Motivation

The Forward Wall detector (FWall) is one of the detector subsystems in the HADES setup at GSI, which is used to determine the collision centrality and event plane orientation in nucleus-nucleus reactions. The results of the FWall calibration in Ag+Ag collisions at 1.58A GeV and 1.23A GeV is very important for accurate estimation of the event centrality and the event plane. In this work results of the FWall calibration at 1.58A GeV are presented.

HADES experimental setup

The FWall consists of 288 individual scintillator detectors. It has total transverse size 176 x 176 cm² and is placed at the beam axis at 7m from the target. The PMTs are used for light readout from each FWall scintillator detector. The FWall includes 144 small cells 40x40 mm², 64 medium cells 80x80 mm², 96 large cells 160x160 mm².

Calibration procedures

The amplitude and time calibration procedures for each cell of the FWall are used to equalize response of the detectors for a certain charge of the particles (Z=1, 2 etc.) in Ag+Ag collisions at an energy of 1.58 A GeV and 1.23 A GeV. The FWall calibrations are day-wise.

Time calibration:

- Walk Time Correction. Fitting raw time vs amplitude (ToT - time over threshold) dependence with function:

  \[ T_{\text{cal}} = T_{\text{raw}} \cdot \text{slope}_{\text{adc}} - WC1 - \frac{WC2}{\text{ToT}} \]

- Determination of the WC1, WC2 parameters (electronic channel property) to eliminate measured hit time vs hit amplitude dependence.

- Fitting the peak of obtained time distribution by Gauss function and determination of TDC offsets to have a real particles time of flight from the target to the FWall.

Amplitude calibration:

- Raw marks for peaks and multiple gaus fitting.

Results of the FWall calibration

The WC parameters and the TDC offsets were established to have a real particles time of flight from the target to FWall. The ADC parameters were determined to equalize response of all cells for a certain charge of the particles.

Conclusion

The implementation of the amplitude and time calibration procedure of FWall detectors based on matching of the recorded signals with a certain charge of the charged spectators was done for Ag+Ag collisions at an energy of 1.58 A GeV and 1.23 A GeV for each of the 28 running day. Corrections for beam shifts along the x, y axis for all runs were determined and will be used in further analyses.

References