Muon Collaboration

The E951 Targetry Program

Targetry Meeting

CERN

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BROOKHAVEN NATIONAL LABORATORY

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Interest in High-power Proton Drivers

High average power—SNS

- Thermal management
- Radiation damage

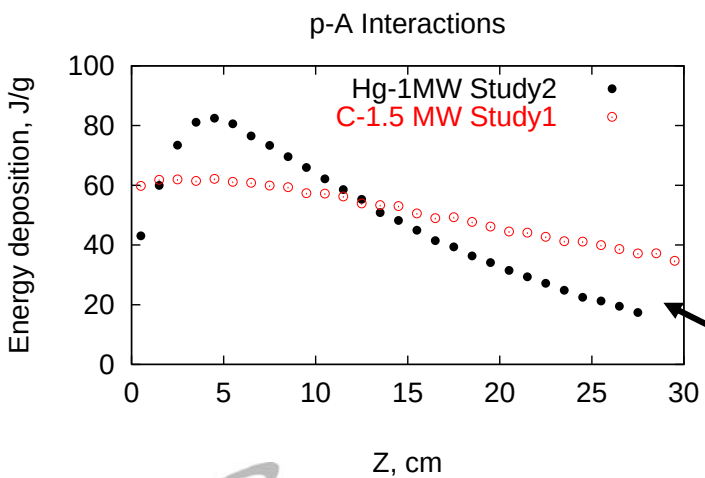
High peak power—NLC, Superbeams, NUFACT

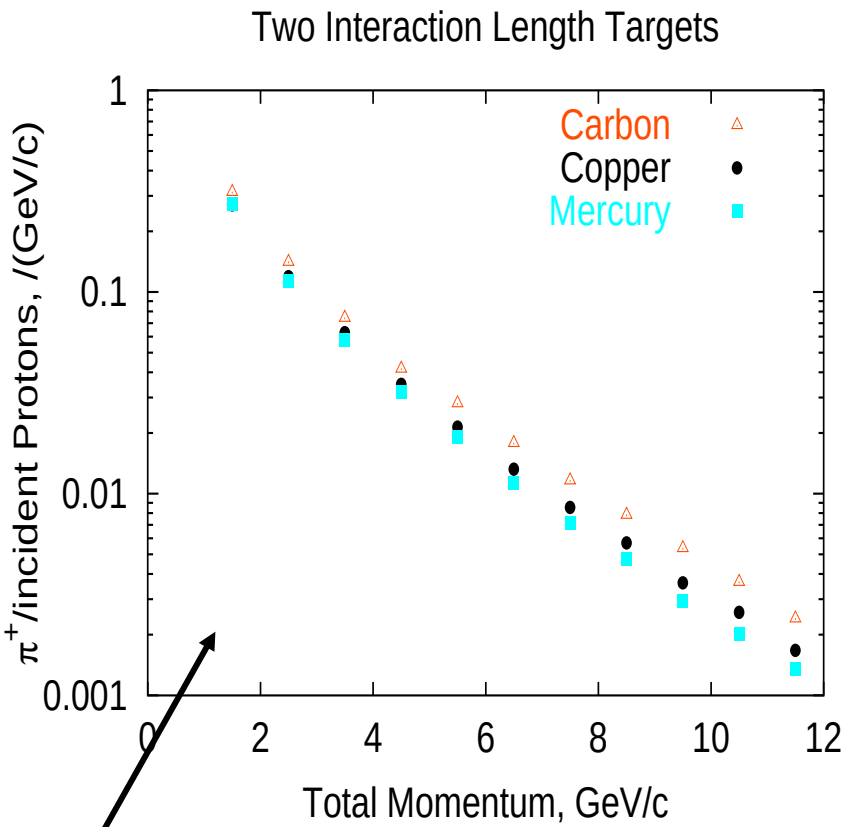
- Thermal management
- Radiation damage
- Thermal shock

Superbeams

Carbon is a good target candidate

- Higher momentum pions
- Stationary target up to 1.5 MW
- Good thermal properties
- Low energy deposition densities



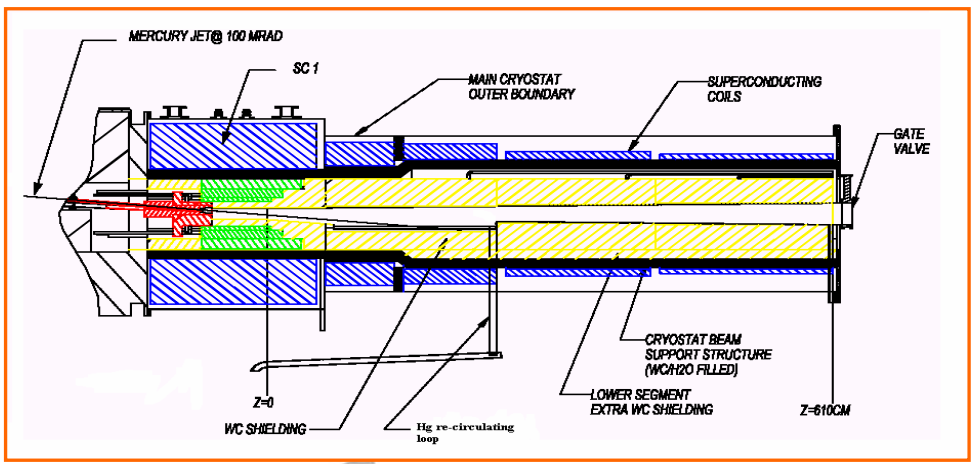


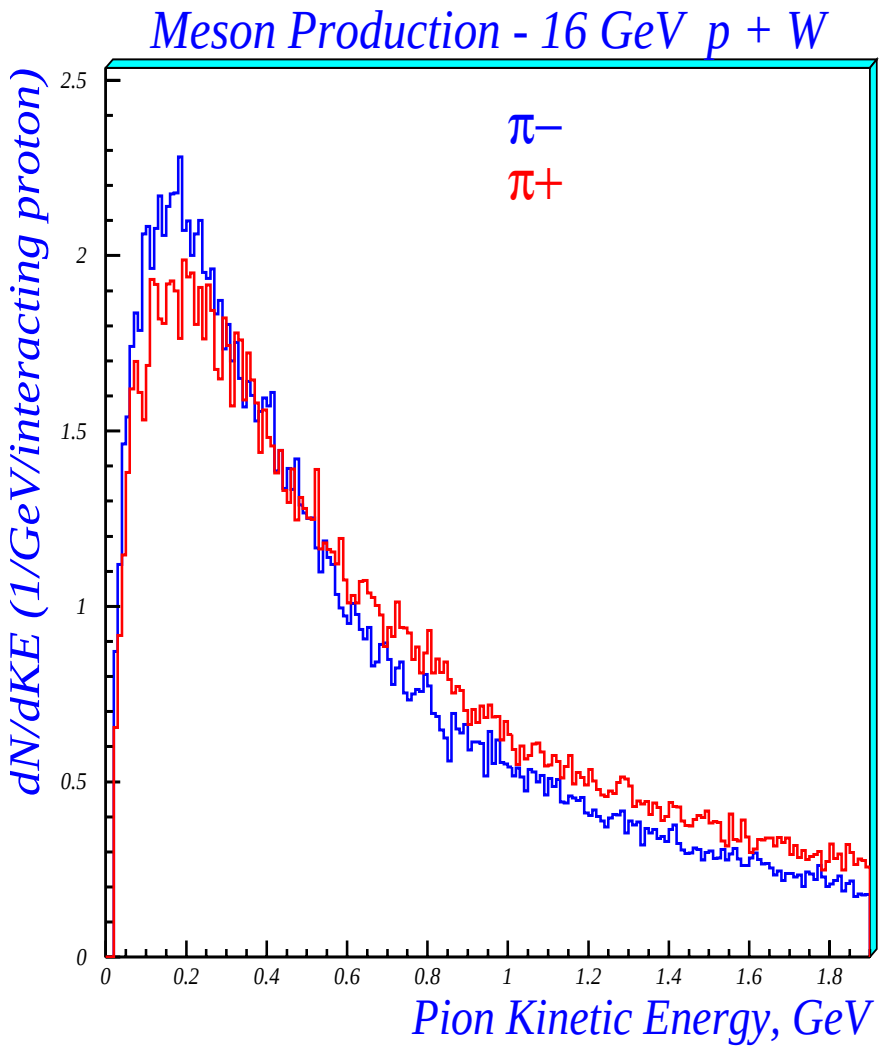
28 GeV Proton Beam

Neutrino Factory

Maximize Pion/Muon Production

- Soft Pion Production
  - Higher Z material
    - High energy deposition
    - Prone to target dissipation
- High Magnetic Field





High-Z Materials

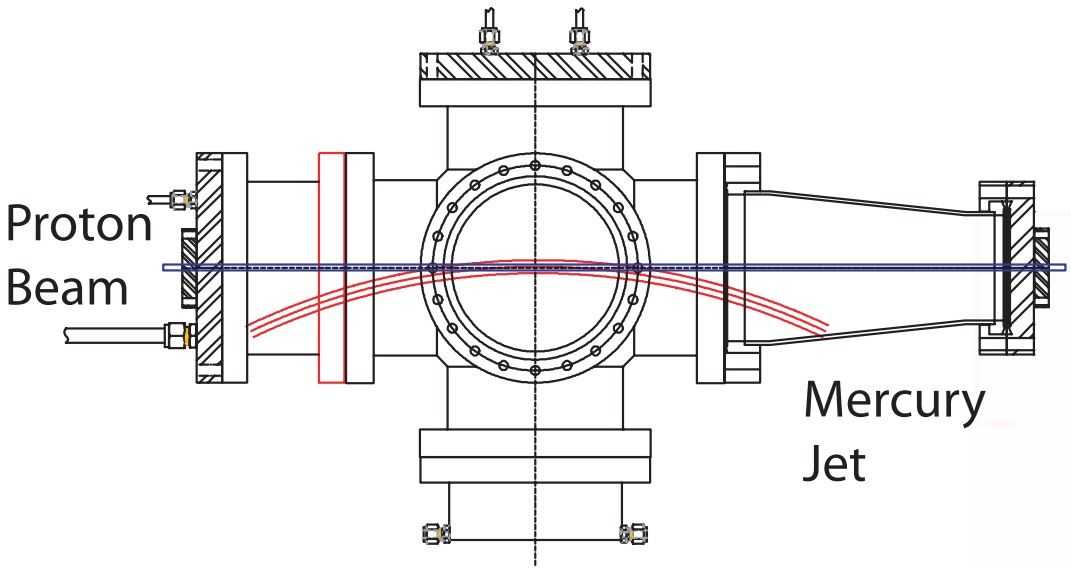
Key Properties

- Maximal soft-pion production
- High pion absorption
- High peak energy deposition
- Potential for extension beyond 4 MW (liquids)

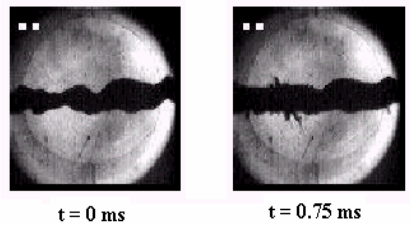
Key Issues

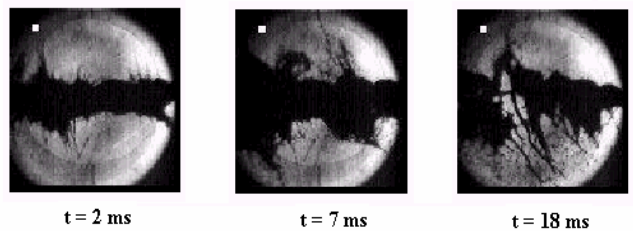
- Jet dynamics in a high-field solenoid
- Target disruption
- Achievement of near-laminar flow for a 20 m/s jet

E951 Hg Jet Tests

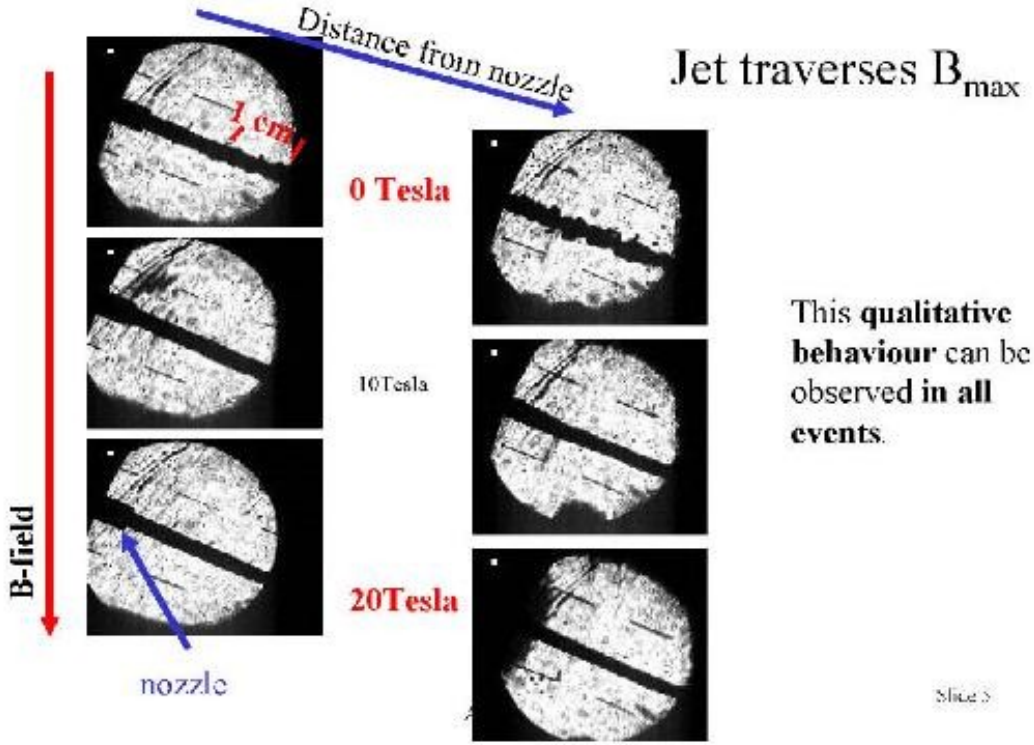


- 1cm Diameter Hg Jet
- 24 GeV 4 TP Proton Beam
- No Magnetic Field





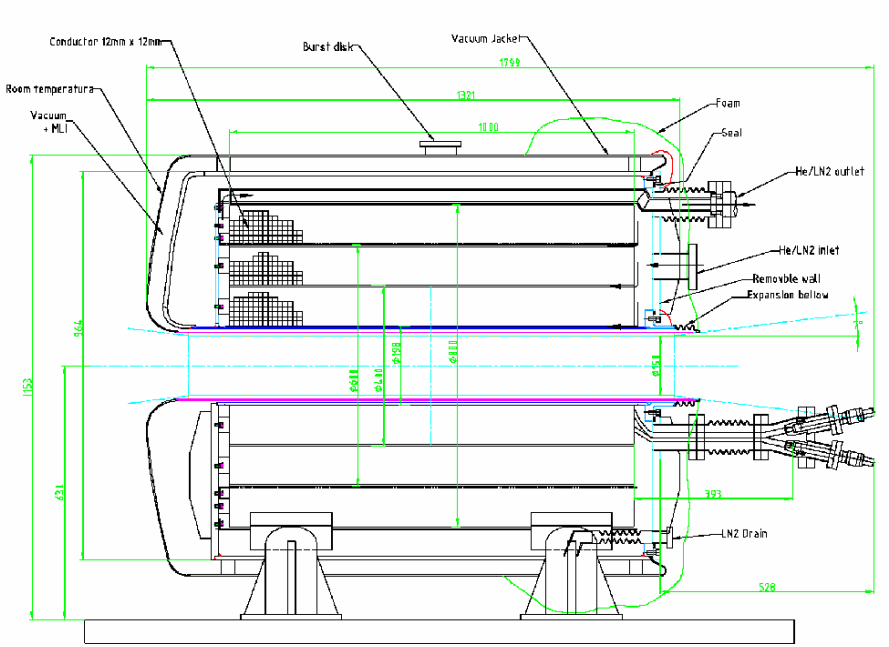
CERN/Grenoble Hg Jet Tests

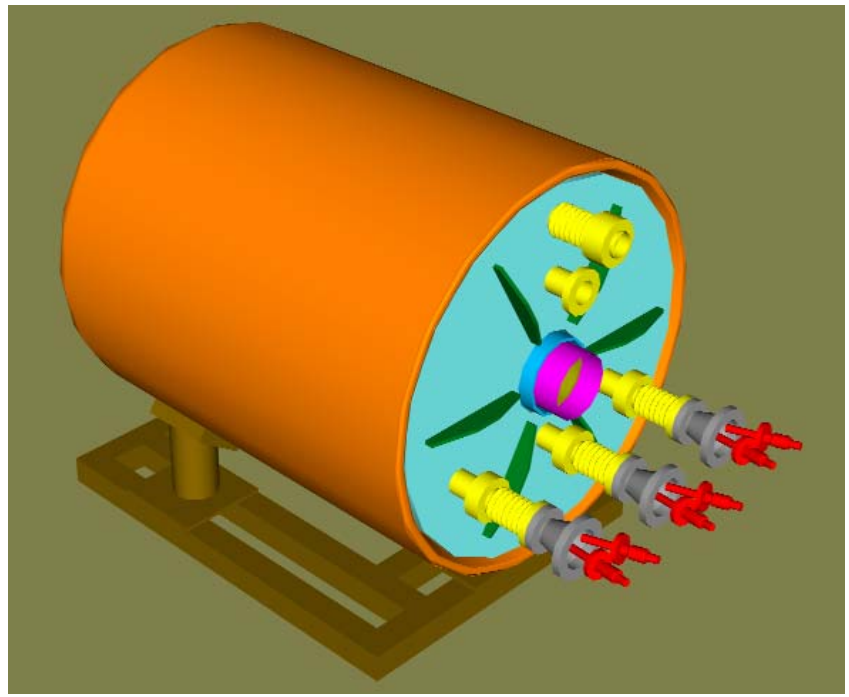


- **4 mm Diameter Hg Jet**
- **v = 12 m/s**
- **0, 10, 20T Magnetic Field**
- **No Proton Beam**

A. Fabich, J. Lettry
Nufact'02

High Field Pulsed Solenoid

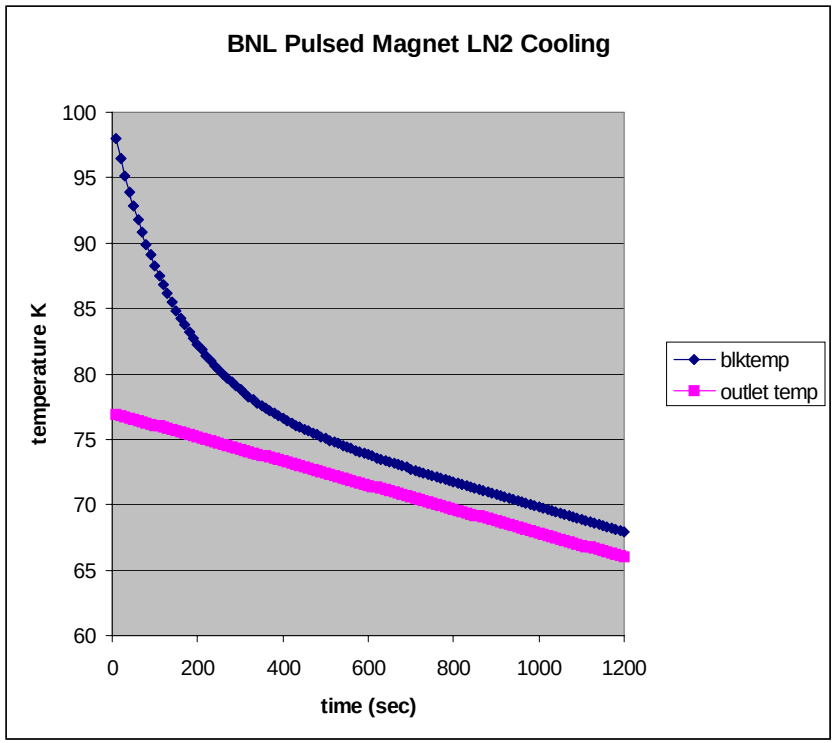


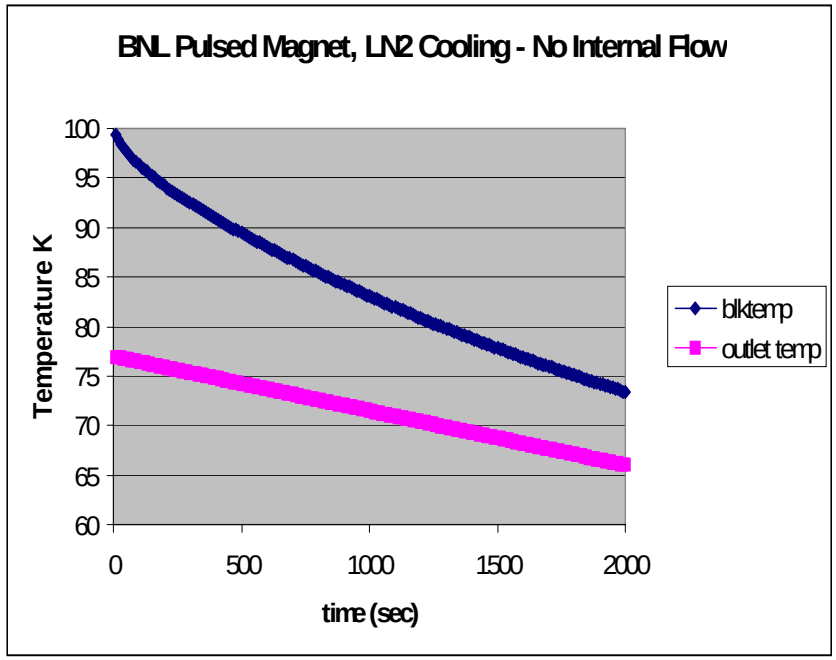


- 70^{o} K Operation
- 15 T with 4.5 MW Pulsed Power
- 20 cm warm bore
- 1 m long beam pipe

Peter Titus, MIT

Cryogenic Performance





LN_2 Forced Flow

LN_2 Pool Boiling

BROOKHAVEN NATIONAL LABORATORY

Battery Power Supply R&D

Battery/Charger
12V 1400A

Mech. Switch
1500V 1600 A

Load

IGCT 600V 4000A

Mechanical Switch capable
of 4.4 MW Pulsed System

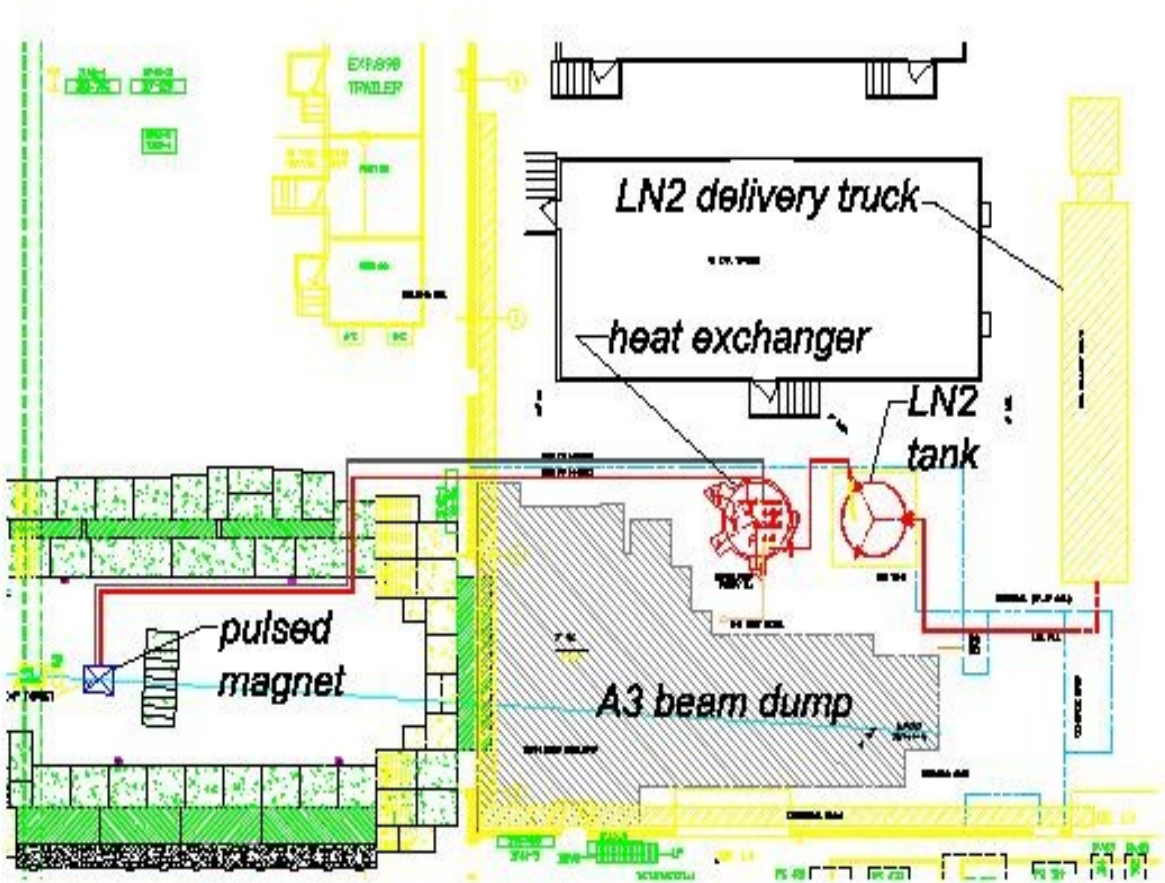
Harold G. Kirk

Future E951 Running

We plan to resume E951 running at the AGS.

But DOE HEP support has been terminated for FY03 and will likely remain so for FY04 and FY05.

We need to explore alternatives.



Alternative Running

Alternatives for targetry running:

Parameter	BNL AGS	CERN PS	JPARC RCS	JPARC MR
Proton Energy, GeV	24	24	3	50
p/bunch, 10^{12}	8	4	40	40
p/cycle, 10^{12}	70	30	80	300
Cycle length, μs	2.2	2.0	0.6	4.2
Availability (?)	07	06	08	09