OSKAR Settings Files

Version history:

Revision	Date	Modification
1	2012-04-23	Creation.
2	2012-05-08	Added default value column to settings tables.
3	2012-06-13	Updated settings for version 2.0.2-beta.
4	2012-07-27	Updated settings for version 2.0.4-beta.
5	2012-10-22	Updated for revised settings in version 2.1.0-beta.
6	2012-11-20	Updated for version 2.1.1-beta.
7	2013-03-01	Updated settings for version 2.2.0. This includes changes to most settings in the sky model group, and changes to the settings that define the files saved from beam pattern simulations.
8	2013-11-13	Updated settings for version 2.3.0. This consists of an update to the specification of beam pattern simulation settings.
9	2014-07-17	Updated settings for version 2.5.0. Moved element pattern fitting parameters out of the telescope model group to the top-level 'element_fit' group. Added global beam normalization option. Added isotropic beam station type. Added Gaussian station beam reference frequency. Added dipole length options. Added UV range filtering parameters. Added scalar mode option. Removed option to make image after interferometer simulation.
10	2014-09-08	Updated descriptions in system noise settings to clarify that the noise is specified for a single polarisation. Changed all random number seed integer ranges to start at 1 (rather than 0). Changed beam normalization to be enabled by default.

1 Introduction

This document describes the settings files used by OSKAR applications, which use the INI plain-text file format.

Note that if you are using the OSKAR GUI, the settings descriptions are available as tool-tips, and you should not need to refer to this document. Settings documentation is provided for scripting reference only.

Settings are defined simply using key-value pairs, for example:

```
simulator/double_precision=true
observation/ start_time_utc=01-01-2000 12:01:02.000
observation/length=06:00:00.000
```

Settings can also be grouped into sections. For example, the above can also be written as:

```
[simulator]
double_precision=true

[observation]
start_time_utc=01-01-2000 12:01:02.000
length=06:00:00.000
```

Settings files can be written or modified using any text editor, or by using the `oskar_settings_set` binary, or (the recommended method) by using the OSKAR GUI.

The following section describes the currently available settings options.

2 Settings Used by OSKAR Applications

The following section describes the possible options that can be currently used in OSKAR settings files. The settings file is arranged into a number of groups, which are described in the subsections below.

2.1 Simulator

These parameters affect the operation of the software.

All settings keys in this group are prefixed by 'simulator/'.

Key	Type	Description	Allowed values	Default
double_precision	bool	Determines whether double precision arithmetic is used.	true / false	true
keep_log_file	bool	Determines whether a log file of the run will be kept on disk.	true / false	false
max_sources_per_chunk	int	Maximum number of sources processed concurrently on a single GPU.		16384
cuda_device_ids	int array / string	A comma-separated string containing device (GPU) IDs to use on a multi-GPU system, or 'all' to use all devices.		all

2.2 Sky

These parameters are used to specify the content of the sky model.

All settings keys in this group are prefixed by 'sky/'.

Key	Type	Description	Allowed values	Default
oskar_sky_model/file	string list	Paths to one or more OSKAR sky model text files. See the accompanying documentation for a description of an OSKAR sky model file.		
oskar_sky_model/filter/flux_min	double	Minimum flux density allowed by the filter, in Jy.	>= 0 or min	min
oskar_sky_model/filter/flux_max	double	Maximum flux density allowed by the filter, in Jy.	>= 0 or max	max
oskar_sky_model/filter/radius_inner_deg	double	Minimum angular distance from phase centre allowed by the filter, in degrees.		0
oskar_sky_model/filter/radius_outer_deg	double	Maximum angular distance from phase centre allowed by the filter, in degrees.		180
oskar_sky_model/extended_sources/FWHM_major	double	Major axis FWHM of all sources in this group, in arc seconds. WARNING: if set, this overrides values in the file.		0
oskar_sky_model/extended_sources/FWHM_minor	double	Minor axis FWHM of all sources in this group, in arc seconds. WARNING: if set, this overrides values in the file.		0
oskar_sky_model/extended_sources/position_angle	double	Position angle of all extended sources in this group (from North to East), in degrees.		0

		WARNING: if set, this overrides values in the file.		
gsm/file	string	Path to a Global Sky Model file, pixellated using the HEALPix RING scheme. This option can be used to load a GSM data file produced from software written by Angelica de Oliveira, available at https://www.cfa.harvard.edu/~adeolive/gsm/		
gsm/filter/flux_min	double	Minimum flux density allowed by the filter, in Jy.	>= 0 or min	min
gsm/filter/flux_max	double	Maximum flux density allowed by the filter, in Jy.	>= 0 or max	max
gsm/filter/radius_inner_deg	double	Minimum angular distance from phase centre allowed by the filter, in degrees.		0
gsm/filter/radius_outer_deg	double	Maximum angular distance from phase centre allowed by the filter, in degrees.		180
gsm/extended_sources/FWHM_major	double	Major axis FWHM of all sources in this group, in arc seconds.		0
gsm/extended_sources/FWHM_minor	double	Minor axis FWHM of all sources in this group, in arc seconds.		0
gsm/extended_sources/position_angle	double	Position angle of all extended sources in this group (from North to East), in degrees.		0
fits_image/file	string list	FITS file(s) to use as a sky model.		
fits_image/downsample_factor	int	The factor by which to downsample the pixel grid.		1
fits_image/min_peak_fraction	double	The minimum allowed pixel value, as a fraction of the peak value in the image.		0.02
fits_image/noise_floor	double	The noise floor of the image, in Jy/PIXEL.		0
fits_image/spectral_index	double	The spectral index of each pixel.		0
healpix_fits/file	string	Paths to one or more HEALPix FITS files, ordered using the HEALPix RING scheme (NEST schemes are not supported).		
healpix_fits/coord_sys	string	The spherical coordinate system used for the HEALPix representation.	• Galactic • Equatorial	Galactic
healpix_fits/map_units	string	The physical units of pixels in the input map. (Choices are temperature per steradian or Jansky per pixel.)	• mK/sr • K/sr • Jy/pixel	mK/sr
healpix_fits/filter/flux_min	double	Minimum flux density allowed by the filter, in Jy.	>= 0 or min	min
healpix_fits/filter/flux_max	double	Maximum flux density allowed by the filter, in Jy.	>= 0 or max	max
healpix_fits/filter/radius_inner_deg	double	Minimum angular distance from phase centre allowed by the filter, in degrees.		0
healpix_fits/filter/radius_outer_deg	double	Maximum angular distance from phase centre allowed by the filter, in degrees.		180
healpix_fits/extended_sources/FWHM_major	double	Major axis FWHM of all sources in this group, in arc seconds.		0
healpix_fits/extended_sources/FWHM_minor	double	Minor axis FWHM of all sources in this group, in arc seconds.		0
healpix_fits/extended_sources/position_angle	double	Position angle of all extended sources in this group (from North to East), in degrees.		0
generator/random_power_law/num_sources	int	Number of sources scattered approximately uniformly over the sphere (before filtering). A value greater than 0 will activate the random power-law generator.		0
generator/random_power_law/flux _min	double	Minimum flux density in the random distribution, in Jy (before filtering).		0
generator/random_power_law/flux _max	double	Maximum flux density in the random distribution, in Jy (before filtering).		0
generator/random_power_law/power	double	Power law exponent describing number per unit flux density.		0
generator/random_power_law/seed	int/string	Random number generator seed used for random distributions.	time or integer seed (1 to INT_MAX)	1

generator/random_power_law/filter/flux_min	double	Minimum flux density allowed by the filter, in Jy.	>= 0 or min	min
generator/random_power_law/filter/flux_max	double	Maximum flux density allowed by the filter, in Jy.	>= 0 or max	max
generator/random_power_law/filter/radius_inner_deg	double	Minimum angular distance from phase centre allowed by the filter, in degrees.		0
generator/random_power_law/filter/radius_outer_deg	double	Maximum angular distance from phase centre allowed by the filter, in degrees.		180
generator/random_power_law/extended_sources/FWHM_major	double	Major axis FWHM of all sources in this group, in arc seconds.		0
generator/random_power_law/extended_sources/FWHM_minor	double	Minor axis FWHM of all sources in this group, in arc seconds.		0
generator/random_power_law/extended_sources/position_angle	double	Position angle of all extended sources in this group (from North to East), in degrees.		0
generator/random_broken_power_law/num_sources	int	Number of sources scattered approximately uniformly over the sphere (before filtering). A value greater than 0 will activate the random broken-power-law generator.		0
generator/random_broken_power_law/flux _min	double	Minimum flux density in the random distribution, in Jy (before filtering).		0
generator/random_broken_power_law/flux _max	double	Maximum flux density in the random distribution, in Jy (before filtering).		0
generator/random_broken_power_law/power1	double	Power law exponent describing number per unit flux density in region 1.		0
generator/random_broken_power_law/power2	double	Power law exponent describing number per unit flux density in region 2.		0
generator/random_broken_power_law/threshold	double	Threshold flux for the intersection of region 1 and 2, in Jy. Region 1 is less than the threshold; Region 2 is greater than the threshold.		0
generator/random_broken_power_law/seed	int/string	Random number generator seed used for random distributions.	time or integer seed (1 to INT_MAX)	1
generator/random_broken_power_law/filter/flux_min	double	Minimum flux density allowed by the filter, in Jy.	>= 0 or min	min
generator/random_broken_power_law/filter/flux_max	double	Maximum flux density allowed by the filter, in Jy.	>= 0 or max	max
generator/random_broken_power_law/filter/radius_inner_deg	double	Minimum angular distance from phase centre allowed by the filter, in degrees.		0
generator/random_broken_power_law/filter/radius_outer_deg	double	Maximum angular distance from phase centre allowed by the filter, in degrees.		180
generator/random_broken_power_law/extended_sources/FWHM_major	double	Major axis FWHM of all sources in this group, in arc seconds.		0
generator/random_broken_power_law/extended_sources/FWHM_minor	double	Minor axis FWHM of all sources in this group, in arc seconds.		0
generator/random_broken_power_law/extended_sources/position_angle	double	Position angle of all extended sources in this group (from North to East), in degrees.		0
generator/grid/side_length	int	Side length of the generated grid. A value greater than 0 will activate the grid generator.		0
generator/grid/fov_deg	double	Field-of-view spanned by the grid centre, in degrees.		0
generator/grid/mean_flux_jy	double	Mean Stokes I flux [Jy].		0
generator/grid/std_flux_jy	double	Standard deviation of Stokes I flux [Jy].		0
generator/grid/seed	int/string	Random number generator seed used for random distributions.	time or integer seed (1 to INT_MAX)	1
generator/grid/pol/mean_pol_fraction	double	The mean polarisation fraction of generated source fluxes (range 0 to 1).		0
generator/grid/pol/std_pol_fraction	double	The standard deviation of polarisation fraction of generated source fluxes (range 0 to 1).		0
generator/grid/pol/mean_pol_angle_deg	double	The mean polarisation angle of generated source fluxes, in degrees.		0
generator/grid/pol/std_pol_angle_deg	double	The standard deviation of polarisation angle of generated source fluxes, in degrees.		0
generator/grid/pol/seed	int/string	Random number generator seed used for random distributions.	time or integer	1

			seed (1 to INT_MAX)	
generator/grid/extended_sources/FWHM_major	double	Major axis FWHM of all sources in this group, in arc seconds.		0
generator/grid/extended_sources/FWHM_minor	double	Minor axis FWHM of all sources in this group, in arc seconds.		0
generator/grid/extended_sources/position_angle	double	Position angle of all extended sources in this group (from North to East), in degrees.		0
generator/healpix/nside	int	HEALPix Nside parameter. A value greater than 0 will activate the HEALPIx generator, which will produce points evenly spaced over the whole sky. The total number of points is 12 * Nside * Nside.		0
generator/healpix/amplitude	double	Amplitude assigned to generated HEALPix points, in Jy.		1
generator/healpix/filter/flux_min	double	Minimum flux density allowed by the filter, in Jy.	>= 0 or min	min
generator/healpix/filter/flux_max	double	Maximum flux density allowed by the filter, in Jy.	>= 0 or max	max
generator/healpix/filter/radius_inner_deg	double	Minimum angular distance from phase centre allowed by the filter, in degrees.		0
generator/healpix/filter/radius_outer_deg	double	Maximum angular distance from phase centre allowed by the filter, in degrees.		180
generator/healpix/extended_sources/FWHM_major	double	Major axis FWHM of all sources in this group, in arc seconds.		0
generator/healpix/extended_sources/FWHM_minor	double	Minor axis FWHM of all sources in this group, in arc seconds.		0
generator/healpix/extended_sources/position_angle	double	Position angle of all extended sources in this group (from North to East), in degrees.		0
spectral_index/override	bool	If true, override all source spectral index values using the parameters below.	true / false	false
spectral_index/ref_frequency_hz	double	Reference frequency of all sources in the final sky model, in Hz.		0
spectral_index/mean	double	Mean spectral index of all sources in the final sky model.		0
spectral_index/std_dev	double	Standard deviation of spectral index values for all sources in the final sky model.		0
spectral_index/seed	int/string	Random number generator seed used for random distribution.	time or integer seed (1 to INT_MAX)	1
common_flux_filter/flux_min	double	Minimum flux density allowed by the filter, in Jy. **Note that this filter is applied on a per-channel basis after scaling all source fluxes by the spectral index.**	>= 0 or min	min
common_flux_filter/flux_max	double	Maximum flux density allowed by the filter, in Jy. **Note that this filter is applied on a per-channel basis after scaling all source fluxes by the spectral index.**	>= 0 or max	max
output_binary_file	string	Path used to save the final sky model structure as an OSKAR binary file. Leave blank if not required.		
output_text_file	string	Path used to save the final sky model structure as a text file (useful for debugging). Leave blank if not required.		
advanced/zero_failed_gaussians	bool	If true, remove (set to zero) sources for which Gaussian width parameter solutions have failed. This can occur for sources very far from the phase centre. If false (the default), sources with failed Gaussian parameter solutions are modelled as point sources.	true / false	false

2.3 Observation

These parameters are used to specify the observation.

All settings keys in this group are prefixed by 'observation/'.

Keyword	Type	Description	Allowed values	Default
phase_centre_ra_deg	double	Right Ascension of the observation pointing (phase centre), in degrees.	0 to 360	0
phase_centre_dec_deg	double	Declination of the observation pointing (phase centre), in degrees.	-90 to 90	0
pointing_file	string	Pathname to optional station pointing file, which can be used to override the beam direction for any or all stations in the telescope model. See the accompanying documentation for a description of a station pointing file.		
start_frequency_hz	double	The frequency at the midpoint of the first channel, in Hz.		0
num_channels	int	Number of frequency channels / bands to use.		1
frequency_inc_hz	double	The frequency increment between successive channels, in Hz.		0
start_time_utc	string	A string describing the start time for the observation.	Date-time string of format: "d-M-yyyy h:m:s.z" where: d = day number (1 to 31) M = month (1 to 12) yyyy = year (4 digits) h = hours (0 to 23) m = minutes (0 to 59) s = seconds (0 to 59) z = milliseconds (0 to 999)	01-01-2000 00:00:00.0
length	string	A string describing the observation length.	Time string of format "h:m:s.z" where: h = hours (0 to 23) m = minutes (0 to 59) s = seconds (0 to 59) z = milliseconds (0 to 999)	00:00:00.0
num_time_steps	int	Number of time steps in the output data during the observation length. This corresponds to the number of correlator dumps for interferometer simulations, and the number of beam pattern snapshots for beam pattern simulations.		1

2.4 Telescope

These parameters are used to specify the contents of the telescope model.

All settings keys in this group are prefixed by 'telescope/'.

Keyword	Type	Description	Allowed values	Default
input_directory	string	Path to a directory containing the telescope configuration data. See the accompanying documentation for a description of an OSKAR telescope model directory.		
longitude_deg	double	Telescope (east) longitude, in degrees.		0
latitude_deg	double	Telescope latitude, in degrees.		0
altitude_m	double	Telescope altitude, in metres.		0
station_type	string	The type of each station in the interferometer. A simple, time-invariant Gaussian station beam can be used instead of an aperture array beam if required for testing. All station beam effects can be disabled by selecting 'Isotropic beam'.	• Aperture array • Isotropic beam • Gaussian beam • VLA (PBCOR)	Aperture array
normalise_beams_at_phase_centre	bool	If true, then scale the amplitude of every station beam at the interferometer phase centre to precisely 1.0 for each time snapshot. This effectively performs an amplitude calibration.	true / false	true
aperture_array/array_pattern/enable	bool	If true, then the contribution to the station beam from the array pattern (given by beamforming the antennas in the station) is evaluated. If false, then the array pattern is ignored.	true / false	true
aperture_array/array_pattern/normalise	bool	If true, the amplitude of each station beam will be divided by the number of antennas in the station; if false, then this normalisation is not performed. Note, however, that global beam normalisation is still possible.	true / false	false
aperture_array/array_pattern/element/gain	double	Mean element amplitude gain factor. If set (and > 0.0), this will override the contents of the station files.		0
aperture_array/array_pattern/element/gain_error_fixed	double	Systematic element amplitude gain standard deviation. If set, this will override the contents of the station files.		0
aperture_array/array_pattern/element/gain_error_time	double	Time-variable element amplitude gain standard deviation. If set, this will override the contents of the station files.		0
aperture_array/array_pattern/element/phase_error_fixed_deg	double	Systematic element phase standard deviation. If set, this will override the contents of the station files.		0
aperture_array/array_pattern/element/phase_error_time_deg	double	Time-variable element phase standard deviation. If set, this will override the contents of the station files.		0
aperture_array/array_pattern/element/position_error_xy_m	double	The standard deviation of the antenna xy-position uncertainties. If set, this will override the contents of the station files.		0

aperture_array/array_pattern/element/x_orientation_error_deg	double	The standard deviation of the antenna X-dipole orientation error. If set, this will override the contents of the station files.		0
aperture_array/array_pattern/element/y_orientation_error_deg	double	The standard deviation of the antenna Y-dipole orientation error. If set, this will override the contents of the station files.		0
aperture_array/array_pattern/element/seed_gain_errors	int/string	Random number generator seed used for systematic gain error distribution.	time or integer seed (1 to INT_MAX)	1
aperture_array/array_pattern/element/seed_phase_errors	int/string	Random number generator seed used for systematic phase error distribution.	time or integer seed (1 to INT_MAX)	1
aperture_array/array_pattern/element/seed_time_variable_errors	int/string	Random number generator seed used for time variable error distributions.	time or integer seed (1 to INT_MAX)	1
aperture_array/array_pattern/element/seed_position_xy_errors	int/string	Random number generator seed used for antenna xy-position error distribution.	time or integer seed (1 to INT_MAX)	1
aperture_array/array_pattern/element/seed_x_orientation_error	int/string	Random number generator seed used for antenna X dipole orientation error distribution.	time or integer seed (1 to INT_MAX)	1
aperture_array/array_pattern/element/seed_y_orientation_error	int/string	Random number generator seed used for antenna Y dipole orientation error distribution.	time or integer seed (1 to INT_MAX)	1
aperture_array/element_pattern/functional_type	string	The type of functional pattern to apply to the elements, if not using a numerically-defined pattern.	• Dipole • Geometric dipole • Isotropic (unpolarised)	Dipole
aperture_array/element_pattern/dipole_length	double	The length of the dipole, if using dipole elements.		0.5
aperture_array/element_pattern/dipole_length_units	string	The units used to specify the dipole length (metres or wavelengths), if using dipole elements.	• Wavelengths • Metres	Wavelengths
aperture_array/element_pattern/enable_numerical	bool	If true, make use of any available numerical element pattern files. If numerical pattern data are missing, the functional type will be used instead.	true / false	true
aperture_array/element_pattern/taper/type	string	The type of tapering function to apply to the element pattern.	• None • Cosine • Gaussian	None
aperture_array/element_pattern/taper/cosine_power	double	If a cosine element taper is selected, this setting gives the power of the cosine(theta) function.		1
aperture_array/element_pattern/taper/gaussian_fwhm_deg	double	If a Gaussian element taper is selected, this setting gives the full-width half maximum value of the Gaussian, in degrees.		45
gaussian_beam/fwhm_deg	double	For stations using a simple Gaussian beam, this setting gives the full-width half maximum value of the Gaussian station beam, in degrees.		1
gaussian_beam/ref_freq_hz	double	The reference frequency of the specified FWHM, in Hz.		0
output_directory	string	Path used to save the final telescope model directory, *excluding* any element pattern data (useful for debugging). Leave blank if not required.		

2.5 Interferometer

These settings are used only when running the interferometer simulation.

All settings keys in this group are prefixed by 'interferometer/'.

Keyword	Type	Description	Allowed values	Default
channel_bandwidth_hz	double	The channel width, in Hz, used to simulate bandwidth smearing. (Note that this can be different to the frequency increment if channels do not cover a contiguous frequency range.)		0
time_average_sec	double	The correlator time-average duration, in seconds, used to simulate time averaging smearing.		0
num_vis_ave	int	Number of averaged evaluations of the full Measurement Equation per visibility dump.	>= 1	1
num_fringe_ave	int	Number of averaged evaluations of the K-Jones matrix per Measurement Equation average. The total number of Measurement Equation evaluations *per time step* is therefore: num_fringe_ave x num_vis_ave	>= 1	1
uv_filter_min	double	The minimum value of the baseline UV length allowed by the filter. **Note that visibilities on baseline UV lengths outside this range will not be evaluated!**	>= 0 or min	min
uv_filter_max	double	The maximum value of the baseline UV length allowed by the filter. **Note that visibilities on baseline UV lengths outside this range will not be evaluated!**	>= 0 or max	max
uv_filter_units	string	The units of the baseline UV length filter values.	• Wavelengths • Metres	Wavelengths
use_common_sky	bool	If true, then use a short baseline approximation where source positions are the same relative to every station. If false, then re-evaluate all source positions and all station beams.	true / false	true
scalar_mode	bool	If true, operate in a scalar mode to simulate only Stokes I data. If false (the default), then simulate fully polarised data.	true / false	false
noise/enable	bool	If true, noise addition is enabled. Note all noise is specified for a single polarisation of the antennas.	true / false	false
noise/seed	int/string	Random number generator seed.	time or integer seed (1 to INT_MAX)	1
noise/freq	string	Specification of the list of frequencies at which noise values are defined: • **Telescope model**: frequencies are loaded from the data file in the telescope model directory. • **Observation settings**: frequencies are defined by the observation settings.	• Telescope model • Observation settings • Data file • Range	Telescope model

		• **Data file**: frequencies are loaded from the specified data file. • **Range**: frequencies are specified by the range parameters.		
noise/freq/file	string	Data file consisting of an ASCII list of frequencies.		
noise/freq/number	int	Number of frequencies.	>= 0	0
noise/freq/start	double	Start frequency, in Hz.		0
noise/freq/inc	double	Frequency increment, in Hz.		0
noise/values	string	Single polarisation noise value specification type: • **Telescope model priority**: values are loaded from files in the telescope model directory, according to the default file type priority. • **RMS flux density**: use values specified in terms of noise RMS flux density. • **Sensitivity**: use values specified in terms of station sensitivity. • **Temperature ...**: use values specified by the system temperature, effective area, and system efficiency. Note: Noise values are interpreted as a function of frequency. The list of frequencies to which noise values correspond is based upon the value of the noise frequency specification.	• Telescope model priority • RMS flux density • Sensitivity • Temperature, area, and system efficiency	Telescope model priority
noise/values/rms	string	Root mean square (RMS) flux density specification: • **No override**: values are loaded from RMS files found in the telescope model directory. • **Data file**: values are loaded from the specified file. • **Range**: values are evaluated according to the specified range parameters.	• No override (telescope model) • Data file • Range	No override (telescope model)
noise/values/rms/file	string	RMS flux density data file.		
noise/values/rms/start	double	RMS flux density range start value, in Jy.		0
noise/values/rms/end	double	RMS flux density range end value, in Jy.		0
noise/values/sensitivity	string	System sensitivity (or System Equivalent Flux Density, SEFD) specification type: • **No override**: values are loaded from sensitivity files found in the telescope model directory. • **Data file**: values are loaded from the specified file. • **Range**: values are evaluated according to the specified range parameters.	• No override (telescope model) • Data file • Range	No override (telescope model)
noise/values/sensitivity/file	string	Data file containing system noise sensitivity value(s).		
noise/values/sensitivity/start	double	Sensitivity range start value, in Jy.		0
noise/values/sensitivity/end	double	Sensitivity range end value, in Jy.		0
noise/values/components/t_sys	string	System temperature specification type: • **No override**: values are loaded from system temperature files found in the telescope model directory. • **Data file**: values are loaded from the specified file.	• No override (telescope model) • Data file • Range	

		• **Range**: values are evaluated according to the specified range parameters.		
noise/values/components/t_sys/file	string	Data file containing system temperature value(s).		
noise/values/components/t_sys/start	double	System temperature range start value, in K.		0
noise/values/components/t_sys/end	double	System temperature range end value, in K.		0
noise/values/components/area	string	Station effective area specification type: • **No override**: values are loaded from effective area files found in the telescope model directory. • **Data file**: values are loaded from the specified file. • **Range**: values are evaluated according to the specified range parameters.	• No override (telescope model) • Data file • Range	No override (telescope model)
noise/values/components/area/file	string	Data file containing effective area value(s).		
noise/values/components/area/start	double	Effective area range start value, in m^2.		0
noise/values/components/area/end	double	Effective area range end value, in m^2.		0
noise/values/components/efficiency	string	Station system efficiency specification type: • **No override**: values are loaded from system efficiency files found in the telescope model directory. • **Data file**: values are loaded from the specified file. • **Range**: values are evaluated according to the specified range parameters.	• No override (telescope model) • Data file • Range	No override (telescope model)
noise/values/components/efficiency/file	string	Data file containing system efficiency value(s).		
noise/values/components/efficiency/start	double	System efficiency range start value.	0 to 1	0
noise/values/components/efficiency/end	double	System efficiency range end value.	0 to 1	0
oskar_vis_filename	string	Path of the OSKAR visibility output file containing the results of the simulation. Leave blank if not required.		
ms_filename	string	Path of the Measurement Set containing the results of the simulation. Leave blank if not required.		

2.6 Beam Pattern

These settings are used only when running the beam pattern simulation.

All settings keys in this group are prefixed by 'beam_pattern/'.

Keyword	Type	Description	Allowed values	Default
station_id	int	The station ID number (zero based) to select from the telescope model when generating the beam pattern.		0
coordinate_type	string	Specification of the coordinates for which the beam pattern is to be evaluated.	Beam image	Beam image
beam_image/size	Int[2]	Image width in pixels along the Right Ascension and Declination directions. If a single value is specified, the image is assumed to have the same number of pixels in each dimension. For example: • A value of 256 results in an image of dimensions 256 by 256 pixels. • A value of 128,512 results in an image with 128 pixels along the Right Ascension direction and 512 pixels in the Declination direction.		256
beam_image/fov_deg	double[2]	Field of view (FOV) specified degrees along the right Right Ascension and Declination directions. If a single value is specified, the image is assumed to have the same FOV in each direction. For example: • A value of 2.0 results in an image with a FOV of 2.0 degrees in both RA and Dec. • A value of 1.5,3.0 results in an image with a FOV of 1.5 degrees in RA and 3.0 degrees in Dec.		2.0
root_path	string	Root path name of the generated data file. Appropriate suffixes and extensions will be added to this, based on the settings below.		
oskar_image_file/save_voltage	bool	If true, save the voltage amplitude pattern in an OSKAR image file. (This is given by the square root of the sum of the squares of the real and imaginary values.)	true / false	false
oskar_image_file/save_phase	bool	If true, save the phase pattern in an OSKAR image file.	true / false	false
oskar_image_file/save_complex	bool	If true, save the complex (real and imaginary) pattern in an OSKAR image file.	true / false	false
oskar_image_file/save_total_intensity	bool	If true, save the total intensity beam in an OSKAR image file. This is the Stokes I response of the beam pattern auto-correlation. *Note: This option is ignored for unpolarised beam patterns.*		
fits_file/save_voltage	bool	If true, save the voltage amplitude pattern in FITS image file. (This is given by the square root of the sum of the squares of the real and imaginary values.)	true / false	false
fits_file/save_phase	bool	If true, save the phase pattern in a FITS image file.	true / false	false
fits_file/save_total_intensity	bool	If true, save the total intensity beam in a FITS image file. This is the Stokes I response of the beam pattern auto-correlation. *Note: This option is ignored for unpolarised beam patterns.*		

2.7 Image

These settings are used when running the OSKAR imager. Note that the OSKAR imager in its current form is not recommended for general use: visibilities should normally be written to a Measurement Set for imaging in CASA.

All settings keys in this group are prefixed by 'image/'.

Keyword	Type	Description	Allowed values	Default
fov_deg	double	Total field of view in degrees.		2.0
size	int	Image width in one dimension (e.g. a value of 256 would give a 256 by 256 image).		256
image_type	string	The type of image to generate. Note that the Stokes parameter images (if selected) are uncalibrated, and are formed simply using the standard combinations of the linear polarisations: • I = 0.5 (XX + YY) • Q = 0.5 (XX - YY) • U = 0.5 (XY + YX) • V = -0.5i (XY - YX) The point spread function of the observation can be generated using the PSF option.	• Linear (XX,XY,YX,YY) • XX • XY • YX • YY • Stokes (I,Q,U,V) • I • Q • U • V • PSF	I
channel_snapshots	bool	If true, then produce an image cube containing snapshots for each frequency channel. If false, then use frequency-synthesis to stack the channels in the final image.	true / false	true
channel_start	integer	The start channel index to include in the image or image cube.	>= 0	0
channel_end	integer	The end channel index to include in the image or image cube.	>= 0 or max	max
time_snapshots	bool	If true, then produce an image cube containing snapshots for each time step. If false, then use time-synthesis to stack the times in the final image.	true / false	true
time_start	integer	The start time index to include in the image or image cube.	>= 0	0
time_end	integer	The end time index to include in the image or image cube.	>= 0 or max	max
transform_type	string	The type of transform used to generate the image. More options may be available in a later release.	DFT 2D	DFT 2D
direction	string	Specifies the direction of the image phase centre. • If **'Observation direction'** is selected, the image is centred on the pointing direction of the primary beam. • If **'RA, Dec.'** is selected, the image is centred on the values of RA and Dec. found below.	• Observation direction (default) • RA, Dec. (override)	Observation direction (default)
direction/ra_deg	double	The Right Ascension of the image phase centre. This value is used if the image centre direction is set to 'RA, Dec. (override)'.		0
direction/dec_deg	double	The Declination of the image phase centre. This value is used if the image centre direction is set to 'RA, Dec. (override)'.		0

input_vis_data	string	Path to the input OSKAR visibility data file.		
root_path	string	Path consisting of the root of the image filename used to save the output image. The full filename will be constructed as <root>_<image_type>.<extension>.		
fits_image	bool	If true, save the image in FITS format.	true / false	true
oskar_image	bool	If true, save the image in OSKAR image binary format.	true / false	false
overwrite	bool	If true, existing image files will be overwritten. If false, new image files of the same name will be created by appending an number to the existing filename with the pattern: <filename>-<N>.<extension> where N starts at 1 and is incremented for each new image created.	true / false	true

2.8 Element Fit

These settings are used when running the 'oskar_fit_element_data' application binary to fit splines to numerically-defined element pattern data.

All settings keys in this group are prefixed by 'element_fit/'.

Keyword	Type	Description	Allowed values	Default
input_cst_file	string	Pathname to a file containing an ASCII data table of the directional element pattern response, as exported by the CST software package in (theta, phi) coordinates. See the Telescope Model documentation for a description of the required columns.		
frequency_hz	double	Observing frequency at which numerical element pattern data is applicable, in Hz.		
pol_type	string	Specify whether the input data is to be used for the X or Y dipole, or both.	• XY • X • Y	XY
element_type_index	int	The type index of the element. Leave this at zero if there is only one type of element per station.		0
ignore_data_at_pole	bool	If true, then numerical element pattern data points at theta = 0 and theta = 180 degrees are ignored.	true / false	false
ignore_data_below_horizon	bool	If true, then numerical element pattern data points at theta > 90 degrees are ignored.	true / false	true
average_fractional_error	double	The target average fractional error between the fitted surface and the numerical element pattern input data. Choose this value carefully. A value that is too small may introduce fitting artefacts, or may cause the fitting procedure to fail. A value that is too large will cause detail to be lost in the fitted surface.	< 1	0.005
average_fractional_error_factor_increase	double	If the fitting procedure fails, this value gives the factor by which to increase the allowed average fractional error between the fitted surface and the numerical element pattern input data, before trying again. Must be > 1.0.	> 1	1.1
output_directory	string	Path to the telescope or station directory in which to save the fitted coefficients.		