

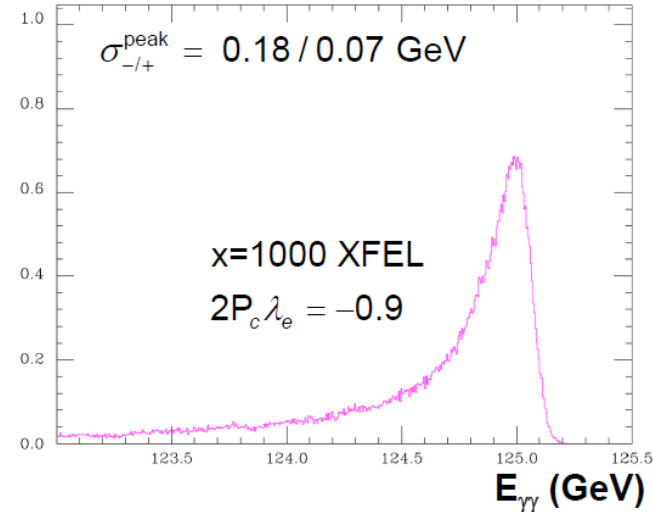
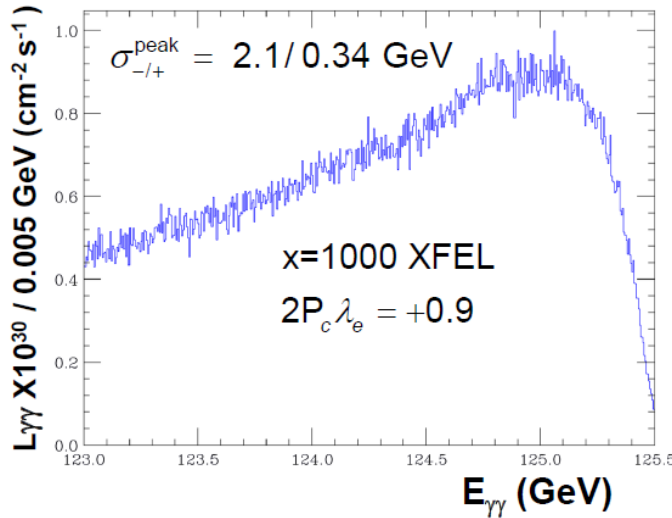
XFEL-based $\gamma\gamma$ Collider Higgs Factory

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XFEL $\gamma\gamma$ Collider Meeting

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$\gamma\gamma$ Luminosity Spectra $2P_c\lambda_e = +0.9$ vs -0.9



Bin size $\approx$
SM $\Gamma_H = 4$ MeV

Helicity product $2P_c\lambda_e = +0.9$ is chosen
to optimize Higgs production rate.

To measure total Higgs width with an
energy scan it is better to use
 $2P_c\lambda_e = -0.9$ ($\Delta\Gamma_H = 34$ vs. 8 MeV).

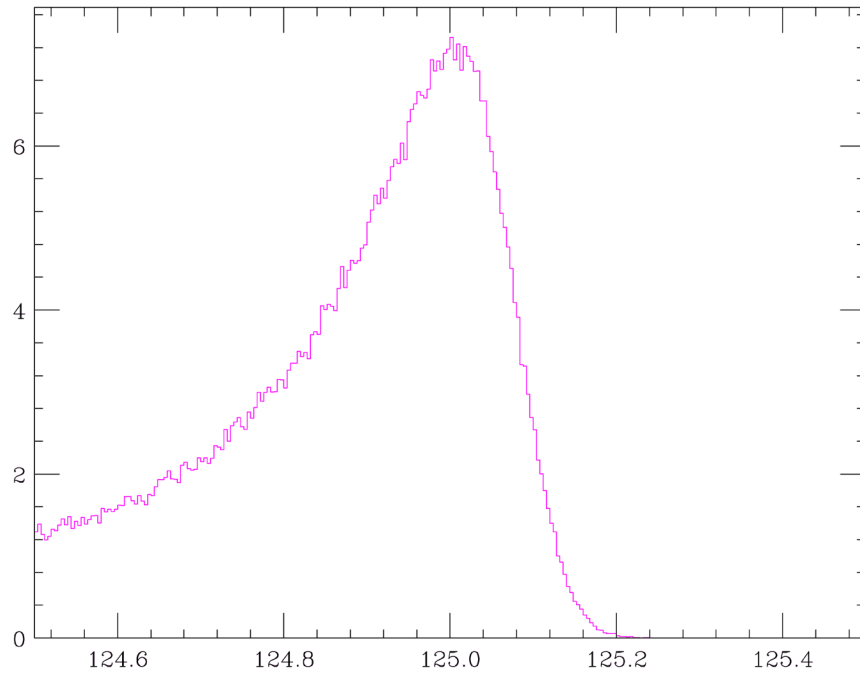
Non-linear QED $e^-\gamma_0 \rightarrow e^-\gamma$, $\gamma_0\gamma \rightarrow e^+e^-$
linear QED $e^-\gamma_0 \rightarrow e^-e^+e^-$ & $\Delta E_{e^-} = 0.05\%$
included in all $\gamma\gamma$ luminosity plots (CAIN)

Table 1: Summary of Compton and Primary IP parameters.

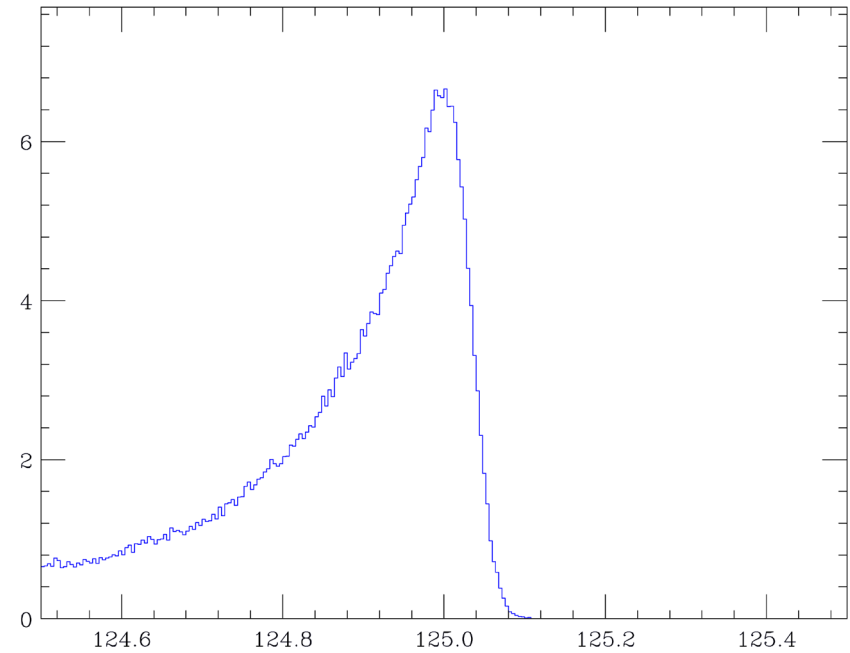
	x=1000 $2P_c\lambda_e = +0.9$	x=1000 $2P_c\lambda_e = -0.9$
Laser wavelength λ (nm)	1.2	1.2
Laser waist radius a_γ (nm)	37.7	37.7
Laser pulse length $= 2\beta_\gamma = \frac{4\pi a_\gamma^2}{\lambda}$ (μm)	15.0	15.0
Laser pulse energy (J)	0.72	0.72
e^- Compton conversion efficiency (%)	44.2	37.1
peak non-linear QED $\xi^2 = \frac{2n_\gamma r_e^2 \lambda}{\alpha}$	0.17	0.17
$\mathcal{L}_{\gamma\gamma}$ ($10^{33} \text{ cm}^{-2} \text{ s}^{-1}$)	0.92	0.13
$\mathcal{L}_{e^-\gamma}$	6.21	2.4
$\mathcal{L}_{e^+\gamma}$	0.54	0.24
$\mathcal{L}_{e^-e^-}$	7.5	8.0
$\mathcal{L}_{e^+e^-}$	2.54	3.64
$\mathcal{L}_{e^+e^-}$, $\sqrt{s} > 50$ GeV	0.34	0.38
$N_{\text{Higgs}}/\text{yr}$	30,800	21,700
$\Delta\Gamma_H$ from 1 yr energy scan (MeV)	34	8

$\gamma\gamma$ Luminosity Spectra $x=1000$ & 1400 $2P_c\lambda_e = -0.9$

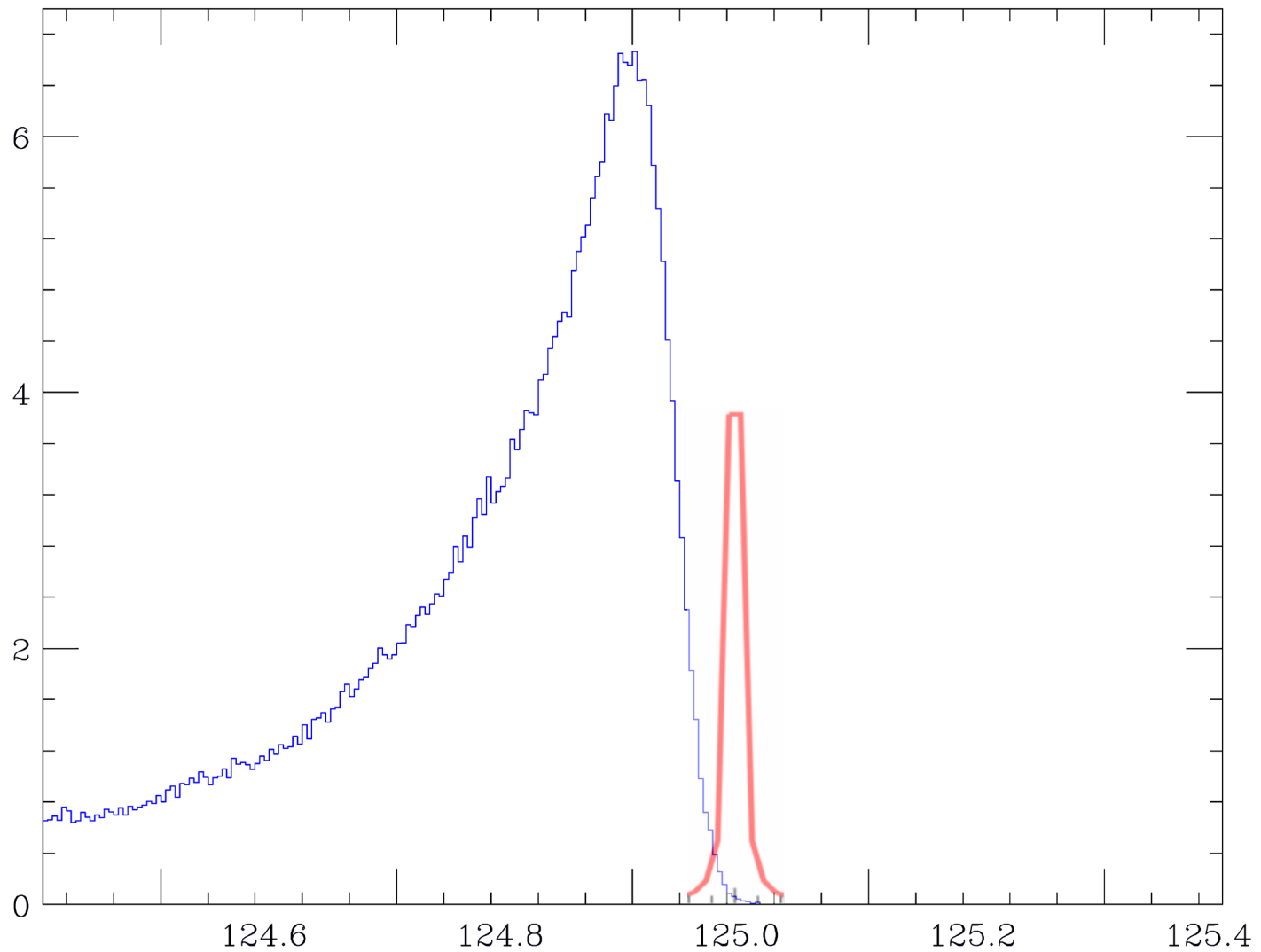
$x = 1000$ $a_\gamma = 37.7$ nm $\sigma_z = 10$ μm $\sigma_E = 0.05\%$



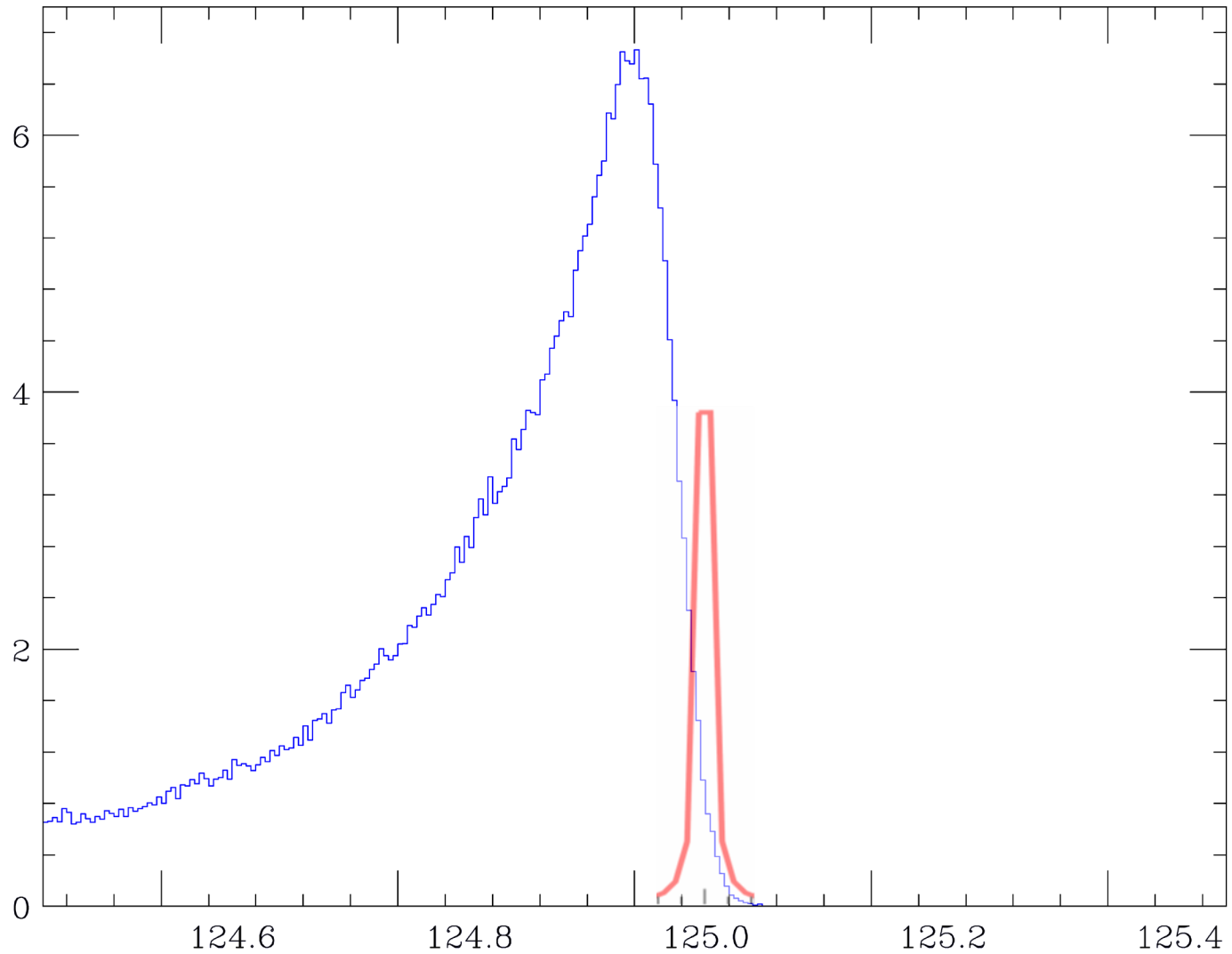
$x = 1400$ $a_\gamma = 27.6$ nm $\sigma_z = 5$ μm $\sigma_E = 0.02\%$



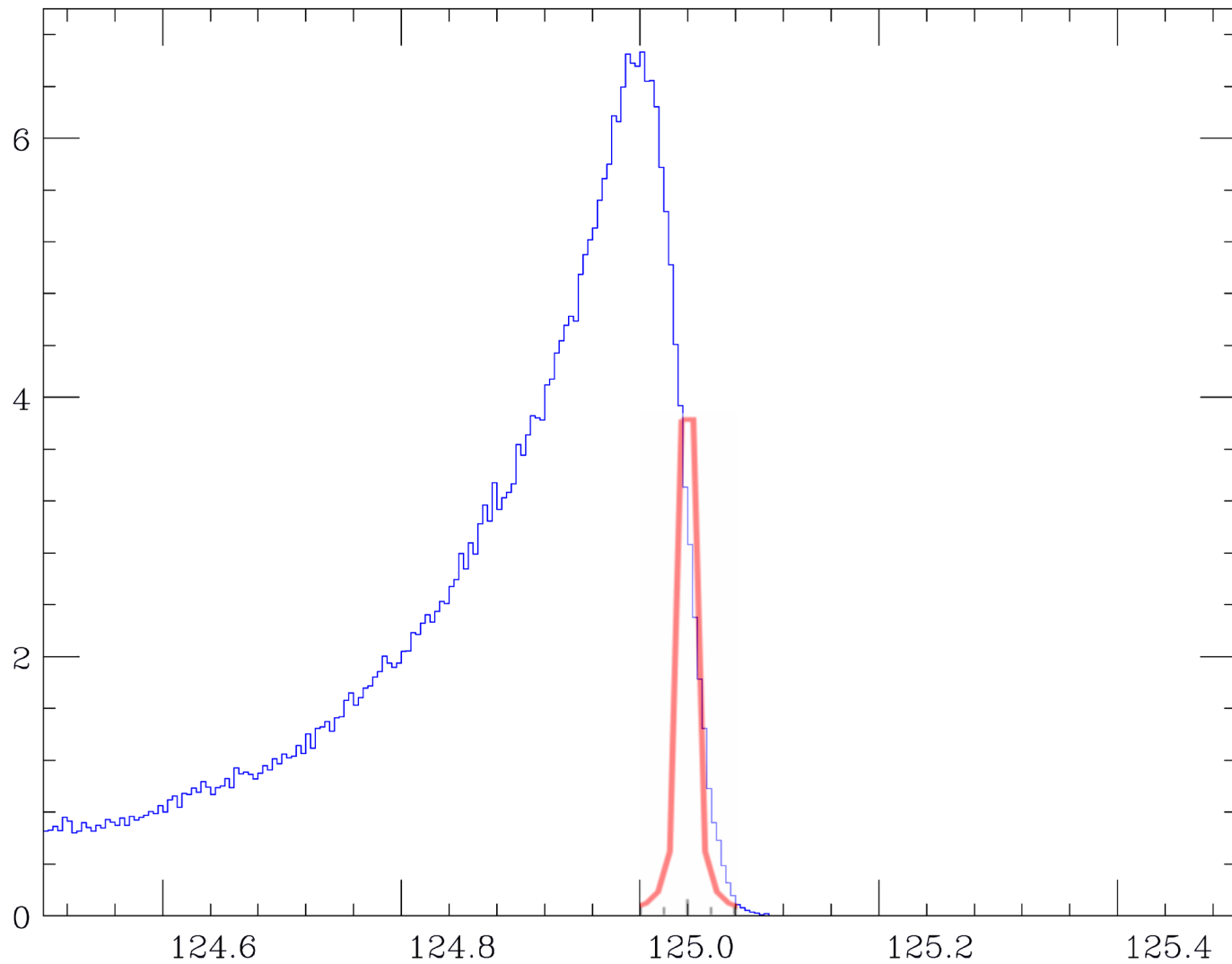
$\gamma\gamma$ Luminosity Spectra $x=1400$ $2P_c\lambda_e = -0.9$



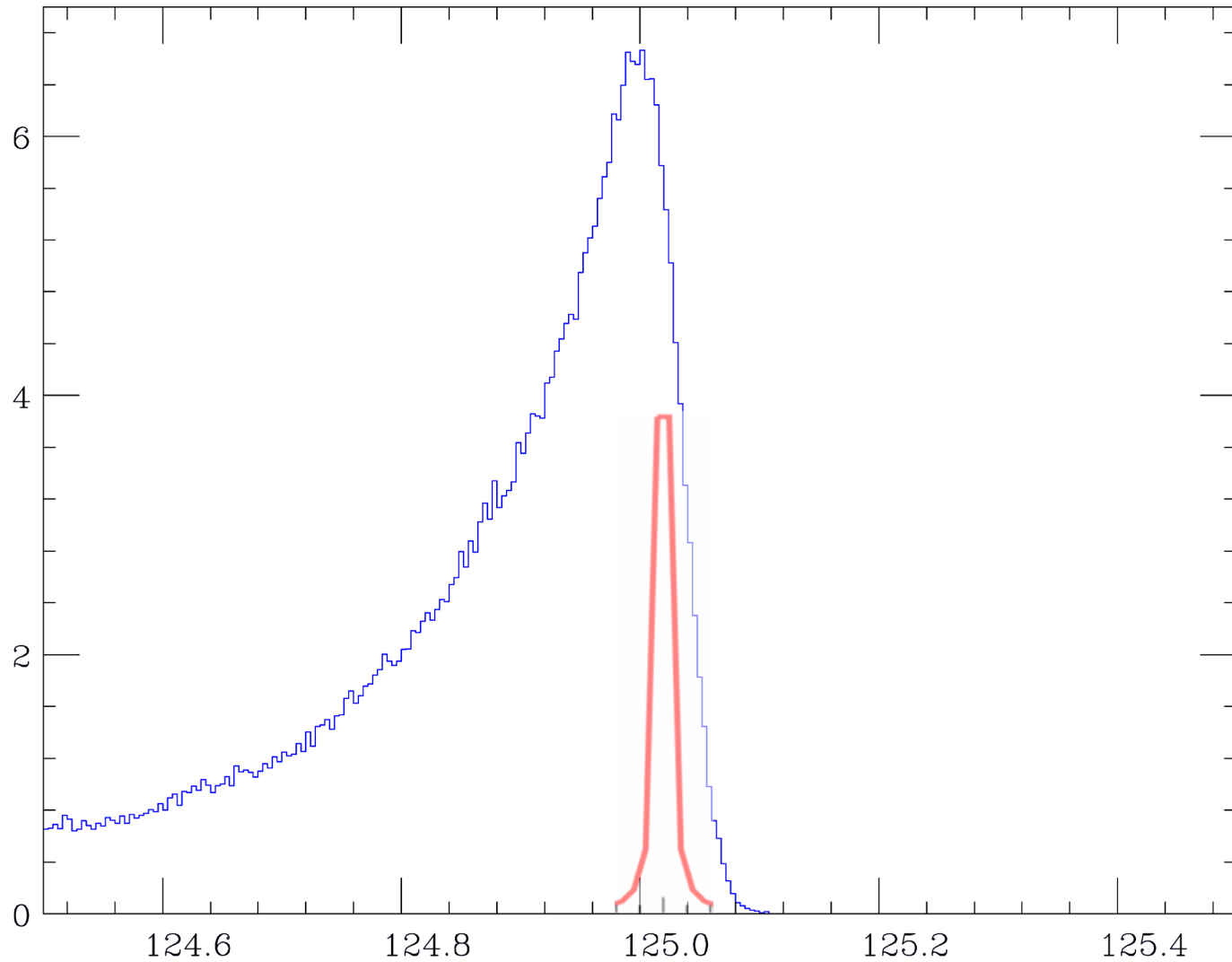
$\gamma\gamma$ Luminosity Spectra $x=1400$ $2P_c\lambda_e = -0.9$



$\gamma\gamma$ Luminosity Spectra $x=1400$ $2P_c\lambda_e = -0.9$



$\gamma\gamma$ Luminosity Spectra $x=1400$ $2P_c\lambda_e = -0.9$



$\gamma\gamma$ Luminosity Spectra $x=1400$ $2P_c\lambda_e = -0.9$

