CLIC BDS : From 500 GeV to 3 TeV CM

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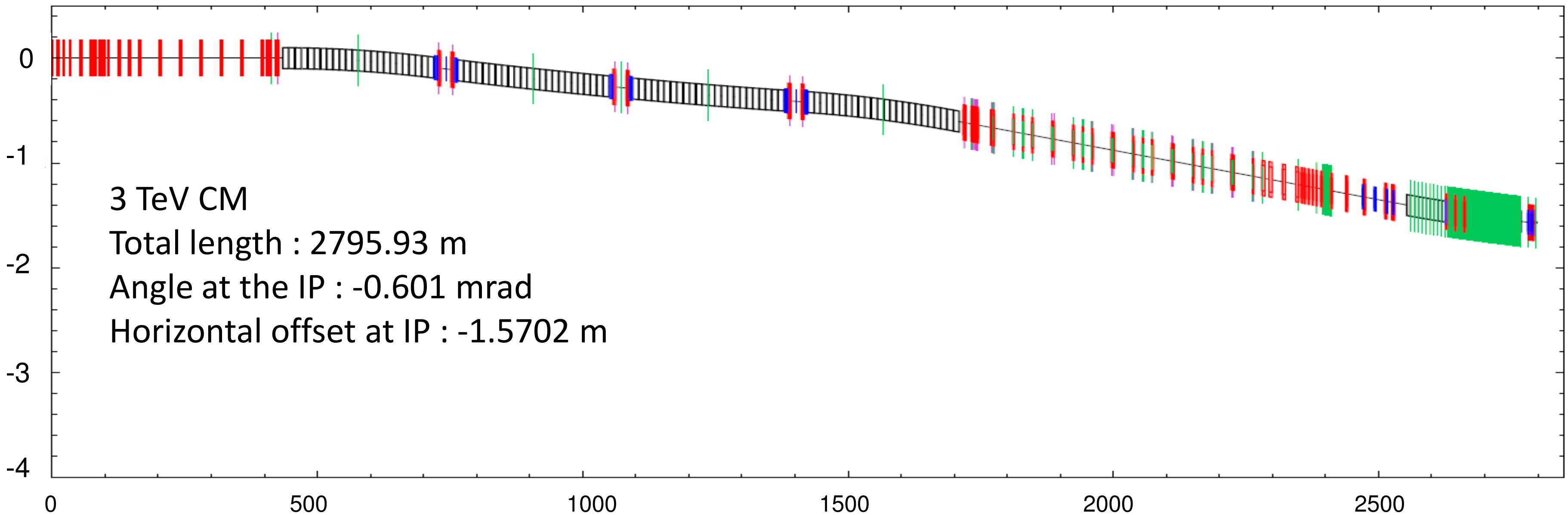
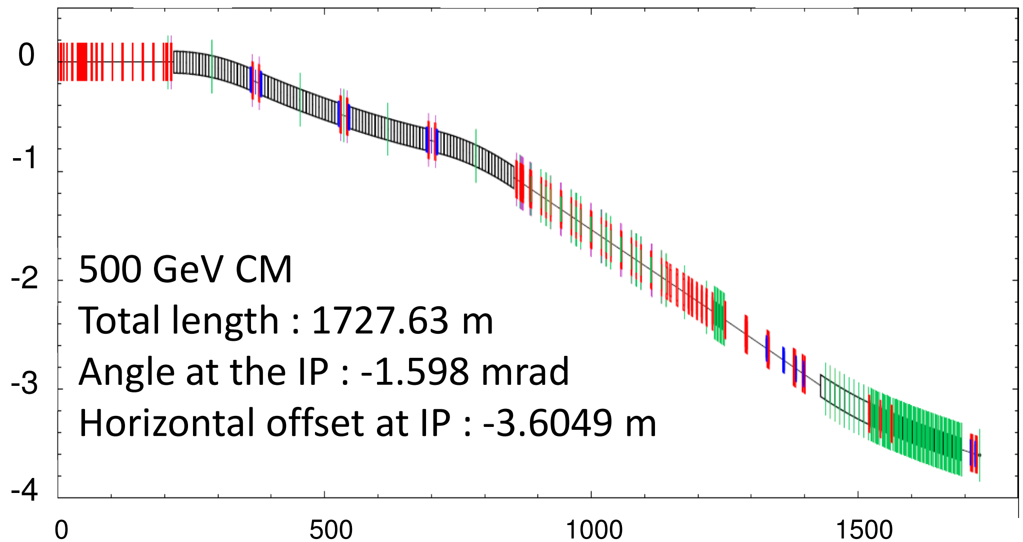
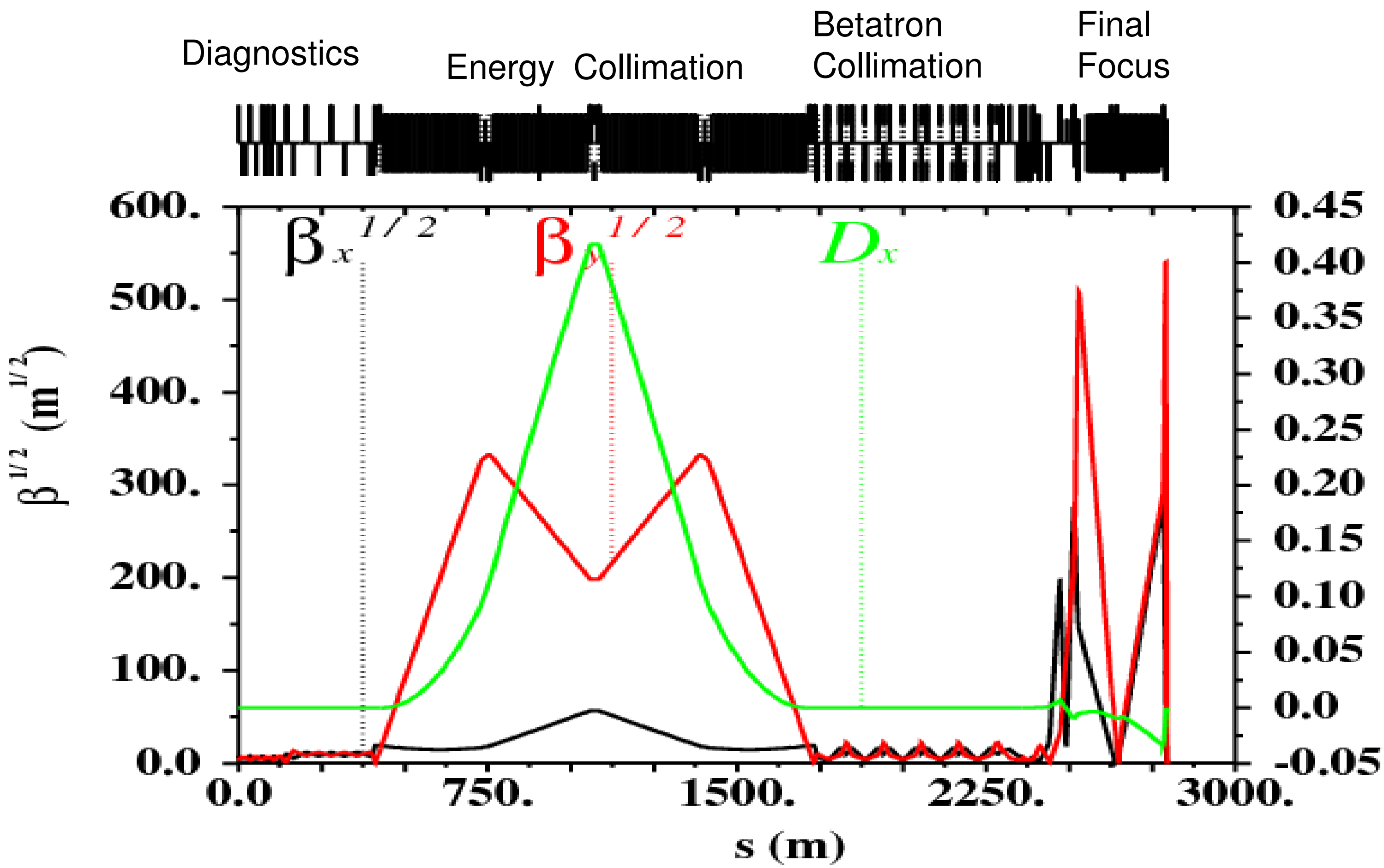
Layout for 500 GeV and 3 TeV CM designs



Location of IP fixed.
Post collision lines and 14 MW beam dump location same.



Optics of 1.5 TeV BDS

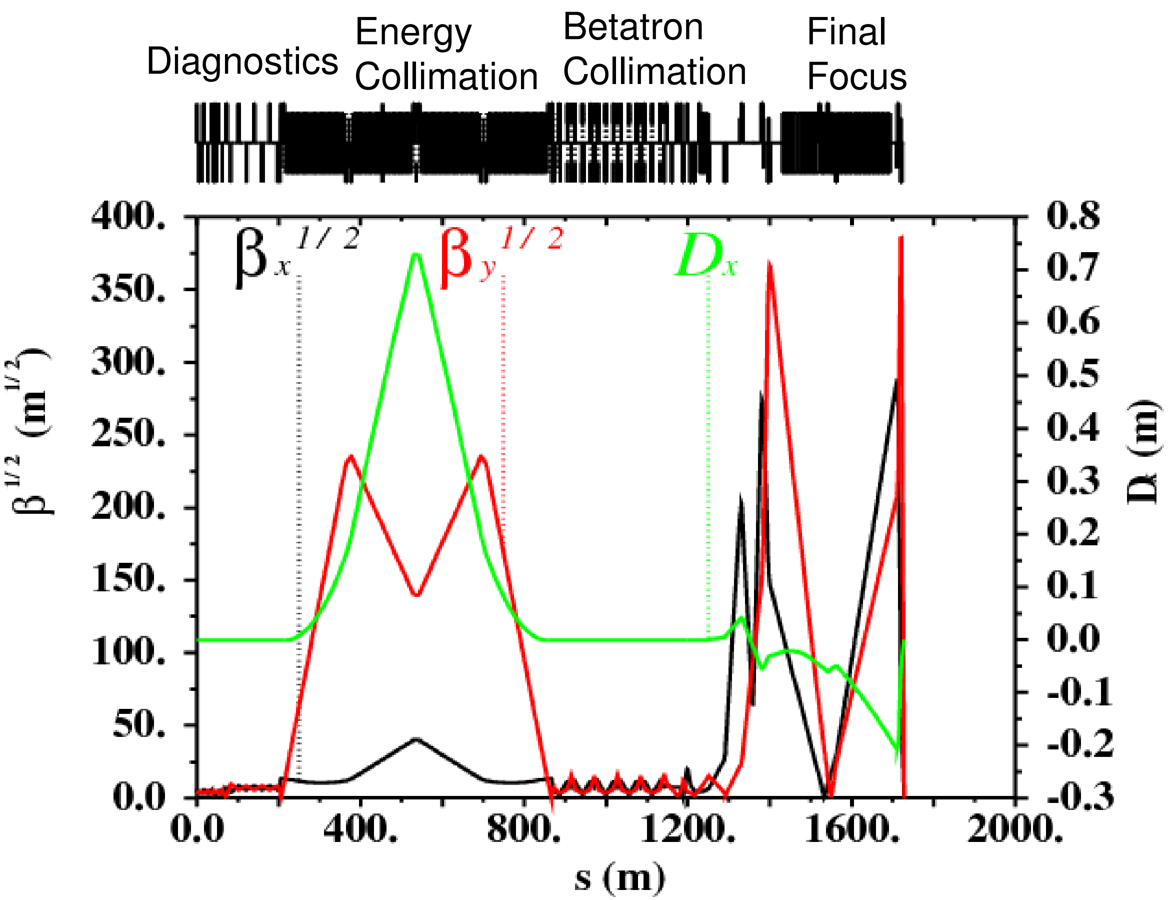


Lengths of dipoles : ECOL : B3A , B3B, B4A, B4B = 11.302083 m
FFS : B1,B2 :1.490472m, B3 = 7.328154 m, B4 =2.7140265 m

Optics of 250 GeV BDS

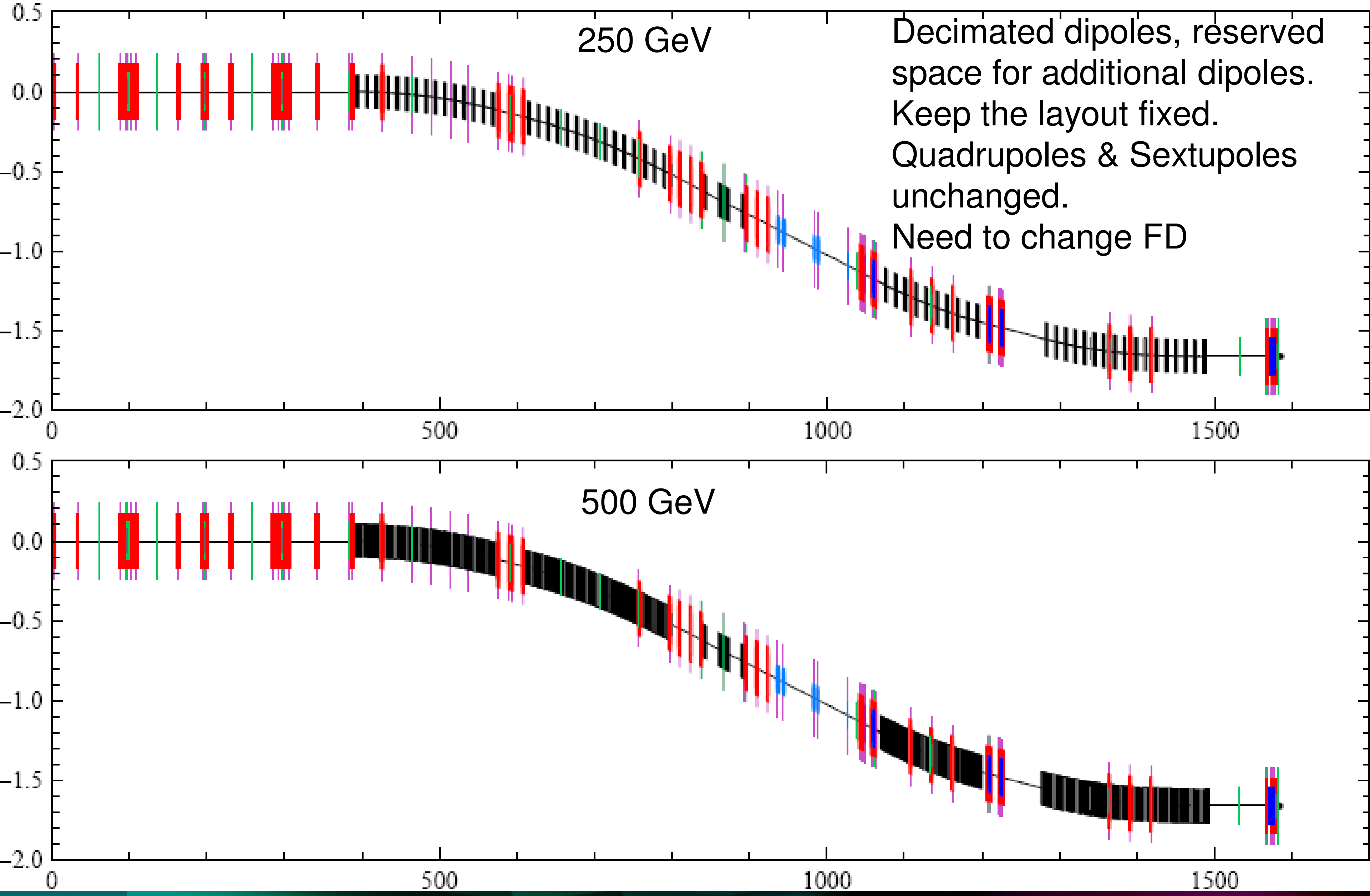
Shorter beam delivery system design at 500 GeV CM.

Design optimised from beam dynamics point of view : beam spot at energy spoiler & better control of aberrations



Lengths of dipoles : ECOL : B3A, B3B, B4A, B4B = 5.6510417 m
FFS : B1 :1.8288m, B2=1.8288m, B3 = 8.9916 m, B4 =2.10312m

ILC collimation + FFS : upgrade from 250 GeV to 500 GeV



ILC BDS layout (RDR, volume II)

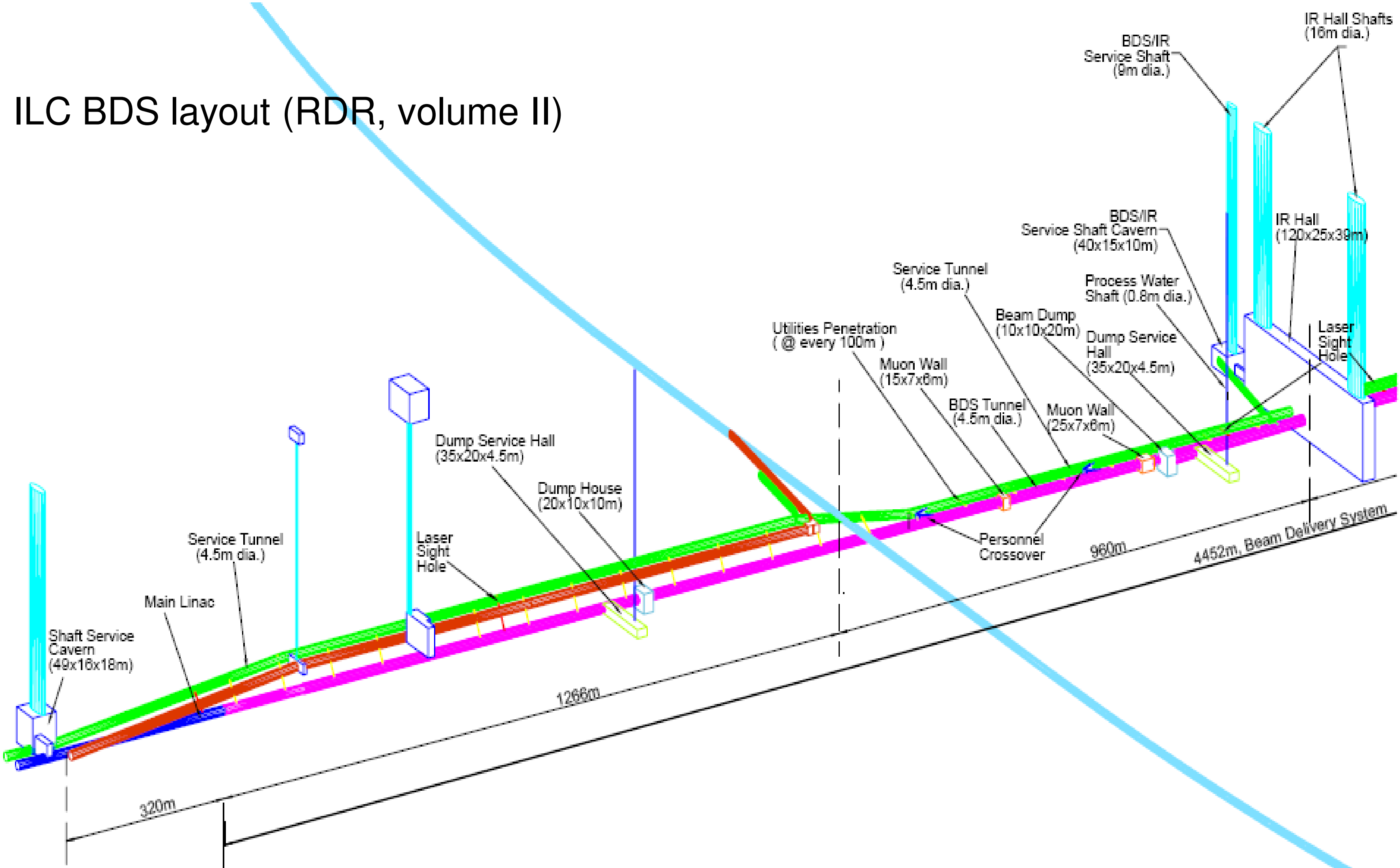


FIGURE 2.7-1. BDS layout, beam and service tunnels (shown in magenta and green), shafts, experimental hall.

ILC muon shield in a tunnel vault

ILC (RDR, volume II)

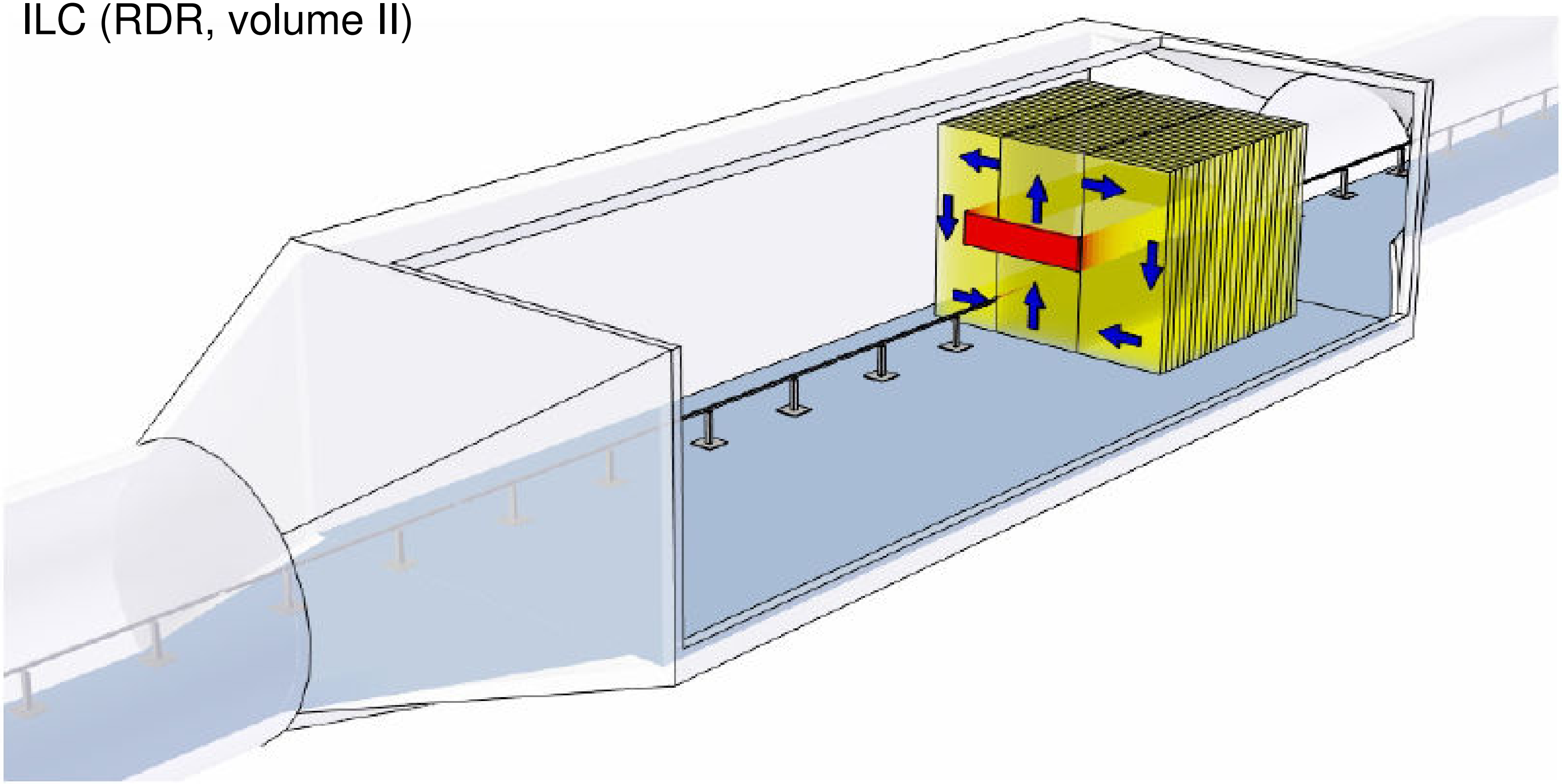
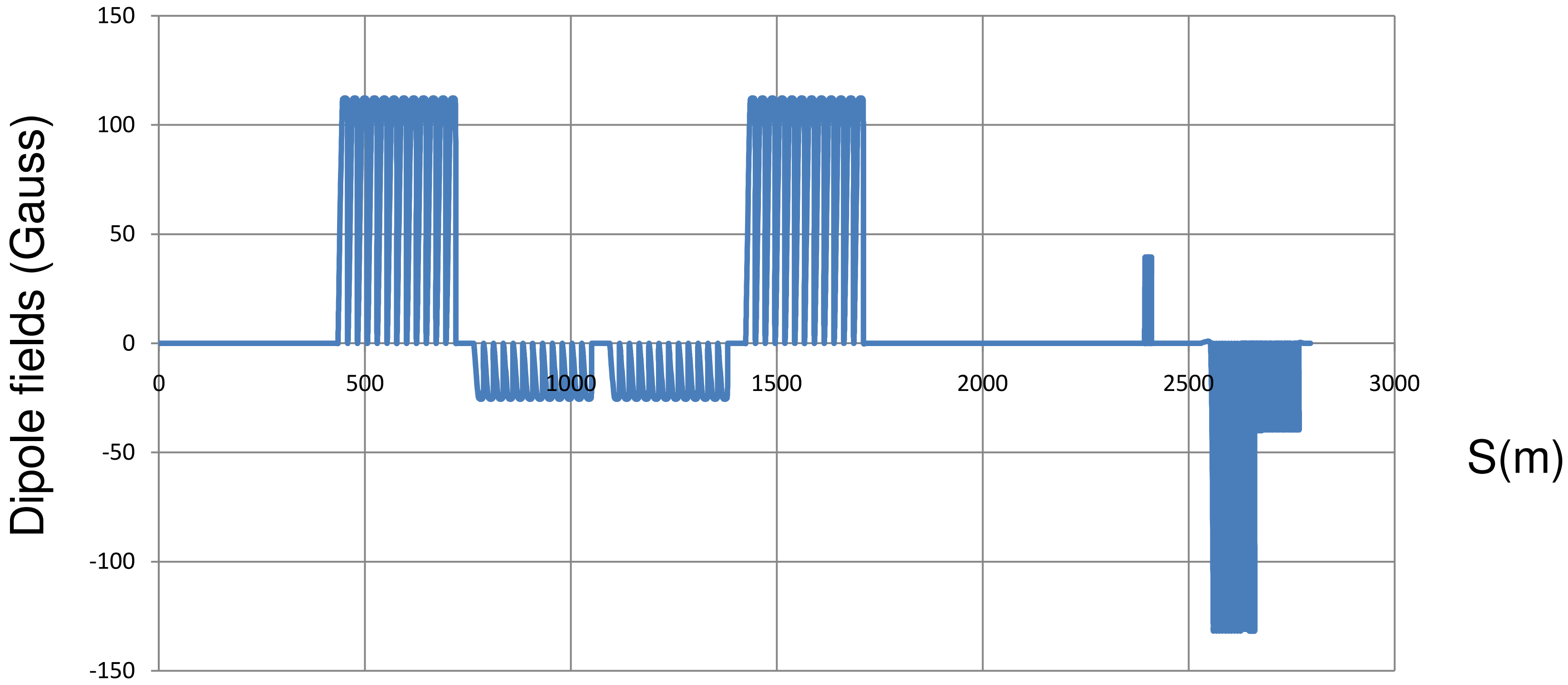


FIGURE 2.7-3. Schematic of the 5-meter magnetized muon shield installed in a tunnel vault which is configured to accommodate possible upgrade to 19-meter shield. The coil is shown in red, and blue arrows indicate direction of the magnetic field in the iron.

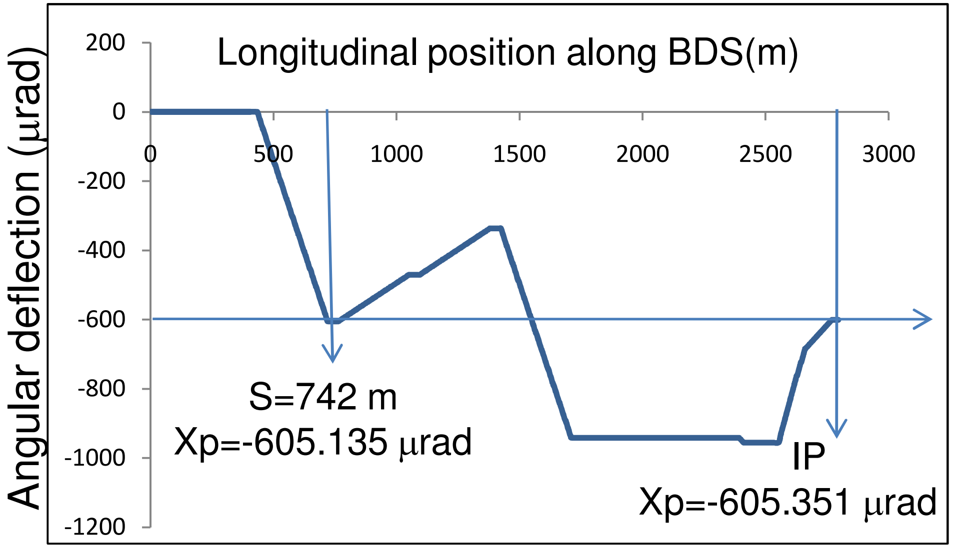
CLIC BDS : Dipole fields at 1.5 TeV



Fields factor of 6 lower at 250 GeV, need to decimate dipoles

Upstream Polarimeter

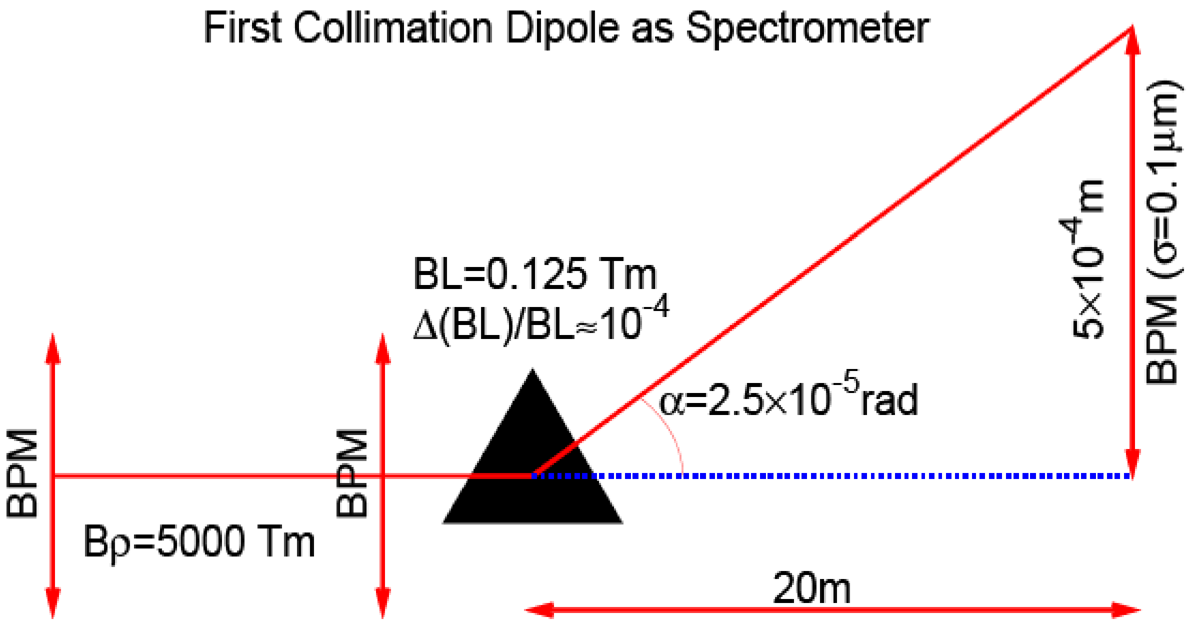
P. Schüler, CLIC08



- For Physics requirements, upstream polarimetry needs to be robust and fast and need to provide ΔP/P = 0.25%.
- Need directional tolerance between Compton IP and IR to be < 13 μrad
- Location at s=742 m is aligned within 3.8 μrad w.r.t. IP, has 20 m space for laser beam crossing and is upstream of energy collimation which is desirable.

The location of polarimetry in the 250 GeV lattice – different due to different net angle at the IP and shorter energy collimation.
Perhaps a dedicated chicane like in the ILC plausible at 250 GeV?

Upstream Energy Measurements



No dedicated chicane like in ILC due to Space constraints. Possible to measure energy using First dipole in the energy collimation section with resolution of 0.04%.

Conceptual layout. Needs to be included in the lattice by adjusting the fields of first dipoles to provide the required drift space. Should not affect the optics severely.

May be possible to include a chicane at 500 GeV CM if different layout is acceptable?

Define layout constraints

- Location of IP, post collimation lines and dump locations same
- Angle at the IP same.

- Is it absolutely essential to have a shorter BDS (the length difference is 1068m on single BDS)?

- Tunnel constraints
  - Experimental hall + Main dump shafts (stay same)
  - Muon wall tunnel vault locations should stay same
  - Locations for other shafts, caverns should be compatible for both the layouts
  - Diagnostics section : LW set up, polarimetry and spectrometry

- Collimators
- Crab system
- Collective effects
- Vacuum pipe radius

……………?

Lattice constraints

- Beam spot size at laser wires in the beam diagnostics section
- Beam spot size at energy spoiler
- Betatron collimation : phase advances w.r.t. IP/FD, collimation depths, gaps, efficiency, wake fields, background (including muons)
- Upstream polarimetry & spectrometry
- IP parameters : bx, by, n, nx’ & luminosity
- Maximum pole tip fields in quadrupoles and sextupoles (length and apertures)
- Minimum dipole fields
- Synchrotron radiation
- Final doublet

- Post collision line (is there a 500 GeV lattice?)