

MODIS Team Meeting Minutes

Minutes of the MODIS Team Meeting held on Tuesday March 21, 1995.

Action Items:

94. Provide a detailed (high fidelity) analysis of scatter in the scan cavity. The results would determine the need for PF near field scatter measurements vs scan angle. Assigned to Guenther 8/23/94 Preliminary results due 10/15/94. Final due 2/28/95. New due date 4/28/95
108. Prepare a report addressing the status of the MODIS Reliability Program. Reliability elements will include: FMEA, Worst Case, CIL, Reliability Assessment and Parts Device Stress Analysis and Trend Analysis. Assigned to Silva 1/3/94. Due 1/17/95
110. Write up the disposition of the reduced -5°C torque margin on the scan mirror, given increasing torque requirement of test bearings. If the decision is to accept as is, document the rationale. Assigned to Roberto 1/17/95. Due 1/31/95 CLOSED 3/27/95
111. Recommend an optical design for the diffuser screen. Assigned to Waluschka 1/31/95. Due 2/28/95
112. Analyze the ScMA optical design. Assigned to Waluschka 1/31/95. Due 2/7/95

Attendees:

- | | | |
|--------------------|--------------------|--------------------|
| ✓ Richard Weber | ✓ Bruce Guenther | ✓ Larissa Graziani |
| ✓ John Bauernschub | ✓ George Daelemans | ✓ Bob Martineau |
| Rosemary Vail | Patricia Weir | Bob Silva |
| Lisa Shears | ✓ Mitch Davis | Robert Kiwak |
| ✓ Mike Roberto | ✓ Ken Anderson | ✓ Harvey Safren |
| Nelson Ferragut | Rick Sabatino | ✓ Ed Knight |
| Gene Waluschka | Cherie Congedo | ✓ Harry Montgomery |
| ✓ Bill Barnes | ✓ Jose Florez | ✓ Marvin Maxwell |
| Les Thompson | ✓ Gerry Godden | ✓ Bill Mocarisky |
| ✓ John Bolton | ✓ Sal Cicchelli | Helen Phillips |
| Pat Delosa | | |

The following items were distributed:

- 1) Weekly Status Report #181
- 2) SBRC Memos submission from week #173
- 3) Minutes of the previous team meeting

MODIS Technical Weekly March 24, 1995

Sent out 3/27/95 at about 1:15 PM to MODIS.REVIEW

1. Summary

Lee Tessmer of SBRC presented a good Quarterly Management Review on March 24 at GSFC. Comments on the review will be prepared by GSFC.

The first MODIS Science Quarterly Management Review was held on 20 March 1995. Both Level 1A and Level 1B algorithms and software development were discussed.

Tom Pagano has requested that any SBRC involvement in action items from the science team meeting last fall be deferred until sometime next month. The next science team meeting is May 3 to 5.

SBRC has measured scatter from the first dichroic. It may be contributing as much as 80% of the measured scatter. SBRC is going back to OCLI to determine how much improvement is possible in scatter from this dichroic. Breault Research, Tucson, will do an analysis with improved dichroic predictions.

Topics covered in this weekly from our science and engineering teams include the following: Mitch Davis has reviewed FAM/CLAM and SAM test procedures. Bob Martineau would classify the ECR for the Test Plan for the Focal Plane Assemblies (ECR M00924/01) as Class I. Ed Knight and Tim Zukowski have processed SBRC polarization data on the GSFC TAC. Cherie Congedo has developed a schedule for the SRCA STOP analysis. Dan Powers has examined the effects of additional roll and pitch maneuvers for the instrument and the impact of these attitude events on the radiative cooler. Jose Florez has determined that Hi Pot testing is not required for the MEM wire wrap. Jose has proposed a new award fee milestone for testing of the EM electronics to help assure the adequacy of the PFM electronics. Bruce Guenther pointed out that MCST is preparing for the Software Requirements Review (SRR) for the Level 1B algorithm and an internal Laboratory program review on April 4-5. Status updates are included from Bob Martineau, Rick Sabatino, and Bill Mocarsky. There are excerpts from David Jones' weekly. Nelson Ferragut has prepared a preliminary report on the review of the ball bearing data from the life test.

Topics from SBRC include the systems and calibration telecon from Tom Pagano, and a message from Al De Forrest on the elimination of the temperature sensor at the solar diffuser location (as well as some other locations).

David Jones provided the following in his weekly: Homework Assignments!: It is recommended that GSFC personnel supporting MODIS T/V, read Doc E151808 (T/V Test Equip Setup Procedure), and E151807 (MODIS EM T/V Test Procedure). This will aid tracking the tests and monitoring progress.

2. David Jones (Weekly Report)

excerpts from David Jones' weekly email on 3/23/95 at 2:12 PM:

1) SI&T Status

On Monday 20 March, the instrument was powered-up and System functionality checked, Cmd & TLM verified, and System Readiness for ambient testing in the Chamber confirmed. "Data Collects," for the VIS, SWIR, NIR channels (Test group RCO1) were obtained.

On Tuesday 21 March, a DC Restore performance test was conducted on the PV and PC FPAs, using the internal MODIS Black Body.

SBRC reports that the instrument is performing correctly, as last tested in the Hi-bay. RCO2 for the IR Bands will be started 23 March.

2) Electronic "Fixes" Status: David Rogers has been assigned the task of documenting the "fixes" identified during the past two weeks of trouble-shooting. All affected drawings will be changed to allow a trouble-free PFM Electronics to be manufactured.

3) Thermal Status: At Monday's Status meeting, SBRC report that the six FAM CCAs (AF01-AF06) containing potentially "hot" components were processed as described in my last weekly (95/03/19). It is now expected that the EM can be safely operated over the temperature range of 285 - 305K.

4) MCC Status: The MCC area is looking rather congested, now that the full complement of T/V test support equipment has been installed.

Test personnel have complained that the ventilation system is noisy, to a point of being stressful. A review of the system has shown that the nine fans provide too vigorous an air-flow and steps are being taken to slow the fans (probably by installing a variable speed control).

At Monday's status meeting, Frank Nicolas gave an account of an impressively thorough preliminary assessment of the MCC cleanliness. Particle counts were made inside and outside the Chamber, with Chamber doors open, partially closed, with and without personnel movement, etc. Bottom-line: Worst-case count was 800, better than a factor of ten lower than the rating for the room. These measurements will be repeated after all T/V preparation is completed.

5) Staff Changes: Robert Jensen replaces Daryl Schmidt (who left on 95/03/17). Thus far, SBRC has been able to find quality replacements, who have smoothly picked up the tasks of departees.

3. Bob Martineau (Detectors)

email from Bob, 3/21/95 2:44 PM:

1) LWIR PF FPA: Final tests including linearity, NEI, and response to be completed by March 21. Filter mask assembly delivery date slipped from March 31 to April 10. Expected FPA CTI/delivery has slipped from March 31 to April 24.

2) SMWIR PF FPA: Final detective assembly tests have been completed. Filter/bezel assembly delivery date slipped from March 15 to March 24. FPA delivery has slipped from April 5 to April 7.

3) FM 1 & 2 SMWIR SCAs: One non-flight SCA will be ready for test April 5. Purpose is to correlate new wafer detector probe test and SCA test data. There are 3 to 5 remaining top grade sets and 7 to 9 SCAs are planned to be delivered to test.

4) FM 1 & 2 PV LWIR SCAs: Seven F1 and F2 PV LWIR detector arrays have been diamond point turned, and will be hybridized next.

5) FM 1 & 2 VIS and NIR SCA screen tests have been started. Three VIS and 2 NIR candidate SCAs have completed screen tests.

summary of email from Bob, 3/21/95 4:28 PM:

Bob Martineau would classify the ECR for the Test Plan for the Focal Plane Assemblies (ECR M00924/01) as Class I. The ECR moves many tests from the FPA level to the component level, adding uncertainty about performance at the FPA level. Some tests are moved to a higher level of integration, where it may be too late to do anything about any problem.

4. Bill Mocarsky (GSE and I&T Status)

email from Bill Mocarsky 3/20/95 2:02 PM

a) Telecon with Duane Bates 3/20/95

The MODIS is in the MCC. Alignment of the MODIS to the optical stimuli has started and should be done within 2 days.

They will then start the Ambient tests. It looks like pumpdown should occur within 2 weeks.

Currently, the plan is to start pulling parts off the EM as soon as possible after TV for use on the PFM.

The RAD Cooler SBS gets down to approximately 30 K. I don't know what the spec is but Duane thinks they have a work around for the problem.

Duane believes the FIFO SWAP-NOT EMPTY problem has been fixed. I have a call into Joe Auchter to confirm the story.

b) Telecon with Vern Alferd 3/16/95

MCC/TV Preparations: Things are going well. The SpMA "problem" was operator error. The SIS is ready. Should have no trouble aligning the MODIS.

PFM Operations: Vern is in the process of formally qualifying selected hardware for use on the PFM. The BAEM needs to be qualified by April. He is updating the documentation/drawings to make them correct.

S/W: Vern states that they need to work on getting the housekeeping data to the Archive as well as automate the data retrieval activities from the Archive. He is starting the test stimulus controller "automation" software.

5. Cherie Congedo (STOP Analysis on SRCA)

In a memo dated March 7, Cherie has documented a schedule for the Structural Thermal Optical (STOP) analysis on the Spectroradiometric Calibration Assembly (SRCA). Final results will be available by the end of August, 1995.

6. Daniel Powers (Revisiting MODIS Radiative Cooler Transient Response During Roll and Pitch Maneuvers)

In a memo to George Daelemans dated February 28, 1995, Dan examined the effects of additional roll and pitch maneuvers for the instrument and the impact of these attitude events on the radiative cooler in a memo. The purpose was to determine how long the different attitude events could take place before the FPA detectors would exceed their temperature limit of 85.1 K. Three different cases were investigated:

- 1) Roll Case - spacecraft rolled at plus 6 degrees per minute starting at orbit eclipse. Temperature limits exceeded after about 10 minutes (a s/c roll of about 60 degrees).
- 2) Pitch-Hold Case - s/c enters inertial hold attitude starting at orbit eclipse. Temperature limits exceeded after about 32 minutes.
- 3) Pitch-Driven Case - s/c pitched at plus 6 degrees per minute starting at orbit eclipse for 11 minutes, inertially held for one minute, then returned to nominal attitude. Temperature limits were exceeded after approximately 20 minutes (editor's note).

7. Ed Knight and Tim Zukowski (TAC Polarization Data Analysis)

Ed and Tim have processed SBRC polarization data on the GSFC TAC. Results are documented in a memo dated March 20. The memo includes polarization results summary tables for the measured polarization factor and for the polarization factors resulting from 3 and 4 term fits. There are also plots of polarization factor for the middle and end detectors for each band in one of the data sets as a function of scan angle for each mirror side.

Ed and Tim covered all detectors in the bands identified by SBRC as "good" for each collect.

8. Rick Sabatino (Flight Software)

via phone message 3/21/95, Rick out sick

a) The flight software (s/w) development is concentrating on the s/w acceptance test procedures development. There have been no real coding changes to support integration effort in last couple of weeks.

b) TAC s/w algorithm development proceeding on a pace supporting the EM testing, no problems in that regard to date.

c) Tom Pagano is maintaining s/w development folders for systems calibration, algorithm justification, etc. to support development effort. Tom is doing everything the Flight and GSE folks are doing.

d) Tom mentioned timing of the test readiness review being 30 days beyond the end of the EM test is going to impact in his view the ability to support the test readiness review.

9. Jose Florez (Proposed Electronics Award Fee Milestone; High Potential Testing)

Jose Florez has proposed an electronics award fee milestone for testing of the Engineering Model electronics which should increase confidence in the PFM electronics (email 3/24). The PFM design/layout for the SAM CLK_BIAS/ACE and ACE/ACE cards would be tested in the EM. Analog Electronics Module (AEM) subsystem performance would be tested with cards in the redundant slots of the EM instrument. The cause and required correction for the EM MEM "FIFO Non-Empty Swap Problem" would be identified. Flight software margins would be measured.

Jose Florez has documented discussions with SBRC and GSFC personnel on Hi-Pot testing of the MEM wire wrap backplane (email 3/23). Code 300 does not have a requirement to perform Hi-Pot testing on wire wrap wires. Similarly, there is no requirement for Insulation Resistance testing between each conductor and all other conductors. The requirements for wire wrap connections are specified in NHB 5300.4(3H), Requirements for Crimping and Wire Wrap.

10. Systems and Calibration Telecon

From: Tom Pagano 3/24/95 4:34 AM

Minutes from the NASA Teleconference of March 20, 1995

Barnes. Showed the polarization data to the Vince's group. They are not concerned about our performance on protoflight.

Barnes. We'd like a thermistor near the solar diffuser.

Roberto. Diffuser won't heat up very much.

Barnes. We'd like to use it also for another cal point when the door is closed.

Young. We had considered using the spectralon as a secondary radiometric calibration for the IR. When I looked at the emissivity or reflectance of the spectralon, its a very much irregular spectra, plus we knew of now way to measure the temperature of the radiating surface with any confidence level since the spectralon is not a good conductor. My understanding was that Barker still wanted a sensor. We put a requirement in the specification.

Tom. It shouldn't be a big deal. It is as important or more so than many of the other sensors we have.

Roberto. We may be able to provide the 24006 thermistor in stock.

Barnes. We may want to look in the upper corner behind the diffuser to give us a relative measurement at an extreme angle on the mirror. Is there one there?

Choo. There is one on the zenith bulkhead and one on the cal bulkhead. Two PRT's. One on top and side.

Jim. Also one on KM3

Roberto. We don't have the paperwork. We need to determine how we'd qualify them for flight.

Barnes. Brochure on its way. Al Fleig needs two to three minutes of full up data. OK to have it padded.

Tom/Neil: 315 MBytes of data.

Roberto. Any way of getting the data raw off the instrument.

Tom. I don't know of any way of doing that. We'll think about it.

Barnes. Can we substitute bands into the night mode? Trade one band for another? How big a problem is that?

Ed. My understanding is that required a complete microcode rewrite.

Tom. Near Field Response Data. Good news is that the extinction ratio is about $1e5$ or better. Seeing features of ghosting and doing a good job of characterization. Bad news is we see wings that may indicate we have scatter from the dichroic. Still processing the data.

Ed. Recognizing the fact that you want to process it, when can we get the data?

Tom. Probably about one to two weeks. I need to work out the software details and get the nd transmission data folded in before we can process the data.

Neil. We wound up taking 93 collects worth of data.

Tom. We may want to put this data on tape.

Neil. It may fit on one tape.

Jim. We have measured dichroic 1 BRDF and it is showing a high level of BRDF. We have a factor of 20 more scatter than the objective lenses.

Barnes. Is there any solution if it is the dichroic.

Young. We're looking at options, but there are not many.

Godden. You've eliminated the scan mirror?

Young. When we look at the wings and they plummet when they get to an angular region where the intermediate field baffle comes into play. That suggests that the cause of the scattering is someplace between the field stop and the MODIS FPAs.

Tom. How far from the cloud can we be?

Barnes. I have CZCS data showing masking from the cloud.

Tom. Does this data plot as a function of the size of the cloud?

Barnes. This was a real scene where we simply drew circles around the clouds. We did not do the analysis with cloud size in mind. It's probably a good thing to do.

Young. Spectral calibration of the SRCA has been written up. Memo number N04744

Godden. Have you also measured the BTDF of the dichroic?

Young. Yes we have a fairly extensive set. When we measured the transmittance of dichroic 1, my "recollection" is that we did it for 3.39 um laser and a 10.6 um laser and the amplitude for the Harvey Shack model was in the 0.1 level. Much more reduced.

Godden. Same slope?

Young. I didn't look at the slope. There are 17 BRDF plots, 5 are characterization of the scatterometer. The other are divided between dichroic 1 2 and 3.

Godden. Have you seen scatter in the infrared?

Young. Haven't looked at it yet.

Tom. Terry has a memo that indicates the IR is 3.2 x higher than the visible.

Ed. What is the current schedule for T/V?

Tom. April 7th.

Ed. How far into test for the thermal bands?

Tom. Right way. There is a few days of pumping down.

Ed. There are hints in the monthly that you have unreversed bands 1 and 2?

Neil. That's correct now.

Ed. Test procedures and reports available electronically?

Tom. Call Duane Bates.

Neil. Currently in chamber. They've moved the MODIS and the GSE in there. We've started a functional. The warm bands are operating well. We're aligning the SpMA.

Ed. We're interested in being able to look at the thermal bands during ambient measurements at MM. We need the BTC in use for that.

Roberto. Has the CQCM been installed?

Tom. It's still on the action item list.

Harry. For one lamp how do we adjust the voltage or current to achieve constant radiance? For multi lamp operation how is constant radiance achieved.

Young. When you say constant radiance, are you using it in the same way we're using it. Constant radiance here would mean a uniform output as a function of time.

Ed. We're meaning the radiance feedback mode using the photodiode. Are you modifying the current or the voltage. How do you do this with three bulbs on.

Young. The person you need to talk to is Eric Johnson.

Tim. Is it in the test plan to characterize the polarization of the output of the SRCA?

Young. I do not believe we have any plans to check polarization output. I know of no reason why we need to do that. If you can give us some reasons for doing that, we'd be interested in that.

Ed. Report being fed x'd. As per your request, we've included a large number of the plots where the fit routine failed.

Tom. Thank You.

Rick. What is your understanding of when the SWTRR will be held. I want to keep high the awareness of when the review is being held. Last week, the assurance group has come to the realization that they have not been covering software assurance. Bob and myself want to come out to review procedures.

Tom. We have a TAC development file which includes all the current code and test data. We also have an algorithm development file which defines the requirements of the specification we are working to. The spec

is REA released and in redline mode. We also have a test data folder which holds all the data processed on the EM.

Godden. How did you eliminate the field stop as a major player in the scatter?

Young. If the scan mirror is the culprit, then we should see wings that extend beyond the region of the intermediate field stop. We have had this discussion with a number of other people here.

Godden. I've been trying to get the BRDF mirror data at longer wavelengths. Do you know when we could get that?

Young. I believe the dichroic data is available. Scan mirror measurements?

Godden. Tom's said he's measured witness samples in the IR. We want to know if our IR scaling is on track. I've sent Tom an E-mail and a Voice Mail. Waiting for witness sample.

Godden. Are you tracking characterization of FPAs.

Tom. We have crosstalk data independent of the filters.

Ed. Band to band or element to element? Is there data within element? The data we got from EM is much better.

Tim. We were trying to run the response vs scan angle. We get a failure when we try to read files. End of file encountered. Its a PV wave call. It has problems reading the summary file.

Tom. I'll look at the PV wave routine.

11. Al De Forrest (Re: System's Telecon Minutes)

From: Al De Forrest 3/24/95 11:29 AM

Solar diffuser temp sensor: The SBRC Configuration Review Board meets every Thursday. I recall signing engineering documents last week eliminating several temp sensors and one was for the solar diffuser location. Maybe your group should sit down and review the hundreds of temp sensor locations and write down new directions. While the idea of installing or not installing a simple temp sensor seems innocuous, it is actually rather expensive by the time all hours spent detailing and documenting the work are totaled.

12. Bruce Guenther (MODIS Calibration Support Team)

Excerpts from Bruce Guenther's Weekly MCST Report on 3/23/95:

The Team is preparing for our Software Requirements Review (SRR) for the Level 1B algorithm and an internal Laboratory program review on April 4-5. The SRR is a public meeting and will begin at 9:00 AM in room 365, Building 22.

APART SCATTERED LIGHT MODEL DEVELOPMENT

Reviewed preliminary APART model scatter results for the VIS channel. Identified several inconsistencies and model check points. Expedited SBRC new BRDF measured data for the aft-optics dichroics for incorporation, and results from SBRC's preliminary analysis of their EM Near-Field Response

measurements. These data raise several issues to be explained by our model. We are approaching the half way point for computer calculations. SBRC has measured the near-field scattering for a witness sample for dichroic 1 and found an equivalent surface roughness of about 85 Angstroms. This value will be used in some of our data runs with Breault.

MODULATION TRANSFER FUNCTION (MTF)

Initiated an investigation in to the MODIS MTF specification, measurement and application. Outlined an investigation and analyses plan to investigate the implications of the nominal/as specified MTFs applied to point sources, linear boundaries, the Moon and heterogeneous scenes; the probable measurement errors of the SBRC Line Spread Function (LSF) measurement methodology, and various on-orbit determination approaches using the SRCA spatial calibration mode and the Moon. Applied preliminary results of the Point Spread Function (PSF) to the brightest stars and planets to improve our estimates of the Signal to Noise Ratios (SNRs) for each of the MODIS bands for each of these astronomical objects. Currently evaluating the feasibility of using observations of Venus at maximum elongation to measure and monitor the stability of the MODIS PSF which is closely related to the MTF. If workable, this could be a much cleaner way to track image quality than using the edge of the Moon, or terrestrial features.

13. Mitch Davis (Review of Test Procedures for the FAM/CLAM and SAM)

Mitch Davis has reviewed the test procedures for the Space view Analog electronics Module (SAM), Cooler Located Analog Module (CLAM), and the Forward viewing Analog Module (FAM). In reviewing the test procedures, Mitch looked for two items: 1) any "non-GSFC" way of testing, and 2) that all testable requirements were verified. Mitch documented his review in a memo dated March 22, 1995

14. Nelson Ferragut (Review of Ball Bearing Data)

Data from the bearing life tests have been analyzed by Nelson Ferragut. Nelson has concluded that the bearing data contains too much electrical and aliasing noise. His recommendations are included in a preliminary memo dated March 20, 1995:

Nelson's preliminary conclusions are the following:

- 1) Results raise questions about validity of accelerated test (i.e. totally different frequency content).
- 2) Sampling rate should be increased as high as possible above 100 HZ.
- 3) Notch filters should be added to take out electrical frequency noise.
- 4) Low pass filters having the Nyquist frequency as the upper limit should be added to take out high frequency noise.

There is a question about whether or not a longer data set could be analyzed and at least a portion of the noise removed analytically.

Mike Roberto
March 27, 1995