

ATLAS

~ Focus on Japanese Activities ~

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ATLAS Japanese Activities

- ❖ Operation & Physics
 - ▶ Pixel, SCT, LAr, TGC

- ❖ Phase-I upgrade

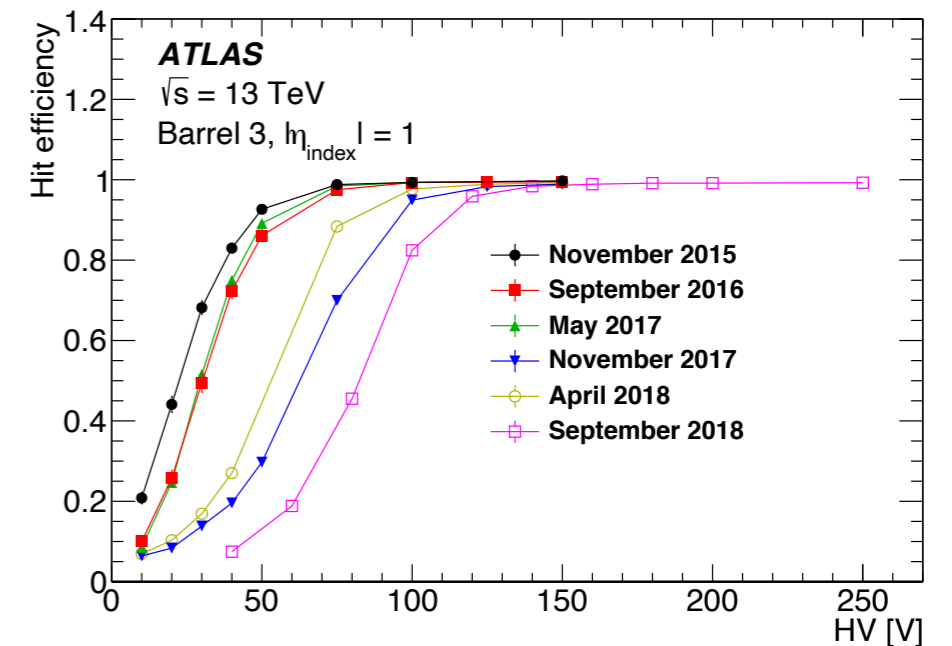
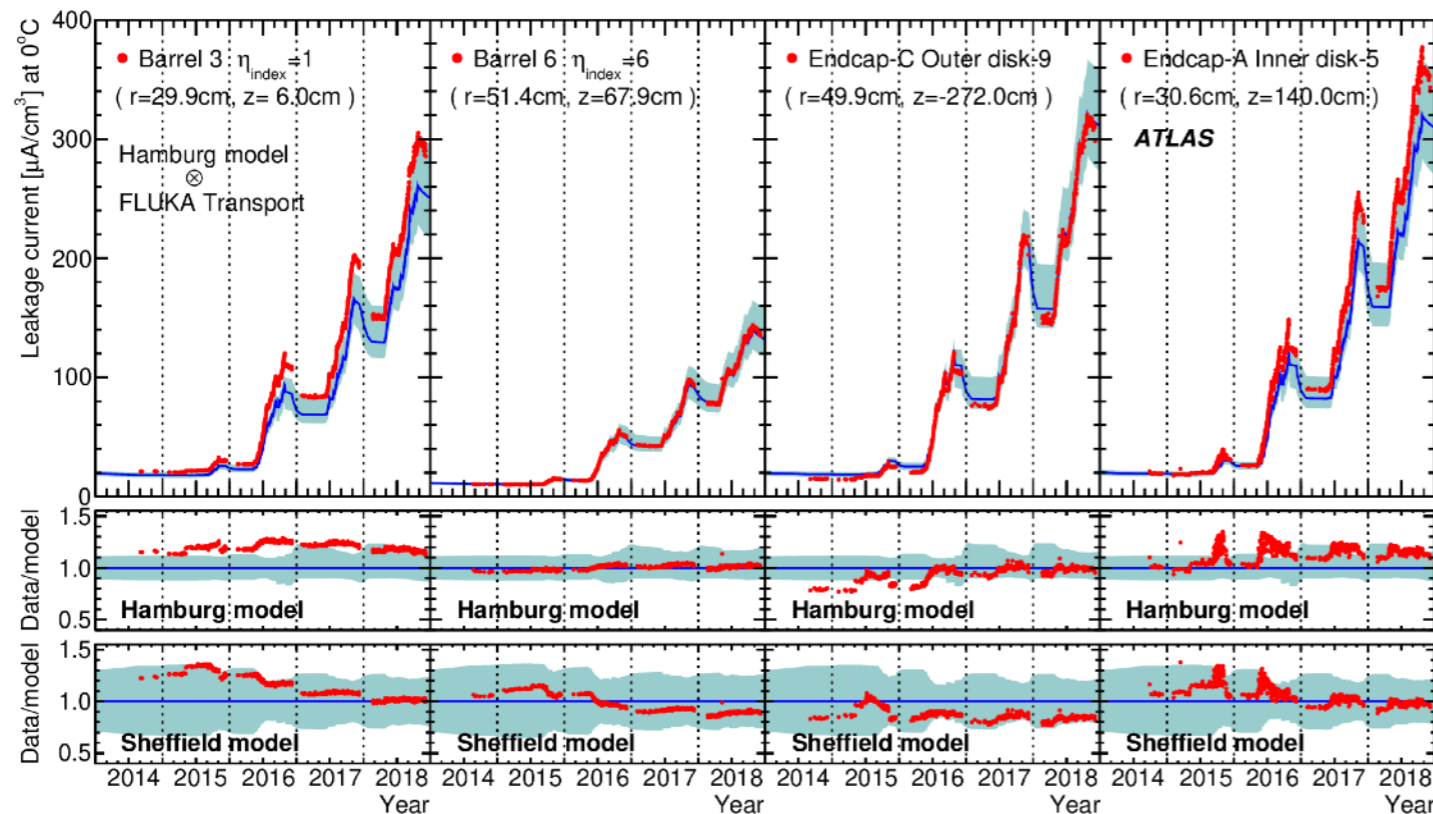
- ❖ Phase-II upgrade

Selected Topics from Operation

❖ SCT

- ▶ 20% of Barrel module produced by Japan
- ▶ Leading role of operation
 - ▶ many Japanese Run coordinators
 - M. Morinaga 2020 July - now
 - S. Hirose 2019 Jan - 2020 June
 - K. Mochizuki 2018 Jul - 2018 Dec
 - H. Otono 2017 Jan - 2017 Oct

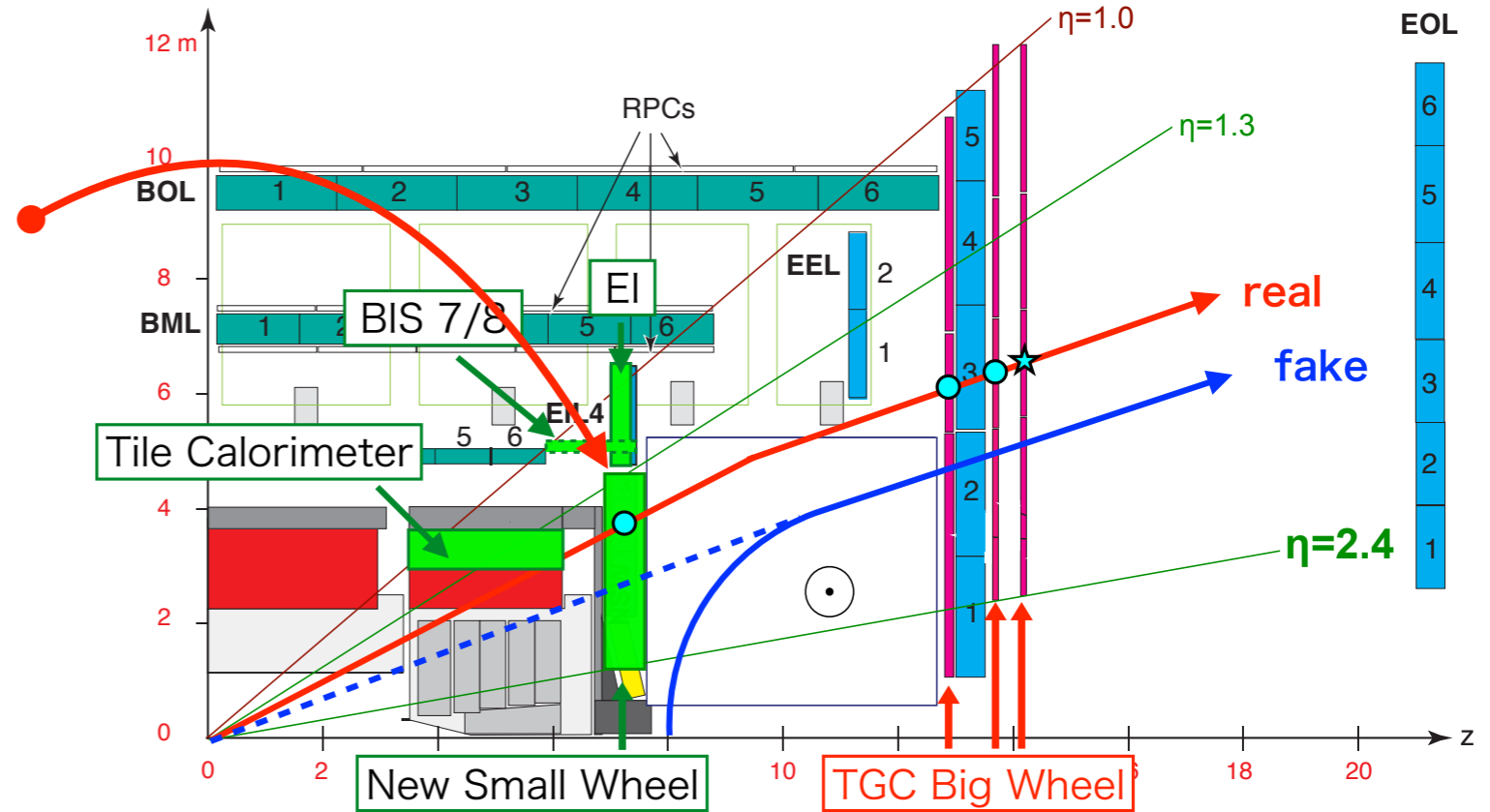
lead run2
paper



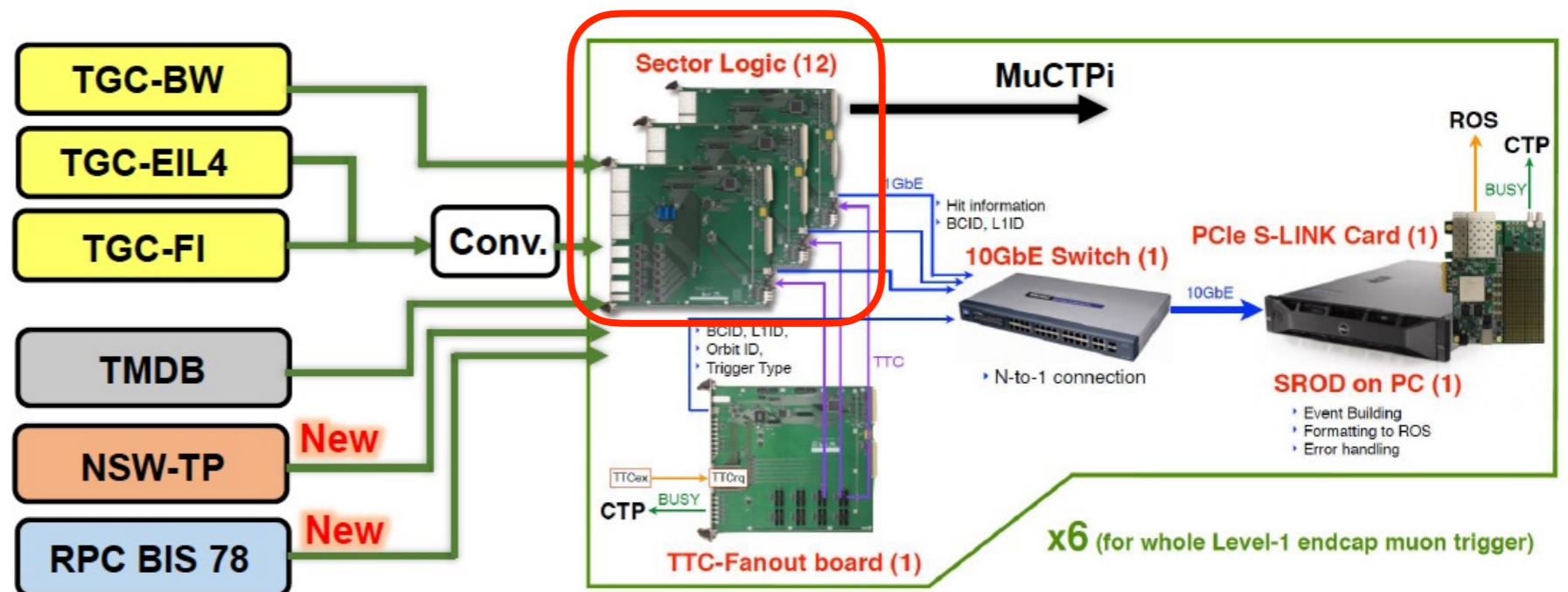
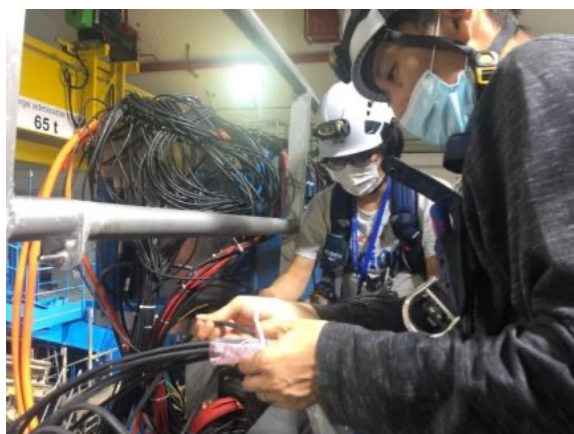
Japanese Phase-I Activities

- ❖ Consolidation of Pixel and SCT
- ❖ Phase-I upgrade
 - ▶ Muon trigger
 - ▶ LAr trigger

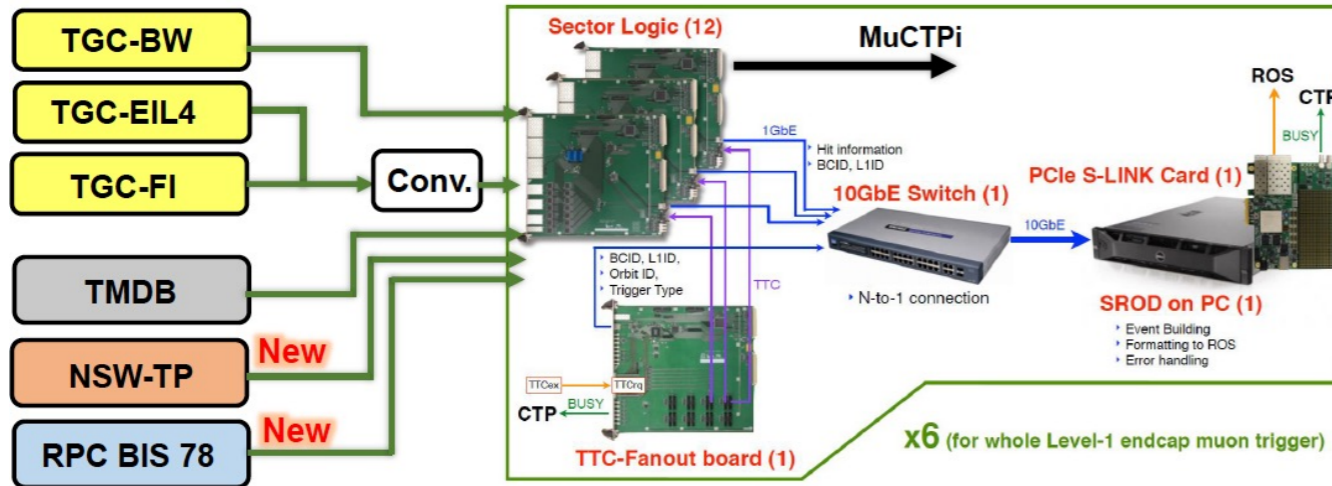
Muon Trigger for Phase-I



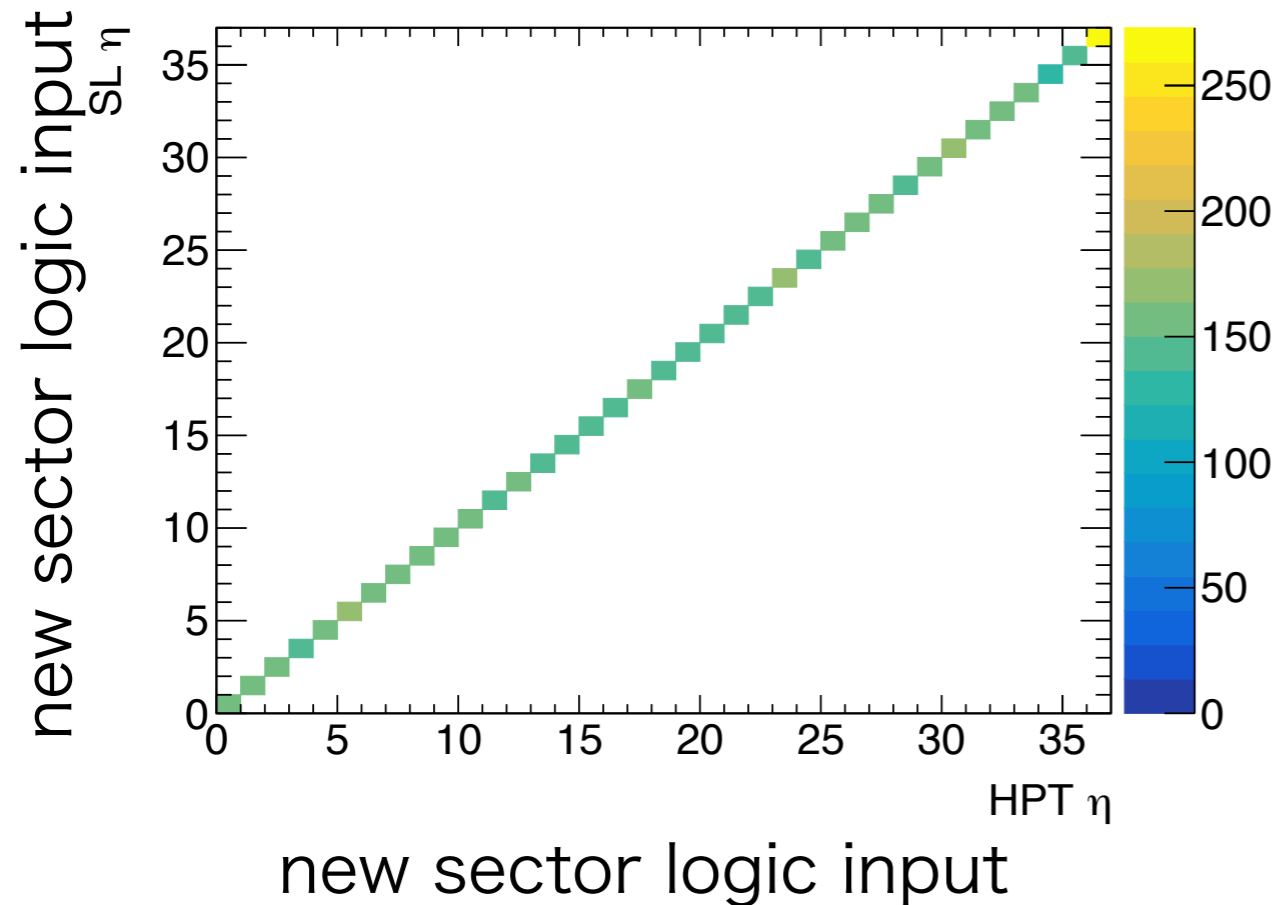
built by Japan



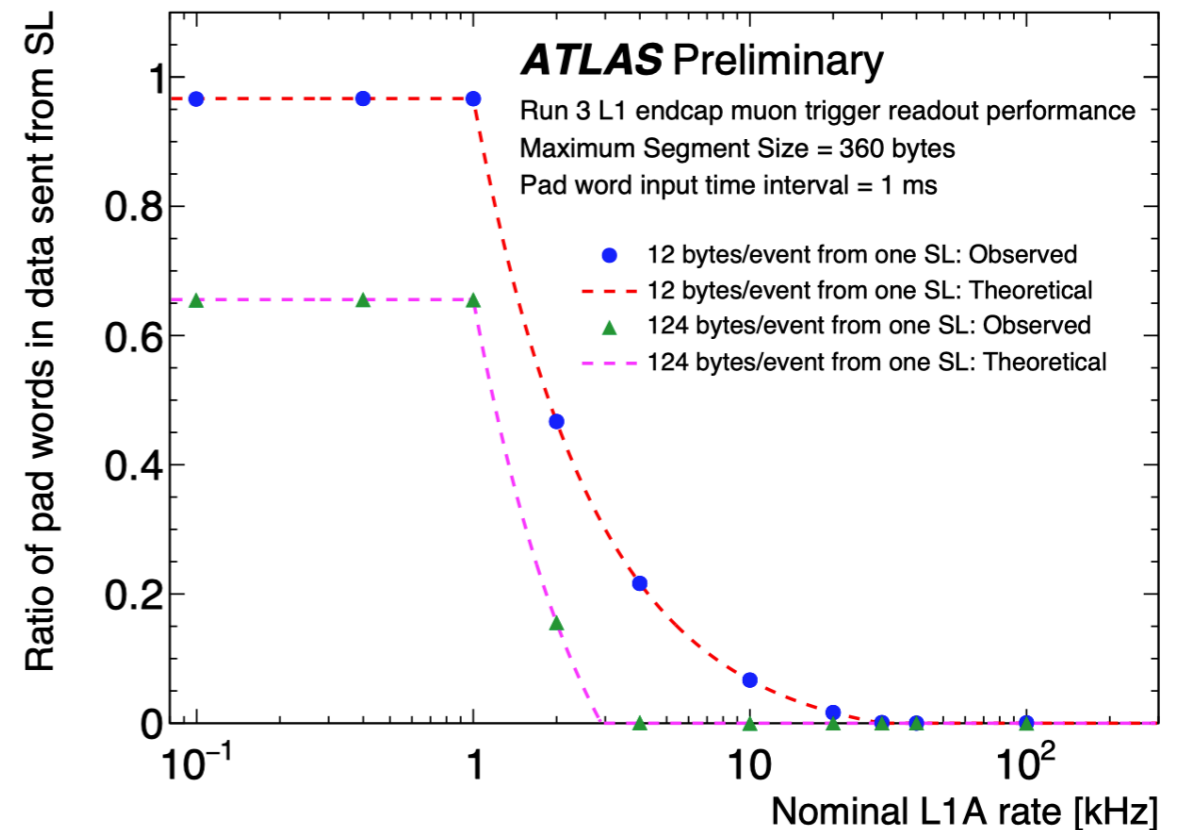
Muon Trigger Commissioning



not only hardware but also firmware/software ready including new sector logic



scheme to accommodate low rate

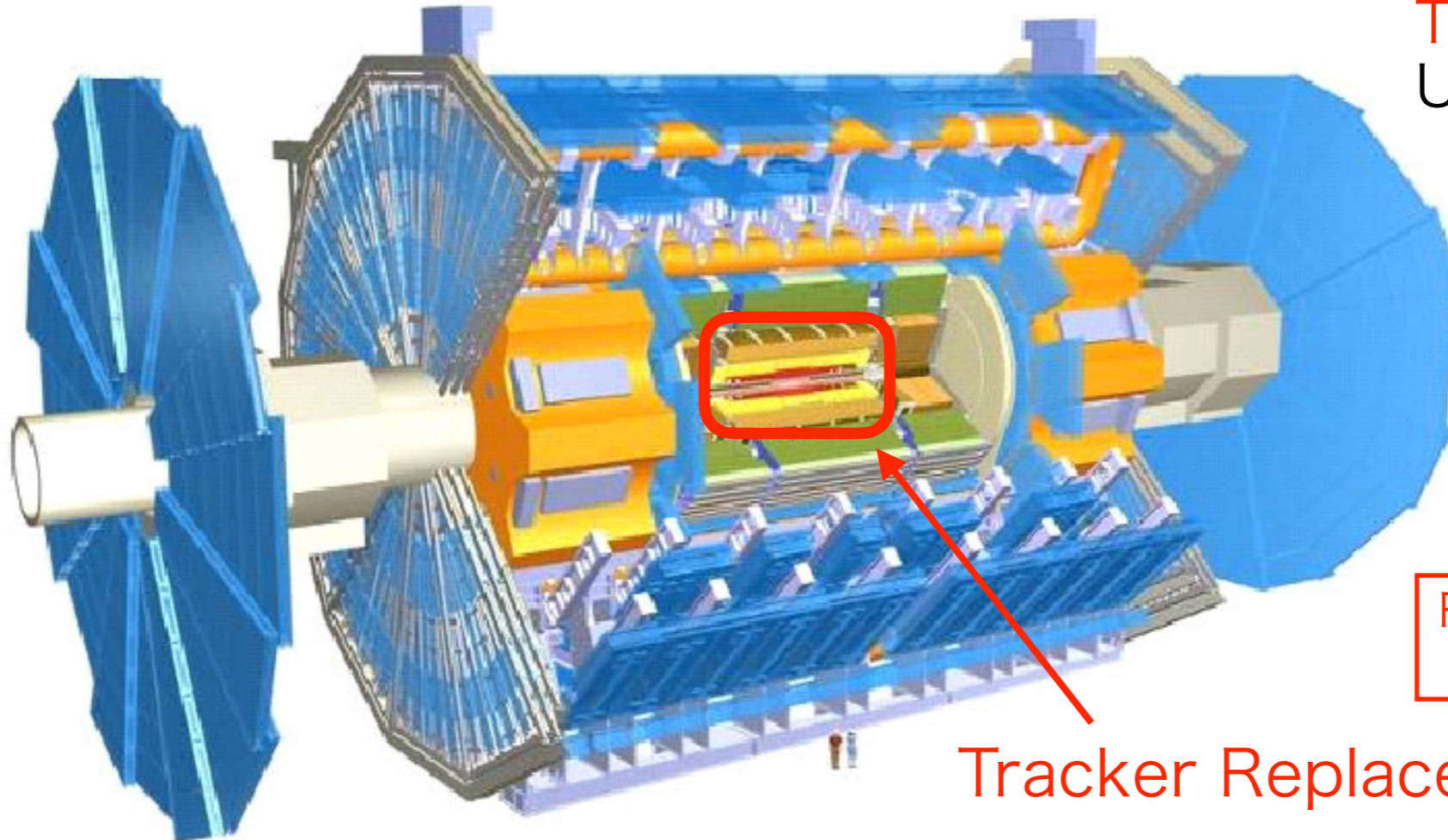


Phase-II Upgrade

Electronics replacement

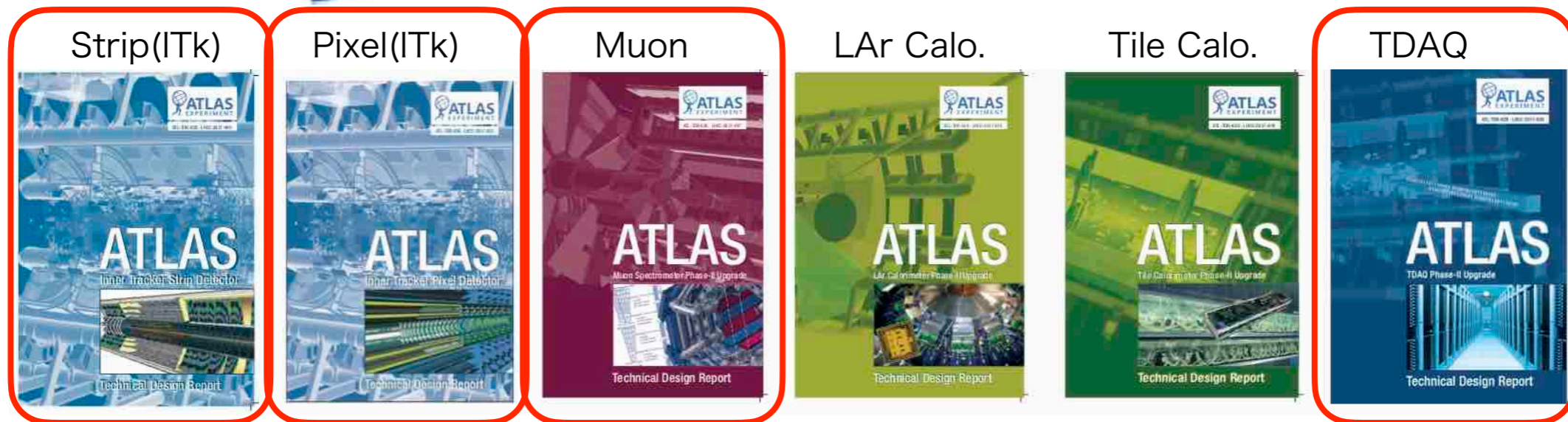
- LAr calorimeter
- Tile calorimeter
- Muon

Trigger & DAQ Upgrade

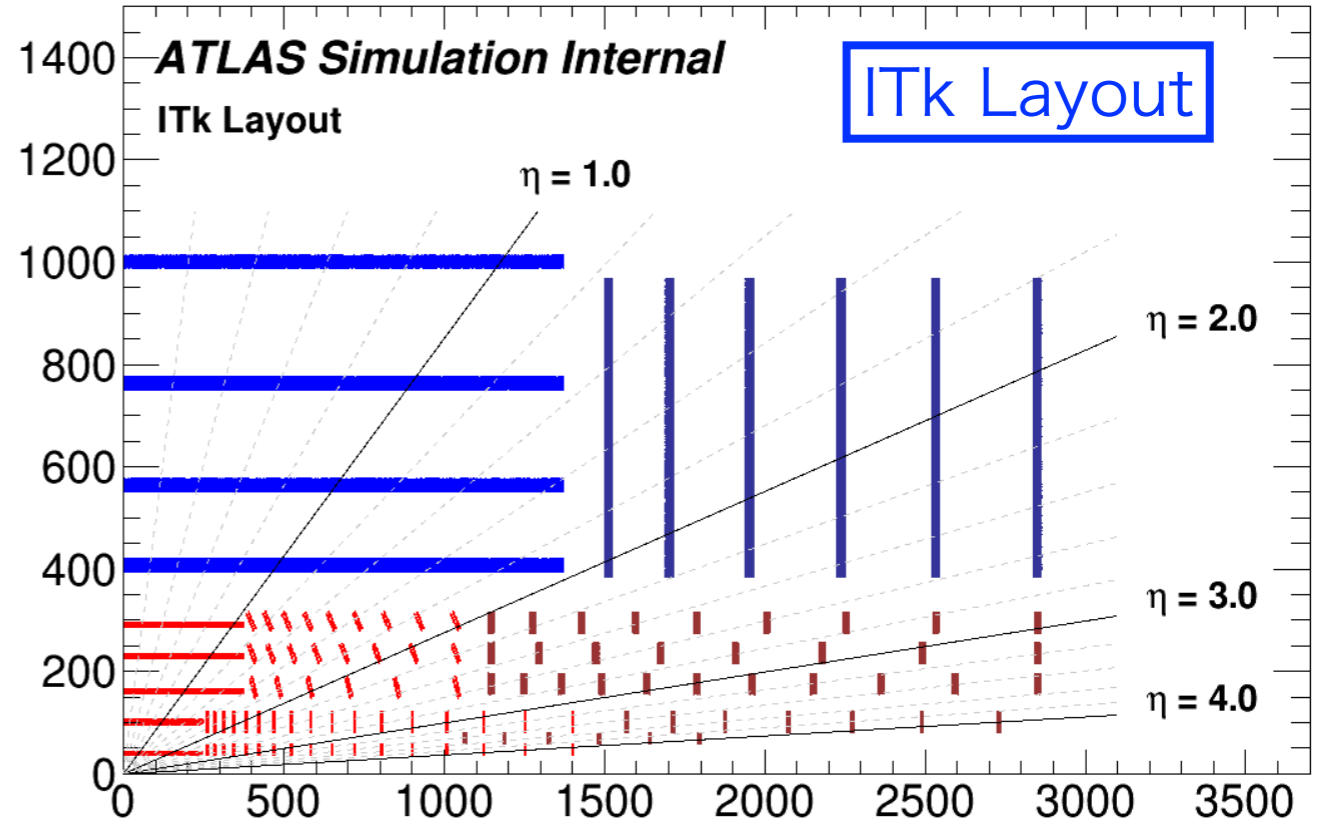
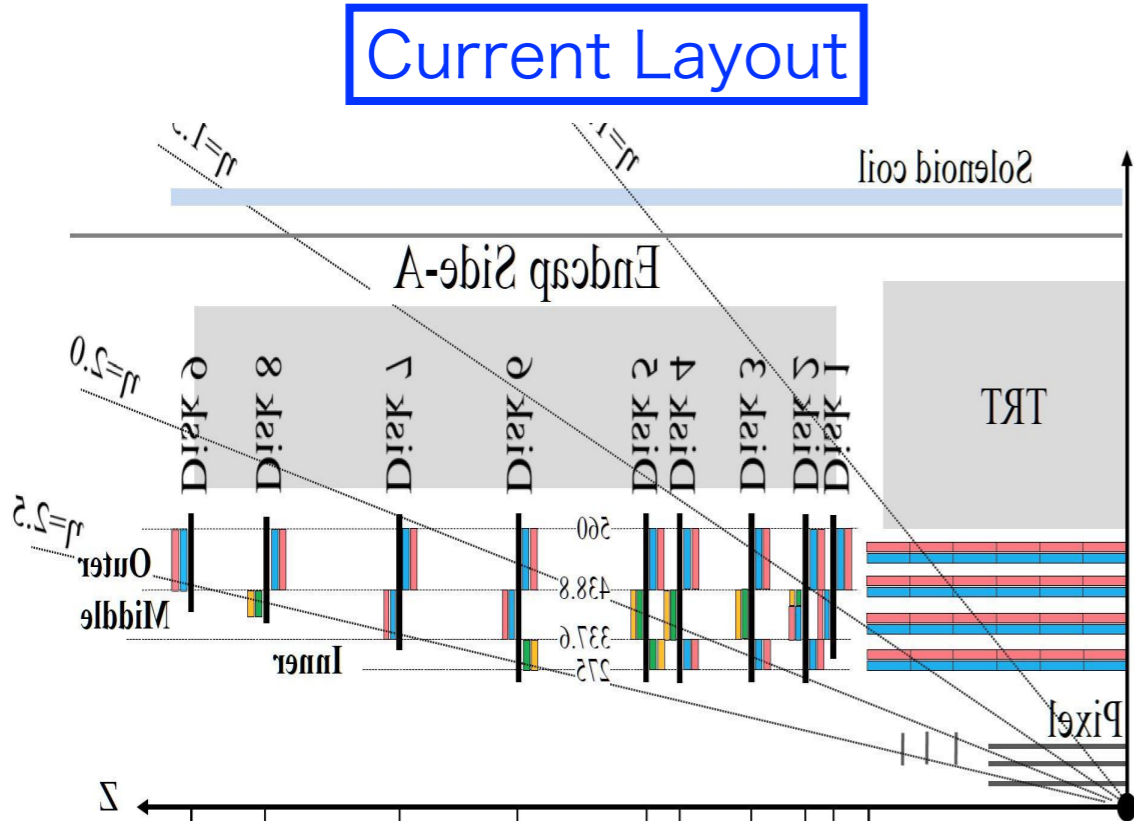


Tracker Replacement

Red : contribution by KEK/Japan



Silicon Tracker (ITk)



- ❖ Totally new detector
- ❖ Area
 - ▶ Pixel $2.7\text{m}^2 \rightarrow 13.5\text{m}^2$
 - ▶ Strip $62\text{m}^2 \rightarrow 165\text{m}^2$
- ❖ The number of channels
 - ▶ Pixel $90\text{M} \rightarrow >5\text{G}$
 - ▶ Strip $6\text{M} \rightarrow 60\text{M}$

- Finer
 - Pixel size
 $50 \times 400 \mu\text{m}^2 \rightarrow 50 \times 50 \mu\text{m}^2$
 - Strip length
 $20\text{cm} \rightarrow 2.4\text{cm}$ (shortest)
 ⇒ faster data transfer
- Radiation harder
 - Innermost $1 \times 10^{15} \text{ n}_{\text{eq}}/\text{cm}^2$
 $\rightarrow 2 \times 10^{16} \text{ n}_{\text{eq}}/\text{cm}^2$

Japanese ITk Activities

❖ Pixel

- ▶ 2200 Outer Barrel/EndCap modules
 - ~ 25% of total
- ▶ Sensor
 - Placed order for pre-production
- ▶ Bump bonding studies on-going
- ▶ In preparation of mass-production of module assembly

❖ Strip

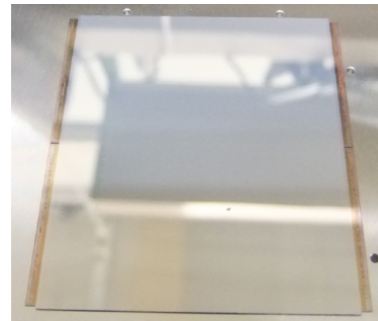
- ▶ Sensor production, QC/QA
 - A half of Barrel
 - Started production

Pixel production

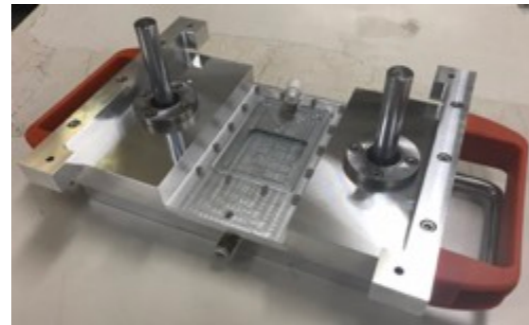
Japan activities

CERN activities

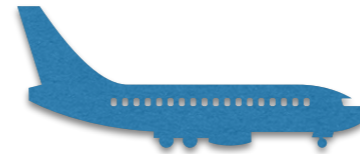
Sensor



Assembly

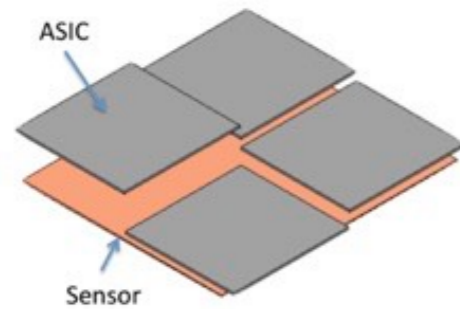


Transport

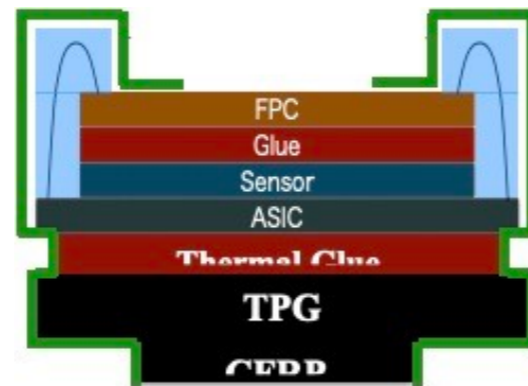


~2,200 modules from Japan

Installation

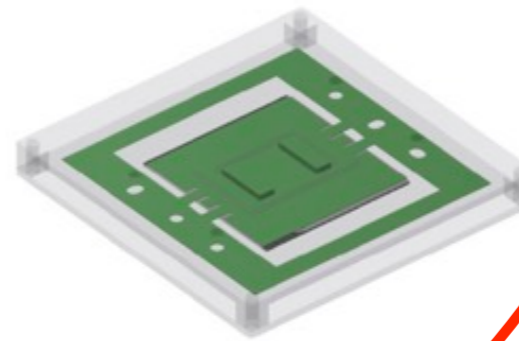


Hybridization



Module

QA/QC



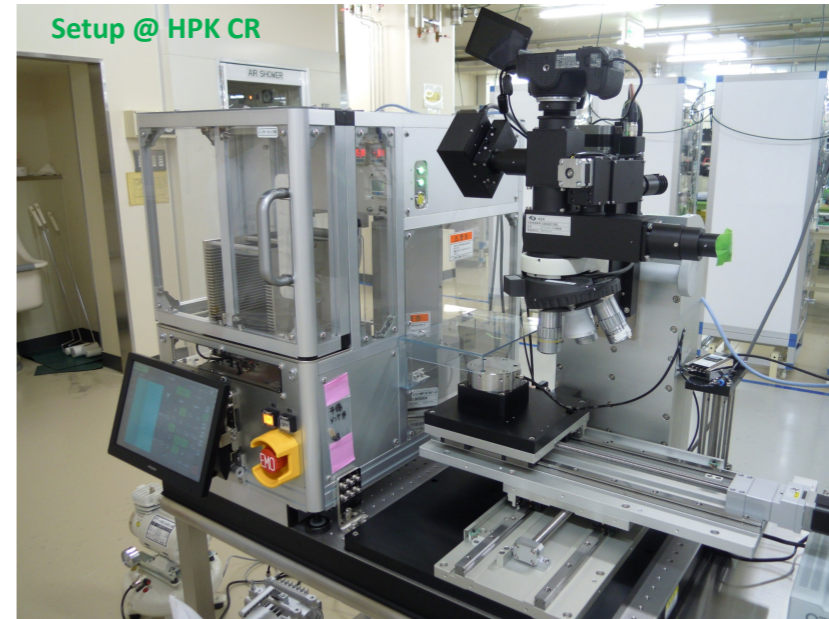
Transport Box

Operation

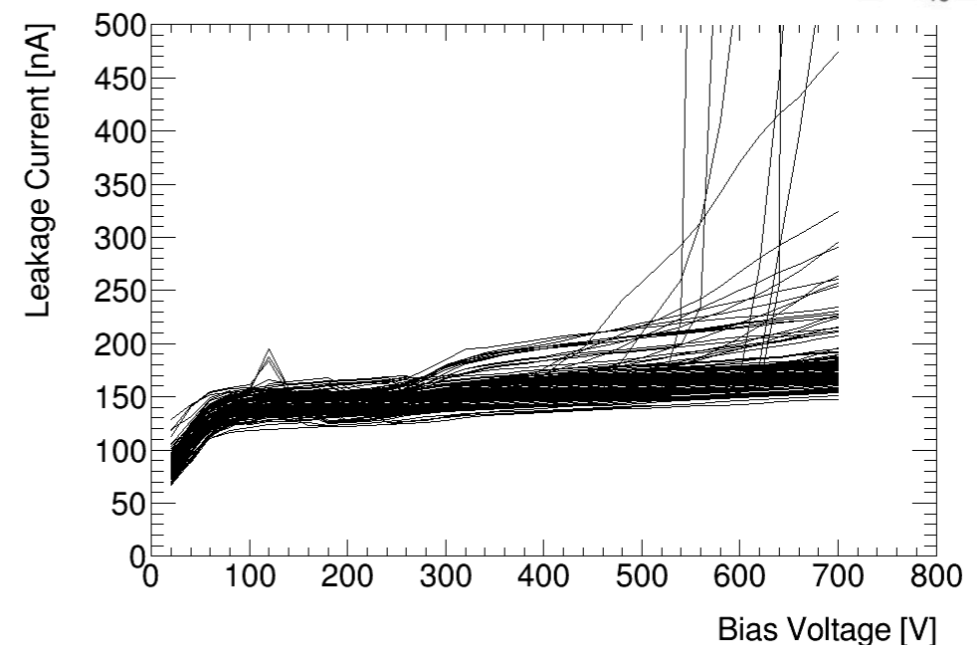
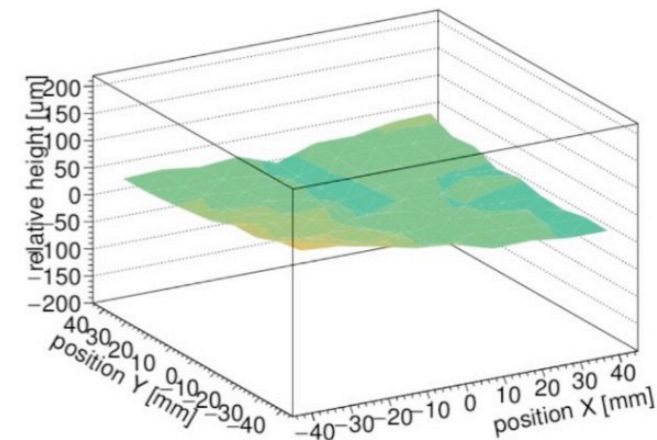
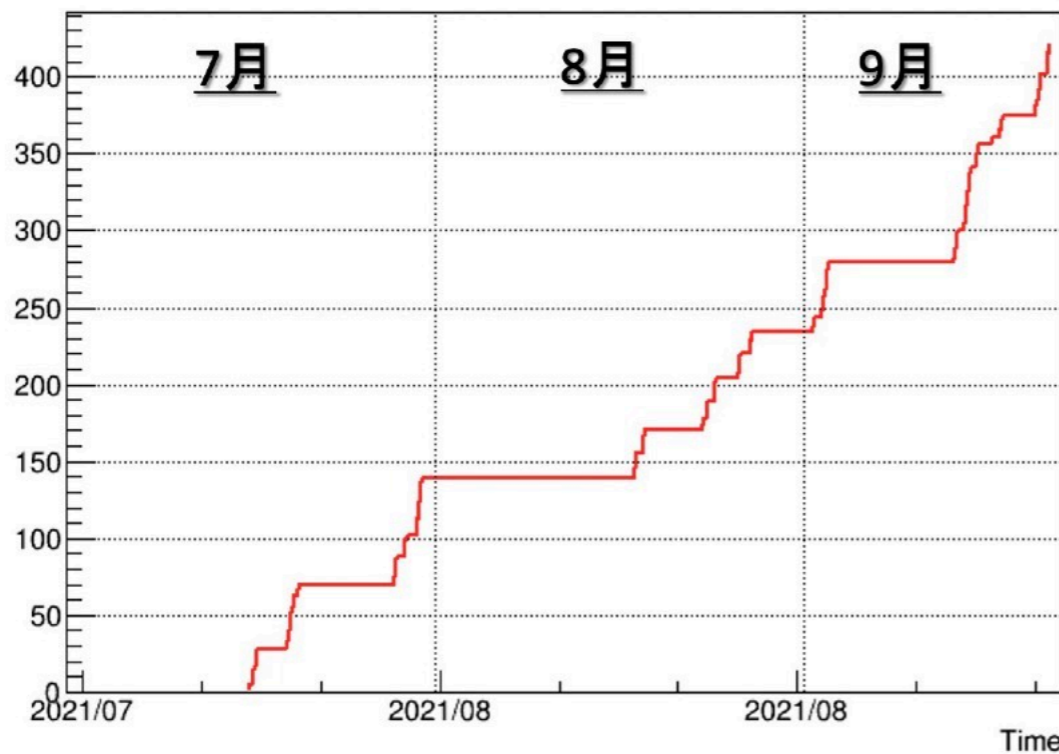
The Challenge : 5 modules / day
more than 2200 modules (including spares) in two years

Silicon Strip Sensor

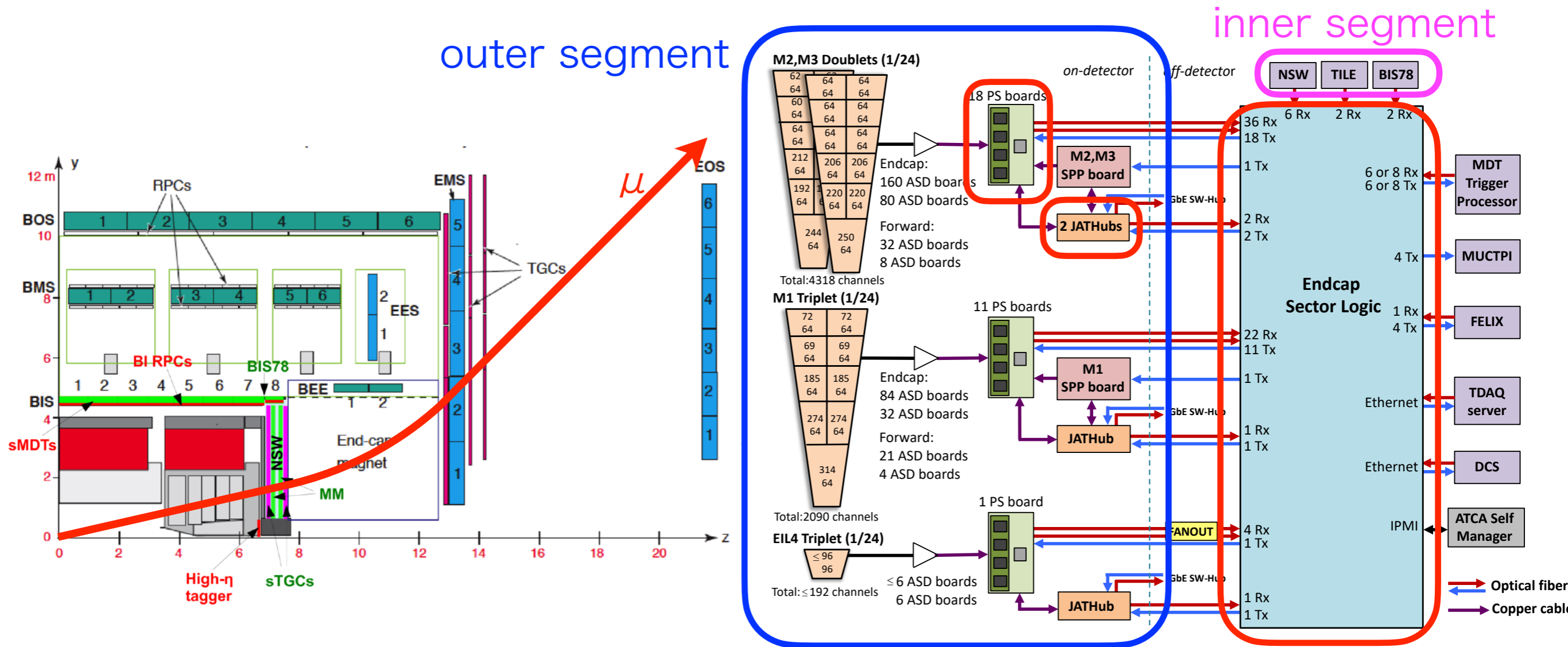
- ❖ A half of barrel sensors will be procured and tested by Japan
- ❖ Production started!!
 - ❖ Testing indicates no issues
 - ❖ Issue of production rate at HPK was solved
- ❖ Testing results and images are recorded



#(photo-capture/metrology)



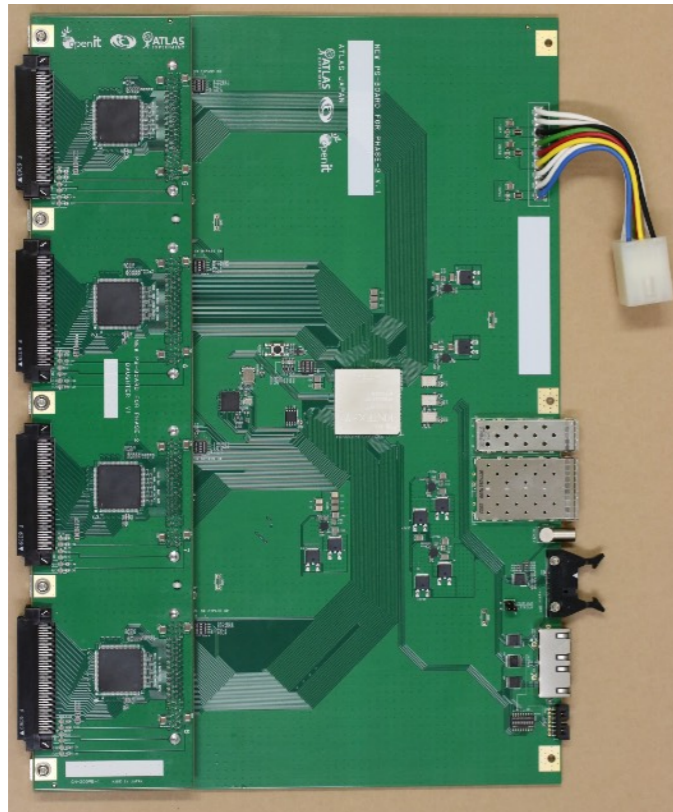
Endcap Muon Trigger Upgrade



- ❖ New trigger uses informations from
 - ▶ Outer segment by TGC
 - ▶ Inner segment by NSW, BIS7&8, Tile Calorimeter
- ❖ Japanese group develops and build three types of boards; PS board, JATHub board, Sector Logic board

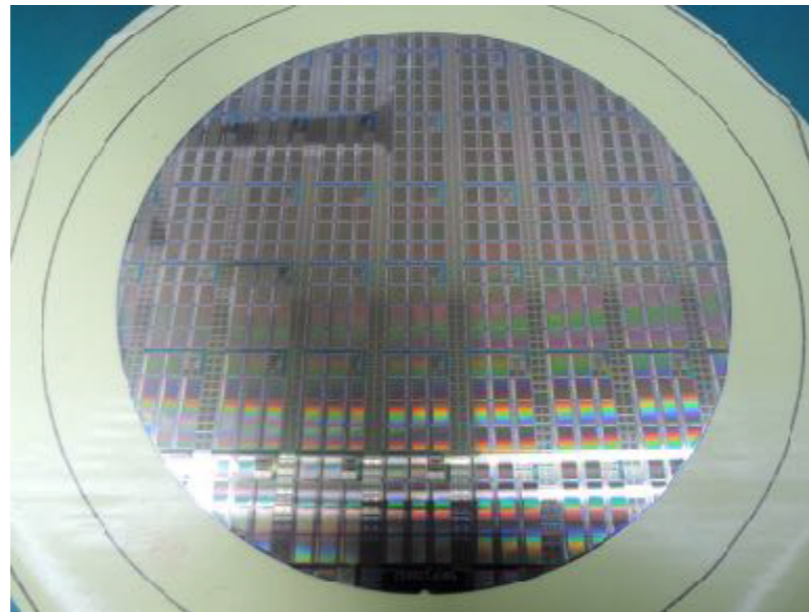
TGC Frontend Boards

- ❖ Prototyping finished
 - ❖ Procurement of PS board parts on-going
 - ❖ Some issues in getting the electronics parts
 - ❖ Mass production of JATHub board will start in this year
 - ❖ Tendering in final stage

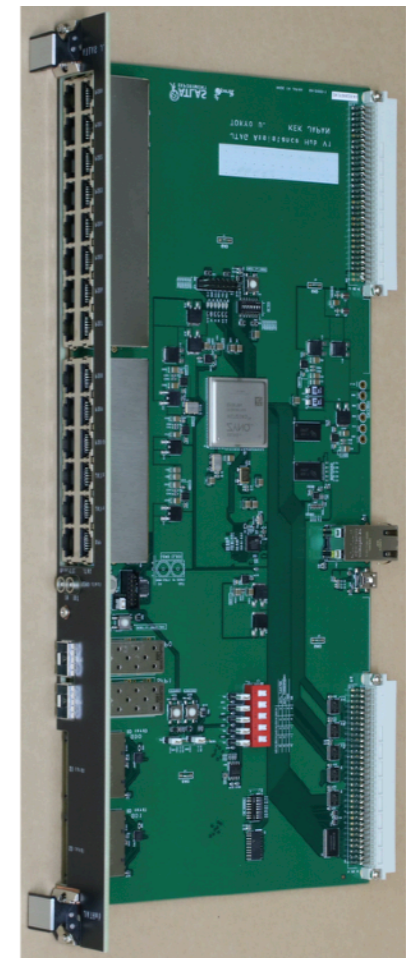


PS board

- identify BCID and
- send all TGC hit information to the backend module



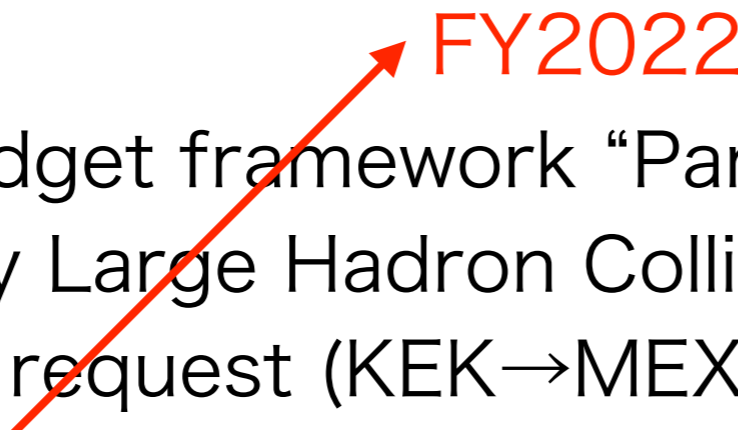
Patch Panel ACIS
for PS board



JATHub board

- monitor and control FPGAs on PS board

Japanese Funding Situation

- 
- ❖ 2019 : Budget framework “Particle physics with the High-Luminosity Large Hadron Collider (HL-LHC)” is approved
 - ▶ Budget request (KEK→MEXT→MOF) for each single year
 - ▶ FY2021 request now in MEXT→MOF
 - Actual budget size determined at the end of year
 - ❖ So far no problems to fulfill the MoU share (although signing is not yet...)
 - ▶ In my personal impression, expect no serious problems in coming years

This is the slide I showed last year, i.e. the situation same as last year ← strong support from KEK and MEXT

Conclusions

- ❖ Japanese contributions to :
 - ▶ Operation
 - ▶ Phase-I trigger upgrade including NSW
 - ▶ Phase-II Japanese contributions
 - Pixel in preparation for production, finishing R&D
 - Strip sensor production started
 - Muon trigger development in good shape
 - Very close to start the production
 - Difficulties in procurement of electronics parts