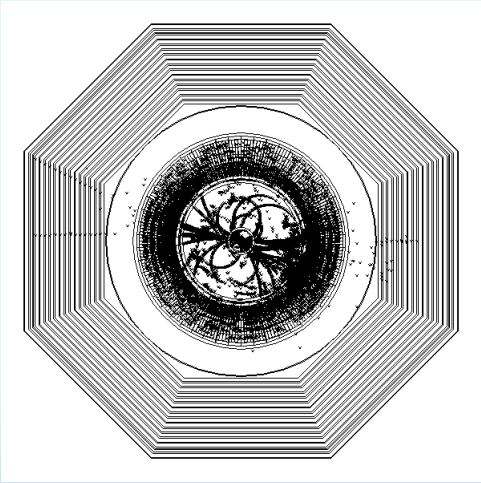
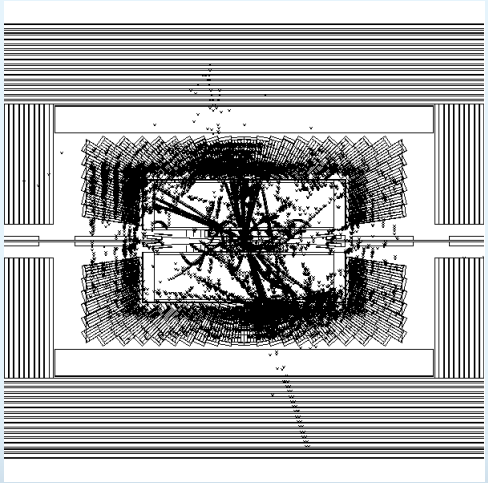
Test beam for muon detector





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Test beams muon detector requirements

- Two types of questions to be answered:
  - Behavior of the detectors as such in the expected environment
    - e.g. robustness w.r.to neutron background (endcap layers)
    - e.g. local rate capability in jetty environment
  - Behavior of the muon system as part of the calorimetric *ensamble* of the apparatus.
    - e.g. muon detection efficiency in jets
    - e.g. calorimetric measurement of energy leaking out of had-cal
- One might add also special tasks like evaluate timing performances to tag non I.P. muons.

Detector specific questions

- Can be probably answered either by means of *non organized* efforts.
- Cosmic ray test stands and or (small) prototypes exposed to available beams could provide the sought out answers.
- Specific questions related to (quasi) full scale prototypes might even obtained in the *non organized* mode.

Scintillator strips specific questions

- Light yield vs coordinate
- Light yield vs time (different conditions)
- Timing and amplitude stability (vs strip length)
- Calorimetric read-out

Gas detector specific questions

- Gas mixes studies
  - Life tests
  - Neutron sensitivity
- Local rate capability
  - Different regimes (bears also on first question)
    - Electrodes geometry
- Calorimetric readout
  - Here too geometry plays an important role.

ALC Muon Detector Test Beam Plans (an example of organized effort)

- Set-up: 7 scintillator planes 2.5m (H) X 5m (W) (3-u, 3-v, 1-x); ~ 600 strips 4.1 cm (W) X 1 cm (T); Read-out both ends of the 43 - 3.5m long strips (86 channels) and one end of 21 + 21 next longest strips for a total of 128 channels per plane. 4" Fe between planes. 7 planes => 896 channels previously tested with cosmic rays.
- Objectives: Muons – Check timing, pedestals, pulse height, etc. for minimum ionizing particles. Measure efficiencies, (u,v) tracking, multiple hit capability, etc.

  Hadrons: Measure calorimetry capabilities with other calorimeters upstream (utility as a shower tail-catcher).
- Beam Conditions: E = few – 100 GeV; e, π, p, μ. Beam rate < 10^6 Hz.
- DAQ: FE will be custom development with FPGA logic and digitization, using CAMAC and LINUX software debugged in cosmic ray running.
- Dates: Earliest is probably late 2005.
- Where: Fermilab – Mtest.

Conclusions

- Test beams for muon should be seen as a concerted effort:
  - Muon detector should be considered a part of the calorimetric system for the detector.
- Apart from detector specific answers, that should be obtained in a non organized way, my opinion is that the calorimeter for the LC detector should be designed and tested as a single system.
- Some flexibility in the radiator design might allow to test different solutions both for segmentation and type of detectors.
- Target date might well be the late part of 2005.