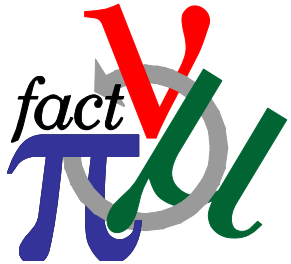
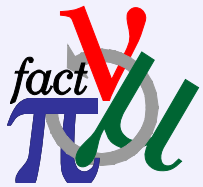


Muon Collaboration Spokespersons Report

1. Collaboration Goals
2. Organization
3. Developments since the last MUTAC review
4. Hopes for the future
5. Summary

Muon Collaboration Institutions



130 Scientists & Engineers from 37 Institutions

6 US Labs
ANL
BNL
FNAL
LBNL
Oak Ridge Nat. Lab.
Thomas Jefferson Lab.

17 US Universities
Columbia Univ.
Cornell Univ.
IIT
Indiana Univ.
Michigan State Univ.
NIU
Northwestern Univ.
Princeton Univ.
UC-Berkeley
UC-Davis
UCLA
UC - Riverside
Univ. Chicago
U. Illinois, Urbana-Champaign
Univ. of Iowa
Univ. Mississippi
Univ. Wisconsin

14 Foreign Institutes
BINP
CERN
DESY
Imperial College, London
INFN - LNF
JINR, Dubna
Karlsruhe
KEK
Kernfysisch Versneller Instit.
Osaka Univ.
Oxford Univ.
Pohang Univ.
RAL
Tel Aviv Univ.

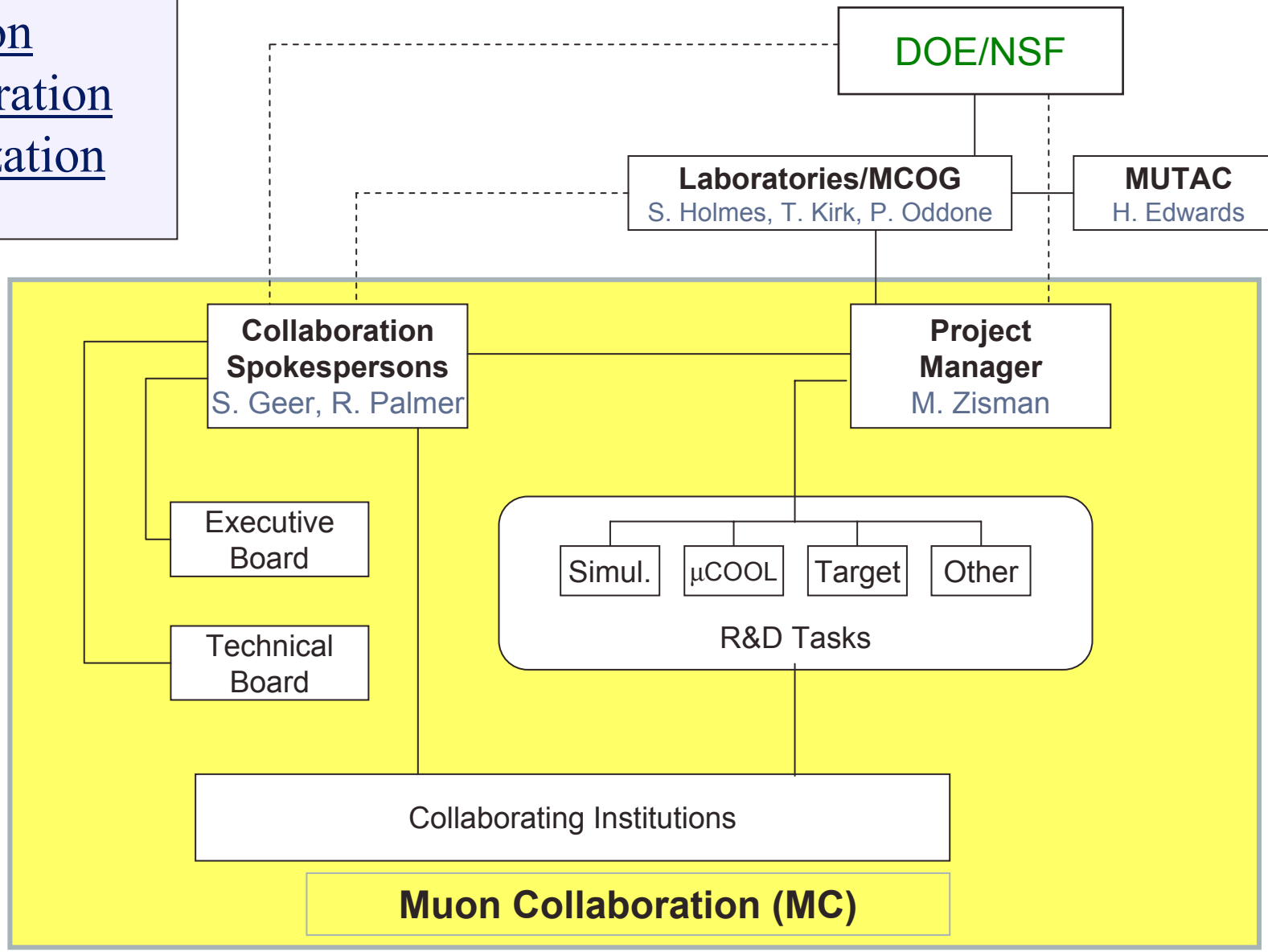
Muon Collaboration

Muon Collaboration Goals

The collaboration is governed by a charter which defines its goals and organization. The goals are defined :-

> "*To study and develop the theoretical tools and the software simulation tools, and to carry out R&D on the unique hardware, required for the design of Neutrino Factories and Muon Colliders.*"

Muon Collaboration Organization



Muon Collaboration

Muon Collaboration Executive Board

S. Geer	FNAL	Co-Spokesperson
R. Palmer	BNL	Co-Spokesperson
A. Sessler	LBNL	Associate Spokesperson
M. Tigner	Cornell Univ.	Associate Spokesperson
J. Gallardo	BNL	Secretary
D. Cline	UCLA	
D. Errede	Univ. of Illinois	
G. Hanson	UC Riverside	
D. Kaplan	IIT	
K. McDonald	Princeton Univ.	
A.N. Skrinsky	BINP	
D. Summers	Univ. Mississippi	
A. Tollestrup	FNAL	
B. Weng	BNL	
J. Wurtele	LBNL/UC-Berkeley	
M. Zisman	LBNL	Project Manager

Muon Collaboration

Muon Collaboration Technical Board

S. Geer	FNAL	Co-Spokesperson
R. Palmer	BNL	Co-Spokesperson
A. Bross	FNAL	
D. Hartill	Cornell Univ.	
H. Haseroth	CERN	
H. Kirk	BNL	
D. Kaplan	IIT	
K. McDonald	Princeton Univ.	
Y. Mori	KEK	
D. Neuffer	FNAL	
J. Norem	ANL	
R. Fernow	BNL	
R. Rimmer	JLab	
T. Roser	BNL	
M. Zisman	LBNL	Project Manager

Muon Collaboration

Muon Collaboration Sub-Activity Leaders

Targetry	K. McDonald (Spokesperson) H. Kirk (Project Manager)
MUCOOL	A. Bross (Spokesperson)
MICE	D. Kaplan (US Contact person)
Simulations/Theory	R. Fernow (Chair, Simulation/Theory Committee)

Speakers Bureau G. Hanson (Chair)

Muon Collaboration

Since the last MUTAC review …

1. Excitement over Neutrino Oscillations continues. The case for Neutrino Factory R&D is as strong as ever (→Debbie Harris talk)

2. Funding has been flat (→ Mike Zisman's talk) in spite of the MCOG recommendation to increase funding by 1M$/year, & the HEPAP report that recommended about double the present level of funding)

3. Despite very tough funding we have completed the civil construction for the new MUCOOL test area, progressed towards the next step in the targetry R&D, and continued making progress with the neutrino factory design studies. We feel we have continued to make good technical progress (→ subject of this review)

Muon Collaboration

Neutrino Factories: General Status

1. Based on Studies 1 & 2 we believe Neutrino Factories are feasible.

2. We have a workable Neutrino Factory design provided we can develop components that meet some aggressive requirements.

3. We have made significant progress with our target R&D and MUCOOL programs, and have scientific approval for an international cooling experiment at the Rutherford Lab (MICE).

4. The simulated performance of the Study 2 Neutrino Factory design should be adequate for the physics, but the estimated cost is high.

5. Therefore, we believe the critical items for the Collaboration to focus on are (i) Component R&D, and (ii) Cost Reduction.

Muon Collaboration

Comments on Technical Progress: Cost Reduction - 1

1. In the last two years our design & simulation activities have focused on reducing the cost of a Neutrino Factory. We are working towards a "Study 3" in 1 or 2 years time, which we hope will be international in its organization and participation, and may be hosted at the Rutherford Lab.

2. This year we are participating in the APS sponsored neutrino study, in which there is a Neutrino Factory & Beta Beam Working Group (Conveners: S. Geer, M. Zisman). We are using this context to make a partial update of our Study 2 baseline design … this "Study 2a" is a good step towards a more comprehensive Study 3.

Muon Collaboration

Comments on Technical Progress: Cost Reduction - 2

1. The Neutrino Factory Study cost estimate was dominated by three roughly equally expensive sub-systems: (i) Phase Rotation, (ii) Cooling Channel, (iii) Acceleration. These accounted for ~3/4 of the total cost.

2. We have therefore focused on, and are making good progress in developing, potentially cheaper solutions for all three sub-systems.

See talks of Fernow, Berg, and Palmer

Muon Collaboration

Comments on Technical Progress: NCRF R&D

Neutrino Factory RF cooling channel performance requirements:
NCRF providing 16 MV/m at 201 MHz in a multi-Tesla field

PROGRESS:

-- 805 MHz tests
- large dark currents&breakdown mapped out vs magnetic field
- Be windows with TiN coating do not seem to suffer breakdown damage
- Be windows OK for multipactoring and stability with RF heating
- Successful Muons Inc Phase 1 high pressure hydrogen measurements

-- 201 MHz cavity
- Cavity construction advanced
- MUCOOL Test Area construction completed and preparation for 201 MHz tests beginning

BUT WE NEED

-- 805 MHz tests re-established in MTA
-- 201 MHz cavity
-- 201 MHz test capability
-- magnet for 201 MHz test (funds ?)

See talks of Bross, Li, Torun & Johnson

Comments on Technical Progress: SCRF R&D

Neutrino Factory SCRF performance requirements for acceleration: 17 MV/m at 201 MHz (Study 2)

PROGRESS:

-- 201 MHz test cavity built
-- Test facility built at Cornell
-- First tests achieved 11 MV/m and observed Q-slope
-- Cavity improvements (recoating) underway, ready for retesting soon.

BUT WE NEED

-- Continued testing and development to achieve goals, including exploration of various coating techniques.

See talk of Hartill

Muon Collaboration

Comments on Technical Progress: Absorber R&D

Cooling channel absorber requirements are demanding:

-- Liq. H2 absorbers operating next to RF cavities with very thin low-Z windows

PROGRESS:

-- Absorbers designed (forced flow & convection driven)
-- Thin windows designed, fabricated, and burst tests (including at LN2 temp) made.
-- Non-linear FEA calculations developed →good description of measurements
-- New (thinner/stronger) window designed: new window prototype built.
-- KEK absorber and cryostat built and being installed in MUCOOL Test Area
-- MUCOOL Test Area construction completed, & being equipped for first absorber filling tests

BUT WE NEED

-- Filling test for KEK absorber
-- Filling test for forced flow absorber
-- Study alternative window materials
-- Eventual beam test

See talks of Cummings, Ishimoto, & Errede

Muon Collaboration

Comments on Technical Progress: MUCOOL Test Area

1. The MUCOOL NCRF and absorber R&D programs need a test area.

2. Expensive … but our experience with both the Lab G facility and the targetry experiment have taught us the value of having the right test facilities.

3. We decided, even with a reduced budget, to put the largest slice of the FY03/04 funds devoted to MUCOOL into pushing ahead with the new test area.

CIVIL CONSTRUCTION IS COMPLETED
(On Time, On Budget, No Accidents)

Area now being equipped for first absorber and RF tests

Muon Collaboration

Comments on Technical Progress: Targetry

Need target that can handle 4 MW proton beam

PROGRESS

-- Carbon-rod & Hg-jet targets studied at BNL ✹ OK to ~1.5 MW
-- Hg jet preferred because x 2 pion yield & may survive 4 MW proton beam
-- Jet (2 m/s) remains intact for beam spill ✹ Fragments have small velocities
-- Development of 20 m/s jet under way
-- Target test magnet designed and out for bid
-- Future home for target R&D at CERN being explored

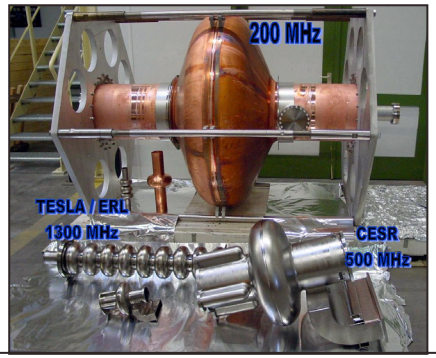
BUT WE NEED TO:

-- develop & test 20 m/s jet
-- test in higher intensity (x 4) AGS beam
-- test in high-field solenoid + beam.

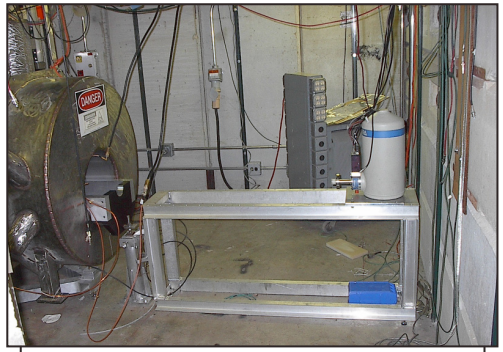
See talks of McDonald, Kirk, & Samulyak

Previous Hardware Activities - 1

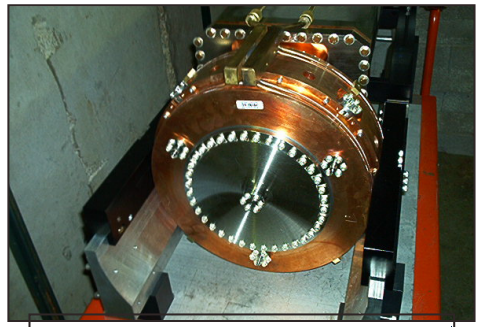
Muon Collaboration



201 MHz SCRF Cavity for Acceleration – Cornell



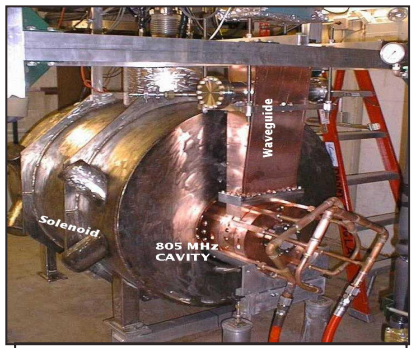
Studied dark current & X-rays from cavity with various detectors



Single cell cavity with Be windows - LBNL

Tested Be-Windows for RF Cavities – LBNL

High-Gradient RF Tests in High Magnetic Field – FNAL



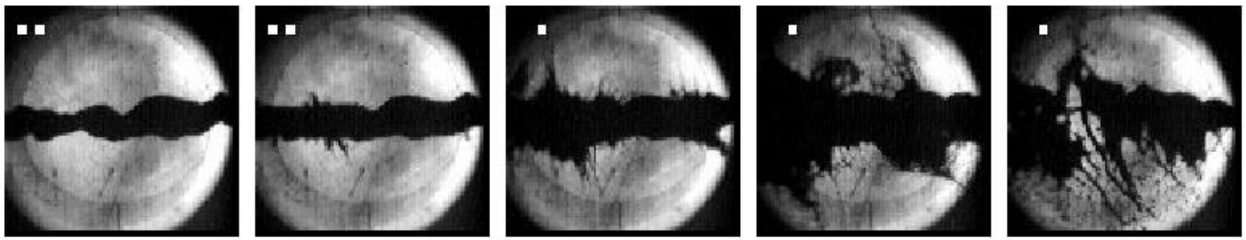
5T Cooling Channel Solenoid – LBNL & Open Cell NCRF Cavity operated at Lab G – FNAL

High pressure seal test for high-pressure RF studies – Muons Inc

Dark current ring measurements on glass plate – ANL/FNAL/IIT

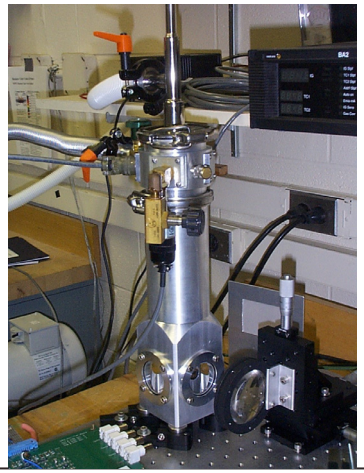
Muon Collaboration

Previous Hardware Activities - 2

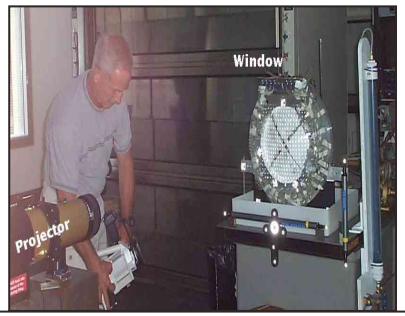


t = 0 | 0.75 ms | 2 ms | 7 ms | 18 ms

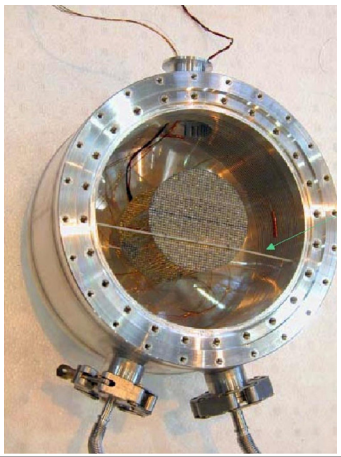
Hg jet beam tests – Target experiment



Bolometer detectors for Window Beam profile – cryogenic setup– U. Chicago

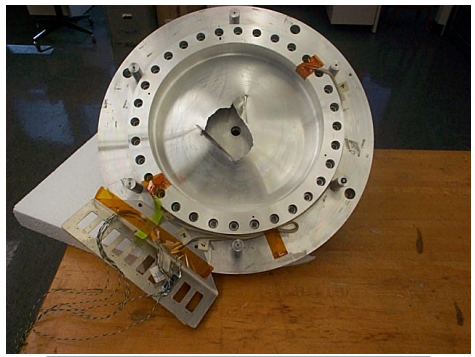


Thin absorber windows Tested – new technique – ICAR Universities



Liq.H Absorber with central heater– KEK

Liq.H Absorber – KEK To be tested at FNAL



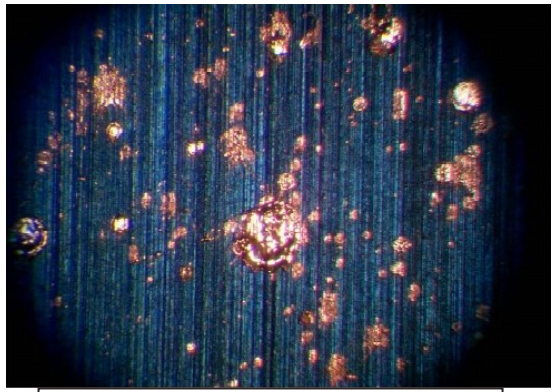
Window burst tests – ICAR Universties

Muon Collaboration

New Hardware Activities - 1

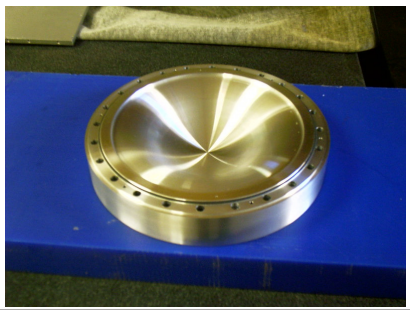
Calibration of LH2 Level Sensor – KEK

201 MHz half-shell ebeam welding of Stiffening – JLab



Be RF Window Tested – LBNL

500 MHz Cavity for sputtering studies – Cornell



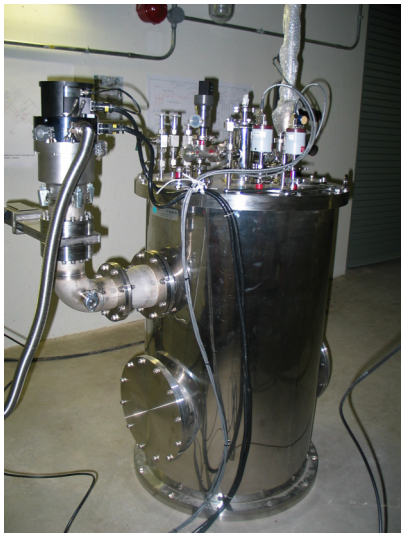
New Double Bell Absorber Window – U. Mississippi

2000 Atmos H2 805 MHz Test Cell – Muons Inc

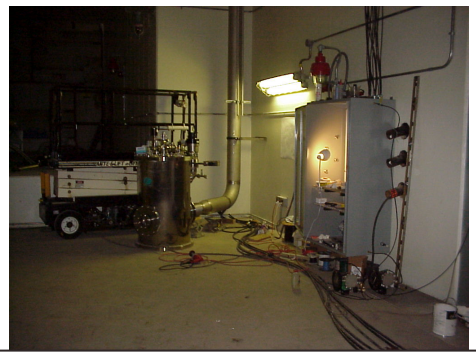
805 MHz SS Domed Window – LBNL

Hg Pump for high-speed Jet – Princeton

New Hardware Activities - 2



LH2 Absorber Cryostat – KEK

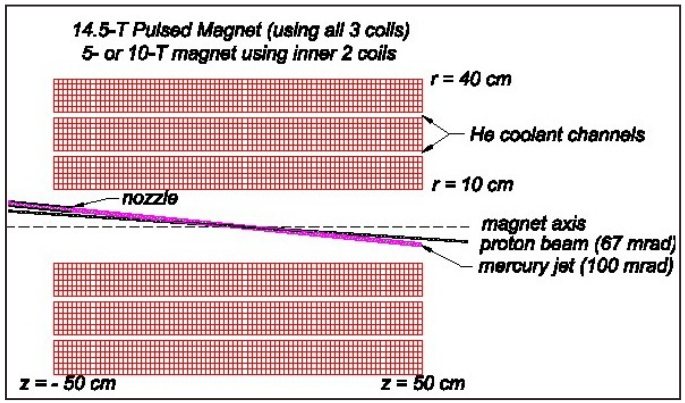


LH2 Absorber Cryostat installed in MTA FNAL/KEK

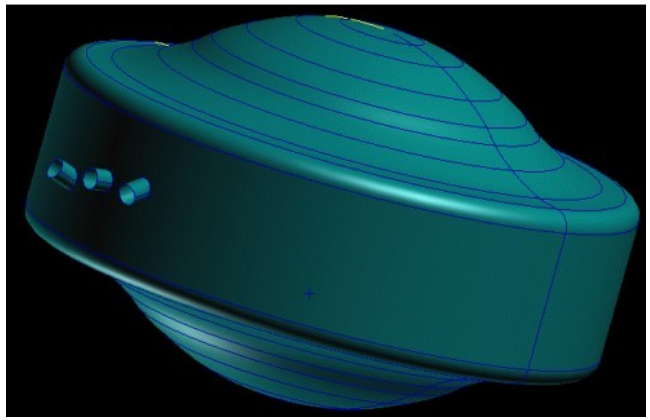
New MUCOOL Test Area Completed – FNAL

Muon Collaboration

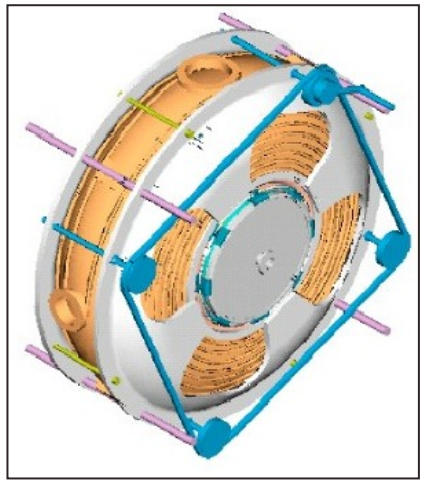
Previous Design Activities



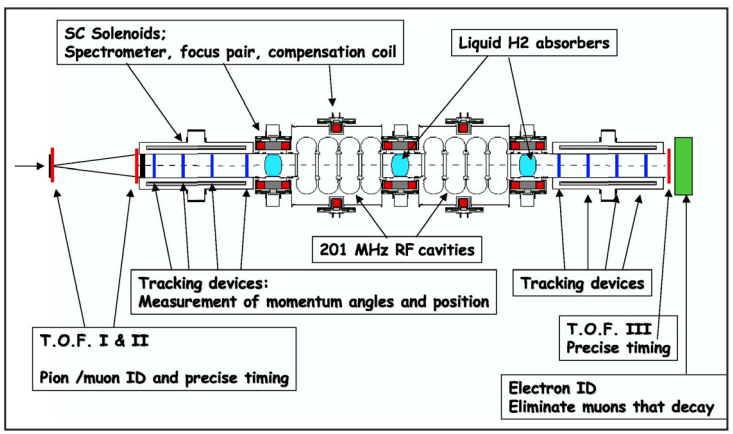
Design for pulsed target test magnet - BNL



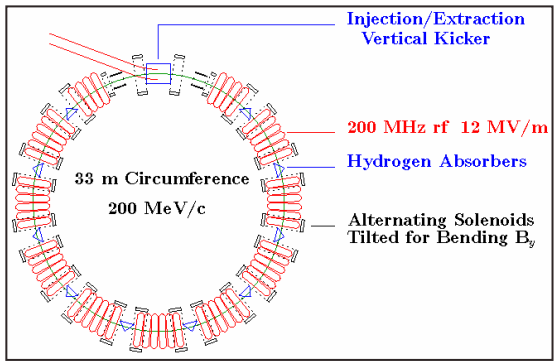
Improved absorber window design -- U. Oxford



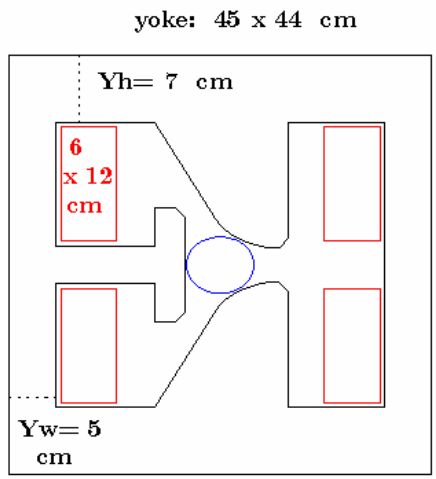
200 MHz NCRF Cavity design -- LBNL



Cooling experiment design (MICE)



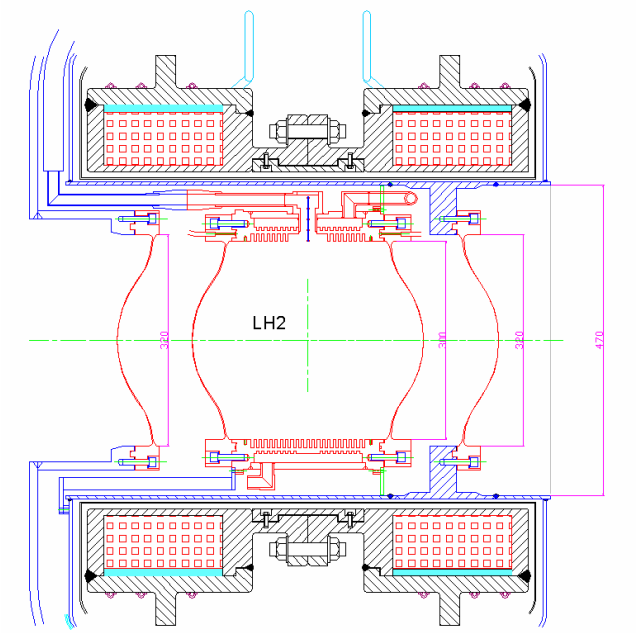
Ring cooler design work



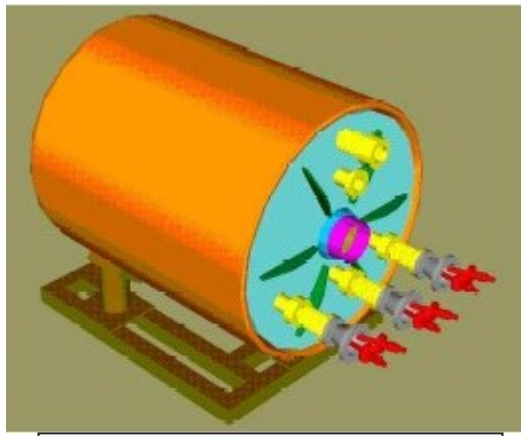
Rapid cycling magnet design – U. Mississippi

Muon Collaboration

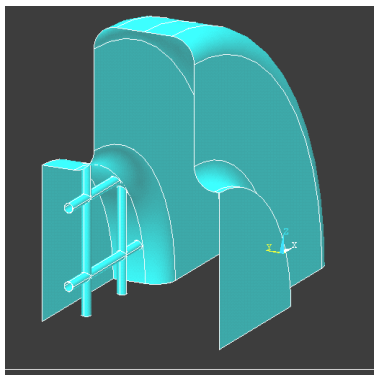
New Design Activities



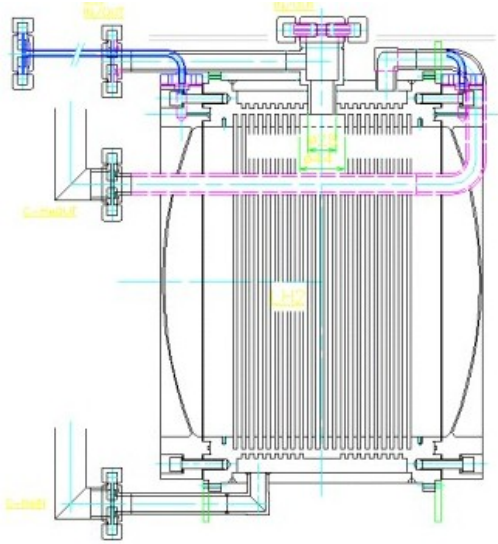
MICE Integrated Absorber & Magnet Design – Oxford/IIT/LBNL/NIU



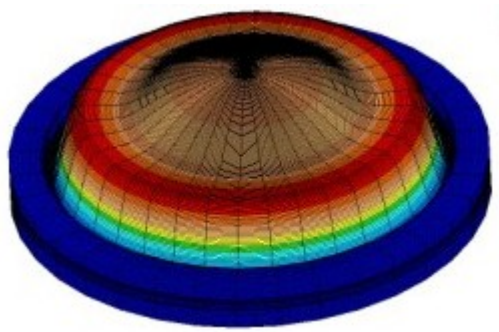
Target Solenoid – BNL



Gridded Tube RF Design – FNAL/IIT



MICE Absorber – Oxford/IIT/LBNL/NIU



New window design FEA studies – Oxford

Muon Collaboration

Comments on Technical Progress: International Muon Ionization Cooling Experiment (MICE)

MUTAC has previously said that:
"The cooling demonstration is the key systems test for a Neutrino Factory "

In the last couple of years we have assembled a strong international collaboration to propose MICE -- a muon cooling experiment in a muon beam at the Rutherford Lab.

MICE has scientific approval

It is proposed to fund MICE with contributions from four funding "regions" – UK, US, EU (excluding UK), and Japan.

UK funds are earmarked. The next big step is to secure US funding.

See talks of Drumm and Long

Muon Collaboration

Hopes for the Future

(same hopes as last year)

Funding is a concern, but the support for our R&D from the ν community, the exciting developments in ν physics, the enthusiasm within the Collaboration & continued progress towards our goals, give us hope for the future.

We would like:

1. To get adequate support from the funding agencies to pursue our current hardware R&D program (FY01 funding level – consistent with the HEPAP recommendation)

2. To get support for MICE so that within a few years the critical cooling demonstration can be made

3. In one or two years to participate in a "study 3" which will be focused on a cost-optimized Neutrino Factory design.

Muon Collaboration

Summary

1. We believe that, with limited funds, we have made good progress on:

   i) Hardware development
   ii) Scientific approval for MICE
   iii) Design studies aimed at cost reduction – participation in APS sponsored neutrino study

2. We think that the Muon Collaboration is well organized and continues to provide a model for doing accelerator R&D that is succeeding … except for funding woes.

3. We hope that the committee will again support restoring the funding for the collaboration to a more reasonable level (the level recommended by the HEPAP sub-panel), and agree this is desirable and justified.