Final Focus Design of CLIC BDS at 7 TeV

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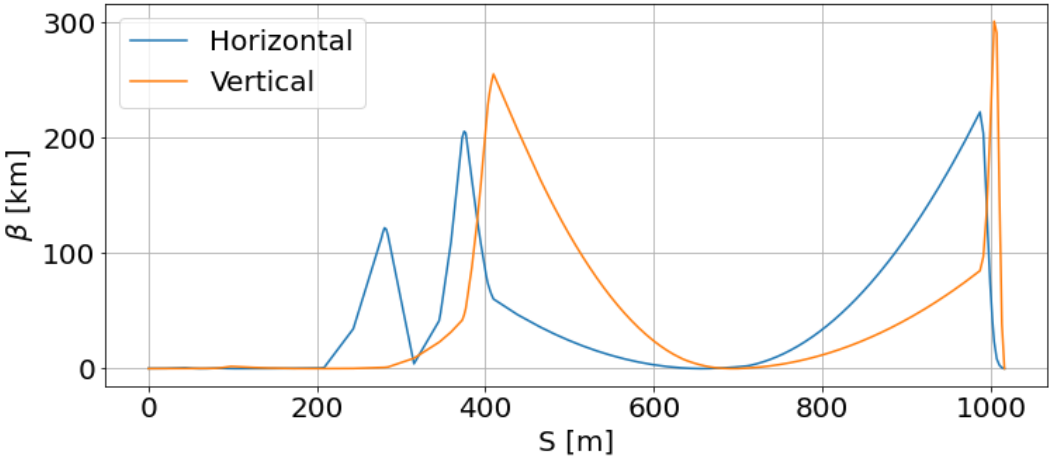
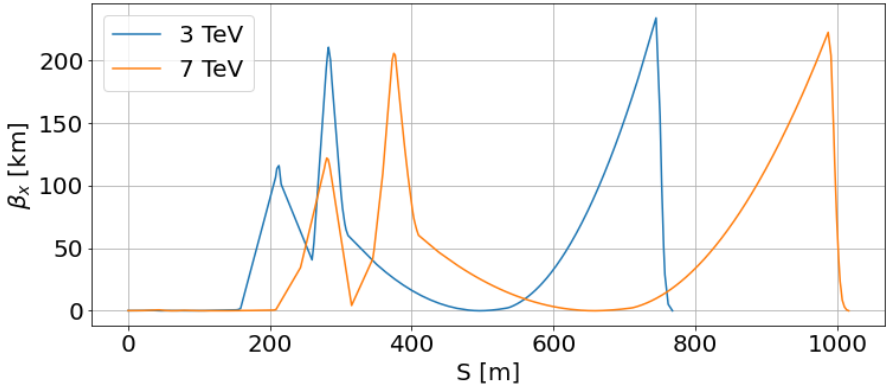
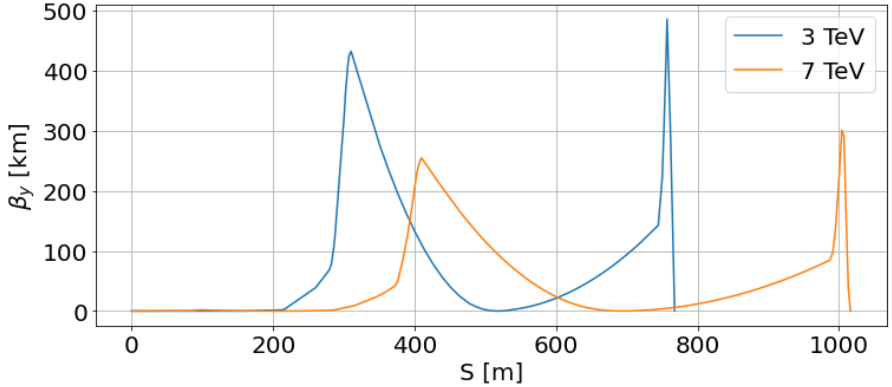
Steps

1. Scaling the line from 3 TeV to 7 TeV.
2. Set L* = 6 m.
3. β^* optimization.
4. Back-tracking starting from IP to the start of the FFS for phase optimization.
5. Scaling of the bending angles to minimize the Synchrotron Radiation.
6. Higher order correction with sextupoles, octupoles and decapoles.
7. Repeat steps 6-7 for the best optimization.

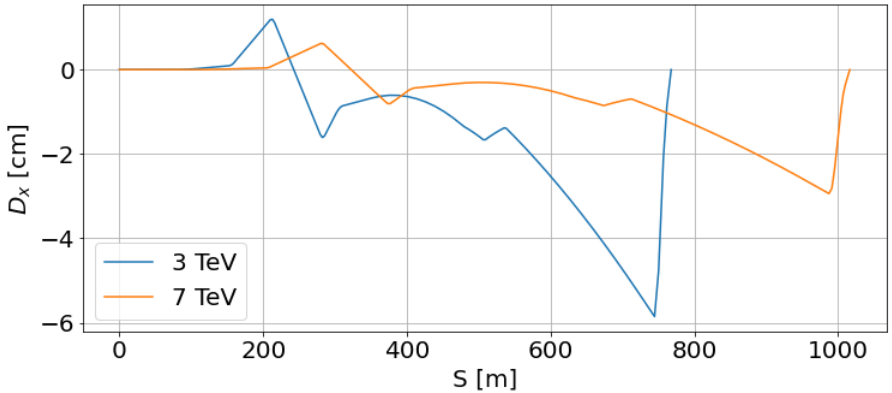


FFS design



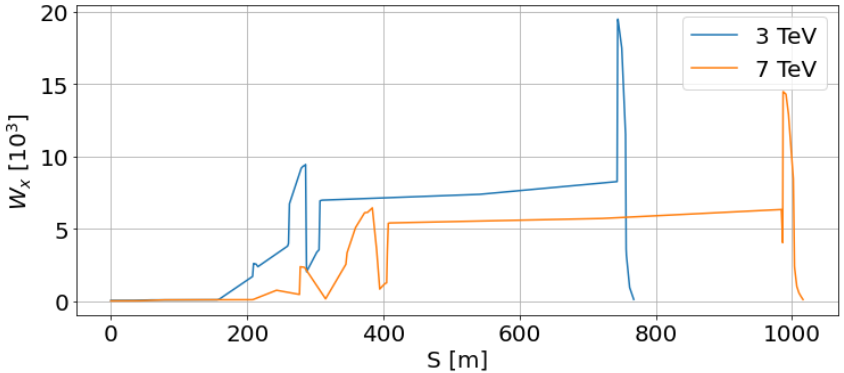


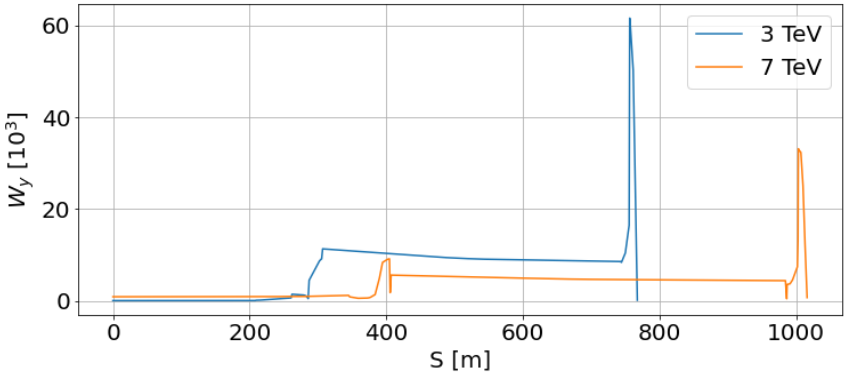
	3 TeV	7 TeV
β_x [mm]	7	12
β_y [mm]	0.12	0.23



Chromatic amplitude function

	3 TeV		7 TeV	
	Start	**IP**	**Start**	**IP**
$\mathbf{W_x}$	46	117	43	136
$\mathbf{W_y}$	41	127	305	107



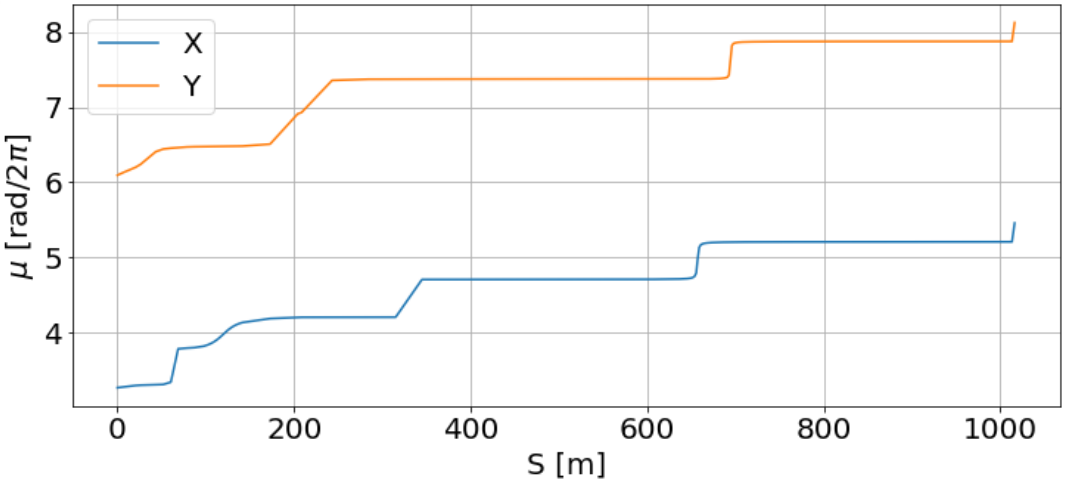


Phase advance between sextupoles

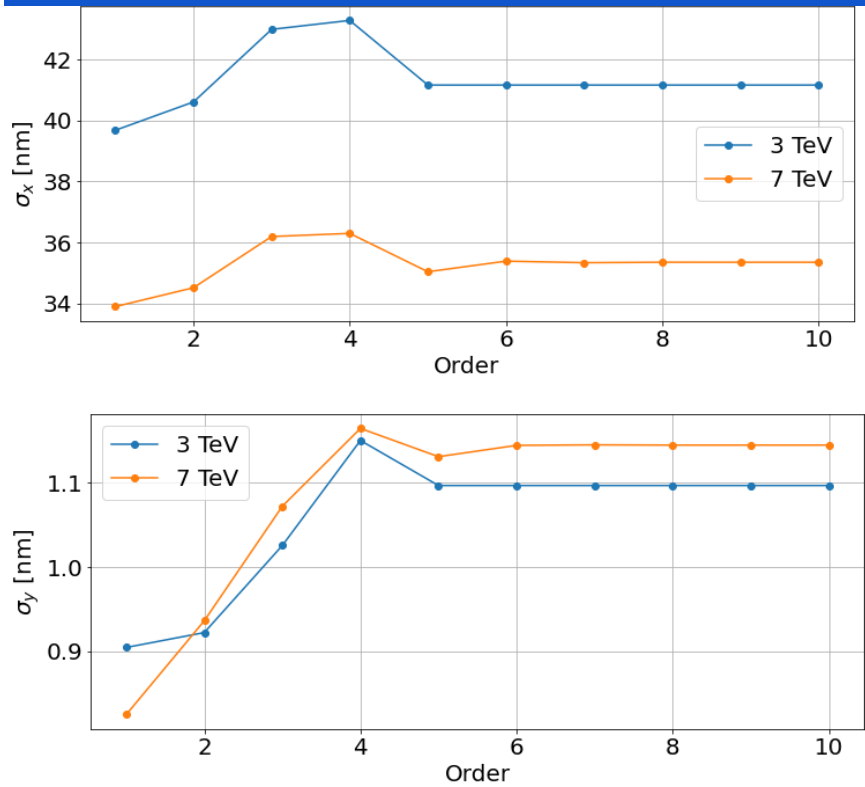
7 TeV			
NAME	**MUX**	**MUY**	**DX**
SF6	4.210007	7.368486	0.006002
SD5	4.709885	7.371364	-0.003903
SF5	4.709943	7.371535	-0.006423
SD4	4.709971	7.371549	-0.004604
SF1	5.209940	7.871527	-0.029300
SD0	5.209965	7.871547	-0.011337

3 TeV			
NAME	**MUX**	**MUY**	**DX**
SF6	4.100513	7.326341	0.009224
SD5	4.600407	7.329715	-0.006268
SF5	4.600447	7.329896	-0.012160
SD4	4.600480	7.329934	-0.007246
SF1	5.100451	7.829906	-0.027325
SD0	5.100472	7.829931	-0.010574

	$\Delta\mu_{SD0-SD4} \cdot 10^{-6}$		$\Delta\mu_{SF1-SF5} \cdot 10^{-6}$	
	X	**Y**	**X**	**Y**
7 TeV	5.6	2	3.1	8.6
3 TeV	8.2	2.8	-3.7	-10



Beam size and Luminosity



$\sigma_x^* = 33.8$ nm
$\sigma_y^* = 0.82$ nm

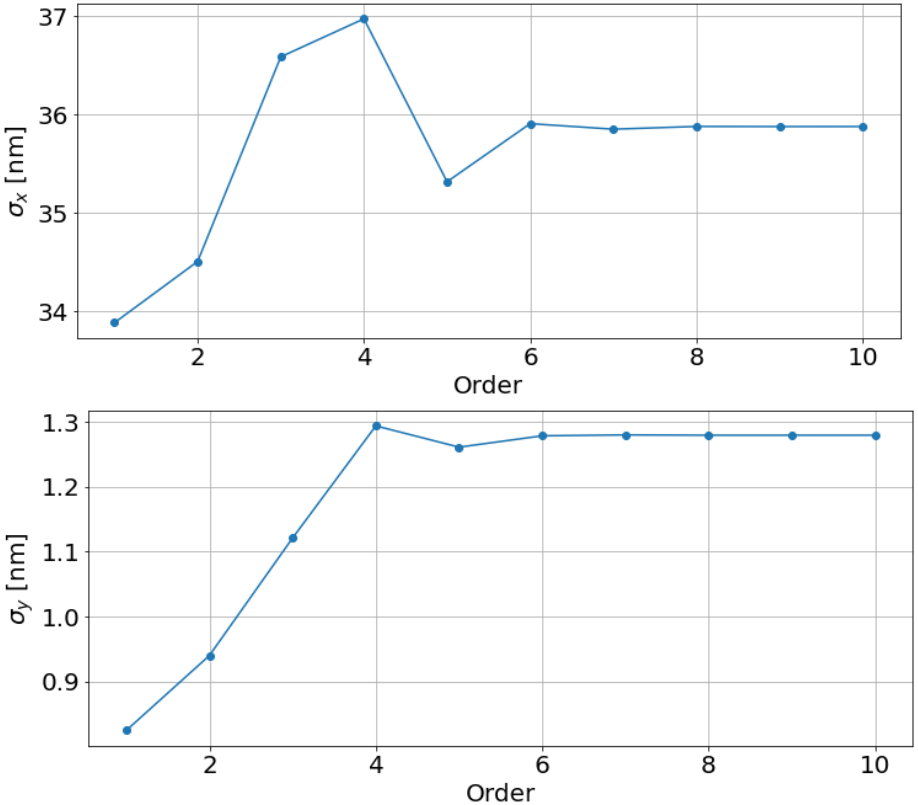
With Synchrotron Radiation
$\sigma_x^* = 41$ nm
$\sigma_y^* = 1.7$ nm

$L_{TOT} = 9.6 \cdot 10^{34} cm^{-2} s^{-1}$

Full BDS Parameters

	3 TeV	7 TeV
L_{BDS} [m]	3117	4942
L_{FFS} [m]	758	1016
β_x^* / β_y^* [mm]	7/0.12	12 / 0.23
σ_x^* / σ_y^* [nm]	40/0.9	33.8 / 0.82
$\delta_{p,\,rms}$ [%]	0.3	0.3
$\gamma\varepsilon_x$ / $\gamma\varepsilon_y$ [nm]	600 / 20	600 / 20
L^* [m]	6	6
L_{TOT} $[10^{34}\ \mathrm{cm^{-2}s^{-1}}]$	5.9	8.6

Alternative beam size



$\sigma_x^* = 33.8$ nm
$\sigma_y^* = 0.82$ nm

With Synchrotron Radiation
$\sigma_x^* = 40$ nm
$\sigma_y^* = 1.75$ nm

$L_{TOT} = 10 \cdot 10^{34} cm^{-2} s^{-1}$