Xenon Doping

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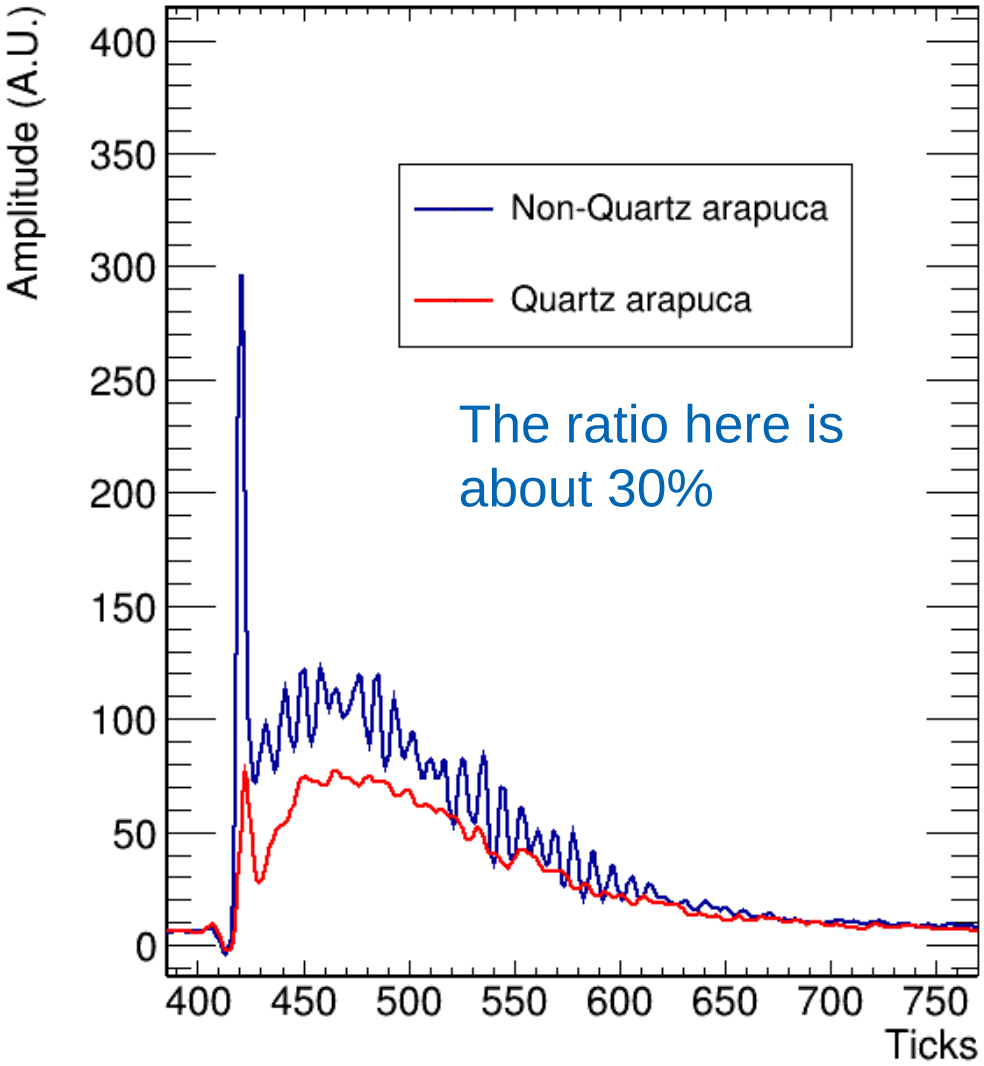
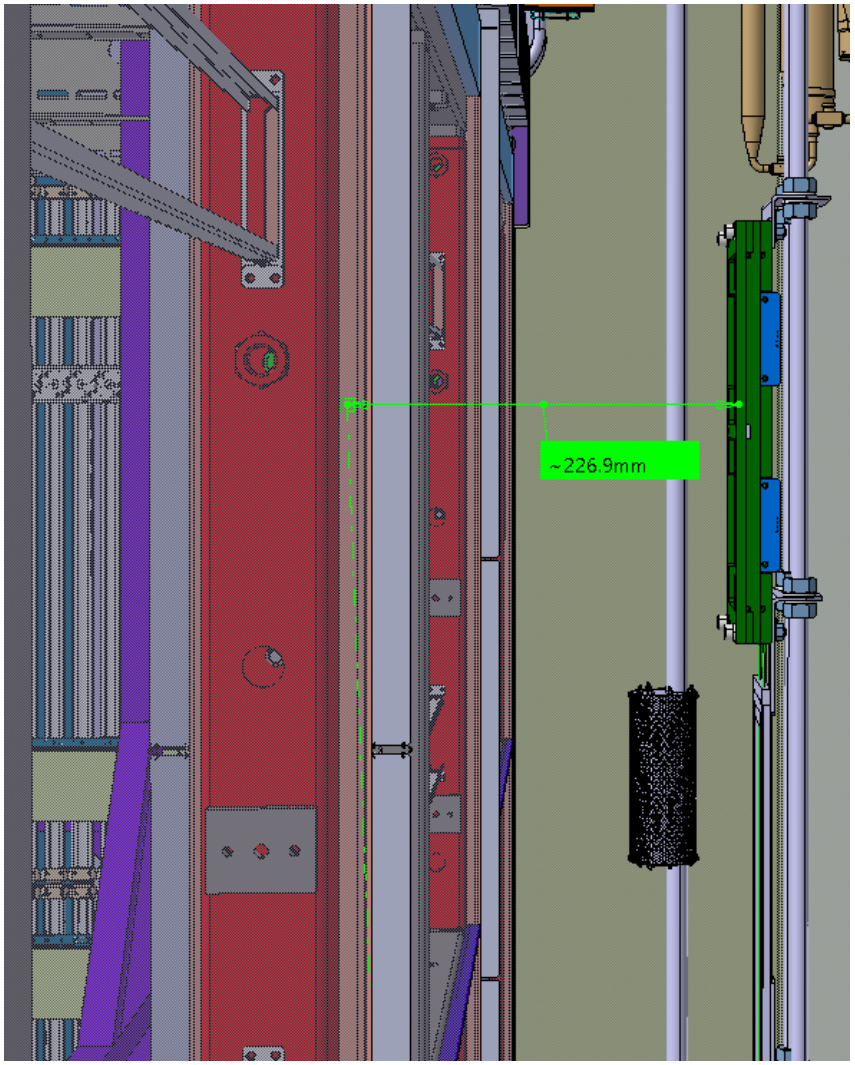
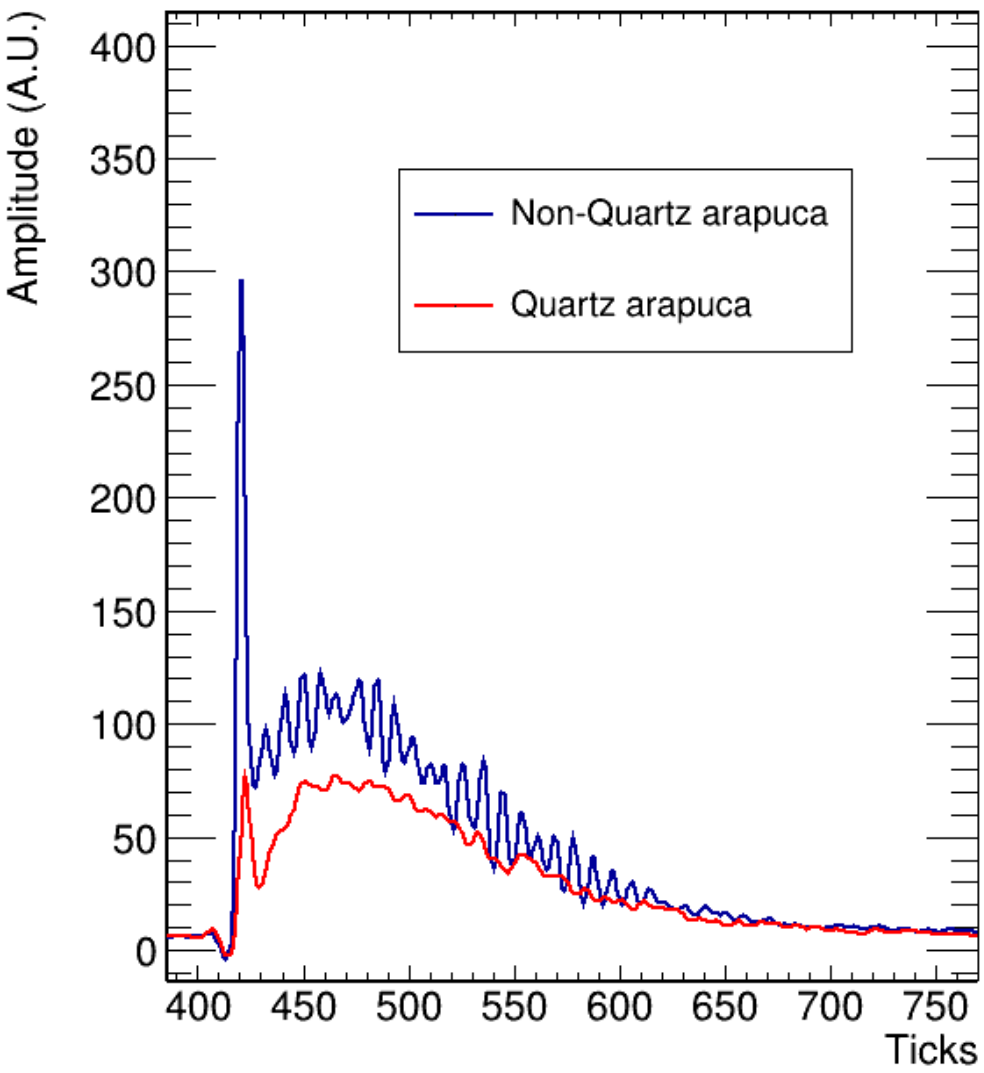
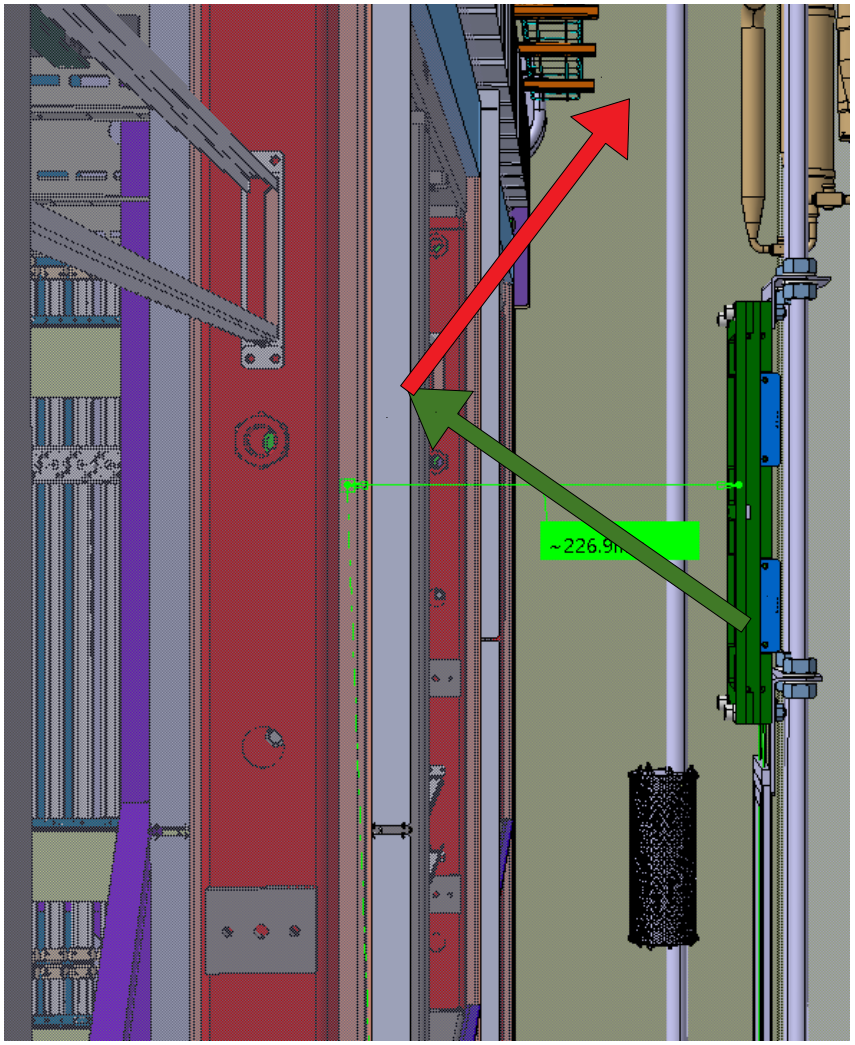
Fast light component





Fast light component





MC toy-model

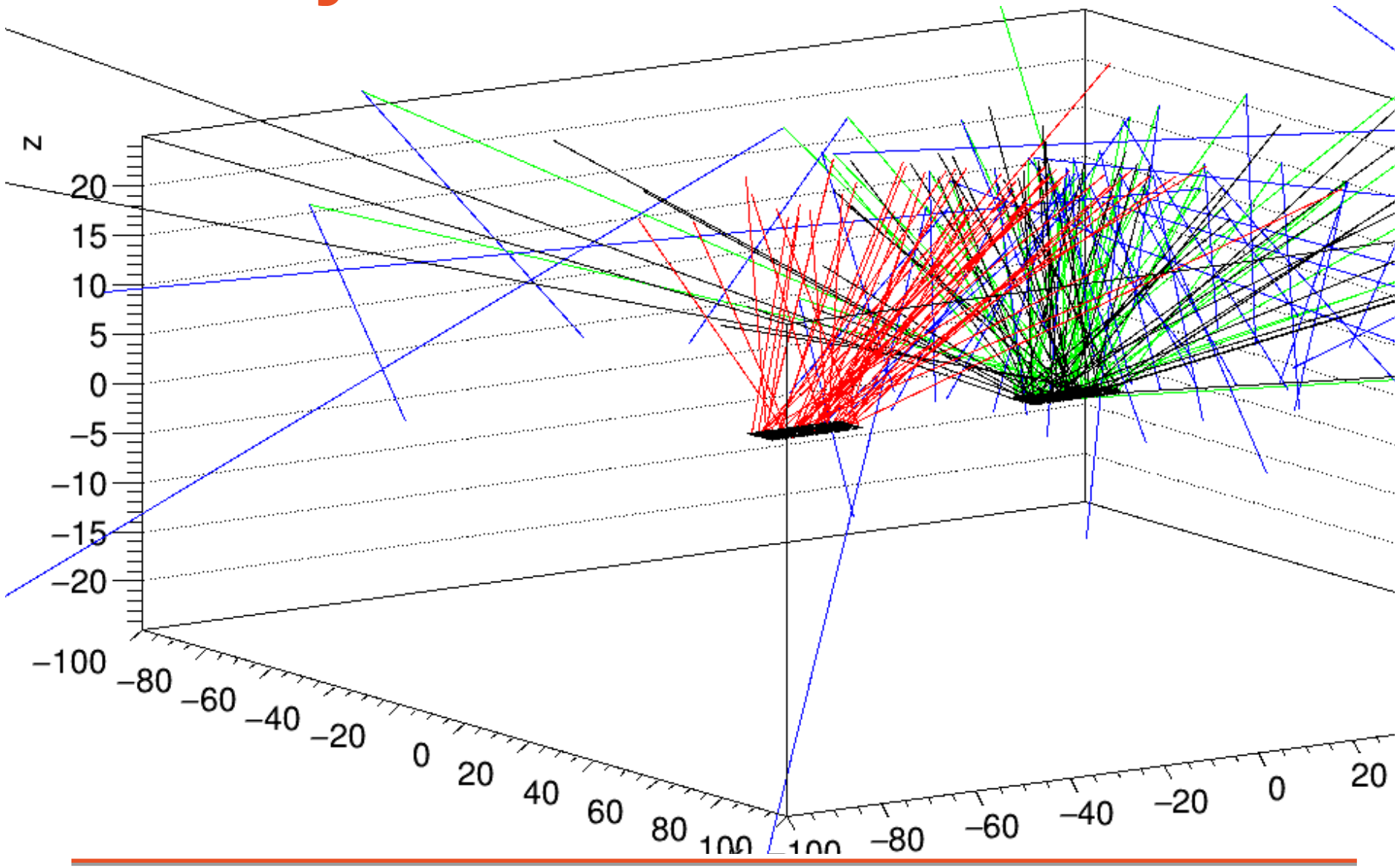
- Generate **10.000 photons** on the surface of the NQ arapuca.
    - **Isotropic “upwards” emission**
    - This correspond to 20.000 photons arriving the arapuca

- This photons can **reflect into the wires** (22.7 cm away) with a certain probability
    - **Probability ranged from 10 to 100%** with steps of 10%
    - Isotropic “downward” reflection (+/- diffuse)

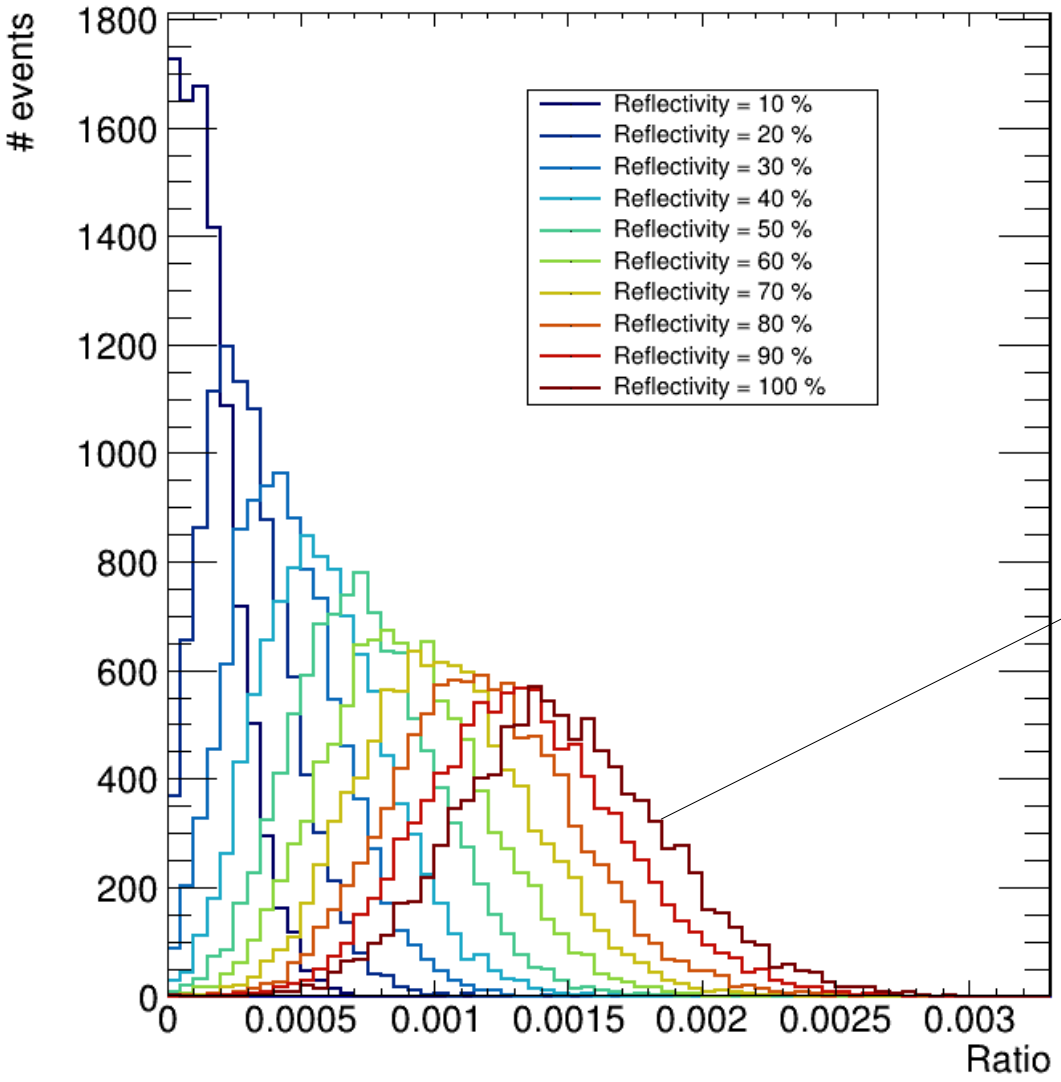
- **The ratio between the amount of photons arriving the NQ arapuca and the photons that could arrive the Q arapuca was taken.**

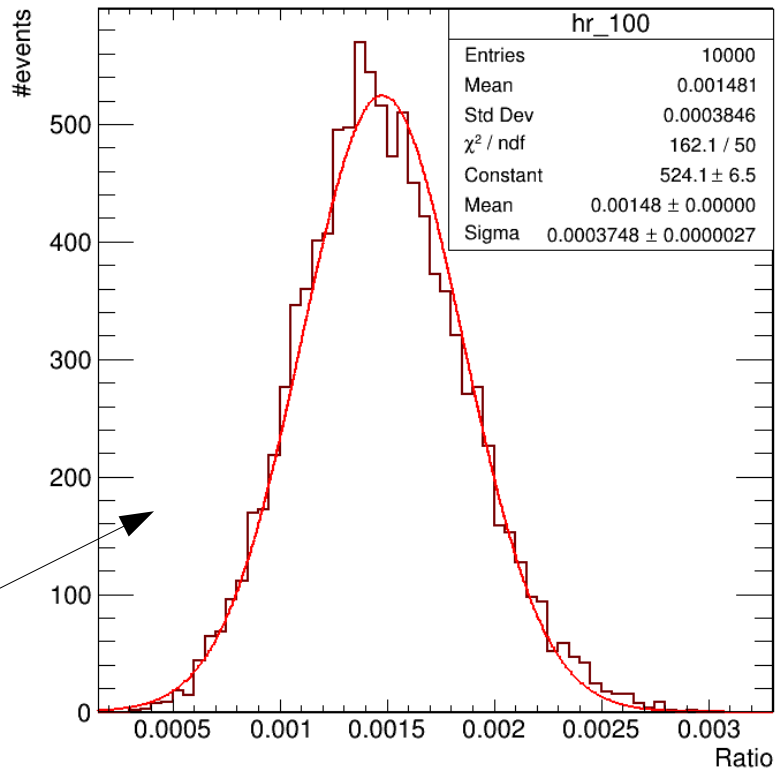
- This is repeated **10000 times.**

MC toy-model

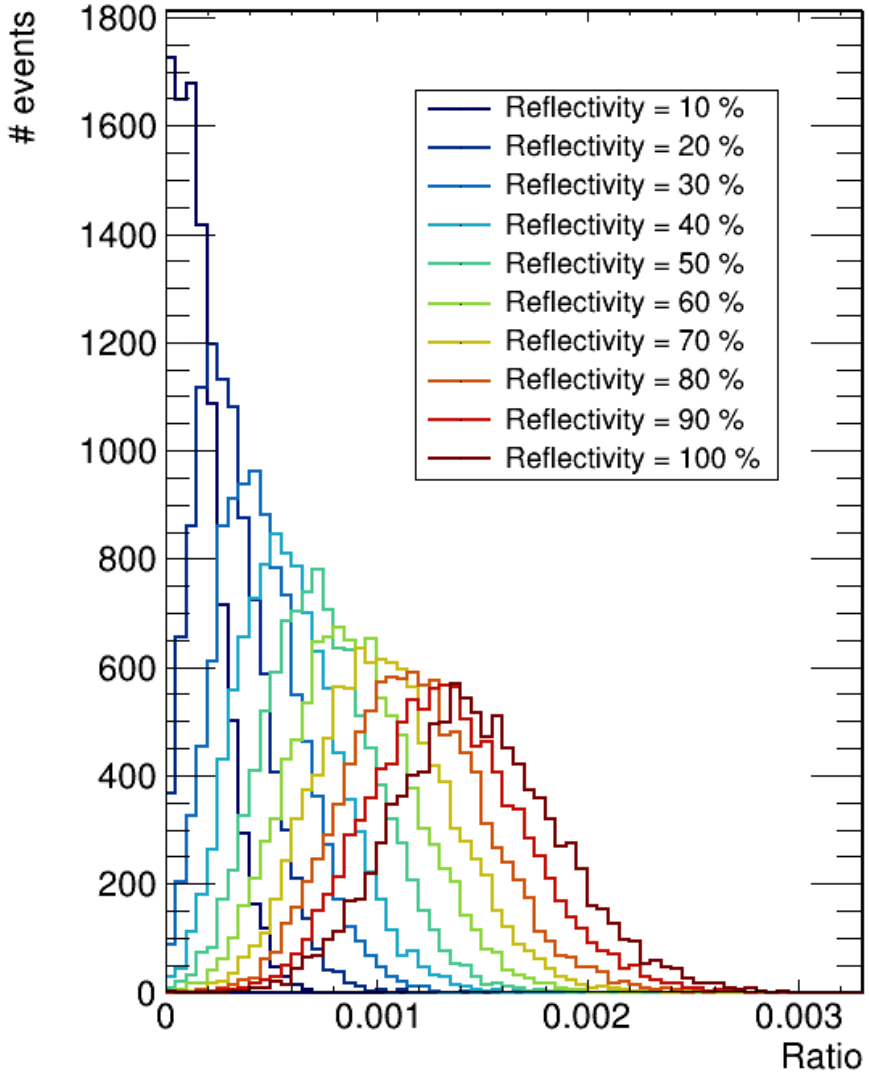

z
20
15
10
5
0
−5
−10
−15
−20
−100
−80
−60
−40
−20
0
20
40
60
80
100
−100
−80
−60
−40
−20
0
20

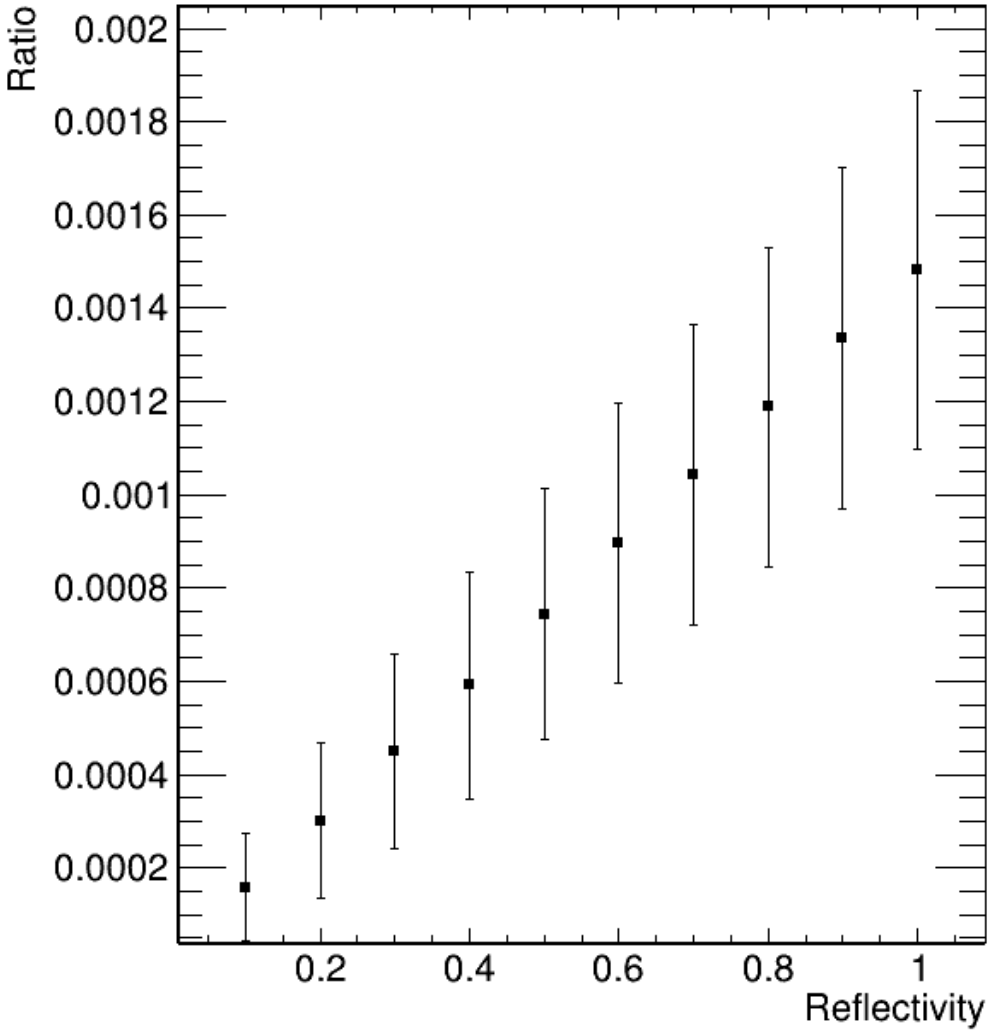
MC output


# events
Reflectivity = 10 %
Reflectivity = 20 %
Reflectivity = 30 %
Reflectivity = 40 %
Reflectivity = 50 %
Reflectivity = 60 %
Reflectivity = 70 %
Reflectivity = 80 %
Reflectivity = 90 %
Reflectivity = 100 %
Ratio

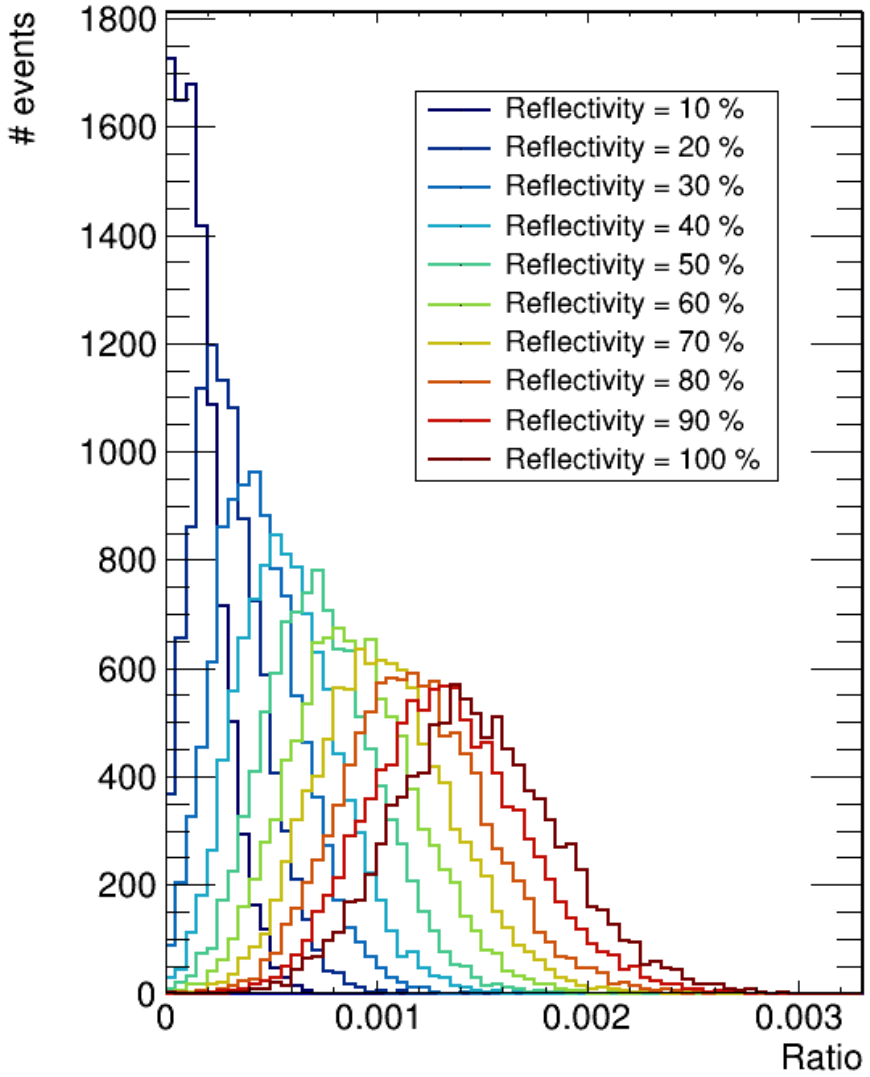

#events
hr_100
Entries 10000
Mean 0.001481
Std Dev 0.0003846
χ² / ndf 162.1 / 50
Constant 524.1 ± 6.5
Mean 0.00148 ± 0.00000
Sigma 0.0003748 ± 0.0000027
Ratio

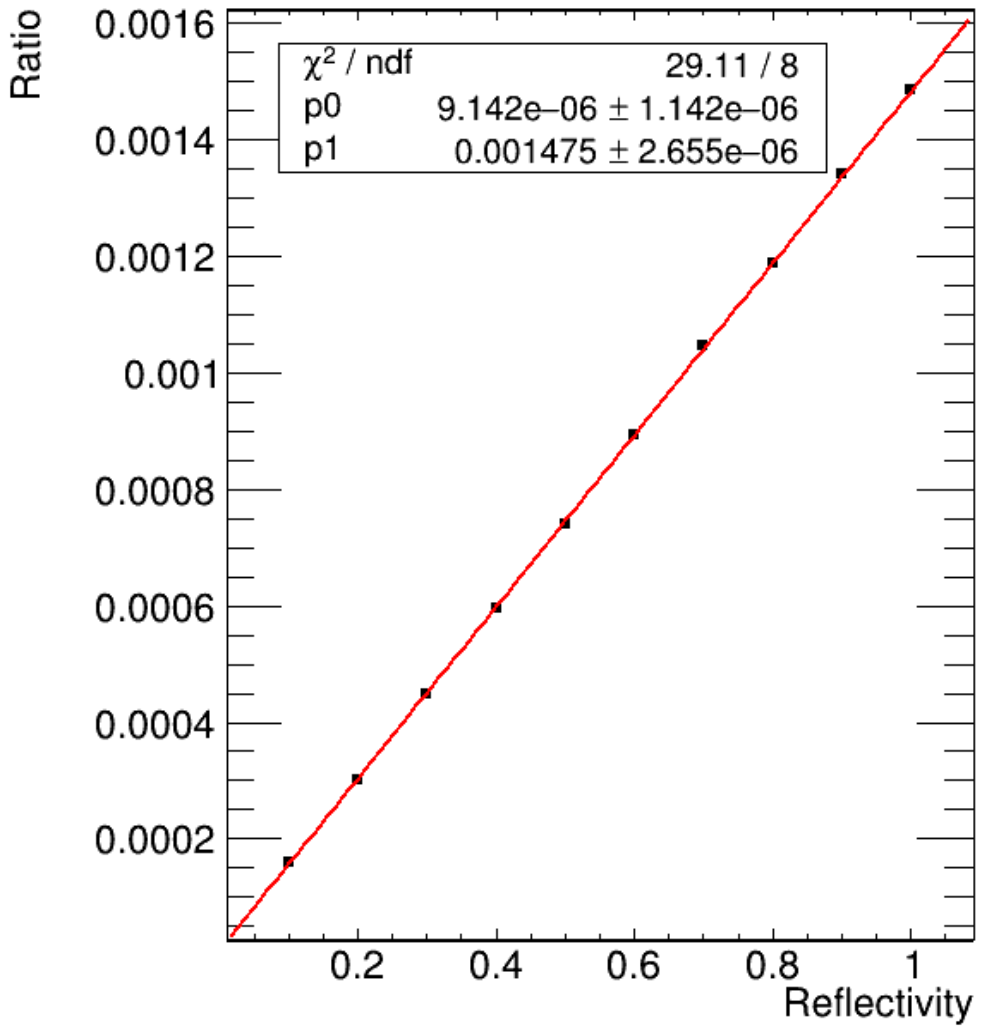
MC output


events
1800
1600
1400
1200
1000
800
600
400
200
0
0
0.001
0.002
0.003
Ratio
Reflectivity = 10 %
Reflectivity = 20 %
Reflectivity = 30 %
Reflectivity = 40 %
Reflectivity = 50 %
Reflectivity = 60 %
Reflectivity = 70 %
Reflectivity = 80 %
Reflectivity = 90 %
Reflectivity = 100 %

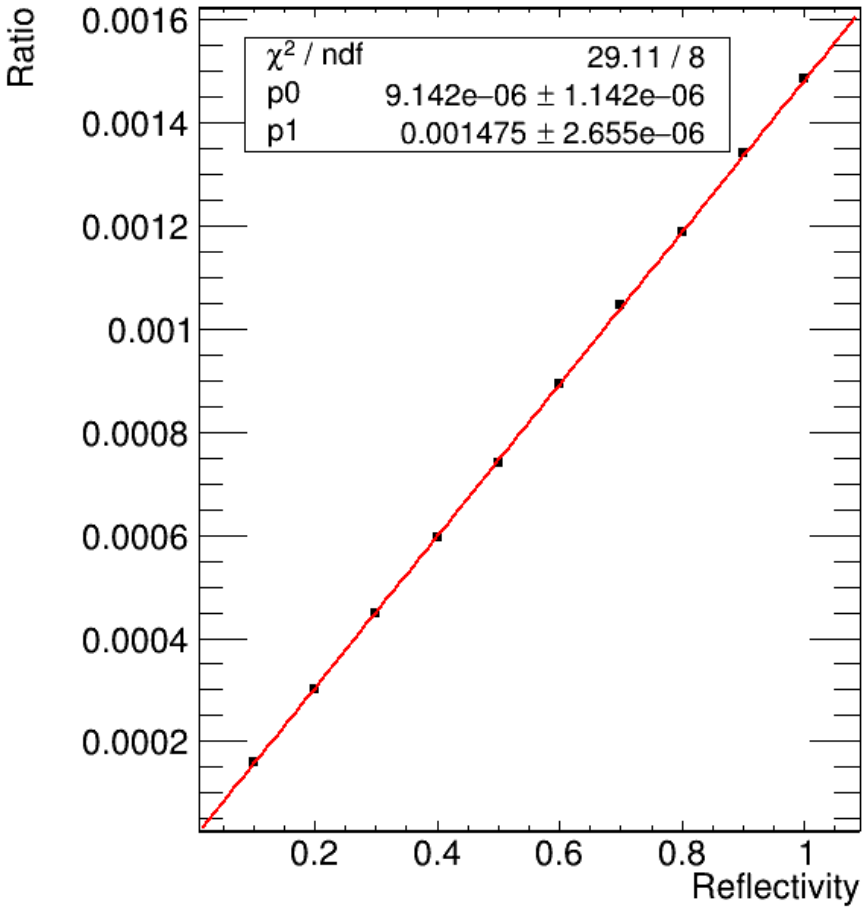

Ratio
0.002
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0.2
0.4
0.6
0.8
1
Reflectivity

MC output


events
Ratio
Reflectivity = 10 %
Reflectivity = 20 %
Reflectivity = 30 %
Reflectivity = 40 %
Reflectivity = 50 %
Reflectivity = 60 %
Reflectivity = 70 %
Reflectivity = 80 %
Reflectivity = 90 %
Reflectivity = 100 %
0
200
400
600
800
1000
1200
1400
1600
1800
0
0.001
0.002
0.003


Ratio
Reflectivity
χ^2 / ndf 29.11 / 8
p0 9.142e−06 ± 1.142e−06
p1 0.001475 ± 2.655e−06
0.0002
0.0004
0.0006
0.0008
0.001
0.0012
0.0014
0.0016
0.2
0.4
0.6
0.8
1

MC output



For instance:

- Reflectivity at 50%, **Ratio ~ 0.074%**

- If 50.000 photons reached NQ arapuca, about 2 – 3 % will be detected.
  - **Assuming 1.000 photons** (2%)

- From this 50.000 only 0.074% will reach the Q arapuca.
  - **Only 37 photons**

- The efficiency from the Q arapuca for pTP light would still need to be taken.

Conclusion

- If the numbers are correct, light from pTP cannot explain the fast component present in the Q-arapuca data.

Ongoing

- We still checking the 150 nm Xe emission.

- We are going to verify if the fast component doesn't change between the dopings.

Backup slides