

W40 - Dual-Channel Mapping of a Cluster

Science Case: Getting >30 Mic photometry of sources in a cluster. Typical case since WISE does not go past 22 mic. Expecting to make small mosaic since cluster is slightly larger than FORCAST FOV.

NAME: W 40 IRS 1a

Feasibility

1. **Has target been observed before by SOFIA?** [NO DEMO]
 - a. <https://dcs.arc.nasa.gov/>
 - i. Search on W40 (Resolve; FORCAST Imaging only; AORs)
 - ii. Note exposure time; you need propose for significantly more time
 - iii. Pretend this hasn't been done though...
2. **On the ROC?**
 - a. Check Call for Proposals: https://www.sofia.usra.edu/sites/default/files/Other/Documents/SOFIA_Cy8_CfP.pdf
 - b. No ROC for FORCAST for OC8
3. **Which filters?**
 - a. Pick broadest filters for best sensitivity using Tab 4-2 from Observers Handbook: <https://www.sofia.usra.edu/science/proposing-and-observing/observers-handbook-cycle-8/4-forcast>
 - b. Pick one to anchor to WISE 22 mic: F197
 - c. Pick broadest past 30: F315
 - d. But note that different science case might benefit from longer wave filter at 37 mic.
4. **Dual or single channel?**
 - a. Since F197 is in SWC and F315 is in LWC, we have the option of using FORCAST in dual channel mode (using the dichroic beam splitter)
 - b. Compare sensitivities in Table 4-3 of Observers Handbook: <https://www.sofia.usra.edu/science/proposing-and-observing/observers-handbook-cycle-8/4-forcast>
 - c. Single channel mode gets best sensitivity, but note that you don't lose much in either filter going to dual, and we'll see that this will save us a *lot* of time for the mapping.
5. **Now calculate integration time for F315:**
 - a. <https://dcs.arc.nasa.gov/proposalDevelopment/SITE/index.jsp>
 - b. S/N = 5 (5-sigma detection) in F315 at flux limit of 0.2 Jy (justify in technical section):
 - c. F315: $\text{inttime} = 543 \text{ sec} = 9.05 \text{ min}$
 - d. For completeness, you can go back and find limiting flux in F197 for 543 sec.

Feasibility looks good...

Phase I Detail in USPOT

1. **Create main target:**
 - a. NAME W 40 IRS 1a
2. **Download background image:**
 - a. WISE image with 30' FOV
3. **Create AOR for F197/F315 dual channel observation and overlay onto WISE image.**
4. **What Chop/Nod Mode should be used?**
 - a. Start with NMC:
 - i. Chop Angle: 0
 - ii. Chop Throw: 260
 - b. *Notice that we aren't going to be able to get away from nebular background -> need to go to C2NC2 to get good background subtraction (and also best imaging).*
 - c. C2NC2: check to make sure nod throws will work
 - i. Nod Throw: 600
 - ii. Nod Angle: 90
5. **Assess duration:**
 - a. Duration = 53 min --> fits comfortably onto one flight leg, so OK.
 - b. *If much longer, then consider shortening inttime. Could probably go a little longer on inttime, but won't gain much in sensitivity...*
6. **Assess FOV coverage and mapping points:**
 - a. One FORCAST FOV (3.3' square) does not cover whole cluster. So need additional map positions:
 - b. *But note that detector angle is *not* known prior to execution; so must plan for arbitrary angle [demo].*
 - c. Due to unknown detector PA, max separation for mosaic points should be $3.3' / \sqrt{2} = 2.33'$
 - d. $N_x = (X / 2.3)$ (and round up)
 - i. E.g. for 5' by 5' map would be 2x2 grid to ensure complete coverage at any det angle. (4 positions)
 - e. *You don't need to create all mapping positions, that can wait until Phase II, just need to know *how many* map positions are needed.*
 - f. Use 4 cycles to cover 4 map positions
7. **Total Duration: 212 min**
 - a. This is the total requested time.