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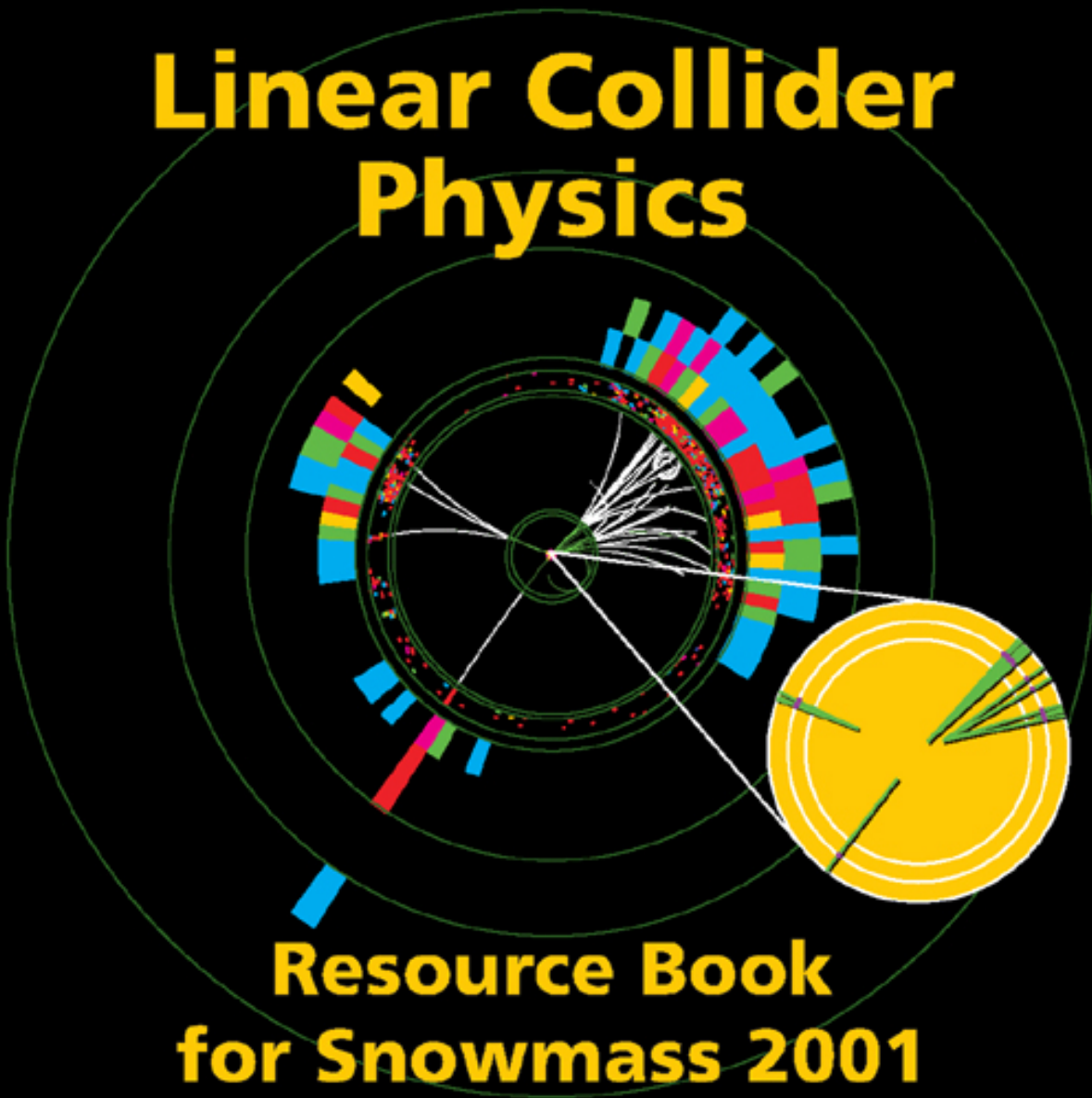
LBNL-47813
SLAC-R-570
UCRL-ID-143810-DR
May 2001

Linear Collider Physics



Resource Book for Snowmass 2001

American Linear Collider Working Group

Interaction Region Issues

Both TESLA and NLC base designs allow for 2 Interaction Regions

What are the issues?

The Physics Program - Could the physics goals be achieved by 1 IR?

Luminosity Sharing - Time sharing and/or luminosity enhancements?

International Participation - need for international financing of a world LC - could you envision an LC without international financing of an LC Detector?

Competition – wouldn't the scientific honesty and rigor be enhanced by competition of two detectors? Wouldn't the pace and efficiencies of construction be enhanced ? Wouldn't competition broaden the user involvement?

PHYSICS Topics

Topic	ENERGY
	(LEIR)
Giga – Z	92
W+- threshold	160
Higgs	220-340
tt-bar threshold	350
SUSY states	500 - 1 TeV
	(HEIR)
ZHH (Higgs self coupling)	> 500
νν-bar H (WWH coupling)	> 500
$e^- e^-$ and/or γ γ	> 500 (staged?)

TESLA Philosophy

Versus

NLC Philosophy

TESLA:

2^{nd} IR *IF* funding for BEAMLINE plus IR Hall
plus DETECTOR is available
time sharing of pulses (2 ½ Hz)
Both IRs have full/equal capabilities and luminosity
Possibility for $e^- e^-$ and $\gamma\gamma$ options

NLC:

Both IRs in baseline
Energy capabilities different – LEIR and HEIR
Potentially two distinct physics programs
Potentially different luminosities
Potentially increased luminosity
(180 Hz running?)

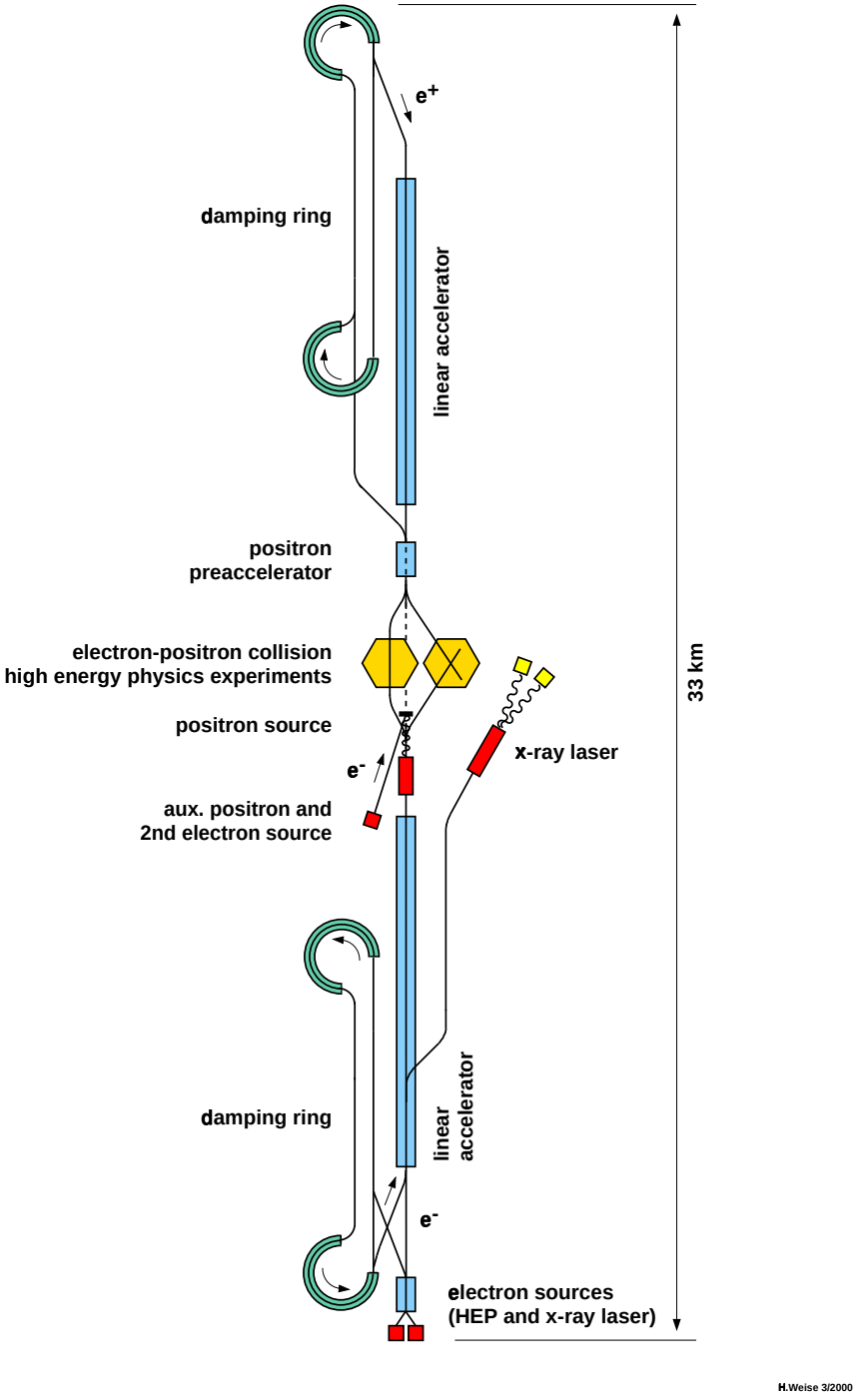


Figure 1.2.1: *Sketch of the overall layout of TESLA.*

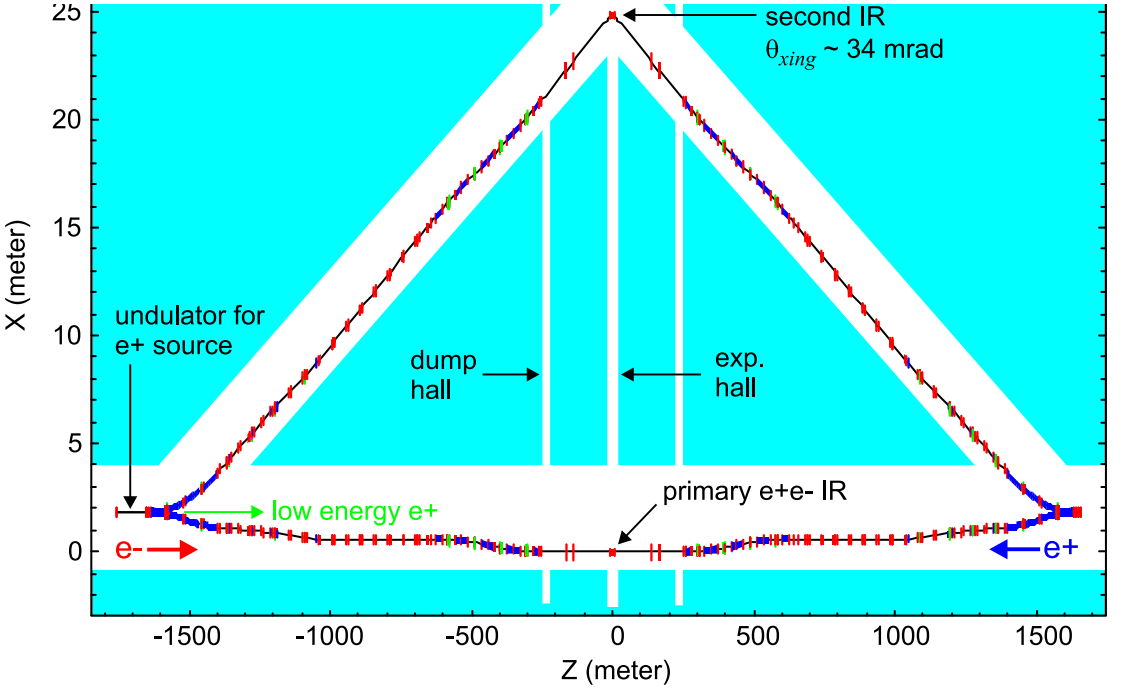
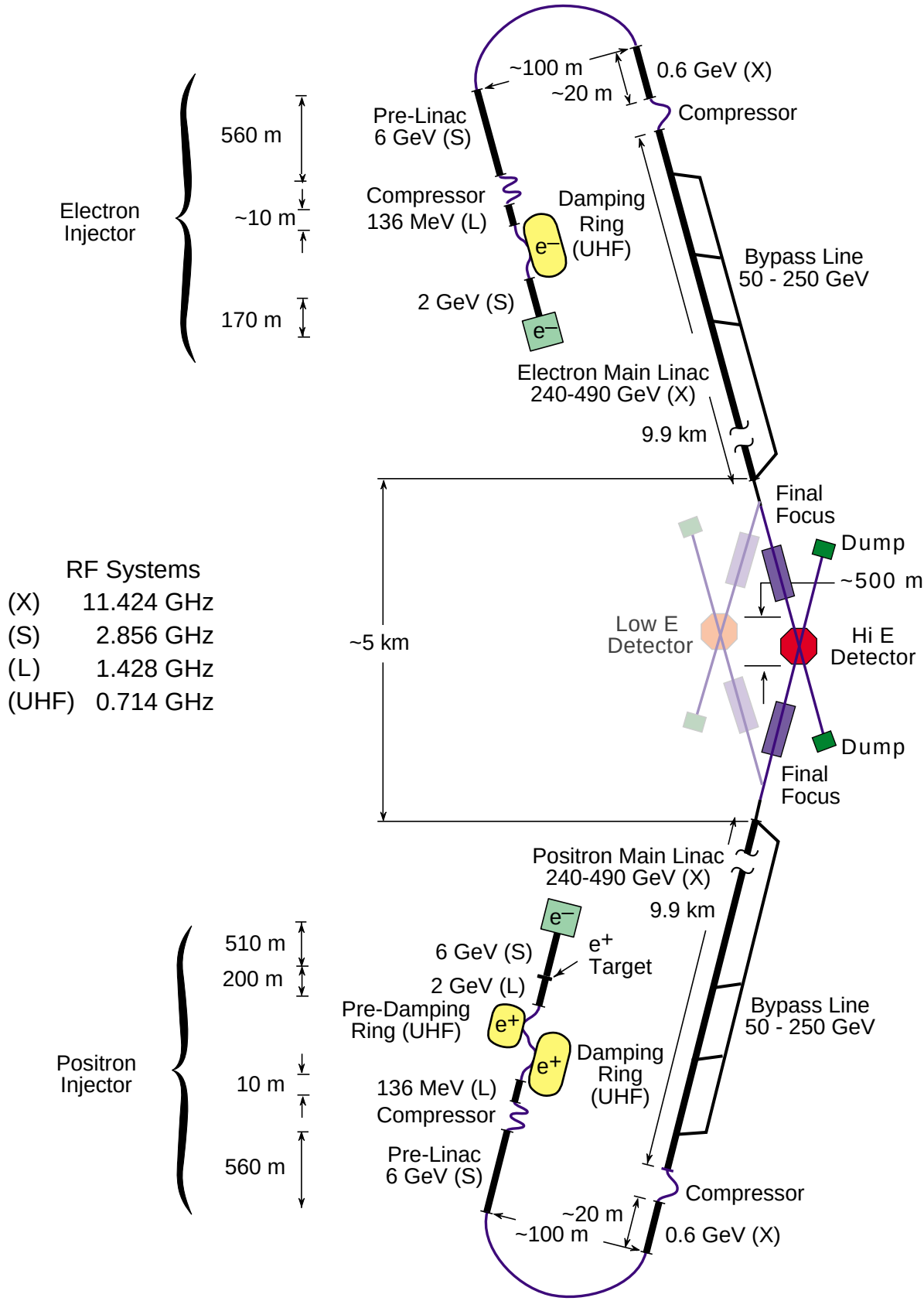


Figure 7.2.3: *Geometry of the TESLA BDS, including the second IR.*



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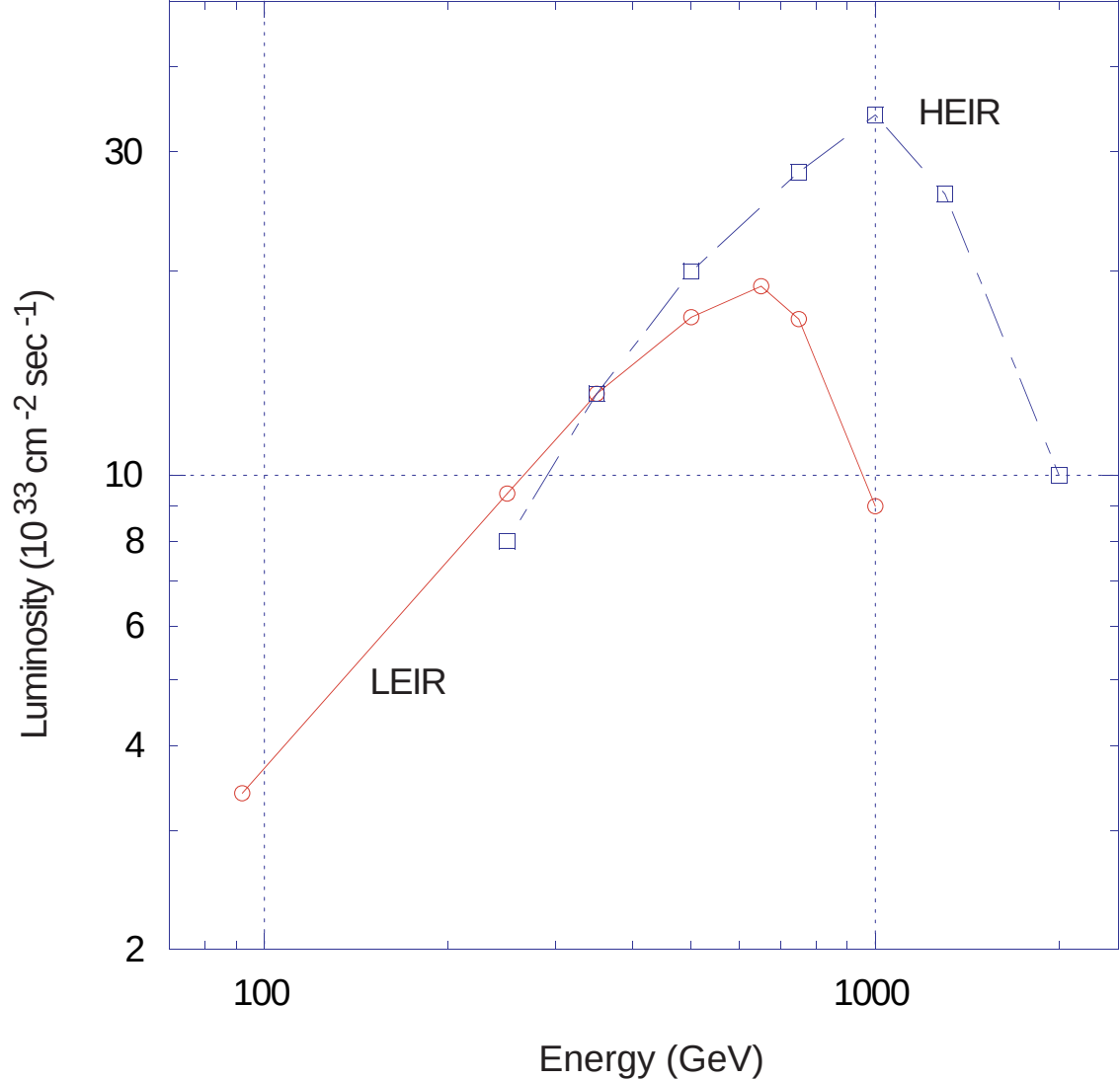
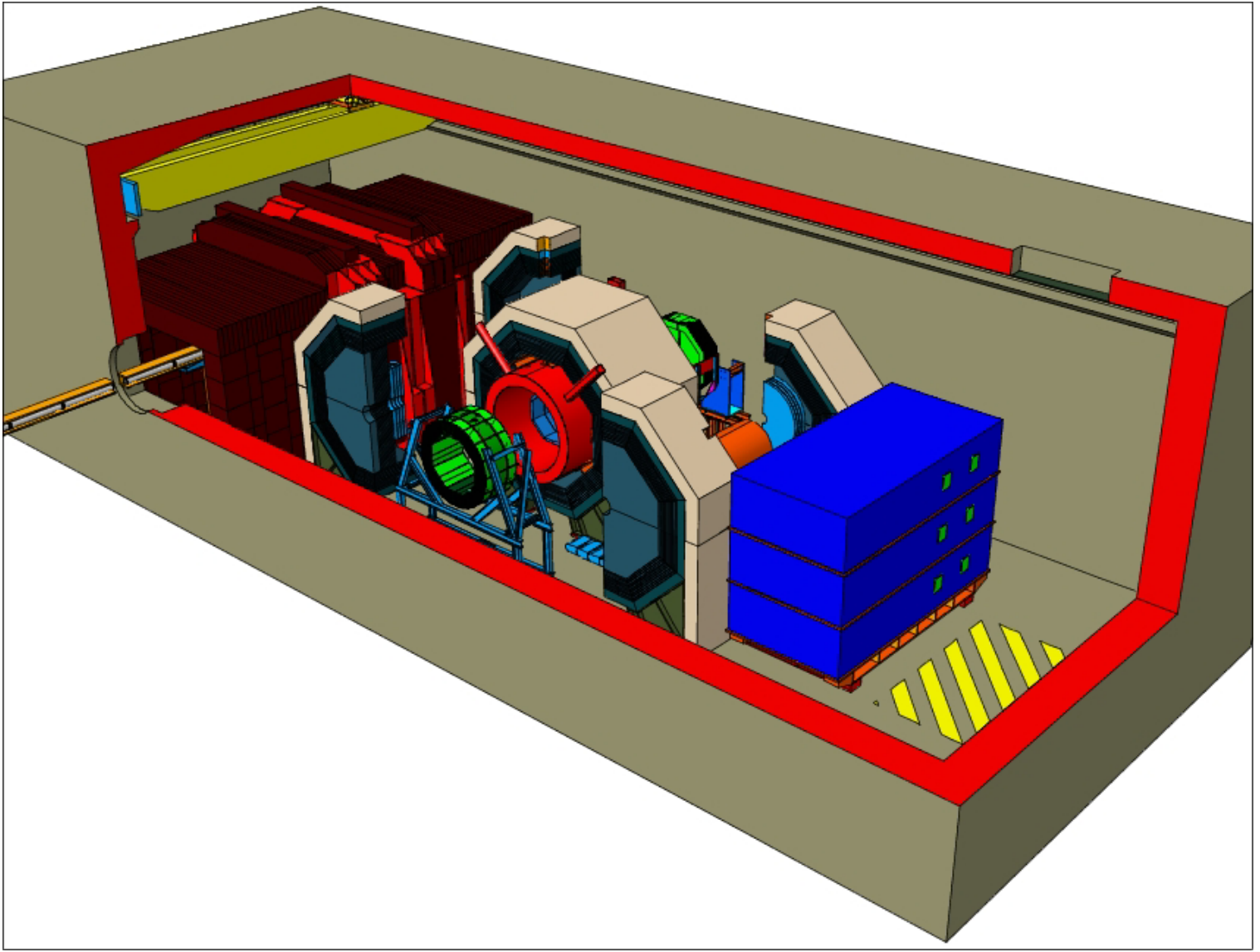
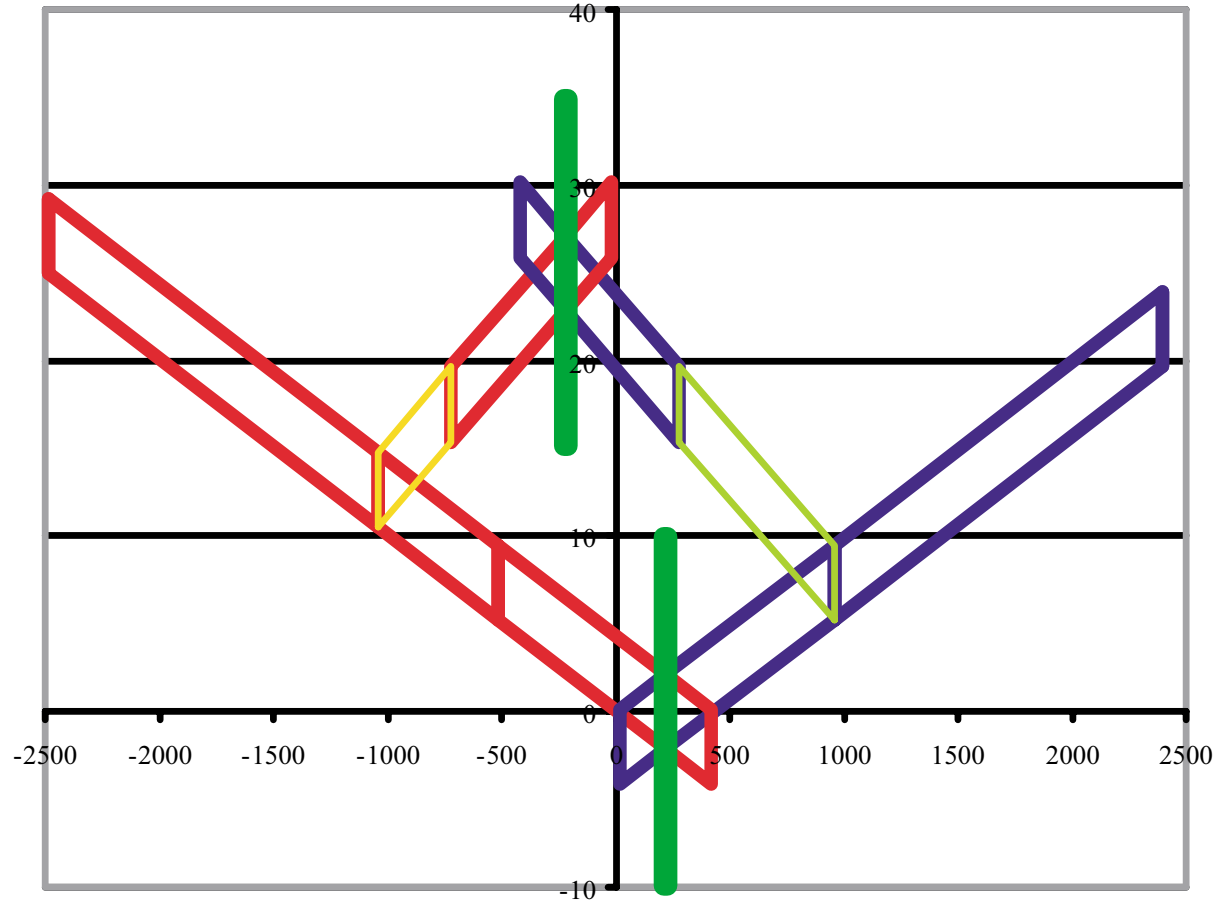

HEIR
LEIR
30
10
8
6
4
2
100
1000
Energy (GeV)
Luminosity (10 33 cm -2 sec -1)



Parameter	Small Detector	Large Detector
Detector footprint	12 × 11 m	20 × 20 m
Pit length	40 m	62 m
Pit width	20 m	30 m
Pit depth below beamline	5 m	7 m
Door height	10 m	13 m
Door width	10 m	13 m
Barrel weight	2000 MT	7300 MT
Door weight	500 MT	1900 MT
Total weight	3100 MT	11100 MT

Table 11.1: The Baseline Interaction Region Parameters


40
30
20
10
0
-10
-2500
-2000
-1500
-1000
-500
0
500
1000
1500
2000
2500