

# Magnet Discussion Meeting

GSI, SB3 3.170

Tuesday 11th December 2007

## 1 Attendance

**Present:-** Andrea Bersani (Genova), Evie Downie (Glasgow), Alexander Efremov (Dubna), Francisco Garcia (Helsinki), Michela Greco (Torino), Inti Lehmann (Glasgow), Berndt Lewandowski (GSI), Edward Lisowski (Krakow), Yuri Lobanov (Dubna), Jost Lühning (GSI), Agnello Michaelangelo (Torino), Dario Orecchini (Frascati), Herbert Orth (GSI), Renzo Parodi (Genova), Andrea Pastorino (Genova), Mauro Savrie (Ferrara), Lars Schmitt (GSI), Sandro Thomassini (Frascati), Alexander Vodopianov (Dubna)

## 2 Minutes

The Magnet Group met on Tuesday 11th December at GSI. The meeting focused on the discussion of Magnet Volumes (as presented in the Draft Interface Document Section 5 - Definition of Magnet Volumes). It was suggested that we define separate Magnet and Detector Volumes, the idea being that the Detector groups can then design freely in the space outside of the magnet volumes, but where they would like to encroach on these defined regions, they should engage the Magnet Group in detailed discussion. A set of dimensions were presented by Inti Lehmann as suggested defaults. These dimensions were altered slightly during the discussion and so will not be presented here, for clarity, only the final values are presented in Table 1.

The radial dimensions of the magnet yoke were considered first. It was agreed by all that the cryostat should be contained within 950 mm to 1340 mm and that the main barrel of the yoke should be contained within 1490 mm to 2240 mm in the radial direction. It was accepted that the radial yoke dimensions applied only to the main barrel as it may be necessary to extend further than this in the region of the forward and rear doors to allow for door attachment mechanisms and suspension devices.

The cryostat axial length and position were agreed as outer limits. However, there was detailed discussion of the magnet yoke length, mainly with regard to extending the magnet in the upstream direction. By extending the yoke length, the saturation in the iron of the upstream door might be reduced, placement of the DIRC readout inside the yoke might become possible, the sensitivity of the magnetic field to small misalignments in the coil placement is reduced and the axial force is also reduced. However, lengthening the yoke may involve increased cost (due to the increased material budget) and Andrea

Bersani expressed concerns about the length of slit that would then be required for the insertion of the cryostat chimney, and the haste with which this important decision was being considered and possibly finalised. As it was not possible to reach a unanimous decision to recommend the lengthened yoke to the collaboration, it was agreed that the formal position of the magnet group to be reported back to the collaboration was that, “We [The Magnet Group] do not object to prolonging the upstream door position, e.g. as far as in the Dubna design, as long as this is useful for the detectors”.

The Technical Coordinator informed the group that the Forward Endcap EMC has increased in thickness from 42 to 43 cm and, as such, requested that the forward door be moved forward by 1 cm, thereby extending from 2475 mm to 2915 mm in the axial direction. After comment from the floor on the fact that the most reliably fixed numbers ever given to the Magnet Group were now also changing, the Magnet Group accepted the new downstream dimensions.

It was agreed that Inti Lehmann should present the Magnet Volume idea to the Technical Board and ask for agreement to the radial dimensions, and the forward region axial dimensions. He would present the upstream axial dimensions to the Technical Board and ask for their decision, after making the defined statement as agreed.

It was mentioned that the unbalanced axial forces were best resisted in a way that produced tensile rather than compressive stresses in the structure. Thus a design in which the unbalanced axial force is directed downstream might be preferable, as then the coil is best supported in the upstream region where space is less restricted. Andrea Bersani explained that the force on the current Genova coil design, although directed upstream, was supported by attachment of the coil to the inside of the cryostat in the upstream direction, and that it has been calculated that forces of 100 tonnes would then be adequately transmitted through the 3 cm stainless steel cryostat wall to the upstream region.

Presentations were then made by Yuri Lobanov, Renzo Parodi and by Andrea Bersani, the slides of all presentations are available on the magnet wiki page at:- <http://panda-wiki.gsi.de/cgi-bin/view/Magnet/MagnetMinutes071211>. Yuri Lobanov showed the effect of the external support frame on the structural rigidity of the magnet, reducing the structural deviation under load from 6.5 to 1.4 mm. He also presented a shorter coil option, achieved by increasing the current density. Concern was expressed that this increase in current density and shortening of the coil might reduce the overall field quality. Andrea Bersani made a detailed presentation of the latest Genova Magnet design, which complies with all known field requirements and the reviewers’ recommendations and has 13 full-length laminated layers in the magnet barrel iron. Renzo Parodi showed the latest developments in the Genova coil, which included a slight modification of the cable cross-section.

Lars Schmitt expressed enthusiasm for the progress that had taken place in the meeting and encouraged the group to continue this movement towards the allocation of work packages in the near future. He suggested that the yoke dimensions and design should be our initial focus as this forms the physical boundary for the detector design and that, once we have a more complete picture of the yoke, then we should focus on the coil optimisation in more detail. He indicated that the yoke dimensions would be a focus of discussion in the Technical Board Meeting on 12th December 2007.

It was stated that after the Technical Board meeting, appropriate updates should be made to the Draft Interface Document to reflect the agreed dimensions etc. During the

Dimensions of	radius / mm	axial length / mm	$z_{min.}$ / mm	$z_{max.}$ / mm
Cryostat Inner	950	3130	-1180	1950
Cryostat Outer	1340	3130	-1180	1950
Yoke Inner	1490	4050	<i>-1585</i>	2475
Yoke Outer	2240	4875	<i>-1970</i>	2915

Table 1: Magnet Volumes. All number shown in upright font were unanimously agreed by the magnet group as dimensional limits. Those shown in italics were suggested for consideration by the Technical Board should prolongation be desired.

meeting, concern was also expressed that insufficient detail from the detector groups is currently available on the required cable routing within the yoke and the required cable throughput from inside the yoke to the outside world. It was emphasised that these details are a necessary consideration in the production of the final magnet design for tendering and that, as such, these issues should be clarified as soon as possible. It was also suggested that we consider a telephone meeting in between the Technical Board meeting scheduled for the 12th December and the next meeting after that in order to further the progress of the magnet design and facilitate communication.

### 3 Required Actions

**Individual / Group Responsible** Agreed responsibility.

**I. Lehmann** Represent the agreed Magnet Dimensions and statement on the axial length to the Technical Board on 12th December 2007.

**I. Lehmann & E. Downie** Update Interface Document according to output from the Technical Board meeting on 12th December 2007.

**Whole Magnet Group** Arrange intermediate telephone conference between Technical Board and March Magnet Group meeting.