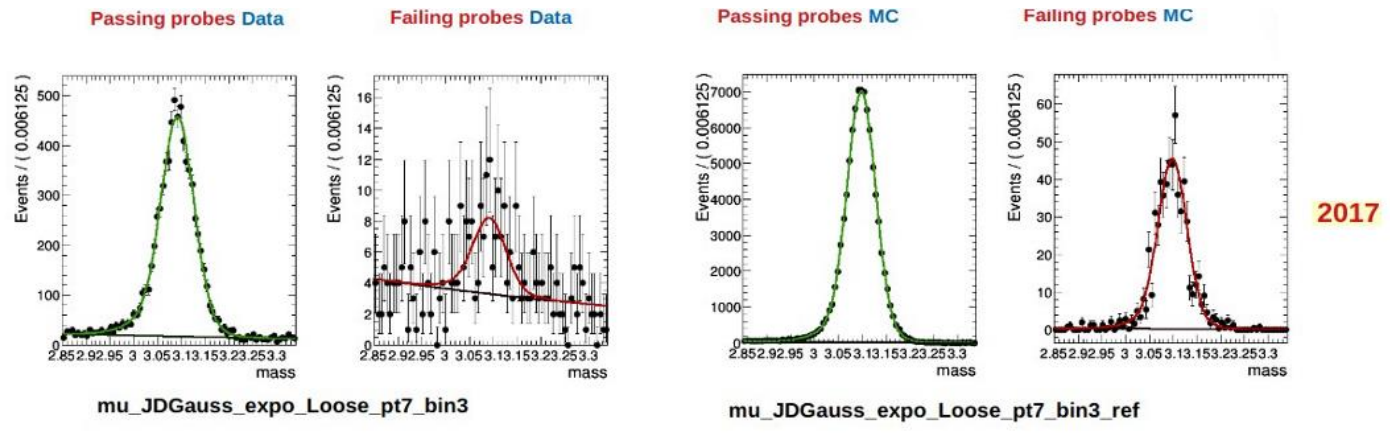
Muon Identification Efficiency via Tag and Probe Method by using object info from CMS 2017 J/Psi Datasets

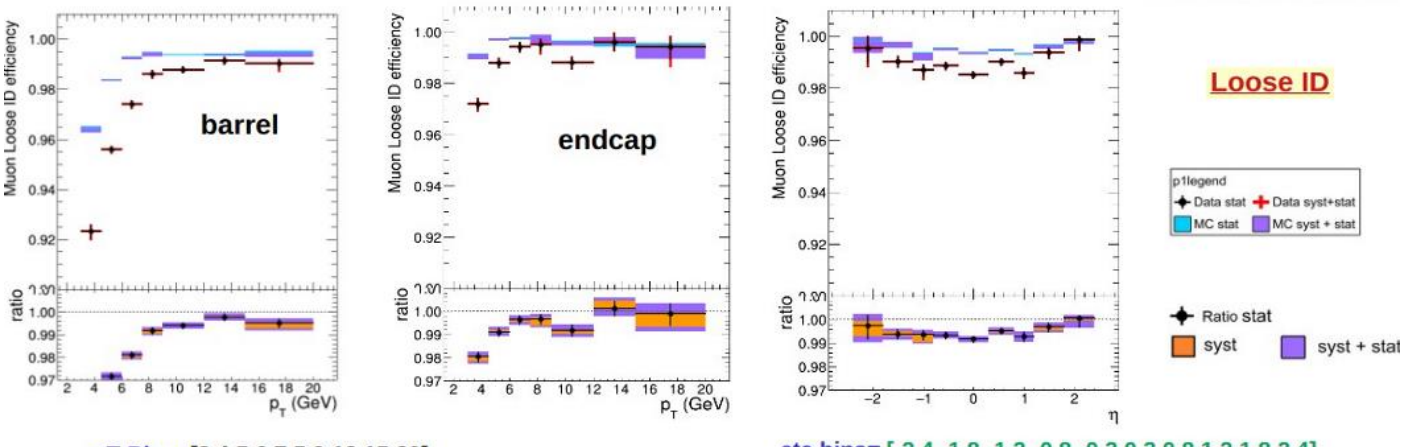
Muon identification efficiency can be determined using the tag-and-probe method. In this method, one identifies a "tag" muon that passes tight identification criteria and then looks to see if there is a second "probe" muon nearby that passes looser identification criteria. By comparing the number of times a probe muon is found with the tag muon (the "passing probe" rate) to the number of times a probe muon is found without a tag muon nearby (the "failing probe" rate), one can determine the efficiency of the loose identification criteria for identifying muons. Here, the efficiency is parametrized as a function of kinematic variables such as the transverse momentum and pseudo-rapidity of the muons.

Tag muons are usually good quality muons matched to a dedicated muon Trigger and *Probe muons* are inclusive calo. muons or just tracks in the tracker or the muon system.

$$\text{Loose ID efficiency } = \frac{passing\ probe\ muons}{all\ probe\ muons\ i.e.\ passing\ probes + failing\ probes}$$

During my M.Phil. course work, I performed this short analysis with CMS environment. Here are the results:





pT Bins=[3,4.5,6,7.5,9,12,15,20]

eta bins= [-2.4,-1.8,-1.2,-0.8,-0.3,0.3,0.8,1.2,1.8,2.4]