MPD/ECal – geometry and simulation

VV.Kulikov1, S.A.Bulychjov1, M.A.Martemianov1, M.A.Matsyuk1, A.V.Skoblyakov1, I.A.Tyapkin2

1 NRC “Kurchatov Institute” – ITEP, Moscow 117218, Russia; 2 JINR, Dubna, MR 141980, Russia

ECAL main tasks:
1) register photons
2) Identify e+/e- pairs, which are the main probes of the formation of quark-gluon plasma.
Dimensions: in/out diameter Ø3.45/4.6 m, length 6m, 38400 “shashlik” towers, total weight 60 tons, projective geometry.

Carbon fiber power frame weight ~10 tons

New in MPD/ECAL technology
1) Lego scintillator plates provide rigidity and accuracy to the box tower of 210 scintillator and Pb plates (11 Radiation lengths)

a) 40x40x1.5 mm scintillator with 4 legs pins + 16 holes for Ø 1.2 mm WLS + 2 holes for Ø 1 mm fixing strings;
b) 0.3 mm white painted Pb plate added

2) Box shaped towers are machined to truncated trapezoids with vertex angles 0.9° (1.2°) in R(ZXY)-plane to get projective geometry in a cylindrical volume with 64 types of towers and 8 types of modules, shown with different colors.

WLS fibers in each tower transport light to 6x6 mm² MPPC Hamamatsu S13360-6025PE (~64000 cells)

3) 9 tons carbon fiber supporting frame. It is the best structural material due to its strength and a large radiation length of 26.6 cm

Carbon fiber frame Ø4.6 m, length 8 m, 25 sectors.
Basket for 48 modules, total weight 1.2 tons, 50 pieces.
Module, 2x8 towers

ECAL response to 1 GeV photons

Effect of power frame passive materials on ECAL response

The cut rejects photons with hit position near the walls. The passive materials of the walls result in an increase of non-gaussian low energy tail and uncertainty in energy resolution determination. But overall degradation of energy resolution is small ~ 0.5 %.

*Работа выполнена при поддержке РФФИ, грант № 18-02-40054.