

MODIS Team Meeting Minutes

Minutes of the MODIS Team Meeting held on Tuesday July 26, 1994.

Action Items:

82. Work with the MODIS team to obtain a consensus on a revised MODIS crosstalk specification and provide inputs for a Configuration Change Request. Assigned to Ed Knight 12/14/93. Due 1/11/94
Tabled on 2/ 1/94 until 8/ 1/94
88. Obtain drawings from SBRC for CDR Actions 65 & 68. Assigned to Ken Anderson 5/19/94. Due 6/15/94 CLOSED 7/26/94
90. Clarify what is required of SBRC to allow GSFC qualification of flight detectors. Assigned to Silva 6/30/94. Due 8/ 2/94
91. Clarify the round-robin BRDF measurement requirements. Assigned to Guenther. Due 8/16/94
92. Determine the best way to balance the scan mirror. Assigned to Roberto. 7/19/94. Due 9/ 6/94.

The following items were distributed:

- 1) Weekly Status Report #148
- 2) SBRC Memos submission from week #140
- 3) Minutes of the previous team meeting

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 | | Marvin Maxwell |
| ✓ Les Thompson | | ✓ Bill Mocarisky |

MODIS Team Technical Weekly 29 July 94

Systems and Calibration Telecon

The systems and calibration telecon was held on July 25. Participants at SBRC included Tom Pagano, Jim Young, Neil Therrien, John Mehrten, David Jones, and Dzung Phan. At GSFC, attendees were Bill Barnes, Ed Knight, Harry Montgomery, Bruce Guenther, and Mike Roberto.

A few action items for GSFC were discussed during the telecon:

- 1) SBRC has a concern with the EMI susceptibility of the MODIS PC channels to the ASTER cryo coolers. GSFC has an action item for MMC to calculate this magnetic field at the MODIS (ref

PL3095-I03446). Roger Stone will follow up on this with MMC. However, he needs the referenced memo. SBRC has been called for a copy of the memo.

2) GSFC will look into the effects on the bearings of operating the scan mirror bearings at a higher speed.

3) GSFC will look into nominal mirror speed tests to assure the static imbalance requirement for the scan mirror and motor encoder is met.

Bill Barnes brought up the matter of possible adjustment in the sample timing for the 250 m and 500 m bands. At this time, we believe that new Read Out Integrated Circuits (ROICs) would be needed to individually set sample timing for each band on a focal plane based on the IFOV.

Mike Roberto mentioned:

a) GSFC technical comments on the QMR had been distributed in a memo dated July 15.

b) A couple of suggestions for determining if the scan mirror and motor encoder meet the 0.3 kg mm static imbalance requirement were recommended for analysis at GSFC. In each case, the scan mirror would be run at nominal speed. Dick Weber suggested the motor encoder be hung from the ceiling by a pipe which would not rotate. The scan mirror would operate in a horizontal plane. Static imbalance would cause the scan mirror to move slightly in the horizontal plane. This test would probably need to be done in vacuum to assure results would not be influenced by aerodynamics forces. An alternative setup was suggested by Joe Bolek, which would have the motor/encoder supported by flexible stilts.

Jim Young mentioned SBRC is still looking for the cause of the spurious response for bands 1 and 2. A test will be done in the lab using an f/2 beam. The detectors will be able to move. There is some question about how close analysis predictions and test results might be expected to compare. For some tests, a factor of 5 difference may be considered agreement

Ed Knight covered the following topics:

a) Can you provide the status of the spurious response? Crosstalk, striped filters, etc.?

Jim mentioned that a viable candidate would be light coming through the blocker for filter 2 and into the cavity for filter 1. The light is finally seen by a band 1 detector.

b) The pixels for the 250 m bands are 10% larger than spec. This will cause a little more image blur and will violate the IFOV spec.

c) Are some of the anomalies due to charge subtraction circuitry?

SBRC does not believe that the charge subtraction causes spurious results. The Engineering Model (EM) ROIC design may be a problem.

d) For detector and electronics crosstalk, the MSAP model is based on November measurements. When will the new measurements be incorporated in the model?

Tom mentioned the measurements made by the detector division were not conducive to modeling. They could not distinguish the test set noise from crosstalk. Good measurements will not be made until they have the Scatter Spectral Measurement Assembly (SSMA) in three or four months.

e) Ed has strong disagreement with the simplified 5 zone filter for the intermediate S/MWIR focal plane rather than the 7 zone filter. Ed has documented this in a memo dated July 21, 1994.

Tom mentioned SBRC is discussing the possibility of limiting the DC restore function on the PV bands to reduce the amount of on-board processing. This seems okay to Tom because:

1) The PV bands do not drift much and SBRC has a drift allowance on the SNR calculations.

2) The accuracy can be improved by using the same part of the A/D converter.

DC restore could be provided by command by:

- 1) uploading values per band or pixel or
- 2) enabling the function for the PV bands.

If enabling the DC restore function for the PV bands is an option, then it is important to assure that the microprocessor has sufficient margin to handle this possibility. MODIS should be tested with DC restore enabled.

David Jones mentioned that Lee Tessmer does not think new lots of S/MWIR and PC LWIR detectors need to be started at this time.

Additional details, including progress in integrating the EM Aft Optics Assembly (AOA) are provided by Tom's report on this telecon which is included at the end of this report.

Science

Al Fleig has written a memo on MODIS Sensor Patterns and Multiresolution Pixel Registration dated July 27. It describes the response of the instrument on a single pixel basis and shows how pixels overlap in the scan direction. Al requests that each science team member decide whether it is better to register the different size pixels the way it is done now or to change.

Ed Knight presented the current understanding of spurious response to science team members in a meeting on July 27.

Electronics

There was a conversation with Dick Julian on July 29. Changing the sample timing for the individual bands based on IFOV size would require changes in the Read Out Integrated Circuits (ROICs).

Software

Rick Sabatino reported that elimination of the MODIS Ground Based Calibrator (MGBC) would not save on the software.

Structural

Cherie Congedo mentioned that assembly procedures may influence the non-linearity in the kinematic mounts.

Contamination

Larissa Graziani mentioned that two flat samples of scan mirror material will have BRDF measurements made at two wavelengths in the VIS and NIR. The purpose is to see if the cleaning system will change the properties of the mirror.

The outgassing allowed will be going down in the PAR.

SBRC Report on Systems Telecon

The following are minutes from the systems telecon provided by Tom Pagano:

Posted: Mon, Jul 25, 1994 1:22 PM EST Msg: SJJE-1562-7826/20 From:
("RFC-822":<SB06685(a)msgate.emis.hac.com>, SITE:NASA) CC: mroberto/GSFCMAIL Subj:
Systems Minutes

Below are the systems minutes for Tuesday 7/25/94

Minutes from the Systems Engineering Bi-Weekly Teleconference With NASA GSFC

July 25, 1994.

Pagano:

a) As you recall, up to now we have installed all four focal planes, the radiative cooler, and the objective assemblies, and are receiving very nice signals from all FPAs. The PMIRR BTC is cooling our detectors to better than 82K. We have been performing focus and alignment operations for the past few weeks. The VIS and NIR are in focus and aligned, and I'd like to happily report that as of Friday, the SWIR/MWIR and LWIR are now in focus. This process was very challenging in that focusing involved proper shimming of the mount of the radiative cooler, and the eyelens of the SWIR/MWIR and LWIR objectives. The next step in the process before mounting the telescope is to align the SWIR/MWIR and LWIR arrays.

b) The minutes from the MODIS Technical Team Meeting of July 15, 1994 state that there is a "misregistration problem" of the MODIS 250 m and 500 m bands with the 1000 m bands. Perhaps there is a misunderstanding. The design is such that 3 of the 500 m samples applied with the center one weighted doubly overlay identically with one 1000 m sample. The suggested wish to rephase would only result in mismatch of the resulting LSFs and a radiometric error.

c) The report from L. Thompson and B. Martineau appear to be overly pessimistic. The case is that SBRC has 7 full sets of SWIR/MWIR subarrays that all have no dead pixels. From there, we have many more that meet our specifications. I do not understand the concern with obtaining protoflight, or even flight 1 arrays with our current assets.

d) We have a concern with the EMI susceptibility of the MODIS PC channels to the ASTER cryo coolers. GSFC has an action item for MMC to calculate this magnetic field at the MODIS (ref PL3095-I03446). Do you have a status as of yet?

e) With respect to bands 13 and 14. The data we sent you were only preliminary representative profiles. We have some variability from sample to sample. We are now compiling the correct spectrals to use for PF. It is our estimate that we should be able to find a part for band 14 that meets all specifications; we may be off by only 0.1 to 0.2 nm in band 13 edge range. (I calculate band 13 upper edge range to be off by only 0.13 nm. not 0.3 nm). Refab of these filters is not a simple task.

f) We are discussing the possibility of limiting the DC restore function on the PV bands. First of all they don't drift much at all from what we have seen; we have 10 % drift allowance in our SNR calculations. Secondly, if they don't drift, we can improve our accuracy by using the same part of the A/D converter, rather than sliding around with drifts on the blackbody. We could then apply DC restore by command by either a) uploading values per band/pixel, or b) enabling the function for the PV bands.

Barnes:

a) Crisp answer on the 500 to 250 m band issue is correctable. Disagree with our assessment. Interested in centroid of response function. Want centroid of 2 of the 250s to lie within 500 ms. Want to shift integration time by 1/2 pixel. Some comment by Mitch Davis as to feasibility. Will tell science team about this, they will have to determine effects on their algorithms.

Roberto:

a) Should have received report on QMR.

b) Weber: hang scan motor from ceiling. Imbalance from mirror will cause motion. Will spend a few days to write this up. Joe Bolek has another approach which does the same thing but suspends it from the floor. Hang it so scan plane is horizontal to floor.

Pagano

We are waiting on NASA's response on the effects of bearings or rotating at the higher rate.

c) Report from G. Waluschka, as to what's happening with the alignment of the FPAs and the telescope. Gene concludes that in terms of focusing everything is going well, telescope is looking good. Thinks most troubling thing is filter crosstalk between bands 1 and 2.

Ed Knight

a) What is the status of the spurious response?

Jim

Its still there, we're planning on doing a laboratory type measurement with illumination at $f/2$ with a detector we can translate underneath the filter to see what we get. That was ready to start late last week. Last week on Friday, he noted that one of the assumptions to validate the observable was wrong, when fixed, then the quantitative assessment is within a factor of 5 withn we see, which is better than what we had before. This is reasonable due to the large number of assumptions we are making. Energy comes in through blocker for filter two, gets into cavity for filter one, bounces around a few times, and then is seen by spectral band 1 detector. This is a viable candidate.

Barnes

Seen in another pair of bands that were not stripe filters; 7 and 8.

b) 250 m bands larger. Why is it not a problem? There are three elements that go into this, the timing circuitry, the detector size, the image blur. What can we do to fix this.

Tom

Integration blur will make this effect a small observable equivalent to a minor MTF degradation. MTF meets spec.

Jim

The IFOV spec is instantaneous;

Barnes

Triangular response function looks larger.

c) Charge subtraction. Anomalies may be due to charge subtraction?

Tom

We see a power drain on the EM chips that appears to be a crosstalk phenomenon, this should go away on PF. The spurious response effect does not appear to be dependent on charge subtraction.

Remember we're not doing any calibration using the charge subtraction.

d) 2 week stability test to be done in ambient

Jim

It is true that in the cal management plan that we said the short term stability. For the MWIR/LWIR, the stability will be done in the T/V chamber. Don't think we can do MWIR/LWIR stability in ambient.

e) Crosstalk in detectors/electronics. The model that's being used is based on Nov measurements; at science team, want to present latest information.

Tom

We may not get reasonable crosstalk/ghosting data until SSMA.

Bruce

Difference between correction with and without crosstalk/ghosting/scatter effects is a major impact on software. Promised Vince that we will get them this answer by spring of 1995. Science team needs a briefing by the calibration team in October.

Tom

We should have a meeting on this soon. Detector measurements are indeterminate; ghosting analysis you've seen. Jim's done a good assessment on mirror scatter.

Bruce

Will put together a tiger team. Want 11th and 12th of August to discuss this with Santa Barbara.

f) Memo on simplified 5 zone FPA. SBRC believes its acceptable even though increases ghosting in several bands. Ed not agree ghosting is acceptable.

Tom

My own personal assessment. Appears to be reasonable. Ultimately NASA decision.

Barnes

There may be a cost issue. Balance cost savings with results. Needs that information.

Montgomery

It may be worth while if its correctable.

Knight

Looked at analysis, came to different conclusion to similar results.

Barnes:

Band 13, 14 filter. See above.

Therrien

Testing on NIR bands 1 and 2 crosstalk data reported. Blocking piece of glass, bandpass glass for a total of 4 pieces were inserted into the IAC beam. We will be documenting those results soon. Those measurements are consistent with our theory on the mechanism of this phenomenon.

Jones

Plan to vibrate the optical bench with full complement of parts in it. Low level sine at or below acceptance levels. Inspired by J. Bell's wishes for alignment.

End of Tom's write-up of systems minutes.

Mike Roberto

July 29, 1994