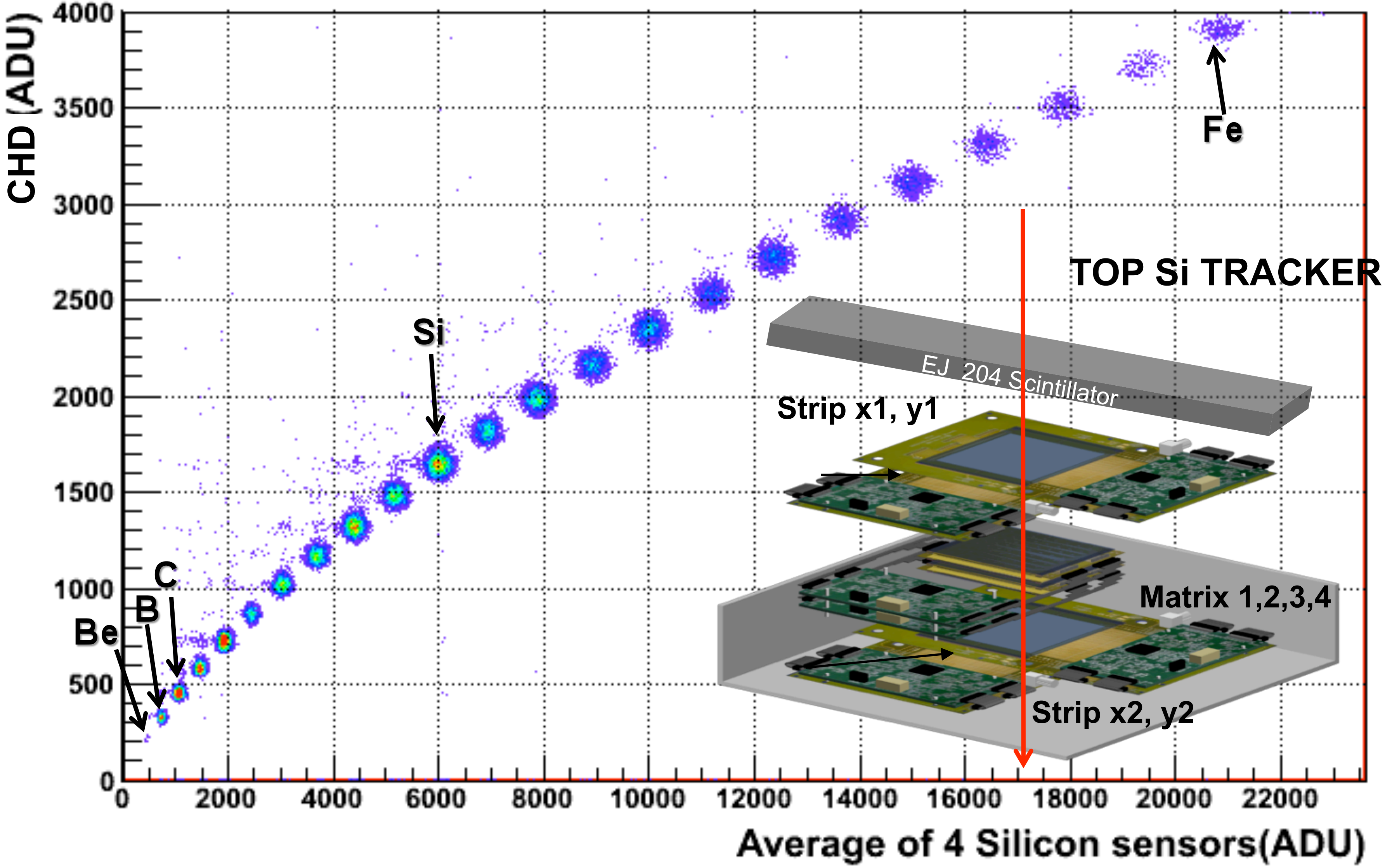
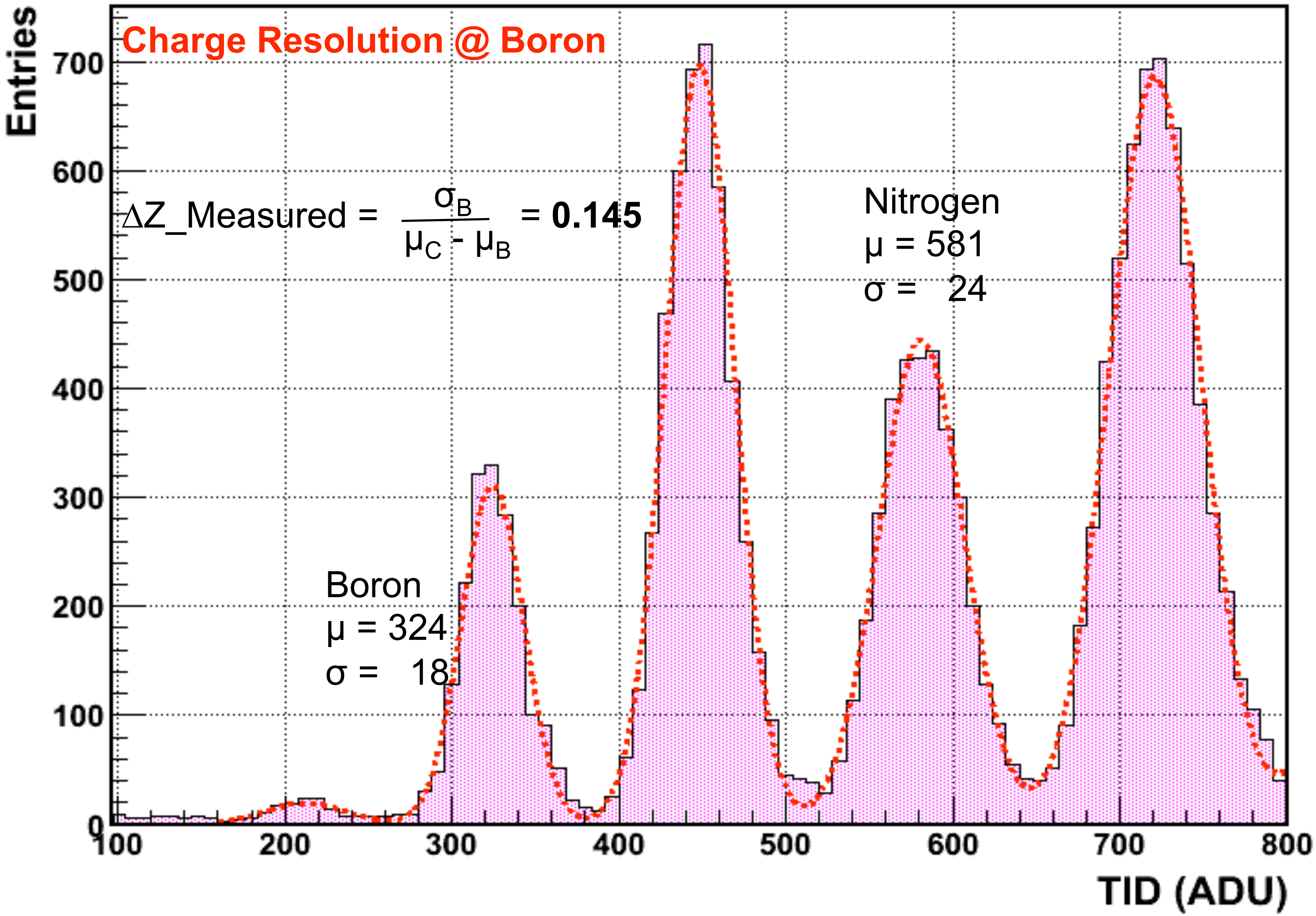
SPIDER-2

- Attivita' conclusive di SPIDER nel 2010
- Alcuni risultati dell'attivita' di SPIDER2 dopo 6 mesi di attivita'
- Manpower e richieste in sezione per il 2012

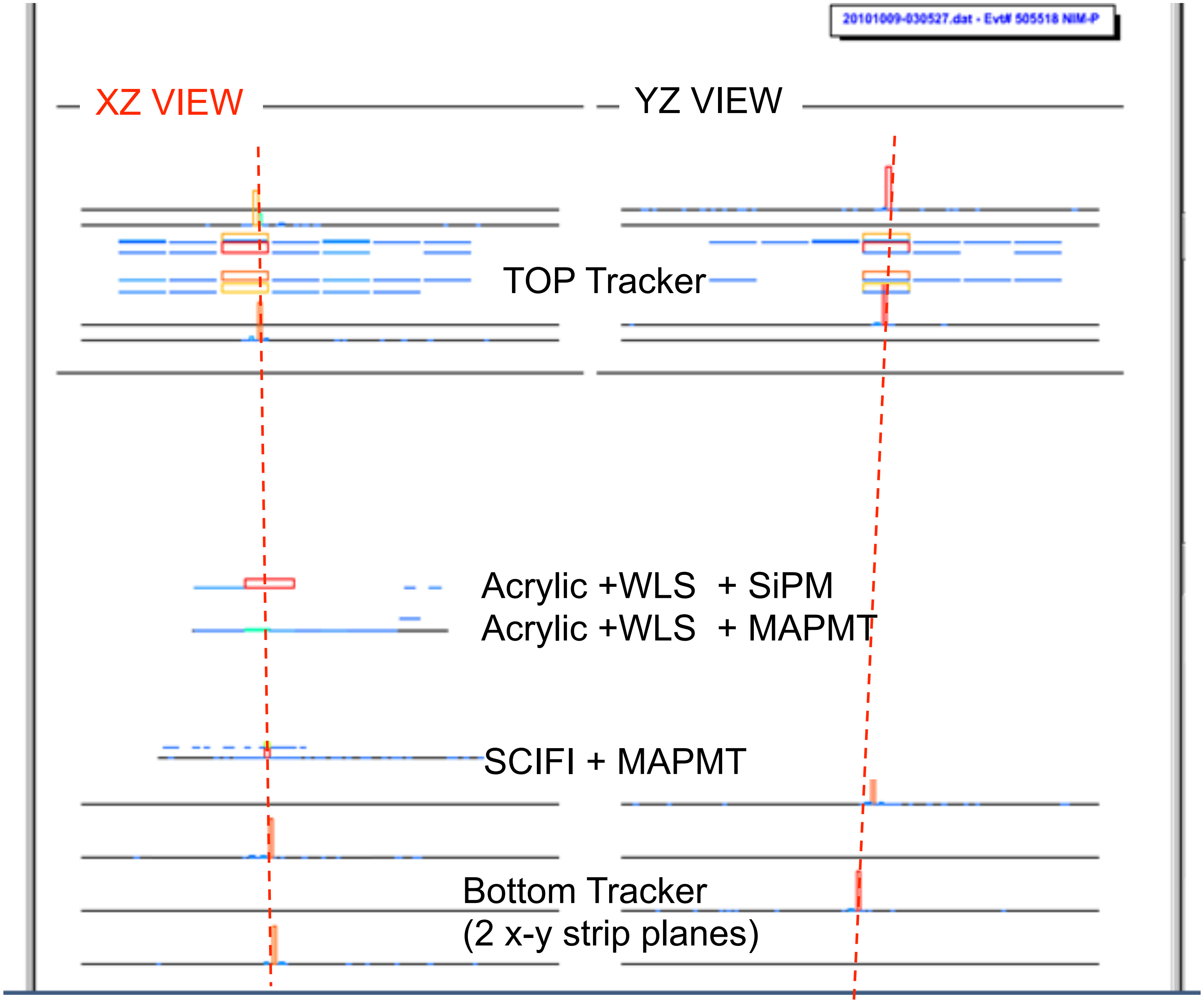
Oct. 2010 GSI beam test: Scintillator (10 mm) vs. Silicon Matrix



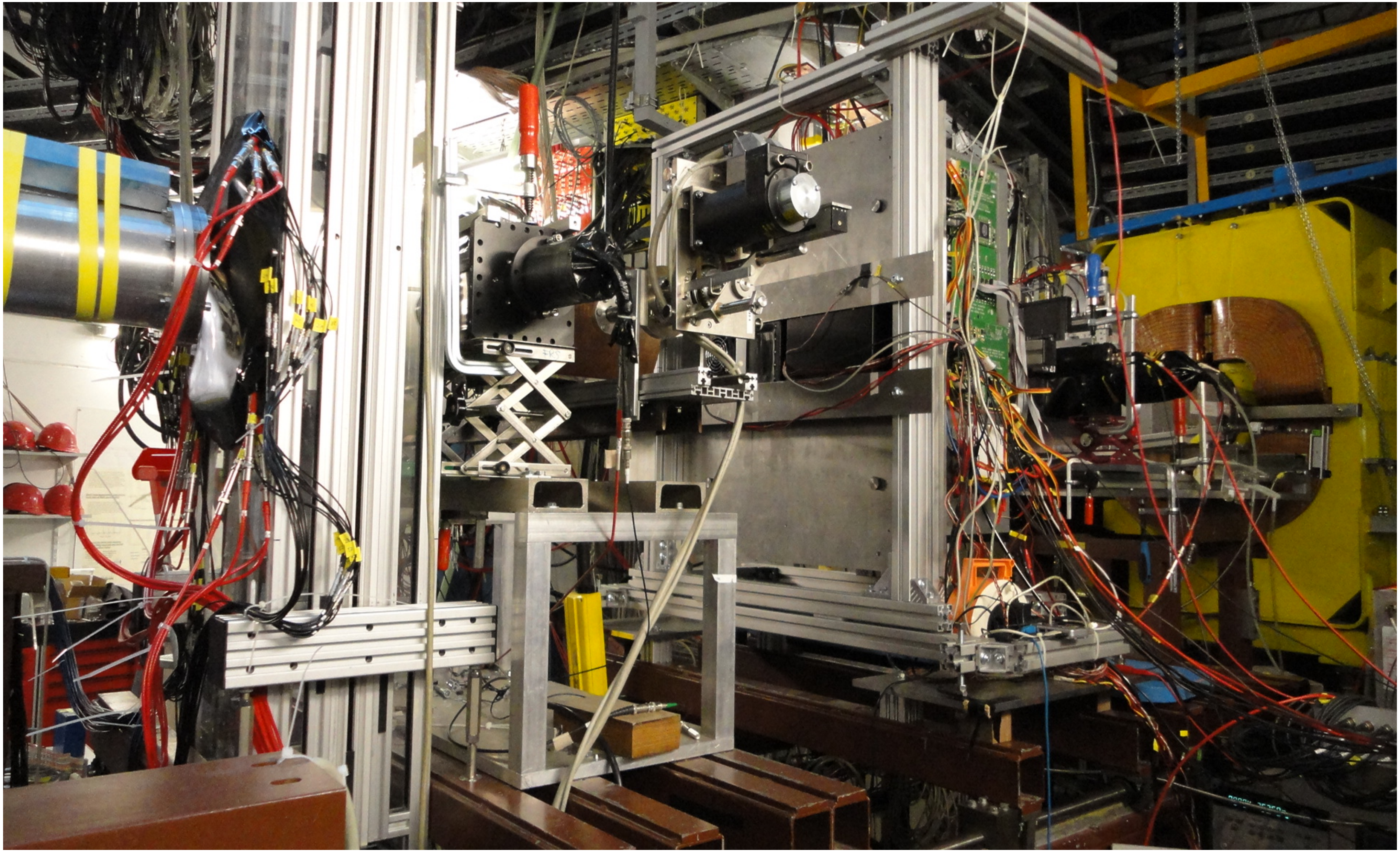
Oct. 2010 GSI beam test : Charge Resolution (EJ 204)



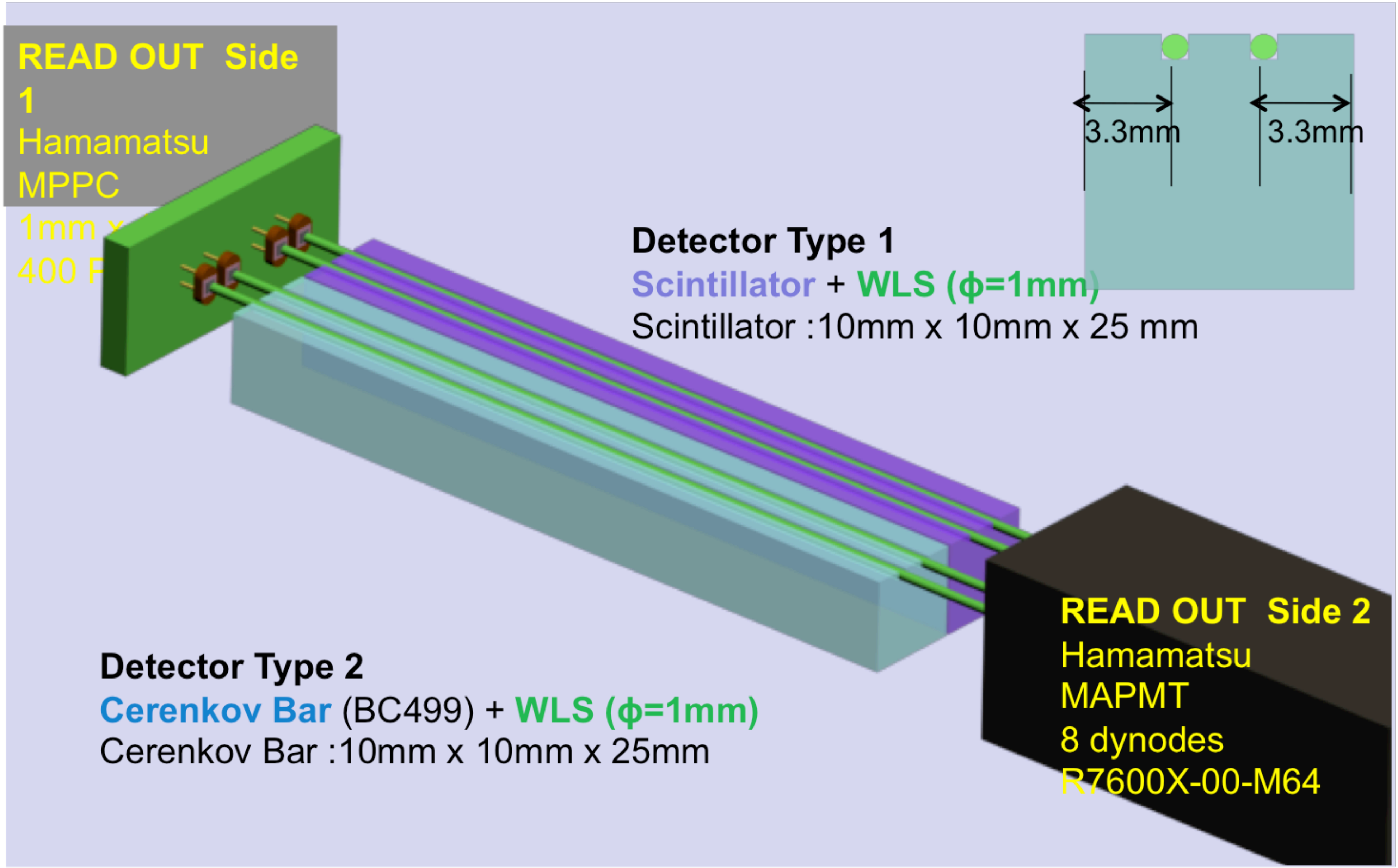
Oct. 2010 GSI beam test: event display



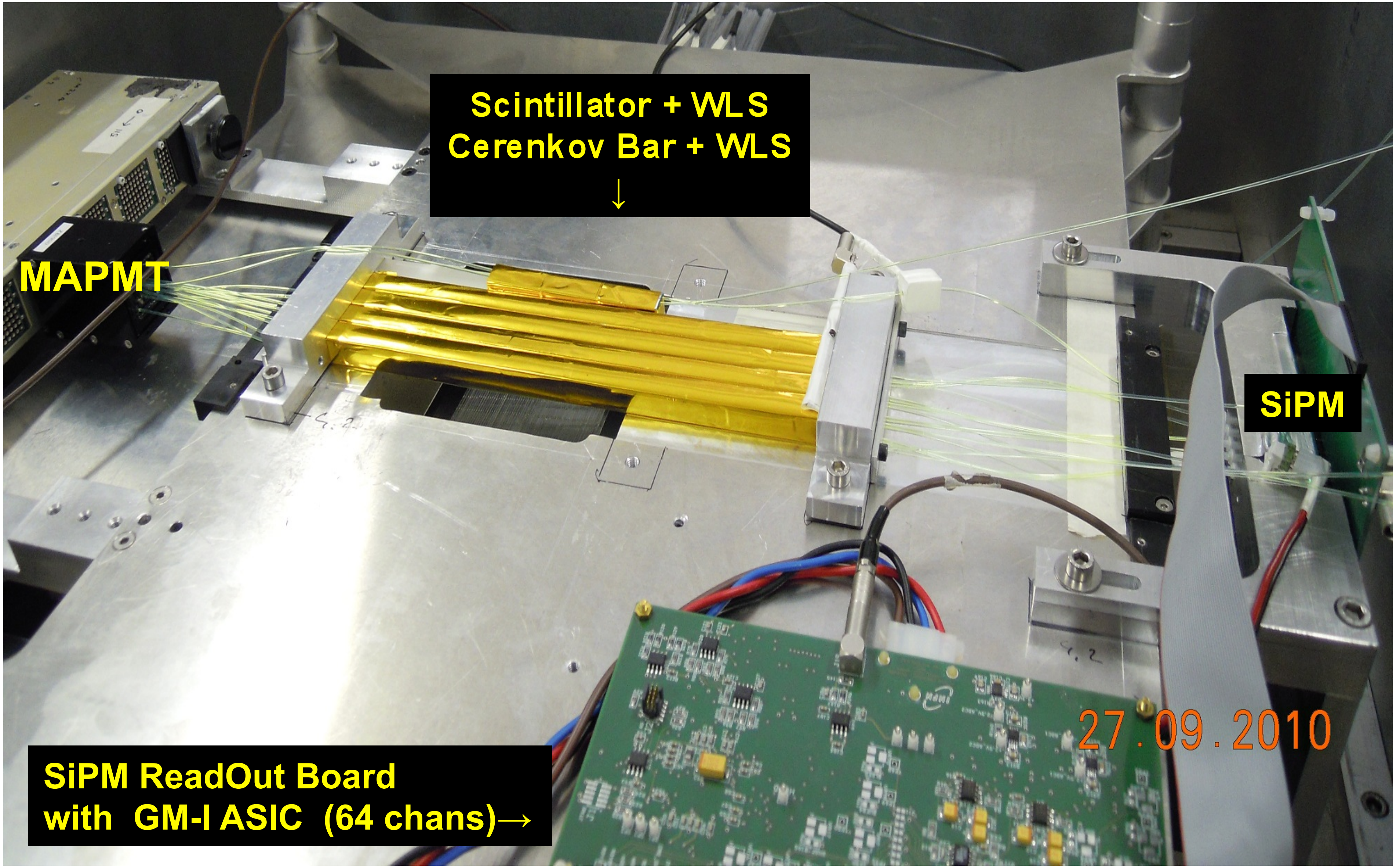
Oct. 2010 GSI beam test



(1) Scintillator and Cherenkov bars + WLS + SiPM



2010 GSI BEAM TEST (subset of the setup)



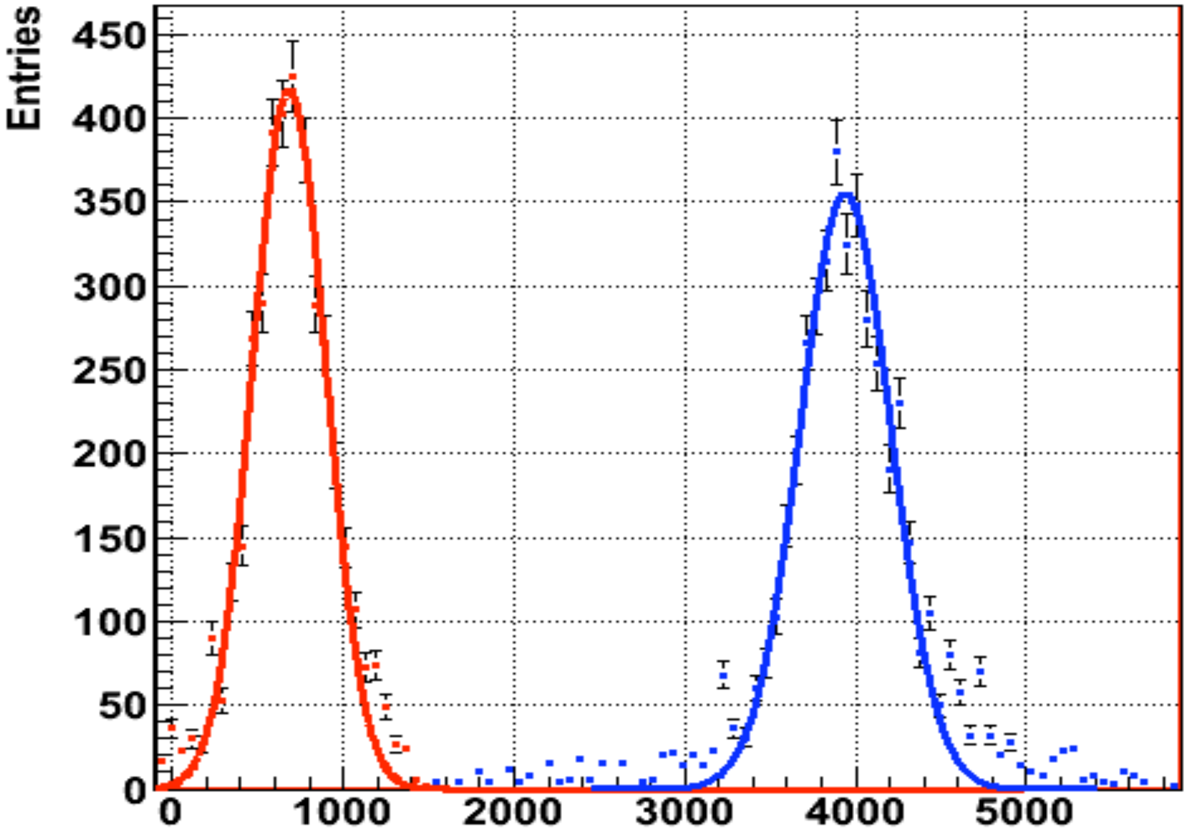
2010 GSI BEAM TEST

detection of Carbon Nuclei @ 1.2 GeV/n

Signals from the two detectors **readout by SiPM sensors**

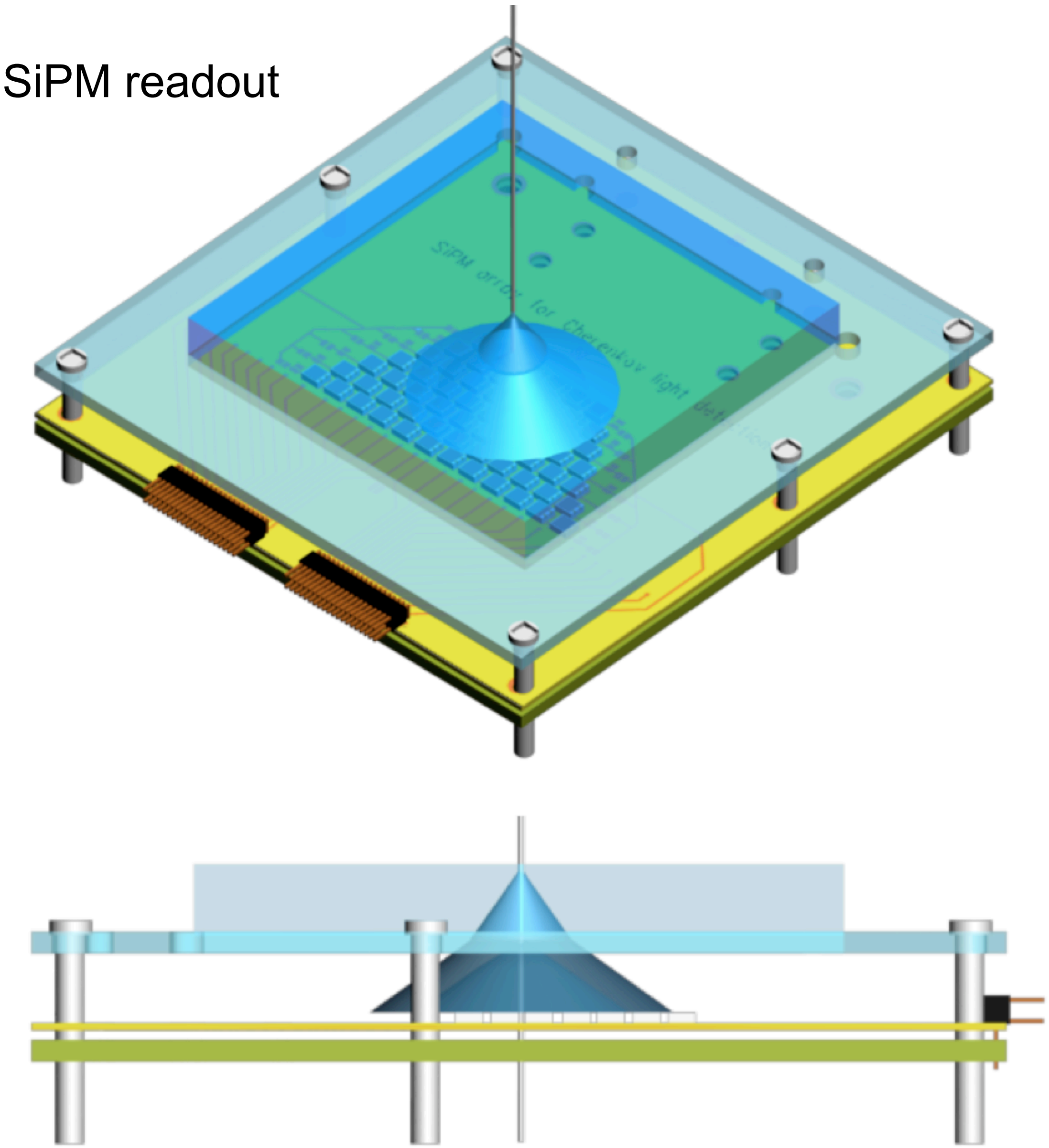
Cerenkov Bar + WLS + SIPM
684 ± 255 ADU 12 p.e

Scintillator + WLS + SIPM
3955±329 ADU 72 p.e

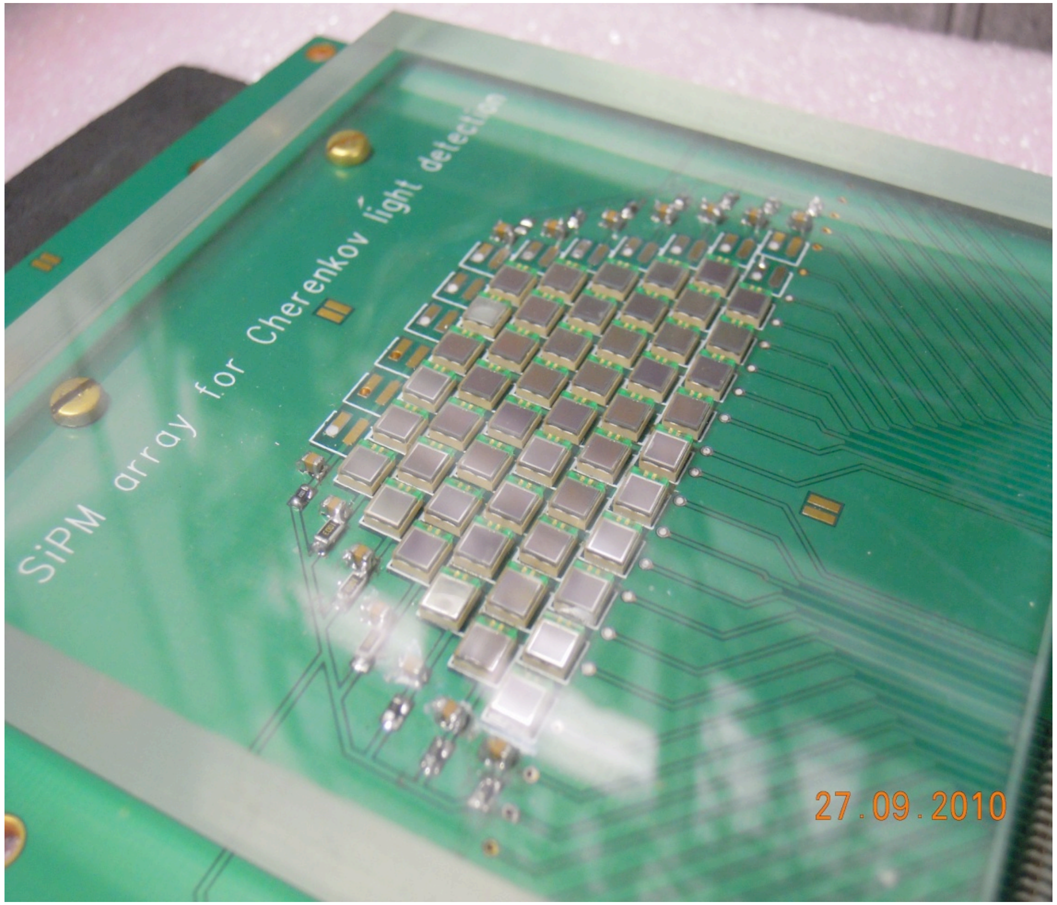


[ADU]

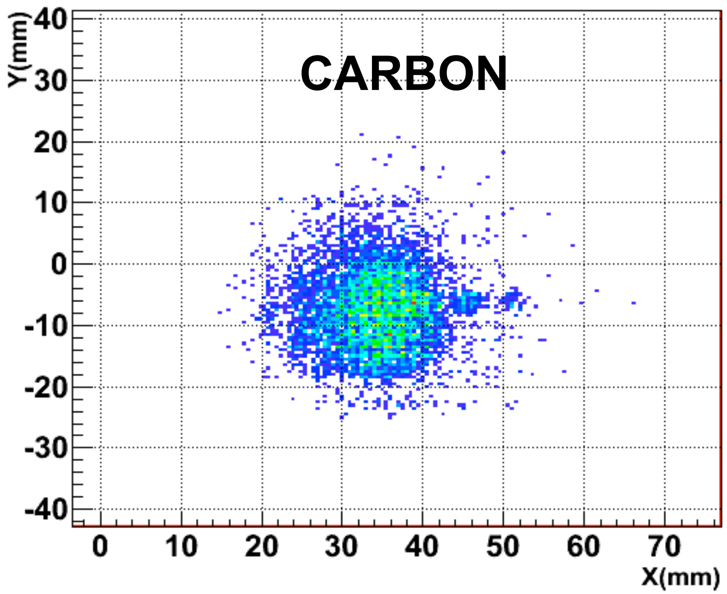
Cherenkov with SiPM readout



(2) Proximity Imaging of Cerenkov radiation
Carbon Nuclei @ 1.2 GeV/n GSI BEAM TEST

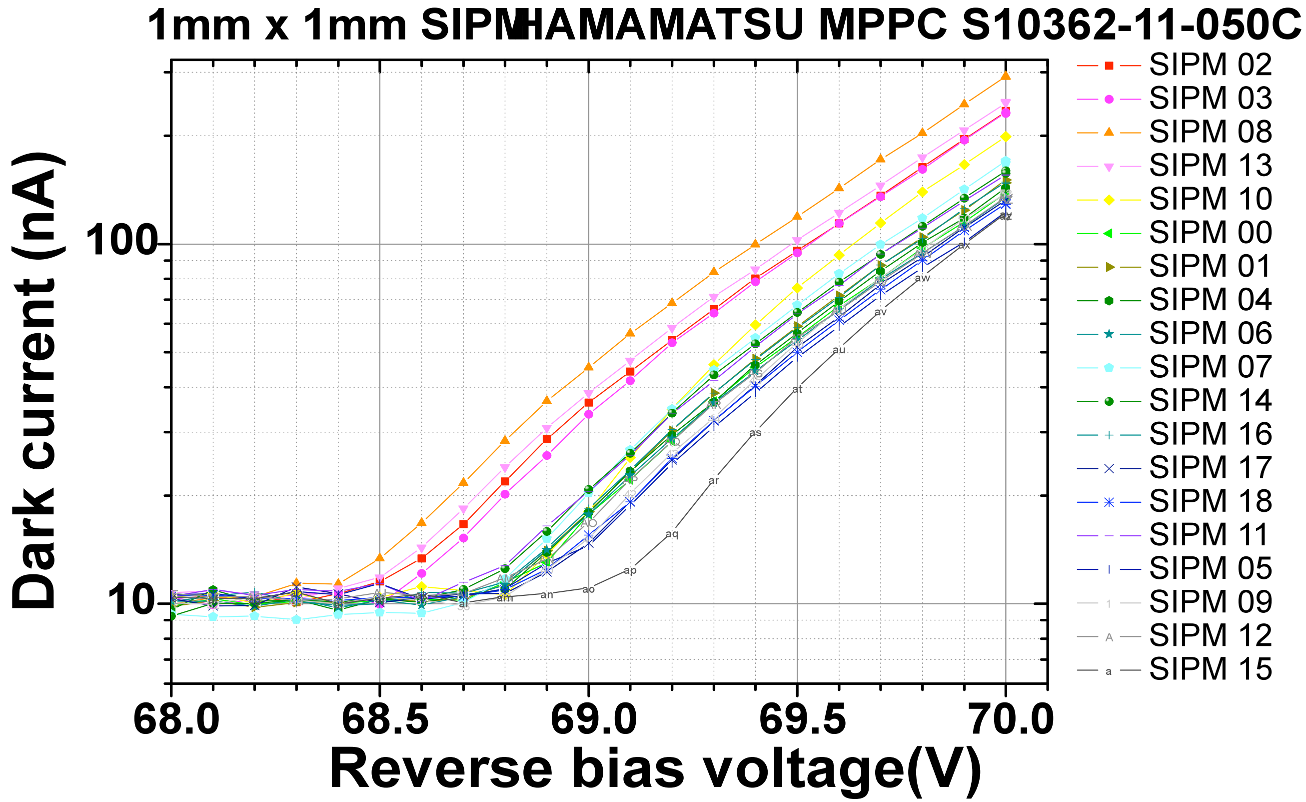


CERENKOV Detector
Acrylic converter : 14mm thick
Discrete Array of SiPMs :
Hamamatsu MPPC
3mm x 3mm
3600 pixels
Gain : 0.5 x 10^5



Characterization and Grouping of SiPM

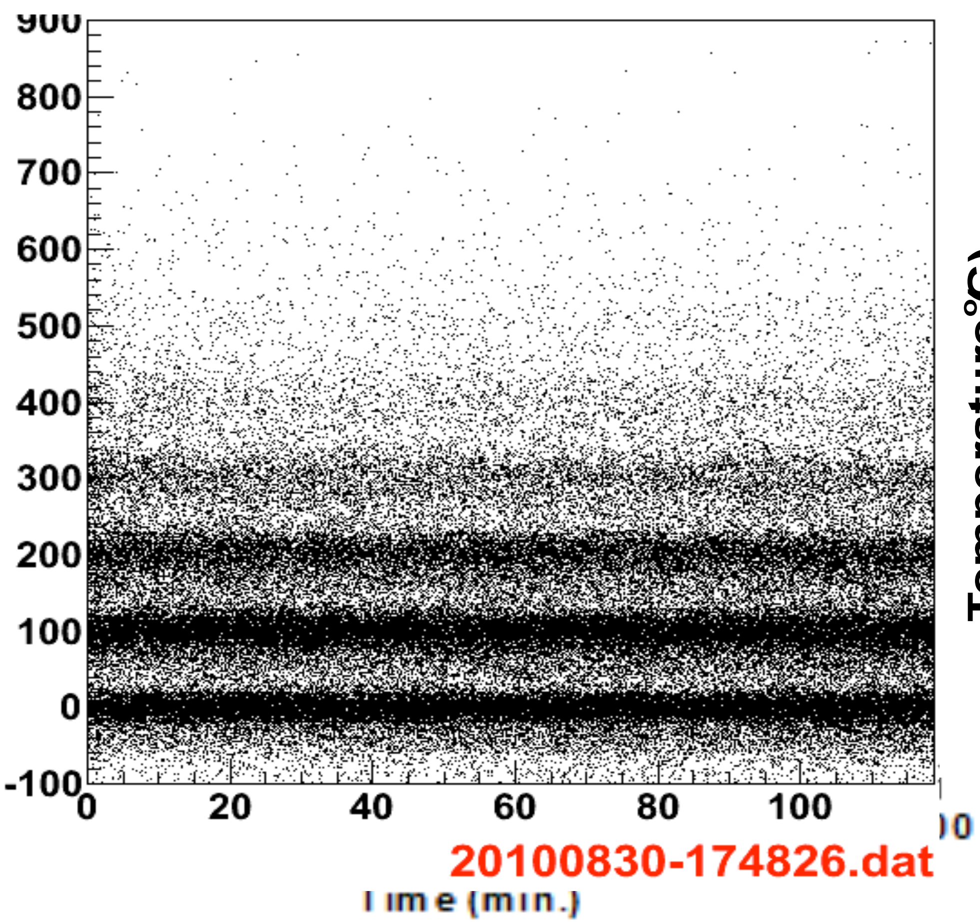
IV curve @ 23.5oC



	Group 1				Group 2			Group 3							Group 4				
	02	08	13	03	07	11	14	00	01	04	06	10	12	16	17	18	05	09	15
V_{BD}	68.4	68.5	68.5	68.5	68.6	68.6	68.6	68.7	68.7	68.7	68.7	68.7	68.7	68.7	68.8	68.8	68.8	68.8	69.0

Active Gain Control of SiPM

Temperature between 24^{o}C and 30^{o}C.
G = 3 x 10^5 (with 1% accuracy)



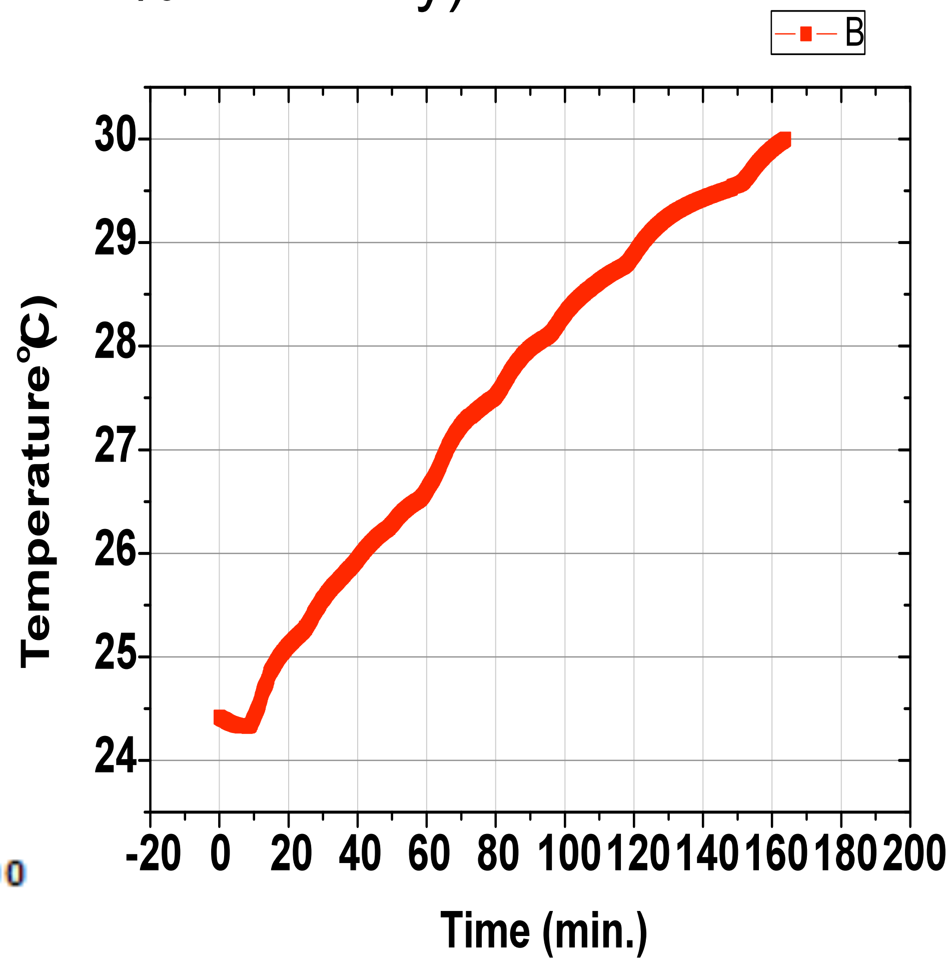
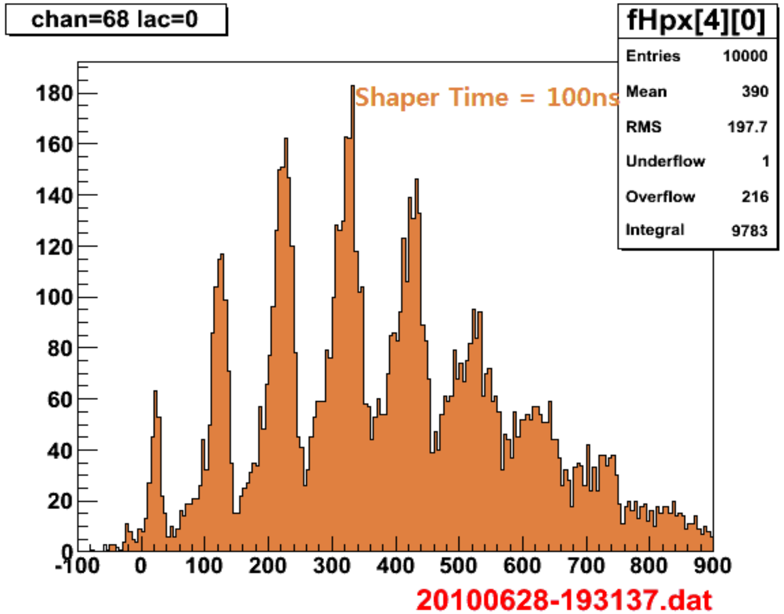
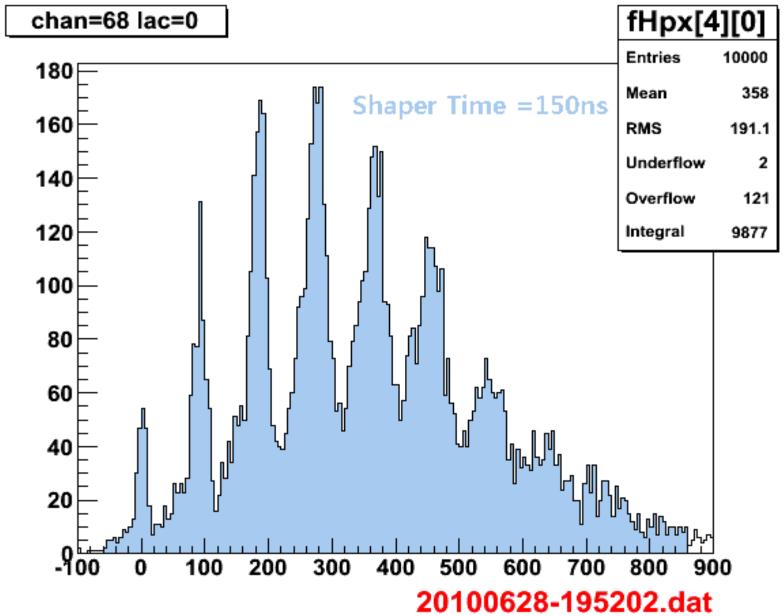


Photo Electron Peaks of SiPM with GM-I ASIC



	MEAN	RMS
Ped	22	10
1st Peak	121	16
2nd Peak	220	21
3rd Peak	322	25
4th Peak	419	28

1 P.E. Peak Fit : 99.5 ± 0.4ADU



	MEAN	RMS
Ped	0.7	9.9
1st Peak	90	15
2nd Peak	183	19
3rd Peak	272	26
4th Peak	364	30

1 P.E. Peak Fit : 90.8 ± 0.33ADU

SPIDER-2

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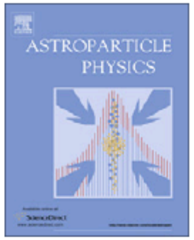

An high resolution FDIRC for the measurement of cosmic-ray isotopic abundances

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A R T I C L E   I N F O

Article history:
Received 26 February 2011
Received in revised form 10 April 2011
Accepted 5 May 2011
Available online 11 May 2011

Keywords:
Cosmic-ray isotopes
Particle identification
Silicon PhotoMultiplier
FDIRC

A B S T R A C T

Measurements of the relative abundance of cosmic isotopes and of the energy dependence of their fluxes may clarify our present understanding on the confinement time of charged cosmic rays in the Galaxy. Experimental studies of these *propagation clocks* have been carried out by balloon and space missions at energies of a few 100 MeV/amu by means of detection techniques based on multiple dE/dx sampling, coupled with a measurement of the energy released in a thick absorber. At larger energies, the isotopic separation of light nuclei (as, for instance, ^{9}Be/^{10}Be) can be achieved by combining a precise measurement of the particle's rigidity with an high resolution determination of its velocity, via the observation of the Cherenkov effect in a radiator.

In this paper, we propose the introduction – for the first time in a space experiment – of the DIRC technique (Detection of Internal Reflected Cherenkov light) for the identification of cosmic-ray isotopes. This type of detector has been successfully used in electron–positron colliders for particle identification and in particular for π–K separation. While for particles with unit charge the light yield is a limiting factor, in the case of a nucleus of charge Z the larger photostatistics (due to the Z^2 dependence of Cherenkov light emission) is the key to reach an adequate angular resolution to provide a mass discrimination for isotopes of astrophysical interest. We report on the early development phase of a DIRC prototype with a focussing

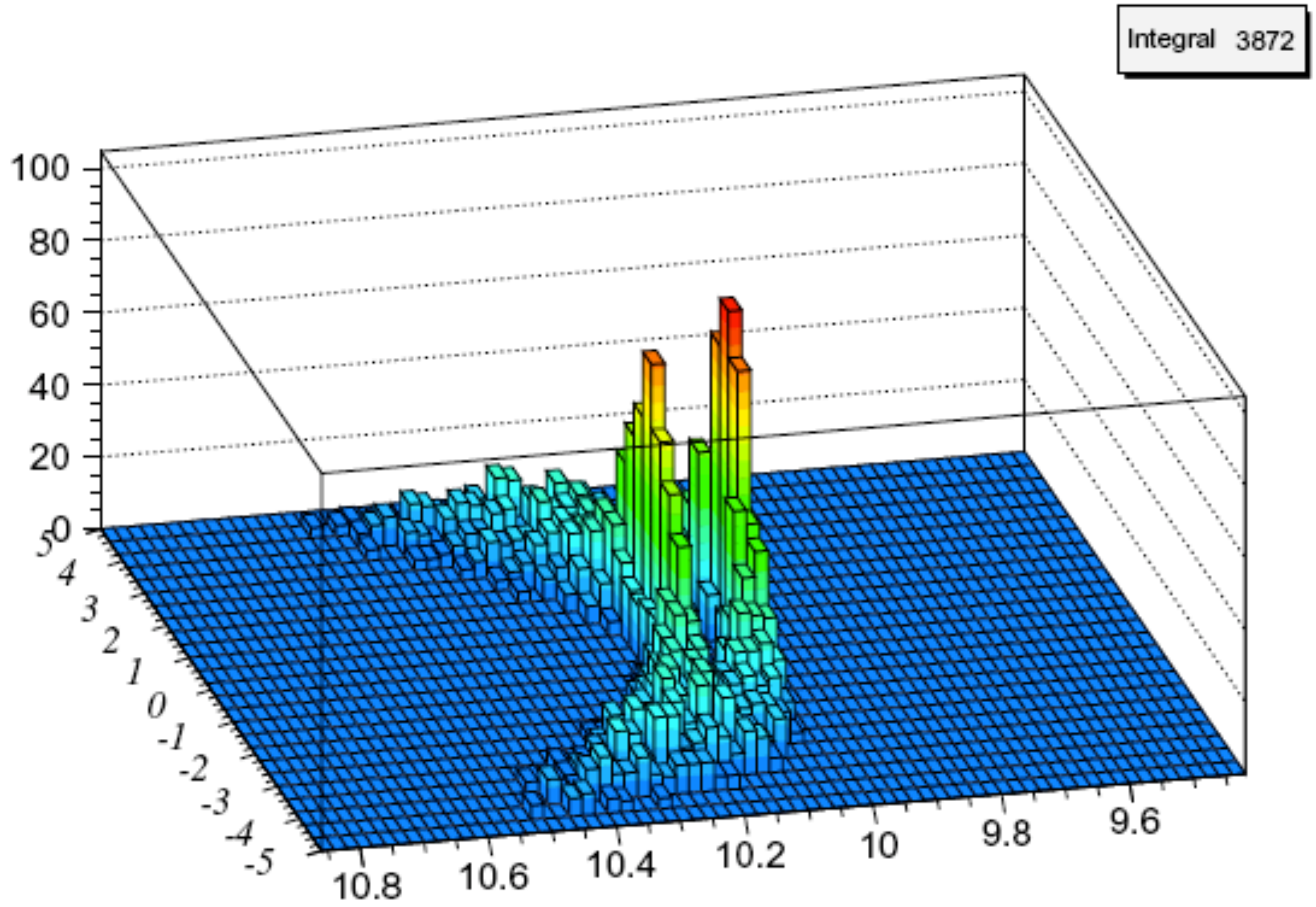

Fig. 8. Example of the superposition on the focal plane of two Cherenkov patterns generated via Monte Carlo by one ^{9}Be and one ^{10}Be tracks both with a total particle momentum of 25 GeV/c.

SPIDER-2 started on 1/1/1011

Under development during 2011:

- SiPM arrays for SPIDER-2 in fabrication at FBK (p/n)
- SIPM array structures for fiber readout (in the same batch)
- full readout with 64 channels/ board already tested at GSI
- development of hybrid + modular board 8 x 64 chans

Main activities in 2012:

- tests of hybrid + readout board with 1024 SiPM units
- prototype of the focussing optics + radiator bar (20 cm)
- ion beam test at GSI or HIMAC

SPIDER-2	2012 INFN sez. di Pisa + Siena GC	%
P.S. Marrocchesi	PO Univ.Siena + INFN Gruppo Collegato	0.7
P. Maestro	RC Univ. Siena + INFN Gruppo Collegato	0.5
G. Bigongiari	Borsa post-doc Siena	0.4
M.G. Bagliesi	Borsa post-doc Siena	0.5
M.Y. Kim	Borsa post-doc Siena	0.5
S. Bonechi	Dottorando Univ. di Siena	1.0
Full Time Eq.		3.6
C.Avanzini	Tecnologo INFN Pisa (consulenza realizzazione schede)	
R.Cecchi	Tecnologo (Univ.Siena + INFN Gruppo Collegato)	0.5

Richieste di servizi in sezione per il 2012

- Supporto gruppo alte-tecnologie per micro-bonding
- Officina Meccanica (3 weeks/uomo) meccanica per test articles/prototipi
- Officina Meccanica (2 weeks/uomo) preparazione + beam test (2012)