LHC online model aplications: coupling correction and aperture studies.

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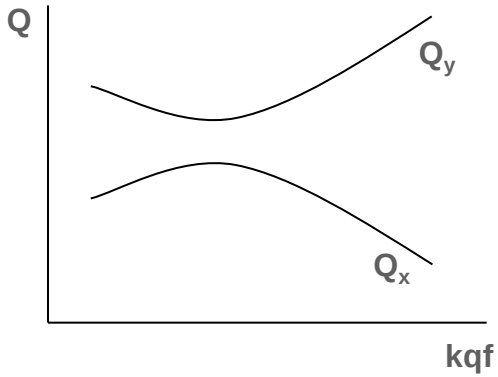
Online model aplications: coupling correction.

Creation of coupling correction knobs for the LHC:

The aim is to reduce the module of the C^- coupling vector, that is proportional to the ΔQ_{min} , which can be measured:

All skew quadrupole families available used (beam 1)

- **kqs.r5b1**
- **kqs.r3b1**
- **kqs.r1b1**
- **kqs.l8b1**
- **kqs.l6b1**
- **kqs.l4b1**
- **kqs.l2b1**
- **kqs.a81b1**
- **kqs.a67b1**
- **kqs.a45b1**
- **kqs.a23b1**



Online model aplications: coupling correction.

Creation of coupling correction knobs for the LHC:

Skew quadrupoles varied to get certain coupling coefficients (C^-_{imag}, C^-_{real})

For C^-_{imag} = 0.0001:

kqs.r5b1 =	-2.702452093e-09
kqs.r1b1 =	2.331285438e-08
kqs.l8b1 =	1.263682305e-07
kqs.l6b1 =	-2.226785577e-08
kqs.l2b1 =	2.340590196e-07
kqs.a81b1 =	-2.538564138e-07
kqs.a67b1 =	1.889923109e-07
kqs.a45b1 =	1.498263682e-07
kqs.a23b1 =	-2.088014893e-07

For C^-_{real} = 0.0001:

kqs.r5b1 =	-4.602158449e-07
kqs.r1b1 =	2.346451911e-07
kqs.l8b1 =	-8.883238151e-08
kqs.l6b1 =	-1.681356188e-07
kqs.l2b1 =	-6.458783187e-08
kqs.a81b1 =	1.59814108e-07
kqs.a67b1 =	1.671990073e-07
kqs.a45b1 =	3.932770622e-07
kqs.a23b1 =	3.298848927e-07

Online model aplications: coupling correction.

Testing the coupling correction knobs in simulation:

1. Nominal injection optics used (beam 1).

$C^-_{imag} = 0.0$

$C^-_{real} = 0.0$

2. Skew quadrupole errors are introduced in the bending magnets.

$C^-_{imag} = -0.08393291138$

$C^-_{real} = -0.03228233669$

3. Coupling correction performed by means of the created knobs.

$C^-_{imag} = -0.0001918894898$

$C^-_{real} = 0.0001660564853$

Online model aplications: coupling correction.

Creation of coupling correction knobs for the LHC:

- Create the knobs for beam 2:

Skew quadrupole families

- kqs.r2b2
- kqs.r4b2
- kqs.r6b2
- kqs.r8b2
- kqs.l1b2
- kqs.l3b2
- kqs.l5b2
- kqs.l7b2
- kqs.a12b2
- kqs.a78b2
- kqs.a56b2
- kqs.a34b2

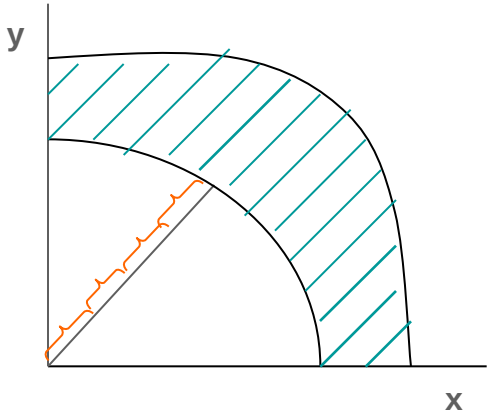
- Implement the knobs in the machine.

Online model aplications: aperture studies.

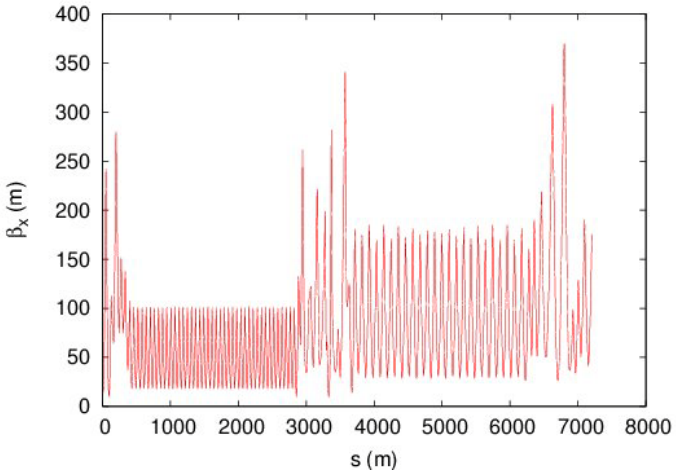
Obtaining the n1 aperture for the common zone of the injection lines and the LHC (TI2+LHC, TI8+LHC):

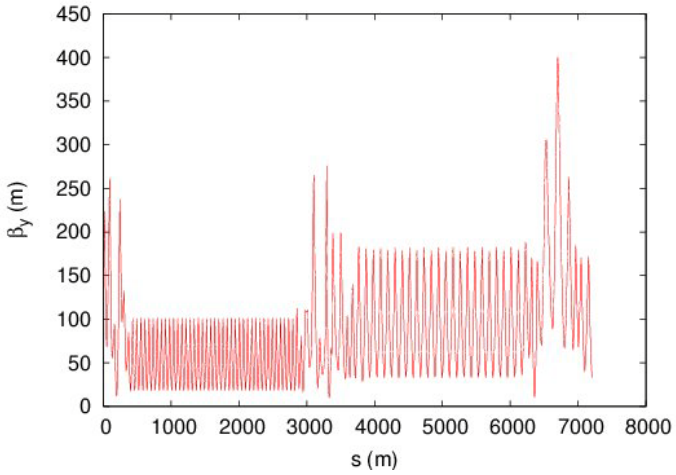
The n1 aperture parameter gives the minimum available space in terms of beam sizes at each location, taking into account the ß-functions and:

- closed orbit
- contribution from dispersion
- magnet tolerances
- offset due to the bump at the IP



TI2+LHCarc23



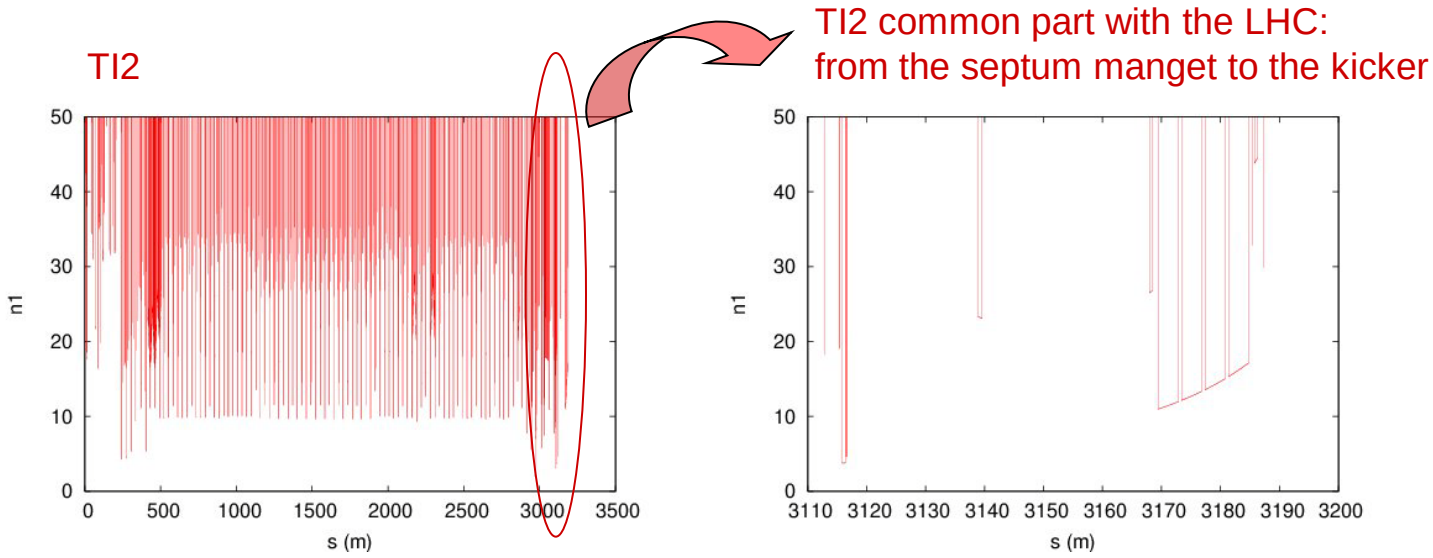


Online model aplications: aperture studies.

Obtaining the n1 aperture for the common zone of the injection lines and the LHC (TI2+LHC, TI8+LHC):

- In the common part, when the beam is extracted from TI2, it passes displaced with respect the reference orbit until it is sent back by the kicker.

- This displacement has to be taken into account for the n1 computation



(On-going work)