

1 GEM tracker

The Gas Electron Multiplier (GEM) tracker for GMn experiment consists of four GEM detector layers before the GRINCH detector and one GEM detector layer after GRINCH. Each of the first four layers has an active area of 150 cm × 40 cm and consists of three SBS front tracker GEM modules. The GEM layer after GRINCH has an active area of 200 cm × 60 cm and consists of four SBS back tracker GEM modules. All GEM modules will be powered by Wiener-Iseg 6 kV power supplies housed in a Wiener-Iseg mainframe crate. The GEM signals will be readout using an APV-25 chip based Multi-Purpose Digitizer (MPD) system, where the APV-25 front-end cards on GEM detectors are connected using HDMI cables to a the MPD units housed in VME crates inside a shielding enclosure behind Bigbite spectrometer. The low voltage power for the readout system is provided by KEPCO 15 V, 15 A power supplies. HV and LV power supplies will be controlled using Labview interfaces running on a computer located in the hall A counting room. A pre-mixed non-flammable gas mixture of 70% Ar and 30 % CO₂ will be continuously supplied to the GEM detectors from a gas line coming into the hall from the Hall A gas shed. The total gas flow rate into the detectors will be approximately 160 liters per hour.

1.1 Hazards

Hazards to personnel include the high voltage applied to the GEM chambers, and the low voltages supplied at high currents to power the readout electronics.

Hazards to equipment (GEM detectors) include:

- Exceeding the recommended high voltage values applied to the detectors.
- Exceeding the gas flow rates/input pressures to the detectors leading to the rupture of the detectors.
- Exceeding the recommended voltage values applied to readout electronics.

1.2 Mitigations

- Hazards to personnel are mitigated by turning off HV and LV before doing any work on the detectors.
- Hazards associated with high voltage, both to personnel and detectors, is also mitigated by the use of HV voltage modules with a maximum current limit of 1 mA. Furthermore, a more strict pre-set current limit of 0.8 mA is programmed into all channels. Any current exceeding this limit causes the that HV channel to trip off and remain off.
- Hazards associate with exceeding the recommended voltage values will be mitigated by locking the controls with password protections with only the authorized trained personnel having access to change the setting. Any change to the established settings will have to be authorized by the responsible personnel for the detector.
- Hazards to the detectors associate with excessive gas flow rates and input pressures will be mitigated by the use of input relief bubblers in the input gas line of each detector module.

1.3 Responsible Personnel

Individuals responsible for the system are:

Name	Inst.	Phone	email	comment
Kondo Gnanvo	UVa	321-604-8026	kg6cq@virginia.edu	First contact
Evaristo Cisbani	INFN		evaristo.cisbani@iss.infn.it	
Nilanga Liyanage	UVa	434-466-4670	nilanga@virginia.edu	