Branching from TT10: Very Preliminary Layout Studies

C. Bracco, K. Balazs and J. A. Osborne

TT10 Branching

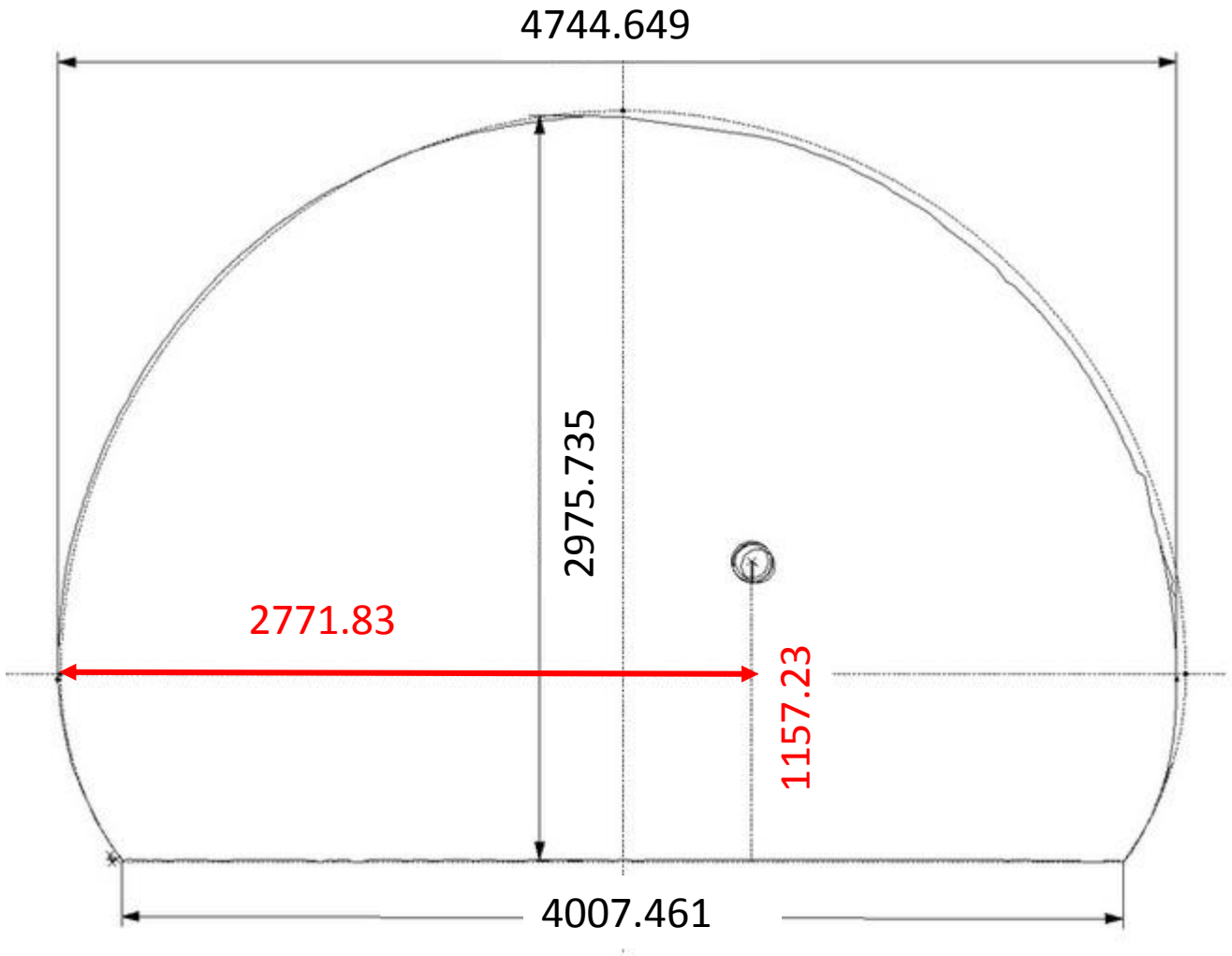
TT10: Transfer line from PS to SPS

First question: left or right?

The need of a junction cavern for this branching would constraint CE works to LS

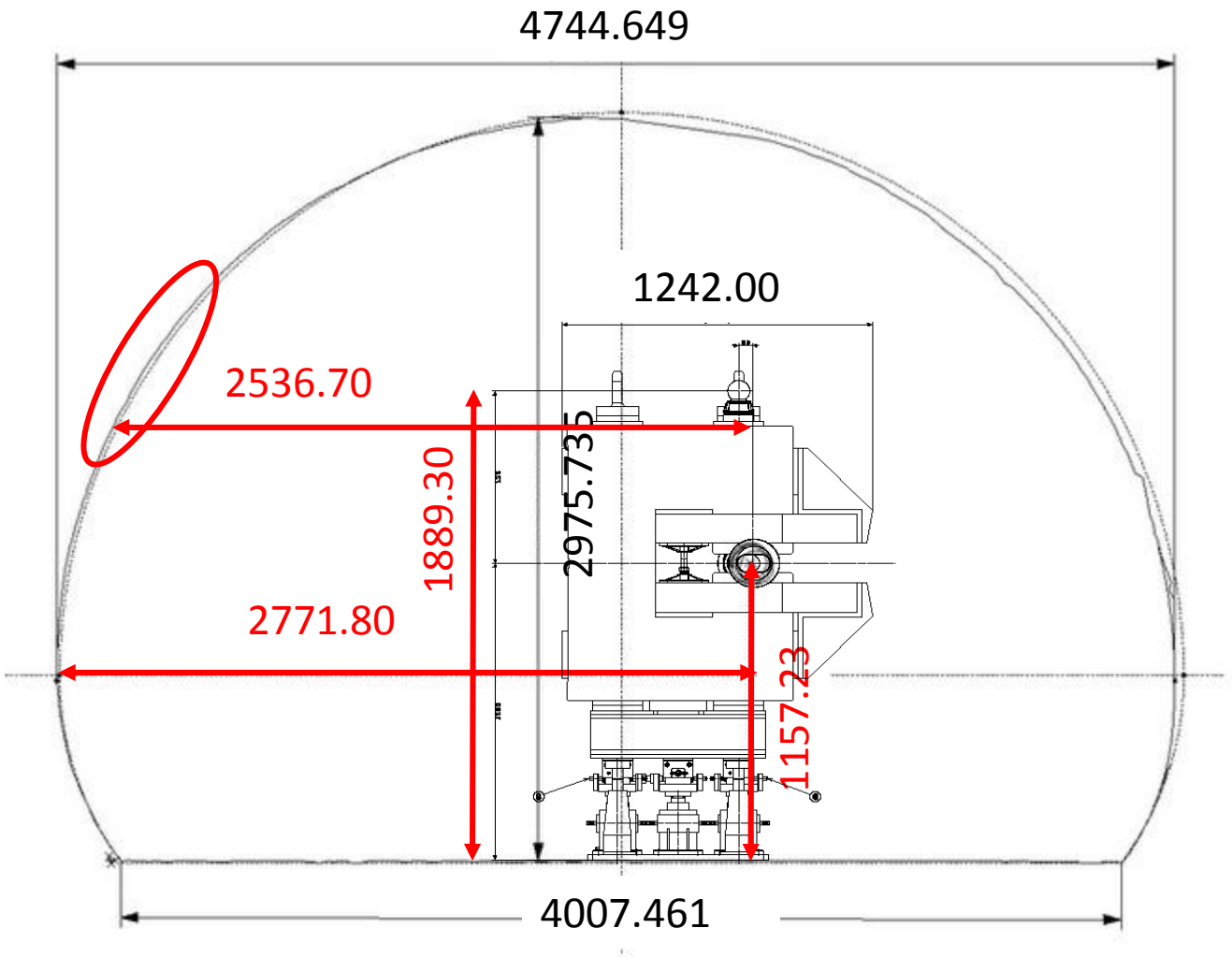
Any way to avoid digging a junction cavern? ➔ have a as sharp as possible angle between line and tunnel walls!

Tunnel and Present Layout



PSZHMBAD0005

Design	PXMBXHCCWP
Description	Bending Magnet, H or V, type HB1, 2.5m gap 80mm
Old Name	HB1 / MCA
Family	Bending
Function	Horizontal or Vertical
Cooling system	Water
Aperture width [mm]	320.0
Aperture height [mm]	80.0
Iron Length [mm]	2500.0
Total Length [mm]	3120.0
Total Width [mm]	1246.0
Total Height [mm]	1250.0
Weight [Kg]	20500
Dielectric Test Tension [KV]	*Not available*
Peak current (cycled) [A]	1434.0
RMS current [A]	1434.0
Resistance at 20°C [mΩ]	15.9
Inductance [mH]	62.9
Power [KW]	38.0
Delta P nominal [bar]	5.0
Nominal Cooling Flow [l/min]	40.0
Delta T nominal [°C]	25.0
Lamination Thickness [mm]	1.5
Total number of turns/pole	32
Dipole Nominal Field at Peak Current [T]	1.3
Dipole Integrated Field at Peak Current [Tm]	3.38
Observations	2 pancakesper coil 2018-07-10 - Can be operated up to 2250 A in pulsed mode



Branching to the left (transport side!) gives the freedom of using more switch magnets ➔ sharper angle

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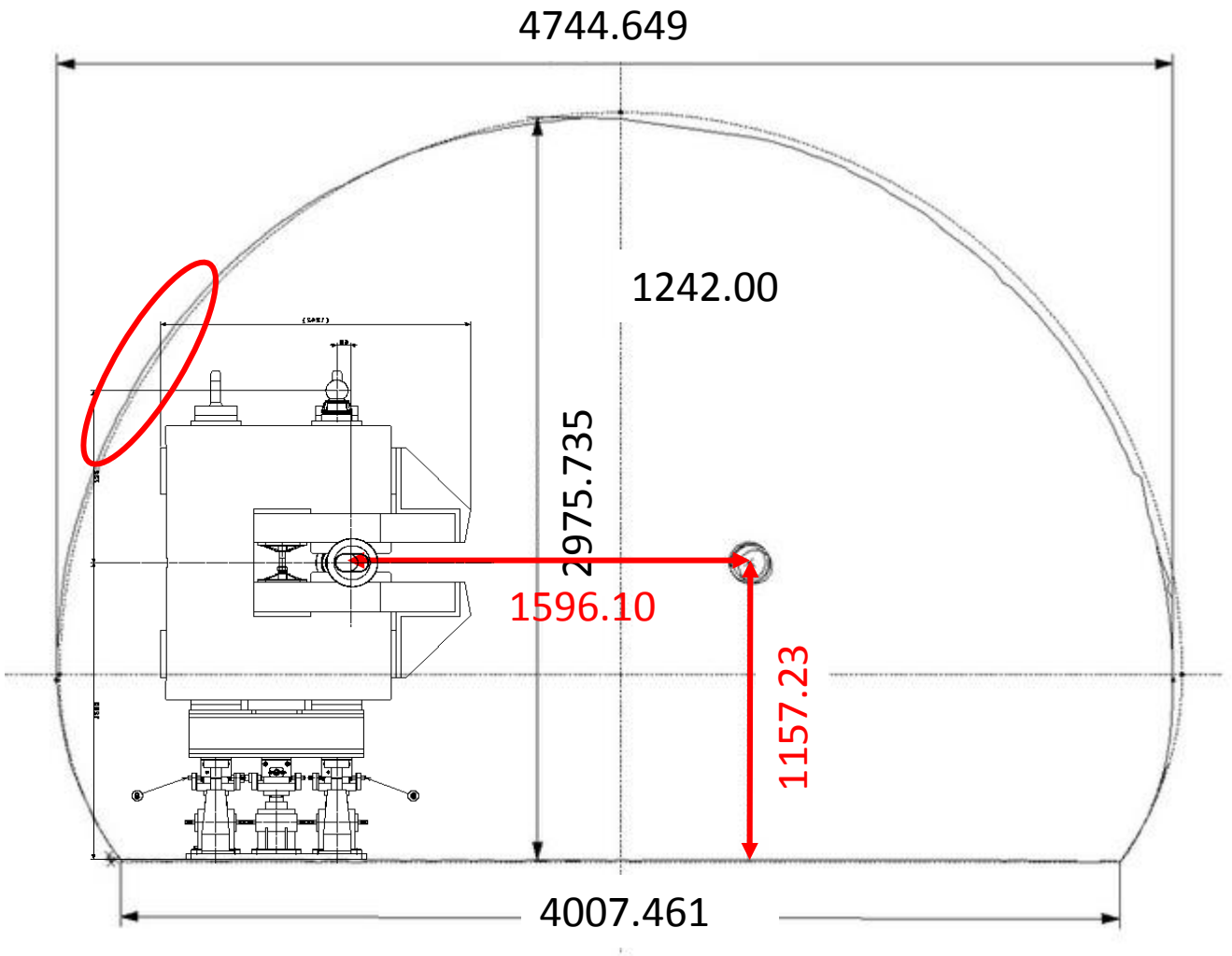
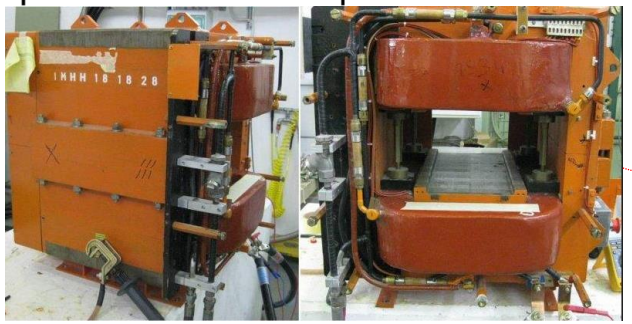


5 switch magnets each providing 0.0405 rad ➔ 1037 mm offset (without drifts) ➔Total angle wrt walls = 11.6°

Gnuplot

H [m] x W [m] x L [m] = 0.78 x 0.75 x 0.68



H [m] x W [m] x L [m] = 1.25 x 1.25 x 3.12

~3 m ~5 m

11.6°

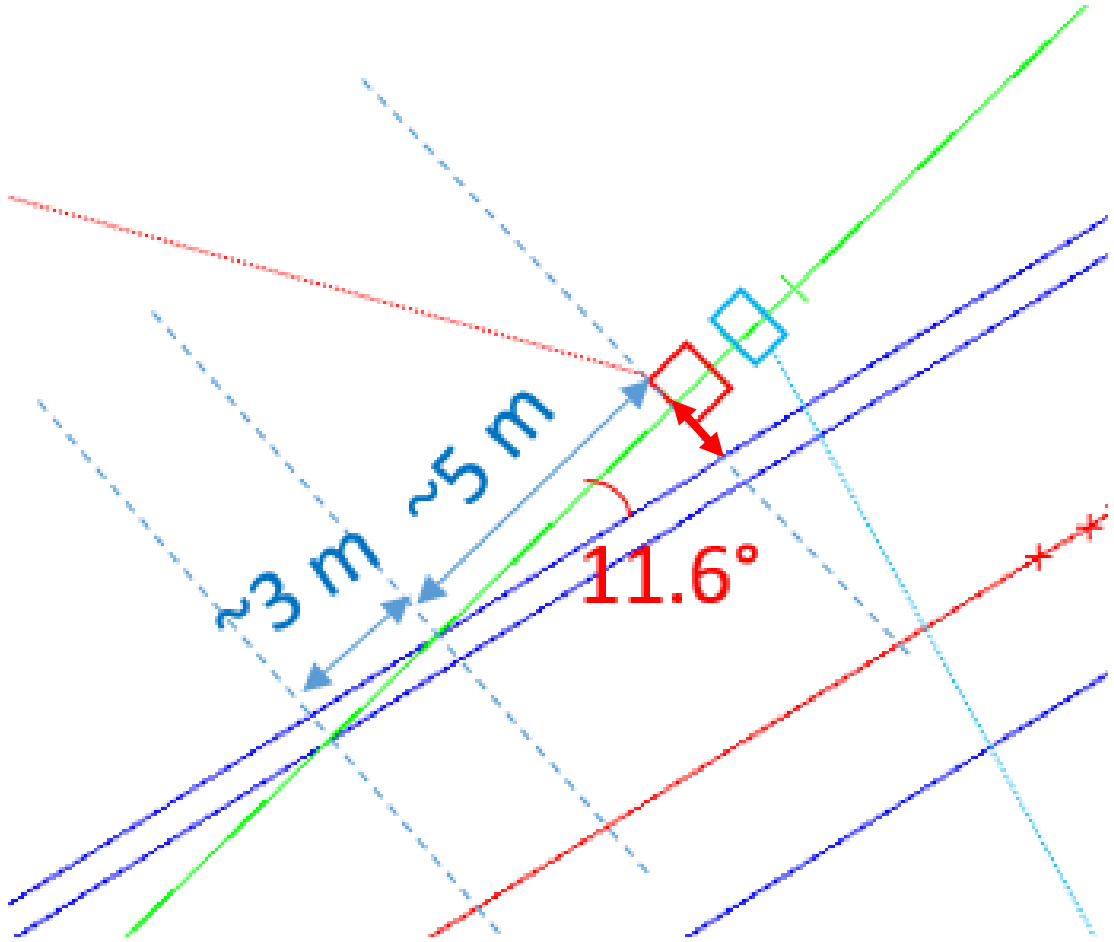
H [m] x W [m] x L [m] = 0.78 x 0.75 x 0.68

1345
1350
1355
1360
1365
1370
1375
1380

2405
2410
2415
2420
2425
2430

2430.63, -1364.92

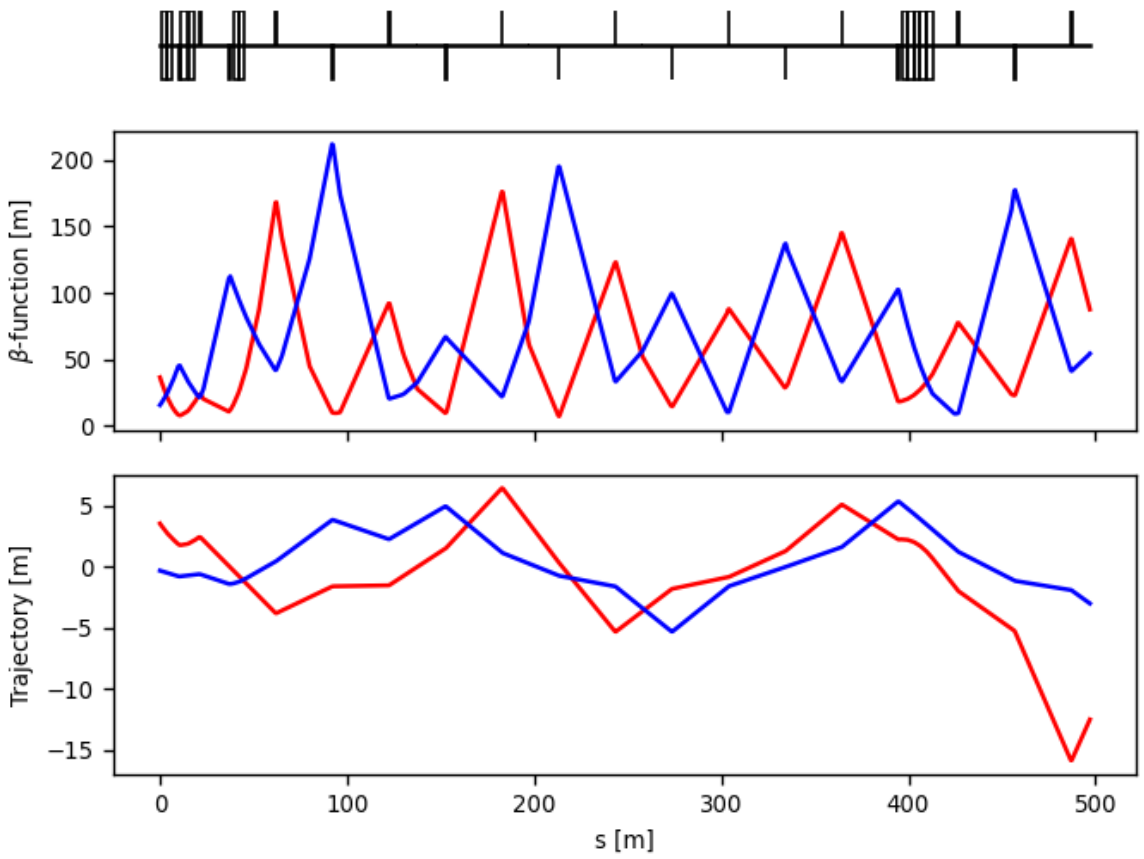
Zoom of critical region

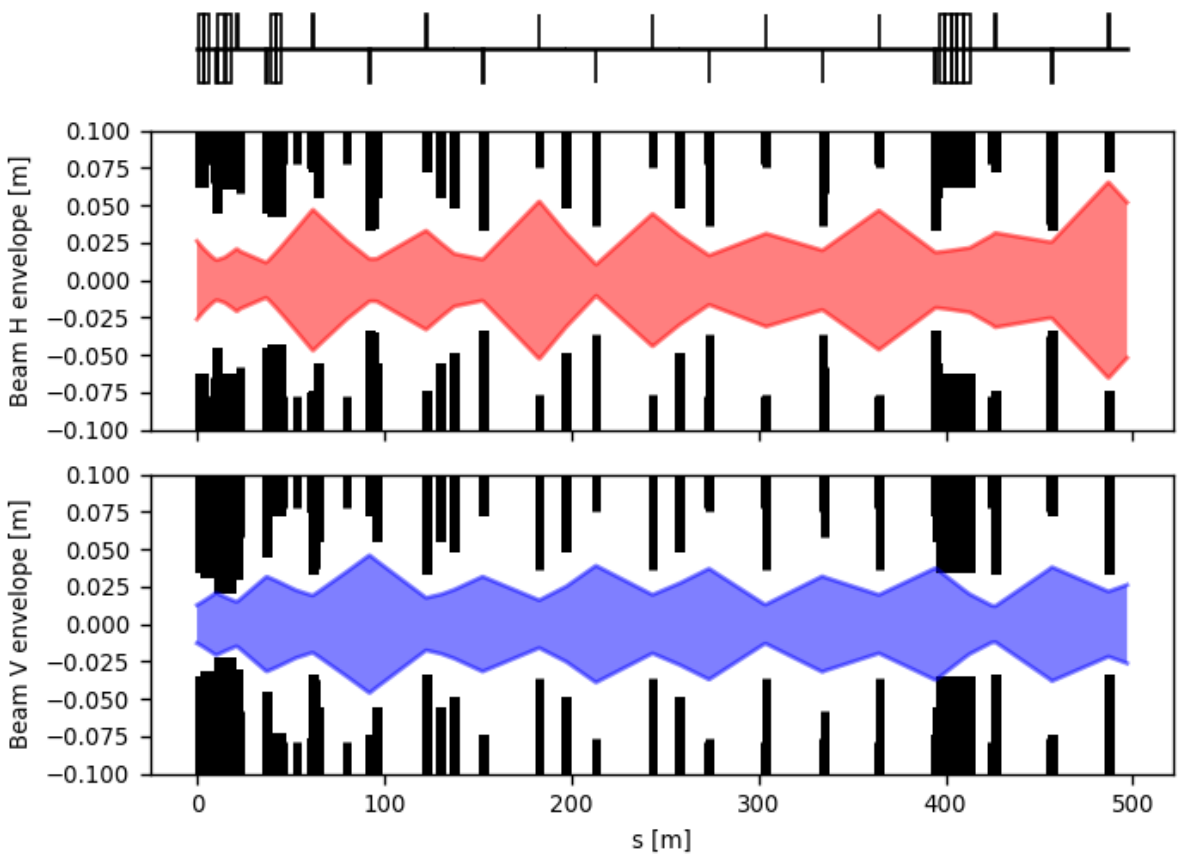


< 1 m (0.13 m from wall to magnets)

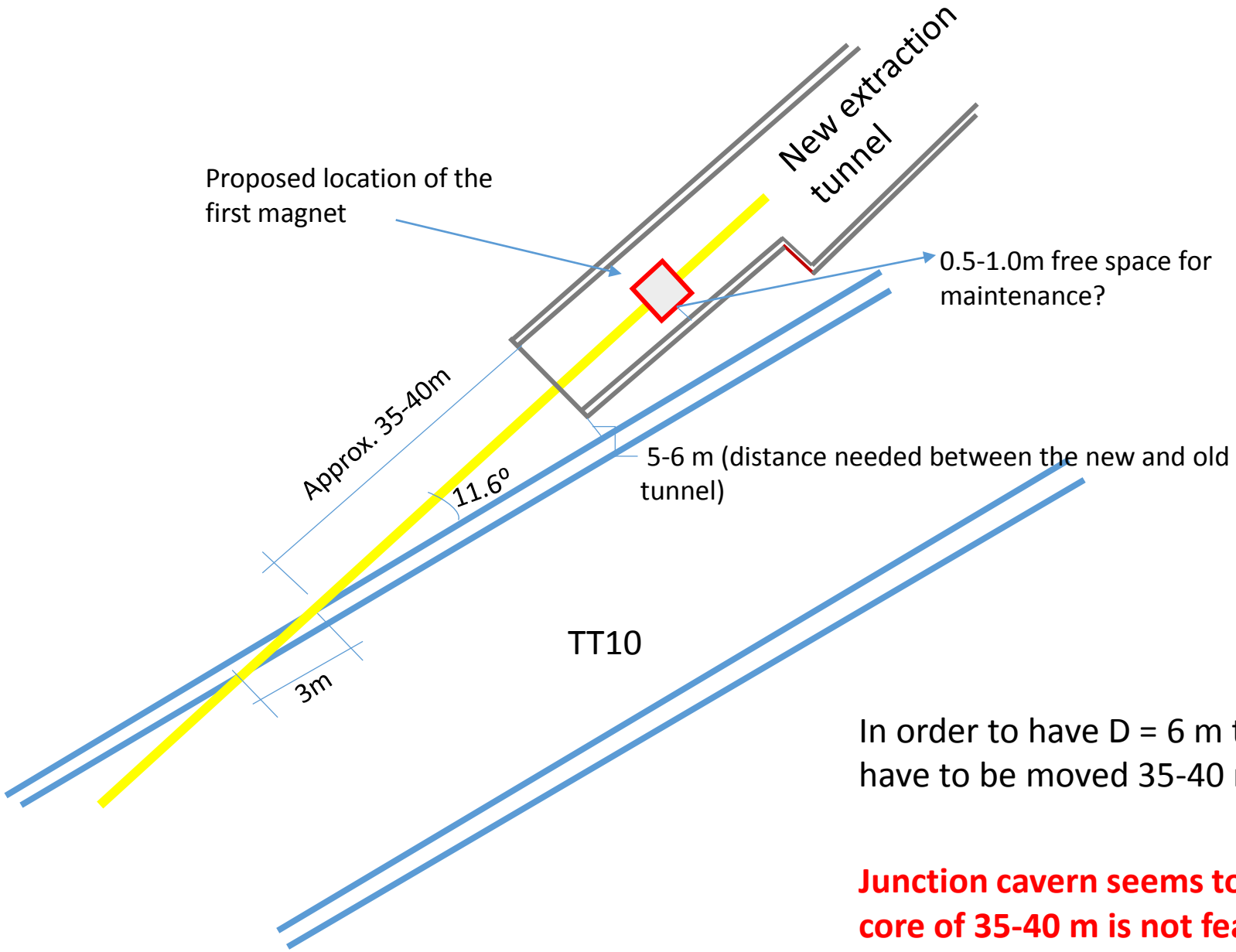
Possible moving corrector+quadrupole further downstream? (enough aperture?)

First glance at optics and Aperture





5 sigma envelope assuming 26 GeV and horizontal and vertical normalized 8 um and 6 um respectively



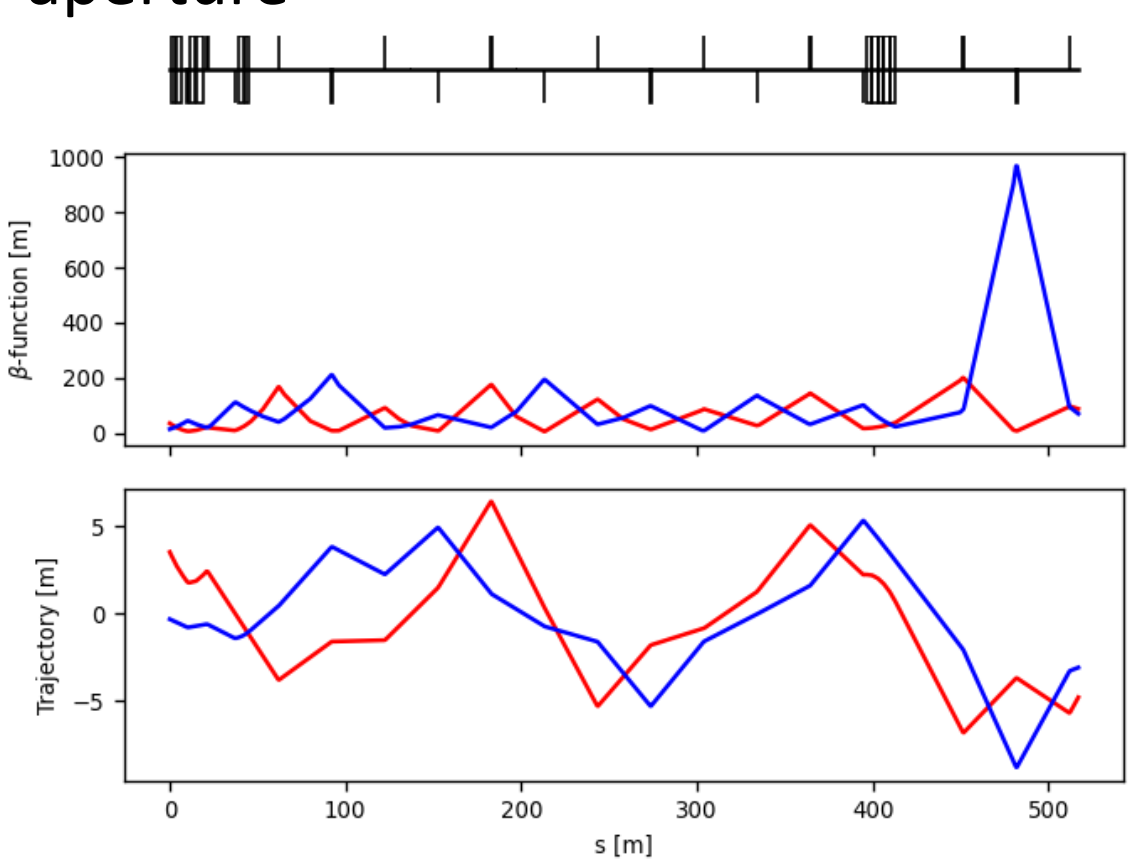
Courtesy of K. Balazs
In order to allow the structural integrity of the existing and new tunnel we would need to keep a certain distance between the two. This distance it is marked with “D”, in our case the TT10 being 4 m wide that would mean approximately 5-6m distance between the two tunnels in the first 10-15 m, but in order to confirm we need to do a proper alignment drawing to see the exact dimensions.

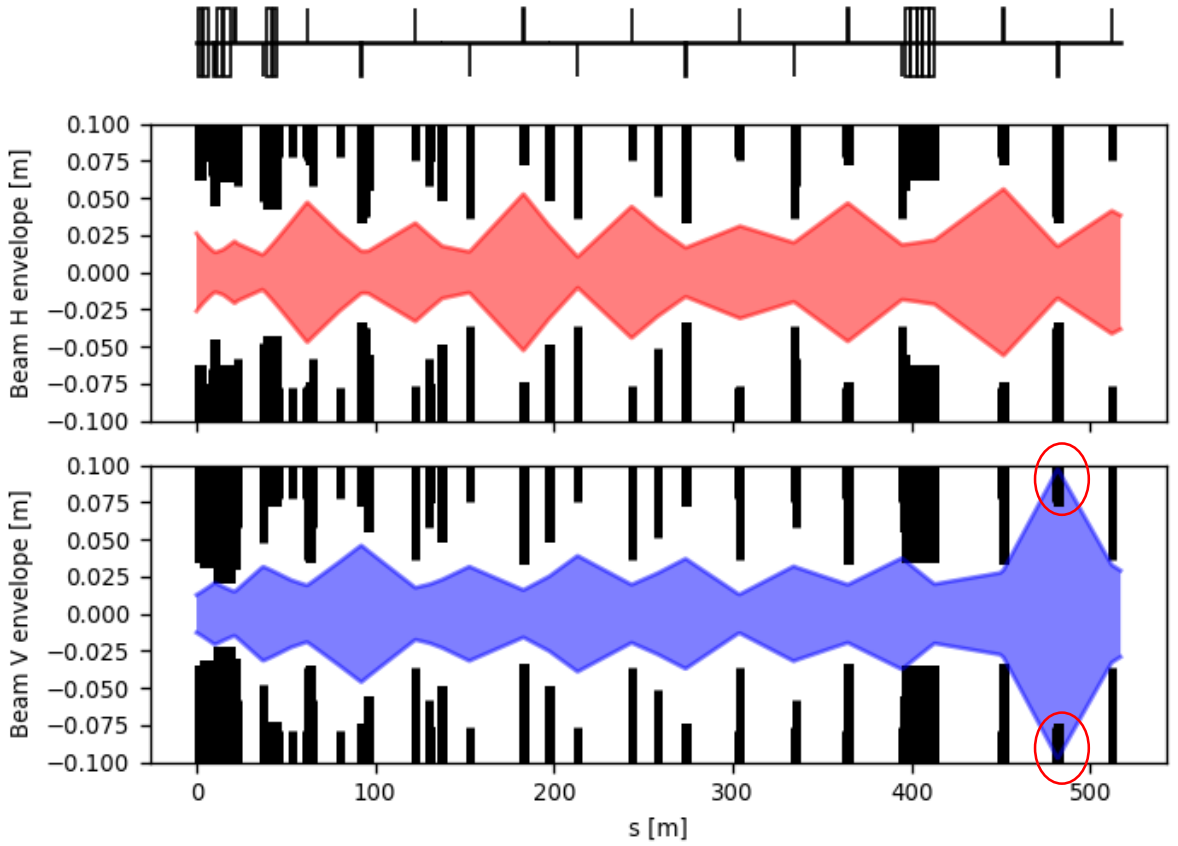
In order to have D = 6 m the corrector+quadrupole magnets have to be moved 35-40 m more downstream

Junction cavern seems to be needed since also drilling a core of 35-40 m is not feasible

First glance at optics and Aperture

Moving Corrector+Quadrupole 25 m more downstream ➔ already out of aperture





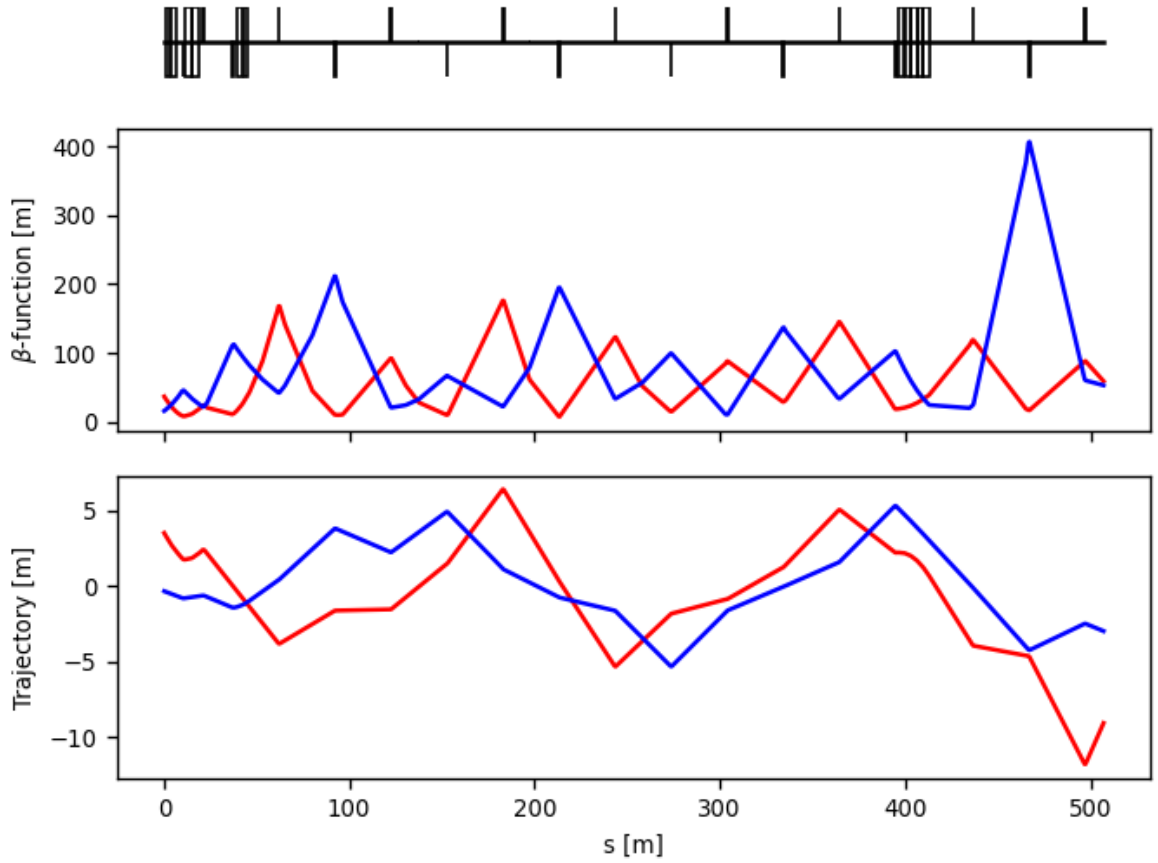
Conclusions

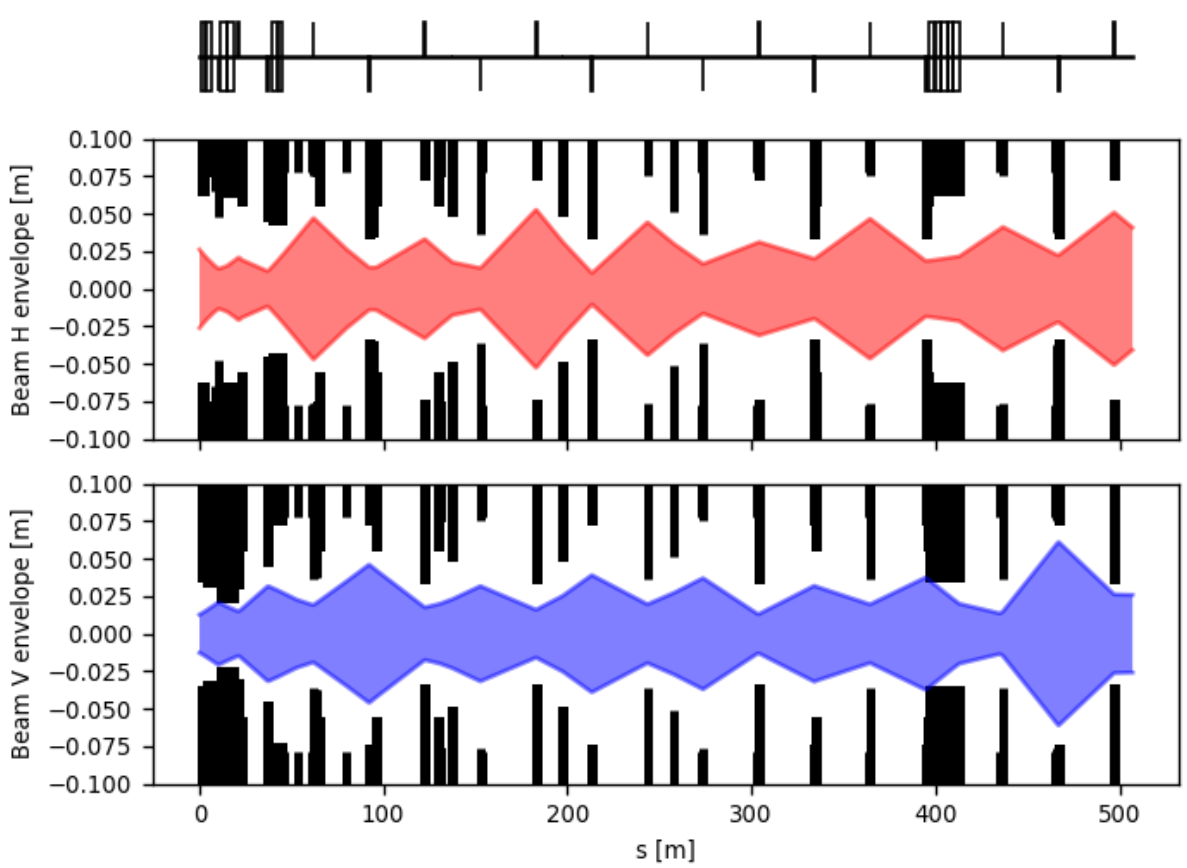
- Preliminary studies were performed to assess the possibility of avoiding a junction caver for branching from TT10 TL
- Existing magnets are used
- The sharpest angle (11.6°) can be obtained by branching towards the left side → cutting transport passage (allowed?)
- Also in this case, to allow for enough distance between the two tunnels, the first magnets in the new line should be to far (not enough aperture) and it would require drilling a 35-40 m core
- Presently a junction cavern seems to be unavoidable….

Thank you for
your attention!

First glance at optics and Aperture

Moving Corrector+Quadrupole 10 m more downstream





First glance at optics and Aperture

Moving Corrector+Quadrupole 20 m more downstream