MARS flux simulations - update

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Technical problems

- Detectors are small 0.75x0.75x0.05 cm3

- Direct MARS simulations can not provide acceptable statistical accuracy in reasonable time (7x24 hours 16 CPU)

- Two ways to get small enough statistical errors:

1. using large detector size
2. pre-calculate sources for all detectors and run sources until get small statistical errors

Choice of methods

- Even with 20x20x0.1 cm3 detectors statistical errors exceed 40% for one of detectors in run
- Jet vertical radius is determined by magnetic field:

  0 Tesla – 8.65 mm, 5 Tesla – 8.4 mm, 10 Tesla – 7.95 mm.

  Jet horizontal radius is same for round jet, but density is reduced.

  For elliptic jet horizontal radius is 0.25 cm2/vertical radius.

  Ilias model is used to determine beam size as function of beam intensity
- Source terms were calculated for 7 setups:

  elliptic jet, 0 Tesla, 0.25 Tp

  elliptic jet, 5 Tesla, 16 Tp

  elliptic rising radius jet, 5 Tesla, 16 Tp

  round jet, 0 Tesla, 0.25 Tp

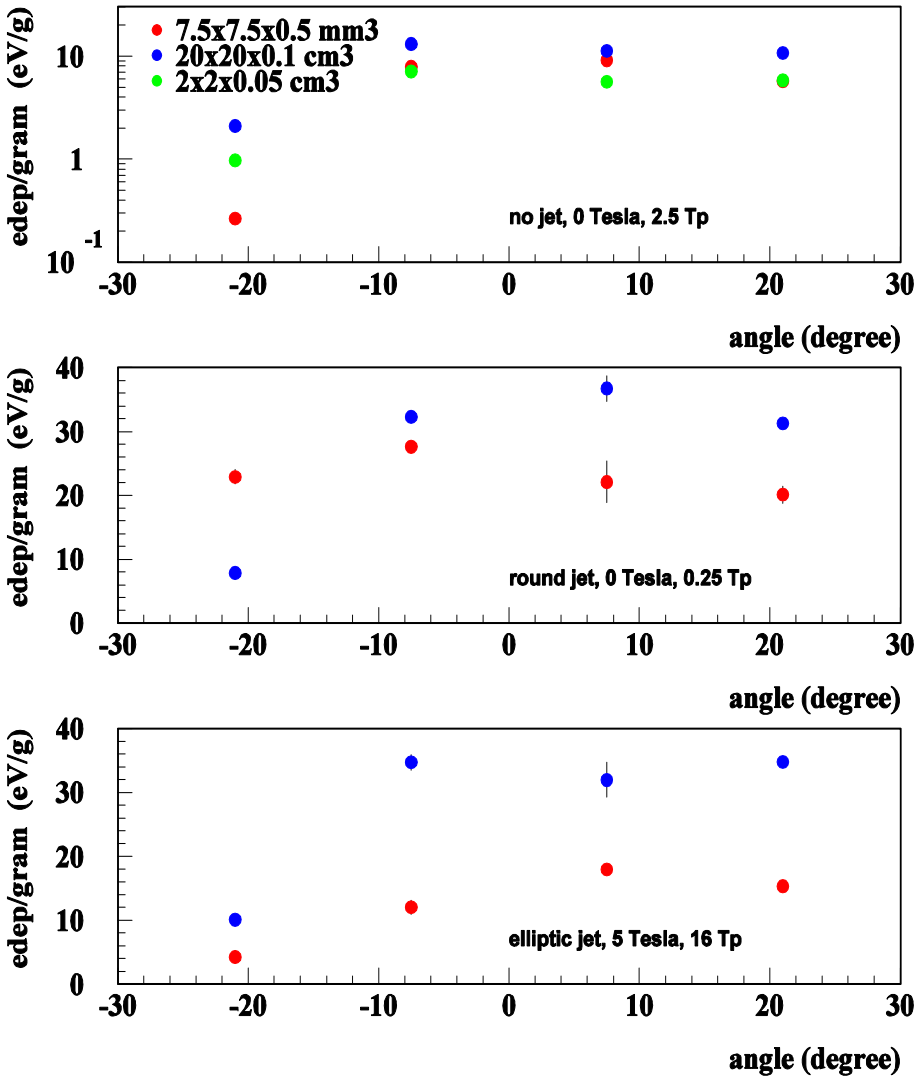
  round jet, 5 Tesla, 16 Tp

  no jet, 0 Tesla, 0.25 Tp

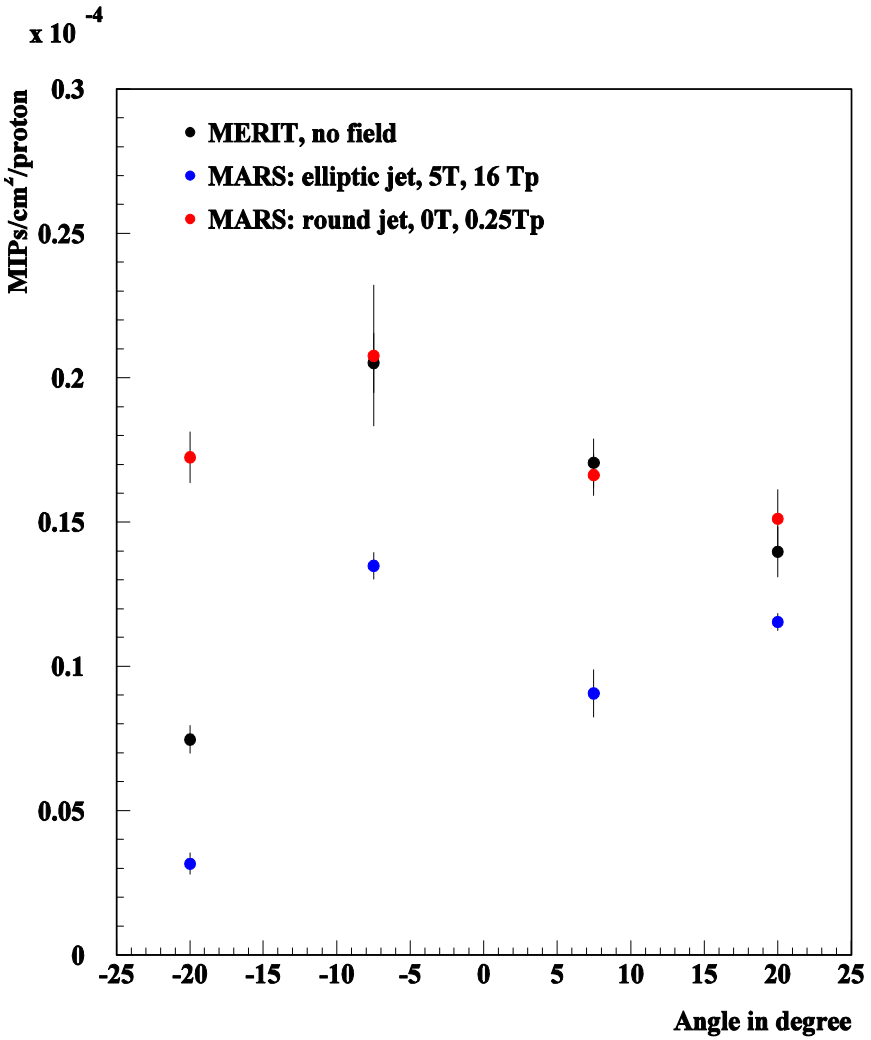
  no jet, 5 Tesla, 16 Tp

Detector size in simulation

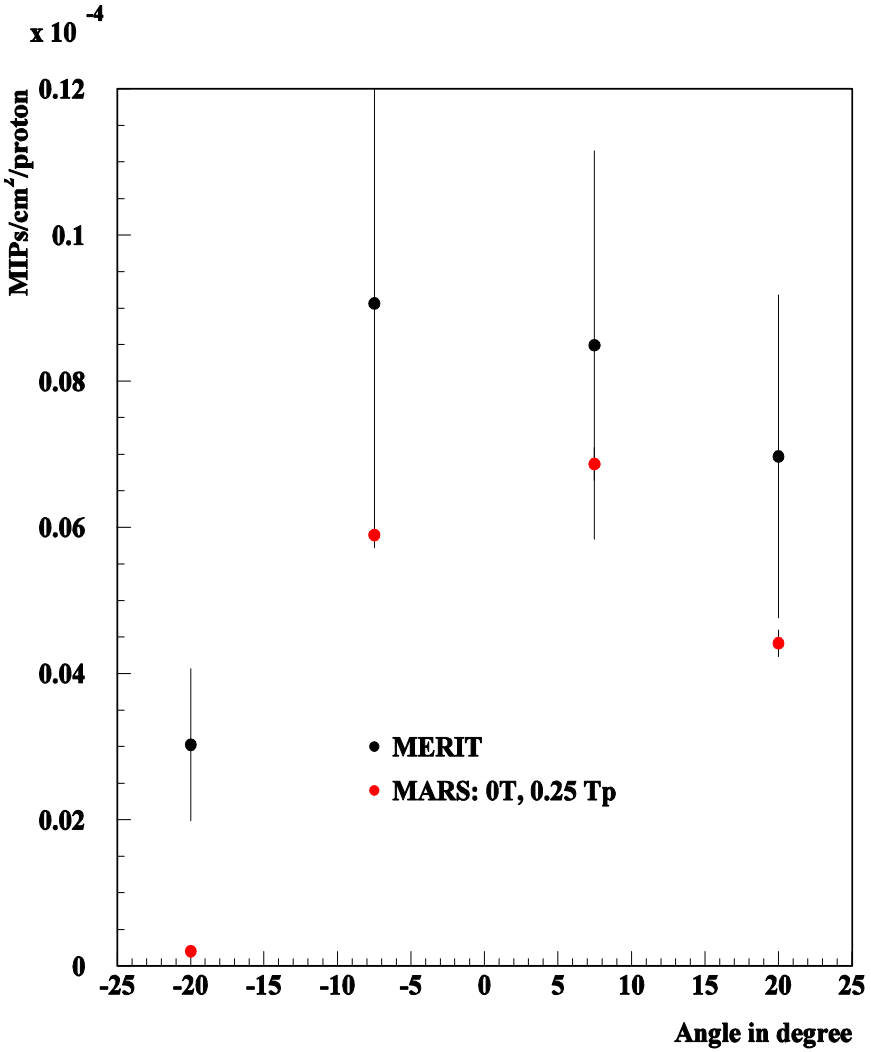
- All previous calculation were performed with large detectors. It is important to check how results depends on detector size.
- Simulations with large detector size (with reduced and/or real density) overestimate results obtained with real detector size
- It is more simple to run jobs with real detector size and pre-calculated sources, then find acceptable large detector size



Preliminary results



14 GeV/c proton on gravity affected mercury jet



Charged particle flux, no jet, 14 GeV/c

Conclusion

- Simulation of particle detector signals should be performed with real detector size
- It looks like that difference of detector signals for round and elliptic jet are not small
- Systematic problems with -20 degree detector still unclear
- Simulation with 5 other inputs should clarify dependence of detector signals on magnetic field and beam intensity
- Update of measured detector signals at 14 and 24 GeV/c and different magnetic fields and beam intensities is needed