SiTRA multipurpose and standalone test infrastructure

EUDET Meeting

September 29, 2010,

Jacques David

On behalf of the LPNHE-LC team

Test beam Infrastructure

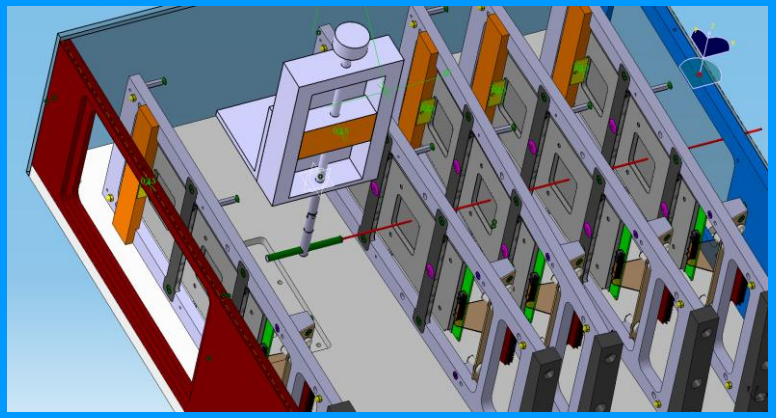
- Major deliverable for EUDET
- Several versions have been developed
- A new version was developed in 2009 and used since May 2010. It is multipurpose & ***standalone, i.e. includes***

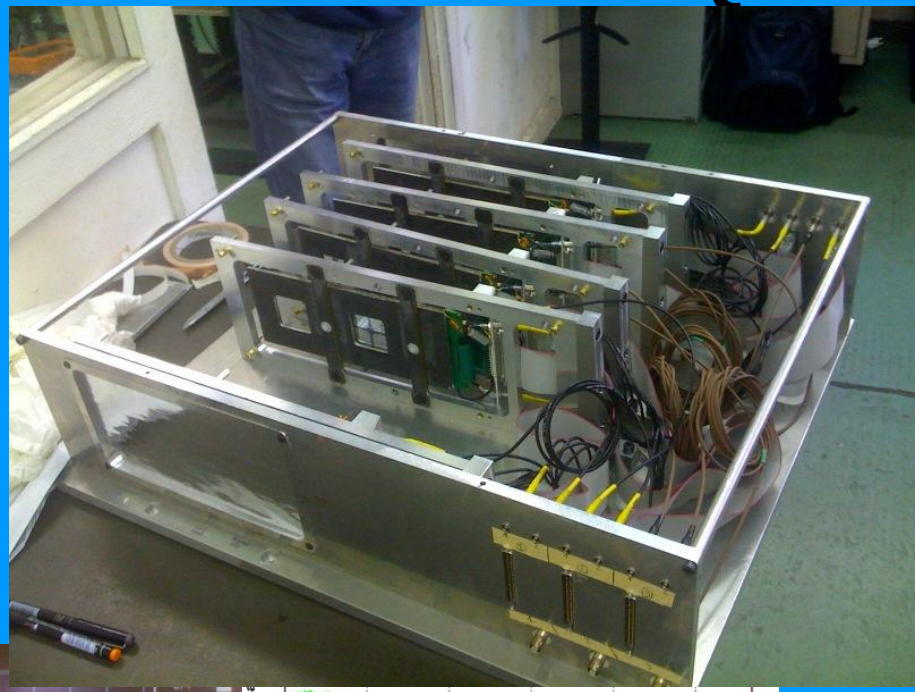
  => a mechanical infrastructure with Faraday cage, cooling, alignment (including IR laser system), the possibility to host its own telescope system and several layers of Si modules.

  => a dedicated DAQ hardware and software system easy to interface to any other DAQ was developed based on VHDL + C++ & ROOT for the software and a DAQ hardware that is adapted for the reference FE readout (VA1') or the new developed SiTR_130 chips.
- It multipurpose as it can be adapted to test any type of new sensors and/or FE readout chip.
- It can be used in Lab test bench or at test beam

Stand-alone & portable test bench for multiple applications + associate DAQ

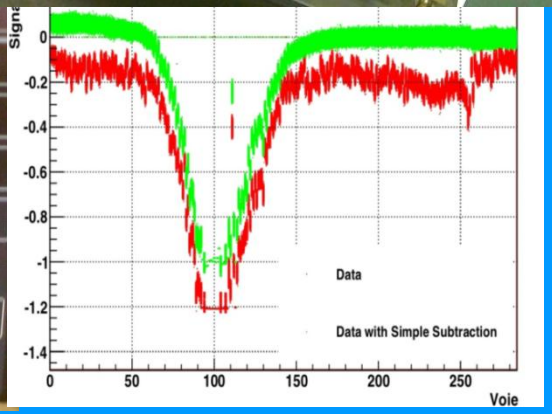
Ex: test of alignment system





Tests of alignment system based on AF HPK sensors

Alignement test with IR laser



Reconstruct signal

Mechanical conception of modules

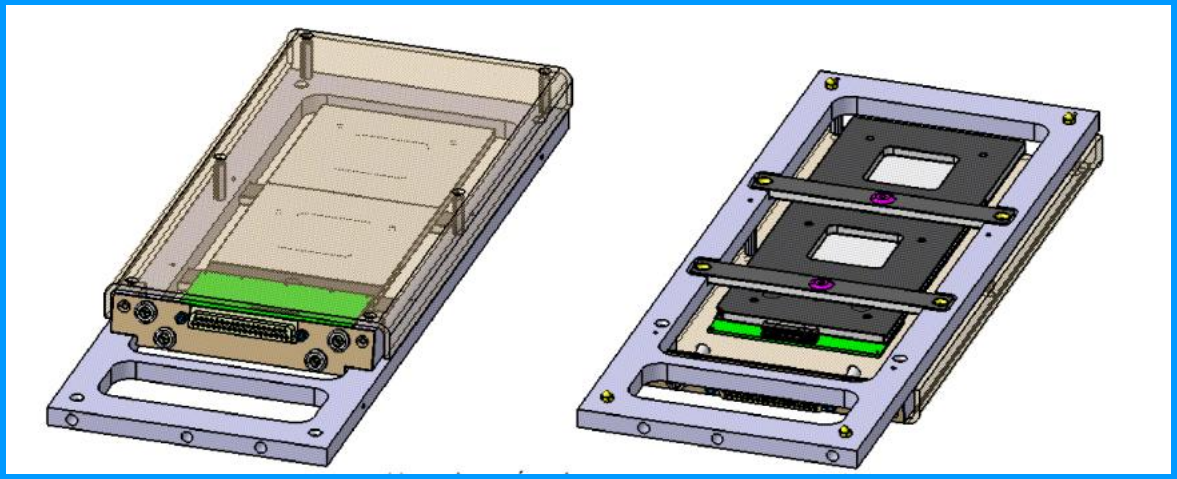
Module equipped with one or more sensors

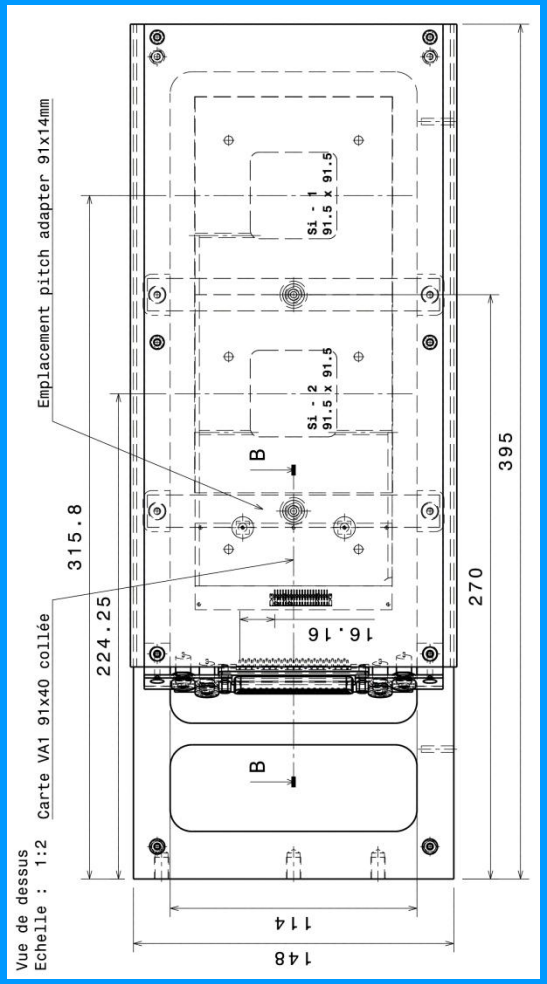
Hybrid card (for now) ensure a kind of flexibility for connection to front end electronics (related to used ASIC)

Constraints linked to “bonding” between same module sensors and pitch adapter (now in CERN)

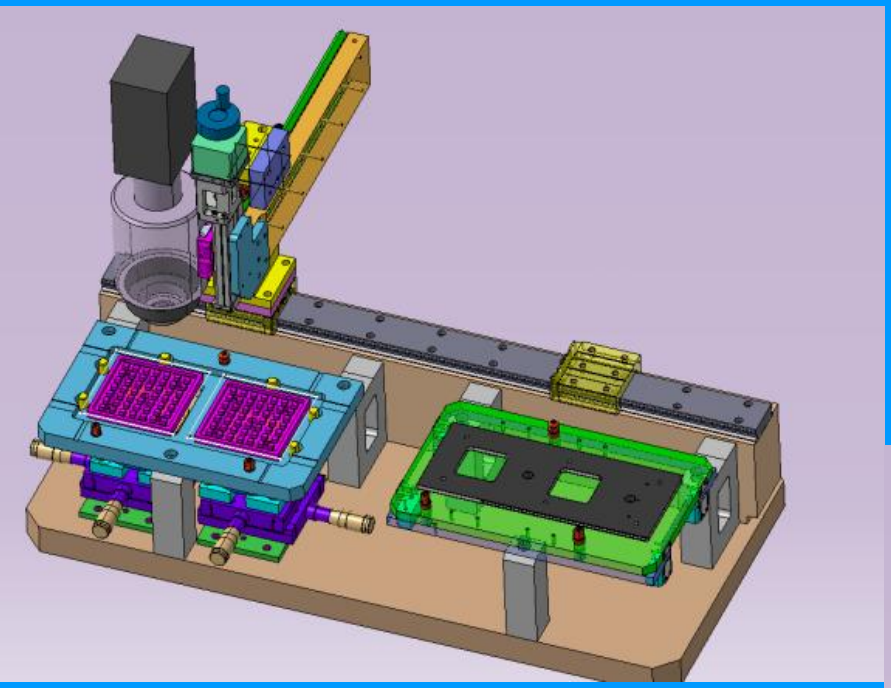
Choice of robust support structure to ease numerous manipulations when we test

Protection case for transportation or storage.

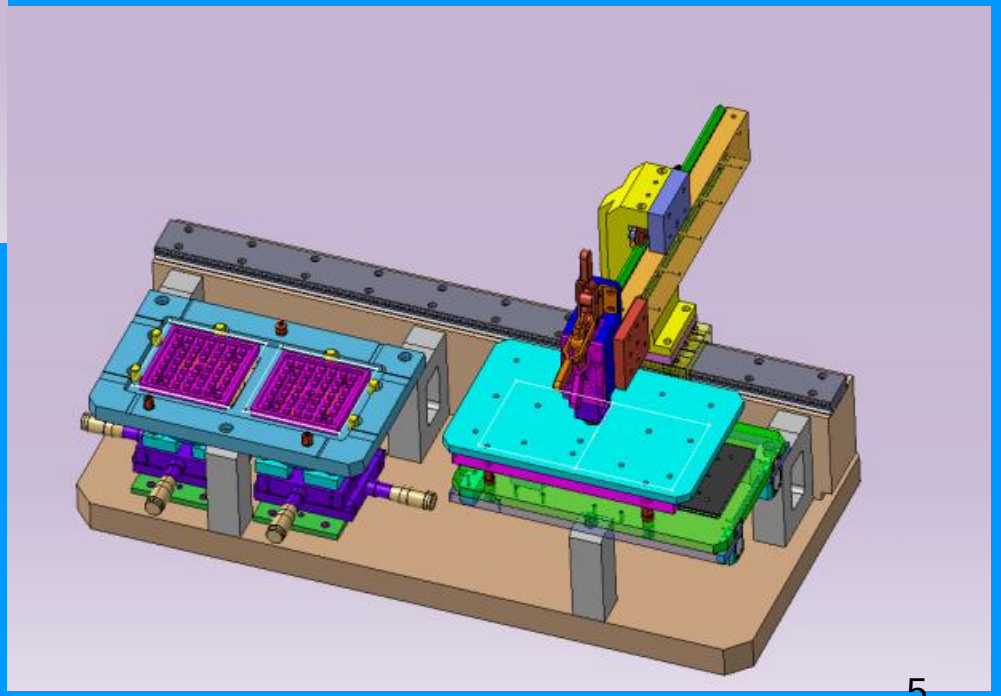




Mechanical conception of tools
Modules building

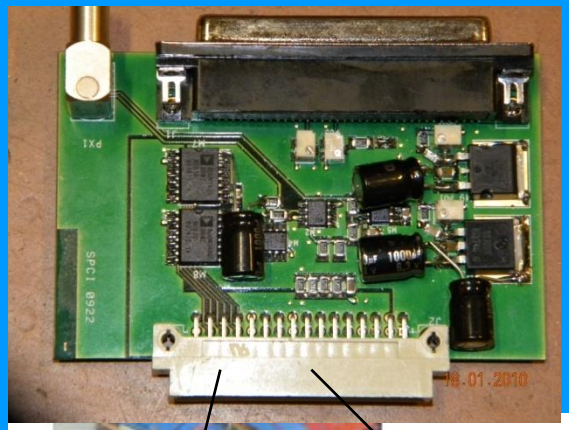


Alignment tool
Precision alignment between different parts of module:
Silicium sensors, pitch adapter, front-end electronics

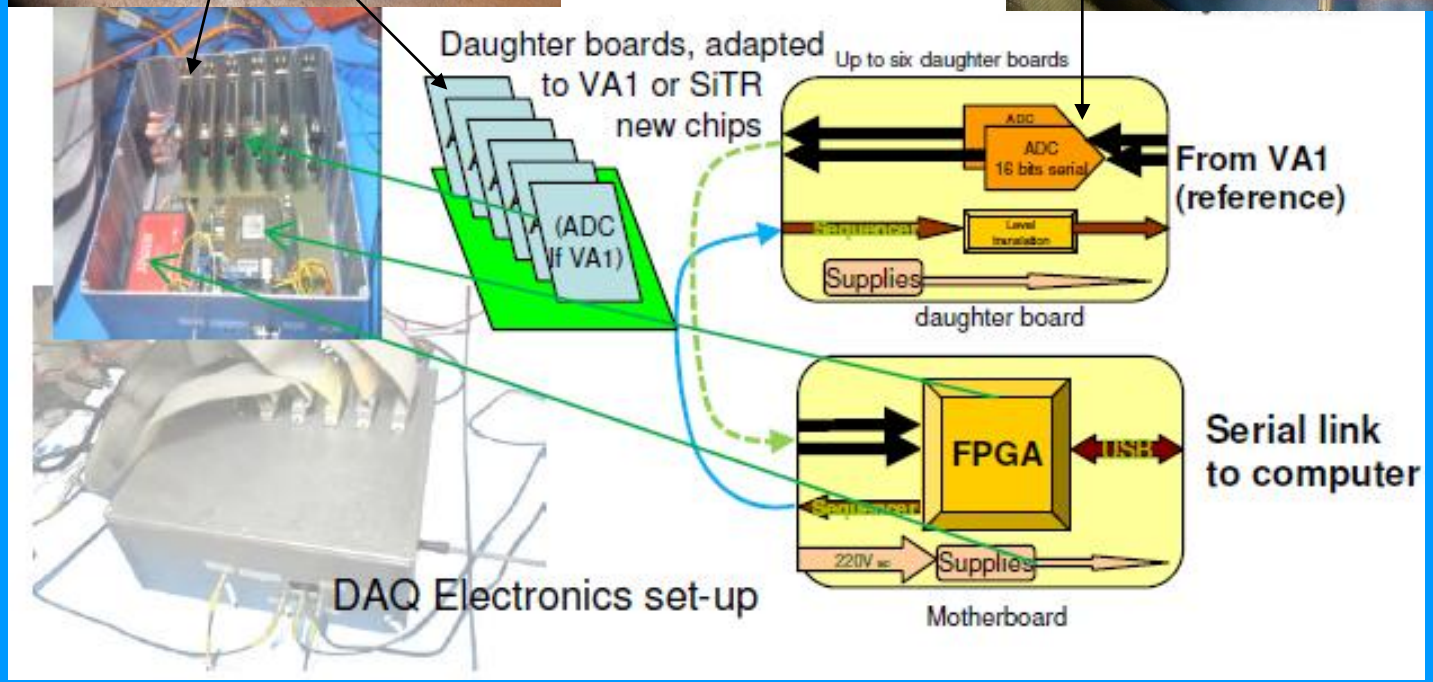


Gluing tool
Preservation of alignment
Integration of sensors on Carbone support

Standalone TB infrastructure: FE & DAQ Electronics



VA1' ASIC used as reference devices



DAQ Software

VHDL & ROOT
C++ based
Easy to combine to any other DAQ system

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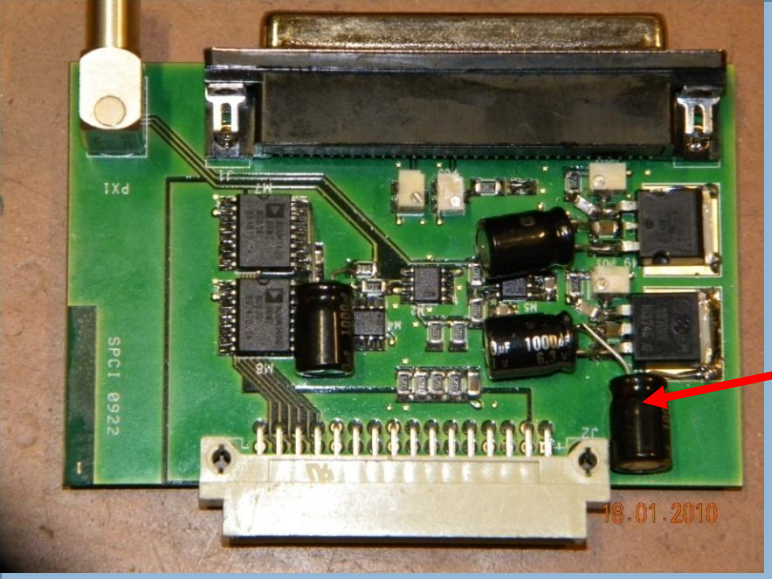
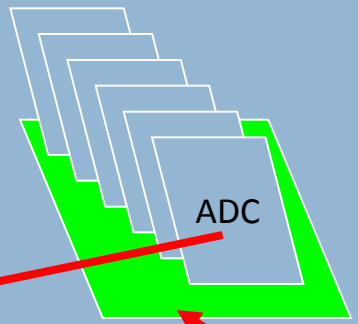
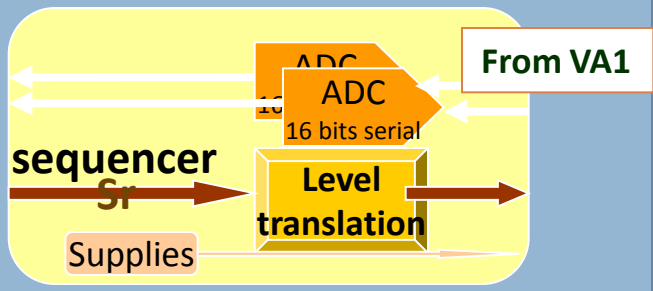
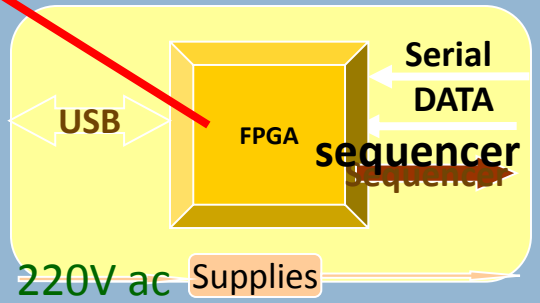
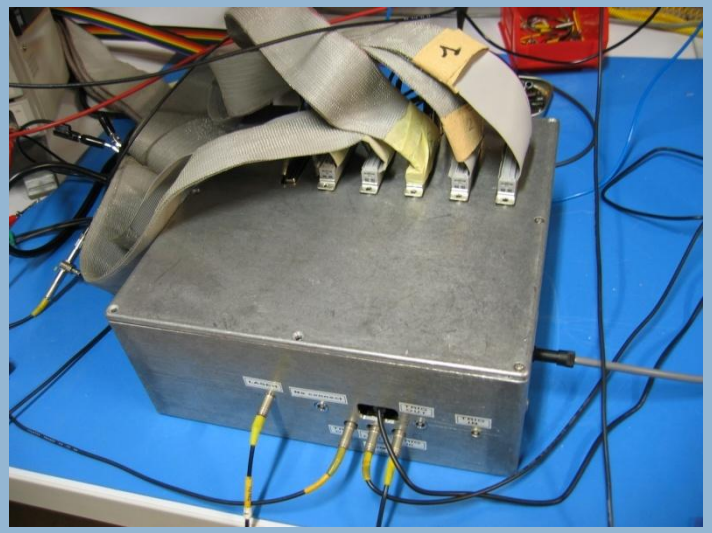


Up to 6 daughter boards for VA1’









A new DAQ electronics for VA1’ readout only

Only one USB link for the whole box

Under development

USB → TCP IP

26-February-2010 2010 SPS Fixed Target Programme

Version 1.0

Colour code: green = SPS-exp ; purple = LHC-exp ; dark blue = Outside exp ; yellow = not allocatable or Machine Development

	P1	P2	P3	P4	P5	P6
	35 29 Apr 3 Jun	35 3 Jun 8 Jul	35 8 Jul 12 Aug	35 12 Aug 16 Sep	35 16 Sep 21 Oct	32 21 Oct 22 Nov
T2 -H2	NA 3: 14 | NA61 TR 10	CMS PIX 14 | CMS CALO 14 | CMS HCALRO 7	4 | CMS HCALVF 7 | NA61 24	NA61 35	NA61 20 | NA61 15	4 | CREAM 7 | 4 | CMS SiBT 10 | 7
T2 -H4	NA 2: CMS ECAL 7 | LHCf 8 | NA63 9	PHOTAG 14 | CALICE MMEGAS 14 | RD51 7	CALICE GRPC 11 | CMS ECAL 10 | RD51 14	RD51 11 | ALICE EMCAL 7 | SCIFIX 9 | CALO 8	4 | CALET 10 | CMS ECAL 11 | RD51 10	4 | PEBS 7 | ALICE VHMPID 7 | ALICE SPD 7 | CMS ECAL 7
T4 -H6	NA 3: SiLCRO 7 | MEDIPIX 8 | SPIDER 6 | 3	4 | ATLAS BCM 7 | ATLAS 3DSI 7 | NA62_TB 14 | 3	CERF 11 | CMOSLC 7 | MMEGAS PIX 14 | 3	Diamond RD42 11 | ALFA FP BCM 14 | PEBS 7 | 3	4 | SPIDER 7 | SiLC EUDET 14 | MMEGAS PIX 10	4 | ATLAS IBL 14 | SiLCRO 7 | DEPFET 7
T4 -H8	NA 3: TOTEM 7 | LHCb 17	4 | TOTEM 7 | UA9 7 | 7 | ATLAS MDTMPI 10	4 | DREAM 14 | ATLAS MDTMPI 14 | 3	4 | LHCb 10 | DREAM 11 | UA9 10	UA9 18 | TOTEM 7 | ATLAS 3DSi 10	4 | ATLAS STGC 14 | ATLAS MDTROM 14
T4 -P0	NA 3: 24	35	35	35	35	32
T6 -M2	NA 3: COMPASS 24	COMPASS 35	COMPASS 35	COMPASS 35	COMPASS 35	COMPASS 32
CNGS	Setup 6 | CNGS 29	CNGS 35	CNGS 35	CNGS 35	CNGS 35	CNGS 32

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mobile: 164212 (ext. +41 76 487 4212)

Comments:

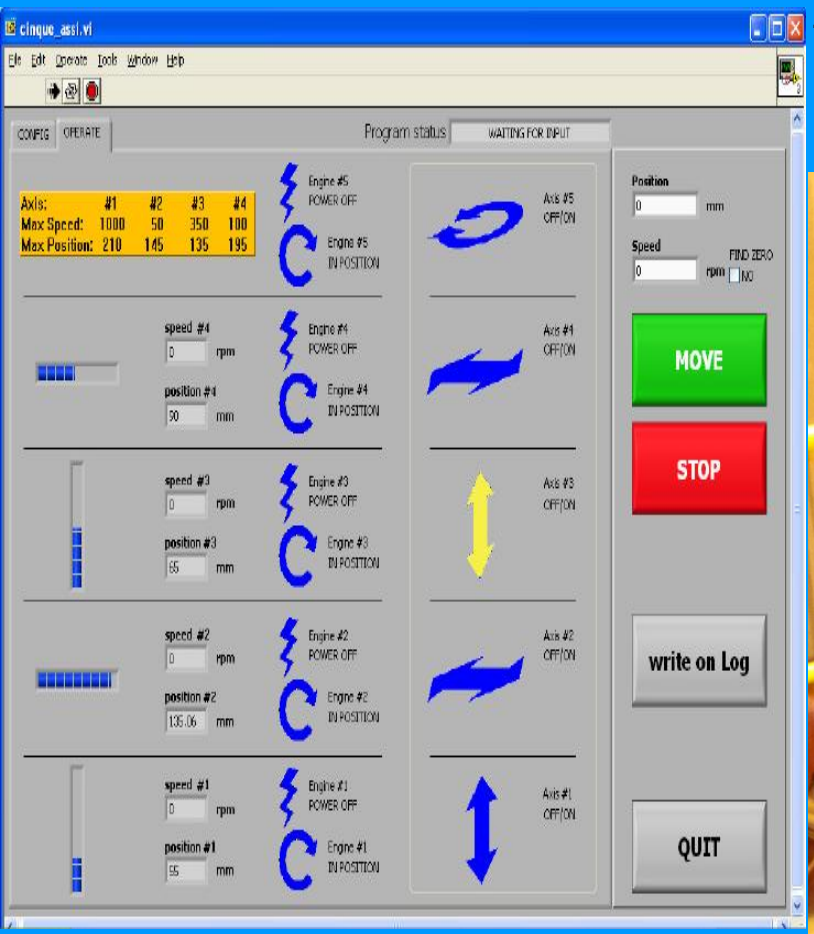
- no comments

Test beam at CERN-SPS H6, with 120 GeV proton beam

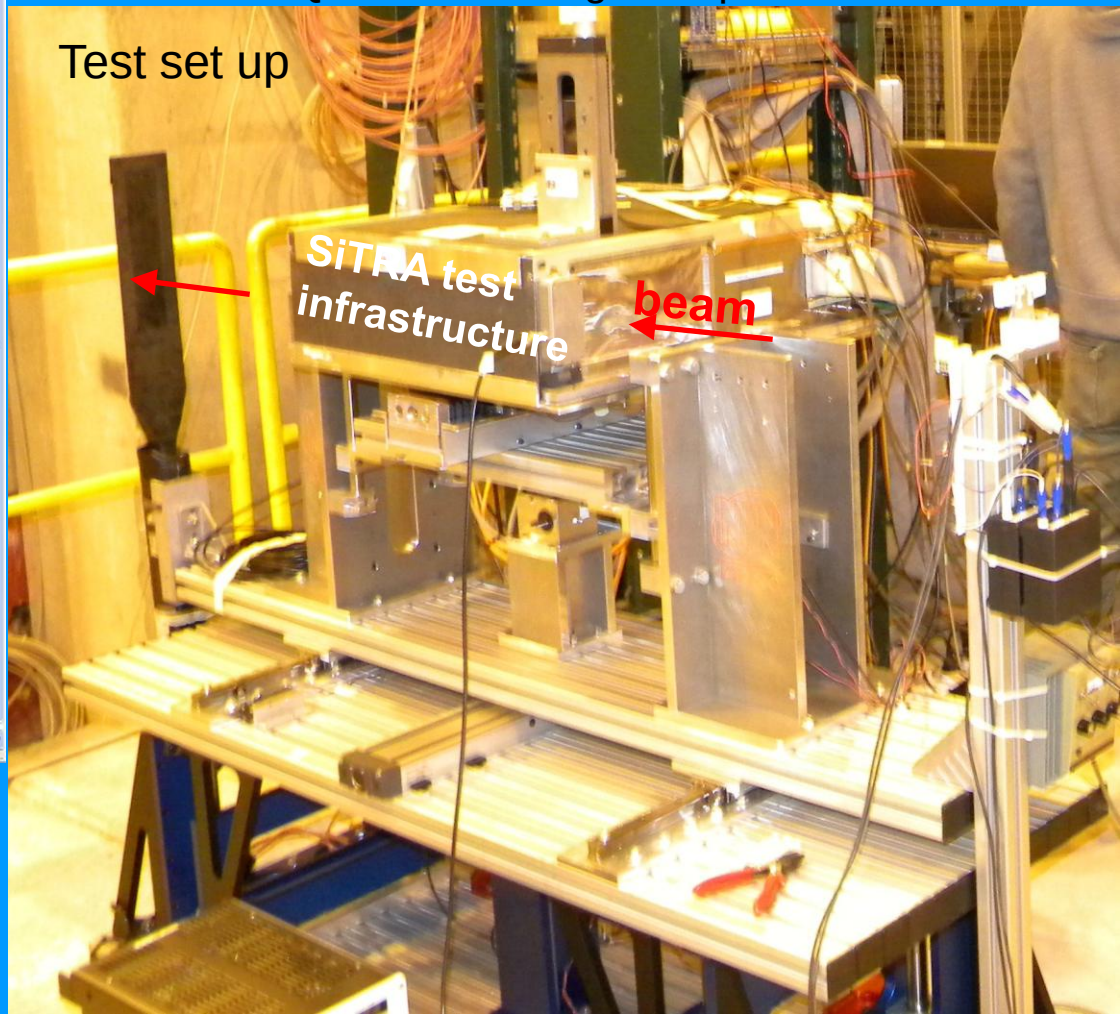
A. Charpy (LPNHE), M. Fernandez (IFCA), G. Alampi (Torino), J. David (LPNHE), M. Dhellot (LPNHE), P, Ghislain (LPNHE), A. Savoy-Navarro (LPNHE), D. Gamba (Torino), F. Kapusta (LPNHE), G. Cotto (Torino), P. Mereu (Torino), W. da Silva (LPNHE)

3D Table (Torino)

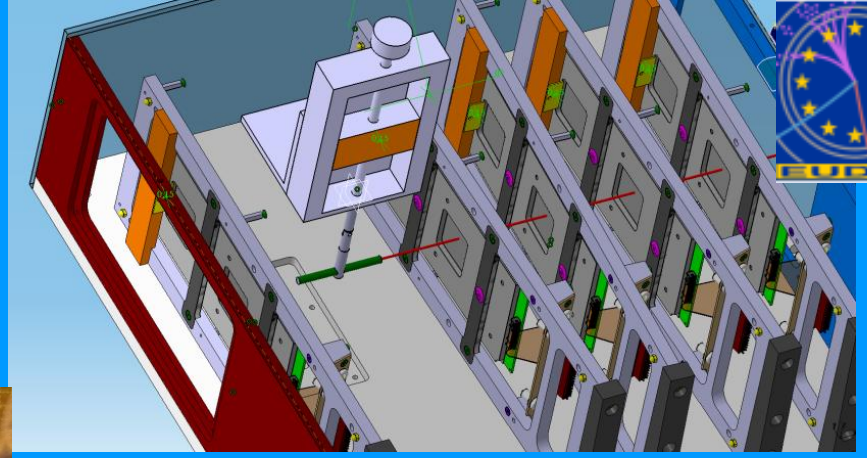
- 5 motorized & controlled movements:4 linear+1 rotation 2 movements for positioning test bench; 3 for a 3D scan of the DUT
- Main feature: highly precise position repeatability: with Linear mvt □ 0.1mm and rot□ 0.01 degree (tested by TB)
- Control & monitor via serial line by LabView and through Ethernet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

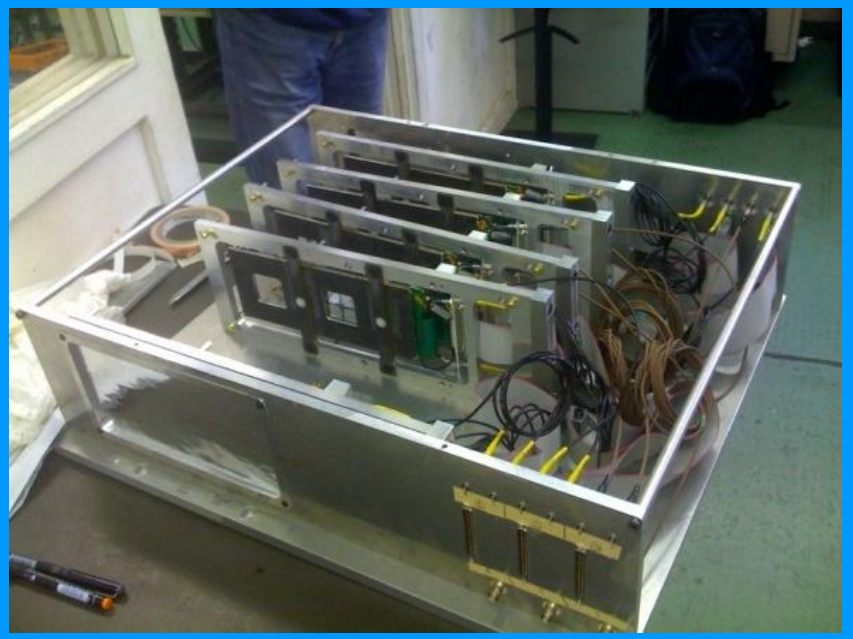


LabView based GUI allowing the adjustement of 4 movements available with this 4D Table



Standalone T.B. infrastructure





Test in May 2010 at SPS-CERN (alignment sensors and New 3D Table made by Torino

SPS May 2010 T.B.:Online plots

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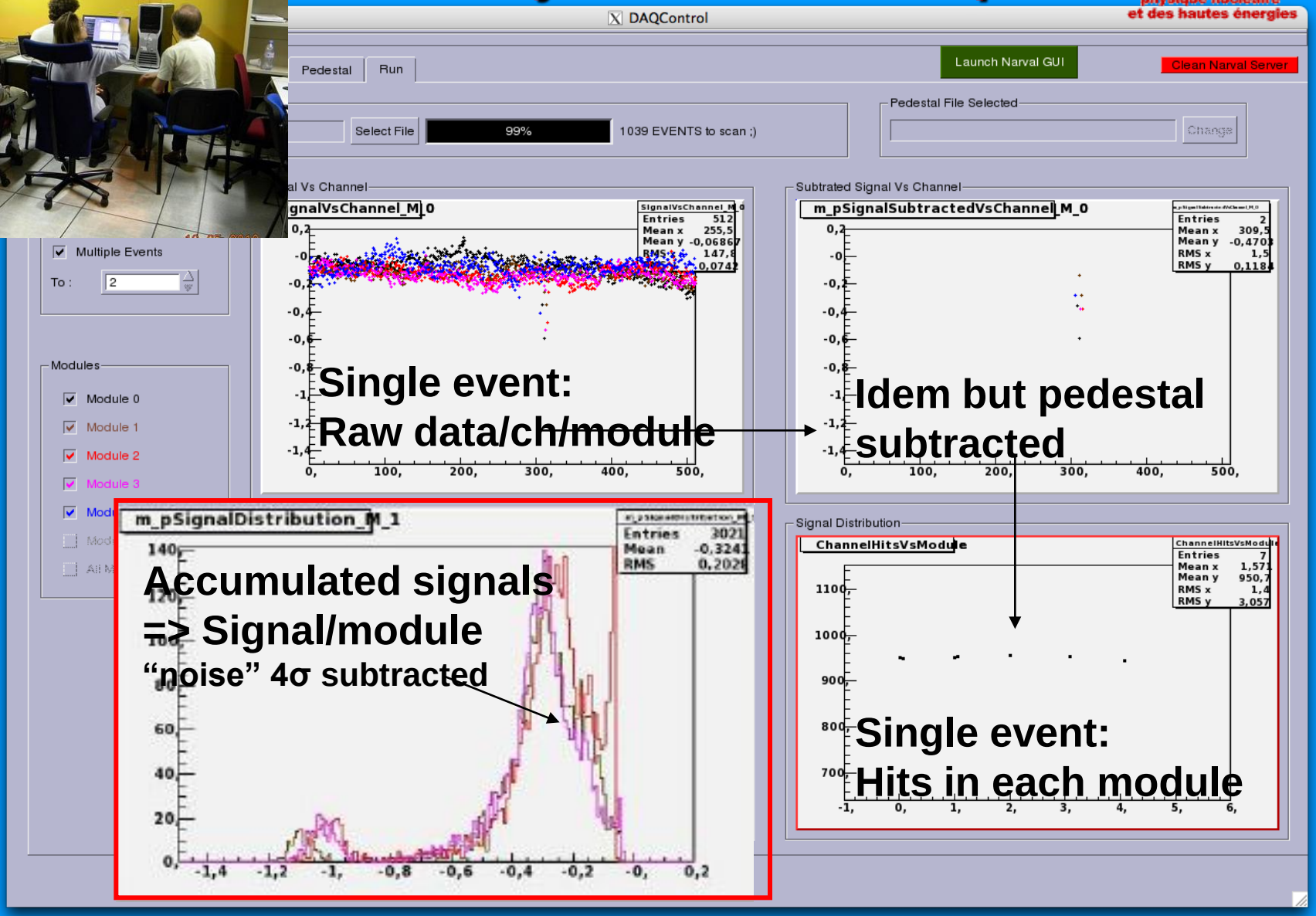
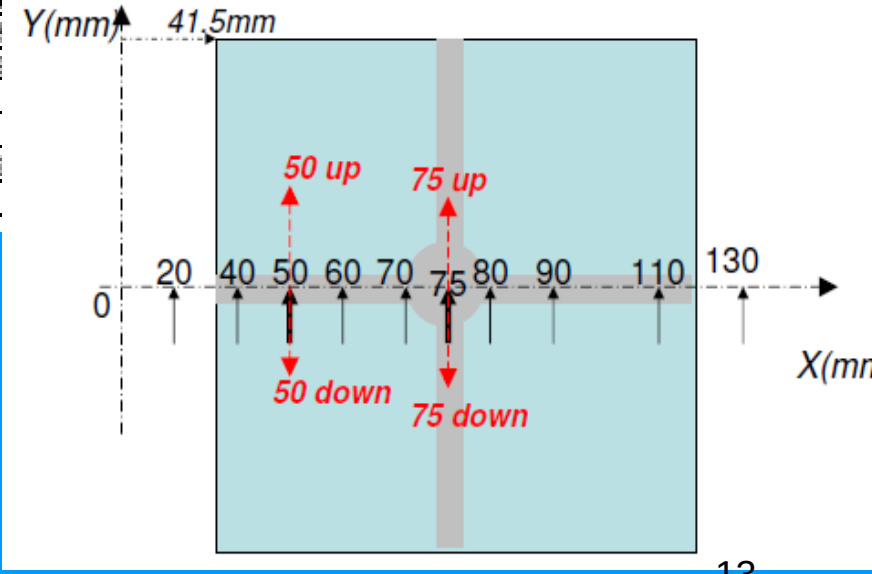


An online system (NARVAL, C++, ROOT) developed by A. Charpy works during May Tests. It is the system used also at Lab test bench for tests with system

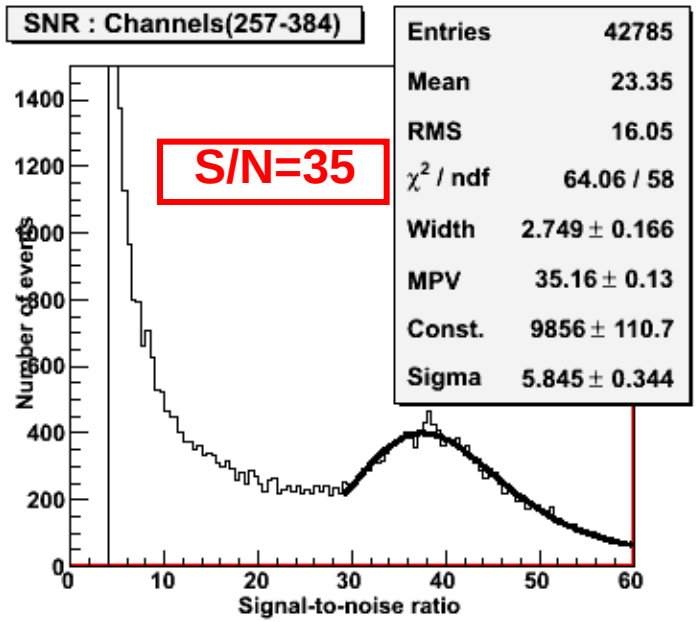
run	jour	heure	Moteur 1	Moteur 2	Moteur 3	Moteur 4	nb evts	plot	file size
Run_1.txt	Thu 13 May 10	19:36	55	102	55	60	5088	Run1Plot.jpg	195M
Run_2.txt	Thu 13 May 10	21:17	55	102	50	60	2004	Run2Plot.jpg	89M
Run_3.txt	Thu 13 May 10	22:04	55	102	45	60	annulé		99M
Run_4.txt	Thu 13 May 10	22:17	55	102	40	60			108M
	Thu 13 May 10	22:52	55	102	40	60			
Run_5.txt	Thu 13 May 10	23:45	55	135	40	60			55M
Run_6.txt	Thu 13 May 10	?	55	135	variable	60			82M
Run_7.txt	Thu 13 May 10	?	55	135	70	60		Run7Plot.jpg	38M
Run_8.txt	Thu 13 May 10	?	55	135	70	60	60000 (?)		1400M
Run_9.txt	Fri 14 May 10	08:46	55	135	70	80	1039		38M
Run_10.txt	Fri 14 May 10	09:10	55	135	70	100	1034		38M
Run_11.txt	Fri 14 May 10	09:25	55	135	70	120	1047	Run11Plot.jpg	38M
Run_12.txt	Fri 14 May 10	09:44	55	135	70	130	1025	Run12Plot.jpg	45M
Run_13.txt	Fri 14 May 10	10:04	55	135	70	20	961	Run13Plot.jpg	42M
Run_14.txt	Fri 14 May 10	10:18	55	135	70	30	1013		45M
Run_15.txt	Fri 14 May 10	10:50	55	135	70	50			956M
Run_16.txt	Fri 14 May 10	16:50	55	135	70	60			791M
Run_17.txt	Fri 14 May 10	16:55	55	135	70	70			948M
Run_18.txt	Fri 14 May 10	20:13	55	135	70	80			951M
Run_19.txt	Fri 14 May 10	23:30	55	135	70	75	57406		2800M
Run_20.txt	Sat 15 May 10	08:25	55	135	70	90	2004		
Run_21.txt	Sat 15 May 10	12:33	55	135	70	110	2003		
Run_22.txt	Sat 15 May 10	16:01	55	135	65	90	1999		
Run_23.txt	Sat 15 May 10	19:54	55	135	75	50			
Run_24.txt	Sun 16 May 10	00:17	55	135	65	75			
Run_25.txt	Sun 16 May 10	04:45	55	135	75	75	1999		
Run_26.txt	Sun 16 May 10	09:00	55	135	70	60			

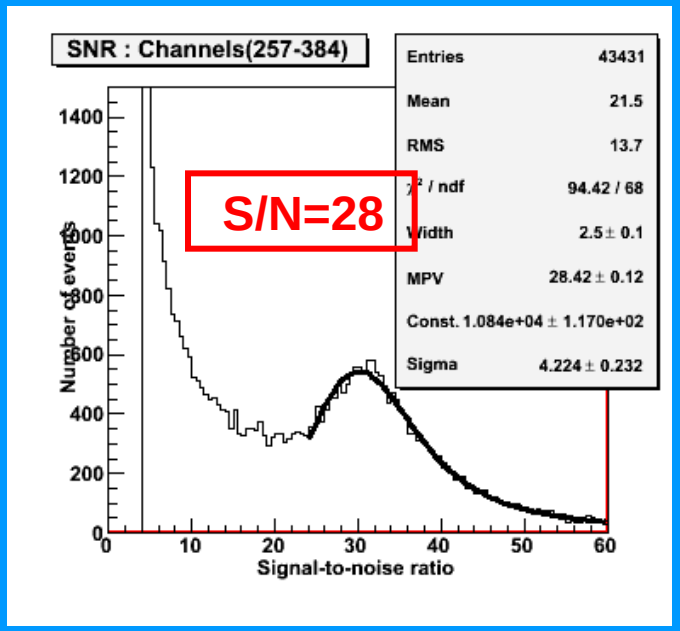


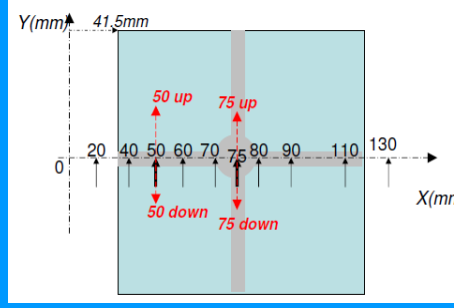
Taking Data

Scan in position of the HPK A.F. sensor

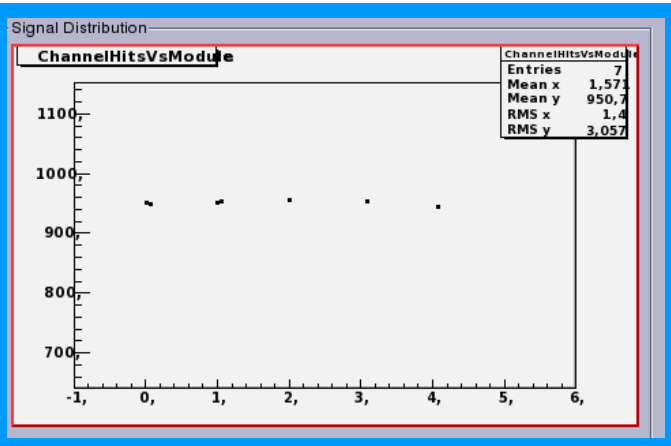
Data Analysis

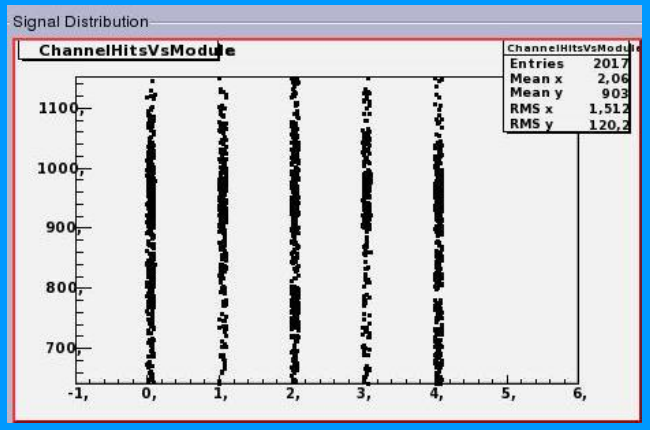






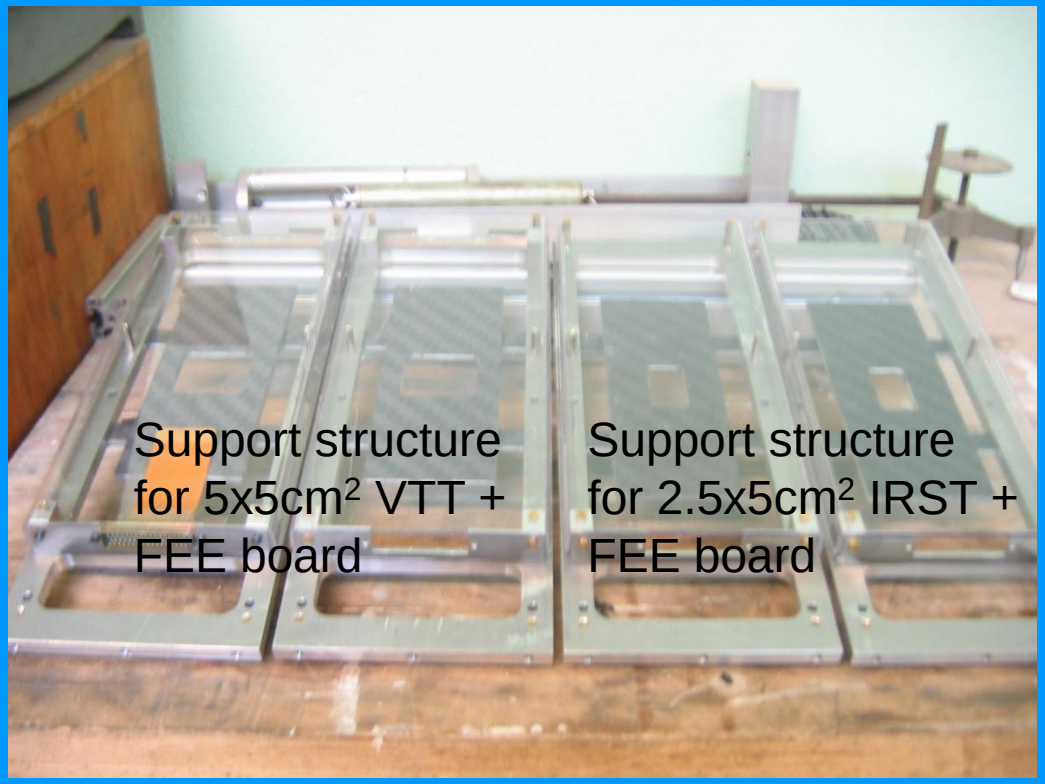
Evaluate S/N for each position and verify result is independent of scan position.





In progress: Tracks reconstruction (5 layers)

Preparing modules and FEE for tests of new sensors at SPS-CERN in November

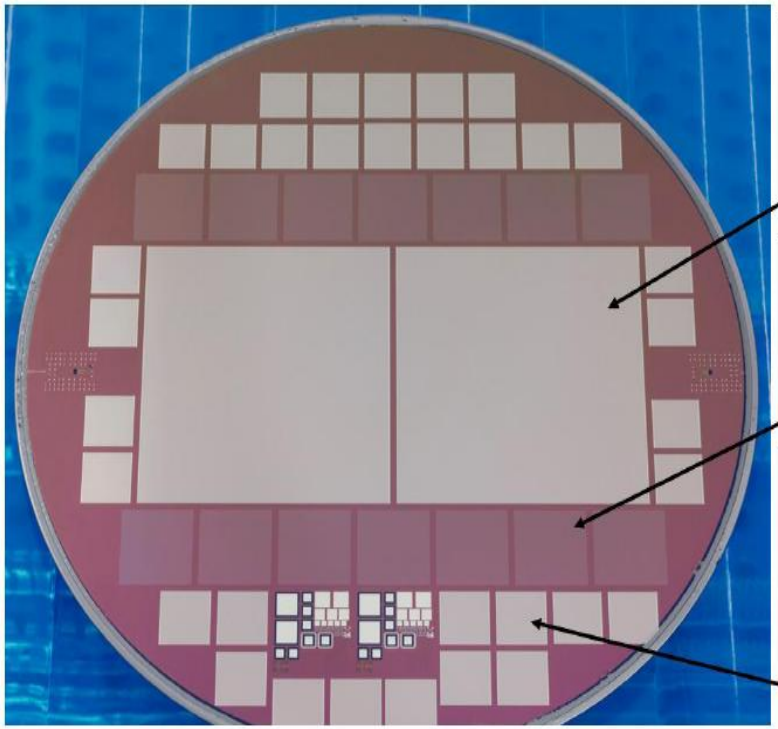


- Support structures: ready for the new VTT and IRST active edge sensor prototypes
- To be ready for the November test beam at SPS-CERN.
- New HPK DSSD sensors to be also tested at SPS.

New VA1' Front-end card support equipping all sensor-channels (1024 channels/sensor, 8chips; Each chip process 128 channels)

VTT TECHNICAL RESEARCH CENTRE OF FINLAND

EDGELESS DETECTORS on 6" (150 mm) WAFER

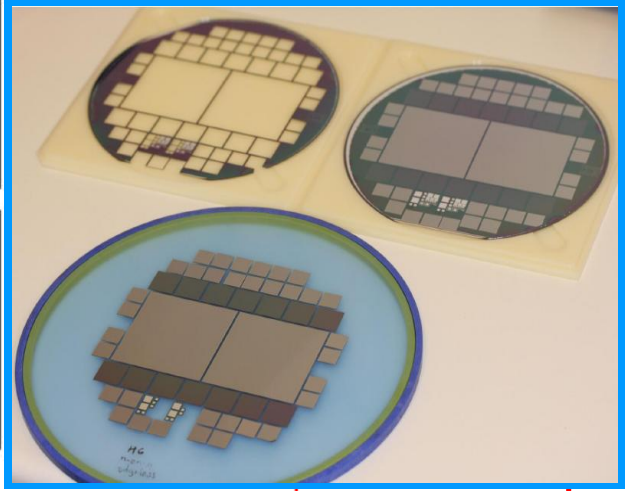


Main edgeless strip detectors
- 5 x 5 cm²
- DC & FOXFET

Medipix 2 edgeless pixels
- 1,4 x 1,4 cm²
- 6 different designs

Baby edgeless strip detectors
- 1 x 1 cm²
- DC, PT & FOXFET
- 24 different designs

Goal in November: test of new sensor types

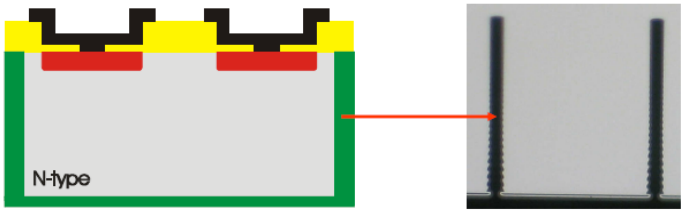


Università degli Studi di Trento

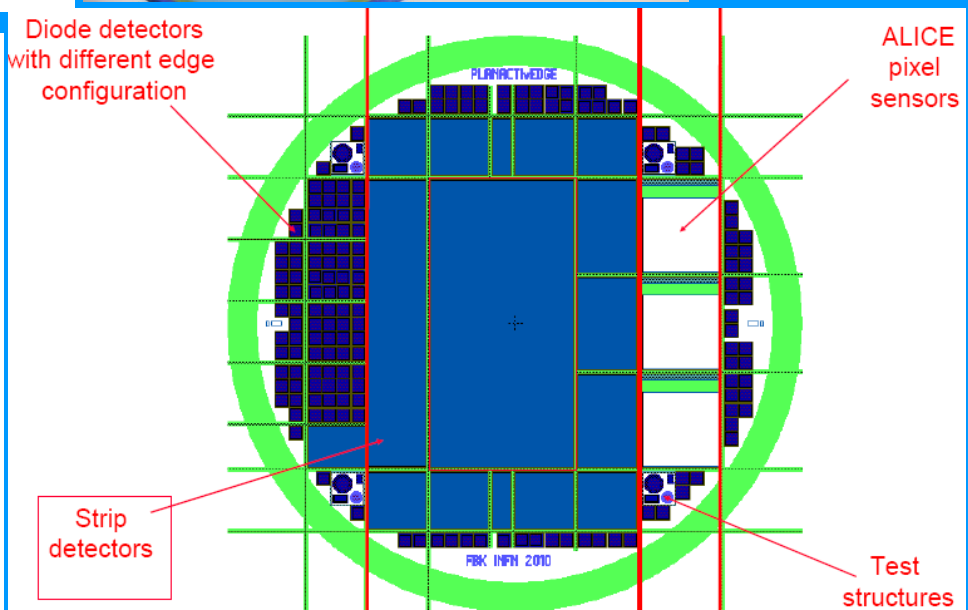
G.-F. Dalla Betta — SiLC Meeting, Paris, January 26, 2010

INFN

Next steps (2): Planar detectors with active edge

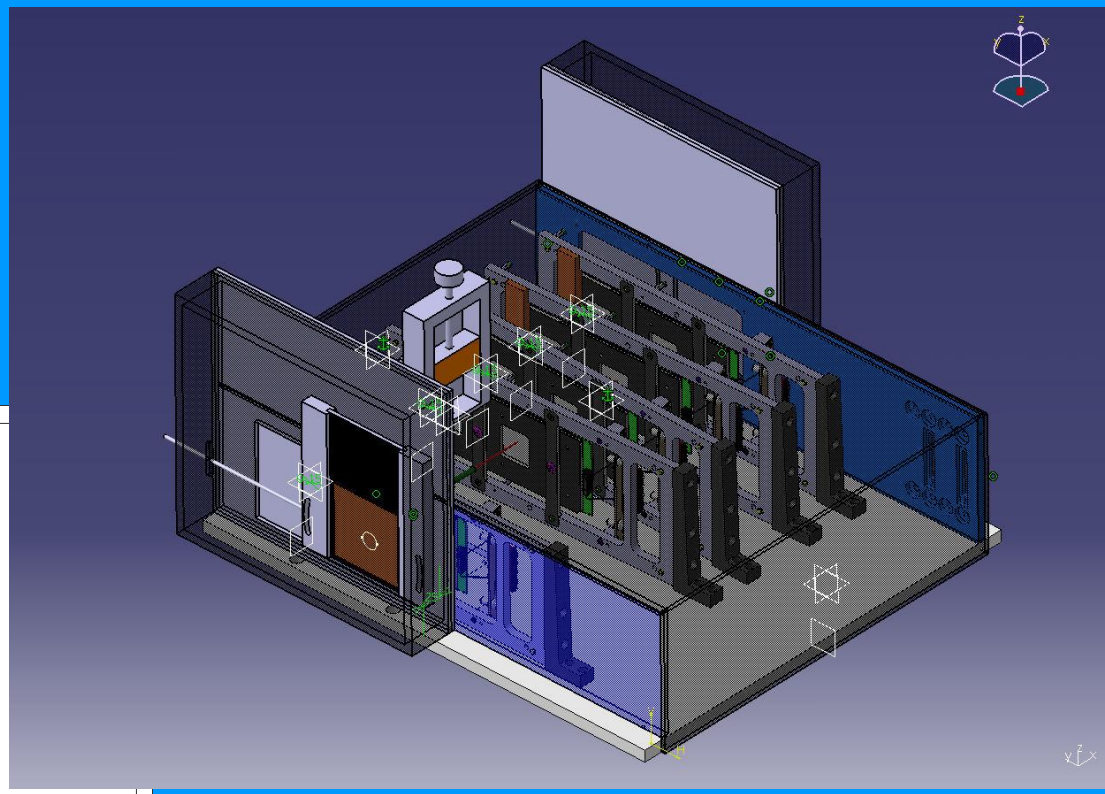


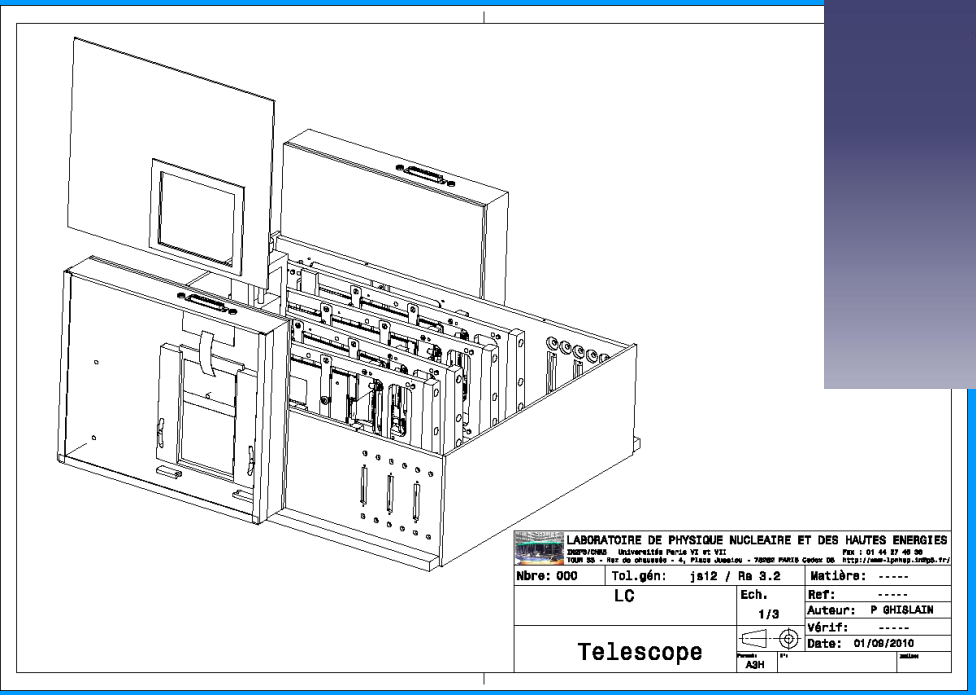
- Trench etching steps investigated on test wafers
- TCAD simulations for breakdown prediction
- Layout complete (p-on-n, mainly strips)



Modification of stand-alone test bench for November 2010 tests

Addition of a vertical strips sensor, each side i-e for the beam telescope-sensors to define a XY position (in& out)

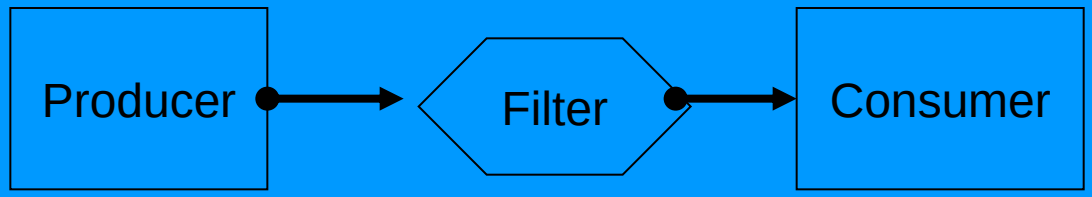




Development of a new online system more powerful for beam tests

Actually based on NARVAL:

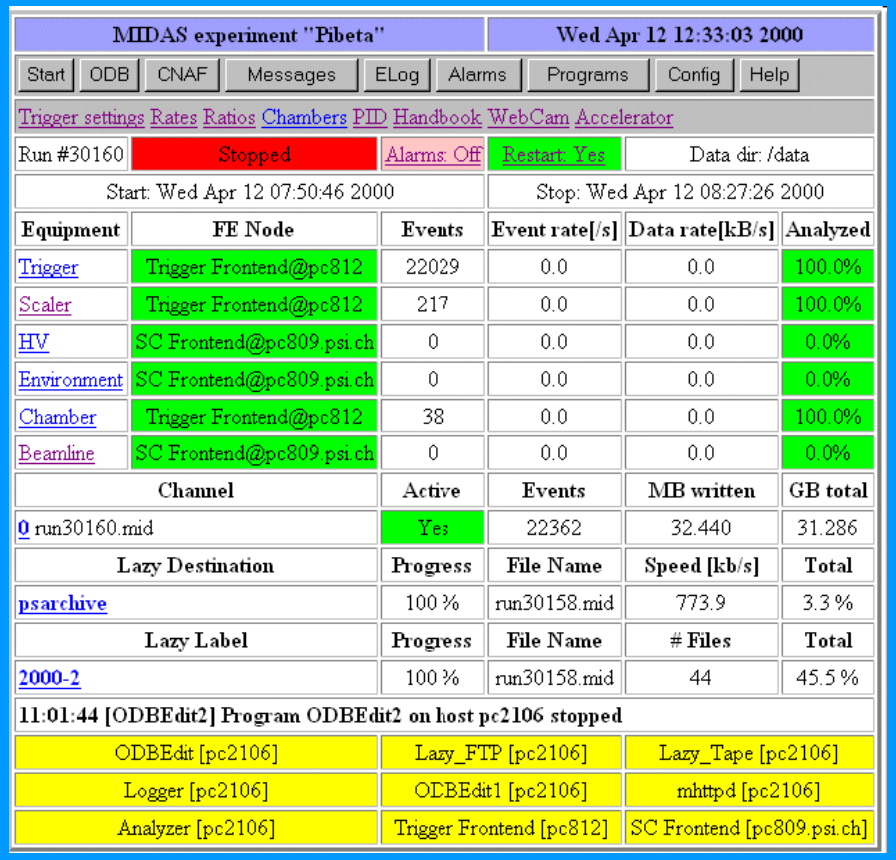
- Distributed acquisition system written in ADA
- Implement software layer of data processing.
- Divide every acquisition in two activities « Producers et Consumers » and one treatment: Filter



•We use it for handling read data from USB card (Producer) up to disk writing(consumer).

- Pros: fast, distributed, flexible coding.
- Cons: weak docs, still need some complementary modules for user management, Slow Control & DAQ, very new.

⇒Alternative in progress based on « Midas »



MIDAS experiment "Pibeta" | Wed Apr 12 12:33:03 2000

Start | ODB | CNAF | Messages | ELog | Alarms | Programs | Config | Help

Trigger settings Rates Ratios Chambers PID Handbook WebCam Accelerator

Run #30160	Stopped	Alarms: Off	Restart: Yes	Data dir: /data
Start: Wed Apr 12 07:50:46 2000			Stop: Wed Apr 12 08:27:26 2000	

Equipment	FE Node	Events	Event rate[/s]	Data rate[kB/s]	Analyzed
Trigger	Trigger Frontend@pc812	22029	0.0	0.0	100.0%
Scaler	Trigger Frontend@pc812	217	0.0	0.0	100.0%
HV	SC Frontend@pc809.psi.ch	0	0.0	0.0	0.0%
Environment	SC Frontend@pc809.psi.ch	0	0.0	0.0	0.0%
Chamber	Trigger Frontend@pc812	38	0.0	0.0	100.0%
Beamline	SC Frontend@pc809.psi.ch	0	0.0	0.0	0.0%

Channel	Active	Events	MB written	GB total
0 run30160.mid	Yes	22362	32.440	31.286

Lazy Destination	Progress	File Name	Speed [kb/s]	Total
psarchive	100 %	run30158.mid	773.9	3.3 %

Lazy Label	Progress	File Name	# Files	Total
2000-2	100 %	run30158.mid	44	45.5 %

11:01:44 [ODBEdit2] Program ODBEdit2 on host pc2106 stopped

ODBEdit [pc2106]	Lazy_FTP [pc2106]	Lazy_Tape [pc2106]
Logger [pc2106]	ODBEdit1 [pc2106]	mhttpd [pc2106]
Analyzer [pc2106]	Trigger Frontend [pc812]	SC Frontend [pc809.psi.ch]

- Generic acquisition system for small size & middle size experiments .
- Known for years at TRIUMF and PSI
- Easily portable for any operating system (embedded systems included)
- Include a « slow control » system, on-line database and an « history system »
- Tests in progress with this system to be used during November tests and a future embedded system.

VHDL software is slightly modified for processing data from new front-end cards in November