

Software for Proposal Preparation

Ravi Sankrit
(SOFIA Science Center / USRA)

Data Cycle System & Science Operations

SOFIA Data Cycle System

RETRIEVE ARCHIVE
OBSERVE
PROPOSE PLAN

Username Password

Message Of The Day DCS 2.3.1
 • DCS is ready for Cycle 2, phase 1. VT runs on limited platforms. More support will come soon.

Welcome to the SOFIA Data Cycle System!

The SOFIA Data Cycle System (DCS) provides tools and infrastructure for both General Investigators (GIs) and Science and Mission Operations (SMO) staff for:

- proposal preparation and submission
- observation and mission planning
- observation execution (*coming soon!*)
- data pipelining (*coming soon!*)
- data archiving and distribution

All tools and resources are available using the links below.

To start using the DCS, please [register](#) and check out the documents in the [DCS Help Resources](#) area. In addition, most of the tools have embedded help pages and links.

Be sure to check the Message of the Day for recent news and updates regarding DCS status, including planned downtime for upgrades and maintenance.

User Support	Proposal Development	Observation Planning	Data Archive & Retrieval
About DCS	Download SPT	Download SSPOT	Search Science Archive
Register With DCS	Search Proposals	Search Observing Plans	Search Mission Data Archive
DCS Help Resources	SOFIA Instrument Time Estimator	Search AORs	Search Missions
	ATRAN	Visibility Tool	

• DCS Help Resources • DCS Site Map • About DCS
 • SOFIA Science Page • SOFIA Public Site

Lan Lin
Li Sun
Bill Vacca

Sean Colgan
Bob Krzaczek
Thomas Lau*
Kaori Nishikida
Robert Perez

Ralph Shuping
Elizabeth Moore

<https://dcs.sofia.usra.edu>

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Stratospheric Observatory for Infrared Astronomy

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The links on the left allow navigation to pages that contain information about the observatory, its scientific capabilities, and other matters of interest.

ANNOUNCEMENTS
(Click on the above link for details.)

SOFIA Users Group meeting on April 26th
SOFIA splinter session at the AAS on hold

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[SOFIA Science Archive](#)

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Two Stage Proposal Process

Phase I:

Preparation and submission of a scientific justification, a high level description of targets and observing modes, and a feasibility analysis for the proposed program.

Technical review of proposals by SMO staff, independent peer-review, and selection of proposals by SMO Director.

Phase II:

Preparation and submission of detailed specifications for each observation in a selected program.

Software, and Online Tools

Proposal/Observation Preparation:

SOFIA Proposal Tool (SPT) ; Phase I
SOFIA Spot (SSpot) ; Phase II

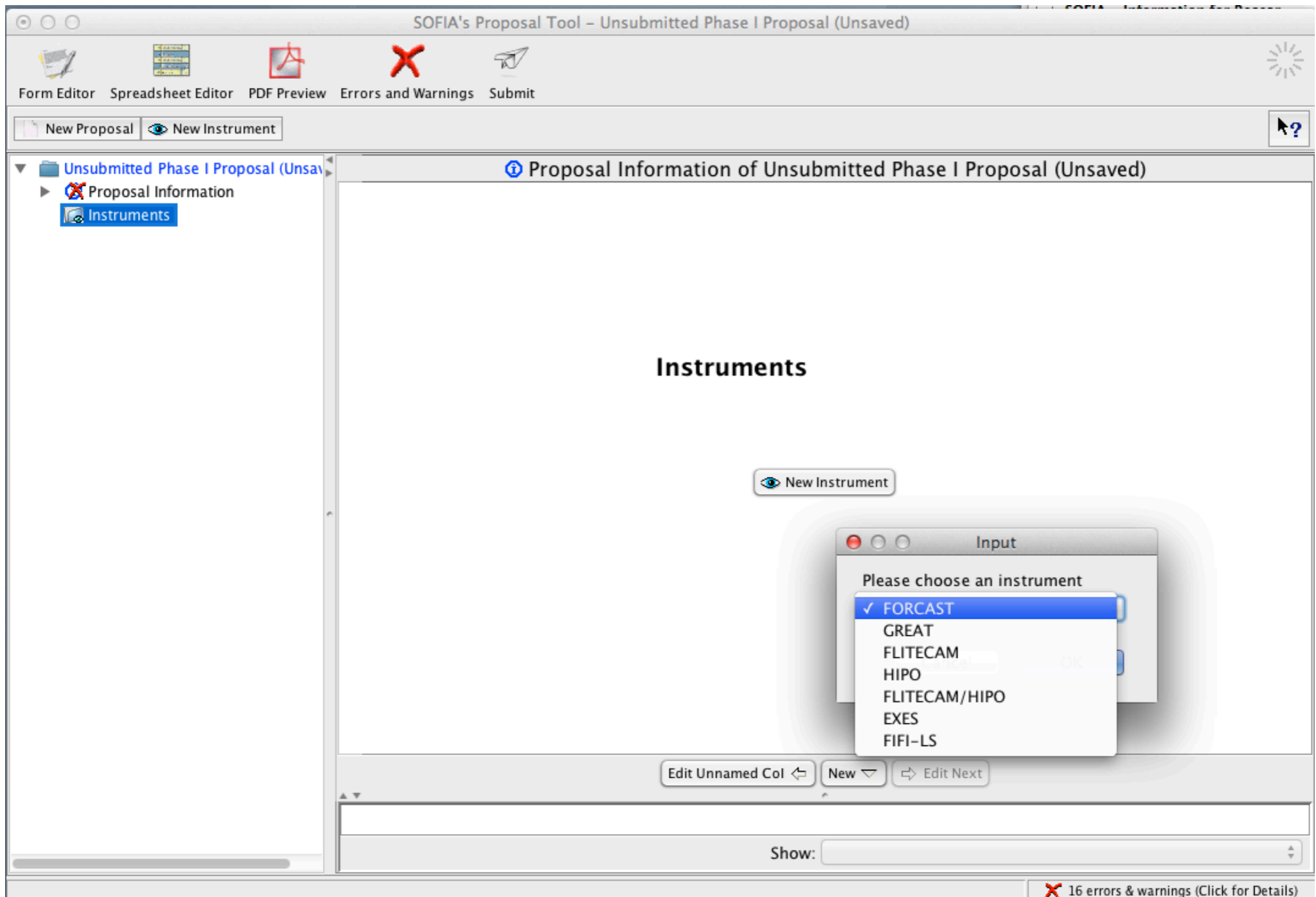
Exposure time estimation:

SOFIA Instrument Time Estimator (SITE)
FLITECAM Grism Observation Calculator
FORCAST Grism Observation Calculator
GREAT Time Estimator

Other resources:

Atmospheric Transmission Models (ATRAN)
Visibility Tool (VT)
AOR Search Page (for duplication checks)

SOFIA Proposal Tool (SPT) ; <https://dcs.sofia.usra.edu/proposalDevelopment/installSPT/index.jsp>



SOFIA Proposal Tool - Form Editor

SOFIA's Proposal Tool - Unsubmitted Phase I Proposal (Unsaved)

Form Editor | Spreadsheet Editor | PDF Preview | Errors and Warnings | Submit

New Proposal | New Observation

Unsubmitted Phase I Proposal (Unsaved)

- Proposal Information
- Instruments
 - Instrument FORCAST
 - Observations
 - Observation 1: M 1
 - Instrument FLITECAM
 - Observations
 - Observation 1: M1
 - Observation 2: M1

Observation 1: M1 of Unsubmitted Phase I Proposal (Unsaved)

Instrument: FLITECAM

Target Name: M1

Source Type: Sidereal SIMBAD NED

NAIF ID: NAIF ID Selection List

Coordinates: Galactic RA/GalLong: 5 34 31.94 DEC/GalLat: 22 0 52.20

Proper Motion ("/yr): RA: 0 DEC: 0

Instrument	Configuration	Spectral Element 1	Spectral Element 2	Slit
IMAGING	FLT_Pa	None Selected	None Selected	None Selected

Instrument Mode: NOD_OFFARRAY Overheads - Constant (secs): 60.0 + Factor: 1.0

Integration Time (secs): 600 Alternate Overhead: 0 Default Overhead: 660.0 Duration: 1260.0

Map Area: 0.00 arcmin X 0.00 arcmin

Order of Observation:

Priority: Low

Time Critical Observation:

From Month: None Selected

From Day: None Selected

From Year: None Selected

To Month: None Selected

To Day: None Selected

To Year: None Selected

Edit Observations | New | Edit Observation 2: M1

Observa...	Instrument	Target Name	Source Type	SIMBAD	NED	NAIF ID field	Galactic	Lambda	Beta	Instrument	Instrum
------------	------------	-------------	-------------	--------	-----	---------------	----------	--------	------	------------	---------

Show: Observation

16 errors & warnings (Click for Details)

SOFIA Proposal Tool - Spreadsheet Editor

SOFIA's Proposal Tool - Unsubmitted Phase I Proposal (Unsaved)

Form Editor | Spreadsheet Editor | PDF Preview | Errors and Warnings | Submit

New Proposal | New Observation

Unsubmitted Phase I Proposal (Unsaved)

- Proposal Information
 - PI: Dr. Ravi Sankrit
 - Unnamed Col
- Instruments
 - Instrument FORCAST
 - Observations
 - Observation 1: M1
 - Instrument FLITECAM
 - Observations
 - Observation 1: M1
 - Observation 2: M 41
 - Instrument GREAT
 - Observations
 - Observation 1: M1

Show: Observation Include all

Observa... △	Instrument	Target Name	Source Type	SIMBAD	NED	NAIF ID field	Galactic	Lambda	Beta	Proper Mo...	Instrument	Frequency...	Frequency...	Velocity (...	Reference...
Observati...	FORCAST	M1	Sidereal	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	5 34 31.94	22 0 52.20	0	0	GRISM_XD...	C2N, 300...	300, 0, 4...	0.00, 0.00,
Observati...	FLITECAM	M1	Sidereal	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	5 34 31.97	22 0 52.06	0	0	IMAGING,...	NOD_OFF...	600, 0, 6...	0.00, 0.00,
Observati...	FLITECAM	M 41	Sidereal	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	6 46 1.00	-20 45 2...	0	0	IMAGING,...	NOD_OFF...	600, 0, 6...	0.0, 0.0,
Observati...	GREAT	M1	Sidereal	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	184.55750	-5.78426	0, 0,	DUAL-CH...	1510.1	1825.5	0	LSR

Show: Observation Include all

12 errors & warnings (Click for Details)

SOFIA Spot ; <https://dcs.sofia.usra.edu/observationPlanning/installSSPOT/sspotDownload.jsp>

Query

Obs Plan List Logout

Get ObsPlan List

User:

Prop Cycle: 01

Search Text:

Inst Run ID:

Get Obsplan List

Found Obs Plan List:

Get Obs Plan

ObsPlanID: 01_0042

Get Plan

ObsPlanList

Next Display 50 results per page

ObsPlanList

- Proposal= "An Opportunity to Solve the Nebular Abundance Problem with SOFIA" completionrate= "0" lastdatamod= "2013-04-24 19:55:5"
- ObsPlanID=01_0042
- PropCycleID= 1
- Proposal SMOMember="ahelton, jdebuizer,wacca,wreach" TACGrade="4.6" TACQueue="US" datesubmitted="2012-01-28 05:16:32"
- Investigator
- Investigator
- Investigator
- Investigator
- Investigator
- Investigator
- Object="NGC 2440 PA1-1" key="01_0042_1" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 2440 PA1-1" key="01_0042_2" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 2440 PA1-1" key="01_0042_3" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 7009 PA1-1" key="01_0042_4" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 7009 PA1-1" key="01_0042_5" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 7009 PA1-1" key="01_0042_6" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 2440 PA2-1" key="01_0042_7" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 2440 PA2-1" key="01_0042_8" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 2440 PA2-1" key="01_0042_9" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 7009 PA2-1" key="01_0042_10" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 7009 PA2-1" key="01_0042_11" order="1" priority="1" watervapor_max="10.0"
- Object="NGC 7009 PA2-1" key="01_0042_12" order="1" priority="1" watervapor_max="10.0"
- SSMOCScientist=scasey,jdebuizer,wreach,jrho,gsandell,rsankrit,msavage,wacca,jvaillancourt,jwolf,ahelton,rklein,kbower,kleppik
- IsLocked

Pick an id from the id list and click on the Proposal to continue

Accept Cancel

SSpot - Retrieved AORs

SOFIA Planning Tool

📁
📄
🔄

✖️
⬆️
⬆️

🎯
🚫
⬆️
🔗

Observations

Astronomical Observation Requests (AORs)

Label	Target	Position	Type	Instrument	Duration	Stat	On	
01_0042_1	NGC 2440 PA1-1	7h41m55.00s,...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_2	NGC 2440 PA1-1	7h41m55.00s,...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_3	NGC 2440 PA1-1	7h41m55.00s,...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_4	NGC 7009 PA1-1	21h04m11.00...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_5	NGC 7009 PA1-1	21h04m11.00...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_6	NGC 7009 PA1-1	21h04m11.00...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_7	NGC 2440 PA2-1	7h41m55.00s,...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_8	NGC 2440 PA2-1	7h41m55.00s,...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_9	NGC 2440 PA2-1	7h41m55.00s,...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_10	NGC 7009 PA2-1	21h04m11.00...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_11	NGC 7009 PA2-1	21h04m11.00...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	
01_0042_12	NGC 7009 PA2-1	21h04m11.00...	Fixed Single	FORCAST_Grism	1686	ready	<input checked="" type="checkbox"/>	

📄 Observations

Target: NGC 2440 PA1-1 Type: Fixed Single

Estimated: 337 min Awarded: 336 min

Existing Project - 01_0042 username:rsankrit
📄
↔️ Net Up
Total AORs: 12 / Active: 12

SSpot - AOR Detail and Editing

FORCAST_Grism

AOR Not Editable! You may not save this AOR.

Unique AOR Label:

Target: NGC 7009 PA1-1 Type: Fixed Single
316.045833, -11.363333 Equ J2000 or 21h04m11.00s, -11d21m48.0s Equ J2000

FORCAST

Exposure Time (sec)

Cycles

Min Contiguous Exp Time (sec)

Grism

- SW FOR_G063
- SW FOR_G111
- LW FOR_G227
- LW FOR_G329
- None

Slit

- FOR_LS24
- FOR_LS47
- None

Chop / Nod

Example Rotation Angle (deg)

Chop/Nod Style

Chop Type

Chop Throw (arcsec)

Chop Angle Coordinate

Chop Angle (deg)

Nod Throw (arcsec)

Nod Angle Coordinate

Nod Angle (deg)

Dither Pattern

No Yes

AOR Search ; <https://dcs.sofia.usra.edu/observationPlanning/AORSearch.jsp>

AOR Search

Get AORs for matching criteria [\[help\]](#)

Cycle Number:

Instrument Name:
 Spectral Element1:
 Spectral Element2:
 Mode:

Target Type:

Target:

Spatial Area:

RA (hh:mm:ss)	Dec (deg:mm:ss)	Search Radius (arcsec)	Equinox
<input type="text" value="21:04:10.88"/>	<input type="text" value="-11:21:48.26"/>	<input type="text" value="60"/>	<input type="text" value="2000"/>

Results Per Page:

Page of 1 (1 - 10 of 10)

[\[help\]](#)

AORID ▲ ▼	Target ▲ ▼	RA(J2000) ▲ ▼	Dec(J2000) ▲ ▼	NAIF_ID ▲ ▼	Instrument ▲ ▼	Spectral1 ▼	Spectral2 ▲ ▼	Freq1 ▲ ▼	Freq2 ▲ ▼	ObsMode ▲ ▼	Exposure (minutes) ▲ ▼
01_0042_10	NGC 7009 PA2-1	21:04:11.0	-11:21:48.0		FORCAST	FOR_G111	FOR_LS47			C2N	15
01_0042_11	NGC 7009 PA2-1	21:04:11.0	-11:21:48.0		FORCAST	FOR_G227	FOR_LS47			C2N	15
01_0042_12	NGC 7009 PA2-1	21:04:11.0	-11:21:48.0		FORCAST	FOR_G329	FOR_LS47			C2N	15
01_0042_4	NGC 7009 PA1-1	21:04:11.0	-11:21:48.0		FORCAST	FOR_G111	FOR_LS47			C2N	15
01_0042_5	NGC 7009 PA1-1	21:04:11.0	-11:21:48.0		FORCAST	FOR_G227	FOR_LS47			C2N	15
01_0042_6	NGC 7009 PA1-1	21:04:11.0	-11:21:48.0		FORCAST	FOR_G329	FOR_LS47			C2N	15
81_0029_1	NGC 7009	21:04:10.79	-11:21:47.7		FORCAST	19.7 microns	31.5 microns				30
81_0029_2	NGC 7009	21:04:10.79	-11:21:47.7		FORCAST	19.7	33.6 microns				30
81_0029_3	NGC 7009	21:04:10.79	-11:21:47.7		FORCAST	24.2 microns	34.8 microns				30
81_0029_4	NGC 7009	21:04:10.79	-11:21:47.7		FORCAST	24.2 microns	37.1 microns				30

SITE ; <https://dcs.sofia.usra.edu/proposalDevelopment/SITE/index.jsp>

SOFIA Instrument Time Estimator (SITE)

In the four sections of this form, select the instrument, astronomical source, telescope, observing condition constraints and calculation method. Click on the **Calculate** button to submit the parameters from all the sections to the server. The results are reported in a separate web page that can be resized and printed. Links to related tools are here:

[FORCAST GRISM Time Estimator](#)
 [FLITECAM GRISM Time Estimator](#)
 [GREAT Time Estimator](#)
 [ATRAN](#)

Please Check 'Notes and Known Issues' Before Proceeding

Instrument FORCAST ▾ Calculate

Instrument properties: [\(more info\)](#)

Filter: FOR_F086 ▾ FOR_F315 ▾ [more info](#)

Calculation Method
Calculation method: [\(more info\)](#)
 Select the calculation method

S/N ratio resulting from a Total Integration Time of secs
 Total Integration Time to achieve a S/N ratio of

Astronomical Source Definition
Spatial profile and continuum brightness: [\(more info\)](#) Choose point or extended source.

Point source (nominal spatial profile) with spatially integrated brightness Jy ▾
 Spatially integrated brightness for the long wavelength filter Jy
 Extended source having uniform surface brightness Jy / sq arcsec ▾
 Surface brightness for the long wavelength filter Jy/sq arcsec
 Emission line: [\(more info\)](#) in addition to the above continuum. The output SNR or observing time will be for the sum of continuum plus line.
 Single emission line at wavelength microns with line flux W/m² ▾
 Emission line at longer wavelength microns with line flux W/m²

Observing Condition Constraints
 Note: You can read the [explanatory notes](#) for more information on the water vapor overburden.

Zenith Water Vapor Overburden in microns: 2 5 7 10 13 20 27 34 40

Elevation Angle: 20° 40° 60°

Calculate Reset to Defaults

Notes and Known Issues
 1) Because of uncertainties in the sensitivity for the long wavelength range of FLITECAM, not all filters listed in SITE and SPT are valid for Cycle 1 proposals. Only filters short-ward of 3.6 mic. will be supported in Cycle 1 (see SOFIA Cycle 1 Call for Proposals, Section 1.3.1): J, H, K, Pa_alpha, Pa_alpha continuum, Water Ice (3.08 mic.), PAH (3.29 mic.). In addition, the order sorting filters used for grism spectroscopy (H_W, K_W, K_long, LM) will not be supported for imaging. Proposals requesting filters or grism modes other than those advertised in the CfP will be considered as non-conforming to the rules of the proposal call.

FLITECAM Grism Observation Calculator ; http://flitecam.sofia.usra.edu/cgi-bin/flitecam/flitecam_calc2.cgi

Web-based input form for FLITECAM Grism Observation Calculator -- beta version

This form can be used to estimate (1) the limiting fluxes of objects that can be observed with FLITECAM for a given signal-to-noise and exposure time; (2) the integration time needed to reach a requested signal-to-noise for an input source flux and temperature; or (3) the signal-to-noise resulting from an input source flux and temperature and integration time. The output data file generated by this routine (flitecam.plt...dat) can be saved to your machine from your browser window once the program has been run.

When estimating (1) the limiting flux, the user should specify the slit size, the desired signal-to-noise ratio (per resolution element), the integration time for an individual image (in sec), and the total integration time for the observation (in sec). At each wavelength point over the observed range, the limiting flux is calculated for the input parameters. Magnitude limits are given for the nominal centers of each broadband filter covered (e.g., at 2.2 microns for the K band). Saturation will occur if the single frame integration time is too long. This can be seen in the plot as a red background for those wavelengths that are saturated.

When estimating (2) the integration time needed to reach a specified signal-to-noise ratio (per resolution element), the user should specify the slit size, the desired signal-to-noise ratio, the integration time for an individual image (in sec), the source flux at 2.2 microns (K band), and the effective blackbody temperature of the source. It should be noted that 0.3 sec is the shortest frame time allowable for a full array readout. For long wavelengths single frame times of 0.3 sec are typical in order to prevent saturation, while for the mid wavelengths 3 sec is a typical value. For the shortest wavelengths, 300 sec is common. (Note that Vega has a mag of 0.03 and a flux of approximately 4.14×10^{-10} W/m²/micron, or 655 Jy, in the K band.)

When estimating (3) the signal-to-noise ratio per resolution element, the user should specify the slit size, the source flux at 2.2 microns (K band), the effective blackbody temperature of the source, the integration time for an individual image (in sec), and the total integration time for the observation (in sec). Saturation will occur if the single frame integration time is too long. This can be seen in the plot as a red background for those wavelengths that are saturated. (Note that Vega has a mag of 0.03 and a flux of approximately 4.14×10^{-10} W/m²/micron, or 655 Jy, in the K band.)

The conversion between the limiting continuum flux and limiting line flux, under the assumption of a Gaussian line, is given by $F_l = 1.06 \cdot \lambda \cdot F_c / R$ where F_l is the line flux in units of W/m², F_c is the continuum flux in units of W/m²/micron, λ is the wavelength of the line in microns, and R is the resolving power. Alternatively, $F_l = 3.19 \times 10^{-15} \cdot F_c / (\lambda \cdot R)$ for F_c in units of mJy.

This form and the program to estimate the desired quantities was written by Bill Vacca based on the **expected** performance of FLITECAM. No guarantees regarding actual performance are claimed or implied. The program uses a model of the atmospheric transmission and emission as a function of wavelength for an altitude of 41000 ft, an elevation angle of 45 deg (airmass of 1.4), and a zenith water vapor content of 7.3 microns. The model is smoothed to the requested resolution (which depends on the slit size). The calculations assume perfect flat-fielding and telluric division, and nominal instrument behavior. Note that the plate scale for FLITECAM is 0.475 arcsec/pixel.

Questions about FLITECAM and its expected performance should be directed to the SOFIA Help Desk. If you have problems with this form, please contact the SOFIA Help desk (sofia_help@sofia.usra.edu).

Input Observing Parameters

Select the quantity to be estimated:

Choose a slit size (arcsec):

Required Signal-to-Noise ratio:

Single frame integration time (sec):

Total integration time (sec):

Source Flux at 2.2 microns:

Source blackbody temperature (K):

[Back to the SOFIA Home Page](#)

FLITECAM Grism Observation Calculator - Input

Input Observing Parameters

Select the quantity to be estimated:

Choose a slit size (arcsec):

Required Signal-to-Noise ratio:

Single frame integration time (sec):

Total integration time (sec):

Source Flux at 2.2 microns:

Source blackbody temperature (K):

FLITECAM Grism Observation Calculator - Output

FLITECAM Calculator Output

Input Parameters

Mode: Limiting Flux
Slit: 1.0 arcsec
Requested Signal-to-Noise Ratio: 5
Single frame exposure time: 5 sec
Total exposure time: 600 sec

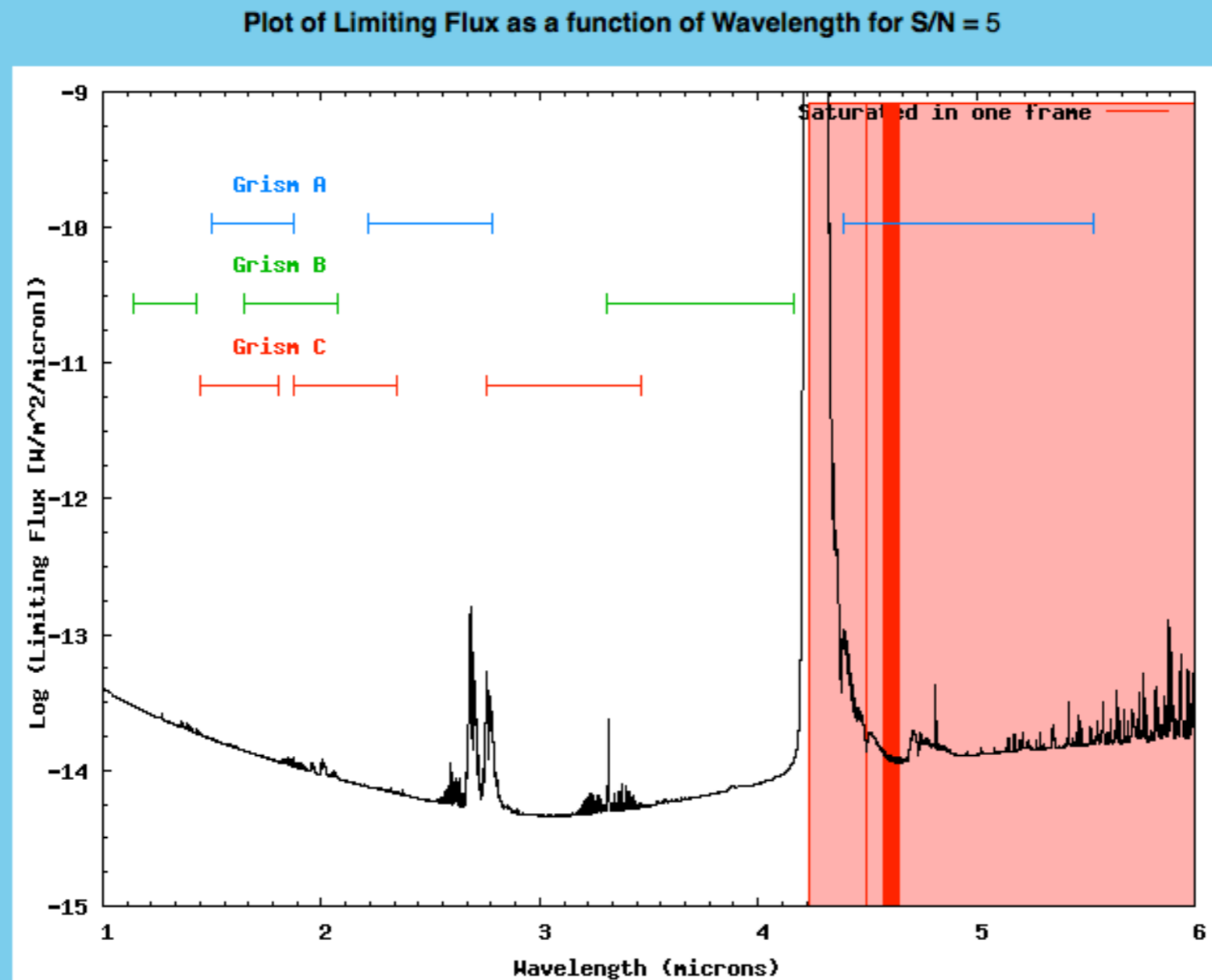
[View output data file](#)

Slit size = 1.000 arcsec
 Resolution = 1700.0
 Single frame exposure time = 5.000 sec
 Number of Coadds = 120.00000
 Total Exposure Time = 600.00000 sec

Wavelength (microns)	FWHM (arcsec)	Fractional Slit Transmission
1.250	3.64	0.25
1.650	3.58	0.25
2.200	3.52	0.26
3.550	3.49	0.26
3.760	3.49	0.26
4.750	3.50	0.26

Limiting Magnitudes	Limiting Fluxes (mJy)	Limiting Fluxes (W/m2/micron)
J = 12.791	12.819	0.2460E-13
H = 12.321	12.733	0.1402E-13
K = 11.817	12.634	0.7825E-14
L = 10.189	23.850	0.5674E-14
Lprime = 9.797	30.743	0.6519E-14
M = 7.831	121.276	0.1611E-13 -- Saturated!

FLITECAM Grism Observation Calculator - Output Plot



[View output data file](#)

GREAT Time Estimator ; <http://great.sofia.usra.edu/cgi-bin/great/great.cgi>

Web-based input form for GREAT time estimator -- beta version

This form can be used to estimate the integration time needed to reach a requested signal-to-noise for an input source flux and temperature. The output data file generated by this routine can be saved to your machine from your browser window once the program has been run.

This form and the program to estimate the desired quantities was written by Riccardo Melchiorri based on a previous PHP code version.

Input Parameters

Observatory Altitude (in feet; < 60000 ft):	<input type="text" value="43000"/>	<input checked="" type="radio"/> ft <input type="radio"/> m
Water Vapor Overburden (in microns; 0 if unknown):	<input type="text" value="0"/>	
Telescope elevation (between 20 and 60 deg):	<input type="text" value="45"/>	
Signal to Noise Ratio / Integration Time (s) :	<input type="text" value="5"/>	<input checked="" type="radio"/> SNR <input type="radio"/> Total Int. Time
Rest Frequency (in THz, use 7 decimals):	<input type="text" value="1.9005369"/>	
Velocity correction(Observer VLSR + source VLSR) in km/s:	<input type="text" value="0"/>	
Brightness Temperature or RMS (K) :	<input type="text" value="5"/>	
Frequency or Velocity Resolution :	<input type="text" value="1"/>	<input type="radio"/> MHz <input checked="" type="radio"/> km/s
Comments for the plot :	<input type="text"/>	

The time estimator calculates the time required to reach a certain rms brightness temperature, T_R^* , ($T_R^* = T_A^* / \eta_{fss}$, where η_{fss} is the forward scattering efficiency, assumed to be 0.95 for GREAT at all bands) for a line at a frequency ν ; by solving the standard radiometric formula

$$\Delta T_A^* = (2 T_{sys}) / \sqrt{t \Delta \nu}$$

Here ΔT_A^* is the antenna temperature corrected for ohmic losses and rear spillover. T_{sys} is the single sideband system temperature outside the earth atmosphere, t is the integration time (ON+OFF) and $\Delta \nu$ is the desired frequency resolution. For further details, see [Guide to GREAT v3](#).

The calculator uses the most recent measured receiver temperatures (April 2013) and calls the atmospheric transmission program ATRAN to estimate the atmospheric transmission for a given frequency, altitude, telescope elevation and water vapor overburden. The transmission is used to calculate T_{sys} , assuming an ambient temperature of the atmosphere of 220 K and a telescope temperature of 230 K.

The time estimator can also compute the required integration time (ON + OFF) for a line with a given peak brightness temperature, desired signal to noise ratio (SNR) and frequency or velocity resolution. To estimate the total time needed for your observations, enter the integration times in the SOFIA Proposal Tool, or calculate them yourself. For position, beam switched observations and raster maps the overheads are currently assumed to be 100% (2 x integration time). Add 5 minutes for tuning and calibration. For on-the-fly mapping the overheads are 50% (1.5 x integration time for the map) plus 5 minutes for tuning and calibration.

If your line estimates are in main beam brightness temperature, T_{mb} , convert to radiation temperature $T_R^* = T_{mb} / \eta_{mb}$, where η_{mb} is the main beam efficiency. The Main beam efficiency has been measured from observations of Jupiter in April 2013 and found to be 0.67 for both L1 and L2.

If your desired line rest frequency falls close to or in an atmospheric absorption feature, you may still be able to observe the line if you choose the right time of the year and your source is blue or redshifted to move you out of the atmospheric feature. The time estimator therefore also allows you to put in a velocity correction. The first term in this velocity correction calculates the radial velocity of the observer with respect to your source for a given date and location ([hyperlink](#)) and then you still need to add the VLSR of your source.

The time estimator also plots the position of both sidebands (separated by +/- 3.25 GHz from the signal band). If the transmission is poor at the lower frequency but very good at the higher frequency, you would tune your line to the lower sideband. If the opposite is true you would tune your line to the upper sideband (USB). If both sidebands have poorer transmission than your signal band, your system temperature will be underestimated and your time estimate will be too optimistic, since GREAT is a dual sideband receiver and emission from both the signal and the image band contributes equally to the system temperature.

GREAT Time Estimator - Input

Input Parameters

Observatory Altitude (in feet; < 60000 ft):	<input type="text" value="43000"/>	<input checked="" type="radio"/> ft <input type="radio"/> m
Water Vapor Overburden (in microns; 0 if unknown):	<input type="text" value="0"/>	
Telescope elevation (between 20 and 60 deg):	<input type="text" value="45"/>	
Signal to Noise Ratio / Integration Time (s) :	<input type="text" value="5"/>	<input checked="" type="radio"/> SNR <input type="radio"/> Total Int.Time
Rest Frequency (in THz, use 7 decimals):	<input type="text" value="1.9005369"/>	
Velocity correction(Observer VLSR + source VLSR) in km/s:	<input type="text" value="0"/>	
Brightness Temperature or RMS (K) :	<input style="border: 2px solid red;" type="text" value=".5"/>	
Frequency or Velocity Resolution :	<input type="text" value="1"/>	<input type="radio"/> MHz <input checked="" type="radio"/> km/s
Comments for the plot :	<input type="text"/>	

GREAT Time Estimator - Output

Output

Rest Frequency	1.900537 THz
Single Sideband System Temperature	2217 K
Integration Time	343.7 s
Atmospheric Transmission	0.91 -

Input Parameters

Rest Frequency	1.900537 THz
Doppler correction	0 km/s
Signal to Noise Ratio	5 -
Frequency resolution	6.3 MHz
Velocity resolution	1.0 km/s
Brightness Temperature or RMS	0.5 K
Altitude	43000 ft
Zenith water vapor overburden	default μm
Elevation angle	45 deg

Assumed Parameters

Ambient temperature for the atmosphere	220 K
Physical Temperature of the Telescope	230 K
Telescope Efficiency incl. ohmic losses and spillover	0.92
Double Side Band Receiver Temperature	900 K
Forward Scattering Efficiency	0.95

GREAT Time Estimator - Output Plot

Plot of Atmospheric Transmission

