

# User Tools for Cycle 1

## *Phase II: AOR Preparation with SOFIA Spot*

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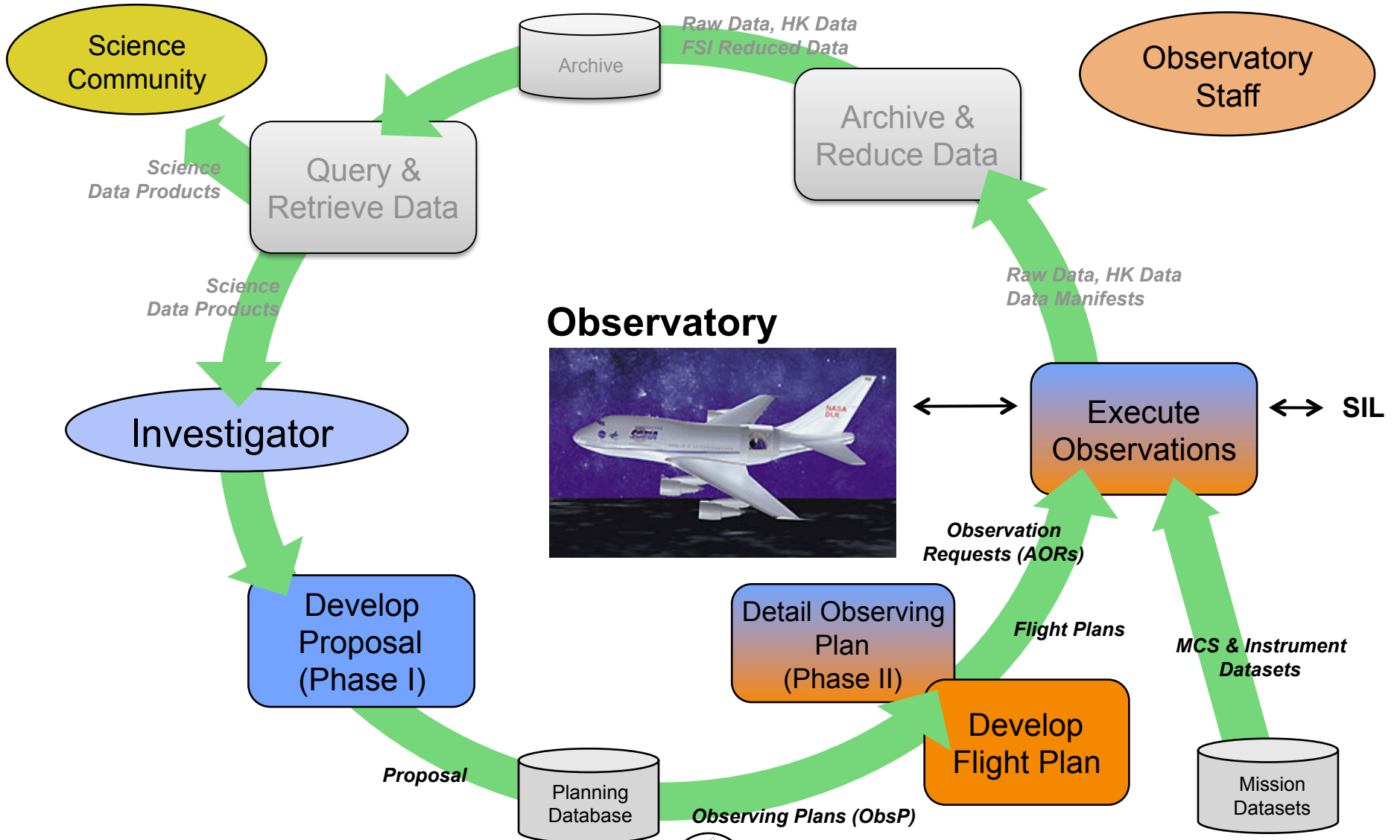
Sean Colgan (NASA-SOFIA), Robert Krzaczek (RIT)

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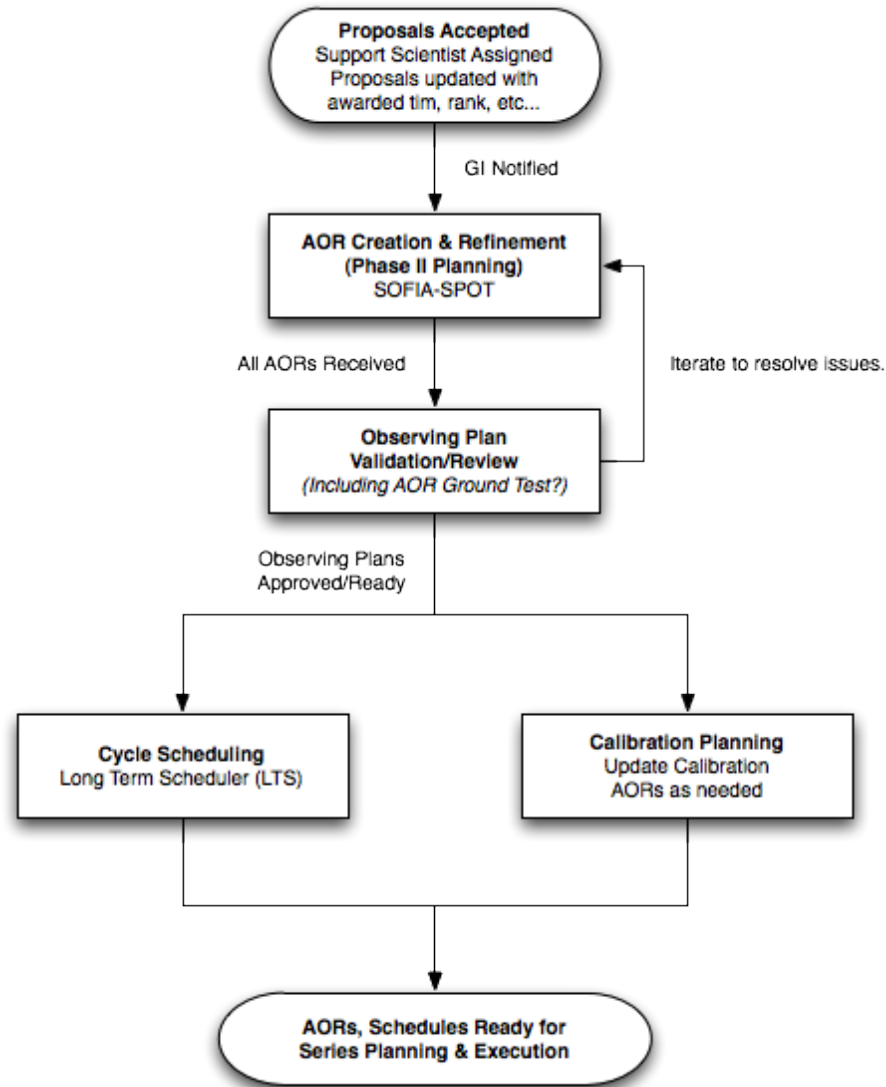
## Introduction

- GI Observation planning for SOFIA is composed of two parts:
  - Phase I: Proposal Preparation (SPT, SITE)
  - Phase II: AOR creation/modification
- Early decision was to not force GIs to create AORs as part of the proposal process.
- Trade study of existing Obs Planning tools was conducted in 2001: included SPOT, SEA, OASIS, and the Gemini OT.
- Trade study was reviewed in 2009 and decision was made by SMO director and ISD manager (Sept.) to go ahead with SPOT as the Phase II planning tool for SOFIA.

# SOFIA Information Systems Mission Lifecycle



# Observing Cycle Planning Process



## Observing Modes and AOTs

- **SI Observing Mode:** Instrument and telescope configuration combined with methodology/algorithm for how an observation is carried out.
- 1 Observing Mode  $\approx$  1 AOT
- AOTs are defined in XML.
- AOT *structure* defined in DTD for XML.
- SI can *extend* the structure as needed, then define AOTs for each observing mode available for their instrument
- ***AOT drives the GUI used to create AORs***
- ***SOFIA AOT paradigm designed for maximum flexibility at the cost of some additional interpretation overhead***

## AOT Content

- Description: human readable; provides enough info for GI to understand the mode. Can be used for help pages, tool tips, etc...
- Observation: contains all parameters that describe the mode
  - Global Aspects: Obs type, source type, name, approx. duration, etc...
  - Instrument specific: integration times, filter selections, etc...
  - Observatory: parameters for dithering, nodding, chopping, etc...
  - Pipeline: version, default parameters, etc...
- Calibration: all parameters needed to specify any calibration requirements (preliminary design)

## AORs for SOFIA

- An AOR is a request for a specific observation with enough info for an SI to carry it out “automatically”.
  - Instantiation of an AOT; i.e. a “filled-out” AOT.
  - defined in XML; structure defined in accompanying DTD.
- AORs will be created/modified using SOFIA-SPOT – graphical tool based on the *Spitzer Planning Observations Tool*.
  - Saved and managed in the DCS Observation Planning database.
  - AORs generated from GIs accepted proposal.
- AORs are then used for manual control, scripted control, or automatic control (e.g. DCS Observation Queue).

## AOR Content

- AOR DTD and content dictated by the AOTs.
- Content mirrors AOT
- Additional content:
  - Observing plan details (investigator, SSMOC scientist, etc...)
  - Notes, comments, special instructions
  - **State** (new, approved, planned, executed, etc...)
  - View/edit privileges (locking)
- *AOR ID used to associate related data products.*



## SI Deliverables

- 1 AOT for each instrument observing \*mode\* according to DCS-SI ICD with specification in the SI-DCS ICD.
  - DCS team can support.
- AOR translation capability (just rules? Or an actual tool to do the translation?)

## AOT Development Coordination

- Specification:
  - AOT development lead (JR) to work directly with USRA SI scientist and DCS lead (RYS); bringing in SI team as necessary.
  - AOT lead & SI scientist update SI-DCS ICD with approval from SI team and submit for NASA review/approval.
- Once specification is mature/complete, AOT can be implemented as XML (by either SI or DCS development team, or combination of both).
- Once XML is complete, AOT handed off to SSPOT application developer for implementation.

## Intro to SOFIA Spot

- Standalone Java application
  - User downloads from DCS website, installs on local desktop.
- Built on Spot-Common: codebase developed at IPAC and used by Spitzer and Herschel:
  - 10+ year development/testing legacy at IPAC
  - On-going support from IPAC Spot team in development of SOFIA-Spot
- Integrated with DCS planning database
  - AORs are saved/managed in planning database;
  - AORs created automatically when proposal is accepted.

# Intro to SSPOT features/capabilities

- AOR Management
- AOR Specification/  
Editing
- Visualization
  - Archive image/catalog integration
  - Focal Plane
  - AOR
- Integration with Planning Database
- Target generation functions

SOFIA Planning Tool

File Edit Targets Observation Tools Images Overlays Options Window Help

Observations

Astronomical Observation Requests (AORs)

Label	Target	Position	Type	Instrument	Duration	Stat	On
FORCAST_TPC-0000	M42	5h35m17.30...	Fixed Single	FORCAST	1800	new	<input checked="" type="checkbox"/>
GREAT_SP-0000	W40	18h31m29.0...	Fixed Single	GREAT	1800	new	<input checked="" type="checkbox"/>

Observations

Target: W40 Type: Fixed Single Estimated: 60 min Awarded: 0 min

Existing Project - newfile.aor Net Up Total AORs: 2 / Active: 2

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The screenshot shows the FORCAST software interface. At the top, the title bar reads "FORCAST". Below it, a text field contains "Unique AOR Label: FORCAST\_TPC-0000". The main area displays target information: "Target: M42 Type: Fixed Single" and "Position: 5h35m17.30s, -5d23m28.0s". There are three buttons: "New Target", "Modify Target...", and "Target List...". Below this, there are two tabs: "Observing Condition" and "Aquisition/Tracking". The "Observing Condition" tab is active, showing "FORCAST" with an "Exposure Time (min)" of 30.000. Under "Instrument Configuration", "IMG-DUAL" is selected. There are two filter sections: "LW Filter" with options 31.5, 33.6, 34.8, and 37.1 microns; and "SW Filter" with options 11.1, 11.3, 19.7, and 24.2 microns. The "Aquisition/Tracking" tab shows "Chop / Nod" settings: "Chop/Nod Style" is C2 N C2, "Chop Type" is Asym, "Chop Throw (arcsec)" is 180.000, "Chop Angle Coordinate" is Sky, and "Chop Angle (deg)" is 0.000. There is a "Set Chop Angle Ranges" button. "Nod Throw (arcsec)" is -600.000, "Nod Angle Coordinate" is Sky, "Nod Angle (deg)" is 90.000, and "Desired Rotation Angle (deg)" is 0.000. At the bottom, there is a "Dither Pattern" section with "No" selected and a "Set Dither Pattern" button. At the very bottom, there are buttons for "Observation Est...", "Comments...", "Visibility...", "Proposal Info...", "Cancel", and "OK".

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Target

Target Name (required): SIMBAD Resolve the Name

W40

Fixed Single Moving Single Fixed Cluster

Coord Sys: Equatorial J2000

RA: 18h31m29.04s

Dec: -2d05m24.0s

Epoch: 2000.00

Proper Motion

Use Proper Motion

PM RA ("/yr): 0.000

PM Dec ("/yr): 0.000

? Cancel OK



# Planning an Observation with SSPOT



# AOR generated from approved proposal 01\_0048

The screenshot shows the SOFIA Planning Tool interface. The main window is titled 'Observations' and contains a table of 'Astronomical Observation Requests (AORs)'. Below the table, the status bar shows 'Target: Mercury Type: Moving Single' and 'Estimated: 20 min Awarded: 20 min'. At the bottom, a green bar indicates 'Existing Project - 01\_0048.aor' and 'Total AORs: 2 / Active: 2'.

Instrument	Label	Target	Position	Type	Duration	Stat	On
FORCAST	01_0048_1	Mercury	1	Moving Single	720	new	<input checked="" type="checkbox"/>
FORCAST	01_0048_2	cygnus x-1	356.31958...	Fixed Single	480	new	<input checked="" type="checkbox"/>

AOR Summary Table

Saved AOR file

Estimated time matches awarded time

Proposal Info Window

The Proposal Info window displays the following details:

- Proposal ID: 01\_0048
- Proposal Title: Test AAA EPO Option
- Proposal PI: Benjamin Grimm, Spydir Mann, Martha Vineyard
- Awarded Time (min): 20.0

The Observing Condition window displays the following details:

- AOR ID: 01\_0048\_1
- ObservationNumber: 1.0
- Order: 1
- Overhead (sec): 120.0
- Observing Priority: High
- Required Calibration Accuracy: High
- Required WV Overburden: Nominal
- Map Area (sq arcmin): 0.000

Observing Condition Window

# FORCAST Nod Match Chop on haro3

The screenshot shows the SOFIA Planning tool interface. The main window displays a star field with a chop mask overlaid. A table titled "Pointings Table - FORCAST\_TPC-0000 - Roll Angle: 0.00" is overlaid on the right side of the window. The table lists four pointing configurations with their respective RA and Dec values. A blue arrow points to the table with the label "Overlay Position table".

On	Field Of View	RA	Dec	Detail
<input checked="" type="checkbox"/>	forecast_fov	161.3434	55.9604	
<input checked="" type="checkbox"/>	forecast_fov_chop	161.3732	55.9604	
<input checked="" type="checkbox"/>	forecast_fov_nod	161.3136	55.9604	
<input checked="" type="checkbox"/>	forecast_fov_chop_nod	161.3434	55.9604	

Roll Angle: 0.00 Date: 2011 Aug 10 04:00 GMT

Target: haro3 Type: Fixed Single Estimated: 30 min Awarded: 0 min

Existing Project - haro3.aor Net Up Total AORs: 1 / Active: 1

Overlay Position table

# FORCAST Nod Perpendicular to Chop on haro3

The screenshot shows the SOFIA Planning tool interface. The main window displays a star field with several overlaid observation fields. A control panel on the right shows a table of observation parameters. The table is titled 'Pointings Table - FORCAST\_TPC-0000 - Roll Angle: 0.00' and contains the following data:

On	Field Of View	RA	Dec	Detail
<input checked="" type="checkbox"/>	forcast_fov	161.3285	55.9687	
<input checked="" type="checkbox"/>	forcast_fov_chop	161.3583	55.9687	
<input checked="" type="checkbox"/>	forcast_fov_nod	161.3285	55.9521	
<input checked="" type="checkbox"/>	forcast_fov_chop_nod	161.3583	55.9521	

Below the table, the 'Roll Angle' is set to 0.00 and the 'Date' is 2011 Aug 10 04:03 GMT. The interface also shows various control buttons like 'Hide All', 'Animation', and 'Animation w/ Trail'.

← Overlay Position table

# FORCAST C2\_N\_C2 on haro3

AOR Summary Table

Instrument	Label	Target	Position	Type	Duration	Stat	On
FORCAST	FORCAST_TP...	haro3	10h45m...	Fixed Single	1800	new	<input checked="" type="checkbox"/>
FORCAST	FORCAST_TP...	haro3	10h45m...	Fixed Single	600	new	<input checked="" type="checkbox"/>

Target: haro3 Type: Fixed Single Estimated: 40 min Awarded: 0 min  
Existing Project - haro3\_c2\_n\_c2\_demo\_copy.aor Net UpTotal AORs: 2 / Act

Dither Definition Dialog

Dither Pattern

None  
 3\_Point  
 5\_Point  
 9\_Point  
 Custom

Dither Offset  
 DitherOffset (arcsec) 10.000

Number	Offset East/Row/Perpendicular (")	Offset North/Column/Parrell (")
1	0.0	0.0
2	10.0	10.0
3	10.0	-10.0
4	-10.0	10.0
5	-10.0	-10.0

Done

Target Definition Panel

Unique AOR Label: FORCAST\_TPCD\_1

Target: haro3 Type: Fixed Single  
 Position: 10h45m22.41s,+55d57m37.4s

New Target Modify Target... Target List...

Observing Condition Aquisition/Tracking

FORCAST  
 Exposure Time (min) 30.000

Instrument Configuration  
 IMG-DUAL  
 IMG-LWC  
 IMG-SWC

LW Filter  
 31.5 microns  
 33.6 microns  
 34.8 microns  
 37.1 microns

SW Filter  
 11.1 microns  
 11.3 microns  
 19.7 microns  
 24.2 microns

Chop / Nod  
 Chop/Nod Style C2 N C2  
 Chop Type Asym  
 Chop Throw (arcsec) 300.000  
 Chop Angle Coordinate Sky  
 Chop Angle (deg) 90.000  
 Set Chop Angle Ranges

Nod Throw (arcsec) 180.000  
 Nod Angle Coordinate Sky  
 Nod Angle (deg) 90.000  
 Desired Rotation Angle (deg) 45.000

Dither Pattern  
 No  Yes Set Dither Pattern

Observation Est... Comments... Visibility... Proposal Info...

Cancel OK

AOR Definition Dialog

AOR Overlay Next slide



# FORCAST C2\_N\_C2 on haro3

FOV:

- Beam A dither 5 Point
- Beam B Chop
- Beam A Nod
- Beam B Chop after Nod

Chop Angle  
Range Limited  
By Telescope:

- FORCAST 292 arcsec FOV
- FORCAST 8 arcmin FOV
- Chop Angle min
- Chop Angle max

File name, local mode

# GREAT Single Point Total Power

GREAT

Unique AOR Label: GREAT\_SP-0000

Target: M81 Type: Fixed Single  
Position: 9h55m33.17s,+69d03m55.1s

New Target    Modify Target...    Target List...

Observing Condition    Aquisition/Tracking

**GREAT**

Integration Time (min)

Velocity (Km/s)

Instrument Configuration

L1aF1+L2  
 L1aF2+L2  
 L1b+L2

Filter 1

L1aF1 1.246 - 1.342 THz  
 L1aF2 1.318 - 1.404 THz  
 L1b 1.43 - 1.52 THz

Filter 2

L2 1.82 THz - 1.92 THz  
 M 2.7 THz - 2.2 THz  
 L 4.7 THz

**Chop / Nod**

Instrument Mode

Chop Throw (arcsec)

Chop Angle Coordinate

Chop Angle (deg)

Reference Position

Has Ref  
 Yes  
 No

Ref Type  
 By Throw/Angle  
 By Position  
 By Offset

Specification

Nod Throw (arcsec)

Nod Angle (deg)

RA (deg)

Dec (deg)

RA Offset (arcmin)

Dec Offset (arcmin)

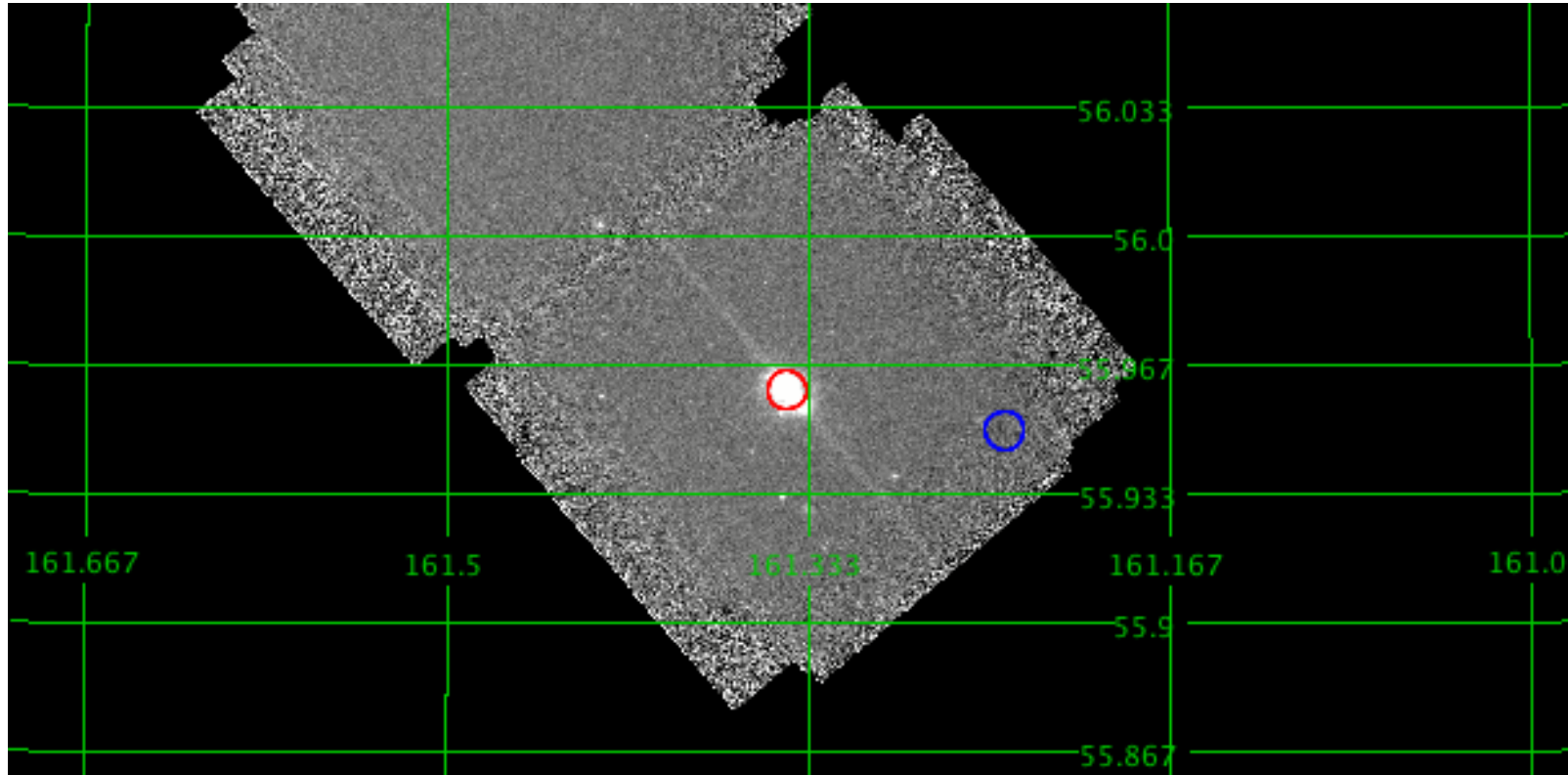
Chooser Position

Observation Est...    Comments...    Visibility...    Proposal Info...

Cancel    OK

Reference Point

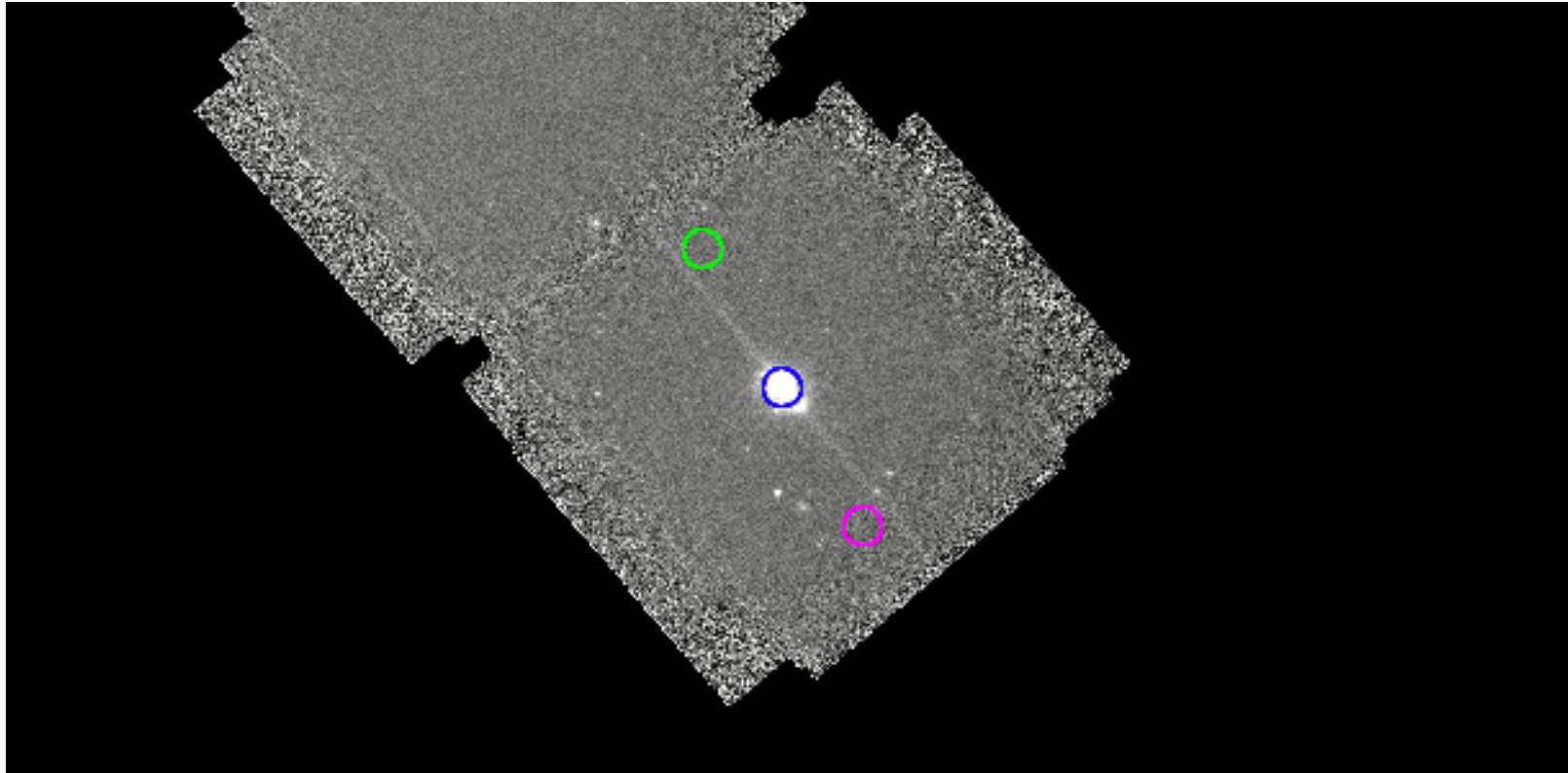
# GREAT Single Point Total Power



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# GREAT Single Point Beam Switch



## SSPOT for Cycle 1

- SSPOT will be available for GIs to use in Phase II planning for Cycle 1 for the following SIs:
  - FORCAST
  - FLITECAM
  - GREAT
- Detailed instructions for Phase II planning and SSPOT to be available on the SOFIA website (Info for Researchers).
- SSPOT will be available for download from the DCS in the Spring of 2012.

*If you are interested in assisting the SOFIA Science Center with SSPOT beta testing, please email Ravi Sankrit and/or Ralph Shuping:*

( [rsankrit@sofia.usra.edu](mailto:rsankrit@sofia.usra.edu) | [rshuping@sofia.usra.edu](mailto:rshuping@sofia.usra.edu) )

# The SOFIA Data Cycle System

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

## DCS Help Resources

- <https://dcstest.sofia.usra.edu/userSupport/dcsUserGuide.jsp>

## SOFIA Help-Desk:

- [sofia\\_help@sofia.usra.edu](mailto:sofia_help@sofia.usra.edu)

