

## SHIFTS GUI Parameter Set

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**Purpose:** This document describes the set of parameters passed from the user/GUI settings data file to the SHIFTS engine.

**Overview:** There are effectively three different entry forms: textboxes, pull-down menus, and checkboxes. For variables entered in a text-box, each has four associated values: **min**, **max**, **default**, and **value**; **min** defines the lower bound of the variable, **max** defines the upper bound of the variable, **default** defines the default value given in the text-box, and **value** defines the value the user chooses for the variable. For variables entered in a pull-down menu, each has three associated values: **options**, **file\_path**, **default\_file\_path** and **value**; **value** is the same as above; **options** is an array where each entry contains an allowable entry. **File\_path** and **default\_file\_path** describe the location of the value and the default location of the value respectively. For variables entered in a checkbox, there are two associated values: **default** and **value**. Except for determining pixels, when a checkbox is turned off, a group of parameters are blocked off from user control.

In Expert and Basic user modes, only the tabs available to those users are shown.

### Basics

**Description:** These modules are direct subcomponents of gui\_settings itself and describe the fundamental settings of the particular SHIFTS run.

**Relevant user(s):** Basic, Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
expert_mode		INT		N/A	Describes whether the settings were applied in basic or expert mode
unit	['GHZ', 'WN', 'UM']	STR		Units (menu bar pull-down)	Describes the units in which SHIFTS is executed

### Logging

**Description:** These modules describe the amount of logging and to where the logging is outputted.

**Relevant user(s):** Neither, not incorporated into the GUI

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
logging.level.options	['off', 'severe', 'warning', 'info', 'config', 'debugFine', 'debugFiner', 'debugFinest']	STRARR		Not incorporated into GUI	Defines the output level of log comments
.value		STR			
.default	'debugFinest'	STR			
.index	7	UINT			
logging.output.options	['console', 'both']	STRARR		Not incorporated into GUI	
.value		STR			
.default	'both'	STR			
.index	1	UINT			

Run

**Description:** These modules describe the run for identifying a specific gui settings save file.

**Relevant user(s):** Basic, Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
run.comment		STR		N/A	Comment for tracking different gui setting files
run.description		STR		Description	Description of the gui settings inputted

Spectrometer Mechanism (smec)

**Description:** These modules create the mechanical path difference of the spectrometer mechanism as a function of time.

**Relevant user(s):** Basic, Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
smec.sof_description	['Point Source Continuous Scan', 'Point Source Step-and-Integrate']	STRARR		Spectrometer Observatory Function (description of pull-down menu)	Defines SOF1 or SOF3 when they're selected
smec.scanlength_basic.options	['Low', 'Medium', 'High']	STRARR		Resolution (pull-down menu)	Defines the resolution of the scan by setting the scan length for basic users
.value		STR			
.default	Low	STR			
smec.scalength_expert.default	0.07	DBL	cm	Stage Scan Length (textbox)	Defines the length of the scan for expert users
.min	0.07	DBL			
.max	3.5	DBL			
.value		DBL			
smec.sof1.stagespeed.default	0.05	DBL	cm/s	Stage Speed (text box)	Defines the speed of the SOF1 stage
.min	0.02	DBL			
.max	0.1	DBL			
.value		DBL			
smec.sof1.vjloc.options	['smec_velocity_error_PFM1.sav', ' ', 'Open File']	STRARR		Velocity jitter (pull-down menu)	Chooses the velocity jitter profile for SOF1
.defaultindex	0	UINT			
.index	0	UINT			
.value		STR			
.file_path		STR			
.default_file_path		STR			
smec.sof3.stagespeed.default	0.1	DBL	cm/s	Stage Speed (text box)	Defines the speed of the SOF3 stage
.min	0.02	DBL			
.max	0.1	DBL			

.value		DBL		
smec.sof3.vjloc.options	['smec_velocity_error_PFM1.sav', '', 'Open File']	STRARR		Velocity jitter (pull-down menu) Chooses the velocity jitter profile for SOF3
.defaultindex	0	UINT		
.index	0	UINT		
.value		STR		
.file_path		STR		
.default_file_path		STR		
smec.nscans.default	1	UINT		Number of scans (interferograms) per run Sets the number of scans per run
.min	1	UINT		
.max	100	UINT		
.value		UINT		
smec.sof.options	['SOF1', 'SOF3']	STRARR		Spectrometer Observatory Function (pull-down menu) Toggles between SOF1 and SOF3
.value		STR		
.default	SOF1	STR		
.index	0	UINT		
smec.sof_common.vj.nflag.default	1	LON		Velocity Jitter (checkbox) Turns velocity jitter for the stage on/off
.value		LON		
smec.sof_common.vj.scaling.default	1	DBL	%	RMS Error (textbox) Defines the RMS error for the smec velocity jitter
.min	0.01	DBL		
.max	1000	DBL		
.value		DBL		

#### Source

**Description:** Extracts from a file the source datacube and the associated wavenumber grid.

**Relevant user(s):** Basic, Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
source.loc.options	['simpleLines1_tRot300_nColumn6d21.sav', '', 'Open File']	STRARR		Spectra Filename (pull-down menu)	File containing spectra datacube.
.defaultindex	0	UINT			
.index	1	UINT			
.value		STR			
.file_path		STR			
.default_file_path		STR			

#### Beam-Steering Mirror (BSM)

**Description:** The beam steering mirror (BSM) affects the pointing in SHIFTS. However, since BSM characterization data is currently unavailable, this routine is currently a stub (i.e., a place holder). All it creates is a blank pointing timeline for the BSM, so that shifts\_powerBolo has an input BSM timeline to use.

**Relevant user(s):** None, not part of the GUI currently

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
bsm.sof3.chop_cycles.default	2	DBL	TBD	Not currently incorporated into GUI	SOF3 not currently implemented
.min	2	DBL			
.max	100	DBL			
.value		DBL			
bsm.sof3.chop_freq.default	2	DBL	TBD	Not currently incorporated into GUI	SOF3 not currently implemented
.min	0.2	DBL			
.max	2	DBL			
.value		DBL			
bsm.pointing.jitter.axis1.nflag.default	0	LON		Not currently incorporated into GUI	Turns pointing jitter for the beam steering mechanism on axis 1 on/off
.value		LON			
bsm.pointing.jitter.axis1.amplitude.default	0	DBL	Arcmin	Not currently incorporated into GUI	Sets the amplitude for the beam steering pointing jitter on axis 1
.min	0	DBL			
.max	100	DBL			
.value		DBL			
bsm.pointing.jitter.axis1.frequency.default	0.001	DBL	Hz	Not currently incorporated into GUI	Sets the frequency for the beam steering pointing jitter on axis 1
.min	1.0E-9	DBL			
.max	100	DBL			
.value		DBL			
bsm.pointing.jitter.axis2.nflag.default	0	LON		Not currently incorporated into GUI	Turns pointing jitter for the beam steering mechanism on axis 2 on/off
.value		LON			
bsm.pointing.jitter.axis2.amplitude.default	0	DBL	Arcmin	Not currently incorporated into GUI	Sets the amplitude for the beam steering pointing jitter on axis 2
.min	0	DBL			
.max	100	DBL			
.value		DBL			
bsm.pointing.jitter.axis2.frequency.default	0.001	DBL	Hz	Not currently incorporated into GUI	Sets the frequency for the beam steering pointing jitter on axis 2
.min	1.0E-9	DBL			
.max	100	DBL			
.value		DBL			

#### Herschel

**Description:** Models the background emission of the Herschel primary mirror as well as the pointing errors of the telescope.

**Relevant user(s):** Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
herschel.thermal.temperature.default	70	DBL	K	Primary Mirror	Temperature of Herschel

	.max	100	DBL		temperature (textbox)	primary mirror.
	.min	1	DBL			
	.value		DBL			
herschel.thermal.temperature.tempDrift.nFlag.default	.value	1	LON LONG		Temperature Drift (checkbox)	Controls whether temperature drift is included.
herschel.thermal.tempdrift.change.default	.max	10	DBL	K	Change in Temperature (textbox)	Change in temperature of Herschel primary mirror temperature drift
	.min	20	DBL			
	.value	0	DBL			
herschel.thermal.tempdrift.period.default	.max	1.0E6	DBL	s	Change in Temperature (textbox)	Time constant of Herschel primary mirror temperature drift
	.min	1.0E9	DBL			
	.value	1.0	DBL			
herschel.thermal.emissivity.default	.max	2	DBL	%	Primary Mirror emissivity (textbox)	Emissivity of Herschel primary mirror.
	.min	10	DBL			
	.value	0	DBL			
herschel.pointing.drift.nFlag.default	.value	1	LON LON		Pointing errors (checkbox)	Controls whether pointing errors are included
herschel.pointing.drift.absolute_amplitude.default	.min	0.0616667	DBL	°	Absolute error magnitude (textbox)	Controls the absolute error magnitude of pointing errors
	.max	0	DBL			
	.value	100	DBL			
herschel.pointing.drift.relative_amplitude.default	.min	0.005	DBL	°	Relative error magnitude (textbox)	Controls the relative error magnitude of pointing errors
	.max	0	DBL			
	.value	100	DBL			
herschel.pointing.drift.period.default	.min	60	DBL	Hz	Time Period (textbox)	Controls the time period of pointing errors
	.max	1.0E-9	DBL			
	.value	100	DBL			

### Pixels

**Description:** Describes the pixels for which the signal is read.

**Relevant user(s):** Basic, Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
pixels.ssw.a	depends on cube	LONARR		SSW (hexagonal checkbox array)	Turns SSW pixels on/off
.b		LONARR			
.c		LONARR			
.d		LONARR			
.e		LONARR			

.f		LONARR		
.g		LONARR		
pixels.slw.a	depends on cube	LONARR	SLW (hexagonal checkbox array)	Turns SLW pixels on/off
.b		LONARR		
.c		LONARR		
.d		LONARR		
.e		LONARR		
.f		LONARR		
.g		LONARR		

### Spectrometer Calibrator (SCal)

**Description:** Models the spectrometer calibrator, used to nullify the telescope background. In SOF3, SCal.nFlag is frozen at 0.

**User Permissions:** Expert

Variable	Value	Data Type	Units	Name in GUI (entry form)	Description
SCal.nFlag.default	1	LON		SCal (checkbox)	Turn SCAL on/off.
.value		LON			
SCal.coating.loc.options	['scal_coating_emissivity_ideal.	STRARR		Not incorporated into GUI presently	Defines file location for SCAL coating profile
.defaultindex	sav', 'Open File']	UINT			
.index	0	UINT			
.value	0	STR			
.file_path		STR			
.default_file_path		STR			
SCal.scal_a.temp.default	60	DBL	K	SCAL1 temperature (textbox)	Temperature of SCAL4 source.
.max	100	DBL			
.min	4	DBL			
.value		DBL			
SCal.scal_a.drift.nFlag.default	1	LON		Temperature drift (checkbox)	Turn SCAL4 temperature drift on/off.
.value		LON			
SCal.scal_a.drift.Loc.options	['scal_temperature_error_PFM1	STRARR		Drift Profile Filename (pull-down menu)	Defines file location for SCAL4.
.sav', 'Open File']		STR			
.defaultindex		UINT			
.index	0	UINT			
.value	0	STR			
.file_path		STR			
.default_file_path		STR			
SCal.scal_a.drift.scaling.nflag.default	1	LON		Not incorporated into GUI	Turns SCAL4 temperature drift scaling on/off
.value		LON			
SCal.scal_a.drift.scaling.level.default	2	DBL		Not incorporated into GUI	Defines the level of SCAL4 temperature drift
.min	0.01	DBL			
.max	1000	DBL			
.value		DBL			

SCal.scal_b.drift.pe.default	1	DBL	%	RMS Error (textbox)	Defines the root mean square error of SCAL4 temperature drift
.min	0.1	DBL			
.max	10	DBL			
.value		DBL			
SCal.scal_b.temp.default	60	DBL	K	SCAL2 temperature (textbox)	Temperature of SCAL2 source.
.max	100	DBL			
.min	4	DBL			
.value		DBL			
SCal.scal_b.drift.nFlag.default	1	LON		Temperature drift (checkbox)	Turn SCAL 2 temperature drift on/off.
.value		LON			
SCal.scal_b.drift.Loc.options	['scal_temperature_error_PFM1.sav', 'Open File']	STRARR		Drift Profile Filename (pull-down menu)	Defines file location for SCAL2.
.defaultindex		STR			
.index	0	UINT			
.value	0	UINT			
.file_path		STR			
.default_file_path		STR			
SCal.scal_b.drift.scaling.nflag.default	1	LON		Not incorporated into GUI	Turns SCAL2 temperature drift scaling on/off
.value		LON			
SCal.scal_b.drift.scaling.level.default	2	DBL		Not incorporated into GUI	Defines the level of SCAL2 temperature drift
.min	0.01	DBL			
.max	1000	DBL			
.value		DBL			
SCal.scal_b.drift.pe.default	1	DBL	%	RMS Error (textbox)	Defines the root mean square error of SCAL2 temperature drift
.min	0.1	DBL			
.max	10	DBL			
.value		DBL			
SCal.cavity.nflag.default	1	LON		Not incorporated into GUI	Turns SCAL cavity on/off
.value		LON			

### Beamsplitter (BS)

**Description:** Models the effect on the beams of the beamsplitter.

**Relevant user(s):** Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
bs.bs1.loc.options	['SBS1_PFM1_realistic.sav', 'SBS1_PFM1_ideal.sav', 'Open File']	STRARR		BS1Filename (pull-down menu)	File containing characteristics for first beamsplitter
.defaultindex	0	UINT			
.index	1	UINT			
.value		STR			
.file_path		STR			

.default_file_path		STR		
bs.bs2.loc.options	['SBS2_PFM1_realistic.sav', 'SBS1_PFM1_ideal.sav', 'Open File']	STRARR	BS2Filename (pull-down menu)	File containing characteristics for second beamsplitter.
.defaultindex	0	UINT		
.index	1	UINT		
.value		STR		
.file_path		STR		
.default_file_path		STR		

### Bandpass

**Description:** Models the effect on the beams of the filter stacks, the feedhorn cutoff and the quantum efficiency.

**Relevant user(s):** Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
bandpass.ssw.sky.loc.options	['filter_ssw_sky_realistic_PFM1. sav', 'filterssw.sav', 'Open File']	STRARR		SSW Sky Port Filter Options (pull-down menu)	File containing characteristics of ssw sky port filters
.defaultindex	0	UINT			
.index	1	UINT			
.value		STR			
.file_path		STR			
.default_file_path		STR			
bandpass.ssw.scal.loc.options	['filter_ssw_scal_realistic_PFM1. .sav', 'filterssw.sav', 'Open File']	STRARR		SSW SCAL Port Filter Options (pull-down menu)	File containing characteristics of ssw SCAL port filters
.defaultindex	0	UINT			
.index	1	UINT			
.value		STR			
.file_path		STR			
.default_file_path		STR			
bandpass.slw.sky.loc.options	['filter_slw_sky_realistic_PFM1. sav', 'filterslw.sav', 'Open File']	STRARR		SLW Sky Port Filter Options (pull-down menu)	File containing characteristics of slw sky port filters
.defaultindex	0	UINT			
.index	1	UINT			
.value		STR			
.file_path		STR			
.default_file_path		STR			
bandpass.slw.scal.loc.options	['filter_slw_scal_realistic_PFM1. sav', 'filterslw.sav', 'Open File']	STRARR		SLW SCAL Port Filter Options (pull-down menu)	File containing characteristics of slw SCAL port filters
.defaultindex	0	UINT			
.index	1	UINT			
.value		STR			
.file_path		STR			
.default_file_path		STR			



### Detector

**Description:** Models the bolometer response of the detectors.

**Relevant user(s):** Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
detector.bolometer.nFlag.default	1	LON		Bolometer response (checkbox)	Turns bolometer response on/off
detector.bolometer.nFlag.value		LON			
detector.bolometer.ssw.tau.default	0.008	DBL	s	SSW time constant (textbox)	Time constant of SSW detector array
detector.bolometer.ssw.tau.max	0.01	DBL			
detector.bolometer.ssw.tau.min	0.0000	DBL			
detector.bolometer.ssw.tau.value	1	DBL			
detector.bolometer.slw.tau.default	0.014	DBL	s	SLW time constant (textbox)	Time constant of SLW detector array
detector.bolometer.slw.tau.max	0.01	DBL			
detector.bolometer.slw.tau.min	0.0000	DBL			
detector.bolometer.slw.tau.value	1	DBL			
detector.cosmic.nflag.default	1	LON		Cosmic Ray Noise (checkbox)	Turns cosmic ray noise on/off
detector.cosmic.nflag.value		LON			
detector.cosmic.rate.default	60	DBL	Min <sup>-1</sup>	Cosmic Ray Impacts Per Minute (textbox)	Impacts per minute of cosmic ray noise
detector.cosmic.rate.min	1	DBL			
detector.cosmic.rate.max	200	DBL			
detector.cosmic.rate.value		DBL			
detector.cosmic.power.default	3	DBL		Power Law Exponent (textbox)	Power law exponent of cosmic ray noise
detector.cosmic.power.min	1	DBL			
detector.cosmic.power.max	20	DBL			
detector.cosmic.power.value		DBL			
detector.nflagphotonNoise.default	1	LON		Photon Noise (checkbox)	Turns photon noise on/off
detector.nflagphotonNoise.value		LON			

### Electronics

**Description:** Models the electrical filtering and the electrical noise of the bolometers

**Relevant user(s):** Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
electronics.nFlag.default	1	LON		Electrical Filtering	Turns electrical filtering on/off
electronics.nFlag.value		LON		(checkbox)	
electronics.model.options	['CQM', 'FM']	STRARR		N/A	Not used. Historical placeholder to select between the electronics used during the CQM and any later test campaigns.
electronics.model.options.value		STR			
electronics.model.options.default	CQM	STR			
electronics.model.options.index	0	UINT			
electronics.noise.nFlag.default	1	LON		Electrical Noise (checkbox)	Turns electrical noise on/off

.value		LON			
electronics.noise.level.default	0.0	DBL	nV/rt(Hz)	Noise Level (textbox)	Sets the level of electronic noise
.max	20.0	DBL			
.min	0.0	DBL			
.value		DBL			

Readout

**Description:** Describes the readout frequency

**Relevant user(s):** Expert

Variable	Value	Data Type	Units	Name in GUI (entry type)	Description
readout.smecSampling.default	226	DBL	Hz	Position sampling Frequency (textbox)	Defines sampling frequency for position readout
.max	500	DBL			
.min	1	DBL			
.value		DBL			
readout.signalSampling.default	80	DBL	Hz	Signal sampling frequency (textbox)	Defines sampling frequency for pixel readout
.max	500	DBL			
.min	1	DBL			
.value		DBL			