

Optics Solution for IR7

Comparison of

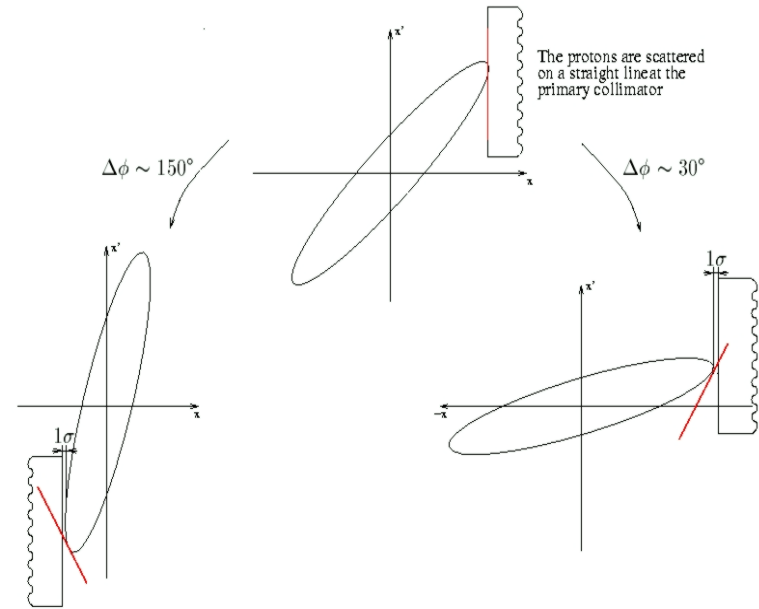
- Present optics solution in IR7
- 90° cell: secondary collimators at 45°, 90°, 135°, 180° from primary collimator

Why looking for a new solution?

- Impedance depends on the beta function at the collimator location. The location of some collimators not appropriate in terms of impedance.
- Space problems in IR7: splitting of quads, etc.
- Phase advance condition – cleaning efficiency?

Which phase advance between collimators?

Present Scheme in IR7:
Secondary collimators to
remove particles scattered
out at primary collimators



2D: 4 secondary collimators per primary
collimator

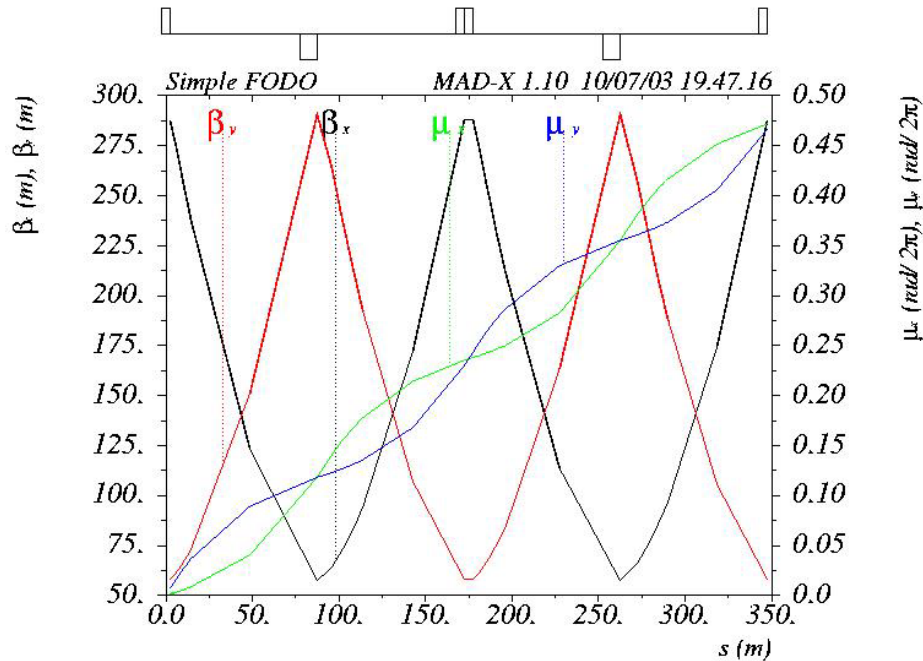
Present Solution in IR7:Reduced Version

| Name | Tilt | Beta_x | Beta_y | Gap (6/7 σ) inj/ramp | Gap (6/10.5 σ) Squeezed | Impedance H, 7 TeV | Impedance V, 7 TeV |
|-------------|-------|--------|--------|---------------------------------|------------------------------------|-----------------------|-----------------------|
| | [°] | [m] | [m] | [m] | [m] | [M Ω /m] | [M Ω /m] |
| tcp.d6l7.b1 | 90 | 90.5 | 156.44 | 0.00664 | 0.00168 | 2.7 | 9.5 |
| tcp.c6l7.b1 | 0 | 89.1 | 158.7 | 0.00501 | 0.00127 | 11.7 | 10.4 |
| tcp.b6l7.b1 | 138.1 | 87.8 | 161.1 | 0.00582 | 0.00148 | 2.8 | 5.2 |
| tcs.a6l7.b1 | 167.2 | 48.5 | 320 | 0.00486 | 0.00185 | 11.1 | 37.1 |
| tcs.b5l7.b1 | 148.6 | 126.5 | 248.5 | 0.00782 | 0.00298 | 2.8 | 5.5 |
| tcs.a5l7b.1 | 31.5 | 131.3 | 242 | 0.00787 | 0.00299 | 2.9 | 5.4 |
| tcs.a4l7.b1 | 89.9 | 303.5 | 69.3 | 0.00515 | 0.00196 | 29.9 | 13.6 |
| tcs.a4r7.b1 | 21.2 | 66.9 | 198.3 | 0.00568 | 0.00216 | 10.1 | 14.9 |
| tcs.b4r7.b1 | 178.6 | 64.2 | 204.4 | 0.00496 | 0.00189 | 14 | 22.3 |
| tcs.c4r7.b1 | 79.1 | 63 | 207.3 | 0.00880 | 0.00335 | 1.4 | 8.9 |
| tcs.f4r7.b1 | 33.9 | 66.2 | 319.9 | 0.00746 | 0.00284 | 1.7 | 8.3 |
| tcs.g4r7.b1 | 154.8 | 68.4 | 317 | 0.00660 | 0.00251 | 6.7 | 15.6 |
| tcs.a5r7.b1 | 92.3 | 362.6 | 50.1 | 0.00440 | 0.00168 | 54.9 | 15.2 |
| tcs.b5r7.b1 | 87.7 | 356.6 | 50.4 | 0.00442 | 0.00168 | 55.5 | 15.2 |

Different Optics Layout

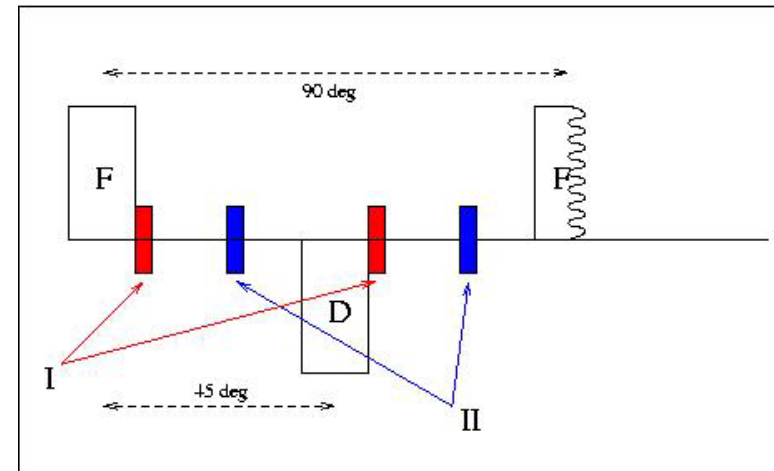
- 4 collimation planes
- Phase advance between collimators of one collimation plane: 45°
- Enough space provided (secondary: 3m, primary: 1m)
- Test with simple FODO-cells
- Length of FODO cell: 175m, β_{\max} : 290m, β_{\min} : 60m

2 possibilities investigated:



- I) Collimators after quads
- II) Collimators at locations with $\beta_x \sim \beta_y$

Compatible with beam2?



FODO, version II:

| name | beta_x | beta_y | $\Delta\mu_x$ | $\Delta\mu_y$ | gap squeeze/inj.,ramp | tilt |
|-------------|--------|--------|---------------|---------------|-----------------------|------|
| | [m] | [m] | [°] | [°] | [m] | [°] |
| tcp.d6l7.b1 | 146.5 | 127.5 | | | 0.0015 / 0.006 | 90 |
| tcp.c6l7.b1 | 140.1 | 133.5 | | | 0.0016 / 0.0063 | 0 |
| tcp.b6l7.b1 | 133.2 | 140.5 | | | 0.0016 / 0.006 | 135 |
| tcp.a6.7.b1 | 122.4 | 152.4 | | | 0.0016 / 0.006 | 45 |
| tcs.b6l7.b1 | 141.8 | 131.9 | 61.6 | 25.8 | 0.0028 / 0.00737 | 0 |
| tcs.b5l7.b1 | 160 | 116.2 | 61.1 | 26.3 | 0.00276 / 0.00727 | 45 |
| tcs.b4l7.b1 | 141.2 | 132.5 | 85.1 | 85.1 | 0.0028 / 0.0074 | 0 |
| tcs.c6l7.b1 | 133.3 | 140.6 | 61.2 | 25.8 | 0.0028 / 0.0073 | 90 |
| tcs.a4r7.b1 | 116.2 | 160 | 86.5 | 86.2 | 0.00276 / 0.00727 | 45 |
| tcs.a5l7.b1 | 124.4 | 150.1 | 88.6 | 88.5 | 0.00288 / 0.00758 | 90 |
| tcs.a4l7.b1 | 132.5 | 141.2 | 85.4 | 85.4 | 0.00275 / 0.00724 | 135 |
| tcs.c4r7.b1 | 144.7 | 129.2 | 147.3 | 111.8 | 0.00282 / 0.00745 | 0 |
| tcs.e4r7.b1 | 163.2 | 113.7 | 146.7 | 112.1 | 0.00276 / 0.00728 | 45 |
| tcs.g4r7.b1 | 130.5 | 143.3 | 172 | 171.95 | 0.00268 / 0.0071 | 0 |
| tcs.d4r7.b1 | 153.8 | 121.3 | 147.4 | 112.2 | 0.00275 / 0.00726 | 135 |
| tcs.b5r7.b1 | 112.4 | 165 | 172.5 | 171.99 | 0.00276 / 0.0073 | 45 |
| tcs.b4r7.b1 | 136.1 | 137.5 | 146.9 | 111.5 | 0.00275 / 0.00726 | 90 |
| tcs.f4r7.b1 | 138.9 | 134.7 | 171.6 | 171.7 | 0.0027 / 0.007 | 90 |
| tcs.a5r7.b1 | 122.6 | 152.2 | 172.3 | 172.1 | 0.00275 / 0.00726 | 135 |
| tcs.a6l7.b1 | 150.7 | 123.9 | 61.8 | 26.4 | 0.00275 / 0.00725 | 135 |

Is it possible to match such an
insertion?