MD3312: HL-LHC DA Studies Status

Joschua Dilly
General MD Outline

Amplitude Detuning Analysis
   Vertical Kicks

Outlook
General MD Outline
### General MD Parameters

**Table:** Key MD parameters.

<table>
<thead>
<tr>
<th><strong>Objective:</strong></th>
<th>Replication of HL-LHC Dynamic Aperture and Amplitude Detuning.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MD #:</strong></td>
<td>3312</td>
</tr>
<tr>
<td><strong>Operators:</strong></td>
<td>Markus Albert, Matteo Solfaroli Camillocci</td>
</tr>
<tr>
<td><strong>Fill #:</strong></td>
<td>7391</td>
</tr>
<tr>
<td><strong>Beam Process:</strong></td>
<td>MD $\rightarrow$ SQUEEZE-6.5TeV-ATS-65cm-60_15cm-2017_V1_ATSFlat@526 [END]</td>
</tr>
<tr>
<td><strong>Date:</strong></td>
<td>30.10.2018</td>
</tr>
<tr>
<td><strong>Start Time:</strong></td>
<td>12:00</td>
</tr>
<tr>
<td><strong>End Time:</strong></td>
<td>17:30</td>
</tr>
<tr>
<td><strong>Optics:</strong></td>
<td>R2017aT65_A60_15C15_60A10mL300</td>
</tr>
<tr>
<td><strong>Crossing:</strong></td>
<td>No crossing</td>
</tr>
<tr>
<td><strong>Separation:</strong></td>
<td>[0.3 / 1.4 / 0.3 / -1] mm in [IP1 / IP2 / IP5 / IP8], Plane: [V / V / H / H]</td>
</tr>
<tr>
<td><strong>Offset:</strong></td>
<td>No offset</td>
</tr>
</tbody>
</table>
Outline

- Setup: End-of-Squeeze, flat-optics, 6.5TeV
- Coupling Correction
- Waist-Shift tests with K-Modulation
- Trimming RCTX to replicate HL-LHC $b_6$ errors
- Beam 1: Amplitude Detuning, Beam 2: Dynamic Aperture
- Trimming RCOX, RCSSX, RCSX and RCSOX to replicate HL-LHC $b_4$, $a_3$, $b_3$, $a_4$ errors
- Beam 1: Amplitude Detuning, Beam 2: Dynamic Aperture

⇒ Dump because of Beam 2
Preliminary Results (in MD Note)

- Influence of Tune Feedback on ATS-optics
- Summary of Waist-Correction
- Lifetime Analysis during Trims of errors
- Some Lifetime Analysis during AD-Kicks
- Some Lifetime Analysis during DA-Kicks
Amplitude Detuning Analysis
• One WP close to 6\textsuperscript{th} order resonance line (-4, 1)
• One WP far away from resonance lines
Subsection 1

Vertical Kicks
Problem: Only in 5 out of 14 kicks tune visible
Tried with SVD Cuts down to 4, Old/New Harpy, SUSSIX
Also: Resonance Line not Visible
Vertical Kicks - Spectrum

- Problem: Only in 5 out of 14 kicks tune visible
- Tried with SVD Cuts down to 4, Old/New Harpy, SUSSIX
- Also: Resonance Line not Visible
Vertical Kicks - Amplitude Detuning

⇒ Very high but maybe wrong Amplitude Detuning analysis

• To be checked: Maybe error in code with units as new Harpy
Vertical Kicks - Intensity Losses

Date: 2018-10-30

Time
14:10:00 14:15:00 14:20:00
Beam Intensity [%]
-0.1±0.1 % -0.1±0.0 % -0.2±0.1 % ...
-1.3±0.1 %
-2.0±0.1 %
-2.5±0.1 %
-1.2±0.0 %
-0.6±0.1 %
-0.4±0.0 %

• Losses at kicks clearly visible
Vertical Kicks - Forced DA

⇒ Forced DA evaluation possible from

\[ DA_J = J^{\text{forced}} - \epsilon \ln \left( \frac{\Delta I}{I_0} \right) \]  \hspace{1cm} (1)

⇒ Very small?
Outlook
To do

• Check old AD analysis with new code (to exclude errors)
• Check MD3312 data again with SUSSIX
• Analyse Horizontal Kicks with $b_6$
• Analyse RDTs during DA kicks
• What else to do with Beam 2 Dynamic Aperture Kicks?
• Forced DA for 2D kicks ??
• Analyse Vertical Kicks after full HL-errors
Merry Christmas