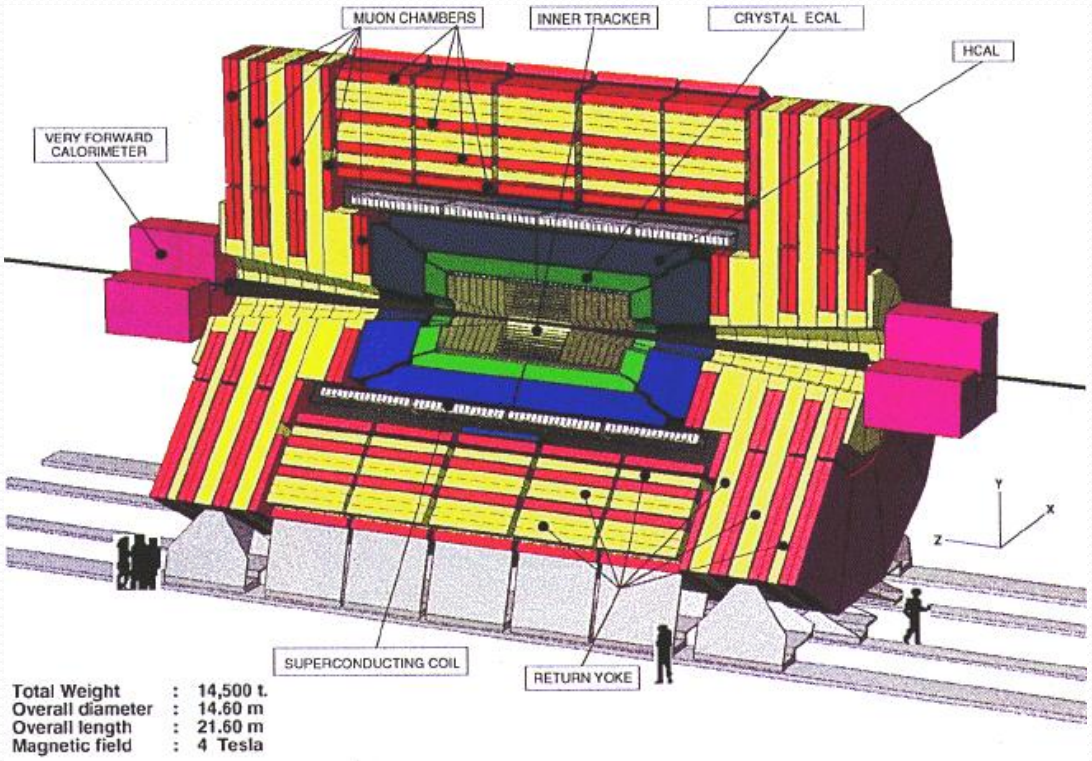
Trigger Efficiency of CMS RPCs

Eric Dodds

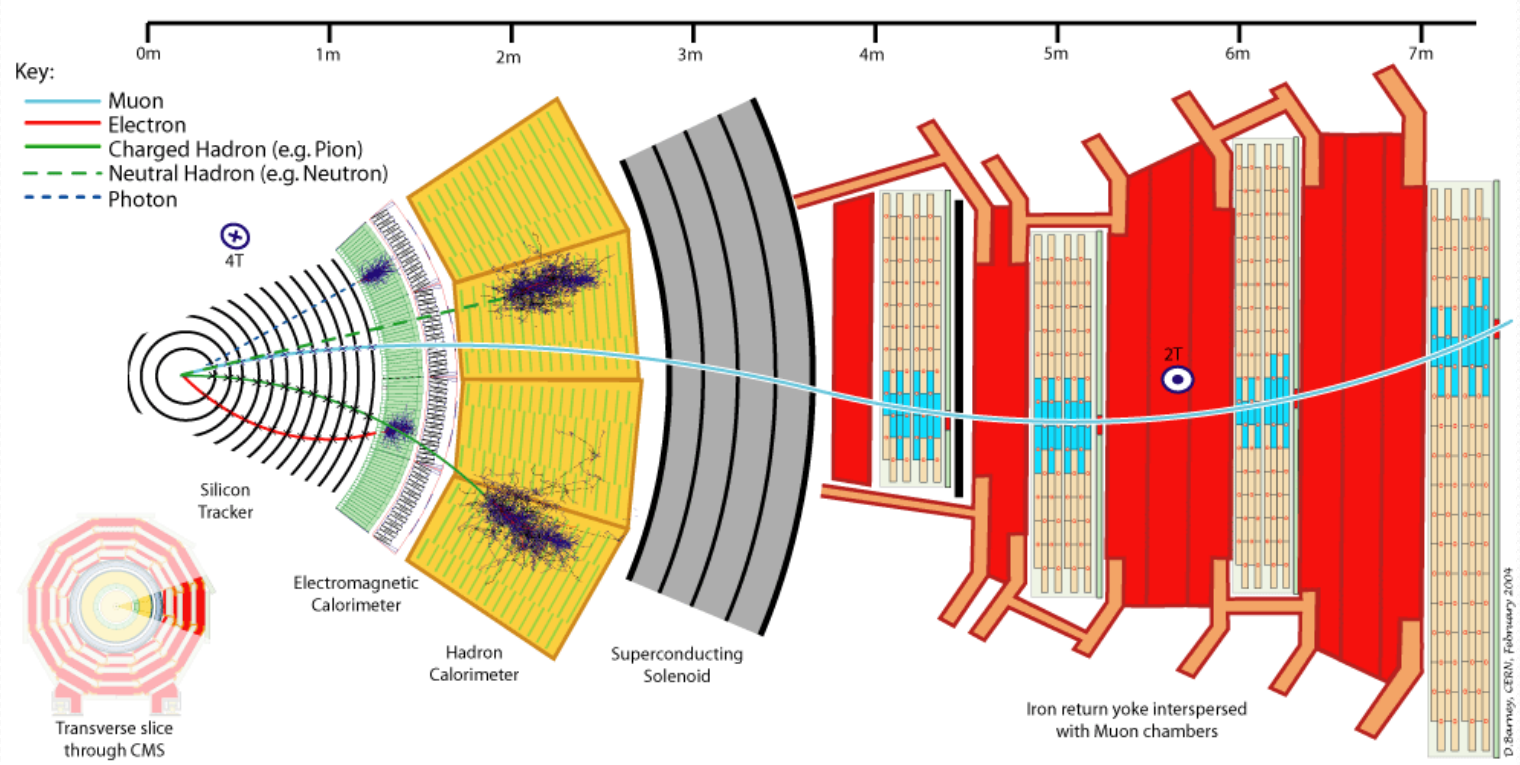
Compact Muon Solenoid

- All-purpose detector at LHC
- Looking for Higgs, supersymmetry, extra dimensions, etc
- Too much data (~40 TB/s)!
- Trigger system selects interesting events



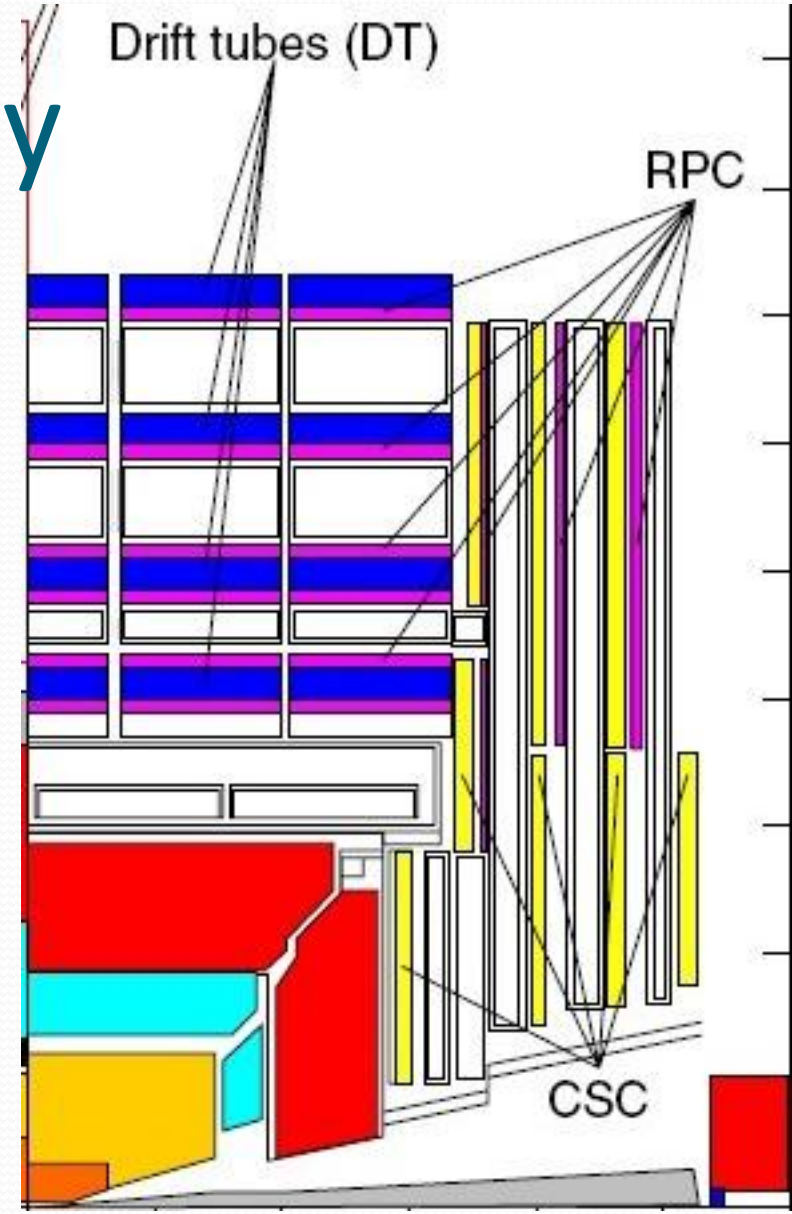
The Muon System

- Drift Tubes (DT)
- Cathode Strip Chambers (CSC)
- Resistive Plate Chambers (RPC)



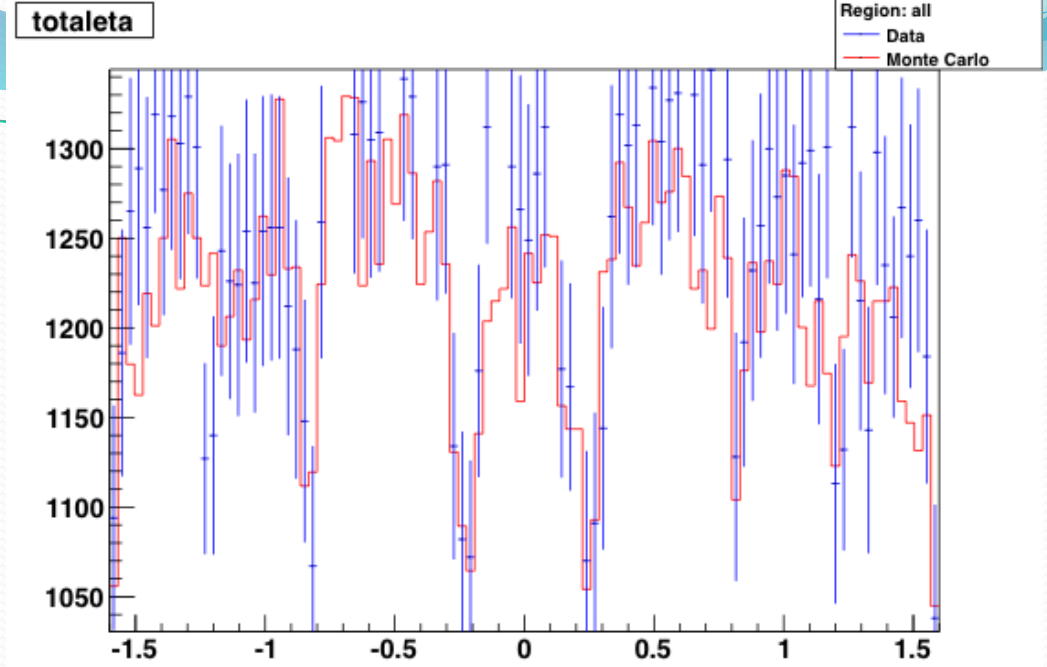
Evaluating Efficiency

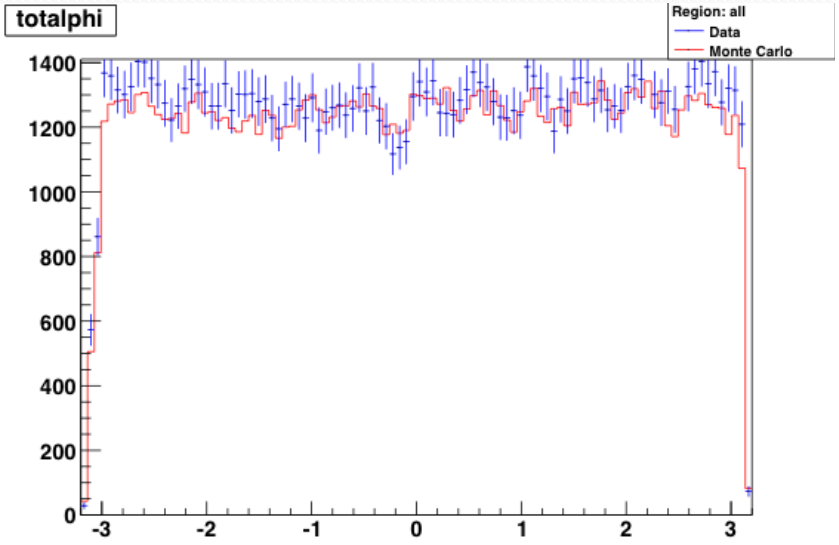
- Use DT- or CSC-triggering muons as standard
- (Nearly) unbiased sample
- How often are RPCs also triggered?

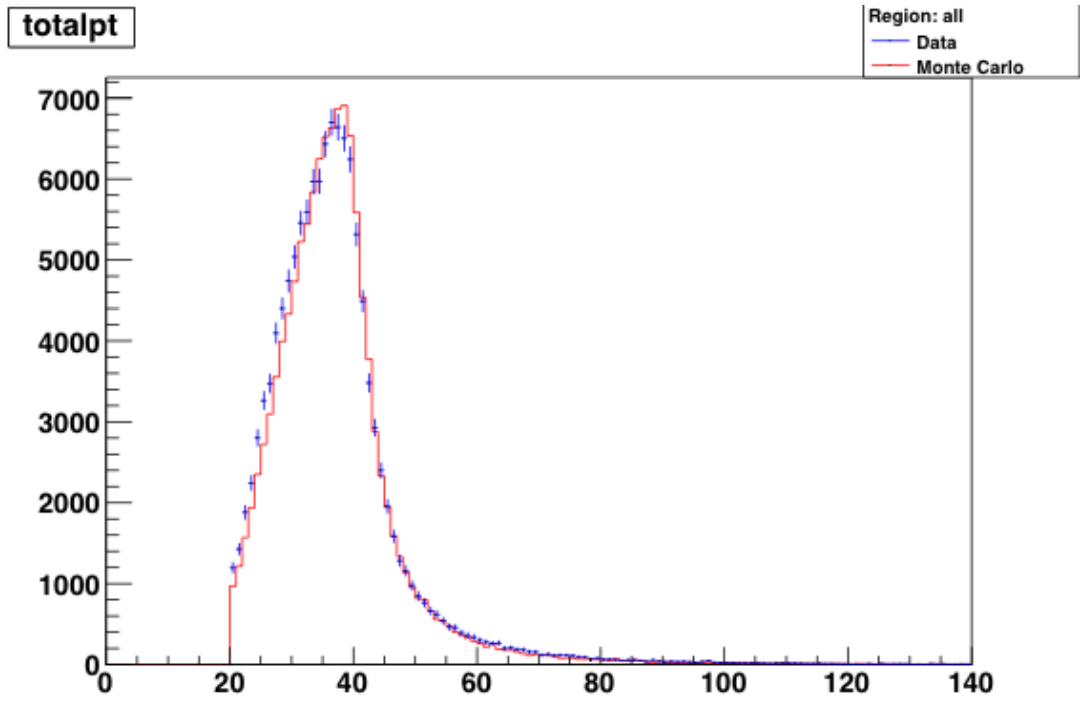


The data sets

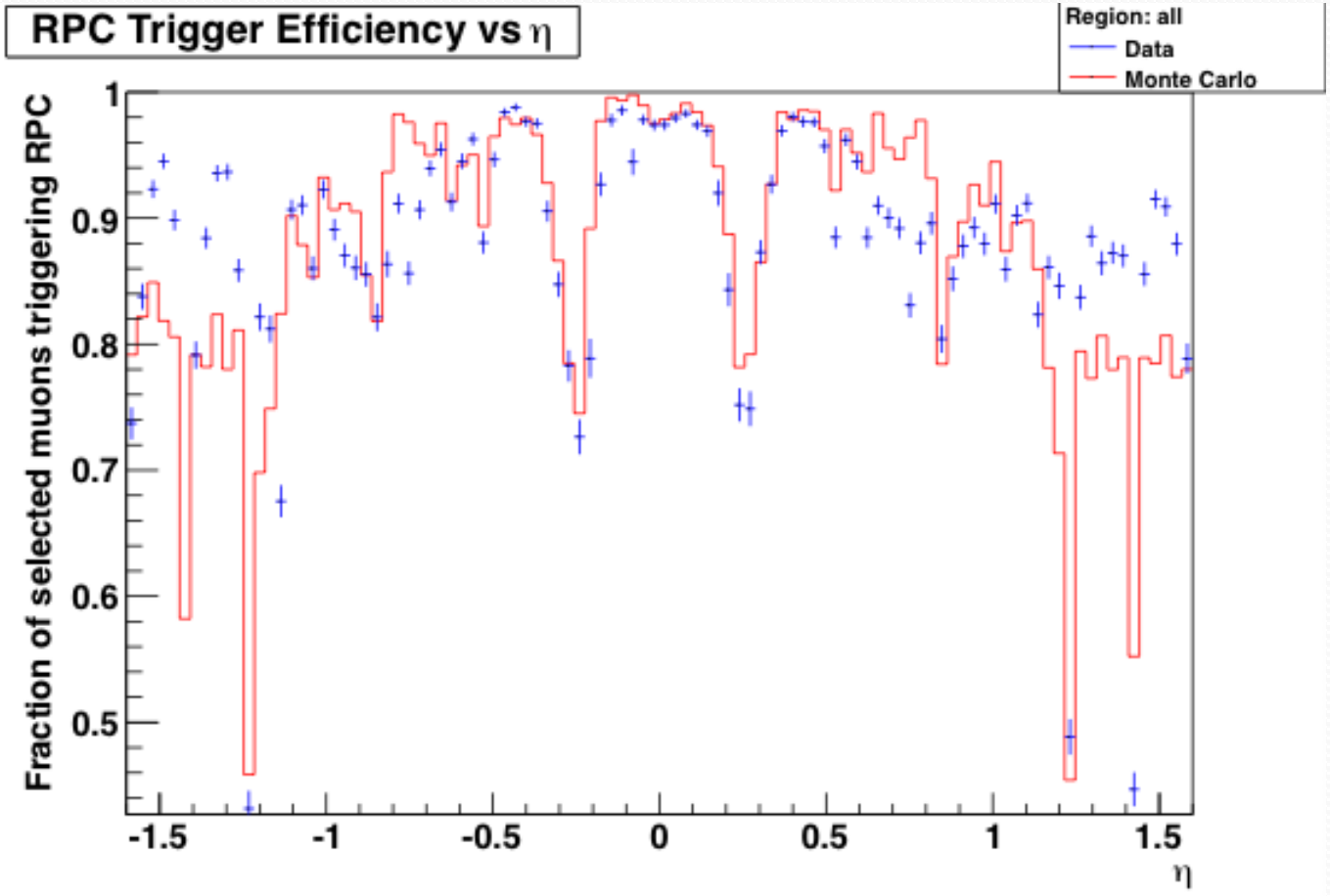
- $p + p \rightarrow W \rightarrow \mu + X$
  - $P_T > 20$ GeV/c
  - 1 muon
- ~200000 events
- Data, Monte Carlo

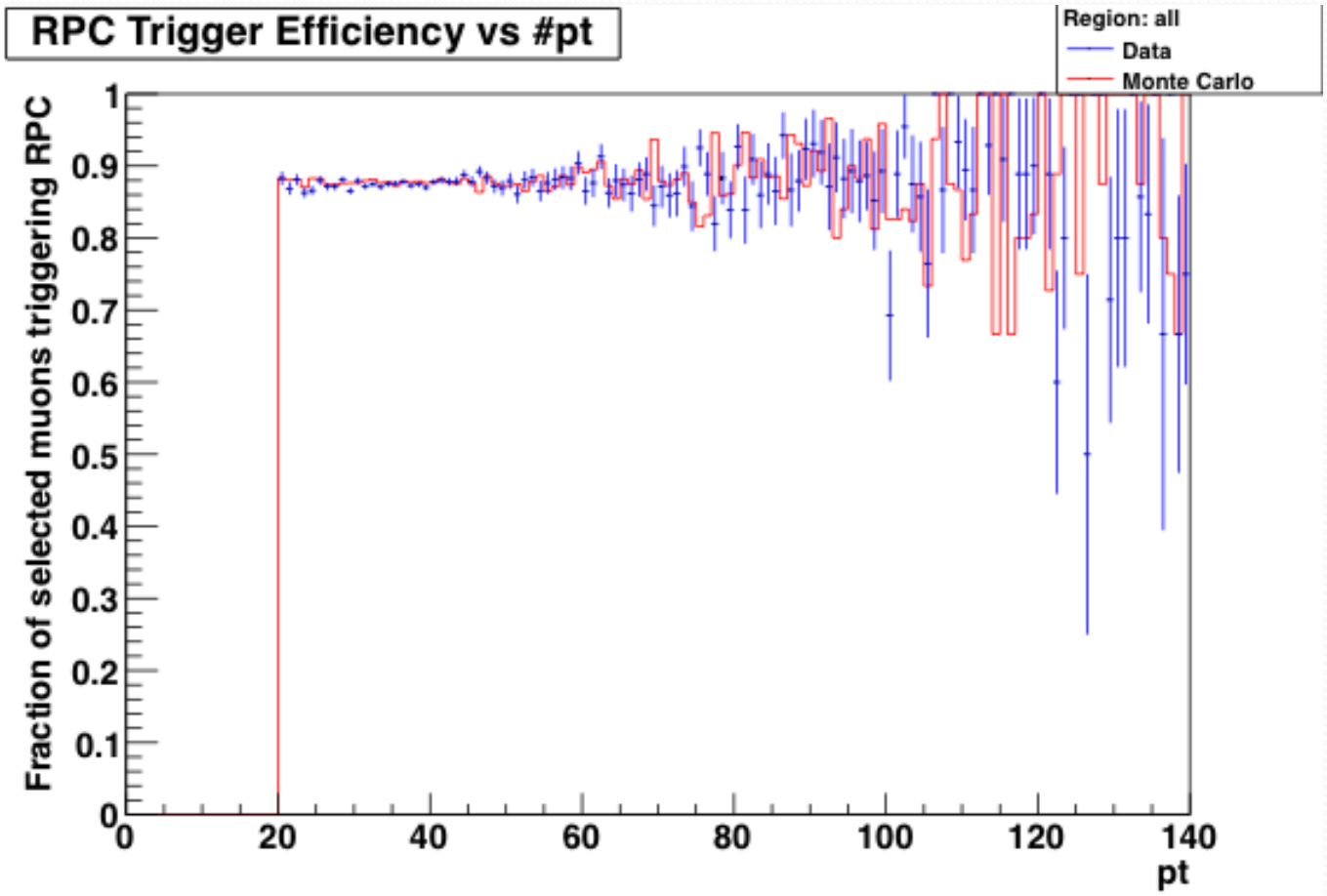


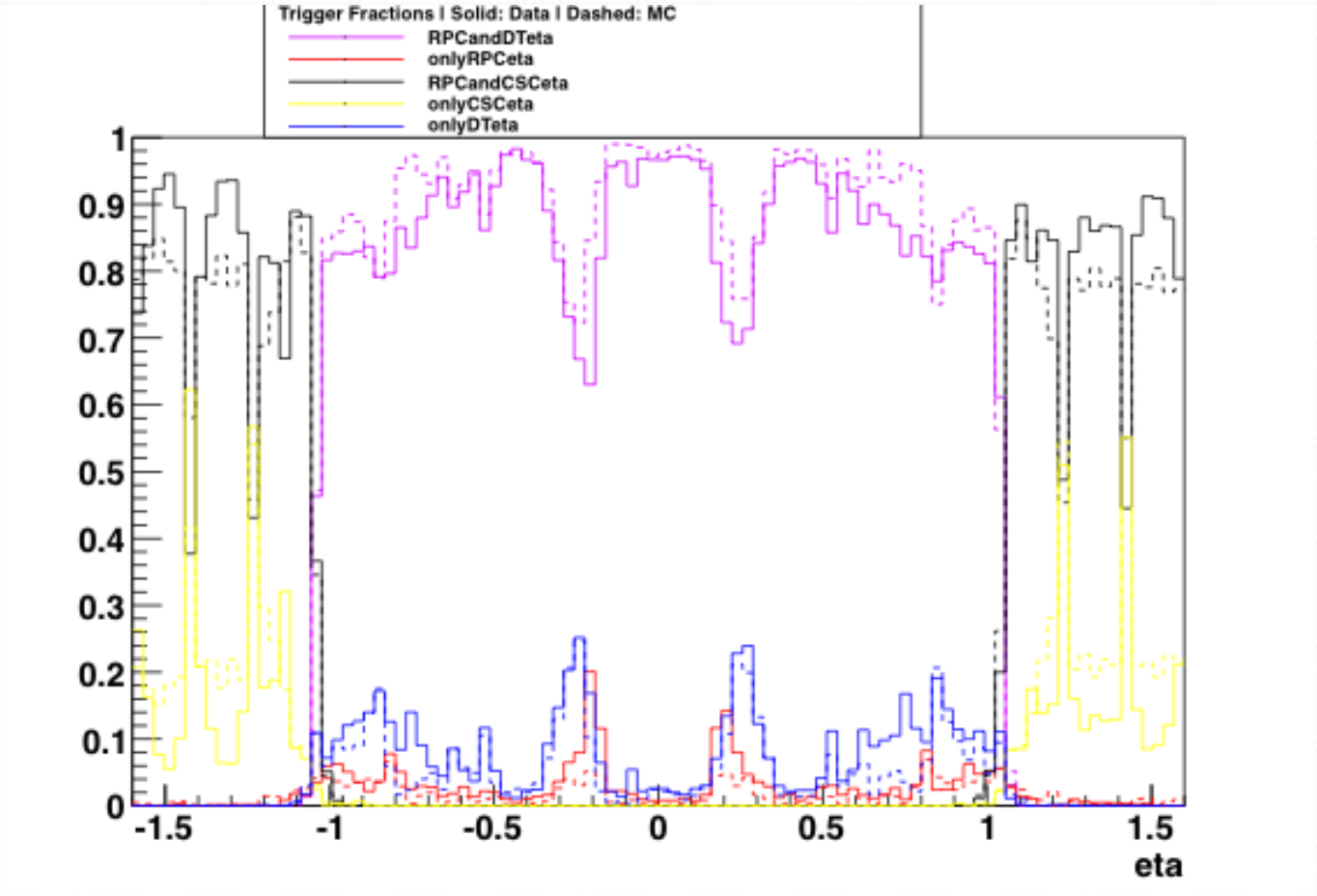




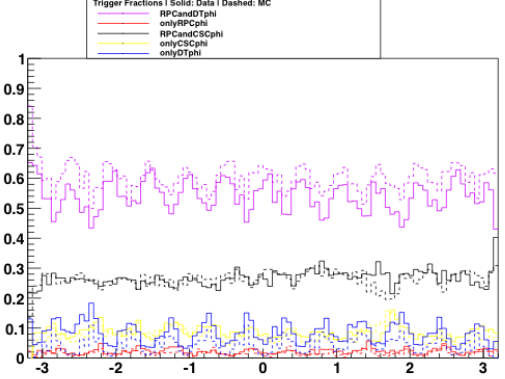
The results

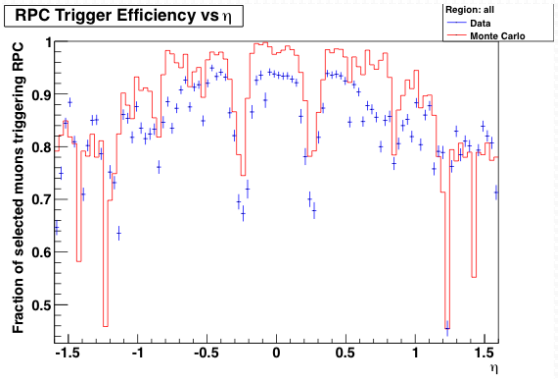

RPC Trigger Efficiency vs η
Region: all
Data
Monte Carlo
Fraction of selected muons triggering RPC
1
0.9
0.8
0.7
0.6
0.5
-1.5
-1
-0.5
0
0.5
1
1.5
η

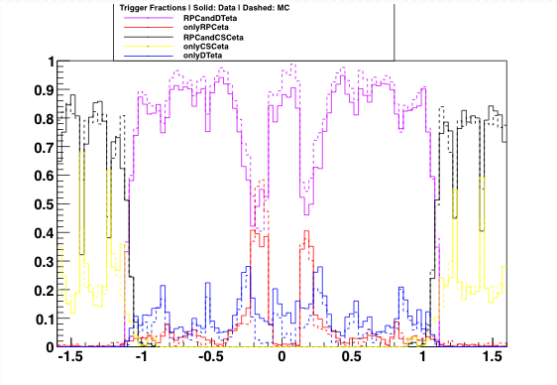

RPC Trigger Efficiency vs #pt
Region: all
Data
Monte Carlo
Fraction of selected muons triggering RPC
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
20
40
60
80
100
120
140
pt

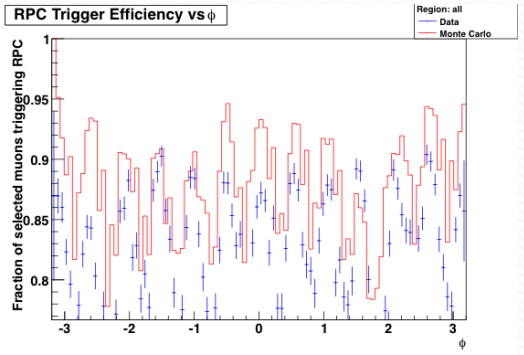

Trigger Fractions | Solid: Data | Dashed: MC
RPCandDTeta
onlyRPCeta
RPCandCSCeta
onlyCSCeta
onlyDTeta
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-1.5
-1
-0.5
0
0.5
1
1.5
eta

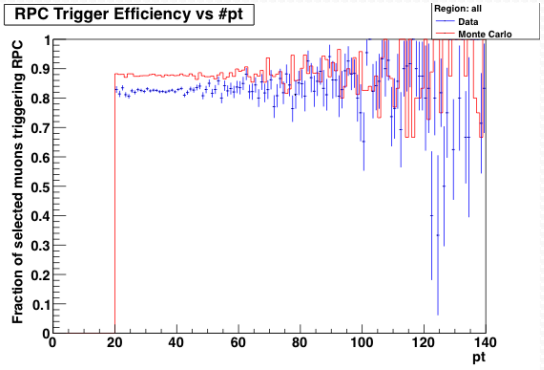
Some more results…

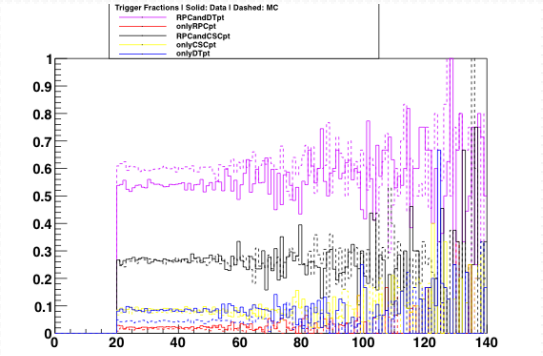


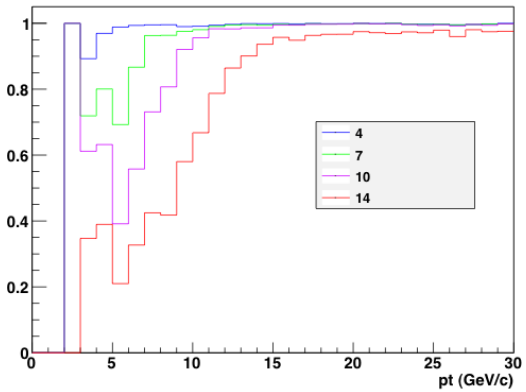












So what now?

- Lots of histograms…what do they mean?
  - Data vs Monte Carlo
  - Differences between trigger levels
  - Different data runs
    - Effect of RPC voltage -> cluster size