Grounding Considerations for ATLAS Cathode Strip Chambers

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1. Electronics Overview

The CSC system will follow the guidelines from the ATLAS Policy on Grounding:

- All detector subsystems will be electrically isolated.
- There will be no connection to ground other than "Safety Network".
- There will be no connection between different detector subsystems.

There are 64 CSC chambers arranged in two wheel assemblies, one for each endcap. Each chamber has 20 ASM boards with preamplifiers, shapers, analog memory, and ADCs. The ASM boards are arranged along the edge of each chamber, see Figure 1. Data from the ASM boards goes to a Data Collection Card (DCC) mounted on the chamber. The data from each chamber is transmitted by optical fiber link to a read-out driver (ROD) mounted in crates elsewhere in the cavern. Timing and slow control signals are also transmitted from the ROD to the DCC on the optical fiber.

2. Faraday shield

The on-chamber electronics and detector electrodes will be enclosed in a Faraday shield to prevent interference from electromagnetic radiation generated by other detector subsystems. Penetrations of the enclosure will be carefully designed to prevent unwanted pickup of noise from low- and high-voltage power cables. Shielded cables with an AC connection from the shield to the Faraday enclosure at the point of penetration will be used.

3. On-chamber signals

Signals between boards on the chamber are transmitted using a balanced, differential protocol capable of handling data rates up to 40 Mb/s. Cable routing must be planned to avoid coupling into the preamplifier inputs.

4. Signals between chambers and RODs

These signals are transmitted on optical fiber with a maximum data rate of about 80 Mb/sec. Optical transceivers on the Data Collection card will be immune to groung loops and electromagnetic pickup. It should be emphasized that there will be no signals entering or leaving the Faraday shield except as digital data on optical fiber.

5. Low voltage power

Each chamber will be fed by a separate low voltage power supply and cable with only one entry point. Low voltage power supplies will comply with the general ATLAS guidelines, which call for floating low voltage supplies with safety ground attached only at the transformer secondary shielding. As discussed above power cables will have their shields AC-connected to the Faraday shield at point of entry. Filtering of common-mode noise by ferrite baluns may also be necessary.

6. High voltage

Separate supplies and cables for each chamber, with one connection into the chamber. Both the supply and return connections should be filtered by a resistor in the Kohm range. Supply and return sides decoupled to the shield where they enter the enclosure.

7. Isolation

Each chamber is to be electrically isolated from the other chambers in the endcap, and from all other structures of the ATLAS detector, e.g. support members, the endcap toroid, thin-gap chambers, and hadronic calorimeter. The Faraday shield and optical isolation of all signals should eliminate most ground loops. Auxiliary service lines into the chambers (gas system, cooling fluids) should be strictly isolated.

CSC on-chamber electronics

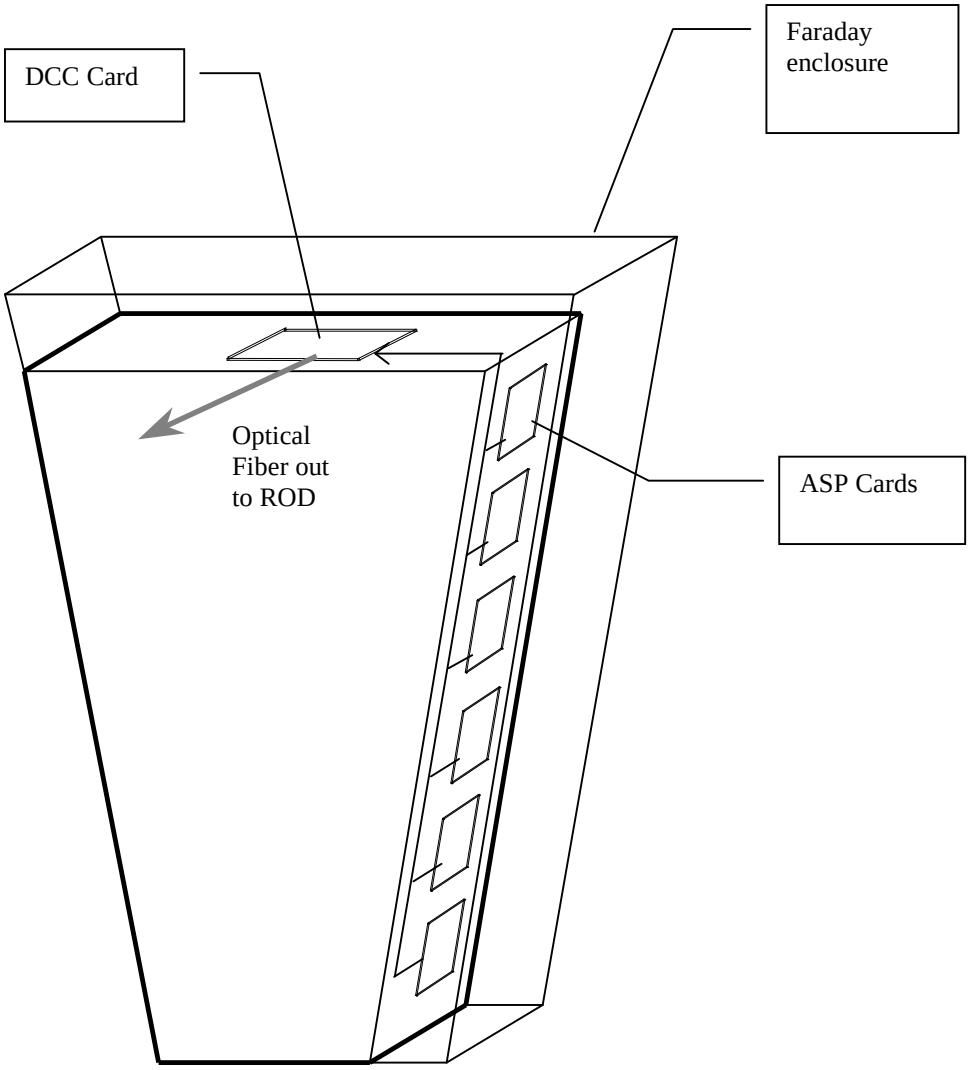

Figure 1