

Optics and non-linear beam dynamics at 4 and 6.5 TeV

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Abstract

2012 has been an extraordinary year for the control and understanding of the LHC optics. A record low beta-beating of about 6% has been achieved during nominal operation. Consequently the luminosity imbalance between the two main experiments has also achieved a record low value.

Magnet experts have found 1% gradient errors in some MQY quadrupoles which are in good agreement with the beam-based optics corrections. A large effort has been put in probing the polarity of the non-linear correction circuits. So far, more than 60 sextupolar and octupolar circuits have been probed revealing some inconsistencies.

A large collection of new optics have been tested, including the post LS1 baseline beta = 40 cm.

Dedicated MDs have brought first time achievements in the LHC non-linear beam dynamics regime, namely: Measurement of DA at injection, chromatic coupling correction, IR non-linear corrections at beta=0.6 m and the direct measurement of amplitude detuning with AC dipoles.

All these accomplishments give a comfortable basis to make projections and recommendations towards 6.5TeV.