HL-LHC v1.5. Flat optics. End of levelling. $N_b = 1.4 \times 10^{11}$ ppb, $β_{v. IP1}^* = 7.5$ cm, $β_{x, IP1}^* = 18$ cm, $Φ/2_{IP1(H)/5(V)} = 250$ μrad CC ON, σ_z = 7.61 cm, $\Phi/2_{IP8,\,V}$ = 170 µrad, ϵ_n = 2.5 µm, Q' = 15, I_{MO} = 60 A, C $^-$ = 10^{-3} 8.0 - 7.5 - 7.0 60.323 -60.321 -Vertical tune Qy 60.319 -60.317 -60.315 -60.313 -

Horizontal tune Q_x

62.36 62.36 62.36 62.31 62.32 62.31 62.31 62.31 62.32 62.32 62.31

- 4.5

- 4.0

60.311 -

60.309 -

60.305 -