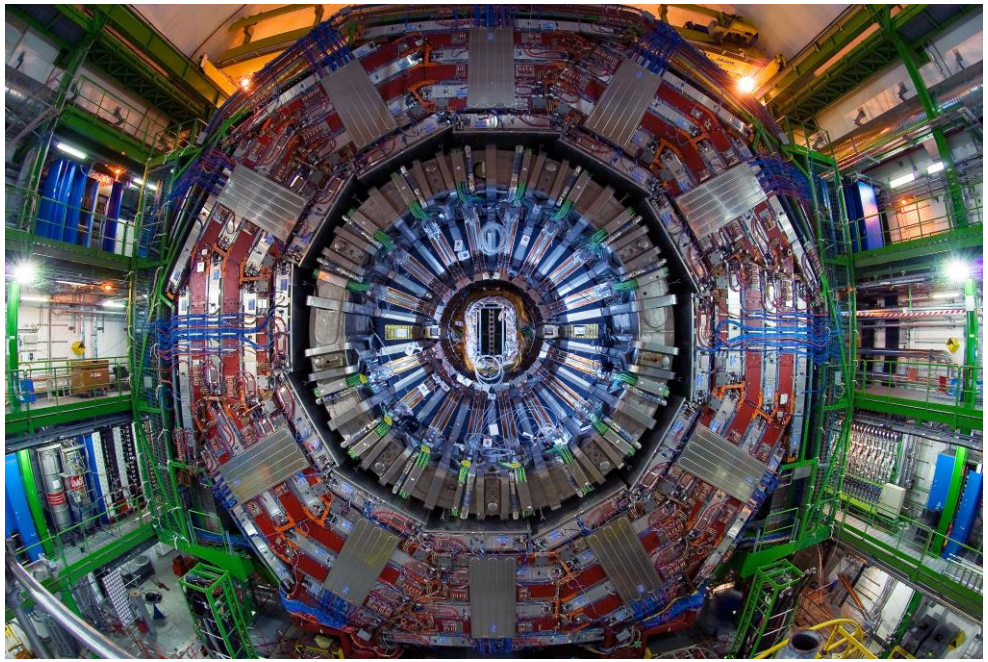
Monte-Carlo modelling using CMSSW



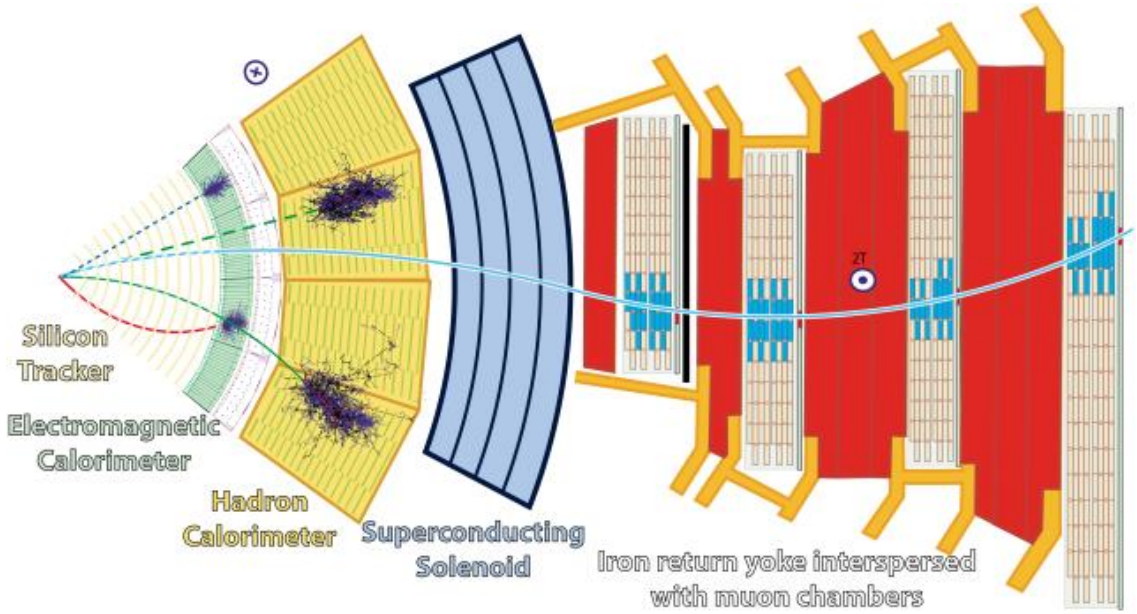
ДИМИТЪР ТОМОВ – РУСЕ

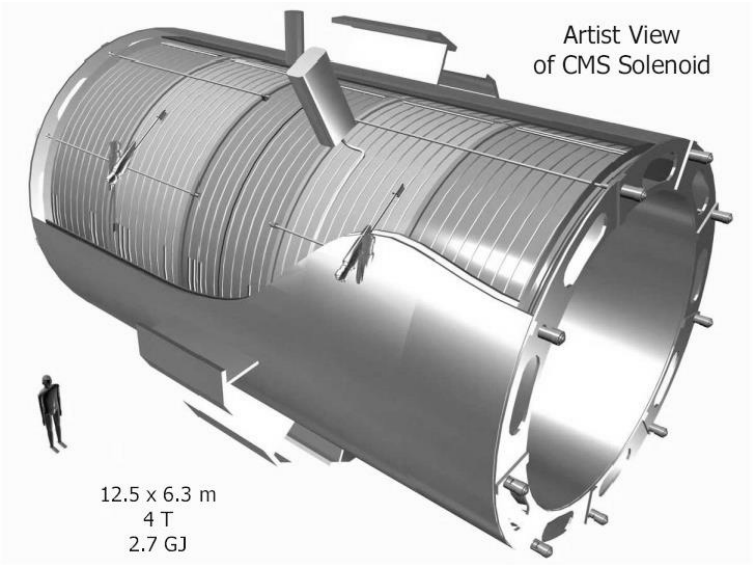
ВИКТОР БАЛТИН – БУРГАС

ЦВЕТЕЛИНА СТЕФАНОВА – РУСЕ

РЪКОВОДИТЕЛ – РУМЯНА ХАДЖИЙСКА

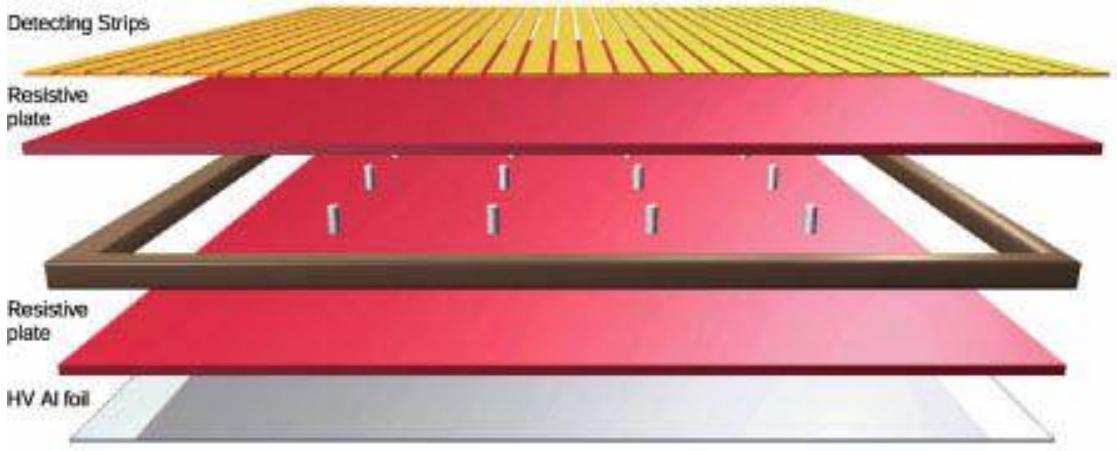
Въведение в CMS





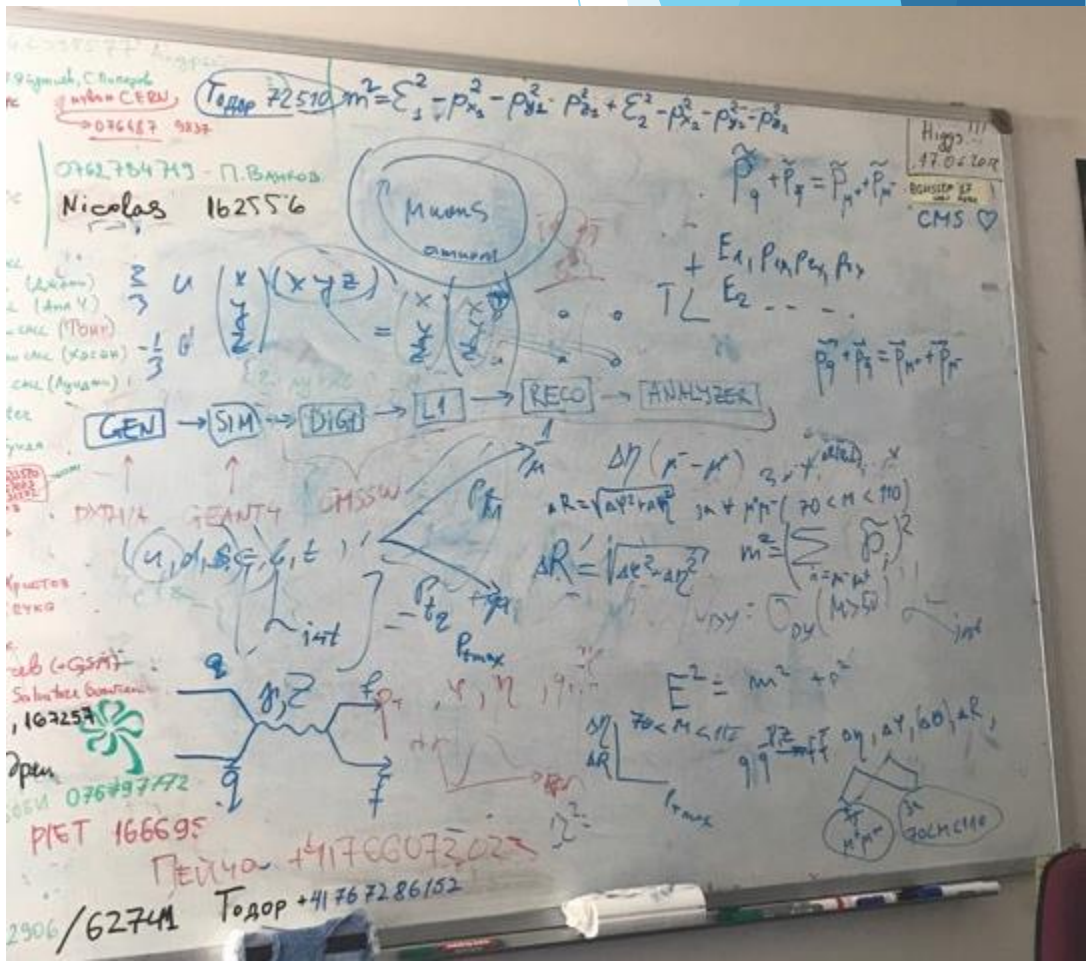
Muon — Electron — Charged hadron (e.g. pion)

Neutral hadron (e.g. neutron) - - - - Photon



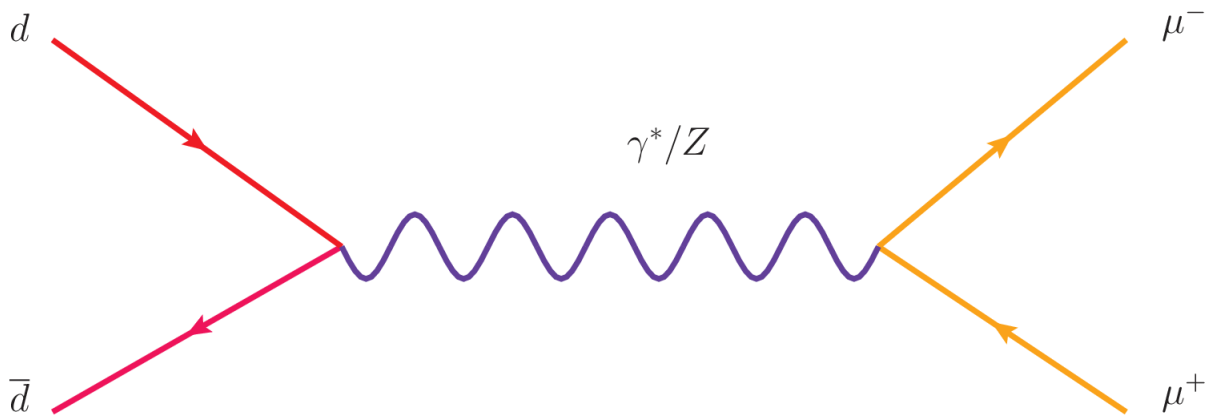
Процес на работа с Monte Carlo симулации в CMS

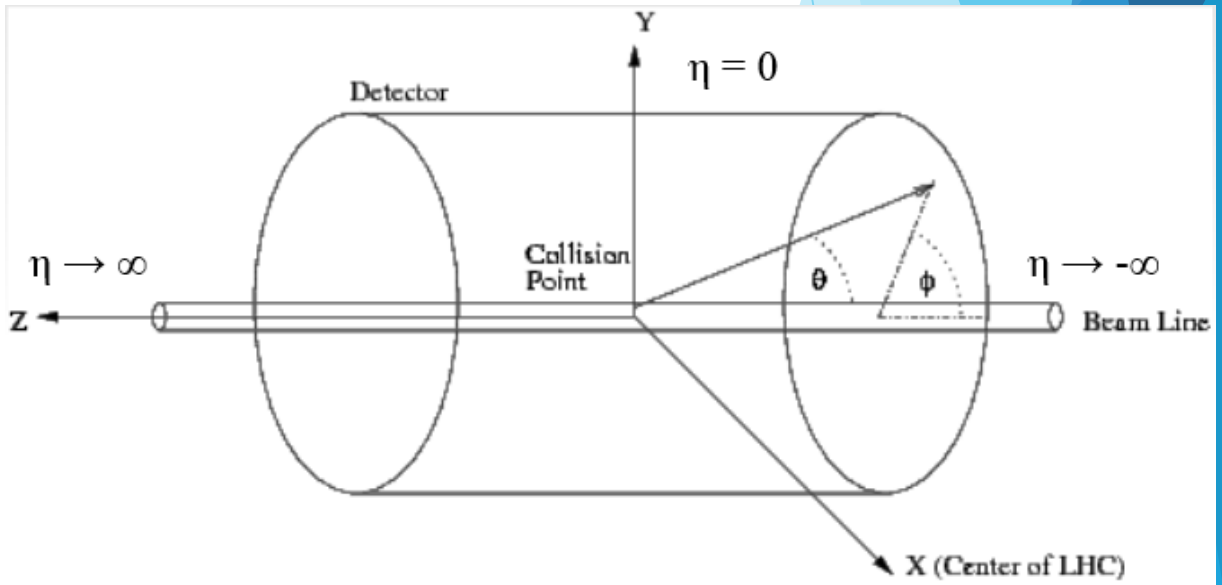
- Генериране на събития (Pythia)
- Детекторна симулация (Geant4)
- Дигитализация (CMSSW)
- Тригер (CMSSW)
- Реконструкция (CMSSW)
- Анализ (CMSSW & Root)



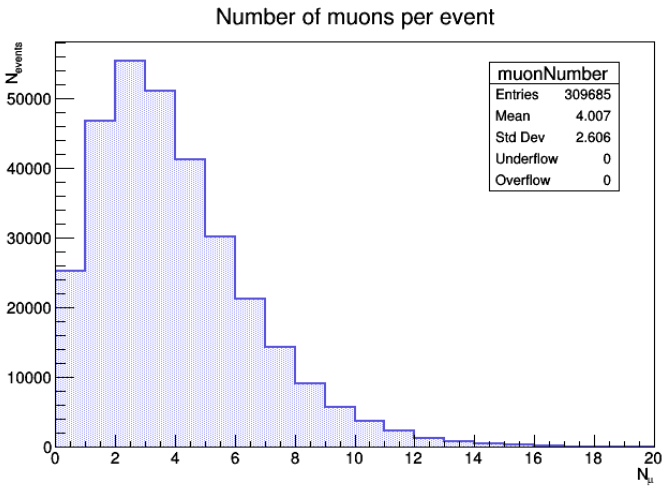
Какво сме използвали

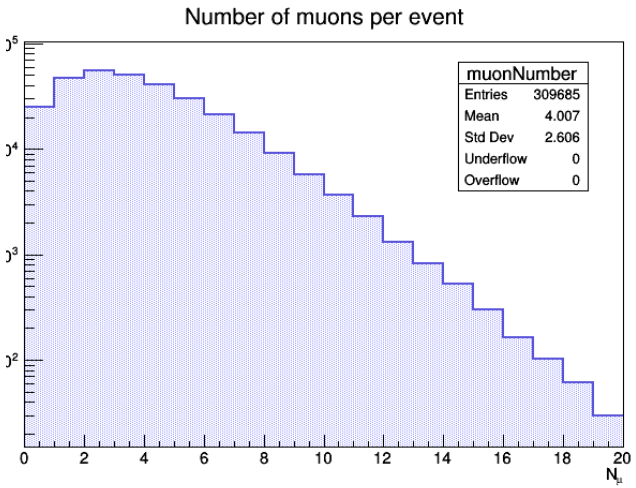
- Дрел-Ян процеси
- Закон за запазване на енергия
- Закон за запазване на импулс
- $m^2=E_1^2-p_{x1}^2-p_{y1}^2-p_{z1}^2+E_2^2-p_{x2}^2-p_{y2}^2-p_{z2}^2$

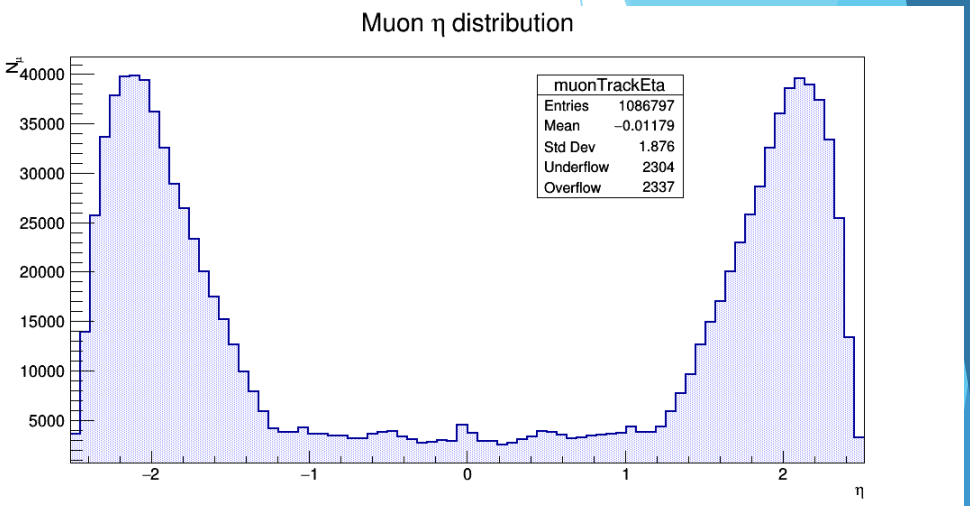


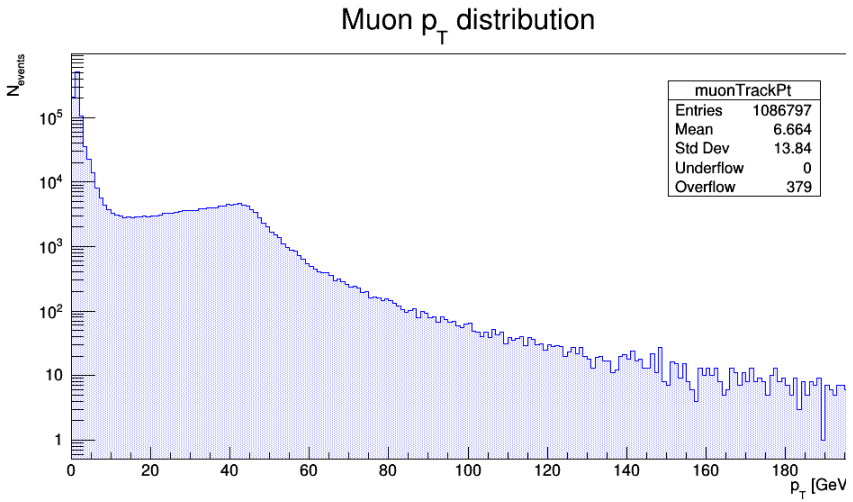


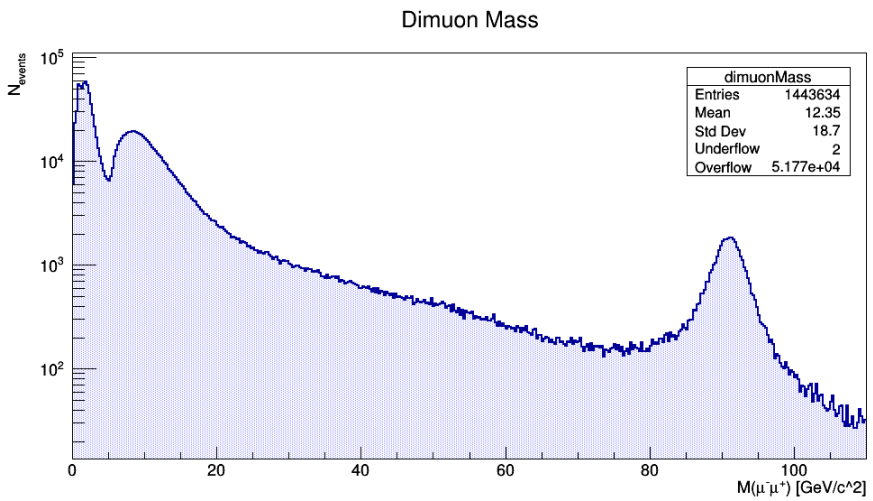
Резултати


Number of muons per event
muonNumber
Entries 309685
Mean 4.007
Std Dev 2.606
Underflow 0
Overflow 0
N_events
N_μ

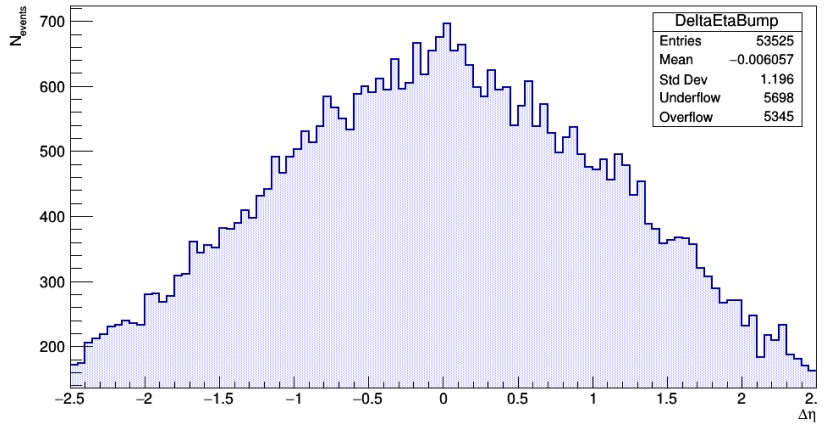

Number of muons per event
muonNumber
Entries 309685
Mean 4.007
Std Dev 2.606
Underflow 0
Overflow 0
N_μ


Muon η distribution
muonTrackEta
Entries 1086797
Mean −0.01179
Std Dev 1.876
Underflow 2304
Overflow 2337
N_μ
η

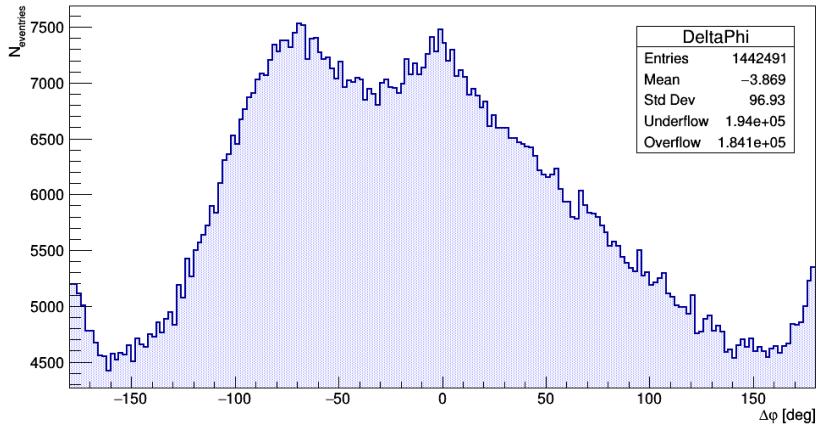

Muon p_T distribution
muonTrackPt
Entries 1086797
Mean 6.664
Std Dev 13.84
Underflow 0
Overflow 379
N_events
p_T [GeV


Dimuon Mass
dimuonMass
Entries 1443634
Mean 12.35
Std Dev 18.7
Underflow 2
Overflow 5.177e+04
N_events
M(μ⁻μ⁺) [GeV/c^2]

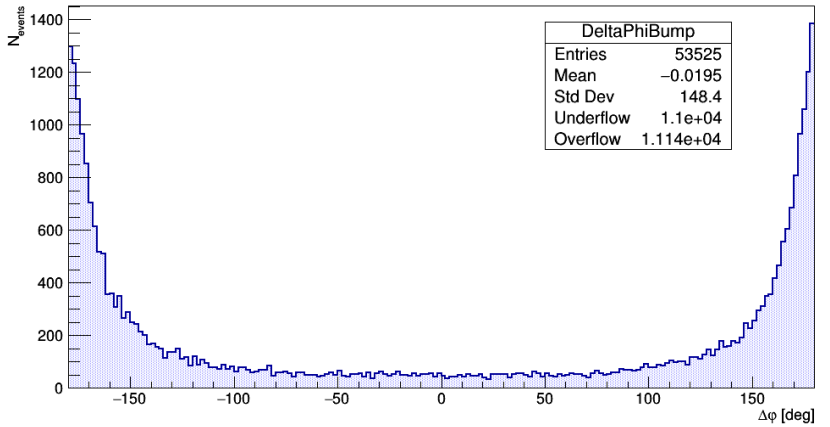
Δη bump



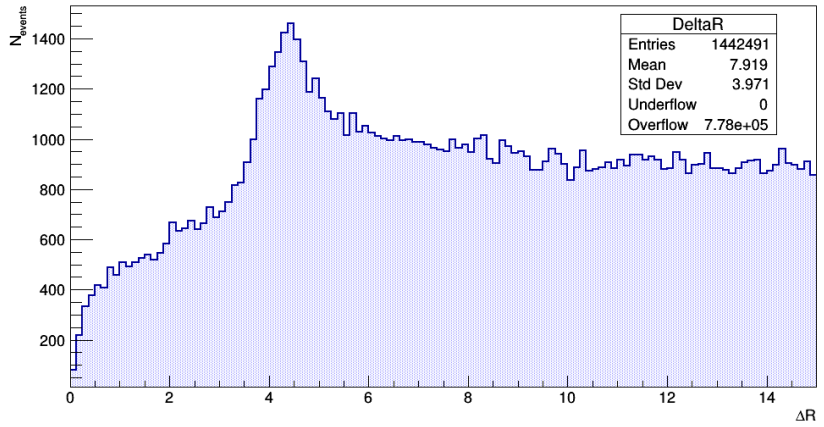
Δφ



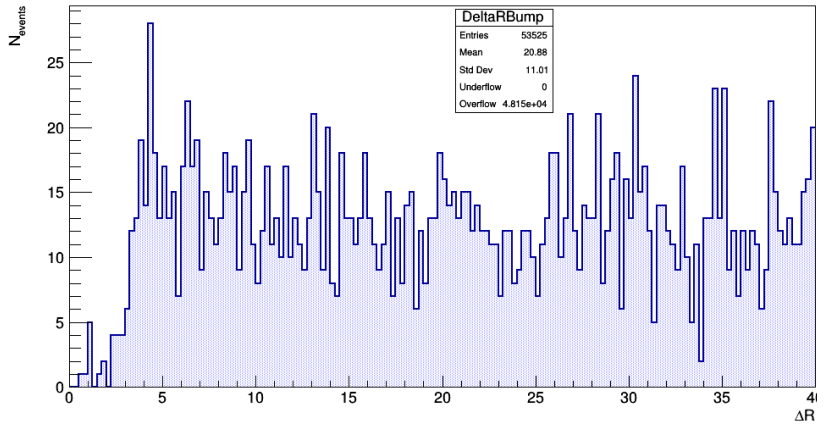
Δφ bump



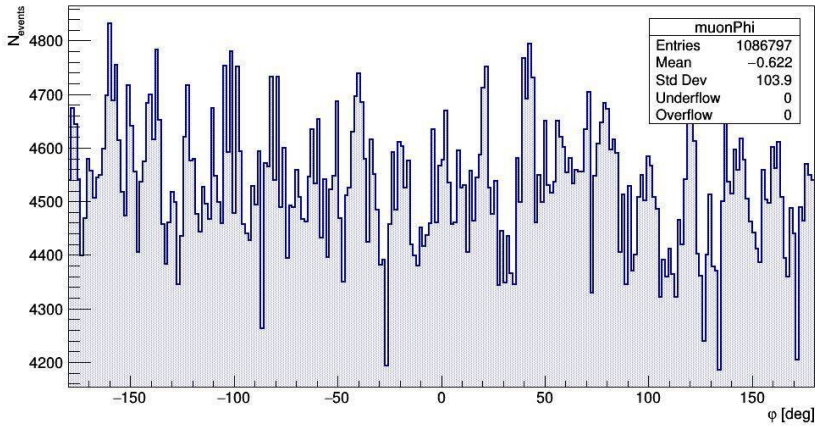
ΔR



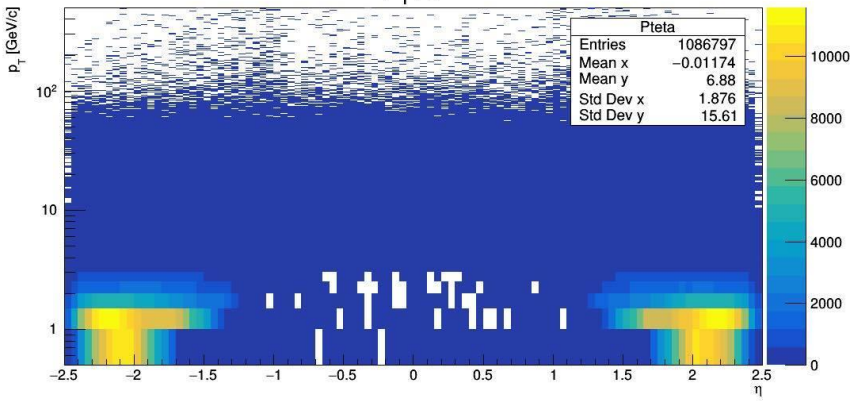
ΔR bump



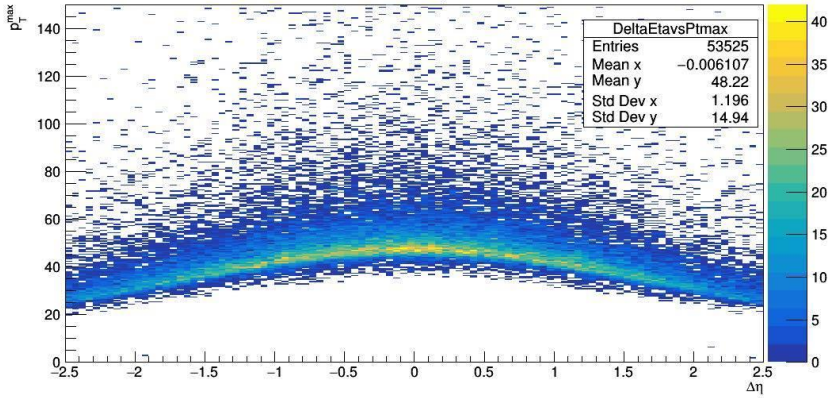
Muon φ distribution



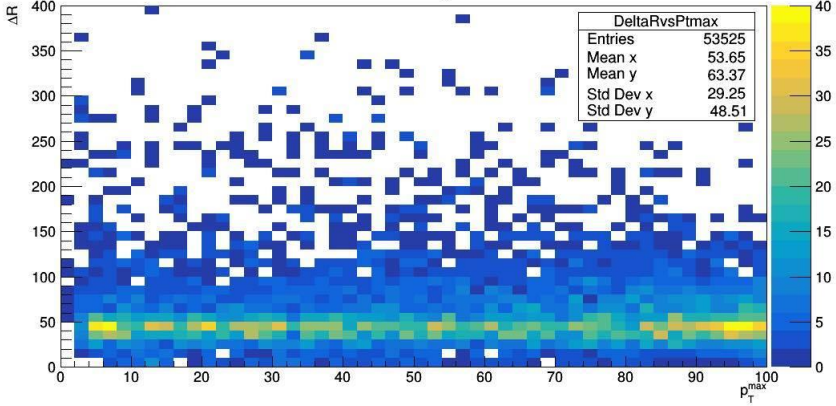
$p_T(\eta)$



$\Delta\eta$ vs p_T^{max}



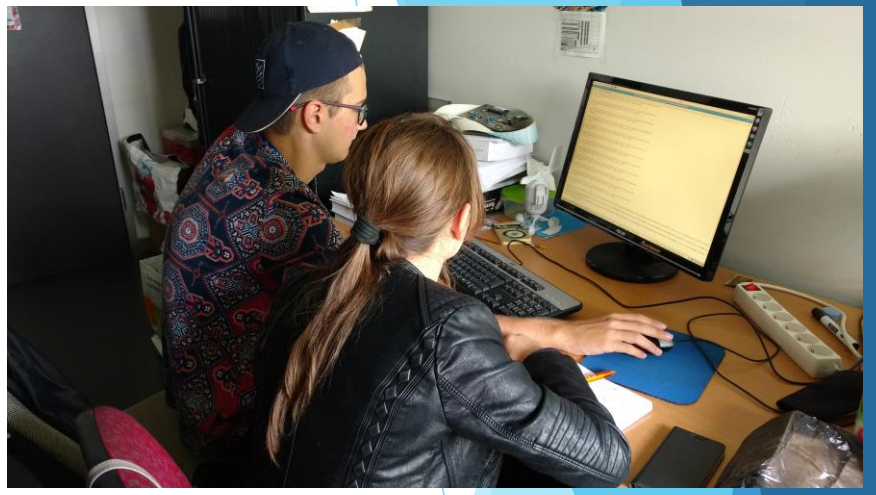
ΔR vs p_T^{max}

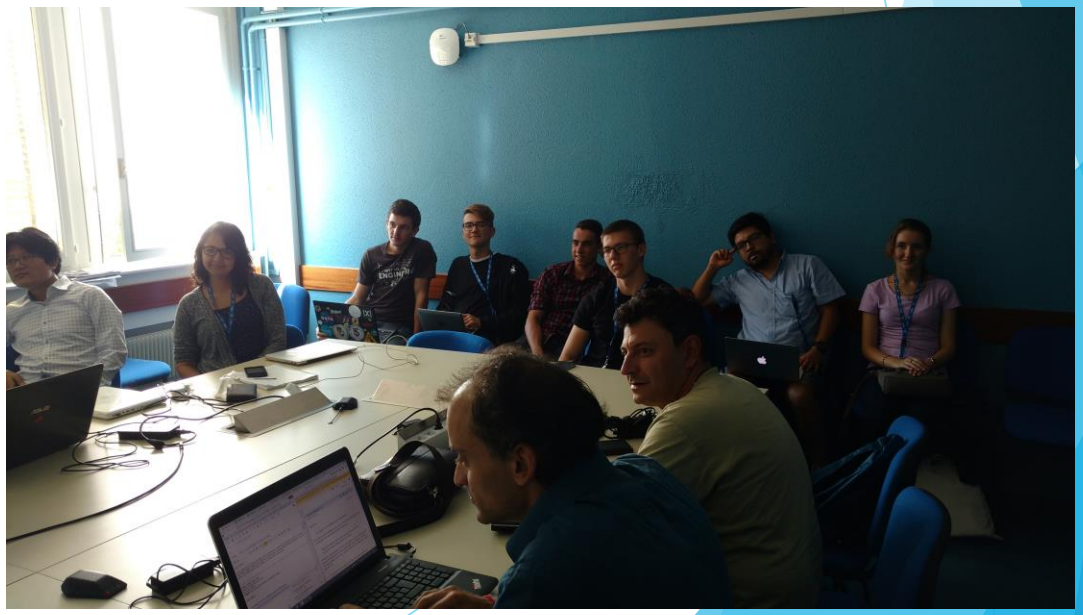


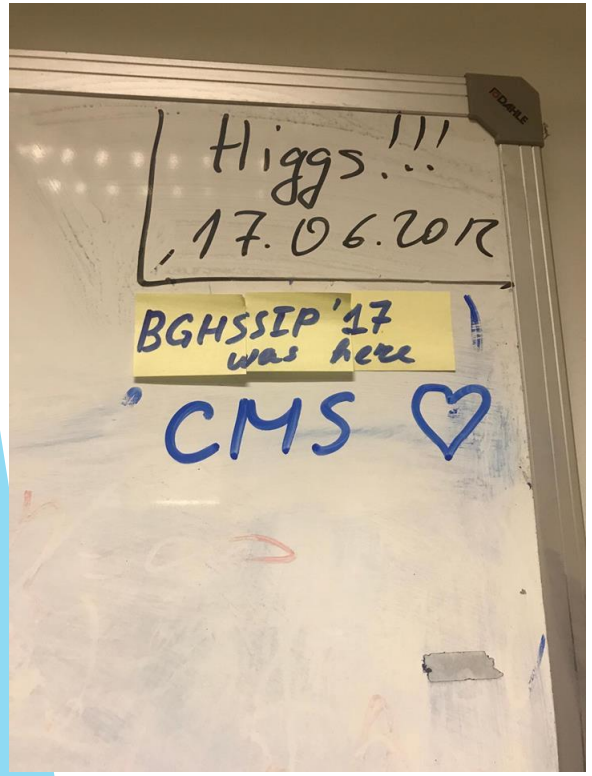
Защо са ни необходими тези симулации?

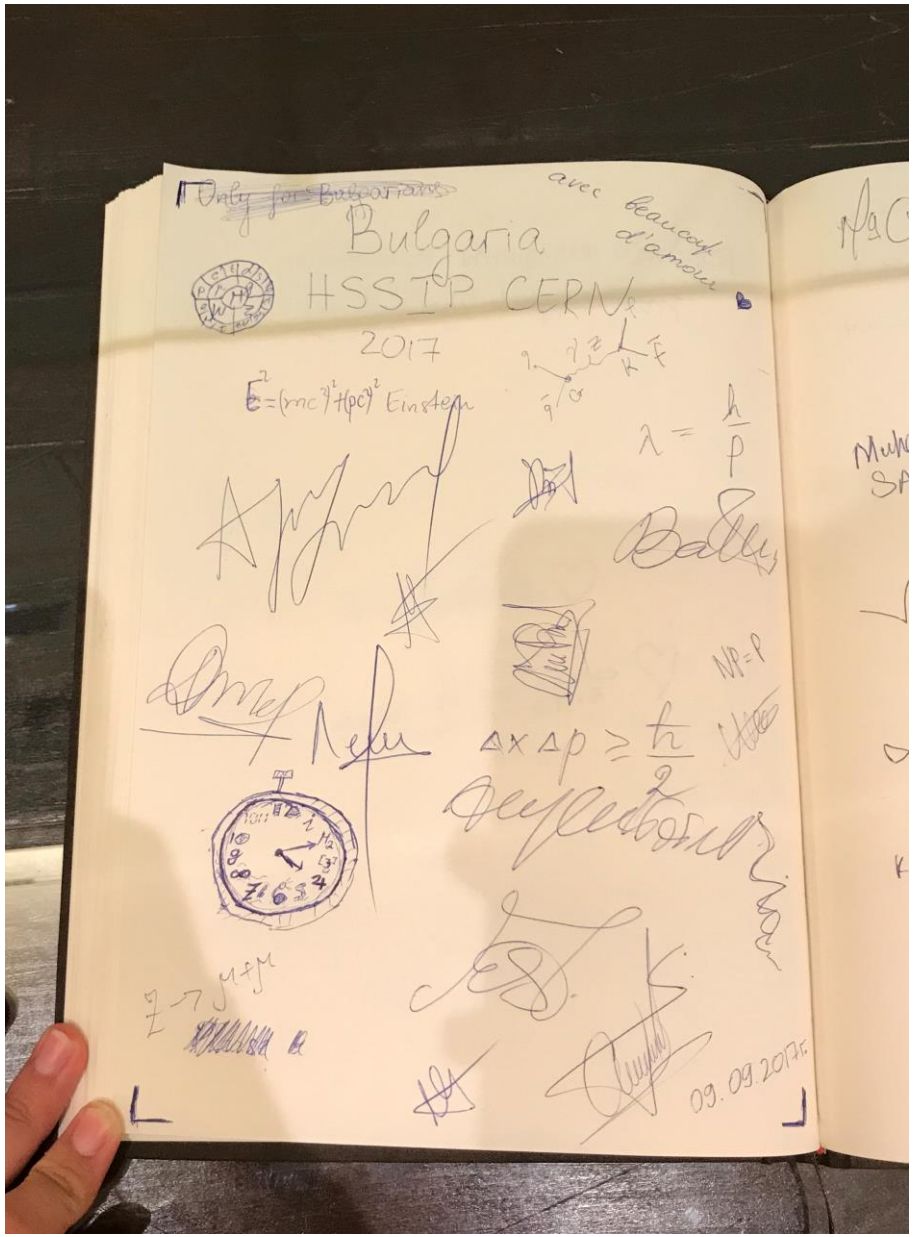
- За да видим как трябва да построим детектор, засичащ определени събития, и къде евентуално биха възникнали проблеми
- За да потвърдим или опровергаем определена теория
- За да съпоставим данни от реални експерименти с очаквани възможни резултати
- За учебни цели

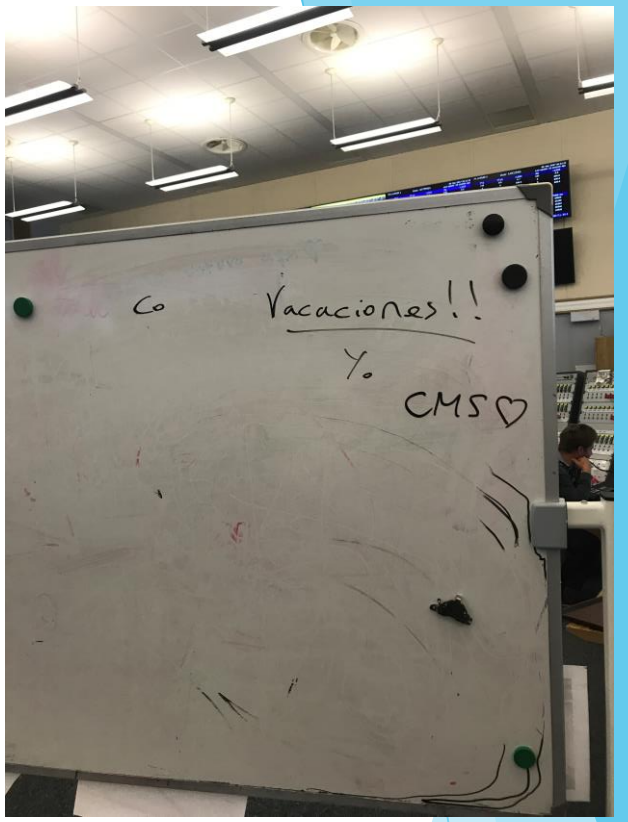
Какво друго сме видели в ЦЕРН и впечатления

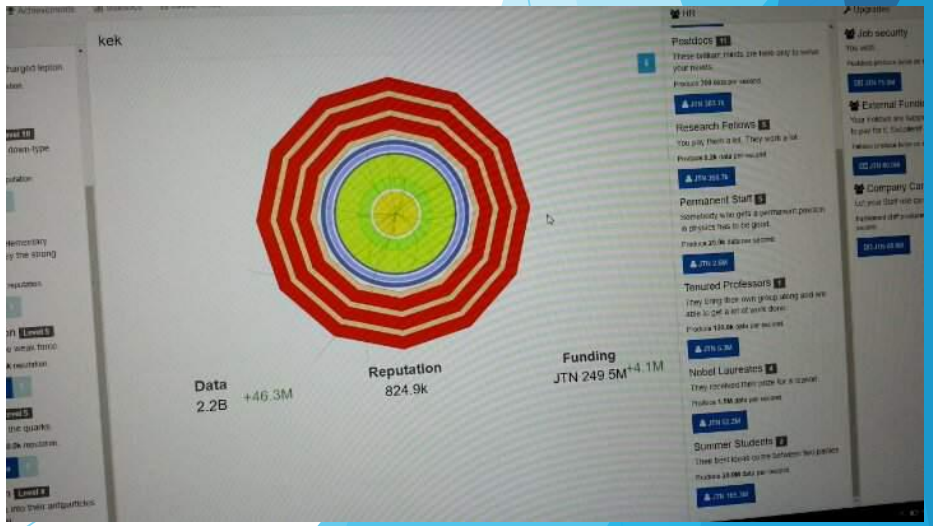





Higgs!!!
17.06.2017
BGHSSIP '17
was here
CMS


Only for Bulgarians
avec beaucoup d'amour
Bulgaria
HSSIP CERN
2017
Einstein
09.09.2017


Vacaciones!!
CMS


kek
Data
2.2B
+46.3M
Reputation
824.9k
Funding
JTN 249.5M
+4.1M

Благодарим за вниманието