George C. Marshall Space Flight Center
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ORGANIZATIONAL WORK INSTRUCTION

EM50

OPERATION OF

SCATTEROMETER

Revision E

APPROVING AUTHORITY	NAME	TITLE	ORG	DATE
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CHECK THE MASTER LIST—
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		August 7, 1997	Baseline of OWI
Revision	A	May 23, 1999	Updated to reflect reorganization
Revision	B	Feb. 22, 2000	Changed QMS documents to directives
Revision	C	July 6, 2000	Updated for records management
Revision	D	Sept. 1, 2004	Updated per HQ Rules Review Action
Revision	E	April 27, 2005	Changes made due to reorganization

OPERATION OF SCATTEROMETER

1. SCOPE

1.1 Scope.
This document establishes the organizational work instruction for the TMA QwikScan scatterometer.

1.2 Purpose.
The purpose of this document is to outline the steps necessary for measurement of a material's bidirectional scatter distribution function (BSDF) or root mean square (RMS) roughness using the TMA QwikScan scatterometer.

1.3 Applicability.
This document applies to the scatterometer used by EM50. This work instruction is not a substitute for formal training in TMA QuikScan scatterometer operation. Untrained personnel should not attempt to use this document to operate the QwikScan unless supervised by trained, experienced personnel.

2. APPLICABLE DOCUMENTS

MPD 1280.1	Marshall Management Manual
EM50-OWI-002	Document and Data Control
EM50-OWI-003	Control of Records
	TMA QwikScan Scatterometer Manual

3. DEFINITIONS

Warning - Warnings are used when failure to observe instructions or precautions could result in injury to personnel.

Caution - Cautions are used when failure to observe instructions could result in damage to equipment.

Note - Information to help clarify multi-person procedures or simultaneous multiple operations.

4. INSTRUCTIONS

Work performed and data generated within EM50 that affects the quality of products as specified in the scope of MPD 1280.1 will be documented and controlled per EM50-OWI-002.

4.1 Turn on TMA Qwikscan.
4.2 Turn on controlling computer and type "CASI" at the prompt.
4.3 Make a background signature measurement.

4.3.1 Detectors are placed on the lower 90° of the arc. Choose detector angles according to the sample to be measured, near-specular angles for mirrors, higher angles for thermal control coatings and other diffuse samples. Record detector angles in the appropriate lab notebook.
4.3.2 Turn key to activate laser.
4.3.3 Defeat laser safety interlock and check alignment with specular reflectance detector.

Warning - The HeNe laser may cause eye damage from chronic exposure. Do not stare directly into the laser beam. Wear protective goggles.

4.3.4 Close lid.
4.3.5 Follow software prompts for recording a signature. Refer to TMA QwikScan scatterometer manual, chapter III.
4.4 If making reflectance measurements, move detectors to upper 90° of the arc, being sure to place them at the corresponding angles used in the signature file.
4.5 Place sample in holder.
4.6 Using front eyepiece, align sample so that half of the alignment marker on the back wall of the TMA QwikScan is obscured.
4.7 Defeat the laser interlock, and check alignment with specular reflectance detector. If sample is diffuse, adjust x and y position of sample holder so that the small mirror at the base of the sample holder reflects the laser light into the specular reflectance detector. Repeat step 4.6.

Warning - The HeNe laser may cause eye damage from chronic exposure. Do not stare directly into the laser beam. Wear protective goggles.

4.8 Adjust x and y position of sample so that laser strikes the center of the sample.
4.9 Close lid.
4.10 Follow software prompts for making scatter measurements.
4.11 Make a total signal measurement and record the specular reflectance.
4.12 Make an angle scan (CASI) of the sample.
4.13 Save the angle scan, and record the file name.
4.14 Follow software prompts for making a raster scan of the sample. Select the appropriate sample size and spot size for the scan - raster scan should not extend beyond the sample are to be measured.
4.15 Make a raster scan (RASI) of the sample.
4.16 Save the raster scan and record the file name.

4.17 Follow the software prompts for analyzing raw data to compute the BSDF. Refer to TMA QwikScan scatterometer manual, chapter IV.
4.18 Print BSDF and raster scan graphs.
4.19 Exit program and turn off computer and TMA Qwik Scan.

5. NOTES

Do not make signature, reflectance, or transmission measurements with the lid open.

6. SAFETY PRECAUTIONS AND WARNING NOTES

Follow general safety precautions for Class II lasers. Do not stare directly into the beam. Exercise caution with mirrors where specular reflectance may hit an eye. Protective eyewear should be used and spectators kept to a minimum.

7. APPENDICES, DATA, REPORTS, AND FORMS

When qualifying a material for spacecraft use, a data sheet shall be filled out with scattering data for each sample, usually the printouts from the CASI and RASI programs. This data sheet shall be presented to quality personnel for stamping. MSFC Quality may choose whether or not to be present for the sample characterization.

8. RECORDS

Records will be retained in accordance with EM50-OWI-003. Copies are to be maintained on file in EM50 for a period not less than two years.

9. TOOLS, EQUIPMENT, AND MATERIALS

None.

10. PERSONNEL TRAINING AND CERTIFICATION

The leader of the Environmental Effects Group shall be responsible for ensuring that all personnel using the TMA QwikScan are trained. Training is generally accomplished as on-the-job training by experienced personnel or a manufacturer’s representative. Records of personnel training shall be kept in the group office.

11. FLOW DIAGRAM