

# Magnet Discussion Meeting

Meeting via EVO

Wednesday 11th June 2008

## 1 Attendance

**Present:-** Andrea Bersani (Genova), Evie Downie (Glasgow), Alexander Efremov (Dubna), Inti Lehmann (Glasgow), Yuri Lobanov (Dubna), Jost Lühning (GSI), Lars Schmitt (GSI), Carsten Schwartz (GSI), Günther Rosner (Glasgow)

## 2 Minutes

The Magnet Group met on Wednesday 5th March via EVO. The meeting began with short reports by both Andrea Bersani and Yuri Lobanov on their recent progress in the production of a single unified Magnet design.

Yuri Lobanov reported that he had updated the TDR to reflect all of his recent results. After discussions at the last Collaboration meeting, the cryostat chimney has now been shifted upstream to facilitate the installation of the cryostat, and some minor changes have been made to the cable feed-through arrangements. He has made a 3D finite element model of this updated design and used TOSCA to calculate the magnetic field, which now satisfies all requirements. Yuri emphasised the need for answers to the questions highlighted in the Interface Document, especially with regard to the DIRC readout and the turbo pump requirements in order to allow absolute completion of the magnet design. He is currently studying the effect on the residual field of the depth of the cut away region for the target turbo pumps. His studies show that this residual field was higher for a laminated than for a solid yoke, but remains in the region of 5 mT. Yuri emphasised that he would be happy to produce a field map from the design as it currently stands, but that the field is likely to be changed by future modification of the solenoid as the parameters are optimised and more details of the detector requirements for cable feed-throughs etc. become known.

It was explained that, if magnetic shielding and trimming coils are required in order to effect the Barrel DIRC readout outside of the solenoid yoke, these features have become more awkward and expensive to produce than was first assumed, due to the requirement that the upstream door be made in two separable halves in order to allow access for detector maintenance.

In response to this, Carsten Schwartz explained that whether the Barrel DIRC will be read out either inside of outside of the yoke, the plan is to use micro channel plate PMTs

which can tolerate fields of up to 0.5 T. Thus, for external read out, it is only required that the field drop to 0.5 T within 400 mm of the end of the yoke. For internal readout, the major restriction is that of space and the Magnet Group must allow 500 mm in the beam direction for the Barrel DIRC readout. The geometric requirement of the MCP readout option, that the field should have a specific orientation, is naturally satisfied by the current geometry of the solenoid. Should it be necessary to optimise the yoke design for one specific readout option, it should be optimised for internal readout, but external readout should remain physically possible.

Andrea Bersani explained that the Genova and Dubna groups had exchanged AutoCAD files after the Collaboration Meeting. He had been working to adapt the Genova coil in order to satisfy the field requirements when combined with the yoke layout as presented by Dubna at the Collaboration Meeting. His proposed solution was to design the yoke in such a way that it could be equally compatible with either Barrel DIRC readout option after modification by simply adding an appropriate piece of shielding, which could be designed and constructed separately from the main body of the solenoid.

Andrea also made some suggestions with regard to final changes to the solenoid design before the production of a field map. He suggested that the gaps in the forward door be increased to 30 mm in z so that there was the same space allocation for the muon detectors in both barrel and forward regions. After studying the combination of the Genovese coil with the Dubna yoke, he found that the prolongation of the cryostat by 20 mm would drastically improve the magnetic field and allow a more acceptable margin of safety in the coil design. Thus he proposed that we prolong the upstream end of the cryostat from -1190 to -1210 mm.

Lars Schmitt explained that the EMC services were already at the technical drawing stage and were currently routed through this, now increasingly crowded, region. It was suggested that simply prolonging the yoke by 10 mm might improve this crowding at only minor cost. There was also a suggestion that making the upstream door thicker might achieve the same thing. It was agreed that Andrea would discuss the situation with regard to the EMC with Phillipe Rossier (including Lars Schmitt on all discussions) and would study the various options of cryostat and barrel length and door thickness and report his findings to the Magnet Group. It was agreed that, in parallel to this, Yuri Lobanov would discuss the muon chamber gaps in the forward door with Gennady Alexeev in order to discover if the muon group require 25 or 30 mm gaps. Should 30 mm gaps be necessary, Lars Schmitt stated that the increase in the forward door gap thickness has to be achieved by a combination of decreasing the Iron thickness and increasing the total door thickness as simply increasing the door width by 20 mm cannot now be accommodated, the maximum allowable increase being 10 mm towards the dipole.

Lars Schmitt presented his aims in the production of the magnetic field map for the simulations and detector design: that it should be accurate and unchanging to the 1% level in the region of the central tracker, to the 2-5% level in the region of the forward GEM trackers, to the 5% level in the region of the muon chambers and to the 20% level in the region of the photon detectors and services. It was agreed by all that this seemed a reasonable aim. However, concern was expressed that an unchanging map on the 5% level might be unachievable for the muon counter region while the magnet optimisation was still ongoing as, being between the iron layers, this region is particularly sensitive to small changes in the magnet structure. Andrea Bersani will investigate the effect of small design changes on the magnetic field in the required regions in order to allow the

production of a magnetic field map with known uncertainty due to future magnet design optimisation.

It was agreed that Yuri Lobanov and Andrea Bersani be given up to two more weeks to optimise the unified magnet design and that both groups should then submit the AutoCAD files of their unified design to Jost Lühning. Jost will use this information to produce a complete field map for the magnet system which can be incorporated into the simulation. Once this field map is created, it will be studied by both Genova and Dubna Groups to ensure that it agrees with their individual field calculations. It was decided that the field map production for the simulation should take place at GSI in order to allow close collaboration between the Magnet Group and the FAIRROOT responsables. However, it was requested that the details of this field map construction be documented somewhere in order that all member of the Magnet Group have access to the procedural information which may be highly useful in the comparison of the simulation field map with each group's local calculations.

It was agreed that some private pages would be set up on the Magnet Group Wiki in order to allow exchange of AutoCAD files etc., that are not yet open for general distribution, between members of the Magnet Group and other authorised individuals. It was also agreed that we would try and arrange EVO access to the Magnet Group Meeting at the Collaboration Meeting in Krakow in order to allow fuller participation by those members of the group who are unable to make the journey to Poland. Günther Rosner will enter into discussions with Renzo Parodi and Alexander Vodopianov in order to arrange the required financial schedule for the production of the PANDA Magnet System TDR.

### 3 Required Actions

**Individual / Group Responsible** Agreed responsibility.

**A. Bersani & Y. Lobanov** Optimisation of the unified magnet design over a two-week period, followed by submission of the appropriate AutoCAD files to J. Lühning and checking of the magnetic field map produced for the simulation.

**A. Bersani** Investigation of the effect of magnet optimisation on the magnetic field. Investigation of upstream door, yoke and cryostat prolongation options.

**Y. Lobanov** Discussion of and agreement on the required muon counter gaps in the forward door with Gennady Alexeev.

**I. Lehmann** Construction of private pages on the Magnet Group Wiki to allow file exchange private to the Group.

**J. Lühning** Construction of a magnetic field map for the simulation and detailing the procedure.