

Report from the SOFIA International Summit (SIS) in response to the material presented and discussed at the 11 December 2020 SIS meeting.
Prepared by SIS coChairs Michael Werner and Sebastian Wolf
January 4, 2021

The SOFIA International Summit (SIS) met for a half day videoconference on 11 December, 2020. SIS members Andy Harris, Karl Gordon, Chick Woodward, Michael Werner, Karl Menten, and Sebastian Wolf participated. As this was the first meeting of this group in over two years, a good deal of time was spent updating the SIS members on the current status of SOFIA. That material and much of the discussion at the meeting is well-summarized in the notes on the meeting prepared by Jill Sherman of the SOFIA staff. These minutes form the bulk of this report. They include real-time comments from the SIS on a number of topics. For the purpose of this report, they are presented in italics to make them easily accessible. We encourage recipients of this report to read through them as they include many insightful comments by SIS members on a range of topics. In addition, we summarize in this executive summary the comments and recommendations of the SIS in several key areas which are of particular importance to the SOFIA international partnership. We note that the SIS is the only forum within which scientists from the US and Germany meet to discuss such high level issues which are of importance to both partners.

1. **Overall impressions.** The SIS was very enthusiastic about the new energy which the new management team, both at NASA and at the SMO, have brought to SOFIA, and in particular in the renewed and strengthened emphasis on science. This manifests itself throughout all elements of the project in ways too numerous to recount, and we applaud all such efforts and note that they build on the efforts of earlier SOFIA leaders who put the observatory on the path to its current successes. In addition, we were pleased to learn of the recent scientific accomplishments of SOFIA, ranging from the discovery of water on the dayside of the moon to the detection of HeH⁺ in a planetary nebula. The fact that the overall upturn in SOFIA noted above and exemplified by these results have occurred in the teeth of the CoVID pandemic makes them all the more noteworthy.
2. **The Senior Review[s].** We note that the SOFIA team will soon be preparing for the upcoming Senior Review, with proposals expected to be due in January of 2022. Although that may seem like a long time from now, any new initiatives – operational or scientific – which are planned to be part of the Senior Review proposal should be underway ASAP. Although the Senior Review is a serious gate and NASA expects certain metrics to be met, we encourage the SOFIA team to think about it not as a threat but as an opportunity to put a coherent picture before a diverse set of experts. This presumably is how HST and CXO approach the Senior Review which they have every three years; it might be instructive for the SOFIA team to discuss with them how they approach this review. Also, of course, the members of the SIS stand ready to help the SOFIA project by reviewing the material being prepared for the Senior Review. We agree that the “Five Bold Initiatives” enunciated by Naseem form a good framework for portions of the Senior Review proposal.
3. **Instrumentation.** The development of new instrumentation, and the maintenance of the current instrumentation suite, are critical to the continued success of SOFIA. This is also an area where cooperation between the US and German project elements is particularly

important. The SIS supports the plan to convert EXES into a facility instrument. We also encourage the ongoing discussions between NASA and DLR which will assure the availability of the GREAT instrument to the SOFIA community even when the current PI, Jurgen Stutzki, retires. We feel that the best solution could be to have GREAT also become a facility instrument under the management of the SMO; the closer the final solution is to this model the better.

We note the ambitious but necessary plans for further instrumentation development presented by the SOFIA team. Upgrading the HAWC+ arrays is a really excellent first step and we encourage the team to move ahead with it [editorial comment: The HAWC+ upgrade could be folded into Naseem's Five Bold Steps, because it will already be underway at the time of the SR]. The steps beyond that are still a bit hazy and will require careful coordination between SOFIA/NASA, technology development supported by NASA outside of the SOFIA project, and the German community which certainly has an interest in a possible successor to GREAT.

We feel that GREAT is sufficiently essential to the continued success of SOFIA that we recommend that, if at all possible, the instrument development program proceed without taking the step of decommissioning GREAT while a successor is undergoing final development.

We note the mismatch between the three year Senior Review cadence and the longer time required to develop a new instrument on either the US or the German side. We hope that the more upbeat approach to the Senior Review recommended above, if it appears credible and can be adopted based on the results of the 2022 review, will break this logjam by allowing the SOFIA team to plan realistically more than three years in advance.

4. The Future of the SIS

Alessandra Roy and Naseem Rangwala presented their vision for a group to replace the SIS, which they labelled the STIC [an acronym already monopolized by STScI for one of their advisory groups]. That aside, the main proposed objectives of the STIC, which stands for Science and Technology International Council, are to:

- Discuss high level strategy regarding science operations, science implementation, instrumentation, new technologies on the horizon that could help SOFIA/enhance science.
- Advocacy to other observatories, missions, institutions.
- Provide input/feedback on our ongoing efforts to increase SOFIA's science return on the investment.

And the main proposed characteristic of the STIC to achieve these objectives are:

- STIC is not going to be an advisory council.
- Eight international scientists (including the chair) from the astronomical and planetary communities as selected by NASA & DLR.
- Ex-Officio: GSSWG & SUG chairs
- Members of the Project (e.g. SMO Director, DSI/SMO deputy director) can participate and present as needed.
- Chair appointed by the STIC members (2 year term, but can change earlier if needed).
- STIC members appointed also for 2 years but staggered.
- NASA & DLR (Project Scientists & Project Managers) convene the STIC
- STIC meeting cadence: yearly. Either F2F or videoconference.

These objectives and characteristics are reflected in the current draft charter for the STIC.

Not surprisingly, this description elicited vigorous response from the current members of the SIS, who will be supplanted by, or perhaps asked to join, the STIC. The high points of the discussion include:

Agreement on the importance of an independent, international body of scientists to interact with the SOFIA Project. In addition, such a group is mandated by the current version of the Joint SOFIA Project Plan [JSPP].

Agreement that the membership of the STIC should reflect the challenges/opportunities that SOFIA faces at the time. In particular folks with expertise in instrument technology and planetary science might be good additions.

Comfort with the idea that the STIC is not an advisory group per se but an outside body which would engage in discussion with the SOFIA team on topics of current interest and engage in advocacy and outreach both to other observatories and to the general science community.

SOFIA International Summit (SIS)

Date: 11 December 2020 / **Time:** 8:30 a.m. - 12:50 p.m. (PST)

Page 4 of 11

On the other hand, the SIS felt that a cadence of meetings of only once per year with two year membership, as proposed, would not equip the STIC with the knowledge and continuity which would allow it to partner efficiently with the SOFIA project. It was suggested instead that meetings every six to eight months would allow the STIC to be much more effective.

Jill's notes contain numerous more detailed suggestions from SIS members about how the STIC might be managed for maximum efficiency [apart from the schedule issue]. These include distribution of status/operational summary information prior to the meeting so that the STIC members could study it before the meeting; limiting the discussion at the meeting simply to questions on the Observatory status [rather than full presentations..the questions could be based on the status material presented to the SIS prior to the meeting]; enunciation prior to the meeting of the key issues on which STIC input will be sought; attendance by SIS members at APAC meetings and other venues at which SOFIA will be described, etc. These should be considered while the charter is being revised.

Ultimately, the SIS/STIC reports to Naseem and Alessandra, so they should set the terms of reference to what would be most helpful to them, balancing the above considerations against the "review fatigue" which they, particularly Naseem, are currently experiencing. Bear in mind that the STIC could always be assembled ad hoc if there is a particular issue needing discussion. On the other hand, the proposed role of the STIC in advocacy and outreach, in addition to discussing more internal project matters, will clearly be most effective if the members are up-to-date and aware of the latest SOFIA news.

This ends the summary of the SIS reaction to key elements of the meeting. We thank all of those on the NASA/DLR side who contributed material and energy to making this a very productive meeting. We are available on an ad hoc or more formal basis to continue to help keep SOFIA on the very promising science-driven trajectory which is now following.

Submitted by:

Michael Werner, JPL, and Sebastian Wolf, University of Kiel
Co-Chairs of the SOFIA International Summit

Jill Sherman's detailed notes on the SIS meeting are given below:

SOFIA International Summit (SIS)

Date: 11 December 2020 / **Time:** 8:30 a.m. - 12:50 p.m. (PST)

Notes taken by Jill Sherman **Rev. 3.5**

Page 5 of 11

SIS Members - Present

Gordon, Karl	Menten, Karl	Wolf, Sebastian
Harris, Andy	Werner, Mike	Woodward, Chick

SIS Members - Not Present

Sargent, Anneila

SOFIA Project Attendees

Hammes, Heinz	Meixner, Margaret	Roy, Alessandra
Landis, Rob	Rangwala, Naseem	Schulz, Bernhard

Additional Attendees

Klein, Bernd	Knezek, Patricia	Stutzki, Juergen
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Meeting Purpose

The Stratospheric Observatory for Infrared Astronomy (SOFIA) Project updated SIS members on SOFIA activities that have occurred since the SIS meeting on October 8-9, 2018.

Topics Discussed

- Introduction to new SOFIA management team members
- NASA's response to the 5-Year Flagship Mission Review (FMR)
 - Progress in Germany since the FMR
 - SOFIA Science and Mission Operations (SMO): Science Progress since the FMR
- Deutsches SOFIA Institut (DSI) Role in SOFIA Science and Mission Operations
- NASA's definition of SOFIA in extended mission
- Roadmap for new instrumentation on SOFIA
- Status of the Observatory: C-check/other topics
- Preparation for the next Senior Review
- NASA-DLR Memorandum of Understanding (MoU) and Joint SOFIA Project Plan (JSPP)
- German SOFIA structure
- Overview of SOFIA Project science councils, committees, and working groups
- New SIS structure + charter + membership

Introduction to new SOFIA management team members

- SOFIA Project Manager, Rob Landis, as of October 26, 2020
- SOFIA Project Scientist, Naseem Rangwala, as of September 17, 2019
- SOFIA Science and Mission Operations Director, Margaret Meixner, as of April 13, 2020

SOFIA Science Flight Operations

The COVID-19 pandemic suspended SOFIA operations, effective March 19, 2020, and the Project resumed science flight operations on August 17, 2020. SOFIA is currently in Germany for C-check/extended observatory maintenance, but the Project will resume science flights in February 2021.

SOFIA Bold Initiatives

SOFIA's five bold initiatives for 2020-2021 were part of the SOFIA response to the FMR.

1. Pursue large coordinated legacy programs.
2. Grow the SOFIA science community.
3. Increase the total number of flights in Southern Hemisphere to 50 annually.
4. Convert EXES and GREAT to facility-class science instruments.
5. Build the operational capacity to plan for five 10-hour flights per week.

Roadmap for new instrumentation on SOFIA

- SOFIA's preliminary plans for new instrumentation were discussed. The final instrument roadmap document is in work by the SMO and will be released to the public in January 2021.

SIS Comments on Roadmap for new instrumentation on SOFIA

- Mike Werner: Any plan for GREAT should go beyond 2023; GREAT is key to SOFIA science. Naseem said the Project would like to invest in a newer instrument; and, additional U.S. investment in GREAT will need to be discussed with NASA HQ.
- Karl Menten: In exchange for the investment in GREAT, does NASA get compensated with U.S. open time? SMO Director said GREAT supports U.S. community (open-time) flights, and the work is viewed as research collaboration. U.S. open-time flights are exchanged for GREAT guaranteed-time.

Preparation for the next Senior Review

- SOFIA will participate in NASA's Senior Review for Astrophysics operating missions every three years.
- Anticipate proposals will be due for comparative review in January 2022.
- A scenario has been developed to substantially increase research hours in the extended mission. Project is ready to execute this initiative starting May 2021.
- Science/dollar is the most important criterion in the Senior Review
- Space missions in extended phase typically have the same observing time with a lower annual budget and ramp up in archival research. SOFIA in extended mission will provide more observing time for a lower annual budget.

NASA's response to the FMR (see presentation charts and full report for details)

- The SOFIA response to the June 2019 FMR report is posted on the [SOFIA website](#).
- The Project's response was submitted to NASA HQ on September 30, 2020.
- SOFIA makes significant discoveries (e.g., water on the sunlit surface of the Moon, HAWC+ magnetic field results in Serpens).
- During past year, the SOFIA Project Scientist responded to many reviews and audits.
- The Project is increasing science per dollar and increasing observing opportunities with a lower operating budget.
- Cycle-9 selections will be announced in December 2020.
- Key metrics and objectives were briefed (see FMR document). H-index has gone up in the past year by 2 points.
- All SOFIA major initiatives for 2019-2020 (see FMR document) have been completed.
- Increasing observing time in the Southern Hemisphere by adding more deployments; Project will continue with the routine annual long deployment and also begin adding mini deployments.
- With water-vapor data, SOFIA can change flight plans and adjust to ensure the highest quality observing time.
 - For example, if the Project knows water vapor is high (due to flying in late spring from Palmdale or due to a storm coming), the Project can adjust the flight plans (and even switch the planned observations for a given night) to create the ideal observing schedule.
- Reduced downtime by going to only one long maintenance period for the Observatory per year, which is the primary reason the Project is able to increase observing opportunities.
- Reduced development and invested more in the science operations; and, with this change, the Project takes on higher observatory systems mission-assurance risk (some items may take longer to fix if broken due to lower number of staff on hand), but the Project has been able to bolster science operations. No safety risks are taken; safety of mission and team remains the highest priority.
- The SOFIA Project briefed the SIS on the Project's response to each of the four top-level and the ten specific FMR recommendations (see FMR document for details).
- The Project is committed to implementing legacy programs that may be either community- or Observatory-led.
 - Even if Observatory-led, the legacy programs will be driven by the community.
 - SMO has new category called "pilot" legacy program that involves the award of a small amount of observing time, and, if proven, may turn into a full legacy program.
- The Project is pursuing synergies with other missions (e.g., providing maps of water on the Moon to VIPER to assist with their mission planning).
- Continuing to focus on providing the community with the best-available data; and, working to increase the quantity of high-quality data in the archive.
- Efforts to grow the SOFIA science community currently are in work; the Project seeks to expand and diversify the community (e.g., lunar scientists researching Moon, planetary scientists looking at asteroids).
- The SOFIA data archive has moved to IRSA and has improved significantly.
- The Project recently released a call for proposals for archival research.
- To ensure SOFIA completes high-priority programs, the Project categorizes observations as Priority 1 (P1), Priority 2 (P2), and Priority 3—for scheduling purposes. P1 programs always will be completed because the Project wants P1 to result in publications. P2 programs will be completed once started.

- Increased observing opportunities also are a result of scheduling and implementing Friday “contingency” flights to provide the highest probability of SOFIA consistently achieving four flights per week (if a Monday, Tuesday, Wednesday, or Thursday flight is missed, then can fly on a Friday night). The fifth flight is in the schedule to ensure that SOFIA can consistently reach the 4-flight-per-week goal.
- Data quality on SOFIA depends on selection (select those programs that can achieve high-quality data) as well as planning and scheduling (taking into account the water-vapor requirements).
- FMR and SOMER panelists recommended maximizing observing time at stratospheric altitudes; but, they did not have the data that is available to the Project today. After a 6- to 7-month study, the Project revealed that stratospheric altitude is not the right metric to track high-value observing time. The zenith water vapor is the right metric for measuring and tracking observing conditions on SOFIA.
 - The Project study confirmed that SOFIA is providing good observing conditions most of the time; but, the Project is striving to make observing conditions even better.
 - The Project now has a sophisticated program to get the water-vapor data from NASA GEOS weather database and then feed that data to the SMO for flight planning and scheduling; the Project now provides global water maps to flight planners (which was not done a year ago).
 - When comparing the water-vapor map totals for North American observing time with those for New Zealand, do not automatically assume that New Zealand is way better. Take into account that the North American map observing time includes all the late spring and early summer (which is not as good as other times). The Project deploys and observes in New Zealand only during the best Southern Hemisphere observing conditions.
- Observing conditions are good in Palmdale and equal to those in the Southern Hemisphere during certain times of the year (Northern Hemisphere late fall to early spring).
 - Northern Hemisphere late spring to early summer are okay in Palmdale, but observing is typically better in the Southern Hemisphere at that time.
 - During the Northern Hemisphere summertime, the observing conditions are clearly better in the Southern Hemisphere; unfortunately, this year (2020), due to the COVID-19 pandemic, SOFIA was not able to go on deployment to the Southern Hemisphere.

SIS questions about SOFIA response to FMR

- *Chick Woodward: Is the reason for the shorter flights that with less fuel the aircraft can get up to higher altitude faster? Naseem said yes, and the shorter flight duration is 8 to 8.5 hours.*
- *Andy Harris: How do you manage to show such an increase in flight hours? Naseem said used to have three maintenance periods in earlier observing cycles; and, now the Project will have only one maintenance period and that is the primary reason the flight hours will increase.*
- *Sebastian Wolf: Individual instruments have not been mentioned (e.g., productivity and impact of various instruments); is there a specific view on instrumentation that will make productivity higher? Naseem said the Project is looking to improve productivity by transferring the EXES science instrument from a Principal-Investigator-class science instrument (PSI) to a Facility-class science instrument (FSI); so, EXES, as an FSI, could be better publicized and used by the community due to greater flexibility.*

NASA’s definition of SOFIA in extended mission (see presentation charts for details)

- NASA has placed SOFIA in extended mission—similar to Hubble and Chandra—which also are categorized by NASA as being in extended mission. However, extended mission for SOFIA is slightly different than for Hubble and Chandra because SOFIA can upgrade science instruments and can replenish cryogenics.
- SOFIA’s extended mission began fall 2019 after the conclusion of the FMR.
- NASA’s direction to the Project is to divert “development” resources (without impacting sustained operations of 4 flights per week); and, at the same time, increase scientific data collection by flying more and minimizing downtime (e.g., moving to 1-year maintenance per the SOMER & FMR) and increase scientific productivity and impact by hiring more post-docs, promoting archival research, and increasing community engagement.
- DLR’s perspective is that SOFIA is not a space mission and the term “Extended Mission Lifetime” is therefore not fitting for SOFIA. However, DLR’s overall approach to the next phase of SOFIA is similar to NASA’s extended mission philosophy in that new telescope assembly upgrades will be considered if required by science and development funds are available. Preventative maintenance on the telescope is ongoing.

SIS questions/comments about FMR response and SOFIA in extended mission

- *Mike Werner: Are any efforts under way to improve image quality? Naseem said that effort will be driven by the SMO. EXES is the only current science instrument (SI) that would significantly benefit from image quality improvement. If SOFIA receives a future infrared SI, may want to invest in image-quality improvements.*

- *Sebastian: Does anything need to be improved between SOFIA and the user community (e.g., in terms of data processing or the help desk). Naseem said when the Project moved the data archive to IRSA, the Project heavily invested in the data archive user interface; and, and the Project has significantly improved the archive. The SMO has done a good job advertising the calls for proposal; and, now there is a project tracker called “my proposals” that allows any user to go online to find out the status of their data project.*
- *Sebastian: You mentioned the categories of P1 and P2 should be finished. Do users know if their observations are categorized as P1 or P2. Naseem said P1 will be finished no matter what; P2 will be finished once started. Margaret said the Project tells users that their observations will be completed, but the specific reference to “P1” is typically only used internally within the Project for scheduling purposes. Bernhard said the categorizations of “will do,” “should do,” and “do if time” are explained in the SOFIA call for proposals.*
- *Chick Woodward: Going forward, the objective is to have a useful archive. Naseem said “yes.” Not enough high-quality data in the archive was a concern from the FMR panelists. The Project has worked to heavily invest and improve the data archive. The Project has done very well since Cycle 5. Separate chain on this topic in the webex chat window: incomplete data were the major source of poor-quality data in the archive. Naseem clarified that her comment was primarily related to earlier cycles (before Cycle 5) when the Project was still learning how to maximize high-quality data. There is sufficient data in the SOFIA archive currently to enhance archival research.*

Progress in Germany since the FMR

- DLR worked with NASA and the Project Office during the FMR.
 - One member of the PAEW (German version of the APAC) participated in the FMR.
 - The PAEW recommendation to DLR was to continue with SOFIA and to improve observatory operations
- In June 2019 (after the FMR panelist review meeting and report), DLR had a successful “open-door day” in Bonn, Germany, and Alessandra Roy and Clemens Plank spent the day talking about SOFIA with the general public.
- Changes in DLR SOFIA staff:
 - Clemens Planck, DLR SOFIA Project Engineer, will leave.
 - Juergen Boeker will join as DLR SOFIA Project Engineer in February 2021.
- C-check happening right now in Hamburg, Germany; work is on track.
- Planning for GREAT science campaign from Cologne, Germany, beginning February 2021.
- DLR’s work to implement an imager-improvement of the telescope was delayed due to COVID-19 restrictions at NASA centers and due to California fires that delayed on-sky testing.
- At DLR, SOFIA is funded by the Ministry of Economic Affairs and Energy.
 - DLR provides infrastructure for the German science community.
 - DLR funds and manages the telescope and Deutsches SOFIA Institut (DSI) contractor.
 - DLR funds and manages the Lufthansa contract for aircraft C-check/extended maintenance.
 - The German SOFIA contract does not fund DLR SOFIA project management (e.g., Heinz and Alessandra).
- German science instruments have not been funded by DLR.
 - DFG funds the German science instruments; and DFG funds come from the Federal Ministry for Education and Research (BMBF).
 - Interested institutions submit SOFIA-related proposals directly to DFG (and not to DLR).
 - DLR discussions ongoing at Ministry level for funding for development of German science instrumentation.
 - Planning for a German workshop for development of a new heterodyne receiver after 2021.
 - The current NASA-DLR Memorandum of Understanding does not cover German science instrumentation.
- DLR is looking at ways to improve the telescope to help SOFIA have state-of-the-art systems so the community can use it. During annual maintenance, there is an opportunity to make telescope improvements.
- 20% of the observing time on SOFIA goes to Germany.

SIS questions/comments about Progress in Germany since the FMR

- *Chick Woodward: Why is the Project flying the GREAT campaign out of Germany? Naseem said we lost GREAT science instrument flight opportunities due to COVID-19, and this was a good opportunity to make up those flights. Due to COVID-19, GREAT team international travel has been difficult. Since the GREAT team is located in Germany, conducting SOFIA flights in Germany—with the GREAT science instrument—posed lower risk to the Project. The Project is making the best use of resources during the times we are in; however, the Project does not plan to conduct science flights out of Germany every year.*
- *Sebastian Wolf: Wondering about the review of the SOFIA project. How could this have been done on both sides (NASA and DLR)? Naseem said the FMR was U.S.-focused, but DLR was allowed to be involved. However, SOFIA only went through an FMR and a SOMER (SOFIA Operations and Maintenance Efficiency Review).*

SOFIA has not yet undergone a Senior Review. A Senior Review is mandated by the U.S. Congress; and, for the Senior Review, only a U.S. review panel will be involved. German participation in the Senior Review is not up to the SOFIA Project.

- *Sebastian Wolf: How many more Senior Reviews will occur on SOFIA? Naseem said because NASA defines SOFIA to be in “extended mission,” U.S. congress mandates for SOFIA to be in Senior Review every three years.*
- *Sebastian Wolf: Regarding German investment in science instrumentation, it may be difficult for Germany to invest in science instrumentation for SOFIA—if the Senior Review is every three years. It may not be feasible to develop and implement a science instrument on SOFIA within that time-scale (to justify development costs, there must be time to collect science data).*

SOFIA Science and Mission Operations (SMO): Science Progress since the FMR

- SOFIA SMO Director, Margaret Meixner, briefed recent science results (e.g., water on sunlit surface of the Moon, Helium-Hydride molecule discovery, cover of Nature Astronomy in December 2020).
- First legacy program on SOFIA is Galactic Center mapping.
- For legacy programs, SOFIA Project wants large, coherent data sets for the archive.
- SOFIA research can be combined with data from Spitzer and Herschel.
- Another legacy program is called the “FEEDBACK” legacy program.
 - FEEDBACK is a buzz word in the community for “trying to understand star formation.”
- SMO Director will implement the USRA strategic plan that has three themes: impact, productivity, and efficiency.
- SMO briefed a dashboard that showed the status of SMO strategic initiatives (e.g., the proposal selection process is now automated, focusing on observing program completion rate as part of the selection process).
- Completion of observing programs is heavily important factor contributing to increasing publications. The first technical evaluation upon entering the SOFIA Time Allocation Committee (TAC) is to determine whether or not a program can be successfully completed. TAC will not select science that technically cannot be done or completed.
- Breaking down stove-pipes in SMO organization; improving how DSI and SMO/USRA are working together.
- SMO Director presented the science metrics goals for 2022 from the FMR response document; and, she gave status of where the Project stands at present time. (See SMO presentation for details.)
- SOFIA SMO Director stated that the Project wants 80% of observations that are proposed to be put in the archive.
- Discussed some impacts due to COVID-19.
- SMO Director requested SIS members to help with the growth of community on SOFIA.
 - The Project is increasing the Co-Is and PIs over time, but we need to get this bigger.
 - The Project invited SIS members to support SOFIA science events.
- Margaret presented the need to increase archival research and to diversify user community.
- SMO is considering a large SOFIA science conference perhaps at Asilomar.
- Working on collaboration with other observatories.
- Considering offering a summer school in infrared astronomy.

Deutsches SOFIA Institut (DSI) Role in SOFIA Science and Mission Operations

- Bernhard Schulz briefed the SIS members on German SMO participation.
- In addition to telescope maintenance, DSI operates and maintains the Focal Plane Imager (FPI+) science instrument, currently used as a guide camera; and, DSI supplies instrument scientists for the Field-Imaging Far-Infrared Line Spectrometer (FIFI-LS) science instrument.
- Bernhard Schulz’ current title on SOFIA is “Deputy Director, Science and Mission Operations”; however, Bernhard stated that, due to the current NASA/USRA set-up, a real “deputy” role is not feasible. Bernhard stated that his role more appropriately functions as a “Co-Director.”
- Bernhard defined his role and responsibility for DSI (see SMO presentation for details).
- Bernhard presented the need to increase the user base on both sides of the ocean.
- Bernhard discussed plan for ensuring a future for the GREAT science instrument on SOFIA.
 - Need to compensate for the rampdown of GREAT personnel in September 2022.
 - Hire 2 instrument hardware specialists in 2021 for training with the GREAT team.
 - Provide 3 SMO instrument scientists to support GREAT.
 - DFG and MPG are the main sources of instrument funding.
 - Cadences of U.S. Senior Review (3 years) and German SI development (5 to 6 years) do not match.
 - German funding agencies need assurance of SOFIA’s future in order to commit to instrument funding. NASA instrument roadmap and investments in SOFIA could change the perception on the German side.
 - A German-funded second instrument in 2026 timeframe would be very desirable.

SIS Questions/Comments about SOFIA Science and Mission Operations (SMO)

- *Mike Werner said the advertisement of summer school for “far infrared astronomy” is not a good idea; he believes that may be a turn-off. Instead, Mike suggests the summer school should cover a specific science topic.*
- *Andy Harris agreed that the SMO should select a science topic. Andy asked what is the optimal size of the science community for SOFIA? He commented that it may be difficult to bring in graduate students if the community is too large. Margaret said the goal was to achieve an oversubscription rate of 5. Andy said while it is important to grow the community now, how do you keep community members interested if the community grows too large? In terms of growing the community, it may be helpful to grow in specific areas that may have dissipated. Right now, it is uncertain if you can keep your graduate student funded if there is uncertainty with SOFIA.*

Status of the Observatory: C-check/other topics

- Heinz Hammes reported that SOFIA is on-track with C-check/extended maintenance.
- The GREAT science instrument traveled to Hamburg on SOFIA; GREAT is now in the lab for maintenance.
- Performing telescope maintenance; Shack-Hartmann test instrument will be used to test the equipment on the telescope; up to now, Project has not had that capability; DLR wants to bring this capability to the observatory.
- Image-quality upgrade will be mostly from software/controls; however, the active mass damper upgrade is working and functioning. The Project still can improve the vibration levels using the active mass damper.

NASA-DLR Memorandum of Understanding (MoU) and Joint SOFIA Project Plan (JSPP)

- *Mike Werner: What is the MOU vs. JSPP? Heinz said the MOU includes a general discussion about the German vs. the U.S. contribution and defines the manner in which Germany pays their share of the project costs. The SIS is mentioned in the Joint SOFIA Project Plan (JSPP) and not in the MOU.*
- *Sebastian Wolf: How can the MOU be signed before the JSPP? Heinz said the JSPP is a project-level document signed at a much lower level. The JSPP is a living document. Whereas, the MOU is signed between NASA HQ and DLR HQ. The JSPP defines how NASA and DLR work together. JSPP is for the daily working arrangement between NASA and DLR project offices.*
- *Heinz and Alessandra have dual roles for SOFIA at the Project Office level and at the DLR HQ level. Whereas, at NASA, Naseem/Rob are at the Project Office level, and Lucien Cox/Pat Knezek are at the HQ level.*

Retiring the SIS and Starting the STIC

- The SOFIA Science and Technology International Council (STIC) will:
 - Discuss high-level strategy regarding science operations, science implementation, instrumentation, new technologies on the horizon that could help SOFIA/enhance science.
 - Advocate for SOFIA with other observatories, missions, and institutions.
 - Provide input/feedback on our ongoing efforts to increase SOFIA’s science return on investment.
- The STIC will not be advisory.
- The new group would be “advocates” and would be available to “discuss” topics.
- For the STIC, SOFIA plans to keep the 8 members, including the chair.
- Plan to close the SIS within the first quarter of 2021 and to sign a new charter.

Comments from SIS about the New Charter for the STIC

- *Andy Harris: There is value in hearing people whether the group is considered “advisory” or just a group of people you trust to give you ideas. We are sending you our report, and you can take the suggestions or not.*
- *Mike Werner: Include an instrumentation expert and a planetary scientist (for occultations, sun, and the Moon).*
- *Karl Gordon: The amount of material presented is too much to ingest. With so much information, it is very difficult to have a real discussion. What are the areas that you really want to discuss? Meeting only once a year is too infrequent. If the group meets more frequently that would reduce the status update needed.*
- *Andy Harris: Advice on operations cannot really happen in half a day.*
- *Chick Woodward: When the agenda comes out for the next meeting, please structure and tell the group where they need to focus. What are the specific questions that need to be addressed? Once per year is not really enough to give you input to pivot on.*
- *Karl Menten: The composition of the new STIC should be well-chosen. People who can identify the unique capabilities of the SOFIA observatory. Important to have experts who can add ideas. It is important to have good advisors who know the unique capabilities of SOFIA.*

- *Sebastian Wolf: All the ideas are good. Also want to come back to the cadence of the meeting. Every six months is a good frequency to meet. We should have a one-day meeting every six months. If all have different perspectives and different areas of expertise, need some status report; but, then need a little time to catch up.*

Final Remarks from the SIS

- *Mike Werner: Requested comments on the presentations and on items that should be addressed in final SIS report.*
- *Sebastian: No final remarks. Based on his experience with the German SOFIA Science Working Group (GSSWG), he concurs that to have this type of committee is helpful.*
Karl Menten: No more questions. Agree with your review fatigue. From the German side, must address the future of GREAT, which is a significant issue. Juergen Stutzki and myself will retire in 2022 and 2025. GREAT is a fantastic instrument but requires significant manpower while being operated. If GREAT had flown 40 hours this year, that would have been hard to manage. In Chile, the Max Planck Institute for Radio Astronomy will operate the APEX telescope from 2023 on alone. There are competing commitments in its submillimeter technology division (SOFIA vs. APEX). If you do not find a way to operate GREAT with NASA participation, it will be difficult for the MPIfR to continue. If we want GREAT to exist beyond 2023, we will have to address this problem. For us, GREAT is virtually synonymous with SOFIA.
- *Karl Gordon: Clarify the other groups roles and responsibilities (vs. the STIC). That will be helpful. Margaret Meixner responded that the SOFIA Users Group (SUG) does give advice. Karl Gordon requested that NASA and DLR tell the SIS what all the groups do. Also, it would be nice if "STIC" was not already being used as an acronym. Already have the Space Telescope Institute Committee (STIC).*
- *Chick Woodward: Suggested that next time an acronym is selected, perform a Google search to ensure no duplication of acronyms. Get the groups to engage in those public conversations. If there are other advisory structures, please notify and this group could attend. Could capitalize on the areas allowing public comment.*
- *Sebastian: Mainly this was a starting meeting to revamp the SIS—even if the SIS will no longer be called the SIS but called the STIC. Need to have specific real controversial questions to be answered—questions that would need to be answered to help for the future. In favor of joining a STIC, the general outline is well-accepted by all of us.*
- *Andy Harris: Really like the expression and energy from the new management team. Quite a different atmosphere in this meeting than in past meetings. Things look like they are on the right track. People are asking the right questions. Long overdue; the previous teams have had to focus on survival, but SOFIA has entered a new period with science productivity. Focusing on science, the Senior Review is to be looked-forward-to in order to have a check on what the important issues are on SOFIA. Having an international group focusing on science is good. The German and U.S. partnership is core to this project. The timing is good to move to all facility-class science instruments on SOFIA. There is no longer a large community of infrared instrument builders; the instrument-building community is too small and that was demonstrated in the latest instrument call for proposals. No university group could complete. JPL, Goddard, and Ames are the centers that have this experience. Technology has moved past what we used to do in university labs. GREAT is an example of that. Moving GREAT to an FSI is a really good plan. At this point, continuing to grow the community is the right way to go. But need to have a strategy for where this community eventually will go. Hubble and JWST have their own communities, but not much time is available. An oversubscription rate of 10 may look good for the observatory, but that high of an oversubscription rate is not good for the researcher because that means you're not going to get your research done.*
- *Chick Woodward: International part of SOFIA is good to see. When management came in, there seemed to be a shift. Hopefully, we will get good flight hours moving forward.*
- *Karl Menten: Sees a fresh breeze flowing through the Project. Makes him very optimistic.*
- *Karl Gordon: Like the science focus. That is where SOFIA needs to be in the future.*
- *Mike Werner: Where does the SIS report from the meeting go? Naseem requested the report come to the Project. The Project will send a copy to Pat Knezek.*