

# HPS Chicane Operations Manual v1.0

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Controls of the HPS chicane are updated for 2016 to simplify operations during shift. This includes a simplified user interface, automatic retrieval of beam energy, automatic calculations of magnet current setpoints based on [1], and EPICS sequencers to energize and disable all HPS chicane magnets with minimal user interaction. This manual explains the operations of the new interface.

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## I. Overview

The new chicane screen is accessible from the main HPS-EPICS screen, under *Magnets*→*Chicane*, and shown in Figure 1. It contains a few buttons and many readbacks describe in the following subsections. Displayed numbers are in units Amps, Gauss, or MeV.

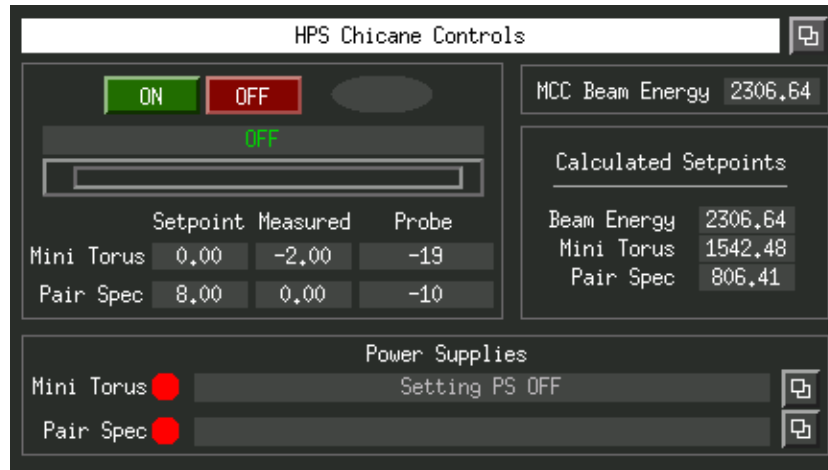


FIG. 1. The new chicane screen with both magnets power supplies completely off and interlocked, and setpoints calculated for a beam energy of 2.306 GeV.

### A. Buttons

This GUI contains five buttons:

1. The basic *ON* and *OFF* buttons, which is all the general shift worker should need for controls.
2. One expert button in the top right corner for customization of chicane setpoints.
3. Two expert buttons in the bottom right corner that are just links to the magnets' power supplies' old expert screens.

### B. Readbacks

This GUI also contains various readback values:

1. In the top left is a global status message and a corresponding progress bar.
2. Below that are setpoints and measured currents from the magnets' power supplies, and our Hall probes' readback values.

3. In the top right is the beam energy currently being reported from MCC, and the beam energy and magnet current calculations currently being used by this software to set HPS's magnets.
4. The bottom portion of the screen is status readbacks from the power supplies.

## II. Shifters Operations

This is all that shift workers need to operate the chicane: “On” and “Off”.

### A. On

To turn the chicane on, press the green *ON* button. That will begin a sequence to energize the magnets and eventually bring them to the desired “calculated” setpoints shown in the top right of the GUI. After that is accomplished the main message bar will display “Ready” and you are then ready for beam. This will take a total of about 40 minutes between the time *ON* is pressed and “Ready” is achieved. The details of the *ON* sequence are described in the next section.

### B. Off

To turn the chicane off, press the red *OFF* button. That will begin a sequence to ramp the magnets down to zero current and then switch the power supplies off. Then the main message box should display “OFF”. This will take a total of about 10 minutes. The details of the “OFF” sequence are described in the next section.

## III. Sequence Details

### A. On

The “On” button will initiate the procedure to go from chicane off to beam ready. This would normally be done during operations when preparing for first beam after an extended down time or any time the chicane was turned off.

1. turn both power supplies on

the main message box will display which supply it is turning on

2. ramp both power supplies up to their max current

the progress meter will display progress towards max current

3. saturate at max current for N minutes

the main message box will display the expected remaining time

4. ramp both power supplies down to their calculated setpoints

the progress meter will display the progress towards zero

5. display “Ready” in the main message box

## **B. Off**

The “Off” button will initiate the procedure to turn the chicane off. This would normally be done any time the magnets need to be set to zero.

1. ramp both power supplies down to zero current

the progress meter will display progress towards zero current

2. turn both power supplies off

the main message box will display which supply it is turning off

3. display “OFF” in the main message box

## IV. Expert Operations

The expert gui is a work in progress, written mostly in anticipation of what may be needed in the future.

1. The topmost section is of most importance, calculating the magnet currents from the MCC beam energy. This uses the relationship between beam energy and magnet currents given in [1].
2. The second section allows to choose your own beam energy, and then calculate the magnet currents based on beam energy given in [1].
3. The third sections allows to manually scan the magnet currents by adjusting only the beam energy, in accordance with the equations given in [1]. This could be useful for a manual scan of chicane settings.
4. The fourth section just allows to manually input setpoints to the power supplies. This is identical to manually inputting the currents in the expert screens for the individual power supplies.
5. The last section is some parameters on the sequencer: time to hold for saturation and tolerance to for the sequencer to think measured currents are acceptable.

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[1] M.Ehrhart *et al.*, [https://misportal.jlab.org/mis/physics/hps\\_notes/viewFile.cfm/2015-007.pdf?documentId=10](https://misportal.jlab.org/mis/physics/hps_notes/viewFile.cfm/2015-007.pdf?documentId=10), hPS-NOTE 2015-007.

HPS Chicane Controls - EXPERT

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Automatically Calculate Energy/Current

PROPOGATES TO POWER SUPPLIES DURING 'ON' PROCEDURE  
\* These Are Autosaved \*

MCC Beam Energy 2306,64	<table style="width: 100%; border-collapse: collapse;"> <tr><th colspan="2" style="text-align: left;">Calculated Setpoints</th></tr> <tr><td>Beam Energy</td><td>2306,64</td></tr> <tr><td>Mini Torus</td><td>1542,48</td></tr> <tr><td>Pair Spec</td><td>806,41</td></tr> </table>	Calculated Setpoints		Beam Energy	2306,64	Mini Torus	1542,48	Pair Spec	806,41
Calculated Setpoints									
Beam Energy	2306,64								
Mini Torus	1542,48								
Pair Spec	806,41								

Use MCC Energy and Recalculate Currents

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Manually Adjust Energy/Current Calculations

PROPOGATES TO POWER SUPPLIES DURING 'ON' PROCEDURE  
\* These Are Autosaved \*

Energy	2306,64	2306,64
Mini Torus	1542,48	1542,48
Pair Spec	806,41	806,41

Recalculate Currents from Energy

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Manually Scan Current Setpoints

PROPOGATES TO POWER SUPPLIES IMMEDIATELY  
\* These Are Autosaved \*

Calc

Energy	2306,64	2306,64		
Mini Torus	1542,48	0,00	-2,00	
Pair Spec	806,41	8,00	-2,00	

Recalculate Currents from Energy

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Manually Adjust Current Setpoints

PROPOGATES TO POWER SUPPLIES IMMEDIATELY  
\* These Are NOT Autosaved \*

Mini Torus	0,00	0,00	
Pair Spec	8,00	8,00	

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	Sat. Time (min)	Tolerance (A)
Mini Torus	10,0	50,0
Pair Spec	10,0	50,0

FIG. 2.