Transverse and longitudinal segmented forward hadron calorimeters with SiPMs light readout for future fixed target heavy ion experiments

Forward hadron calorimeters with transverse and longitudinal segmentation are developed for upgraded heavy ion NA61 and BM@N experiments and future CBM experiment at FAIR. The main purpose of these calorimeters is to provide an experimental event-by-event measurements of centrality and orientation of reaction plane in heavy-ion collisions at high beam rates. One of the features of these modular calorimeters is the presence of a beam hole in the centre, which is necessary for the operation at high beam rates. Hadron calorimeters in all these experiments are composed of sampling lead/scintillator modules with longitudinal segmentation. Light collection in the modules is provided by WLS fibers glued in each scintillator plate. The light from 6 consecutive scintillator plates in module is detected by one SIPM with an active area of 3x3mm2 placed at the end of module. Light readout from 10 longitudinal sections in each module for NA61 and CBM calorimeters is provided by 10 Hamamatsu MPPCs. Central modules in BM@N calorimeter are more compact and have only 7 longitudinal sections. The light yield measured with muons beam for CBM modules is about 40-50 ph.e./section. The response of supermodule (array 3x3 assembled from 9 CBM modules) has been studied on CERN T9, T10 and NA61 with proton beams in the energy range 1.5-150 GeV. The details of calorimeters, measured response of the supermodule and radiation conditions simulated for these calorimeters will be presented.

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