

Signal simulation update

Tom Blackburn

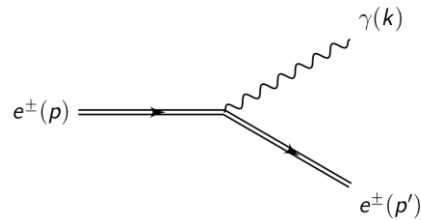
Department of Physics, University of Gothenburg

1 Aug 2022

LUXE Simulation, Analysis and Software meeting

Electron + laser

Nonlinear Compton scattering



Signals:

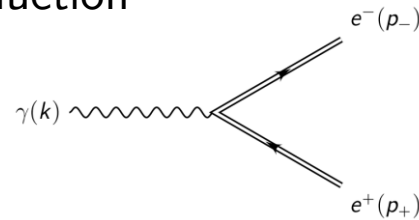
- Intensity dependence of Compton edges
- γ -photon angular profile

Needed:

- Photon emission rate (LMA, LP)

Bremsstrahlung γ + laser

Nonlinear Breit-Wheeler pair production



Signals:

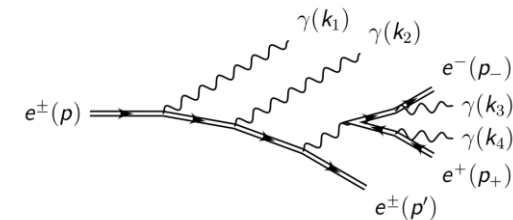
- Intensity dependence of positron yield

Needed:

- Pair creation rate (LMA, LP), unpolarized γ photons

Electron + laser

Nonlinear trident pair creation



Signals:

- Intensity dependence of positron yield

Needed:

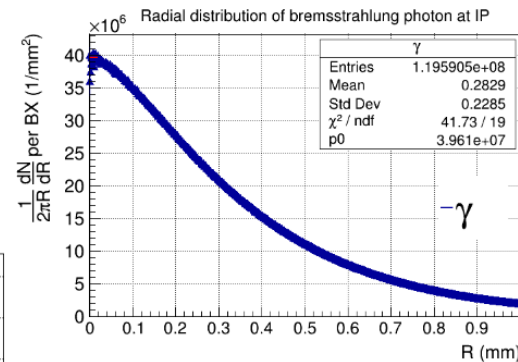
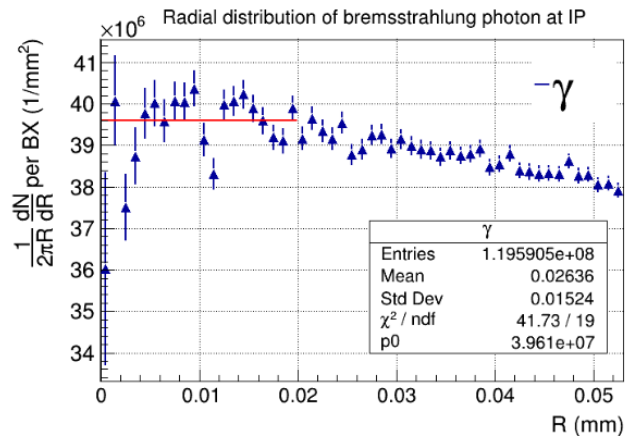
- Photon emission rate (LMA, LP), γ -polarization resolved
- Pair creation rate (LMA, LP), γ -polarization resolved

Signal simulation update

Refined γ -laser configuration

Bremsstrahlung photons radial distribution at IP

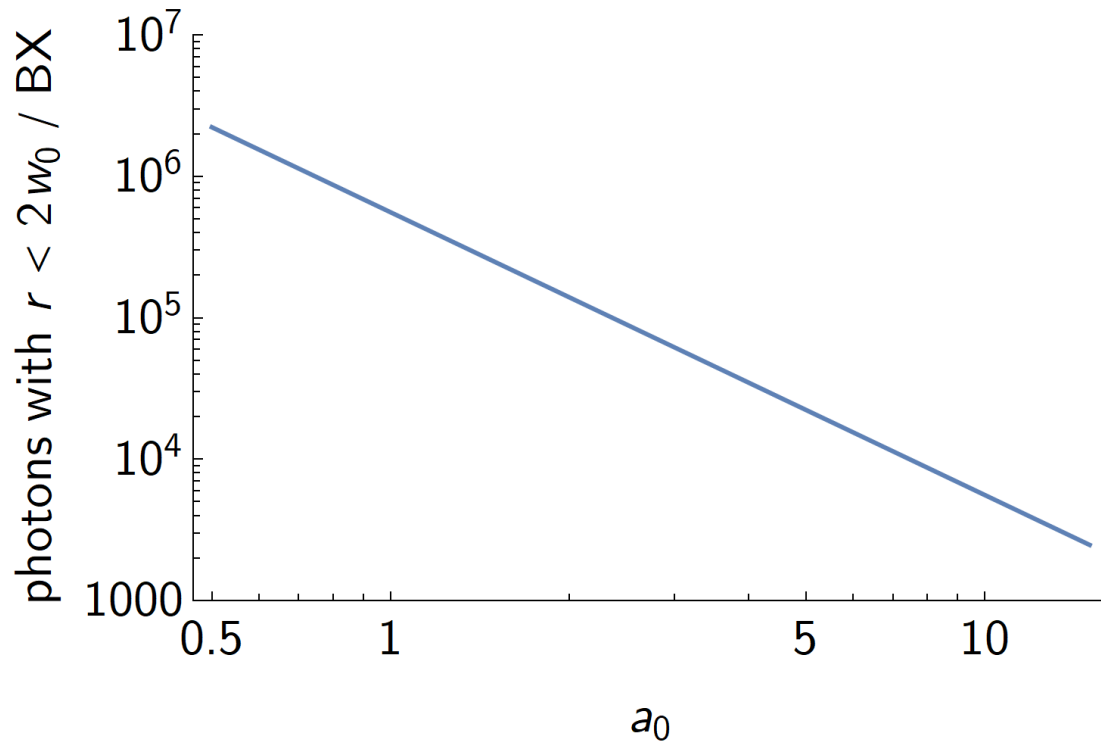
$$N_\gamma = 39.6 \pm 0.3 \mu\text{m}^{-2}$$



$$p0 = 3.96077e+07 \pm 92344.3$$

- Simulation setup for γ -laser improved (thanks to Sasha) from uniform flux of 41.0 photons/ μm^2 to “Gaussian” flux, peaking at 39.6 photons/ μm^2 , with e-folding radius of 230 μm .

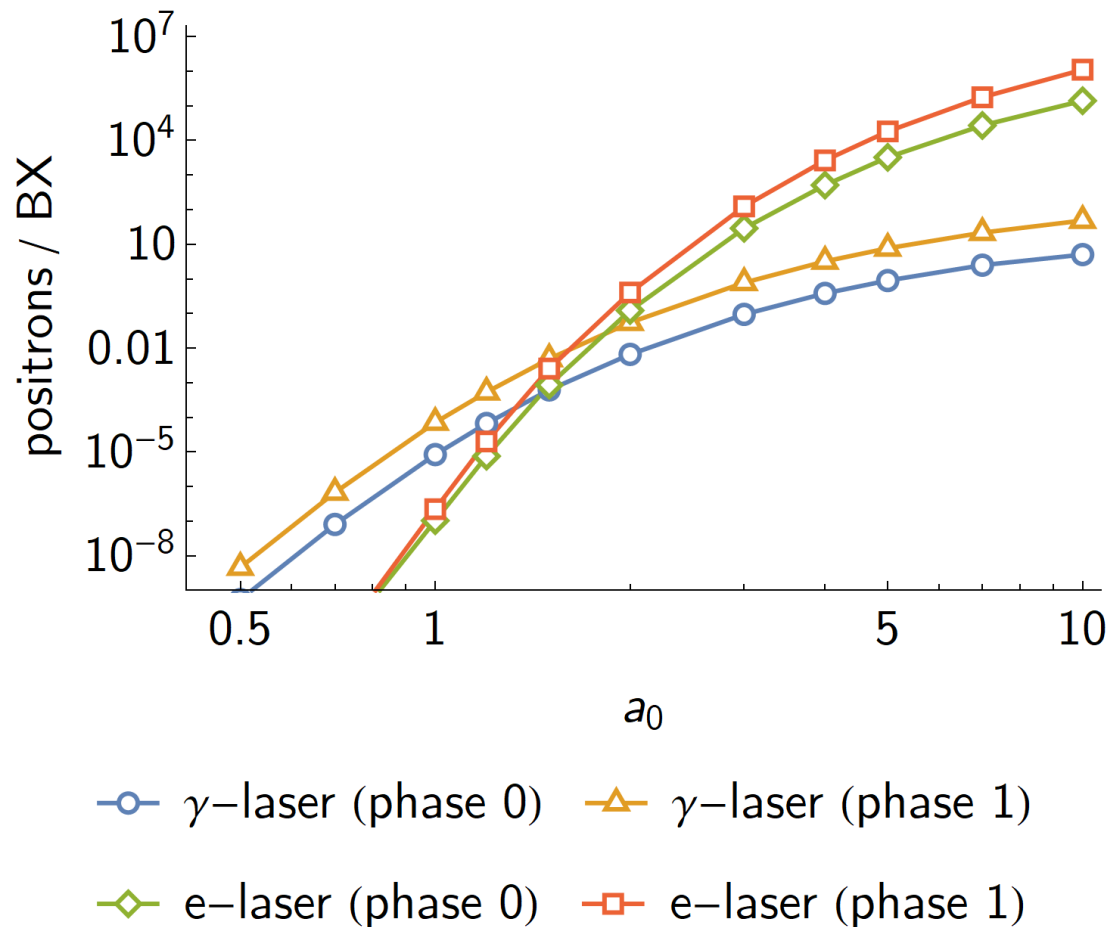
Refined γ -laser configuration



- Simulation setup for γ -laser improved (thanks to Sasha) from uniform flux of 41.0 photons/ μm^2 to “Gaussian” flux, peaking at 39.6 photons/ μm^2 , with e-folding radius of 230 μm .
- Load only photons with impact parameter $< 2w_0$ (as before)
- Physical positron weights achieved by using the real number of photons.

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Results



- First batch of simulation results for LP lasers available for γ - and e-laser collisions, phases 0 and 1, for $\xi < 10$ in </nfs/dust/luxe/MCProduction/Signal/ptarmigan-v0.11>.
- HDF5 output follows new filename convention:
mc21.elaser_xi{xi}_{40/350}TW_
lp.GEN.{tag}.{NNNN}.h5

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Results

Tag	Type	Phase	Rate biasing?	BXs
g0050	γ -laser	0	physical weights	200 ($\xi = 5,7,10$)
g0051	γ -laser	0	on	10
g0052	γ -laser	1	physical weights	100 ($\xi = 5,7,10$)
g0053	γ -laser	1	on	10
g0054	e-laser	0	physical weights	10
g0055	e-laser	0	on	10
g0056	e-laser	1	physical weights	10
g0057	e-laser	1	on	10

Full details available on [Confluence page](#).