ATCA cooling tests

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Outline

Project motivations and goals

- Check LHC rack cooling capabilities
- Temperature and air speed monitoring
- Possible improvements

Hardware and software status

- Install and implement rack equipment and hardware
- T, p and air velocity sensors installation and reading
- LabView implementation and user interface

Preliminary tests schedule
Project motivations

Vertical air flow cooling test on a standard LHC rack

- Cooling capabilities of the LHC rack need to be checked moving from VME Crates to ATCA shelves
- Rack turbines capabilities are lower than the fans system integrated in the ATCA shelves. Removal of the turbines is an option that we would like to check
- Temperature and air velocity gradients in the rack must be checked (room temperature long term effect?)
- Identify potential in-rack bottlenecks and airflow resistance sources. Propose possible alternatives/fixes to remove them and test these adaptations. If required and possible run complementary simulations to confirm solution improvement.
Hardware: schematic connection

- **Ethernet ATCA 1**: 14x 350 W = 4.9kW
- **Ethernet ATCA 2**: 6 x air velocity sensors
- **Agilent 34870**: 30 x T sensors PT100, 2 x p sensors

- **Power setting**: T sensors reading, power sensors reading, fan control
- **Fan control**:
The sensors layout could change according to the kind of tests we have to carry out.
LabVIEW Program- Main view

This graphical user interface allows users to:
• see low and high alarms
• set a power
• select temperature visible on the trend plots
LabVIEW Program - air deflector

- Sensors inside deflector
  - T and p measurements inside the air deflector
  - Set Temp alarms and warnings
  - Panels optimization ongoing

Alarm configuration
LabVIEW Program- ATCA 1

This panel allows users to:

• check low and high levels alarm
• set the power dissipated by the blades
• select the temperature to be displayed on the graph
List of tests

- Evaluate the thermal performance by measuring the distribution of temperatures, air velocity and pressure in the rack volume with different "rack layouts and functional settings"
- Identify any hot spots or high air speed locations
  - ATCA load blades from 0 W to full power: 350W
  - Rack turbines performance at different speed of the ATCA fans system

Verify simulation outcome and proposed adaptations and, where possible, check alternative improvements
  - Remove the turbines blowers repeat the tests
  - Small mechanical modification to improve the air circulation (reduce noise?)
  - Different Heat exchangers?

The commissioning of the control system is ongoing and we could start the tests at the end of this week
Summary

The ATCA cooling tests and measurements are important to identity any possible cooling or mechanical issues the integration of 2 ATCA chassis in a standard LHC rack may cause.

The test rack is being equipped with ATCA chassis, HX and all the sensors.

We identified a preliminary list of tests we would like to make to assess the cooling capability of the rack in its standard configuration.

According to the results, we would like to apply some mechanical modifications on the rack and check the new performance.

We plan to start the tests this week and get the first results very soon.