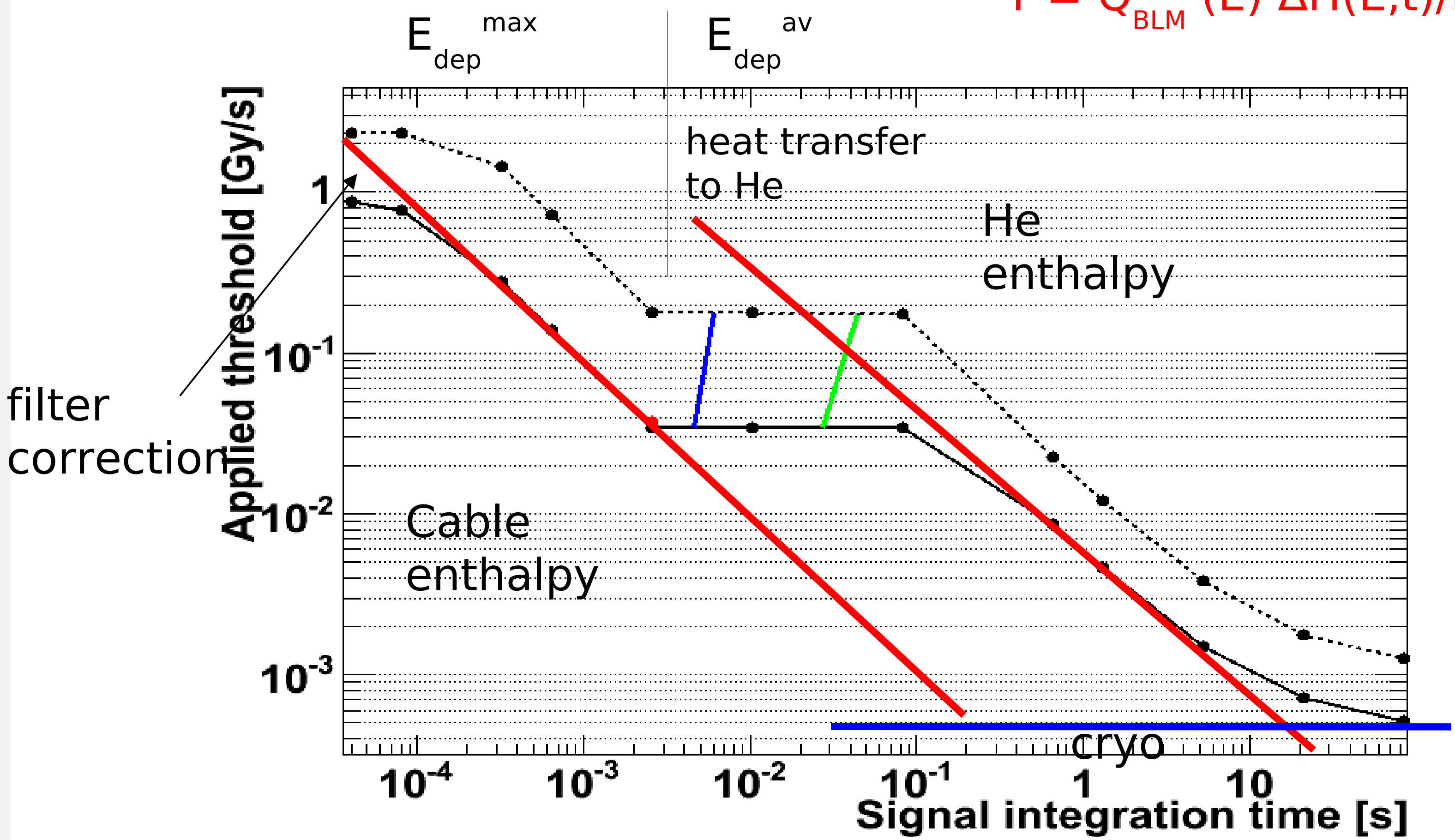
Quench Levels

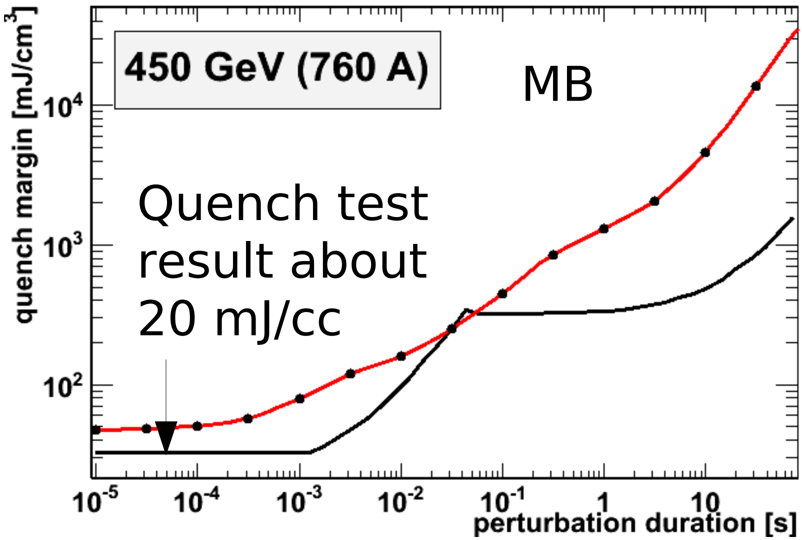
Note44 algorithm

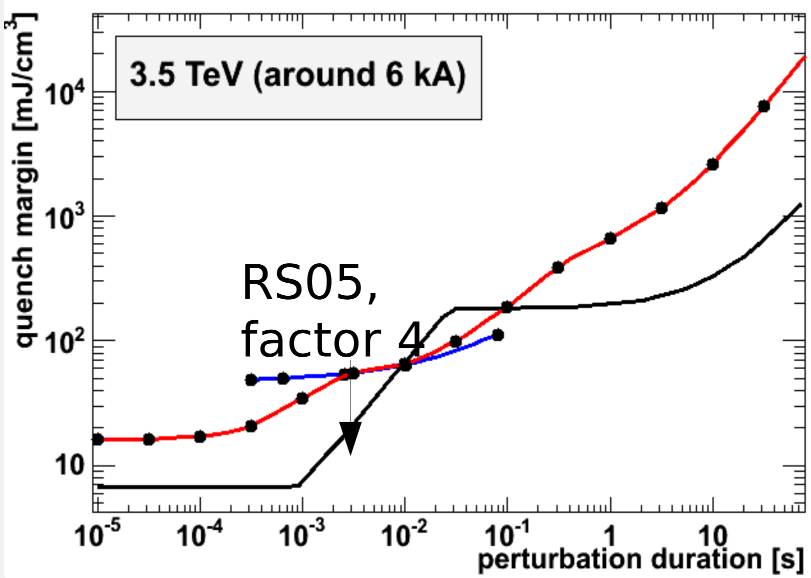
Typical threshold on cold magnet based on LHC Note 44:

$T = Q_{BLM}(E)\ \Delta H(E,t)/E_{dep}(E,t)$



Comparison of various codes





Note44 – algorithm

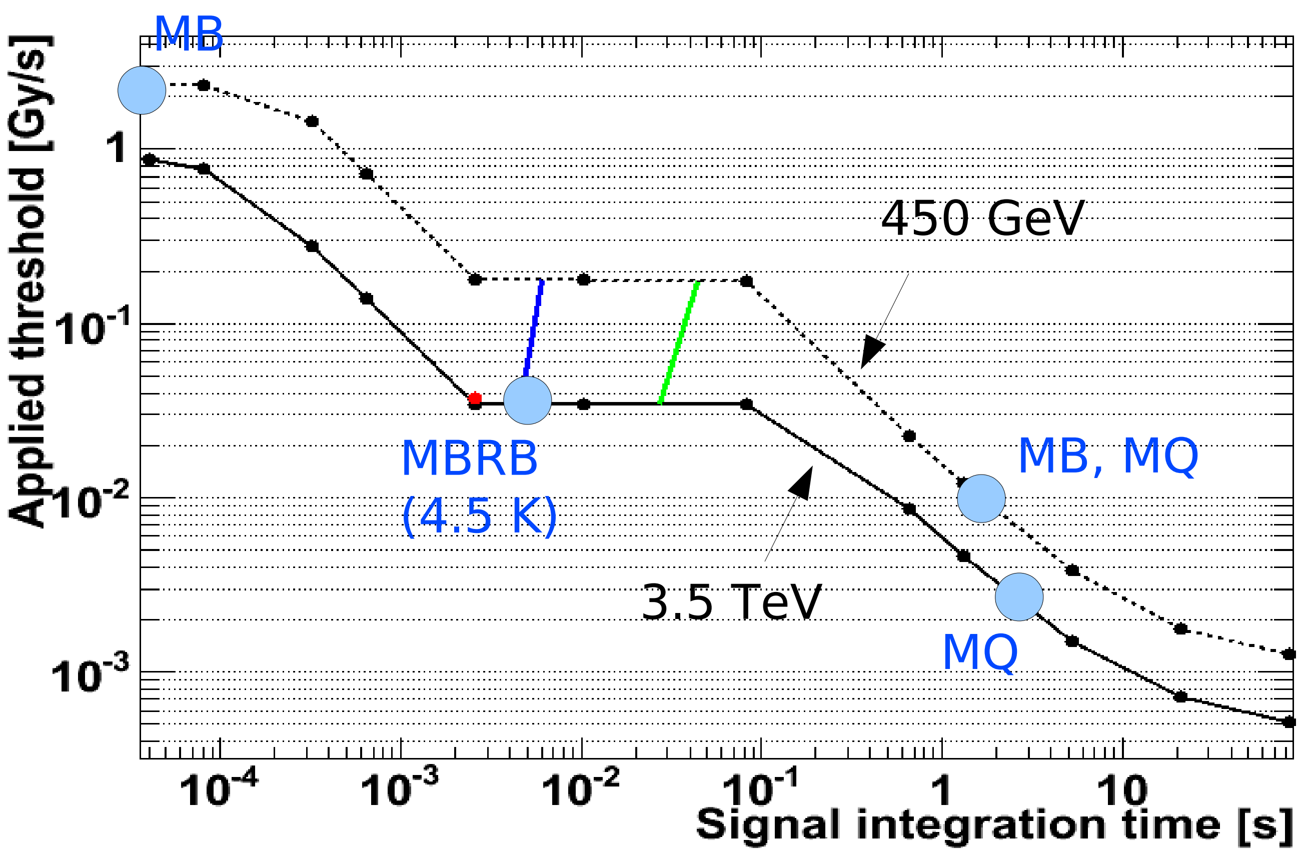
ZERODEE (P-P. Granieri, 2008)

QP3 (A. Verweij)

What has been tested (with beam)

Tested are really BLM thresholds, interpretation might be difficult!

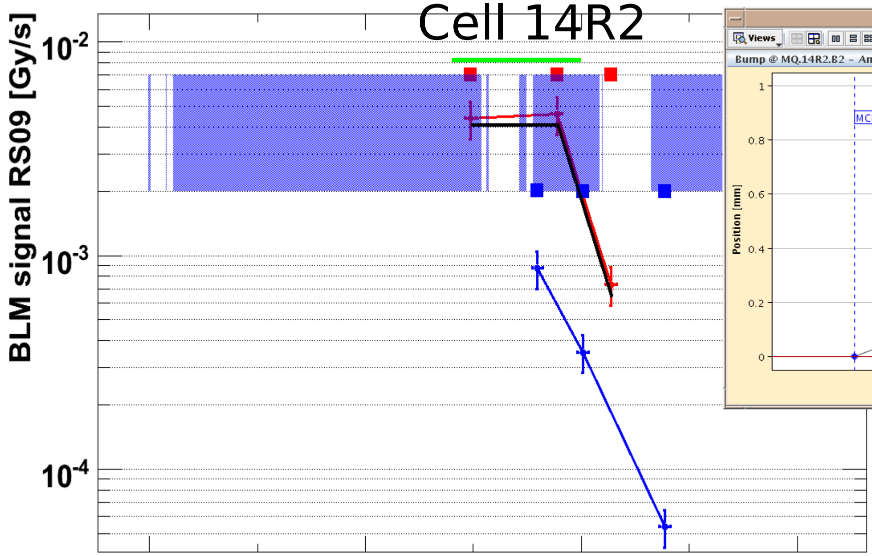
$T = Q_{BLM}(E)\ \Delta H(E,t)/E_{dep}(E,t)$

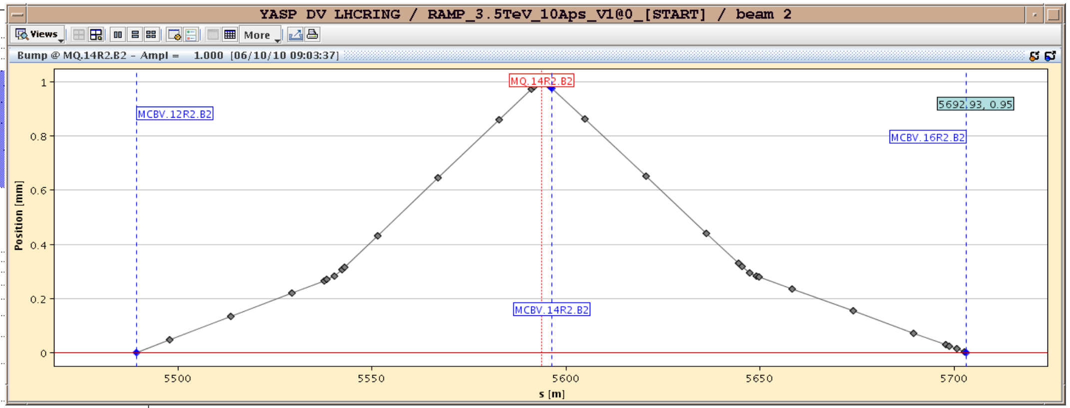


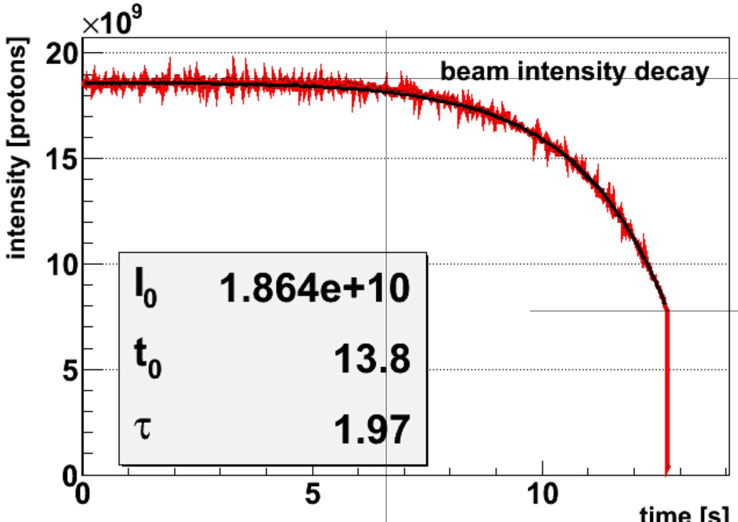
Quench test 3.5 TeV

October 17th, 2010, quench test at 3.5 TeV

Cell 14R2







~6 s

10^{10} protons lost on magnet before dump

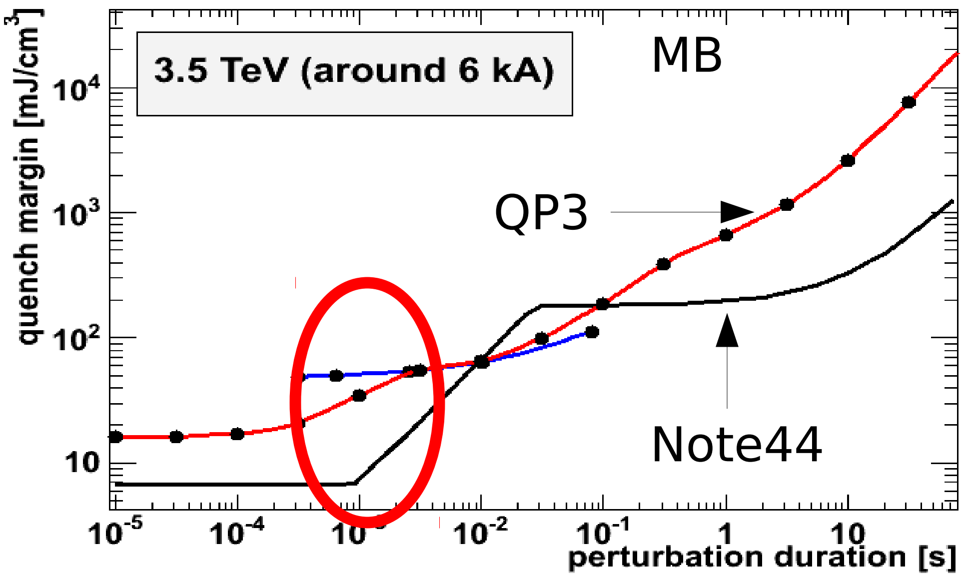
Quench level:

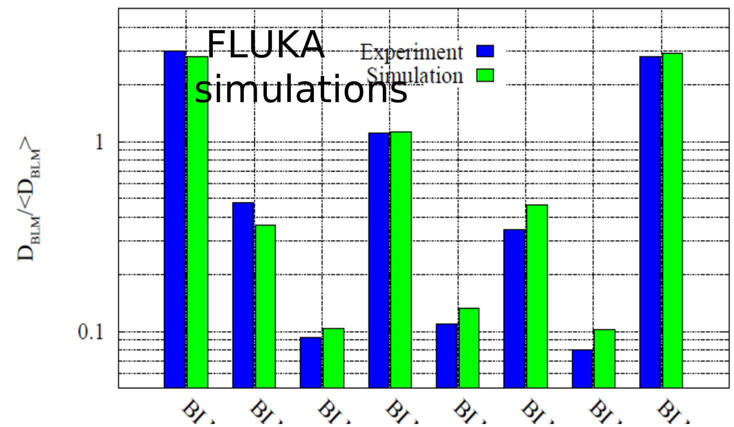
Note44: 300 mJ/cc

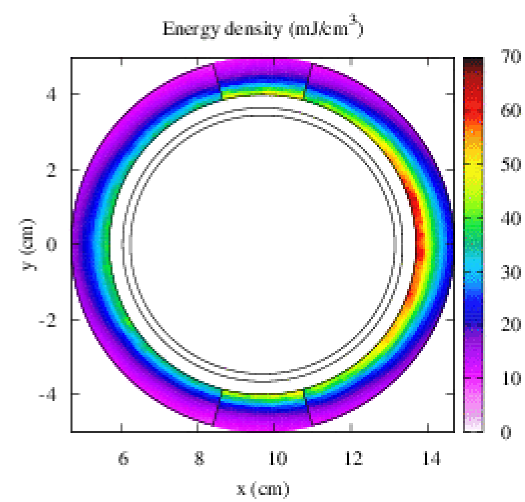
Geant4: 50 mJ/cc (preliminary!!!!!)

Wire Scanner test

One of the most spectacular quench tests: generate millisecond scale losses using with Wire Scanner at 3.5 TeV.
Motivation: explore quench limit for losses similar to UFOs.
Quench occurred after about 10 ms



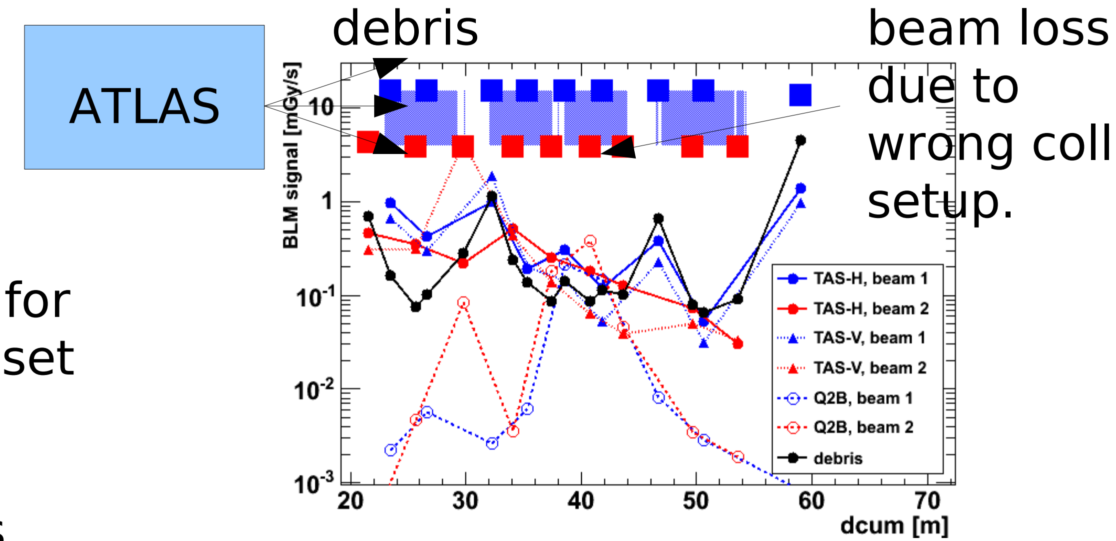




Max E_{dep}
FLUKA: 62.5 mJ/cc
QP3: 38 mJ/cc (preliminary)
we call it a good agreement

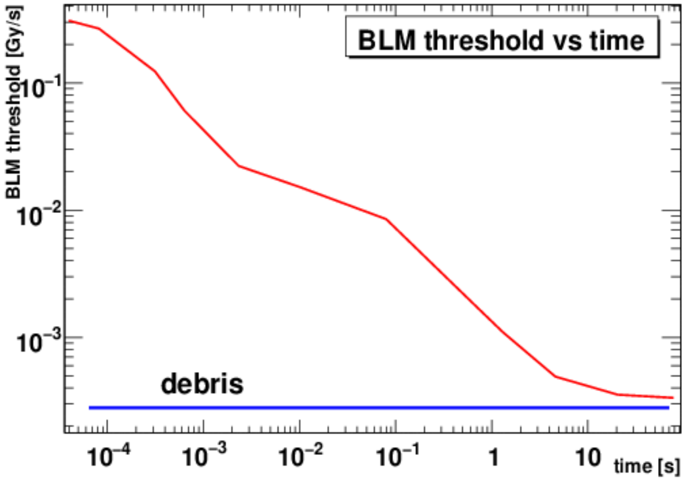
Limitations

Example: debris from ATLAS and slow beam losses in the triplet:



In order to protect Q2 magnet the threshold for slow losses should be set very close to constant debris signal.
Spurious beam dumps would be unavoidable.

Similar problem of radiation masking signal from dangerous beam loss is observed in other locations on LHC.



Development

Idea: put BLM detectors closer to magnet coil.

Cryogenic BLMs undergo first tests right now at T9 beamline in East Hall.

Yesterday signals from Si and Diamond detectors were measured at 1.9 K.

current BLM position