

# SIS for Orbit and Correctors

- First implementation of SIS interlocks on orbit readings and CODs settings is ready.
  - Based on concentrated data from Orbit Feedback, both for monitor and for CODs.
  - Reference settings and tolerances stored in the LSA DB, controlled through the LHC steering application (YASP).
    - Reference, tolerance, enabled for interlock.
    - To be done: protect parameters with MCS (CO).
  - Configured to dump the corresponding beam.
  - One group of settings for injection+ramp+squeeze, one group for stable beams.
    - To be validated by experience.
  - Independent of the interlocks for injection for the experiments (triplet CODs and sep. dipoles).

# Orbit Interlock Settings Control (I)

**SIS Reference Control**

Settings Control | Settings Viewer

**Selection**

Beam: Beam2  
Plane: Horizontal  
Type: Monitors  
Setting: Injection

**Table filter**

Name filter: %33%  
Disabled elements:

**Tolerance**

Tolerance: 10  
Set tolerance

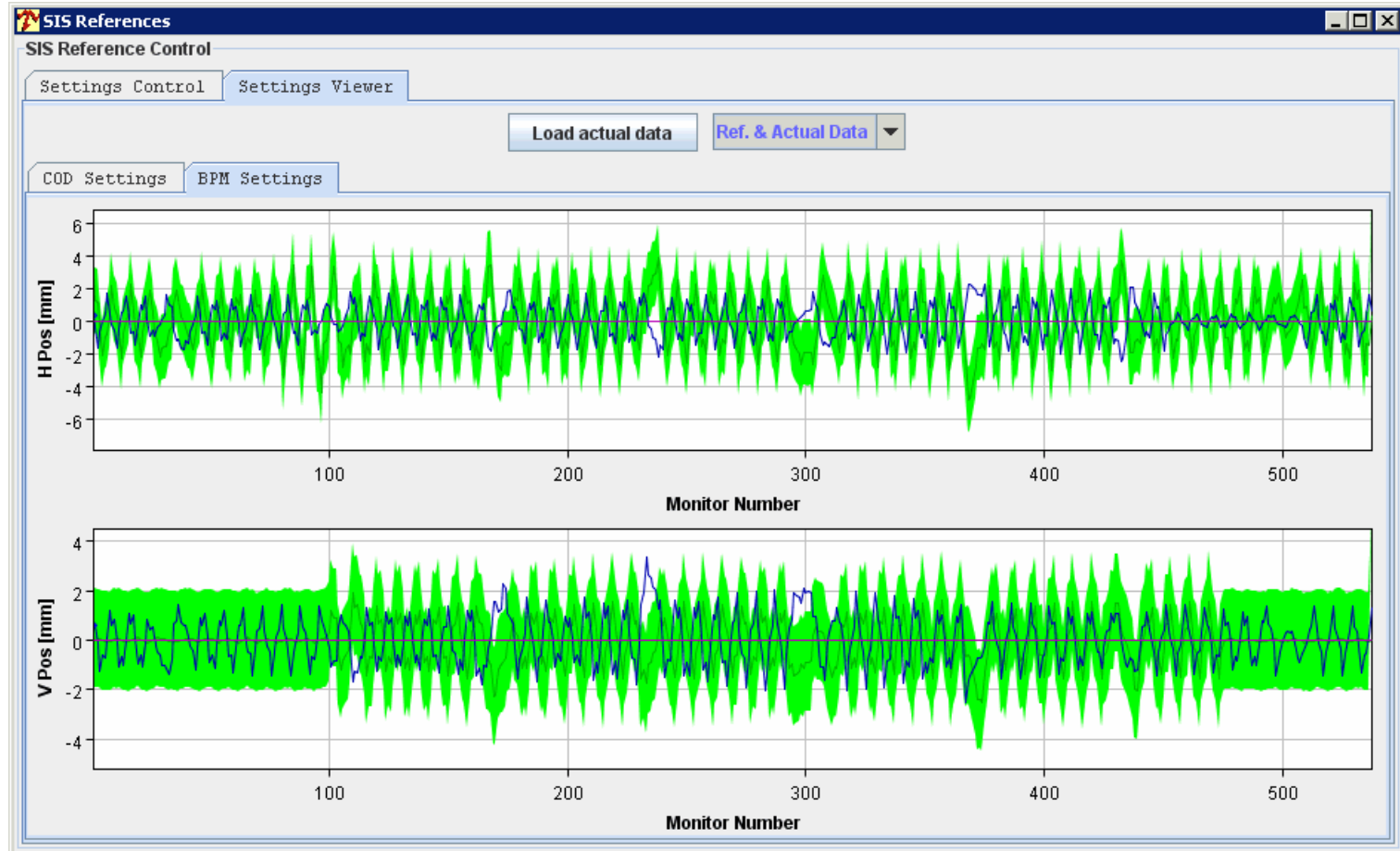
Name	Ref	Tol	Active
BPM.33L1.B2	2.866	2	<input checked="" type="checkbox"/>
BPM.33R1.B2	0.112	2	<input checked="" type="checkbox"/>
BPM.33L2.B2	0.916	2	<input checked="" type="checkbox"/>
BPM.33R2.B2	-0.328	2	<input type="checkbox"/>
BPM.33L3.B2	-2.554	2	<input type="checkbox"/>
BPM.33R3.B2	1.085	2	<input type="checkbox"/>
BPM.33L4.B2	-0.334	2	<input checked="" type="checkbox"/>
BPM.33R4.B2	-1.352	2	<input checked="" type="checkbox"/>
BPM.33L5.B2	2.343	2	<input checked="" type="checkbox"/>
BPM.33R5.B2	-0.235	2	<input checked="" type="checkbox"/>
BPM.33L6.B2	1.248	2	<input checked="" type="checkbox"/>
BPM.33R6.B2	0.205	2	<input checked="" type="checkbox"/>
BPM.33L7.B2	-3.017	2	<input checked="" type="checkbox"/>
BPM.33R7.B2	0.834	2	<input checked="" type="checkbox"/>
BPM.33L8.B2	-0.821	2	<input checked="" type="checkbox"/>
BPM.33R8.B2	-1.434	2	<input checked="" type="checkbox"/>

Import Ref | Read Settings  
Trim BPM Ref

UI interface to edit interlock settings.

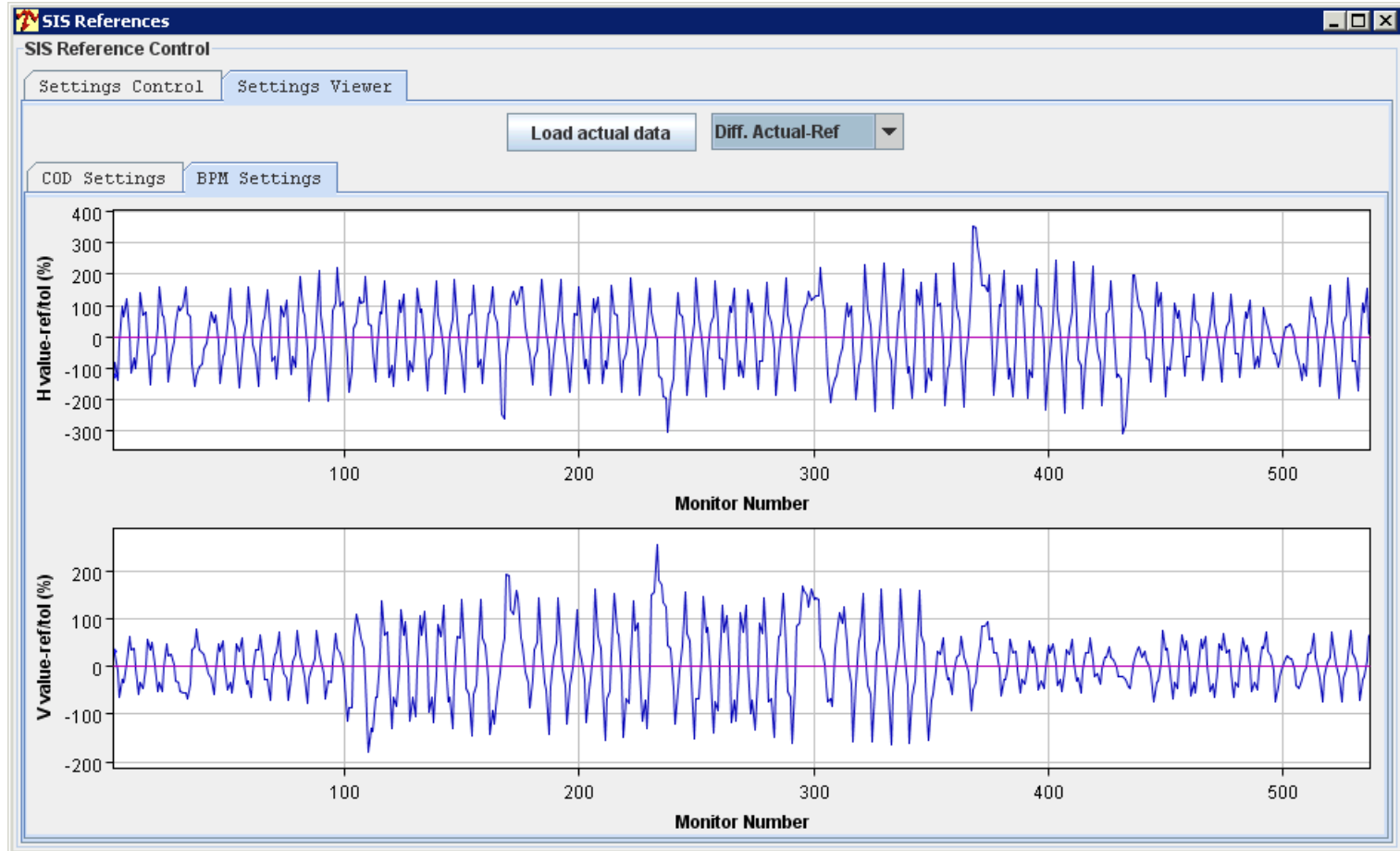
- Manual edition (table)
- Import of actual settings/readings into the interlock settings.
- ...

# Orbit Interlock Settings Control (II)



Display of interlock reference (green line), interlock tolerance (green band) and actual orbit/settings.

# Orbit Interlock Settings Control (III)



Display of difference actual-ref normalized to tolerance.

# SIS UI

The screenshot displays the LHC SIS GUI Local interface. The main window is titled "LHC SIS GUI Local" and has a menu bar with "File", "Operation", "Unlatch all channels", and "Help". Below the menu bar is a toolbar with a green play button icon.

The interface is divided into several sections:

- Filtering Parameters:** Includes a "Pattern:" text box, a "Search:" text box, and "Extra Parameters" with a dropdown menu set to "OR" and checkboxes for "Masked", "Invalid", "Latched", and "Invalid for beam".
- Filtering Options:** Includes checkboxes for "Use RegExps", "Invert filtering", and "'Flat' view", along with "Filter!" and "Clear" buttons.
- Permits Tree:** A hierarchical tree view showing various permits. The tree is expanded to show the "RING\_ORBIT\_B2" permit, which is highlighted in red. The tree structure includes:
  - [-] P [AND] INJ\_B1\_PERMIT
  - [-] P [AND] INJ\_B2\_PERMIT
  - [-] P [AND] INJ\_PERMIT
  - [-] P [AND] POWERING\_PERMIT
  - [-] P [AND] RING\_ALARM
  - [-] P [AND] RING\_B1\_PERMIT
    - [+] L [AND] BPM\_IR6\_B1
      - [+] ENERGY\_LIMIT
    - [-] L [AND] INTENSITY\_B1
    - [-] L [AND] LBDS\_PC\_SURVEY\_B1
    - [-] L [AND] RING\_ORBIT\_B1
      - [-] L [AND] COD\_FIELD\_INTEGRAL\_B1
      - [-] L [AND] COD\_SETTINGS\_H\_B1
      - [-] L [AND] COD\_SETTINGS\_V\_B1
      - [-] L [AND] ORBIT\_READING\_H\_B1
      - [-] L [AND] ORBIT\_READING\_V\_B1
  - [-] P [AND] RING\_B2\_PERMIT
    - [+] L [AND] BPM\_IR6\_B2
      - [+] ENERGY\_LIMIT
    - [-] L [AND] INTENSITY\_B2
    - [-] L [AND] LBDS\_PC\_SURVEY\_B2
    - [-] L [AND] RING\_ORBIT\_B2
      - [-] L [AND] COD\_FIELD\_INTEGRAL\_B2
      - [-] L [AND] COD\_SETTINGS\_H\_B2
      - [-] L [AND] COD\_SETTINGS\_V\_B2
      - [-] L [AND] ORBIT\_READING\_H\_B2
      - [-] L [AND] ORBIT\_READING\_V\_B2

- Properties (cern.sis.impl.config.IsicDescriptorImpl):** A detailed view of the selected permit. The "Mask effect" is highlighted in red and set to "(CRITICAL)". Other properties include:
- Id: RING\_B2\_PERMIT.RING\_ORBIT\_B2.COD\_SETTINGS\_H\_B2
- Description: Settings survey for H plane
- Maskable?:  True
- Mask effect: (CRITICAL)
- Latchable?:  True
- Acq. Window: 36000000000
- Cycle aware?:  False
- Cond. info: Index: -1
- No value policy: FALSE
- Operator: CUSTOM
- Param. Id: (empty)
- Value: (empty)
- Exporters: No exporters defined

At the bottom of the interface, there are controls for "Depth:" (set to 1) and "Font size:" (+1, -1, Reset).

Interlocks implemented in SIS (not yet in production).

- Interlocks by plane and by beam.
- Trigger a dump of corresponding beam.
- Interlocks are latched.

# Issues : Corrector Interlocks

- What should SIS do with a corrector that is OFF and outside tolerance? If the corrector trips off with beam:
    - Either the beam is lost because BLMs etc trigger directly. Then it does not matter what SIS does.
    - Or the beam survives... In that case, is it a good idea if SIS dumps the beam?
  - What should SIS do if some correctors do not deliver data?
    - Set a limit on the max. number of missing CODs, as is done for the hor. COD field integral (limit of 10%)?
- For the first operation during the commissioning (single bunch and 450 GeV), my proposal would be:
- Ignore CODs that are OFF or that do not deliver data. Save the machine uptime...
  - Revise the policy after the first few weeks...

# Issues : Monitor Interlocks

- ❑ What should SIS do with a monitor that is does not deliver data?
  - ❑ What should SIS do with a group of monitors (typically one frontend) that is does not deliver data?
  - ❑ Should SIS dump on a SINGLE monitor?
- » For the first operation during the commissioning (single bunch and 450 GeV), my proposal would be:
- Ignore monitors that do not deliver data (excursions are also covered by COD interlocks).
  - Revise the policy after the first few weeks...

# Issues : Monitors & CODs

- The interlock scheme made for 'reproducible operation'.
- It is tricky to handle special 'experiments', for example tests of Xing scheme at the end of physics fills:
  - Tricky to integrate such gymnastics (and keep it safe).
  - To disable affected monitors/correctors seems to be the simplest solution.
  - For MDs at low intensity, could integrate BCT data to deactivate automatically the interlocks (SBF from timing system).