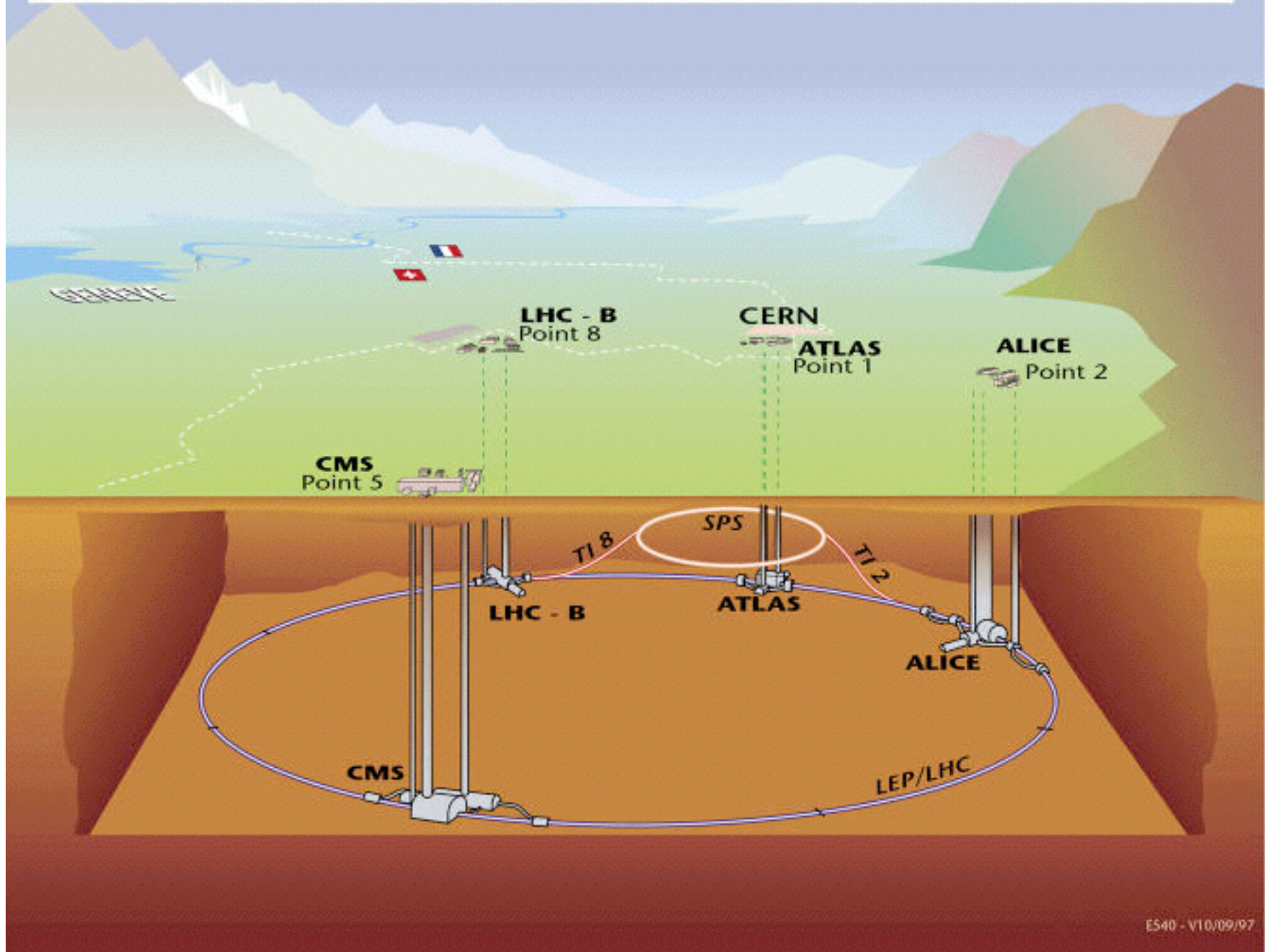


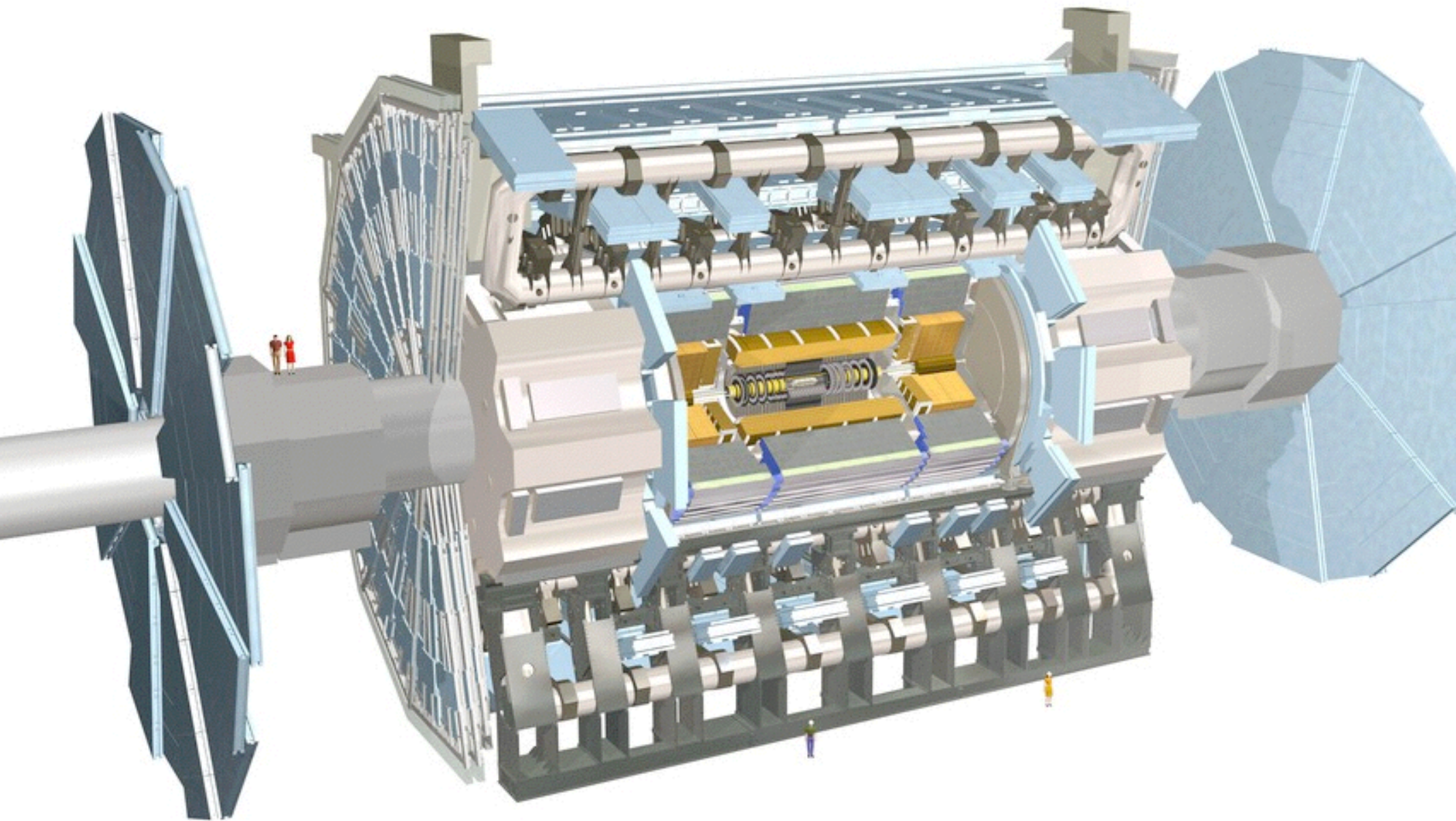
Physics 450:
Particle Physics at the Large
Hadron Collider

Sept. 25 lecture: figures

M. E. Peskin
Fall Term 2008

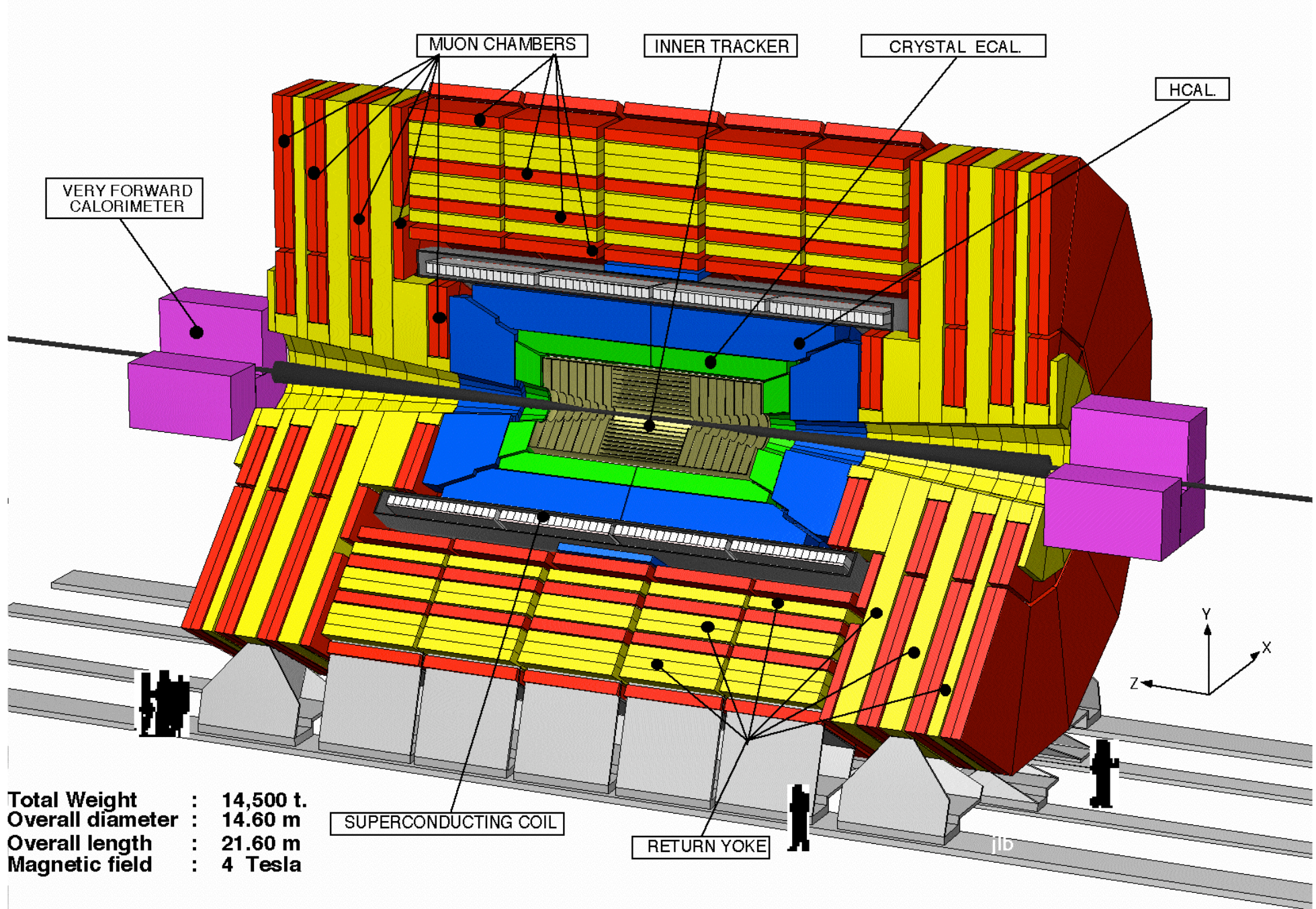
Overall view of the LHC experiments.



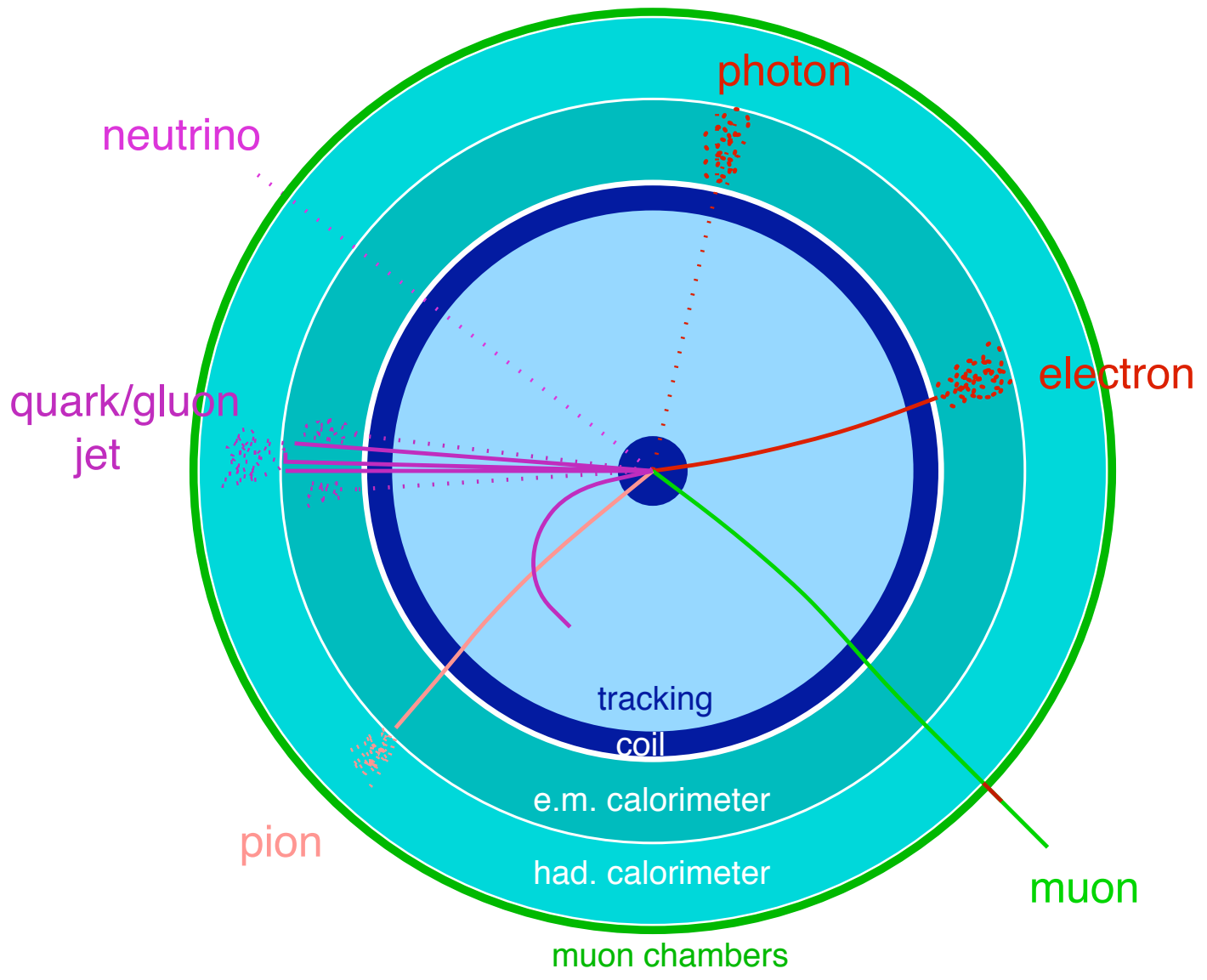


the ATLAS experiment

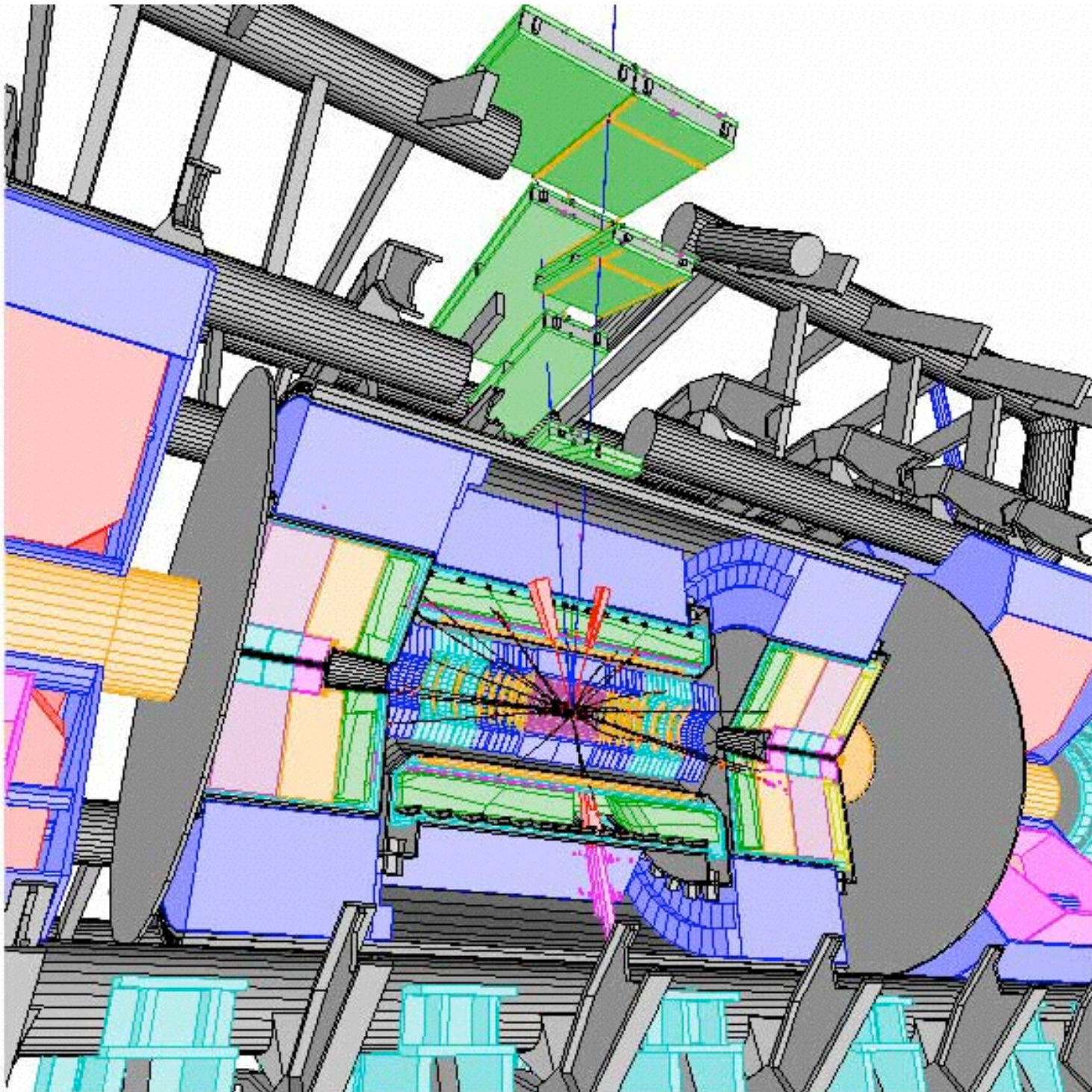
A Compact Solenoidal Detector for LHC



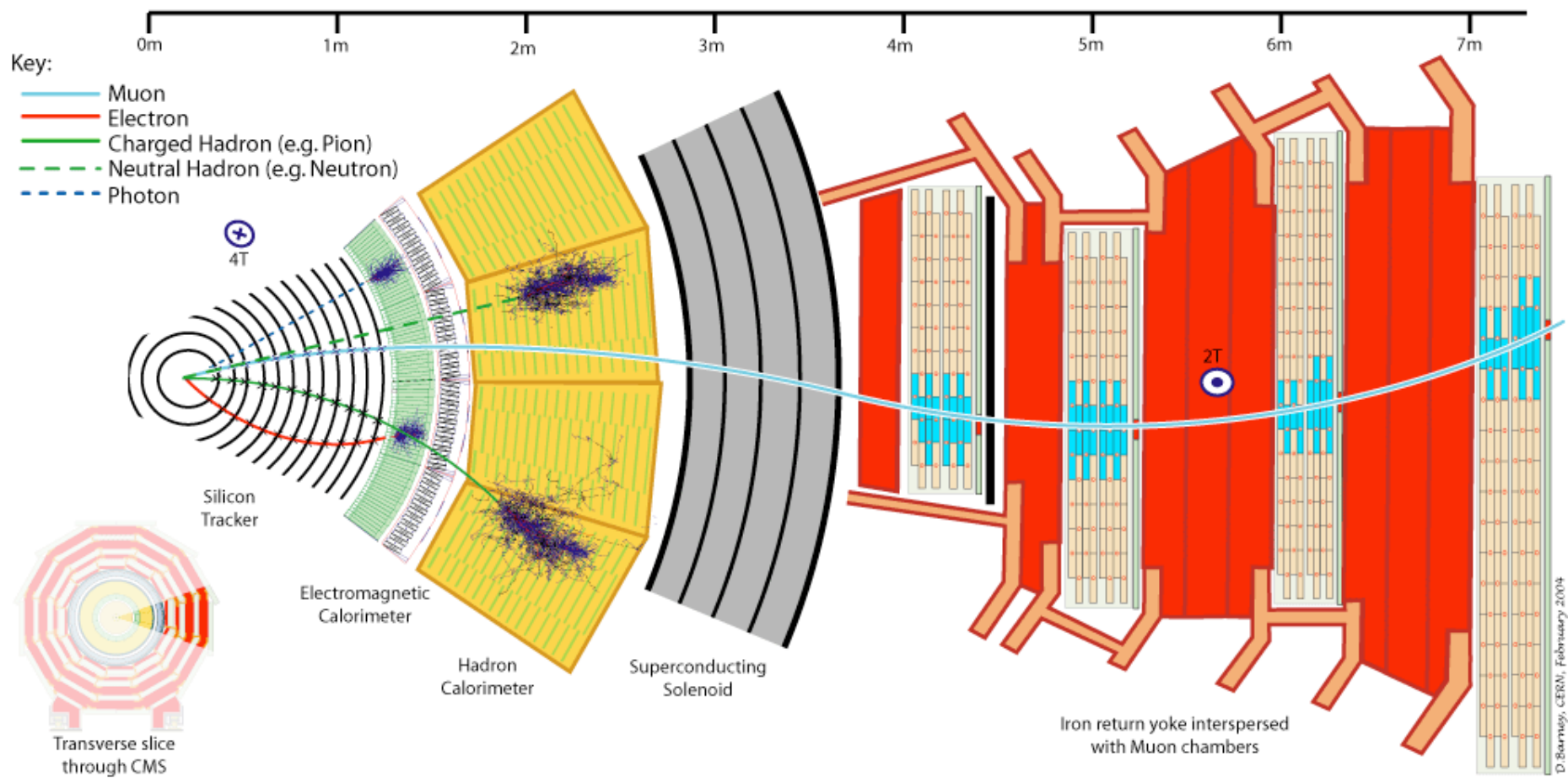
Total Weight : 14,500 t.
Overall diameter : 14.60 m
Overall length : 21.60 m
Magnetic field : 4 Tesla



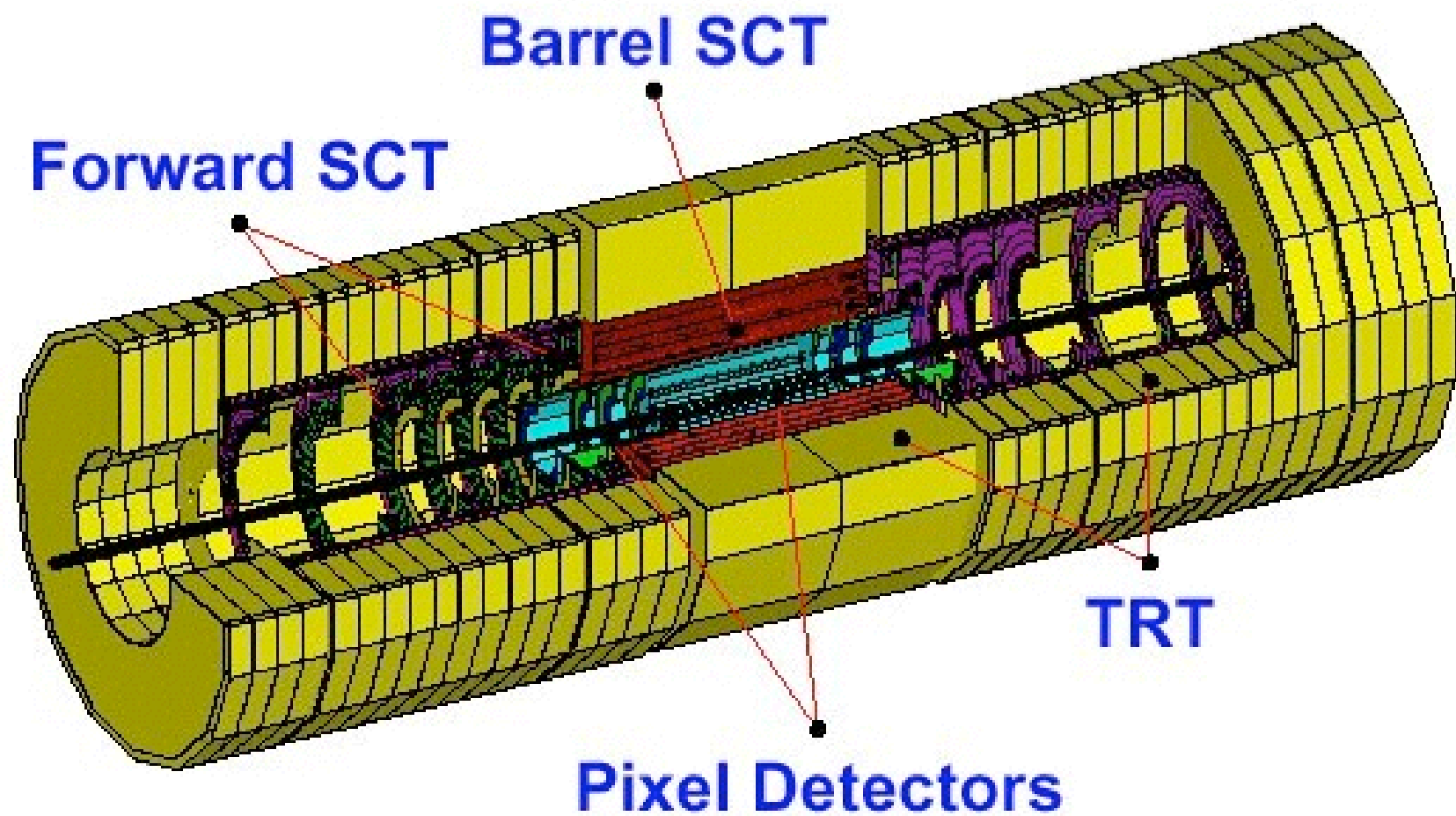
Conway



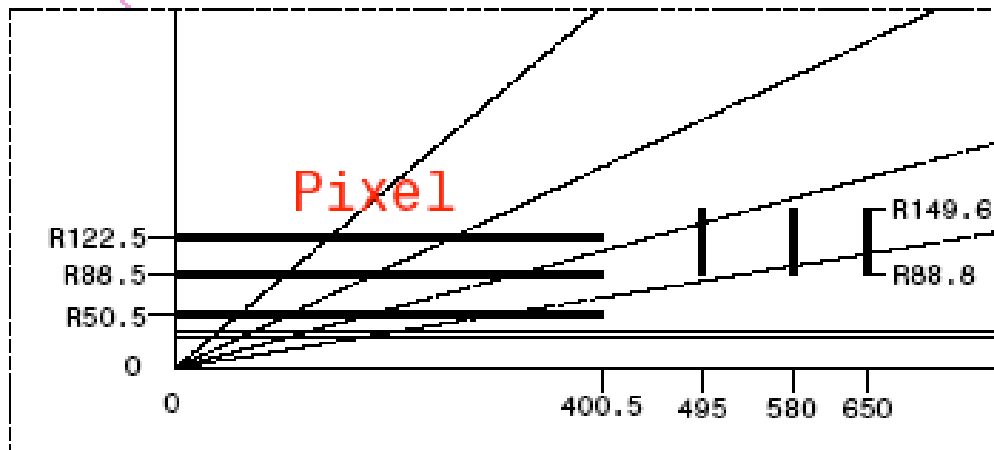
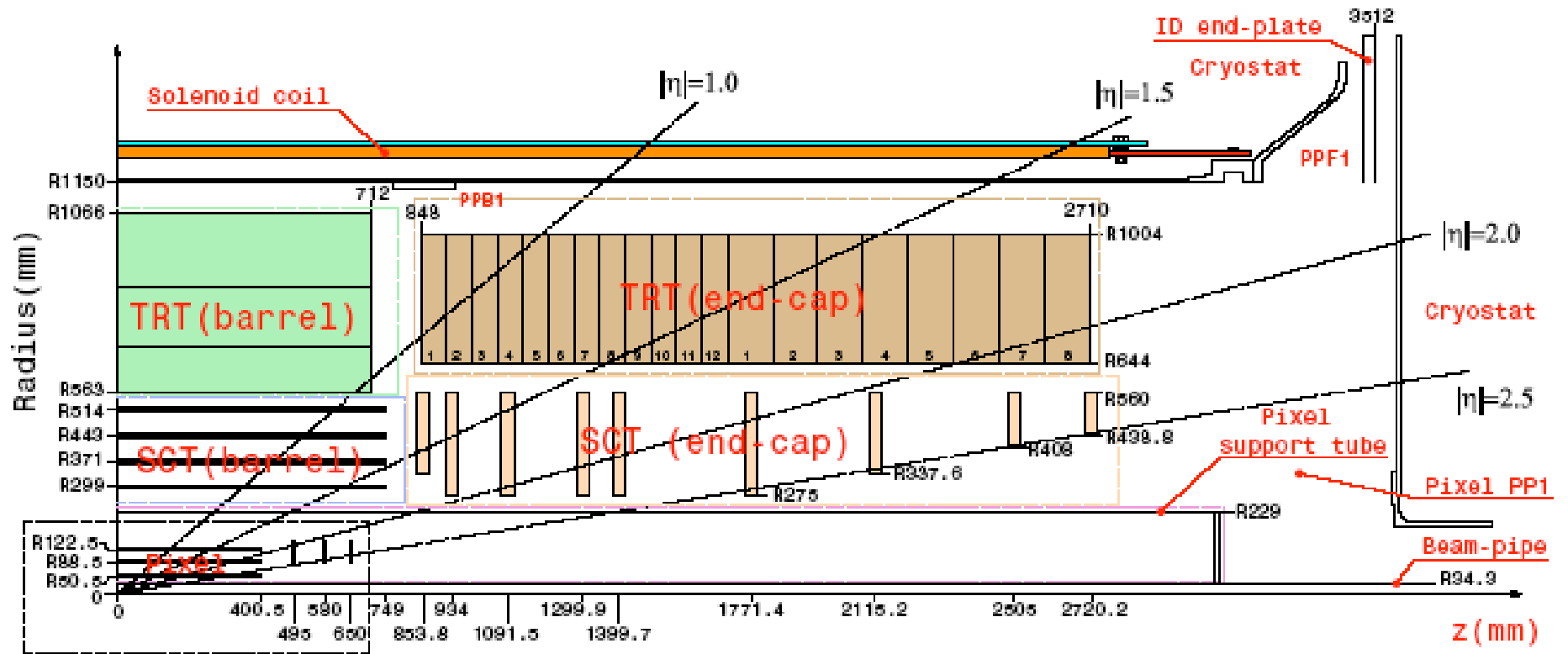
simulated
high-energy
event in ATLAS



particle identification in CMS

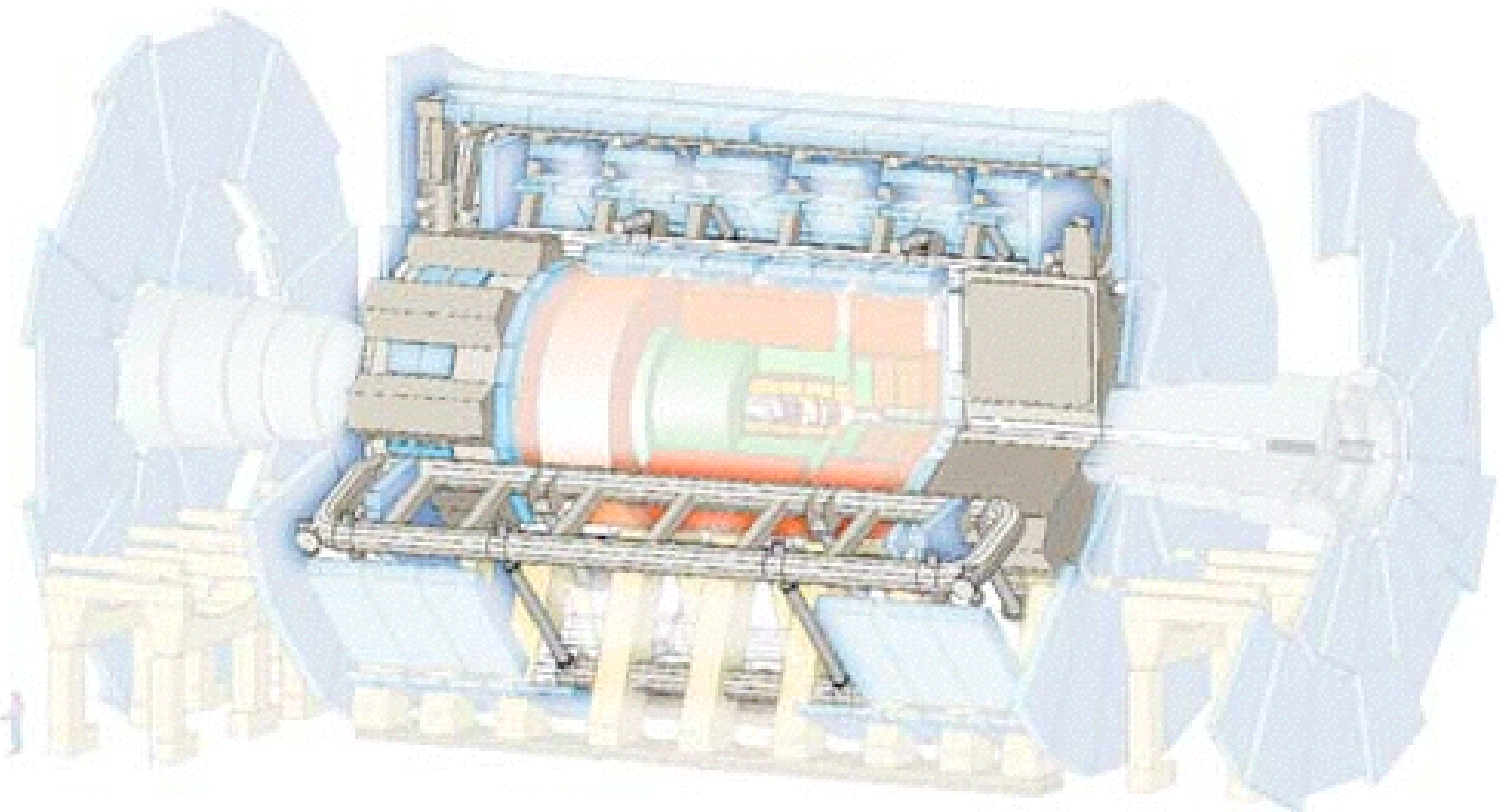


ATLAS tracking detector

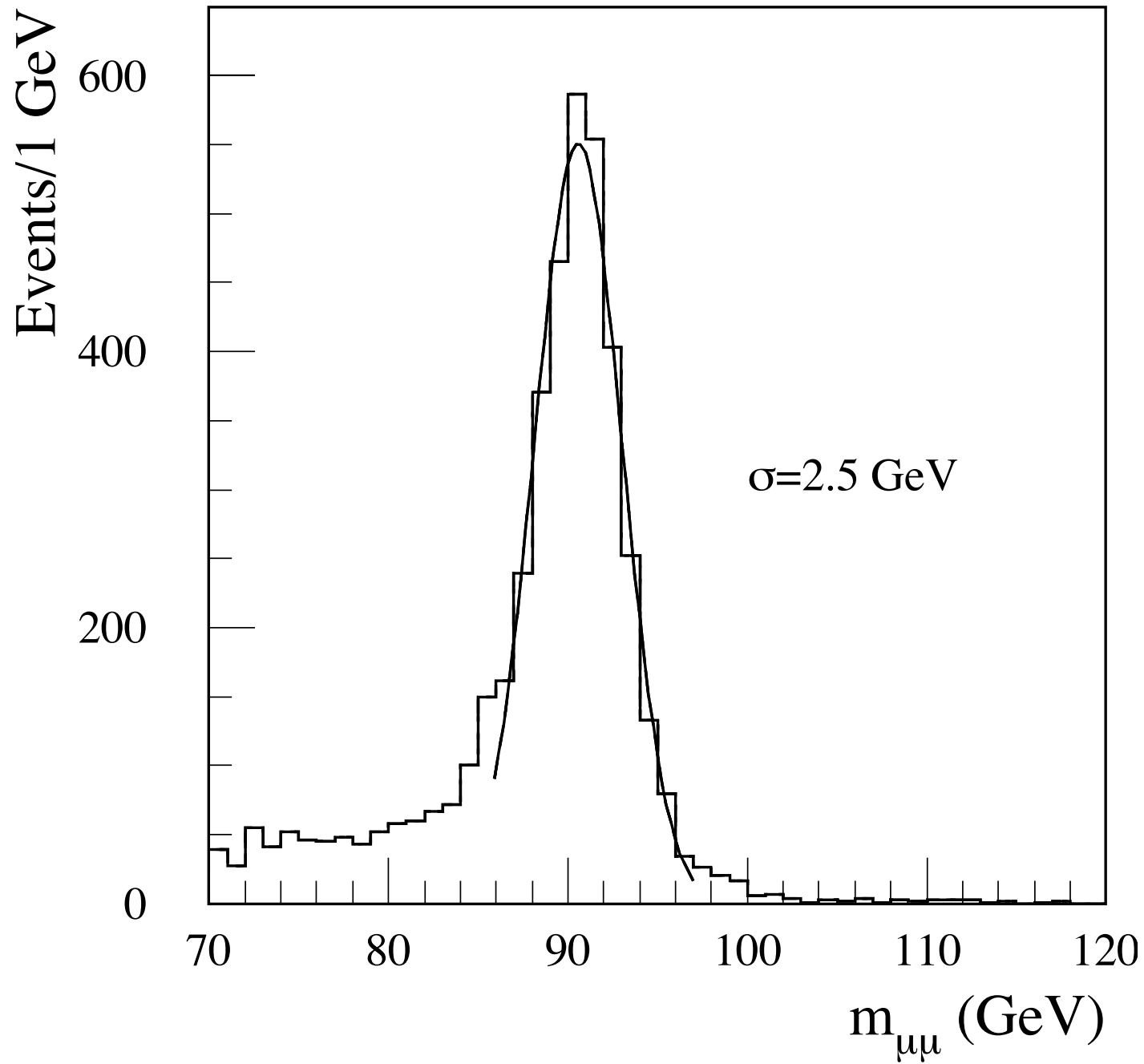


Envelopes

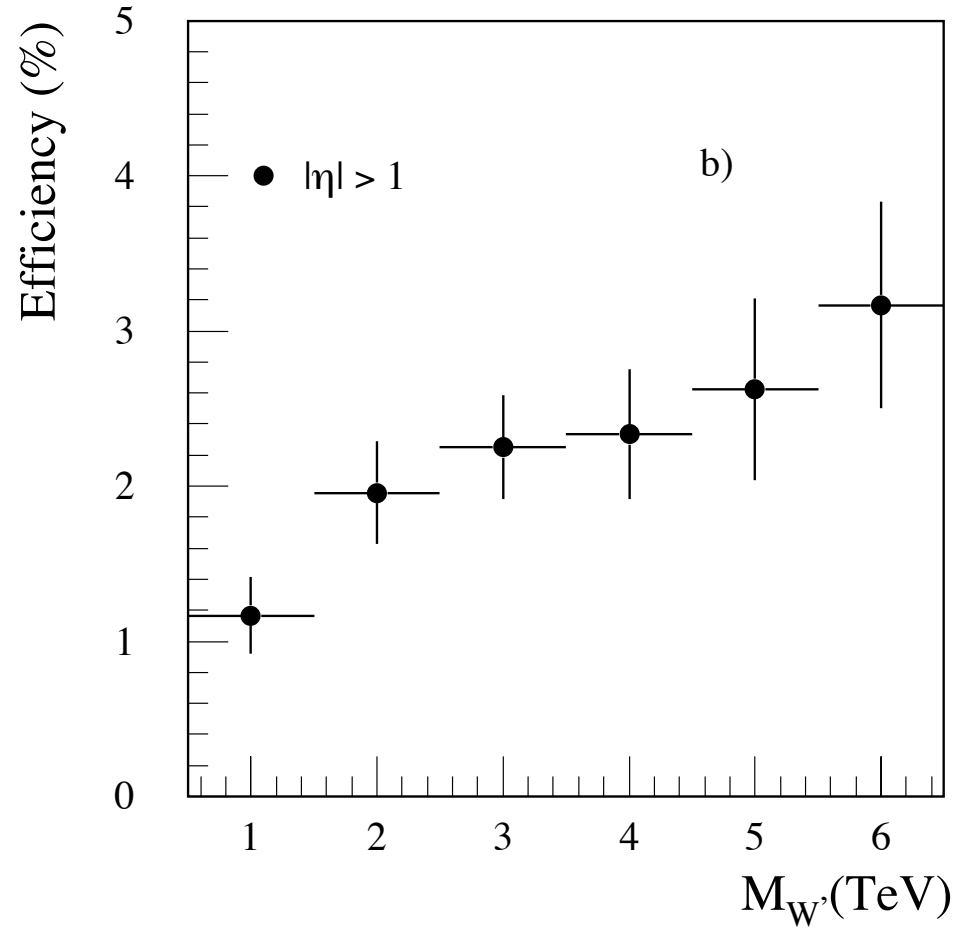
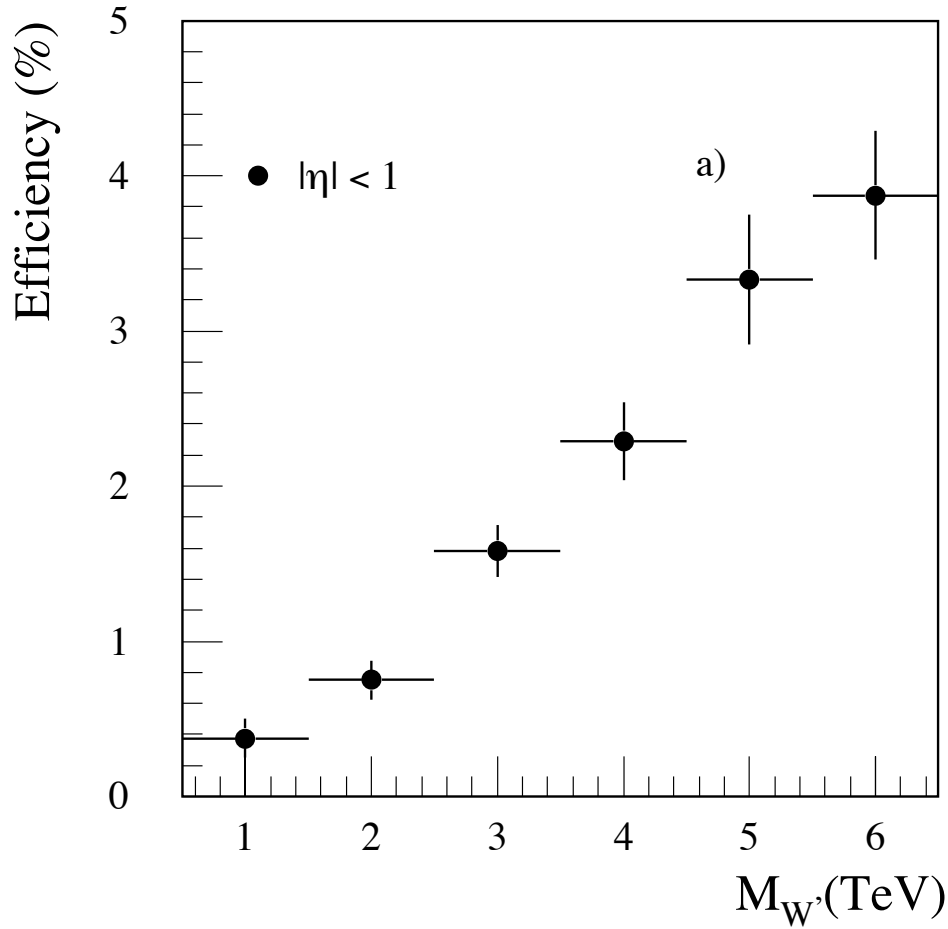
Pixel	---	$45.5 < R < 242 \text{ mm}$ $ Z < 3092 \text{ mm}$
SCT barrel	---	$255 < R < 549 \text{ mm}$ $ Z < 805 \text{ mm}$
SCT end-cap	---	$251 < R < 610 \text{ mm}$ $810 < Z < 2797 \text{ mm}$
TRT barrel	---	$554 < R < 1082 \text{ mm}$ $ Z < 780 \text{ mm}$
TRT end-cap	---	$617 < R < 1106 \text{ mm}$ $827 < Z < 2744 \text{ mm}$



ATLAS toroidal-field muon spectrometer

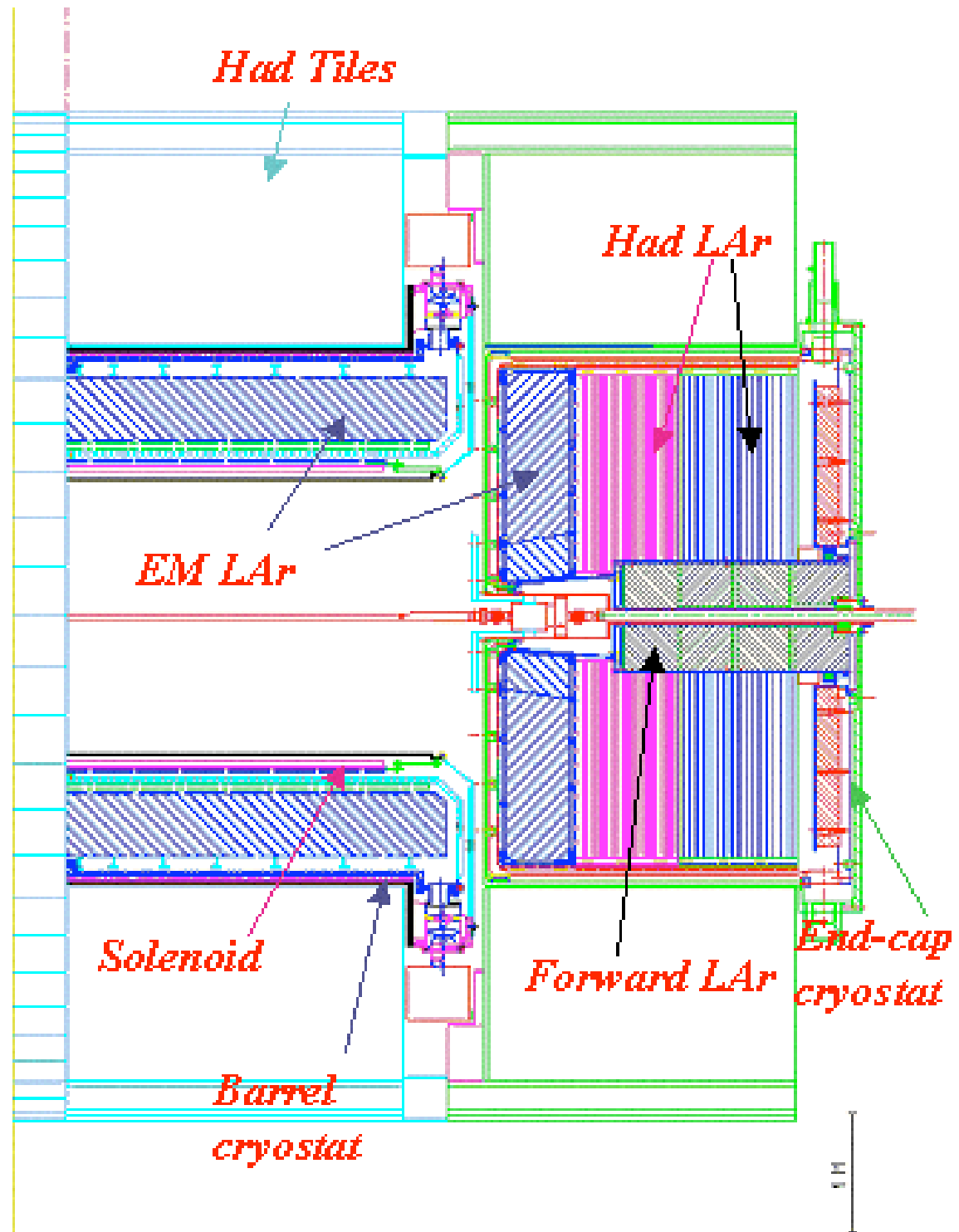


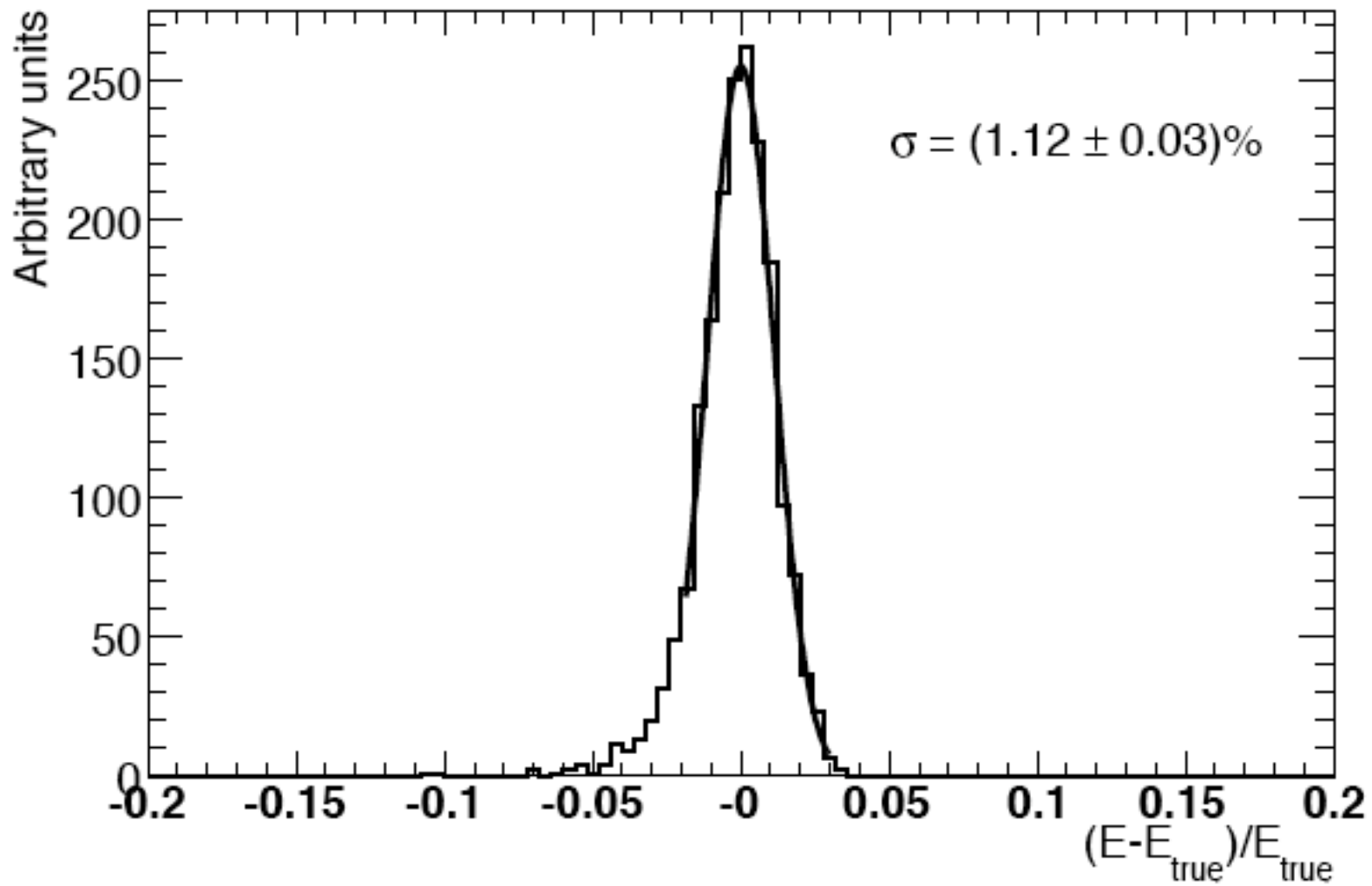
ATLAS - Z mass resolution in $Z \rightarrow \mu^+ \mu^-$



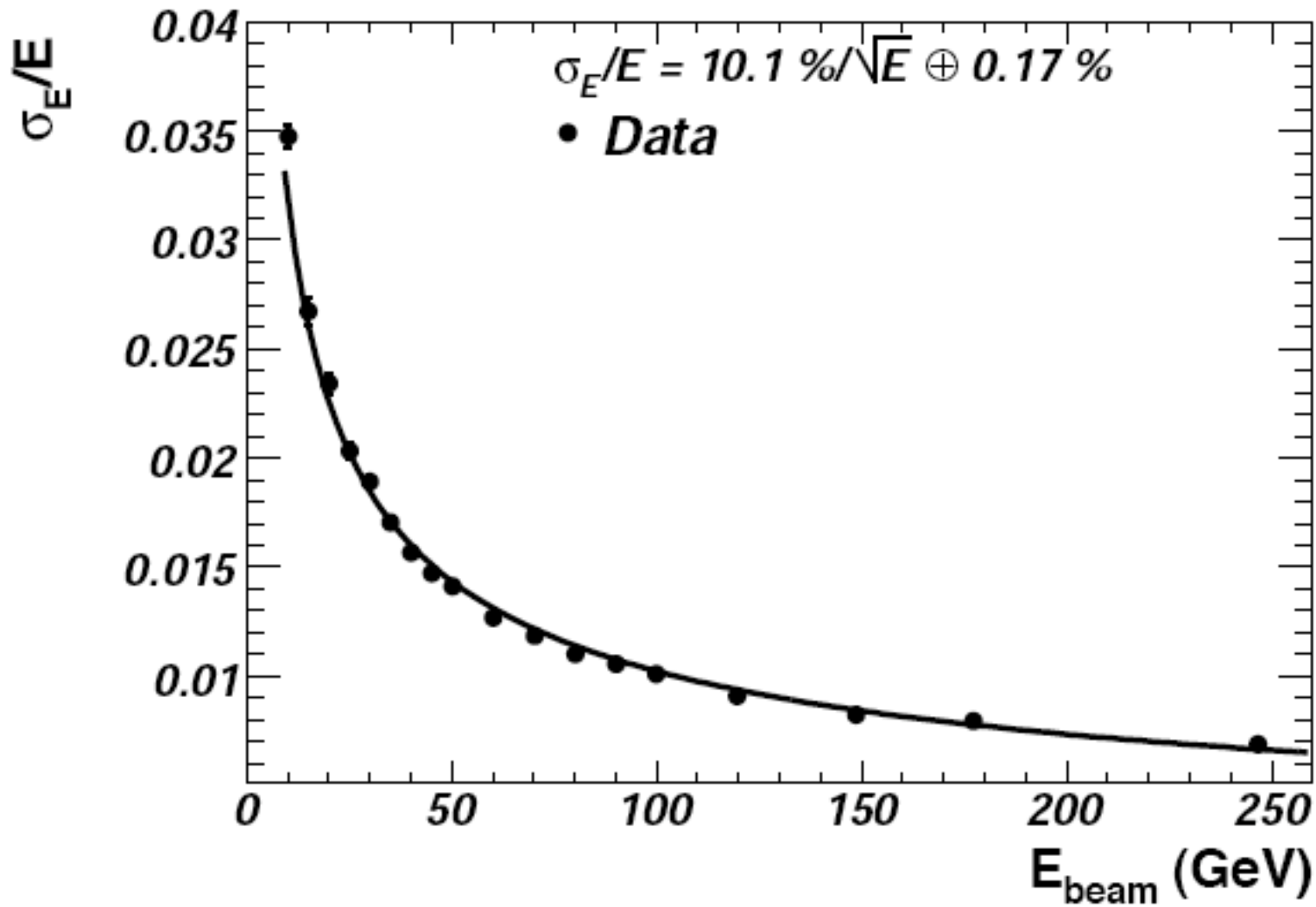
ATLAS - muon charge misidentification probability

ATLAS
liquid-argon
calorimeter

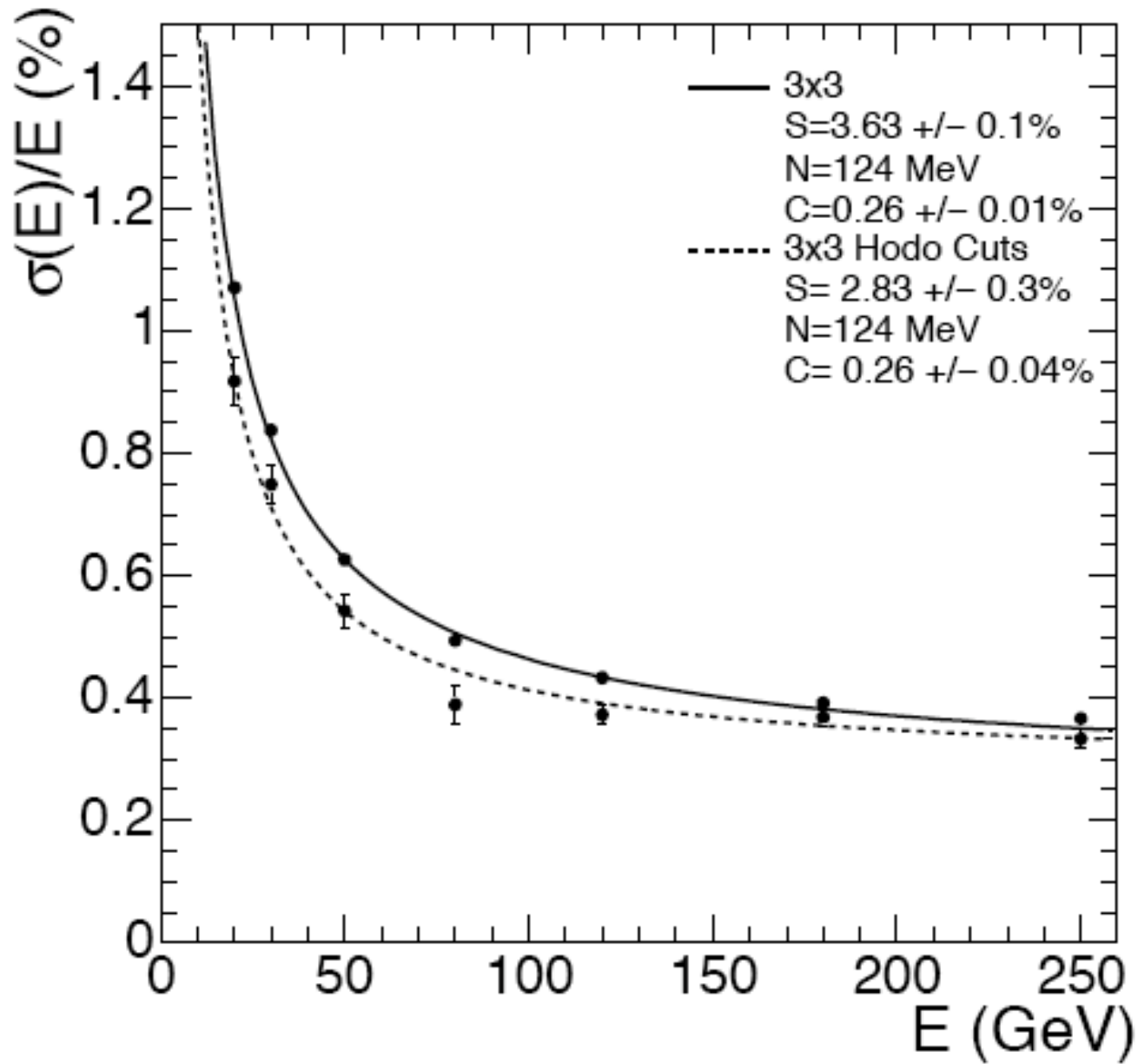




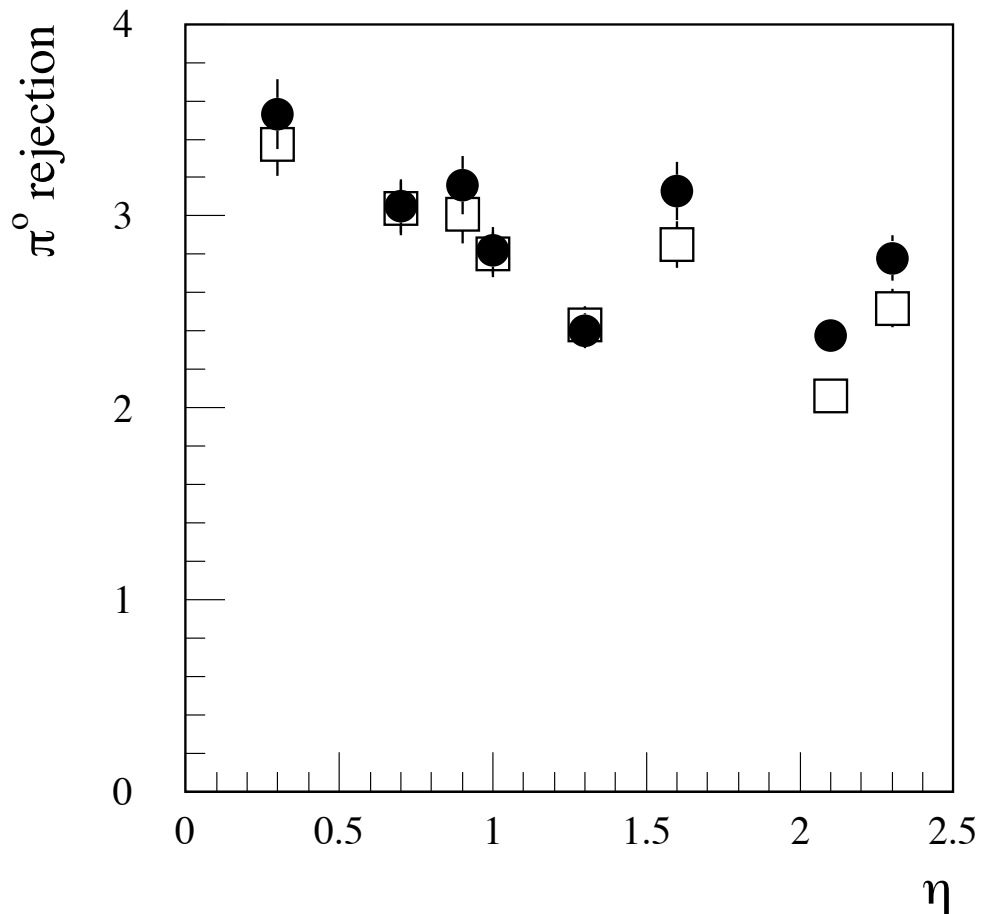
ATLAS: fractional energy measurement error for a central 100 GeV electron



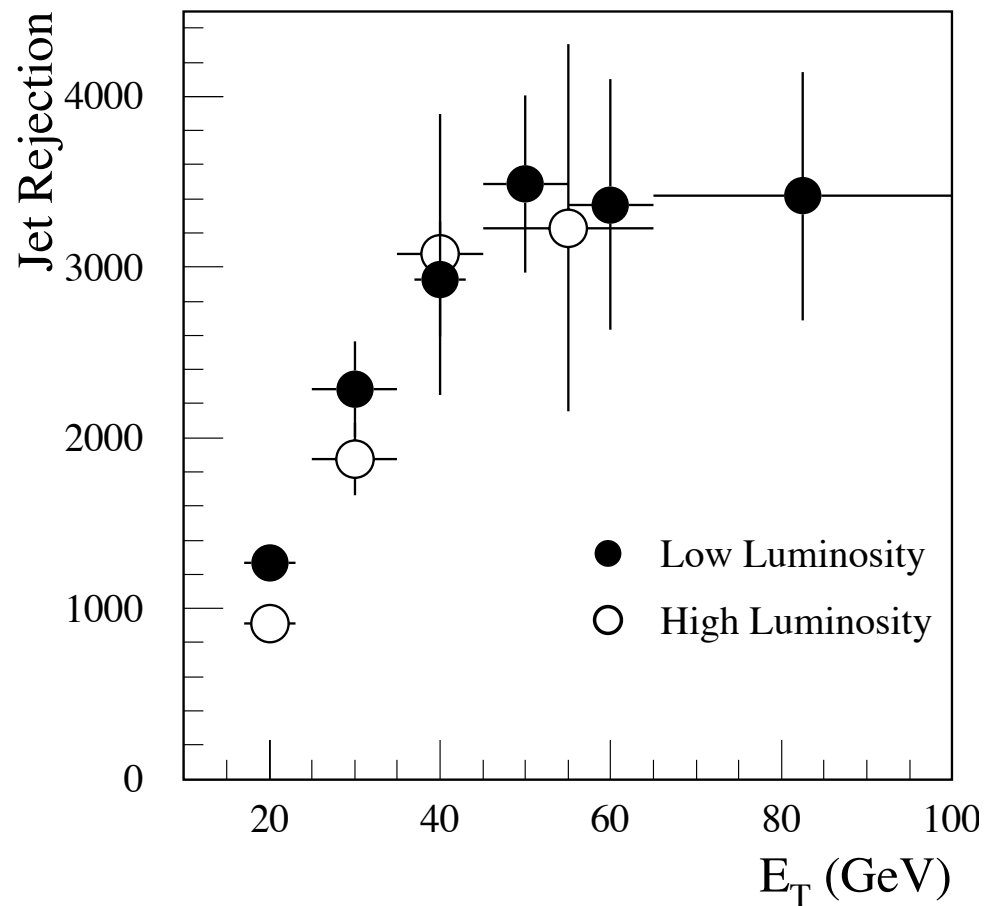
ATLAS liquid Ar calorimeter energy resolution for electrons.



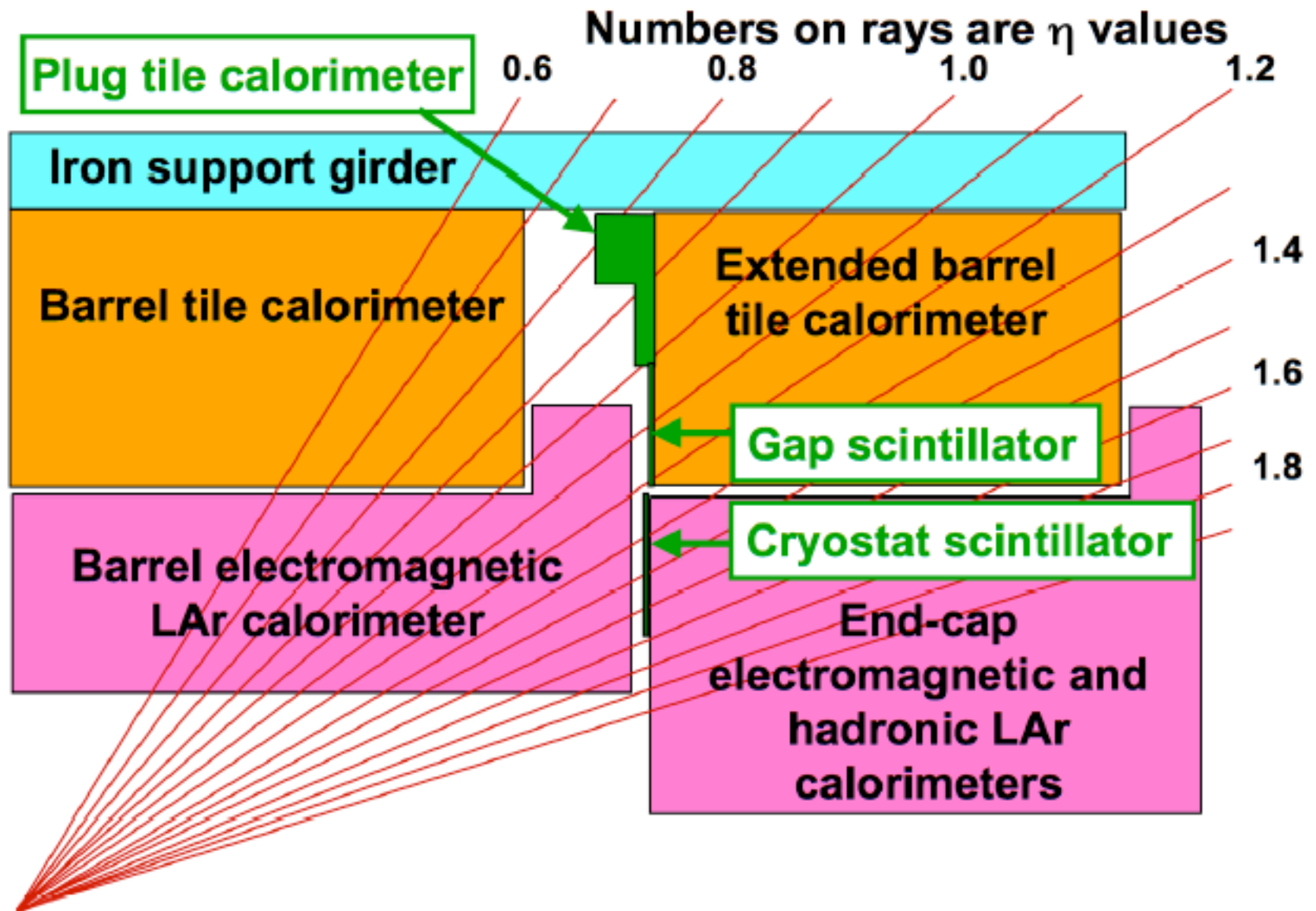
energy resolution of the CMS crystal calorimeter



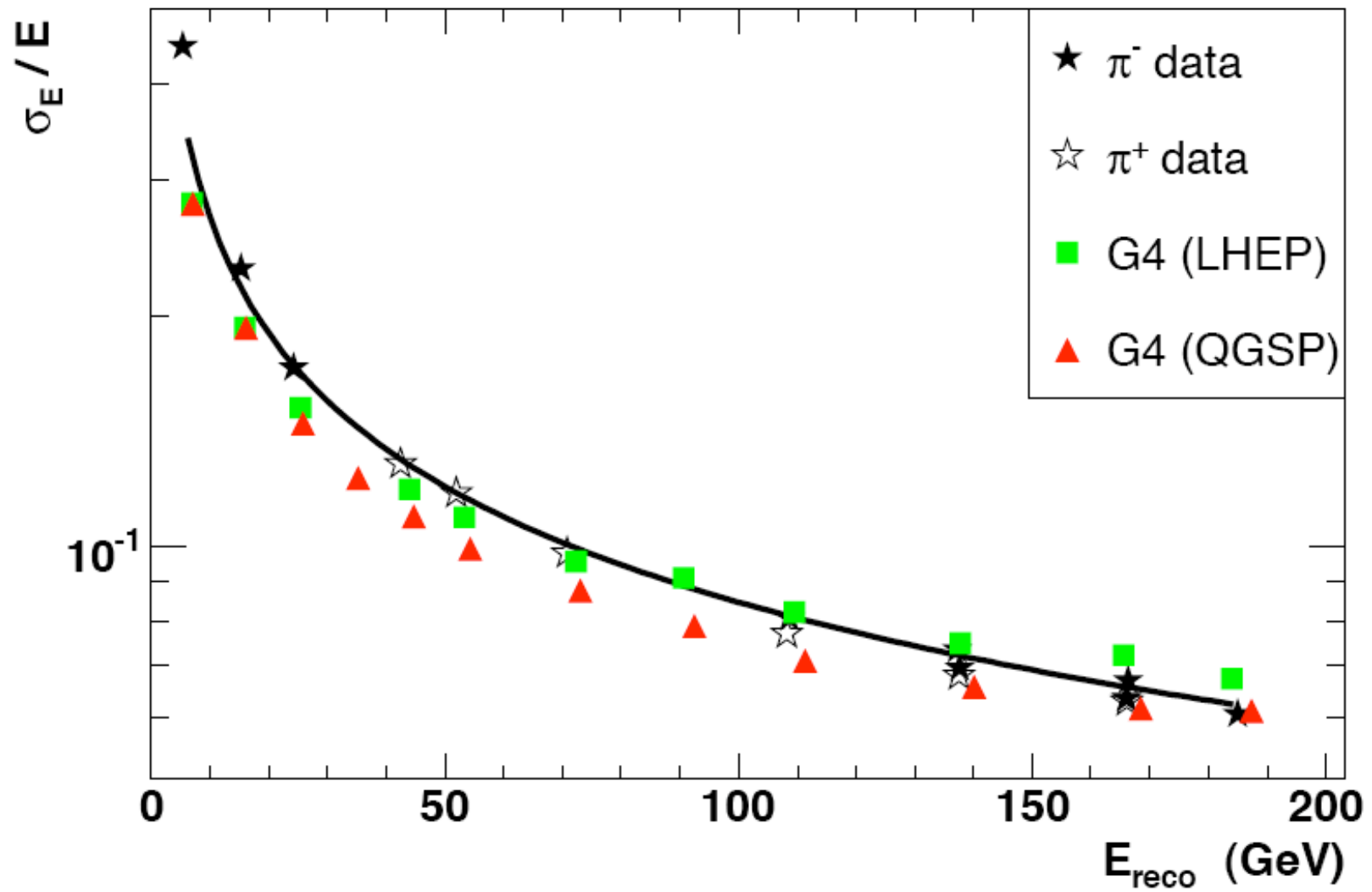
ATLAS - π^0 rejection in
photon detection
(50 GeV pions)



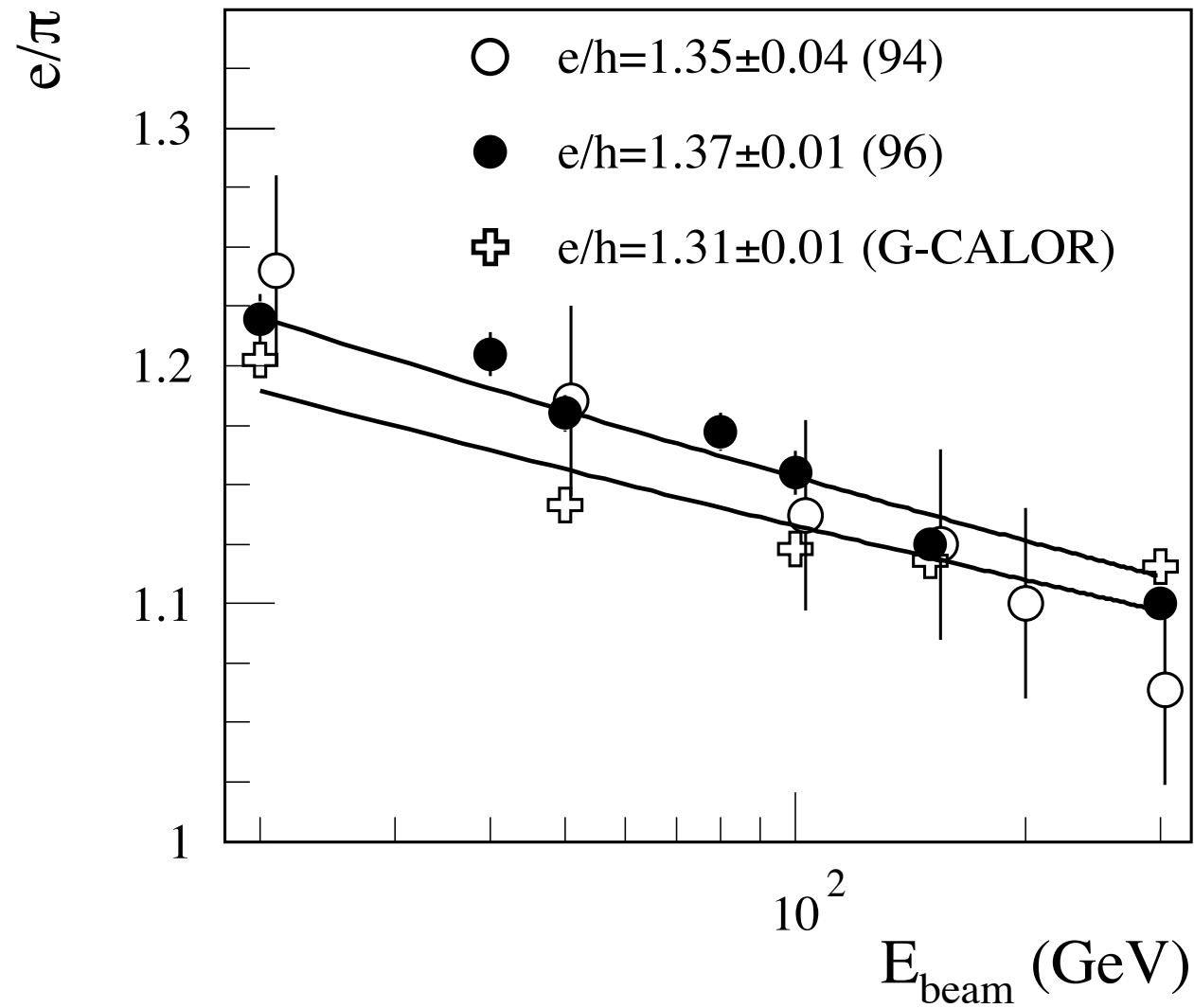
ATLAS - rejection factor
for jets in photon selection



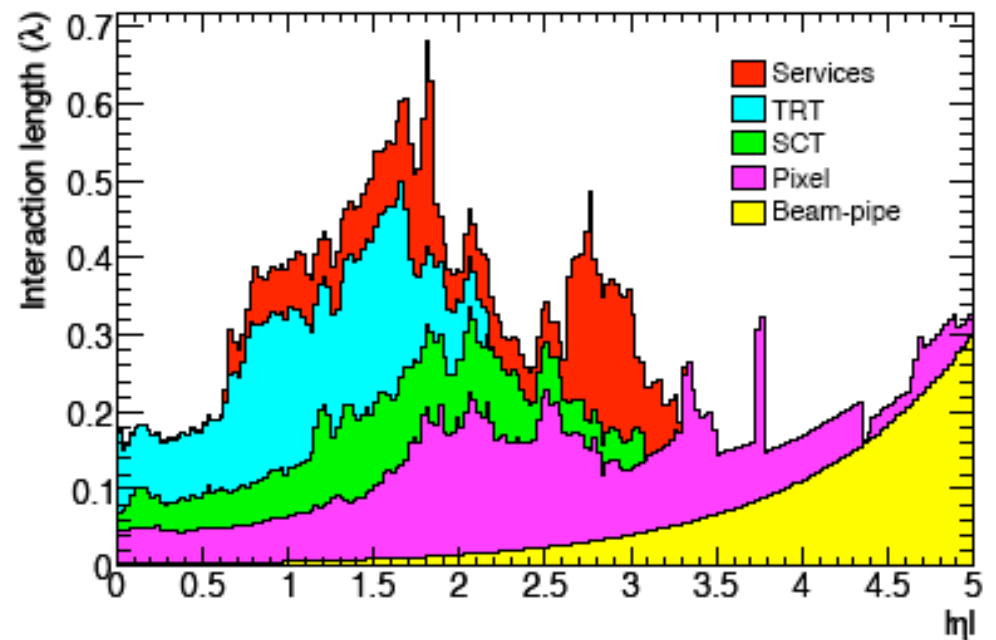
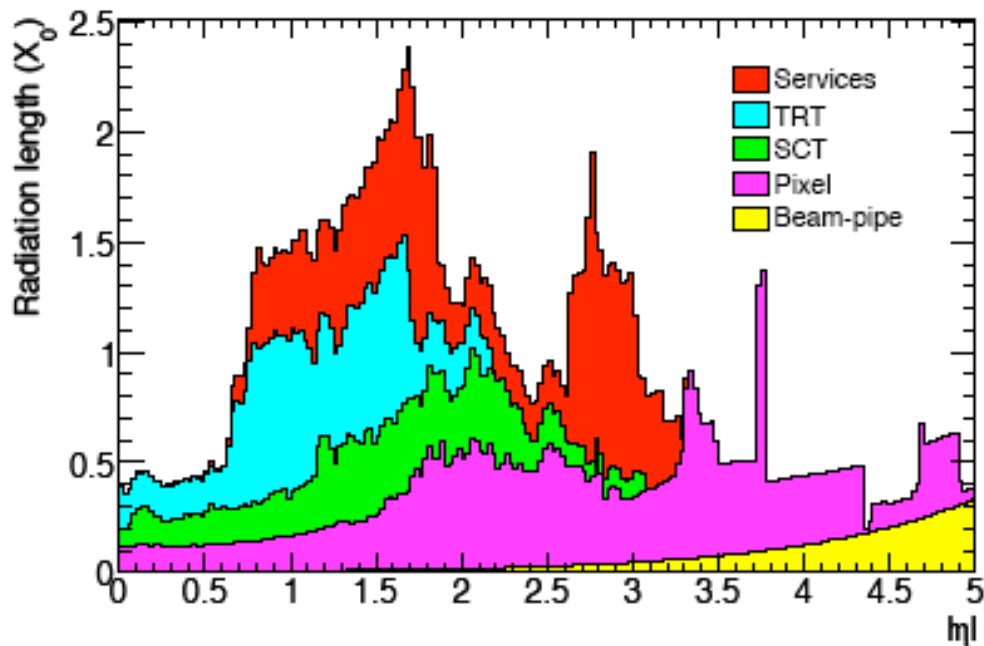
plan of the full ATLAS calorimeter system



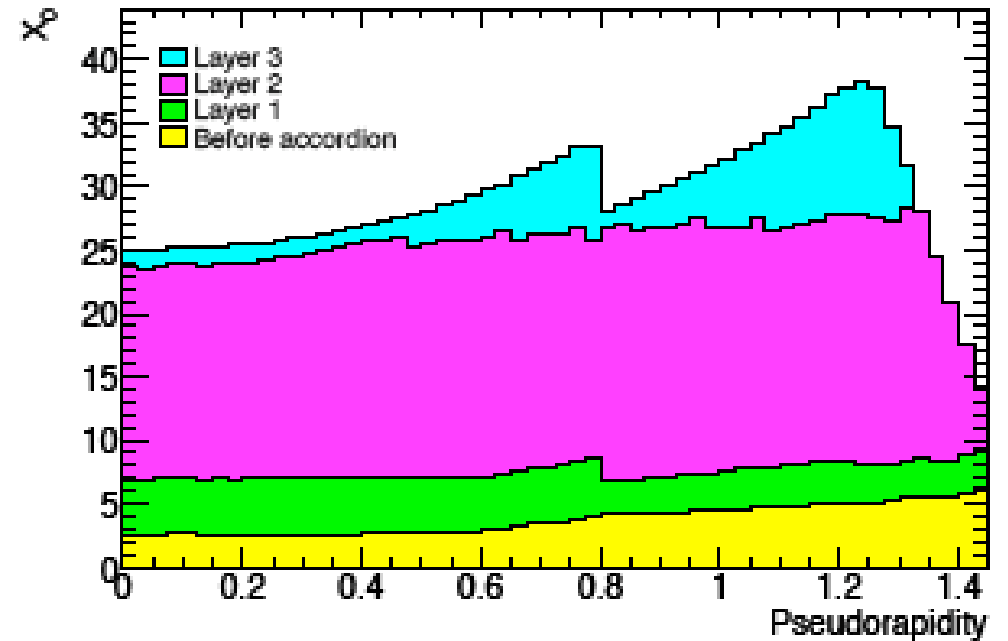
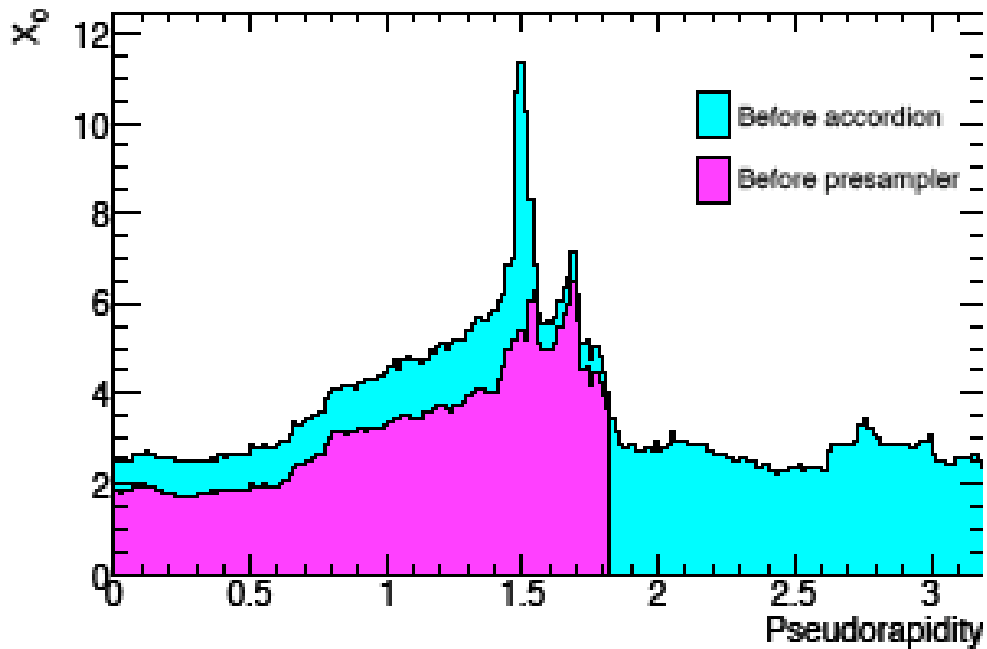
ATLAS calorimeter resolution for pions



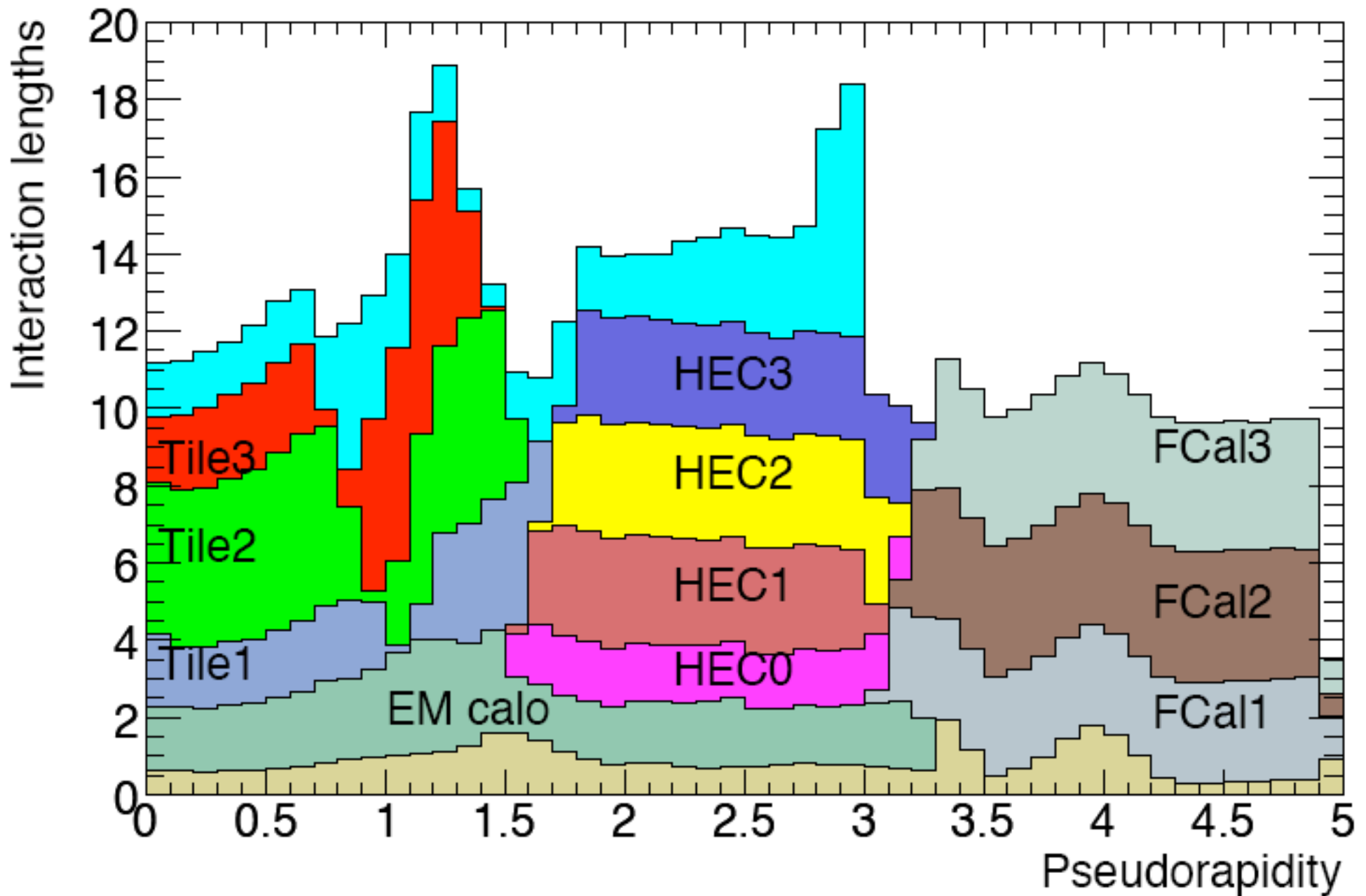
ATLAS calorimeter electron/pion response



ATLAS:
 material in the inner detector as a function of
 pseudorapidity

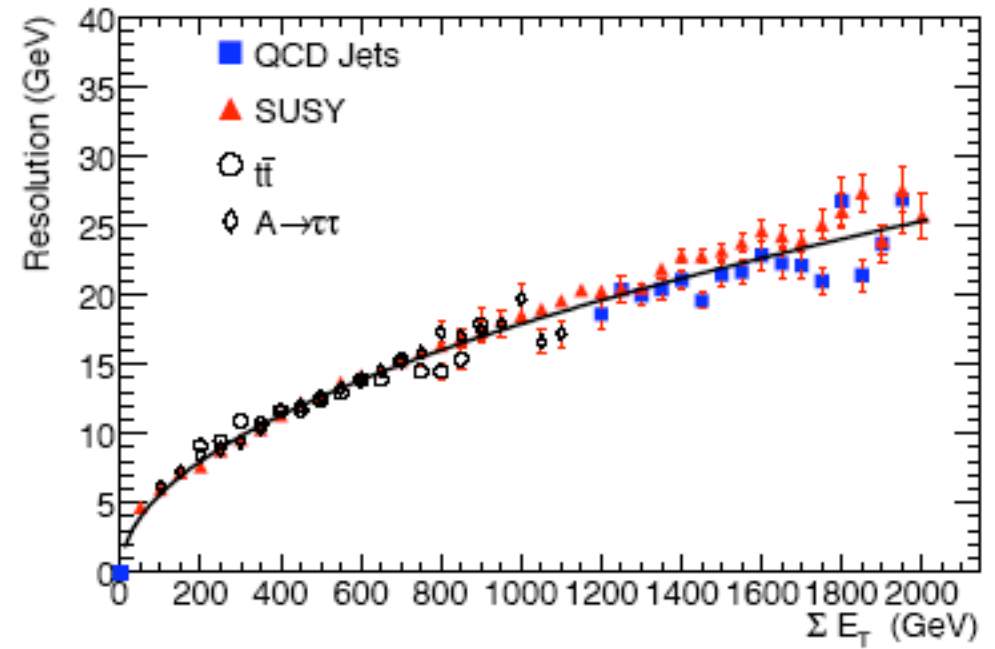
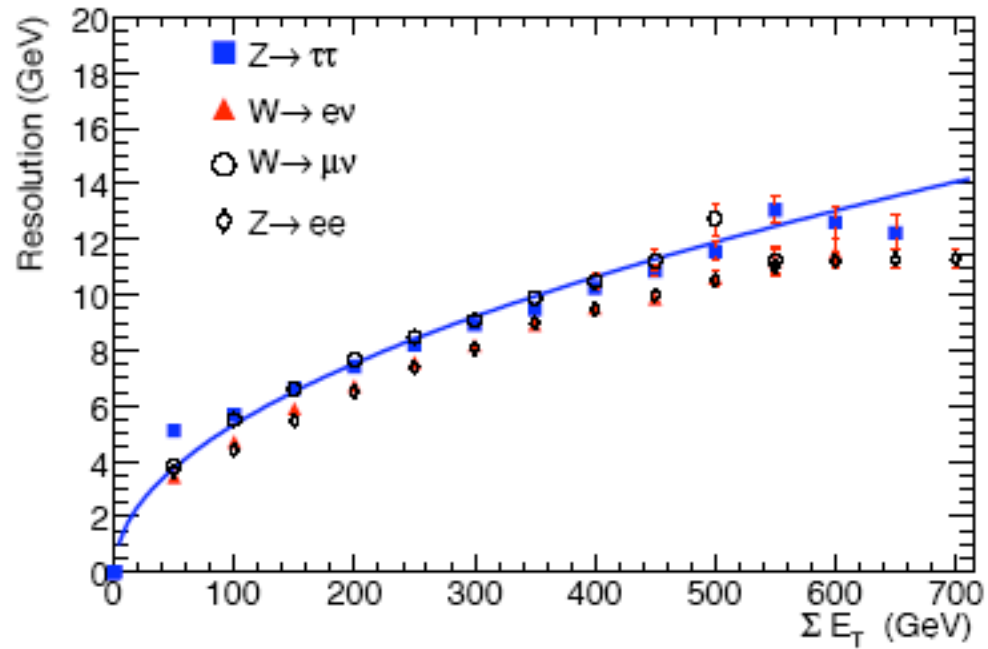


ATLAS:
 radiation lengths of material in front of and within the
 EM calorimeter, as a function of pseudorapidity

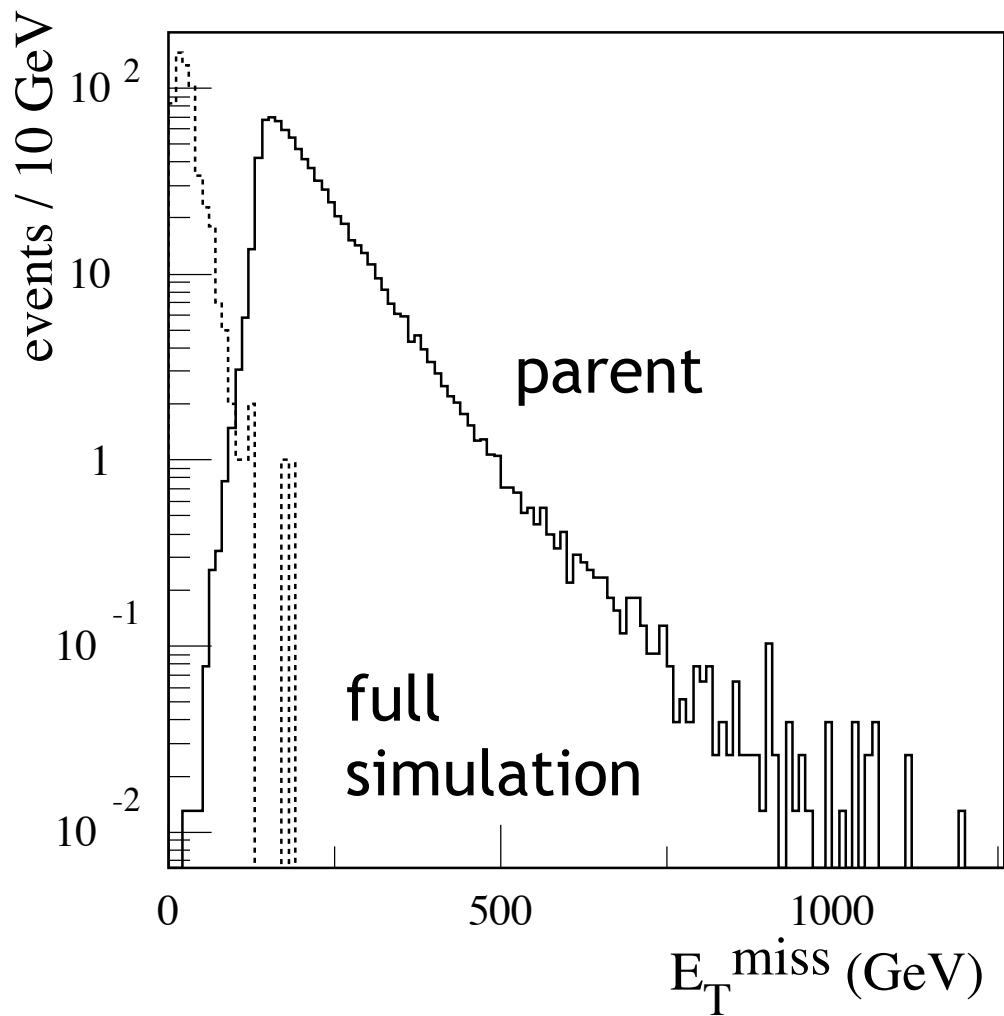


thickness of the ATLAS calorimetry, in hadronic interaction lengths, as a function of η

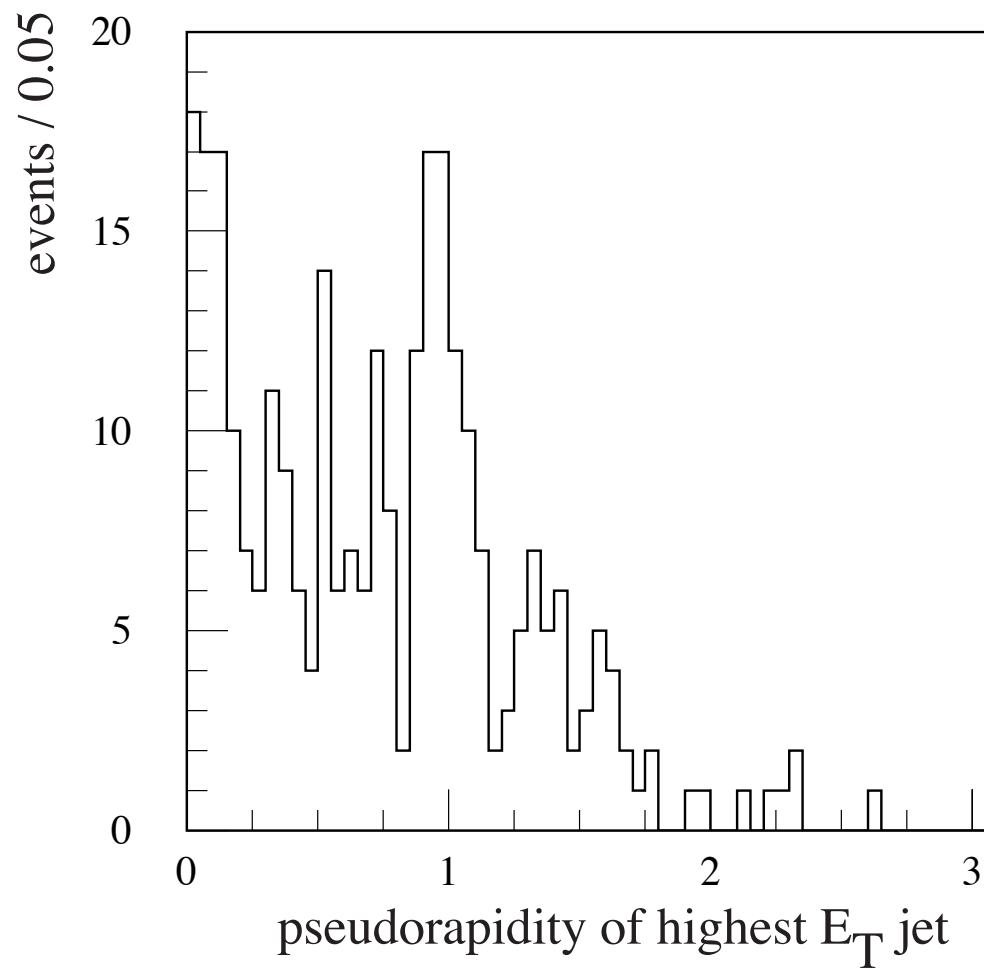
curve: $\sigma = 0.53\sqrt{\sum E_T}$



Expected missing ET resolution in ATLAS

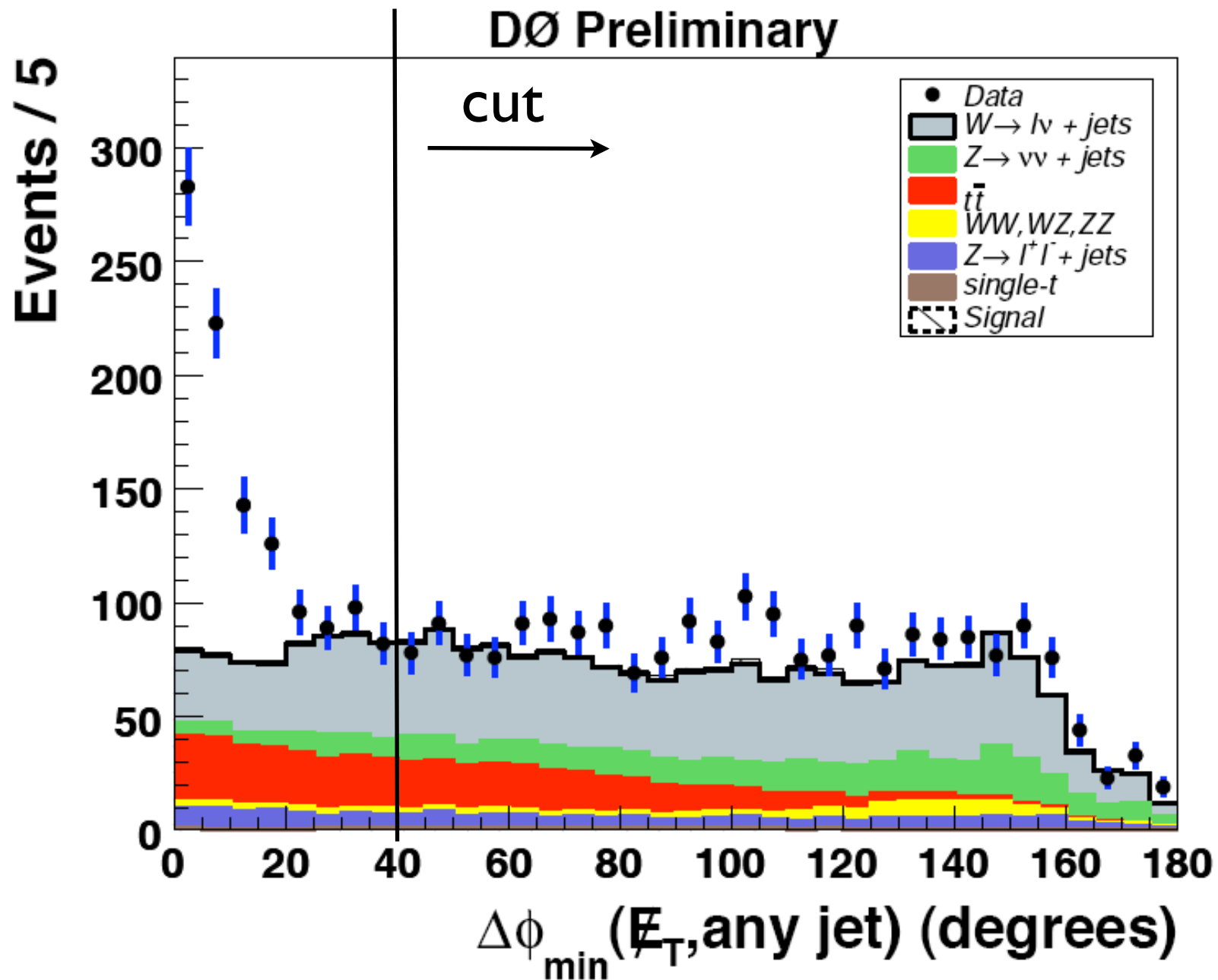


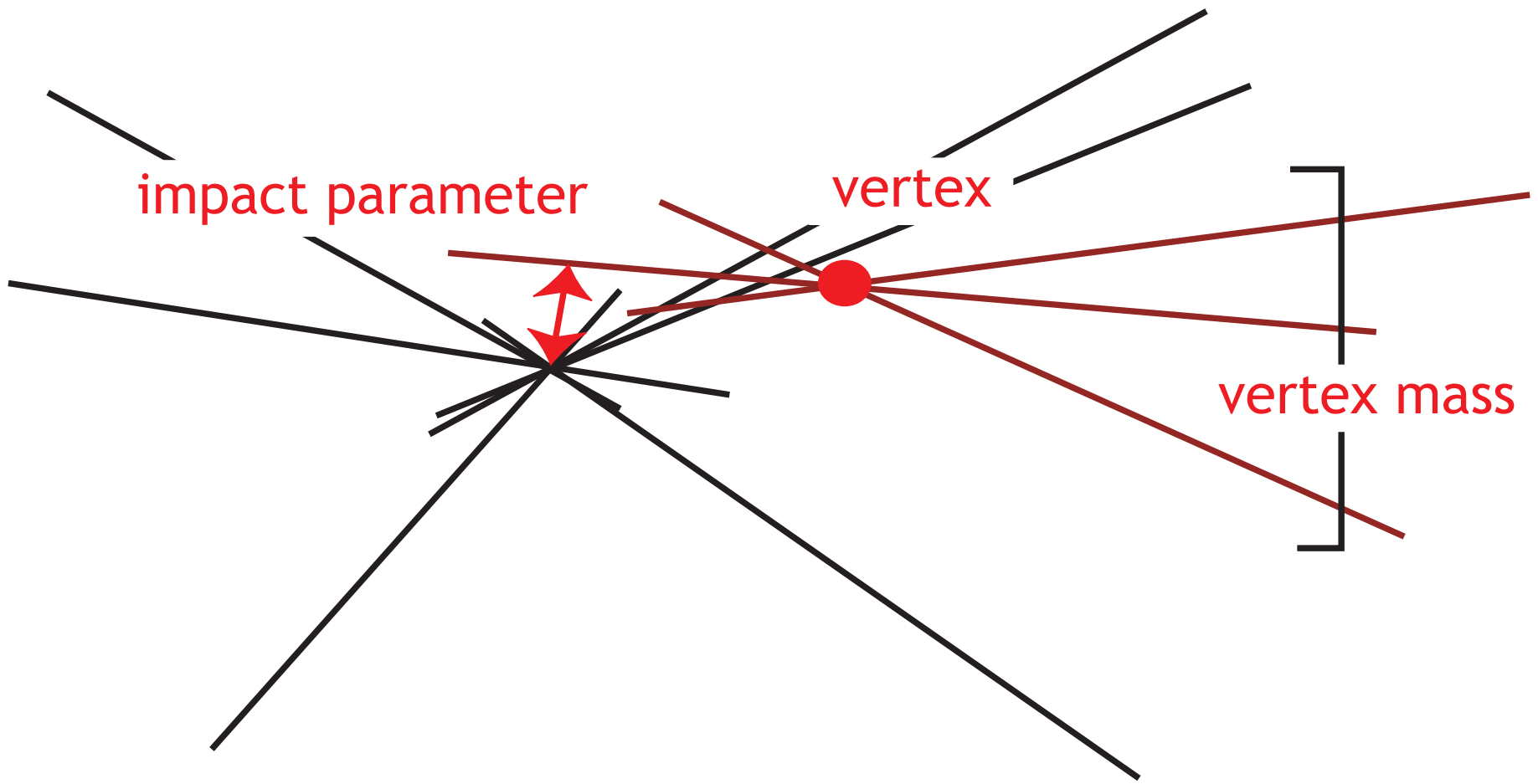
ATLAS simulation of missing ET in
 $Z(\rightarrow \mu^+ \mu^-) + jet$



η of the jet w. the highest
 ET in events w. ET > 50

DØ missing ET search - dijet sample

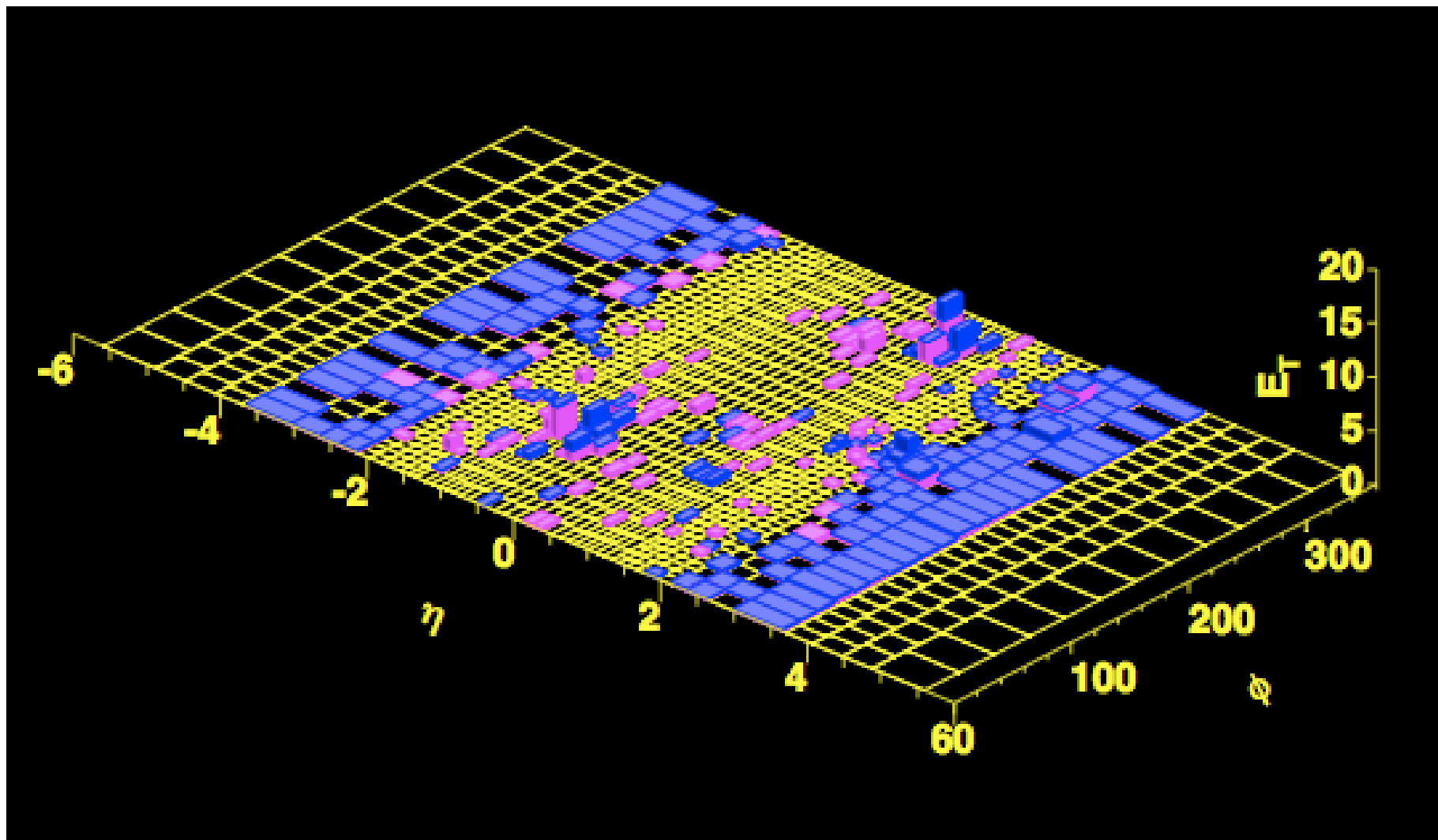




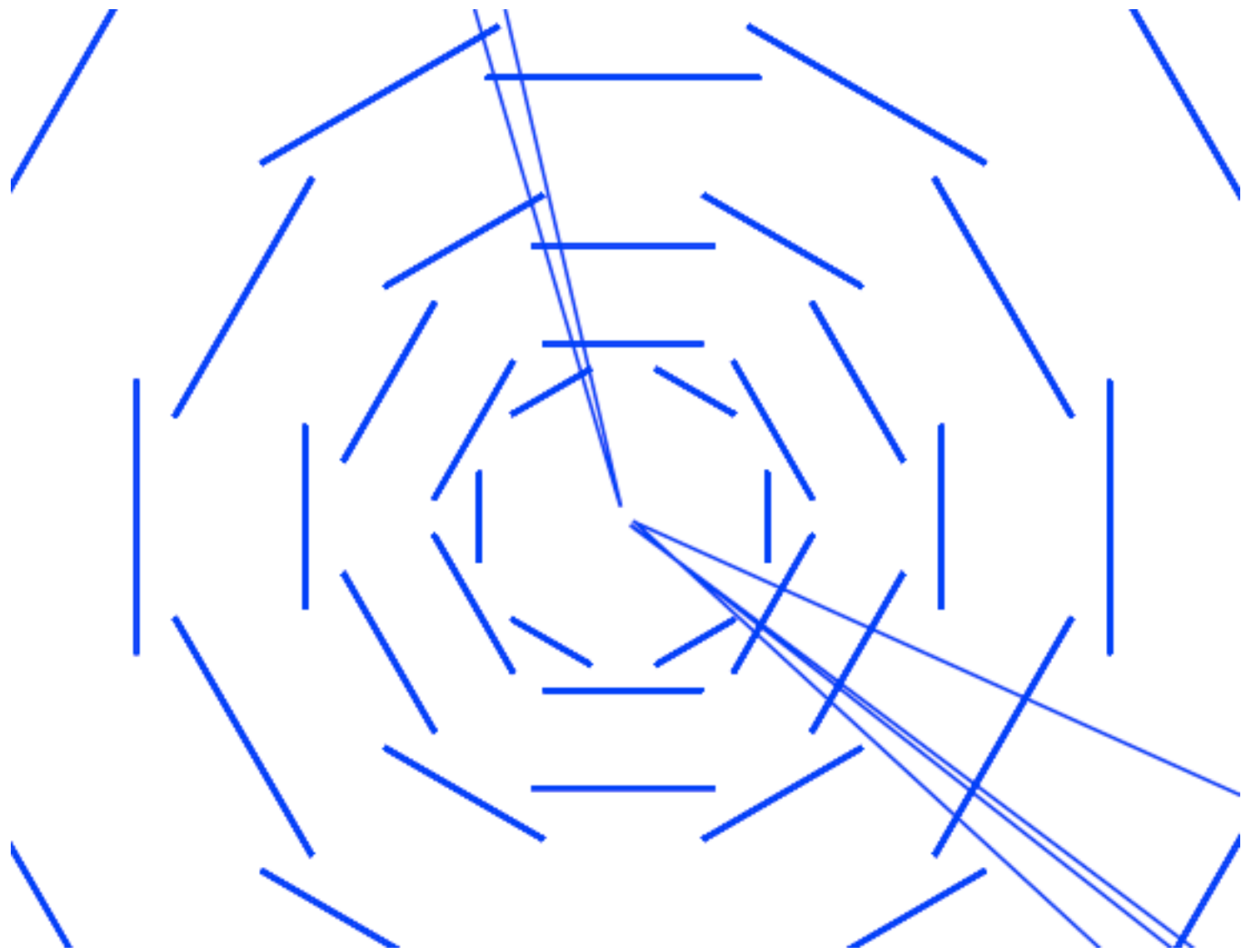
impact parameter

vertex

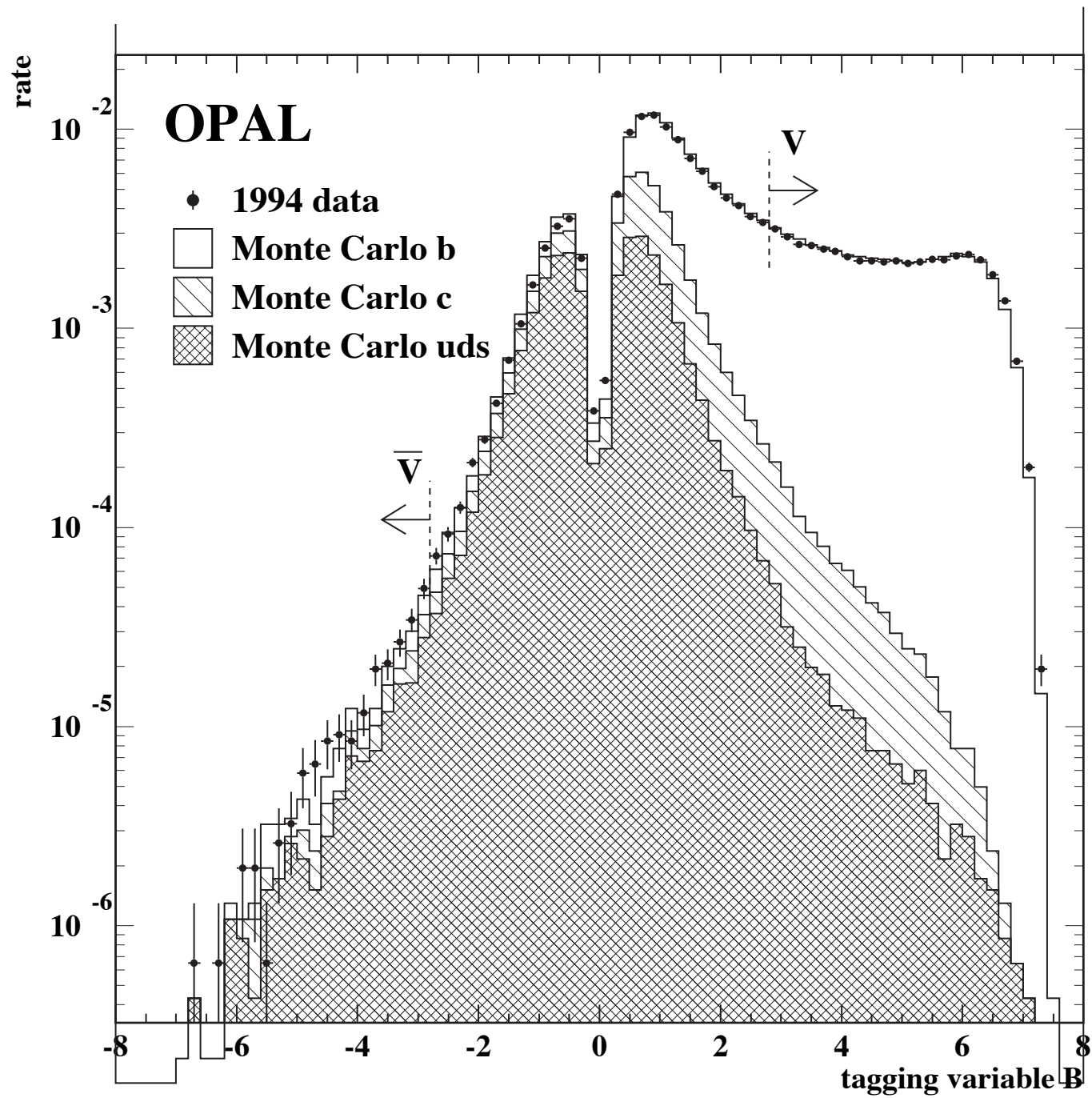
vertex mass

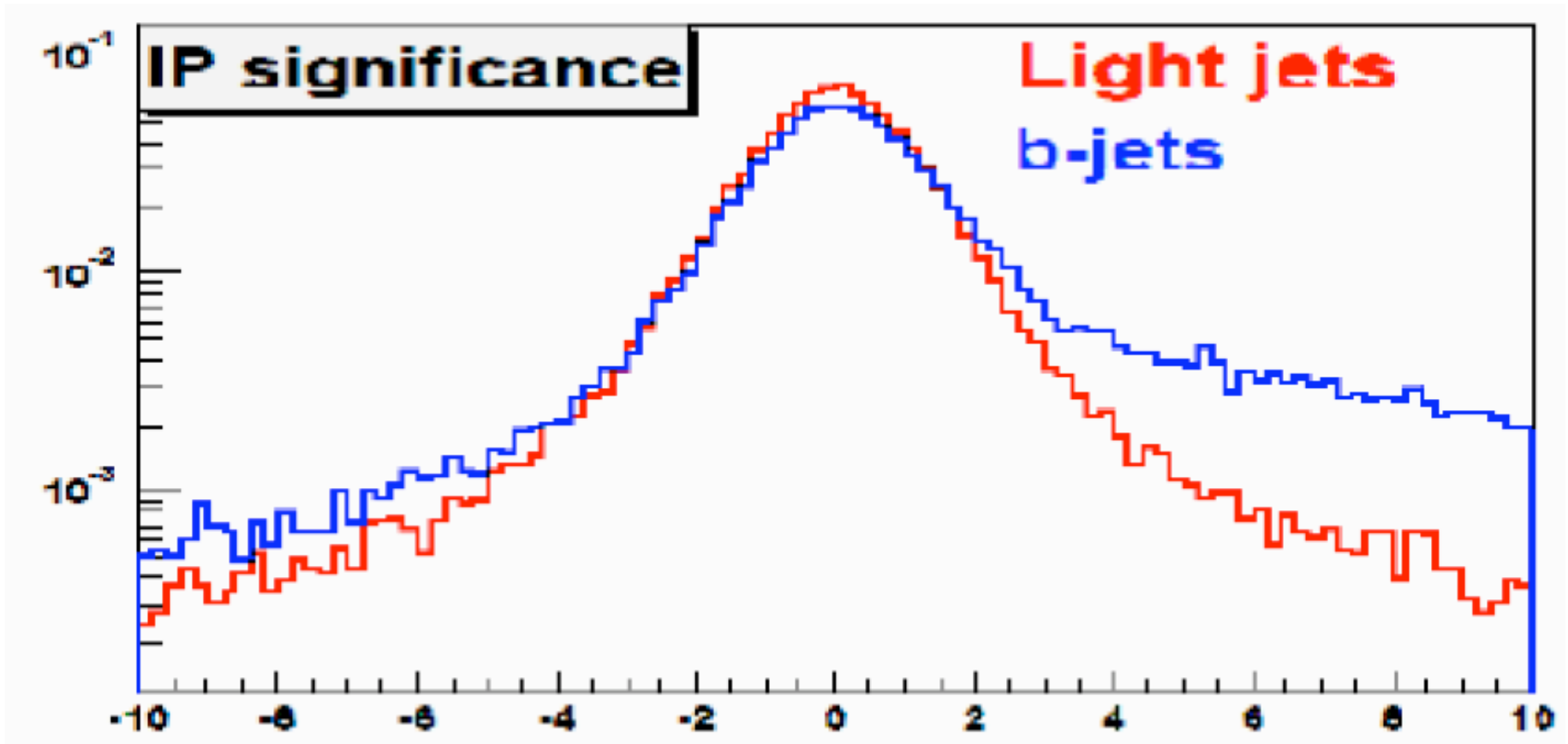


CDF event

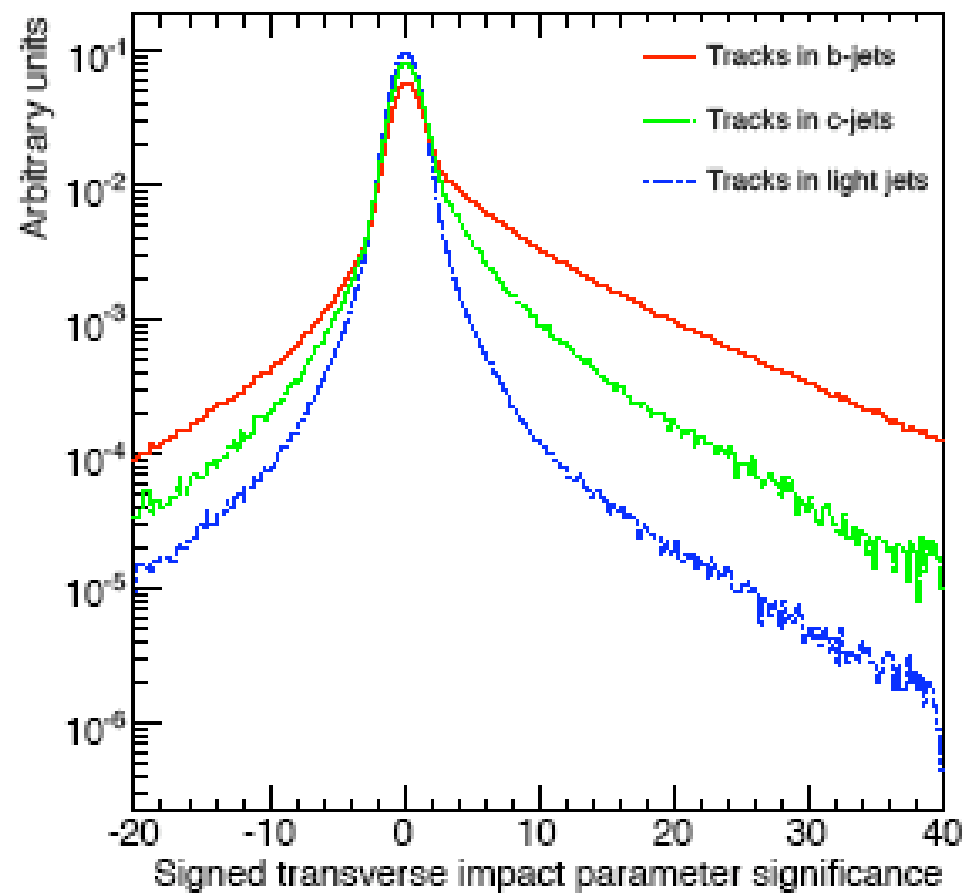
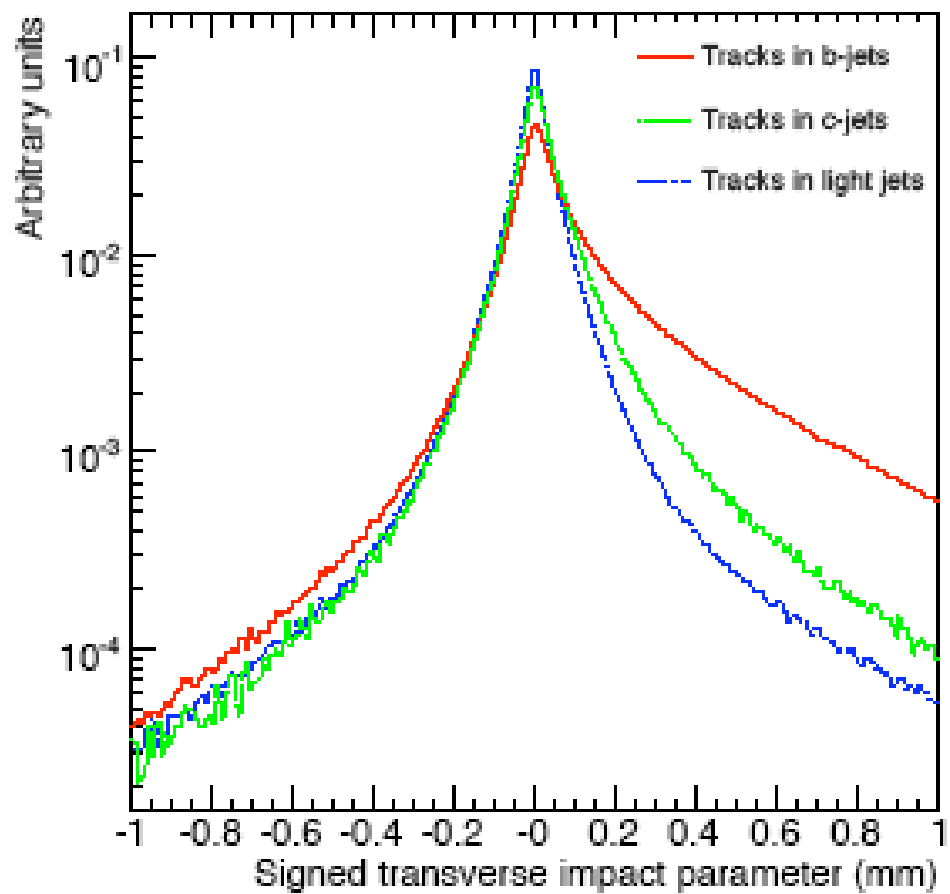


CDF event

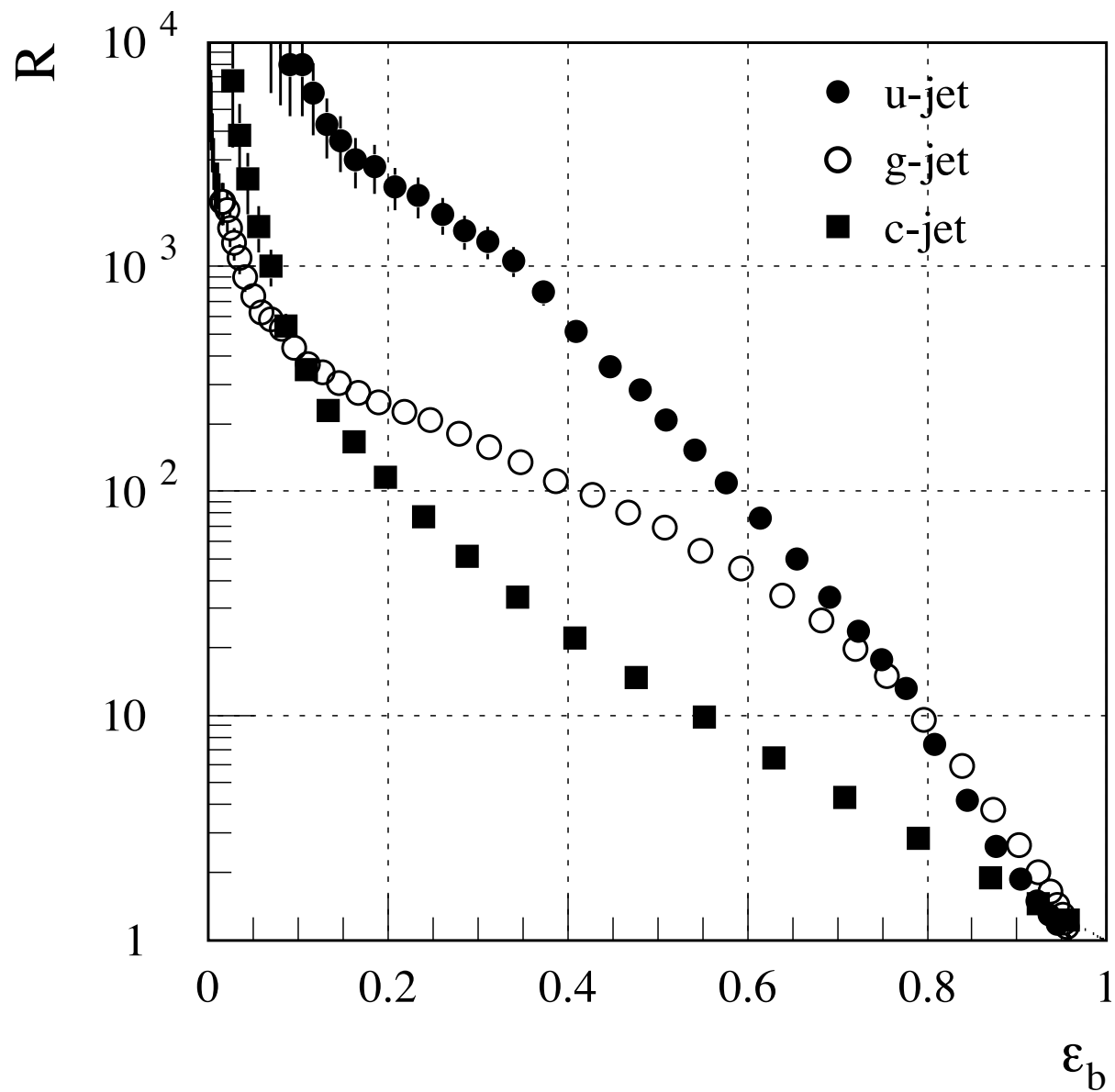




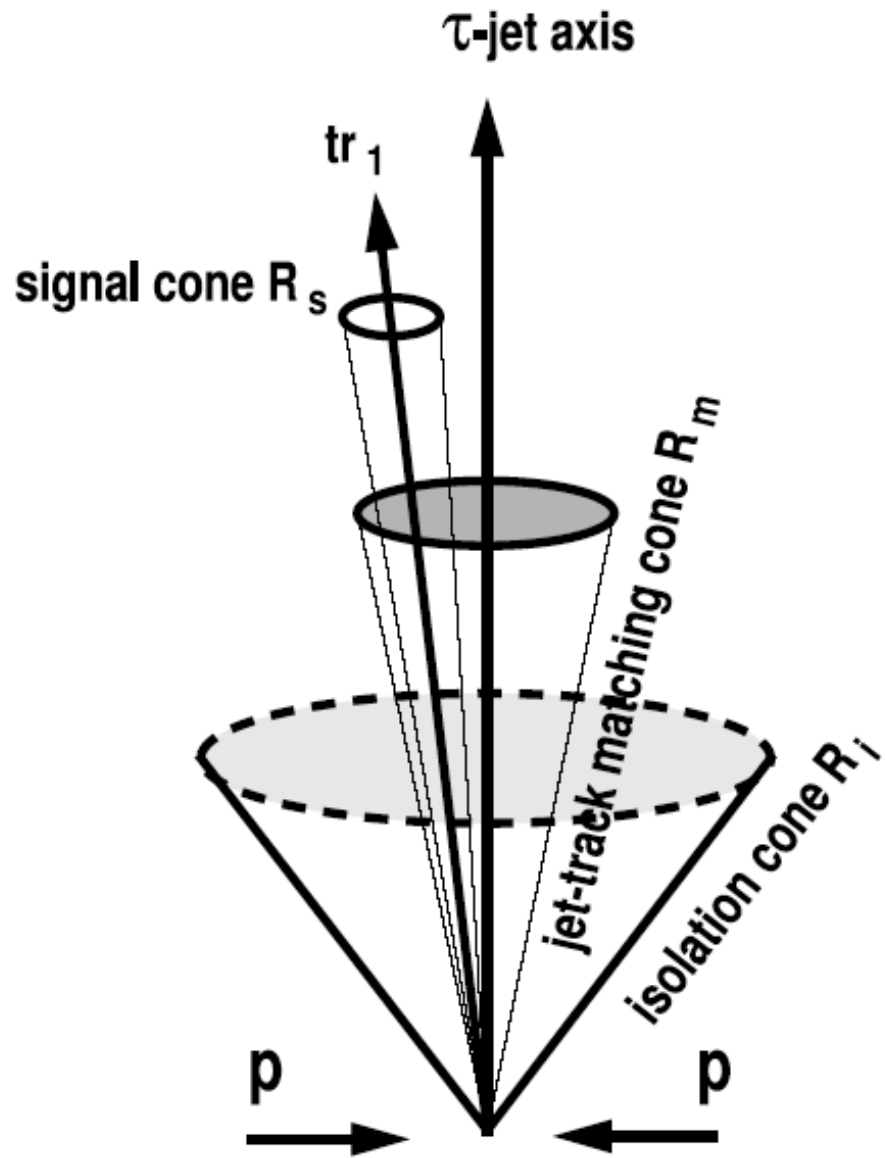
impact parameter significance distribution
at DO



ATLAS expectation

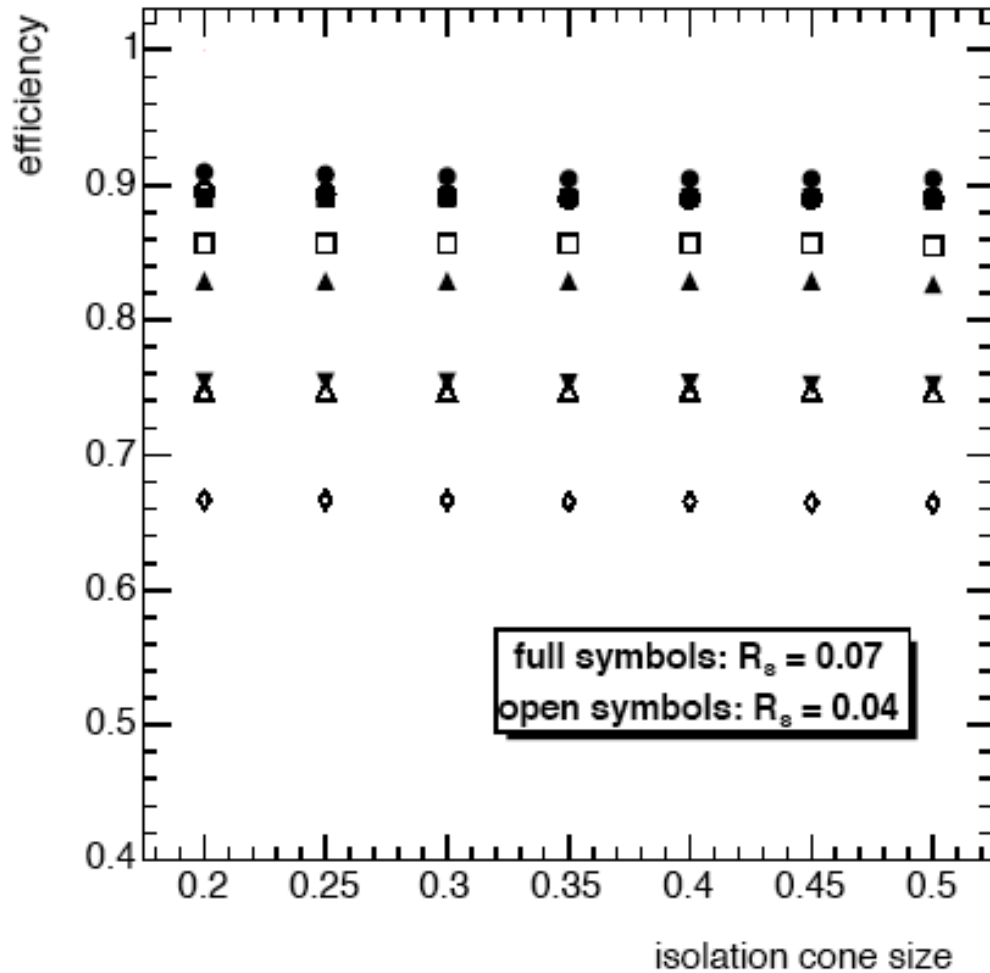


ATLAS - background rejection
as a function of b jet finding efficiency

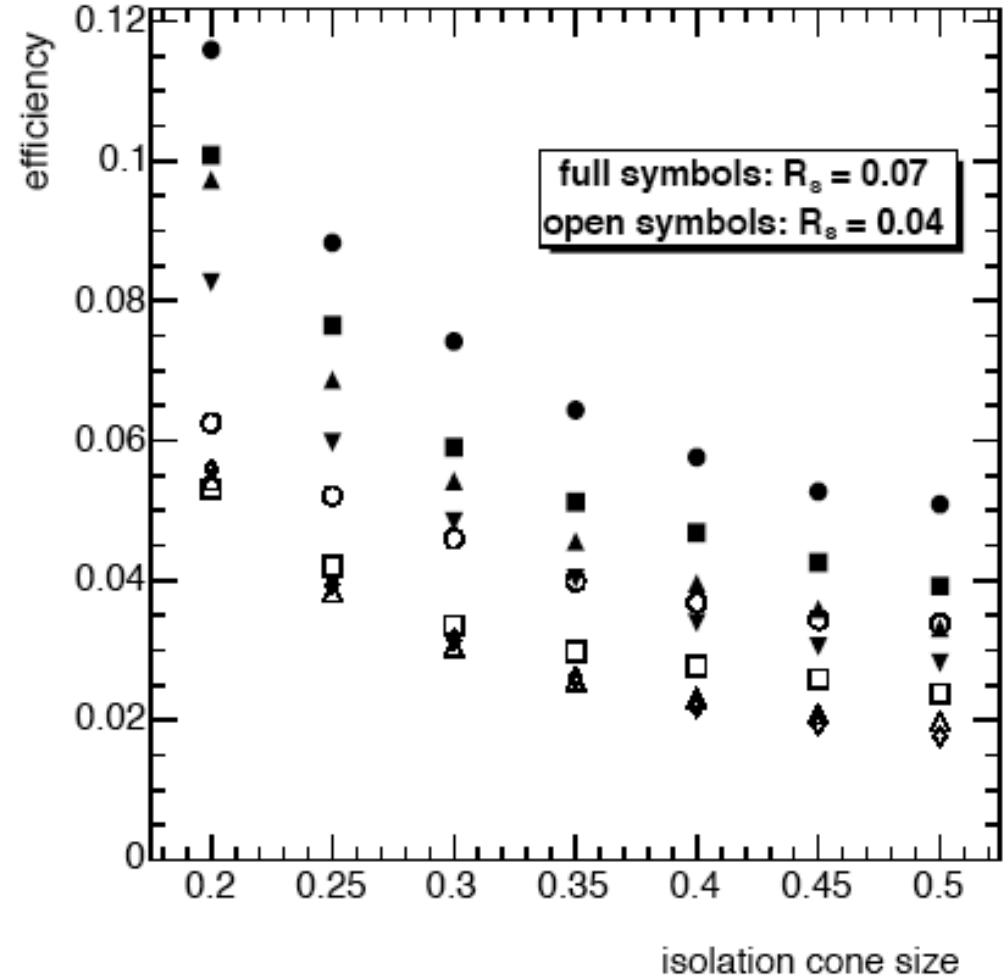


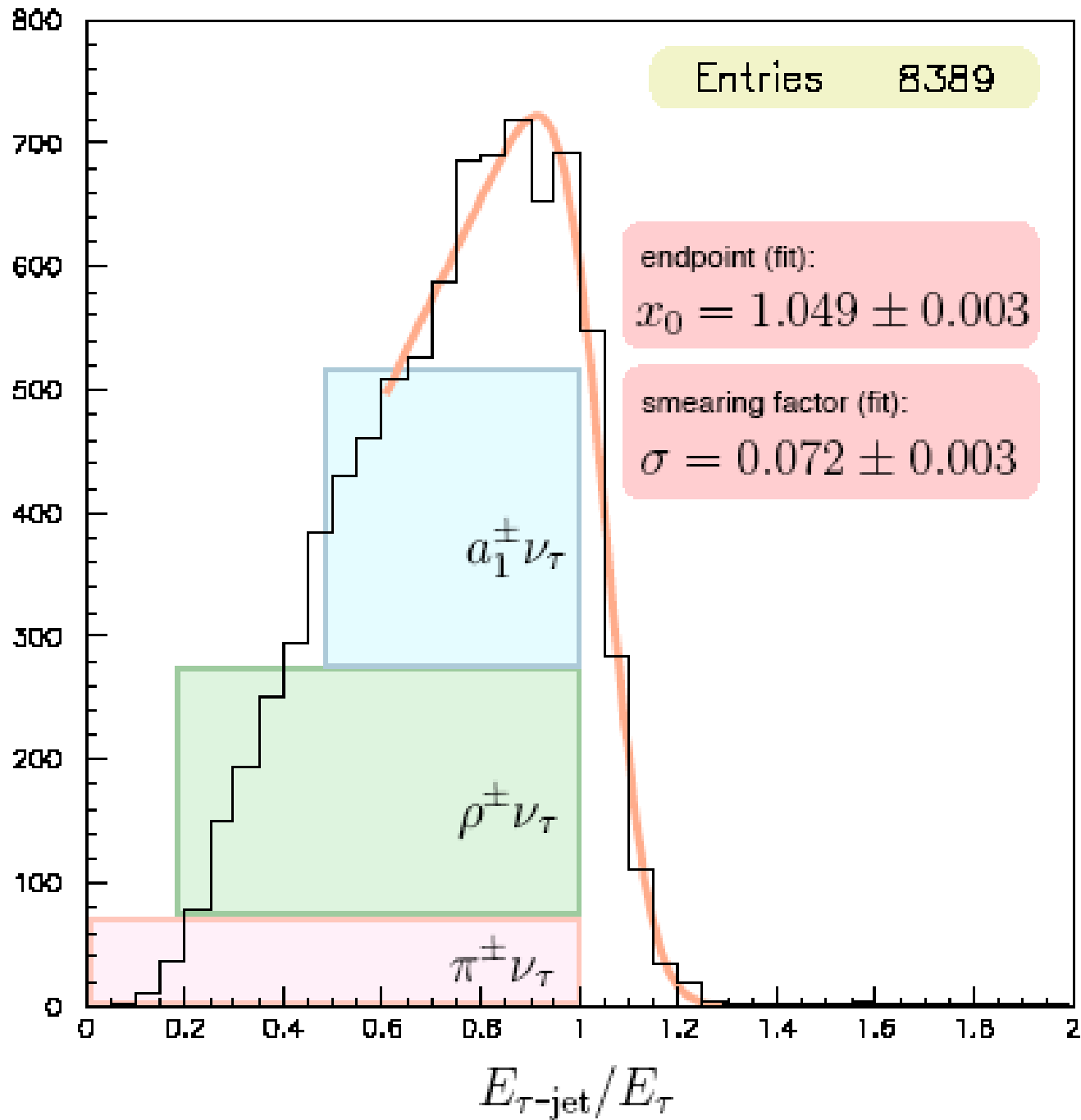
selection efficiency as a function of cone sizes

tau jets



QCD jets





Kitano-Ibe

HERWIG +
TAOULA +
AcerDET

more precisely:

Trigger

(Functional elements and their connections)

DAQ

40 MHz

75 kHz

~2 kHz

~ 200 Hz

