

Strangeness in Quark Matter 2019



Contribution ID: 108

Type: Poster

Heavy-flavour studies with the new ALICE pixel trackers in Runs 3 and 4

Tuesday 11 June 2019 18:45 (2 hours)

The ALICE Collaboration is preparing a major upgrade of the detector apparatus during the second LHC long shutdown (LS2, 2019-20) in view of the LHC Runs 3 and 4 (2021 to 2029).

The objective of the ALICE upgrade for LS2 is two-fold: i) an improvement of the tracking precision and efficiency, in particular in the low-momentum range; ii) an improvement of the readout capabilities of the experiment, to fully exploit the LHC luminosity for heavy ions envisaged after LS2.

The first goal will be achieved by replacing the Inner Tracking System with a new tracker, composed of seven cylindrical layers of monolithic silicon pixel detectors (MAPS) with fast readout, high granularity and low material thickness, and by introducing a new telescope tracker, also composed of MAPS, in front of the muon spectrometer. Consequently, the resolution of the track spatial position will improve by about a factor of three in the direction transverse to the beam line. The second goal will be achieved by replacing the readout chambers of the Time Projection Chamber with Gas Electron Multiplier (GEM) detectors, by upgrading or replacing the readout electronics of several of the other detector systems, by adding a new fast trigger detector and by implementing a new integrated online-offline architecture. The upgraded ALICE detector will be capable of reading out Pb-Pb interactions in minimum-bias trigger mode at a rate of 50 kHz, corresponding to 50 times the current rate.

The prime physics goals of the ALICE upgrade are high-precision measurements of heavy-flavour, charmonium and low-mass dilepton production, with particular emphasis on the low- p_T region. For example, in the sector of open heavy flavour, the new silicon trackers, in conjunction with the high-rate capabilities, will allow us to extend the measurements of nuclear modification factor and flow coefficients of charm and beauty mesons down to or close to zero in p_T . The reconstruction of heavy-flavour baryon decays will be possible down to about 2 GeV/c. In the quarkonium sector, the production and elliptic flow of J/ψ and $\psi(2S)$ states will be measured with unprecedented precision down to zero p_T , with the separation of prompt and B-decay contributions at both central and forward rapidity.

This presentation will summarise the expected performance of the new pixel trackers at central and forward rapidity and discuss its impact on the heavy flavour and quarkonium studies, with emphasis on the new results prepared for the CERN Yellow Report on HL-LHC Physics.

Collaboration name

ALICE

Track

Upgrades and new experiments

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Session Classification: Poster session with "aperitivo"