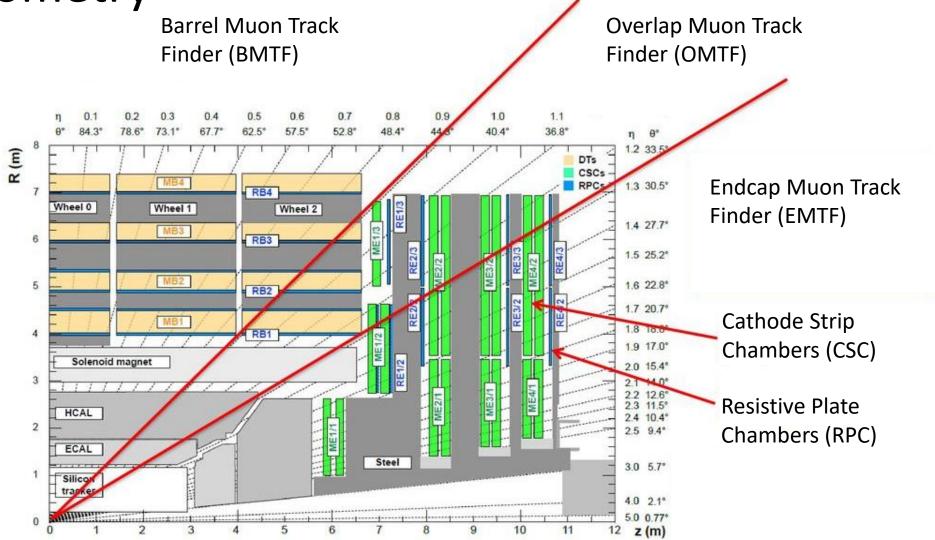


# 2018 EMTF Emulator Study

EMTF Working Meeting
Wei Shi



Geometry



5/13/2018 **A.** Madorsky

weishi@rice.edu

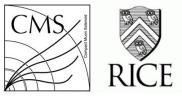
- 2



## **Basics**

- Emulator changes in 2018
  - Track building BX window: 3→2
  - 2-station tracks with different hit BX removed
  - dTheta ambiguity when multiple LCTs are in the same chamber resolved
  - Mode 9 promoted to DoubleMu, mode 12 demote to MuOpen [1]
  - Maximum dTheta for "Zone 0" (ring 1) changed from 8 to 4

- 3



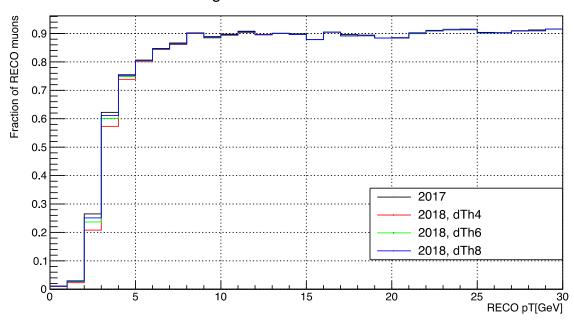
# Selections

- Remove biased events
  - "HLT IsoMu27" or "HLT Mu50"
  - Only use RECO muons
    - Events with more than 2 fired the trigger
    - From the endcap when only 1 fired trigger from the barrel
  - Selection on RECO muons
    - Eta and eta@station1 in (1.25, 2.4);
    - pT<8GeV: loose && soft or medium; 8<pT<64GeV: medium; pT>64GeV: tight
- Rate
  - Trk\_BX=0; trk\_mode != trk\_mode\_neighbour; abs(eta)>1.25

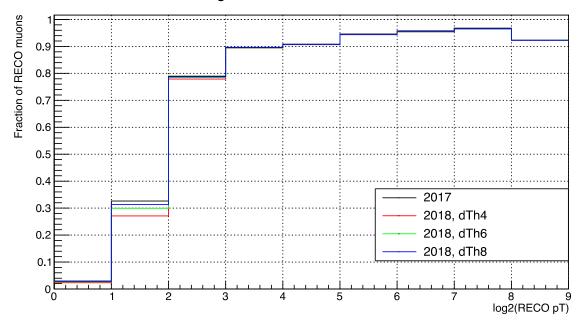


# SingleMu: Efficiency

SingleMu: IsRecoMatch && BX0

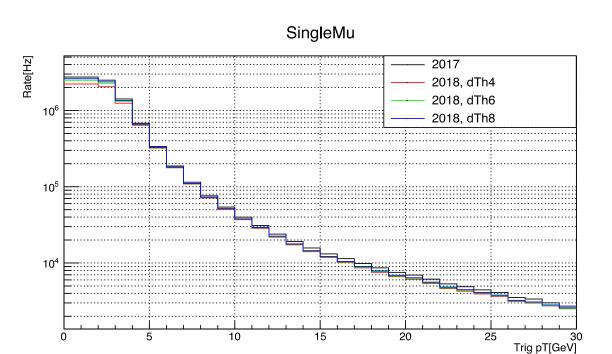


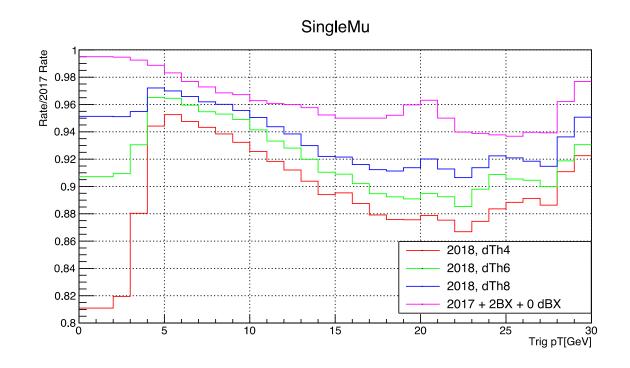
### SingleMu: IsRecoMatch && BX0





# SingleMu: Rate

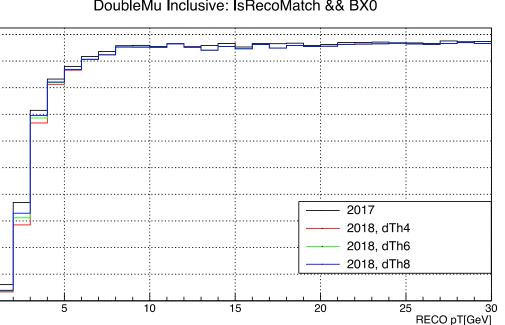






# DoubleMu Inclusive: Efficiency

# DoubleMu Inclusive: IsRecoMatch && BX0 Fraction of RECO muons

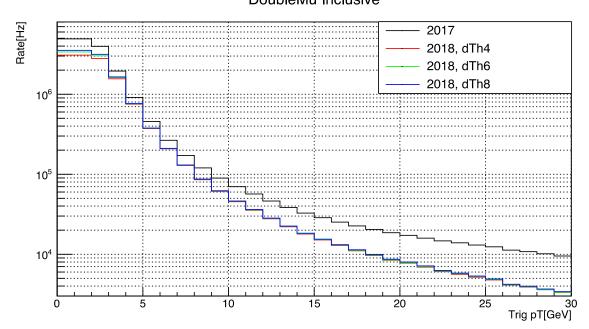


# DoubleMu Inclusive: IsRecoMatch && BX0 Fraction of RECO muons 2017 2018, dTh4 2018, dTh6 2018, dTh8 log2(RECO pT)



# DoubleMu Inclusive: Rate

### DoubleMu Inclusive



# 0.9 0.8 2018, dTh4 2018, dTh6 2018, dTh8 2017 + 2BX + 0 dBX 2017 + 2BX + 0 dBX 2017 + 2BX + 0 dBX 2017 + 2BX + 0 dBX

15

20

10

DoubleMu Inclusive

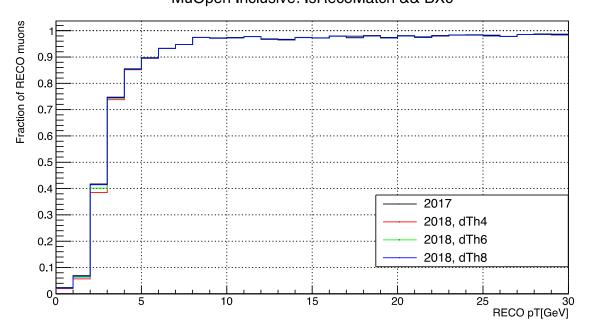
Trig pT[GeV]

25

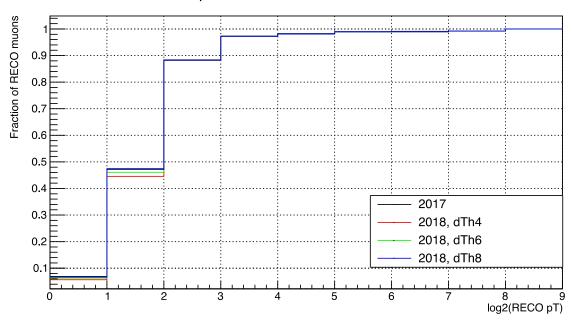


# MuOpen Inclusive: Efficiency

### MuOpen Inclusive: IsRecoMatch && BX0

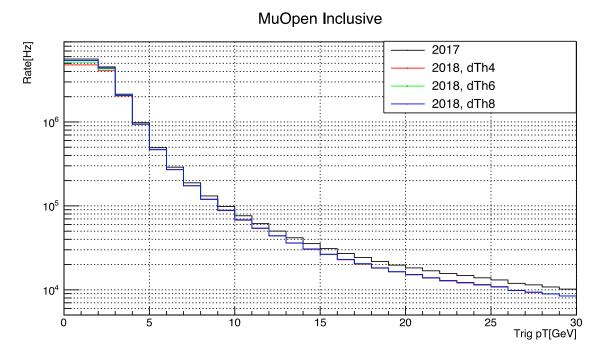


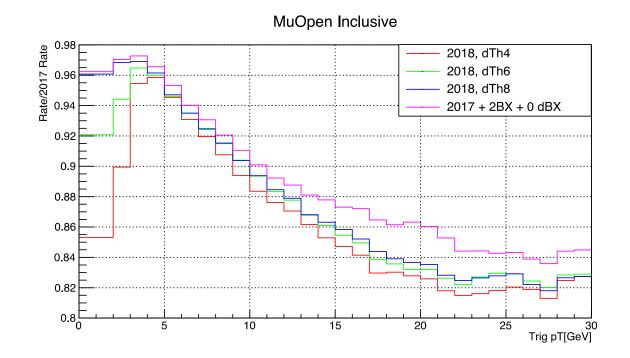
### MuOpen Inclusive: IsRecoMatch && BX0



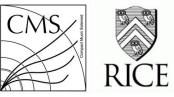


# MuOpen Inclusive: Rate



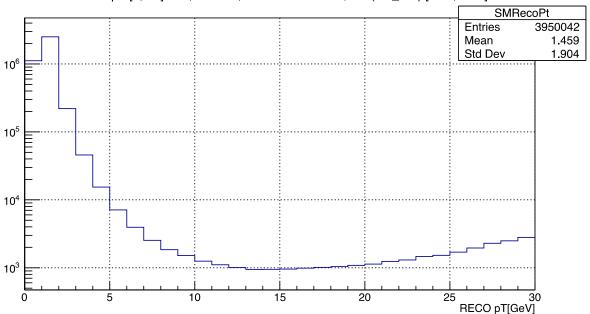


# Back Up

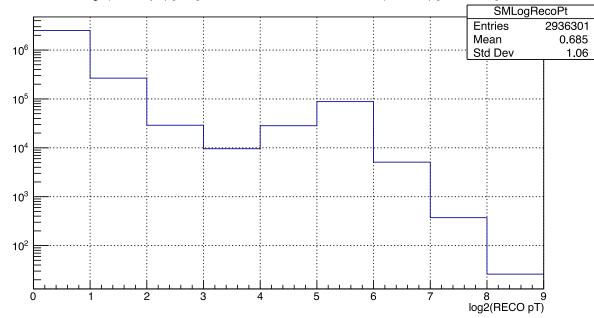


# RECO pT

RECO pT [0, 30]GeV, looseID, ReachStationOne, abs(eta\_St2) [1.25, 2.40]



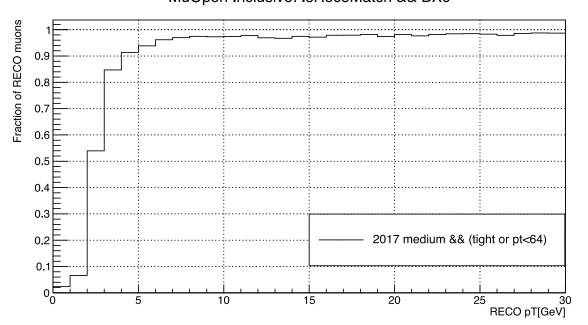
Log2(RECO pT) [0, 9], looseID, ReachStationOne, abs(eta\_St2) [1.25, 2.40]



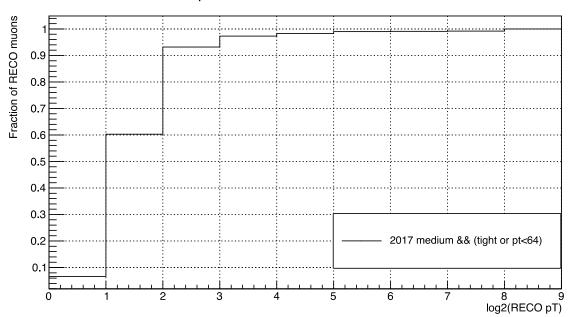


# MuOpen Inclusive: Efficiency





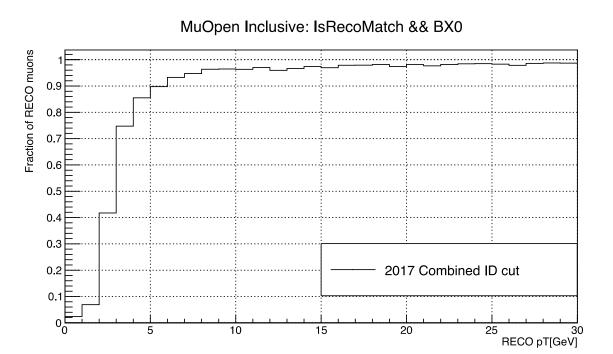
### MuOpen Inclusive: IsRecoMatch && BX0

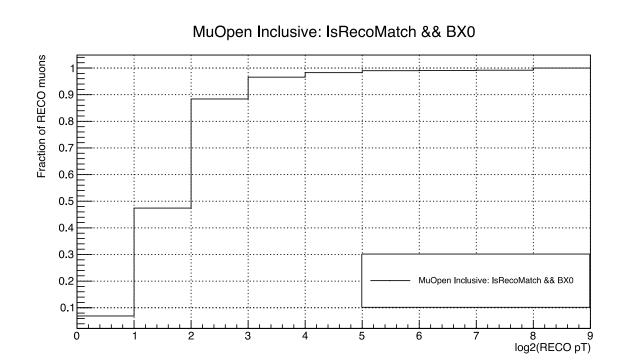


- Require
  - reco\_ID\_medium == 1 && (reco\_pt < 64 || reco\_ID\_tight == 1)</li>

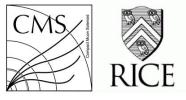


# MuOpen Inclusive: Efficiency





- Require
  - ((reco\_ID\_loose == 1 && reco\_ID\_soft == 1) || reco\_ID\_medium == 1) && (reco\_pt < 16 || reco\_ID\_medium == 1) && (reco\_pt < 64 || reco\_ID\_tight == 1)</li>



# **Muon Quality**

- SingleMu Quality (Q>=12)
  - EMTF mode 15, 14, 13, 11
- DoubleMu Quality (Q>=8)
  - EMTF mode 12, 10, 7
  - EMTF mode 15, 14, 13, 11
- MuOpen Quality (Q>=4)
  - EMTF mode 9, 6, 5, 3
  - EMTF mode 9, 10, 7
  - EMTF mode 15, 14, 13, 11

- SingleMu Quality (Q>=12)
  - EMTF mode 15, 14, 13, 11
- DoubleMu Quality (Q>=8)
  - EMTF mode 9, 10, 7
  - EMTF mode 15, 14, 13, 11
- MuOpen Quality (Q>=4)
  - EMTF mode 12, 6, 5, 3
  - EMTF mode 9, 10, 7
  - EMTF mode 15, 14, 13, 11

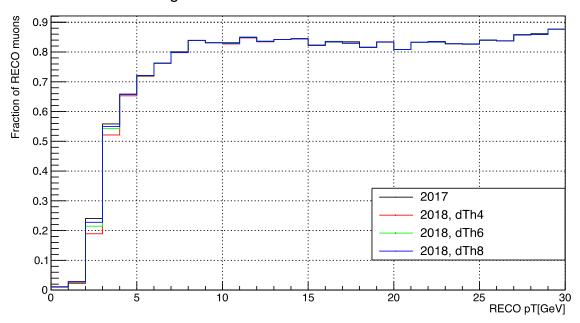
2017 Emulator

2018 Emulator

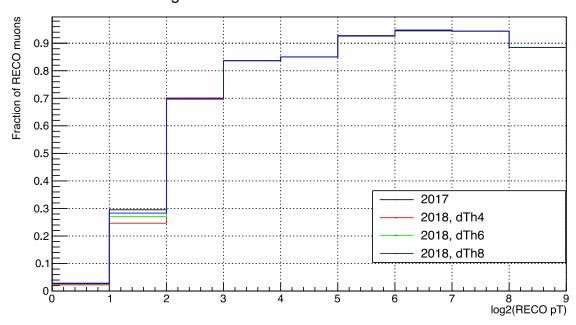


# SingleMu: Plateau Efficiency

SingleMu: IsRecoMatch && BX0 && Plateau

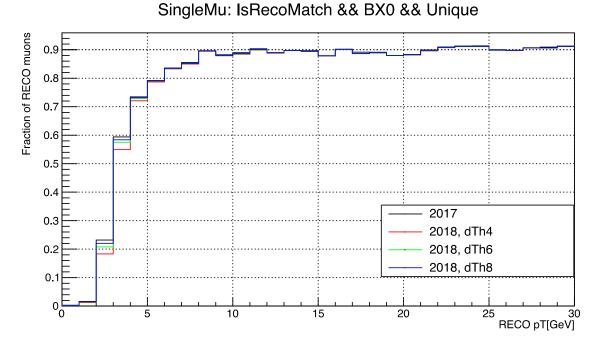


### SingleMu: IsRecoMatch && BX0 && Plateau

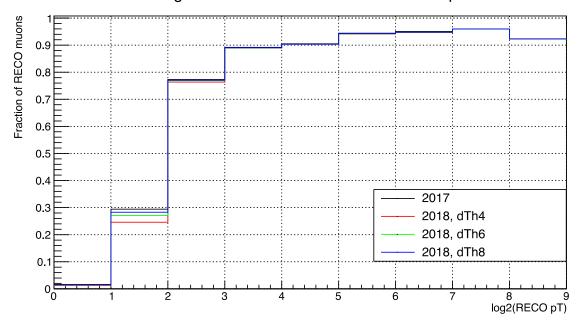




# SingleMu: Efficiency (match unique)



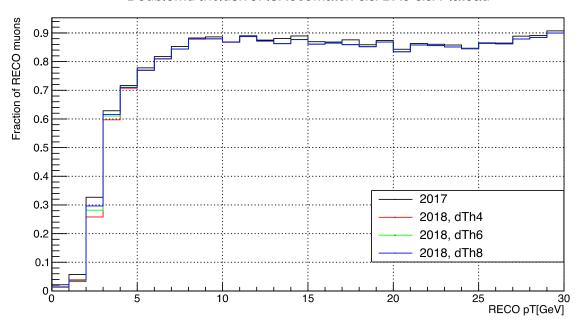
SingleMu: IsRecoMatch && BX0 && Unique



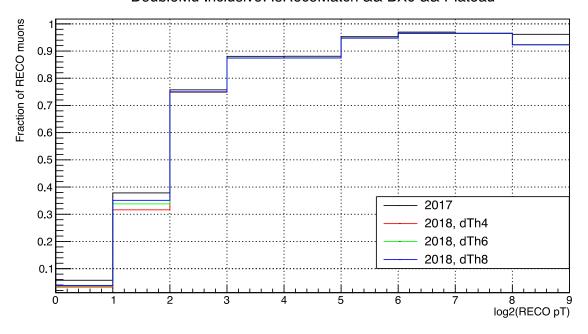


# DoubleMu Inclusive: Plateau Efficiency

### DoubleMu Inclusive: IsRecoMatch && BX0 && Plateau



### DoubleMu Inclusive: IsRecoMatch && BX0 && Plateau

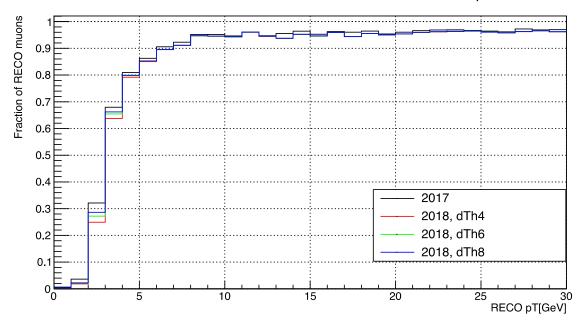




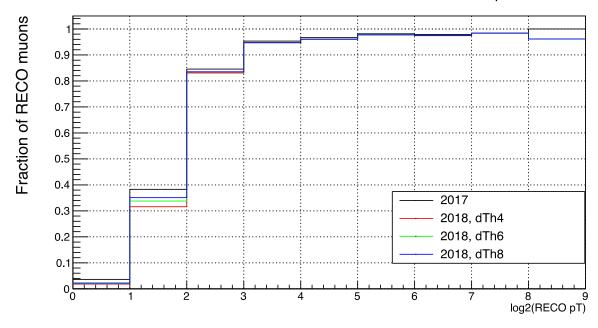
19

# DoubleMu Inclusive: Efficiency (match unique)

### DoubleMu Inclusive: IsRecoMatch && BX0 && Unique



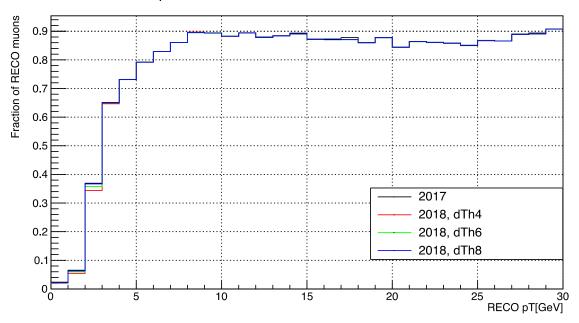
### DoubleMu Inclusive: IsRecoMatch && BX0 && Unique



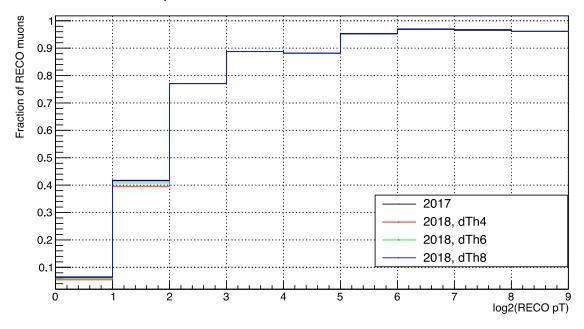


# MuOpen Inclusive: Plateau Efficiency

### MuOpen Inclusive: IsRecoMatch && BX0 && Plateau



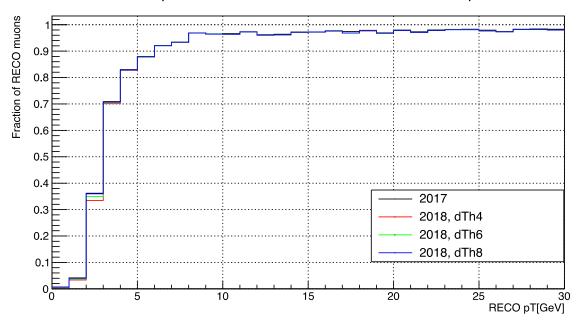
### MuOpen Inclusive: IsRecoMatch && BX0 && Plateau



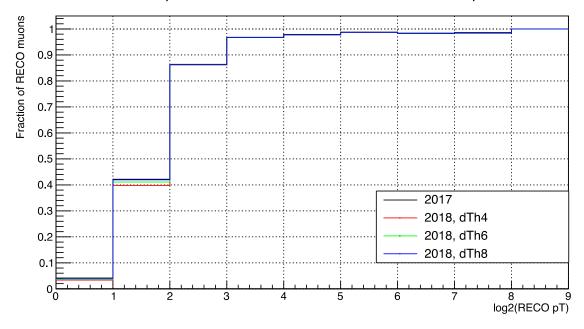


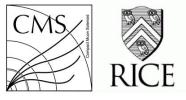
# MuOpen Inclusive: Efficiency (match unique)

### MuOpen Inclusive: IsRecoMatch && BX0 && Unique



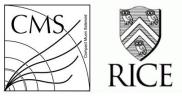
### MuOpen Inclusive: IsRecoMatch && BX0 && Unique





# Track Modes vs Stations

Mode #	Definition	Stations
15	1+2+4+8	1,2,3,4
14	2+4+8	1,2,3
13	1+4+8	1,2,4
12	4+8	1,2
11	1+2+8	1,3,4
10	2+8	1,3
9	1+8	1,4
7	1+2+4	2,3,4
6	2+4	2,3
5	1+4	2,4
3	1+2	3,4



# **Data Files**

root://eoscms.cern.ch//store/user/abrinke1/EMTF/Emulator/ntuples/HADD/

### • 2017

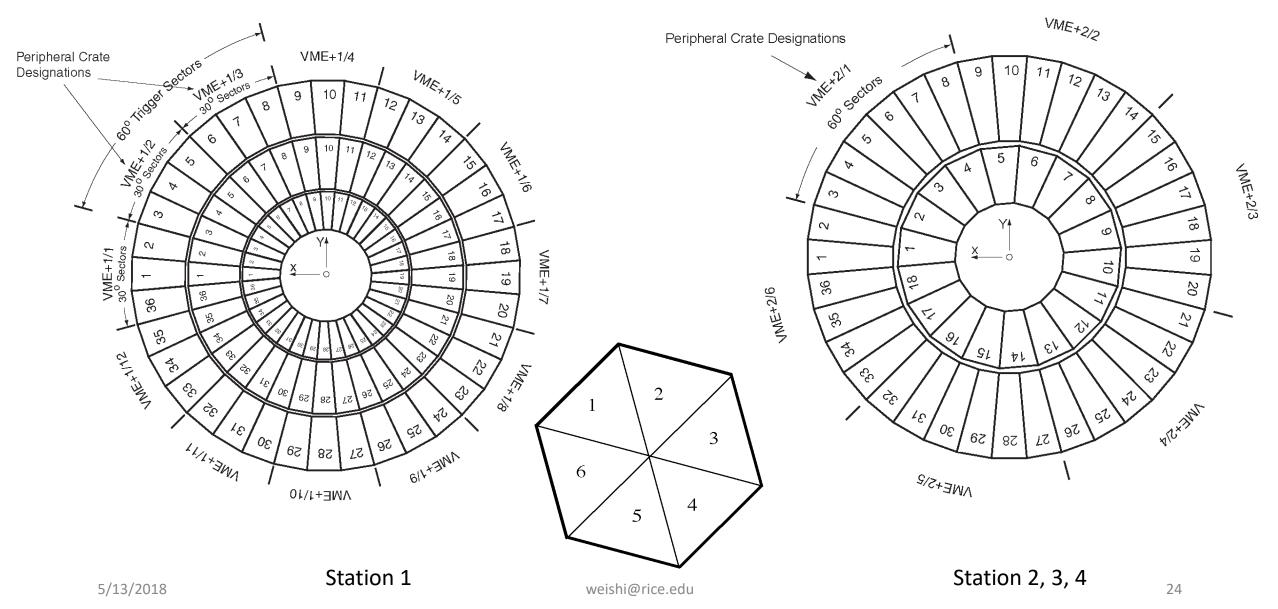
- NTuple\_SingleMuon\_FlatNtuple\_Run\_306154\_2018\_05\_07\_SingleMu\_2017\_emul.root
- NTuple\_ZeroBias1\_FlatNtuple\_Run\_306091\_2018\_05\_07\_ZB1\_2017\_emul.root
- NTuple ZeroBias1 FlatNtuple Run 306091 2018 05 07 ZB1 2017 emul dBX.root

### • 2018

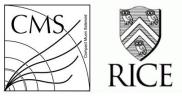
- NTuple\_SingleMuon\_FlatNtuple\_Run\_306154\_2018\_05\_07\_SingleMu\_2018\_emul\_dTh4.root NTuple\_SingleMuon\_FlatNtuple\_Run\_306154\_2018\_05\_07\_SingleMu\_2018\_emul\_dTh6.root NTuple\_SingleMuon\_FlatNtuple\_Run\_306154\_2018\_05\_07\_SingleMu\_2018\_emul\_dTh8.root
- NTuple\_ZeroBias1\_FlatNtuple\_Run\_306091\_2018\_05\_07\_ZB1\_2018\_emul\_dTh4.root NTuple\_ZeroBias1\_FlatNtuple\_Run\_306091\_2018\_05\_07\_ZB1\_2018\_emul\_dTh6.root NTuple\_ZeroBias1\_FlatNtuple\_Run\_306091\_2018\_05\_07\_ZB1\_2018\_emul\_dTh8.root

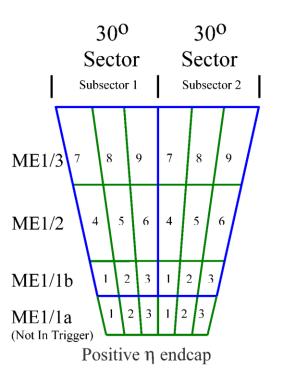
# **CSC Geometry**

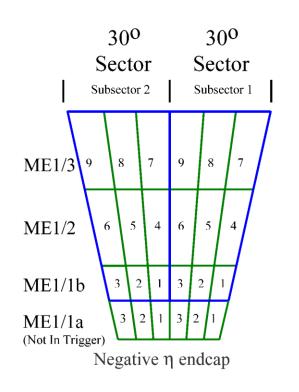


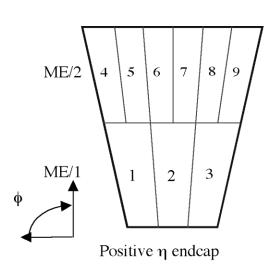


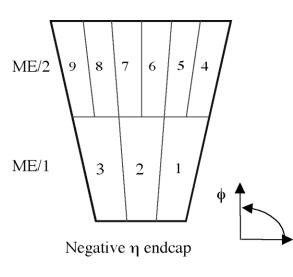
# CSCs in a trigger sector











Station 1 Station 2, 3, 4