Micromegas QA/QC

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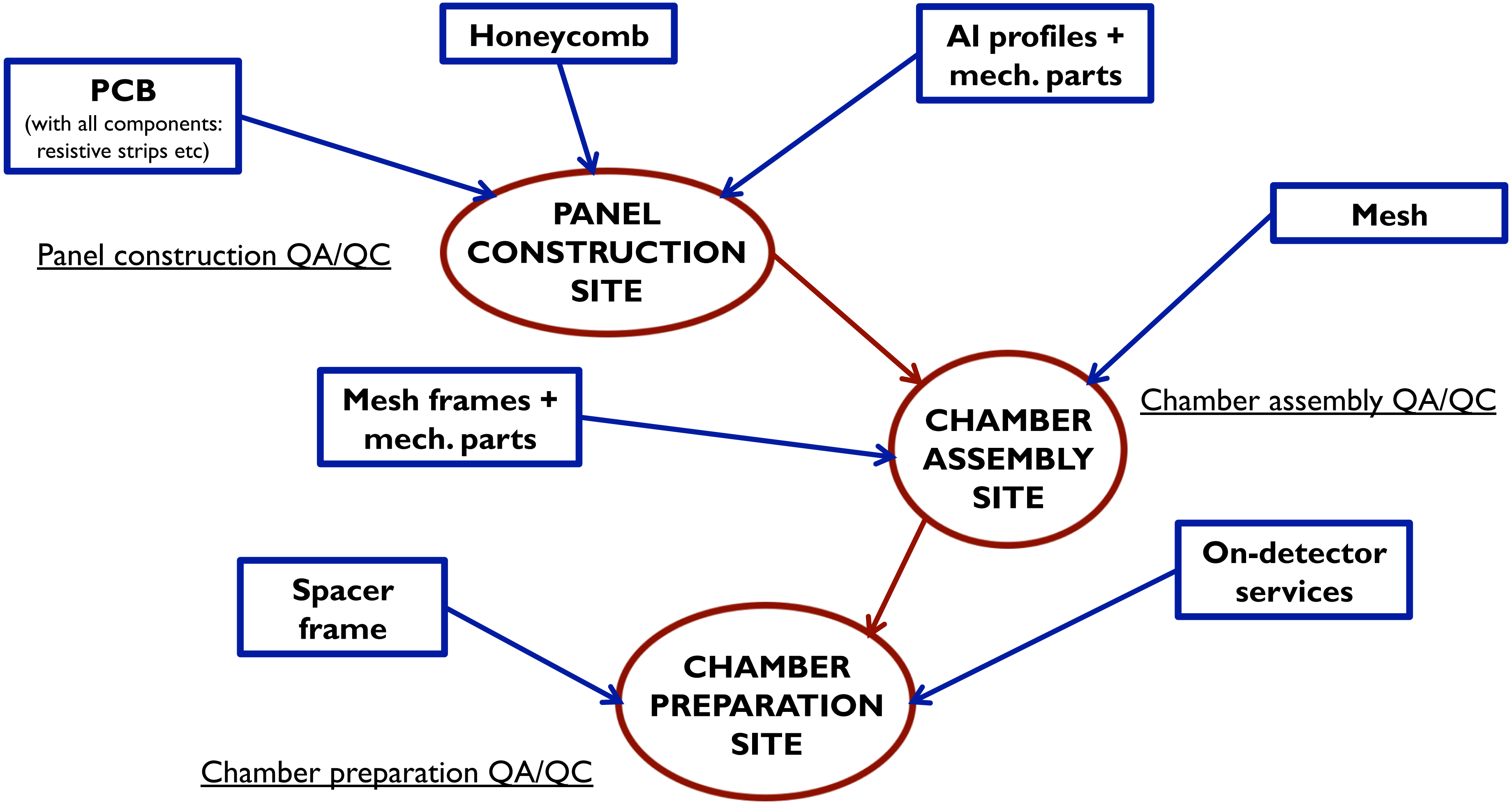
Introduction

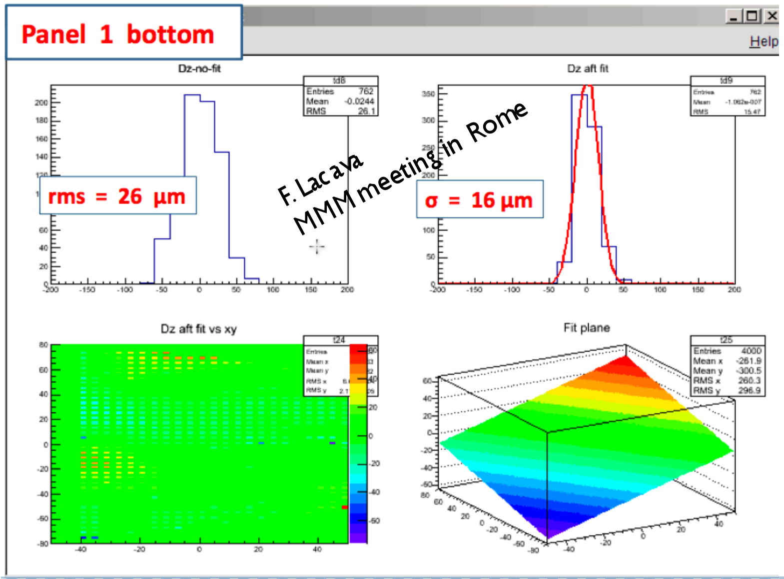
- The ideas in this presentation are all preliminary
- QA/QC procedures need to be defined for each component and at each step of the construction process
- Procedures not to be discussed here
- Rejection criteria need to be defined at each step
  - Sometimes trivial (short circuits)
  - Sometimes less obvious, for instance when thresholds need to be defined

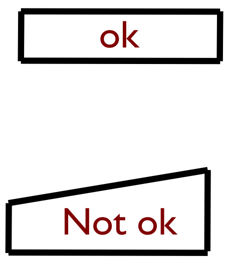
Micromegas construction flow-chart



Panel Construction QA/QC

- Mechanical parts (honeycomb, Al frames, spacers etc.):
  - verify the thickness
  - Integrity check
- Panel flatness: mech. or optical tool with a given precision (reproducibility)
  - Map of the panel surface: define the minimal measurement density needed
  - Verify the thickness
  - Rejection based on: RMS; absolute deflection (rotation); thickness uniformity
  - Procedure (and corresponding rejection criteria) to be defined: panel suspended vertically or sitting on a flat surface



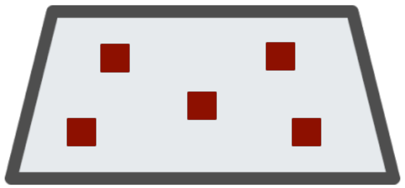


Panel Construction QA/QC

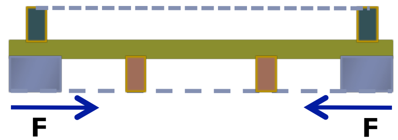
- R/O panel: check of the alignment between the two PCBs
  - Use the strips routed to the edge of the PCB with alignment holes in the panel profile and a camera
- Drift panel
  - Gas tightness test before mounting the mesh→ need a dummy R/O panel (cover panel)
    with o-ring and 5 mm thick frame for the drift gap
  - Check of the cooling channel
- HV test after soldering HV connectors on the panels
  - R/O panel
    - Check for shorts
    - HV test in air (for instance: 900 V for ½ hour monitoring the current; define rejection criteria).
    - Need a dummy drift panel with mesh
    - To be done in clean room
  - Drift panel: check for shorts

Chamber assembly QA/QC

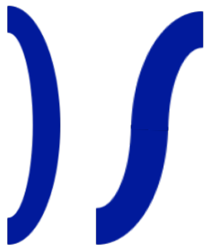
- Mechanical parts (mesh frames, spacer etc.):
  - verify the thickness
  - Integrity check
- Test on mesh tension before/after glueing on the frame
  - Press the mesh in some pre-defined places by a known amount (1 mm) and measure the corresponding force
  - Repeat the measurements 1 or 2 weeks later to check time stability after the glueing



- Check the bending of the drift panel after having mounted the mesh
  - Use a 'bridge' or pre-bent panels to compensate the mesh tension?



- Check for shorts on the drift panel after mounting the mesh
- After the assembly of the module
  - Check of flatness and shape of the module
  - Gas tightness
  - Check bending of external panels by putting a given gas overpressure
  - HV test: check for shorts, current monitor in air



- Module equipped with read-out electronics
  - Strip alignment with X-ray tool
    - Channel mapping control
  - Test with cosmics → see next slide

Chamber assembly QA/QC

- Test with cosmics
  - General comments
    - The test stand can be set-up differently in the different labs but they should provide the same set of measurements on which the acceptance/rejection criteria will be based.
    - It is preferable to use (at least) the same front-end elx; the best would be to implement a 'standalone' validation (w/o external trackers) with common DAQ and analysis algorithm
  - Pedestal/Noise
  - Strip profile (dead channels)
  - Efficiency vs HV → define operating point
  - Efficiency map at plateau
  - Amplification map at plateau
  - Cluster size, multiplicity etc
  - Time distribution
  - Space resolution, time resolution
  - Charge response

Chamber preparation QA/QC

- Mechanical parts (spacer frames etc.):
  - Integrity check
- On-detector services (alignment, B-field, T sensors etc.)
  - Verify functionality
- Prior to the wedge assembly
  - Gas tightness test on each module
  - HV test in air on each module
- Wedge assembly (4 MM modules per sector)
  - Verify envelope/layout
  - Verify modules alignment on the frame
  - Check interconnections of gas pipes and cooling channels between modules
- Test of the wedge with X-ray and/or cosmics

Database - bookkeeping

- Traceability of all parts and test is a fundamental aspects
- It must be developped as part of the NSW, Muon and ATLAS frameworks
- In particular common tools should be developped within the NSW community (for MM, sTGC and common parts)
- All parts entering the detector construction must have an identifier (partID)
- All tests done on each part must be recorded in the construction DB (including visual inspections) → responsibility of the sites where the test is performed
- All the history of each single part must be fully traceable, including decisions taken on acceptance/rejection of the part
- DB interface and tools must be common in all sites