

ITS Upgrade Goals

The LHC will increase the instantaneous luminosity of Pb-Pb collisions in Run 3 to :

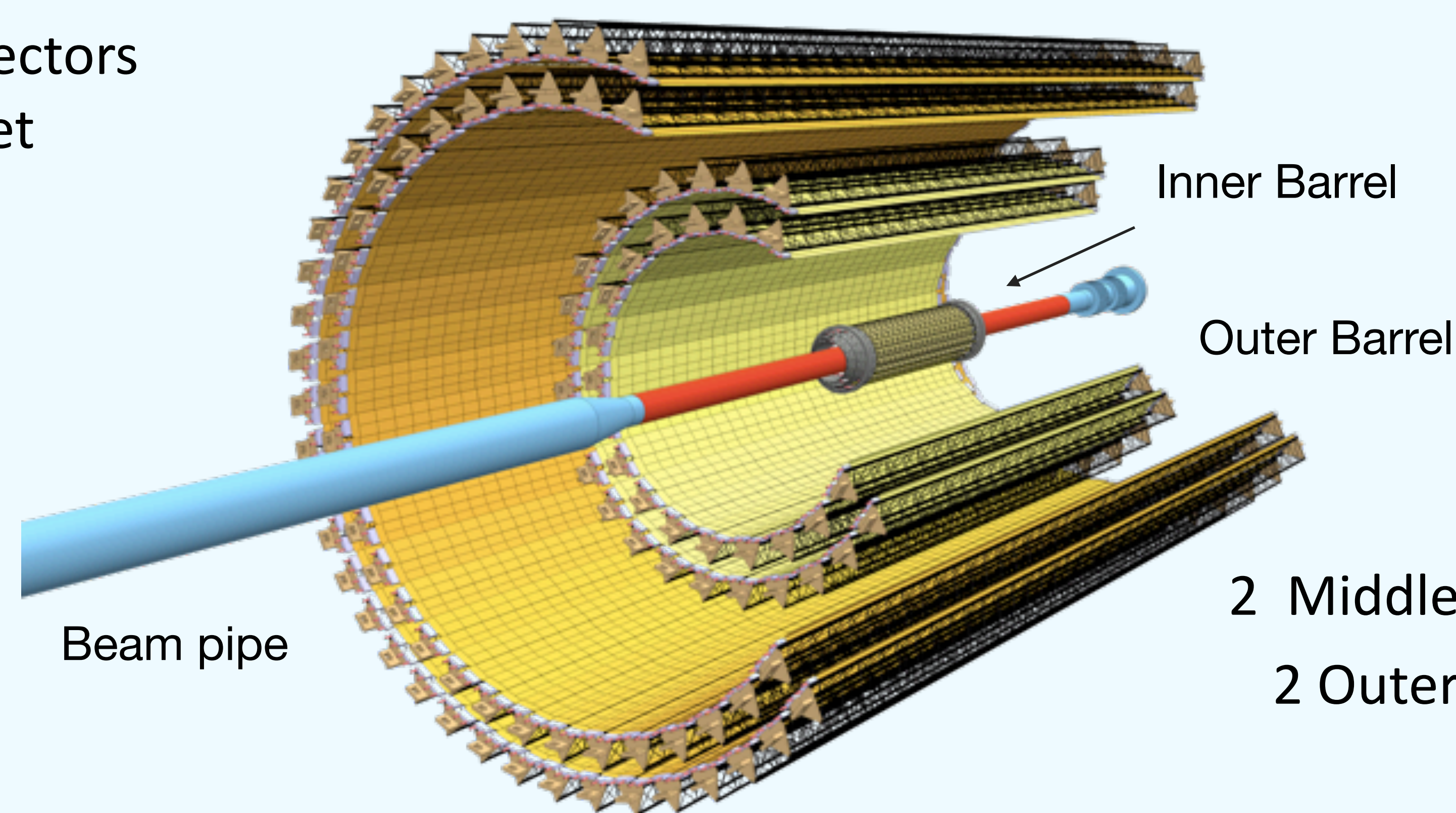
$$L = 6 * 10^{27} \text{ cm}^{-2} \text{ s}^{-1}$$

which translates into an increase of the interaction rate to values of up to 50kHz. In order to cope with this increased luminosity ALICE is developing a major upgrade of its detectors, which will be installed during the second long LHC shutdown (2019-20). The **Upgrade of the Inner Tracking System** is playing a leading role in this regard. The main goal of the ITS Upgrade is to improve the readout rate capabilities, the tracking resolution and efficiency. The modifications in the current setup of ITS will improve the determination of the track distance of closest approach to the primary vertex and as a result, the efficiency of tracking low momentum particles ($< 1\text{GeV}/c$).

- Seven layers of Silicon Pixel Detectors
- Reduction of the material budget
- Innermost layer approaches the beam line
- Increase the read-out rate

Inner Barrel (IB)

3 Layers -> 48 Staves
 1 IB Module -> 1 Stave
 1 Stave -> 9 ALPIDE chips
 Material budget 0.3 % X_0

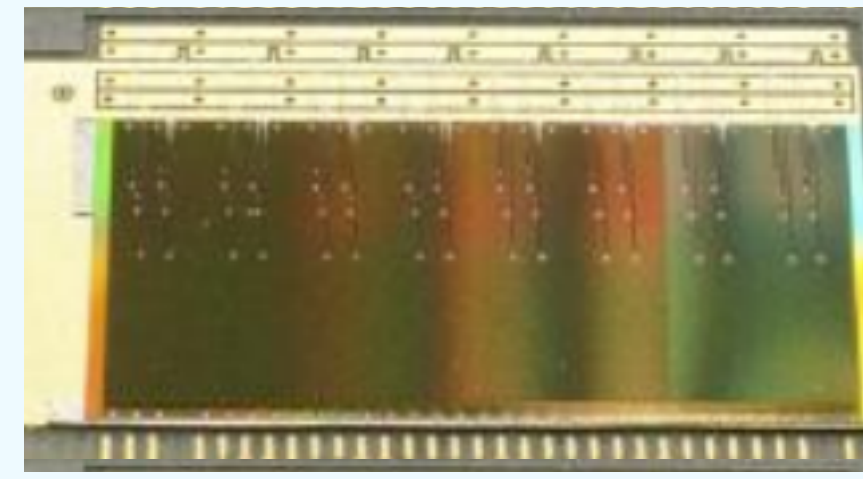


Outer Barrel (OB)

2 Middle Layers -> 4 Modules / Half-Stave
 2 Outer Layers -> 7 Modules / Half-Stave
 1 OB Module -> 14 ALPIDE chips
 Material budget 1 % X_0

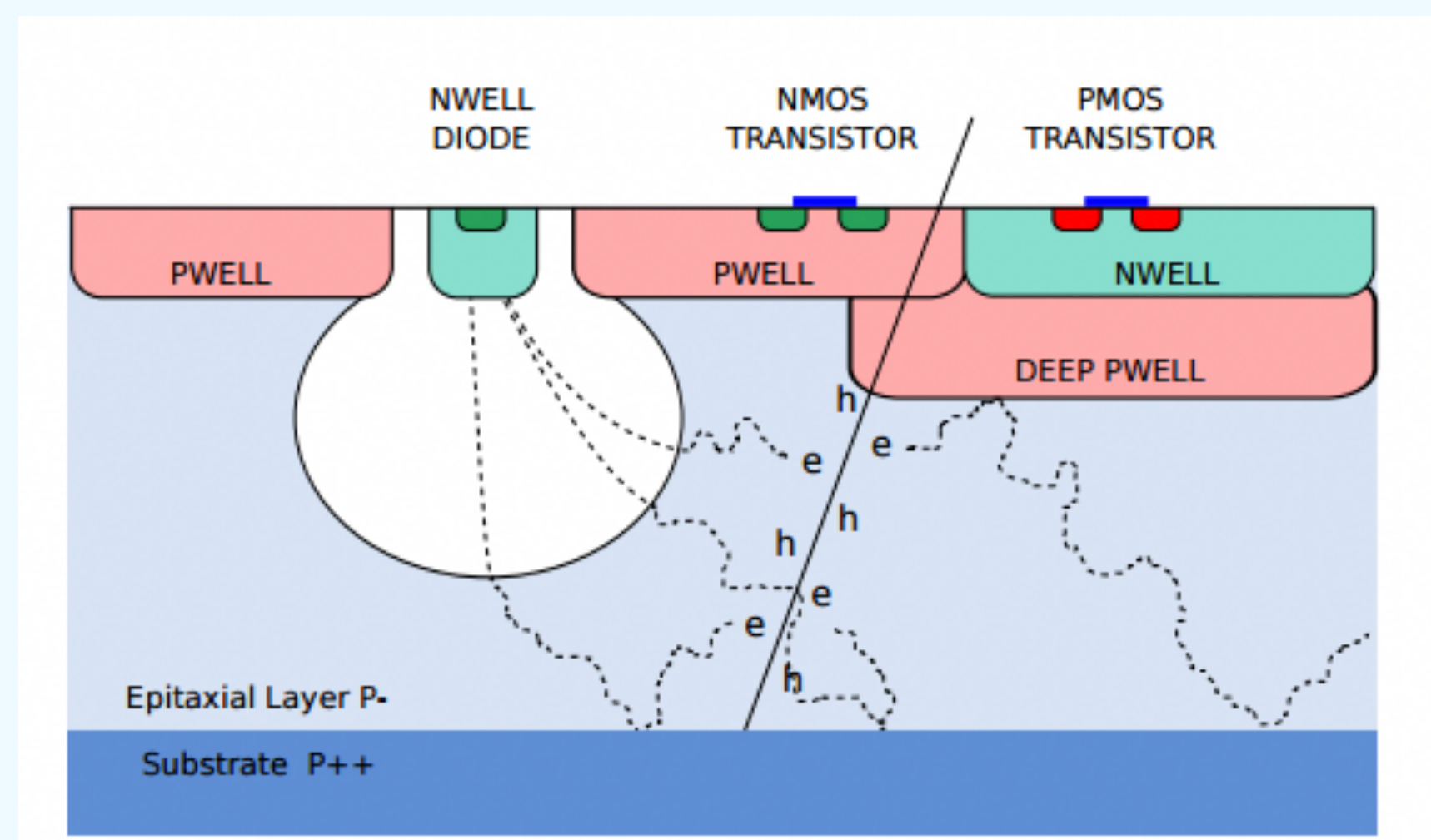
ALICE Silicon Pixel Detectors - ALPIDE chip

CMOS Monolithic Active Pixel Sensor



Size 15 mm (Y) x 30 mm (X)
 Sensitive Pixels 512 x 1024
 Spatial Resolution 5 μm

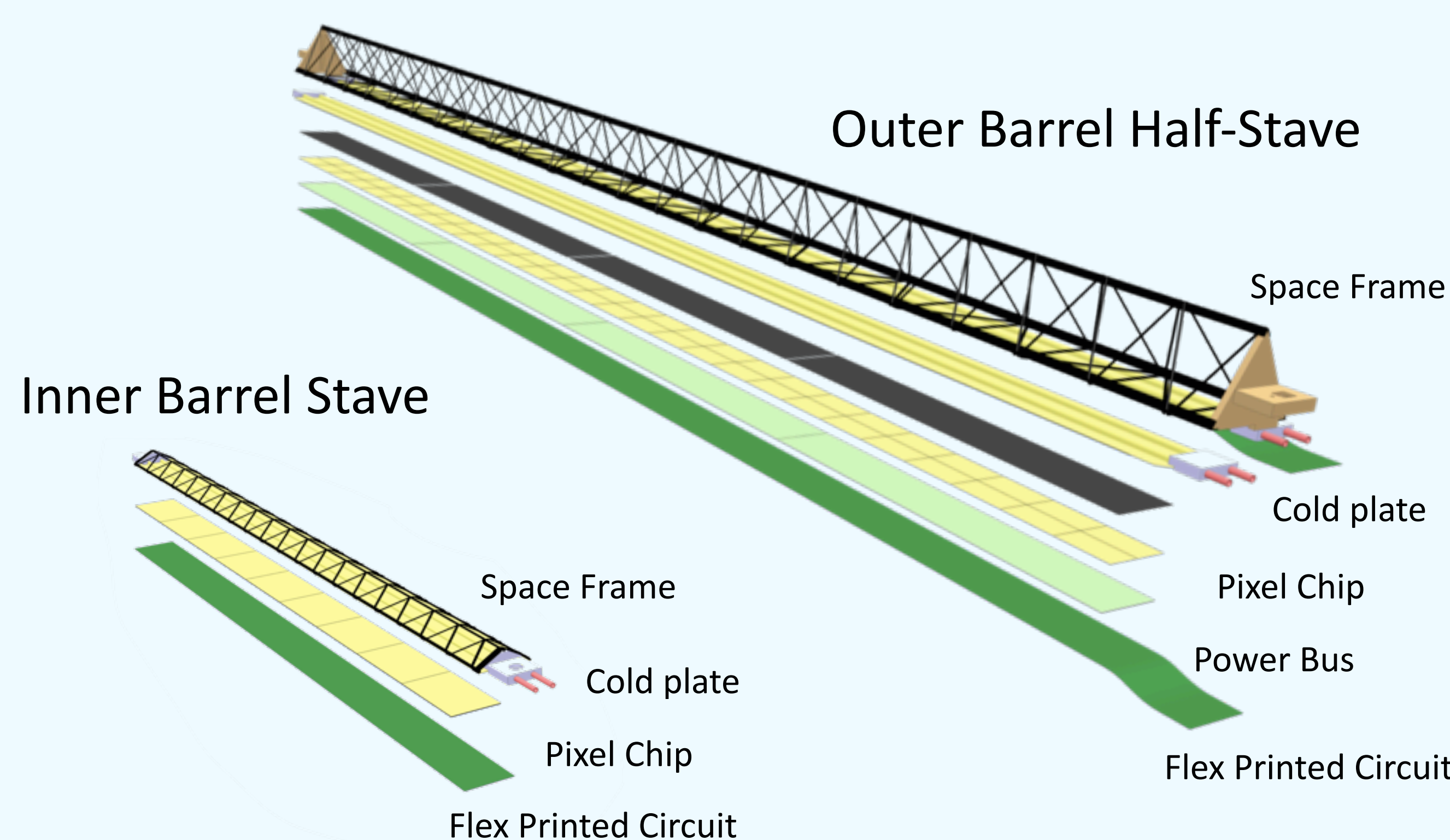
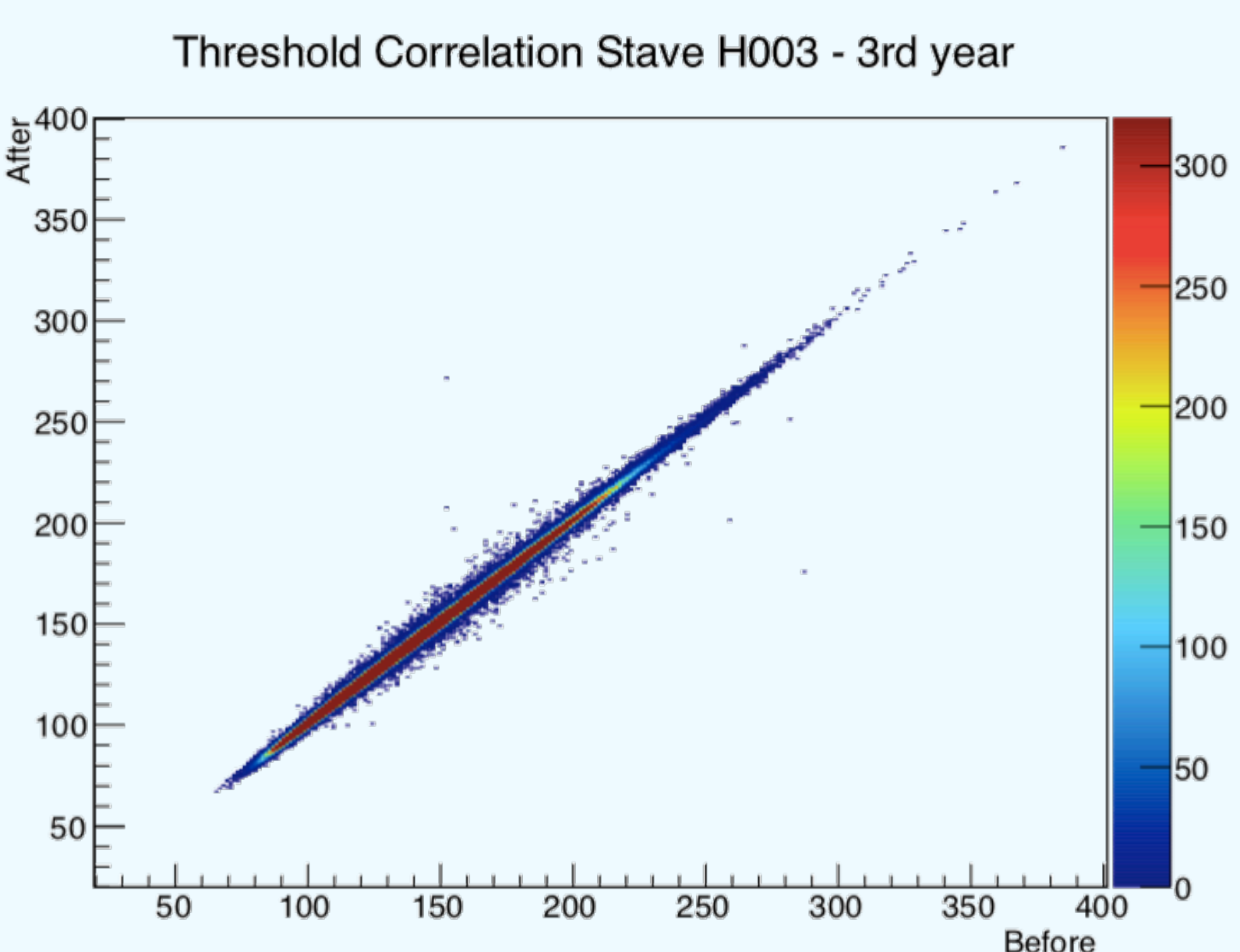
The ionisation of the p-type epitaxial layer produces electrons and holes in the active silicon area. The resulting charge is collected by a p-n junction operating as a diode. Around the N-well of the PMOS transistor there is a deep P-well layer that is used for shielding the epitaxial layer from the N-well.



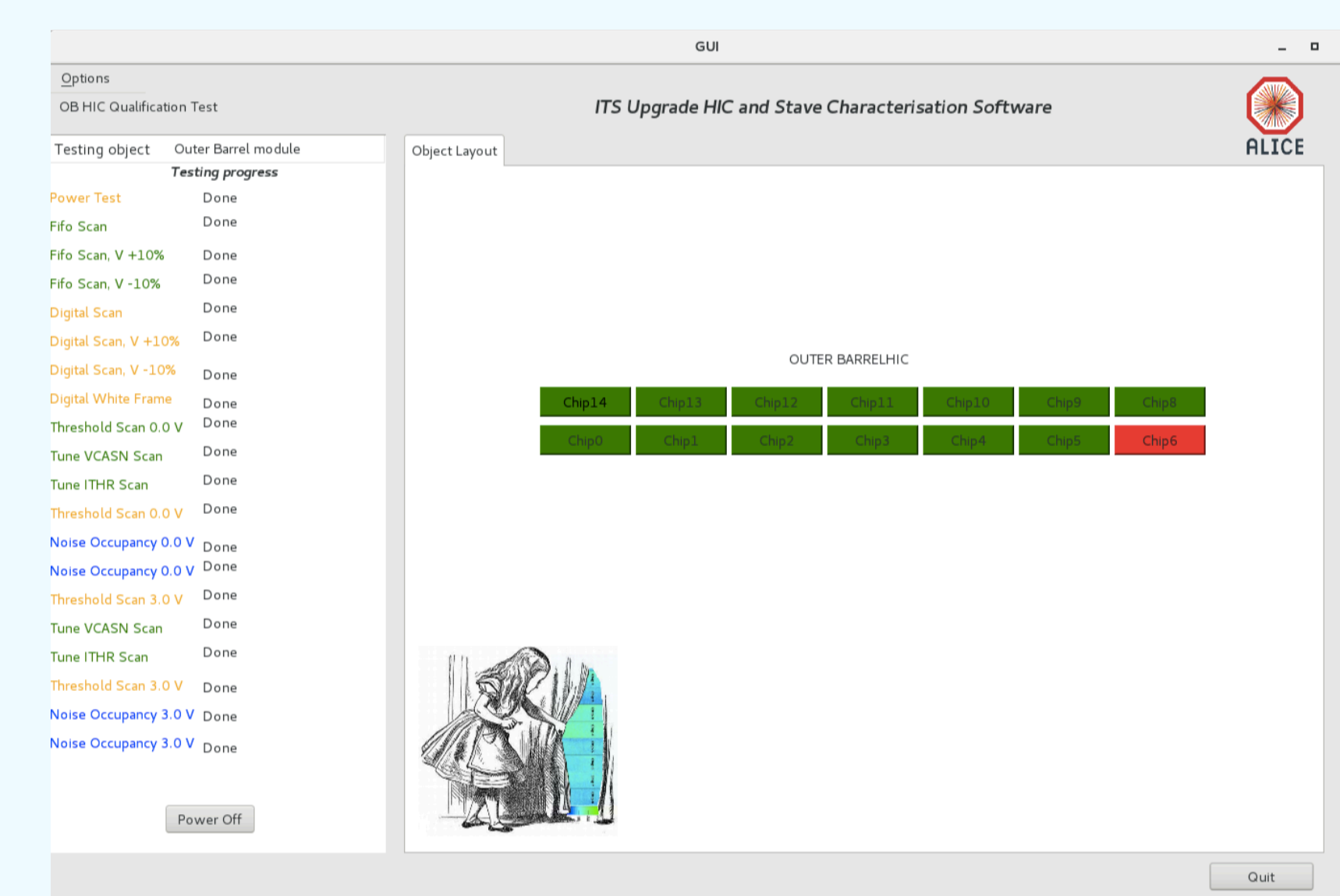
- High resistivity p-type
- Low capacitance
- Large Signal / Noise
- Reverse bias

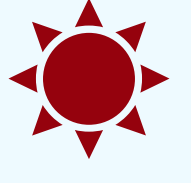
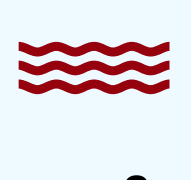
Assembly and Validation

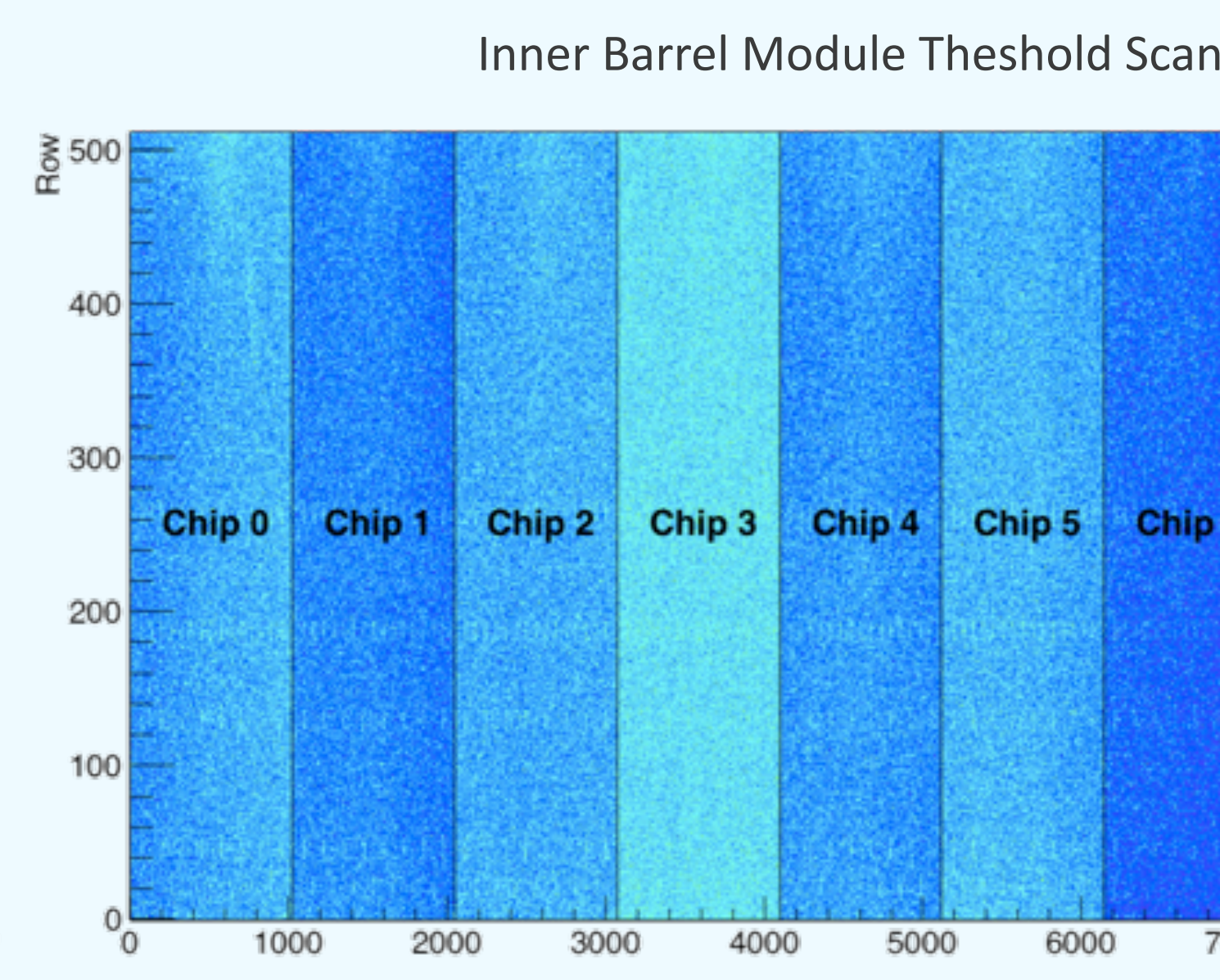
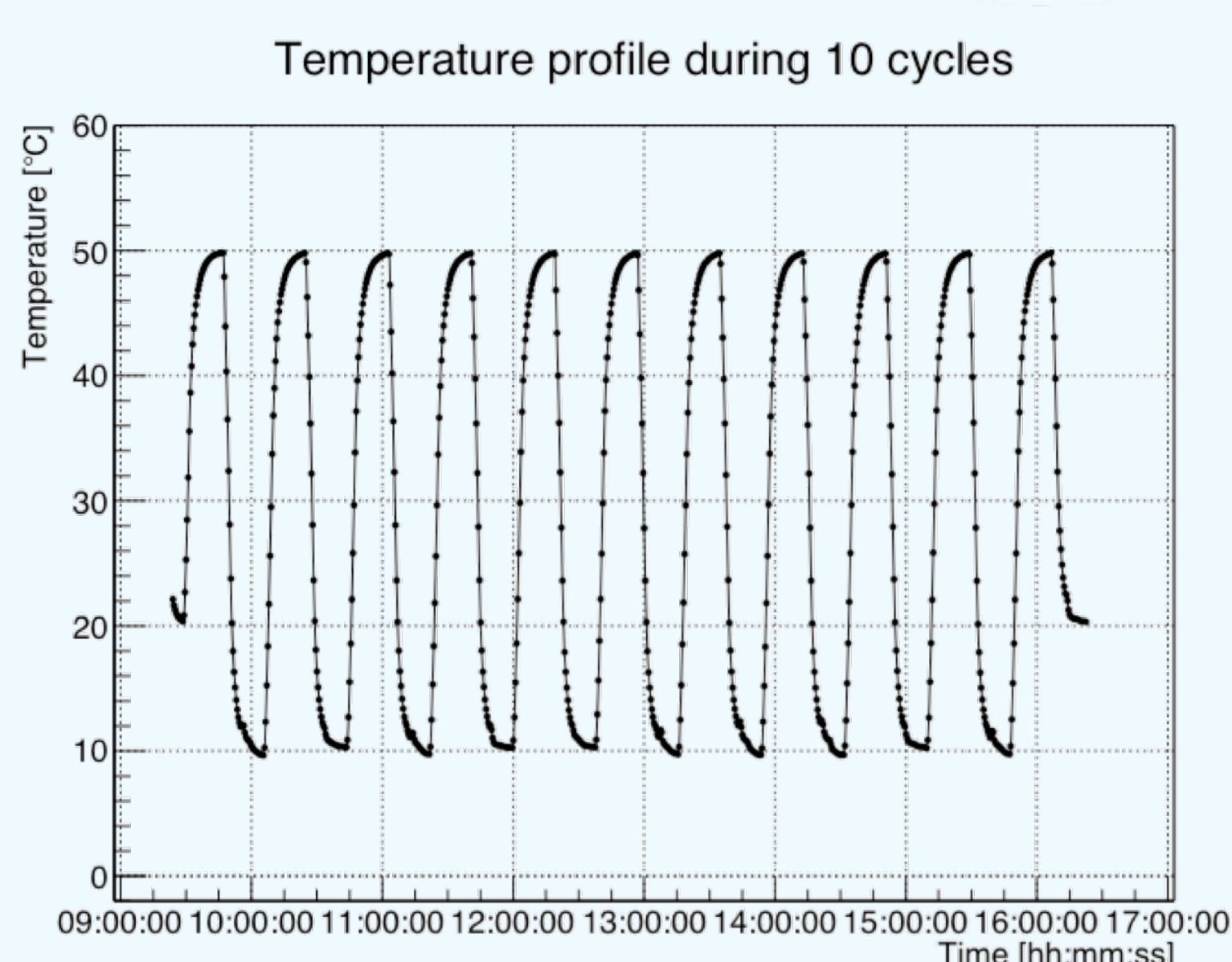
Ageing Tests



Characterisation of components



Simulate nominal conditions inside ALICE
 Temperature 35 °C 
 Humidity 35 % RH* 
 Thermal Cycles 10 - 50 °C
 Humidity 60 °C - 60 % RH
 *Relative Humidity



- Powering Tests
- Quality Control Scans
- Endurance Tests
- Digital Scan
- Threshold Scan

