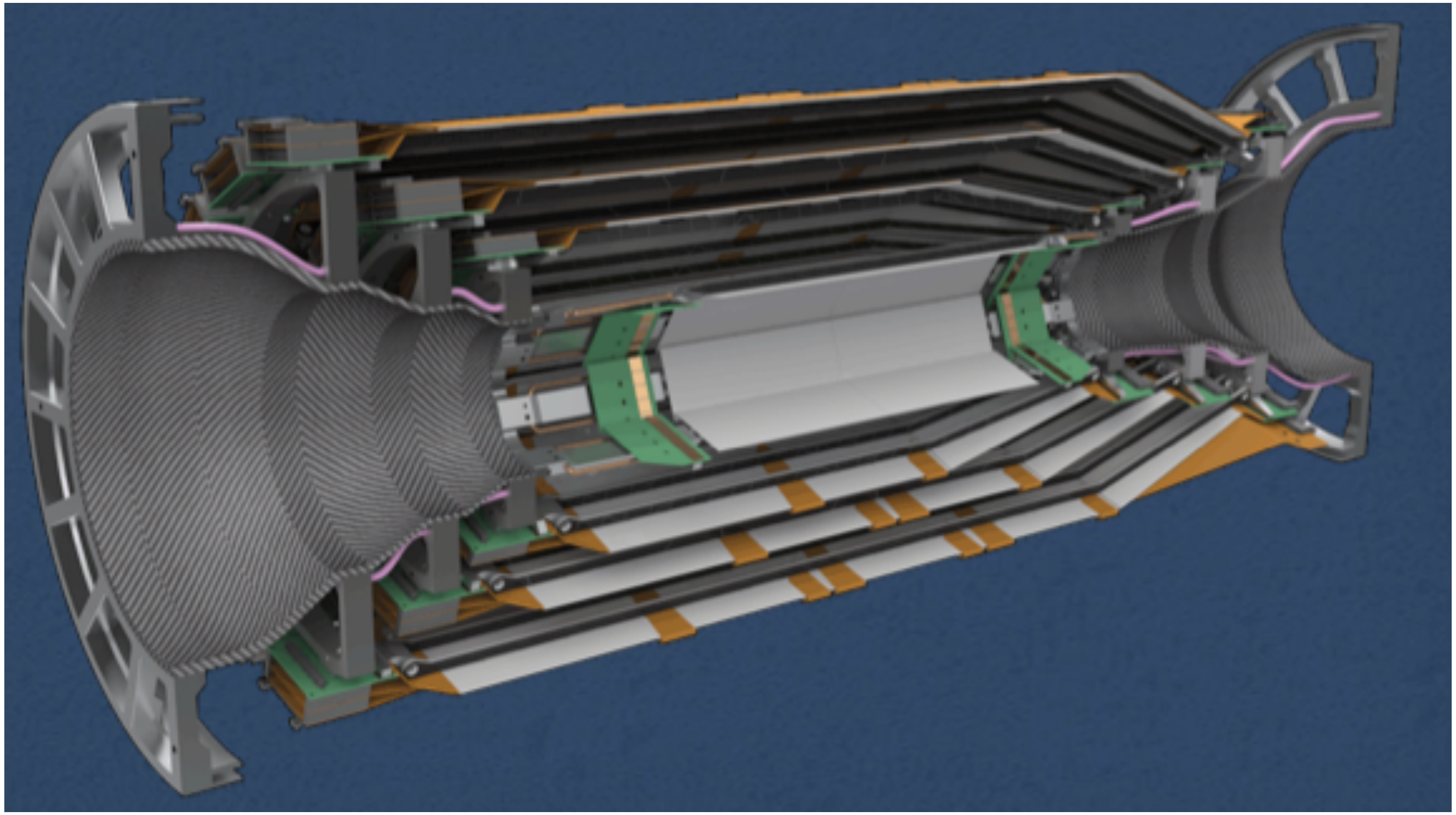
SVD Status Report



Meeting con i Referees di Belle2
Roma La Sapienza, 7 Settembre 2015

S.Bettarini per Belle2-SVD

OUTLINE

SVD general:

Introduction

- SVD new organization
- Schedule
- Pitch Adapter Issues

Activity - Pisa: (jump to slide 15)

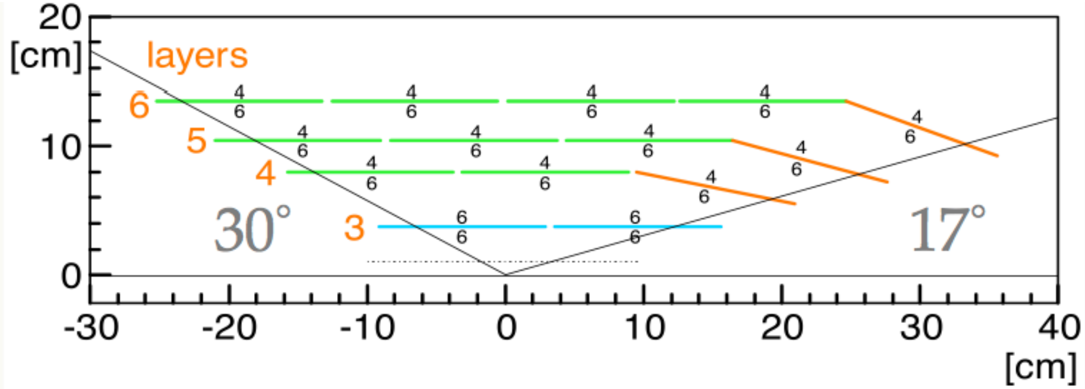
- FW/BW sub-assembly construction
- Ladder Mech. Test & Pipe Mounting
- Power Supply commissioning
- Richieste

Activity - Trieste:

- DSSD Sensor Test (Micron & HPK)
- Radiation monitoring (installation on BEAST), beam abort
- Monitoring temperature/humidity & ILK
- Riassunto richieste (variazioni rispetto alle previsioni 2014)

Belle II SVD Overview

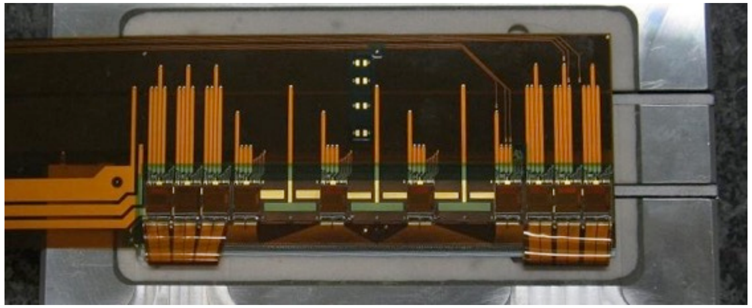
- Four DSSD layers
  - 2, 3, 4, 5 sensors (L3 to L6)
- Only three variants of sensor made from 6" wafers
  - Large rectangular DSSD (HPK)
  - Small rectangular DSSD (HPK)
  - Trapezoidal DSSD (Micron)
- Fast readout based on
  - APV25 chips 50ns shaping time
  - Origami chip-on-sensor concept
  - FPGA for pulse processing, zero-suppression, common-mode corr., hit time finding
- Low material budget $0.6\% X_0$ per layer
  - Very light mechanical structure
  - Thin cooling pipes (CO_2)

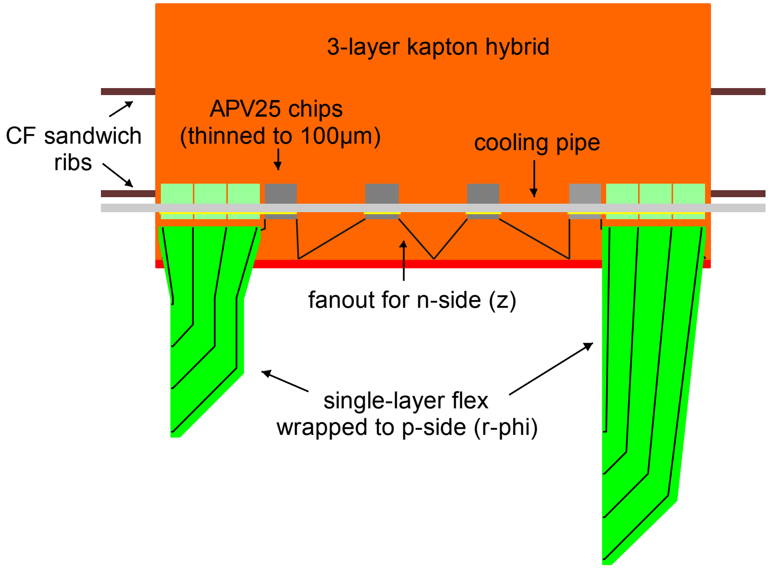


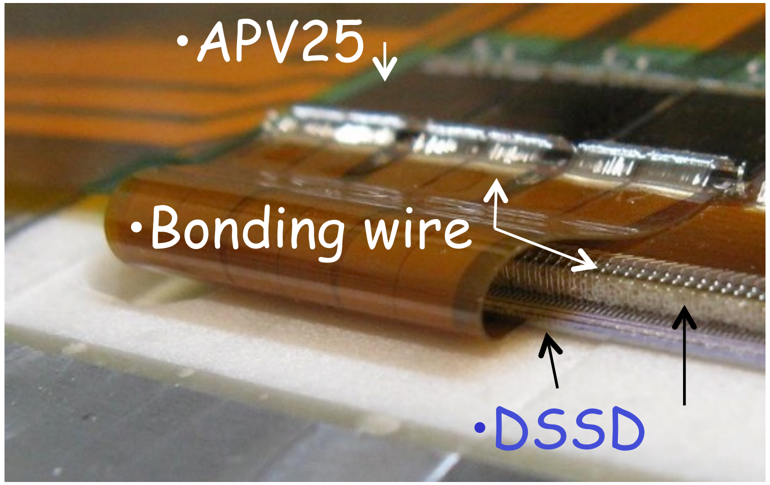
Layer	Ladders	Sensors / Ladder	APVs
6	16	5	800
5	12	4	480
4	10	3	300
3	7	2	168

Origami Chip-on-Sensor Concept

- **Chip-on-sensor** concept for **double-sided readout**
- **Flex fan-out** pieces **wrapped** to opposite side (hence "Origami")
- *All chips aligned on one side →* **single cooling pipe**

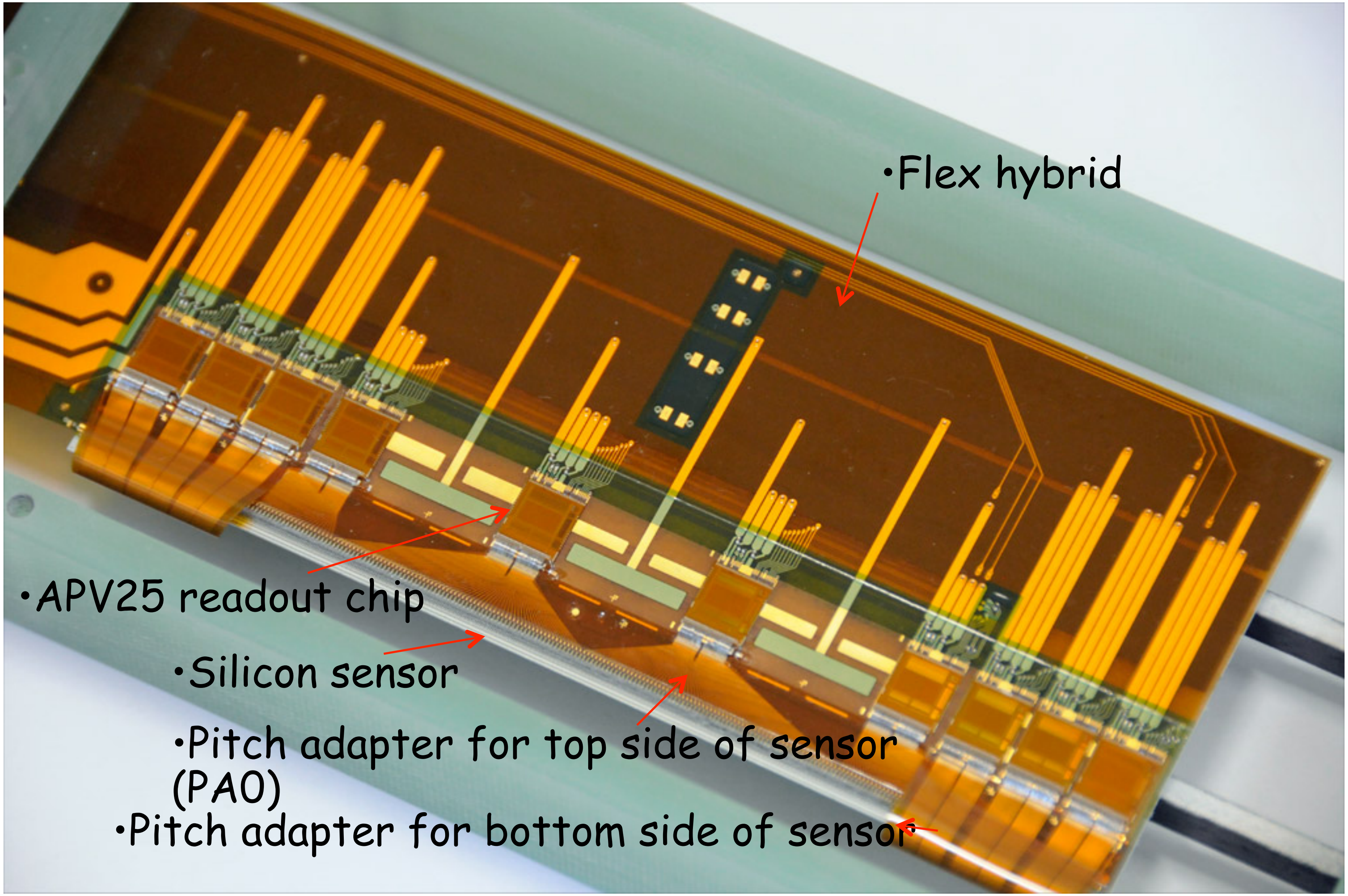






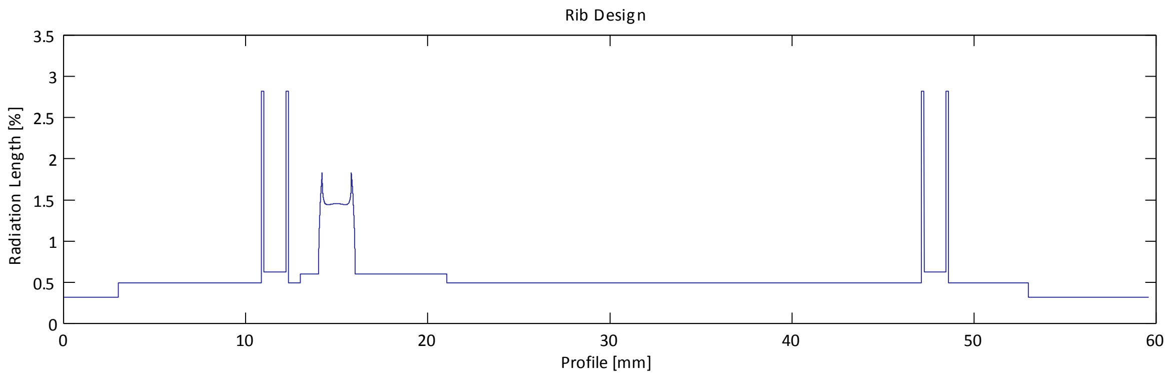
Airex

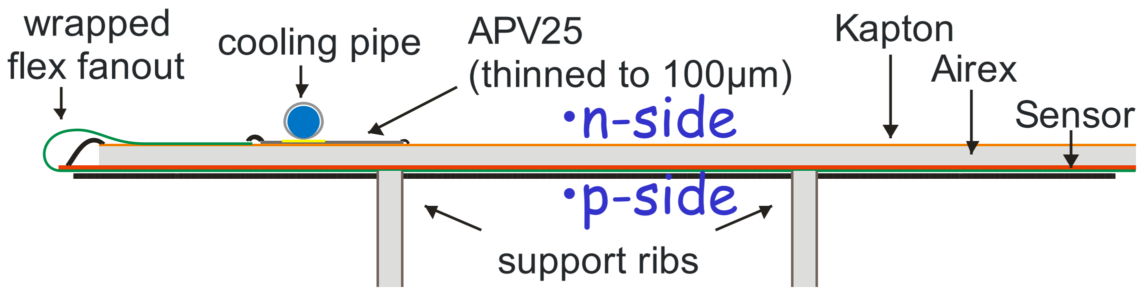
Origami Prototype Module with 6" HPK DSSD



Material Budget of a ladder

- Largest peak contribution by
  - Cooling pipe
  - Support ribs





- Average Material Budget:~ 0.6% X_0 /layer

Components:

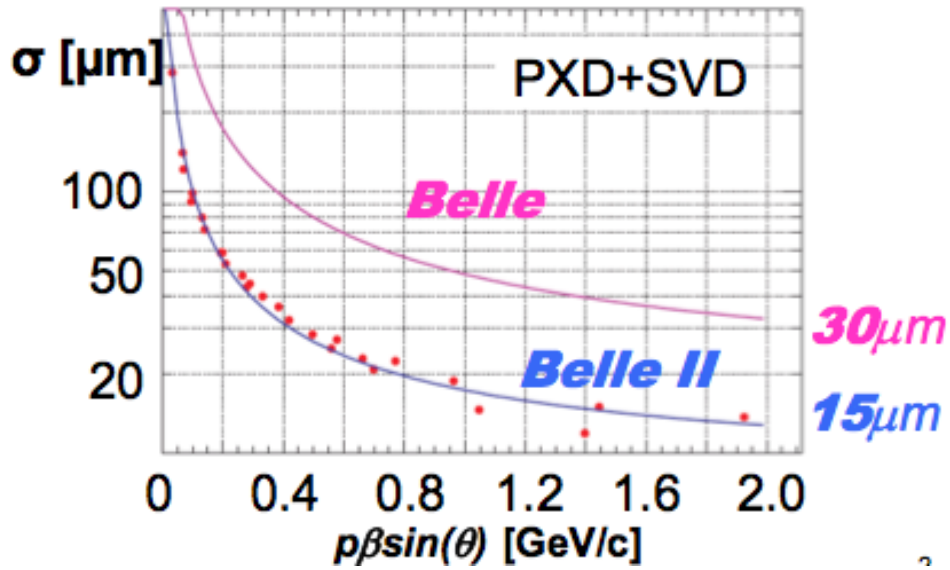
- Single cooling pipe
- Thinned APV25 (100μm)
- 3-layer flex circuit
- Connection to Strips:
  - PA on top side
  - wrapped PA for bottom
- 1mm Airex sheet
- 6" DSSD
- CF support ribs

Performance

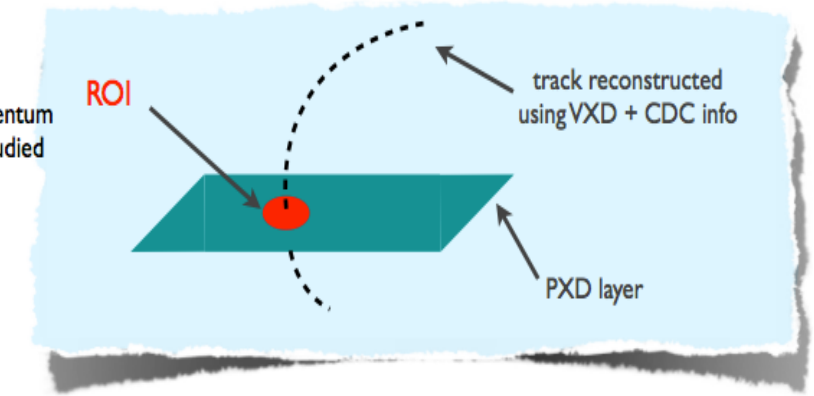
- The PXD + SVD resolution is adequate
  - ×2 improvement w.r.t Belle

- SVD+CDC fast tracking is essential to do Region-Of-Interest selection in PXD
  - Keep readout bandwidth under control
  - Tested in beam test at DESY Jan 2014

Significant improvement in z-vertex resolution



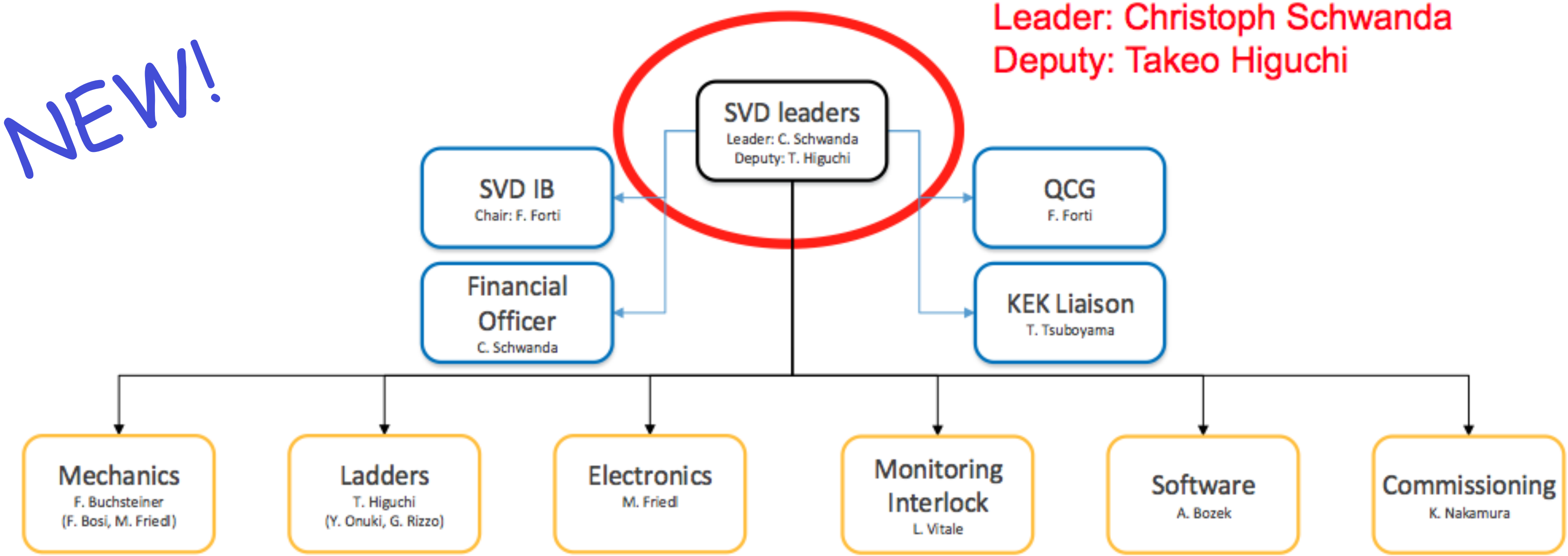
size, form, angle/momentum dependence to be studied and optimized



SVD Group Organization

NEW!

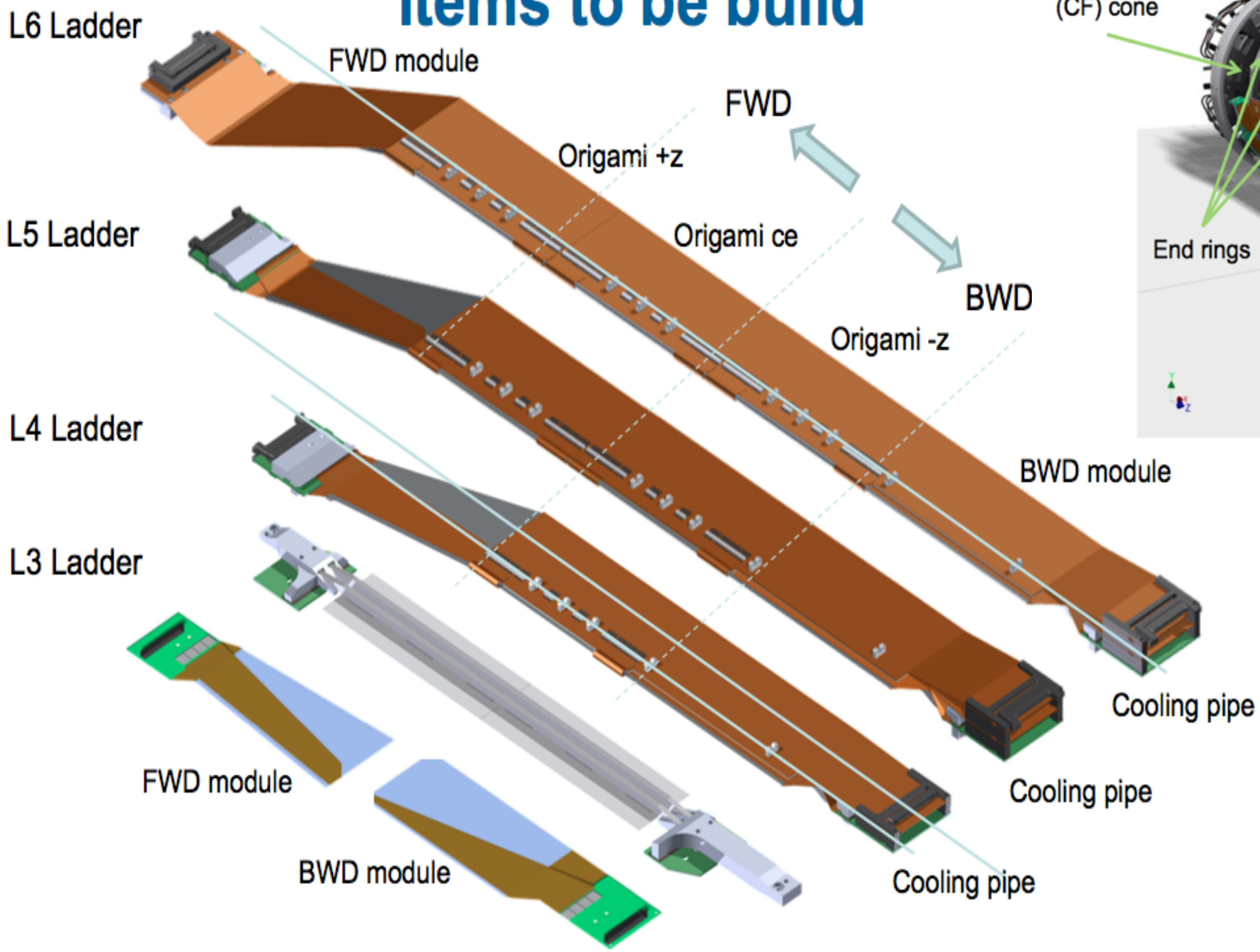
New leaders appointed Feb. 7th
Leader: Christoph Schwanda
Deputy: Takeo Higuchi

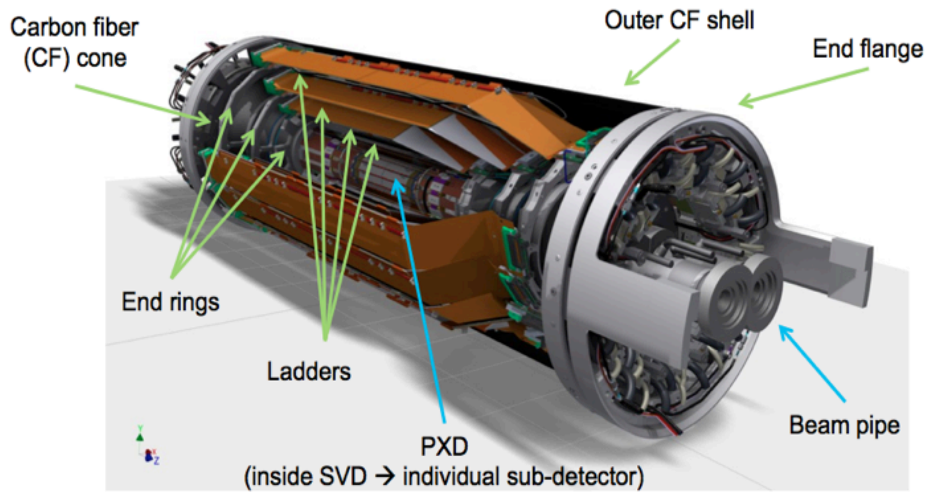


SVD Sub-Group Coordinators

Sub-group	Coordinator	Deputy	Advisor
Mechanics	Florian Buchsteiner	Markus Friedl	Filippo Bosi
Ladders	Takeo Higuchi	Yoshiyuki Onuki	Giuliana Rizzo
Electronics	Markus Friedl		
Monitoring & Interlocks	Lorenzo Vitale		
Software	Andrzej Bozek		
Commissioning	Katsuro Nakamura		

Items to be build





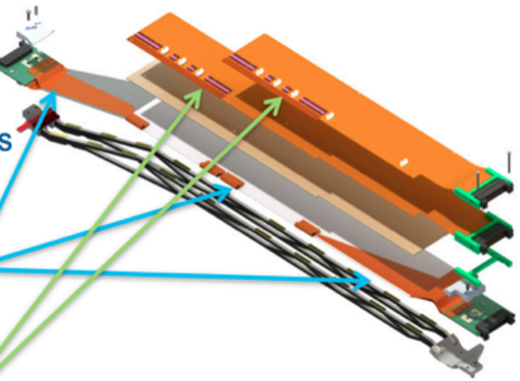
SVD Ladder Assembly Sites

- L3 ladders: Univ. of Melbourne
- L4 ladders: TIFR (@ IPMU)
- L5 ladders: HEPHY Vienna
- L6 ladders: Kavli IPMU
- FWD/BWD sub-assemblies: INFN Pisa

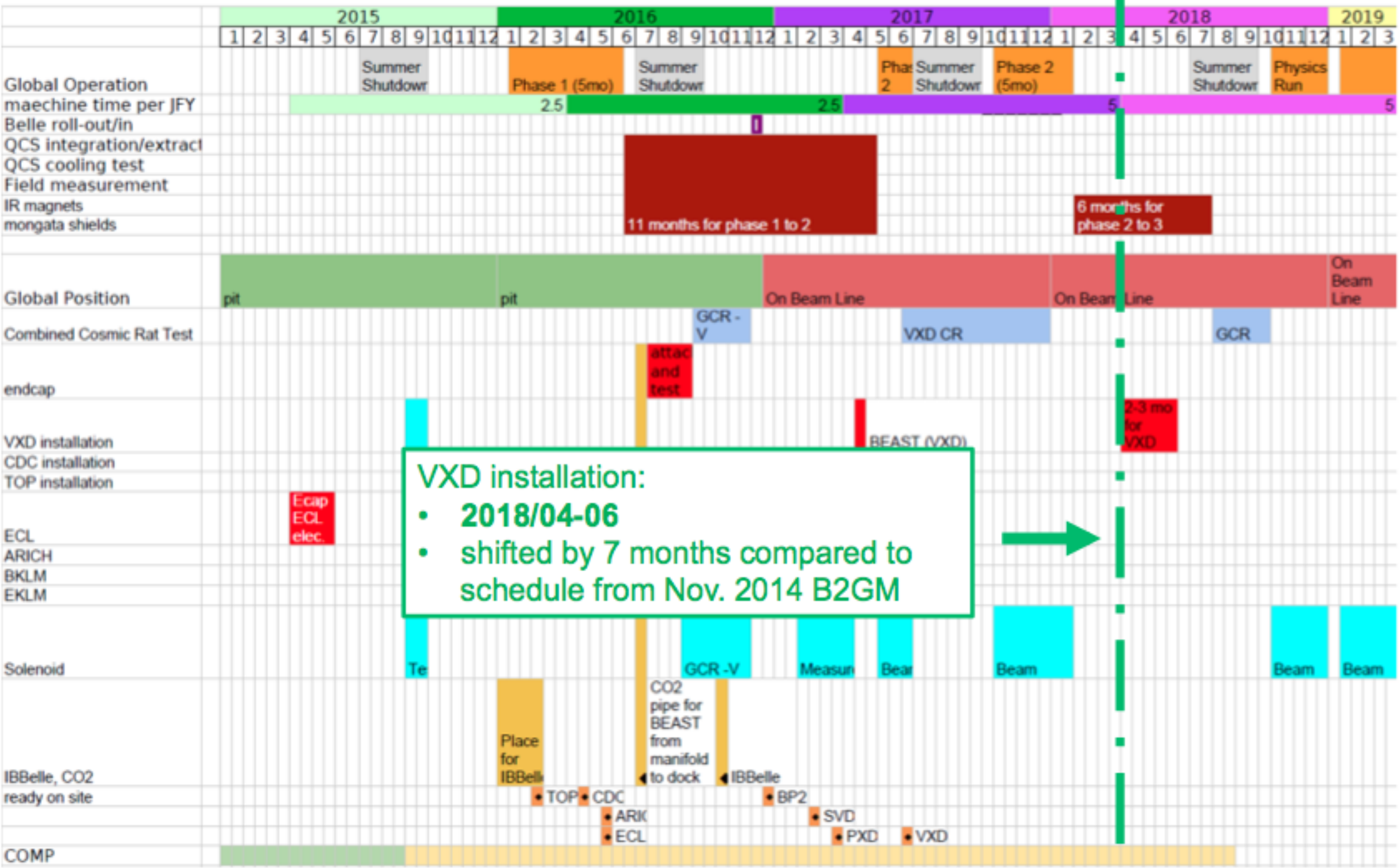
Pitch Adapters

connect sensor strips to APV25 chips

- Two types of pitch adapters
- **FlexPA**
  - Flexible, single-layer
  - PF,PB,P3F,P3B,PA
  - Produced by Tokai Denshi
- **PA0**
  - Flat, dual-layer
  - Glued onto Origami hybrids
  - Produced by Taiyo



Belle II Schedule

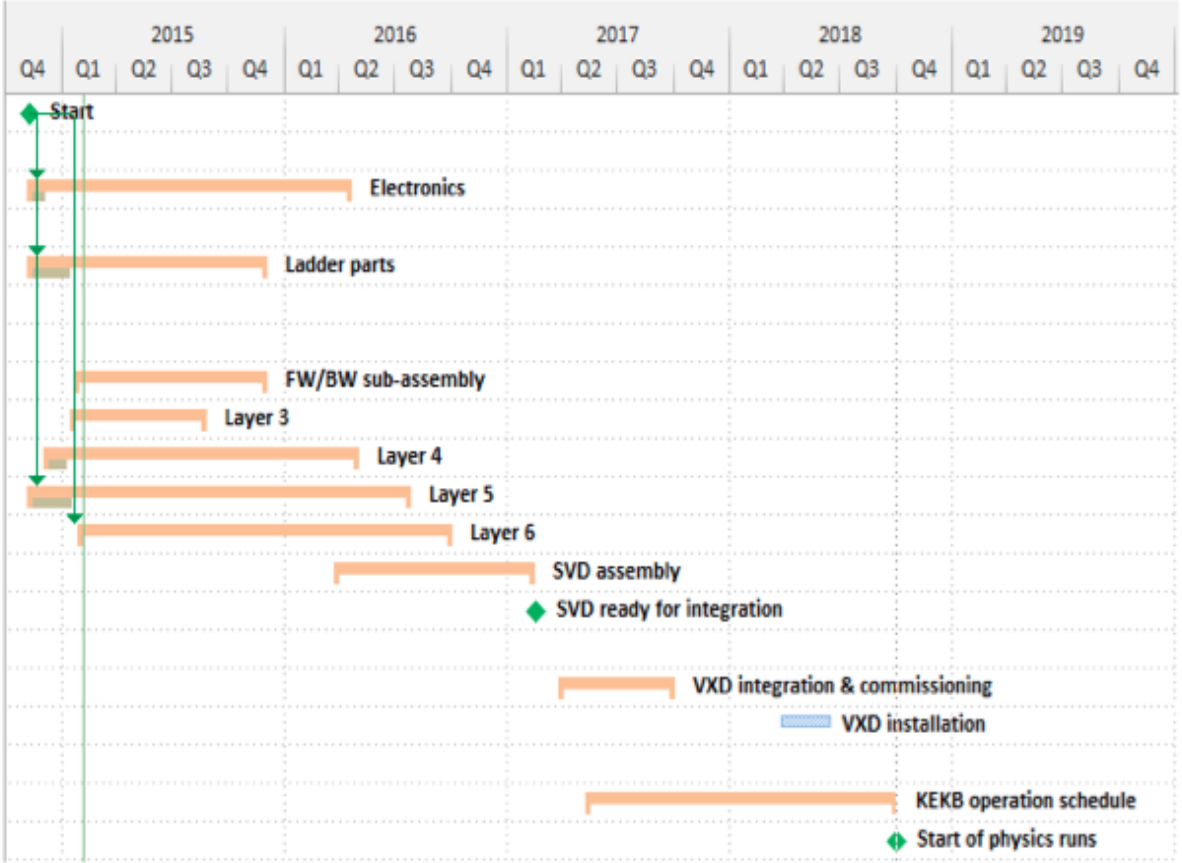


VXD installation:

- **2018/04-06**
- shifted by 7 months compared to schedule from Nov. 2014 B2GM

SVD Schedule Overview
(to match global Belle2 schedule)

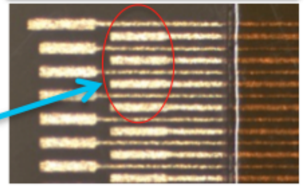
	Name	Start	Finish	Durati
1	Start	Sun 09.11.14	Sun 09.11.14	1 d?
2				
3	**Electronics**	**Mon 10.11.14**	**Fri 15.04.16**	**375 d**
15				
16	**Ladder parts**	**Mon 10.11.14**	**Mon 30.11.15**	**276 d**
67				
105				
106	**FW/BW sub-assembly**	**Mon 26.01.15**	**Mon 30.11.15**	**221 d**
118	**Layer 3**	**Mon 19.01.15**	**Fri 21.08.15**	**155 d**
131	**Layer 4**	**Mon 08.12.14**	**Fri 29.04.16**	**365 d**
149	**Layer 5**	**Mon 10.11.14**	**Fri 22.07.16**	**445 d**
171	**Layer 6**	**Mon 02.02.15**	**Tue 27.09.16**	**432 d**
185	**SVD assembly**	**Mon 28.03.16**	**Fri 10.02.17**	**230 d**
189	SVD ready for integration	Fri 17.02.17	Fri 17.02.17	0 d
190				
191	**VXD integration & commissioning**	**Thu 30.03.17**	**Fri 29.09.17**	**132 d**
196	VXD installation	Mon 26.03.18	Fri 15.06.18	3 mo
197				
198	**KEKB operation schedule**	**Mon 15.05.17**	**Fri 28.09.18**	**360 d**
203	Start of physics runs	Tue 02.10.18	Tue 02.10.18	0 d



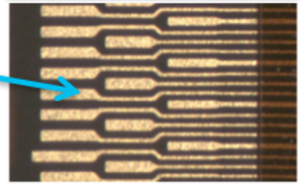
Pitch Adapters Issues

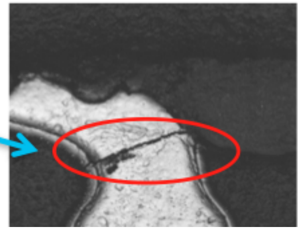
- **Problem #1**
  - Related to **FlexPA**
  - Arose end of 2013
  - Size of pads on APV side were too small for wire bonding
  - Could be solved by design change
- **Problem #2**
  - Related to **PA0** only
  - Disconnected lines due to cracks close to bond pads of PA0
- **PA task force formed to solve issues**

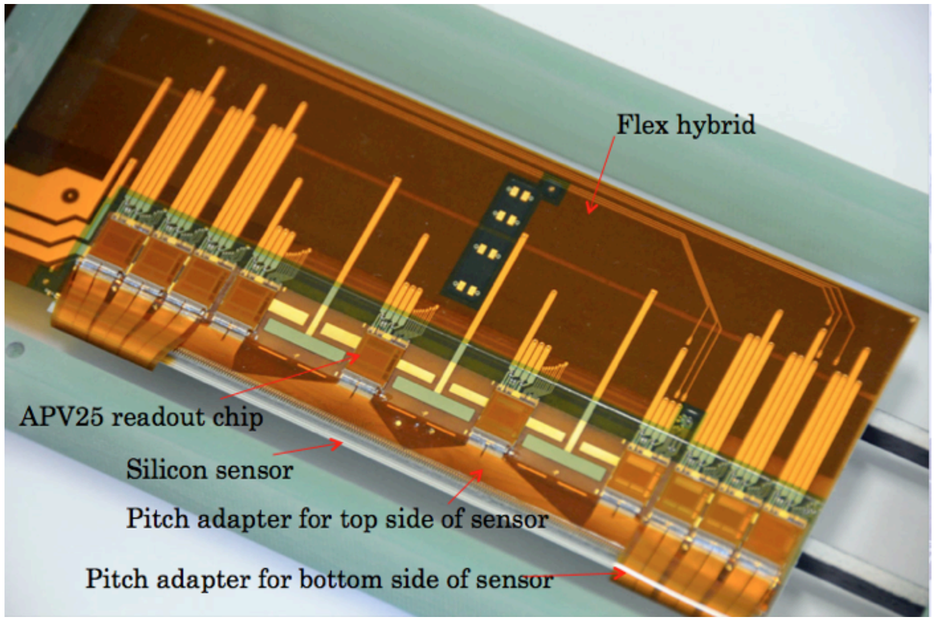
APV SIDE 2-row pads



APV SIDE 3-row pads







#1:

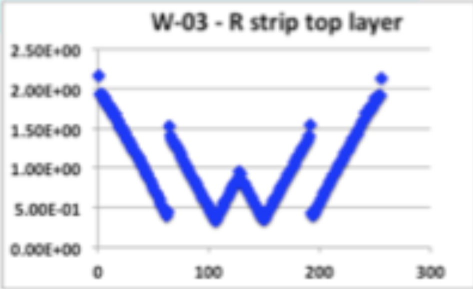
- Tested samples of the flex new production have been delivered in mid-March
- OK (~80% yield) after the pad survey@IPMU
- Issue solved: the full production of PA delivered to the sites

PA0

#2:

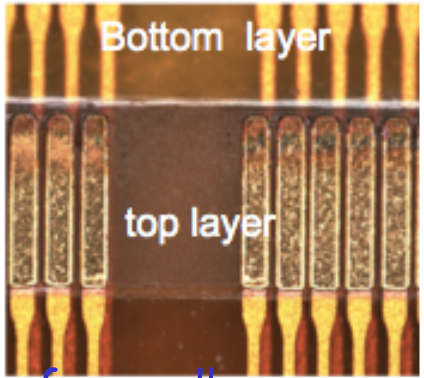
- Required re-production of all Origami hybrids with thinned APV chips
- More robust design against cracks implemented

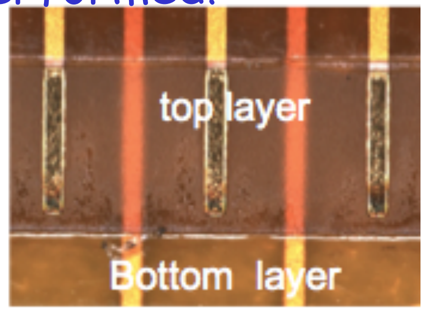
Evaluation of new PA0 produced



- **24 PA0 with new design**
  - No cracks found: no opens, from electrical test, no small cracks seen by visual inspection.
  - A few shorts found on 6/24 pieces
  - Yield 75%, acceptable

- **Unexpected new issues on PA0: "glue spread"**
  - PA0 are made of 2 layers: interlayer glue spreads onto edge of the top layer, covering part of the APV pads and with a lot of residuals on sensor side pads.
  - PA0 have been wiped and then bonding tests successfully performed!





- **Continued with the assembly of 12 PA0/ORIGAMI with present PA0, to verify:**

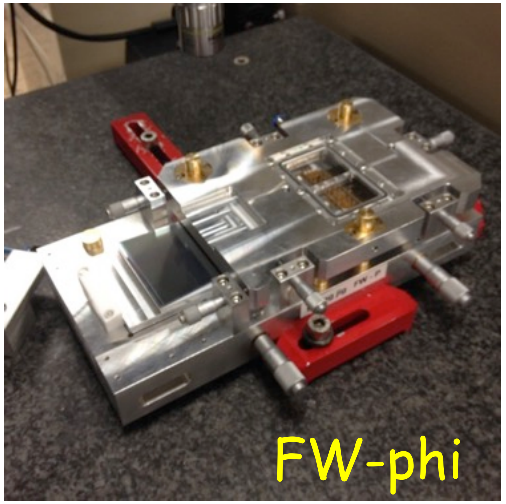
- no cracks until the end of stress-full assembly steps
- verify all the ORIGAMI assembly procedure up to SMD and reflow (all the stress-full steps for PA0, but NO APV chips will be lost).
- Visual inspection/measurements done at the end of May.
- OK to go on with the chip loading/bonding and electrical tests (end-July)

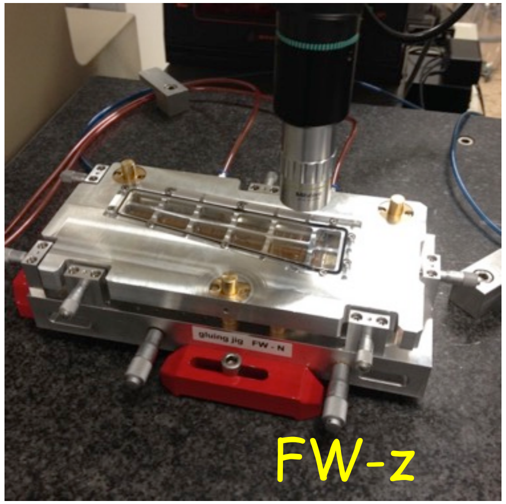
PA0 continued…& impact on ladder production schedule

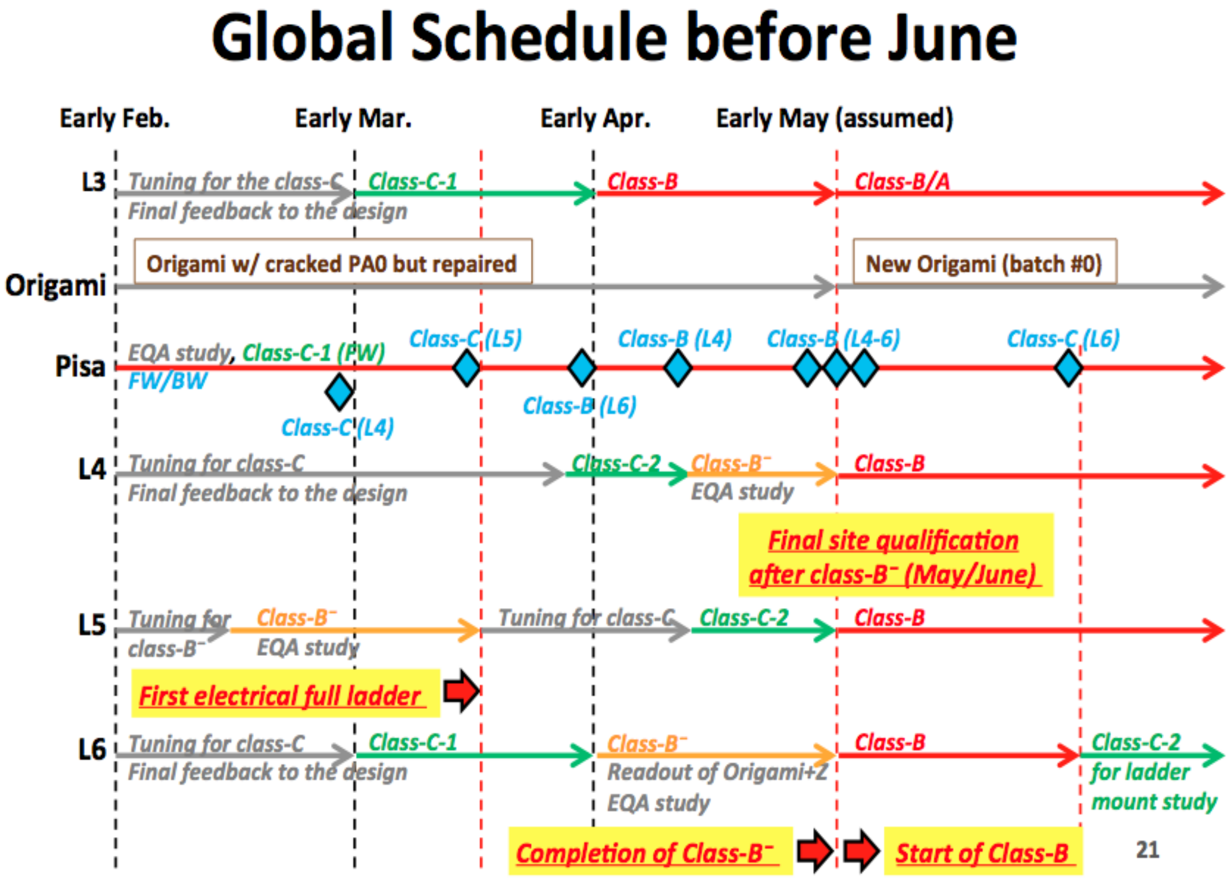
- The successful results of the test with a detector connected to the origami (end August) just gave the OK to the assembly of the origami with the new PA0:
  - 1st production batch of origami expected for the end of November
  - Soon after the Layer 4,5,6 will start the class "A" ladder production
- In the meantime Layer 4 and layer 6 sites could start the production of their class B+ ladder once solved some minor issues spotted by the internal review (QCG group), by building an extra class "C" ladder.
- The solution of the PA0 and Flex-PA issues have been achieved by the effort of the SVD-PA task force (chaired by G.Rizzo)!

FW-BW subassembly pre-production

The final gluing jigs and the procedures have been tuned to produce the Class C (mechanical) and Class B (electrically working, built with low quality parts) needed by the ladder assembly sites.







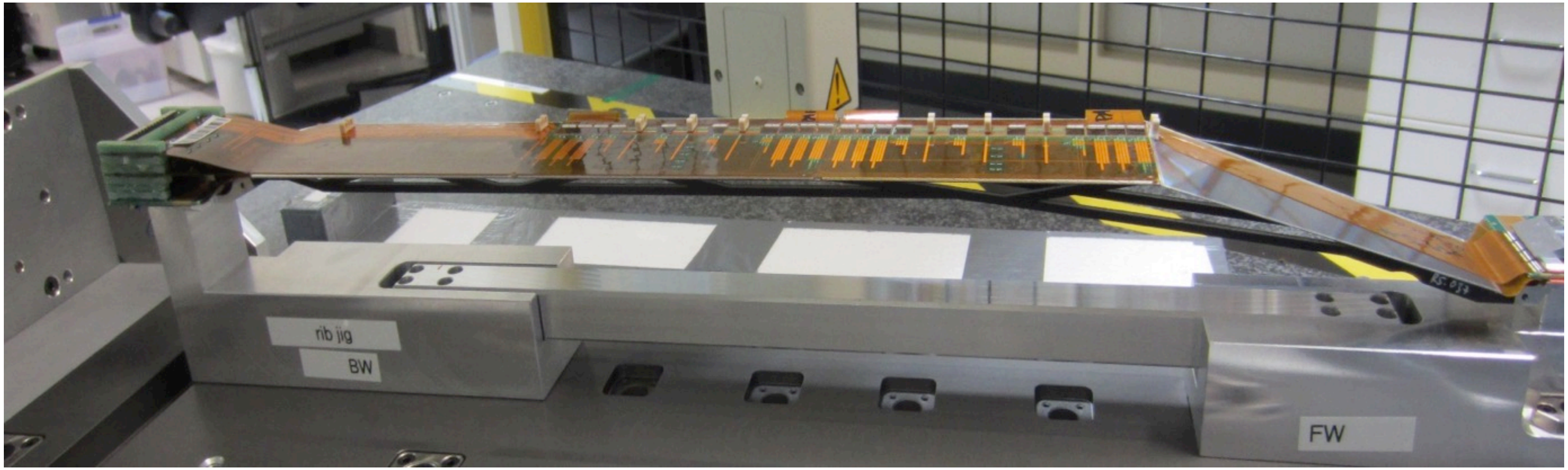
FW/BW Subassemblies status/production

- Il 29/5 superata la review di Pisa→ produzione dei classe A (da installare in esperimento), iniziata a meta' luglio.
- Durata effettiva della produzione: ~7.5 mesi:
  - Rate "a regime": 2FW+2BW subassemblies/working week → 2x[38+9(spares)]=2x47 ~24 settimane=6 mesi
  - Aggiunti 1.5 mesi (chiusura estiva/natale istituto + meetings vari)
- Per rispondere alle esigenze dei siti sono stati prodotti nuovi classe "C" e "B" insieme ai classe "A".

- Totale produzione dei subassemblies in Pisa (al 4/9)
  - Mechanical (class C) prototypes: 7BW + 7FW
  - El. Funzionanti (class B): 3BW+3FW
  - El. Funzionanti e di qualita' (classe B+): 3BW + 3FW
  - Classe "A" (da installare): 4FW + 4BW

Costruito il primo ladder elettricamente funzionanate (L5)

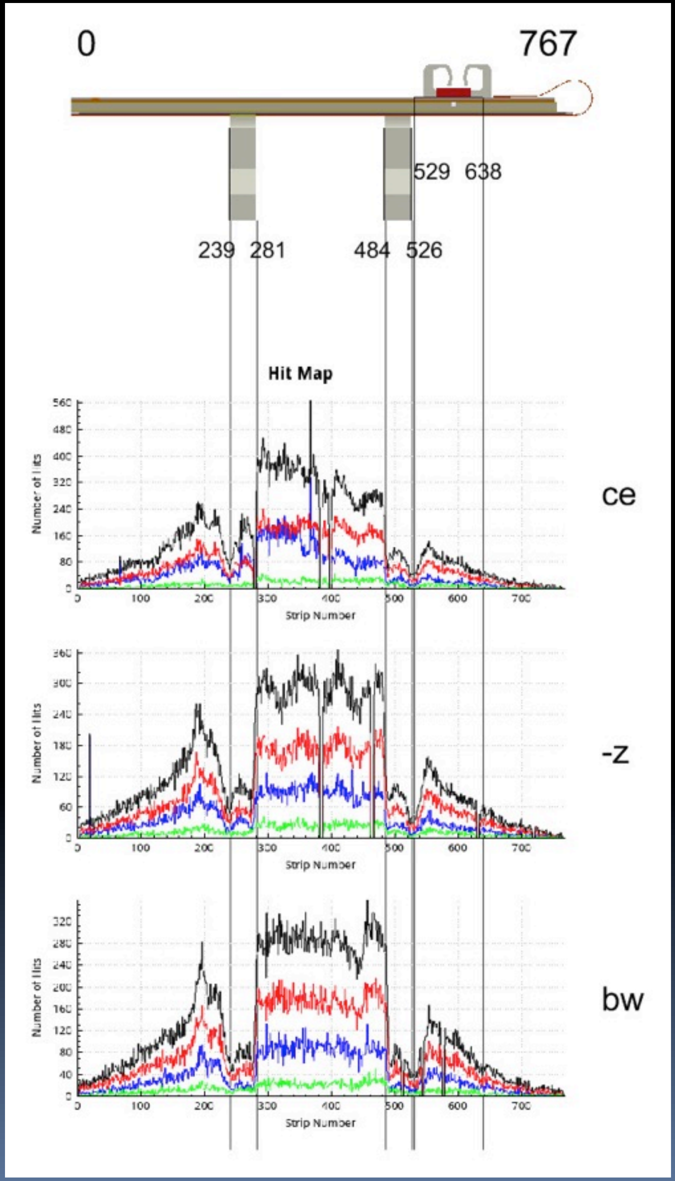
- Vienna ha finito (24/3) di costruire il primo ladder class B:



- Usati i tools meccanici e procedure finali
- Caratterizzazione elettrica → completamente funzionante
- Una milestone importante!

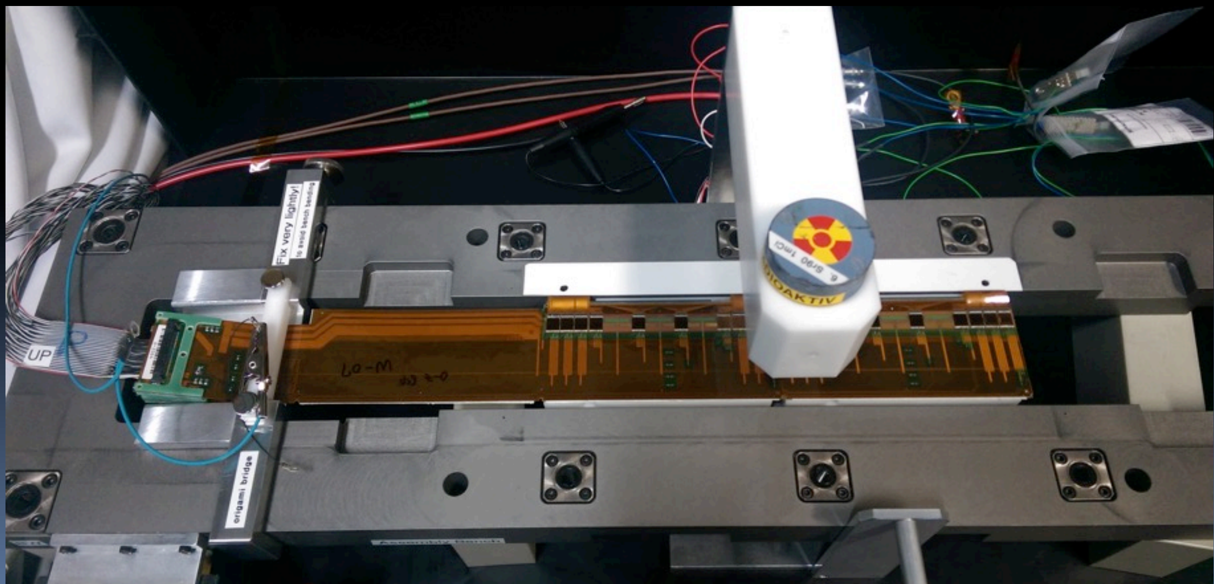
Hit Profiles

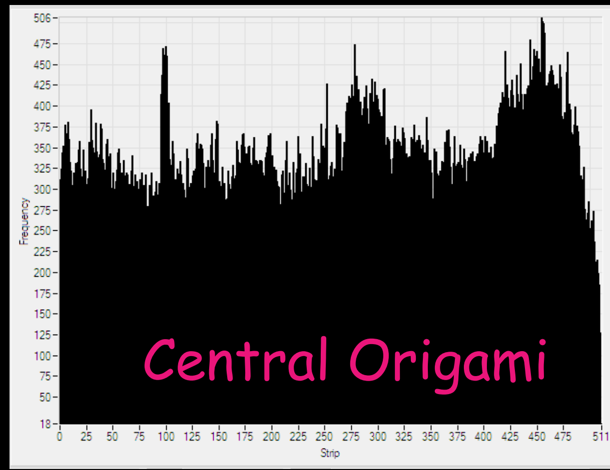
- FADC readout (full ladder)
- 4 measurements with source pointing ~at center of each sensor
- Profile is much wider than scintillator
  - multiple scattering
- Shadow of ribs clearly visible (blurred outer edges)
- APV25 chips not visible



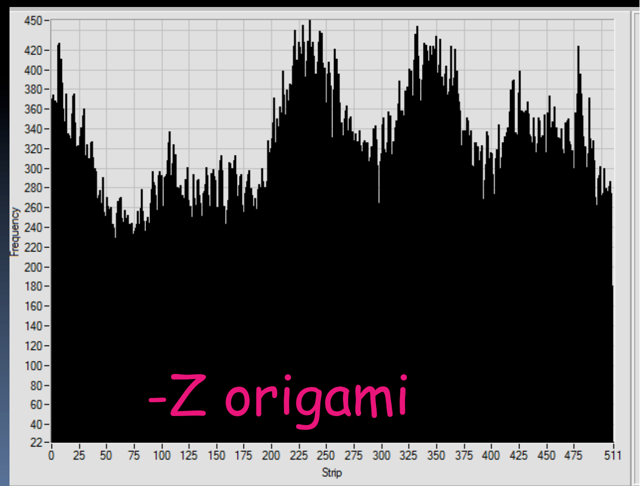
Status of the B+ ladder

- Assembly completed last Thursday (27/8)
- Electrically tested:
  - Usual E-Test (Pedestal, IntCal, Vsep)
  - Detailed source test on assembly bench.
  - **Works fine, no problems with batchO Origamis**





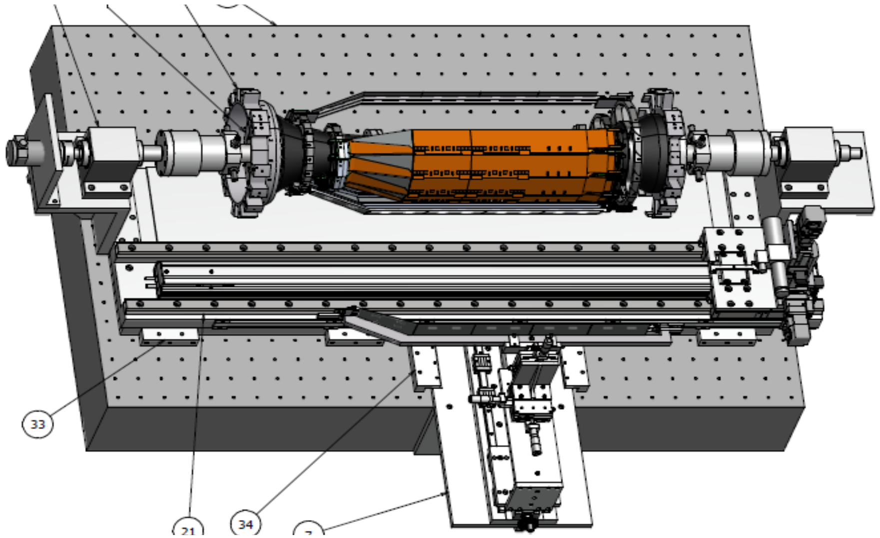
HIT maps



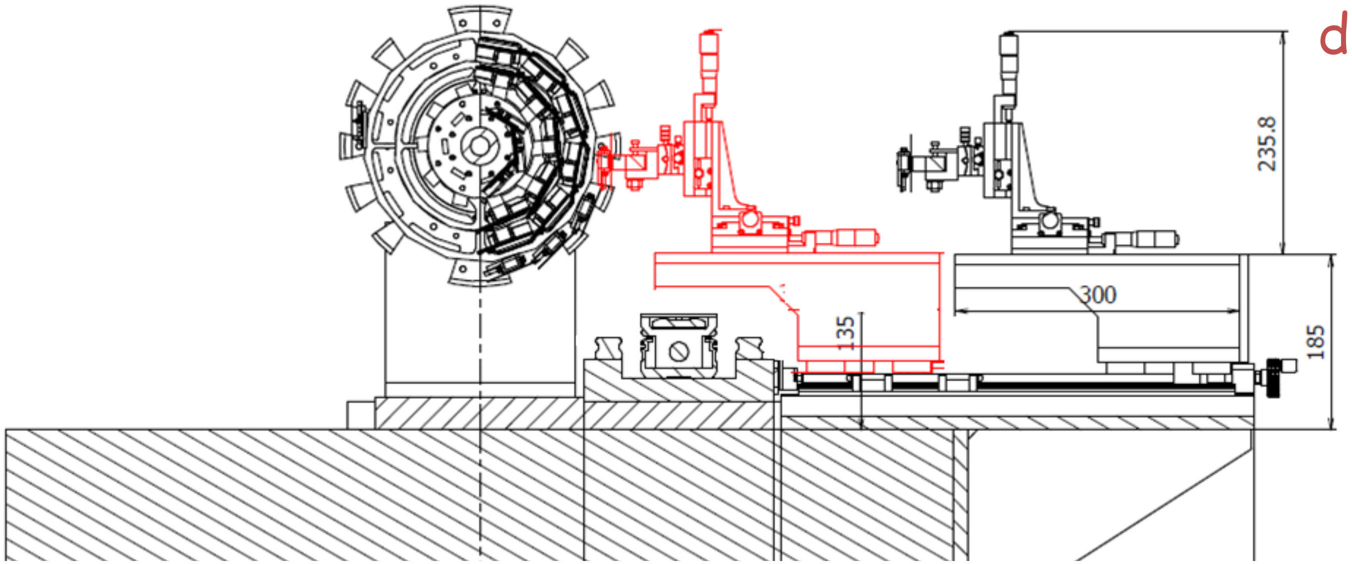
Ladder mount

- Clearance between modules:

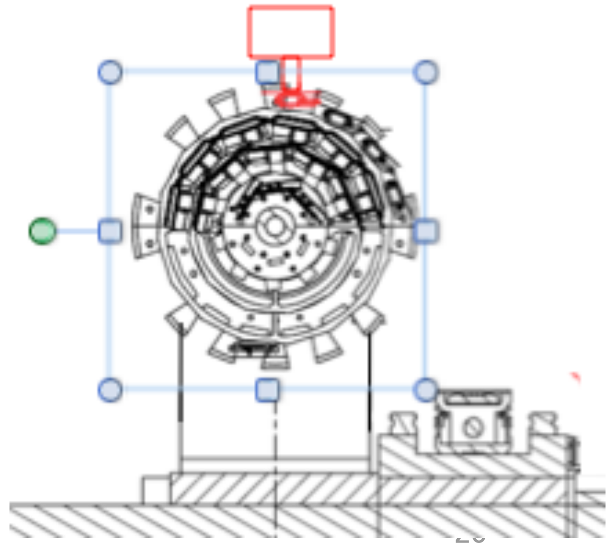
Less than 1 mm!



Option 1: hold ladders with arm and approach to the end rings by side, insert pins of ladders to the positioning holes.

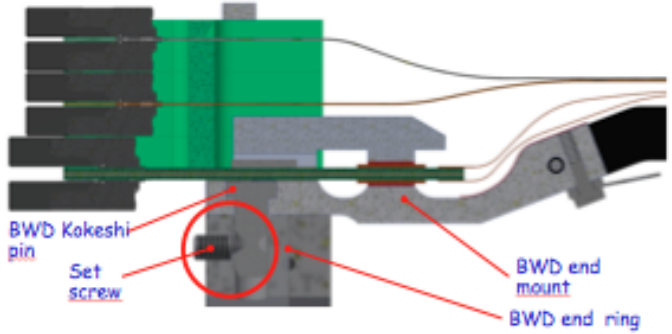


Option 2: support ladders from top using a sliding guide in vertical direction.



Conceptual Top mounting procedure

According to our (BaBar-SVT) experience, the whole operation could be split into 3 main phases:



1. Ladder loading from the shipping box to the "Two Arm Support", fixed to a sliding cart
2. Horizontal movement of the ladder on top of the end-rings
3. Guided lowering and locking of the ladder in its final position

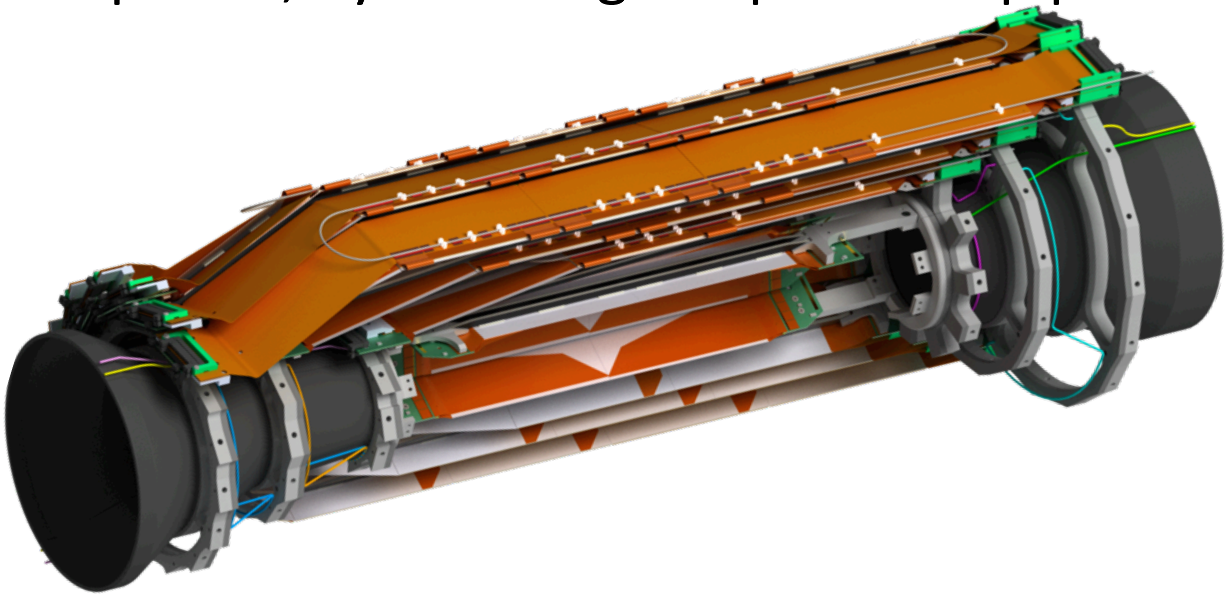
The details of the vertical methods with the cad drawings of the tools are shown in the presentation: http://www.pi.infn.it/~bettarin/vertical_ladder_mount.pdf

The Japanese side-mounting option was much more advanced, in terms of design and prototype realization. After the B2GM the pros/contra of the 2 methods have been evaluated and the SVD group decided to adopt the horizontal method.

Even if the Japanese method has been adopted, the Pisa group will significantly contribute to the ladder mounting operation ad to el. the tests needed for commissioning the SVD detector. (*)

Cooling pipes mounting

- The design work done can be re-used in the operation of the cooling pipe mounting, that can be realized only after each half-layer is completed, by lowering the pre-bent pipe from the top.

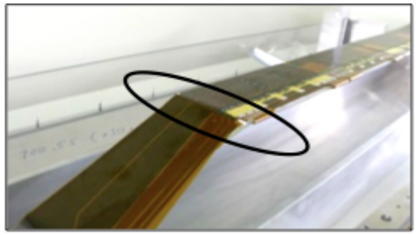


- Pisa has the responsibility to provide the mechanical tools necessary for the mounting of the cooling pipes for the 4,5 & 6 layers(*) and the necessary manpower for the installation (*).
- First conceptual design will be discussed to the VXD workshop next week and a first prototype (to be adapted to the existing mount table movements) will be taken to October B2GM.

Module Mechanical Characterization

Issues in the Stress Tests

- **Thermal cycling test**
  - Study items (open issues):
    - Permanent deformation.
    - Permanent damage (e.g.: wire break).
    - Component aging (e.g.: glue at the PA1/2 bend).
    - Thermal fatigue (e.g.: sharply folded part in the Origami+Z).

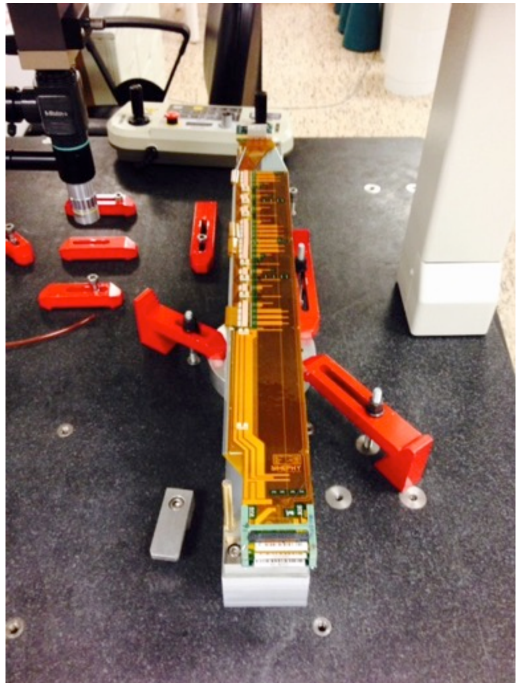


The folded part in the Origami+Z

  - The thermal excursion program for the studies above needs defined.
    - Suggestion: x100 cycles of (–30 ↔ 60)^{o}C at about $\pm$2^{o}C/min.

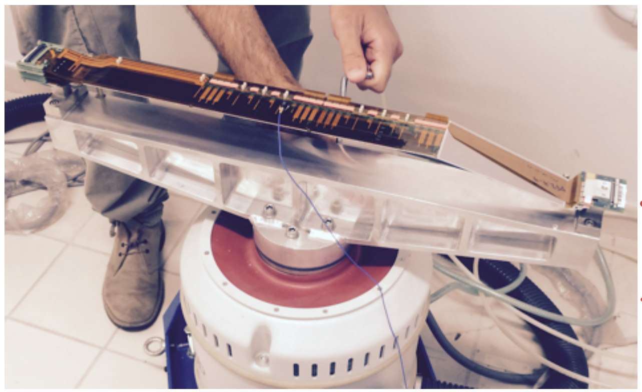
- **Mechanical stress test**
  - Study items (open issues):
    - Stress from the end-rings and CO_2 pipe.
    - Gravity sag.
    - Vibration in the transportation.

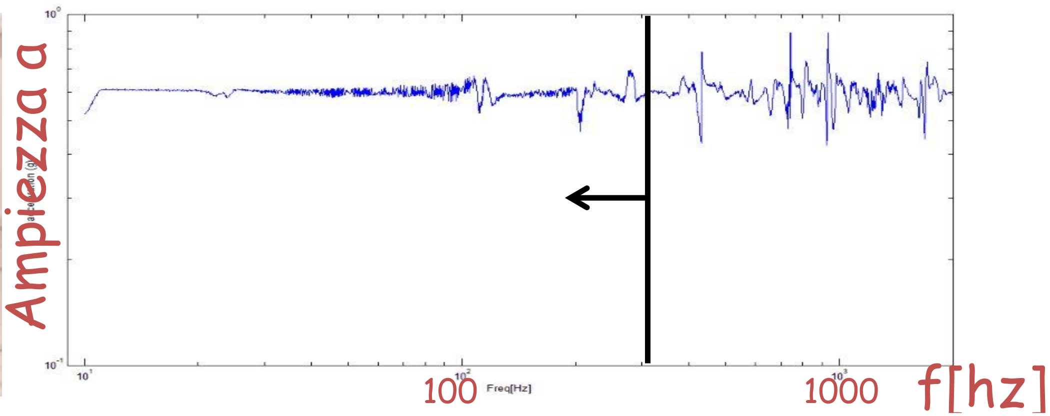
Pisa's vibration tester



The mech. survey of a Layer5 ladder under the CMM

Vibrational tests in Pisa (3rd Sept.)





Power Supply Commissioning

In Agosto sono stati spediti e PS a KEK ed e’ stata eseguito con successo il loro collaudo con un modulo di SVD.

Il noise e’ lo stesso che si ha con dei PS da banco/vecchi PS Kenwood (lin).

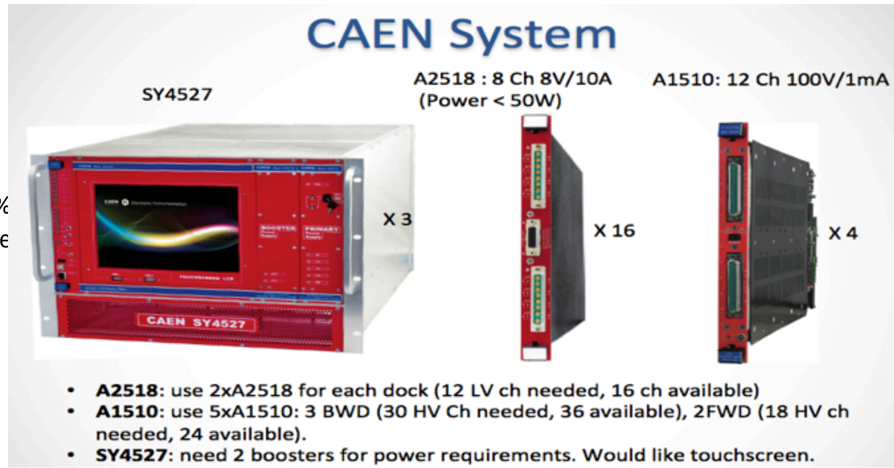
E’ emersa la necessita’ di installare un patch-panel (*).

Costo totale PS: 93 kE (inizialmente: 150→115)

Prodotto	Q.ta	Prezzo unitari	Sconto %	Totale aggiudicato	Spare	CostoSpare	CostoTotale	G
SY4527	2	5700	10	10260.00	1	5130		A
A4533	2	1450	10	2610.00	1	1305		R
A2519A	12	1950	15	19890.00	3	4972.5		A
A1510	2	4800	18	7872.00	0	0		+
A1519B	4	4800	10	17280.00	1	4320		~30%
TOTALE				57912.00		15727.50	**73639.50**	spare
30% aggiudicato				17373.60				

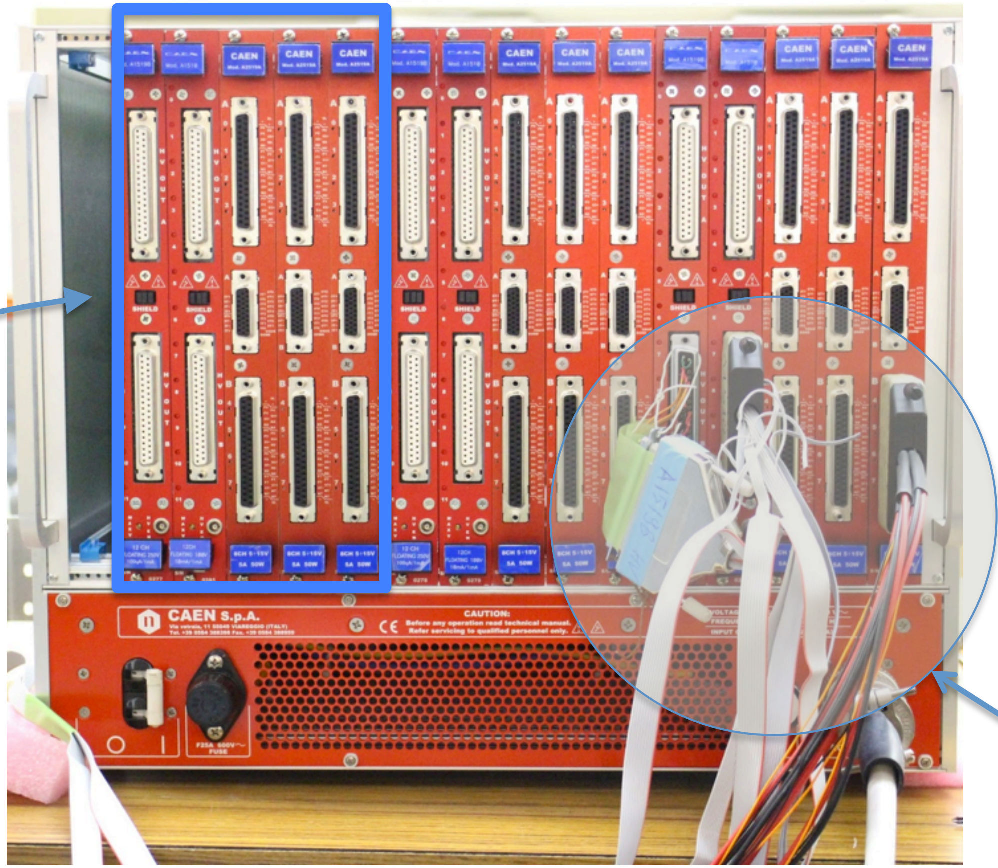
Richiesta: (finanziata)

A1510	2	4800.00	18	7872.00	1	3936	11808.00
Tasse	8%	consumable tax sul totale					6835.8
TOTALE							**18643.80**



SVD PS Patch panel issue

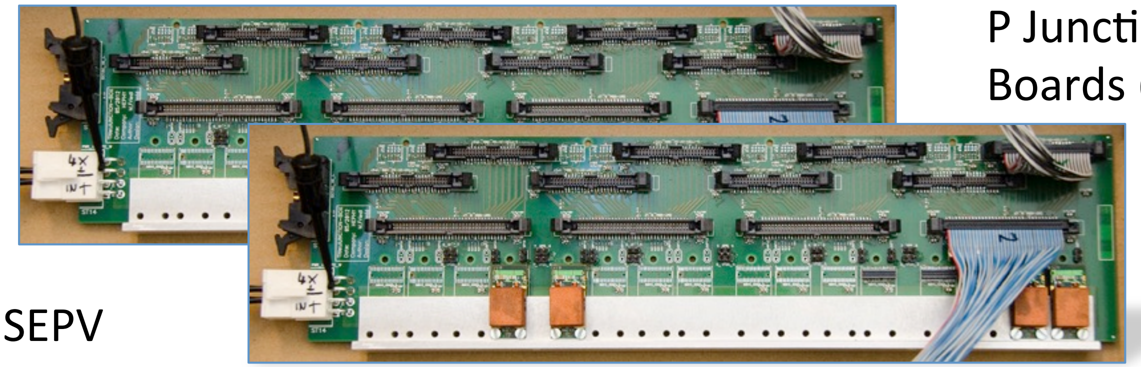
5 PS boards group =
24LV, 12 HV, 12 SEPV =
6 P Junction board +
6 N Junction board
(max 48 sensors)



Power supplies =
4 PS Board groups
+ 1 spare group

Not a good way of connecting the cables

P=2 LV, 1 HV, 1 SEPV



P Junction Boards (x24)

Each board powers 8 hybrids

N Junction Boards (x24)

N=2 LV, 1 HV, 1 SEPV

SVD PS patch panel functions

- Provide interconnection between cables from junction boards and power supply boards
- Generate a “HV ON” signal to inhibit injection (currently can only be generated via software)
- Prevent SEPV to turn on if HV is off (risk of direct biasing the sensor)
- Flexibility to allow quick reconfiguration in case of power supply failures.
- One PP serves 6P + 6N Junction boards:
  - Detector side: 6 LVP + 6HVP + 6LVN + 6HVN = 24 connectors
  - Power supply side: 2 HV, 2 SEPV, 6 LV = 10 Connectors
  - NIM connector for HV ON signal
- Need one patch panel per each power supply board group
  - Total of 4 PP + 1 spare.

Aggiornamento necessita' Pisa
(dalla chiusura dei preventivi and oggi)

1. Tools di montaggio delle cooling pipes: 10 kE (nei preventivi 2016)
2. Patch panel Power Supply: questa e' emersa dopo il commissioning (agosto 2015) dei PS: 10 kE
3. Nel 2015 era stato finanziato il ladder-mounting verticale: 25 + 10 kE (queste spese per i tools non devono piu' essere fatte)

→ Chiediamo di poter realizzare 2. . Se "approvato" → Pisa avrebbe un avanzo netto da 3. di 25 kE

- Brutta Notizia: si e' rotta la CMM (Mitutoyo/1998) prevista per l'incollaggio dei subassembly. Stiamo utilizzando un'altra CMM, inizialmente destinata ai survey dei moduli di CMS, con interferenze sempre maggiori… Preventivo per la riparazione (necessita sostituzione completa del circuito ad aria compressa e nuova calibrazione) ~12 kE. Siamo in contatto con il nuovo/vecchio direttore per fare un ragionevole sharing del costo Belle2/sezione (50/50?).
- Nell'ipotesi 50/50, i 19 kE sarebbero utilizzabili per anticipare l'acquisto dell'interrogatore di TS con una integrazione da altri "avanzi"?

Update on Trieste SVD activities

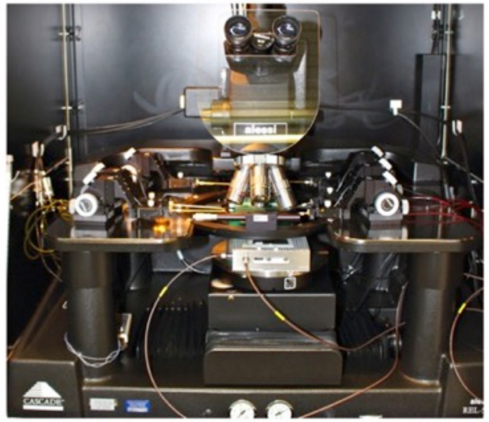
1. Test sensori DSSD, Micron e HPK

2. Radiation Monitoring e Beam Abort
   - Sensori diamante scCVD: caratterizzazione, meccanica, cablaggi
   - Elettronica
3. Temperature Monitoring & Interlocks
   - NTC thermistors, read-out basato su ELMB
   - FOS fibers
4. Humidity Monitoring & Interlocks

I. Test sensori DSSD Micron e HP

- Attività svolte o in corso, 2015
  - Completamento test sensori Micron
  - Test sensori 'meccanici' Hamamatsu
  - Test sensori Micron graffiati (a Vienna…) + separazione corti metallici
  - Contributo a interpretazione test di Vienna
  - Separazione corti metallici sensori small HPK per il Layer3 (Irina, missione a Melbourne)

Sensor testing set-up



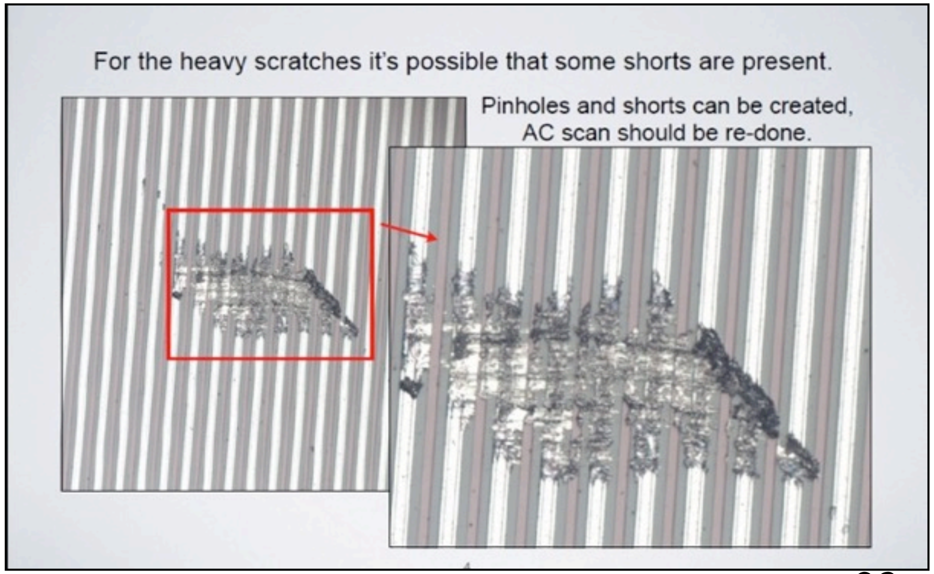
- Front and Back-side Rings are connected through cables
- Strips are contacted by a 40-needle Probe Card

5th Belle II PXD/SVD Workshop 23-01-2014 – L. Bosisio - Test of Micron Trapezoidal Sensors

- Attività previste, 2016
  - Test supplementari per investigare eventuali problemi

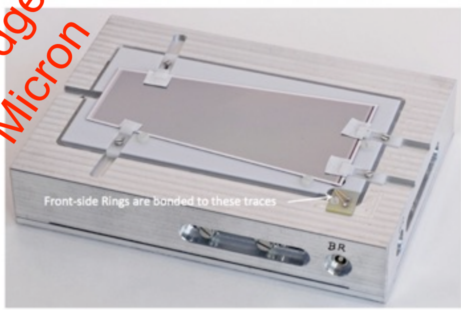
- Richieste finanziarie 2016
  - solo contributi alla manutenzione ordinaria

(parte della richiesta di 2.0 kEuro consumi)



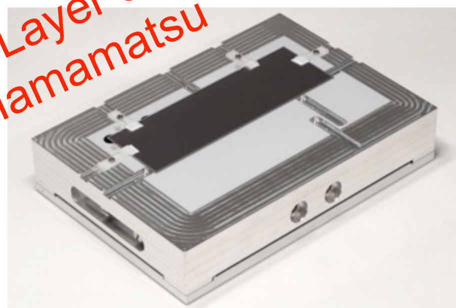
Sensor testing Jig (top)

Wedge Micron



5th Belle II PXD/SVD Workshop 23-01-2014 – L. Bosisio - Test of Micron Trapezoidal Sensors 3

Layer 3 Hamamatsu



2. Radiation Monitor & Beam Abort - sensori

- **Attività in corso, 2015**

  Sensori scCVD, 4 prototipi per BEAST I

  Assemblati, completamente caratterizzati (I-V, sorgenti β e α)

  Installati a KEK (fine Agosto – inizio Settembre) per BEAST I

  Preparate specifiche, acquisto 20 sensori scCVD entro fine 2015

  Posizionamenti e meccanica finali: definiti

- **Attività previste, 2016**

  Partecipazione a BEAST I a KEK:

  - misure delle dosi istantanee di radiazione e confronti con diodi PiN
  - test del sistema di Beam Abort

  Acquisto di ulteriori 4 sensori scCVD per BEAST 2

  Ricezione, test e assemblaggio dei sensori scCVD acquistati

  Installazione sensori a KEK durante montaggi VXD

2. Radiation Monitor & Beam Abort - elettronica

- Attività in corso, 2015

  Specifiche dell'elettronica di lettura e Beam Abort:

    dosi istantanee attese, sensibilità nella misura delle correnti

    soglie per Beam Abort, scambio di segnali con l'acceleratore

  Disegno e realizzazione di un primo prototipo (collab. Elettra)

    Modulo (box) per 4 sensori:

      front end, conversione A/D, FPGA, memoria, interfaccia Ethernet

      HV individuale per sensori scCVD

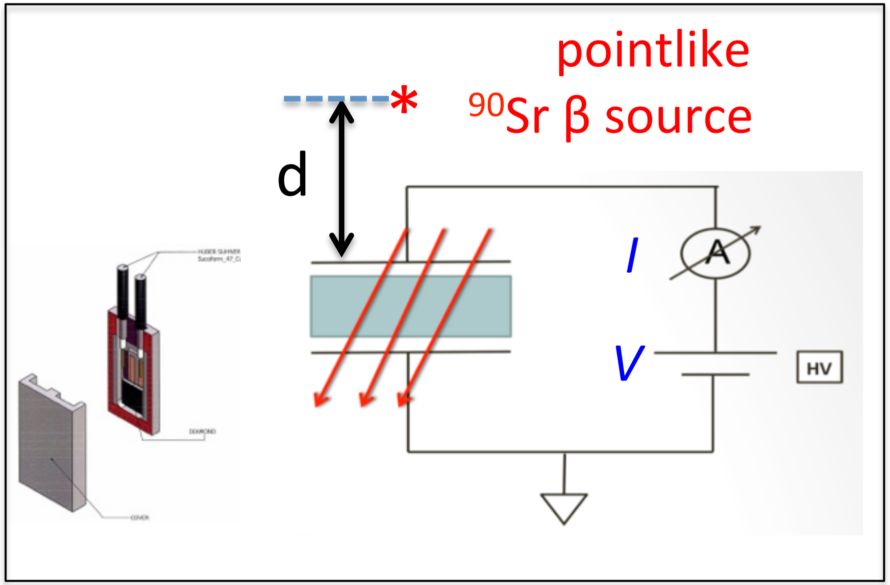
  Test preliminari in laboratorio e a KEK (preparazione BEAST 1)

- Attività previste, 2016

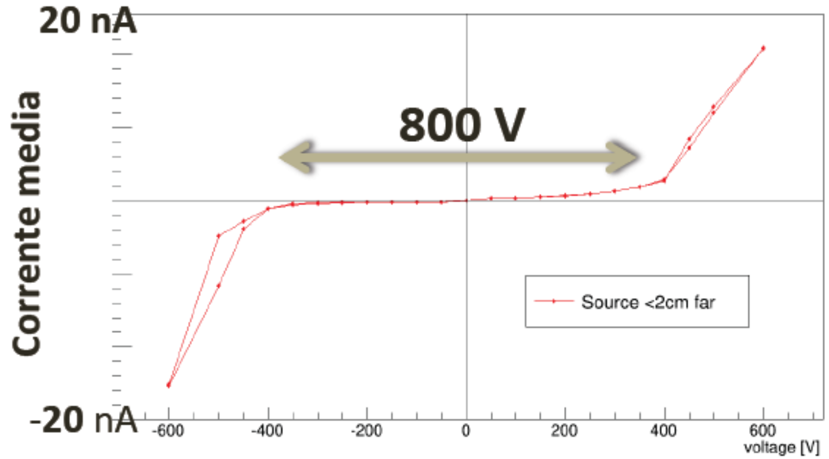
  Validazione del prototipo con 4 sensori scCVD a KEK (BEAST 1)

  Disegno finale, inizio realizzazione 5 moduli (4 ch./mod.) + spare

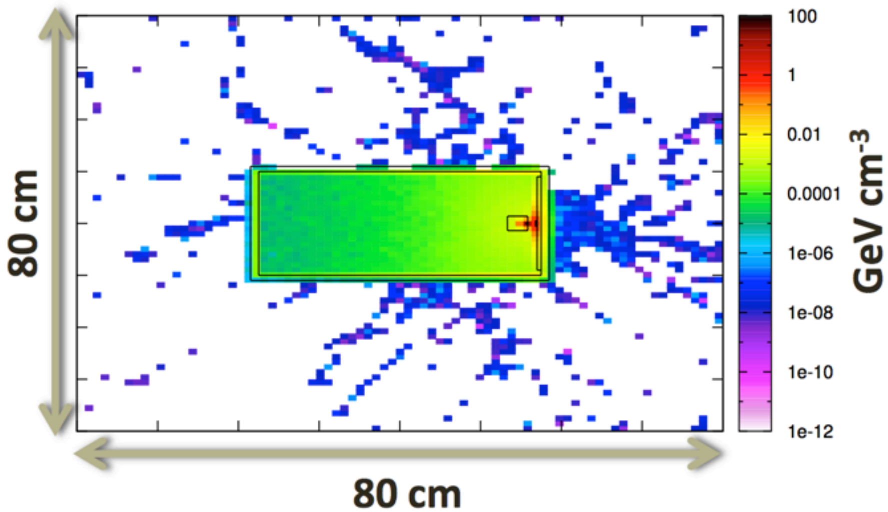
2. Characterisation of scCVD sensors - I



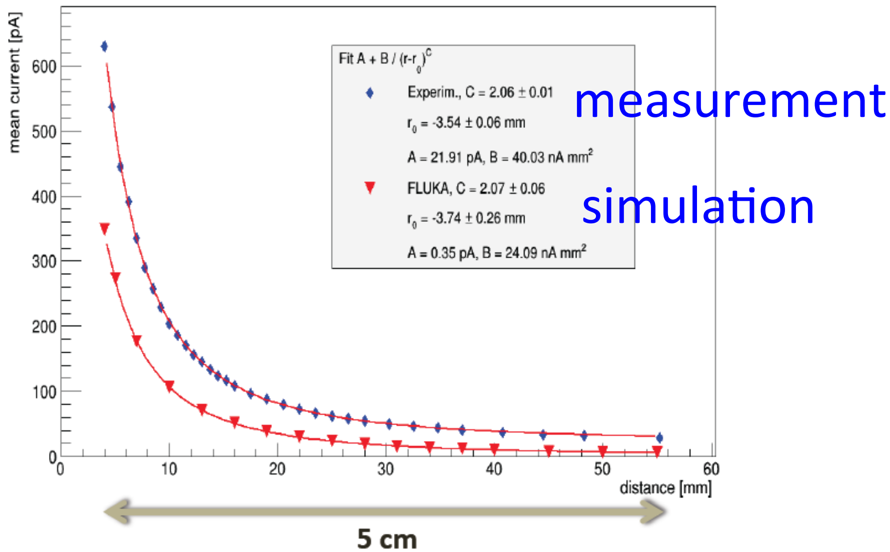
I-V with ^{90}Sr β source at fixed *d*



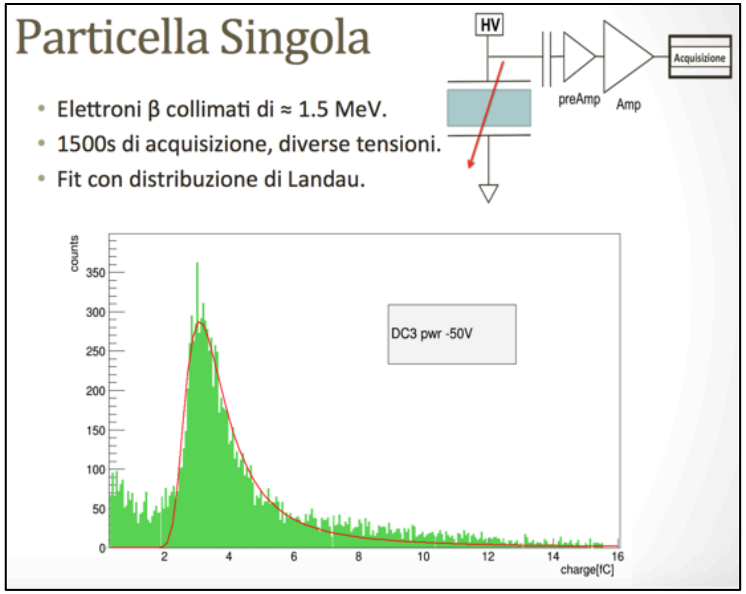
FLUKA simulation, ^{90}Sr β source



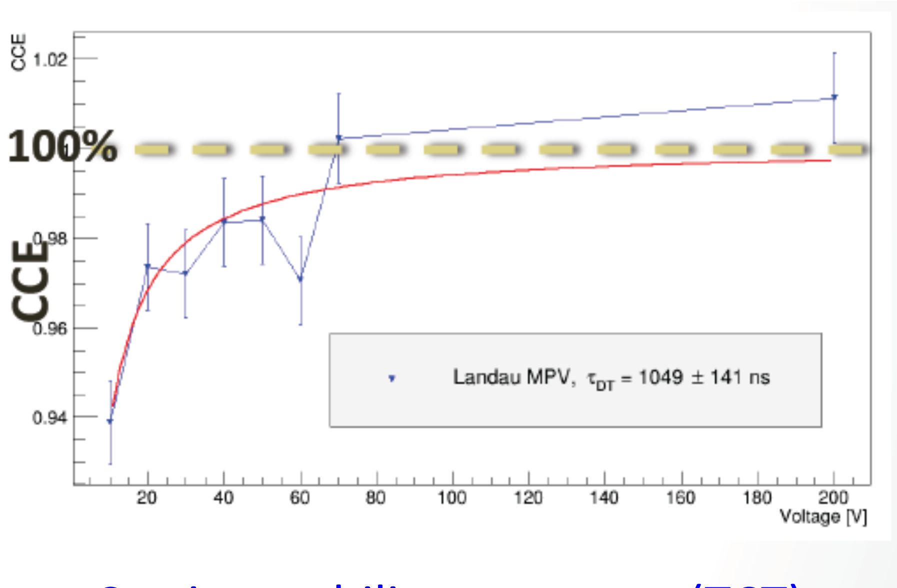
Current *I* vs distance *d* of ^{90}Sr β source

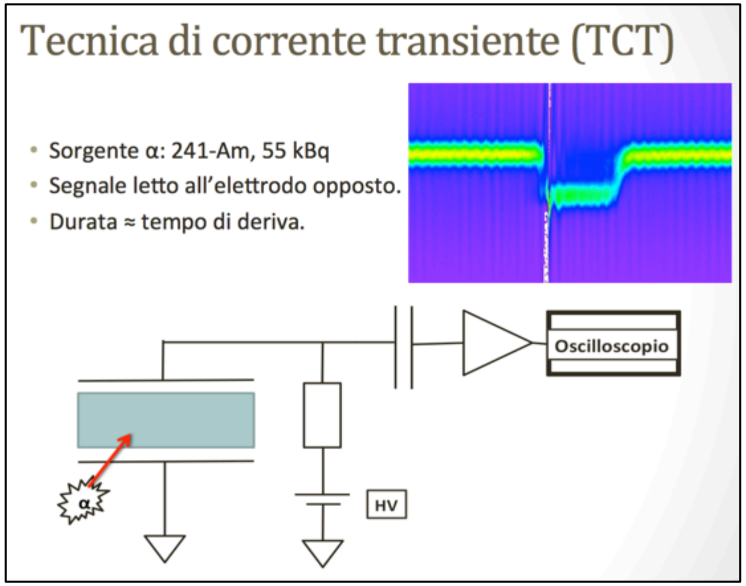


2. Characterisation of scCVD sensors - II

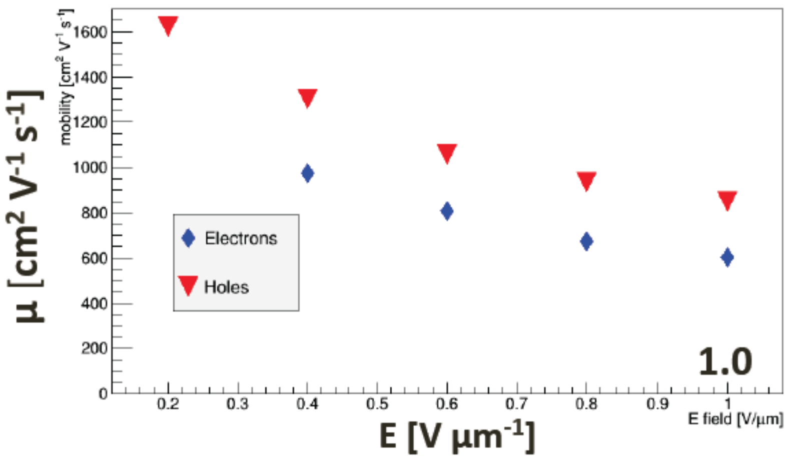


Charge Collection Efficiency from MIPs

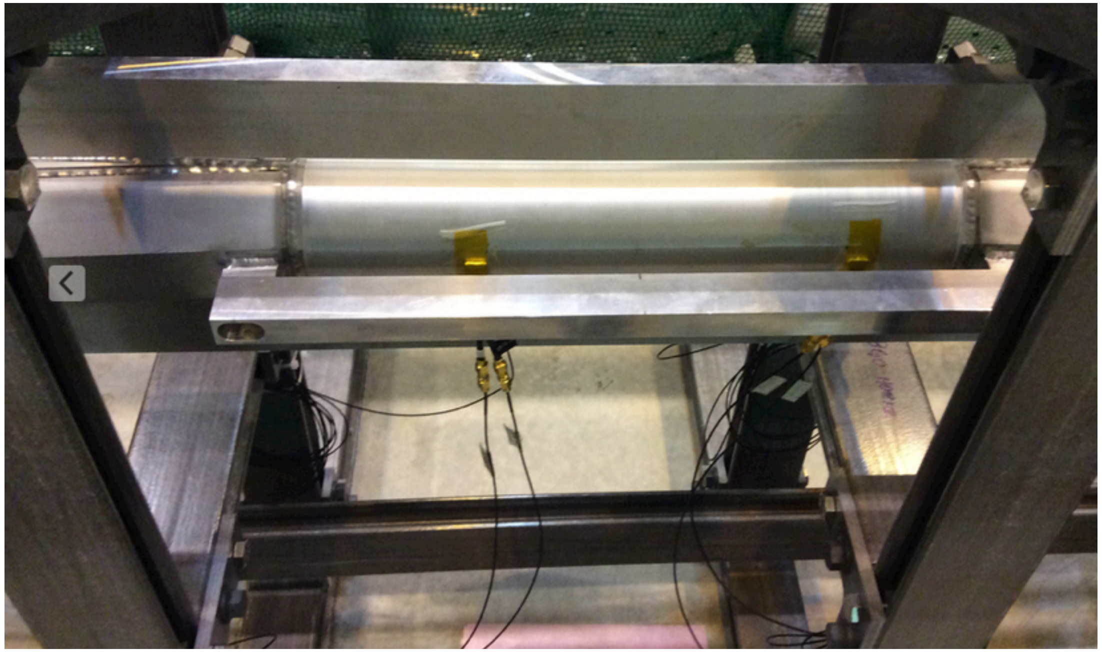




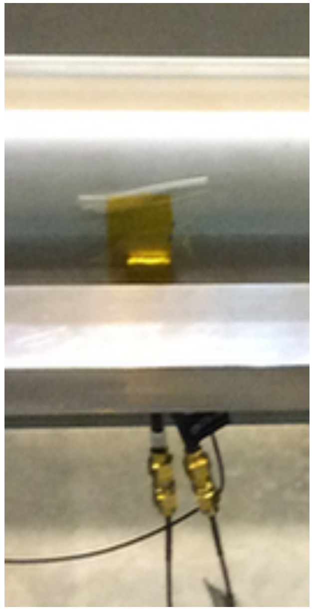
Carrier mobility, α source (TCT)



2. Radiation monitoring installation with diamond sensors in BEAST (Aug. 26 → Sept. 3)

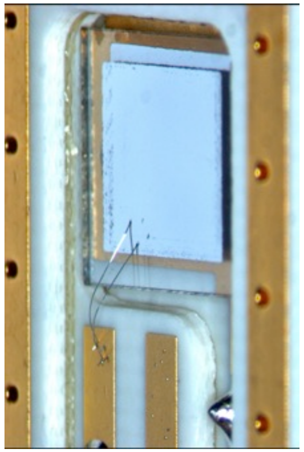


Installed readout system



Installed HW at the IP

4 diamond sensors directly taped on the beampipe in the horizontal plane (close to the PIN diodes) in the same location of phase 2



Electronic noise (and signal from b-source) measured with:

- AH501 picoammeter
- CAEN PS

Noise level as expected!

2. Readout & Beam Abort: electronics prototype

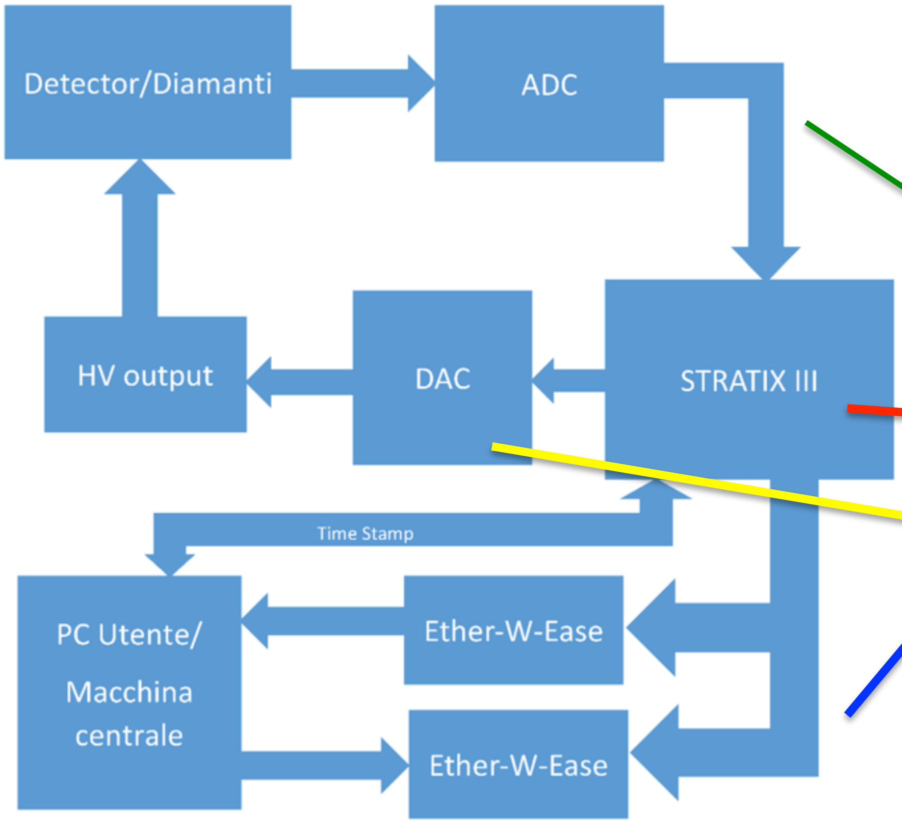
F.Vulpone, thesis with G.Cautero et al. (Elettra): prototype ready of:

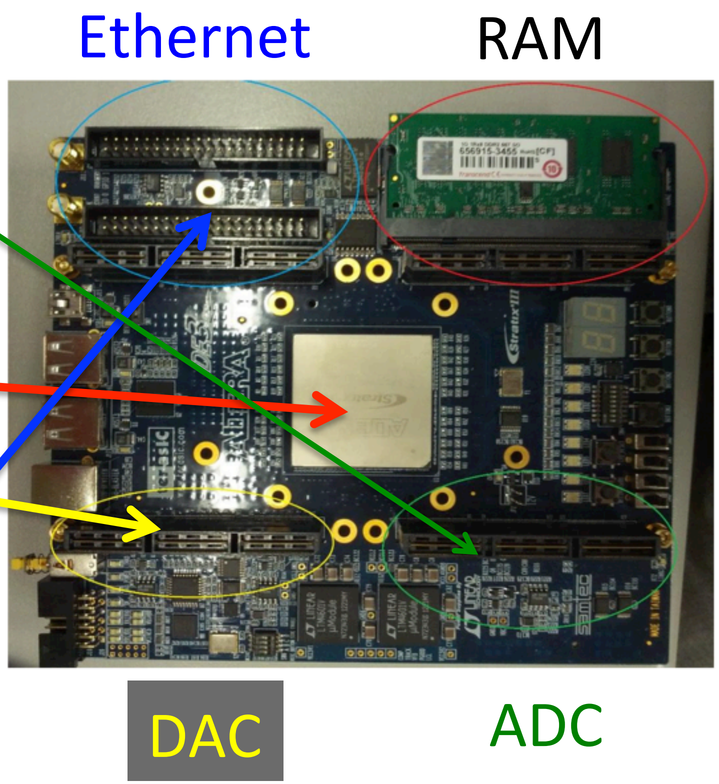
Analog front end: picoammeter (transimpedence amplifier, ADC 16 bit 130 MHz)

Digital section: FPGA (running averages, abort thresholds, timing&control)

External RAM and Ethernet interfaces; Labview control & readout test program

Ready for first field tests at KEK in October!





2. Radiation Monitor & Beam Abort – Richieste 2016

- Sensori

  Apparati:

4 sensori scCVD aggiuntivi, per BEAST 2 (*)	15 kE
30 cavi coax. 3m	3 kE
40 cavi coax. 5m	10 kE

  Consumi:

  (Vedi metabolismo + 2 kE lab.el., officina)

  Missioni:

4 m.u. partecipazione BEAST 1 a KEK	24 kE

  (*) richiesta dalla collaborazione: non riutilizzabili
  BEAST 2 con 4+4 sensori; montaggio 20 sensori VXD in parallelo

- Elettronica

  Apparati

  6 moduli lettura e beam abort, 5.5 kEuro/modulo (**) 33 kE

  Missioni

  1 m.u. (tecnologi, Elettra) per messa a punto a KEK 6 kE

  (**) costo effettivo IVA inclusa, dettaglio nella slide di backup
  Aumentato rispetto alle previsioni (~ 3.0 kE/modulo):FPGA + potente, HV individuali

3. Temperature Monitoring & Interlock - NTC

- Attività in corso, 2015

  Acquisto sensori NTC per le basse temperature (-30°C)

  Definizione della meccanica di supporto dei sensori (*fatto*),

  Sistema di lettura e interlock basato su ELMB (*completato*)

  Test al thermal mock-up di DESY (*da fare*)

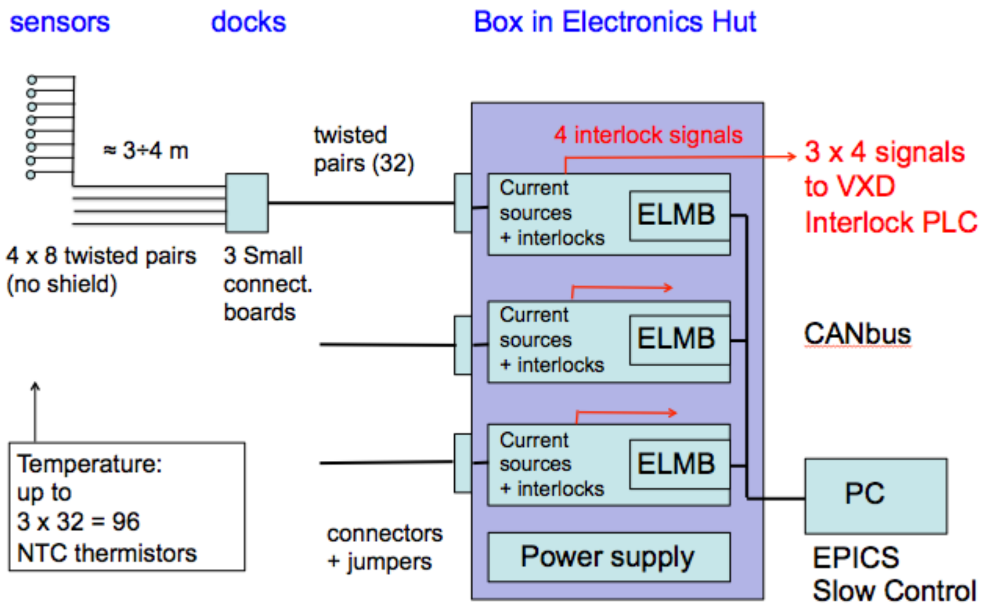
- Attività previste, 2016

  Realizzazione meccanica supporto sensori e cablaggi

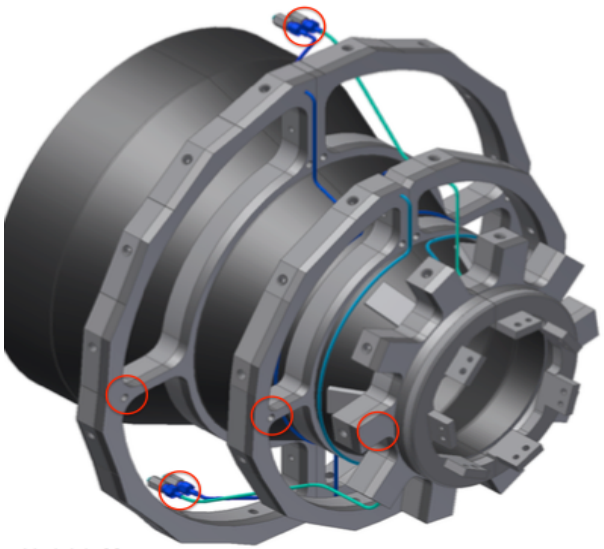
  Installazione e test durante i montaggi VXD a KEK (Apr. – Dic.)

Temperature Monitoring & Interlock - NTC

NTCs – ELMB-based electronics ready!



NTC final locations and fixing

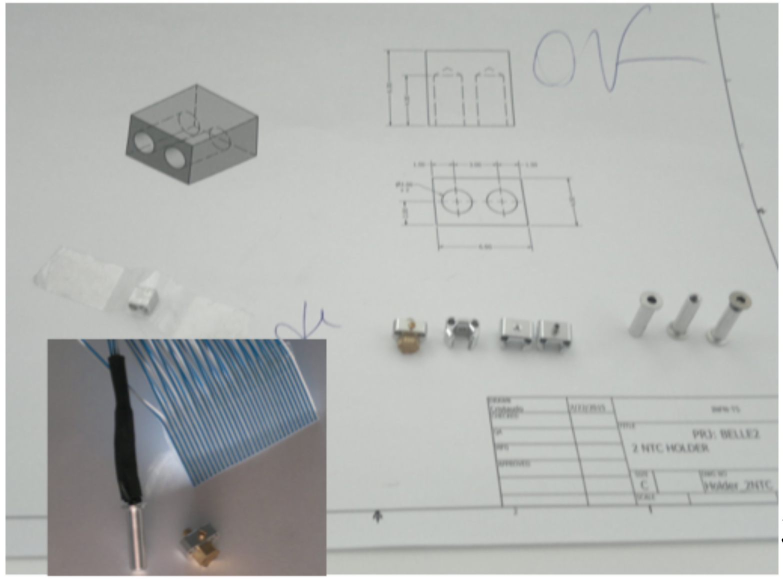


12 sensor pairs attached to the 12 half-rings supporting the SVD ladders:
4mm alignment holes in half rings L5 and L6, glued L3-4

16 sensor pairs on the inlets and outlets of the CO_2 cooling pipes:
on the "streuli connectors" of CO2 inlets-outlets

A few (~8) positioned near fibers for cross-calibration

NTC mechanics



3. Temperature Monitoring – FBG/FOS

- Attività in corso, 2015

  Test di prototipi (diverso numero di sensori, diversi fornitori)

  Messa a punto delle procedure di calibrazione, camera climatica

  Acquisto fibre con sensori finali, connettori, accoppiatori

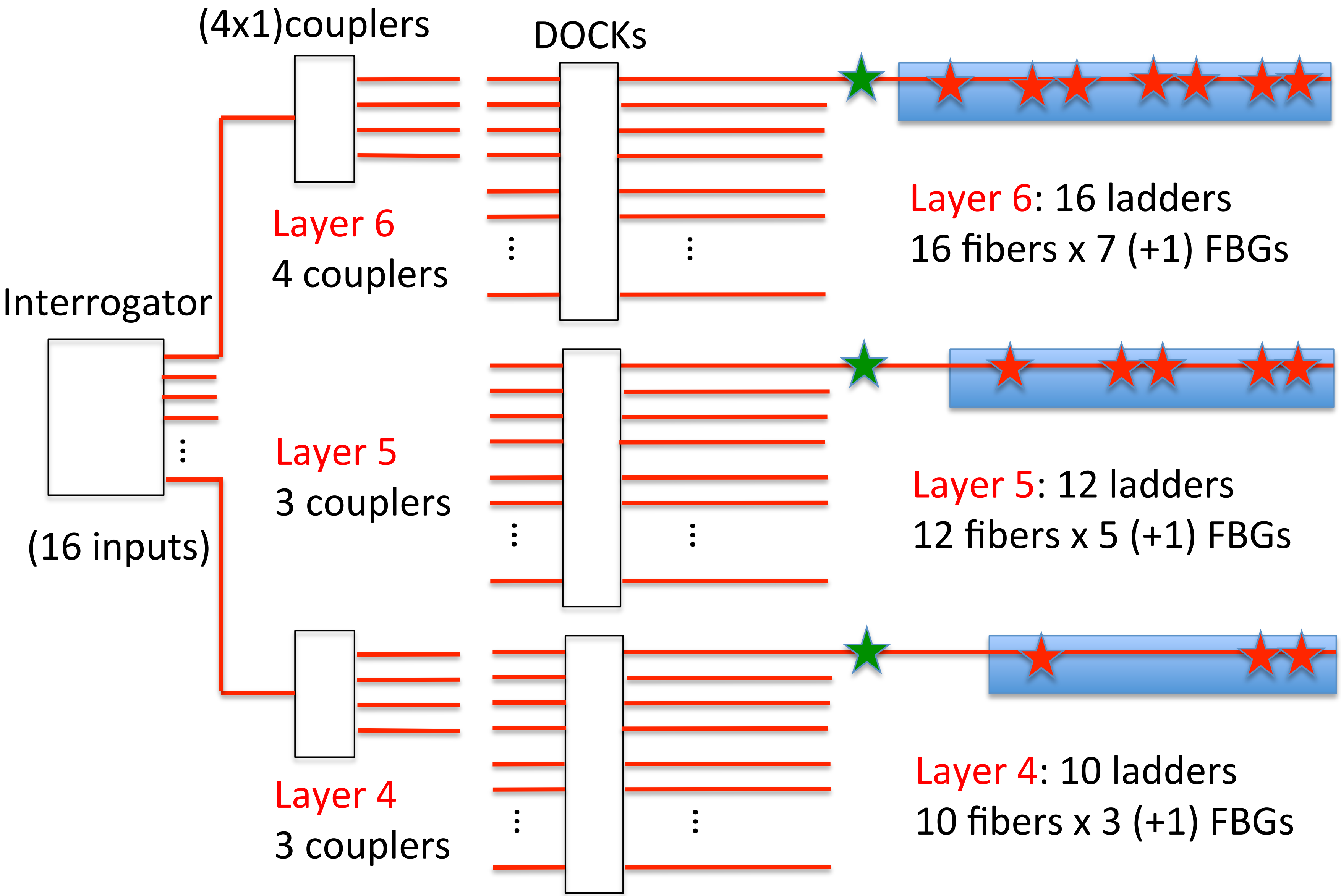
- Attività previste, 2016

  Calibrazione e preparazione delle fibre in sede

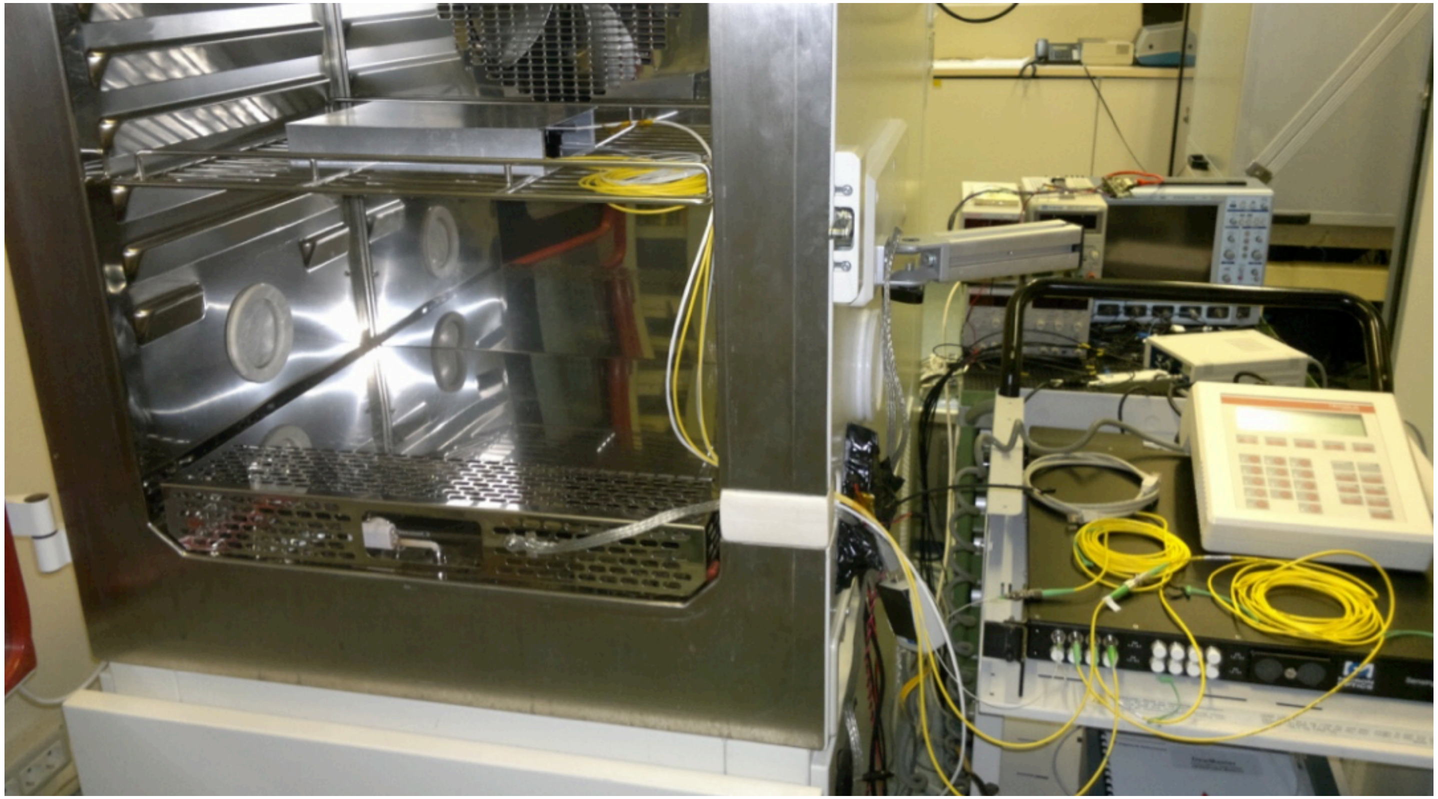
  Installazione delle fibre nei ladder SVD a KEK

  Test a KEK prima/dopo l'inserzione nei ladder

3. Temperature: optical Fiber Bragg Grating sensors



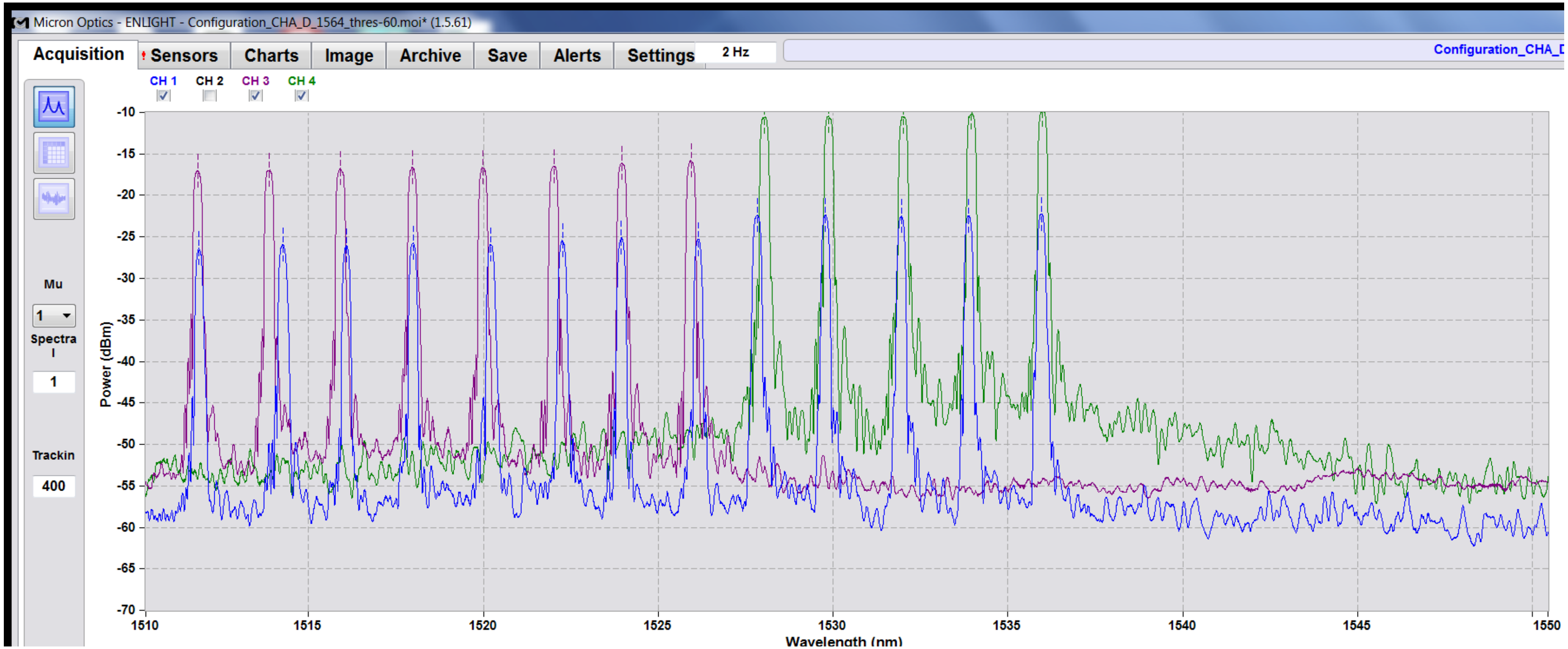
3. FBG (FOS): tests and calibrations



- Multiplexed fibers with 5 or 8 FBG sensors
  attenuations OK, well separated peaks
- Calibrations in environmental chamber,
  -20 to +40 ^{o}C: polynomial fits OK

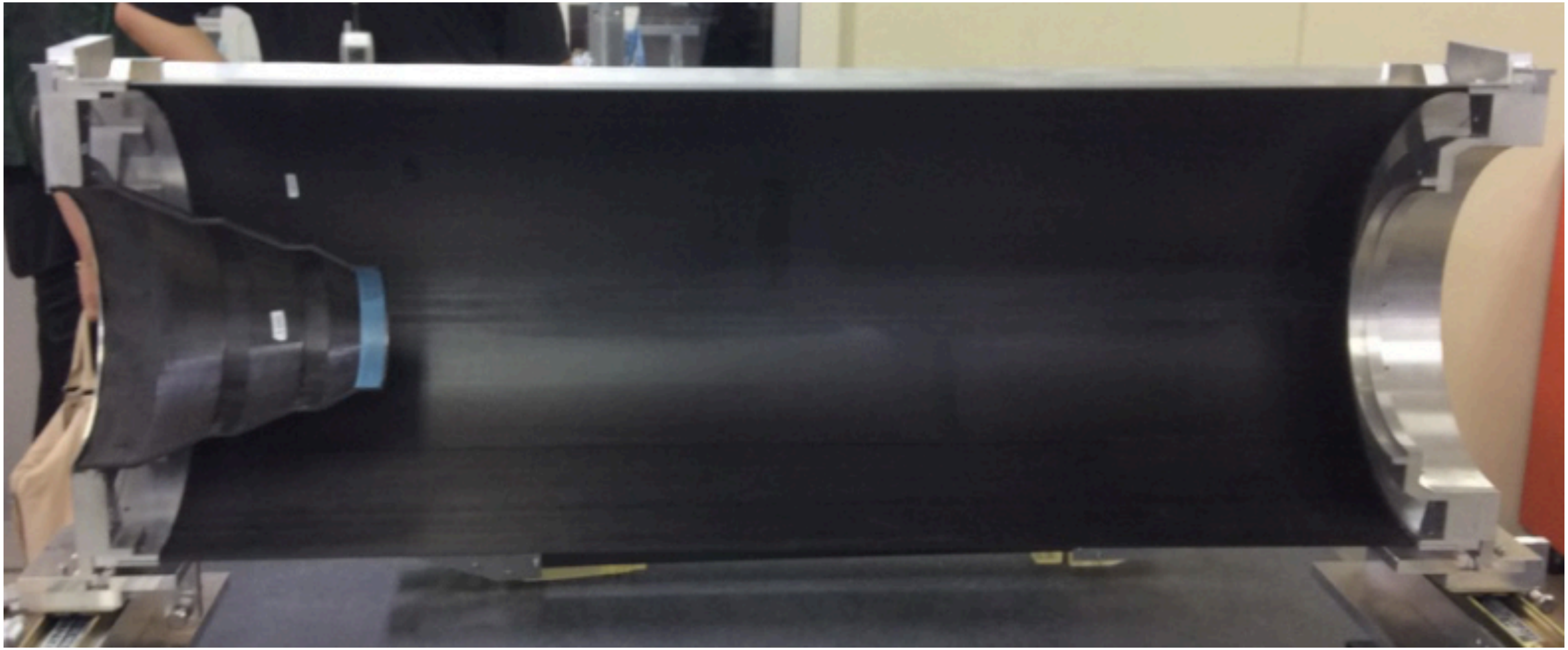
3. 8/5 FBGs with/without splitters

- 5 sensors fiber direct to interrogator
- 8 sensors fiber with 1x2 splitter
- 2 fibers (8 sensors +5 sensors), 1x4 splitter, 30m fiber and all PC/APC connectors is OK, the attenuation is ~ as expected: OK!



How to monitor temperature close to CDC?

2 Fibers with several sensors to monitor temperature close to CDC
First discussion in June 22 Gemba meeting. Outcome: several constraints, but it might be possible to glue it (to be clarified).



3. Temperature Monitoring & Interlock – NTC + FOS – Richieste 2016

- NTC

Apparati

Interfacce CANbus per readout NTC	1 kE
Connettori e meccanica per NTC	0.5 kE

Missioni

3 m.u. installazione ladder, NTC (e FOS) a KEK	18 kE
1 m.u. tecnici a KEK (test NTC e FOS)	6 kE

- FBG/FOS

Apparati

4 fibre (5 FBG/fibra) per umidità e temperatura	3.5 kE
5 fibre (8 FBG/fibra) per temperatura	4 kE
Lettore aggiuntivo durante montaggi e poi spare (*)	35 kE

Missioni

Installazione nei ladder e test a KEK: vedi NTC (già conteggiate)

(*) uso in parallelo sede/KEK durante calibrazioni e montaggi

Se uguale a quello già acquistato, anche spare durante data taking

(nuova richiesta, rispetto al primo acquisto anticipato da Pisa nel 2014)

3. Humidity Monitoring & Interlock

- Attività in corso, 2015

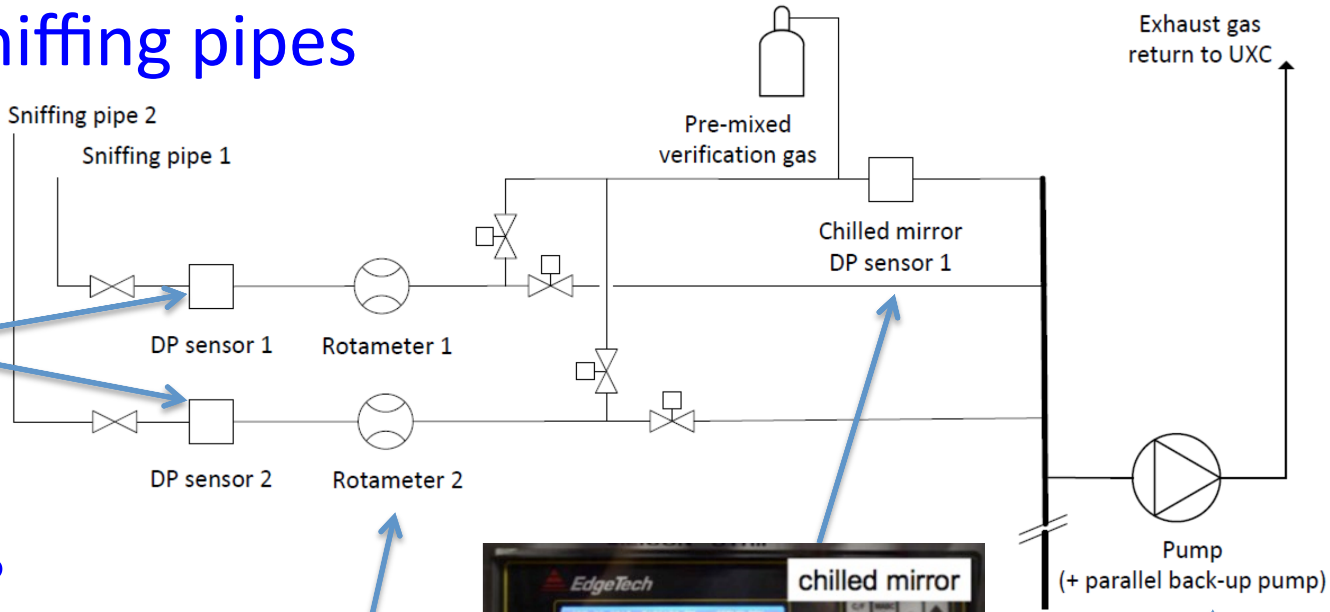
  Prototipo sniffer con un Vaisala Dew Point Transmitter (*completata*)
  calibrazione con Chilled Mirror Hygrometer (*completata*)
  Calibrazioni e utilizzo del segnale d'allarme per interlock (*da fare*)
  Test su thermal mock-up a DESY (*da fare*)

- Attività previste, 2016

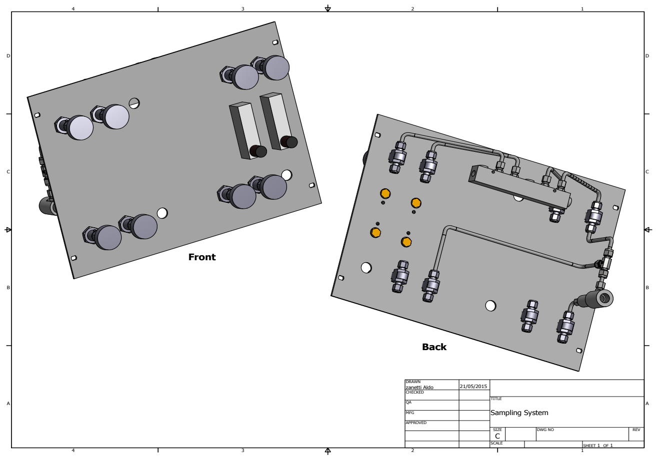
  Completamento a 4 tubi "sniffer" (con 4 Vaisala)
  messa a punto dell'interlock con PLC

Dew Point Sensors (interlock @ -30°C)

Sniffing pipes



Vaisala DMT242B
Dew Point Transmitters
[-60, +60]°C dew point range



Rotameter
flux meters

Edgetech Dewmaster
Chilled Mirror Hygrometer
(for calibrations)

Pump

3. Humidity Monitoring & Interlock - Richieste 2016

- Richieste finanziarie 2016

Apparati

3 Vaisala Dew Point Transmitter	7 kE
Pompa per aspirazione (sniffer)	1 kE
Moduli I/O per PLC Schneider esistente	1.5 kE

Consumi

Piping, flussometri, cavi, connettori: non esplicitati (da metabolismi)

Riepilogo richieste 2016 apparati TS

item	keuro
RadMon: 4 sensori diamante scCVD metallizzati	15.0
RadMon: 30 diamond sensor coax cables (3m)	3.0
RadMon: 40 diamond sensor coax cables (30m)	10.0
RadMon: 6 moduli lettura sensori e beam abort (5.5 kE/modulo)	33.0
NTC: interfaccia CANbus per readout	1.0
NTC: connettori e meccanica	0.5
FOS: 4 fibres (humidity+temp., 5FBG/fibra; 900 E/fibra)	3.5
FOS: 5 fibres (temperatura, 8 FBG/fibra; 750 E/fibra)	4.0
FOS: lettore aggiuntivo fibre	35.0
Sniffer Umidità: 3 Vaisala dew point transmitter (2.4 kE/unita)	7.0
Sniffer Umidità: pompe	1.0
moduli I/O per PLC Schneider Interlock	1.5
totale	114.5

Profilo di spesa apparati TS, aggiornato al 2014

Tabella di previsioni 2015 e 2016 presentata nella riunione di settembre 2014:

Item	2013	2014	2015	2016	TOT
Initial CORE	5	75	70	0	**150**
DSSD tests	2.5	0	0	0	2.5
Rad.Mon.+Abort (diamonds, cables, etc)	2	7	96	10	115
Rad.Mon.+Abort (electronics)	0	4	4	19	27
Temperature Mon. (FOS fibers, offers)	0	17.5	1	30	48.5
Temperature Mon. (NTC thermistors)	0	3	2	4	9
Humidity Mon. (very preliminary)	0	0	10	0	10
TOTAL	4,5	31.5	113	**63**	**212**

Spesa prevista per 2016: 63.0 keuro (– 30 keuro anticipati su Pisa 2014)
Richieste attuali per 2016: 114.5 keuro
Principali motivi dell'aumento:
15.0 keuro (sensori diam. aggiuntivi per BEAST 2)
15.0 keuro (aumento costo elettronica: 33-18)
7.5 kEuro (FOS aggiuntive chieste da collab.)
35.0 keuro (lettore FOS aggiuntivo)

SVD totale Richieste 2016

Sys	Sede	Capitolo	Categoria	Descrizione	Richiesta	Richiesta SJ	Anticipabile 2015?	Commenti
SVD	TS	missioni	A	2 x VXD workshop (2kE) x 3 persone	12			
SVD	TS	missioni	D	4 m.u. (6 kE/m.u.) partecipazione BEAST 1 (rad.mon. e beam abort)	24			
SVD	TS	missioni	D	1 m.u. tecnologi Elettra per test elettronica Beam Abort	6			
SVD	TS	missioni	D	3 m.u. installazione e test NTC e FOS durante ladder mount (da Aprile a Dicembre)	18			calcolato con 1 persona presente durante alcune fasi dell'assemblaggio per inserzione e test FOS e NTC; procedura esatta e presenze da chiarire (forse serve di più?)
SVD	TS	missioni	D	1 m.u. tecnici per test iniziali NTC e FOS a KEK	6			
SVD	TS	missioni	C	Coordinamento monitor radiazione e ambientale VXD e Beam Abort	5			
SVD	TS	apparati	A	4 sensori diamante scCVD metallizzati (Cividec)	15			per soddisfare richiesta di equipaggiare in simultanea BEAST 2 e il setup finale
SVD	TS	apparati	A	30 diamond sensor coax cables (3m)	3			
SVD	TS	apparati	A	40 diamond sensor coax cables (30m)	10			
SVD	TS	apparati	A	6 moduli lettura sensori diamante e beam abort (4-ch/modulo) (5.5 kE/modulo)	33			costo aggiornato e dettagliato dopo realizzazione primo prototipo (aumento dovuto a separazione HV e FPGA + performante); una frazione del totale potrebbe andare al 2017
SVD	TS	apparati	A	4 FOS fibre (humidity+temp., 5FBG/fibra; 900 E/fibra)	3.5			nuova richiesta da collab. SVD
SVD	TS	apparati	A	5 FOS fibre (temperatura, 8 FBG/fibra; 750 E/fibra)	4			nuova richiesta da collab. SVD
SVD	TS	apparati	A	3 Vaisala dew point transmitter (2.4 kE/unita) per sniffer umidita`	7			
SVD	TS	apparati	A	pompe per sniffer umidita`	1			
SVD	TS	apparati	A	CANbus per readout NTC	1			
SVD	TS	apparati	A	connettori e meccanica per NTC	0.5			
SVD	TS	apparati	A	moduli I/O per PLC Schneider (Interlock temperatura e umidità SVD)	1.5			
SVD	TS	apparati	A	lettore aggiuntivo fibre FOS in fase assemblaggio/backup in presa dati	35		Si'	potrebbe finire al 2017
SVD	TS	consumo	A	contributo consumi e manutenzioni, laboratorio elettronica e officina mecc.	2			
SVD	TS	trasporti	A	spedizione sensori (diamanti, NTC, FOS), cavi, elettronica	4			
SVD	PI	missioni	A	2 x SVD workshop 2kE x 4 pers	16			
SVD	PI	missioni	A	Test Beam VXD Desy (2 weeks x 2 pers)	5			
SVD	PI	missioni	D	2 m.u. (6 kE/m.u.) per ladder/cooling pipe mounting incluso tecnico	12			
SVD	PI	missioni	D	3 m.u. (6 kE/m.u.) per test ladders/layers durante il mounting	18			
SVD	PI	trasporti	A	spedizioni finali FW/BW	5			
SVD	PI	consumo	A	consumabili di laboratorio	3			
SVD	PI	consumo	A	contributo manutenzioni laboratorio	3			
SVD	PI	consumo	A	tools meccanici per pipe mounting	10			
SVD	PI	missioni	C	Coordinamento SVD	5			

	A	B	C	D	E	F	G	H	I	J	K
1		apparati		consumo		missioni		trasporti		Grand Total	
2		SUM of Richiesta	SUM of Richiesta SJ	SUM of Richiesta	SUM of Richiesta SJ	SUM of Richiesta	SUM of Richiesta SJ	SUM of Richiesta	SUM of Richiesta SJ	SUM of Richiesta	SUM of Richiesta SJ
3	PI			16	0	56	0	5	0	77	0
4	TS	114.5	0	2	0	71	0	4	0	191.5	0
5	Grand Total	114.5	0	18	0	127	0	9	0	268.5	0

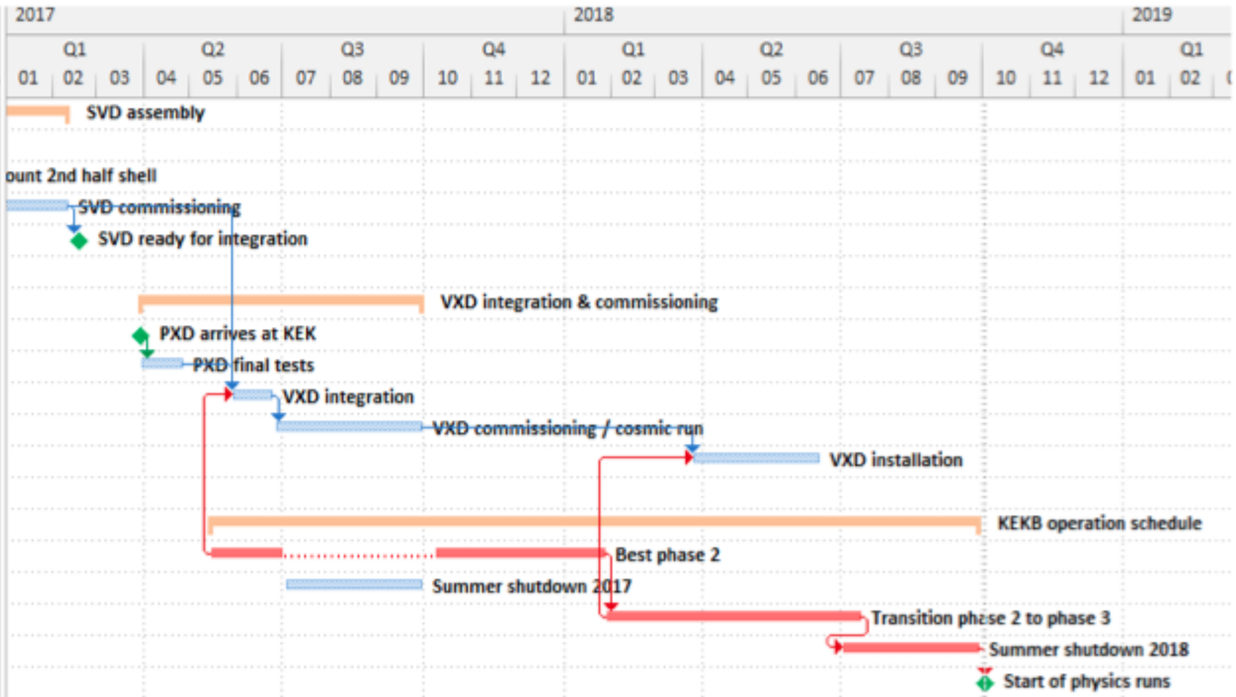
Conclusioni

- Dopo aver risolto il problema sui Flex-PA e ri-testato i rivelatori Micron graffiati, la produzione dei classe A FW e BW subassemblies e' iniziata e occupera' molte risorse di Pisa in Lab. per i prossimi 6→8 mesi.
- La complessita' del sistema di monitoring e' aumentata nel tempo, con richieste addizionali da parte dell'esperimento. Il gruppo di Trieste, che ne ha la responsabilita', ha fatto convergere i progetti su monitor di radiazione & beam abort, monitoring di temperatura, umidita' e i relativi interlocks.
- Con prossimo anno hanno inizio le costruzioni/installazioni HW ed e' importante poter assicurare la presenza degli esperti del rivelatore a KEK.

BACKUP SLIDES

Commissioning Schedule

	Name	Start	Finish	Durati
185	**SVD assembly**	**Mon 28.03.16**	**Fri 10.02.17**	**230 d**
186	Ladder mount 1st half shell	Mon 28.03.16	Fri 08.07.16	75 d
187	Ladder mount 2nd half shell	Mon 25.07.16	Fri 04.11.16	75 d
188	SVD commissioning	Mon 21.11.16	Fri 10.02.17	3 mo
189	SVD ready for integration	Fri 17.02.17	Fri 17.02.17	0 d
190				
191	**VXD integration & commissioning**	**Thu 30.03.17**	**Fri 29.09.17**	**132 d**
192	PXD arrives at KEK	Thu 30.03.17	Thu 30.03.17	0 d
193	PXD final tests	Thu 30.03.17	Wed 26.04.17	4 w
194	VXD integration	Mon 29.05.17	Fri 23.06.17	4 w
195	VXD commissioning / cosmic rur	Mon 26.06.17	Fri 29.09.17	14 w
196	VXD installation	Mon 26.03.18	Fri 15.06.18	3 mo
197				
198	**KEKB operation schedule**	**Mon 15.05.17**	**Fri 28.09.18**	**360 d**
199	Best phase 2	Mon 15.05.17	Fri 26.01.18	5,75 mo
200	Summer shutdown 2017	Mon 03.07.17	Fri 29.09.17	65 d
201	Transition phase 2 to phase 3	Mon 29.01.18	Fri 13.07.18	6 mo
202	Summer shutdown 2018	Mon 02.07.18	Fri 28.09.18	65 d
203	Start of physics runs	Tue 02.10.18	Tue 02.10.18	0 d



2. Radiation Monitor & Beam Abort - elettronica

Apparati: dettaglio del costo (5.5 kEuro/modulo, IVA inclusa)

Oggetto	Costo al pezzo	Quantità	Sub	TOTALE
Evaluation Board DE3	1700	1	1700	2577,7171
PCB	100	1	100	
ADC (LTC2208)	120,34	4	481,36	
BAS70 Schottky	0,2924	4	1,1696	
SI2308 N-MOS	0,328	2	0,656	
Buffer dati	10,56	4	42,24	
Buffer clock	3,387	1	3,387	
Clock splitter	6,52	1	6,52	
Oscillatore	31,7	1	31,7	
REF5025	6,93	1	6,93	
relè	6,48	8	51,84	
connettore HSTC	11,9	1	11,9	
ad820brz	6,28	8	50,24	
LTC6404	9,42	4	37,68	
LD3930	2,03	5	10,15	
uA7805	1	1	1	
uA7905	1	1	1	
SMA	7,29	4	29,16	
condensatori	0,04735	191	9,04385	
blm	0,04735	24	1,1364	
resistenze	0,04735	55	2,60425	
EMCO	230	4	920	
Power Supply	120	1	120	
PCB	50	1	50	
Electronics (EMCO)	150	4	600	
Rack	100	1	100	
Lavorazioni mecc.	100	1	100	
		Tot.	4469,7171	