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(E84-10184) SPECTRAL CHARACTERIZATION OF  
THE LANDSAT THEMATIC MAPPER SENSORS (NASA)  
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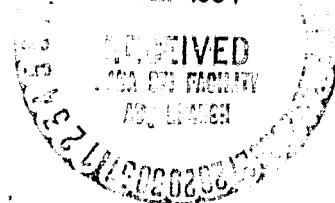
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Unclassified  
G3/43 00184

SPECTRAL CHARACTERIZATION OF THE LANDSAT THEMATIC MAPPER SENSORS

Brian L. Markham and John L. Barker  
NASA/Goddard Space Flight Center  
Earth Resources Branch/Code 923  
Greenbelt, MD 20771

131415/6  
SEP 1984



## SPECTRAL CHARACTERIZATION OF THE LANDSAT THEMATIC MAPPER SENSORS

### INTRODUCTION

The intent of this document is to provide a summary of the information obtained on the spectral characteristics of the two Thematic Mapper (TM) instruments built and tested by Hughes Aircraft Company for the NASA Landsat Program. The first of these two units, the protoflight (TM/PF) model, was integrated into the Landsat-4 satellite, which was launched on 16 July, 1982. The second, the flight (TM/F) unit, has been integrated into the Landsat-4 backup spacecraft, which is scheduled for possible launch in 1985.

Each Thematic Mapper has seven spectral bands. These bands, with their nominal bandpasses, are:

1. Blue-green, 450 nm to 520 nm.
2. Green, 520 nm to 600 nm.
3. Red, 630 nm to 690 nm.
4. Near-IR, 760 nm to 900 nm.
5. Mid-IR 1, 1550 nm to 1750 nm.
6. Thermal-IR, 10.4  $\mu\text{m}$  to 12.5  $\mu\text{m}$ .
7. Mid-IR 2, 2080 nm to 2350 nm.

Each reflective band consists of an array of 16 channels; the thermal band consists of four channels. Although there are multiple detectors per band, there is only one filter per band (covering all detectors). This design differs from the MSS where each channel has both an individual detector and

filter, the first four bands are located at the primary focal plane of the TM, which is uncooled, and all use monolithic silicon detectors. Bands 5 through 7 are located on the cooled focal plane, which operates at 90°K-105°K. Bands 5 and 7 use monolithic InSb detectors; band 6 uses photoconductive HgCdTe detectors.

NASA placed two sets of specifications related to spectral performance on the instrument. One set of specifications concerned the spectral coverage of the bands. The specifications were on the following parameters (Fig. 1):

1. Lower and upper-band edges--points at 50% of peak relative spectral response (RSR).
2. Lower and upper-edge slopes--widths between specified percentages of maximum spectral response.
3. Spectral flatness--percentage of bandpass within given percentage (10% for reflective bands, 20% for thermal band) of peak response, after dividing out detector slope for silicon detectors.
4. Spurious system response--percentage of response outside 5% RSR points relative to response inside 50% points for solar equivalent input.

The second set of specifications concerned the spectral matching of the channels within each of the reflective bands. It stated that when all channels within a band are calibrated to produce equivalent outputs when viewing the specified flat scene radiances, the maximum difference in output between channels when all are viewing the specified spectrally sloping scene shall be less than 0.5 percent of the minimum saturation level (Fig. 2).

Hughes developed separate tests to determine compliance with the spectral coverage and spectral matching specifications. In addition, other tests conducted on the TM instruments revealed spectrally related information. Time and program constraints limited the number and detail of the spectral tests conducted, and in general, less spectral data was collected on the TM instruments than on the MSS sensors (Markham and Barker, 1982).

## SPECTRAL COVERAGE

### Procedures

The primary spectral coverage test\* was based on analyses of spectral measurements on the components contributing to the spectral response: filters, detectors and optical surfaces. The overall spectral response for a TM channel was defined as:

$$\text{RSR}_{Ai}(\lambda) = \frac{\text{TOA}(\lambda) * \text{TFA}(\lambda) * \text{RA}_i(\lambda)}{KA_i} \quad (1)$$

\*Hughes Aircraft Company, Santa Barbara Research Center, "TM System Spectral Response," internal memorandum HS236-7213, Jan. 13, 1981; "F-1 TM System Relative Spectral Response," internal memorandum HS236-8162, Nov. 9, 1982.

Where:

$RSR_{Ai}(\lambda)$  = normalized relative spectral response in band A, channel i (percent).

$TOA(\lambda)$  = spectral throughput of the optical system in band A (percent).

$TFA(\lambda)$  = spectral transmission of the filters in band A (percent).

$RA_i(\lambda)$  = relative spectral response of detector i for band A (percent).

$KA_i$  = the normalization factor to bring the peak overall band A, channel i response to 100%.

By measuring the component responses and then calculating the overall spectral response, determination of compliance with the spectral coverage specifications could be facilitated without tying up the TM instrument for the test. Note that the filter and optical responses were band specific, whereas the detector response was channel specific.

The optical system for bands 1-4 consists of five mirror surfaces: the scan mirror, the primary and secondary telescope mirrors and the two mirrors of the scan line corrector (Fig. 3). Bands 5-7 have two additional mirror surfaces and two windows: the relay spherical and folding mirrors and the ambient and dewar windows. The optical components' transmittances and reflectances were measured with a spectrophotometer. Measurements of mirror reflectance were taken on witness samples which were coated concurrently with each mirror. Reflectance measurements were taken at an angle corresponding to use within the system, that is, normal incidence for all but the scan and scan line corrector mirrors, which were measured at a 45 degree angle. Window transmittances were measured on the actual flight parts at a normal angle of incidence. The products of the appropriate set of measurements were used as the optical spectral throughputs for the individual bands.

Each TM band has one filter for all channels within the band (Fig. 4). The small size of each filter made measuring its spectral transmittance difficult, so measurements made on the filter material prior to sizing were used in the calculations of RSR. Filter materials for bands 1-5, 7 were measured at nominal operating temperature. Band 6 filter material could not be measured at operating temperature (900K-1050K) prior to sizing, and was therefore measured at ambient temperature. Measurements on a piece of witness filter material at ambient and at 900K were used to determine a factor for converting ambient measurements to 900K conditions. Both the TM/PF and TM/F used filters cut from the same pieces of filter material, therefore identical filter transmission data were used for both calculations of RSR.

Each TM has 16 silicon photodiode detectors for each of bands 1-4, 16 InSb detectors for bands 5 and 7 and four HgCdTe detectors for band 6 (Fig. 4). The relative spectral responses of three of the TM/PF detectors per band were measured for bands 1-4. Differences between the three detector measurements were deemed to be smaller than the measurement errors, so the

average of the three was used to represent all 16 detectors of the TM/PF. As the detector spectral response should theoretically be smooth, a best-fit curve through the averaged measured responses was used in the calculations of RSR. The TM/PF measurements were also used to represent the TM/F detectors as all detector arrays were from the same batch. For bands 5 and 7, one element of "sister" arrays (manufactured from the same wafer as the actual parts) were measured, as the actual parts could not be measured directly. These measurements were used to represent all 16 detectors for both the TM/PF and TM/F. For band 6 in the TM/PF all four detectors were measured and were individually used to make channel-by-channel calculations of RSR. For the TM/F, the odd (1 and 3) channels were similar and the even (2 and 4) channels were similar, and only two calculations were made for band 6.

Thus, with the exception of band 6, RSR's for the TM units were calculated on a band-by-band basis. In addition, again excluding band 6, the same numbers were used for the TM/F as for the TM/PF for the filter and detector responses. In the reflective bands only the differences in the optical surfaces between TM/PF and TM/F affected the calculated RSR's. In band 6, RSR was calculated on a channel-by-channel basis for the TM/PF and with one calculation for the even channels and one for the odd channels for the TM/F.

The one spectral coverage specification not addressed by the RSR calculation was spurious system response. The spurious system response, a measure of out-of-band response, is the integrated response outside the 5% response points relative to inside the 50% response points for solar equivalent input. What was typically used to determine compliance with this specification was the filter vendor's (Optical Coating Laboratory, Inc.) calculations of the integrated spurious filter transmission--with the integration being performed across the nominal range of sensitivity for the detectors, but not considering the detector's response or solar irradiance. For bands 4 and 6, the nominal detector responses and solar irradiances were considered in the calculation and these should give more accurate representations of true out-of-band response.

A limited empirical determination of out-of-band response was also conducted on the TM/F.\* Peak responses of the primary focal plane bands to scans of a slit of light passed separately through witness filter pieces of the other bands were recorded.

### Results

The results of the RSR calculations are presented in Figures 5-11, along with a comparison of the spectral performance to specifications. In Appendix A the RSR data for TM/PF and TM/F are tabulated (Tables A1-A7). For the reflective bands (1-5, 7) performance was within specifications and near nominal with the following exceptions:

1. Bands 2 and 3 flatnesses were slightly below specifications (<5%), and band 7 flatness was below specifications.

\*Hughes Aircraft Company, SBRC, "Light Leaks in the Prime Focal Plane Assembly-II," internal memorandum HS236-8163, November 19, 1982.

2. Band 5 upper-band edge was higher than specifications: 1730-1770 nm specified, 1784 nm actual.

3. Band 2 band edges were shifted upward about 9 nm relative to nominal.

4. Band 4, 5 and 7 lower-band edges were 16-18 nm higher than nominal.

The band 5 out-of-specification upper-band edge resulted in the inclusion of a portion of the spectrum affected by atmospheric water absorption. This could contribute to increased sensitivity of the band to atmospheric water content variability. The other variations from specifications are not expected to produce significant data utility impacts. In bands 1-5 and 7 the TM/PF and TM/F responses were similar, with the only differences being apparent in the within-band shape. The differences in within-band shape were due to the only differences in the numbers input to the RSR calculations: optics.

In band 6, the TM/PF and TM/F showed fundamentally different spectral responses. The TM/PF upper-band edge was detector determined at a temperature dependent value of about 11.7  $\mu\text{m}$ ; the TM/F upper-band edge was filter determined at 12.43  $\mu\text{m}$ . The TM/PF band 6 was out of specification in terms of the upper band edge, upper-edge slope and flatness. The TM/F band 6 was within specification except for the lower-edge slope which was slightly wide. The principal reason for the 10.4  $\mu\text{m}$  to 12.5  $\mu\text{m}$  bandwidth specification on band 6 was to allow sufficient signal to achieve the 0.50% radiometric sensitivity requirement. As the TM/PF scanner's band 6 radiometric response was significantly better than specified, the failure to meet the spectral specification was not critical.

The calculated out-of-band responses suggest that all bands are within specifications (Table 1). In most bands the spurious response is simply an indication as to how rapidly the RSR rises from 0% to 5% and drops from 5% to 0%. The bands in general do not contain significant response peaks away from the primary response region. In band 1 there are two minor transmission "peaks" at 800 and 885nm with magnitudes of 0.5% and 0.7%, respectively (Fig. 12). In band 3 there is some transmission in the 950-1100nm range, reaching a peak transmittance of 3% at about 955nm (Fig. 13).

In the empirical test of spurious system response each band gave the highest output to light externally filtered through a piece of its filter material, as expected (Table 2). Also adjacent bands showed some spectral "crosstalk" as their spectral responses overlapped. The only noteworthy out-of-band response occurred in band 1. Band 1 gave a 1.2 count response for a radiance passing through a band 4 filter that produced 115 counts in band 4. This indicates that the two small peaks in the filter transmission of band 1 in the band 4 region result in a 1 count response in band 1 for about every 100 counts in band 4. A comparable impact on band 4 output filtered by a band 1 filter material was not obtained due to the lower gain setting in band 4 and the higher response of silicon in the band 4 region. Note that the impact of the band 3 response at 950-1100 nm was not evaluated in this test as no TM band covered this spectral region. The impact of the band 3 response at 950-1100 nm would be less than the filter transmission indicates, as the relative response of the silicon detectors drops rapidly with increasing wavelength in this region. At 950 nm it is

down to about 50% of its peak response at 850 nm and dropping rapidly.

## SPECTRAL MATCHING

### TM/PF Procedures\*

The spectral matching test designed for the TM/PF scanner made use of instrumentation configurations already planned for other tests and data from existing tests, thereby limiting the impact on program scheduling. First, each channel of the TM/PF scanner was calibrated on a 1.22 m integrating sphere of known spectral radiance (Fig. 14). This test, conducted 29-30 June 1981, was a standard calibration test and provided the gains and offsets for each channel. Then on 8-11 July 1981, a second test, slightly modified to allow for spectral matching data collection, was conducted. In this test, the TM/PF was aligned to the TM calibrator (a collimator and several light sources) (Fig. 14). The output of each channel to the TM calibrator MTF source (a small integrating sphere) was recorded and converted to radiance using the gains and offsets from the first test. The MTF source was filtered for the band 1, 2 and 4 tests. As the large integrating sphere and the MTF light source were spectrally different, this provided a spectral matching test, with the differences in output between channels to the second source indicating the mismatch.

The spectral mismatch was determined as follows:

1. Using the gains and offsets of each channel in a band from the 29-30 June large integrating sphere test, the effective spectral radiance of the calibrator MTF source in each channel was calculated from the 8-11 July test output, e.g. band 1 channel 1:

<u>Parameter</u>	<u>Units</u>	<u>Value</u>	<u>Source</u>
a. GAIN	( $\text{mW}/\text{cm}^2\text{st}\mu\text{m}^{-1}$ )	16.490	29-30 June test
b. OFFSET	(mux)	1.187	29-30 June test
c. OUTPUT TO CALIBRATOR	(mux)	146.720	8-11 July test
d. EFFECTIVE SPECTRAL RADIANCE	( $\text{mW}/\text{cm}^2\text{st }\mu\text{m}$ )	8.825	$\frac{(c)-(b)}{(a)}$

2. The channels with the maximum and minimum effective spectral radiances in each band were determined. The difference in their spectral radiances was the spectral mismatch. This difference was expressed as a percentage of the average output of all channels in the band to the calibrator or as a percentage of the minimum saturation level. The first number gave a better measure of the spectral mismatch; the second number was useful for comparing to the specifications.

Although a spectral matching test, this test was not responsive to the original NASA specifications. It somewhat more closely matched a set of spectral matching

\*Hughes Aircraft Company, SBRC, "Spectral Matching Test Requirement-Supplement to Test BL07," internal memorandum HS236-692, July 21, 1980.

parameters provided by the Landsat-4 science office (Fig. 15).

### TM/PF Results

The results of the TM/PF spectral matching tests (Table 3)\* showed "spectral mismatches" of up to 6% of signal values (2% of minimum saturation levels), suggesting that either the detectors were poorly matched within bands or the filters had significant local variations in spectral transmittance. Two factors may have caused the indicated spectral mismatches to be greater than the actual values. First, the two tests were conducted about two weeks apart. Although TM detectors are stable relative to MSS photomultipliers, some changes in gains and offsets may have affected the results. Second, measurements of the TM calibrator's MTF spherical integrating source (SIS) indicated significant non-uniformities in illumination. As in the test using the calibrator's SIS, each channel views a different portion of the source, these non-uniformities could have contributed to inflating the spectral mismatches.<sup>†</sup> No additional spectral matching tests were performed on the TM/PF to improve the spectral mismatch estimates.

### TM/F Procedures<sup>‡</sup>

The spectral matching test was redesigned for the TM/F tests. Data from a 1.22 m integrating sphere test (14 July 1982) were again used to provide the gains and offsets. Then, a new second test, conducted on 15 July 1982 provided the alternate spectral source. In this test a laboratory collimator and a 15 cm integrating sphere replaced the TM calibrator with its spherical integrating source. In addition, a new set of spectral filters was obtained, such that the differences in spectral slopes of the two sources closely approximated the specified differences.

A second modified TM/F spectral matching test was conducted in an attempt to reduce the inflation of the spectral mismatch due to any non-uniformities of this 15 cm integrating sphere. In this test, the same data as before were taken with the filtered source mounted in the collimator and a second set of data was taken with the spectral filter removed. The data, signal levels in MUX, were converted to effective spectral radiance using the 1.22 m sphere calibration. To calculate spectral mismatch, the minimum difference in any channel's output to the two sources was subtracted from the maximum difference in any channels output to give the error quantity, which was then expressed as a percentage of the output or the minimum saturation level. An additional correction was applied to the resultant percentages to account for the fact that the difference in spectra for the collimator with and without filters did not conform to the specified values.

\*Hughes Aircraft Co., SBRC, "TM PF BL07R Test Result Summary," internal memorandum, HS236-7567, July 23, 1981.

<sup>†</sup>Hughes Aircraft Co., SBRC, "Protoflight Spectral Matching Performance Revisited," internal memorandum, HS236-7608, August 25, 1981.

<sup>‡</sup>Hughes Aircraft Co., SBRC, "TM Spectral Matching," internal memorandum, HS236-7873, March 1, 1982.

## TM/F Results

Results of the first test (Table 4)\* were generally "better" than in the TM/PF tests, except in band 4 where the TM/F test was more severe than the TM/PF test. Still, specifications were not indicated as being met in bands 1, 4 and 5. In the second test (Table 5) better performance was indicated, with all but band 4 meeting specifications.

To provide a reference point for the TM/F spectral mismatch results, the spectral mismatches of the five existing MSS sensors were calculated using their measured channel-by-channel relative spectral responses (Norwood et al., 1972; Felkel et al., 1977; Markham and Barker, 1982) for the specified targets (Table 6).† The TM spectral mismatches fell within the range of MSS mismatches or were somewhat better. Thus, if the TM/F results can also be considered representative of the TM/PF spectral mismatches, no greater spectral striping problems can be expected on the TM than on past MSS's.

\*Hughes Aircraft Company, SBRC, "Spectral Matching Test Results--Second Revision," internal memorandum, HS236-8084-2, July 21, 1982.

†The output of each MSS channel was calculated as:

$$\text{OUTPUT} = \frac{\sum_{I=a}^b SR(I) * RSR(I)}{\sum_{I=a}^b RSR(I)}$$

Where:

- |        |  |
|--------|--|
| I      | - points of RSR measurement  |
| a,b    | - range of non-zero relative spectral responses for channel                                |
| SR(I)  | - sloped radiance at I for comparable TM Band ( $\text{mw/cm}^2 \text{ st } \mu\text{m}$ ) |
| RSR(I) | - relative spectral response of channel at I   |
| OUTPUT | - output of channel ( $\text{mw/cm}^2 \text{ st } \mu\text{m}$ )                           |

The maximum output minus the minimum output equalled the spectral mismatch. This divided by the average output in the band provided the percentage spectral mismatch.

## PRIMARY FOCAL PLANT LIGHT LEAKS\*

One additional spectrally related characteristic observed on the TM/F was a family of light leaks in the primary focal plane. These leaks were discovered during the spatial coverage testing of the TM/F. The light leaks have the following characteristics:

1. They affect all four bands in the prime focal plane (PFP) and no bands in the cooled focal plane (CFP).
2. They appear as secondary maxima in the scan direction line spread function (Fig. 16).
3. Their position is the same for both the odd and even half bands, (the odd and even detectors are displaced from each other by 2.5 IFOV's) (Table 7). The magnitude of the light leaks is the same for all detectors in a half-band.
4. They are roughly 20 IFOV's (track direction) by 1 IFOV (scan direction) in dimensions.
5. They are white leaks: the light does not pass through the spectral filters, though their relative magnitude does depend on the spectral character of the illumination.

The location and shape of the light leaks suggests they are associated with the gaps between the filter mounts in the primary focal plane (Fig. 4). The gaps between the filter mounts and the slots between the individual band assemblies do not perfectly coincide. This may be allowing light to scatter into the detectors. Note that the PFP diagram is for the TM/PF, whereas the light leak data is the TM/F. It is believed that the TM/PF has comparable leaks, though not exactly at the same locations and of the same magnitudes. Also note that the worst measured light leak was about 1% of the detector's response, though this percentage would be greater when the detector is centered on a dark target and the light leaks are centered on a neighboring bright area.

## SUMMARY

Spectral coverage for the TM/PF and TM/F instruments was determined by analyses of spectral measurements of the optics, filters and detectors. Individual channel relative spectral responses were not measured. In the reflective bands, optics accounted for the only differences between the TM/PF and the TM/F, and the calculated spectral responses were similar. The only significant deviation from specifications in the reflective bands was the band 5 upper-band edge which extended to 1784 nm into an atmospheric water absorption region. In band 6 (emissive thermal) the TM/PF and TM/F had fundamentally different spectral responses. The TM/PF upper-band edge was lower than specifications, however the detectors were sufficiently sensitive to exceed the 0.5°K radiometric specification, so the narrower bandwidth was not critical. The TM/F met the upper-band edge specification, as well as the radiometric specification, but was less sensitive overall.

\*Hughes Aircraft Co., SBRC, "Light Leaks in the Prime Focal Plane Assembly-II," internal memorandum, HS236-8163, November 19, 1982.

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FIGURE 9  
COMPARISON OF CALIBRATION PULSES BETWEEN FORWARD AND  
REVERSE SCANS  
POSTLAUNCH DATA

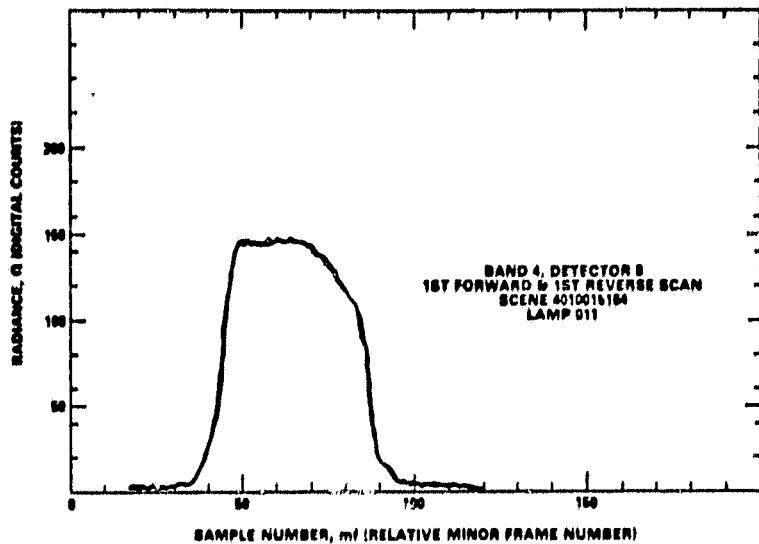
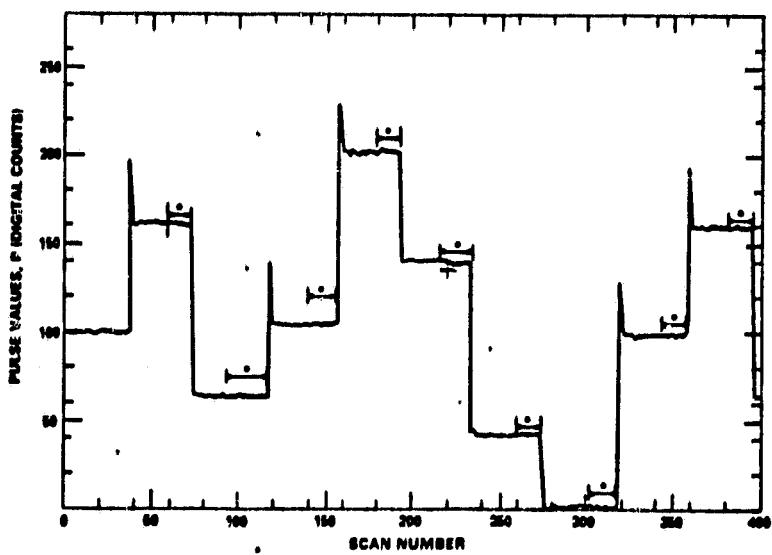


FIGURE 9  
POSTLAUNCH RADIOMETRIC CALIBRATION - TM LANDSAT-4  
TM1 CHANNEL 9



\*PULSE VALUES USED IN COMPUTING PULSE AVERAGE,  
F, IN THE SCROUNCE SYSTEM.

Band 1 and band 3 filters had minor transmission peaks in the near-IR region: 0.5% and 0.7% at 800 nm and 885 nm respectively for band 1, 2.8% and 1.2% at 945 nm and 1000 nm respectively for band 3.

Satisfactory spectral matching data for the TM/PF was never obtained. The TM/F spectral matching data indicated within specification performance (< 0.5%) for all but band 4 (1.7%). Comparison to MSS performance indicated TM performed comparably or better than MSS's in spectral matching.

Several minor leaks were detected in the TM/F prime focal plane. The odd channels of band 1 (magnitude of the light leaks comparable for all detectors in a half band), had the largest light leaks. In the band 1 odd channels, with the TM calibrator 'white' light source, a light leak at 13.1 IFOV along scan off the detector center made about a 1% contribution to the signal. The location and shape of the light leaks suggests that they are associated with the slots at the sides of the individual band assemblies. It is believed the TM/PF has comparable light leaks.

#### ACKNOWLEDGEMENTS

This paper is based solely on data obtained from Hughes/SBRC. This data has been provided along with generous assistance in interpretation by R. W. Cline, J. C. Lansing and D. G. Brandshaft. The assistance of Sy Lee and Ronald Achenbach in data entry and presentation is also greatly appreciated.

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Norwood, V. T., L. R. Fernelia and G. A. Tadler, 1972, "Multispectral Scanner System for ERTS-Four-Band Scanner System, Final Report," NASA CR-132758, NASA/GSFC, Greenbelt, MD.

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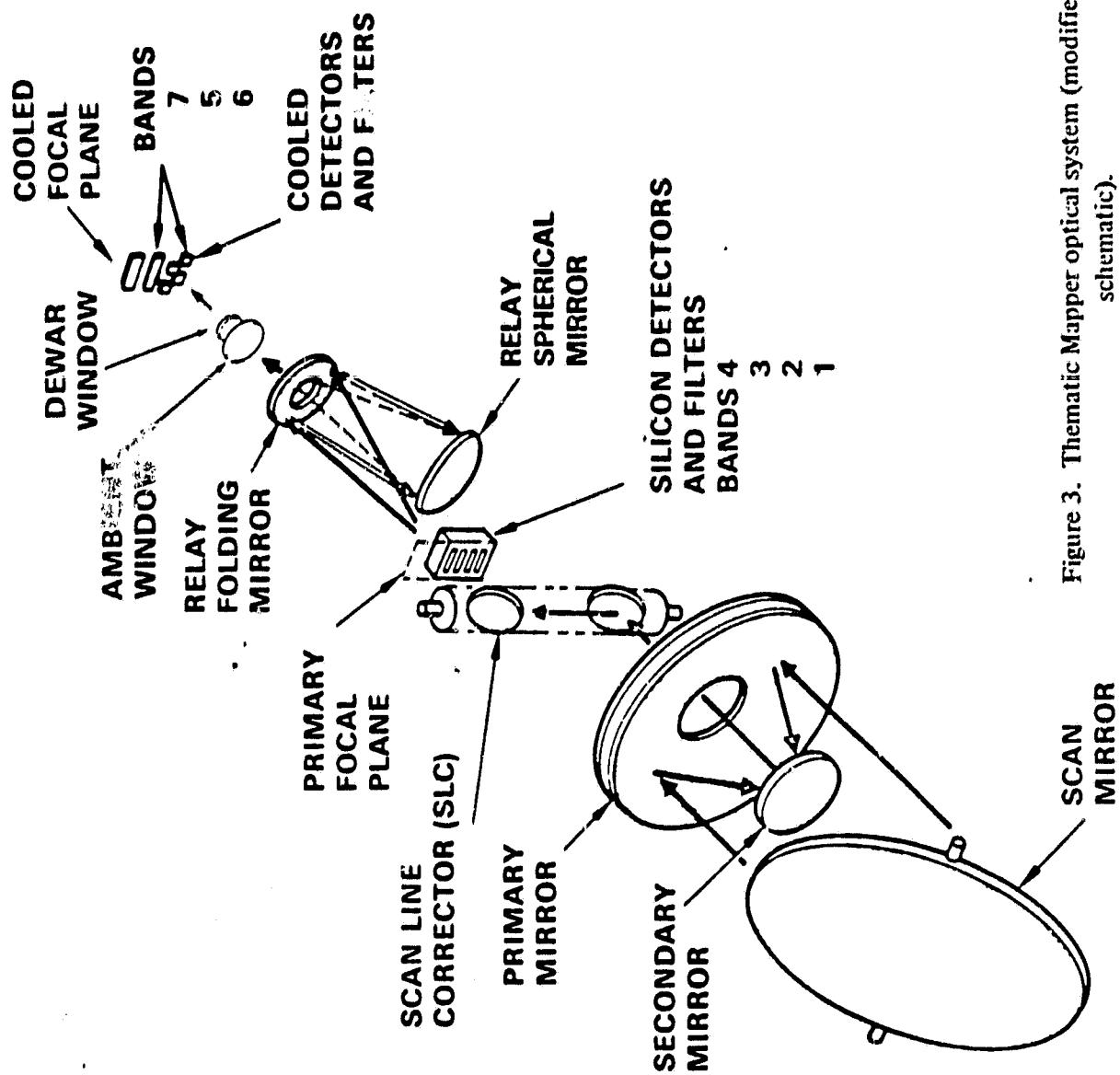
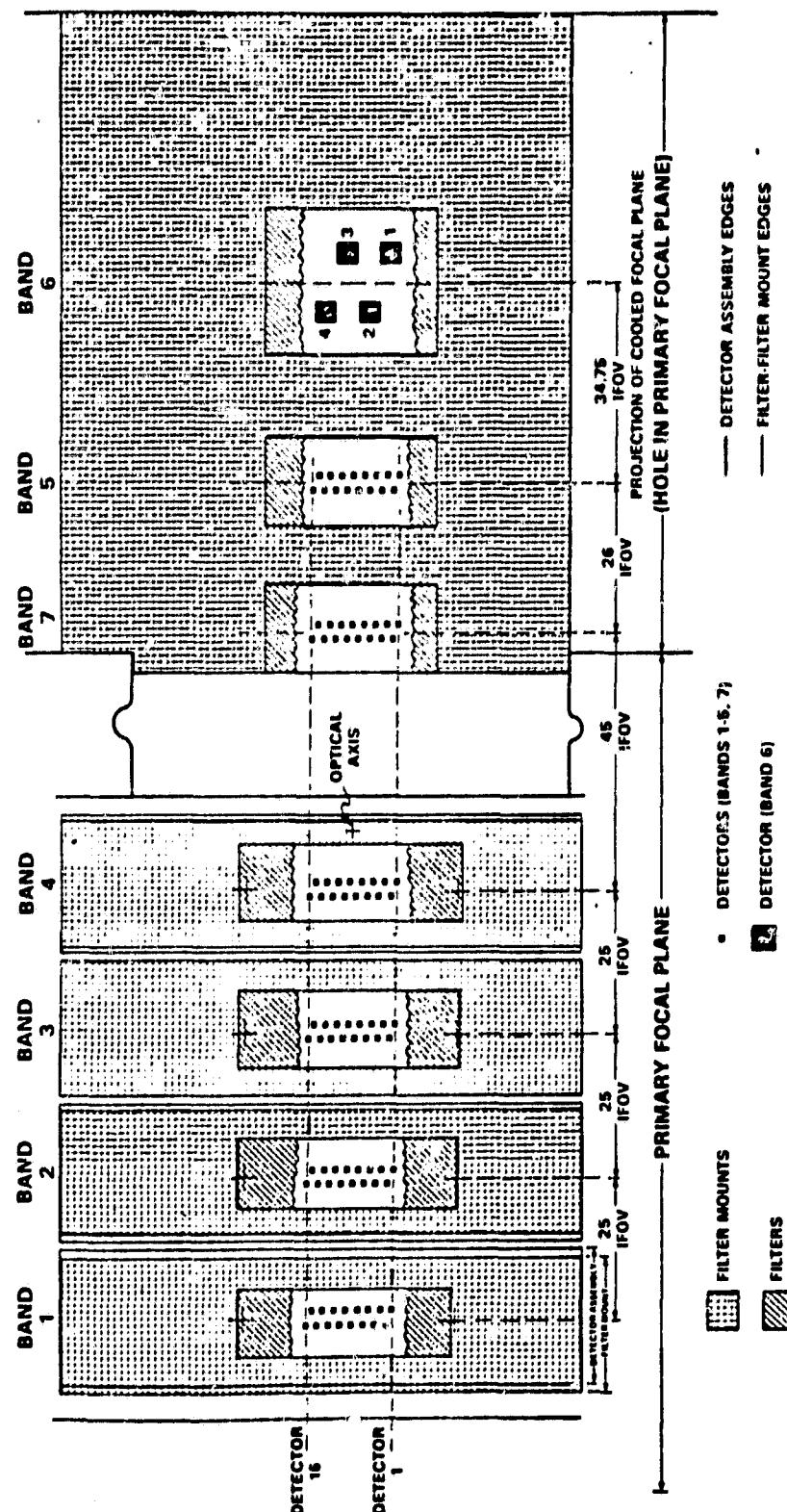


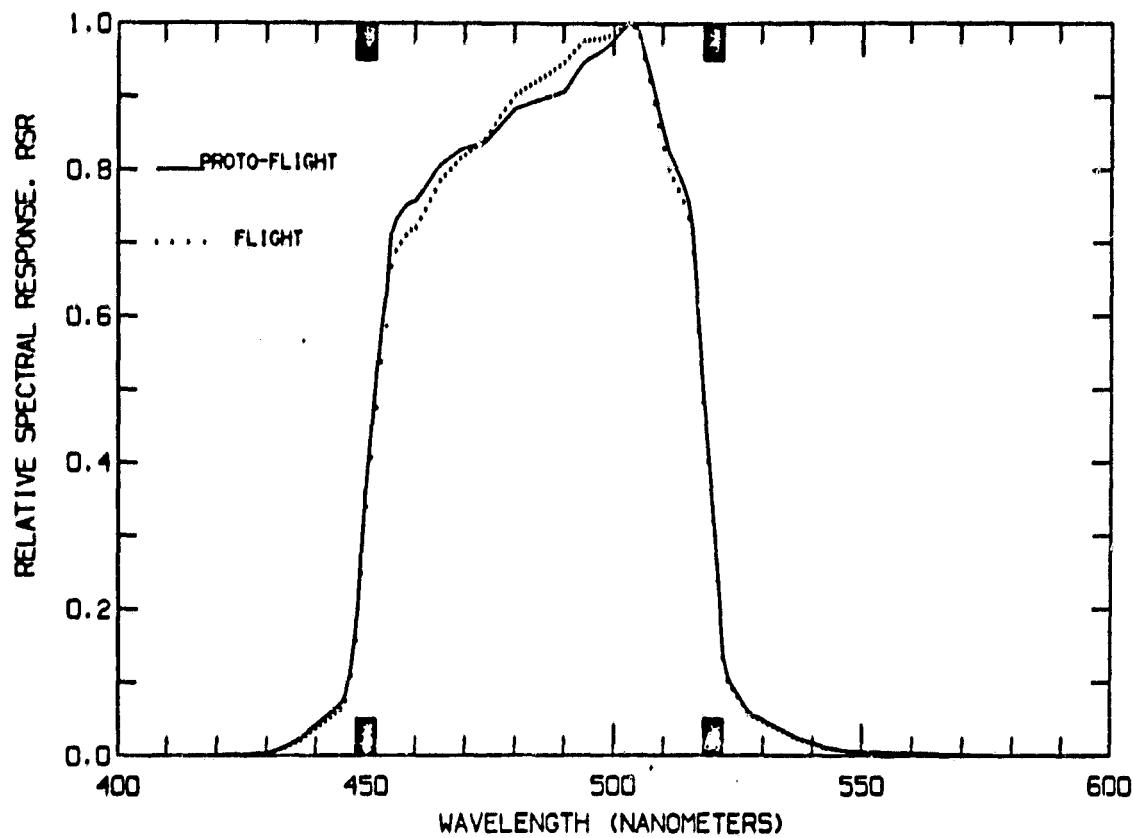
Figure 3. Thematic Mapper optical system (modified Hughes schematic).

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**Figure 4.** TM/PF primary focal plane and projection of cooled focal plane at primary focal plane.

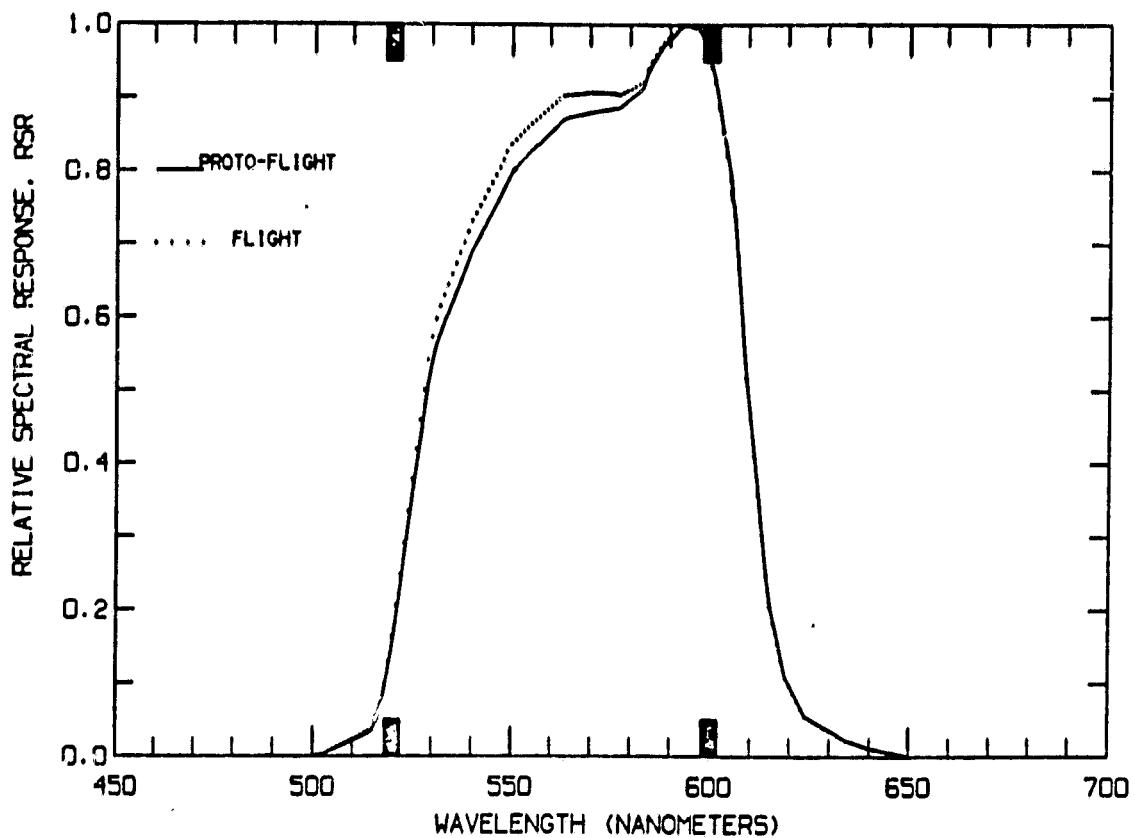
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SPECTRAL PARAMETER	SPECIFICATION	PROTOFLIGHT	FLIGHT
LOWER BAND EDGE (nm)	$450 \pm 10$	452	452
UPPER BAND EDGE (nm)	$520 \pm 10$	518	518
LOWER BAND EDGE SLOPE (nm)			
20% TO 70%	20 (MAX)	7	8
5% TO 70%	30 (MAX)	14	15
UPPER BAND EDGE SLOPE (nm)			
70% TO 20%	20 (MAX)	5	6
70% TO 5%	40 (MAX)	14	14
FLATNESS (%) WITH LINEAR CORRECTION	— 75 (MIN)	32 78	42 76

Figure 5. Thematic Mapper spectral performance – band 1.

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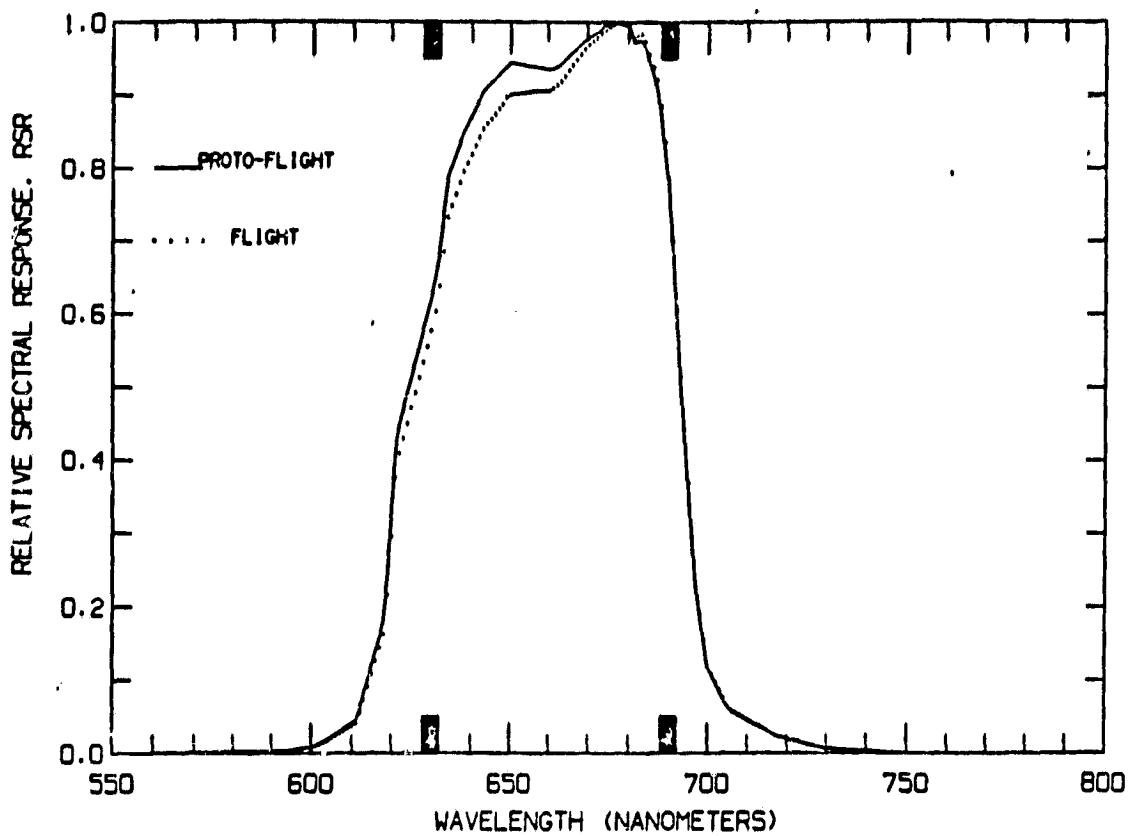


<u>SPECTRAL PARAMETER</u>	<u>SPECIFICATION</u>	<u>PROTOFLIGHT</u>	<u>FLIGHT</u>
LOWER BAND EDGE (nm)	$520 \pm 10$	529	528
UPPER BAND EDGE (nm)	$600 \pm 10$	610	610
LOWER BAND EDGE SLOPE (nm)			
20% TO 70%	20 (MAX)	20	17
5% TO 70%	30 (MAX)	25	22
UPPER BAND EDGE SLOPE (nm)			
70% TO 20%	20 (MAX)	9	9
70% TO 5%	40 (MAX)	19	18
FLATNESS (%)	—	26	48
WITH LINEAR CORRECTION	75 (MIN)	[71] *	[72] *

\*OUT OF SPECIFICATION

Figure 6. Thematic Mapper spectral performance – band 2.

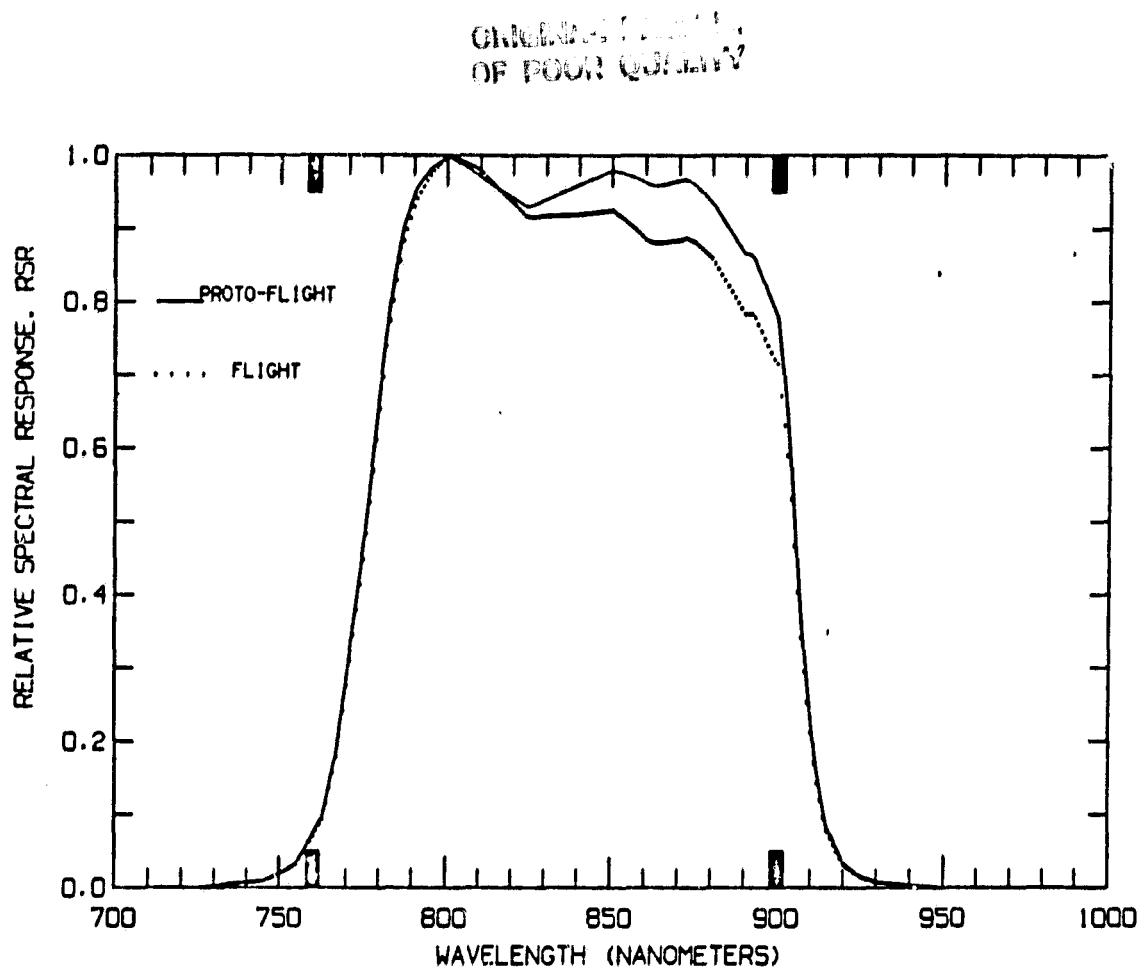
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<u>SPECTRAL PARAMETER</u>	<u>SPECIFICATION</u>	<u>PROTOFLIGHT</u>	<u>FLIGHT</u>
LOWER BAND EDGE (nm)	$630 \pm 20$	624	626
UPPER BAND EDGE (nm)	$690 \pm 10$	693	693
LOWER BAND EDGE SLOPE (nm)			
20% TO 70%	20 (MAX)	14	15
5% TO 70%	30 (MAX)	21	22
UPPER BAND EDGE SLOPE (nm)			
70% TO 20%	20 (MAX)	7	6
70% TO 5%	40 (MAX)	18	18
FLATNESS (%) WITH LINEAR CORRECTION	— 75 (MIN)	65 [71] *	56 [73] *

\*OUT OF SPECIFICATION

Figure 7. Thematic Mapper spectral performance – band 3.

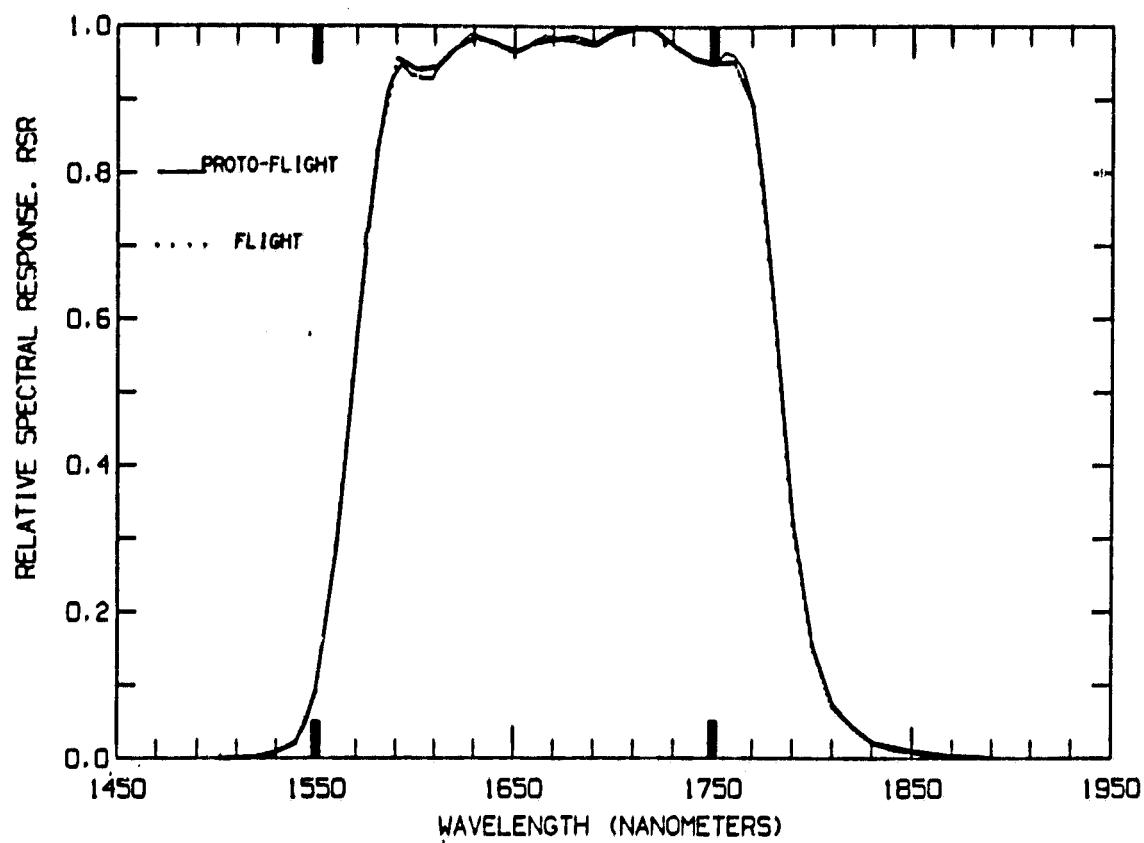


<u>SPECTRAL PARAMETER</u>	<u>SPECIFICATION</u>	<u>PROTOFLIGHT</u>	<u>FLIGHT</u>
LOWER BAND EDGE (nm)	$760 \pm 20$	776	776
UPPER BAND EDGE (nm)	$900 \pm 10$	905	904
LOWER BAND EDGE SLOPE (nm) 20% TO 70%	20 (MAX)	13	13
5% TO 70%	30 (MAX)	23	24
UPPER BAND EDGE SLOPE (nm) 70% TO 20%	30 (MAX)	9	10
70% TO 5%	40 (MAX)	17	18
FLATNESS (%) WITH LINEAR CORRECTION	— 75 (MIN)	76 ↑	53 81

†NO CORRECTION NEEDED

Figure 8. Thematic Mapper spectral performance – band 4.

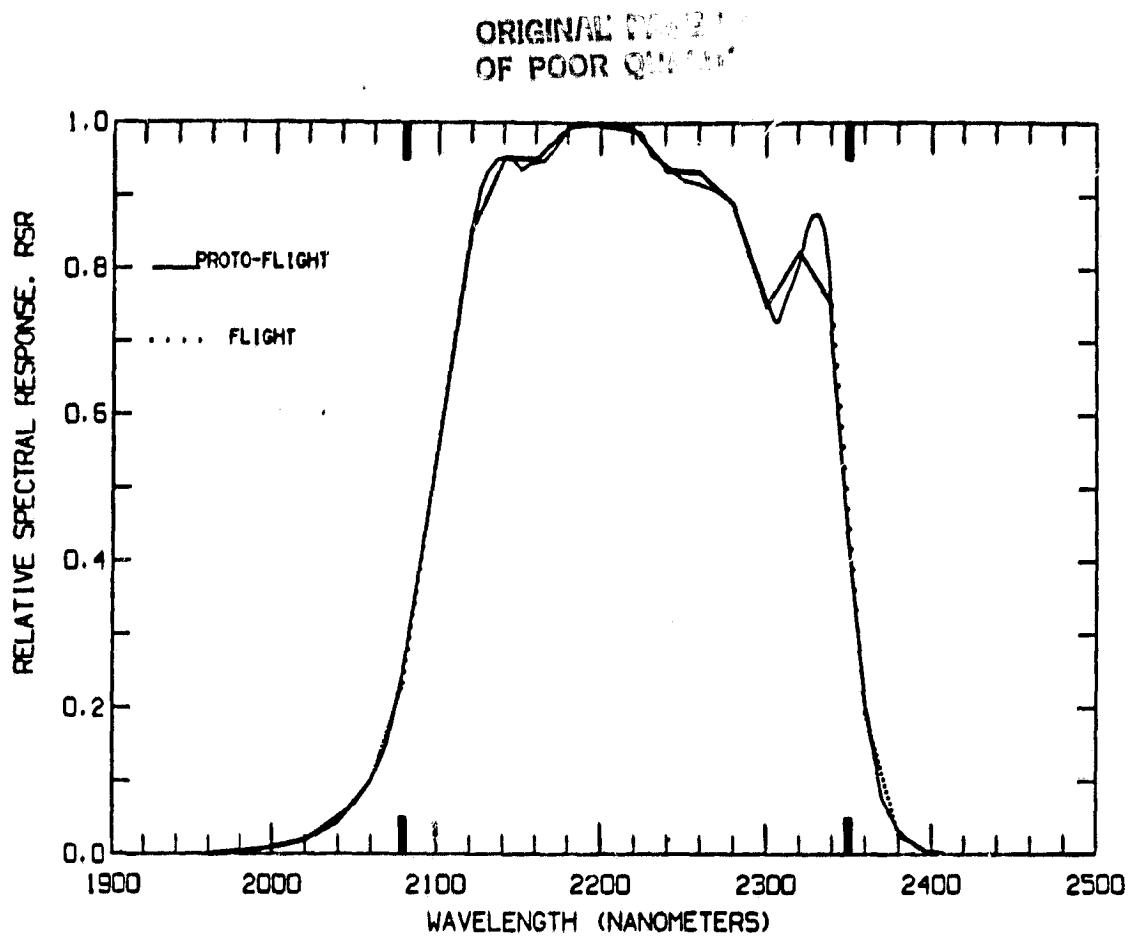
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<u>SPECTRAL PARAMETER</u>	<u>SPECIFICATION</u>	<u>PROTOFLIGHT</u>	<u>FLIGHT</u>
LOWER BAND EDGE (nm)	$1550 \pm 20$	1568	1567
UPPER BAND EDGE (nm)	$1750 \pm 20$	1784 *	1784 *
LOWER BAND EDGE SLOPE (nm) 5% TO 75%	50 (MAX)	32	33
UPPER BAND EDGE SLOPE (nm) 75% TO 5%	50 (MAX)	42	43
FLATNESS (%)	75 (MIN)	84	84

\*OUT OF SPECIFICATION

Figure 9. Thematic Mapper spectral performance – band 5.

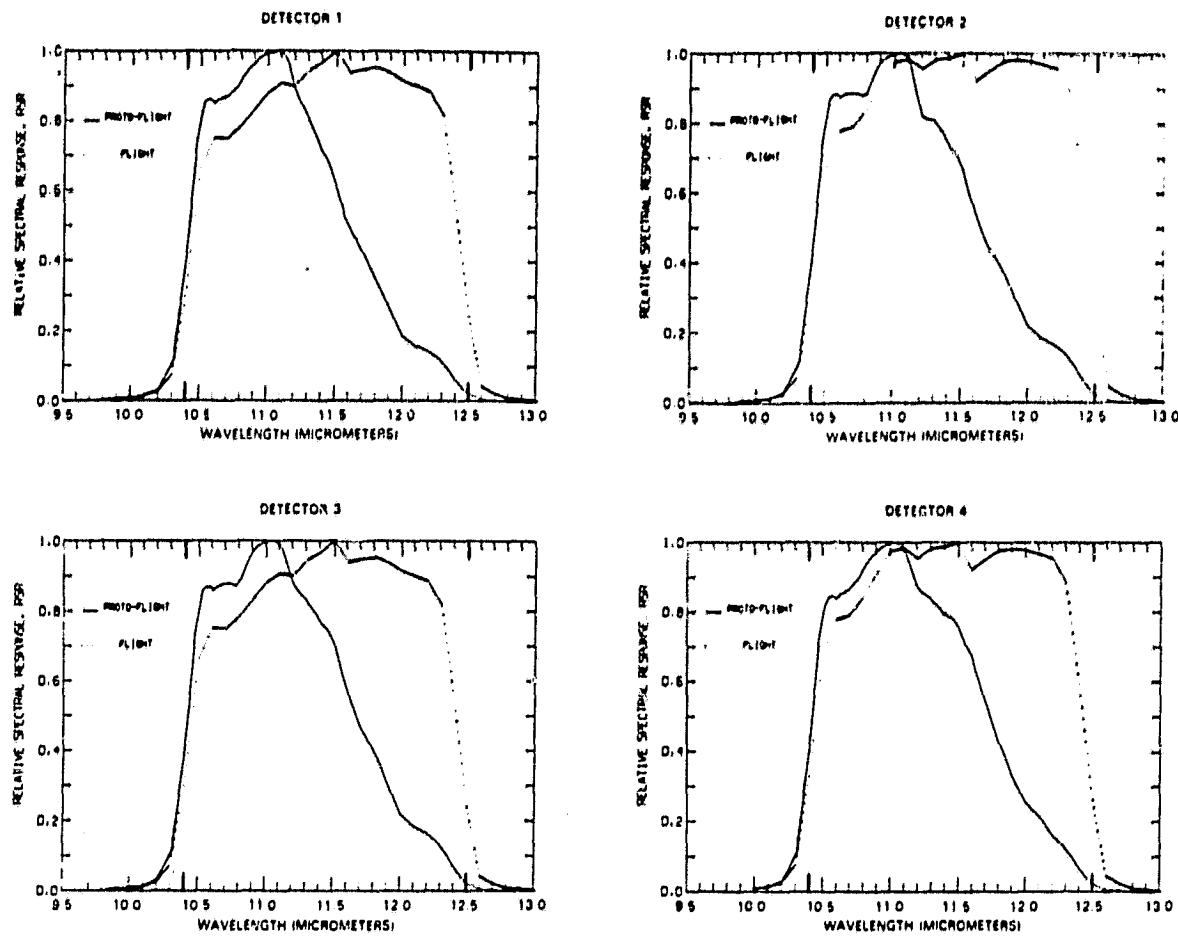


<u>SPECTRAL PARAMETER</u>	<u>SPECIFICATION</u>	<u>PROTOFLIGHT</u>	<u>FLIGHT</u>
LOWER BAND EDGE (nm)	$2080 \pm 30$	2097	2097
UPPER BAND EDGE (nm)	$2350 \pm 30$	2347	2349
LOWER BAND EDGE SLOPE (nm) 5% TO 75%	80	75	71
UPPER BAND EDGE SLOPE (nm) 75% TO 5%	80	37	37
FLATNESS (%)	75	59 *	57 *

\*OUT OF SPECIFICATION

Figure 10. Thematic Mapper spectral performance – band 7.

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<u>SPECTRAL PARAMETER</u>	<u>SPECIFICATION</u>	<u>PROTOFLIGHT</u>	<u>FLIGHT</u>
LOWER BAND EDGE ( $\mu\text{m}$ )	$10.4 \pm 0.1$	10.42	10.45
UPPER BAND EDGE ( $\mu\text{m}$ )	$12.5 \pm 0.1$	[11.66] *	12.43
LOWER BAND EDGE SLOPE ( $\mu\text{m}$ ) 5% TO 75%	0.3 (MAX)	0.25	[0.34] *
UPPER BAND EDGE SLOPE ( $\mu\text{m}$ ) 75% TO 5%	0.3 (MAX)	[1.01] *	0.26
FLATNESS (%)	75	[67] *	78

\*OUT OF SPECIFICATION

Figure 11. Thematic Mapper spectral performance – band 6.

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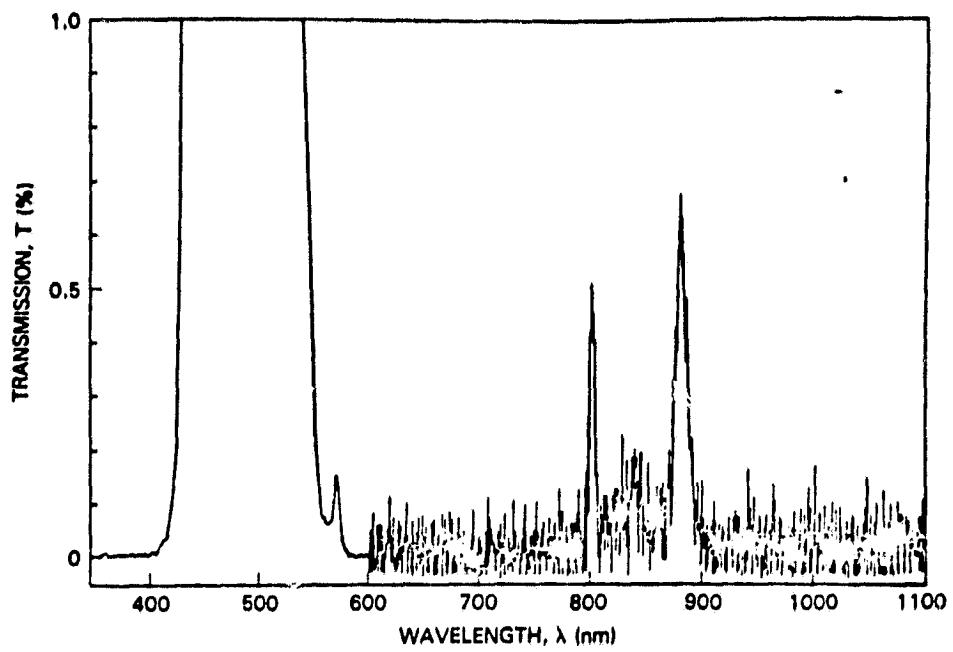


Figure 12. Thematic Mapper band 1 out-of-band filter transmission. Note scale 0-1%.

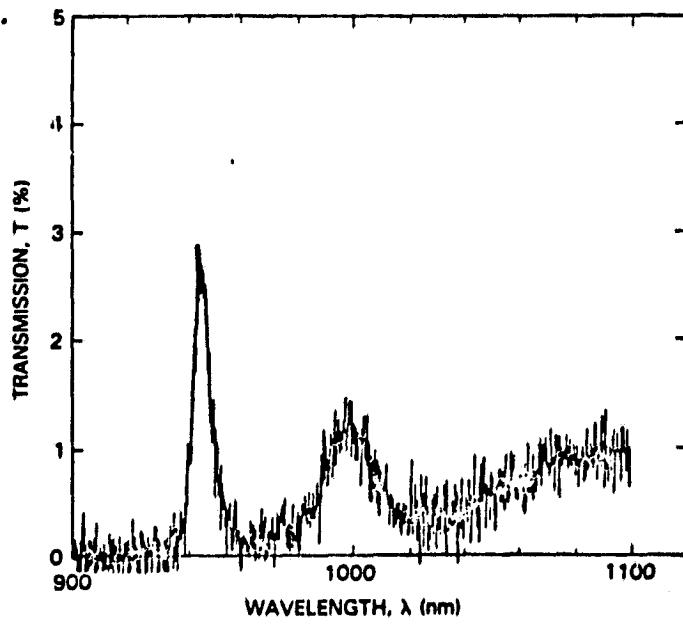
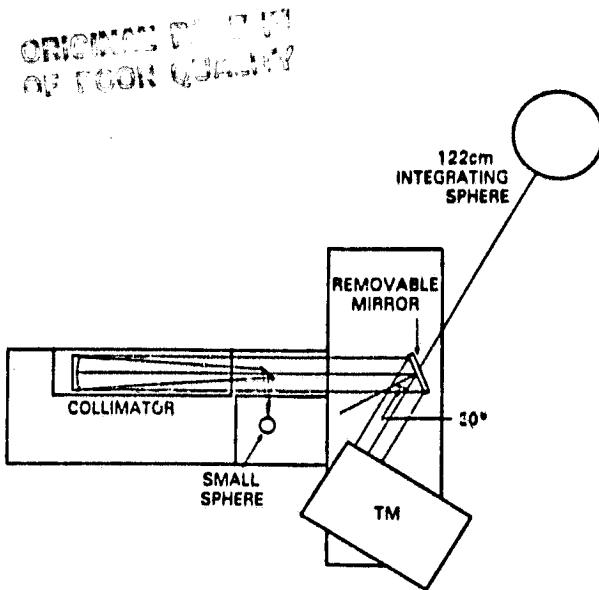
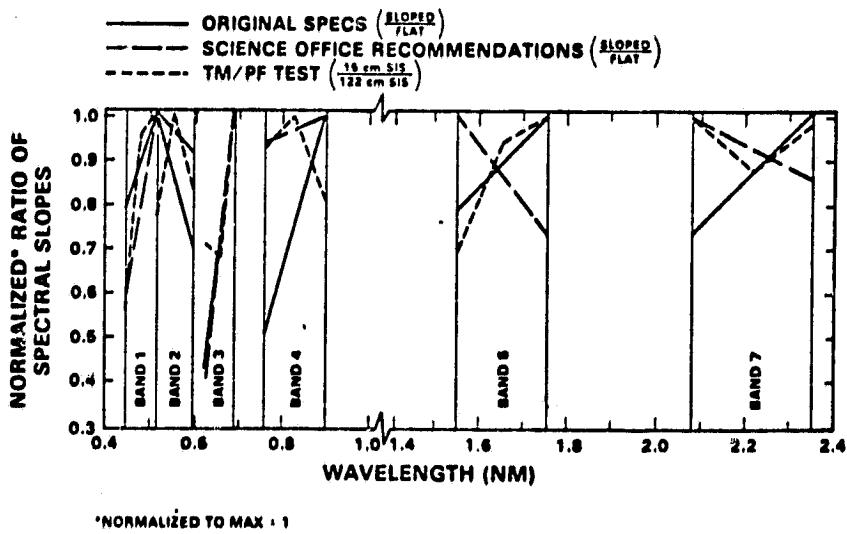


Figure 13. Thematic Mapper band 3 out-of-band filter trans-  
mission between 900 & 1100 nm. Note scale 0-5%.



**Figure 14.** Spectral matching test schematic. One set of measurements was taken viewing the large integrating sphere (mirror removed). A second set of measurements was taken viewing the small sphere (mirror in place). The TM calibrator with MTF source acted as the collimator/small sphere for the PF tests. A laboratory collimator and a separate small sphere were used for the F tests.



**Figure 15.** Ratio of spectral slopes of Spherical Integration Sources (SIS) used for TM/PF spectral matching tests in relation to specifications and science office recommendations. TM/F tests simulated the original specifications.

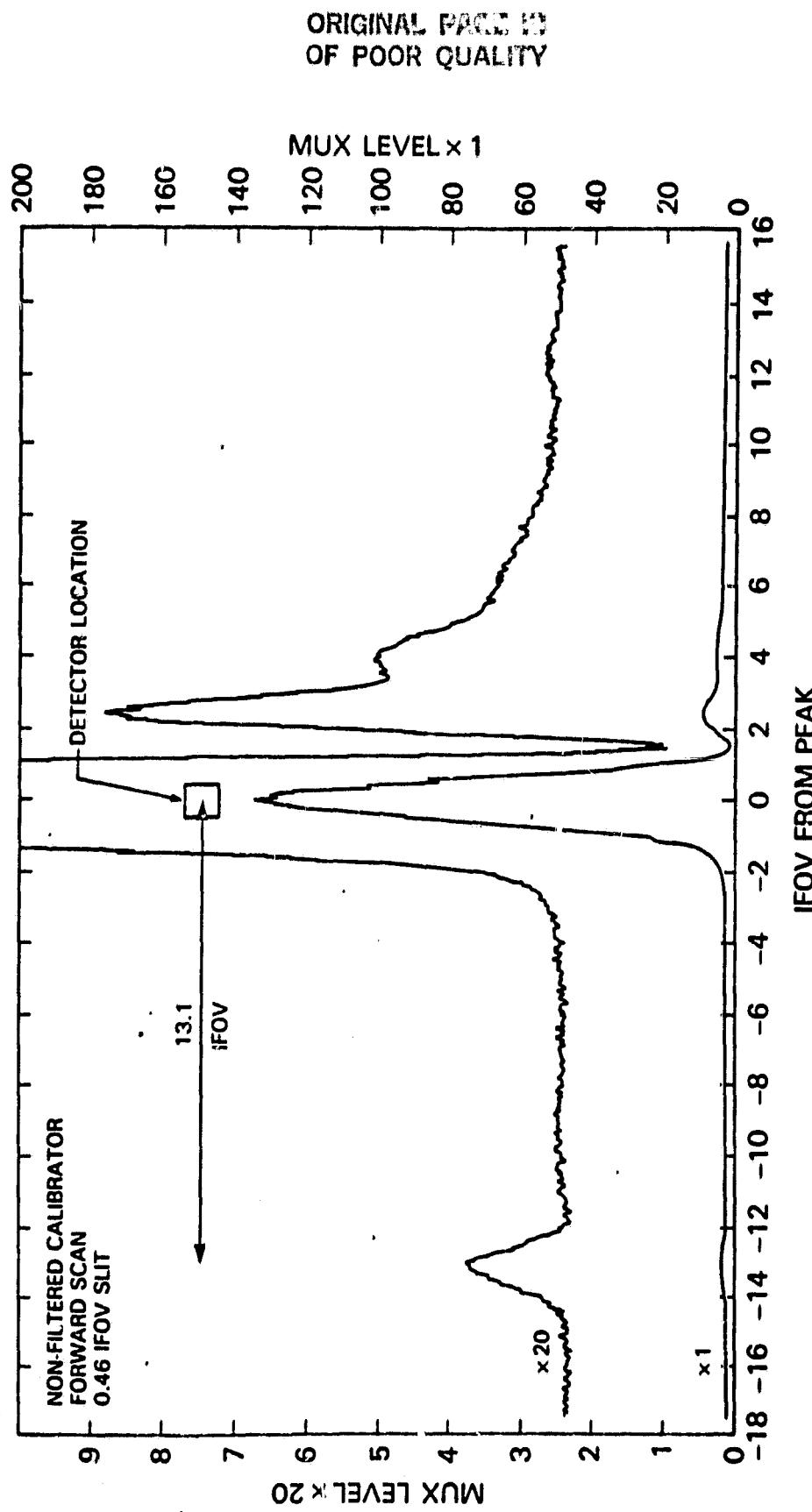
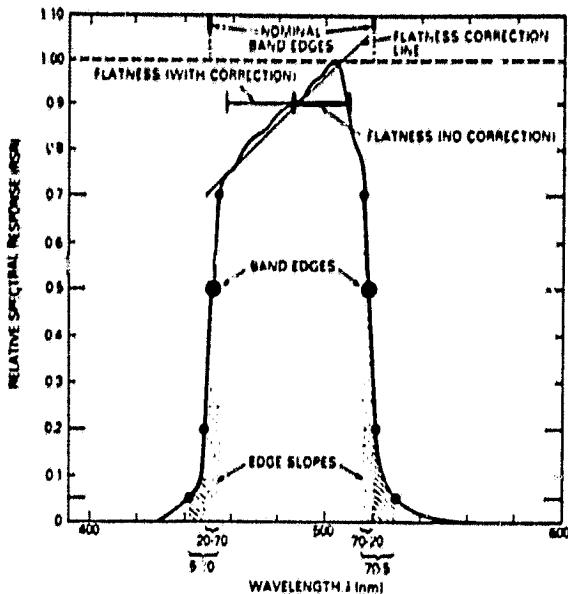
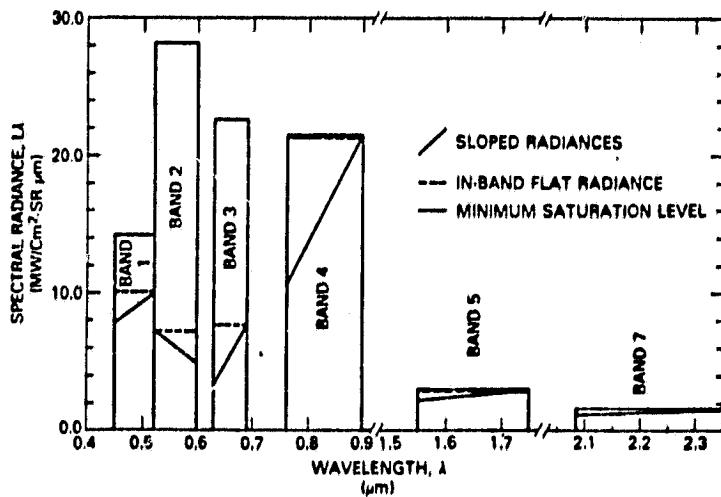


Figure 16. TM/F band 1 odd-channel forward scan line spread function showing location of light leak at 13.1 IFOV off of detector center.

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**Figure 1.** Spectral coverage parameters under specification for TM bands 1-4. The bands 5-7 specifications were on the 5-75% edge slope and the band 6 flatness specification was at 80% RSR.



**Figure 2.** Spectral matching requirements for the Thematic Mapper reflective bands. When all channels within a band are calibrated to produce equivalent outputs when viewing the specified flat scene radiance, then the maximum difference in output between channels when all are viewing the spectrally sloping scene shall be less than 0.5 percent of the minimum saturation level.

**Table 1.**  
**TM Integrated Out-of-Band Responses in Relation**  
**to Specifications**

BAND	<u>OUT-OF-BAND RESPONSES</u>	
	CALCULATED FROM FILTER TRANSMISSION	(%) SPECIFICATION
1	1.64%	5 (MAX)
2	1.30%	5 (MAX)
3	2.87%	5 (MAX)
4	0.78% *	5 (MAX)
5	0.79%	5 (MAX)
7	1.25%	5 (MAX)
6	0.81% *	5 (MAX)

\* DETECTOR RSR AND SOLAR IRRADIANCE CONSIDERED IN CALCULATION

**Table 2.**  
**TM/F Peak Responses to Filtered Slit Light Source**

BAND IN WHICH OUTPUT MEASURED	SOURCE LIGHT FILTER (BAND #)			
	1	2	3	4
1	120.0	6.6	0.0	1.2
2	2.7	82.0	1.2	0.2
3	<0.2	1.5	105.0	0.2
4	-0.2	-0.2	<0.1	115.0

Table 3.  
TM/PF Spectral Matching Results — Large and  
Filtered Small Integrating Spheres

MAXIMUM BETWEEN CHANNEL SPECTRAL MISMATCH					
BAND	PERCENT OF OUTPUT (%)	MINIMUM SATURATION LEVEL (%)	SPECIFICATION (% MSS)	BAND	PERCENT OF OUTPUT (%)
1	2.3	1.8*	0.5	1	1.67
2	5.9	2.0*	0.5	2	1.20
3	1.3	0.2	0.5	3	1.50
4	0.8	0.6*	0.5	4	2.58
5	1.6	1.2*	0.5	5	0.92
7	2.6	1.2*	0.5	7	0.85

\*OUT OF SPECIFICATION

Table 4.  
TM/F Spectral Matching Results Test 1 — Large  
and Filtered Small Integrating Spheres

MAXIMUM BETWEEN CHANNEL SPECTRAL MISMATCH					
BAND	PERCENT OF OUTPUT (%)	MINIMUM SATURATION LEVEL (%)	SPECIFICATION (% MSS)	BAND	PERCENT OF MINIMUM SATURATION LEVEL (%)
1	1.89	1.8*	0.5	1	0.89*
2	5.9	2.0*	0.5	2	4.5
3	1.3	0.2	0.5	3	0.35
4	0.8	0.6*	0.5	4	1.50*
5	1.6	1.2*	0.5	5	0.73*
7	2.6	1.2*	0.5	7	0.42

\*OUT OF SPECIFICATION

Table 5.  
TM/F Spectral Matching Results Test 2 — Small  
Integrating Sphere With and Without Filters

MAXIMUM BETWEEN CHANNEL SPECTRAL MISMATCH					
BAND	PERCENT OF OUTPUT (%)	MINIMUM SATURATION LEVEL (%)	SPECIFICATION (% MSS)	MSS BAND	COMPARABLE TM BAND
1	0.89	0.46	0.50	1	2
2	—*	—*	0.50	2	3
3	1.50	0.34	0.50	3	4
4	3.00	1.74†	0.50	4	1-4
5	0.09	0.07	0.50	4	4
7	0.22	0.11	0.50	1-5	1-5

\*VALID TEST COULD NOT BE CONDUCTED  
†OUT OF SPECIFICATION

Table 6.  
Comparison of MSS to TM/F Spectral Mismatch

FLIGHT MODEL					
TM SPECTRAL MISMATCH (% OF SIGNAL)					
BAND	PERCENT OF OUTPUT (%)	MINIMUM SATURATION LEVEL (%)	SPECIFICATION (% MSS)	MSS BAND	COMPARABLE TM BAND
1	1.89	1.8*	0.5	1	2
2	5.9	2.0*	0.5	2	3
3	1.3	0.2	0.5	3	4
4	0.8	0.6*	0.5	4	1-4
5	1.6	1.2*	0.5	4	4
7	2.6	1.2*	0.5	1-5	1-5

\*CALCULATED FROM MSS 1, 2, 3, 4 (PI). F CHANNEL BY CHANNEL  
RELATIVE SPECTRAL RESPONSE MEASUREMENTS USING THE  
COMPARABLE TM BAND SPECIFIED SLOPING RADIANCE

**Table 7.**  
**Principal TM/F Primary Focal Plane Light Leaks (Magnitudes > 0.2 MUX with  
 MTF Slit Source)**

HALF-BAND	LEAK POSITION RELATIVE TO CENTRAL MAX (IFOV'S)	LEAK AMPLITUDE (MUX)	LEAK AMPLITUDE (% PEAK RESPONSE)
1-ODD	-13.1	1.3	1.10
1 - EVEN	-15.6	0.45	0.37
	14.7	0.20	0.16
2 - ODD	-12.0	0.20	0.18
2 - EVEN	-	-	-
3 - ODD	-12.0	0.30	0.27
	12.3	0.90	0.80
3 - EVEN	-14.8	0.25	0.21
	9.7	0.30	0.26
4 - ODD	-11.7	0.30	0.24
	12.6	0.20	0.16
4 - EVEN	-14.0	0.60	0.53
	-7.4	0.30	0.26
	10.1	0.20	0.18

## APPENDIX A

**Table A1**  
THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE  
BAND 1

WAVELENGTH (NM)	PF	F									
4.12	0.0005	.....	453	0.5788	0.5366	494	0.9476	0.9761	535	0.2039	0.0296
4.13	0.0006	.....	454	0.6282	0.5856	495	0.9519	0.9775	536	0.0273	0.0261
4.14	0.0006	.....	455	0.7114	0.6667	496	0.9533	0.9788	537	0.0237	0.0227
4.15	0.0007	.....	456	0.7318	0.6860	497	0.9607	0.9802	538	0.0215	0.0205
4.16	0.0007	.....	457	0.7415	0.6939	498	0.9651	0.9815	539	0.0192	0.0184
4.17	0.0008	.....	458	0.7500	0.7095	499	0.9703	0.9837	540	0.0170	0.0162
4.18	0.0008	.....	459	0.7550	0.7165	500	0.9769	0.9891	541	0.0147	0.0140
4.19	0.0009	.....	460	0.7554	0.7200	501	0.9816	0.9935	542	0.0125	0.0119
4.20	0.0009	0.0007	461	0.7643	0.7326	502	0.9943	0.9978	543	0.0110	0.0105
4.21	0.0010	0.0008	462	0.7763	0.7454	503	1.0000	1.0000	544	0.0098	0.0093
4.22	0.0010	0.0008	463	0.7864	0.7583	504	0.9986	0.9952	545	0.0086	0.0081
4.23	0.0011	0.0009	464	0.7955	0.7714	505	0.9897	0.9828	546	0.0073	0.0059
4.24	0.0012	0.0009	465	0.8067	0.7841	506	0.9629	0.9524	547	0.0061	0.0058
4.25	0.0012	0.0010	466	0.8117	0.7924	507	0.9358	0.9219	548	0.0059	0.0056
4.26	0.0016	0.0013	467	0.8168	0.8002	508	0.9095	0.8914	549	0.0057	0.0054
4.27	0.0010	0.0016	468	0.8219	0.8080	509	0.8807	0.8607	550	0.0055	0.0052
4.28	0.0024	0.0020	469	0.8266	0.8156	510	0.8519	0.8293	551	0.0053	0.0050
4.29	0.0028	0.0023	470	0.8289	0.8206	511	0.6244	0.8021	552	0.0048	0.0046
4.30	0.0032	0.0027	471	0.8309	0.8257	512	0.8101	0.7877	553	0.0048	0.0046
4.31	0.0051	0.0042	472	0.8331	0.8308	513	0.7956	0.7732	554	0.0016	0.0014
4.32	0.0012	0.0010	473	0.8351	0.8359	514	0.7688	0.7565	555	0.044	0.042
4.33	0.0013	0.0008	474	0.8383	0.8421	515	0.7559	0.7339	556	0.0042	0.0040
4.34	0.0114	0.0113	475	0.8457	0.8526	516	0.7058	0.6859	557	0.0040	0.0038
4.35	0.0156	0.0141	476	0.8532	0.8524	517	0.5965	0.5784	558	0.0036	0.0035
4.36	0.0159	0.0170	477	0.8607	0.8724	518	0.4956	0.4813	559	0.0038	0.0033
4.37	0.0252	0.0216	478	0.8682	0.8824	519	0.4137	0.4002	560	0.0034	0.0031
4.38	0.0310	0.0268	479	0.8758	0.8925	520	0.3292	0.3187	561	0.0031	0.0029
4.39	0.0357	0.0321	480	0.8835	0.9016	521	0.2447	0.2367	562	0.0029	0.0027
4.40	0.0371	0.0370	481	0.8850	0.9049	522	0.1359	0.1324	563	0.0027	0.0025
4.41	0.0376	0.0420	482	0.8885	0.9111	523	0.1054	0.1018	564	0.0025	0.0023
4.42	0.0531	0.0471	483	0.8910	0.9154	524	0.0945	0.0911	565	0.0023	0.0021
4.43	0.0538	0.0524	484	0.8934	0.9196	525	0.0834	0.0804	566	0.0020	0.0018
4.44	0.0645	0.0577	485	0.8959	0.9238	526	0.0713	0.0696	567	0.0018	0.0016
4.45	0.0704	0.0633	486	0.8983	0.9285	527	0.0612	0.0588	568	0.0016	0.0014
4.46	0.0127	0.0146	487	0.9007	0.9132	528	0.0554	0.0532	569	0.0014	0.0012
4.47	0.1213	0.1097	488	0.9031	0.9379	529	0.0520	0.0438	570	0.0011	0.0009
4.48	0.1175	0.1564	489	0.9054	0.9425	530	0.0485	0.0465	571	0.0009	0.0007
4.49	0.2730	0.2483	490	0.9078	0.9472	531	0.0450	0.0431	572	0.0007	0.0005
4.50	0.3718	0.3391	491	0.9179	0.9548	532	0.0445	0.0397	573	0.0005	0.0003
4.51	0.4425	0.4058	492	0.9281	0.9623	533	0.0380	0.0364	574	0.0002	0.0001
4.52	0.5142	0.4741	493	0.9384	0.9698	534	0.0344	0.0330			

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Table A2  
THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE - BAND 2

WAVELENGTH (NM)	PF F										
501	0.0007	519	0.6754	0.7463	527	0.0863	0.3017	614	0.2457	0.2464	
502	0.0019	540	0.6899	0.7312	578	0.8914	0.9013	615	0.2057	0.2039	
503	0.0032	541	0.7003	0.7416	579	0.8958	0.9018	616	0.1796	0.1796	
504	0.0065	542	0.7107	0.7520	580	0.9002	0.9124	617	0.1562	0.1552	
505	0.0089	543	0.7213	0.7625	581	0.9037	0.9155	518	0.1313	0.1306	
506	0.0114	544	0.7319	0.7730	582	0.9092	0.9186	619	0.1078	0.1072	
507	0.0139	545	0.7426	0.7836	583	0.9136	0.9218	620	0.0973	0.0969	
508	0.0164	546	0.7533	0.7941	584	0.9223	0.9312	621	0.0868	0.0865	
509	0.0190	547	0.7642	0.8047	585	0.9444	0.9503	622	0.0760	0.0760	
510	0.0215	548	0.7751	0.8153	586	0.9536	0.9591	623	0.0657	0.0655	
511	0.0241	549	0.7861	0.8260	587	0.9630	0.9683	624	0.0550	0.0549	
512	0.0268	550	0.7971	0.8367	588	0.9715	0.9768	625	0.0518	0.0517	
513	0.0295	551	0.8081	0.8425	589	0.9769	0.9819	626	0.0486	0.0485	
514	0.0322	552	0.8191	0.8891	590	0.9820	0.9881	627	0.0454	0.0453	
515	0.0349	553	0.8317	0.8152	591	0.9875	0.9913	628	0.0422	0.0422	
516	0.0504	554	0.8454	0.8206	592	0.9941	0.9967	629	0.3390	0.3389	
517	0.0632	555	0.0713	0.8261	593	0.9986	0.9999	630	0.0357	0.0357	
518	0.0912	556	0.0982	0.8316	594	1.0000	1.0000	631	0.0324	0.0324	
519	0.1205	557	0.1297	0.8371	595	0.9991	0.9994	632	0.0291	0.0292	
520	0.1570	558	0.1675	0.8427	596	0.9984	0.9991	633	0.0258	0.0259	
521	0.1912	559	0.2055	0.8482	597	0.9953	0.9970	634	0.0225	0.0226	
522	0.2309	560	0.2479	0.8538	598	0.9794	0.9757	635	0.0207	0.0207	
523	0.2711	561	0.2908	0.8593	599	0.9644	0.9592	636	0.0188	0.0188	
524	0.3117	562	0.3341	0.8650	600	0.9488	0.9428	637	0.0170	0.0171	
525	0.3529	563	0.3779	0.8706	601	0.9265	0.9199	638	0.0151	0.0152	
526	0.3917	564	0.4190	0.8731	602	0.8941	0.8810	639	0.0132	0.0133	
527	0.4229	565	0.4593	0.8743	603	0.8644	0.8516	640	0.0114	0.0115	
528	0.4605	566	0.4999	0.8754	604	0.8288	0.8210	641	0.0102	0.0103	
529	0.5015	567	0.5409	0.8766	605	0.8056	0.7959	642	0.0091	0.0092	
530	0.5372	568	0.5718	0.8777	606	0.7963	0.7878	643	0.0080	0.0081	
531	0.5606	569	0.5967	0.8788	607	0.7621	0.7637	644	0.0069	0.0069	
532	0.5772	570	0.6142	0.8799	608	0.7974	0.7970	645	0.0057	0.0058	
533	0.5909	571	0.6286	0.8809	609	0.8073	0.8015	646	0.0046	0.0046	
534	0.6046	572	0.6431	0.8820	610	0.8072	0.8016	647	0.0034	0.0035	
535	0.6186	573	0.6578	0.8830	611	0.8070	0.8013	648	0.0023	0.0023	
536	0.6325	574	0.6722	0.8840	612	0.8069	0.8012	649	0.0012	0.0012	
537	0.6467	575	0.6868	0.8850	613	0.8067	0.8007	650	0.0000	0.0000	
538	0.6610	576	0.7015	0.8860							

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Table A3  
THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE - BAND 3

WAVELENGTH (nm)	PF	F												
559	0.0007	.....	607	0.0304	0.0272	655	0.9397	0.9052	703	0.0844	0.0864	751	0.0727	0.0756
560	0.0008	.....	608	0.0341	0.0306	656	0.9368	0.9058	704	0.0727	0.0756	752	0.0629	0.0646
561	0.0009	.....	609	0.0318	0.0340	657	0.9319	0.9058	705	0.0629	0.0646	753	0.0559	0.0583
562	0.0009	.....	610	0.0315	0.0375	658	0.9310	0.9060	706	0.0629	0.0646	754	0.0559	0.0555
563	0.0010	.....	611 <sup>c</sup>	0.0453	0.0409	659	0.9360	0.9052	707	0.0559	0.0555	755	0.0510	0.0525
564	0.0011	.....	612	0.0616	0.0555	660	0.9351	0.9064	708	0.0510	0.0525	756	0.0480	0.0494
565	0.0012	.....	613	0.0811	0.0700	661	0.9212	0.9104	709	0.0480	0.0494	757	0.0450	0.0464
566	0.0013	.....	614	0.1007	0.0905	662	0.9294	0.9143	710	0.0450	0.0464	758	0.0420	0.0433
567	0.0014	.....	615	0.1024	0.1082	663	0.9219	0.9155	711	0.0420	0.0433	759	0.0390	0.0402
568	0.0014	.....	616	0.102	0.1262	664	0.9463	0.9265	712	0.0390	0.0402	760	0.0360	0.0371
569	0.0015	.....	617	0.102	0.1414	665	0.9537	0.9138	713	0.0360	0.0371	761	0.0330	0.0340
570	0.0016	.....	618	0.103	0.1626	666	0.9531	0.9412	714	0.0330	0.0340	762	0.0300	0.0309
571	0.0017	.....	619	0.202	0.2169	667	0.9616	0.9488	715	0.0270	0.0277	763	0.0239	0.0246
572	0.0017	.....	620	0.3271	0.2958	668	0.9700	0.9563	716	0.0270	0.0277	764	0.0224	0.0230
573	0.0017	.....	621	0.4445	0.3753	669	0.9753	0.9640	717	0.0224	0.0230	765	0.0210	0.0215
574	0.0018	.....	622	0.491	0.4086	670	0.9753	0.9639	718	0.0210	0.0215	766	0.0195	0.0200
575	0.0018	.....	623	0.496	0.4293	671	0.9811	0.9749	719	0.0195	0.0200	767	0.0186	0.0185
576	0.0017	.....	624	0.4921	0.4503	672	0.9819	0.9799	720	0.0186	0.0185	768	0.0186	0.0185
577	0.0019	0.0017	625	0.5138	0.4715	673	0.9904	0.9847	721	0.0186	0.0185	769	0.0166	0.0169
578	0.0020	0.0017	626	0.5354	0.4923	674	0.9819	0.9895	722	0.0186	0.0185	770	0.0151	0.0154
579	0.0020	0.0018	627	0.5572	0.5132	675	0.9164	0.9932	723	0.0186	0.0185	771	0.0135	0.0139
580	0.0021	0.0018	628	0.5710	0.5343	676	0.9912	0.9966	724	0.0186	0.0185	772	0.0121	0.0123
581	0.0021	0.0019	629	0.6010	0.5555	677	1.0000	1.0000	725	0.0186	0.0185	773	0.0097	0.0099
582	0.0022	0.0019	630	0.6235	0.5774	678	0.9977	0.9995	726	0.0186	0.0185	774	0.0097	0.0099
583	0.0022	0.0020	631	0.6304	0.6031	679	0.9937	0.9989	727	0.0097	0.0099	775	0.0095	0.0095
584	0.0023	0.0020	632	0.656	0.6734	680	0.9916	0.9983	728	0.0095	0.0095	776	0.0095	0.0095
585	0.0023	0.0020	633	0.7016	0.6448	681	0.9735	0.9784	729	0.0073	0.0074	777	0.0065	0.0062
586	0.0024	0.0021	634	0.7869	0.7325	682	0.9734	0.9805	730	0.0065	0.0062	778	0.0058	0.0059
587	0.0024	0.0021	635	0.8027	0.7482	683	0.9732	0.9827	731	0.0065	0.0062	779	0.0055	0.0056
588	0.0025	0.0022	636	0.8485	0.7642	684	0.9695	0.9732	732	0.0055	0.0056	780	0.0053	0.0053
589	0.0025	0.0022	637	0.8145	0.7802	685	0.9451	0.9558	733	0.0053	0.0053	781	0.0049	0.0050
590	0.0026	0.0023	638	0.8485	0.7947	686	0.9265	0.9384	734	0.0049	0.0050	782	0.0046	0.0047
591	0.0026	0.0023	639	0.8598	0.8065	687	0.9076	0.9209	735	0.0046	0.0047	783	0.0042	0.0043
592	0.0026	0.0023	640	0.8711	0.8184	688	0.8710	0.8850	736	0.0042	0.0043	784	0.0032	0.0040
593	0.0027	0.0023	641	0.8826	0.8304	689	0.8210	0.8362	737	0.0040	0.0040	785	0.0031	0.0037
594	0.0029	0.0024	642	0.8941	0.8424	690	0.7737	0.7874	738	0.0034	0.0034	786	0.0016	0.0016
595	0.0029	0.0024	643	0.9056	0.8545	691	0.6859	0.7006	739	0.0031	0.0031	787	0.0012	0.0012
596	0.0029	0.0026	644	0.9116	0.8614	692	0.5910	0.6052	740	0.0028	0.0028	788	0.0009	0.0009
597	0.0029	0.0026	645	0.9170	0.8678	693	0.5039	0.5143	741	0.0028	0.0028	789	0.0006	0.0006
598	0.0029	0.0026	646	0.9224	0.8743	694	0.4333	0.4413	742	0.0028	0.0028	790	0.0003	0.0003
599	0.0029	0.0026	647	0.9278	0.8809	695	0.3612	0.3678	743	0.0028	0.0028	791	0.0003	0.0003
600	0.0029	0.0029	648	0.9332	0.8875	696	0.2888	0.2942	744	0.0019	0.0019	792	0.0003	0.0003
601	0.0029	0.0029	649	0.9386	0.8971	697	0.2235	0.2277	745	0.0016	0.0016	793	0.0003	0.0003
602	0.0029	0.0029	650	0.9441	0.9008	698	0.1879	0.1916	746	0.0012	0.0012	794	0.0003	0.0003
603	0.0029	0.0029	651	0.9423	0.9017	699	0.1522	0.1552	747	0.0009	0.0009	795	0.0006	0.0006
604	0.0029	0.0029	652	0.9424	0.9026	700	0.1162	0.1186	748	0.0006	0.0006	796	0.0003	0.0003
605	0.0029	0.0029	653	0.9415	0.9035	701	0.1056	0.1079	749	0.0006	0.0006	797	0.0003	0.0003
606	0.0029	0.0029	654	0.9406	0.9044	702	0.0950	0.0972	750	0.0006	0.0006	798	0.0003	0.0003

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**Table A4**  
THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE - BAND 4

WAVELENGTH (NM)	PF	F									
726	0.0005	.....	783	0.7950	0.7745	839	0.9578	0.9194	895	0.8344	0.7532
727	0.0010	.....	784	0.6218	0.8017	840	0.9598	0.9195	896	0.8229	0.795
728	0.0014	.....	785	0.8487	0.8290	841	0.9618	0.9202	897	0.8114	0.7398
729	0.0019	.....	786	0.8756	0.8563	842	0.9638	0.9208	898	0.8000	0.7302
730	0.0024	0.0023	787	0.9025	0.8838	843	0.9658	0.9214	899	0.7889	0.7208
731	0.0028	.....	788	0.9170	0.6992	844	0.9677	0.9220	900	0.7786	0.7152
732	0.0033	0.0032	789	0.9315	0.9146	845	0.9697	0.9226	901	0.7333	0.6710
733	0.0038	0.0037	790	0.9460	0.9300	846	0.9717	0.9232	902	0.6882	0.6239
734	0.0043	0.0042	791	0.9564	0.9418	847	0.9737	0.9237	903	0.6434	0.5891
735	0.0048	0.0046	792	0.9629	0.9399	848	0.9756	0.9243	904	0.5785	0.5259
736	0.0053	0.0051	793	0.9695	0.9580	849	0.9776	0.9249	905	0.5090	0.4683
737	0.0058	0.0056	794	0.9760	0.9661	850	0.9796	0.9254	906	0.4400	0.4033
738	0.0063	0.0060	795	0.9826	0.9743	851	0.9822	0.9277	907	0.3714	0.3405
739	0.0067	0.0065	796	0.9881	0.9794	852	0.9768	0.9179	908	0.3211	0.2945
740	0.0072	0.0070	797	0.9895	0.9845	853	0.9754	0.9141	909	0.2755	0.2348
741	0.0077	0.0074	798	0.9930	0.9937	854	0.9740	0.9104	910	0.2303	0.2114
742	0.0082	0.0079	799	0.9565	0.9548	855	0.9726	0.9067	911	0.1853	0.1702
743	0.0087	0.0084	800	1.0000	1.0000	856	0.9711	0.9029	912	0.1557	0.1410
744	0.0092	0.0088	801	0.9973	0.9982	857	0.9697	0.8892	913	0.1301	0.1195
745	0.0097	0.0093	802	0.9945	0.9954	858	0.9674	0.8937	914	0.1047	0.0962
746	0.0116	0.0112	803	0.9918	0.9946	859	0.9651	0.8931	915	0.0840	0.0772
747	0.0136	0.0130	804	0.9891	0.9928	860	0.9627	0.8956	916	0.0738	0.0679
748	0.0156	0.0149	805	0.9853	0.9910	861	0.9604	0.8831	917	0.0638	0.0587
749	0.0175	0.0168	806	0.9833	0.9889	862	0.9591	0.8815	918	0.0538	0.0495
750	0.0195	0.0186	807	0.9803	0.9868	863	0.9589	0.8810	919	0.0439	0.0404
751	0.0224	0.0214	808	0.9772	0.9846	864	0.9587	0.8804	920	0.0341	0.0314
752	0.0254	0.0242	809	0.9742	0.9825	865	0.9559	0.8811	921	0.0306	0.0281
753	0.0283	0.0270	810	0.9712	0.9804	866	0.9610	0.8818	922	0.0271	0.0239
754	0.0313	0.0298	811	0.9682	0.9758	867	0.9621	0.8824	923	0.0236	0.0217
755	0.0343	0.0326	812	0.9555	0.9712	868	0.9632	0.8831	924	0.0201	0.0186
756	0.0422	0.0402	813	0.9422	0.9665	869	0.9643	0.8838	925	0.0167	0.0154
757	0.0503	0.0478	814	0.9594	0.9620	870	0.9655	0.8844	926	0.0150	0.0138
758	0.0583	0.0554	815	0.9561	0.9574	871	0.9666	0.8850	927	0.0132	0.0122
759	0.0662	0.0630	816	0.9530	0.9529	872	0.9677	0.8871	928	0.0115	0.0106
760	0.0744	0.0716	817	0.9500	0.9483	873	0.9653	0.8853	929	0.0098	0.0095
761	0.0825	0.0784	818	0.9474	0.9442	874	0.9626	0.8832	930	0.0081	0.0075
762	0.0905	0.0862	819	0.9447	0.9400	875	0.9599	0.8810	931	0.0077	0.0071
763	0.0987	0.0940	820	0.9420	0.9359	876	0.9549	0.8768	932	0.0072	0.0067
764	0.1207	0.1152	821	0.9391	0.9313	877	0.9499	0.8725	933	0.0068	0.0063
765	0.1428	0.1354	822	0.9367	0.9367	878	0.9449	0.8683	934	0.0063	0.0059
766	0.1649	0.1577	823	0.9333	0.9221	879	0.9400	0.8641	935	0.0059	0.0055
767	0.1871	0.1791	824	0.9304	0.9178	880	0.9350	0.8539	936	0.0051	0.0051
768	0.2158	0.2069	825	0.9204	0.9161	881	0.9290	0.8530	937	0.0047	0.0047
769	0.2511	0.2409	826	0.9150	0.9150	882	0.9218	0.8451	938	0.0046	0.0013
770	0.2864	0.2752	827	0.9140	0.9164	883	0.9175	0.8372	939	0.0042	0.0039
771	0.3219	0.3055	828	0.9160	0.9167	884	0.9077	0.8394	940	0.0038	0.0035
772	0.3577	0.3410	829	0.9280	0.9170	885	0.9006	0.8217	941	0.0033	0.0032
773	0.3929	0.3766	830	0.9393	0.9173	886	0.8936	0.8139	942	0.0028	0.0028
774	0.4285	0.4133	831	0.9419	0.9176	887	0.8866	0.8063	943	0.0024	0.0024
775	0.4642	0.4438	832	0.9446	0.9178	888	0.8796	0.7986	944	0.0019	0.0021
776	0.5000	0.4833	833	0.9459	0.9181	889	0.8726	0.7910	945	0.0015	0.0017
777	0.5436	0.5259	834	0.9479	0.9183	890	0.8657	0.7835	946	0.0012	0.0014
778	0.5868	0.5633	835	0.9499	0.9185	891	0.8641	0.7835	947	0.0008	0.0010
779	0.6301	0.6108	836	0.9519	0.9188	892	0.8640	0.7836	948	0.0005	0.0007
780	0.6733	0.6534	837	0.9539	0.9190	893	0.8577	0.7787	949	0.0003	0.0003
781	0.7166	0.6933	838	0.9558	0.9192	894	0.7690	0.7690	950	0.0000	0.0000

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**Table A5**

THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE - BAND 5

WAVELENGTH (NM)	PF	F									
1501	0.0000	0.0001	1561	0.3120	0.3179	1621	0.9719	0.9788	1681	0.9854	0.9814
1502	0.0001	0.0002	1562	0.3399	0.3454	1622	0.9717	0.9733	1682	0.9713	0.9814
1503	0.0002	0.0003	1563	0.3650	0.3732	1623	0.9715	0.9713	1683	0.9712	0.9825
1504	0.0003	0.0004	1564	0.3953	0.4012	1624	0.9803	0.9762	1684	0.9718	0.9825
1505	0.0003	0.0004	1565	0.4248	0.4294	1625	0.9811	0.9777	1685	0.9767	0.9815
1506	0.0004	0.0005	1566	0.4536	0.4578	1626	0.9835	0.9791	1686	0.9762	0.9805
1507	0.0005	0.0006	1567	0.4876	0.4865	1627	0.9817	0.9805	1687	0.9757	0.9796
1508	0.0006	0.0007	1568	0.5118	0.5154	1628	0.9834	0.9821	1688	0.9752	0.9786
1509	0.0007	0.0008	1569	0.5112	0.5146	1629	0.9835	0.9818	1689	0.9746	0.9776
1510	0.0008	0.0009	1570	0.5059	0.5739	1630	0.9882	0.9850	1690	0.9741	0.9766
1511	0.0009	0.0010	1571	0.5980	0.5989	1631	0.9811	0.9842	1691	0.9751	0.9784
1512	0.0010	0.0011	1572	0.6252	0.6239	1632	0.9859	0.9835	1692	0.9767	0.9802
1513	0.0010	0.0011	1573	0.6556	0.6492	1633	0.9818	0.9827	1693	0.9744	0.9820
1514	0.0011	0.0012	1574	0.6801	0.6746	1634	0.9816	0.9810	1694	0.9800	0.9838
1515	0.0012	0.0013	1575	0.7077	0.7002	1635	0.9835	0.9813	1695	0.9816	0.9857
1516	0.0013	0.0014	1576	0.7319	0.7260	1636	0.9813	0.9805	1696	0.9833	0.9875
1517	0.0014	0.0015	1577	0.7546	0.7516	1637	0.9821	0.9798	1697	0.9839	0.9893
1518	0.0015	0.0015	1578	0.7775	0.7811	1638	0.9746	0.9790	1698	0.9835	0.9911
1519	0.0016	0.0016	1579	0.8005	0.8044	1639	0.9718	0.9783	1699	0.9832	0.9926
1520	0.0017	0.0017	1580	0.8236	0.8308	1640	0.9767	0.9776	1700	0.9859	0.9947
1521	0.0022	0.0024	1581	0.8417	0.8430	1641	0.9758	0.9763	1701	0.9905	0.9953
1522	0.0029	0.0031	1582	0.8518	0.8553	1642	0.9749	0.9750	1702	0.9912	0.9958
1523	0.0036	0.0039	1583	0.8740	0.8676	1643	0.9737	0.9737	1703	0.9918	0.9963
1524	0.0044	0.0046	1584	0.8903	0.8300	1644	0.9722	0.9724	1704	0.9925	0.9974
1525	0.0051	0.0054	1585	0.906	0.8925	1645	0.9721	0.9711	1705	0.9924	0.9974
1526	0.0059	0.0061	1586	0.9165	0.9150	1646	0.9712	0.9693	1706	0.9939	0.9979
1527	0.0066	0.0069	1587	0.9236	0.9175	1647	0.9703	0.9673	1707	0.9946	0.9985
1528	0.0074	0.0077	1588	0.9302	0.9301	1648	0.9694	0.9614	1708	0.9932	0.9990
1529	0.0082	0.0085	1589	0.9334	0.9428	1649	0.9695	0.9650	1709	0.9961	0.9995
1530	0.0090	0.0093	1590	0.9387	0.9553	1650	0.9676	0.9648	1710	0.9977	1.0000
1531	0.0102	0.0104	1591	0.9428	0.9540	1651	0.9671	0.9661	1711	0.9978	1.0000
1532	0.0116	0.0116	1592	0.9468	0.9526	1652	0.9656	0.9674	1712	0.9965	0.9994
1533	0.0131	0.0128	1593	0.9539	0.9511	1653	0.9639	0.9687	1713	0.9930	0.9991
1534	0.0146	0.0140	1594	0.9429	0.9497	1654	0.9637	0.9701	1714	0.9935	0.9988
1535	0.0161	0.0152	1595	0.9739	0.9482	1655	0.9715	0.9714	1715	0.9991	0.9994
1536	0.0176	0.0165	1596	0.9766	0.9467	1656	0.9722	0.9727	1716	0.9991	0.9991
1537	0.0191	0.0177	1597	0.9337	0.9453	1657	0.9747	0.9740	1717	0.9976	0.9978
1538	0.0207	0.0190	1598	0.9327	0.9438	1658	0.9753	0.9753	1718	0.9962	0.9975
1539	0.0222	0.0203	1599	0.9326	0.9423	1659	0.9766	0.9767	1719	0.9947	0.9972
1540	0.0238	0.0216	1600	0.9375	0.9409	1660	0.9803	0.9780	1720	0.9912	0.9968
1541	0.0278	0.0263	1601	0.9308	0.9412	1661	0.9719	0.9730	1721	0.9915	0.9945
1542	0.0327	0.0351	1602	0.9290	0.9415	1662	0.9722	0.9727	1722	0.9896	0.9922
1543	0.0376	0.0419	1603	0.9285	0.9418	1663	0.9747	0.9755	1723	0.9878	0.9893
1544	0.0428	0.0488	1604	0.9284	0.9421	1664	0.9861	0.9830	1724	0.9859	0.9877
1545	0.0419	0.0557	1605	0.9283	0.9424	1665	0.9816	0.9815	1725	0.9740	0.9854
1546	0.0556	0.0626	1606	0.9282	0.9421	1666	0.9810	0.9815	1726	0.9821	0.9831
1547	0.0567	0.0695	1607	0.9261	0.9431	1667	0.9837	0.9817	1727	0.9802	0.9808
1548	0.0710	0.0767	1608	0.9280	0.9434	1668	0.9839	0.9820	1728	0.9784	0.9785
1549	0.0813	0.0837	1609	0.9328	0.9437	1669	0.9847	0.9825	1729	0.9763	0.9763
1550	0.0377	0.0909	1610	0.9395	0.9440	1670	0.9834	0.9830	1730	0.9746	0.9740
1551	0.1138	0.104	1611	0.9436	0.9467	1671	0.9839	0.9833	1731	0.9727	0.9723
1552	0.1235	0.1300	1612	0.9465	0.9493	1672	0.9834	0.9817	1732	0.9709	0.9706
1553	0.1513	0.1497	1613	0.9493	0.9519	1673	0.9840	0.9840	1733	0.9690	0.9688
1554	0.1702	0.1695	1614	0.9516	0.9546	1674	0.9824	0.9844	1734	0.9671	0.9671
1555	0.1893	0.1894	1615	0.9550	0.9572	1675	0.9849	0.9847	1735	0.9652	0.9654
1556	0.2035	0.2094	1616	0.9578	0.9598	1676	0.9816	0.9813	1736	0.9634	0.9637
1557	0.2278	0.2295	1617	0.9606	0.9625	1677	0.9808	0.9804	1737	0.9615	0.9620
1558	0.2473	0.2498	1618	0.9634	0.9651	1678	0.9803	0.9807	1738	0.9537	0.9603
1559	0.2659	0.2701	1619	0.9662	0.9677	1679	0.9798	0.9861	1739	0.9576	0.9586
1560	0.2867	0.2906	1620	0.9691	0.9703	1680	0.9793	0.9793	1740	0.9559	0.9559

**Table A5**  
(continued)

**ORIGINAL PAPER  
OF POOR QUALITY**

**ORIGINAL PAGE IS  
OF POOR QUALITY**

**Table A6**  
**THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE NANO 7**

WAVELENGTH (NM)	PF	F									
1951	0.0002	.....	2011	0.0148	0.0151	2071	0.1600	0.1732	2131	0.9187	0.9170
1952	0.0003	.....	2012	0.0152	0.0156	2072	0.1701	0.1798	2132	0.9144	0.9120
1953	0.0005	.....	2013	0.0158	0.0160	2073	0.1802	0.1865	2133	0.9441	0.9170
1954	0.0007	.....	2014	0.0163	0.0165	2074	0.1933	0.1931	2134	0.9469	0.9219
1955	0.0008	.....	2015	0.0168	0.0170	2075	0.2004	0.1938	2135	0.9395	0.9259
1956	0.0010	.....	2016	0.0173	0.0175	2076	0.2106	0.2055	2136	0.9498	0.9319
1957	0.0012	.....	2017	0.0178	0.0180	2077	0.2207	0.2132	2137	0.9500	0.9369
1958	0.0014	.....	2018	0.0183	0.0185	2078	0.2309	0.2199	2138	0.9502	0.9419
1959	0.0016	.....	2019	0.0188	0.0190	2079	0.2410	0.2266	2139	0.9504	0.9469
1960	0.0017	.....	2020	0.0193	0.0194	2080	0.2512	0.2333	2140	0.9506	0.9519
1961	0.0019	0.0001	2021	0.0209	0.0207	2081	0.2654	0.2486	2141	0.9503	0.9519
1962	0.0021	0.0002	2022	0.0225	0.0219	2082	0.2797	0.2640	2142	0.9500	0.9518
1963	0.0023	0.0003	2023	0.0241	0.0231	2083	0.2940	0.2794	2143	0.9497	0.9517
1964	0.0025	0.0004	2024	0.0258	0.0244	2084	0.3084	0.2939	2144	0.9494	0.9517
1965	0.0026	0.0004	2025	0.0274	0.0256	2085	0.3227	0.3103	2145	0.9491	0.9516
1966	0.0028	0.0005	2026	0.0290	0.0269	2086	0.3371	0.3258	2146	0.9464	0.9515
1967	0.0030	0.0006	2027	0.0307	0.0281	2087	0.3515	0.3413	2147	0.9337	0.9515
1968	0.0032	0.0007	2028	0.0323	0.0294	2088	0.3659	0.3458	2148	0.9141	0.9514
1969	0.0034	0.0008	2029	0.0340	0.0306	2089	0.3803	0.3723	2149	0.9384	0.9513
1970	0.0036	0.0009	2030	0.0356	0.0319	2090	0.3947	0.3818	2150	0.9157	0.9512
1971	0.0037	0.0010	2031	0.0373	0.0331	2091	0.4092	0.4034	2151	0.9491	0.9512
1972	0.0039	0.0011	2032	0.0389	0.0344	2092	0.4237	0.4190	2152	0.9389	0.9511
1973	0.0041	0.0012	2033	0.0406	0.0356	2093	0.4382	0.4346	2153	0.9405	0.9510
1974	0.0043	0.0013	2034	0.0422	0.0357	2094	0.4520	0.4521	2154	0.9421	0.9509
1975	0.0045	0.0014	2035	0.0439	0.0381	2095	0.4673	0.4658	2155	0.9437	0.9509
1976	0.0047	0.0015	2036	0.0456	0.0394	2096	0.4819	0.4814	2156	0.9442	0.9508
1977	0.0049	0.0016	2037	0.0473	0.0407	2097	0.4965	0.4971	2157	0.9447	0.9507
1978	0.0050	0.0017	2038	0.0489	0.0419	2098	0.5111	0.5128	2158	0.9453	0.9506
1979	0.0052	0.0018	2039	0.0506	0.0432	2099	0.5257	0.5255	2159	0.9458	0.9505
1980	0.0054	0.0019	2040	0.0522	0.0452	2100	0.5404	0.5432	2160	0.9463	0.9503
1981	0.0056	0.0022	2041	0.0540	0.0472	2101	0.5557	0.5591	2161	0.9466	0.9526
1982	0.0058	0.0024	2042	0.0547	0.0500	2102	0.5710	0.5744	2162	0.9470	0.9548
1983	0.0060	0.0030	2043	0.0574	0.0537	2103	0.5864	0.5816	2163	0.9473	0.9570
1984	0.0062	0.0034	2044	0.0591	0.0555	2104	0.6018	0.6048	2164	0.9476	0.9592
1985	0.0064	0.0037	2045	0.0608	0.0583	2105	0.6172	0.6200	2165	0.9480	0.9614
1986	0.0066	0.0041	2046	0.0625	0.0611	2106	0.6327	0.6333	2166	0.9507	0.9636
1987	0.0068	0.0045	2047	0.0642	0.0638	2107	0.6482	0.6506	2167	0.9534	0.9658
1988	0.0070	0.0049	2048	0.0659	0.0666	2108	0.6637	0.6659	2168	0.9562	0.9680
1989	0.0072	0.0053	2049	0.0676	0.0694	2109	0.6792	0.6813	2169	0.9589	0.9702
1990	0.0074	0.0057	2050	0.0693	0.0712	2110	0.6948	0.6967	2170	0.9617	0.9724
1991	0.0076	0.0061	2051	0.0723	0.0750	2111	0.7104	0.7121	2171	0.9646	0.9747
1992	0.0078	0.0065	2052	0.0753	0.0778	2112	0.7261	0.7276	2172	0.9675	0.9769
1993	0.0080	0.0069	2053	0.0783	0.0806	2113	0.7418	0.7431	2173	0.9704	0.9791
1994	0.0082	0.0073	2054	0.0813	0.0834	2114	0.7576	0.7587	2174	0.9733	0.9813
1995	0.0084	0.0077	2055	0.0843	0.0862	2115	0.7733	0.7743	2175	0.9762	0.9835
1996	0.0086	0.0081	2056	0.0874	0.0891	2116	0.7891	0.7899	2176	0.9792	0.9857
1997	0.0088	0.0085	2057	0.0904	0.0919	2117	0.8050	0.8056	2177	0.9821	0.9880
1998	0.0090	0.0093	2058	0.0934	0.0957	2118	0.8209	0.8213	2178	0.9850	0.9902
1999	0.0092	0.0093	2059	0.0964	0.0975	2119	0.8368	0.8376	2179	0.9879	0.9924
2000	0.0094	0.0097	2060	0.0995	0.1004	2120	0.8527	0.8539	2180	0.9909	0.9947
2001	0.0098	0.0102	2061	0.1045	0.1056	2121	0.8744	0.8641	2181	0.9946	0.9949
2002	0.0104	0.0107	2062	0.1095	0.1116	2122	0.8755	0.8627	2182	0.9954	0.9952
2003	0.0109	0.0112	2063	0.1146	0.1201	2123	0.8869	0.8776	2183	0.9968	0.9955
2004	0.0114	0.0117	2064	0.1196	0.1267	2124	0.8983	0.8875	2184	0.9971	0.9957
2005	0.0118	0.0121	2065	0.1247	0.1334	2125	0.9098	0.8874	2185	0.9975	0.9960
2006	0.0123	0.0126	2066	0.1297	0.1406	2126	0.9205	0.8823	2186	0.9979	0.9963
2007	0.0128	0.0131	2067	0.1348	0.1466	2127	0.9202	0.8813	2187	0.9982	0.9966
2008	0.0133	0.0136	2068	0.1398	0.1532	2128	0.9255	0.8932	2188	0.9986	0.9968
2009	0.0138	0.0141	2069	0.1449	0.1599	2129	0.9307	0.8911	2189	0.9989	0.9971
2010	0.0143	0.0146	2070	0.1500	0.1655	2130	0.9359	0.9021	2190	0.9993	0.9974

**CHARTS FOR  
OF POOR QUALITY**

**Table A6**  
(CONTINUED)

WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F
2191	0.9996	0.9976	2246	0.9300	0.9348	2301	0.7514	0.7523	2356	0.2864	0.3060	2356	0.2738	0.2781	2357
2192	1.0000	0.9994	2247	0.9281	0.9345	2302	0.7455	0.7561	2357	0.2738	0.2781	2357	0.2512	0.2502	2358
2193	0.9992	0.9984	2248	0.9261	0.9342	2303	0.7396	0.7598	2358	0.2738	0.2781	2358	0.2286	0.2223	2359
2194	0.9989	0.9984	2249	0.9242	0.9343	2304	0.7337	0.7636	2359	0.2738	0.2781	2359	0.2512	0.2502	2360
2195	0.9983	0.9982	2250	0.9223	0.9342	2305	0.7278	0.7673	2360	0.2660	0.1943	2360	0.2060	0.1856	2361
2196	0.9977	0.9989	2251	0.9217	0.9340	2306	0.7218	0.7710	2361	0.1930	0.1801	2361	0.1774	0.1692	2362
2197	0.9972	0.9972	2252	0.9211	0.9338	2307	0.7159	0.7748	2362	0.1801	0.1774	2362	0.1672	0.1692	2363
2198	0.9966	0.9995	2253	0.9205	0.9335	2308	0.7143	0.7785	2363	0.1774	0.1692	2363	0.1542	0.1609	2364
2199	0.9960	0.9993	2254	0.9198	0.9335	2309	0.7107	0.7822	2364	0.1609	0.1526	2364	0.1413	0.1444	2365
2200	0.9954	1.0000	2255	0.9192	0.9333	2310	0.7071	0.7860	2365	0.1526	0.1444	2365	0.1283	0.1361	2366
2201	0.9952	0.9995	2256	0.9186	0.9331	2311	0.7056	0.7897	2366	0.1444	0.1361	2366	0.1153	0.1278	2367
2202	0.9949	0.9991	2257	0.9180	0.9329	2312	0.7000	0.7935	2367	0.1361	0.1278	2367	0.1023	0.1195	2368
2203	0.9946	0.9987	2258	0.9174	0.9328	2313	0.6960	0.7972	2368	0.1278	0.1195	2368	0.0993	0.1112	2369
2204	0.9943	0.9983	2259	0.9168	0.9326	2314	0.6921	0.8009	2369	0.1195	0.1112	2369	0.0963	0.1020	2370
2205	0.9940	0.9978	2260	0.9162	0.9324	2315	0.6881	0.8047	2370	0.1112	0.1020	2370	0.0933	0.1046	2371
2206	0.9937	0.9974	2261	0.9153	0.9302	2316	0.6841	0.8084	2371	0.1020	0.0945	2371	0.0904	0.1063	2372
2207	0.9934	0.9970	2262	0.9145	0.9280	2317	0.6802	0.8121	2372	0.0945	0.0862	2372	0.0876	0.0959	2373
2208	0.9931	0.9965	2263	0.9136	0.9258	2318	0.6762	0.8159	2373	0.0862	0.0822	2373	0.0833	0.0978	2374
2209	0.9928	0.9961	2264	0.9128	0.9235	2319	0.6722	0.8196	2374	0.0822	0.0850	2374	0.0813	0.0945	2375
2210	0.9925	0.9956	2265	0.9119	0.9213	2320	0.6683	0.8223	2375	0.0850	0.0931	2375	0.0813	0.0983	2376
2211	0.9922	0.9952	2266	0.9110	0.9191	2321	0.6643	0.8199	2376	0.0931	0.1011	2376	0.0850	0.0959	2377
2212	0.9919	0.9948	2267	0.9102	0.9169	2322	0.6600	0.8162	2377	0.0959	0.0927	2377	0.0822	0.0927	2378
2213	0.9916	0.9943	2268	0.9093	0.9147	2323	0.6560	0.8126	2378	0.0927	0.0916	2378	0.0812	0.0943	2379
2214	0.9913	0.9939	2269	0.9077	0.9125	2324	0.6517	0.8089	2379	0.0916	0.0959	2379	0.0812	0.0959	2380
2215	0.9910	0.9934	2270	0.9061	0.9103	2325	0.6472	0.8053	2380	0.0959	0.0978	2380	0.0833	0.0978	2381
2216	0.9907	0.9930	2271	0.9045	0.9081	2326	0.6427	0.8016	2381	0.0978	0.1027	2381	0.0813	0.0945	2382
2217	0.9904	0.9926	2272	0.9028	0.9059	2327	0.6383	0.7980	2382	0.0945	0.0925	2382	0.0803	0.0925	2383
2218	0.9901	0.9921	2273	0.9012	0.9037	2328	0.6348	0.7943	2383	0.0925	0.0911	2383	0.0783	0.0925	2384
2219	0.9898	0.9917	2274	0.8996	0.9015	2329	0.6310	0.7907	2384	0.0911	0.0916	2384	0.0763	0.0911	2385
2220	0.9895	0.9912	2275	0.8980	0.8993	2330	0.6270	0.7870	2385	0.0911	0.0922	2385	0.0743	0.0922	2386
2221	0.9891	0.9885	2276	0.8964	0.8971	2331	0.6235	0.7845	2386	0.0922	0.0939	2386	0.0723	0.0939	2387
2222	0.9886	0.9885	2277	0.8948	0.8949	2332	0.6200	0.7817	2387	0.0939	0.0959	2387	0.0703	0.0959	2388
2223	0.9882	0.9889	2278	0.8932	0.8932	2333	0.6168	0.7780	2388	0.0959	0.0978	2388	0.0683	0.0978	2389
2224	0.9877	0.9882	2279	0.8916	0.8906	2334	0.6130	0.7744	2389	0.0978	0.1050	2389	0.0663	0.0959	2390
2225	0.9872	0.9874	2280	0.8900	0.8884	2335	0.6090	0.7686	2390	0.0959	0.0922	2390	0.0643	0.0922	2391
2226	0.9868	0.9871	2281	0.8882	0.8814	2336	0.6054	0.7640	2391	0.0922	0.0916	2391	0.0623	0.0916	2392
2227	0.9864	0.9878	2282	0.8764	0.8747	2337	0.6019	0.7615	2392	0.0916	0.0904	2392	0.0603	0.0904	2393
2228	0.9867	0.9871	2283	0.8696	0.8673	2338	0.5982	0.7586	2393	0.0904	0.0906	2393	0.0582	0.0906	2394
2229	0.9863	0.9863	2284	0.8627	0.8603	2339	0.5947	0.7542	2394	0.0906	0.0908	2394	0.0562	0.0908	2395
2230	0.9859	0.9855	2285	0.8560	0.8532	2340	0.5907	0.7505	2395	0.0908	0.0909	2395	0.0542	0.0909	2396
2231	0.9854	0.9868	2286	0.8492	0.8462	2341	0.5868	0.7473	2396	0.0909	0.0911	2396	0.0522	0.0911	2397
2232	0.9853	0.9850	2287	0.8424	0.8392	2342	0.5829	0.7434	2397	0.0911	0.0914	2397	0.0502	0.0914	2398
2233	0.9851	0.9852	2288	0.8357	0.8322	2343	0.5792	0.7400	2398	0.0914	0.0916	2398	0.0482	0.0916	2399
2234	0.9850	0.9853	2289	0.8290	0.8252	2344	0.5755	0.7368	2399	0.0916	0.0917	2399	0.0462	0.0917	2400
2235	0.9849	0.9847	2290	0.8222	0.8182	2345	0.5718	0.7332	2400	0.0917	0.0918	2400	0.0442	0.0918	2401
2236	0.9845	0.9840	2291	0.8157	0.8112	2346	0.5681	0.7296	2401	0.0918	0.0919	2401	0.0422	0.0919	2402
2237	0.9842	0.9842	2292	0.8092	0.8043	2347	0.5643	0.7260	2402	0.0919	0.0922	2402	0.0402	0.0922	2403
2238	0.9846	0.9844	2293	0.8027	0.7973	2348	0.5604	0.7224	2403	0.0922	0.0924	2403	0.0382	0.0924	2404
2239	0.9841	0.9838	2294	0.7961	0.7904	2349	0.5567	0.7188	2404	0.0924	0.0926	2404	0.0363	0.0926	2405
2240	0.9846	0.9839	2295	0.7896	0.7834	2350	0.5530	0.7152	2405	0.0926	0.0927	2405	0.0343	0.0927	2406
2241	0.9847	0.9837	2296	0.7832	0.7765	2351	0.5493	0.7089	2406	0.0927	0.0928	2406	0.0323	0.0928	2407
2242	0.9842	0.9837	2297	0.7767	0.7717	2352	0.5456	0.7055	2407	0.0928	0.0929	2407	0.0303	0.0929	2408
2243	0.9838	0.9834	2298	0.7702	0.7626	2353	0.5419	0.6986	2408	0.0929	0.0930	2408	0.0283	0.0930	2409
2244	0.9833	0.9832	2299	0.7637	0.7557	2354	0.5382	0.6947	2409	0.0930	0.0931	2409	0.0263	0.0931	2410
2245	0.9831	0.9839	2300	0.7573	0.7488	2355	0.5345	0.6886	2410	0.0931	0.0932	2410	0.0243	0.0932	2411

ORIGINAL PAGE IS  
OF POOR QUALITY

Table A7a  
THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE - BAND G \*\*\* DETECTOR 1

WAVELENGTH (nm)	R <sub>F</sub>	F	WAVELENGTH (nm)	R <sub>F</sub>								
9760	0.0004	.....	10360	0.2824	0.2209	10960	0.9874	0.8613	11560	0.5421	0.9636	0.5421
9770	0.0008	.....	10370	0.3157	0.2461	10970	0.9696	0.9661	11570	0.5311	0.9715	0.5311
9780	0.0011	.....	10380	0.3495	0.2715	10980	0.9918	0.8109	11580	0.5203	0.9515	0.5203
9790	0.0015	.....	10390	0.3825	0.2971	10990	0.9941	0.8758	11590	0.5025	0.9514	0.5025
9800	0.0019	.....	10400	0.4184	0.3230	11000	0.9653	0.8055	11600	0.5003	0.9193	0.5003
9810	0.0023	.....	10410-	0.4535	0.3566	11010	0.9366	0.8832	11610	0.4912	0.9013	0.4912
9820	0.0027	.....	10420	0.4920	0.3903	11020	0.9968	0.8659	11620	0.4820	0.9112	0.4820
9830	0.0031	.....	10430	0.5378	0.4241	11030	0.9220	0.8885	11630	0.4710	0.9212	0.4710
9840	0.0035	.....	10440	0.5839	0.4581	11040	0.9373	0.8912	11640	0.4673	0.9111	0.4673
9850	0.0038	.....	10450	0.6306	0.4922	11050	0.9975	0.8938	11650	0.4606	0.9110	0.4606
9860	0.0042	.....	10460	0.6777	0.5263	11060	0.9984	0.8965	11660	0.4538	0.9119	0.4538
9870	0.0046	.....	10470	0.7252	0.5606	11070	0.9992	0.8931	11670	0.4471	0.9158	0.4471
9880	0.0050	.....	10480	0.7532	0.5950	11080	1.0000	0.9018	11680	0.4402	0.9167	0.4402
9890	0.0053	.....	10490	0.7760	0.6295	11090	0.9992	0.9044	11690	0.4326	0.9176	0.4326
9900	0.0058	.....	10500	0.7990	0.6641	11100	0.9985	0.9071	11700	0.4253	0.9185	0.4253
9910	0.0062	.....	10510	0.8225	0.6726	11110	0.9957	0.9064	11710	0.4188	0.9191	0.4188
9920	0.0066	.....	10520	0.8405	0.6812	11120	0.9883	0.9056	11720	0.4106	0.9196	0.4106
9930	0.0070	.....	10530	0.8531	0.6898	11130	0.9807	0.9019	11730	0.4024	0.9202	0.4024
9940	0.0074	.....	10540	0.8568	0.6985	11140	0.9731	0.9042	11740	0.3942	0.9207	0.3942
9950	0.0078	.....	10550	0.8604	0.7072	11150	0.9556	0.9034	11750	0.3860	0.9213	0.3860
9960	0.0082	.....	10560	0.8618	0.7160	11160	0.9505	0.9024	11760	0.3778	0.9219	0.3778
9970	0.0086	.....	10570	0.8617	0.7248	11170	0.9355	0.9015	11770	0.3695	0.9223	0.3695
9980	0.0090	.....	10580	0.8615	0.7338	11180	0.9207	0.9011	11780	0.3610	0.9228	0.3610
9990	0.0094	.....	10590	0.8570	0.7427	11190	0.9059	0.9003	11790	0.3525	0.9233	0.3525
10000	0.0098	.....	10600	0.8514	0.7507	12000	0.8913	0.9095	11800	0.3441	0.9238	0.3441
10010	0.0101	.....	10610	0.8542	0.7516	12100	0.8821	0.9089	11810	0.3371	0.9222	0.3371
10020	0.0105	.....	10620	0.8571	0.7515	12200	0.8730	0.9083	11820	0.3301	0.9206	0.3301
10030	0.0109	0.0078	10630	0.8599	0.7514	1230	0.8638	0.9078	11830	0.3230	0.9190	0.3230
10040	0.0113	0.0085	10640	0.8625	0.7513	1240	0.8553	0.9072	11840	0.3152	0.9174	0.3152
10050	0.0117	0.0093	10650	0.8639	0.7512	1250	0.8480	0.9077	11850	0.3069	0.9168	0.3069
10060	0.0121	0.0100	10660	0.8652	0.7511	1260	0.8405	0.9062	11860	0.2986	0.9112	0.2986
10070	0.0125	0.0108	10670	0.8665	0.7509	1270	0.8330	0.9037	11870	0.2901	0.9116	0.2901
10080	0.0129	0.0116	10680	0.8678	0.7507	1280	0.8254	0.9032	11880	0.2815	0.9109	0.2815
10090	0.0132	0.0123	10690	0.8690	0.7505	1290	0.8177	0.9028	11890	0.2729	0.9104	0.2729
10100	0.0136	0.0131	10700	0.8710	0.7503	1300	0.8072	0.9024	11900	0.2647	0.9108	0.2647
10110	0.0140	0.0146	10710	0.8745	0.7537	1310	0.7967	0.9018	11910	0.2564	0.9104	0.2564
10120	0.0144	0.0160	10720	0.8780	0.7571	1320	0.7891	0.9043	11920	0.2482	0.9101	0.2482
10130	0.0149	0.0175	10730	0.8812	0.7605	1330	0.7808	0.9018	11930	0.2401	0.9107	0.2401
10140	0.0153	0.0188	10740	0.8814	0.7639	1340	0.7725	0.9042	11940	0.2322	0.9104	0.2322
10150	0.0157	0.0204	10750	0.8876	0.7673	1350	0.7641	0.9067	11950	0.2245	0.9106	0.2245
10160	0.0160	0.0219	10760	0.8911	0.7707	1360	0.7556	0.9059	11960	0.2168	0.9106	0.2168
10170	0.0164	0.0234	10770	0.8946	0.7741	1370	0.7457	0.9046	11970	0.2081	0.9112	0.2081
10180	0.0168	0.0249	10780	0.9002	0.7776	1380	0.7350	0.9044	11980	0.2014	0.9114	0.2014
10190	0.0172	0.0263	10790	0.9079	0.7810	1390	0.7255	0.9064	11990	0.1932	0.9115	0.1932
10200	0.0176	0.0280	10800	0.9156	0.7845	1400	0.7160	0.9088	12000	0.1851	0.9116	0.1851
10210	0.0180	0.0316	10810	0.9211	0.7892	1410	0.7054	0.9119	12010	0.1822	0.9127	0.1822
10220	0.0184	0.0325	10820	0.9213	0.7911	1420	0.6956	0.9138	12020	0.1621	0.9113	0.1621
10230	0.0188	0.0371	10830	0.9285	0.7940	1430	0.6892	0.9151	12030	0.1592	0.9116	0.1592
10240	0.0192	0.0417	10840	0.9337	0.7978	1440	0.6830	0.9166	12040	0.1564	0.9021	0.1564
10250	0.0196	0.0464	10850	0.9389	0.8037	1450	0.6789	0.9183	12050	0.1533	0.8986	0.1533
10260	0.0200	0.0511	10860	0.9440	0.8085	1460	0.6750	0.9204	12060	0.1507	0.8755	0.1507
10270	0.0204	0.0568	10870	0.9552	0.8134	1470	0.6653	0.9275	12070	0.1480	0.8555	0.1480
10280	0.0208	0.0654	10880	0.9581	0.8231	1480	0.6434	0.9318	12080	0.1462	0.8310	0.1462
10290	0.0212	0.0704	10890	0.9610	0.8280	1490	0.6219	0.9359	12090	0.1439	0.8016	0.1439
10300	0.0216	0.0751	10900	0.9638	0.8330	1500	0.6196	0.9382	12100	0.1416	0.7805	0.1416
10310	0.0220	0.1172	10910	0.9689	0.8377	1510	0.6063	0.9379	12110	0.1390	0.7513	0.1390
10320	0.0224	0.1498	10920	0.9729	0.8423	1520	0.5922	0.9379	12120	0.1364	0.7212	0.1364
10330	0.0228	0.1815	10930	0.9768	0.8470	1530	0.5802	0.9318	12130	0.1340	0.6923	0.1340
10340	0.0232	0.2155	10940	0.9820	0.8518	1540	0.5673	0.9358	12140	0.1317	0.6719	0.1317
10350	0.0236	0.1960	10950	0.9852	0.8555	1550	0.5546	0.9397	12150	0.1300	0.6555	0.1300

ORIGINAL DATA  
OF POOR QUALITY

**Table A7a**  
(CONTINUED)

WAVELENGTH (nm)	F PF										
12160	0 1372	0 8207	0 12880	0 0707	0 5991	12600	0 0034	0 0422	0 0020	12810	0 0005
12170	0 1454	0 8891	12700	0 0656	0 5721	12610	0 0032	0 0400	12830	0 0005	0 0073
12180	0 1437	0 8815	12450	0 0606	0 5451	12620	0 0030	0 0377	12840	0 0004	0 0070
12190	0 1419	0 8859	12410	0 0561	0 5149	12630	0 0029	0 0356	12850	0 0004	0 0067
12200	0 1396	0 8843	12420	0 0517	0 4846	12640	0 0026	0 0334	12860	0 0004	0 0064
12210	0 1371	0 8774	12430	0 0473	0 4543	12650	0 0024	0 0312	12870	0 0004	0 0061
12220	0 1346	0 8706	12440	0 0430	0 4238	12660	0 0022	0 0291	12880	0 0004	0 0058
12230	0 1320	0 8638	12450	0 0389	0 3934	12670	0 0020	0 0270	12890	0 0003	0 0055
12240	0 1295	0 8571	12460	0 0349	0 3628	12680	0 0018	0 0248	12900	0 0003	0 0051
12250	0 1269	0 8503	12470	0 0311	0 3322	12690	0 0016	0 0228	12910	0 0003	0 0047
12260	0 1244	0 8435	12480	0 0274	0 3015	12700	0 0015	0 0207	12920	0 0002	0 0043
12270	0 1219	0 8368	12490	0 0238	0 2708	12710	0 0014	0 0184	12930	0 0002	0 0039
12280	0 1197	0 8301	12500	0 0205	0 2400	12720	0 0013	0 0162	12940	0 0002	0 0035
12290	0 1174	0 8234	12510	0 0166	0 2197	12730	0 0012	0 0140	12950	0 0002	0 0031
12300	0 1092	0 8166	12520	0 0167	0 1996	12740	0 0011	0 0157	12960	0 0001	0 0026
12310	0 1051	0 7893	12530	0 0149	0 1795	12750	0 0010	0 0145	12970	0 0001	0 0022
12320	0 1006	0 7620	12540	0 0130	0 1596	12760	0 0009	0 0132	12980	0 0001	0 0018
12330	0 9593	0 7347	12550	0 0112	0 1397	12770	0 0008	0 0120	12990	0 0001	0 0014
12340	0 9271	0 7075	12560	0 0095	0 1200	12780	0 0007	0 0107	13000	0 0001	-----
12350	0 8972	0 6803	12570	0 0077	0 1003	12790	0 0006	0 0095	13010	0 0000	-----
12360	0 8615	0 6532	12580	C 0061	0 0808	12800	0 0005	0 0083	13020	0 0000	-----
12370	0 8360	0 6261	12590	O 0047	O 0614	12810	O 0005	O 0079	13030	O 0000	-----

**ORIGINAL PAGE IS  
OF POOR QUALITY**

**Table A7b**  
**THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE - REND 6 \*\*\* /FFECTEUR 2**

WAVELENGTH (nm)	F <sub>r</sub>															
9760	0.0004	10360	0.2893	0.2256	10960	0.9914	0.5479	11560	0.5876	0.9524	11570	0.5761	0.9146	11580	0.5439	0.9368
9770	0.0008	10370	0.3227	0.2511	10970	0.9913	0.9517	11570	0.5761	0.9146	11580	0.5439	0.9368	11590	0.5337	0.9200
9780	0.002	10380	0.3585	0.2769	10980	0.9951	0.9614	11580	0.5439	0.9146	11590	0.5337	0.9200	11600	0.5222	0.9213
9790	0.0015	10390	0.3934	0.3029	10990	0.9969	0.9613	11590	0.5337	0.9200	11600	0.5222	0.9213	11610	0.5209	0.9213
9800	0.0019	10400	0.4290	0.3392	11000	0.9988	0.9751	11610	0.5197	0.9213	11620	0.5197	0.9213	11630	0.5197	0.9213
9810	0.0023	10410	0.4618	0.3613	11010	0.9990	0.9753	11620	0.5197	0.9213	11630	0.5197	0.9213	11640	0.5197	0.9213
9820	0.0027	10420	0.5042	0.3974	11020	0.9992	0.9768	11650	0.5087	0.9202	11660	0.5087	0.9202	11670	0.5087	0.9202
9830	0.0031	10430	0.5506	0.4317	11030	0.9995	0.9776	11680	0.4994	0.9202	11690	0.4994	0.9202	11700	0.4994	0.9202
9840	0.0035	10440	0.5974	0.4661	11040	0.9997	0.9784	11700	0.4900	0.9202	11710	0.4900	0.9202	11720	0.4900	0.9202
9850	0.0039	10450	0.6447	0.5005	11050	1.0000	0.9793	11720	0.4900	0.9202	11730	0.4900	0.9202	11740	0.4900	0.9202
9860	0.0043	10460	0.6923	0.5350	11060	0.9978	0.9801	11750	0.4807	0.9191	11760	0.4715	0.9210	11770	0.4715	0.9210
9870	0.0047	10470	0.7403	0.5696	11070	0.9956	0.9809	11760	0.4623	0.9150	11780	0.4539	0.9180	11800	0.4539	0.9180
9880	0.0051	10480	0.7983	0.6043	11080	0.9974	0.9816	11780	0.4460	0.9202	11790	0.4366	0.9202	11810	0.4366	0.9202
9890	0.0055	10490	0.8515	0.6391	11090	0.9878	0.9824	11800	0.4296	0.9202	11810	0.4296	0.9202	11820	0.4296	0.9202
9900	0.0059	10500	0.8147	0.6739	11100	0.9823	0.9834	11820	0.4133	0.9202	11830	0.4036	0.9202	11850	0.4036	0.9202
9910	0.0063	10510	0.8574	0.6840	11110	0.9724	0.9846	11850	0.3968	0.9202	11870	0.3968	0.9202	11890	0.3968	0.9202
9920	0.0067	10520	0.8574	0.6840	11120	0.9547	0.9748	11920	0.3111	0.9202	11930	0.3111	0.9202	11950	0.3111	0.9202
9930	0.0071	10530	0.8709	0.7052	11130	0.9750	0.9750	11950	0.2272	0.9583	11970	0.2272	0.9583	11990	0.2272	0.9583
9940	0.0075	10540	0.8753	0.7145	11140	0.9751	0.9751	11970	0.2156	0.9612	11990	0.2156	0.9612	12010	0.2156	0.9612
9950	0.0080	10550	0.8797	0.7238	11150	0.9023	0.9633	12010	0.2036	0.9688	12030	0.2036	0.9688	12050	0.2036	0.9688
9960	0.0084	10560	0.8818	0.7553	11160	0.8652	0.9665	12050	0.1933	0.9787	12070	0.1933	0.9787	12090	0.1933	0.9787
9970	0.0088	10570	0.8823	0.7558	11170	0.8583	0.9681	12070	0.1840	0.9819	12090	0.1840	0.9819	12110	0.1840	0.9819
9980	0.0092	10580	0.8828	0.7628	11180	0.8518	0.9698	12090	0.1756	0.9846	12110	0.1756	0.9846	12130	0.1756	0.9846
9990	0.0096	10590	0.8788	0.7671	11190	0.8354	0.9750	12150	0.1670	0.9877	12170	0.1670	0.9877	12190	0.1670	0.9877
10000	0.0100	10600	0.8737	0.7779	11200	0.8193	0.9752	12190	0.1586	0.9901	12210	0.1586	0.9901	12230	0.1586	0.9901
10010	0.0104	10610	0.8761	0.7793	11210	0.8173	0.9753	12210	0.1476	0.9926	12230	0.1476	0.9926	12250	0.1476	0.9926
10020	0.0108	10620	0.8773	0.7806	11220	0.8153	0.9754	12250	0.1366	0.9945	12270	0.1366	0.9945	12290	0.1366	0.9945
10030	0.0112	10630	0.8811	0.8006	11230	0.8131	0.9755	12290	0.1254	0.9964	12310	0.1254	0.9964	12330	0.1254	0.9964
10040	0.0116	10640	0.8888	0.8826	11240	0.8116	0.9756	12310	0.1160	0.9981	12330	0.1160	0.9981	12350	0.1160	0.9981
10050	0.0120	10650	0.8936	0.8734	11250	0.8104	0.9758	12350	0.1070	0.9997	12370	0.1070	0.9997	12390	0.1070	0.9997
10060	0.0124	10660	0.8942	0.8759	11260	0.8104	0.9760	12370	0.0984	0.9997	12390	0.0984	0.9997	12410	0.0984	0.9997
10070	0.0128	10670	0.8849	0.8782	11270	0.8098	0.9761	12390	0.0898	0.9997	12410	0.0898	0.9997	12430	0.0898	0.9997
10080	0.0132	10680	0.8855	0.8884	11280	0.8090	0.9771	12410	0.0813	0.9997	12430	0.0813	0.9997	12450	0.0813	0.9997
10090	0.0136	10690	0.8862	0.8916	11290	0.8081	0.9781	12450	0.0727	0.9997	12470	0.0727	0.9997	12490	0.0727	0.9997
10100	0.0140	10700	0.8945	0.8945	11300	0.8016	0.9782	12470	0.0642	0.9997	12490	0.0642	0.9997	12510	0.0642	0.9997
10110	0.0148	10710	0.8950	0.8952	11310	0.7950	0.9790	12490	0.0562	0.9997	12510	0.0562	0.9997	12530	0.0562	0.9997
10120	0.0156	10720	0.8953	0.8956	11320	0.7913	0.9818	12510	0.0487	0.9997	12530	0.0487	0.9997	12550	0.0487	0.9997
10130	0.0193	10730	0.8842	0.8842	11330	0.7855	0.9844	12530	0.0412	0.9997	12550	0.0412	0.9997	12570	0.0412	0.9997
10140	0.0213	10740	0.8835	0.8843	11340	0.7818	0.9849	12550	0.0337	0.9997	12570	0.0337	0.9997	12590	0.0337	0.9997
10150	0.0221	10750	0.8822	0.8858	11350	0.7789	0.9855	12570	0.0262	0.9997	12590	0.0262	0.9997	12610	0.0262	0.9997
10160	0.0226	10760	0.8803	0.8863	11360	0.7679	0.9860	12590	0.0187	0.9997	12610	0.0187	0.9997	12630	0.0187	0.9997
10170	0.0241	10770	0.8797	0.8860	11370	0.7606	0.9866	12610	0.0112	0.9997	12630	0.0112	0.9997	12650	0.0112	0.9997
10180	0.0287	10780	0.8852	0.8863	11380	0.7545	0.9871	12630	0.0047	0.9997	12650	0.0047	0.9997	12670	0.0047	0.9997
10190	0.0205	10790	0.8862	0.8862	11390	0.7455	0.9876	12650	0.0000	0.9997	12670	0.0000	0.9997	12690	0.0000	0.9997
10200	0.024	10800	0.8921	0.8843	11400	0.7387	0.9881	12670	0.0000	0.9997	12690	0.0000	0.9997	12710	0.0000	0.9997
10210	0.0378	10810	0.8974	0.8877	11410	0.7317	0.9889	12690	0.0000	0.9997	12710	0.0000	0.9997	12730	0.0000	0.9997
10220	0.0456	10820	0.9068	0.8854	11420	0.7271	0.9895	12710	0.0000	0.9997	12730	0.0000	0.9997	12750	0.0000	0.9997
10230	0.0535	10830	0.9162	0.8610	11430	0.7224	0.9917	12730	0.0000	0.9997	12750	0.0000	0.9997	12770	0.0000	0.9997
10240	0.0614	10840	0.9257	0.8677	11440	0.7174	0.9939	12750	0.0000	0.9997	12770	0.0000	0.9997	12790	0.0000	0.9997
10250	0.0593	10850	0.9352	0.8743	11450	0.7123	0.9941	12770	0.0000	0.9997	12790	0.0000	0.9997	12810	0.0000	0.9997
10260	0.0774	10860	0.9448	0.8810	11460	0.7052	0.9953	12790	0.0000	0.9997	12810	0.0000	0.9997	12830	0.0000	0.9997
10270	0.0854	10870	0.9543	0.8877	11470	0.6983	0.9963	12810	0.0000	0.9997	12830	0.0000	0.9997	12850	0.0000	0.9997
10280	0.0936	10880	0.9612	0.8945	11480	0.6926	0.9975	12830	0.0000	0.9997	12850	0.0000	0.9997	12870	0.0000	0.9997
10290	0.1018	10890	0.9750	0.9013	11490	0.6876	0.9989	12850	0.0000	0.9997	12870	0.0000	0.9997	12890	0.0000	0.9997
10300	0.1100	10900	0.9757	0.9031	11500	0.6820	0.9999	12870	0.0000	0.9997	12890	0.0000	0.9997	12910	0.0000	0.9997
10310	0.1201	10910	0.9787	0.9146	11510	0.6543	0.9990	12910	0.0000	0.9997	12930	0.0000	0.9997	12950	0.0000	0.9997
10320	0.1353	10920	0.9824	0.9212	11520	0.6142	0.9980	12930	0.0000	0.9997	12950	0.0000	0.9997	12970	0.0000	0.9997
10330	0.1502	10930	0.9859	0.9278	11530	0.5935	0.9970	12950	0.0000	0.9997	12970	0.0000	0.9997	12990	0.0000	0.9997
10340	0.1751	10940	0.9878	0.9315	11540	0.5741	0.9961	12970	0.0000	0.9997	12990	0.0000	0.9997	13010	0.0000	0.9997
10350	0.2002	10950	0.9896	0.9412	11											

**ORIGINAL SPECTRUM  
OF POOR QUALITY**

**Table A7b**  
(CONTINUED)

WAVELLENGTH (nm)	PF	F									
12160	0.9602	0.9607	12380	0.0814	0.6523	12600	0.0038	0.0458	12820	0.0005	0.0281
12170	0.1710	0.9589	12390	0.0154	0.6232	12610	0.0035	0.0433	12830	0.0005	0.0278
12180	0.1688	0.9577	12400	0.0636	0.5940	12620	0.0033	0.0409	12840	0.0005	0.0274
12190	0.1665	0.9564	12410	0.0643	0.5614	12630	0.0031	0.0385	12850	0.0004	0.0271
12200	0.1638	0.9551	12420	0.0531	0.5286	12640	0.0028	0.0361	12860	0.0004	0.0268
12210	0.1607	0.9481	12430	0.0510	0.4957	12650	0.0026	0.0337	12870	0.0004	0.0262
12220	0.1576	0.9412	12440	0.0490	0.4627	12660	0.0024	0.0314	12880	0.0004	0.0261
12230	0.1545	0.9343	12450	0.0442	0.4295	12670	0.0022	0.0291	12890	0.0003	0.0258
12240	0.1514	0.9274	12460	0.0355	0.3964	12680	0.0020	0.0268	12900	0.0003	0.0254
12250	0.1483	0.9205	12470	0.0252	0.2631	12690	0.0018	0.0245	12910	0.0003	0.0250
12260	0.1452	0.9135	12480	0.0309	0.3297	12700	0.0016	0.0223	12920	0.0003	0.0215
12270	0.1422	0.9067	12490	0.0269	0.2962	12710	0.0015	0.0209	12930	0.0002	0.0211
12280	0.1372	0.8999	12500	0.0220	0.2627	12720	0.0014	0.0195	12940	0.0002	0.0207
12290	0.1320	0.8920	12510	0.0209	0.2403	12730	0.0013	0.0182	12950	0.0002	0.0202
12300	0.1270	0.8861	12520	0.0187	0.2181	12740	0.0012	0.0168	12960	0.0002	0.0208
12310	0.1220	0.8568	12530	0.0166	0.1960	12750	0.0011	0.0155	12970	0.0001	0.0203
12320	0.1168	0.8275	12540	0.0146	0.1741	12760	0.0010	0.0141	12980	0.0001	0.019
12330	0.1116	0.7982	12550	0.0126	0.1523	12770	0.0009	0.0128	12990	0.0001	0.0185
12340	0.1066	0.7690	12560	0.0106	0.1307	12780	0.0008	0.0115	13000	0.0001	.....
12350	0.1009	0.7398	12570	0.0086	0.1092	12790	0.0007	0.0101	13010	0.0000	.....
12360	0.0941	0.7136	12580	0.0068	0.0879	12800	0.0005	0.0088	13020	0.0000	.....
12370	0.0877	0.6814	12590	0.0053	0.0667	12810	0.0006	0.0035			

**ORIGINAL PAGE IS  
OF POOR QUALITY**

**Table A7C**

THEMATIC MAPPER RELATIVE SPECTRAL RESPONSES

WAVELENGTH (nm)	RF			PF			Wavelength (nm)			RF			Wavelength (nm)			RF			Wavelength (nm)			RF			
	F	RF	Wavelength (nm)	F	RF	Wavelength (nm)	F	RF	Wavelength (nm)	F	RF	Wavelength (nm)	F	RF	Wavelength (nm)	F	RF	Wavelength (nm)	F	RF	Wavelength (nm)	F	RF	Wavelength (nm)	
9760	0.0004	10350	0.2830	0.2209	10350	0.9906	0.8613	11560	0.6197	0.9636	11570	0.6072	0.9575	11580	0.5950	0.9515	11590	0.5829	0.9254	11600	0.5816	0.9193	11610	0.5583	0.9103
9770	0.0008	10370	0.3167	0.2715	10370	0.9947	0.8709	11570	0.6170	0.9575	11580	0.6051	0.9515	11590	0.5934	0.9254	11600	0.5822	0.9193	11610	0.5589	0.9103	11620	0.5462	0.9112
9780	0.0011	10380	0.3507	0.2931	10390	0.9957	0.8758	11580	0.6170	0.9575	11590	0.6051	0.9515	11595	0.5934	0.9254	11600	0.5822	0.9193	11610	0.5589	0.9103	11620	0.5462	0.9112
9803	0.0015	10390	0.3849	0.3220	10400	0.9988	0.8804	11600	0.6160	0.9575	11610	0.6044	0.9515	11620	0.5816	0.9103	11630	0.5462	0.9112	11640	0.5214	0.9122	11650	0.5141	0.9131
9810	0.0019	10400	0.4203	0.3568	10410	0.9980	0.8816	11620	0.6160	0.9575	11630	0.6044	0.9515	11640	0.5816	0.9103	11650	0.5462	0.9112	11660	0.5214	0.9122	11670	0.5141	0.9131
9815	0.0023	10410	0.4561	0.3903	10420	0.9970	0.8822	11630	0.6160	0.9575	11640	0.6044	0.9515	11650	0.5816	0.9103	11660	0.5462	0.9112	11670	0.5214	0.9122	11680	0.5141	0.9131
9820	0.0027	10420	0.4914	0.4241	10430	0.9970	0.8825	11640	0.6160	0.9575	11650	0.6044	0.9515	11660	0.5816	0.9103	11670	0.5462	0.9112	11680	0.5214	0.9122	11690	0.5141	0.9131
9820	0.0031	10430	0.5115	0.4581	10440	0.9970	0.8827	11650	0.6160	0.9575	11660	0.6044	0.9515	11670	0.5816	0.9103	11680	0.5462	0.9112	11690	0.5214	0.9122	11700	0.5141	0.9131
9830	0.0035	10440	0.5880	0.4921	10450	0.9970	0.8828	11660	0.6160	0.9575	11670	0.6044	0.9515	11680	0.5816	0.9103	11690	0.5462	0.9112	11700	0.5214	0.9122	11710	0.5141	0.9131
9850	0.0038	10450	0.6350	0.5263	10460	0.9970	0.8828	11670	0.6160	0.9575	11680	0.6044	0.9515	11690	0.5816	0.9103	11700	0.5462	0.9112	11710	0.5214	0.9122	11720	0.5141	0.9131
9860	0.0042	10460	0.6825	0.5606	10470	0.9970	0.8828	11680	0.6160	0.9575	11690	0.6044	0.9515	11700	0.5816	0.9103	11710	0.5462	0.9112	11720	0.5214	0.9122	11730	0.5141	0.9131
9870	0.0046	10470	0.7204	0.6070	10480	0.9970	0.8828	11690	0.6160	0.9575	11700	0.6044	0.9515	11710	0.5816	0.9103	11720	0.5462	0.9112	11730	0.5214	0.9122	11740	0.5141	0.9131
9880	0.0050	10480	0.7586	0.6470	10490	0.9970	0.8828	11700	0.6160	0.9575	11710	0.6044	0.9515	11720	0.5816	0.9103	11730	0.5462	0.9112	11740	0.5214	0.9122	11750	0.5141	0.9131
9890	0.0054	10490	0.7816	0.6725	10500	0.9970	0.8828	11710	0.6160	0.9575	11720	0.6044	0.9515	11730	0.5816	0.9103	11740	0.5462	0.9112	11750	0.5214	0.9122	11760	0.5141	0.9131
9900	0.0058	10500	0.8047	0.6914	10510	0.9970	0.8828	11720	0.6160	0.9575	11730	0.6044	0.9515	11740	0.5816	0.9103	11750	0.5462	0.9112	11760	0.5214	0.9122	11770	0.5141	0.9131
9910	0.0062	10510	0.8286	0.7218	10520	0.9970	0.8828	11730	0.6160	0.9575	11740	0.6044	0.9515	11750	0.5816	0.9103	11760	0.5462	0.9112	11770	0.5214	0.9122	11780	0.5141	0.9131
9920	0.0066	10520	0.8488	0.7412	10530	0.9970	0.8828	11740	0.6160	0.9575	11750	0.6044	0.9515	11760	0.5816	0.9103	11770	0.5462	0.9112	11780	0.5214	0.9122	11790	0.5141	0.9131
9930	0.0070	10530	0.8688	0.7598	10540	0.9970	0.8828	11750	0.6160	0.9575	11760	0.6044	0.9515	11770	0.5816	0.9103	11780	0.5462	0.9112	11790	0.5214	0.9122	11800	0.5141	0.9131
9940	0.0074	10540	0.8888	0.7793	10550	0.9970	0.8828	11760	0.6160	0.9575	11770	0.6044	0.9515	11780	0.5816	0.9103	11790	0.5462	0.9112	11800	0.5214	0.9122	11810	0.5141	0.9131
9950	0.0078	10550	0.9088	0.7987	10560	0.9970	0.8828	11770	0.6160	0.9575	11780	0.6044	0.9515	11790	0.5816	0.9103	11800	0.5462	0.9112	11810	0.5214	0.9122	11820	0.5141	0.9131
9960	0.0082	10560	0.9285	0.8184	10570	0.9970	0.8828	11780	0.6160	0.9575	11790	0.6044	0.9515	11800	0.5816	0.9103	11810	0.5462	0.9112	11820	0.5214	0.9122	11830	0.5141	0.9131
9970	0.0086	10570	0.9482	0.8381	10580	0.9970	0.8828	11790	0.6160	0.9575	11800	0.6044	0.9515	11810	0.5816	0.9103	11820	0.5462	0.9112	11830	0.5214	0.9122	11840	0.5141	0.9131
9980	0.0090	10580	0.9678	0.8578	10590	0.9970	0.8828	11800	0.6160	0.9575	11810	0.6044	0.9515	11820	0.5816	0.9103	11830	0.5462	0.9112	11840	0.5214	0.9122	11850	0.5141	0.9131
9990	0.0094	10590	0.9874	0.8774	10600	0.9970	0.8828	11810	0.6160	0.9575	11820	0.6044	0.9515	11830	0.5816	0.9103	11840	0.5462	0.9112	11850	0.5214	0.9122	11860	0.5141	0.9131
10000	0.0098	10600	0.9970	0.8970	10610	0.9970	0.8828	11820	0.6160	0.9575	11830	0.6044	0.9515	11840	0.5816	0.9103	11850	0.5462	0.9112	11860	0.5214	0.9122	11870	0.5141	0.9131
10010	0.0102	10610	0.9970	0.9166	10620	0.9970	0.8828	11830	0.6160	0.9575	11840	0.6044	0.9515	11850	0.5816	0.9103	11860	0.5462	0.9112	11870	0.5214	0.9122	11880	0.5141	0.9131
10020	0.0106	10620	0.9970	0.9362	10630	0.9970	0.8828	11840	0.6160	0.9575	11850	0.6044	0.9515	11860	0.5816	0.9103	11870	0.5462	0.9112	11880	0.5214	0.9122	11890	0.5141	0.9131
10030	0.0110	10630	0.9970	0.9558	10640	0.9970	0.8828	11850	0.6160	0.9575	11860	0.6044	0.9515	11870	0.5816	0.9103	11880	0.5462	0.9112	11890	0.5214	0.9122	11900	0.5141	0.9131
10040	0.0114	10640	0.9970	0.9754	10650	0.9970	0.8828	11860	0.6160	0.9575	11870	0.6044	0.9515	11880	0.5816	0.9103	11890	0.5462	0.9112	11900	0.5214	0.9122	11910	0.5141	0.9131
10050	0.0115	10650	0.9970	0.9850	10660	0.9970	0.8828	11870	0.6160	0.9575	11880	0.6044	0.9515	11890	0.5816	0.9103	11900	0.5462	0.9112	11910	0.5214	0.9122	11920	0.5141	0.9131
10060	0.0118	10660	0.9970	0.9946	10670	0.9970	0.8828	11880	0.6160	0.9575	11890	0.6044	0.9515	11900	0.5816	0.9103	11910	0.5462	0.9112	11920	0.5214	0.9122	11930	0.5141	0.9131
10070	0.0121	10670	0.9970	0.9946	10680	0.9970	0.8828	11890	0.6160	0.9575	11900	0.6044	0.9515	11910	0.5816	0.9103	11920	0.5462	0.9112	11930	0.5214	0.9122	11940	0.5141	0.9131
10080	0.0124	10680	0.9970	0.9946	10690	0.9970	0.8828	11900	0.6160	0.9575	11910	0.6044	0.9515	11920	0.5816	0.9103	11930	0.5462	0.9112	11940	0.5214	0.9122	11950	0.5141	0.9131
10090	0.0127	10690	0.9970	0.9946	10700	0.9970	0.8828	11910	0.6160	0.9575	11920	0.6044	0.9515	11930	0.5816	0.9103	11940	0.5462	0.9112	11950	0.5214	0.9122	11960	0.5141	0.9131
10100	0.0131	10700	0.9970	0.9946	10710	0.9970	0.8828	11920	0.6160	0.9575	11930	0.6044	0.9515	11940	0.5816	0.9103	11950	0.5462	0.9112	11960	0.5214	0.9122	11970	0.5141	0.9131
10110	0.0134	10710	0.9970	0.9946	10720	0.9970	0.8828	11930	0.6160	0.9575	11940	0.6044	0.9515	11950	0.5816	0.9103	11960	0.5462	0.9112	11970	0.5214	0.9122	11980	0.5141	0.9131
10120	0.0135	10720	0.9970	0.9946	10730	0.9970	0.8828	11940	0.6160	0.9575	11950	0.6044	0.9515	11960	0.5816	0.9103	11970	0.5462	0.9112	11980	0.5214	0.9122	11990	0.5141	0.9131
10130	0.0136	10730	0.9970	0.9946	10740	0.9970	0.8828	11950	0.6160	0.9575	11960	0.6044	0.9515	11970	0.5816	0.9103	11980	0.5462	0.9112	11990</td					

**OK QUALITY**  
**OR POOR QUALITY**

Table A7c  
(CONTINUED)

WAVELENGTH (nm)	PF	F									
12160	0.8907	12380	0.0817	0.5931	12600	0.0038	0.0472	0.0005	12820	0.0005	0.0016
12170	0.1728	0.8691	12390	0.0757	0.5121	12610	0.0036	0.0400	12830	0.0005	0.0013
12180	0.1685	0.8875	12400	0.0699	0.5151	12620	0.0033	0.0377	12840	0.0005	0.0010
12190	0.1663	0.8559	12410	0.0646	0.5149	12630	0.0031	0.0356	12850	0.0004	0.0007
12200	0.1636	0.8843	12420	0.0595	0.4846	12640	0.0028	0.0334	12860	0.0004	0.0004
12210	0.1606	0.8774	12430	0.0544	0.4553	12650	0.0026	0.0312	12870	0.0004	0.0001
12220	0.1575	0.8106	12440	0.0494	0.4238	12655	0.0024	0.0291	12880	0.0004	0.0058
12230	0.1544	0.8338	12450	0.0446	0.3934	12670	0.0022	0.0270	12890	0.0003	0.0055
12240	0.1514	0.8571	12460	0.0399	0.3628	12680	0.0020	0.0248	12900	0.0003	0.0051
12250	0.1483	0.8503	12470	0.0355	0.3322	12690	0.0018	0.0228	12910	0.0003	0.0047
12260	0.1453	0.8415	12480	0.0312	0.3015	12700	0.0016	0.0207	12920	0.0003	0.0043
12270	0.1422	0.8368	12490	0.0272	0.2708	12710	0.0015	0.0194	12930	0.0002	0.0039
12280	0.1373	0.8301	12500	0.0233	0.2400	12720	0.0014	0.0182	12940	0.0002	0.0035
12290	0.1322	0.8234	12510	0.0211	0.2197	12730	0.0013	0.0170	12950	0.0002	0.0031
12300	0.1271	0.8166	12520	0.0189	0.1996	12740	0.0012	0.0157	12960	0.0001	0.0026
12310	0.1222	0.7893	12530	0.0168	0.1795	12750	0.0011	0.0145	12970	0.0001	0.0022
12320	0.1170	0.7620	12540	0.0147	0.1596	12760	0.0010	0.0132	12980	0.0001	0.0018
12330	0.1119	0.7337	12550	0.0127	0.1397	12770	0.0009	0.0120	12990	0.0001	0.0014
12340	0.1069	0.7075	12560	0.0107	0.1200	12780	0.0008	0.0107	13000	0.0001	.....
12350	0.1012	0.6693	12570	0.0088	0.1004	12790	0.0007	0.0095	13010	0.0000	.....
12360	0.0945	0.6532	12580	0.0068	0.0806	12800	0.0006	0.0083	13020	0.0000	.....
12370	0.0880	0.6261	12590	0.0053	0.0614	12810	0.0005	0.0079			

**ORIGINAL FILE IS  
OF POOR QUALITY**

**Table A7d**  
THEMATIC MAPPER RELATIVE SPECTRAL RESPONSE - BAND 6 \*\*\* DETECTOR 4

WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F
10000	0.0034	10500	0.8375	0.7719	11200	0.8728	0.9552	11800	0.4297	0.3773	
10010	0.0037	10510	0.8411	0.7793	11210	0.8652	0.9579	11810	0.4215	0.3778	
10020	0.0040	10520	0.8437	0.7805	11220	0.8637	0.9608	11820	0.4133	0.3782	
10030	0.0043	10530	0.8453	0.7820	11230	0.8591	0.9635	11830	0.4050	0.3787	
10040	0.0047	10540	0.8475	0.7835	11240	0.8552	0.9656	11840	0.3958	0.3792	
10050	0.0050	10550	0.8508	0.7846	11250	0.8524	0.9788	11850	0.3859	0.3797	
10060	0.0053	10560	0.8539	0.7859	11260	0.8496	0.9716	11860	0.3761	0.3801	
10070	0.0057	10570	0.8579	0.7872	11270	0.8468	0.9743	11870	0.3659	0.3806	
10080	0.0061	10580	0.8600	0.7884	11280	0.8439	0.9771	11880	0.3557	0.3810	
10090	0.0065	10590	0.8623	0.7895	11290	0.8410	0.9798	11890	0.3455	0.3815	
10100	0.0068	10600	0.8647	0.7908	11300	0.8382	0.9826	11900	0.3357	0.3819	
10110	0.0071	10610	0.8694	0.7958	11310	0.8294	0.9822	11910	0.3224	0.3815	
10120	0.0075	10620	0.8732	0.8008	11320	0.8266	0.9814	11920	0.3190	0.3813	
10130	0.0077	10630	0.8730	0.8058	11330	0.8232	0.9838	11930	0.3109	0.3809	
10140	0.0084	10640	0.8850	0.8108	11340	0.8197	0.9849	11940	0.3030	0.3805	
10150	0.0092	10650	0.8915	0.8158	11350	0.8167	0.9855	11950	0.2953	0.3801	
10160	0.0100	10660	0.9128	0.8219	11360	0.8126	0.9860	11960	0.2876	0.3797	
10170	0.0112	10670	0.9150	0.8256	11370	0.8075	0.9866	11970	0.2799	0.3795	
10180	0.0115	10680	0.9170	0.8276	11380	0.8017	0.9871	11980	0.2722	0.3788	
10190	0.0118	10690	0.9171	0.8277	11390	0.7971	0.9876	11990	0.2639	0.3781	
10200	0.0120	10700	0.9195	0.8310	11400	0.7955	0.9881	12000	0.2556	0.3779	
10210	0.0121	10710	0.9210	0.8324	11410	0.7984	0.9893	12010	0.2524	0.3769	
10220	0.0122	10720	0.9216	0.8326	11420	0.7889	0.9905	12020	0.2484	0.3759	
10230	0.0124	10730	0.9211	0.8338	11430	0.7854	0.9917	12030	0.2414	0.3719	
10240	0.0125	10740	0.9256	0.8379	11440	0.7875	0.9929	12040	0.2404	0.3739	
10250	0.0127	10750	0.9272	0.8395	11450	0.7865	0.9941	12050	0.2335	0.3729	
10260	0.0133	10760	0.9272	0.8460	11460	0.7834	0.9953	12060	0.2326	0.3719	
10270	0.0141	10770	0.9288	0.8413	11470	0.7784	0.9965	12070	0.2287	0.3708	
10280	0.0157	10780	0.9334	0.8479	11480	0.7733	0.9973	12080	0.2248	0.3698	
10290	0.0151	10790	0.9342	0.8514	11490	0.7683	0.9989	12090	0.2210	0.3688	
10300	0.0156	10800	0.9356	0.8528	11500	0.7654	0.9994	12100	0.2144	0.3619	
10310	0.0161	10810	0.9376	0.8610	11510	0.7617	0.9997	12110	0.2122	0.3619	
10320	0.0167	10820	0.9435	0.8677	11520	0.7587	0.9999	12120	0.2080	0.3653	
10330	0.0172	10830	0.9512	0.8743	11530	0.7551	0.9999	12130	0.2026	0.3653	
10340	0.0175	10840	0.9569	0.8810	11540	0.7522	0.9999	12140	0.1971	0.3627	
10350	0.0171	10850	0.9595	0.8827	11550	0.7500	0.9999	12150	0.1915	0.3615	
10360	0.0166	10860	0.9612	0.8913	11560	0.7476	0.9999	12160	0.1859	0.3603	
10370	0.0166	10870	0.9711	0.9051	11570	0.7452	1.0000	12170	0.1803	0.3589	
10380	0.1141	10880	0.9732	0.9146	11580	0.7421	0.9446	12180	0.1747	0.3577	
10390	0.1459	10890	0.9730	0.9212	11590	0.7385	0.9268	12190	0.1747	0.3574	
10400	0.1095	10900	0.9732	0.9230	11600	0.7359	0.9213	12200	0.1690	0.3564	
10410	0.1751	10910	0.9740	0.9254	11610	0.7332	0.9191	12210	0.1629	0.3551	
10420	0.2428	10920	0.9816	0.9412	11620	0.7223	0.9113	12220	0.1591	0.3481	
10430	0.2755	10930	0.9860	0.9479	11630	0.7126	0.9063	12230	0.1554	0.3412	
10440	0.2511	10940	0.9570	0.9547	11640	0.7039	0.9054	12240	0.1517	0.3443	
10450	0.2752	10950	0.9937	0.9614	11650	0.6980	0.9034	12250	0.1479	0.3274	
10460	0.3292	10960	0.9965	0.9783	11660	0.6743	0.9016	12260	0.1405	0.3136	
10470	0.4438	10970	0.9910	0.9909	11670	0.6592	0.9013	12270	0.1368	0.2982	
10480	0.7365	10980	0.9960	0.9918	11680	0.6422	0.9022	12280	0.1317	0.2999	
10490	0.7588	10990	0.9885	0.9821	11690	0.6300	0.9059	12290	0.1256	0.2930	
10500	0.5262	11000	0.9315	0.9715	11700	0.6206	0.9036	12300	0.1201	0.2851	
10510	0.5713	11010	0.9887	0.9784	11710	0.6188	0.9032	12310	0.1156	0.2858	
10520	0.6168	11020	0.9737	0.9739	11720	0.6121	0.9036	12320	0.1107	0.2875	
10530	0.6629	11030	0.9510	0.9750	11730	0.6124	0.9058	12330	0.1053	0.2982	
10540	0.8398	11040	0.9356	0.9721	11740	0.6068	0.9155	12340	0.1013	0.2930	
10550	0.8339	11050	0.9213	0.9653	11750	0.6034	0.9181	12350	0.0960	0.2938	
10560	0.8458	11060	0.9160	0.9613	11760	0.6014	0.9187	12360	0.0927	0.2916	
10570	0.8471	11070	0.9110	0.9577	11770	0.6010	0.9194	12370	0.0897	0.2913	
10580	0.8464	11080	0.8938	0.9598	11780	0.5980	0.9197	12380	0.0826	0.2814	
10590	0.8425	11090	0.8837	0.9580	11790	0.4417	0.9247	12390	0.0721	0.2832	

ORIGINAL PAGE IS  
OF POOR QUALITY

Table A7d  
(CONTINUED)

WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F	WAVELENGTH (nm)	F
12400	0.0667	0.5940	12560	0.0105	0.1307	12720	0.0014	0.0195	12880	0.0004	0.0061
12410	0.0617	0.5614	12570	0.0006	0.1092	12730	0.0013	0.0182	12890	0.0004	0.0058
12420	0.0570	0.5286	12580	0.0067	0.0879	12740	0.0012	0.0168	12900	0.0003	0.0054
12430	0.0522	0.4957	12590	0.0052	0.0667	12750	0.0011	0.0155	12910	0.0003	0.0050
12440	0.0475	0.4627	12600	0.0038	0.0458	12760	0.0010	0.0141	12920	0.0003	0.0045
12450	0.0430	0.4296	12610	0.0035	0.0313	12770	0.0009	0.0128	12930	0.0002	0.0041
12460	0.0396	0.3964	12620	0.0033	0.0199	12780	0.0008	0.0115	12940	0.0002	0.0037
12470	0.0354	0.3631	12630	0.0031	0.0365	12790	0.0007	0.0101	12950	0.0002	0.0032
12480	0.0310	0.3297	12640	0.0028	0.0151	12800	0.0006	0.0098	12960	0.0002	0.0028
12490	0.0265	0.2962	12650	0.0026	0.0337	12810	0.0005	0.0085	12970	0.0001	0.0023
12500	0.0228	0.2627	12660	0.0024	0.0314	12820	0.0005	0.0081	12980	0.0001	0.0019
12510	0.0206	0.2403	12670	0.0022	0.0291	12830	0.0005	0.0078	12990	0.0001	0.0015
12520	0.0185	0.2181	12680	0.0020	0.0268	12840	0.0005	0.0074	13000	0.0001	.....
12530	0.0165	0.1960	12690	0.0018	0.0245	12850	0.0005	0.0071	13010	0.0001	.....
12540	0.0145	0.1741	12700	0.0016	0.0223	12860	0.0004	0.0068	13020	0.0000	.....
12550	0.0125	0.1523	12710	0.0015	0.0209	12870	0.0004	0.0064			