Thermal Vacuum Test Procedure

IMAGE FUV GEO subsystem

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1. GENERAL

1.1 Scope

This procedure is intended for thermal vacuum testing of IMAGE flight equipment in the UCB/SSL Thermal Vacuum Chamber. Prior to beginning this procedure the chamber should be pre-cleaned and certified as described in UCB document titled "Thermal Vacuum Chamber Cleaning and Cleanliness Certification Procedure", document # UCB-BYW-1.

1.2 Clean Room Operations

This procedure involves operations in class 10,000 cleanrooms. All personnel requirements for the facility (gowning, materials, etc.) must be met.

1.3 Acronyms and Definitions

NVR	Non-volatile residue; molecular contamination occupying a volume of air or vacuum in a gaseous or liquid-droplet state, which can precipitate onto surfaces
RGA	Residual Gas Analyzer; A laboratory instrument designed to evaluate partial pressures of residual gasses in vacuum, and which is able to resolve partial pressures to less than 1 amu (atomic mass unit)
TQCM	Thermally Controlled Quartz Crystal Microbalance; A laboratory instrument designed to detect changes in the amount of molecular surface contamination on a thermally controlled surface

2. THERMAL VACUUM TEST PROCEDURES

2.1 Preparation

1. If available install a TQCM head in the chamber.

2. Install GEO detector hardware, electronics and stim lamp into the chamber. All hardware, including cables and fixtures, should be pre-cleaned and have suitable materials that meet outgassing requirements for space flight hardware.

3. Perform the IMAGE GEO detector functional test in air (see separate document) to ensure that the detector electronics are operative and that cable and harness continuity has been achieved. Perform a similar test on the stim lamp and associated electronics to ensure photons are emitted from the lamp which hit the detector window. Perform test with sun sensor lamp stim lamp to verify that lamp can stimulate sun sensor.

2.2 Pump down

1. Pump down the chamber to high vacuum ($< 10^{-5}$ torr) and if installed turn on the TQCM unit. Set the temperature of the TQCM to -20˚C and allow the frequency to stabilize. Begin recording TQCM frequency on the attached Thermal Vacuum Log. If there is no TQCM available a high vacuum of $< 10^{-5}$ torr is required for 2 hours prior to turning on the high voltage for functional test.

2. 3 Thermal Cycle Tests

1. Once at high vacuum, perform and record a detector functional test at ambient temperature (~25C). Turn detector electronics OFF.

2. Set the shroud and baseplate temperature to +50˚C. If there will be operators present, it may be desirable to set the shroud and baseplate temperatures 5˚ to 10˚ beyond the desired limits to accelerate the heating process. Shroud and baseplate temperatures should be restored to desired instrument temperature after the instrument is within 5˚ of the desired temperature.

3. Once the system temperature has stabilized for at least 2 hours at the desired temperature, turn the detector electronics ON and perform the specified functional test record the test data. **No HV** to be applied to the detector at this temperature at this time.

4. Turn the detector electronics OFF, and cool the system down to -30C.

5. Once the system temperature has stabilized for at least 2 hours at the desired temperature, turn the detector electronics ON and perform the specified functional test record the test data. **No HV** to be applied to the detector at this temperature

6. Set the temperature to +40˚C,

7. Once the system temperature has stabilized for at least 2 hours at the desired temperature, turn the detector electronics ON and perform the specified functional test record the test data. **HV** to be applied to the detector at this temperature at this time and full functional performed.

8. Turn the detector electronics OFF, and cool the system down to -20C.

9. Once the system temperature has stabilized for at least 2 hours at the desired temperature, turn the detector electronics ON and perform the specified functional test record the test data. **HV** to be applied to the detector at this temperature

10. With the detector electronics ON, go through 6 more thermal cycles between +40˚C and -20˚C, however functional testing of the detector **with applied no HV** is allowed.

11. After completion of the functional testing at +40C of cycle number 6 , with the detector electronics ON, cool system to +20C, +15C and record functional data at each stable temperature.

12. Complete cycle 6 functional testing at -10C, and then turn detector electronics OFF. Heat system to ambient (+25C).

13. Record final functional in vacuum at +25C.

14. Turn all electronics OFF.

On completion of the test:

15. Record the base pressure of the chamber.

16. Turn off the TQCM.

17. Vent the chamber/ or initiate procedures for IMAGE Detector System Cleanliness Certification

Thermal Vacuum Log
IMAGE FUV Project

Date:_____ Performed by:_____

Begin pump down time:_____

Time to reach 30 microns:_____

Time from 30 microns to 1.0 x 10e-5 Torr:_____

TQCM Data (TQCM = -20C) : (note - 1.56 x 10-9 g/cm2/Hz)

Time	Tank Temperature	TQCM Frequency

** Record data on continuation sheet if necessary

T-V test completed at (time/date):_____

TQCM rate of change at completion:_____

Chamber base pressure:_____

Thermal Vacuum Log
IMAGE FUV Project
(continued)

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Time	Tank Temperature	TQCM Frequency
