Rates on Taggers from synchrotron radiation
Ken Livingston 20th Oct 2021

RunParameters.txt

10 GeV
2.5 A beam: 2.25A in primary distribution
and 0.25A in "tail" distribution

photon threshold of 5 keV
only photons > 5 keV tracked.

Magnets using 210405 parameters
This incorporates the 0.5m shift with eForward 10Gev - 210405.bxy
D1_eF at -3569 cm
Q1_eF at -1237 cm
Q0_eF at -700 cm

Data from Jarda:

SR.10GeV_5kVthreshold.tar.gz (Synrad format)
SR.10GeV_5kVthreshold_hepmc.tar.gz converted to HepMC3.

This is data from Synrad+ simulation of photons due to the final electron_Forward magnets.

Used csv facet files

taggers.xml from Simon.

Analyse with ROOT sr.C (available)

Pos_X_[cm]	Pos_Y_[cm]	Pos_Z_[cm]	Pos_u	Pos_v	Dir_X	Dir_Y	Dir_Z	Dir_theta_[rad]	Dir_phi_[rad]	LowFluxRatio	Energy_[eV]	Flux_[photon/s]	Power_[W]
2.63	-1.31368	337.877	0.850503	0.346157	0.00365035	-0.00064578	0.999993	1.57438	0.000957433	1	10925	4887760	8.55546E-09
2.73228	-1.09434	67.0428	0.48939	0.816785	0.00596541	-0.000630545	0.999982	1.57647	0.00194966	1	6641.03	13219300	1.40656E-08
2.71535	-1.13064	230.328	0.707104	0.738897	0.004366	-0.000506874	0.99999	1.57497	0.00138578	1	21153.3	8399340	2.84668E-08
2.77189	-1.00939	332.311	0.843081	0.999066	0.00385143	-0.000488912	0.999992	1.57449	0.00118459	1	7572.95	5359230	6.50251E-09
2.68175	-1.2027	344.737	0.859649	0.584287	0.00358034	-0.000600313	0.999993	1.57429	0.000969056	1	12804.2	4260330	8.73995E-09
2.64404	-1.28357	169.749	0.626333	0.410752	0.00464833	-0.000637215	0.999989	1.57528	0.00138697	1	7545.26	9558460	1.15552E-08
2.68264	-1.20079	386.886	0.915848	0.588383	0.00339755	-0.00057411	0.999994	1.57412	0.000915553	1	6076.44	3801220	3.70072E-09
2.68867	-1.18786	399.255	0.932339	0.616126	0.00383038	-0.000554572	0.999993	1.5745	0.00111618	1	9026.82	7148270	1.03383E-08
2.7325	-1.09386	425.621	0.967495	0.817824	0.00330499	-0.000504278	0.999994	1.574	0.000939723	1	8676.12	4642200	6.45302E-09
2.67526	-1.21661	436.799	0.982398	0.554437	0.00360159	-0.000554988	0.999993	1.5743	0.00101911	1	7086.49	6216770	7.05845E-09
2.64079	-1.29053	309.957	0.813276	0.395824	0.00370703	-0.000652683	0.999993	1.57443	0.000975133	1	6445.11	4654220	4.80608E-09

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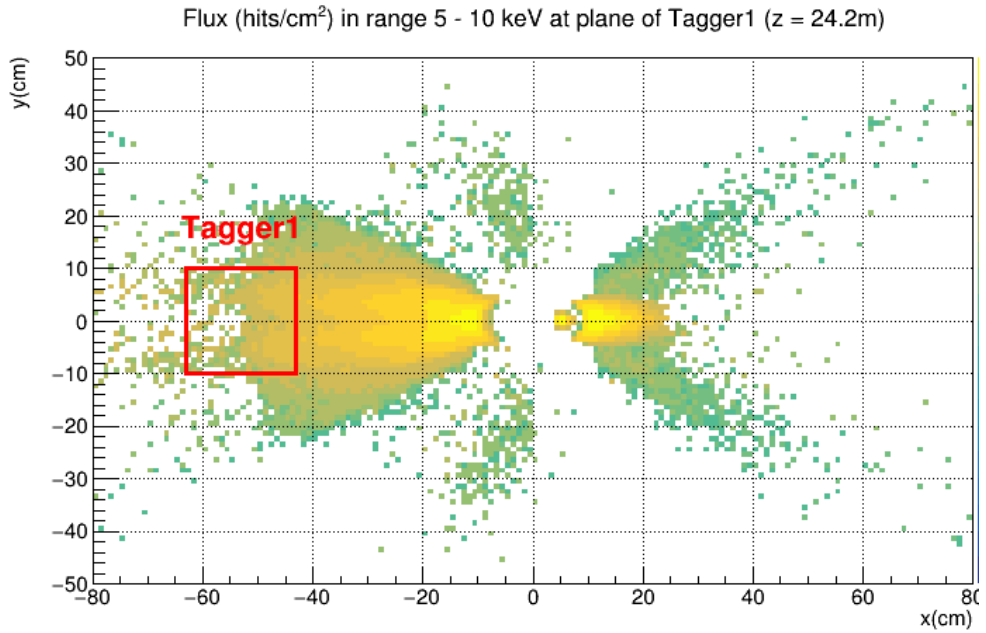

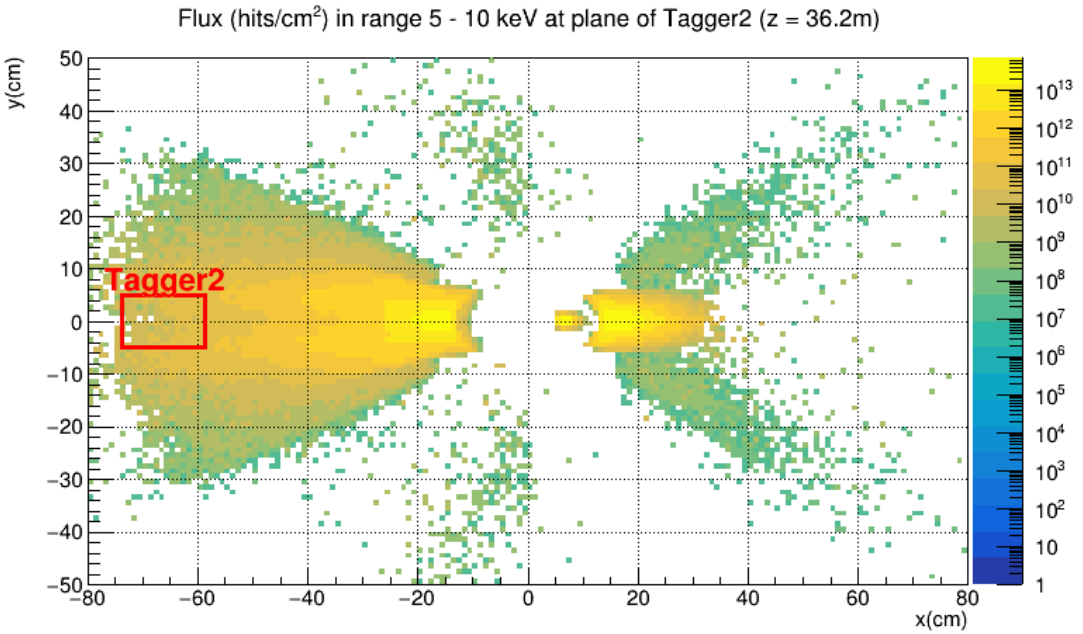

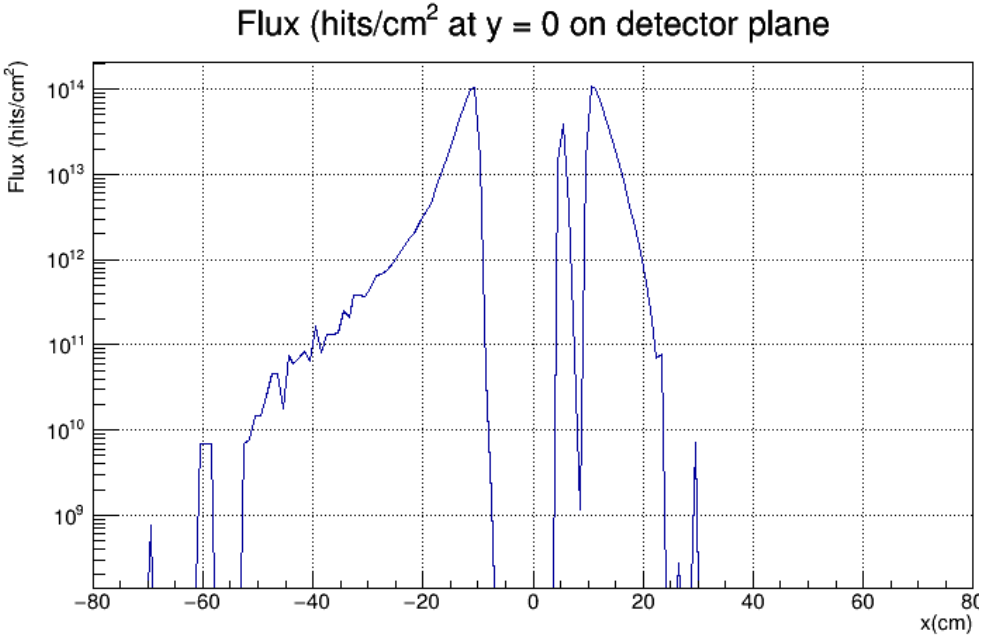

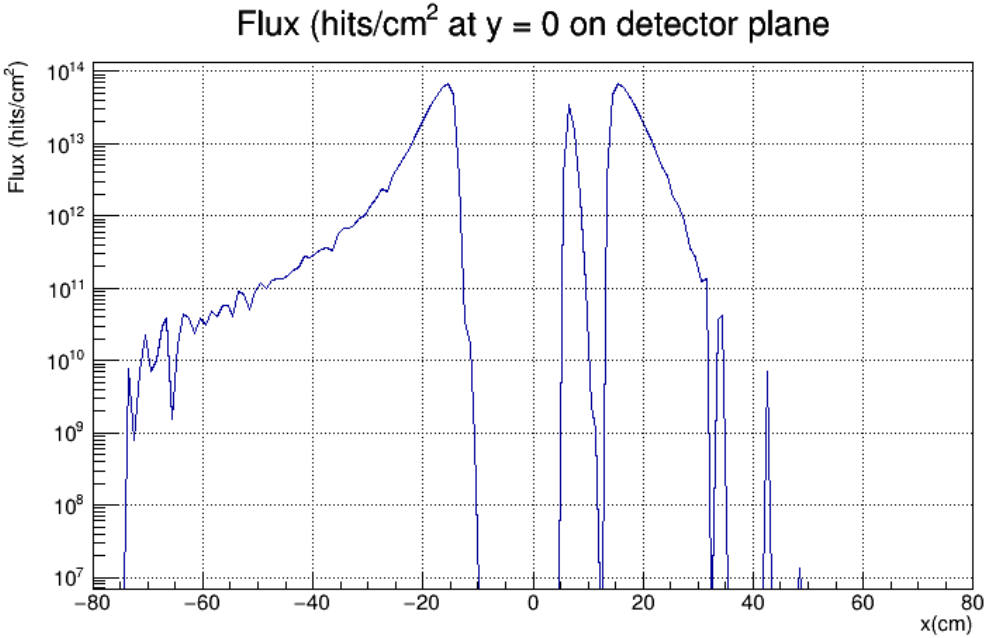

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Summary:

Non-negligible rates on both taggers.

Rates of 10^{10} – 10^{11} hits / cm^2
5 keV < Ee < 10 keV

2.5nA , 10GeV Beam

Should we worry about it?

To do:
Investigate shielding.
Study other beam energies
Geant4 ?

https://web-docs.gsi.de/~stoe_exp/web_programs/x_ray_absorption/index.php

X-Ray attenuation & absorption calculator

INPUT:

Target Material: Cu

X-Ray Energy [keV]: 10

Target length [mm]: 0.1

Pressure (only gases) [atm]: 1

Calculate!

RESULTS:

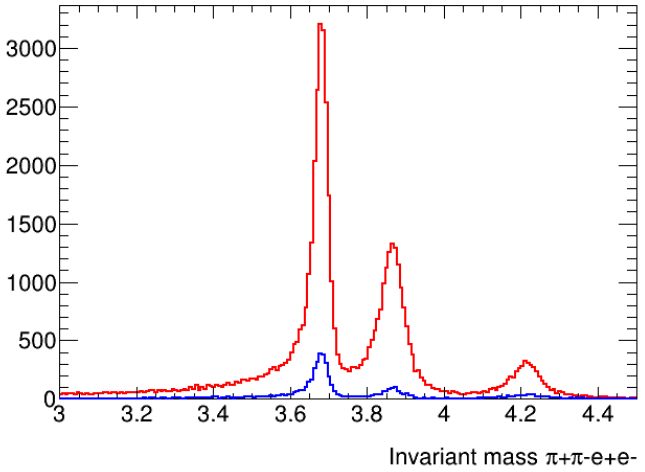
Attenuation [%]: 100.0000

Transmission [%]: 0.0000

Interaction Probability [%]:
Photoabsorption: 99.2914
Compton Scattering: 0.0359
Rayleigh Scattering: 0.6728
Nuclear Field Pair Production: 0.0000
Electron Field Pair Production: 0.0000

Caculations are based on the NIST data for X-ray interaction cross sections and material densities.

Bonus material: Why Tagging electrons would be good



With Tagger (red). main detector (blue) generated (black)) For Jpsi + pi+ + pi- production.

In the model we assume meson Psi(2s) (normal meson at lower mass peak), X(3872) exotic middle peak, Y(4270) exotic high peak. These numbers are for 5x100 beam settings. Basically we get **order of magnitude more events with tagger**, so it will be very important, particularly if we get some phi resolution.

These results are with **the full ECCE simulation** and correspond to about a couple of weeks beamtime, the tagger is just a cut on pseudorapidity<-6.5 (basically just a small angle acceptance cut).

Derek Glazier, Glasgow.