Higgs to Tau(mu) Tau(mu)

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Motivation:

Will lowering the single-muon and dimuon trigger thresholds increase the acceptance in the mu-mu channel?

Dataset Used:

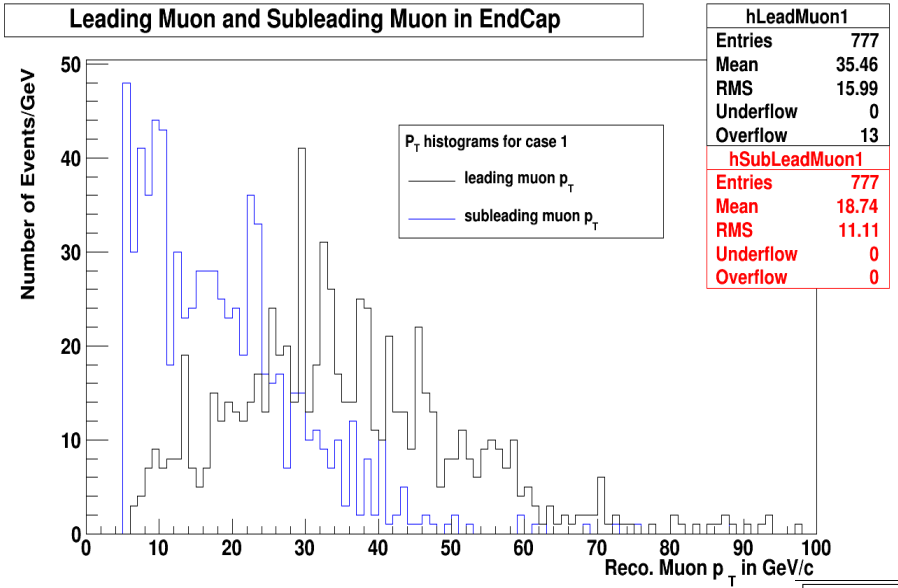
S/B	Physics channel	# of Events	Pile-Up	GEMs Used		# of dimuon Events
Signal	Glu Glu To Higgs (All Taus decaying to Muons)	50K	0	Yes	Private	18K
	Glu Glu To Higgs	500K	Yes	No	Official (2012)	6K
Background	DYTauTau	800K	Yes	Yes	Official	---

Cuts Applied

- η: EndCap-> 1.6<|η|<2.1; Barrel->|η|<1.5
- p_T : No Cuts
- Run-1 Cuts: Shown in the acceptance plots

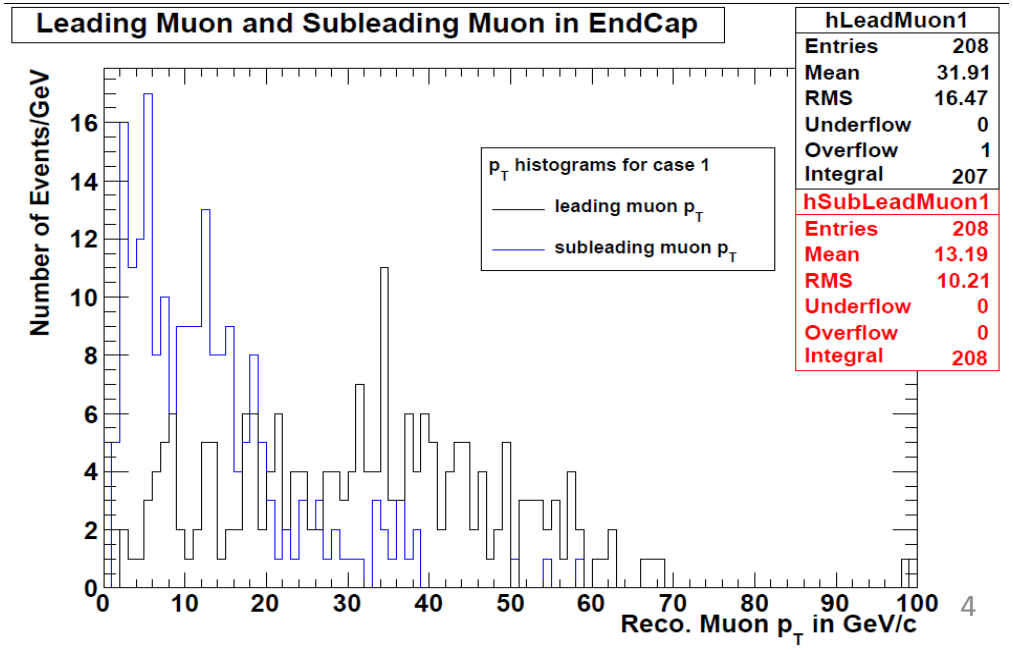
p_T distributions

Case-1



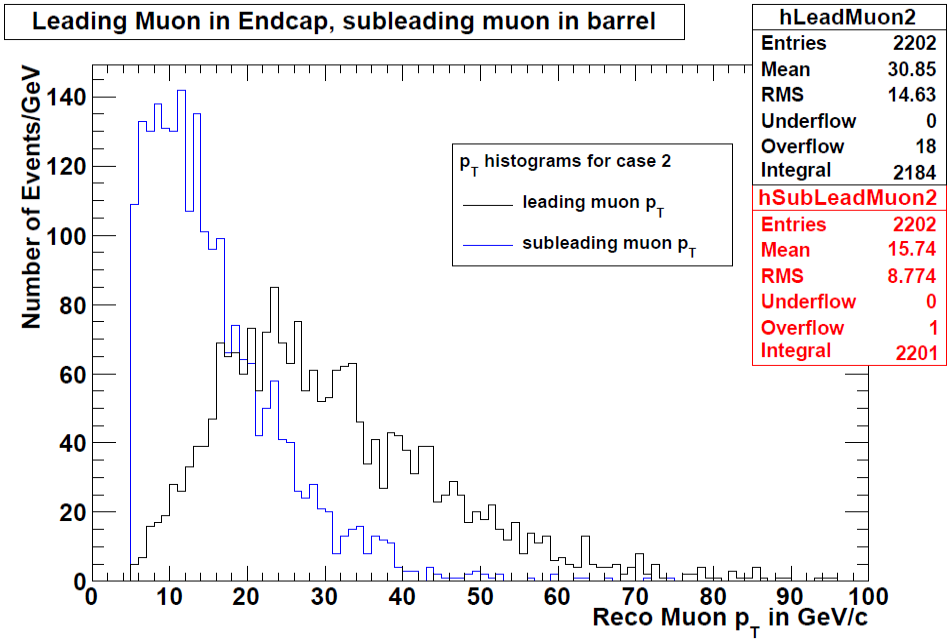
Without GEM

With GEM



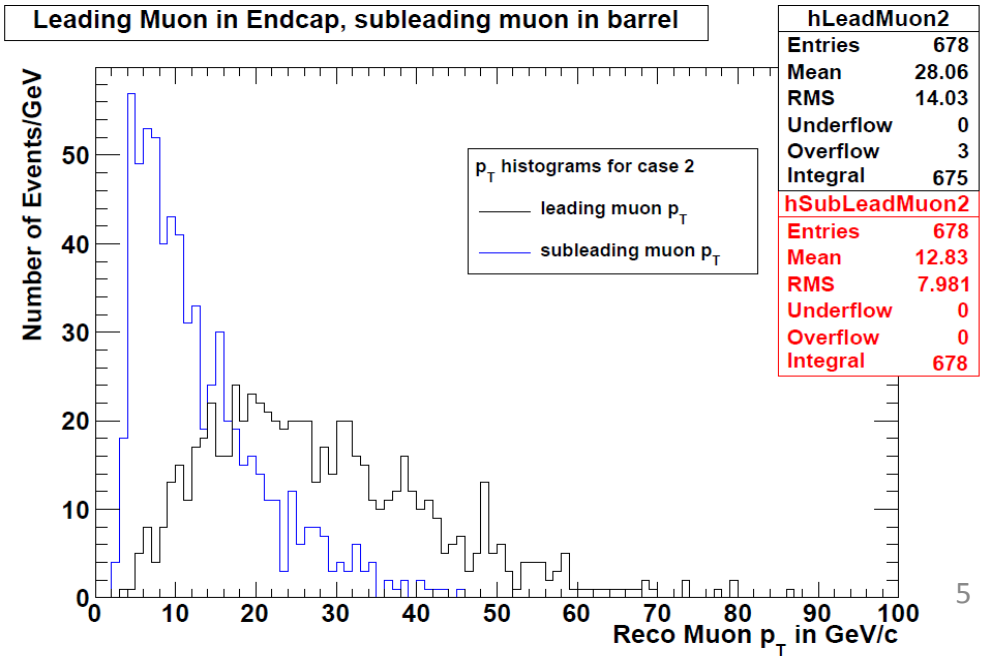
Not sure why the p_T distribution in case of the samples with GEMs starts at 5 GeV/c !

Case-2

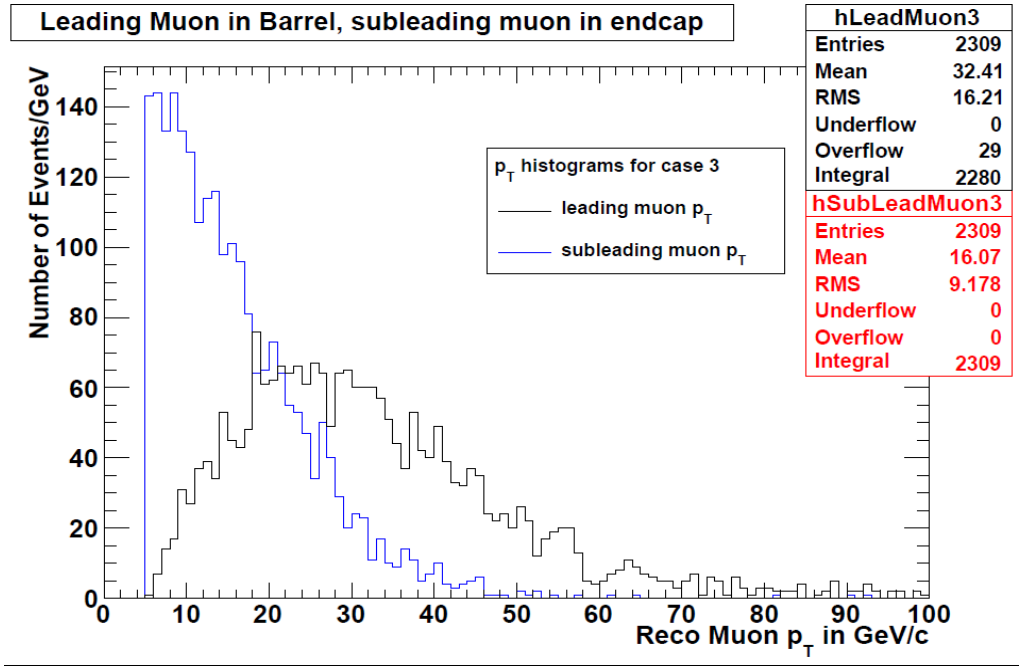


Without GEM

With GEM

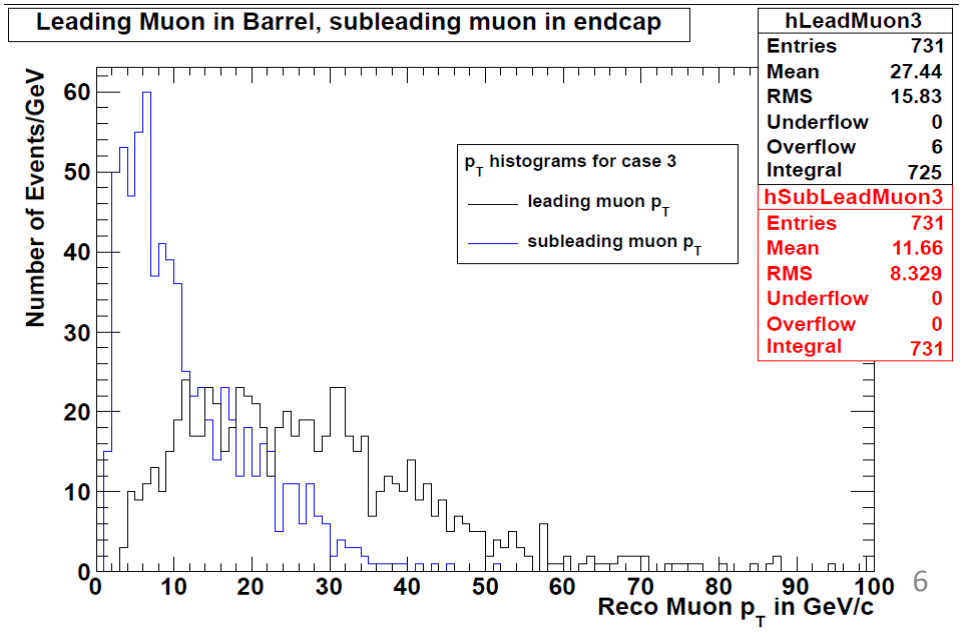


Case-3

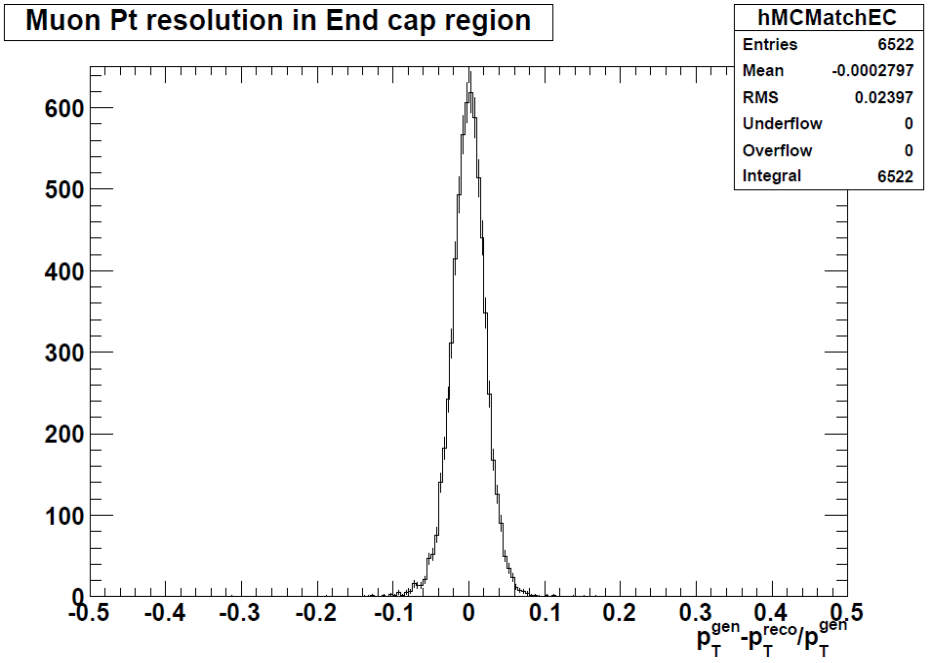


Without GEM

With GEM

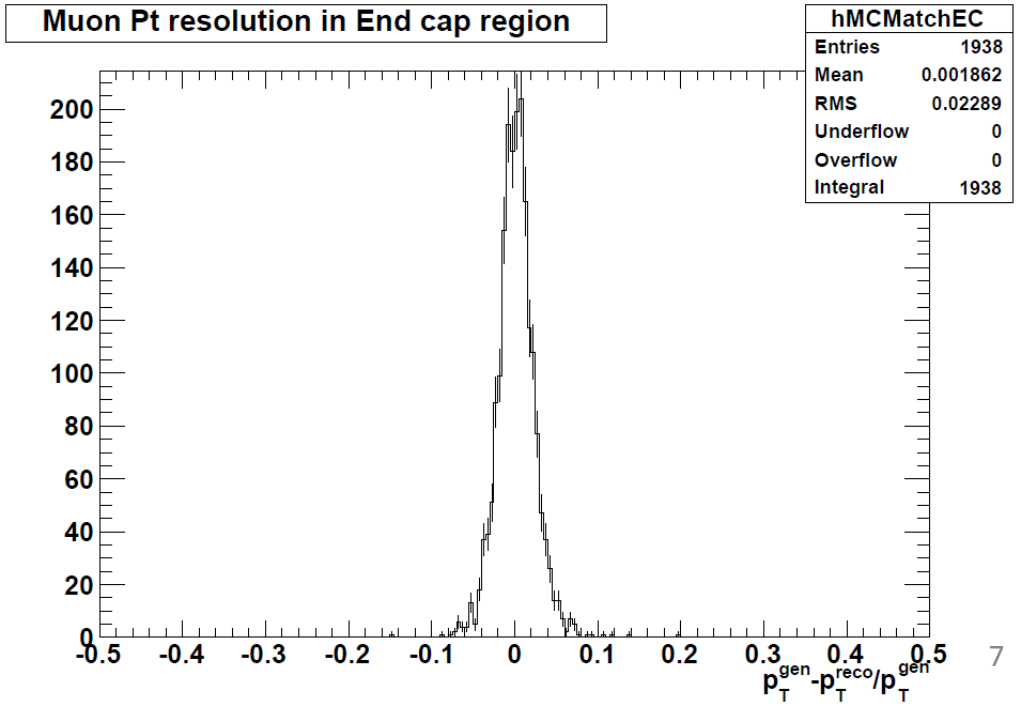


p_T resolution

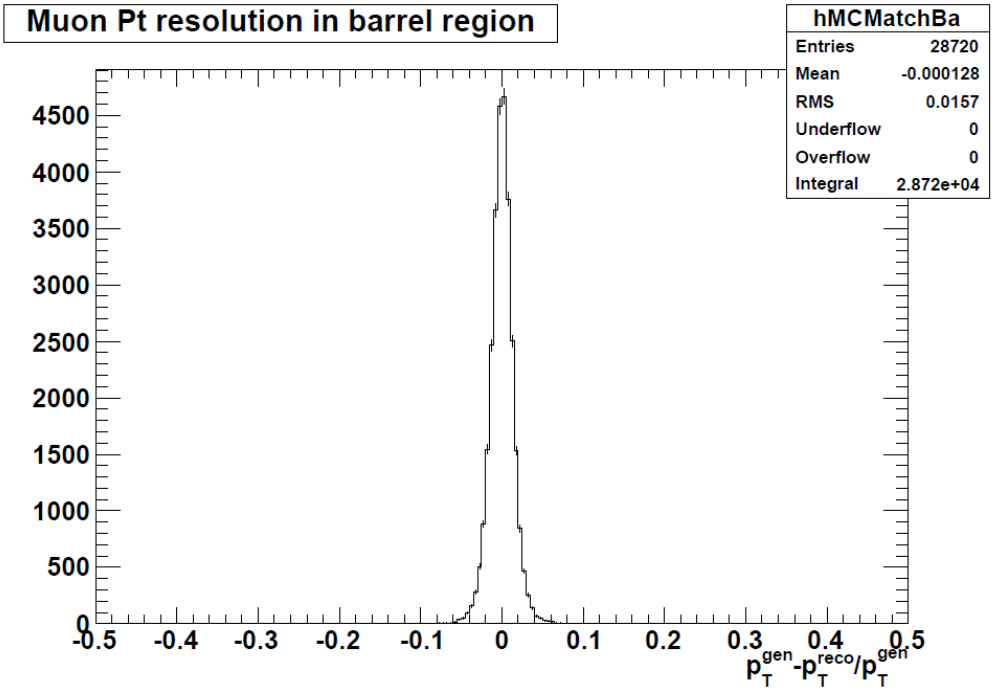


Without GEM

With GEM

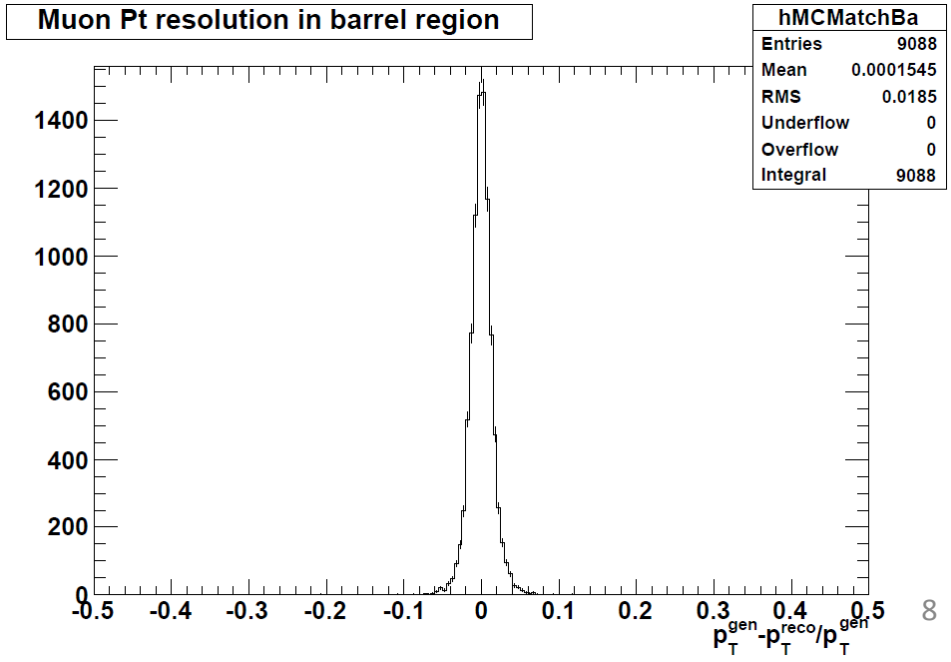


Mean Values:
GEMs: -0.0002797
w/o GEMs:0.001862

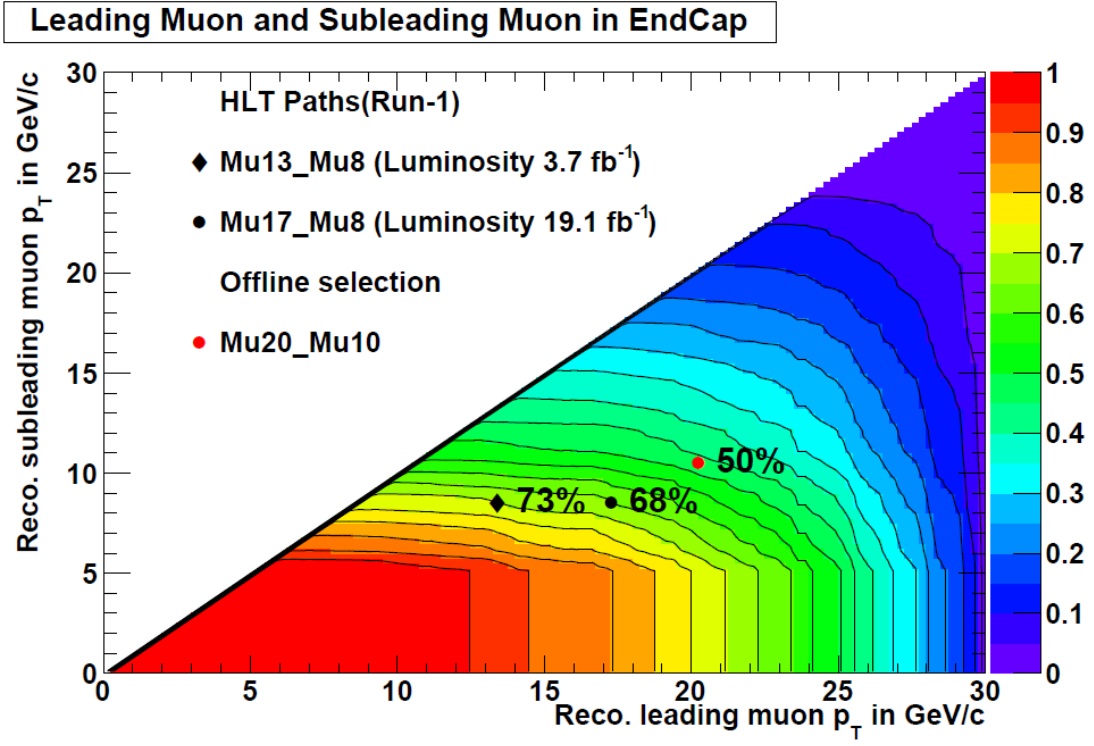


Without GEM

With GEM



Mean Values:
GEMs: -0.000128
w/o GEMs:0.0001545

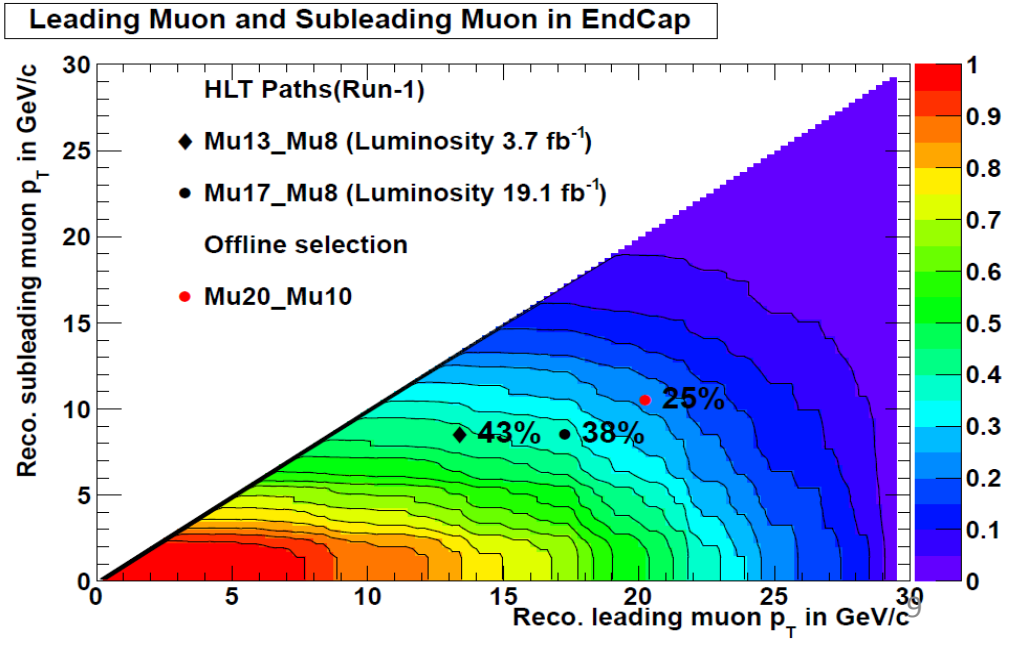


Acceptance plots

Case-1

Without GEM

With GEM

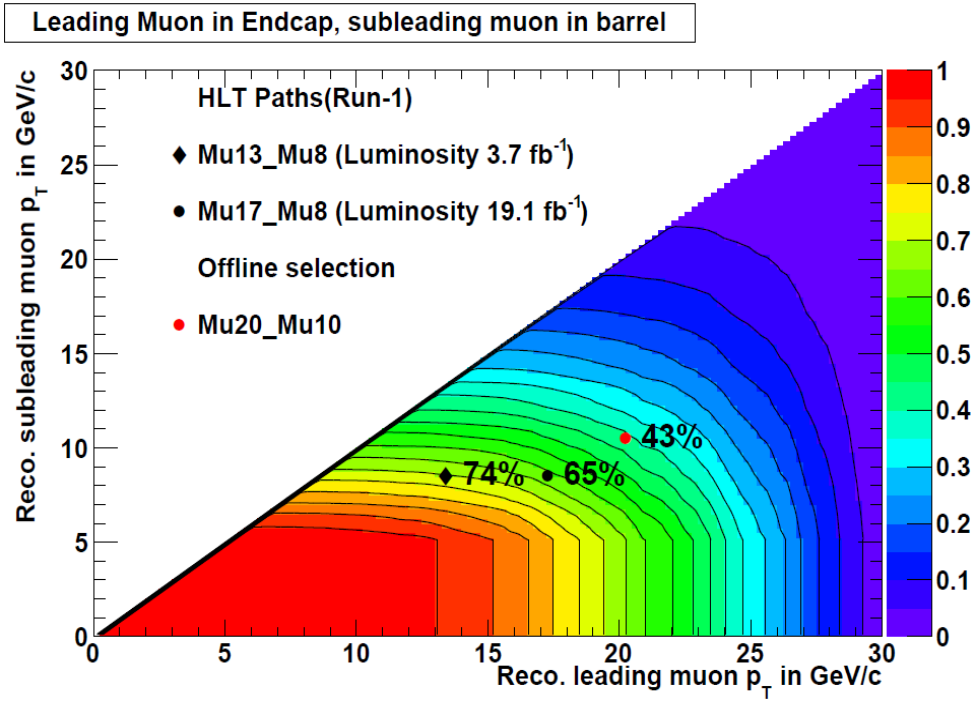


Much lower values of acceptance!

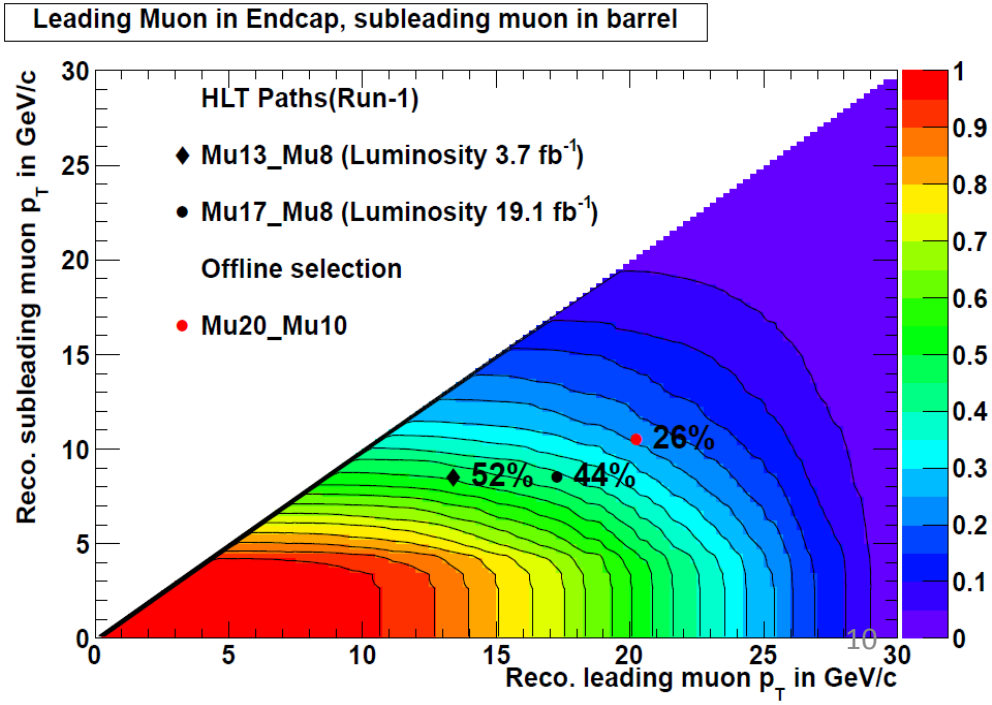
Acceptance plots

Case-2

Without GEM



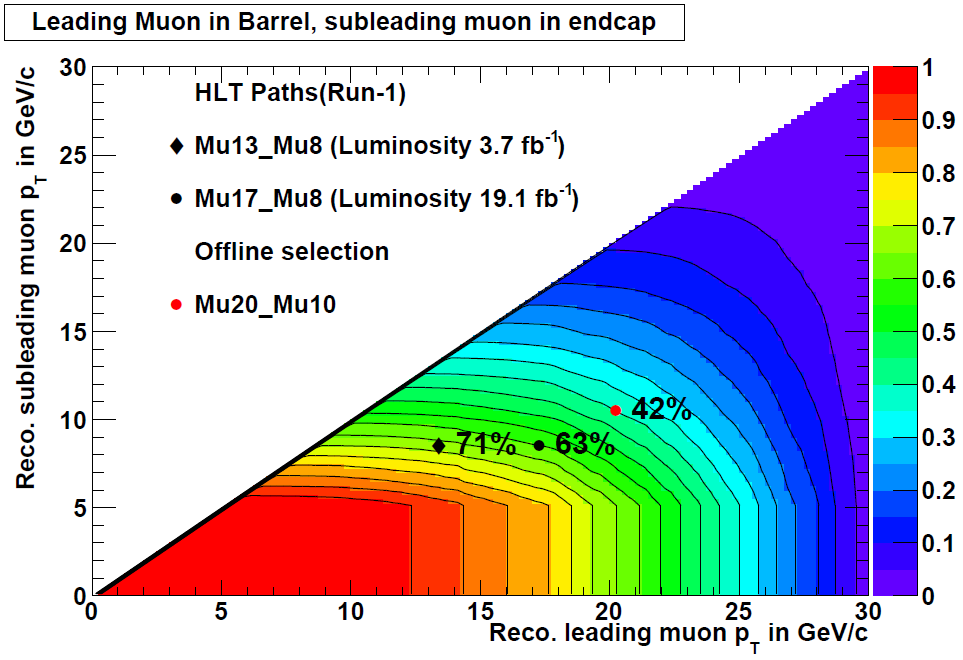
With GEM



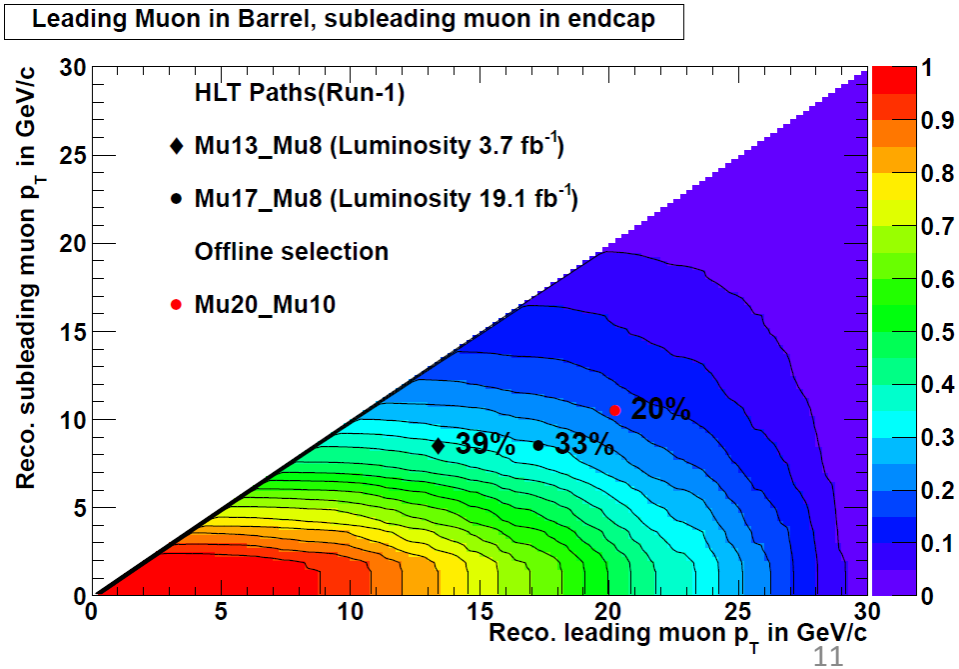
Acceptance plots

Case-3

Without GEM



With GEM

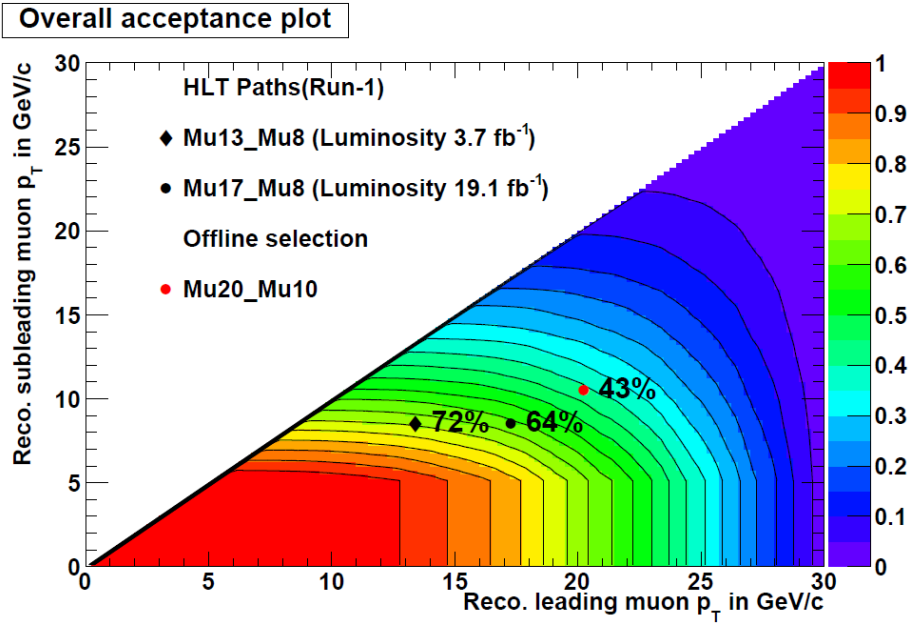


Acceptance much more sensitive to change in subleading muon pT

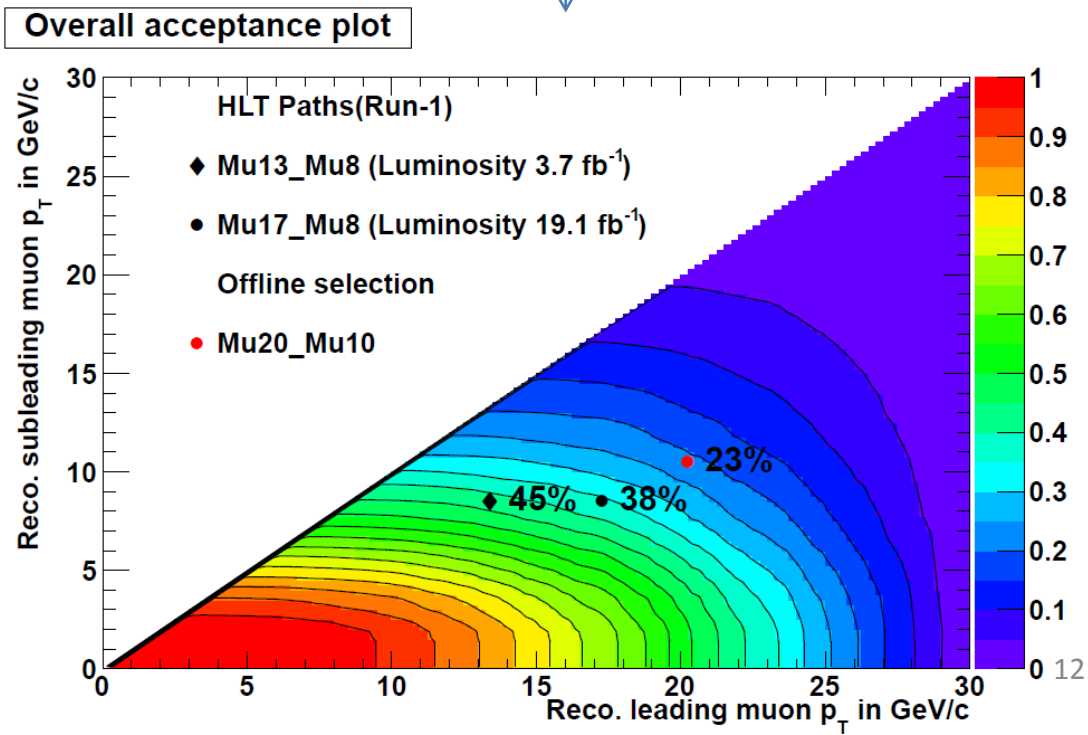
Acceptance plots

Overall

Without GEM



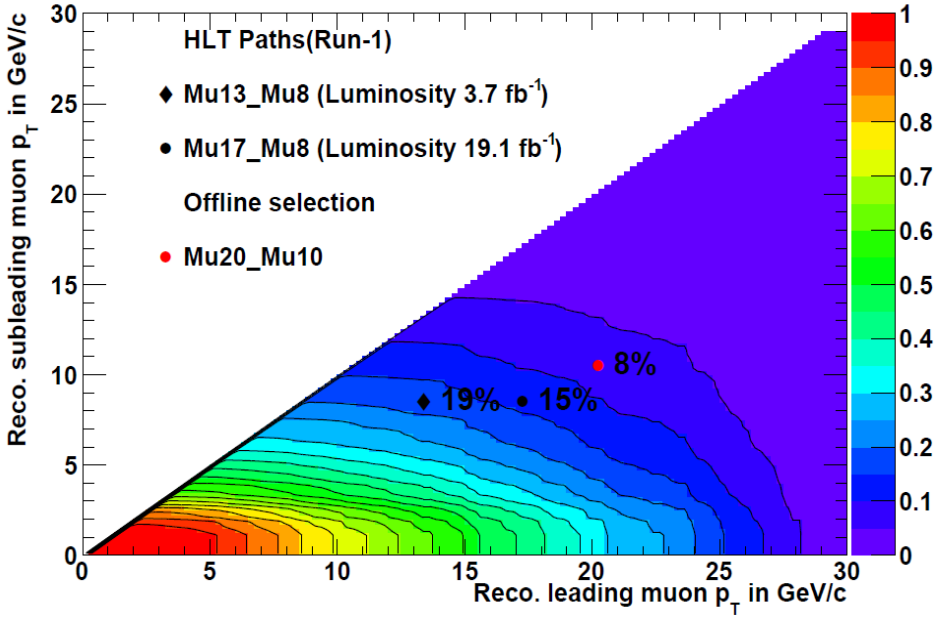
With GEM



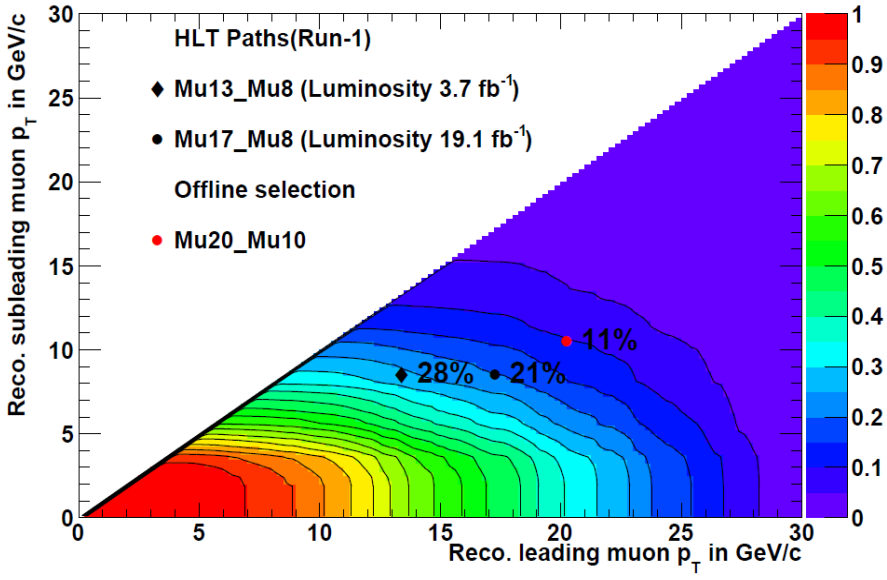
Background sample

- Only Drell Yan to Tau Tau
- Acceptance plots for all the 3 cases
- Trying to make the ratio plot of the signal to background acceptance, should shed more light on the choice of working points

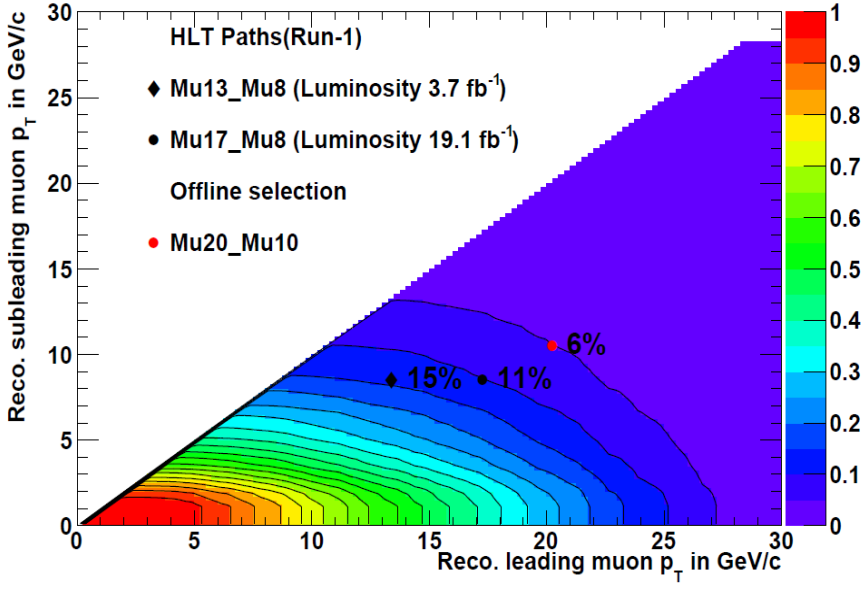
Leading Muon and Subleading Muon in EndCap



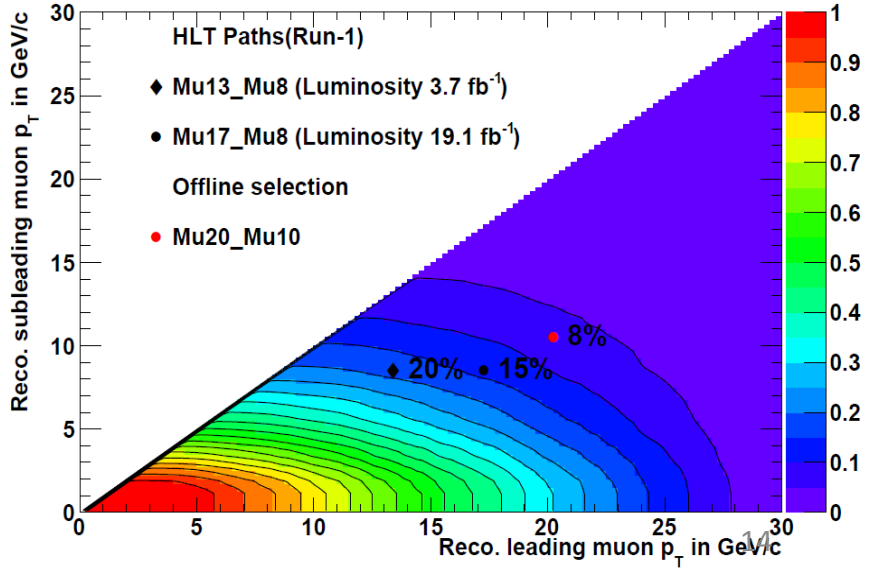
Leading Muon in Endcap, subleading muon in barrel



Leading Muon in Barrel, subleading muon in endcap



Overall acceptance plot



Conclusions and Future work

- Seems like there is improvement in the Muon p_T resolution, but that could also be due to other (tracker) upgrades
- Need to understand why the private samples start at 5 GeV/c
- GEM samples seem to have higher acceptance values for the same working values.
- Look at the Run-1 analysis and see if the Discriminator (BDT) value improves with the GEM samples