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Tag and Probe studies for muon efficiencies and scale factors measurements with 2016 and 2017 data & MC

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One of the most important aspect in every analysis is the optimisation of the event selection. The ideal selection would efficiently eliminate the background events while keeping the signal rates untouched. Since every real selection affects signal efficiencies also, this effect has to be studied and quantified. These efficiencies can be extracted directly from the simulation, but there is a danger such as bias which can appear because of insufficient event description and the lack of understanding of the detector. Mitigating the bias from MC is achieved by measuring the selection efficiencies directly from the experimental data using the Tag-and-Probe (TnP) method. In the case of muon efficiency measurements, this method exploits Z and J/ψ events to estimate the reconstruction and selection efficiencies. We measure efficiencies and scale factors (SFs) pertaining to muon identification, isolation and requirement on impact parameter with 2017 rereco data recorded with CMS detector of LHC. Individual SFs are then combined to get final muon SFs. We also validate TnP studies with 2016 data and MC. We find that muon selection efficiency results are good. The overall scale factors are typically ˜0.99. The uncertainties are ˜1% per muon.

Primary author: Mr JAVAID, TAHIR (IHEP, CAS)

Presenter: Mr JAVAID, TAHIR (IHEP, CAS)