MICE SUPERCONDUCTING MAGNETS

Competencies

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Change Record

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Contents

1 Classification

The competencies required by personnel fall into two categories:

1. *Magnet experts*: for example those who have built and operated the magnets and associated power and control systems; and
2. *MICE personnel*: Personnel taking MICE shifts ("operators") or with responsibilities for systems other than magnets systems within the MICE Hall.

2 Magnetic field in the MICE Hall

The superconducting solenoids that transport the beam through the MICE experiment are contained within a partial return yoke (PRY). For the purposes of defining competence in this document, three areas are identified:

- *The area within the PRY:* within the area delineated by the PRY high fields (in excess of 30 G) will be present when one or more of the superconducting magnets is energised;
- *The area outside the PRY and bounded by the 5 G line:* the PRY has been designed to contain the stray field generated by the superconducting solenoids. The magnetic field may be as high as 30 G on the surface of the PRY. The field falls rapidly to 5 G. The 5 G line is clearly marked on the approach to the experiment within the MICE Hall; and
- *The area outside the 5 G line:* outside the 5 G line the magnetic field is below 5 G.

The Superconducting Magnet Permit is required before the MICE Magnets can be operated. Therefore the MICE Hall is under PPS control and access to the mezzanines is not permitted when the Superconducting Magnet Permit is enabled.

3 Competencies

<u>Magnet experts:</u>

To date, the spectrometer solenoid and focus-coil magnet systems have been operated during the training periods necessary to qualify the magnets for acceptance either at the vendor or, in the case of the focus-coil modules, at the Rutherford Appleton Laboratory. During these periods of operation, the designated operators exclusively carried out the following duties:

- Interaction with the dedicated magnet control systems:
  - Automated sequences
  - Vacuum system
  - Power system
- Movement and connection of Dewars and gas bottles
- Setting of regulators
- Actuation of hand valves
- Miscellaneous interaction with associated hardware

Full experimental operation will be broadly similar to this, with some minor changes to hardware to reflect the implementation in the MICE Hall. Magnet experts will be fully present during transition periods and on-call during stable operation.

MICE system experts:

MICE system experts are those responsible for particular pieces of equipment for example the tracker readout electronics, TOF, KL, EMR or vacuum equipment that lies between the 5 G line and the PRY. MICE system experts will have received a briefing on the hazards of working in magnetic fields larger than 5 G but lower than 30 G.

In addition to the activities that may be carried out by "MICE personnel" (see below), MICE system experts may perform maintenance of the equipment for which they are responsible that lies between the PRY and the 5 G line. Interventions or maintenance of the equipment between the 5 G line and the PRY when one or more of the superconducting magnets is energised may be carried out by other personnel not classified as MICE system experts so long as the persons are supervised by a MICE system expert, the MICE Hall Manager, the MICE Operations Manager, the MICE Operations Engineer or the Group Leader in Matters of Safety. Where-ever possible, non-ferrous tools will be used. The System expert will ensure that all tools and other objects taken within the 5 G line are accounted for once the work is complete.

The list of MICE system experts will be maintained by the MICE Operations Coordinator in the "CHEESE" shift tool.

MICE personnel:

MICE personnel will have received a briefing on the risks of the magnetic fields in the MICE Hall as part of the shift training. The list of personnel who have received the briefing will be maintained by the MICE Operations Coordinator in the "CHEESE" shift tool.

The activities of persons classified as "MICE personnel" are limited to:

- In stable operation, applying pre-defined magnet settings via the MICE Run Control and MICE Magnet Control panels; and
- During a controlled access, when the Superconducting Magnet Permit is enabled, MICE personnel will not cross the 5 G line.

4 Competent persons

4.1 Magnet experts

- Victoria Bayliss (RAL)
  - Focus-coil magnets; operation (cryo, vacuum, powering, training);
  - Cryogenic Engineer. Part of focus-coil team for a number of years.
- Daniel Bowring (FNAL)
  - Spectrometer solenoid operations (cryo, vacuum, powering, training)
  - Postdoc: Cryogenic training, basic electrical training, system training
- Alan Bross (FNAL)
  - Spectrometer solenoid operations (cryo, vacuum, powering, training)
  - Scientist: (US construction manager), spectrometer solenoid design and assembly, cryogenics, advanced electrical training, vacuum systems expertise.
- John Cobb (JAI/Oxford)

    - Focus-coil magnets; operation (cryo, vacuum, powering, training);
    - Scientist; MICE Focus Coil co-work-package manager.
- Kyle McCombs (LBNL)
    - Spectrometer solenoid; operation (cryo, vacuum, powering, training)
    - Experienced technician. Part of the team that completed, commissioned and trained the spectrometer solenoids at the vendor.
- Mike Courthold (RAL)
    - Focus-coil magnets; operation (cryo, vacuum, powering, training);
    - Applied physicist (part time). Relevant training: DSEAR/ATEX, Cryogenic safety, Compressed gas safety, Risk assessments, Manual handling, Working at heights. Part of focus-coil team from 2005.
- Sandor Feher (FNAL)
    - Spectrometer solenoid operations (cryo, vacuum, powering, training)
    - Magnet scientist: advanced electrical training, cryogenic training, system design, quench protection system design and implimentation
- Stephen Griffiths (DL)
    - Magnet power supplies and electrical systems;
    - Electrical Engineer; Head of Electrical Engineering Group, DL
- Pierrick Hanlet (IIT)
    - Spectrometer solenoid operations (cryo, vacuum, powering, training), control systems integration, operation and debug
    - Scientist: control systems design and implementation, quench protection system integration, magnet systems design
- Stephen Harrison (RAL)
    - Magnets; operation (cryo, vacuum, powering, training);
    - Superconducting magnet designed for 24 years with wide experience of superconducting magnets.
- Trevor Hartnett (DL)
    - Magnet power supplies and electrical systems.
    - Electrical Engineer;
- Maria Leonova (FNAL)
    - Spectrometer solenoid operations (cryo, vacuum, powering, training)
    - Post doc: Cryogenic training, basic electrical training, system training
- Mark Palmer (FNAL)
    - Spectrometer solenoid operations (cryo, vacuum, powering, training)
    - Scientist (Group leader): Cryogenic training, basic electrical training, system training
- Milorad Popovic (FNAL)
    - Spectrometer solenoid operations (cryo, vacuum, powering, training)

    - Experimental physicist; long experience of accelerator systems, magnet and power systems
- Soren Prestemon (LBNL)
    - Spectrometer solenoid operations (cryo, vacuum, powering, training)
    - Design engineer. Part of the team that designed, built, commissioned and trained the spectrometer solenoids at the vendor.
- Mark Tucker (RAL)
    - Vacuum and cryogenic operations;
    - Experienced practical physicist with extensive experience in vacuum and cryogenic systems.
- Steven Virostek (LBNL)
    - Spectrometer solenoid operations (cryo, vacuum, powering, training), control systems integration, operation and debug
    - Mechanical Engineer: engineer responsible for manufacture, initial commissioning at the vendor and initial training.
- Stephen Watson (RAL)
    - Focus-coil magnets; operation (cryo, vacuum, powering, training);
    - Engineer with responsibility for the focus-coil module construction and commissioning. Leader of the focus-coil construction and commissioning activities.
- Adrian Williams (LBNL)
    - Spectrometer solenoid; operation (cryo, vacuum, powering, training)
    - Experienced technician. Part of the team that completed, commissioned and trained the spectrometer solenoids at the vendor.
- Holger Witte (BNL)
    - Partial Return Yoke; design and performance analysis.
    - Magnet designer; designer of the PRY and part of the team that procured the PRY and performed the necessary QA on the magnet iron.

4.2 MICE system experts

MICE system experts will have received a briefing on the hazards of working in magnetic fields larger than 5 G but lower that 30 G are listed in the “CHEESE” shift tool.

4.3 MICE personnel

MICE personnel who have undergone the MICE Hall induction and the shift training are listed in the “CHEESE” shift tool.

5 Formal requirements

5.1 Training

The expertise of “Magnet experts” will be assessed on a case-by-case basis. The personnel will have had all necessary Laboratory and MICE inductions and training. In particular, if the individual will be handling cryogens, he/she will have undergone the RAL cryogenic training.

MICE personnel will have undergone all necessary Laboratory and MICE inductions and training. As part of the MICE training, MICE personnel will have been made aware of the risks associated with magnetic field in the MICE Hall and the rules regarding interventions they may make. MICE system experts will, in addition have received a briefing on the risk associated with working in the presence of magnetic fields between 5 G and 30 G.

5.2 Sign-off

Once there is satisfactory evidence of the above competency, designation of a new Magnet expert will be signed-off by the:

- MICE GLIMOS (currently Andy Nichols)
- MICE Project Manager (currently Colin Whyte)
- Chair of MICE/ISIS safety (currently John Thomason)