



George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

EM50-OWI-012
Revision F
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ORGANIZATIONAL WORK INSTRUCTION

EM50

OPERATION OF ARC VUV REFLECTOMETER WITH CAMS SOFTWARE

**APPROVING
AUTHORITY**

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EM50

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VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline	Initial Release	7/30/97	Baseline
Revision	A	10/3/97	
Revision	B	6/2/99	Revision to incorporate re-organizational changes
Revision	C	08/16/02	Revision made to incorporate applicable OWI changes and clarifications and correct errors
Revision	D	2/4/04	Revision made to clarify procedure steps and revise data analysis section to reflect software updates.
Revision	E	9/3/04	Revision to accommodate NASA HQ actions for document standardization.
Revision	F	04-27-05	Changes made due to reorganization

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OPERATION OF ARC VUV REFLECTOMETER WITH CAMS SOFTWARE

1. SCOPE

1.1 Scope

This work instruction defines the recommended method of operation for the ARC VUV Reflectometer system in Building 4711 room E114A.

1.2 Purpose

This work instruction will provide a standard procedure for the use of this equipment.

1.3 Applicability

This work instruction applies to all those who intend to operate this equipment. This document is not a substitute for formal training on this equipment.

1.4 Responsibilities

The test requester shall log out/log in sample(s), on the designated log out/log in sheets provided, being as descriptive as possible (project, etc.).

2. APPLICABLE DOCUMENTS

EM50-OWI-002 – Work Request Process

EM50-OWI-003 - Control of Records

EM50-OWI-004 - Control of Customer-Supplied Product

3. DEFINITIONS

3.1 Sample, optical witness sample (OWS) – 1” diameter reflective surface exposed to some process.

3.2 Control – Reference OWS placed in a controlled environment during sample exposure.

3.3 CAMS – Control software purchased with system that operates vacuum and monochromator components.

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3.4 Carousel – Fixture that holds up to eight samples in reflectometer chamber. It is placed on a shaft controlled by CAMS during testing.

3.5 Visually contaminated – A film or fog seen on OWS with the human eye under normal lighting without magnification.

3.6 Slot – Opening in the sample carousel for the OWS.

3.7 Pinch Clips – “C” shaped rings used to hold the OWS in the carousel.

4. INSTRUCTIONS

4.1 Pre-loading

- a. Put on appropriate gloves.
- b. Visually inspect sample for contamination. If OWS is visibly contaminated note in logbook but do not place in carousel.
- c. If sample has no visible contamination, put OWS in carousel. NOTE: Backside of sample has serial number engraved on it. Load front side down when carousel is in holder.
- d. Put OWS control in carousel.
- e. Document on VUV test log the slot location of each OWS.
- f. Place pinch clip over each OWS.
- g. After each OWS has been recorded in VUV log, a letter shall be assigned to each one. To assign a letter, look in the VUV test log for the last time that sample was run. Go up one letter for this run.
- h. Turn on computer and monitor.
- i. Check the reflectometer chamber door. If it is under vacuum, go to section 4.5.

4.2 Automatic and Manual Pump Down Procedure

4.2.1 Automatic Pump Down Procedure

- a. Open CAMS and click on “**Load Samples**” tab.
- b. Open reflectometer chamber door and slide carousel on shaft in reflectometer chamber.
- c. Gently rotate carousel until key is seated.
- d. Place nut on shaft end and finger tighten.
- e. Close chamber door and finger tighten thumbscrew.
- f. In CAMS window, click on “**Pump Down Sample Chamber**” and turn on roughing pump.
- g. Tighten chamber door thumbscrew when prompted by CAMS.
- h. In CAMS window, enter appropriate sample and control numbers in their

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- corresponding carousel slot positions.
- i. Close “**Load Samples**” window.
- j. Click on “**Setup**” tab and select “**Vacuum Control.**”
- k. When chamber has reached high vacuum (takes several minutes), turn off roughing pump.
- l. Close “**Vacuum System Control**” window.

4.2.2 Manual Pump Down Procedure

- a. Open reflectometer chamber door and slide carousel on shaft in reflectometer chamber.
- b. Gently rotate carousel until key is seated.
- c. Place nut on shaft end and finger tighten.
- d. Close chamber door and finger tighten thumbscrew.
- e. In CAMS, click on “**Setup**” tab and select “**Vacuum Control.**”
- f. Verify that all valves are closed. Close any that are open.
- g. Turn on roughing pump and open roughing valve.
- h. When TC3 on the multi-gauge reads below 3.0×10^{-1} torr, close the roughing valve and turn off roughing pump.
- i. Open the high vacuum valve and the slit valve.
- j. Close “**Vacuum System Control**” screen.

4.3 Running an Instrument Baseline Reference

- a. Click on the “**Analyze Samples**” tab and select “**Recall Reference.**” Select most recent reference file.
- b. Click on the “**Analyze Samples**” tab and select “**New Reference.**”
- c. When vacuum is below 4×10^{-5} torr, turn lamp on in CAMS window and on lamp control panel.
- d. Allow lamp to warm up for at least 30 minutes.
- e. Click “**Start Scan**” and rotate detector to the reference position when prompted by CAMS.
- f. It may take several runs to get a repeatable reference. Monitor scan progress. If a number 1 appears in the first “Readings” block on the first two wavelength scans, the reference scan will have to be repeated.
- g. When an acceptable reference is obtained name the file per the following method:
E.g., 071202A.rfp where
07 = month
12 = day
02 = year
A = alpha sequence of reference scan in one day
- h. Click the “**Print Data**” and “**Print Scan**” buttons.
- i. Close “**Scan Reference**” screen.

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j. Close “**Reference Scan**” screen.

4.4 Running Samples

- a. Click on “**Analyze Samples**” and select “**New Sample**”.
- b. Click “**Scan All.**”
- c. Deselect sample boxes that are empty in carousel.
- d. Click on “**Print All Samples.**”
- e. Click on “**Continue.**”
- f. When prompted, rotate detector to correct position.
- g. When scans are completed, close “**Sample Scan**” screen.

4.4.1 Turning off Deuterium Lamp

- a. Click on “**Setup**” tab and select “**Manual Control.**”
- b. Turn off D2 lamp on screen and on lamp control panel.
- c. Close “**Manual Control**” screen.

4.5 Automatic and Manual Chamber Vent Procedure

4.5.1 Automatic Vent Procedure

- a. Open CAMS (if not already running).
- b. Click on “**Load Samples**” tab and click on “**Vent Sample Chamber.**”
- c. Unscrew thumbscrew on chamber door.
- d. Turn on Missile Grade Air switch.
- e. When chamber has reached atmospheric pressure, make sure door is closed with a small opening.
- f. Close “**Load Samples**” screen and turn off Missile Grade Air.
- g. Shut down CAMS.

4.5.2 Manual Vent Procedure

- a. Open CAMS (if not already running).
- b. Click on “**Setup**” tab and select “**Vacuum Control.**”
- c. Close all valves.
- d. Unscrew thumbscrew on chamber door.
- e. Turn on Missile Grade Air switch.
- f. Open “**Vent Valve #2.**”
- g. When chamber has reached atmospheric pressure, make sure door is closed with a small opening.
- h. Close “**Vacuum System Control**” screen and turn off Missile Grade Air.
- i. Shut down CAMS.

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4.6 Removing Samples

- a. Put on appropriate gloves.
- b. Open chamber door, unscrew nut on shaft and place in bottom of chamber, remove carousel.
- c. Close chamber door.

4.7 Data Analysis

- a. Click on “**VUV Analysis**” Icon on desktop.
- b. Enter appropriate information from Work Instructions and data sheets. Reflectance changes are calculated automatically.
- c. Save data report using Work Instruction number (e.g. WR-434).
- d. Repeat for other samples (if required).
- e. Print report(s).
- f. Close Excel and shut down computer.

5. SAFETY PRECAUTIONS AND WARNING NOTES

Always wear appropriate gloves when handling any piece of equipment that goes into chamber or tools that come in contact with equipment that goes into chamber (i.e., all samples, controls, sample holders, clips, and flow bench items).

6. APPENDICES, DATA, REPORTS, AND FORMS

6.1 OWS Login Book

6.2 OWS Logout Book

6.3 VUV Test Log

7. RECORDS

A work request form per EM50-OWI-002 shall accompany the sample and will have a Group tracking number. After completion of analysis, test results shall be sent to Team Lead or Test Engineer for verification. Afterwards, a report shall be generated of the data and reported to the requester. A copy of this report shall then be filed in the Group archive and another placed in lab notebook. These records shall be in compliance with MPG 1441.1 per EM50-OWI-003. All sample data is maintained in notebooks near system and on system computer.

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8. PERSONNEL TRAINING

A qualified operator in all aspects of system use and operation shall train personnel conducting tests per this OWI. They shall be approved by the Group Lead to be a qualified operator before being left alone to generate data to be reported outside the Group. Untrained and unapproved personnel shall not attempt to use the system unless supervised by trained, experienced personnel.

