

# $\beta^*$ Reach: IR7 Collimation Hierarchy and Impedance MD314

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MPP Meeting, CERN, 21<sup>st</sup> Aug 2015



# Motivation

- **Small  $\beta^*$**  (<80cm) in high Luminosity collision points;
  - **larger  $\beta$**  functions in the **ITs** + **smaller** available **aperture** ( $\sigma$ );
    - smaller gaps of **TCTs**;
    - **smaller gaps of TCSGs**, to **accomodate** **TCTs** opening;
- **Smaller gaps of TCSGs** (= smaller **retractions** between TCSGs and TCPs):
  1. Do we have enough **machine stability**? Can we reach smaller retractions **without breaking** the **IR7 hierarchy**? (cleaning inefficiency)
  2. TCSGs have a relevant impact on LHC **impedance** budget; what about the impact on impedance and consequently beam stability?
    - we must **verify with beam** that we can have **reduced retractions** between TCPs and TCSGs;
- **moreover: long term stability of alignment**, i.e. can we rely on a single alignment per year (with settings tighter than the present ones)?

# The MD Activity

## Priorities:

- Verify **alignment** of IR7 collimators - **standard alignment procedure**;
- **Reach** and **qualify**  $2\sigma$ - and  $1\sigma$ -retractions;
  - **move TCSGs further in** wrt present settings + standard **qualification loss maps** (betatron);
- Verify impact on **impedance** of new settings:
  - **Tune shift measurements** as function of TCSG opening (up to  $20\sigma$ );
    - not only with all TCSGs, but also with **one** (with smallest  $\sigma$ );
  - TCSGs at tested settings: perform an **instability threshold measurement**, lowering octupole currents in steps (MD 755, and MD 346 during MD1 of 2015);

CERN-ATS-Note-2012-092 MD

### Results on nominal collimator settings MD at 4 TeV

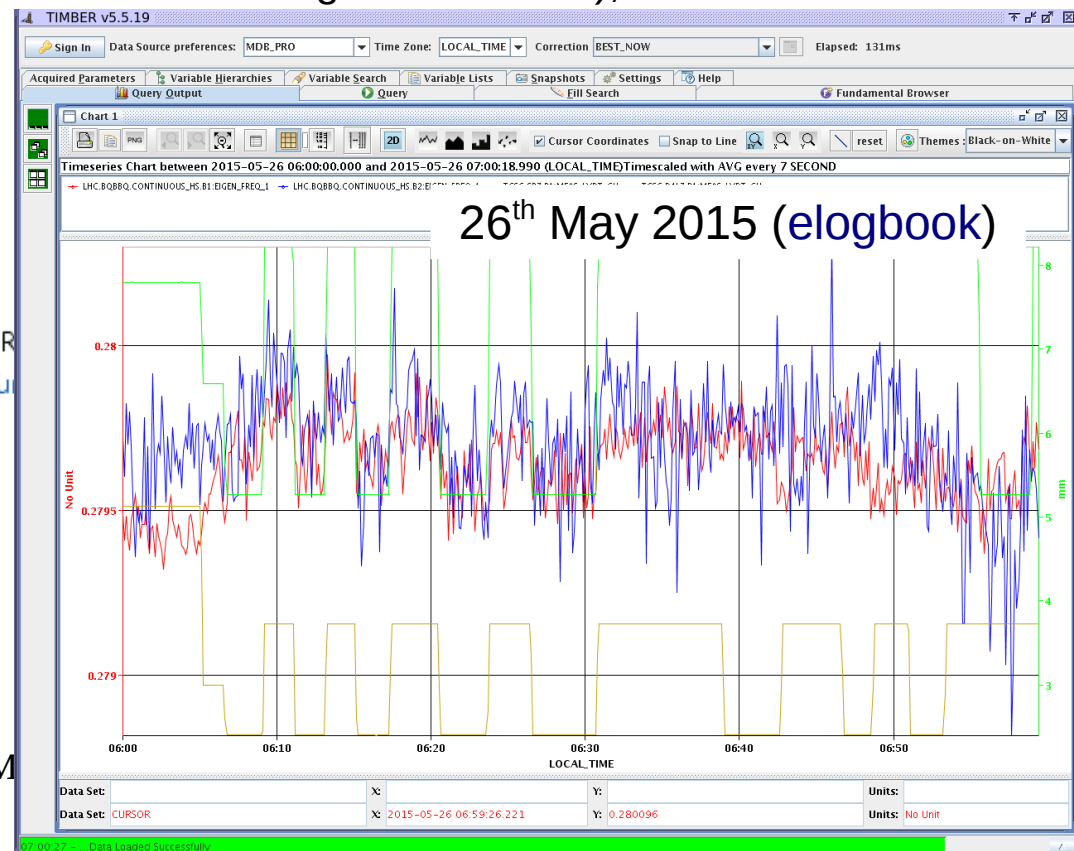
Salvachua, B (CERN) ; Assmann, RW (CERN) ; Burov, A (CERN) ; Bruce, R (CERN) ; Deboy, D (CERN) ; Lari, L (CERN) ; Marsili, A (CERN) ; Metral, E (CERN) ; Mou  
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CERN. Geneva. ATS Department

24 Jun 2012. - mult. p.

MPP, CERN, 2015-08-21

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# The MD Activity (II)

- In practice:
  - scheduled: Sat 29<sup>th</sup> Aug 2015, 06:00 - 14:00;
  - FT: **6.5 TeV**, **no squeeze** and **no collisions** (IR7 settings do not change);
  - 2 nominal bunches (2 $\mu$ m and 3 $\mu$ m) + several pilots (e.g. 12) – non colliding;
  - Q'=7 (requirements for instability threshold measurements);
  - Move **only IR7 TCSGs** (setup sheet / update beam process), keeping **in place any other collimator**;
    - TCSG settings to be tested: **7.5 $\sigma$**  → **6.5 $\sigma$**  → **6 $\sigma$**  (steps of **0.25 $\sigma$** );
  - Impedance measurements:
    - Tune shift measurements: TCSGs moved back and forth between 6.5 $\sigma$  and 20 $\sigma$ ;
    - Instability threshold measurement;

<b>IR7</b>	TCP / TCSG / TCLA	5.5 $\sigma$ / <b>8<math>\sigma</math></b> / 14 $\sigma$
<b>IR3</b>	TCP / TCSG / TCLA	15 $\sigma$ / 18 $\sigma$ / 20 $\sigma$
<b>IR6</b>	TCSP / TCDQ	9.1 $\sigma$ / 9.1 $\sigma$
<b>IR1/2/5/8</b>	TCT / TCL	37 $\sigma$ / 25mm

Collimator settings at FT (before squeeze)