

MODIS Technical Weekly

3 March 95

Sent out 3/6/95 at about 2 PM to MODIS.REVIEW

1. Summary

Nelson Ferragut is leaving the MODIS engineering team. We almost lost Nelson's support back in October, but were fortunate to have him remain on the team for several more months. I want to thank Nelson again for his excellent support of MODIS. Sal Cicchelli will continue to provide support to MODIS and will take over Nelson's work.

SBRC continued to make progress in ferreting out the EM electronics problems. The following are a few recommendations from our team to help this process:

a) To the extent possible, the PFM electronics needs to be completely checked out on the bench before system level integration (for example, electronics could be hooked up to representative focal planes).

b) Extender boards should be available for the EM and PFM electronics. Some extender boards were improvised during EM testing at the system level after problems were found.

c) It is recommended that dummy electronics boards with appropriate terminations for the redundant electronics be provided for the EM (this was required as part of the agreement to not populate redundant electronics boards for the EM). Ideally, the inclusion of the dummy boards for the EM electronics will provide a closer simulation electrically and thermally to the PFM electronics.

d) It is recommended that we go into the EM and PFM system level thermal vacuum test having done as much as possible to assure we have acceptable performance, temperature, and noise margins for the electronics.

Rick Mills, Ken Anderson, and Mike Roberto were at SBRC February the week of February 21. Rick will be providing additional support in the area of integration and test. Bill Mocarsky extended his stay through about mid day on February 22.

Jose Florez was at SBRC last week (week of February 27) monitoring the work on the electronics problems. Jose will leave SBRC on March 6 after bringing Mitch Davis up to date. Mitch will be at SBRC from

March 6 for a stay of up to two weeks. George Daelemans will be at SBRC for a few days beginning on March 7 for work on preparations for EM thermal vacuum testing.

Many thanks to David Jones and our SBRC hosts for the help they continue to provide to members of our team visiting at SBRC. We had excellent support from SBRC in getting copies of many red-lined electronics drawings. The provision of office space, computers, and phones has been very helpful.

The cryogenic quartz crystal microbalance (CQCM), control/data acquisition unit, cabling, and operating manuals have been received by GSFC. The CQCM was developed by QCM Research of Laguna Beach, CA. MODIS paid for half of the CQCM and will share this device at SBRC with the VIRS program. After GSFC stickers are applied, the CQCM will be shipped to SBRC this week.

2. Electronics Status Report 1

This report was provided as a separate e-mail message to MODIS.Review on March 6 at 10:23 AM. It includes the above general recommendations as well as reports from Jose Florez, Bill Mocarisky, David Jones, and Tom Koch.

3. Tom Pagano (NASA Telecon 27 Feb 95)

Subject: NASA Telecon

From: Tom Pagano 2/27/95 5:32 PM

Minutes from the Weekly Systems Engineering Teleconference with NASA GSFC

2/27/95

Neil. Checking grounding scheme. VIS displacement turned out to be clock on VIS SAM card. Its been repaired. All bands warm and cold are operating. Taken preliminary data on IR bands using OBC BB heated to 312K. This data will be used to compute gains and offsets. We will do scattering after noise and grounding. Back to the noise, the spec on the electronics is in the 1 to 2 count range. On the cold FPA's we're seeing 3-4 count rms value. Emphasis now on the warm FPAs we have a 10 to 15 count peak to peak noise signal for a dark background. Gives RMS noise of 2 to 4 counts. It is correlated and appears to have a frequency that varies from 100 Hz to 500 Hz. We really want to get into the hardware and find the source of that

problem. We're looking at the grounding with Spence Lee, who has been involved extensively with other space instruments. Jose from NASA is observing what is happening. We are looking at supplies in the SAM. If we don't have any active supplies causing the problems, we'll have to make changes to the SAM grounding scheme. We've gotten it down to 2 to 3 counts peak to peak, with jumpering, but need to understand the problem better.

Barnes. Are all the electronics modules in?

Neil. All are integrated, and cables connected. Most of the telemetry issues have been resolved. Feel most of the noise is due to the SAM, so we probably won't be pulling the MEM out.

Montgomery. How about a Faraday cage around the MEM?

Neil/Tom. The Mainframe serves that purpose. The SAM housing also serves that purpose.

Neil. Problem is grounding vs radiative pickup.

Barnes. Schedule revised?

Tom. Approximately March 10th we start testing in the MODIS Calibration Chamber.

Barnes. We are running into the science team meeting. Want to give the science team an indication of where we are going, but detailed understanding after that. Would rather look at the data more closely after the science team meeting.

Young. Last week, Tom P., Tom K. and myself talked to Gene Walushka and the bottom line is that as of now we are not planning on making more polarization measurements on the EM. We're not real happy, but significantly more satisfied now than I was three weeks ago when I was willing to accept then. We are not saying all measurements are in spec, because some of them are at the 2.2 to 2.4 % level, but that could be all right.

Godden. Are we including the $1 + \cos^2\theta$

Young. We assume it is appropriate for us to remove the drift in the data. We fit using a \cos^2 plus a linear term. The data then hangs together with respect to noise and standard deviation.

Barnes. Is the linear term the same for all channels?

Tom. The dependency for band 1 is 0.5% to 1.5%.

Young. When we normalized the drift to the peak signal, all bands except spectral band 1 seemed to be reasonably well clustered. Spectral band 1 has very little slope to it.

Tom. Since we looked at channel 20 in band 1, it had the lowest slope of all the channels. We may want to look at channel 5 or so.

Young. I believe it is spatially related. It doesn't fit the lamp temperature changing. I don't have a mechanism for the spatial yet. Whenever we write the results up we will give a little bit of data on the GSE so people know what we have so there will be reference to several documents and synopsis of the measurement, and another section on the test philosophy, and then the data presented in different kinds of formats.

Barnes. You will include the other things you've tried that didn't work?

Young. It is our intent to do that.

Zukowski. Will you report the tabulated data used to compute the correlation with lamp effects.

Young. Also writing up FOV data. Tom and I having discussions on how to reduce the near field response data. I think we are close to converging, but may not quite be there.

Tom. Tar'd up the polarization and response vs scan angle data. All TAC algorithms are complete except those that need the real data in ambient testing. We'd like to check them out with real data.

Bowser. Printing problem with TAC plots. Fixed it.

Eric Augustine. Tom asked us to send out data. It is 324 MBytes. I'm compressing it now and should have it out this afternoon.

Tim. Looking for something that details the data format. We will probably like to work on another version of dn. for data extraction. Can't extract data from the data files without the road map. Concerned with the Engineering Telemetry. Is there somewhere where it is written down.

Tom. Use Mehrten's Command and Telemetry CDRL.

Ed. Want to take the raw data and repacketize and use it as test data for the end-to-end algorithm.

Tom. May want to reverse the process from the MODIS to the ARC rather than the ARC to the TAC.

Ed. The MGBC collimator used for IAC2 will be different than what IAC1 will do.

Vern. We have potential schedule problem with IAC1 in the initial alignment operations of the PFM aft optics. To minimize that will be to take the collimator for the MGBC and configure it in a simple setup where we use a VIS/NIR lamp source with a reticle assembly at the input. We'd have some scanning capability since we have an output flat that can be rotated #177#1#161#. This will give us a 3 to 4 week on PFM integration and alignment while IAC1 is on EM. All final alignments would be with IAC1. IAC2 is only an additional instrument for up-front operations.

Barnes. Understood.

Ed. Flight Operations Workshop. Spacecraft I&T. With regards to the data we collect at S/C I&T. We get 16Kbits of housekeeping data. Do we have requirements from the chamber or test equipment. Is there a third source of data that we will want to store at MM.

Vern. Their test set at the S/C is the interface to MODIS. Our test equipment does not accept anything except science data. Our plan is that if we need any optical stimulus, we'd use the on-board calibrator sources. Any data related to those would come in the engineering housekeeping data. I'm not aware of any requirement for any other data that we're providing. If they were doing environmental testing, we have temperature sensors in our HK telemetry.

Ed. Do we need them to provide metadata files.

Vern. If we want them to we can just enter that into our archiver. For the PFM we store data from the external calibration sources here at SBRC. If they are doing a specific test, then the operator can add a note into the metadata.

Ed. Within 8 hours of test completion MM wants to know if the test was a success.

Tom. This is possible to first order, but depends on the test we lay out.

Vern. We're not ready to tell them what the tests are to be performed.

Ed. MM will be running typical orbits. We have no such test plans for instrument I&T? 5 to 10 typical orbits for interferences.

Tom. We don't do orbitals, we do thermal cycling.

Ed. GSFC being invited to the SRCA design reviews. Described in the risk mitigation reports.

Young. We had a peer review for the SRCA last week, and there were no indications that this was to be a NASA participation.

Tom. I'll send out the actions from that meeting and invite you to the next peer review.

Ed. Have you addressed the system stability of the SRCA and the photodiode stability and STOP analysis. Was that included in this review?

Young. Not this review.

Ed. We have some information on the SIS, but not the entire SRCA. Have you made measurements on the BCS?

Young. What was done has been to make reflectance measurements, BRDF, on the radiating plates, then that data was fed into the ORDAS model. An effective emissivity calculated from that.

Ed. Is there a write-up on those results?

Young. I did a memo on something similar, but that was for the OBC BB. This came about after we noted the crazing. My recollection was we got an emissivity of 0.9998 before the crazing, then 0.9993 after we put the measured reflectances of the crazing in the model. Our specification was 0.999.

Tom. Vern said he'd talk to Chris to find the emissivity.

Sabatino. Beginning of the month we've tracked a dozen tasks that needed to be done over the month. There may be several of those that would be outstanding. Given that they've slipped to this point. What is the current status?

Tom. We're caught up. Polarization, Near Field Response, Response vs Scan Angle, DN analyzer and Gains and Offsets, and C_Sub, have all been tested with real data. SNR, Spectral and Spatial routines are done, but are waiting for real data.

Godden. Did you have any thoughts on our response to the scattered light results.

Young. Believe we are in reasonable agreement. We've had discussions with the ME group with respect to putting a thin walled structure next to the calibration bulkhead so the light reflected off the inner lip would be minimized. It is possible to do that, but there are potentially significant cost impacts. On the other hand. Based upon Terry's first or second cut at this, where he had 2.7% scattered light off that lip and that could well change vs time of year, that's unacceptable and would ruin our calibration. Since then there have been some other results from the modeling which suggests that model is significantly lower.

Godden. Telecon with Breault and Spiak with the scatter data that T. Kampe gave me. The data looks good, but we're missing data on the dichroics. We're looking at how we may come up with BRDF, BTDF on the dichroics. We'll have to proceed with typical data since Tom probably won't have them measured. The scatter data for ZnSe at 632.8 looks high. Especially with the data measured at 10.6 um. I sent Tom an E-mail last week. We'll request the 2 ZnSe witness

samples to be sent to Breault for measurements. Have you started the scan mirror inspection?

Young. Using the low power microscope?

Godden. Yes it is.

Young. I don't know the status of that.

Barnes. Has the mirror been pretty buttoned up?

Tom. We have a plastic cover we use whenever the mirror is not in use.

Godden. Are you aware of CERES affect of Denton coatings? TRW attributed that to Chlorine. Have your people been alerted to use of solvents with Chlorine.

Young. That is a no. no. I would presume our folks know that.

Godden. Do you have a feeling whether you'd know if there was in-band crosstalk between a fully saturated pixel and it neighbors.

Tom. We do expect some small crosstalk. But not blooming.

Godden. How would this affect our data when looking at the moon where we saturate some IR channels. I've also see that there is a point in the scan cavity before the SD where we might be able to get a look at the scan cavity.

Young. We'd need to have an understanding of the temperature. May not have temperature sensors there.

Barnes. We may want to turn the diffuser sampling on before we look at the diffuser.

Young. There may be some limitations. As we go from end of earth scan to beginning of solar diffuser, there are many calculations going on.

Barnes. Understand.

Godden. That position would have an AOI on the scan mirror of 64#161#.

Young. That's were we were talking about a retroreflecting cube for another capability to measure contamination monitoring. Regarding a memo in applied optics. The title was "Possible Causes of Calibration Degradation of the AVHRR VIS and NIR channels". It appears to say there's enough interplanetary dust which causes little pits on the mirrors which reduce the responsivity of an instrument. Mention that Guenther was talked to concerning this. If that mechanism is applicable to MODIS, and we have that kind of calibration problems, my expectation of near field response effects is that this effect is an order of magnitude higher.

Barnes. We are looking at how we can look at the moon and space and even the internal of the cavity. We need to measure the mirror post launch as much as possible.

Tom. I'm not understanding why the particles end up in the scan cavity?

Godden. Galactic particles can overcome the spacecraft velocity vector and come at you at any direction.

Barnes. Jim, your memo says conduction in the OBC blackbody is not a problem.
Why?

Young. There will be a conduction path. It was not in the model. The model appears to be consistent with what we have noted in the heating phase in ambient. That may just be because there are some other parameters where we are putting in values.

Tom. I think the blackbody is conductively isolated at the mounts.

4. Ed Knight (Flight Operations Workshop Report)

On February 21-23, Ed Knight attended the February Flight Operations Workshop as the MODIS representative. This meeting focused on three major issues-- clarification of FOS requirements, the division of responsibility and roles between the Flight Operations Team and the Instrument Operations Teams, and the scenarios under which the Instrument Operations Teams would use the IST and Ground System to participate in flight operations. A demonstration

of the ground system prototypes was conducted at the end. This report addresses the highlights of each of these discussions and some general concerns at the end. The complete report is in an e-mail message from Ed dated 2/24/95 at 9:23 AM.

5. Bob Martineau (Focal Planes)

E-mail from Bob on 3/3/95 at 3:28 PM

a) PF S/N109 has been mounted successfully. Tests are to be completed this week. NEI meets spec so far with 2 soft pixels. The bezel/filter assembly is late and will impact delivery of the PF SMWIR FPA. The SMWIR backup, PF S/N110 has been tested, and is in storage awaiting assembly. FPA delivery is now expected to slip from 24 March to 5 April, and is still hostage to delivery of the bezel/filter assembly.

b) The LWIR PF FPA delivery date is expected to be March 29, and is being held up by late delivery of the LWIR filter mask. Both SMWIR and LWIR FPA deliveries are now on the instrument critical path.

Mike Roberto

6 March 95