1st Princeton/Oxford High-Power Targets Workshop

Oxford

May 1-2, 2008

Harold G. Kirk
Brookhaven National Laboratory

Workshop Purpose

Post-MERIT discussions of the next steps in high power target design

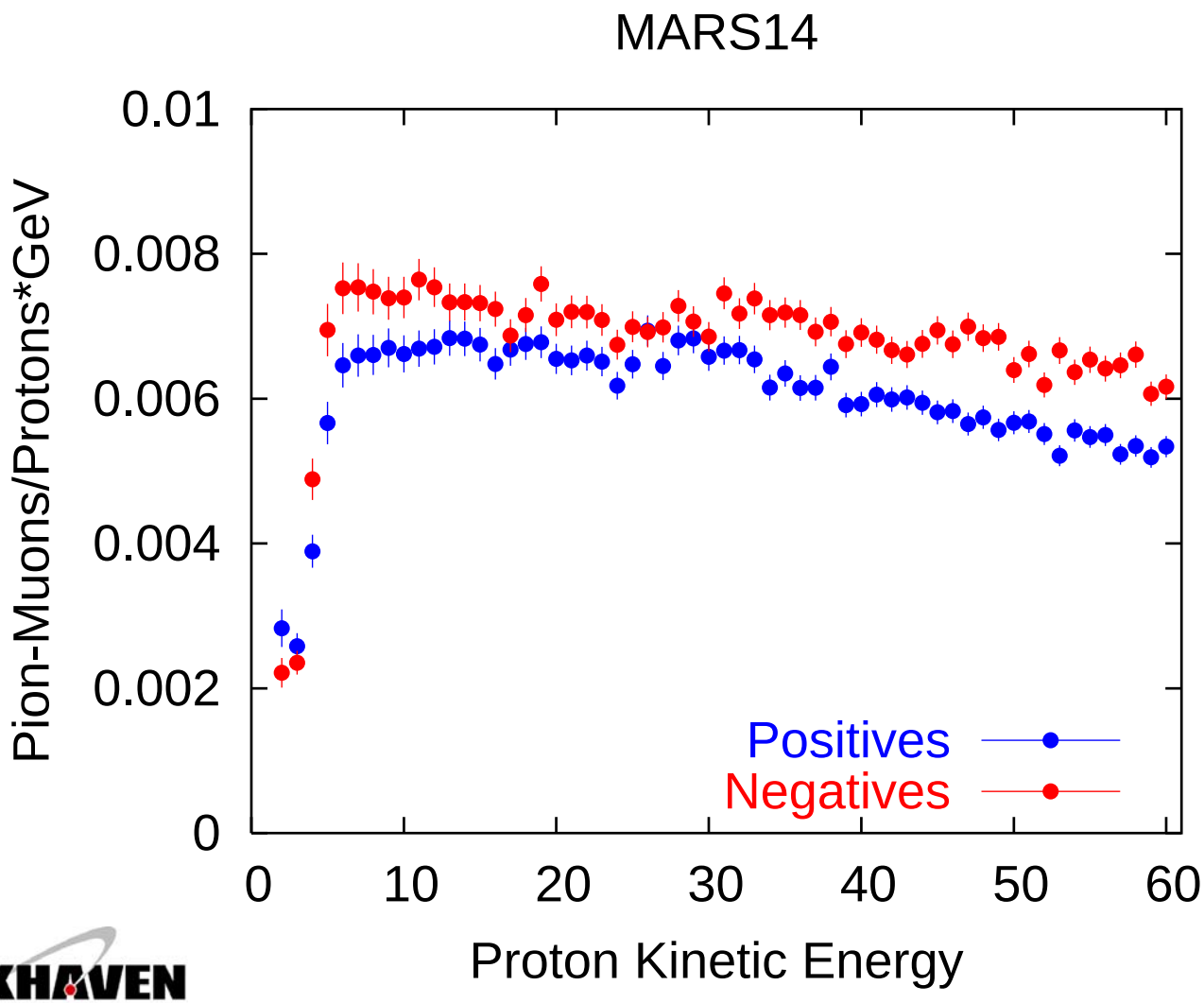
- **Review current knowledge**
- **Define what we do not know**
- **Engineering challenges**
- **Define R&D requirements**

http://www.physics.ox.ac.uk/users/peachk/HPT/Talks.htm

Workshop Speakers

Kirk McDonald	Princeton
Harold Kirk	BNL
Stephen Brooks	RAL
Chris Densham	RAL
Bob Palmer	BNL
Van Graves	ORNL
Goran Skoro	Sheffield
Nick Simos	BNL
Roman Samulyak	SUNYSB
John Back	Warwick
Tristan Devenne	RAL

Post-cooling 30π Acceptance



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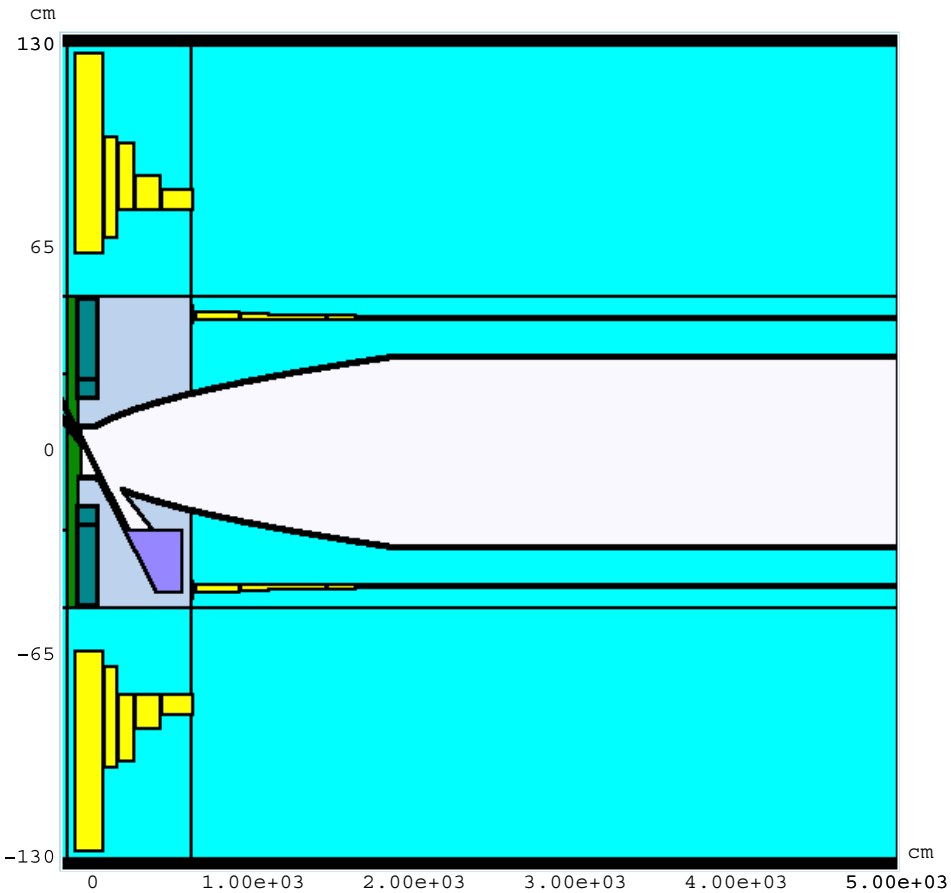
The Study2 Target System



Count all the pions and muons that cross the transverse plane at z=50m.

For this analysis we select all pions and muons with KE< 0.35 GeV.

Y
Z

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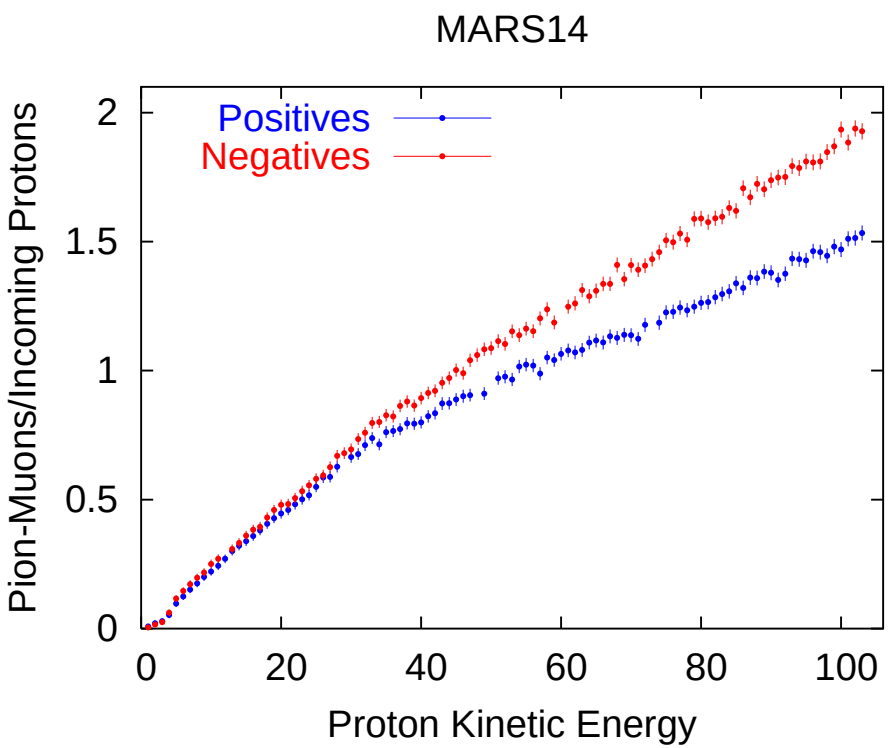
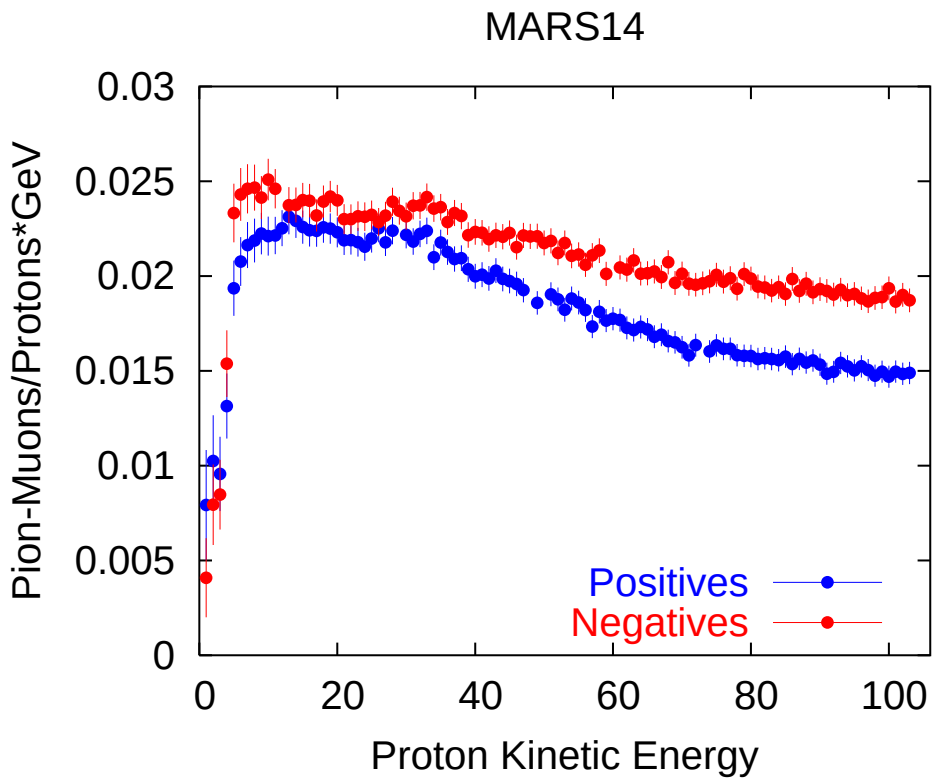
Mesons 100 < KE < 800 MeV at 50m

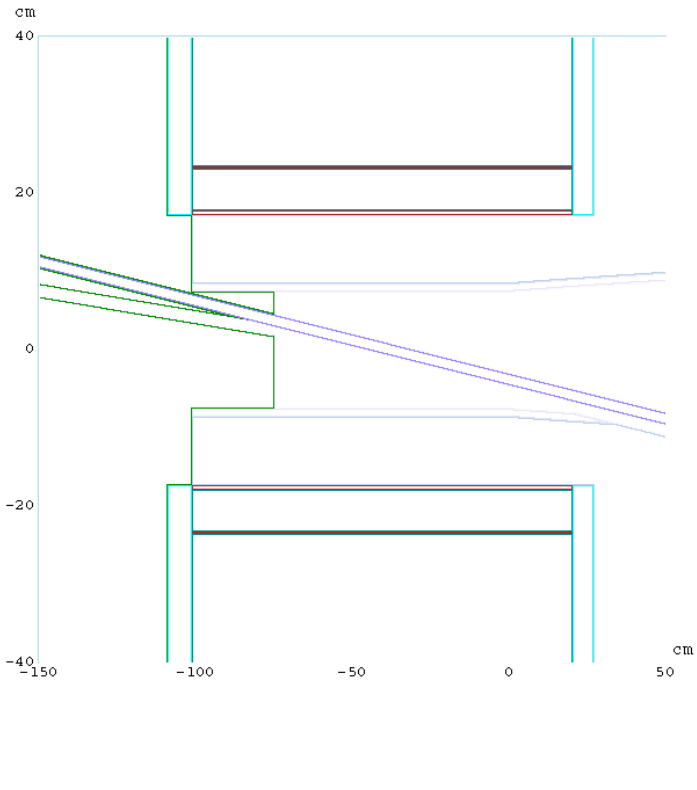


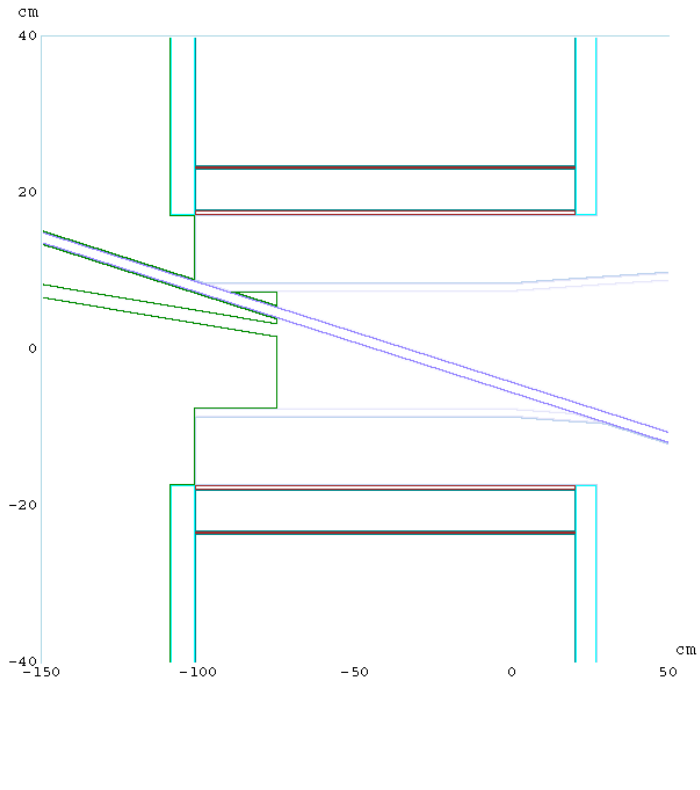
Mesons/Proton



Mesons/Proton normalized to beam power

The Target Interaction Length

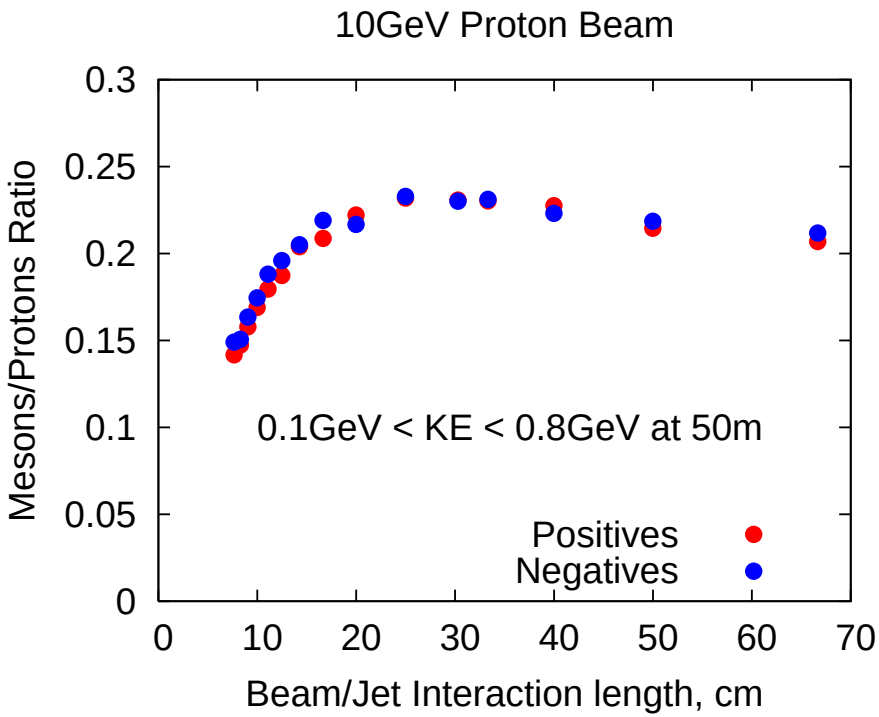




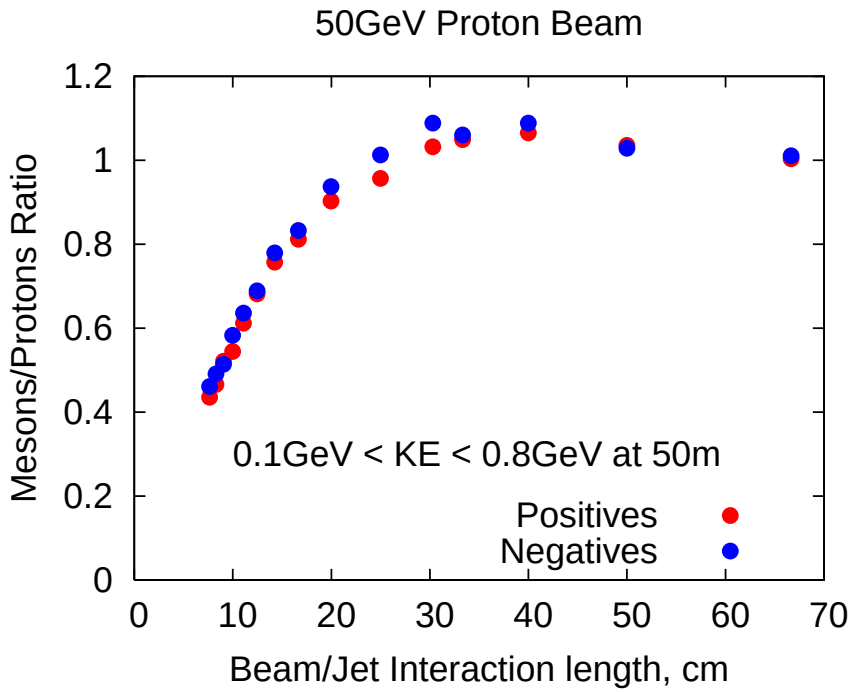
Hg/Beam angle=33mrad
➔ 30.3cm Hg/Beam overlap

Hg/Beam angle=60mrad
➔ 16.6cm Hg/Beam overlap

Meson Production Effeciency



Peak at 25cm (40mrad)



Peak at 30cm (33mrad)

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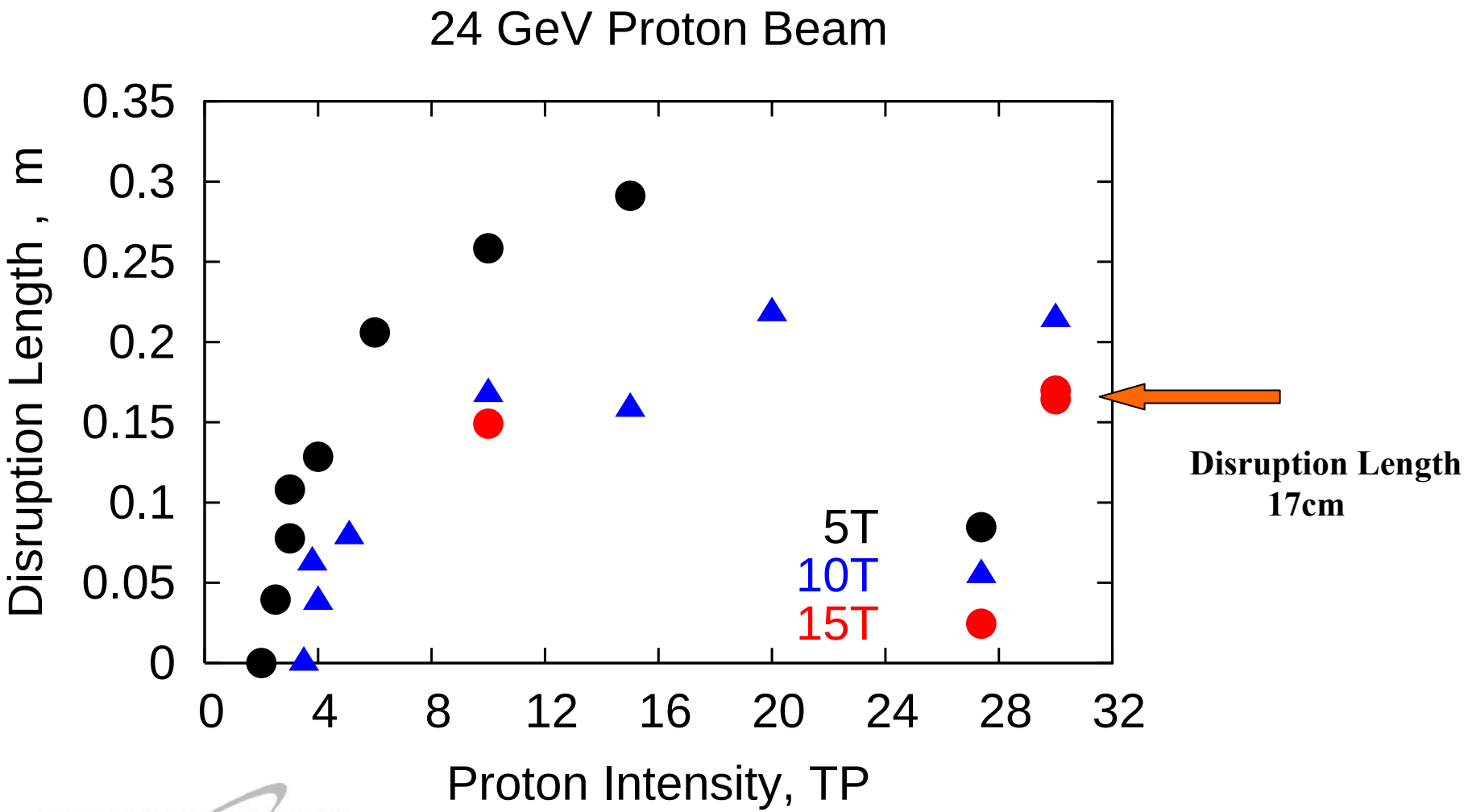
Key Merit Result



Powder jet targets for Neutrino Facilities

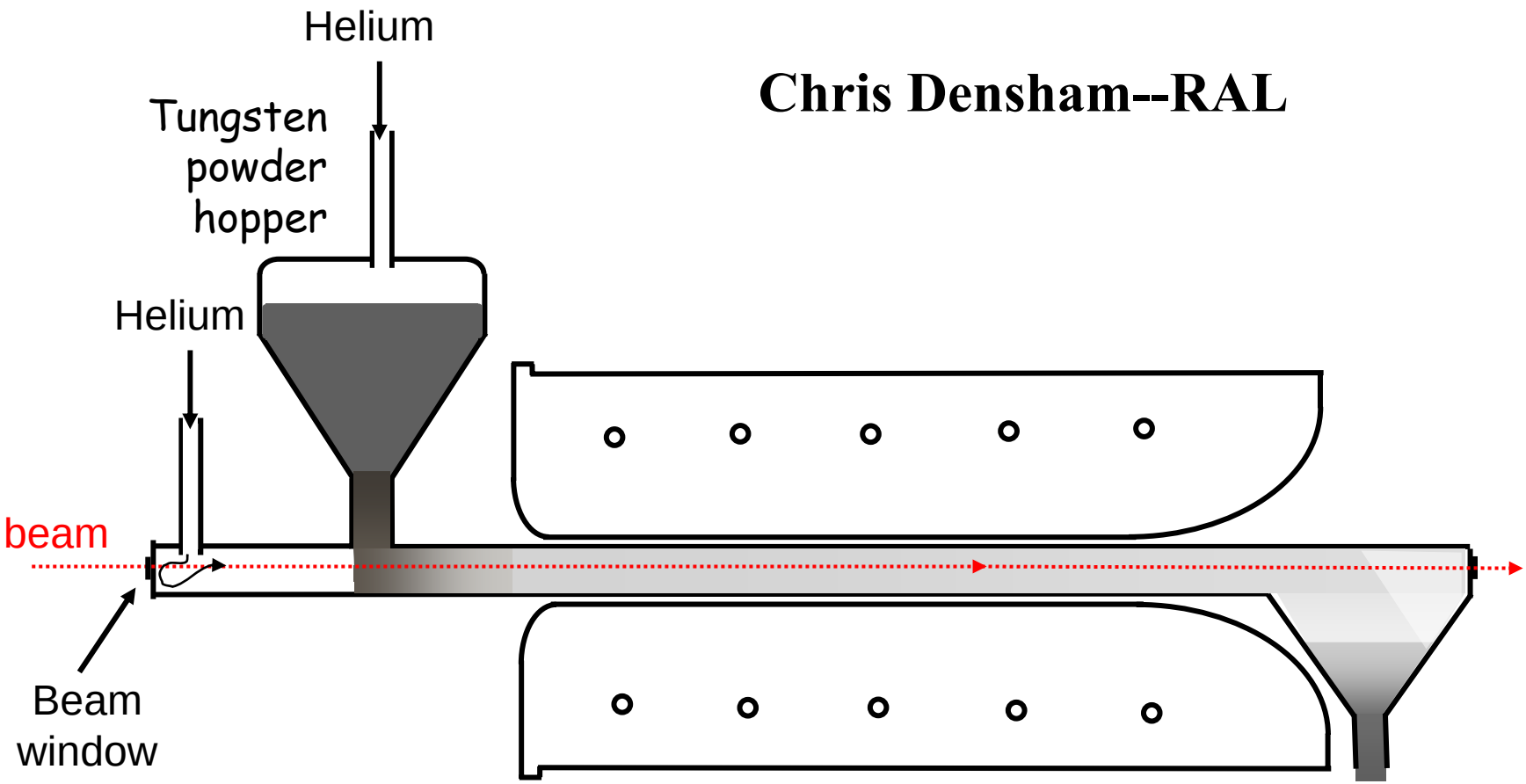
Ottone Caretta, Tristan Davenne, Chris Densham (Rutherford Appleton Laboratory),

Richard Woods (Gericke Ltd),

Tom Davies (Exeter University), Goran Skoro (Sheffield University), John Back (Warwick University)

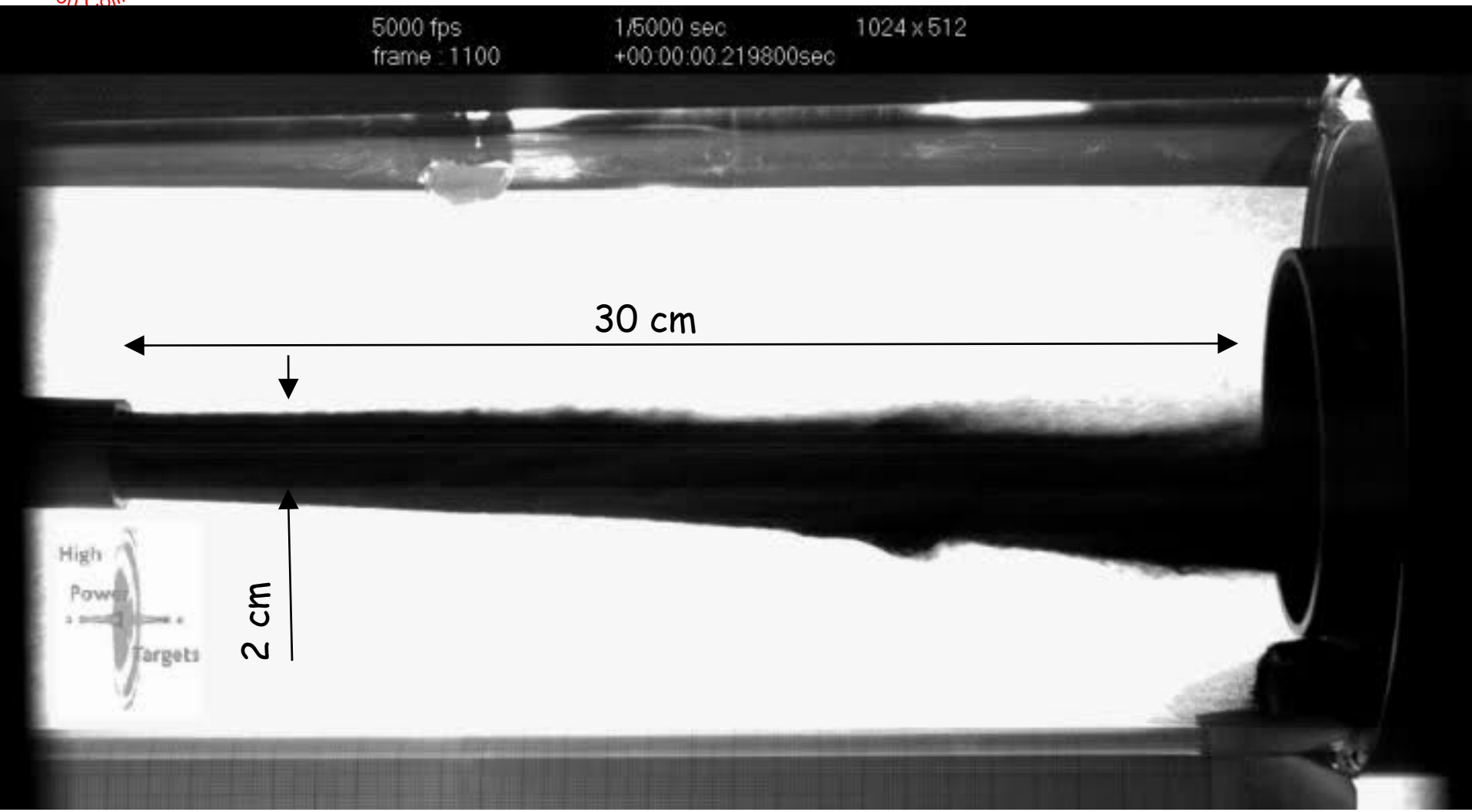
Harold G. Kirk
Brookhaven National Laboratory

A flowing powder target for a Superbeam or Neutrino Factory?



Chris Densham--RAL

Feasibility test results:



(Thanks to EPSRC Intrument Loan Pool for use of a high speed video camera)

Tungsten powder jet – feasibility test results

Initial bulk density

= 8660 kg/m^3

= 45 % W (by volume)

Jet bulk density (approx. results):
Jet velocity = 7-15 m/s
(100 kg in 8 seconds)

~ 5000 kg/m^3

~ 28 % W by vol.

(~ 2.5 x graphite density)

Studies of the solid high-power targets

Goran Skoro

University of Sheffield

HPT Meeting

May 01 – 02, 2008
Oxford, UK

Harold G. Kirk
Brookhaven National Laboratory

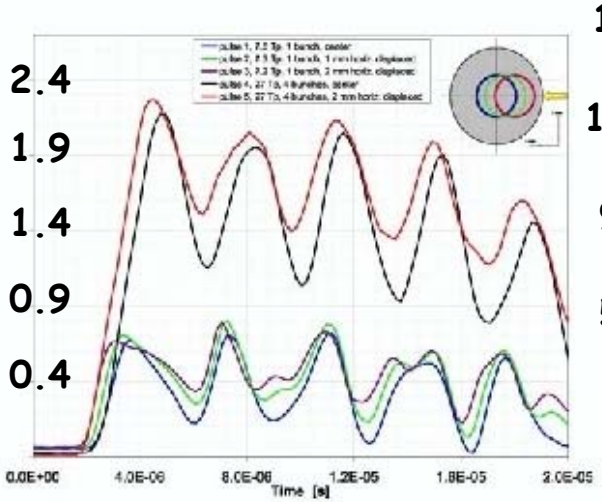
Comparison with existing experimental results

Tests at the ISOLDE

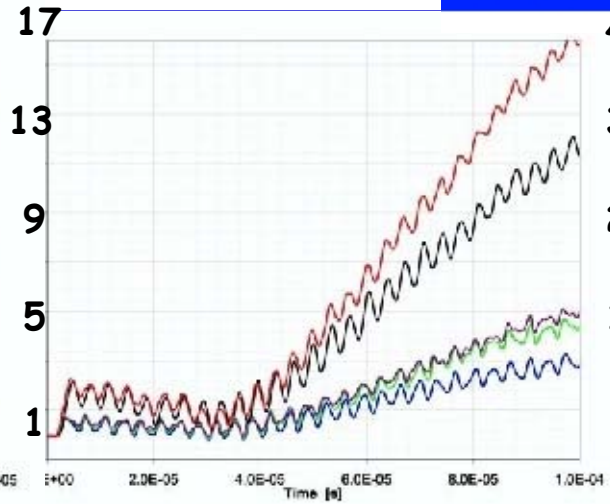
Tantalum Cylinder, 1x10 cm

Roman WILFINGER
ISOLDE, CERN & TU Vienna

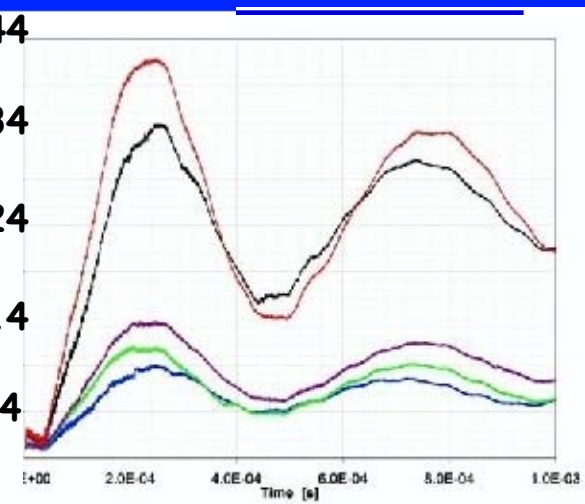
surface displacement [μm]



(d) First 20 μs.



(c) First 100 μs.

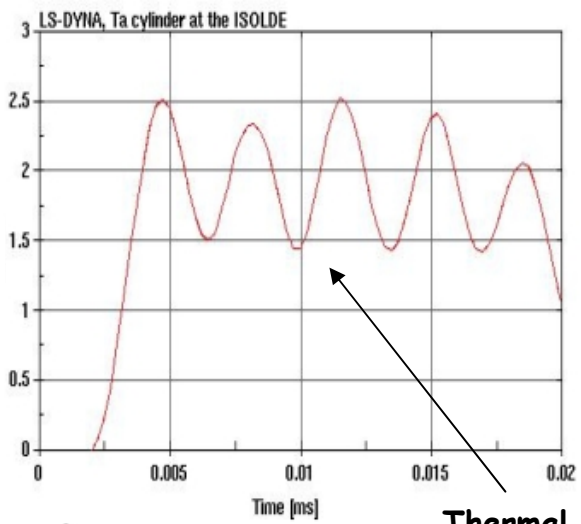


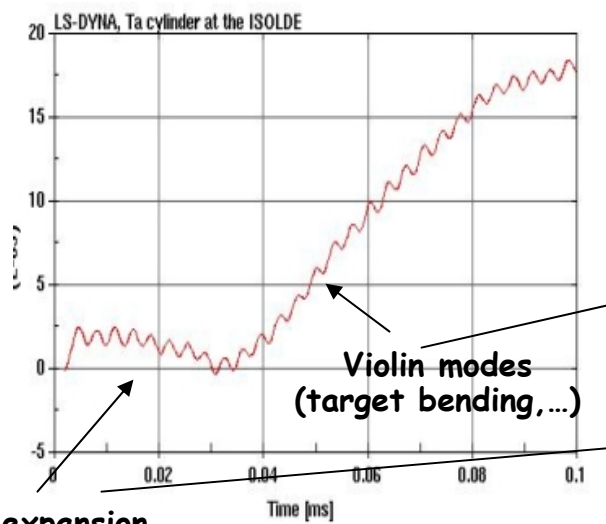
(b) First 1 ms.

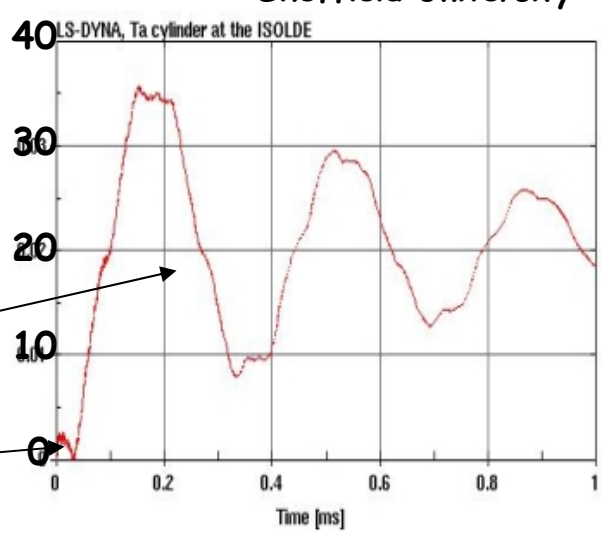
LS-DYNA simulations

Goran SKORO,
Sheffield University

surface displacement [μm]







Violin modes
(target bending,…)

Thermal expansion

Mercury Jet Studies

Tristan Davenne
Rutherford Appleton Laboratory

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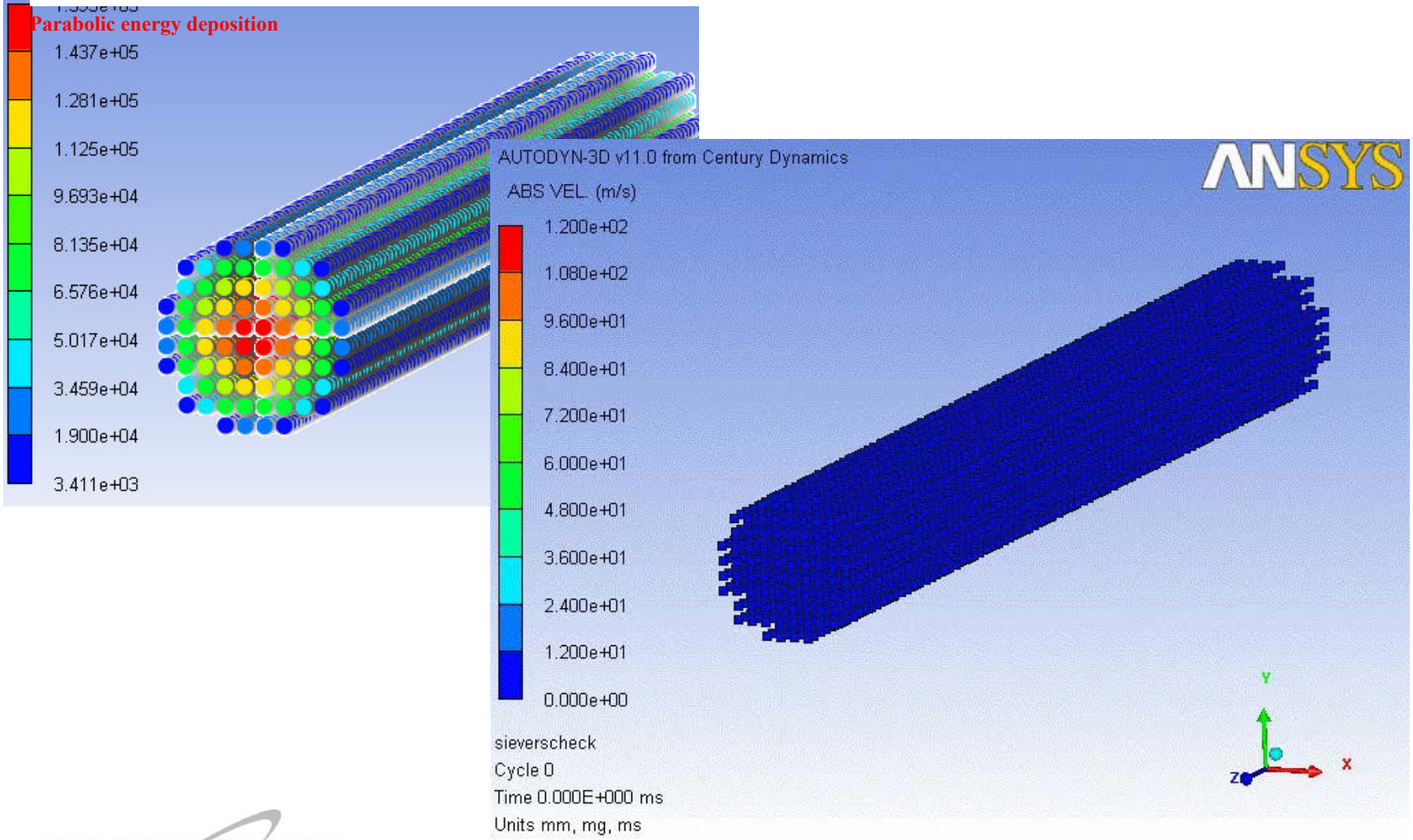
High Power Targets

www.STFC.ac.uk

Numerical simulation of Sievers & Pugnat Result



Click on image above to watch video of 2cm mercury target responding to concentric parabolic energy deposition

Targetry Action Items

(To be presented at the October Princeton Workshop)

1. **Complete MERIT analysis**
2. **Extend MERIT-related MHD simulations**
3. **Powder POP facility commissioned, erosion studies begun.**
4. **Simulations of splash of Hg in collection pool (B = 0).**
5. **Pion acceptance cuts refined, pi production plots updated.**
6. **VISAR data of pulsed wires**
7. **Mechanical analysis of Helmholtz coil configuration for wheel target.**
8. **W bar in ISIS beam.**
9. **Update of Study 2 target concept**
10. **W wheel design**
11. **Hg erosion**
12. **Hg nozzle: engineering design, prototype R&D**