Dispersion Suppressor Protection

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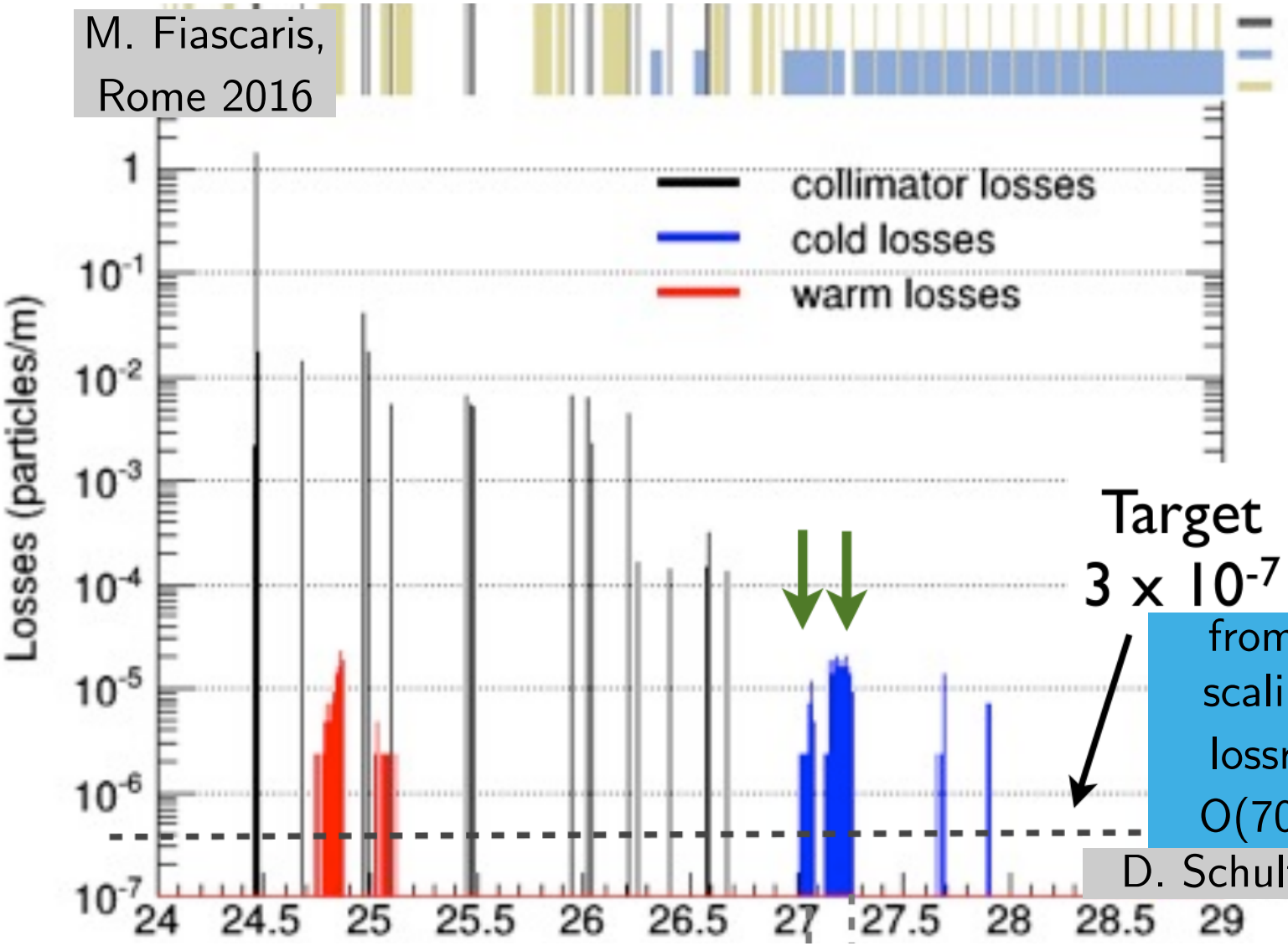
Why is Protection necessary?



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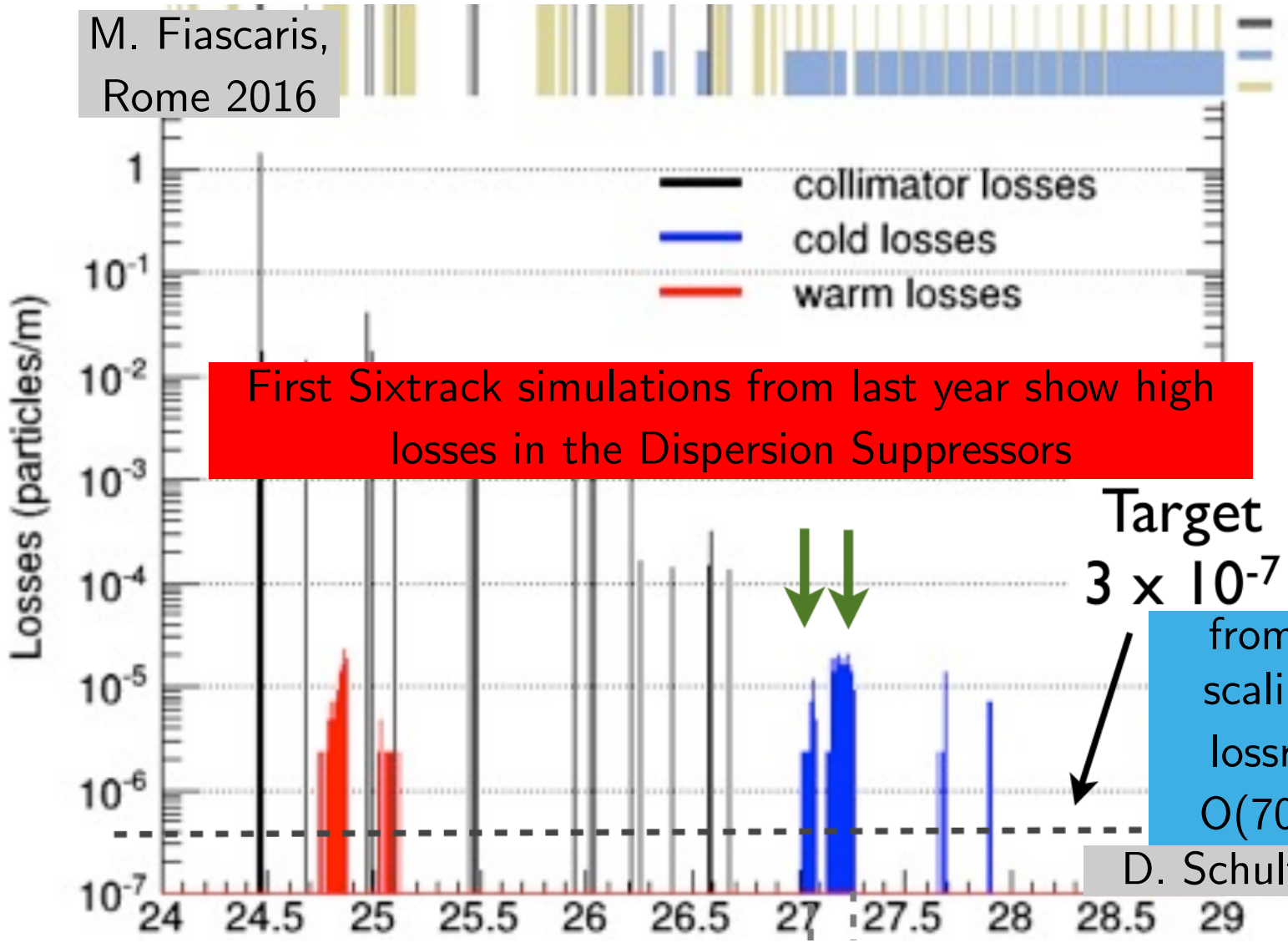
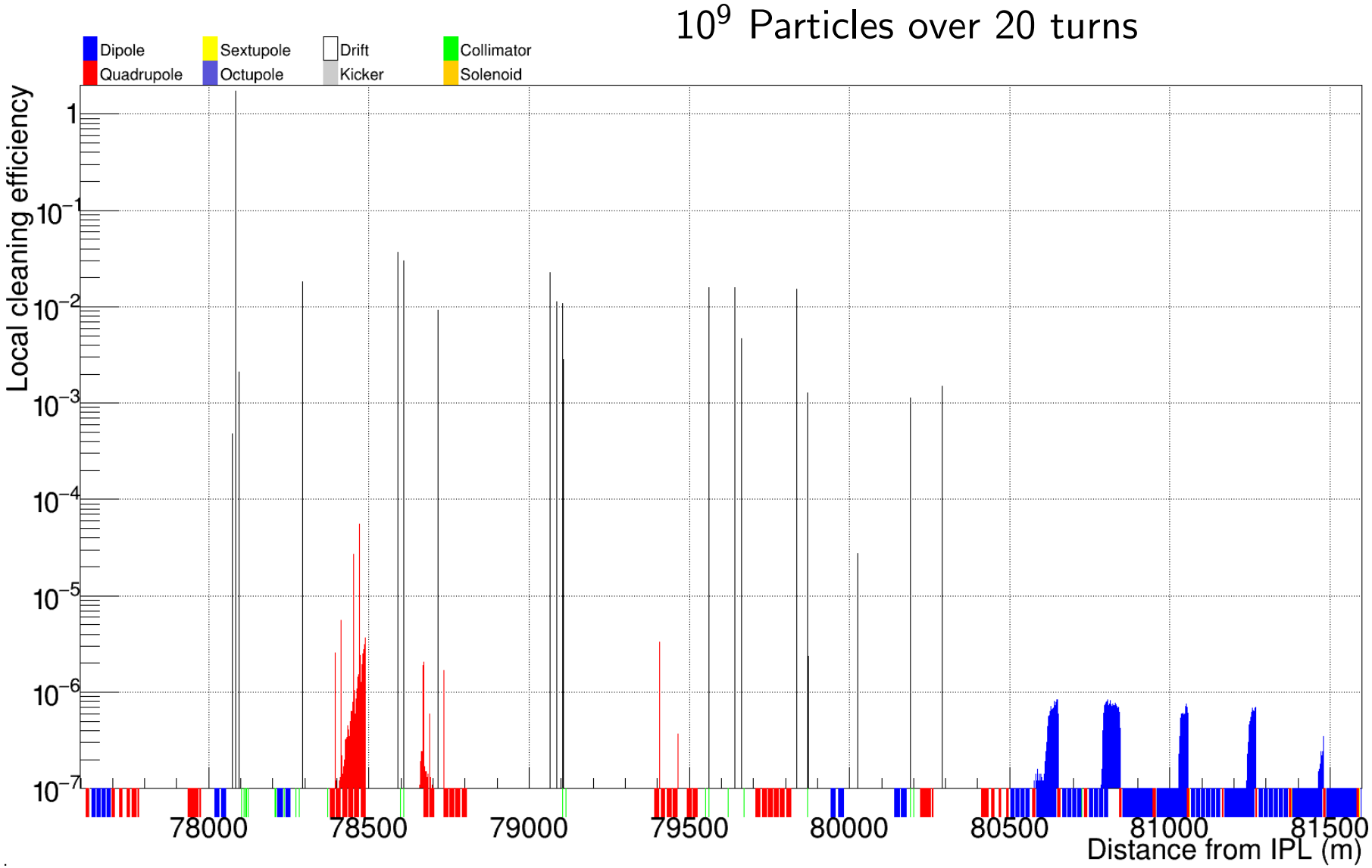


Lossmaps with Merlin

- Lattice and Optics have changed
- Merlin uses a different scattering model for single diffractive processes than Sixtrack
  - The model in Sixtrack has been updated
  - differences in DS losses are now in the order of a factor 2 (James Molson IPAC17)

Lossmaps with Merlin



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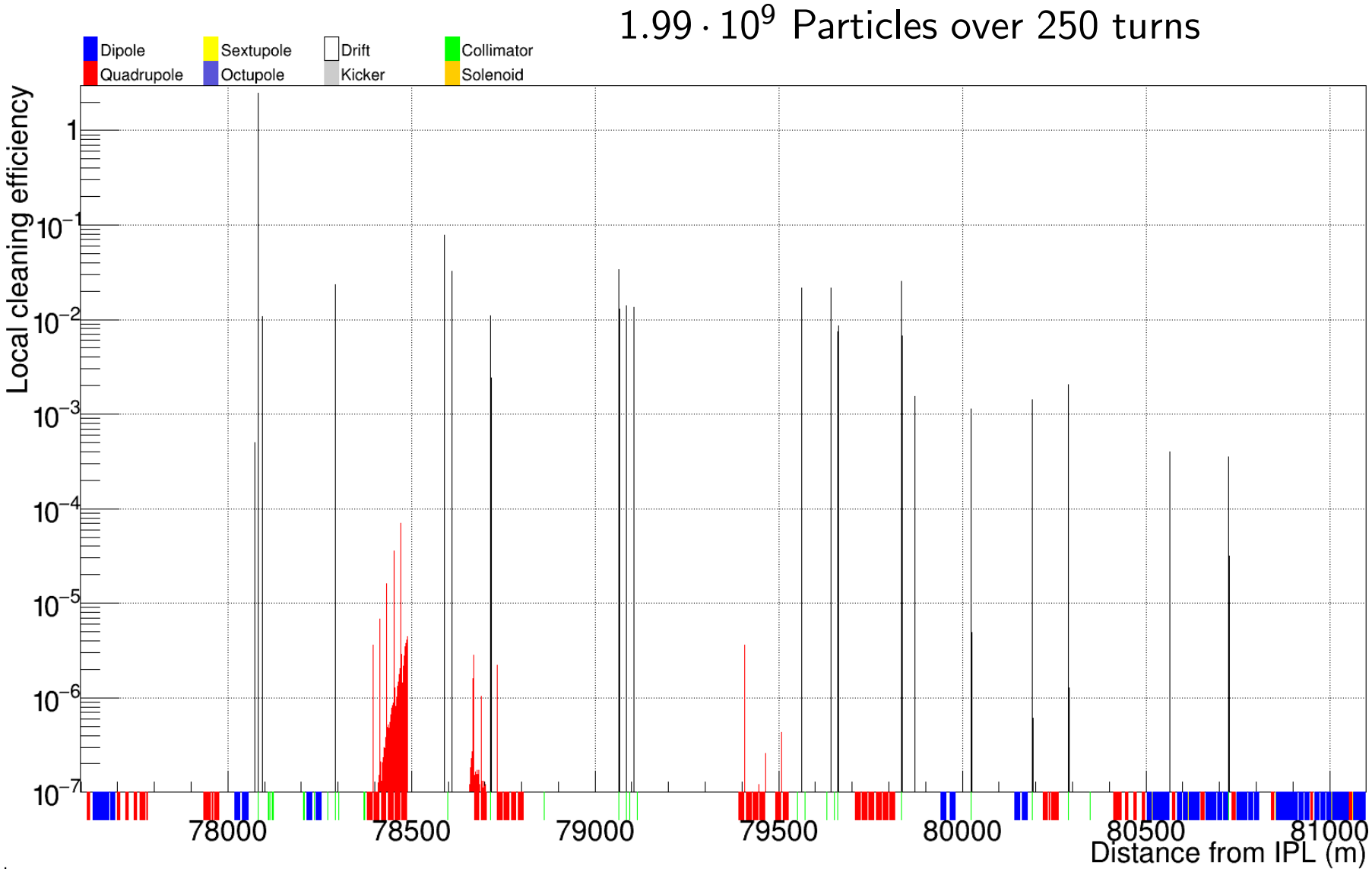

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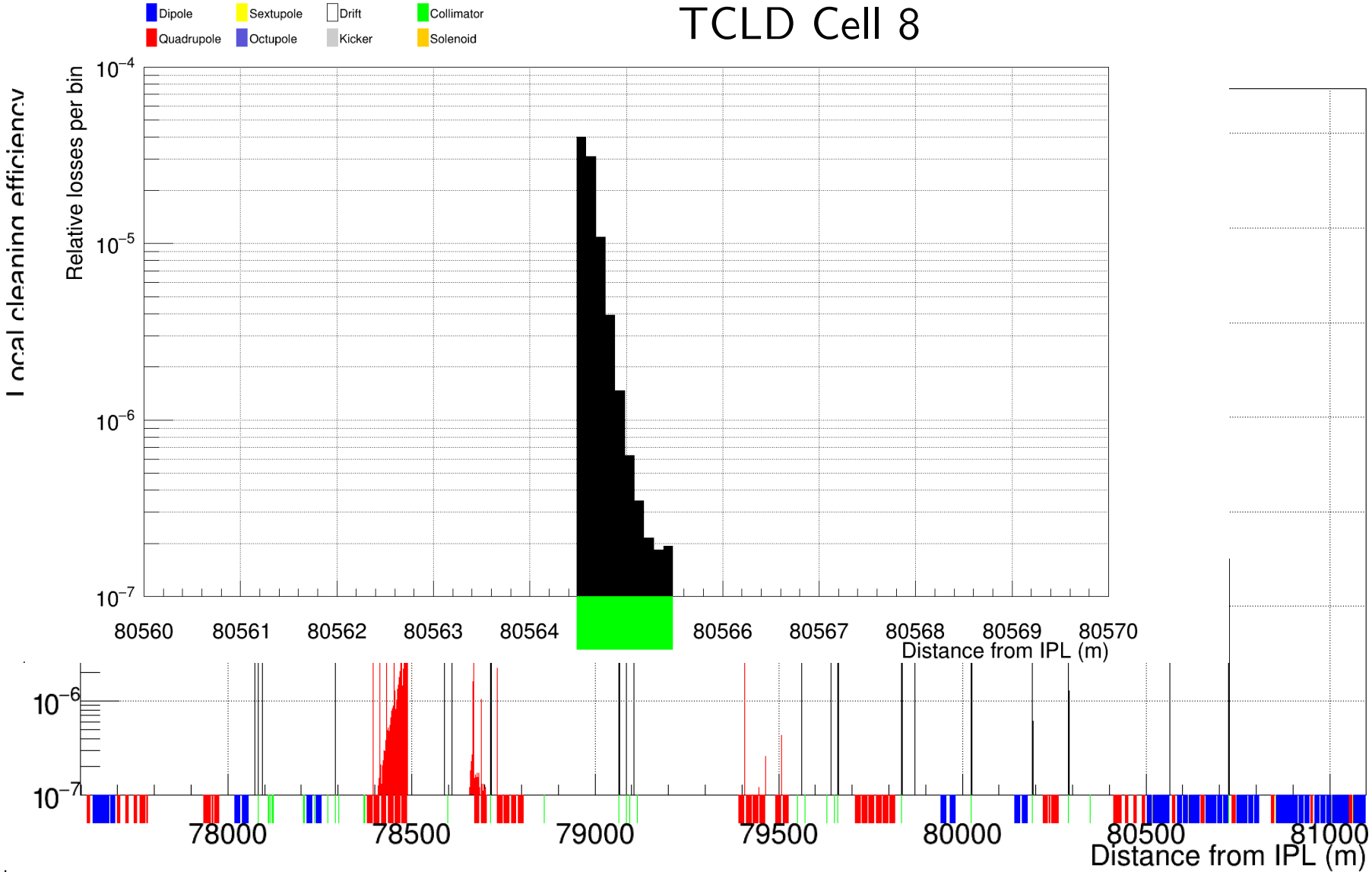

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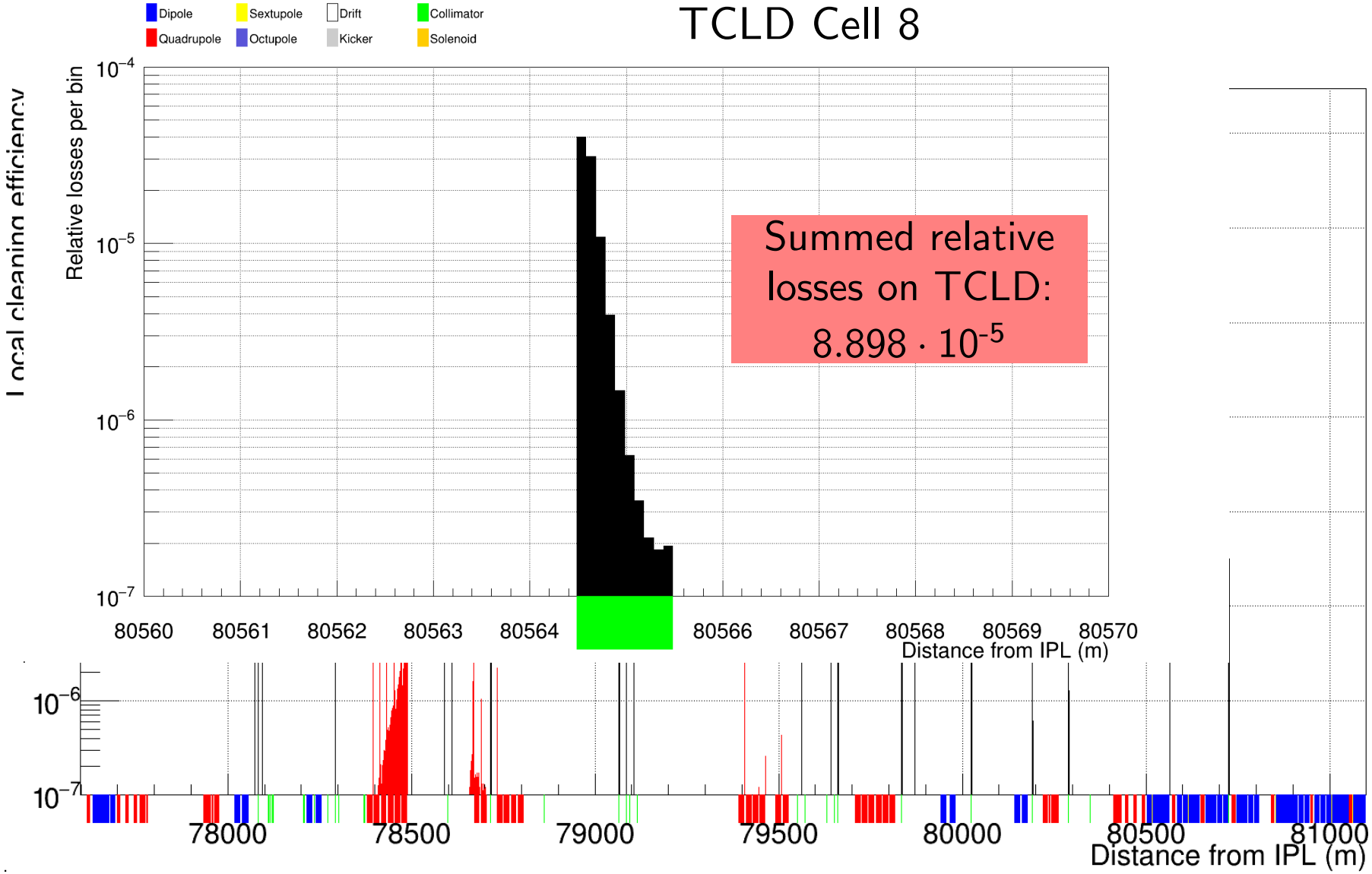

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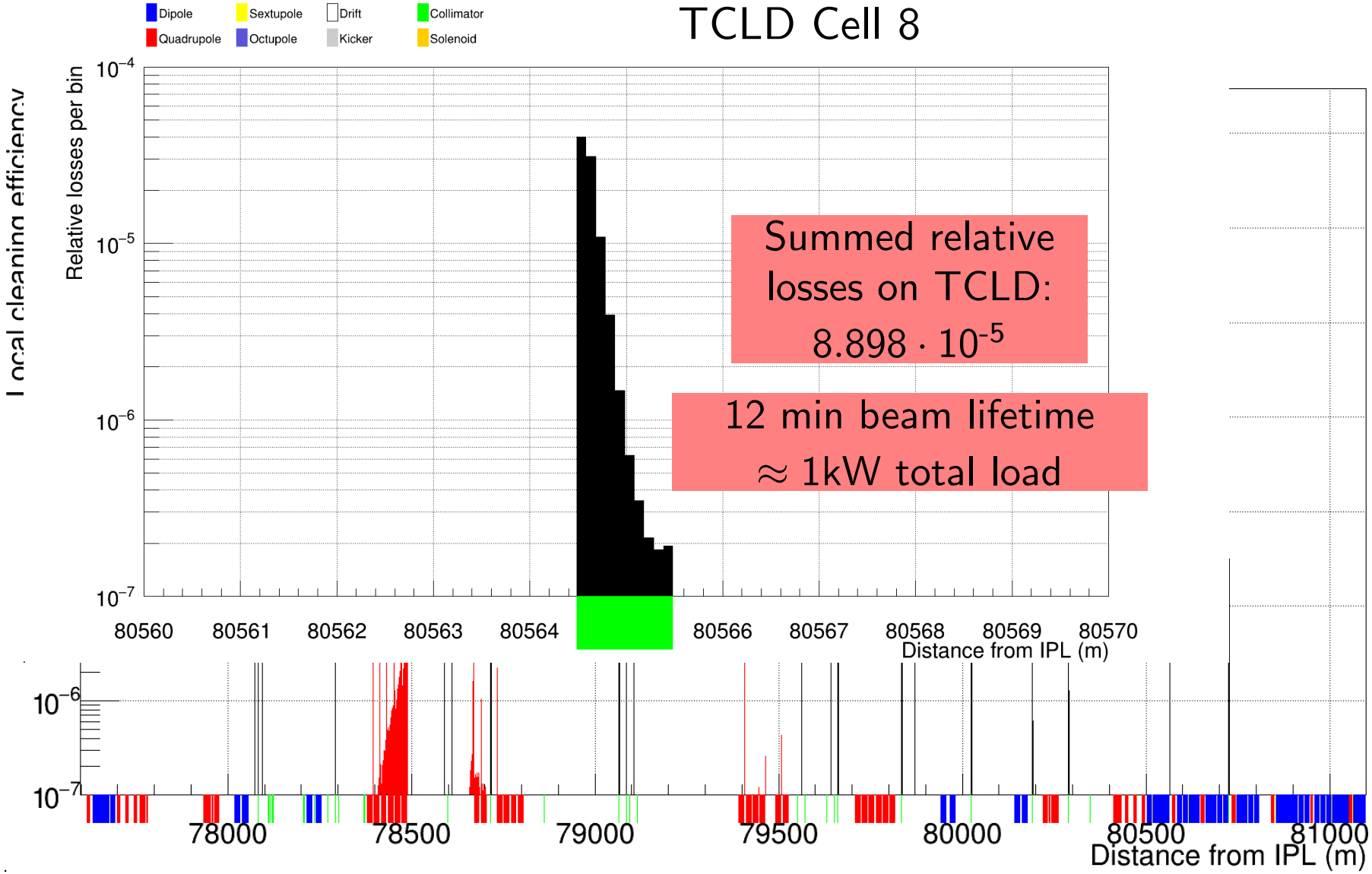
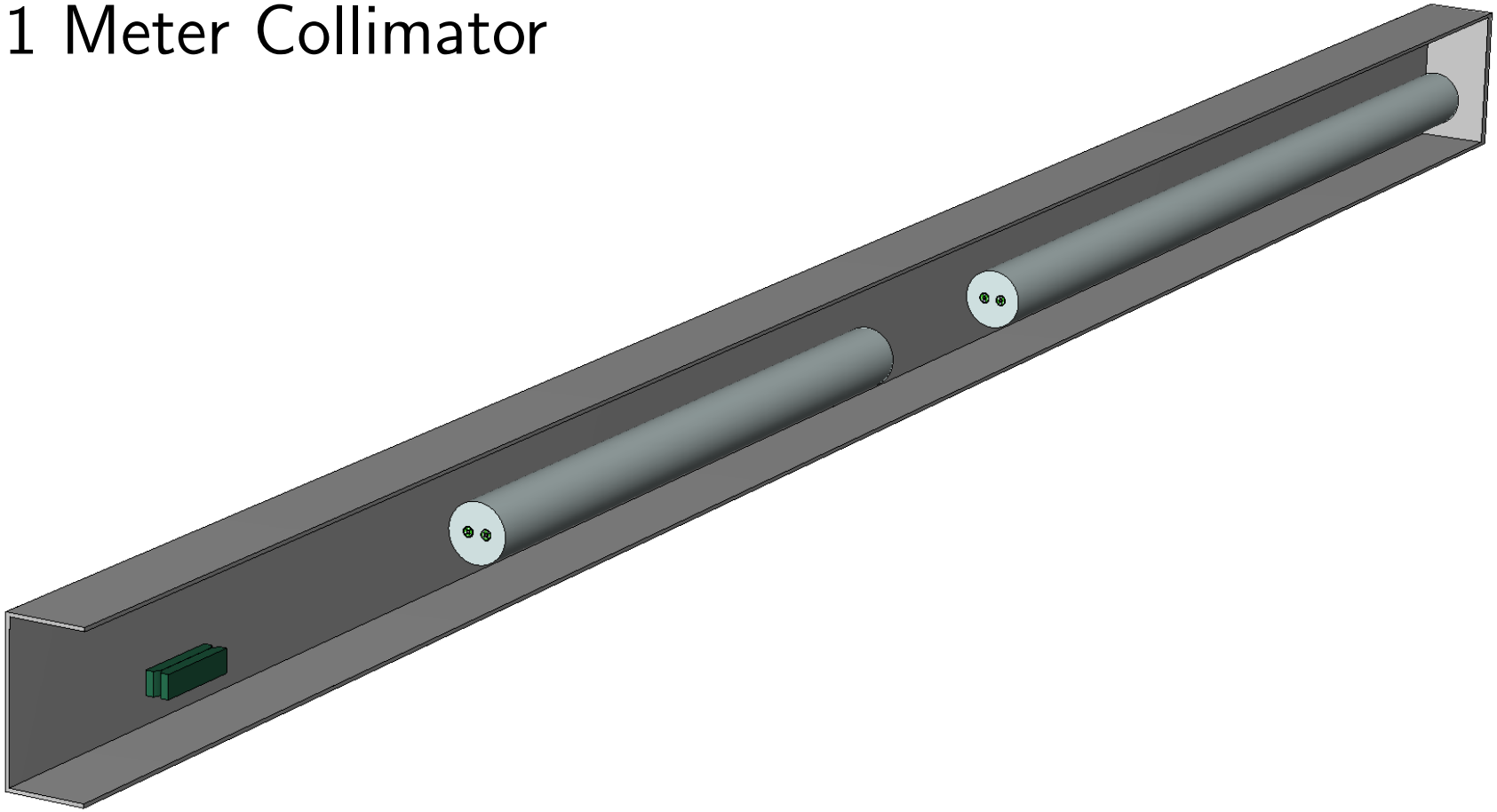


Geometry for FLUKA simulations

1 Meter Collimator



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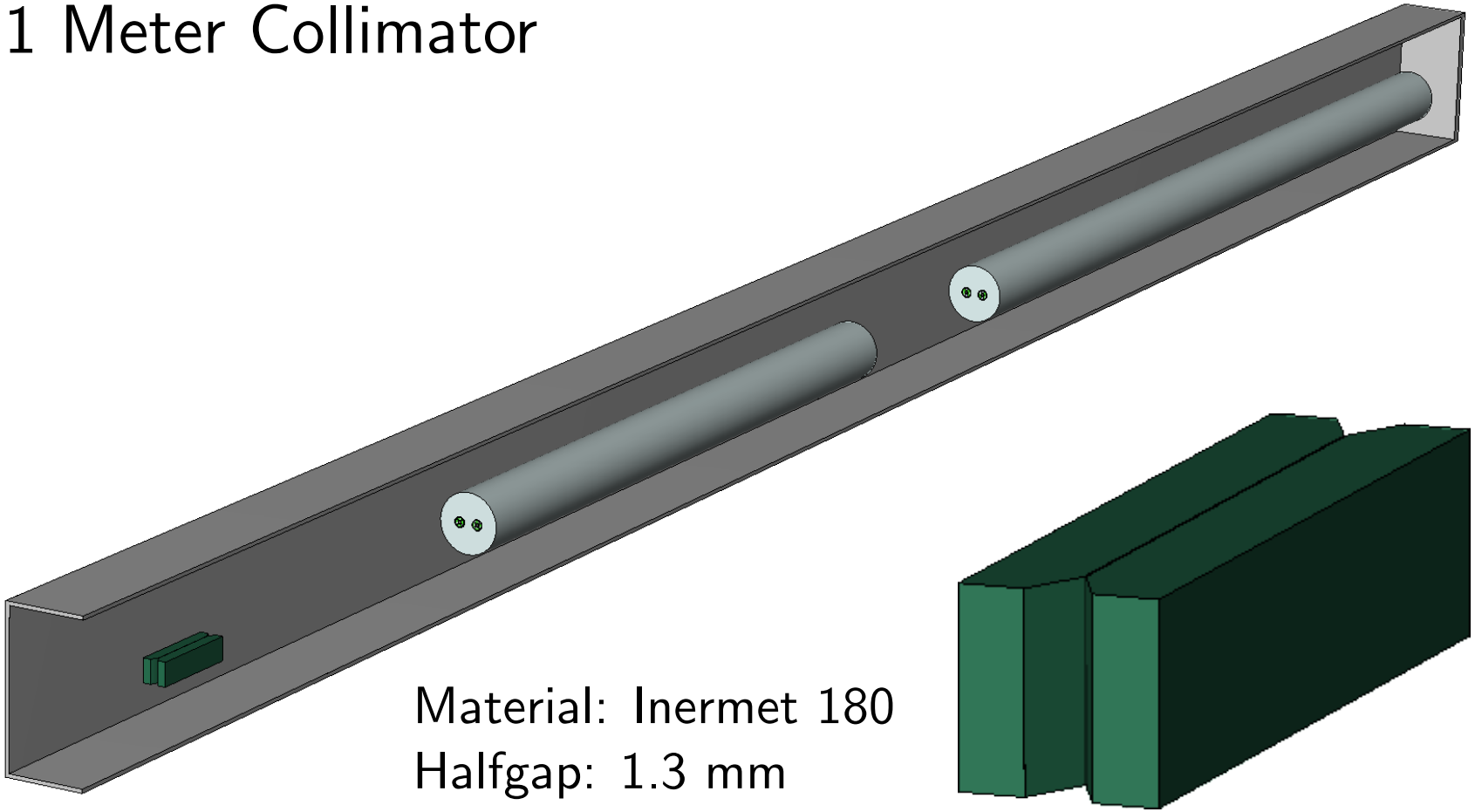
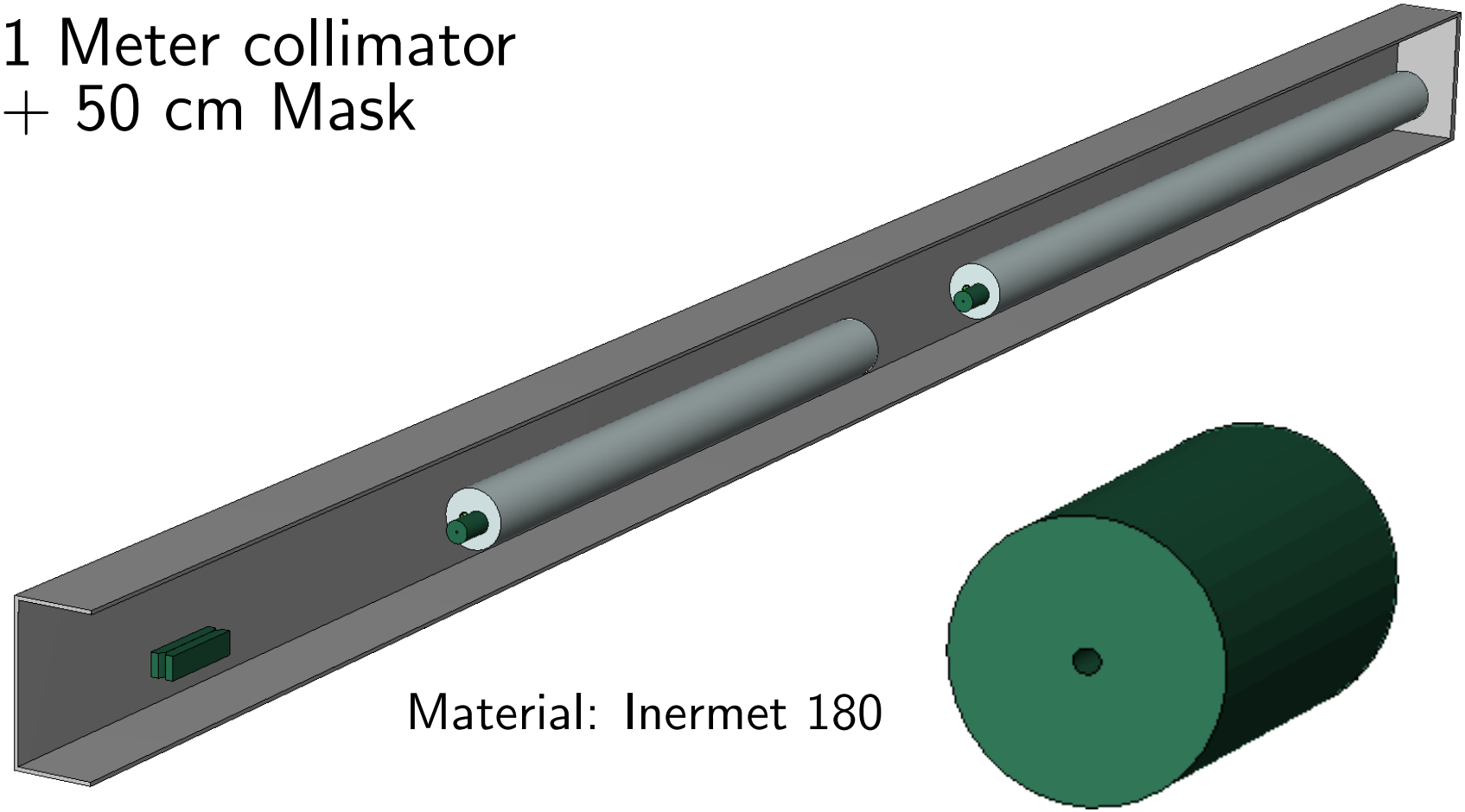


Material: Inermet 180
Halfgap: 1.3 mm

Geometry for FLUKA simulations

1 Meter collimator
+ 50 cm Mask



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Geometry for FLUKA simulations

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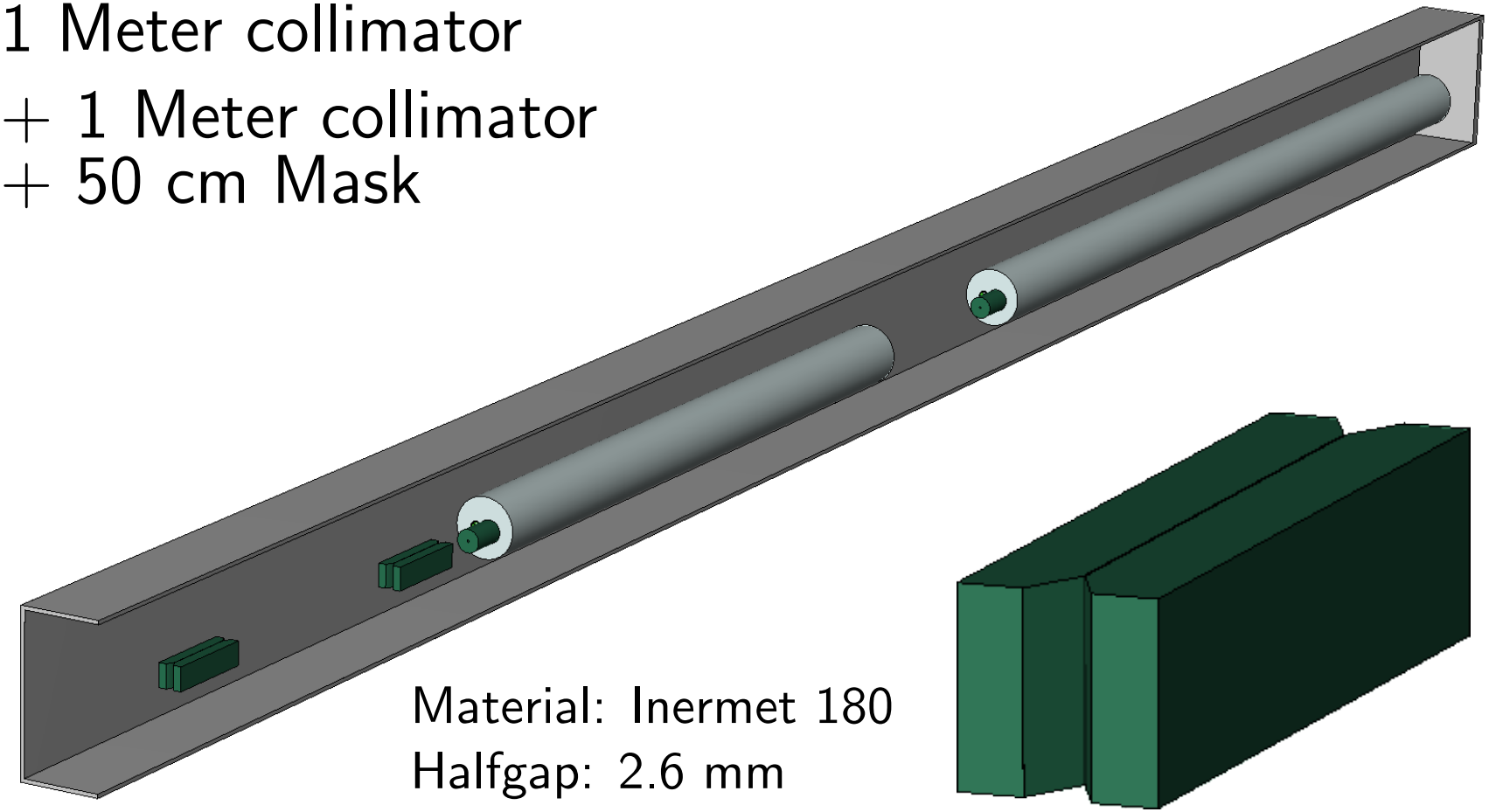
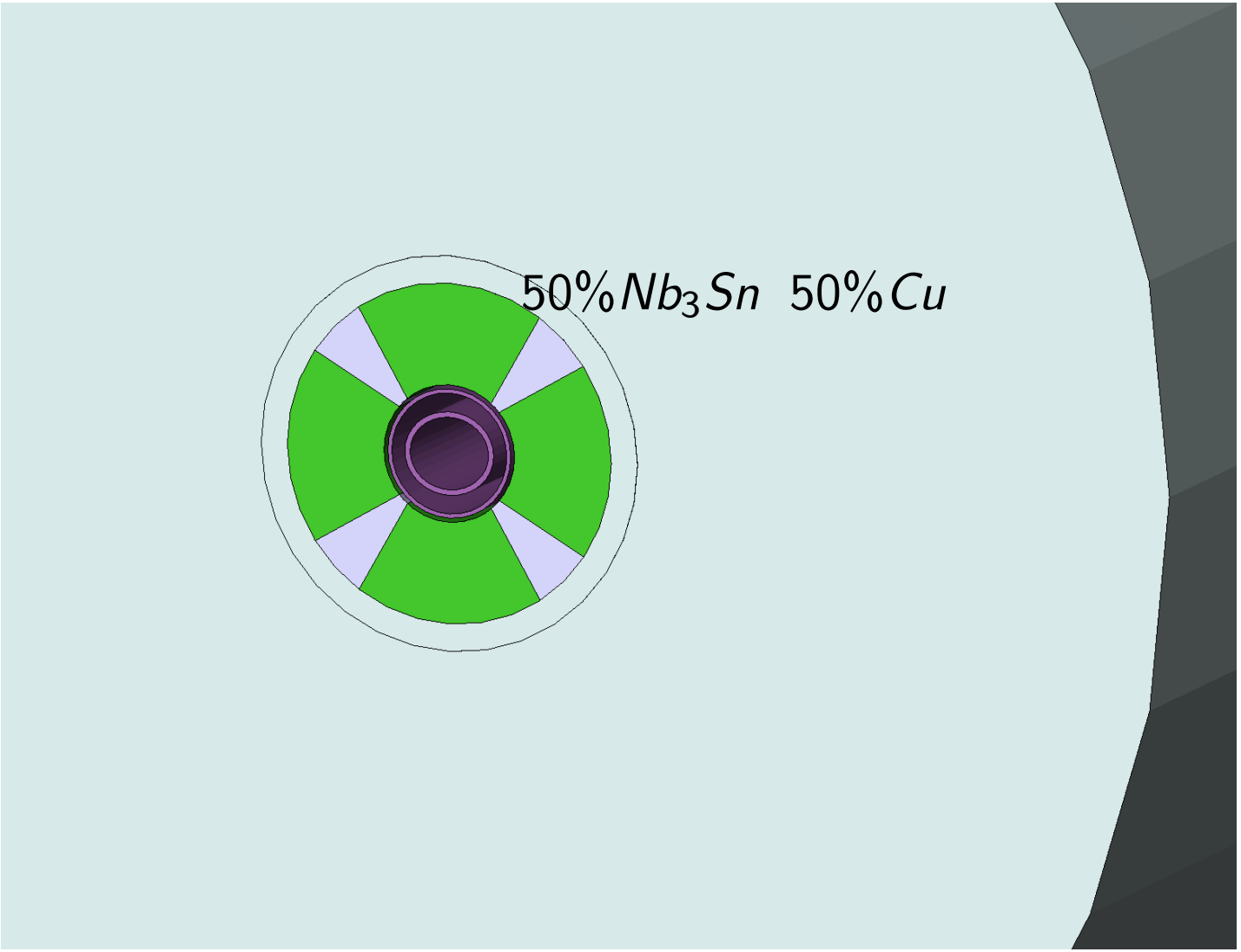


Material: Inermet 180
Halfgap: 2.6 mm

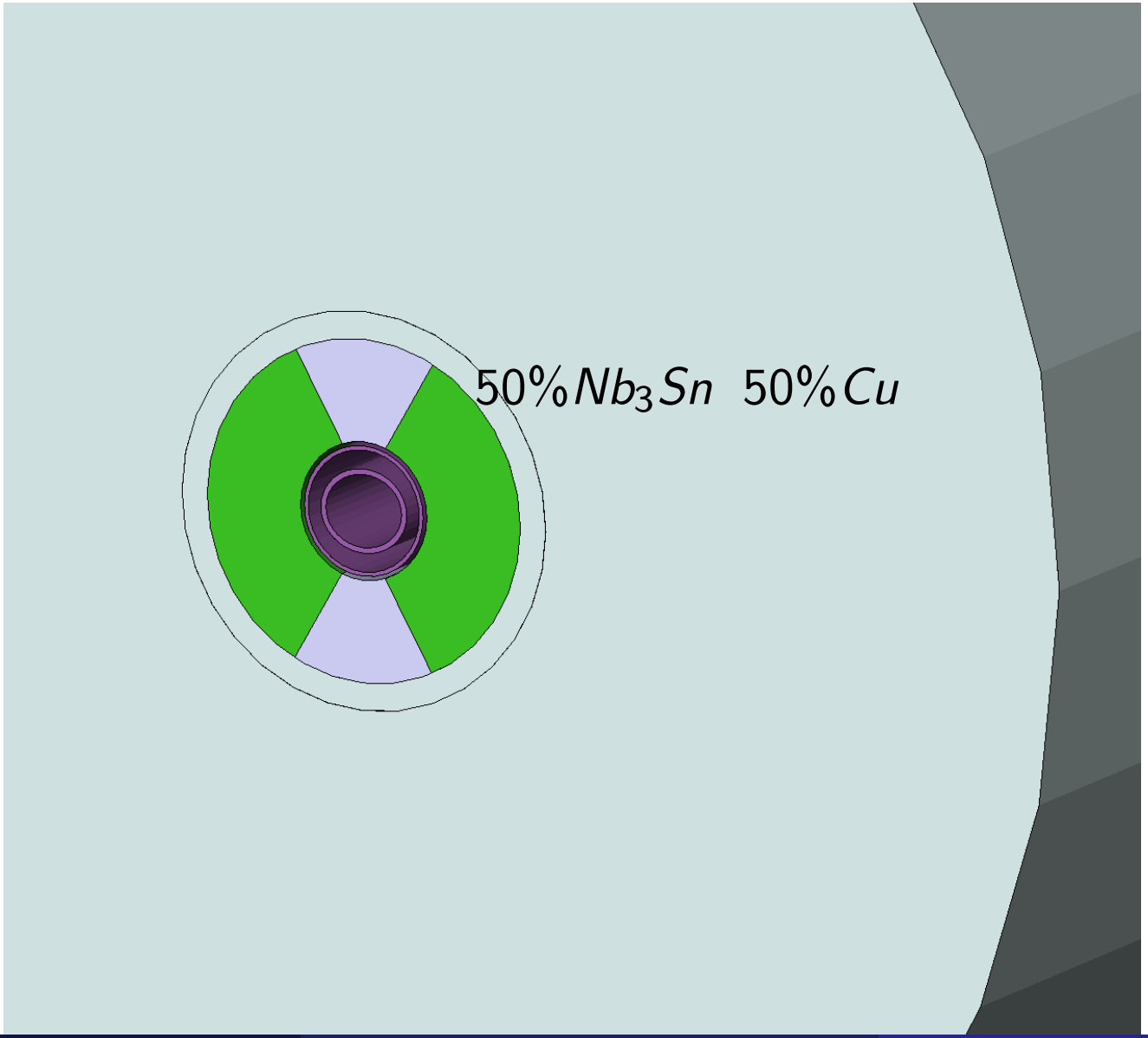
Geometry for FLUKA simulations - Magnets

Simplified MQ coil model (based on P. Vedrine, Rome 2016)



Geometry for FLUKA simulations - Magnets

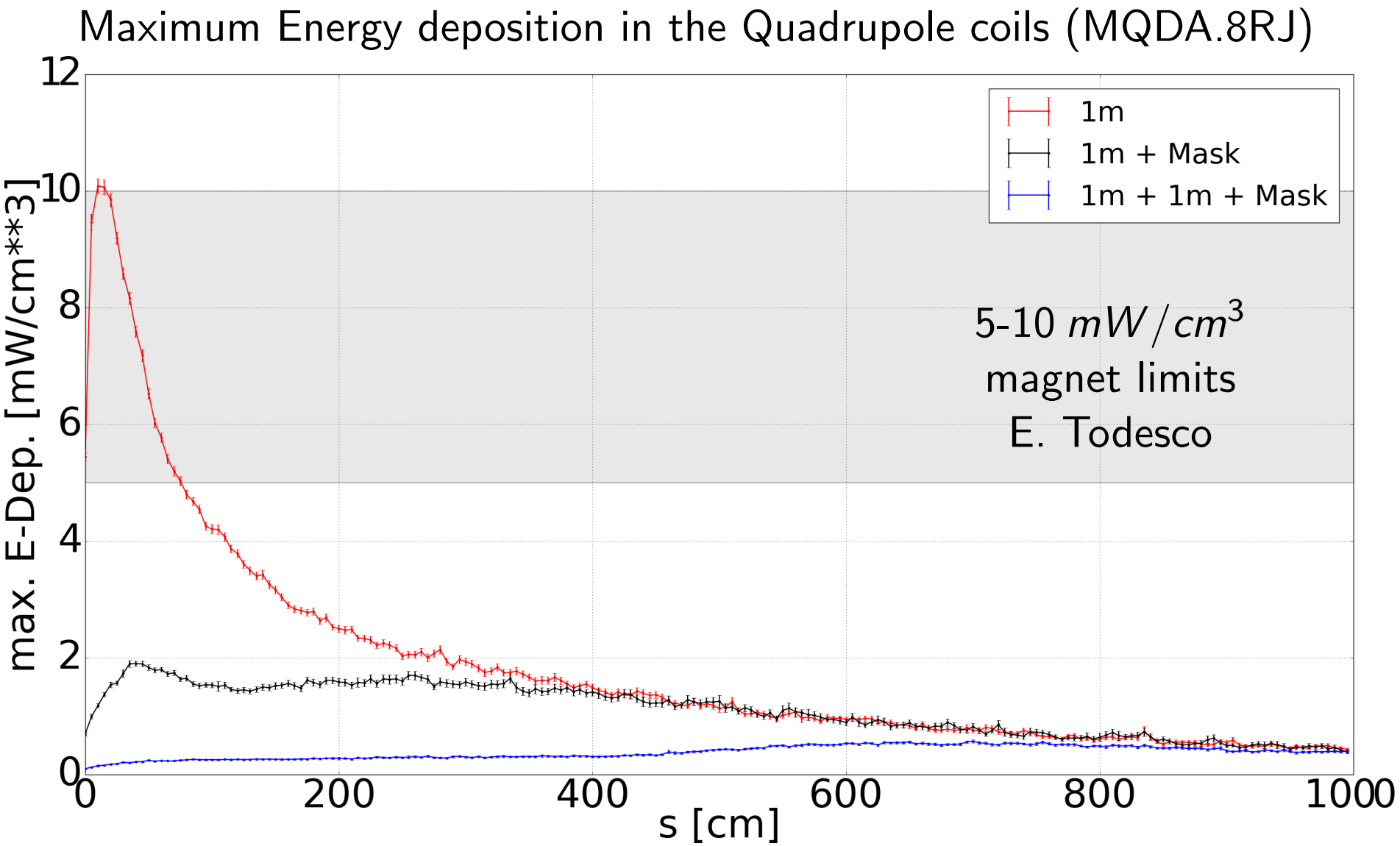
Simplified MB coil model (based on V. Marinozzi, Rome 2016)



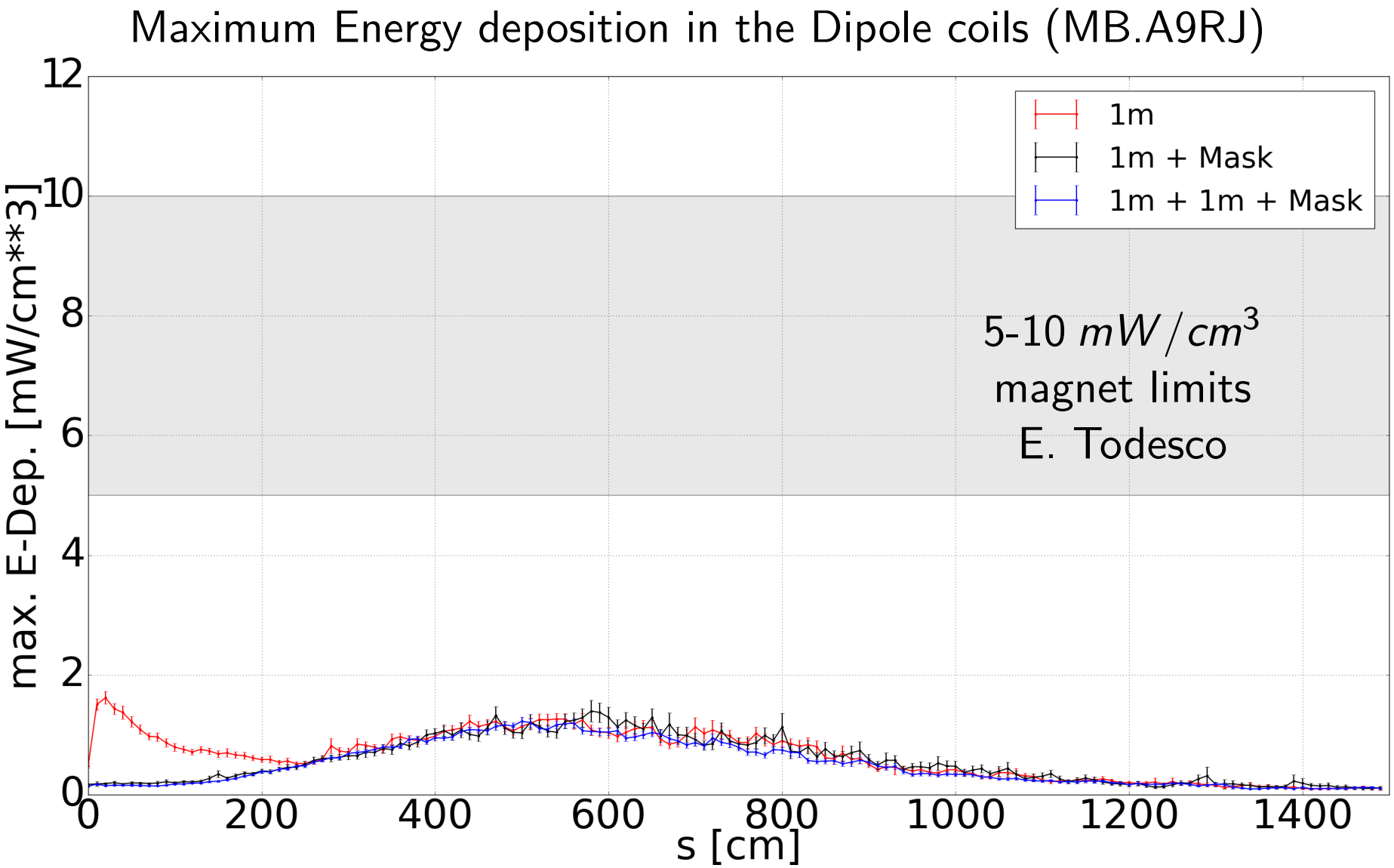
FLUKA simulations

- Input distribution is generated from Merlin tracking
  - Every turn the whole bunch is recorded before the collimator.
  - Particles which hit the collimator are selected.
  - This distribution is loaded into FLUKA and particles are randomly selected from it.
- Energy deposition is scored in a meshgrid of bins.
  - Scoring in the coils with 0.5 cm radial, 2° angular and 5 - 10 cm longitudinal binning.

Energy Deposition - Quadrupole



Energy Deposition - Dipole

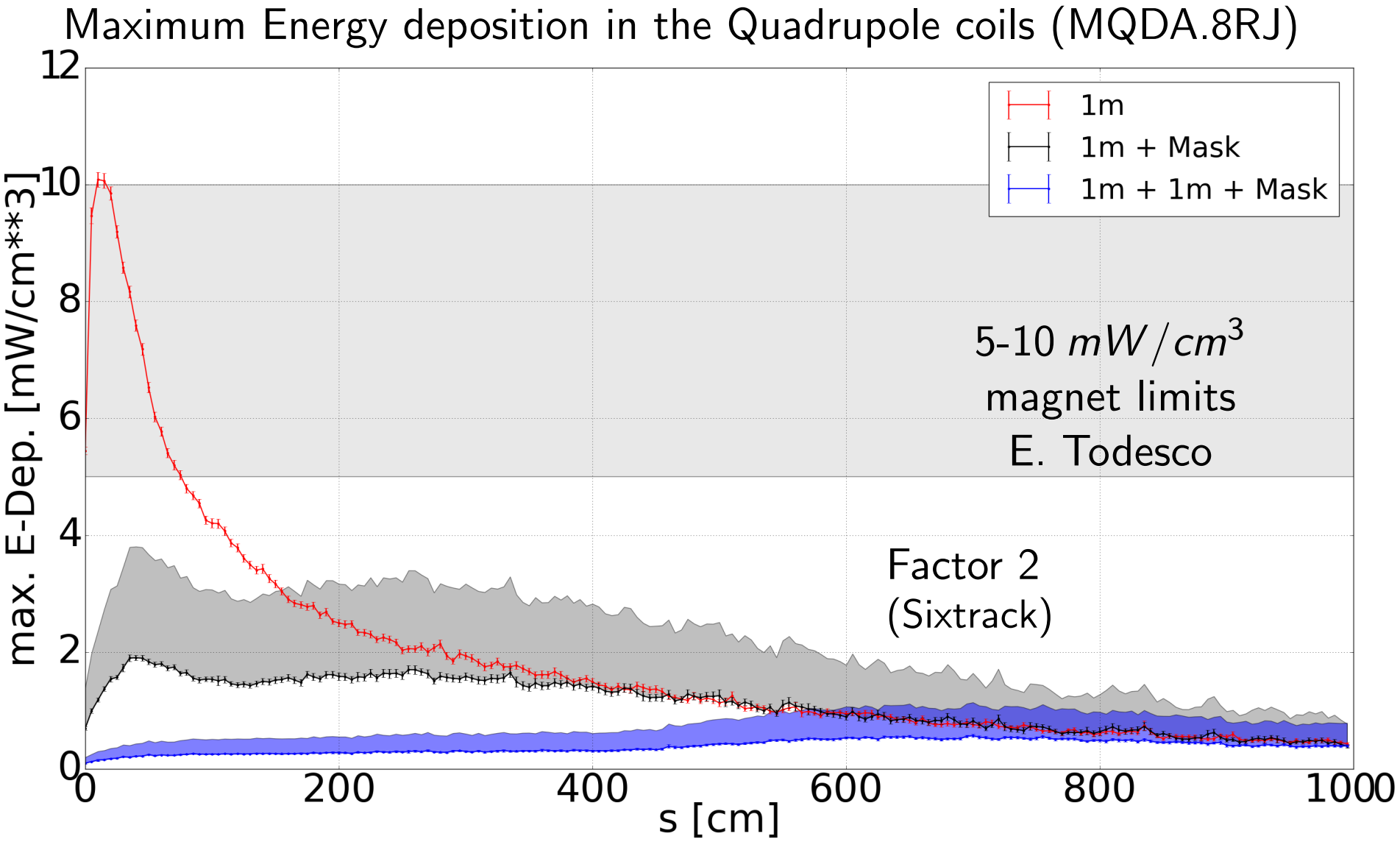


Energy Deposition

- Merlin and Sixtrack show discrepancies of a factor ~ 2.

  (J. Molson IPAC17)

Energy Deposition



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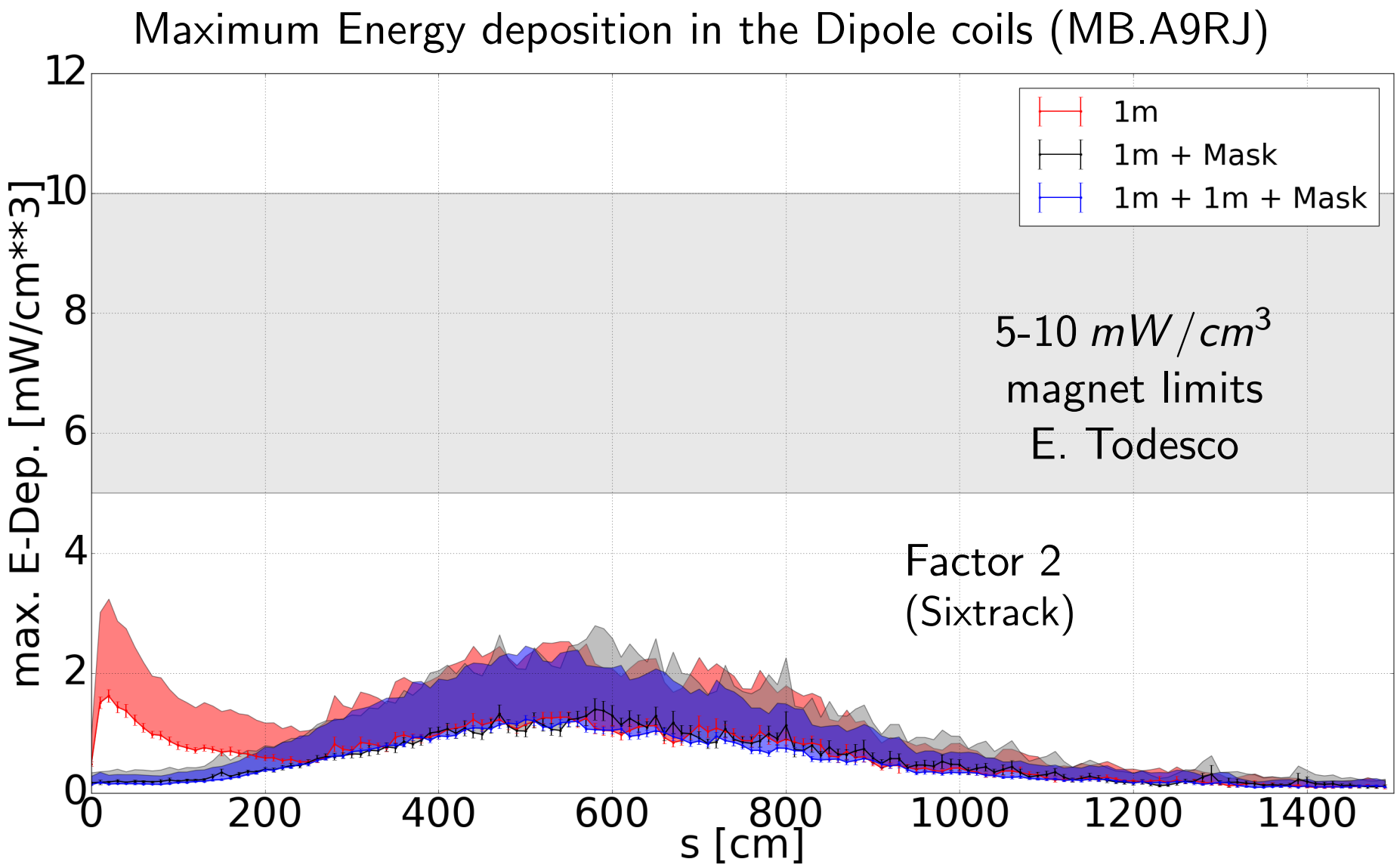


Energy Deposition

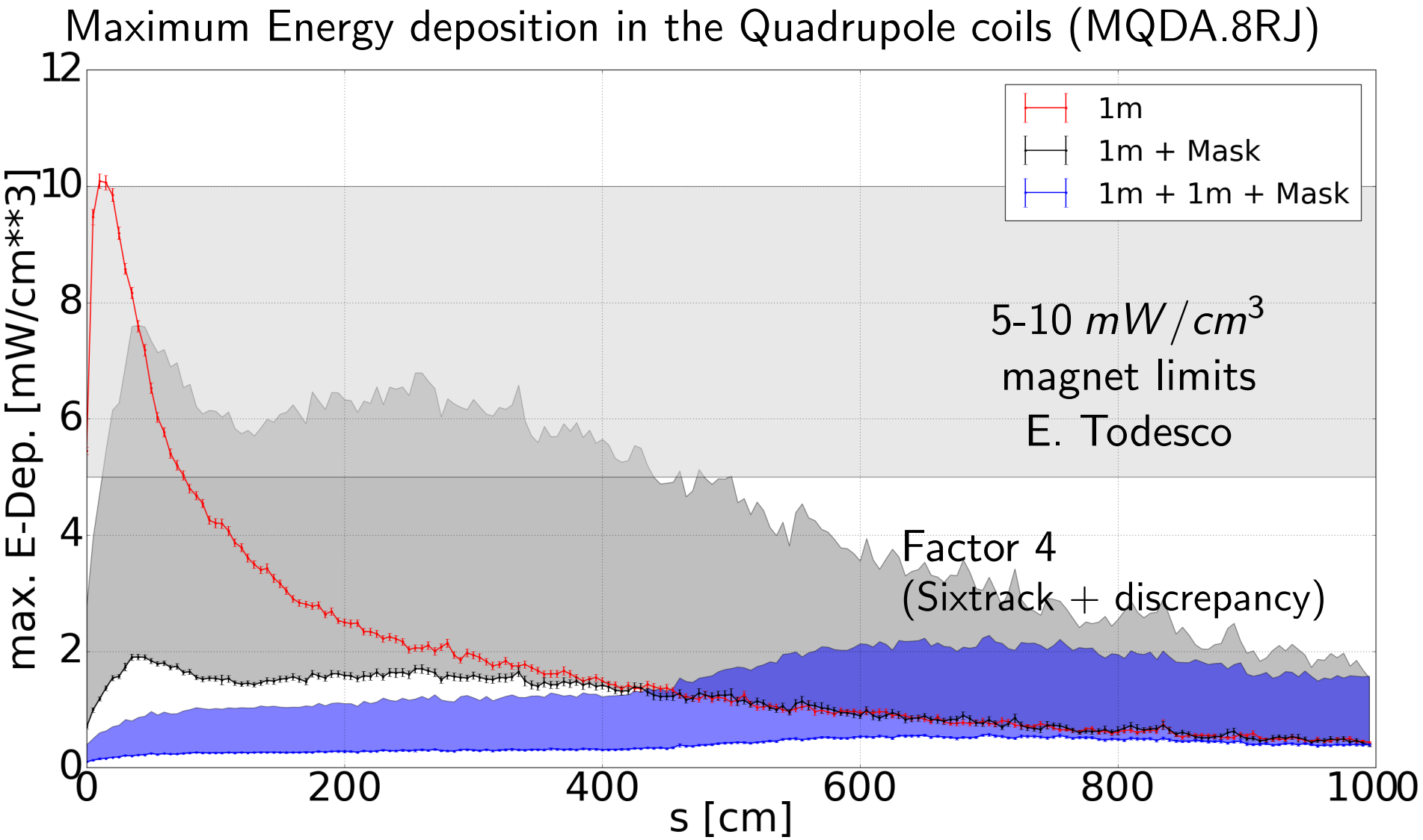
- Merlin and Sixtrack show discrepancies of a factor ~ 2.

  (J. Molson IPAC17)

- Comparisons of simulations and measurements at the LHC show a factor 2-3 discrepancy.

  (R. Bruce et. al. Phys. Rev. ST Accel. Beams 17, 081004 (2014))

Energy Deposition



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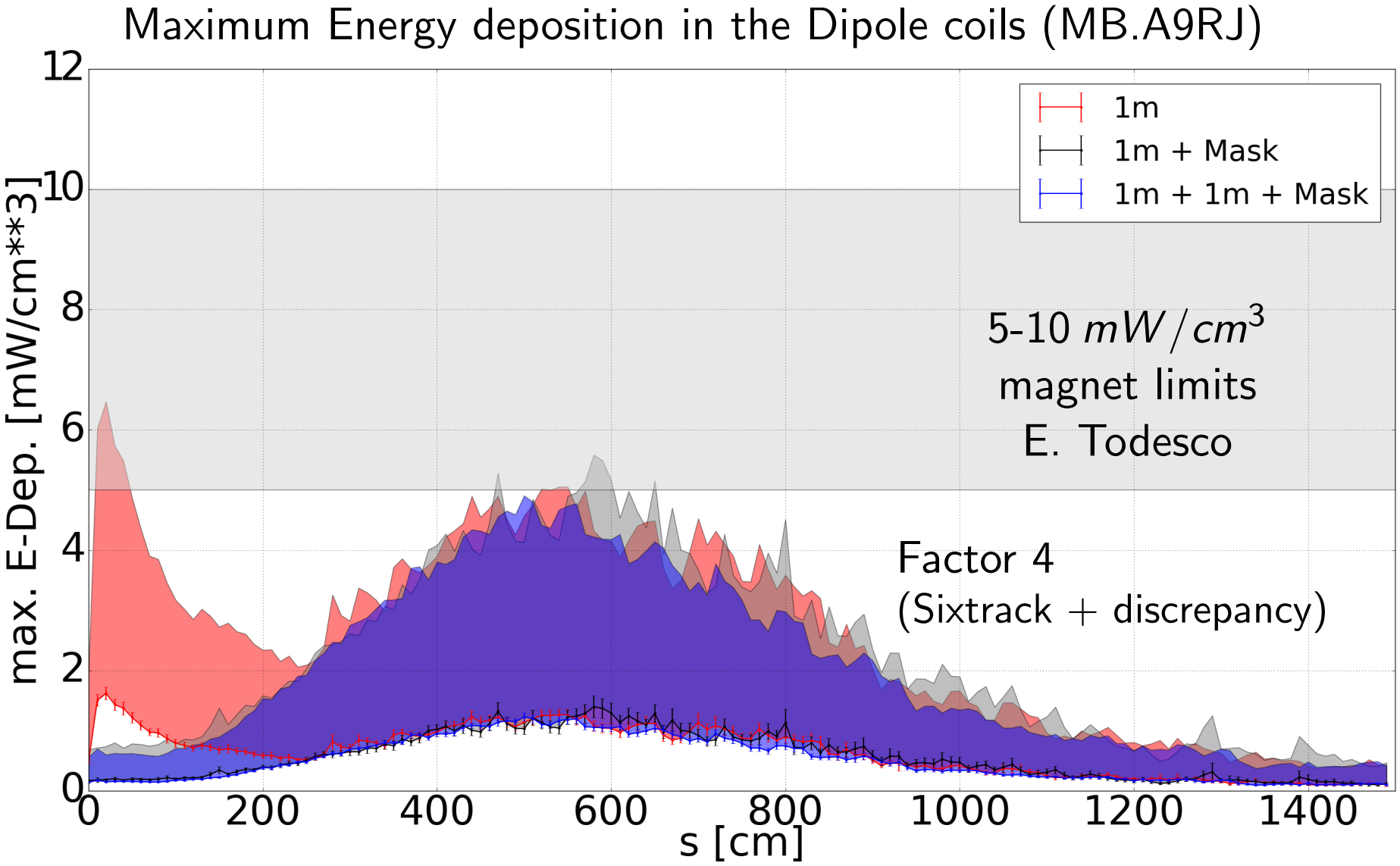
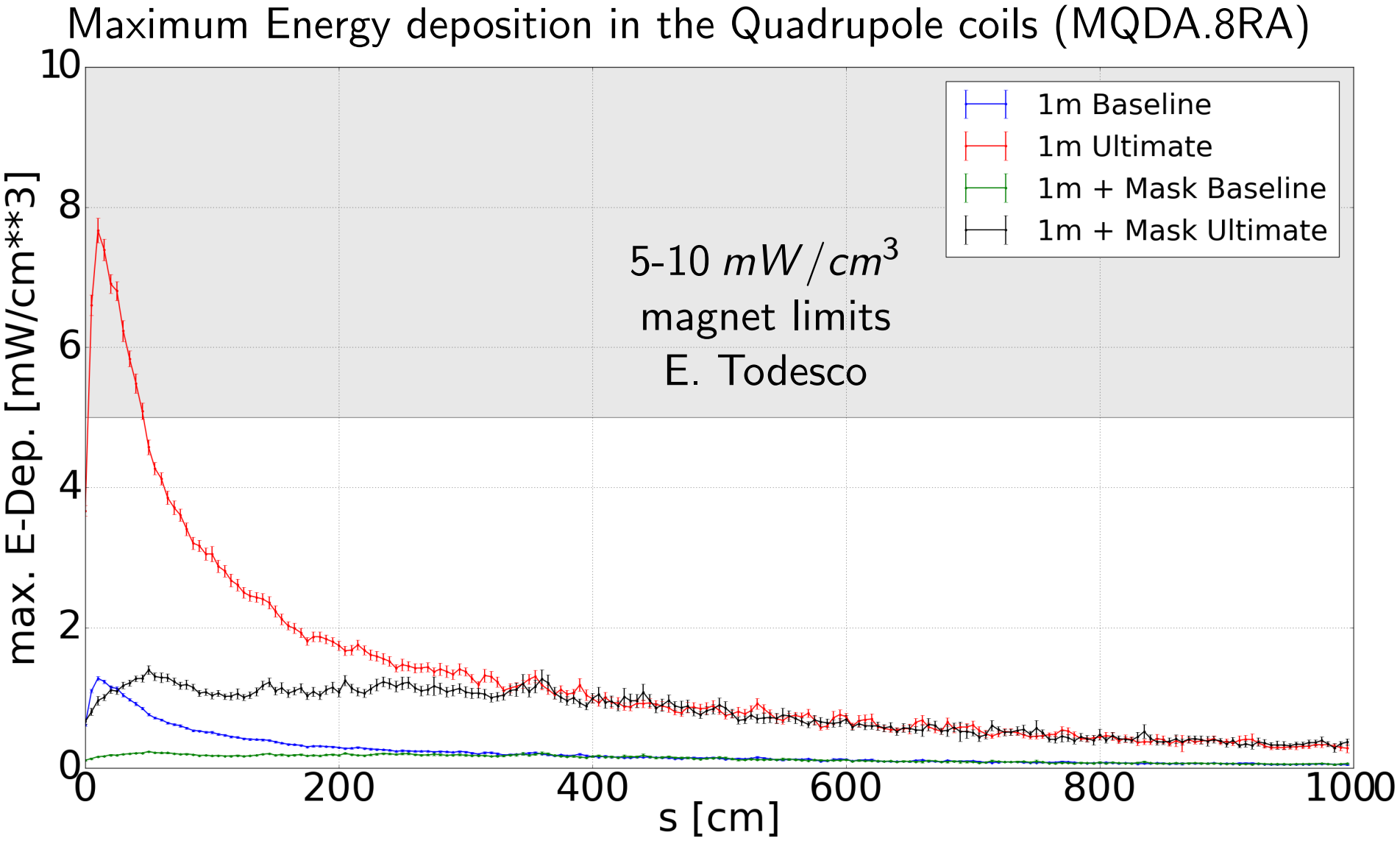


Energy Deposition around IP

- Energy deposition in the dispersion suppressors after IPA from collision debris.
- Input distribution from H. Rafique.

(H. Rafique, A. Krainer, IPAC17)

Energy Deposition around IP



Conclusion

- Combination of updated tracking codes and changes in optics gives a factor ~ 5 reduction.
- With 2 collimators and masks in cell 8 and 10, even a big underestimation should not pose a problem.
- Losses in the DS after the experiments are easily manageable with the same system.

Outlook

- Collimator gaps have not been optimized
  - Not sure if energy collimation hierarchy is violated
- Look if this system can be used in other critical places, like injection
- Run simulations for cell 10 to show that it is also not a problem