

SOFIA-SPOT (SSPOT): The SOFIA AOR Editor

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Introduction

- From the GI perspective, observation planning for SOFIA is composed of two parts:
 - Phase I: Proposal Preparation (SPT, SITE, VT)
 - Phase II: AOR creation/modification (SSPOT)
- Early decision not to force GIs to create AORs as part of the proposal process.
- Trade study of existing Obs Planning tools was conducted in 2001: included *Spitzer* SPOT and the Gemini OT.
- Trade study reviewed in 2009; decision was made by SMO director and ISD manager to use a version of *Spitzer* SPOT as the Phase II planning tool for SOFIA.

SOFIA-SPOT (SSPOT)

- During Phase 2 observation planning, GIs will use **SOFIA-SPOT** to specify an observing strategy and detail their AORs.
- Developed by Lan Lin, with assistance from Trey Roby (IPAC) and input from W. Vacca and Instrument Scientists
- Features:
 - Detailed AOR editor with constraints and validation
 - Support for multiple AOTs as defined by SI teams
 - AOR visualization with SI FOVs on image background, including SOFIA specific constraints (e.g. chopping secondary limits)
 - Interface with existing archives (2MASS, IRAS, MSX, etc...)
 - Observation duration estimate, including overheads
 - Integrated with DCS planning database and proposal system
 - Help pages, example AORs, and sample images are available

SSPOT has undergone verification and validation testing within SOFIA Science Center. Comments and suggested modifications from science staff incorporated. A beta version was distributed to the SI teams and SUG in April 2012 – no comments received.

SSPOT cont.

- AOT specification worked out with SI representatives for each mode, including:
 - Options
 - Constraints
 - Parameters
 - Value ranges and defaults
- AOT/AOR visualization validated with SI representatives
- 8 AOTs offered in SSPOT for Cycle 1 for FORCAST, GREAT, and FLITECAM
- SSPOT generates an XML file as output that can then be parsed/translated into scripts that control the SI during the observations
 - Work on translator is underway

Cycle 1 AOTs Supported

- 8 AOTs offered in SSPOT for Cycle 1:
 - FORCAST Imaging (NMC, NPC, C2NC2)
 - FORCAST Grism (NMC, NPC, C2NC2)
 - FORCAST Grism XD
 - GREAT Single Point (Total Power, Beam Switch)
 - GREAT Raster Mapping
 - GREAT OTF Mapping
 - FLITECAM Imaging (STARE, Nod Off Array)
 - FLITECAM Grism (Nod Along Slit, Nod Off Slit)

Cycle 1 User Experience

- SSPOT is online and available for download from the DCS website:
 - <https://dcs.sofia.usra.edu/>
- After receiving Phase 2 instructions, GI downloads SSPOT and installs to local desktop.
- GI uses SSPOT to log in to the DCS and download proposal data.
- “Draft” AORs are generated automatically by SSPOT
- GI completes/modifies AORs using visualization features to achieve science goals.
- AORs can be uploaded to the DCS for safekeeping at any time.
 - AORs stored in the DB
 - Key values are parsed; support staff can view AORs and compare to original proposal
- GI makes final uploads before Phase 2 deadline.
- After deadline, the GI may download and view AORs, but cannot upload unless SMO staff indicates that there is a problem.
- **Sept. 2012:** Cycle 1 Phase 2 planning begun; instructions sent to GIs; some AORs already received

SOFIA Planning Tool

Observations

Astronomical Observation Requests (AORs)

Label	Target	Position	Type	Instrument	Duration	Stat
01_0431_1	LkHalpha 101	4h30m14.39s...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_2	LkHalpha 101	4h30m14.39s...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_3	LkHalpha 101	4h30m14.39s...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_4	MWC 137	6h18m45.52s...	Fixed Single	FORCAST_Imaging	385	new
01_0431_5	MWC 137	6h18m45.52s...	Fixed Single	FORCAST_Imaging	385	new
01_0431_6	MWC 137	6h18m45.52s...	Fixed Single	FORCAST_Imaging	385	new
01_0431_7	MWC 147	6h33m05.19s...	Fixed Single	FORCAST_Imaging	385	new
01_0431_8	MWC 147	6h33m05.19s...	Fixed Single	FORCAST_Imaging	385	new
01_0431_9	MWC 147	6h33m05.19s...	Fixed Single	FORCAST_Imaging	385	new
01_0431_10	MWC 297	18h27m39.51...	Fixed Single	FORCAST_Imaging	385	new
01_0431_11	MWC 297	18h27m39.51...	Fixed Single	FORCAST_Imaging	385	new
01_0431_12	MWC 297	18h27m39.51...	Fixed Single	FORCAST_Imaging	385	new
01_0431_13	BD+40 4124	20h20m28.24...	Fixed Single	FORCAST_Imaging	385	new
01_0431_14	BD+40 4124	20h20m28.24...	Fixed Single	FORCAST_Imaging	385	new
01_0431_15	BD+40 4124	20h20m28.24...	Fixed Single	FORCAST_Imaging	385	new
01_0431_16	MWC 1080	23h17m25.59...	Fixed Single	FORCAST_Imaging	385	new
01_0431_17	MWC 1080	23h17m25.59...	Fixed Single	FORCAST_Imaging	385	new
01_0431_18	MWC 1080	23h17m25.59...	Fixed Single	FORCAST_Imaging	385	new
01_0431_19	HD 37903	5h41m38.39s...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_20	HD 37903	5h41m38.39s...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_21	HD 37903	5h41m38.39s...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_22	HD 200775	21h01m36.92...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_23	HD 200775	21h01m36.92...	Fixed Single	FORCAST_Imaging	1215	new
01_0431_24	HD 200775	21h01m36.92...	Fixed Single	FORCAST_Imaging	1215	new

FORCAST_Imaging

Unique AOR Label: 01_0431_1

Target: LkHalpha 101 Type: Fixed Single
67.559960, 35.273415 Equ J2000 or 4h30m14.39s, +35d16m24.3s Equ J2000

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

Observing Condition Acquisition/Tracking

FORCAST

Exposure Time (sec) 240.000

Cycles 1

Min Contiguous Exp Time (sec) 0.000

SW

- FOR_F064
- FOR_F066
- FOR_F077
- FOR_F111
- FOR_F197
- FOR_F242
- NONE

LW

- FOR_F315
- FOR_F336
- FOR_F348
- FOR_F371
- NONE

Chop / Nod

Chop/Nod Style C2NC2

Chop Type Asym

Chop Throw (arcsec) 300.000

Chop Angle Coordinate Sky

Set Chop Angle Ranges

Chop Angle (deg) 90.000

Nod Throw (arcsec) 300.000

Nod Angle Coordinate Sky

Nod Angle (deg) 190.000

Example Rotation Angle (deg) 30.000

Dither Pattern

No Yes Set Dither Pattern

Observation Est... Comments... Open Visibility Tool... Proposal Info...

Cancel Apply OK

Target: LkHalpha 101 Type: Fixed Single

Estimated: 278 min Awarded: 400 min

Existing Project - sofia_forcast.aor

Net Up

Total AORs: 24 / Active: 24

FORCAST Imaging C2NC2

SOFIA Planning Tool

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

LkHalpaha 101 POSS2/UKSTU Infrared

Observations: LkHalpaha 101 POSS2/UKSTU Infrared

FORCAST Imaging

Unique AOR Label: 01_0431_1

Target: LkHalpaha 101 Type: Fixed Single
 67.559960, 35.273415 Equ J2000 or 4h30m14.39s, +35d16m24.3s Equ J2000

Buttons: New Target, Modify Target..., Target List...

Observing Condition / Aquisition/Tracking

FORCAST

Exposure Time (sec): 240.000
 Cycles: 1
 Min Contiguous Exp Time (sec): 0.000

SW

- FOR_F064
- FOR_F066
- FOR_F077
- FOR_F111
- FOR_F197
- FOR_F242
- NONE

LW

- FOR_F315
- FOR_F336
- FOR_F348
- FOR_F371
- NONE

Chop / Nod

Chop/Nod Style: C2NC2

Chop Type: Asym

Chop Throw (arcsec): 300.000

Chop Angle Coordinate: Sky

Buttons: Set Chop Angle Ranges

Chop Angle (deg): 90.000

Nod Throw (arcsec): 300.000

Nod Angle Coordinate: Sky

Nod Angle (deg): 190.000

Example Rotation Angle (deg): 30.000

Dither Pattern: No Yes **Set Dither Pattern**

Buttons: Observation Est..., Comments..., Open Visibility Tool..., Proposal Info...

Buttons: Cancel, Apply, OK

Target: LkHalpaha 101 Type: Fixed Single Estimated: 278 min Awarded: 400 min

Existing Project - sofia_forcast.aor Net Up Total AORs: 24 / Active: 24

FORCAST Imaging C2NC2

SOFIA Planning Tool

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

LkHalpha 101 POSS2/UKSTU Infrared

Observations | LkHalpha 101 POSS2/UKSTU Infrared

Target: LkHalpha 101 Type: Fixed Single **Estimated: 278 min Awarded: 400 min**

Existing Project - sofia_forcast.aor Net Up Total AORs: 24 / Active: 24

Dither Set Up

Dither Pattern:
 None
 3 point
 5 point
 9 point
 custom

Dither Offset:
 Dither Coordinate: Sky
 DitherOffset (arcsec): 10.000

Number	Offset East/Row/Perpen...	Offset North/Column/Pa...
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

Pointings Table - 01_0431_1 - Roll Angle: 30.00

Controls: Hide All Animation Animation w/ Trail Save...

On	Field Of View	RA	Dec	Detail
<input checked="" type="checkbox"/>	target	67.5600	35.2734	
<input checked="" type="checkbox"/>	nodA_chop1	67.5600	35.2734	
<input checked="" type="checkbox"/>	nodA_chop2	67.6620	35.2734	
<input checked="" type="checkbox"/>	nodB_chop1	67.5422	35.1914	
<input checked="" type="checkbox"/>	nodB_chop2	67.6443	35.1914	
<input checked="" type="checkbox"/>	nodA_chop1	67.5634	35.2762	
<input checked="" type="checkbox"/>	nodA_chop2	67.6654	35.2762	
<input checked="" type="checkbox"/>	nodB_chop1	67.5422	35.1914	
<input checked="" type="checkbox"/>	nodB_chop2	67.6443	35.1914	
<input checked="" type="checkbox"/>	nodA_chop1	67.5634	35.2706	
<input checked="" type="checkbox"/>	nodA_chop2	67.6654	35.2706	
<input checked="" type="checkbox"/>	nodB_chop1	67.5422	35.1914	
<input checked="" type="checkbox"/>	nodB_chop2	67.6443	35.1914	
<input checked="" type="checkbox"/>	nodA_chop1	67.5566	35.2762	
<input checked="" type="checkbox"/>	nodA_chop2	67.6586	35.2762	
<input checked="" type="checkbox"/>	nodB_chop1	67.5422	35.1914	
<input checked="" type="checkbox"/>	nodB_chop2	67.6443	35.1914	
<input checked="" type="checkbox"/>	nodA_chop1	67.5566	35.2706	
<input checked="" type="checkbox"/>	nodA_chop2	67.6586	35.2706	
<input checked="" type="checkbox"/>	nodB_chop1	67.5422	35.1914	
<input checked="" type="checkbox"/>	nodB_chop2	67.6443	35.1914	
<input checked="" type="checkbox"/>	ExAsym_min_angle	67.5600	35.2734	
<input checked="" type="checkbox"/>	ExAsym_max_angle	67.5600	35.2734	
<input checked="" type="checkbox"/>	ExAsym_min_throw	67.5600	35.2734	
<input checked="" type="checkbox"/>	ExAsym_max_throw	67.5600	35.2734	

Roll Angle: 30.00 Date: 2012 Sep 10 20:50 GMT

Done

FORCAST Grism C2NC2

The screenshot displays the SOFIA Planning Tool interface. The main window shows a target image titled 'Haro3_8mu_rot.fits' with several colored lines (blue, magenta, red, green) overlaid, representing the grism configuration. A 'FORCAST_Grism' dialog box is open on the right, showing configuration parameters for the observation.

FORCAST_Grism Configuration:

- Unique AOR Label: FORCAST_Grism-C2NC2
- Target: haro3 Type: Fixed Single
- Coordinates: 161.343375, 55.960389 Equ J2000 or 10h45m22.41s, +55d57m37.4s Equ J2000
- Buttons: New Target, Modify Target..., Target List...
- Observing Condition: FORCAST
 - Exposure Time (sec): 60.000
 - Cycles: 4
 - Min Contiguous Exp Time (sec): 2,222.000
 - Grism:
 - SW FOR_G063
 - SW FOR_G111
 - LW FOR_G227
 - LW FOR_G329
 - None
 - Slit:
 - FOR_LS24
 - FOR_LS47
 - None
- Aquisition/Tracking:
 - Chop / Nod:
 - Example Rotation Angle (deg): -30.000
 - Chop/Nod Style: C2 N C2
 - Chop Type: Asym
 - Chop Throw (arcsec): 120.000
 - Chop Angle Coordinate: Sky
 - Chop Angle (deg): 180.000
 - Nod:
 - Nod Throw (arcsec): 200.000
 - Nod Angle Coordinate: Sky
 - Nod Angle (deg): 50.000
 - Dither Pattern:
 - No
 - Yes
 - Set Dither Pattern
- Buttons: Observation Est..., Comments..., Open Visibility Tool..., Proposal Info...

At the bottom of the interface, a status bar shows: Target: haro3 Type: Fixed Single, Estimated: 650 min Awarded: 300 min, Existing Project - sample_aors.aor, Net Up, Total AORs: 27 / Active: 27.

GREAT OTF Mapping/Total Power

SOFIA Planning Tool

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

Mouse:

01_0432_29-PSW-Offset

Base Image

Observations | Haro3_8mu_rot.fits

Target: haro3 Type: Fixed Single Estimated: 637 min Awarded: 300 min

Existing Project - sample_aors.aor Net Up Total AORs: 27 / Active: 26

GREAT OTF

Unique AOR Label: 01_0432_29-PSW-Offset

Target: haro3 Type: Fixed Single
 161.343375, 55.960389 Equ J2000 or 10h45m22.41s, +55d57m37.4s Equ J2000

Observing Condition | Acquisition/Tracking

Config Mode Map

Velocity (Km/s) 30.000
 Frequency 1 (GHz) 2.510.000
 Frequency 2 (GHz) 1.870.000

Mixer 1
 L1B 1.430 - 1.520 THz
 L1A 1.246 - 1.404 THz
 M1 2.51 THz
 L1AB

Mixer 2
 L2 1.82 - 1.92 THz

GREAT OTF

Unique AOR Label: 01_0432_29-PSW-Offset

Target: haro3 Type: Fixed Single
 161.343375, 55.960389 Equ J2000 or 10h45m22.41s, +55d57m37.4s Equ J2000

Observation

Observing Condition | Acquisition/Tracking

Config Mode Map

Map Offset RA (arcsec) 0.000
 Map Offset Dec (arcsec) 0.000
 Step Size Along Lat (arcsec) 6.000
 Step Size Along Lon (arcsec) 6.000
 Num Steps Along Lat 11
 Num Steps Along Lon 11
 Lines Per Off (Total Power) 1
 Map Rotation Angle (deg) 30.000
 Exposure Time Per Point (sec) 1.000
 Exposure Time Per Cycle (sec) 157.483
 Cycles 1
 Min Contiguous Exp Time (sec) 6,600.000

Observation Est... Comments... Open Visibility Tool... Proposal Info...

Cancel Apply OK

Known Issues

- SSPOP currently does not support overlays for non-sidereal targets.
- Rotation of Field (ROF) depends on flight plan and hence cannot be specified in SSPOP during Phase 2.
 - GIs can explore impact of ROF on observations using the “Example Rotation Angle” parameter.
 - Slit position angle cannot be specified by GI during Phase 2 planning of spectroscopic (grism) observations
 - *Any required constraints must be communicated to the GI’s Support Scientist in the “Comments” section.*
- ***We are working bugs as we uncover them, but in general SSPOP works well.***
 - Bug fixes incorporated into latest releases and distributed to GIs via built-in auto-update feature