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 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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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
Probability to make energy deposition in -20 degree detector
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 determined.

• 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 ...).