

Thermal Vacuum Test Procedure

IMAGE FUV SI Detector Assembly

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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 precleaned 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 SI detector hardware, electronics and stimulation lamp with pin hole mask into the chamber. All hardware, including cables and fixtures, shall be pre-cleaned and have suitable materials that meet out-gassing requirements for space flight hardware.
3. Perform the IMAGE FUV SI detector functional test in air (Dwg No 8304-T1) to ensure that the detector electronics are operative and that cable and harness continuity has been achieved. Perform a similar test on the stimulation lamp and associated electronics to ensure photons correct alignment of the lamp, mask, and detector.

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 vacuum of $< 10^{-5}$ torr is required for 2 hours prior to turning on detector high voltage.

2.3 Thermal Cycle Tests

1. Once at high vacuum, perform and record a detector functional using the forms in dwg 8304-T1 test at ambient temperature ($\sim 25\text{C}$). Turn detector electronics OFF.
2. Set the shroud and baseplate temperature to $+50^{\circ}\text{C}$. 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 functional test 8304-T1 but with out using high voltage, and record the test data. **No HV** to be applied to the detector at this temperature.
6. Set the temperature to $+40^{\circ}\text{C}$,
7. Once the system temperature has stabilized for at least 2 hours at the desired temperature, turn the detector electronics ON and perform the full 8304-T1 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 functional test and record the test data. **HV** to be applied to the detector at this temperature
10. With the detector electronics ON, perform 6 more thermal cycles between +40°C and -20°C, with functional testing of the detector **without applying high voltage**.
11. After completion of functional testing at +40C in cycle 8 , with the detector electronics ON, cool the system to +20C and record functional data.
12. Complete cycle 8 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 and perform IMAGE Detector System Cleanliness Certification.

