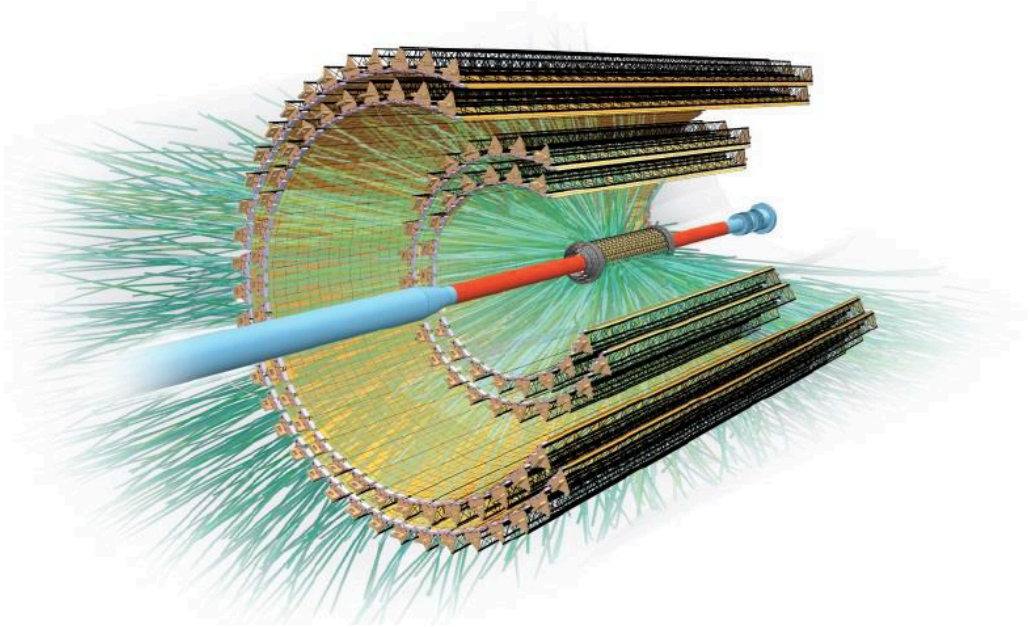
12th ALICE ITS upgrade, MFT and O2 Asian Workshop
19-21 November 2018 Inha University

OB HIC Production @ Wuhan

Yaping Wang for the CCNU Team

Wenjing Deng, Chaosong Gao, Guangming Huang, Donghai Liu, Jun Liu, Daming Sun, Xiangming Sun, Yalei Tan, Kai Wang, Ping Yang, Zhongbao Yin, Biao Zhang, Li'ang Zhang, Wenjing Zhang, Peipei Zheng, Daicui Zhou

(Central China Normal University, Wuhan)



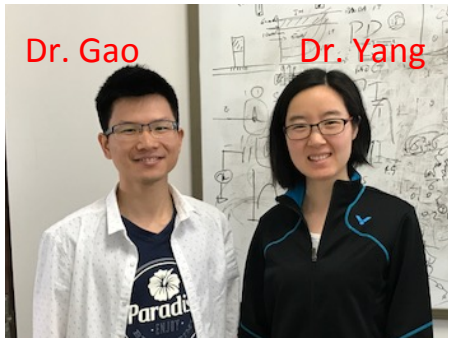
Outline

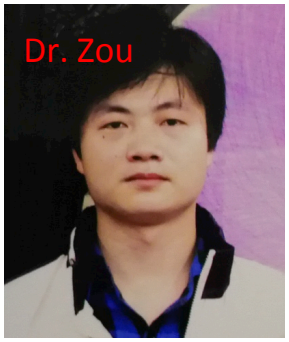
- CCNU Effort on ALICE ITS Upgrade
- OB HIC Production Status @ Wuhan
  - ✓ Overview
  - ✓ Material Availability
  - ✓ ALICIA Status
  - ✓ Bonding Quality
  - ✓ HIC Assembly, Tests and DB
  - ✓ Shipping
- Production Plan for Coming Months
- Summary and Outlook

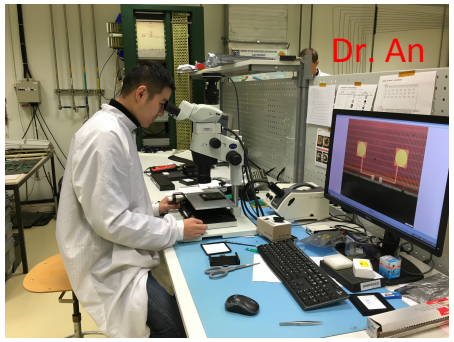
CCNU Effort on ALICE ITS Upgrade

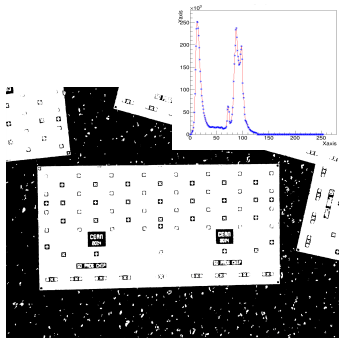
- CCNU team decided to join the ALICE ITS upgrade project in 2012 with manpower and resources from CCNU-PLAC group (Dr. Nu Xu) and ALICE-CCNU group (Prof. Daicui Zhou)
- The project was supported by CCNU talent fund since 2012 and also supported by MOST special fund since 2016

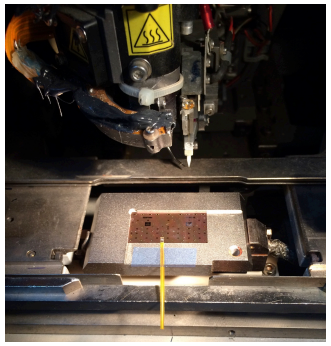
- Two phD students from CCNU were sent to CERN working on ALPIDE chip design since 2012 (Dr. Ping Yang: 2012 ~ 2014; Dr. Chaosong Gao: 2013 ~ 2016)
- Two phD students from CCNU were sent to CERN working on chip testing and HIC module assembly since 2015 (Dr. Mangmang An: 2015 ~ 2016; Dr. Shuguang Zou: 2016 ~ 2017)
- R&D on automatic chip alignment SW and chip-FPC interconnection since 2014





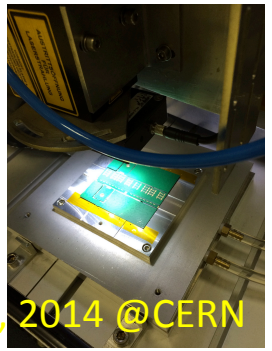






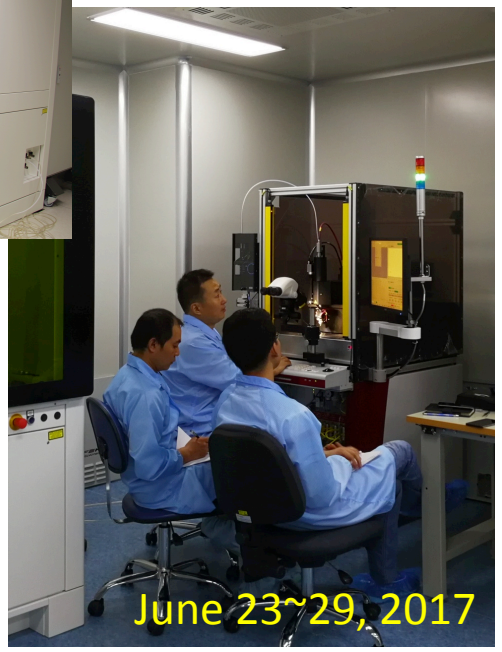
CCNU Effort on ALICE ITS Upgrade

- I joined the ALICE ITS upgrade since 2014 when I was back from STAR Heavy Flavor Tracker project from US, and visited CERN to learn the ITS assembly techniques from Nov. 28 to Dec. 13, 2014
- Started to construct clean room since June 2015, and run since end of 2016
- The facilities preparation and team organization and training started since 2015
- Series production started since April 2018



Dec., 2014 @CERN




May 5, 2017




June 2015


Nov. 2016


Oct. 31, 2016


Nov. 22, 2016

June 23~29, 2017

HIC Production Status – Overview

Production Week #	Assembled	SILVER/BRONZE/NOBB in Qualification Test	Pull Test
30	6	5	
31	6	4	
32	8	7	
33	9	7	
34	3	3	3
35	0	0	1
36	0	0	
37	10	6	4
38	9	7	4
39	7	4	
40	10	8	
41	7	4	
42	0	0	
43	1	0	5
44	11	11	1
45	11	11	
46	0	0	
47	12	9	4
48	11	9	3
49	12	11	2
50	10	7	1
51	9	5	2
52	9		1

Since last Asian workshop 161 HICs were produced and tested at Wuhan site, 31 of them have been done pull-force test.

Production stop due to FPC quality check

Air Conditioner check

Production slow down and stop due to ALICIA issue

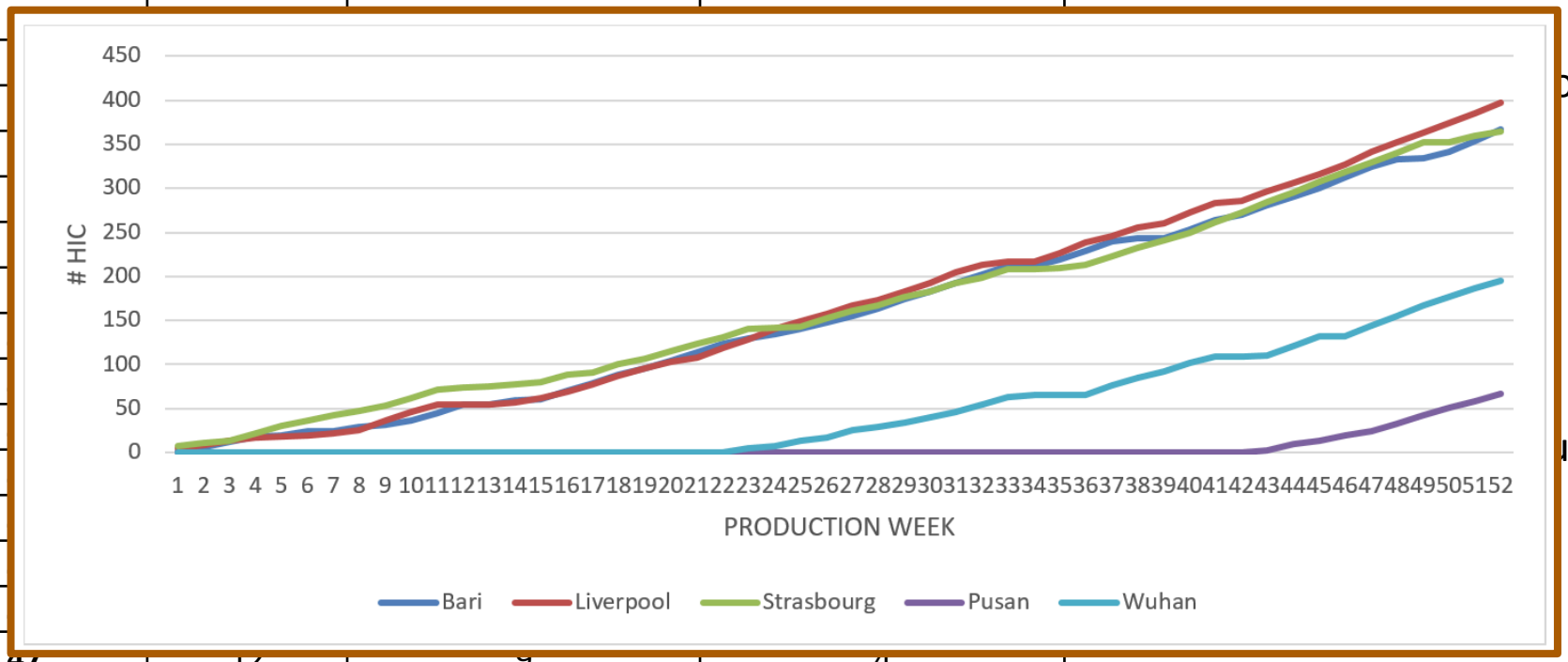
National holiday

BRONZE HICs production

HIC Production Status – Overview

Production Week #	Assembled	SILVER/BRONZE/NOBB in Qualification Test	Pull Test
30	6	5	
31	6	4	
32	8	7	
47	12	9	4
48	11	9	3
49	12	11	2
50	10	7	1
51	9	5	2
52	9		1

195 HICs have been produced at Wuhan site in series production, 185 of them have been tested, and 142 working HICs.



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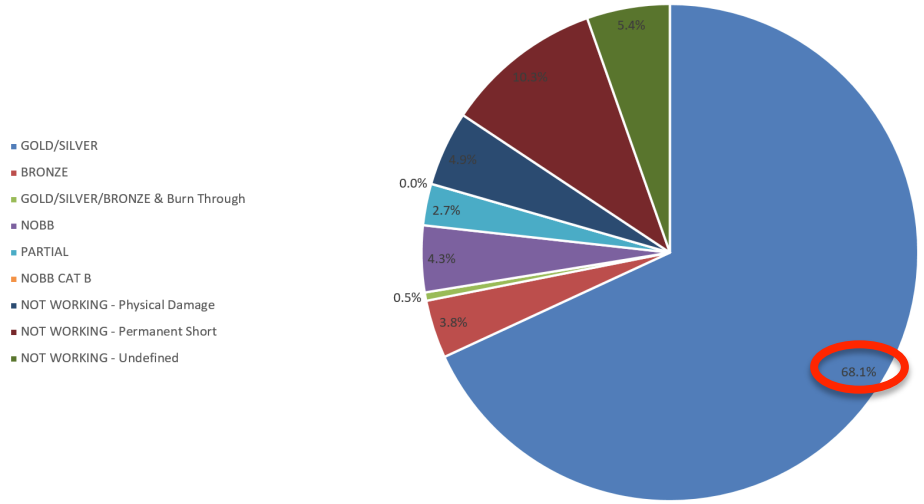
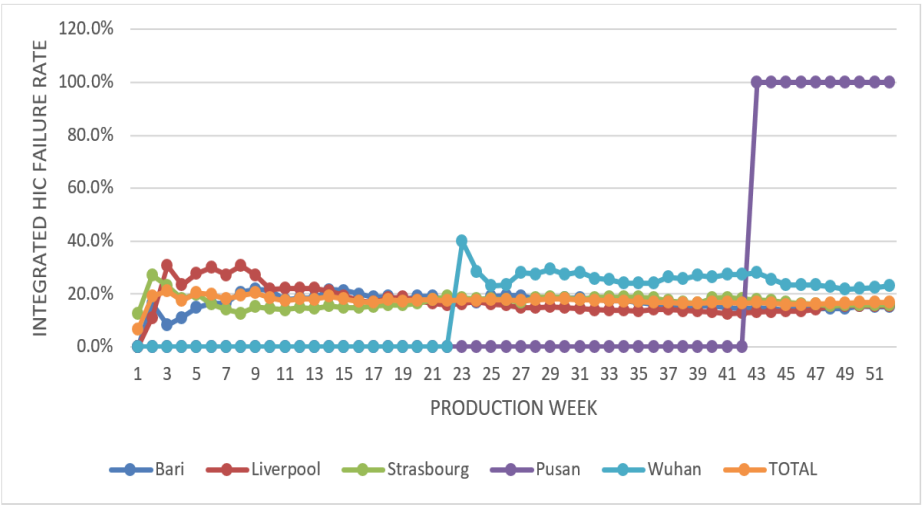
BRONZE HICs production

HIC Production Status – Overview





1	WEEK	NAME	DATE	SITE	BONDED	PLACE	COMMENTS	CHIP GRADE	PHYS. STAT.	
170	50	AL001455	29.10.2018	Wuhan	YES	Wuhan		SILVER	OK	SILVER
171	50	BL001234	29.10.2018	Wuhan	YES	Wuhan		SILVER	OK	SILVER
172	50	BL001235	30.10.2018	Wuhan	YES	Wuhan	permanent short, AVDD-DVDD-BB shorts, BURT-THROUGH failed; no hot spots -- pull tested	SILVER	MISSED	NOT WORKING
173	50	BL001236	30.10.2018	Wuhan	YES	Wuhan	ermanent short, BURT-THROUGH failed; hot spots on chip6 : a FPC pad can not be bonded, but bonded after clean -- pull teste	SILVER	MISSED	NOT WORKING
174	50	BL001237	31.10.2018	Wuhan	NO	Wuhan	3 pixel pads were contaminated by glue, and 2 FPC pads seems to be contaminated too	MISSED	MISSED	NOT WORKING
175	50	BL001494	31.10.2018	Wuhan	YES	Wuhan		SILVER	OK	SILVER
176	50	BL001495	01.11.2018	Wuhan	YES	Wuhan	chip3	SILVER	OK	NOBB
177	50	AL001738	01.11.2018	Wuhan	YES	Wuhan		SILVER	OK	SILVER
178	50	AL001739	02.11.2018	Wuhan	YES	Wuhan		SILVER	OK	NOBB
179	50	AL001741	02.11.2018	Wuhan	YES	Wuhan		SILVER	OK	SILVER
180	51	AL001742	05.11.2018	Wuhan	YES	Wuhan		SILVER	OK	SILVER
181	51	AL001740	06.11.2018	Wuhan	YES	Wuhan	BRONZE; impedance of DVDD is below 100 Ω (~73 Ohm), no hot spots;	BRONZE	NOK	BRONZE
182	51	AL001743	06.11.2018	Wuhan	YES	Wuhan	BRONZE; threshold Scan 3.0V failed	BRONZE	OK	NOT WORKING
183	51	AL001744	07.11.2018	Wuhan	YES	Wuhan		SILVER	OK	SILVER
184	51	AL001745	07.11.2018	Wuhan	YES	Wuhan	ere failed to bond, but succeeded with BondDelay = 20; back bias not working at power test & Digital scan BB 3 failed & Thresh	BRONZE	OK	NOBB
185	51	AL001666	08.11.2018	Wuhan	YES	Wuhan	BRONZE; back bias not working at power test	BRONZE	OK	NOBB
186	51	AL001667	08.11.2018	Wuhan	YES	Wuhan	BRONZE; Noise Occupancy 0.0V failed	BRONZE	OK	
187	51	AL001668	09.11.2018	Wuhan	YES	Wuhan	BRONZE; impedance of DVDD is below 100 Ω (~87 Ohm)	BRONZE	NOK	
188	51	AL001669	09.11.2018	Wuhan	YES	Wuhan	BRONZE;	BRONZE	OK	NOT WORKING
189	52	AL001670	12.11.2018	Wuhan	YES	Wuhan	BRONZE; permanent short, DVDD shorts(~41 Ohm), BURT-THROUGH failed, no hot spots; Threshold Scan 0V & 3.0V failed	BRONZE	OK	NOT WORKING
190	52	AL001671	12.11.2018	Wuhan	YES	Wuhan	BRONZE;	BRONZE		
191	52	AL001672	13.11.2018	Wuhan	YES	Wuhan	BRONZE; 3 pads on chipX fully covered by glue; 4 bonds failed, but rebonded; short; pull tested	BRONZE	MISSED	NOT WORKING
192	52	AL001673	13.11.2018	Wuhan	YES	Wuhan	BRONZE; Threshold Scan 3.0V failed	BRONZE	OK	
193	52	AL001674	14.11.2018	Wuhan	YES	Wuhan	BRONZE; Digital scan BB 3 failed	BRONZE	OK	
194	52	AL001675	14.11.2018	Wuhan	YES	Wuhan	BRONZE;			
195	52	AR001889	15.11.2018	Wuhan	YES	Wuhan	BRONZE;			
196	52	AR001891	15.11.2018	Wuhan	YES	Wuhan	BRONZE;			
197	52	AR001892	16.11.2018	Wuhan	YES	Wuhan	BRONZE;			

HIC Production Status – Materials Status

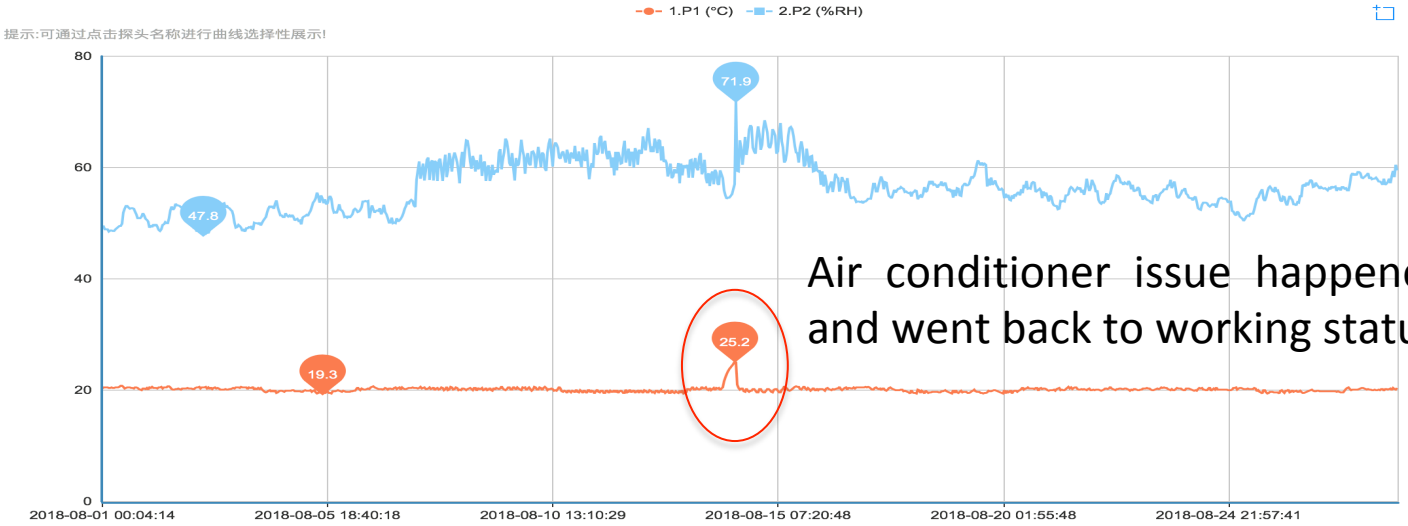
SHIPMENT INDEX	FPC (Units, EDH No.)	CHIPS (Units, EDH No.)
1	7, EDH 6907845	230, EDH 7061128
2	10, EDH 7026633	346, EDH 7193163
3	10, EDH 7042872	1012, EDH 7236377
4	18, EDH 7204743	1012, EDH 7277072
5	10, EDH 7234967	1104, EDH 7331292
6	10, EDH 7270045	1057, EDH 7378011
7	10, EDH 7285051	920, EDH 7507039
8	10, EDH 7306087	
9	10, EDH 7311211	
10	20, EDH 7325938	
11	20, EDH 7386033	
12	20, EDH 7403919	
13	20, EDH 7430037	
14	20, EDH 7442720	
15	20, EDH 7481968	
16	20, EDH 7495513	
17	20, EDH 7509338	
18	20, From Bari	
Total (shipped/remaining)	275 / 225	5681 / 1819

Material	Availability
Glue masks	216
FPC (BL/AL/BR/AR)	57 (4 / 26 / 2 / 25)
Chips	8 (S) + 8 (B) + 20 wafers

- The available materials will cover 5-weeks production (SILVER + BRONZE HICs)
- Procedures of custom clearance for chips and FPCs were processed much faster recently
- Amount of chips: 7500 PCs

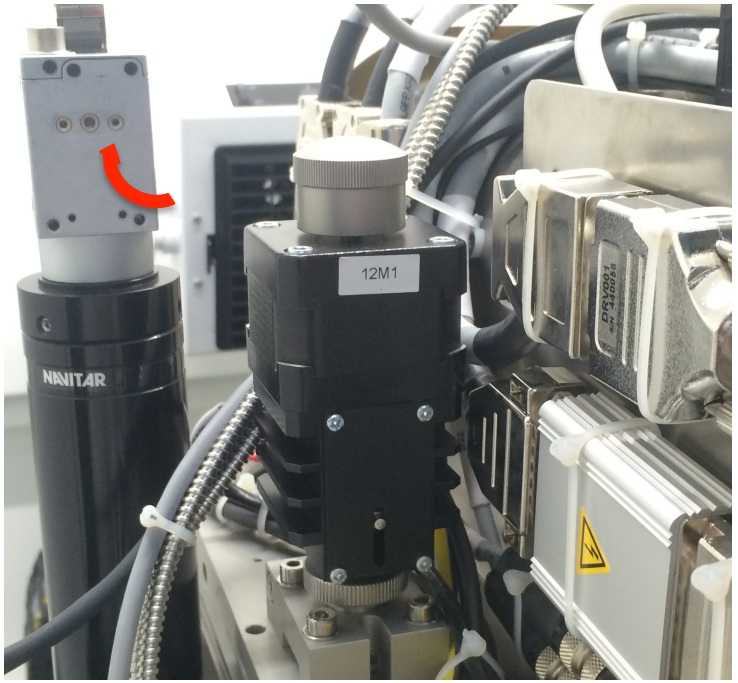
→ more needed to cover future 225 HICs production

HIC Production Status – ALICIA Machine Status

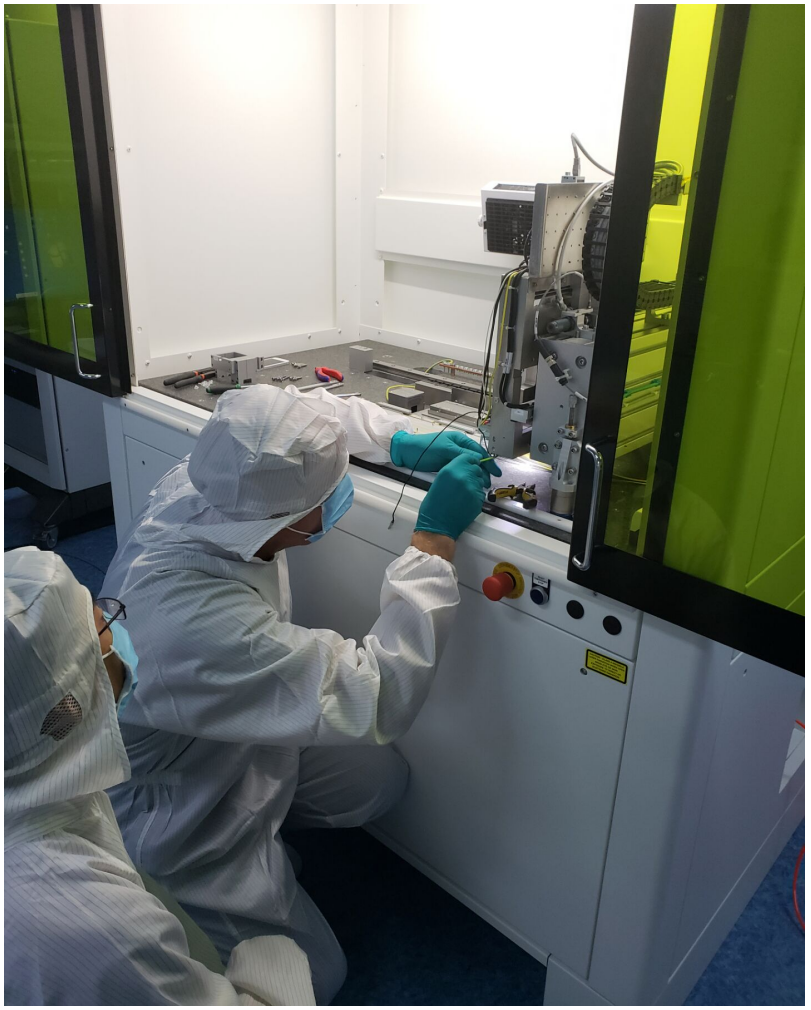


Air conditioner issue happened on August 14, and went back to working status 10 hours later.

- MAM lost focus on both PPC and HIC, and chip alignment can be done only manually by RESET GRIPPER for each action
- IBS investigated remotely, suggest to replace the Z1 motor
- After adjustments on Z1 motor, the situation seems to be improved a little (sometimes the focus became good)
- Serious chip gripper deformation was found two weeks later



HIC Production Status – ALICIA Machine Status



OB OB

X: -1.2 Y: -1.5 Rz: 0.01 Total: 1.9	X: -2.1 Y: -1.1 Rz: -0.03 Total: 2.4	X: -2.2 Y: -1.9 Rz: 0.08 Total: 2.9	X: -1.6 Y: -1.5 Rz: -0.05 Total: 2.2	X: -1.8 Y: -1.0 Rz: -0.02 Total: 2.1	X: -2.2 Y: -1.6 Rz: 0.06 Total: 2.8	X: -2.7 Y: -1.7 Rz: 0.02 Total: 3.2
X: -1.4 Y: -2.6 Rz: 0.05 Total: 2.9	X: -2.0 Y: -3.1 Rz: 0.07 Total: 3.7	X: -1.6 Y: 1.0 Rz: -0.01 Total: 1.9	X: -1.3 Y: 1.3 Rz: -0.03 Total: 1.8	X: -1.9 Y: 1.0 Rz: -0.03 Total: 2.2	X: -1.8 Y: 1.2 Rz: 0.05 Total: 2.2	X: -1.1 Y: -0.3 Rz: 0.04 Total: 1.1

- Production resumed on Sept. 14 after IBS engineer replaced the Z1 motor and damaged gripper (total accuracy within 3 microns)
- ALICIA-6 works well after the IBS on-site maintanence

HIC Production Status – Bonding Quality

1		NAME	FPC lot	ASSEMBLY DATE	TEST DATE	ASS. SITE	# BONDS TESTED	AVG FORCE (g)	MAX FORCE (g)	MIN FORCE (g)	ST.DEV. FORCE (g)	LIFT OFF 1st (FPC)	LIFT OFF 2nd (Chip)
152		AR000193	0	06.07.2018		WUHAN	56	10.38	15.26	5.37	2.57		
153	pull test @Wuhan	AL000819	2	12.06.2018	13.07.2018	WUHAN	55	9.772	13.504	5.19	2.344		
154	pull test @CERN	AL000819	2	12.06.2018	26.07.2018	WUHAN	60	11.176	13.285	8.824	0.85	0	4
155	pull test @Wuhan	AR000560	1	08.05.2018	13.07.2018	WUHAN	56	10.62	15.565	5.427	2.616		
156	pull test @Wuhan	AL001027	3	05.07.2018	13.07.2018	WUHAN	56	9.11	13.475	5.311	2.355		
157	pull test @CERN	AL001027	3	06.07.2018	26.07.2018	WUHAN	60	9.306	12.352	7.869	0.754	0	0
158		AR000562	1	25.04.2018	01.08.2018	WUHAN	56	12.054	15.545	5.135	1.899	0	3
159		AL000535	1	24.05.2018	01.08.2018	WUHAN	56	11.668	14.364	7.423	1.466	1	2
160		AL000745	2	22.05.2018	17.07.2018	WUHAN	56	9.913	14.918	4.424	2.536	0	8
161	pull test @CERN	AR000560	1	08.05.2018	26.07.2018	WUHAN	60	11.398	12.785	7.218	1.098	0	6
162		AL000822	2	30.05.2018	02.08.2018	WUHAN	56	11.367	14.705	7.895	1.638	0	0
163		AR000843	2	19.06.2018	03.08.2018	WUHAN	55	11.241	14.388	6.555	1.867	0	0
164		AR000562	1	25.04.2018	06.08.2018	WUHAN	298	11.67	15.695	5.404	1.65	0	0
165		AR001008	3	30.07.2018	08.08.2018	WUHAN	56	9.373	12.968	4.333	2.179	0	0
166		AL001031	3	03.08.2018	09.08.2018	WUHAN	56	9.213	14.068	4.601	1.879	0	0
167		AL000169	1	10.08.2018	10.08.2018	WUHAN	29	12.556	13.998	9.987	0.958	0	0
168		AR001035	3	01.08.2018	10.09.2018	WUHAN	56	8.331	13.278	2.694	2.172		
169		AR001050	3	10.08.2018	10.09.2018	WUHAN	56	8.486	12.553	2.707	2.559		
170		AL001032	3	31.07.2018	12.09.2018	WUHAN	56	9.187	12.036	5.754	1.481		
171		AR001036	3	06.08.2018	12.09.2018	WUHAN	56	9.705	12.544	4.893	1.788		
172		BR000932	2	15.08.2018	12.09.2018	WUHAN	56	8.509	11.255	3.716	1.279		
173		BL001215	3	14.09.2018	21.09.2018	WUHAN	56	9.621	12.535	5.981	1.229		

	TEST	AVERAGE (g)	STD.DEV. (g)	MINIMUM (g)	MAXIMUM (g)
BARI	33	13.03	0.96	9.95	15.11
LIVERPOOL APEX	49	11.81	2.12	6.79	15.47
LIVERPOOL	44	10.56	1.08	7.92	13.13
STRASBOURG	20	10.56	1.02	7.95	12.59
PUSAN	4	9.16	0.56	8.29	10.66
WUHAN	22	10.21	1.78	5.76	13.69

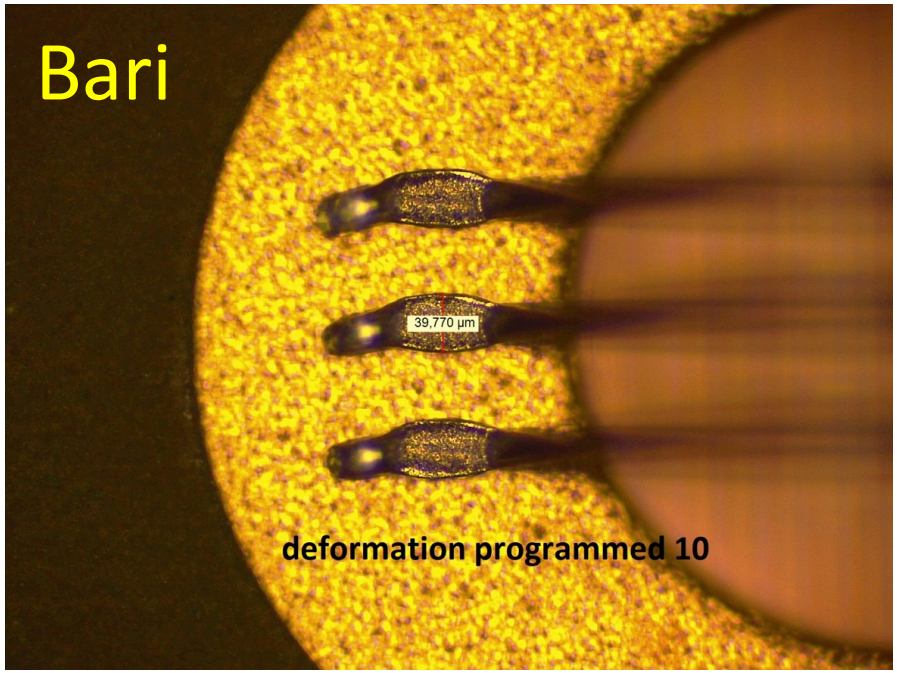
Detailed investigation:

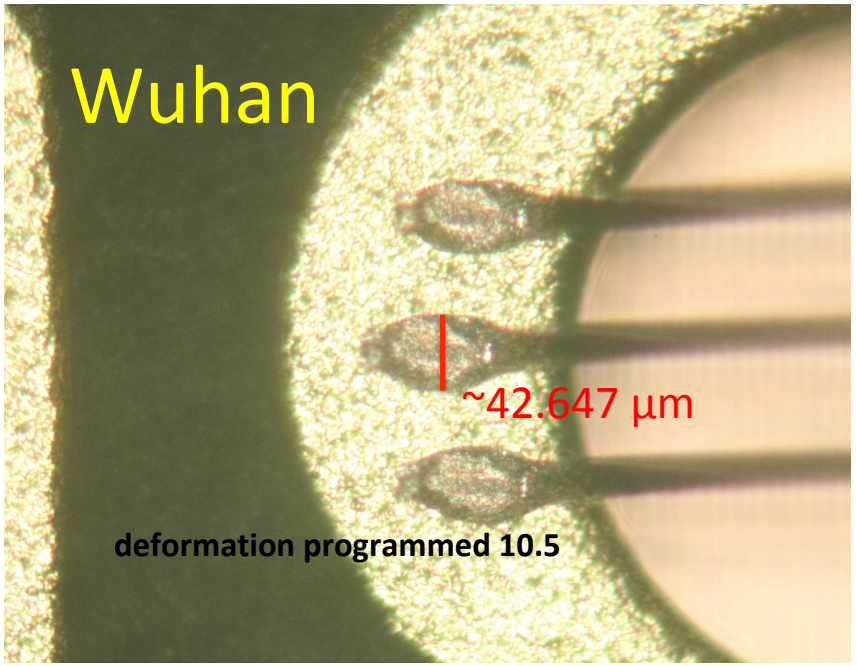
- ✓Deformation parameter for 1st bond (FPC side) was set too high (Wuhan value: 10.5) or other reasons ?
- ✓More HICs were tested to monitor the bonding quality

HIC Production Status – Bonding Quality

Deformation parameters:

Deformation programmed	1st bond (FPC side)	2nd bond (Chip side)
Wuhan	**10.5**	**8.5**
Bari	10	8

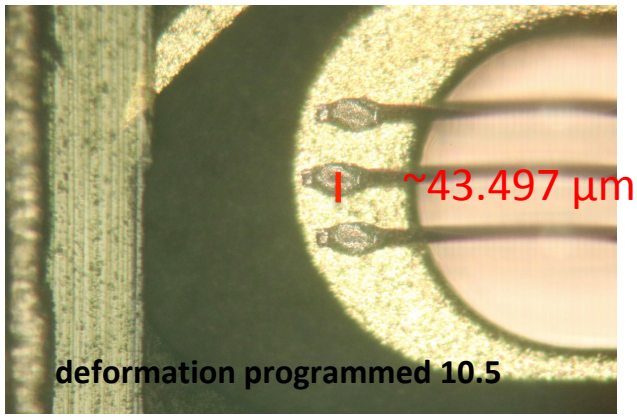


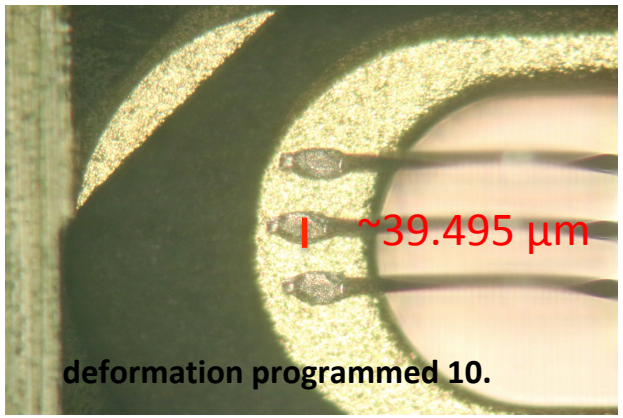


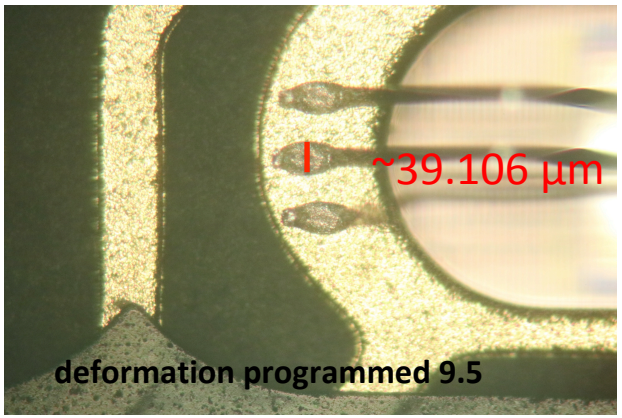
HIC Production Status – Bonding Quality

Deformation parameters:

Deformation programmed	1st bond (FPC side)	2nd bond (Chip side)
Wuhan	**10.5**	**8.5**
Wuhan	10	8.5
Wuhan	9.5	8.5







- The ratios of bond feet width to wire diameter are around 1.7, 1.6 and 1.55 on FPC side for deformation 10.5, 10.0 and 9.5, respectively.

HIC Production Status – Bonding Quality

① AL001281（NOBB：Deformation programmed 10.5，assembled on Sept. 17，bonded on Sept. 19）
② AL001364（BRONZE：Deformation programmed 10.5，assembled on Sept. 20，bonded on Sept. 25）

③ AL001373（NOBB：Deformation programmed 10，assembled on Sept. 27，bonded on Oct. 8）
④ AR001407（SILVER：Deformation programmed 10，assembled on Oct. 8，bonded on Oct. 10）

⑤ AR001408（SILVER：Deformation programmed 10, also update the bondDelay and deformation difference ranges as same as Bari team，assembled on Oct. 9，bonded on Oct. 11)
⑥ AR001440（SILVER：Deformation programmed 10, also update the bondDelay and deformation difference ranges as same as Bari team，assembled on Oct. 9，bonded on Oct. 15)

1		NAME	FPC lot	ASSEMBLY DATE	TEST DATE	ASS. SITE	# BONDS TESTED	AVG FORCE (g)	MAX FORCE (g)	MIN FORCE (g)	ST.DEV. FORCE (g)
204	NOBB	AL001373	3	27.09.2018	11.10.2018	WUHAN	56	9.92	12.566	6.356	1.491
205	NOBB	AL001281	3	17.09.2018	12.10.2018	WUHAN	56	10.005	11.525	5.835	1.334
206	BRONZE	AL001364	3	20.09.2018	12.10.2018	WUHAN	56	9.226	12.192	6.563	1.407
207	SILVER	AR001408	3	09.10.2018	12.10.2018	WUHAN	56	10.888	13.204	7.372	1.396
208	SILVER (1st wire)	AR001407	3	08.10.2018	12.10.2018	WUHAN	56	10.334	12.827	6.981	1.642
209	SILVER (2nd wire)	AR001407	3	08.10.2018	15.10.2018	WUHAN	56	10.131	12.68	4.38	1.738
210	SILVER (3rd wire)	AR001407	3	08.10.2018	15.10.2018	WUHAN	56	10.626	13.254	6.706	1.232
211	Untest (1st wire)	AR001440	3	09.10.2018	15.10.2018	WUHAN	56	10.329	13.722	4.9	1.75
212	Untest (2nd wire)	AR001440	3	09.10.2018	15.10.2018	WUHAN	56	10.268	12.921	4.662	1.696
213	Untest (3rd wire)	AR001440	3	09.10.2018	15.10.2018	WUHAN	56	10.449	14.369	6.843	1.564

HIC Production Status – Bonding Quality

AR001407, assembled on Oct. 8, bonded on Oct. 10: SILVER / OK / SILVER

8.874/10.081/9.736	10.782/11.264/11.045	8.644/11.143/9.284	8.294/9.733/13.254	10.741/11.227/9.333	9.134/7.63/8.739	10.827/11.099/11.051
12.217/11.288/12.596	11.543/11.258/9.867	12.49/10.032/11.794	10.855/9.987/10.559	8.247/10.805/9.417	7.675/9.872/9.749	11.327/11.669/11.508
12.598/5.674/12.748	12.256/4.38/9.119	10.755/9.675/11.508	7.785/9.084/10.507	8.826/9.24/9.804	11.7/10.802/11.15	12.698/10.508/12.378
9.49/12.68/9.529	9.91/12.107/11.299	12.823/12.265/11.473	11.239/8.723/9.666	10.541/10.252/11.7	10.884/9.532/9.7	11.102/9.496/11.243
10.132/12.09/12.007	12.366/11.193/10.893	10.749/11.876/12.101	11.12/8.004/10.954	8.51/11.322/10.546	12.827/11.253/11.11	11.966/10.795/9.262
10.712/10.89/12.143	6.981/11.335/11.487	11.767/9.046/10.472	11.799/10.408/10.312	7.749/10.573/9.96	11.152/11.113/11.434	7.498/11.573/11.417
8.653/9.652/12.196	11.634/8.414/10.105	7.526/12.229/6.706	8.121/11.911/9.099	9.227/11.058/11.305	12.348/7.05/10.962	9.052/7.013/10.742
12.081/12.133/12.09	10.001/9.778/9.073	8.322/9.935/10.417	11.004/10.731/10.46	9.779/8.43/9.889	10.877/6.132/9.205	10.491/9.904/8.949

AR001440, assembled on Oct. 9, bonded on Oct. 15: Untested

8.353/8.166/9.688	13.722/11.398/14.369	11.951/12.743/9.739	11.998/10.138/11.454	10.701/10.537/8.825	10.766/11.652/13.013	8.022/10.369/10.049
9.913/12.353/10.975	6.332/8.51/9.553	10.834/9.943/11.667	7.894/10.903/10.149	8.794/10.967/10.719	11.852/9.798/10.051	11.2/10.6/11.426
9.999/11.774/9.161	12.833/12.324/11.26	8.596/10.933/10.77	10.05/11.449/12.329	10.647/10.712/8.767	8.597/9.383/11.264	10.503/8.631/11.929
12.762/12.921/9.576	11.556/11.313/13.68	11.411/12.542/8.276	11.235/10.84/12	10.716/11.739/12.935	12.688/12.367/11.932	12.507/12.257/9.536
9.844/4.662/9.142	11.942/9.733/12.424	12.241/8.248/7.249	10.454/11.491/10.064	10.828/11.314/11.927	9.94/5.799/11.06	9.095/8.717/9.734
9.647/8.643/10.09	11.577/8.179/8.592	9.978/10.434/12.39	11.026/11.215/8.213	11.738/10.437/10.533	9.641/10.717/10.561	10.376/9.371/6.843
10.837/8.463/8.808	11.081/10.131/11.269	8.478/12.378/10.663	7.13/8.995/10.967	7.339/6.552/10.947	7.44/10.759/9.174	10.78/9.153/11.97
4.9/10.323/9.96	10.085/9.597/8.515	10.837/10.841/9.516	12.057/11.148/10.287	10.287/11.154/11.63	12.177/8.654/8.353	10.241/10.638/9.17

- ✓ No pad was found with low pull forces for its all three wires.
- ✓ The bonding quality is uncorrelated with respected to the pads.

HIC Production Status – Bonding Quality

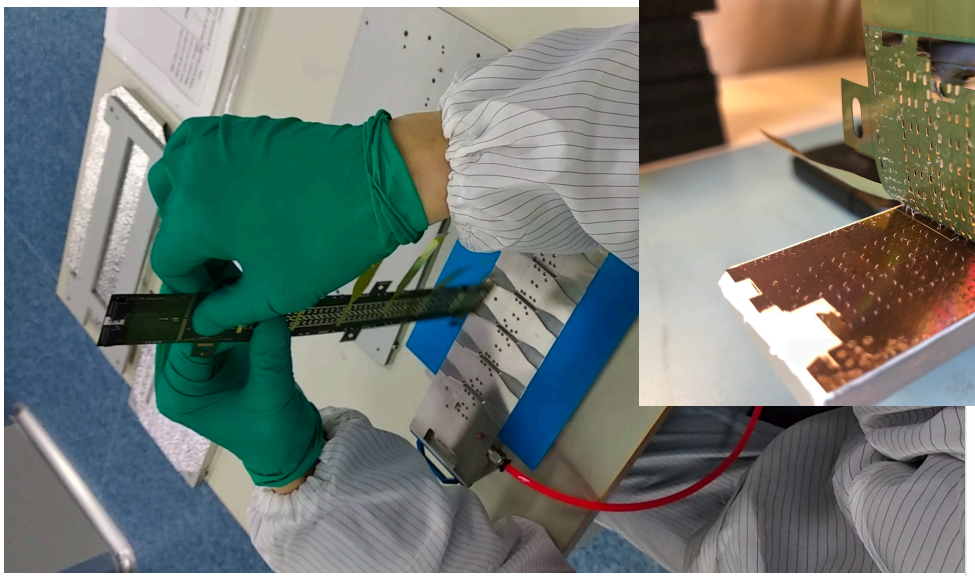
		NAME	FPC lot	ASSEMBLY DATE	TEST DATE	ASS. SITE	# BONDS TESTED	AVG FORCE (g)	MAX FORCE (g)	MIN FORCE (g)	ST.DEV. FORCE (g)	LIFT OFF 1st (FPC	LIFT OFF 2nd (Chip)	PEEL OFF 1st (FPC)	PEEL OFF 2nd (Chip	CRATER (Chip)
225		AR000562	1	25.04.2018	06.08.2018	WUHAN	298	11.67	15.695	5.404	1.65	0	0	--	--	--
226		AR001008	3	30.07.2018	08.08.2018	WUHAN	56	9.373	12.968	4.333	2.179	0	0	--	--	--
227		AL001031	3	03.08.2018	09.08.2018	WUHAN	56	9.213	14.068	4.601	1.879	0	0	--	--	--
228		AL000169	1	10.08.2018	10.08.2018	WUHAN	29	12.556	13.998	9.987	0.958	0	0	--	--	--
229		AR001035	3	01.08.2018	10.09.2018	WUHAN	56	8.331	13.278	2.694	2.172	--	--	--	--	--
230		AR001050	3	10.08.2018	10.09.2018	WUHAN	56	8.486	12.553	2.707	2.559	--	--	--	--	--
231		AL001032	3	31.07.2018	12.09.2018	WUHAN	56	9.187	12.036	5.754	1.481	--	--	--	--	--
232		AR001036	3	06.08.2018	12.09.2018	WUHAN	56	9.705	12.544	4.893	1.788	--	--	--	--	--
233	SHORT	BR000932	2	15.08.2018	12.09.2018	WUHAN	56	8.509	11.255	3.716	1.279	--	--	--	--	--
234	SHORT	BL001215	3	14.09.2018	21.09.2018	WUHAN	56	9.621	12.535	5.981	1.229	--	--	--	--	--
235	NOBB	AL001373	3	27.09.2018	11.10.2018	WUHAN	56	9.92	12.566	6.356	1.491	0	0	0	0	0
236	NOBB	AL001281	3	17.09.2018	12.10.2018	WUHAN	56	10.005	11.525	5.835	1.334					
237	BRONZE	AL001364	3	20.09.2018	12.10.2018	WUHAN	56	9.226	12.192	6.563	1.407					
238	SILVER	AR001408	4	09.10.2018	12.10.2018	WUHAN	56	10.888	13.204	7.372	1.396					
239	SILVER (1st wire)	AR001407	4	08.10.2018	12.10.2018	WUHAN	56	10.334	12.827	6.981	1.642					
240	SILVER (2nd wire)	AR001407	4	08.10.2018	15.10.2018	WUHAN	56	10.131	12.68	4.38	1.738					
241	SILVER (3rd wire)	AR001407	4	08.10.2018	15.10.2018	WUHAN	56	10.626	13.254	6.706	1.232					
242	Untest (1st wire)	AR001440	4	09.10.2018	15.10.2018	WUHAN	56	10.329	13.722	4.9	1.75					
243	Untest (2nd wire)	AR001440	4	09.10.2018	15.10.2018	WUHAN	56	10.268	12.921	4.662	1.696					
244	Untest (3rd wire)	AR001440	4	09.10.2018	15.10.2018	WUHAN	56	10.449	14.369	6.843	1.564					
245	wedge tool replace	BR001230	3	10.10.2018	16.10.2018	WUHAN	56	11.277	14.062	8.236	1.565					
246		AR001415	4	12.10.2018	24.10.2018	WUHAN	56	11.743	14.368	8.06	1.595	0	0	0	26	0
247		AR001417	4	15.10.2018	24.10.2018	WUHAN	56	12.105	14.73	8.324	1.654	5	0	0	17	0
248	wedge tool replace	AR001453	4	26.10.2018	30.10.2018	WUHAN	56	11.899	14.104	8.523	1.346	4	0	0	25	0
249		BL001235	4	30.10.2018	07.11.2018	WUHAN	56	12.001	14.55	9.219	1.079	2	0	0	28	0
250		BL001236	4	30.10.2018	07.11.2018	WUHAN	56	12.064	14.549	7.204	1.271	1	0	0	22	0
251		AL001672	5	13.11.2018	15.11.2018	WUHAN	56	11.109	13.113	8.269	1.209					

Wire-bonding quality improvement and monitoring:

- ✓After detailed investigation, we optimized the bonding parameters with Bari's experiences, and the bonding quality have been improved.
- ✓2~3 HICs per week in average were tested to monitor bonding quality

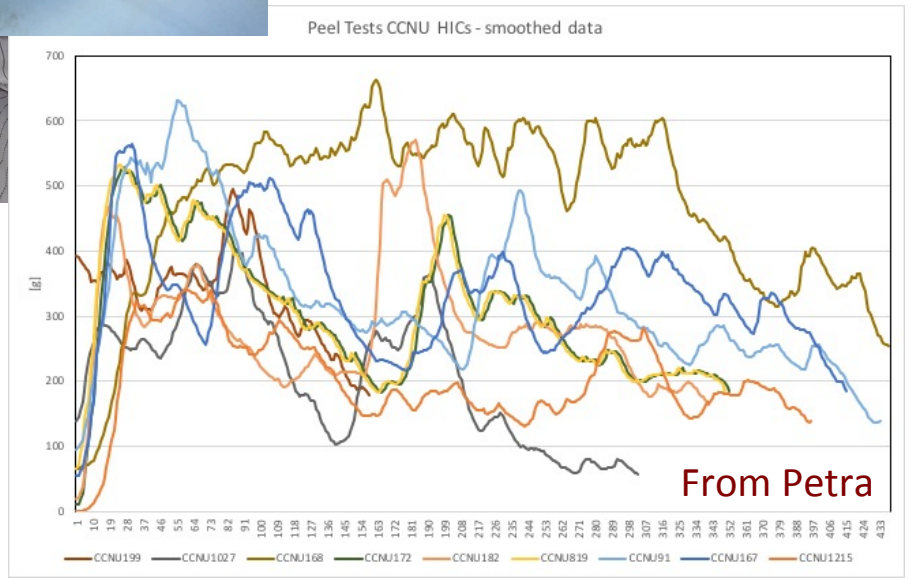
HIC Production Status – Assembly Quality

- Fully follow the assembly procedures of the assembly manual (ver. 5), and several steps have been improved as Vito's REMARKS discussed in HIC Production on 18/10/2018
- More attention and slightly flattening procedure are needed during FPC preparation



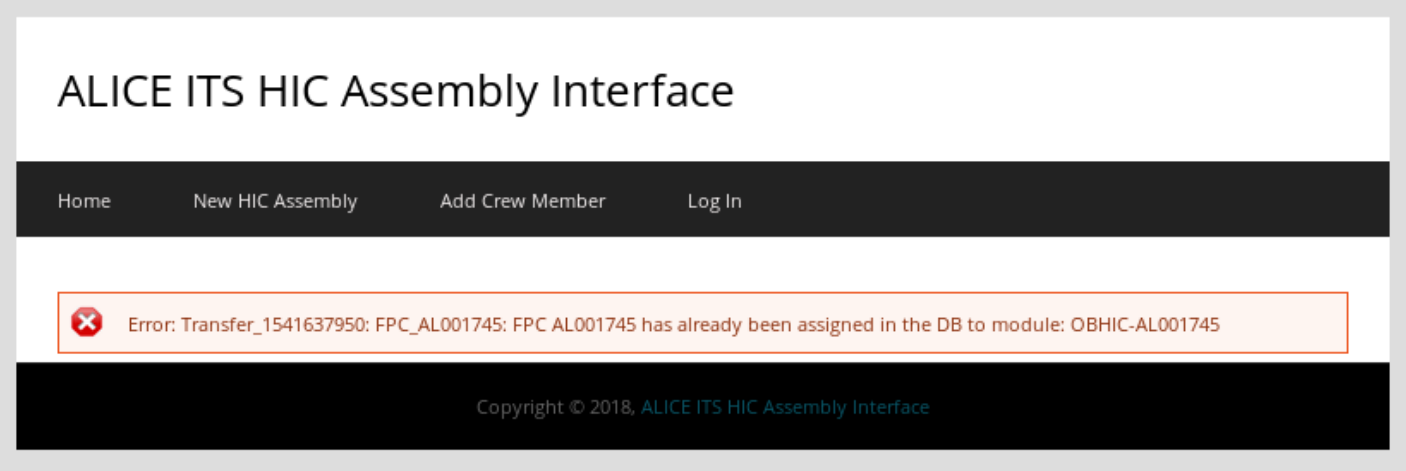
- Filaments visible during pull test
- Variable values ~200-300g
- Investigations: glue not fully cured? Mixed fully, …

HIC	center	Average [g]	Stdv [g]	Bonding/gluing
199	CCNU	320.64	111.85	Aug 30/Sep 3 2018
819	CCNU	314.82	123.70	Jun 11/16 2018
1027	CCNU	207.01	103.95	July 9/ 5 2018
1215	CCNU	212.41	76.47	Sep 14/17, 2018

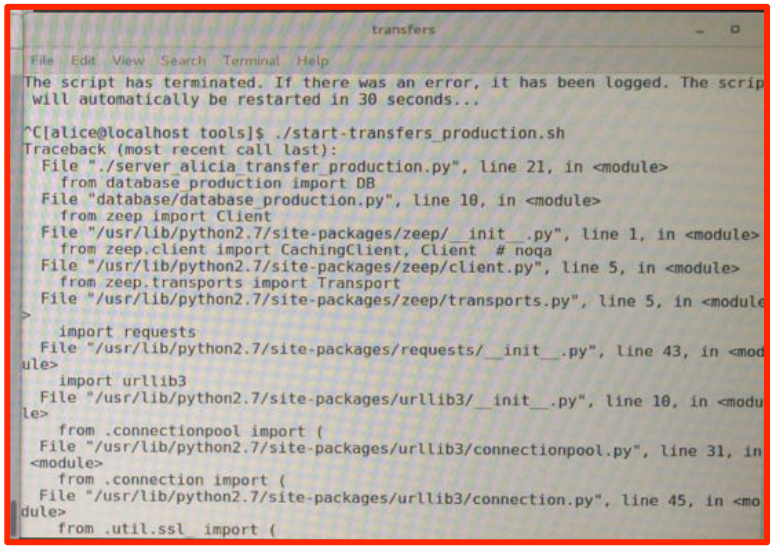


HIC Production Status – Assembly DBs

- The assembly DB works well except for below exception (Cesar comment: the issue was probably caused by slow internet connection)

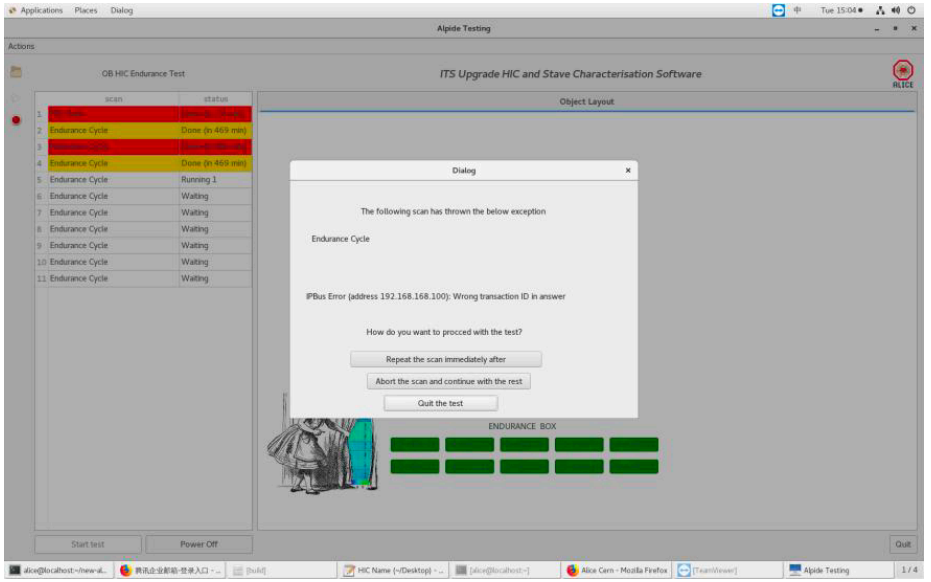


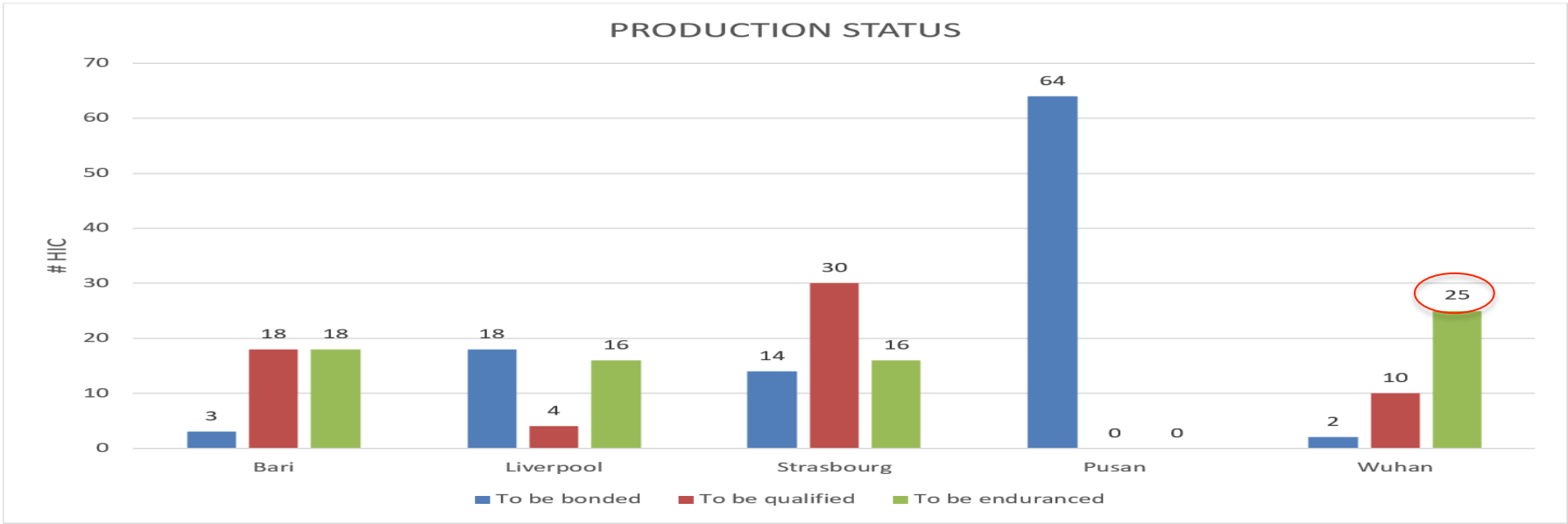
- Assembly DB interface works well, except an issue was not understood: *urllib3* not support while running database transfer script (temporally fixed by uninstallation & re-installation)



HIC Production Status – Impedance/Qualification/Endurance Tests

- Impedance & Qualification tests go well
- Endurance test does not behave as expected:
  - ✓IPBuserror occurred frequently (about twice every round). One round endurance could be done in a week
  - ✓The recovery file couldn't be loaded. Have to restart the test from beginning rather than the interrupt point.





HIC Production Status – Shipping

- 107 SILVER/GOLD HICs have been distributed to following stave sites:
  - ✓ LBL: 67
  - ✓ Frascati: 10
  - ✓ Nikhef: 7
  - ✓ Torino: 23

	PRODUCED	TESTED	WORKING	NOT WORKING	DISTRIBUTED TO THE STAVE SITES
Bari	367	346	293	53	257
Liverpool	397	375	317	58	269
Strasbourg	365	321	270	51	240
Pusan	67	3	0	3	0
Wuhan	195	185	142	43	107
TOTAL	1391	1230	1022	208	873

- Try to start HIC shipment within one week once we get the HIC distribution plan
- Wuhan site needs to return certain number of NK chips to CERN during the production (Lesson learned on chip packing for shipment, and attention will be paid in future)

	HICs AVAILABLE FOR SHIPMENT																							
	SILVER ASSEMBLED						BRONZE ASSEMBLED						"BURNT THROUGH"						"NO BACK BIAS"					
	BL	AL	BR	AR	TOTAL	LAST UPDATE	BL	AL	BR	AR	TOTAL	LAST UPDATE	BL	AL	BR	AR	TOTAL	LAST UPDATE	BL	AL	BR	AR	TOTAL	LAST UPDATE
BARI	0	0	0	0	0	18/11/2018	0	0	0	1	1	18/11/2018	0	4	0	5	9	18/11/2018	0	1	0	0	1	18/11/2018
LIVERPOOL	3	5	0	0	8	18/11/2018	0	2	0	2	4	18/11/2018	0	5	1	3	9	18/11/2018	1	7	1	3	12	18/11/2018
STRASBOURG	3	0	1	0	4	18/11/2018	1	0	0	1	2	18/11/2018	0	0	0	0	0	18/11/2018	0	1	1	0	2	18/11/2018
PUSAN	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	
WUHAN	0	5	0	4	9	19/11/2018	0	0	0	0	0	19/11/2018	0	0	0	1	1	19/11/2018	0	0	0	0	0	19/11/2018
TOTAL	6	5	1	0	12		1	2	0	4	7		0	9	1	9	19		1	9	2	3	15	

Production Plan for Coming Months

- As so far, 195 HIC modules have been produced at Wuhan site
- 75 HICs (maximum) can be produced till end of this year (2018)
- 130 HICs (maximum) could be produced in 2019 (till end of March, due to a 2-3 weeks stop for Chinese Spring Festival).
- In total, 400 HICs can be produced with production rate of 11~12 HICs/week

2~3 HICs produced per day
(assembly + bonding + testing)

2018

2018年11月

CW	日	一	二	三	四	五	六
44					1 廿四	2 廿五	3 廿六
45	4 廿七	5 廿八	6 廿九	7 立冬	8 十月	9 初二	10 初三
46	11 初四	12 初五	13 初六	14 初七	15 初八	16 初九	17 初十
47	18 十一	19 十二	20 十三	21 十四	22 小雪	23 十六	24 十七
48	25 十八	26 十九	27 廿	28 廿一	29 廿二	30 廿三	

2018年12月

CW	日	一	二	三	四	五	六
48							1 廿四
49	2 廿五	3 廿六	4 廿七	5 廿八	6 廿九	7 大雪	8 初二
50	9 初三	10 初四	11 小雪	12 初六	13 初七	14 初八	15 初九
51	16 初十	17 十一	18 十二	19 十三	20 十四	21 十五	22 冬至
52	23 十七	24 十八	25 圣诞节	26 廿	27 廿一	28 廿二	29 廿三
53	30 廿四	31 廿五					

2019

1 Jun.

日	一	二	三	四	五	六
		1 元旦	2 廿七	3 廿八	4 廿九	5 小寒
6 腊月	7 初二	8 初三	9 初四	10 初五	11 初六	12 初七
13 腊八节	14 初九	15 初十	16 十一	17 十二	18 十三	19 十四
20 大寒	21 十六	22 十七	23 十八	24 十九	25 二十	26 廿一
27 廿二	28 小年	29 廿四	30 廿五	31 廿六		

2 Feb.

日	一	二	三	四	五	六
					1 廿七	2 廿八
3 廿九	4 除夕	5 春节正月	6 初二	7 初三	8 初四	9 初五
10 初六	11 初七	12 初八	13 初九	14 情人节	15 十一	16 十二
17 十三	18 十四	19 元宵节	20 十六	21 十七	22 十八	23 十九
24 二十	25 廿一	26 廿二	27 廿三	28 廿四		

3 Mar.

日	一	二	三	四	五	六
					1 廿五	2 廿六
3 廿七	4 廿八	5 廿九	6 惊蛰	7 二月	8 龙抬头	9 初三
10 初四	11 初五	12 植树节	13 初七	14 初八	15 初九	16 初十
17 十一	18 十二	19 十三	20 十四	21 春分	22 十六	23 十七
24 十八	25 十九	26 二十	27 廿一	28 廿二	29 廿三	30 廿四
31 廿五						

Summary and Outlook

- ✓ CCNU joins the ALICE ITS upgrade since 2012, mainly contributing to chip design and detector construction. In coming years, CCNU team will put effort on the ITS commissioning and heavy flavor physics!
- ✓ CCNU team has been stepped into OB HIC series production since end of April, 2018, and now under steady production.
- ✓ Assembly quality and bonding quality will be monitored and improved for coming produced HICs.
- ✓ Weekly production rate of 11~12 HICs will be kept till the end of March, 2019!

Thanks for your attention & the whole ITS team's support!