Estimating the energy density in MQ beam screen in view of ADT quench test

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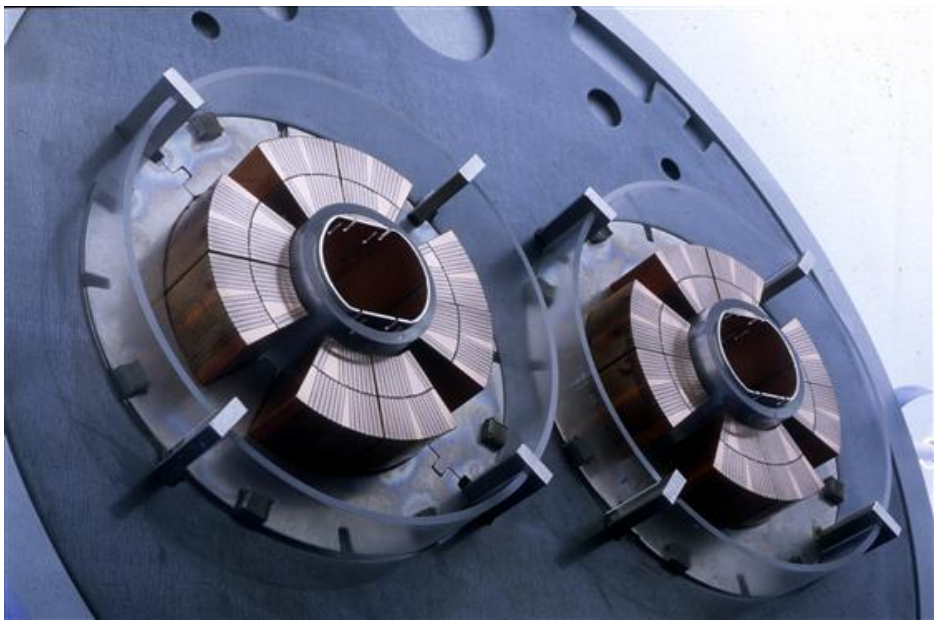
Quench test (MQ) using ADT

Evidently, the peak energy density in the MQ beam screen depends on:

- Number of protons impacting
- Impact distribution (spatial distribution, impact angles)

Proton impact distribution:

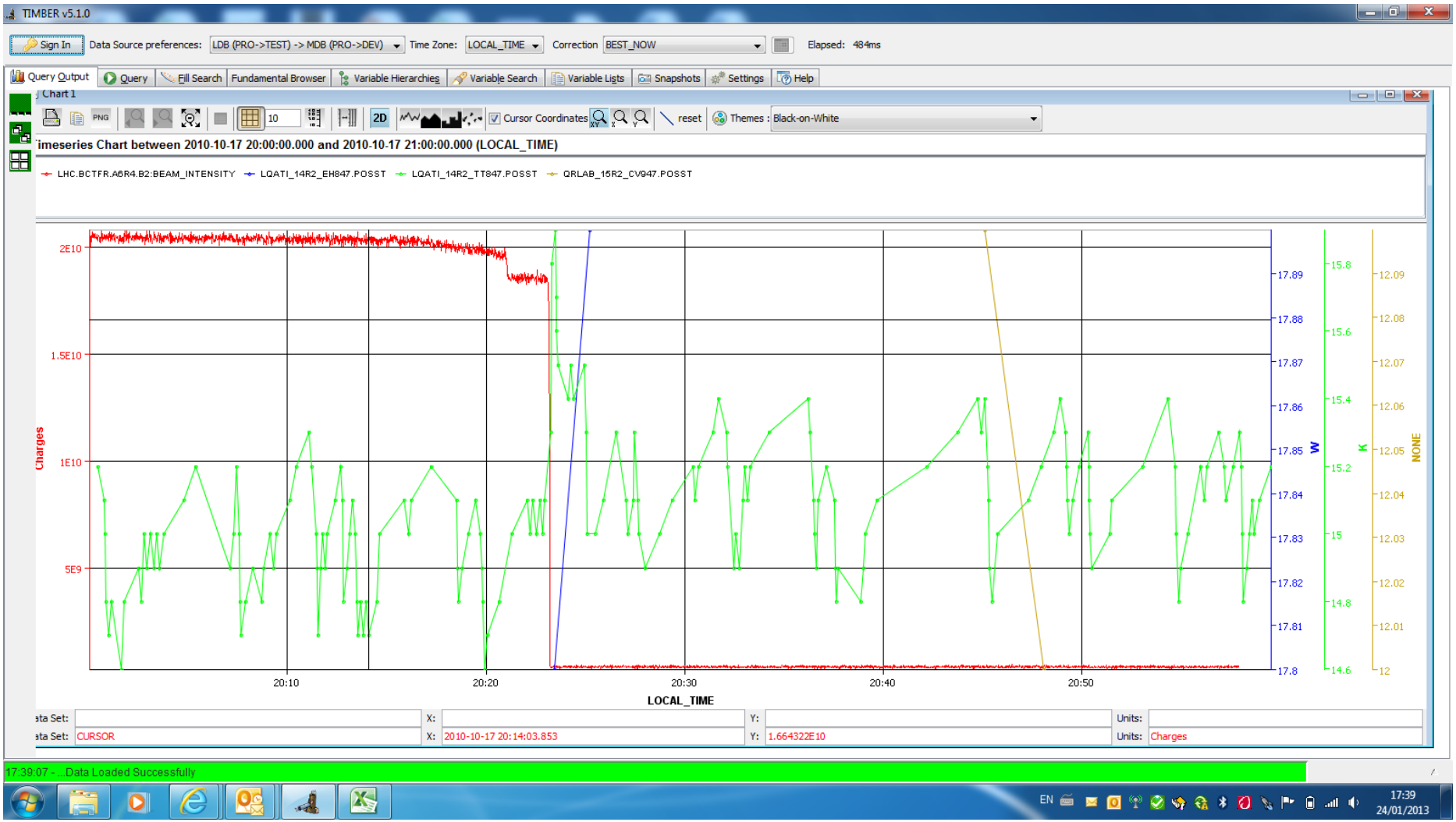
- Non-trivial, requires detailed optics tracking simulation (study ongoing)



This slides:

- Temperature measurement (He) during last test
- Attempt to estimate dose to beam screen for very simplistic impact scenarios

Temperature measurement during last test



Plot by K. Brodzinski.

Simulation example I

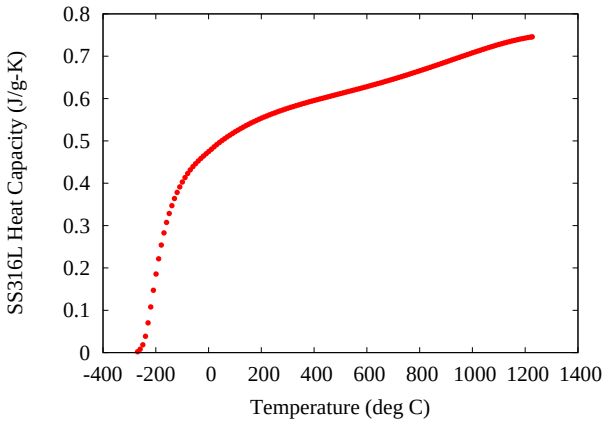
Pessimistic (academic) example:

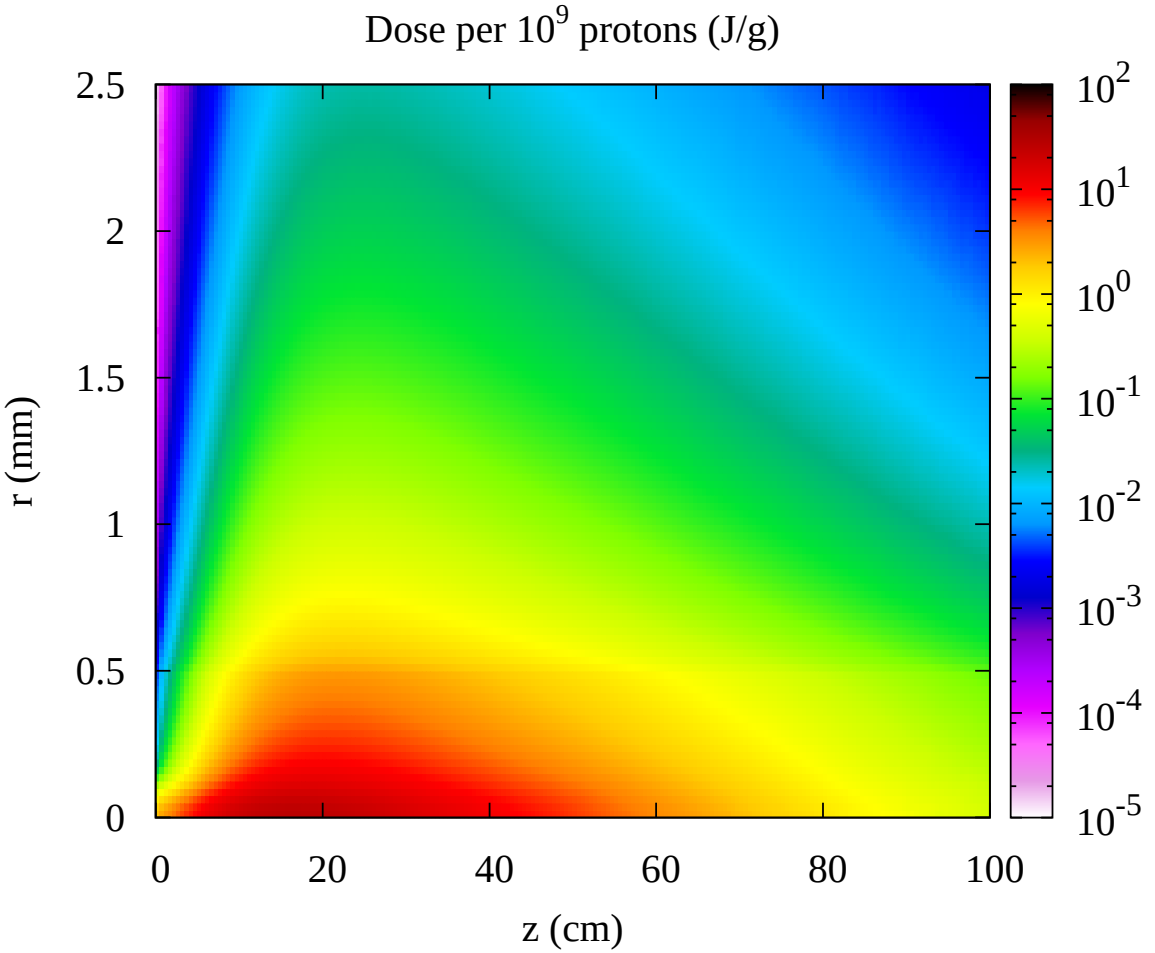
- 4 TeV proton impact on AISI316LN steel layer
- Beam size smaller than in reality (σ=50 μm)

Peak dose:

- <27 J/g (for 10^9 protons)

Heat capacity of AISI316L:

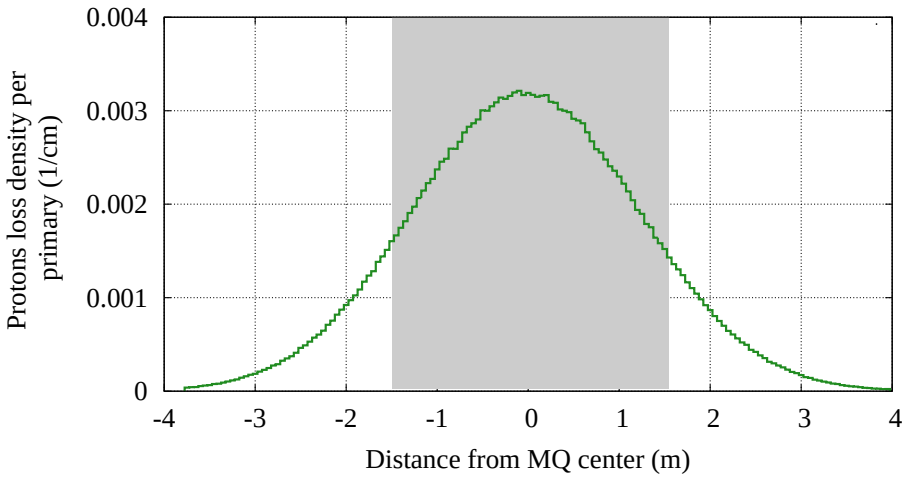




Simulation example II

Still simple, but potentially more realistic beam impact:

- 4 TeV protons, hitting BS with an impact angle of 200 μrad (assuming that beam center hits longit. center of MQ BS)
- More realistic beam size: σ_x=0.25 mm, σ_x=0.11 mm
- Proton losses diluted over several meters (see figure below)



Peak dose:

- $<$2 J/g (for 10^9 protons)