Contribution ID: **264** Type: **Poster**

Development of the CBM RICH detector

The Compressed Baryonic Matter (CBM) experiment is the future heavy-ion experiment at FAIR being designed to explore the intermediate range of the QCD phase diagram in a beam energy interval of 10-45 AGeV. With its physics program CBM will investigate the properties of dense baryonic matter and the expected phase transition between hadronic and partonic matter. Among the key observables are low-mass vector mesons and charmonium decaying into lepton pairs. In CBM, electrons with energies lower than 8 GeV/c will be identified through a RICH detector being developed at several laboratories. In addition the detector will improve the kaon/pion separation at momenta higher than 4 GeV/c.

The proposed concept of the RICH detector foresees CO2 as radiator gas, spherical glass mirrors reflecting the Cerenkov radiation on an array of Multianode Photomultipliers (MAPMTs) as photo detectors.
CO2 has been chosen because it has a Lorenz factor, gth, of 33.3, a radiation length of 183 m and a pion momentum threshold for Cerenkov light production of 4.65 GeV/c, it represents a very good compromise to fulfill the CBM RICH requirements.
The mirror system will be of approximately 11.8 m² with a curvature radius of 3 m and a thickness of 6 mm. For the reflective coating Al+MgF2 are foreseen. In order to cover a spherical mirror wall with a radius of 3 m, square mirror tiles of approximately 40×40cm² will be used.
Regarding the photo detector investigations indicated that the 64 channel Hamamatsu H8500 MAPMT is one of the most promising candidates for the CBM RICH. The main criteria for the readout of this MAPMT are the high interaction rates (up to 10 MHz) and the challenging high level triggers in CBM. To cope with these facts a self triggered readout electronics is foreseen. The Front End Electronics (FEE) will be based on a further development of the so called n-XYTER chip which was developed for the readout of silicon detectors. The chip offers 128 channels at a readout speed of 32 MHz. As an intermediate solution the high gain of the MAPMT is currently matched to the existing chip via a charge attenuator board.

These components were successfully tested in laboratories and in several test beams. Single photon counting and Cerenkov light detection confirmed the suitability of the FEE and MAPMT setup. The tests also show that uncorrelated noise can be well separated from the signal using available timing information. The usage of wavelength shifter films in order to enhance the quantum efficiency of the MAPMT for wavelengths below 300 nm is investigated. An industrial provider for mirror prototypes with promising surface homogeneity and reflectivity has been found.

The concept of the RICH detector as well as results of several tests will be presented. They are valuable experience for the preparation of a full scale RICH prototype setup currently under construction and to be tested at CERN in fall 2011.

Primary author: Dr MAHMOUD, Tariq (Universität Gießen)

Co-author: CBM, RICH Collaboration (–)

Presenter: Dr MAHMOUD, Tariq (Universität Gießen)

Track Classification: Experiments upgrade, future facilities and instrumentations