STEREO
IMPACT

FM1 IDPU Thermal Vacuum Test Report

IMPACT-IDPU-FM1-TVac-Report.doc
Version B – 2005-Feb-28

David Curtis, UCB IMPACT Project Manager

Document Revision Record

Rev.	Date	Description of Change	Approved By
A	2005-Feb-22	Preliminary Draft	-
B	2005-Feb-28	Editorial changes, add TQCM criteria	-

Distribution List

Dave Curtis, UCB
Jeremy McCauley, UCB
Lil Richenthal, GSFC

Table of Contents

1. Overview

1.1. *Introduction*

The Instrument Data Processing Unit (IDPU) is the part of the STEREO IMPACT instrument suite. It resides inside the spacecraft, hard-mounted (conductively coupled) to the deck.

This document describes the results of the thermal vacuum testing performed on the FM1 IDPU unit. This testing was performed at U.C. Berkeley following the test procedure called out in reference 1. There was no thermal balance test performed on the IDPU, as called out in reference 2.

The IDPU FM1 has satisfactorily completed its thermal vacuum test program and has met all of its requirements spelled out in reference 1 and 2.

1.2. *Applicable Documents*

The following documents are closely interrelated with this specification. All documents can be found on the Berkeley STEREO/IMPACT FTP site unless otherwise indicated:

http://sprg.ssl.berkeley.edu/impact/dwc/

1. IMPACT IDPU TVAC TEST PLAN
2. APL Document APL 7381-9003 Rev A – STEREO Environment Definition, Observatory and Instrument (on APL web site)
3. IMACT-IDPU-CPT

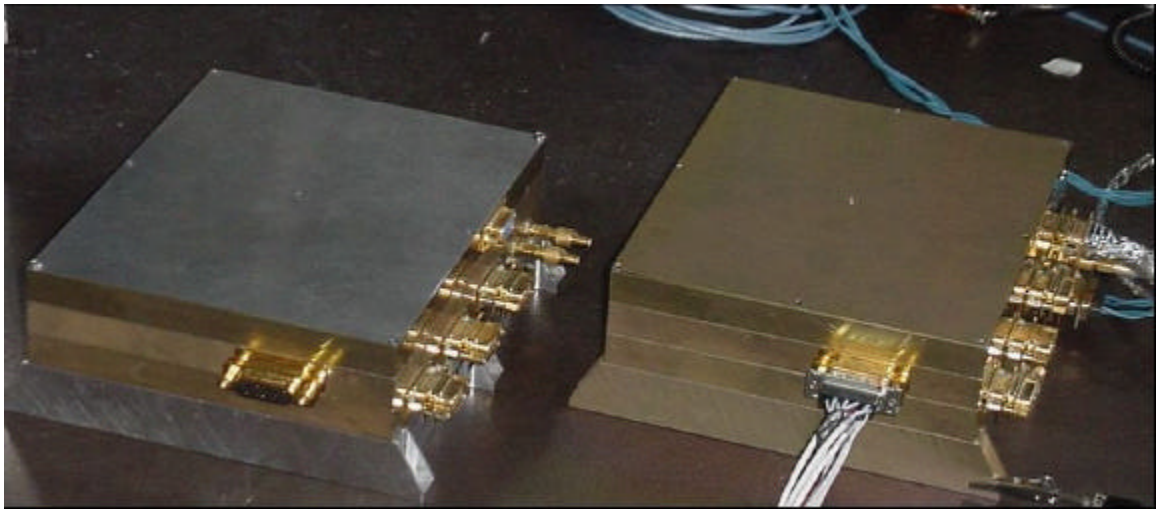


Fig 1. FM1 and FM2 IDPU

2. Test Setup

The "Jeffrey" thermal vacuum chamber at U.C. Berkeley was used for the first part of the thermal vac of the IDPU. This is the chamber built for the IMPACT Boom thermal vacuum tests. Later the test was moved to the smaller SNOUT chamber to allow Jeffrey to be used for the SWEA Thermal Balance tests. Final outgassing certification was completed in Jeffrey, since SNOUT is not certified for that purpose.

The FM1 boom, including the FM1 MAG and STE-U instruments were setup outside the chamber. SEP, SWEA, and PLASTIC were simulated by GSE (ISG).

In addition to chamber monitoring TCs (on the baseplate, cold plate, and shrouds), a number of chamber TCs were attached to the exterior of the instrument to monitor the temperature. These instrument-mounted TCs were used to determine when temperature soaks were met. The one internal temperature sensor tended to run 10-15C warmer when the instrument was powered due to power dissipation in the unit.

3. Test History

3.1. *First Run*

This test was first attempted starting on 2004-November-19, following vibration testing of the IDPU. Following a ~72 hour +60C bakeout / non op hot cycle, the instrument was transitioned to non-op cold. After non-op cold soak the instrument was cycled to operational warm temperature. During the first operational hot and cold soaks the instrument was powered up and passed CPT. However at both hot and cold soak the instrument failed to start up properly below a bus voltage of 26V (requirement is 24V). The test was aborted and the unit was removed from the chamber for diagnostics (see PFR 1027). The problem was diagnosed as a failed diode in the soft-start circuit of the power converter. The part was replaced and testing resumed. Project agreed to allow us to continue from the place we left off (start of cycle 3), rather than starting from scratch.

The instrument was again baked out at non-op temperature levels for ~100 hours (over Thanksgiving weekend). The first operational cycle (cycle 3) we repeated cold-start at the hot and cold plateaus and had no trouble starting at down to 24V. Cycles 3,4,5 were completed successfully (with CPTs at each plateau).

After cycle 5 it was decided that the diode we replaced should have been replaced with a part from a newer lot date code. One theory for why the part failed is because it was from an older lot date code and there was no proof that the supplier had re-screened the part. It was decided to abort thermal vac again, replace the diode again, and then complete the last 2 cycles. Note that a workmanship vibration was also completed prior to putting the IDPU back in the chamber. At this time SWEA was ready to start thermal balance testing, which needed the Jeffrey chamber, and the Snout chamber had become available, so Snout was used for the last 2 cycles.

The IDPU was mounted in Snout and baked out for another ~48 hours. The last 2 cycles were complete successfully (with CPTs at each plateau), with cold starts being demonstrated hot and cold on the last cycle. This testing finished on 2004-December-22.

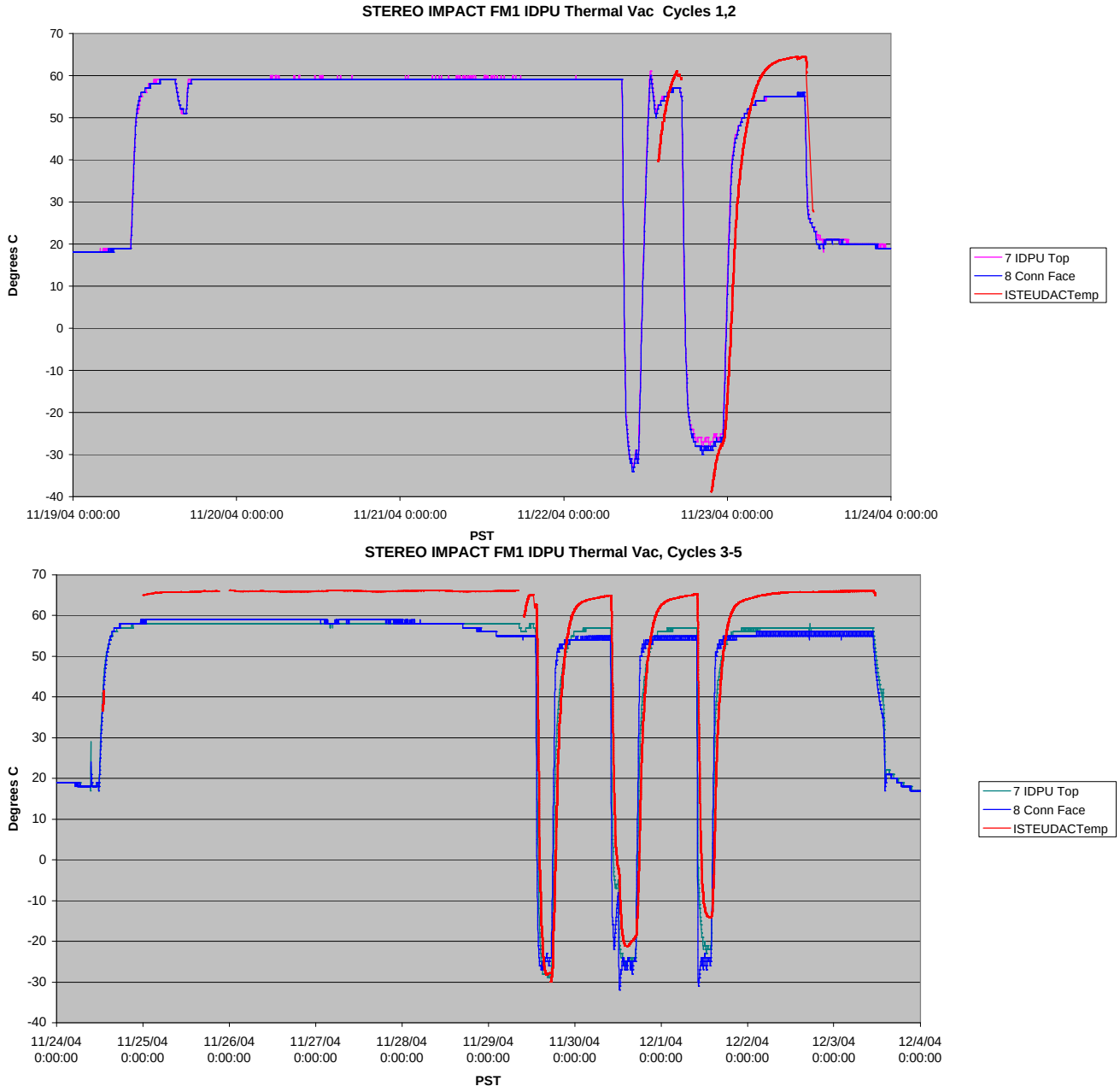
3.2. *Second Run*

A problem was discovered during the last thermal vac cycle of the FM2 IDPU (PFR 1032) which was determined to be caused by a reverse-biased tantalum capacitor in the power converter. It was determined that the FM1 IDPU also had this reverse-biased capacitor. The capacitor in both units was replaced so that it was correctly biased. FM1 IDPU then returned for 4 more cycles of thermal vac in the SNOUT chamber.

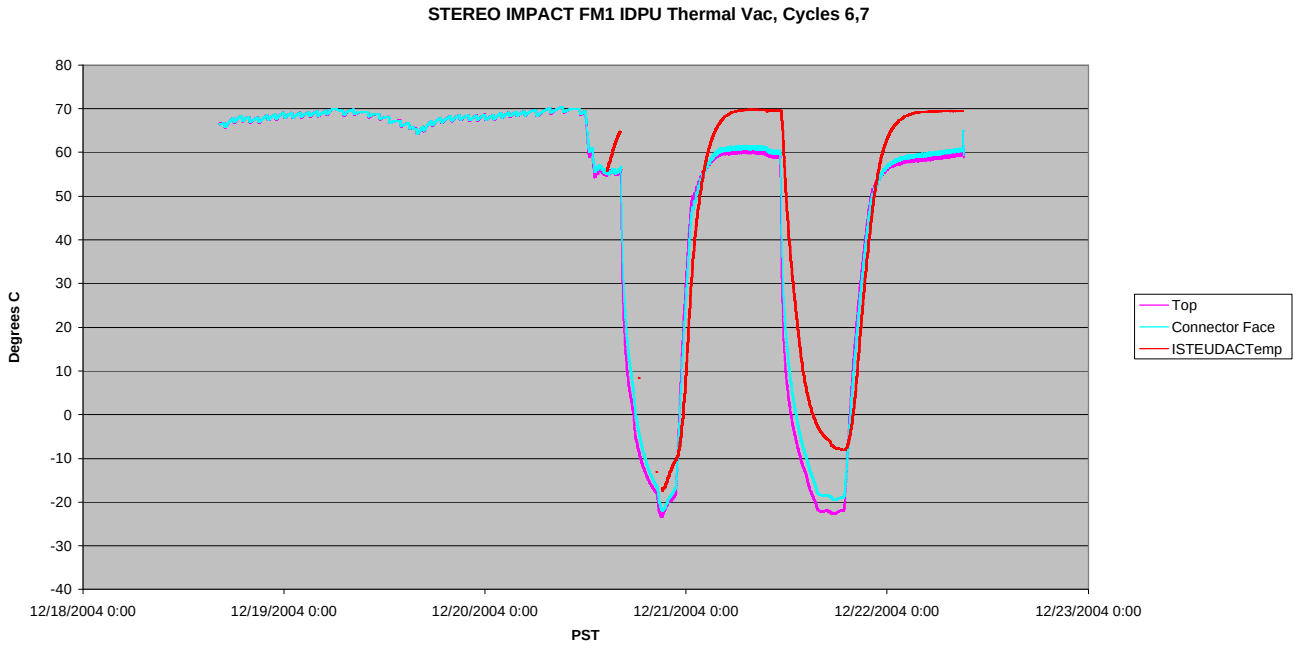
Starting on 2005-January-21 the IDPU was baked out at non-op hot for 72 hours. The unit was then cycled 4 times with CPTs at each plateau and cold start demonstrated at hot and cold of the first and last cycles at high and low bus voltage limits. The test completed 2005-February-1.

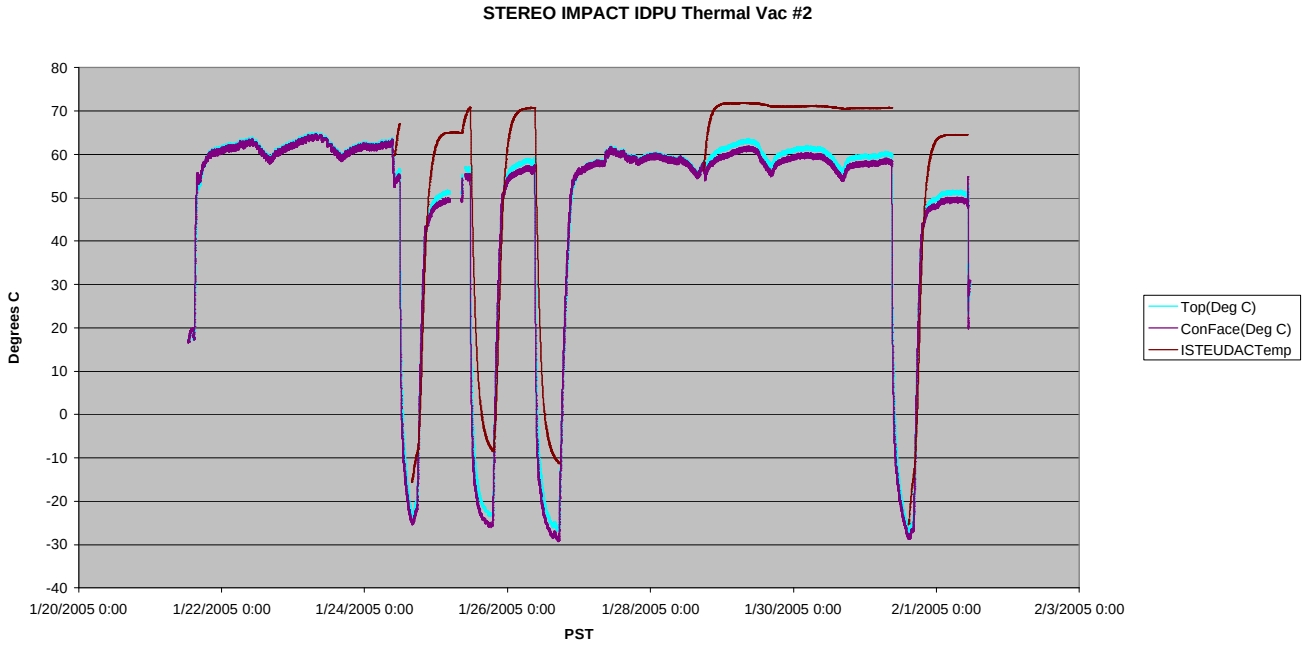
Following this second thermal vac run the unit complete a workmanship vibration and passed the subsequent CPT test. The unit then went back into the Jeffrey chamber for bakeout certification (see below)

4. Temperature Profile



IDPU Top is a chamber thermocouple taped to the top of the IDPU. Conn Face is a chamber TC taped to the connector face of the IDPU. ISTEUDACTemp is an instrument thermistor mounted to the STE-U interface board in the IDPU.


STEREO IMPACT FM1 IDPU Thermal Vac, Cycles 6,7
Degrees C
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
12/18/2004 0:00
12/19/2004 0:00
12/20/2004 0:00
12/21/2004 0:00
12/22/2004 0:00
12/23/2004 0:00
PST
Top
Connector Face
ISTEUDACTemp


STEREO IMPACT IDPU Thermal Vac #2
Degrees C
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
1/20/2005 0:00
1/22/2005 0:00
1/24/2005 0:00
1/26/2005 0:00
1/28/2005 0:00
1/30/2005 0:00
2/1/2005 0:00
2/3/2005 0:00
PST
Top(Deg C)
ConFace(Deg C)
ISTEUDACTemp

5. Trending

5.1. *Trending Data Explanation*

The trending data on the previous pages is extracted from the trending file for the STE-U and Magnetometer instruments, plus the IDPU power trend. It is composed of values measured during the CPT, either directly, or from a post-processing fitting function which evaluates the data collected.

- The Door Open and Door Close columns show two times; from application of power to the time when the door comes off the first switch (starts moving), and the time from the application of power to the time when the door reaches the destination switch.
- Threshold values are DAC levels, corresponding to ~100eV per step. Requirement is <5keV.
- The test pulser fit data measures the electronic performance. Of particular interest is the FWHM, which measures the electronic noise in the system. Other values can be used to look for thermal drift and other trends in energy gain and offset.
- The "door source" fit data measures the calibration source on the STE door, and so is a end-to-end measurement (albeit using mostly photons rather than electrons). Again the FWHM is of interest (requirement < 2keV).

- Magnetometer RMS data is mostly influenced by noise sources in the vicinity of the sensor during the test (pretty bad in the clean room and close to the Jeffrey chamber, not so bad close to the Snout chamber)
- The IFC (In-Flight Calibration) data are parameters from a fit to the transition from IFC off to IFC on. This includes the measured amplitude of the stimulation (should be stable to a few percent), the relative timing (important for correlation of data timing with SWAVES, should be good to a few milliseconds), and the decay time of the signal (which indicates how the front end filtering is working; the fit is not great because only a few data points are taken during the transition).

- IDPU trends show the primary current (data logger) and secondary voltages (instrument housekeeping). There was a significant decrease in the instrument current when the soft start circuit was fixed. No other significant trends.

5.2. ***STE-U Trending Data***

STE-U FM1 Performance Trend

													Test Pulser					Door Source						Long Integration Door Source (Door LUT)						
Date	File	Test	STE-U Temp	Preamp Temp	IDPU Temp	ISTEU Cur (mA)	Door Open (sec)	Door Close (sec)	Bias	Fit Rev	Det.	Thresh.	Offset (keV)	Gain (keV/Bin)	Curv. (1/keV)	Test Gain	FWHM (keV)	Offset (keV)	Gain (keV/Bin)	Curv. (1/keV)	6keV c/s	22keV c/s	FWHM	AccTime (sec)	Offset (keV)	Gain (keV/Bin)	Curv. (1/keV)	6keV c/s	22keV c/s	58keV c/s	FWHM
18-Nov-04	0411181804.fim	FM1 IDPU post vib CPT (with FM1 boom, STE-U; no SWEA)	22		27.4	19	0.38 / 0.38	0.38 / 0.50		12/8/2004	0	8	-0.02	0.3847	1.32E-04	13.9591	0.820	-0.04	0.3891	6e-5 (F)	41.24	21.96	0.953	680	-0.03	0.3879	1.11E-04	37.17	21.20	3.91E-03	0.929
											1	9	-0.03	0.3841	1.46E-04	13.2304	0.844	-0.08	0.3849	6e-5 (F)	40.18	21.74	0.930		-0.07	0.3855	3.82E-05	36.01	20.17	3.83E-03	0.913
											2	8	-0.02	0.3837	1.48E-04	12.8552	0.797	-0.09	0.3908	6e-5 (F)	33.41	19.87	0.877		-0.07	0.3904	7.68E-05	32.26	18.44	1.09E-02	0.888
											3	8	-0.04	0.3842	1.31E-04	13.6208	0.794	-0.04	0.3846	6e-5 (F)	33.18	20.40	0.902		-0.04	0.3947	6e-5 (F)	31.83	18.36	7.96E-03	0.894
22-Nov-04	0411221349.fim	FM1 IDPU Tvac Hot #2	25.2		54.9	16	0.38 / 0.38	0.25 / 0.38		12/8/2004	0	9	-0.04	0.3839	1.37E-04	13.5813	0.885	-0.11	0.3896	6e-5 (F)	36.21	20.51	1.077	630	-0.11	0.3902	3.68E-05	33.13	19.17	1.19E-02	1.063
											1	9	-0.06	0.3833	1.56E-04	12.9280	0.992	-0.16	0.3846	6e-5 (F)	35.51	20.33	1.046		-0.17	0.3849	3.73E-05	32.70	18.83	8.97E-03	1.066
											2	10	-0.01	0.3834	1.63E-04	12.5943	0.870	-0.11	0.3892	6e-5 (F)	32.13	18.94	0.963		-0.11	0.3892	5.09E-05	29.40	17.06	4.61E-03	0.949
											3	8	-0.01	0.3837	1.45E-04	13.3839	0.875	-0.06	0.3944	6e-5 (F)	31.27	18.49	0.961		-0.06	0.3944	6e-5 (F)	29.22	17.10	7.93E-03	0.964
22-Nov-04	0411221349.fim	FM1 IDPU Tvac Cold #2	31.4		-33.3	24.3	0.38 / 0.38	0.25 / 0.38		12/8/2004	0	10	-0.20	0.3856	9.62E-05	13.8488	0.962	-0.18	0.3879	6e-5 (F)	35.74	20.37	1.049	610	-0.14	0.3873	7.33E-05	32.97	19.52	9.41E-03	1.053
											1	11	-0.19	0.3854	1.27E-04	13.1337	0.986	-0.18	0.3845	6e-5 (F)	34.34	20.41	1.034		-0.17	0.3843	5.95E-05	32.48	18.58	1.81E-02	1.014
											2	9	-0.18	0.3854	1.27E-04	12.8973	0.850	-0.16	0.3913	6e-5 (F)	31.00	18.03	0.924		-0.18	0.3919	6e-5 (F)	28.89	17.04	2.26E-03	0.929
											3	9	-0.17	0.3862	1.06E-04	13.6374	0.859	-0.15	0.3935	6e-5 (F)	31.07	17.93	0.950		-0.15	0.3930	6.79E-05	28.56	16.76	1.18E-02	0.951
29-Nov-04	0411290000.fim	FM1 IDPU Tvac Hot #3	19		64.2	12	0.38 / 0.50	0.38 / 0.38		12/8/2004	0	9	0.00	0.3839	1.43E-04	13.5300	0.914	-0.03	0.3887	6e-5 (F)	39.26	21.76	0.984	830	-0.04	0.3888	8.04E-05	36.96	20.49	6.41E-03	0.997
											1	9	0.01	0.3835	1.64E-04	12.9117	0.911	-0.08	0.3833	6e-5 (F)	39.05	22.31	0.954		-0.08	0.3833	6.60E-05	35.29	19.86	1.24E-02	0.939
											2	8	0.04	0.3835	1.70E-04	12.5980	0.820	-0.05	0.3890	6e-5 (F)	33.44	20.22	0.890		-0.07	0.3863	4.45E-05	31.03	18.18	7.80E-03	0.899
											3	8	0.02	0.3834	1.53E-04	13.3168	0.862	-0.02	0.3941	6e-5 (F)	33.29	18.96	0.915		-0.01	0.3939	7.74E-05	30.94	18.03	1.47E-02	0.930
29-Nov-04	0411290000.fim	FM1 IDPU Tvac Cold #3	25.9		-27.9	26	0.38 / 0.38	0.25 / 0.38		12/8/2004	0	11	-0.19	0.3859	0.88E-05	13.8308	1.155	-0.13	0.3870	6e-5 (F)	38.16	21.48	0.977	750	-0.12	0.3873	6e-5 (F)	35.70	20.33	3.00E-03	0.966
											1	12	-0.17	0.3846	1.30E-04	13.1012	1.319	-0.15	0.3846	6e-5 (F)	38.03	21.63	0.957		-0.13	0.3842	6e-5 (F)	35.63	19.33	4.43E-03	0.936
											2	13	-0.16	0.3852	1.31E-04	12.8980	1.003	-0.18	0.3922	6e-5 (F)	32.47	19.12	0.897		-0.15	0.3914	6.72E-05	30.56	17.89	1.63E-02	0.902
											3	10	-0.18	0.3856	1.07E-04	13.5958	1.214	-0.13	0.3932	6e-5 (F)	32.52	19.05	0.916		-0.13	0.3934	6e-5 (F)	30.75	17.52	7.17E-03	0.916
30-Nov-04	0411300000.fim	FM1 IDPU Tvac Hot #4	23		64.7	14.3	0.38 / 0.38	0.25 / 0.38		12/8/2004	0	8	-0.02	0.3838	1.37E-04	13.5270	0.892	-0.05	0.3893	6e-5 (F)	37.89	21.64	0.962	1750	-0.05	0.3890	6.53E-05	36.34	20.56	1.09E-02	0.974
											1	8	-0.01	0.3837	1.60E-04	12.9167	0.895	-0.07	0.3834	6e-5 (F)	38.43	21.78	0.963		-0.08	0.3833	6.04E-05	35.37	19.88	8.63E-03	0.942
											2	8	0.03	0.3834	1.68E-04	12.5836	0.820	-0.06	0.3890	6e-5 (F)	33.34	19.23	0.891		-0.07	0.3889	6.03E-05	30.80	17.90	8.73E-03	0.889
											3	8	0.03	0.3835	1.53E-04	13.3323	0.822	-0.01	0.3938	6e-5 (F)	33.98	18.90	0.928		-0.02	0.3943	5.42E-05	30.98	17.96	8.63E-03	0.911
30-Nov-04	0411300000.fim	FM1 IDPU Tvac Cold #4	26.6		-20.7	25.1	0.38 / 0.38	0.25 / 0.38		12/8/2004	0	10	-0.17	0.3855	1.02E-04	13.8072	0.997	-0.13	0.3879	6e-5 (F)	38.89	21.23	0.981	1400	-0.12	0.3879	5.62E-05	34.84	19.93	1.48E-02	0.999
											1	11	-0.16	0.3852	1.27E-04	13.0863	1.025	-0.12	0.3841	6e-5 (F)	37.73	20.86	0.950		-0.13	0.3840	7.54E-05	34.50	19.49	9.95E-03	0.966
											2	12	-0.14	0.3855	1.31E-04	12.8960	0.875	-0.13	0.3910	6e-5 (F)	33.01	19.10	0.917		-0.14	0.3913	6.44E-05	30.29	17.38	1.51E-02	0.907
											3	9	-0.15	0.3855	1.12E-04	13.5794	0.850	-0.12	0.3935	6e-5 (F)	32.80	19.47	0.932		-0.12	0.3933	6e-5 (F)	30.40	17.43	1.11E-02	0.919
1-Dec-04	0412010000.fim	FM1 IDPU Tvac Hot #5	24.3		65	14.3	0.38 / 0.38	0.25 / 0.38		12/8/2004	0	9	-0.03	0.3842	1.40E-04	13.5712	1.012	-0.06	0.3892	6e-5 (F)	38.99	22.24	0.981	610	-0.07	0.3898	5.29E-05	36.14	20.22	6.83E-03	0.993
											1	9	-0.06	0.3834	1.59E-04	12.9229	1.123	-0.09	0.3834	6e-5 (F)	40.53	20.93	0.959		-0.09	0.3835	6.62E-05	34.95	19.72	1.22E-02	0.960
											2	9	0.01	0.3837	1.64E-04	12.5902	0.913	-0.07	0.3888	6e-5 (F)	33.73	18.81	0.910		-0.08	0.3886	3.65E-05	30.90	17.41	6.14E-03	0.907
											3	9	-0.02	0.3840	1.46E-04	13.3490	0.859	-0.02	0.3943	6e-5 (F)	32.05	19.81	0.921		-0.02	0.3942	6e-5 (F)	31.09	17.66	8.90E-03	0.907
1-Dec-04	0412010000.fim	FM1 IDPU Tvac Cold #5	28.5		-13	24	0.38 / 0.38	0.25 / 0.38		12/8/2004	0	11	-0.14	0.3856	1.08E-04	13.8034	1.024	-0.12	0.3884	6e-5 (F)	37.98	21.24	0.998	1670	-0.11	0.3880	4.71E-05	35.04	19.76	1.02E-02	1.006
											1	11	-0.14	0.3843	1.34E-04	13.0594	1.074	-0.14	0.3848	6e-5 (F)	36.93	21.10	0.968		-0.13	0.3844	6.14E-05	34.88	19.45	1.12E-02	0.970
											2	10	-0.13	0.3855	1.33E-04	12.8923	0.895	-0.13	0.3913	6e-5 (F)	33.52	18.70	0.921		-0.14	0.3915	5.56E-05	30.44	17.63	1.53E-02	0.915
											3	9	-0.16	0.3853	1.12E-04	13.5502	0.893	-0.12	0.3937	6e-5 (F)	31.99	19.58	0.915		-0.11	0.3933	6e-5 (F)	30.04	17.48	4.52E-03	0.924
17-Dec-04	0412171330.fim	FM1 IDPU Post-workmanship vib CPT	19.1		24.4	20.3	0.38 / 0.50	0.38 / 0.38	150	12/8/2004	0	8	-0.04	0.3844	1.38E-04	12.7705	0.823	-0.12	0.3902	6e-5 (F)	42.57	22.56	0.929	1840	-0.11	0.3905	4.06E-05	38.14	20.84	1.15E-02	0.918
											1	11	-0.01	0.3854	1.60E-04	12.3499	1.054	-0.12	0.3859	6e-5 (F)	40.41	21.89	1.086		-0.11	0.3856	6.41E-05	36.85	20.28	7.35E-03	1.086
											2	10	-0.01	0.3868	1.56E-04	12.3219	0.974	-0.10	0.3911	6e-5 (F)	31.52	18.71	1.051		-0.10	0.3916	5.08E-05	31.29	18.12	8.54E-03	1.032
											3	8	No fit					-0.07	0.3948	6e-5 (F)	35.37	20.17	0.896		-0.09	0.3953	6e-5 (F)	32.42	18.27	9.09E-03	0.858
20-Dec-04	0412201426.fim	FM1 IDPU Tvac Hot #6	16		58.2	16	0.50 / 0.50	0.38 / 0.38	150	12/8/2004	0	10	0.02	0.3840	1.52E-04	12.8843	0.848	-0.07	0.3902	6e-5 (F)	42.11	21.33	0.942	820	-0.08	0.3909	4.06E-05	38.64	20.52	1.11E-02	0.945
											1	10	0.04	0.3860	1.71E-04	12.9336	1.034	-0.08	0.3846	6e-5 (F)	40.78	22.04	1.057		-0.08	0.3839	7.61E-05	37.47	20.66	1.30E-02	1.066
											2	9	0.06	0.3868	1.75E-04	12.3155	0.970	-0.04	0.3891	6e-5 (F)	34.37	18.96	1.031		-0.05	0.3884	6.42E-06	31.90	18.36	1.16E-02	1.029
											3	8	0.05	0.3843	1.61E-04	12.5775	0.780	-0.04	0.3851	6e-5 (F)	35.17	19.74	0.897		-0.04	0.3953	6e-5 (F)	33.16	18.17	8.97E-03	0.871
20-Dec-04	0412201426.fim	FM1 IDPU Tvac Cold #6	17		-15.9	24.7	0.38 / 0.50	0.38 / 0.38	150	12/8/2004	0	8	-0.11	0.3857	1.19E-04	12.8987	0.799	-0.14	0.3896	6e-5 (F)	41.10	21.61	0.975	1710	-0.14	0.3894	5.29E-05	38.59	20.61	9.39E-03	0.981
											1	10	-0.08	0.3848	1.43E-04	12.3784	0.948	-0.14	0.3858	6e-5 (F)	41.04	22.13	0.997		-0.12	0.3852	7.68E-05	37.76	20.06	1.18E-02	0.939
											2	10	-0.09	0.3853	1.39E-04	12.3242	0.904	-0.15	0.3928	6e-5 (F)	35.30	19.70	0.964		-0.13	0.3922	6e-5 (F)	31.90	18.02	9.50E-03	0.924
											3	8	-0.11	0.3856	1.24E-04	12.7574	0.751	-0.12	0.3948	6e-5 (F)	34.99	20.30	0.843		-0.13	0.3951	5.19E-05	33.00	18.43	1.15E-02	0.844
21-Dec-04	0412210000.fim	FM1 IDPU Tvac Hot #7	15.2		69.6	13.4	0.50 / 0.50	0.38 / 0.50	150	12/8/2004	0	8	0.03	0.3854	1.56E-04	12.8414	0.839	-0.05	0.3901	6e-5 (F)	42.85	22.10	0.930	1610	-0.06	0.3907	3.06E-05	38.80	21.02	1.09E-02	0.934
											1	9	0.07	0.3859	1.79E-04	12.3334	0.830	-0.08	0.3840	6e-5 (F)	41.06	21.94	0.912		-0.07	0.3841	8.04E-05	37.85	20.33	1.18E-02	0.901
											2	8	0.09	0.3912	1.82E-04	12.4604	0.783	-0.03	0.3890	6e-5 (F)	35.07	19.29	0.878		-0.04	0.3894	5.24E-05	31.88	18.26	1.42E-02	0.863
											3	8	0.07	0.3835	1.68E-04	12.5423	0.757	-0.02	0.3951	6e-5 (F)	35.93	19.71	0.855		-0.02	0.3951	6e-5 (F)	32.67	18.44	1.20E-02	0.857
21-Dec-04	0412210000.fim	FM1 IDPU Tvac Cold #7	18.7		-7.5	23.1	0.38 / 0.50	0.38 / 0.38	150	12/8/2004	0	8	-0.12	0.3851	1.20E-04	12.9550	0.793	-0.13	0.3897	6e-5 (F)	41.45	22.17	0.977	1550	-0.14	0.3898	4.22E-05	38.24	20.51	1.20E-02	0.970
											1	9	-0.07	0.3847	1.46E-04	12.3737	0.785	-0.13	0.3856	6e-5 (F)	39.83	21.35	0.893		-0.13	0.3859	5.22E-05	37.52	20.04	1.01E-02	0.865
											2	8	-0.08	0.3863	1.43E-04	12.3280	0.755	-0.13	0.3922	6e-5 (F)	34.00	19.41	0.850		-0.12	0.3921	6e-5 (F)	31.70	17.90	1.15E-02	0.854
											3	8	-0.11	0.3857	1.29E-04	12.7581	0.760	-0.14	0.3950	6e-5 (F)	35.62	20.41	0.865		-0.12	0.3948	6e-5 (F)	32.48	18.16	1.22E-02	0.848

STE-U FM1 Performance Trend

												Test Pulser					Door Source						Long Integration Door Source (Door LUT)							
Date	File	Test	STE-U Temp	Preamp Temp	IDPU Temp	ISTEUCur (mA)	Door Open (sec)	Door Close (sec)	Bias	Fit Rev	Det.	Thresh.	Offset (keV)	Gain (keV/Bin)	Curv. (1/keV)	Test Gain	FWHM (keV)	Offset (keV)	Gain (keV/Bin)	Curv. (1/keV)	6keV c/s	22keV c/s	FWHM	AccTime (sec)	Offset (keV)	Gain (keV/Bin)	Curv. (1/keV)	6keV c/s	22keV c/s	88keV c/s	FWHM
24-Jan-05	0501240956.tlm	FM1 IDPU Tvac #2 Hot #1	15.7		61.1	12.6	0.50 / 0.50	0.38 / 0.38	20	12/6/2004	0	6	0.02	0.3840	1.53E-04	12.6702	0.893	-0.06	0.3898	6e-5 (F)	41.17	21.35	0.950	1230	-0.06	0.3899	5.86E-05	38.28	19.92	1.41E-02	0.958
											1	8	0.06	0.3858	1.78E-04	12.3359	0.828	-0.08	0.3843	6e-5 (F)	40.02	20.26	0.887		-0.07	0.3836	7.10E-05	37.11	19.08	1.60E-02	0.887
											2	8	0.07	0.3939	1.79E-04	12.5464	0.808	-0.04	0.3896	6e-5 (F)	33.75	18.06	0.875		-0.04	0.3889	6.86E-05	31.53	17.02	7.23E-03	0.859
											3	8	0.07	0.3830	1.67E-04	12.5442	0.792	-0.04	0.3950	6e-5 (F)	34.69	18.88	0.861		-0.04	0.3950	6e-5 (F)	32.31	17.33	8.45E-03	0.883
24-Jan-05	0501240956.tlm	FM1 IDPU Tvac #2 Cold #1	19.6		-14.2	24	0.50 / 0.50	0.38 / 0.38	150	12/6/2004	0	6	-0.11	0.3858	1.19E-04	12.8908	0.835	-0.15	0.3890	6e-5 (F)	39.65	21.75	0.905	1390	-0.15	0.3890	5.77E-05	37.53	19.52	7.76E-03	0.906
											1	9	-0.08	0.3846	1.47E-04	12.3789	0.828	-0.15	0.3855	6e-5 (F)	40.45	20.66	0.874		-0.14	0.3858	5.14E-05	36.61	19.07	1.36E-02	0.886
											2	8	-0.08	0.3861	1.43E-04	12.3268	0.776	-0.12	0.3917	6e-5 (F)	33.21	17.70	0.861		-0.13	0.3918	6.24E-05	30.95	16.89	8.72E-03	0.852
											3	8	-0.10	0.3856	1.25E-04	12.7604	0.786	-0.14	0.3947	6e-5 (F)	33.85	18.59	0.848		-0.13	0.3944	6e-5 (F)	32.08	17.17	1.15E-02	0.855
25-Jan-05	0501250000.tlm	FM1 IDPU Tvac #2 Hot #2	17.1		69.9	13.7	0.38 / 0.62	0.38 / 0.38	150	12/6/2004	0	6	0.02	0.3835	1.59E-04	12.6490	0.892	-0.05	0.3907	6e-5 (F)	39.63	20.41	0.955	1380	-0.07	0.3901	4.96E-05	37.59	19.07	1.13E-02	0.915
											1	9	0.03	0.3864	1.74E-04	12.3267	0.852	-0.07	0.3837	6e-5 (F)	39.61	21.37	0.893		-0.06	0.3839	5.80E-05	36.72	19.03	1.40E-02	0.896
											2	8	0.05	0.3948	1.76E-04	12.5445	0.818	-0.05	0.3888	6e-5 (F)	33.47	18.86	0.859		-0.04	0.3883	7.62E-05	30.98	17.11	9.24E-03	0.867
											3	8	0.05	0.3838	1.66E-04	12.5408	0.799	-0.03	0.3951	6e-5 (F)	34.78	19.02	0.913		-0.03	0.3950	6e-5 (F)	32.39	17.38	1.23E-02	0.900
25-Jan-05	0501250000.tlm	FM1 IDPU Tvac #2 Cold #2	18.6		-6.6	23	0.38 / 0.50	0.38 / 0.38	20	12/6/2004	0	10	-0.11	0.3853	1.09E-04	13.7576	1.004	-0.04	0.3878	6e-5 (F)	38.61	21.33	1.115	4080	-0.06	0.3879	6.21E-05	36.13	19.41	1.34E-02	1.083
											1	10	-0.07	0.3848	1.37E-04	13.0487	0.956	-0.06	0.3851	6e-5 (F)	37.99	20.53	1.035		-0.06	0.3846	6.79E-05	35.56	19.07	1.38E-02	1.029
											2	9	-0.06	0.3848	1.38E-04	12.6508	0.795	-0.10	0.3913	6e-5 (F)	32.54	18.14	0.899		-0.10	0.3915	6.57E-05	30.74	16.96	1.24E-02	0.882
											3	9	-0.06	0.3851	1.20E-04	13.5046	0.828	-0.09	0.3942	6e-5 (F)	33.44	18.52	0.957		-0.06	0.3939	6.56E-05	31.22	17.26	1.22E-02	0.932
26-Jan-05	0501260000.tlm	FM1 IDPU Tvac #2 Hot #3	16.2		70.8	13.8	0.38 / 0.62	0.38 / 0.38	20	12/6/2004	0	10	0.03	0.3838	1.44E-04	13.5307	0.995	0.03	0.3887	6e-5 (F)	39.07	21.45	1.075	2030	0.04	0.3884	6.04E-05	36.08	19.61	7.17E-03	1.073
											1	10	0.04	0.3829	1.63E-04	12.8697	0.958	-0.03	0.3836	6e-5 (F)	39.06	21.15	1.025		0.01	0.3824	7.82E-05	35.47	19.09	1.13E-02	1.021
											2	8	0.05	0.3829	1.70E-04	12.5463	0.816	-0.02	0.3887	6e-5 (F)	33.80	18.15	0.898		-0.01	0.3882	7.64E-05	30.87	17.09	8.21E-03	0.889
											3	8	0.04	0.3841	1.53E-04	13.3129	0.835	0.04	0.3938	6e-5 (F)	33.35	19.12	0.903		0.03	0.3936	8.40E-05	31.26	17.40	1.08E-02	0.930
26-Jan-05	0501260000.tlm	FM1 IDPU Tvac #2 Cold #3	18		-10.4	23.5	0.50 / 0.50	0.38 / 0.38	20	12/6/2004	0	10	-0.11	0.3851	1.11E-04	13.7675	0.988	-0.07	0.3896	6e-5 (F)	39.16	21.23	1.054	870	-0.05	0.3875	7.39E-05	35.92	19.42	1.30E-02	1.057
											1	10	-0.07	0.3848	1.38E-04	13.0538	0.950	-0.13	0.3884	6e-5 (F)	38.33	19.46	0.997		-0.07	0.3844	6e-5 (F)	35.58	18.91	4.43E-03	1.006
											2	8	-0.06	0.3847	1.38E-04	12.6542	0.800	-0.09	0.3906	6e-5 (F)	32.88	18.71	0.893		-0.10	0.3915	6.84E-05	30.58	17.09	1.33E-02	0.880
											3	9	-0.10	0.3857	1.19E-04	13.5374	0.829	-0.07	0.3920	6e-5 (F)	33.69	18.91	0.925		-0.09	0.3942	6e-5 (F)	31.27	17.35	1.35E-02	0.920
29-Jan-05	0501290000.tlm	FM1 IDPU Tvac #2 Hot #4	13.9		71.6	13.6	0.50 / 0.50	0.38 / 0.50	150	12/6/2004	0	6	0.04	0.3832	1.60E-04	12.6459	0.861	-0.04	0.3906	6e-5 (F)	40.66	21.14	0.941	37780	-0.05	0.3898	5.53E-05	37.99	19.80	1.34E-02	0.942
											1	8	0.07	0.3858	1.62E-04	12.3318	0.817	-0.05	0.3836	6e-5 (F)	40.08	21.35	0.875		-0.06	0.3836	6.39E-05	37.11	19.15	1.15E-02	0.882
											2	8	0.06	0.3866	1.62E-04	12.3084	0.795	-0.03	0.3889	6e-5 (F)	33.43	17.74	0.849		-0.04	0.3886	6.89E-05	31.52	17.20	1.08E-02	0.865
											3	8	0.07	0.3832	1.70E-04	12.5327	0.793	-0.02	0.3951	6e-5 (F)	34.79	18.57	0.885		-0.02	0.3947	6.79E-05	32.35	17.39	1.16E-02	0.882
31-Jan-05	0501310000.tlm	FM1 IDPU Tvac #2 Cold #4	19.6		-22.5	25.2	0.50 / 0.50	0.38 / 0.38	150	12/6/2004	0	9	-0.14	0.3856	1.15E-04	12.9040	0.831	-0.16	0.3888	6e-5 (F)	39.87	20.29	0.898	1720	-0.16	0.3892	4.73E-05	37.24	19.22	9.44E-03	0.899
											1	10	-0.11	0.3847	1.42E-04	12.3799	0.829	-0.14	0.3855	6e-5 (F)	39.28	20.07	0.877		-0.15	0.3861	4.16E-05	36.40	18.67	8.31E-03	0.886
											2	9	-0.11	0.3862	1.39E-04	12.3245	0.776	-0.16	0.3926	6e-5 (F)	32.05	18.26	0.851		-0.14	0.3920	6.29E-05	30.79	16.83	9.43E-03	0.859
											3	9	-0.12	0.3856	1.22E-04	12.7651	0.757	-0.14	0.3945	6e-5 (F)	34.48	18.93	0.855		-0.14	0.3946	6e-5 (F)	31.67	16.84	1.14E-02	0.855
14-Feb-05	0502150000.tlm	FM1 IDPU post-vib	22.2		31.5	18.5	0.38 / 0.50	0.38 / 0.38	20	12/6/2004	0	10	-0.13	0.3848	1.07E-04	13.9535	1.075	-0.04	0.3905	6e-5 (F)	38.12	19.86	1.070	1520	-0.04	0.3890	7.35E-05	34.70	18.50	1.24E-02	1.075
											1	11	-0.07	0.3841	1.40E-04	13.2008	1.129	-0.07	0.3849	6e-5 (F)	36.14	19.32	1.041		-0.05	0.3843	7.48E-05	34.68	18.23	1.27E-02	1.034
											2	9	-0.03	0.3839	1.50E-04	12.9068	0.906	-0.08	0.3913	6e-5 (F)	32.48	17.46	0.900		-0.05	0.3899	7.27E-05	30.00	16.20	5.57E-03	0.894
											3	9	-0.05	0.3843	1.32E-04	13.7427	0.912	-0.03	0.3944	6e-5 (F)	32.59	17.97	0.917		-0.03	0.3945	6.11E-05	30.18	16.60	1.04E-02	0.942

5.3. ***MAG Trending Data***

MAG FM1 Performance Trend

Date	File	Test	MAG Temp	IDPU Temp	Heater On HKP	RMSx	RMSy	RMSz	IFC Fit Rev	IFC X Sample Time	IFC X Amplitude	IFC X Rate	IFC Y Sample Time	IFC Y Amplitude	IFC Y Rate	IFC Z Sample Time	IFC Z Amplitude	IFC Z Rate
Nov 17 2004	0411171046.tlm	Pre IDPU Vib	22.8	Ambient	10.4	8.4	3.4	12.8	10/15/2004	-22.2	8905	8.3	-22.0	8799	9.0	-22.0	9283	9.3
Nov 18 2004	0411181804.tlm	Post IDPU Vib	22.6	Ambient	10.4	8.0	3.0	7.0	12/6/2004	-22.4	8908	9.0	-21.9	8801	9.0	-22.2	9281	9.4
Nov 22 2004	0411221349.tlm	IDPU Tvac Hot 2	22.5	54.9	12.2	11.0	9.0	9.0	12/6/2004	-12.1	8892	4.9	-21.8	8778	9.3	-21.5	9372	9.5
Nov 22 2004	0411221349.tlm	IDPU Tvac Cold 2	20.8	-33.3	7.7	16.0	10.0	9.0	12/6/2004	-24.6	8922	11.2	-14.2	8778	6.1	-20.7	9361	9.6
Nov 29 2004	0411290000.tlm	IDPU Tvac Hot 3	18.7	64.2	19.5	15.0	9.0	9.0	12/6/2004	-21.9	8892	9.3	-26.6	8789	11.3	-25.2	9370	10.9
Nov 29 2004	0411290000.tlm	IDPU Tvac Cold 3	20.5	-27.9	8.3	11.0	11.0	8.0	12/6/2004	-20.9	8875	10.1	-22.8	8776	10.1	-22.8	9355	10.1
Nov 30 2004	0411300000.tlm	IDPU Tvac Hot 4	18.5	64.7	14	16.0	11.0	8.0	12/6/2004	-21.9	8883	9.5	-20.8	8801	8.5	-21.2	9387	9.0
Nov 30 2004	0411300000.tlm	IDPU Tvac Cold 4	19.8	-20.7	8.1	13.0	10.0	8.0	12/6/2004	-20.4	8894	9.2	-23.5	8783	10.8	-26.2	9365	12.5
Dec 1 2004	0412010000.tlm	IDPU Tvac Hot 5	19	65	13.6	12.0	8.0	10.0	12/6/2004	-22.4	8884	9.7	-22.0	8783	9.1	-23.1	9374	9.9
Dec 1 2004	0412010000.tlm	IDPU Tvac Cold 5	19.7	-13	8.6	16.0	10.0	8.0	12/6/2004	-20.2	8883	9.1	-21.8	8784	10.0	-23.8	9360	11.0
Dec 17 2004	0412171330.tlm	IDPU post-vib	20.2	24	10.9	1.3	1.3	1.3	12/6/2004	-20.4	8884	8.7	-22.1	8769	9.7	-22.1	9353	9.9
Dec 20 2004	0412201426.tlm	IDPU Tvac Hot 6	17.2	58.2	13.6	2.3	2.2	1.9	12/6/2004	-22.0	8891	9.3	-21.6	8772	9.2	-21.6	9357	9.5
Dec 20 2004	0412201426.tlm	IDPU Tvac Cold 6	17.4	-15.9	8.6	1.4	1.0	1.0	12/6/2004	-21.4	8878	9.6	-22.6	8769	10.3	-22.9	9347	10.7
Dec 21 2004	0412210000.tlm	IDPU Tvac Hot 7	17.2	69.6	11.5	1.4	1.5	1.0	12/6/2004	-21.7	8892	9.1	-21.7	8774	9.1	-21.7	9359	9.4
Dec 21 2004	0412210000.tlm	IDPU Tvac Cold 7	19.4	-7.5	9.1	1.3	2.2	1.4	12/6/2004	-22.9	8881	10.4	-21.7	8768	9.8	-21.5	9349	9.9
Jan 24 2005	0501240956.tlm	IDPU Tvac2 Hot 1	17.3	61.1	11.1	1.5	1.4	1.0	12/6/2004	-21.1	8884	8.8	-21.7	8770	9.2	-22.0	9360	9.5
Jan 24 2005	0501240956.tlm	IDPU Tvac2 Cold 1	19.5	-14.2	8.6	1.6	4.0	2.1	12/6/2004	-23.1	8874	10.5	-21.4	8762	9.6	-22.1	9348	10.3
Jan 25 2005	0501250000.tlm	IDPU Tvac2 Hot 2	20.7	69.9	14.2	1.4	1.6	1.0	12/6/2004	-21.8	8883	9.2	-21.7	8769	9.1	-21.7	9360	9.4
Jan 25 2005	0501250000.tlm	IDPU Tvac2 Cold 2	20.2	-6.6	9.5	1.8	3.4	1.3	12/6/2004	-21.9	8875	9.9	-21.3	8765	9.6	-22.0	9349	10.2
Jan 26 2005	0501260000.tlm	IDPU Tvac2 Hot 3	20	70.8	14.3	1.5	3.1	1.2	12/6/2004	-22.1	8885	9.3	-21.9	8766	9.1	-22.1	9359	9.6
Jan 26 2005	0501260000.tlm	IDPU Tvac2 Cold 3	19.5	-10.4	9.3	1.5	3.0	1.2	12/6/2004	-22.8	8876	10.3	-21.9	8747	9.9	-22.2	9348	10.3
Jan 29 2005	0501290000.tlm	IDPU Tvac2 Hot 4	17.6	71.6	15	1.5	1.7	2.0	12/6/2004	-22.0	8885	9.3	-19.6	8767	8.1	-21.7	9360	9.3
Jan 31 2005	0501310000.tlm	IDPU Tvac2 Cold 4	19.5	-22.5	8.4	2.1	1.6	1.4	12/6/2004	-21.6	8869	9.7	-22.4	8760	10.2	-23.1	9348	10.8
Feb 14 2005	0502150000.tlm	IDPU Post-vib	22.9	31.5	10.6	6.8	2.5	6.4	12/6/2004	-22.5	8970	9.3	-22.9	8780	9.5	-22.2	9286	9.3

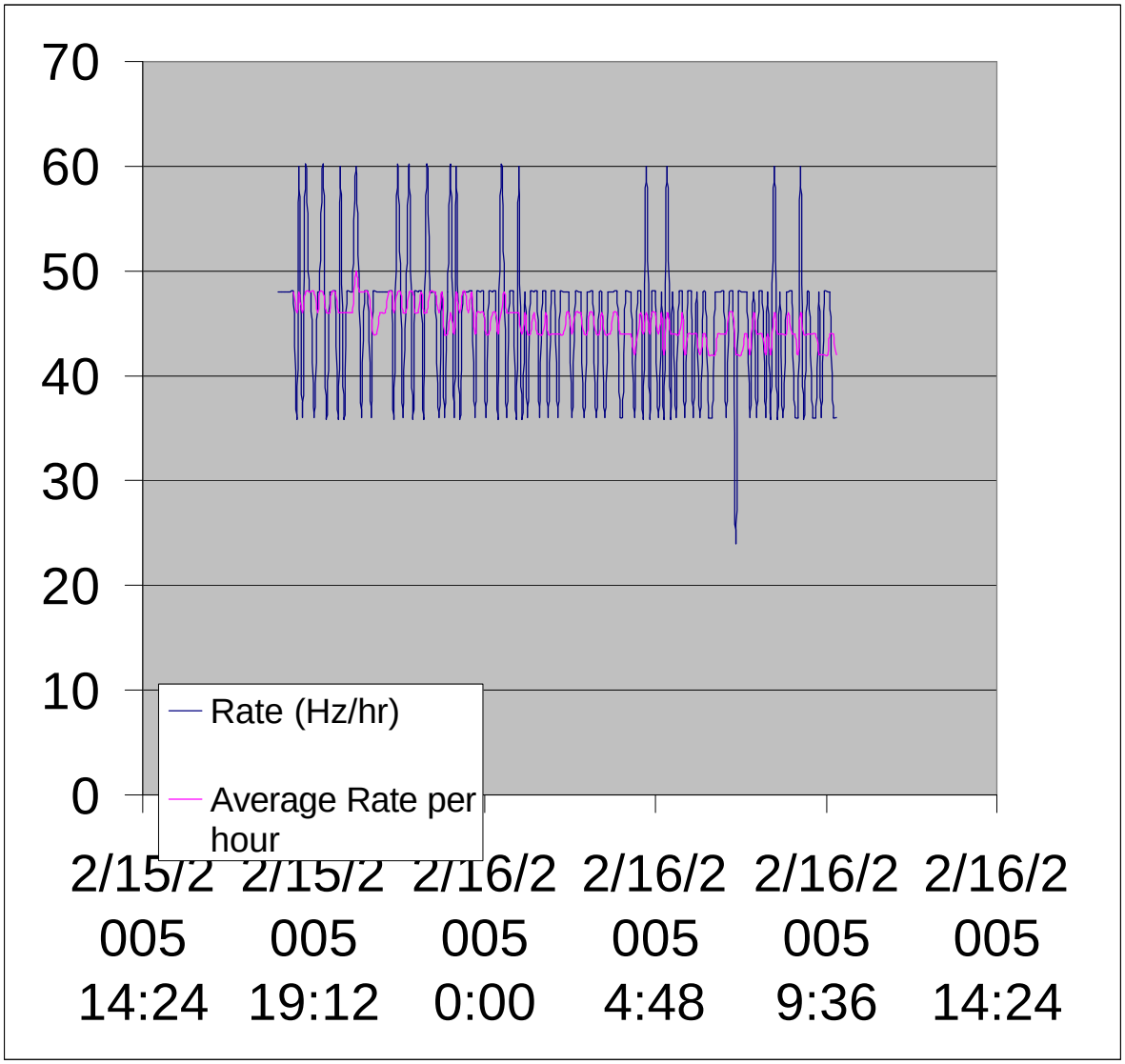
5.4. *IDPU Trending Data*

IDPU FM1 Performance Trend

Date	File	Test	S/W Version	IDPU Temp	Primary Current, mA	2.5V	5VD	5VA	12VA	STE-U?	
Oct 1 2004	0410011640.tlm	Boom I&T, less SWEA	24	Ambient	222	2.50	4.98	4.87	12.84	FM1	
Oct 16 2004	0410160000.tlm	Suite I&T, pre EMC	24	Ambient	238	2.48	4.98	4.86	12.81	FM1	
Nov 3 2004	0411031353.tlm	Post EMC @ UCB	24	Ambient	223	2.49	4.98	4.85	12.84	FM1	
Nov 17 2004	0411171046.tlm	Pre IDPU Vib	24	Ambient	215	2.49	4.98	4.86	12.85	FM1	
Nov 18 2004	0411181804.tlm	Post IDPU Vib	24	Ambient	216	2.49	4.98	4.86	12.86	FM1	
Nov 22 2004	0411221349.tlm	IDPU Tvac Hot 2	24	54.9	222	2.49	4.97	4.83	12.89	FM1	
Nov 22 2004	0411221349.tlm	IDPU Tvac Cold 2	24	-33.3	222	2.51	4.99	4.91	12.82	FM1	
Nov 29 2004	0411290000.tlm	IDPU Tvac Hot 3	24	64.2	196	2.49	4.97	4.82	12.90	FM1	Fix soft start
Nov 29 2004	0411290000.tlm	IDPU Tvac Cold 3	24	-27.9	194	2.51	4.99	4.91	12.81	FM1	
Nov 30 2004	0411300000.tlm	IDPU Tvac Hot 4	24	64.7	198	2.49	4.97	4.83	12.90	FM1	
Nov 30 2004	0411300000.tlm	IDPU Tvac Cold 4	24	-20.7	193	2.50	4.99	4.90	12.82	FM1	
Dec 1 2004	0412010000.tlm	IDPU Tvac Hot 5	24	65	199	2.49	4.97	4.82	12.90	FM1	
Dec 1 2004	0412010000.tlm	IDPU Tvac Cold 5	24	-13	193	2.50	4.99	4.90	12.82	FM1	
Dec 17 2004	0412171330.tlm	IDPU post-vib	24	24	190	2.49	4.98	4.86	12.84	FM1	
Dec 20 2004	0412201426.tlm	IDPU Tvac Hot 6	24	58.2	198	2.49	4.97	4.83	12.89	FM1	
Dec 20 2004	0412201426.tlm	IDPU Tvac Cold 6	24	-15.9	194	2.50	4.99	4.90	12.81	FM1	
Dec 21 2004	0412210000.tlm	IDPU Tvac Hot 7	24	69.6	197	2.49	4.97	4.82	12.87	FM1	
Dec 21 2004	0412210000.tlm	IDPU Tvac Cold 7	24	-7.5	196	2.50	4.99	4.89	12.81	FM1	
Jan 24 2005	0501240956.tlm	IDPU Tvac2 Hot 1	24	61.1	195	2.49	4.97	4.82	12.88	FM1	Fix reverse biased tantalum
Jan 24 2005	0501240956.tlm	IDPU Tvac2 Cold 1	24	-14.2	195	2.50	4.99	4.90	12.81	FM1	
Jan 25 2005	0501250000.tlm	IDPU Tvac2 Hot 2	24	69.9	200	2.49	4.97	4.82	12.88	FM1	
Jan 25 2005	0501250000.tlm	IDPU Tvac2 Cold 2	24	-6.6	201	2.50	4.99	4.89	12.80	FM1	
Jan 26 2005	0501260000.tlm	IDPU Tvac2 Hot 3	24	70.8	197	2.49	4.97	4.82	12.88	FM1	
Jan 26 2005	0501260000.tlm	IDPU Tvac2 Cold 3	24	-10.4	193	2.50	4.99	4.89	12.81	FM1	
Jan 29 2005	0501290000.tlm	IDPU Tvac2 Hot 4	24	71.6	196	2.49	4.97	4.82	12.88	FM1	
Jan 31 2005	0501310000.tlm	IDPU Tvac2 Cold 4	24	-22.5	195	2.51	4.99	4.90	12.80	FM1	
Feb 14 2005	0502150000.tlm	IDPU Post-vib	24	31.5	192	2.49	4.98	4.85	12.85	FM1	

6. TQCM Data

Both flight IDPU units were placed in the Jeffrey chamber together. They had both spent a considerable amount of time in bakeout during thermal vac, so all that was required was certification, which involves measuring the TQCM rates while the chamber control surfaces are held at non-op hot for the IDPU (60C). The measured TQCM rate was steady at 45Hz/hour, not significantly above chamber background. The corresponding calculated outgassing rate is 3.4E-13 g/cm^2/sec per unit, compared to a requirement of 5e-11.


70
60
50
40
30
20
10
0
Rate (Hz/hr)
Average Rate per hour
2/15/2005 14:24
2/15/2005 19:12
2/16/2005 0:00
2/16/2005 4:48
2/16/2005 9:36
2/16/2005 14:24