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Forward hadron calorimeter (PSD) upgrade for the NA61/SHINE experiment

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The main purpose of the forward hadron calorimeter (Projectile Spectator Detector PSD) in the NA61/SHINE experiment is to provide an experimental measurement of a heavy-ion collision centrality and orientation of its reaction plane. Precise event-by-event estimate of these basic observables is crucial for many physics phenomena studies to be performed by the NA61 Collaboration. The PSD is a modular compensating lead-scintillator calorimeter designed to measure the energy distribution of the projectile nuclei fragments (spectators) and forward going particles produced close to the beam rapidity. Each module of the PSD has a lead-scintillator sandwich structure with longitudinal segmentation. A scintillator light readout is provided by WLS-fibers and by silicon photomultipliers (micropixel avalanche photodiodes). In order to fulfill the future requirements for NA61/SHINE experiment upgrade the PSD has been re-designed. The beam rate at NA61/SHINE is expected to be increased ten times. To prevent radiation damage of PSD modules the new calorimeter system consist of two calorimeters: main PSD (MPSD) with a beam hole in the center and forward PSD (FPSD) as a beam dump downstream of NA61/SHINE experiment area. The new approaches for centrality determination with upgraded forward hadron calorimeter system will be discussed. The first results of MPSD + FPSD performance tests will be presented.

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