Matching the OPPP exponential



OPPP rate, full vs exponential asymptote

Simplify OPPP to understand mc signal 0

• fit:
$$\sqrt{\frac{27}{32}} \chi e^{-\frac{8}{3\chi}(1-1/15\xi^2)}, \ \chi = \xi \frac{k \cdot k_i}{m^2}$$

- fit validity: $\xi \gtrsim 1/\sqrt{\chi} \gg 1$, $(2 \lesssim \xi \lesssim 5.5)$ 0
- Why does the rate decline for higher ξ ? 0

• threshold number of laser photons,

$$n_{\min} = \frac{2m^2(1+\xi^2)}{k \cdot k_i}$$

- More intense laser provides more energy, but the pair rest mass also increases
- Gaussian pulse compared to flat pulse: 0 less ξ overall
- Monte carlo can help understand 0 experimental fits

IPstrong v1.1.00 data sets, update 29/10/2020

• Completed phaseII e-laser, g-laser configurations with $w_0 = 3, 4, 5, 6, 7, 8 \mu m$

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Experiment Config	$w_0 = 3\mu m$	3.5µm	4.0µm	4.5µm	5.0µm	6.5µm	8.0µm	10.0µm	13.0µm	15.0µm	20.0µm	50.0µm	100.0µm
peak SQED §	5.12	4.44	3.88	3.45	3.1	2.39	1.94	1.553	1.195	1.04	0.78	0.31	0.15
peak SQED χ (16.5 GeV)	0.9	0.79	0.69	0.61	0.55	0.42	0.34	0.275	0.212	0.183	0.138	0.055	0.028
JETI40 e-laser 16.5 GeV	10000	6000	5994	6000	6000		10000	1000	1000	1000	500	5000	500
JETI40 e-laser 17.5 GeV	1000	1000	1000	1000	1000		1000						
JETI40 g-laser (coarse) 16.5 GeV	1000	1000	999	1000	1000		1000						
JETI40 g-laser 16.5 GeV	5000	2000	2000	2000	2000	2000	2000						
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	pulse shape	$w_0 = 3.0 \mu \text{m}$	$w_0 = 4.0 \mu \text{m}$	$w_0=5.0\mu{\rm m}$	$w_0 = 6.0 \mu m$	$w_0 = 7.0 \mu \text{m}$	$w_0 = 8.0 \mu \text{m}$	$w_0 = 9.0 \mu \text{m}$	$w_0=10.0\mu{\rm M}$	$w_0=11.0\mu{\rm m}$	$w_0=12.0\mu{\rm m}$		
peak SQED ¿	pulse shape gauss	$w_0 = 3.0 \mu m$ 16.7	$w_0 = 4.0 \mu m$ 12.53	$w_0 = 5.0 \mu m$ 10.03	$w_0 = 6.0 \mu m$ 8.35	$w_0 = 7.0 \mu m$ 7.16	$w_0 = 8.0 \mu m$ 6.27	$w_0 = 9.0 \mu m$ 5.57	$w_0 = 10.0 \mu m$ 5.01	$w_0 = 11.0 \mu m$ 4.56	$w_0 = 12.0 \mu m$ 4.18		
peak SQED ξ peak SQED χ (16.5 GeV)	gauss gauss	$w_0 = 3.0 \mu m$ 16.7 2.96	w ₀ = 4.0µm 12.53 2.22	$w_0 = 5.0 \mu m$ 10.03 1.78	w ₀ = 6.0μm 8.35 1.48	$w_0 = 7.0 \mu m$ 7.16 1.27	$w_0 = 8.0 \mu m$ 6.27 1.11	$w_0 = 9.0 \mu m$ 5.57 0.99	$w_0 = 10.0 \mu m$ 5.01 0.89	$w_0 = 11.0 \mu m$ 4.56 0.81	w ₀ = 12.0μm 4.18 0.74		
peak SQED ξ peak SQED χ (16.5 GeV) phasell e-laser 16.5 GeV	gauss gauss gauss	w ₀ = 3.0μm 16.7 2.96 1000	w ₀ = 4.0μm 12.53 2.22 1000	w ₀ = 5.0μm 10.03 1.78 1000	w ₀ = 6.0μm 8.35 1.48 1000	w ₀ = 7.0μm 7.16 1.27 1000	w ₀ = 8.0µm 6.27 1.11 1000	w ₀ = 9.0μm 5.57 0.99 1000	w ₀ = 10.0μm 5.01 0.89 1000	w ₀ = 11.0μm 4.56 0.81 1000	w ₀ = 12.0µm 4.18 0.74 1000		
peak SQED ξ peak SQED χ (16.5 GeV) phasell e-laser 16.5 GeV phasell e-laser 17.5 GeV	gauss gauss gauss gauss gauss	w ₀ = 3.0μm 16.7 2.96 1000 1000	w ₀ = 4.0μm 12.53 2.22 1000 1000	w ₀ = 5.0μm 10.03 1.78 1000 1000	w ₀ = 6.0μm 8.35 1.48 1000 1000	w ₀ = 7.0μm 7.16 1.27 1000 1000	w ₀ = 8.0μm 6.27 1.11 1000 1000	w ₀ = 9.0μm 5.57 0.99 1000 1000	w ₀ = 10.0μm 5.01 0.89 1000 1000	w ₀ = 11.0μm 4.56 0.81 1000 1000	w ₀ = 12.0μm 4.18 0.74 1000 1000		
peak SQED ξ peak SQED χ (16.5 GeV) phasell e-laser 16.5 GeV phasell e-laser 17.5 GeV phasell g-laser 16.5 GeV	pulse shape gauss gauss gauss gauss gauss gauss	w ₀ = 3.0μm 16.7 2.96 1000 1000 2000	w ₀ = 4.0μm 12.53 2.22 1000 1000 1000	$w_0 = 5.0 \mu m$ 10.03 1.78 1000 1000 1000	w ₀ = 6.0µm 8.35 1.48 1000 1000 1000	w ₀ = 7.0μm 7.16 1.27 1000 1000	w ₀ = 8.0μm 6.27 1.11 1000 1000 1000	$w_0 = 9.0 \mu m$ 5.57 0.99 1000 1000 2000	w ₀ = 10.0μm 5.01 0.89 1000 1000 2000	w ₀ = 11.0μm 4.56 0.81 1000 1000 2000	w ₀ = 12.0μm 4.18 0.74 1000 1000 2000		
peak SQED peak SQED phasell e-laser 16.5 GeV phasell e-laser 15.5 GeV phasell g-laser 16.5 GeV	pulse shape gauss gauss gauss gauss gauss gauss fiatTR	w ₀ = 3.0μm 16.7 2.96 1000 1000 2000	w ₀ = 4.0μm 12.53 2.22 1000 1000	w ₀ = 5.0μm 10.03 1.78 1000 1000 1000	w ₀ = 6.0μm 8.35 1.48 1000 1000	w ₀ = 7.0μm 7.16 1.27 1000 1000	$w_0 = 8.0 \mu m$ 6.27 1.11 1000 1000 2285	$w_0 = 9.0 \mu m$ 5.57 0.99 1000 1000 2000 2000	w ₀ = 10.0μm 5.01 0.89 1000 1000 2000 2000	w ₀ = 11.0μm 4.56 0.81 1000 1000 2000 2000	w ₀ = 12.0μm 4.18 0.74 1000 1000 2000 2000		
peak SQED { peak SQED { (h.S. GeV) phasell e-laser 16.5 GeV phasell e-laser 15.5 GeV phasell g-laser 15.5 GeV phasell g-laser 15.5 GeV	pulse shape gauss gauss gauss gauss gauss gauss flatTR	w ₀ = 3.0μm 16.7 2.96 1000 1000 2000	w ₀ = 4.0μm 12.53 2.22 1000 1000 1000	w ₀ = 5.0μm 10.03 1.78 1000 1000 1000	w ₀ = 6.0µm 8.35 1.48 1000 1000	w ₀ = 7.0μm 7.16 1.27 1000 1000 1000	w ₀ = 8.0μm 6.27 1.11 1000 1000 2285	w ₀ = 9.0μm 5.57 0.99 1000 2000 2000	$w_0 = 10.0 \mu m$ 5.01 0.89 1000 1000 2000 2000	w ₀ = 11.0μm 4.56 0.81 1000 1000 2000 2000	w ₀ = 12.0μm 4.18 0.74 1000 1000 2000 2000		
peak SQED ¢ peak SQED ¢ phasell e-laser 16.5 GeV phasell e-laser 17.5 GeV phasell g-laser 16.5 GeV phasell g-laser 16.5 GeV phasell g-laser 17.5 GeV phasell g-laser 17.5 GeV	pulse shape gauss gauss gauss gauss gauss flatTR	w ₀ = 3.0µm 16.7 2.96 1000 1000 2000	w ₀ = 4.0µm 12.53 2.22 1000 1000	w ₀ = 5.0µm 10.03 1.78 1000 1000 1000	w ₀ = 6.0µm 8.35 1.48 1000 1000 1000	w ₀ = 7.0µm 7.16 1.27 1000 1000	w ₀ = 8.0µm 6.27 1.11 1000 1000 2285 1000	w ₀ = 9.0µm 5.57 0.99 1000 1000 2000 2000	w ₀ = 10.0μm 5.01 0.89 1000 1000 2000 2000	w ₀ = 11.0μm 4.56 0.81 1000 1000 2000 2000	w ₀ = 12.0µm 4.18 0.74 1000 1000 2000 2000		
peak SQED c peak SQED c phasel - laster 16.5 GeV phasel - laster 16.5 GeV phasel g-laster 16.5 GeV phasel g-laster 16.5 GeV phasel g-laster 16.5 GeV phasel ig-laster 16.5 GeV phasel ig-laster 16.5 GeV	pulse shape gauss gauss gauss gauss gauss flatTR	w ₀ = 3.0µm 16.7 2.96 1000 1000 2000	w ₀ = 4.0µm 12.53 2.22 1000 1000	w ₀ = 5.0µm 10.03 1.78 1000 1000 1000	w ₀ = 6.0µm 8.35 1.48 1000 1000 1000	w ₀ = 7.0µm 7.16 1.27 1000 1000 1000	w ₀ = 8.0µm 6.27 1.11 1000 1000 2285 1000	w ₀ = 9.0µm 5.57 0.99 1000 1000 2000 2000	w ₀ = 10.0μm 5.01 0.89 1000 1000 2000 2000	w ₀ = 11.0μm 4.56 0.81 1000 1000 2000 2000	w ₀ = 12.0μm 4.18 0.74 1000 1000 2000 2000		

Aug-Oct 2020 Data Runs, bunch/pulse crossings completed

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