

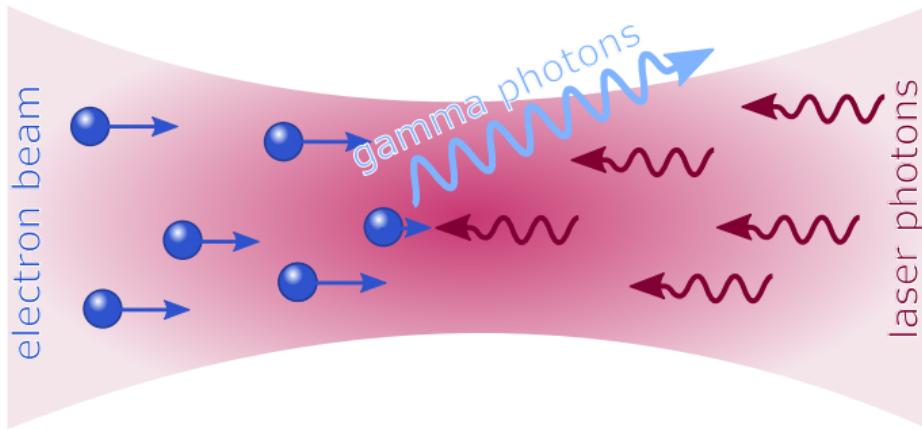
ICS Simulations Update

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Principle of ICS



parameter	value
ω_L	4.1 eV
γ	32290
ξ	< 0.1
η	0.518
$\gamma\theta$	$\ll 0.1$
ω	$\approx 8.4 \text{ GeV}$
E_L	100 mJ

$$\omega \approx \frac{4\gamma^2\omega_L}{1 + \frac{\xi^2}{2} + \gamma^2\theta^2 + 2\eta}, \quad \eta \approx \frac{2\gamma\omega_L}{m}$$

Input:

Ebeam: energy spread, emittance, finite size in x, y, z : **Uncorrelated** phase space

Laser: finite transverse size w_0 but with ∞ Rayleigh range, finite pulse duration

Sim:

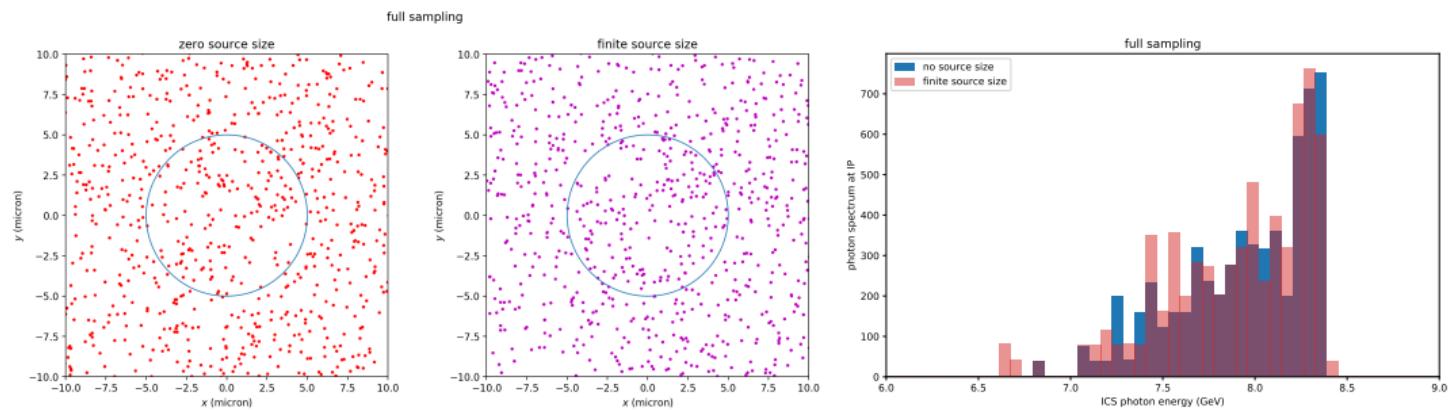
- Determine photon emission probability from (modified) Klein-Nishina cross section
- Spectral shape \sim Fourier transformed temporal pulse duration
- ξ -effects are estimated ($\xi < 0.1$)
- Monte Carlo rejection sampling to generate (macro)photons

Output:

γ -rays: (position, momentum weight) of generated photons in user specified energy range and up to maximum angle

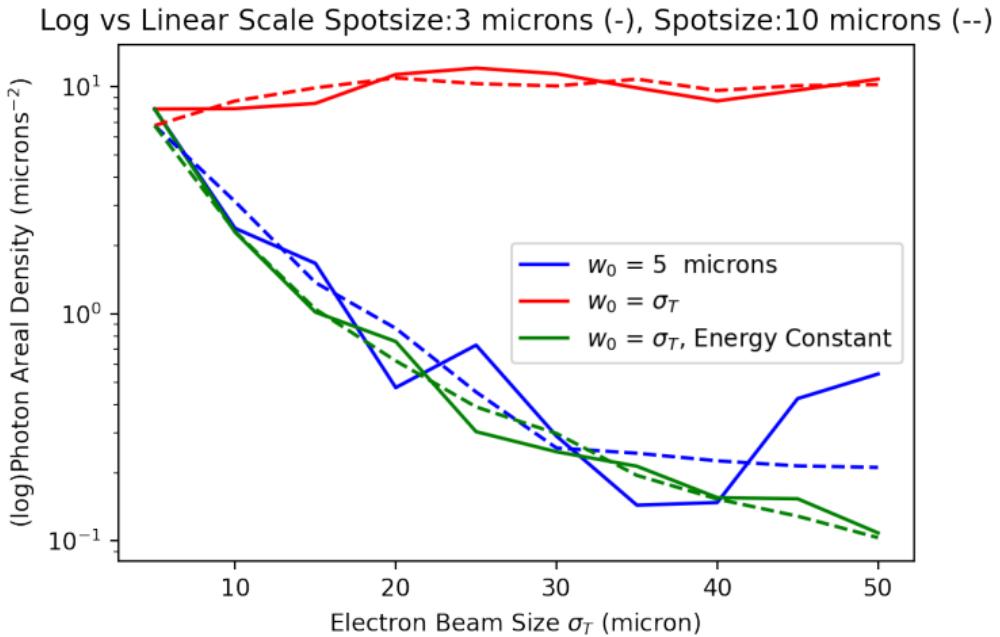
electrons: (position, momentum weight) of electrons that emitted a photon

Photon Counting



IP spot size 5 μm ,
photons at IP : 6606.77

New Sim Results (10 mJ): $Y_\gamma \sim 1/\sigma_T^2$



Conclusions: ebeam as small as possible (5 micron) gives highest photon yield

Future Work

1. Scale up to 100 mJ laser energy (this sims were 10 mJ) $\Rightarrow \times 10$ more photons
2. Constraint that $cT < z_R$
3. Need to look at γ spectrum: Larger σ_T gives narrower spectrum but fewer photons
 \Rightarrow What do we want to optimize for?
4. Include in code correlated ebeam phase space: Focusing of ebeam at SF-IP