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Report of the Mice diffuser informal mechanical review held at the Université de Genève on October 11, 2007

Part takers (most only part time):

W. Lau (University of Oxford)

G. Barbier, P. Béné, F. Masciocchi, M. Matter, S. Perneckner and E. Perrin (Université de Genève, DPNC)

Note: The draft report was sent to W. Lau who answered (31/10) – in red - below

The Mice diffuser has been presented by Wing Lau (Oxford). Mechanical solutions presented are well worked out and the drawings are of good quality and mostly complete. The control aspects were not really covered.

The usefulness of this review is limited by the fact that it occurred too late with respect to the required production schedule, and the fact that the production of components has already started. The absence of the design engineer in charge of this project also prevented to cover several details of the design.

This project would have benefited more if a design review would have been organised at the time when the design was frozen.

Our general recommendation is now to schedule a full commissioning and testing of the diffuser and carousel including all controls before their installation.

Recommendations (in random order):

- Due to the magnetic constraints, the exact type of stainless steel has to be better specified on drawings, especially if parts are subcontracted.

Agreed. However, since the fabrication is carried out by our own workshop, material specifications were specified clearly in the material purchase order, rather than the drawings, to ensure the correct type of material is being ordered.

- Layout of services (cables and pipe routing) has to be defined.

This will be done at a later stage once we have the full information on how other cables are laid around the diffuser area.

- Assemble parts and test subassemblies as soon as possible.

Agreed. We are already working on this.

- The diffuser system using a M310 internal thread to generate the linear motion of the lead disk seems tedious to manufacture and may be prone to varying and large friction forces which may induce

bending of the guides. We recommend that it is fabricated soon to have time to do extensive testing, including the choice of lubricant.

This has already been addressed in the design as the aluminium cylinder which has the internal threads will be hard anodized to reduce wear.

- Some installation difficulties could have been avoided if the diffuser and the carousel could have been linked together to form one unit.

This has been considered before, but because of the space constraint in and around the diffuser area, it has not been possible to do this. However we are considering having some temporary jigs to allow the two sub-assemblies to be “joined” together temporarily during assembly to achieve the mating tolerance between the bayonet pins and holes to ensure good fit up.

- We recommend to develop simple tooling to help adjusting finely the positions of the carousel and diffuser on the Mice magnet.

Agreed. This is being done.

- We recommend to consider the introduction of a method allowing for a precise repositioning of the carousel and diffuser if they have to be dismounted, this to avoid re-alignment.

The assembly jigs, mentioned previously, will ensure this should happen.

- The bayonet system as designed requires high precision on numerous parts, their assembly and their positioning. We recommend to re-visit the build up of tolerances and try to implement larger clearances. Here too the system has to be fully tested before installation.

We should have better information on this during trial assembly and testing. This information will allow us to fine-tune the system to minimise any effect due to tolerance built-up.

- Backlash of the gears and out of balance of the carousel to be carefully considered in terms of efforts generated and precision both for stopping and locking.

The Control system will address this. Besides, we will know better how this would affect its accurate positioning once the trial assembly is carried out.

- Air motors have parts rotating at high speed prior to the reducing gears. Verify that eddy currents do not create problems.

We are seeking expert advice on how this would affect the performance of the air motors.

- We recommend to write a simple assembly procedure listing sequentially all steps and adjustments to be performed during the assembly of the diffuser.

Agreed. This is in our list of “things to do” to bring it to a close.

06/11/07ep