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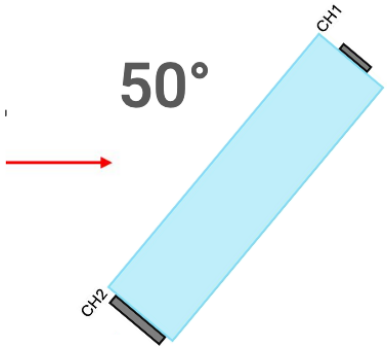
GEANT4 SIMULATION REPORT

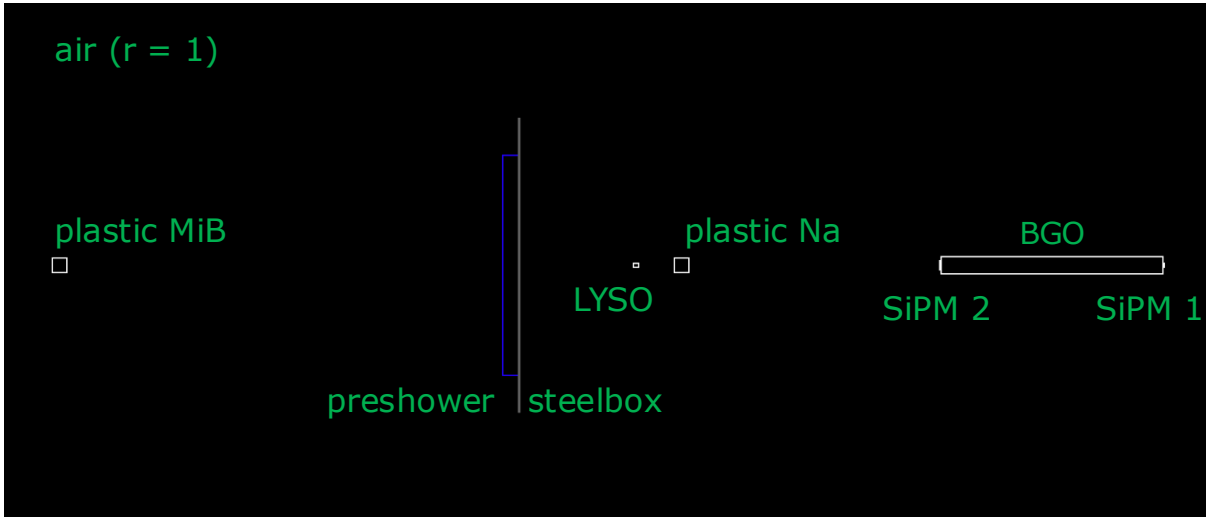
FCC Napoli weekly meeting, 21 March 2025

NEWS

- Look at timing distributions of cerenkov photons arriving on SiPMs
  - e+ beams, BGO crystal, filter on CH2



Distance beam-crystal = 3.10 m

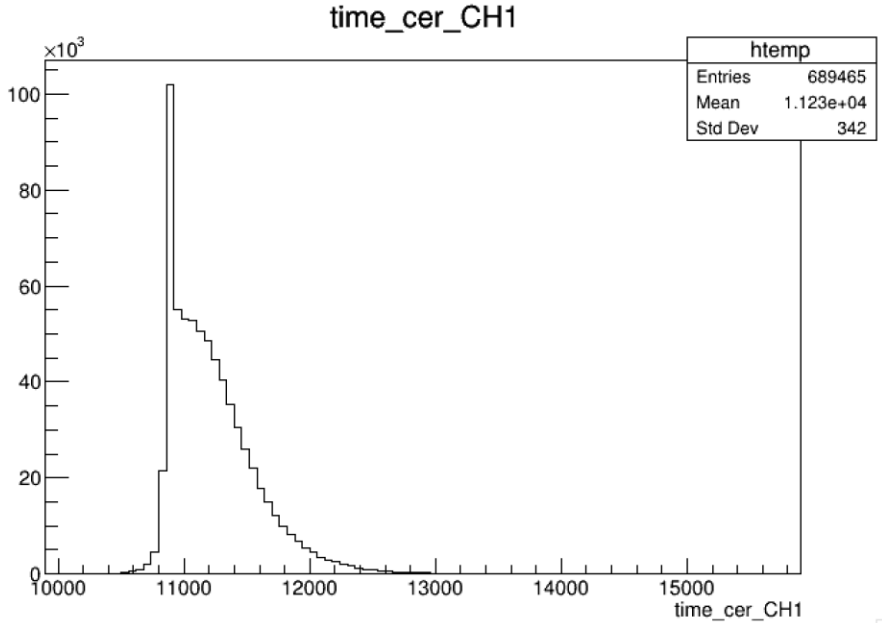


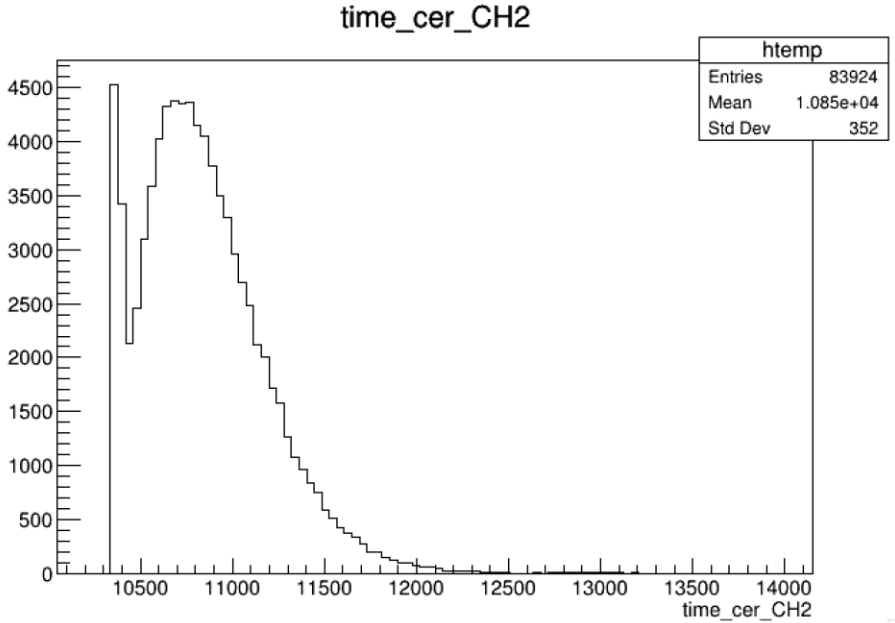
link to relative distances

0 DEGREES

- e+ at 10 GeV, σ_{beam} = 0.25 cm, 1000 events

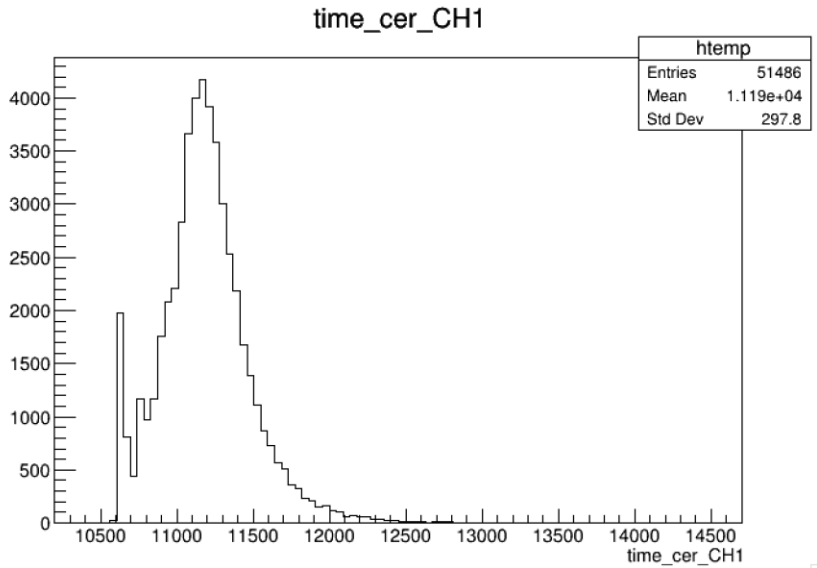
c ≅ 30cm/ns
n (BGO) ≅ 2.1

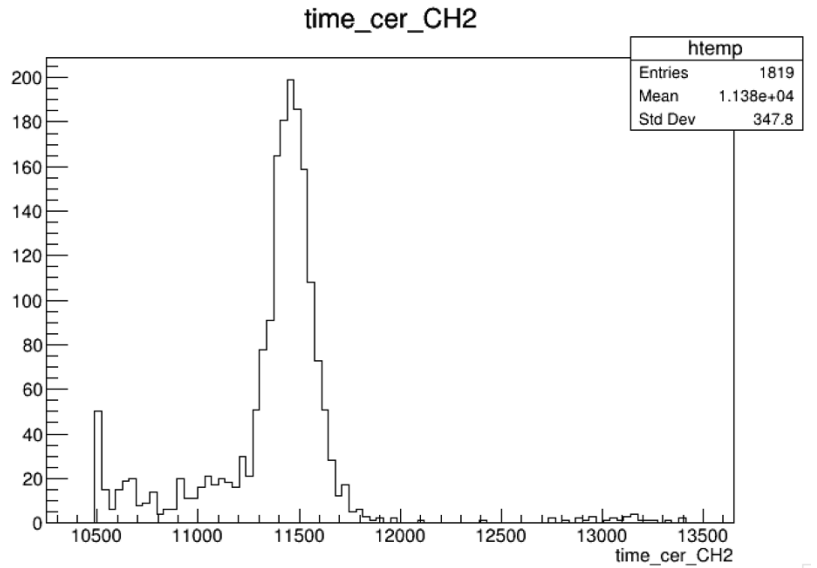




60 DEGREES

- e+ at 10 GeV, σ_{beam} = 0.25 cm, 1000 events
  - Below is referred to **all events** due to low statistic





90 DEGREES

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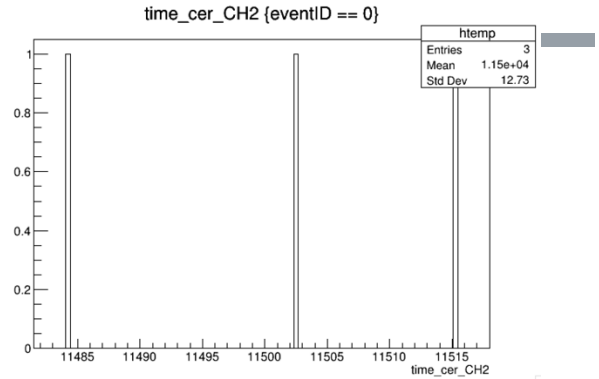

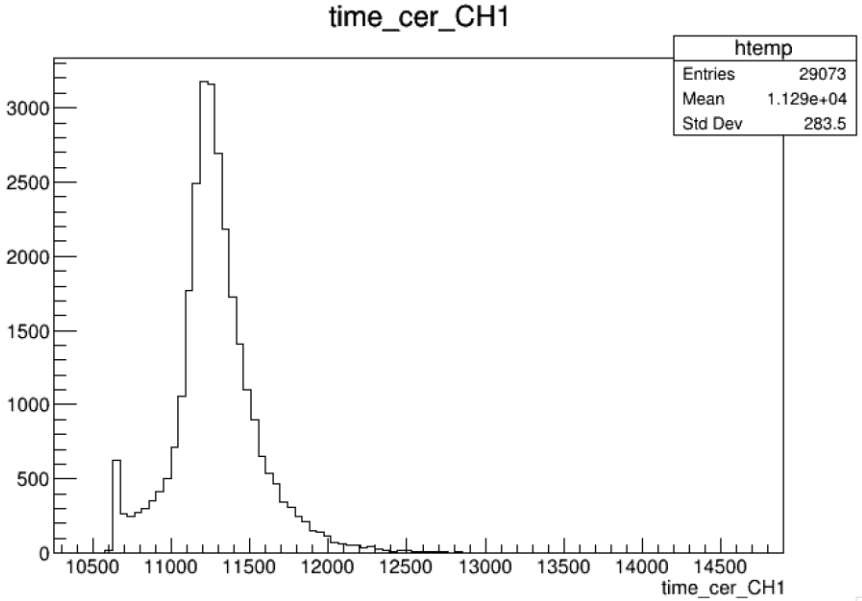

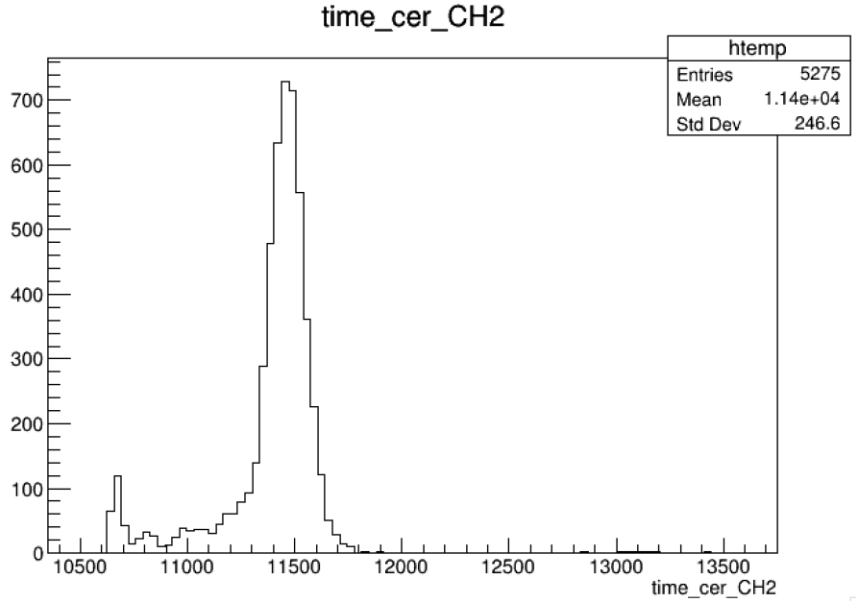

120 DEGREES

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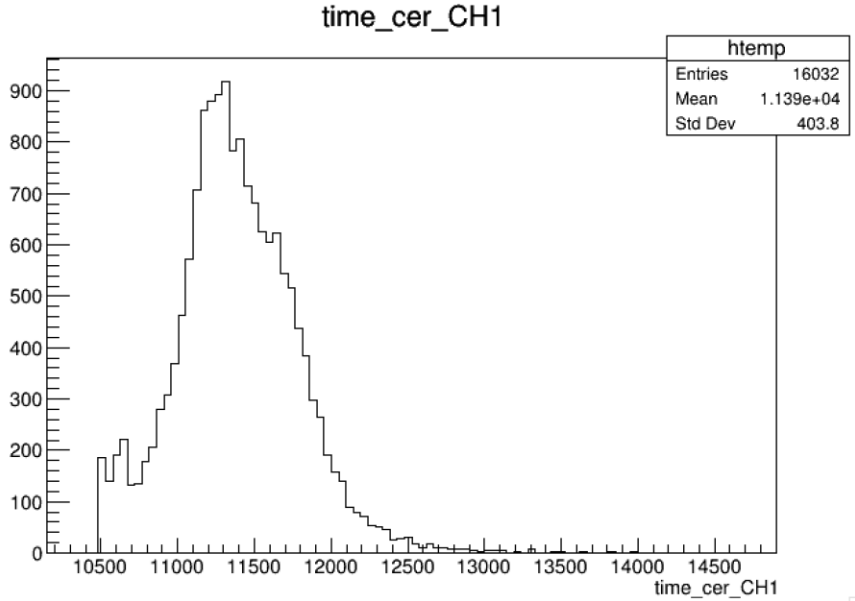

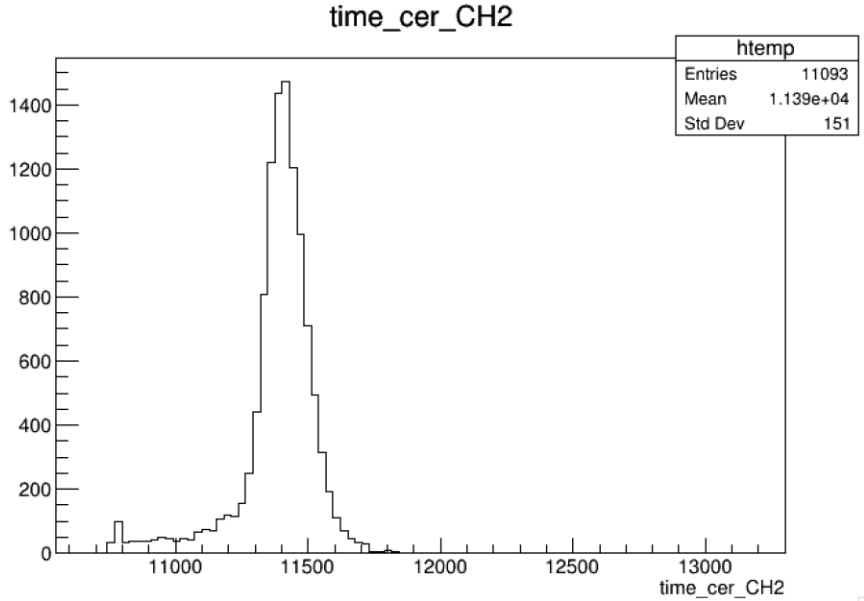

180 DEGREES

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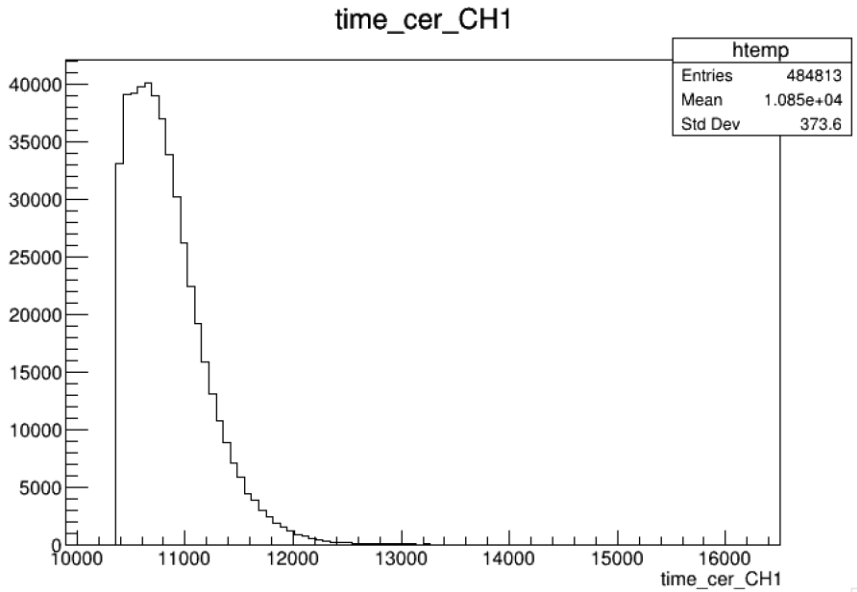
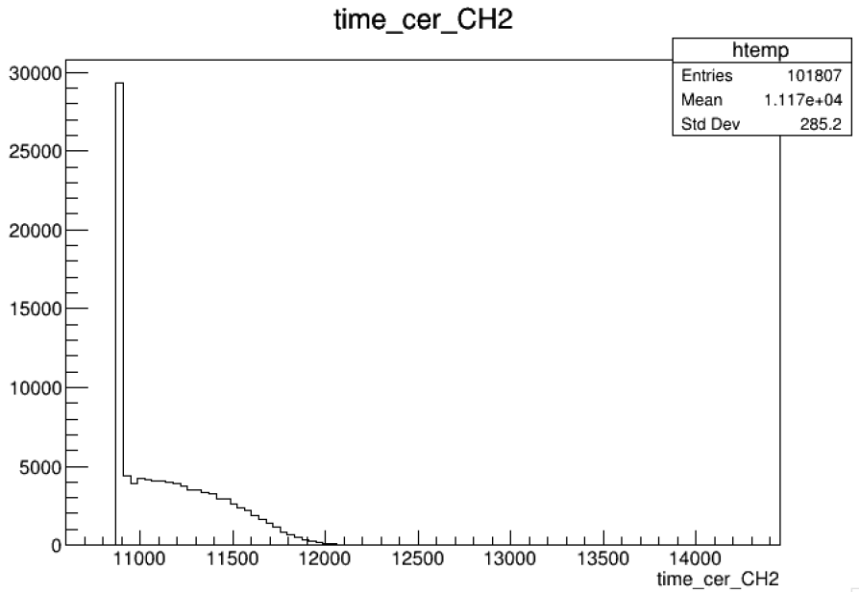
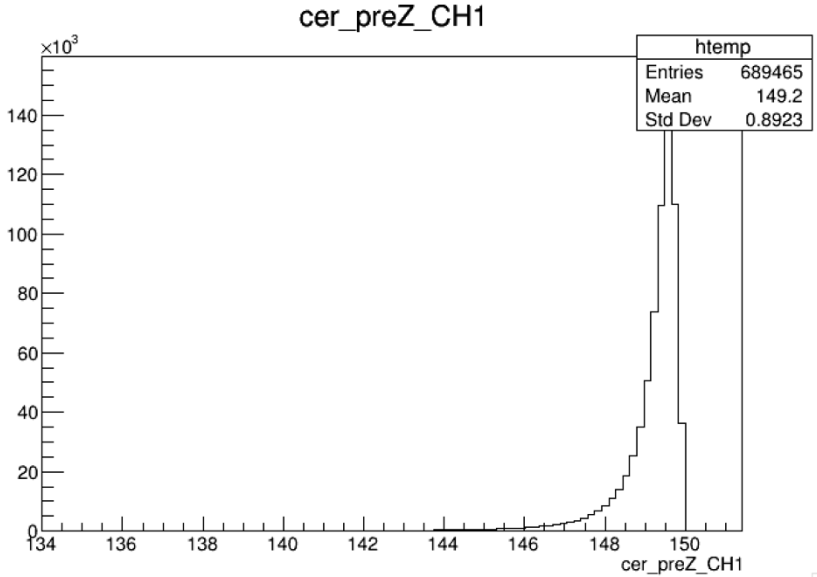
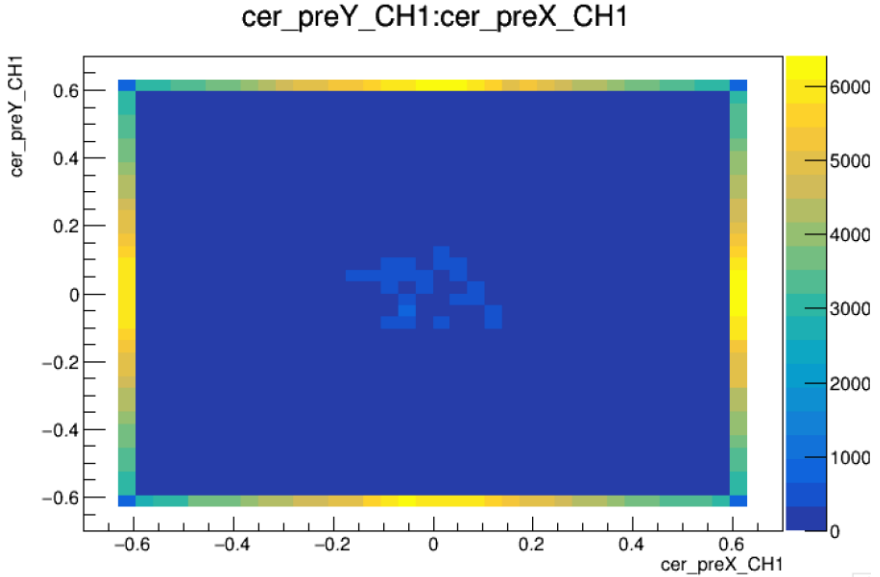




PREPOSITIONS OF PHOTONS - 0 DEGREES

- e+ at 10 GeV, σ_{beam} = 0.25 cm, 1000 events
  - Coordinates refer to position of photons at the step **before** entering the sipms





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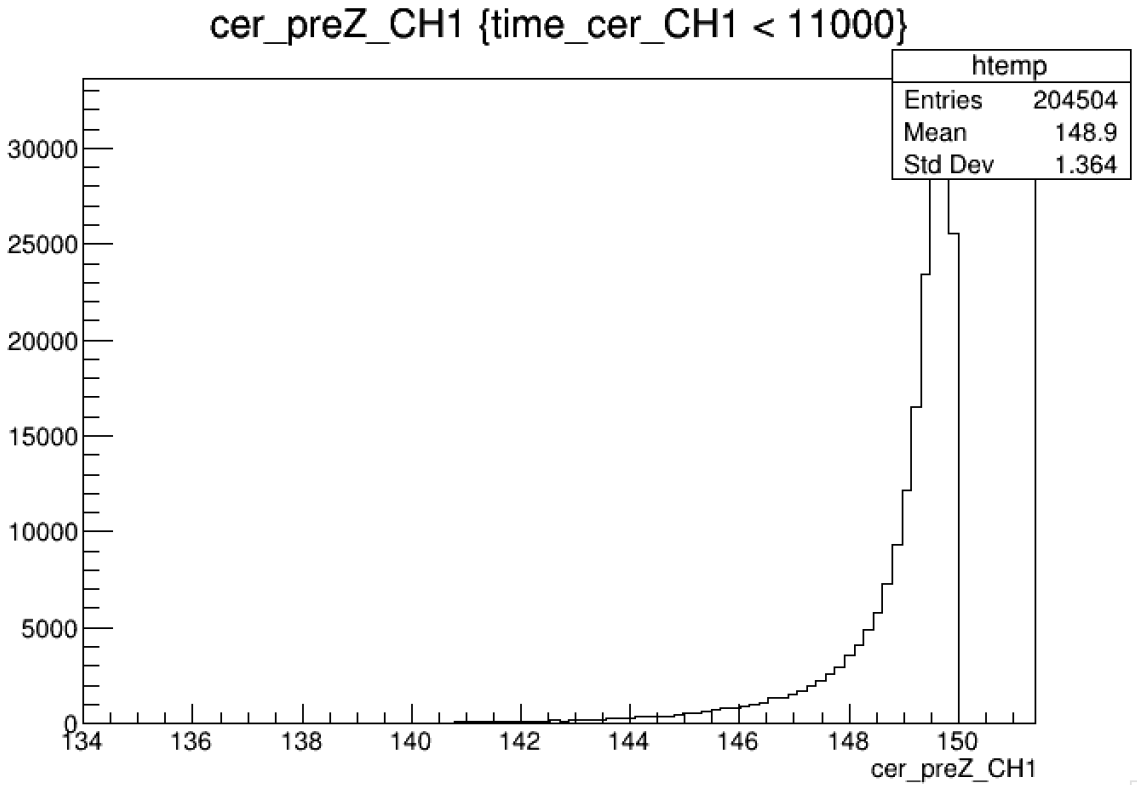

PREPOSITION AND TIMING CORRELATION - 0 DEGREES

- e+ at 10 GeV, σ_{beam} = 0.25 cm, 1000 events
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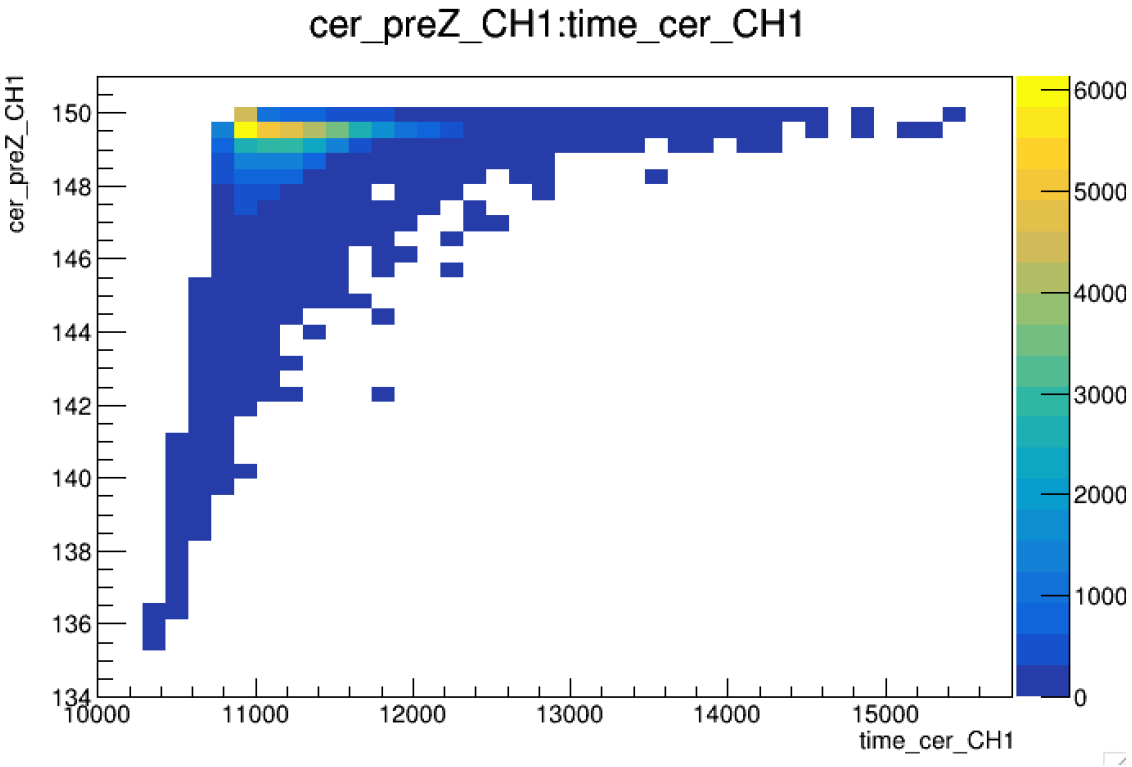

PREPOSITIONS OF PHOTONS - 60 DEGREES

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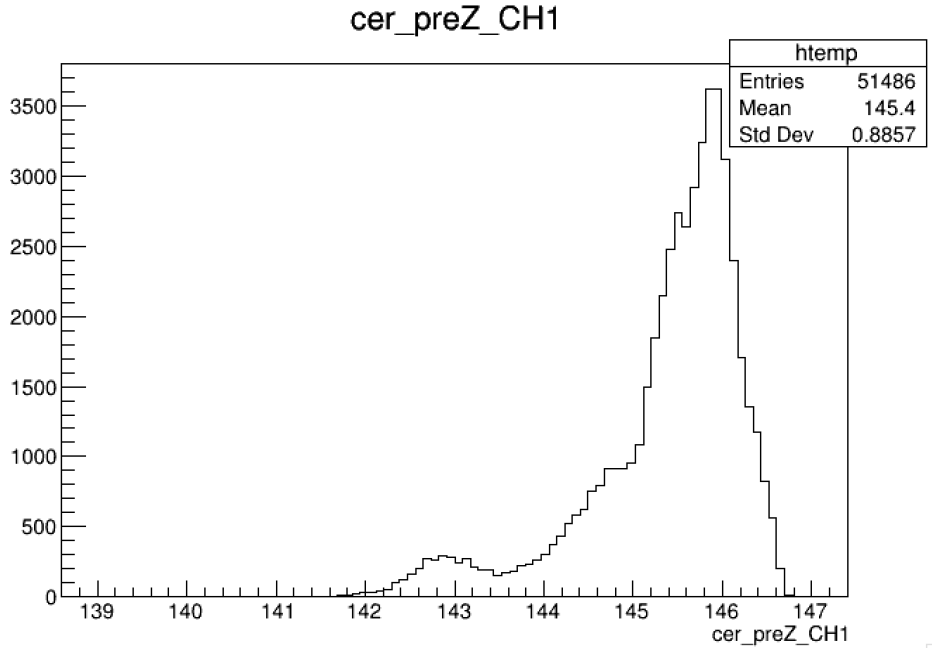

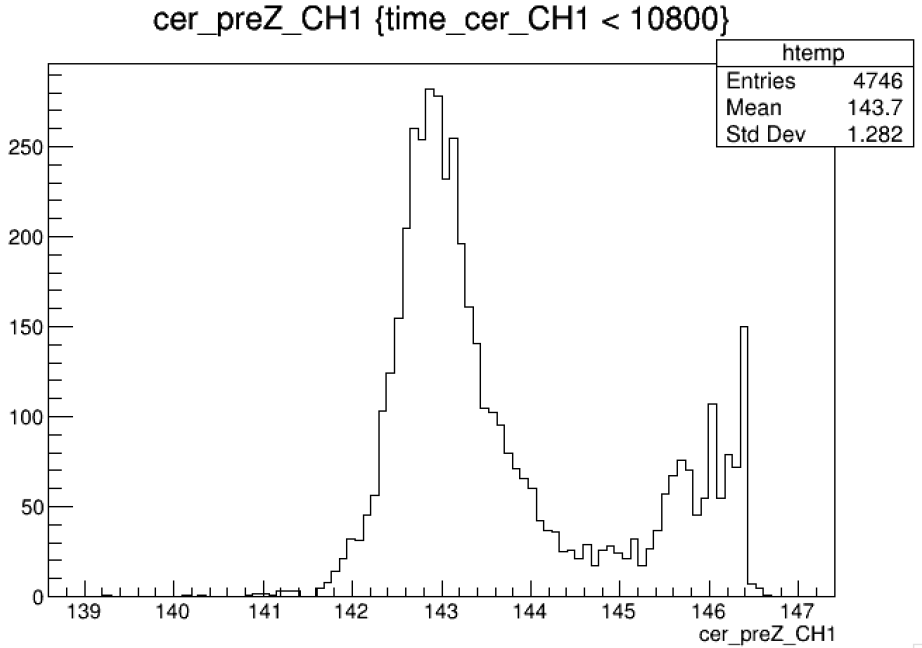

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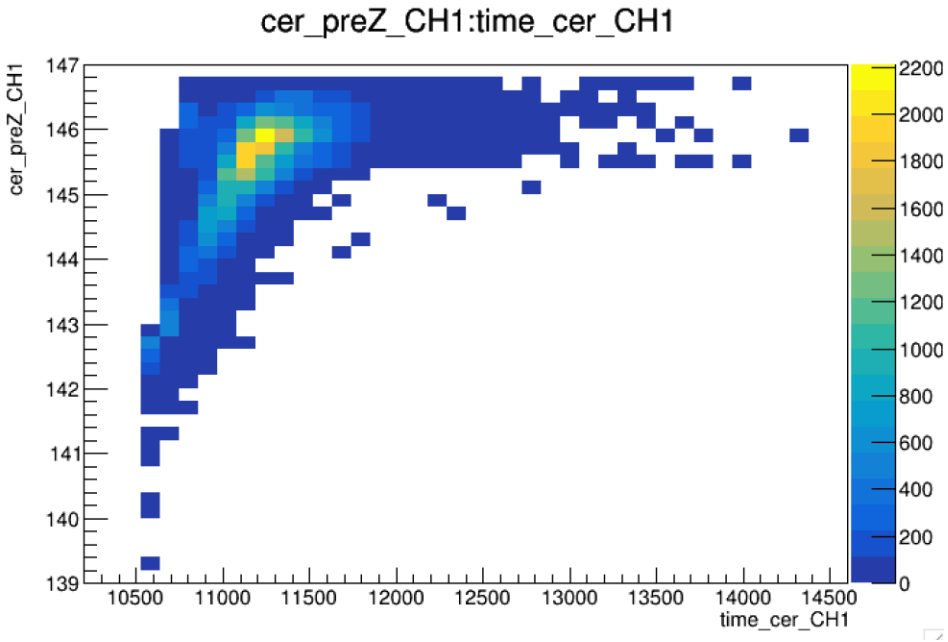

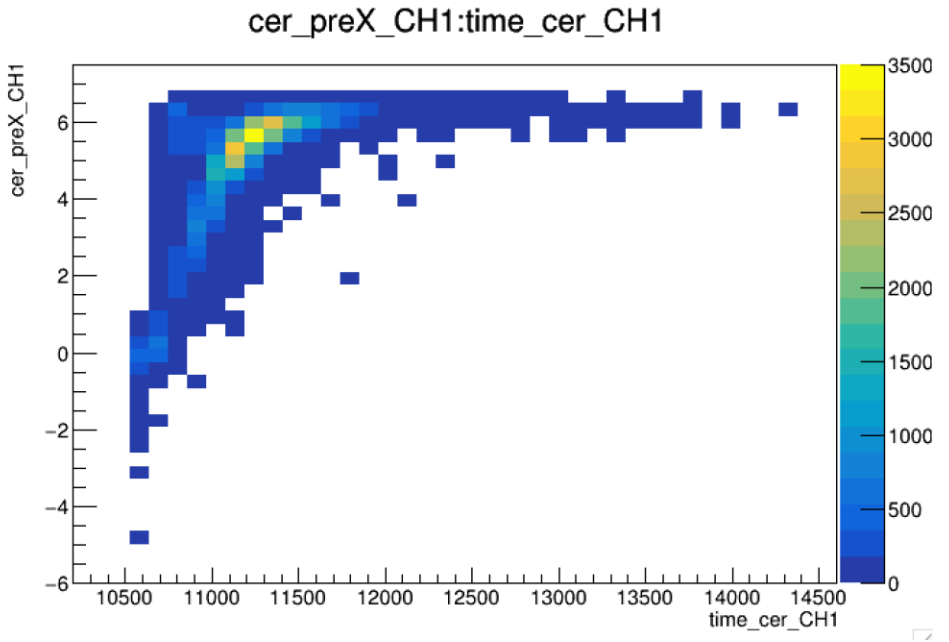

PREPOSITIONS OF PHOTONS - 90 DEGREES

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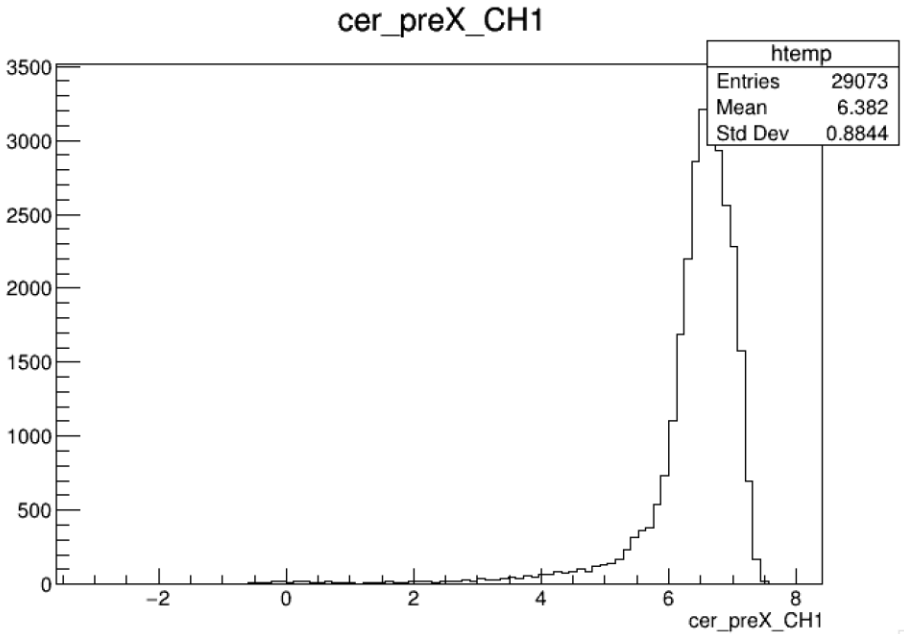

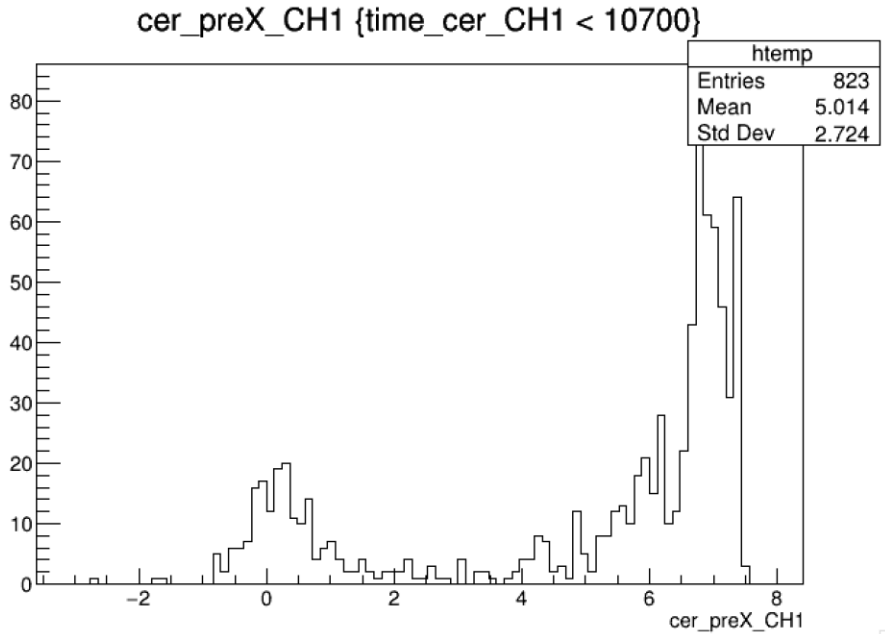

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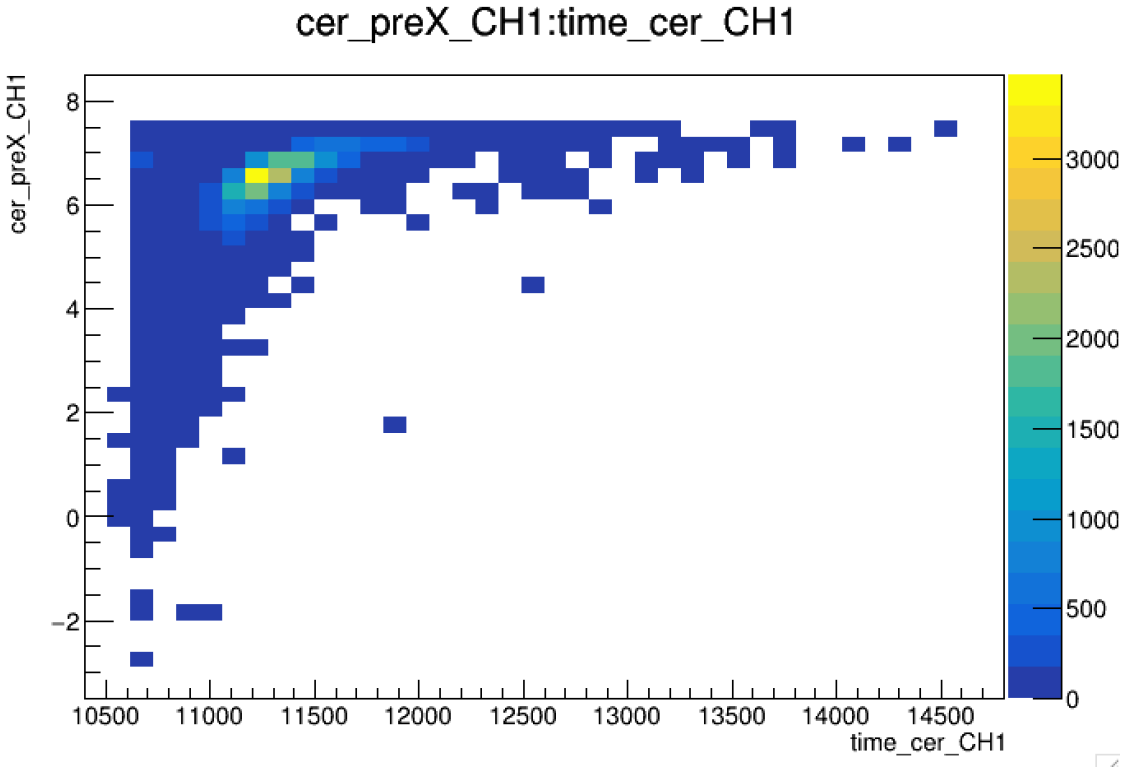

PREPOSITIONS OF PHOTONS - 180 DEGREES

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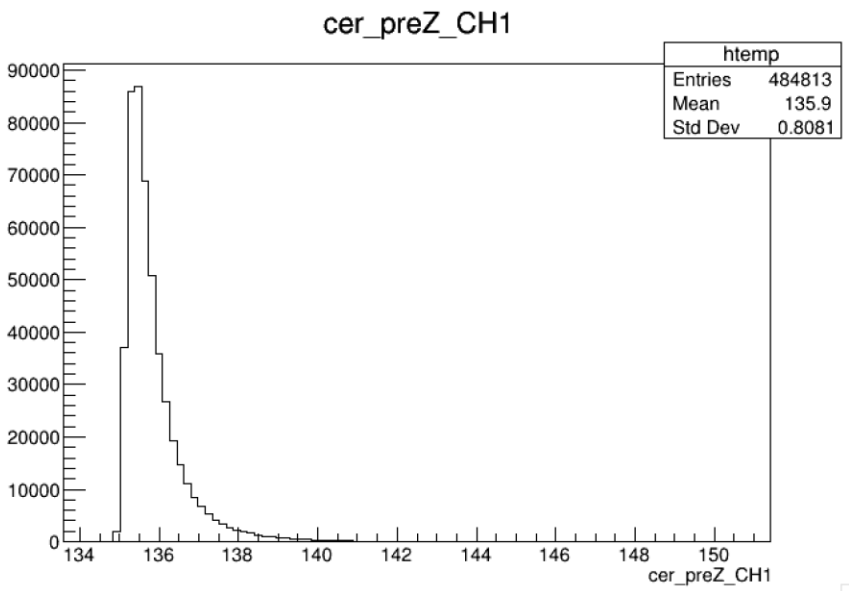

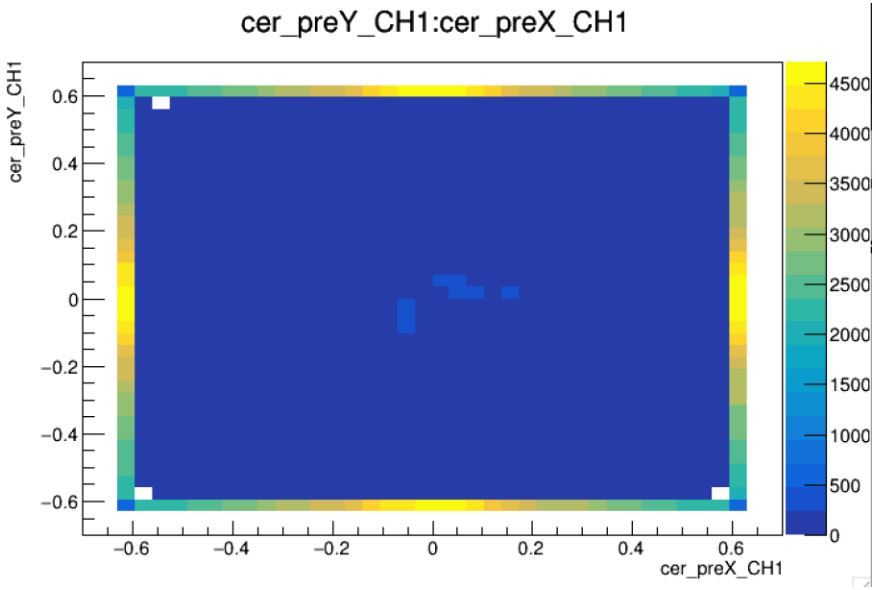

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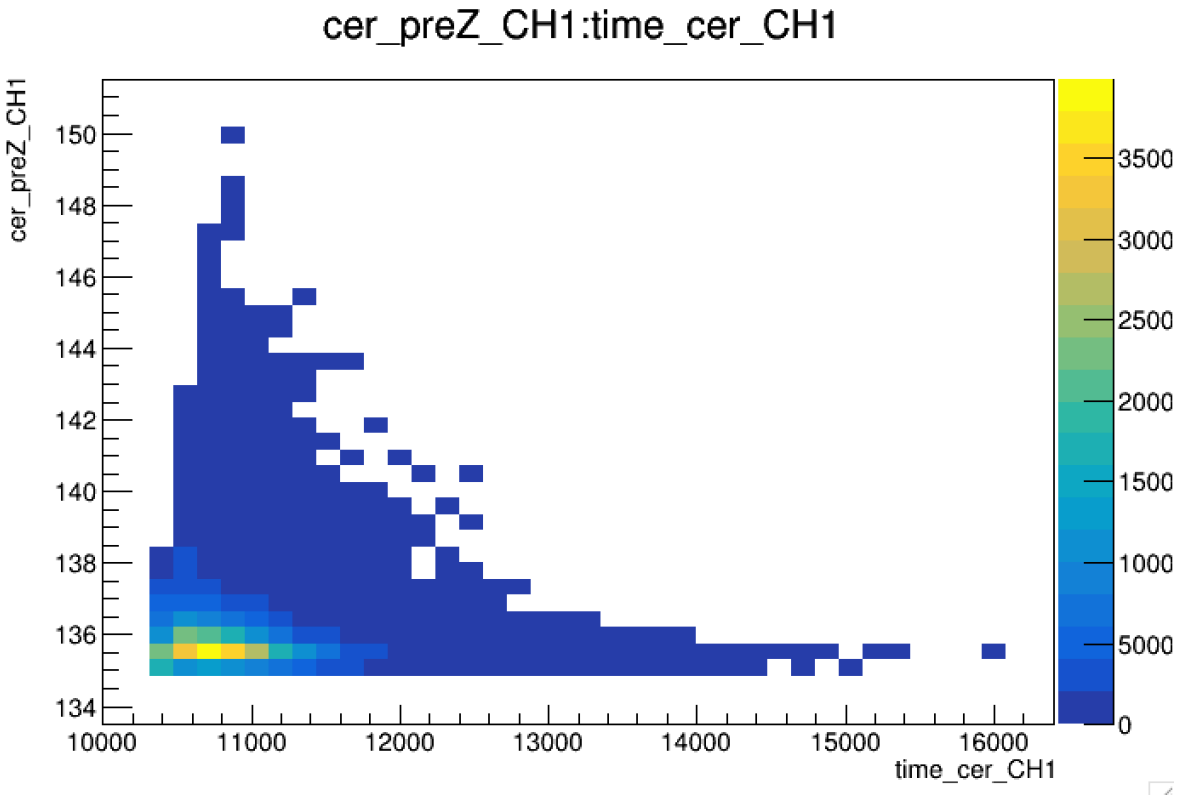


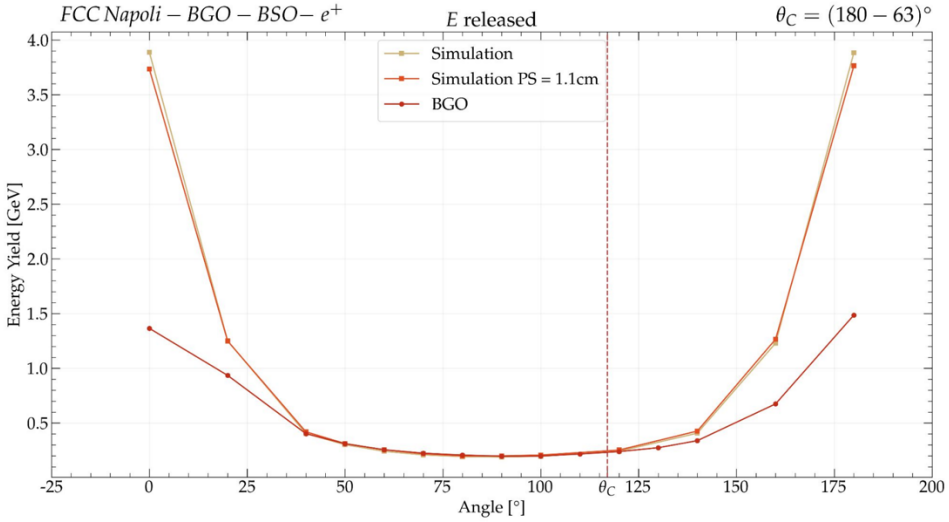
SUMMARY OF SIMULATION STUFF AGREEING WITH DATA

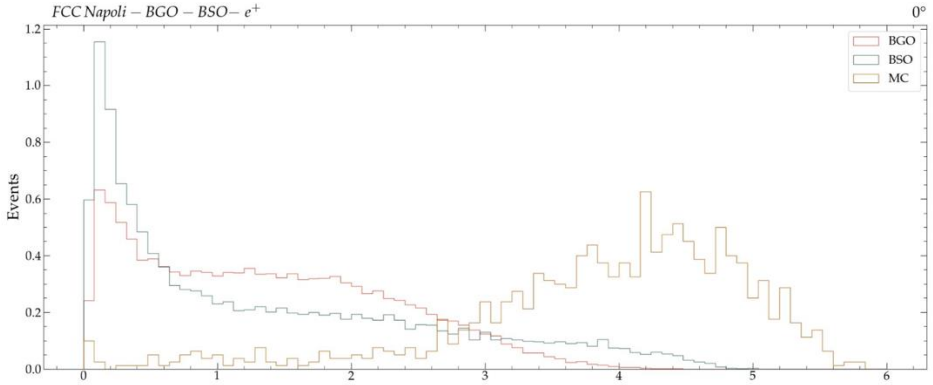
- Energy deposit in crystal:
  - Works for intermediate degrees, worse around 0 and 180 degrees
  - Tuning of angular dispersion of beam improves closure to data shapes

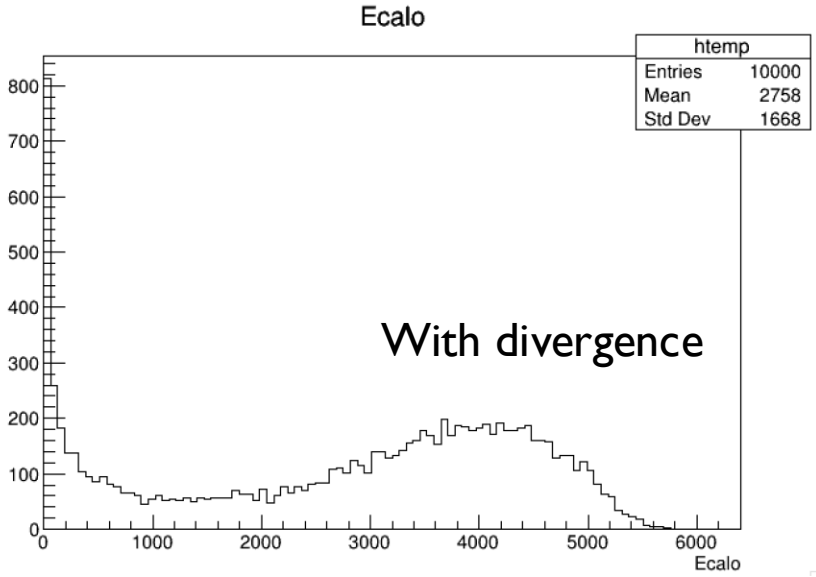
- Ratio C/S vs crystal angles
  - Peak is at the expected positions for both channels
  - 0 and 180 degrees points are mostly off trend, probably due to larger spread of photons number

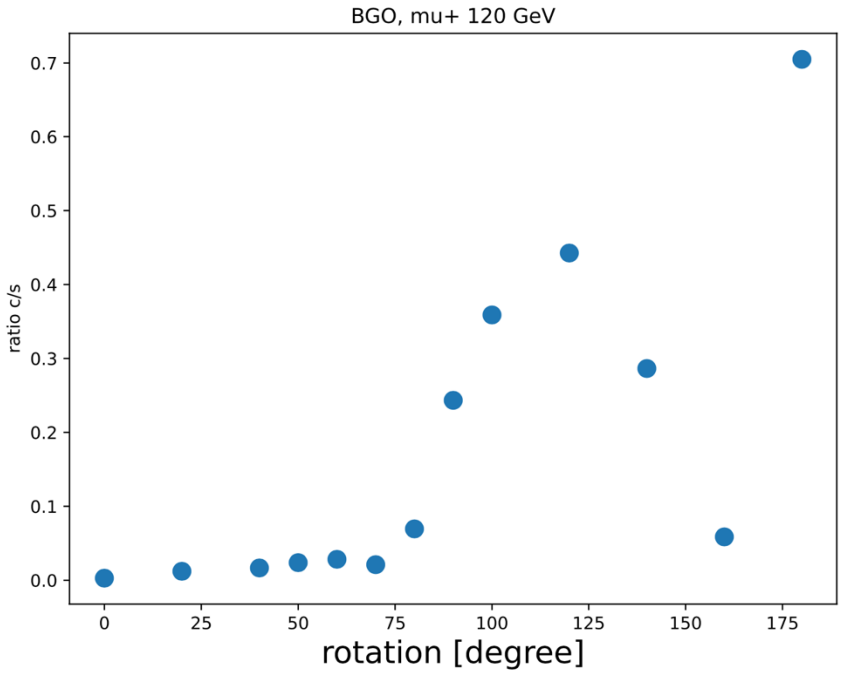
- Technical issues
  - Daniele's slides

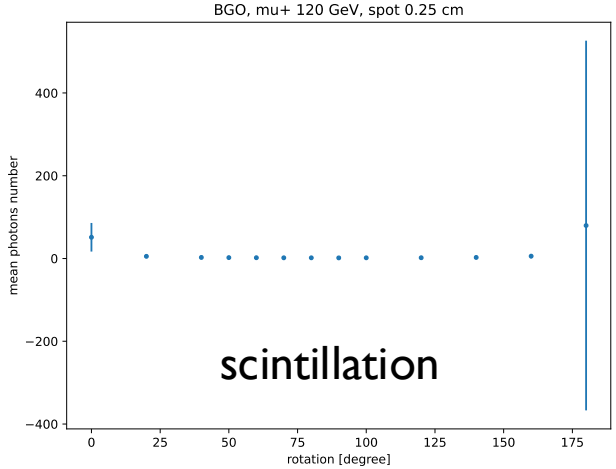
Backup

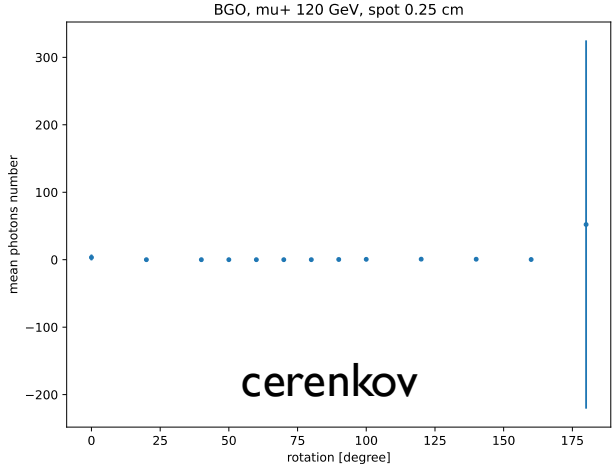

FCC Napoli – BGO – BSO– e^+
E released
$\theta_C = (180 - 63)°$
Simulation
Simulation PS = 1.1cm
BGO
Energy Yield [GeV]
Angle [°]
θ_C


FCC Napoli – BGO – BSO– e^+
0°
BGO
BSO
MC
Events


Ecalo
htemp
Entries 10000
Mean 2758
Std Dev 1668
With divergence
Ecalo


BGO, mu+ 120 GeV
ratio c/s
rotation [degree]


BGO, mu+ 120 GeV, spot 0.25 cm
mean photons number
rotation [degree]
scintillation


BGO, mu+ 120 GeV, spot 0.25 cm
mean photons number
rotation [degree]
cerenkov