MCST Thermal Emissive Bands Calibration
Progress Report
to the
MODIS Science Team

October 24, 1997
# Progress Report Briefing
## Outline and Schedule

<table>
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<th>Topic</th>
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| 1.0 Introduction  
- Key Issues  
- Objectives  
- Progress/Caveats  
- UW Workshop Key Issues Summary | 10 minutes |
| 2.0 Summary of Test Data and Analysis Progress to date | 10 minutes |
| 3.0 Instrument Key Features and Performance Summaries  
- Reference Configuration Charts  
- Performance Summary ("Murphy Charts")  
- Preliminary Radiance Uncertainty Estimates  
- Projected $L_s$ and $T_s$  
- Calibration Temperature Ranges (Specified and recent ST requests)  
- Scan Mirror Reflectivity vs AOI  
- ACD non-linearities  
- ECAL results | 30 minutes |
| 4.0 Relative Spectral Responses  
- Wavelength correction procedures overview  
- Band-by-band summary | 25 minutes |
| 5.0 L vs DN Calibration Summary  
- Overview of L vs DN algorithm  
- Radiometric stability/repeatability  
- Temperature effects on calibration coefficients  
- BCS calibration vs OBC calibration  
- Mirror Side A vs Mirror Side B comparisons  
- Primary Electronics vs Redundant Electronics comparisons | 2.5 hours |
| 6.0 BCS to OBC Blackbody Calibration Transfer Results  
- Review of Qiu/Godden, Xiong and Young Methodologies  
- Summary of Results, Key Issues and Recommended Values | 45 minutes |
| 7.0 Discussion of PC Bands Crosstalk Analysis and Correction Methodologies | 30 minutes |
| **Total** | ~ 5 hours |
Introduction

• Top Level Status Summary
• Key Issues
• Objectives of this Report
• Progress/Caveats
• Key Issues from the September 11-12 Madison Workshop
• Credits
Top Level PFM Emissive IR Status
21 October 1997

Reasonable results fitting data to L vs DN algorithm
- difficult to characterize data to level of $L_{\text{typ}}$ specifications over desired fitting ranges [good progress]

Retrieving reasonable OBC-BB parameters from BCS to OBC-BB thermal vacuum blackbody transfer [good progress]

Reasonable convergence regarding RSR wavelength scale [good progress]

Most pieces are in place

Some issues unfinished
- Band 21 Calibration
- Spatial/Spectral "crosstalk" in PC bands
- Electronic effects $\sim 1/2$ to 1%

Situation encouraging
You will hear something on each of these items in presentation today
Key Issues

- Algorithm polynomial order/Band
- Calibration fitting ranges
- Wavelength calibration/correction
- Band 21 calibration alternatives
- Crosstalk characterization/correction implementation
- BCS to OBC Blackbody calibration transfer
- Electronics effects
- Determination of Uncertainties
- Validation approaches
Objectives of this Report

• Provide the Science Team with an overview of the Thermal Emissive Bands calibration methodology, algorithms and performance
• Address Key Issues Identified in the September 11-12 Madison Workshop
• Identify key issues for continued investigation and development
• Acquire Consent-to-Build L1B at launch code
Progress and Caveats

- Developed L vs DN algorithm as alternative to the more complex V vs L algorithm
- Demonstrated V vs L algorithm functionality
- Madison Workshop (9/11-9/12)
- Coordinated with Science Team regarding calibration fitting ranges
- Coordinated with UW regarding wavelength calibration
- Integration of In-band RSRs with OOB-Dispersive measurements pending normalization clarification
- Band 21 calibration to be derived from detector measurements and system level ECAL results
- Feedback to FM-1 Test Program
- Much work to be done on PC bands crosstalk quantitative assessment and correction algorithm
1) Proceed with L vs DN algorithm as baseline for L1B code
   - Continue development and assessment of V vs L algorithm as potential improvement for PM mission
   - Update ATBD with L vs DN algorithm

2) Select calibration fitting ranges on band-by-band basis with Science Team inputs
   - Continue quadratic vs cubic, and selective weighting fitting studies
   - Investigate alternate calibration data sets
   - Investigate using 1/2 of selected data sets to determine calibration coefficients, and determine performance with remaining 1/2 of the data
3) MCST and UW converge on appropriate RSR wavelength scale correction procedure
   – maintain L1B capability for processing with channel-level RSRs
   – remove Band 35 13.88 micrometer CO$_2$ absorption feature

4) Continue BCS to OBC Blackbody transfer investigation and sensitivity analyses
   – assess role and impact of scan mirror reflectance uncertainties on transfer results (OBC emissivity, temperature errors, etc.)
5) Continue investigation of PC crosstalk correction algorithm
   – parametrically assess impact on calibration coefficients
   – develop strawman correction algorithm
   – determine appropriate coefficients from measured crosstalk data
   – assess impact to L1B code development, testing, processing and validation efforts
Credits for Preparation of this Report

- Jack Xiong
- Tim Dorman
- Jeff Bowser
- Shi-Yue Qiu
- Tim Zukowski
- GSC and RDC Support Staff
- SBRS System Engineering

Previous Analyses by:
- Mohammad Khayat
- Duane Rosenberg
Weeks to Launch

33!

31 October 1997