

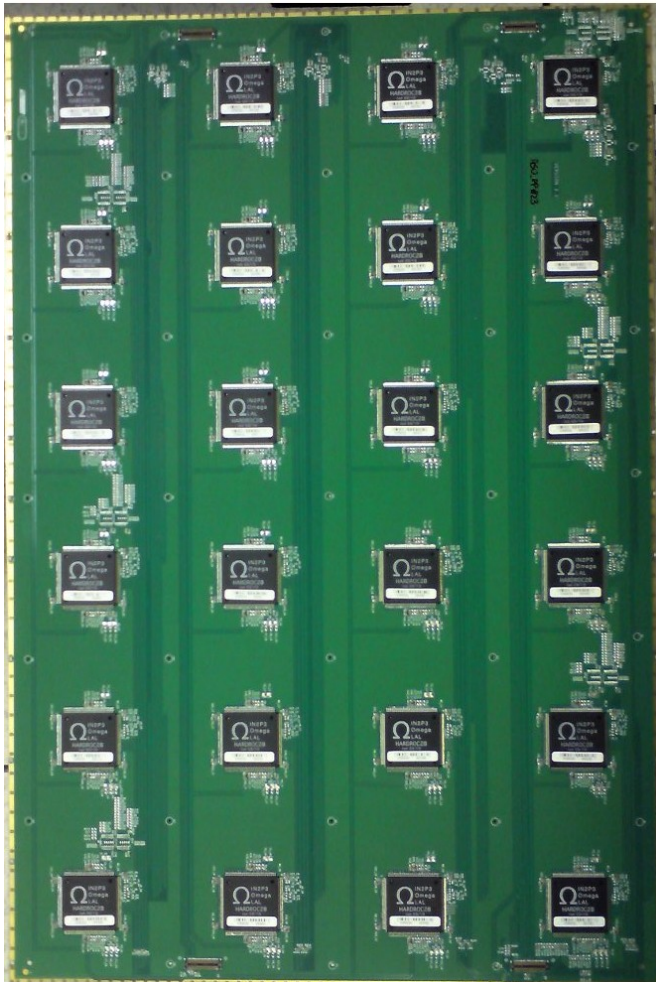
ASU boards for RPC detectors

Production status

Presentation outline

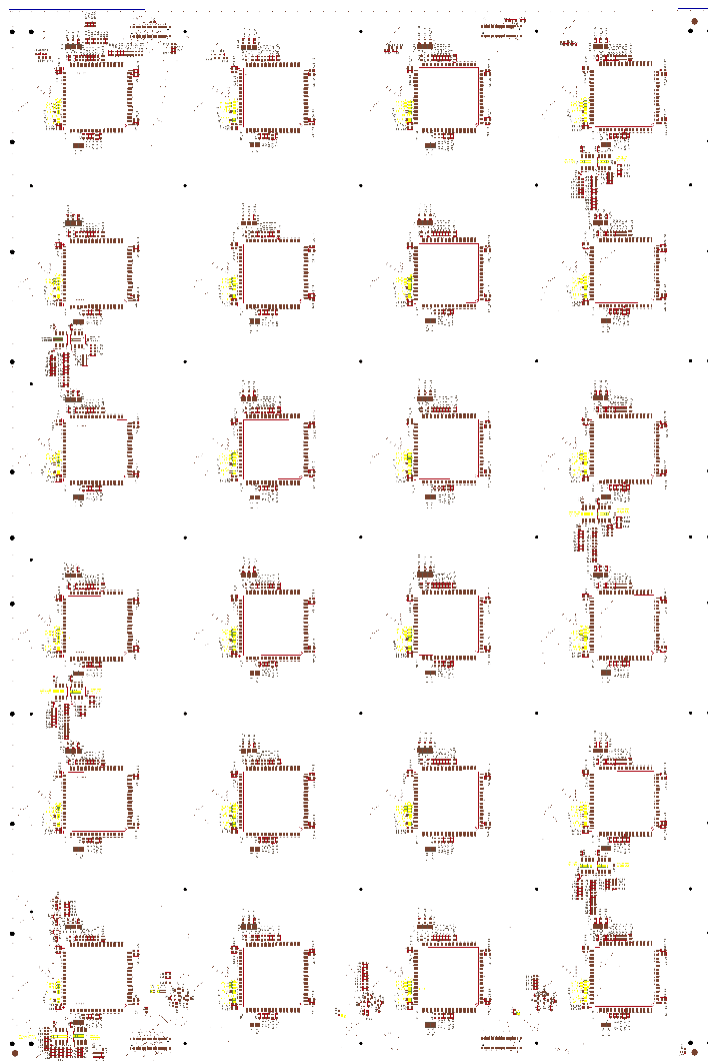
- Active Sensor Unit electronic board for GRPC detectors
 - quick reminder
 - board functional decomposition
 - testing issues
- square meter (m2) board
 - reminder
 - integration scenario
- m2 boards production: provisional plan

The ASU board: reminder



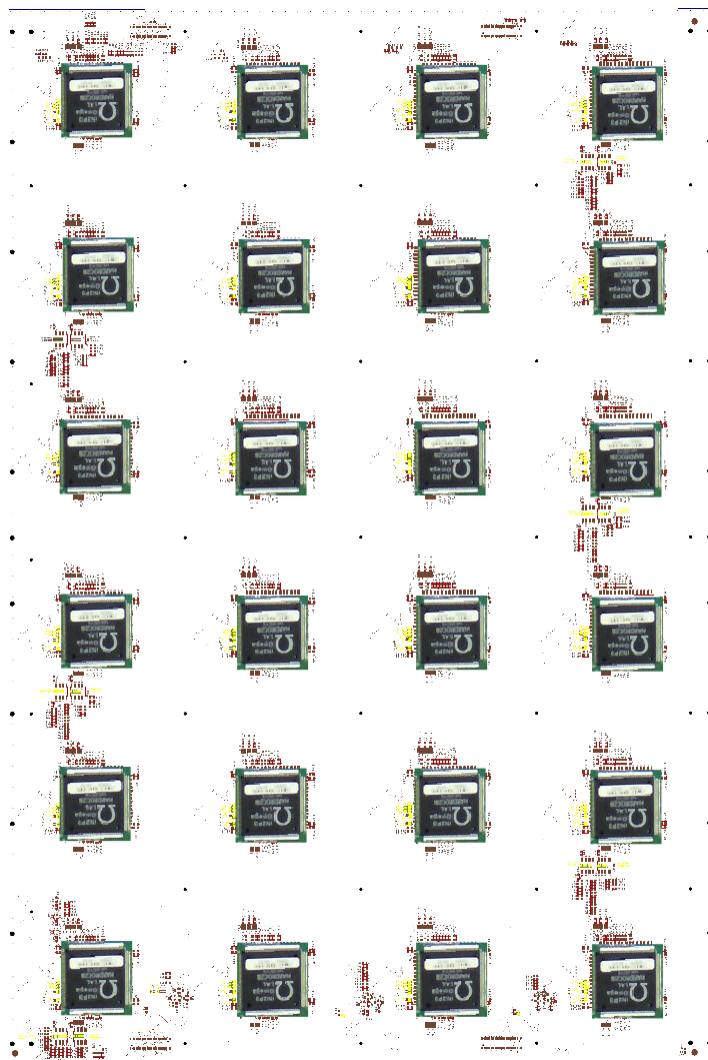
- 2 main functions:
 - interface
front-end electronics \leftrightarrow GRPC
 - functional support for 24 HARDROCs
- boards production outsourcing:
 - 2 different firms for PCB + board manufacturing
 - boards checked and reconfigured at IPNL
- products quality checks:
 - PCB: production samples
 - board manufacturing: visual inspection
 - functional checks performed at IPNL

ASU board structural aspects



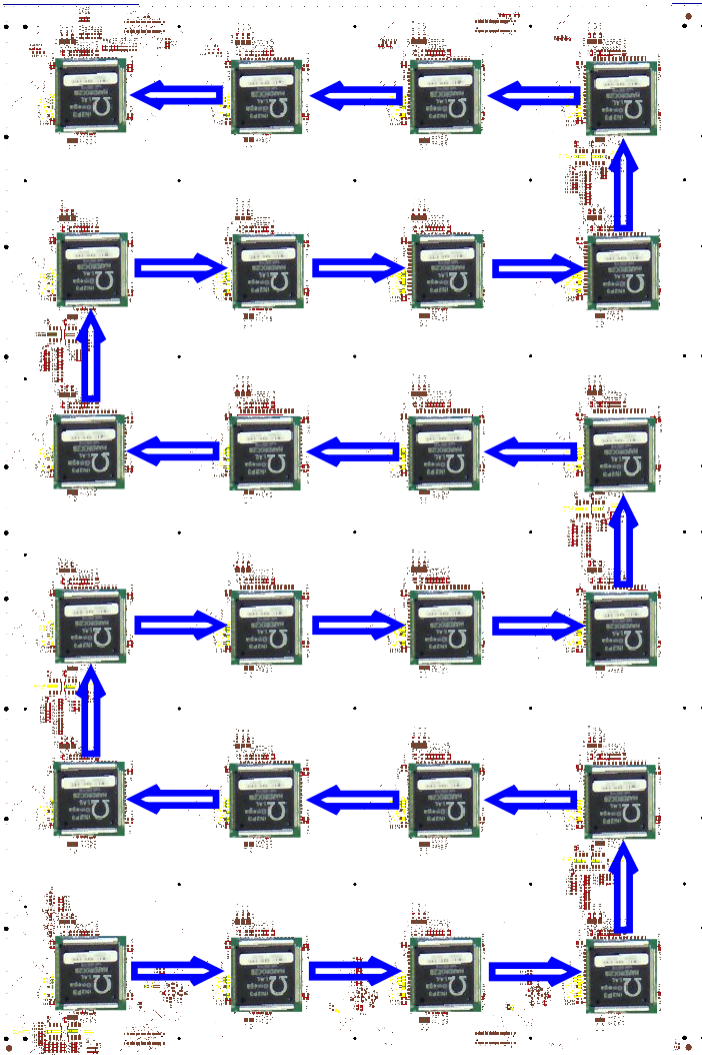
- **HARDROC (HR)**
 - 24 asics/board
 - all asics daisy chained
 - only active device
- input pads
 - 64 pads/HARDROC (1 cm²)
 - board BOTTOM side
- interconnections
 - 4x 80pin smd connectors
 - pwr supply + HR ctrl data
- board configurability
 - 3 ASU board configurations
 - 310 closed straps (362 total)
 - 22 matched lines terminations

ASU board structural aspects



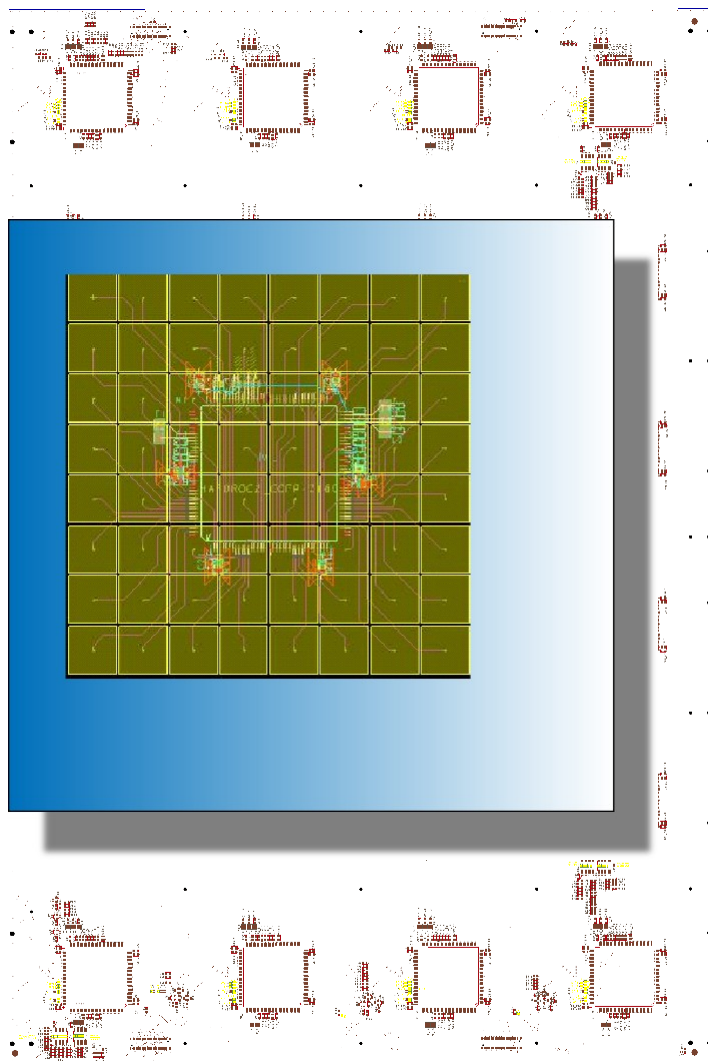
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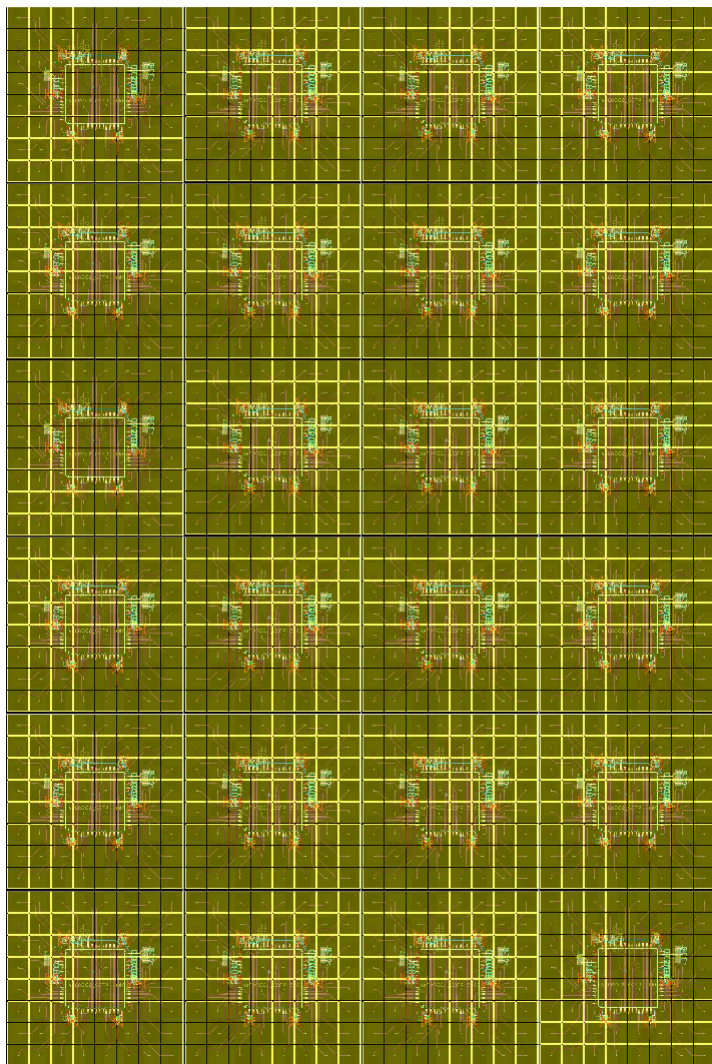
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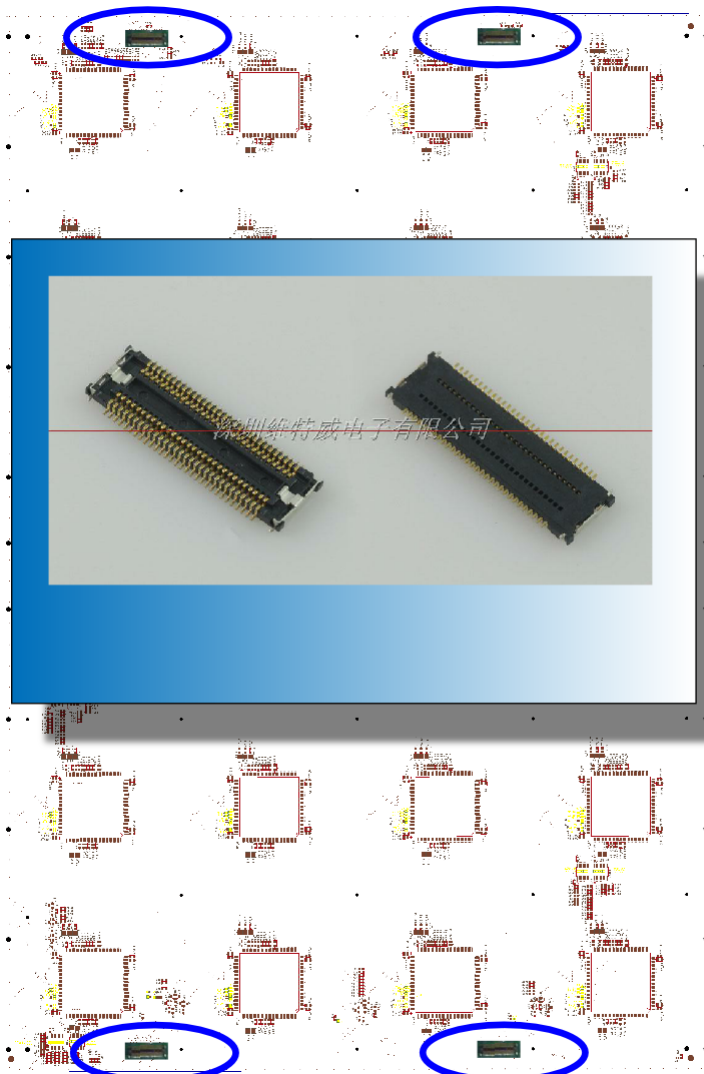
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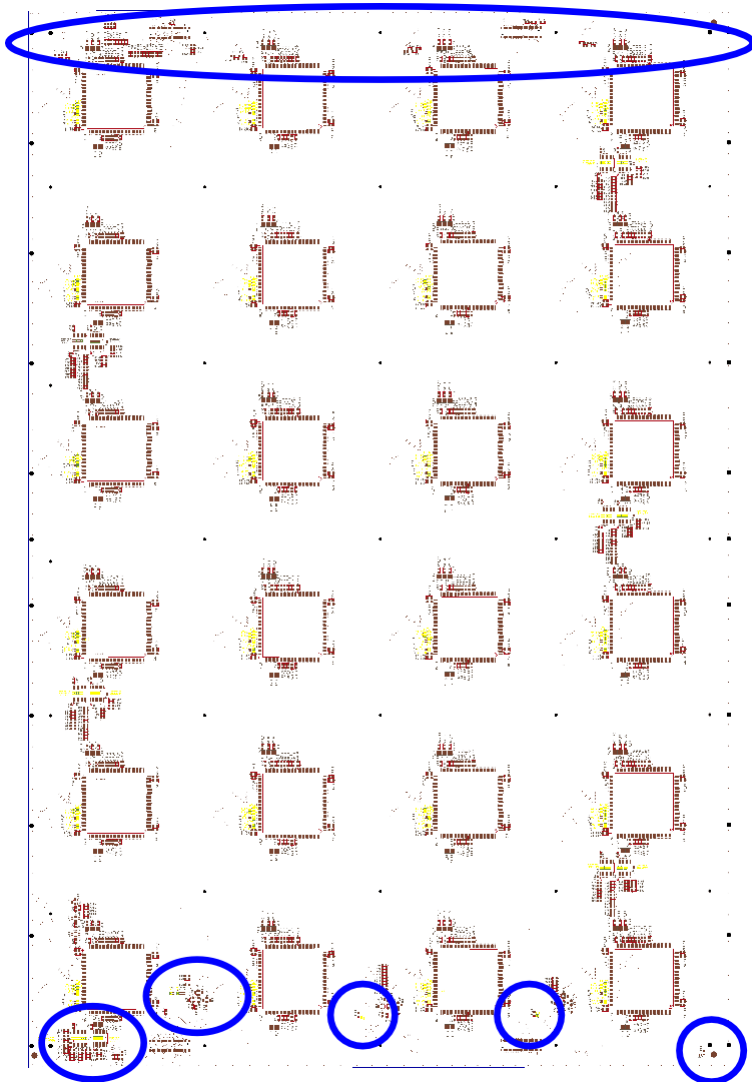
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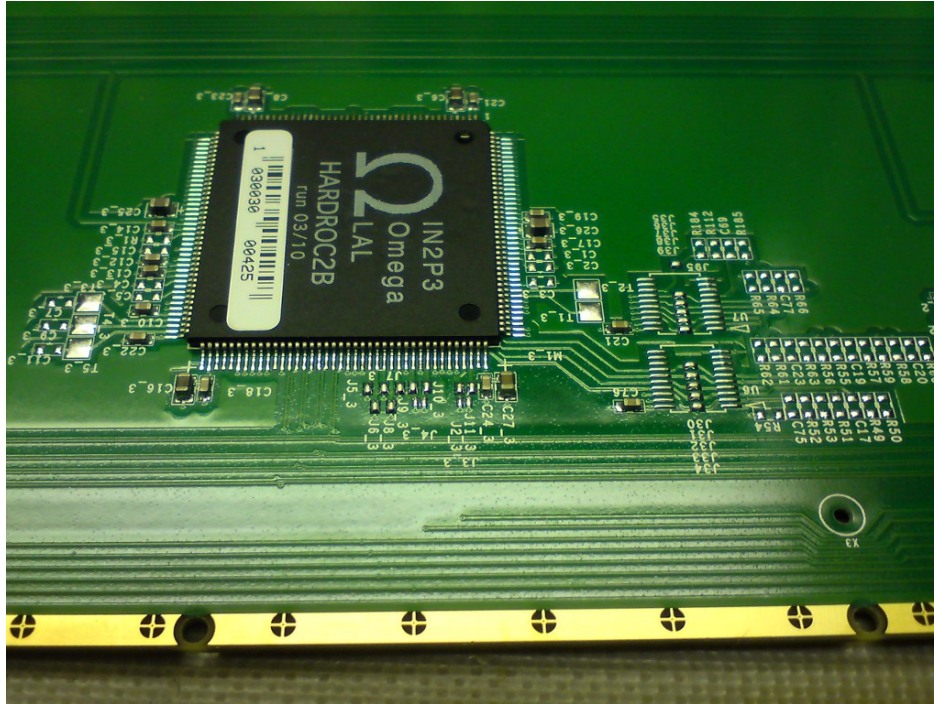
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ASU board: 3 configurations



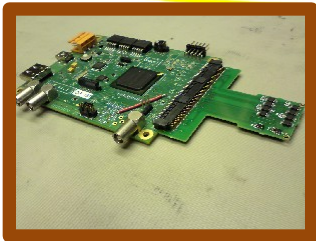
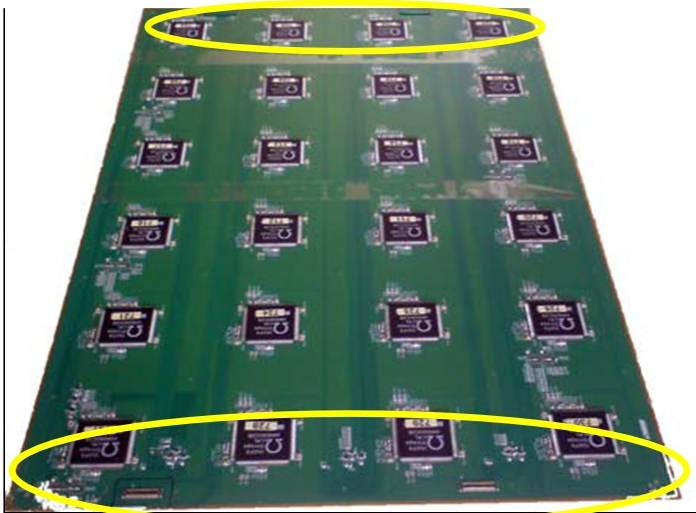
- **only 2 cfg used for m3 integration**
 - “production” cfg only used for single board testing
 - “slab 1st” + “slab 2nd” used in slab integration
- different configurations made by straps and passive components
- test strategy:
 - all configurations need to be checked
 - all integration steps need to be tested

ASU board: test strategy

- **functional test at each integration stage:**
 - the "production" board must pass a functional test
 - boards are reconfigured either as "slab 1st" or "slab 2nd"
 - the slab is functionally tested
 - 3 slabs are integrated in a m2 board
 - the m2 board is functionally tested before integration with the GRPC
 - the m2 is integrated into his cassette
 - the integrated cassette must pass a complete functional test
- two separate test benches will be used
- functional tests: GO / NO GO strategy

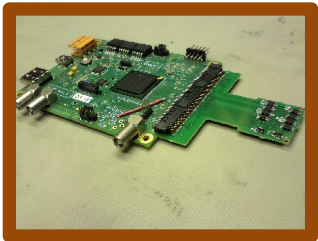
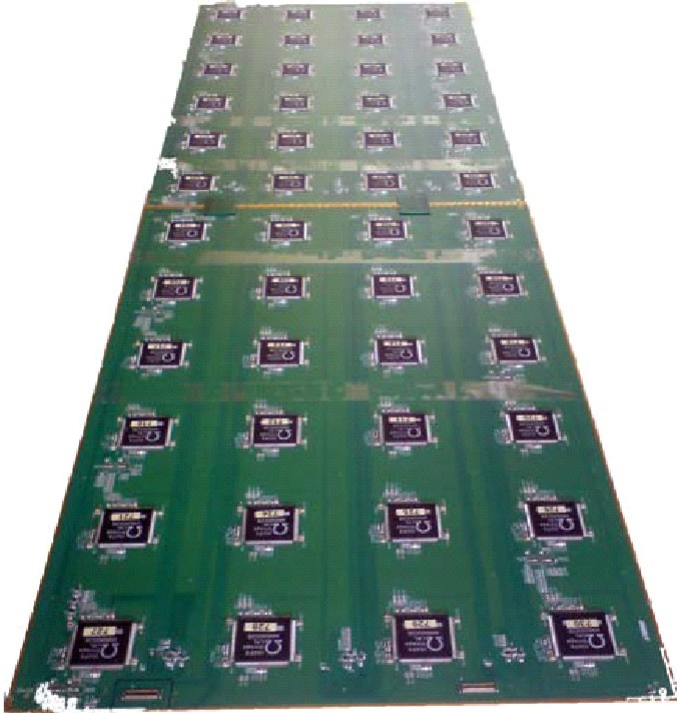


ASU board: test strategy



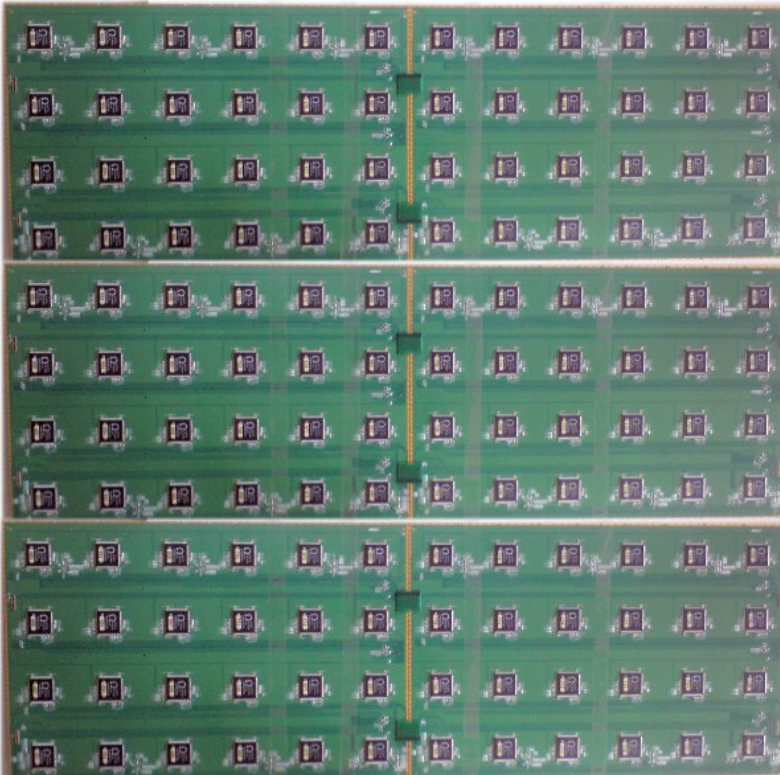
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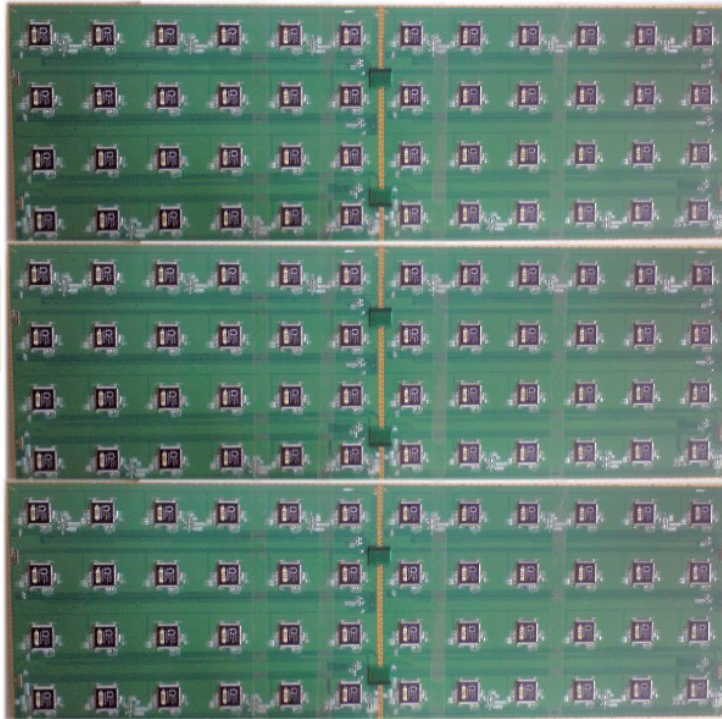
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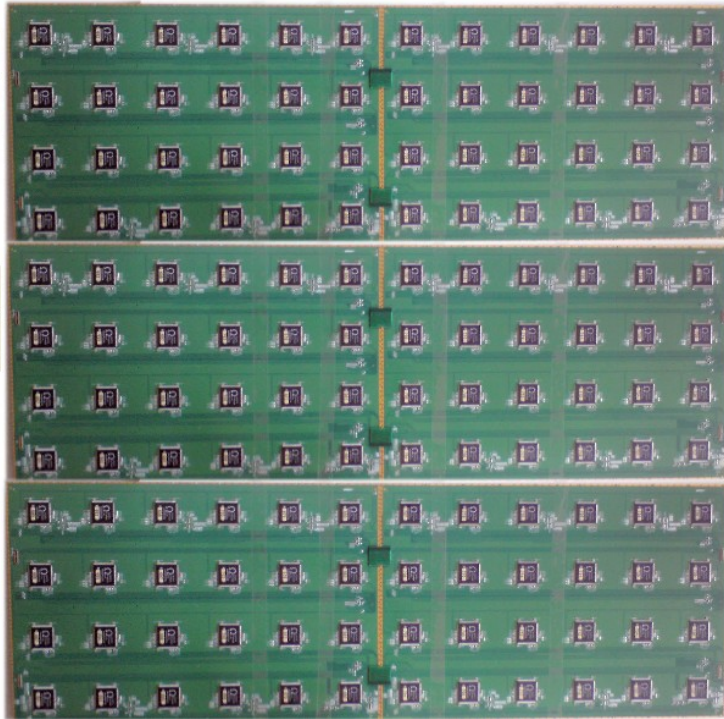
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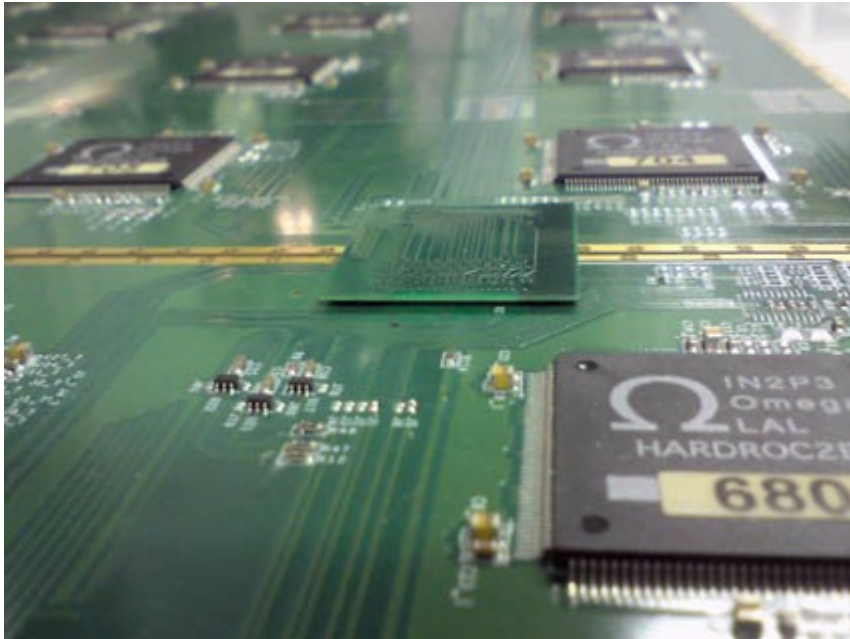
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board/slab/m2 test benches



- two separate test benches:
 - 1 pc with XDAQ
 - DIF + DIF-ASU boards
 - 1 GRPC + HV
 - DAQ software
- GO / NO GO strategy
 - no debugging
- only functional tests:
 - power consumption
 - HR slow control
 - pedestal acquisition runs
 - HR calibration feature (CTEST)
- goals:
 - checking all functionalities/connections
 - electronics checks at each integration step

m2 integration scenario



- components:
 - 6x ASU boards
 - 6x ASU-ASU interlinks
- boards and interlinks already configured and tested before integration
- integration procedure:
 - ASU boards soldered together by the mean of copper gasket
 - m2 board tested as a whole
- goal: one m2 board/day

m2 boards mass production

- production numbers:
 - prototypes + 300x ASU + 330 ASU-ASU + 152 DIF-ASU
- prototypes:
 - 6 ASU V3.1 + 6 ASU-ASU V2 + 6 DIF-ASU V2
- pre-series (mass production conditions):
 - 20 ASU + 30 ASU-ASU + 12 DIF-ASU
- series:
 - 280 ASU + 300 ASU-ASU + 140 DIF-ASU
- pre-series validates mass-production (integrated into M3)
- tests:
 - ongoing tests of ASU preseries show unexpected HR mortality
 - 6 + 20 boards tested: 25 / 624 asics found defectives
 - symptom: "floating" pads
 - investigations ongoing with Omega designers

provisional planning and conclusion

- status:
 - ASU(PCB) series launched
 - HR mortality -> failure analysis ongoing
 - ASU test bench protocol for early identification
 - DIF-ASU and ASU-ASU **preseries** (manufacturing) launched
- provisional planning:
 - ASU series (1st lot available on week 12)
 - AST + radiography to assess infant mortality of HARDROCs
 - test of the DIF-ASU and ASU-ASU **preseries**
 - launching of the DIF-ASU and ASU-ASU **series** (board manufacturing)
 - ASU boards mass production (capability: 60boards/week)
 - start m2 boards integration and test (1m2/day)