Imperial College London

Science & Technology Facilities Council

Introduction

Contents:

- MICE rebaselined
- Step IV:
  - Progress snapshot
  - Commissioning
  - Operations
- Publications
- Public information and conference contributions
- Organisation and outreach

Introduction

MICE REBASELINED

Reprise: 1 slide from August DOE debrief:

VC 22Aug14

Going forward; my view:

- Support preparation of document as requested in the DOE by 15Sep14:
  - Initial "good enough) analysis of Step 3pi/2;
  - Initial analysis of cost/schedule/risk;
- The revised plan is further developed and "put before" the collaboration at its next meeting (24-28Oct 2014):
  - By this time the necessary detailed studies to assess the level of performance will have been done carefully and the collaboration will have had time to deliberate;
- The next international review of the project (Nov 2014):
  - Resource Loaded Schedule Review panel; and the
  - MICE Project Board
- will then review the consensual revised plan and present to the Funding Agency Committee their recommendations
  - If we do our work properly I would anticipate that the recommendations will be in line with the our analysis

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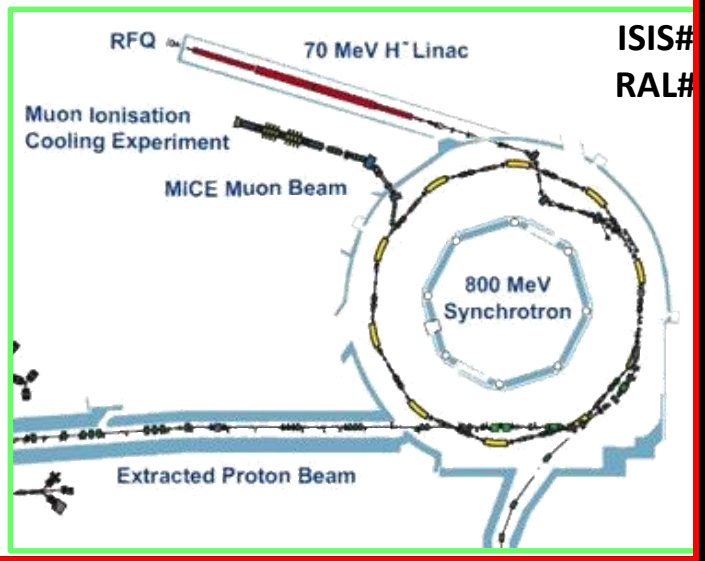
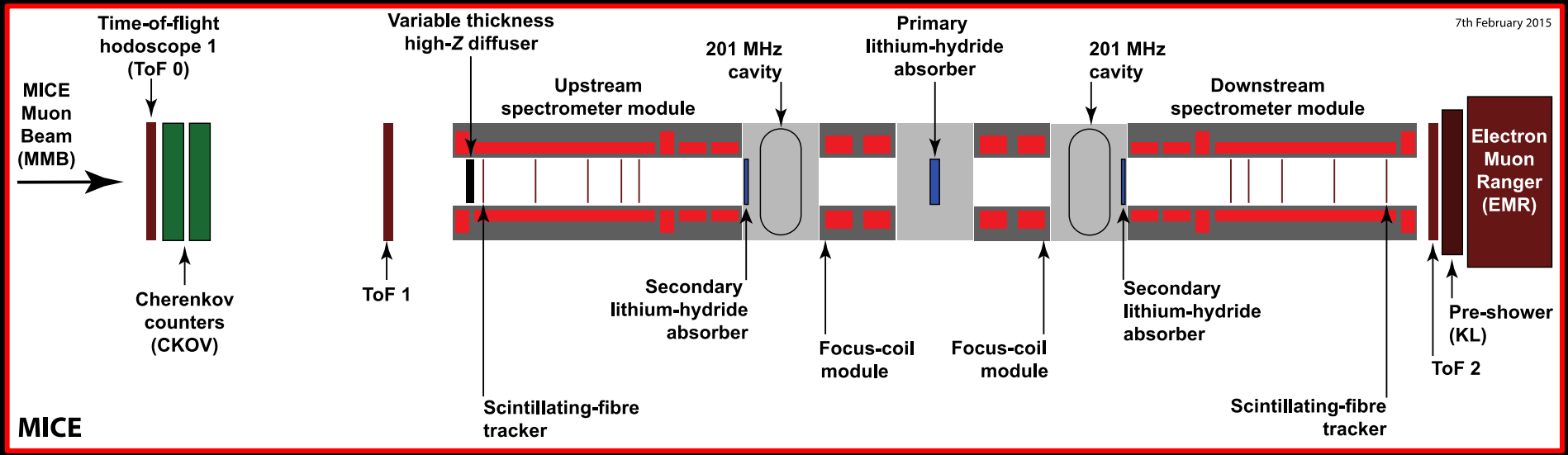
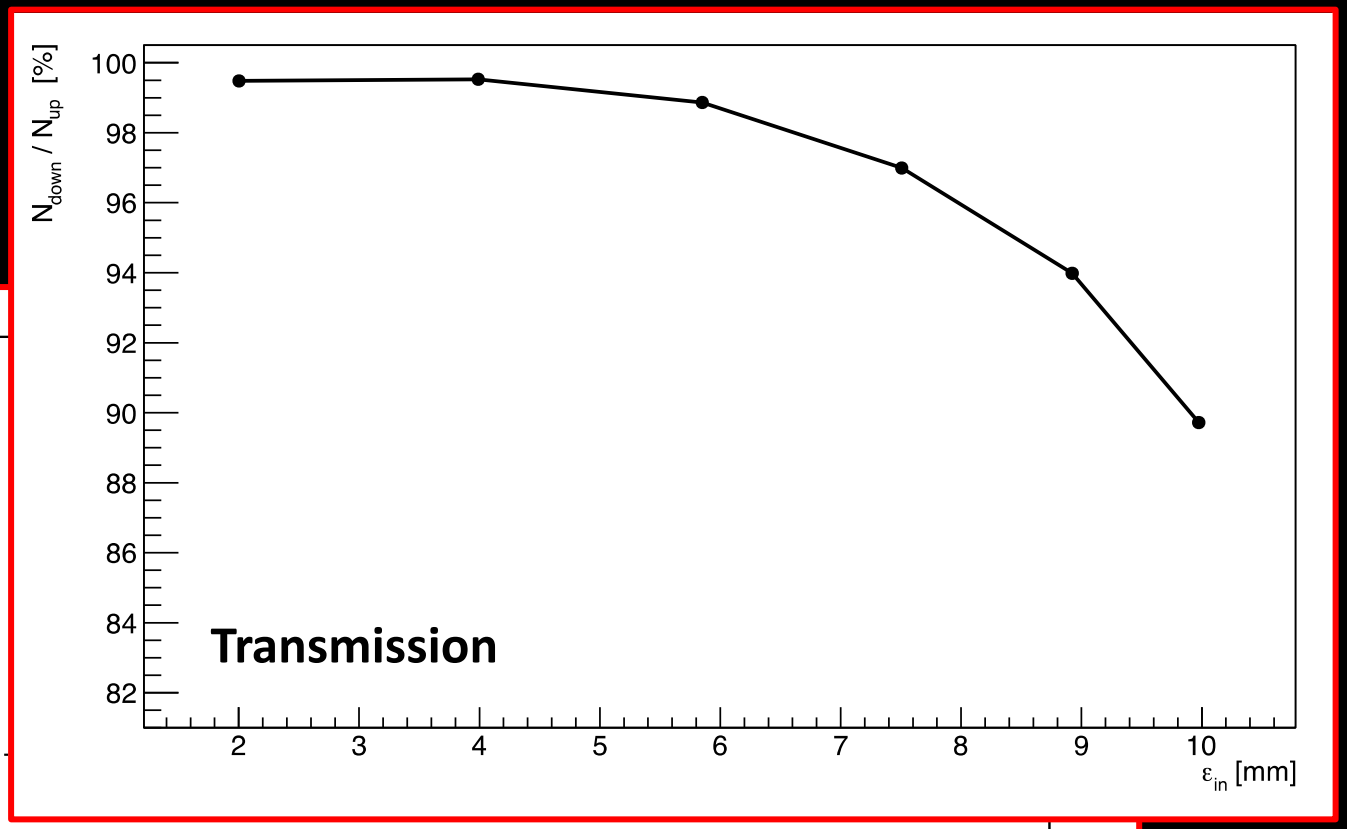
MICE:

- MICE approved to:
  - **Design, build, commission and operate a realistic section of cooling channel**
  - **Measure its performance in a variety of modes of operation and beam conditions**
    - Results will allow Neutrino Factory [and Muon Collider] complex to be optimised
- Requirements:
  - **Normalised transverse emittance: 0.1%**
    - Requires selection of 99.9% pure muon sample





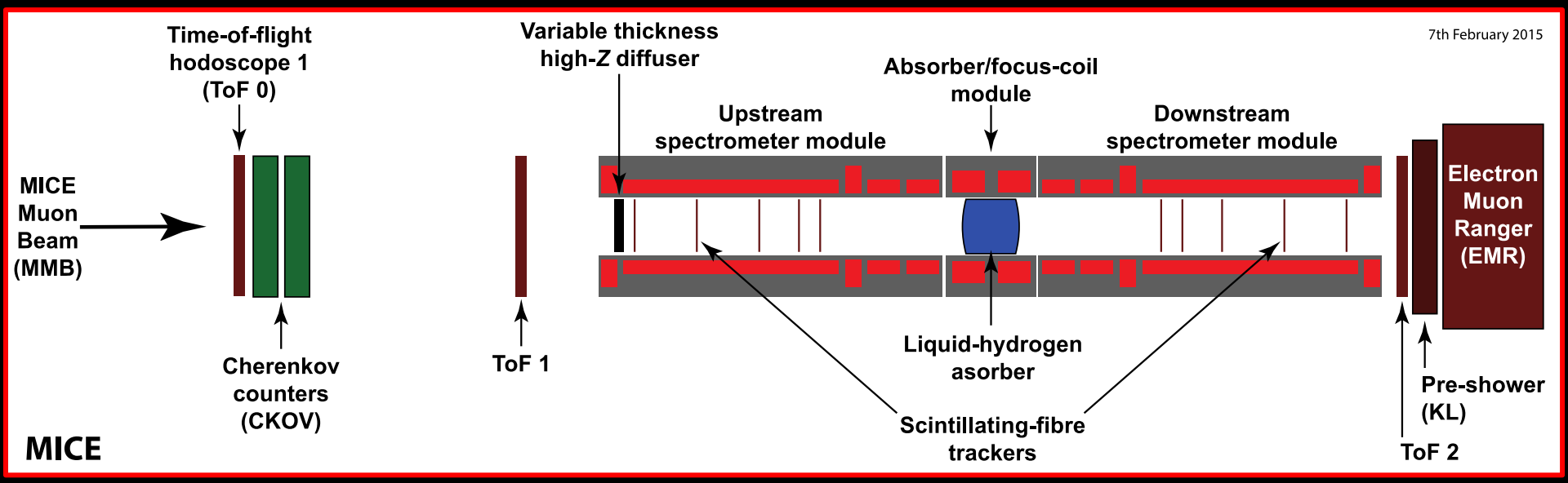
Cooling demonstration; performance:



Ionization cooling demonstration:

Id	Milestone	Date
Step IV		
1	Compressors ready for cooling channel tests	29th January 2015
2	Rack Room Complete	2nd February 2015
3	South side yoke material delivered	16th March 2015
4	South side return yoke installation complete	1st April 2015
5	North side yoke material delivered	28th April 2015
6	North side return yoke installation complete	14th May 2015
7	MICE Step IV installation complete	2nd June 2015
8	Combined magnet operational tests complete	11th August 2015
9	End of Step IV Data taking	1st June 2016
Cooling demonstration		
10	Partial Return Yoke materials arrive at RAL	10th May 2016
11	RF Cavities arrive at RAL	18th May 2016
12	Step IV De-Commissioning complete	22nd July 2016
13	RF Amplifier delivered	31st August 2016
14	RF Amplifier 1 ready for electrical commissioning	6th October 2016
15	RF Amplifier 2 ready for electrical commissioning	7th November 2016
16	Installation of PRY South starts	14th December 2016
17	Installation of the RF Cavities and Chambers starts	19th January 2017
18	Installation of North PRY complete	1st February 2017
19	Cooling Demonstration construction complete	24th March 2017
20	Cooling Demonstration commissioning complete	2nd May 2017
21	End of data taking in the cooling-demonstration configuration	31st March 2018

- Rebaselined!
  - A great success;
  - My congratulations to all involved!
- My view:
  - We've reset the clock; our future is once again in our hands. That is:
    - We can and must
      - Deliver Step IV on schedule
      - Measure the cooling properties of LH2 and LiH in a timely manner
        - » And publish!
    - So that we can deliver the ionization-cooling demonstration that underpins muon accelerators for particle physics in 2017

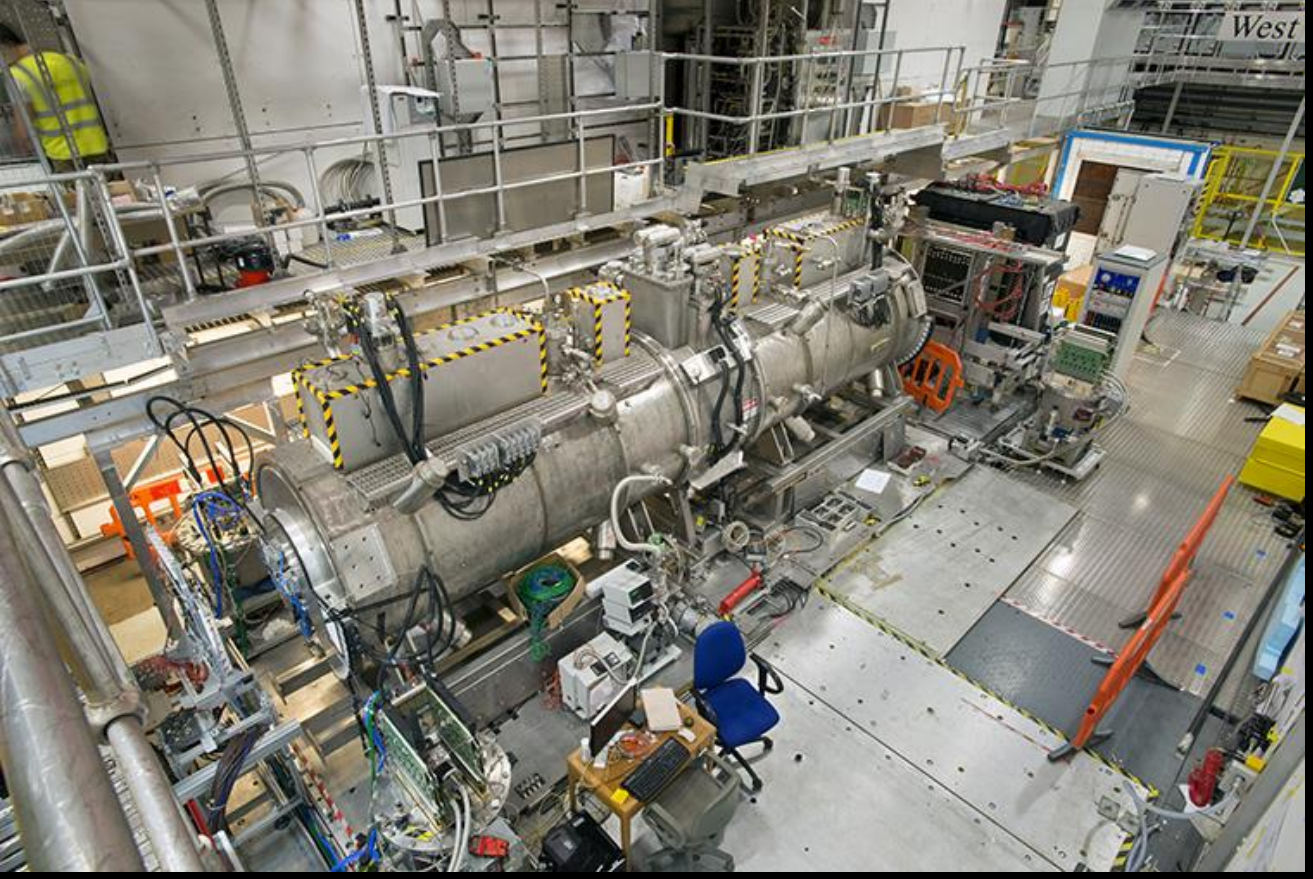


Introduction

STEP IV:
PROGRESS UPDATE

Update:

- MICE Hall:
  - Floor plates etc. installed:
    - Ready for delivery of PRY legs
  - Rack Room 2:
    - Spectrometer and focus-coil racks delivered from DL …
      - … and installed
    - Cabling and other preparation work now underway
- PRY:
  - First set of legs …
    - On UK soil …
  - Machining of magnetic-shielding plates underway:
    - Parallelisation of manufacture to expedite completion
- Services etc.:
  - Many "small" items:
    - Particular examples include:
      - Flushing water for West Wall compressors; rerouting cables, …
- S/w&C:
  - Global-track reconstruction (and Pid) (CP, JK, MU):
    - Broken ground! Initial results presented in parallel … important step on the way
  - Data challenge and automatic processing (RB, JM, HN, et al):
    - Critical component of ensuing high-quality data taking



STEP IV:
COMMISSIONING

Commissioning:

- Mock data run: 21Jan15:
  - Success!
    - Much achieved;
    - List of issues identified that need to be resolved
      - Essential first step!
  - Concerted effort!
    - In preparation and in execution …
  - More in CR's MOM report
- List of issues has been classified by operations team:
  - Priority (following PMH, present MOM):
    - Required for Step IV; Important for Step IV; …
    - Degree of coordination with:
      - Construction team;
      - Other detector/magnet systems
- Future success rests on careful planning:
  - To inject maintenance/operations "jobs" into construction teams plan:
    - Experiment Integration Scientist (P. Hanlet)
    - Beamline Integration Scientist (J. Pasternak)
    - Project Engineer (A. Nichols)
    - Operations Engineer (C. Macwaters)
    - Or, S. Boyd, R. Preece, or KL
- Please be part of the solution:
  - Plan your work early and send in the request …
    - … minimise your stress by passing on your requirements before they become issues!

Commissioning continued:

- 08Mar15:
  - Details from SB, but:
    - Search/lock Hall on Friday or Saturday 06/07 Mar15
      - Ready for data taking start on Sunday
  - Two shifts for MICE in ISIS run-up:
    - 08:30 – 16:00 and 16:00 – 24:00
  - Goal:
    - Time in target and detectors as far as TOF1;
    - Leave in state such that calibration of TOFs could begin:
      - Implies full data chain, including batch processing on GRID within 24 hours

- Weekend operation from 21Mar15:
  - Again, details from SB, but:
    - Construction team will be doing two shifts/day Monday to Friday;
      - On Friday, construction work will end 14:00 …
    - Hall available for operations team from 15:00 on Friday
      - Friday afternoon available for shift training and preparation
      - Lock and search Hall on Friday before end of working day to be ready for operation start Saturday
  - Saturday/Sunday:
    - Two shits per day: 08:00—16:00 and 16:00—24:00
- Coordination:
  - Fridays 11:00:
    - In person Operations meeting (no phone connection):
      - Personnel involved in weekends operations required participants
  - Monday 15:00:
    - Debrief/planning Operations meeting
    - In person for those involved in weekend's operations, phone connection to allow participation of system experts and those involved in the following weekend's operations

Introduction

STEP IV:
OPERATIONS

Operations:

- Goals for the first two ISIS User Runs:
  - User Run 2014(03); “now” to 01May15:
    - MICE Muon Beam commissioning;
    - TOF2, KL, EMR commissioning with beam;
    - Alignment and calibration;
  - User Run 2015(01a): 02Jun15 to 05Jul15;
    - Tracker commissioning with beam in parallel to magnet training;
- More detailed planning required:
  - C. Rogers will organise a meeting in March to collect inputs to the detailed run plan
- Much to do!

Preparation for for data taking:

- **Shifts:**
  - Data taking time reduced by a factor of two if we have to run 16/5 rather than 24/7
  - Shift tool CHEESE released to Group Leaders (CB):
    - Good take-up:
      - We set ourselves the goal to decide on our mode of operation at CM41 (now!)
        - » "This is a hard deadline for a hard decision!"
      - Shifter sign-up in CHEESE has been good:
        - » Await SB analysis; CB will need to take stock this evening

Introduction

PAPERS:

Status at Jan15 VC in green: hope to move some of the papers to the "final draft" stage this CM!

Papers:

Table 2: Physics and technical papers being prepared by the collaboration.

Title	Lead authors
Step I physics	
Electron Muon Ranger: performance in the MICE Muon Beam	A. Blondel, F. Drielsma, R. Asfandiyarov
Measurement of the pion contamination in the MICE Muon Beam	D. Orestano, D. Nugent, P. Soler
Step IV physics	
Commissioning of the MICE experiment in the Step IV configuration	C. Rogers
Ionization cooling demonstration	
Design and expected performance of the MICE demonstration of ionization cooling	V. Blackmore, J. Pasternak, C. Rogers
Technical	
The MICE target upgrade	C. Booth
The design construction of the MICE Electron Muon Ranger	R. Asfandiyarov, A. Blondel, F. Drielsma
The Reconstruction Software for the MICE Scintillating Fibre Trackers	S. Dobbs
The MICE Analysis and User Software framework	D. Ragaram

Progress/drafts will be presented at CM41

Work organised; focus on getting experiment off the ground

18Dec14; lattice freeze (milestone, complete) (final tweaks now underway); JBL editor.

Draft being assembled.

Draft being assembled.

Updated draft to be presented at CM41

Draft being assembled.

PUBLIC INFORMATION AND CONFERENCE CONTRIBUTIONS

MICE

INTERNATIONAL MUON IONIZATION COOLING EXPERIMENT

Home | Collaboration | Working Groups | Meetings | Documents | Resources

- MICE Notes
- Publications
- Theses

About MICE

To demonstrate that the volume occupied by a muon beam can be reduced ("cooled") would be to establish the feasibility of muon accelerators for particle physics. Muon accelerators have the potential to unlock the secrets nature has hidden in the properties of the neutrino and deliver to provide the capability to deliver collisions even more energetic than those that can be achieved at the LHC. MICE will deliver the necessary, seminal, demonstration of cooling.

Read more for an outline of MICE and an introduction to muon accelerators for particle physics.

ormation

Project Dashboard
es MICE Indico
ailing Lists Links

Upcoming Meetings

CM 41 & shift training
- CM 41: Feb 9-11
- Shift training: Feb 12-13

CM 42 & shift training
- CM 42: June 22-24
- Shift training: June 25-26

Recent Publications

Characterisation of the muon beams for the Muon Ionisation Cooling Experiment
DOI, e-print

The MICE Muon Beam on ISIS and the beam-line instrumentation of the Muon Ionization Cooling Experiment
DOI, e-print

Add: public information;
e.g. Publications and public information

November 30, 2014

Page maintainer

MICE » Analysis

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History

Publications and figures are available for the following steps:

- **Step I**:
  - Characterisation of the MICE Muon Beam.
- **Step IV**:
  - Study of impact of material properties, optics and input-beam properties on the ionisation cooling effect.
- **Demonstration of ionization cooling**:
  - Demonstration of ionization cooling and detailed study of its dependence on the optics of the cooling cell and properties of the input beam.

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Publications and Figures Step I

History

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Characterisation of the muon beams for the Muon Ionization Cooling Experiment

Full Details

Abstract:

> *A novel single-particle technique to measure emittance has been developed and used to characterise seventeen different muon beams for the Muon Ionisation Cooling Experiment (MICE). The muon beams, whose mean momenta vary from 171 to 281 MeV/c, have emittances of approximately 1.5--2.3 \pi mm-rad horizontally and 0.6--1.0 \pi mm-rad vertically, a horizontal dispersion of 90--190 mm and momentum spreads of about 25 MeV/c. There is reasonable agreement between the measured parameters of the beams and the results of simulations. The beams are found to meet the requirements of MICE.*

Paper:

Published in European Journal of Physics C, Volume 73, Number 10
arXiv: 1306.1509
DOI: 10.1140/epjc/s10052-013-2582-8
INSPIRE HEP

BibTeX

Figures:

Fig. 1, Fig. 2, Fig. 3, Fig. 4a, Fig. 4b, Fig. 5, Fig. 6, Fig 7a--f, Fig. 8a--c, Fig. 9a, Fig. 9b, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15

Tables:

Table 1, Table 2, Table 3, Table 4

The MICE Muon Beam on ISIS and the beam-line instrumentation of the Muon Ionization Cooling Experiment

Full Details

Abstract:

> *The international Muon Ionization Cooling Experiment (MICE), which is under construction at the Rutherford Appleton Laboratory (RAL), will demonstrate the principle of ionization cooling as a technique for the reduction of the phase-space volume occupied by a muon beam. Ionization cooling channels are required for the Neutrino Factory and the Muon Collider. MICE will evaluate in detail the performance of a single lattice cell of the Feasibility Study 2 cooling channel. The MICE Muon Beam has been constructed at the ISIS synchrotron at RAL, and in MICE Step I, it has been characterized using the MICE beam-instrumentation system. In this paper, the MICE Muon Beam and beam-line instrumentation are described. The muon rate is presented as a function of the beam loss generated by the MICE target dipping into the ISIS proton beam. For a 1 V signal from the ISIS beam-loss monitors downstream of our target we obtain a 30 KHz instantaneous muon rate, with a neglible pion contamination in the beam.*

Paper:

Published in Journal of Instrumentation, Volume 7, Number 5
arXiv: 1203.4089
DOI: 10.1088/1748-0221/7/05/P05009
INSPIRE HEP

BibTeX

Figures:

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Publications and Figures Step IV

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Schematics and engineering drawings:

- Schematic with labels: PDF ; EPS ; AI
- Schematic without labels: PDF ; EPS ; AI

h2. Step IV paper titles

Documentation & figures

Step-4.pdf (281.8 kB) Long, Kenneth, 09 February 2015 21:33
Step-4-labels.ai (1.3 MB) Long, Kenneth, 09 February 2015 21:33
Step-4-labels.eps (971.4 kB) Long, Kenneth, 09 February 2015 21:33
Step-4-labels.pdf (342.1 kB) Long, Kenneth, 09 February 2015 21:33
Step-4.ai (1.2 MB)
Step-4.eps (665.1

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Publications and figures pertaining to the demonstration of ionization cooling

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Schematics and engineering drawings:

- Schematic with labels: PDF ; EPS ; AI
- Schematic without labels: PDF ; EPS ; AI

The MICE Ionisation Cooling Demonstration: Technical Note (MICE Note 452)

Full Details

Abstract:

> *Removal of the RFCC module from the MICE programme necessitated a lattice redesign such that sustainable muon ionisation cooling could be demonstrated by 2017. Two lattice designs are presented, a reference and alternative design, that use existing components. The performance in 4D is compared, while 6D performance is under study. The reference lattice is selected as the future MICE cooling cell for the demonstration of ionisation cooling.*

Paper:

MICE Note 452

Figures:

"Fig. 1":

Tables:

Cooling-demo-labels.eps (1.7 MB) Long, Kenneth, 07 February 2015 14:19
Cooling-demo-labels.pdf (52.6 kB) Long, Kenneth, 07 February 2015 14:19
Cooling-demo-labels.ai (1.1 MB) Long, Kenneth, 07 February 2015 14:37
Cooling-demo.pdf (52.5 kB) Long, Kenneth, 07 February 2015 14:38
Cooling-demo.eps (1 MB) Long, Kenneth, 07 February 2015 14:38
Cooling-demo.ai (1.3 MB) Long, Kenneth, 07 February 2015 14:38

Public information:

- In 6—9 months we will have the "crown jewels":
  - The data that we'll be preparing for publication;
    - So we need to remind ourselves of our rules
      - [and make it easy to get the up-to-date public information]
- Results, plots and figures must be presented to, and agreed by, collaboration:
  - Our policy (agreed ages ago by CB) is that this is normally done at the CM:
    - Exceptional cases by VC/email
- Step I paper, cooling-demonstration configuration (and Step IV performance) speakers have all been asked to flag the information that the collaboration is asked to make public:
  - When agreed, it will be prepared, reviewed and posted

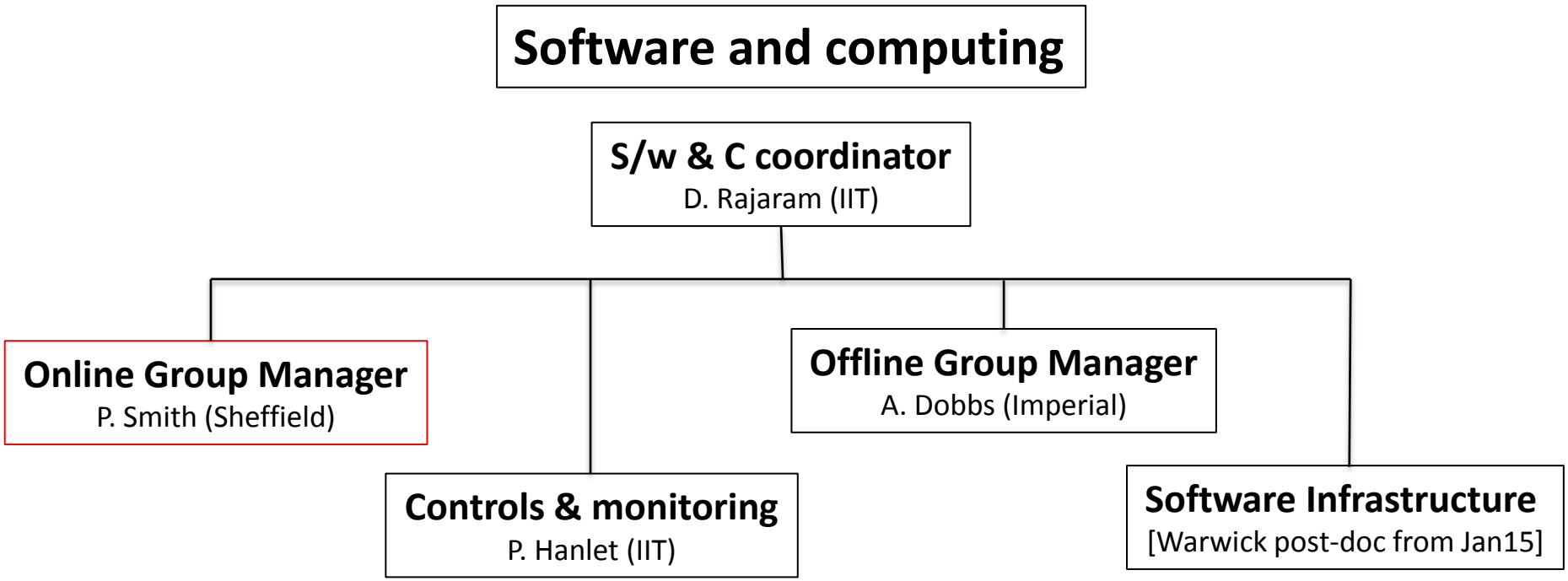
Conference contributions:

- CB has agreed a definition for a "MICE" contribution:
  - Typically when you write "… on behalf of MICE"
- Last summer and autumn we had:
  - Last minute:
    - Abstract submission, talk/poster and procedings preparation
      - With insufficient time for collaboration to comment;
  - We need to be more disciplined:
    - In view of:
      - The imminent arrival of Step IV data; and
      - Our raised profile
- So, the EB has agreed:
  - MICE contributions (abstract, poster/talk and proceedings) must be circulated for comment two weeks before the conference deadlines

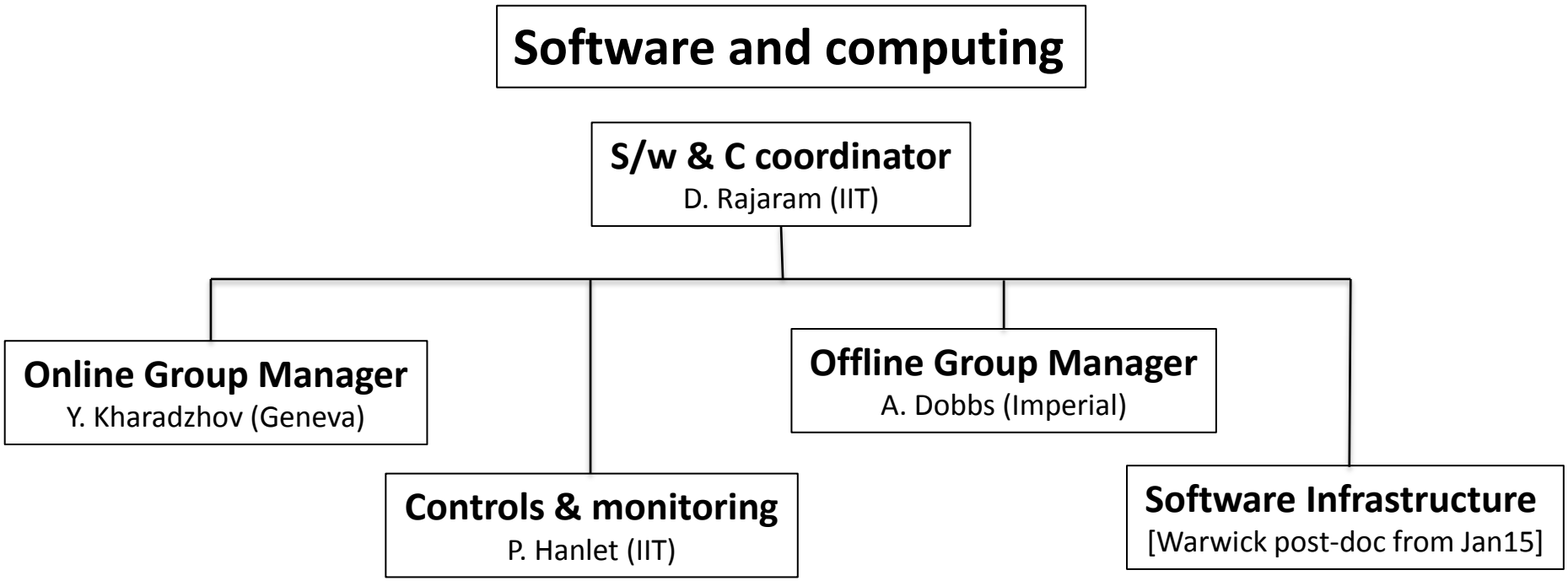
Introduction

ORGANISATION AND OUTREACH

Version date: 26th October 2014; revision E



Version date: 9th February 2015; revision F



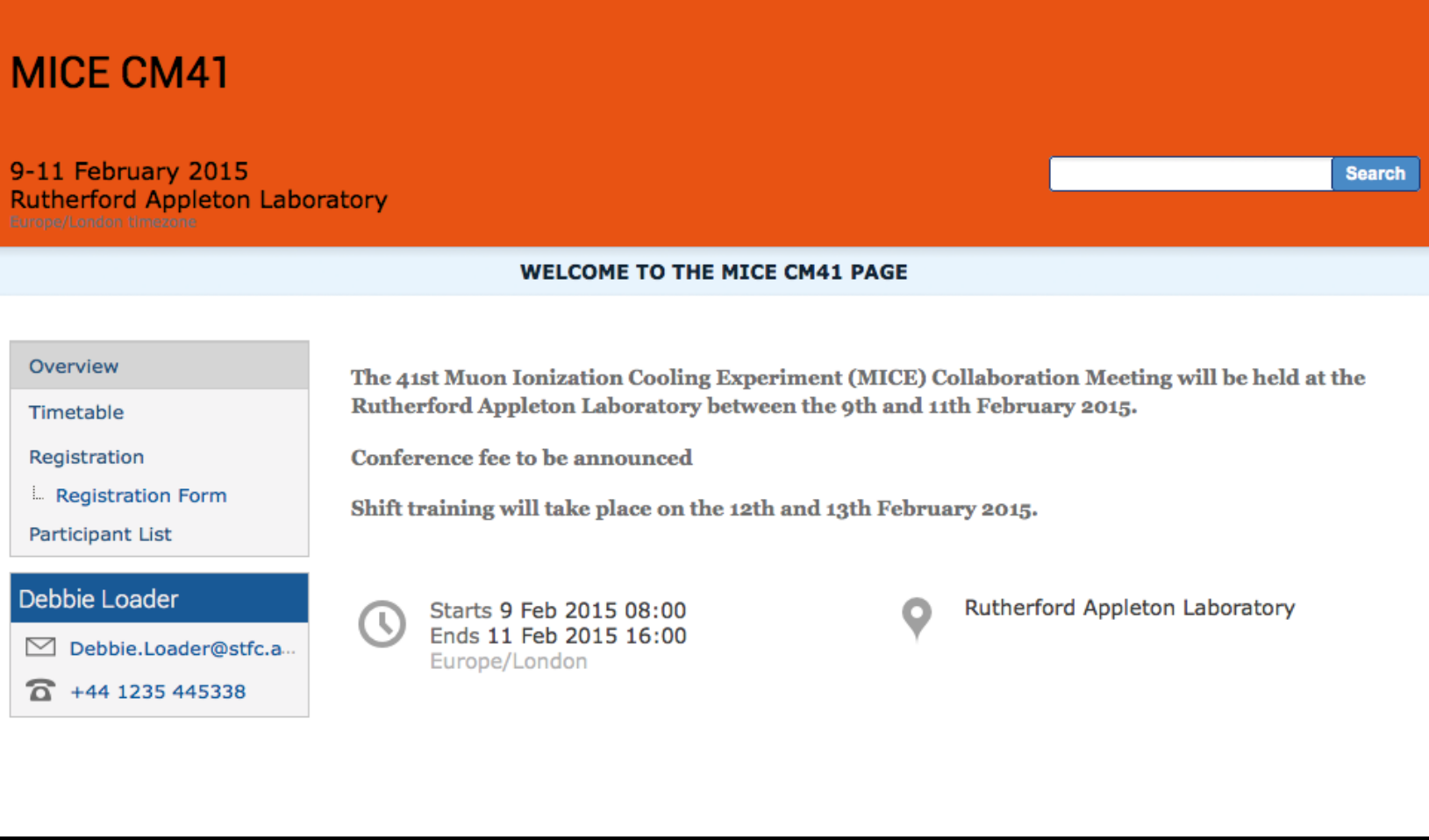
MICE in the ISIS User database:

- "MICE User letter" agreed with STFC Feb15:
  - "Signed off" by A. Taylor
- Clears the way for MICE entry in ISIS User Database:
  - Roll-out will begin in the near future
  - *All* must register:
    - Will hold:
      - Usual personal details
      - Records of Lab and MICE inductions etc.

Outreach:

- From Paul Kyberd:
- MICE group photo:
  - On lawn outside R68 13:00:
    - Be there!

- Communication plan:
  - Includes:
    - Portraits of MICE members so that when contacts are made from outside interviewers know who they will meet:
      - Photo sessions:
        - » Coffee break: 10:30 – 11:00 (KL will guide)
        - » Tea break: 15:30 – 16:00 (PK will guide)


MICE CM41
9-11 February 2015
Rutherford Appleton Laboratory
Europe/London timezone
Search
WELCOME TO THE MICE CM41 PAGE
Overview
Timetable
Registration
Registration Form
Participant List
Debbie Loader
Debbie.Loader@stfc.a...
+44 1235 445338
The 41st Muon Ionization Cooling Experiment (MICE) Collaboration Meeting will be held at the Rutherford Appleton Laboratory between the 9th and 11th February 2015.
Conference fee to be announced
Shift training will take place on the 12th and 13th February 2015.
Starts 9 Feb 2015 08:00
Ends 11 Feb 2015 16:00
Europe/London
Rutherford Appleton Laboratory

- **Over to you!**