

Luminosities for ee, eg, and gg interactions

Update 1 with 350 GeV numbers

Update 2 with 1.4 TeV numbers

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Normalisation of Processes Involving Beamstrahlung Photons



- Remark from A. Miyamoto at ILD Phone Meeting on May 8. <http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=6045>
- Too many events from processes involving Beamstrahlung photons are used, because the instantaneous luminosities differ
- Rates are overestimated

- CLIC is not only a e^+e^- collider, it also collides photons with photons and electron (or positrons) with photons
- GUINEAPIG provides the luminosities for all these collisions
- Photons are coming from Beamstrahlung
- The instantaneous luminosities for these collisions are not the same
- During the same time-frame the total integrated luminosities are different
- 2 ab^{-1} of e^+e^- collisions are not corresponding to the same time as 2 ab^{-1} of $e\gamma$ collisions

Different Instantaneous Luminosities



Total instantaneous luminosities for different centre-of-mass energy CLIC machines

Collision		350 GeV	0.5 TeV	1.4 TeV	3 TeV
ee	$[10^{34} \text{ cm}^{-2}\text{s}^{-1}]$	1.4	2.4		6.7
eg	$[10^{34} \text{ cm}^{-2}\text{s}^{-1}]$	0.63	1.2		5.3
ge	$[10^{34} \text{ cm}^{-2}\text{s}^{-1}]$	0.63	1.2		5.3
gg	$[10^{34} \text{ cm}^{-2}\text{s}^{-1}]$	0.32	0.75		4.6

- From the “summary files” found here:
<http://clic-beam-beam.web.cern.ch/clic-beam-beam/>
- For the 3 TeV files the luminosities are about 10% larger, because the budget for the dynamic emittance growth (10%) was not exhausted (If I Recall Correctly)
- Files for 350 GeV and 1.4 TeV are not available on the website.
- **Update 1:** Ran 350 GeV: Assuming $N = 0.68 \cdot 10^9$, 354 Bunches

Instantaneous luminosities normalised to the ee luminosity for different centre-of-mass energy CLIC machines

Collision		350 GeV	0.5 TeV	1.4 TeV	3 TeV
ee	L_{ee}/L_{ee}	1.0	1.0	1.0	1.0
eg	L_{eg}/L_{ee}	0.45	0.50	0.75	0.79
ge	L_{ge}/L_{ee}	0.45	0.50	0.75	0.79
gg	L_{gg}/L_{ee}	0.23	0.31	0.64	0.69

- **Update 2:** Preliminary numbers for 1.4 TeV from D. Schulte via 'slightly approximated simulation' (private communication)

GG To Hadron Events



This does *not* affect the number of $\gamma\gamma \rightarrow$ hadron events per bunch crossing. This number is coming directly from GUINEAPIG and takes the different luminosities into account

Summary



- $eg/ge/gg$ background rates are probably smaller than anticipated
- Need information about the 1.4 TeV luminosities



Backup Slides

$$L \propto \frac{1}{\sigma_x \sigma_y} \quad (1)$$

$$\sigma = \sqrt{\beta \varepsilon} \quad (2)$$

- σ : bunch size
- β : beta function at IP
- ε : emittance at IP