

MARS flux simulations - update

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Technical problems

- ❑ Detectors are small $0.75 \times 0.75 \times 0.05$ 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 particle sources around detectors and run sources many times

How to determine optimal source&detector sizes?

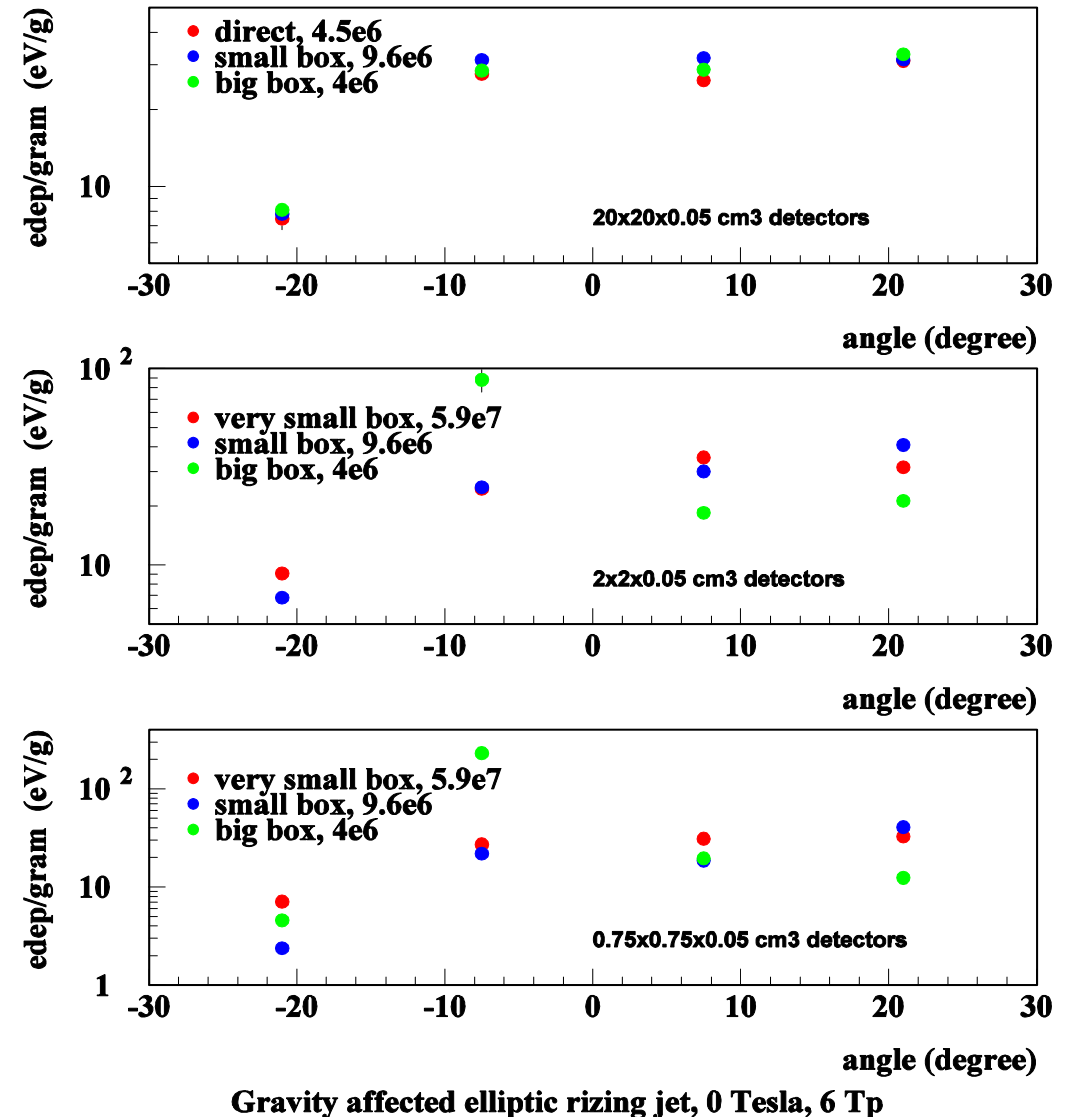
Source&detector size dependence

2 simulation methods:

- direct simulation
- 2 stage simulation & big box source - 50x50x10 cm³
- 2 stage simulation & small box source - 20x20x0.05 cm³
- 2 stage simulation & very small box - 2x2x0.05 cm³ source

3 detector sizes:

- real size – 0.75x0.75x0.05 mm³
- small size – 2x2x0.05 cm³
- large size – 20x20x0.05 cm³



Source&detector size dependence

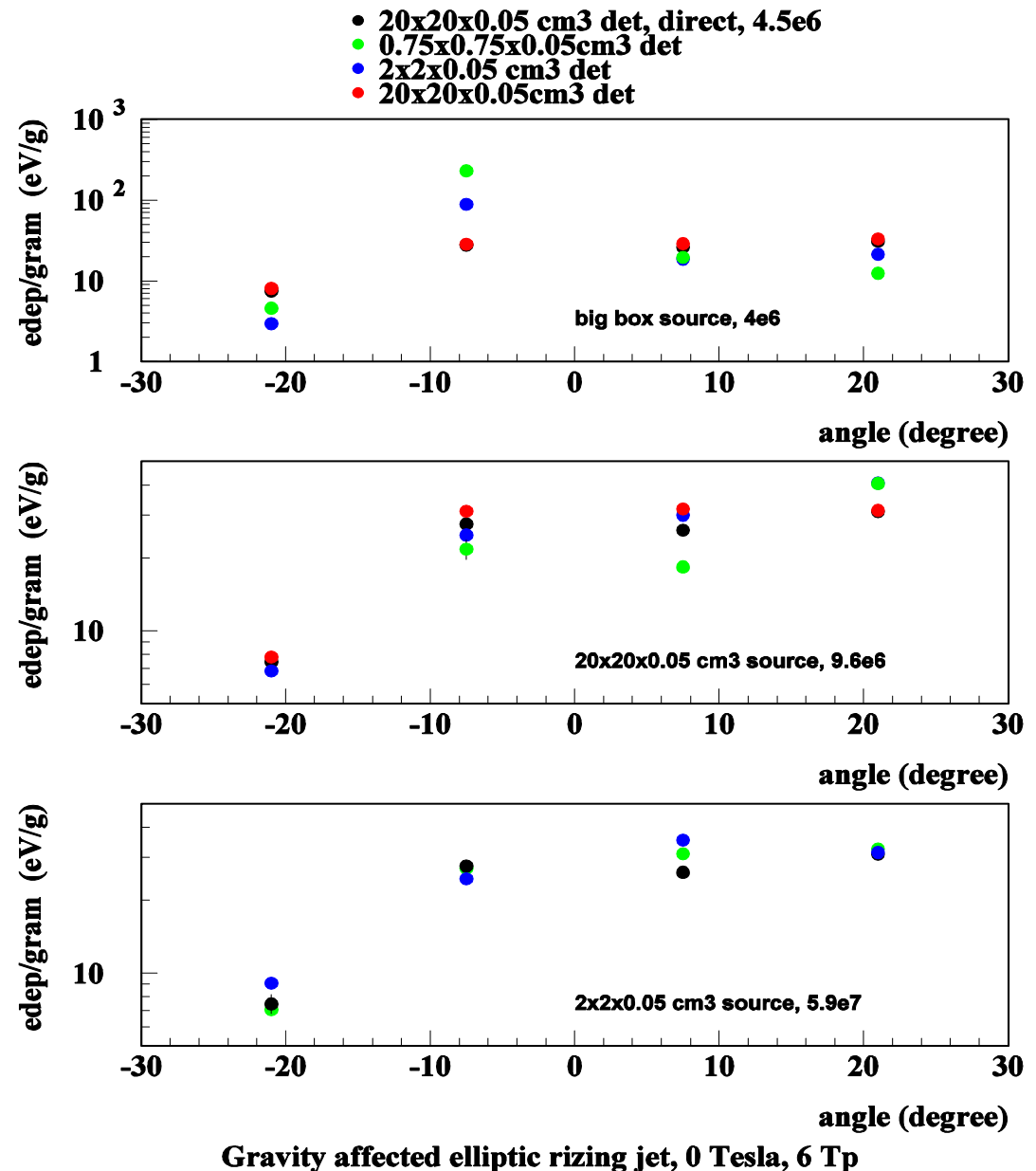
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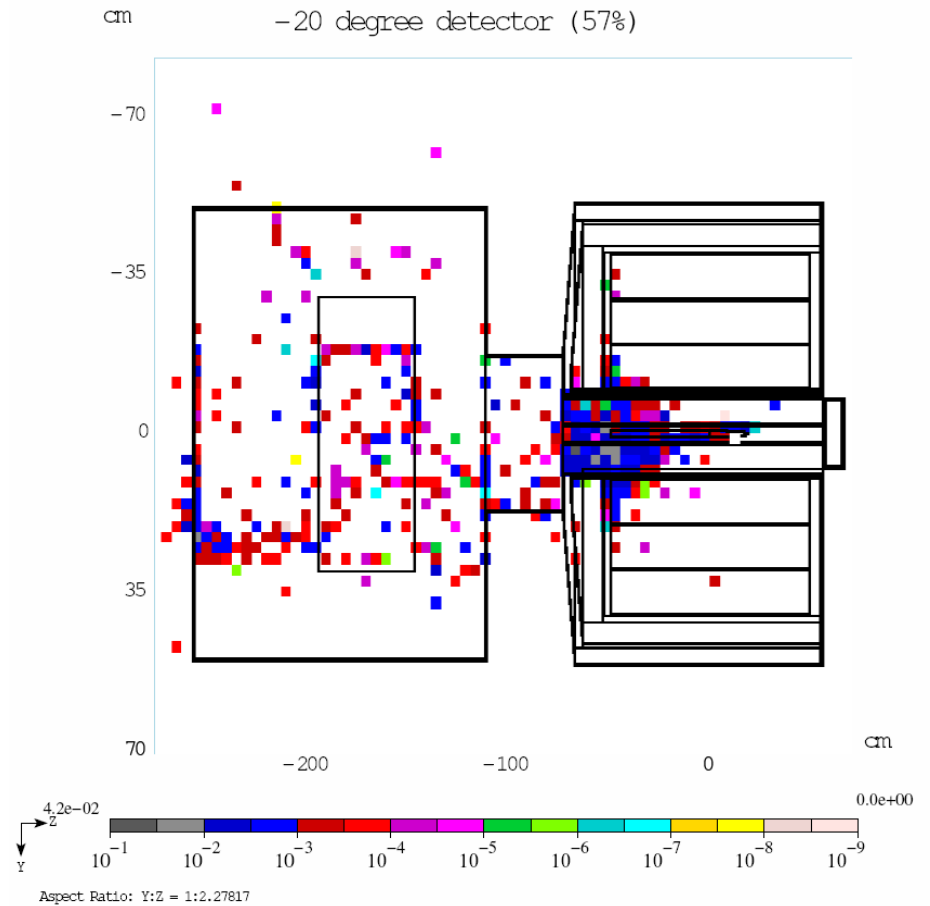
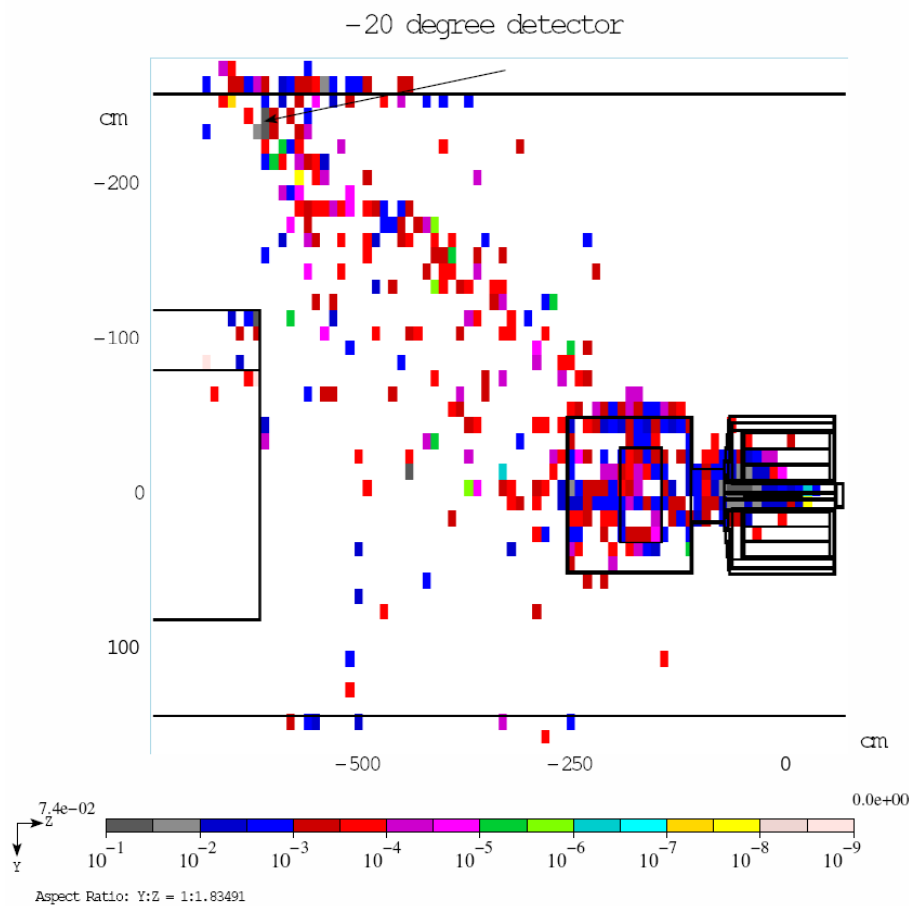
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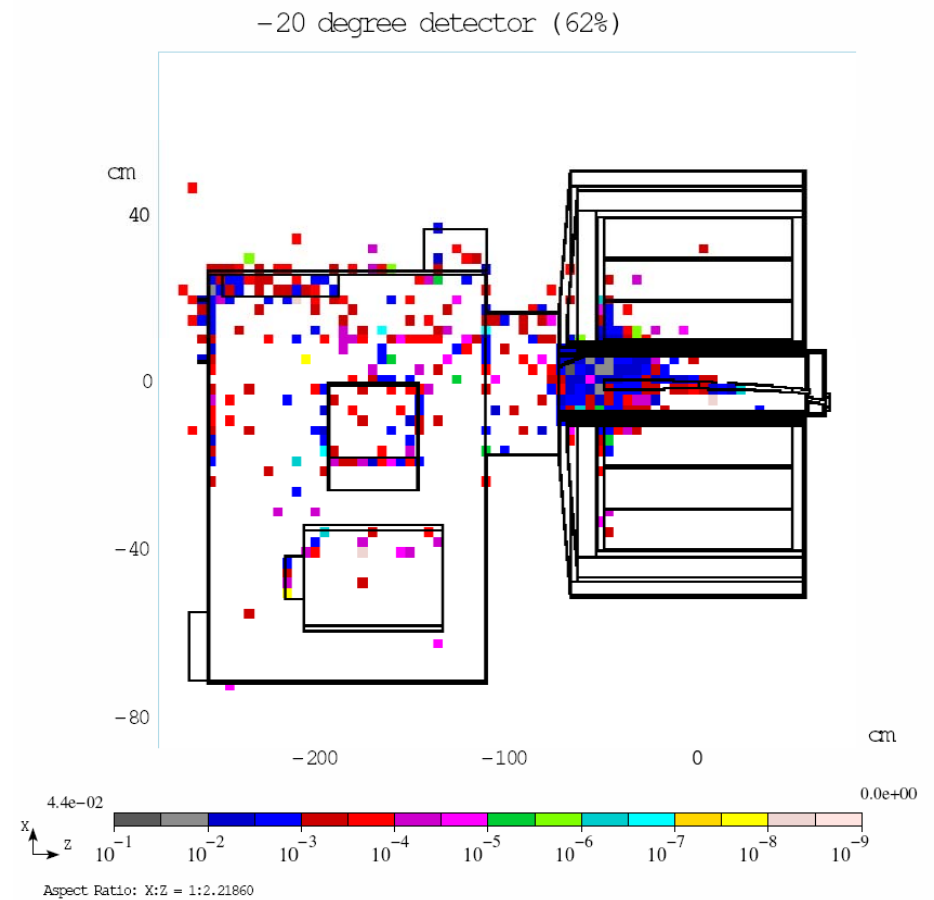
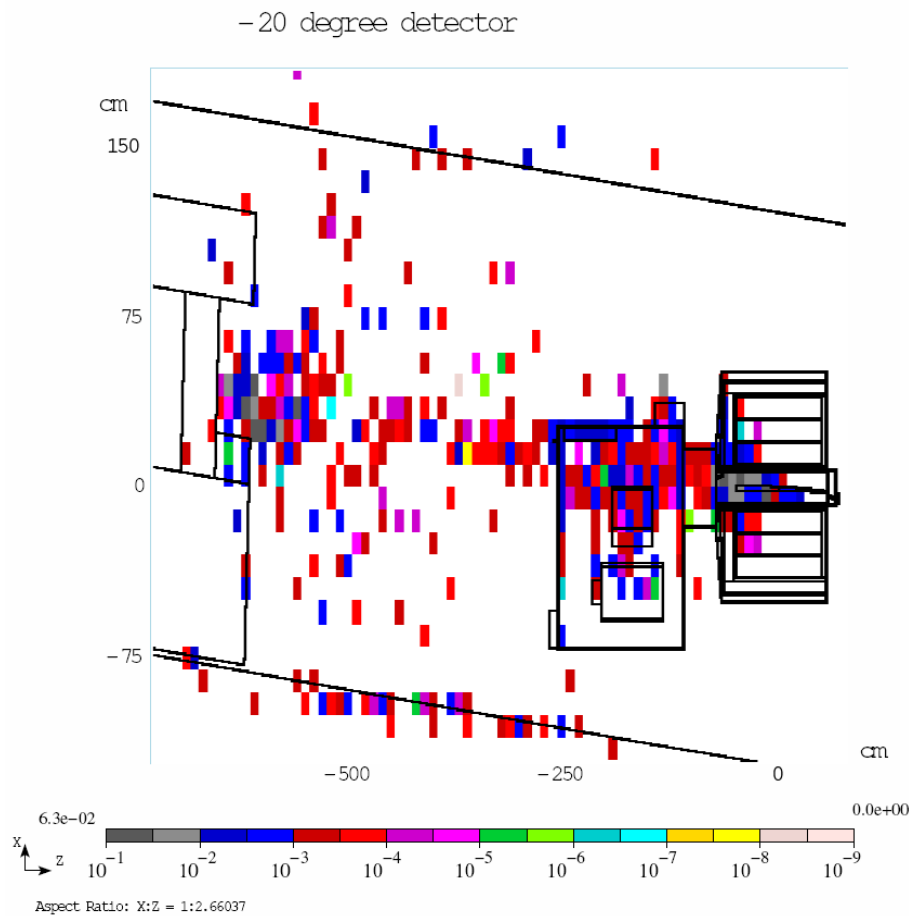
If number of primary protons is large enough (1.e8) results don't depend on source&detector size!



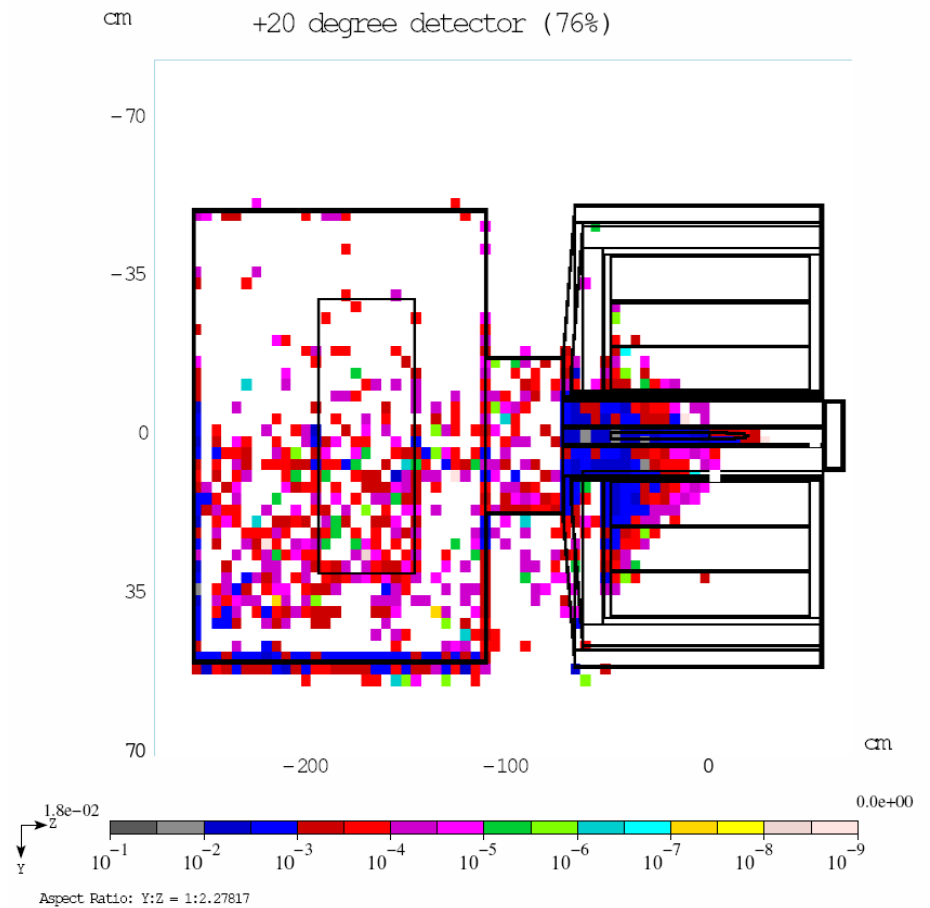
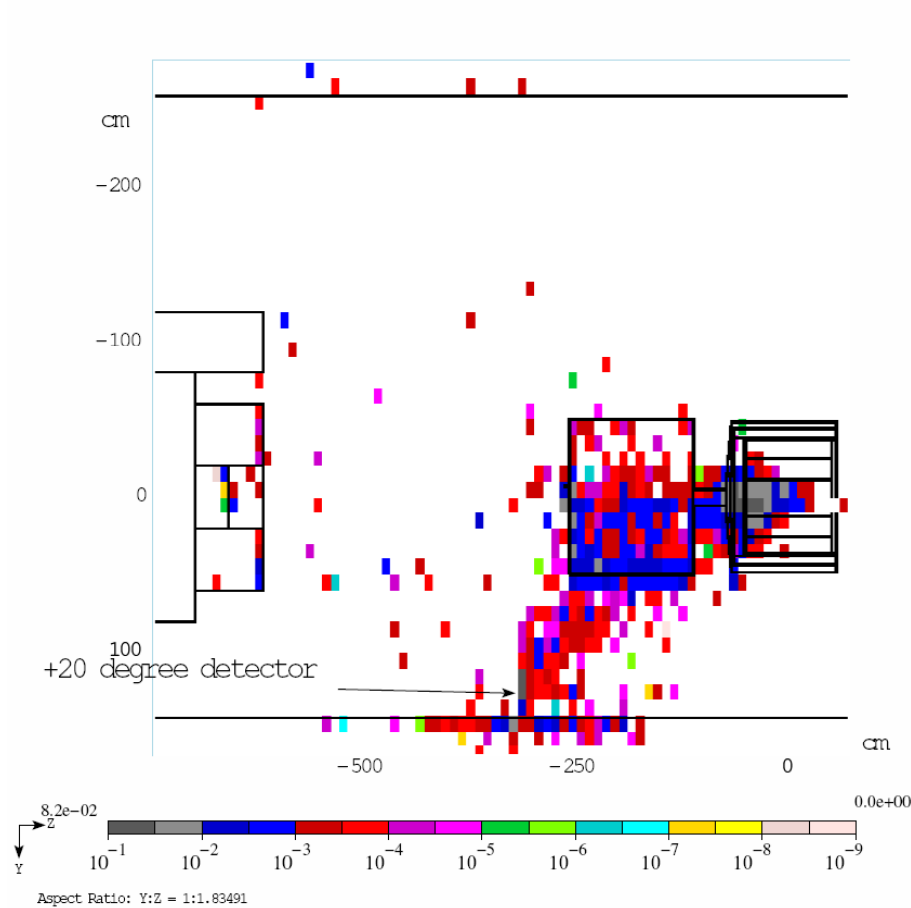
Probability to make energy deposition in -20 degree detector



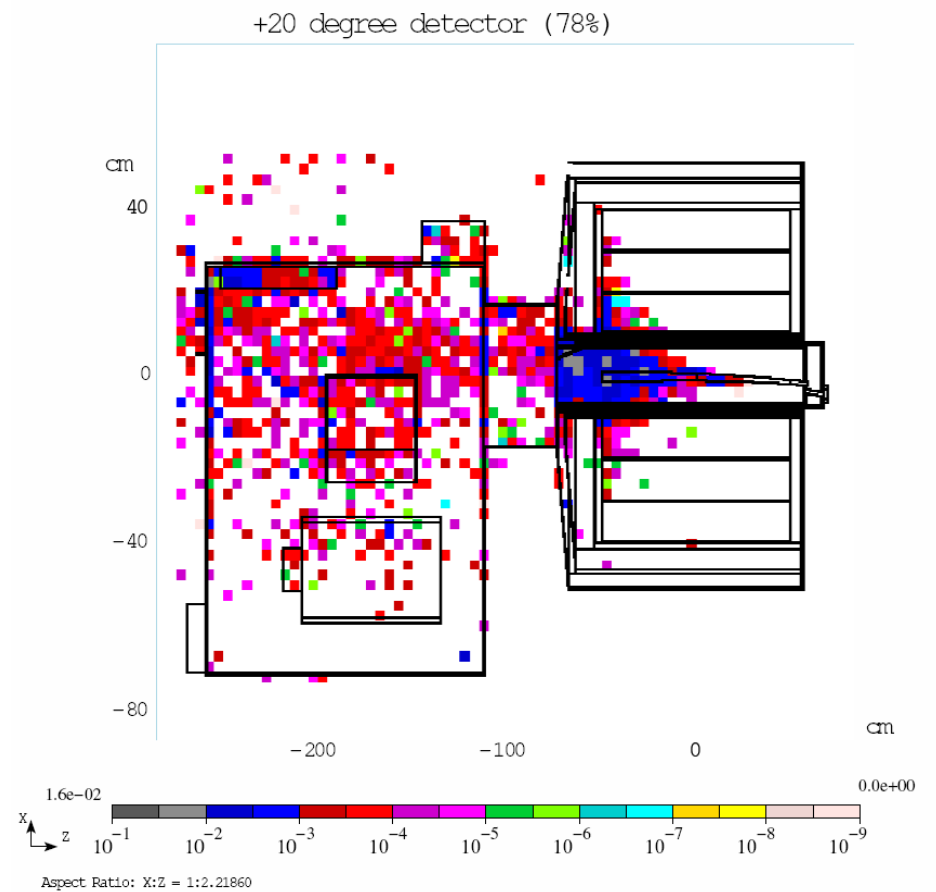
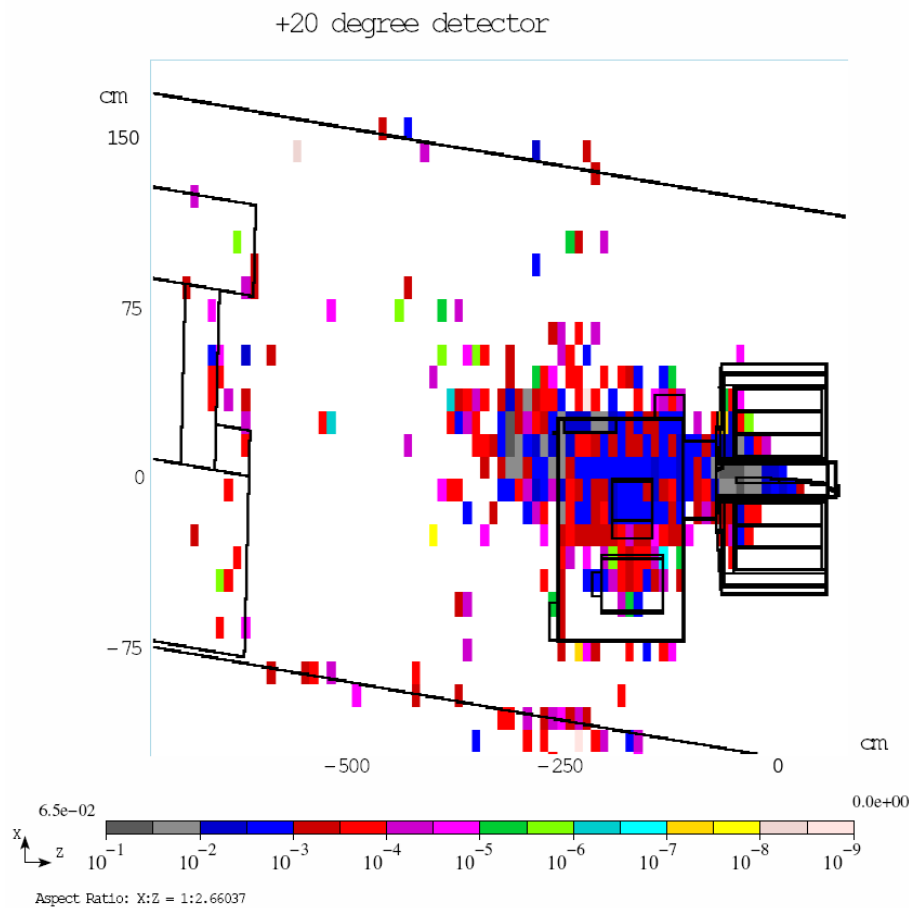
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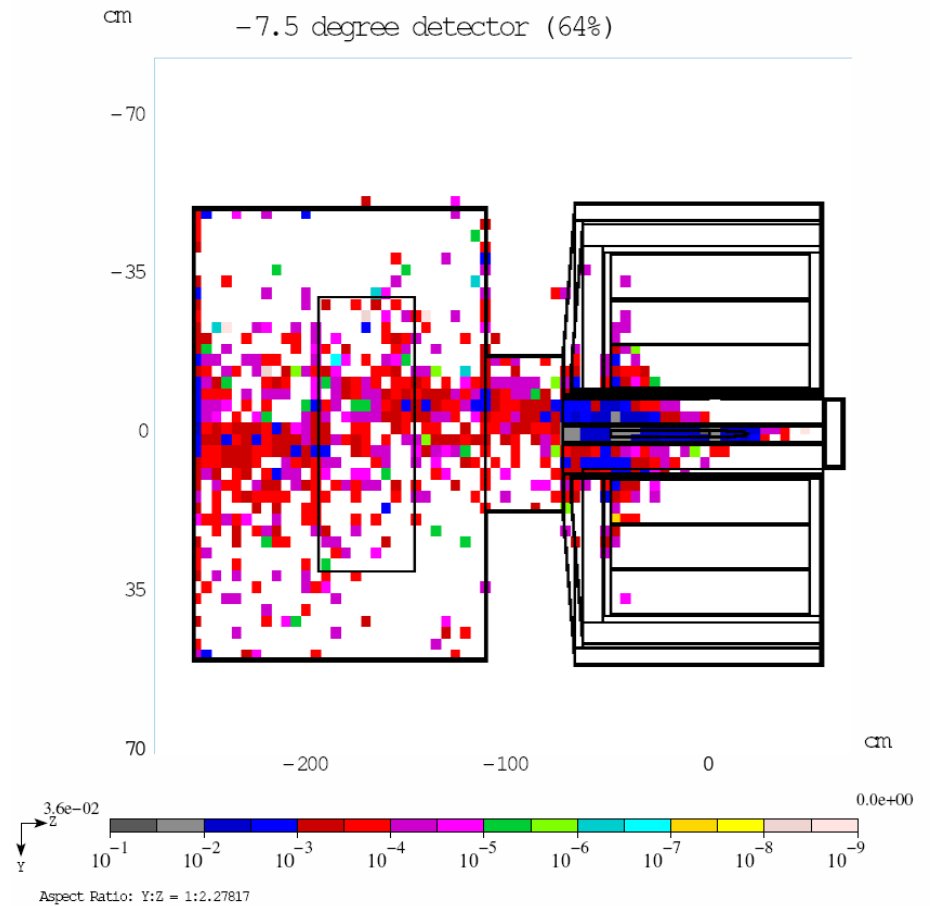
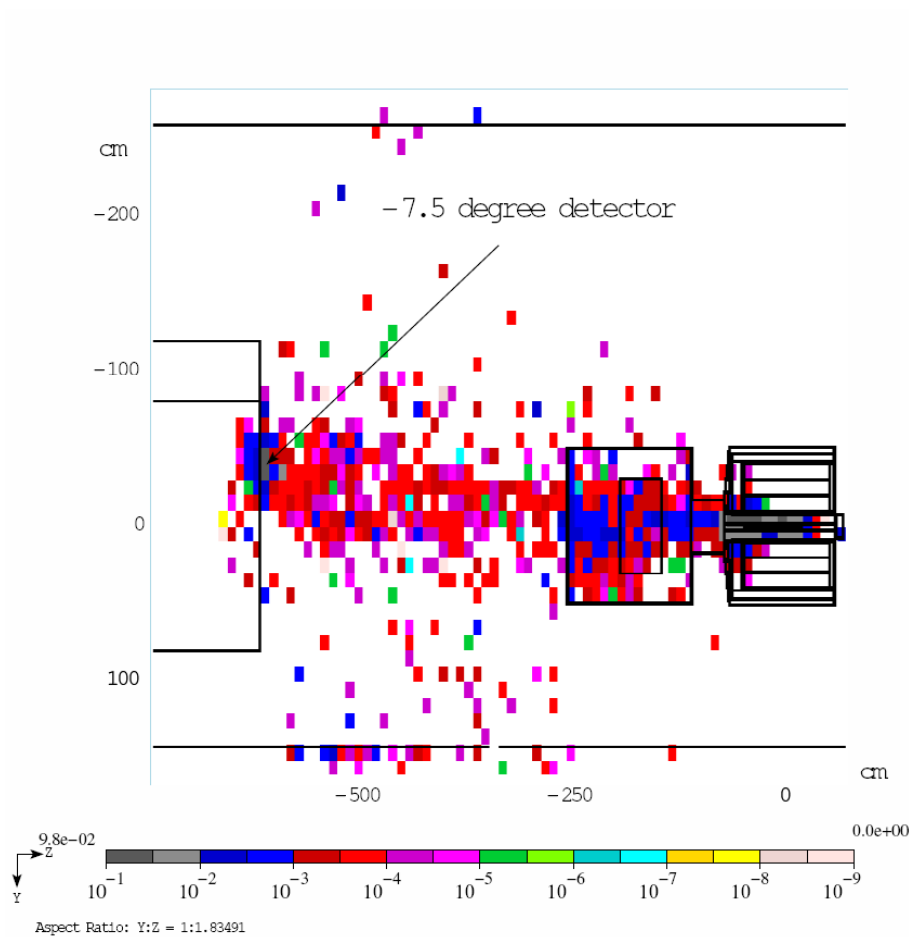
Probability to make energy deposition in 20 degree detector



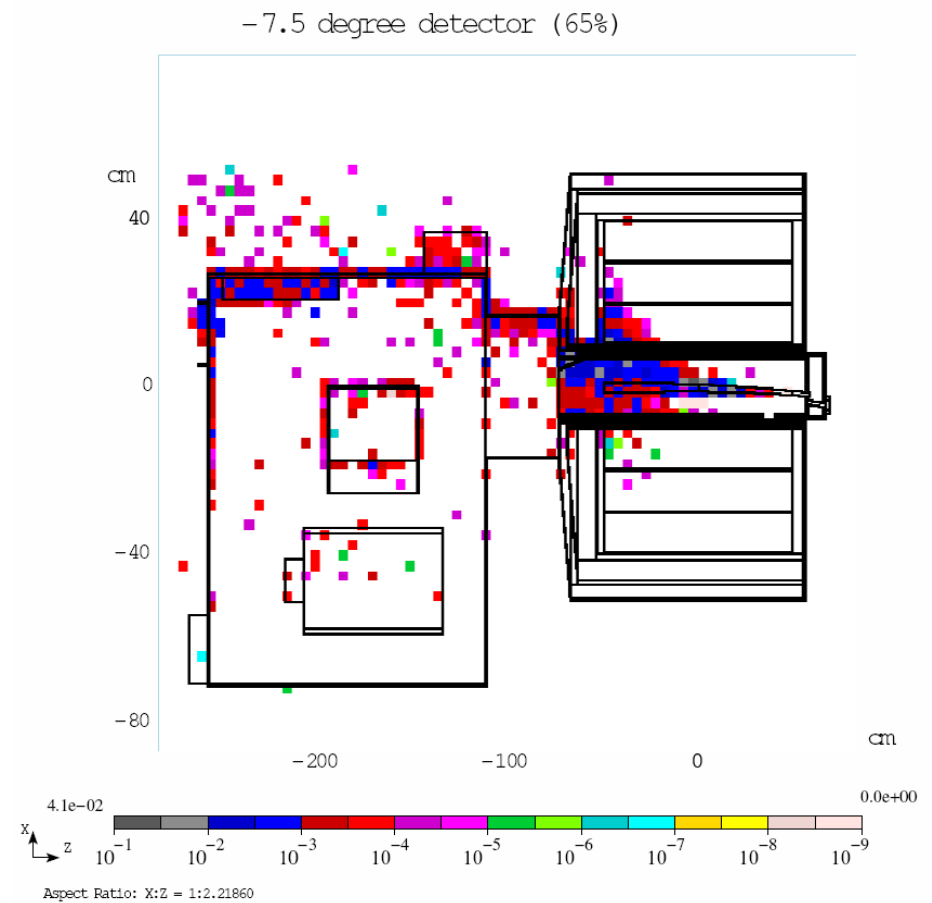
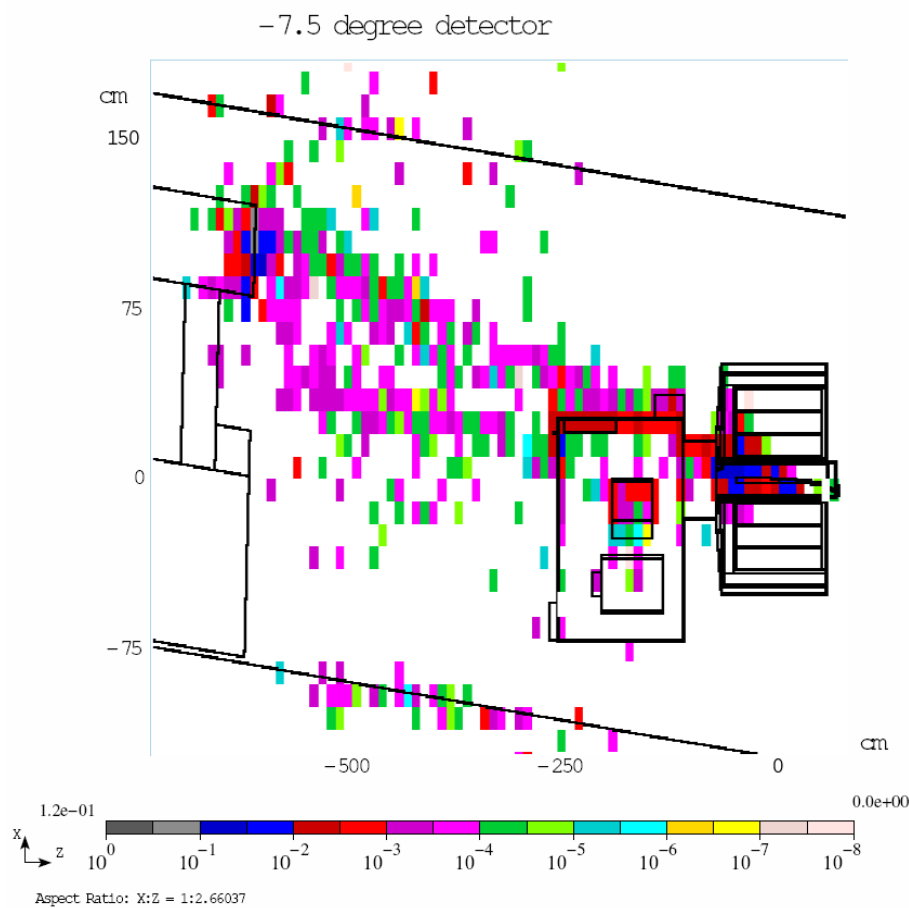
Probability to make energy deposition in 20 degree detector



Probability to make energy deposition in -7.5 degree detector



Probability to make energy deposition in -7.5 degree detector



Conclusion

- Very large number of primary protons on target ($1e8$) should be simulated to reach stable energy deposition in detectors
- In this case signal has weak dependence on detector&source size. Optimal detector size should be determine
- It is possible slightly simplify geometry description to speed up simulation (about 2 times)
- It is needed about 140h&24 CPU to get energy deposition in detectors for one beam intensity and one target type (elliptical, round ...).