



# Annual report of SITRA-JRA2

at the EUDET Steering Committee

August 31<sup>st</sup>, 2010

Aurore Savoy-Navarro, LPNHE, UPMC/CNRS-IN2P3

On behalf of SITRA members:

Institute of Physics, University of Helsinki (Fi) , LPNHE, University Pierre et Marie Curie-Paris/CNRS-IN2P3 (FR), Charles University in Prague (CZ), Instituto de Fisica de Cantabria (IFCA), University of Santander (SP).

# Outline

- Activities achieved in 2010
- Outcomes and Future related projects
- Publications, talks and organized meetings and workshops in 2010.

These TA are achieved thanks to complete test infrastructures for EUDET.

They include:

Faraday cage with possibly cooling, alignment system, integrated mechanical structures to include different types of Si sensors, associated FEE, DAQ hardware et software easy to include in an overall DAQ system, monitoring, Laser calibration and full analysis package both for online and offline.

They can be used both at Lab test bench and at test beams.

# Activities in 2010: transnational activities

## ➤ *Transnational Activity #1: Test beam at CERN led by D. Gamba (Torino)*

An upgraded version of the SiTRA test infrastructure was used by the Torino team to calibrate their new 3D motorized and fully automatized 3D Table with very high precision movements in 3 directions, X,Y,Z. This Table is a new general facility that Torino developed for any requested use by Torino's teams.

*(Torino is an important sezione of INFN and contributes to LHC-CMS and ALICE-, as well as a number of other experiments in particle, nuclear and astroparticle physics, with important participation to detector R&D and construction.)*

At the same time it allowed testing the performances of new HPK microstrip sensors especially treated for the alignment.

***See two next slides***

Participants to this test beam:

D. Gamba, G. Alampi, G. Cotto, P Mereu (Torino INFN and University)

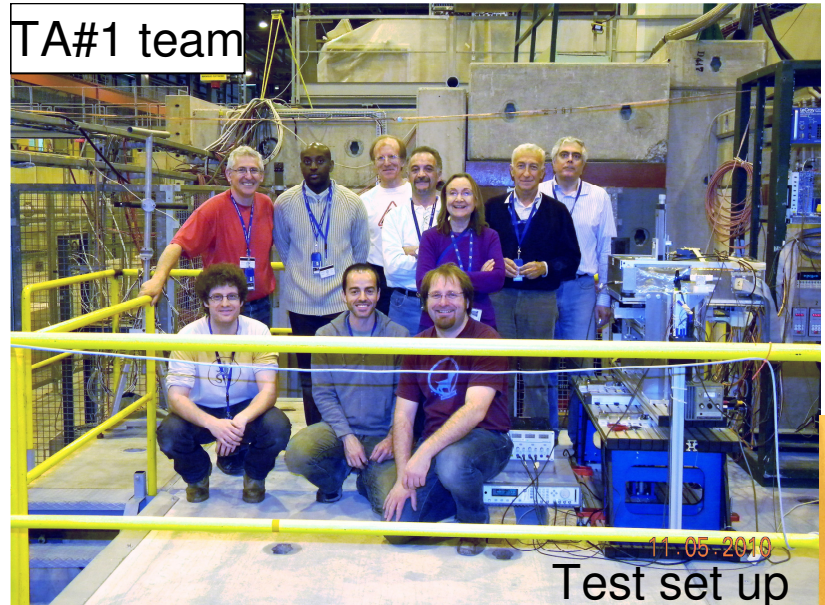
A. Charpy, J. David, M. Dhellot, P. Ghislain, F. Kapusta, A. Savoy-Navarro (LPNHE)

M. Fernandez-Garcia (IFCA)

Contribution from Z. Dolezal for the Telescope PMs.

Test beam at SPS CERN: May 10-17 with proton beam of 120 GeV.

***EUDET-memo in preparation***

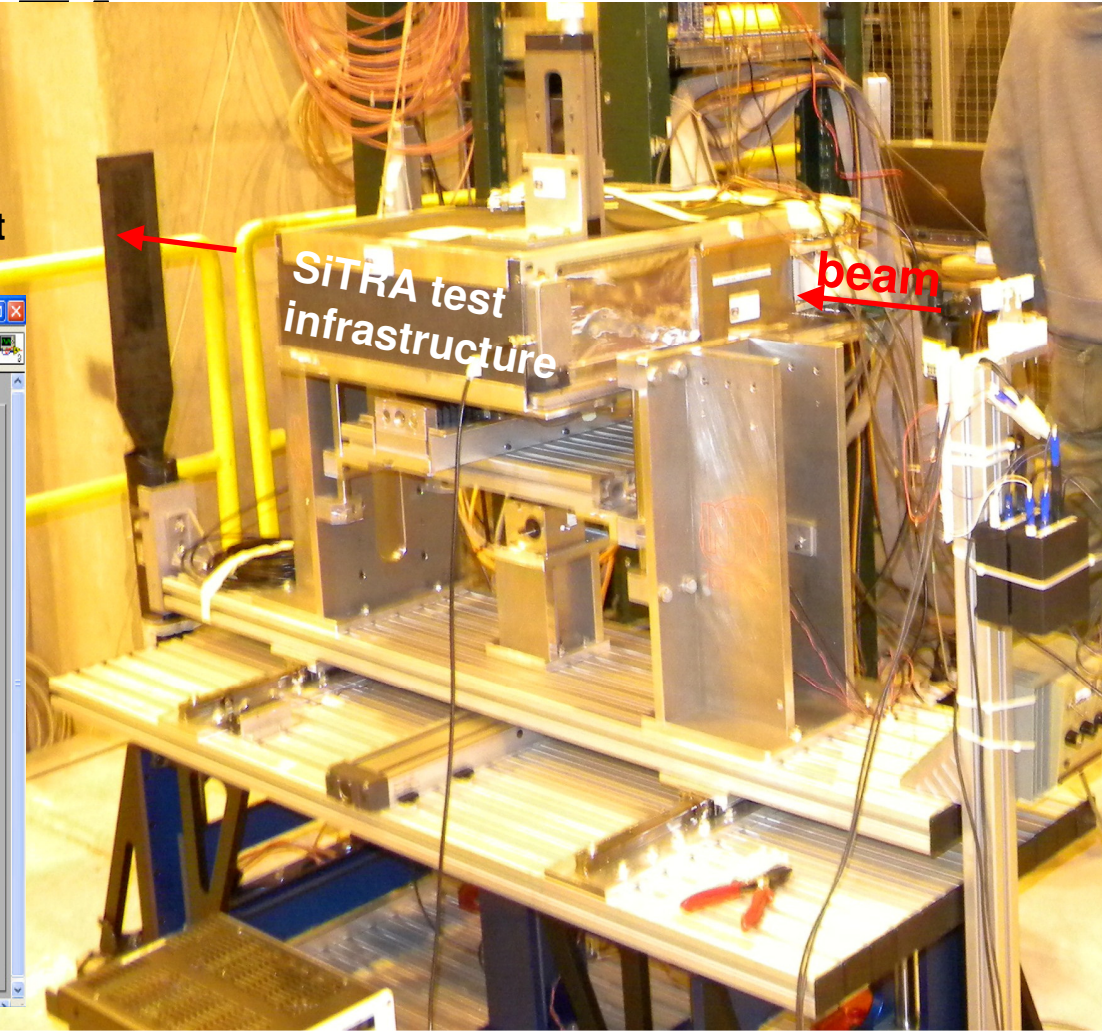
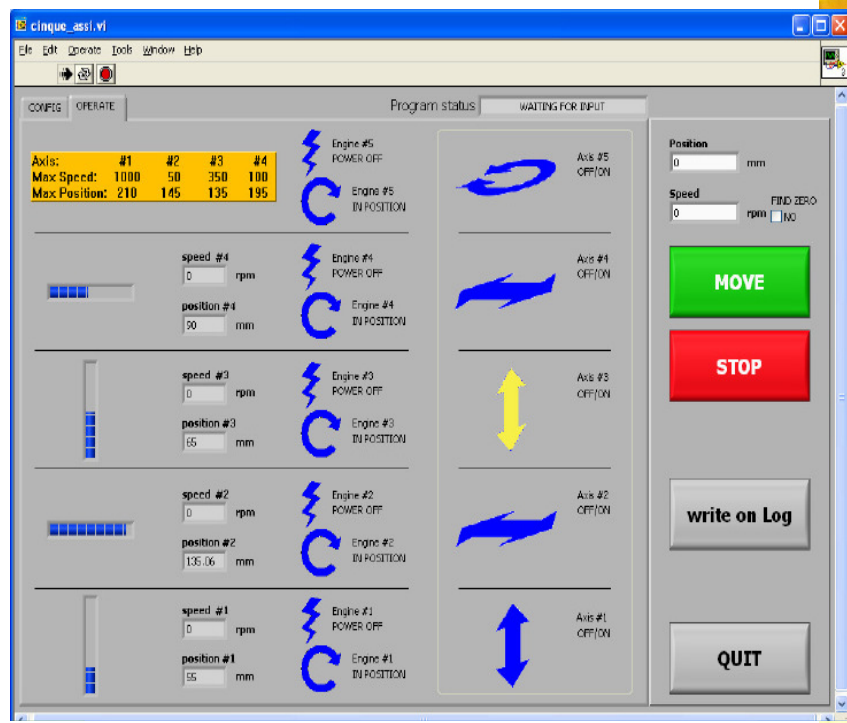


TA#1 team

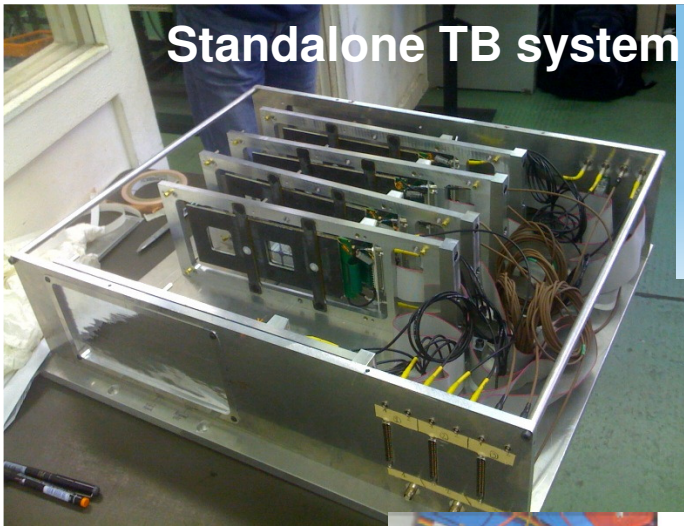
Test set up

- 5 motorized & controlled movements: 4 linear+1 rotation
- 2 movements for positioning test bench; 3 for a 3D scan of the DUT
- Main feature: highly precise position repeatability: with Linear mvt < 0.1mm and rot < 0.01 degree (tested by TB)
- Control & monitor via serial line by LabView and through Ethernet to DAQ thus recording DUT positions/each run.

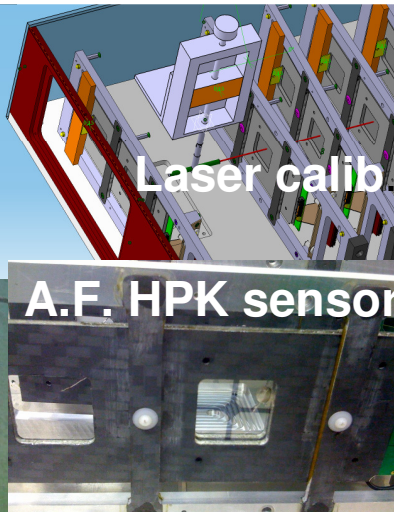
LabView based GUI allowing the adjustment of 4 movements available with this 4D Table





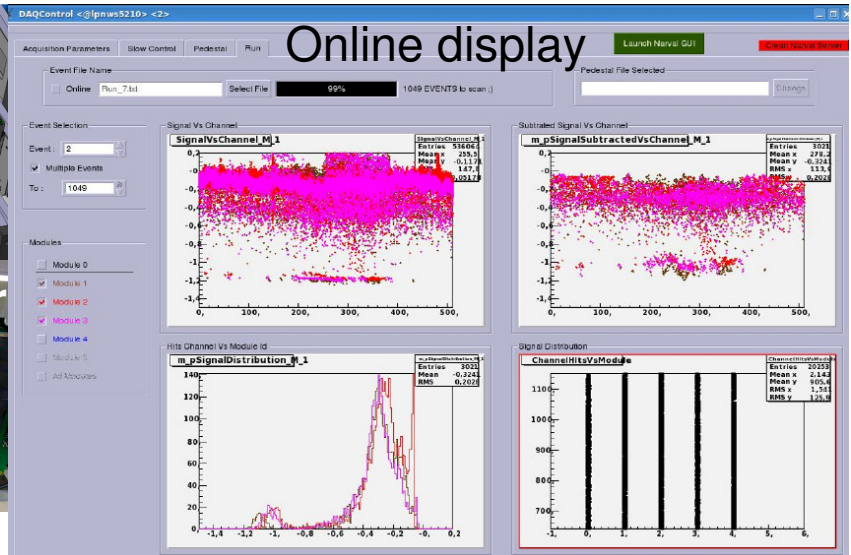


Standalone TB system

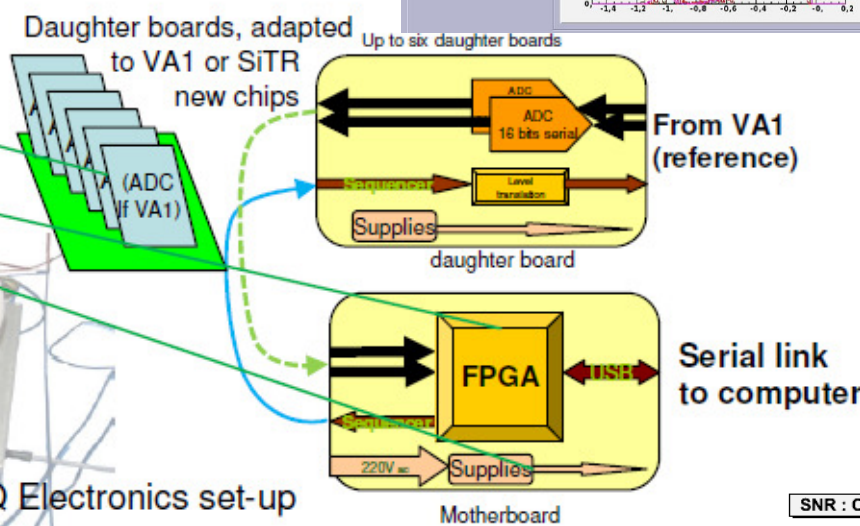
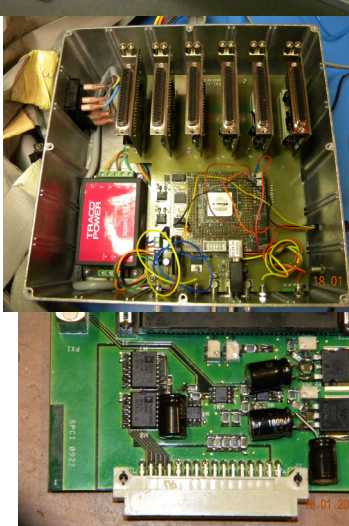


Laser calib

A.F. HPK sensor



Online display

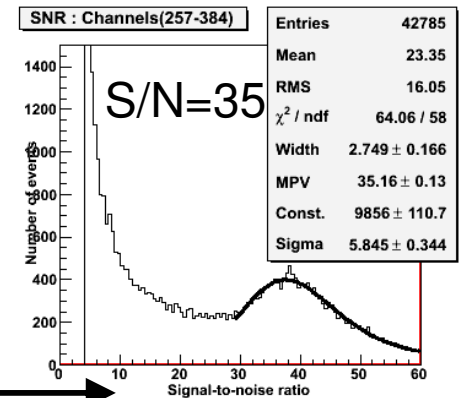
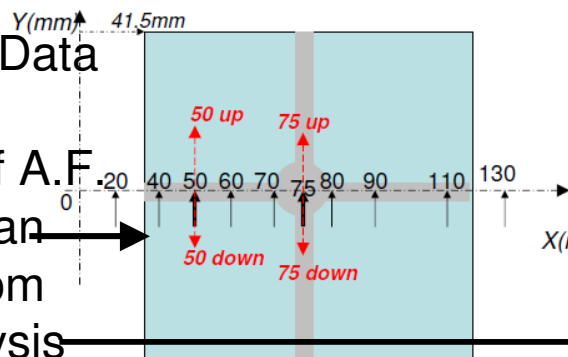


DAQ Electronics set-up

Standalone  
SiTRA test  
Infrastructure:  
DUT, DAQ  
(hardw/softw)  
Data taken  
Analysis results

run	jour	heurs	Moteur 1	Moteur 2	Moteur 3	Moteur 4	nb evts	plot	file size
Run 1.bt	Thu 13 May 10	19:36	55	102	55	60	5088	Run1Plot.jpg	195M
Run 2.bt	Thu 13 May 10	21:17	55	102	50	60	2004	Run2Plot.jpg	89M
Run 3.bt	Thu 13 May 10	22:04	55	102	45	60	annule	89M	108M
Run 4.bt	Thu 13 May 10	22:17	55	102	40	60			
Run 5.bt	Thu 13 May 10	22:52	55	102	40	60			
Run 6.bt	Thu 13 May 10	23:45	55	135	40	60			
Run 7.bt	Thu 13 May 10	?	55	135	variable	60		Run7Plot.jpg	62M
Run 8.bt	Thu 13 May 10	?	55	135	70	60			
Run 9.bt	Thu 13 May 10	?	55	135	70	60	80000 (?)		1400M
Run 10.bt	Fri 14 May 10	08:46	55	135	70	60	1039		38M
Run 11.bt	Fri 14 May 10	09:10	55	135	70	100	1034		38M
Run 12.bt	Fri 14 May 10	09:25	55	135	70	120	1047	Run11Plot.jpg	39M
Run 13.bt	Fri 14 May 10	09:44	55	135	70	130	1025	Run12Plot.jpg	45M
Run 14.bt	Fri 14 May 10	10:04	55	135	70	20	961	Run13Plot.jpg	42M
Run 15.bt	Fri 14 May 10	10:18	55	135	70	30	1013		45M
Run 16.bt	Fri 14 May 10	10:50	55	135	70	50			956M
Run 17.bt	Fri 14 May 10	10:50	55	135	70	60			791M
Run 18.bt	Fri 14 May 10	16:55	55	135	70	75			948M
Run 19.bt	Fri 14 May 10	20:13	55	135	70	80			951M
Run 20.bt	Fri 14 May 10	23:30	55	135	70	75	57408		2800M
Run 21.bt	Sat 15 May 10	08:25	55	135	70	90	20046		950M
Run 22.bt	Sat 15 May 10	12:38	55	135	70	110	20038		950M
Run 23.bt	Sat 15 May 10	16:01	55	135	85	90	19997		948M
Run 24.bt	Sat 15 May 10	19:44	55	135	75	50			950M
Run 25.bt	Sun 16 May 10	00:17	55	135	85	75			950M
Run 26.bt	Sun 16 May 10	04:45	55	135	75	75	19999		950M
Run 27.bt	Sun 16 May 10	09:00	55	135	70	60			

- Recorded Data
- Logbook
- Schema of A.F. sensor scan
- Results from data analysis



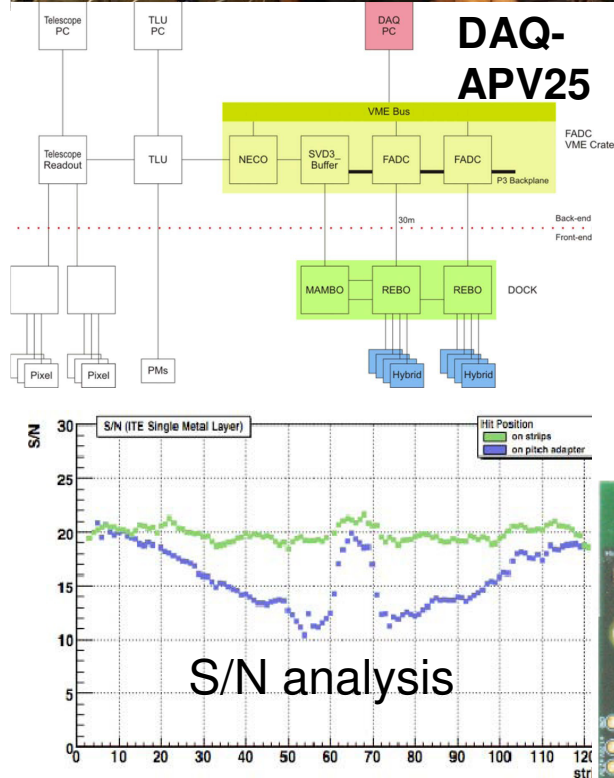
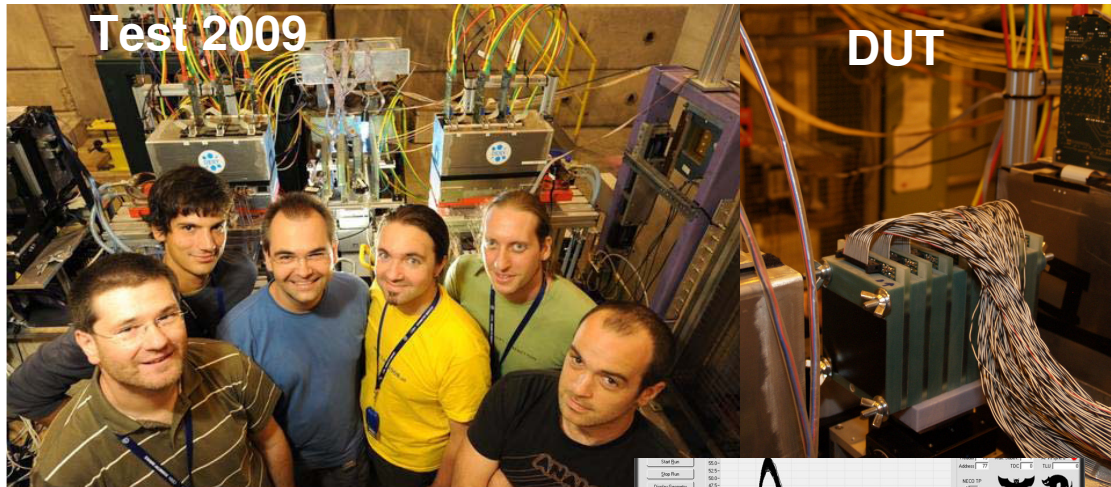


# ➤ Transnational Activity #2: Test beam at CERN led by T. Bergauer(HEPHY)

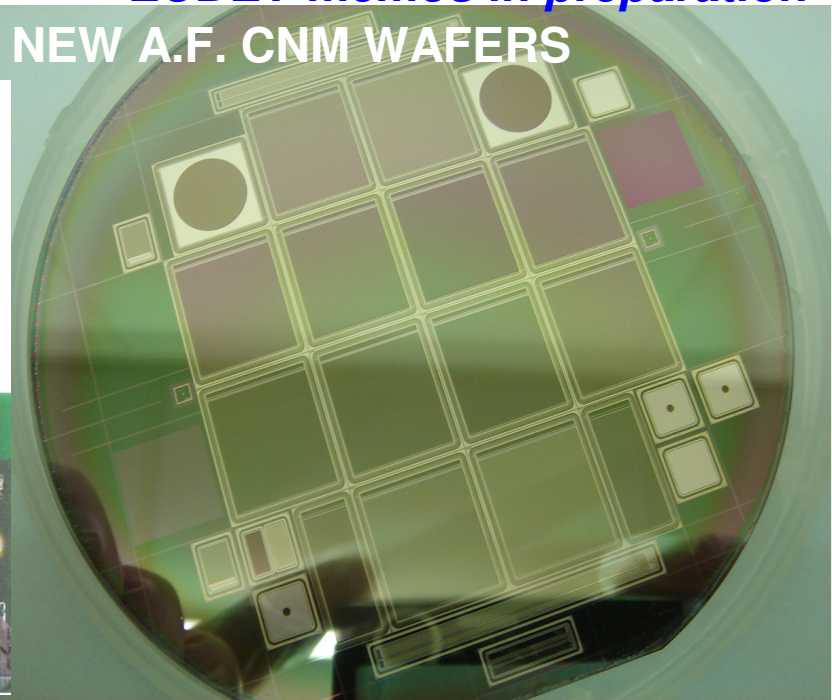
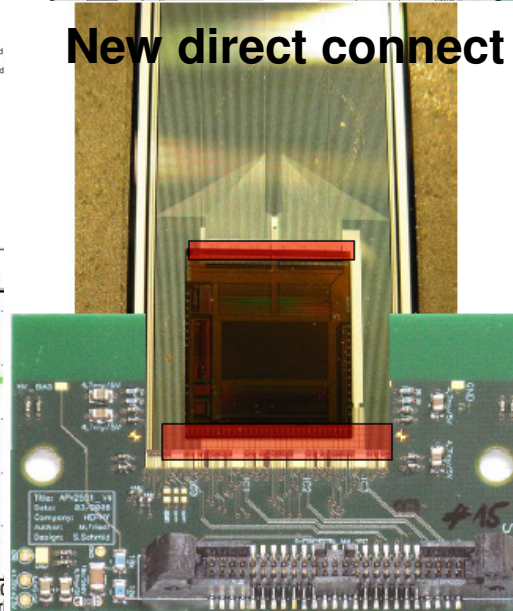
Another test beam infrastructure (similar to 2008-2009) will be used to test:  
 New sensors FE chip direct connexions  
 And  
 New A.F. sensors developed by CNM-IMB and IFCA in the framework of EUDET & SiLC.  
 2 weeks: end Sept/Beg. Oct.

**EUDET-memos in preparation**

**NEW A.F. CNM WAFERS**



**New direct connect**





# ➤ Transnational Activity #3: Test Beam at CERN Nov. 8-15, IRST+VTT

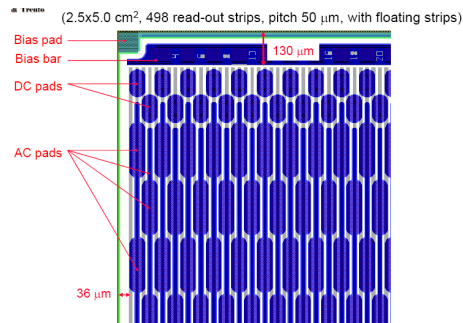
With the Standalone TB system (see TA#1):

*Test of a series of different novel strip sensor technologies as developed by IRST and VTT and based on different technologies (SOI-like for VTT, 3D type for IRST)*

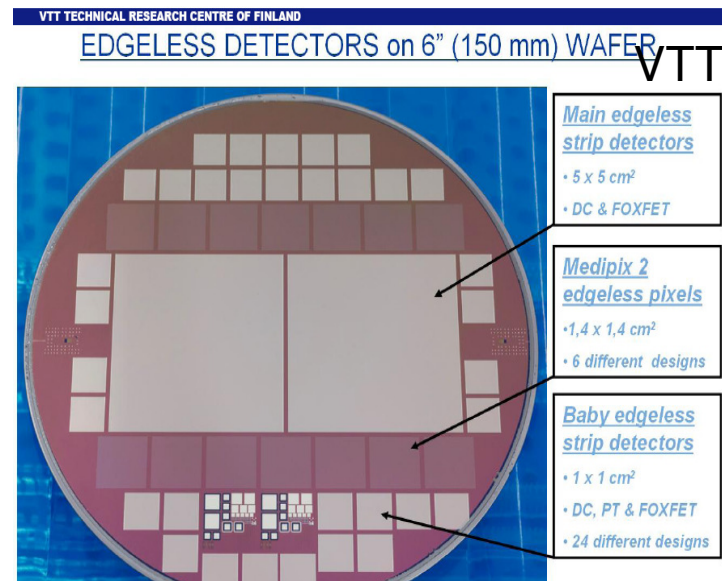
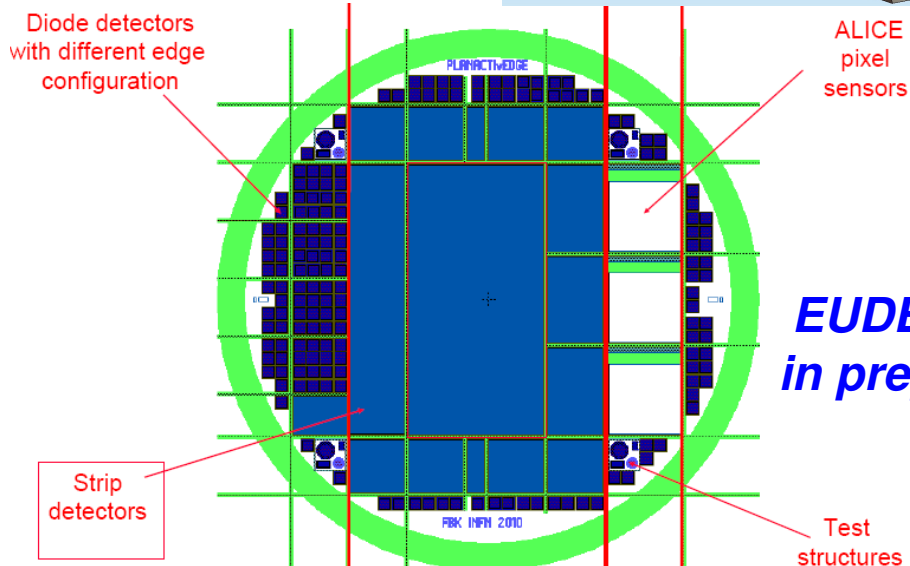
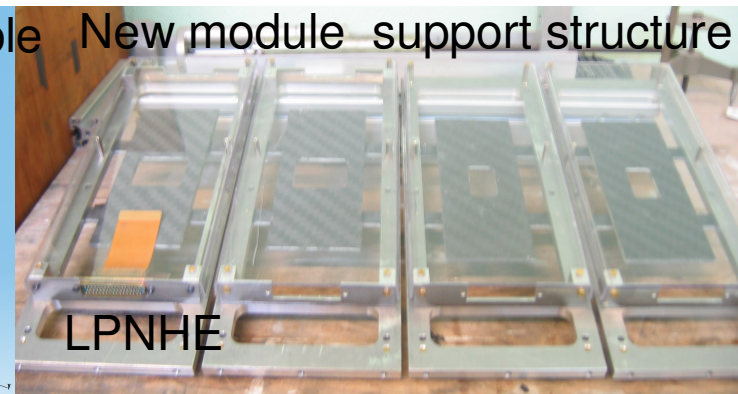
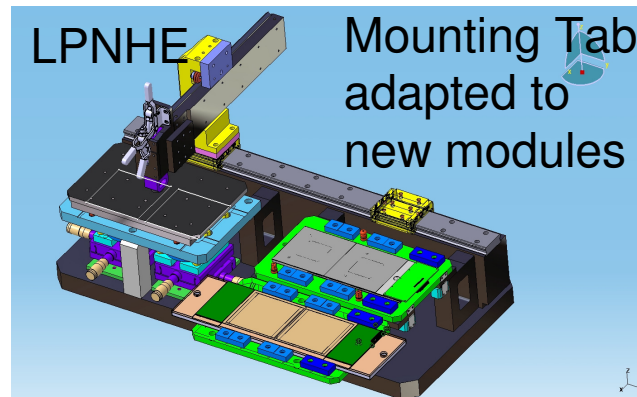
These new microstrip sensors prototypes are 5x5 cm<sup>2</sup>, thinner, active edge, 50µm pitch

The new modules are being built by LPNHE and CERN (bonding Lab)

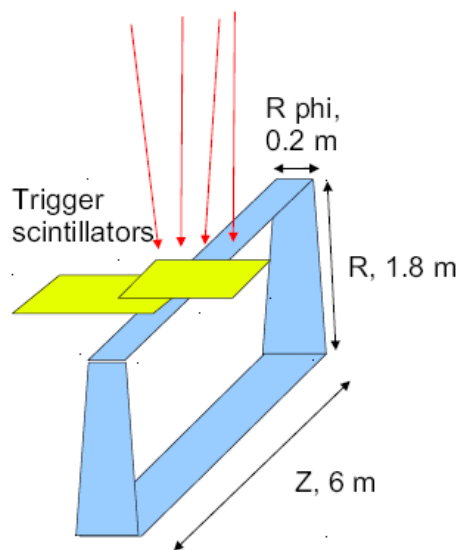
(Possibly also test of new DSSD from HPK)



IRST/trento



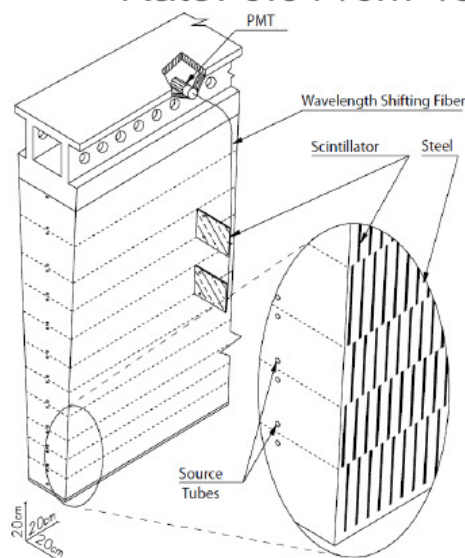
# TA#4: Cosmic test with ATLAS tile starting 2010



- ATLAS Hadronic Calorimeter Tilecal
- Sandwich of iron and scintillator
- Segmentation period
  - Iron: 5+4+5 mm
  - Scintillator 3 mm

Interest:

- Measure z coordinate of the impact point and phi
- Precision:
  - z: < 1 mm
  - Phi: < 2 mrad
- Area:
  - ~100 mm z
  - ~200 mm R x phi
- Rate: 0.01 /cm<sup>2</sup> /s



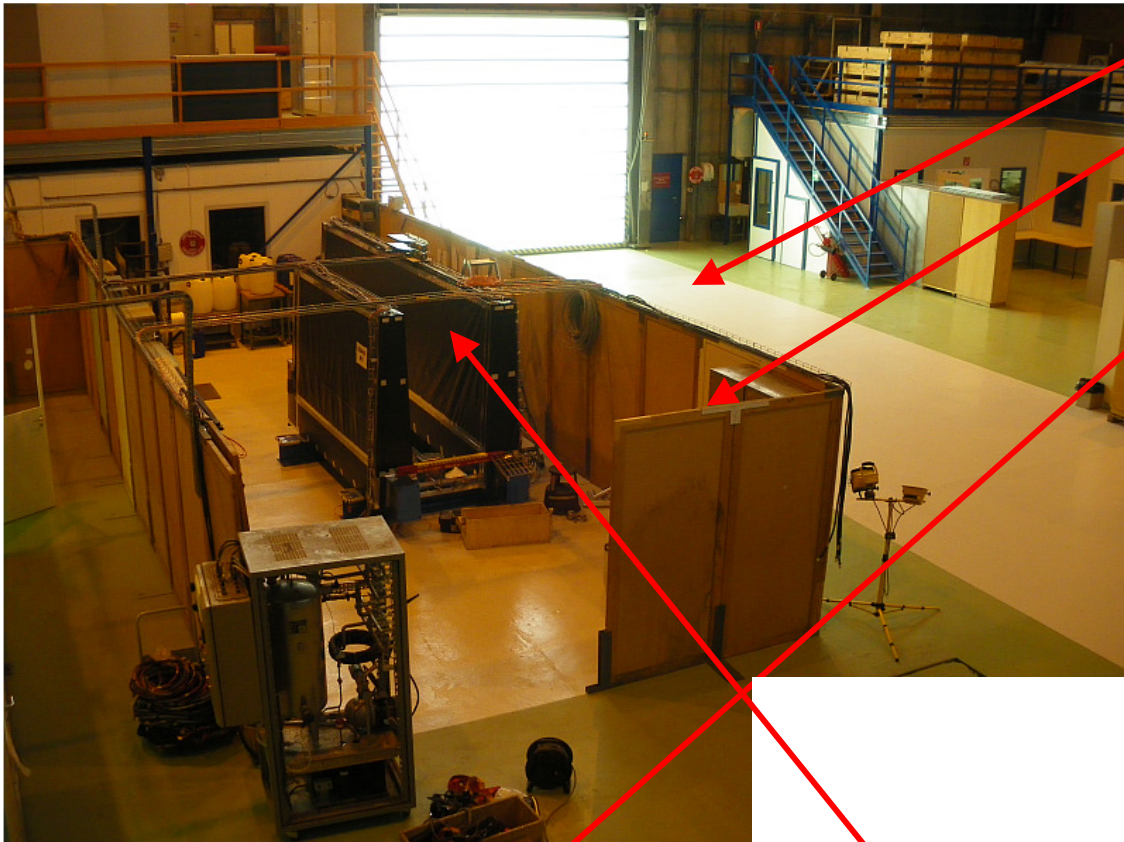
TA effort led by S. Nemecek  
Academy of Sciences, Prague (CZ)  
Collaboration: CU-Prague, LPNHE

## Silicon test infrastructure

- 2 Silicon modules
- Modules currently used as 1<sup>st</sup>
- Telescope (XxY)
- RO pitch: 100 μm
- FEE and DAQ of test infrastructure OK to be associated to the ATLAS Tile cosmic ray test set-up
- DAQ synchronized with common trigger busy signals (at rate ~ 1 Hz/wafer)

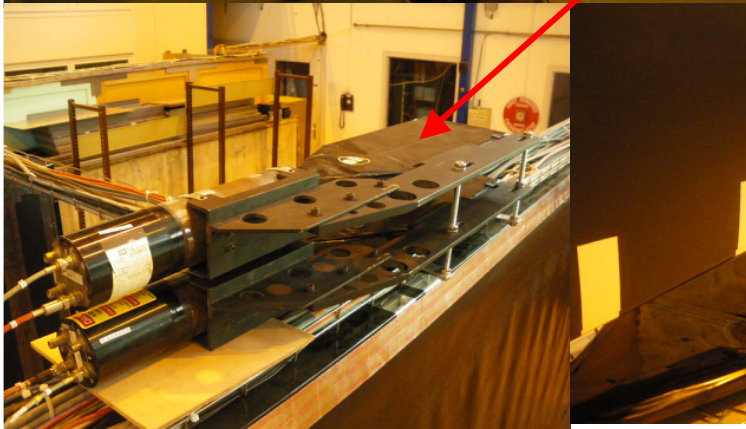
*EUDET-memo in preparation*



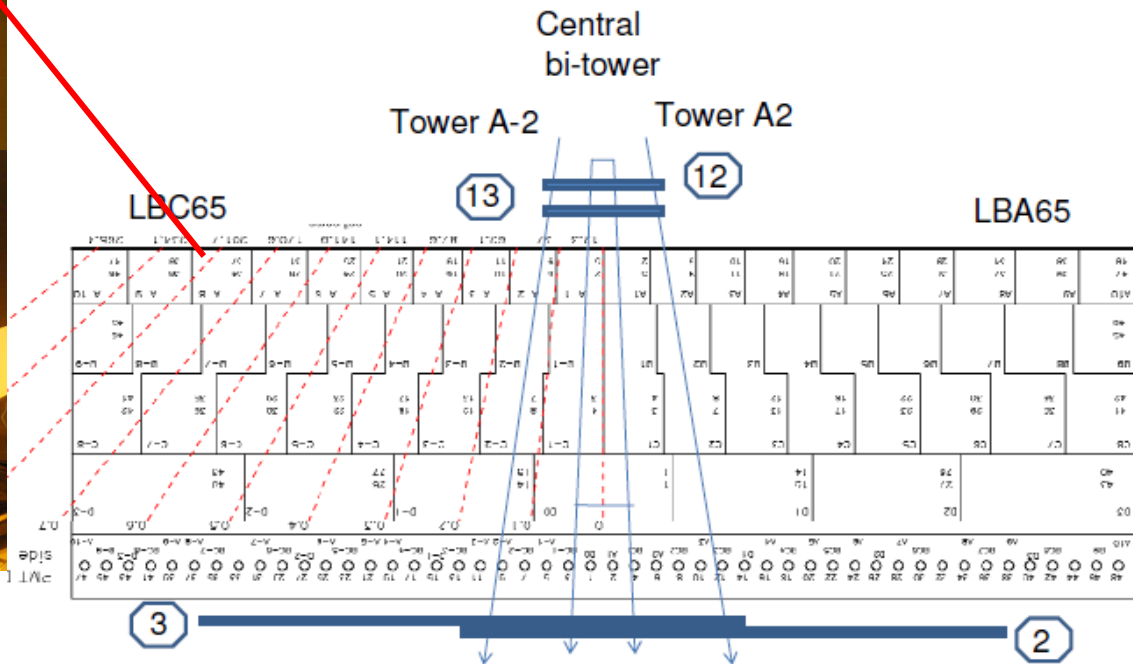


- Floors painted
- Cesium zone enlargement is in progress
- Cosmic ray trigger
  - Installed top/bottom scintillator pairs for long barrel module

***This test set-up will be pursued these next coming years***



ATLAS-TILE test set-up at CERN



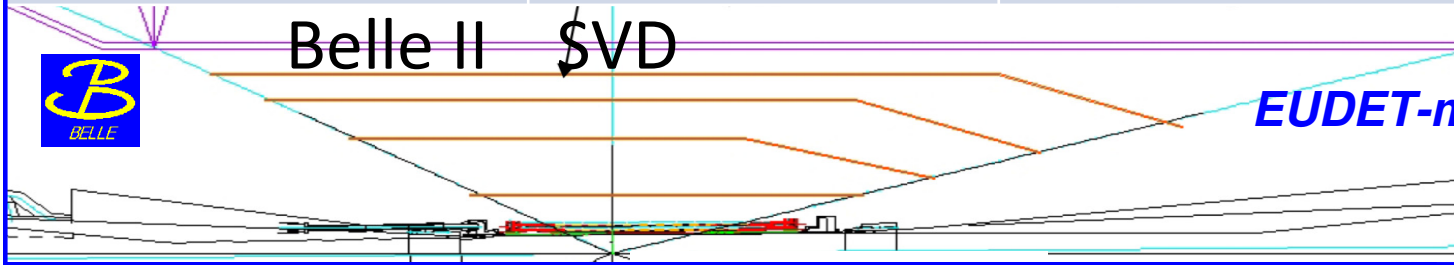
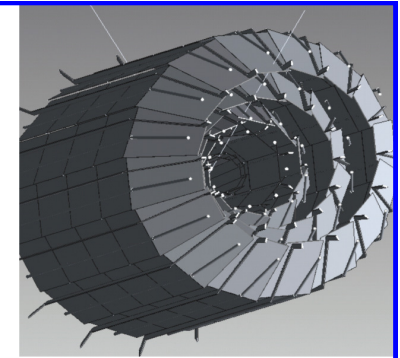
# Outcomes and future prospects

In the next years:

- ATLAS TILE cosmic test at CERN
- BELLE II at KEK
- G-2-EDM at J-PARC/KEK
- All what has been developed will be instrumental for developing the R&D on Silicon Tracking (SiLC) for the future LC, including AIDA project, and impact on new collaborative efforts with various new experiments including LHC (and LHC upgrades).



BELLE II	Belle SVD	Belle upgrade SVD
Vertex detector (radius, cm)	4 layer DSSD (2.0<R<10.0)	2 layer DEPFET (1.8<R<2.2) 4 layer DSSD (4<R<14)
Readout / shaping time	VA1TA / 0.8 $\mu$ sec	APV25 / 0.05 $\mu$ sec
Silicon area (m <sup>2</sup> )	0.6	1.2



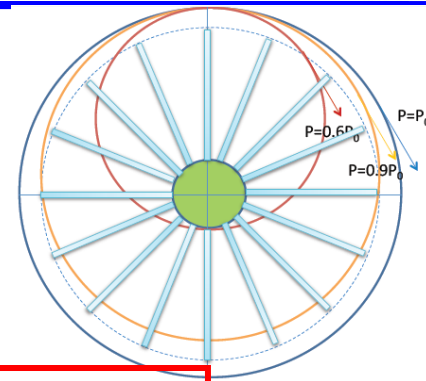
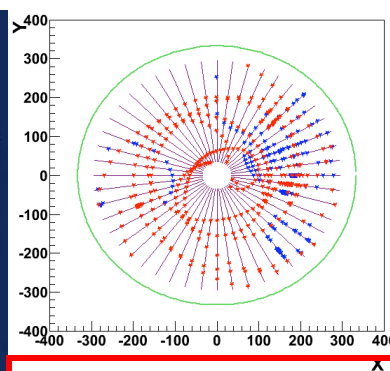
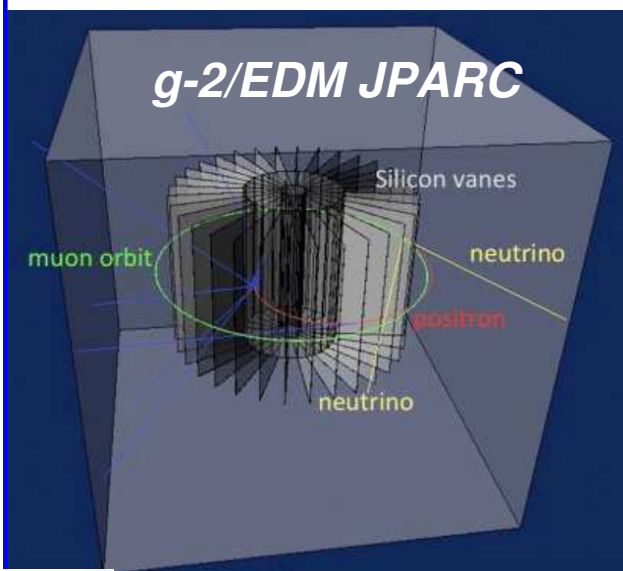
*EUDET-memo in preparation*

2009/8: HPK starts 6" DSSD production line

2009/9: 6" design submitted to HPK

2010/3: Prototype sensors from pilot batch by KEK

Tested @SPS-CERN



- Collaboration:
- ❖ Test beam infrastructure => tests
  - ❖ FEE
  - ❖ Alignment system
  - ❖ Direct connect FEE/strips



**New 6" DSSD HPK**



*EUDET-memo in preparation*

**Will be pursued these next years**

# Talks, publications, Workshops in 2010

- Two NIMA articles to be published in 2010:
  - Development of Semi-Conductor Tracking: The future Linear Collider Case by A.Savoy-Navarro.
  - A 130nm CMOS mixed mode FE readout chip for Si strip tracking at the Future LC by T.H. Pham et al.,
- Presentations at workshops and conferences in 2010 (LCWS10, LCWorkshop-CERN, ...) more before the end of the year.
- Presentations at Collaboration meetings:ILD (Jan, June and Oct. 2010), BELLE II, g-2-JPARC
- Presentations at the Xth SiLC meeting in Paris (Jan. 2010)
- Several EUDET memos as results of the TA activities and related R&D developments (see previous slides)
- More to come...

A complete summary over the 5 years of the project on all the publications and talks will be provided for the final report.