
Settings Manager

Release 3.0

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`Settings Manager` is a PyQt5 application developed for the accelerator physics settings management. It is one of the high-level applications that built on top of `PHANTASY` framework.

INTRODUCTION

`Settings Manager` features convenient loading and saving device settings, as well as value scaling to work with multi-charge state beam. Seamless integrated with other UI components, the user can initialize the device list by loading accelerator settings segment by segment. Columns of values show the information not limited to the current device settings. This application also features easy device accessibility by comprehensive filtering functionality, control knobs through context menu actions, etc.

1.1 Installation

`Settings Manager` is one of the GUI applications that built upon `PHANTASY` framework. The most straightforward installation approach is via `apt install` for Debian Linux OS. The way via `pip install` is under development.

Currently, Debian Buster is the supported Debian release, type the following commands in the Terminal to have it installed.

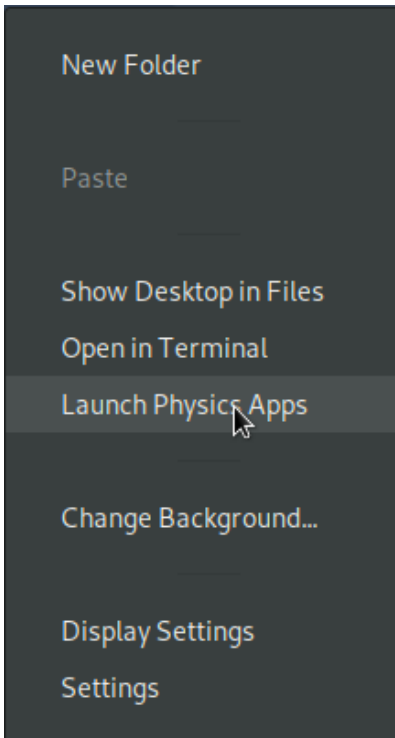
```
sudo apt update
sudo apt install python3-phantasy python3-phantasy-ui python3-phantasy-apps
```

An ideal test environment is VirtualBox with the appliance (.ova file), which is a pre-built Debian Buster with FRIB controls repository configured, the ova file is hosted on lab shared drive: `I:\simulations\physapps\physvms\develop-vmphy0-v7.ova`, along with `develop-vmphy0-v7.pdf` as the guide manual.

1.2 Start up Application

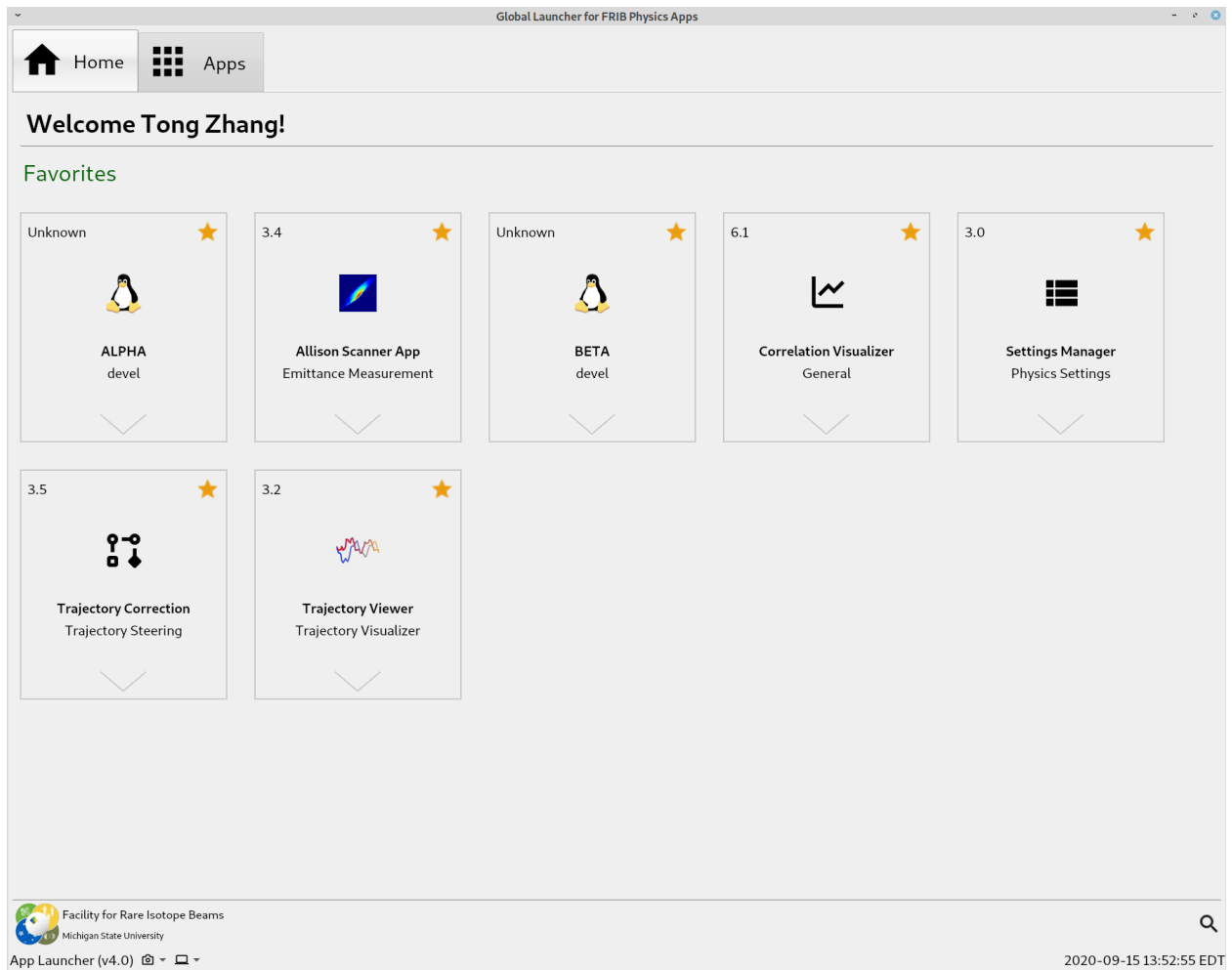
There are the two different ways to start up `Settings Manager`, through the global app launcher system or physics applications or console with command `settings_manager`.

`App Launcher` is another PyQt application developed to manage applications, from where the user can easily launcher any app by clicking. Right-clicking on the GNOME desktop will pop up the menu as the following image shows, click `Launch Physics Apps` will start up `App Launcher`.

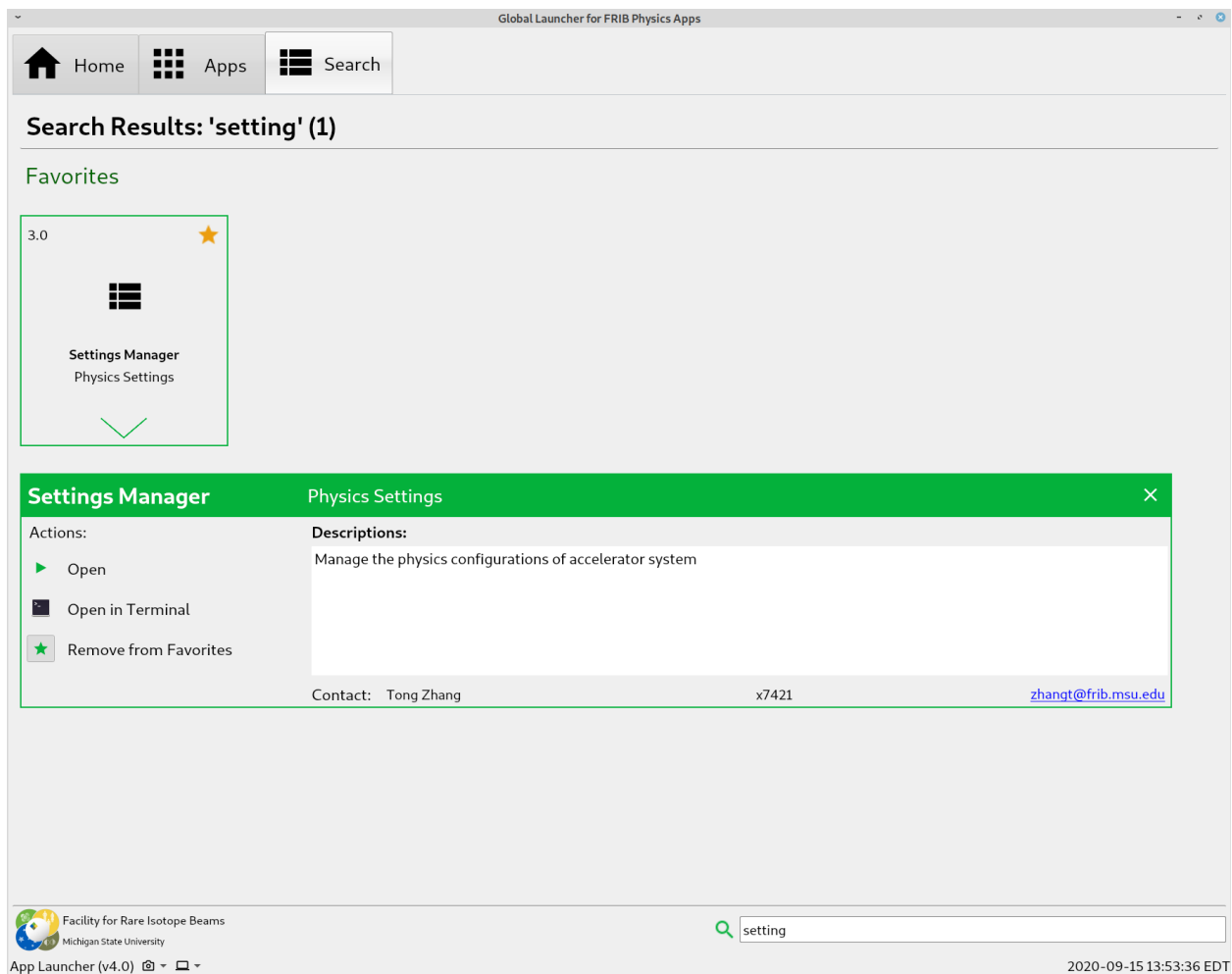


Note: For development (Accelerator Physics Department staff only), in the terminal, execute: `/files/shared/ap/run_apps.sh`

Below shows the main windows of App Launcher, as one can see, by default the welcome page will list all the *Favorites* which is a collection of all favored apps.

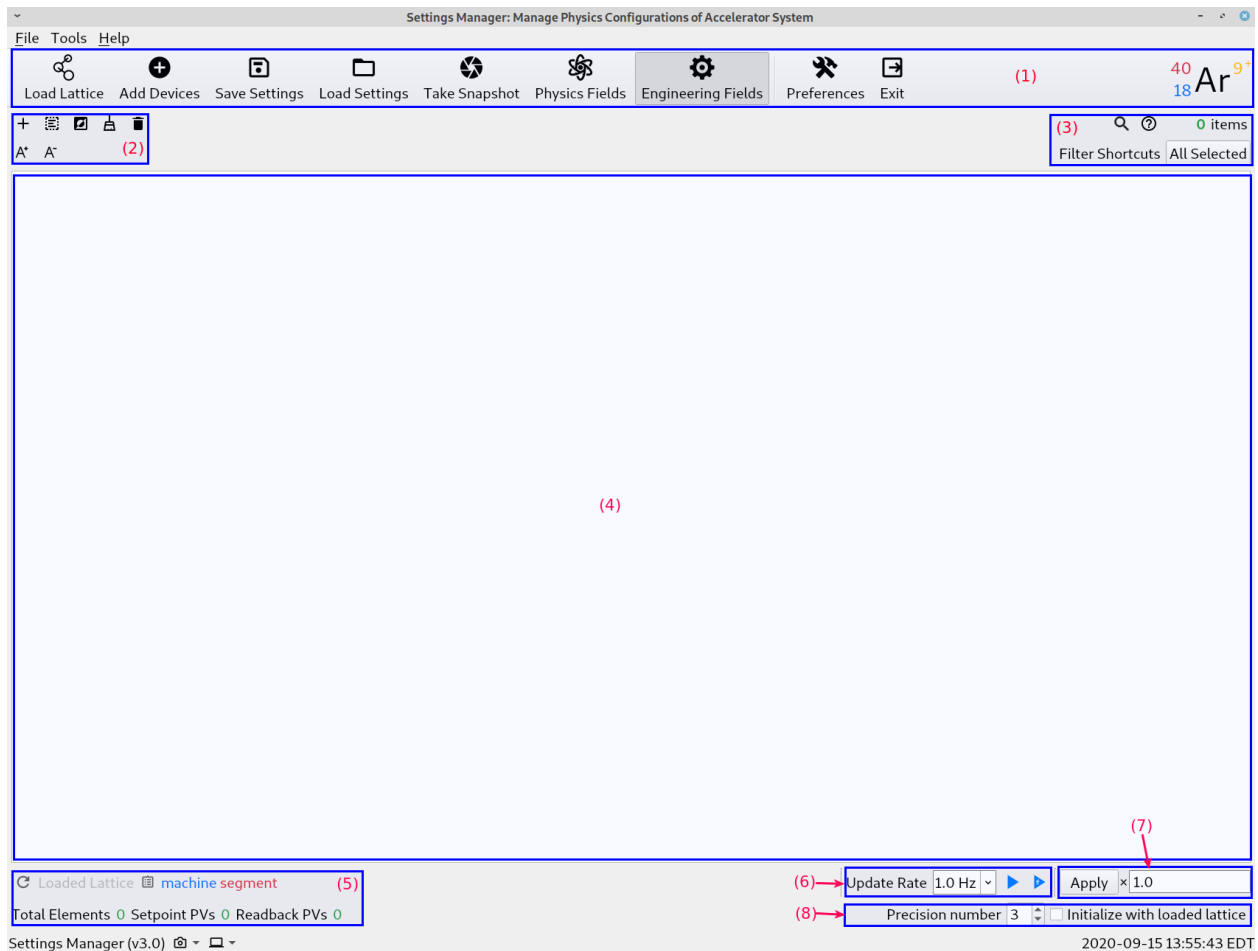


Input string in the right bottom *Search* box to filtering the app, or by hitting + to activate searching function, and pressing to deactivate.



On the card of `Settings Manager`, the top-left corner shows the version, top-right corner indicates it's a favorite app, click the star again will unfavorite it, click the bottom-middle arrow button will open the details of the app, which provides various actions, and descriptions, as well as contact information.

Single click the app icon (in the middle of card) will launch the app, or choose other modes from the *Actions* list. The following image show the main windows of `Settings Manager`.



1.3 GUI Overview

In the above figure, one can read numbered components as following:

- (1): Toolbar presents the buttons for major features
- (2): Convenient buttons for settings view (see (4))
- (3): Device filtering function
- (4): Treeview of device settings
- (5): Statistics
- (6): Value updating function
- (7): Set device settings with scaling factor
- (8): Complementary configurations for settings view

Press or through Help -> Contents will open the help window for references.

After loaded data, below shows the typical how the main window looks like (Settings Manager version 3.x):

Settings Manager: Manage Physics Configurations of Accelerator System

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

36 Ar⁹⁺
18

Working Directory: /home/tong/Dropbox/phantasy-project/phantasy-apps/phantasy_apps/settings_manager/testdata/sm-data Total 14

Timestamp Name Cast Save Note

2020-01-22

2020-01-22T09:58:41 elated_paper Cast Save After correction

2020-09-08

2020-09-08T14:10:09 phobic_garbage Cast Save Before trajectory correction.

2020-09-09

2020-09-10

349 items

Filter Shortcuts All Selected

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	$\Delta(x_0, x_1)$	$\Delta(x_0, x_2)$	$\Delta(x_1, x_2)$	Tolerance
LS1_CA01:CAV1_D1127	PHA	CAV	0.2181	325.00000000	325.25704403	325.00000000	-0.25704403	0.00000000	0.25704...	0.15000
LS1_CA01:CAV1_D1127	AMP	CAV	0.2181	0.64000000	0.63984544	0.64000000	0.00015456	0.00000000	-0.0001...	0.15000
LS1_CA01:SOL1_D1132	I	SOL	0.6854	5.34000000	5.34061519	5.34000000	-0.00061519	0.00000000	0.00061...	0.15000
LS1_CA01:DCV_D1132	I	VCOR	0.7854	0.00021914	0.00000000	0.00000000	0.00021914	0.00021914	0.00000...	0.15000
LS1_CA01:DCH_D1132	I	HCOR	0.7854	0.00000428	0.00000000	0.00000000	0.00000428	0.00000428	0.00000...	0.15000
LS1_CA01:CAV2_D1136	PHA	CAV	1.0598	325.00000000	325.10796014	325.00000000	-0.10796014	0.00000000	0.10796...	0.15000
LS1_CA01:CAV2_D1136	AMP	CAV	1.0598	0.70000000	0.69944396	0.70000000	0.00055604	0.00000000	-0.0005...	0.15000
LS1_CA01:CAV3_D1142	PHA	CAV	1.6933	325.00000000	325.25634614	325.00000000	-0.25634614	0.00000000	0.25634...	0.15000
LS1_CA01:CAV3_D1142	AMP	CAV	1.6933	0.76000000	0.75935640	0.76000000	0.00064360	0.00000000	-0.0006...	0.15000
LS1_CA01:SOL2_D1146	I	SOL	2.1606	5.90000000	5.90390908	5.90000000	-0.00390908	0.00000000	0.00390...	0.15000
LS1_CA01:DCV_D1146	I	VCOR	2.2606	0.00020785	0.00000000	0.00000000	0.00020785	0.00020785	0.00000...	0.15000
LS1_CA01:DCH_D1146	I	HCOR	2.2606	-0.00000380	0.00000000	0.00000000	-0.00000380	-0.00000380	0.00000...	0.15000
LS1_CA01:CAV4_D1150	PHA	CAV	2.5350	325.00000000	324.80899681	325.00000000	0.19100319	0.00000000	-0.1910...	0.30000
LS1_CA01:CAV4_D1150	AMP	CAV	2.5350	0.82000000	0.82016729	0.82000000	-0.00016729	0.00000000	0.00016...	0.15000
LS1_CA02:CAV1_D1161	PHA	CAV	3.5912	325.00000000	325.15914579	325.00000000	-0.15914579	0.00000000	0.15914...	0.15000
LS1_CA02:CAV1_D1161	AMP	CAV	3.5912	0.88000000	0.87978821	0.88000000	0.00021179	0.00000000	-0.0002...	0.15000
LS1_CA02:SOL1_D1165	I	SOL	4.0585	6.50000000	6.49508256	6.50000000	0.00491744	0.00000000	-0.0049...	0.15000
LS1_CA02:DCV_D1165	I	VCOR	4.1585	0.00018492	0.00000000	0.00000000	0.00018492	0.00018492	0.00000...	0.15000
LS1_CA02:DCH_D1165	I	HCOR	4.1585	0.00000479	0.00000000	0.00000000	0.00000479	0.00000479	0.00000...	0.15000
LS1_CA02:CAV2_D1169	PHA	CAV	4.4329	325.00000000	324.88581920	325.00000000	0.11418080	0.00000000	-0.1141...	0.15000
LS1_CA02:CAV2_D1169	AMP	CAV	4.4329	0.94000000	0.93944166	0.94000000	0.00055834	0.00000000	-0.0005...	0.15000
LS1_CA02:CAV3_D1176	PHA	CAV	5.0664	325.00000000	324.83318589	325.00000000	0.16681411	0.00000000	-0.1668...	0.15000
LS1_CA02:CAV3_D1176	AMP	CAV	5.0664	1.00000000	0.99921153	1.00000000	0.00078847	0.00000000	-0.0007...	0.15000
LS1_CA02:SOL2_D1180	I	SOL	5.5337	6.90000000	6.89471512	6.90000000	0.00528488	0.00000000	-0.0052...	0.15000
LS1_CA02:DCV_D1180	I	VCOR	5.6337	0.00017585	0.00000000	0.00000000	0.00017585	0.00017585	0.00000...	0.15000
LS1_CA02:DCH_D1180	I	HCOR	5.6337	-0.00000514	0.00000000	0.00000000	-0.00000514	-0.00000514	0.00000...	0.15000

Loaded Lattice FRIB_VA LS1FS1

Update Rate 1.0 Hz Apply x1.0

Total Elements 245 Setpoint PVs 349 Readback PVs 349

Precision number 8 Initialize with loaded lattice

Settings Manager (v3.0) 2020-09-15 14:30:28 EDT

Region (8) shows the loaded CSV files, which were saved before. When the **Take Snapshot** tool is pressed, a new entry will be added into this area. The user can use button *Cast* to reload different snapshot, and *Save* button to save the snapshot as a file, there is also button available to view the saved CSV file with system application, e.g. LibreOffice Calc.

The red box area shows the device settings, with columns:

- *Device*: Device name
- *Field*: Dynamic field name defined in PHANTASY framework, which is used to control the device
- *Type*: Device type
- *Pos*: Global position along the accelerator beam line, in meter
- *Setpoint*, alias *x0*: Stored field setting, will change after loading settings from a file, or taking snapshot
- *Live Readback*, alias *x1*: Live field readback value
- *Live Setpoint*, alias *x2*: Live field setpoint value
- $\Delta(x_0, x_1)$: $x_0 - x_1$, the discrepancy between stored setpoint and live readback
- $\Delta(x_0, x_2)$: $x_0 - x_2$, the discrepancy between stored setpoint and live setpoint
- $\Delta(x_1, x_2)$: $x_1 - x_2$, the discrepancy between live readback and setpoint
- *Tolerance*: Absolute discrepancy allowed for x_1 and x_2 to present green check status (see the left column), otherwise, show warning symbol

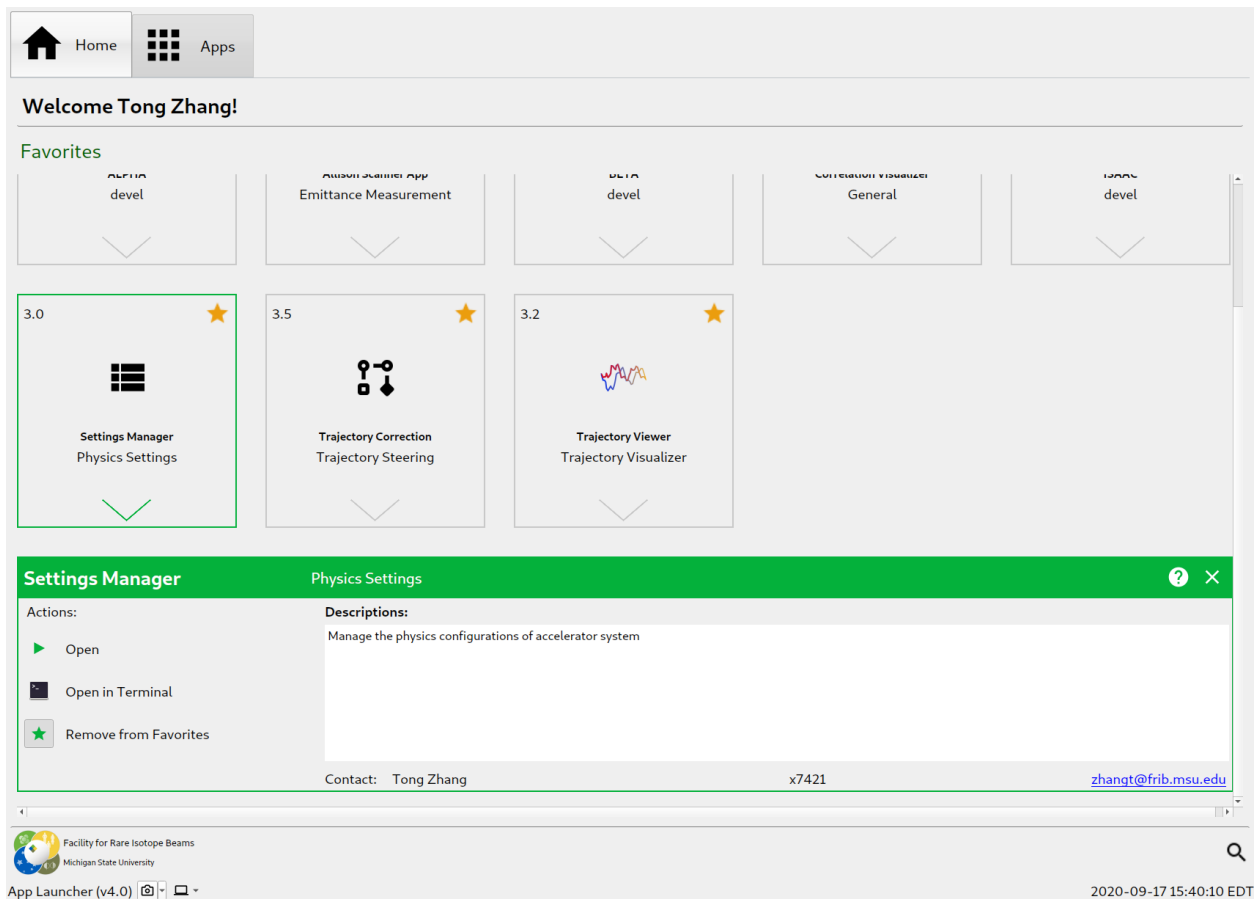
- *Writeable*: if the device is allowed to change, depends on Channel Access permission

Click the column name tab will trigger the sorting feature, either sorting by alphabetic, numerical depends on the column data type, the *Device* column is sorting by the four digits after 'D', which stands for the longitudinal position along the accelerator.

GETTING STARTED

This page presents the quick reference for the user to work with existing saved settings files with *Settings Manager*, to save and restore the machine states.

2.1 App Launcher

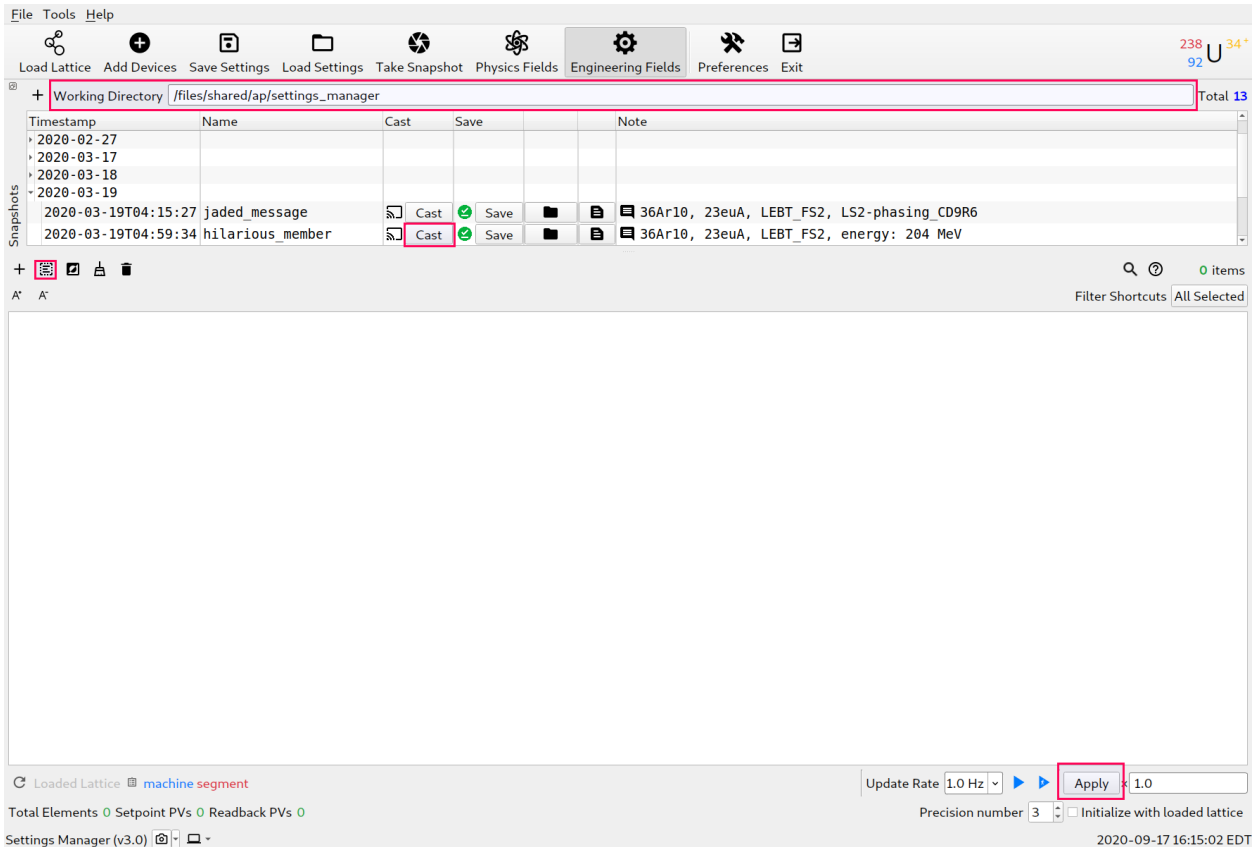


Run `/files/shared/ap/run_apps.sh` in the Terminal will reach *App Launcher*, from where *Settings Manager* can be seen in the *Favorites* tab, the user can:

- Start up the app: click the icon, or through *Actions*
- Read the PDF documentation: click ? mark icon in the app details window

2.2 Restore Settings

After starting up the app, the user should see all the loaded snapshots from the *Working directory*, by clicking any of them will show the settings data in the main settings tree view area.



And check all the devices, then push *Apply* button to do the restore. The text box right besides *Apply* button could be used to apply with the values of *Setpoint(x0)* multiplied by the input scaling factor.

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

Working Directory /files/shared/ap/settings_manager Total 13

Timestamp	Name	Cast	Save	Note
2020-02-27				
2020-03-17				
2020-03-18				
2020-03-19				
2020-03-19T04:15:27	jaded_message	Cast	Save	36Ar10, 23euA, LEPT_FS2, LS2-phasing_CD9R6
2020-03-19T04:59:34	hilarious_member	Cast	Save	36Ar10, 23euA, LEPT_FS2, energy: 204 MeV

Loaded Lattice machine segment

Total Elements 0 Setpoint PVs 0 Readback PVs 0

Settings Manager (v3.0)

Update Rate 1.0 Hz Apply 1.0

Precision number 3 Initialize with loaded lattice

2020-09-17 16:15:02 EDT

Note: The default working directory is /files/shared/ap/settings_manager, where keeps all the saved settings files from *Settings Manager**. The user can find them in *Snapshots* windows. The *cast* button of each row can be used to load device settings. For now, please use *Note* column to append additional information for the dataset.

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

Working Directory /files/shared/ap/settings_manager Total 13

Snapshots

Timestamp	Name	Cast	Save	Note
2020-02-27				
2020-03-17				
2020-03-18				
2020-03-19				
2020-03-19T04:15:27	jaded_message	Cast	Save	36Ar10, 23euA, LEBT FS2, LS2-phasing_CD9R6
2020-03-19T04:59:34	hilarious_member	Cast	Save	36Ar10, 23euA, LEBT FS2, energy: 204 MeV

Select All

Devices without write permission, not selectable

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	Δ(x ₀ ,x ₁)	Δ(x ₀ ,x ₂)	Δ(x ₁ ,x ₂)	Tolerance
FE_LEBT:DCH_D0964	I	HCOR	96.4142	-1.386	-2.699	-2.695	1.313	1.309	✓ 0.004	0.150
FE_LEBT:SOLR_D0967	I	SOL	96.5349	87.240	169.634	169.631	-82.394	-82.391	✓ 0.003	0.150
FE_LEBT:DCV_D0979	I	VCOR	97.8893	0.800	1.566	1.556	-0.766	-0.756	✓ 0.010	0.150
FE_LEBT:DCH_D0979	I	HCOR	97.8893	-0.331	-0.645	-0.644	0.314	0.313	✓ 0.001	0.150
FE_LEBT:SOLR_D0987	I	SOL	98.0101	113.900	221.274	221.470	-107.374	-107.570	✓ 0.196	0.250
FE_LEBT:CAV_D0987	PHA1	CAV	98.7350	179.000	179.288	179.000	0.321	0.000	✓ -0.321	0.500
FE_LEBT:CAV_D0987	PHA1_CREST	CAV	98.7350	1.620	1.620	1.620	0.000	0.000	✓ 0.000	0.150
FE_LEBT:CAV_D0987	PHA2	CAV	98.7350	-179.000	-178.825	-179.000	0.125	0.000	✓ -0.125	0.500
FE_LEBT:CAV_D0987	PHA2_CREST	CAV	98.7350	1.620	1.620	1.620	0.000	0.000	✓ 0.000	0.150
FE_LEBT:CAV_D0987	PHA3	CAV	98.7350	-140.000	-138.363	-140.000	0.129	0.000	✓ -0.129	0.500
FE_LEBT:CAV_D0987	PHA3_CREST	CAV	98.7350	1.620	1.620	1.620	0.000	0.000	✓ 0.000	0.150
FE_LEBT:CAV_D0987	AMP1	CAV	98.7350	2.300	4.463	4.472	-2.182	-2.172	✓ 0.010	0.150
FE_LEBT:CAV_D0987	AMP1_COEF	CAV	98.7350	1.620	1.620	1.620	0.000	0.000	✓ 0.000	0.150
FE_LEBT:CAV_D0987	AMP2	CAV	98.7350	4.000	7.793	7.778	-3.767	-3.778	✓ -0.011	0.150
FE_LEBT:CAV_D0987	AMP2_COEF	CAV	98.7350	1.620	1.620	1.620	0.000	0.000	✓ 0.000	0.150
FE_LEBT:CAV_D0987	AMP3	CAV	98.7350	2.000	3.776	3.889	-1.884	-1.889	✓ -0.005	0.150
FE_LEBT:CAV_D0987	AMP3_COEF	CAV	98.7350	1.620	1.620	1.620	0.000	0.000	✓ 0.000	0.150
FE_LEBT:DCV_D0992	I	VCOR	99.1993	0.000	-0.591	-0.583	0.591	0.583	✓ -0.008	0.150
FE_LEBT:DCH_D0992	I	HCOR	99.1993	0.100	-0.386	-0.389	0.486	0.489	✓ 0.003	0.150
FE_LEBT:SOLR_D0995	I	SOL	99.3201	122.700	238.425	238.581	-115.725	-115.881	✓ -0.156	0.250
FE_RFQ:CAV_D1005	PHA	CAV	100.0000	0.000	-102.983	0.000	167.532	0.000	▲ -167...	0.010
FE_RFQ:CAV_D1005	AMP	CAV	100.0000	56.500	109.888	110.000	-53.553	-53.500	▲ 0.053	0.010

Loaded Lattice FRIB LINAC

Total Elements 704 Setpoint PVs 1575 Readback PVs 1575

Settings Manager (v3.0)

Update Rate 1.0 Hz Apply 1.0

Precision number 3 Initialize with loaded lattice

2020-09-17 16:15:42 EDT

Note: The user can only select and check rows that can be controlled, i.e. with the write permission to the device. Multi-selection is supported with Ctrl, Shift keys, right-clicking on the selected rows will pop up the menu for check and uncheck rows.

2.3 Save Settings

Anytime the user pushes *Take Snapshot* tool will create a new entry in *Snapshots* window, from where the user can make note, save as a file, etc.

Note: After taking snapshot, if the user does not **save** with the *Save* button of the new snapshot entry, the snapshot data only persistent in the memory when the app is running, so always save *Valuable* data as you want.

Note: The user also can use *Load Settings* and *Save Settings* tools to do the same work, but this may not be managed by *Snapshots* window.

MANAGE ACCELERATOR SETTINGS

This page shows how to initialize the device settings from scratch, and perform save and load settings, as well as set devices with settings. To do the following instructions, a running virtual accelerator is required.

Note: All the following operations are applied to EPICS driven accelerator.

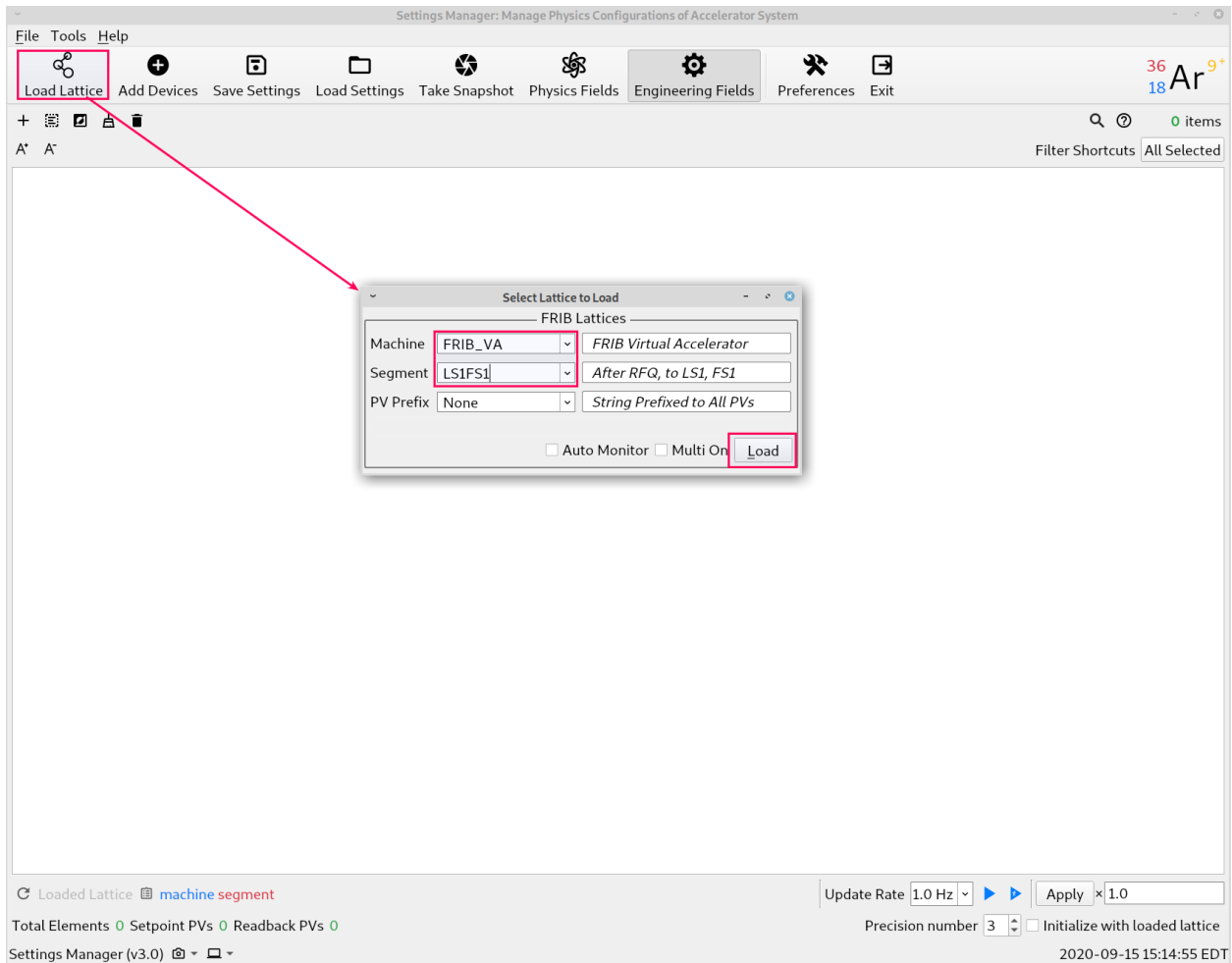
3.1 Controls Environment

Either virtual accelerator or real accelerator is driven by EPICS controls, to start a virtual accelerator to demonstrate the use of *Settings Manager*.

Select *Virtual Accelerator Launcher* from App Launcher, and choose machine *FRIB_VA* and segment *LS1FS1*, or executable the following line in Terminal:

```
phytool flame-vastart --mach FRIB_VA --subm LS1FS1
```

3.2 Initialize Device Settings View



Click *Load* button to load lattice *FRIB_VA/LS1FS1*. A message box will pop up which says the lattice is loaded, but no device settings to show. click *OK* to close the message box, and check the bottom right *Initialize with loaded lattice* option, after that, all the device settings (exclude diagnostic devices) should present in view area.

Note: As one may notice, the listed device values are only of 3 float precision, which is not enough for virtual accelerator, since all the values stand for physics units. Change the precision number spinbox to the value of 8 should be good enough.

Below is the total 445 rows of settings in the loaded lattice.

Settings Manager: Manage Physics Configurations of Accelerator System

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

36 Ar⁹⁺

445 items

Filter Shortcuts All Selected

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	$\Delta(x_0, x_1)$	$\Delta(x_0, x_2)$	$\Delta(x_1, x_2)$
LS1_CA01:CAV1_D1127	PHA	CAV	0.2181	325.00000000	324.82907207	325.00000000	-0.23557686	0.00000000	0.23557686
LS1_CA01:CAV1_D1127	AMP	CAV	0.2181	0.64000000	0.63939057	0.64000000	-0.00044964	0.00000000	0.00044964
LS1_CA01:SOL1_D1132	I	SOL	0.6854	5.34000000	5.33858939	5.34000000	0.00355202	0.00000000	-0.00355202
LS1_CA01:DCV_D1132	I	VCOR	0.7854	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:DCH_D1132	I	HCOR	0.7854	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:CAV2_D1136	PHA	CAV	1.0598	325.00000000	325.26709462	325.00000000	-0.22743457	0.00000000	0.22743457
LS1_CA01:CAV2_D1136	AMP	CAV	1.0598	0.70000000	0.70039162	0.70000000	-0.00036471	0.00000000	0.00036471
LS1_CA01:CAV3_D1142	PHA	CAV	1.6933	325.00000000	324.91210656	325.00000000	0.13412214	0.00000000	-0.13412214
LS1_CA01:CAV3_D1142	AMP	CAV	1.6933	0.76000000	0.76020711	0.76000000	-0.00059665	0.00000000	0.00059665
LS1_CA01:SOL2_D1146	I	SOL	2.1606	5.90000000	5.90308667	5.90000000	-0.00554955	0.00000000	0.00554955
LS1_CA01:DCV_D1146	I	VCOR	2.2606	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:DCH_D1146	I	HCOR	2.2606	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:CAV4_D1150	PHA	CAV	2.5350	325.00000000	324.87426233	325.00000000	-0.13760273	0.00000000	0.13760273
LS1_CA01:CAV4_D1150	AMP	CAV	2.5350	0.82000000	0.81922927	0.82000000	-0.00069540	0.00000000	0.00069540
LS1_CA02:CAV1_D1161	PHA	CAV	3.5912	325.00000000	325.29823929	325.00000000	-0.15659943	0.00000000	0.15659943
LS1_CA02:CAV1_D1161	AMP	CAV	3.5912	0.88000000	0.87925846	0.88000000	-0.00080202	0.00000000	0.00080202
LS1_CA02:SOL1_D1165	I	SOL	4.0585	6.50000000	6.50230071	6.50000000	-0.00154661	0.00000000	0.00154661
LS1_CA02:DCV_D1165	I	VCOR	4.1585	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA02:DCH_D1165	I	HCOR	4.1585	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA02:CAV2_D1169	PHA	CAV	4.4329	325.00000000	325.32002739	325.00000000	-0.01575253	0.00000000	0.01575253
LS1_CA02:CAV2_D1169	AMP	CAV	4.4329	0.94000000	0.93992235	0.94000000	-0.00016927	0.00000000	0.00016927
LS1_CA02:CAV3_D1176	PHA	CAV	5.0664	325.00000000	325.19140398	325.00000000	-0.06770398	0.00000000	0.06770398
LS1_CA02:CAV3_D1176	AMP	CAV	5.0664	1.00000000	0.99952070	1.00000000	-0.00047930	0.00000000	0.00047930
LS1_CA02:SOL2_D1180	I	SOL	5.5337	6.90000000	6.89887346	6.90000000	-0.00511757	0.00000000	0.00511757
LS1_CA02:DCV_D1180	I	VCOR	5.6337	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA02:DCH_D1180	I	HCOR	5.6337	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA02:CAV4_D1184	PHA	CAV	5.9081	325.00000000	325.31358021	325.00000000	-0.11005469	0.00000000	0.11005469
LS1_CA02:CAV4_D1184	AMP	CAV	5.9081	1.00000000	0.99931533	1.00000000	-0.00068467	0.00000000	0.00068467
LS1_CA03:CAV1_D1195	PHA	CAV	6.9643	325.00000000	324.69448847	325.00000000	0.02244662	0.00000000	-0.02244662
LS1_CA03:CAV1_D1195	AMP	CAV	6.9643	1.00000000	1.00044109	1.00000000	-0.00044109	0.00000000	0.00044109
LS1_CA03:SOL1_D1199	I	SOL	7.4316	7.20000000	7.20108489	7.20000000	-0.00069722	0.00000000	0.00069722
LS1_CA03:DCV_D1199	I	VCOR	7.5316	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA03:DCH_D1199	I	HCOR	7.5316	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA03:CAV2_D1203	PHA	CAV	7.8060	325.00000000	325.27339095	325.00000000	-0.11563124	0.00000000	0.11563124

Loaded Lattice FRIB_VA LS1FS1

Update Rate 1.0 Hz Apply x1.0

Total Elements 329 Setpoint PVs 445 Readback PVs 445

Precision number 8 Initialize with loaded lattice

Settings Manager (v3.0) 2020-09-15 15:32:22 EDT

3.3 Capture Device Settings

Beginning from now, the user can take snapshot of the accelerator by clicking *Take Snapshot*, the program will first update the settings view, then make a copy of all the data into memory, and show in the *Snapshots* dock window (just right below the Toolbar, it is relocatable).

Let's say before doing the trajectory correction, the user wanna save all the device settings. After clicking *Take Snapshot*, a new entry appears in the *Snapshots*, see the following figure.

The screenshot shows the 'Settings Manager: Manage Physics Configurations of Accelerator System' window. The 'Snapshots' panel is active, displaying a table of snapshots. The first snapshot is selected, showing its details in the 'Note' area. Below the snapshots, a table lists various devices and their parameters.

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	$\Delta(x_0, x_1)$	$\Delta(x_0, x_2)$	$\Delta(x_1, x_2)$
LS1_CA01:CAV1_D1127	PHA	CAV	0.2181	325.00000000	324.74461346	325.00000000	-0.18458467	0.00000000	0.18458467
LS1_CA01:CAV1_D1127	AMP	CAV	0.2181	0.64000000	0.63955434	0.64000000	0.00038365	0.00000000	-0.00038365
LS1_CA01:SOL1_D1132	I	SOL	0.6854	5.34000000	5.33755899	5.34000000	-0.00153447	0.00000000	0.00153447
LS1_CA01:DCV_D1132	I	VCOR	0.7854	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:DCH_D1132	I	HCOR	0.7854	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:CAV2_D1136	PHA	CAV	1.0598	325.00000000	324.92858833	325.00000000	0.30980440	0.00000000	-0.30980440
LS1_CA01:CAV2_D1136	AMP	CAV	1.0598	0.70000000	0.69984194	0.70000000	-0.00010688	0.00000000	0.00010688
LS1_CA01:CAV3_D1142	PHA	CAV	1.6933	325.00000000	325.21674850	325.00000000	0.23189618	0.00000000	-0.23189618
LS1_CA01:CAV3_D1142	AMP	CAV	1.6933	0.76000000	0.75956969	0.76000000	-0.00029066	0.00000000	0.00029066
LS1_CA01:SOL2_D1146	I	SOL	2.1606	5.90000000	5.89496229	5.90000000	-0.00161965	0.00000000	0.00161965
LS1_CA01:DCV_D1146	I	VCOR	2.2606	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:DCH_D1146	I	HCOR	2.2606	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA01:CAV4_D1150	PHA	CAV	2.5350	325.00000000	324.99351344	325.00000000	-0.06565765	0.00000000	0.06565765
LS1_CA01:CAV4_D1150	AMP	CAV	2.5350	0.82000000	0.81976885	0.82000000	0.00053551	0.00000000	-0.00053551
LS1_CA02:CAV1_D1161	PHA	CAV	3.5912	325.00000000	324.80826123	325.00000000	0.32151978	0.00000000	-0.32151978
LS1_CA02:CAV1_D1161	AMP	CAV	3.5912	0.88000000	0.88010123	0.88000000	-0.00007437	0.00000000	0.00007437
LS1_CA02:SOL1_D1165	I	SOL	4.0585	6.50000000	6.50374465	6.50000000	-0.00374465	0.00000000	0.00374465
LS1_CA02:DCV_D1165	I	VCOR	4.1585	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA02:DCH_D1165	I	HCOR	4.1585	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
LS1_CA02:CAV2_D1169	PHA	CAV	4.4329	325.00000000	325.28183918	325.00000000	0.09311458	0.00000000	-0.09311458
LS1_CA02:CAV2_D1169	AMP	CAV	4.4329	0.94000000	0.94066191	0.94000000	0.00029602	0.00000000	-0.00029602
LS1_CA02:CAV3_D1176	PHA	CAV	5.0664	325.00000000	325.24917109	325.00000000	0.08703764	0.00000000	-0.08703764
LS1_CA02:CAV3_D1176	AMP	CAV	5.0664	1.00000000	1.00049442	1.00000000	-0.00033633	0.00000000	0.00033633
LS1_CA02:SOL2_D1180	I	SOL	5.5337	6.90000000	6.89736567	6.90000000	0.00090218	0.00000000	-0.00090218

At the bottom, the 'Loaded Lattice' is 'FRIB_VA LS1FS1'. The 'Update Rate' is '1.0 Hz'. The 'Precision number' is '8'. The 'Initialize with loaded lattice' checkbox is checked. The status bar shows 'Settings Manager (v3.0)' and the date '2020-09-15 15:47:04 EDT'.

Now the snapshot is **ONLY** existing in the memory, the user has the option to save it to a file (do what as *Save* button guides), the *Note* area is filled with default message, the user may want input more useful information, here input “Before trajectory correction” as a memo, the *Name* area is also editable. The *Cast* column is lit with blue if current snapshot is showing in the main settings treeview, otherwise, it will be grayed out. Here we save this snapshot to a file.

Do trajectory correction with the apps *Trajectory Viewer* and *Trajectory Correction*, could be found in the App Launcher, here skip the details, just post the figures below.

Help

Open Matrix Save Matrix Open Settings Save Settings Exit

Loaded **FRIB_VA** **LS1** **Central Trajectory Response Measurement**

Field X&Y **58** **Central Trajectory Correction**

Monitors

Name	Field
<input checked="" type="checkbox"/> LS1_CA01:BPM_D1144	X&Y
<input checked="" type="checkbox"/> LS1_WA01:BPM_D1155	X&Y
<input checked="" type="checkbox"/> LS1_CA02:BPM_D1163	X&Y
<input checked="" type="checkbox"/> LS1_CA02:BPM_D1177	X&Y
<input checked="" type="checkbox"/> LS1_WA02:BPM_D1188	X&Y
<input checked="" type="checkbox"/> LS1_CA03:BPM_D1196	X&Y
<input checked="" type="checkbox"/> LS1_CA03:BPM_D1211	X&Y

Field I **90**

Correctors

Name	Field
<input checked="" type="checkbox"/> LS1_CA01:DCH_D1132	I
<input checked="" type="checkbox"/> LS1_CA01:DCV_D1132	I
<input checked="" type="checkbox"/> LS1_CA01:DCH_D1146	I
<input checked="" type="checkbox"/> LS1_CA01:DCV_D1146	I
<input checked="" type="checkbox"/> LS1_CA02:DCH_D1165	I
<input checked="" type="checkbox"/> LS1_CA02:DCV_D1165	I
<input checked="" type="checkbox"/> LS1_CA02:DCH_D1180	I

Settings Limit From To ☐ Change Limit

Scaling Settings Scaling factor multiplied onto corrector settings

Damping Factor Iteration(s)

Additional Wait Time Second

Float Precision e.g. for the case of 2, the original float 0.123 will be applied as 0.12.

Trajectory DAQ Frequency Short Number

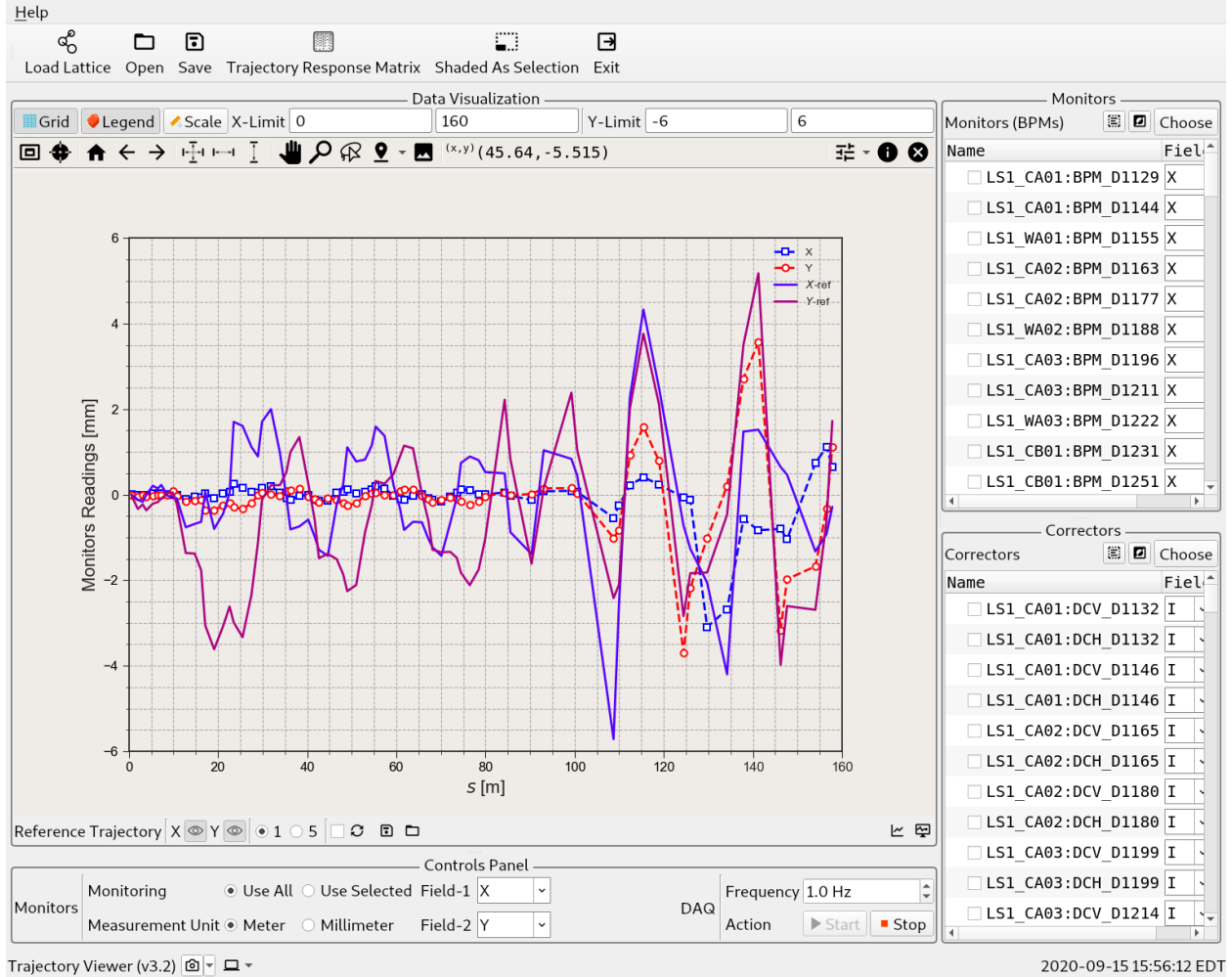
Timestamp	Name	Field	Setpoint	ID
2020-09-14 13:41:31				
2020-09-14 13:42:20				
2020-09-14 13:42:48	LS1_CA01:DCH_D1132	I	4.45e-06	001
	LS1_CA01:DCV_D1132	I	0.00020179	002
	LS1_CA01:DCH_D1146	I	-6.45e-06	003
	LS1_CA01:DCV_D1146	I	0.00018706	004
	LS1_CA02:DCH_D1165	I	2.24e-06	005
	LS1_CA02:DCV_D1165	I	0.00017024	006
	LS1_CA02:DCH_D1180	I	-4.97e-06	007
	LS1_CA02:DCV_D1180	I	0.00016415	008
	LS1_CA03:DCH_D1199	I	2.189e-05	009
	LS1_CA03:DCV_D1199	I	0.0001227	010
	LS1_CA03:DCH_D1214	I	-2.793e-05	011
	LS1_CA03:DCV_D1214	I	0.00019558	012
	LS1_CB01:DCH_D1235	I	2.478e-05	013
	LS1_CB01:DCV_D1235	I	0.00076612	014

Select/Apply settings from above list

Log

[2020-09-15 15:56:02]	Set [83]	LS1_BTS:DCH_D1997 [I]:	-0.000001 (RD: 0.000000)
[2020-09-15 15:56:02]	Set [84]	LS1_BTS:DCV_D1997 [I]:	0.000001 (RD: 0.000000)
[2020-09-15 15:56:02]	Set [85]	LS1_BTS:DCH_D2024 [I]:	0.000005 (RD: 0.000000)
[2020-09-15 15:56:02]	Set [86]	LS1_BTS:DCV_D2024 [I]:	0.000003 (RD: 0.000000)
[2020-09-15 15:56:02]	Set [87]	LS1_BTS:DCH_D2061 [I]:	-0.000006 (RD: 0.000000)
[2020-09-15 15:56:02]	Set [88]	LS1_BTS:DCV_D2061 [I]:	0.000056 (RD: 0.000000)
[2020-09-15 15:56:02]	Set [89]	LS1_BTS:DCH_D2114 [I]:	-0.000001 (RD: 0.000000)
[2020-09-15 15:56:02]	Set [90]	LS1_BTS:DCV_D2114 [I]:	0.000103 (RD: 0.000000)

Optics Response Matrix (v3.5) 2020-09-15 15:56:23 EDT



Now it is ready to take another snapshot of current device settings after trajectory correction. Following the same operation, click *Take Snapshot*, a new entry will append to the *Snapshots* window, shown name as *rare_queen* (random words trick), we may add note as “After trajectory correction”, and save.

Settings Manager: Manage Physics Configurations of Accelerator System

File Tools Help

Load Lattice Add Devices Save Settings Load Settings **Take Snapshot** Physics Fields Engineering Fields Preferences Exit

Working Directory: /home/tong/sm-wdir Total 2

Timestamp Name Cast Save Note

2020-09-15

2020-09-15T15:46:49 clear_confusion Cast Save ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1, before trajec...

2020-09-15T16:01:18 rare_queen Cast Save ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1,

445 items

Filter Shortcuts All Selected

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	$\Delta(x_0, x_1)$	$\Delta(x_0, x_2)$	$\Delta(x_1, x_2)$
LS1_CA01:CAV1_D1127	PHA	CAV	0.2181	325.00000000	325.07837337	325.00000000	-0.29186804	0.00000000	0.29186...
LS1_CA01:CAV1_D1127	AMP	CAV	0.2181	0.64000000	0.63972456	0.64000000	0.00044706	0.00000000	-0.0004...
LS1_CA01:SOL1_D1132	I	SOL	0.6854	5.34000000	5.34300754	5.34000000	-0.00340628	0.00000000	0.00340...
LS1_CA01:DCV_D1132	I	VCOR	0.7854	0.00020179	0.00020165	0.00020179	0.00000013	0.00000000	-0.0000...
LS1_CA01:DCH_D1132	I	HCOR	0.7854	0.00000445	0.00000445	0.00000445	0.00000000	0.00000000	0.00000...
LS1_CA01:CAV2_D1136	PHA	CAV	1.0598	325.00000000	324.84334032	325.00000000	0.10628826	0.00000000	-0.1062...
LS1_CA01:CAV2_D1136	AMP	CAV	1.0598	0.70000000	0.70007561	0.70000000	-0.00013166	0.00000000	0.00013...
LS1_CA01:CAV3_D1142	PHA	CAV	1.6933	325.00000000	325.22397162	325.00000000	0.25974416	0.00000000	-0.2597...
LS1_CA01:CAV3_D1142	AMP	CAV	1.6933	0.76000000	0.76075280	0.76000000	-0.00069121	0.00000000	0.00069...
LS1_CA01:SOL2_D1146	I	SOL	2.1606	5.90000000	5.90230330	5.90000000	0.00334414	0.00000000	-0.0033...
LS1_CA01:DCV_D1146	I	VCOR	2.2606	0.00018706	0.00018711	0.00018706	0.00000013	0.00000000	-0.0000...
LS1_CA01:DCH_D1146	I	HCOR	2.2606	-0.00000645	-0.00000644	-0.00000645	0.00000000	0.00000000	0.00000...
LS1_CA01:CAV4_D1150	PHA	CAV	2.5350	325.00000000	325.22165219	325.00000000	0.10801015	0.00000000	-0.1080...
LS1_CA01:CAV4_D1150	AMP	CAV	2.5350	0.82000000	0.81931565	0.82000000	-0.00074809	0.00000000	0.00074...
LS1_CA02:CAV1_D1161	PHA	CAV	3.5912	325.00000000	325.01447074	325.00000000	-0.06970899	0.00000000	0.06970...
LS1_CA02:CAV1_D1161	AMP	CAV	3.5912	0.88000000	0.87938170	0.88000000	0.00000564	0.00000000	-0.0000...
LS1_CA02:SOL1_D1165	I	SOL	4.0585	6.50000000	6.49872801	6.50000000	-0.00578625	0.00000000	0.00578...
LS1_CA02:DCV_D1165	I	VCOR	4.1585	0.00017024	0.00017030	0.00017024	-0.00000008	0.00000000	0.00000...
LS1_CA02:DCH_D1165	I	HCOR	4.1585	0.00000224	0.00000224	0.00000224	0.00000000	0.00000000	0.00000...
LS1_CA02:CAV2_D1169	PHA	CAV	4.4329	325.00000000	325.19963372	325.00000000	-0.01546129	0.00000000	0.01546...
LS1_CA02:CAV2_D1169	AMP	CAV	4.4329	0.94000000	0.93995683	0.94000000	-0.00047986	0.00000000	0.00047...
LS1_CA02:CAV3_D1176	PHA	CAV	5.0664	325.00000000	324.81475311	325.00000000	-0.02779968	0.00000000	0.02779...
LS1_CA02:CAV3_D1176	AMP	CAV	5.0664	1.00000000	0.99993891	1.00000000	-0.00072739	0.00000000	0.00072...
LS1_CA02:SOL2_D1180	I	SOL	5.5337	6.90000000	6.90324219	6.90000000	-0.00353945	0.00000000	0.00353...

Loaded Lattice FRIB_VA LS1FS1

Update Rate 1.0 Hz Apply x1.0

Total Elements 329 Setpoint PVs 445 Readback PVs 445

Precision number 8 Initialize with loaded lattice

Settings Manager (v3.0) 2020-09-15 16:07:25 EDT

Since the trajectory correction app only changed the settings of correctors. The user may only see the correctors. *Settings Manager* was designed with comprehensive search function. Here is the simple guide.

Click *Search* button to enable search function, or use short cut + to activate, and pressing to deactivate.

Type `type=*COR` in the search input box, press to start filtering.

Settings Manager: Manage Physics Configurations of Accelerator System

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

Working Directory: /home/tong/sm-wdir Total 2

Snapshots

Timestamp	Name	Cast	Save	Note
2020-09-15				
2020-09-15T15:46:49	clear_confusion	Cast	Save	ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1, before trajec...
2020-09-15T16:01:18	rare_queen	Cast	Save	ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1, after trajec...

type=*COR 120 items

Filter Shortcuts All Selected

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	$\Delta(x_0, x_1)$	$\Delta(x_0, x_2)$	$\Delta(x_1, x_2)$
LS1_CA01:DCV_D1132	I	VCOR	0.7854	0.00020179	0.00020165	0.00020179	0.00000013	0.00000000	✓ -0.0000...
LS1_CA01:DCH_D1132	I	HCOR	0.7854	0.00000445	0.00000445	0.00000445	0.00000000	0.00000000	✓ 0.00000...
LS1_CA01:DCV_D1146	I	VCOR	2.2606	0.00018706	0.00018711	0.00018706	0.00000013	0.00000000	✓ -0.0000...
LS1_CA01:DCH_D1146	I	HCOR	2.2606	-0.00000645	-0.00000644	-0.00000645	0.00000000	0.00000000	✓ 0.00000...
LS1_CA02:DCV_D1165	I	VCOR	4.1585	0.00017024	0.00017030	0.00017024	-0.00000008	0.00000000	✓ 0.00000...
LS1_CA02:DCH_D1165	I	HCOR	4.1585	0.00000224	0.00000224	0.00000224	0.00000000	0.00000000	✓ 0.00000...
LS1_CA02:DCV_D1180	I	VCOR	5.6337	0.00016415	0.00016418	0.00016415	-0.00000016	0.00000000	✓ 0.00000...
LS1_CA02:DCH_D1180	I	HCOR	5.6337	-0.00000497	-0.00000497	-0.00000497	0.00000000	0.00000000	✓ 0.00000...
LS1_CA03:DCV_D1199	I	VCOR	7.5316	0.00012270	0.00012262	0.00012270	-0.00000004	0.00000000	✓ 0.00000...
LS1_CA03:DCH_D1199	I	HCOR	7.5316	0.00002189	0.00002188	0.00002189	-0.00000002	0.00000000	✓ 0.00000...
LS1_CA03:DCV_D1214	I	VCOR	9.0068	0.00019558	0.00019553	0.00019558	-0.00000013	0.00000000	✓ 0.00000...
LS1_CA03:DCH_D1214	I	HCOR	9.0068	-0.00002793	-0.00002792	-0.00002793	0.00000000	0.00000000	✓ 0.00000...
LS1_CB01:DCV_D1235	I	VCOR	11.1442	0.00076612	0.00076628	0.00076612	-0.00000008	0.00000000	✓ 0.00000...
LS1_CB01:DCH_D1235	I	HCOR	11.1442	0.00002478	0.00002479	0.00002478	0.00000000	0.00000000	✓ 0.00000...
LS1_CB01:DCV_D1255	I	VCOR	13.1419	0.00072807	0.00072772	0.00072807	-0.00000004	0.00000000	✓ 0.00000...
LS1_CB01:DCH_D1255	I	HCOR	13.1419	0.00003376	0.00003374	0.00003376	0.00000001	0.00000000	✓ -0.0000...
LS1_CB01:DCV_D1275	I	VCOR	15.1397	0.00067194	0.00067183	0.00067194	0.00000012	0.00000000	✓ -0.0000...
LS1_CB01:DCH_D1275	I	HCOR	15.1397	-0.00003157	-0.00003155	-0.00003157	-0.00000001	0.00000000	✓ 0.00000...
LS1_CB02:DCV_D1299	I	VCOR	17.5166	0.00057451	0.00057437	0.00057451	-0.00000003	0.00000000	✓ 0.00000...
LS1_CB02:DCH_D1299	I	HCOR	17.5166	0.00003055	0.00003054	0.00003055	0.00000000	0.00000000	✓ 0.00000...
LS1_CB02:DCV_D1319	I	VCOR	19.5144	0.00046467	0.00046436	0.00046467	0.00000027	0.00000000	✓ -0.0000...
LS1_CB02:DCH_D1319	I	HCOR	19.5144	0.00003106	0.00003106	0.00003106	0.00000001	0.00000000	✓ -0.0000...
LS1_CB02:DCV_D1339	I	VCOR	21.5121	0.00044575	0.00044552	0.00044575	0.00000020	0.00000000	✓ -0.0000...
LS1_CB02:DCH_D1339	I	HCOR	21.5121	-0.00000928	-0.00000928	-0.00000928	0.00000000	0.00000000	✓ 0.00000...

Loaded Lattice FRIB_VA LS1FS1

Total Elements 329 Setpoint PVs 445 Readback PVs 445

Update Rate 1.0 Hz Apply x1.0

Precision number 8 Initialize with loaded lattice

Settings Manager (v3.0) 2020-09-15 16:18:21 EDT

*COR matches both HCOR and *COR, which stands for horizontal corrector and vertical corrector, respectively.

Click the question mark button right of search button will show the tips for searching.

Settings Manager: Manage Physics Configurations of Accelerator System

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

Working Directory /home/tong/sm-wdir Total 2

Timestamp Name Cast Save Note

2020-09-15

2020-09-15T15:46:49

2020-09-15T16:01:18

Search Tips

Input filter string with the format of **keyword=pattern**. *Pattern* applies Unix wildcard rules. *Keyword* is case insensitive, if *keyword* is not given, *device* is used. Valid keywords are: *device*, *field*, *type*, *pos*, *x0*, *x1*, *x2*, *dx01*, *dx02*, *dx12*, *tolerance*, *writable*. For *Setpoint* column, the keyword *x0* is used, the same rule applies to *x1*, *x2*, *dx01*, *dx02*, *dx12*, where dx_{ij} is $\Delta(x_i, x_j)$ as shown in the headers.

Press **Enter** to activate the filter, **Esc** to clear the filter.

General wildcard rules:

1. * is to match any char or digit.
2. ? is to match one char or digit, pure " is to interpret as *.

Filter examples:

1. *: match all device names, which is equivalent of `device=*`.
2. `*LEBT*`: match device name which has string 'LEBT'.
3. `type='CAV'`: match all devices of type 'CAV'.
4. `type='*COR'`: match all devices of type 'HCOR' and 'VCOR'.
5. `dx12=0.00*`: match the diff between readback and setpoint of 0.00xx...

Number Columns:

For the columns where values are numbers, value range or single value filter is supported:

6. `pos=(1,)` matches all the position value equal or greater than 1.0.
7. `x1=(-1, 2)` matches current readback value is in [-1, 2] range.
8. `dx12=0.1` matches the discrepancy between the live readback and setpoint is 0.1.

LS1 CA01:DCV D1132

LS1 CA01:DCH D1132

LS1 CA01:DCV D1146

LS1 CA01:DCH D1146

LS1 CA02:DCV D1165

LS1 CA02:DCH D1165

LS1 CA02:DCV D1180

LS1 CA02:DCH D1180

LS1 CA03:DCV D1199

LS1 CA03:DCH D1199

LS1 CA03:DCV D1214

LS1 CA03:DCH D1214

LS1 CB01:DCV D1235

LS1 CB01:DCH D1235

LS1 CB01:DCV D1255

LS1 CB01:DCH D1255

LS1 CB01:DCV D1275

LS1 CB01:DCH D1275

LS1 CB02:DCV D1299

LS1 CB02:DCH D1299

LS1 CB02:DCV D1319

LS1 CB02:DCH D1319

LS1 CB02:DCV D1339

LS1 CB02:DCH D1339

I HCOR 21.5121 -0.00000928 -0.00000928 -0.00000928 0.00000000 0.00000000

Loaded Lattice FRIB_VA LS1FS1

Total Elements 329 Setpoint PVs 445 Readback PVs 445

Update Rate 1.0 Hz Apply x1.0

Precision number 8 Initialize with loaded lattice

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3.4 Cast Device Settings

Now the user want load the device settings before trajectory correction, and restore the machine status.

1. Click the *Cast* button of snapshot of the name *clear_confusion*, which was noted “before trajectory correction”, keep eye on the *casted* icon, should mark as blue.
2. Select and check the devices for settings apply, see next section.

3.5 Apply Device Settings

Note: Set devices with the settings shown in *Setpoint (x0)* column only work with the rows that the *Device* item is checked.

Now after loading a different snapshot by casting, the user directly go to press *Apply* button, the following message box may pop up.

Settings Manager: Manage Physics Configurations of Accelerator System

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

36 Ar⁹⁺
18

+ Working Directory /home/tong/sm-wdir Total 2

Timestamp Name Cast Save Note

2020-09-15

2020-09-15T15:46:49 clear_confusion Cast Save ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1, before trajec...

2020-09-15T16:01:18 rare_queen Cast Save ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1, after trajec...

Snapshots

+ [Icons]

445 items

Filter Shortcuts All Selected

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	$\Delta(x_0, x_1)$	$\Delta(x_0, x_2)$	$\Delta(x_1, x_2)$
LS1_CA01:CAV1_D1127	PHA	CAV	0.2181	325.00000000	324.87846100	325.00000000	0.25060052	0.00000000	▲ -0.2506
LS1_CA01:CAV1_D1127	AMP	CA				0.64000000	0.00024098	0.00000000	✓ -0.0002
LS1_CA01:SOL1_D1132	I	SOL				5.34000000	0.00108381	0.00000000	✓ -0.0010
LS1_CA01:DCV_D1132	I	VCOR				0.00020179	-0.00020167	-0.00020179	✓ -0.0000
LS1_CA01:DCH_D1132	I	HCOR				0.00000445	-0.00000445	-0.00000445	✓ 0.0000
LS1_CA01:CAV2_D1136	PHA	CAV				325.00000000	0.21460721	0.00000000	▲ -0.2146
LS1_CA01:CAV2_D1136	AMP	CA				0.70000000	0.00032267	0.00000000	✓ -0.0003
LS1_CA01:CAV3_D1142	PHA	CAV	1.6933	325.00000000	324.74835904	325.00000000	0.26061541	0.00000000	▲ -0.2606
LS1_CA01:CAV3_D1142	AMP	CAV	1.6933	0.76000000	0.75972812	0.76000000	0.00022447	0.00000000	✓ -0.0002
LS1_CA01:SOL2_D1146	I	SOL	2.1606	5.90000000	5.89616901	5.90000000	0.00429468	0.00000000	✓ -0.0042
LS1_CA01:DCV_D1146	I	VCOR	2.2606	0.00000000	0.00018705	0.00018706	-0.00018715	-0.00018706	✓ 0.0000
LS1_CA01:DCH_D1146	I	HCOR	2.2606	0.00000000	-0.00000645	-0.00000645	0.00000645	0.00000645	✓ 0.0000
LS1_CA01:CAV4_D1150	PHA	CAV	2.5350	325.00000000	325.16305630	325.00000000	0.28357338	0.00000000	✓ -0.2835
LS1_CA01:CAV4_D1150	AMP	CAV	2.5350	0.82000000	0.81980917	0.82000000	-0.00020931	0.00000000	✓ 0.0002
LS1_CA02:CAV1_D1161	PHA	CAV	3.5912	325.00000000	324.67989758	325.00000000	0.21765221	0.00000000	▲ -0.2176
LS1_CA02:CAV1_D1161	AMP	CAV	3.5912	0.88000000	0.87992917	0.88000000	-0.00037899	0.00000000	✓ 0.0003
LS1_CA02:SOL1_D1165	I	SOL	4.0585	6.50000000	6.49506188	6.50000000	-0.00646669	0.00000000	✓ 0.0064
LS1_CA02:DCV_D1165	I	VCOR	4.1585	0.00000000	0.00017038	0.00017024	-0.00017009	-0.00017024	✓ -0.0000
LS1_CA02:DCH_D1165	I	HCOR	4.1585	0.00000000	0.00000224	0.00000224	-0.00000224	-0.00000224	✓ 0.0000
LS1_CA02:CAV2_D1169	PHA	CAV	4.4329	325.00000000	325.17101116	325.00000000	-0.30810658	0.00000000	▲ 0.3081
LS1_CA02:CAV2_D1169	AMP	CAV	4.4329	0.94000000	0.93986491	0.94000000	-0.00051345	0.00000000	✓ 0.0005
LS1_CA02:CAV3_D1176	PHA	CAV	5.0664	325.00000000	325.03826218	325.00000000	-0.21836561	0.00000000	▲ 0.2183
LS1_CA02:CAV3_D1176	AMP	CAV	5.0664	1.00000000	0.99966972	1.00000000	0.00020458	0.00000000	✓ -0.0002
LS1_CA02:SOL2_D1180	I	SOL	5.5337	6.90000000	6.89311892	6.90000000	0.00648758	0.00000000	✓ -0.0064

Loaded Lattice FRIB_VA LS1FS1

Update Rate 1.0 Hz Apply × 1.0

Total Elements 329 Setpoint PVs 445 Readback PVs 445

Precision number 8 [x] Initialize with loaded lattice

Settings Manager (v3.0) 2020-09-15 16:36:36 EDT

Instead, check all correctors, and *Apply* again, it will set devices with new settings.

Settings Manager: Manage Physics Configurations of Accelerator System

File Tools Help

Load Lattice Add Devices Save Settings Load Settings Take Snapshot Physics Fields Engineering Fields Preferences Exit

Working Directory: /home/tong/sm-wdir Total 2

Snapshots

Timestamp	Name	Cast	Save	Note
2020-09-15				
2020-09-15T15:46:49	clear_confusion	Cast	Save	ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1, before trajec...
2020-09-15T16:01:18	rare_queen	Cast	Save	ion: 40Ar18+9, machine: FRIB_VA, segment: LS1FS1, after trajec...

type=*COR 120 items

Filter Shortcuts All Selected

Device	Field	Type	Pos [m]	Setpoint(x ₀)	Live Readback(x ₁)	Live Setpoint(x ₂)	Δ(x ₀ ,x ₁)	Δ(x ₀ ,x ₂)	Δ(x ₁ ,x ₂)
✓ LS1_CA01:DCV_D1132	I	VCOR	0.7854	0.00000000	0.00020196	0.00020179	-0.00020167	-0.00020179	✓ -0.00000000
✓ LS1_CA01:DCH_D1132	I	HCOR	0.7854	0.00000000	0.00000445	0.00000445	-0.00000445	-0.00000445	✓ 0.00000000
✓ LS1_CA01:DCV_D1146	I	VCOR	2.2606	0.00000000	0.00018705	0.00018706	-0.00018715	-0.00018706	✓ 0.00000000
✓ LS1_CA01:DCH_D1146	I	HCOR	2.2606	0.00000000	-0.00000645	-0.00000645	0.00000645	0.00000645	✓ 0.00000000
✓ LS1_CA02:DCV_D1165	I	VCOR	4.1585	0.00000000	0.00017038	0.00017024	-0.00017009	-0.00017024	✓ -0.00000000
✓ LS1_CA02:DCH_D1165	I	HCOR	4.1585	0.00000000	0.00000224	0.00000224	-0.00000224	-0.00000224	✓ 0.00000000
✓ LS1_CA02:DCV_D1180	I	VCOR	5.6337	0.00000000	0.00016424	0.00016415	-0.00016424	-0.00016415	✓ 0.00000000
✓ LS1_CA02:DCH_D1180	I	HCOR	5.6337	0.00000000	-0.00000497	-0.00000497	0.00000497	0.00000497	✓ 0.00000000
✓ LS1_CA03:DCV_D1199	I	VCOR	7.5316	0.00000000	0.00012269	0.00012270	-0.00012280	-0.00012270	✓ 0.00000000
✓ LS1_CA03:DCH_D1199	I	HCOR	7.5316	0.00000000	0.00002188	0.00002189	-0.00002190	-0.00002189	✓ 0.00000000
✓ LS1_CA03:DCV_D1214	I	VCOR	9.0068	0.00000000	0.00019573	0.00019558	-0.00019575	-0.00019558	✓ 0.00000000
✓ LS1_CA03:DCH_D1214	I	HCOR	9.0068	0.00000000	-0.00002793	-0.00002793	0.00002793	0.00002793	✓ 0.00000000
✓ LS1_CB01:DCV_D1235	I	VCOR	11.1442	0.00000000	0.00076538	0.00076612	-0.00076662	-0.00076612	✓ 0.00000000
✓ LS1_CB01:DCH_D1235	I	HCOR	11.1442	0.00000000	0.00002476	0.00002478	-0.00002476	-0.00002478	✓ -0.00000000
✓ LS1_CB01:DCV_D1255	I	VCOR	13.1419	0.00000000	0.00072835	0.00072807	-0.00072821	-0.00072807	✓ 0.00000000
✓ LS1_CB01:DCH_D1255	I	HCOR	13.1419	0.00000000	0.00003379	0.00003376	-0.00003378	-0.00003376	✓ 0.00000000
✓ LS1_CB01:DCV_D1275	I	VCOR	15.1397	0.00000000	0.00067218	0.00067194	-0.00067165	-0.00067194	✓ -0.00000000
✓ LS1_CB01:DCH_D1275	I	HCOR	15.1397	0.00000000	-0.00003156	-0.00003157	0.00003158	0.00003157	✓ -0.00000000
✓ LS1_CB02:DCV_D1299	I	VCOR	17.5166	0.00000000	0.00057488	0.00057451	-0.00057491	-0.00057451	✓ 0.00000000
✓ LS1_CB02:DCH_D1299	I	HCOR	17.5166	0.00000000	0.00003055	0.00003055	-0.00003057	-0.00003055	✓ 0.00000000
✓ LS1_CB02:DCV_D1319	I	VCOR	19.5144	0.00000000	0.00046424	0.00046467	-0.00046452	-0.00046467	✓ -0.00000000
✓ LS1_CB02:DCH_D1319	I	HCOR	19.5144	0.00000000	0.00003107	0.00003106	-0.00003104	-0.00003106	✓ -0.00000000
✓ LS1_CB02:DCV_D1339	I	VCOR	21.5121	0.00000000	0.00044533	0.00044575	-0.00044563	-0.00044575	✓ -0.00000000
✓ LS1_CB02:DCH_D1339	I	HCOR	21.5121	0.00000000	-0.00000929	-0.00000928	0.00000927	0.00000928	✓ 0.00000000

Loaded Lattice FRIB_VA LS1FS1

Update Rate 1.0 Hz Apply 1.0

Total Elements 329 Setpoint PVs 445 Readback PVs 445

Precision number 8 Initialize with loaded lattice

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The above figure shows how to check all correctors, when the setting process is undergoing, a progress bar below *Apply* button shows the progress, meanwhile the applied device setting will be marked with green checked symbol.

If go to check the *Trajectory Viewer* app, the trajectory is back to the original.

Note: For trajectory correction, the *Trajectory Correction* app can do all the similar task as shown here, i.e. arbitrary switch between different set of corrector settings. While *Settings Manager* provides the general way to manage the machine states, which is much more robust and powerful.

Additional feature of *Apply*, before pressing this button, the user may multiple a additional scaling factor to the *Setpoint* (X₀) column, the scaling factor is a single float number, or a valid mathematic expression, e.g. 12/18, 0.5, etc., for invalid input, 1.0 is used by default.

MANAGE SNAPSHOT FILES

For those already have saved settings files from *Settings Manager*, the device settings could be loaded in a pretty simple way, there is no need to load lattice and do the initialization any more starting version 3.0.

A comprehensive module for manage the snapshots have been developed to facilitate these features.

4.1 Load Snapshot Files

Settings Manager supports loading snapshot files by drag and drop. To do this, simply drag files and drop into the main window, it will present all the data in *Snapshots* window, then the user can load any of them by *Cast* button and *Apply* the checked items to change machine state.

4.2 Working Directory

By default, *Settings Manager* will load all of the saved files from *Working Directory*, and present in the *Snapshots* window, however, the user has the option to change the working directory in the *Preferences* dialog.

INDICES AND TABLES

- `genindex`
- `modindex`
- `search`