EuCARD Work Package 6 MICE: Open Accelerator Science Facilities,
MICE Transnational Access application form

APPLICATION FORM

1) Group Leader

Family Name BLONDEL_____

First Name Alain_____

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Legal Status of Home Institution Code (1) __UNI_____

Home Institution Country Code (2) _____CH____Position Code (3) __EXP_____

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2) Group Researchers

Family Name BERGSMA_____

First Name Felix_____

Nationality NETHERLANDS_____

Home Institution CERN_____

Legal Status of Home Institution Code (1) __RES_____

Home Institution Country Code (2) _CH_____Position Code (3) ____EXP (Scientist)_____

(1) **UNI**=University, **RES**=Public Research Organisation, **SME**=Small or Medium Enterprise, **PRV**=Other and/or profit or not profit Private Organisation, **OTH**= Other Organisation

(2) **AT**=Austria, **BE**=Belgium, **BG**=Bulgaria, **CY**=Cyprus, **CZ**=Czech Republic, **DK**=Denmark, **EE**=Estonia, **FI**=Finland, **FR**=France, **DE**=Germany, **GR**=Greece, **HU**=Hungary, **IS**=Iceland, **IO**=International Organisation, **IE**=Ireland, **IL**=Israel, **IT**=Italy, **LV**=Latvia, **LI**=Liechtenstein, **LT**=Lithuania, **LU**=Luxembourg, **MT**=Malta, **NL**=Netherlands, **NO**=Norway, **OT**=Others, **PL**=Poland, **PT**=Portugal, **RO**=Romania, **SK**=Slovakia, **SI**=Slovenia, **ES**=Spain, **SE**=Sweden, **CH**=Switzerland, **TR**=Turkey, **GB**=United Kingdom.

(3) **UND**=Undergraduate, **PGR**=Post graduate (student with a first University degree or equivalent), **PDOC**=Post-doc researcher, **TEC**=Technician, **EXP**=Experienced researcher (professional researcher).

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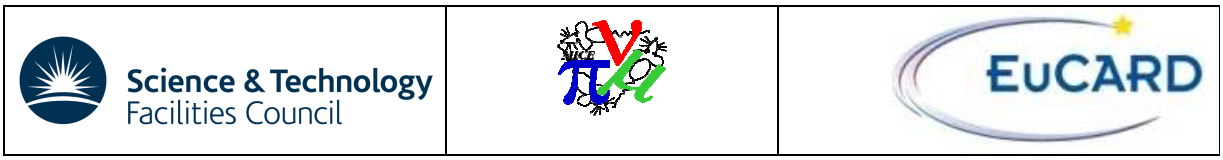
Family Name GIUDICI_____
First Name Pierre-Ange_____
Nationality FRANCE_____
Home Institution CERN_____
Legal Status of Home Institution Code (1) _RES_____
Home Institution Country Code (2) ___CH_____Position Code (3) _____EXP(engineer)_

Family Name KARADHZOV_____
First Name Yordan_____
Nationality Bulgaria_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____PDOC_____

Family Name RAYNER_____
First Name Mark_____
Nationality United Kingdom_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____PDOC_____

Family Name CADOUX_____
First Name FRANCK_____
Nationality FRANCE_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____EXP (engineer)

Family Name MASCIOCCHI_____
First Name FLORIAN_____
Nationality SWISS_____



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Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____EXP (Engineer)

Family Name DEBIEUX_____
First Name STEPHANE_____
Nationality SWISS_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____EXP (engineer)

Family Name NICOLA_____
First Name LAURENT_____
Nationality SWISS_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____TEC

Family Name HUSI_____
First Name CORALIE_____
Nationality FRANCE_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____TEC

Family Name BLOCH_____
First Name REYNALD_____
Nationality SWISS_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____TEC

EuCARD Work Package 6 MICE: Open Accelerator Science Facilities,
MICE Transnational Access application form

Family Name ASFANDIYAROV_____
First Name Ruslan_____
Nationality Russia_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) ____PGR_____

Family Name VERGUILOV_____
First Name VASSIL_____
Nationality BULGARIA_____
Home Institution UNIVERSITY OF GENEVA_____
Legal Status of Home Institution Code (1) __UNI_____
Home Institution Country Code (2) _CH_____Position Code (3) __PGR

Please add an extra page if needed

3) **Project Title** **MICE-UNIVERSITY OF GENEVA PROJECT**
4) **Project Acronym** *(max 20 characters)* __MICE-UNIGE_____
5) **Access is requested for the following MICE activity (tick the item chosen)**:

(X) MICE experiment; if yes:

(X) MICE data-taking

(X) MICE detector installation, commissioning or maintenance

(X) MICE online, trigger, controls and monitoring

(X) MICE cooling channel installation, commissioning or maintenance

(X) MICE data analysis and/or collaboration meeting

( ) muon cooling studies

(X) detector tests on MICE beam line

6) **Experimental Setup of interest:** **___MICE EXPERIMENTAL AREA**

7) **Duration of the Project:** **ONE YEAR** Starting 01 APRIL 2011

8) **Access Periods Requested under TA Programme:**

Researcher	**Total No. of Days**	**No. of visits**
BLONDEL	**120**	**20**
KARADHZOV	**90**	**10**
RAYNER	**10**	**2**
VERGUILOV	**10**	**2**
ASFANDIYAROV	**90**	**10**
BERGSMA	**75**	**5**
GIUDICI	**75**	**5**
CADOUX	**15**	**1**
MASCIOCCHI	**15**	**1**
DEBIEUX	**20**	**2**
NICOLA	**20**	**2**
HUSI	**20**	**2**
BLOCH	**20**	**2**
Technician CERN (Garnier or other)	**75**	**5**
TOTAL	655	69

9) Curriculum Vitae of the Group Leader and a short description (max. 2 pages) of the latest group research activity.
(Separate document enclosed)

10) Description (max. 3 pages) of the project and of the research work planned by the group during the stay at RAL.

This application refers to the work of the University of Geneva team at RAL including the work of the CERN team in charge of magnetic measurements for the MICE magnets, which is subcontracted to University of Geneva. It is divided in four broad classes

responsibilities in the experiment.
-- Prof. Blondel (MICE spokesperson) is regularly present on the MICE site to follow development of daily work or data taking, and to participate in meetings of managerial nature (MICE MICO meetings, MICE safety committee, MICE Project Board, MICE Funding Agency Committee), for typically 5-10 days and two trips a month.
-- Dr Yordan Karadzov responsible for the experiment's DAQ, and is one of the MICE MOMs. His presence is necessary for typically one week and one trip a month, plus one full month every year. His contract with University of Geneva started in June 2011.
-- Dr Mark Rayner is now on T2K but has been one of the leading members of the MICE analysis team. He will continue some involvement in the MICE team until all papers from 2010 data taking is complete.
-- Vassil Verguilov is a key expert for the MICE DAQ and for the online reconstruction, as well as for the calibration of the beam Cherenkov. His presence at RAL is needed for typically two to three weeks at the beginning of each running cycle. He will defend his PhD thesis in May 2012 and has been replaced by Ruslan Asfandiyarov starting in December 2010.
-- Ruslan Asfandiyarov is the physicist in charge for all things regarding the EMR. He has already come to RAL for the first test run in June-July 2011 and will be coming again for the final installation and run in May June 2012. He will also participate in analysis and collaboration meetings and in the running of the detector in December 2012 to March 2013.
-- Frank Cadoux is the project leader for the EMR. During the construction period his presence together with that of other technicians and engineers is required for planning of the integration of the detector with the MICE engineering team at RAL.
-- Felix Bergsma is the leading scientist for the CERN magnetic measurements. He will take part at RAL in four data taking sessions for the AFC and the two spectrometer solenoids and for analysis of the results with the MICE magnet coordination team.
-- Pierre-Ange GIUDICI is the Engineer in charge of the magnetic measurement devices, design fabrication and installation. He will be present at RAL for the installation and commissioning of the measurement device for the AFC and the two spectrometer solenoids. He will be accompanied with a CERN technician (François Garnier or other)

Operation of the experiment (MOM and data taking shifts)
-- Yordan Karadhzov is also one of the MICE Operation Managers (MOM), for one month a year (in 2012 this will be in July)

-- Shifts: all Geneva physicists will be taking during beam operation of the experiment (i.e. during ISIS physics run as well as Machine physics periods). This will require presence for two weeks each in March 2012 and May-June 2012, and the in December 2012 until March 2013 included.

Installation and commissioning of the MICE EMR

We refer to the 2011 MICE Status report[i] for a description of the MICE EMR and its location and function in the experiment. The EMR consists of a 1x1x1 m3 fully active scintillator calorimeter made of 48 planes of triangular shaped bars of scintillator readout by wavelength shifting fibers connected with Multianode PMTs (one pixel per scintillator bar) on one side and single channel PMTs (one PMT per plane) on the other. The scintillator provided by Fermilab has been delivered; the scintillating fibre and photomultipliers have been provisioned, 24 planes have been assembled, 24 others are under construction. The front-end electronics is designed and tested and production is nearly comple. The present schedule of the experiment is described on Figure 1, the detail of one plane of the EMR , the engineering drawing of the detector on Figure 2.

EMR planes are tested on a cosmic ray telescope provided by the Como group at UNIGE (Figure 3) before assembly. Production of the planes continues at the rate of one module (=double plane) a week until March 2012.

In June 2011 three modules were be assembled and transported to RAL and exposed to beam. This tested successfully the detector and electronics and the integration in the experiment DAQ on site, Figure 4.

The complete assembly of the detector will be completed at UNIGE until April 2012 and then shipped to RAL. The detector will then be integrated downstream of the MICE apparatus and commissioned in beam in the ISIS cycle of May- June 2012.

This work will require a couple weeks at RAL of mechanical engineers (Cadoux, Masciocchi) and technicians (Nicola, Husi, Bloch) for the actual installation of the detector. For the detector commissioning the presence of the electronics engineer (Debieux) may be needed.

Magnetic field mapping for MICE

The experiment aims at measurements of beam emittance before and after the cooling channel with a relative precision of 10^{-3}, by measurements of individual muons in the beam. The magnetic field must be known throughout the experiment with a precision of $3\ 10^{-4}$ so that the systematic error due to the magnetic field does not contribute significantly to the total systematic error.

The measurement devices are the well known 3D Hall probes, shown in Figure 5, conceived for the measurement of the ATLAS magnets[ii] and upgraded to 4T for the CMS magnets. The mapping device is represented in Figure 6, Figure 7 and Figure 8. A set of 7 Hall probes is

placed on a precision cradle and trolley system allowing location and orientation of the probes to be scanned and determined with a precision of a few hundreds of microns. The group will provide a grid of measurements from which the positions and the alignment of the coils (aas well as possible irregularities) will be determined precisely enough to ensure knowledge of the magnetic field to the required precision. The procedure will be similar to that applied for the ATLAS muon system.

The magnets will be measured in their final position to take into account the effect of iron masses in the MICE hall. The present schedule of measurements is as follows: first the AFC magnet number one, probalby in March in building R9 and May 2012 in the MICE hall; then the spectrometer I in June-July 2012; then spectrometer II in September 2012. The AFC magnet number 2 will be measured after the spectrometer solenoid in R9 towards the end of the year.

Each series of measurements is expected to take about two weeks including set-up and dismounting of the equipment. The magnetic maps will be established in collaboration with the group in Oxford.

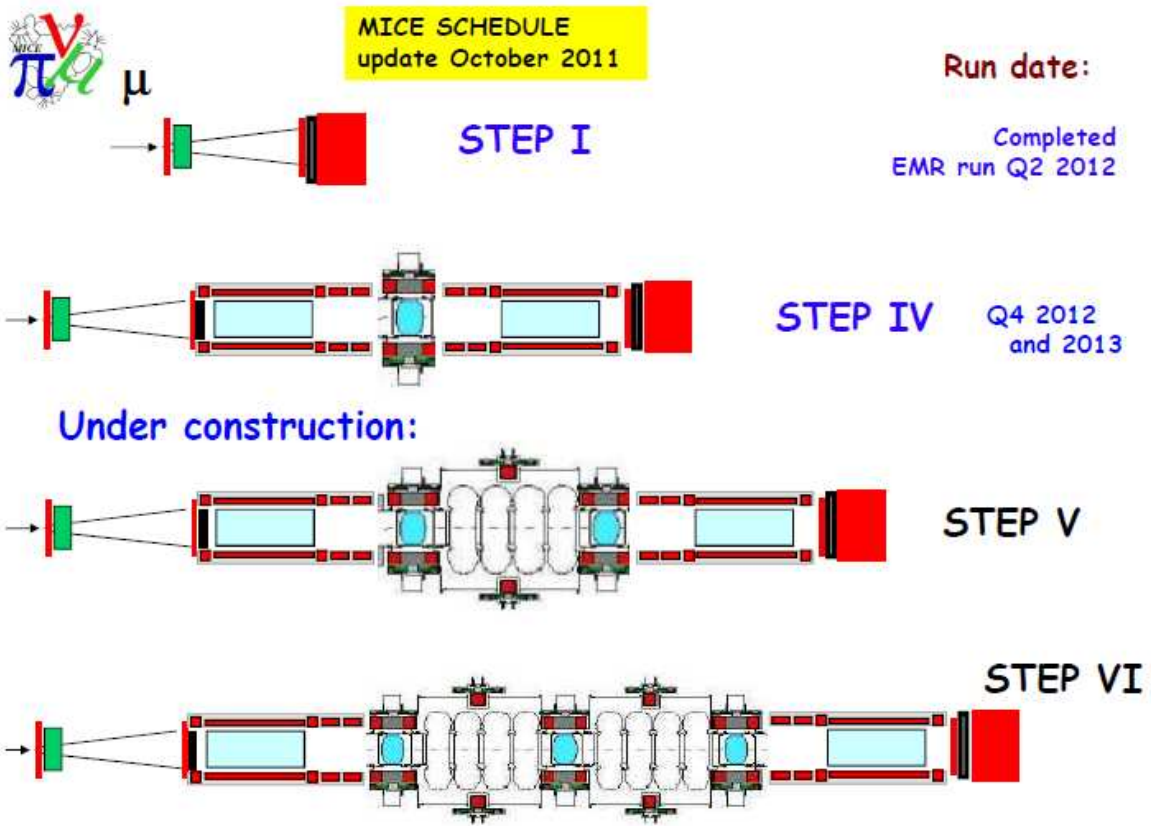

Figure 1: The proposed steps in the implementation of MICE with schedule dates. The Electron Muon Ranger (EMR) is sketched by the red block downstream of the experiment; the target for completion of Step VI construction is 2016.

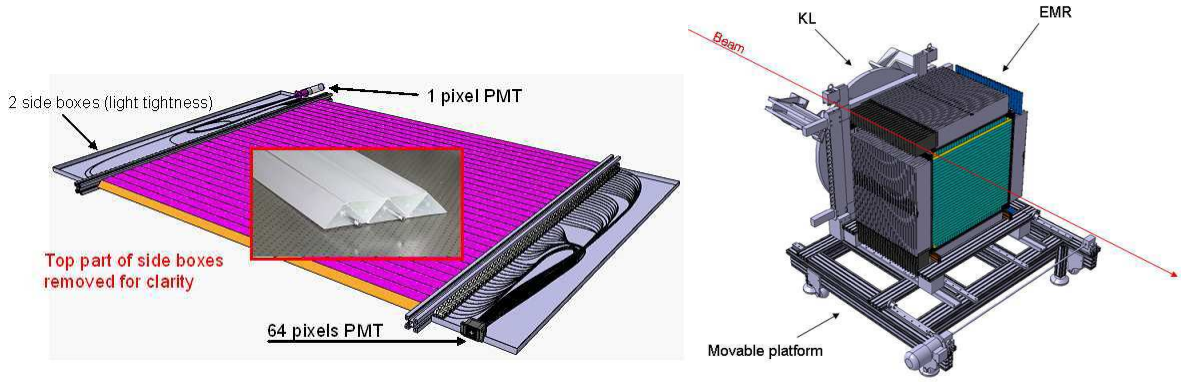

Figure 2: CAD view of one EMR plane with 59 triangular bars, and the WLS fibres routing to the PMT's. The inset shows a close out of the triangular bars with mechanical fasteners. CAD overview of the EMR (without Outer Box) positioned on its platform shared with the KL detector.

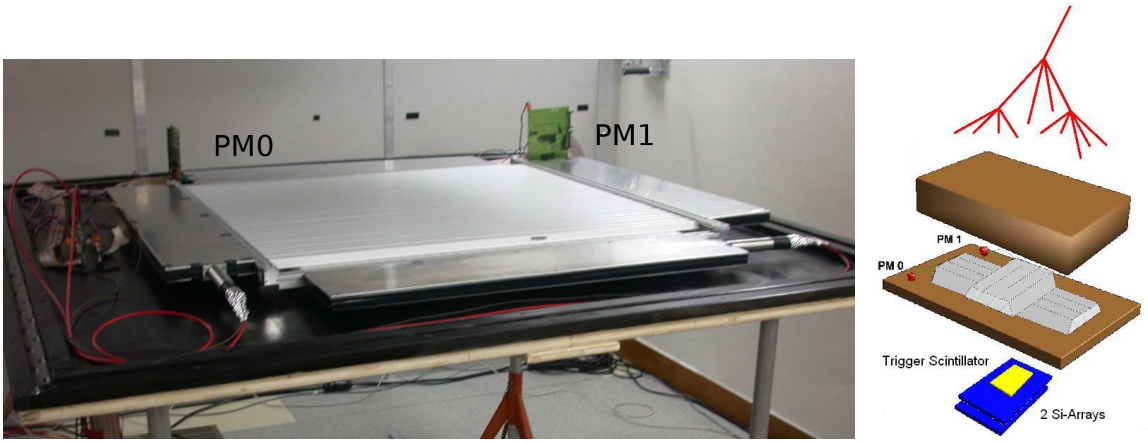

Figure 3: Cosmics test setup in Geneva. A module made of 2 EMR planes is placed in a large, light tight, wooden box (left). Underneath the table, a trigger scintillator and 2 X-Y arrays of Si detectors allow the tracking of cosmic rays (right).

Figure 4 top: The EMR (test module of 6 planes) in the MICE hall in June 2011; the UNIGE team in front of the detector; the time structure of the MICE spill as recorded by EMR signals in beam.

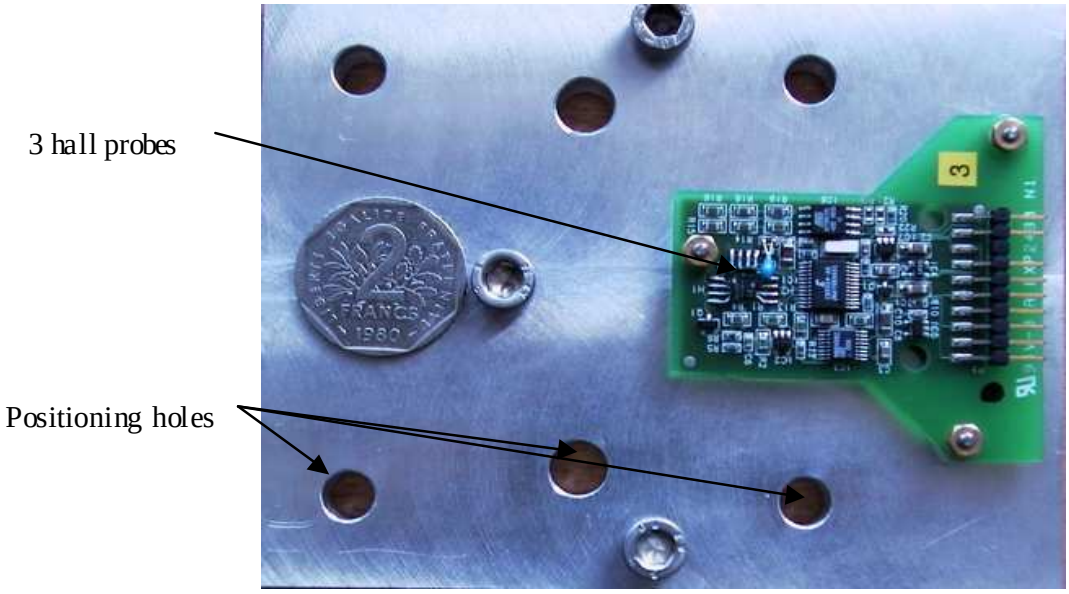

Figure 5 A picture of one ATLAS magnetic sensor with its electronics

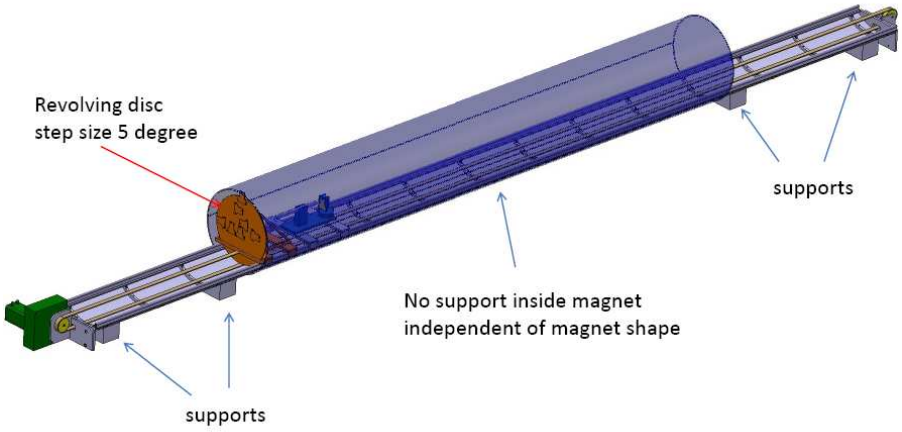

Figure 6 Magnetic field measurement device: layout of the system, whereby a rotating disk carrying 7 3D magnetic probes can be rotated or translated along a magnet on a cradle (5m long for the spectrometer solenoids or coupling coils, 2 m long for the Focus coils)

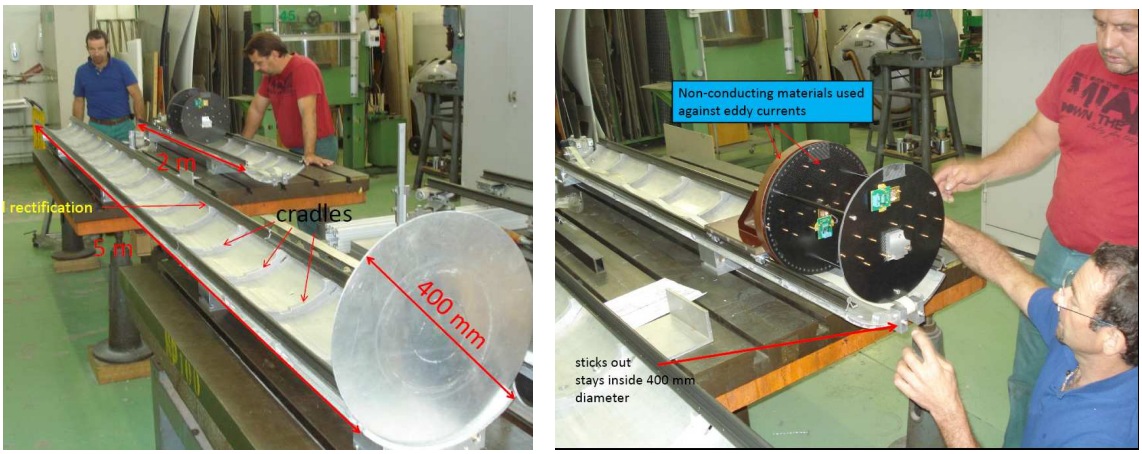

Figure 7 Construction of the magnetic measurement device at CERN. Right, P.-A. Giudici and F. Garnier next to the 5m and 2 m cradles; on the left, a closer view of the trolley on which 2 probes are attached.

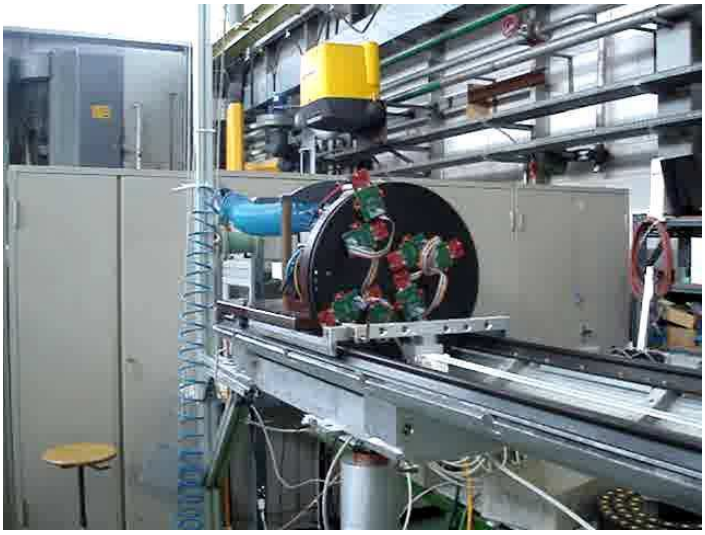

Figure 8 Ready to go: the magnetic measurement device, rolling on the cradle and rotating with the pressurized air motors, probes read out and recorded.

11) Safety hazards

Safety hazards will be similar but not worse that for the TOF and KL detectors already situated in the MICE hall. Installation of the EMR which weights over one ton will be done in close coordination between the UNIGE engineers and technicians and the MICE CDM team of MICE project manager Andy Nichols. The magnetic field measurement requires no other safety precaution than normal operation of MICE with magnetic fields.

12) Comments

The group benefits from a 'rolling' grant of the Swiss National Foundation in which a total travel budget of 90 kCHF per year (out of 145 requested) has been obtained, to be shared between the participation to T2K in Japan, MICE and travel to conferences, workshops etc… In spite of our relatively cheap travel from Geneva (Easyjet) the budget has been systematically at the limit or even exceeded in the previous years at the expense of other aspects of the neutrino project. With the installation and commissioning of EMR, it can be foreseen that the resources of the group would be largely exceeded without TNA funding.

We have obtained a limited grant for the construction of the magnetic measurement device at CERN and some initial travel, but there is no other budget than TNA for the travel of the CERN team to MICE for effecting the measurements.

The table under point 8) above lists the sum of all visits that we expect to carry out during the coming year. **Our actual request would be that TNA covers 60% of the total listed in the above table.**

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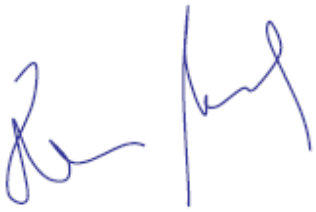
Date

Group Leader Signature



30 January 2012

[i] MICE Collaboration, Y. Karadzhov et al., MICE Status Report – Juin 2011
http://mice.iit.edu/micenotes/public/pdf/MICE0349/MICE0349.pdf

[ii] Measurement of the ATLAS solenoid magnetic field, M. Aleksa, F. Bergsma, et al, 2008 JINST 3 P04003
http://iopscience.iop.org/1748-0221/3/04/P04003/pdf/jinst8_04_p04003.pdf
and references therein.