Compact Neutrino Sources for π^+ Decay-At-Rest Experiments

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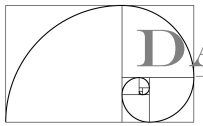
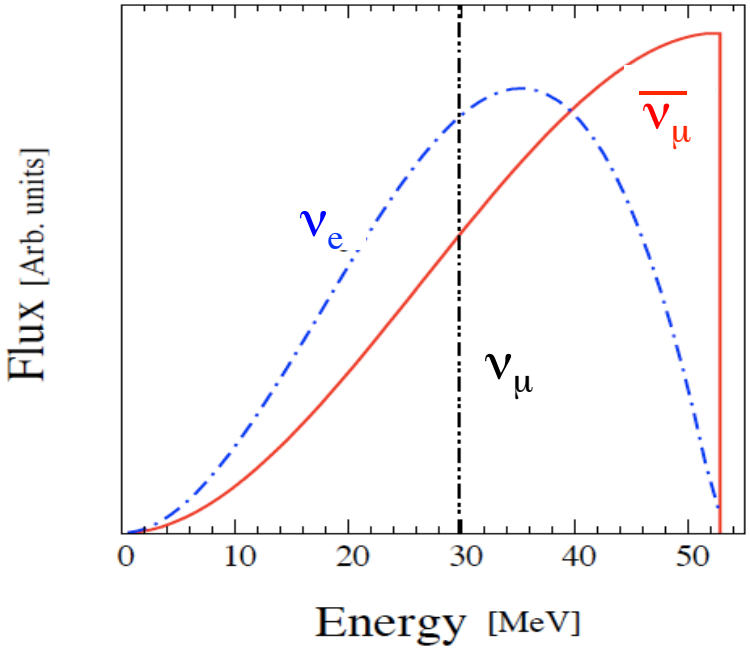
FNAL, Oct 25, 2011



Case for Compact Neutrino Sources

- Decay-at-Rest spectrum offers attractive option for oscillation experiments
  - $\overline{\nu}_e$ appearance
  - Complementary to long-baseline

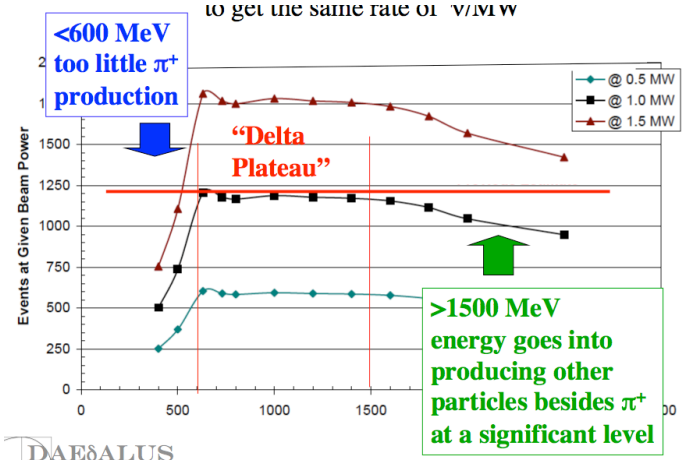


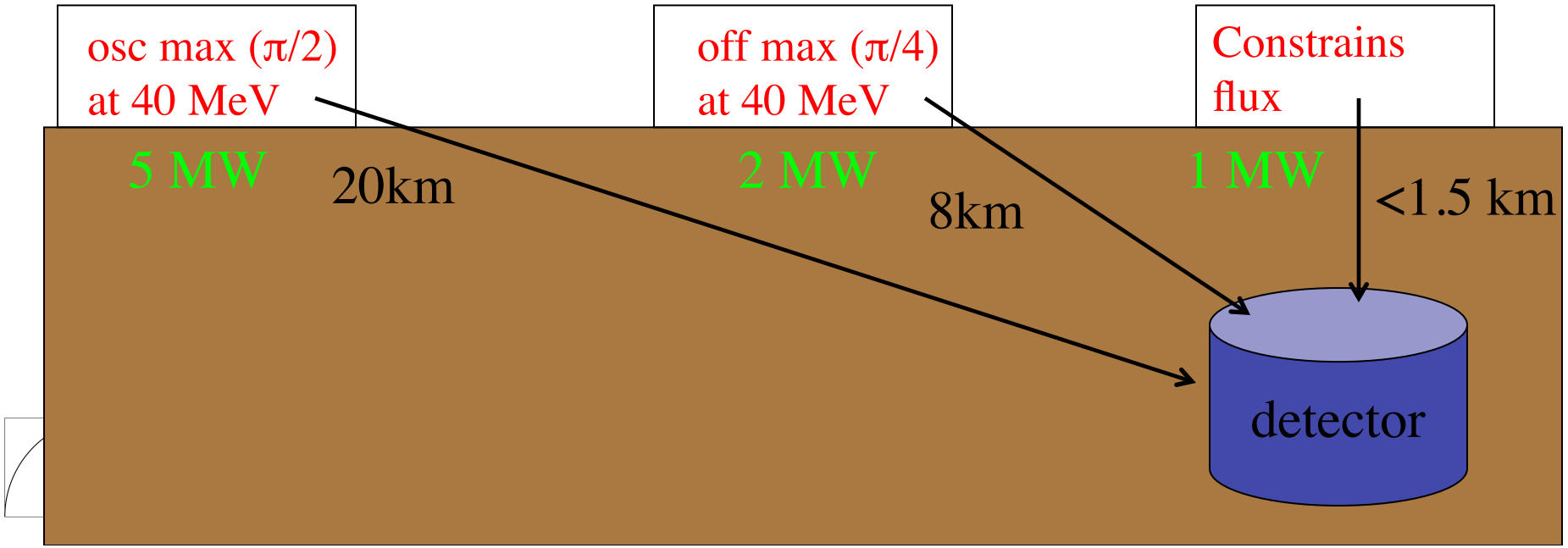
- Flexibility of source placement with respect to detectors

Accelerator Requirements

Beam on target: 800 MeV protons

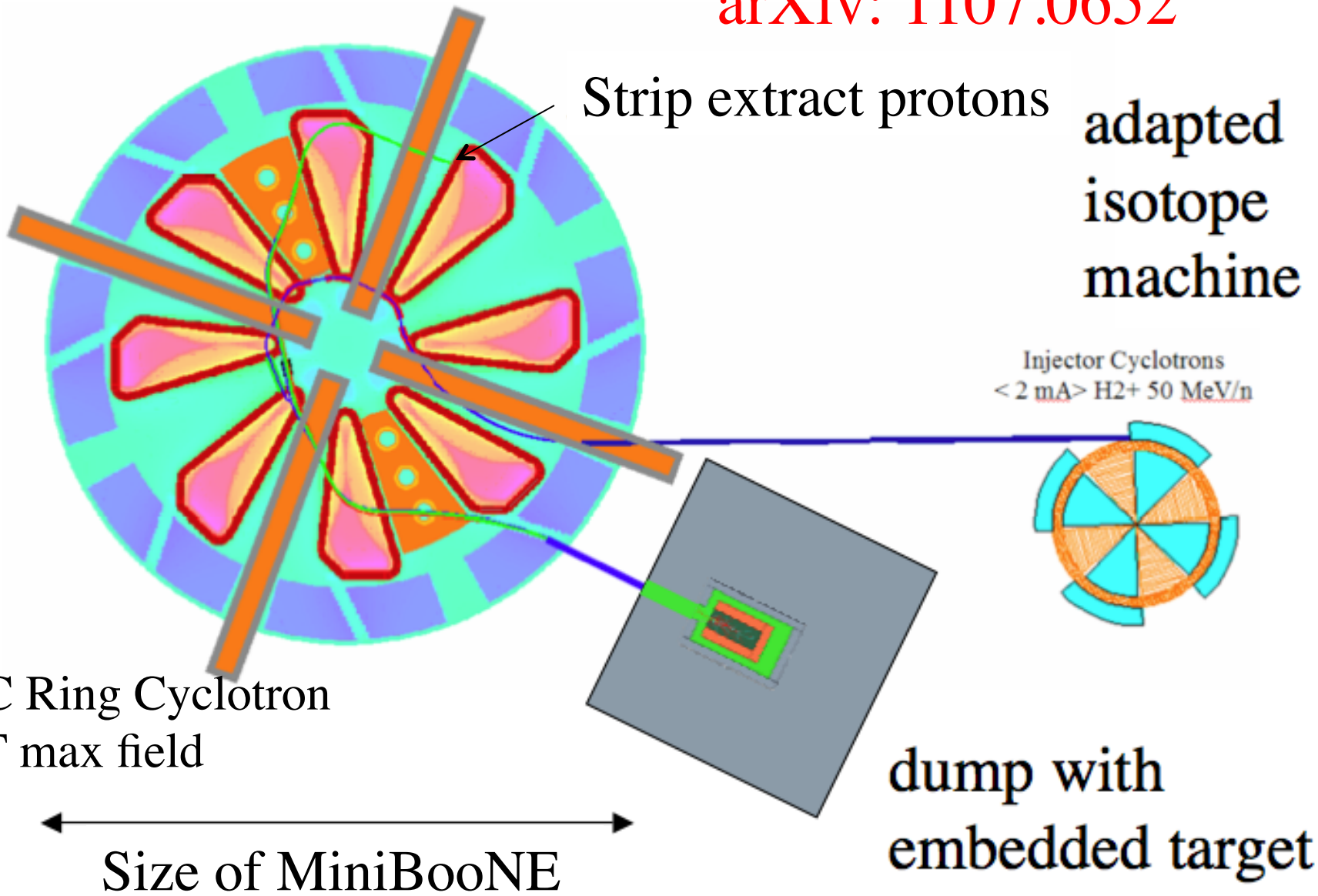
Beam power:
(20% duty factor each station)
1/2/5 MW average
5/10/15 MW peak





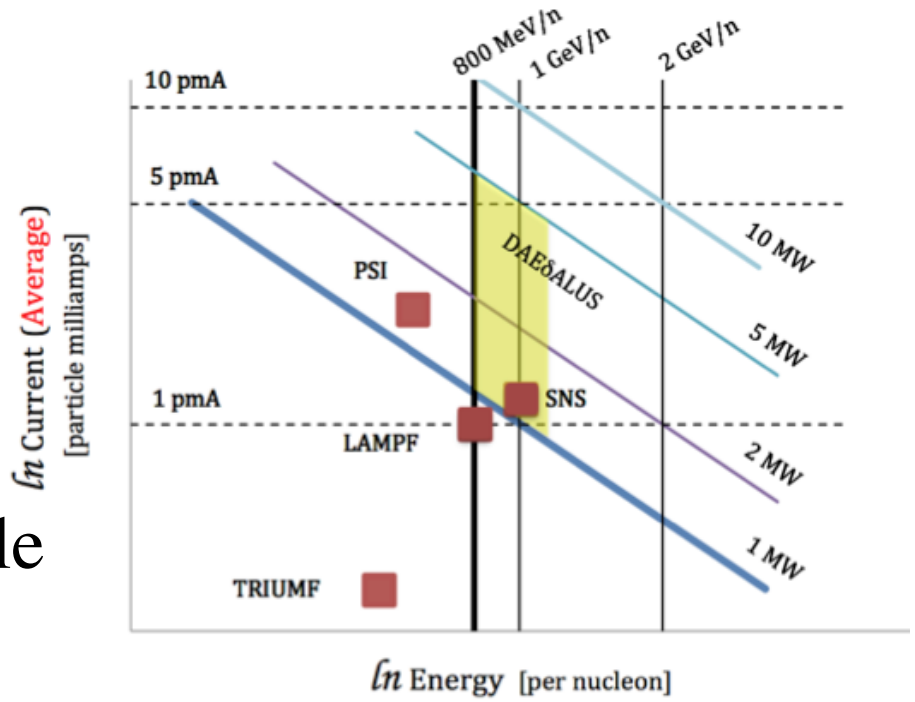
Concept Accelerating H_2^+ Ions

arXiv: 1107.0652



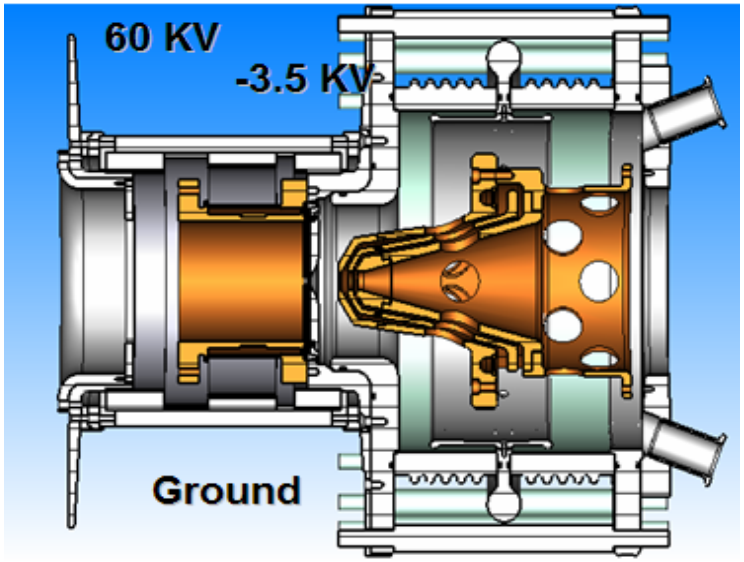
Status

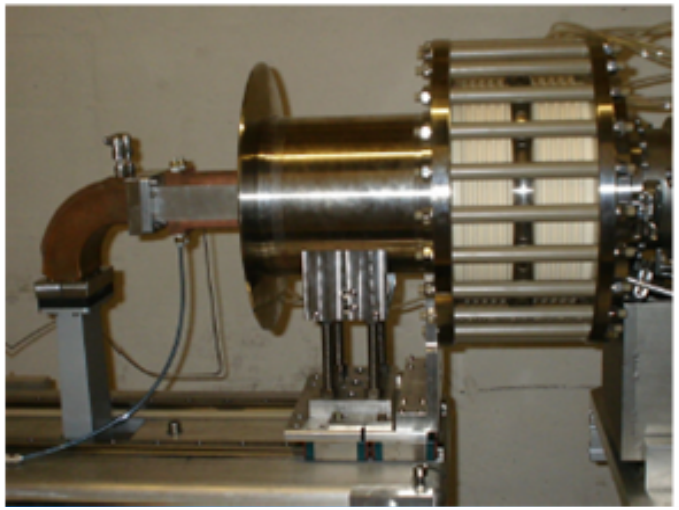
- Requirements press existing technology
  - Goals believed achievable
- Long list of challenges
  - Defines focus for R&D program
- To date no apparent showstoppers



Ion Source

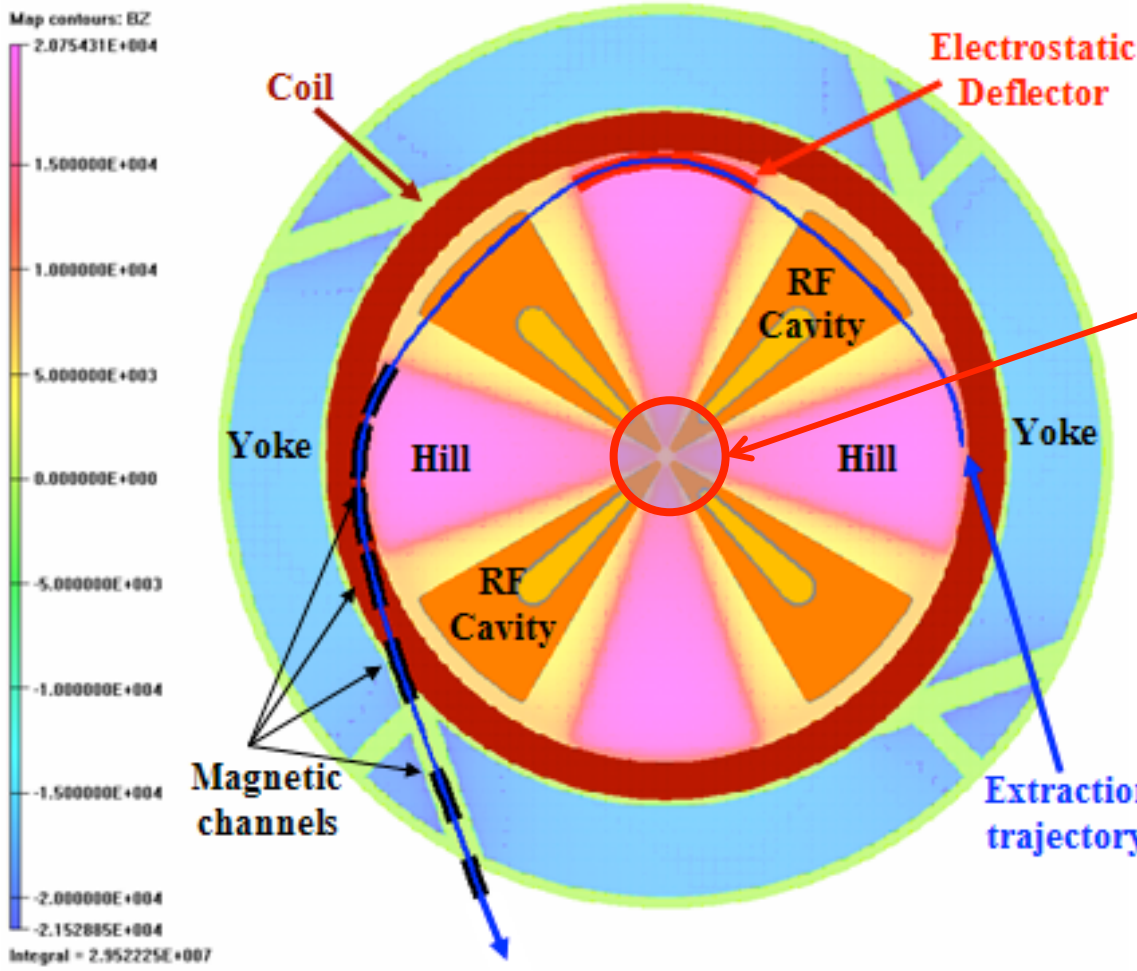
- 30 mA H_2^+ CW
  - Microwave proton source, tuned for H_2^+





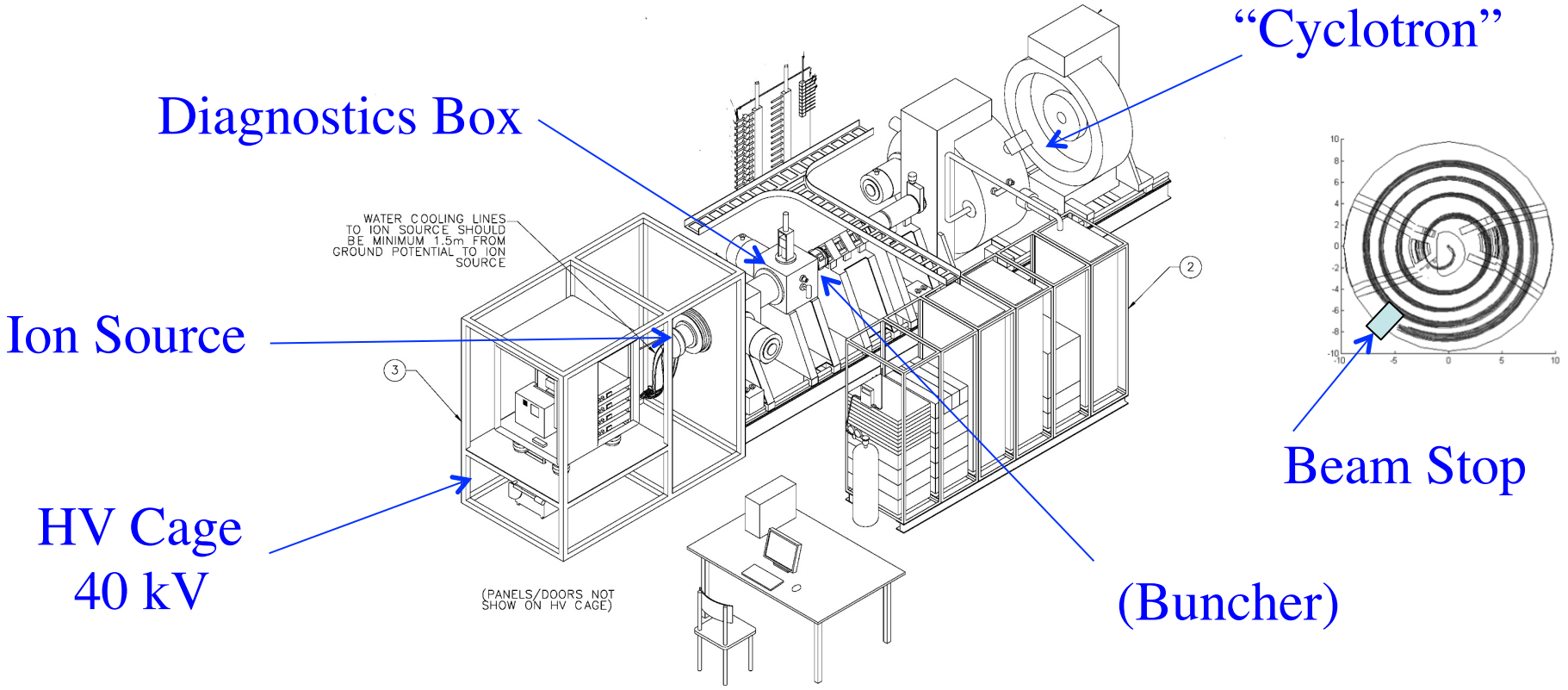
VIS – LNS-Catania

Injector Cyclotron



50 MeV/amu, 3 emA

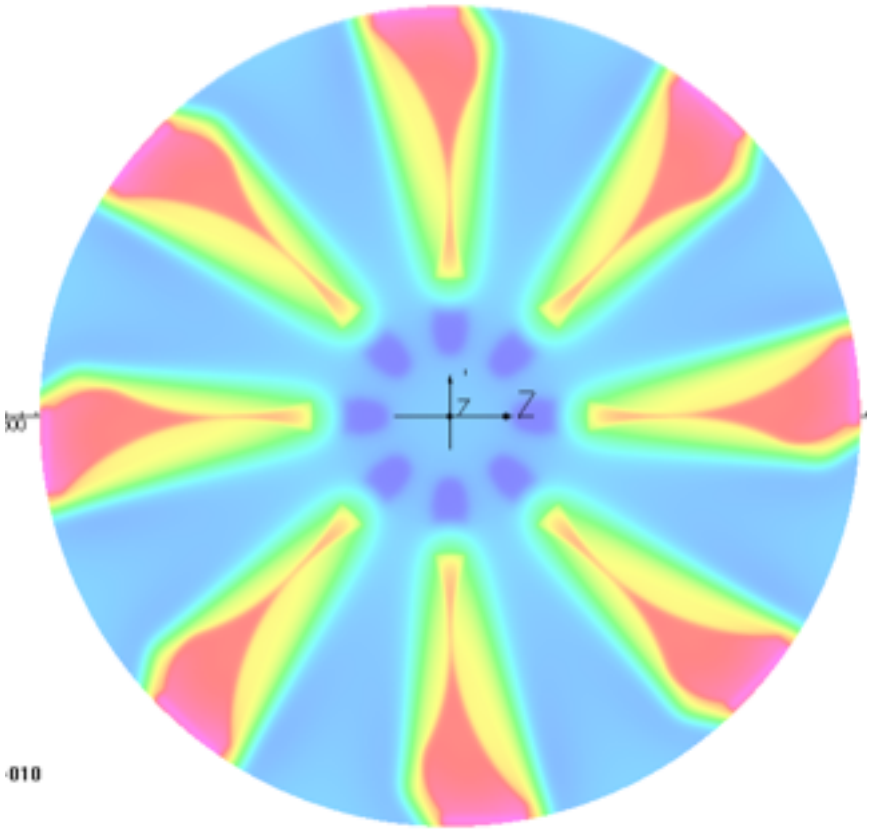
Test Stand at BEST Cyclotrons
(Vancouver BC)

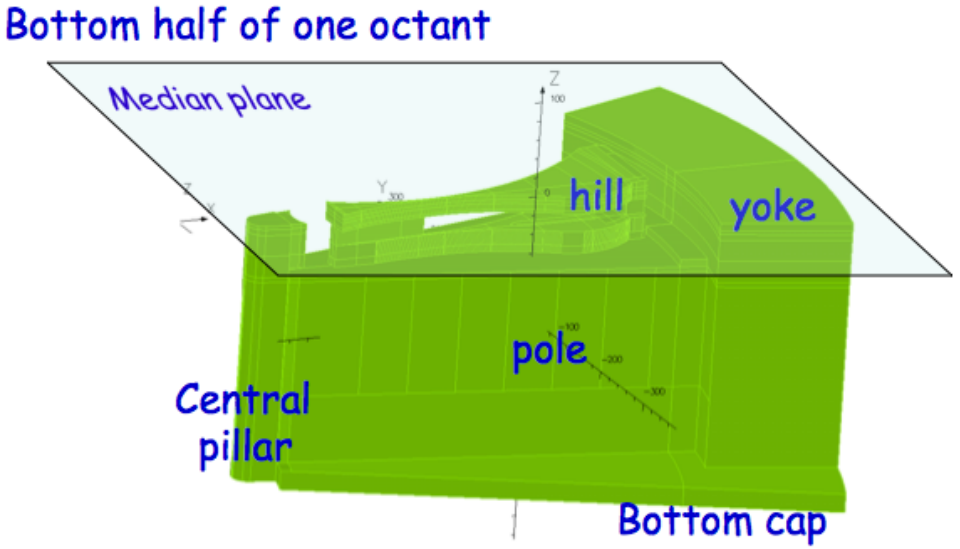


DAEδALUS

Run tests June 2012

Superconducting Ring Cyclotron

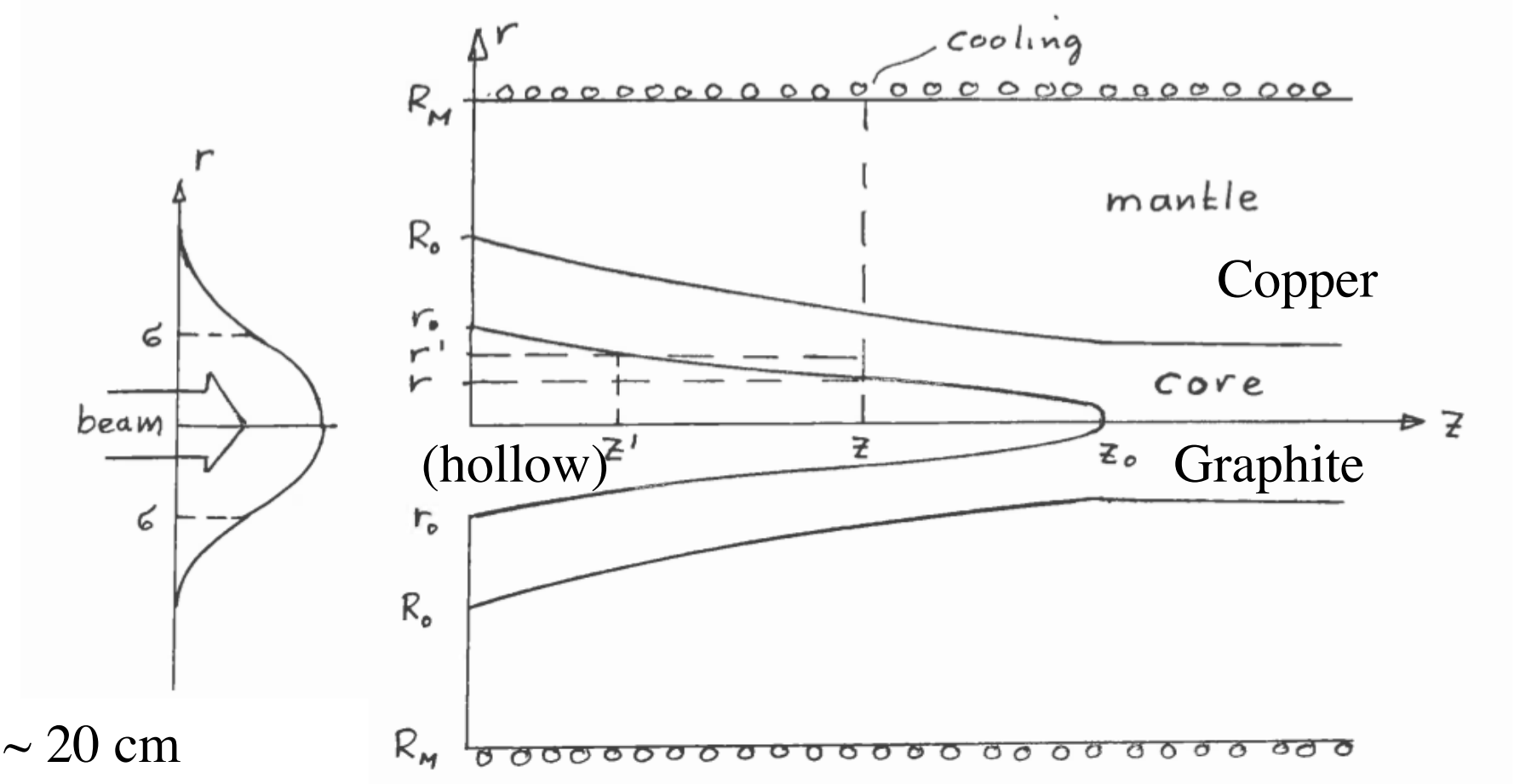




R_{max}(beam) = 4.9 m
B_{max} = 6.3 T
E_{max} = 800 MeV/amu

RFP issued for engineering design

Target/Dump Concept



$R_0 \sim 20$ cm
$z_0 \sim 8$ m
weight = 55 tons
Power ~ MW

Chris Tschalaer, MIT 2011

Summary

- Establishment of feasibility in ~1 year
- R&D program well-defined
- Developing roadmap for prototyping and construction

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--- for further information:

Janet Conrad, MIT

Mike Shaevitz, Columbia

Jose Alonso, MIT/LBNL