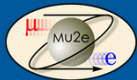


Update on Radiation Studies for MU2E-II (and MU2E)

S. E. Müller

Helmholtz-Zentrum Dresden-Rossendorf

MU2E-II workshop, April 28, 2021



DRESDEN
concept



hzdr

HELMHOLTZ
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Conveyor target simulations with Tungsten spheres

Vitaly provided the coordinates for 285 tungsten spheres for the conveyor target design. This has been implemented in MARS15, FLUKA(.org) and the MU2E Offline. Had to scale sphere radius to 6.3mm in FLUKA to avoid overlaps (and make HRS bore radius 25cm to fit it in).

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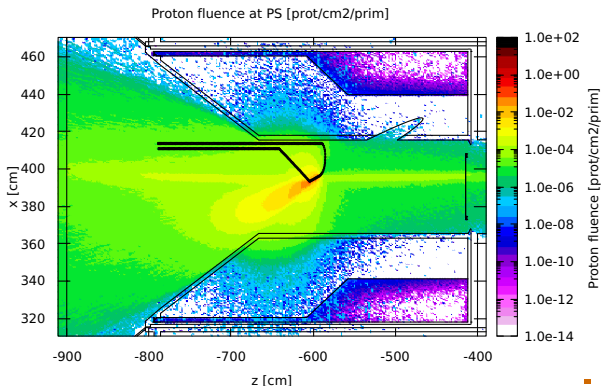
MARS geometry:



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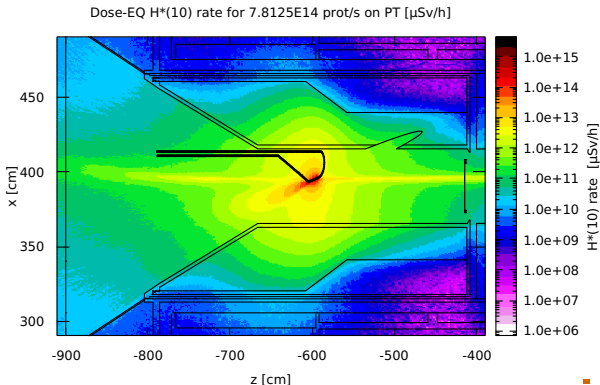
800 MeV protons on tungsten conveyor target: Proton fluence



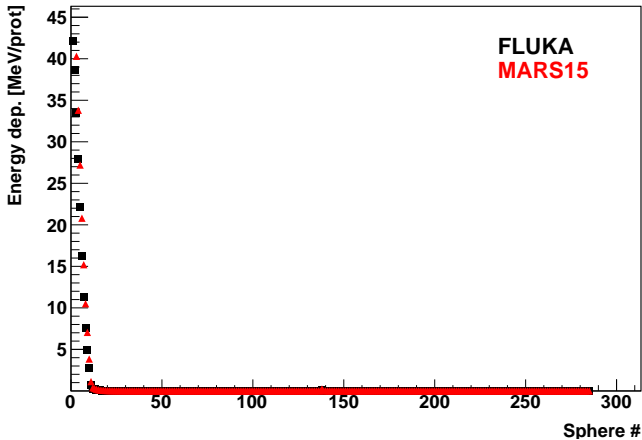
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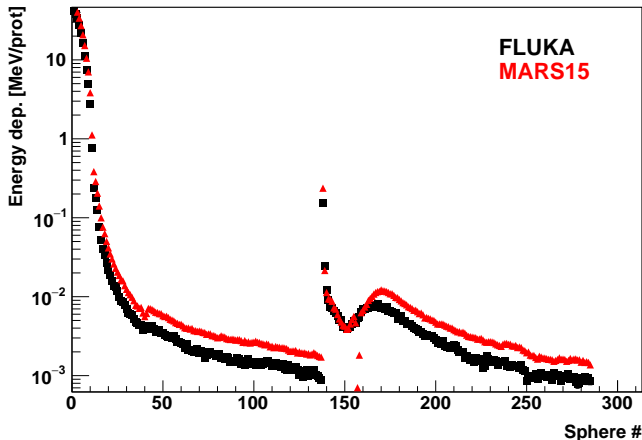
800 MeV protons on tungsten conveyor target: Dose-Rate



Energy deposition for 285 balls from FLUKA and MARS



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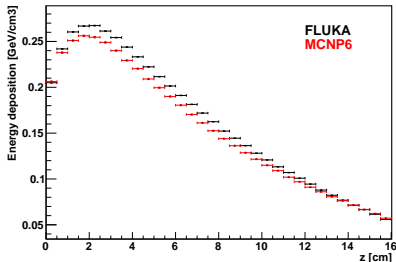
MU2E cylindrical tungsten target comparisons

A problem in the position sampling of primary protons was cured in FLUKA (which resulted in a narrower beam than expected). Comparison between FLUKA and MCNP6 simulations:

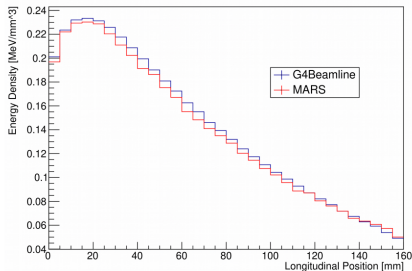
Longitudinal energy deposition along PT (to be compared with docdb-26811):

Longitudinal energy density

Energy deposition along z-axis



G4Beamline Longitudinal Energy Density Profile



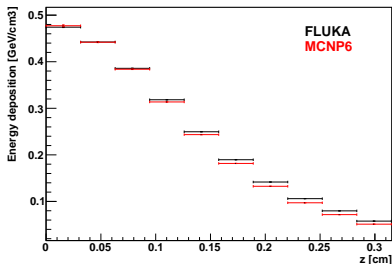
MARS15 and G4Beamline lower in peak values (different thresholds?)

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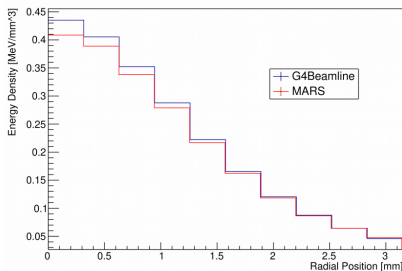
Radial energy deposition along PT (to be compared with docdb-26811):

Energy deposition along z-axis



Radial energy density

G4Beamline Radial Energy Density Profile



MARS15 and G4Beamline lower in peak values (different thresholds?)

Conclusions and Outlook

- Conveyor target with 285 tungsten balls has been implemented in MARS15, FLUKA(.org) and MU2E offline
- Comparison between MARS15, FLUKA, MCNP6 and Offline (or G4beamline) results ongoing
 - First energy deposition comparison in 285 conveyor target spheres with MARS15 and FLUKA
 - Energy deposition in MU2E cylindrical tungsten target comparison between FLUKA and MCNP6.
- Following a remark from last time, I also evaluated the charged kaon yields for the cylindrical tungsten target (using the kaon capture model in FLUKA's development version)
 - K^- -yield per proton (up to 100 MeV): $2.565 \times 10^{-4} \pm 1.3 \times 10^{-5}$
 - K^+ -yield per proton (up to 100 MeV): $5.560 \times 10^{-3} \pm 5.6 \times 10^{-5}$