

# The quality control programme for ITk strip tracker module assembly



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## Abstract

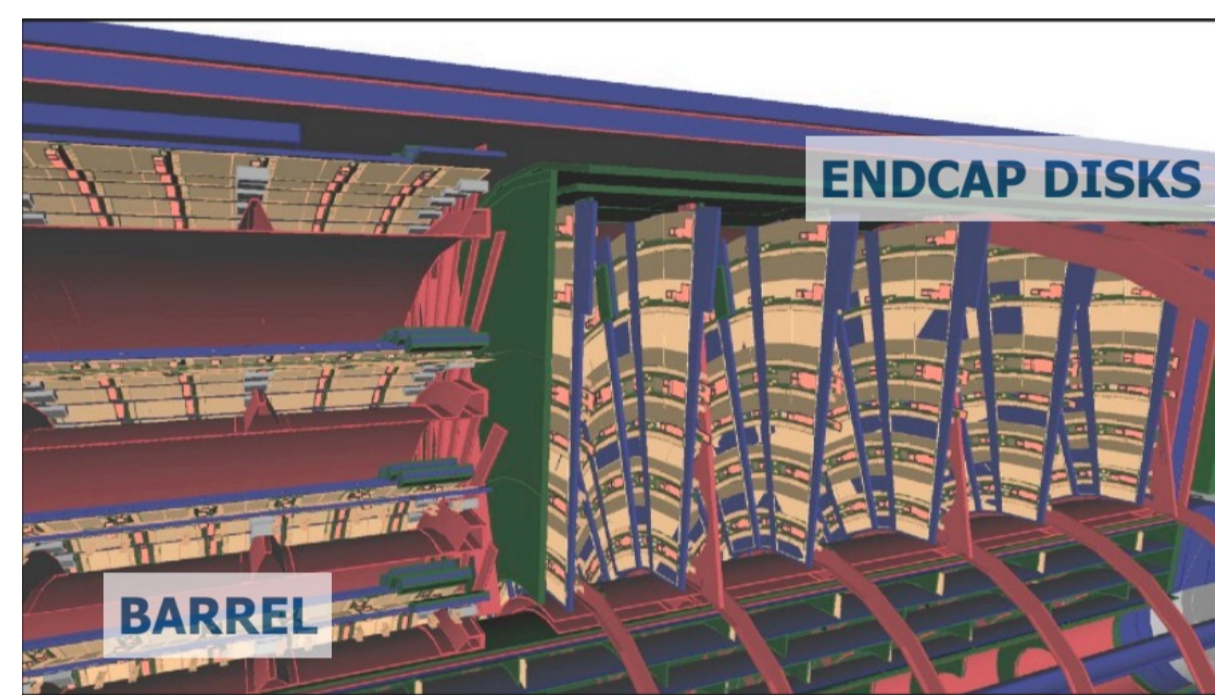
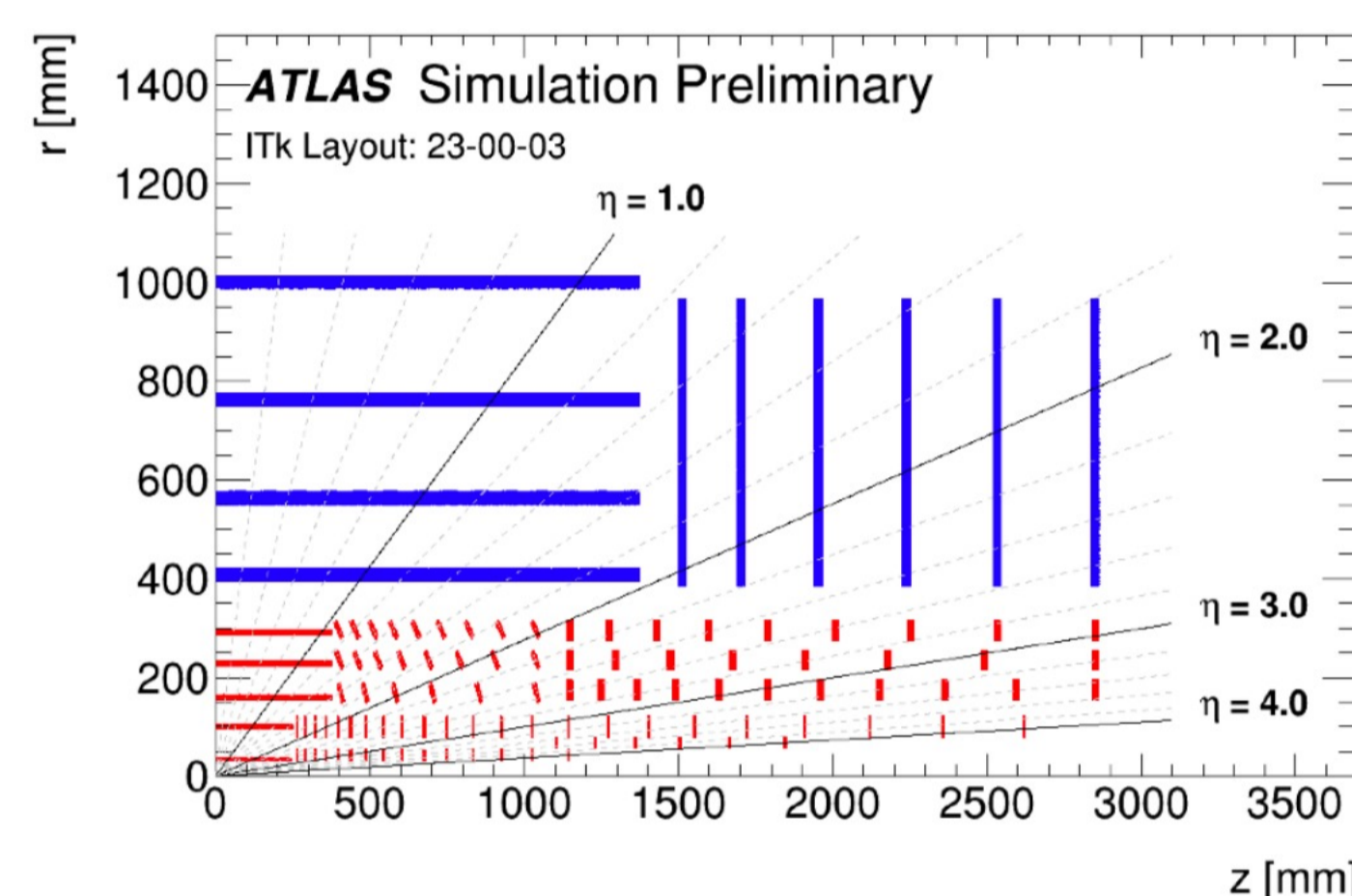
The assembly of the ATLAS Inner Tracker requires the construction of 19,000 silicon strip sensor detector modules in eight different geometries. Modules will be assembled and tested at 31 institutes on four continents, from sensors, readout chips and flexes. In order to adhere to the module specifications defined for sufficient tracking performance, a rigorous programme of quality control and assurance was established to cover components at every stage of assembly. This contribution presents an overview of the QA/QC programme for ITk strip tracker modules, results from the pre-production phase (5% of the production volume) and proposed adjustments for production.

## Introduction

- **2029: Start of HL-LHC operations** to provide more data to experiments. Detector upgrade required to handle increased rates, radiation
- ITk strips: Part of ATLAS tracker upgrade. Will have **four barrel layers, six endcap disks** per side
- Building block: **Modules**. Requires assembly, testing of multiple parts from many institutes.

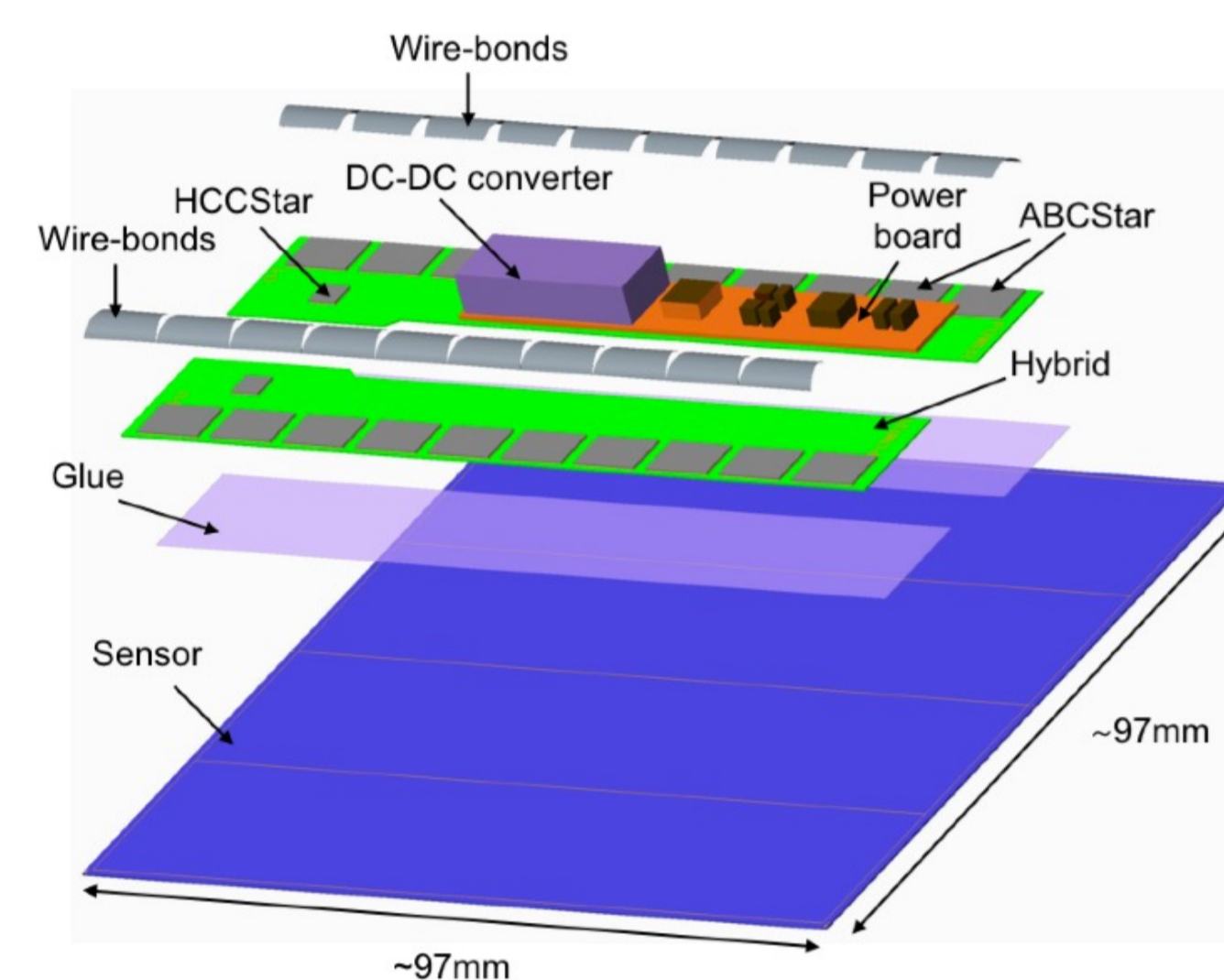
## ITk layout

- **ITk strips** just outside **ITk pixels** inner detector
- Require **finer granularity** closer to interaction point

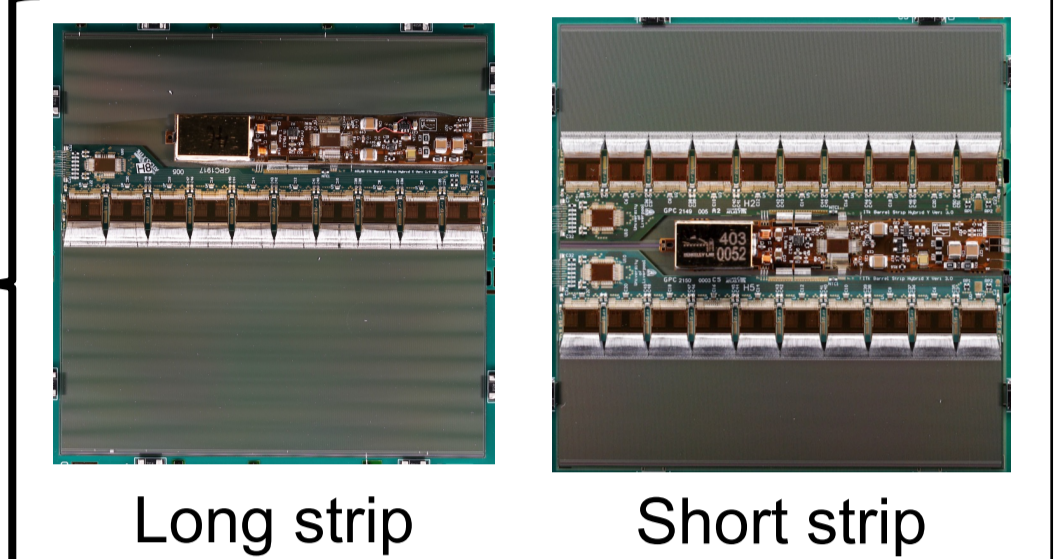


## Modules

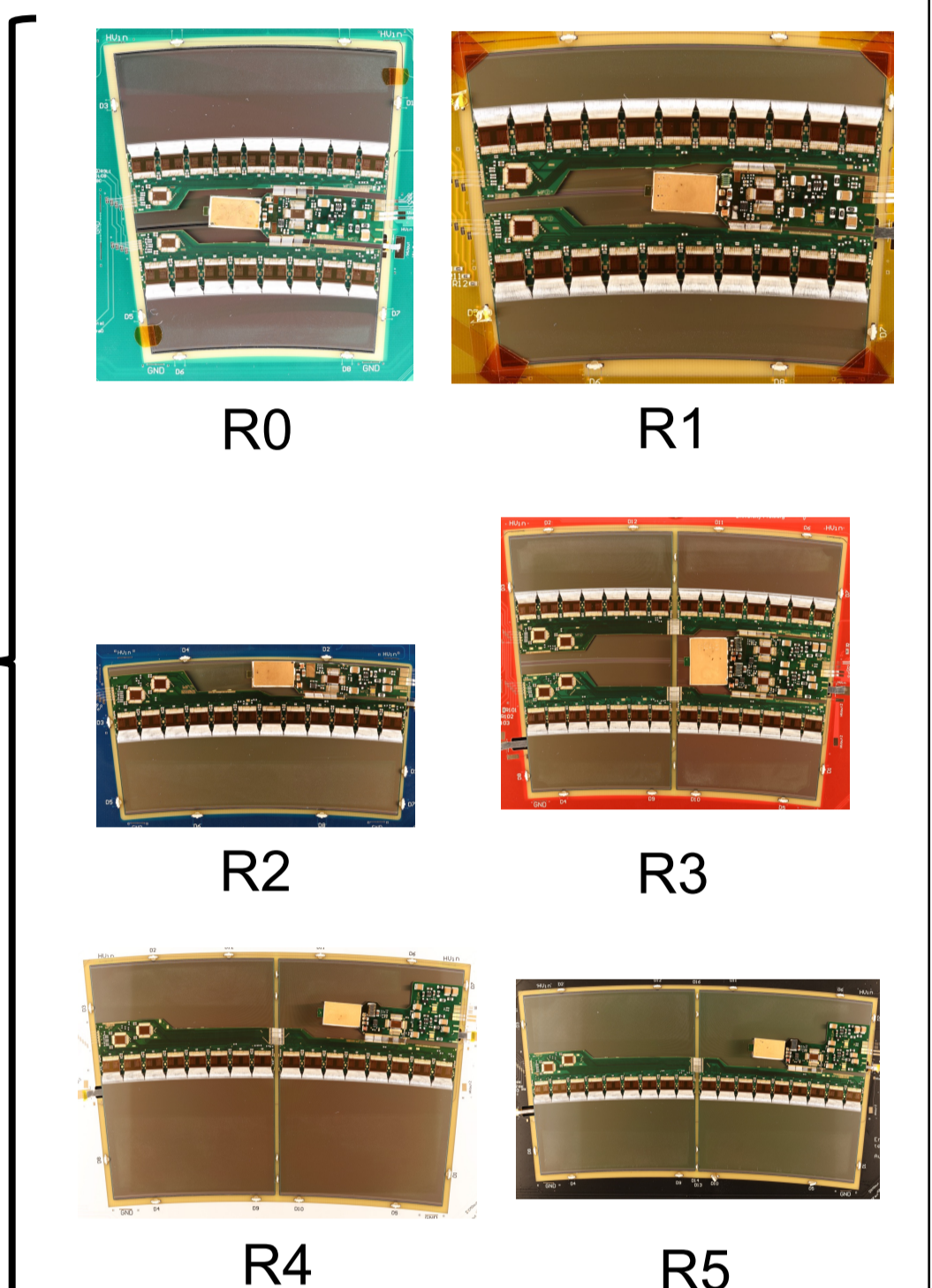
- Modules consist of silicon **sensors**, readout and powering electronics **glued on**
- Individual strips **wirebonded** to readout chips
- Barrel and endcap geometries require **different module geometries**



**Barrel** module shapes:

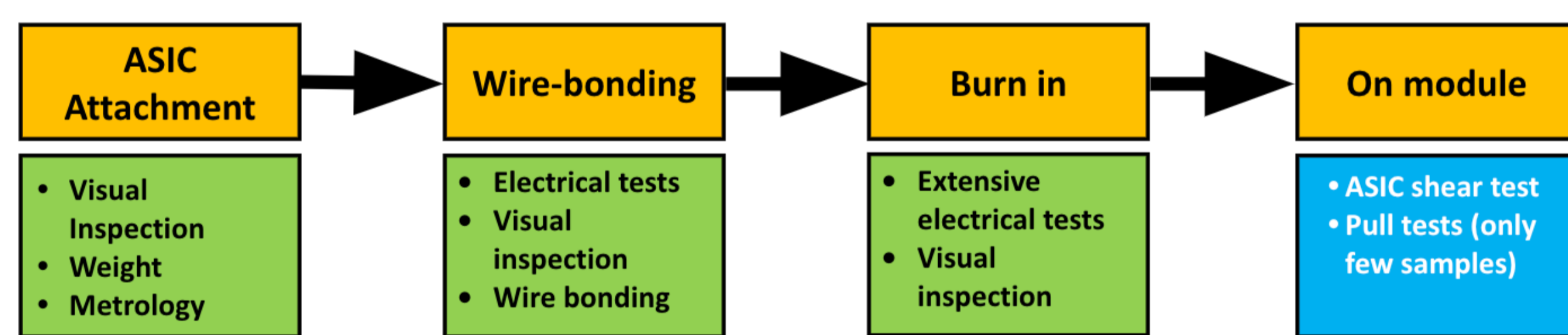


**Endcap** module shapes:

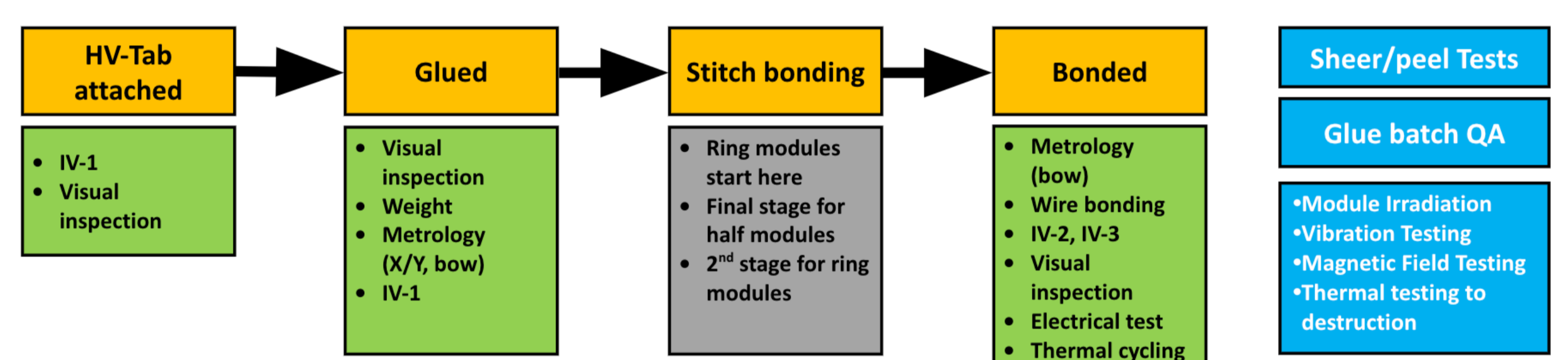


## Assembly and QA/QC steps

### Hybrids

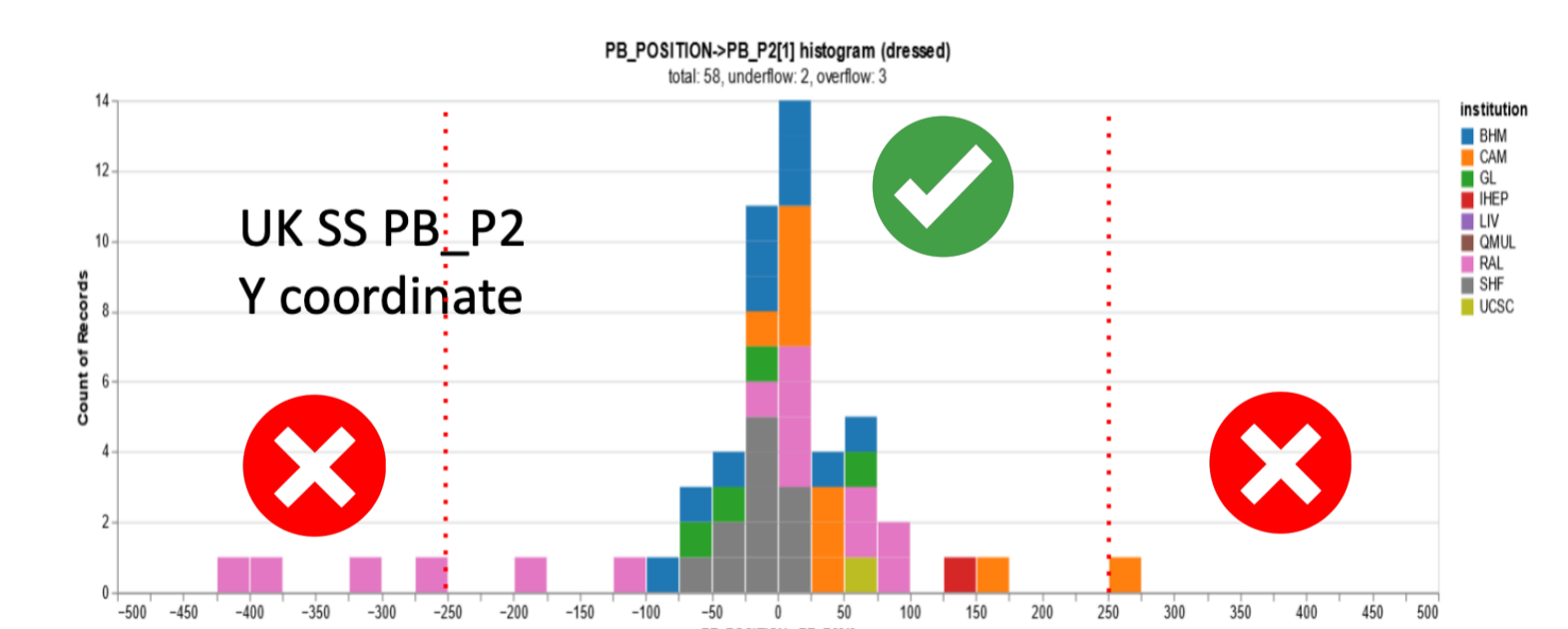
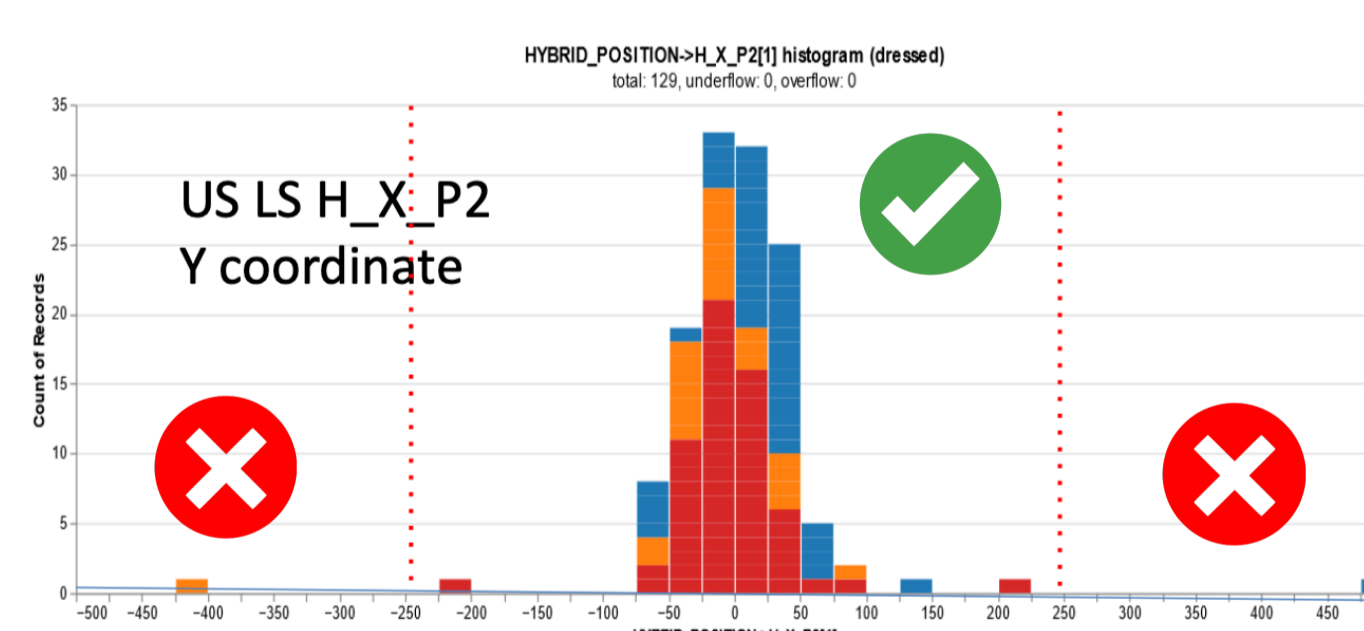


### Modules



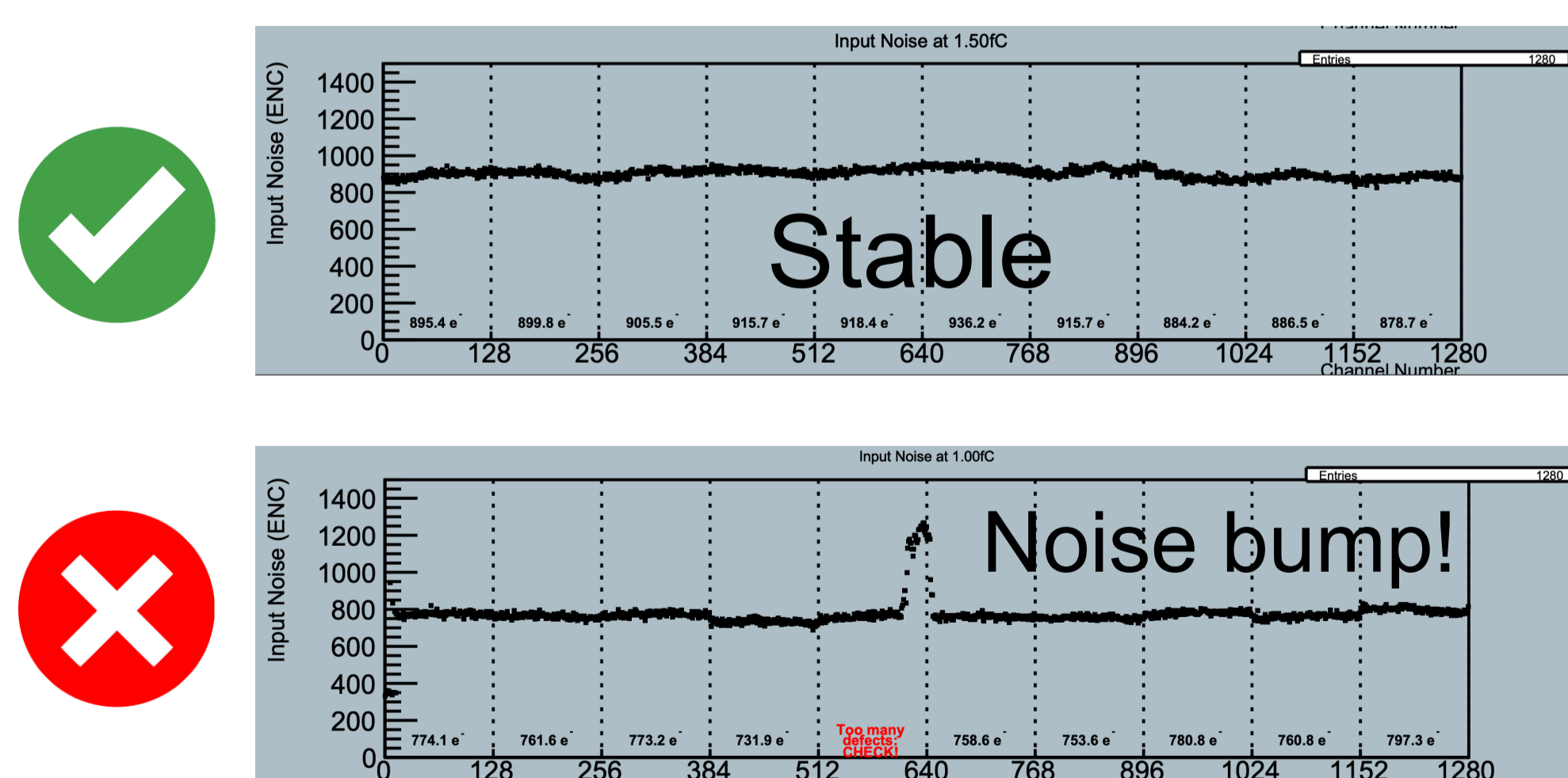
IV-1: With PS, before bonding (700V)  
IV-2: with PS, after bonding (550V)  
IV-3: with AMAC (550V)

**Metrology examples:**



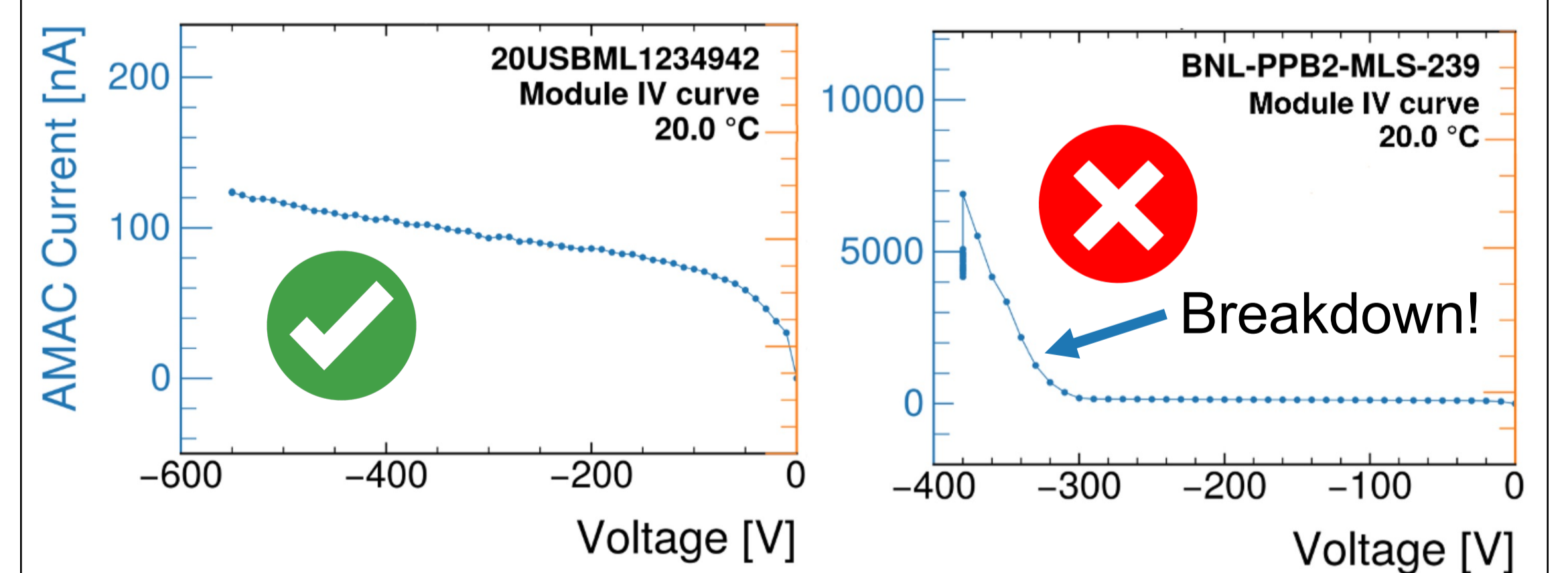
## Module QC

- **Final QC step** of modules before mounting: **Electrical test** and **thermal cycling**
- Ensure stable **noise** after assembly, stable noise and current through **temperature changes**



Increasing current caught during thermal cycling!

## IV examples



## Summary

- For ITk strips, extensive ongoing **assembly** and **testing** among 31 institutes
- QA/QC procedures defined and ongoing. Crucial for **catching issues** and ensuring a **quality detector** for HL-LHC