Photon flux simulations by GF-CMCC

Camilla Curatolo

INFN Padova, Italy

camilla.curatolo@pd.infn.it

Gamma Factory meeting at CERN
March 27, 2019

Proof of Principle: input file and GF-CMCC results for laser at resonance and laser 2 σ below resonance.

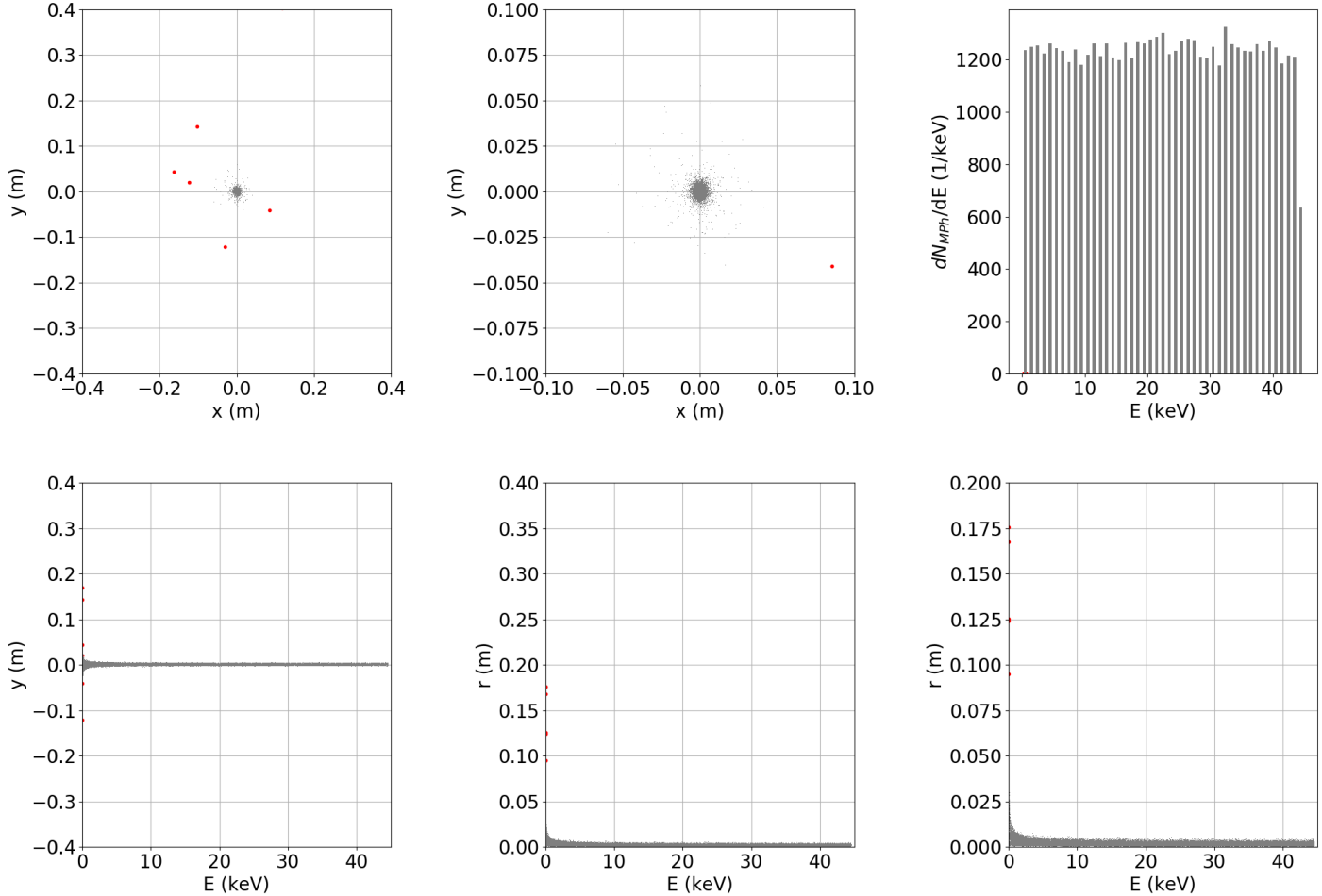
```
2000000          !nions ----- num of macroparticles
193.687D+9       !mion ----- ion mass in eV
18.68908D+12     !eionmed  ----- mean ion energy
0.0003           !relenspread ------rel energy spread
0.001051         !sigx ---- in m
0.001171         !sigy ---- in m
0.12             !sigz ----- in m
2.D-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
0                !ncmcut 1=selection in angle in CM/ 0=no sel
74.D-12          !tau0 ---- mean lifetime spont emission in s
1.               !rep -----repetition rate collisione
2.               !g1
2.               !g2
2.6               !angcoll in deg
```

```
-------------------------------------------------------------------------
Cross section (Mbarn)          3.3102313989131242
Photons per ion              MC  0.12152549999999999       LUM  0.17557019781144328
Real photons per shot (10^7) MC   2.4305099999999999       LUM   3.5114039562288655
-------------------------------------------------------------------------
```

```
-------------------------------------------------------------------------
Cross section (Mbarn)          2.2176744024710850
Photons per ion              MC   8.2598000000000005E-002  LUM  0.11762245191252839
Real photons per shot (10^7) MC   1.6519600000000001       LUM   2.3524490382505676
-------------------------------------------------------------------------
```

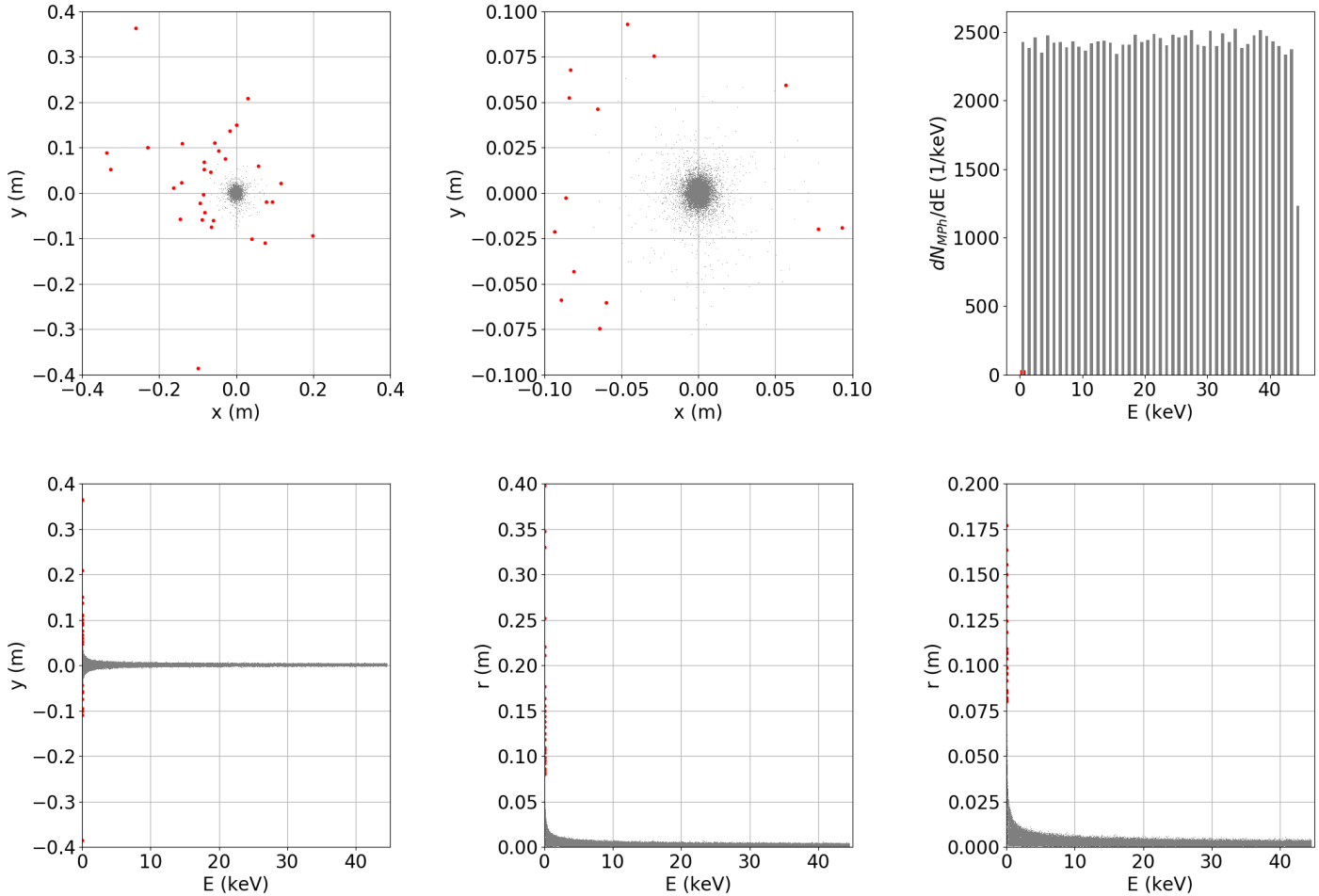
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.1 m from IP
Real photons at radius > 0.0795 m (in red): 140.0
Real photons 0.13 m < radius < 0.14 m: 0.0
Total energy photons at radius > 0.0795 (in red): 0.0004658819770737534 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0 MeV



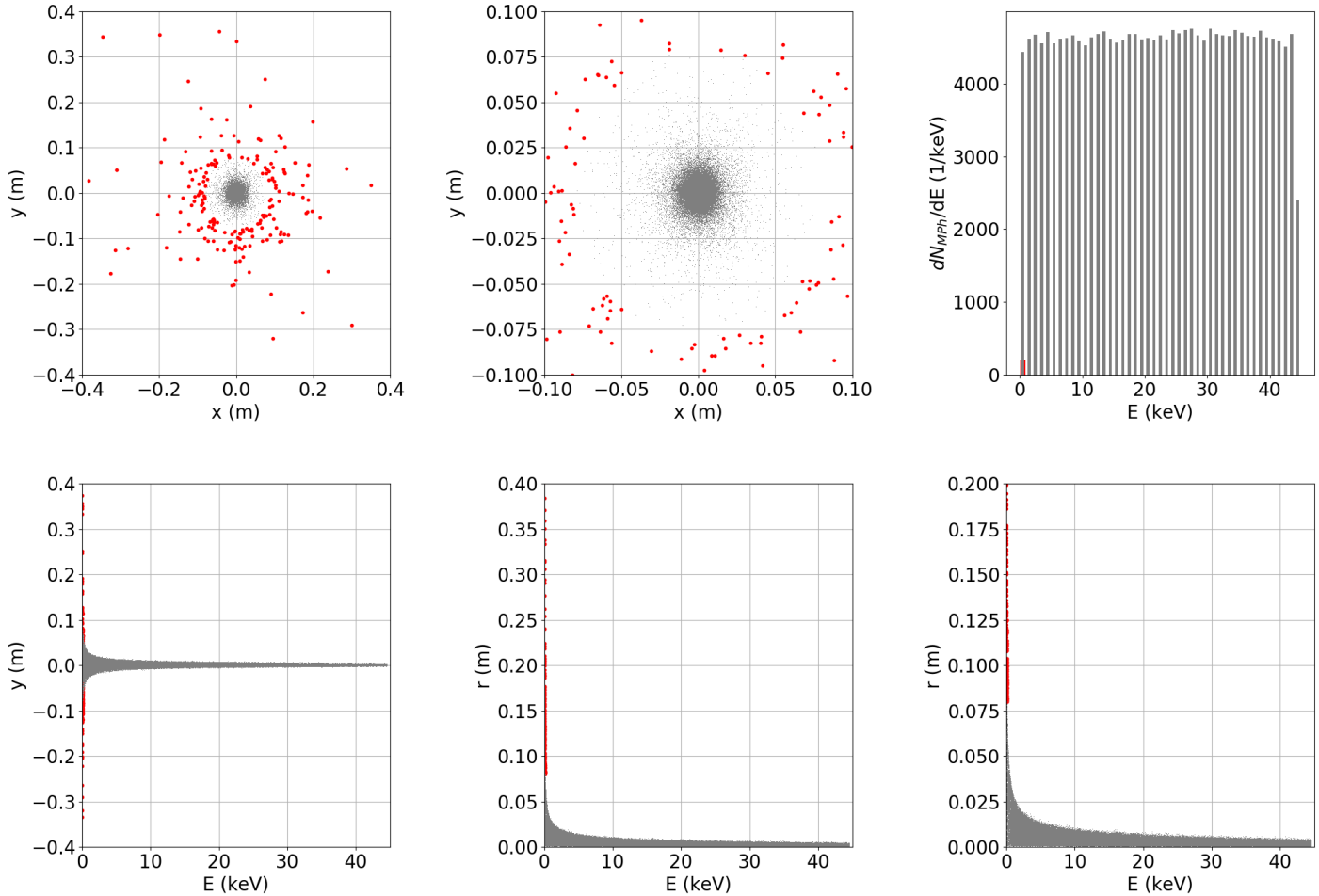
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.2 m from IP
Real photons at radius > 0.0795 m (in red): 680.0
Real photons 0.13 m < radius < 0.14 m: 40.0
Total energy photons at radius > 0.0795 (in red): 0.0073818768999135585 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0001888539955092367 MeV



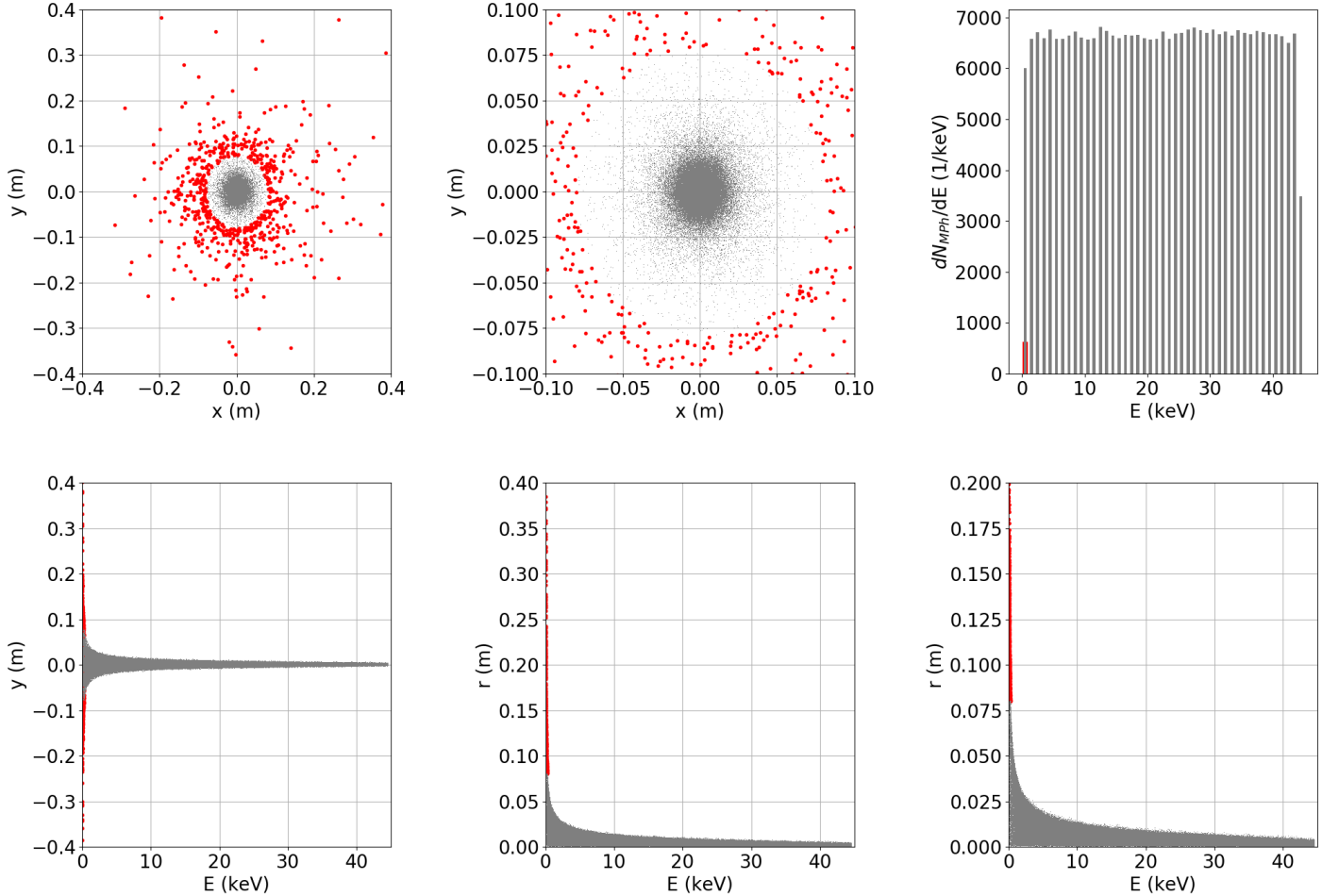
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.4 m from IP
Real photons at radius > 0.0795 m (in red): 4180.0
Real photons 0.13 m < radius < 0.14 m: 220.0
Total energy photons at radius > 0.0795 (in red): 0.1637910622249706 MeV
Real photons 0.13 m < radius < 0.14 m: 0.007323894314746721 MeV



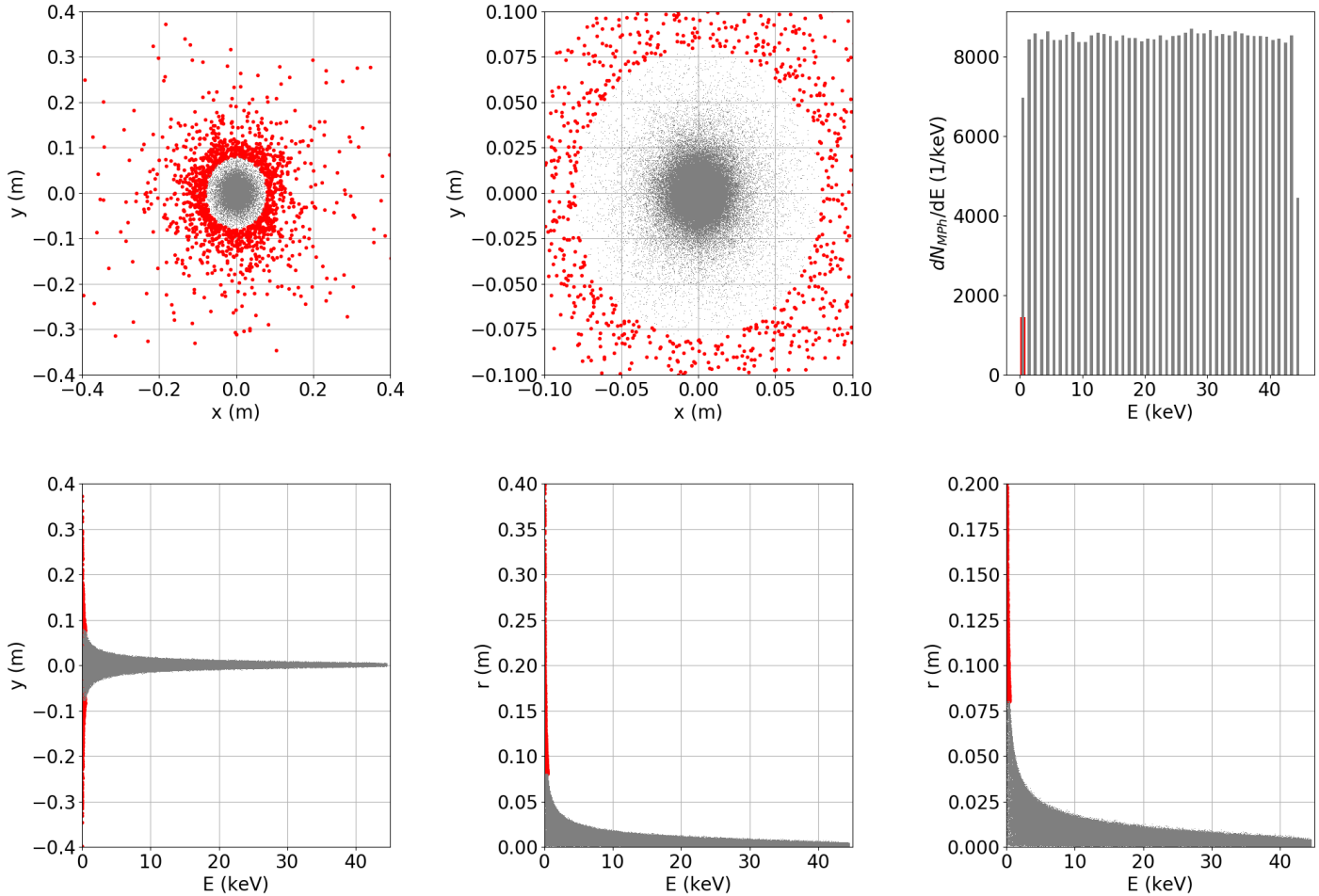
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.6000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 12560.0
Real photons 0.13 m < radius < 0.14 m: 720.0
Total energy photons at radius > 0.0795 (in red): 1.0416130116003222 MeV
Real photons 0.13 m < radius < 0.14 m: 0.04938503986275675 MeV



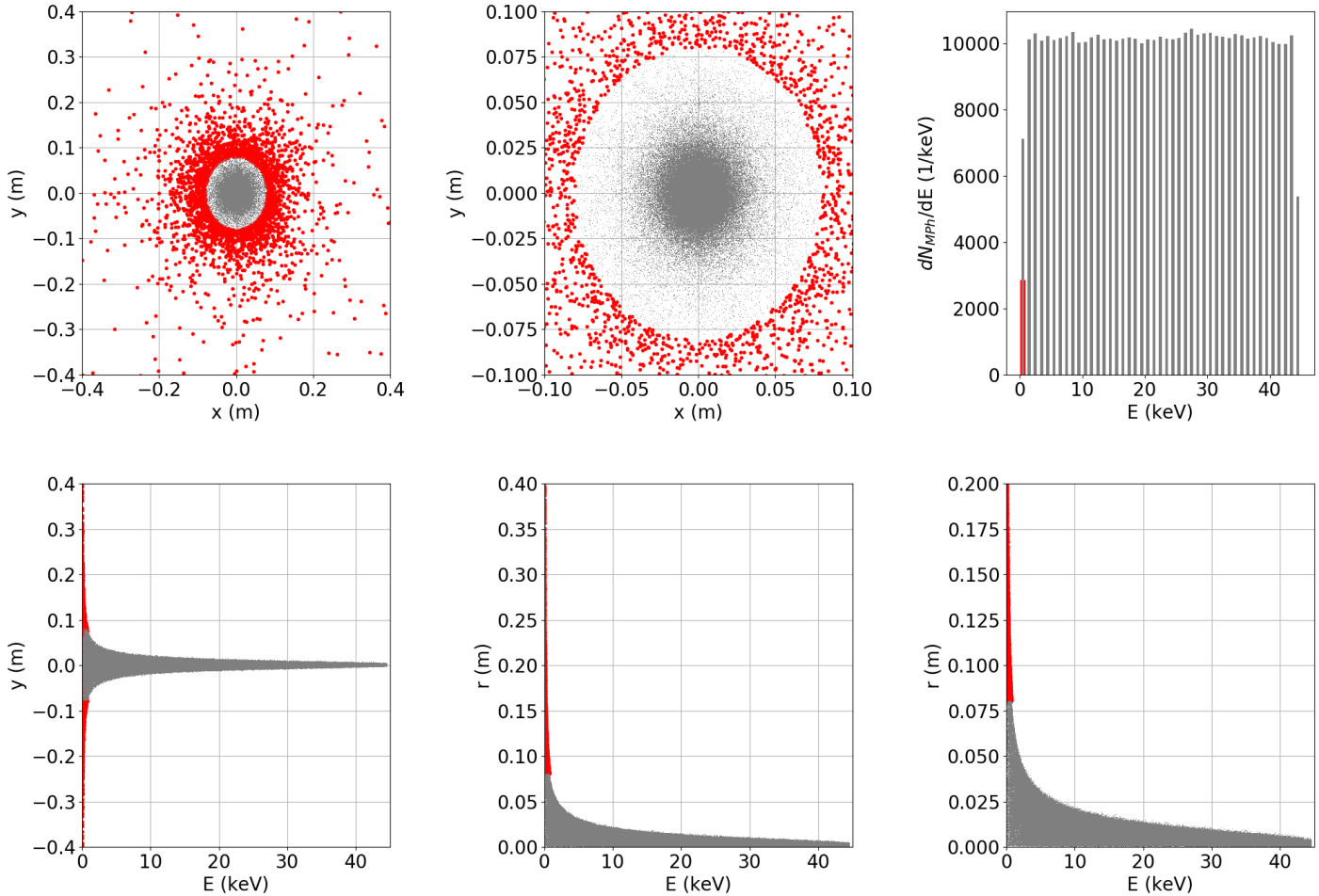
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.8 m from IP
Real photons at radius > 0.0795 m (in red): 28880.0
Real photons 0.13 m < radius < 0.14 m: 1080.0
Total energy photons at radius > 0.0795 (in red): 4.206341914380608 MeV
Real photons 0.13 m < radius < 0.14 m: 0.12315767096277735 MeV



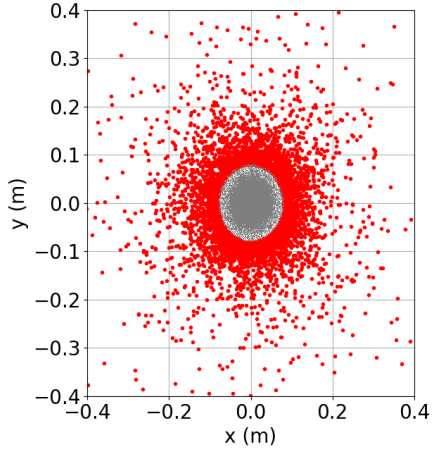
LASER AT RESONANCE

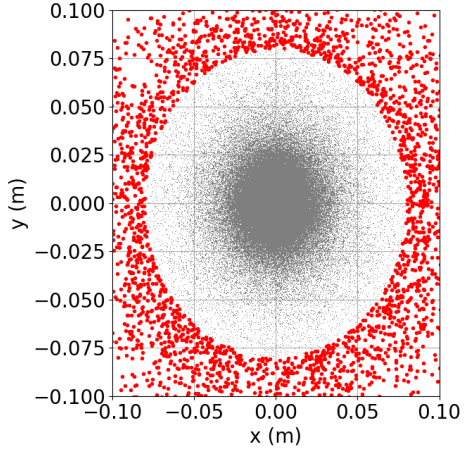
Flat screen perpendicular to z axis (of propagation) @ 1.0 m from IP
Real photons at radius > 0.0795 m (in red): 57120.0
Real photons 0.13 m < radius < 0.14 m: 2960.0
Total energy photons at radius > 0.0795 (in red): 13.380416135635603 MeV
Real photons 0.13 m < radius < 0.14 m: 0.4684457202257352 MeV

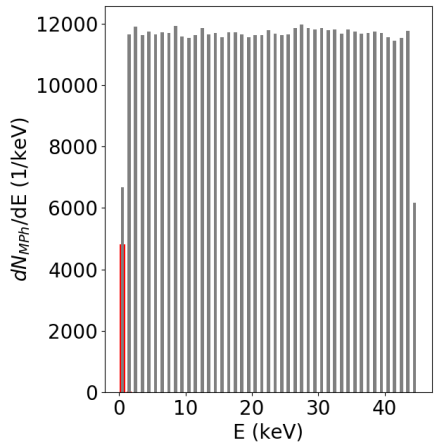


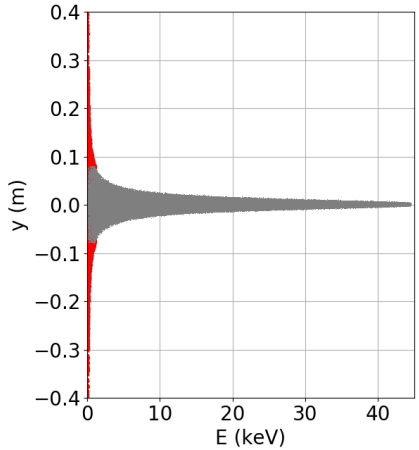
LASER AT RESONANCE

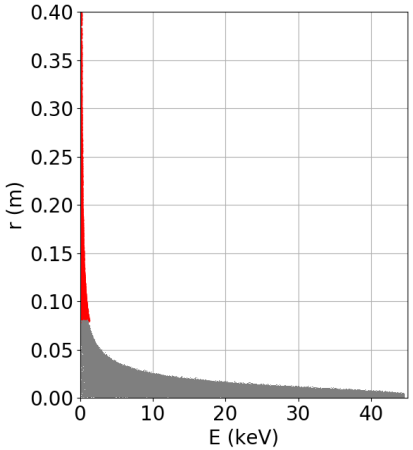
Flat screen perpendicular to z axis (of propagation) @ 1.2000000000000002 m from IP
Real photons at radius > 0.0795 m (in red): 96820.0
Real photons 0.13 m < radius < 0.14 m: 4900.0
Total energy photons at radius > 0.0795 (in red): 32.63701693502334 MeV
Real photons 0.13 m < radius < 0.14 m: 1.1092860125028645 MeV

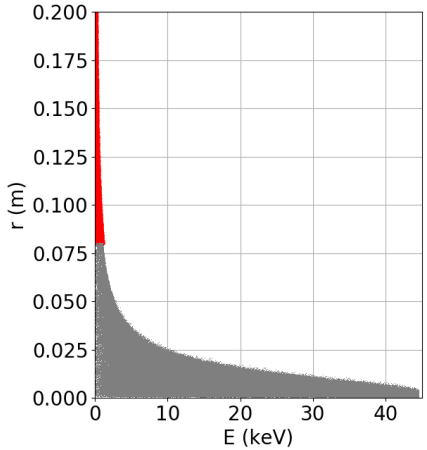






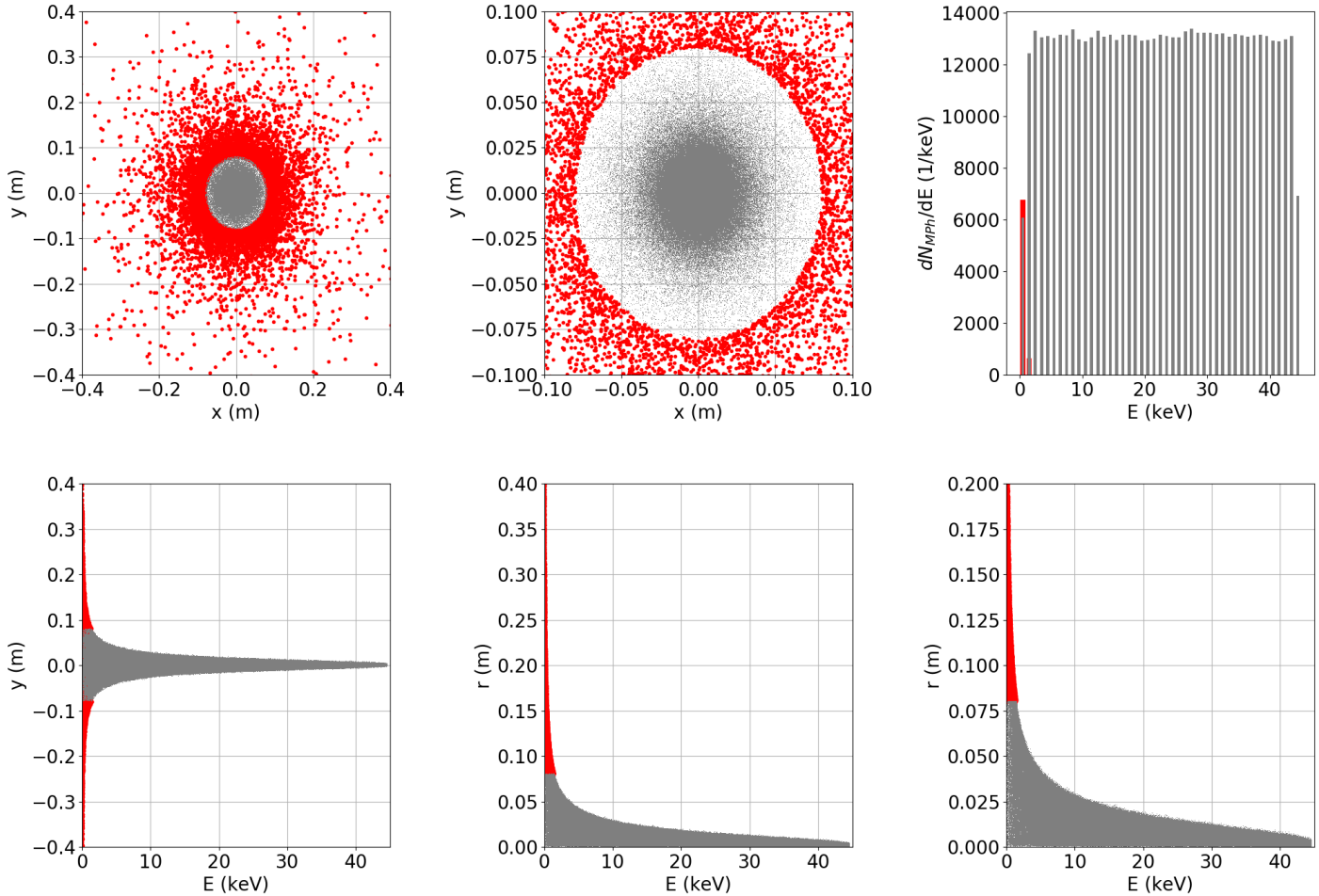






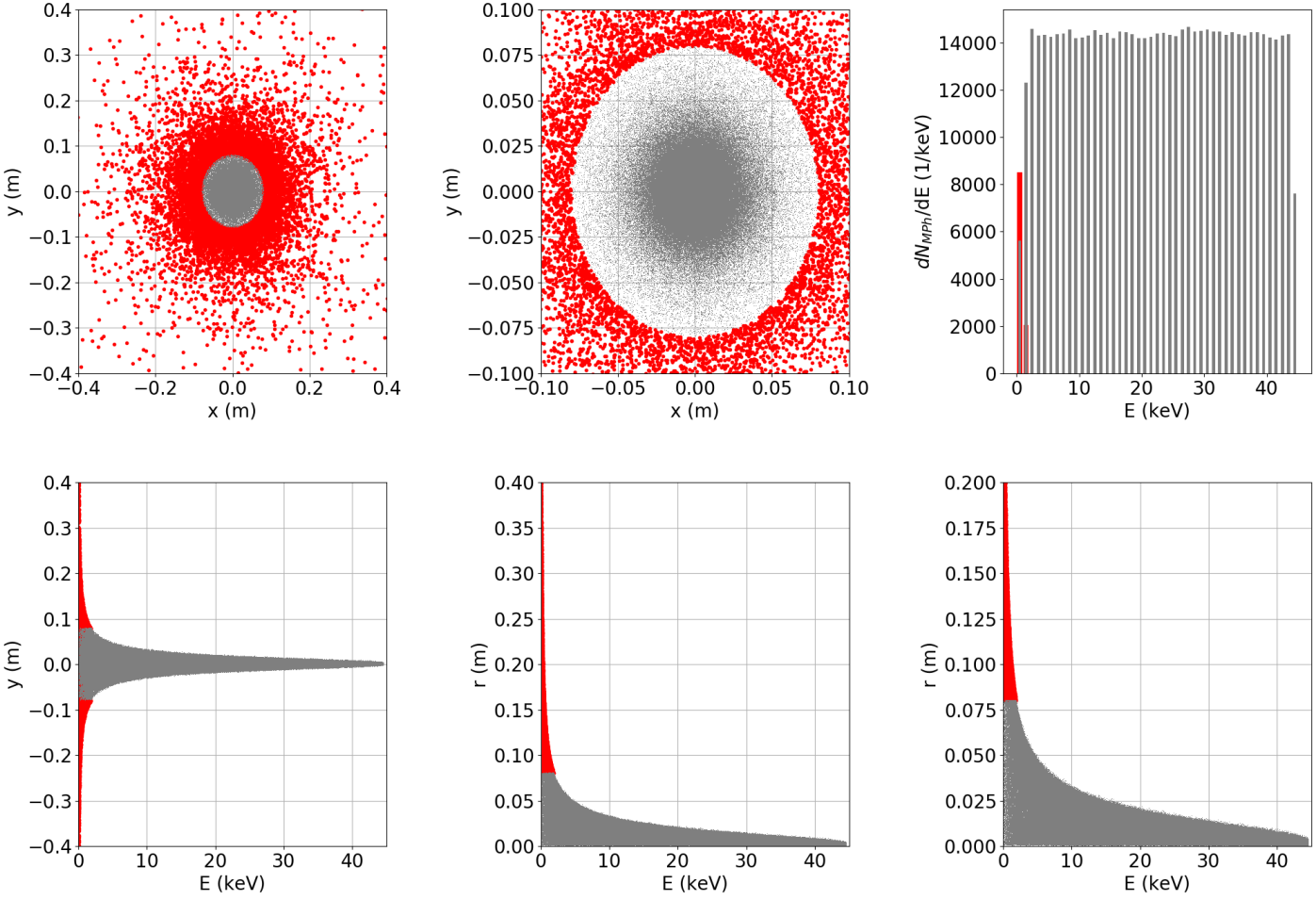
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.4000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 147960.0
Real photons 0.13 m < radius < 0.14 m: 7680.0
Total energy photons at radius > 0.0795 (in red): 67.50028220818822 MeV
Real photons 0.13 m < radius < 0.14 m: 2.590118848560454 MeV



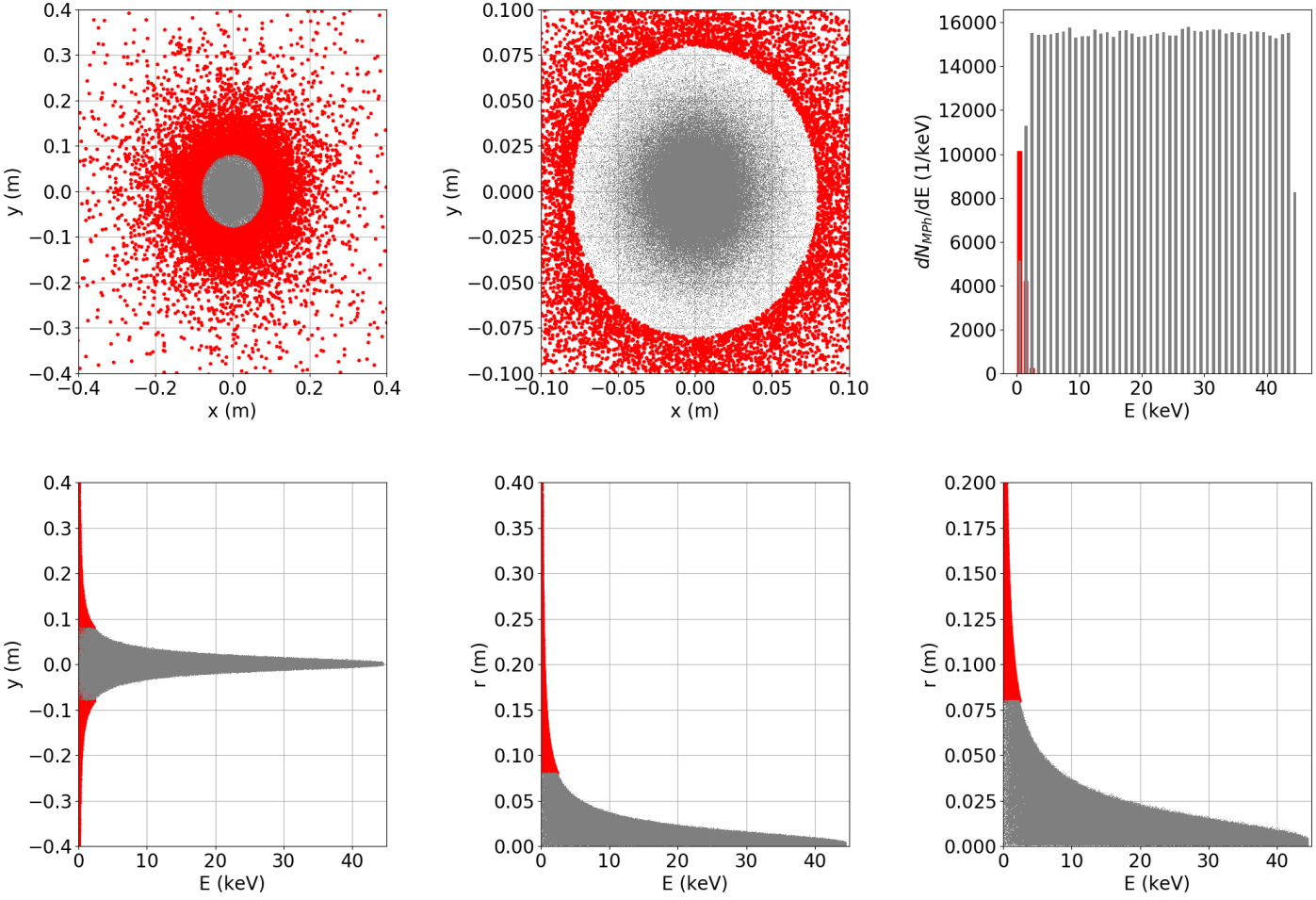
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 211340.0
Real photons 0.13 m < radius < 0.14 m: 10980.0
Total energy photons at radius > 0.0795 (in red): 123.97137259211175 MeV
Real photons 0.13 m < radius < 0.14 m: 4.747604578097614 MeV



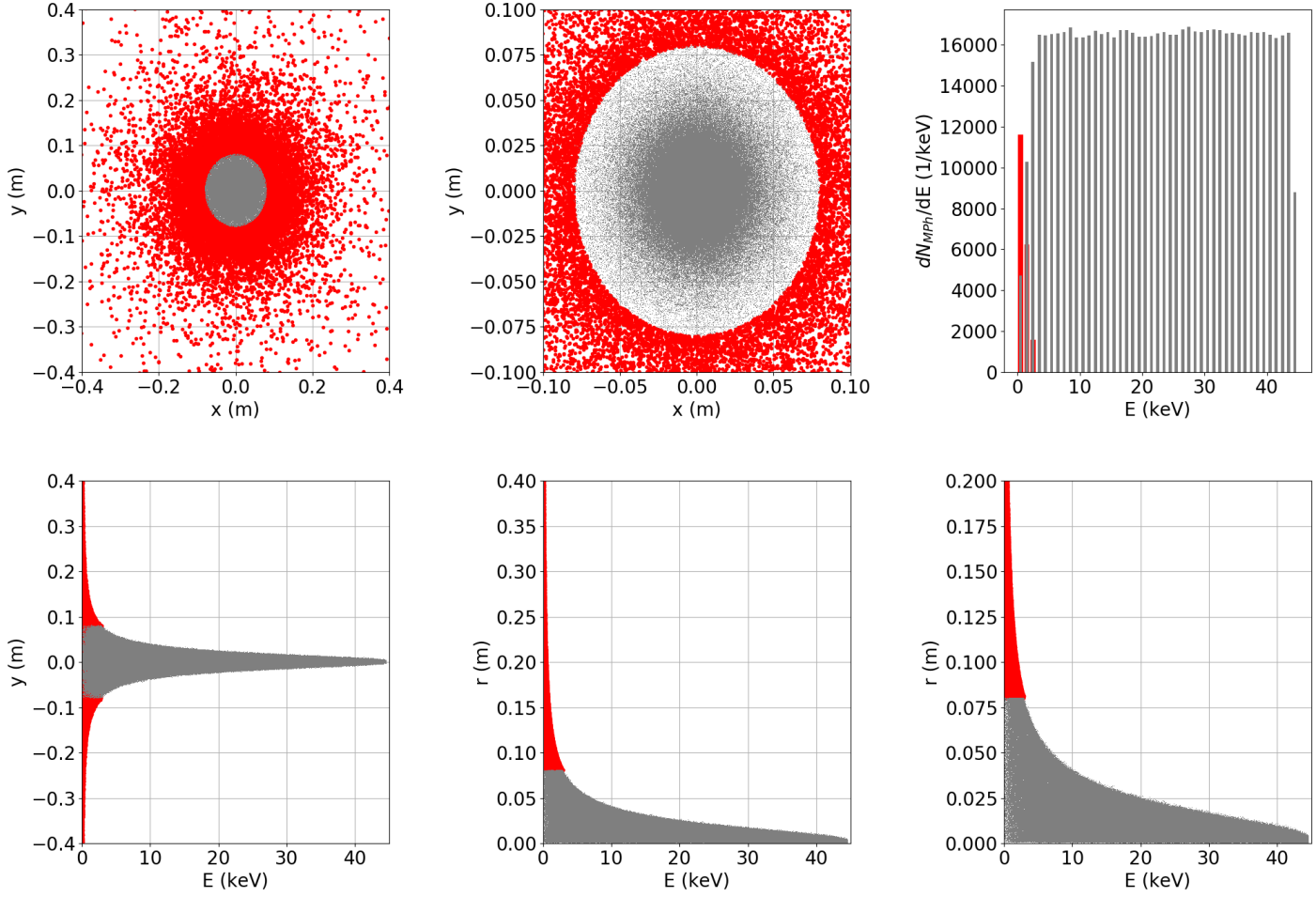
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.8 m from IP
Real photons at radius > 0.0795 m (in red): 291600.0
Real photons 0.13 m < radius < 0.14 m: 15800.0
Total energy photons at radius > 0.0795 (in red): 215.85855287550973 MeV
Real photons 0.13 m < radius < 0.14 m: 8.589042608523446 MeV

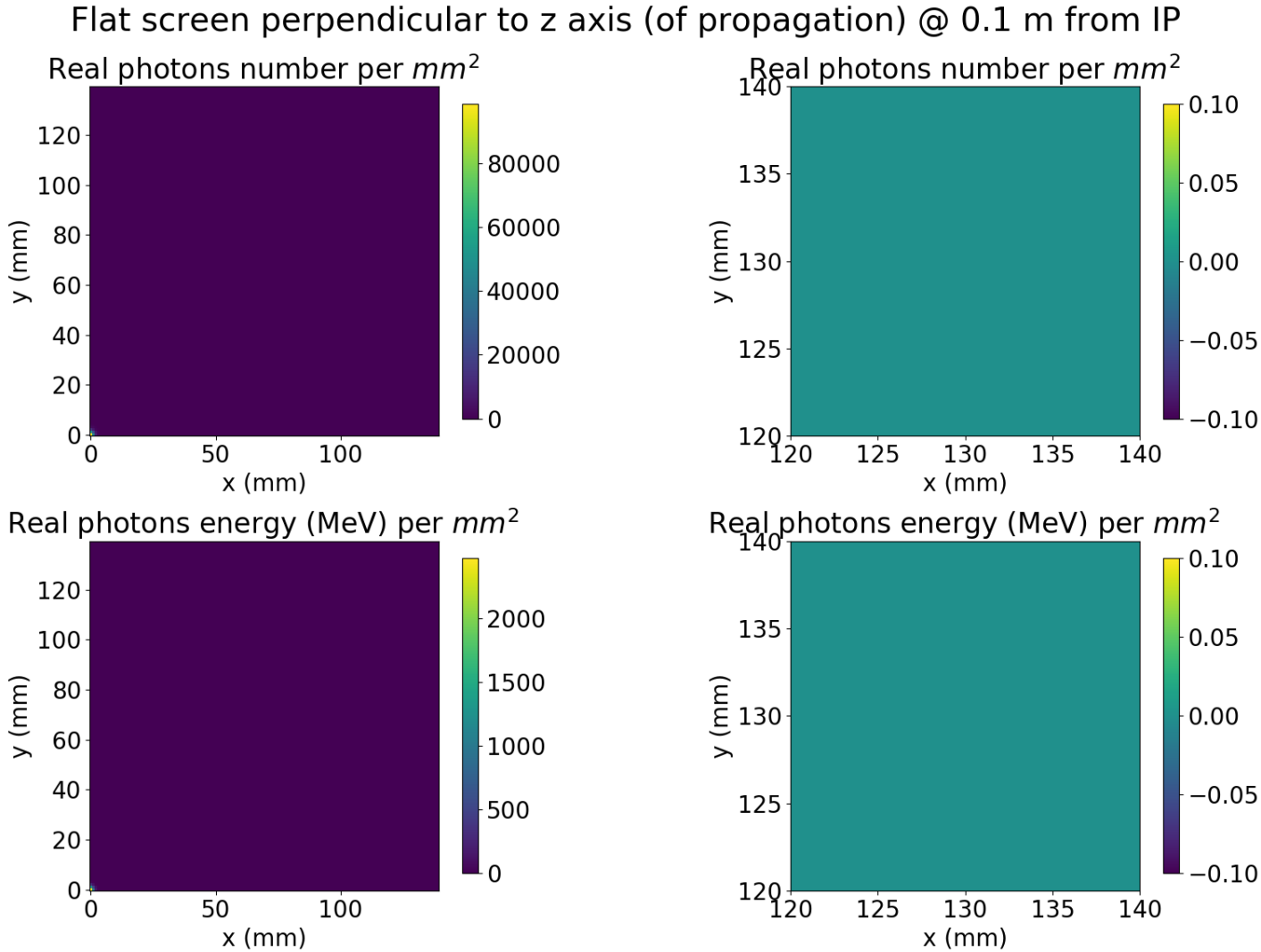


LASER AT RESONANCE

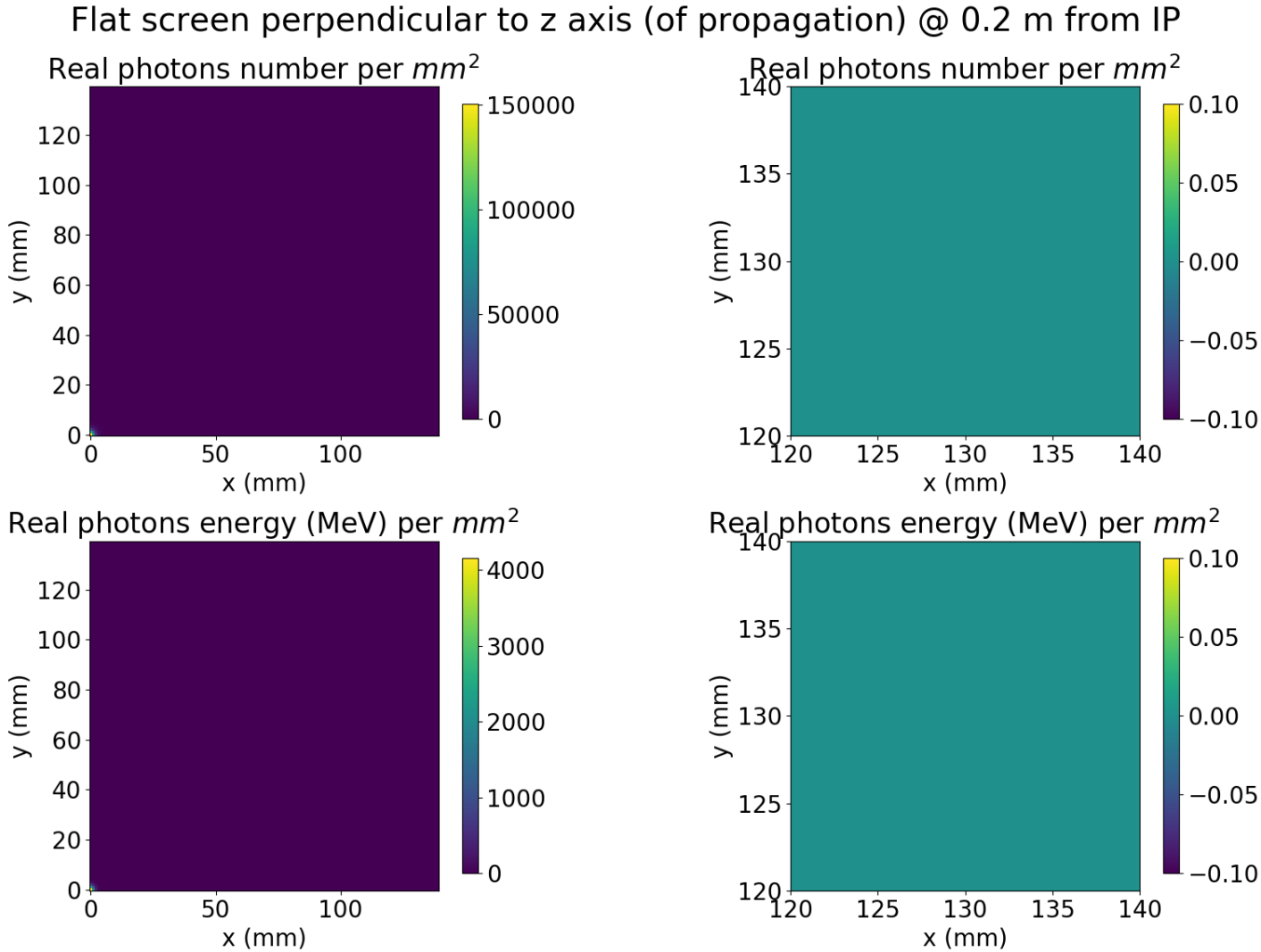
Flat screen perpendicular to z axis (of propagation) @ 2.0 m from IP
Real photons at radius > 0.0795 m (in red): 388500.0
Real photons 0.13 m < radius < 0.14 m: 20620.0
Total energy photons at radius > 0.0795 (in red): 355.1726476170208 MeV
Real photons 0.13 m < radius < 0.14 m: 13.648452275899459 MeV



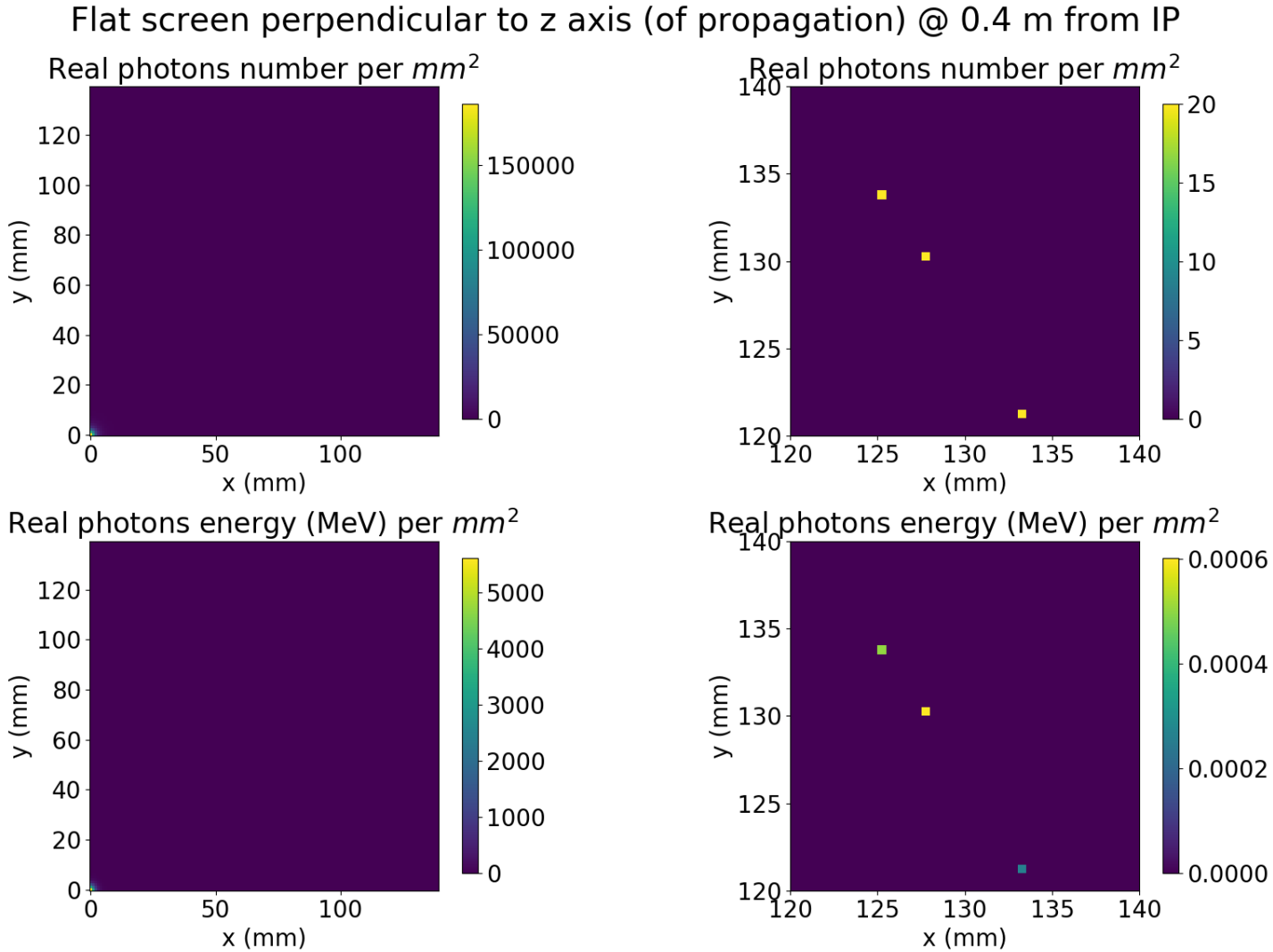
LASER AT RESONANCE



LASER AT RESONANCE

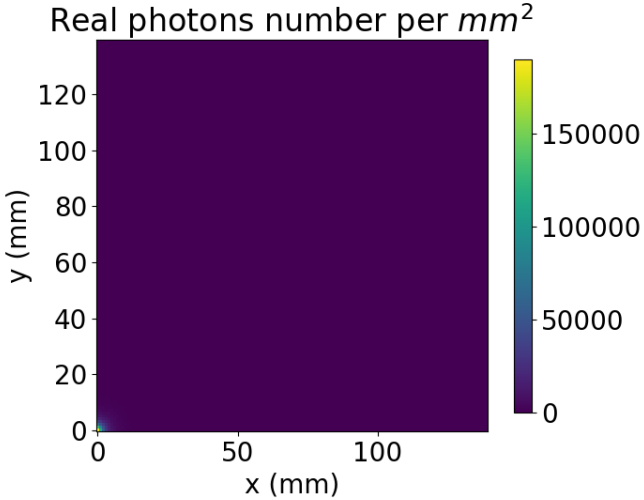


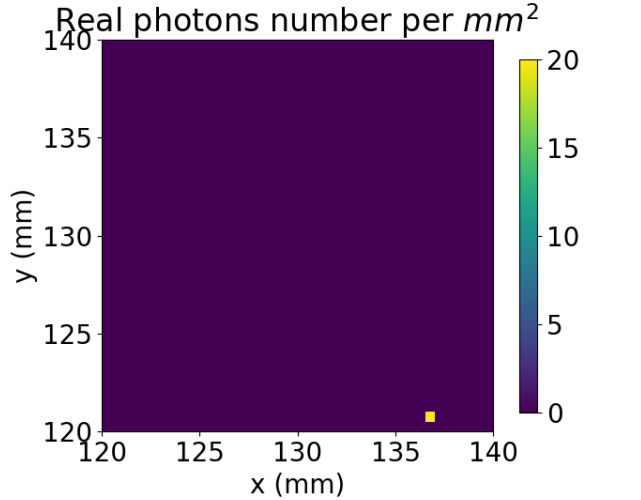
LASER AT RESONANCE

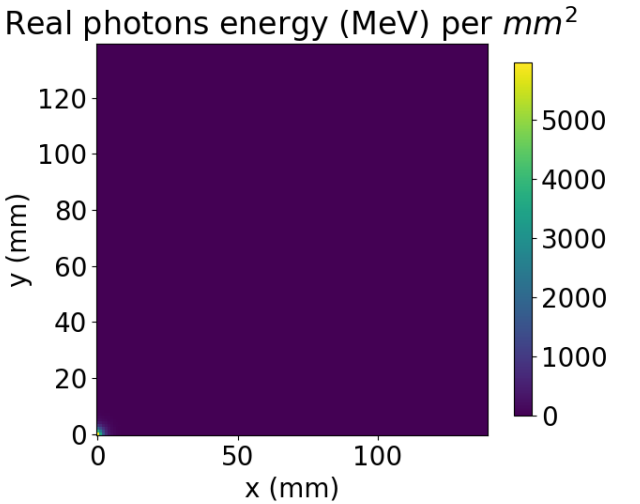


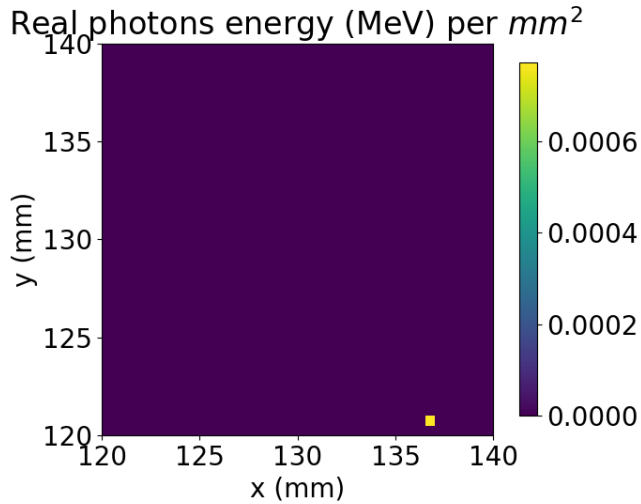
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.6000000000000001 m from IP

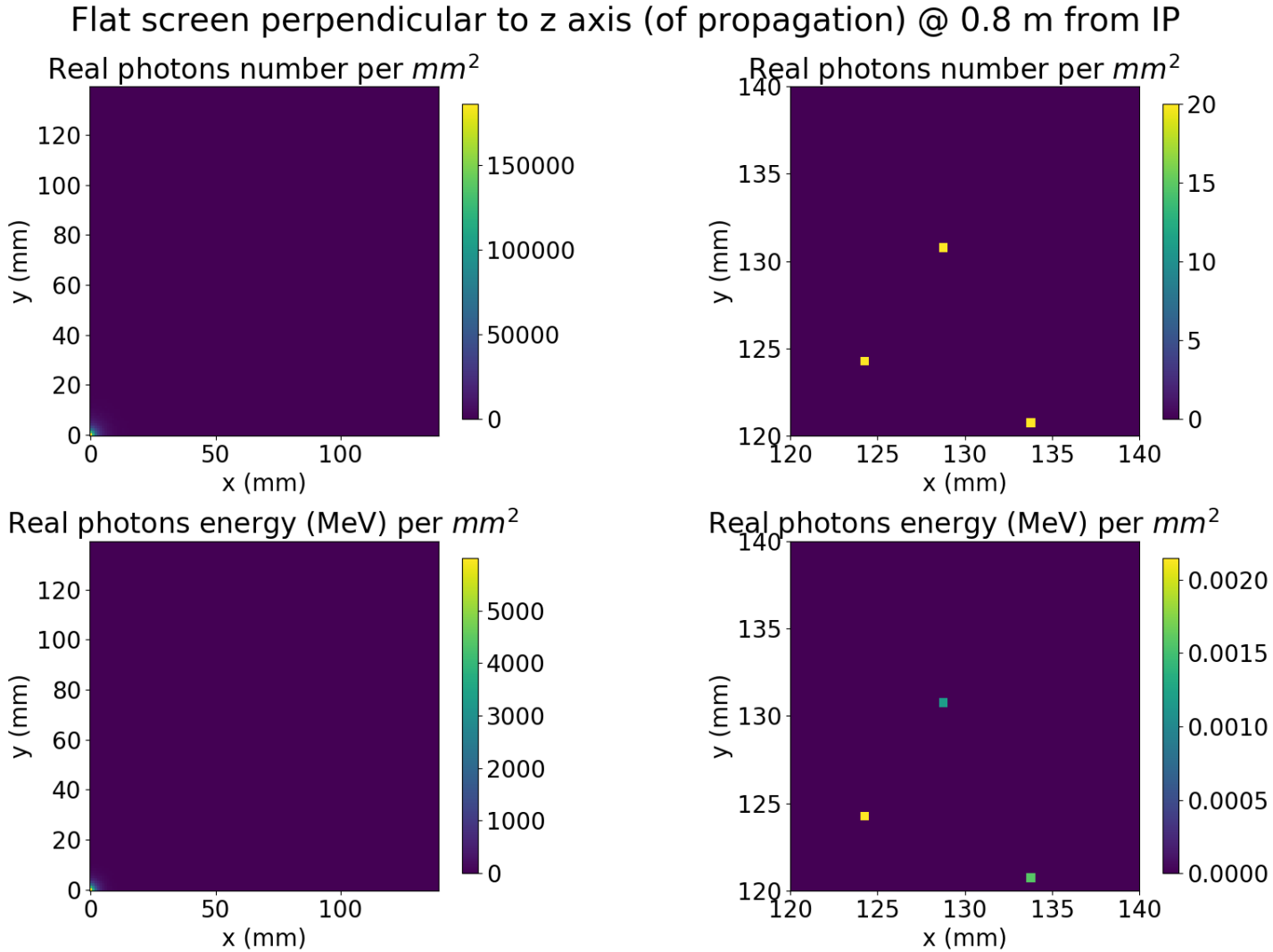




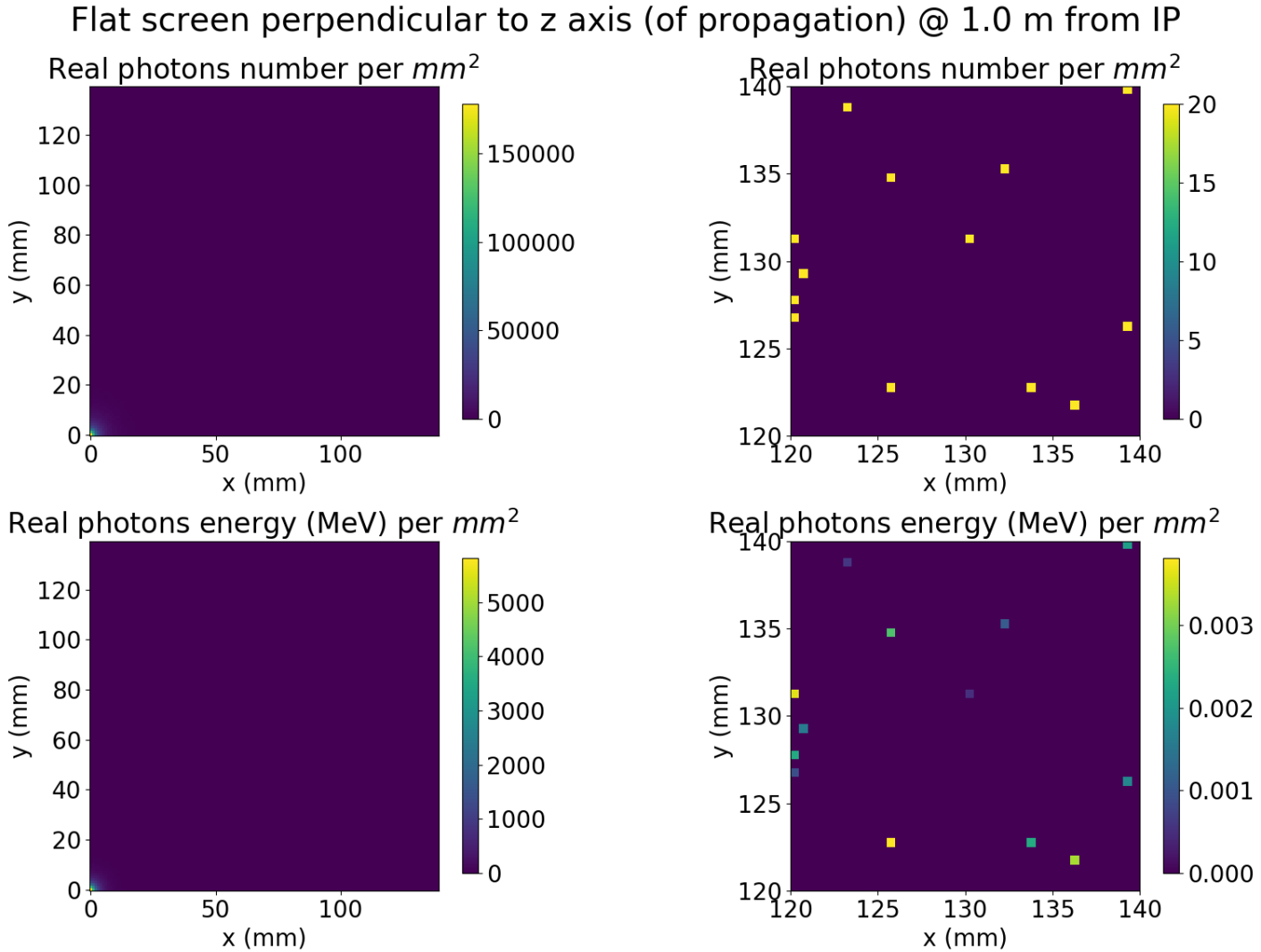




LASER AT RESONANCE

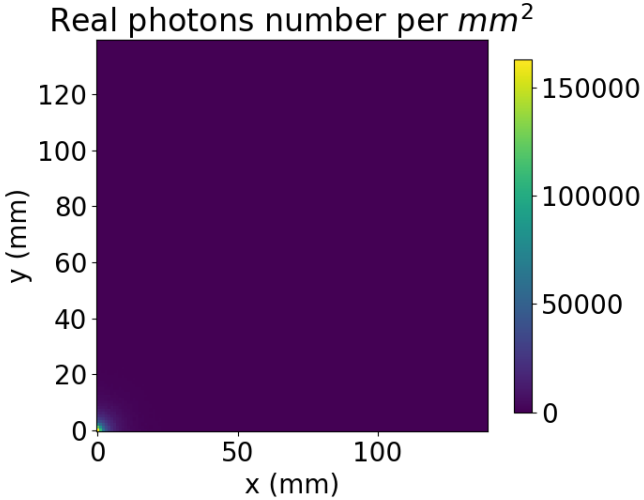


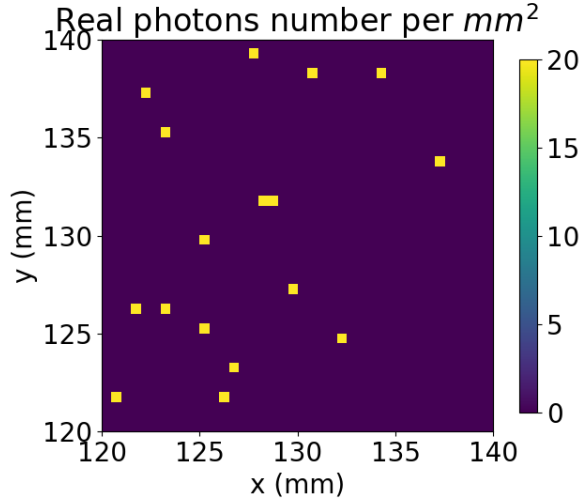
LASER AT RESONANCE

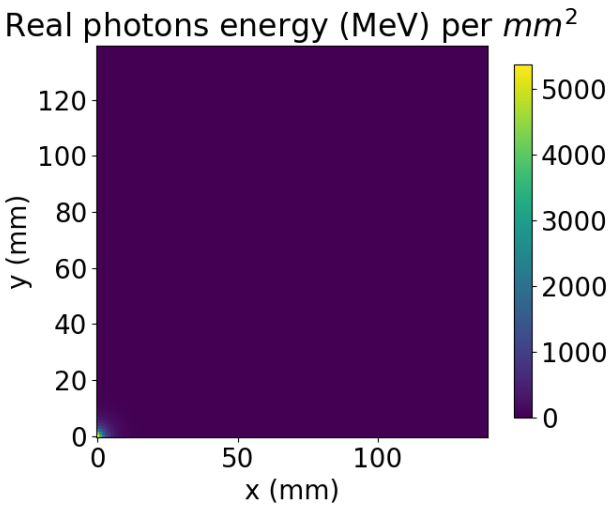


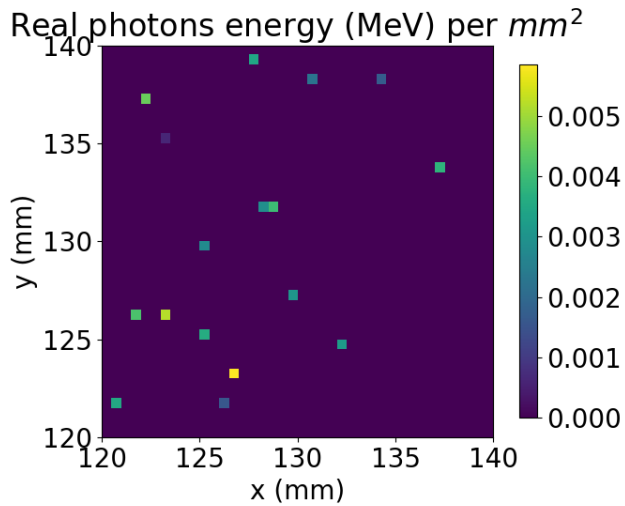
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.2000000000000002 m from IP



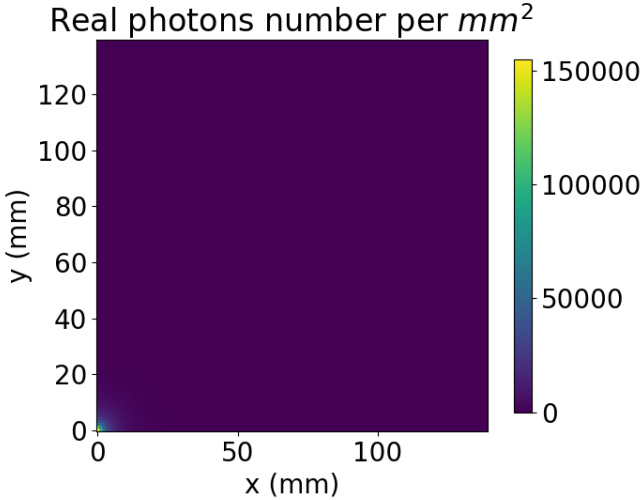


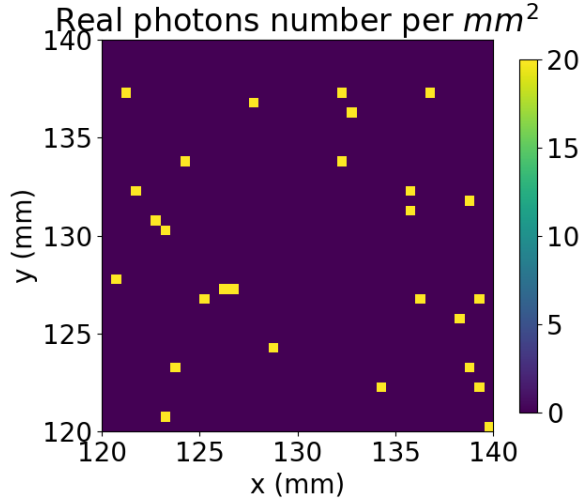


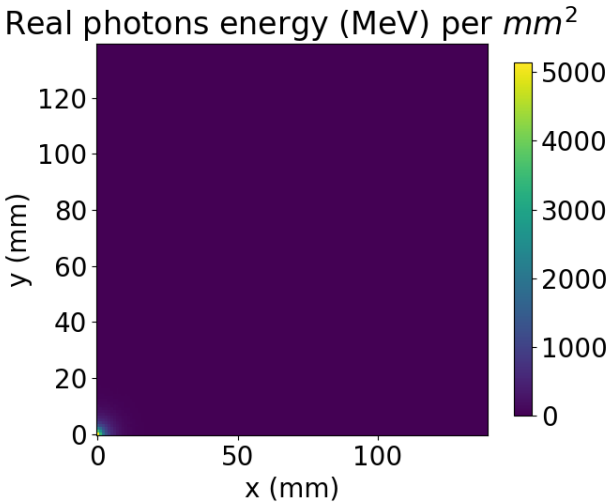


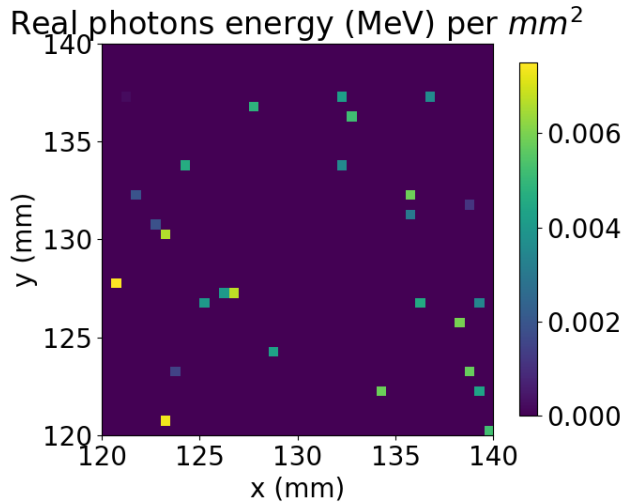
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.4000000000000001 m from IP

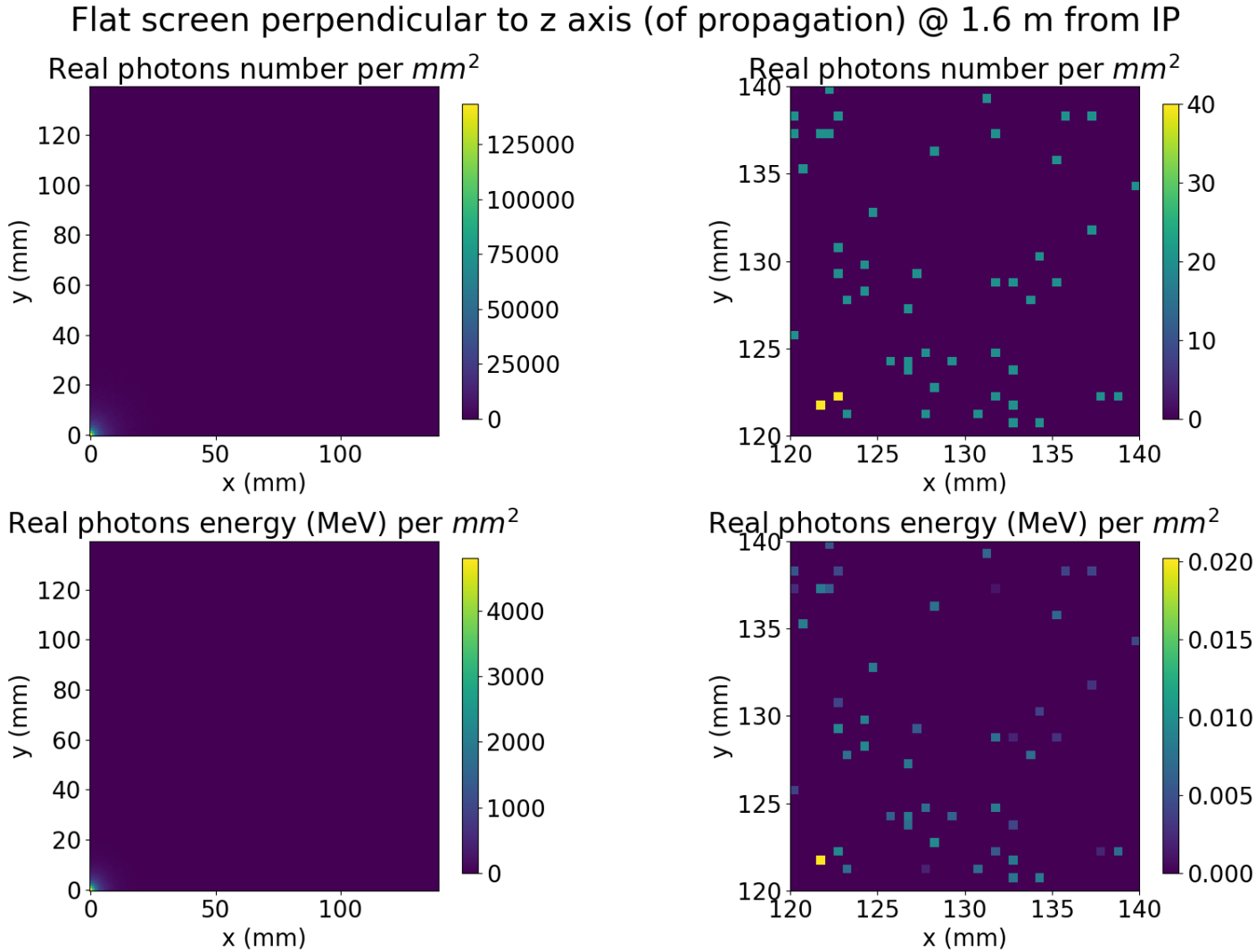




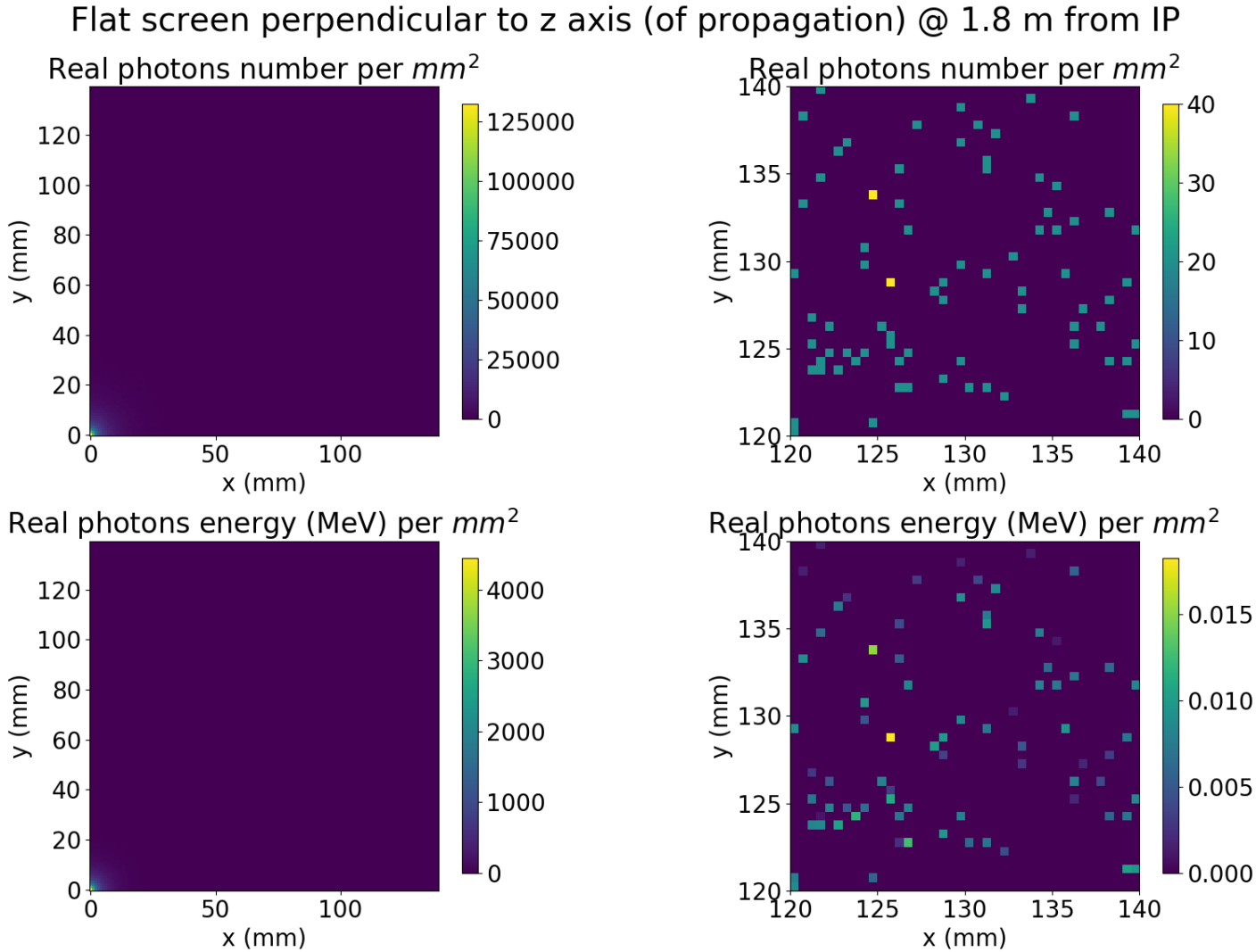




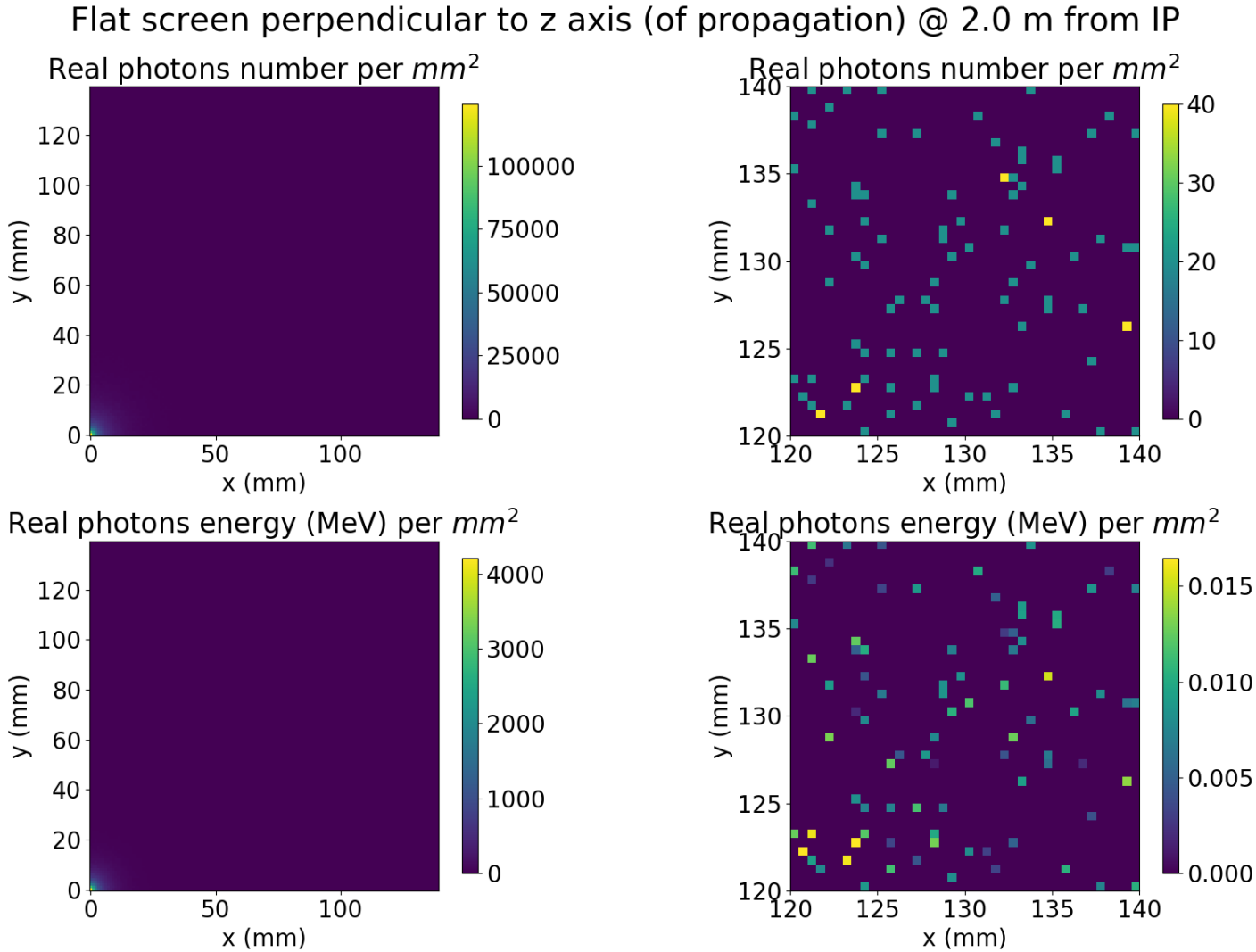
LASER AT RESONANCE



LASER AT RESONANCE

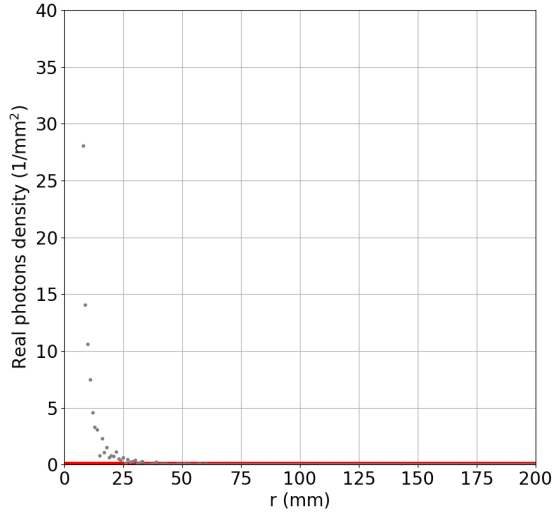


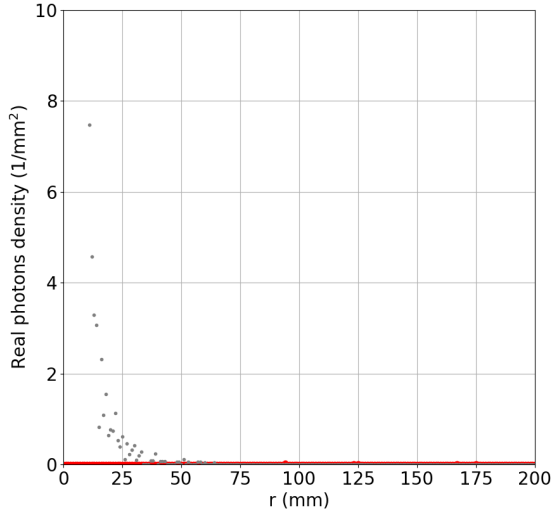
LASER AT RESONANCE

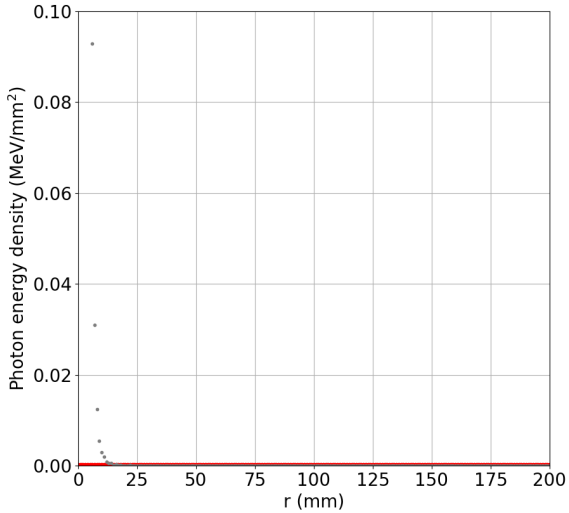


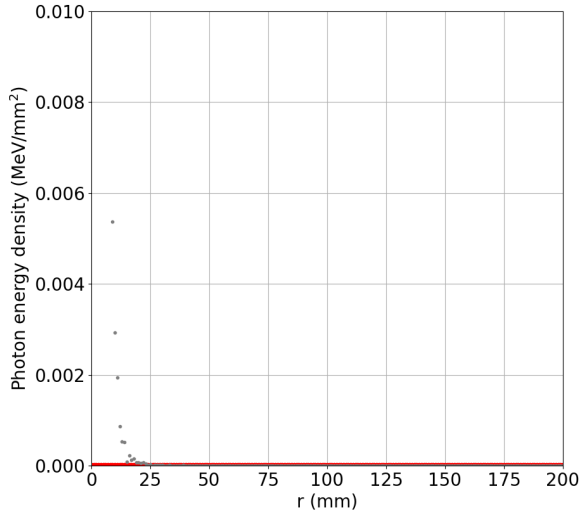
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.1 m from IP
Real photons at radius > 0.0795 m (in red): 140.0
Real photons 0.13 m < radius < 0.14 m: 0.0
Total energy photons at radius > 0.0795 (in red): 0.0004658819770737534 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0 MeV



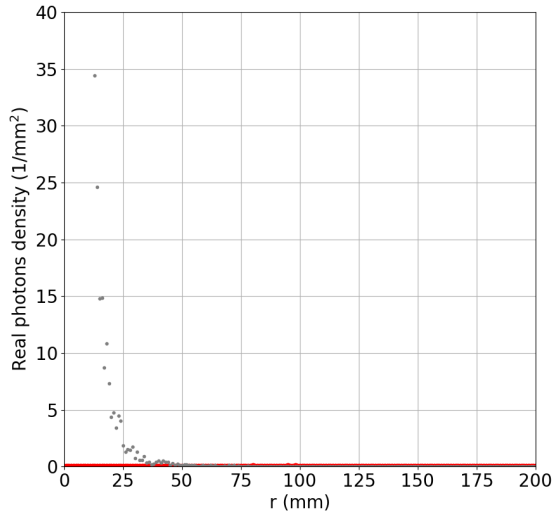


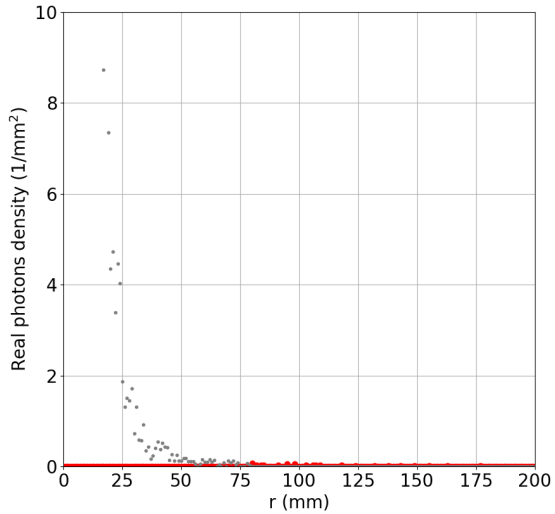


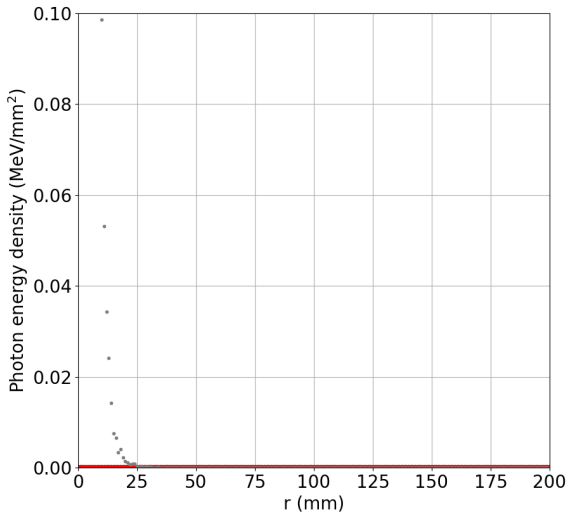


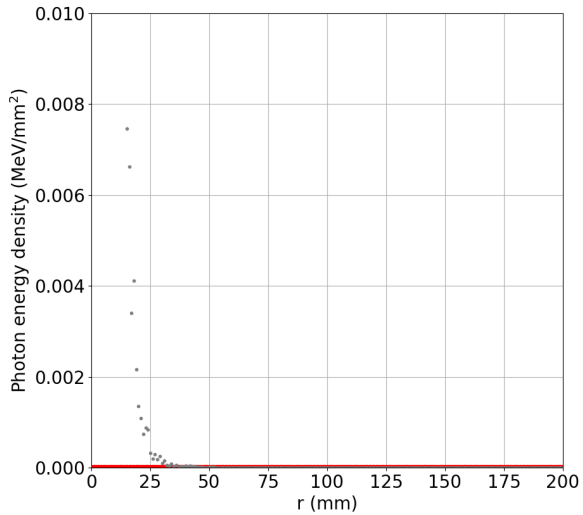
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.2 m from IP
Real photons at radius > 0.0795 m (in red): 680.0
Real photons 0.13 m < radius < 0.14 m: 40.0
Total energy photons at radius > 0.0795 (in red): 0.0073818768999135585 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0001888539955092367 MeV



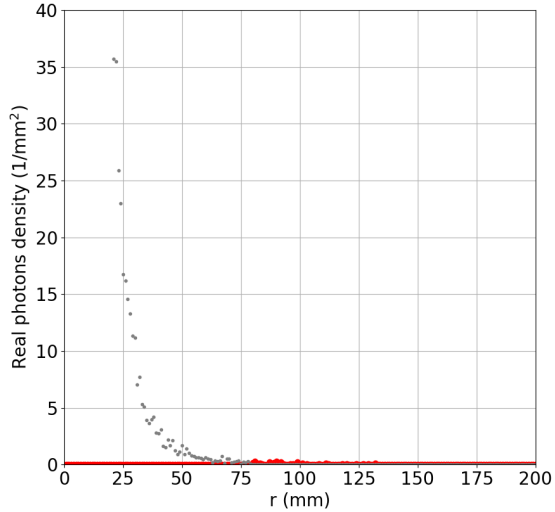


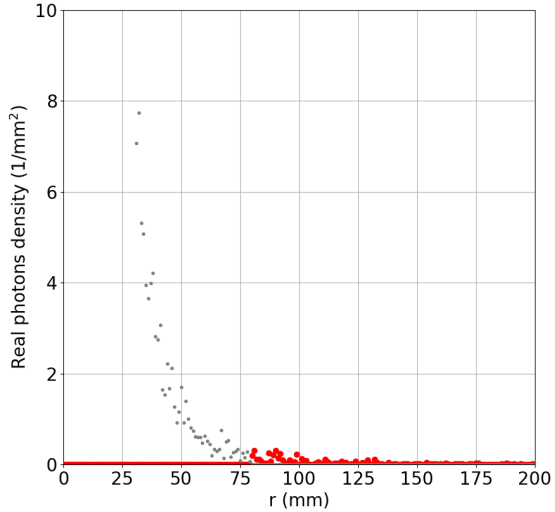


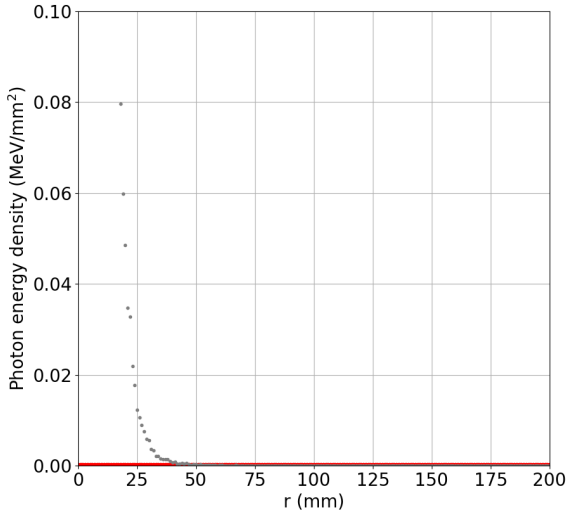


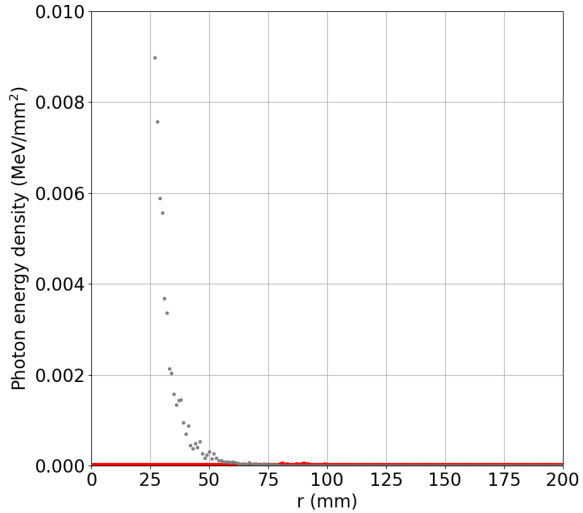
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.4 m from IP
Real photons at radius > 0.0795 m (in red): 4180.0
Real photons 0.13 m < radius < 0.14 m: 220.0
Total energy photons at radius > 0.0795 (in red): 0.1637910622249706 MeV
Real photons 0.13 m < radius < 0.14 m: 0.007323894314746721 MeV



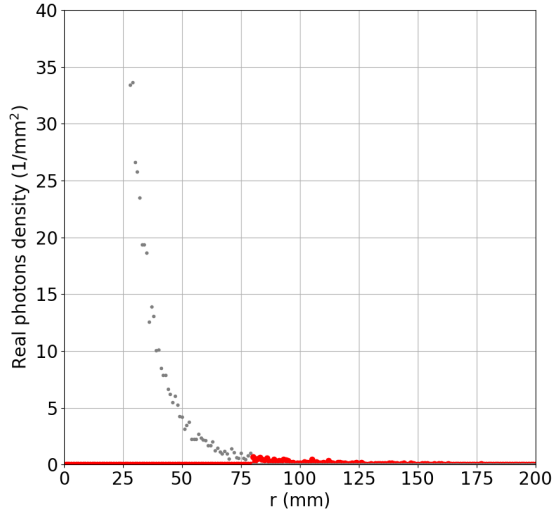


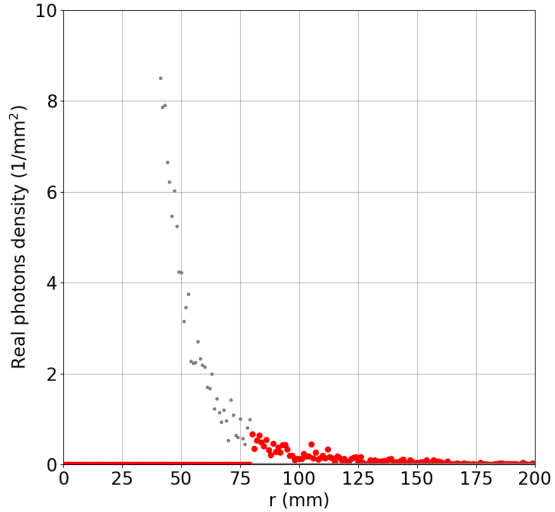


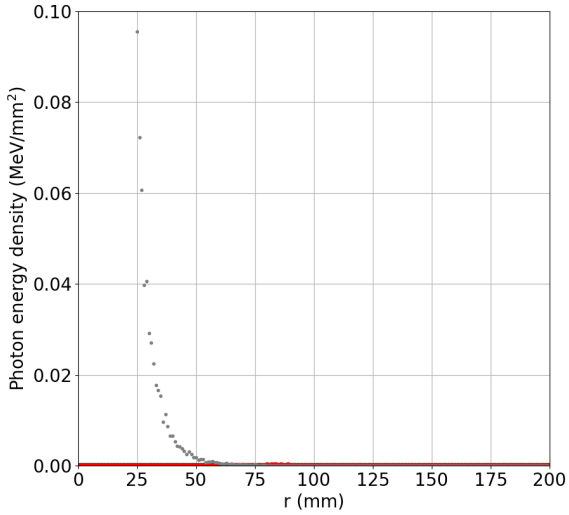


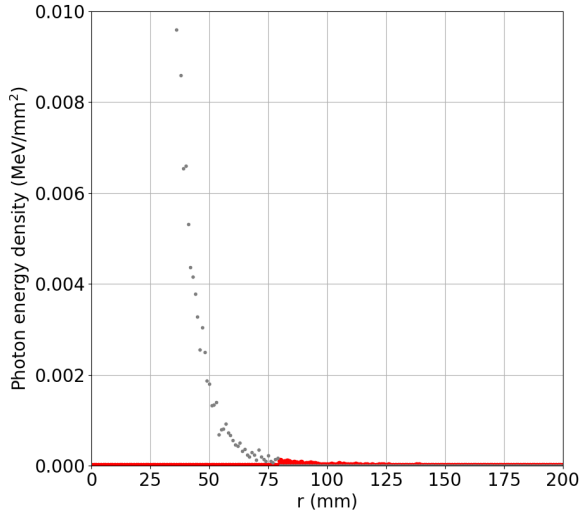
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.6000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 12560.0
Real photons 0.13 m < radius < 0.14 m: 720.0
Total energy photons at radius > 0.0795 (in red): 1.0416130116003222 MeV
Real photons 0.13 m < radius < 0.14 m: 0.04938503986275675 MeV



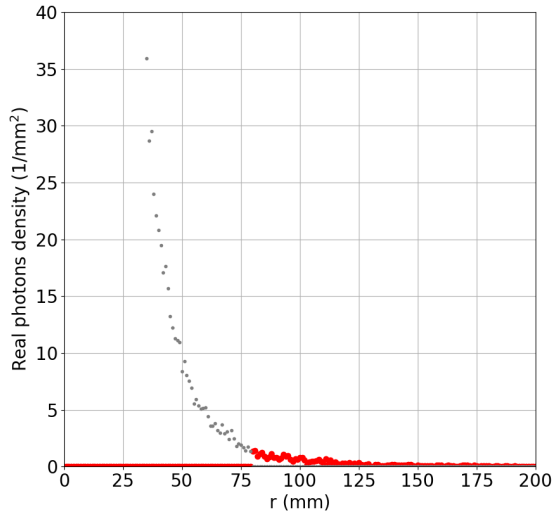


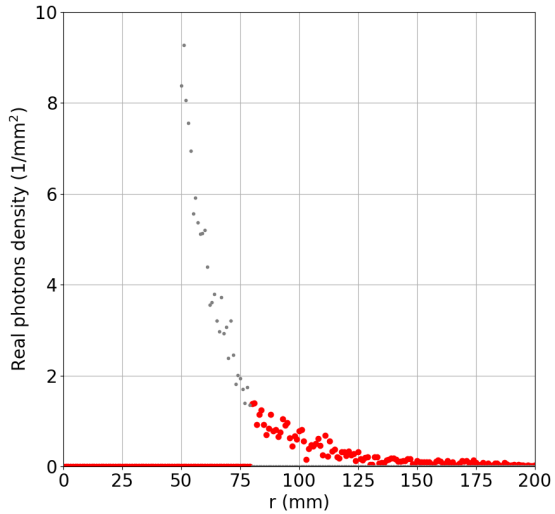


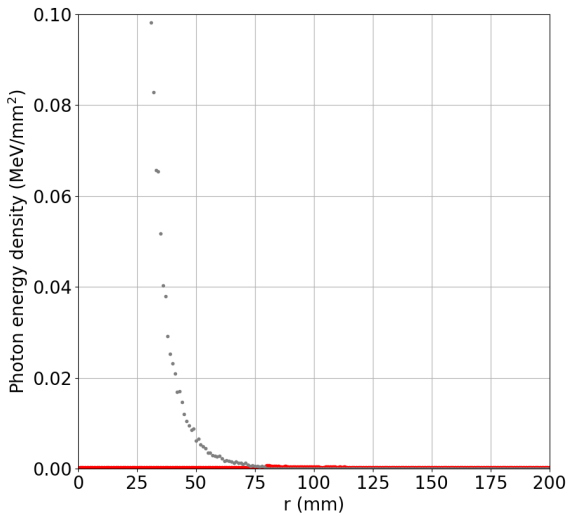


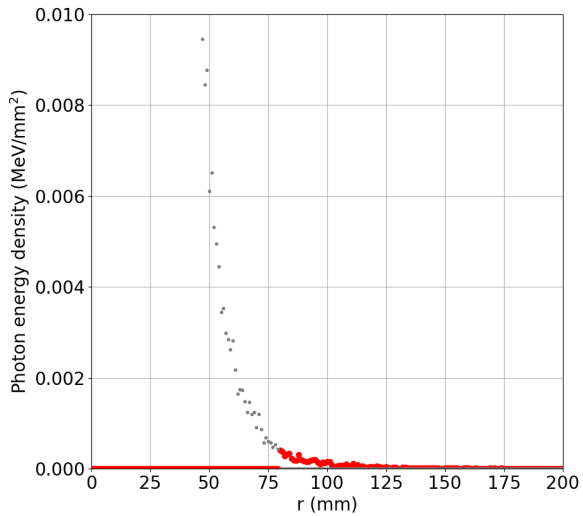
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.8 m from IP
Real photons at radius > 0.0795 m (in red): 28880.0
Real photons 0.13 m < radius < 0.14 m: 1080.0
Total energy photons at radius > 0.0795 (in red): 4.206341914380608 MeV
Real photons 0.13 m < radius < 0.14 m: 0.12315767096277735 MeV



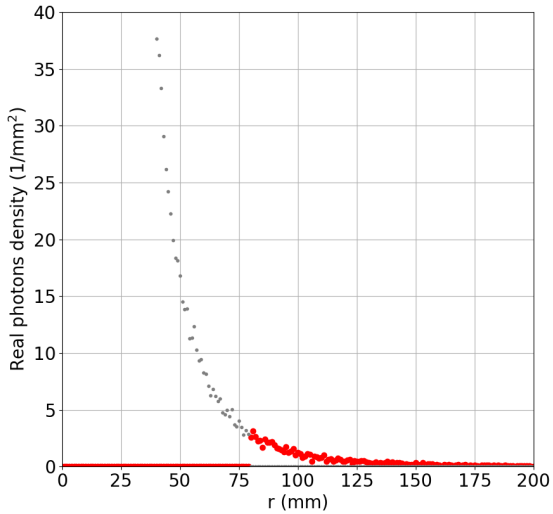


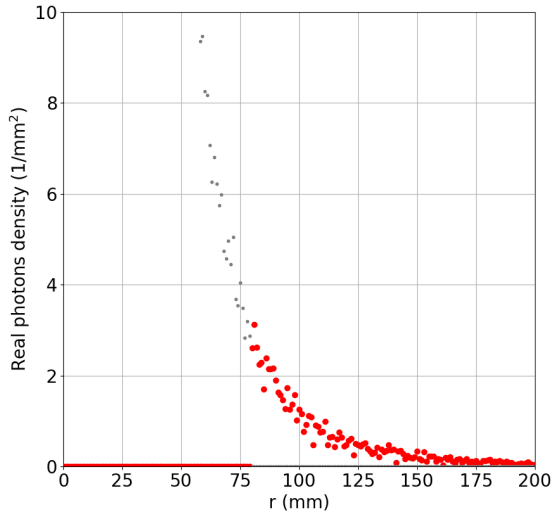


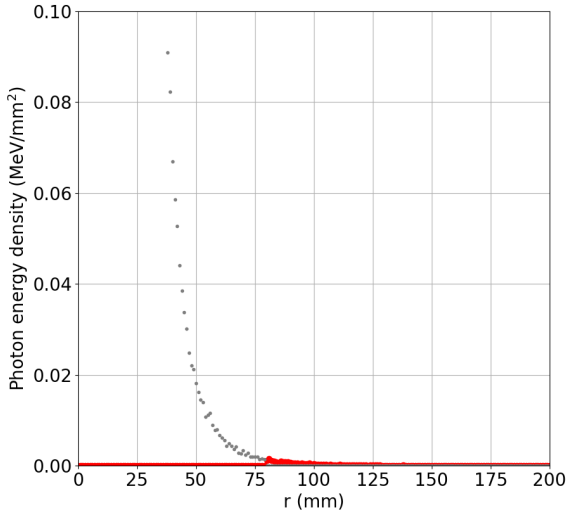


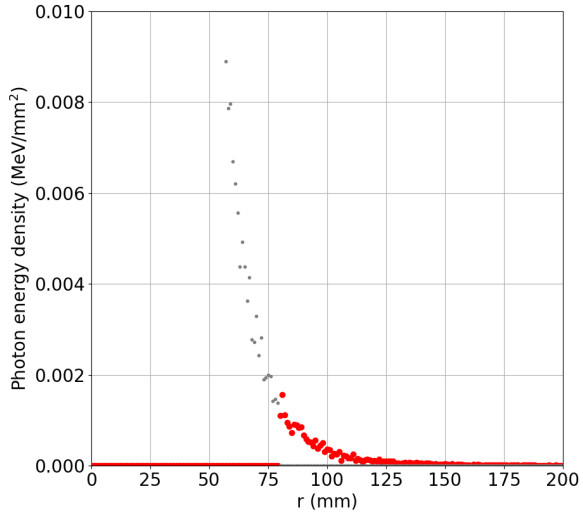
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.0 m from IP
Real photons at radius > 0.0795 m (in red): 57120.0
Real photons 0.13 m < radius < 0.14 m: 2960.0
Total energy photons at radius > 0.0795 (in red): 13.380416135635603 MeV
Real photons 0.13 m < radius < 0.14 m: 0.4684457202257352 MeV



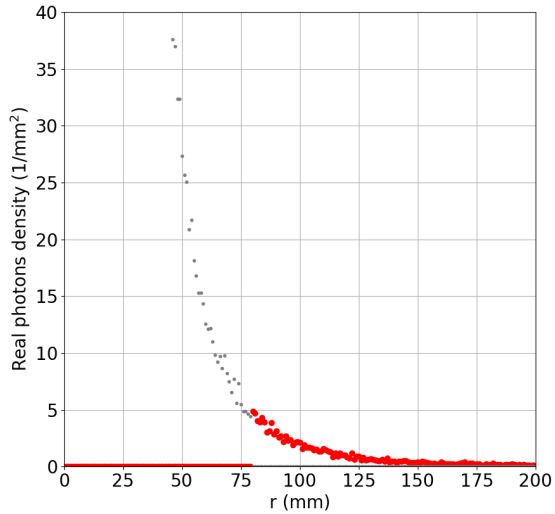


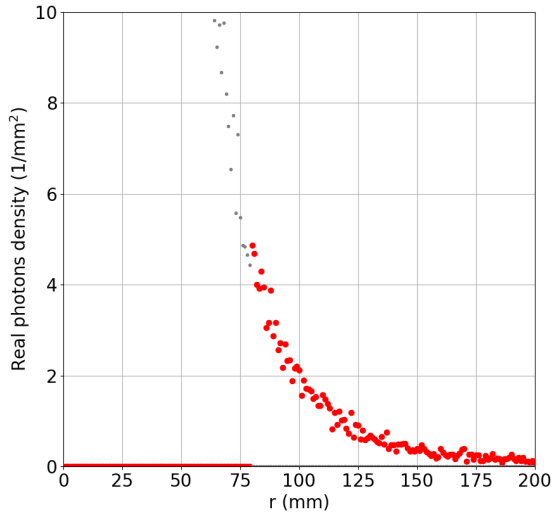


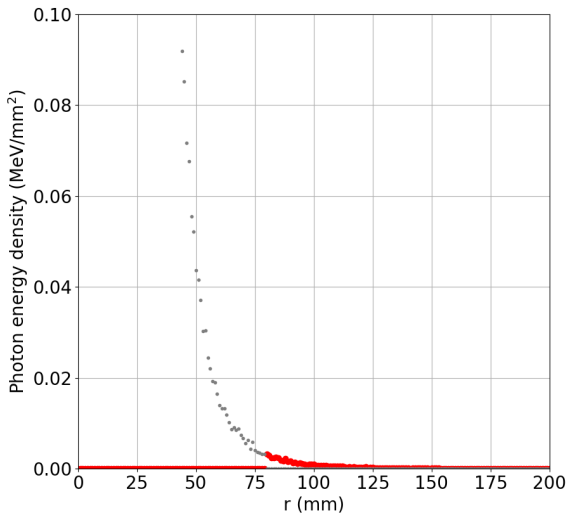


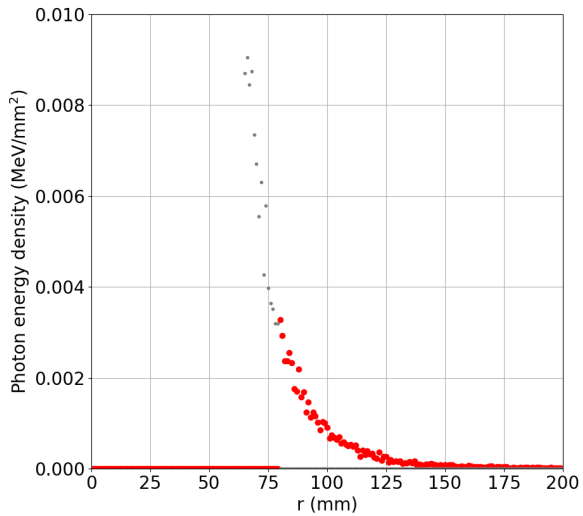
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.2000000000000002 m from IP
Real photons at radius > 0.0795 m (in red): 96820.0
Real photons 0.13 m < radius < 0.14 m: 4900.0
Total energy photons at radius > 0.0795 (in red): 32.63701693502334 MeV
Real photons 0.13 m < radius < 0.14 m: 1.1092860125028645 MeV



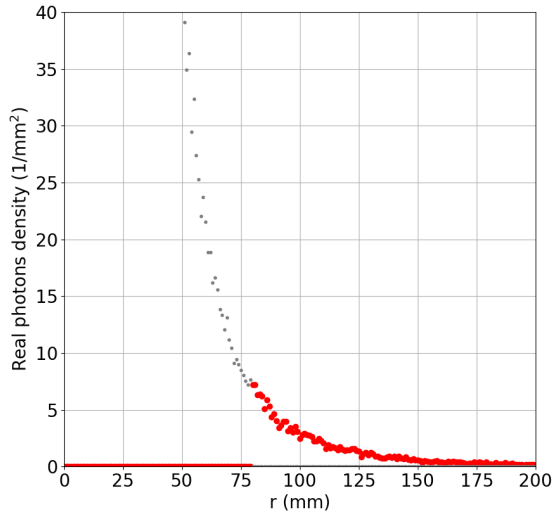


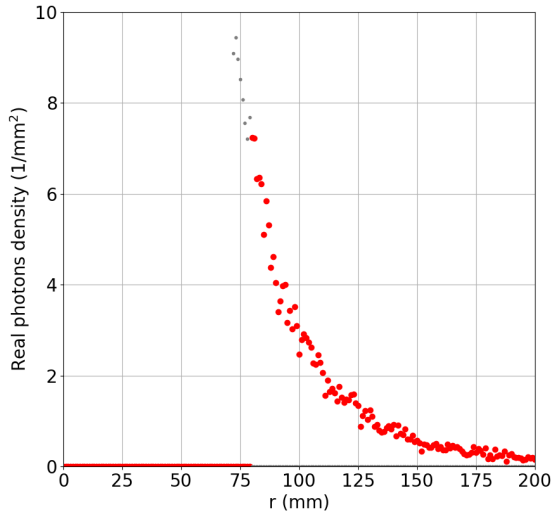


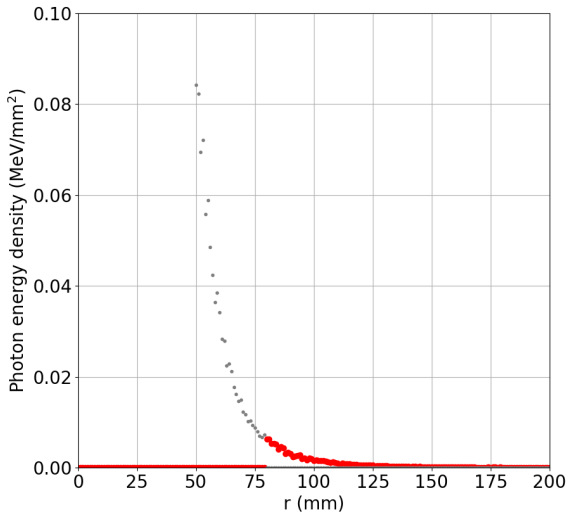


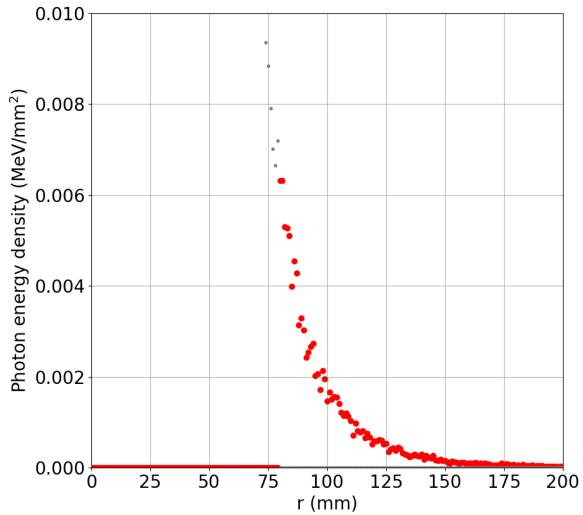
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.4000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 147960.0
Real photons 0.13 m < radius < 0.14 m: 7680.0
Total energy photons at radius > 0.0795 (in red): 67.50028220818822 MeV
Real photons 0.13 m < radius < 0.14 m: 2.590118848560454 MeV



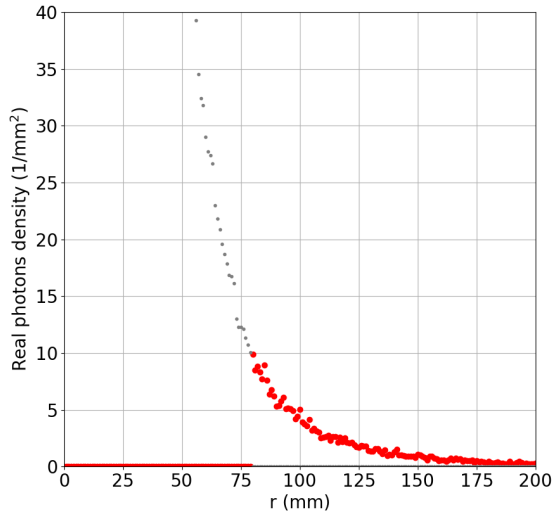


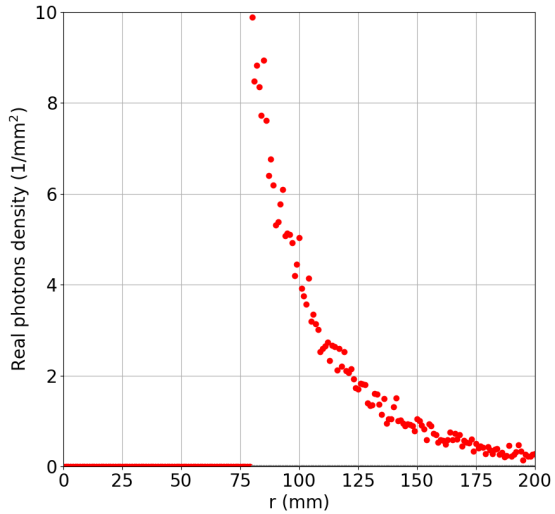


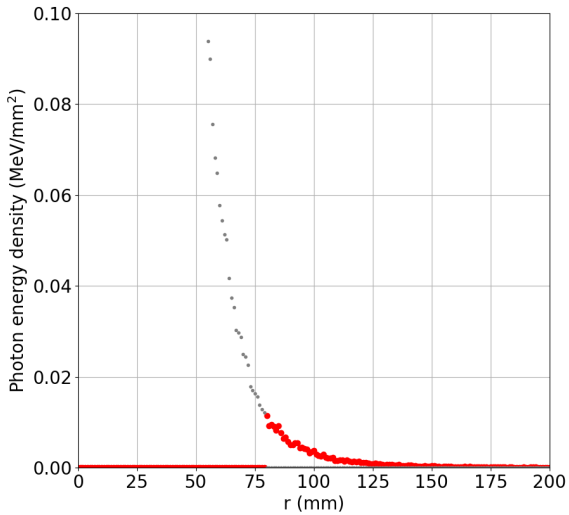


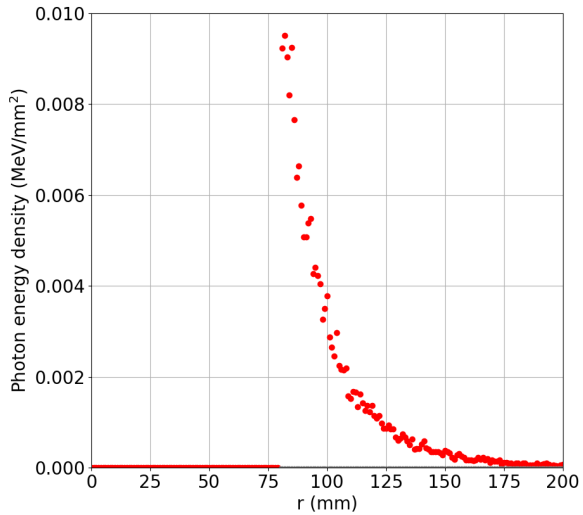
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 211340.0
Real photons 0.13 m < radius < 0.14 m: 10980.0
Total energy photons at radius > 0.0795 (in red): 123.97137259211175 MeV
Real photons 0.13 m < radius < 0.14 m: 4.747604578097614 MeV



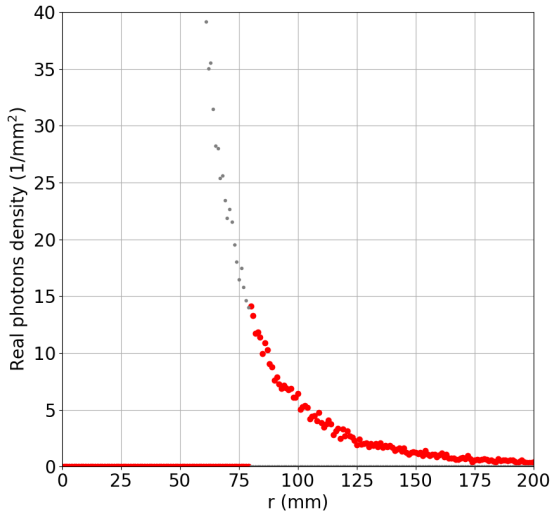


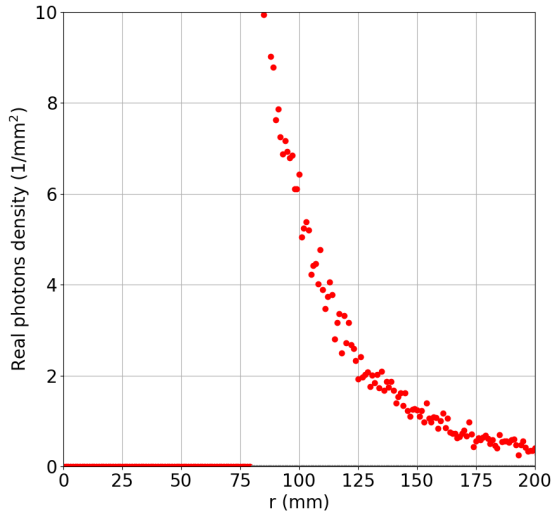


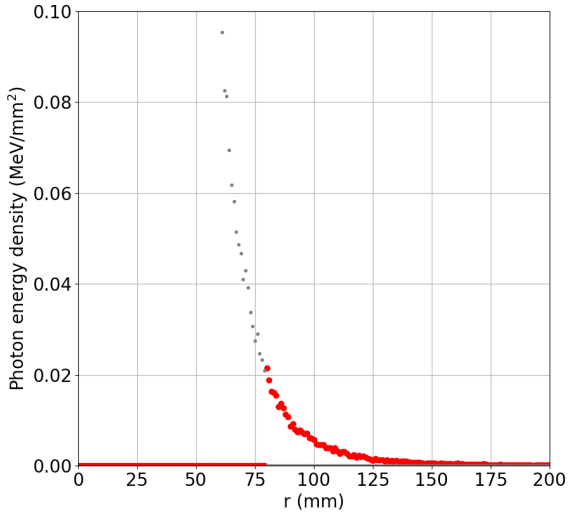


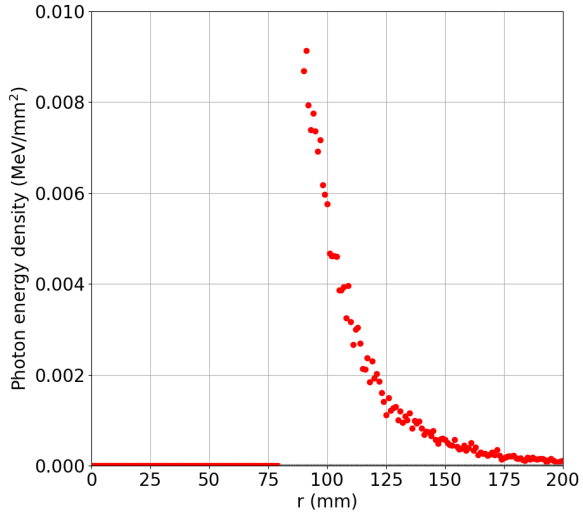
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.8 m from IP
Real photons at radius > 0.0795 m (in red): 291600.0
Real photons 0.13 m < radius < 0.14 m: 15800.0
Total energy photons at radius > 0.0795 (in red): 215.85855287550973 MeV
Real photons 0.13 m < radius < 0.14 m: 8.589042608523446 MeV



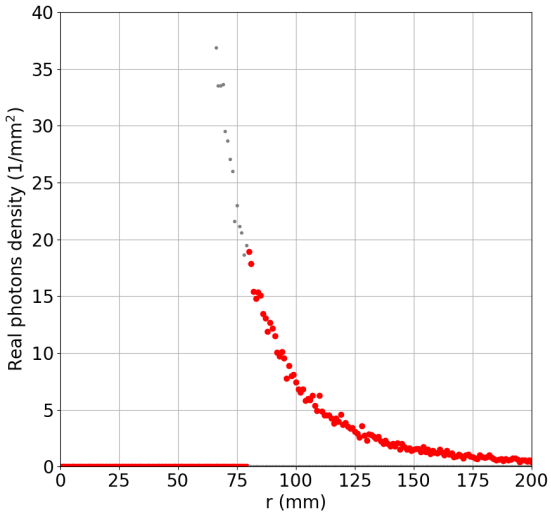


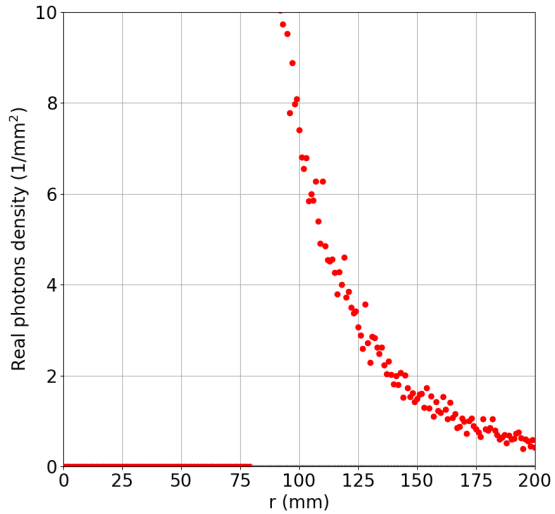


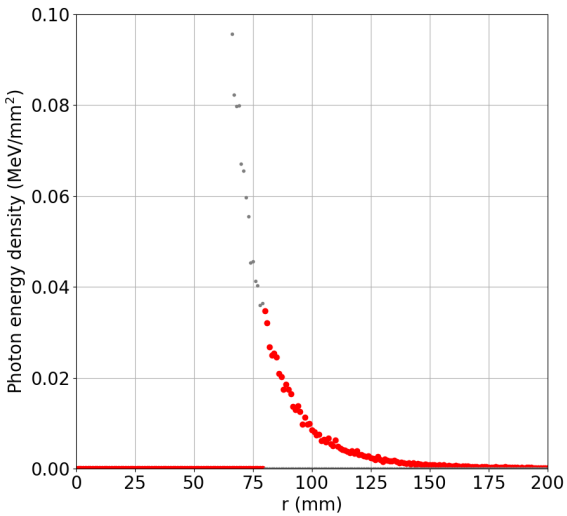


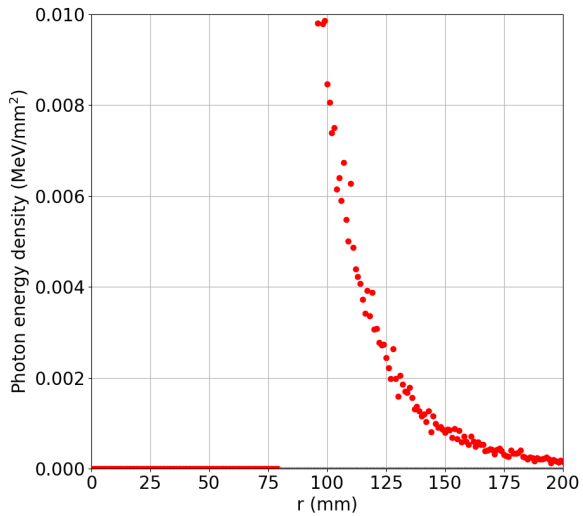
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 2.0 m from IP
Real photons at radius > 0.0795 m (in red): 388500.0
Real photons 0.13 m < radius < 0.14 m: 20620.0
Total energy photons at radius > 0.0795 (in red): 355.1726476170208 MeV
Real photons 0.13 m < radius < 0.14 m: 13.648452275899459 MeV



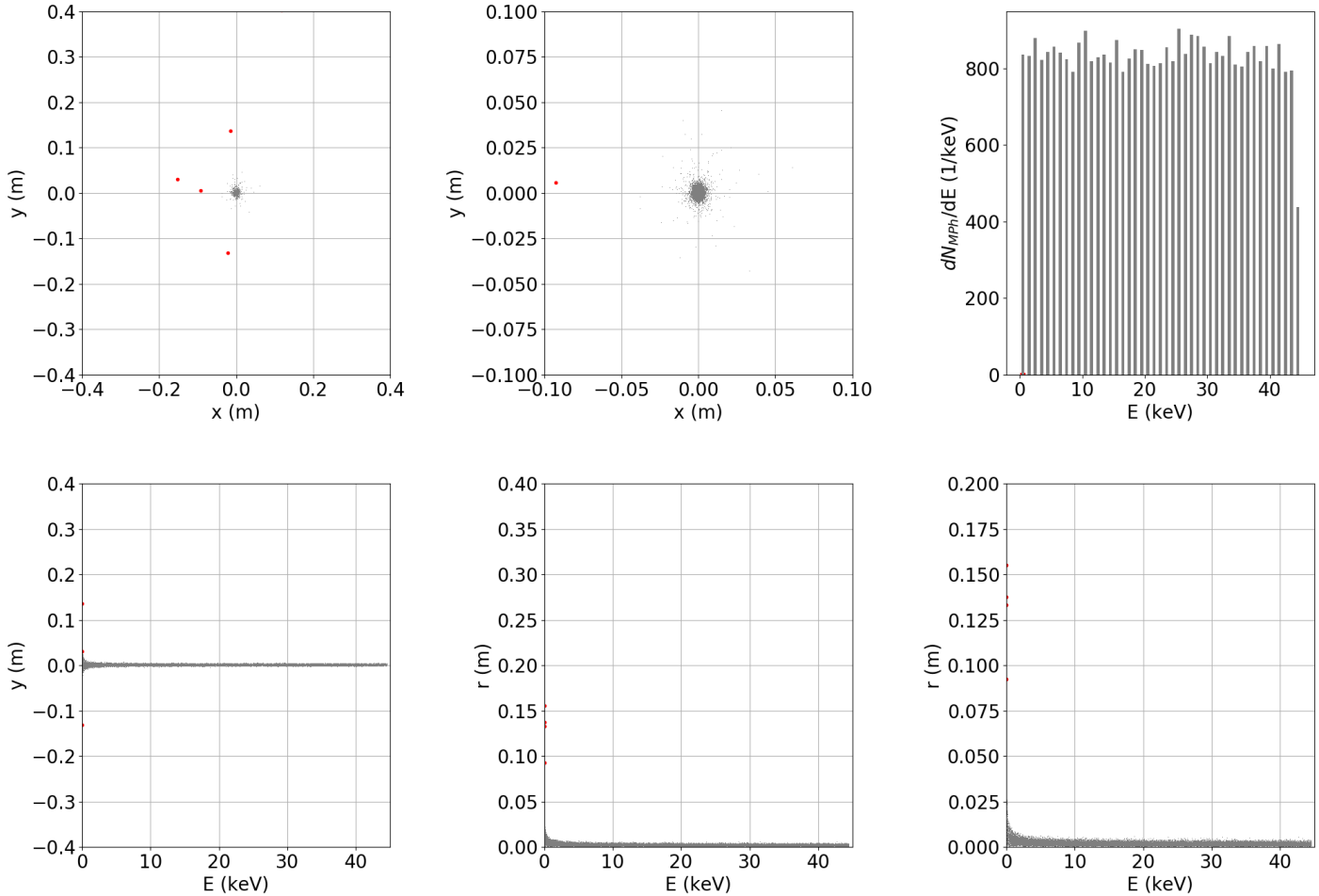






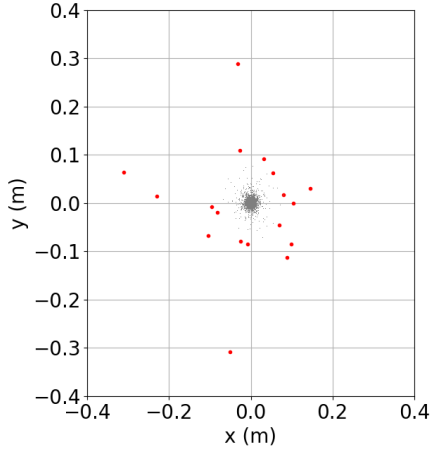
LASER 2 σ BELOW RESONANCE

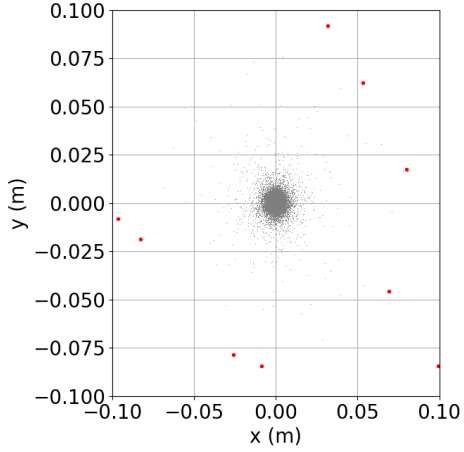
Flat screen perpendicular to z axis (of propagation) @ 0.1 m from IP
Real photons at radius > 0.0795 m (in red): 100.0
Real photons 0.13 m < radius < 0.14 m: 40.0
Total energy photons at radius > 0.0795 (in red): 0.0004747228873985506 5 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0001989623030125919 2 MeV

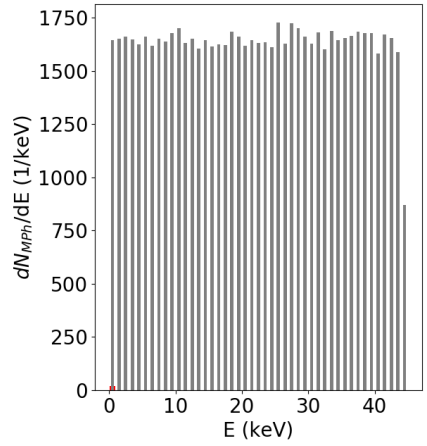


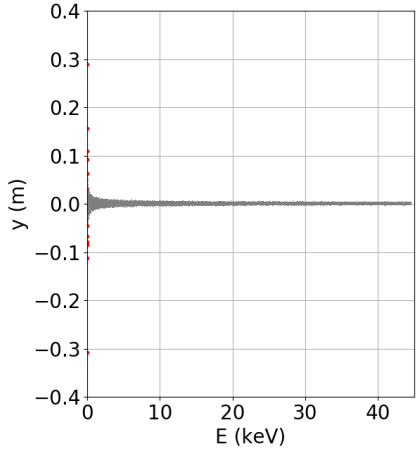
LASER 2 σ BELOW RESONANCE

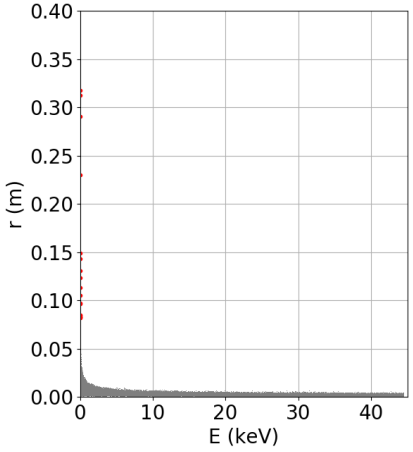
Flat screen perpendicular to z axis (of propagation) @ 0.2 m from IP
Real photons at radius > 0.0795 m (in red): 400.0
Real photons 0.13 m < radius < 0.14 m: 20.0
Total energy photons at radius > 0.0795 (in red): 0.005426189823980404 MeV
Real photons 0.13 m < radius < 0.14 m: 8.99974462234375e-05 MeV

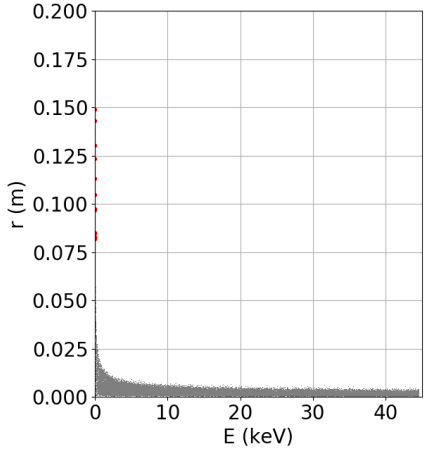






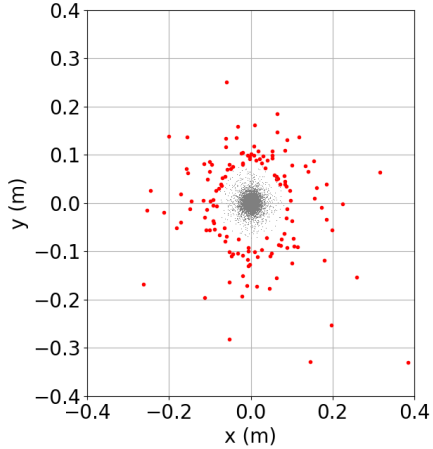


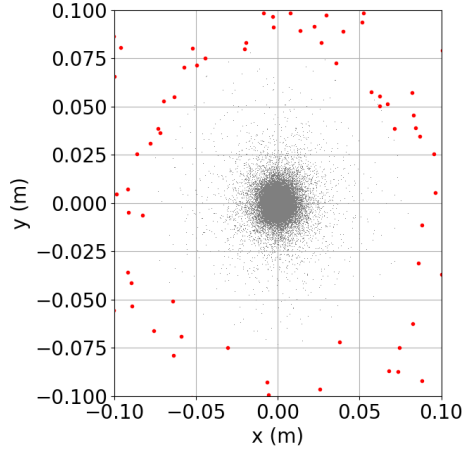


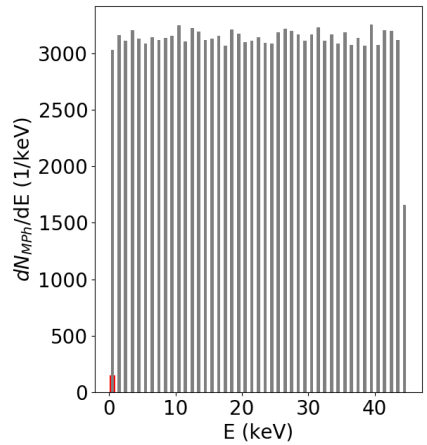


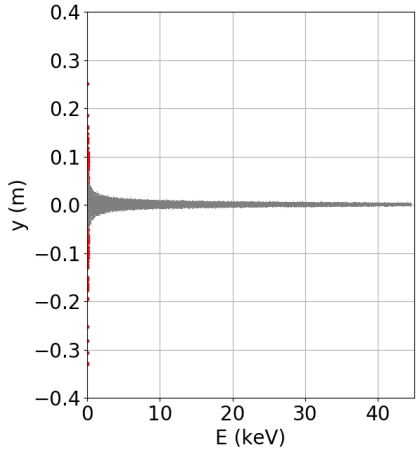
LASER 2 σ BELOW RESONANCE

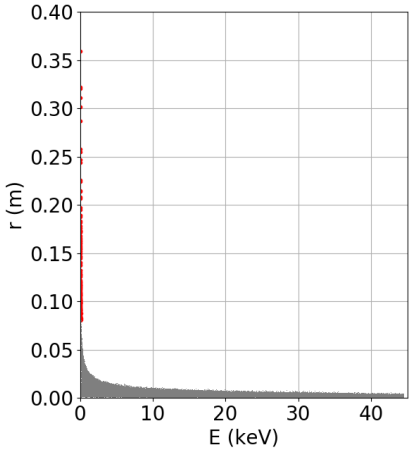
Flat screen perpendicular to z axis (of propagation) @ 0.4 m from IP
Real photons at radius > 0.0795 m (in red): 3000.0
Real photons 0.13 m < radius < 0.14 m: 100.0
Total energy photons at radius > 0.0795 (in red): 0.1044432955091591 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0030197209270645606 MeV

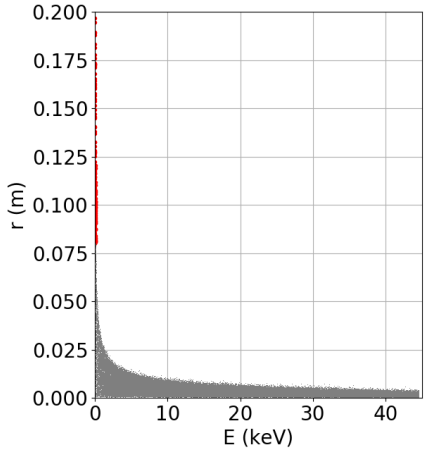






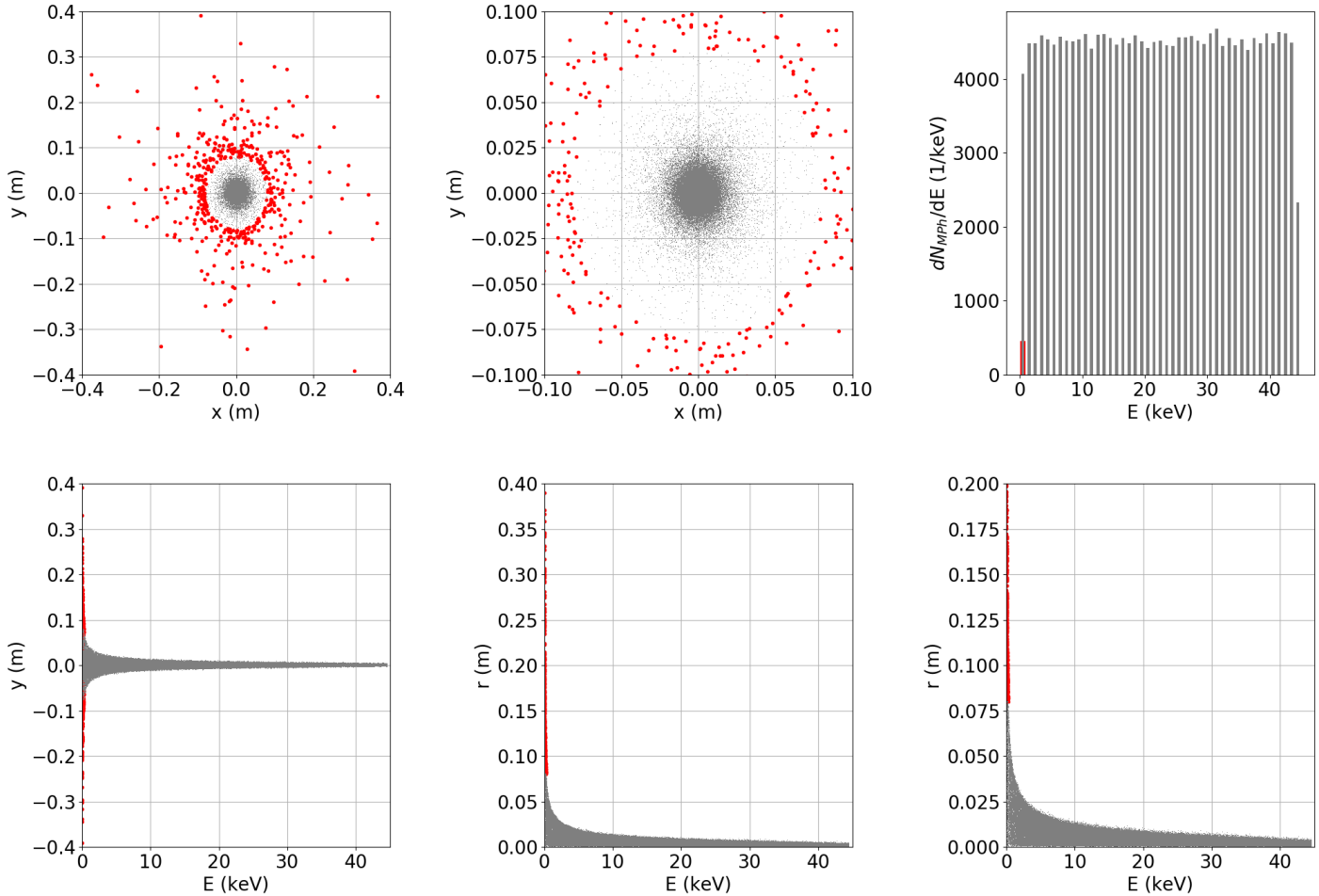






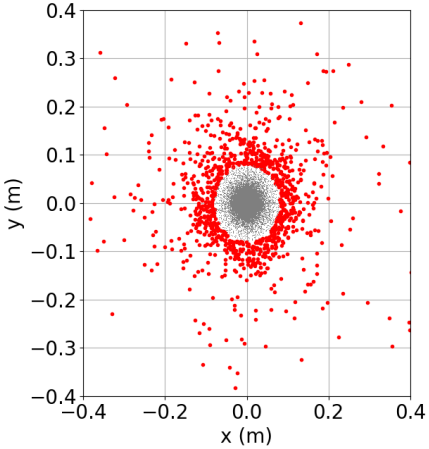
LASER 2 σ BELOW RESONANCE

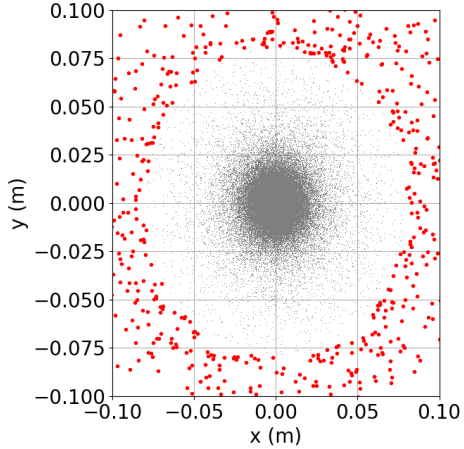
Flat screen perpendicular to z axis (of propagation) @ 0.6000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 9120.0
Real photons 0.13 m < radius < 0.14 m: 460.0
Total energy photons at radius > 0.0795 (in red): 0.7882211733914979 MeV
Real photons 0.13 m < radius < 0.14 m: 0.02802578320718845 MeV

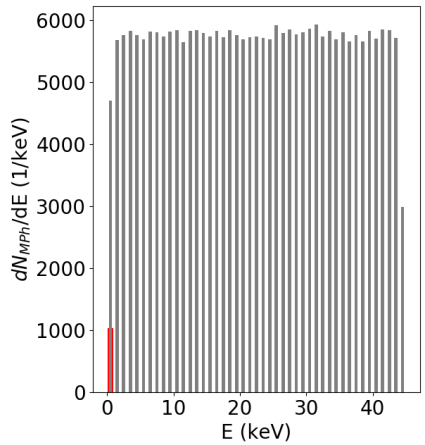


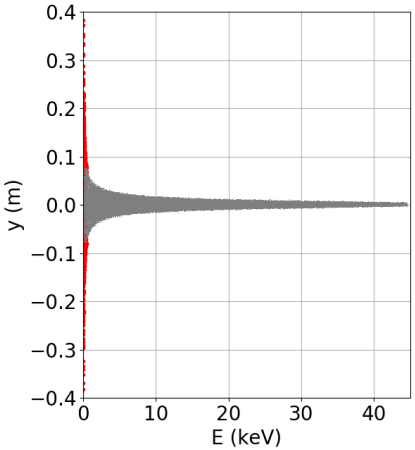
LASER 2 σ BELOW RESONANCE

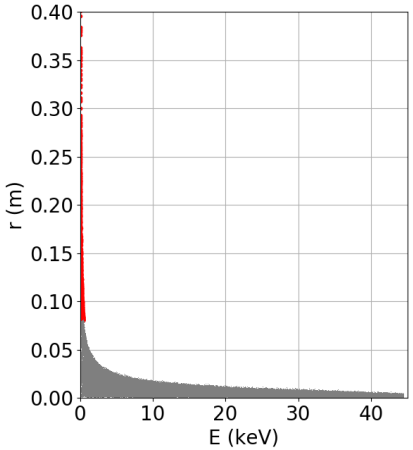
Flat screen perpendicular to z axis (of propagation) @ 0.8 m from IP
Real photons at radius > 0.0795 m (in red): 20540.0
Real photons 0.13 m < radius < 0.14 m: 940.0
Total energy photons at radius > 0.0795 (in red): 2.9515396243735132 MeV
Real photons 0.13 m < radius < 0.14 m: 0.10260858924469583 MeV

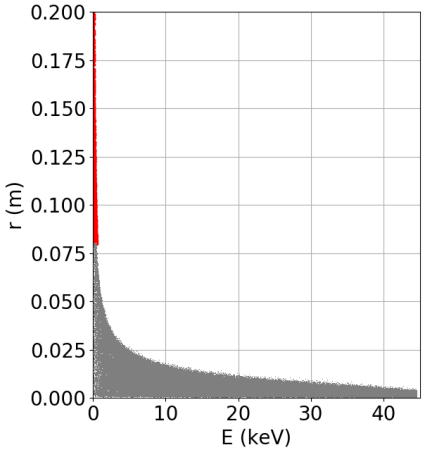






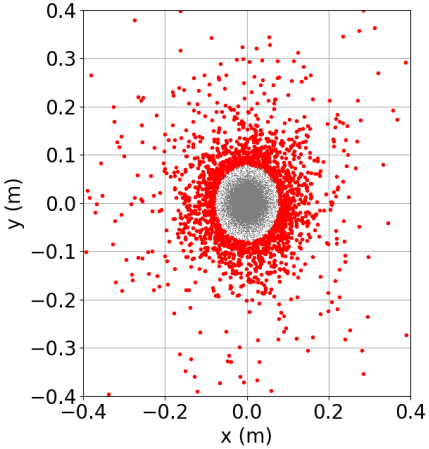


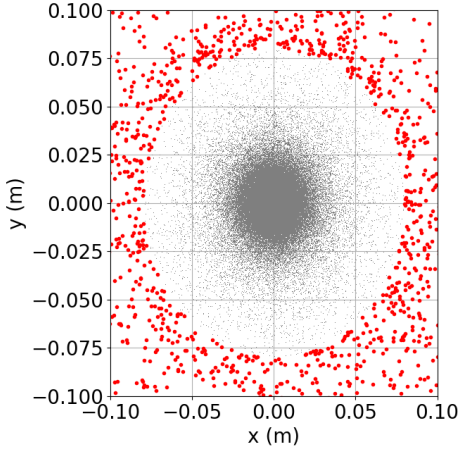


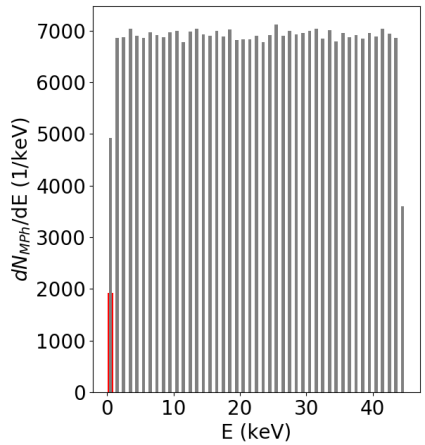


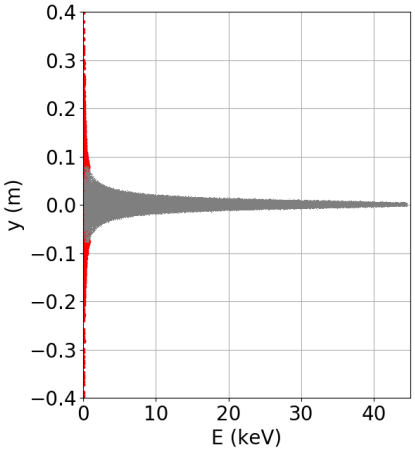
LASER 2 σ BELOW RESONANCE

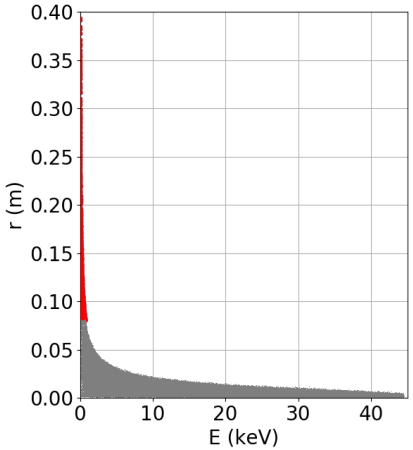
Flat screen perpendicular to z axis (of propagation) @ 1.0 m from IP
Real photons at radius > 0.0795 m (in red): 38340.0
Real photons 0.13 m < radius < 0.14 m: 1840.0
Total energy photons at radius > 0.0795 (in red): 8.828809359632407 MeV
Real photons 0.13 m < radius < 0.14 m: 0.3069129984266657 MeV

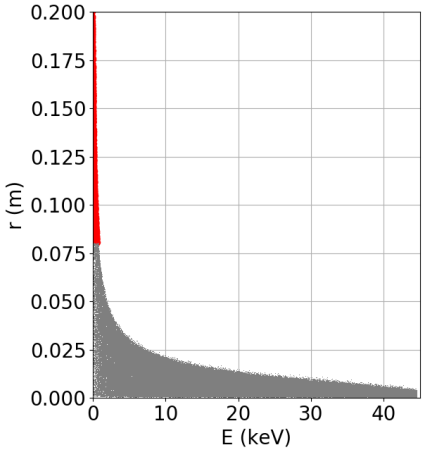






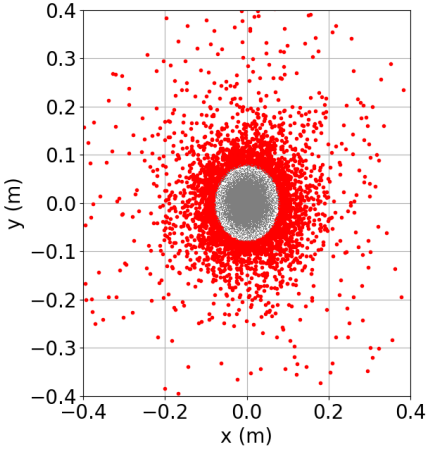


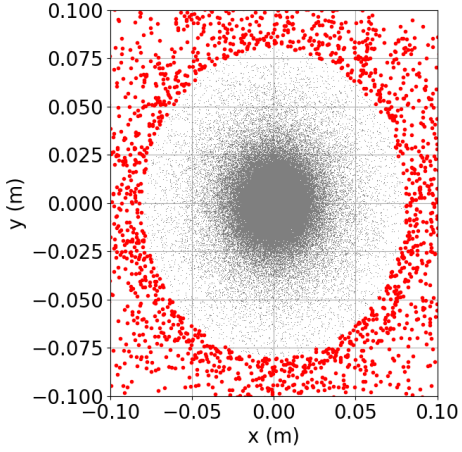


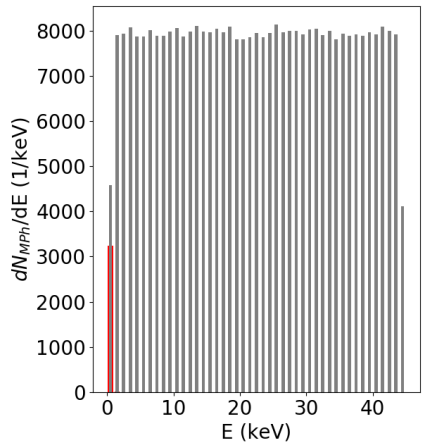


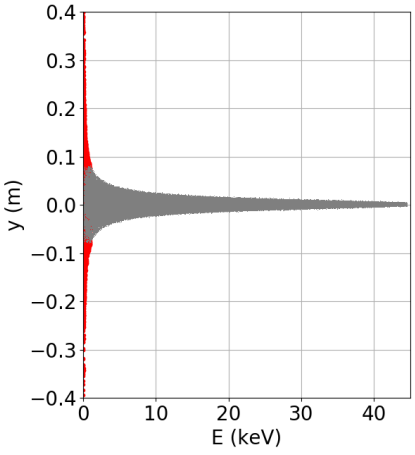
LASER 2 σ BELOW RESONANCE

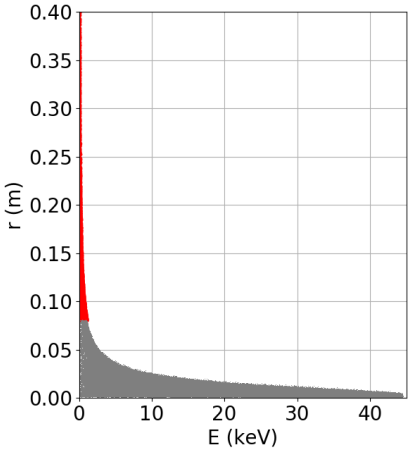
Flat screen perpendicular to z axis (of propagation) @ 1.2000000000000002 m from IP
Real photons at radius > 0.0795 m (in red): 64860.0
Real photons 0.13 m < radius < 0.14 m: 3400.0
Total energy photons at radius > 0.0795 (in red): 21.35066246857667 MeV
Real photons 0.13 m < radius < 0.14 m: 0.7442226887119099 MeV

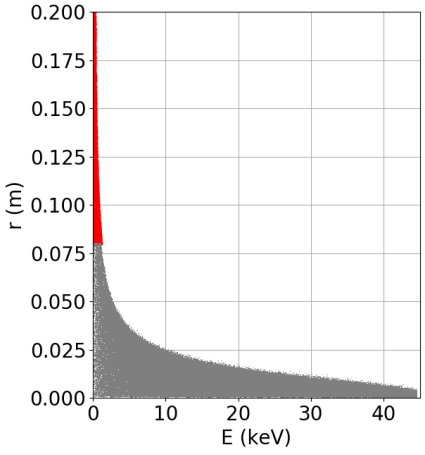






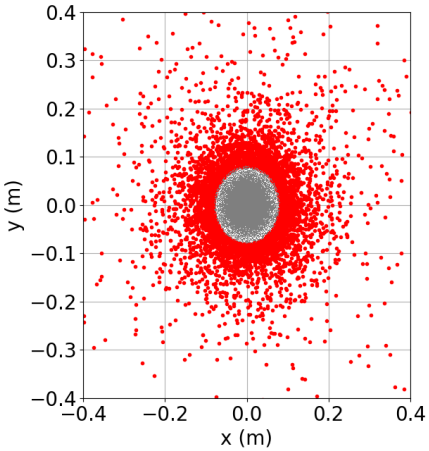


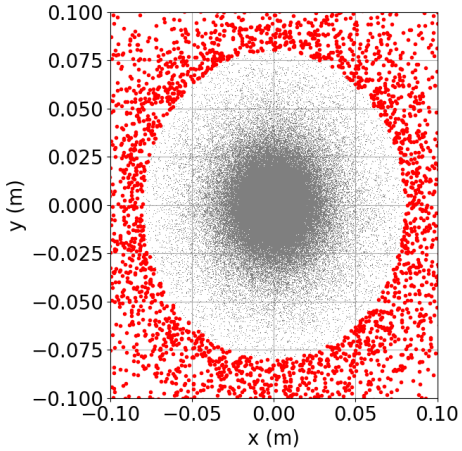


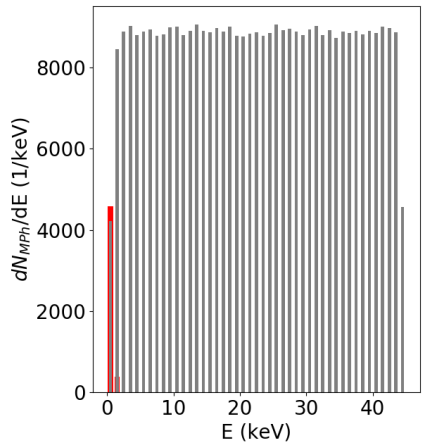


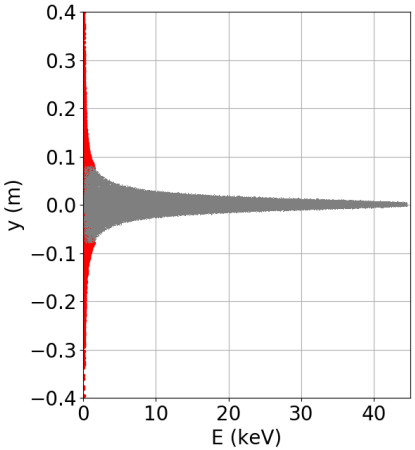
LASER 2 σ BELOW RESONANCE

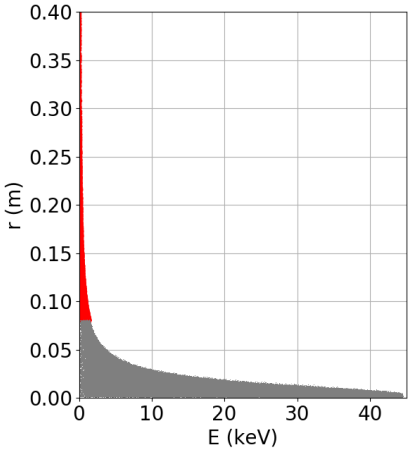
Flat screen perpendicular to z axis (of propagation) @ 1.4000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 99360.0
Real photons 0.13 m < radius < 0.14 m: 5540.0
Total energy photons at radius > 0.0795 (in red): 44.91407643539817 MeV
Real photons 0.13 m < radius < 0.14 m: 1.8361400854071868 MeV

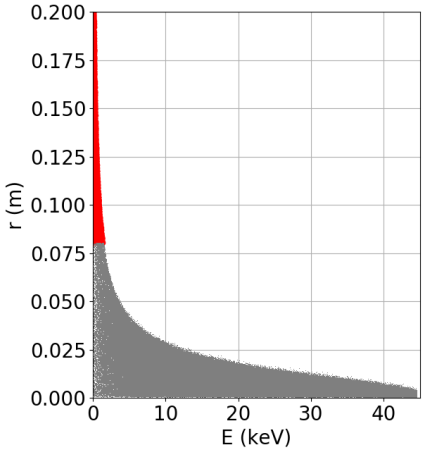






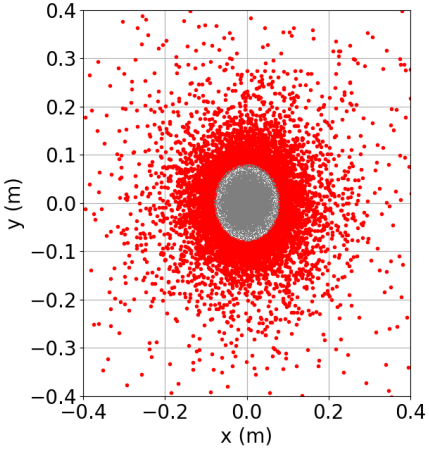


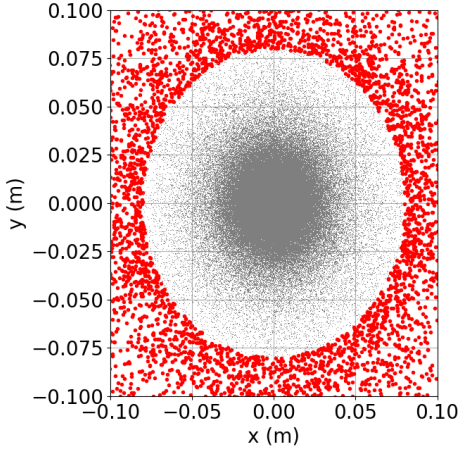


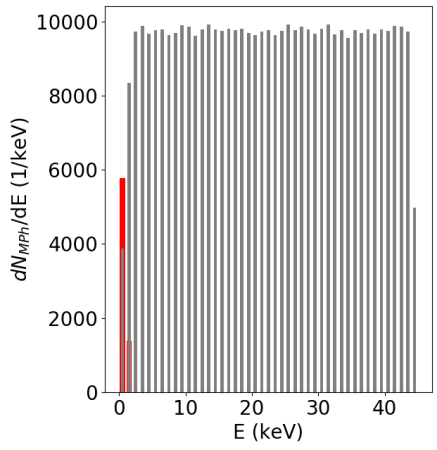


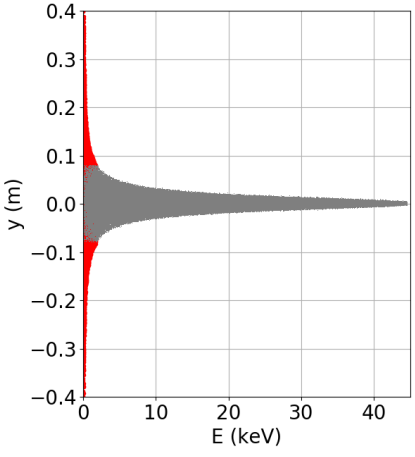
LASER 2 σ BELOW RESONANCE

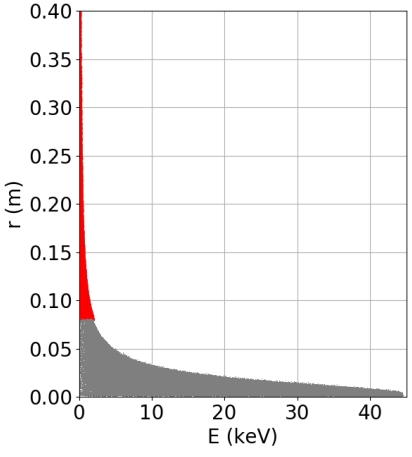
Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 143160.0
Real photons 0.13 m < radius < 0.14 m: 7900.0
Total energy photons at radius > 0.0795 (in red): 84.44894511198567 MeV
Real photons 0.13 m < radius < 0.14 m: 3.364563405568128 MeV

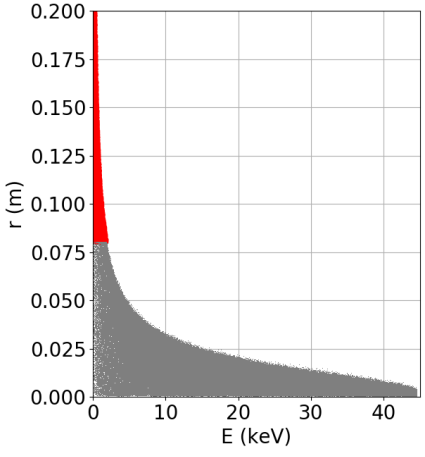






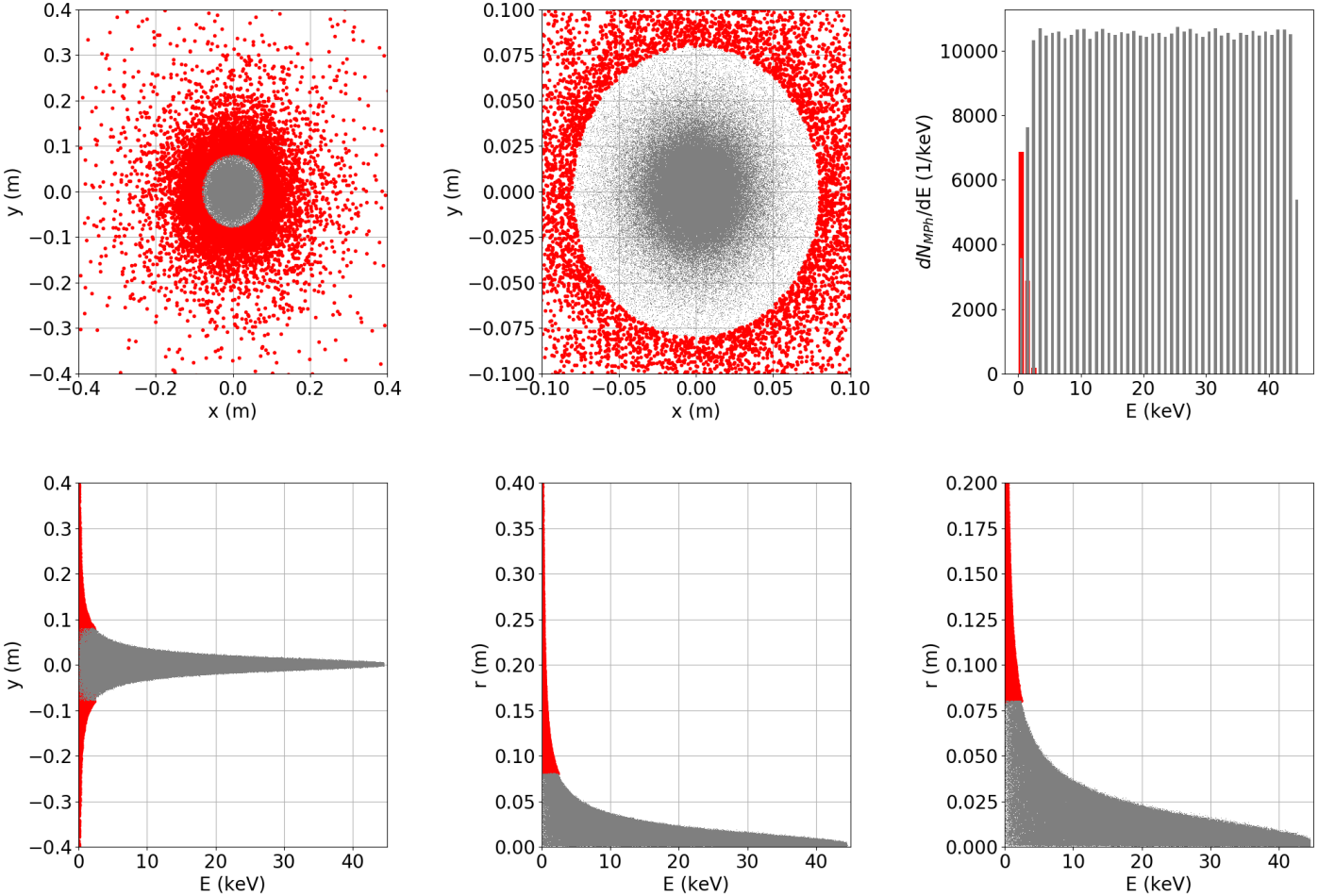






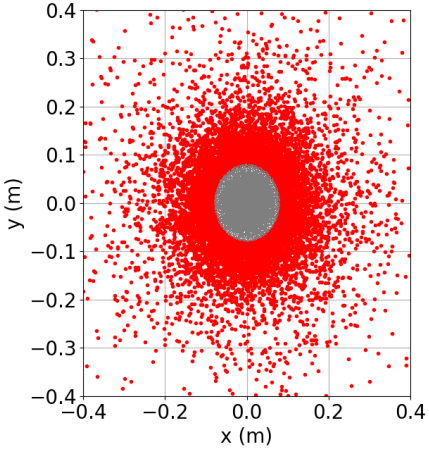
LASER 2 σ BELOW RESONANCE

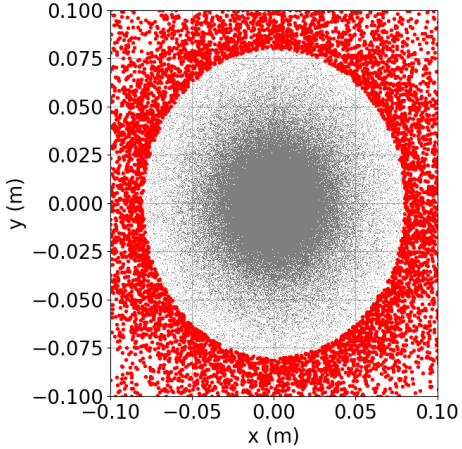
Flat screen perpendicular to z axis (of propagation) @ 1.8 m from IP
Real photons at radius > 0.0795 m (in red): 198140.0
Real photons 0.13 m < radius < 0.14 m: 10300.0
Total energy photons at radius > 0.0795 (in red): 148.22699087132307 MeV
Real photons 0.13 m < radius < 0.14 m: 5.699662077300006 MeV

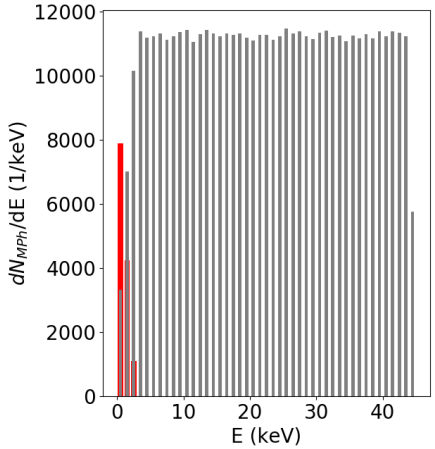


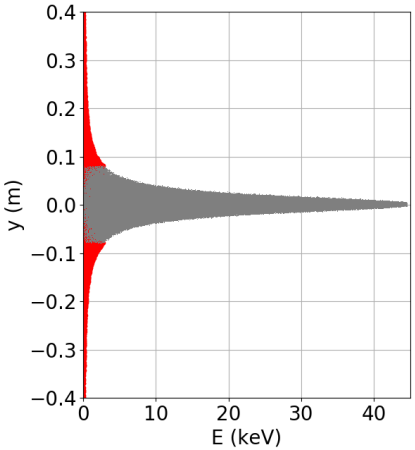
LASER 2 σ BELOW RESONANCE

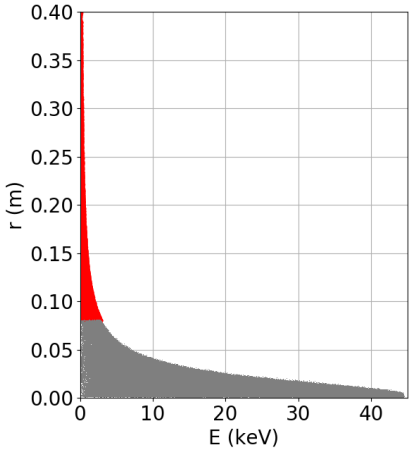
Flat screen perpendicular to z axis (of propagation) @ 2.0 m from IP
Real photons at radius > 0.0795 m (in red): 264380.0
Real photons 0.13 m < radius < 0.14 m: 14280.0
Total energy photons at radius > 0.0795 (in red): 243.07789423378566 MeV
Real photons 0.13 m < radius < 0.14 m: 9.492558094856397 MeV

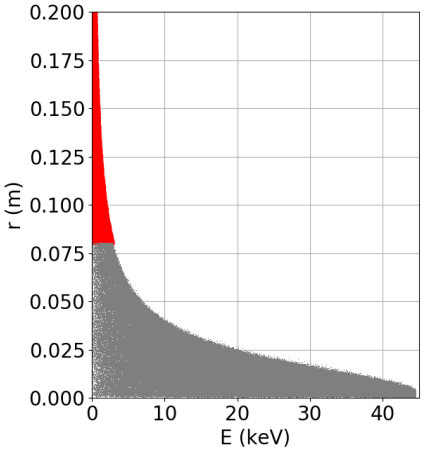




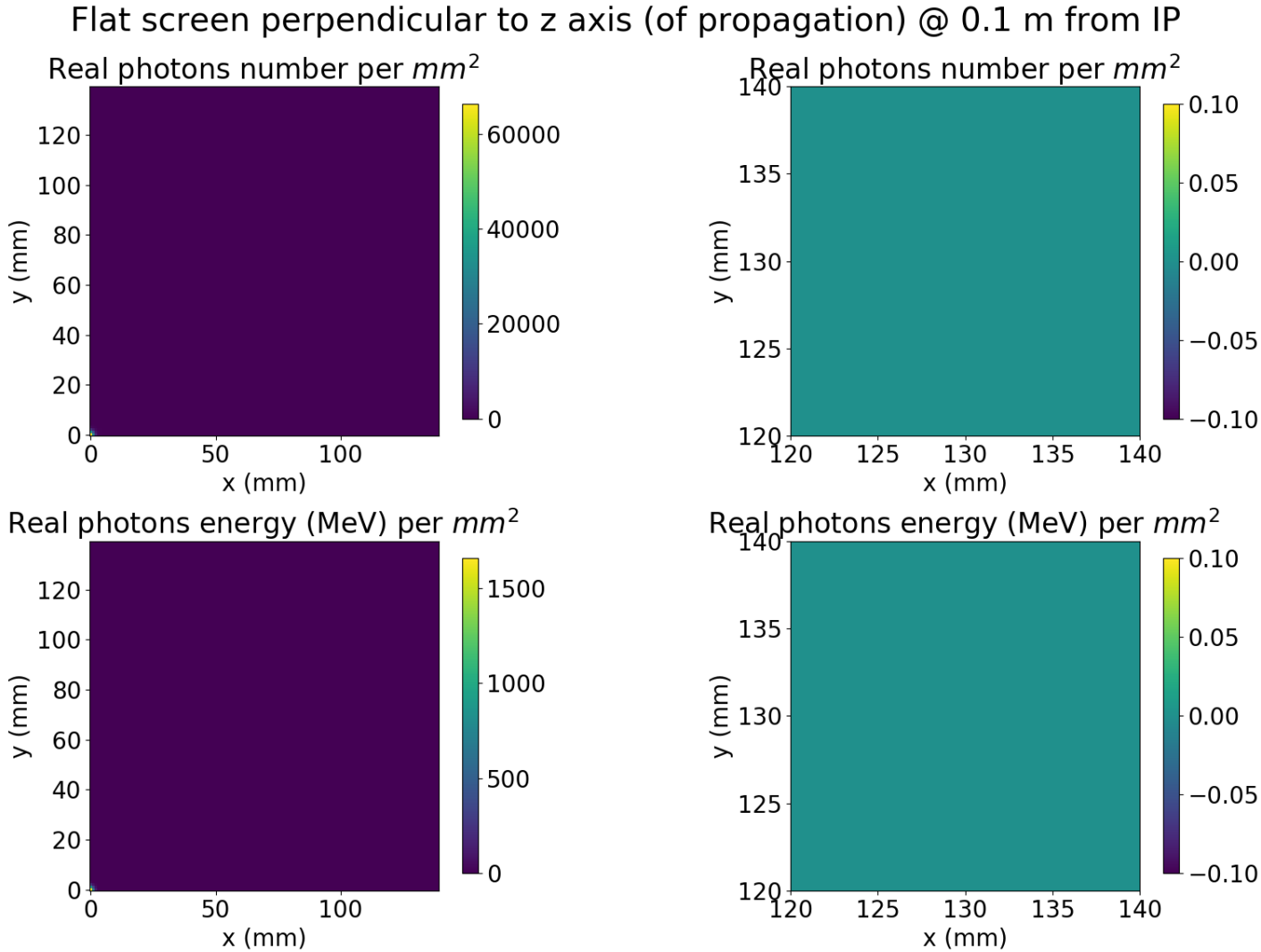






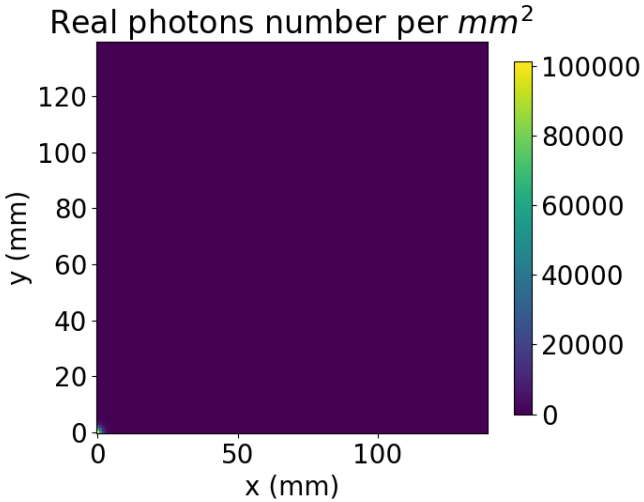


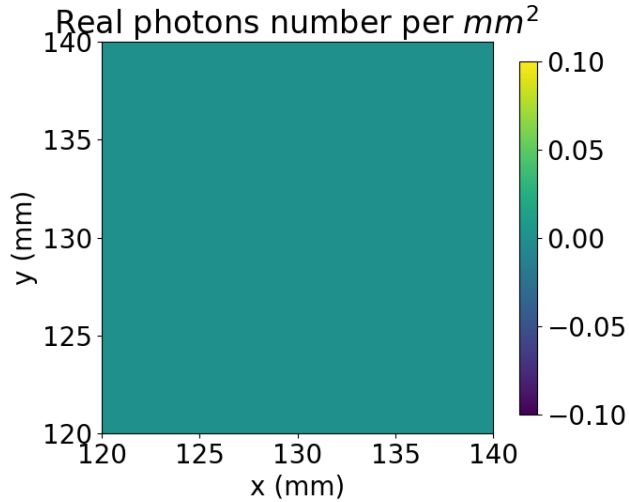
LASER 2 σ BELOW RESONANCE

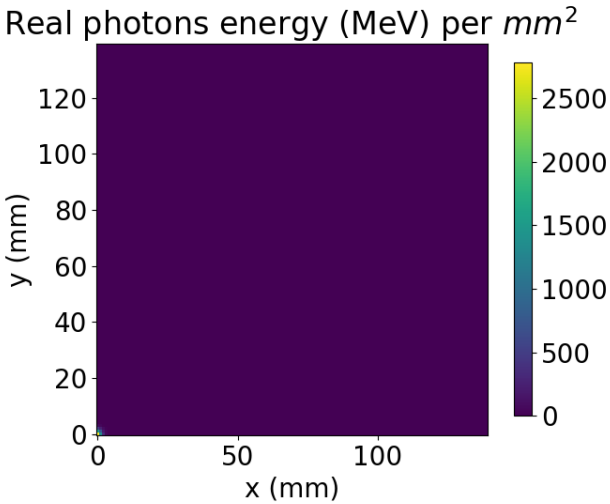


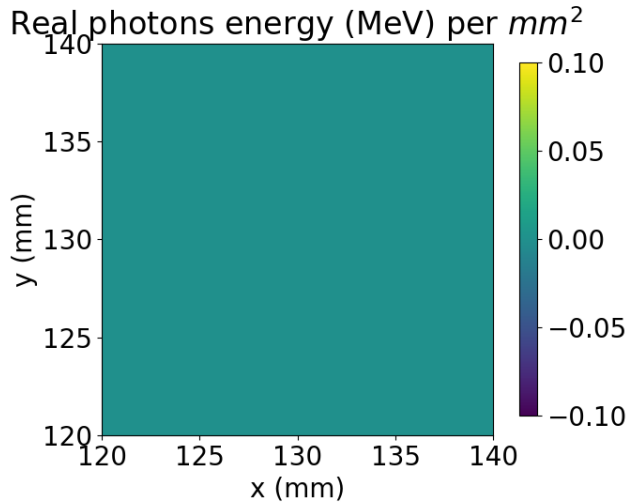
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.2 m from IP

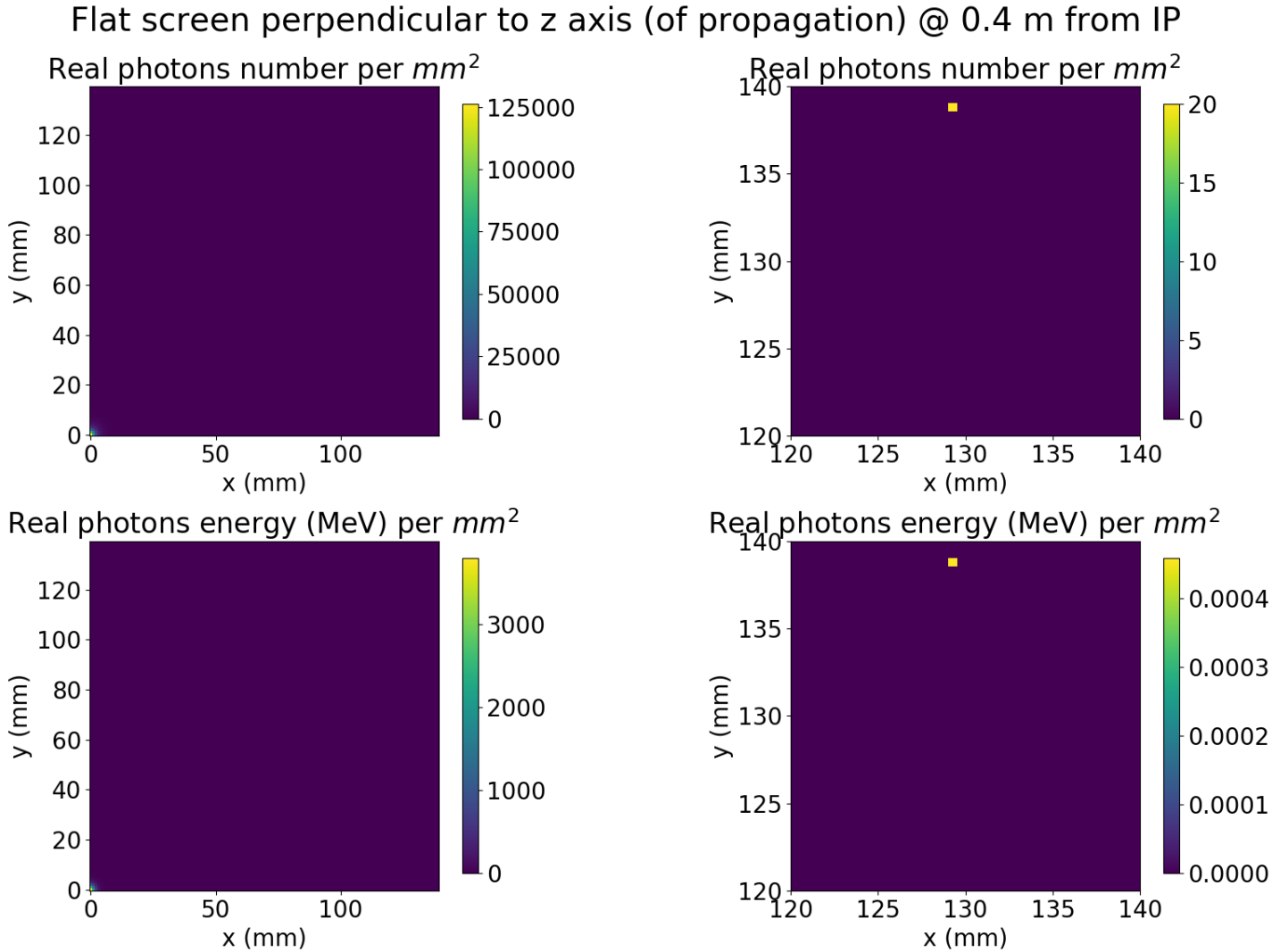






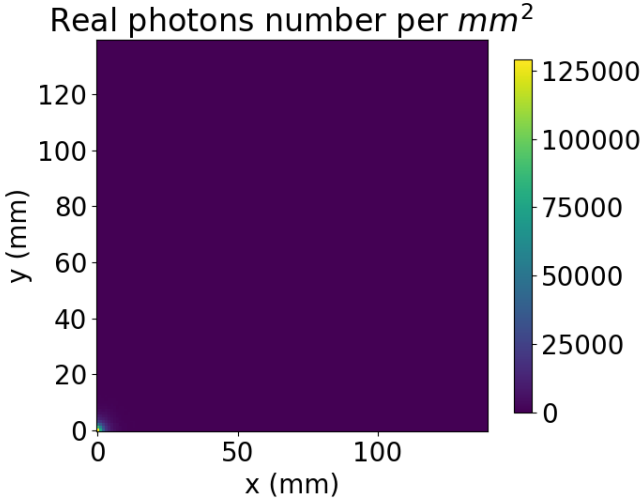


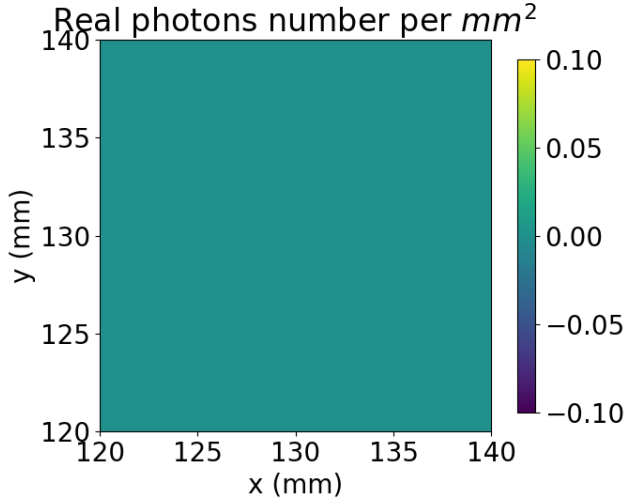
LASER 2 σ BELOW RESONANCE

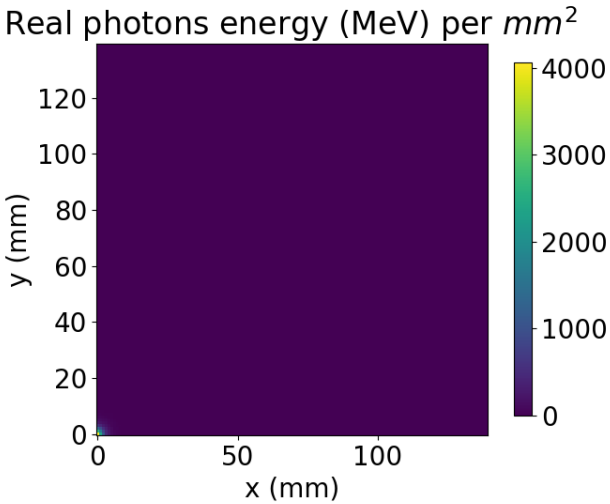


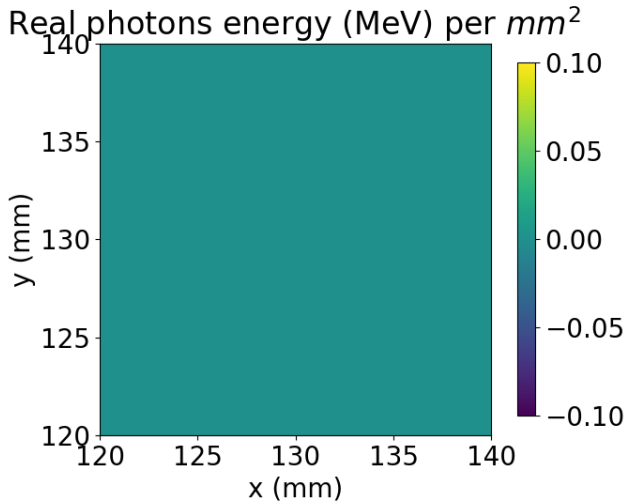
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.6000000000000001 m from IP

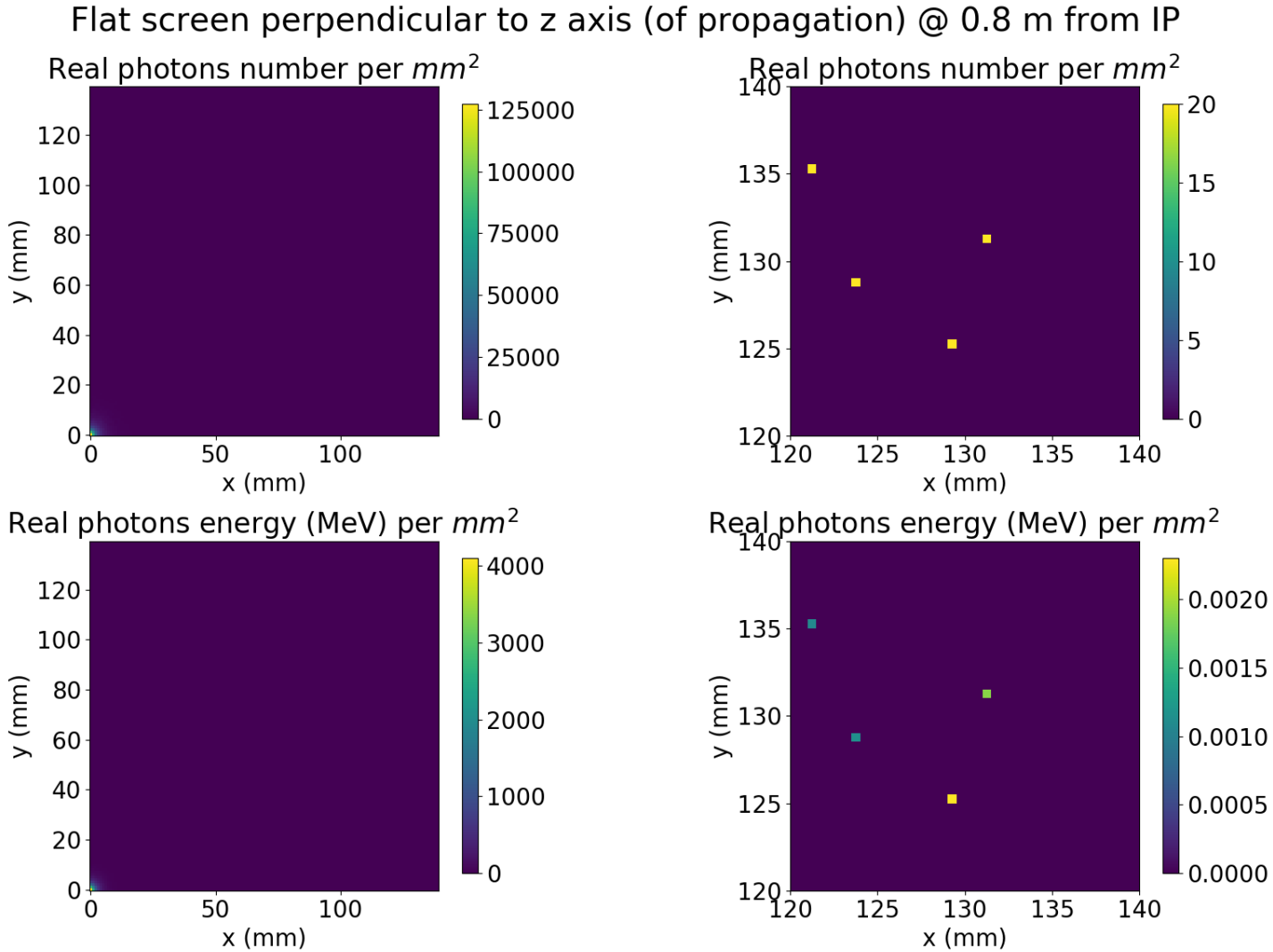




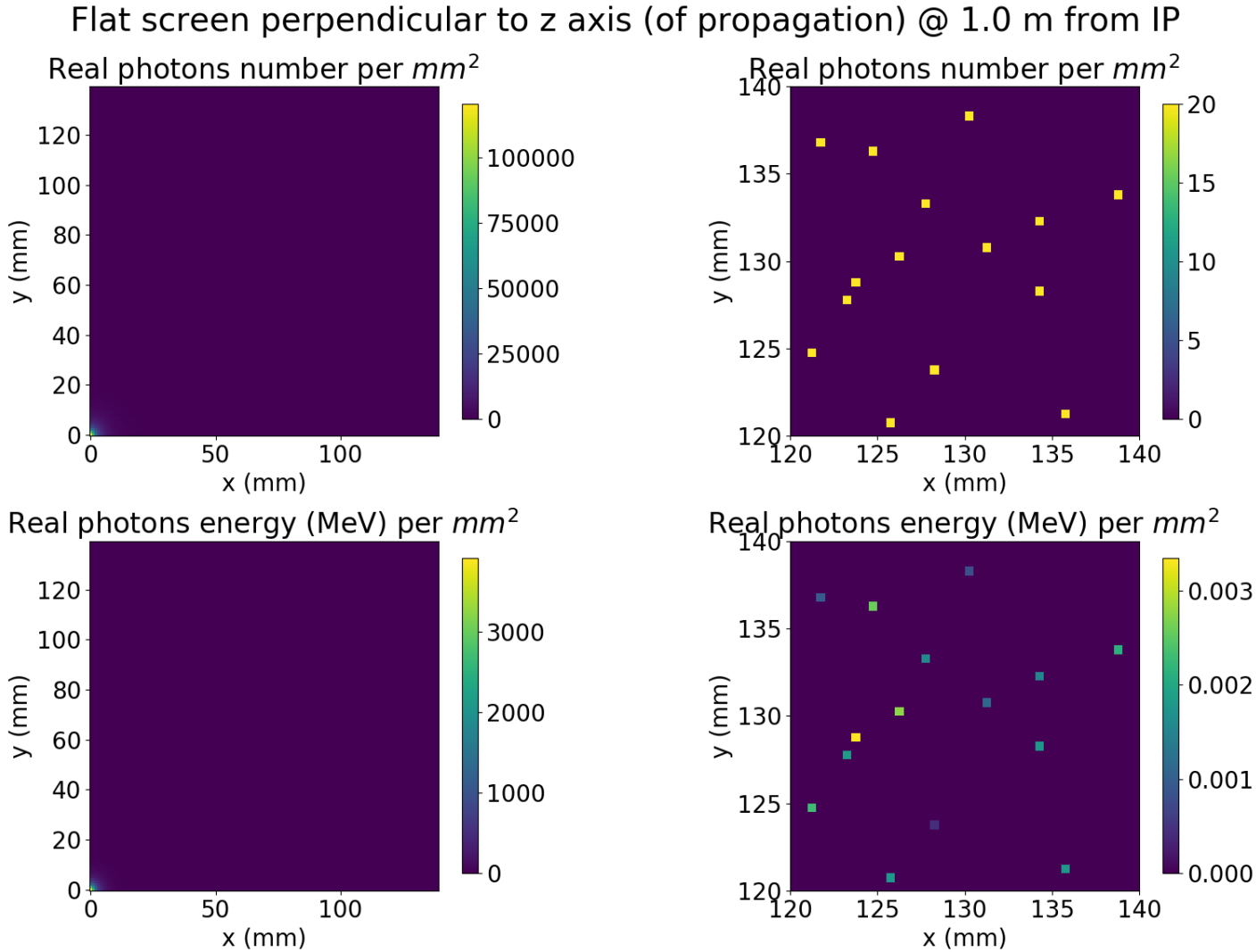




LASER 2 σ BELOW RESONANCE

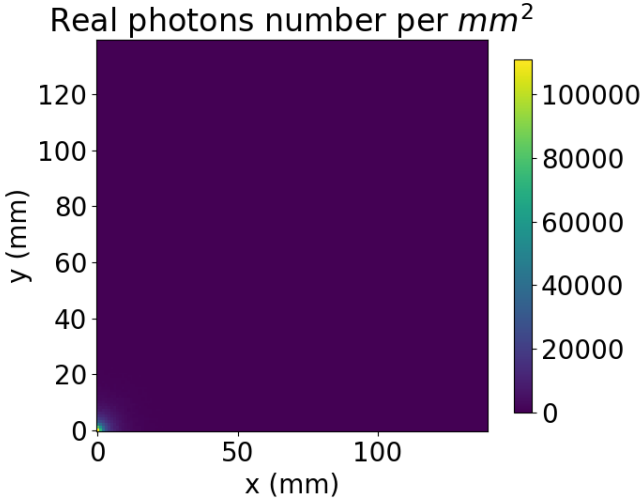


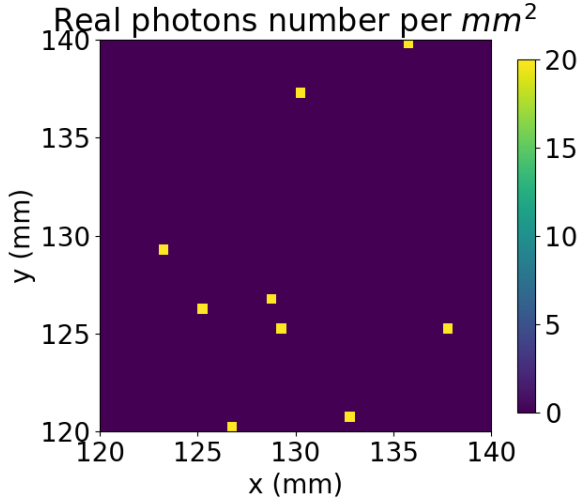
LASER 2 σ BELOW RESONANCE

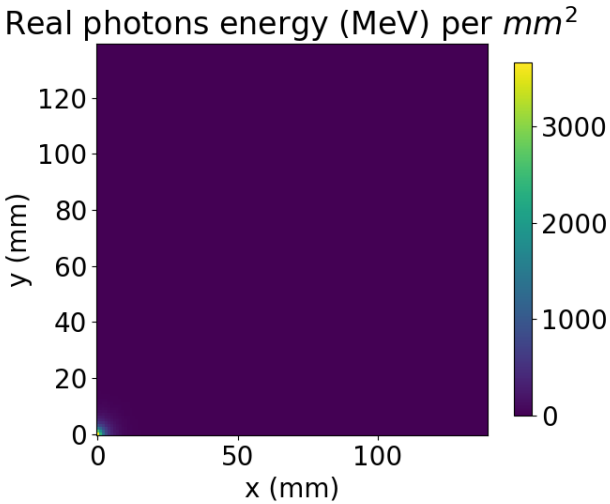


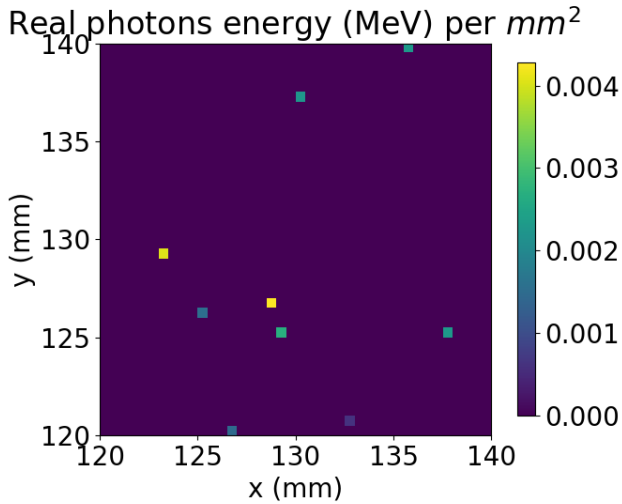
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.2000000000000002 m from IP



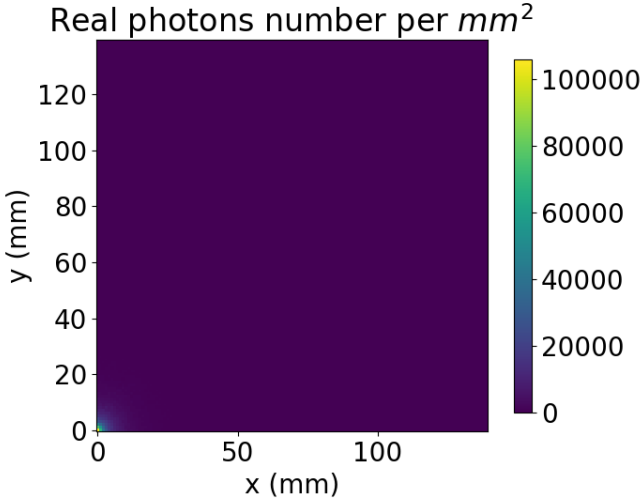


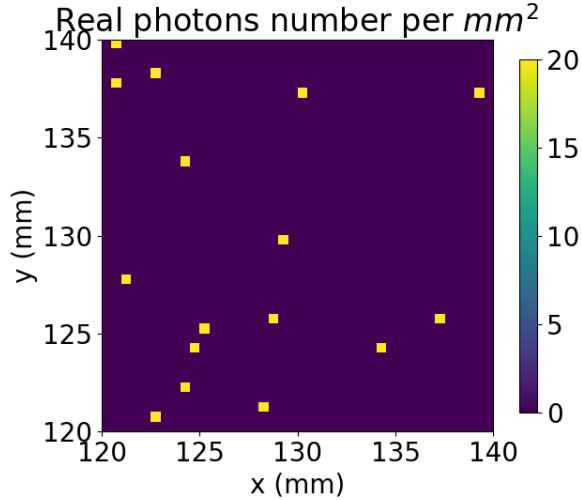


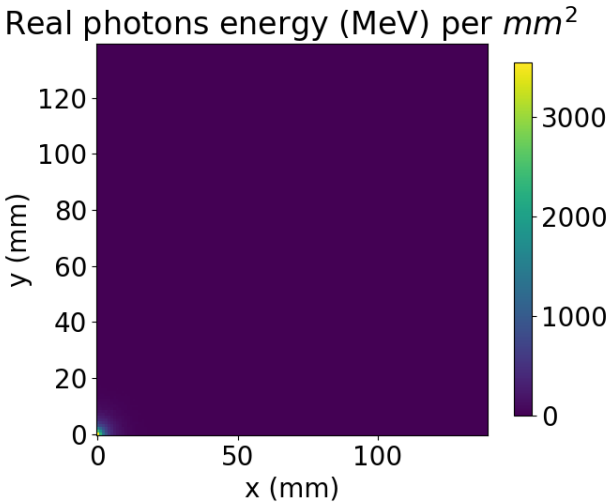


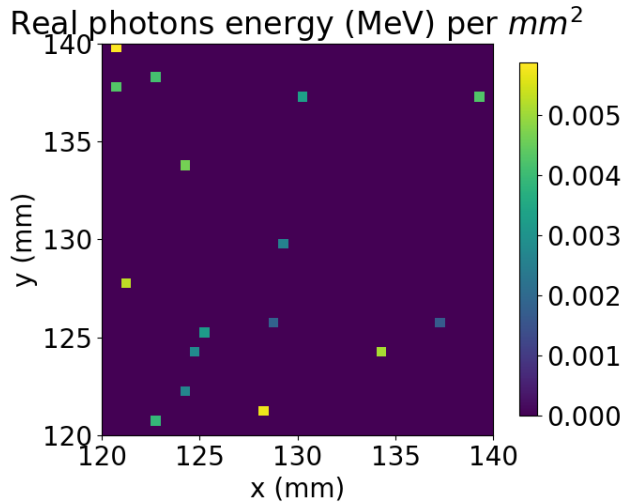
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.4000000000000001 m from IP



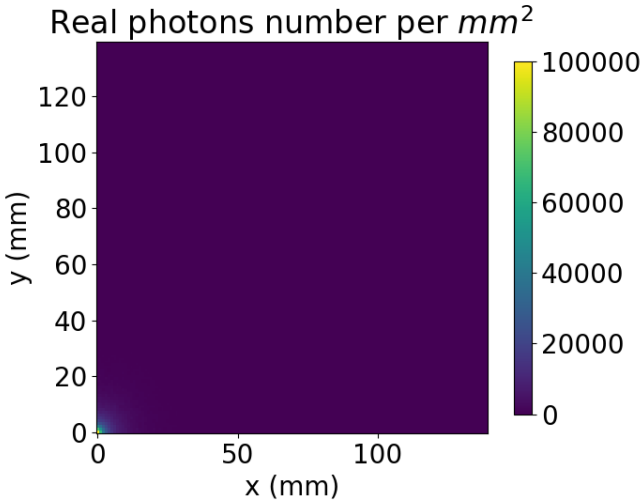


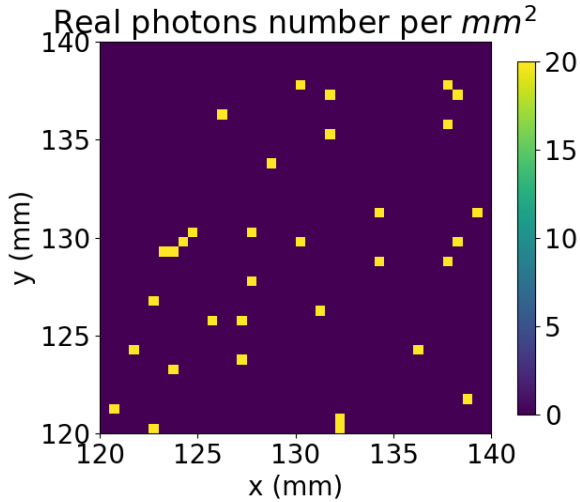


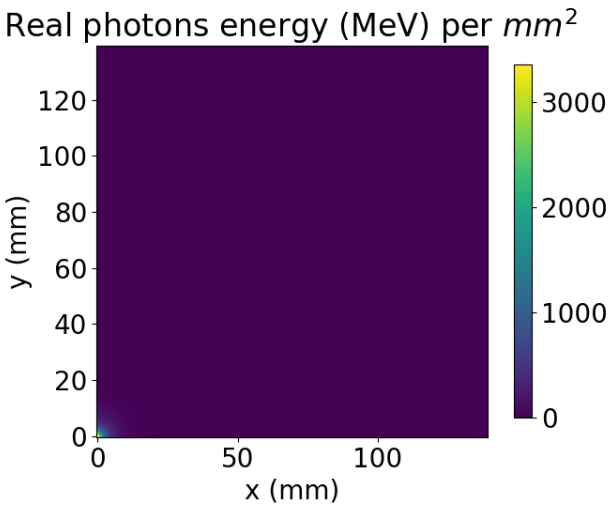


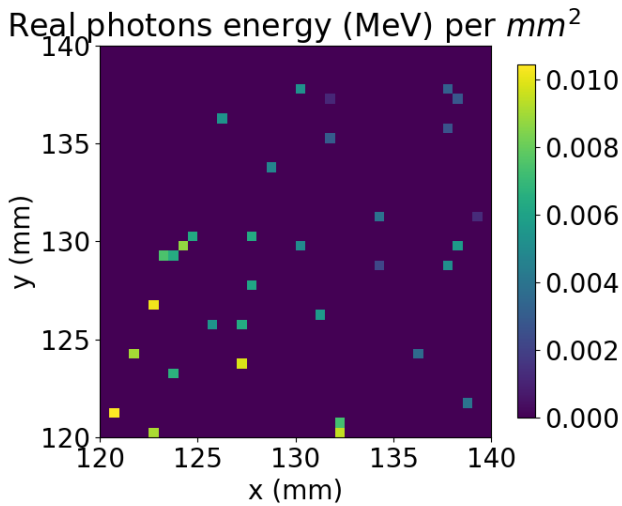
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP



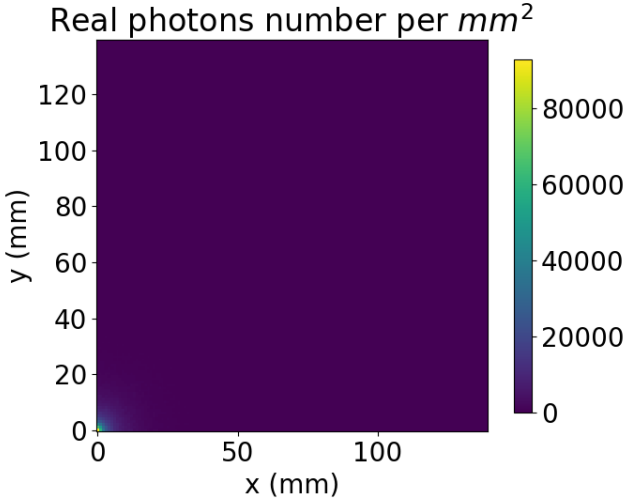


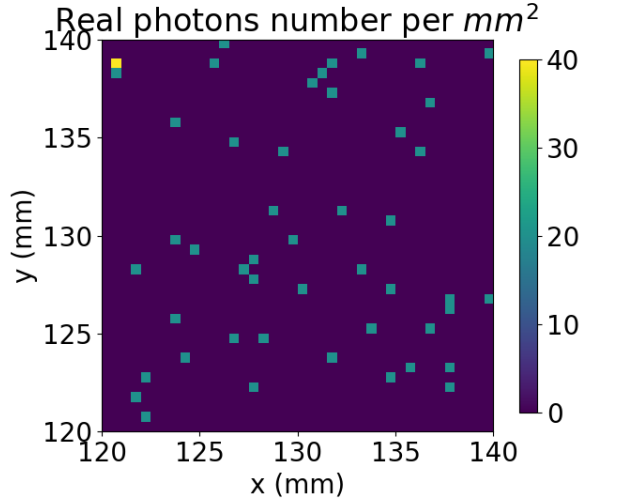


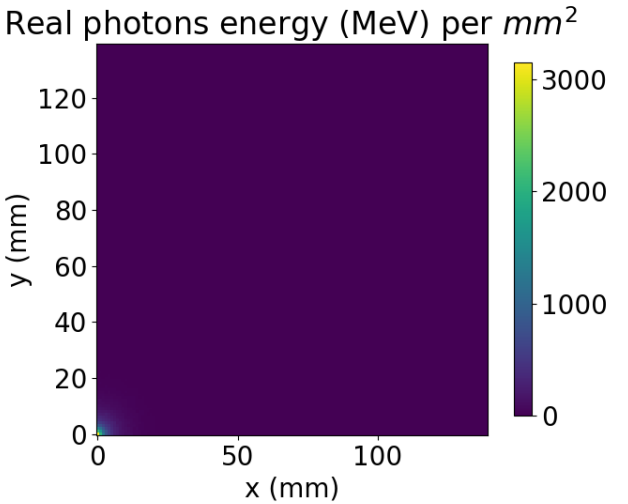


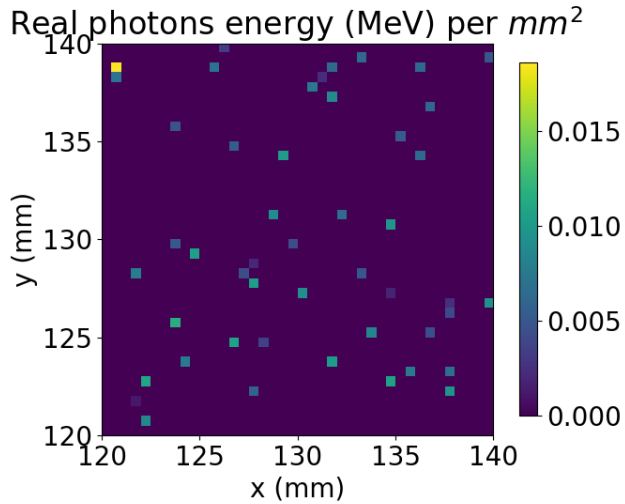
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.8 m from IP

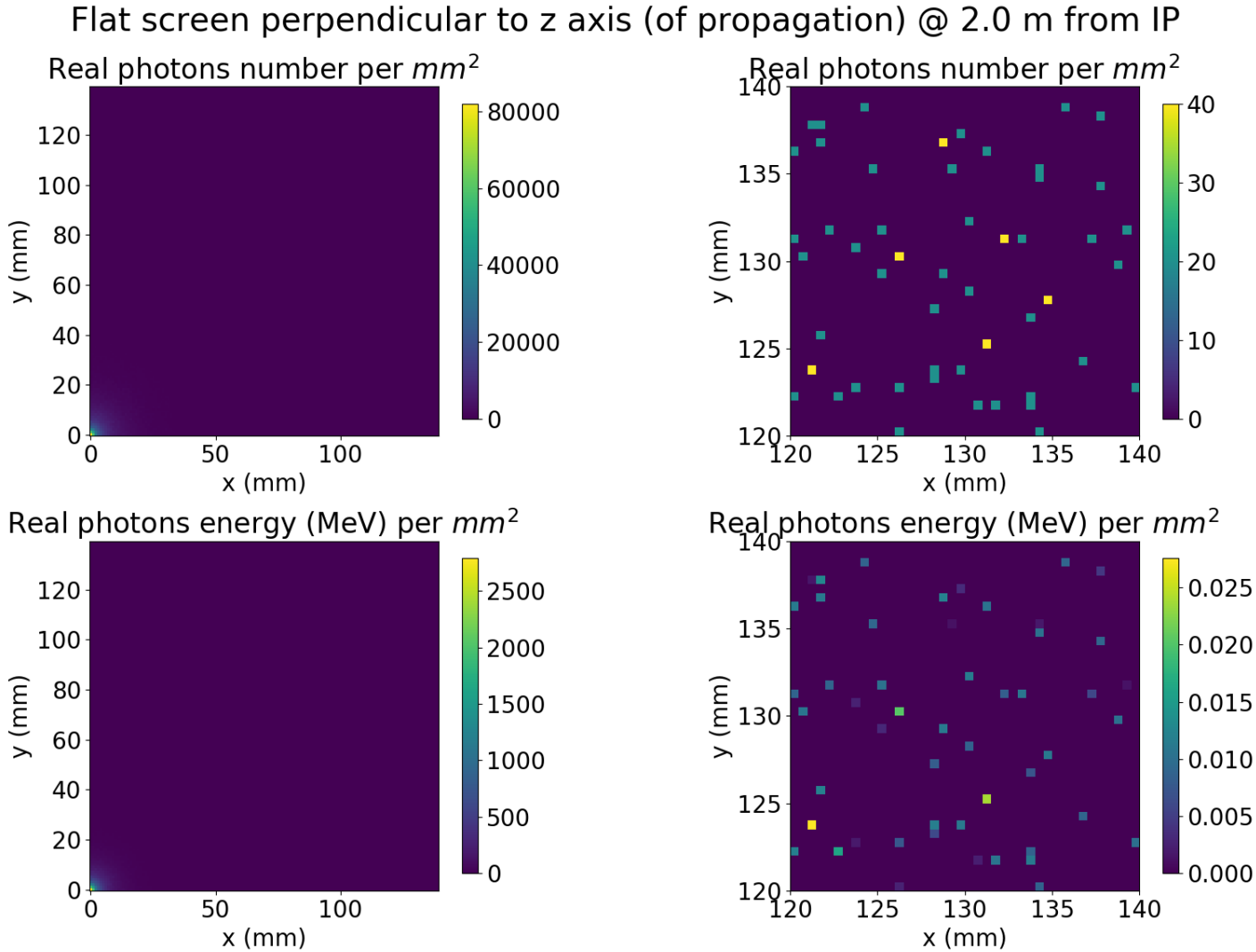






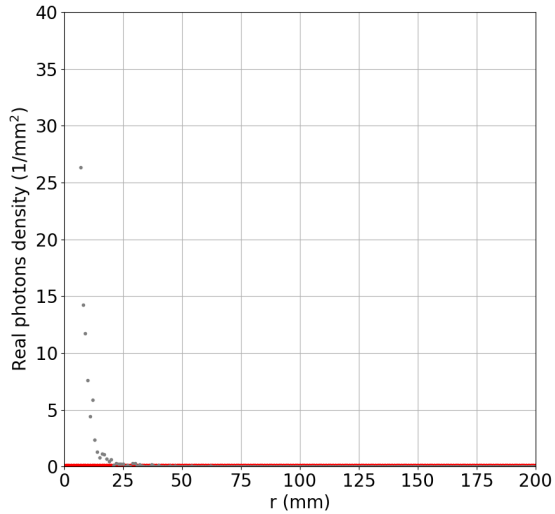


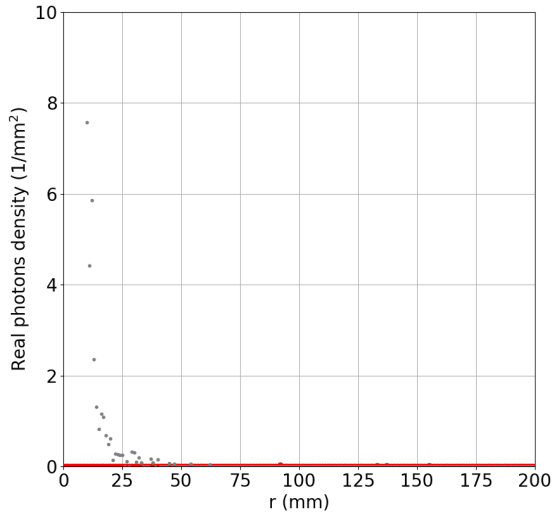
LASER 2 σ BELOW RESONANCE

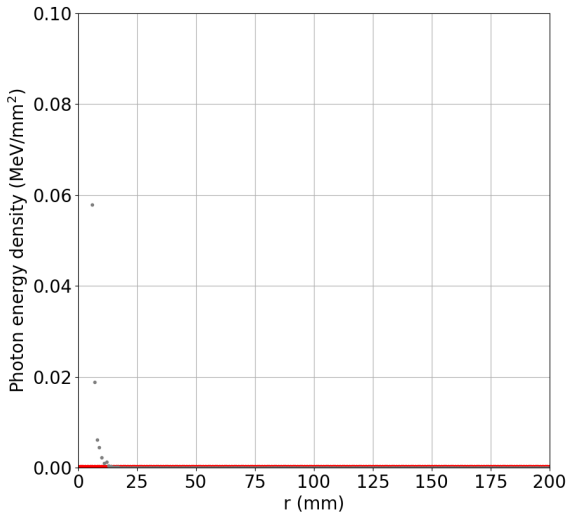


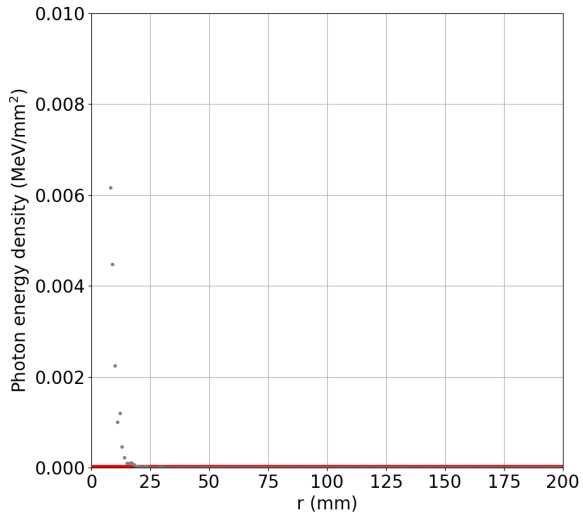
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.1 m from IP
Real photons at radius > 0.0795 m (in red): 100.0
Real photons 0.13 m < radius < 0.14 m: 40.0
Total energy photons at radius > 0.0795 (in red): 0.0004747228873985506 5 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0001989623030125919 2 MeV



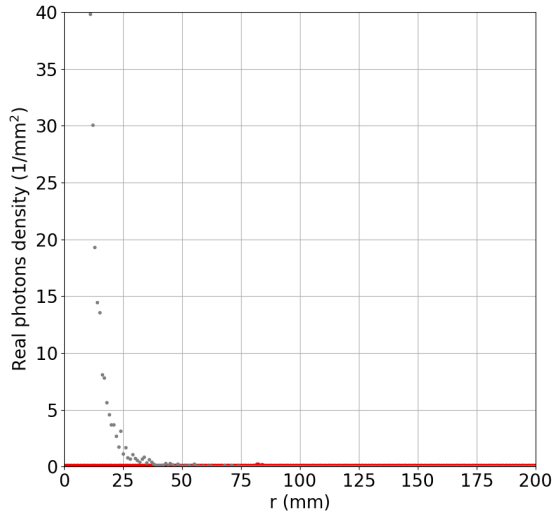


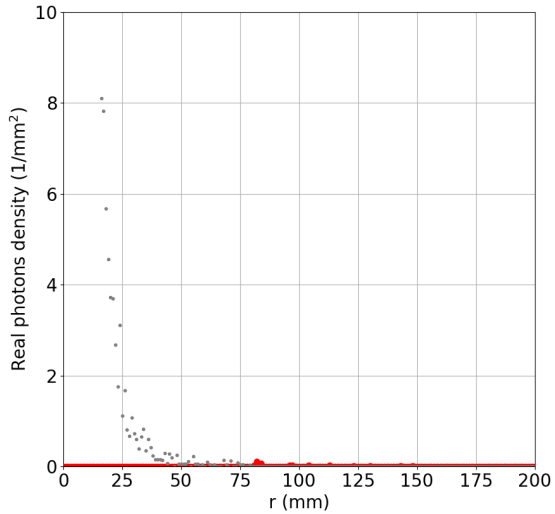


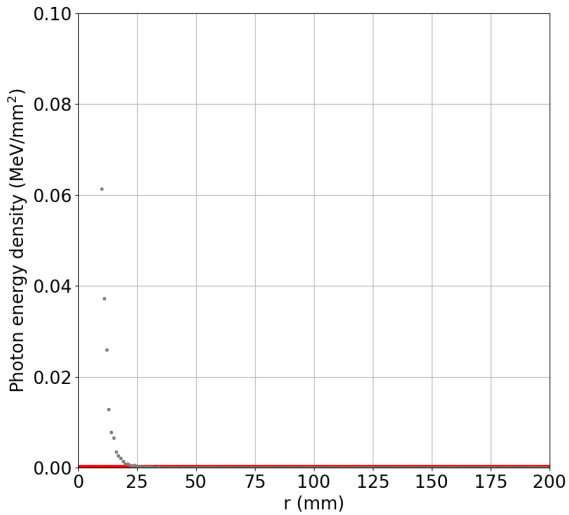


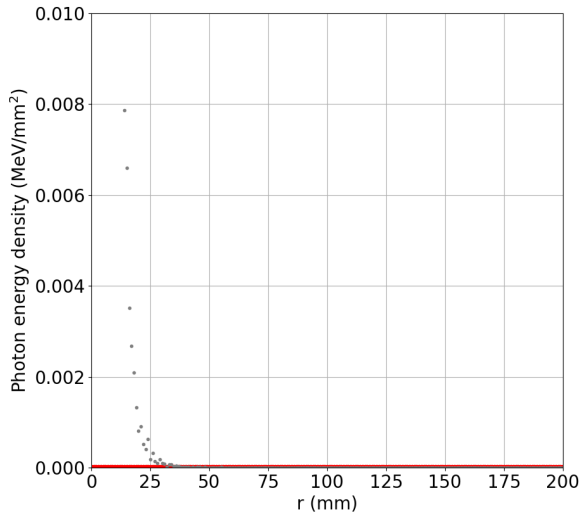
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.2 m from IP
Real photons at radius > 0.0795 m (in red): 400.0
Real photons 0.13 m < radius < 0.14 m: 20.0
Total energy photons at radius > 0.0795 (in red): 0.005426189823980404 MeV
Real photons 0.13 m < radius < 0.14 m: 8.99974462234375e-05 MeV



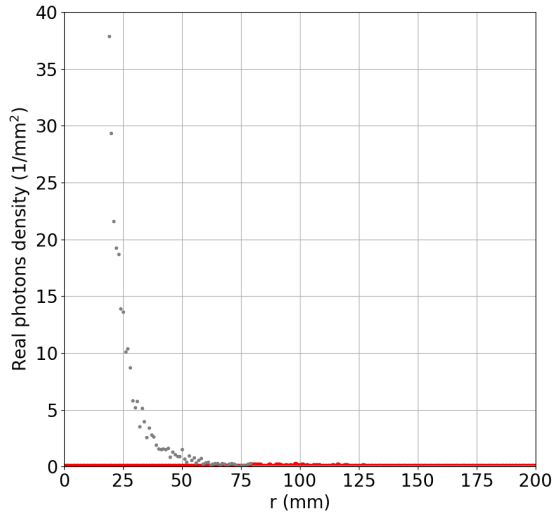


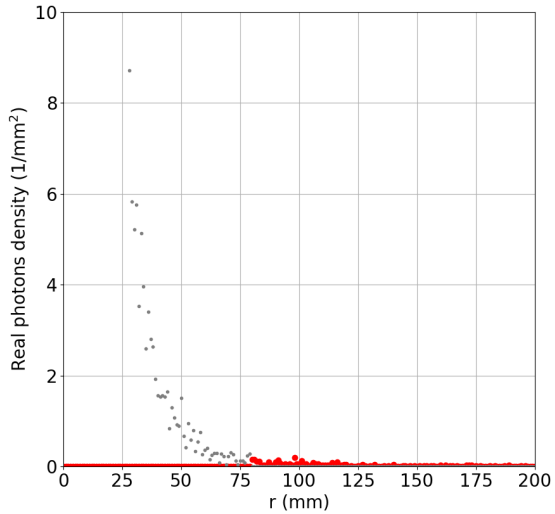


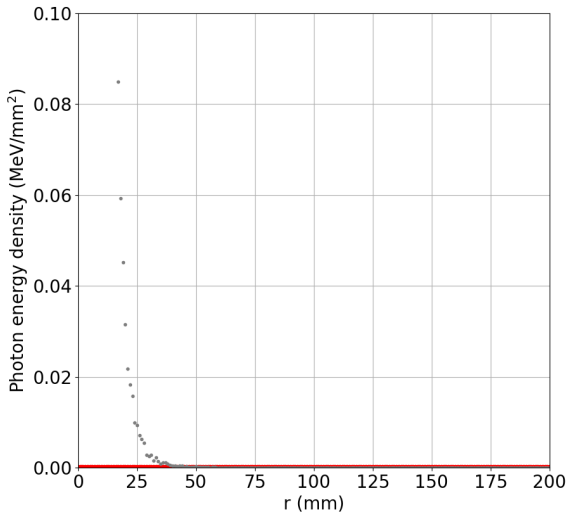


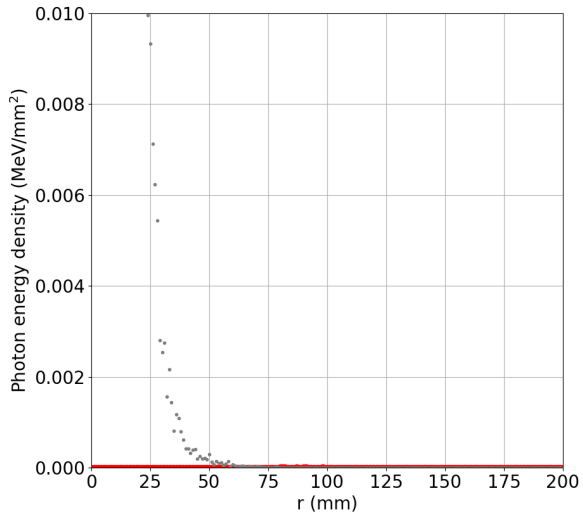
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.4 m from IP
Real photons at radius > 0.0795 m (in red): 3000.0
Real photons 0.13 m < radius < 0.14 m: 100.0
Total energy photons at radius > 0.0795 (in red): 0.1044432955091591 MeV
Real photons 0.13 m < radius < 0.14 m: 0.0030197209270645606 MeV



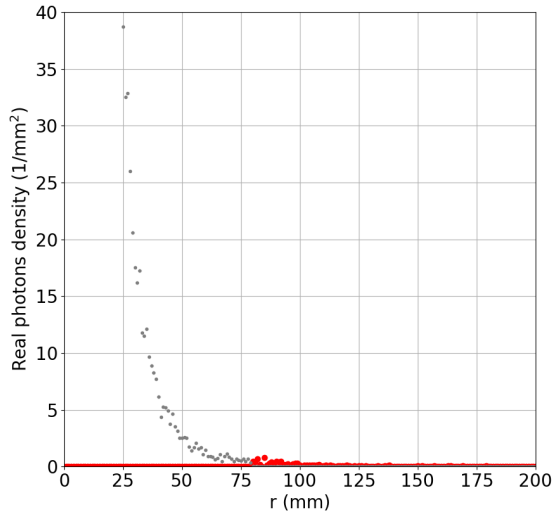


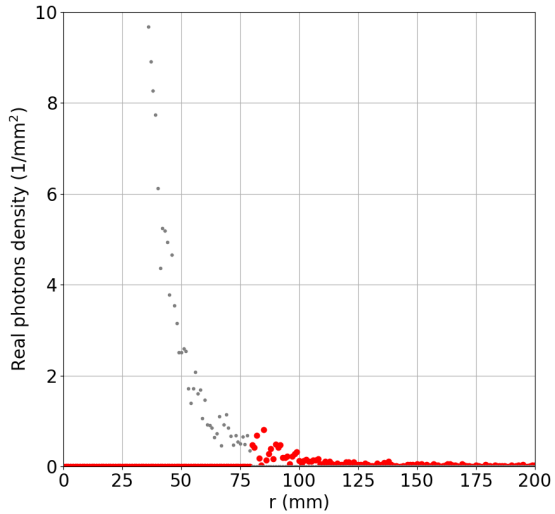


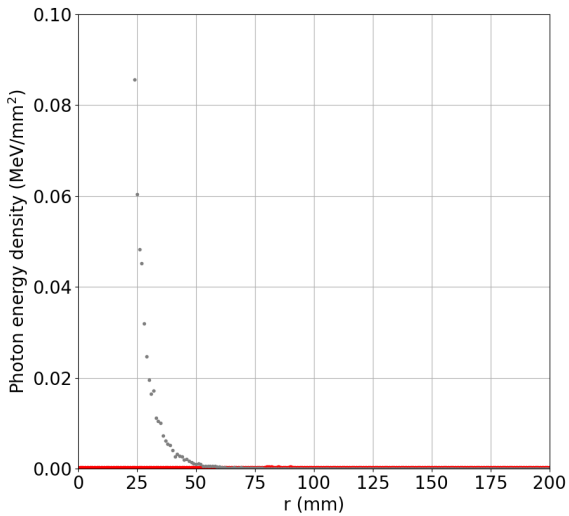


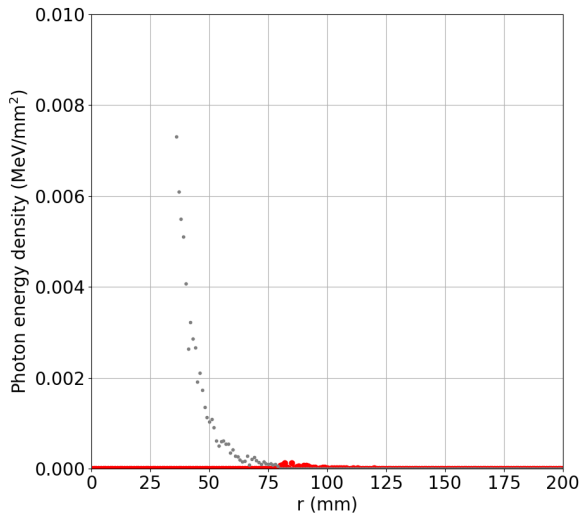
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.6000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 9120.0
Real photons 0.13 m < radius < 0.14 m: 460.0
Total energy photons at radius > 0.0795 (in red): 0.7882211733914979 MeV
Real photons 0.13 m < radius < 0.14 m: 0.02802578320718845 MeV



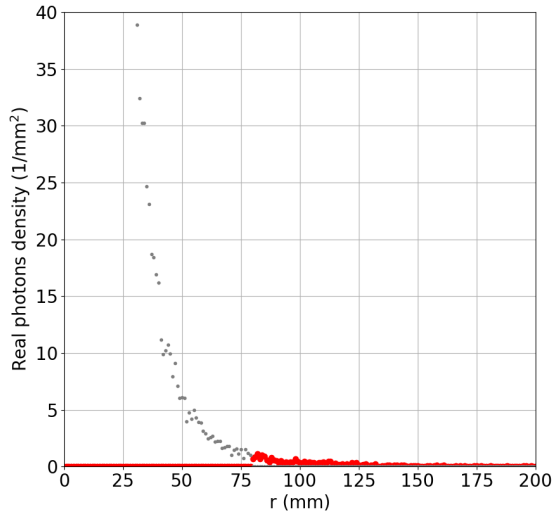


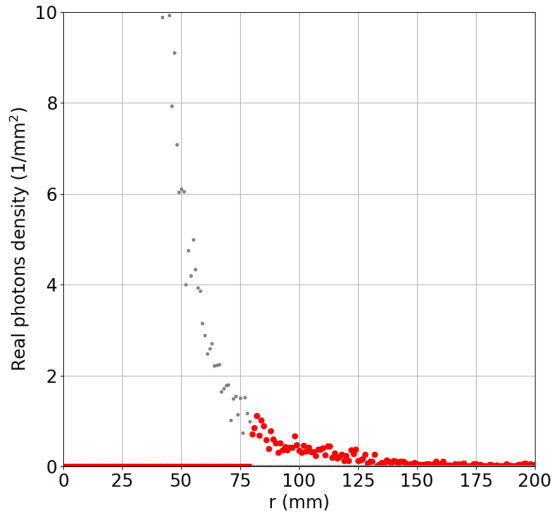


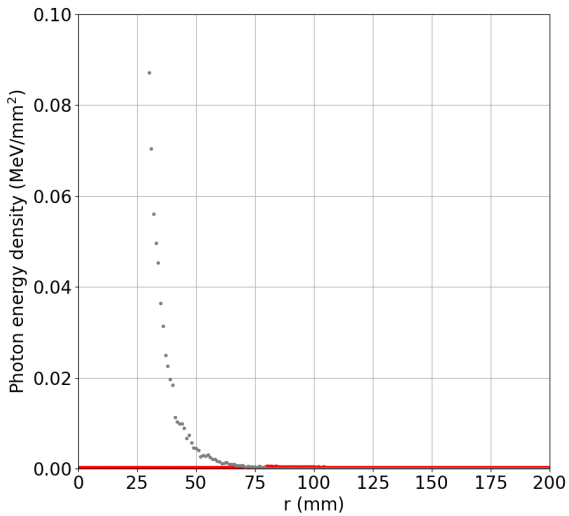


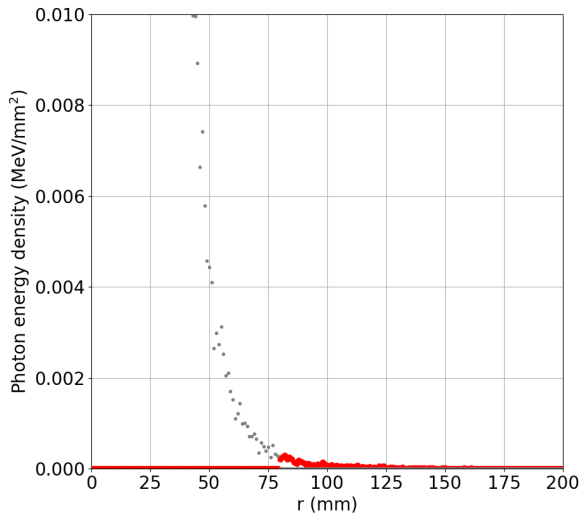
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 0.8 m from IP
Real photons at radius > 0.0795 m (in red): 20540.0
Real photons 0.13 m < radius < 0.14 m: 940.0
Total energy photons at radius > 0.0795 (in red): 2.9515396243735132 MeV
Real photons 0.13 m < radius < 0.14 m: 0.10260858924469583 MeV



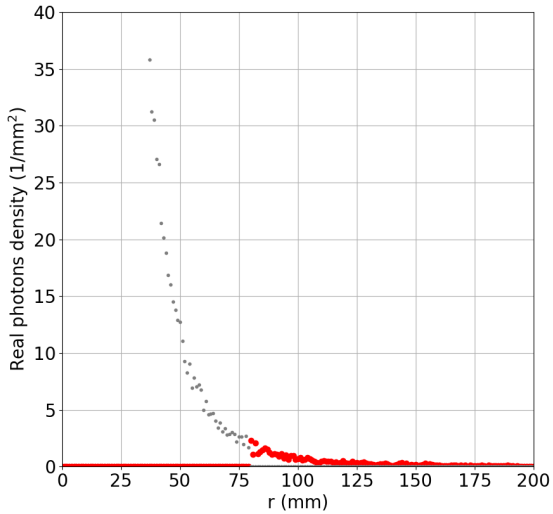


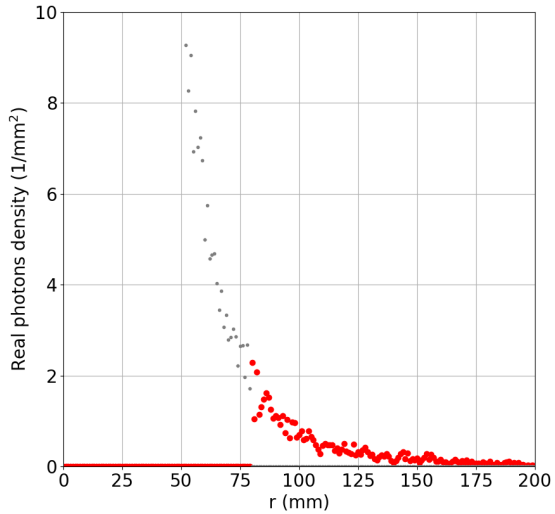


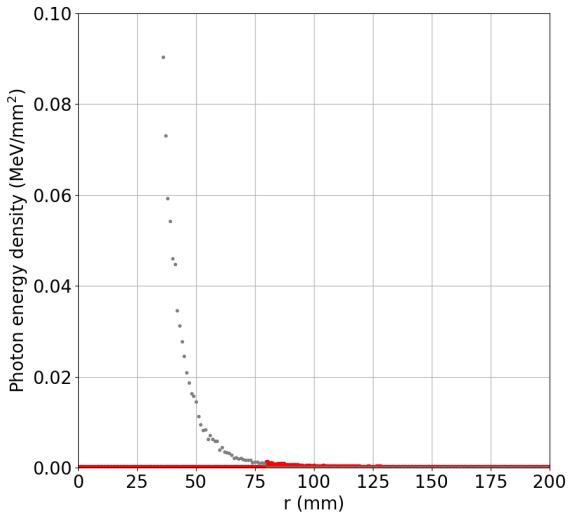


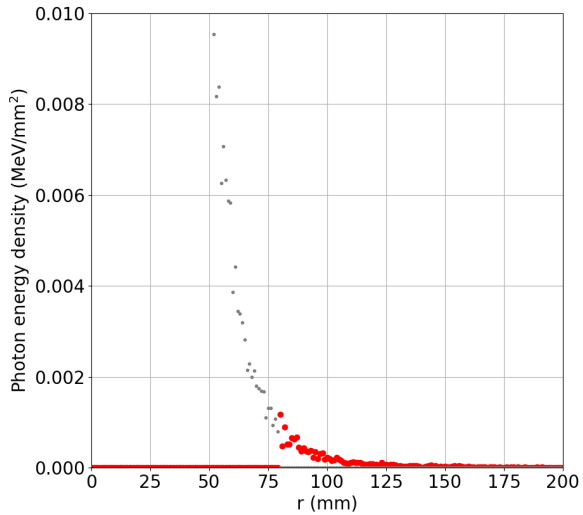
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.0 m from IP
Real photons at radius > 0.0795 m (in red): 38340.0
Real photons 0.13 m < radius < 0.14 m: 1840.0
Total energy photons at radius > 0.0795 (in red): 8.828809359632407 MeV
Real photons 0.13 m < radius < 0.14 m: 0.3069129984266657 MeV



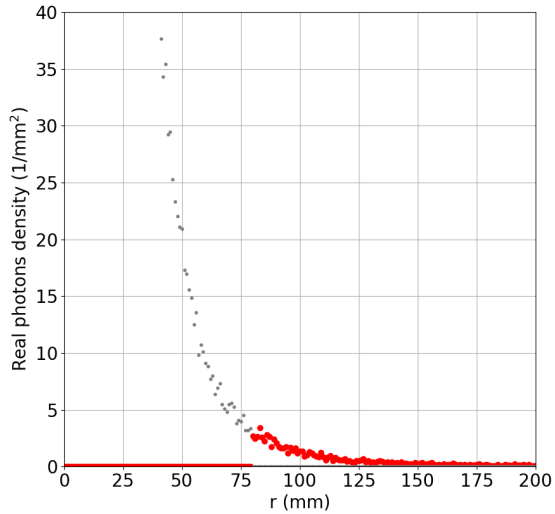


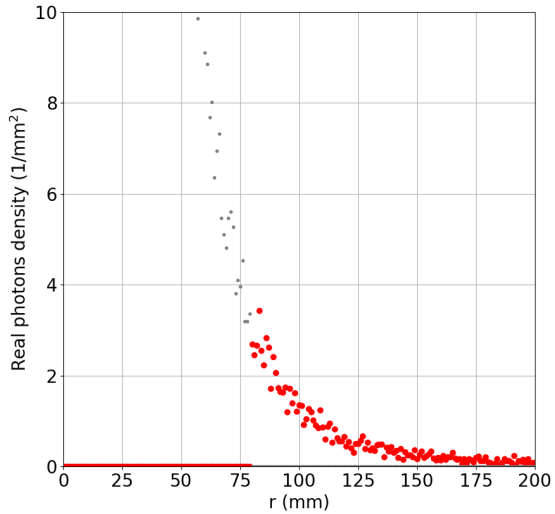


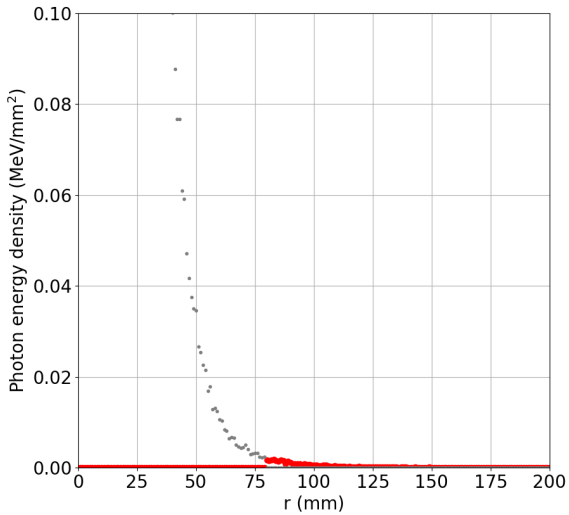


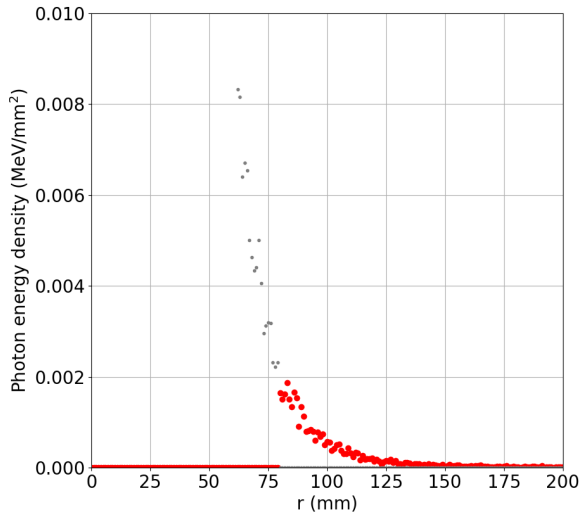
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.2000000000000002 m from IP
Real photons at radius > 0.0795 m (in red): 64860.0
Real photons 0.13 m < radius < 0.14 m: 3400.0
Total energy photons at radius > 0.0795 (in red): 21.35066246857667 MeV
Real photons 0.13 m < radius < 0.14 m: 0.7442226887119099 MeV



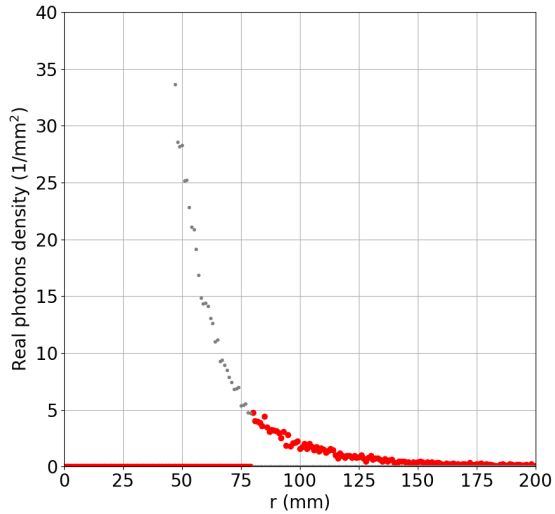


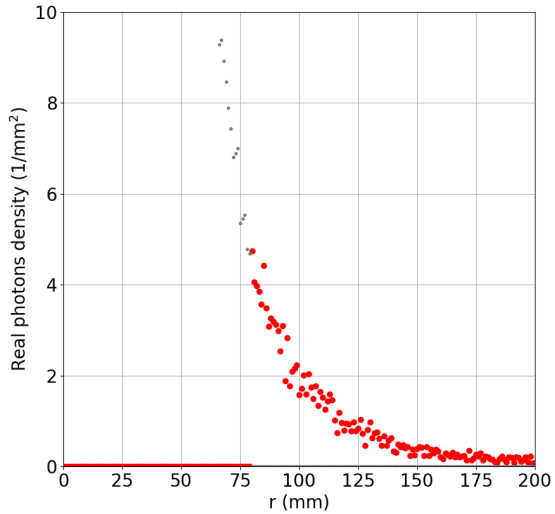


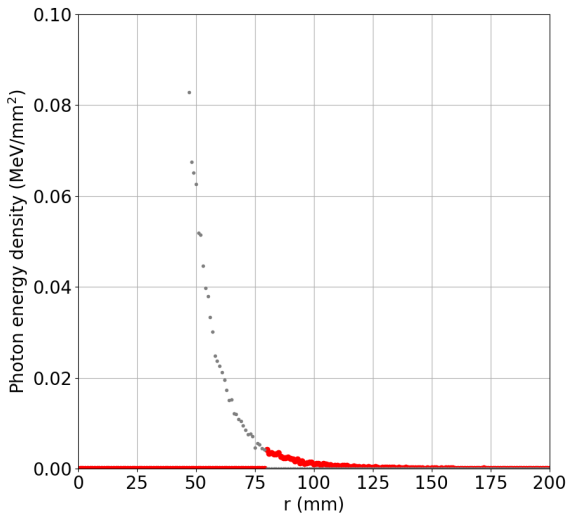


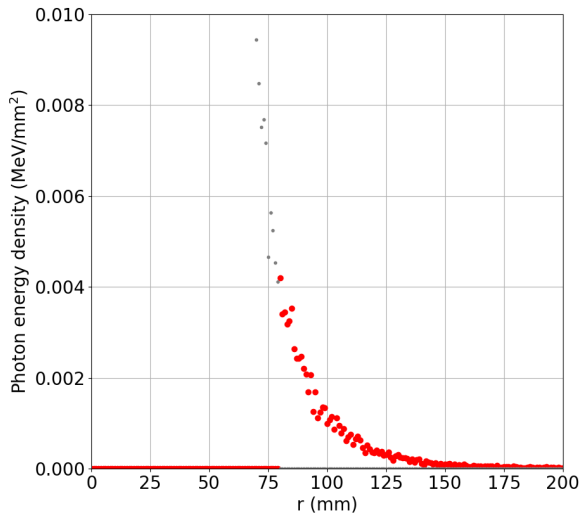
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.4000000000000001 m from IP
Real photons at radius > 0.0795 m (in red): 99360.0
Real photons 0.13 m < radius < 0.14 m: 5540.0
Total energy photons at radius > 0.0795 (in red): 44.91407643539817 MeV
Real photons 0.13 m < radius < 0.14 m: 1.8361400854071868 MeV



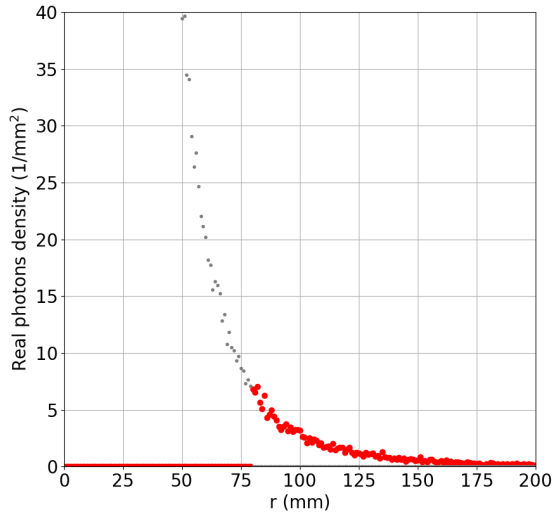


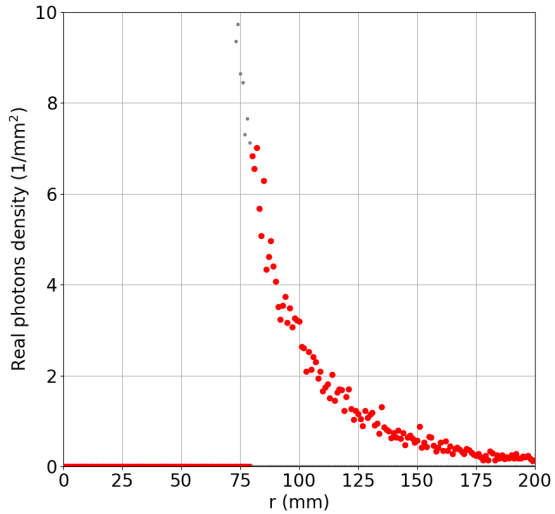


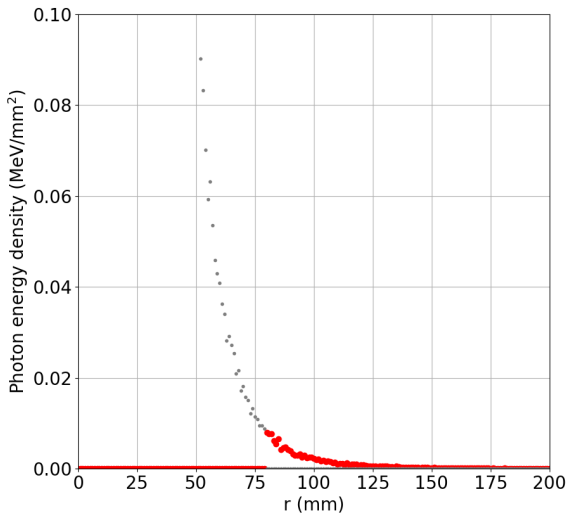


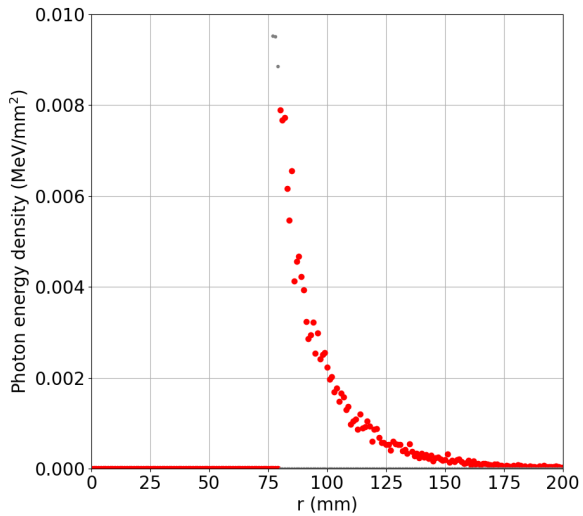
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 143160.0
Real photons 0.13 m < radius < 0.14 m: 7900.0
Total energy photons at radius > 0.0795 (in red): 84.44894511198567 MeV
Real photons 0.13 m < radius < 0.14 m: 3.364563405568128 MeV



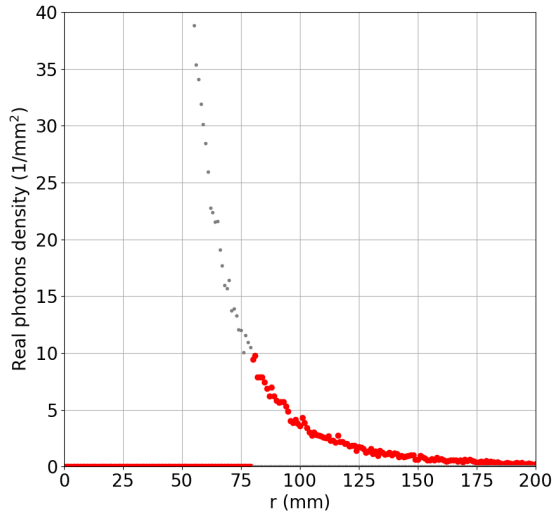


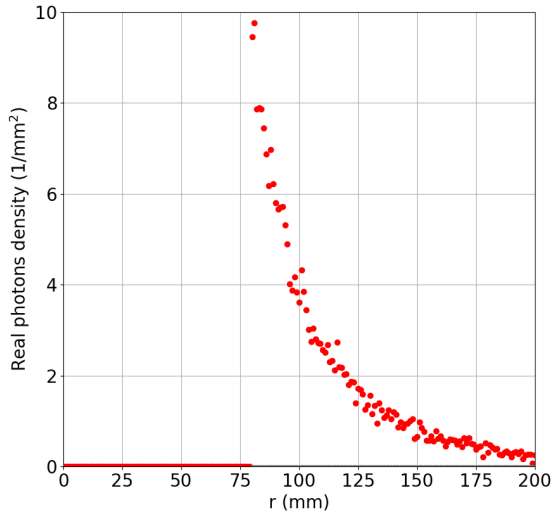


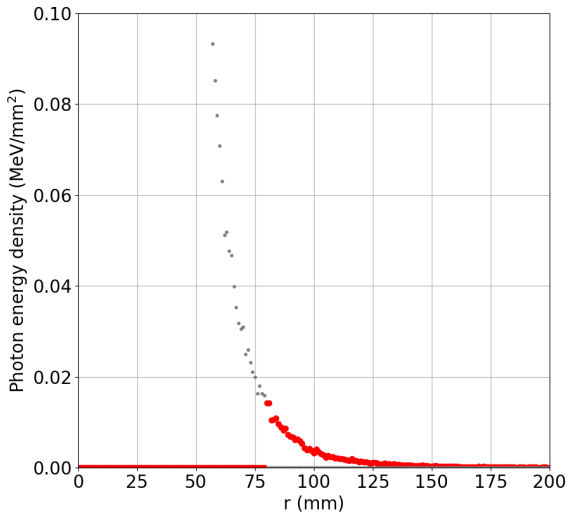


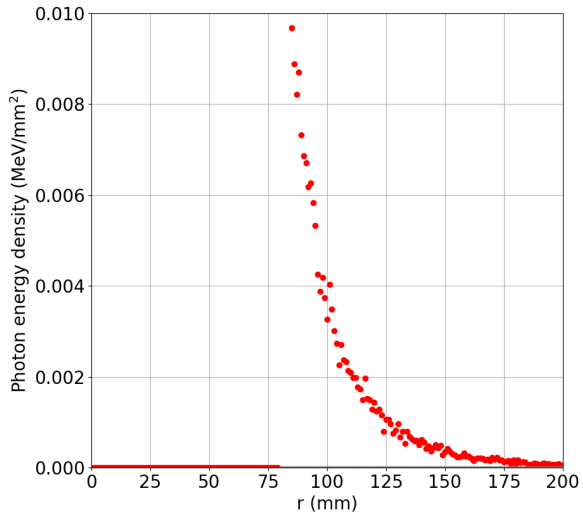
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.8 m from IP
Real photons at radius > 0.0795 m (in red): 198140.0
Real photons 0.13 m < radius < 0.14 m: 10300.0
Total energy photons at radius > 0.0795 (in red): 148.22699087132307 MeV
Real photons 0.13 m < radius < 0.14 m: 5.699662077300006 MeV



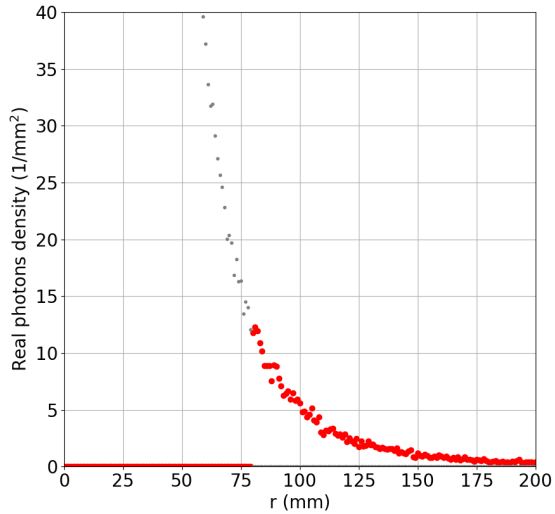


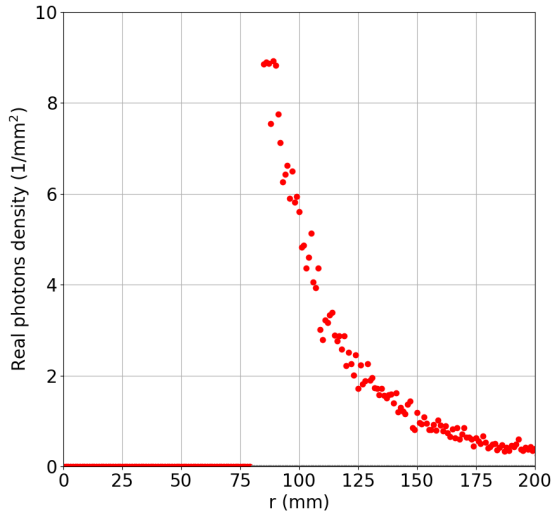


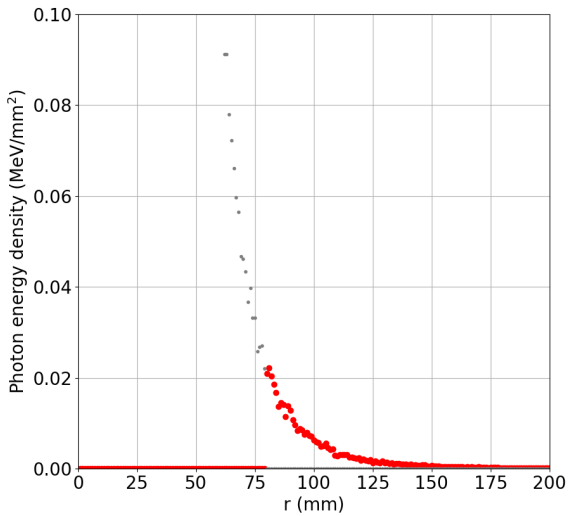


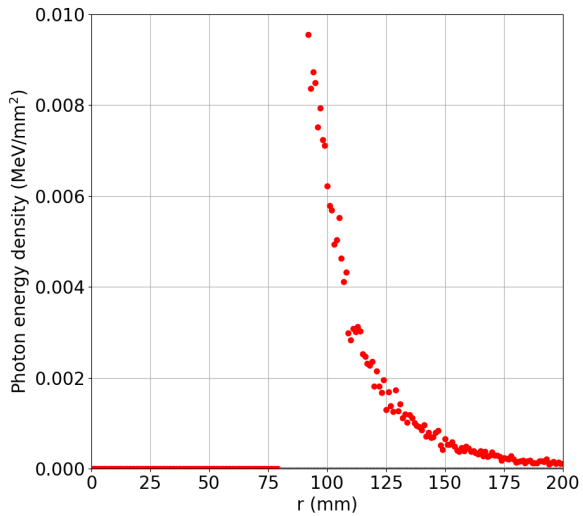
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 2.0 m from IP
Real photons at radius > 0.0795 m (in red): 264380.0
Real photons 0.13 m < radius < 0.14 m: 14280.0
Total energy photons at radius > 0.0795 (in red): 243.07789423378566 MeV
Real photons 0.13 m < radius < 0.14 m: 9.492558094856397 MeV

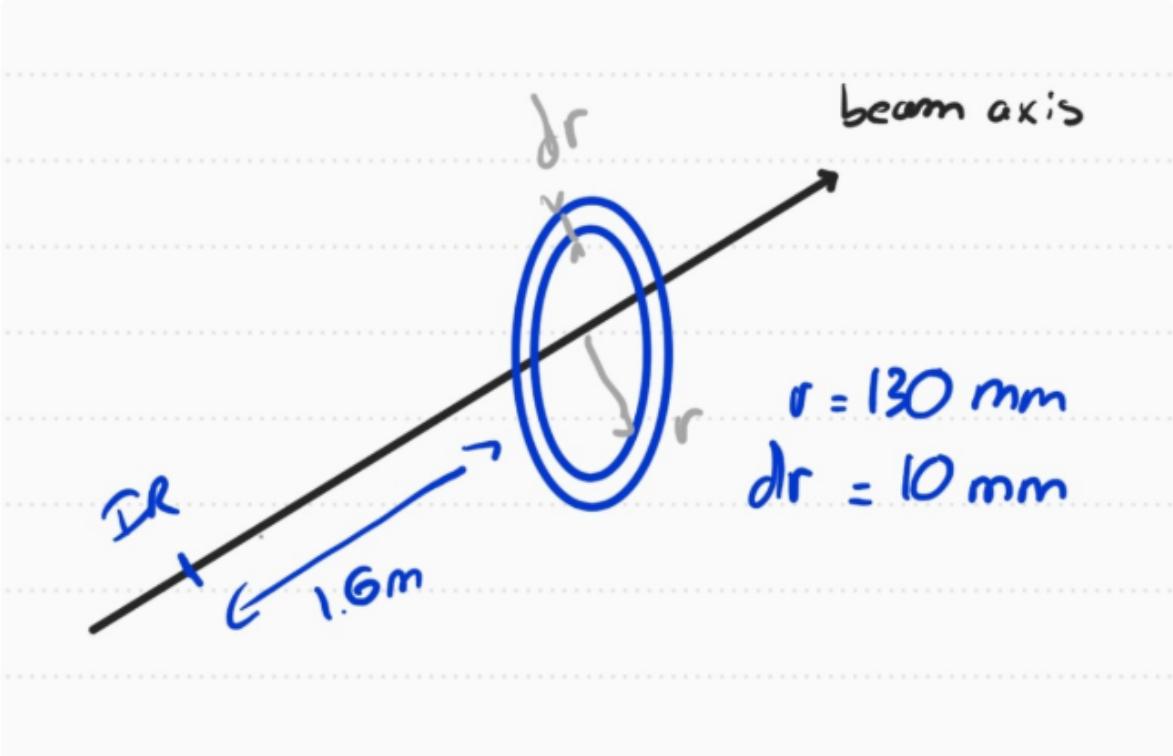






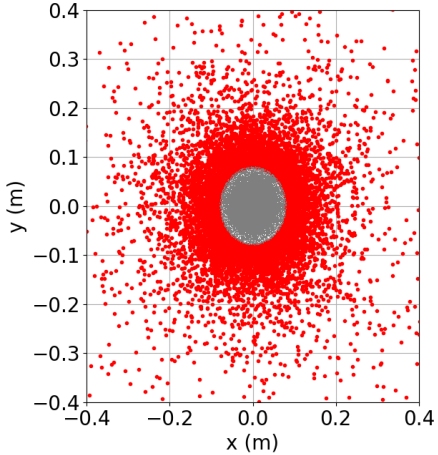


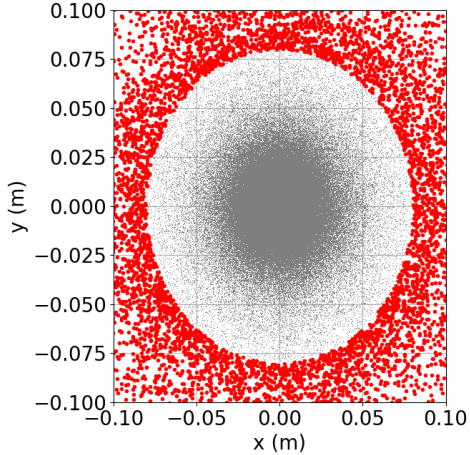
SKETCH OF DETECTOR

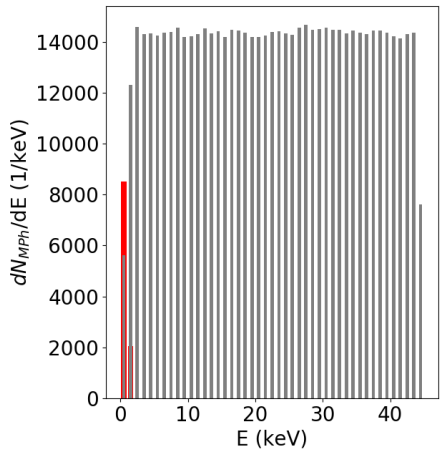


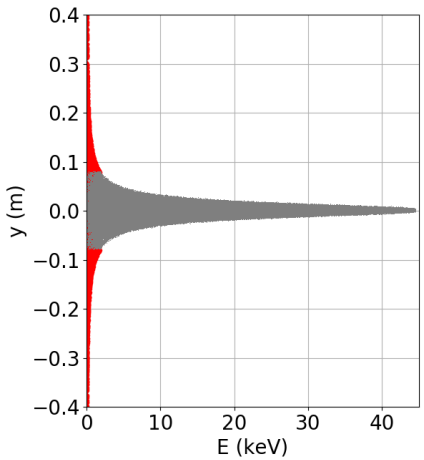
LASER AT RESONANCE

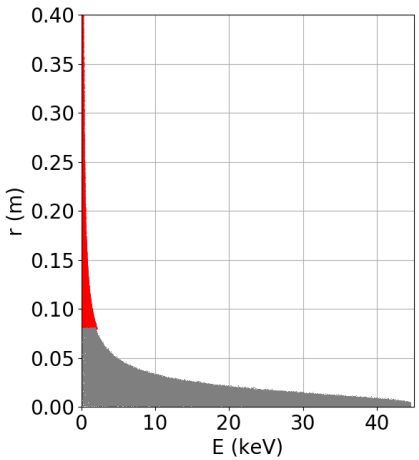
Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 211340.0
Real photons 0.13 m < radius < 0.14 m: 10980.0
Total energy photons at radius > 0.0795 (in red): 123.97137259211175 MeV
Real photons 0.13 m < radius < 0.14 m: 4.747604578097614 MeV

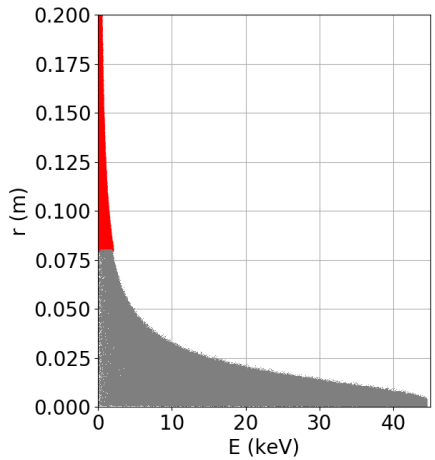






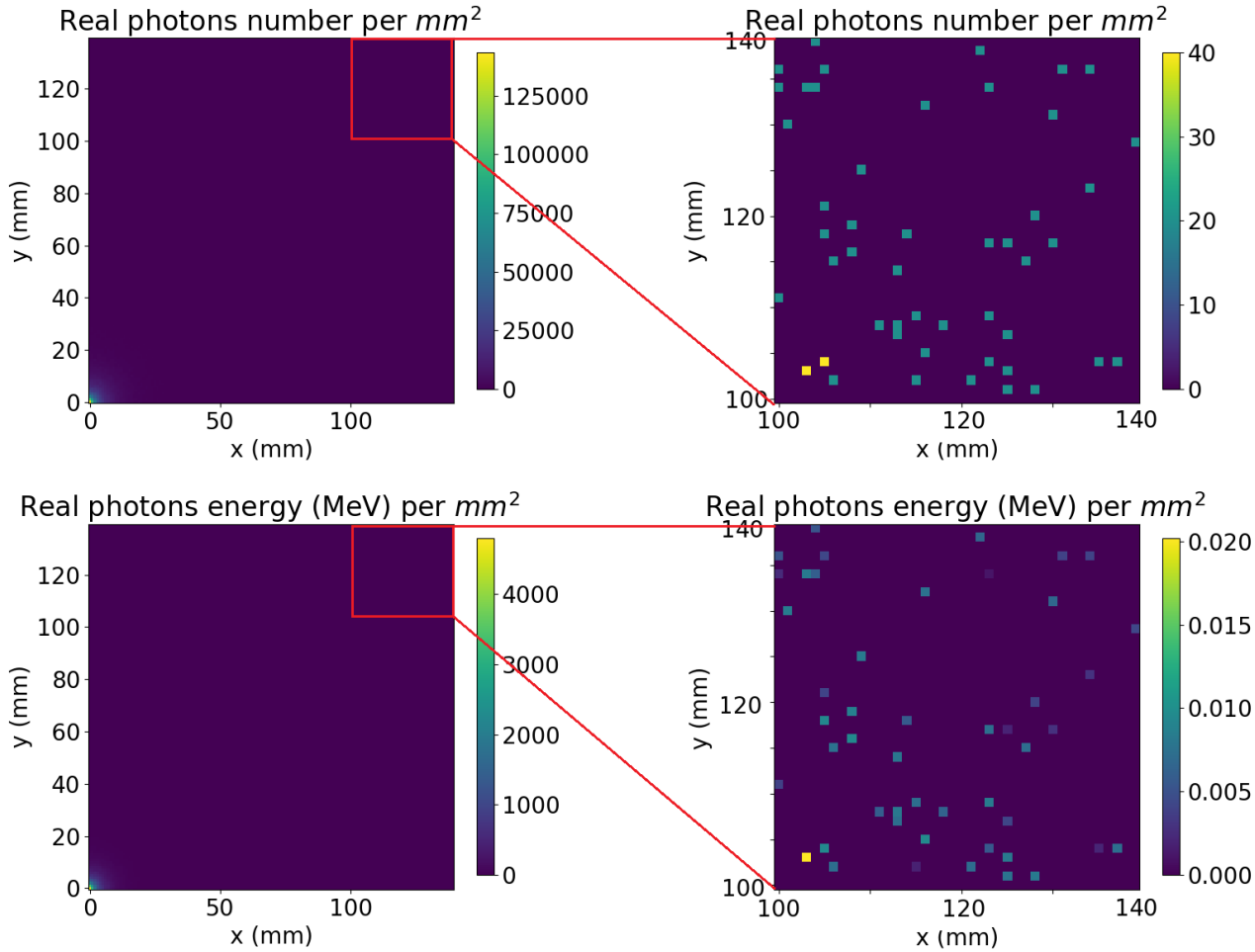






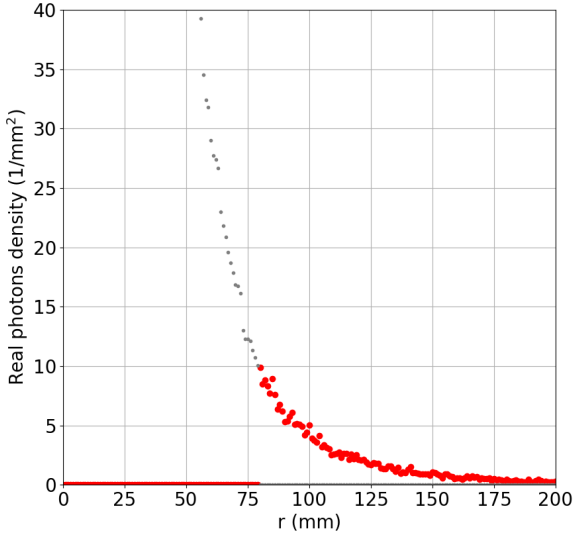
LASER AT RESONANCE

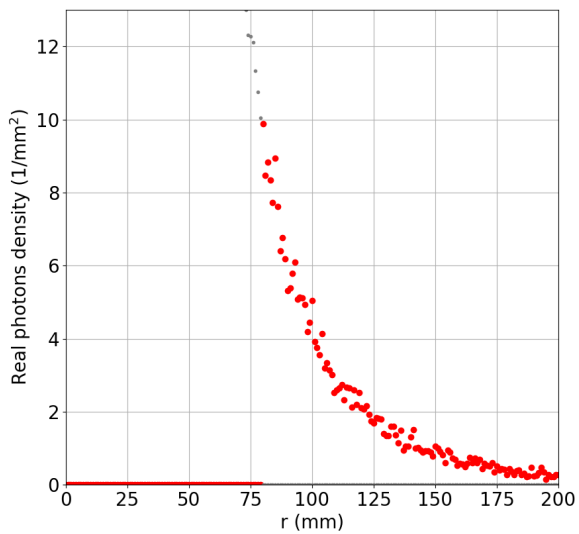
Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP

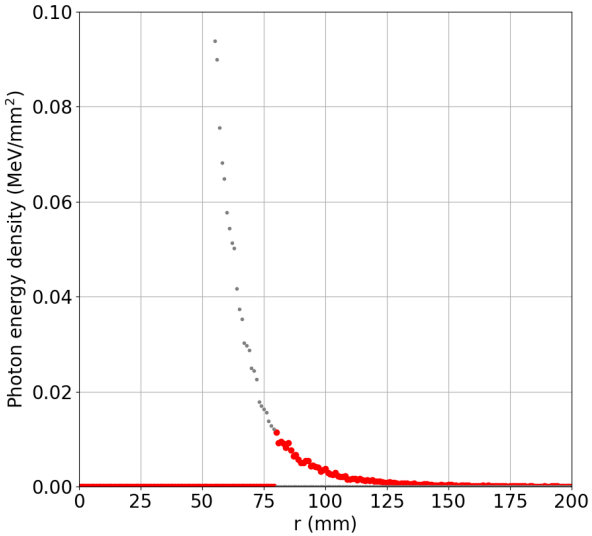


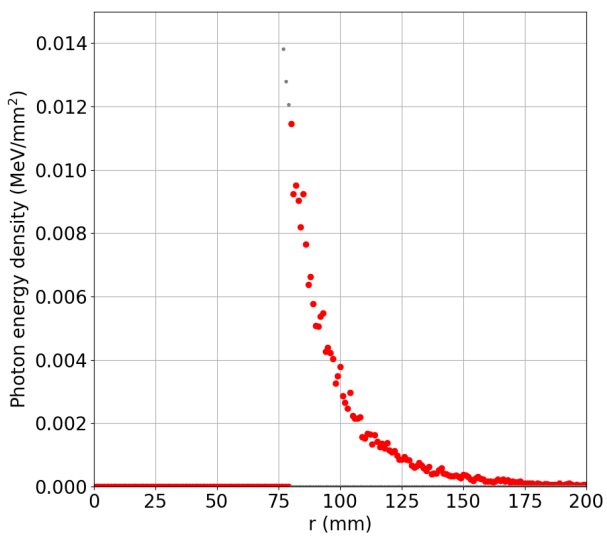
LASER AT RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 211340.0
Real photons 0.13 m < radius < 0.14 m: 10980.0
Total energy photons at radius > 0.0795 (in red): 123.97137259211175 MeV
Real photons 0.13 m < radius < 0.14 m: 4.747604578097614 MeV



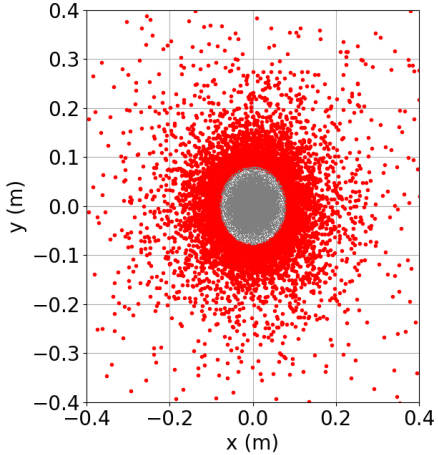


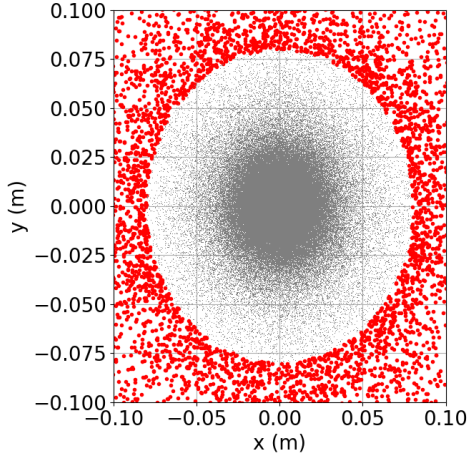


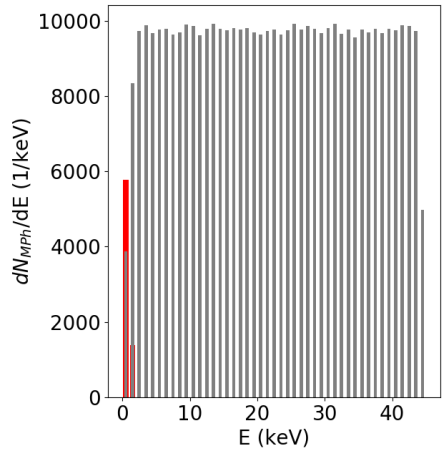


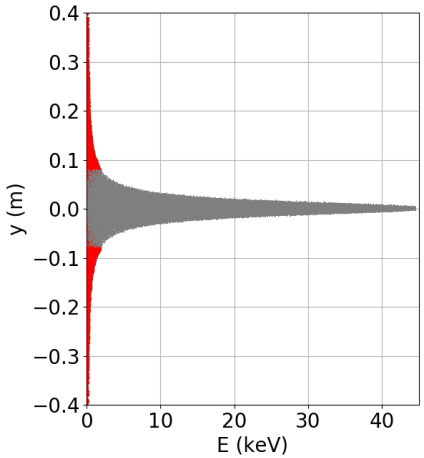
LASER 2 σ BELOW RESONANCE

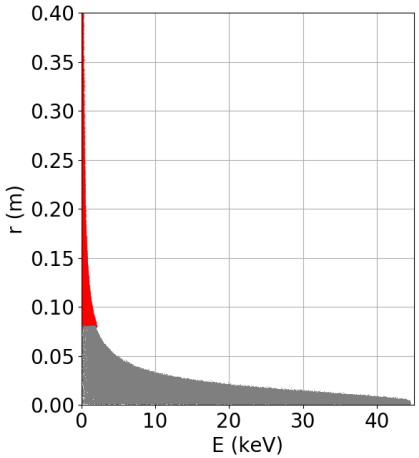
Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 143160.0
Real photons 0.13 m < radius < 0.14 m: 7900.0
Total energy photons at radius > 0.0795 (in red): 84.44894511198567 MeV
Real photons 0.13 m < radius < 0.14 m: 3.364563405568128 MeV

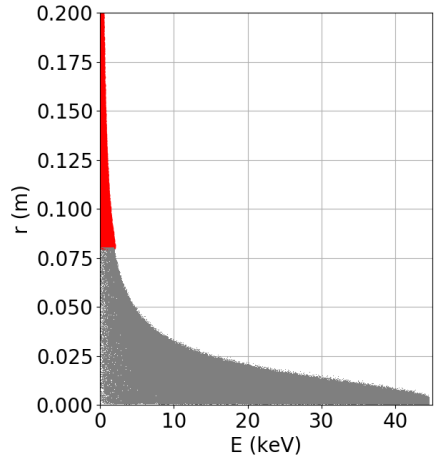






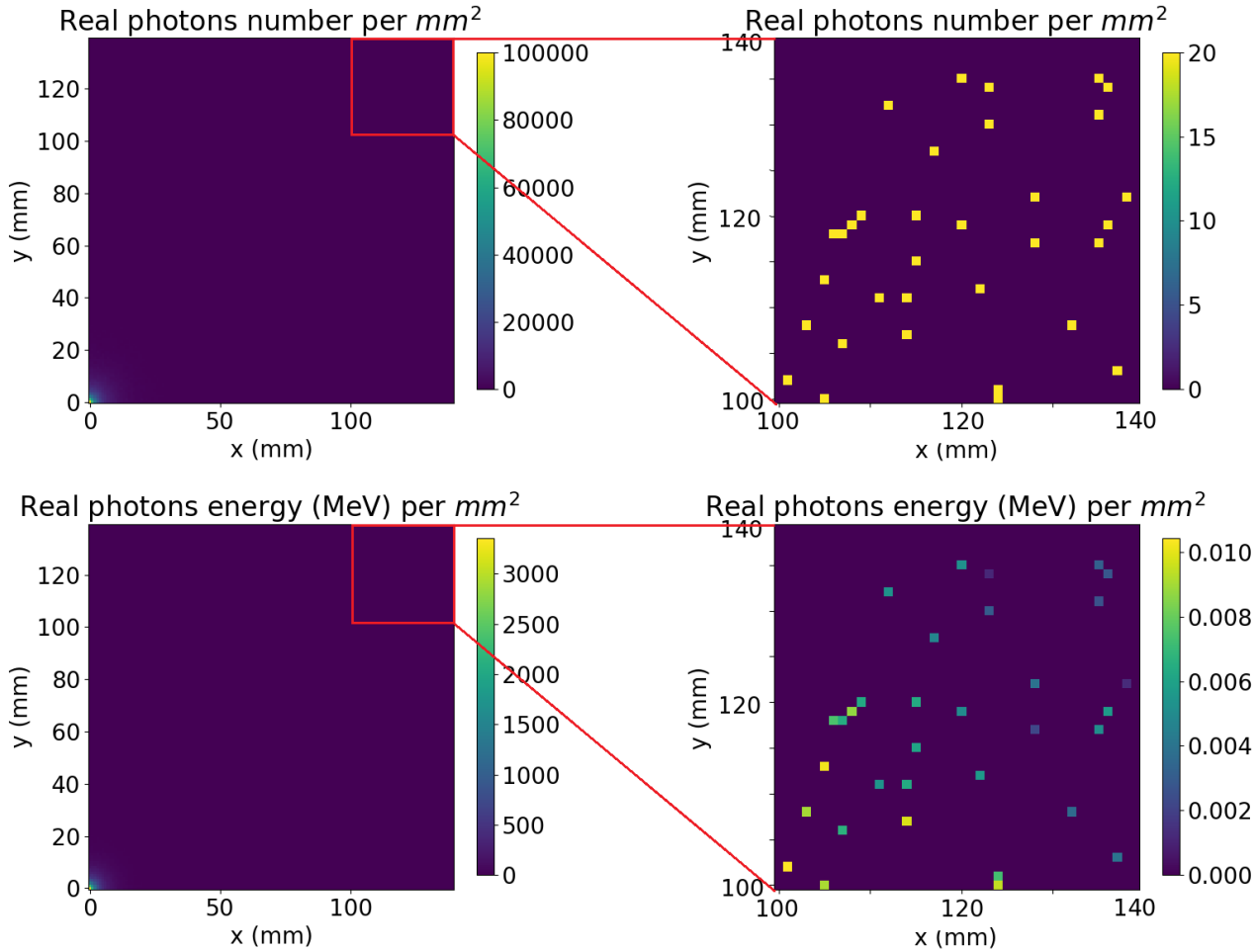






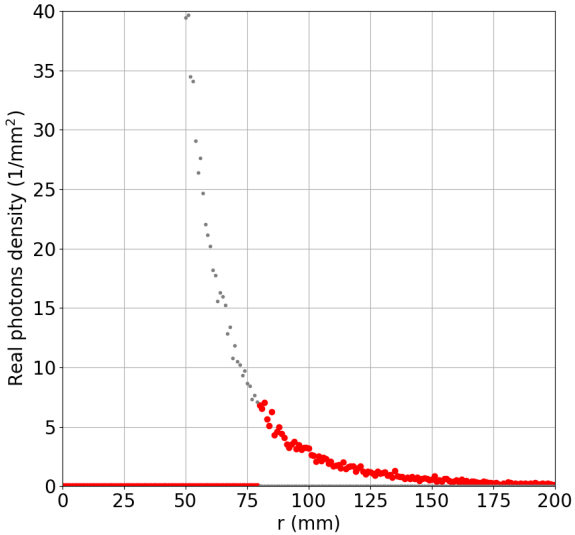
LASER 2 σ BELOW RESONANCE

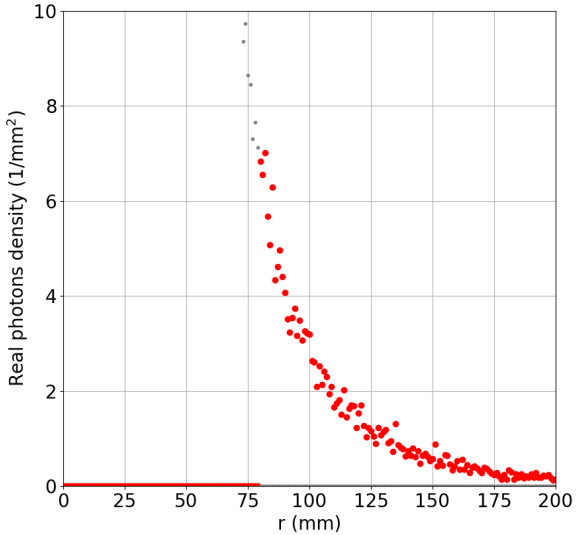
Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP

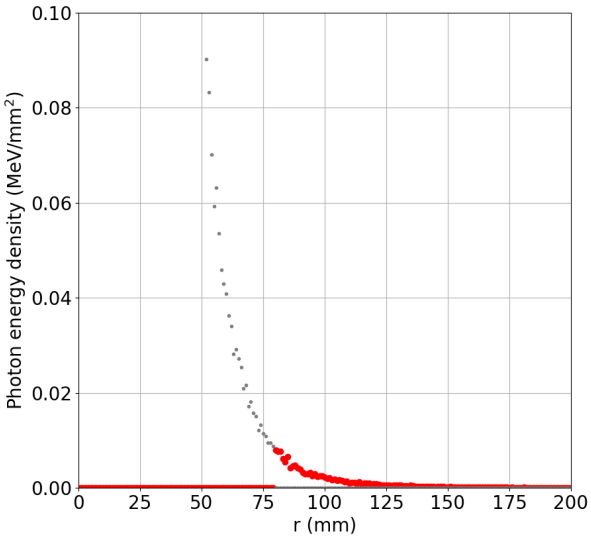


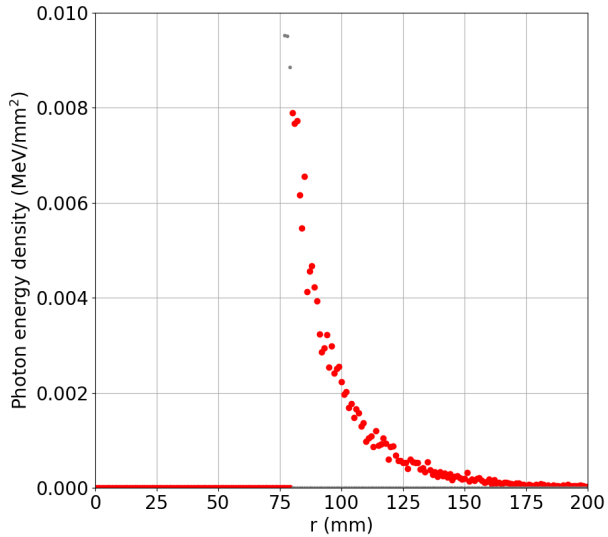
LASER 2 σ BELOW RESONANCE

Flat screen perpendicular to z axis (of propagation) @ 1.6 m from IP
Real photons at radius > 0.0795 m (in red): 143160.0
Real photons 0.13 m < radius < 0.14 m: 7900.0
Total energy photons at radius > 0.0795 (in red): 84.44894511198567 MeV
Real photons 0.13 m < radius < 0.14 m: 3.364563405568128 MeV





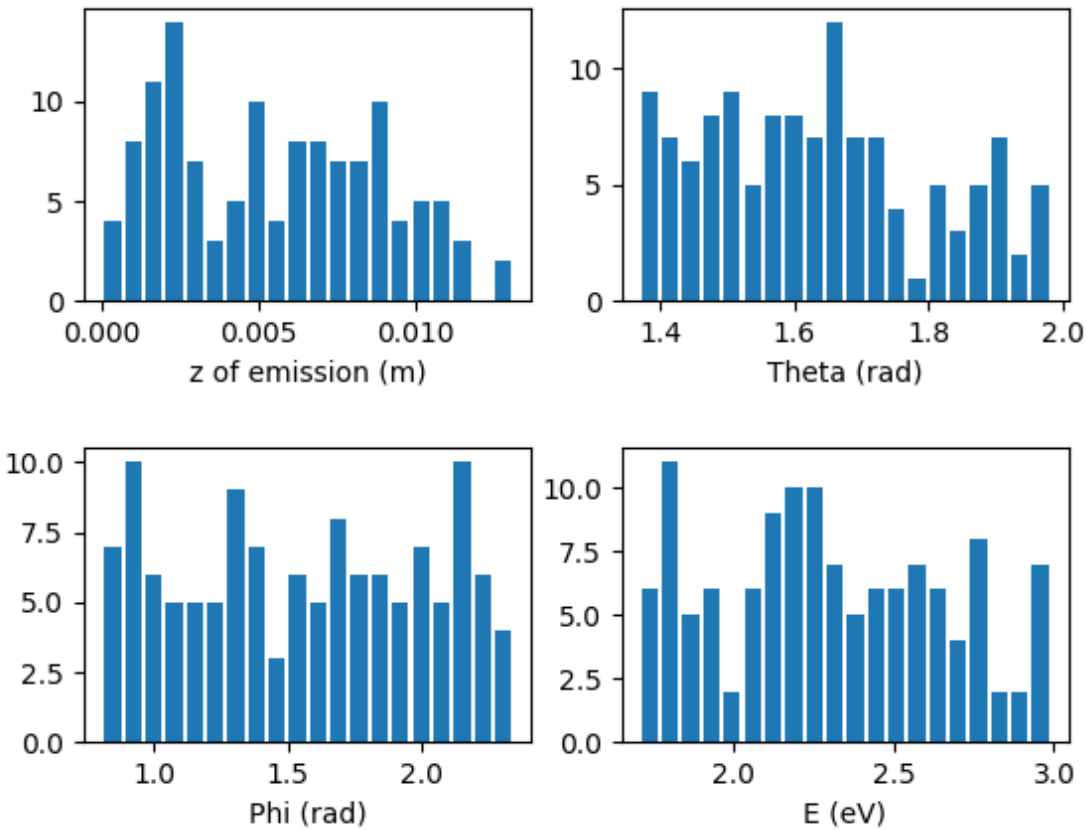




DETECTOR ABOVE THE INTERACTION POINT

Visible photons per shot in a window of 4×4 cm at 10 mm above the IP.
The graphs are overpopulated in order to better show the photons features, but the number of real photons in the detector per shot is:

- without stimulated emission $\sim 7,\ 5$ for laser at resonance and 2σ below
- with stimulated emission $\sim 5,\ 3$ for laser at resonance and 2σ below



CONCLUSIONS

- All of these results need to be cross checked by other codes!!
- Generation of stimulated emitted photons: impotant for visible photon detection

- All of these results need to be cross checked by other codes!!
- Generation of stimulated emitted photons: impotant for visible photon detection

Thank you for your attention!


E. G. Bessonov, *Fundamentals of gamma-Ray Light Sources (Gamma-Factory) based on backward resonance scattering of laser beam photons by cold relativistic ion beams*


E. G. Bessonov, *Light sources based on relativistic ion beams*, Nucl. Instr. Meth. Phys. Res. B 309 (2013) 92–94


M. W. Krasny, *The Gamma Factory proposal for CERN*, arxiv:1511.07794 (2015)


M. W. Krasny *et al.*, *The CERN Gamma Factory initiative: an ultra-high intensity gamma source* in *Proc. 9th Int. Particle Accelerator Conf. (IPAC'18)*, Vancouver, BC, Canada, WEYGBD3 (2018)


C. Curatolo, W. Placzek, L. Serafini, and M. W. Krasny, *New simulation programs for partially stripped ions - laser light collisions* in *Proc. 9th Int. Particle Accelerator Conf. (IPAC'18)*, Vancouver, BC, Canada, THPMF076 (2018)