Preparing SOFIA Cycle 4 Proposals

Ravi Sankrit
(User Support Group Lead)

SOFIA Observers’ Workshop, May 20-21, 2015; Mountain View, CA
Cycle 4 Basics

Approximately 500 hours of observing time offered via the US queue, and an additional 80 hours via the German queue.

Infrared instruments - EXES, FIFI-LS, FLITECAM, FORCAST, GREAT, HAWC+.
Optical photometers - HIPO, (FLITECAM/HIPO), FPI+.

Southern hemisphere deployments with two instruments.

$5.5 million funding available for successful US based investigators.

New category, “Impact Proposals” - multi-year, of order 100 hour requests. Not surveys!

Observing period will be March 2016 through February 2017.
Two Phase Process

**Phase I** proposals contain the scientific justification and the feasibility analysis for the proposed observing program. The deadline for Cycle 4 Phase I proposal submission is July 10, 2015, at 9:00pm Pacific Time.

The submitted proposals undergo technical review by SOFIA Science Center staff, peer reviews are held separately for the US and German queue proposals, the recommendations are discussed by the Director and Deputy Director and the merged results announced (expected, early October, 2015).

**Phase II** starts soon after the announcement of results. Each successful proposal is assigned a support scientist, who helps the PI prepare the detailed observing set-up for each of the targets. The submission consists primarily of a set of “Astronomical Observation Requests” (AORs) that are planned and implemented.

**This talk focuses on the Phase I proposal preparation!**
Webpage and Documents

Outline

1. Generating the science idea(s).
2. Checking existing and planned observations.
3. Exposure time estimation and feasibility analysis.
4. Proposal preparation and submission.
5. Using SSpot, the Phase II tool.
Generating the science idea(s)

Resources available on our Science webpages:

- Links to publications
- SOFIA Community Teletalks archive
- Workshop, Splinter Session presentations
- The Science Vision document
- Instrument flyers
Checking existing and planned observations

Reserved Observations Catalogs
(appendices in the Call for Proposals document)

AOR search for Cycle 3 (current observing cycle).

Science Archive for past and current observing cycles.
**Appendix A2 - FIFI-LS Reserved Observations Catalog (ROC)**

<table>
<thead>
<tr>
<th>Target</th>
<th>RA (J2000)</th>
<th>DEC (J2000)</th>
<th>Extent A (arcmin)</th>
<th>Lines B</th>
<th>Lines R</th>
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<td>[OI] 145</td>
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<td>-02 00 49.6</td>
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<td>-69 06 03</td>
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<td>[OI] A19</td>
<td>3</td>
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| N159 E/SW
| LMC     | 05 40 19   | -69 44 52   | 2 x 2 each        | [OI] A19 | [OI] A19 | 2        |
| N11 LMC | 05 39 36   | -69 40 00   | 2 x 2 each        | [OI] A19 | [OI] A19 | 2        |
| N44 LMC | 05 22 06.9 | -67 56 46   | 3 x 3             | [OI] A19 | [OI] A19 | 1.5      |
| NG6 SMC | 00 59 27.9 | -72 10 11   | 3 x 3             | [OI] A19 | [OI] A19 | 1.5      |
AOR Search Page
## AOR Search Results

### AOR Search

**Cycle Number**: 3 - CYCLE 3

**Primary Investigator**: Name

**Instrument**: ALL

**Target Type**: ALL

**Target**: CW Leo

**Spatial Area**: RA (hr:mm:ss) 09:47:57.41, Dec (deg:mm:ss) +13:16:43.56

**Results Per Page**: 50

**Submit**  **Reset**

### Save As CSV File

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<th>Target</th>
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<th>Dec(J2000)</th>
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<th>Instrument</th>
<th>InstConfig</th>
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<th>Spectral2</th>
<th>Slit</th>
<th>Freq1</th>
<th>Freq2</th>
<th>ObsMode</th>
<th>Exposure</th>
<th>Processing</th>
<th>Last/Archived (UTC)</th>
<th>MissionIDs</th>
</tr>
</thead>
</table>
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| 03_0104_40 | IRC+10216 | 09:47:57.41 | +13:16:43.56 | FORCAST | GRISM | FOR_G111 OPEN | FOR_L647 C2N | 00:00:20
| 03_0146_1  | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S19 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
| 03_0146_10 | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S14 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
| 03_0146_11 | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S19 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
| 03_0146_12 | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S14 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
| 03_0146_13 | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S19 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
| 03_0146_14 | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S14 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
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| 03_0146_4  | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S19 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
| 03_0146_5  | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S14 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
| 03_0146_6  | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S19 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
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| 03_0146_9  | IRC+10216 | 09:47:57.41 | +13:16:43.56 | EXES    | LOW | EXE_ECHL EXE_S14 | NOD_OFF_SLIT LEVEL_1 2015-04-27 2015-03-03_EX_F197 |
https://dcs.sofia.usra.edu

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
- 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.

<table>
<thead>
<tr>
<th>User Support</th>
<th>Proposal Development</th>
<th>Observation Planning</th>
<th>Data Archive &amp; Retrieval</th>
</tr>
</thead>
<tbody>
<tr>
<td>About DCS</td>
<td>Download SPT</td>
<td>Download SSPOT</td>
<td>Search Science Archive</td>
</tr>
<tr>
<td>Register With DCS</td>
<td>Search Proposals</td>
<td>Search Observing Plans</td>
<td>Search Mission Data Archive</td>
</tr>
<tr>
<td>DCS Help Resources</td>
<td>SOFIA Instrument Time Estimator</td>
<td>Search AORs</td>
<td>Search Missions</td>
</tr>
<tr>
<td>ATRAN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- DCS Help Resources
- DCS Site Map
- About DCS
- SOFIA Science Page
- SOFIA Public Site
Science Archive Search Page

Message Of The Day
- Cycle 4 U3 queue has been opened.
- Cycle 3 flights started March 2015.

Science Archive Search

Get Observations For Matching Criteria [help]

Name
Instrument: ALL
Processing State: ALL
Target: IRC+10216
SIMBAD Position
NED Position
RA( hh:mm:ss )
Dec( dd:mm:ss )
Equinox
Equatorial
Galactic
Spatial Search: Radius 60 (arcsec)
OR
Longitude
Latitude
Advanced Search

Result Per Page
Downloadable Only
Result Organized By

Optional Fields in Data File Table
- PlanID
- PI
- AORID
- Obse Type
- Exposure Time
- Obse Start/End
- Product Type
- Observer
- Ingest Date
- Source

Submit  Reset

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

SOFIA Observers’ Workshop, May 20-21, 2015 ; Mountain View, CA
Science Archive Search Results - 1
### Science Archive Search Results - 2

![Image of a window with a spreadsheet of data]

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Product Code</th>
<th>Product Description</th>
<th>Level</th>
<th>Quality</th>
<th>Duration</th>
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<td>Get Data Products</td>
<td>LEVEL_1</td>
<td>94</td>
<td>00:02:05</td>
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<td>12:11</td>
<td>F189000234</td>
<td>Get Data Products</td>
<td>LEVEL_1</td>
<td>94</td>
<td>00:02:05</td>
</tr>
<tr>
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<td>12:12</td>
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<td>LEVEL_1</td>
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<td>00:02:05</td>
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<td>12:13</td>
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<td>Get Data Products</td>
<td>LEVEL_1</td>
<td>94</td>
<td>00:02:05</td>
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**Details:**
- **Date & Time:** 2015-03-12 12:10
- **Product Code:** F189000324
- **Product Description:** Get Data Products
- **Level:** LEVEL_1
- **Quality:** 94
- **Duration:** 00:02:05

**Note:** The spreadsheet contains similar entries with varying dates, times, and codes. The window also includes options like.xml, .txt, .csv, and .pdf for downloading the data.
https://dcs.sofia.usra.edu
Exposure time estimation: SITE

SOFIA Observers' Workshop, May 20-21, 2015; Mountain View, CA
FORCAST Grism Time Estimation - 1

Input Observing Parameters

Select the quantity to be estimated:

Choose a grism: FOR_G063
Choose a slit size (arcsec): 2.4
Required Signal-to-Noise ratio: 10.0
Total on-source integration time (sec): 900.0

Source type: Point Source
Source Flux: 1 Jy at 10 microns
Source spectral shape: Blackbody
Source blackbody temperature (K) or Power Law Index: 25000

Submit Form  Clear Form
### FORCAST Grism Calculator Output

**Input Parameters**
- **Mode:** Limiting Flux
- **Grism:** 1
- **Slit:** 2.4 arcsec
- **Requested Signal-to-Noise Ratio:** 10.0
- **Total exposure time:** 900.0 sec

Slt size = 2.400 arcsec  
Resolution = 180.0  
Single frame exposure time = 0.11734 sec  
Frame Rate = 8.950 Hz  
Number of Coadds = 9055.0000  
Total Exposure Time = 900.00000 sec

<table>
<thead>
<tr>
<th>Wavelength (microns)</th>
<th>FWHM (arcsec)</th>
<th>Fractional Slit Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0000</td>
<td>3.51</td>
<td>0.40</td>
</tr>
<tr>
<td>6.350</td>
<td>3.53</td>
<td>0.40</td>
</tr>
<tr>
<td>7.700</td>
<td>3.54</td>
<td>0.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wavelength (microns)</th>
<th>Limiting Fluxes (Jy/beam)</th>
<th>Fluxes (W/m²/μm)</th>
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</thead>
<tbody>
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<td>343.340</td>
<td>0.4117E-13</td>
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<tr>
<td>6.350</td>
<td>518.562</td>
<td>0.3898E-13</td>
</tr>
<tr>
<td>7.700</td>
<td>1036.276</td>
<td>0.6243E-13</td>
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</tbody>
</table>

**Plot of Limiting Flux as a function of Wavelength for S/N = 10.0**

View output data file
# GREAT Time Estimation

## Web-based input form for GREAT time estimator

This form can be used to estimate the integration time needed to reach a requested signal-to-noise for a given brightness temperature. GREAT receives signal in two frequency bands, USB and LSB. The transmission plot shows the two possible tunings, putting the line in the USB or in the LSB. Noise comes from both USB and LSB. Integration times are calculated for both tunings.

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

### Submit Form

### Input Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observatory Altitude (in feet; &lt; 60000 ft)</td>
<td>41000</td>
<td>ft</td>
</tr>
<tr>
<td>Water Vapor Overburden (in microns; 0 if unknown)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Telescope elevation (between 20 and 60 deg)</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Signal to Noise Ratio / Integration Time (s)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Rest Frequency (in THz, use 7 decimals)</td>
<td>1.9005369</td>
<td></td>
</tr>
<tr>
<td>Velocity correction (Observer VLSR + source VLSR) in km/s</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Brightness Temperature, TR*(K)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Frequency or Velocity Resolution</td>
<td>1</td>
<td>MHz/km/s</td>
</tr>
<tr>
<td>Comments for the plot</td>
<td>Example</td>
<td></td>
</tr>
</tbody>
</table>

### Submit Form

The time estimator calculates the time required to reach an rms brightness temperature, \( \Delta T_R^* \), \( \Delta T_R^* = T_A^* / \eta_{SS} \), where \( \eta_{SS} \) is the forward scattering efficiency, = 0.95 for GREAT at all bands) for a line at a frequency \( v \) by solving the standard radiometric formula

\[
\Delta T_A^* = \frac{2 \, T_{sys}}{\sqrt{t \, \Delta v}}
\]

Here \( \Delta T_A^* \) 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 \( \Delta v \) is the desired frequency resolution. For further details, see Guide to GREAT v3.
Output

Rest Frequency: 1.900537 THz
Single Sideband System Temperature (LSB tuning): 3429 K
Single Sideband System Temperature (USB tuning): 2844 K
Integration Time (LSB): 8.2 s
Integration Time (USB): 5.7 s
Atmospheric Transmission (RestFreq): 0.87
Atmospheric Transmission (USB): 0.83
Atmospheric Transmission (LSB): 0.86

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: 1100 K
Forward Scattering Efficiency: 0.95
Atmospheric Transmission - ATRAN

Input Parameters

Give the Observatory Altitude (in feet; < 60000 ft):
- 41000

Choose the closest value of the Observatory Latitude:
- 39 deg

Give the desired Water Vapor Overburden (in microns; 0 if unknown):
- 0

Choose the Number of Atmospheric Layers (usually 2):
- 2

Give the Zenith Angle of Observations (between 0 and 90 deg):
- 45

Give the desired Wavelength Range (min and max in microns; min > 0.85):
- 5.5 - 6.0

Give the Resolution R for Smoothing (0 = No Smoothing):
- 10000

Comments for the plot:
- example

Plot of Atmospheric Transmission
Proposal preparation and submission

Phase I proposals must be prepared and submitted using the SOFIA Proposal Tool (SPT).

SPT is based on the Astronomer’s Proposal Tool (APT) developed and used for Hubble Space Telescope proposals.

The most recent version, SPT v2.8.1, has to be used for Cycle 4 proposals.
SOFIA Proposal Tool (SPT)
### Observation 1: CW Leo of Unsubmitted Phase I Proposal (Unsaved)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>FORCAST</th>
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<tbody>
<tr>
<td>Target Name</td>
<td>CW Leo</td>
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<tr>
<td>Source Type</td>
<td>Sidereal</td>
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<tr>
<td>Coordinates</td>
<td>Galactic: RA/GalLong: 9 47 57.41, DEC/GalLat: 13 16 43.56</td>
</tr>
<tr>
<td>Proper Motion (&quot;/yr)</td>
<td>RA: 0, DEC: 0</td>
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<td>Instrument Configuration</td>
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<td>Instrument Mode</td>
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</tr>
<tr>
<td>Time Critical Observation</td>
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<tr>
<td>First Critical Time, From: To:</td>
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</tr>
<tr>
<td>Second Critical Time, From: To:</td>
<td></td>
</tr>
</tbody>
</table>
SSpot (SOFIA Spot)

Astronomical Observation Requests (AORs)

Target: None Specified

Proposal - <No File>

Estimated: 0 min Awarded: 0 min

Net Up
FORCAST Grism AOR
FORCAST Grism Overlay
FIFI-LS AOR - 3

Target: W51  Type: Fixed Single
290.925000, 14.509200 Equ J2000 or 19h23m42.0000s, +14d30m33.120s Equ J2000
FIFI-LS Overlay

- **Left Mouse Button**: Drag to adjust bias (horizontally) and contrast (vertically); double-click to reset.
- **Shift-Left Mouse Button**: Shift the center of image.
Recap

Generating the science idea(s).
Checking existing and planned observations.
Exposure time estimation and feasibility analysis.
Proposal preparation and submission.
Using SSpot, the Phase II tool.
http://www.sofia.usra.edu/Science/proposals/cycle4/phase1.html

SOFIA Cycle 4 Call for Proposals Document

Observer’s Handbook for Cycle 4

Email the SOFIA help desk - sofia_help@sofia.usra.edu