

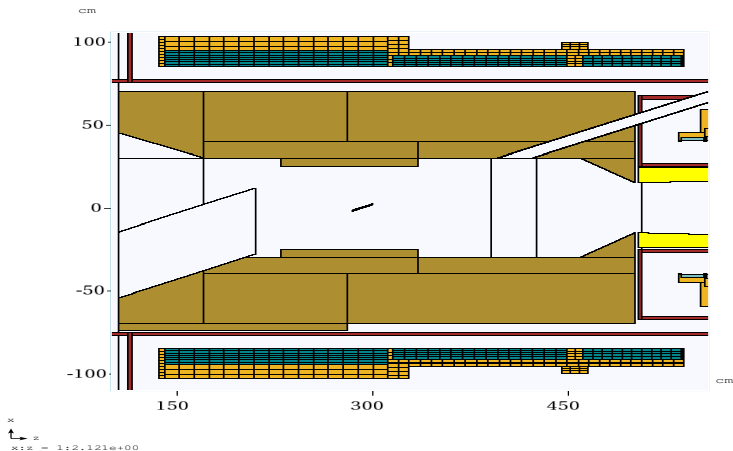
Status of Production Target simulations for Mu2e II

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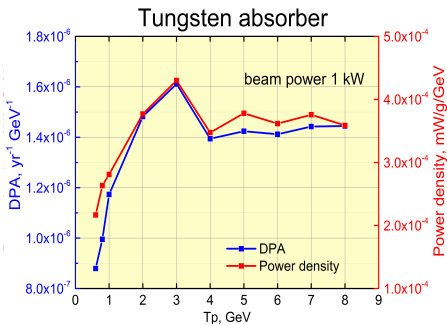
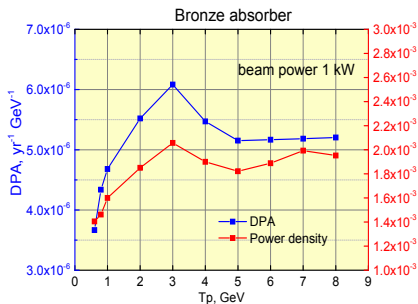


Snowmass 2013 (remotely)



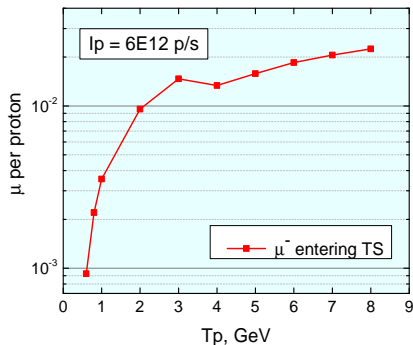
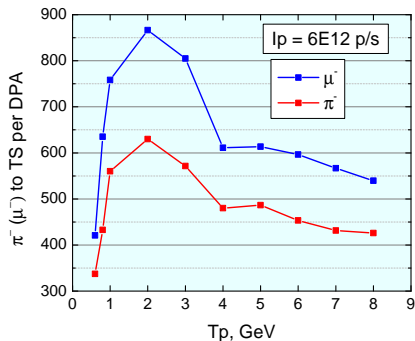
- DPA and power density as functions of beam energy and HRS material
- Muon yield as a function of beam energy
- Figure of merit (muon yield per radiation damage)

DPA and power density vs beam energy at 1 kW

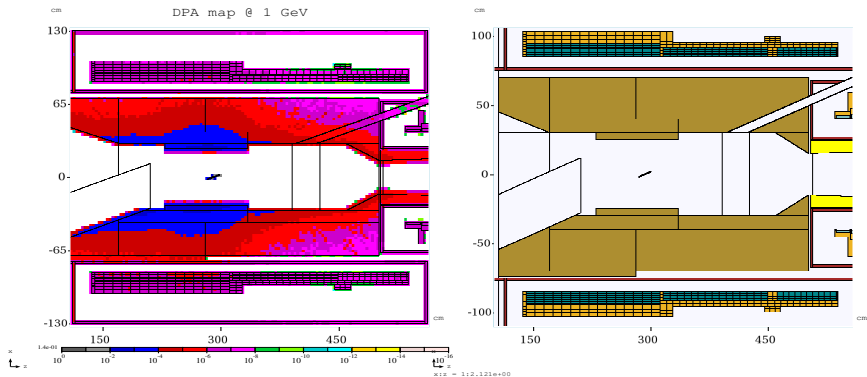


- Damage at 3 GeV beam energy is worst but overall variation is 50%.
- Tungsten is almost a factor of 3 better than bronze.
- Minimum is at 0.5 - 1 GeV.
- At 100 kW the peak DPA is a factor of 4 higher than the requirement.

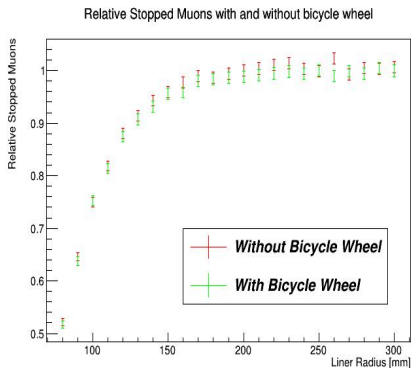
π^- and μ^- yields at constant beam intensity



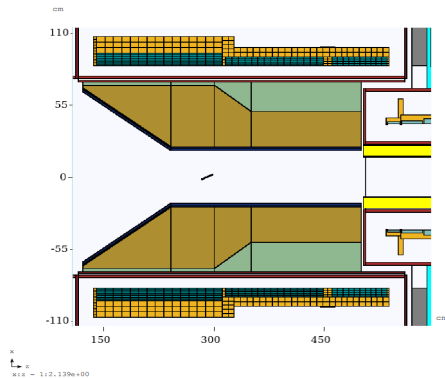
- Constant beam intensity (not power) = $6 \cdot 10^{12}$ p/s.
- Yields per damage unit drop with beam energy.
- Highest rise in μ^- yields is between 0.5 and 2 GeV.



- inner bore shape may affect muon yield
- decrease from 25 to 20 cm was estimated to reduce μ -yield by $\approx 8\%$.
- DPA drops in the tungsten absorber at 1 GeV protons (W target) by a factor of ≈ 4 each ≈ 9 cm of thickness

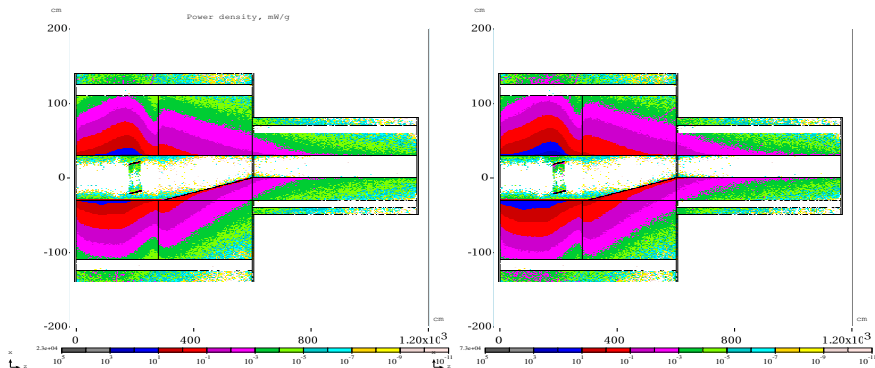


- Mu2e-DocDB-3165, K. Lynch and J. Popp
- Muon yields with liner radius



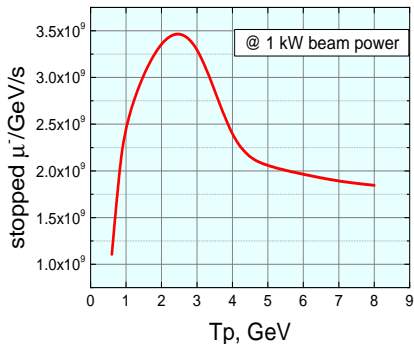
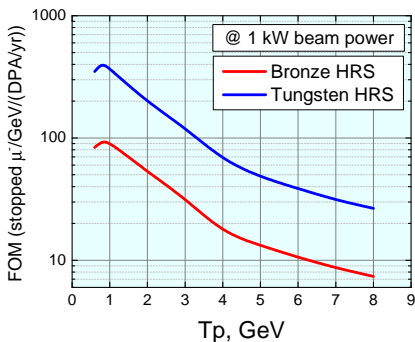
- inner bore 20 cm
- no yield drop down to ≈ 17 cm

Carbon target model at 0.3 and 1 MW



- Beam energy 1 GeV, carbon target.
- Radiation quantities drop with the same rate as w/W target.
- Required a 90 cm HRS radius.

Figure of merit and stopped muon yield



- G4beamline acceptance functions were used with MARS15 for both μ^- and π^- .
- π^-/μ^- ratios are different for MARS15 and G4beamline (GEANT4).
- At some point yields need to be compared (uncertainty).



- Optimal μ^- stopping rate is at 2 - 3 GeV proton beam.
- Optimal μ^- stopping rate per DPA is at 1 GeV.
- Highest radiation damage is at 3 GeV (at constant beam power).
- Radiation damage varies between 1 and 8 GeV by $\sim 50\%$.
- For tungsten absorber at 100 kW :
 - peak DPA is $1.6 \cdot 10^{-4}$ (limit $4 \cdot 10^{-5} \text{yr}^{-1}$),
 - peak power density is $4.2 \cdot 10^{-2}$ (limit $3 \cdot 10^{-2} \text{ mW/g}$).
- Decreasing the HRS inner bore can mitigate much of the difference.
- Tungsten target requires less shielding than carbon.
- More optimization work is needed taking the muon yield into account.
- On-line RRR monitoring during Mu2e I run will help setting limits.