LONG RANGE COMPENSATION for phase 1 IR upgrade

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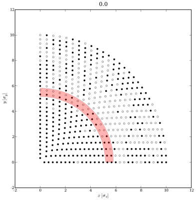
LCU - meeting

MODELL etc.

- BBTrack: weak-strong 6D tracking code
- For this studies: Transfer matrices between nonlinear elements
- Stability defined by Lyapunov criterion (300.000 turns)



- IP1 & IP5 only

POSITION etc.

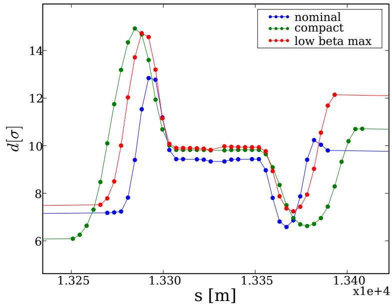
- For comparison: nominal LHC: no wire: $DA = 5.4\sigma$, compensated: $DA = 7.2\sigma$
- Position:
  - defined by equal β functions (or ratio corresponding to the average beam-beam encounter).
  - β huge enough to allow placing a wire with finite extensions
  - in the shade of the collimators ($d > 7\sigma$)
  - separated beam pipes
  - $\Delta\Phi \downarrow\downarrow$

  suitable position can be found in all scenarios
- nominal LHC: 104m from IP (reserved),

UPGRADE SCENARIOS

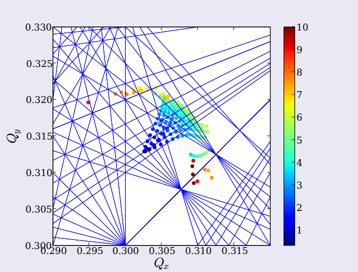
3 Alterantives are studied

variable	nominal N	low β	Compact
β^* [m]	0.55	0.25	0.25
particles/bunch [10^{11}]	1.5	1.15	1.15
#LRBBIs	15	17	21
wire position [m]	104	136	170
β_{wire} [m]	1780	3299	2272



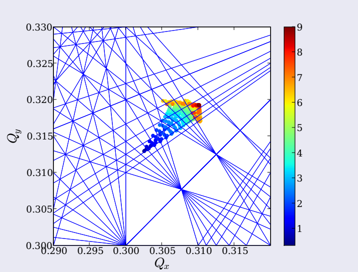
UPGRADE I - INCREASE N

Uncompensated



$DA = 4.33$

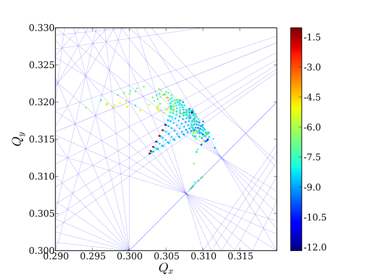
Wire-compensated



$DA = 6.33$

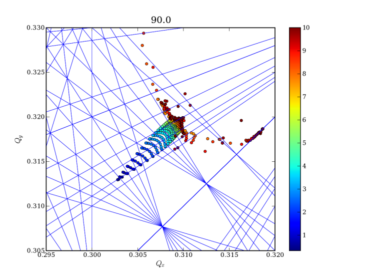
UPGRADE II - LOW β max

Uncompensated



$DA = 5.16$

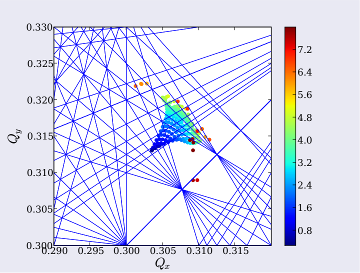
Wire-compensated



$DA = 7.1$

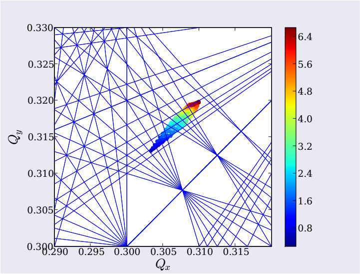
UPGRADE III - COMPACT

Uncompensated



$DA = 4$

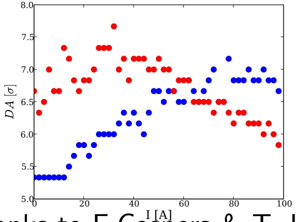
Wire-compensated



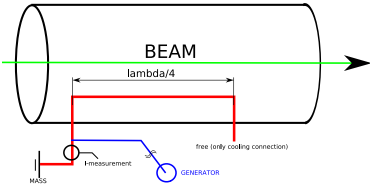
$DA = 5.2$

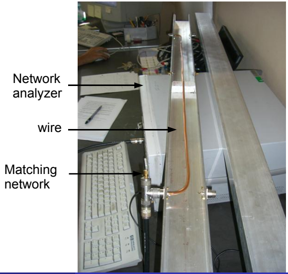
PACMAN

Same "problem" like in nominal LHC - in case of a DC version: Intermediate current level improves as well



Pulsed design based on resonant RF (thanks to F.Caspers & T. Kroyer), no transmission line effects, less power consumption, no fringe fields, lower stability requirement & high Q, works as reliable as the main RF system.





CONCLUSIONS

- No surprise: Compact optics is worst
- Wire compensation is applicable to all optics.
- Low β-max optics is the better one.
- Pulsed RF version progressing