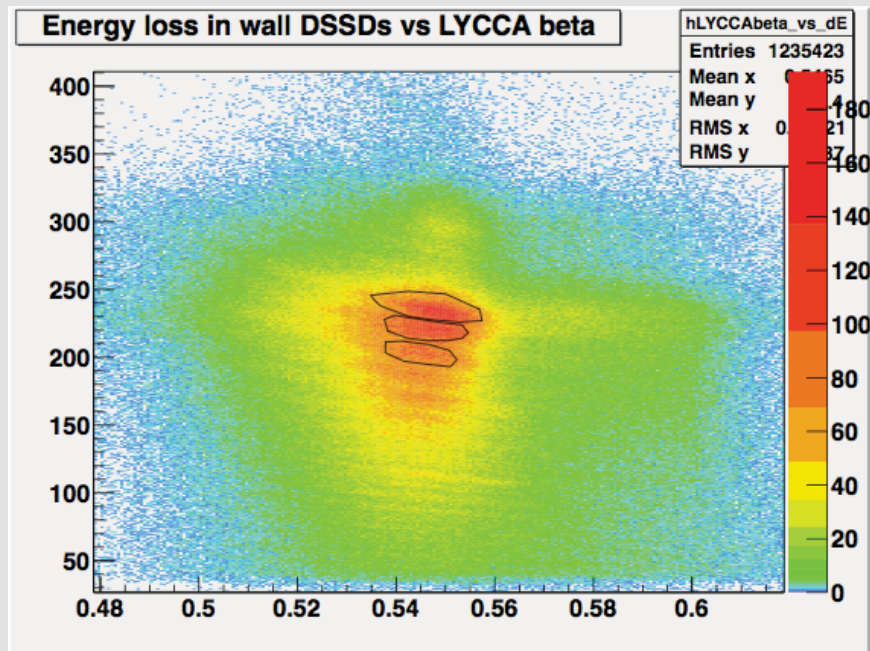
Commissioning - GSI Sep-Oct'10

FRS Identification of ^{63}Co



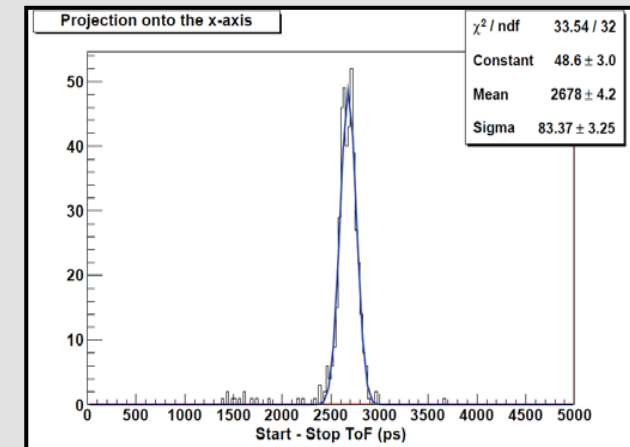
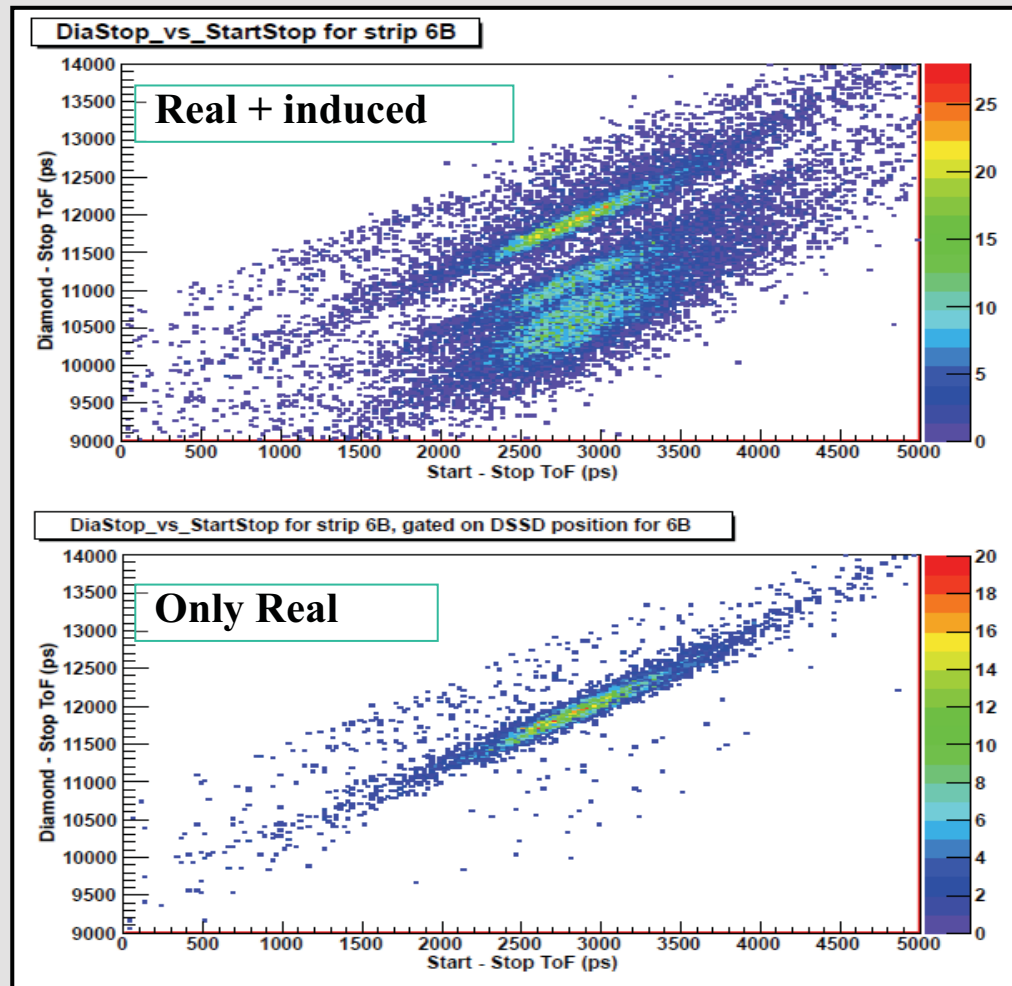
Preliminary Analysis

LYCCA identification of ^{63}Co

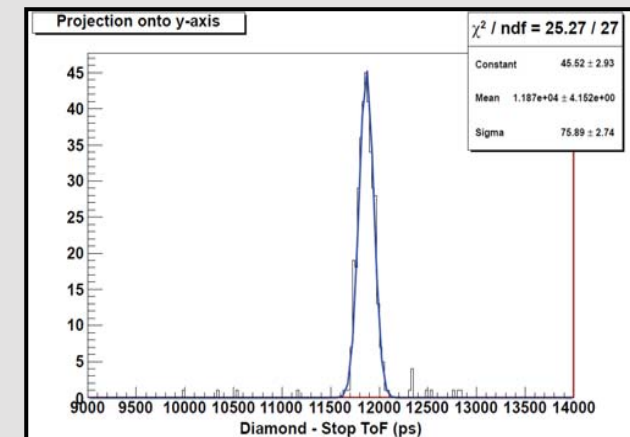


Preliminary Analysis

Diamond efficiencies $\sim 90\%$



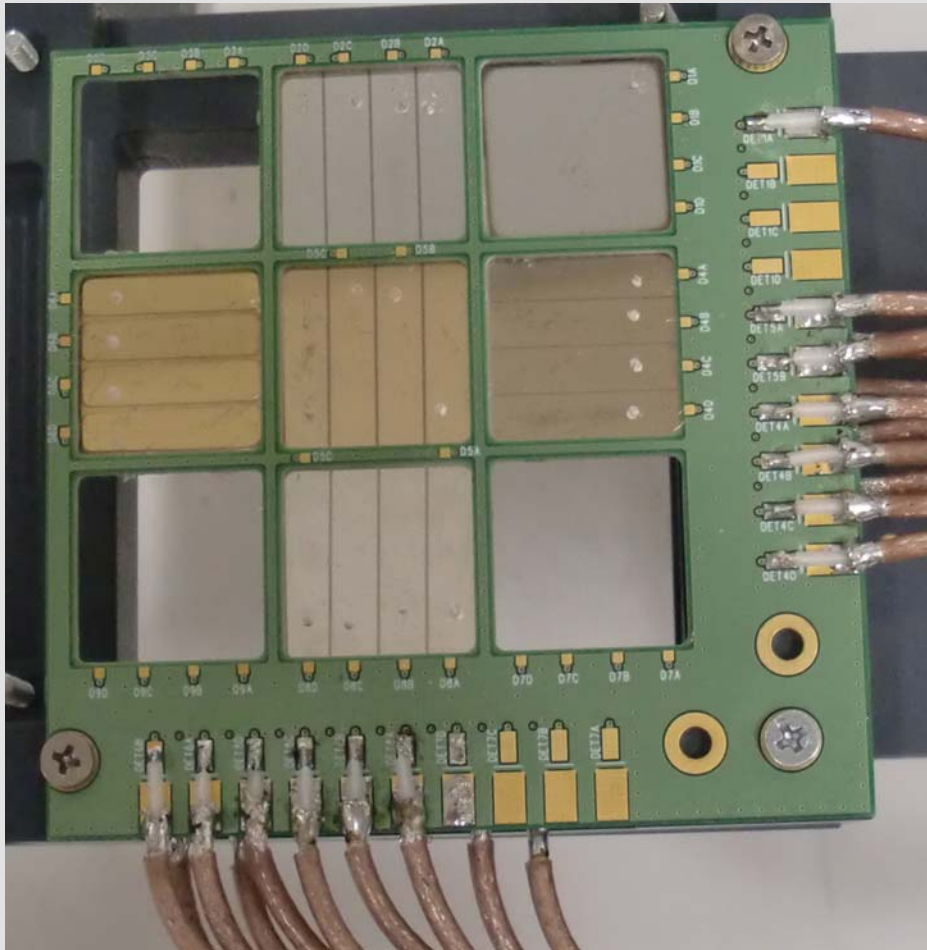
Projections



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B.S. Nara Singh

Commissioning run - Issues



- Stable operation

- Biasing

- Signal transmission from the sample to DBA

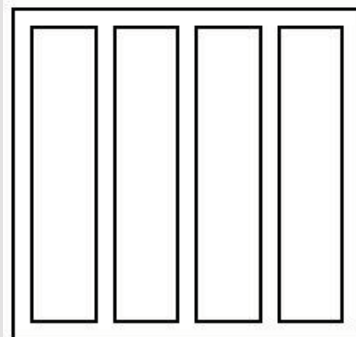
- PCB Material – Active area

Recent Work

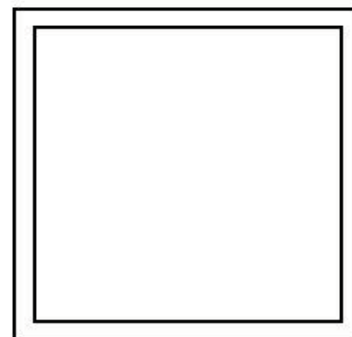
Type1: @ Surrey



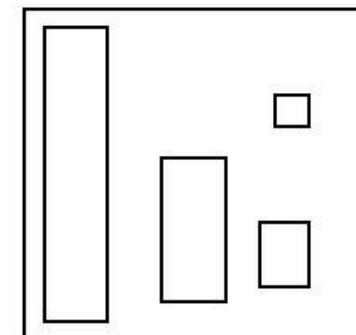
Type 2: @ DDL



Pattern 1

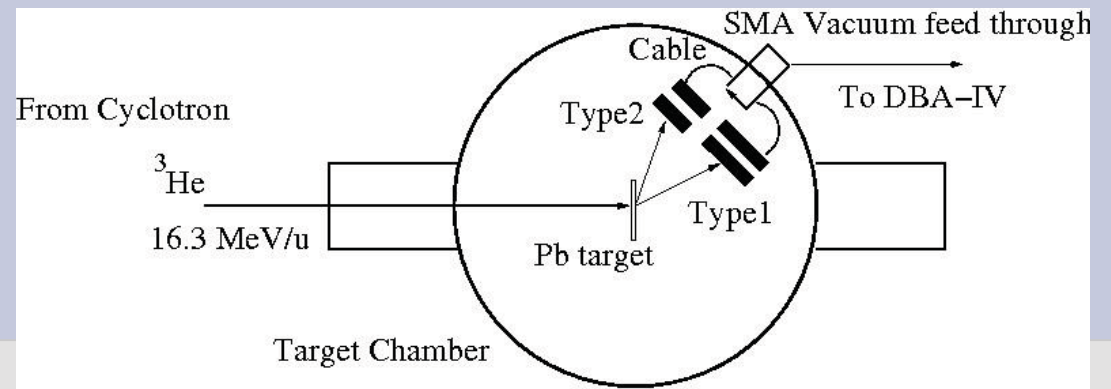


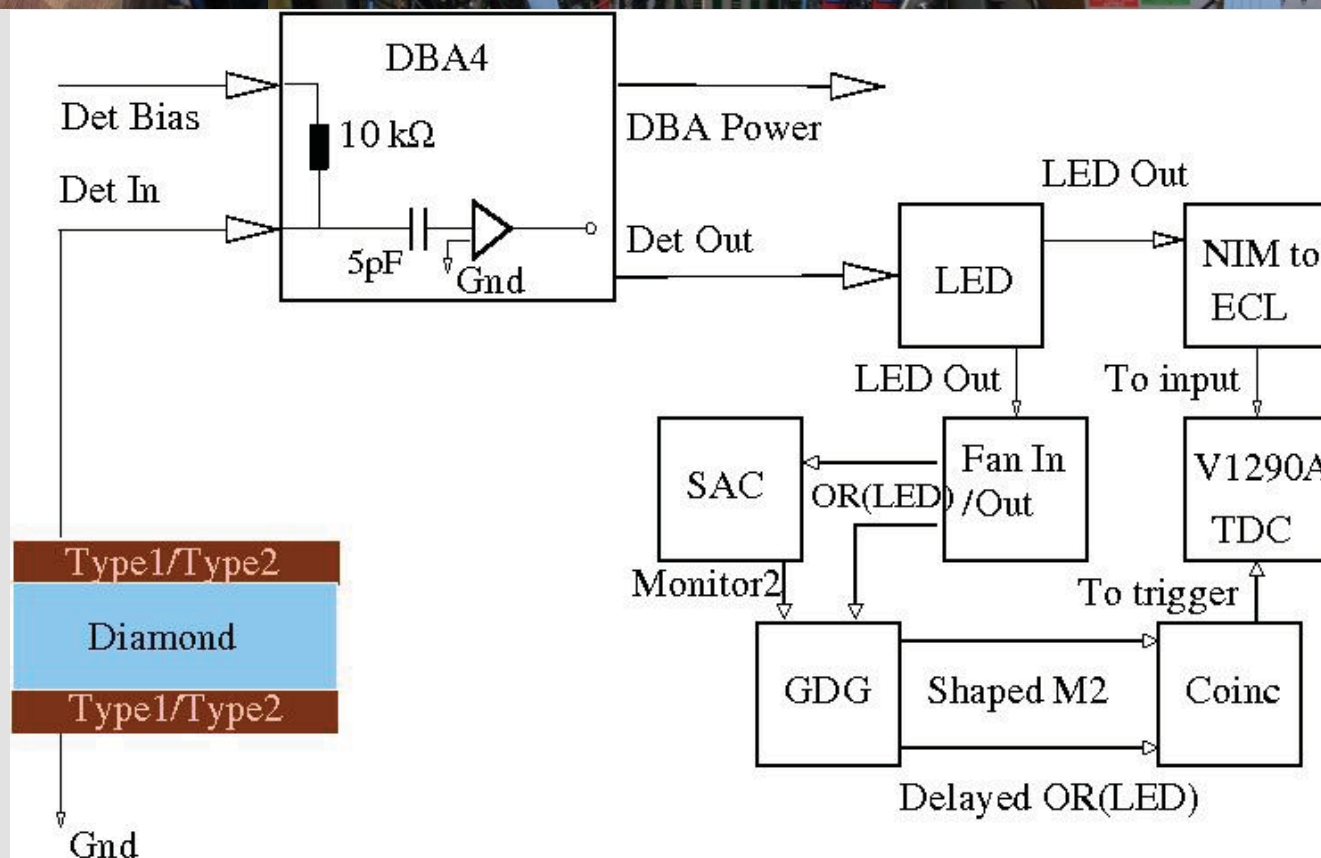
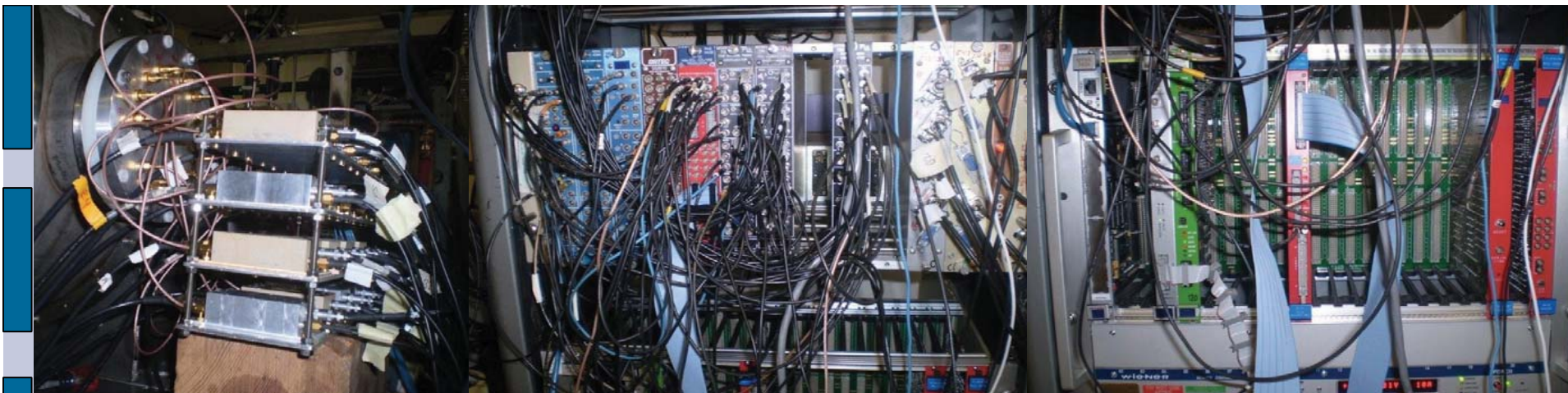
Ground Pad



Pattern 2

Jan 2011 Birmingham Tests

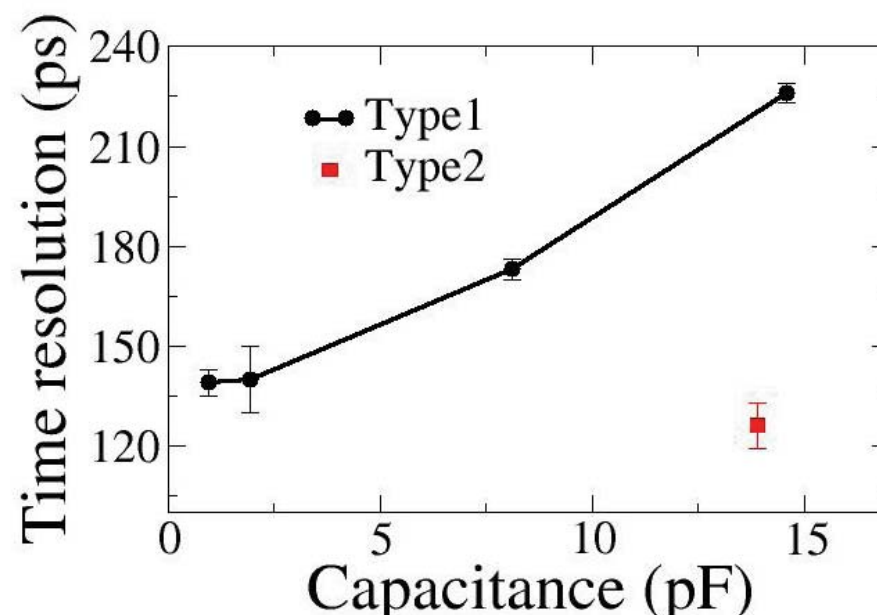
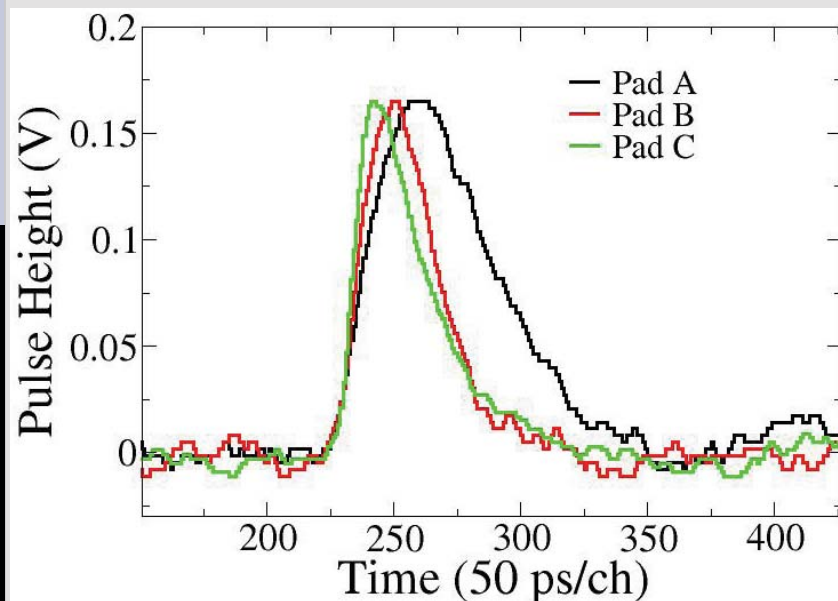




Jan 2011 -Birmingham Tests

$$\sigma \propto C_{\text{Det}}^{1/2}$$

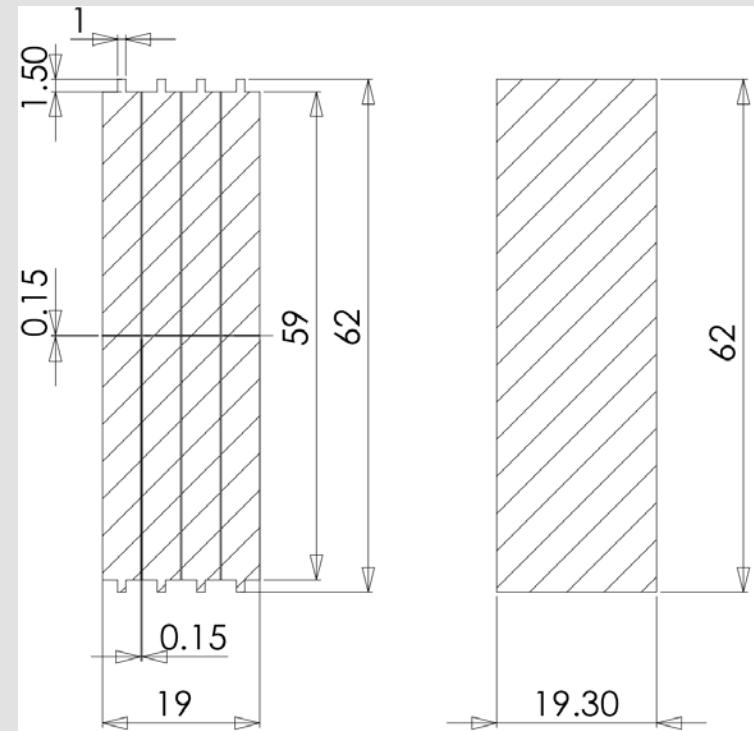
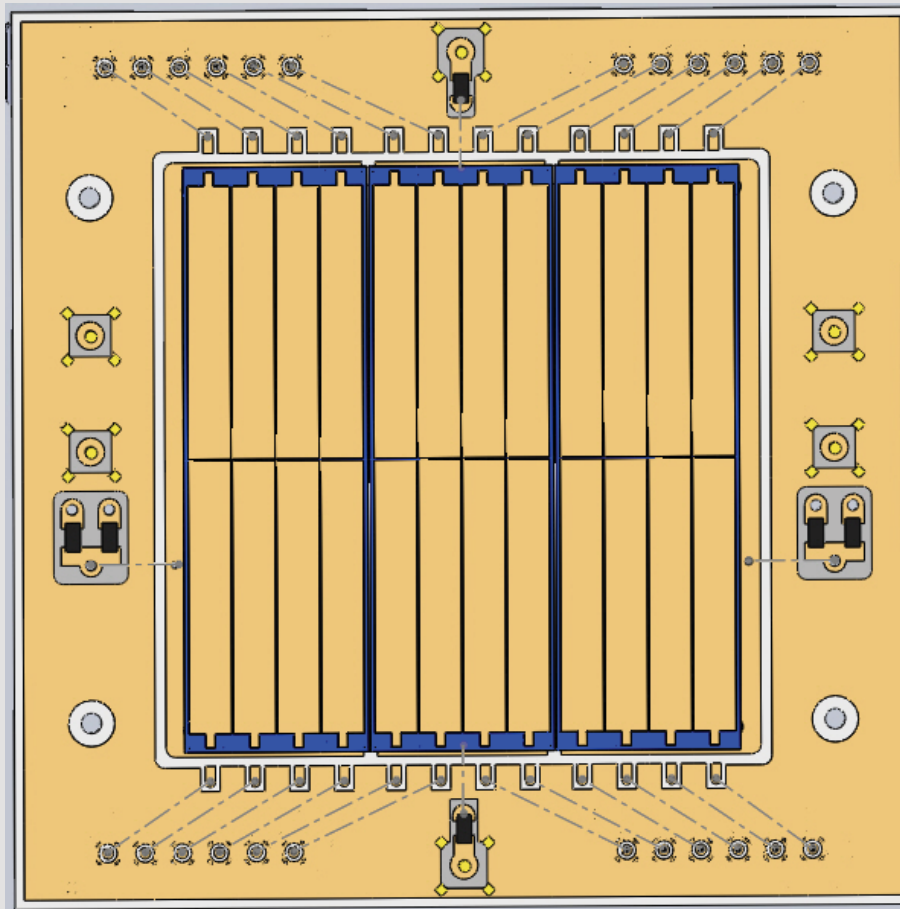
DDL contacts work better.



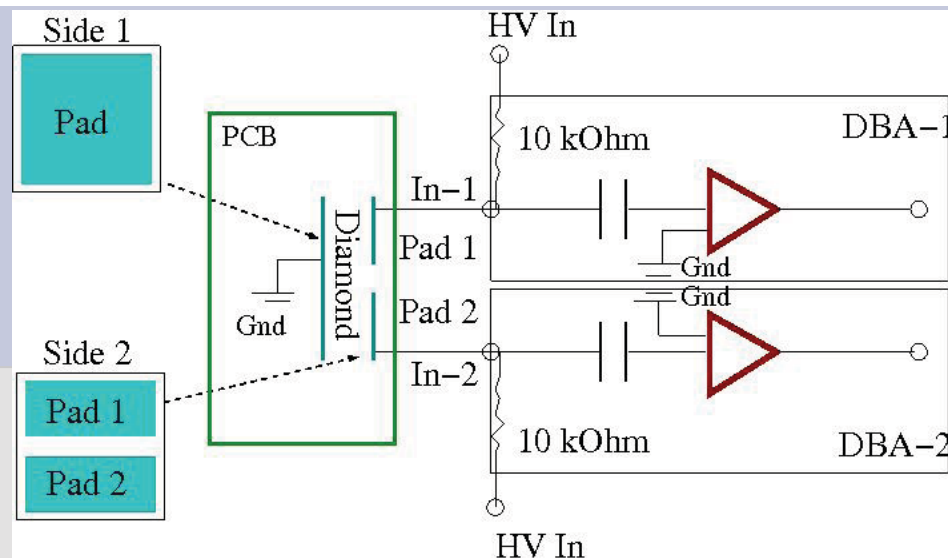
F. Schirru, B.S. Nara Singh, L.Scruton et al. to be submitted.

New Design

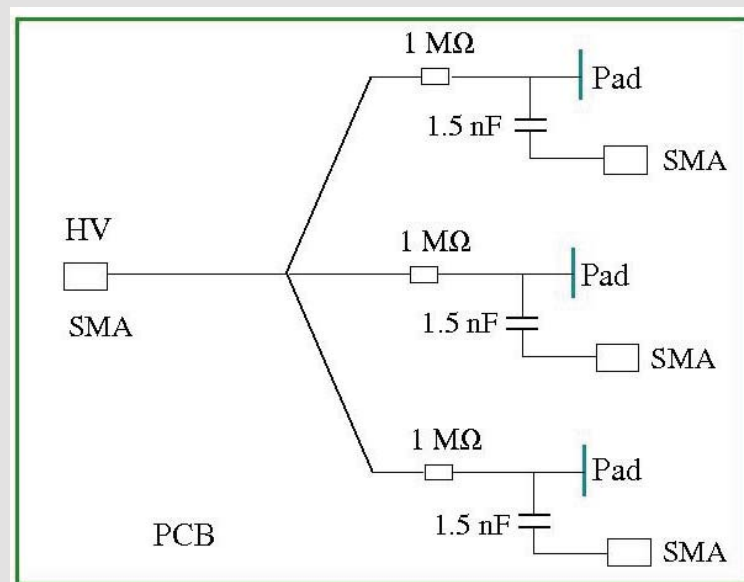
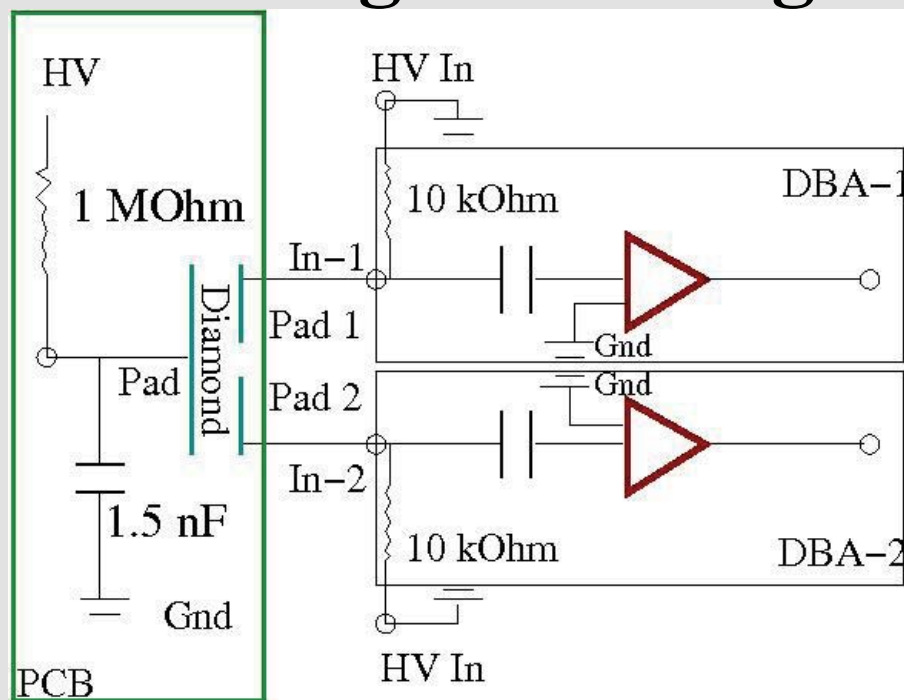
With DDL



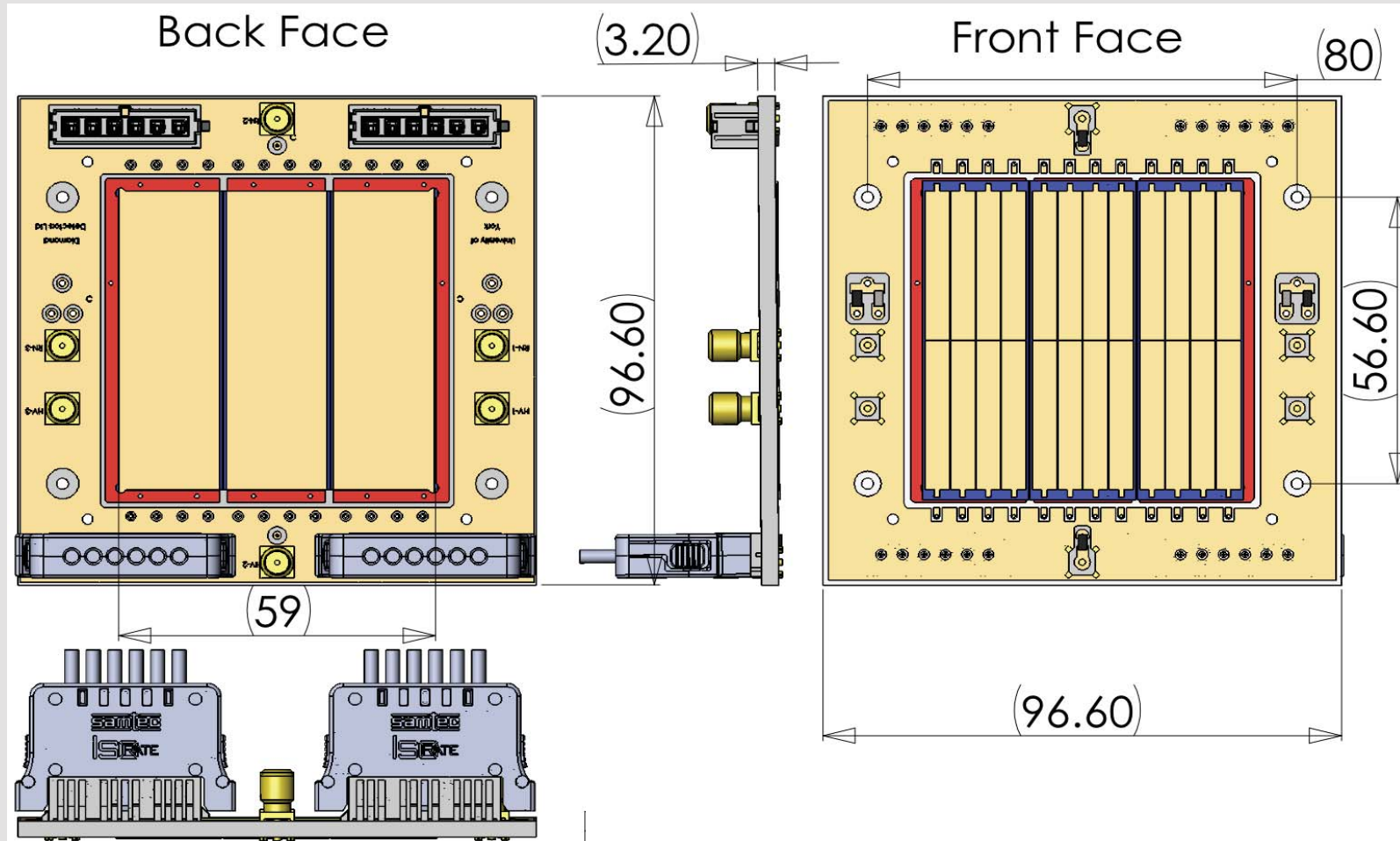
Old design - Biasing



New design - Biasing



New Design



New Design

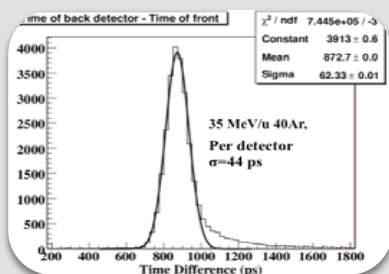
- **Mechanically stable SAMTEC connectors**
- **Biased using the single pad**
- **Controlled wire bonding and signal transmission from the sample to DBA**
- **Maximum possible active area**

Future

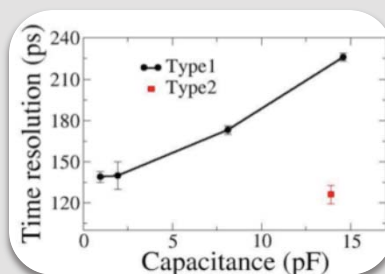


**Test at GSI (Cave-C) :
Diamond against diamond as
well as plastic**

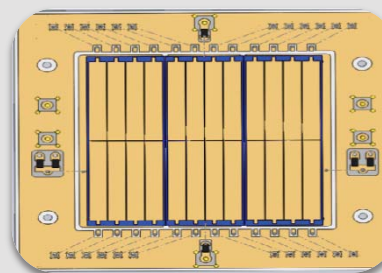
Summary



Till 2010



During 2011



Status



Future Tests

Questions???