

# Production Status Update

RIKEN/RBRC

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# Executive Summary

- Silicon Sensors
  - 100 Sets (batch-2) production silicons are to be delivered **today** as scheduled.
  - Sensors will be shipped to NCU once they are ready.
- FPHX
  - ~1500 good FPHX chips are delivered to NCU on April 29<sup>th</sup>.
- HDI
  - 19 HDI's are delivered to NCU on April 30<sup>th</sup>.
  - To be shipped 39 HDI's to BNL to be delivered by June 1<sup>st</sup> (reopening).
  - Move on to 2<sup>nd</sup> batch once new design around bias connectors are confirmed in BNL
- Stave
  1. 12 prototype-IV staves are delivered to RIKEN in April 30<sup>th</sup>.
    1. 4 staves will be shipped to NCU on May 8<sup>th</sup>.
    2. To be shipped 4+4 staves to BNL to be delivered by June 1<sup>st</sup> (reopening).
  2. Procurements towards production
  3. QA testing procedures optimization for the production
- Trigger Scintillators and PMTs
  - Reuse existing scintillators and PMTs in NCU
  - PO of Light guides from NCU to G-tech. Design is customized to fit the scintillators and PMT in NCU.

# Stave Production Preparation

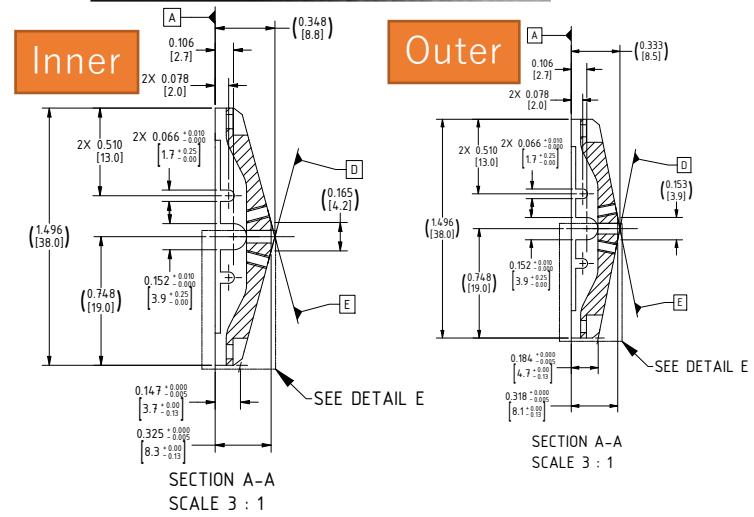
- Procurements of CFRP sheets and tubes
- QA testing procedures @ ASUKA before delivery

# Quantity

- Plan is to produce **150** staves

Ladders	Inner Layer	Outer Layer	Sub Total
In the Barrel	24	32	56
Spare	40	54	94
Total	54	96	<b>150</b>

\*Slightly different design in the end cap between inner and outer layers.



- Note we produced 250 sets silicon sensors = 125 ladders at maximum
- Goal is to produce good 120 functioning ladders (80:BNL, 40:NCU)
- Sufficient to build a full spare barrel in case of disaster (non-negligible risk for inner trackers from the past experience at RHIC)

# Need some action prior to the contract

Item	Make	Quantity	Vendor	Price	Lead Time
Cooling Tube	TOLAYCA 700c	100 m	Kimuraya Co.	\$3,000	2 months
			Rockwest	\$2,000	In stock
Prepreg sheet	Nihon Graphite Fiber (NGF)	75 m <sup>2</sup>	NGF	\$9,000	In stock (On hold until the end of June)

- Investigated PO from either RIKEN and BNL.
- Decided to wait for RIKEN resumes new PO.
- Cooling tubes from Rockwest can be delivered within 2 to 4 weeks
- Prepreg from NGF can be delivered right away.

# QA Test Procedures for Prototype-IV

1. Burst Test : Keep the tube at the high pressure of  $60 \pm 2$  psi and won't burst for 1 hour.
2. Leak Test :  $< 0.01 \text{ ml-mbar/sec}$  ( $\leq 0.15 \pm 0.15$  mbar ml/30s)
3. Assembly with CFRP plates. Drill alignment holes.
4. Heat cycle test :  $+40^\circ\text{C} \sim 0 \pm 5^\circ\text{C}$  (one cycle)
5. Measure flatness ( $< 100 \mu\text{m}$  preferable) and alignment positions



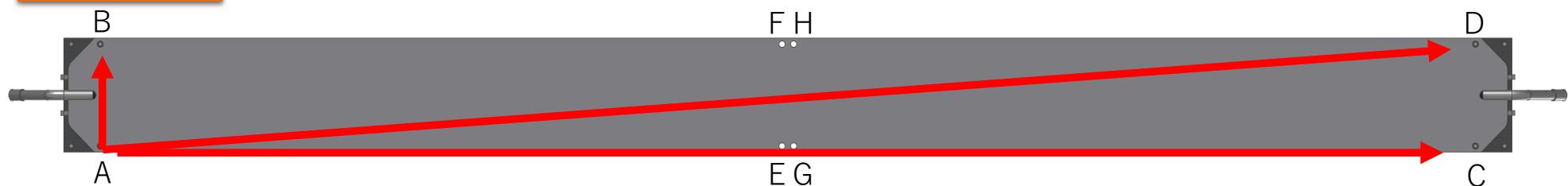
# QA Test Procedures for Production

Quantity : 150 Staves

1. Burst Test : Keep the tube at the high pressure of  $60 \pm 2$  psi and won't burst for 1 hour.
2. Leak Test :  $< 0.2\text{ml-mbar/min}$  (was  $< 0.01\text{ml-mbar/sec}$ )
3. Assembly with CFRP plates. Drill alignment holes.
4. Heat cycle test :  $+40^\circ\text{C} \sim 0 \pm 5^\circ\text{C}$  (one cycle)
5. Measure flatness ( $< 100 \mu\text{m}$  is now feasible) and alignment positions

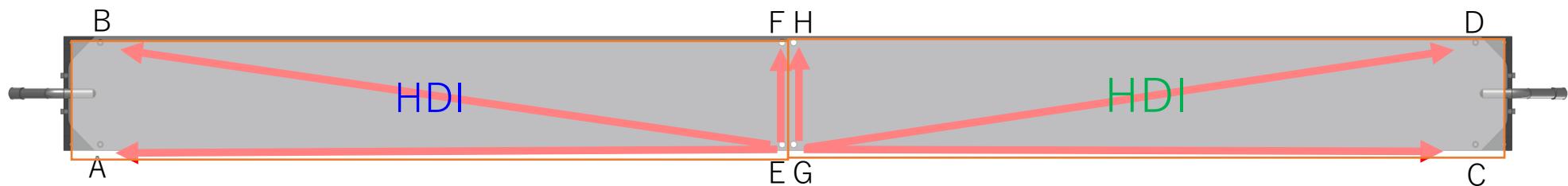
# Position Measurements

Prototype-IV



AC, AD, AB + EF, EG, EH => Doesn't make sense in terms of matching with HDI's

Production (Proposed)



EA, EB, EF match with one **HDI** and GC, GD, GH match with other **HDI**

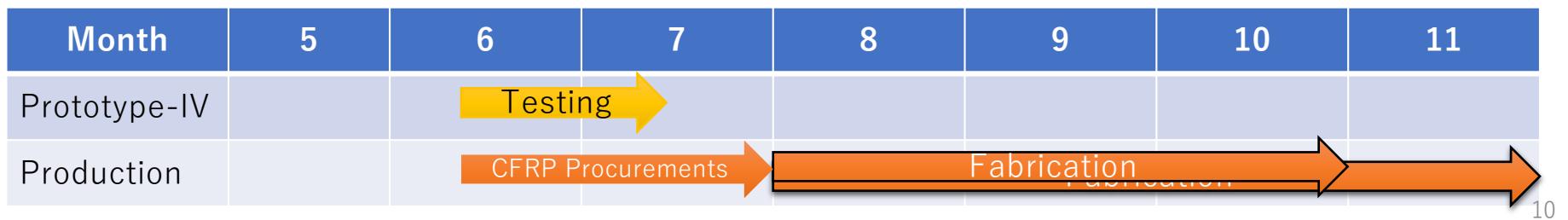
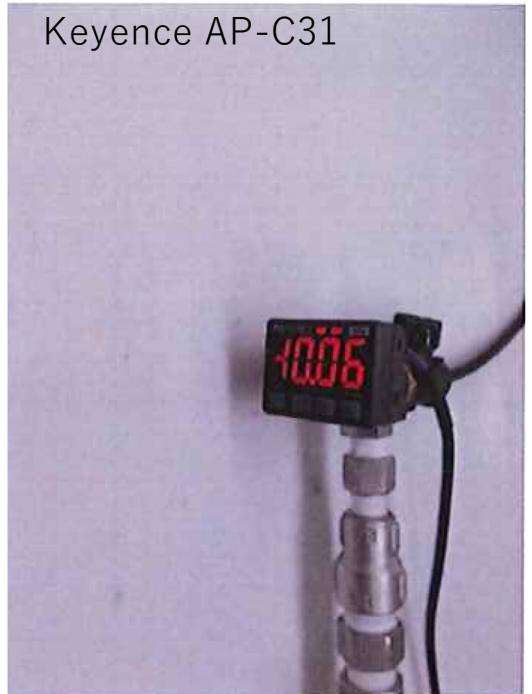
# Leak Test Options

Expected to test 200 cooling tubes taking into account yield rate.

- Dan's Proposal : 15 ~ 20 minutes
  - 30 minutes/cycle x 200 tubes = 100 hours ~ 10 days
  - Dedicated personnel for two weeks
  - A few days **by 10 parallel measurements**
- Rachid's Proposal : overnight
  - 10 hours x 200 tubes = 2,000 hours ~ 200 days <- Out of Option
  - 20 days (~ 1month) **by 10 parallel measurements**
  - Personnel needs to work ~1hour/day for a month

# Discussion

- Either way, leak testing with a single pressure gauge doesn't sound feasible for 200 cooling tubes.
- Need to invest 10 pressure gauges to allow parallel measurements.
- Unit price is \$250/gauge (\$2,500 for 10). \$2.5k is worth investing, given total cost of stave production ~\$100k.
- Ultimate judge is made if we can accommodate +1 month lead time.
- Total lead time is 3~4 months.



# Concerns and Countermeasure

- Gluing HDIs on the stave is the first stage of the current regular assembly procedure.
- Unless we develop the new procedure to assemble HDI and silicon+FPHX first and glue on the stave at the last stage, the production assembly won't start until the production staves are delivered.
- Anyway to have production staves earlier?
  - Separate delivery of 56 + 94 (spares). Gain 1 month for 56. Need to go though complicated contract strategy.
  - Run another procurement of leak tight cooling tubes in July to establish parallel QA procedure in advance.
  - Etc?