SVD Introduction

Koji Hara (KEK)

6th Belle II PXD/SVD workshop and 17th International Workshop on DEPFET Detectors and Applications

Mechanical Design

Mechanical design of ladders has been fixed at July B2GM

- Sliding lock mechanism, improved rib design
- Endring
- Fine tuning for cable space, interference with the physics acceptance

- Rev. 2.1 released
  - Whole SVD structure

- Remaining issues

Ladder (finalized) -> Structure -> cables, pipes, docks

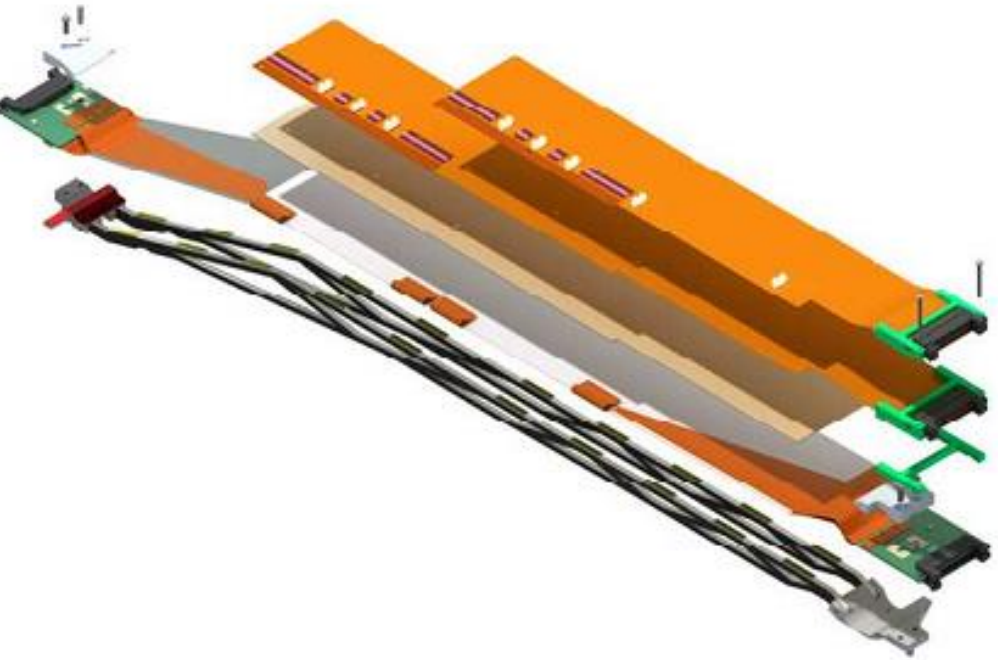
BEAST II

- Fine tuning of set screw to fix Kokeshi-pin
- Final endflange design
- Ladder mount table
- Assembly procedure of SVD structure
- CO2 piping : isolation, fixing, mount on Origamis
- Cabling, piping path on the CDC wall
  - Monitoring, CO2
- BEAST II: mechanical structure, hardware sharing with commissioning

Overview Mechanical Components

Components	Mockup (DESY)	Prototype	Series Production
End rings	in production	delivered	in production
CFRP-Cones	delivered	delivered	delivered
CFRP-Outer cover	delivered	delivered	end 2014
BWD-End mounts	in production	delivered	delivered
FWD-End mounts	in production	delivered (no SLM)	**delivered**
BWD-Kokeshi pins	in production	delivered	delivered
FWD-Kokeshi pins	in production	delivered (no SLM)	**delivered**
BWD-Bridges	delivered	delivered	delivered
FWD-Bridges	delivered	delivered	delivered
L6/L5/L4-Ribs	in production	delivered	**delivered**
Spring clamp	delivered	delivered	delivered

Other Ladder Parts



- All mechanical parts have been produced
- Sensor production at Micron finished
  - Final batch is under test
  - Good quality so far
- 3-row PA quality verified

  (supposed to be the final remaining piece)
  - First production of all of 10 types
  - Good bonding strength
  - Enough pad widths
  - Used in sub-assembly and Origami module with class-B sensors

- Found problem in Origami PA0

Ladder Assembly

- Common milestones has been set
  - Class C (mechanical sample)
  - Class B (electrically working)
  - Class A (production grade) module/ladder assembly

- Keep all history and data of parts and sub-assembly in the assembly Database
  - Database tutorial tomorrow

- Site qualification review is scheduled
  - 10/3-4 Pisa, 10/31-11/1 TIFR , IPMU (class C, full to be decided)
    2015 Jan. HEPHY, Melbourne

- Remaining issue
  - Verification of full ladder assembly procedure
    → attaching CO2 clip, endmount to hybrid, PF1/PB1 gluing strength, any missing procedure?
  - Define details of common QA/QC requirement: electrical, mechanical
  - Document of ladder assembly procedure
  - Preparation for BPAC review in Nov.

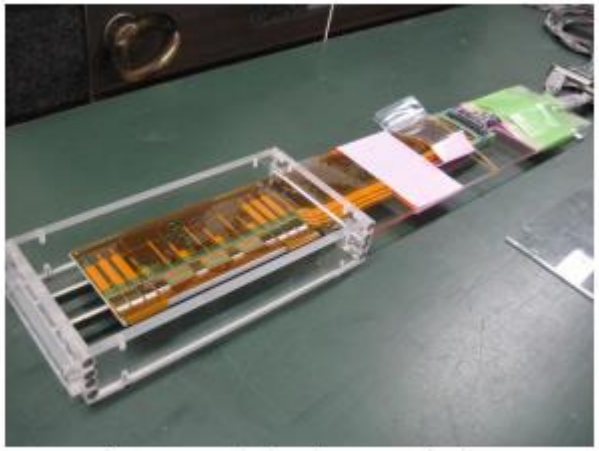
Prototype Assembly

- Class C, B module/ ladder is on-going
  - Class C, B module assemble at Pisa
  - Class C ladder assembly
  - Origami module assembly with final parts at IPMU

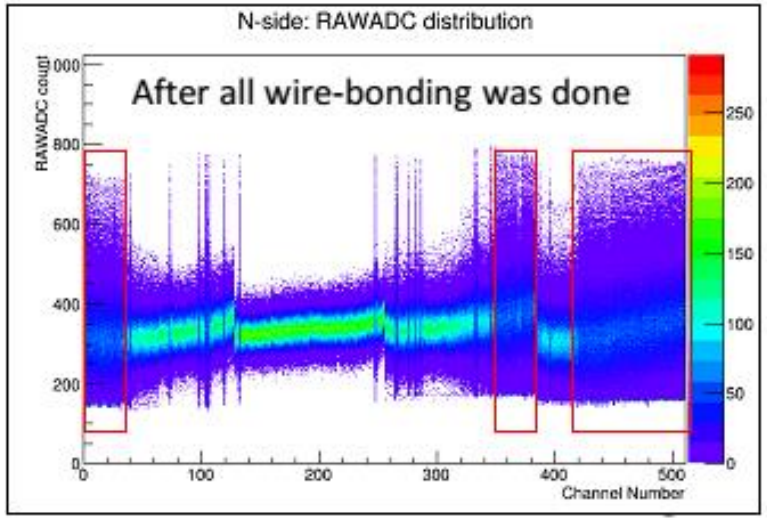
- Mechanical precision will be checked
- APV data has been taken in each step in the assembly

  → Verified electrical quality of the assembled module with the 3-row PA and hybrid board, but found problem in Origami PA0

Origami PA0 Problem

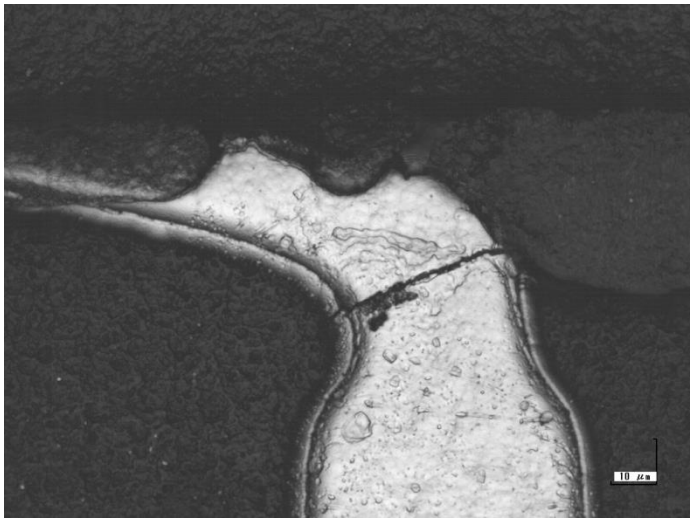


Assembled module



- Origami module assembled with final parts at IPMU
- Found many signal lines on N-side are disconnected

→ Cracks found on PA0



PA0 history and crack

Cracks have been overlooked in Taiyo's check (visual inspection)

We have checked Origami samples we have

- Pre-production before 2013 Oct.
  - No cracks found
- Modification of glue between PA0 layers in 2013 oct.
  - Acrylic glue -> epoxy glue
    - For radiation tolerance and to reduce curvature around PA0
    - Accompanying cover sheet under the glue was also changed
  - Cracks observed
- Final production in late 2013
  - Found cracks in all samples we have checked so far

Solution for PA0 problem

- Cause of the cracks is identified to be the blanking (cutting) process of PA0 at Taiyo
  - Taiyo verified cracks occurred in the blanking process
  - Using old glue, cracks do not occur
  - → Taiyo is trying to improve the process to produce crack-less PA0

- Two possible (not impossible) ways

  All Origami have been equipped with APV chips, 70% wire bonded(control lines)

  a) Gluing new PA0 without cracks on existing Orgami PA0

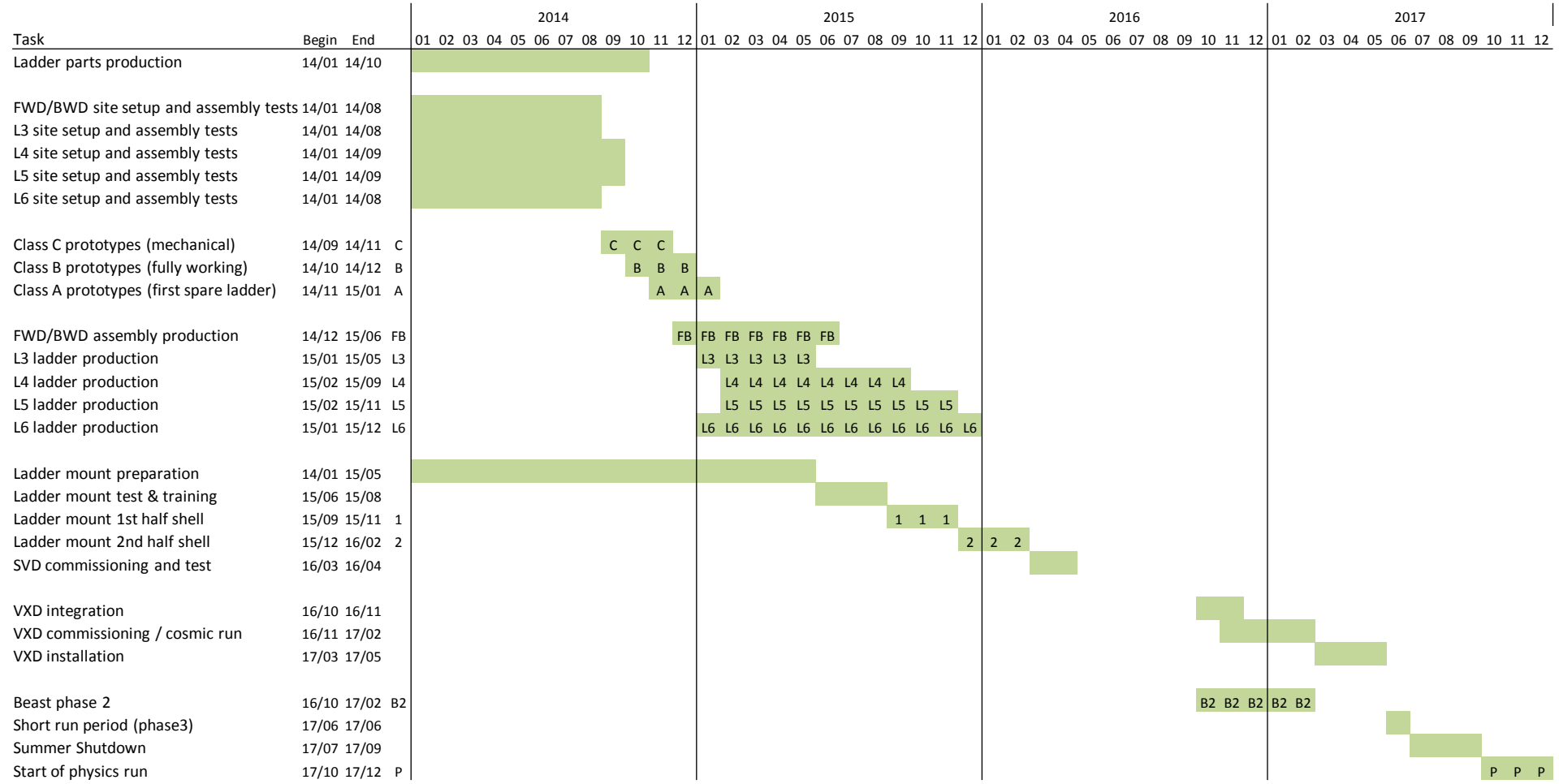
  b) Full reproduction of Origami

→ Need to clarify
  - **Impact on schedule**
  - Total cost , responsibility
  - Solution to go

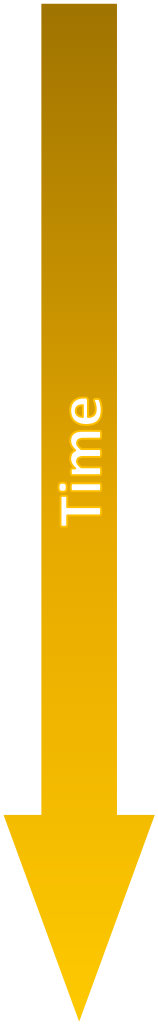
→ Discussion tomorrow

June B2GM

SVD Construction Schedule



Milestones



- July 2014
  - Finishing L4-L6 hybrids assembly
  - Delivery of first 3-row pitch adapters (all variants)
- August 2014
  - Finishing L3 hybrid assembly
  - Finalizing assembly sites preparation
- September 2014
  - Class C prototype of FWD/BWD modules and L3 ladder
  - First version of construction database
- October 2014
  - Production of class C prototypes
  - Class B prototype of FWD/BWD modules and L3 ladder
- November 2014
  - Production of class B prototypes
- December 2014 – February 2015
  - Start of ladder production

Origami PA0 problem affect class-B and ladder production

Other topics

- Logistics
  - Parts between assembly sites
    - IPR procedure
  - Final module/ladder delivery to Japan
    - Customs exemption for scientific research
- Software development
  - Final geometry
  - Database access
  - Raw data analysis tool, data packer in MC
- Electronics hardware
  - Next version of FADC hardware and firmware
  - Power supply

- Slow control, Monitoring
  - Common framework as VXD

Summary

- SVD ladder design finalized in June B2GM

→ all mechanical parts of ladders are produced

Mechanical parts of structure are in production or prototype under verification

- SVD assembly procedure need to be established
  - Ladder mount, cabling, piping
  - Monitoring hardware
  - Logistics of module/ladders
- Ladder assembly site preparation for mass production and BPAC review
  - Common quality requirement and milestones
  - Document preparation
  - Put all parts, data, Database
- Origami PA0 crack problem found
  - Affect production schedule → discussion in tomorrow to clarify the effect

Bottom layer
Top Layer

Many cracks on bottom
A few cracks on top layer

Cracks also observed **on the bonding pad** (frequent on top layer)