Radiative Bhabhas LUMON

(work done for the TESLA-CDR in 1997)

Luminosity Monitor Studies for TESLA

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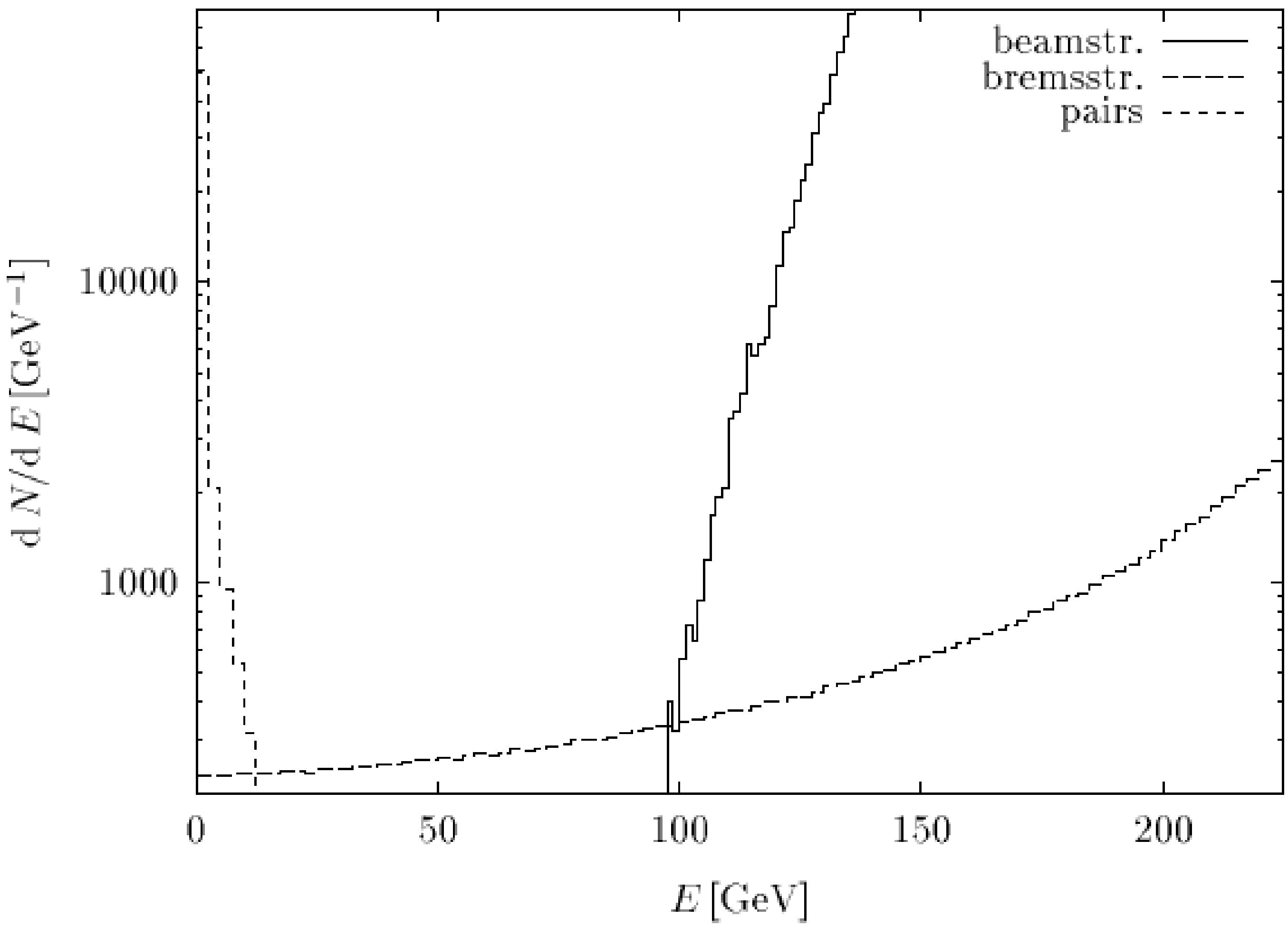
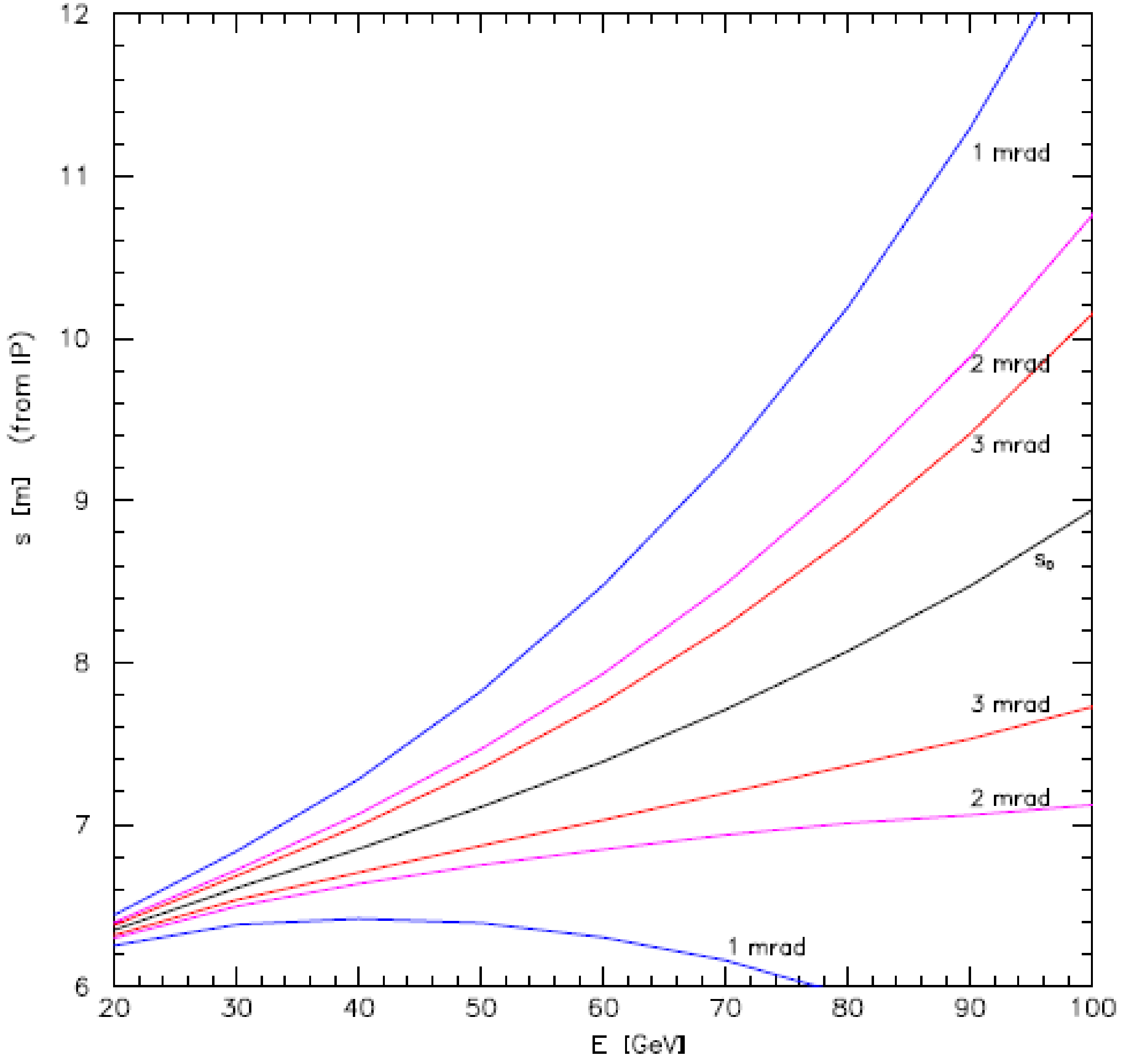


Figure 1: The energy spectrum of the particles due to pair production, bremsstrahlung and beamstrahlung for TESLA (500 GeV c.m.) parameters.

Outgoing Doublet acts as a Rough Spectrometer



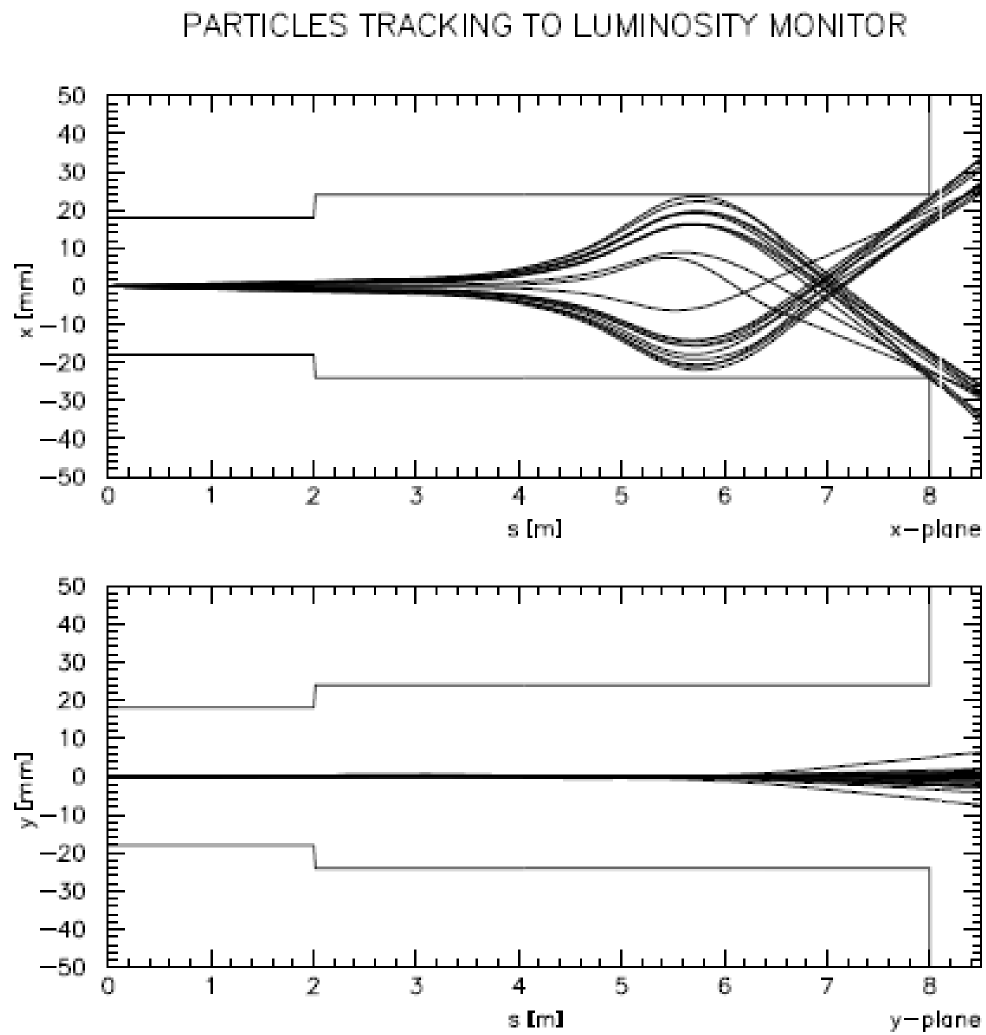


Figure 3: Trajectories from the IP hitting the luminosity monitor at 8.5 m

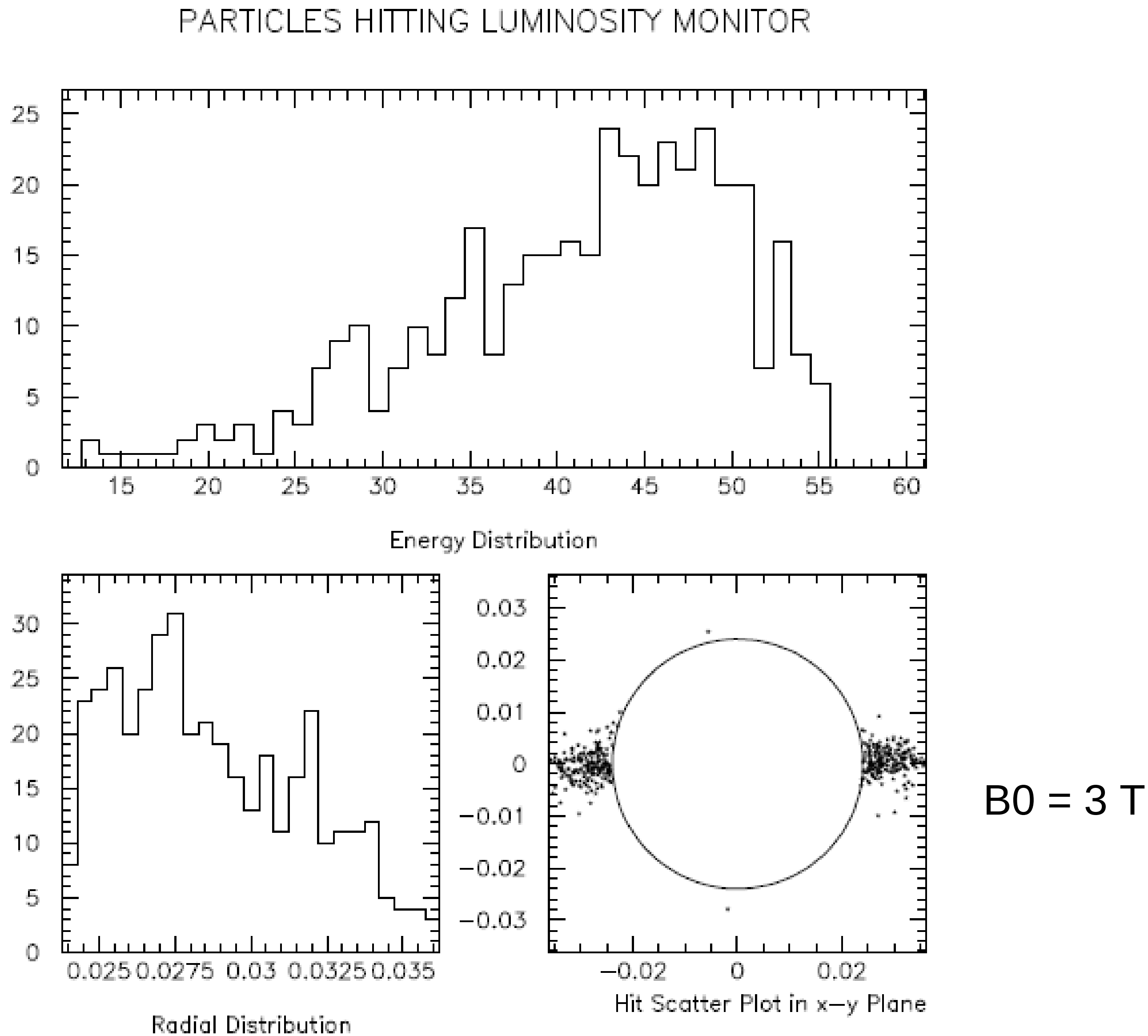
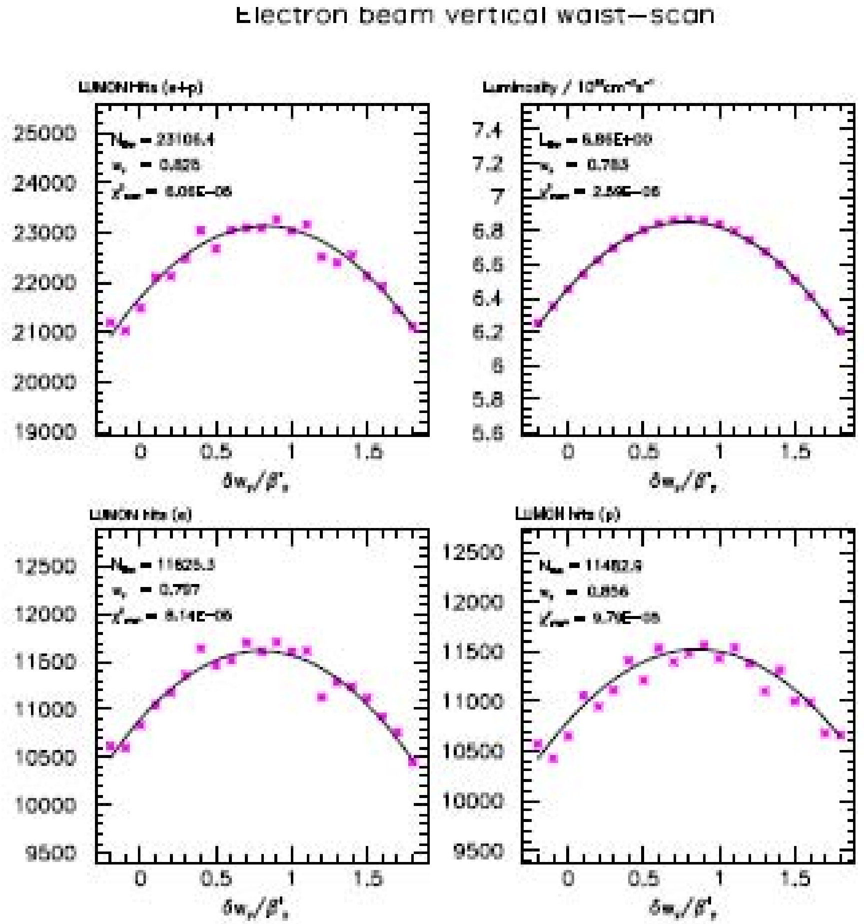
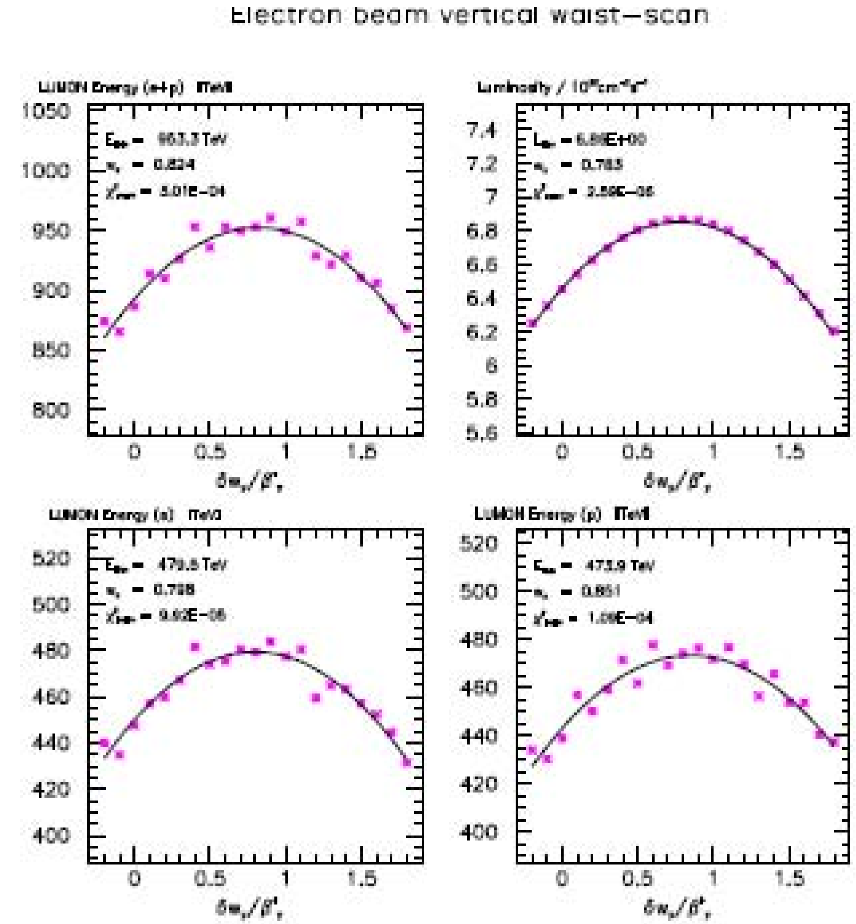


Figure 4: Energy and transverse distributions of the bremsstrahlung particles hitting the luminosity monitor for a single bunch crossing



(a)



(b)

Figure 5: Scan of the vertical waist shift: (a) numbers of hits (b) energy deposited on the luminosity detector. Parabolic fits are drawn through the data points

The waist-shift and coupling scans in Figs.(5,7) involve 21 points, each of them integrating over 25 beam crossings, and therefore a total of 525 beam crossings. In order to test the influence of the number of data points on the fit precision, the dispersion scan involves only 11 points integrating 25 beam crossings and thus 275 beam crossings in total. The optimal luminosity as determined by parabolic fits can be compared with the maximum of the calculated luminosity. The relative precisions $\delta\mathcal{L}/\mathcal{L}$ obtained for the different scans are reported in Table 2. Clearly the luminosity optimum can be

	Waist	Dispersion	Coupling
e^--hits	$2.0 \cdot 10^{-5}$	$2.3 \cdot 10^{-5}$	$3.1 \cdot 10^{-6}$
e^+-hits	$5.1 \cdot 10^{-4}$	$3.6 \cdot 10^{-4}$	$1.7 \cdot 10^{-5}$
$(e^- + e^+)$-hits	$1.7 \cdot 10^{-4}$	$4.8 \cdot 10^{-5}$	$1.5 \cdot 10^{-6}$
e^--energy	$2.3 \cdot 10^{-5}$	$5.4 \cdot 10^{-5}$	$2.6 \cdot 10^{-7}$
e^+-energy	$4.5 \cdot 10^{-4}$	$4.0 \cdot 10^{-4}$	$2.8 \cdot 10^{-5}$
$(e^- + e^+)$-energy	$1.6 \cdot 10^{-4}$	$3.6 \cdot 10^{-5}$	$8.3 \cdot 10^{-6}$

Table 2: Relative precision $\delta\mathcal{L}/\mathcal{L}$ in the determination of the optimal luminosity for the various scans and signals from the luminosity monitor