# Summary

MUTAC Review

Brookhaven National Laboratory

April 19, 2007

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# MUTAC06 MERIT Recommendations

1) Pay close attention to the delivery of the Hg delivery system components to keep on-track with integration tests at MIT and installation at CERN.

DONE

2) Continue negotiations with CERN regarding run schedule with the goal of obtaining a commitment for a follow-up run.

DONE – Initial negotiations negative – concerns with conflicts with subsequent nTOF running. New situation – Conflict with nTOF removed

3) Proceed rapidly with Hg-related safety reviews at CERN, sooner rather than later, to ensure timely readiness for the experimental run.

DONE

4) Continue to investigate mixed-waste issues related to shipping the apparatus back to Oak Ridge after the CERN exposure.

DONE

# MUTAC06 MUCOOL Recommendations

1) High priority should be given to testing the 201 MHz cavity with highest magnetic field available. We have performed the B field scan at as high a field as we can currently apply. Need to modify vacuum system for 201 to move it closer to 5T magnet (this is needed to run with coupling coil if we ever get it)

2) The committee is concerned about contracting the work to produce 8 additional NC 201 MHz cavities. The collaboration has benefited greatly from TJNL expertise, but TJNL has indicated that they cannot do this work in the future. The qualifications of alternative vendors must be carefully evaluated. Working with UK and JLAB will still be available as consultant for outside vendor.

3) The absorber heating tests (up to 600 W) are ideally done with a high intensity beam. Since MICE will not have such a beam, it seems reasonable to do this at MTA. However, the cost for providing a high intensity proton beam is estimated to be about $ 400 k ($ 100 k from the Muon Collaboration). Given the tight NFMCC funding situation, the collaboration should investigate whether this measurement can be done elsewhere or if it is really necessary The high-intensity beam is in progress and is now part of the Fermilab MCTF program.

# The common fund Issue

The MICE common fund: Isn't this a RAL user fee? Will the MTA charge for use of the facility.

The short answers: Maybe and No.

The long answer: It is not completely clear how the "common fund" will be used. We need further clarification. But if you can ask the same question about CERN or the AGS.

CERN: No beam usage fees but …

AGS: Beam usage fee is the norm if you are an "un-favored" user

# MICE Labor Shortage

How bad is the problem? What is the impact? What is the fix?

The short answer: 3 to 4 post-docs are needed.

The long answer: U.S. Mice needs people in order to fully exploit the results from MICE. The NSF award to UC-Riverside is a welcomed start. 2 to 3 more Post-docs are needed.

The longer answer: This issue extends well beyond just MICE. The design work of the NFMCC needs invigoration both for support of the IDS and Muon Collider studies. The pressures of the need for hardware vs. the need for people is great. We need relief.

# FY08 directions

## Wait a moment

# The National Program

## EPP2010

**The United States should remain globally competitive in elementary particle physics by playing a leading role in the worldwide effort to aggressively study Terascale physics.**

**The Muon Collider program contributes to this goal**

**Action Item 5. The committee recommends that the properties of neutrinos be determined through a well-coordinated, staged program of experiments developed with international planning and cooperation.**

**The International Design Study contributes to this Action Item**

# European Strategy for Particle Physics

In addition to the LHC, neutrino physics will have a prominent role to play in the European program.

"Studies of the scientific case for future neutrino facilities and the R&D into associated technologies are required to be in a position to define the optimal neutrino programme based on the information available in around 2012; The CERN Council will play an active role in promoting a coordinated European participation in a global neutrino programme".

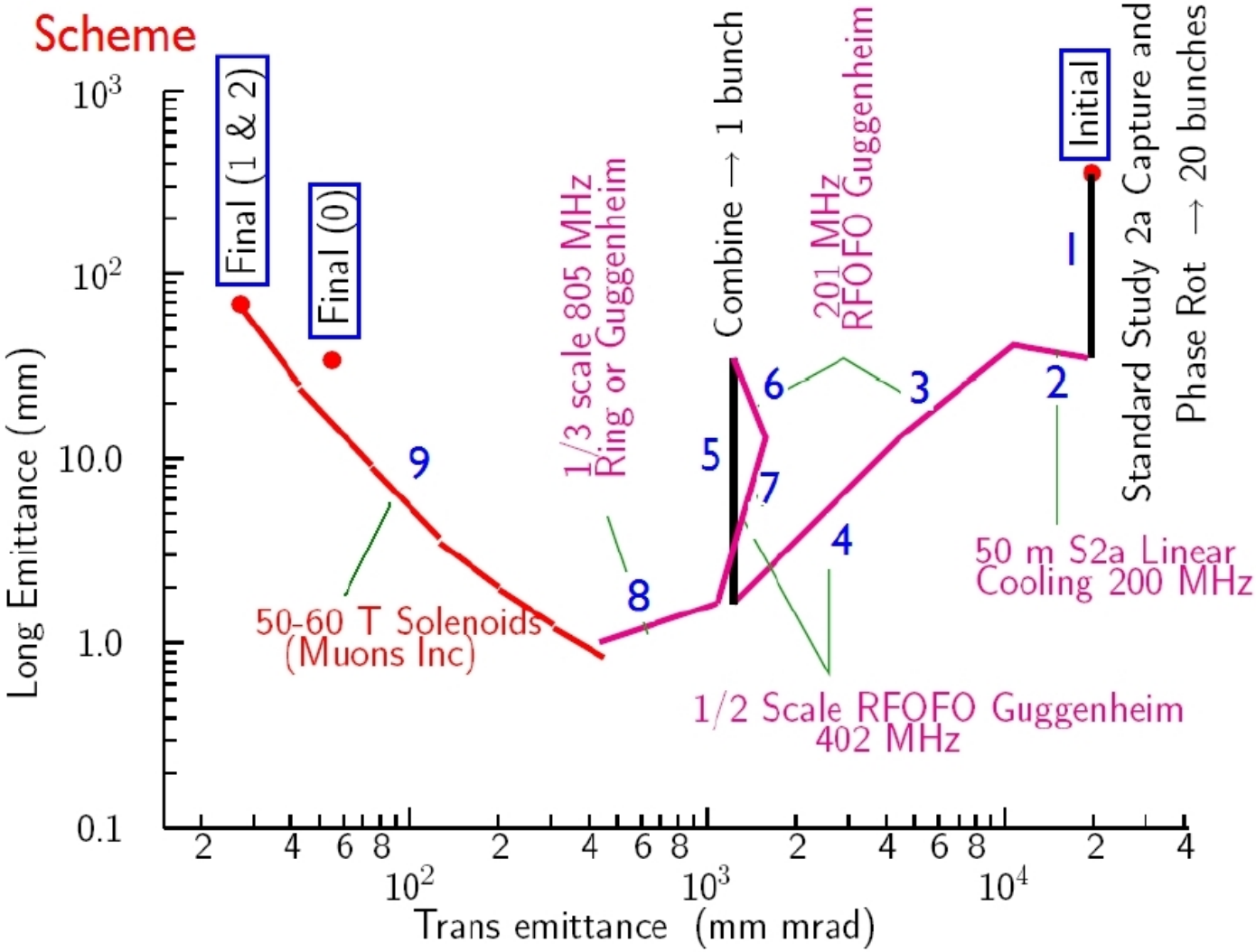
# The International Design Study

**Goal: Unified cost-optimized solution for a Neutrino Factory by 2010. Engineered design by 2012.**

The International Design Study (IDS) will build on the successful conclusion of the International Scoping Study (ISS) in which an international study team developed a unified set of parameters for a future Neutrino Factory.

The year 2012 is significant in that Europe's LHC debt will be retired by that year.

# A Muon Collider Cooling Scenario

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# Key R&D Issues toward a Muon Collider

1) **High Power Targetry – The MERIT experiment**
2) **Initial Cooling – The MICE experiment (4D Cooling)**
3) **200 MHz RF**
   - **Investigate Gas-Filled RF cavities**
   - **Investigate RF cavities in presence of high magnetic fields**
   - **Obtain high accelerating gradients (~15MV/m)**
4) **6D Cooling**
   - **RFOFO "Guggenheim"**
   - **Helical Channel Cooling**
   - **Parametric Resonance Ionization Cooling**
5) **Bunch Recombination**
6) **Acceleration– A cost driver**
   - **FFAG's – The EMMA experiment in the UK**
   - **Multi-turn RLA's – a BIG cost reducer**
7) **Theoretical Studies**
   - **Analytic Calculations**
   - **Lattice Designs**
   - **Numeric Simulations**

# The Marx AARD Panel Report

"We support the MICE project as a critical feasibility demonstration for muon storage rings and colliders. **A reasonable pace of progress on other necessary muon-related R&D tasks is not sustainable at the current level of funding**. Without increased support, essential intellectual resources will disappear".

… "**a reasonable scale would be to restore the funding to the level of four or five years ago which is about twice the current funding level of 3.6 M$** from DOE".

# Future Plans for NFMCC

- MERIT experiment:  Beam in June-July 2007
- MICE experiment: First Beam Winter 2007-2008
- EMMA project: 2007-2010
- Participate in International Design Study: 2007-2010
  - FFAG studies
  - Storage ring designs
- Collaborate with FNAL MCTF and Muons, Inc: 2007-2010
  - Develop 6D cooling scheme
  - 50T Solenoid R&D
  - 1-2 TeV Acceleration
  - Collider design

# The MUTAC Charge (I)

- **Has resonable R&D progress been achieved since the last MUTAC review.**
- **Give advice on the future R&D plans**
- **Are budgets adequate for these plans?**

# The MUTAC Charge (II)

- **Assess and comment on our major hardware programs**
  - **MERIT**
  - **MUCOOL**
  - **MICE**

- **Are they well focused? Do they address key technical issues?**

# The MUTAC Charge (III)

- **Are our Simulation Group plans properly focused?**
- **Is participation in the International Design Study for a future Neutrino Factory appropriate?**
- **Comment on the plans of the Fermilab Muon Collider Task Force and their relationship to the ongoing program of the Neutrino Factory and Muon Collider Collaboration.**

# Backup Slides