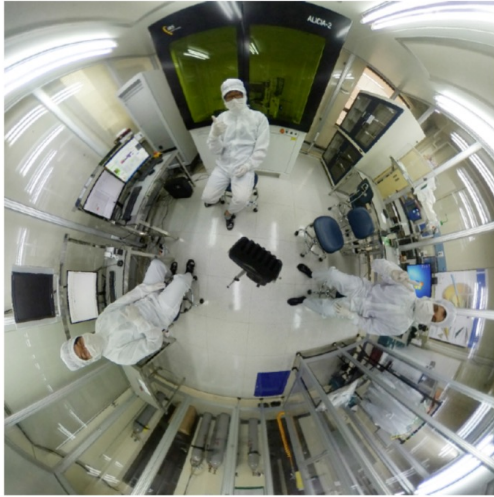


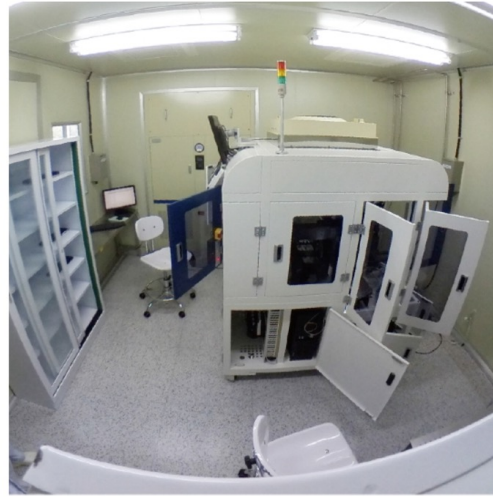
Chip test equipment

Sanghoon Lim
Pusan National University

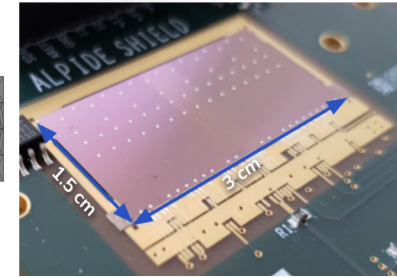
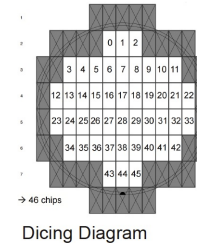
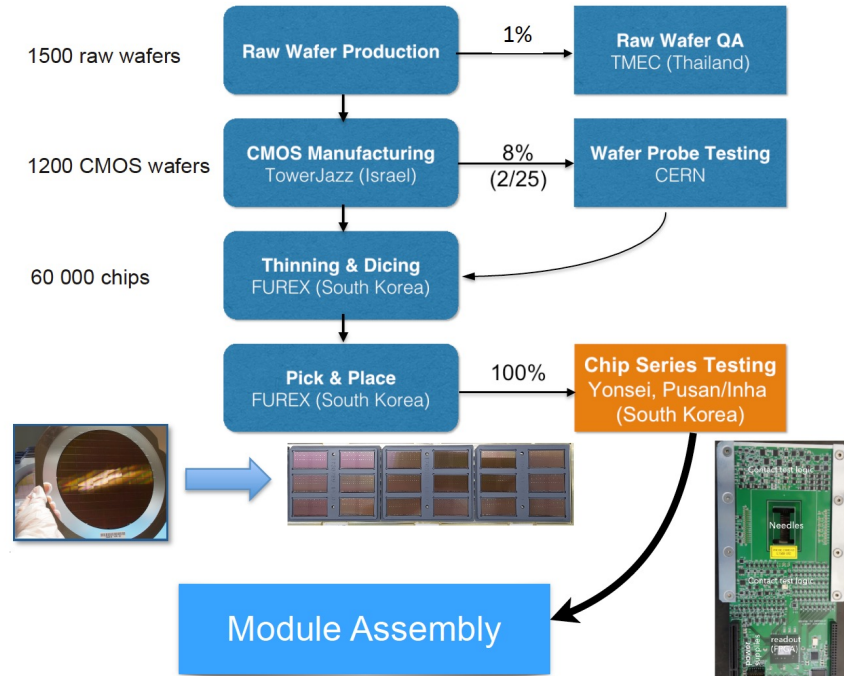
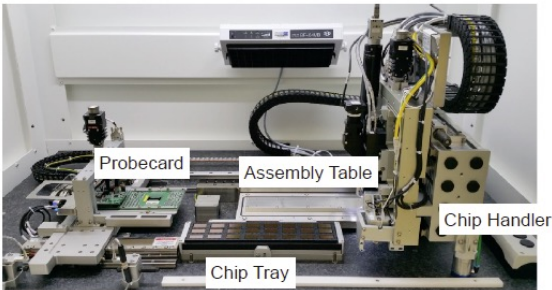
Chip test and module assembly machines for the ALICE ITS2



ALICIA at Pusan National University
Chip test and module assembly



COREA YS-01 at Yonsei University
Chip test only



NOTICE Korea

Chip test (ALICE ITS2, COREA-YS-01)

Clean room

Vision System



한세대학교 Nuclear & Particle Physics Laboratory 청정도입서 결과 보고서

측정장비	측정시간	측정일자	측정자
Particle Counter	2017-08-18		
Model / SN	10110110102	측정시간	측정자
Model / SN	10110110102	측정시간	측정자

단위: 입자 수

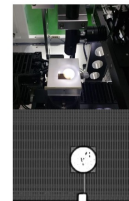
- 2017년 8월 18일 청정도입서 결과보고서(Nuclear & Particle Physics Laboratory)
- 청정도입서 결과보고서 결과: 1000 입자 수를 측정함(1000 입자 수를 측정함)
- 청정도입서 결과보고서 결과: 1000 입자 수를 측정함(1000 입자 수를 측정함)
- 청정도입서 결과보고서 결과: 1000 입자 수를 측정함(1000 입자 수를 측정함)

측정장비	측정시간	측정일자	측정자
Particle Counter	2017-08-18		
Model / SN	10110110102	측정시간	측정자
Model / SN	10110110102	측정시간	측정자

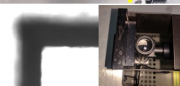
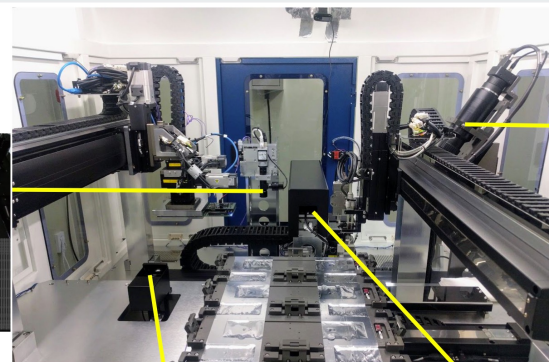
단위: 입자 수

- 2017년 8월 18일 청정도입서 결과보고서(Nuclear & Particle Physics Laboratory)
- 청정도입서 결과보고서 결과: 1000 입자 수를 측정함(1000 입자 수를 측정함)
- 청정도입서 결과보고서 결과: 1000 입자 수를 측정함(1000 입자 수를 측정함)
- 청정도입서 결과보고서 결과: 1000 입자 수를 측정함(1000 입자 수를 측정함)

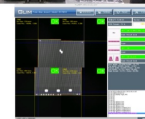
Class 100 inside clean room
Class 10 inside COREA-YS-01



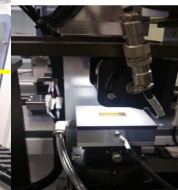
Top vision



Bottom vision



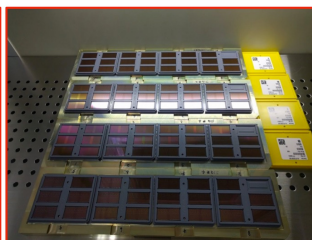
Align vision



Linescan

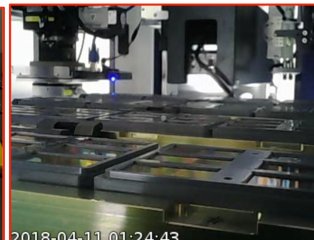


Arrival scan



Sensor preparation

Class 100, ~10 min.



Fully automated test and remote control

Class 10, ~10 hours



Storage inside cabinet



Packaging for shipment

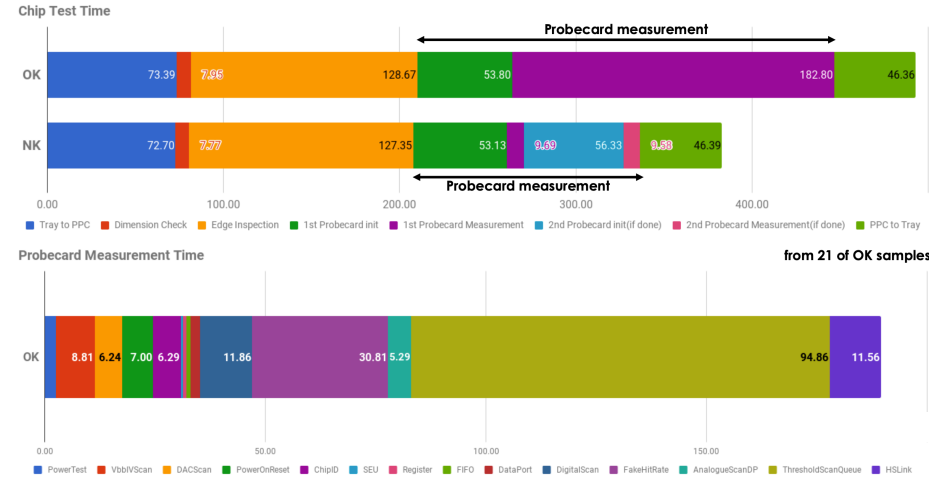


Shipment

Chip test (ALICE ITS2 & EPIC Imaging Calorimeter)

- COREA-YS-01

- ALPIDE chip: $3 \times 1.5 \text{ cm}^2$
- 46 chips per wafer
- Total 60,000 chips (~1,300 wafers)
- Test time:
 - 7 mins per chip
 - 23 x 8 chips per day = 4 wafers per day
 - 325 days for the entire chips (12 hours/shift, 2 shifts/day)



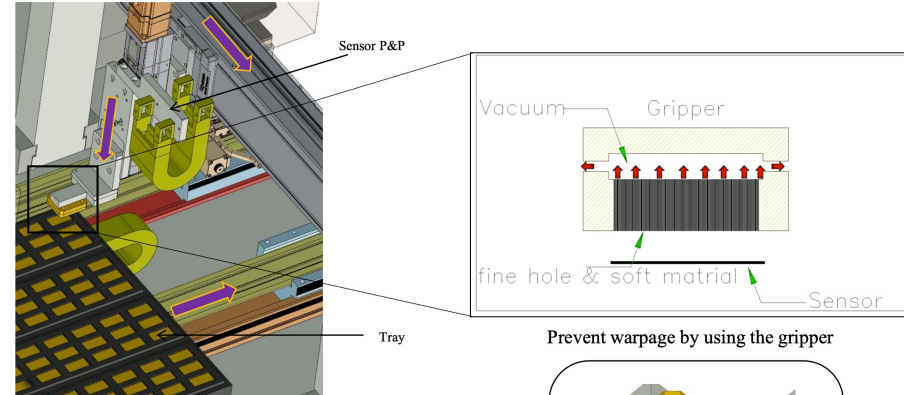
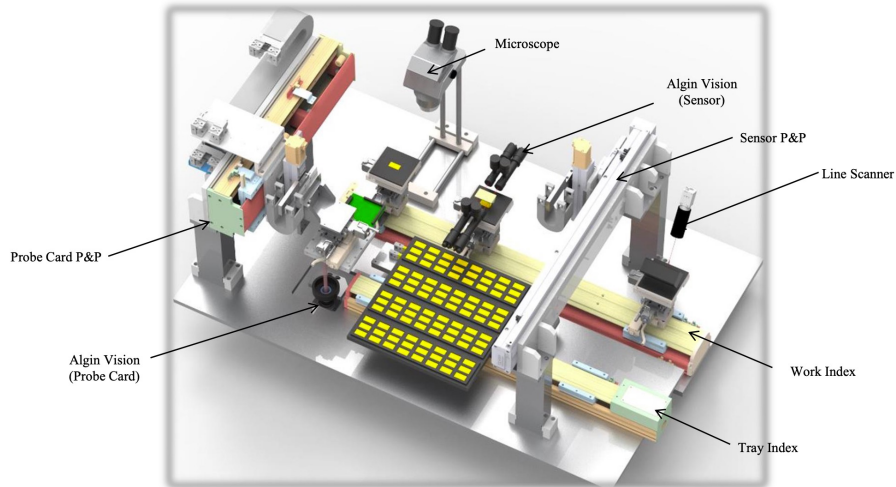
- EIC Imaging Calorimeter

- AstroPix chip: $2 \times 2 \text{ cm}^2$
- 2,500 chips/stave/layer
- $(2,500 \text{ chips}) \times (24 \text{ staves}) \times (6 \text{ layers}) = 360,000 \text{ chips} = 144 \text{ m}^2$
- 144 chips/wafer = 2500 wafers
- **Test time in the cost estimate**
 - 1.25 mins/chip (3 hours/wafer) \Rightarrow 7500 hours \Rightarrow 312 days (in case of 24 working hours/day)
- **Based on the time for the ITS2** (184 chips/day) \Rightarrow 2000 days
 - \$0.2M(~~W~~0.2B) for 1 machine \Rightarrow \$1M(~~W~~1B) for 5 machines \Rightarrow 400 days
- From the initial discussion with the manufacturer, it is possible to build a machine for 12-inch wafer (chips before dicing)

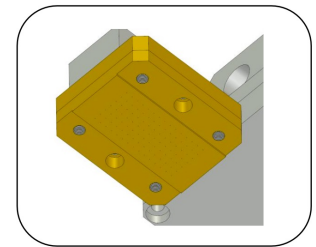
BACKUP

❖ Components of equipment

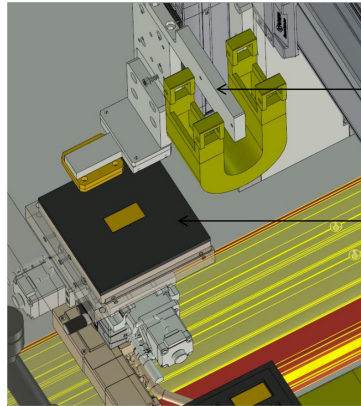
❖ Gripper



1. The tray index is moved to the pick-up position.
2. The gripper head moves to sensor tray.
3. The gripper head is picking up the sensor(vacuum on)



❖ Vacuum chuck



Sensor P&P

Work Index Stage

X-Motorrized

Y angle-Motorrized

X angle-Motorrized

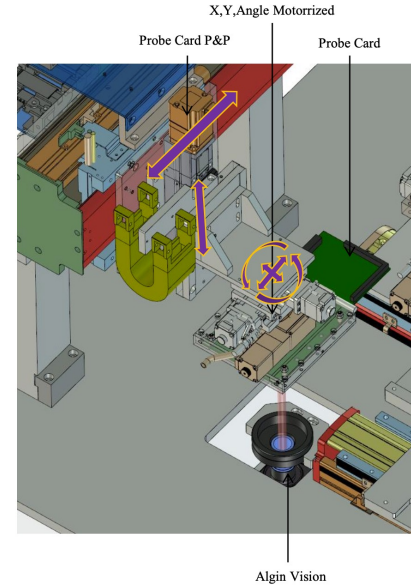
Rotary-Motorrized

Vacuum chuck

Stage

1. The work Index is moved to the P&P position.
2. The gripper is placing the sensor on the vacuum chuck.
3. At the same time sensor is placed, the vacuum chuck is turned on. (Gripper vacuum off, chuck vacuum on)

❖ Probe card head

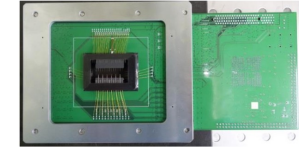
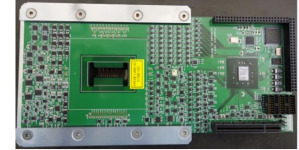


X,Y,Angle Motorrized

Probe Card P&P

Probe Card

Align Vision

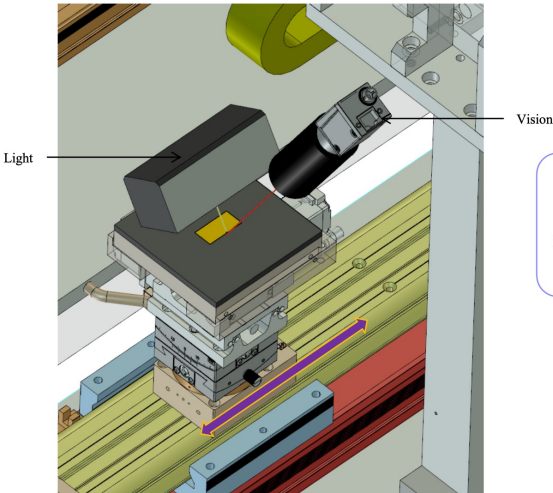


Probe Card

1. The bottom vision check the mark of the probe card.
2. Adjust the position.

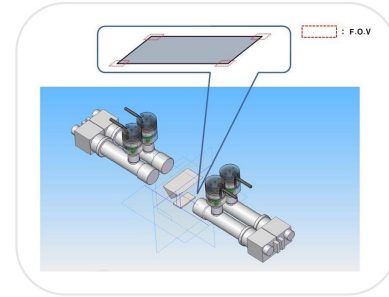
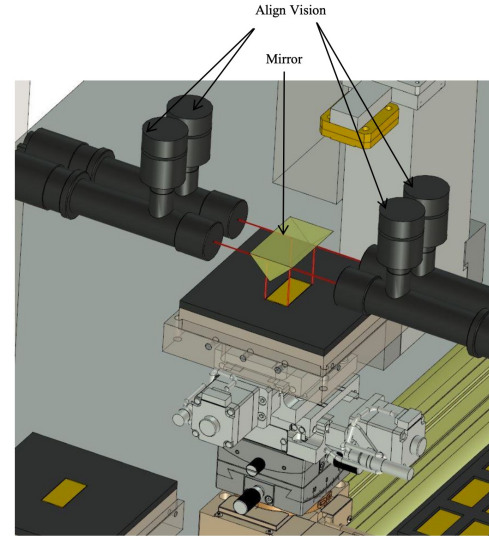
❖ Line scanner

Line Scanning



1. The work index is moved to a line-scan position to inspect the face of sensor.
2. Start the line scan.

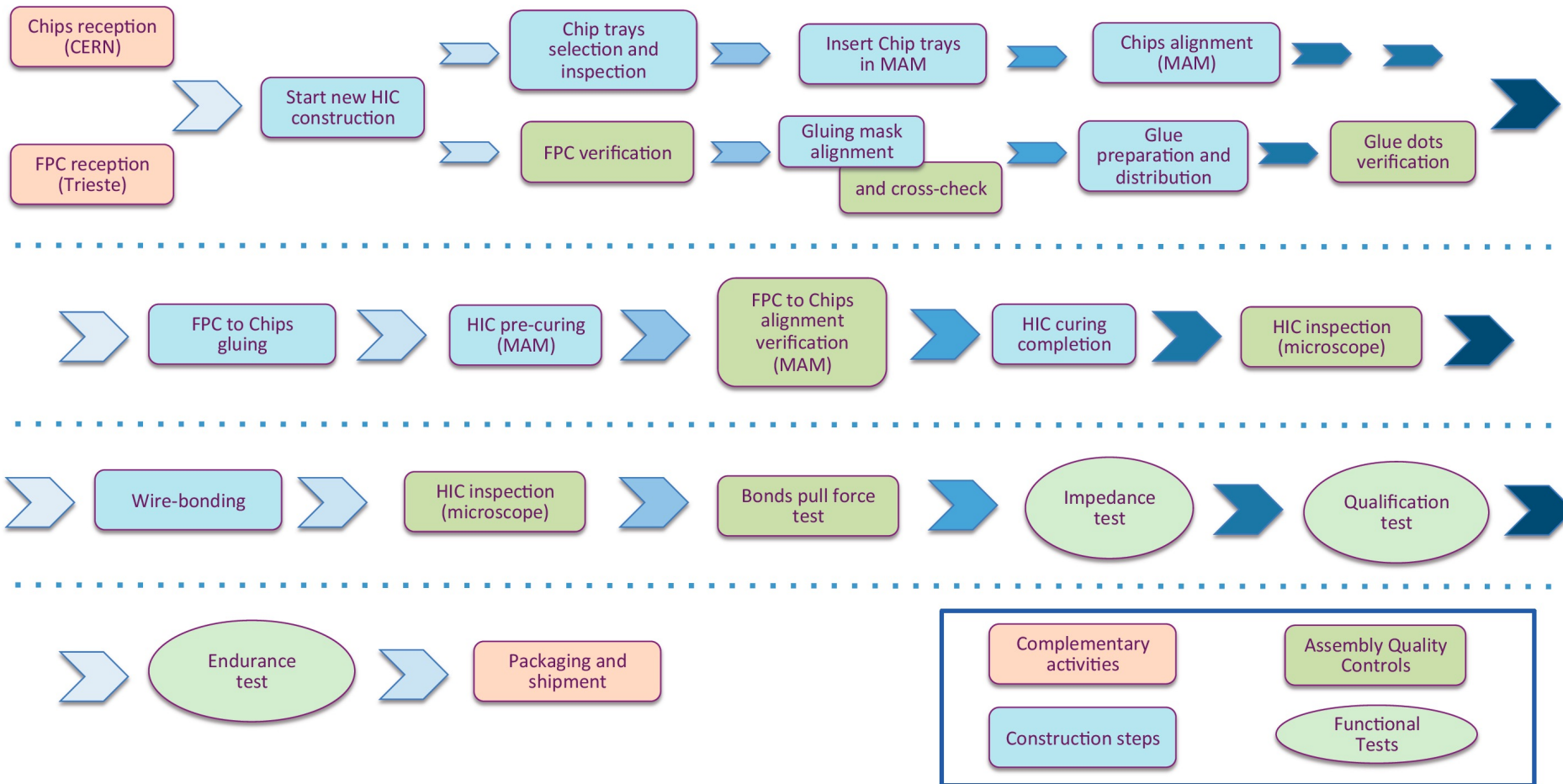
❖ Align vision for sensor



1. The work index is moved to inspection area.
2. Four vision observes the corners of sensor.
3. Use information from the vision to adjust the position of the sensor.

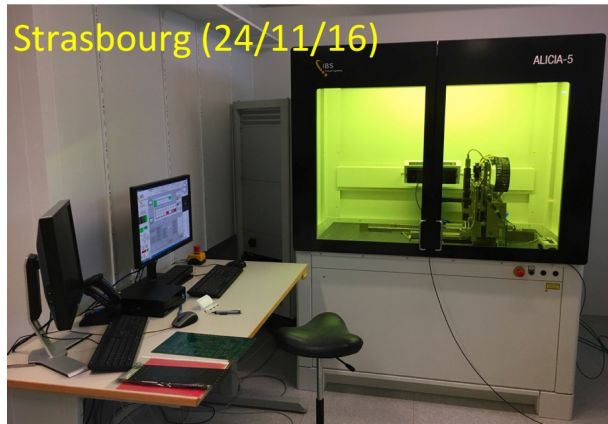
HIC construction process

ALICE ITS Upgrade



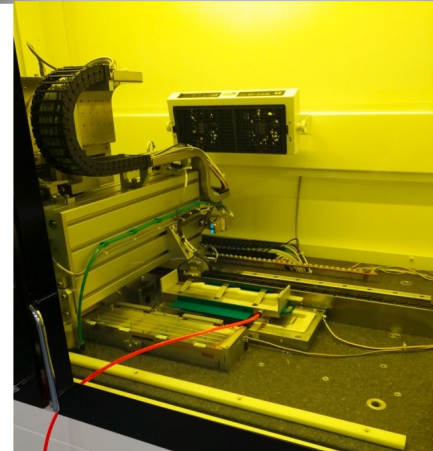
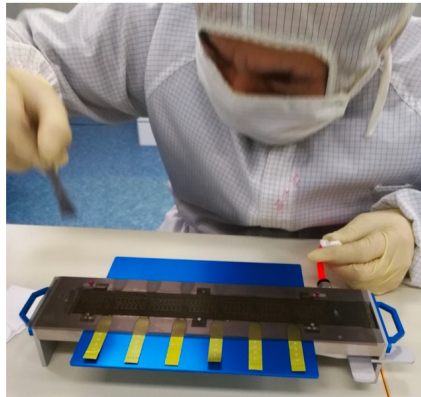
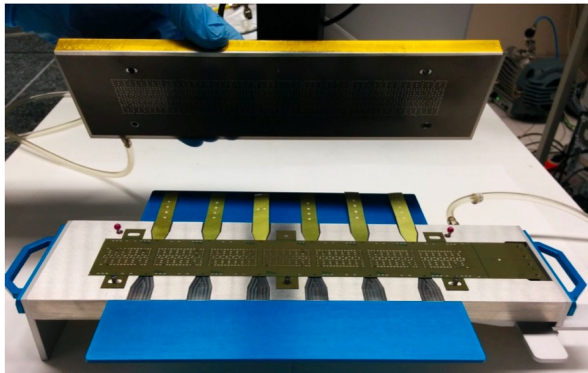
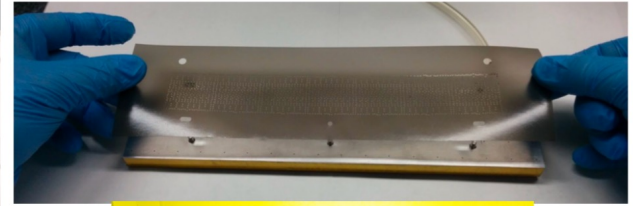
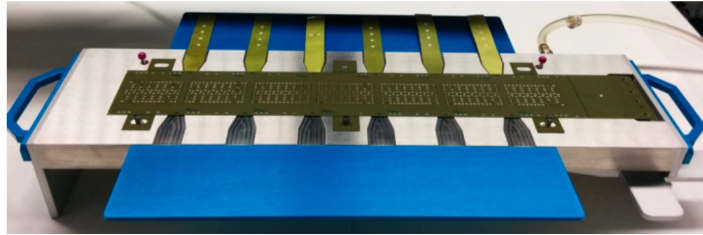
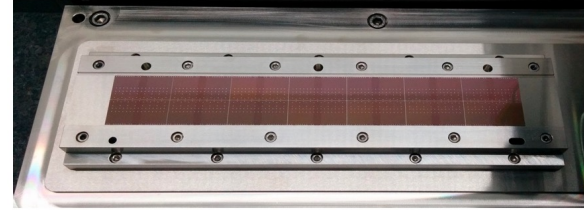
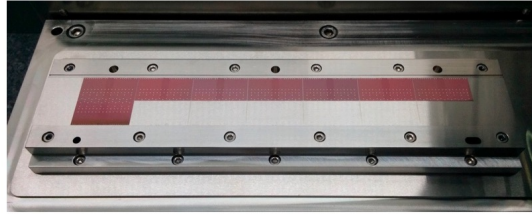
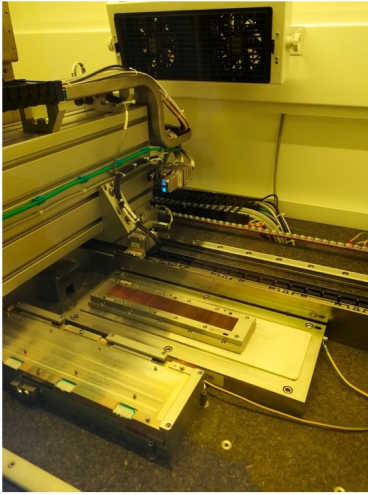
OB HIC construction sites (MAM site acceptance test)

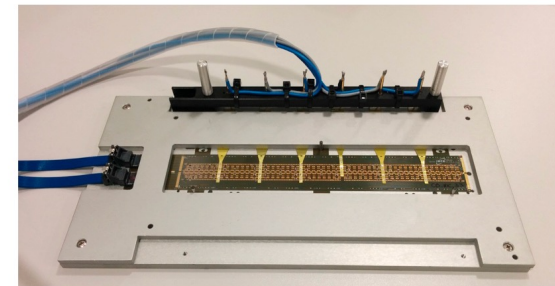
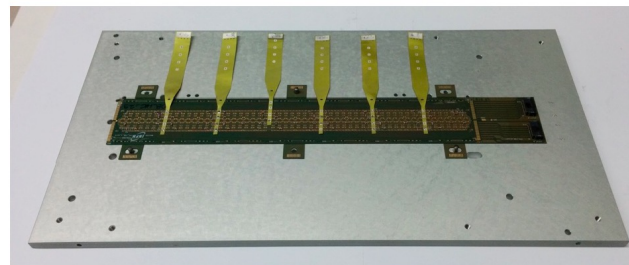
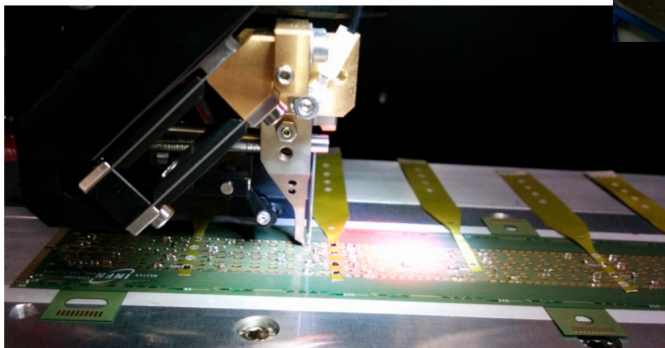
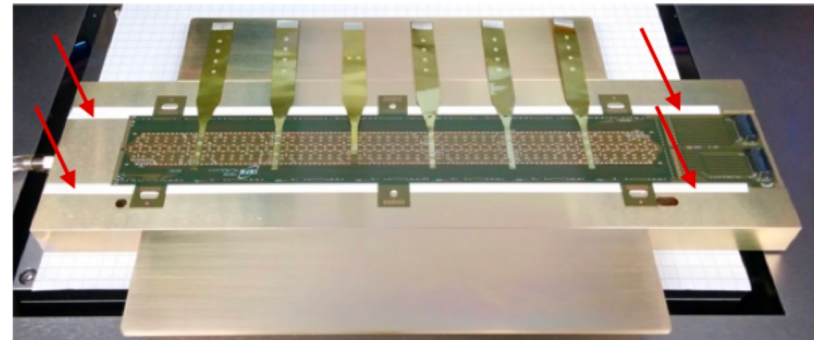
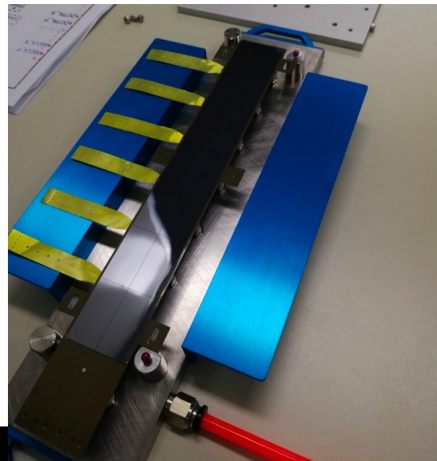
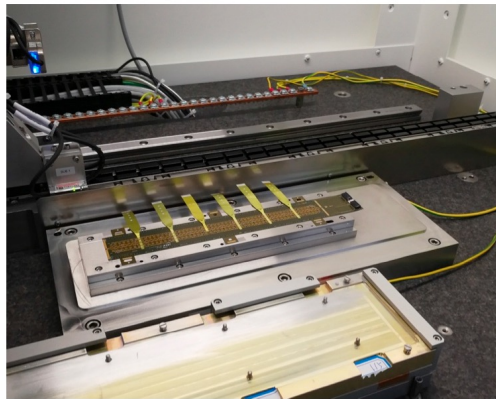
ALICE ITS Upgrade



OB HIC construction - Tooling, Procedures and Training

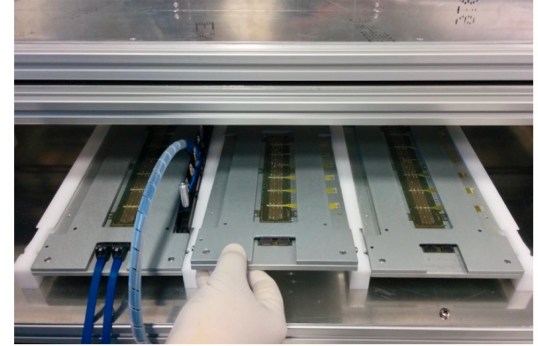
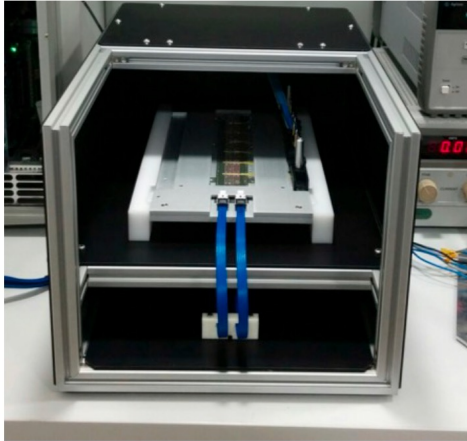
ALICE ITS Upgrade





Ultrasonic wedge bonding for FPC to chip interconnection:

new bonding machine procured for Bari, Strasbourg and Wuhan; a supply contract signed with Sejung company for Pusan; resources allocated by the laboratory management for Liverpool



Qualification and Endurance test systems

