

Developing strategies for advancing Trigger Efficiency Determination in CMS B-Physics Parked Data

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Abstract

The B-parking data is collected during Run-2, using inclusive muon as the event trigger criteria. However, as the strategy for collecting this data, the muon transverse momentum (p_T) threshold varies with instantaneous luminosity and hence over the life time of the beam.

Different trigger paths are active at a given time with different p_T thresholds. We are developing a methodology to determine the trigger efficiency for selecting events with several trigger paths active simultaneously. We are using tag-and-probe method for this purpose. The data used for derivation of the efficiencies is triggered by the same paths and the events containing a J/ψ resonance inclusively, where the J/ψ decays to a muon pair of opposite charges. The kinematic phase space covered by CMS experiment is complementary to that of the LHCb experiment which is essentially a forward spectrometer. However the upper limit on the branching ratio for $B_s^0 \rightarrow e^\pm \mu^\mp$ final state is expected to be competitive with the LHCb experiment.

For Run-3, B-parking trigger has larger bandwidth to provide expanded physics potential for the CMS experiment. The strategy developed by us will be useful for analysis of B-parking data collected in Run-3.