Recap

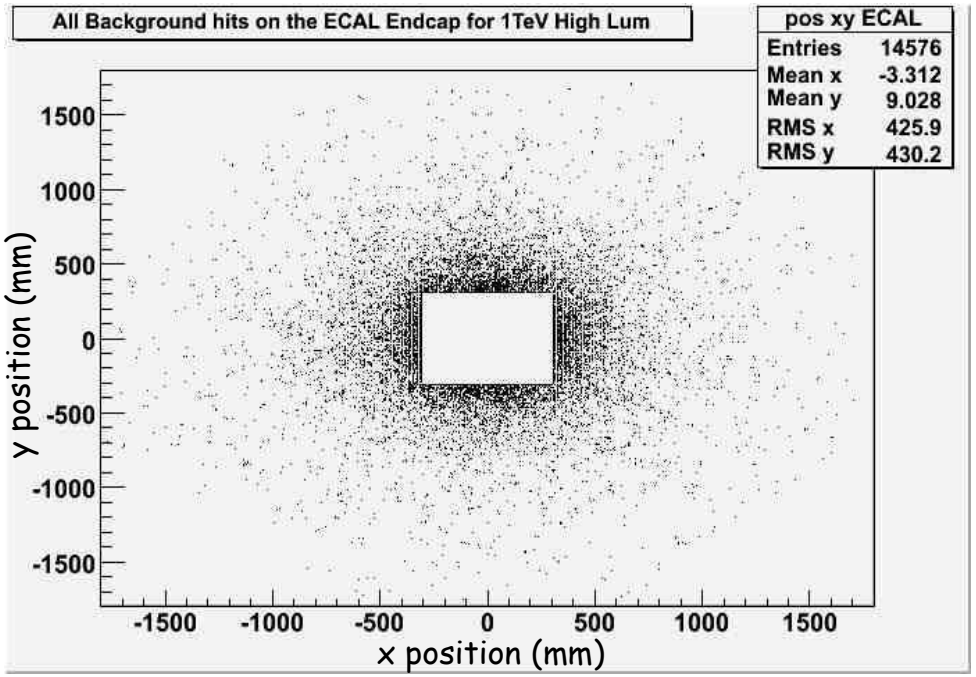
- GuineaPig produces simulations of background pair production for different accelerator configurations.
- Although these background pairs rarely interact directly with the ECAL, (due to low transverse momentum) they may interact with other parts of the detector closer to the beam axis.
- These interactions were simulated in Mokka. The results (for the ECAL) are shown on the following slides.

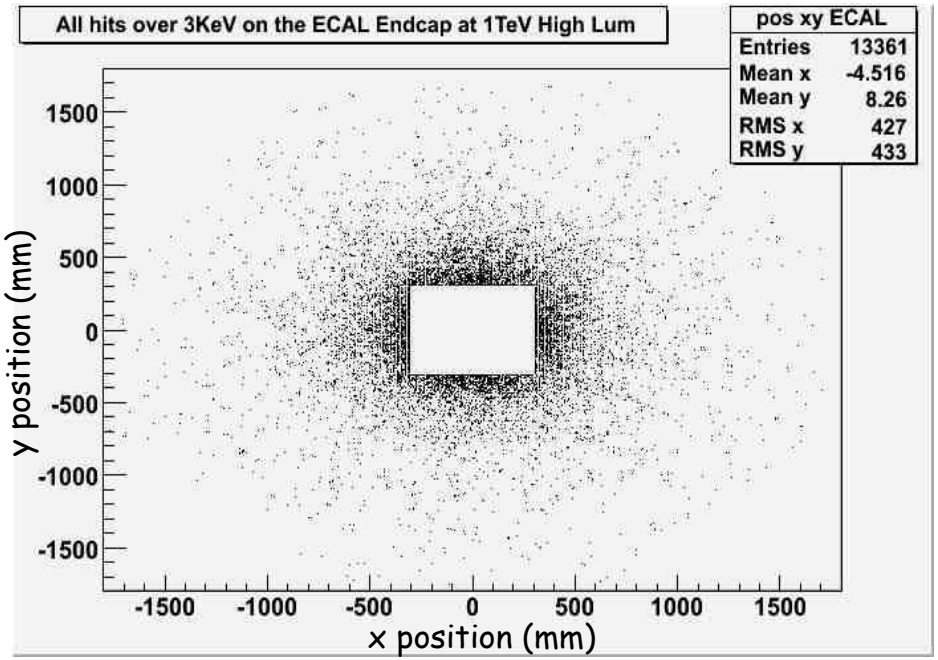
Recap

- The accelerator configurations which by far cause the most hits in the ECAL are the High Luminosity and Low Power configurations. Therefore analysis of 'worst case scenarios' for background hits will tend to focus on these configurations.
- Additionally operating at 1TeV produces more background hits than 500GeV. Therefore those simulations run with 1TeV centre of mass energy are of greater interest than those at 500GeV.
- Note: all data displayed is based on the simulation of a single bunch crossing.

High Luminosity Configuration

- Hits with energy < 3KeV will be drowned out by noise in the detector. Low energy hits have been removed from the right hand plot:

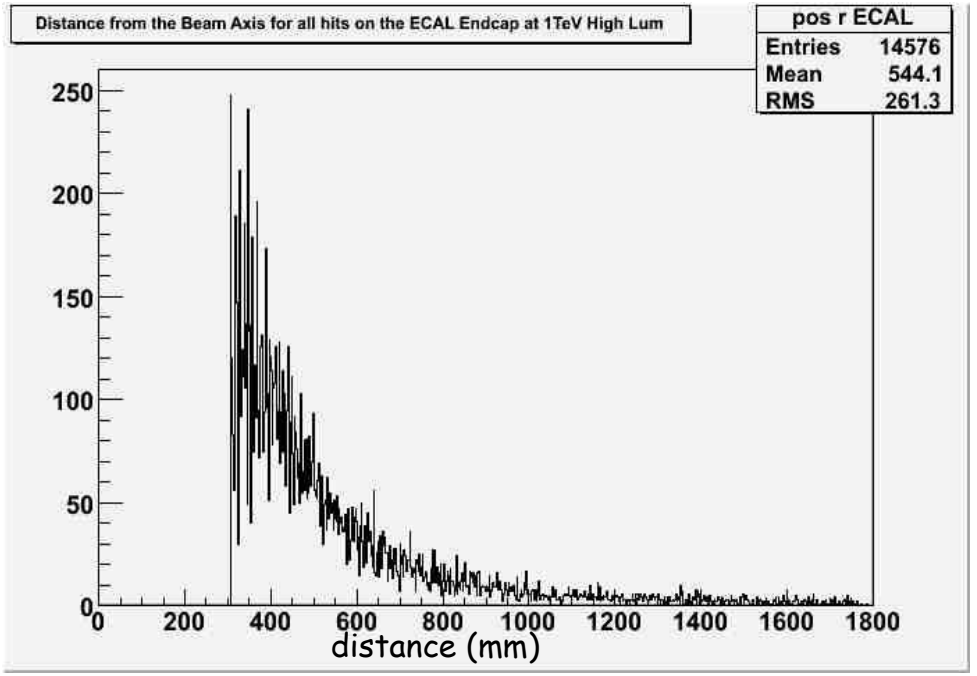


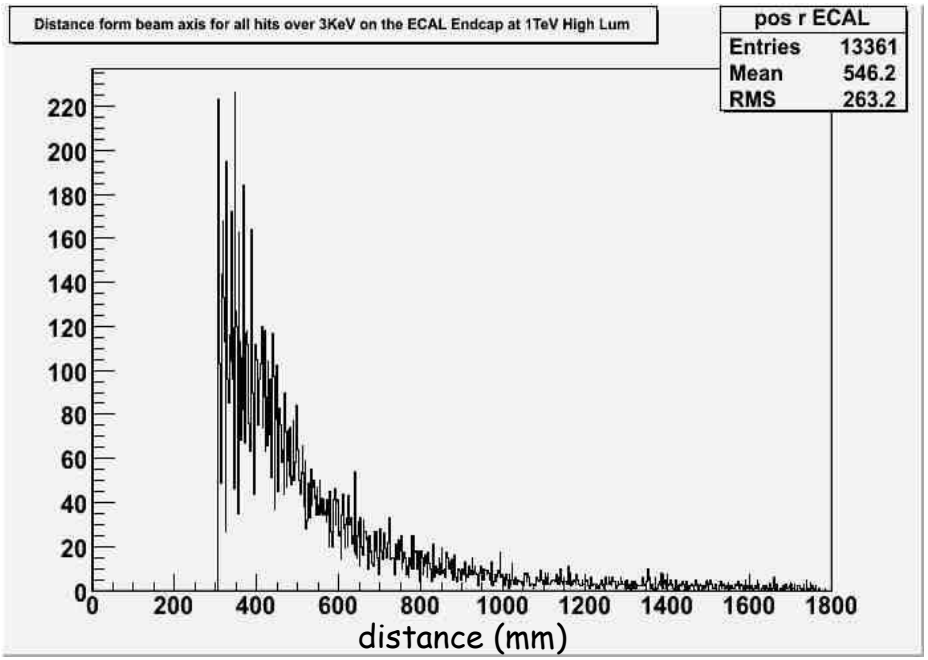


Note: the number of entries shown in the top right hand corner of each plot is the number of particles that hit the ECAL endcap (minus those that have energy less than 3KeV for the right hand plot).

High Luminosity Configuration

- Hits with energy < 3KeV will be drowned out by noise in the detector. Low energy hits have been removed from the right hand plot:

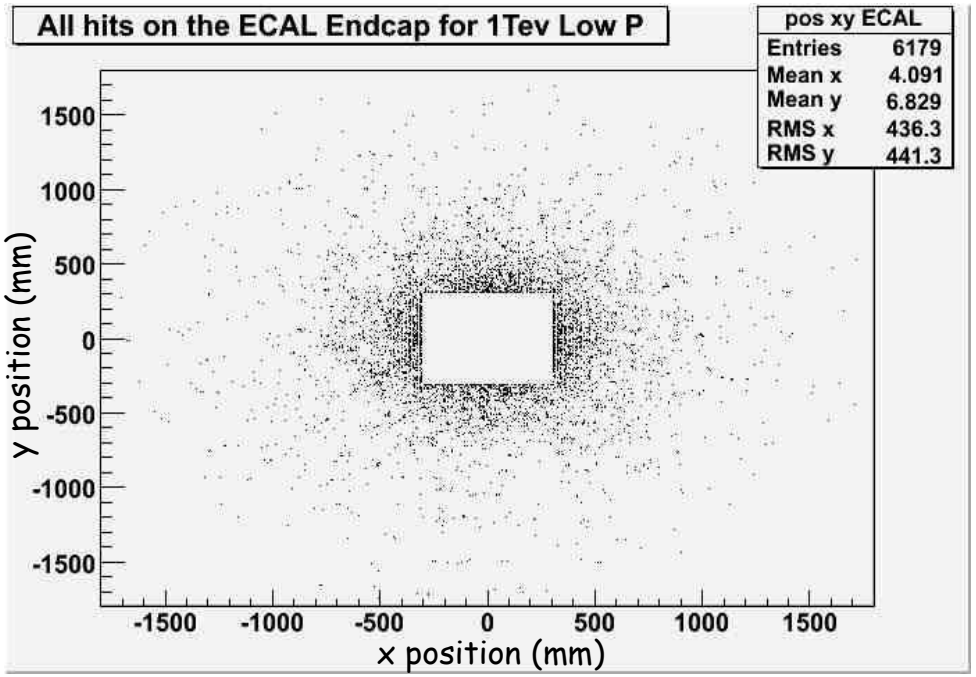


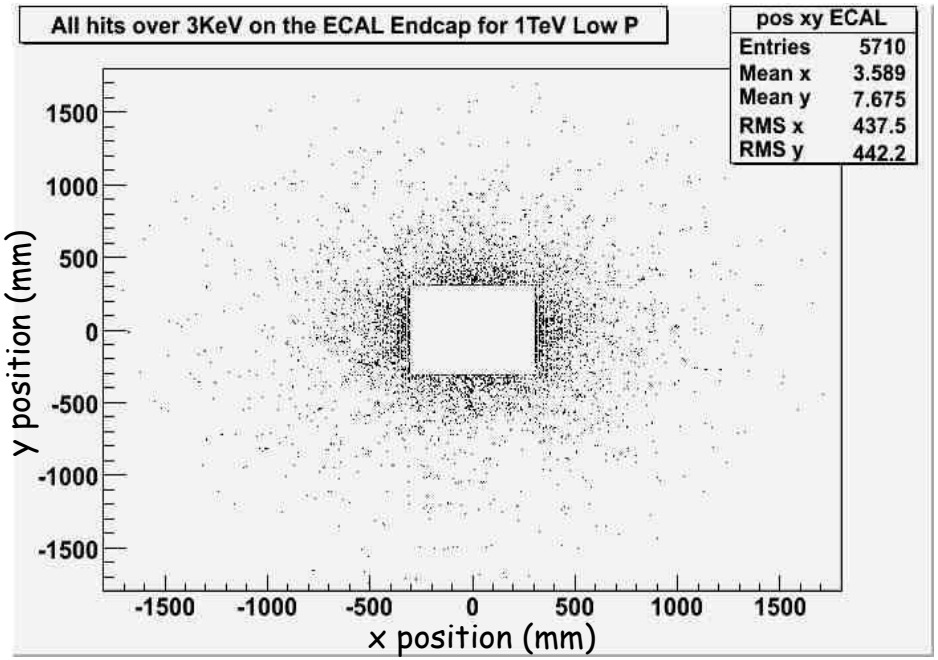


Note: the number of entries shown in the top right hand corner of each plot is the number of particles that hit the ECAL endcap (minus those that have energy less than 3KeV for the right hand plot).

Low Power Configuration

- Hits with energy < 3KeV will be drowned out by noise in the detector. Low energy hits have been removed from the right hand plot:

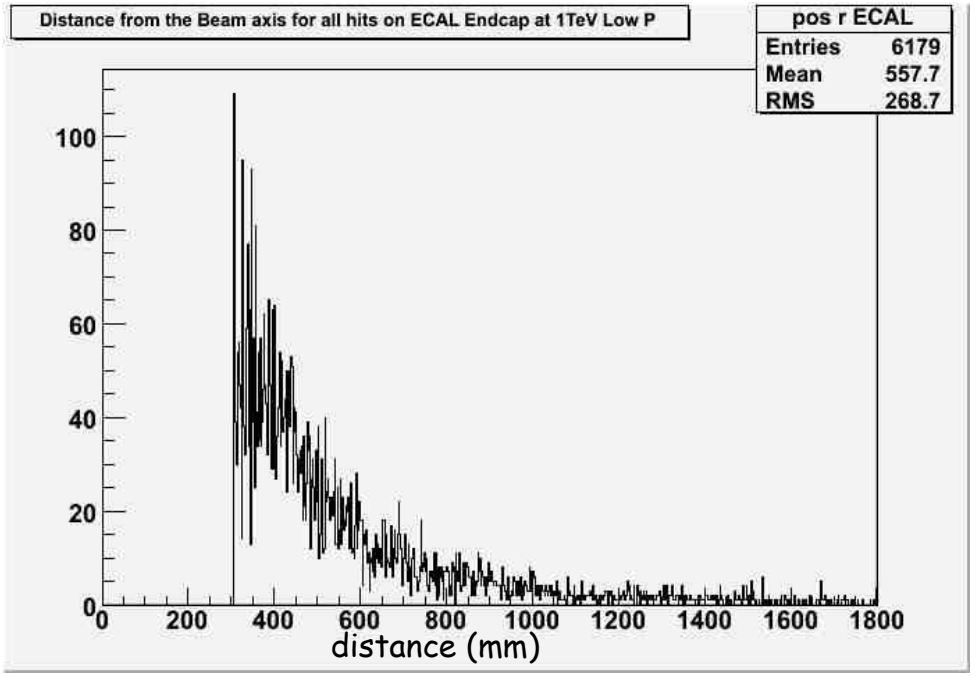


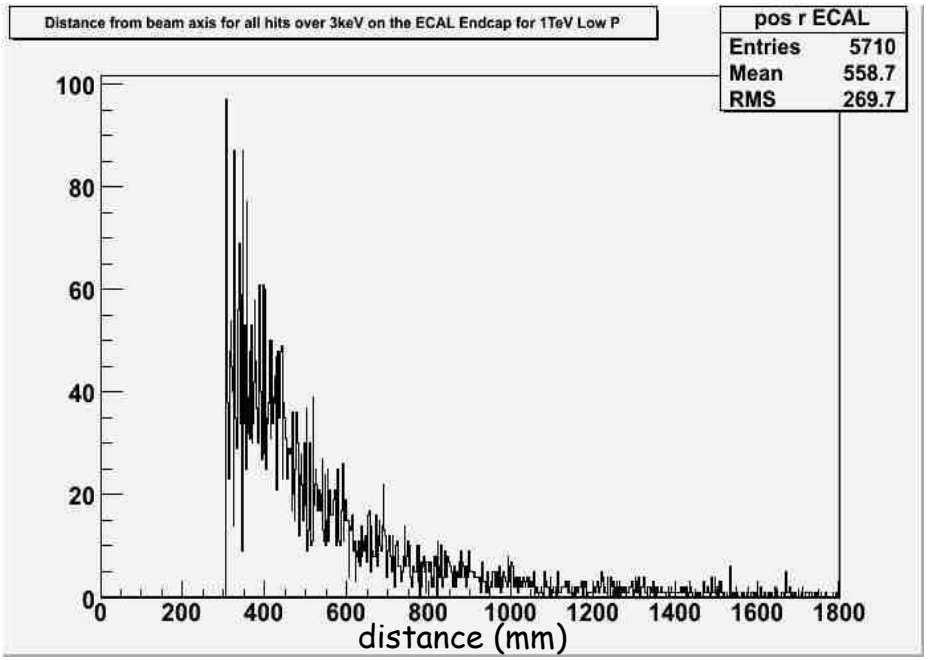


Note: the number of entries shown in the top right hand corner of each plot is the number of particles that hit the ECAL endcap (minus those that have energy less than 3KeV for the right hand plot).

Low Power Configuration

- Hits with energy < 3KeV will be drowned out by noise in the detector. Low energy hits have been removed from the right hand plot:

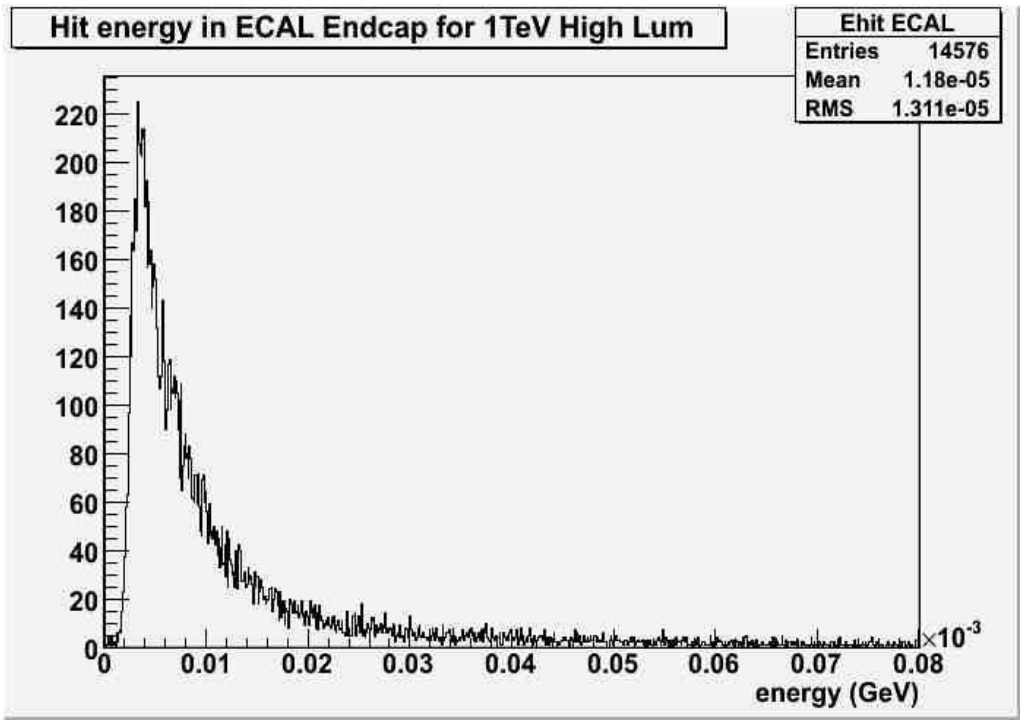




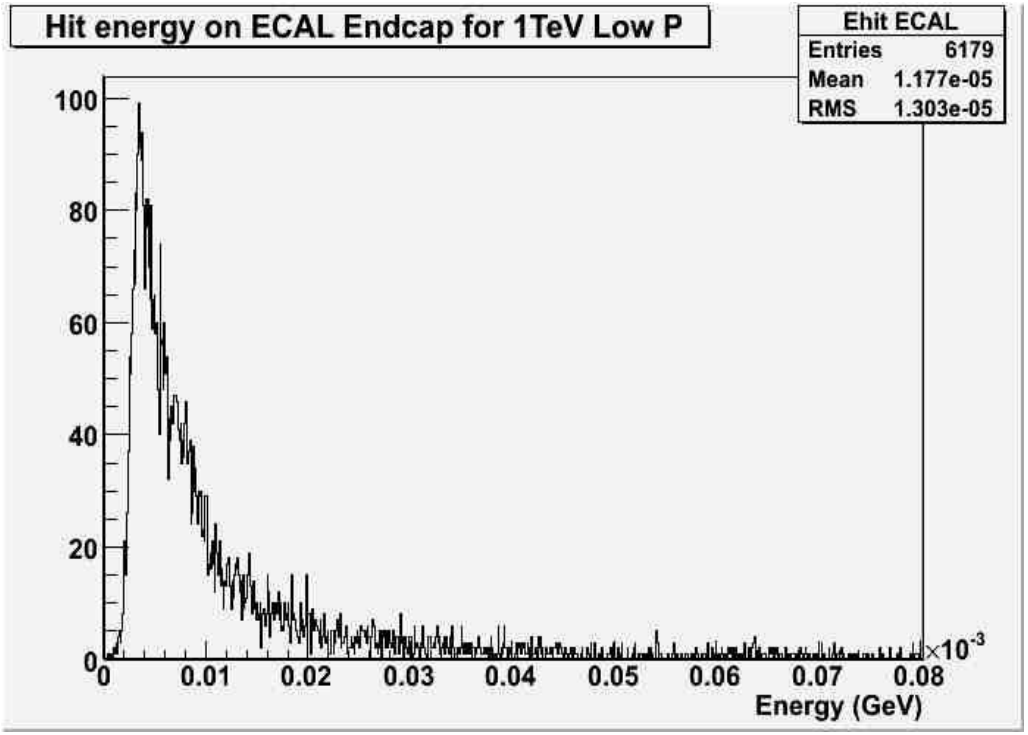
Note: the number of entries shown in the top right hand corner of each plot is the number of particles that hit the ECAL endcap (minus those that have energy less than 3KeV for the right hand plot).

Energy Spectra

High Luminosity Configuration



Low Power Configuration



Proposed work

- This data can be used to extrapolate the effect of multiple bunch crossing on the ECAL.
- This can then be used to calculate how much energy the average pixel will have to absorb and what probability it has of being hit more than once before it has reset.

Numbers of ECAL hits for different configurations:

Accelerator Configuration	Centre of Mass Energy	Number of hits in ECAL Endcap	Number of hits in ECAL Barrel
High Lum	1TeV	14576	1014
Low P	1TeV	6179	501
Low Q	1TeV	39	12
Large Y	1TeV	55	14
nominal	1TeV	100	22
High Lum	500GeV	6197	469
Low P	500GeV	2589	191
Low Q	500GeV	17	5
Large Y	500GeV	33	23
nominal	500GeV	66	10

ILC Machine Parameters

500 GeV Beam and IP Parameters

	TESLA	USSC	Nominal	Low Q	Large Y	Low P	High Lum
E_cms (GeV)	500	500	500	500	500	500	500
N	2.00E+10	2.00E+10	2.00E+10	1.00E+10	2.00E+10	2.00E+10	2.00E+10
Nb	2820	2820	2820	5640	2820	1330	2820
T_sep (ns)	336.9	336.9	307.7	153.8	307.7	461.5	307.7
Buckets @ 1.3 GHz	438	438	400	200	400	600	400
I_ave (A)	0.0095	0.0095	0.0104	0.0104	0.0104	0.0069	0.0104
Gradient	23.40	28.00	30.00	30.00	30.00	30.00	30.00
Geometric Luminosity	1.64E+38	1.45E+38	1.20E+38	1.29E+38	1.12E+38	1.24E+38	2.83E+38
Luminosity ($m^{-2}s^{-1}$)	2.94E+38	2.57E+38	2.03E+38	2.01E+38	2.00E+38	2.05E+38	4.92E+38
Coherent pairs/bc	7.14E-35	4.65E-34	7.71E-43	4.29E-31	3.19E-56	3.31E-15	2.21E-09
Inc. Pairs/bc	4.14E+05	3.66E+05	2.59E+05	8.37E+04	3.50E+05	6.12E+05	6.37E+05

1 TeV Beam and IP Parameters

	TESLA	USCS	Nominal	Low Q	Large Y	Low P	High Lum
E_cms (GeV)	800	1000	1000	1000	1000	1000	1000
N	1.40E+10	2.00E+10	2.00E+10	1.00E+10	2.00E+10	2.00E+10	2.00E+10
Nb	4886	2820	2820	5640	2820	1330	2820
T_sep (ns)	175.4	336.9	307.7	153.8	307.7	461.5	307.7
Buckets @ 1.3 GHz	228	438	400	200	400	600	400
I_ave (A)	0.0128	0.0095	0.0104	0.0104	0.0104	0.0069	0.0104
Gradient	35.00	35.00	30.00	30.00	30.00	30.00	30.00
Geometric Luminosity	2.81E+38	2.27E+38	1.85E+38	1.85E+38	1.40E+38	1.81E+38	4.54E+38
Luminosity ($m^{-2}s^{-1}$)	5.07E+38	3.81E+38	2.82E+38	2.84E+38	2.81E+38	2.92E+38	7.88E+38
Coherent pairs/bc	3.15E-19	6.80E-11	1.92E-13	8.39E-08	2.03E-20	9.91E-01	8.18E+02
Inc. Pairs/bc	4.66E+05	5.01E+05	4.32E+05	1.50E+05	6.67E+05	1.10E+06	1.36E+06