

Dogleg Design

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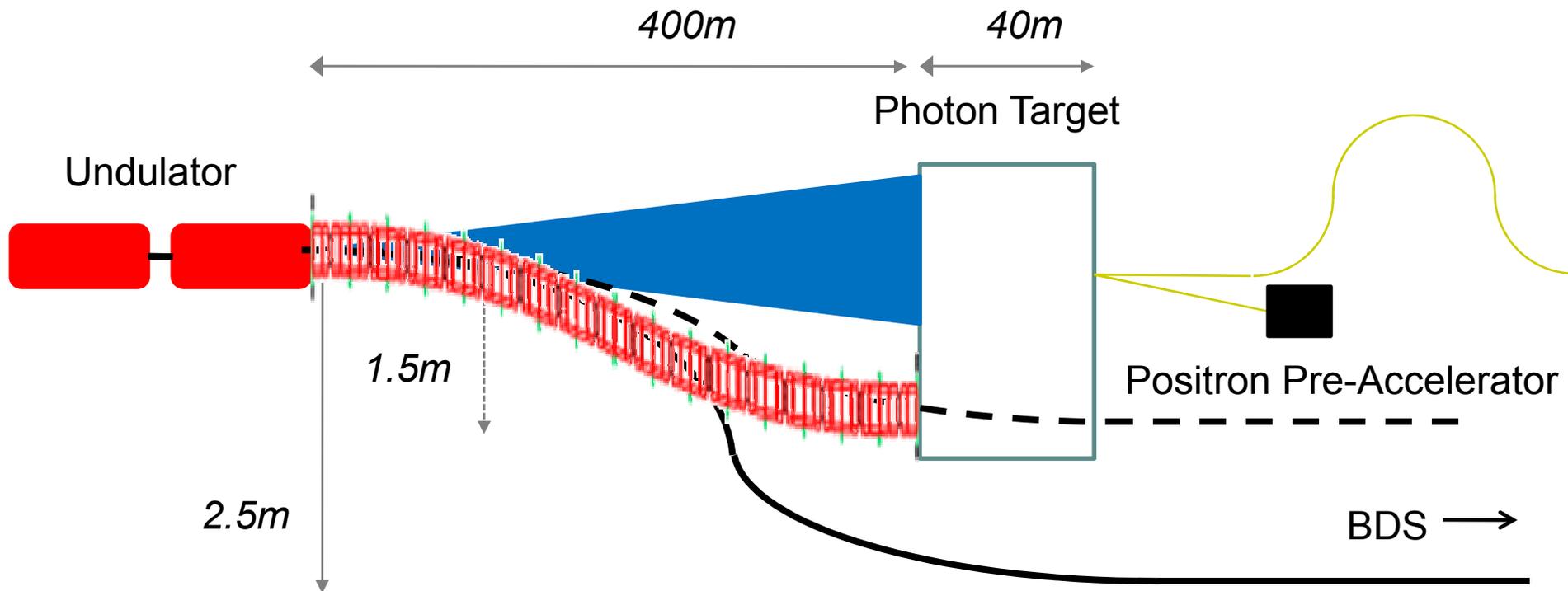


Introduction

- Cost reduction machine design places undulator at the end of the Linac.
- Beamline must bend around the photon target and the associated dump and positron acceleration section.
- There are two options to ‘miss’ the target:
 - A 1.5m offset with a 40m drift section where the target and dump are positioned after 400m.
 - A 2.5m offset with no drift section
- In either case the emittance growth should be kept to below $\sim 700\text{nm}$ normalised.
- Obviously at 500GeV, the smaller bends required for the 1.5m scenario are preferable...

Lattice Design

- Assume a basic TME cell structure, with achromatic matching sections at either end (i.e. an nBA design)
- Maximum Quadrupole pole-tip field < 100T

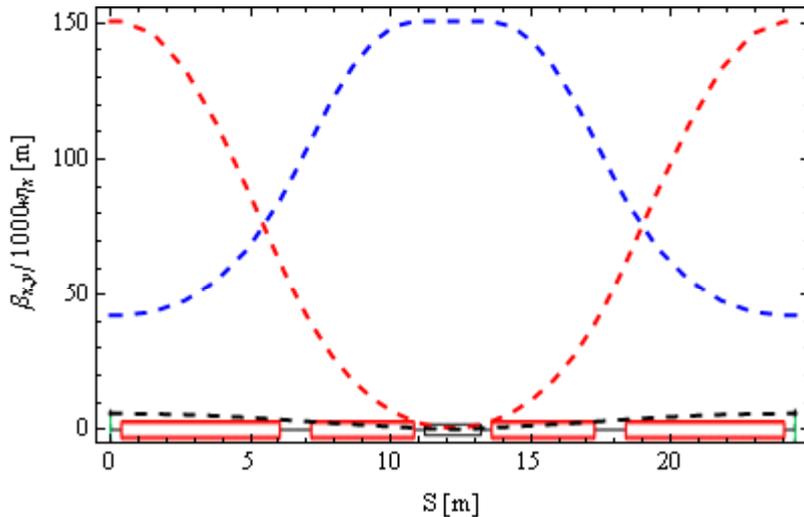


Lattice Design

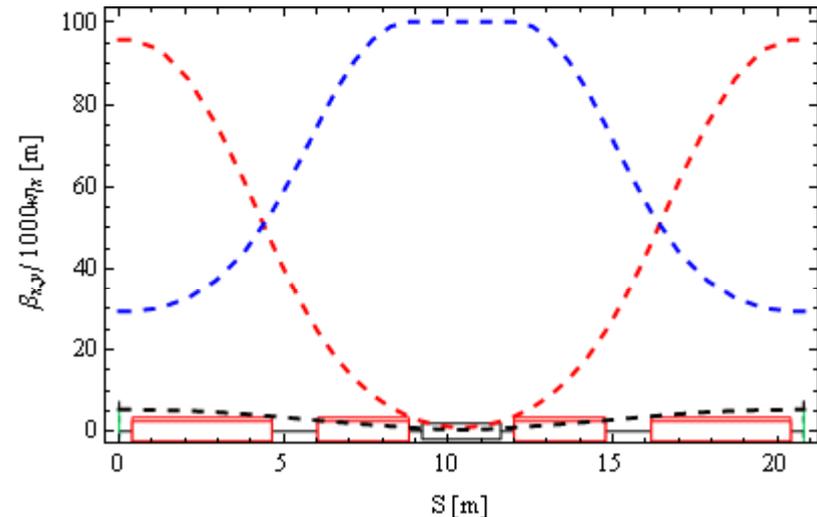
Lattice	Transverse off-set	Normalised Emittance growth due to dogleg	Number of magnets
TESLA TDR	0.7 m	681nm@400GeV ~8.5% 2544nm@500 GeV ~25%	Dipoles 96 Quads 16
Big Bend like (20 mrad and 2 mrad configuration)	1.5 m	493nm@400 GeV 1927nm@500 GeV (~19%)	Dipoles 160 Quads 34

Two Designs

40Tm Optics



60Tm Optics

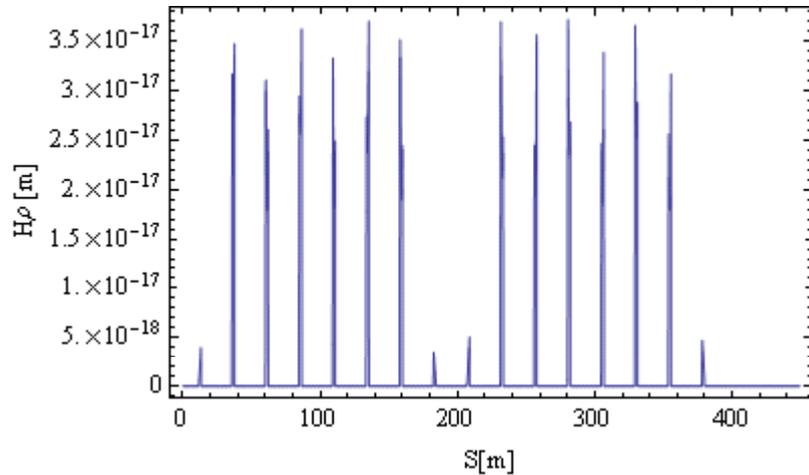


- Reduced Quadrupole field leads to longer arc length, as well as longer quadrupoles
- This raises the required dipole field.

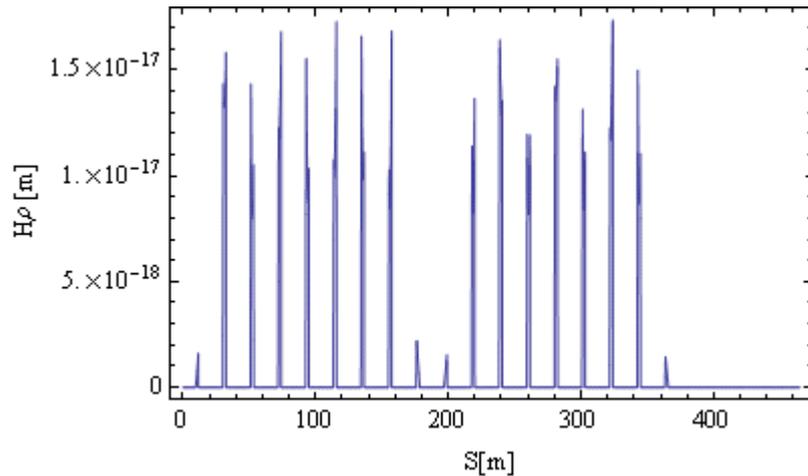
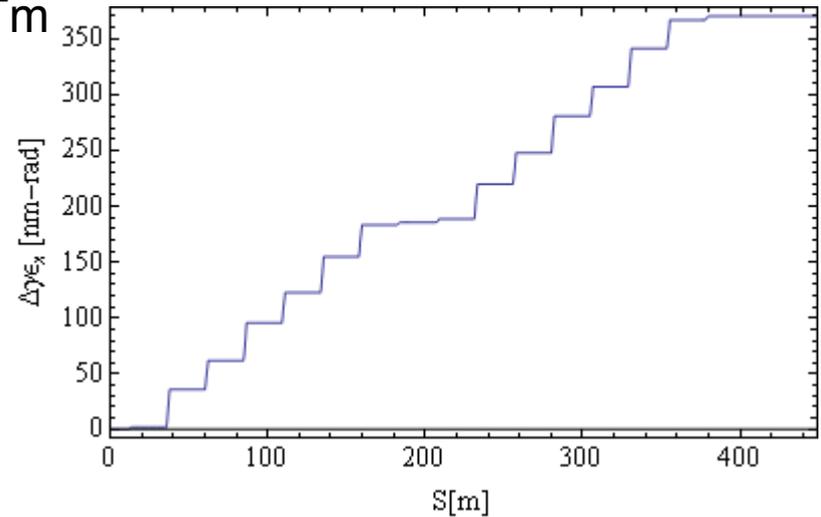
Parameters

Element	40Tm Design	60Tm Design
Bend Angle	1.1mrad	1.02mrad
Focus. Quad L	5.64m	4.23m
Defocus. Quad L	3.66m	2.77m
Smallest Drift L	0.4m	0.4m
Cell Length	24.44m	20.84m
No. Cells	7	6
Number of Elements	64 Quads / 16 Dipoles	72 Quads / 18 Dipoles
Emittance Growth (250/500GeV)	5.77nm / 367nm	3.69nm / 236nm

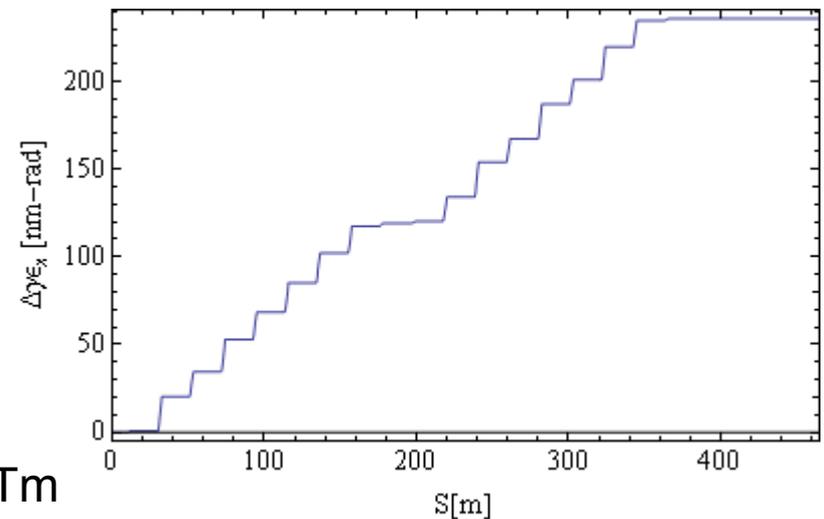
Emittance Growth



40Tm



60Tm



Basic Tolerance Studies

Tolerance (700nm)	40Tm Design	60Tm Design
Dispersion	-4.6mm/4.5mm	-5.4mm/5.6mm
Dispersion' (10^{-3})	-0.0265/0.034	-0.053/0.0625
Alfx	-1.33/1.35	-2.08/1.93

- Tolerances on the Beta Function are large.
- Need to look at correction strategies to improve this...