MUON ISOLATION

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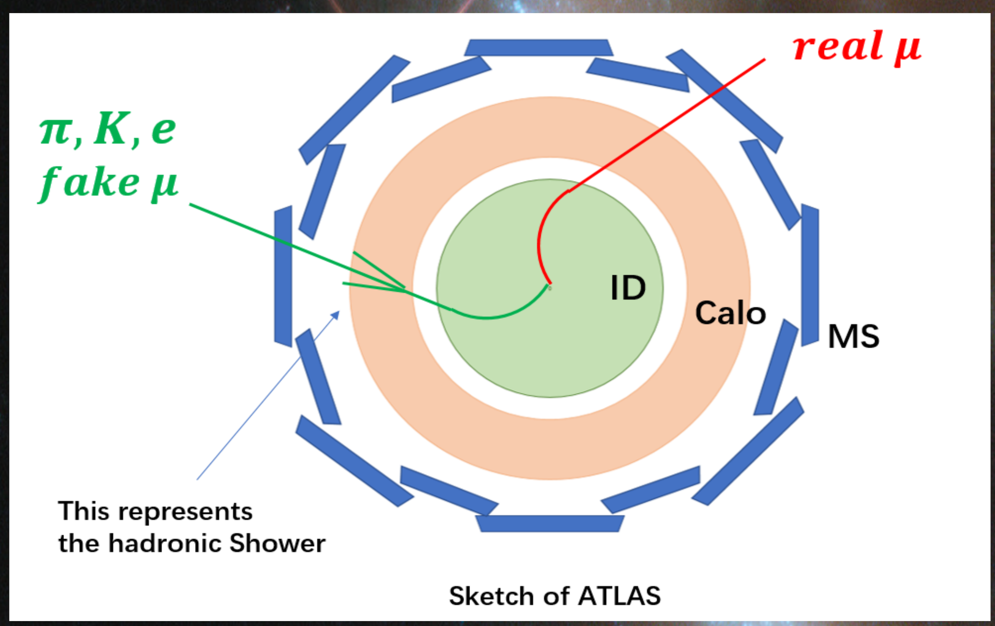
Introduction

The discovery of the Higgs boson is the crowning achievement of the Large Hadron Collider (LHC). However in contrast to the e^+e^- collider LEP, the high energy proton proton LHC produces signals with larger and more complicated backgrounds. For example, the rare decay of the Higgs to muons, along with the relevant measurements of the Z boson require well-isolated muons. These muons can be separated using Muon Isolation by the working points based on track and calorimeter variables.

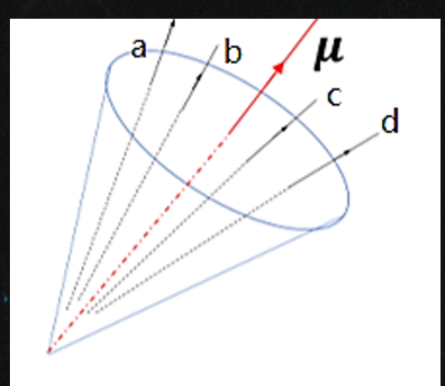
►Real and fake muons



Working Points

►Defined by the Calorimeter and Track isolation variables.

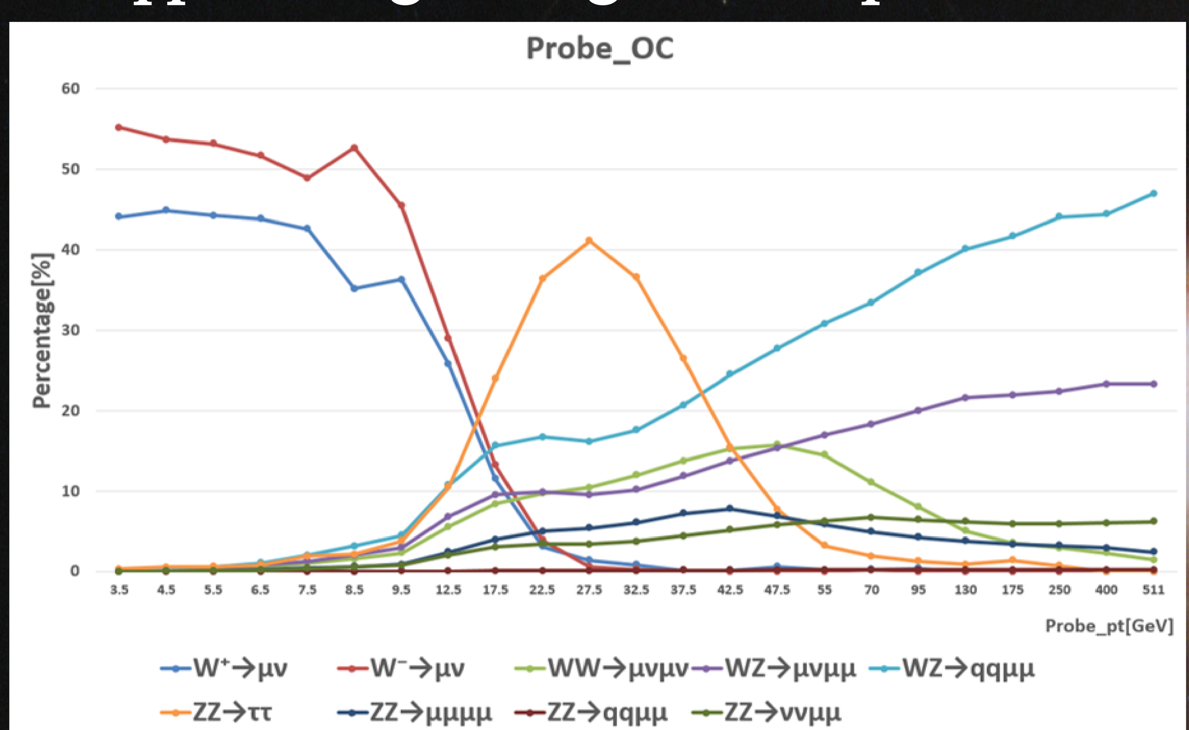
Isolation WPs	Calorimeter Isolation	Track Isolation
Loose	$E_T^{topocone20}/P_T^{\mu} < 0.3$	$P_T^{varcone30}/P_T^{\mu} < 0.15$
Tight	$E_T^{topocone20}/P_T^{\mu} < 0.15$	$P_T^{varcone30}/P_T^{\mu} < 0.04$



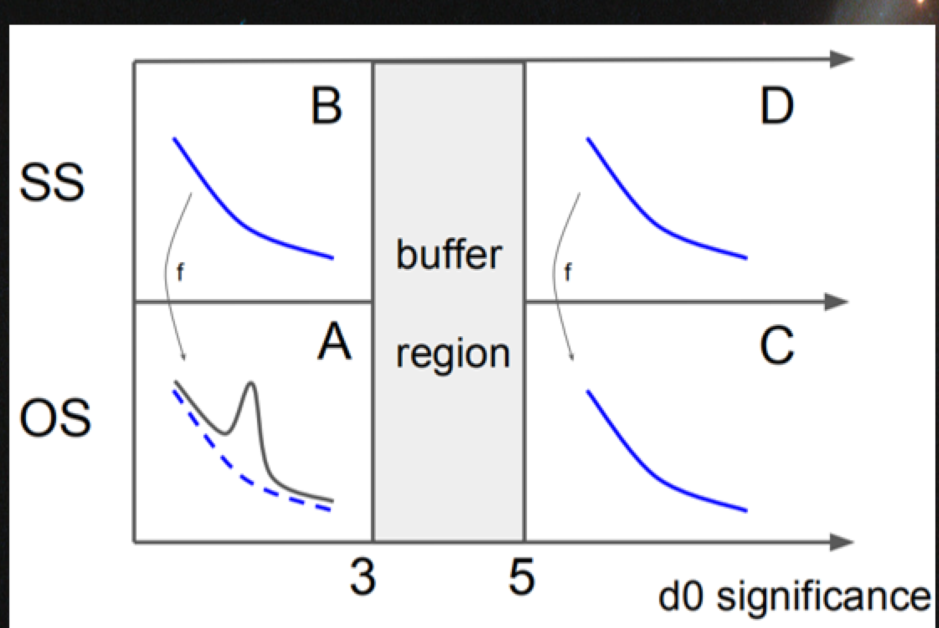
$$E_T^{topocone20} = E_T^a + E_T^b + E_T^c + E_T^d$$
$$P_T^{varcone30} = P_T^a + P_T^b + P_T^c + P_T^d$$

EWK & QCD Backgrounds

►EWK background components distribution for the probe muon in opposite sign charge muons pairs.



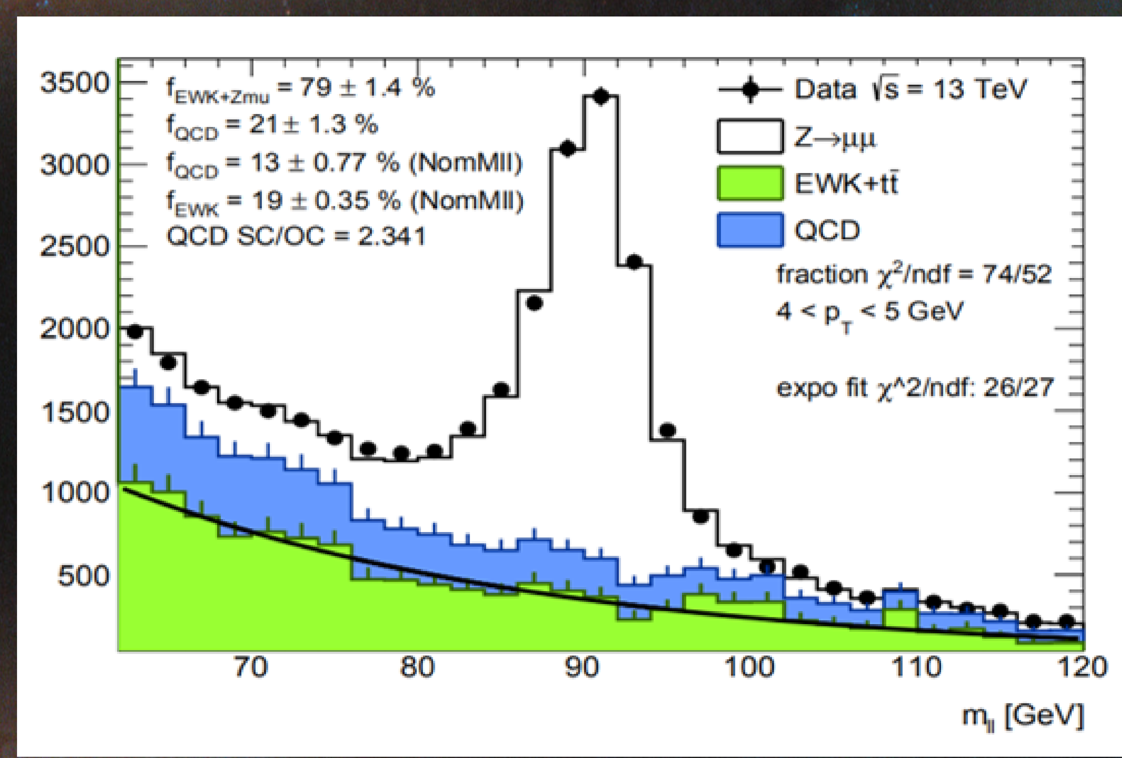
►QCD background is computed using the distribution of the same sign charge muon pairs.



$$\frac{f_{OS}^A}{f_{SS}^B} = \frac{f_{OS}^C}{f_{SS}^D}$$

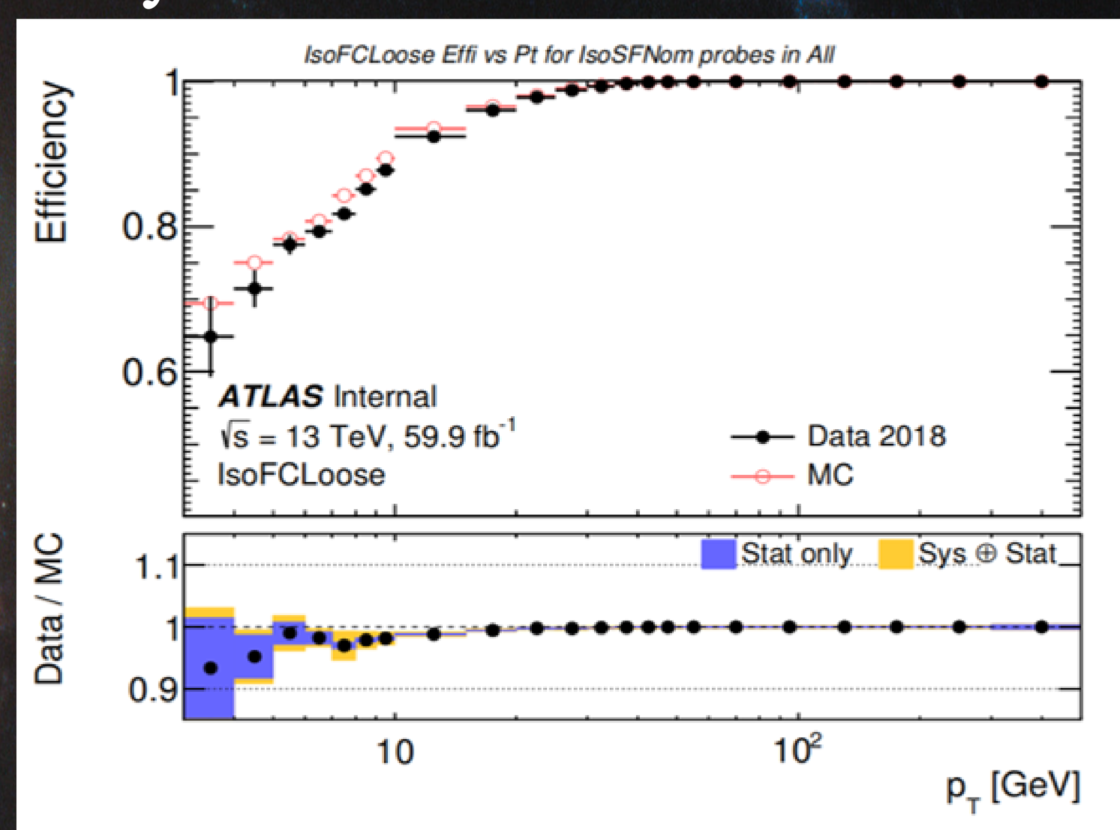
Signal, Background Fitting

►Fitting result of the Z→μμ, EWK and QCD backgrounds

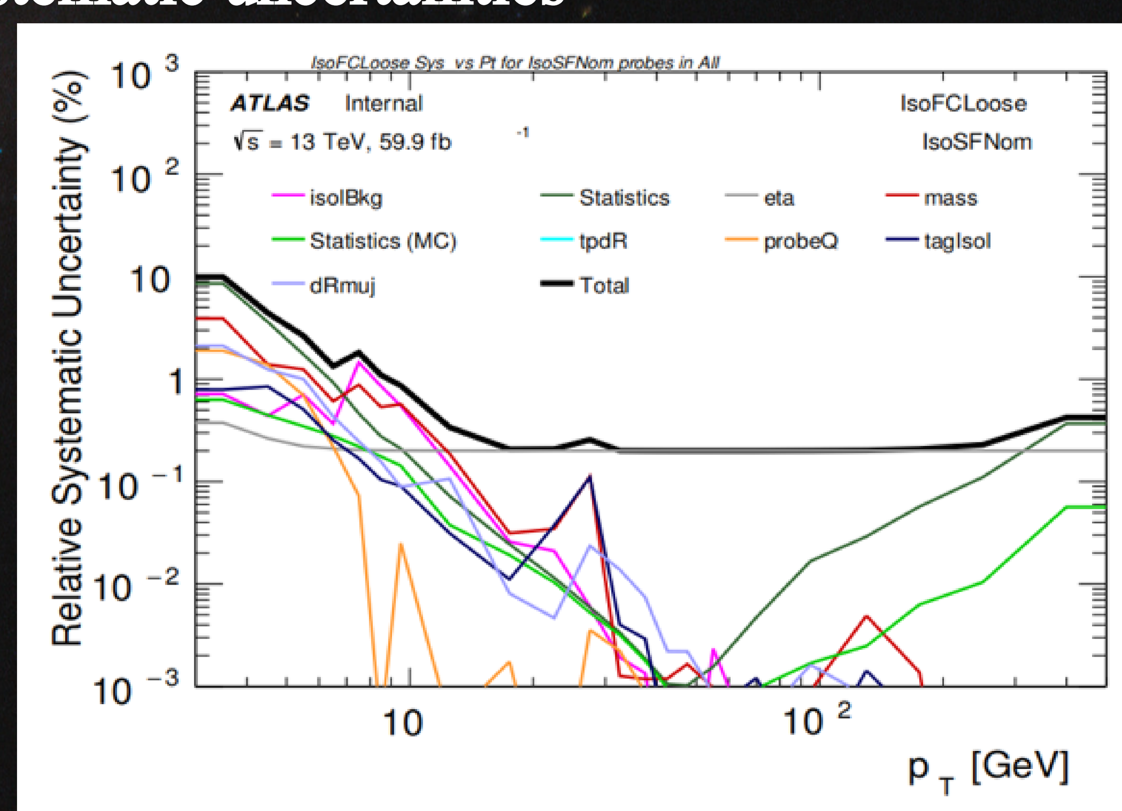


Results

►Efficiency and Scale factor



►Systematic uncertainties



In summary

►Lots of efforts on muon isolation have been done.

►The work has been published on the EPJC.

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