HERA-B Dipole Magnet Simulations for the CBM Experiment

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As a result of the discussions at the Muon Workshop [1] and the Simulation Meeting in October 2006, a dipole magnet with a large gap from HERA-B experiment at DESY was proposed for muon measurements at CBM. The model of the magnet from HERA-B usable for "cbmroot" ("fairroot") framework [2] was created by LIT JINR group on the basis of the available technical drawing of the magnet.

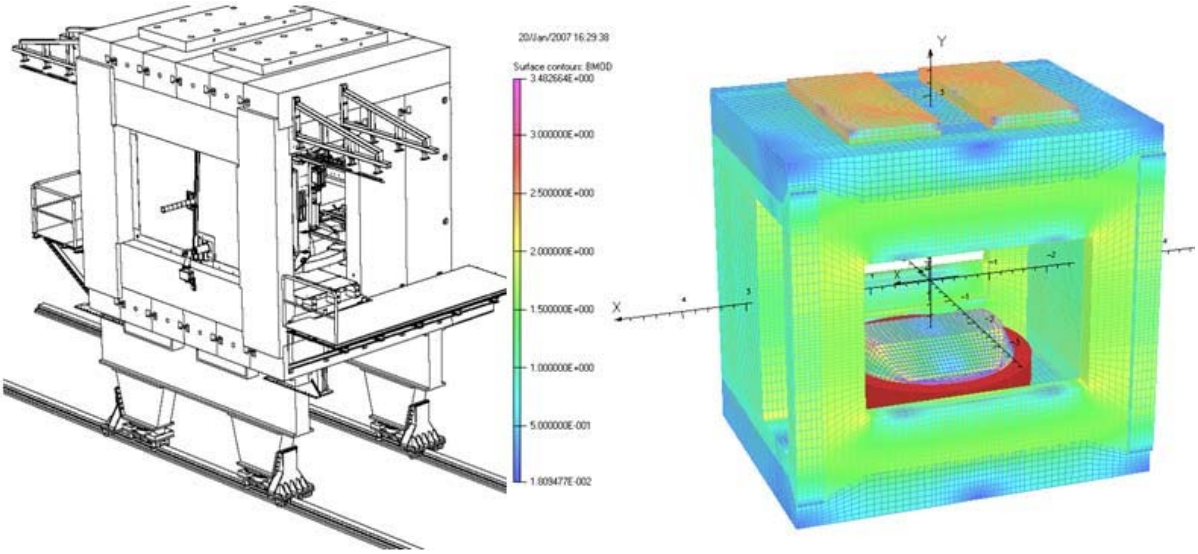

Fig. 1: HERA-B magnet view (left) and its model for TOSCA (right)

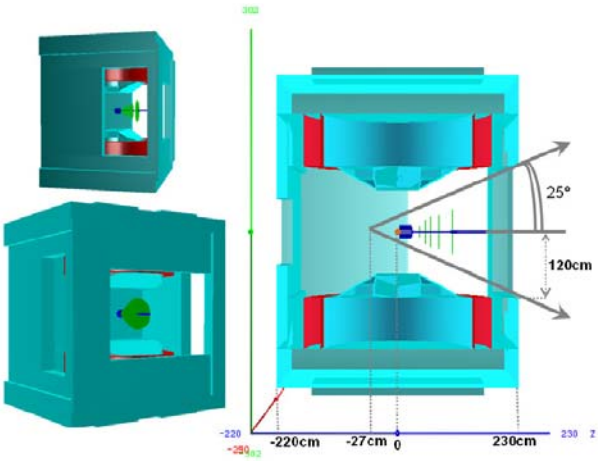

Fig. 2: The magnet ("magnet_hera.geo") and STS detectors under cbmroot

A magnetic field map for the recreated model of the magnet was calculated using TOSCA. Figure 1 (right image) shows the magnet geometry used for these calculations and the magnet view from HERA-B experiment (left picture). The same geometry was

also implemented using a subset of GEANT geometry primitives that is compatible with cbmroot framework software ("magnet_hera.geo"). Figure 2 shows the perspective views of the magnet taken from GEANT transported data simulated under cbmroot together with STS detectors with a standard variant of their geometry ("sts_standard.geo"). Figure 3 shows a satisfactory agreement of the field map "FieldHera" implemented for cbmroot with the available picture from HERA-B.

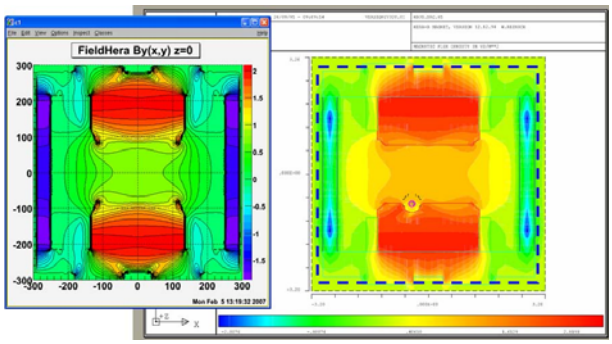

Fig. 3: B_y(x,y,z=0) for implemented field map "FieldHera" (left) and corresponding picture from HERA-B (right)

"FieldHera" (1.803 Tm)		
Magnet center	Last STS	Integral
27cm	100cm	0.668
27cm	182cm	1.005
"FieldHeraP"(1.915 Tm)		
Magnet center	Last STS	Integral
50cm	100cm	0.681
77cm	154cm	1.006

Table 1: Field Integral [Tm] from the target to the last STS detector of "Hera" and "HeraP" field maps for different magnet center and last STS detector positions

To achieve the required angular acceptance of 25 degrees, it is necessary to locate the center of the magnet not further than in 27 cm from the target, thus understating the field integral. In order to increase aperture, we developed a modified model of the magnet (geometry "magnet_hera_p.geo" and field map "FieldHeraP"), in which the size of the magnet along y axis was increased by 60 cm. Certainly, this will require changes in the walls of the magnet by means of the growth with the pieces of iron with a height of 60 cm. Then the magnet can be placed on the distance of 90 cm from the target without loss of the angular acceptance of the installation. The field integrals are shown in Table 1.

References

[1] http://www.gsi.de/documents/FOLDER-1161100002_e.html

[2] http://cbmroot.gsi.de/