Production Status

RIKEN/RBRC
Itaru Nakagawa

Production Schedule

	Year	2020												2021												
Scenario	Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	Quantity
A	Silicon	bacth-II (150)																								250
	HDI	bacth-I (180)						batch-II (90)																		270
	Stave	prototype-IV							batch-I (75)			batch-II (75														150
	Assembly											56			56											112

- 59 HDI's from 1st batch are delivered and forwarded to NCU (20) and BNL (39) already.
- Another 100 HDI are scheduled to be delivered to RIKEN on July 31st.
- The rest 21 HDI's are to be delivered later.

Executive Summary

- Silicon Sensors
  - Waiting for a quote from HPK for another 20 sets sillicon sensors in stock.
- FPHX
  - ~1500 good FPHX chips are delivered to NCU on April 29th.
  - Another bag (1600 *good* FPHX) are under preparation to be shipped to NCU in August.
- HDI
  - 20 and 39 HDI's from the 1st batch are already delivered to NCU and BNL, respectively.
  - 100 HDI's are to be delivered to RIKEN on July 31st.
  - 90 HDI production as 2nd batch is under fabrication. To be delivered by the end of October.
- Stave
  - 3 Staves are under preparation for exporting to BNL. Target pickup date is July 31st.
  - The specification in flow test criteria is fixed.
  - 75 Stave production contract is now under process in RIKEN's contract department. Expected PO in next week.
- Trigger Scintillators and PMTs
  - Placed order 2 x ladder size and 2 x single cell scintillators and light guides to G-tech. Lead time is 2 weeks.
  - Placed PO of 4 PMTs to Hamamatsu. Lead time is 2.5 months.

FPHX Shipping to NCU

- Total of 2080 FPHX Chips are need to assemble 40 ladders.
- 1534 Good FPHX chips were sent to NCU in April, 2020.
- Another 1668 GOOD FPHX chips from the 2018 batch are to be sent to NCU in August, 2020.
- There will be ~3000 FPHXs in NCU which include ~50% spares.

	BNL	NCU
Total Number of *GOOD* FPHX Chips	9683	3202
Total Number of Ladder Assembly	80	40
Number of FPHX Chips to be assembled	4160	2080
Number of *GOOD* Spare FPHX Chips	5523	1122
Excessive Rate [%]	233	154

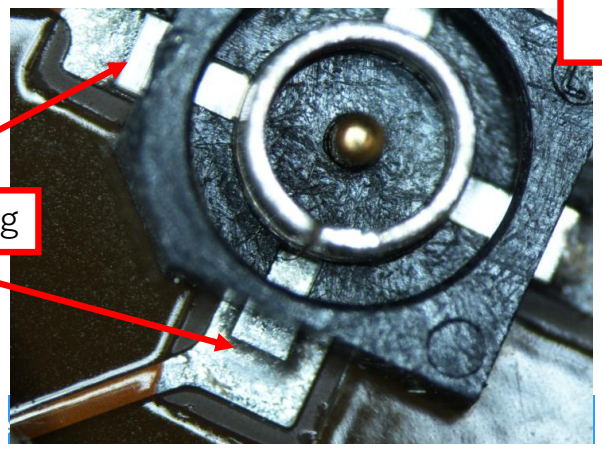
FPHX Production Statistics

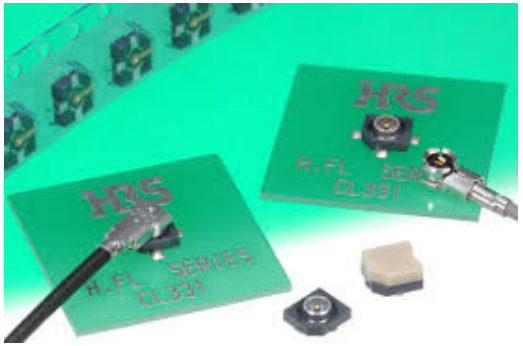
Btach	#	Wafer ID	Good	Bad	Total	
2016	1	19G4	729	108	837	Shipped to NCU on April 23, 2020
	2	18H1	805	27	832	Shipped to NCU on April 23, 2020
	3	24E5	738	95	833	
	4	23F2	798	30	828	
	5	21G4	792	47	839	
	6	20H1	814	22	836	
	7	22F7	705	119	824	
		Total	**5381**	**448**	**5829**	
2018	1	W6B752-01D0	831	9	840	To be shipped to NCU
	2	W68752-02C3	837	3	840	To be shipped to NCU
	3	W6B752-03B6	836	4	840	
	4	W6B752-04B1	833	7	840	
	5	W6B72-05A4	834	6	840	
	6	W6B752-06H2	830	10	840	
	7	W6B752-07G5	831	9	840	
	8	W6B752-08G0	834	6	840	
	9	W6B7562-09F3	838	2	840	
		Total	**7504**	**56**	**7560**	
2018+2019 TOTAL			**12885**	**504**	**13389**	
Quantity for 120 Ladders			6240			
Number of spares			6645			

HDI Production

- 59 good ones out of 180 ordered were delivered by April 23rd.
  - 39 were shipped to BNL and 20 to NCU.
  - 100 HDI's are to be delivered by the end of July.
  - 21 HDI's are still under fabrication. Yamashita co. has been struggling in poor yield rates.

- Always use the dedicated tool to unplug.
- Keep the connector dry and clean. No dust, no moisture. Will induce additional current.





Material Procurement Status for the Stave Production

Item	Make	Vender	Web	Product	Quantity	LeadTime [weeks]	Procurer	Status
NT91500-520S Prepreg	Japan Graphite Fiber	Japan Graphite Fiber Co.		74m^2	1	<1.5 week	RIKEN	PO 7/21
Roha Cell 110 RIST							ASUKA	
Ketron CA30 PEEK	Mitsubishi Chemical Co.	Monotaro?					ASUKA	In stock @ ASUKA
CFRP Pipe	TORAYCA T700	Kimuraya Co.	http://www.saoya-kimuraya.com			8	ASUKA	ROCKWESTから発注
		ROCKWEST	https://www.rockwestcomposites.com/round-tubing/round-carbon-fiber-tubing/t-rnd-118	50cm	200	2~3 weeks	RIKEN	Very slow response.
SUS316 Tube	McMaster-CARR	McMaster-CARR	https://www.mcmaster.com/89935k39	3ft.	20	In stock	RIKEN	PO 7/21
SUS316 Tube Sleeve	McMaster-CARR	McMaster-CARR	https://www.mcmaster.com/1800t518	3ft.	9	In stock	RIKEN	PO 7/21
Pin Receptacle	Mill-Max MFG Corp	Digi-Key					ASUKA	
Epoxy Glue								
EP75-1	Master Bond	MasterBond	https://www.masterbond.com/tds/ep75-1	pints kit	5	1.5 ~ 2 weeks	RIKEN	PO 7/21
					5	保管期間3~6ヶ月のため、２度目の量産時に発注		
HYSOL 9396	Henkel-LOCTITE	ELLSWORTH					ASUKA	
AP-C31	Keyence				9		ASUKA	
Rohacell加工								
Super 77接着剤	3M						ASUKA	
VM&P Naphtha 溶解剤							ASUKA	

QA Test Procedures for Production

Quantity : **150** Staves

1. Tube Flow Test at 200ml/min. Pressure difference between both ends < 1.125 ± 0.056 psi.
2. Burst Test : Keep the tube at the high pressure of 60 ± 2 psi and won't burst for 1 hour.
3. Leak Test : Holds the pressure < 0.2ml-mbar/min for **10 hours**. (120ml-mbar/10h). Perform the test 10 tubes in parallel.
4. Assembly with CFRP plates. Drill alignment holes.
5. Heat cycle test : ＋40°C～0 ± 5°C (one cycle)
6. Measure flatness (**<100 μm**) and relative position between alignment holes under temperature 20 ± 5°C, humidity 10~70% conditions.

QA Test Procedures for Prototype-IV

1. Burst Test : Keep the tube at the high pressure of 60 ± 2 psi and won't burst for 1 hour.
2. Leak Test : < 0.01ml-mbar/sec (≦ 0.15 ± 0.15 mbar ml/30s)
3. Assembly with CFRP plates. Drill alignment holes.
4. Heat cycle test : ＋40°C～0 ± 5°C (one cycle)
5. Measure flatness (<100 μm preferable) and alignment positions

NWU Test Bench Workfest

July 14 ~ 17

INTT Japanese meeting (NWU workshop wrap up meeting)

Wednesday 22 Jul 2020, 14:30 → 17:50 Asia/Tokyo

Description Meeting URL
https://bluejeans.com/915835667?src=join_info

Meeting ID
915 835 667

Want to dial in from a phone?

Dial one of the following numbers:
+1.408.419.1715 (United States(San Jose))
+1.408.915.6290 (United States(San Jose))
(see all numbers - https://www.bluejeans.com/premium-numbers)

Enter the meeting ID and passcode followed by #

Connecting from a room system?
Dial: bjn.vc or 199.48.152.152 and enter your meeting ID & passcode

14:30 → 14:31 **NWU kickoff meeting agenda**
Speaker: Itaru Nakagawa (RIKEN)
200714_NWU_Work...

14:45 → 15:00 **FEM-IB debugging**
Speaker: Mika Shibata
20200721_shibata....

15:00 → 15:20 **進捗報告**
Speaker: Runa Takahama
ラップアップミーテ...

15:20 → 15:50 **workfest summary** 30m
Speaker: Miu Morita
20200721_MiuMorit...

https://indico2.riken.jp/event/3447/

Preparation for the ladder test

STEP	Test	Condition	Purpose
1	Visual Inspection		Check all components and wirebondings with micro scope
2	Calibration	Bias on Bias off	Wirebonding btwn FPHX and HDI. FPHX health check.
3	Bias Scan	Bias on HV vs. Current	Wire bonding btwn FPHX and Silicon. Ground contact/short.
4	Noise	Bias on, self-trigger	Noise distribution and rate
5	Source	Bias on, external trigger by a scintillator	Find dead channel in silicon sensor
6	Cosmic Ray	Bias on, external trigger by sandwich scintillators. Multi-layered ladders.	Uniformity of the entire area and MIP observation. Long term stability,

- One of the ladders assembled in early days in BNL and Taiwan are to be shipped to NWU.
- These ladders performances are tested one by one.
- Various testing conditions are to be established in NWU for these test.
- Some of tests are carried out in BNL and Taiwan as well for the production ladders. It is not practical to send all 120 ladders to NWU and being tested there.
- Invented testing methods in NWU are to be exported to BNL and Taiwan for production ladder testing.
- Not all tests are applied to production ladders. To be optimized testing items for production ladders later.

NWU Test Bench Missions

Task List

1. Further understanding of ladder performance
   - 3% inefficiency (Timing ?)
   - Data timing study (can be tested with Cosmic ray and Test pulse)
   - Inefficiency by massive data from crazy chips

   → Data analysis (software)

   - Timing jitter among ladders
   - Long time stability of DAQ (noise + cosmic ray) for at least 24h

   → Work at test bench (hardware)

2. Upgrade the test bench
   - Data from Trigger counter recorded by CAMAC
   - Necessary to study the data timing wrt clock.

   → Work at test bench (hardware)

3. Bus extender tests
   - Data analysis is going for Eye diagram
   - Thermal shock test (Apr. 9 – May 20, 40 days)
   - New prototype production (End of May)

   → Data analysis
   Work in parallel with BE R&D team

4. QA for new ladder
   - MIP test by Cosmic ray and RI source (β-ray)

   → good to start after May 7th

5. Upgrade LV control system for full detector

   → Work at test bench (hardware)

6. INTT multiplicity trigger
   - Feasibility study with GEANT + HIJING

   → Data analysis

I would like to focus on them, especially 1)-4) in this 2-3 months,

Additional Task Request to NWU in Summer

1. Implement noise trigger to calibration to evaluate the noise performance
   a. Injecting clock trigger to FEM test pin as the external trigger mode
   b. Implement clock trigger to the firm ware
2. Multiple half-ladder simultaneous readout test (up to 4).
3. Multiple column readout of ROC.
4. FEM-IB debugging.
5. Implement channel vs. ADC in the calibration analysis code?
6. Can NWU test a NCU ladder for double check?
7. Establish long time stability of DAQ > 24hours
8. Measurement of pulse height loss of the calibration pulse.