MICE Overview

Daniel M. Kaplan

ILLINOIS INSTITUTE OF TECHNOLOGY
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NFMCC Meeting
UCLA
31 Jan. 2007
Outline

- MICE steps and phases
- PID detectors
- Spectrometers
- DAQ
- Beamline
- Funding & schedule
- MICE News
Avatars of MICE

Phase I

- Characterize beam
  
  STEP I: ≈8/07

- Calibrate Spect. 1
  
  STEP II: ≈11/07

- Intercalibrate Spect. 2 w.r.t. Spect. 1, demonstrate 0.1% emittance measurement
  
  STEP III

- Study 1st abs./focus-coil pair, check dE/dx and scattering
  
  STEP IV: 2008?

- Cooling study w/ 1/2 lattice cell
  
  STEP V: 2009?

- Cooling study w/ full lattice cell & realistic field flip
  
  STEP VI

Phase 2

D. M. Kaplan, IIT

MICE Overview

NFMCC mtg, UCLA, 31 Jan 07
MICE Phase I

- Want 1st PID detectors installed & working when beam turns on (≈ Aug. ’07)

  ![Diagram](image)

  **STEP I**

  US (NFMCC) Responsibilities...

  INFN Responsibilities...

- Want 1st tracker installed & working by ≈ Nov. ’07...

  ![Diagram](image)

  **STEP II**

  ...(in whole or in part)

  ...and, if possible, 2nd tracker shortly thereafter:

  ![Diagram](image)

  **STEP III**
CKOV
UMiss + G. Gregoire

- Needs to operate in tricky momentum region:
  \[ 200 \lesssim p_\mu \lesssim 300 \text{ MeV/c} \] (no single good radiator)
- Solution: dual radiators (aerogel, \( n = 1.08, 1.12 \))

- Design reviewed Oct. 12–13, 2006 @ RAL, response in preparation
- Successful aerogel beam test @ FNAL sum ’06
  ➡️see Cremaldi talk
Spectrometer Solenoids
LBNL + IIT

- Design complete, fabrication in progress

- Cryocoolers on order; power supplies will be soon

See Virostek talk
Spectrometer Solenoids

- Delivery scheduled end-Aug ’07 (1st), end-Sept (2nd)

<table>
<thead>
<tr>
<th>Task Description</th>
<th>2006</th>
<th>2007</th>
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<tbody>
<tr>
<td>Place Magnet Order with Wang NMR (LBNL)</td>
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<tr>
<td>Complete Magnet System Design</td>
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<td>Write QC/QA Administration &amp; Test Report</td>
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<td>Procure &amp; Deliver Superconductor to Wang (LBNL)</td>
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<td>Conduct Magnet Design Review</td>
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<td>Procure Coil Formers from Subcontractor</td>
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<td>Write Spec and Procure High Tc Leads</td>
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<td>Write Spec and Procure Cryocoolers (LBNL)</td>
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<tr>
<td>Write Spec and Procure Power Supplies (LBNL)</td>
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<tr>
<td>Wind Coils on Coil Formers</td>
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<tr>
<td>Assemble and Leak Check He Shell</td>
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<tr>
<td>Install Superinsulation and Cold Mass Supports</td>
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<tr>
<td>Install Hi-Tc Leads, Recondensers &amp; Cryocoolers</td>
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<tr>
<td>Leak Checks,Cooldown &amp; Acceptance Tests</td>
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<td>Ship Magnets</td>
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</tbody>
</table>

» delivery first to Fermilab for field mapping
» delivery to RAL ≈ 2 months later
Tracker
UK + JP + US

- Large, international task coord. by K. Long, ICL
- Regular phone meetings and workshops
- Plan: will build 15 stations and choose the best 10
  ➡ can choose the stations for Tracker 1 once 10 stations have been completed and tested
  ➡ see Ellis talk
Gantt chart for 5 tracker stations: π
(from Takashi Matsushita, ICL)

• Takes 7.5 weeks
...and for 15 stations:

Finish Tracker 1 in June ’07, Tracker 2 in July
Tracker Front-End DAQ

FNAL + IIT

- All F.E. boards now in hand
  - IIT summer students tested all 375 boards (MICE+DØ)
  - some in need of minor repair
- Use of DØ electronics has yielded very substantial savings in cost & effort
  \[\text{}\rightarrow\text{solenoids}\]
- Challenge: speed up DØ readout microcode to enable 600 kHz muon rate during spill
  \[\Rightarrow\text{see Hart talk}\]
Beamline
RAL + IIT

- ISIS shut down for new tgt-station construction
  - startup scheduled Aug 1, ’07
- MICE tgt and pion-transport inst’n scheduled April
- Decay-solenoid installation scheduled May–June
- Muon-transport installation scheduled June–July
- Intermittent MICE beam possible starting Aug 1
- MICE Step 1 scheduled to begin September 15, 2007
Beamline Design Status

- Response to Beamline Review completed
- Collimator found for possible use upstream of TOF0 or Q4
- Haven’t filled in 3x3 emittance-momentum matrix
  - main problem: staffing
  - everybody has other high-priority tasks
- Material in muon transport problematic
  - may need helium bags
  - possibly remove TOF0, rely on CKOV for pion rejection

<table>
<thead>
<tr>
<th>$p_\mu$ (MeV)</th>
<th>$\varepsilon$ (1(mm.mrad))</th>
<th>6</th>
<th>10</th>
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<tbody>
<tr>
<td>140</td>
<td>?</td>
<td>?</td>
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<tr>
<td>200</td>
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<td>240</td>
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Beamline Issues

(from K. Tilley and T. Roberts)

• Diffuser radius
  – Consensus is that it needs to be bigger than current 10 cm radius
  – Possibly mechanical constraints though
  – Plan is to draw up a specification, taking these into account
  – Currently a hot topic of discussion!

• Discussion topics for CERN CM17 Meeting
  – Staffing
  – Diffuser radius
  – MICE beamline commissioning
  – MICE beamline instrumentation

• Beamline Conference Call February 4 to work on these issues and prepare for CM17
Funding / Support

- UK: large (£10M) host contrib
- US: NFMCC ($5M DOE) + IIT ($0.3M NSF base + $0.75M MRI)
- CH: PSI decay solenoid + few-100k€ + Bulg supp’t
- NL: Magnetic probes in production
- IT: 0.2M€ short, RAL £ → TOF/Cal offer in process
- JP: proposal this year not successful - trying again for next year
- UCR NSF proposal (MICE implementation & exploitation) “pending”
- UMiss NSF PIRE preproposlal (for travel, postdocs, & students) not selected - plan to try again next year
- UK bid for Phase 2 funds in process
- In-kind Phase 2 contributions (RF power refurb) proceeding at DL & CERN (US, UK, & CERN equip’t)
- ICST Harbin request for CC fab in process
Progress on the Ground

- Target test
- Linac-side stairs built
- Trench strengthened & new access installed
- Floor cleaned & painted
- Holes (almost) all drilled – last two to go
- Solenoid in hall
- Linde cryoplant delivered to hall (not tested)
- Q35s stripped down; coils tested – ready to rebuild
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Collaboration News

• Analysis Forum Convenor: Torun (IIT) → Cobb (Ox)

• VC Coordinator: Long (ICL) → Graulich (Gen)

• Spokesmouse mandate expires 30 April 2007 – to be extended if needed until election process is finished
  – Search Committee selected: Gamet (Liv), Gregoire (Louvain, ret), Kuno (Osaka)

• CB Chair mandate was extended accordingly – will elect new one after Spokesperson election

• Marx AARD subpanel: “support the MICE project as a critical feasibility demonstration for muon storage rings and colliders.”
  “concerned that the support for muon cooling is below what is needed to sustain momentum in this program.”
Next...

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<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
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<tbody>
<tr>
<td>2:10</td>
<td>Cooling Modules/Magnets</td>
<td>S. Virostek</td>
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<tr>
<td>2:35</td>
<td>Tracking Detectors</td>
<td>M. Ellis</td>
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<tr>
<td>3:00</td>
<td>Coffee</td>
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<td>3:30</td>
<td>DAQ</td>
<td>T. Hart</td>
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<tr>
<td>3:55</td>
<td>Particle ID</td>
<td>L. Cremaldi</td>
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<tr>
<td>4:20</td>
<td>Analysis</td>
<td>M. Ellis</td>
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