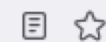


# Simulator tools demo

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## SOFTWARE

[Visibility Calculator](#)[PIPT](#)[HRS Simulator](#)[RSS Simulator](#)[SALTICAM Simulator](#)[PySlitMask](#)[RSMT](#)[Data Reduction](#)[Finder Chart Tool](#)[BVIT](#)

# Simulators and other Tools

These mostly Java programs are made available by the instrument PIs and the SALT team to aid astronomers in the planning of their proposals.

The versions for other operating systems should work on any operating system, as long as Java is installed. You can launch the application by running

```
java -jar MyApplication.jar
```

where `MyApplication.jar` is the downloaded application file.

Java 8 or higher is required. Most of the macOS versions include Java already. (If you have Java on your machine already and want to avoid the additional file size caused by this, use the version for other operating systems instead.)

**macOS Users:** If you get an error “Unable to load Java Runtime Environment”, please use the file for other operating systems. Assuming the file is called `application.jar` and you are in the directory where it is stored, you can launch it with `java -jar application.jar`.

**macOS Users:** Please see [https://astronomers.salt.ac.za/proposals/faq/#phase1\\_14](https://astronomers.salt.ac.za/proposals/faq/#phase1_14) if you get an error about a corrupt file.

## Simulators and other Tools:

**~~1. Visibility Calculator~~**

**~~2. PIPT~~**

**3. Simulators**

*a. RSS*

*b. HRS*

*c. SALTICAM*

**~~4. RSS MOS:~~**

**~~i. PySlitMask~~**

**~~ii. RSMT~~**

**~~5. Finder Chart Tool~~**

# Simulators:

## HRS Simulator

Calculate signal-to-noise (S/N) ratios and other info.

Documentation

Download v1.7

**macOS Users:** Please see the [macOS installation page](#), and please try the jar file if you cannot launch the application (see top of this page). Also note that double-clicking .hsim files will not automatically open the Simulator any longer.

## RSS Simulator

Calculate signal-to-noise (S/N) ratios and other info.

Documentation

Download v4.7

**macOS Users:** Please see the [macOS installation page](#), and please try the jar file if you cannot launch the application (see top of this page). Also note that double-clicking .rsim files will not automatically open the Simulator any longer.

## SALTICAM Simulator

Calculate signal-to-noise (S/N) ratios and other info.

Documentation

Download v1.8

**macOS Users:** Please see the [macOS installation page](#), and please try the jar file if you cannot launch the application (see top of this page). Also note that double-clicking .ssim files will not automatically open the Simulator any longer.



# Download the application:

https://astronomers.salt.ac.za/software/

HRS Simulator

Calculate signal-to-noise (S/N) ratios and other info.

Documentation

Download v1.7

macOS Users:

cannot launch the application (see top of this page). Also note that double-clicking .hsim files will not automatically open the Simulator any longer.

macOS (non-M1)

Other operating systems

macOS installation page

Please see the macOS installation page, and please try the jar file if you cannot launch the application (see top of this page). Also note that double-clicking .rsim files will not automatically open the Simulator any longer.

RSS Simulator

Calculate signal-to-noise (S/N) ratios and other info.

Documentation

Download v4.7

macOS Users:

Please see the macOS installation page, and please try the jar file if you cannot launch the application (see top of this page). Also note that double-clicking .rsim files will not automatically open the Simulator any longer.

SALTICAM Simulator

Calculate signal-to-noise (S/N) ratios and other info.

Documentation

Download v1.8

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❑ Have got science project (scientific justification)

- Have decided to use SALT
- Have chosen which SALT instruments suits the project
- Have a requirement of data quality for the project

❑ Use SALT simulators to check if the proposal is feasible (total time to be requested from TAC?)

- Screenshots for all tab in the simulators
- Demo: a practical example (S/N -> time or vice versa)

# Launch the application:

```
SALT_sim_tools — -bash » java — 161x15
~/Desktop/SALT_sim_tools — -bash » java
[soloher@soloherNewMac:~/Desktop/SALT_sim_tools$ pwd
/Users/soloher/Desktop/SALT_sim_tools
[soloher@soloherNewMac:~/Desktop/SALT_sim_tools$ ls -ltr *.jar
-rw-r--r--@ 1 soloher  staff   61M Jul  7 14:44 VisibilityTool-4.1.jar
-rw-r--r--r--@ 1 soloher  staff   61M Nov  7 20:13 PIPT-5.8.jar
-rw-r--r--r--@ 1 soloher  staff   61M Nov  7 20:18 HrsSimulator-1.7.jar
-rw-r--r--r--@ 1 soloher  staff   61M Nov  7 20:31 RssSimulator-4.7.jar
-rw-r--r--r--@ 1 soloher  staff   61M Nov  7 20:38 SalticamSimulator-1.9.jar
-rw-r--r--r--@ 1 soloher  staff   44M Nov  7 20:44 RSMT-1.99.jar
[soloher@soloherNewMac:~/Desktop/SALT_sim_tools$ java -jar RssSimulator-4.7.jar &
[1] 11754
soloher@soloherNewMac:~/Desktop/SALT_sim_tools$
```

## RSS Simulator: Generate Spectra

RSS Simulator (Version 4.7)

Generate Spectra | Configure RSS | Make an Exposure

Add a Spectrum | Save Target Spectrum | Open Target Spectrum

Redshift (z) 0.0

☒ This is a point source.

☐ This is a diffuse flux. A flat profile is assumed.

Solar Items

Obs. Year 2,019 | Solar Elongation: 180 | Ecliptic Latitude: -90

Lunar Items

Quick Select: Dark | Moon ZD: 180 | Lunar Phase: 180 | Lunar Elongation: 180

Earthly Items

Target ZD: 37 | Effective Telescope Area: 460,000 | Seeing (Zenith): 2 | FWHM (focal plane): 2.37"

Spectrum Plot Options

☐ Include atmospheric extinction.

☐ Multiply flux with mirror area and efficiency.

☒ Calculate flux in seeing disk.

UBVRI Magnitudes

Target: U: ∞ | B: ∞ | V: ∞ | R: ∞ | I: ∞

Sky: U: 22.9 | B: 23.2 | V: 22.2 | R: 21.5 | I: 20.2

Update Spectrum (select spectrum first)

# HRS: Generate Spectra

HRS Simulator (Version 1.7)

Generate SpectraConfigure HRSMake an Exposure

Add a SpectrumSave Target SpectrumOpen Target Spectrum

Redshift (z) 0.0

☒ This is a point source.

☐ This is a diffuse flux. A flat profile is assumed.

Solar Items

Obs. Year2,019Solar Elongation:180Ecliptic Latitude:-90

Lunar Items

Quick Select:DarkMoon ZD:180Lunar Phase:180Lunar Elongation:180

Earthly Items

Target ZD:37Effective Telescope Area:460,000Seeing (Zenith):2FWHM (focal plane):2.37"

Spectrum Plot Options

☐ Include atmospheric extinction.

☐ Multiply flux with mirror area and efficiency.

☒ Calculate flux in seeing disk.

UBVRI Magnitudes

Target:U:∞B:∞V:∞R:∞I:∞  
Sky:U:22.9B:23.2V:22.2R:21.5I:20.2

Update Spectrum (select spectrum first)

# SALTICAM: Generate Spectra

Salticam Simulator (Version 1.9)

Generate SpectraMake an Exposure

Add a SpectrumSave Target SpectrumOpen Target Spectrum

Redshift (z) 0.0

☒ This is a point source.

☐ This is a diffuse flux. A flat profile is assumed.

Solar Items

Obs. Year2,019Solar Elongation:180Ecliptic Latitude:-90

Lunar Items

Quick Select:DarkMoon ZD:180Lunar Phase:180Lunar Elongation:180

Earthly Items

Target ZD:37Effective Telescope Area:460,000Seeing (Zenith):2FWHM (focal plane):2.37"

Spectrum Plot Options

☐ Include atmospheric extinction.

☐ Multiply flux with mirror area and efficiency.

☒ Calculate flux in seeing disk.

UBVRI Magnitudes

Target:U:∞B:∞V:∞R:∞I:∞  
Sky:U:22.9B:23.2V:22.2R:21.5I:20.2

Update Spectrum (select spectrum first)

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# RSS Configure: Spectroscopy

RSS Simulator (Version 4.7)

Generate SpectraConfigure RSSMake an Exposure

ImagingSpectroscopyFabry-Perot

Iterations1

☐ Use Polarimetry

Slit TypeLongslit

Slit Width1.5 arcseconds

Please note that only 0.6, 1.25, 1.5 and 4 arcsec slits are available for polarimetry.

Slit Throughput: 0.545 (for a FWHM of 2.37")

Gratingpg2300

Camera Station

798999109119129

81.25 deg

Grating Angle

0.12510.252030.12540.2550

40.625 deg

	Wavelength	Resolution
Blue Chip Edge	5,150.4 Å	
Blue Chip Center	5,315.9 Å	3024
Blue Chip Gap	5,477.6 Å – 5,495.5 Å	
Central Wavelength	5,651.6 Å	3215
Red Chip Gap	5,801.7 Å – 5,818.2 Å	
Red Chip Center	5,960.4 Å	3391
Red Chip Edge	6,094.8 Å	
Central Dispersion:	0.15 Å per unbinned pixel	
Error Estimate for the Wavelengths:	30 Å	
Spatial Plate Scale:	0.127 arcsec per unbinned pixel	

Order Blocking Filterpc04600(show)

Update Throughput

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# RSS Configure: Imaging


RSS Simulator (Version 4.7)

Generate Spectra   **Configure RSS**   Make an Exposure

Imaging   Spectroscopy   Fabry-Perot

Iterations

☐ Use Polarimetry

Filter not set  [\(show\)](#)

- pi08350
- pi08535
- pi08730
- pc03200
- pc03400**
- pc03850
- pc04600
- ✓ not set

Update Throughput

# RSS Configure: Fabry-Perot

RSS Simulator (Version 4.7)

Generate Spectra   Configure RSS   Make an Exposure

Imaging   Spectroscopy   **Fabry-Perot**

Iterations

☐ Use Polarimetry

Fabry-Perot Configuration

Filter  (show)

**Etalon Pattern**

#	Wavelength (Å)
Right-click to insert/delete rows.	

Start  Å   End  Å   Step size  Å  

Update Throughput

# RSS: Make an Exposure

RSS Simulator (Version 4.7)

Generate Spectra | Configure RSS | Make an Exposure

☐ Calculate the Signal-to-Noise Ratio

☒ Calculate the Exposure Time

Requested Signal-to-Noise Ratio

Detector Iterations  Readouts per Observation: 0

Total Observation Time (for all frames, including overhead time): 0.0 sec

Prebinned Rows

Prebinned Columns

Gain  Gain: 1.5 photons / ADU

Readout Speed

Optional CCD Windowing:

Height  arcseconds

For spatial resolution

☐ Calculate the SNR per binned pixel.

☒ Calculate the SNR per resolution element.

For spectral resolution

☒ Calculate the SNR per binned pixel.

☐ Calculate the SNR per resolution element.

The SNR in spatial direction is calculated in an aperture of  $2 \times \text{FWHM}$  of the user specified seeing value.

**Click "Expose" to calculate the saturation and exposure time.**

Expose (select spectrum first)



# HRS Configure

Low resolution

Medium resolution

High resolution

High radial velocity precision

not set

HRS Simulator (Version 1.7)

Generate Spectra

Configure HRS

Make an Exposure

Spectrograph operation mode

Iodine cell

Out

Update Throughput

# HRS: Make an Exposure

HRS Simulator (Version 1.7)

Generate Spectra | Configure HRS | Make an Exposure

☐ Calculate the Signal-to-Noise Ratio

☒ Calculate the Exposure Time

Requested Signal-to-Noise Ratio

☐ at center of wavelength range

☒ at specified wavelength

Wavelength

Å

Cycles

1

For spectral resolution

☒ Calculate the SNR per pixel.

☐ Calculate the SNR per resolution element.

In spatial direction the SNR is given per fibre.

Exposure (select spectrum first)

# SALTICAM: Make an Exposure

Salticam Simulator (Version 1.9)

Generate SpectraMake an Exposure

Set Exposure Type

Filter ModeSingle FilterCCD ModeNormal

Exposure Time per Frame (s)

Number of Cycles1

Number of Iterations1

Total Readouts: 1

Total observation time for all frames, including overheads: 9 s

Binned Rows4

Binned Columns4

GainBright

Readout SpeedFast

FilterJohnson U(show)

Click "Expose" to generate statistics summed over all cycles and iterations

S/N: Object Counts: Sky Counts: Pixel Saturation: %

Click "Expose" to generate statistics summed over all cycles and iterations

Expose (select spectrum first)

# SALTICAM: Make an Exposure

Salticam Simulator (Version 1.9)

Generate SpectraMake an Exposure

Set Exposure Type

Filter ModeMultiple FiltersCCD ModeNormal

Number of Cycles1

Number of Iterations1

Total Readouts: 0

Binned Rows4

Binned Columns4

GainBright

Readout SpeedFast

#	Filter	Exposur...	S/N	Object C...	Sky Coun...	Through...
Right-click to insert/delete rows.						

Total observation time for all frames, including overheads: 0 s

Click "Expose" to generate statistics summed over all cycles and iterations

Expose (select spectrum first)

Demo