Atlas MDT High Voltage generation and distribution

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1 Abstract

The high voltage generation and distribution system for the Atlas MTD chambers is presented. The layout of the system proposed is based on three main components: the main high voltage generator; the boards for remote regulation, monitor and limiting of tension and current; the hedgehog cards for the distribution of the high voltage to each single MDT's tube. An high modularity together with an high reliability is required to supply a detector with a large number of tubes (about 370000) for at least 10 years at LHC. The capability to reverse the high voltage to cure aged tubes and to disconnect tubes with broken wires must be foreseen.

2 Summary

The high voltage system for the Monitored Drift Tube chambers has to be able to supply the 1200 chambers of the Atlas muon spectrometer.

The MDTs perform the precision coordinate measurement in the bending direction of the spectrometer, providing the momentum measurement. A safe and stable operation for 10 years in high rate environment has to be guarantee. In order to achieve a stable r(t) relation an overall high voltage supply accuracy and stability less then 0.3% is required, together with a maximum operating voltage of 4 kV. Concerning the maximum current that the system must be able to supply, the integrated charge in 10 years at LHC has to be considered. Calculations give an average current of about 1.5 mA for the biggest chamber. Moreover, because the large number of channels involved (we have to supply about 370000 tubes) an high modularity is required: one HV channel for each multilayer is foreseen. In order to avoid that a single tube with broken wire make useless a full chamber multilayer, a fuse per tube must be provided. Lastly, to cure aged tubes, the possibility to supply MDTs using high voltage with reversed polarity has to be taken into account.

The proposed solution for the HV generation and distribution reported is mainly composed by three parts: the main generator, the REgulation MOnitoring LImiting boards and the Hedgehog cards.

The operation of the entire HV system is carried out by the main control system, located in the control room USA 15, which generates the HV and manages communications and controls with the RE.MO.LI. boards. These boards, located on racks around the apparatus, have been designed to provide (for each multilayer) the REgulation of the HV from 0 to 4 kV, the MOnitoring of tension and current and the hardware LImitation of the current to 0.7 mA. The distribution of the HV to each single tube is performed by the Hedgehog cards located inside the Faraday cage. On these cards are present only passive components: the HV limiting resistors, the signal termination networks and the diode networks to blow the fuse or to supply tubes with reverse high voltage (curing option).