Studying Algorithms at CERN

High Energy Particle Physics

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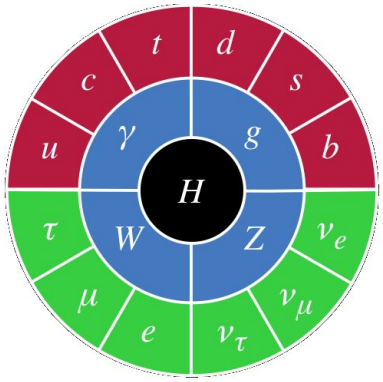
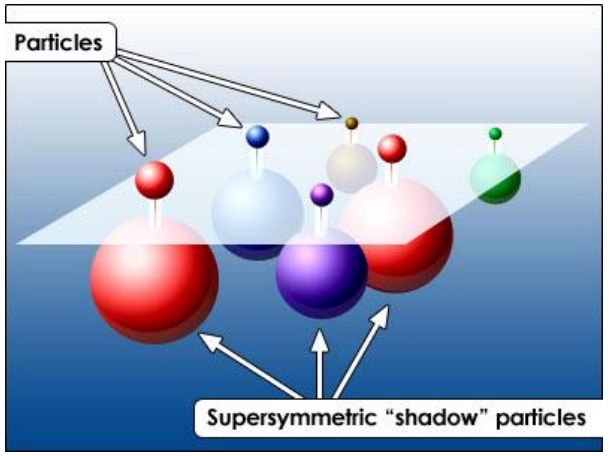
CMS
LHCb
ALICE
ATLAS

Motivation

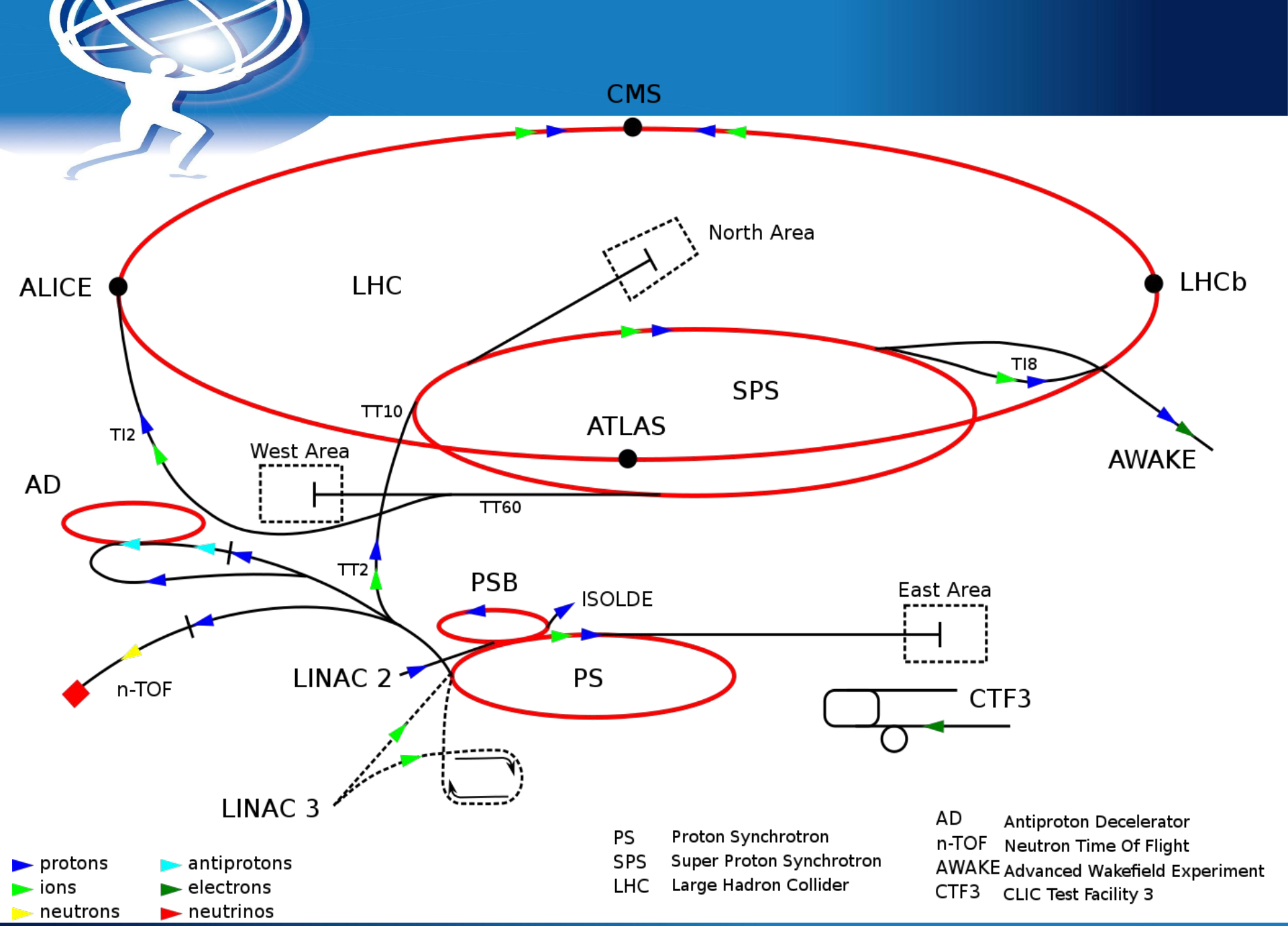


Verify the Standard Model
Probe Grand Unification

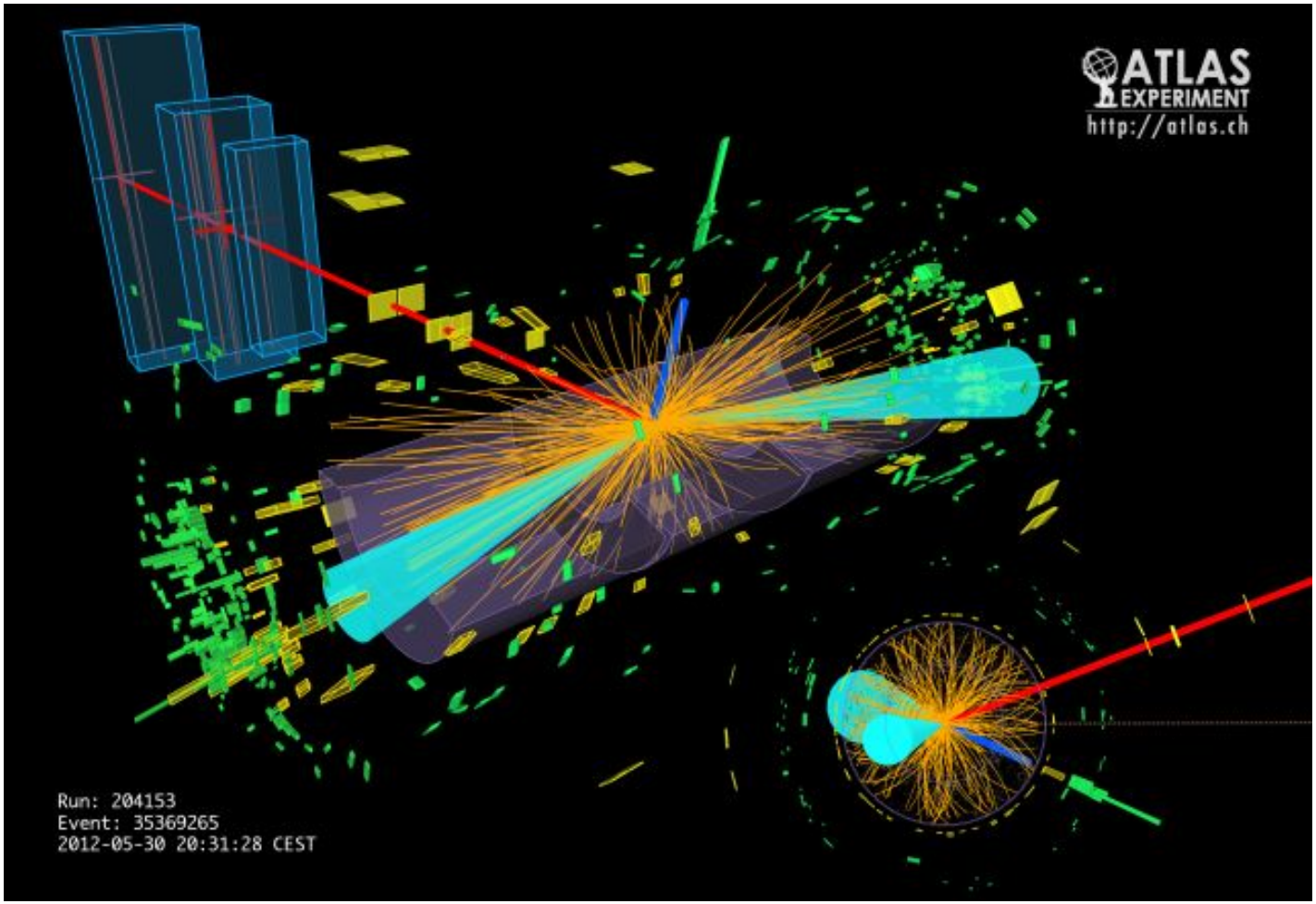
Probe Dark Matter



Probe Supersymmetry


CMS
ALICE
LHC
LHCb
North Area
SPS
ATLAS
TI8
AWAKE
TT10
TI2
West Area
AD
TT60
TT2
PSB
ISOLDE
East Area
n-TOF
LINAC 2
PS
CTF3
LINAC 3
protons
ions
neutrons
antiprotons
electrons
neutrinos
PS Proton Synchrotron
SPS Super Proton Synchrotron
LHC Large Hadron Collider
AD Antiproton Decelerator
n-TOF Neutron Time Of Flight
AWAKE Advanced Wakefield Experiment
CTF3 CLIC Test Facility 3

Missing Energy



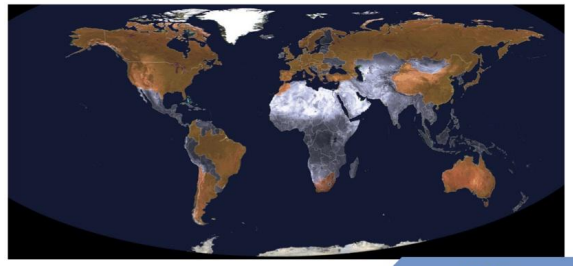
Data collection at 40 Megahertz:

between 1 to 2 megabytes per interaction

60-80 terabytes of data generated per second

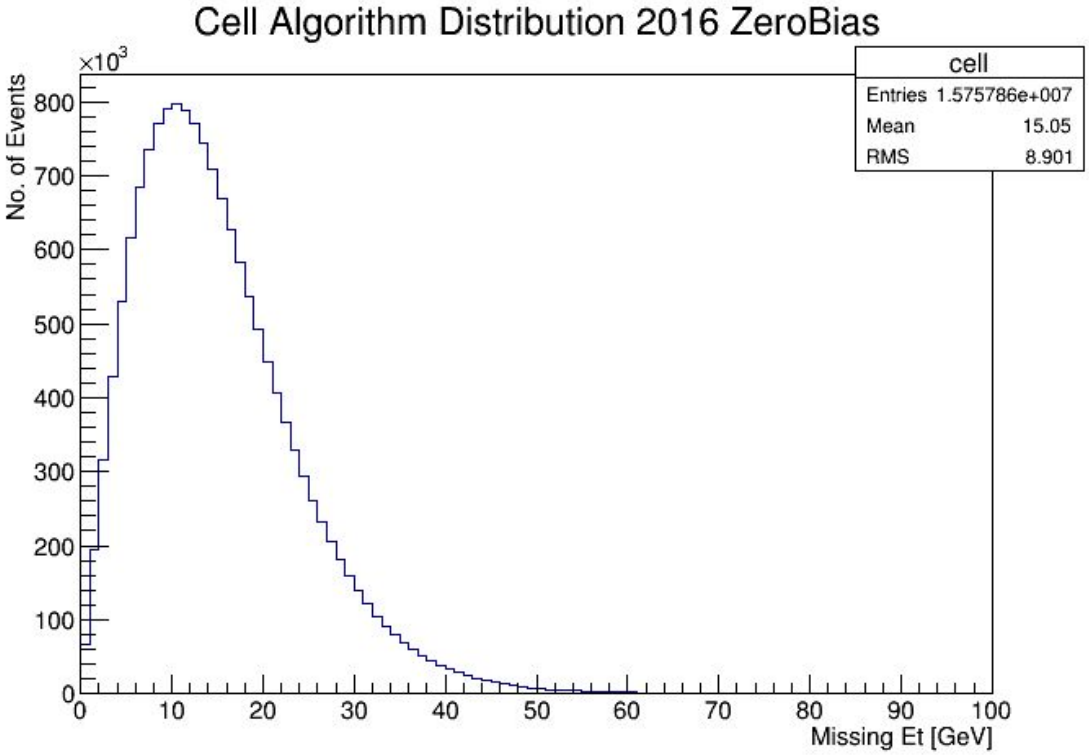
Offline Data Processing

Trigger Data Processing



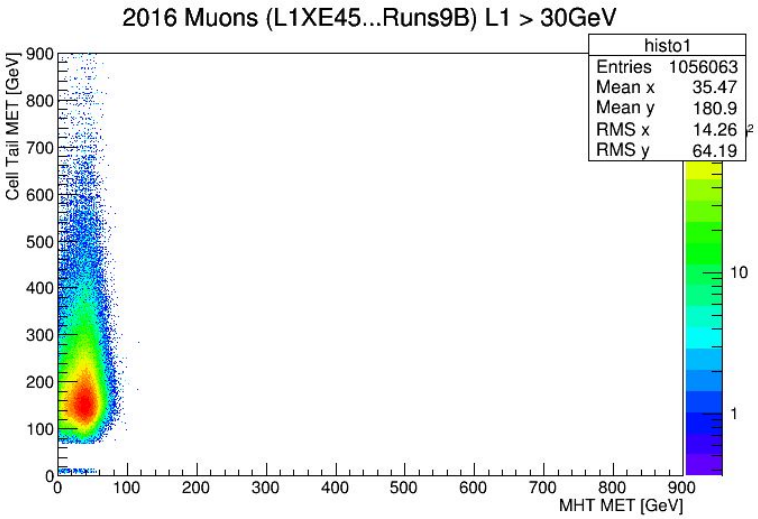
What is a Trigger?

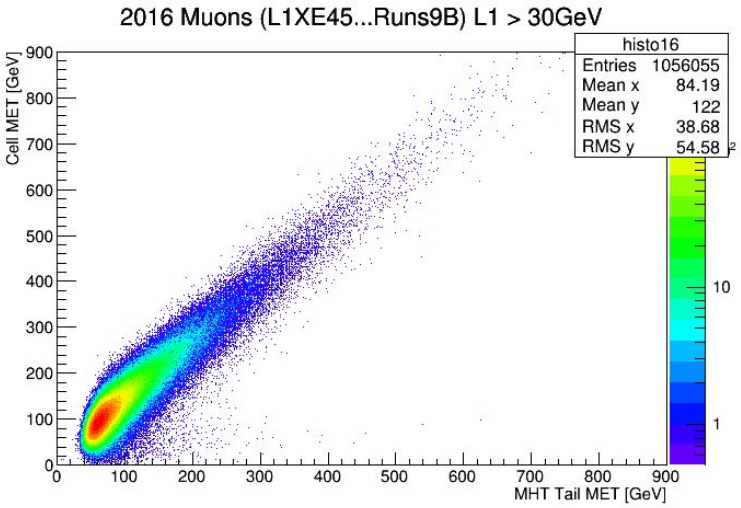
An algorithm used to calculate missing energy and discriminate events

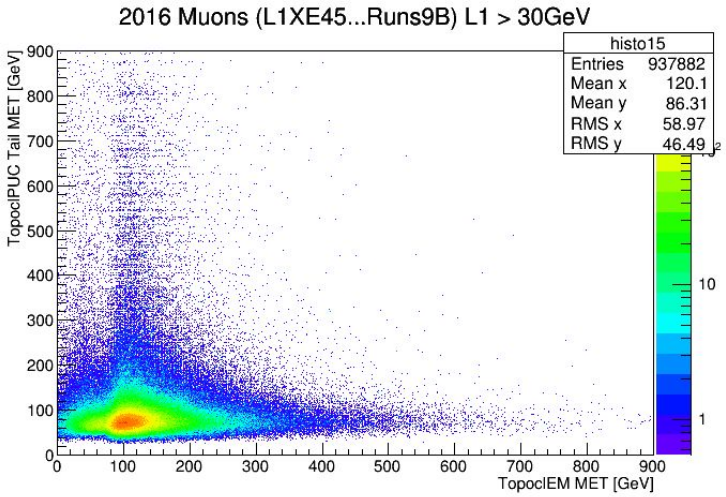


Correlation

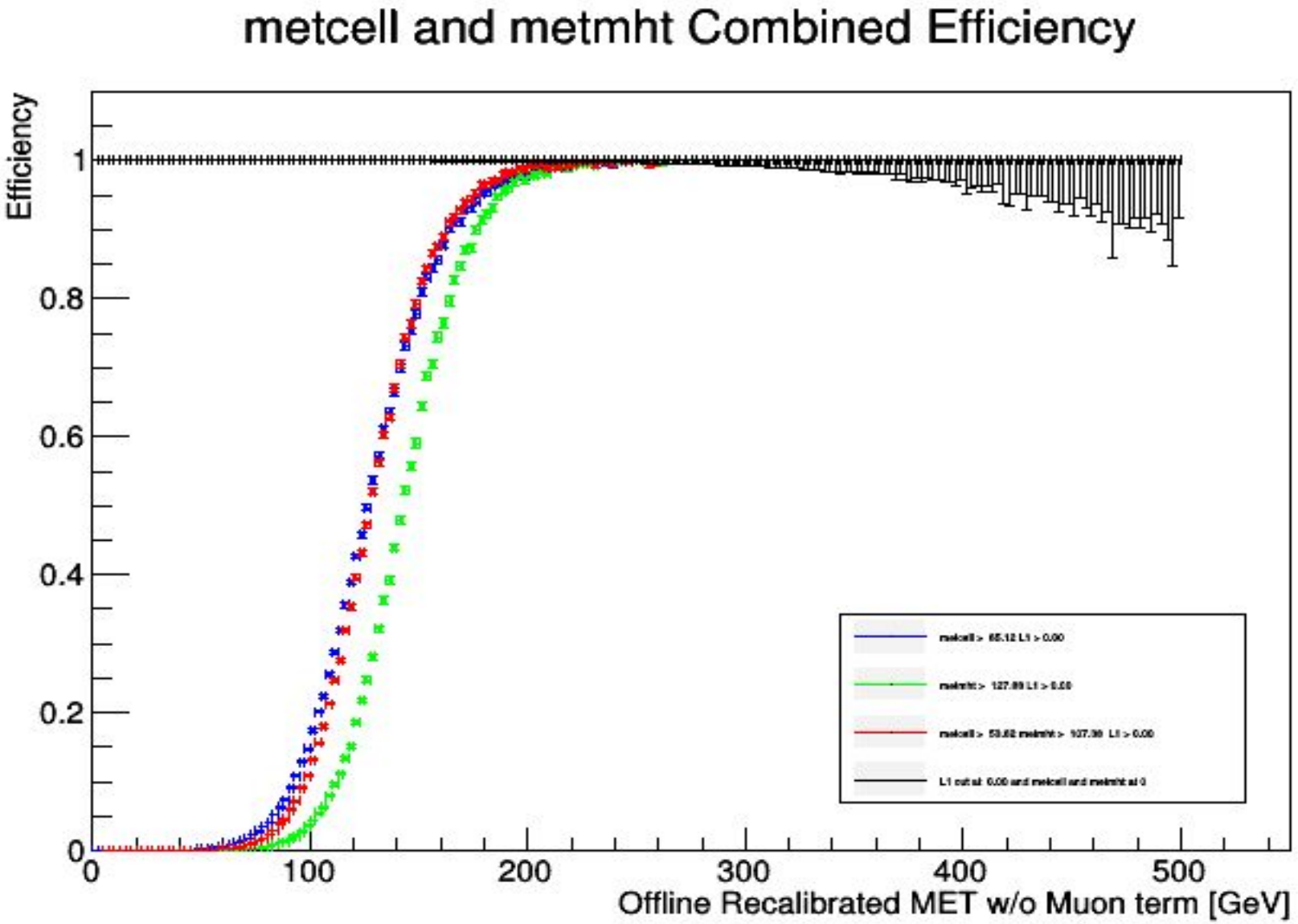
Potential to do better combined if







What is Efficiency?

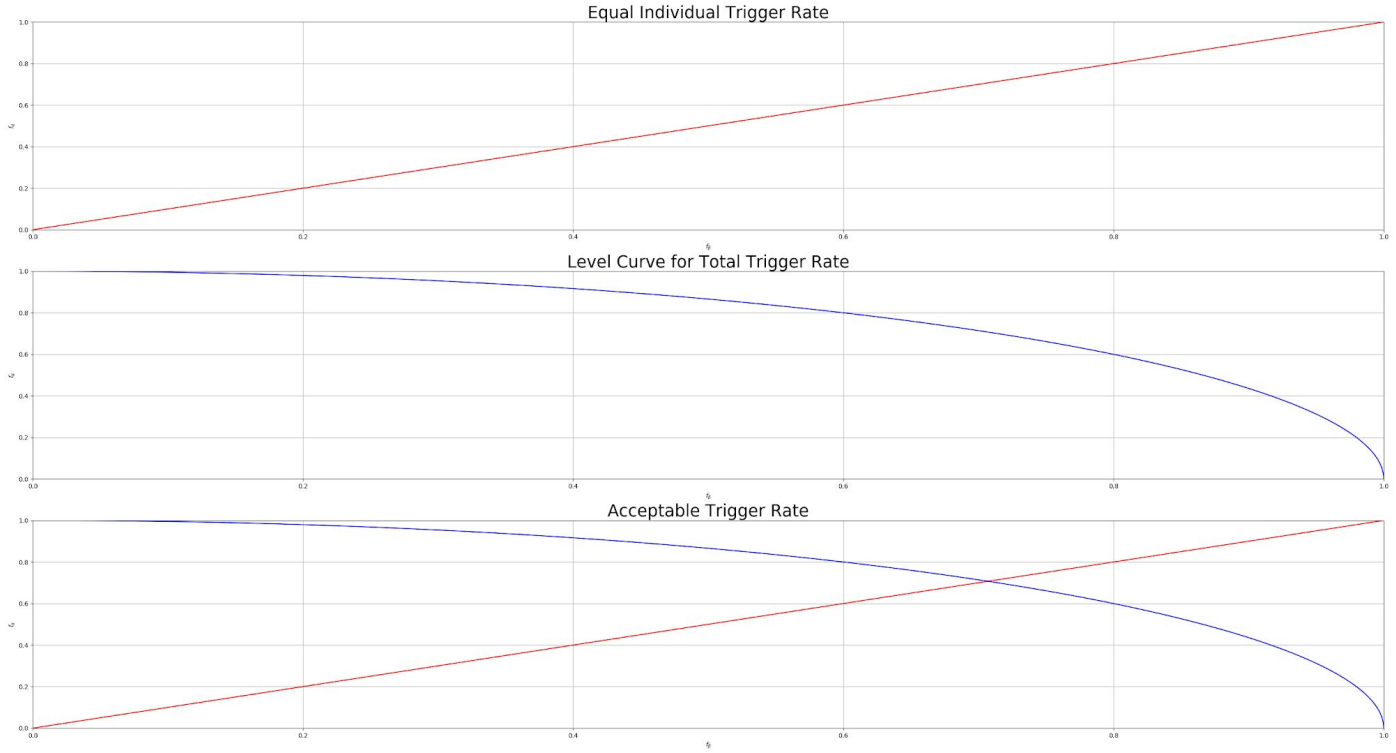


Method

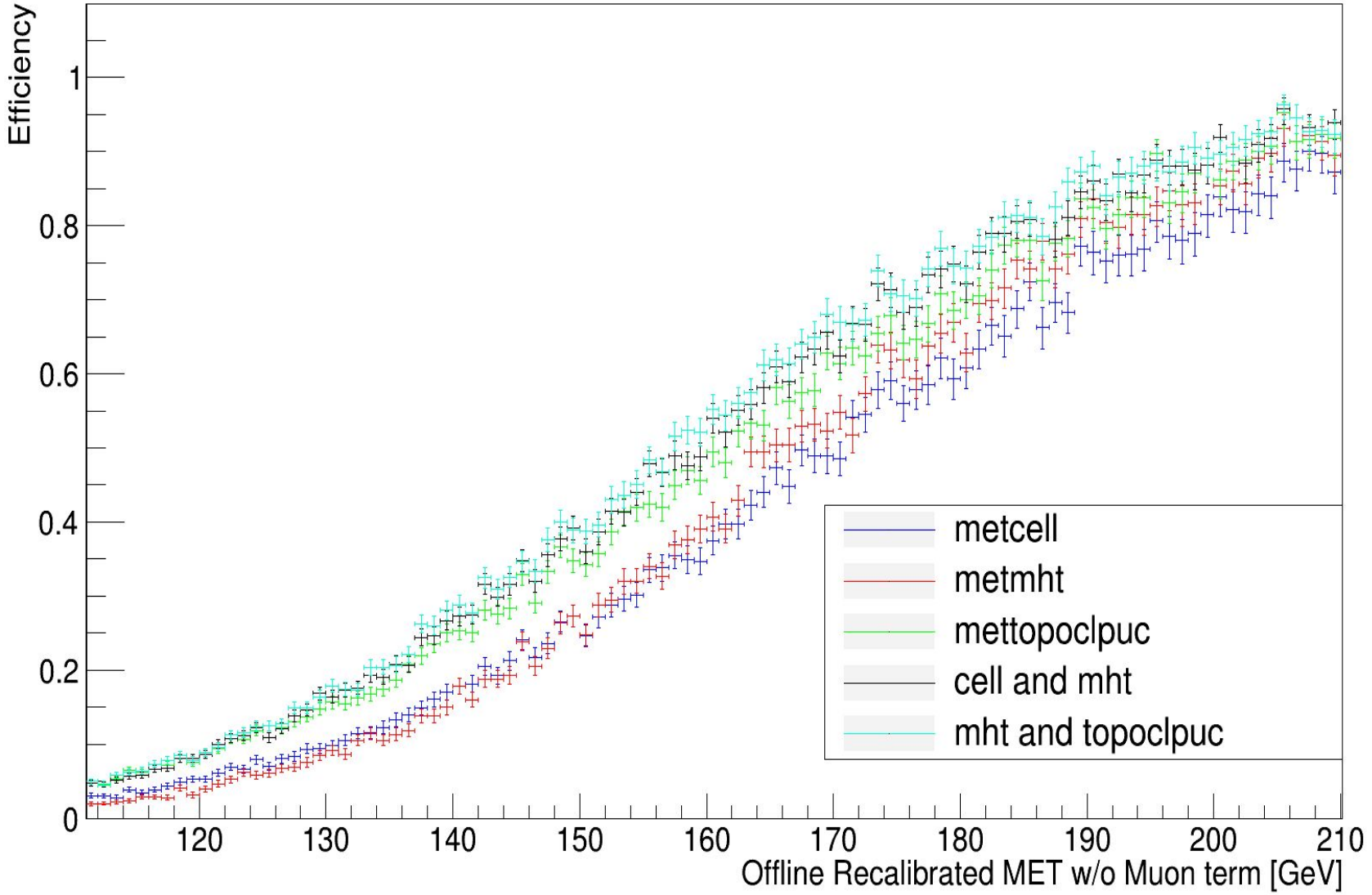
Constraint on trigger rate

Constraint on individual trigger rate

Bisection Algorithm



Efficiency Best Combination vs Best Individual



Conclusion

Our study showed that one can indeed see an improvement in efficiency by combining two different algorithms.

The ATLAS experiment is currently using three such combined algorithms after our work on the efficiency of combined algorithms versus individual ones