

ISTITUTO NAZIONALE DI FISICA NUCLEARE

CONSIGLIO DIRETTIVO

DELIBERAZIONE N. 12059

Il Consiglio Direttivo dell'Istituto Nazionale di Fisica Nucleare, riunito a Roma in data 25 ottobre 2011, alla presenza di n. 31 dei suoi componenti su un totale di n. 33:

- premesso che MICE (Muon Ionisation Cooling Experiment) è una Collaborazione internazionale finalizzata alla progettazione, costruzione e avvio di un esperimento la cui tecnologia è ritenuta essenziale per la realizzazione di una neutrino factory;
- tenuto conto che lo scopo di questo MoU è quello di dare cornice formale alla collaborazione tra le Istituzioni partecipanti ed il Rutherford Appleton Laboratory dello Science and Technology Facilities Council (STFC) in qualità di sito ospite, nonché di delineare le responsabilità e le modalità operative del programma scientifico da attuare congiuntamente tra le Parti;
- visto lo schema di "Memorandum of Understanding between the Science and Technology Facilities Council and the Funding Agencies supporting the Collaborating Institutions of the MICE Experiment", allegato alla presente deliberazione e di esso parte integrante;
- vista la nota del Presidente di Commissione Scientifica Nazionale V, Prof. Massimo Carpinelli, del 11 ottobre u.s.;
- su proposta della Giunta Esecutiva;
- con n. 31 voti favorevoli;

DELIBERA

E' approvato lo schema di "Memorandum of Understanding between the Science and Technology Facilities Council and the Funding Agencies supporting the Collaborating Institutions of the MICE Experiment", allegato alla presente deliberazione e di esso parte integrante. Il Presidente è autorizzato a perfezionarlo e a sottoscriverlo.

Gli oneri a carico dell'Istituto come contributo al Common Fund della Collaborazione per il 2012, pari a Euro 25.000,00, trovano copertura con i finanziamenti allo scopo assegnati dalla CSN V alla Sezione di Milano sul capitolo 130120 (consumo). Per gli anni successivi con quanto sarà assegnato alla medesima CSN V negli esercizi finanziari di competenza.

**MEMORANDUM OF UNDERSTANDING**  
**between**  
**Science and Technology Facilities Council**  
**and**  
**The Funding Agencies supporting the Collaborating institutions of the**  
**MICE experiment,**

*Preamble*

The Muon Ionisation Cooling Experiment (MICE) is an international collaboration of particle and accelerator physicists from Europe, China Japan and the US, that seeks to design, build and operate a muon ionisation cooling channel, an essential technology required for the design of a neutrino factory.

The MICE experiment has been designed and is being constructed by collaborating institutions (The MICE Collaboration) who will operate the experiment in the exploitation phase with a view to obtaining the best scientific results from the data taken. The MICE Charter provides a formal framework for the governance of the MICE Collaboration. This Memorandum of Understanding (MOU) provides a formal framework for collaboration between the Host Institution, STFC's Rutherford Appleton Laboratory, and the international Funding Agencies or their representatives, henceforth termed 'The Parties'. The Parties recognize that the MICE experiment is an exciting and important experiment that must be designed, constructed, operated and completed successfully. The purpose of this MOU is to outline the responsibilities of the parties and the mode of operation of the work to be jointly carried out. While this document is not legally binding, the parties agree that they will make their best effort to fulfil their commitments for the successful design and construction of the experiment, data taking and analysis.

*Article I*  
*The MICE Charter*

In addition to the stipulations of this MOU, all members and member institutions must abide by the current MICE Charter<sup>1</sup> and the ancillary documents mentioned therein.

*Article II*  
*MICE Membership*

The current members of the MICE Collaboration are defined by the MICE collaboration list assembled and approved by the MICE Executive Board. As specified in the documents described in Article I, new junior members (below faculty rank) may be added by a MICE Institution without further approval, while new senior members require the approval of the MICE Executive Board.

*Article III*  
*Governance and Oversight*

Oversight of the MICE project by the funding agencies will be implemented through the MICE Funding Agencies Committee (MICE FAC). The MICE FAC will be convened by STFC and

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<sup>1</sup> The MICE Charter can be found at <http://www.mice.iit.edu/gov/gov.html>

given regular updates by the collaboration and the MICE Project Board (MPB) on the progress of the project. The MICE FAC will aim to reach agreement on any actions necessary for the successful implementation of the project and will be presented with accounting reports on the expenditure of any agreed Common Funds.

The MICE Project Board provides independent scientific and technical advice to the FAC. It monitors the integrated activity of the MICE project and reports on the progress towards the achievement of the scientific objectives.

#### *Article IV Contributions*

A list of the contributions to the construction of the experiment for which the collaborating institutes are responsible is attached to this document.

The level of contribution to the common fund has been agreed by the Funding Agency Committee and is set out in the MICE Common Fund Agreement<sup>2</sup>. It is an institutional responsibility, and is determined by the numbers of PhD holders in each MICE collaborating institute. It may be reviewed by the Funding Agency Committee. A preliminary list of the common operation and maintenance expenses for the experiment is attached to this document. The list is subject to funding agency review and approval. It may be revised as appropriate by proposal by the MICE Executive Board. If approved by the MICE Collaboration Board and the MICE FAC, "in-kind" contributions are an acceptable method of meeting the contribution obligations.

Any further institute wishing to join the MICE Collaboration during the period of validity of this MoU is expected to make an appropriate contribution to the construction of the experiment. This will be negotiated by the Executive Board and endorsed by the Collaboration Board. If this is not possible, as an alternative, an appropriate ad-hoc contribution to the Common Fund will be considered.

#### *Article V Responsibilities of the MICE Collaboration institutes*

**Funding:** Each Collaboration institute is responsible for seeking to obtain necessary funding to satisfy the pledged contributions in Article IV.

**On site operations and maintenance:** Each Collaborating institute is responsible for maintaining the items supplied by them as specified in Article IV during the operational phase of the experiment.

**Shifts:** All institutions must satisfy their institutional and personal shift quotas defined by MICE Collaboration Board or related collaboration guidelines.

**Data Analysis:** All members are strongly encouraged to take part in the MICE data analysis as well as all other collaboration activities. All members of the collaboration will have equal access to the data and the common analysis tools.

**Supervision and Attendance:** Senior members of the groups will make their best effort to attend collaboration meetings and sub-group meetings related to their work, and to supervise their students and post doctoral research associates whilst they are at RAL.

**Insurance:** All Collaboration members are responsible for meeting insurance obligations to work on site at RAL.

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<sup>2</sup> <http://www.hep.shef.ac.uk/research/mice/collabbd/2008-06-06-MICE-Common-Fund-Final.pdf>

Health and Safety: All Collaboration members agree to abide at all times by safety policies established by the MICE Collaboration, and by the safety policies of STFC and RAL laboratory.

*Article VI  
Responsibilities of the Host Institution*

The responsibilities for the provision of the MICE Hall and infrastructure for the MICE experiment were outlined in the MoU of 2006 between PPARC and CCLRC, which set out the host laboratory's contribution. This document has now expired and these two organisations have been merged to form STFC. In line with that agreement STFC will provide;

- an experimental hall and infrastructure suitable for installing MICE and the Muon Beam Line
- a supply of protons for the Muon Beam from the ISIS facility
- Elements of the Muon Beam Line
- The infrastructure needed for MICE including the mechanical and electrical services

STFC will provide on-site offline computing resources as specified in the MICE Common Fund Agreement, and will ensure reasonable and necessary access to the experimental site and office space for all collaborators. These computing resources will remain available until the agreed completion of the data analysis phase, which will be determined by the Funding Agency Committee.

*Article VII  
Rights and Publications*

The MICE Collaboration members have all the rights as full-pledged MICE collaborators, in accordance with MICE Charter, unless any institution or members are found to have not met and fulfilled their pledged contributions and responsibilities. In such case, any institution or individual member may be removed from the collaboration based on procedures specified in MICE or other related guidelines. All members shall adhere to the MICE publication policy as outlined in the MICE Charter and documents adopted under its rules, and all members shall have authorship rights as therein defined. All publications will acknowledge the use of the STFC facility and ISIS beam line. Any IPR developed as part of the MICE experiment shall be disposed of under the policies of the institution in which it was developed, not of the MICE collaboration.

*Article VIII  
Durations*

This MoU shall cover both the construction and operation phases of MICE, effective from the date of signature. The MOU shall be deemed to terminate at the end of the operational phase of the experiment as agreed by the Funding Agency Committee, with the exception of Articles I and VII. Any Party may withdraw from the MOU by giving a minimum of 1 year's notice in writing. In the case of withdrawal from the experiment, reasonable compensation regarding any unavoidable commitments will be negotiated by the parties.

Signed By:

For the STFC: Tony Wells, Senior Sales Commercial Manager  
For the MICE Collaboration:  
Prof. Alain Blondel, MICE spokesperson;

Prof Alan Bross Chair, MICE collaboration board;

Heads of Collaborating Institutes or Funding agencies representatives as appropriate  
(Following pages)  
MICE COLLABORATION  
Memorandum of Understanding

### **University of SOFIA**

**Department of Atomic Physics, St. Kliment Ohridski University of Sofia, 5 James  
Bourchier Boulevard, BG-1164 Sofia, Bulgaria**

Prof. Roumen Tsenov

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### **Harbin Institute of Technology**

Prof. Xeng Zheng Shixian  
Deputy Director  
Institute for Cryogenic and Superconductivity Technology, Harbin Institute of Technology,  
Harbin, 150080, PR China

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### **INFN**

Prof. Roberto Petronzio  
President  
INFN, Via Enrico Fermi, 40 – 00044 Frascati (Rome), Italy

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### **KEK**

Shigeru Ishimoto  
High Energy Accelerator Research Organization (KEK), Institute of Particle and Nuclear  
Studies, Tsukuba, Ibaraki, Japan

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### **Kyoto University**

Prof. Yoshinori Mori  
Kyoto University Research Reactor Institute, Kumatori-cho Sennan-gun, Osaka 590-0494,  
Japan

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Osaka University

Prof. Yoshitaka Kuno  
Osaka University, Graduate School of Science, Department of Physics, Toyonaka, Osaka,  
Japan

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NIKHEF

F. Filthaut  
NIKHEF, Amsterdam, The Netherlands

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CERN

Dr. Roland Garoby  
CERN, Geneva, Switzerland

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Université de Genève

Prof. Alain Blondel  
DPNC, Section de Physique, Université de Genève, Switzerland

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**Argonne National Laboratory**

J. Norem  
Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439, USA

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**DOE**

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**Muons Inc.**

Dr. Thomas J. Roberts  
Muons Inc., Batavia, IL 60510, USA

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**University of Chicago**

Prof. Young-Kee Kim  
The Department of Physics and the Enrico Fermi Institute  
The University of Chicago, 5640 S. Ellis Ave., Chicago, IL 60637  
University of Chicago, Iowa City, IA52242, USA

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**Illinois Institute of Technology**

Prof. Daniel M. Kaplan,  
Illinois Institute of Technology, 3101 S. Dearborn St., Chicago, IL 60616, USA

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**University of New Hampshire**

Prof. Ulisse Bravar  
University of New Hampshire, Durham, NH 03824, USA

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**University of Iowa**

Prof. Yasar Onel  
University of Iowa, Iowa City, IA52242, USA

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**University of Mississippi**

Prof. D. J. Summers  
University of Mississippi, Oxford, MS 38677, USA

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**U.C Riverside**

Prof. Gail G. Hanson  
University of California, Riverside, Riverside, CA 92521-0413 USA



## Appendix I Contributions

The contribution of the different institutions to the MICE apparatus is detailed in the following.

Some items have been delivered and installed in the MICE Hall (target, beamline, decay solenoid, TOF, KL, DAQ, BPM, CKOV), others are yet to be delivered (EMR, spectrometer solenoids) and others are still in construction

### A. CERN contribution

- Two 2 MW refurbished RF power amplifiers
- Magnetic measurement device

### B. INFN contribution

- TOF detectors
- PMTs & front-end electronics for TOF
- KL detector
- PMTs & front-end electronics for KL
- Cables for TOF+KL
- Downstream PID platform
- HV channels for PID(TOF+KL)
- PMTs for the Cherenkov detector
- Infrastructure for online/offline detector monitoring, system test and calibration
- Prototyping/testbeam work (TOF+ EMC)

### C. KEK

- Contribution to fiber tracker construction
- MICE absorber bodies and instrumentation

### D. PSI Contribution

- muon decay solenoid

### E. Sofia University contribution

- splitter/shapers for the TOF and KL systems

### F. STFC

- Mice Muon Beam
- Mice Infrastructure and MICE Hall
- hydrogen-delivery system
- RF power assembly and distribution system
- FC Modules
- Fibre tracker

### G. UniGE contributions

- MICE online cluster, DAQ system and trigger electronics
- TOFO PMTs
- EMR mechanics, electronics, PMTs and fibers

## Magnetic measurement device

### H. US contribution

CKOV detectors (UMiss/IIT/Iowa)

Scifi trackers and readout system (IIT-FNAL with additional contribution from UCLA and UCR)

Spectrometer solenoids (LNBL with additional contributions from IIT and UC Riverside)

RFCC modules (LNBL with additional contribution from UMiss)

RF power distribution system (UMiss)

Absorber windows (UMiss)

Beam Profile Monitors (FNAL)

EMR scintillator (FNAL)

## **Appendix II Common fund Agreement**

As is the case with collaborative particle physics experiments hosted by international laboratories, a MICE Common Fund is being levied to support the activities of the collaboration in the development and operation of the MICE experiment at the Rutherford Appleton Laboratory (RAL).

The Common Fund will be used to share the costs of mounting the experiment at RAL equitably across the MICE Collaboration and will cover items such as utilities, consumables, and support services provided by the host laboratory, and, occasionally, small unforeseen equipment costs associated with detector commissioning or operation by the collaborating institutions.

### **Common Fund**

The list of the items , which maybe covered by the Common Fund includes:

1. Utilities and infrastructure services to operate MICE (e.g. water, gases and cryogens);
2. Technical/engineering support for repair, maintenance of MICE infrastructure and experiment;
3. MICE Muon Beam operation and maintenance;
4. Office facilities (e.g. desks, pc/internet access, phones, photocopiers etc);
5. Access to RAL services (e.g. purchasing & financial, HSE);
6. Miscellaneous cabling (cable trays, break out panels, etc., ethernet connections, and wireless transmitters) for electronics, DAQ and communication;
7. Data-storage media and facilities for data taking;
8. User support for MICE collaborators and visitors, including local transport, and housing; and
9. (On-site) office supplies, including computing supplies.

The ISIS operation and beam delivery are a contribution from the host laboratory and are not costed into the Common Fund.

### Appendix III MICE Collaborating Institutes

Bulgaria	Sofia University
China	ICST Harbin
Italy	INFN, Milano, Napoli, Pavia, Roma3
Japan	Osaka University, Kyoto University and KEK
Netherlands	NIKHEF
Switzerland	DPNC Geneve
	CERN
UK	Brunel, Cockcroft, Glasgow, Imperial College, Lancaster, Liverpool, Oxford, Sheffield, STFC and Warwick
USA	<p>USA institutions supported by DOE: ANL, BNL, Fermilab, JLab, LBNL, UCLA, Illinois Institute of Technology, UC-Riverside, University of Mississippi, Muons Inc.</p> <p>USA Institutions supported by NSF: Chicago, Illinois Institute of Technology, University of Iowa, University of Mississippi, New Hampshire, UC-Riverside</p>

## Appendix IV

### **MICE Project Board Terms of reference**

The MICE Project Board (MPB) reports to the Funding Agency Committee (FAC), which contains representatives from all major MICE funding agencies (STFC, DOE, NSF, et cetera). The FAC is currently chaired by John Womersley (STFC). In reporting to the FAC on the integrated activity of the MICE project, the MPB will:

1. Monitor the progress and the risk management of the MICE construction project and deliverables, including cost and schedule progress within available resources.
2. Advise on the progress towards the achievement of scientific objectives
3. Monitor integrated project management performance, where appropriate
4. Consult and communicate closely with the STFC Project Sponsor, currently Janet Seed.

The MPB will meet at least every 6 months, preceding FAC meetings by an appropriate period. Its reports will be confidential. Key recommendations will be made available to the MICE collaboration management. At each meeting the MPB will receive reports from the MICE collaboration spokesperson, currently Professor Alain Blondel, and from other collaboration members. These reports will summarise:

1. Current project status
2. Major future milestones
3. Schedule to completion (maintaining appropriate GANTT charts and critical path analyses)
4. Cost to completion issues, with clearly defined project wide metrics
5. Major remaining risks
6. Progress towards achieving scientific objectives

The MPB consists of a Chair, 4 or more members, and two ex-officio observers:

Steve Peggs (ESS/BNL)	Chair
Ian Robson (UKATC)	Cross-member from the UK Oversight Committee
Steve Vigdor (BNL)	Cross-member from Muon Collaboration Oversight Group
Tom Taylor (CERN)	External SC magnet expert
Roger Ruber (ATLAS)	External expert on scientific project management
Charlotte Jamieson (STFC)	STFC MICE project officer – ex-officio
David Findlay (STFC)	Host laboratory representative – ex-officio