Inner Ring Heating System

Mu2e Calorimeter Meeting

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DocDB **35445**

Components

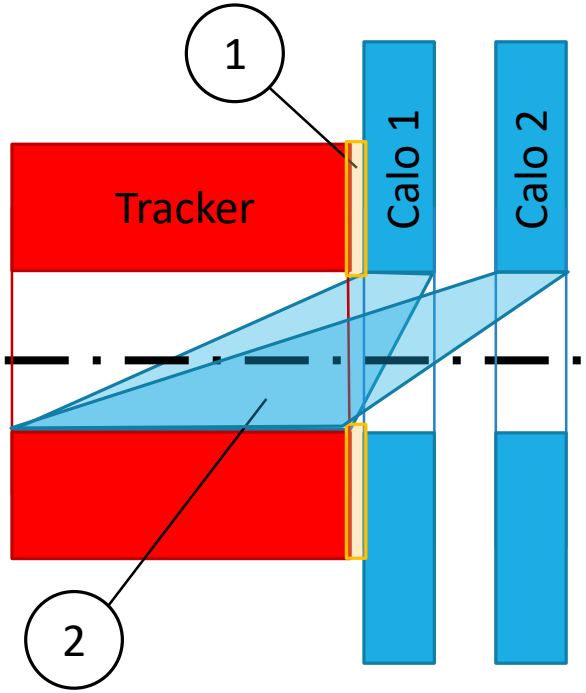
- General issue
- Solution design
- Material
- Cabling
- Control

General issue

- Calorimeter chilling system runs down to -10°C
- Calorimeter structure will cool down in a range between -0°C to 25°C (hard to estimate)
- The Tracker runs at room temperature (25°C)
- Because of the temperature difference the Calorimeter will cool the Tracker for irradiation
- The Tracker straws are oversensitive to temperature variation, because of the Voltage inside, not for the mechanical structure
- In the worse case scenario Calorimeter will cool down the Tracker with less than 20 W
- The Tracker can tolerate less than 1 W of external cooling power (See Russel Eng. Note)
- The goal is to reduce the risk to cool down the Tracker
- The Inner Cylinder and the Source Panel are the only components with a ‘high’ view factor

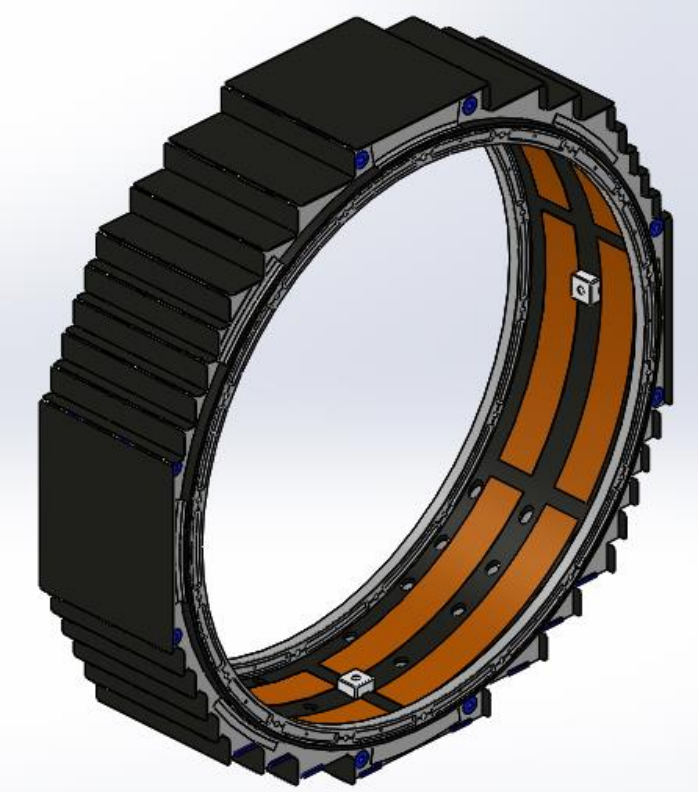
Solution Design

- There are 2 main contribution to cool down the tracker:
  1) The Source Panel
  2) The Inner Cylinder
- To decrease the SP contribution a thermal shield made of 2 Al thin disks (0.05mm) will be set between Tracker and Calorimeter.
  It will be in thermal contact with the Tracker cooling system at 25°C all around the outer surface (See Russel note and Aseet presentation)
- To decrease the second contribution, an active heating system will be placed in the inner surface of the Calorimeter IC



Solution Design

- To decrease the second contribution, an active heating system will be placed in the inner surface of the Calorimeter IC
- The calculated maximum power is less than 200W (per disk)(aggiungere back up slide sui conti)
- Polyammide resistors will be glued on the surface with some temperature sensors
- A thin aluminum sheet will be further applied on the inner surface to minimize emissivity factor and to have a more uniform temperature gradient on the IC inner surface (to be calculated)
- The power and control system will be located in the DAQ room



Components

- 14 polyammide 5×30 cm per disk
- Each pad will supply 14 W max power
- It will be supplied with 28 VDC max voltage
- Temperature sensors **(Ask Ivano) How many? Which type?**

OMEGA™
a spectris company

Image Temperature sensors

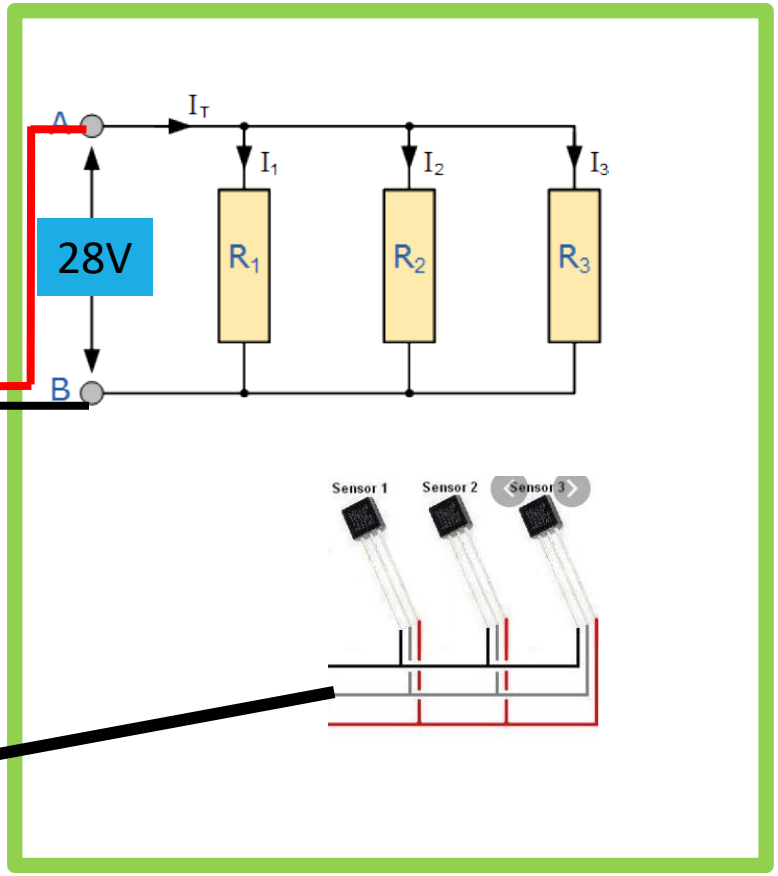
Cabling

- The cabling system is similar to the other service cable arranged for the calorimeter
- **Descrivere I cavi usati**
- Ask Ivano

Schema dei cavi

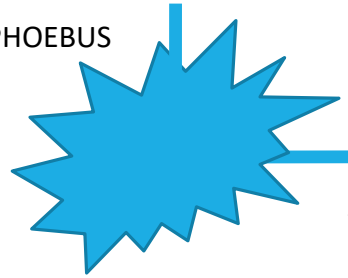
Control

- Kapton pads are connected in parallel to a LV power supply (same of ECAL)
- One wire DS18B20 temperature sensors are connected in parallel
- One small form factor-small computer module (beaglebone or RPI) is used as controller. It implements a simple PID control loop. It includes EPIC service
- Power supply is controlled through a serial link by the RPI



SERIAL

EPICS PHOEBUS CLIENT



ETHERNET TO EPICS SERVER