

GF-CMCC - progress report

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POP SIMULATIONS INPUT FILE

FIGURE: PoP simulations input file.

```
200000      !nions ----- num of macroparticles
193.687D+9  !mion ----- ion mass in eV
18.68908D+12 !eionmed ----- mean ion energy
0.0003      !relenspread -----rel energy spread
0.001051    !sigx ---- in m
0.001171    !sigy ---- in m
0.12        !sigz ----- in m
1.5D-6      !emitt_n
2.D+8       !n_ion ----num ion per bunch
230.76      !rismed ---- resonance energy in eV
0.0051      !U_L energy laser in J
0.00015     !delas relative energy spread laser
2.D-3       !sigl ---- rms transverse size laser in m
3.7D-12     !sigt ----- laser length in s
2.6672D+16  !n_ph ----num laser photons
0           !ncmcut 1=selection in angle in CM/ 0=no sel
74.D-12     !tau0 ---- mean lifetime spont emission in s
6.          !dscreen ---- screen distance in m
1.          !rep -----repetition rate collisione
2.          !g1
2.          !g2
2.          !angcoll in deg
```

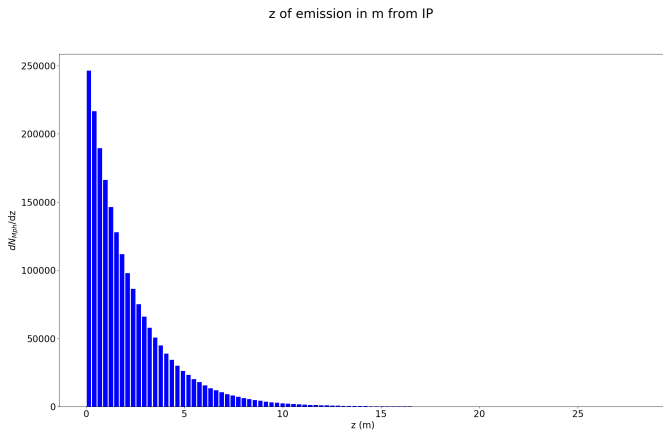
TABLE: Number of emitted photons per ion per shot PoP case, maximum one interaction per ion.

Code Simulation method	GF-CMCC	
	MC	LUM
N_γ per ion laser at resonance	0.199	0.201
N_γ per ion laser 1 σ below resonance	0.18	0.182
N_γ per ion laser 2 σ below resonance	0.133	0.135

FIGURE: PoP with laser at resonance, 1 σ below resonance, 2 σ below resonance.

Cross section (Mbarn)	3.3087673668321855	
Photons per ion	MC 0.199193500000000000	LUM 0.20177807875131243
Real photons per shot (10^7)	MC 3.9838700000000000	LUM 4.0355615750262483
Cross section (Mbarn)	2.9957602550832885	
Photons per ion	MC 0.180449000000000000	LUM 0.18269001160907825
Real photons per shot (10^7)	MC 3.6089799999999999	LUM 3.6538002321815646
Cross section (Mbarn)	2.2165737618689119	
Photons per ion	MC 0.133367500000000000	LUM 0.13517299510903011
Real photons per shot (10^7)	MC 2.6673499999999999	LUM 2.7034599021806023

EXCITED IONS SPONTANEOUS EMISSION

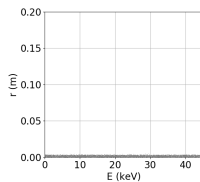
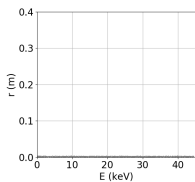
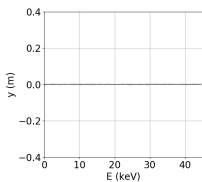
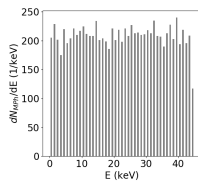
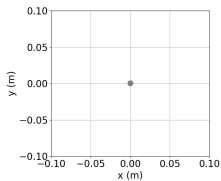
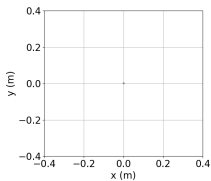


POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.01 m from IP

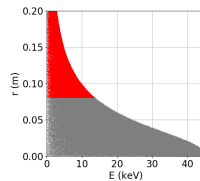
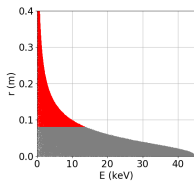
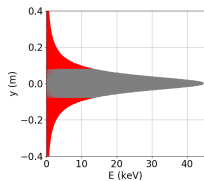
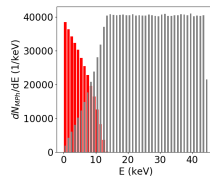
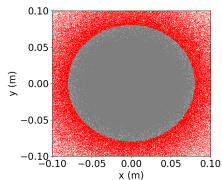
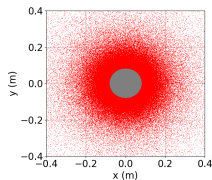
Real photons at radius > 0.0795 (in red): 0.0

Total energy photons at radius > 0.0795 (in red): 0.0 MeV



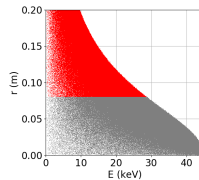
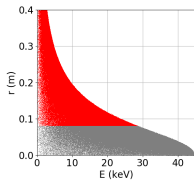
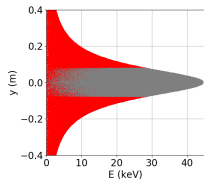
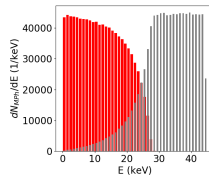
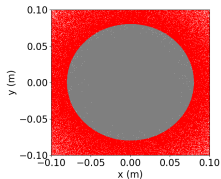
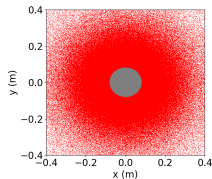
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 5 m from IP
Real photons at radius > 0.0795 (in red): 6233505.970725339
Total energy photons at radius > 0.0795 (in red): 30188.94239861126 MeV



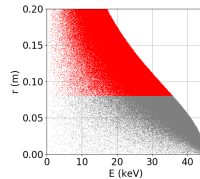
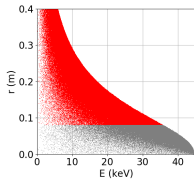
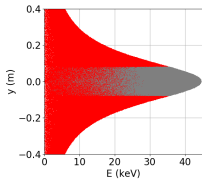
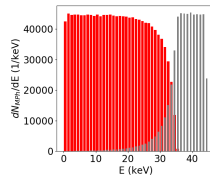
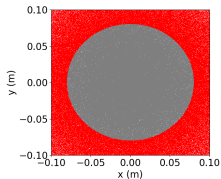
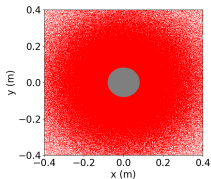
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 10 m from IP
Real photons at radius > 0.0795 (in red): 20109625.476118658
Total energy photons at radius > 0.0795 (in red): 241288.41548936602 MeV



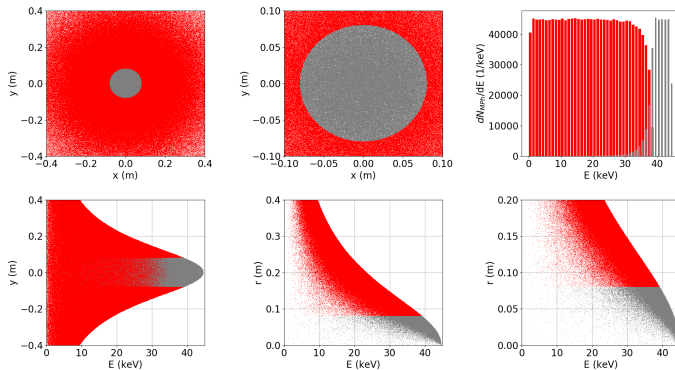
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 15 m from IP
Real photons at radius > 0.0795 (in red): 29126243.461334854
Total energy photons at radius > 0.0795 (in red): 477679.90714560257 MeV



POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 20 m from IP
Real photons at radius > 0.0795 (in red): 33662251.634799585
Total energy photons at radius > 0.0795 (in red): 631212.2412728452 MeV

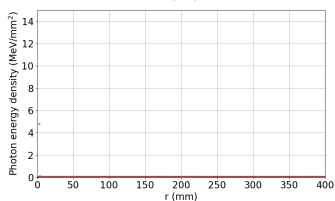
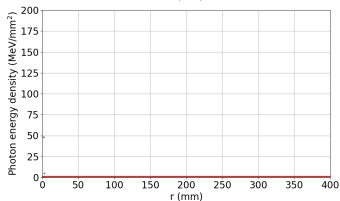
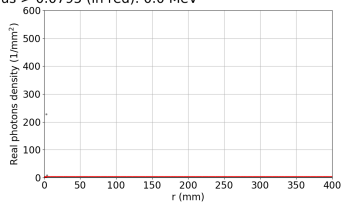
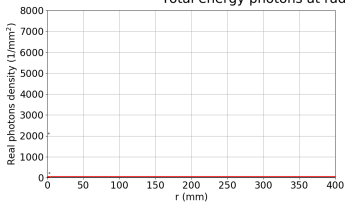


POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.01 m from IP

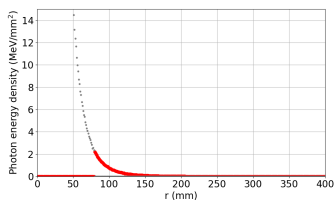
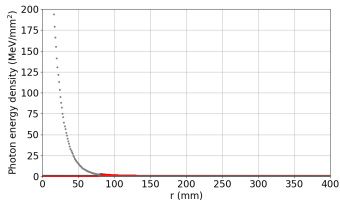
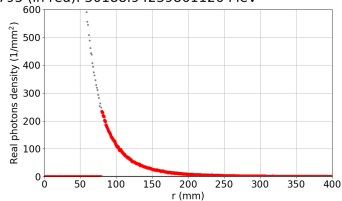
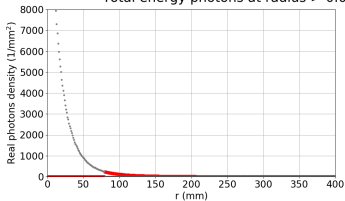
Real photons at radius > 0.0795 (in red): 0.0

Total energy photons at radius > 0.0795 (in red): 0.0 MeV



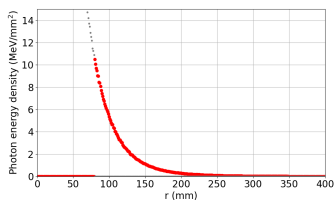
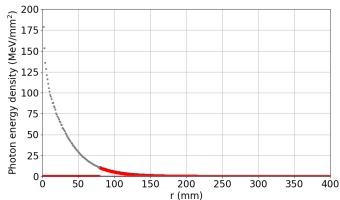
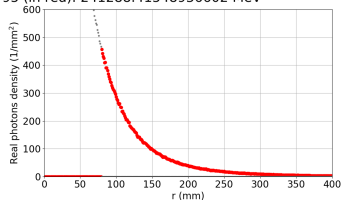
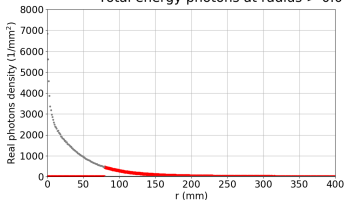
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Flat screen perpendicular to z axis (of propagation) @ 5 m from IP
Real photons at radius > 0.0795 (in red): 6233505.970725339
Total energy photons at radius > 0.0795 (in red): 30188.94239861126 MeV



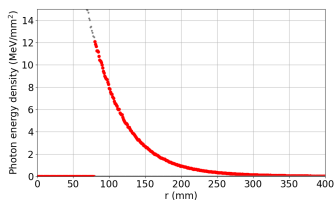
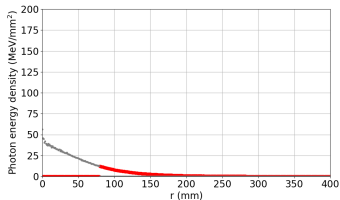
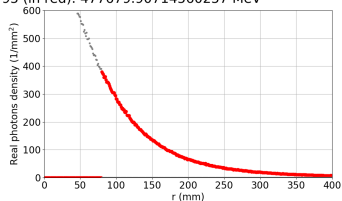
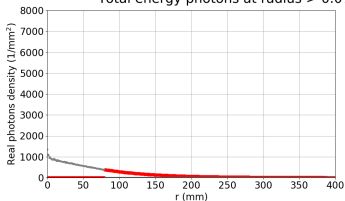
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 10 m from IP
Real photons at radius > 0.0795 (in red): 20109625.476118658
Total energy photons at radius > 0.0795 (in red): 241288.41548936602 MeV



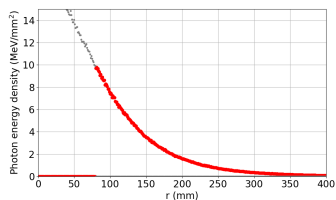
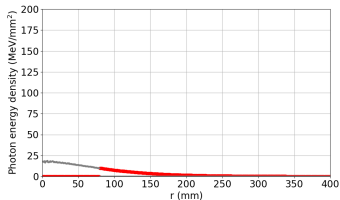
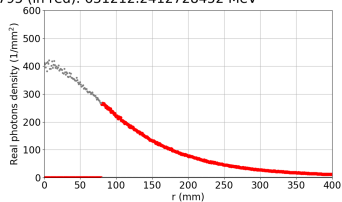
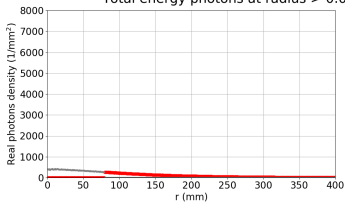
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Real photons at radius > 0.0795 (in red): 29126243.461334854
Total energy photons at radius > 0.0795 (in red): 477679.90714560257 MeV



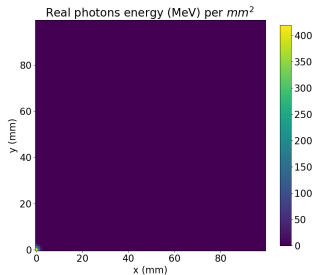
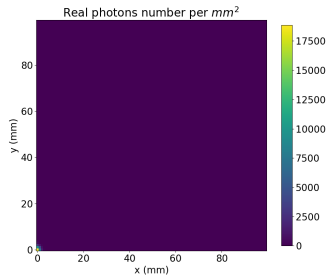
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 20 m from IP
Real photons at radius > 0.0795 (in red): 33662251.634799585
Total energy photons at radius > 0.0795 (in red): 631212.2412728452 MeV



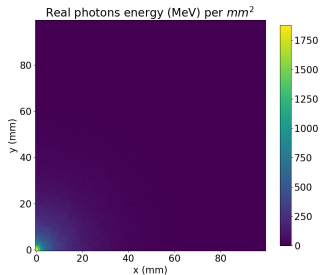
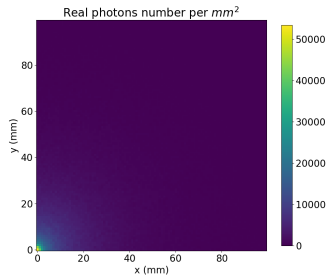
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.01 m from IP



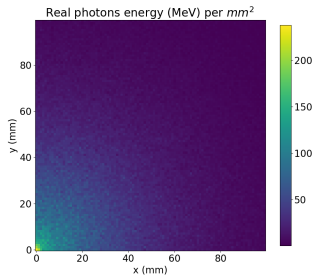
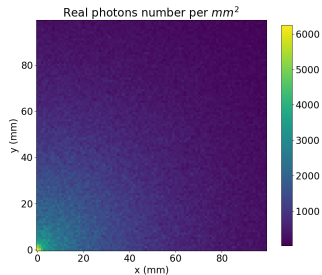
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 5 m from IP



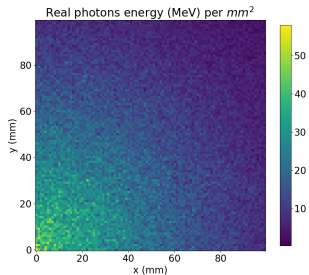
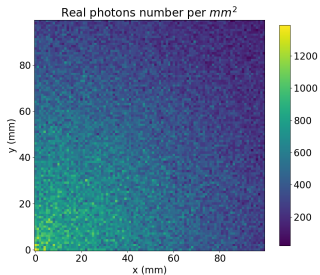
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 10 m from IP



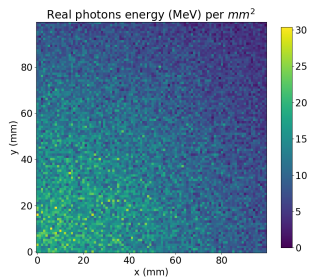
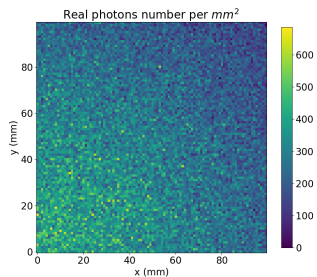
POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 15 m from IP



POP WITH LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 20 m from IP

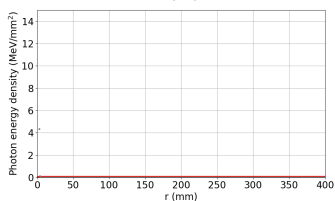
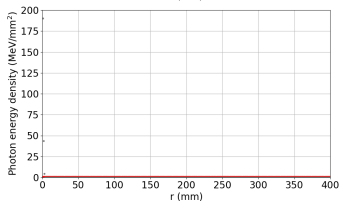
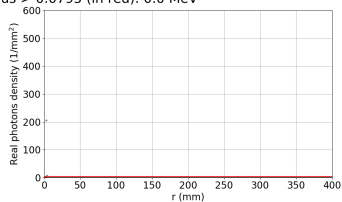
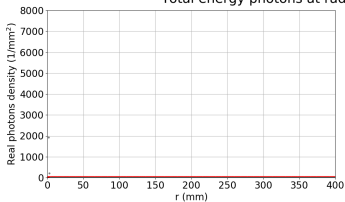


POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.01 m from IP

Real photons at radius > 0.0795 (in red): 0.0

Total energy photons at radius > 0.0795 (in red): 0.0 MeV

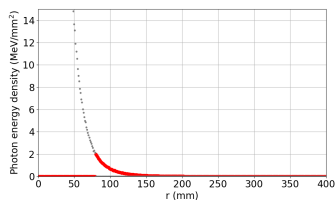
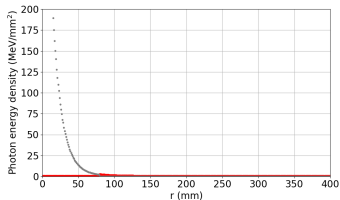
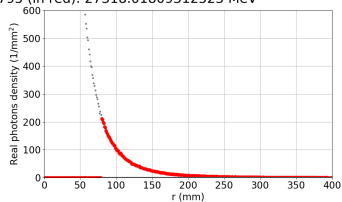
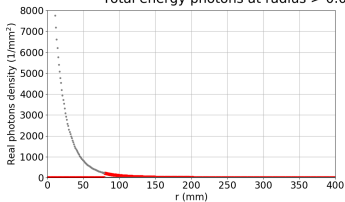


POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 5 m from IP

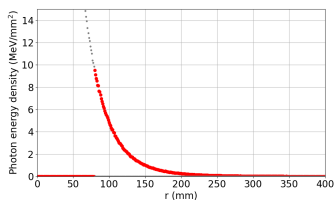
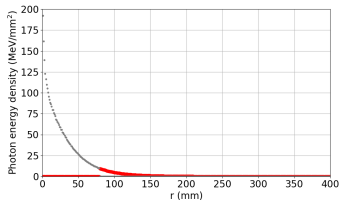
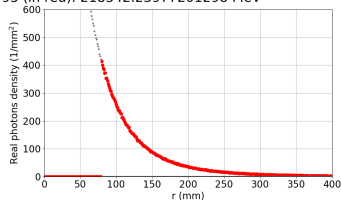
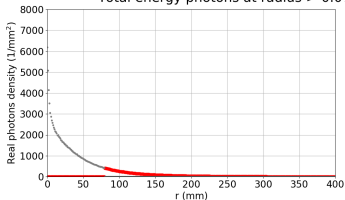
Real photons at radius > 0.0795 (in red): 5641554.887719008

Total energy photons at radius > 0.0795 (in red): 27318.01809312523 MeV



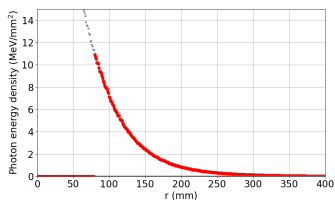
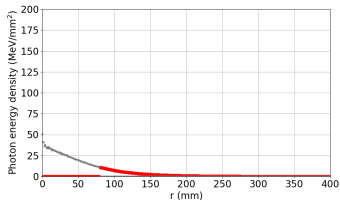
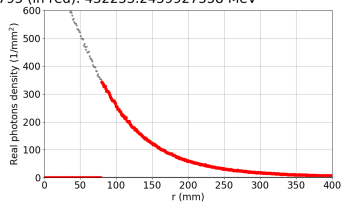
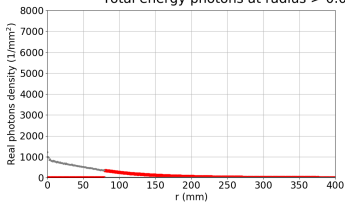
POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 10 m from IP
Real photons at radius > 0.0795 (in red): 18199959.449432395
Total energy photons at radius > 0.0795 (in red): 218342.23977201298 MeV



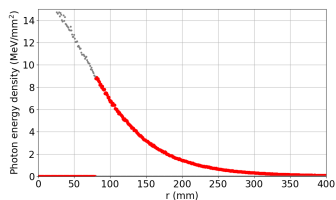
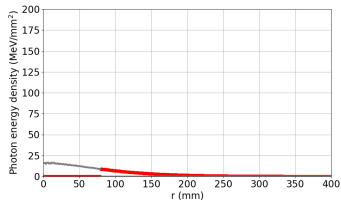
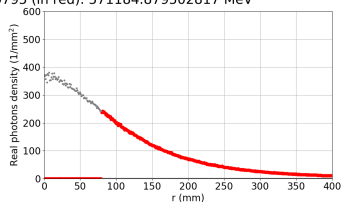
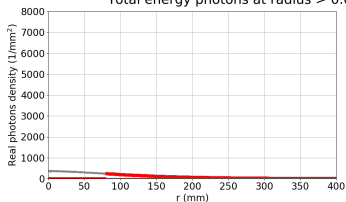
POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 15 m from IP
Real photons at radius > 0.0795 (in red): 26360334.285693683
Total energy photons at radius > 0.0795 (in red): 432253.2459927558 MeV



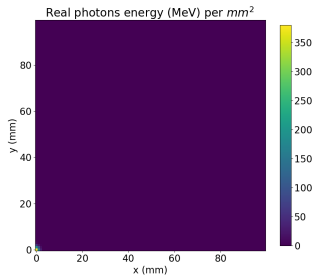
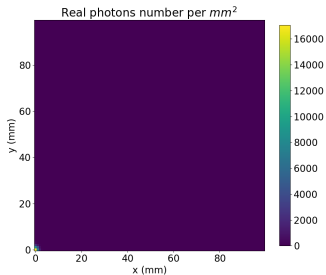
POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 20 m from IP
Real photons at radius > 0.0795 (in red): 30465590.49334365
Total energy photons at radius > 0.0795 (in red): 571184.879502817 MeV



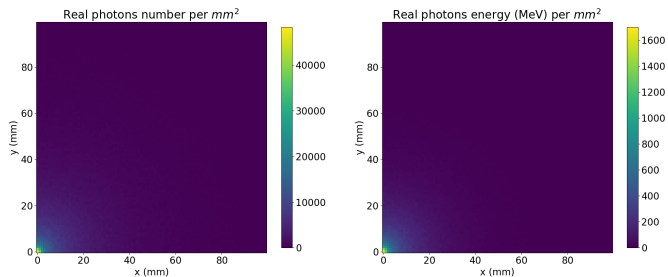
POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.01 m from IP



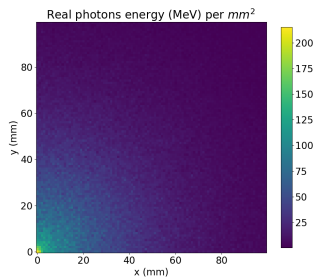
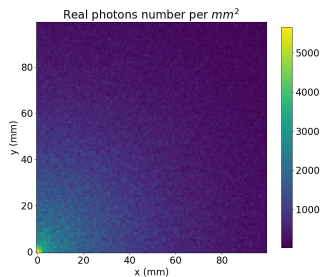
POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 5 m from IP



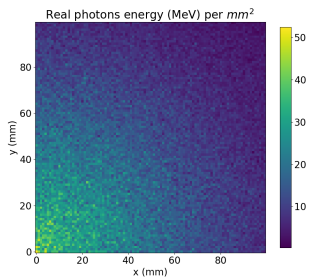
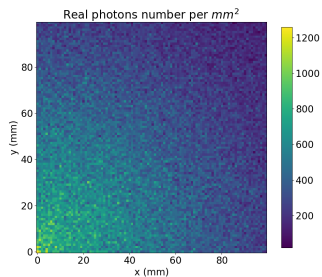
POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 10 m from IP



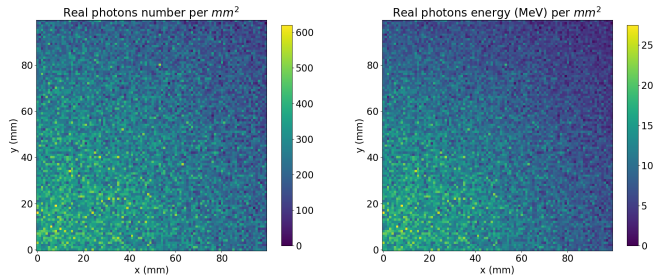
POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 15 m from IP



POP WITH LASER 1σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 20 m from IP

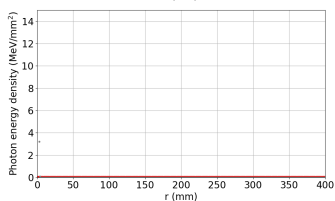
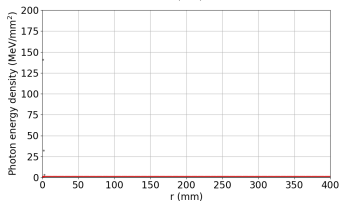
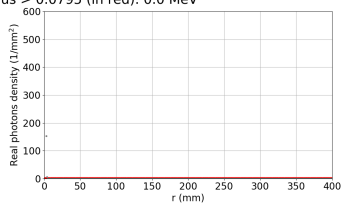
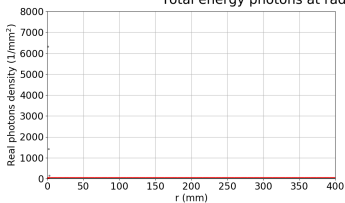


POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.01 m from IP

Real photons at radius > 0.0795 (in red): 0.0

Total energy photons at radius > 0.0795 (in red): 0.0 MeV

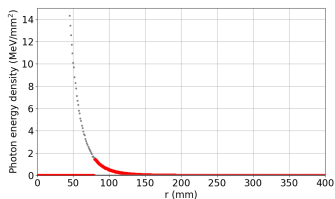
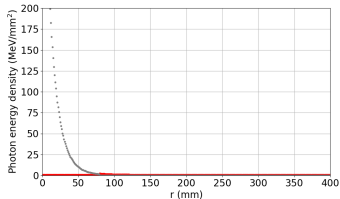
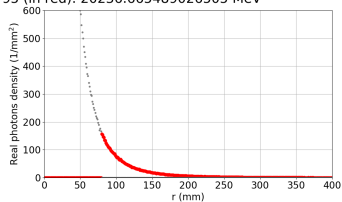
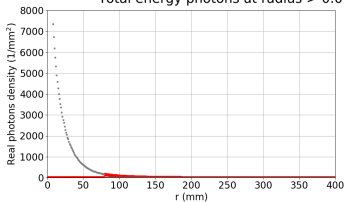


POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 5 m from IP

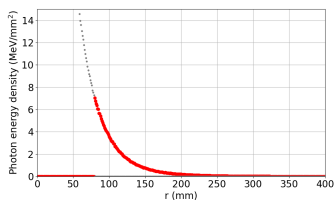
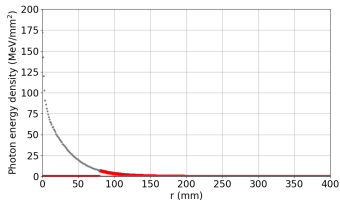
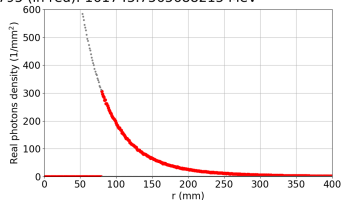
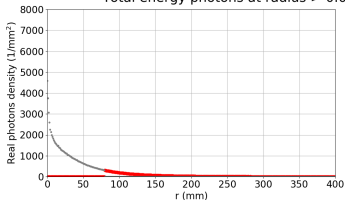
Real photons at radius > 0.0795 (in red): 4179783.052167381

Total energy photons at radius > 0.0795 (in red): 20236.665489026505 MeV



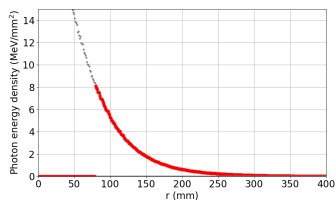
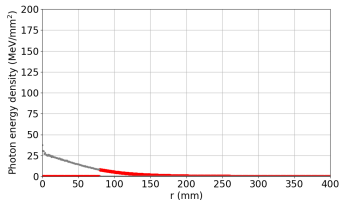
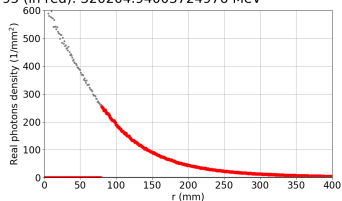
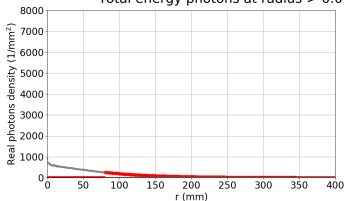
POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 10 m from IP
Real photons at radius > 0.0795 (in red): 13484204.899339102
Total energy photons at radius > 0.0795 (in red): 161743.7565688215 MeV



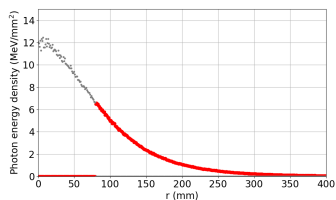
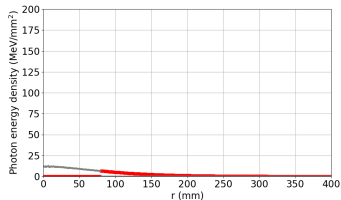
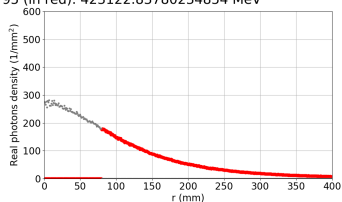
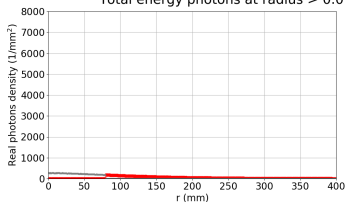
POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 15 m from IP
Real photons at radius > 0.0795 (in red): 19530161.57596179
Total energy photons at radius > 0.0795 (in red): 320204.94003724976 MeV



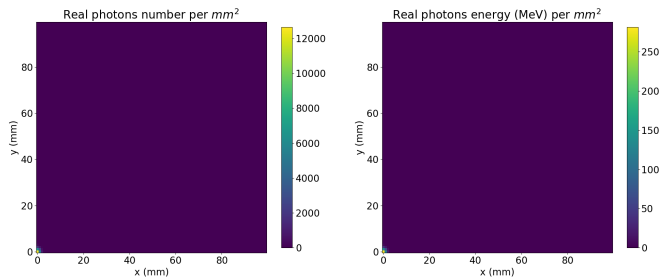
POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 20 m from IP
Real photons at radius > 0.0795 (in red): 22571713.180625524
Total energy photons at radius > 0.0795 (in red): 423122.83780234854 MeV



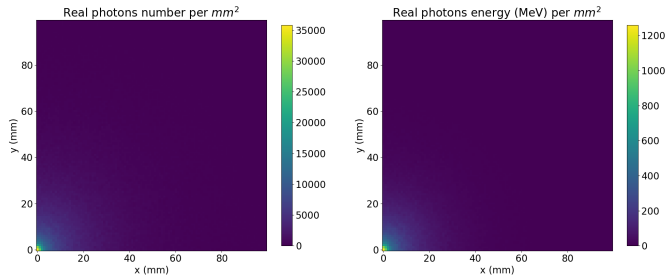
POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.01 m from IP



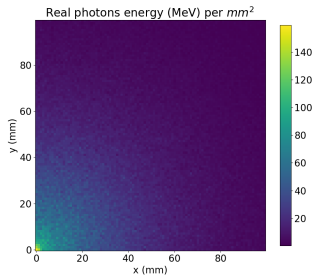
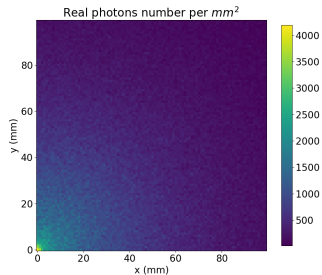
POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 5 m from IP



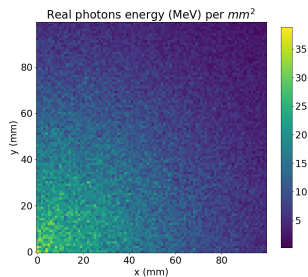
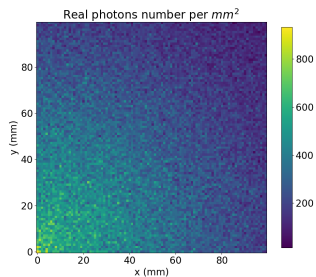
POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 10 m from IP



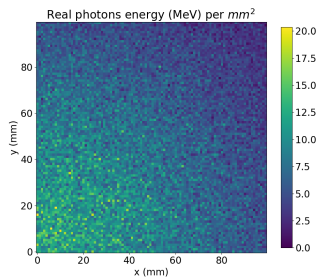
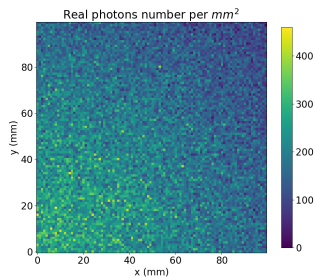
POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 15 m from IP



POP WITH LASER 2σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 20 m from IP



DETECTOR ABOVE THE INTERACTION POINT

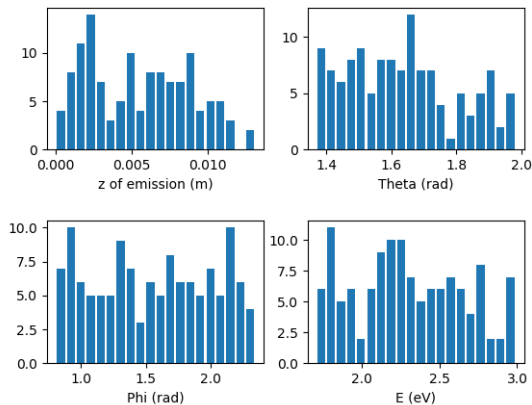


FIGURE: Visible photons in a window of 2×2 cm at 10 mm above the IP. The graphs are overpopulated in order to show better the photons features, but the number of real photons in the detector per shot is ~ 8 , 7, 5 by using a laser at resonance, 1σ and 2σ below resonance respectively.