Magnetic shielding meeting: 2012-09-12: 15:00 BST

Conference Room 4, R1 (phone conference details circulated)

Present: JT, VF, JW, IM, TH, AN, KL, MC, CMacW, PS, ABr, MZ, PH, JC, LC

1. **Actions:**
   - **PS:** Update geometry and add quads;
     - Quads added this am -- see later.
   - **AN,KL:** How to add effort (perhaps B.Sheppard);
     - RP believed to have met J.Clarke. Will find status of this for next week's meeting.
   - **PS, MC:** Send transverse forces to mailing list;
     - Stands. MC has the data for Steps IV, V and VI. Model takes a long time to run, but returns reasonable results. Forces believe to be manageable except Step V in a particular mode. Details will be circulated;
   - **JT:** evaluate cost and complexity of shielding compressors at south wall
     - JT has received information from Magnetic Shields. Original quote of ~£25k reduced to ~ £12k. Done. Needs to inform future considerations.
   - **MC:** evaluate effect of racks on field in RF area;
     - See below.
   - **TH, JT, IM, MC, AG, RP:** Write paper for presentation to the TB for positioning of the racks behind north wall;
     - ***Agreed:***
       - Finalise the report by 05Sep12;
       - Review at our meeting on 05Sep12;
       - Send AN for TB on 07Aug12.
     - Done.
   - **IM:** Check content and limit on operation of the substation;
     - A. Gallagher reported that the manufacturer had reported that 0.5 G is the limit. This indicates that they don't know. Implies we need to study. Done.
   - **PS, MC:** Consult C. Rogers on version management scheme;
     - PS has obtained and account on LanchPad; action stands.
   - **RP:** check with SS team what the experience is;
     - Action transferred to ABr. ABr will try and generate information in short order. MZ points out that the equipment is only ~6m away;
   - JT: notes that up to 100 ft there is no drop in performance. If two hoses are joined together there is a 2-3% drop in performance. Need to check if this is the same for single and two-stage units. Need to re-tune compressors. We don't know what the re-tuning means. Need also to re-evaluate the effect of the 50Hz versus 60Hz mains;
     - ***Agreed:***
       - Check basis of Cryomech estimation;
       - Check Cryomech figures with FC (or SS) as soon as we can;
       - Also need to do same for Sumitomo compressors and hoses.
       - **JT:** Pursues Cryomech basis of estimation;
       - **CMacW:** Liaises with Sumitomo;
       - **ABr:** Will check double-lengths of Cryomech hoses;

2. **Status of review of items in Hall and contacts with system owners: LF/MOM**
   - IM has provided information to LF on DL responsibilities;
   - Will try and get hold of some more information as MOM;

3. **Status of magnetic model of MICE Hall PS**
   - See slides:
     - Need to include EMR and an approximation to the iron buried under the floor before we begin to discuss the model estimations of the fields on the west wall;
   - MC: presented field maps and will distribute information to mailing list. Points noted:
     - ***Substation:***
       - Study of fine details of structures has been difficult. But, MC has results for effect on racks behind the north wall and the sub-station. Difficulty is in the cladding of the racks which is 3mm thick, but large in surface area.
       - MC took VB's models which were used to assess the quantity of shielding that would be needed to shield a compressor. This model was modified

such that the cabinet frame was represented as the first layer of screening material. Results indicate that the sub-station will see on its outer surface see maximum field of 550 G. This is concentrated in the area between the two substation components. Sub-station has many panel-mounted components so the effect of the field is worse than it might be.
    - Inside, if it is assumed that the components are localised the field is at the level of 30 G.
    - JC notes that the transformer has a transformer; the field at the transformer seems to be ~30 G.
    - This is initial information for working out what the options for mitigating the effect of the stray field on the substation;
- ***Racks behind the north wall:***
    - Seven racks and a blister were modelled behind the north wall. Found that external surfaces of the racks will see 300-620 G. Inside the racks you will see only 18G. Still a large field.
    - Need to review the distribution of the magnetic field in the iron and in the racks;
- ***208 V transformer in the trench:***
    - Case will see 0.24 T and field inside the transformer case will be at 81G;
    - Transformer is positioned in line with the Virostek plate upstream of the spectrometer. Q9 was not in the model;

4. **Discussion of options:**
    - **Racks:**
        - Behind north magnetic shield wall: status report **TH**
            - ABr: raises issue of cables for spectrometer solenoids. The cable management has been speced bearing this in mind. Cable lengths will be an issue. May need to make new cables;
        - On the mezzanine level to the north east;
            - Back-up scenario at the moment;
    - **Compressors:** **TH, JT**
        - Along west wall;
            - JT: working on routing of high-pressure hoses from the magnets and tracker cryostats to the west wall;
    - **ISIS plant room:** **KL**
        -
    - **Partial return yokes:** **HW**
        - No report from HW this week. ABr reports that present work of HW has completed but can discuss how to take this forward at/after the TB. ABr has tried to find additional engineering effort at FNAL.
        - **JT:** provide ABr with drawings to ABr for transmission to FNAL engineer;
    - **Igloo:**
        - Closure of ends of shield wall.
            - On hold for the moment.

5. **Exposure of equipment to magnetic field** **CMacW, RP**
    - CMacW: first step is some data from the SS would be valuable.
    - Long discussion of idea of making a worked example. This did not lead to a good conclusion. Issue seems to come down to defining specifications and then designing shielding to meet the specifications.
    - Remove as agenda item; replace with progress on design of shielding for tracker cryostat and electronics;

6. List of specific items to check **PS**
- ***LH2 delivery systems***

- ***Q9 power supply***
- ***HV rack***
- ***Control rack for compressors, vacuum etc.***
- ***Vacuum pumps***
- ***Substation***
- ***Equipment on the roof***

6. AoB

- PH: see slides. Points noted:
  - PH made the case that a 2D simulation might be useful to guide where to put the effort for the 3D model.
  - Basic principle of 2D to guide intuition accepted.
- PH: presentation at MAP meeting in October. Agreed that sharing slides in advance is a reasonable way forward.

Summary of actions:

- **AN,KL:** How to add effort (perhaps B.Sheppard);
- **PS, MC:** Send transverse forces to mailing list;
- **PS, MC:** Consult C. Rogers on version management scheme;
- **ABr:** check with SS team what the experience is;
- **JT:** Pursue clarification of Cryomech basis of estimation of effect of high-pressure hose length;
- **CMacW:** Pursue development of test of non-standard lengths of Sumitomo high-pressure hose;
- **ABr:** Pursue development of test of non-standard lengths of Cryomech hoses;