Geant4: *L-qBar QUARTIC*

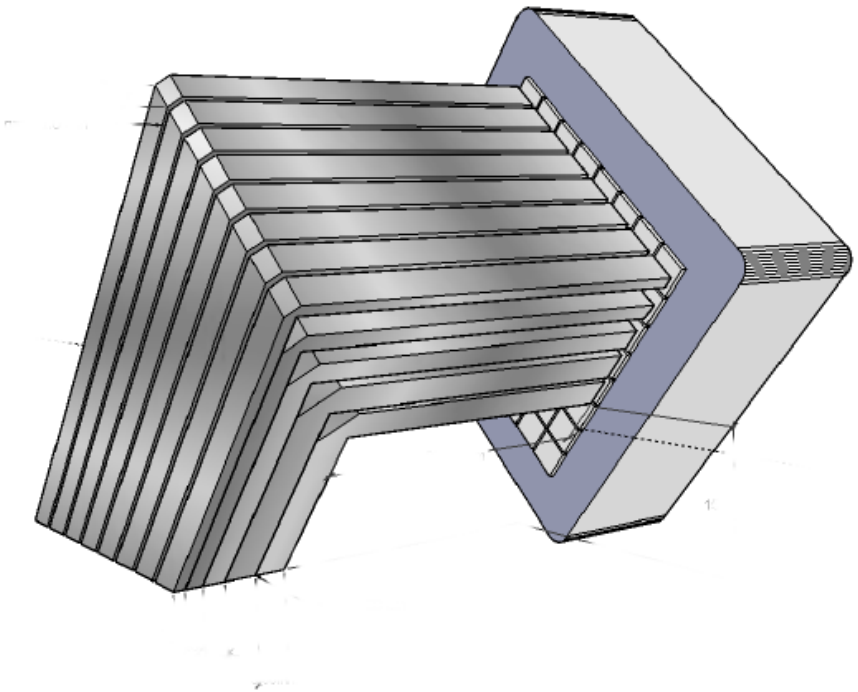
Bartłomiej Rzeszotarski

AGH - Wydział Fizyki i Informatyki Stosowanej

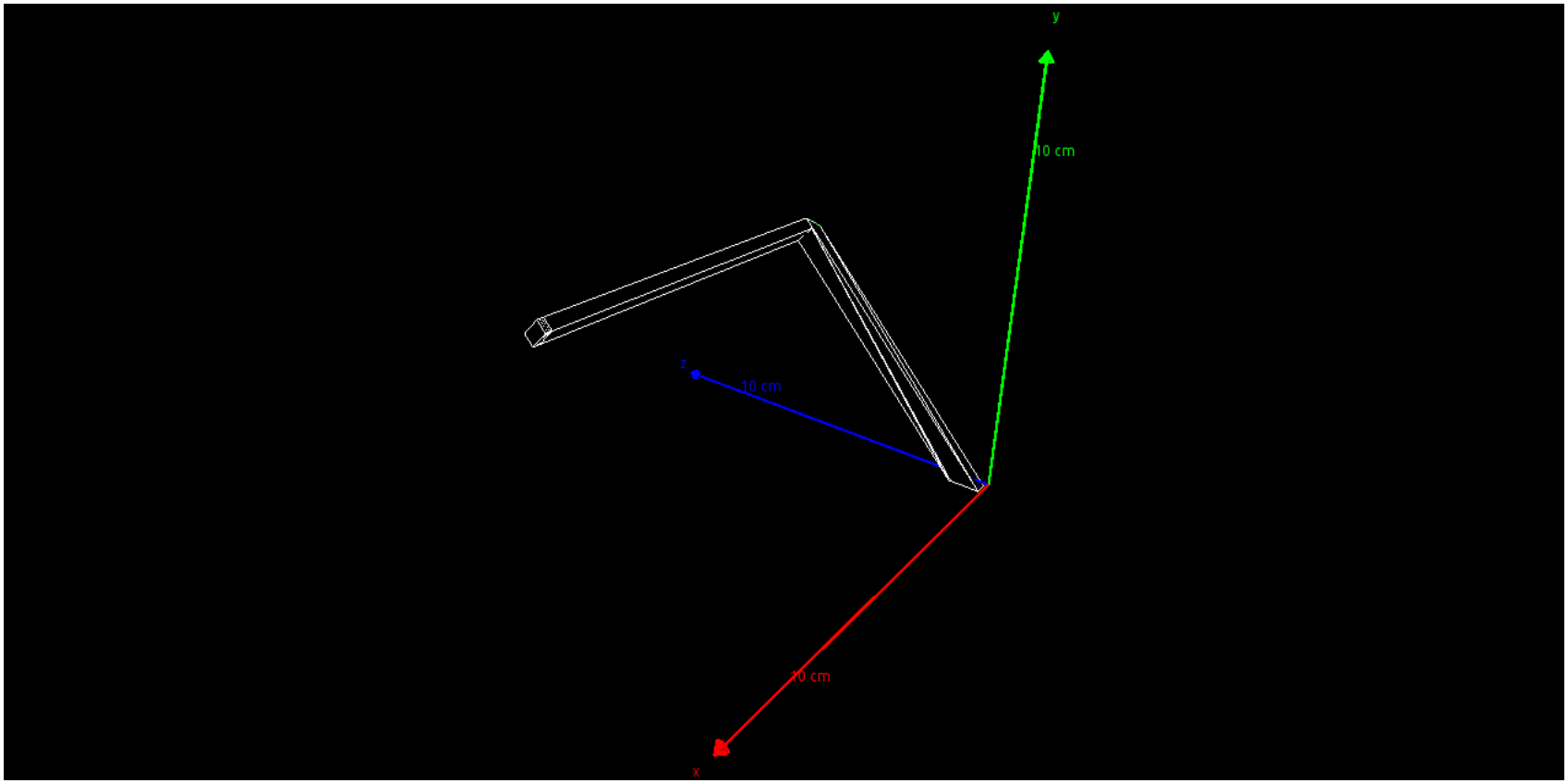
31 marca 2014

ATLAS **F**orward **P**rotons

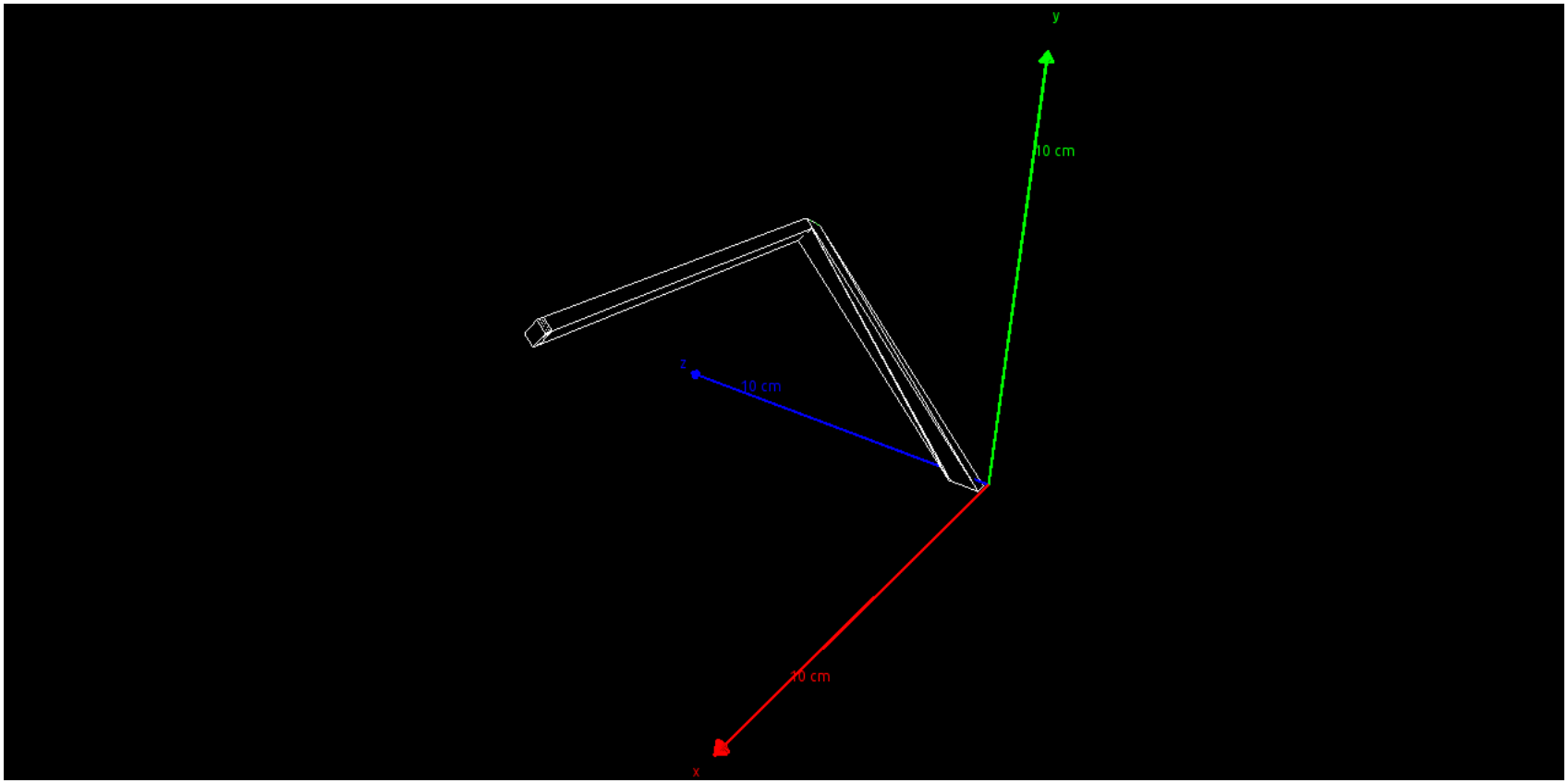
- **QUARTIC** - ***QUAR**z **TI**ming **C**herenkov*



location: symmetrically, ≈214m from collision point



regular quartz L-qbar with aluminized elbow (90% reflectivity):
a. vertical arm: length 80 mm, cross profile 3x6 mm,
b. horizontal arm: length 80 mm, cross profile 3x6 mm,



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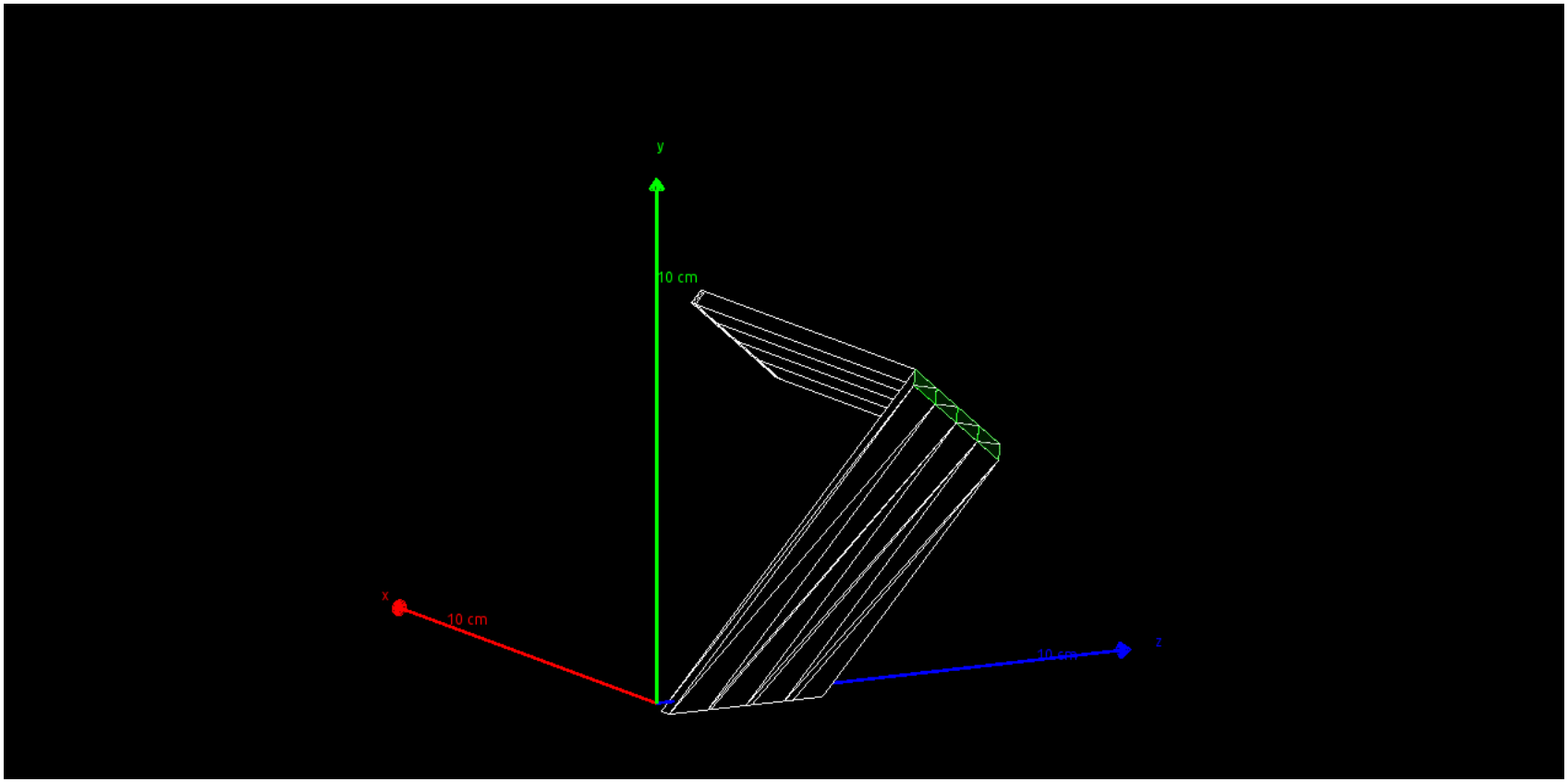
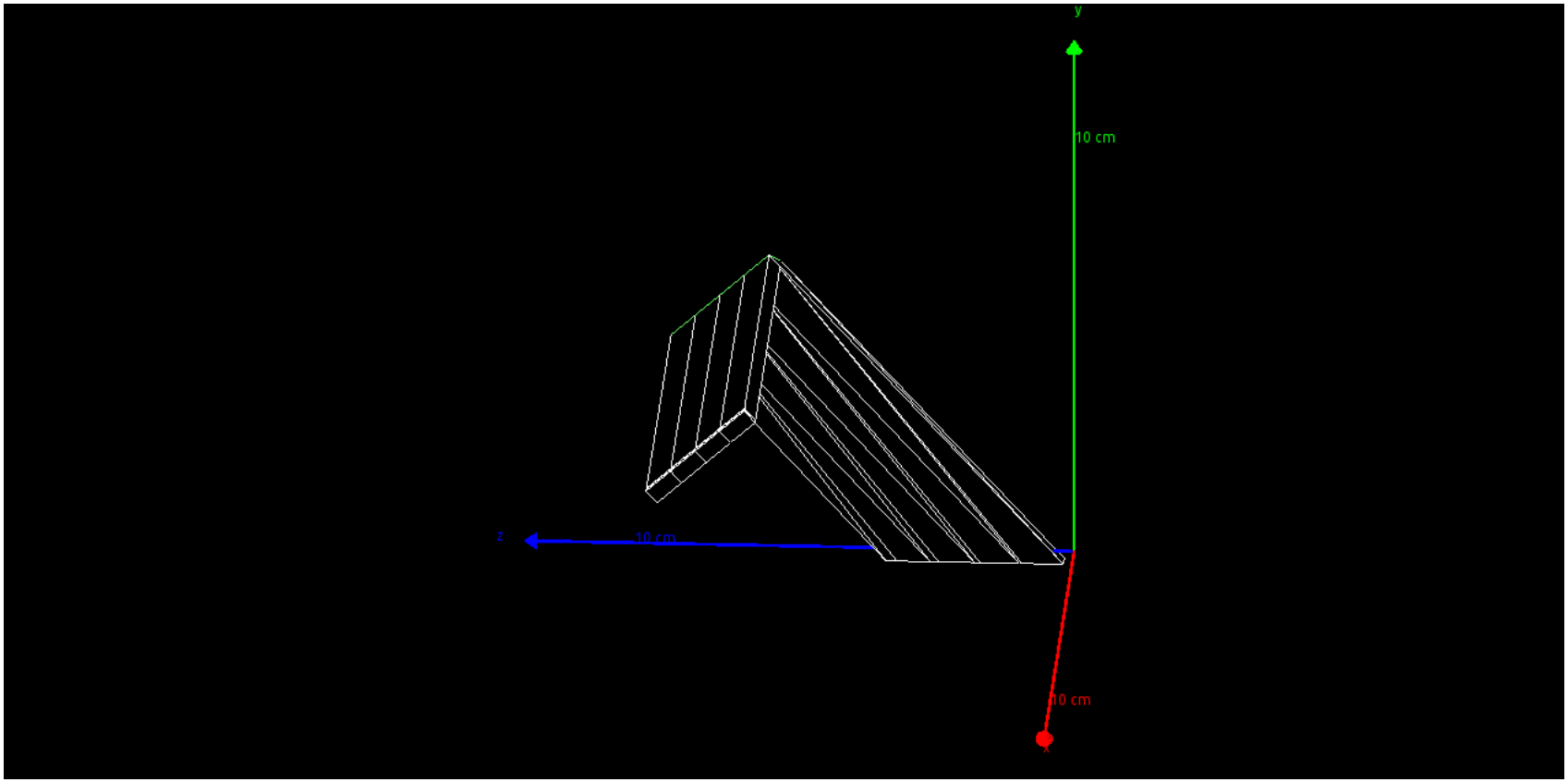

y
10 cm
x
10 cm
z
10 cm


y
10 cm
z
10 cm
10 cm

Fused silica:

- Refractive index 1.45 - 1.51 gives Cherenkov radiation angle $\approx 48^{\circ}$ - total internal reflection
- Absorption length ($\approx 1m$) allows to reach the photodetector by almost all photons

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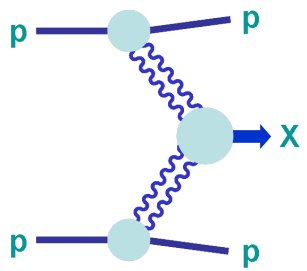
L-qBar is designed to detect the protons scattered at small angles:

- high time resolution $(10 - 15ps)$ allows us to specify the vertex point, and;
- to identify exactly which protons were involved in the interaction

With this information, we can more thoroughly study the *exclusive reactions*, in which is produced the Higgs boson or W^+W^- bosons



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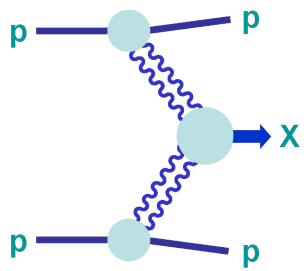

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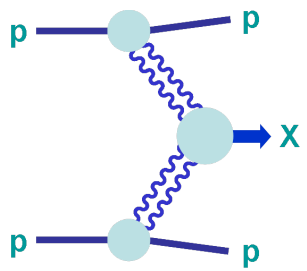

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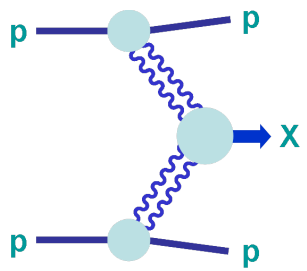

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$$p + p \longrightarrow p + H + p$$

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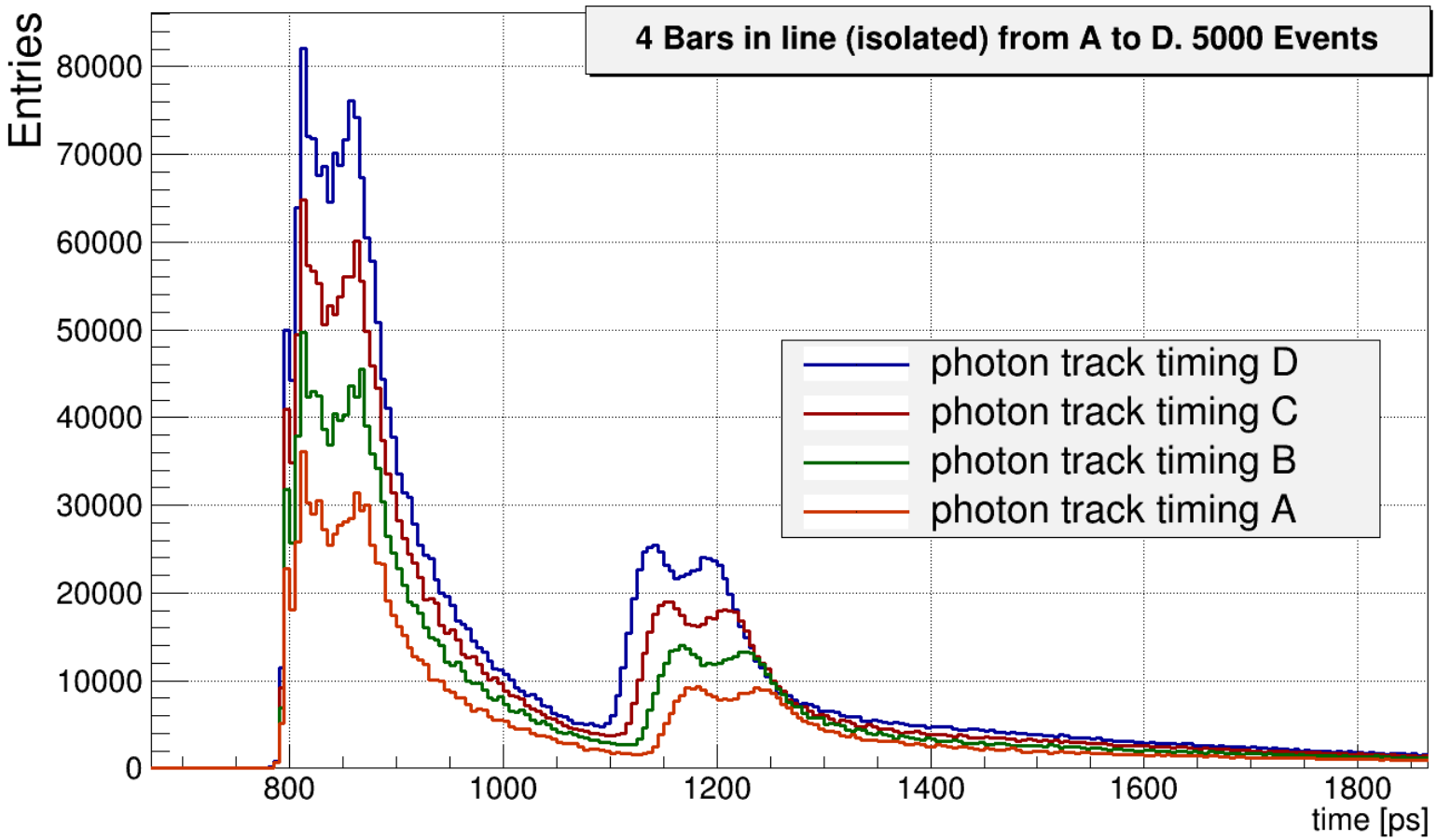
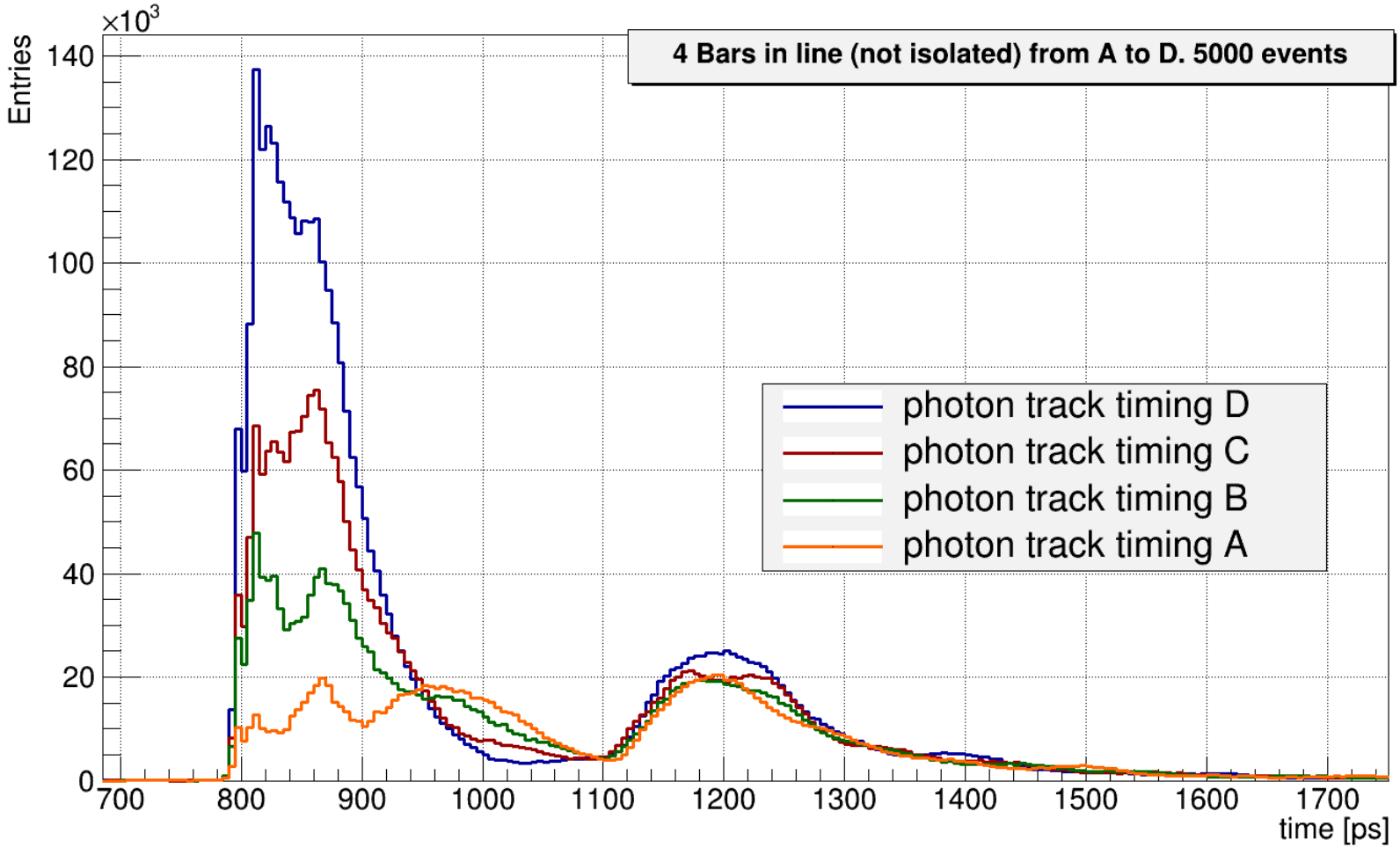
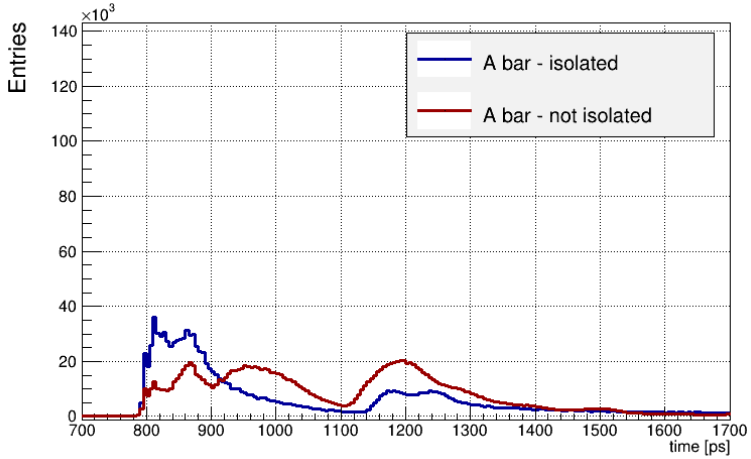
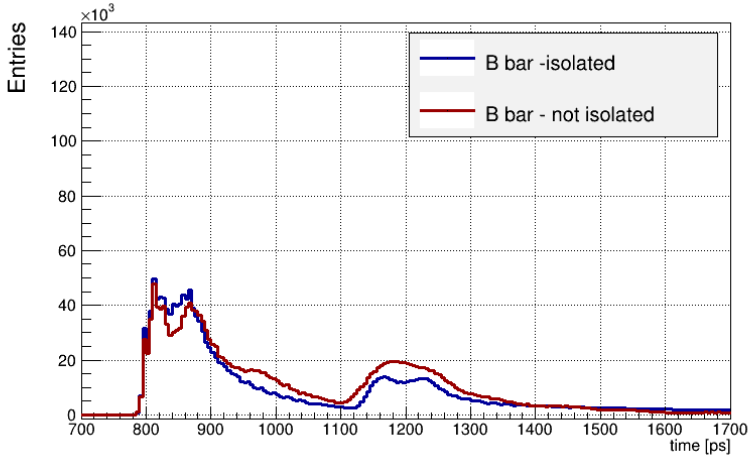
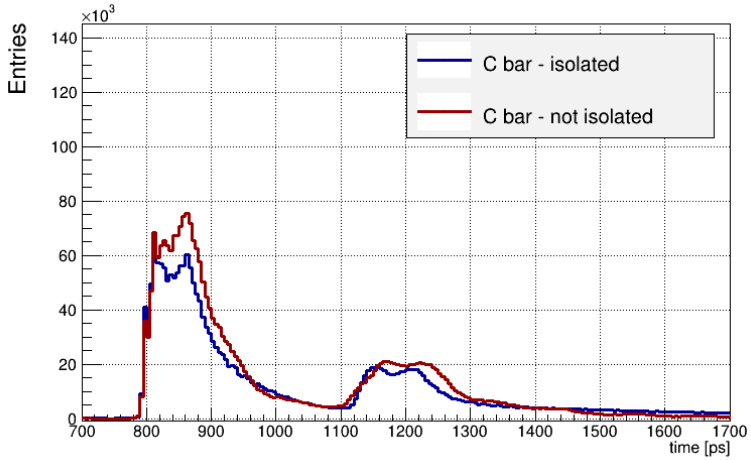
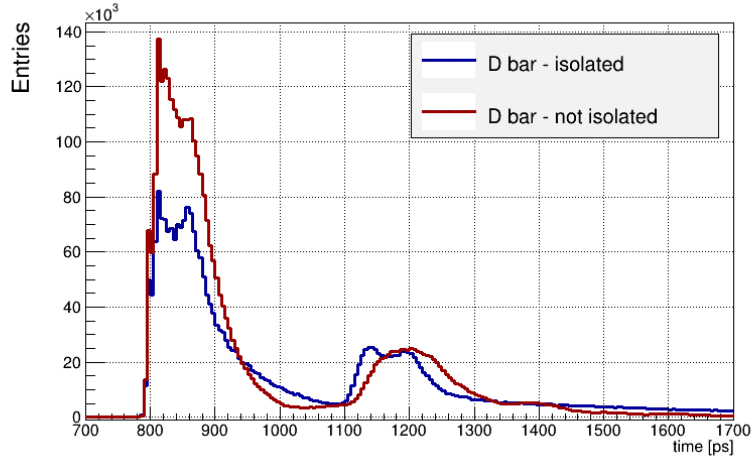

4 Bars in line (isolated) from A to D. 5000 Events
Entries
80000
70000
60000
50000
40000
30000
20000
10000
0
800
1000
1200
1400
1600
1800
time [ps]
photon track timing D
photon track timing C
photon track timing B
photon track timing A

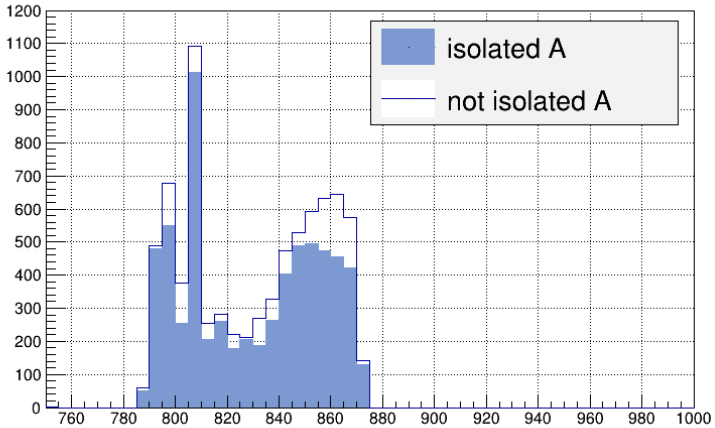

4 Bars in line (not isolated) from A to D. 5000 events
Entries
×10^3
140
120
100
80
60
40
20
0
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
time [ps]
photon track timing D
photon track timing C
photon track timing B
photon track timing A

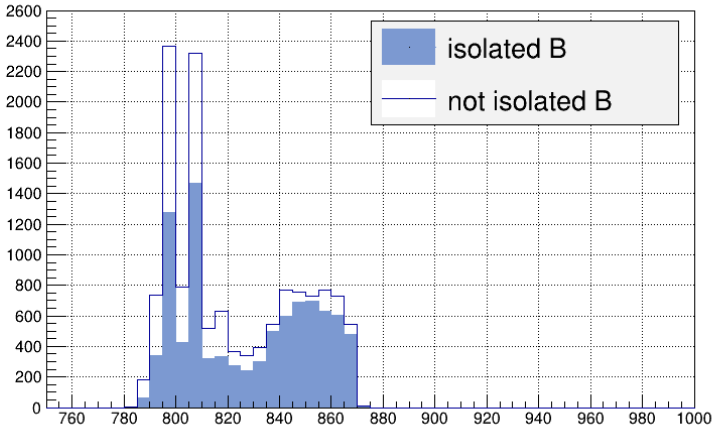

Entries
×10³
A bar - isolated
A bar - not isolated
time [ps]

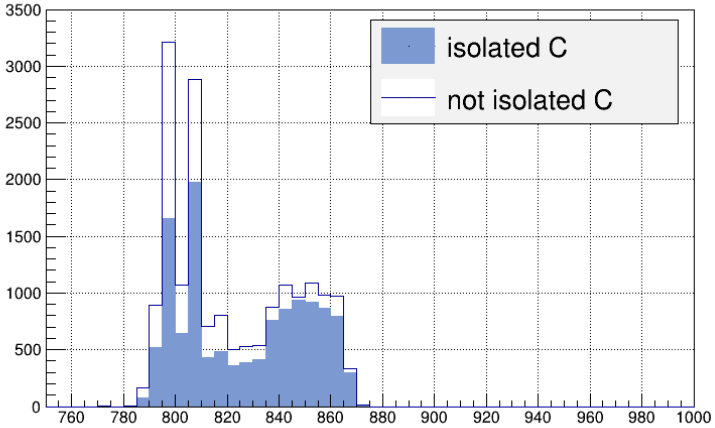

Entries
×10³
B bar -isolated
B bar - not isolated
time [ps]

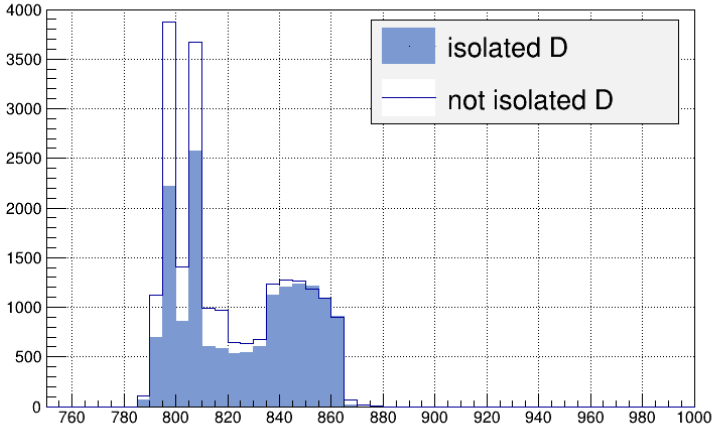

Entries
×10³
C bar - isolated
C bar - not isolated
time [ps]

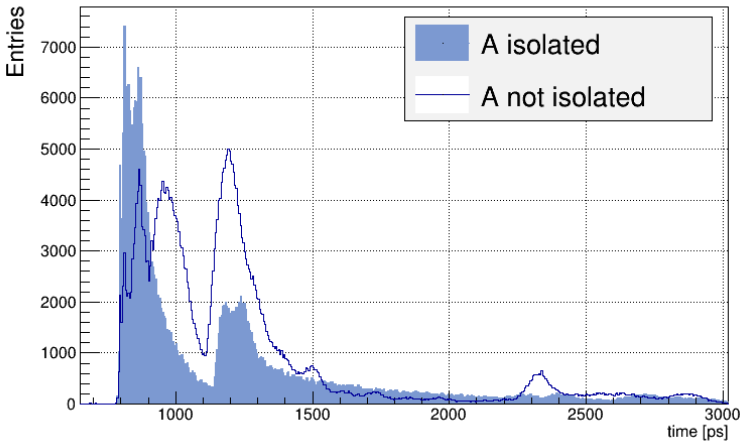

Entries
×10³
D bar - isolated
D bar - not isolated
time [ps]

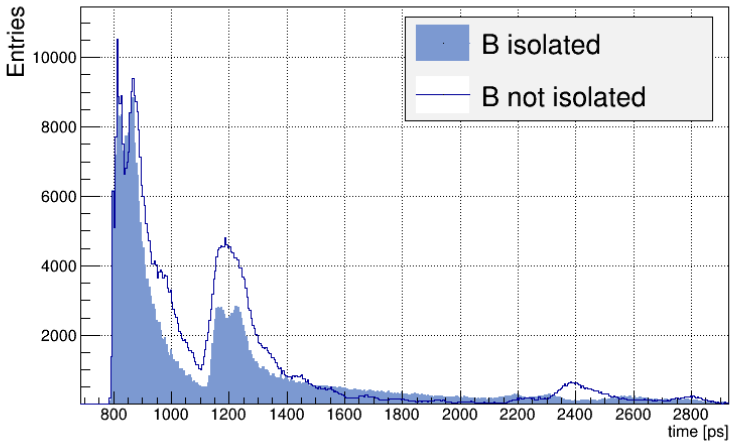

isolated A
not isolated A

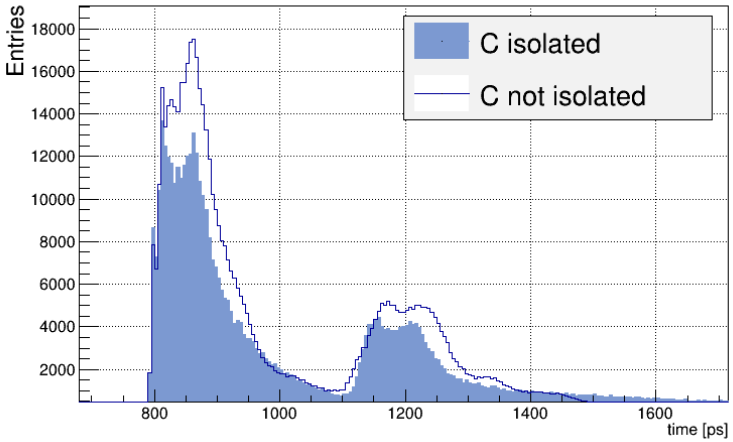

isolated B
not isolated B

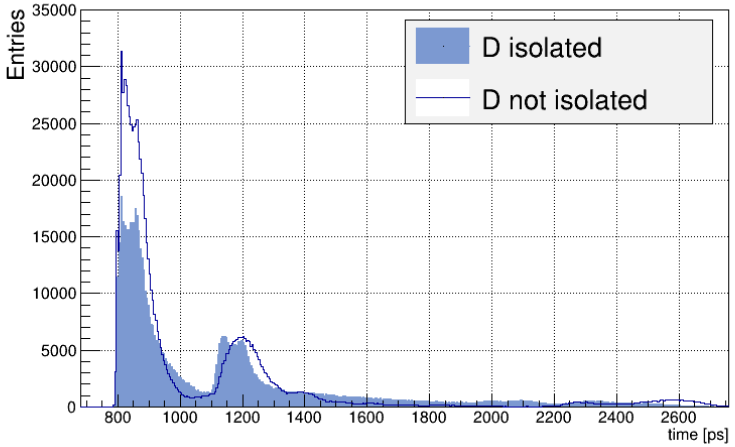

isolated C
not isolated C


isolated D
not isolated D


Entries
A isolated
A not isolated
time [ps]


Entries
B isolated
B not isolated
time [ps]


Entries
C isolated
C not isolated
time [ps]


Entries
D isolated
D not isolated
time [ps]