



Mice Collaboration Meeting CM28

*Bankya Palace Spa Hotel, Sofia,
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Daresbury Laboratory Spectrometer Report

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DL Electrical Visit to LBNL/Wang NMR to Review Spectrometer 22nd & 23rd Feb 2010

Following the Visit, a Report / Recommendations and Actions Document was written and circulated as a discussion document.

The following is a summary of the main contents



Recommendations/Actions

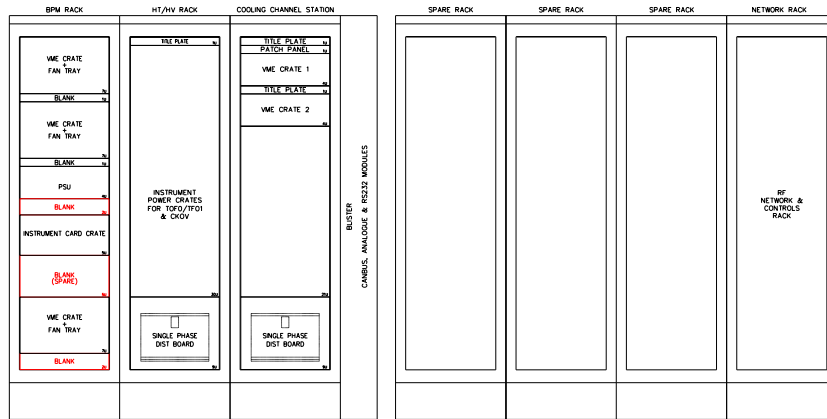
- Re-arrange the present Spectrometer power supply racks from a TWO rack power supply system into a THREE rack system and house the dump circuits in the additional rack.
- This removes the cooling water supplies from the power supply racks and re-establishes the cable access space at the bottom of the racks.
- House the FOUR Lakeshore 218 (temperature monitoring) units and the TWO AMI 135 (Liquid Helium level sensing) units in the re-arranged racks.



Recommendations / Actions

Additional space to be provided in the MICE Hall. This will prove useful for anticipated additional rack space required for future AFC and RFCC power supplies and dump circuits”.

TOP TIER



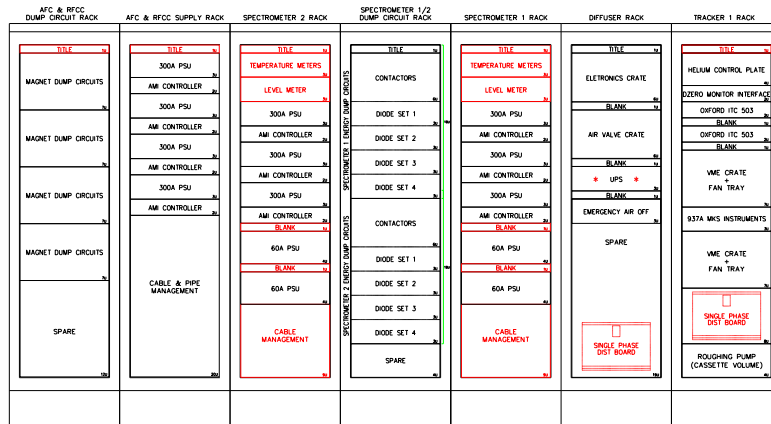
(VIEW LOOKING TOWARDS MAGNETS M07-9 & SOUTH WALL)

Upper Tier (left to right)

- BPM
- High Voltage equipment
- Control System
- Spare
- Spare
- Spare
- Network

Planned rack layout is now as shown

BOTTOM TIER



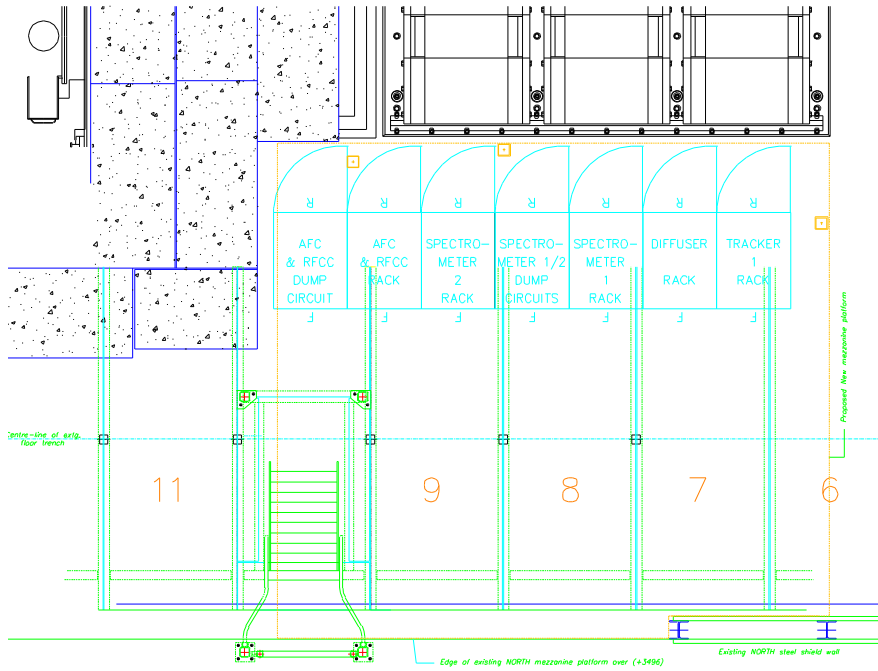
(VIEW LOOKING TOWARDS MAGNETS M07-9 & SOUTH WALL)

Lower Tier (left to right)

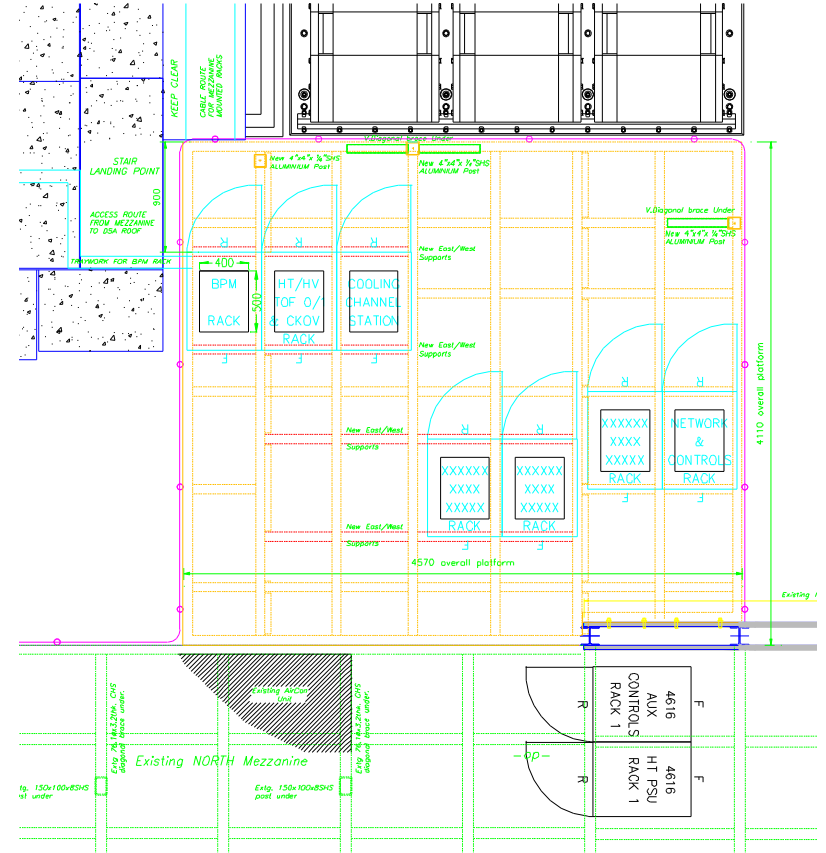
- AFC & RFCC Dump Circuits
- AFC & RFCC Power Supplies
- Spectrometer Solenoid #2 Power Supplies
- Spectrometer Solenoid Dump Circuits
- Spectrometer Solenoid #1 Power Supplies
- Diffuser
- Tracker

Rack Layout - Plan Views

Ground Floor Level

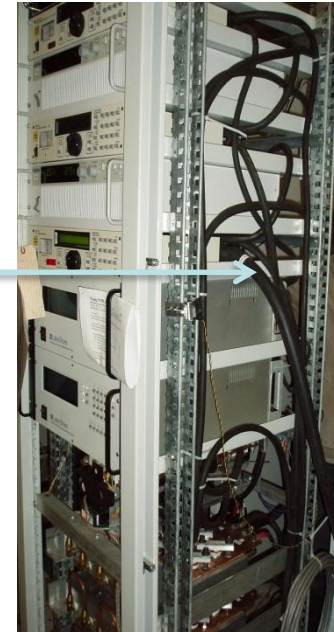
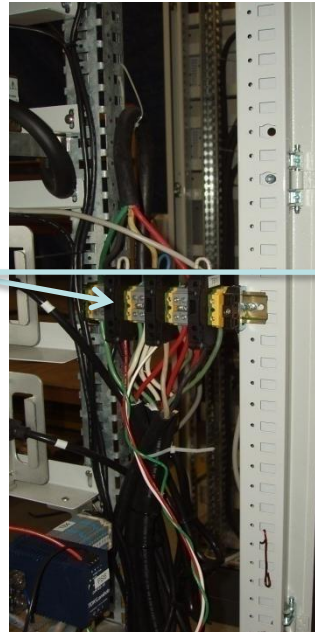


Mezzanine Level



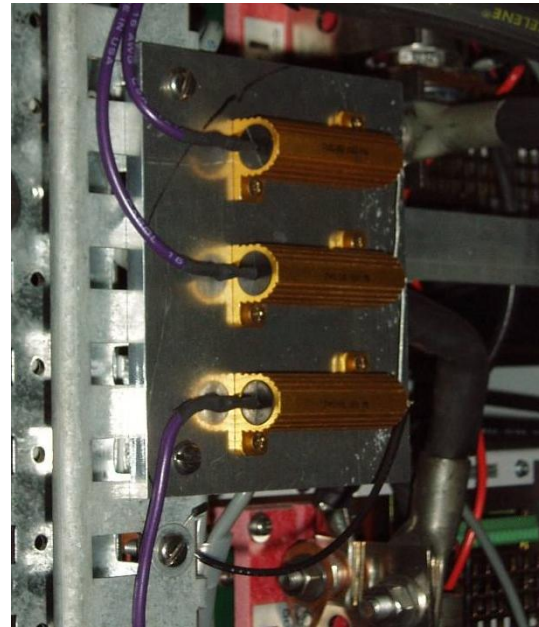
Recommendations / Actions

- STFC DL electrical staff to modify rack wiring and power distribution/cable management in line with UK electrical standards.
- Spare 300A Xantrex power supply and AMI controller to be sent to UK to aid design
- Control of the DC contactors to be undertaken by the MICE Spectrometer control system. Could also incorporate a PPS interlock if required.
- Water cooling systems to dump circuits should be flow and temperature monitored with possible UPS back up for an anticipated 30min period of RAPID discharge.

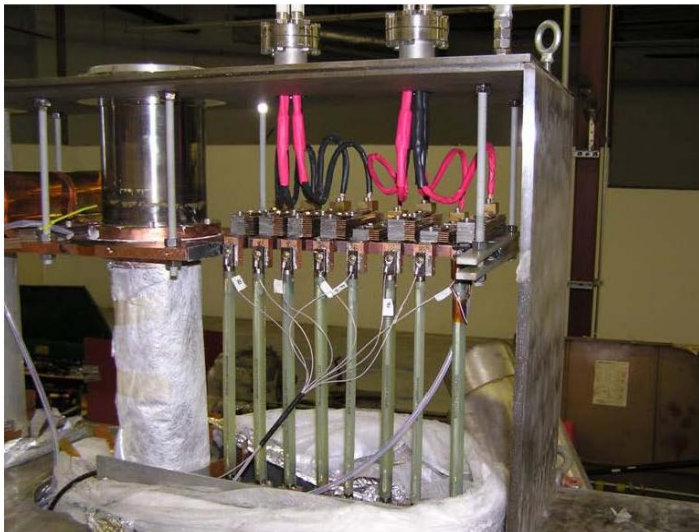


Recommendations / Actions

DL ECS Group power supply specialists strongly recommend that earth leakage protection/interlocking be implemented. An earth fault / leakage would cause an undetected current to flow in the MICE Hall protective earth network.



10 Ohm Leakage Resistors for Xantrex 300A Power Supplies



Upper leads and HTS leads assembly in magnet turret

Voltage taps to be made available for quench diagnostics to highlight areas of concern and as a means to prevent internal HTS lead over heating. Additional external circuitry will be required to achieve this.



Further Recommendations / Actions

- DL ECS Group power supply specialists to liaise with Wang NMR directly, as agreed, to gather further information on the AMI420 quench detection system and the Lakeshore 60A power supply earth leakage arrangements to assist in resolving any issues.
- Spectrometer PSU sequence control to be provided by MICE Spectrometer control system. This will require documented information following the cool down training tests and magnet field mapping. This could prove a KEY requirement.
- A specification of the control system is needed to ensure that the system is designed for purpose and meets what is required.
- Wang NMR to provide a full circuit schematic diagram of the discharge diode arrangements, both INTERNAL and EXTERNAL. This will allow a detailed energy discharge analysis to be performed, to verify that all circuit components are rated accordingly, if not already done.





Further Recommendations / Actions

- Investigate the FULL extent of a Helium release in the MICE hall (possibly all 18 magnets) during a quench, to see if additional extraction/monitoring is needed.
- Check water flow rates in the MICE Hall are sufficient for cooling of cryogenic compressors. (Steve Virostek)
- DL electrical design to investigate the locations of the requested MAG ON lamps for the SC magnets and ensure that non-magnetic fittings are used around the cooling channel.

For complete reference please refer to full report document from IM/JW and Wang NMR PS & Control documentation from Spectrometer Review Nov 10th 2009.





Recovery plan

The control philosophy for the spectrometer has, at present, been given a very low priority. This needs to be addressed because ‘How’ the spectrometer will be controlled in the MICE hall from the MICE control room is just as important an issue as any other concerns with regards modifications that need to be made to the Spectrometer.

For example DL ECS Group feel that after the failure of a high current conductor has meant that the magnet has to be reopened, there is an opportunity to install additional monitoring cables to all positions along the high current conduction path. This should include high current input conductors and all coils / windings, similar to that provided on the Decay solenoid.

These monitoring points can then be measured using a quench detection circuit. (Probably the same as being designed for Decay Solenoid) This will provide an automatic trip to the power supplies feeding the magnet, which provide protection which is fast, reliable and operates even if the magnet is left unattended. This will also provide essential monitoring of the magnet circuit, to identify where the quench has occurred, which would be very useful information particularly during development, commissioning and operation.

DL ECS inclusion in the Recovery Plan team would be highly beneficial to the discussions and recommendations and would ensure that the requirements needed to properly control the spectrometer are given the same priority and consideration as the Cooling, Training and Mapping of the magnetic field.





Time Line / Costing plan

The work required to design, build and programme the software to control the Spectrometer, would be best progressed in parallel with the build of the Spectrometer. Otherwise a significant amount time will have to be added to the Spectrometer completion date prior to its installation in the MICE hall.

The DL E&CS Group is therefore seeking approval to start purchasing the appropriate equipment to build the Cooling Channel control racks. Work would initially concentrate on the compressor controls which have been separated from the main cooling channel control rack into a separate control rack, located on the south mezzanine, which greatly simplifies both the design and cabling.

The compressor controls are straight forward and fairly well understood and so can be progressed with some certainty of no or very small alterations, that would have little impact on the design.

