SUMMARY REPORT OF MISSION ACCELERATION MEASUREMENTS FOR STS-62

Launched March 4, 1994

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ABSTRACT

The second mission of the United States Microgravity Payload on-board the STS-62 mission was supported with three accelerometer instruments: the Orbital Acceleration Research Experiment (OARE) and two units of the Space Acceleration Measurement System (SAMS). The March 4, 1994 launch was the fourth successful mission for OARE and the ninth successful mission for SAMS.

The OARE instrument utilizes a sensor for very low frequency measurements below one Hertz. The accelerations in this frequency range are typically referred to as quasi-steady accelerations.

One of the SAMS units had two remote triaxial sensor heads mounted on the forward MPESS structure between two furnace experiments, MEPHISTO and AADSF. These triaxial heads had low-pass filter cut-off frequencies at 10 and 25 Hz.

The other SAMS unit utilized three remote triaxial sensor heads. Two of the sensor heads were mounted on the aft MPESS structure between the two experiments IDGE and ZENO. These triaxial heads had low-pass filter cut-off frequencies at 10 and 25 Hz. The third sensor head was mounted on the thermostat housing inside the IDGE experiment container. This triaxial head had a low-pass filter cut-off frequency at 5 Hz.

This report is prepared to furnish interested experiment investigators with a guide to evaluating the acceleration environment during STS-62 and as a means of identifying areas which require further study. To achieve this purpose, various pieces of information are included, such as an overview of the STS-62 mission, a description of the accelerometer systems flown on STS-62, some specific analysis of the accelerometer data in relation to the various mission activities, and an overview of the low-gravity environment during the entire mission.

An evaluation form is included at the end of the report to solicit users' comments about the usefulness of this series of reports.

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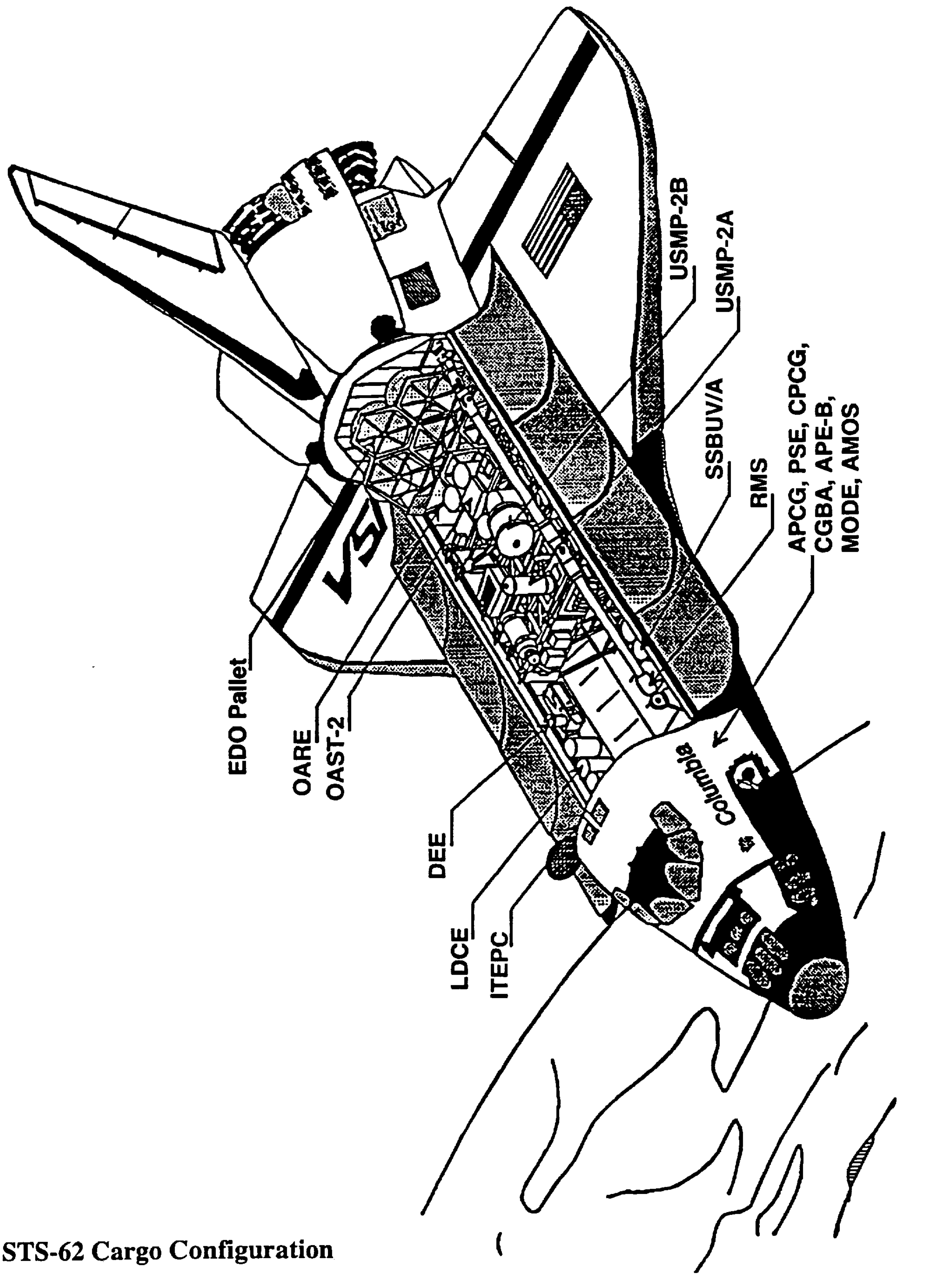
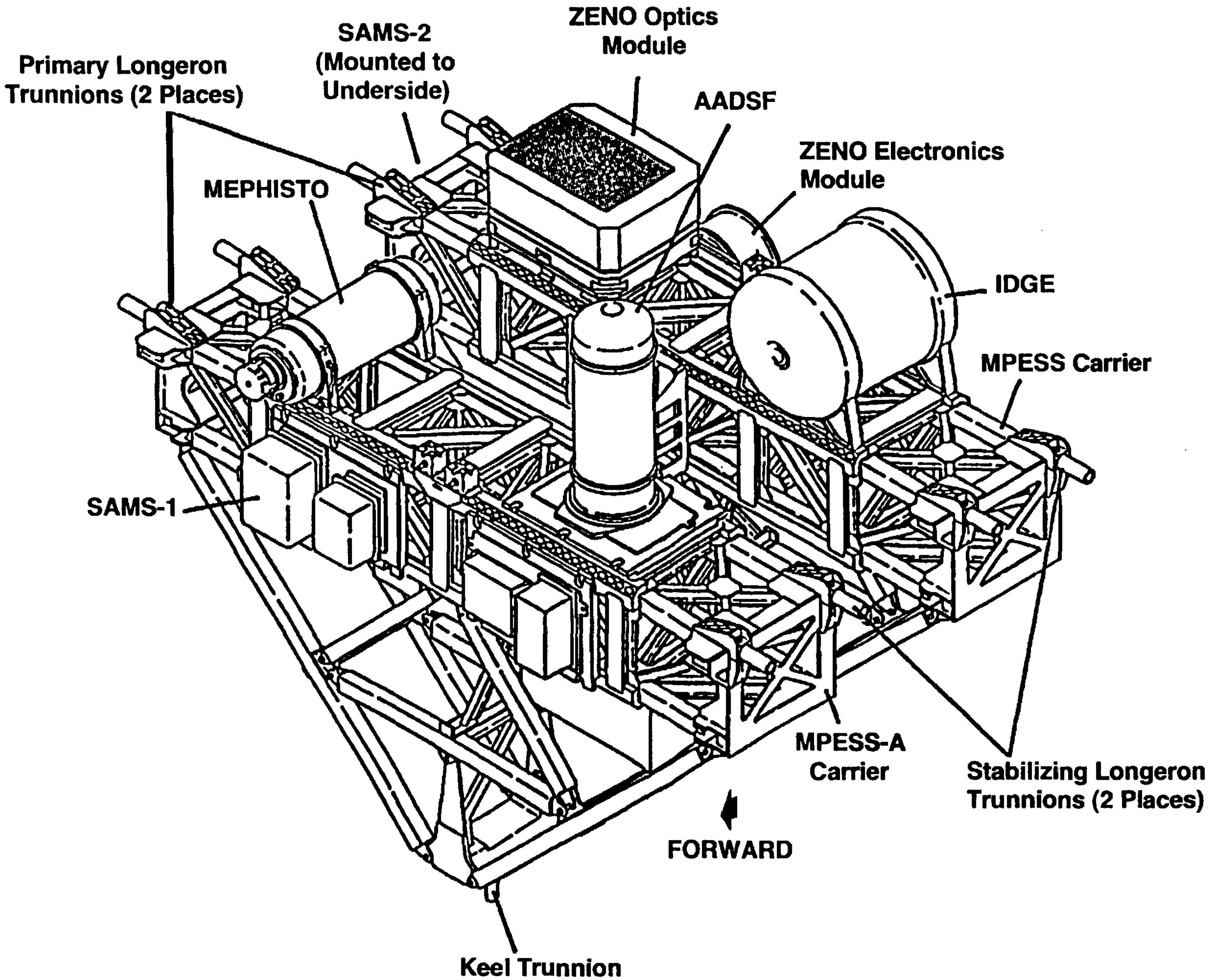


STS-62 Cargo Configuration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Trunnions (2 Places)
SAMS-2
(Mounted to
Underside)
ZENO Optics
Module
AADSF
ZENO Electronics
Module
MEPHISTO
IDGE
MPESS Carrier
SAMS-1
MPESS-A
Carrier
Stabilizing Longeron
Trunnions (2 Places)
FORWARD
Keel Trunnion

ACRONYM LIST

AADSF	Advanced Automated Directional Solidification Furnace
c.g.	center of gravity
DSO	Detailed Supplementary Objective
DTO	Development Test Objective
EEPROM	electrically erasable programmable read only memory
FES	Flash Evaporator System
GSFC	NASA Goddard Space Flight Center
IDGE	Isothermal Dendritic Growth Experiment
JSC	NASA Johnson Space Center
KSC	NASA Kennedy Space Center
LeRC	NASA Lewis Research Center
LV / LH	Local Vertical / Local Horizontal
MEPHISTO	Materials for the Study of Interesting Phenomena of Solidification on Earth and in Orbit
MET	Mission Elapsed Time(day/hour:minute:second)
MPESS	Mission Peculiar Equipment Support Structure
MSAD	NASA Headquarters Microgravity Science and Applications Division
MSFC	NASA Marshall Space Flight Center
OARE	Orbital Acceleration Research Experiment
OAST-2	second Office of Aeronautics and Space Technology payload
OMS	Orbital Maneuvering System
PCIS	Passive Cycle Isolation System
PIMS	Principal Investigator Microgravity Services
POCC	MSFC Payload Operations Control Center
PSD	power spectral density
PRCS	Primary Reaction Control System
RCS	Reaction Control System
RMS	Orbiter Remote Manipulator System
rms	root mean square
SAMS	Space Acceleration Measurement System
TDRSS	Tracking and Data Relay Satellite System
USMP-2	second United States Microgravity Payload
VRCS	Vernier Reaction Control System
VV	Velocity Vector

1. Introduction and Purpose

Fluid physics, materials sciences, and life sciences experiments are conducted on the NASA Space Shuttle Orbiters to take advantage of the reduced gravity environment resulting from the continuous free fall state of low earth orbit. While being in orbit does result in zero-gravity at the center of gravity (c.g.) of the Orbiter, at any point away from the c.g. some residual acceleration exists. These "quasi-steady accelerations" are related to the distance from the Orbiter c.g., the aerodynamic drag experienced by the Orbiter but not by free floating objects or fluids within the Orbiter, and the effects of the rotation and motion of the Orbiter. Accelerometer systems are flown on the Orbiters to record the levels of residual acceleration as well as vibrations of the Orbiter, equipment, and local structures, commonly referred to as g-jitter. The quasi-steady and g-jitter environment of the Orbiter are generally referred to as the microgravity or low-gravity environment.

The second United Stated Microgravity Payload (USMP-2) flew on the Orbiter Columbia on mission STS-62 in March 1994. The USMP-2 portion of STS-62 was dedicated to microgravity experiments. To support these experiments, two accelerometer systems managed by the NASA Lewis Research Center (LeRC) were flown. The Orbital Acceleration Research Experiment (OARE) and the Space Acceleration Measurement System (SAMS) are sponsored by the Microgravity Science and Applications Division (MSAD) of the NASA Office of Life and Microgravity Science and Applications.

The Principal Investigator Microgravity Services (PIMS) project was created at the NASA Lewis Research Center to support principal investigators of microgravity experiments as they evaluate the effects of varying acceleration levels on their experiments. This report is provided by PIMS to furnish interested experiment investigators with a guide to evaluating the acceleration environment during STS-62 and as a means of identifying areas which require further study. To achieve this purpose, we present various pieces of information. Section 2 of this report provides an overview of the STS-62 mission: the payloads, the experiments manifested on the payloads, and the particular activities which may be of interest to microgravity investigators. Section 3 describes the accelerometer systems flown on STS-62 and the means by which they recorded data and provided data to the user. Section 4 discusses some specific analysis of the accelerometer data in relation to the various activities which occurred during the mission. The appendices outline processing applied to the SAMS and OARE data to provide an overview of the microgravity environment during the entire mission. Plots resulting from this analysis are also provided as a snapshot of the environment. Appendix E contains a user comment sheet. Users are encouraged to complete this form and return it to the authors.

2. Mission Overview

At 8:53 am EST, 4 March 1994, the Space Shuttle Columbia launched on the STS-62 mission from NASA Kennedy Space Center (KSC). Touchdown was on 18 March 1994 at 7:58 am EST at KSC. The primary objectives of the STS-62 mission were to use Columbia as a platform for performing science experiments on USMP-2 and the Office of Aeronautics and Space Technology (OAST)-2 payloads. The USMP-2 experiments focused on studies to create better, faster semiconductors; the behavior of a fluid near its critical point; and the formation of dendrites during the solidification of a molten material. The USMP-2 experiments are listed in Table 1. The OAST-2 experiments obtained technology data to support future needs for advanced satellites, sensors, microcircuits, and the international space station. Data collected on OAST-2 experiments could lead to cheaper, more reliable, and more operationally efficient spacecraft. The OAST-2 experiments are listed in Table 2. Eleven other payloads were considered secondary objectives on STS-62. These are listed in Table 3. Seventeen development test objectives (DTO) and 20 detailed supplementary objectives (DSO) were accomplished on STS-62; they are listed in Tables 4 and 5.

Numerous activities occurred during the STS-62 mission that are of interest to the microgravity community. While we cannot provide a complete as-flown timeline of all activities that occurred during the mission, we present here a partial listing of those events with the potential to affect the microgravity environment. A partial timeline of these events is given in Table 6. Table 7 is a list of crew exercise times. Investigators of individual experiments should be contacted for detailed experiment timeline information.

Specific activities of interest during STS-62 were crew exercise, experiment latch operations, closed circuit camera motion, radiator latch operations, flash evaporator system and water dump operations, circulation pump activity, Ku-band antenna activity, orbital maneuvering system and primary reaction control system firings, and attitude changes. The microgravity and vibration environment related to these activities is discussed in section 4.

3. Accelerometer Systems

Two accelerometer systems measured the microgravity and vibration environment of the Orbiter Columbia during the STS-62 mission: the Orbital Acceleration Research Experiment and the Space Acceleration Measurement System.

3.1 Orbital Acceleration Research Experiment

The Orbital Acceleration Research Experiment is presently being used by MSAD to provide information on the quasi-steady acceleration levels experienced in the Space Shuttle Orbiters. STS-62 was the first flight of OARE in this function. Previous flights of OARE collected data in support of Orbiter aerodynamics studies [1-4]; OARE data from these earlier flights have been used in microgravity environment interpretation. OARE consists of an electrostatically suspended proof mass sensor, an in-flight calibration station, and a microprocessor which is used for in-flight experiment control, processing, and storage of flight data. OARE is designed to measure and record low-frequency (<1 Hz), low-level acceleration. Data are collected at 10 samples per second and sent to the payload recorder. During STS-62, data from the recorder were downlinked approximately every three hours to the Marshall Space Flight Center POCC where further analysis was performed. The raw data are also filtered using a statistical trimmed-mean filter and stored in OARE EEPROM (electrically erasable programmable ROM). The EEPROM data are recovered post-mission from the OARE unit. For STS-62, OARE data are available from MET 000/00:10 to 013/22:48.

The OARE system is mounted to the floor of Columbia's cargo bay on a keel bridge. The location and orientation of the sensors with respect to the Orbiter structural coordinate system are given in Table 8.

3.2 Space Acceleration Measurement System

The Space Acceleration Measurement System was developed to monitor and measure the low-gravity environment of Orbiters in support of MSAD-sponsored science payloads [5-8]. STS-62 marked the ninth flight of the SAMS system. This was the second flight during which SAMS supplied data to users in near real-time. A SAMS unit typically consists of three remote triaxial sensor heads, connecting cables, and a controlling data acquisition unit with a digital data recording system using optical disks with 200 megabytes of storage capacity per side. On STS-62, two SAMS units flew on the Mission Peculiar Equipment Support Structure (MPESS) carriers in support of USMP-2 experiments. One SAMS unit recorded data using three remote triaxial sensor heads at 50, 50, and 125 samples per second. Lowpass filters were applied to the data with cutoffs at 5, 10, and 25 Hz, respectively. The other SAMS unit recorded data using two remote triaxial sensor heads at 50 and 125 samples per second. Lowpass filters were applied to the data with cutoffs at 10 and 25 Hz, respectively. The locations and orientations of the SAMS heads, with respect to the Orbiter structural coordinate system, are given in Table 9. More detailed descriptions of the SAMS accelerometers are available in the literature [5-9].

On STS-62, SAMS data are available between MET 000/02:30 and 013/16:30. Data from two of the triaxial sensor heads (TSH-1A and TSH-2B) were downlinked in near real-time during the mission. Data from the remaining sensor heads (TSH-1B, TSH-2A, and TSH-2C) were recorded on optical disks. Data from TSH-2A were also routed to the IDGE experiment hardware. There is not a continuous record of SAMS data for the STS-62 mission. The available SAMS on-board data recording time is fixed and the PI's requested that data recording be enabled at times which were crucial for their experiment operations. For downlinked data, there is a nearly continuous record, especially during the USMP-2 prime operations. During the OAST-2 prime operations, there were times when downlink data acquisition was disabled due to the Orbiter operational format for OAST-2 operations. Fig. 1 gives an overview of what SAMS data are available for this mission. Approximately 923 megabytes of SAMS data were downlinked and approximately 1.6 gigabytes of SAMS data were recorded. Appendix A describes how these data can be accessed via the internet.

4. Columbia Microgravity Environment–STS-62

The acceleration environment measured by an accelerometer system on the Orbiter is contributed to by numerous sources. All ongoing operations of crew life support systems and activities and operations of the Orbiter, crew, carrier and experiments tend to have vibratory and/or oscillatory components that contribute to the "background" acceleration environment. In this report we are concerned with the identification of activities that cause acceleration levels above this background. The Appendices provide an overview of the microgravity and vibration environment during the STS-62 mission. Appendix B shows time history plots of SAMS data. Except where noted, all SAMS data plots shown in this document are from SAMS Unit F, Head B (TSH-1B). Appendix C provides a frequency domain representation of the SAMS data. Appendix D shows several plots of OARE data to serve as an overview of the quasi-steady environment during STS-62.

4.1 Crew Sleep

The five member crew of STS-62 worked on a single shift schedule, see Table 6 for approximate times. Figure 2 shows an example of the vibration environment as recorded by SAMS during a crew sleep period. Fig. 2a is the vector magnitude of the three axes of SAMS Unit F, Head B data from MET 006/10:13:00 to 006/10:15:11. The vector magnitude is calculated using the equation $a=\sqrt{(x^2+y^2+z^2)}$, where (x,y,z) are the three axes of measured acceleration. Fig. 2b shows a power spectral density (PSD) representation of the data. For each axis the PSD is calculated according to Parseval's theorem to give an indication of the frequency distribution of power in the acceleration signal:

$$PSD(k) = [(X(k))/N]^2$$
$$(1/N)\Sigma|x(n)^2|^2 = \Sigma PSD(k).$$

The three resulting PSD's are then combined into a vector magnitude representation. The vibration environment is reduced during crew sleep periods compared to periods of crew activity because some equipment is turned off and crew push-off forces are minimal or nonexistent. The remaining SAMS data plots in this section represent the vibration environment during crew, experiment, and Orbiter activities. Fig. 3 shows OARE data for the extent of the STS-62 mission. Crew sleep times appear as periodic relatively quiet regions of the plot, especially evident in the first half of the mission. Other characteristics of this plot will be discussed later in this section.

4.2 Crew Exercise

Fig. 4 shows an example of the vibration environment as recorded by SAMS while a crew member was exercising on the bicycle ergometer. During STS-62, crew exercise was performed with the ergometer mounted to the Passive Cycle Isolation System (PCIS) and hard-mounted to the Orbiter floor. In Fig. 4a note the increased acceleration level at MET 012/00:46:00 indicating an increase in crew exertion level. In Fig. 4b the exercise activity is identified by the excitation of 1.25 and 2.5 Hz frequencies. These frequencies correspond to the pedaling and body motion frequencies of the crew member. Increased excitation of the 4.7 Hz Orbiter structural mode is related to the proximity of this mode to an upper harmonic of the exercise frequency.

4.3 MEPHISTO Operations

In addition to crew related perturbation of the microgravity environment of the Orbiter, experiment, payload, and Orbiter systems can also affect the environment. Fig. 5 shows SAMS Unit F, Head A, data collected during a MEPHISTO latch opening operation. Note the 1.7 x 10^{-3} g magnitude transient lasting about one second at MET 011/10:15. The PSD for these data shows an increased excitation of a 6.8 Hz mode.

4.4 Closed Circuit Camera Operations

An Orbiter closed circuit television system supports the payload deployment and retrieval system. This system makes available five television cameras that can be positioned in the following locations: remote manipulator system (RMS) arm wrist, RMS arm elbow, forward port bulkhead, forward starboard bulkhead, aft port bulkhead, aft starboard bulkhead, and keel. In addition to payload deployment and retrieval observing, these cameras are also used to record exterior camera pictures of the Orbiter cargo bay and/or earth observations. During STS-62 mission support operations in the POCC, PIMS personnel noted a significant amount of downlink video originating from the cargo bay cameras during the crew sleep periods. The camera views were often jerky when the camera was initiating or stopping a pan operation. Upon casual comparison with the downlinked SAMS data, there appeared to be some correlation between the camera motions and disturbances observed in the data. In response to a PIMS request to the JSC Orbiter operations office, the three available cargo bay cameras were panned, tilted, and zoomed in their different modes and directions during a crew sleep period. The time span of the different operations which were conducted are listed in Table 6.

An example of SAMS data during some of these operations is shown in Fig. 6. During this time period (MET 003/09:45 - 09:47), Camera B performed a slow pan for 20 seconds, a fast pan for 10 seconds, a slow tilt for 20 seconds, and a fast tilt for 10 seconds. Note that there appears to be no microgravity disturbance level attributable to the cameras, above the background vibration level of the Orbiter and payloads seen in Fig. 2.

4.5 Radiator Deploy

One aspect of the Orbiter Environmental Control and Life Support System is the control of Orbiter interior temperatures. Orbiter heat rejection is provided on-orbit by radiator panels attached to the forward payload bay doors. On STS-62, the radiators were deployed at MET 000/03:12. SAMS Unit F, Head A, data recorded during that time are shown in Fig. 7. Note the thirty second long increase in acceleration level in Fig. 7a. This is most likely due to the motor-driven, torque-tube-lever system used to deploy the radiators. Within another thirty seconds, the acceleration level returns to background. In the PSD shown in Fig. 7b, note the increased excitation level at 3.2 and 6.2 Hz.

4.6 Flash Evaporator System

Further heat rejection is provided on-orbit by the flash evaporator system (FES). FES operations provide heat rejection by vaporizing excess water as it contacts a core filled with hot Freon-21 and venting the resulting vapor out two opposing nozzles on the aft Orbiter. FES operations and their effect on the microgravity environment of the Orbiters are discussed in the literature [10]. Fig. 8 shows OARE data collected during a transition between FES off and FES on times. This FES dump occurred from 003/03:20 to 003/07:00. Most FES activity during STS-62 occurred while the crew was awake. The change in OARE data indicative of FES activity is discernible above the increased acceleration levels related to crew activity. Note that at approximately 003/03:15 the mean level of the OARE X_b, Y_b, and Z_b data shift by ~4×10^{-7}g, ~ -2×10^{-7}g, and ~ -3×10^{-7}g, respectively. This is the same reaction to FES activity identified on the STS-50 mission [10].

A waste water dump was started at approximately the same time as the FES operations discussed above. The large transients seen most clearly in the Y_b and Z_b axes of Fig. 8 are caused by RCS thrusters which were fired to counteract the torque forces of the Orbiter about the positive yaw (Z_b) axis [10].

4.7 Circulation Pumps

The electric motor-driven pumps of the three independent Orbiter hydraulic subsystems have an impact on the microgravity environment. The hydraulic subsystem provides power to actuate aerodynamic flight control surfaces, main engine gimbal and valve controls, external tank umbilical retractor, main and nose landing gear uplock and deployment, main landing gear brakes, and nose wheel steering. In orbit, three electric motor-driven pumps are used periodically to circulate the hydraulic fluid to maintain the temperature of the subsystem [11]. The timing of circulation pump activity can be influenced by experiment microgravity requirements. Fig. 9 shows SAMS data collected when Circulation Pump 2 was activated during STS-62. Note in Fig. 9a the relatively large magnitude, short duration transient at MET 008/14:19:55 and the two lower magnitude transients that occur about 75 and 85 seconds later. This data signature appears to be characteristic of the initiation of circulation pump activity. The exact cause of this signature is under investigation. The large magnitude transient signal manifests itself in the PSD of Fig. 9b as an increase in energy level across the entire frequency spectrum. Note that this PSD plot has a different scale than previous plots.

4.8 Ku-band Antenna

The Orbiter Ku-band antenna system is used to transmit voice, data, and video images to the ground via the Tracking and Data Relay Satellite System (TDRSS). The deployed Ku-band assembly is located on the Orbiter sill, near the forward starboard bulkhead. The Ku-band antenna dithers at a frequency of 17 Hz to maintain the ability to smoothly search for and track the TDRSS satellites. This dither is generally active when in orbit. When the Ku-band antenna is in certain operational modes, the dither is deactivated. In acceleration data collected on-orbit, the 17 Hz dither frequency is clearly seen when the dither is on. Fig. 10 shows STS-62 SAMS data when the dither was cycled off and on two times in relatively quick succession. The magnitude of the 17 Hz signal is significantly reduced when the dither is turned off (times bracketed in Fig. 10a).

4.9 Thrusters

The Orbiter orbital maneuvering system (OMS) and reaction control system (RCS) are used to provide thrust on-orbit. There are two OMS engines facing aft on either side of the Orbiter's aft fuselage. OMS thrust is used to modify an orbit for payload rendezvous or deploy, or to change orbit. Each OMS engine provides 6,000 pounds of thrust. The minimum firing duration of an OMS engine is two seconds. During single OMS operations, roll RCS activity also occurs. During OAST-2 operations on STS-62, three OMS burns, designated OMS-3, OMS-4, and OMS-5 occurred. Fig. 11 shows SAMS data collected during the OMS-4 burn. Note the 3×10^{-2}g shift of the acceleration mean level during the burn, followed by a return to the original mean upon burn completion. This signature is typical of OMS engine burns.

The forward and aft RCS on the Orbiters provides thrust for attitude maneuvers and small translational velocity changes on-orbit. The three locations of the RCS are the forward fuselage nose area, and the left and right OMS/RCS pods attached to the aft fuselage. The forward RCS has fourteen primary and two vernier RCS engines, PRCS and VRCS, respectively. The aft RCS has 12 PRCS and two VRCS engines in each pod. The PRCS engines provide 870 pounds of thrust each and are used in steady-state thrusting mode for one to 150 seconds, and in pulse mode with a minimum thrust time of 80 milliseconds. The VRCS engines provide 24 pounds of thrust each and are used in steady-state thrusting mode for one to 125 seconds, and in pulse mode with a minimum thrust time of 80 milliseconds. Fig. 12 shows SAMS data collected during DSO-324, a NASA JSC DSO aimed at evaluating the payload on-orbit low-frequency environment. For this DSO, the PRCS engines were fired numerous times over a period of six minutes. Note that the time domain magnitudes are on the order of 10^{-2}g and that the PSD representation shows an increase in energy level across the entire frequency spectrum compared to Fig. 2a.

4.10 Orbiter Attitude

During the course of an Orbiter mission, the Orbiter vehicle is controlled to maintain certain parameters, such as pointing, rotation rates, or attitudes. These parameters are customarily defined by the primary payload(s) of a particular mission, the Orbiter program office, the crew office, and the safety office. For a typical microgravity science mission, the attitude is maintained to optimize certain secondary parameters, such as the net quasi-steady acceleration, duration and frequency of thruster firings, and attitude changes during the course of the mission.

The STS-62 mission had several primary attitudes defined for the two primary payloads, USMP-2 and OAST-2. The attitude flown for the USMP-2 payload during the majority of the first seven days of the mission (MET 000/10:00 to 006/19:40) was -ZLV/+YVV, Fig. 13. This attitude was chosen to minimize attitude changes and the amount of thruster firings required during the AADSF operations from MET 000/16:00 to 006/12:00. Two additional attitudes, also shown in Fig. 13, were flown at the end of the USMP-2 time for MEPHISTO operations. The XLV/-ZVV attitude was flown from MET 006/19:40 to 008/00:25 and the -XLV/+ZVV attitude was flown from MET 008/00:25 to 009/16:45. During the OAST-2 operations from MET 009/16:45 through MET Day 012, the attitude of the Orbiter was changed frequently in support of various experiments.

The transitions from the -ZLV/+YVV to the -XLV/-ZVV and then to the -XLV/+ZVV attitude can be seen around MET hours 163 and 192 in the OARE data shown in Fig. 3. Two twenty minute windows which encompass these attitude changes are shown in Fig. 14 and 15. The large excursions in the acceleration levels at the transition times are due to the Orbiter thrusters used to change the attitude. The accelerations introduced from attitude maneuvers of this nature are linear accelerations from the thrusters, the attendant Orbiter/payload structural response, and the centripetal accelerations from any rotation of the Orbiter.

The quasi-steady acceleration vector changes direction as a result of these transitions. For the transitions shown in Figs. 14 and 15, the resultant quasi-steady acceleration vector is in the (-0.213, -0.138, -0.967) direction (Orbiter body axes) before the attitude change and changes to the (0.788, -0.087, 0.610) direction after the first attitude change and to the (0.852, -0.345, -0.395) direction after the second attitude change. This illustrates why some experiments require a certain attitude during their critical operations so that a particular quasi-steady acceleration environment is maintained.

4.11 Modeled Environment

The quasi-steady environment during STS-62 can be compared to the environment predicted by numerical modeling. Fig. 16 shows the predicted quasi-steady environment at the OARE location for a three hour period [13]. Acceleration components considered by the model are aerodynamic drag, gravity gradient, and rotational effects. Other low-frequency accelerations such as those induced by FES operations are not modeled. Fig. 17 shows the environment measured by OARE for a comparable time period, that is, same location in orbit and same level of crew activity. Note that the predicted and measured environment are consistent. The difference in sign between the two plots is due to a difference in reference frame, see [10].

Figures 18-20 show the measured acceleration environment for three additional locations: the Orbiter c.g., the Advanced Automated Directional Solidification Furnace (AADSF), and the Isothermal Dendritic Growth Experiment (IDGE). Acceleration data at the c.g. are computed by calculating the gravity gradient and rotational velocity components at the OARE location and removing them from the OARE data [3-4]. An inverse process is performed using c.g. acceleration data to compute the acceleration environment for AADSF and IDGE. The calculations require information about the location of the Orbiter c.g., the orbiter attitude, and the Orbiter body axis rotation rates. Analysis shows that the variation of the c.g. location is negligible in the calculation of gravity gradient and rotational velocity contributions. Pitch rate, yaw rate, and rotational acceleration components were neglected in the computations.

5. Summary

This report serves as a road map to the SAMS and OARE data acquired during the STS-62 mission. Further analysis of specific events and comparisons with other missions will be performed and published in future documents.

There were two primary payloads for the STS-62 mission: the USMP-2 and the OAST-2. Two SAMS units were onboard STS-62 to support the USMP-2 experiments. Five SAMS triaxial sensor heads were mounted at various locations on the MPESS carrier among the four science experiments. The OARE instrument was mounted in the Orbiter cargo bay to support the USMP-2 experiments.

A summary of the vector magnitude rms and average accelerations for the entire mission was produced for a SAMS 25 Hz triaxial sensor head. Spectrograms were also produced to give a frequency domain summary for the entire mission. These plots are presented in the Appendices along with plots of OARE data representing the quasi-steady environment during the mission. Significant events were chosen to give a more detailed look at the acceleration disturbances at the SAMS and OARE sensor head locations. These events were crew exercise, MEPHISTO latch operations, closed circuit camera motion, radiator latch operations, FES and water dump operations, circulation pump activity, Ku-band antenna activity, orbital maneuvering system and primary reaction control system firings, and attitude changes.

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[11] Shuttle Operational Data Book, Volume 1, JSC-08934, Rev. E, Johnson Space Center, Houston, TX, January 1988.

[12] Crew exercise timeline provided by Rick Connell, Krug Life Sciences, Houston, TX.

[13] Data plot provided by Brian Matisak, Teledyne - Brown Engineering, Huntsville, AL.

Table 1. USMP-2 Experiments

Experiment Name	Principal Investigator	Affiliation
Advanced Automated Directional Solidification Furnace (AADSF)	Dr. S. Lehoczky	Space Science Laboratory, NASA MSFC
Materials for the Study of Interesting Phenomena of Solidification on Earth and in Orbit (MEPHISTO)	Dr. R. Abbaschian Dr. J. J. Favier	University of Florida Center for Nuclear Studies, Grenoble
Isothermal Dendritic Growth Experiment (IDGE)	Dr. M. Glicksman	Rensselaer Polytechnic Institute
Critical Fluid Light Scattering Experiment (Zeno)	Dr. R. Gammon	University of Maryland
Space Acceleration Measurement System (SAMS)	R. Sicker (Project Manager)	NASA LeRC

Table 2. OAST-2 Experiments

Experiment Name	Principal Investigator	Affiliation
Solar Array Module Plasma Interaction Experiment (SAMPIE)	Lawrence Wald (Experiment Manager)	NASA LeRC
Cryogenic Two-Phase (CRYOTP)	Marco Stoyanof Mel Bello Matt Buchko	USAF Phillips Laboratory Aerospace Corp. NASA GSFC
Emulsion Chamber Technology (ECT)	J. Gregory	NASA MSFC
Thermal Energy Storage (TES)	Andrew Szaniszlo (Project Manager)	NASA LeRC
Experimental Investigation of Spacecraft Glow / Spacecraft Kinetic Infrared Test (SKIRT)		NASA JSC, Lockheed Palo Alto Research Laboratory, USAF Phillips Laboratory

Table 3. STS-62 Secondary Objectives

Experiment Name	Principal Investigator	Affiliation
Dexterous End Effector (DEE)	NASA Office of Space Systems Development (Sponsor)	NASA JSC Automation and Robotic Division (Management)
Shuttle Solar Backscatter Ultraviolet (SSBUV) A	Ernest Hilsenrath	NASA GSFC
Limited Duration Space Environment Candidate Exposure (LDCE)	John F. Wallace Dawn Davis	Case Western Reserve University
Air Force Maui Optical Site (AMOS)		Air Force Geophysical Laboratory
Advanced Protein Crystal Growth (APCG)	Dan Carter Lawrence DeLucas	NASA MSFC University of Alabama in Birmingham
Auroral Photography Experiment (APE) B	US Air Force (Sponsor)	
Commercial Generic Bioprocessing Apparatus (CGBA)	Marvin Luttges (Program Manager)	Bioserve Space Technologies, University of Colorado
Commercial Protein Crystal Growth (CPCG)	Charles E. Bugg Marianna Long Lawrence DeLucas	University of Alabama in Birmingham
Middeck Zero-Gravity Dynamics Experiment (MODE)	Edward F. Crawley	Massachusetts Institute of Technology
Physiological Systems Experiment (PSE)	W. C. Hymer	Pennsylvania State University
Bioreactor Demonstration System (BDS) A		NASA JSC

Table 4. STS-62 Development Test Objectives

DTOs	Description
DTO 254	Subsonic aerodynamic verification
DTO 301D	Ascent structural capability evaluation
DTO 307D	Entry structural capability evaluation
DTO 312	ET TPS performance (methods 1, 2, and 3)
DTO 319D	Shuttle/payload low-frequency environment
DTO 413	On-orbit PRSD cryogenic hydrogen boil-off
DTO 414	APU shutdown test, sequence A (shut down 3, then 1, then 2)
DTO 521	Orbiter drag chute system
DTO 656	PGSC single-event upset monitoring
DTO 664	Cabin temperature survey
DTO 667	Portable in-flight landing operations trainer
DTO 670	Evaluation of passive cycle isolation system
DTO 674	Thermoelectric liquid cooling system evaluation
DTO 678	Infrared thermal survey of Orbiter crew compartment, Spacelab, and SPACEHAB module
DTO 679	Ku-band communications adapter demonstration
DTO 805	Crosswind landing performance
DTO 910	OEX Orbital Acceleration Research Experiment (OARE)

Table 5. STS-62 Detailed Supplementary Objectives

DSOs	Description
DSO 324	Payload on-orbit low-frequency environment
DSO 326	Window impact observations
DSO 485	Inter-Mars tissue equivalent proportional counter (ITEPC)
DSO 487	Immunological assessment of crew members
DSO 492	In-flight evaluation of a portable clinical blood analyzer
DSO 603B	Orthostatic function during entry, landing, and egress
DSO 604	Visual-vestibular integration as a function of adaptation
DSO 605	Postural equilibrium control during landing/egress

Table 6. STS-62 Event Timeline (Partial)

MET	EVENT
000/02:33:30	KU BAND ANTENNA DEPLOY COMPLETE
000/03:12	RADIATOR DEPLOY
000/04:05 (APPROX)	START SAMS/OARE MANEUVER-KU NOT INHIBITED
000/05:03:35	RMS/DEE OPS HAVE STARTED
000/10:30-006/19:20	FES ENABLED
000/11	SLEEP
006/19:20-007/17:06	FES OFF
000/19:	POST SLEEP
000/21:20	FES DUMP START
001/10	SLEEP
001/18	POST SLEEP
001/23:40	MODE OPERATIONS IN MIDDECK
002/09	SLEEP
002/12:58:00	INCO MOVING KU FROM TDRS W TO TDRS E
002/17	POST SLEEP
002/17:47	FUEL CELL PURGE IN 15 MINUTES
002/22:54:33	START FES NOW
003/08	SLEEP
003/09:40-003/11:34	PIMS REQUESTED CAMERA OPERATIONS
003/03:10 (APP)- 003/03:50:57	WASTE WATER DUMP
003/16	POST SLEEP
004/07	SLEEP
004/15	POST SLEEP
005/06:40	SLEEP
005/14:40	POST SLEEP
006/06:20	SLEEP
006/14:20	POST SLEEP
006/17:40-006/17:48	FUEL CELL PURGE
006/19:27	CIRCULATION PUMP ACTIVITY

Table 6. STS-62 Event Timeline (Partial), continued

007/06	SLEEP
007/09:57:05	INTO 1° DEADBAND MOMENTARILY
007/14	POST SLEEP
008/01:03-008/01:47	RMS OPERATIONS
008/06	SLEEP
008/14	POST SLEEP
008/16:00:50 (05?)	START 2° DEADBAND
008/19:08	START 1° DEADBAND FOR 1.5 HOURS (-XLV ATTITUDE)
008/20:38	START 0.3° DEADBAND
008:22:30	CIRCULATION PUMP ON IN 30 SEC
009/03:19:14	START 3° DEADBAND
009/03:25	START 2° DEADBAND
009/06	SLEEP
009/14	POST SLEEP
009/17:10	OMS BURN
009/17:50	OMS BURN
010:03:58:40- 010:05/39:00	FES DUMP
010/06	SLEEP
010/14	POST SLEEP
011/04:15:00	SUPPLY WATER DUMP
011/06	SLEEP
011/14	POST SLEEP
012/06	SLEEP
012/14	POST SLEEP
013/00:30	RADIATOR STOW AT ABOUT THIS TIME
013/06	SLEEP
013/14	POST SLEEP
013/22:13	OBTAIN DE-ORBIT BURN ATTITUDE

Table 7. Crew exercise log [12]

Crewmember	Start MET	Stop MET	Mounting System	Notes
CDR	0/23:41	1/00:06	PCIS	
PLT	2/03:30	2/04:00	PCIS	Approximate times
MS2	2/04:20	2/05:14	PCIS	Approximate times
MS3	2/05:16	2/05:50	PCIS	
CDR	3/02:59	3/03:40	PCIS	
MS1	3/04:13	3/04:42	PCIS	
MS3	3/04:49	3/05:08	PCIS	
PLT	4/01:11	4/01:49	PCIS	
MS2	4/01:50	4/02:35	PCIS	
CDR	4/02:38	4/03:30	PCIS	
CDR	5/00:21	5/01:07	PCIS	
MS2	5/01:07	5/01:43	PCIS	
MS3	5/01:45	5/02:22	PCIS	
PLT	5/02:27	5/03:01	PCIS	
MS1	5/03:05	5/03:29	PCIS	
CDR	6/00:22	6/01:03	PCIS	
MS1	6/01:24	6/01:58	PCIS	
MS2	6/07:00	6/07:40	PCIS	
PLT	7/00:45	7/01:30	PCIS	
MS3	7/01:30	7/02:05	PCIS	
MS1	8/00:10	8/00:43	PCIS	
CDR	8/00:47	8/01:23	PCIS	
MS2	8/01:??	8/02:01	PCIS	Missing Start Time
PLT	8/02:01	8/02:28	PCIS	
MS3	8/02:31	8/02:57	PCIS	
CDR	8/23:59	9/0:40	PCIS	
MS2	9/??:??	9/01:30	PCIS	Missing Start Time
PLT	9/??:??	9/02:33	PCIS	Missing Start Time
MS2	9/14:45	9/15:19	PCIS	
MS1	9/18:01	9/18:36	PCIS	
PLT	9/18:55	9/20:27	PCIS	
MS3	9/22:00	9/22:40	PCIS	
CDR	10/01:32	10/02:16	PCIS	
CDR	11/00:40	11/00:56	PCIS	
MS2	11/02:15	11/02:50	PCIS	
MS1	11/14:31	11/14:48	Hard-Mounted	
MS2	11/14:48	11/15:38	Hard-Mounted	
PLT	11/20:13	?	Hard-Mounted	Missing Stop Time
CDR	12/00:08	12/00:50	Hard-Mounted	
PLT	12/14:45	12/15:06	Hard-Mounted	
CDR	12/15:41	12/16:24	Hard-Mounted	

Table 8. STS-62 OARE Head Location and Orientation

OARE Sensor Frequency: 0 to 1 Hz		Sample Rate: 10 samples/second Location: Orbiter Cargo Bay Keel Bridge
ORIENTATION		**LOCATION**
Orbiter Structural Axis	**Sensor Axis**	**Structural Axis**
X_0	$-X_{OARE}$	$X_0 = 1153.3$ in
Y_0	Z_{OARE}	$Y_0 = -1.3$ in
Z_0	Y_{OARE}	$Z_0 = 317.8$ in

Table 9. STS-62 SAMS Head Location and Orientation

Unit F Head A (TSH-1A) Serial no.: 821-19 Frequency: 0 to 10 Hz		Sample Rate: 50 samples/second Location: MPESS-A Starboard
ORIENTATION		**LOCATION**
Orbiter Structural Axis	**Sensor Axis**	**Structural Axis**
X_0	$-Y_h$	$X_0 = 925.9$ in
Y_0	Z_h	$Y_0 = 3.81$ in
Z_0	$-X_h$	$Z_0 = 417.8$ in

Unit F Head B (TSH-1B) Serial no.: 821-21 Frequency: 0 to 25 Hz		Sample Rate: 125 samples/second Location: MPESS-A Port
ORIENTATION		**LOCATION**
Orbiter Structural Axis	**Sensor Axis**	**Structural Axis**
X_0	$-Y_h$	$X_0 = 925.9$ in
Y_0	Z_h	$Y_0 = -5.24$ in
Z_0	$-X_h$	$Z_0 = 417.8$ in

Table 9. STS-62 SAMS Head Location and Orientation, continue

Unit G Head A (TSH-2A)
Serial no.: 821-4 — Sample Rate: 50 samples/second
Frequency: 0 to 5 Hz — Location: IDGE Thermostat Housing

ORIENTATION		LOCATION
Orbiter Structural Axis	**Sensor Axis**	**Structural Axis**
X_0	$-X_h$	$X_0 = 1021.7$ in
Y_0	Y_h	$Y_0 = -42.9$ in
Z_0	$-Z_h$	$Z_0 = 433.6$ in

Unit G Head B (TSH-2B)
Serial no.: 821-34 — Sample Rate: 50 samples/second
Frequency: 0 to 10 Hz — Location: MPESS Starboard

ORIENTATION		LOCATION
Orbiter Structural Axis	**Sensor Axis**	**Structural Axis**
X_0	Y_h	$X_0 = 1027.3$ in
Y_0	$-Z_h$	$Y_0 = -3.81$ in
Z_0	$-X_h$	$Z_0 = 417.8$ in

Unit G Head C (TSH-2C)
Serial no.: 821-20 — Sample Rate: 125 samples/second
Frequency: 0 to 25 Hz — Location: MPESS Port

ORIENTATION		LOCATION
Orbiter Structural Axis	**Sensor Axis**	**Structural Axis**
X_0	Y_h	$X_0 = 1027.3$ in
Y_0	$-Z_h$	$Y_0 = 5.24$ in
Z_0	$-X_h$	$Z_0 = 417.8$ in

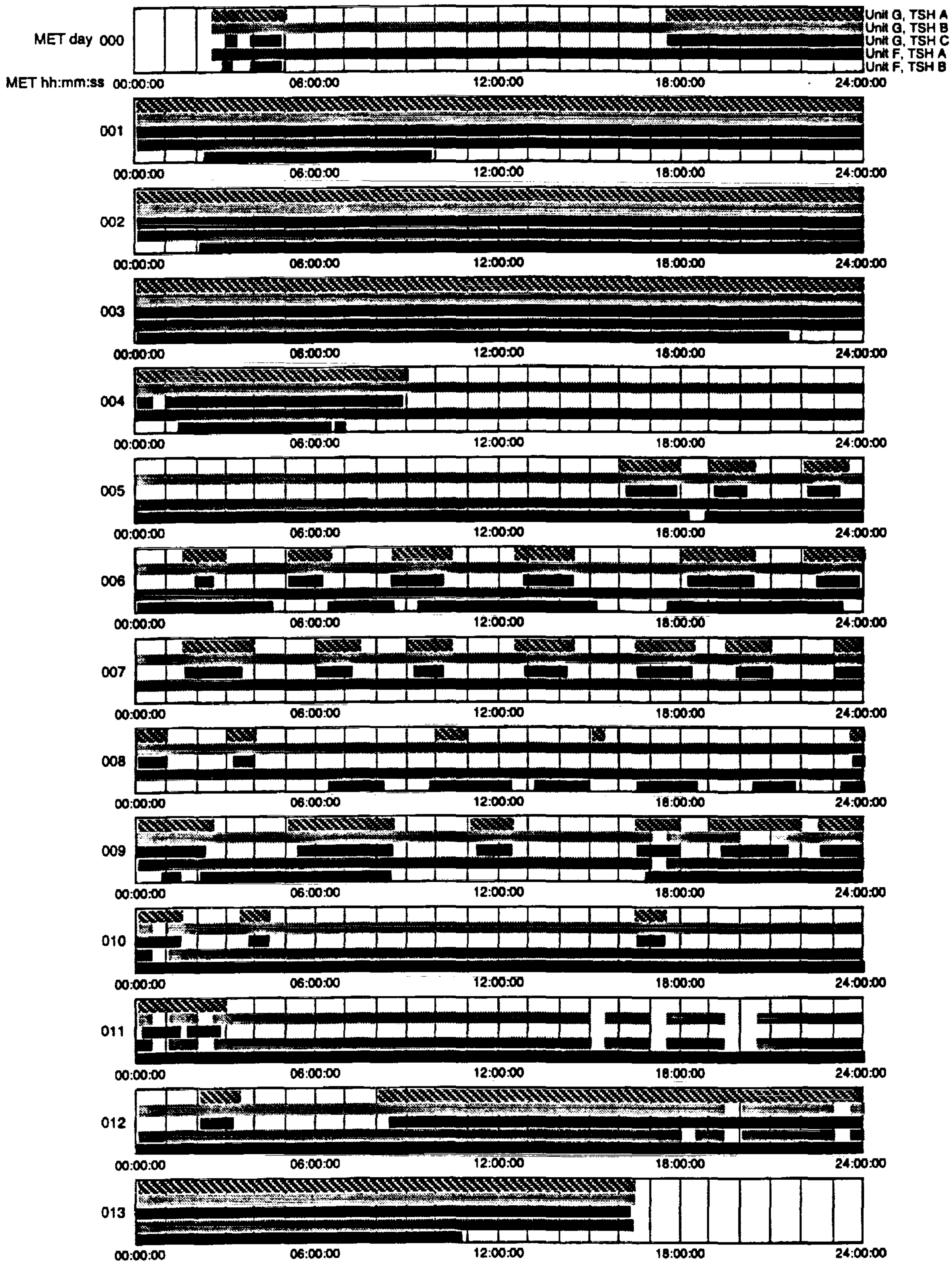

Figure 1 SAMS data availability from STS-62

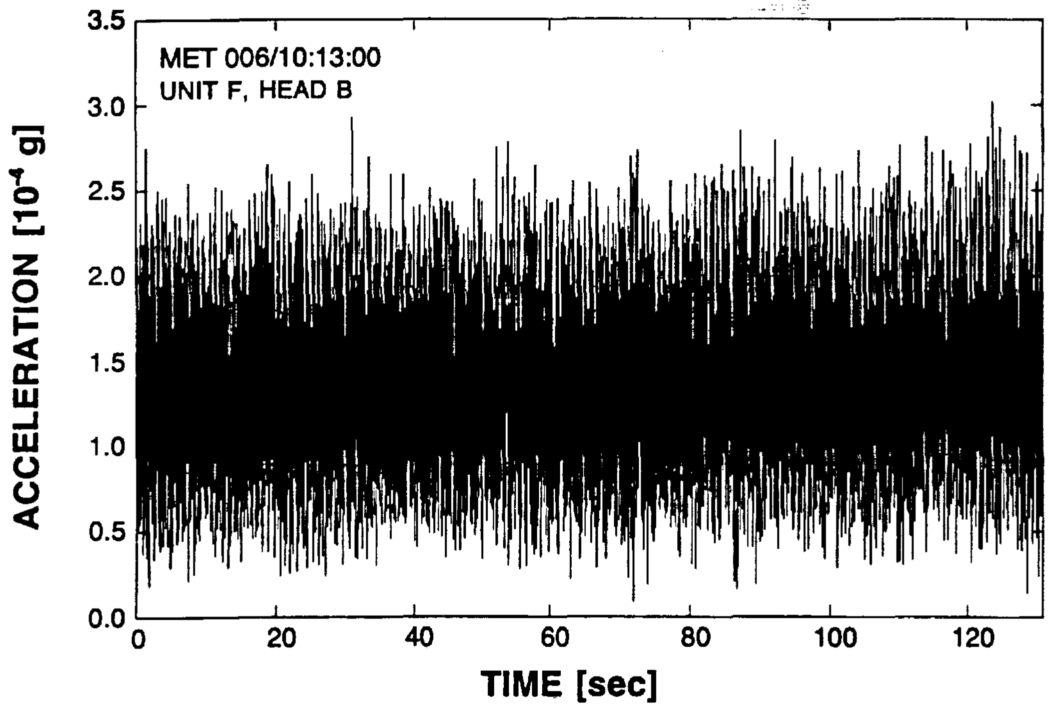

Figure 2a Time Domain vector magnitude of SAMS data for Unit F, Head B, MET 006/10:13:00 - 006/10:15:10

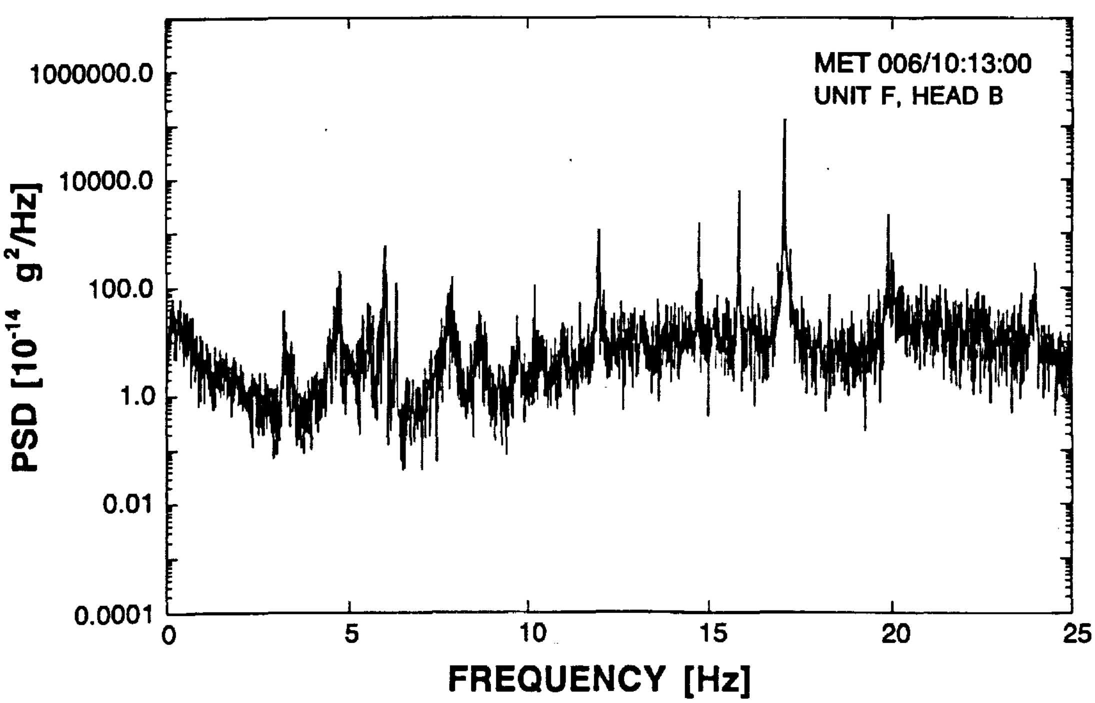

Figure 2b Power spectral density vector magnitude of SAMS data for Unit F, Head B, MET 006/10:13:00 - 006/10:15:10

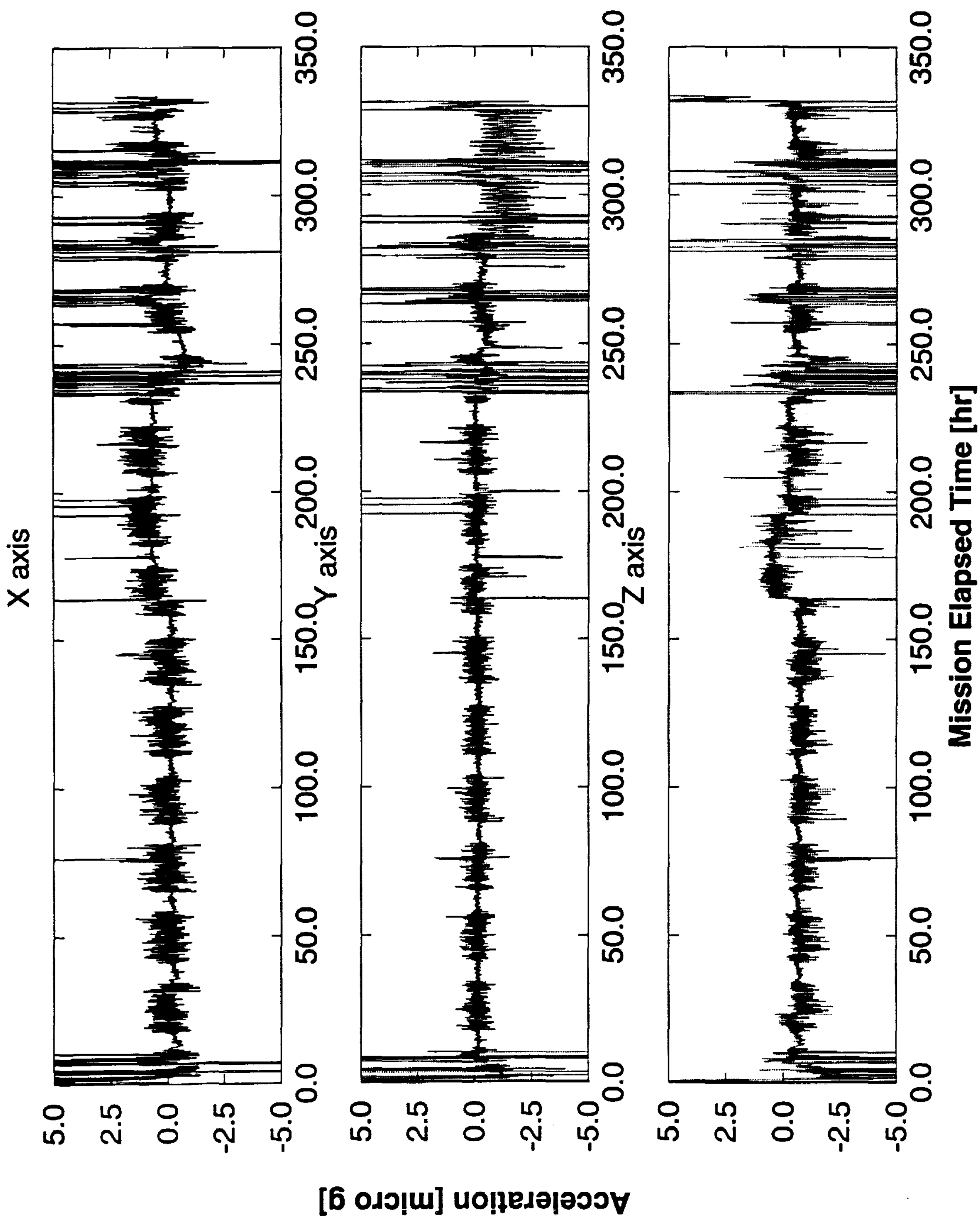

Figure 3 OARE data plotted in Orbiter body coordinate system for STS-62 mission.

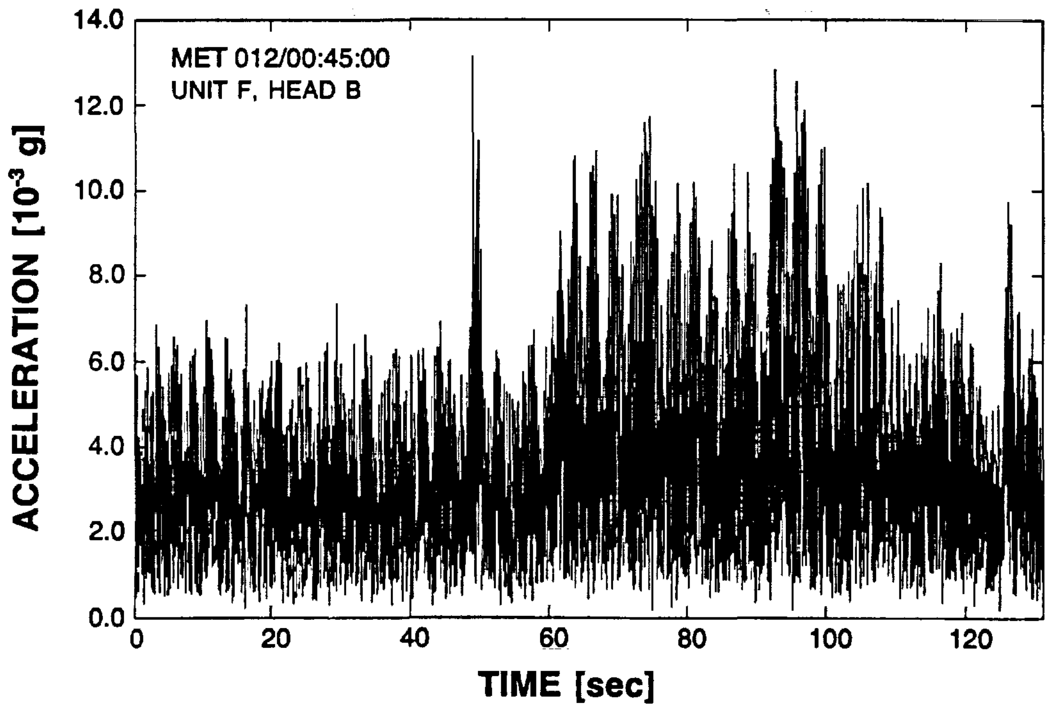

Figure 4a Time Domain vector magnitude of SAMS data for Unit F, Head B, MET 012/00:45:00 - 012/00:47:10

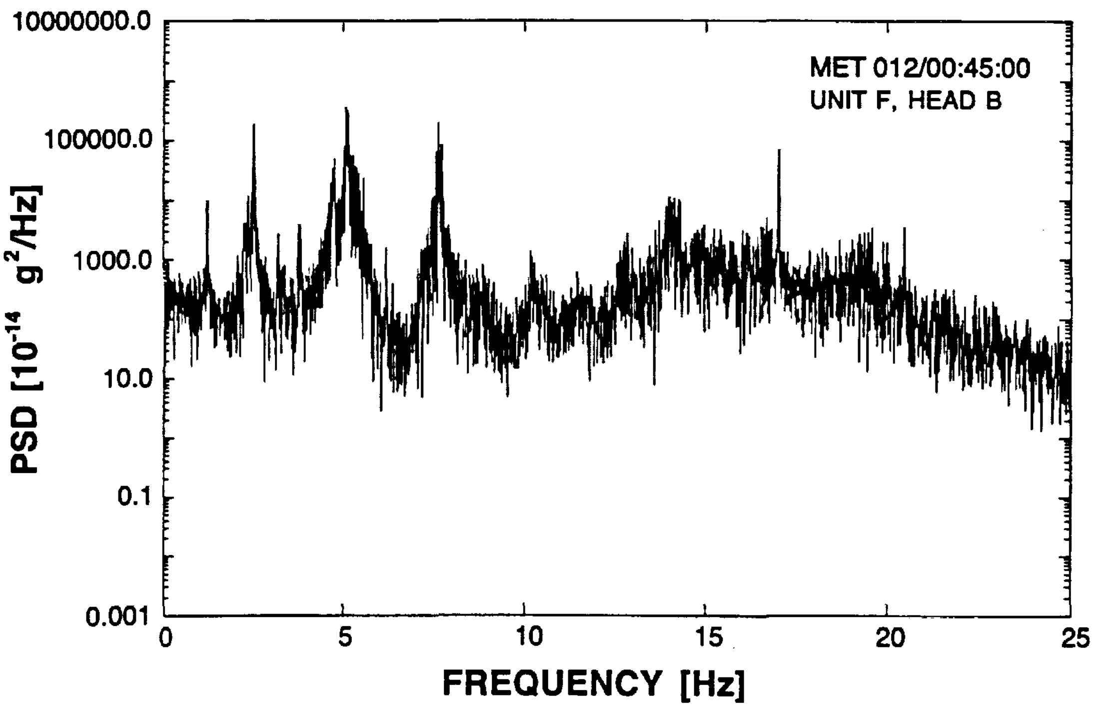

Figure 4b Power spectral density vector magnitude of SAMS data for Unit F, Head B, MET 012/00:45:00 - 012/00:47:10

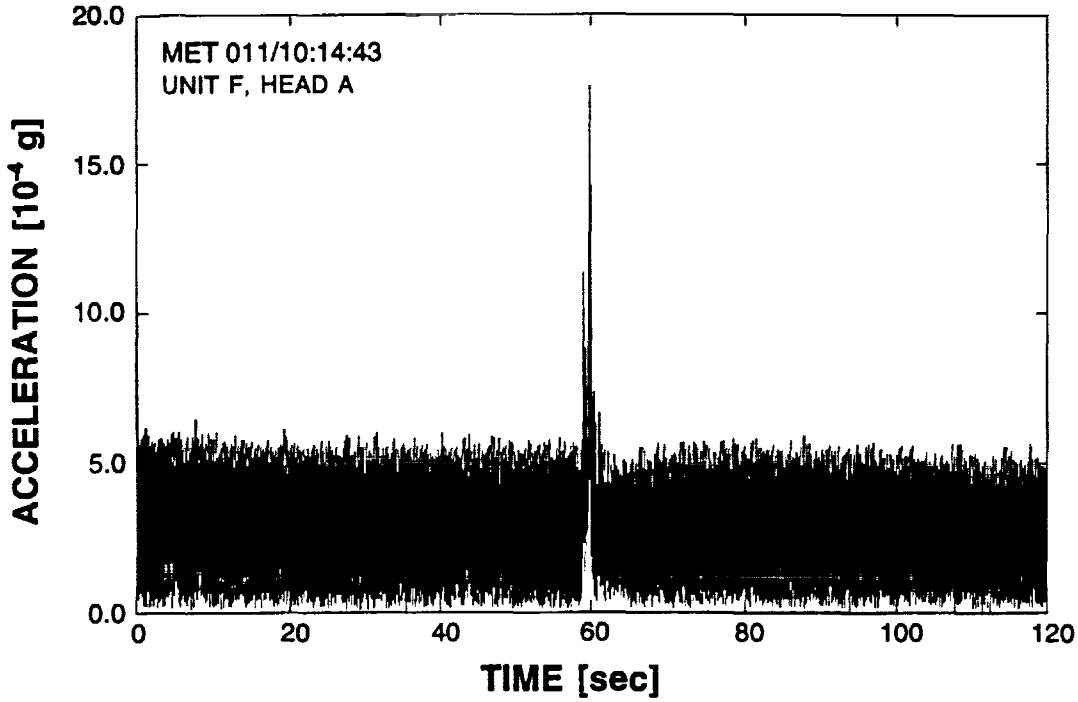

Figure 5a Time Domain vector magnitude of SAMS data for Unit F, Head A, MET 011/10:14:43 - 011/10:16:43

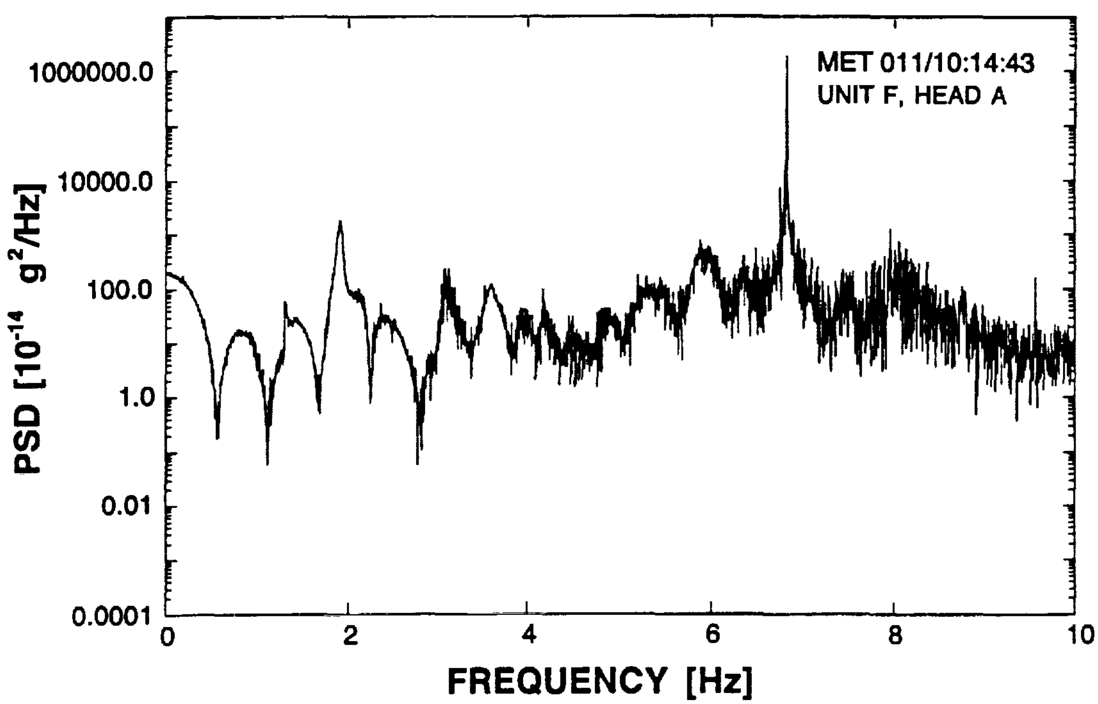

Figure 5b Power spectral density vector magnitude of SAMS data for Unit F, Head A, MET 011/10:14:43 - 011/10:16:43

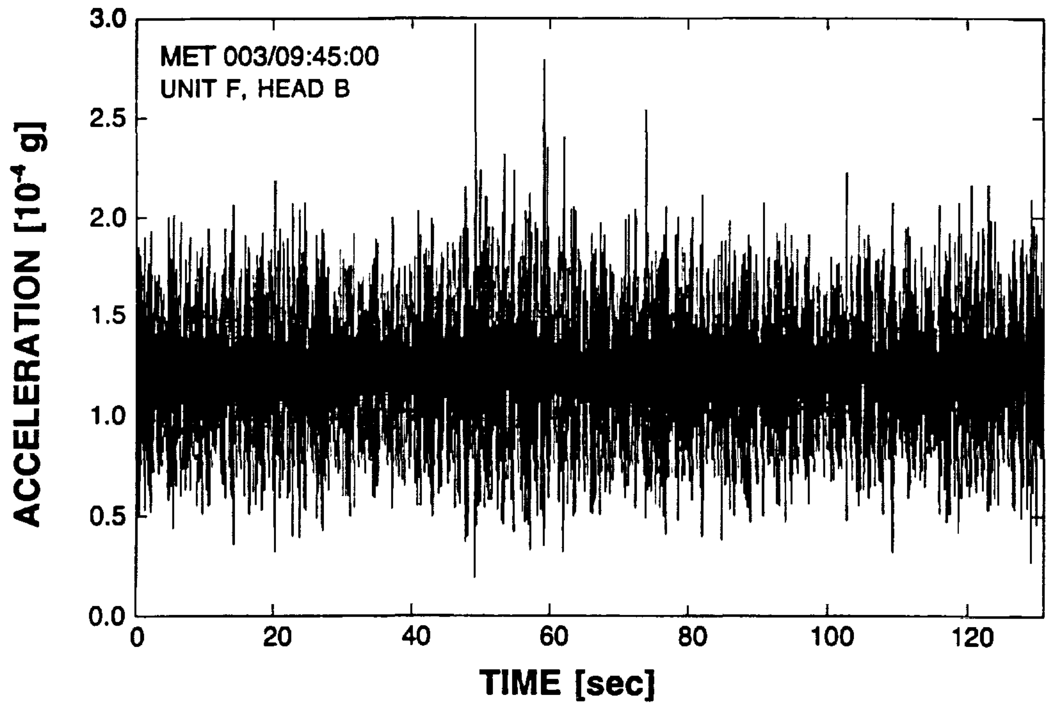

Figure 6a Time Domain vector magnitude of SAMS data for Unit F, Head B, MET 003/09:45:00 - 003/09:47:10

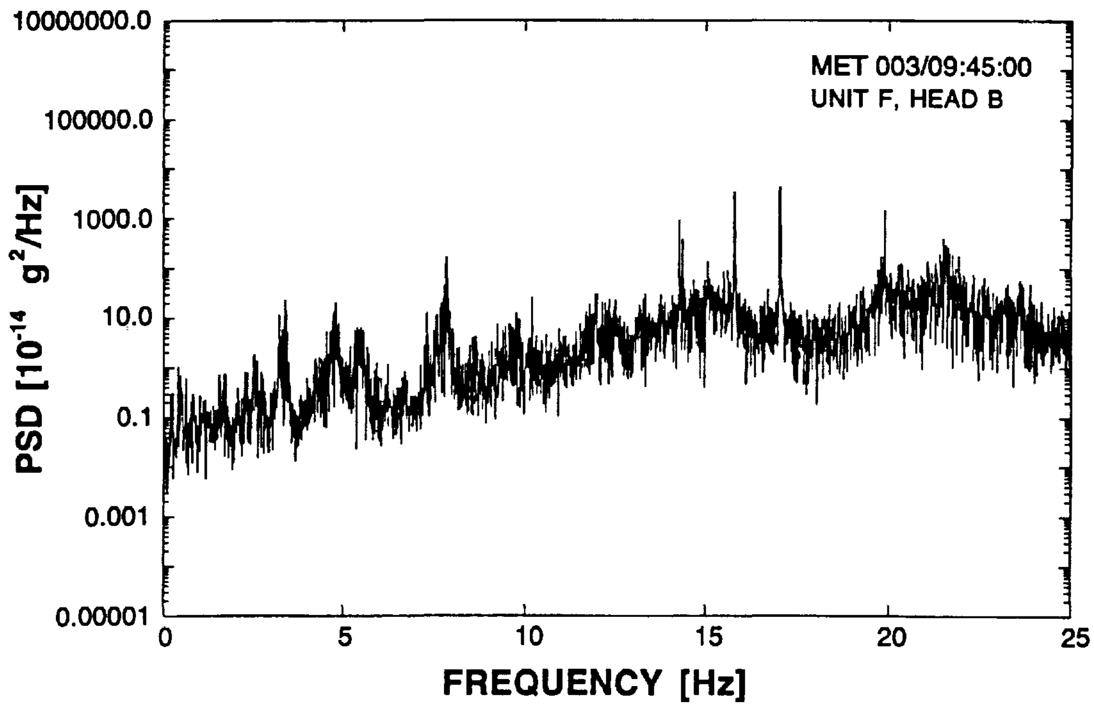

Figure 6b Power spectral density vector magnitude of SAMS data for Unit F, Head B, MET 003/09:45:00 - 003/09:47:10

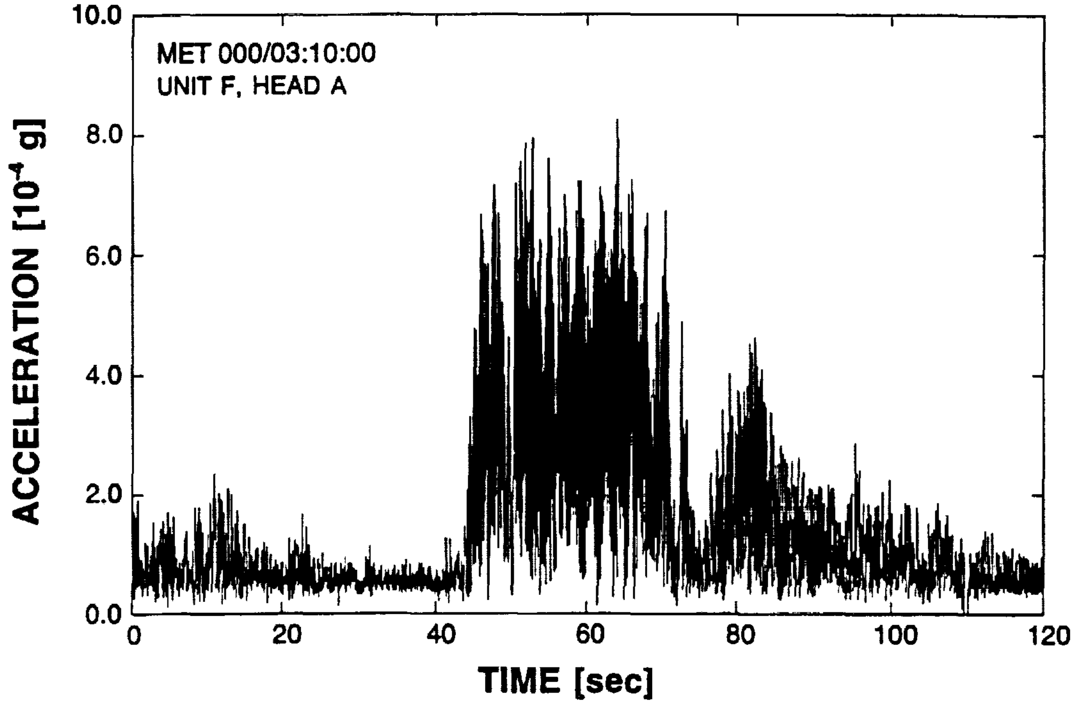

Figure 7a Time Domain vector magnitude of SAMS data for Unit F, Head A, MET 000/03:10:00 - 000/03:12:00

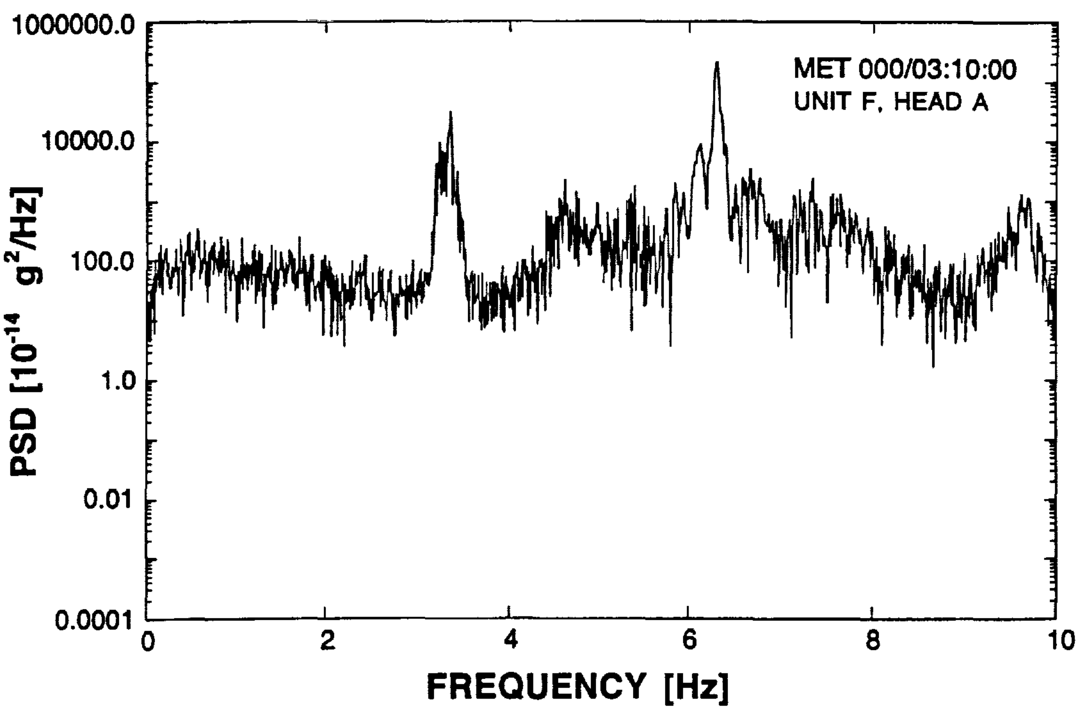

Figure 7b Power spectral density vector magnitude of SAMS data for Unit F, Head A, MET 000/03:10:00 - 000/03:12:00

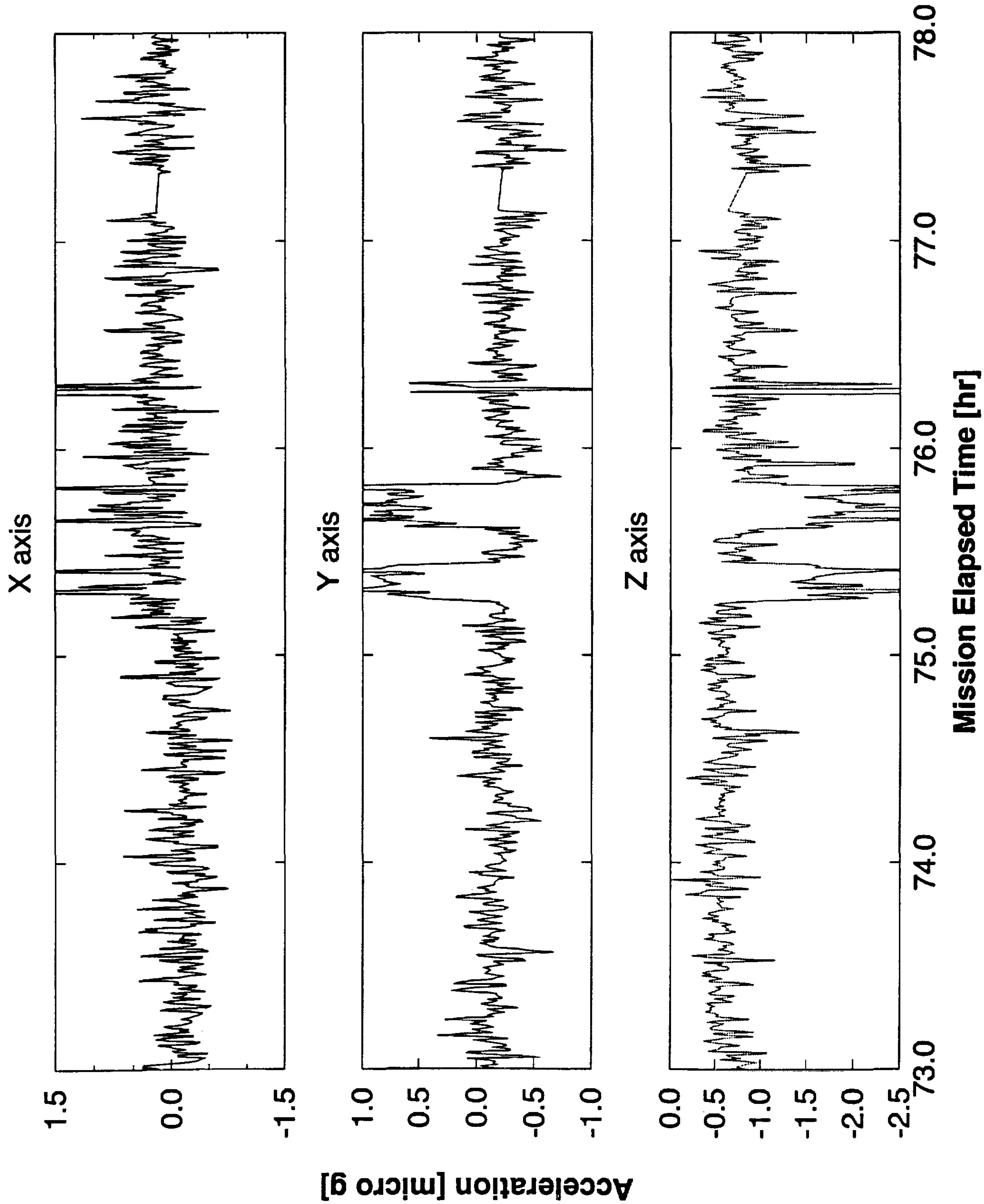

Figure 8 OARE data plotted in Orbiter body coordinate system for time period during initiation of flash evaporator system operations at MET 003/03:20.

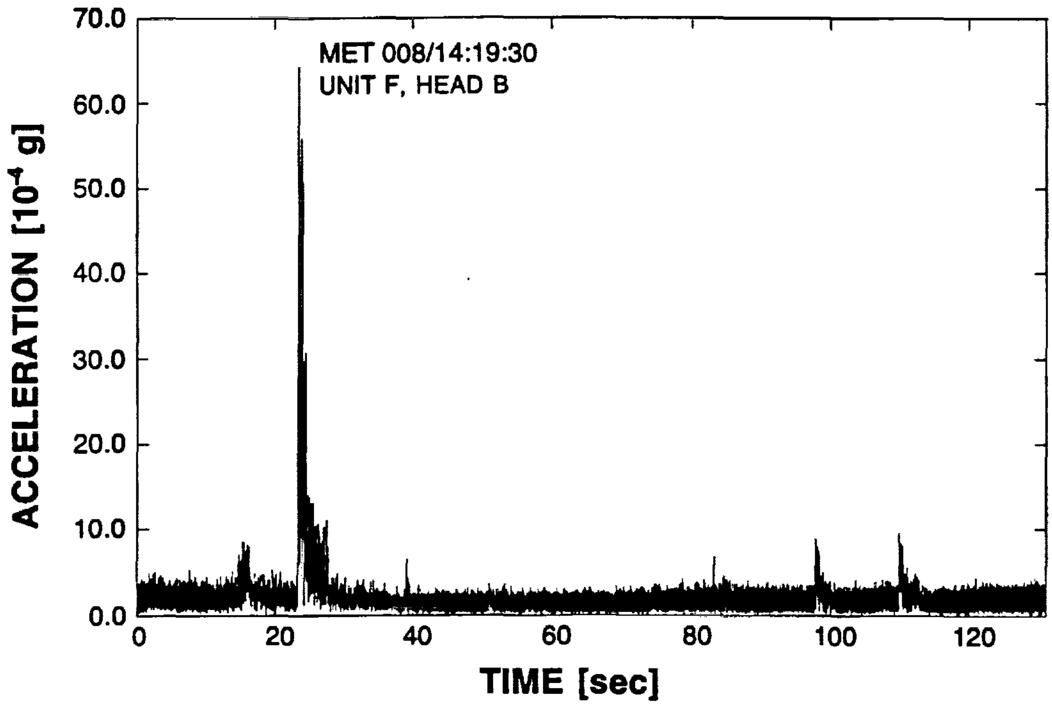

Figure 9a Time Domain vector magnitude of SAMS data for Unit F, Head B, MET 008/14:19:30 - 008/14:21:40

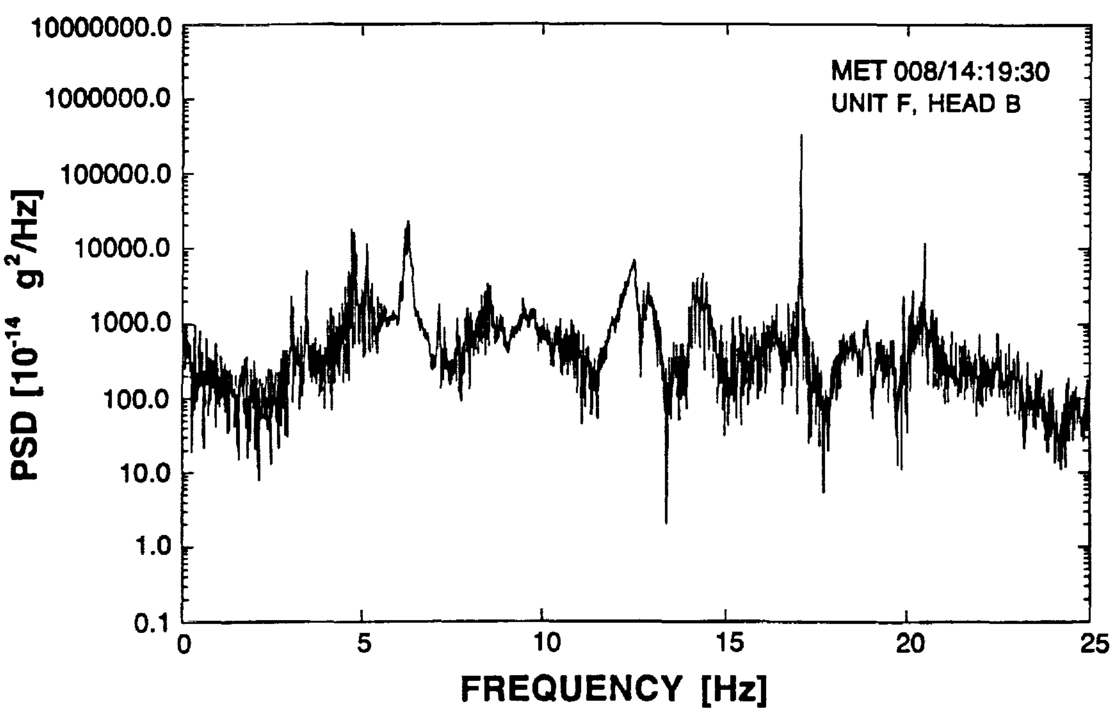

Figure 9b Power spectral density vector magnitude of SAMS data for Unit F, Head B, MET 008/14:19:30 - 008/14:21:40

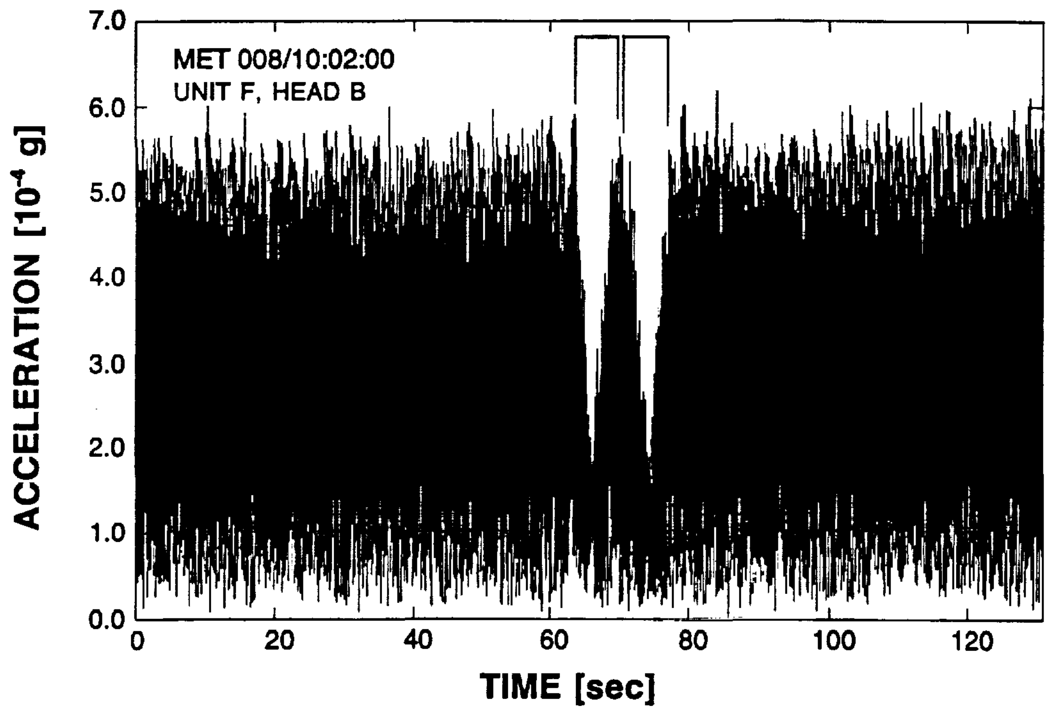

Figure 10a Time Domain vector magnitude of SAMS data for Unit F, Head B, MET 008/10:02:00 - 008/10:04:10

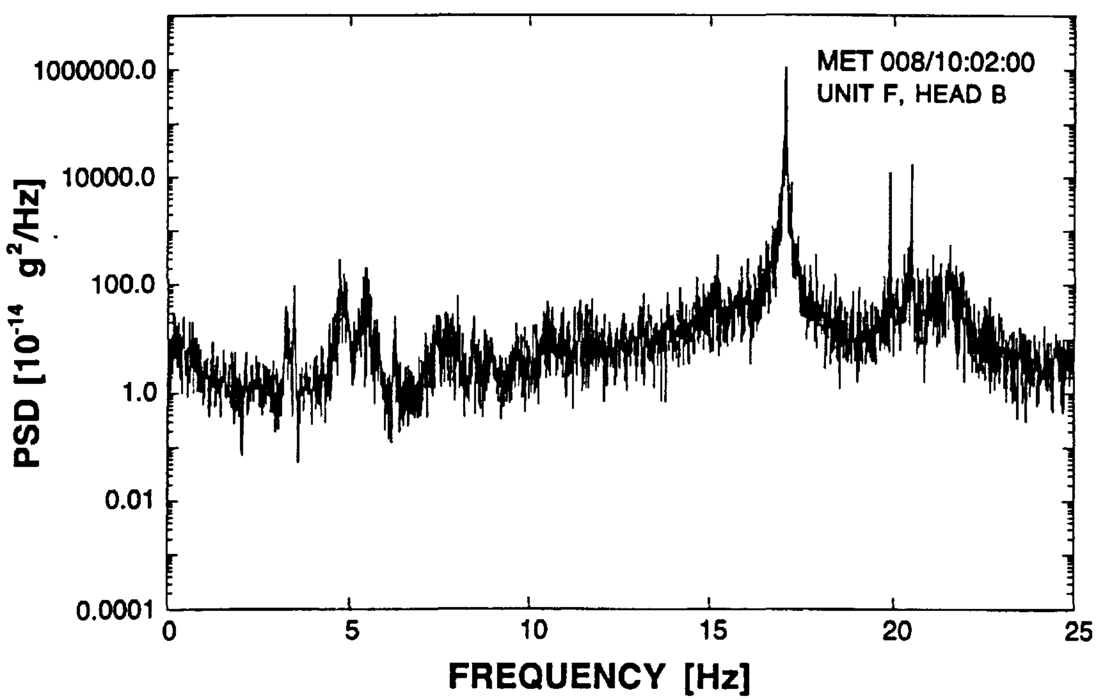

Figure 10b Power spectral density vector magnitude of SAMS data for Unit F, Head B, MET 008/10:02:00 - 008/10:04:10

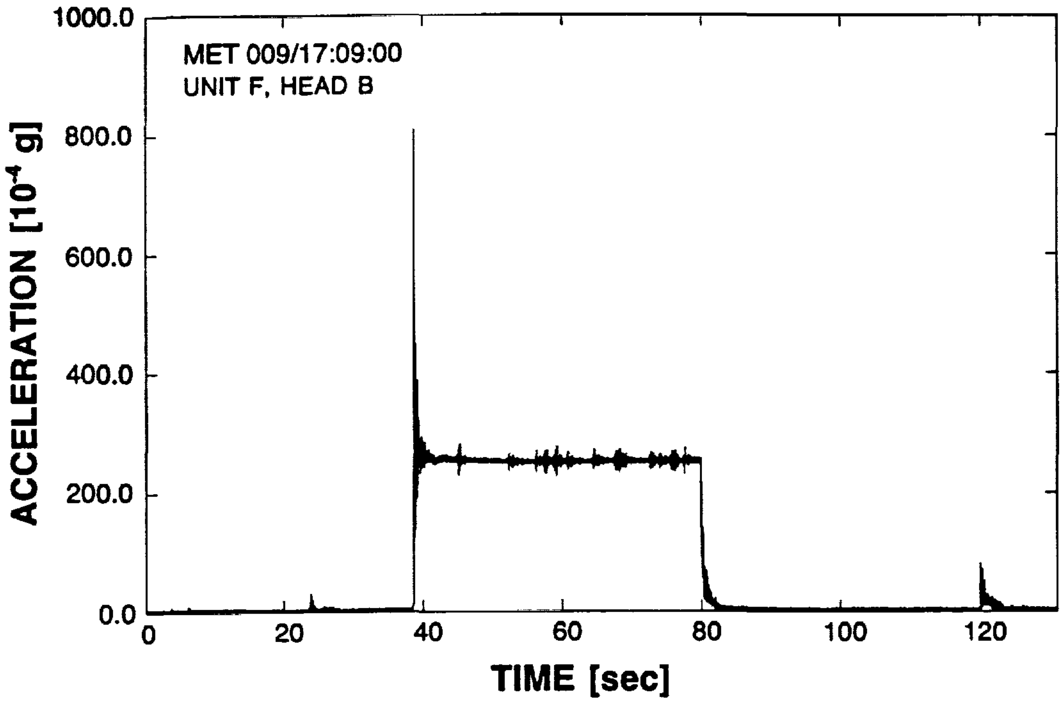

Figure 11a Time Domain vector magnitude of SAMS data for Unit F, Head B, MET 009/17:09:00 - 009/17:11:10

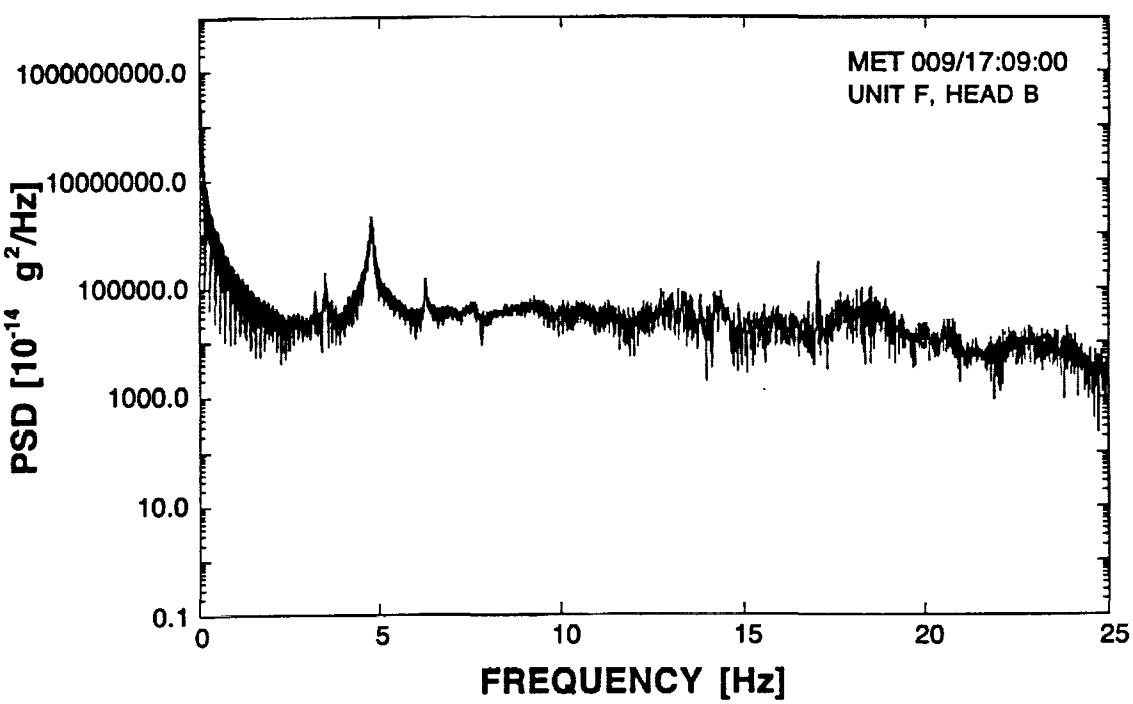

Figure 11b Power spectral density vector magnitude of SAMS data for Unit F, Head B, MET 009/17:09:00 - 009/17:11:10

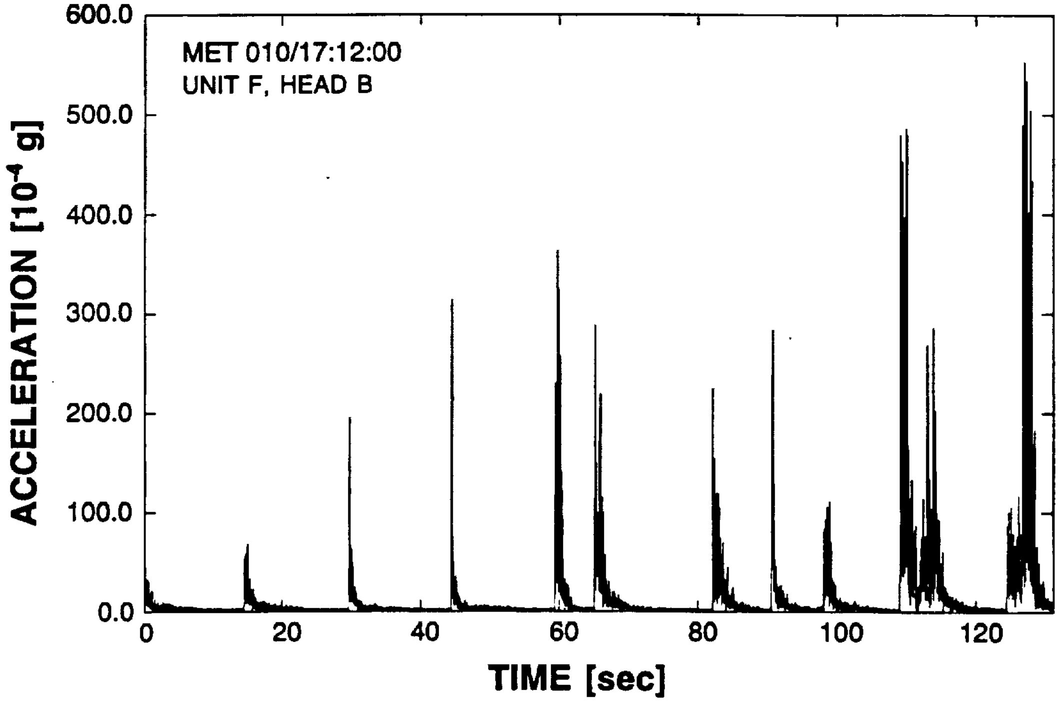

Figure 12a Time Domain vector magnitude of SAMS data for Unit F, Head B, MET 010/17:12:00 - 010/17:14:10

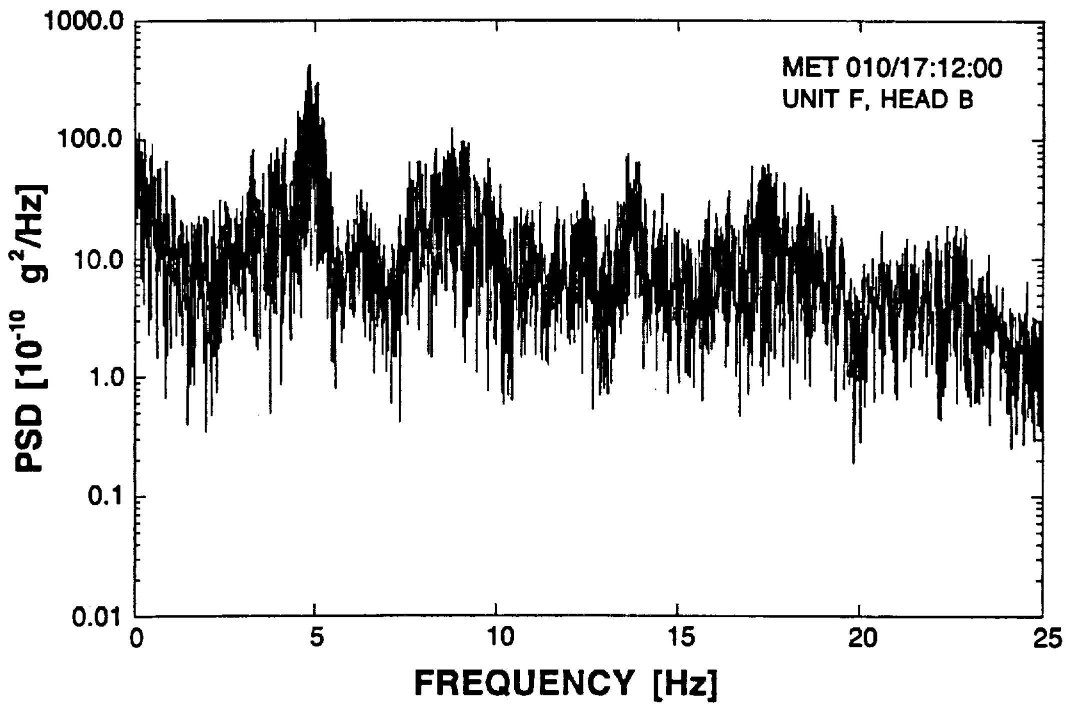

Figure 12b Power spectral density vector magnitude of SAMS data for Unit F, Head B, MET 010/17:12:00 - 010/17:14:10

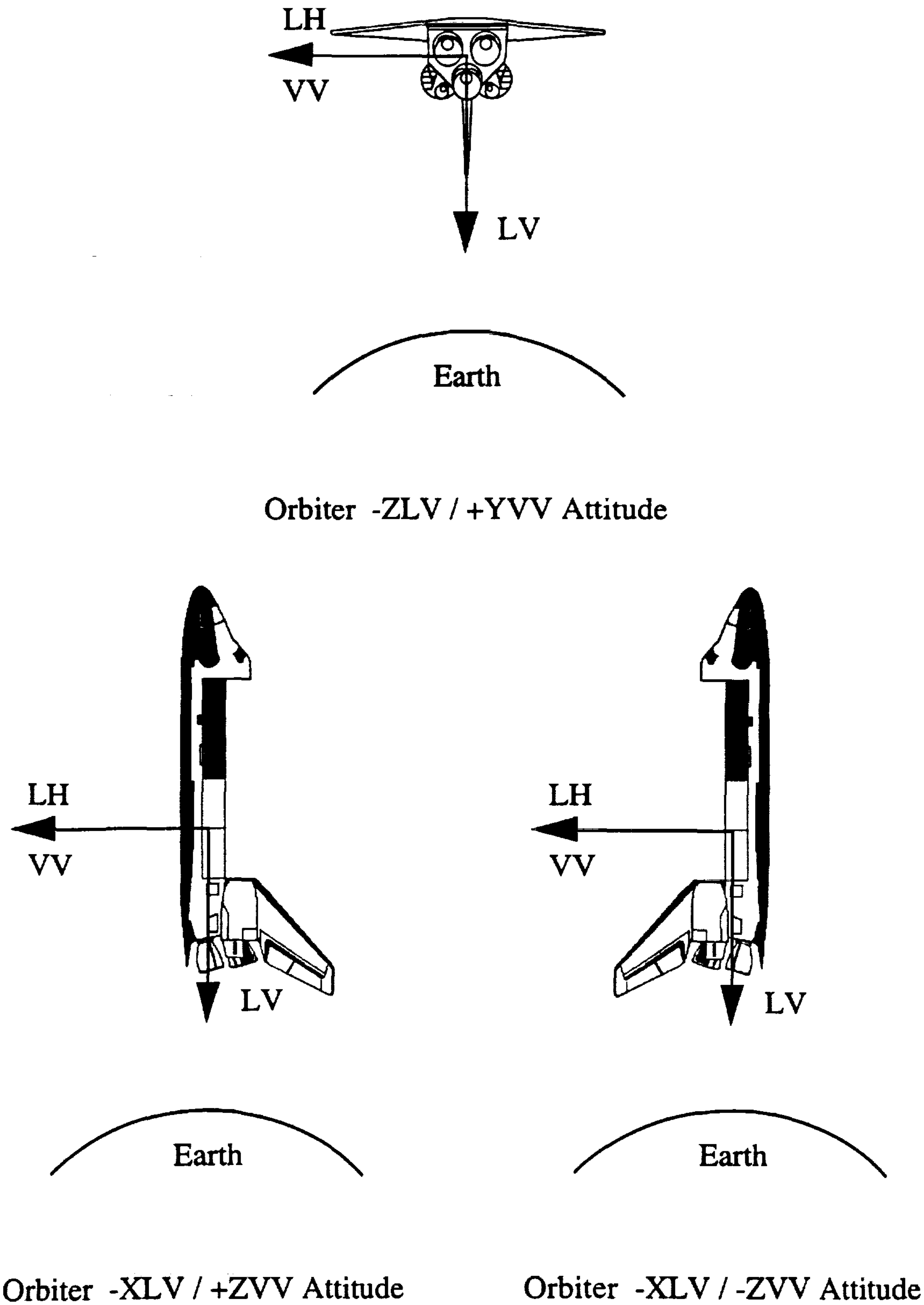

Figure 13 Orbiter Attitudes for USMP-2 on STS-62

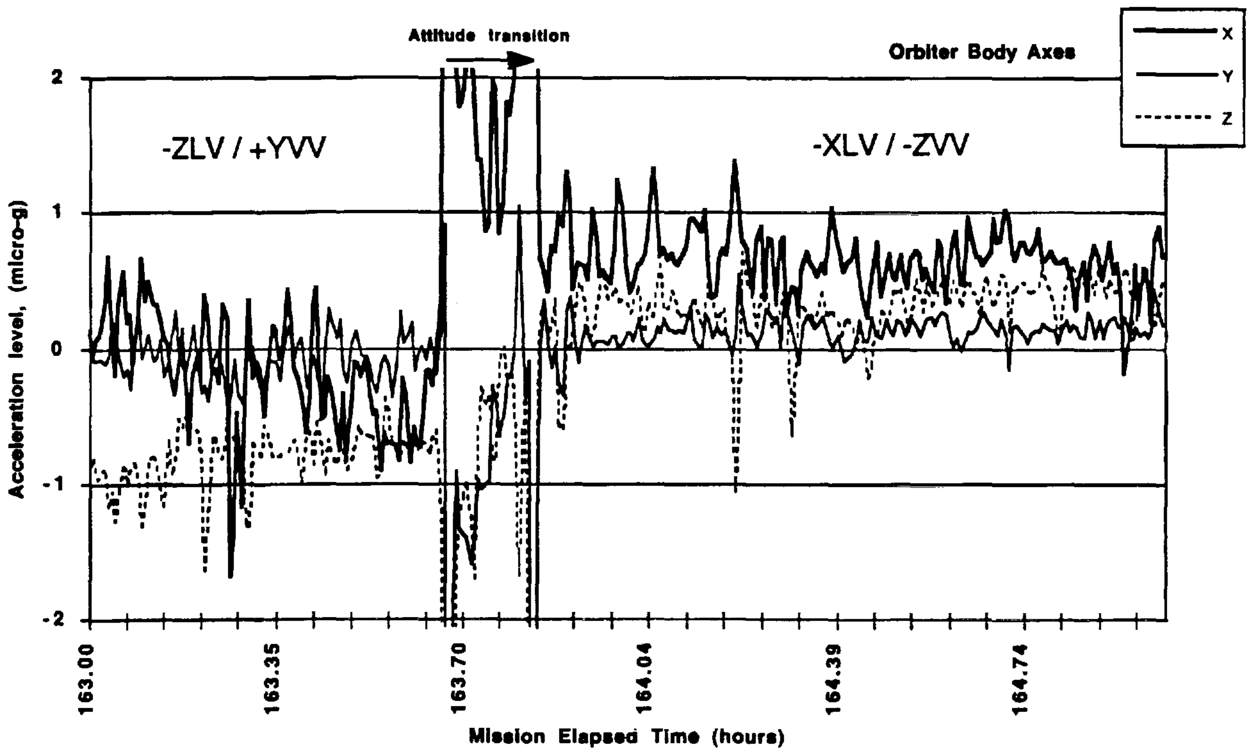

Figure 14 Attitude Transition During USMP-2 Operations (-ZLV / +YVV to -XLV / -ZVV)

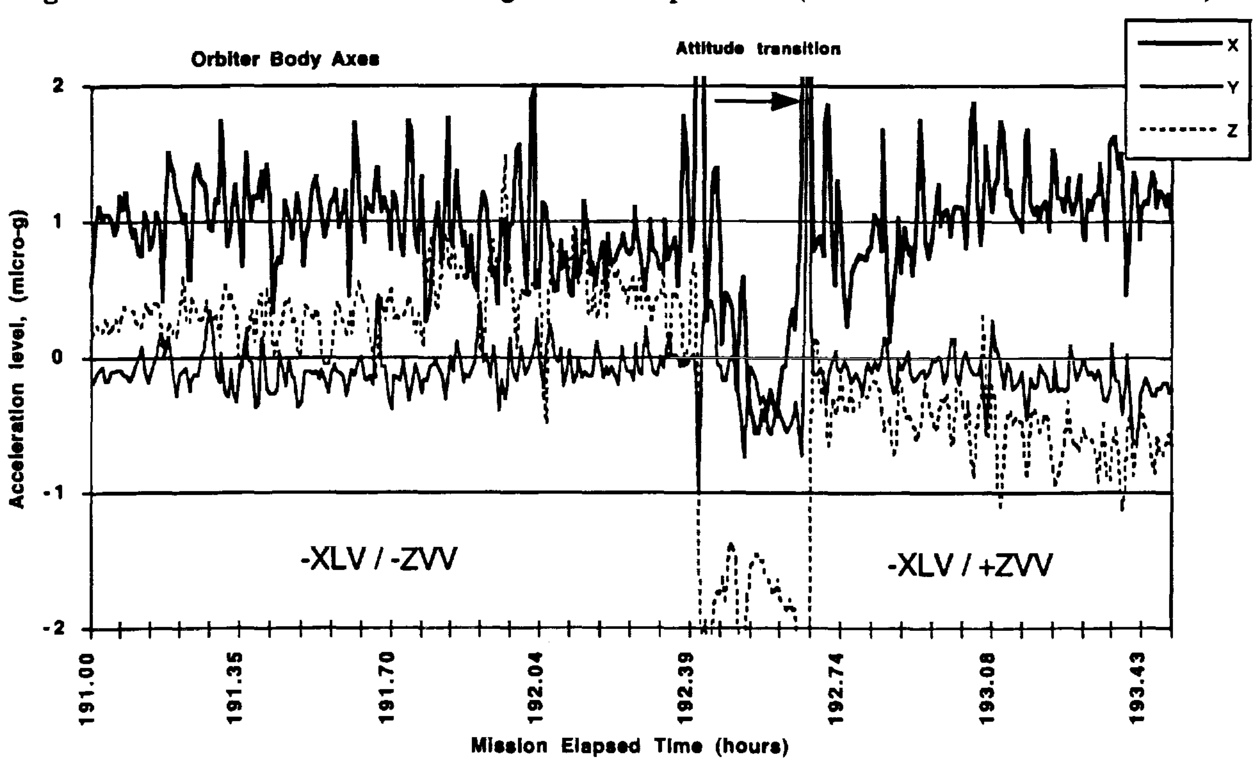

Figure 15 Attitude Transition During USMP-2 Operations (-XLV / -ZVV to -XLV / +ZVV)

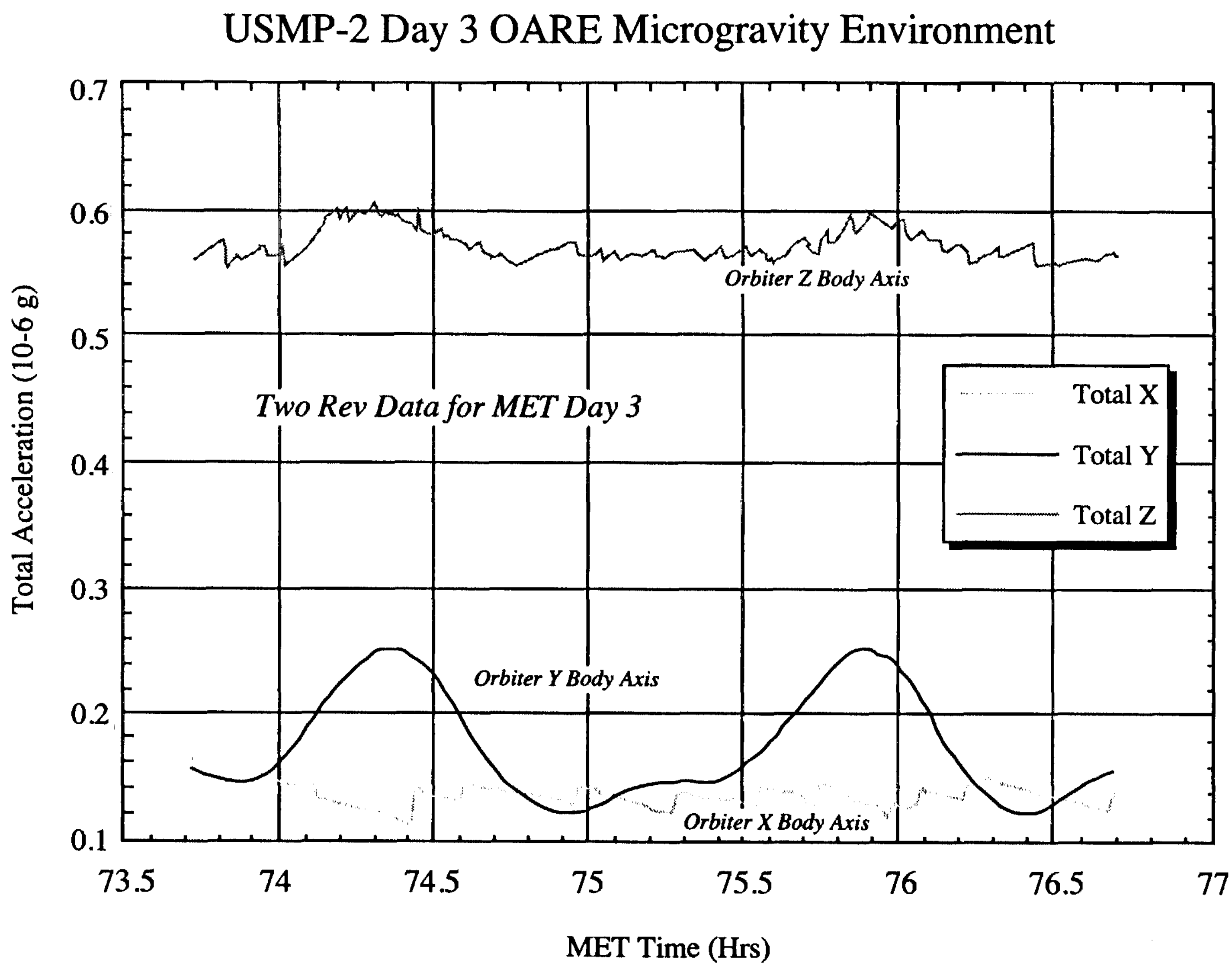

Figure 16 OARE Predicted Environment [13]

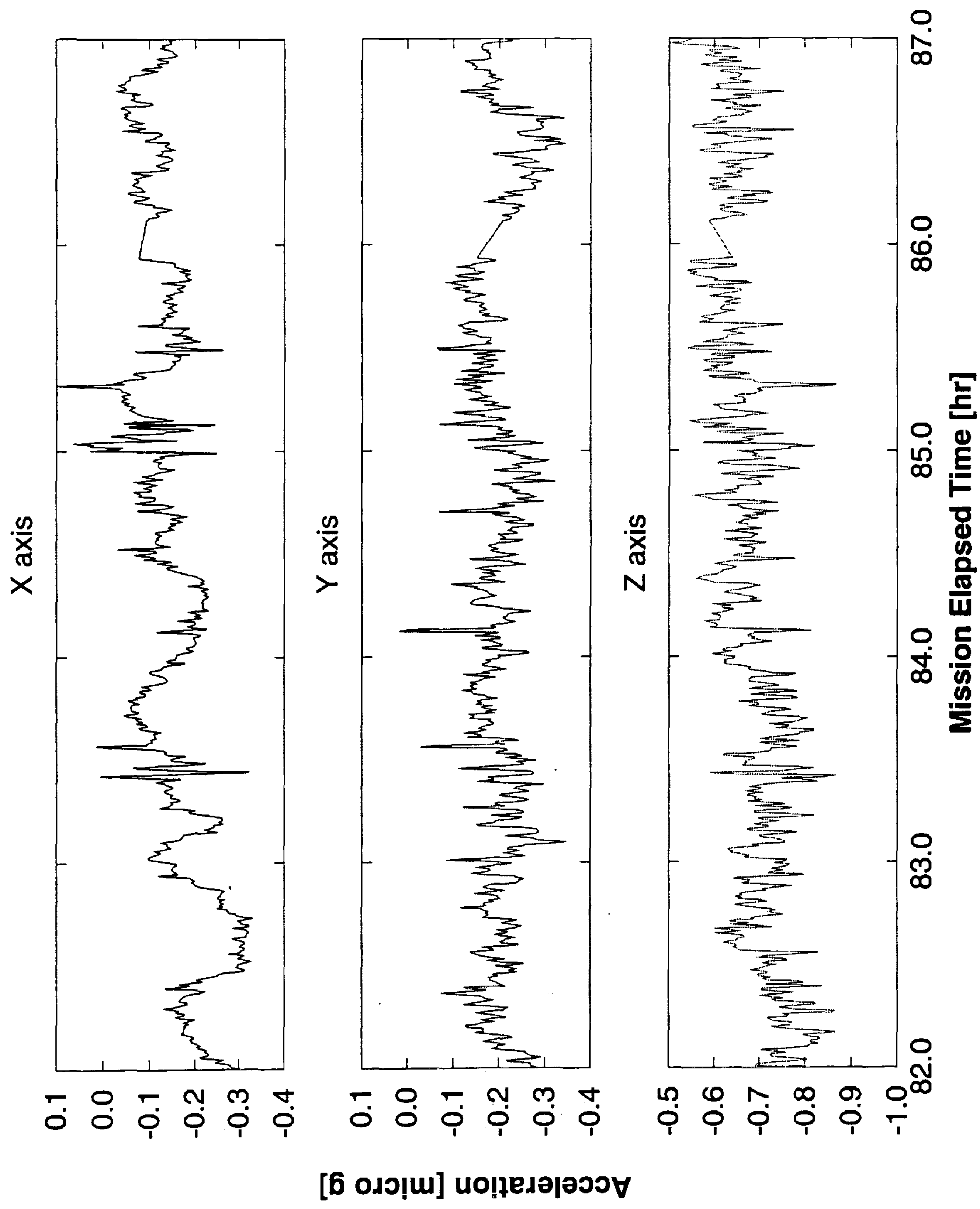

Figure 17 OARE data for a period comparable to Fig. 16.

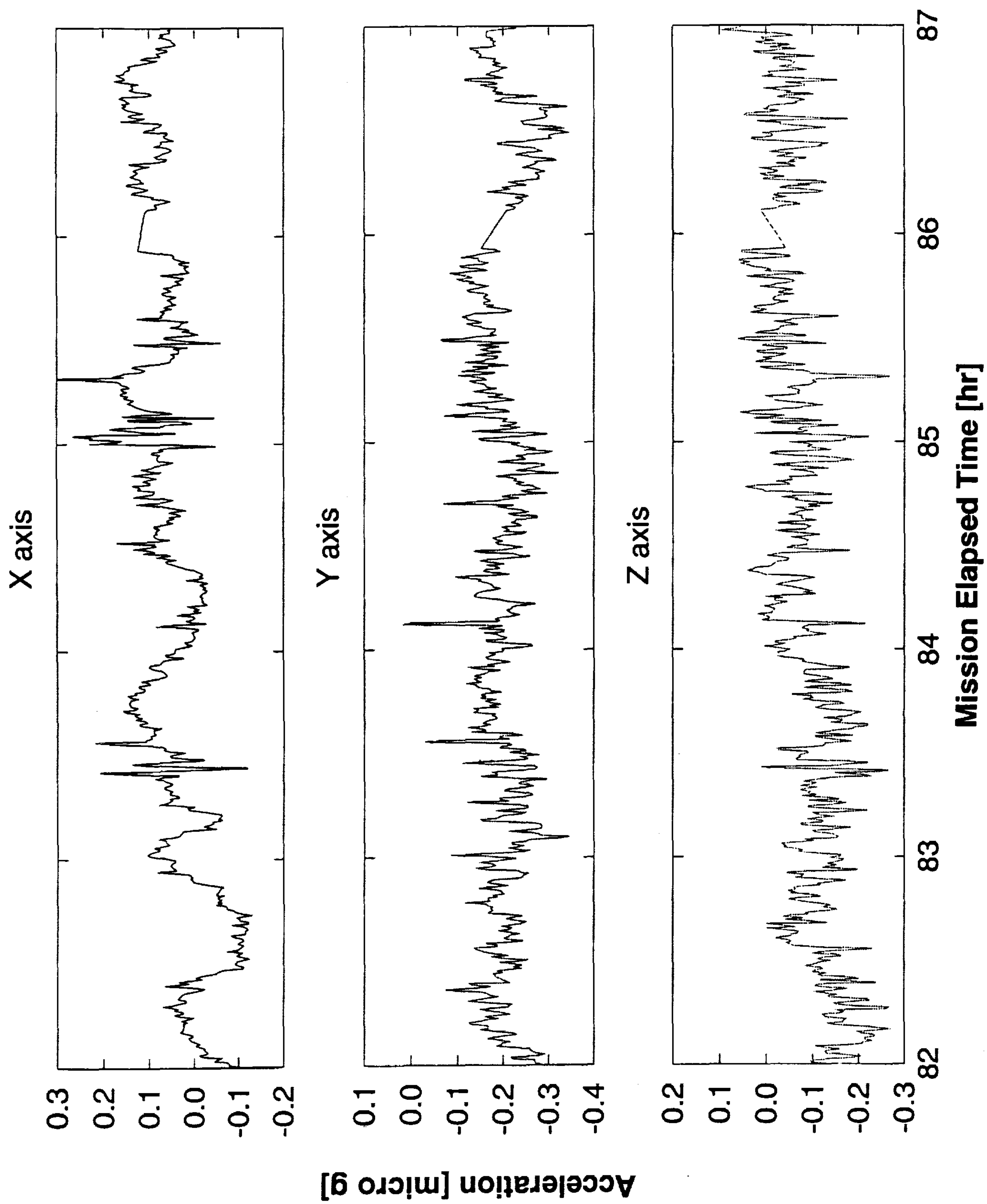

Figure 18 Quasi-steady environment at Orbiter c.g. based on recomputation of OARE data, Orbiter body coordinate system,

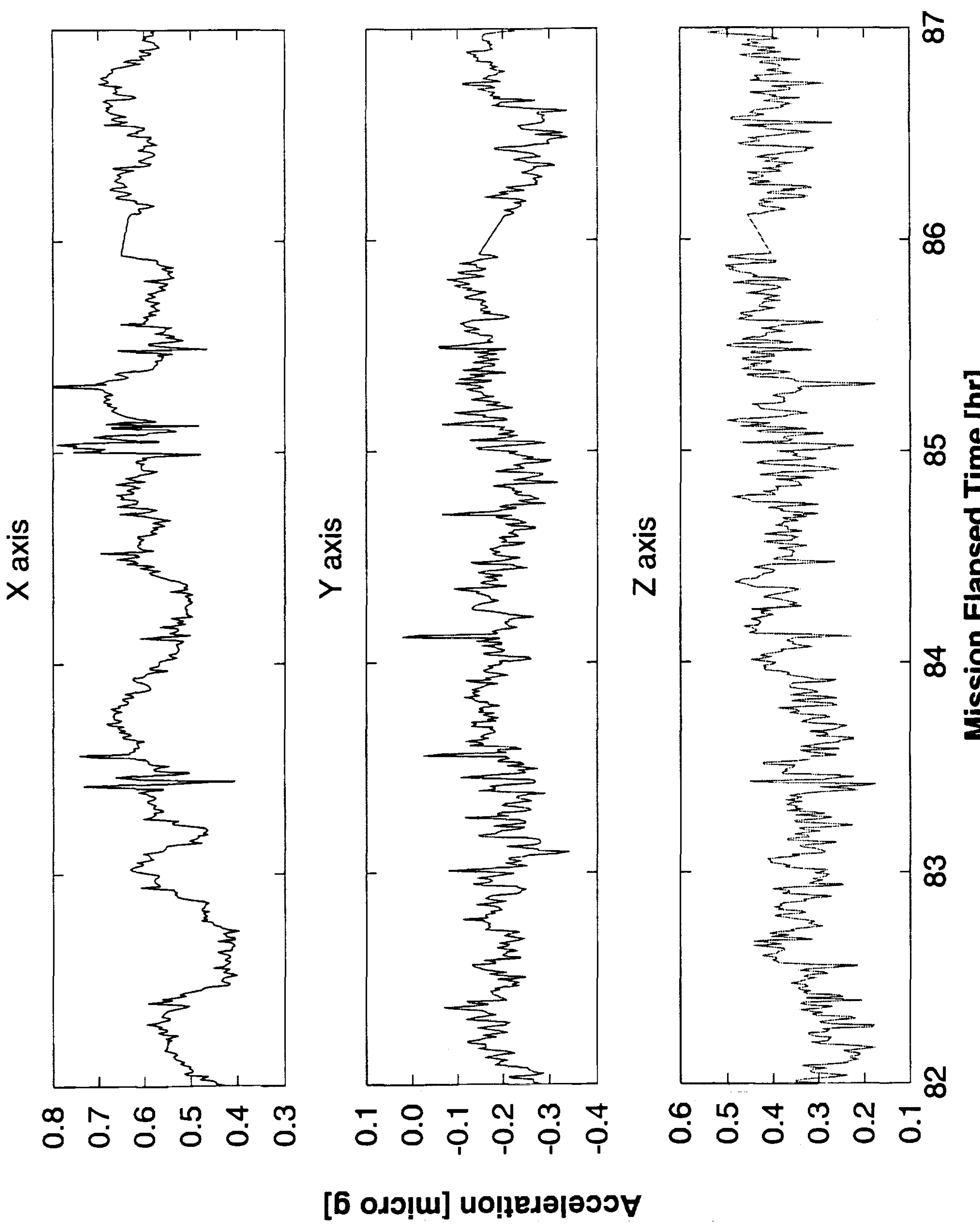

Figure 19 Quasi-steady environment at AADSF based on recomputation of OARE data, Orbiter body coordinate system.

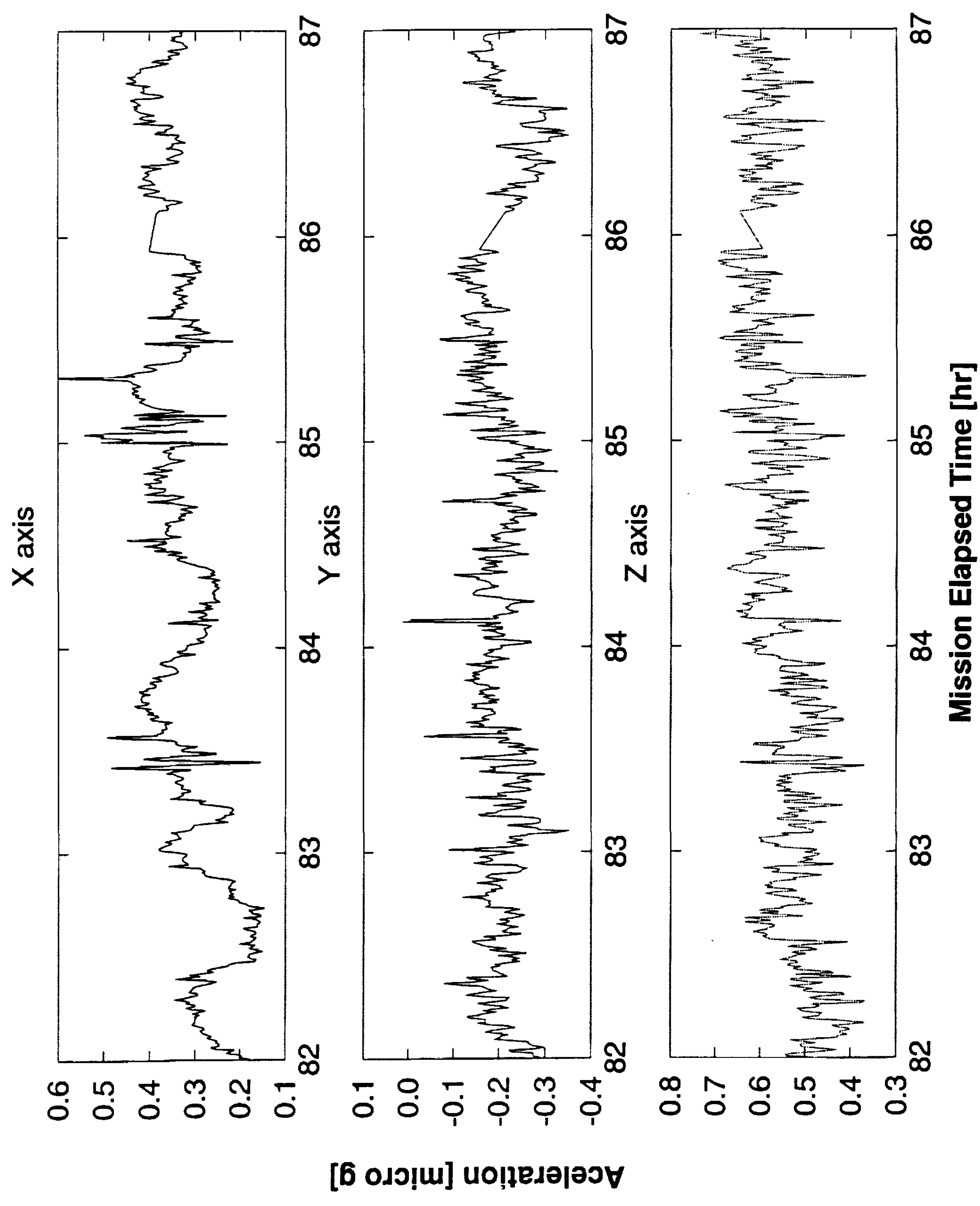

Figure 20 Quasi-steady environment at IDGE based on recomputation of OARE data, Orbiter body coordinate system.

APPENDIX A ACCESSING OARE AND SAMS DATA FILES

OARE and SAMS data files may be accessed from a file server at NASA LeRC. The NASA LeRC file server **beech.lerc.nasa.gov** (tcp/ip address 139.88.19.43) can be accessed via anonymous ftp, as follows

ftp 139.88.19.43
login anonymous
password guest
cd pub
ls (This will list files and directories under pub. OARE and SAMS data are organized within mission directories: usml1, usmp1, etc.)

The SAMS data files are organized in a tree-like structure as pictured in Figure A1. Files are broken down into categories based upon sensor head, mission day, and type of data. Files are stored at the lowest level in the tree, and the data file name reflects the contents of the file. For example, axm00102.15r contains data for sensor head a, the x axis, m means MET (if n, time has been converted into MET), day 001, hour 02, 1 of 5 files and r means reduced (temp/gain compensation applied). The file **readme.doc** provides a comprehensive description and guide to the data.

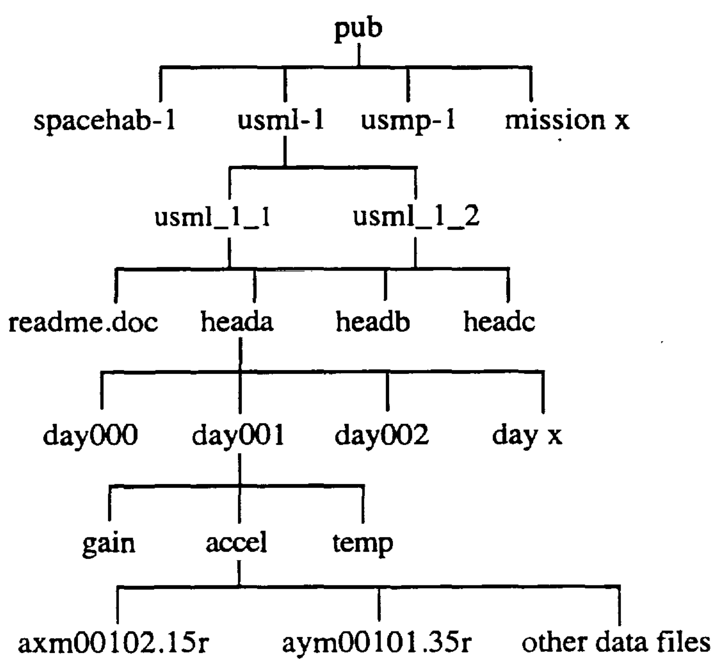

Figure A1 SAMS Data Directory Tree

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APPENDIX B SAMS TIME HISTORIES

Accelerometer data collected on Orbiter missions are generally analyzed by the PI or experiment team responsible for the system. The PI Microgravity Services (PIMS) project at the NASA Lewis Research Center was formed in part to support microgravity PI's in the evaluation of acceleration effects on their experiments and to characterize the vibrational environment of the microgravity carriers and vehicles. The primary continual source of accelerometer data from mission to mission is SAMS. Some of the SAMS data from STS-62 are presented in Appendices B and C to provide PI's with an overview of the environment during the mission.

The raw data recorded by SAMS is processed to compensate for temperature and gain related errors of bias, scale factor, and axis misalignment. The processing utilizes a fourth order temperature model to compensate the data and convert the raw digitized data into engineering units (Thomas, et al., 1992). The data are transformed to the shuttle structural coordinate system and formatted into files for distribution via CD-ROM and file server. See Appendix A for information on file server access to SAMS data.

The compensated data are further processed to produce the plots shown here. Two time history representations of the data are provided: ten second average and ten second root mean square (rms) plots. These calculations are presented in two hour plots with the corresponding average and rms plots on one page. The ten second average plots should be used to identify times when the steady level of the acceleration signal deviates from the background level. The ten second rms plots should be used to identify times when oscillatory and/or transient deviations from the background acceleration levels occurred.

Average and Root Mean Square Calculations

The average plots were produced using STS-62 SAMS Unit F, Head B data. Unit F, Head B data were collected at 125 samples per second and a 25 Hz low pass filter was applied to the data by the SAMS unit prior to digitization. The plots were produced by first forming the vector magnitude of the x, y, z axis data and then taking the average of consecutive ten second intervals of data. The average produces one data point for every ten seconds (N = 1250 points) of data. The following equation was used to calculate the ten second moving window average:

$$Average = \frac{1}{N}\sum_{j=1}^{N} V_j$$

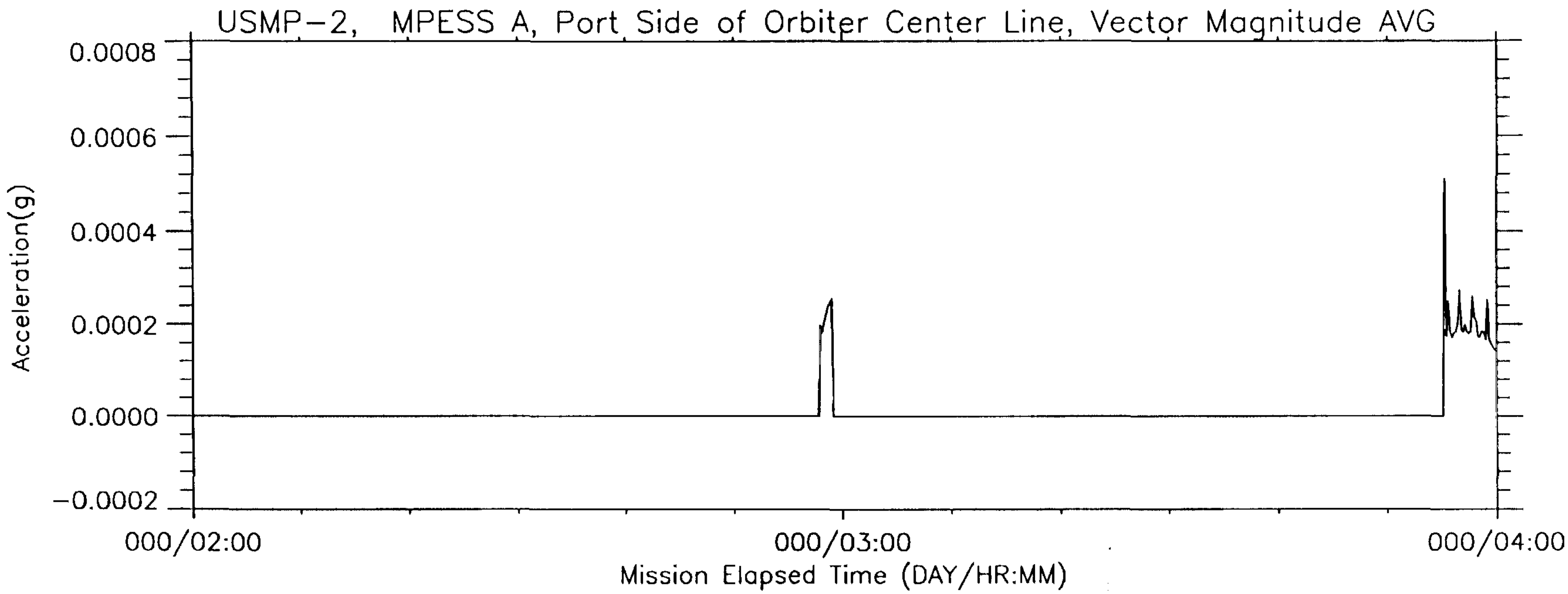
where V is the vector magnitude of the x, y, and z axis data.

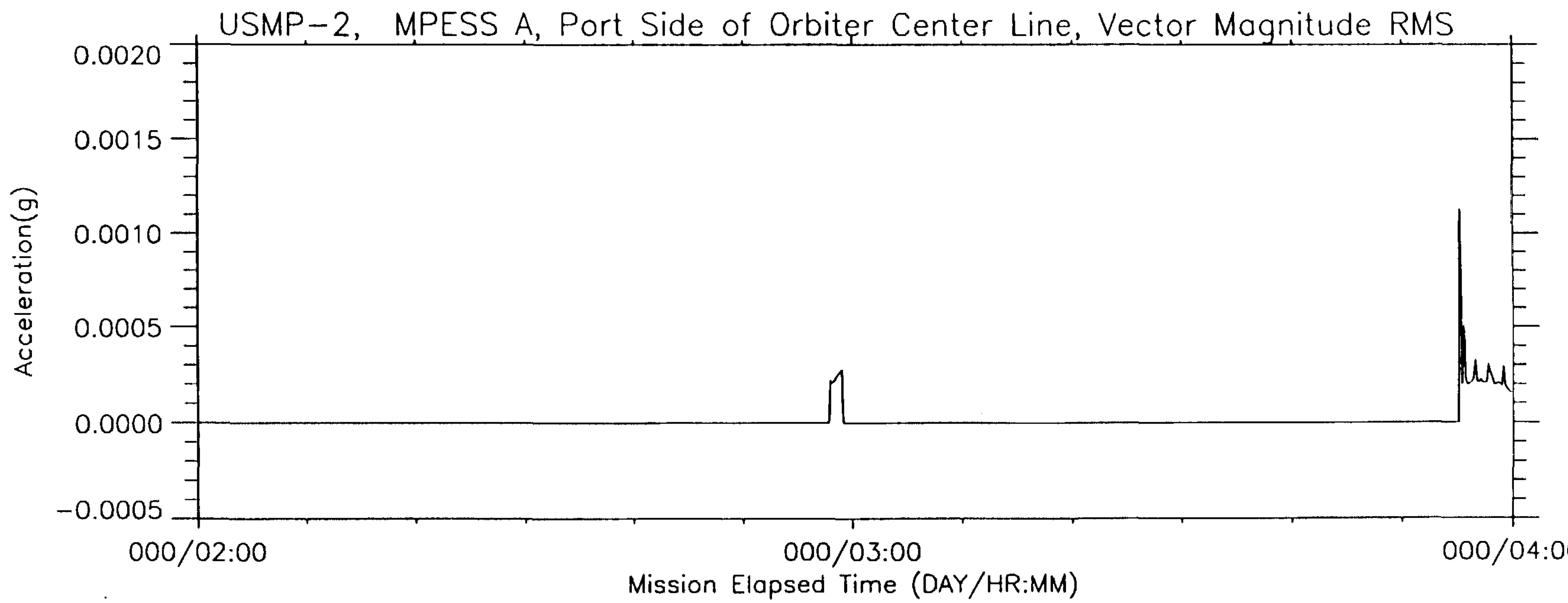
The rms plots were produced by taking the rms of 10 second intervals for the two hour period. The root mean square of a discrete time series for 10 seconds was calculated using the following equation:

$$rms = \sqrt{\left(\frac{1}{N}\sum_{j=1}^{N} V_j^2\right)}$$

References

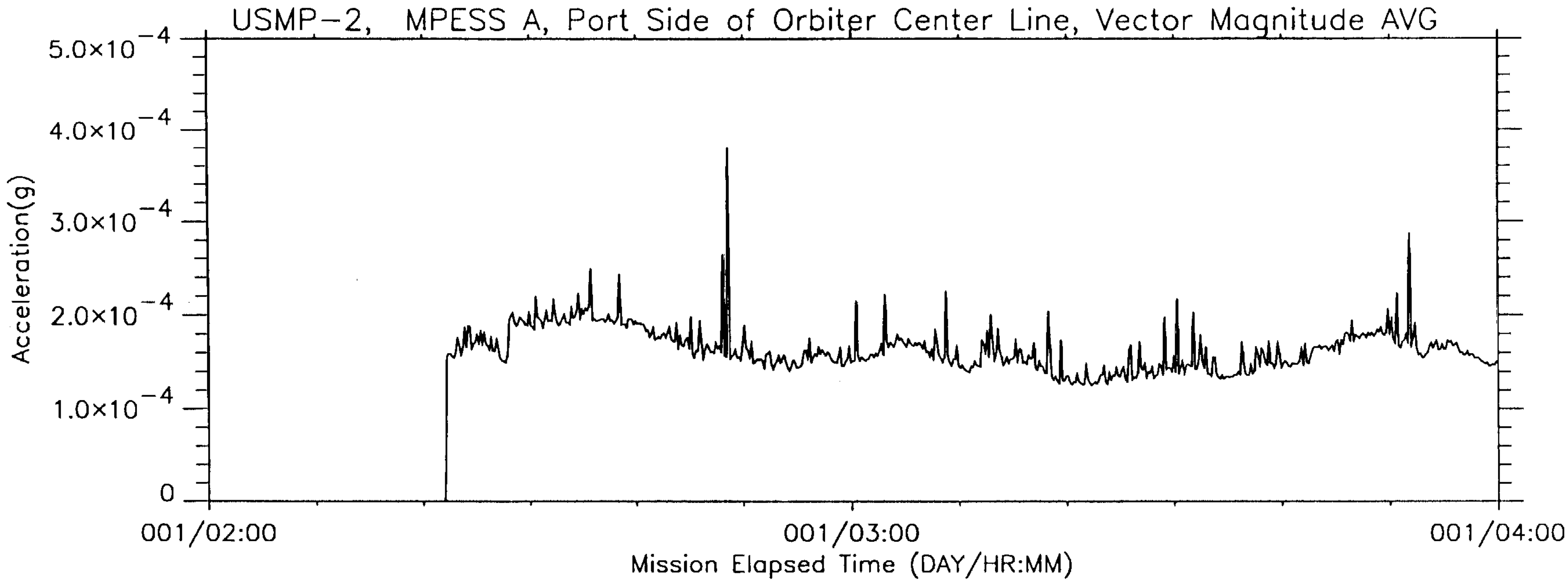
Thomas, J. E., R. B. Peters, and B. D. , Finley, Space Acceleration Measurement System triaxial head error budget NASA Technical Memorandum -105300, January 1992.


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
-0.0002
000/02:00
000/03:00
000/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
000/02:00
000/03:00
000/04:00
Mission Elapsed Time (DAY/HR:MM)

NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

FROM MET 000/04:00:00 - 001/02:22:00


USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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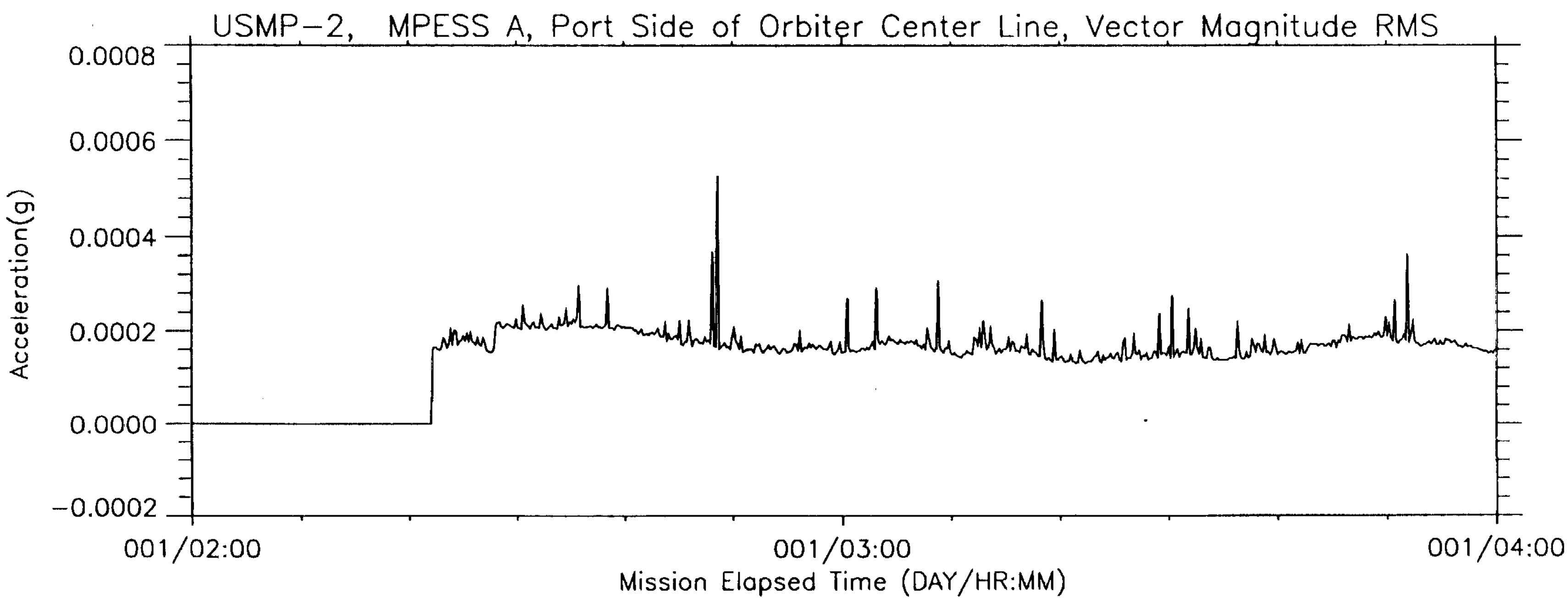
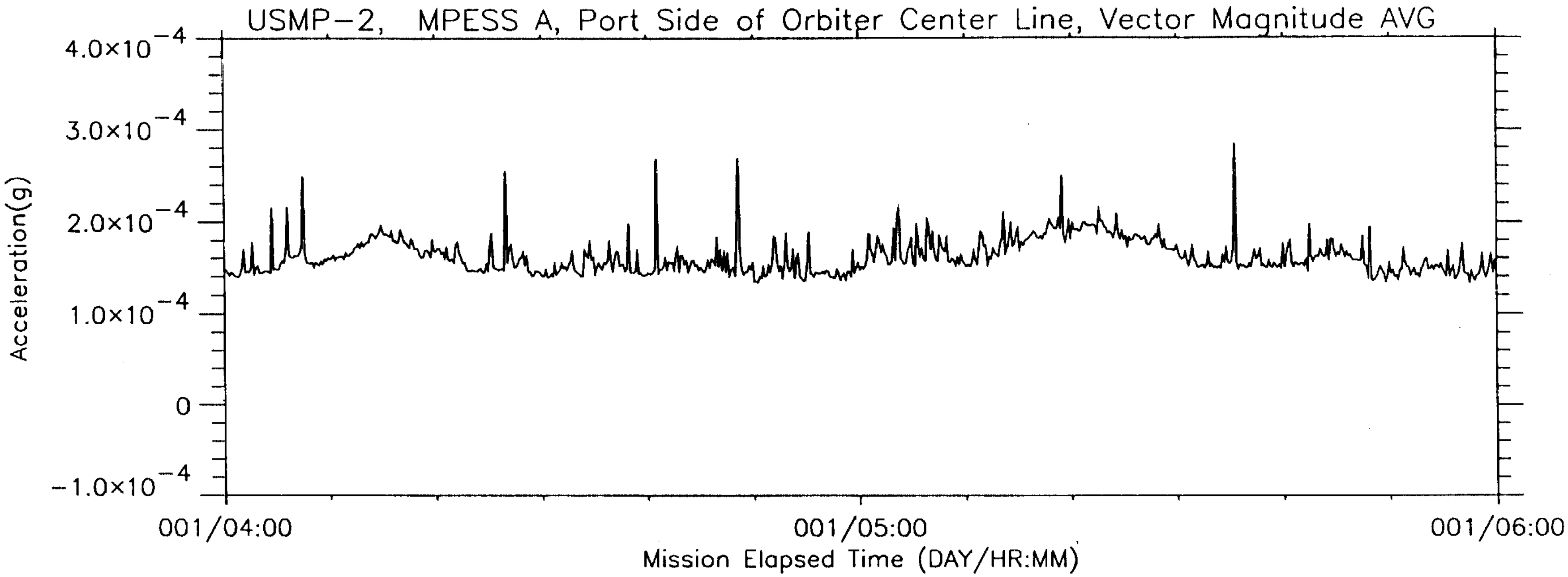
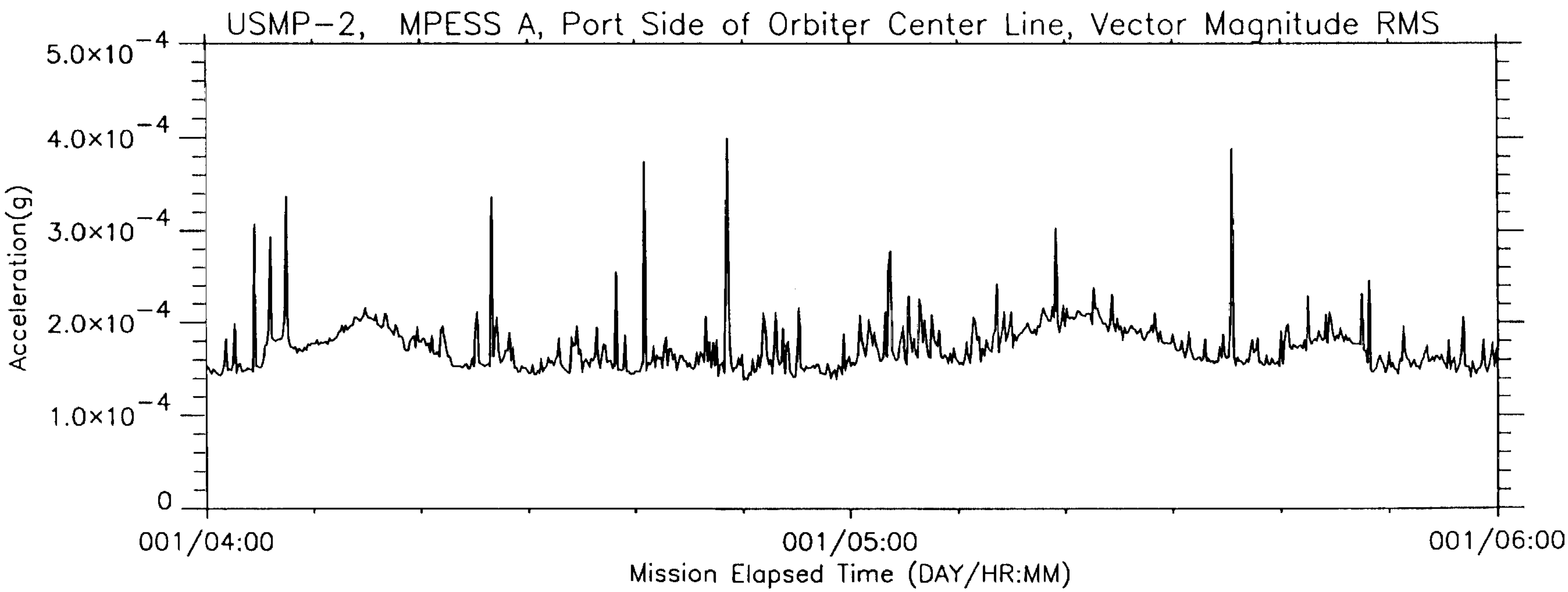
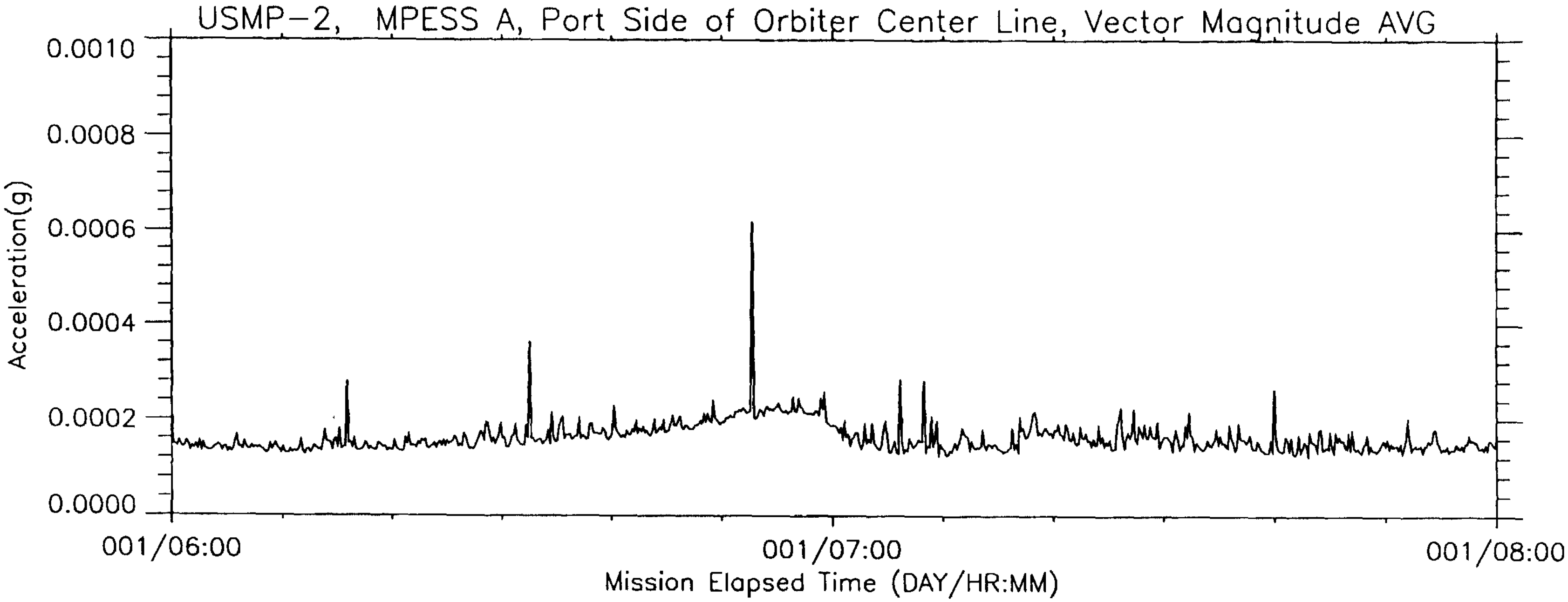
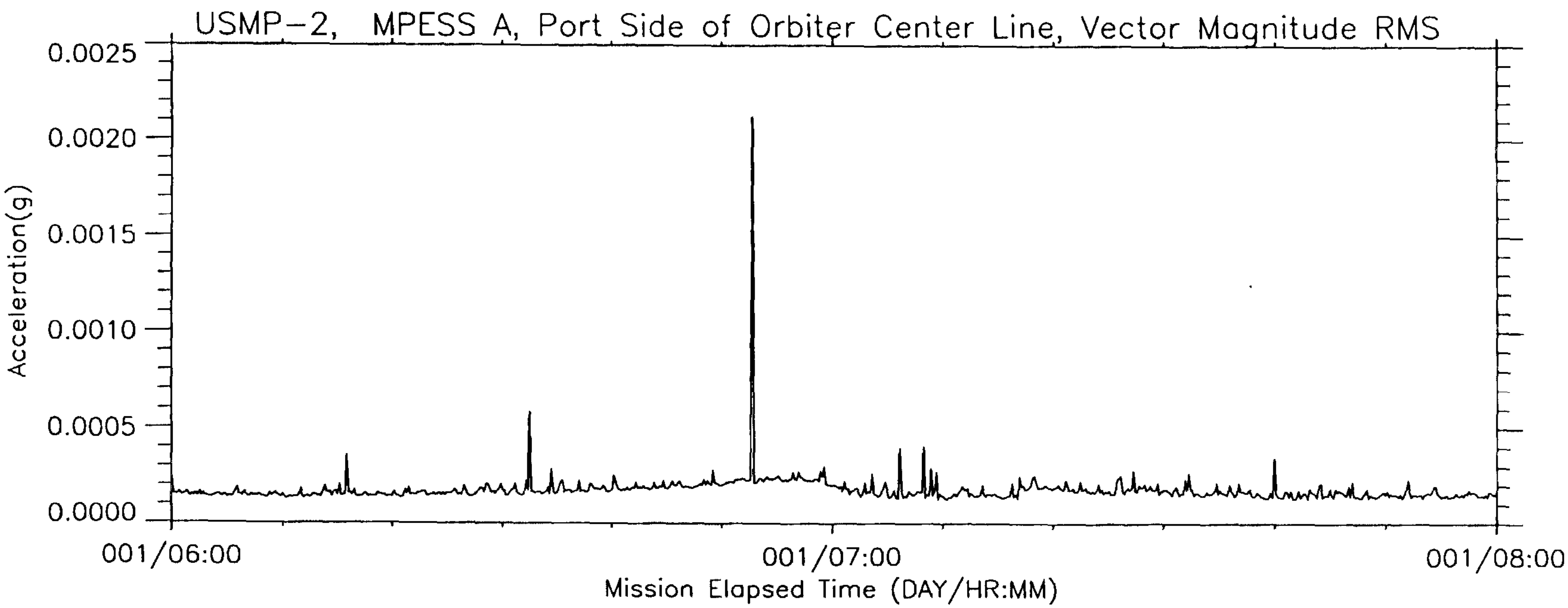
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
001/02:00
001/03:00
001/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
−0.0002
001/02:00
001/03:00
001/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
−1.0×10^{-4}
001/04:00
001/05:00
001/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
001/04:00
001/05:00
001/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
001/06:00
001/07:00
001/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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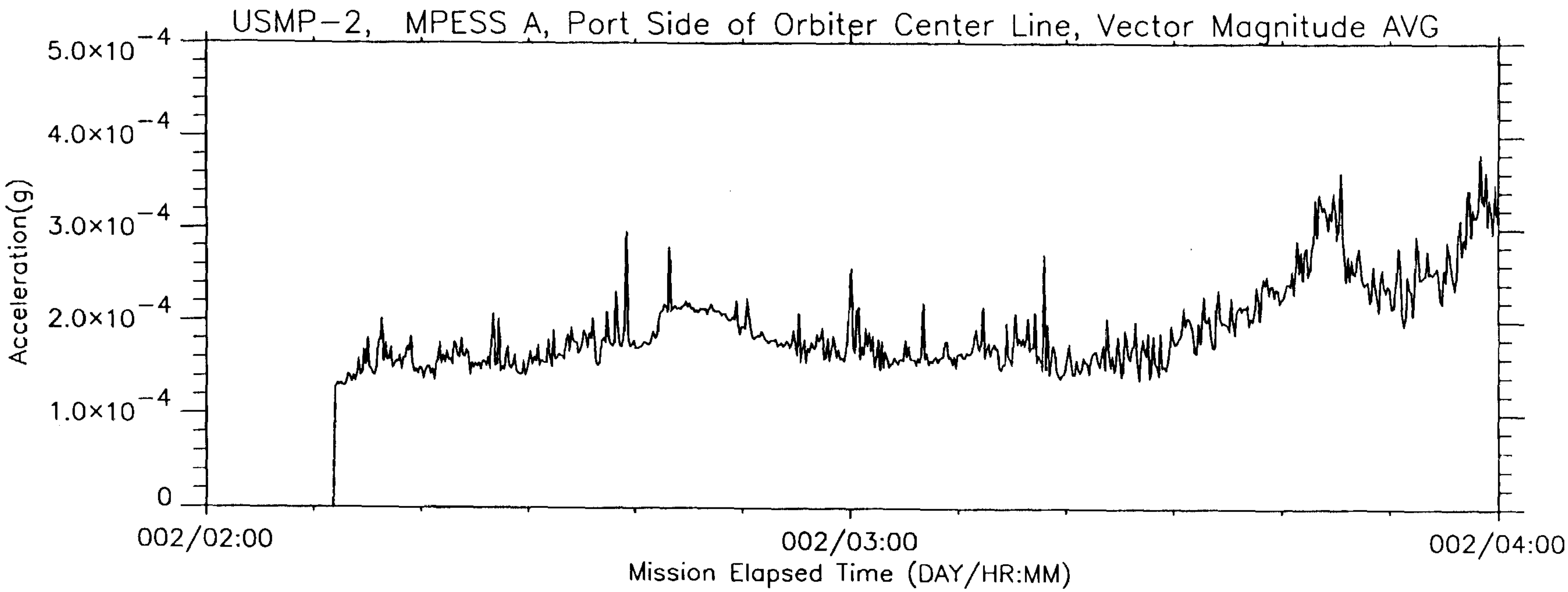
0.0020
0.0015
0.0010
0.0005
0.0000
001/06:00
001/07:00
001/08:00
Mission Elapsed Time (DAY/HR:MM)

NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

FROM MET 001/08:00:00 - 002/02:12:00


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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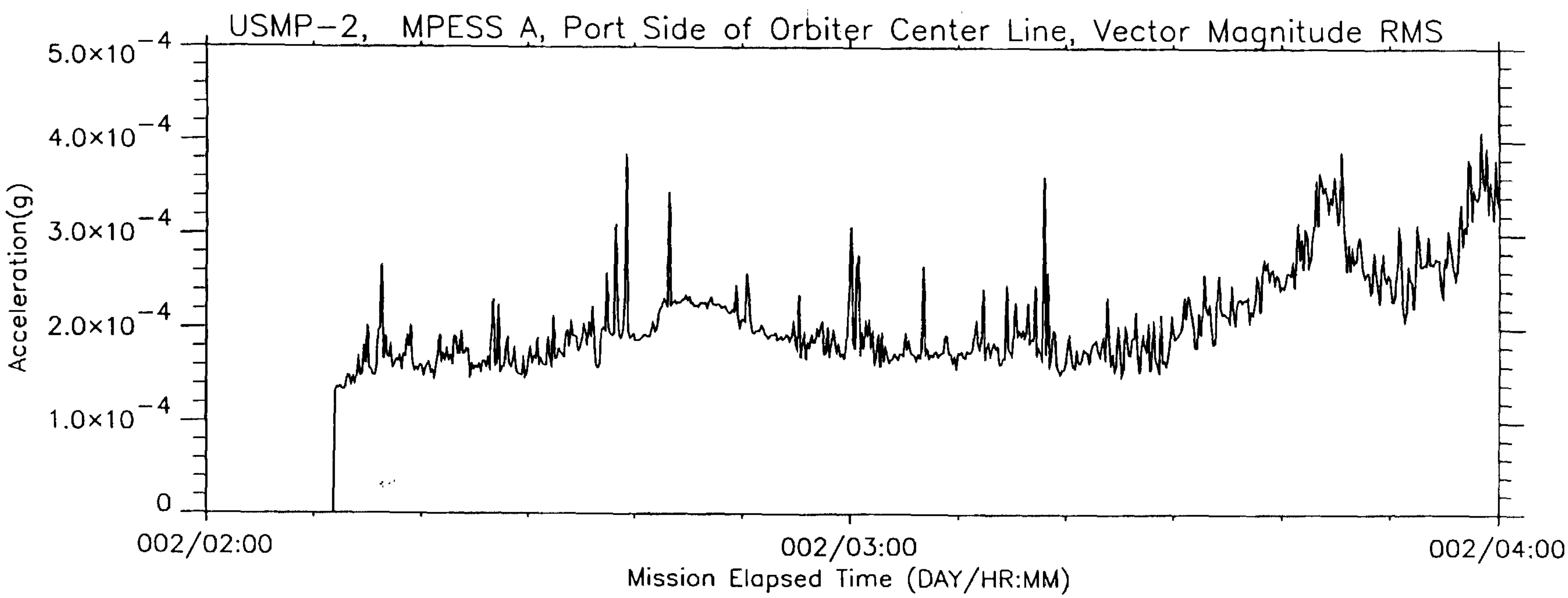
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/02:00
002/03:00
002/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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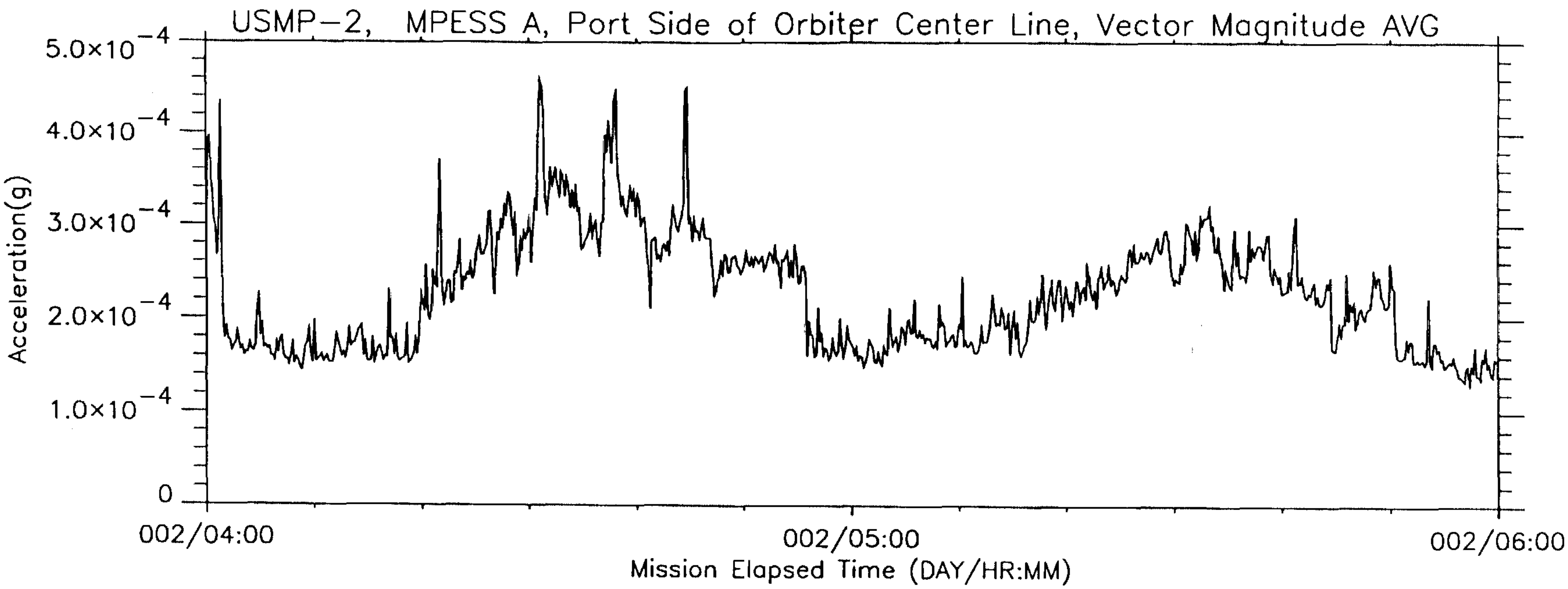
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/02:00
002/03:00
002/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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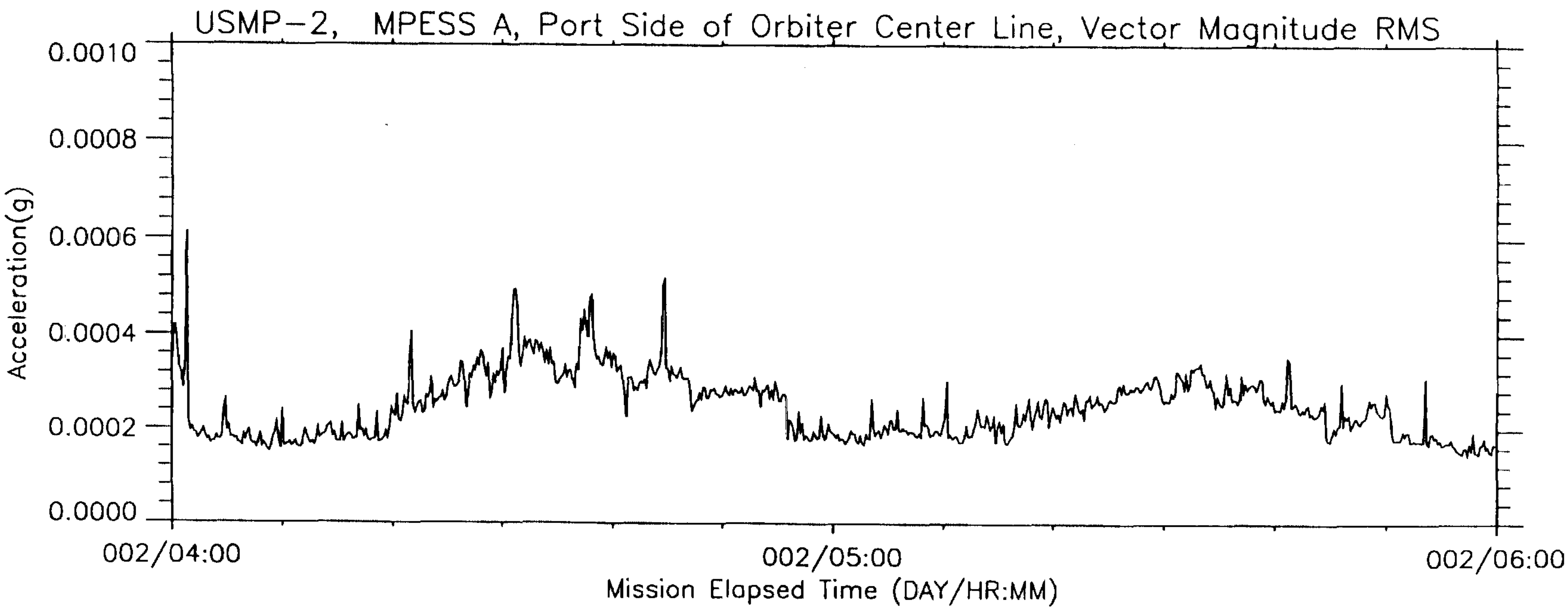
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
002/04:00
002/05:00
002/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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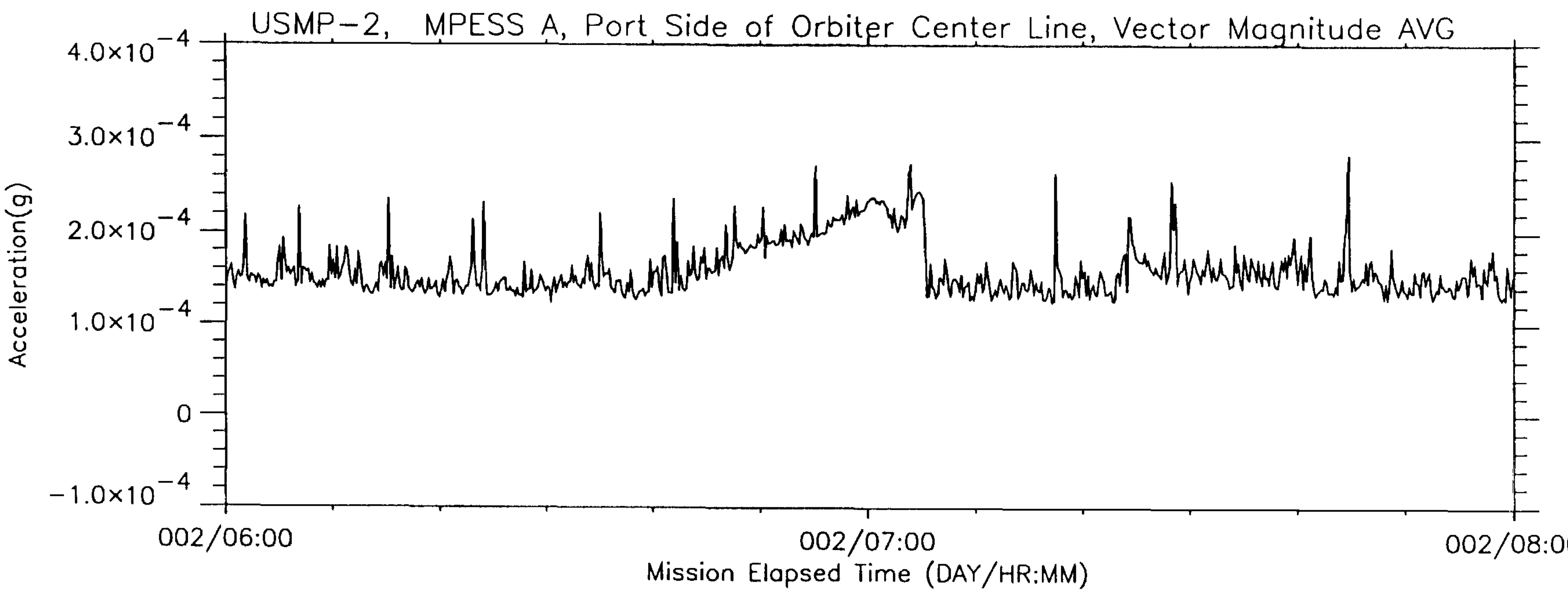
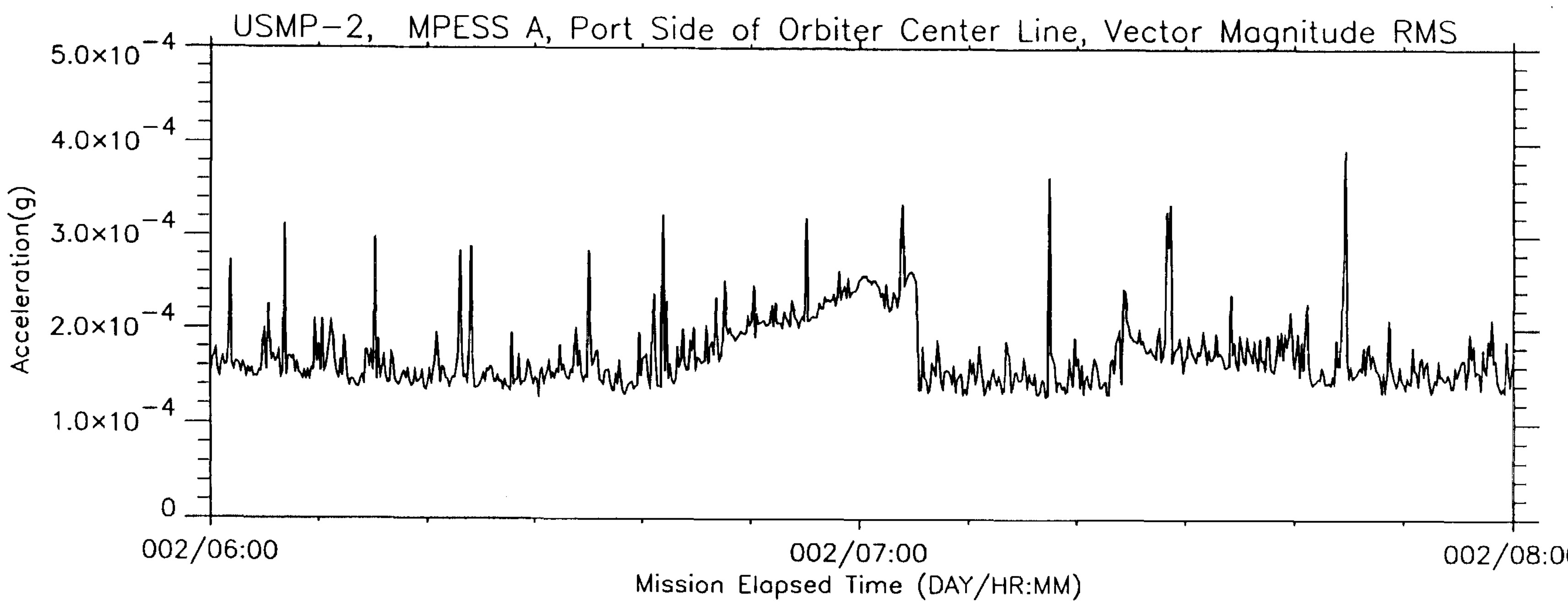
0.0008
0.0006
0.0004
0.0002
0.0000
002/04:00
002/05:00
002/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
-1.0×10^-4
002/06:00
002/07:00
002/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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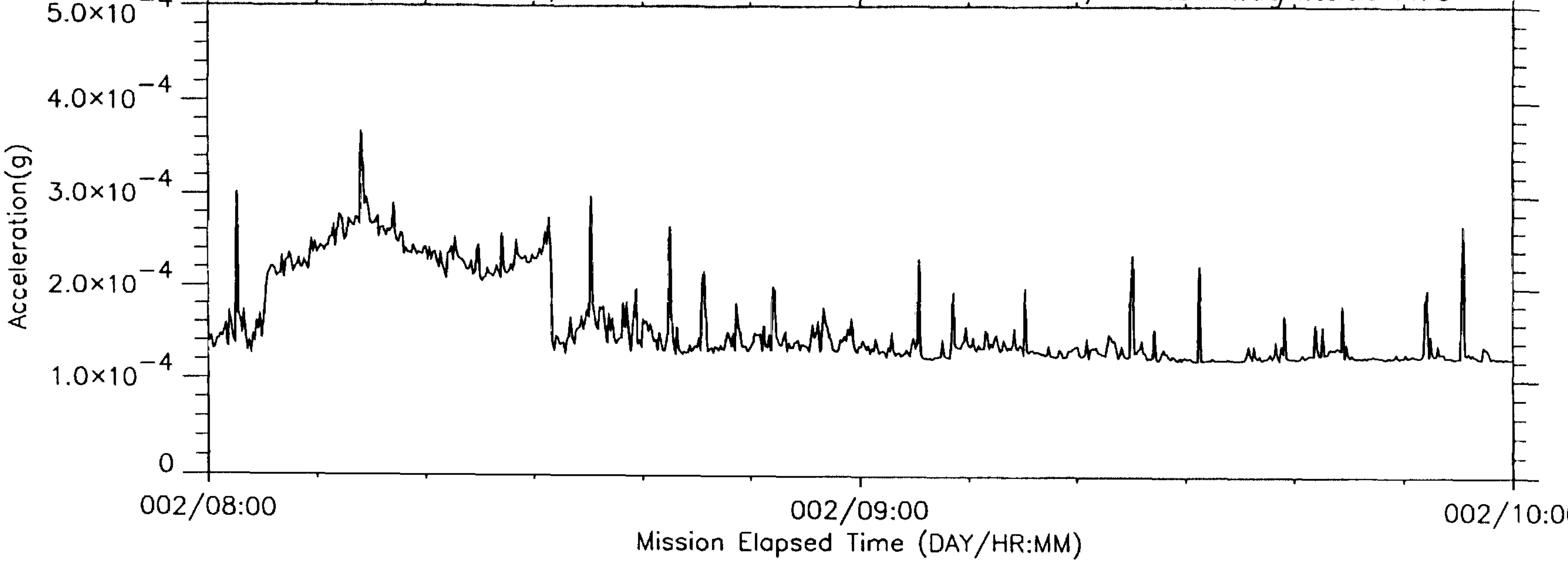
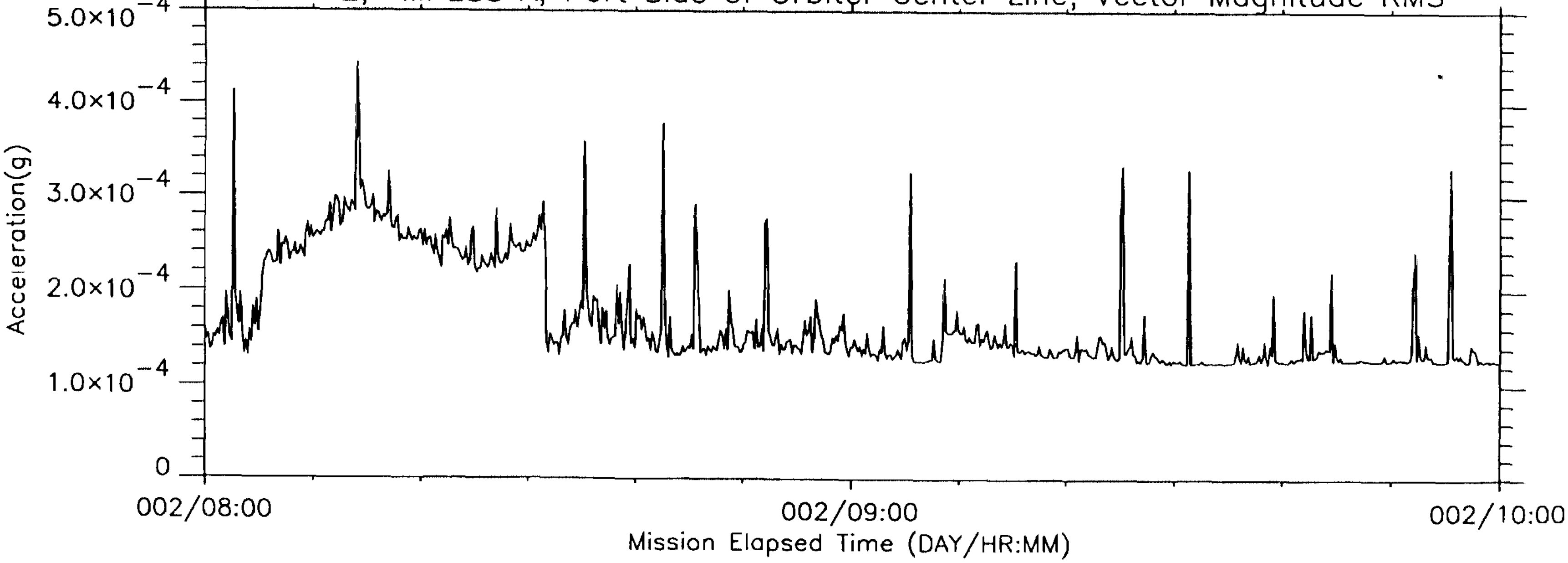
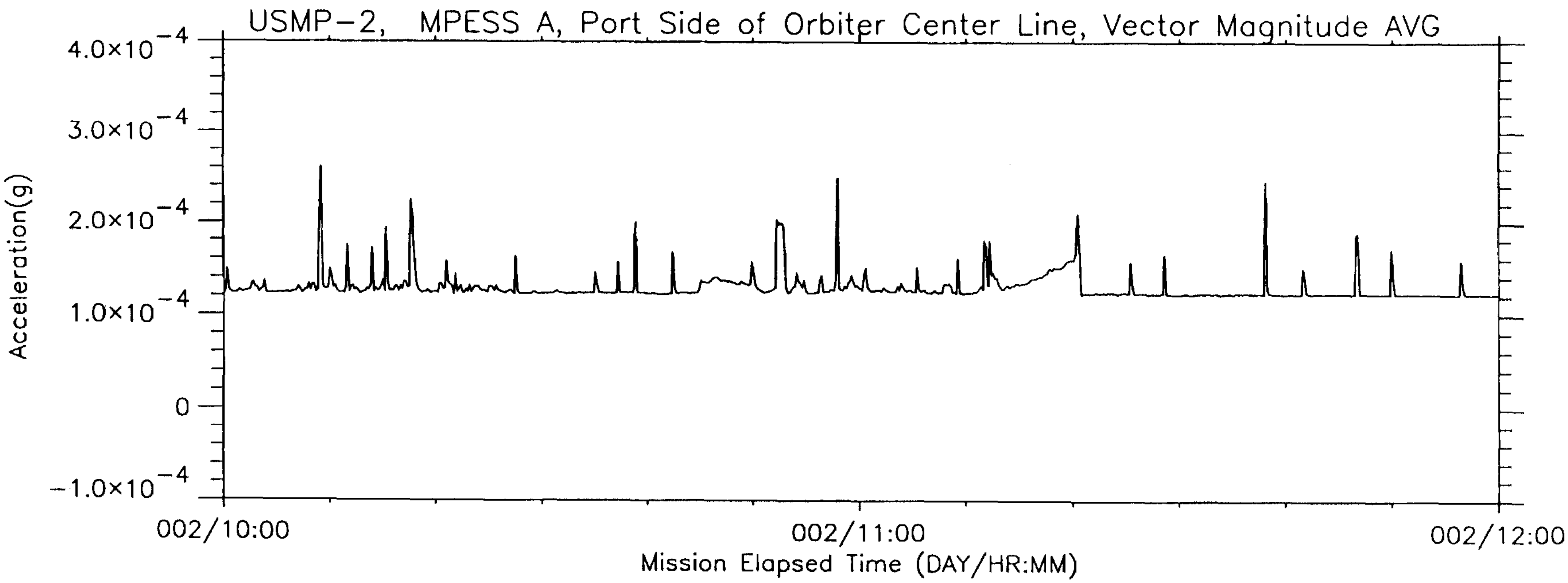
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
002/06:00
002/07:00
002/08:00
Mission Elapsed Time (DAY/HR:MM)

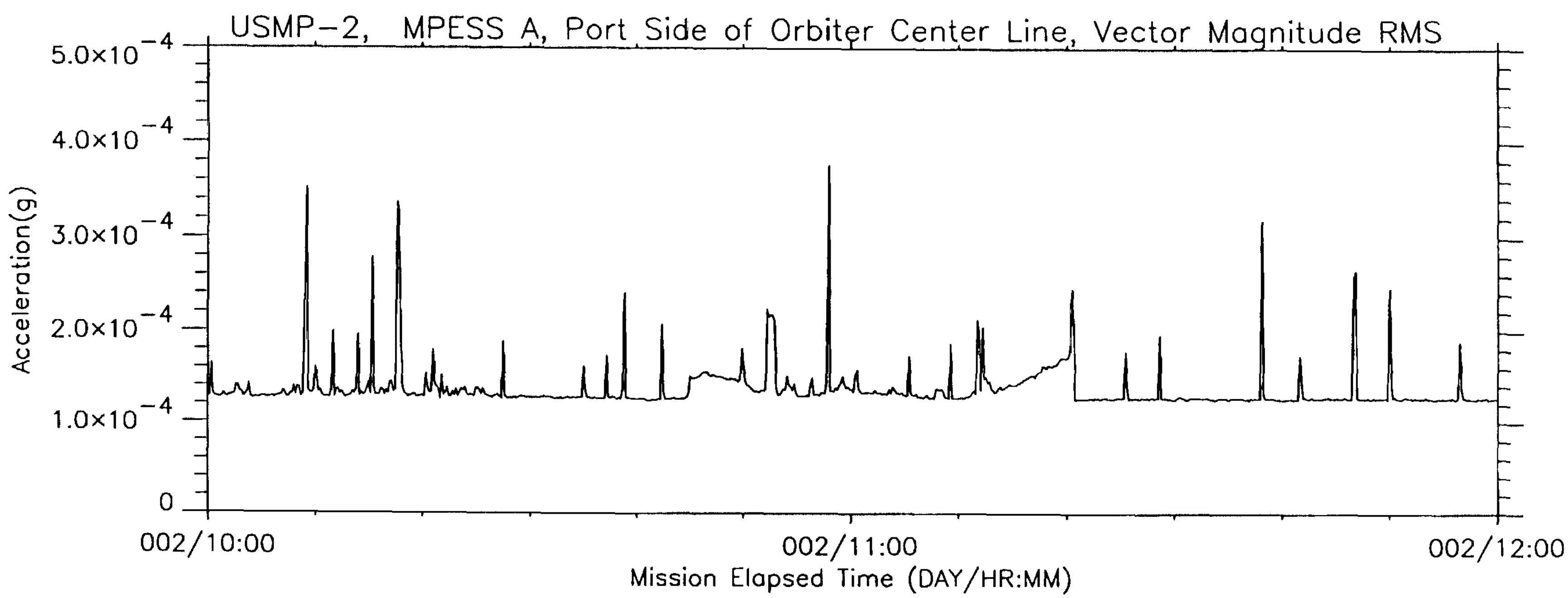
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS




USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
−1.0×10^{-4}
002/10:00
002/11:00
002/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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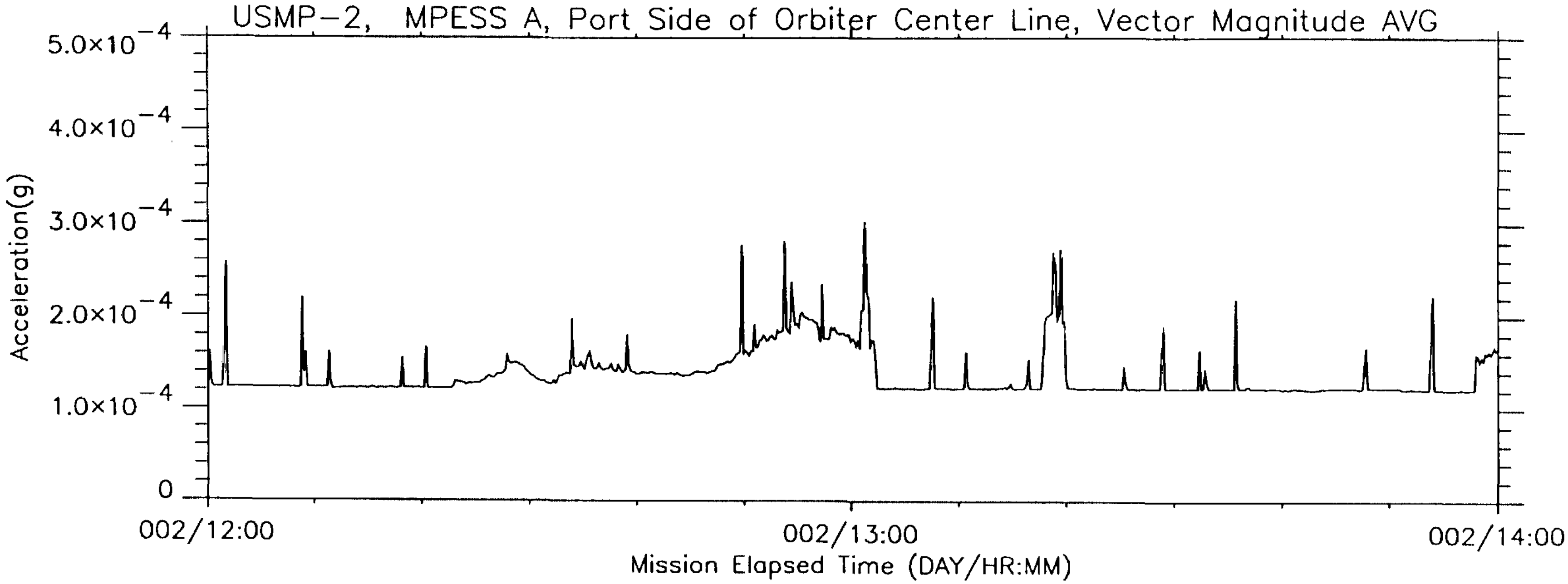
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/10:00
002/11:00
002/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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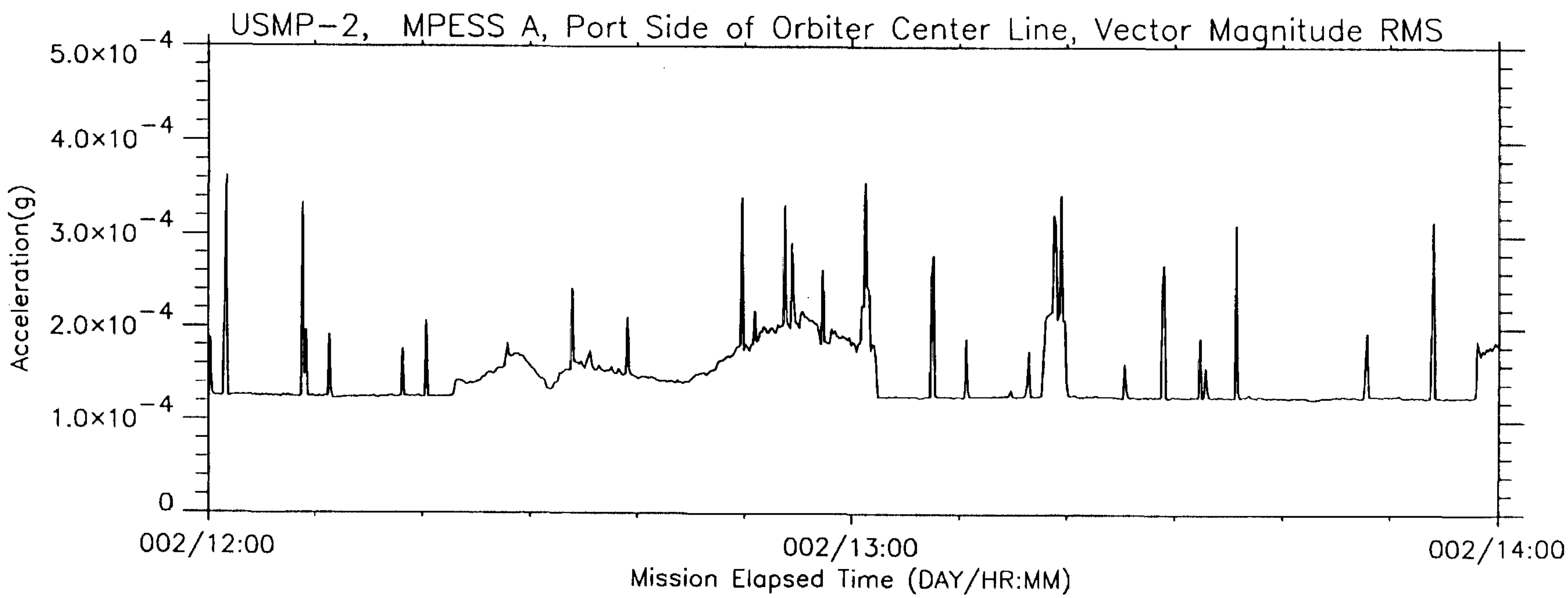
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/12:00
002/13:00
002/14:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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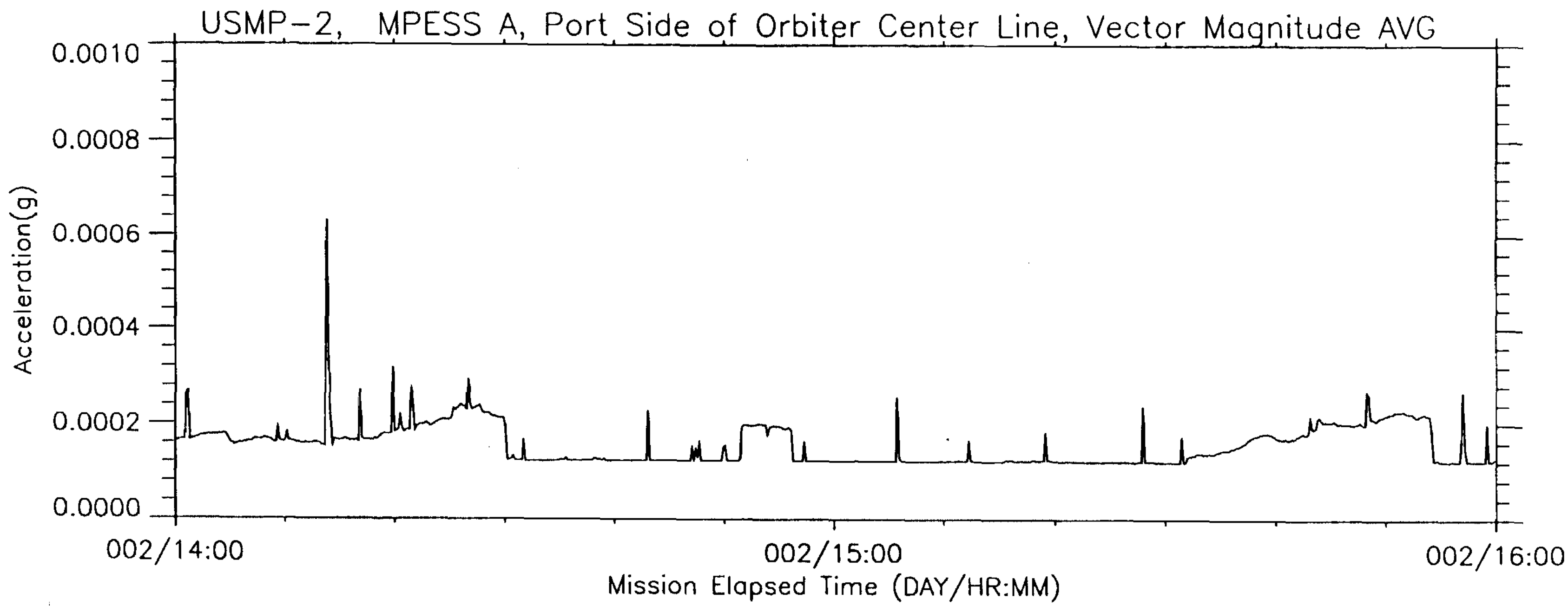
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/12:00
002/13:00
002/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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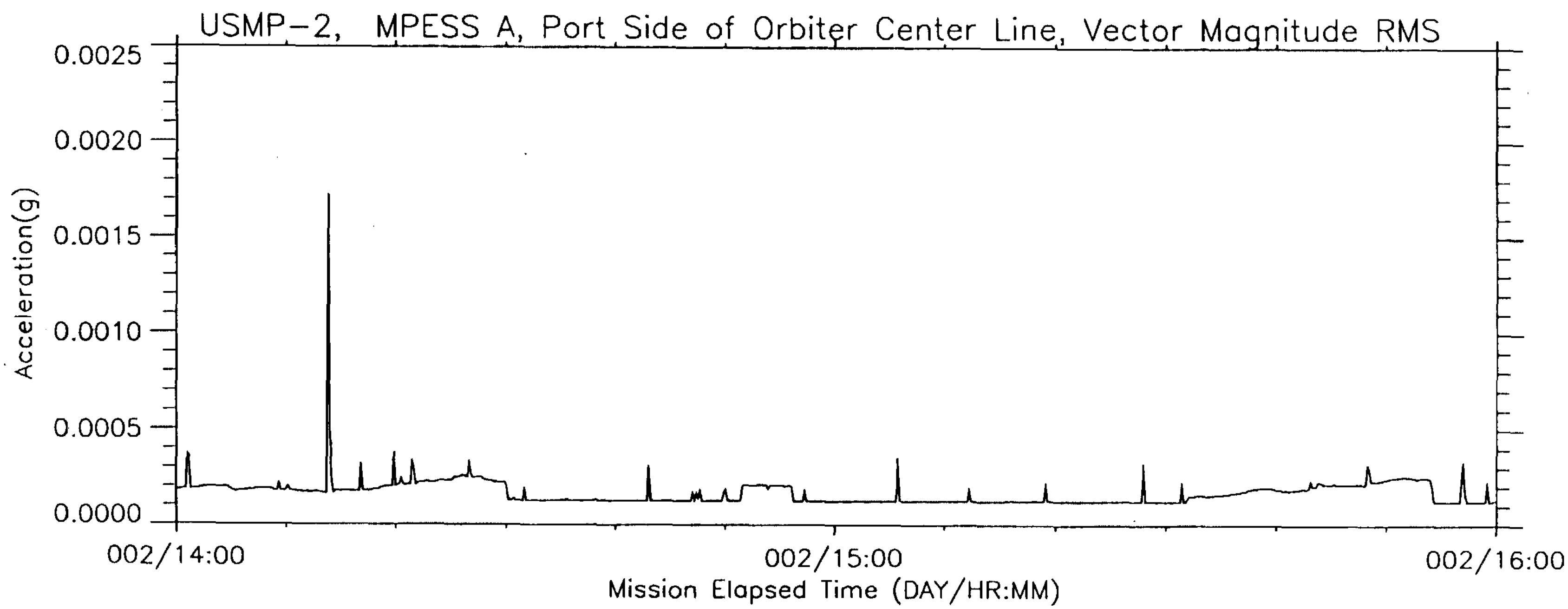
0.0006
0.0004
0.0002
0.0000
002/14:00
002/15:00
002/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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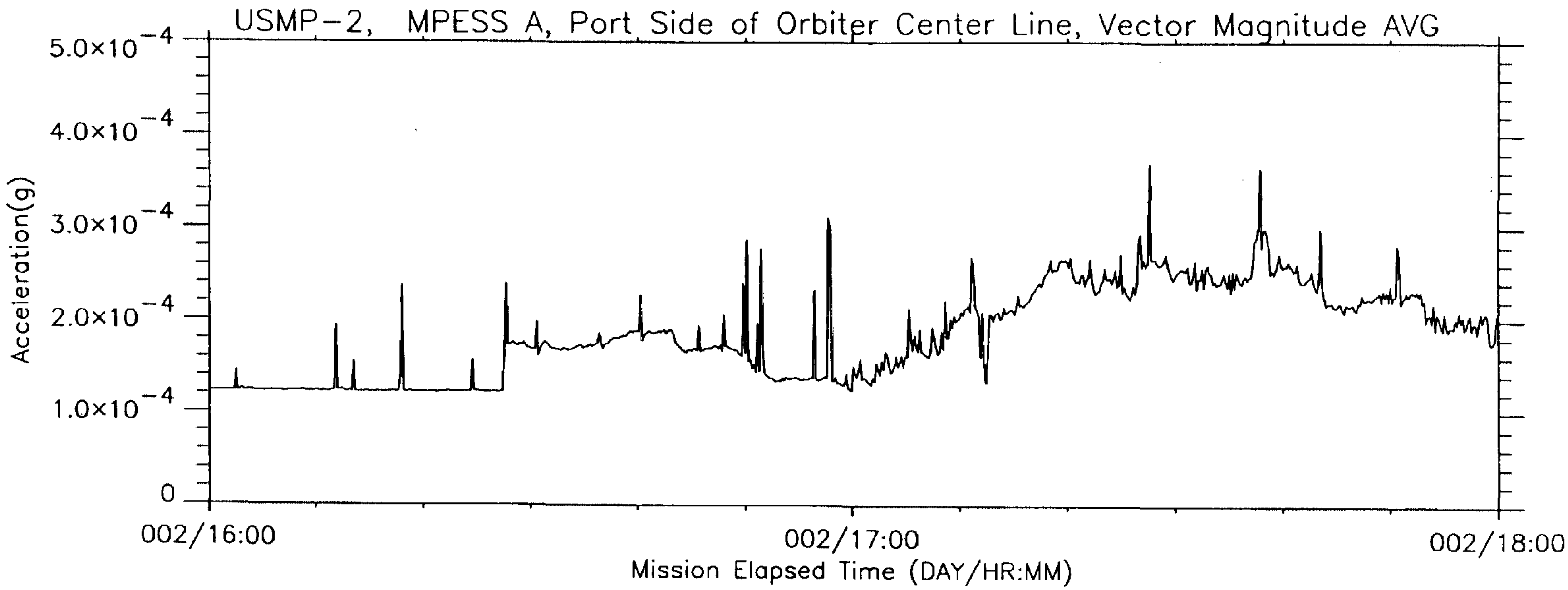
0.0020
0.0015
0.0010
0.0005
0.0000
002/14:00
002/15:00
002/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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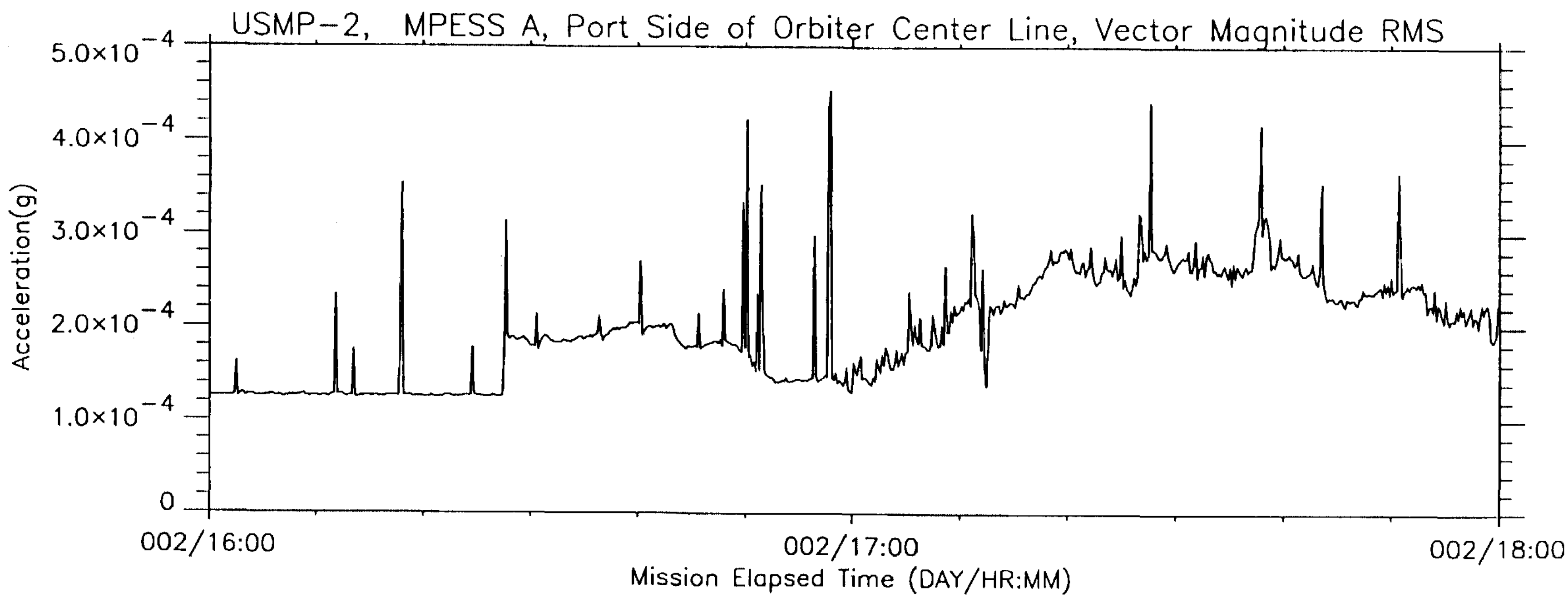
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
002/16:00
002/17:00
002/18:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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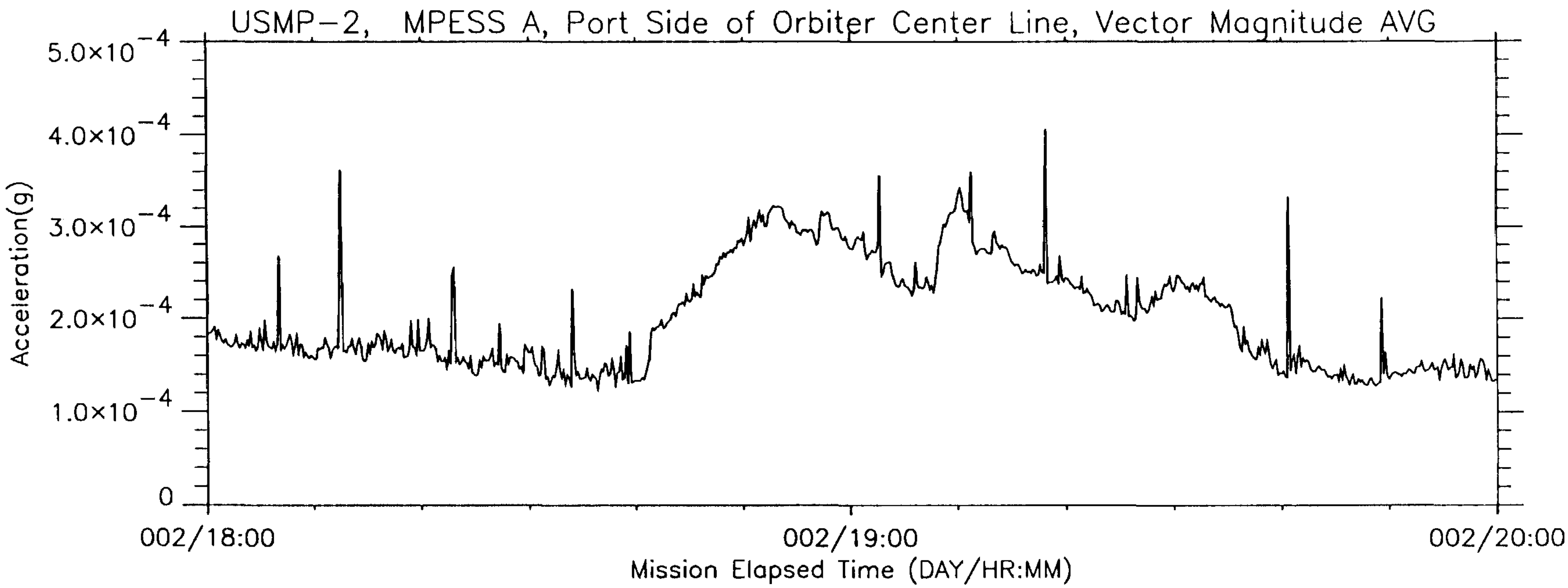
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
002/16:00
002/17:00
002/18:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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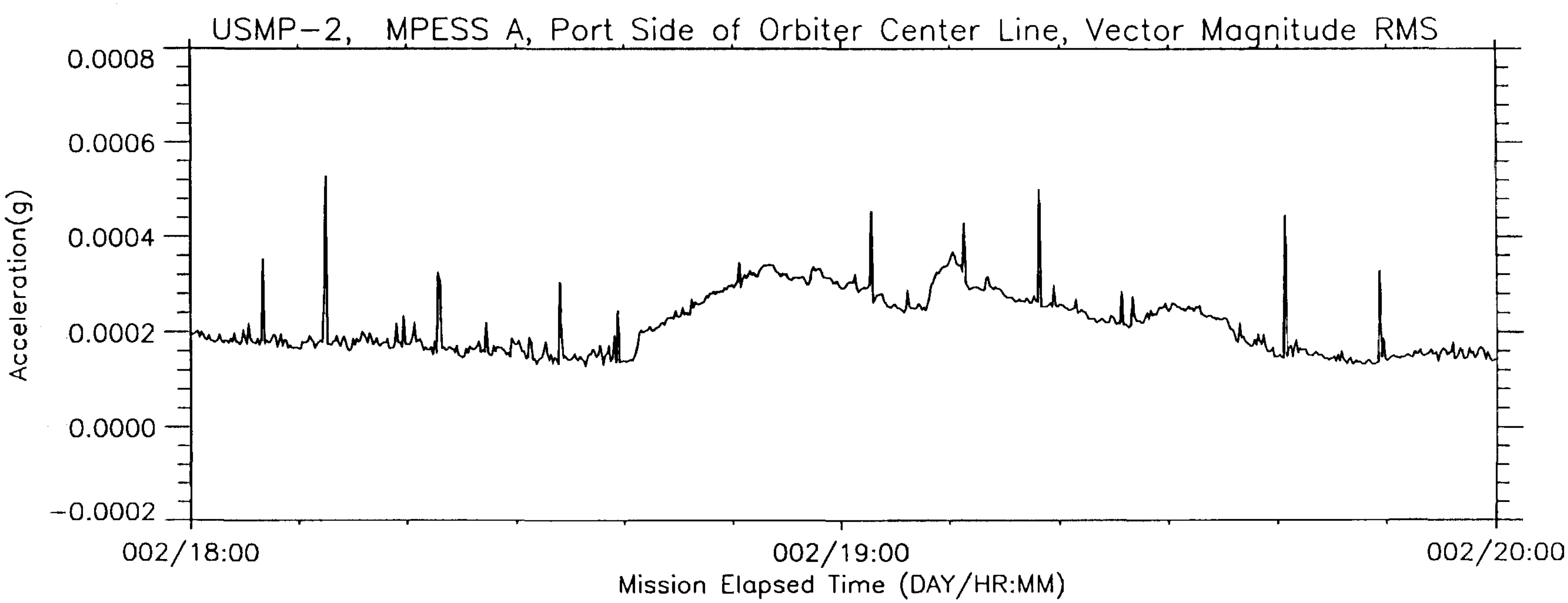
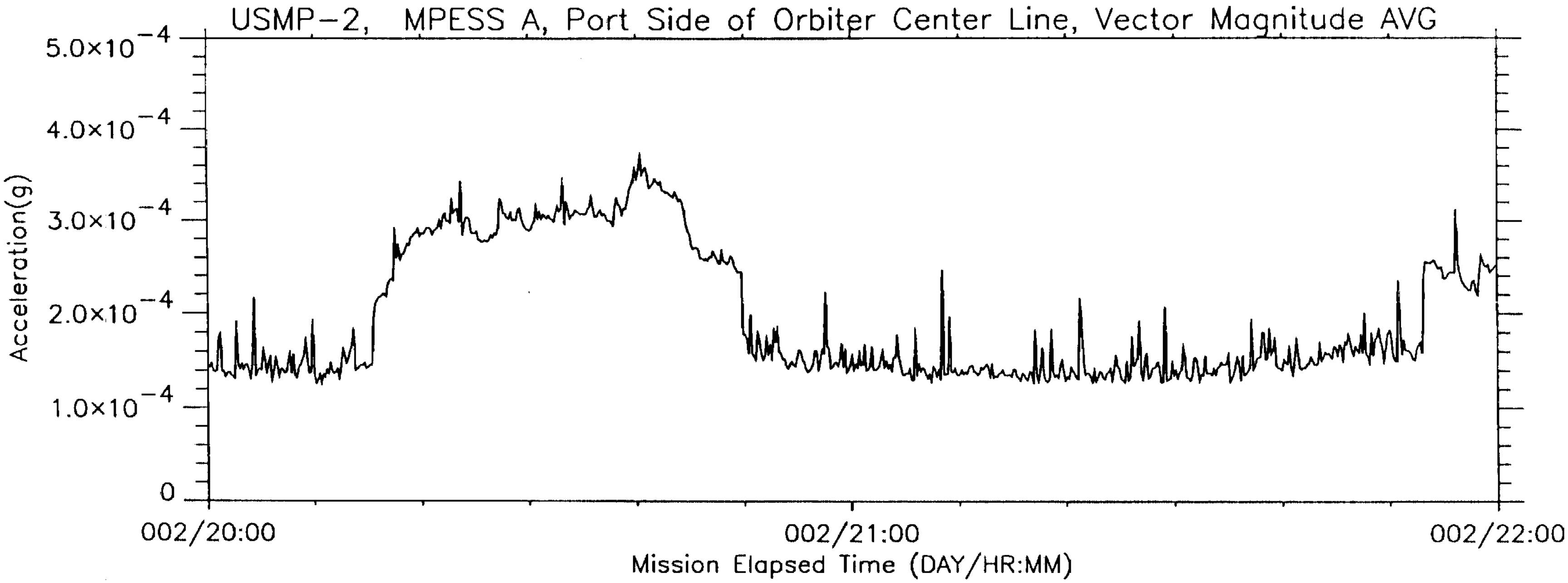
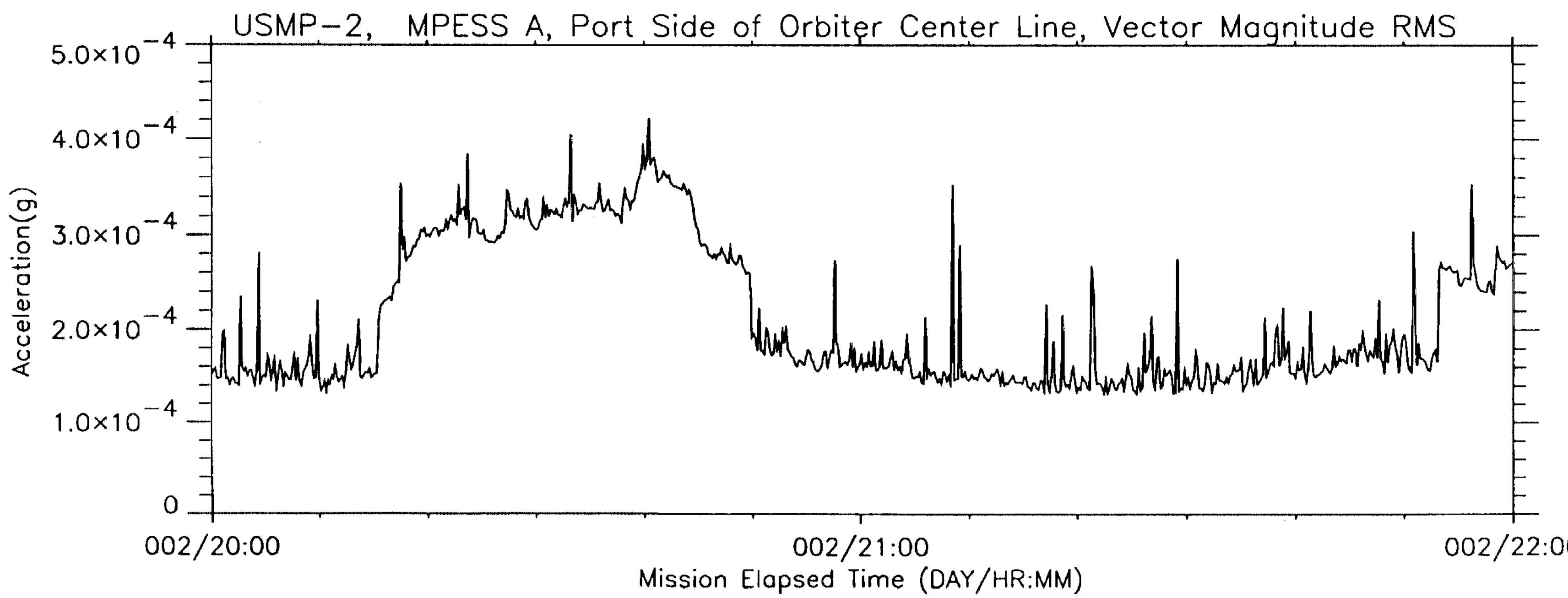
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
002/18:00
002/19:00
002/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
−0.0002
002/18:00
002/19:00
002/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/20:00
002/21:00
002/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
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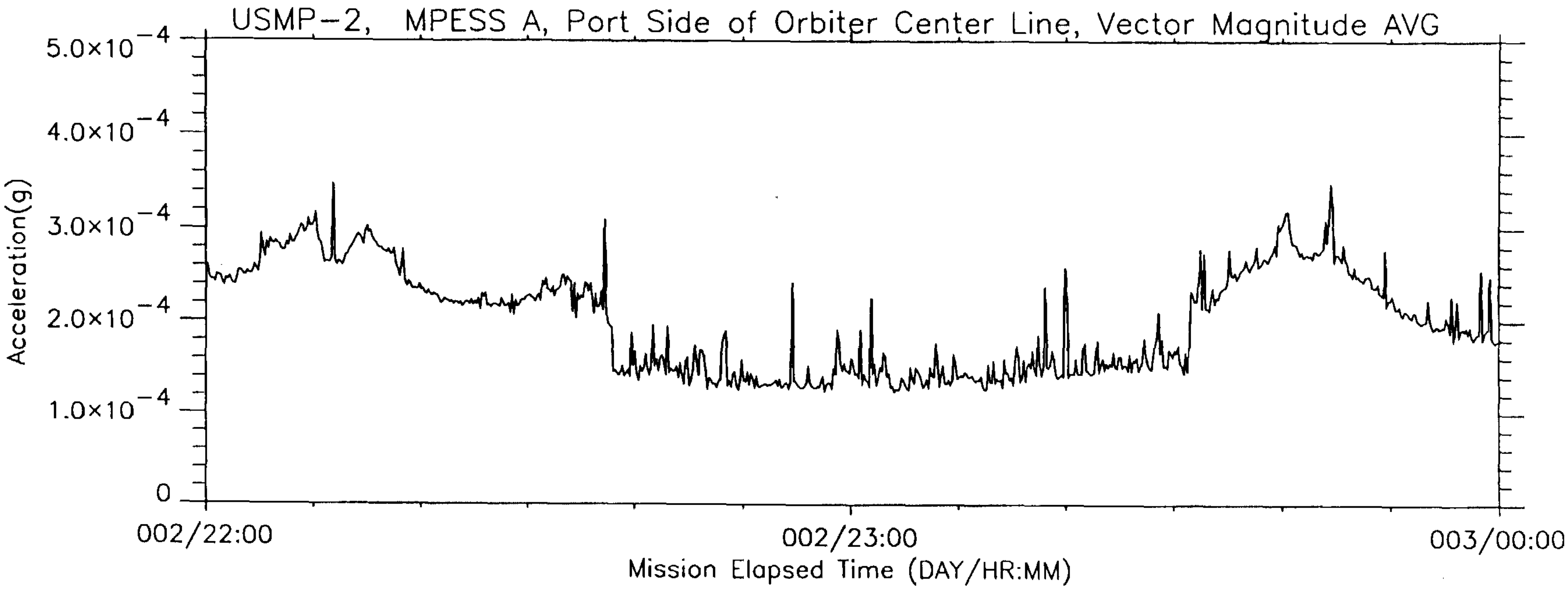
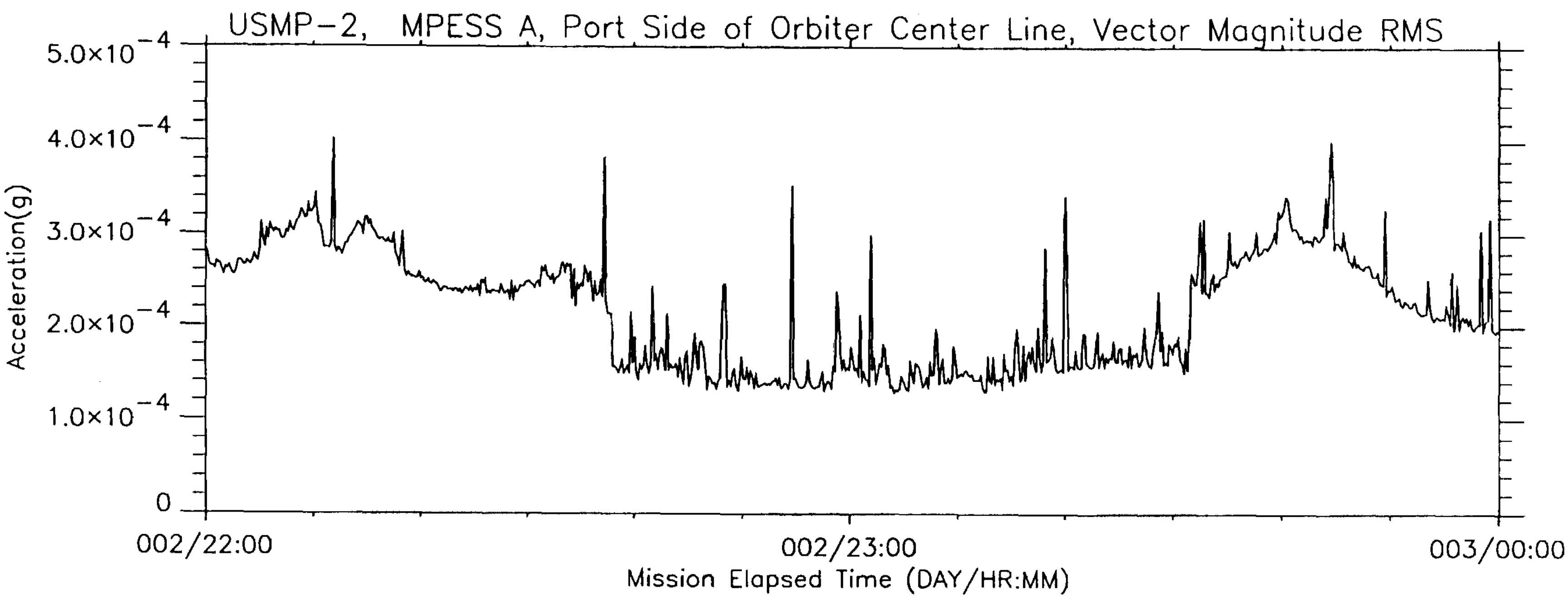
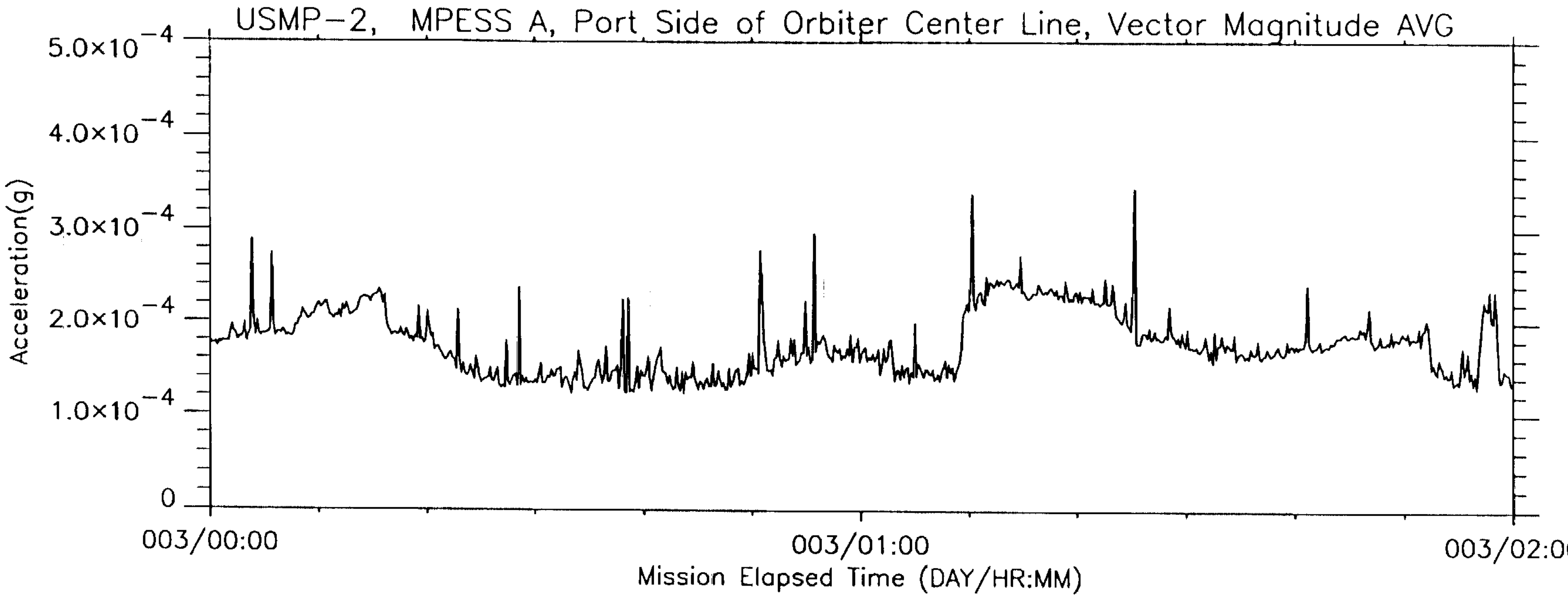
002/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/22:00
002/23:00
003/00:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
002/22:00
002/23:00
003/00:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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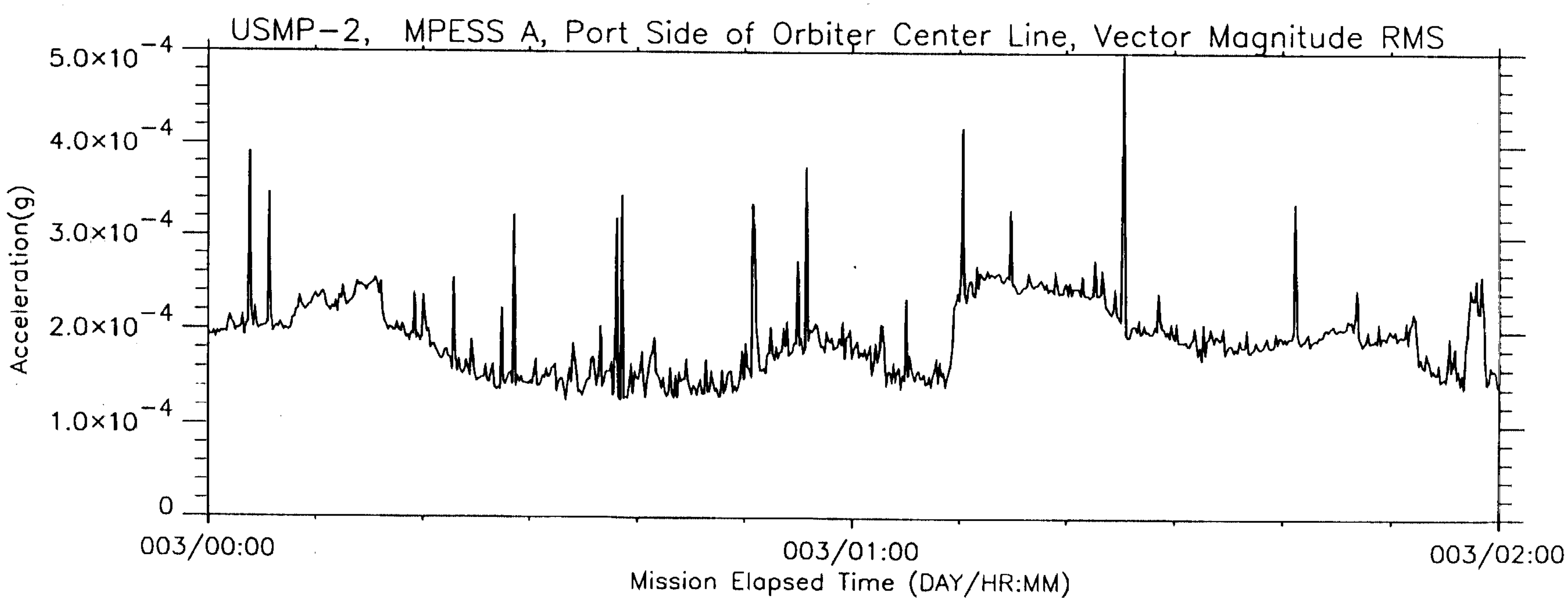
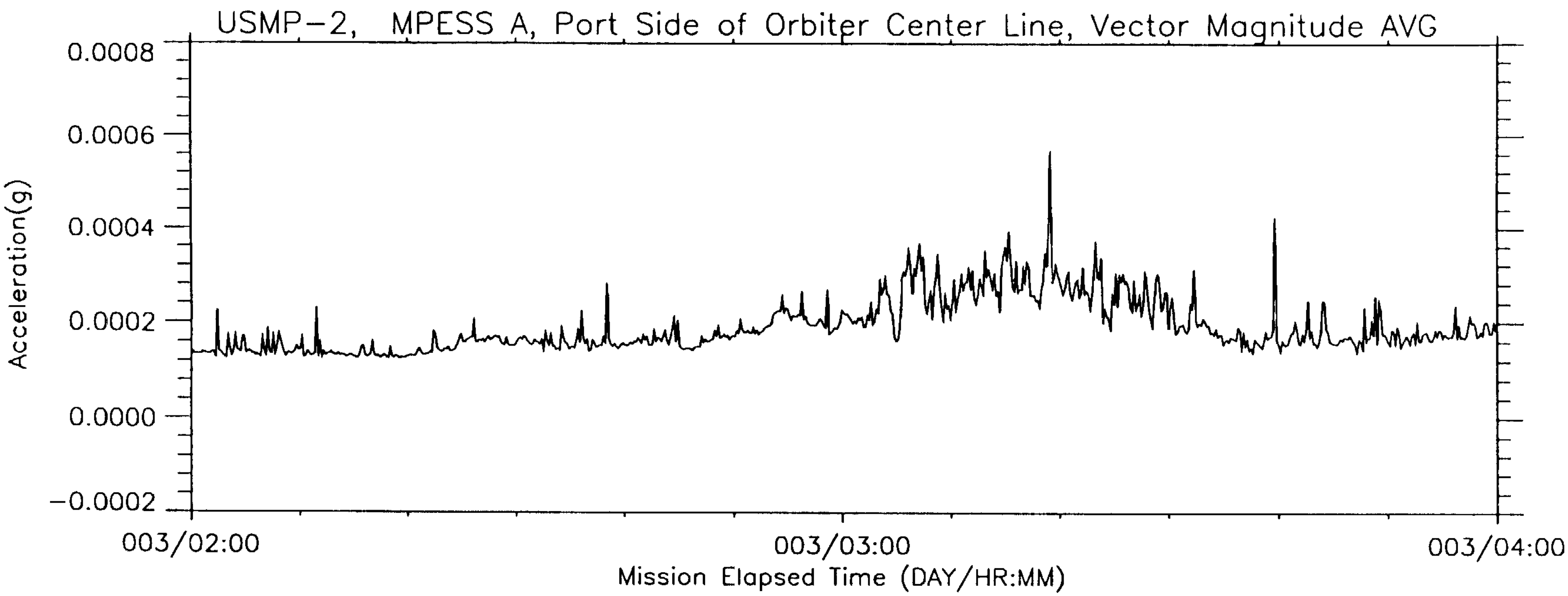
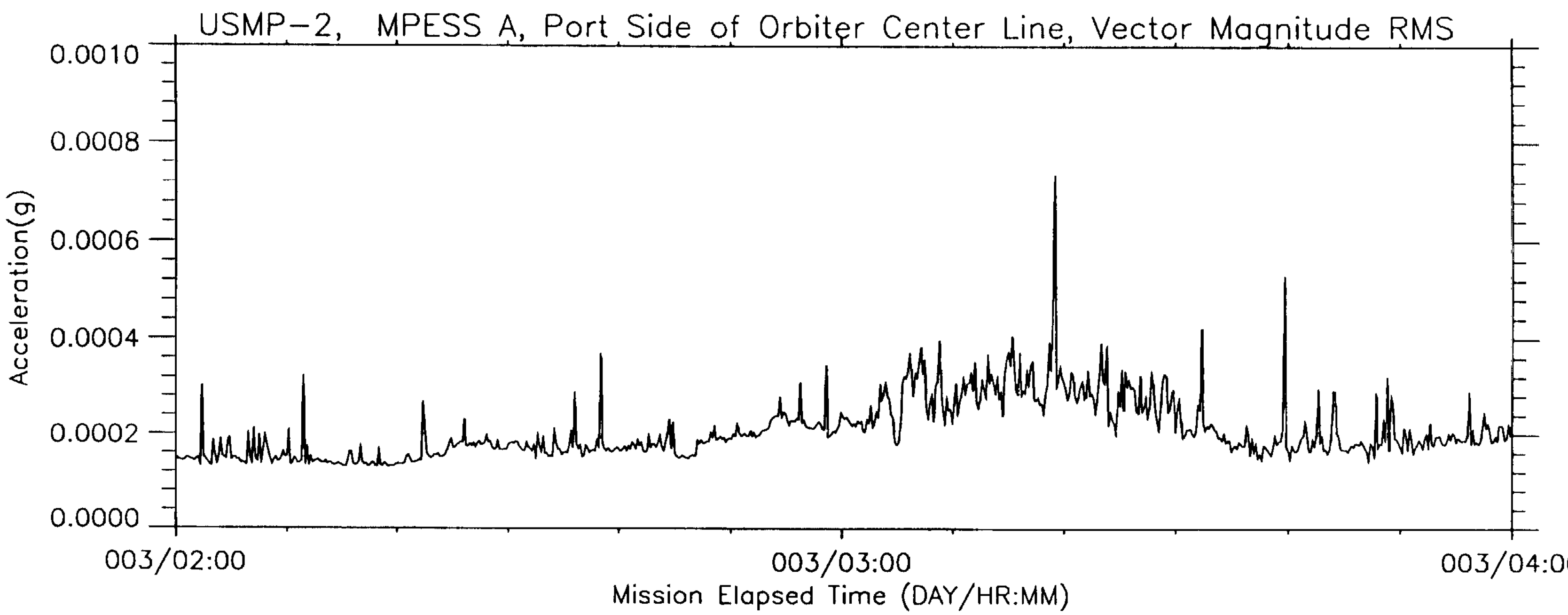
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
003/00:00
003/01:00
003/02:00
Mission Elapsed Time (DAY/HR:MM)

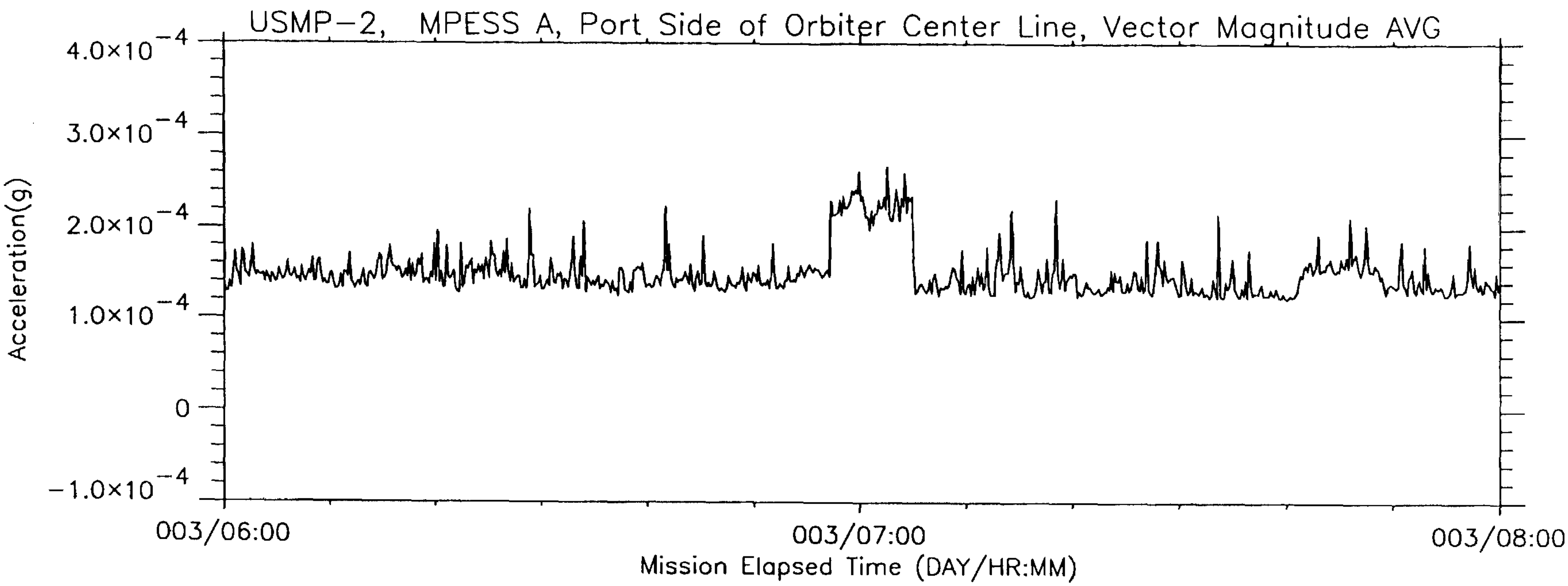

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
003/00:00
003/01:00
003/02:00
Mission Elapsed Time (DAY/HR:MM)

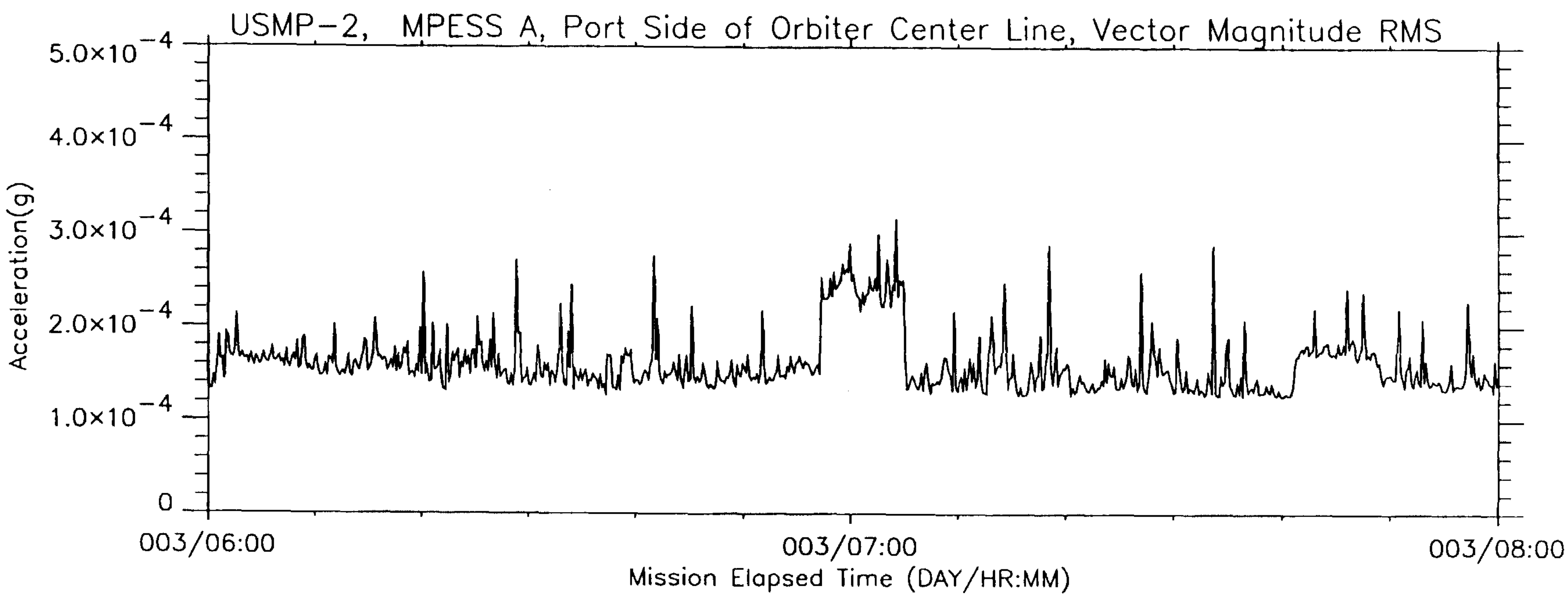

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
-0.0002
003/02:00
003/03:00
003/04:00
Mission Elapsed Time (DAY/HR:MM)

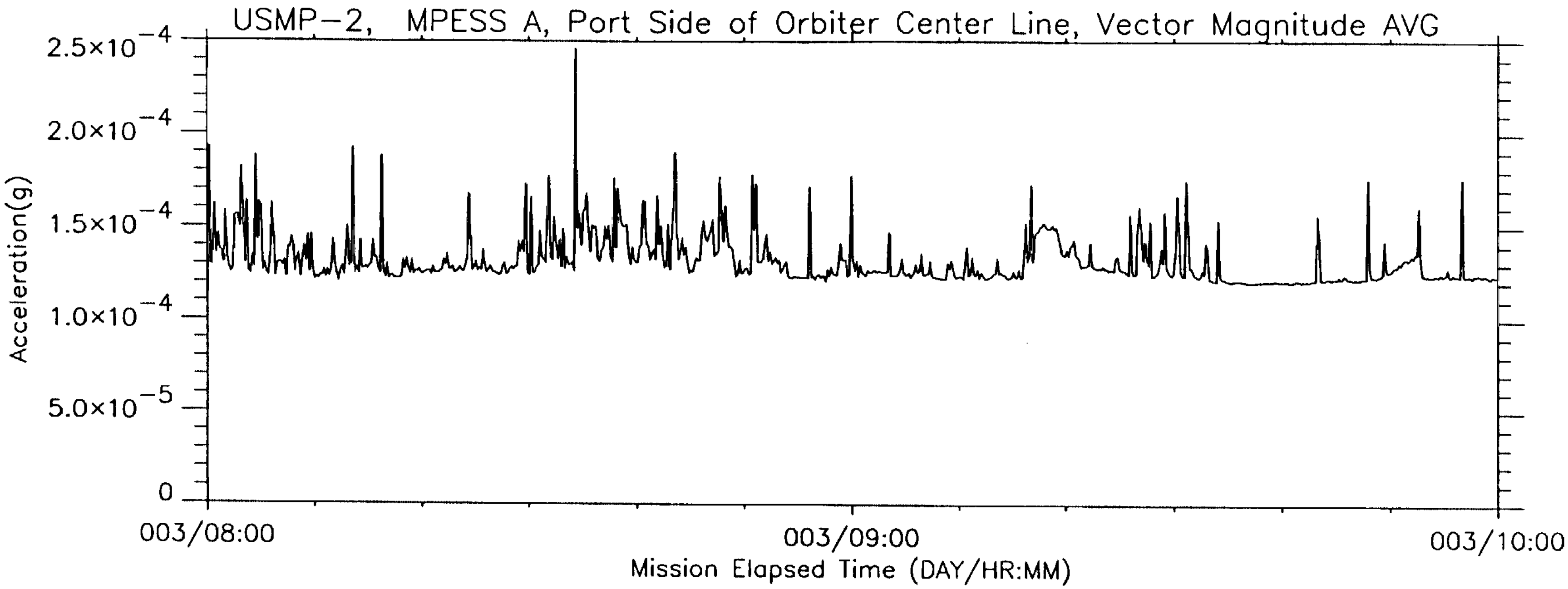

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
003/02:00
003/03:00
003/04:00
Mission Elapsed Time (DAY/HR:MM)

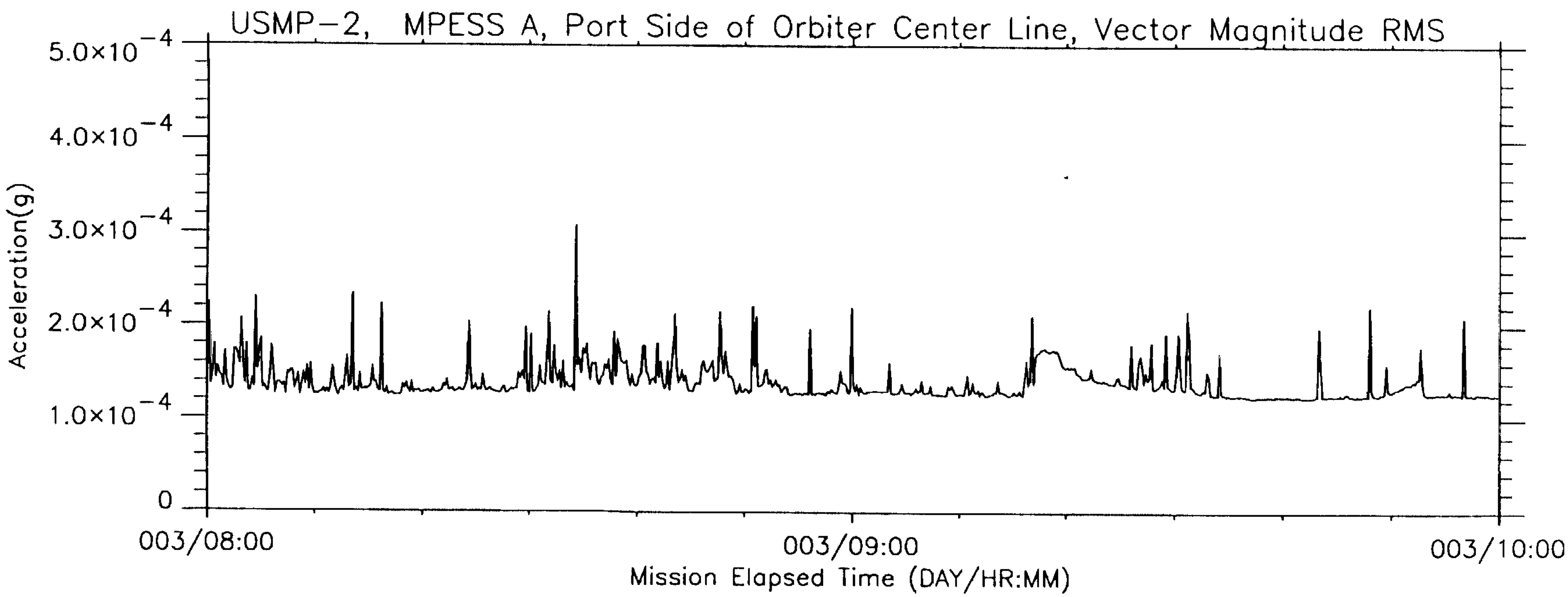
NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

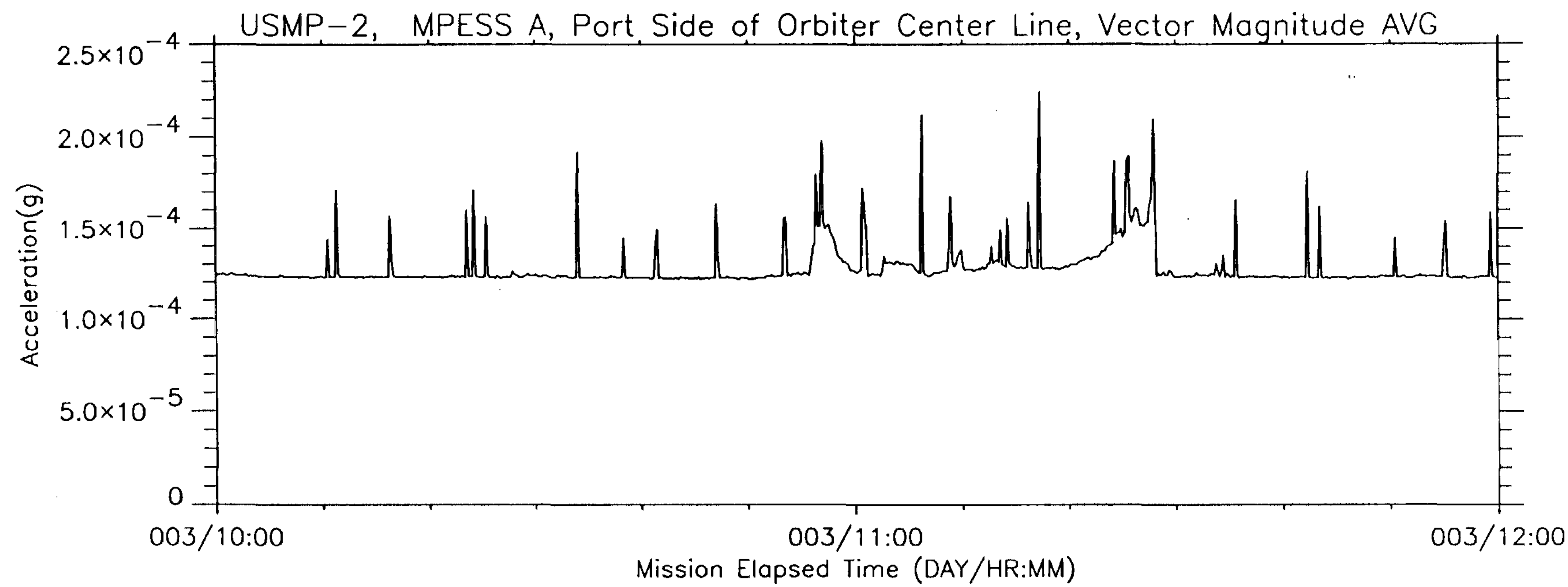
FROM MET 003/04:00:00 - 003/06:00:00

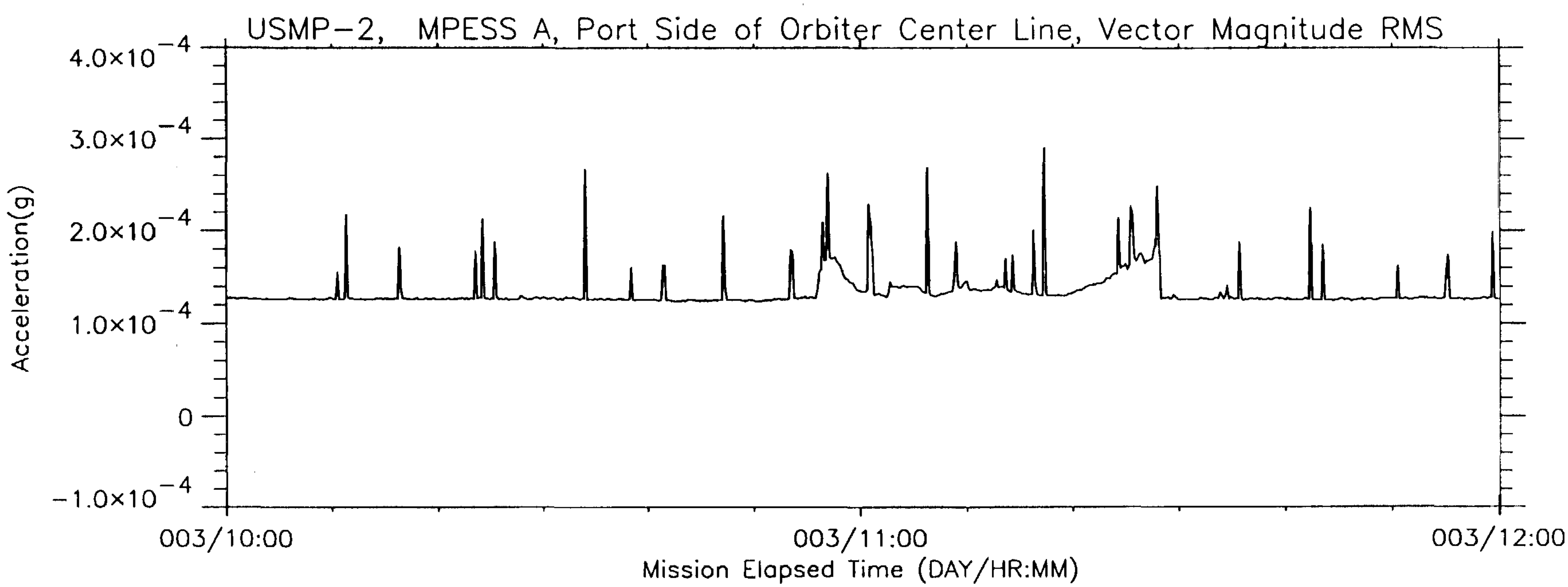

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
-1.0×10^-4
003/06:00
003/07:00
003/08:00
Mission Elapsed Time (DAY/HR:MM)

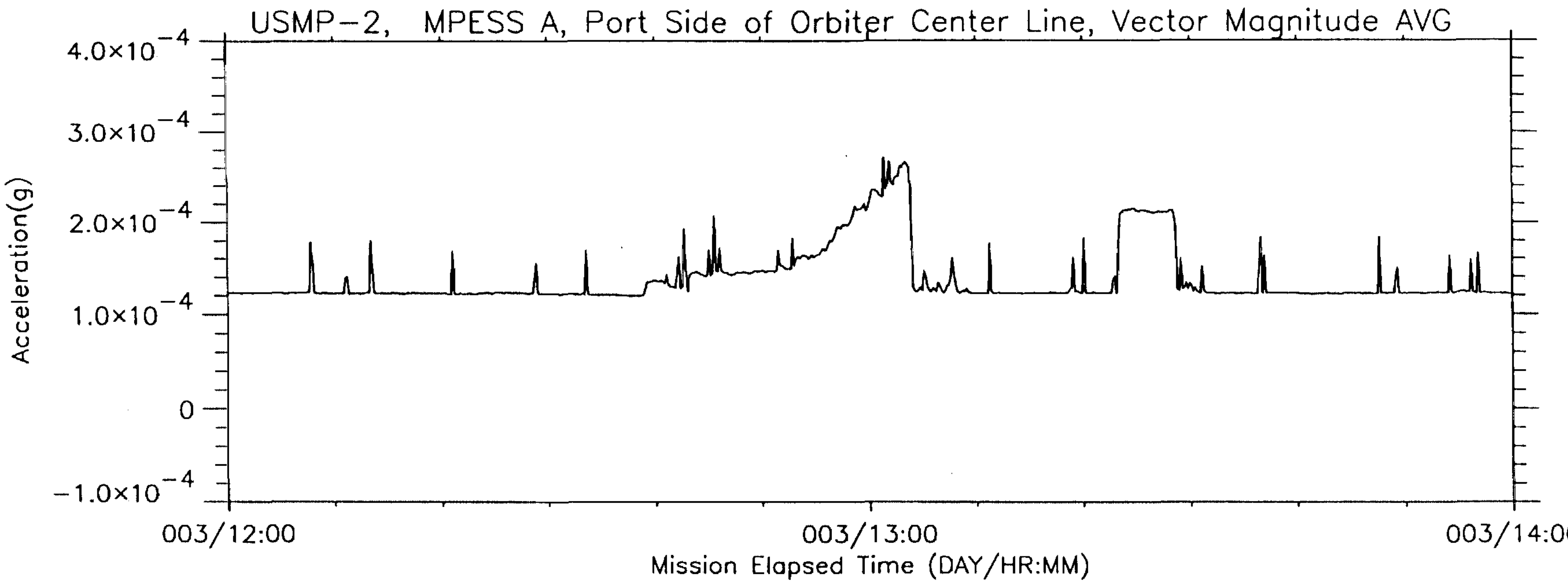

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
003/06:00
003/07:00
003/08:00
Mission Elapsed Time (DAY/HR:MM)

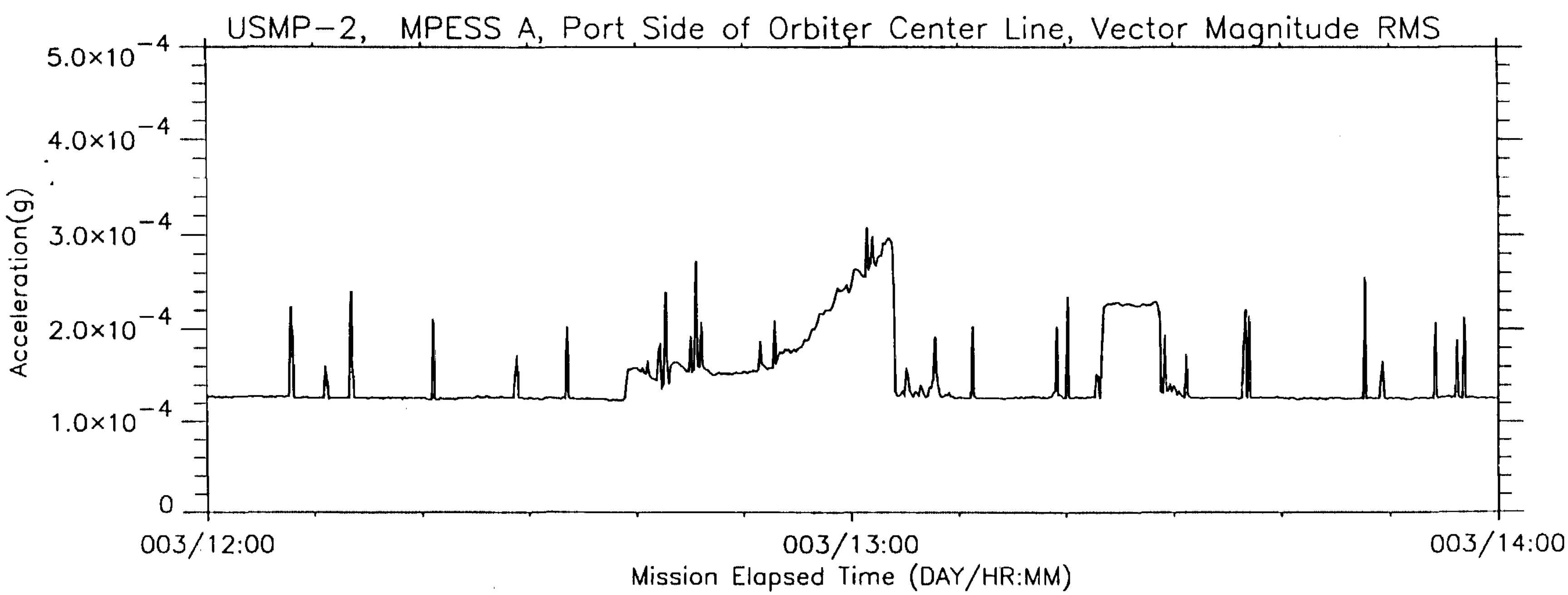

USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
2.5×10^{-4}
2.0×10^{-4}
1.5×10^{-4}
1.0×10^{-4}
5.0×10^{-5}
0
003/08:00
003/09:00
003/10:00
Mission Elapsed Time (DAY/HR:MM)

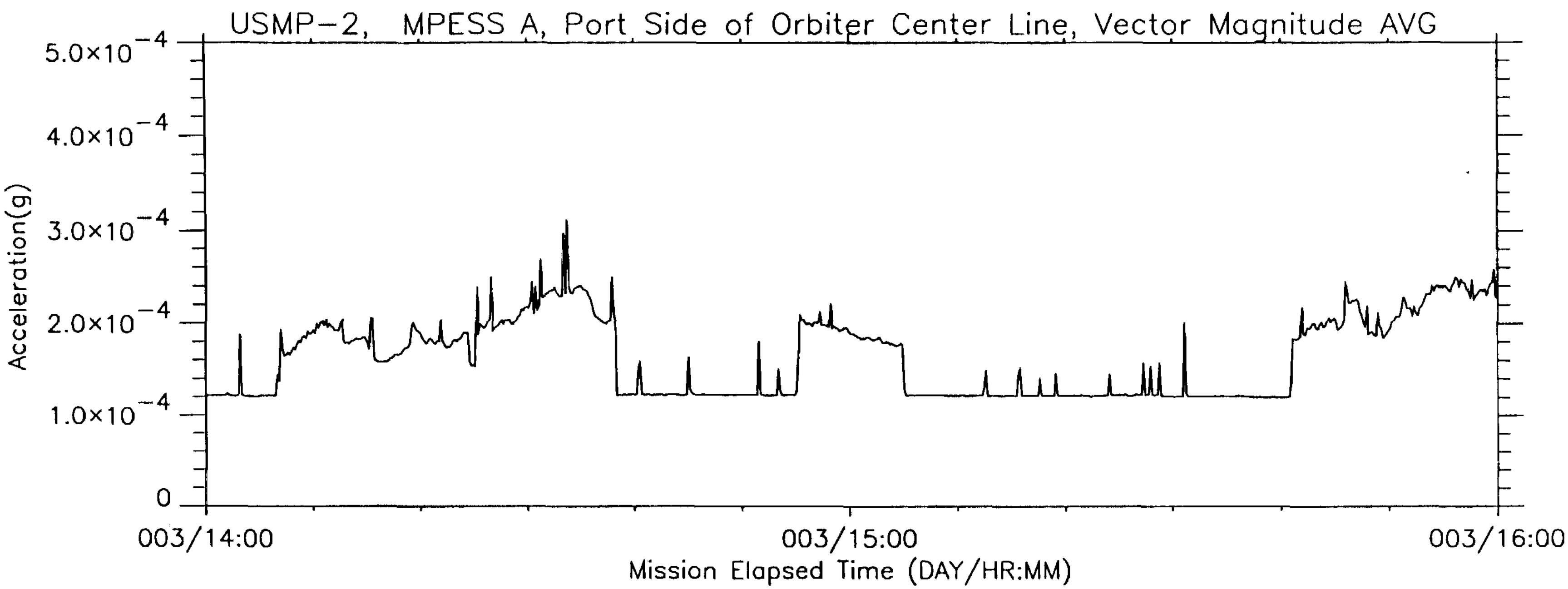

USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
003/08:00
003/09:00
003/10:00
Mission Elapsed Time (DAY/HR:MM)

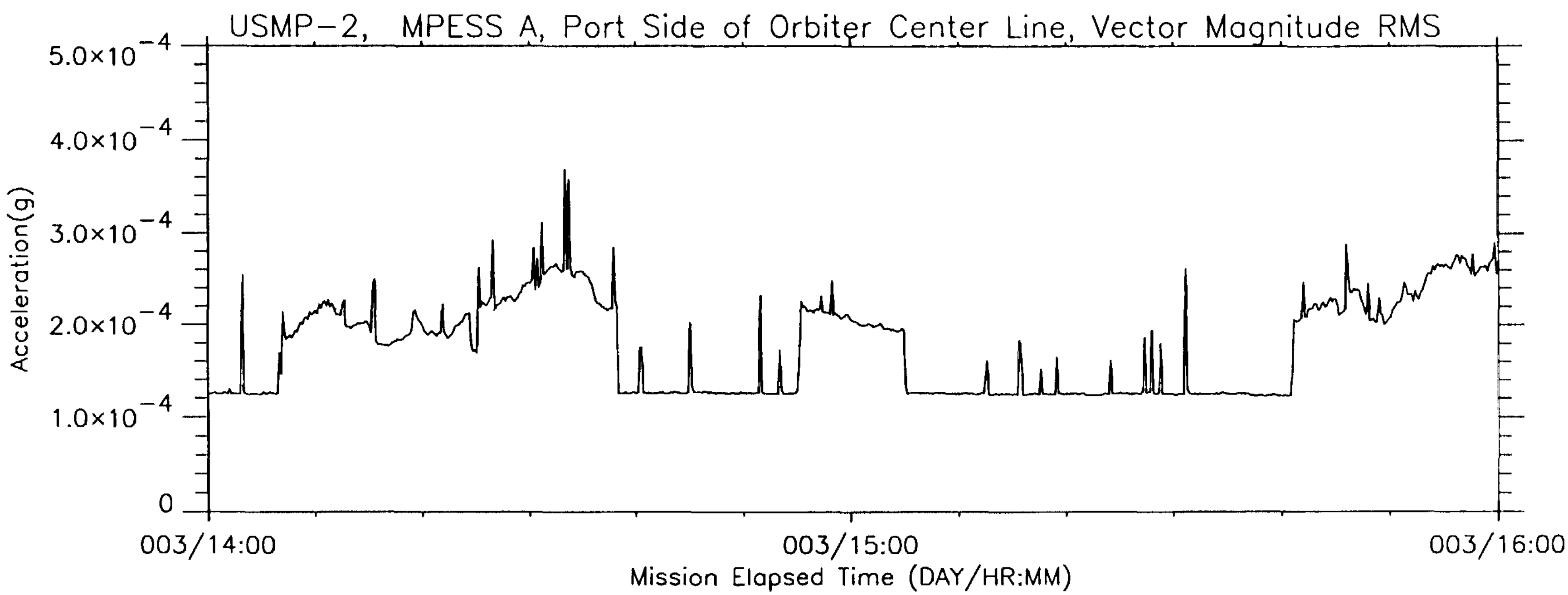

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
2.5×10^−4
2.0×10^−4
1.5×10^−4
1.0×10^−4
5.0×10^−5
0
003/10:00
003/11:00
003/12:00
Mission Elapsed Time (DAY/HR:MM)

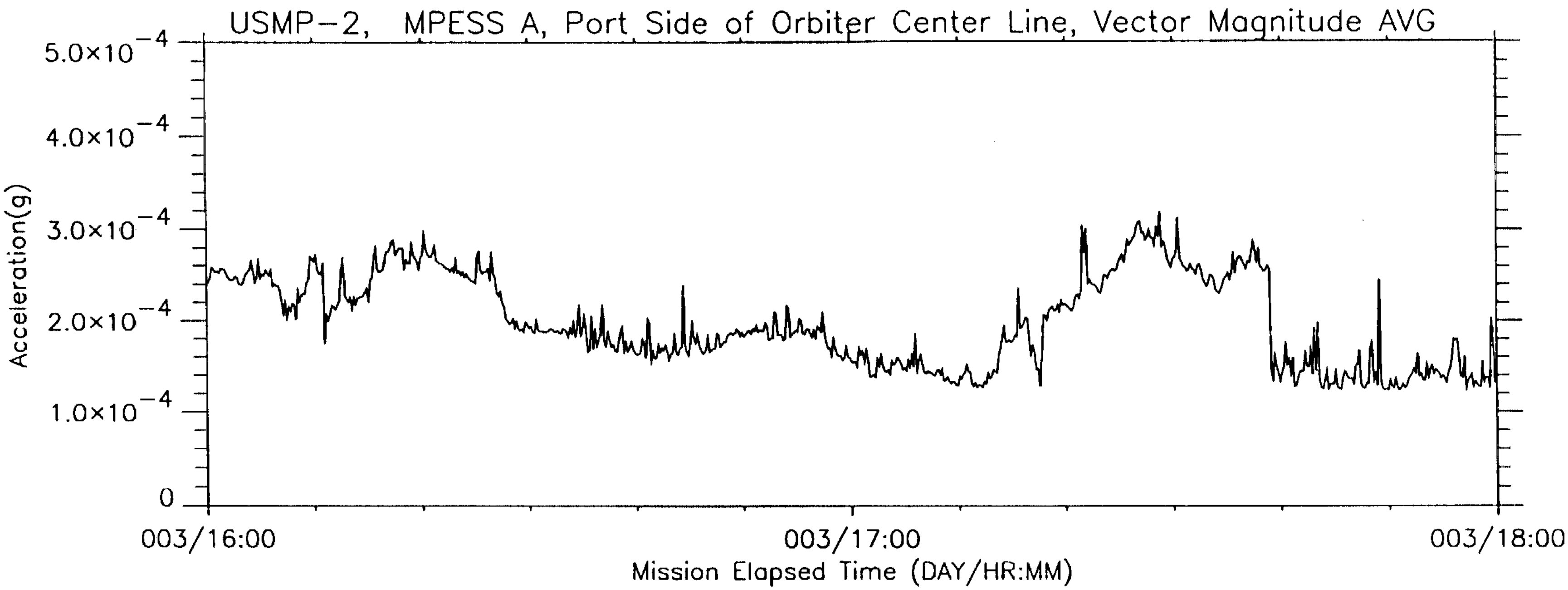

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
4.0×10^−4
3.0×10^−4
2.0×10^−4
1.0×10^−4
0
−1.0×10^−4
003/10:00
003/11:00
003/12:00
Mission Elapsed Time (DAY/HR:MM)

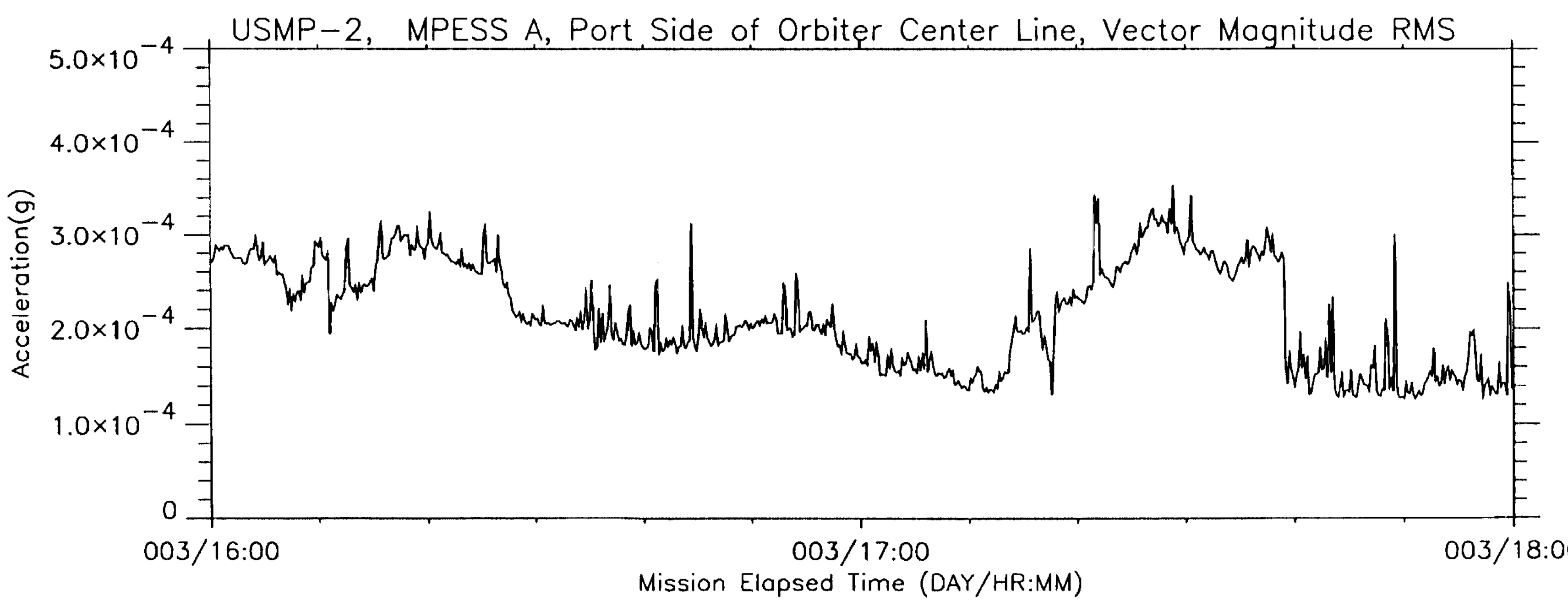

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
-1.0×10^-4
003/12:00
003/13:00
003/14:00
Mission Elapsed Time (DAY/HR:MM)

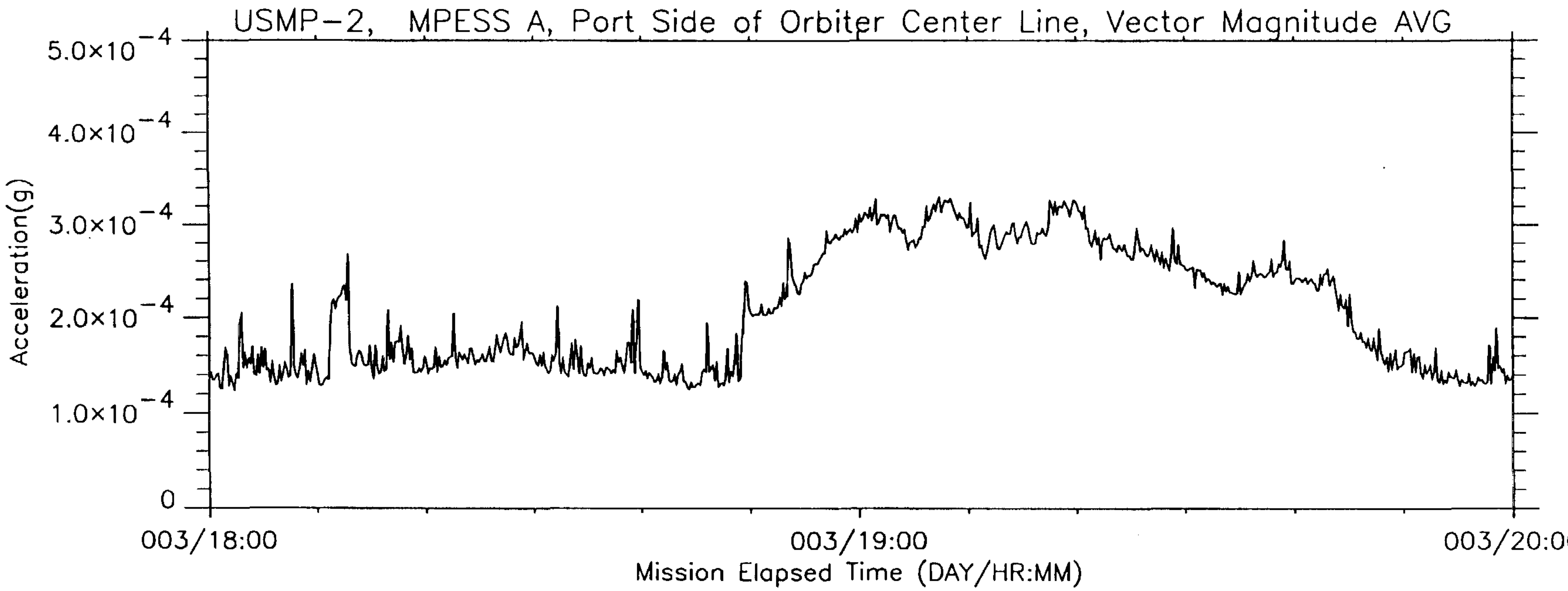

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
003/12:00
003/13:00
003/14:00
Mission Elapsed Time (DAY/HR:MM)

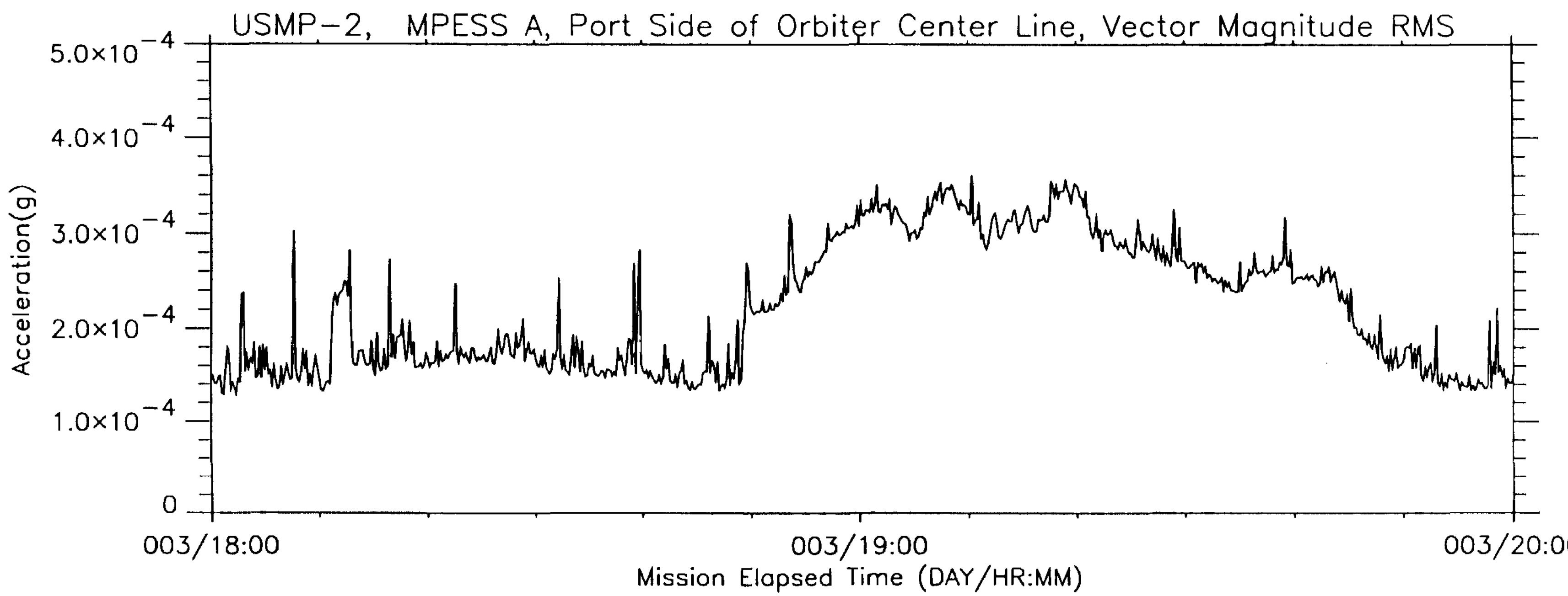

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
003/14:00
003/15:00
003/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
003/14:00
003/15:00
003/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
003/16:00
003/17:00
003/18:00
Mission Elapsed Time (DAY/HR:MM)

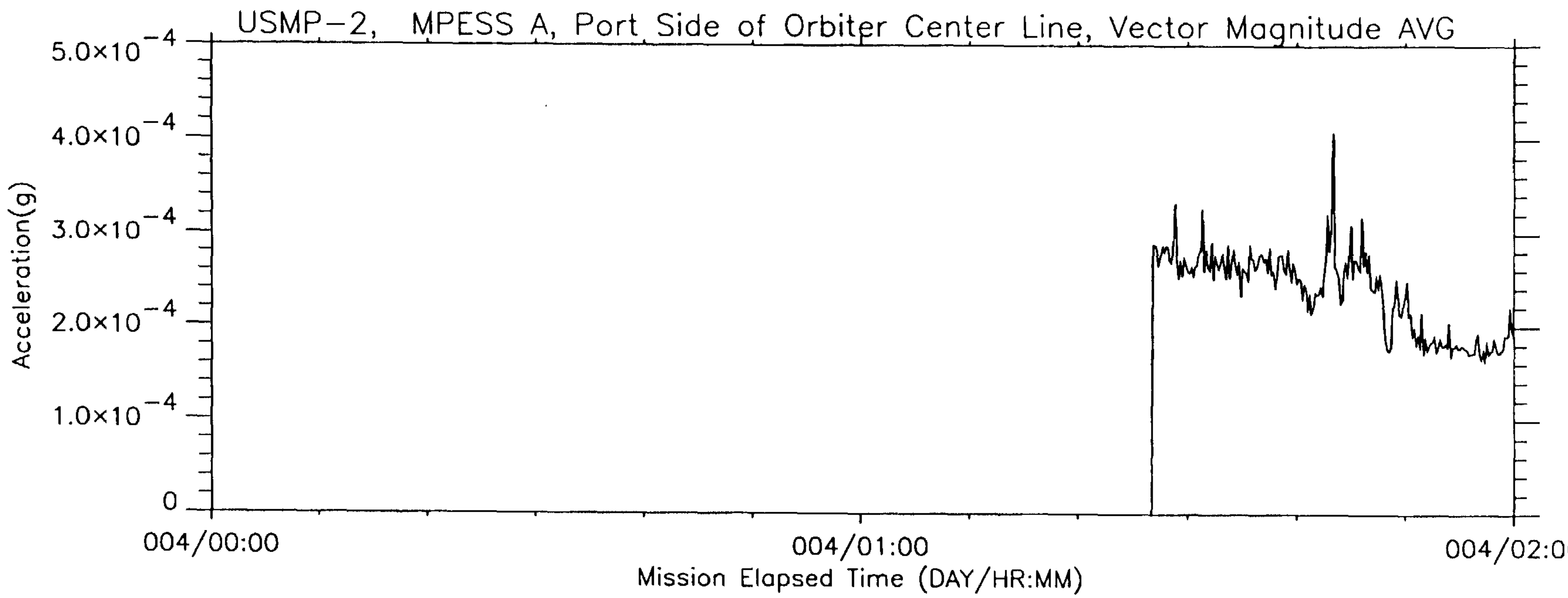

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
003/16:00
003/17:00
003/18:00
Mission Elapsed Time (DAY/HR:MM)

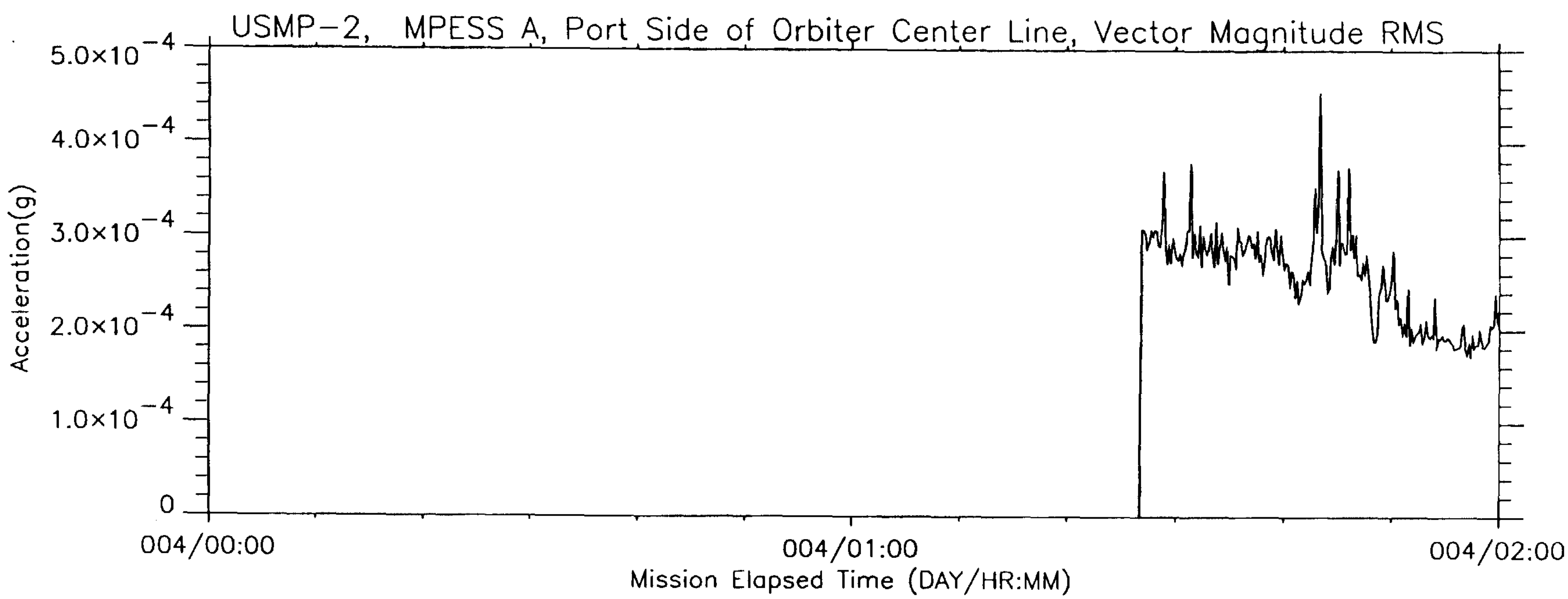

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
003/18:00
003/19:00
003/20:00
Mission Elapsed Time (DAY/HR:MM)

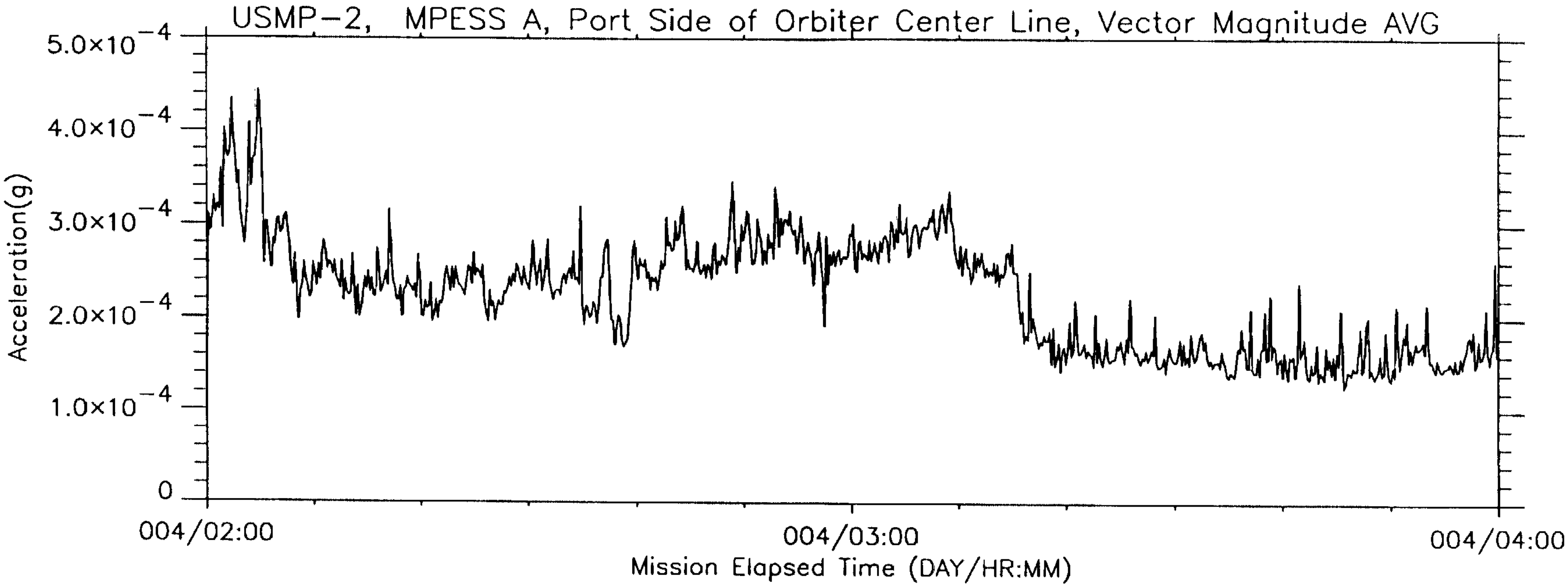

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
003/18:00
003/19:00
003/20:00
Mission Elapsed Time (DAY/HR:MM)

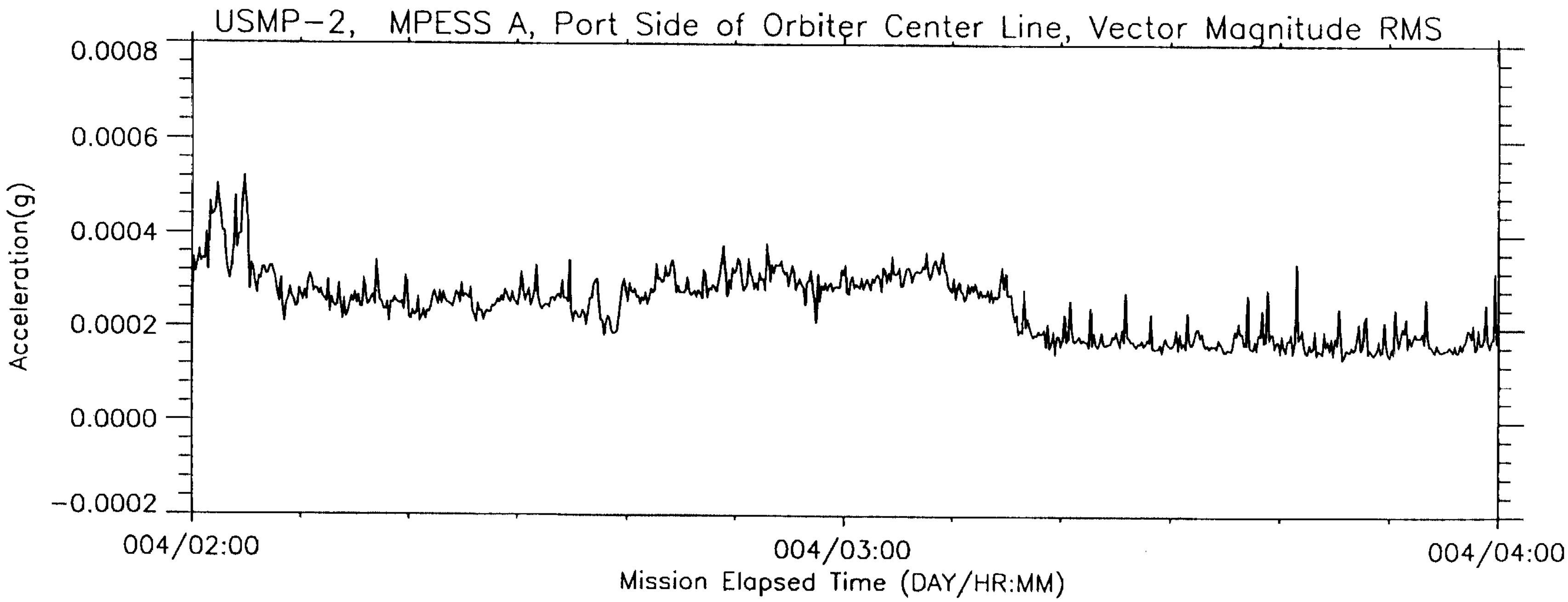
NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

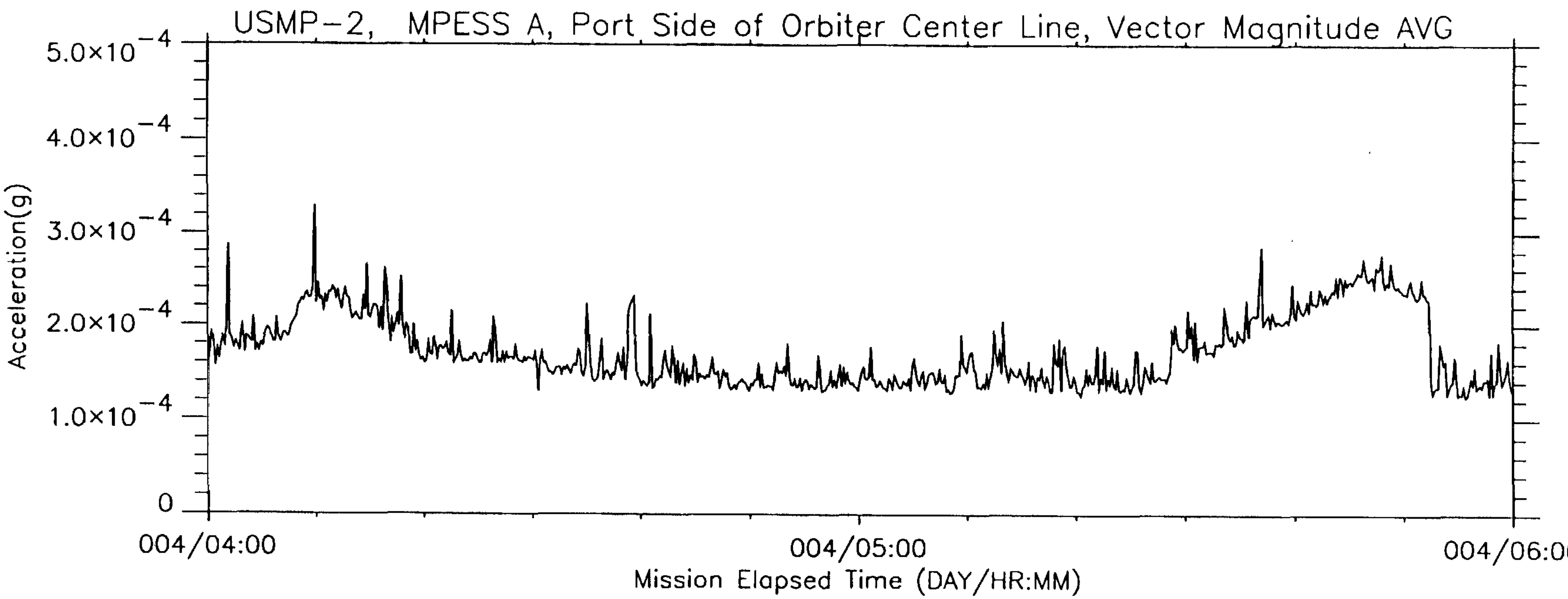
FROM MET 003/20:00:00 - 004/01:27:00

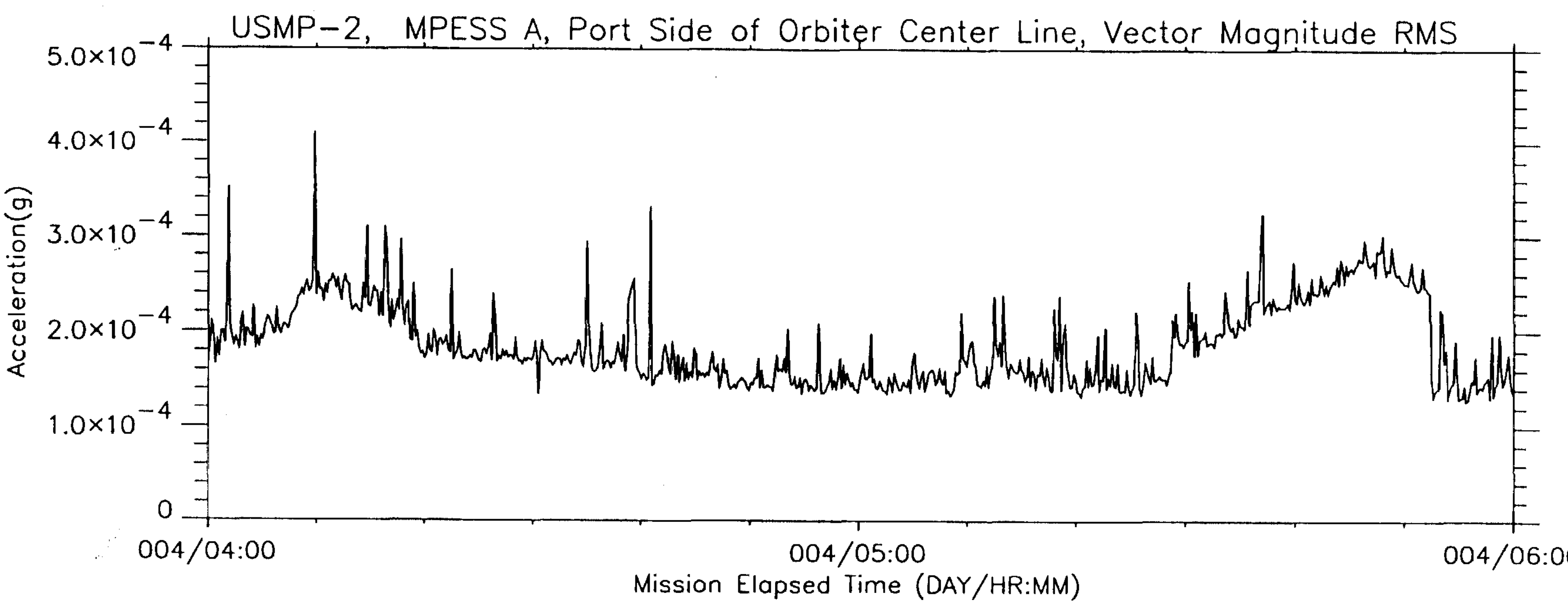

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
004/00:00
004/01:00
004/02:00
Mission Elapsed Time (DAY/HR:MM)

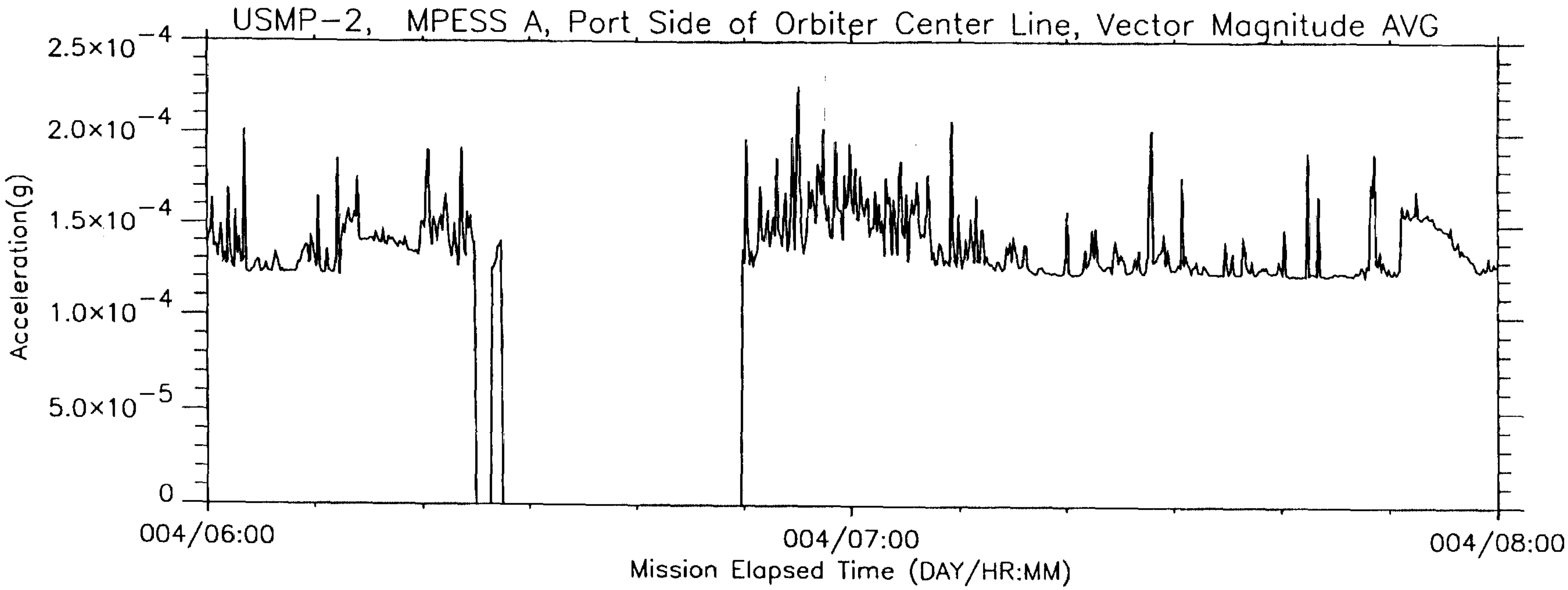

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
004/00:00
004/01:00
004/02:00
Mission Elapsed Time (DAY/HR:MM)

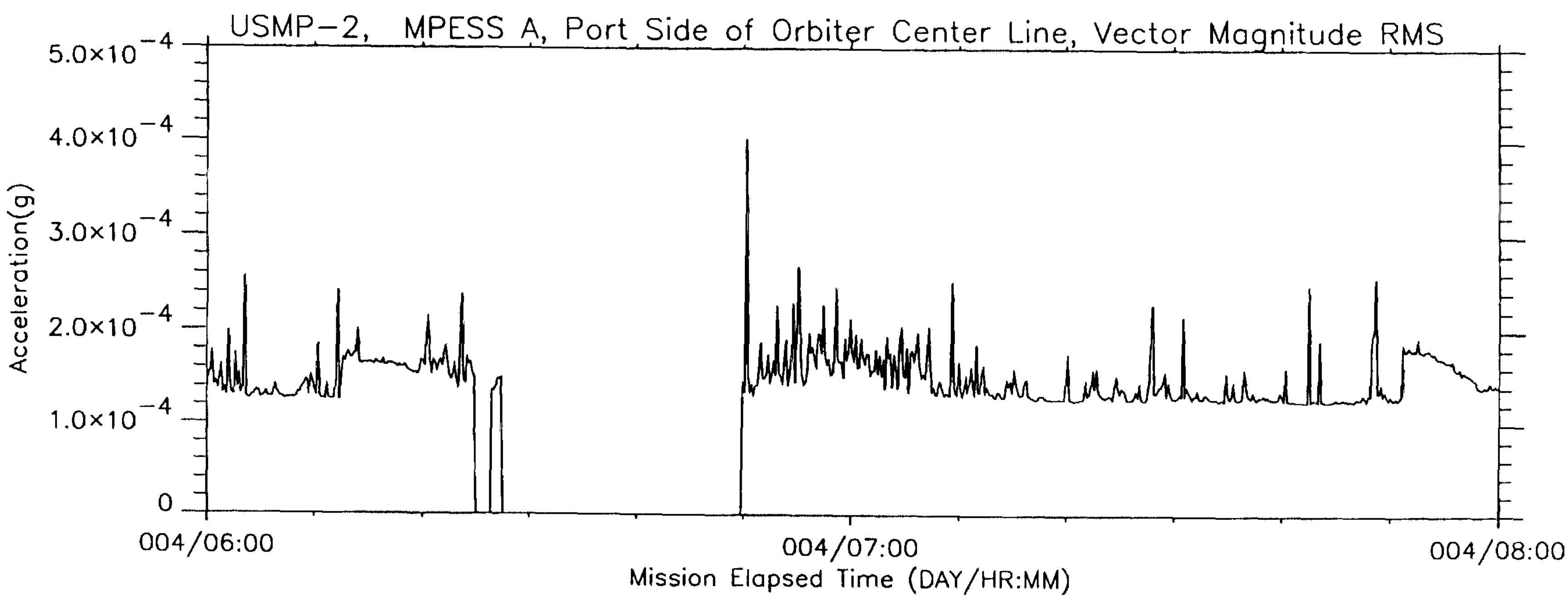

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/02:00
004/03:00
004/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
−0.0002
004/02:00
004/03:00
004/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/04:00
004/05:00
004/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/04:00
004/05:00
004/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
2.5×10^{-4}
2.0×10^{-4}
1.5×10^{-4}
1.0×10^{-4}
5.0×10^{-5}
0
004/06:00
004/07:00
004/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
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1.0×10^{-4}
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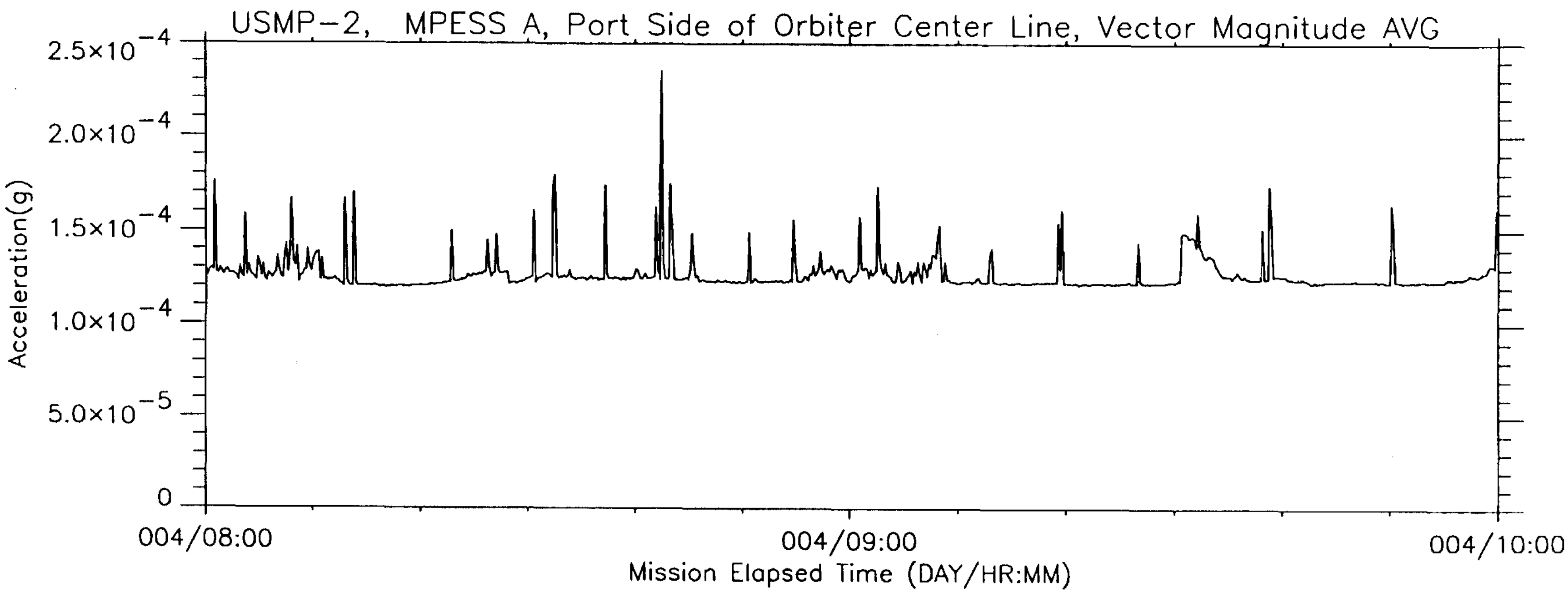
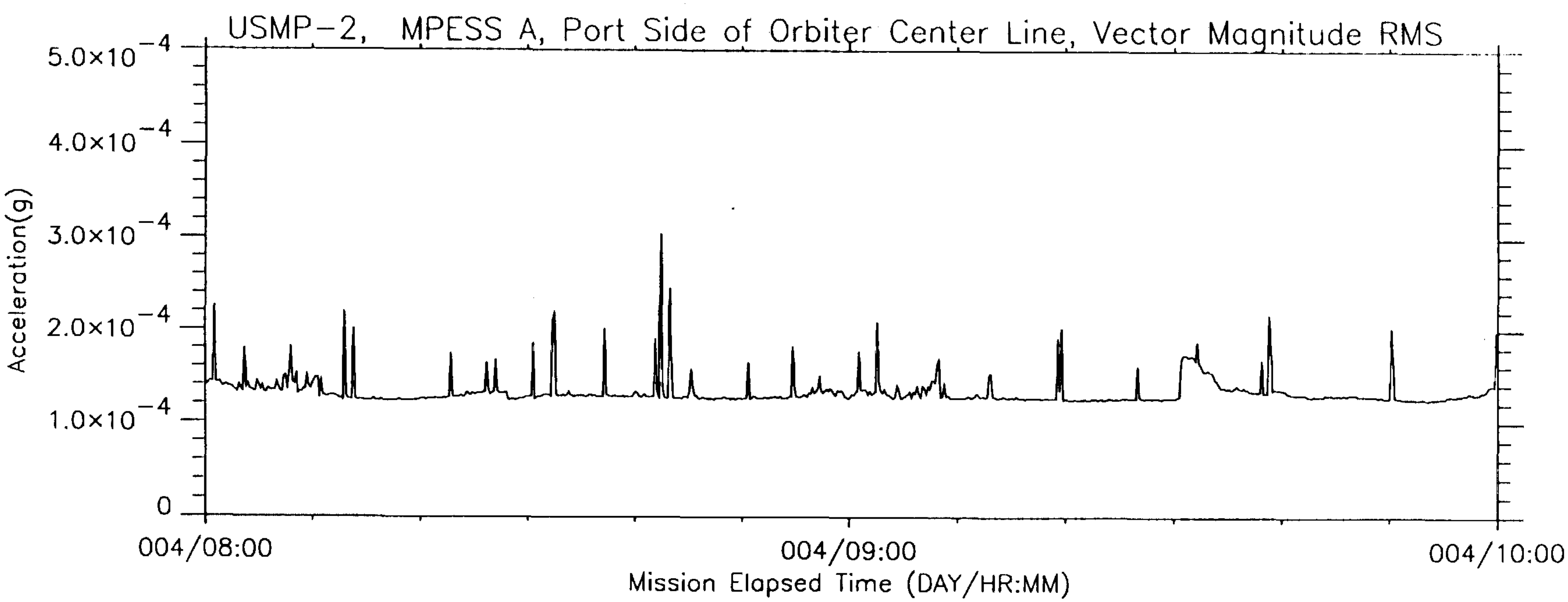
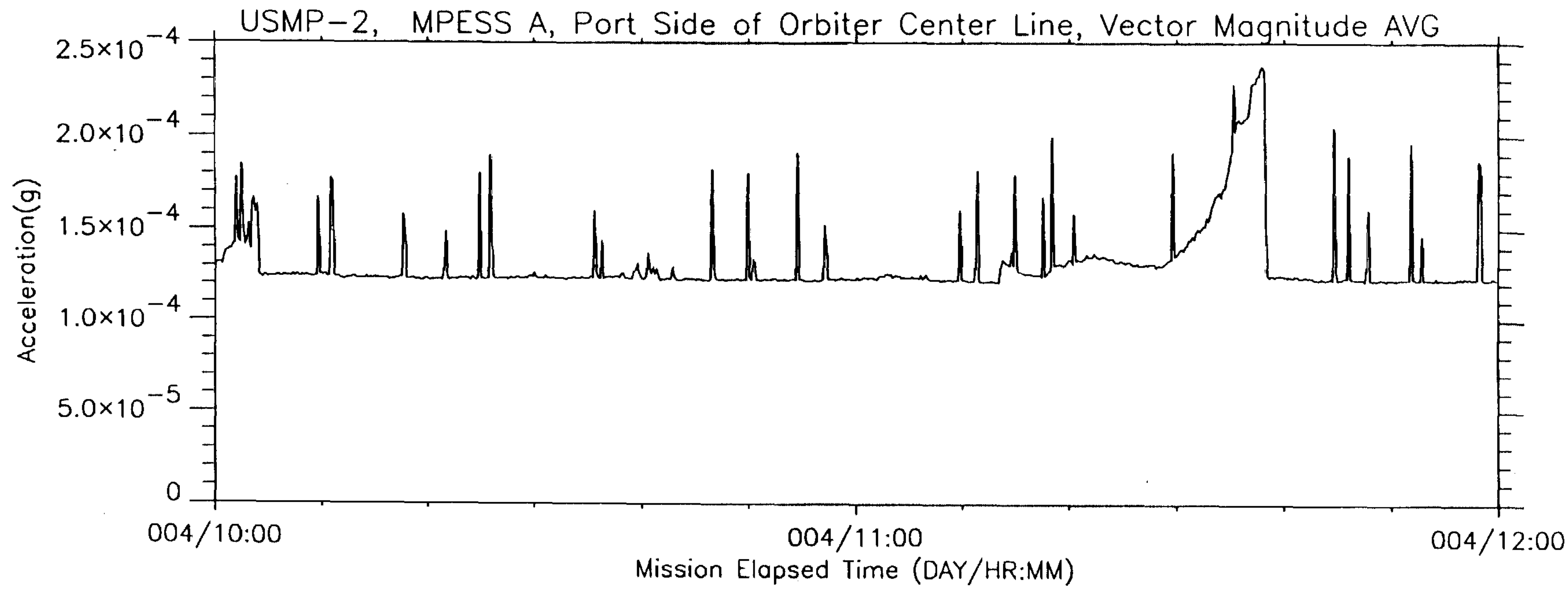
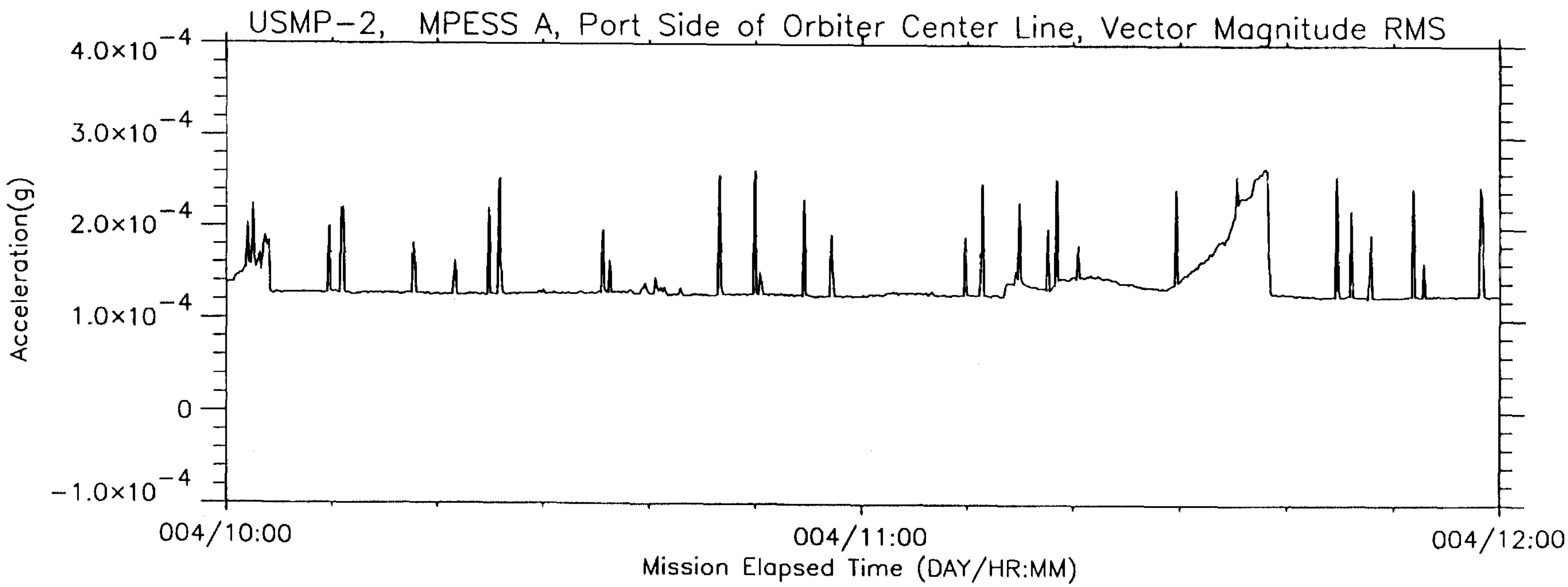
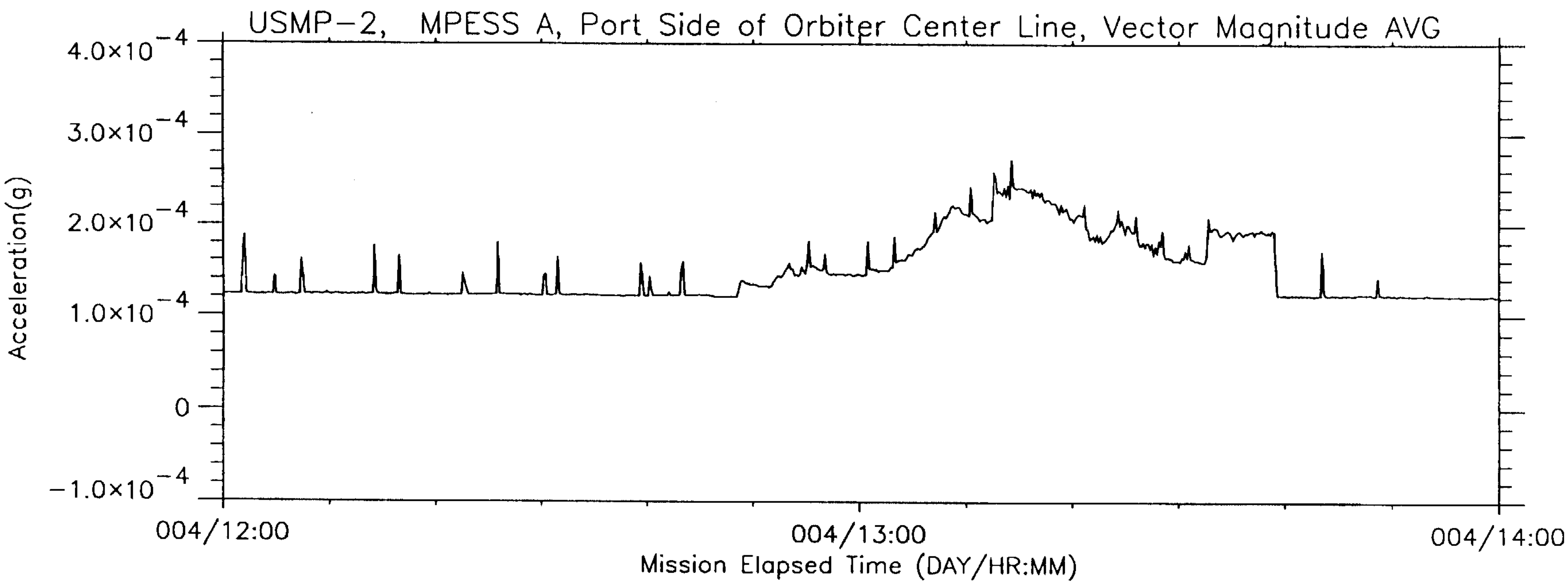
Mission Elapsed Time (DAY/HR:MM)

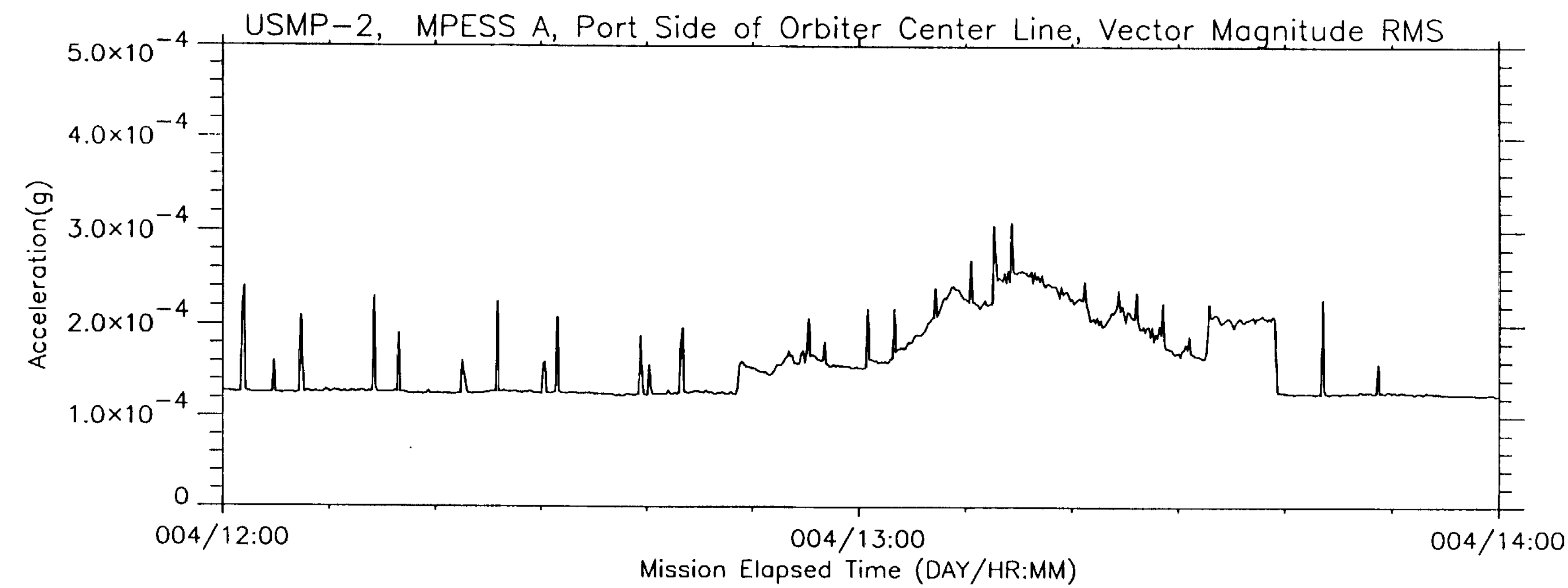

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
2.5×10⁻⁴
2.0×10⁻⁴
1.5×10⁻⁴
1.0×10⁻⁴
5.0×10⁻⁵
0
004/08:00
004/09:00
004/10:00
Mission Elapsed Time (DAY/HR:MM)

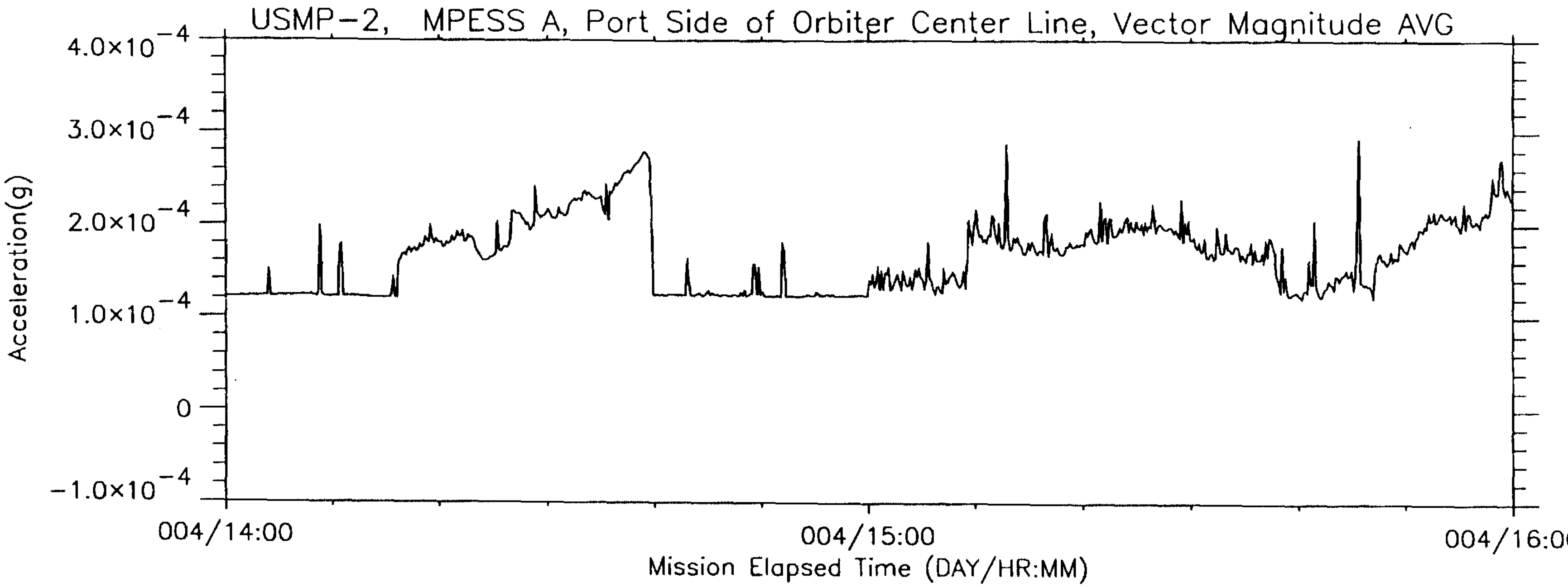

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10⁻⁴
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
004/08:00
004/09:00
004/10:00
Mission Elapsed Time (DAY/HR:MM)

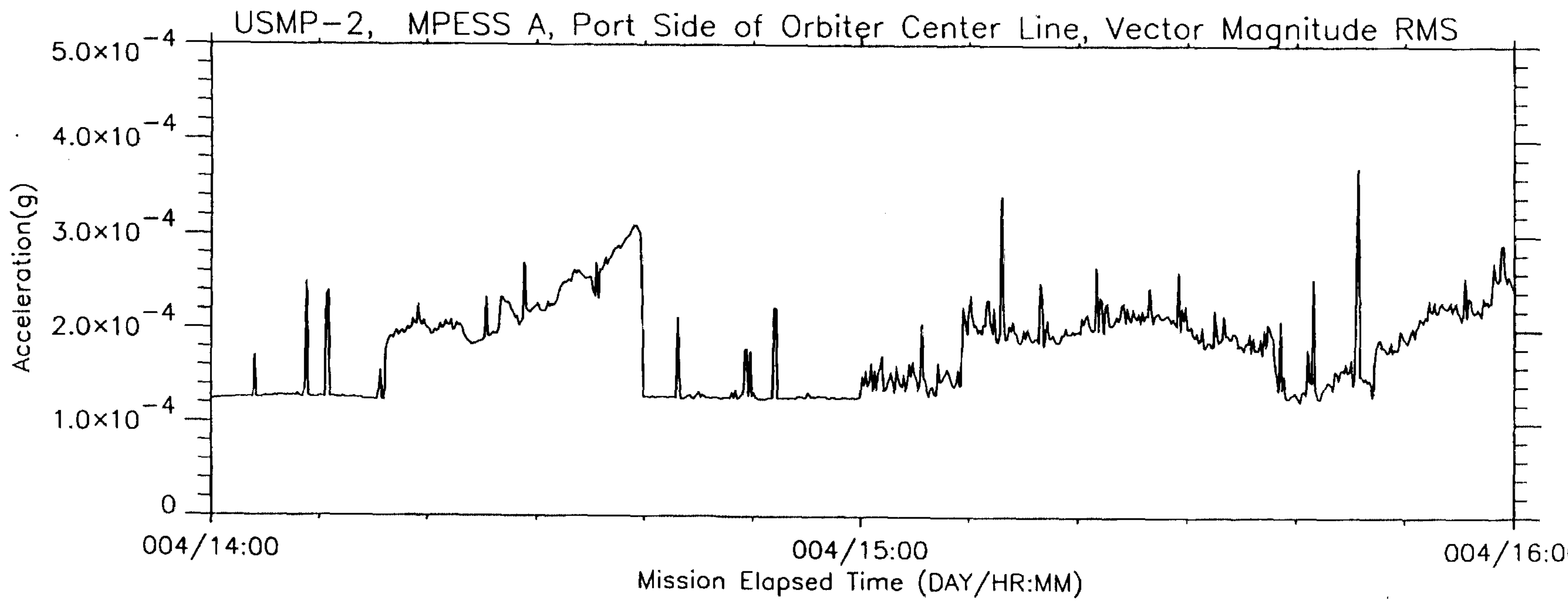

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
2.5×10^-4
2.0×10^-4
1.5×10^-4
1.0×10^-4
5.0×10^-5
0
004/10:00
004/11:00
004/12:00
Mission Elapsed Time (DAY/HR:MM)

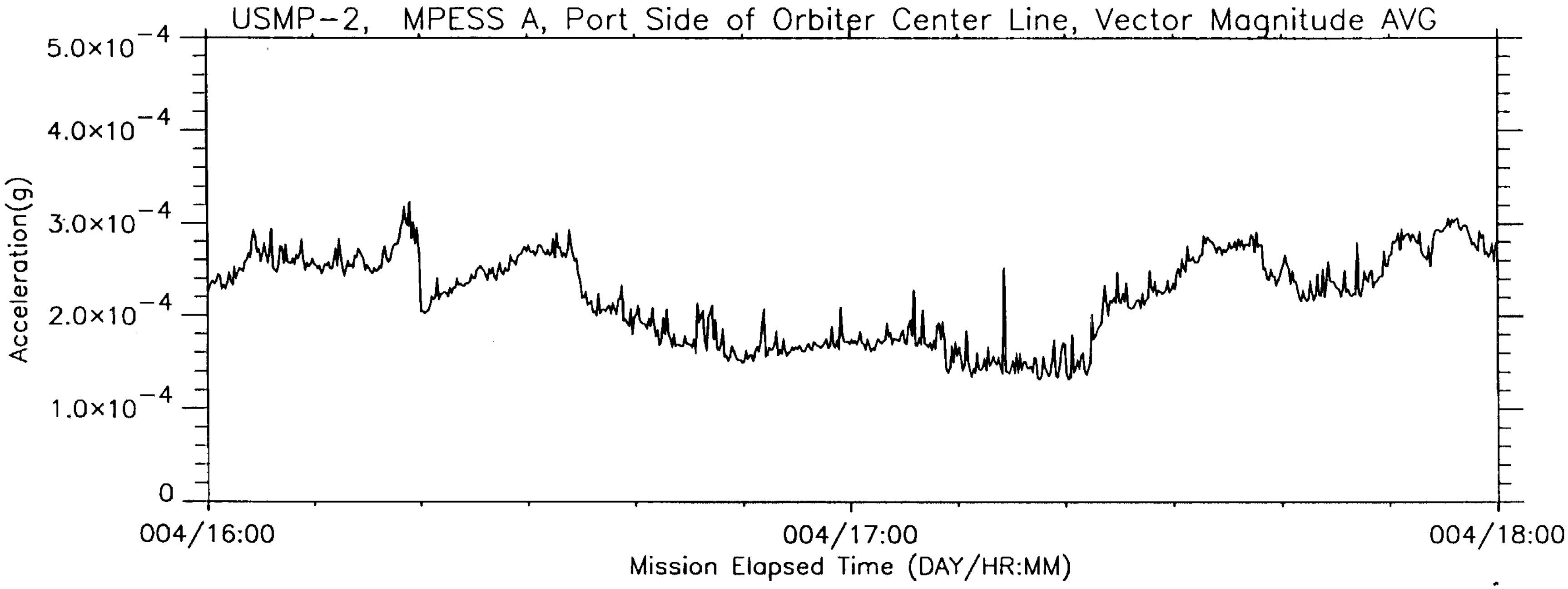

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
−1.0×10^-4
004/10:00
004/11:00
004/12:00
Mission Elapsed Time (DAY/HR:MM)

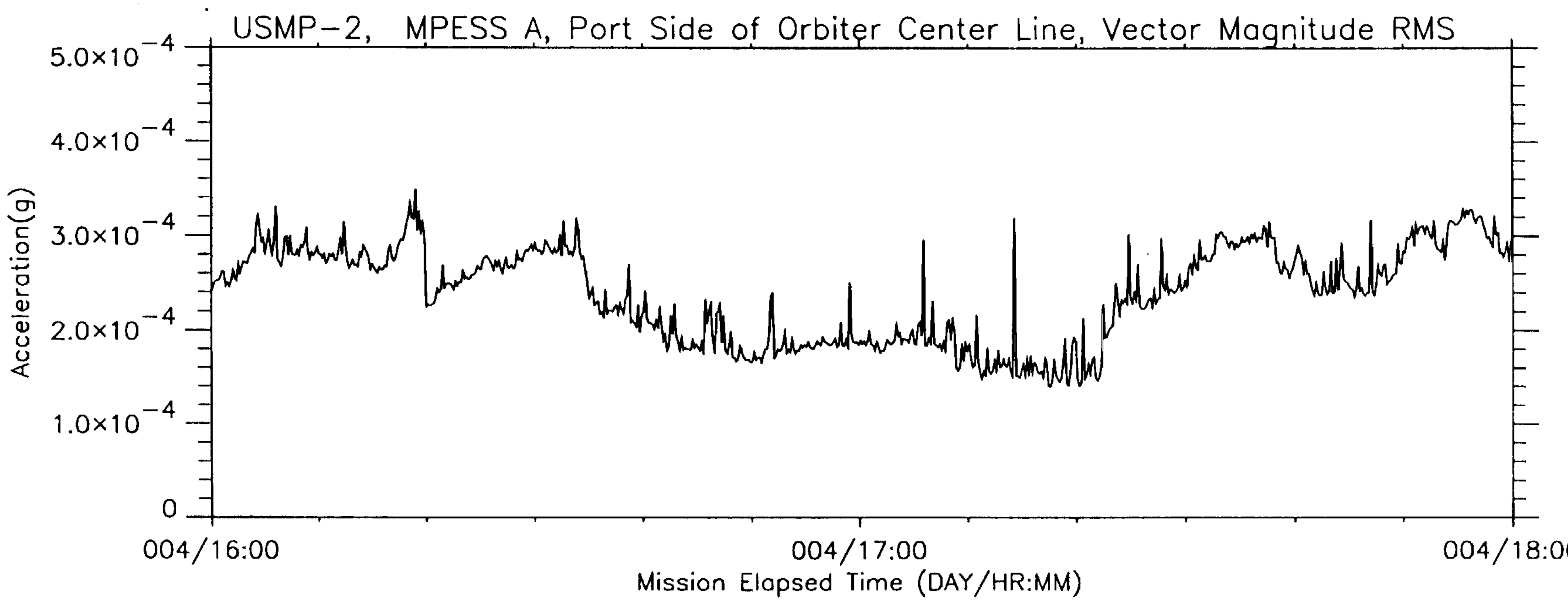

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
-1.0×10^{-4}
004/12:00
004/13:00
004/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/12:00
004/13:00
004/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0x10^-4
3.0x10^-4
2.0x10^-4
1.0x10^-4
0
-1.0x10^-4
004/14:00
004/15:00
004/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0x10^-4
4.0x10^-4
3.0x10^-4
2.0x10^-4
1.0x10^-4
0
004/14:00
004/15:00
004/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/16:00
004/17:00
004/18:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
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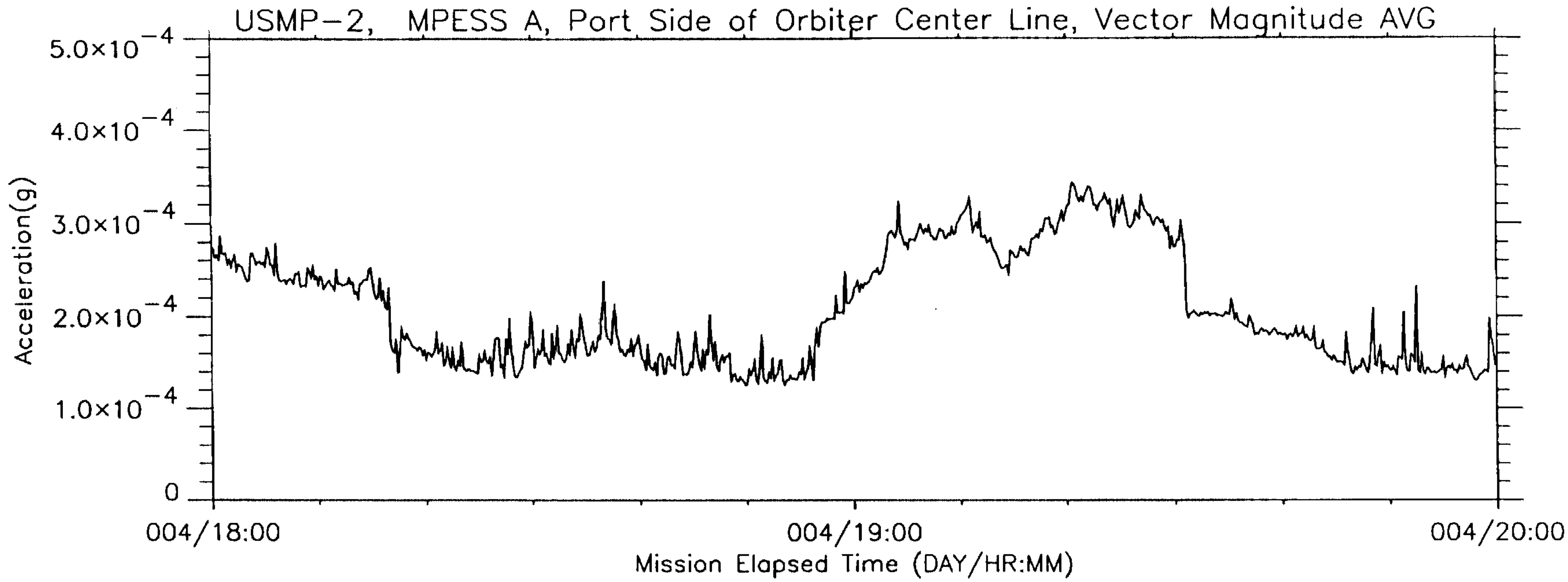
004/18:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
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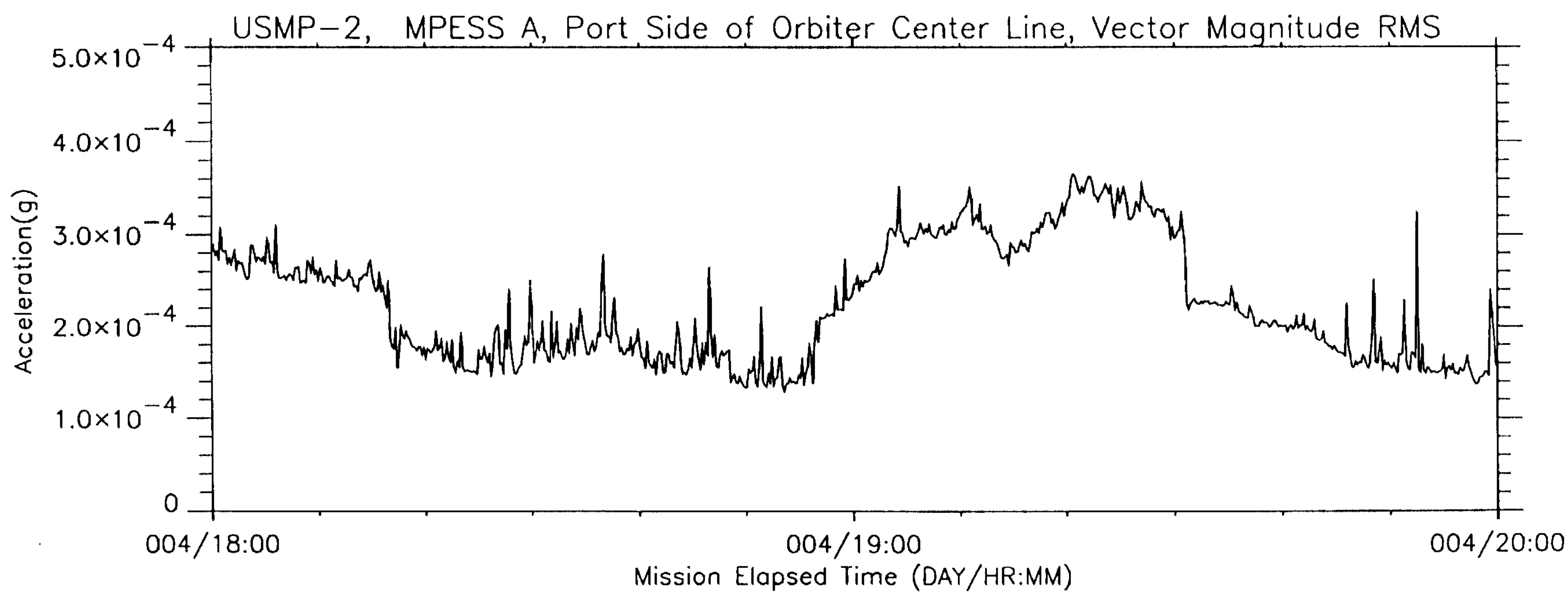
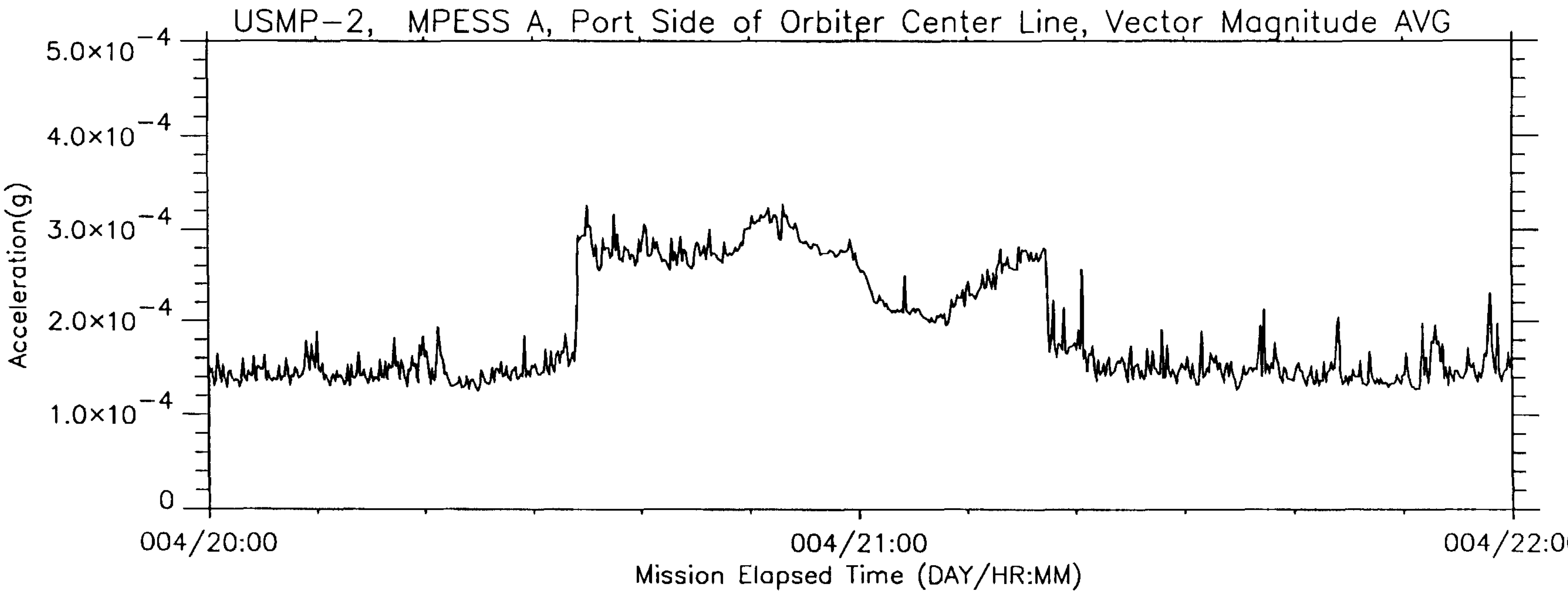
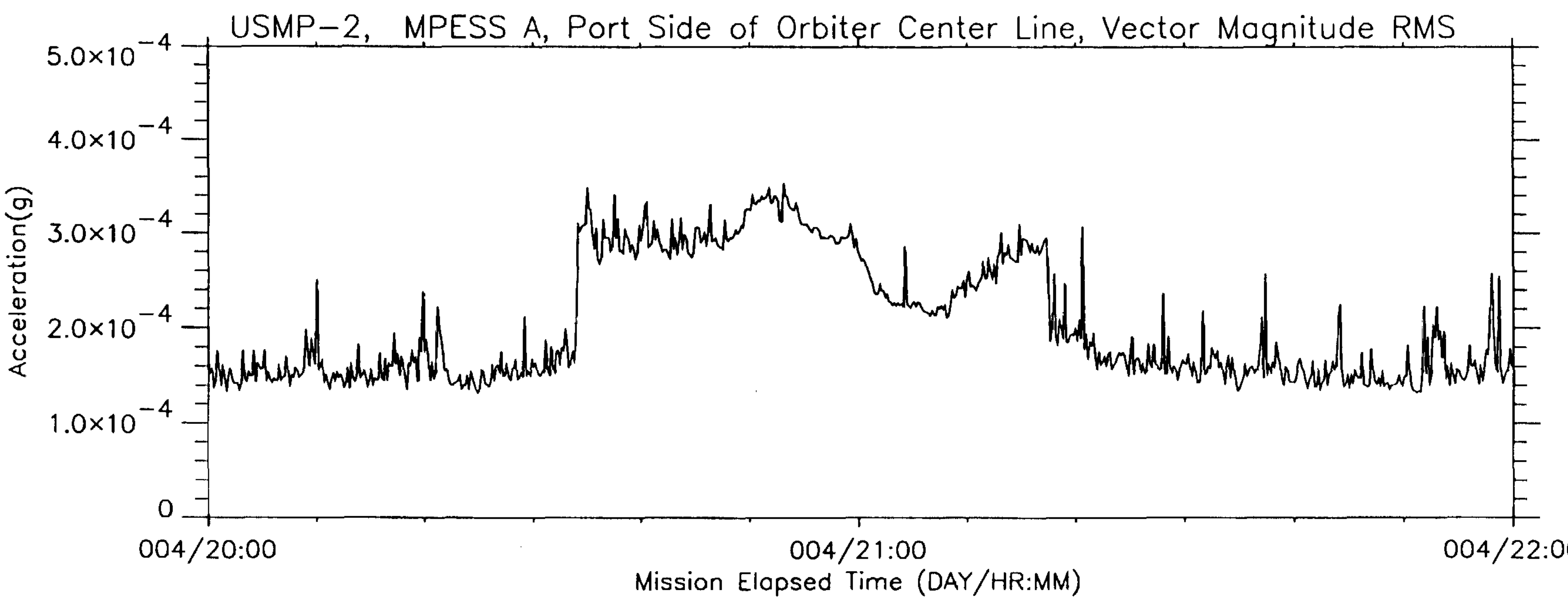
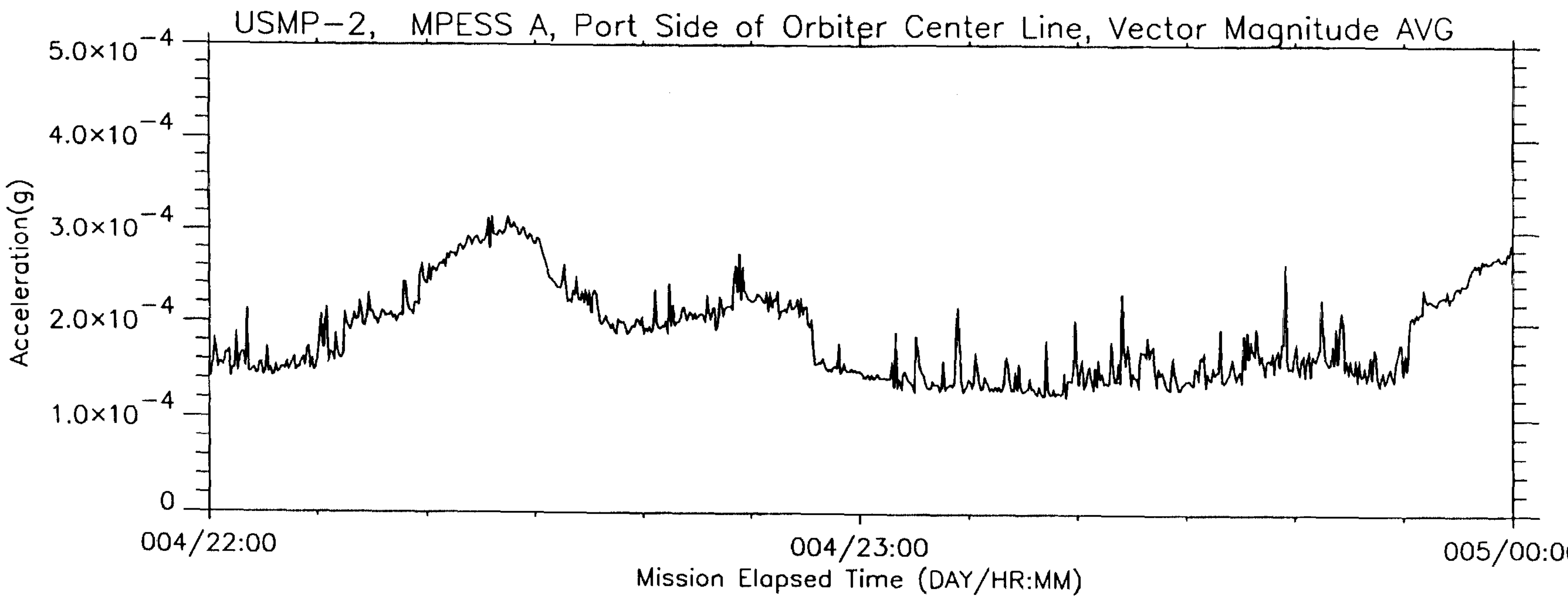
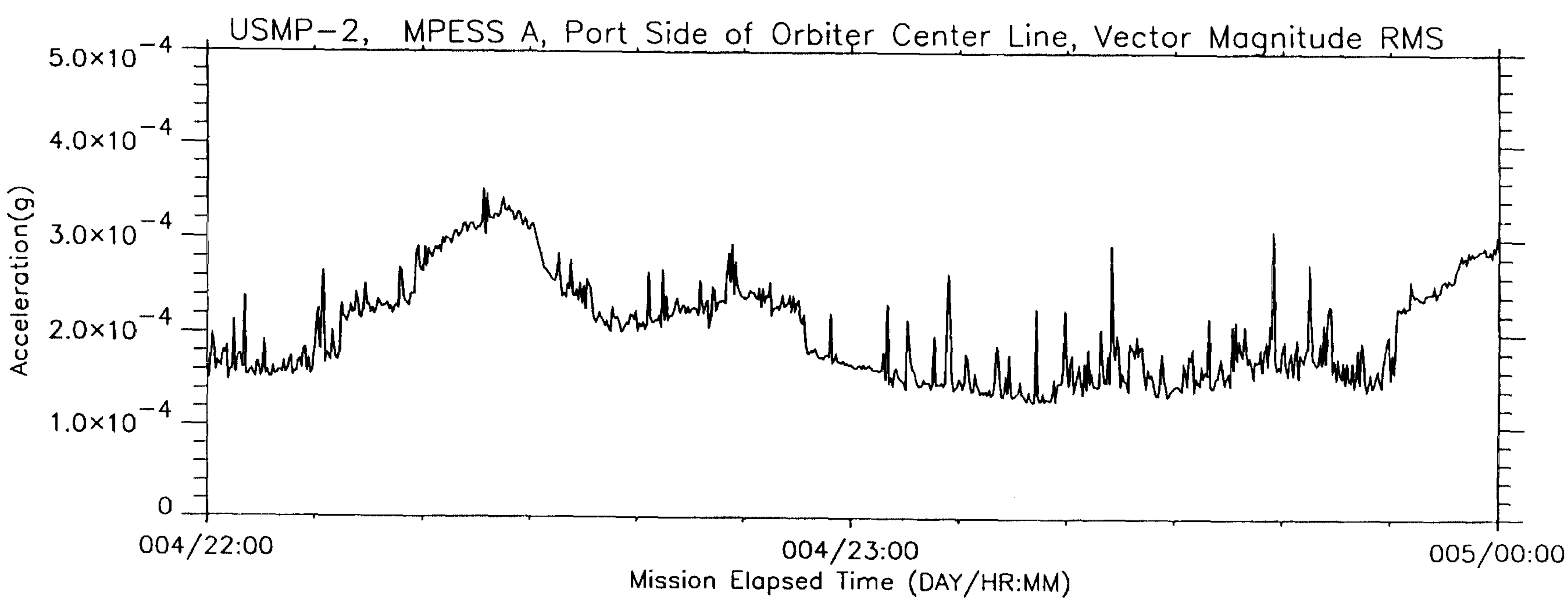
004/20:00
Mission Elapsed Time (DAY/HR:MM)

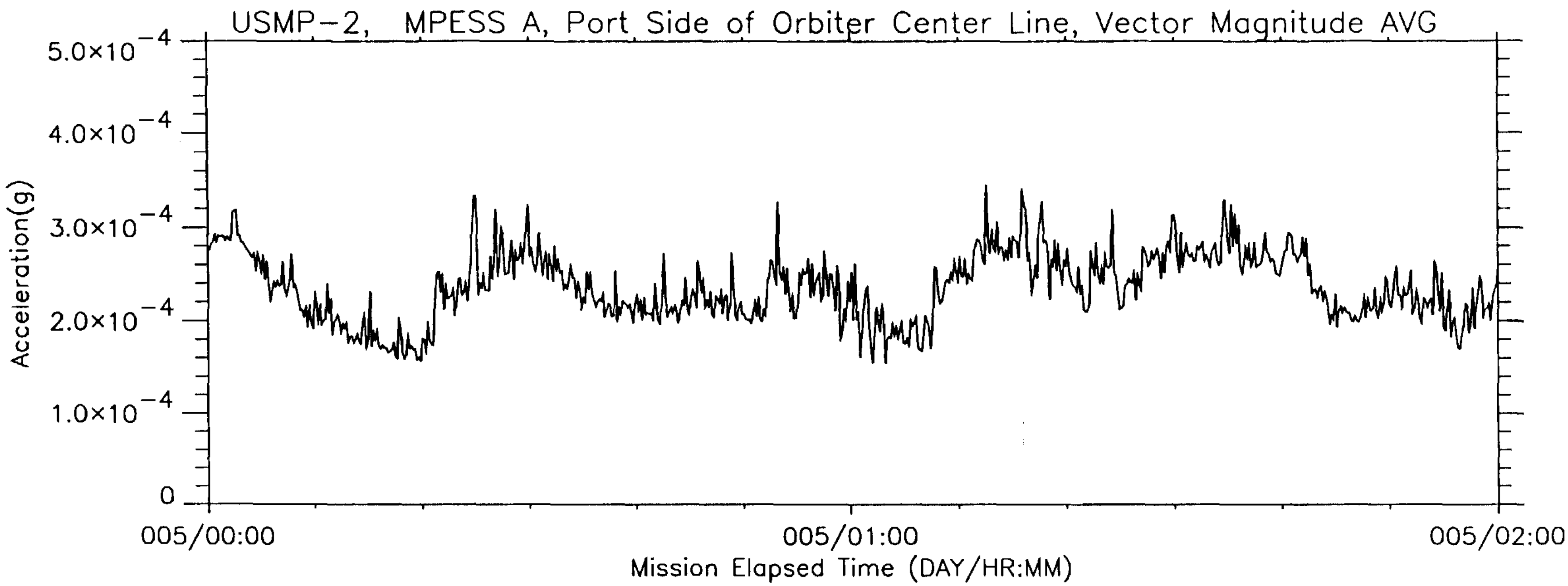

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/18:00
004/19:00
004/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/20:00
004/21:00
004/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/20:00
004/21:00
004/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/22:00
004/23:00
005/00:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
004/22:00
004/23:00
005/00:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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3.0×10^-4
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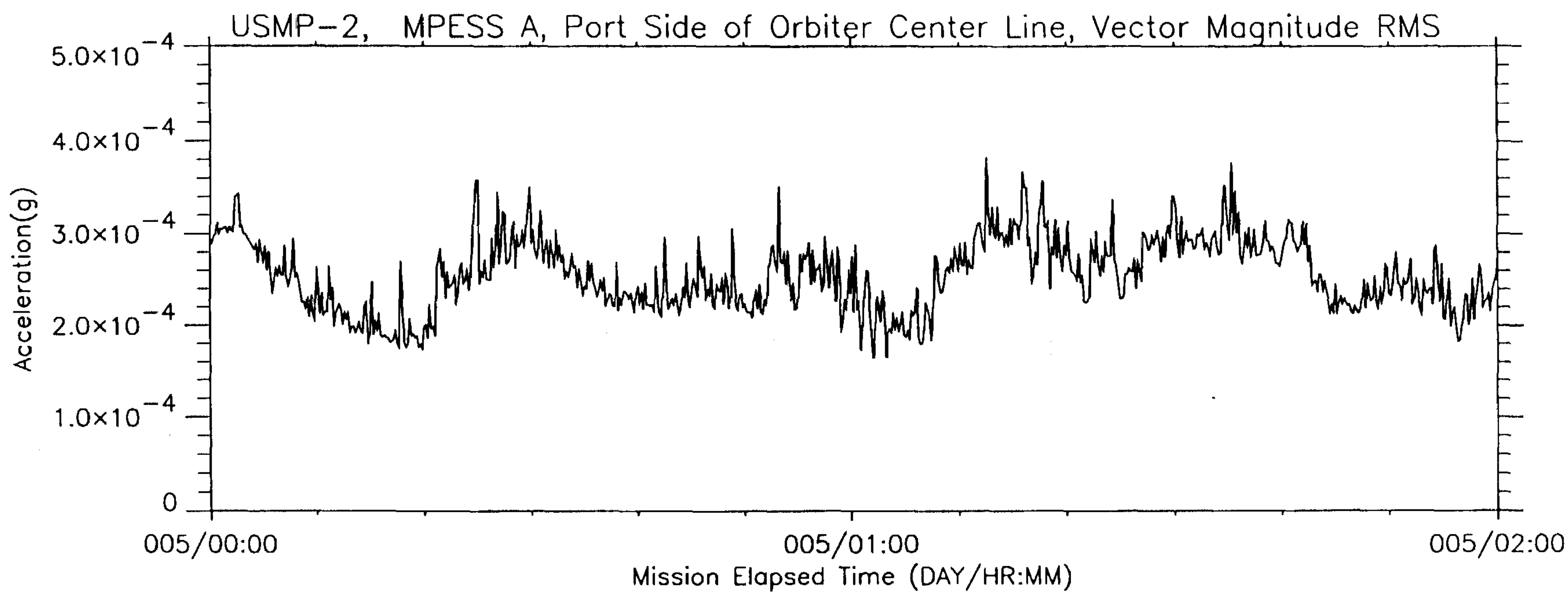
1.0×10^-4
0
005/00:00
005/01:00
005/02:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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3.0×10^-4
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0
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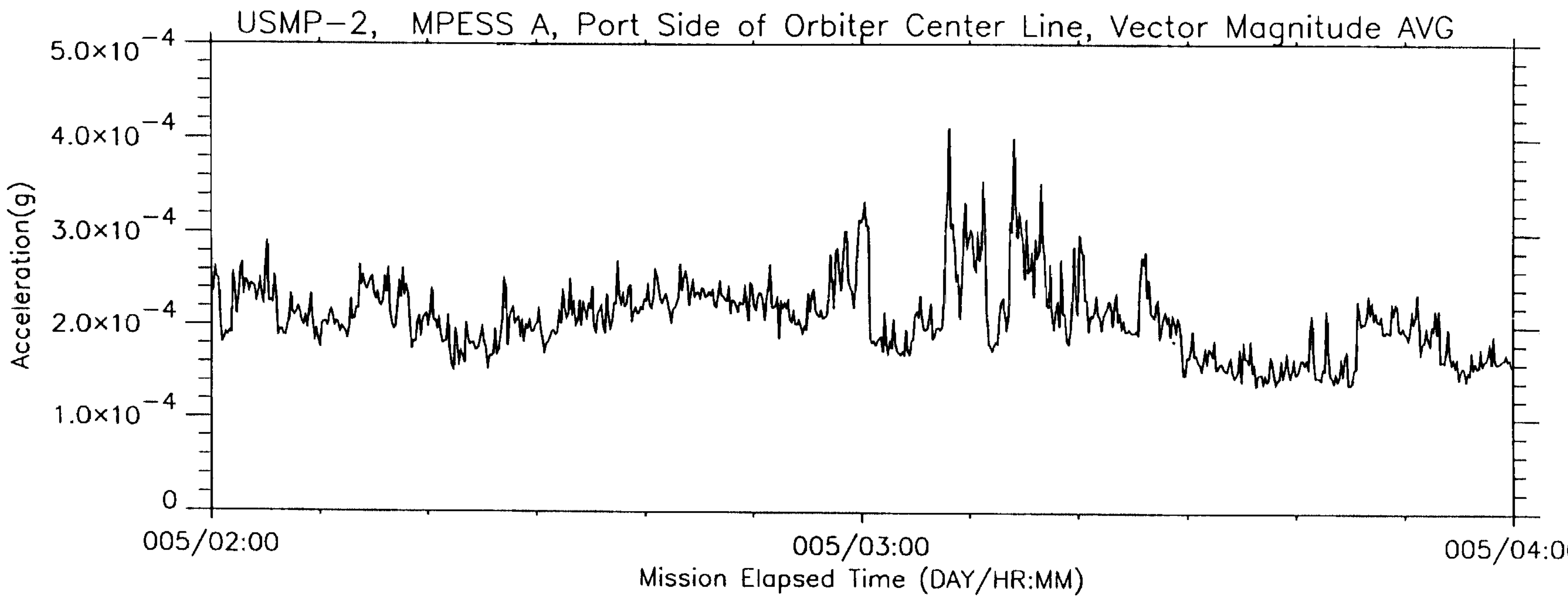
005/01:00
005/02:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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4.0×10^-4
3.0×10^-4
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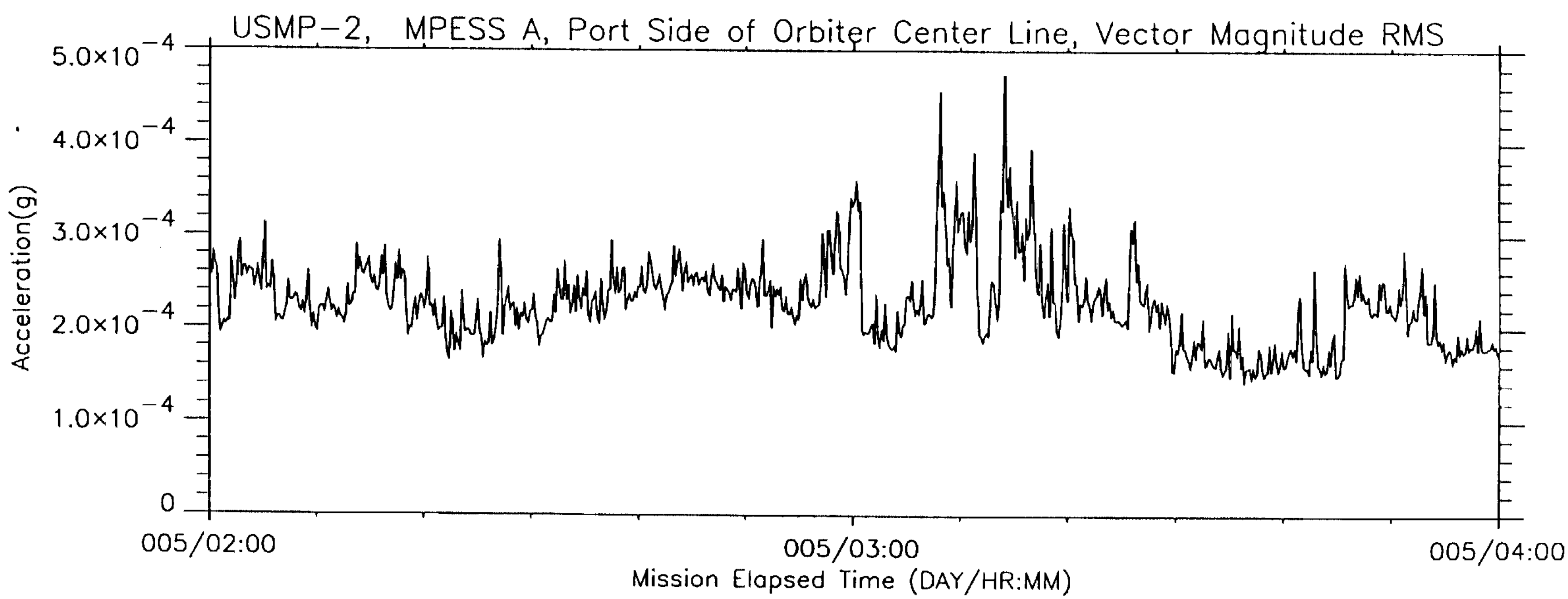
1.0×10^-4
0
005/02:00
005/03:00
005/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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4.0×10^-4
3.0×10^-4
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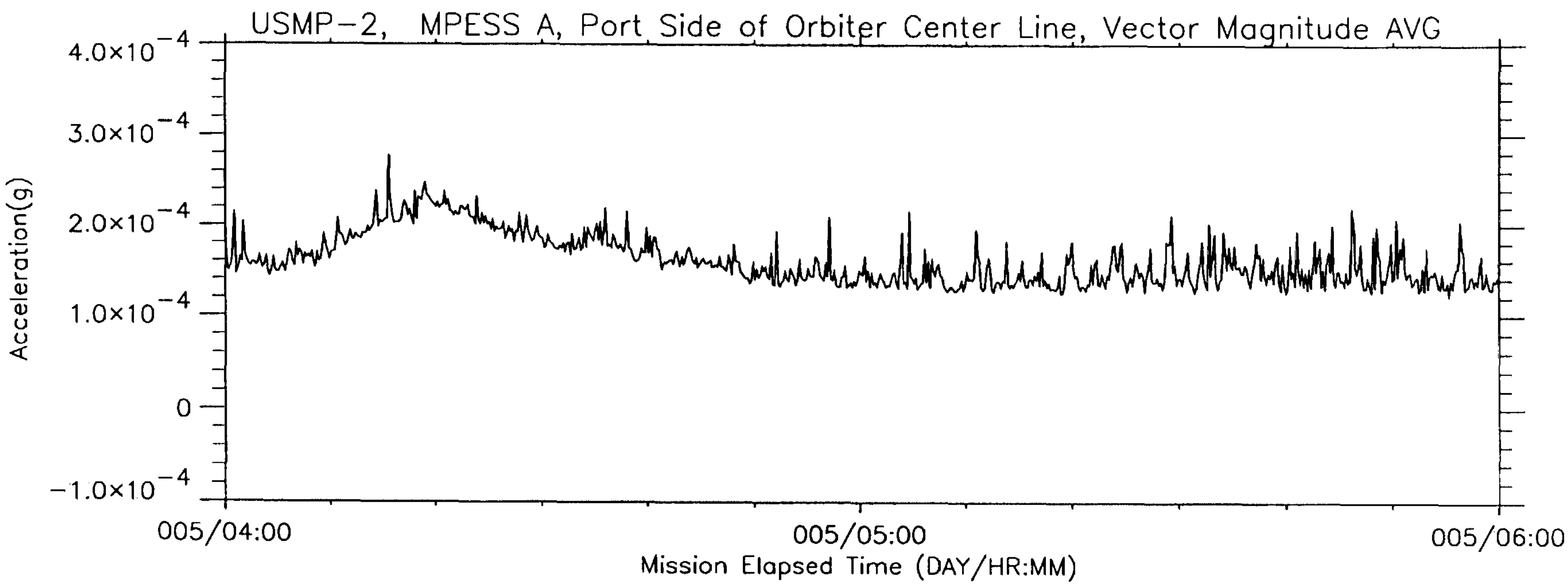
1.0×10^-4
0
005/02:00
005/03:00
005/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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3.0×10^-4
2.0×10^-4
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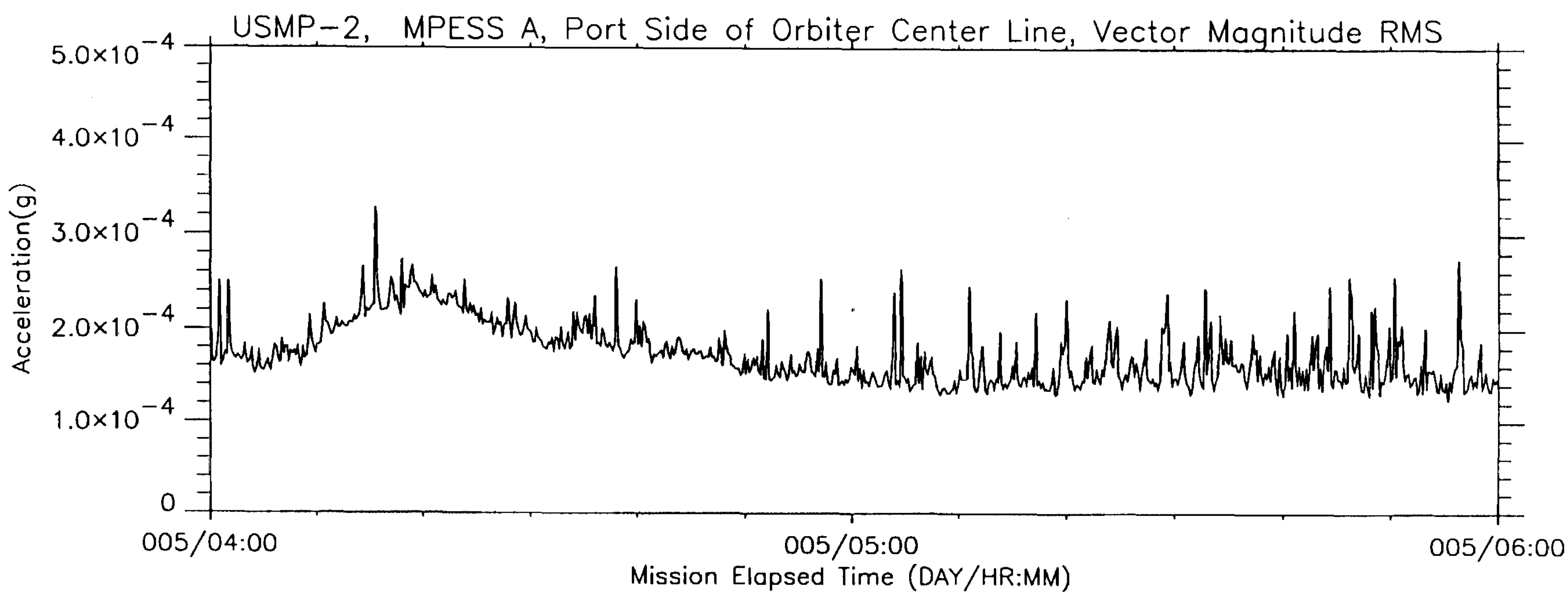
0
-1.0×10^-4
005/04:00
005/05:00
005/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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3.0×10^-4
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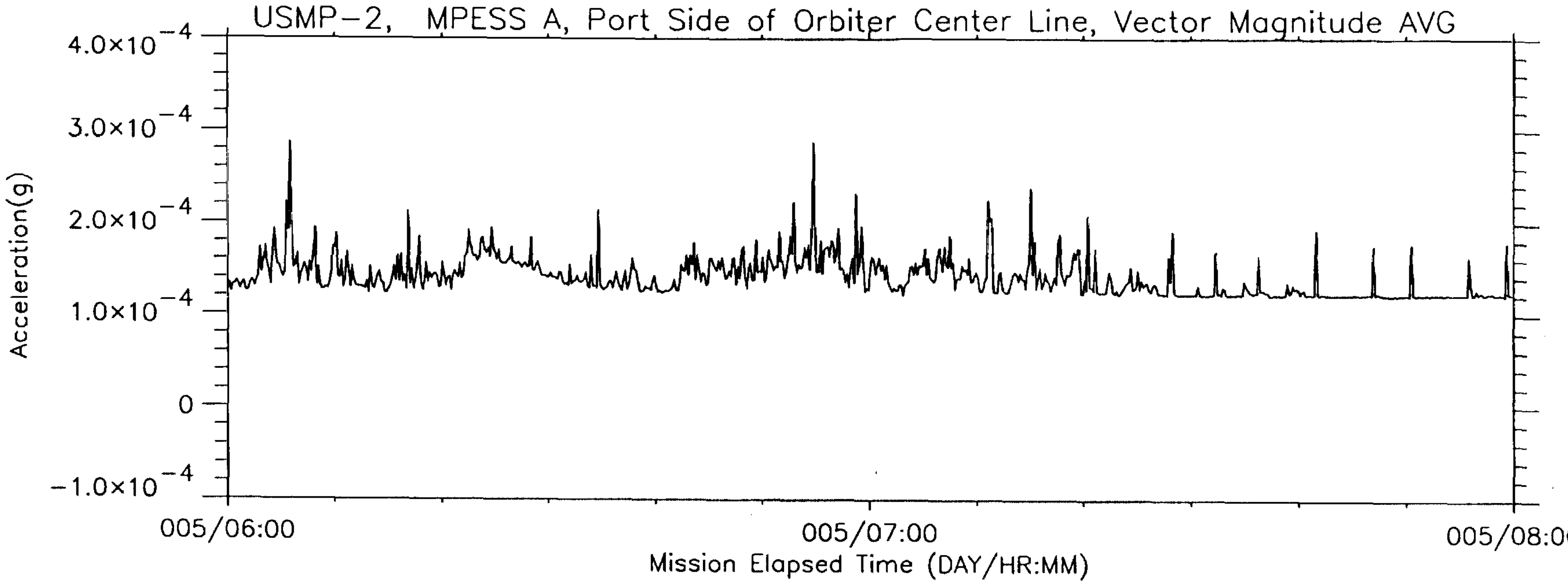
1.0×10^-4
0
005/04:00
005/05:00
005/06:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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3.0×10^{-4}
2.0×10^{-4}
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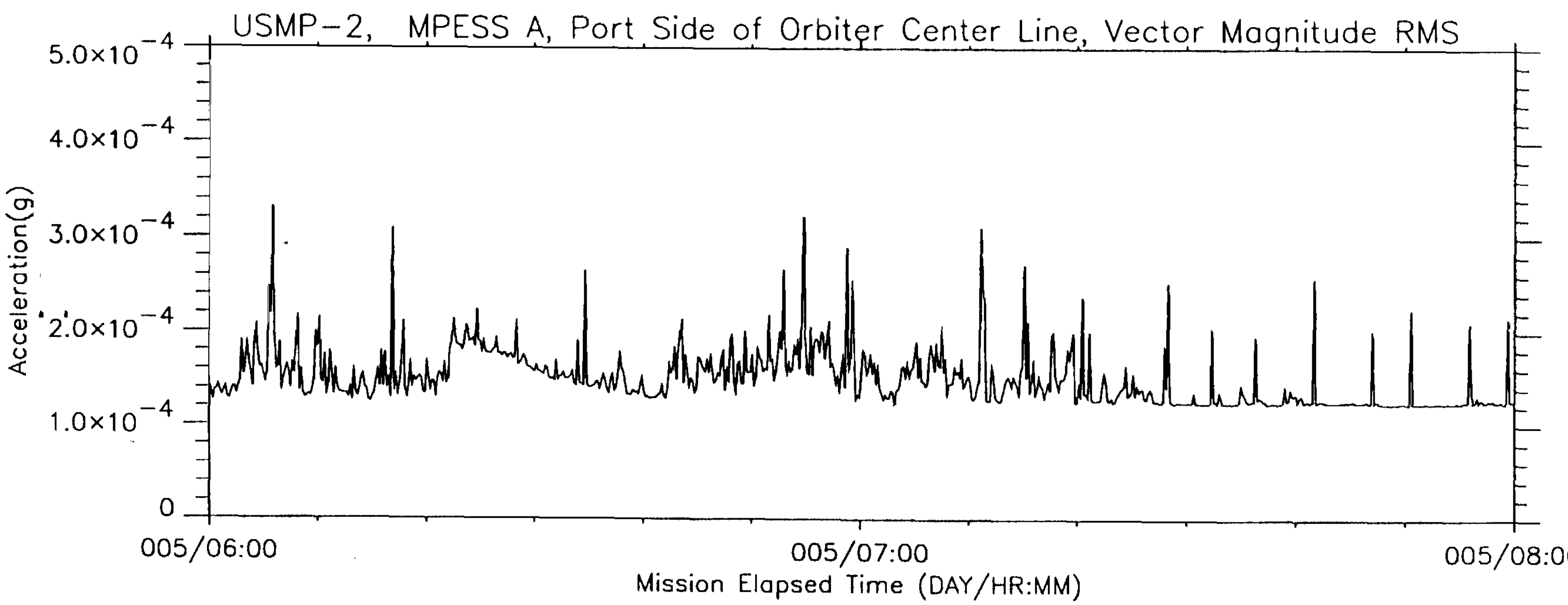
0
-1.0×10^{-4}
005/06:00
005/07:00
005/08:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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3.0×10^{-4}
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1.0×10^{-4}
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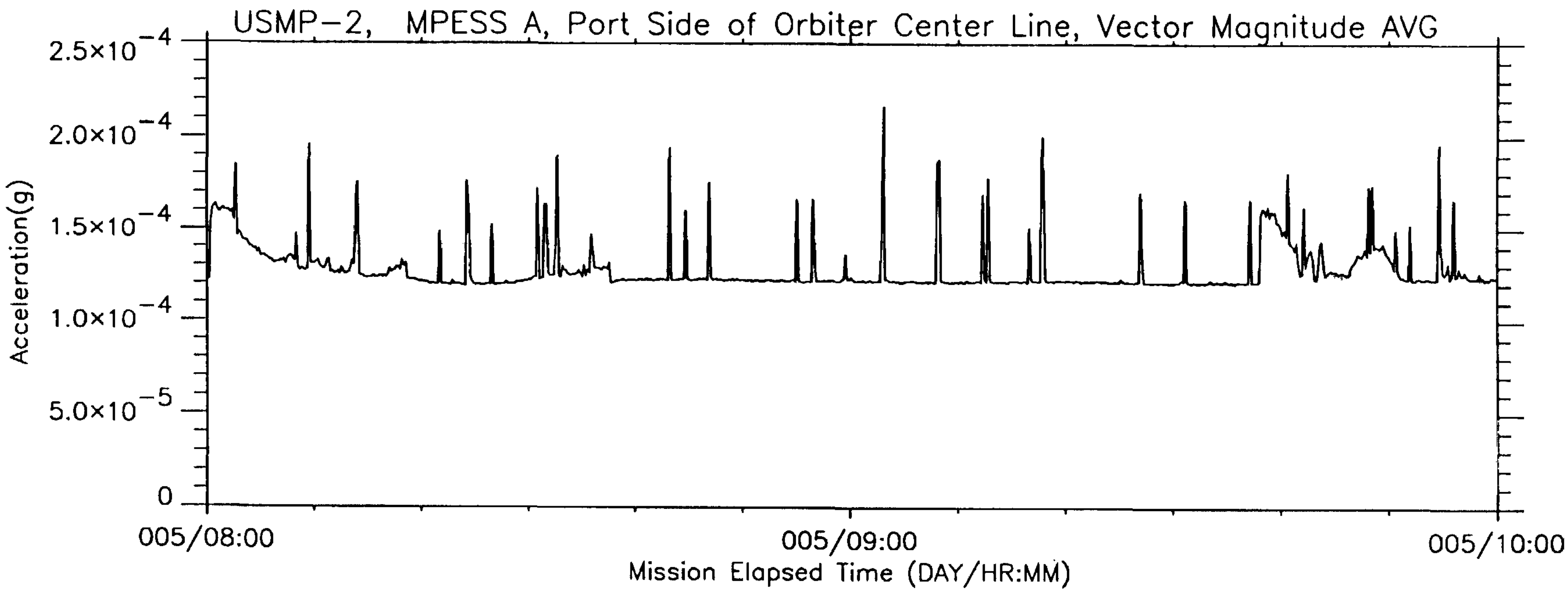
005/07:00
005/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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1.5×10^-4
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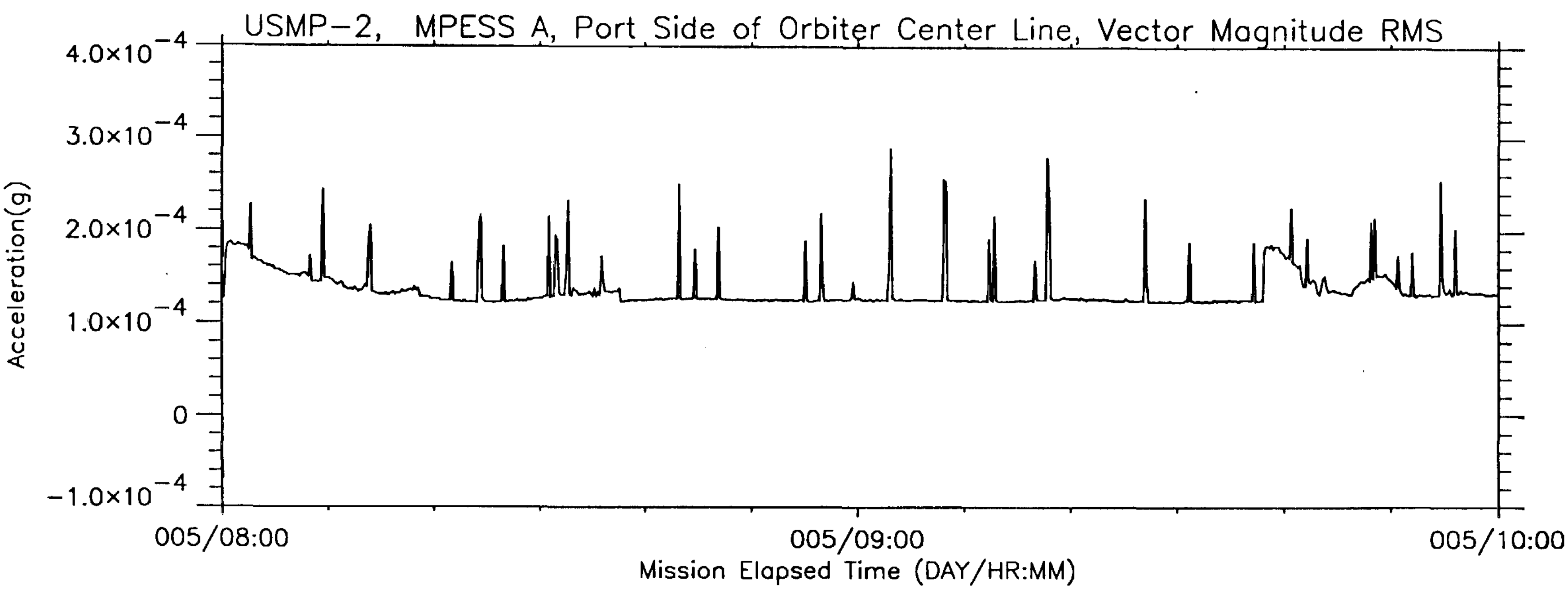
005/09:00
005/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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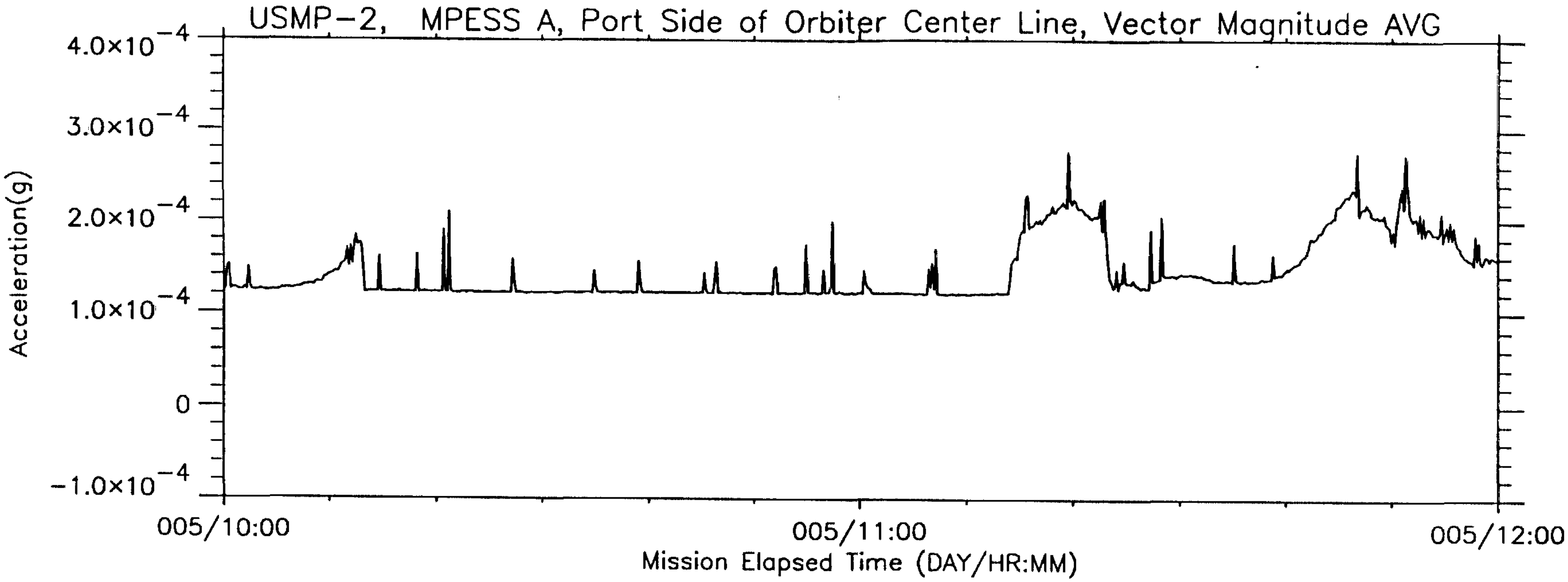
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
-1.0×10^-4
005/08:00
005/09:00
005/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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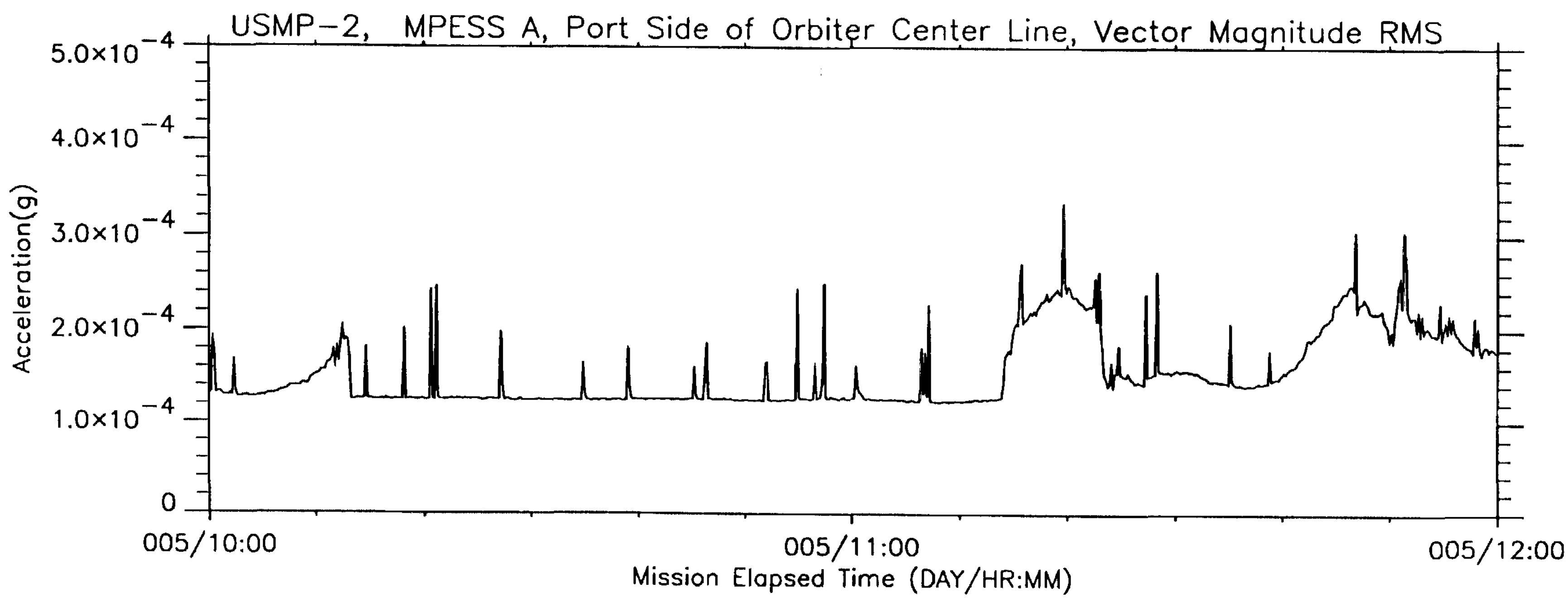
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
-1.0×10^-4
005/10:00
005/11:00
005/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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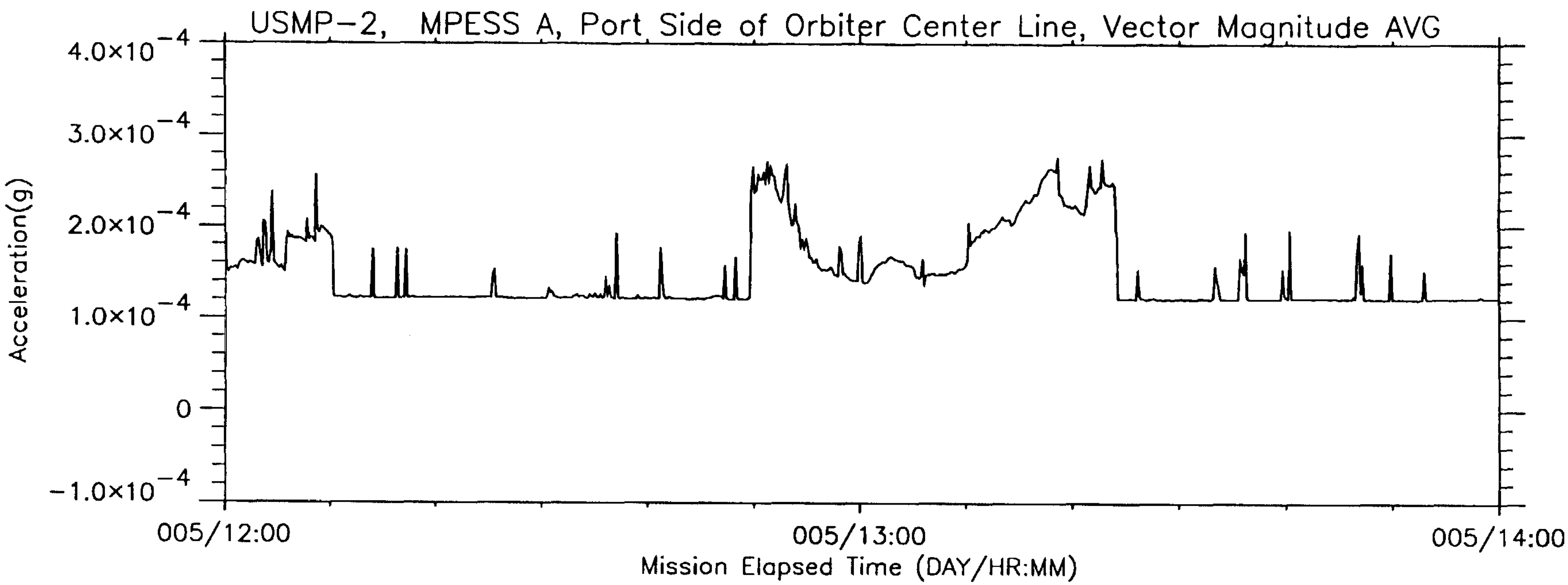
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
005/10:00
005/11:00
005/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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3.0×10−4
2.0×10−4
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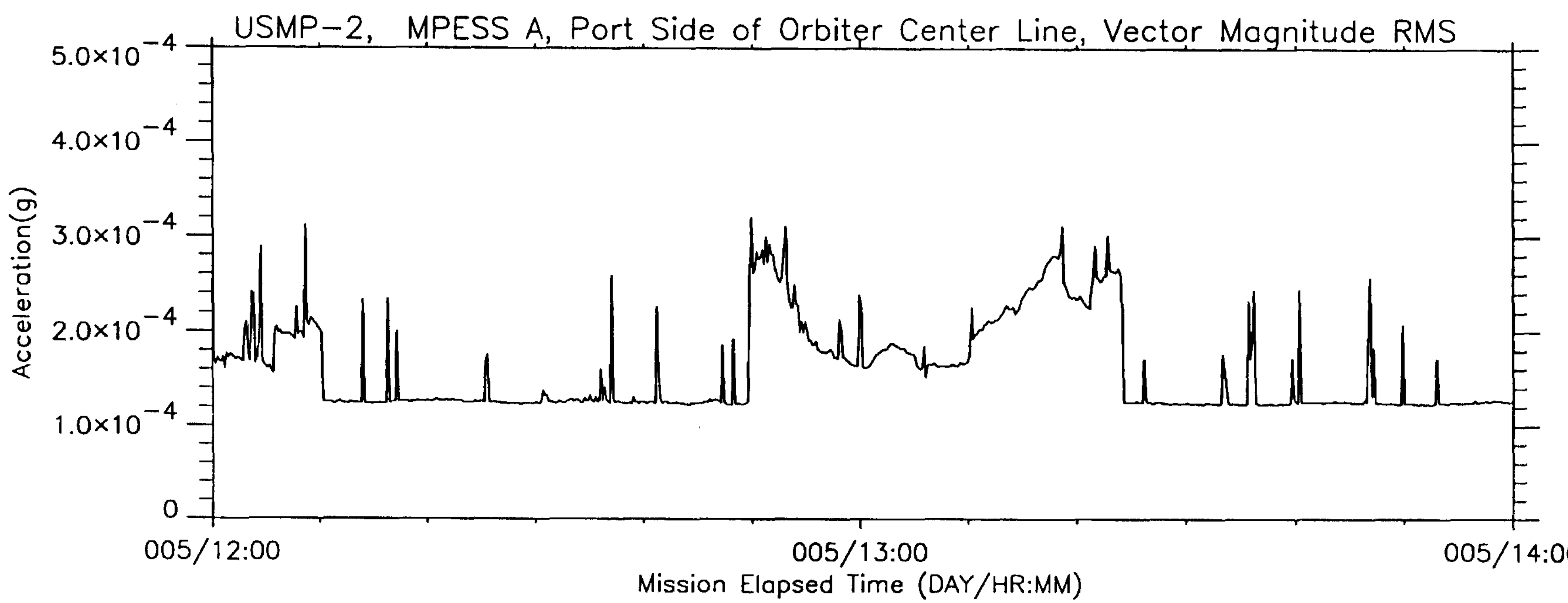
0
−1.0×10−4
005/12:00
005/13:00
005/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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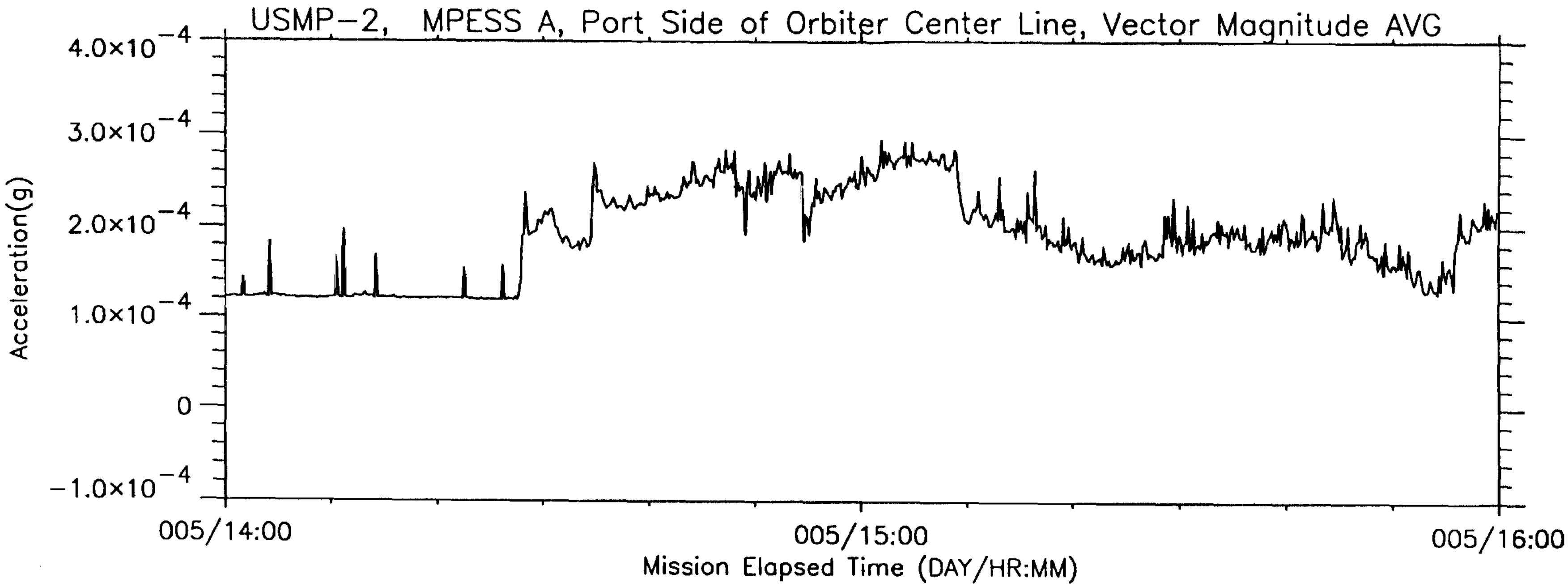
4.0×10−4
3.0×10−4
2.0×10−4
1.0×10−4
0
005/12:00
005/13:00
005/14:00
Mission Elapsed Time (DAY/HR:MM)

C-2


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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3.0×10^{-4}
2.0×10^{-4}
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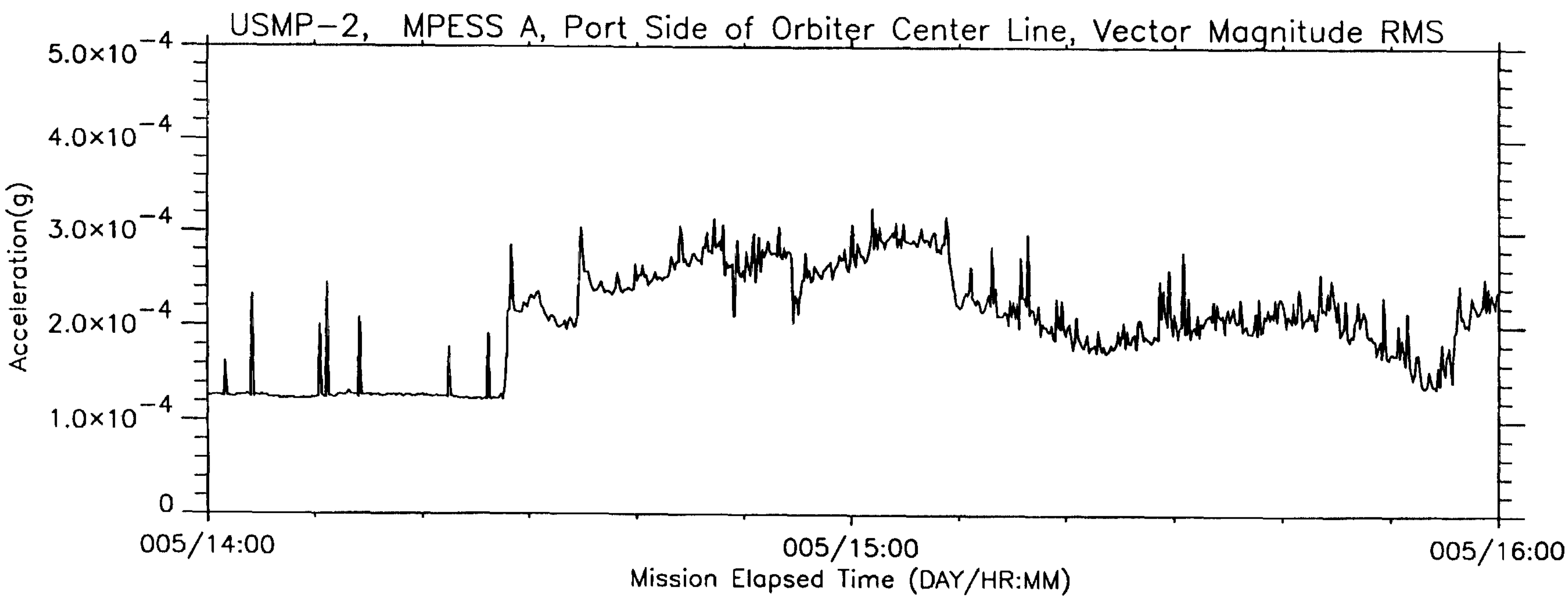
0
−1.0×10^{-4}
005/14:00
005/15:00
005/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
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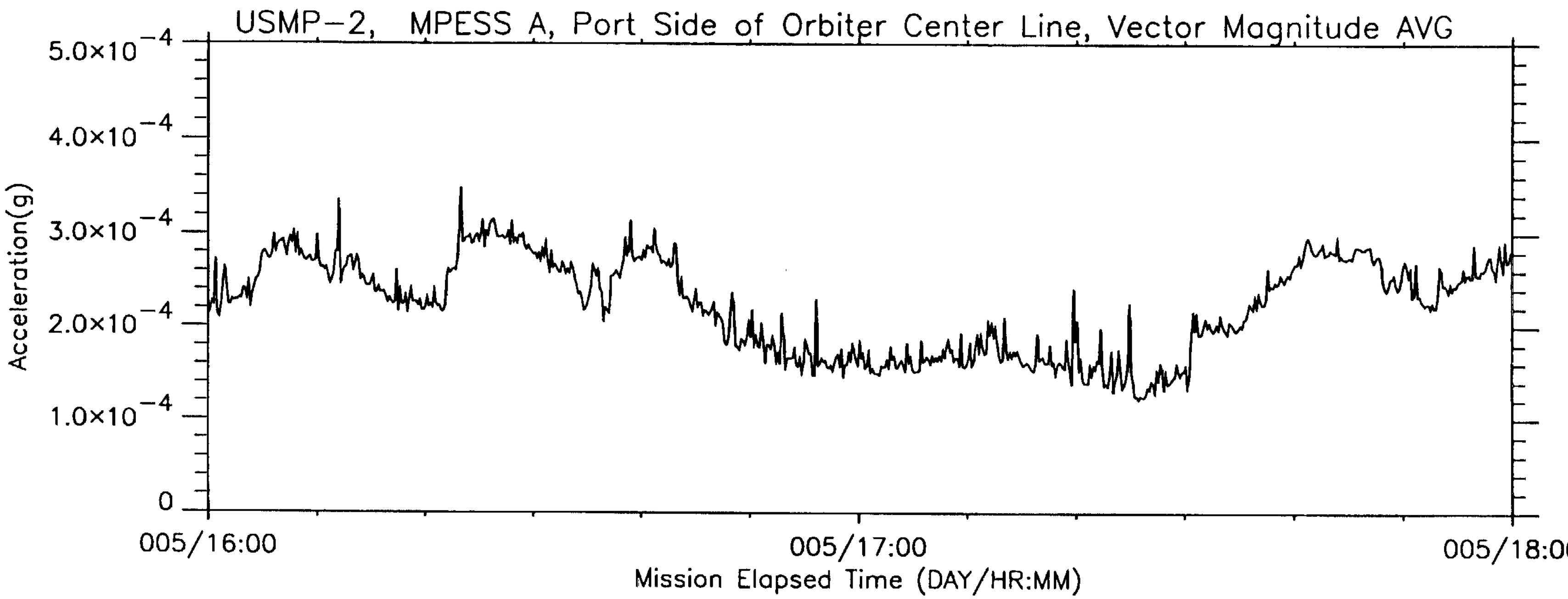
005/16:00
Mission Elapsed Time (DAY/HR:MM)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0
Acceleration(g)
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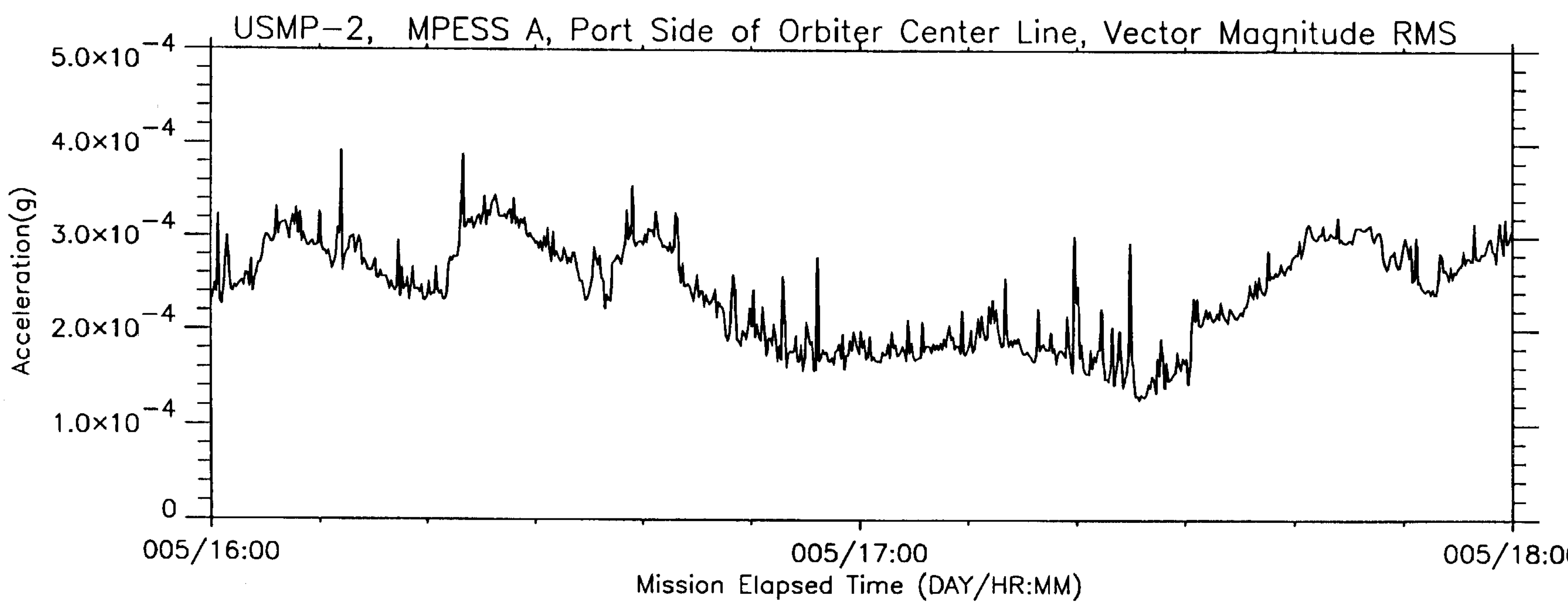
005/17:00
005/18:00
Mission Elapsed Time (DAY/HR:MM)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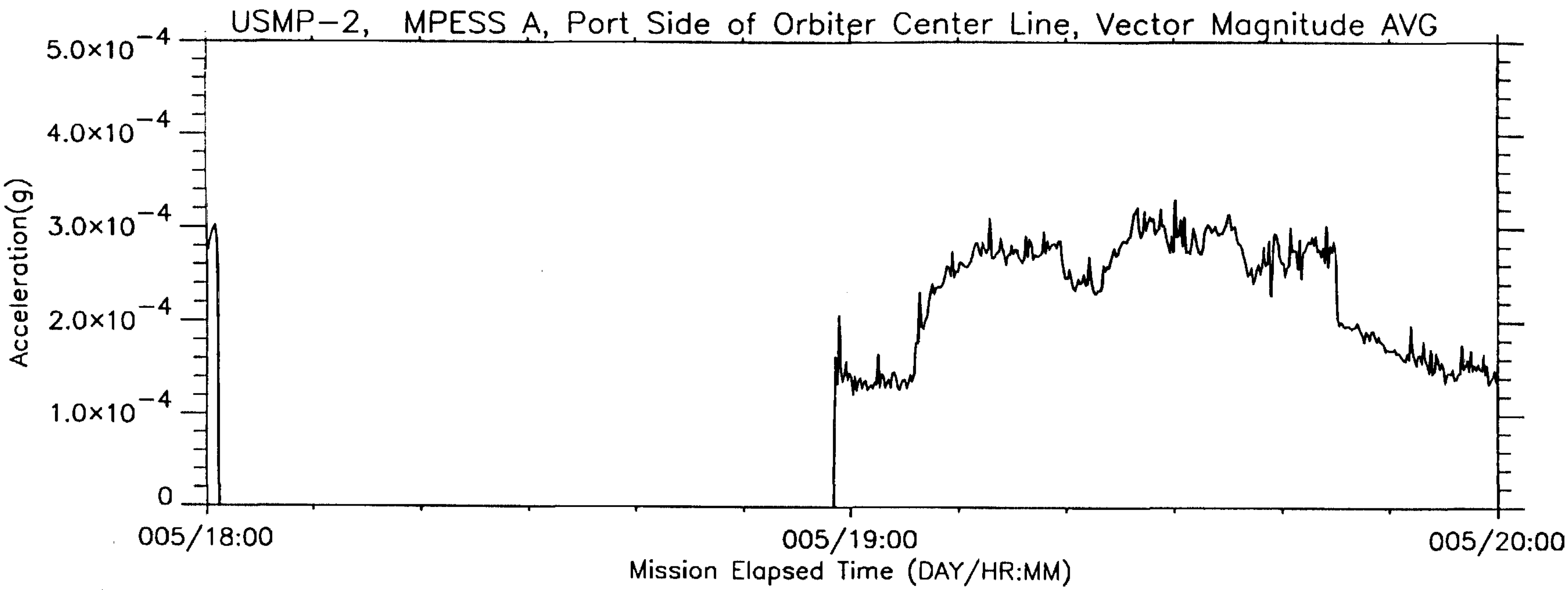
0
Acceleration(g)
005/16:00
005/17:00
005/18:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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3.0×10^{-4}
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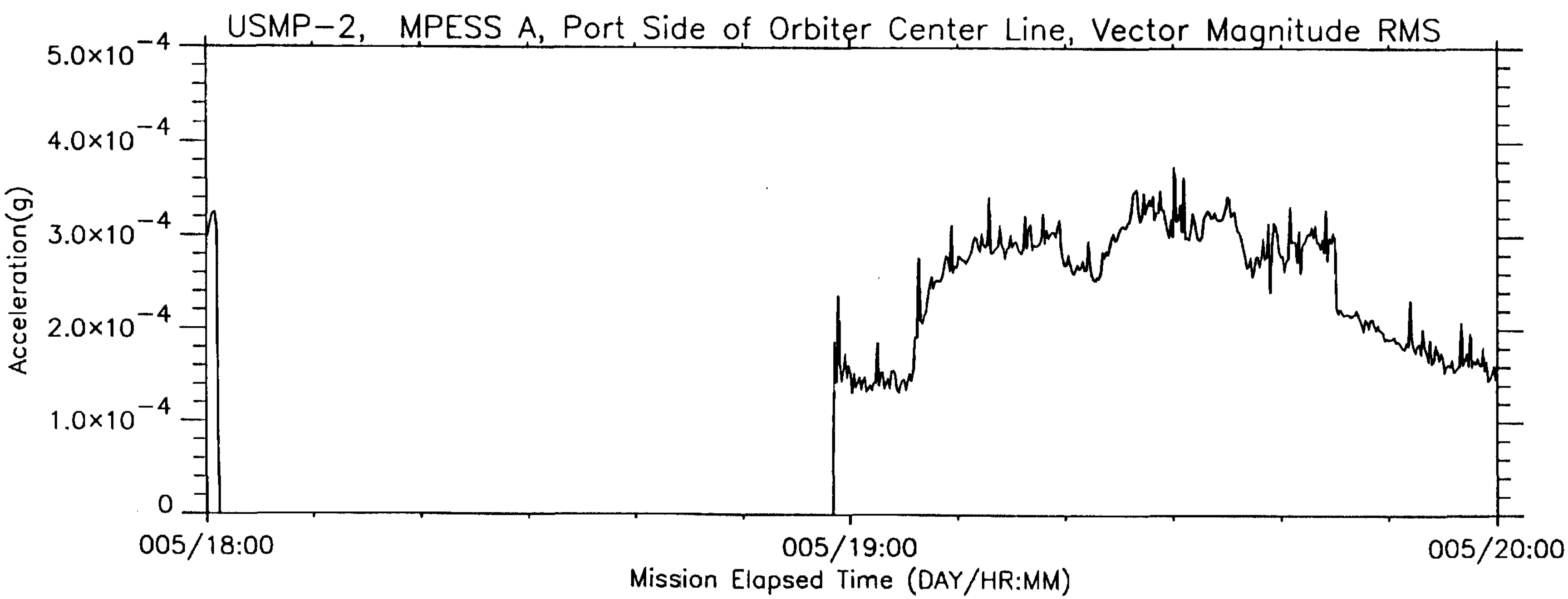
005/19:00
005/20:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
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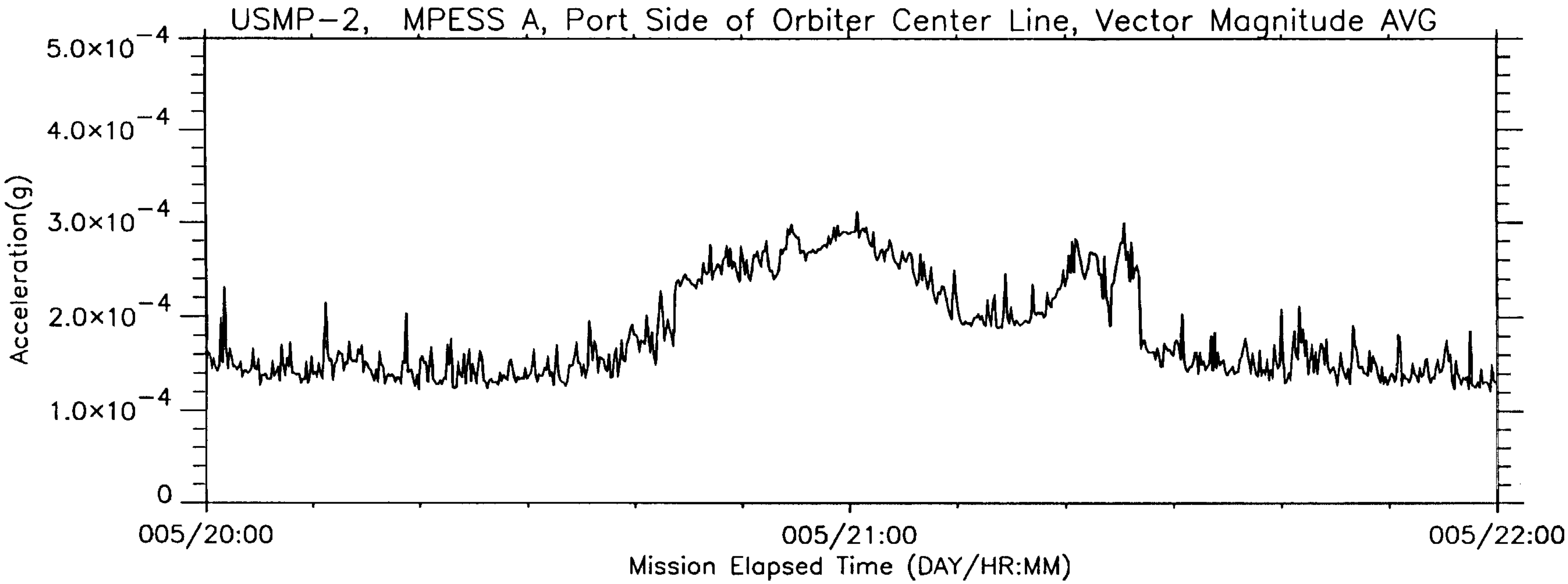
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
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1.0×10^{-4}
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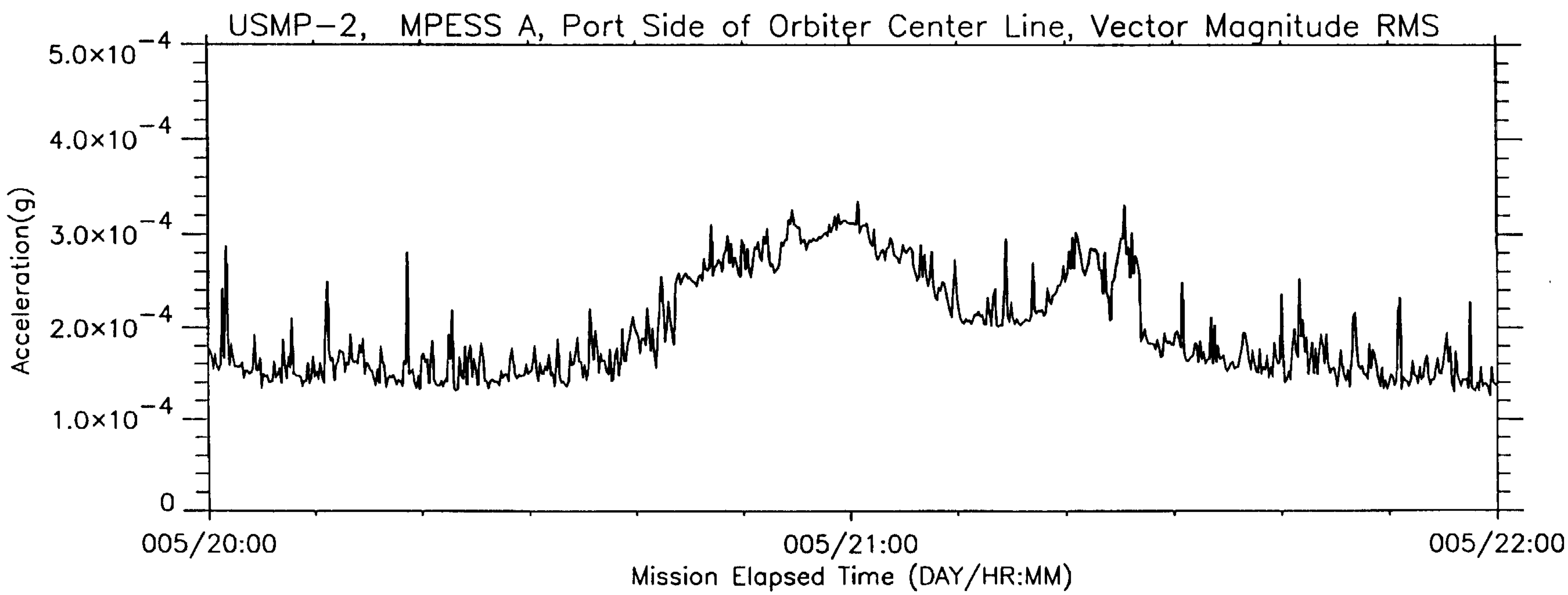
005/21:00
005/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
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1.0×10^{-4}
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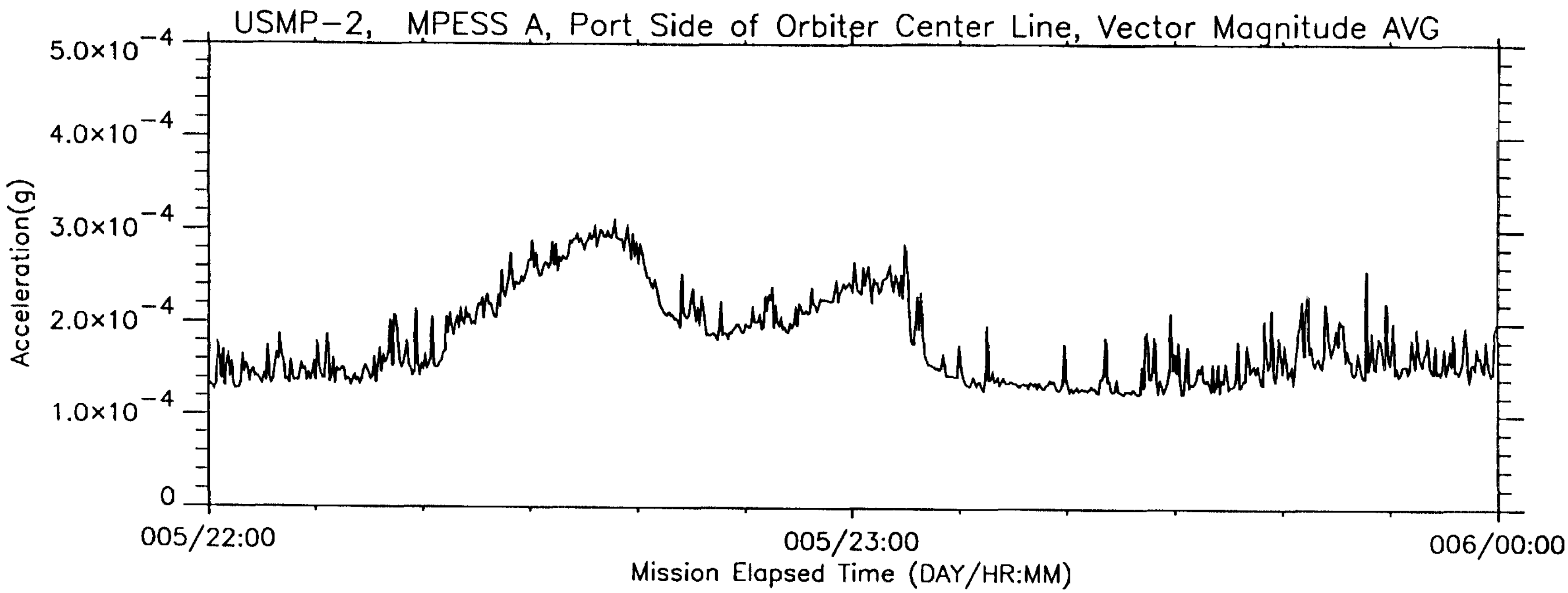
005/21:00
005/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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4.0×10^-4
3.0×10^-4
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1.0×10^-4
0
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005/23:00
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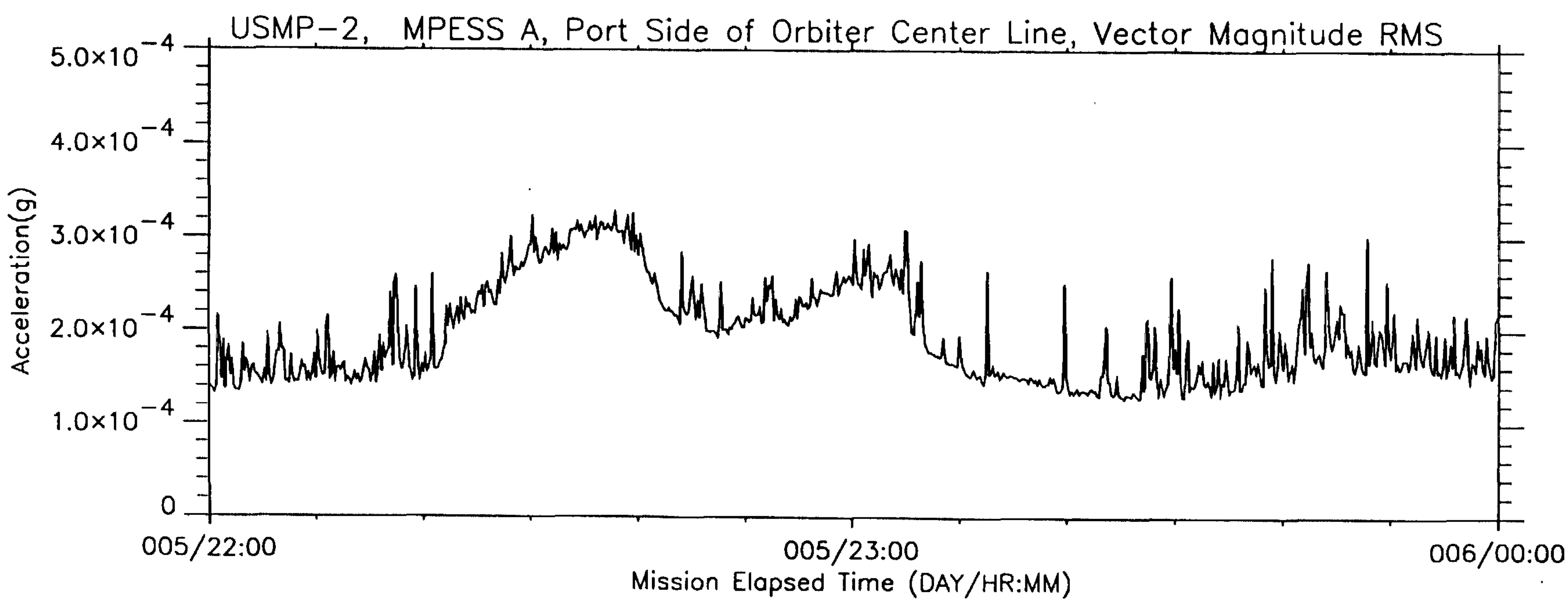
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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3.0×10^-4
2.0×10^-4
1.0×10^-4
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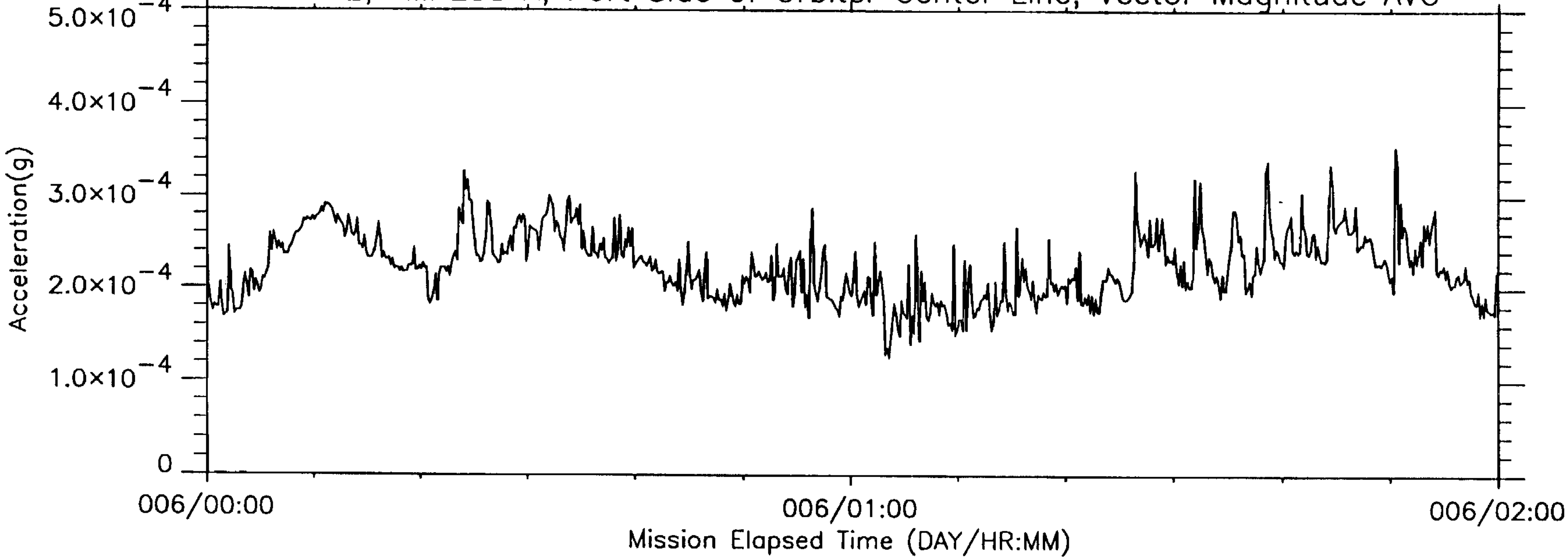
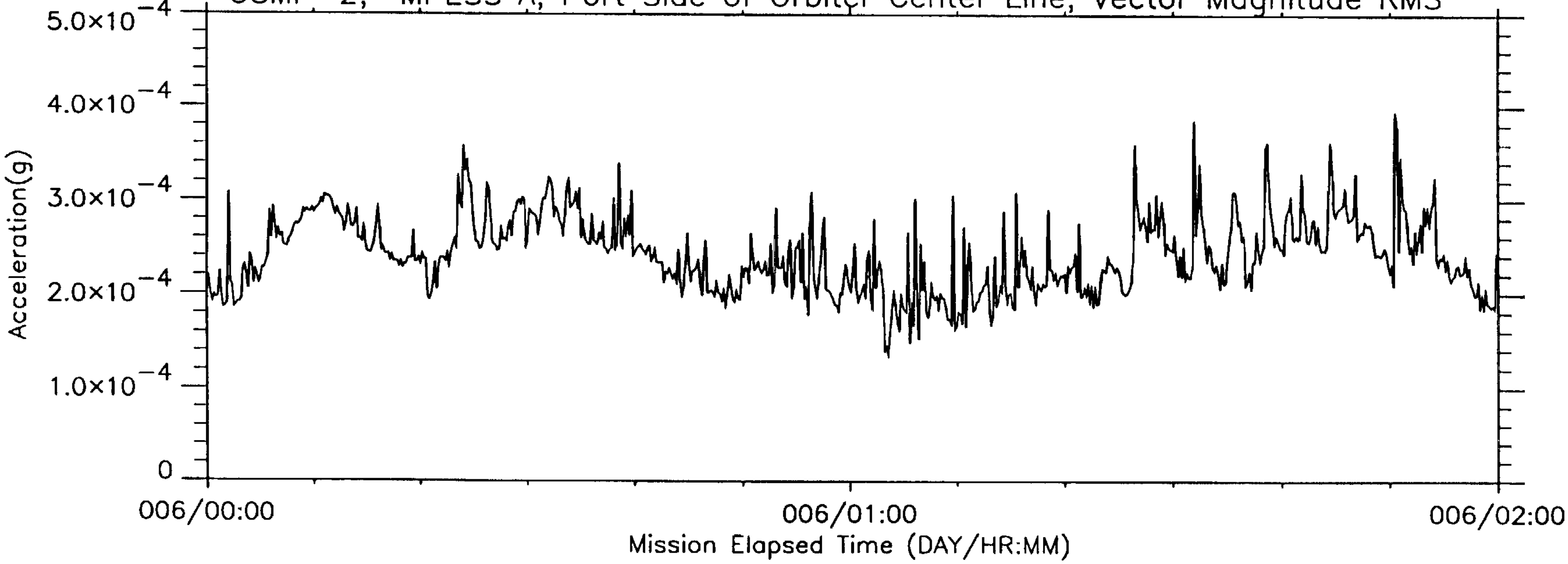
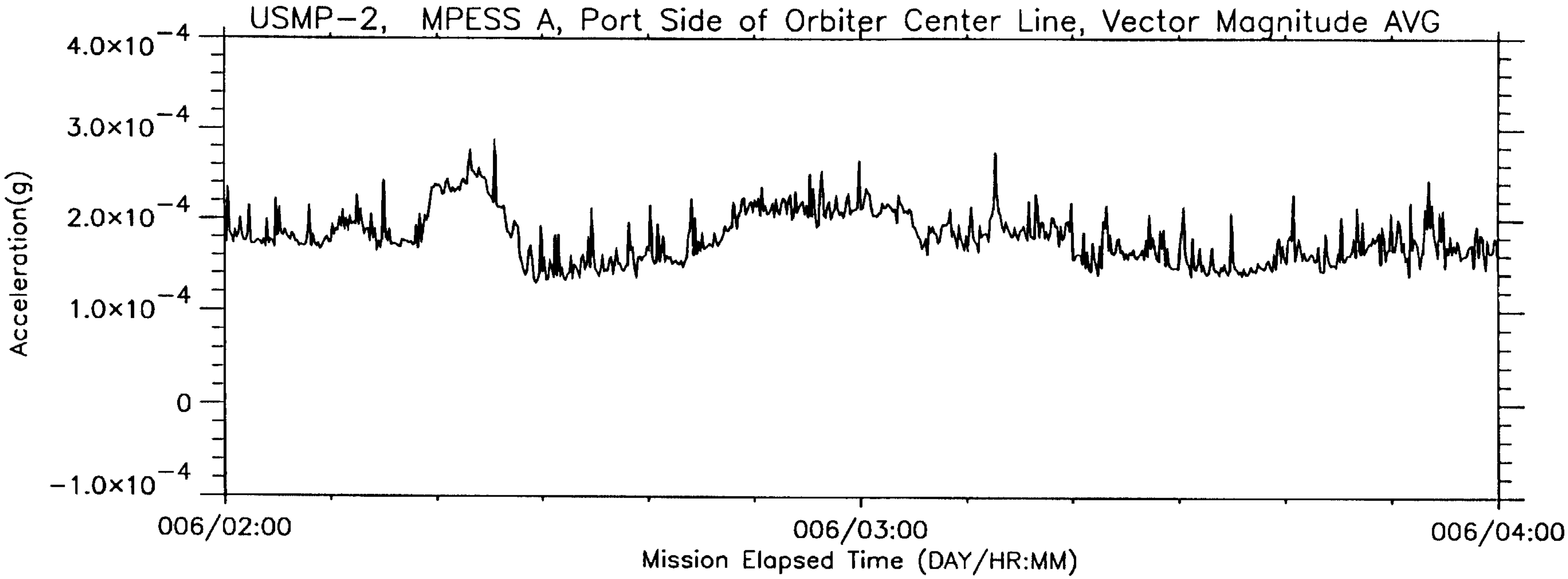
006/00:00
Mission Elapsed Time (DAY/HR:MM)

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS




USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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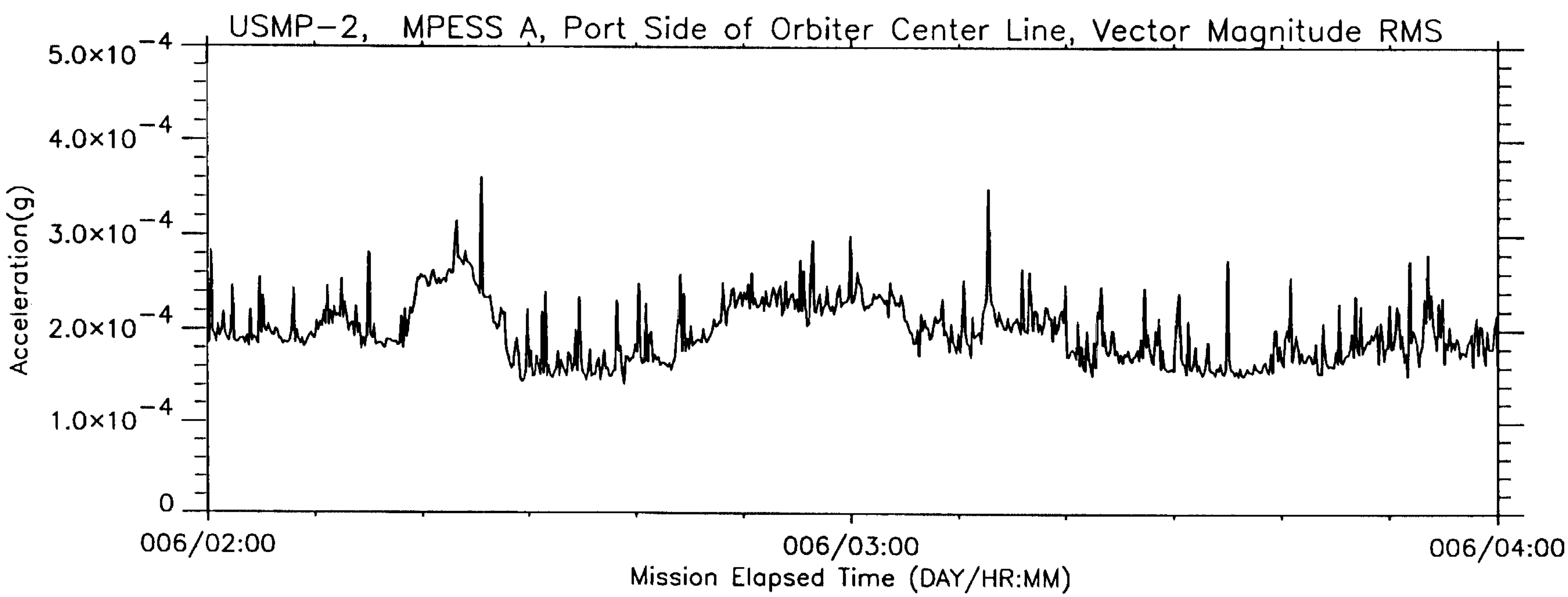
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
-1.0×10^-4
006/02:00
006/03:00
006/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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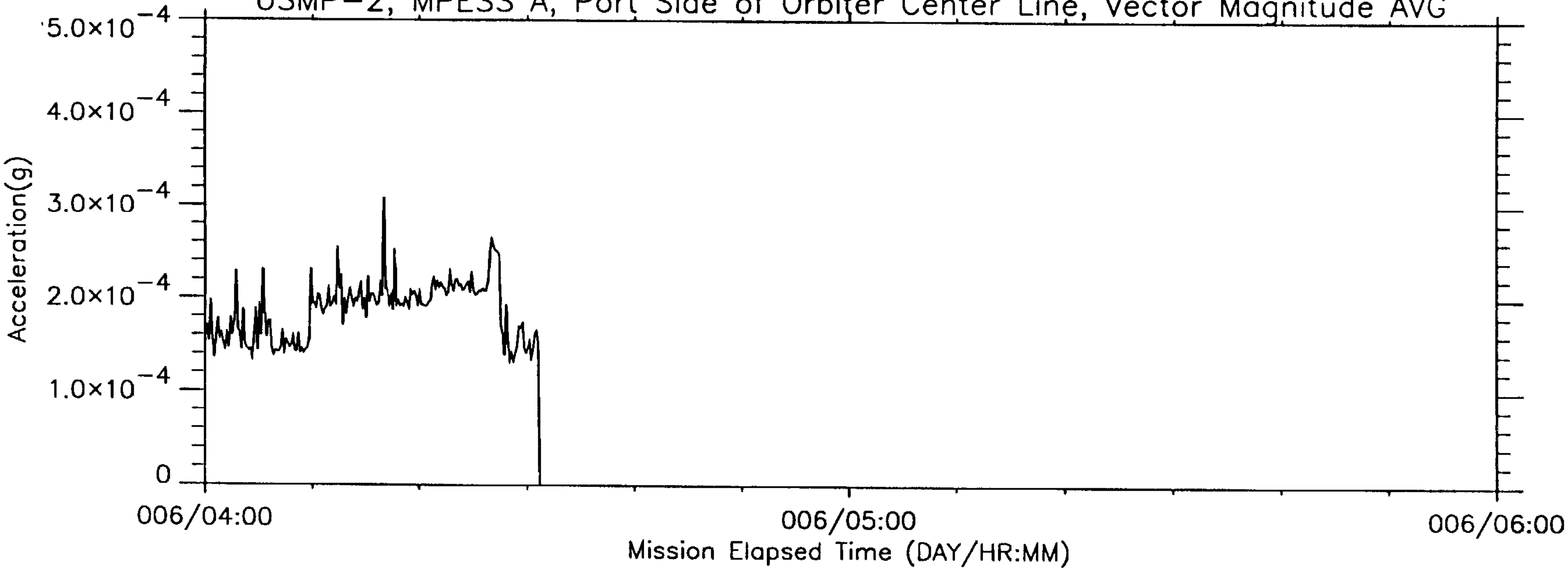
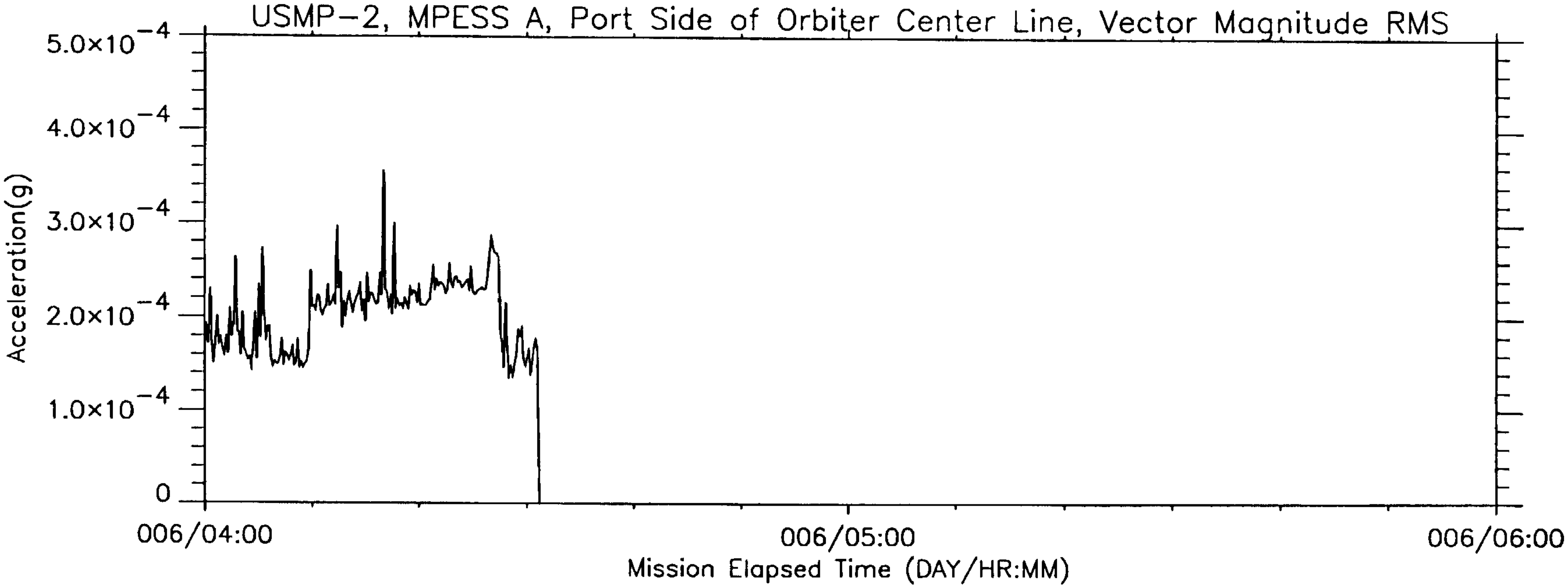
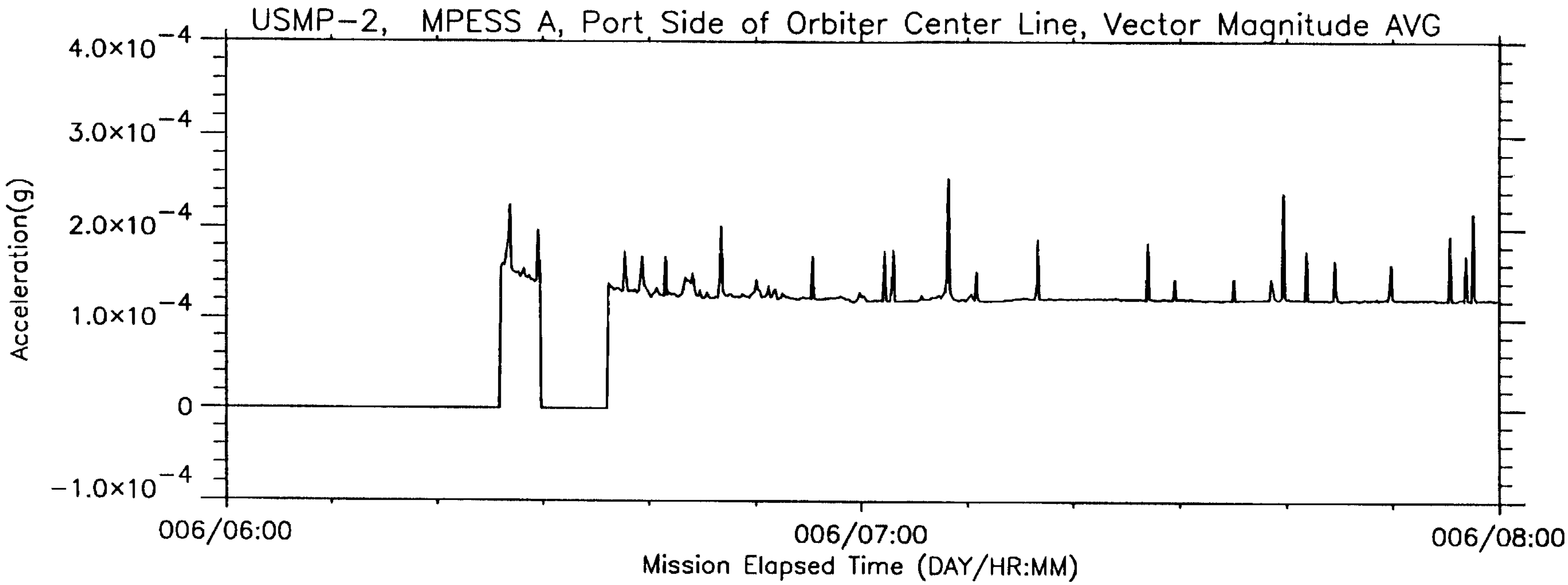
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
006/02:00
006/03:00
006/04:00
Mission Elapsed Time (DAY/HR:MM)

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS




USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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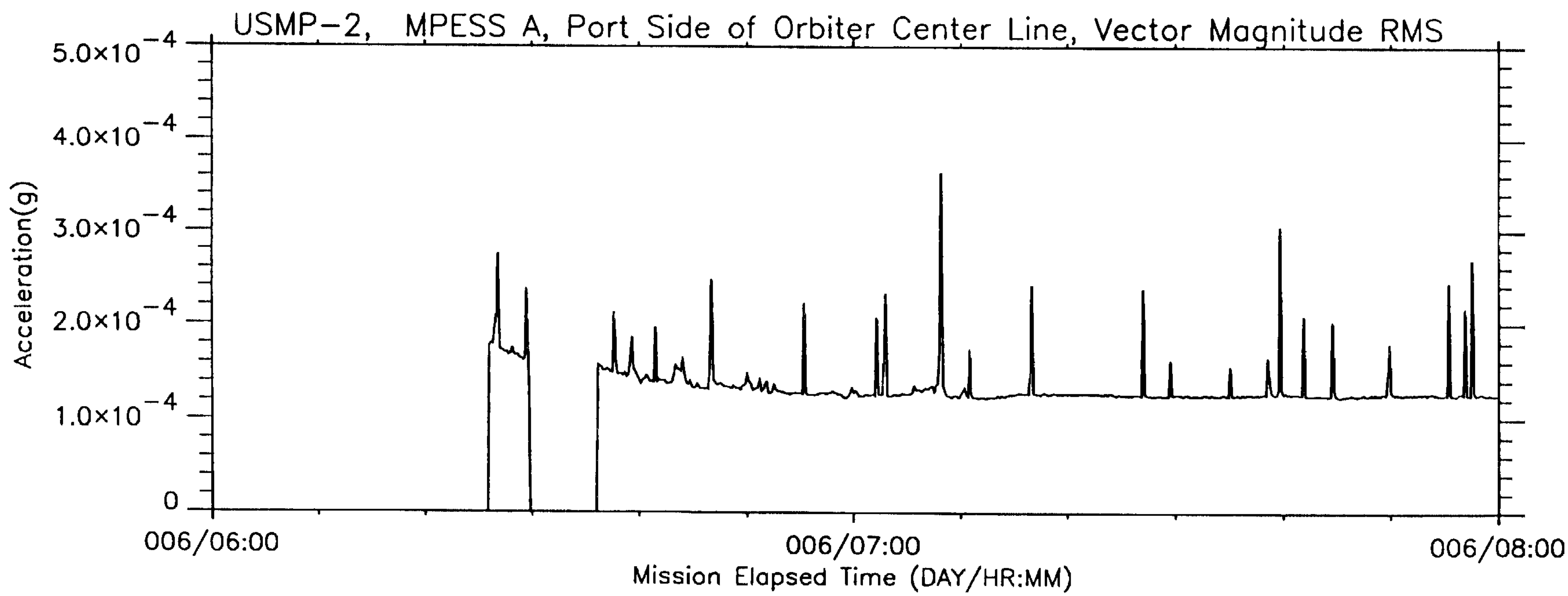
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
−1.0×10^{-4}
006/06:00
006/07:00
006/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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3.0×10^{-4}
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1.0×10^{-4}
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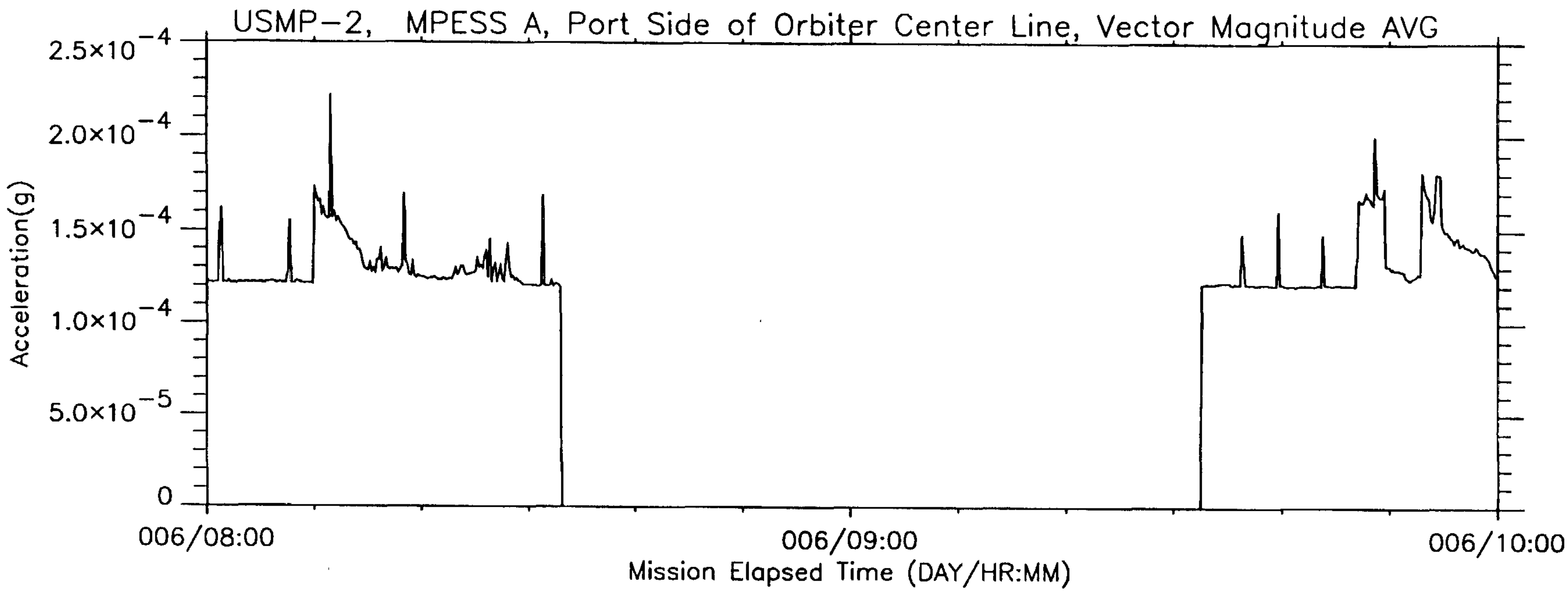
006/06:00
006/07:00
006/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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2.0×10^{-4}
1.5×10^{-4}
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5.0×10^{-5}
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006/08:00
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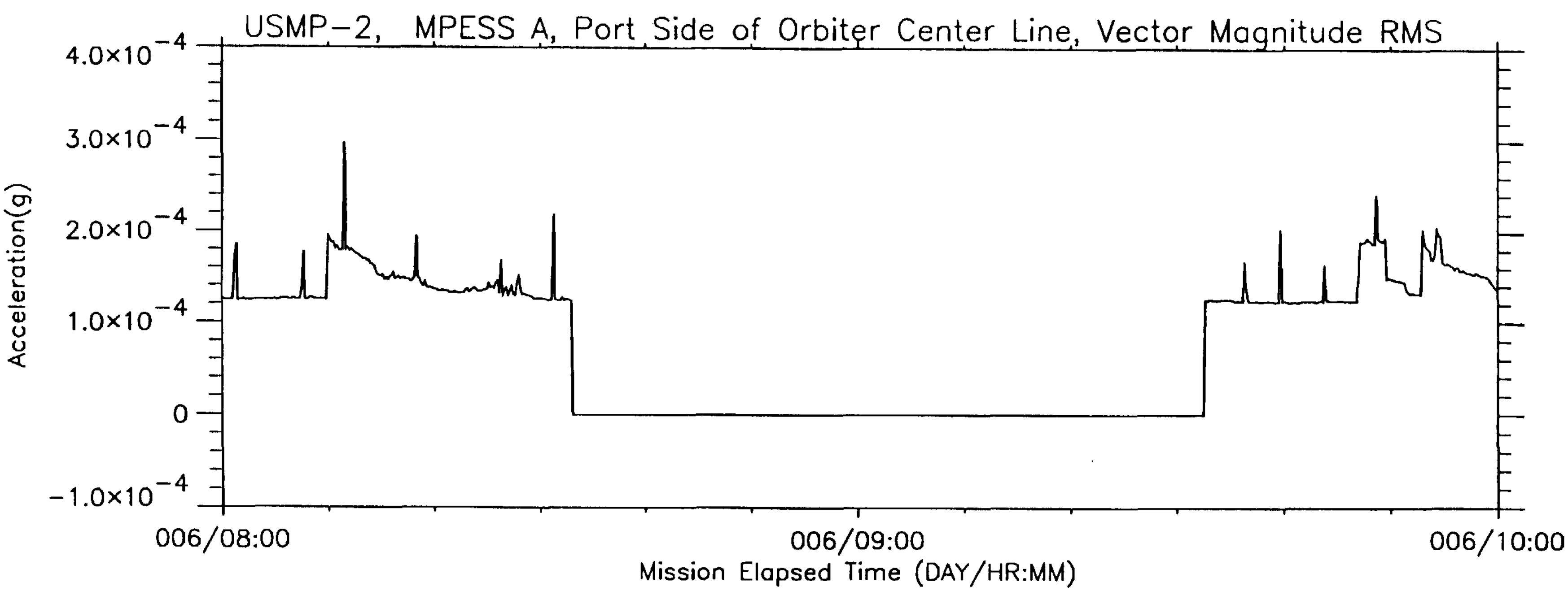
006/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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3.0×10^{-4}
2.0×10^{-4}
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0
-1.0×10^{-4}
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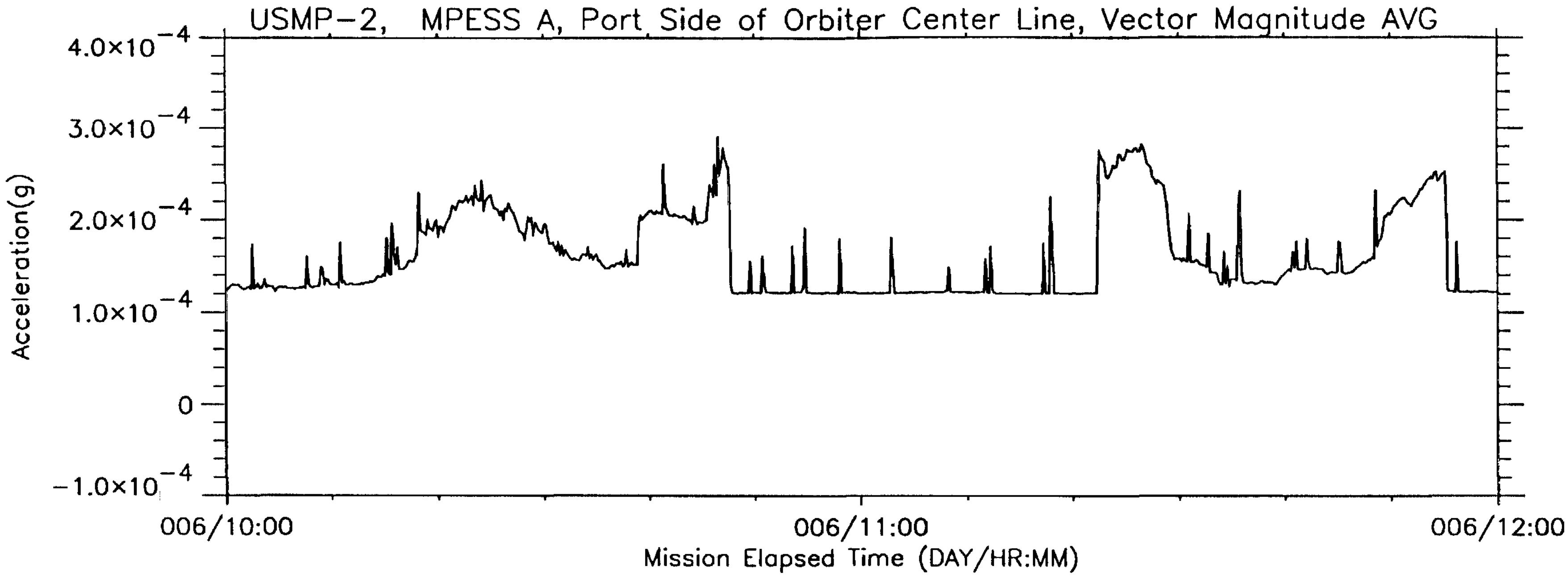
006/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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3.0×10^-4
2.0×10^-4
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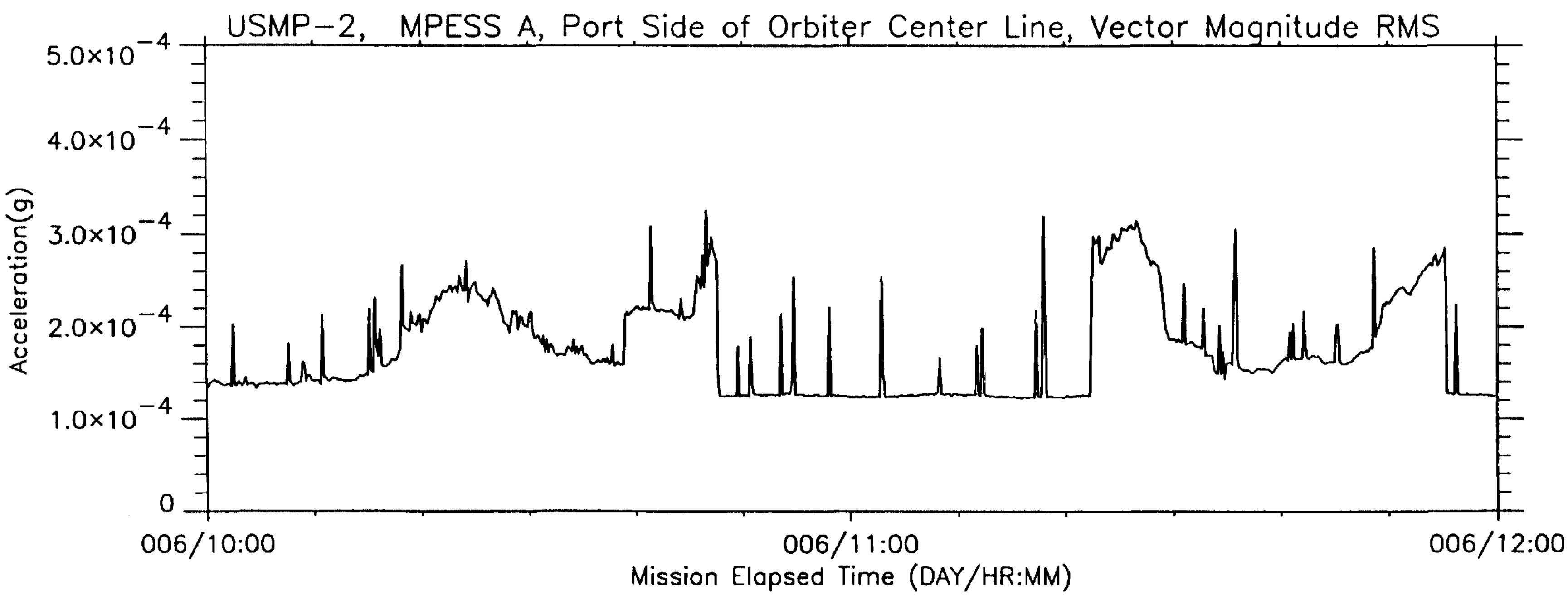
0
-1.0×10^-4
006/10:00
006/11:00
006/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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3.0×10^-4
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1.0×10^-4
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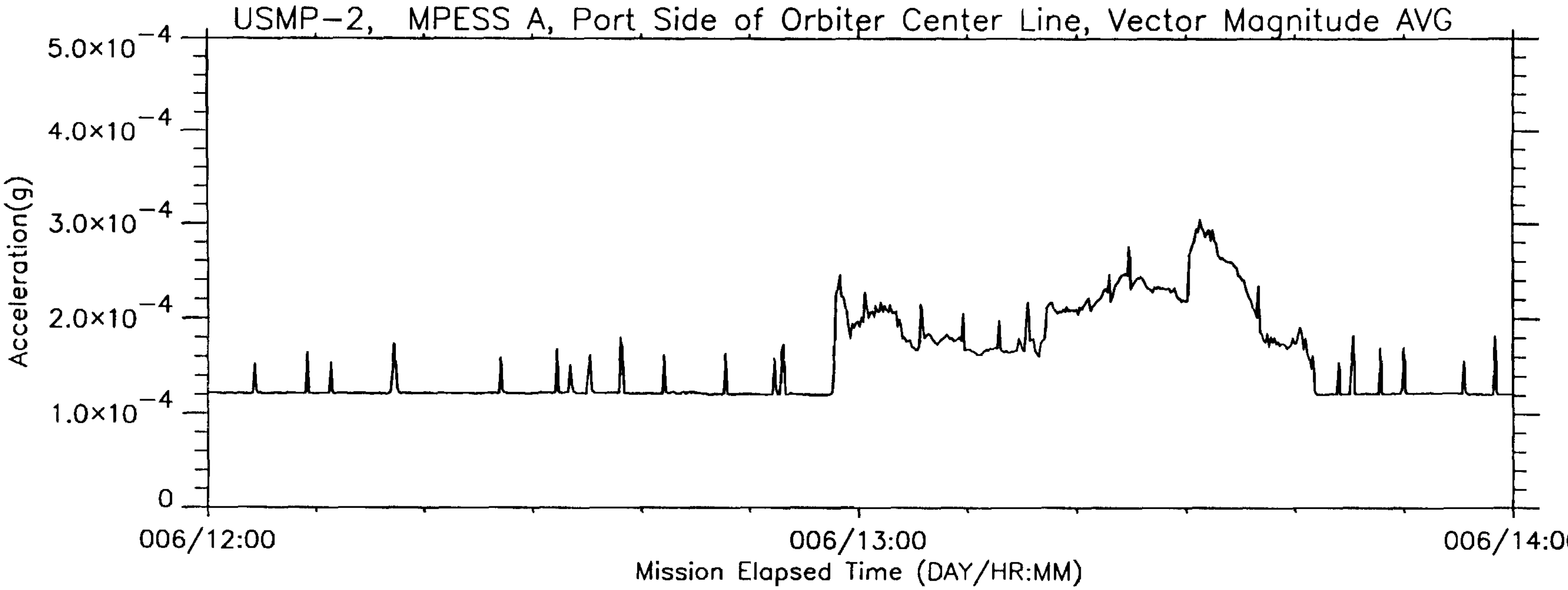
006/10:00
006/11:00
006/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
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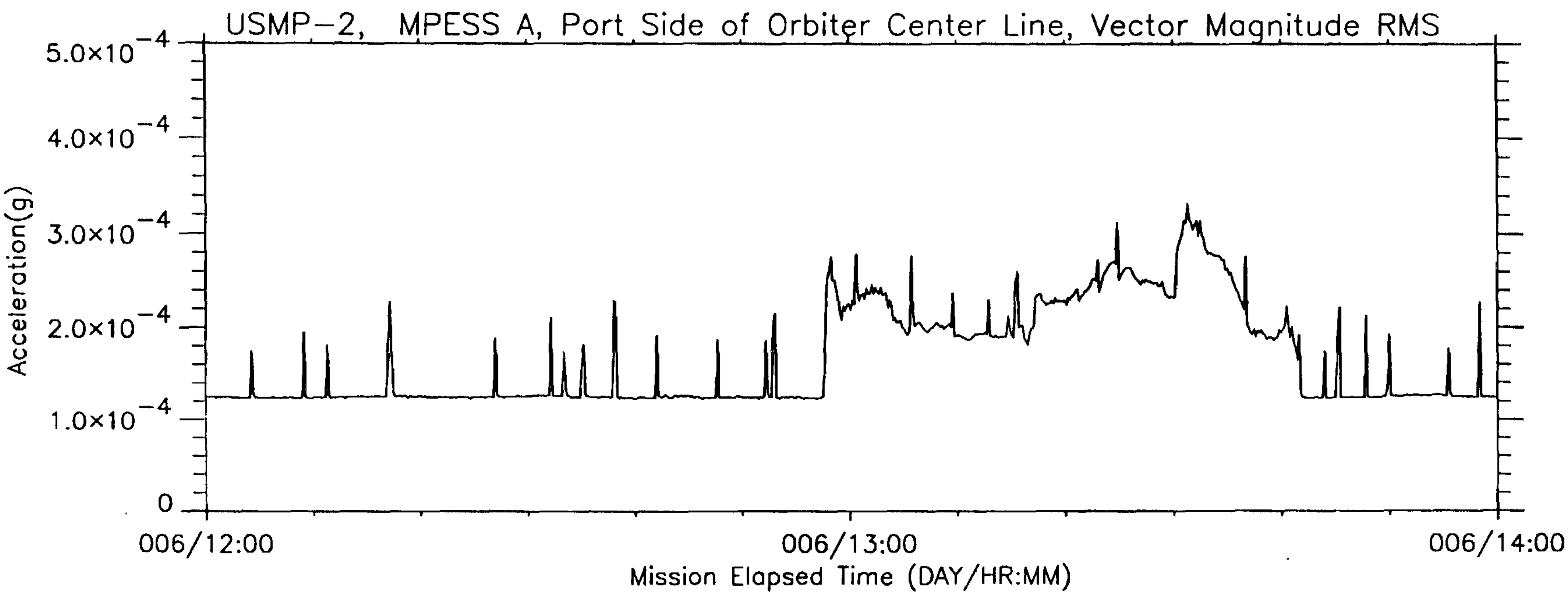
1.0×10^{-4}
0
006/12:00
006/13:00
006/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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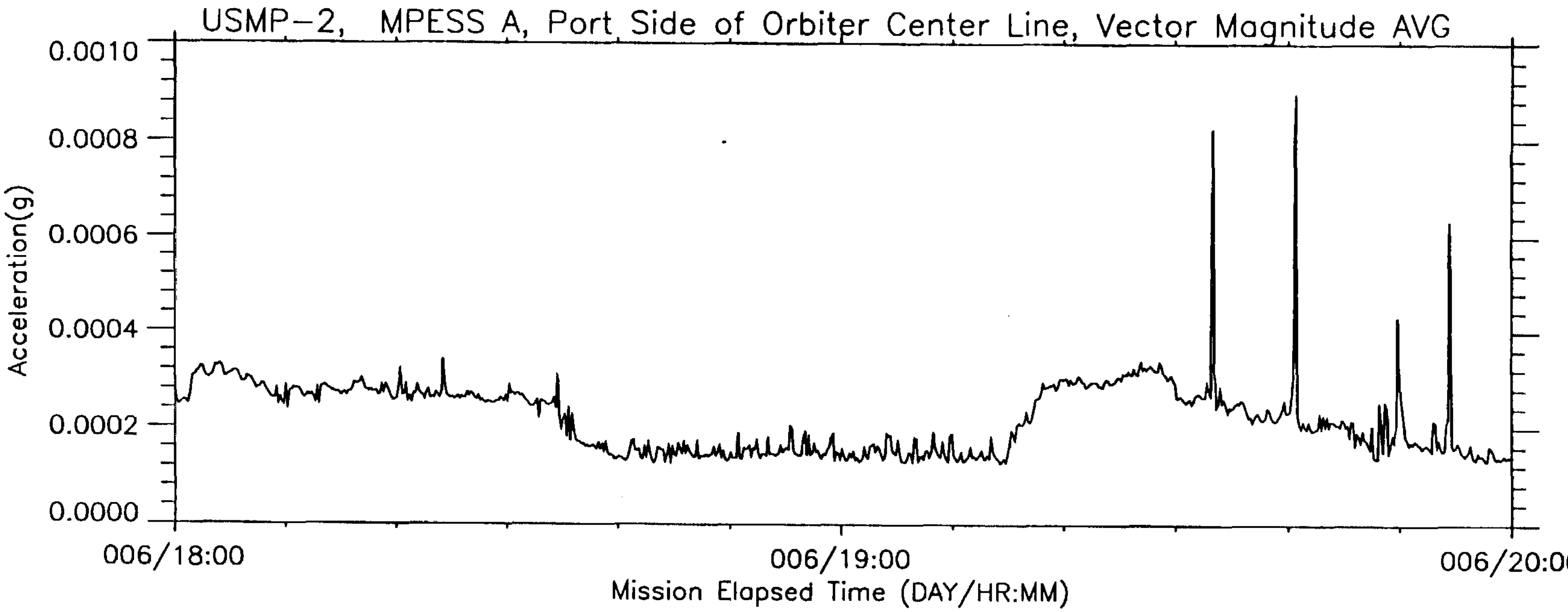
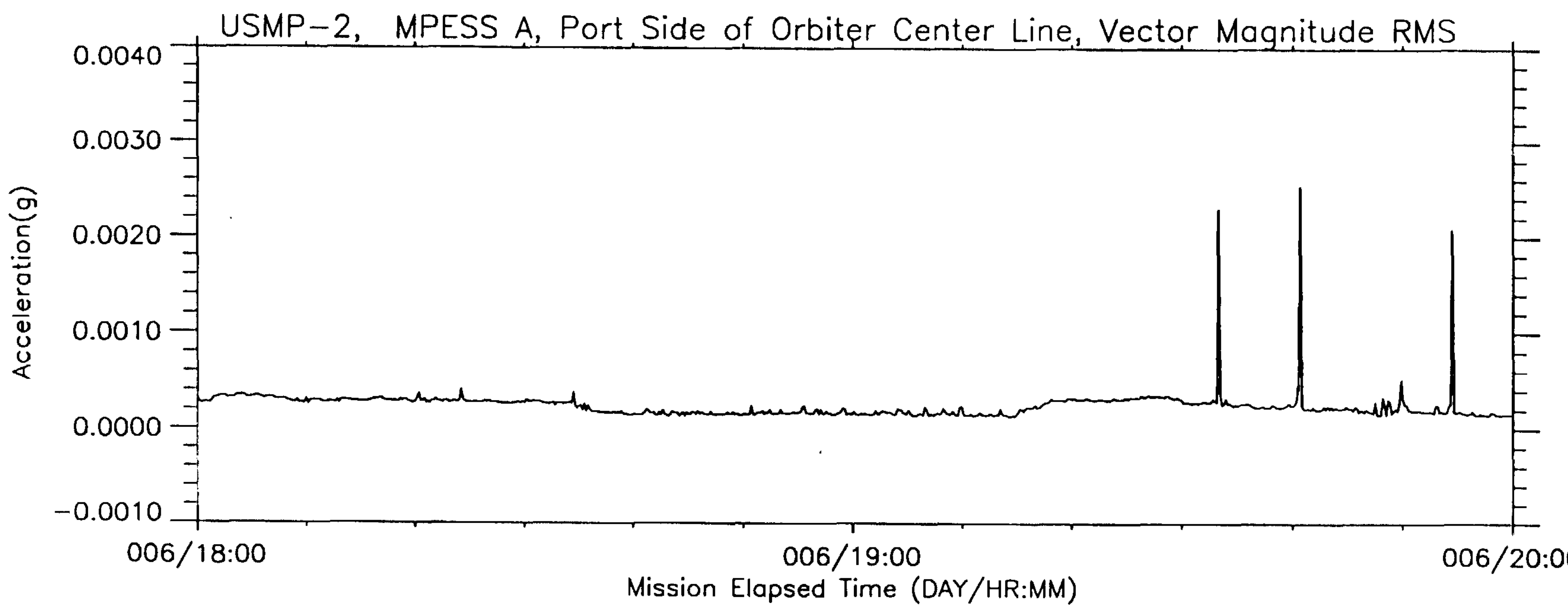
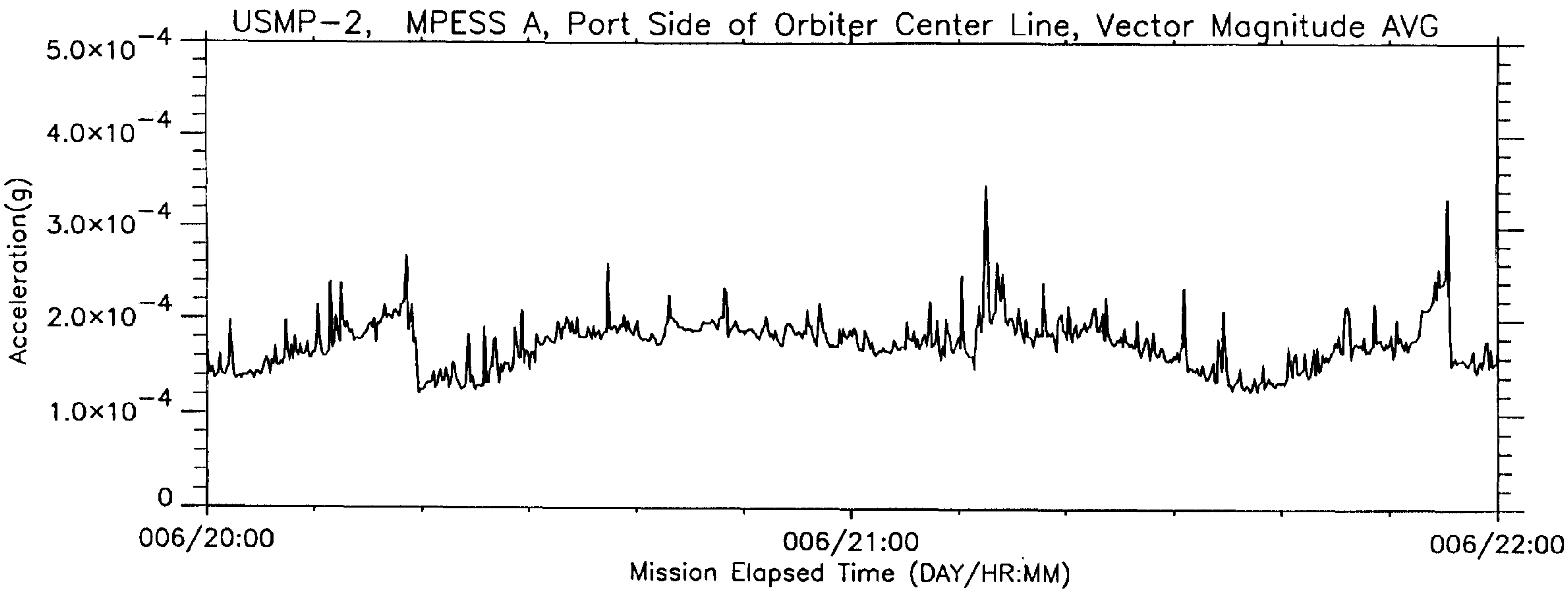
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
006/12:00
006/13:00
006/14:00
Mission Elapsed Time (DAY/HR:MM)

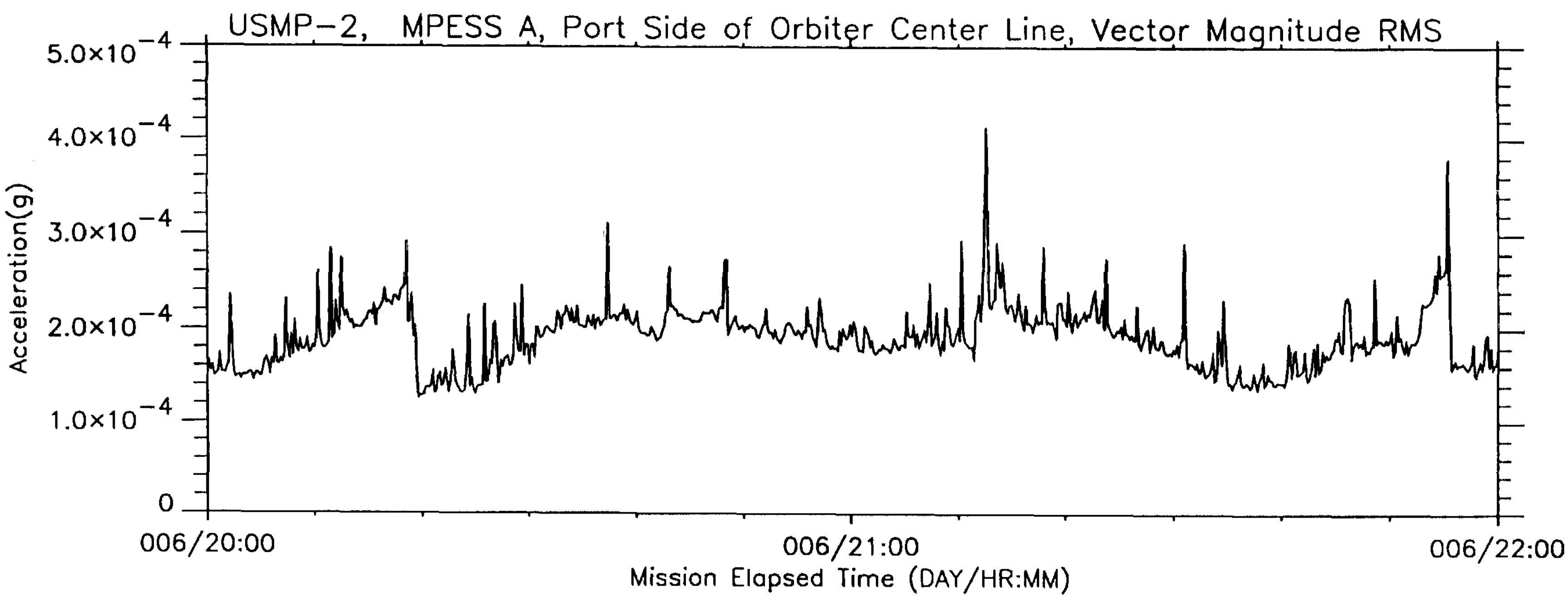
NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

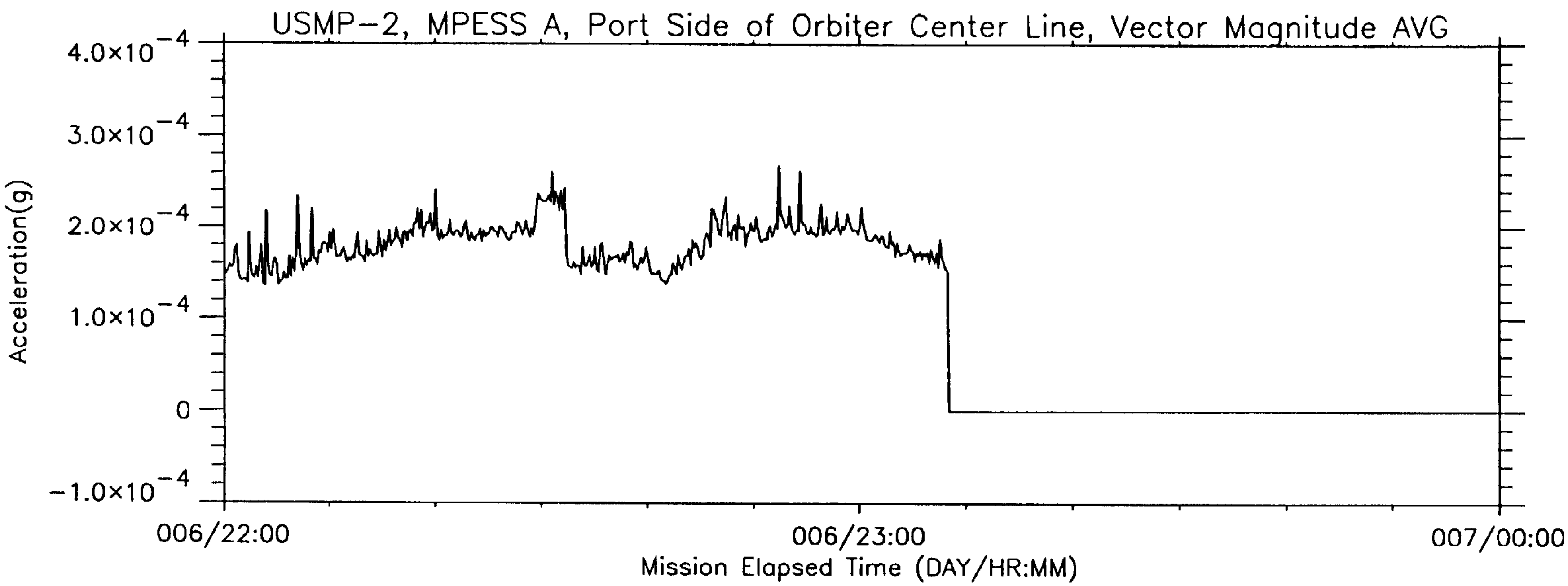
FROM MET 006/14:00:00 - 006/18:00:00

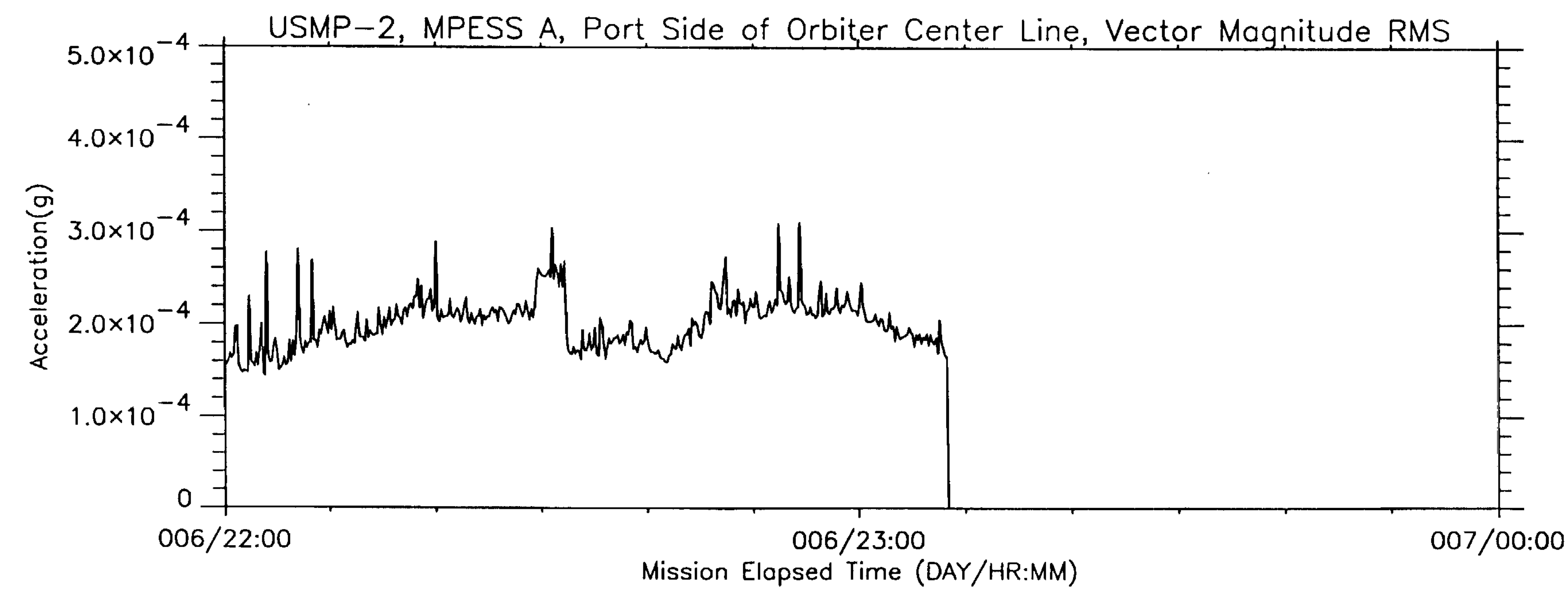

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
006/18:00
006/19:00
006/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0040
0.0030
0.0020
0.0010
0.0000
−0.0010
006/18:00
006/19:00
006/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0x10^{-4}
4.0x10^{-4}
3.0x10^{-4}
2.0x10^{-4}
1.0x10^{-4}
0
006/20:00
006/21:00
006/22:00
Mission Elapsed Time (DAY/HR:MM)

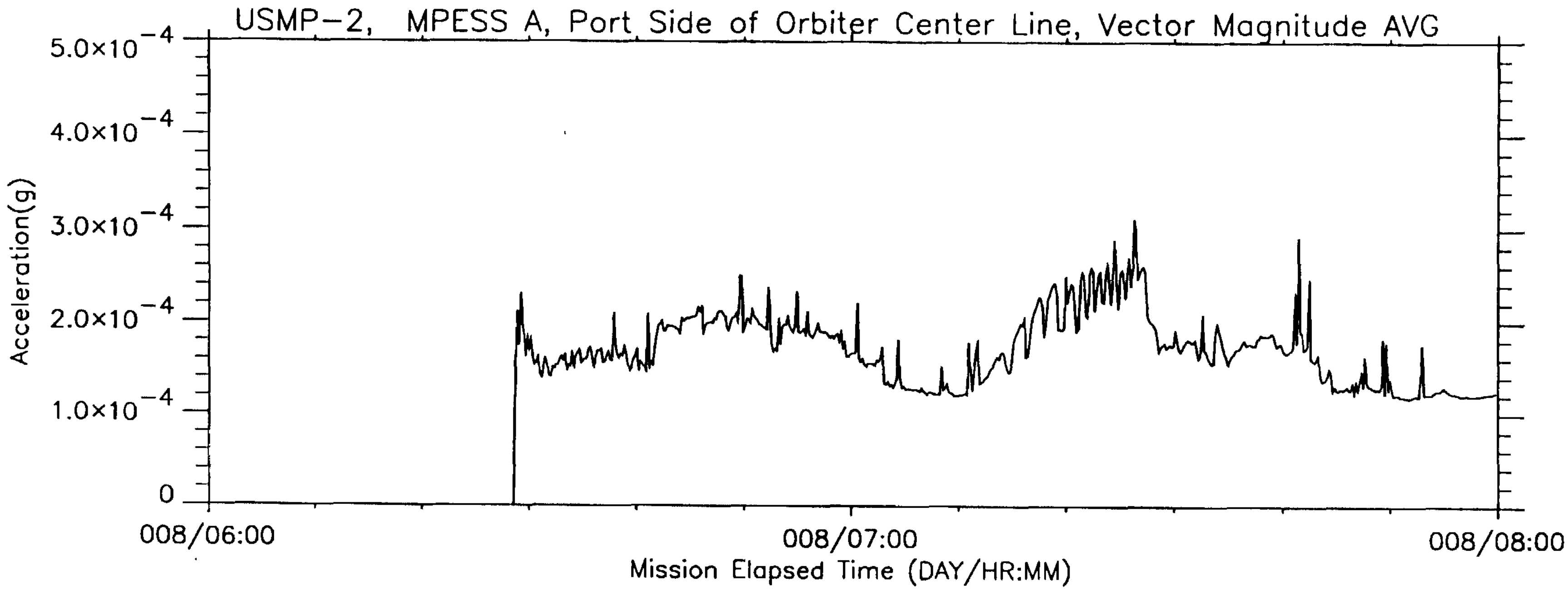

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0x10^{-4}
4.0x10^{-4}
3.0x10^{-4}
2.0x10^{-4}
1.0x10^{-4}
0
006/20:00
006/21:00
006/22:00
Mission Elapsed Time (DAY/HR:MM)

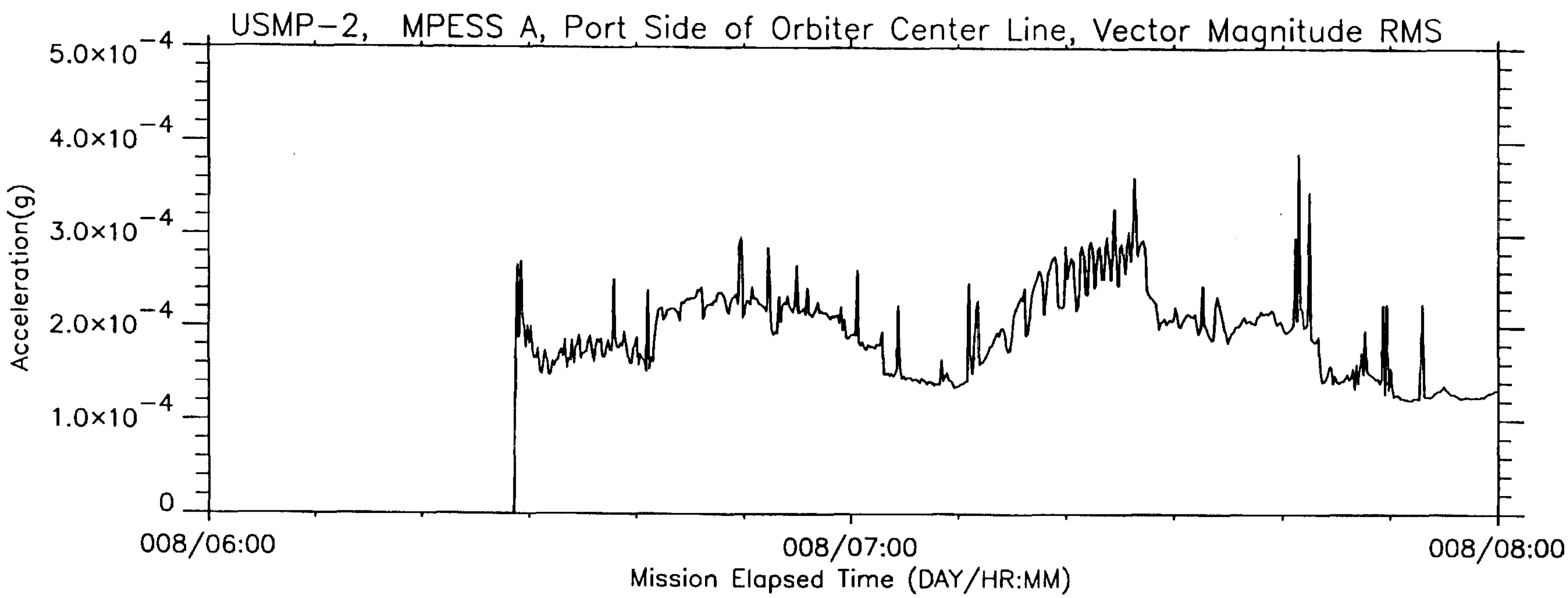

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
-1.0×10^-4
006/22:00
006/23:00
007/00:00
Mission Elapsed Time (DAY/HR:MM)

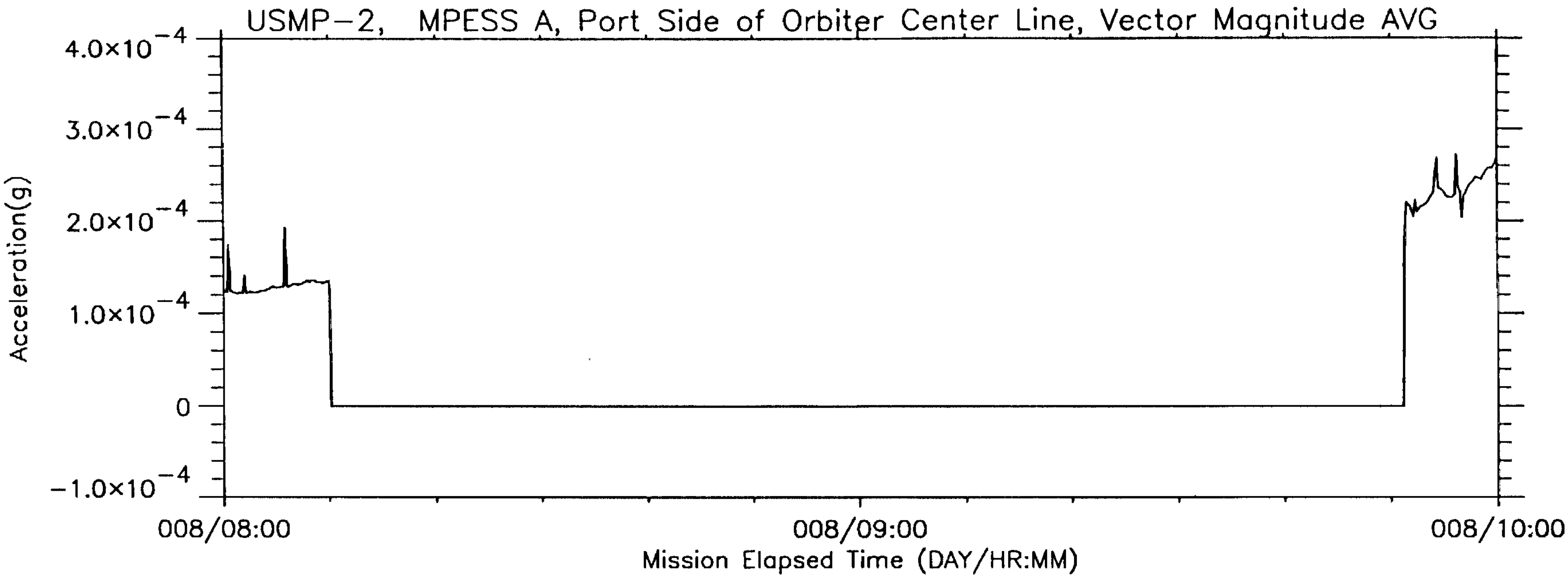

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
006/22:00
006/23:00
007/00:00
Mission Elapsed Time (DAY/HR:MM)

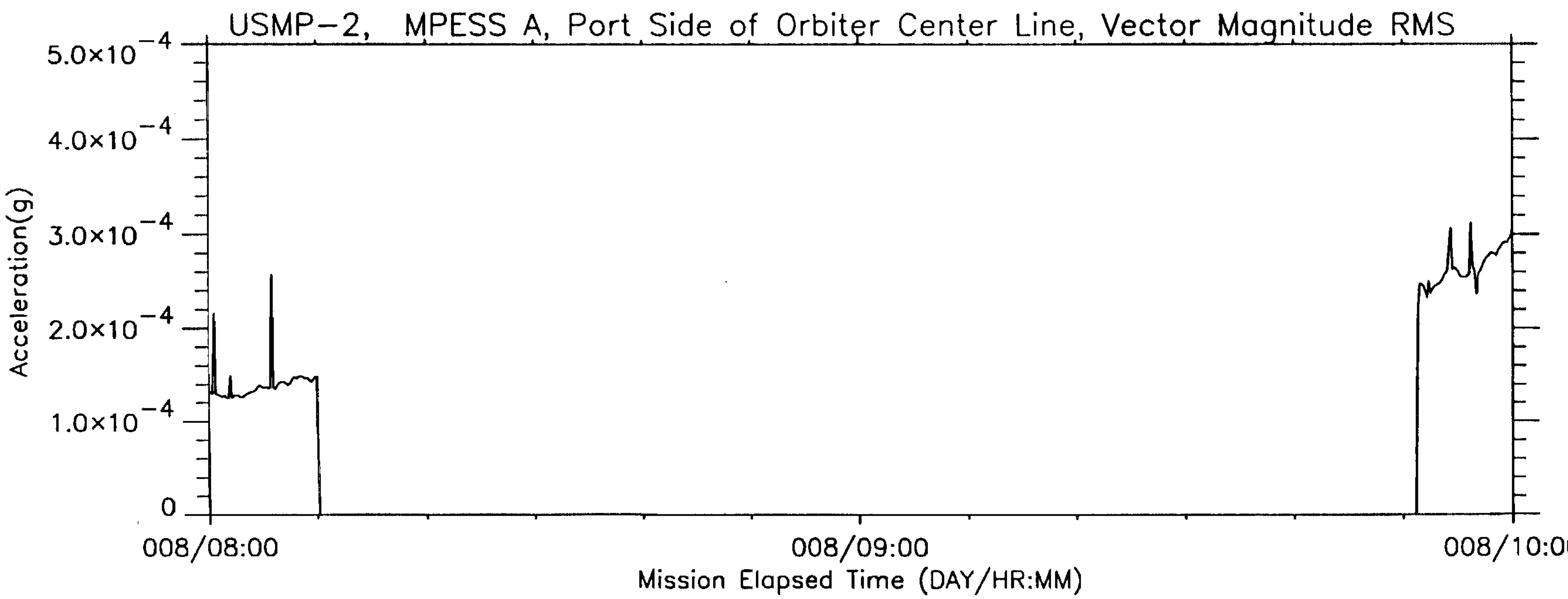
NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

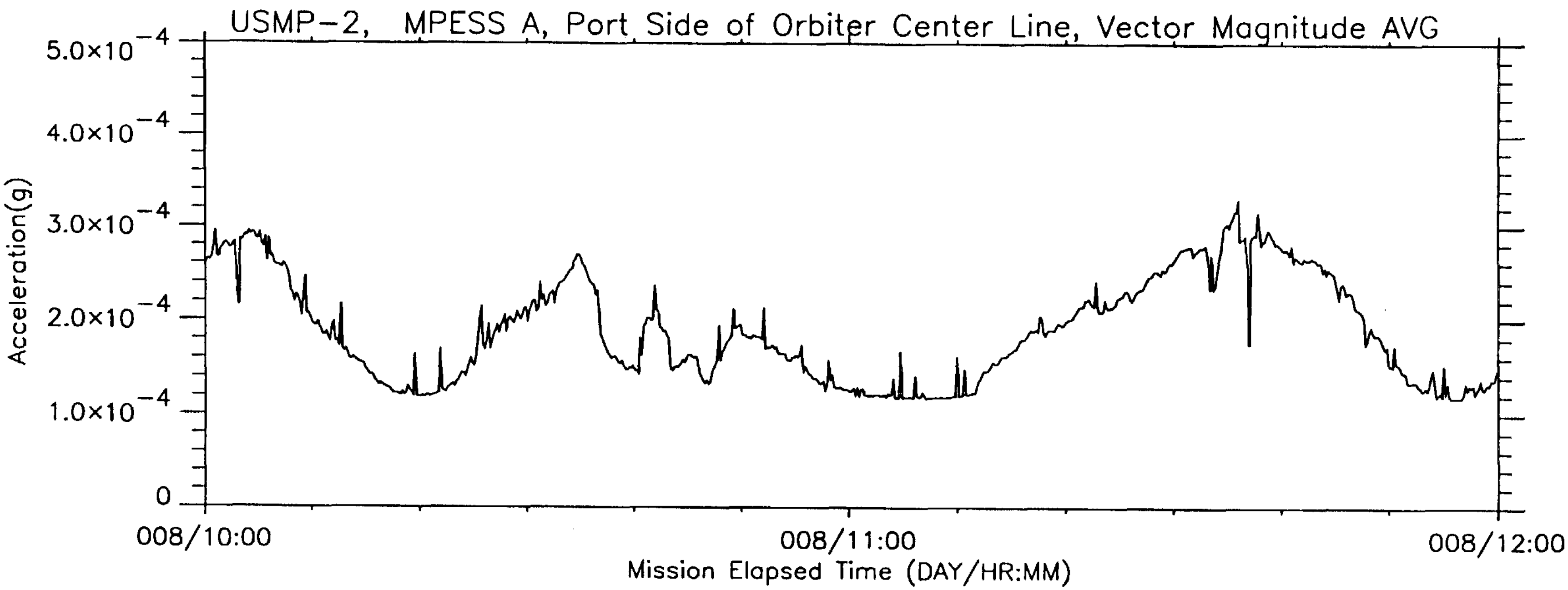
FROM MET 006/23:08:00 - 008/06:28:00

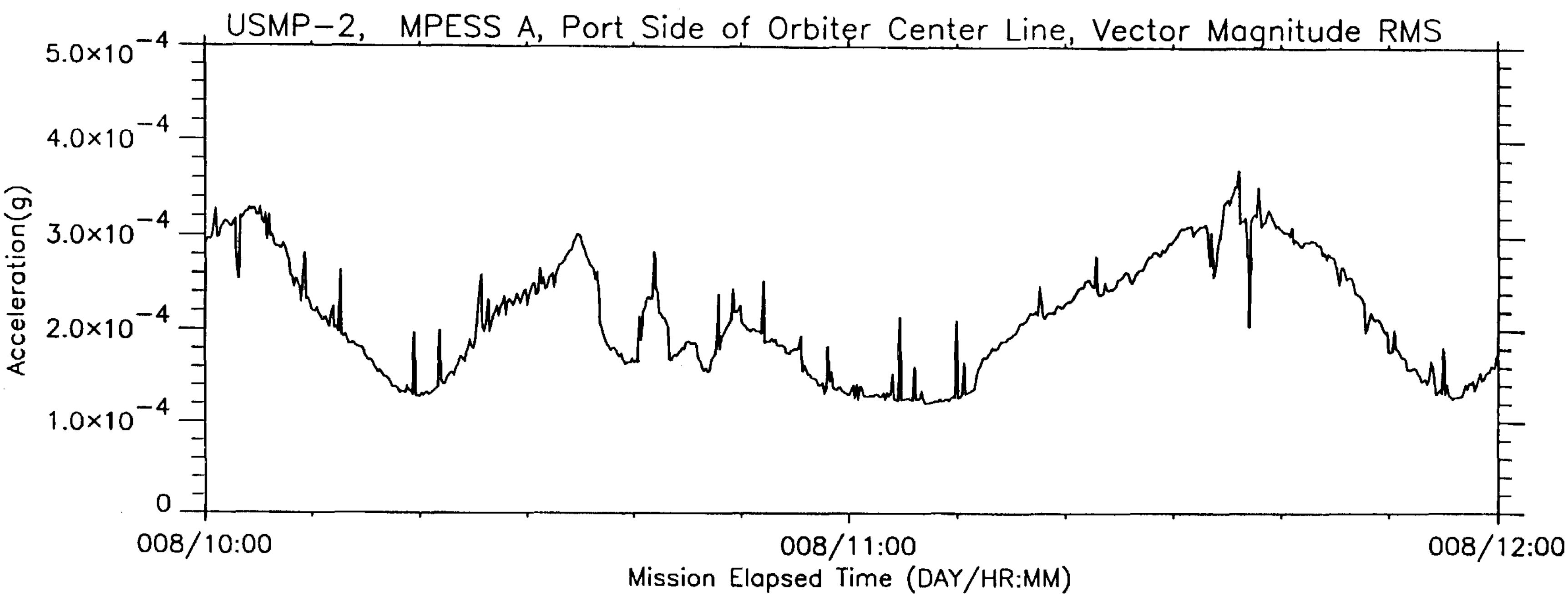

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
008/06:00
008/07:00
008/08:00
Mission Elapsed Time (DAY/HR:MM)

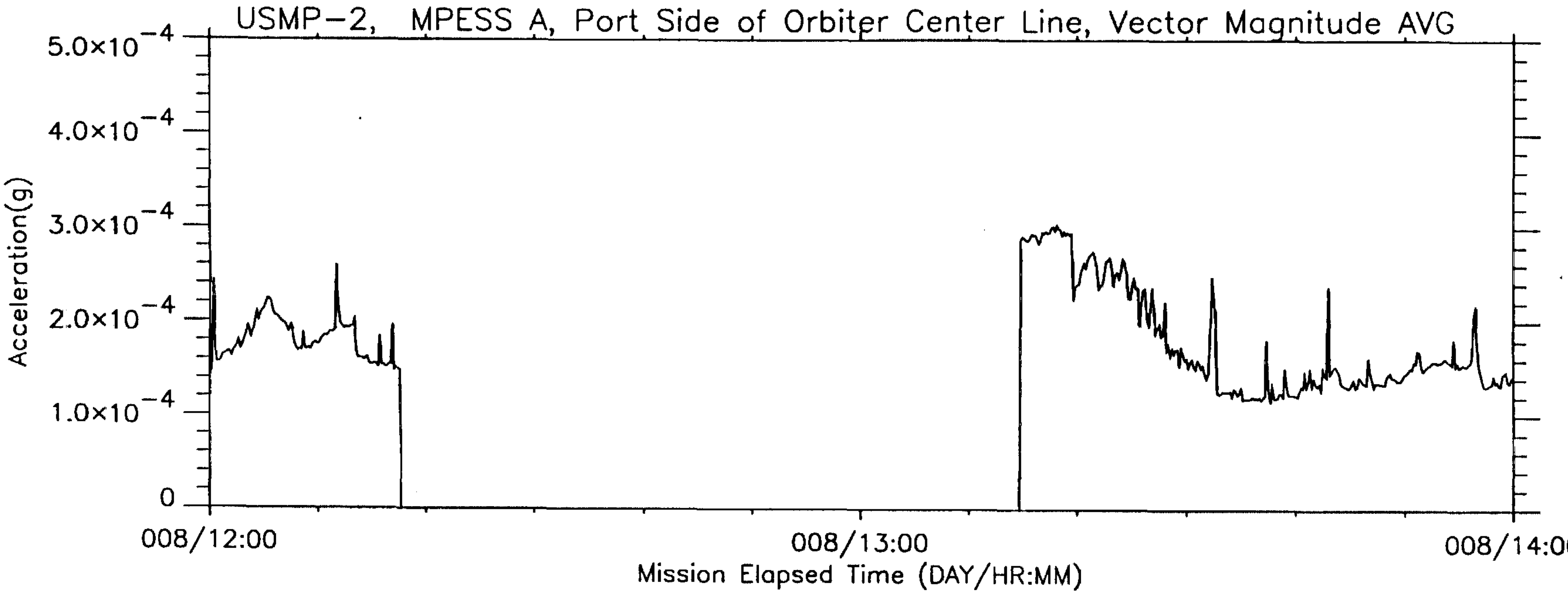

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
008/06:00
008/07:00
008/08:00
Mission Elapsed Time (DAY/HR:MM)

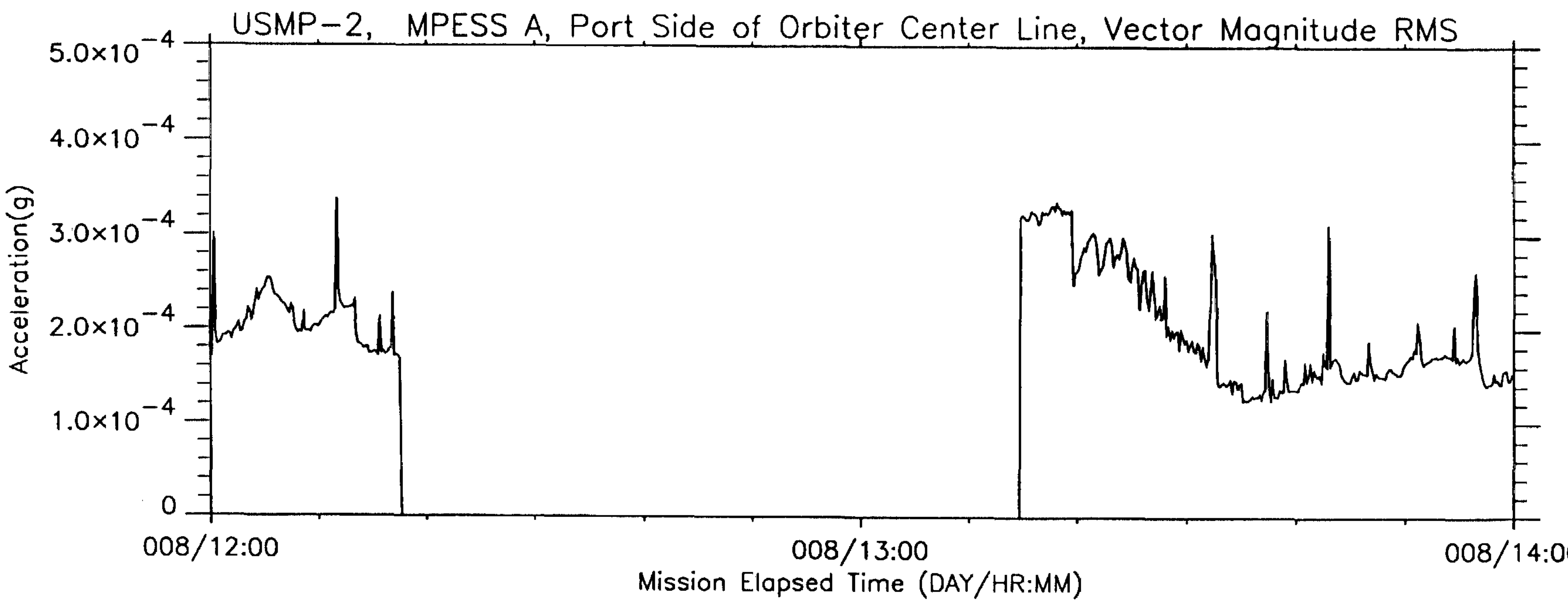

USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^−4
3.0×10^−4
2.0×10^−4
1.0×10^−4
0
−1.0×10^−4
008/08:00
008/09:00
008/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^−4
4.0×10^−4
3.0×10^−4
2.0×10^−4
1.0×10^−4
0
008/08:00
008/09:00
008/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10⁻⁴
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
008/10:00
008/11:00
008/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10⁻⁴
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
008/10:00
008/11:00
008/12:00
Mission Elapsed Time (DAY/HR:MM)

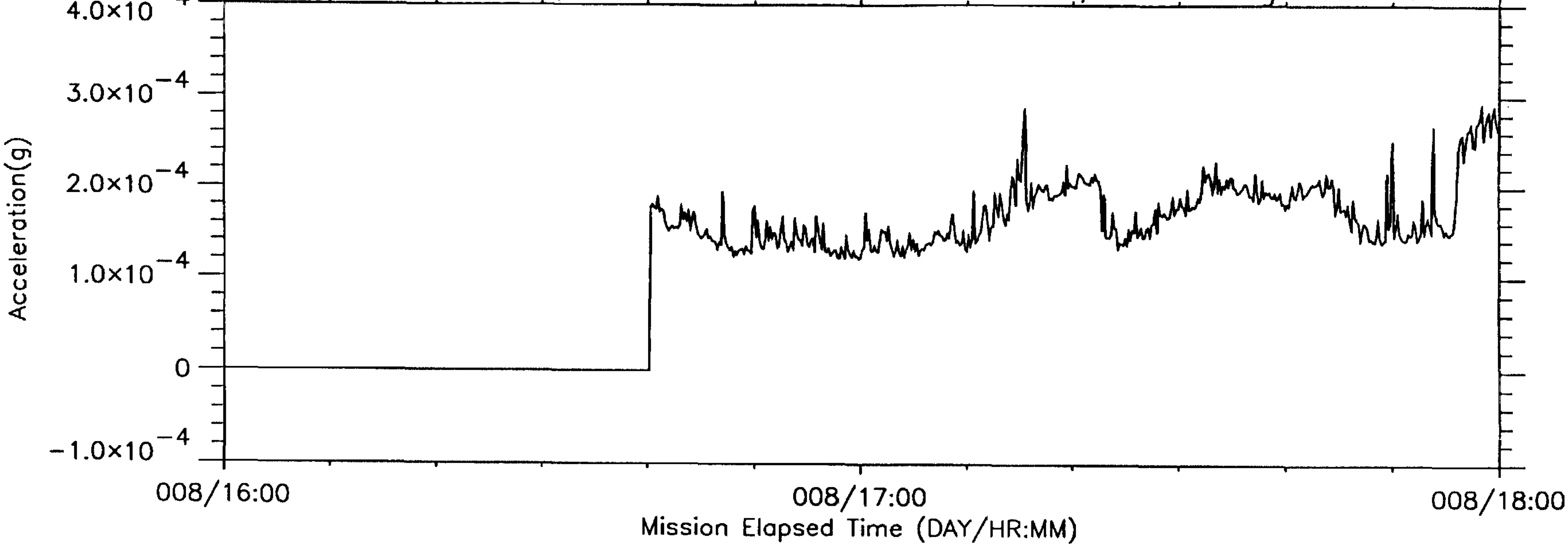

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0x10^{-4}
4.0x10^{-4}
3.0x10^{-4}
2.0x10^{-4}
1.0x10^{-4}
0
008/12:00
008/13:00
008/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0x10^{-4}
4.0x10^{-4}
3.0x10^{-4}
2.0x10^{-4}
1.0x10^{-4}
0
008/12:00
008/13:00
008/14:00
Mission Elapsed Time (DAY/HR:MM)

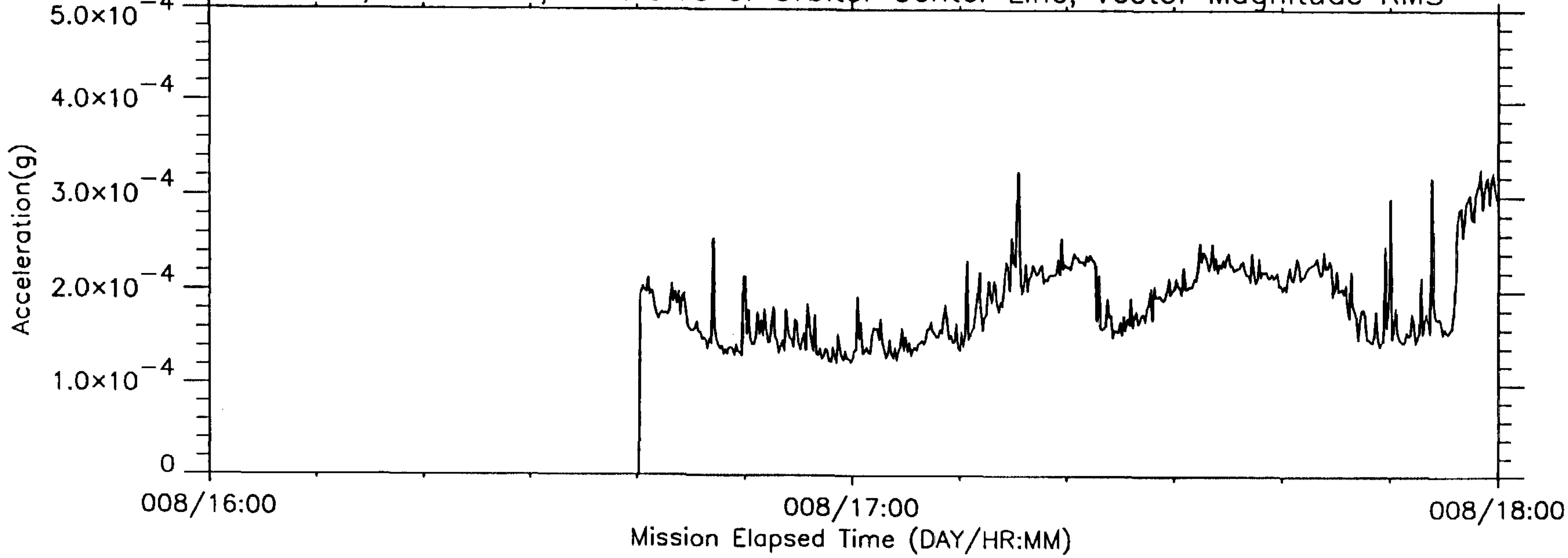
NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

FROM MET 008/14:00:00 - 008/16:40:00

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG

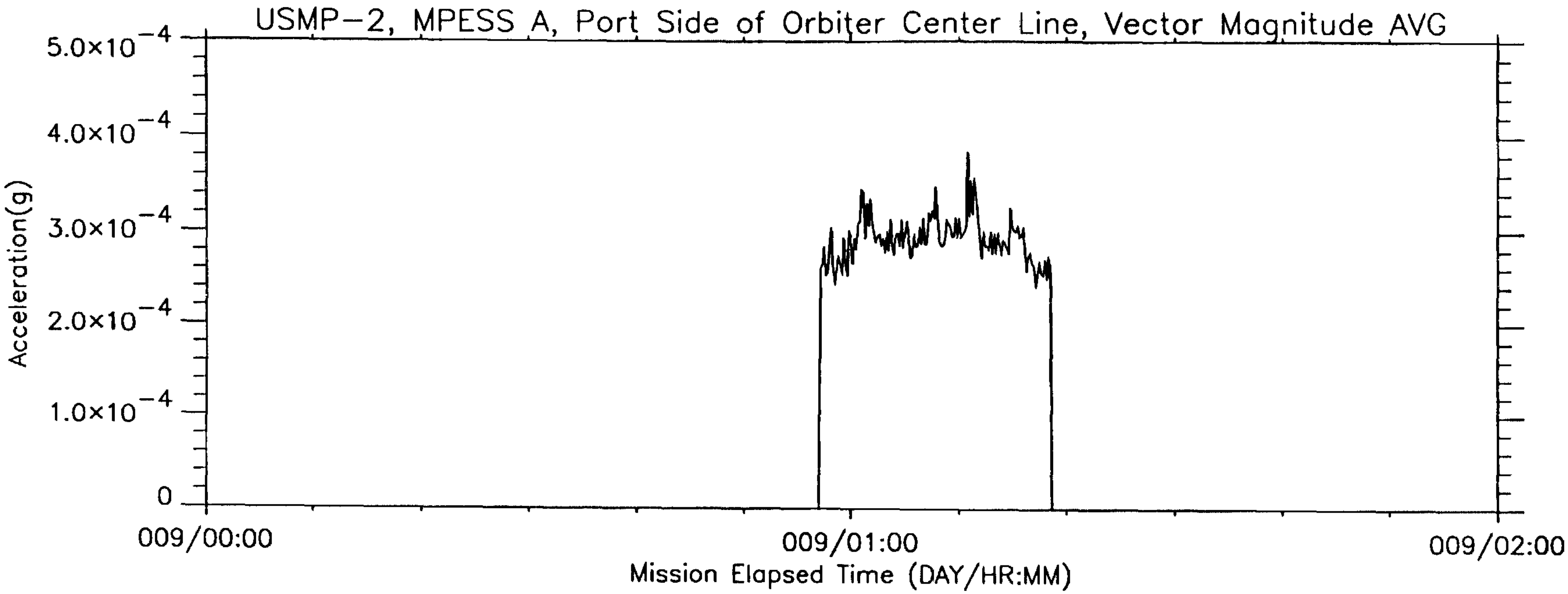


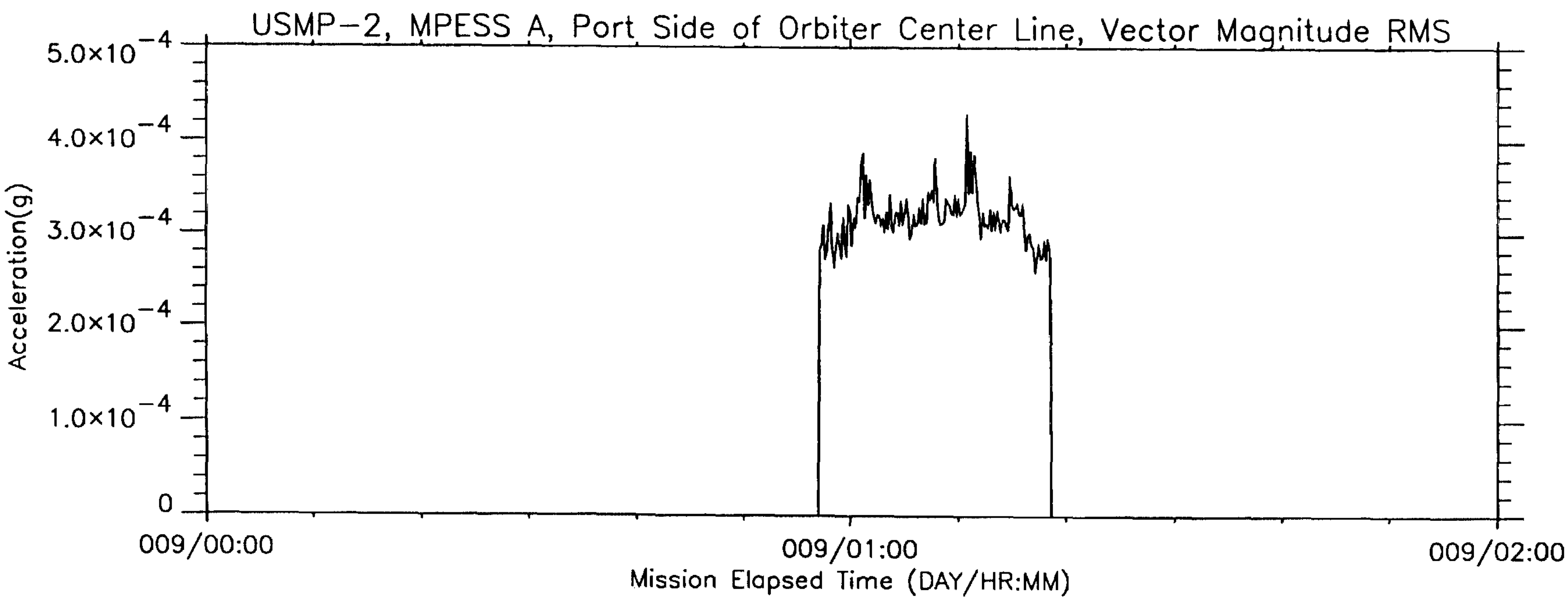
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS

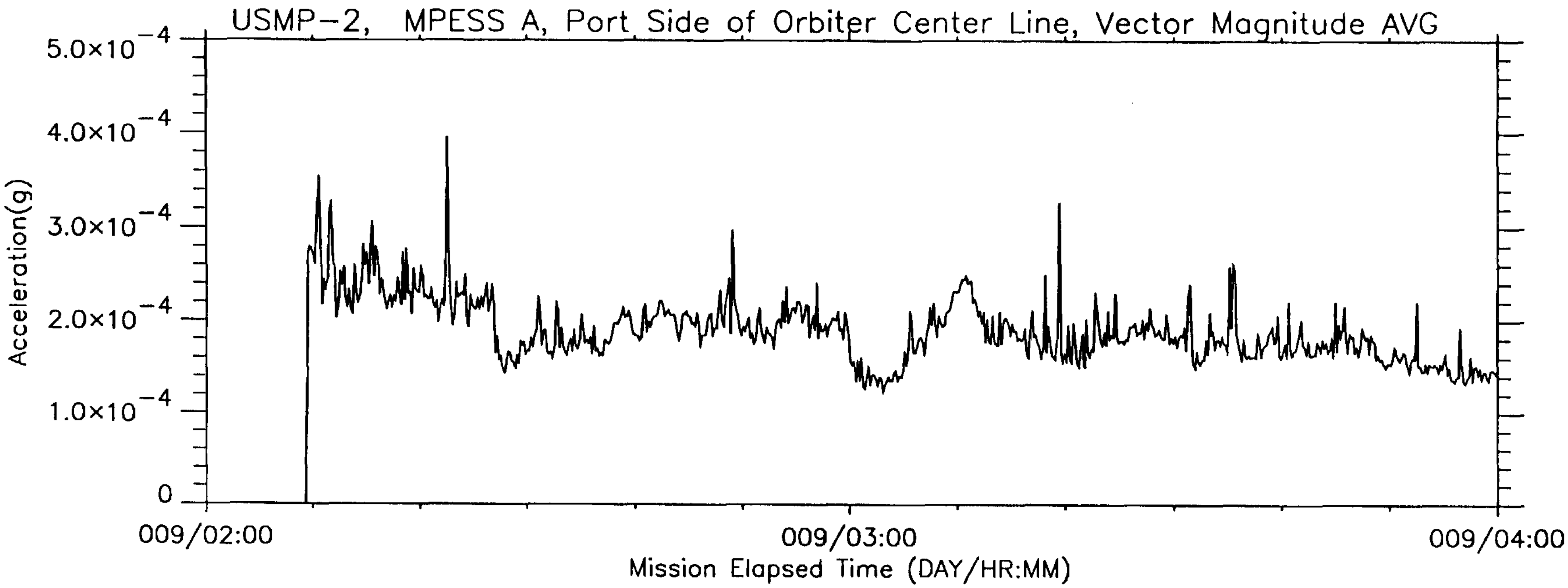


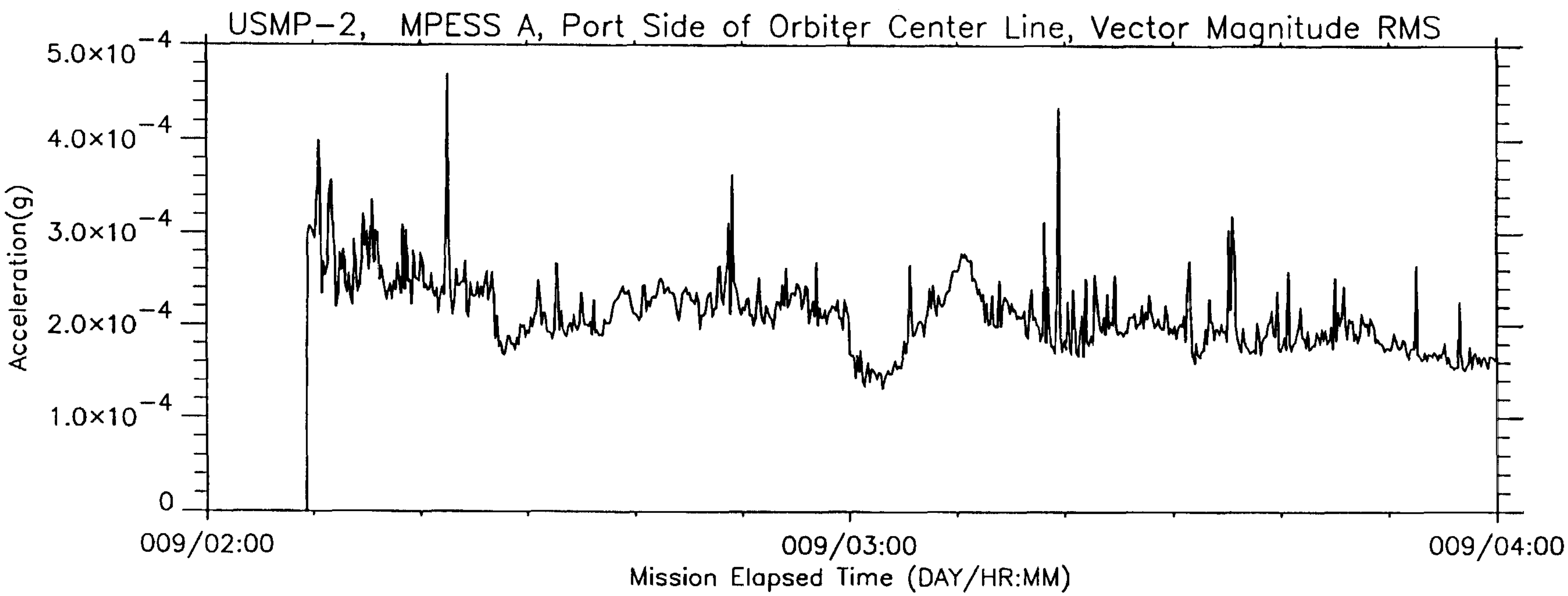
NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

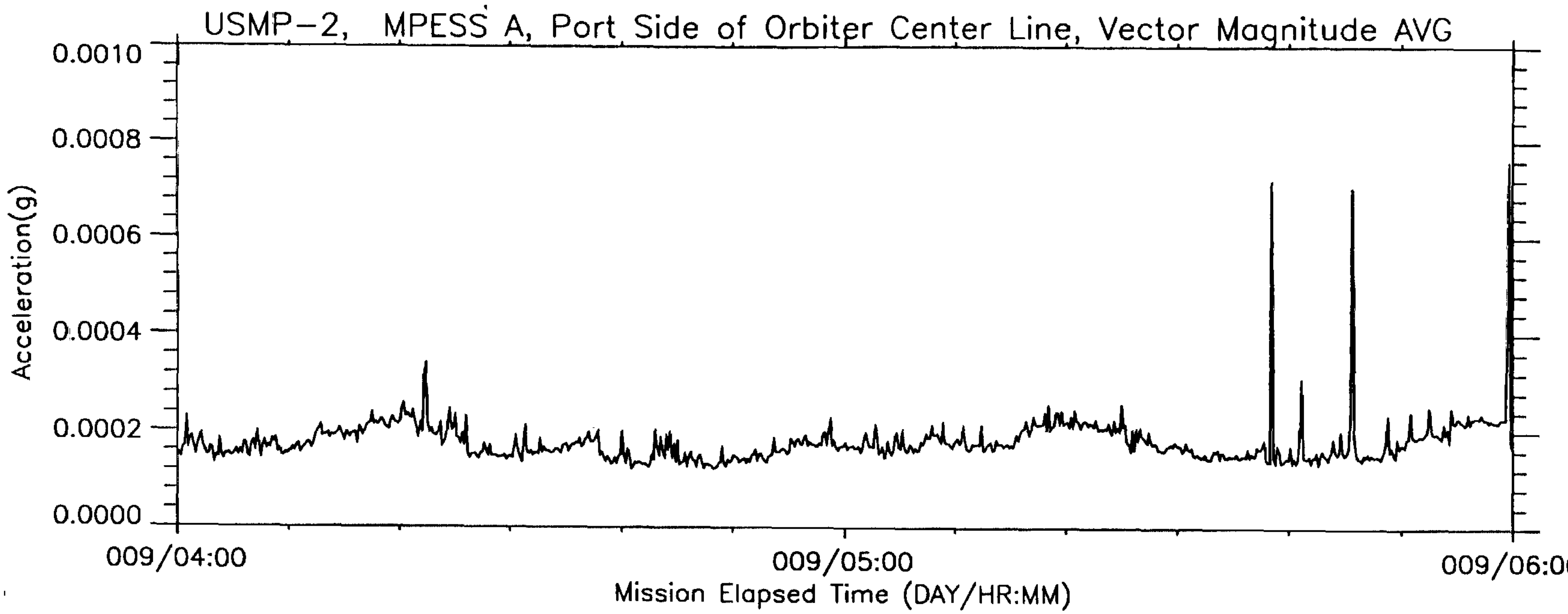
FROM MET 008/18:00:00 - 009/00:57:00

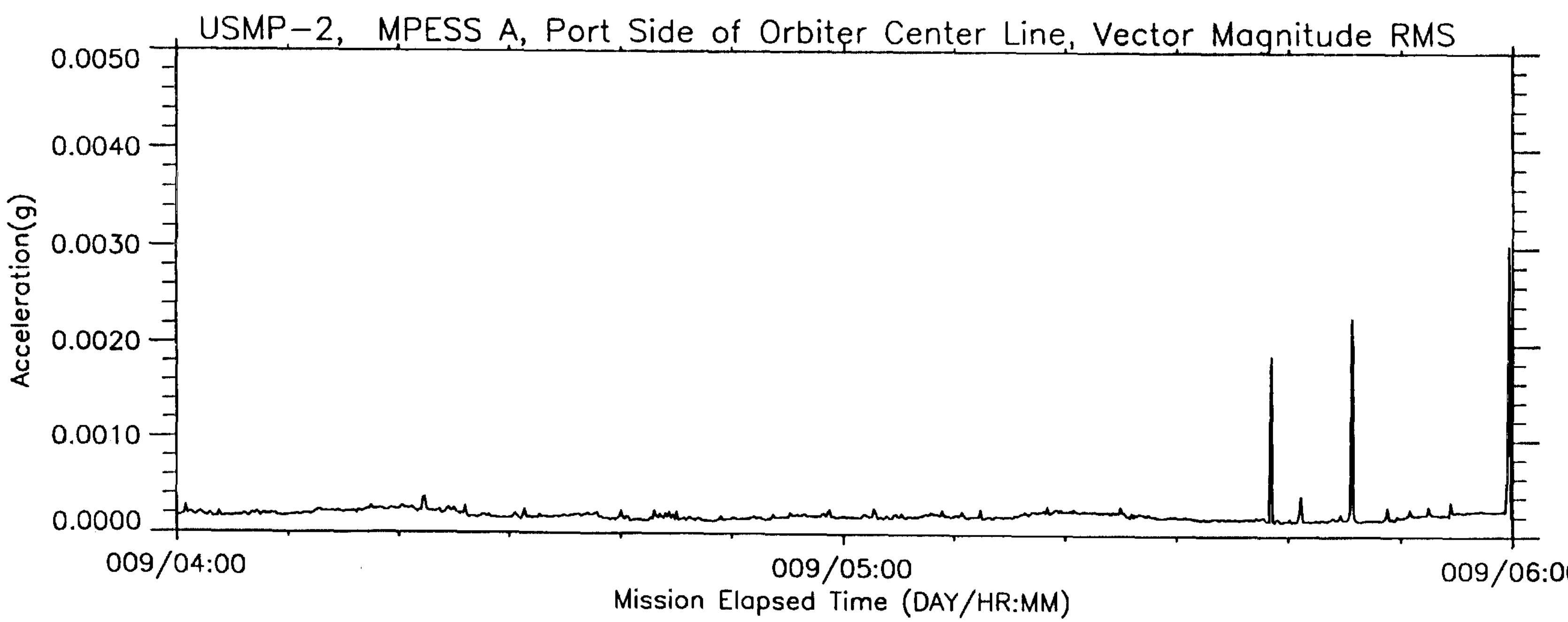

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
009/00:00
009/01:00
009/02:00
Mission Elapsed Time (DAY/HR:MM)

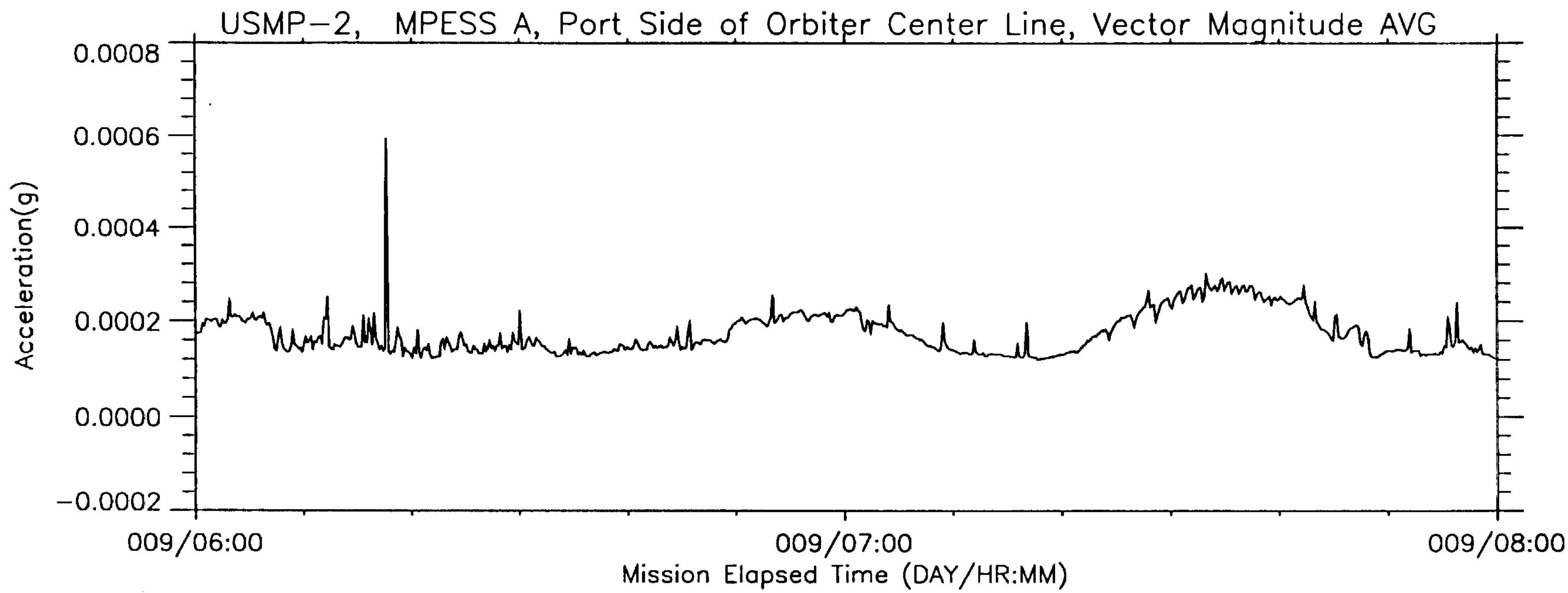

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^-4
4.0×10^-4
3.0×10^-4
2.0×10^-4
1.0×10^-4
0
009/00:00
009/01:00
009/02:00
Mission Elapsed Time (DAY/HR:MM)

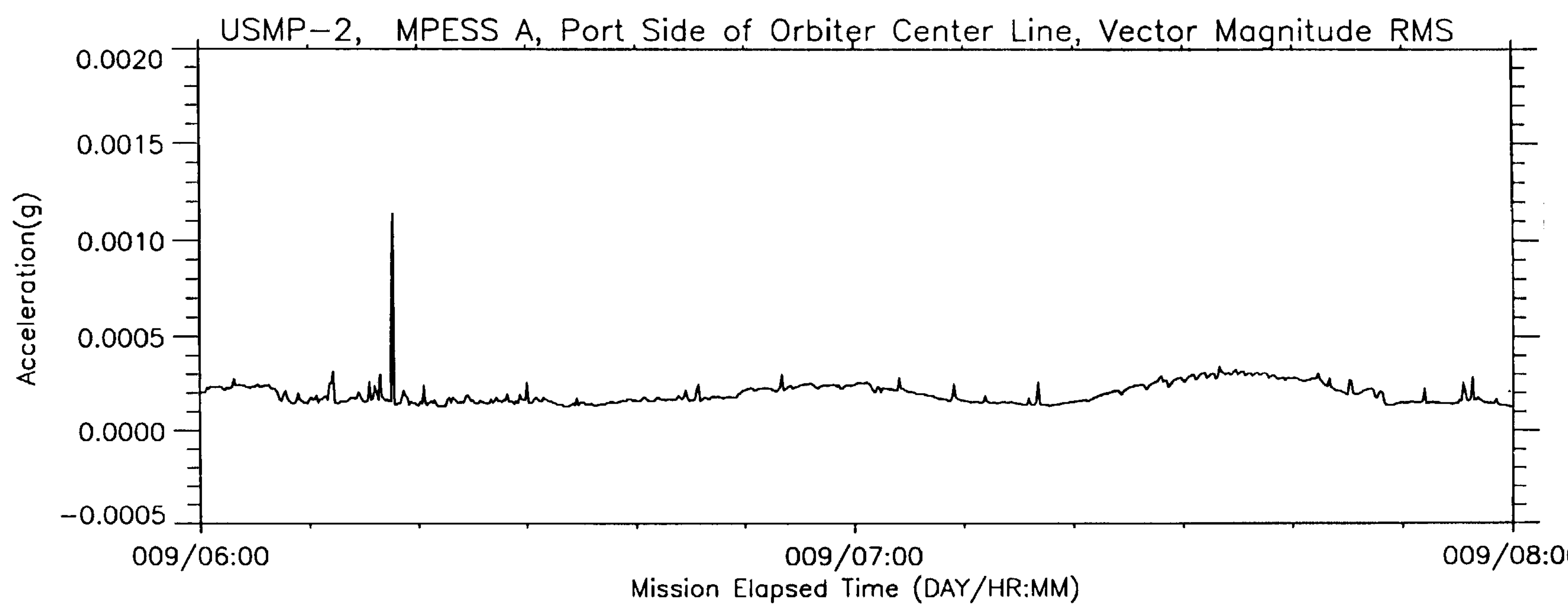

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
009/02:00
009/03:00
009/04:00
Mission Elapsed Time (DAY/HR:MM)

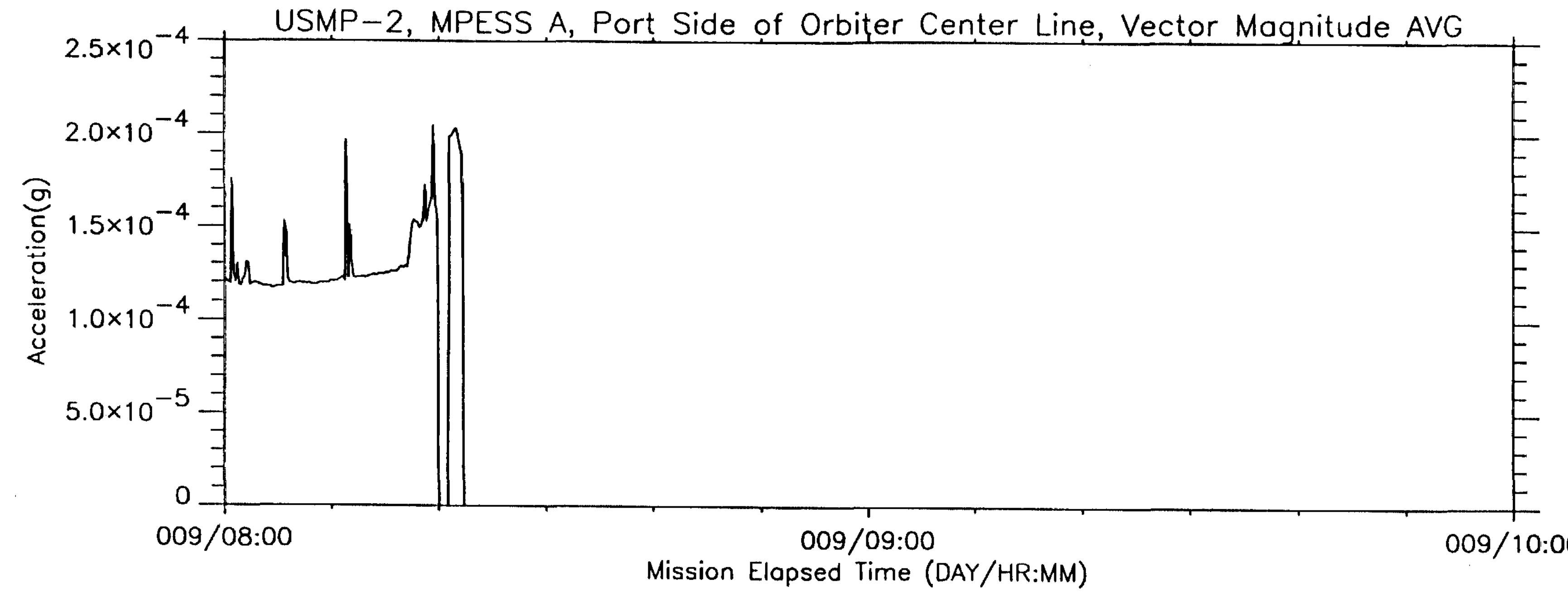

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
009/02:00
009/03:00
009/04:00
Mission Elapsed Time (DAY/HR:MM)

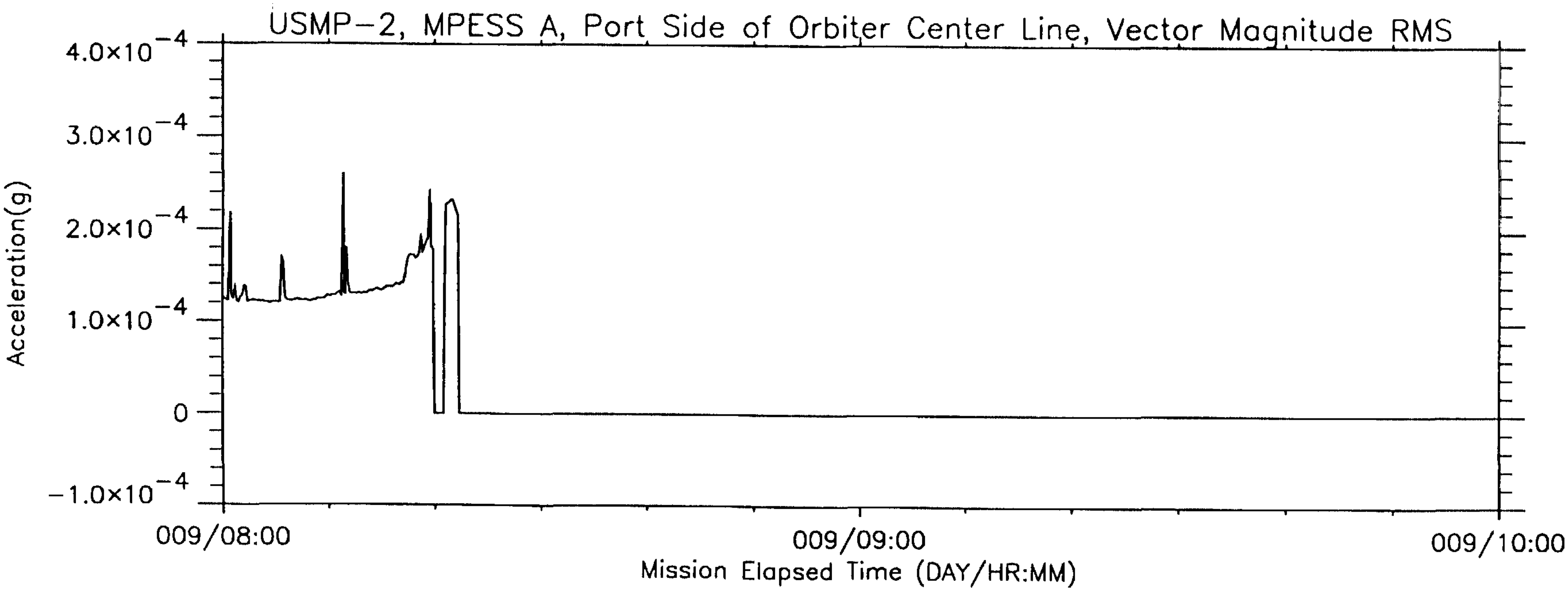

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
009/04:00
009/05:00
009/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
009/04:00
009/05:00
009/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
-0.0002
009/06:00
009/07:00
009/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
009/06:00
009/07:00
009/08:00
Mission Elapsed Time (DAY/HR:MM)

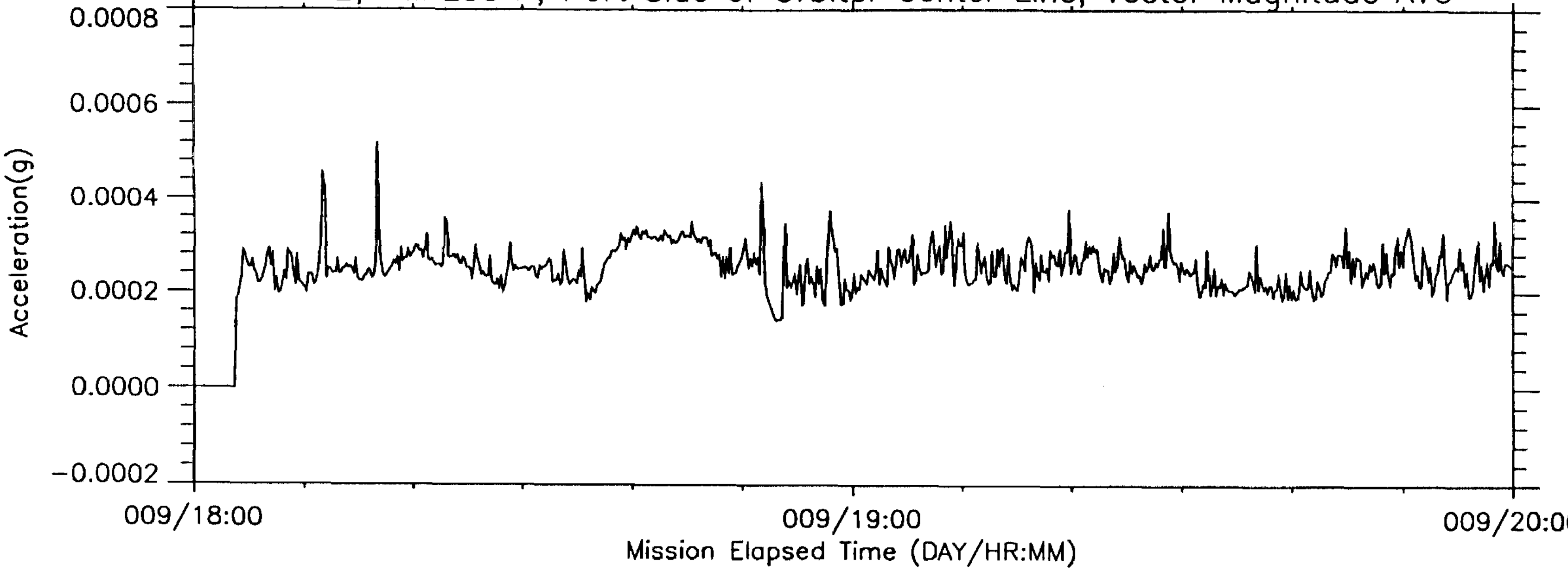

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
2.5×10^{-4}
2.0×10^{-4}
1.5×10^{-4}
1.0×10^{-4}
5.0×10^{-5}
0
009/08:00
009/09:00
009/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
−1.0×10^{-4}
009/08:00
009/09:00
009/10:00
Mission Elapsed Time (DAY/HR:MM)

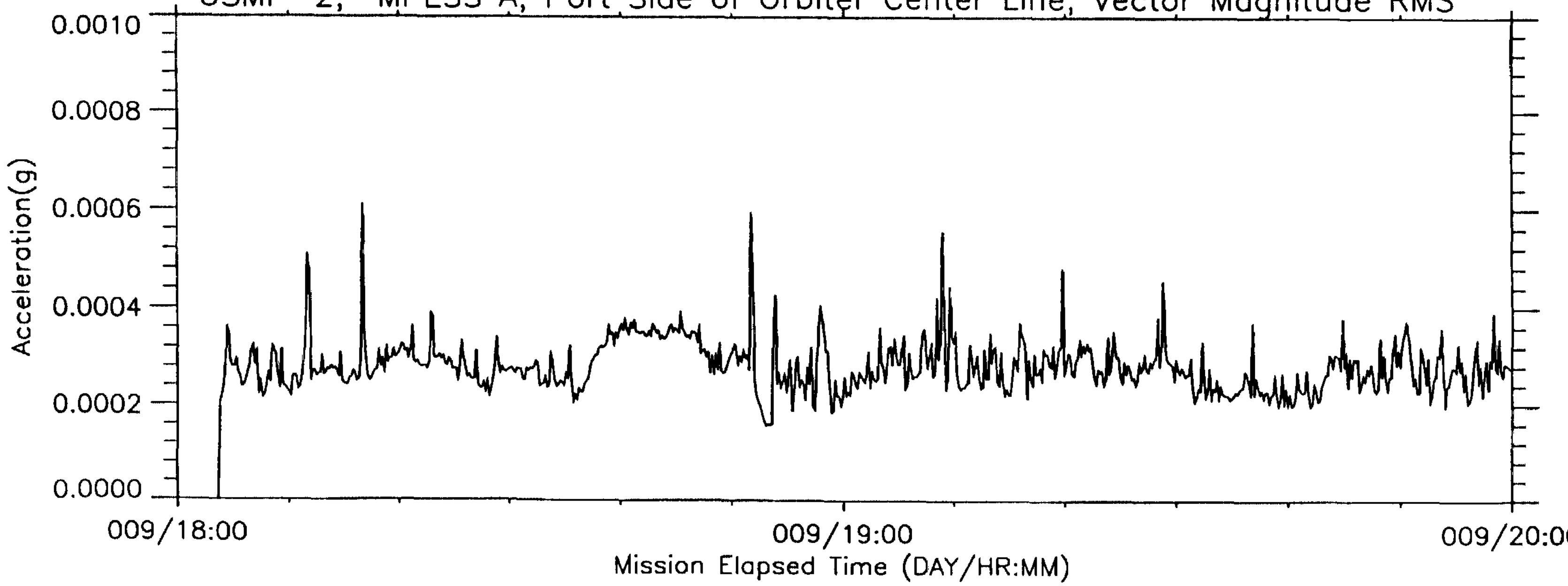
NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

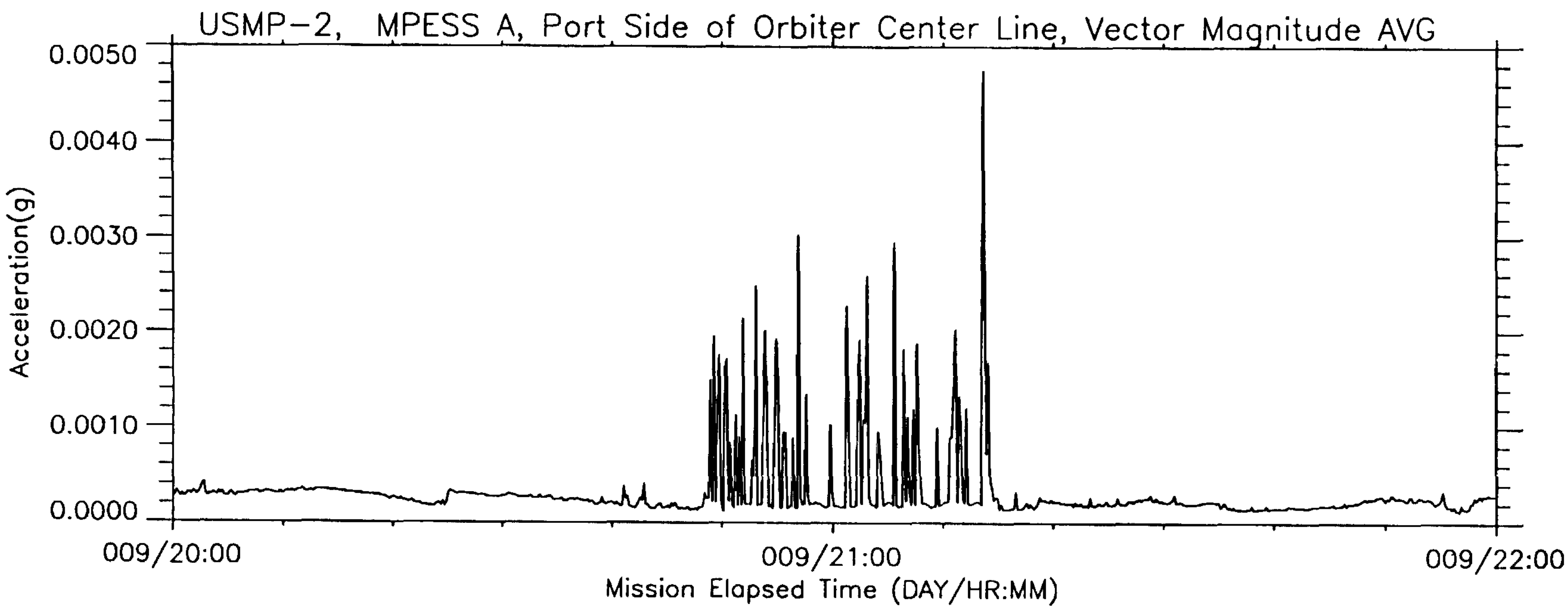
FROM MET 009/08:22:00 - 009/18:04:00

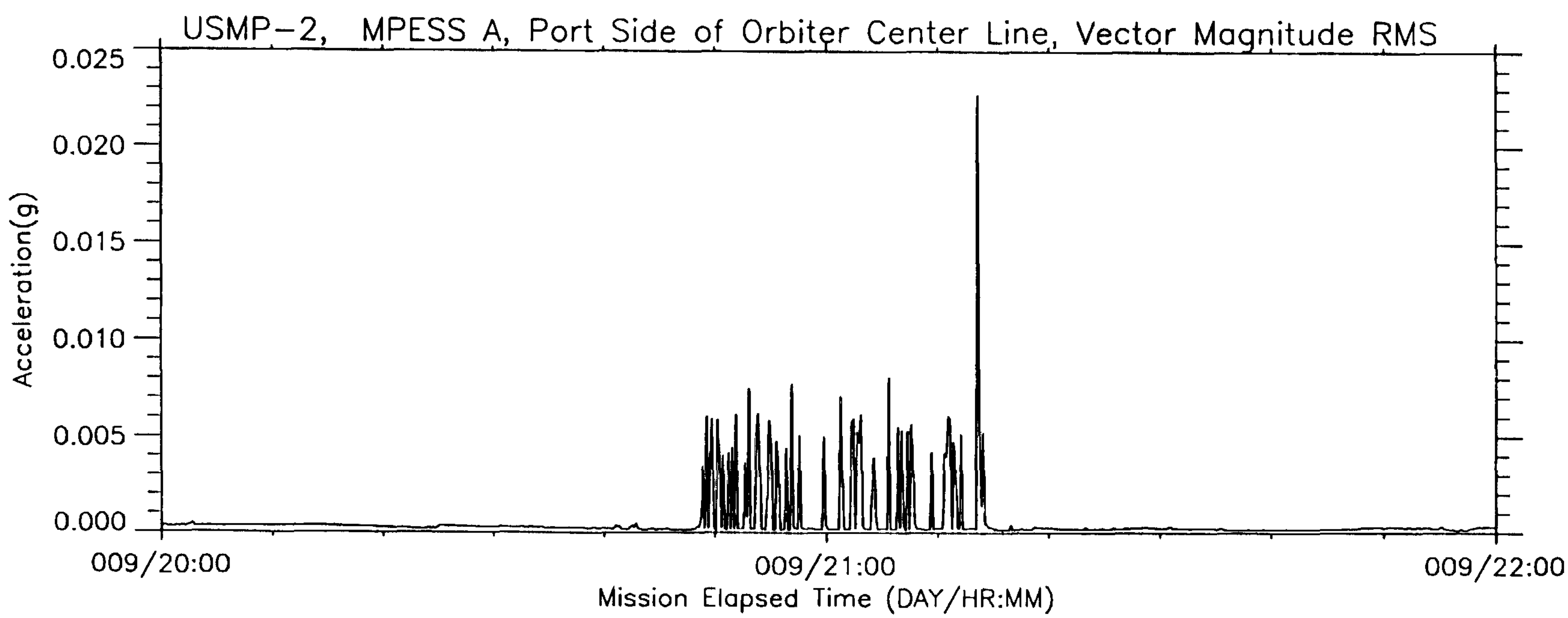
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG

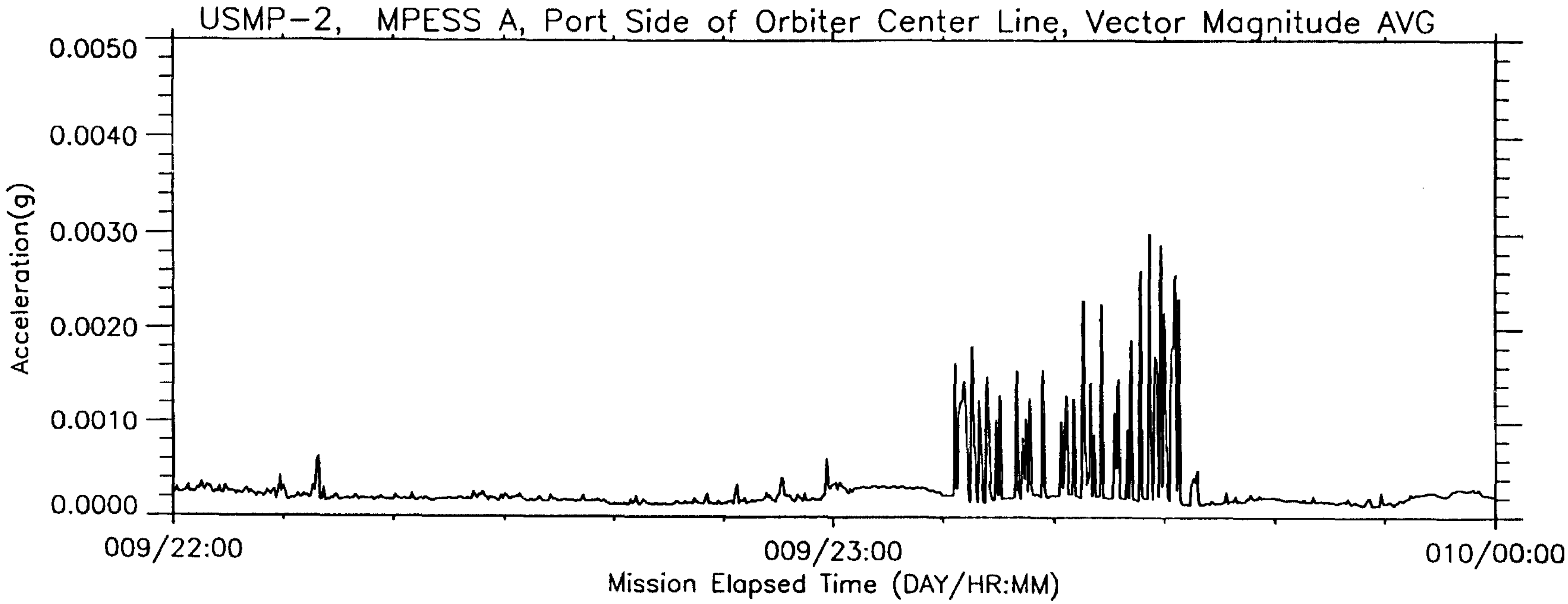


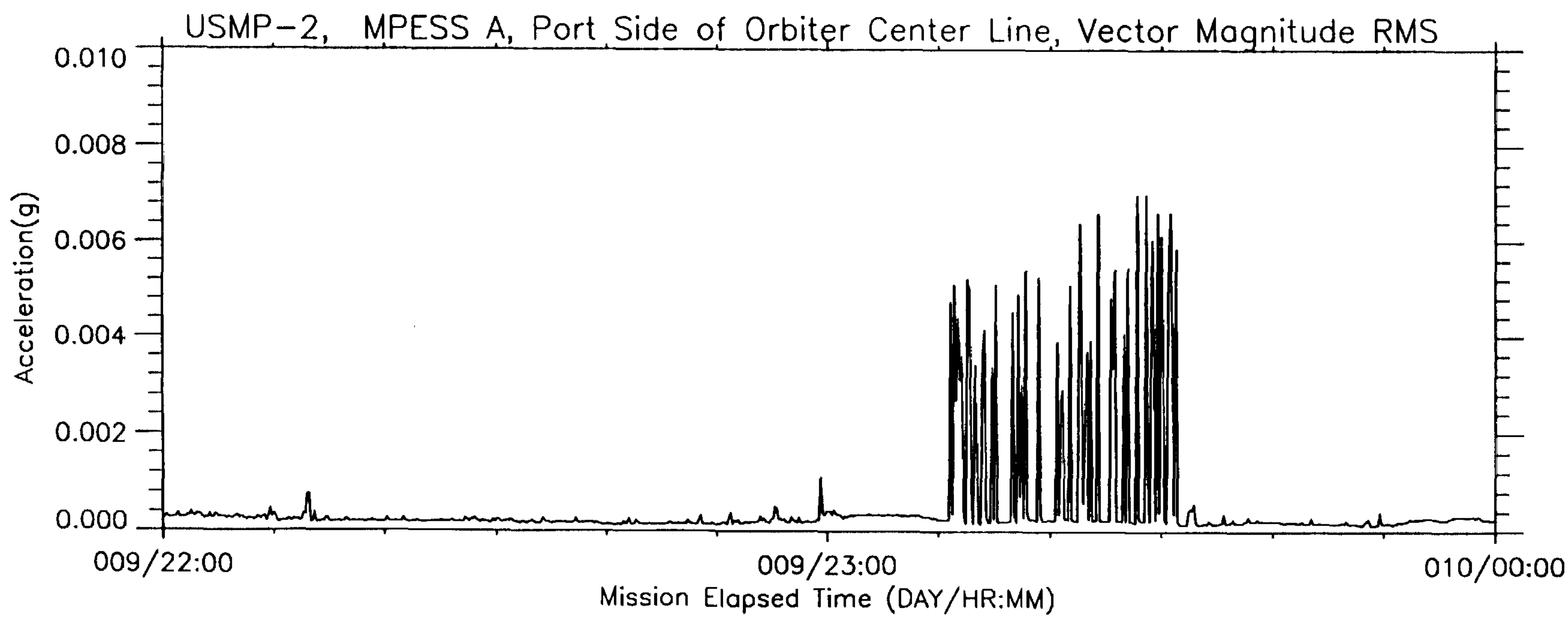
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS

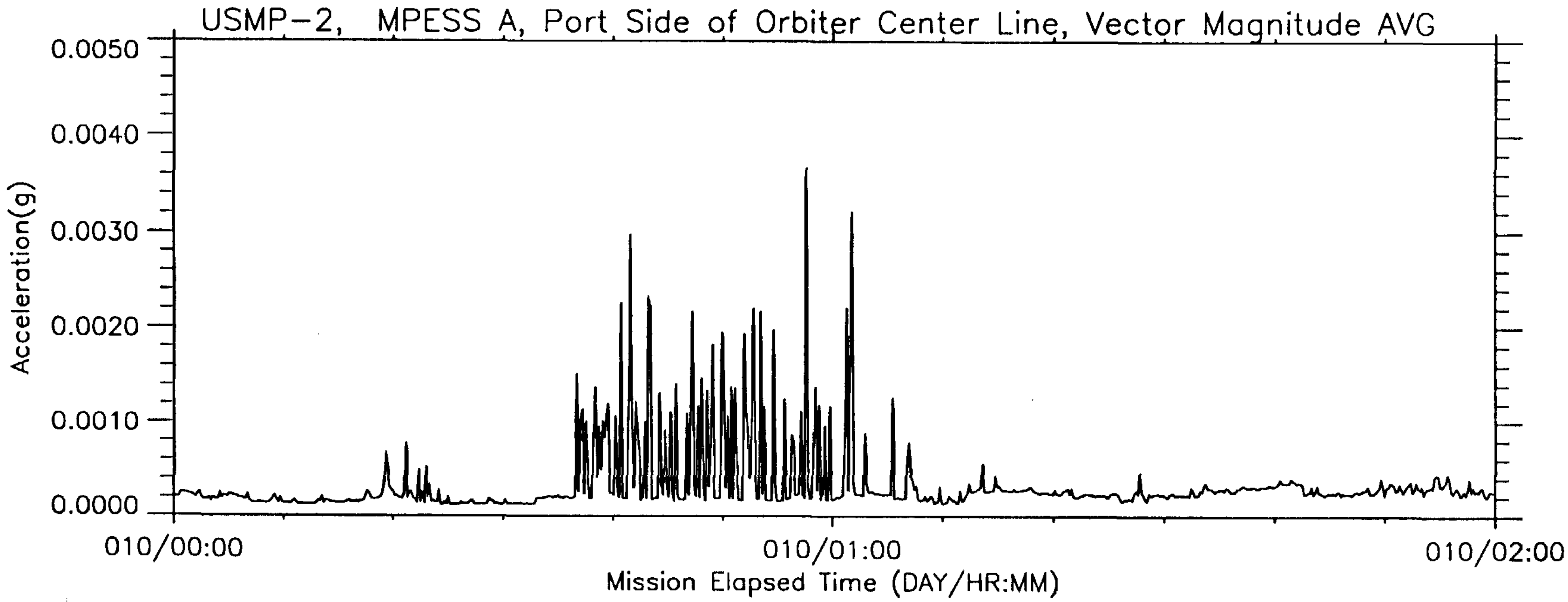



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
009/20:00
009/21:00
009/22:00
Mission Elapsed Time (DAY/HR:MM)

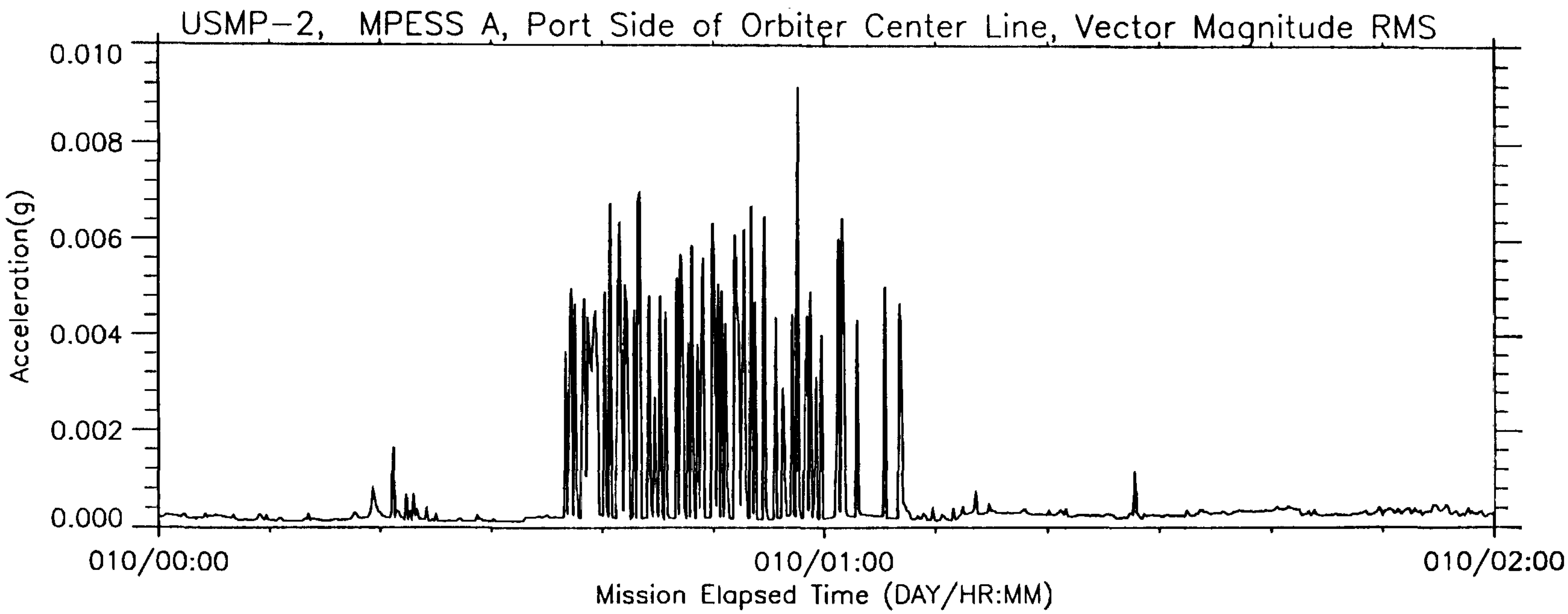

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.025
0.020
0.015
0.010
0.005
0.000
009/20:00
009/21:00
009/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
009/22:00
009/23:00
010/00:00
Mission Elapsed Time (DAY/HR:MM)

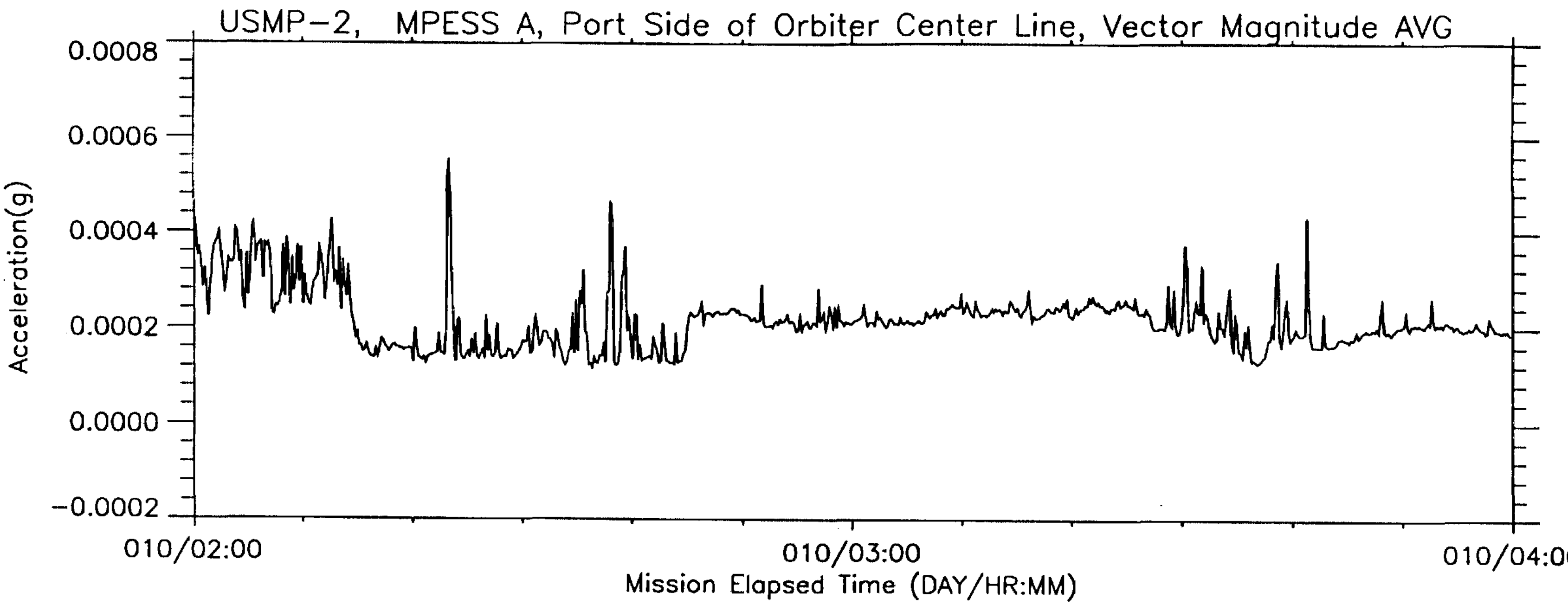

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.010
0.008
0.006
0.004
0.002
0.000
009/22:00
009/23:00
010/00:00
Mission Elapsed Time (DAY/HR:MM)

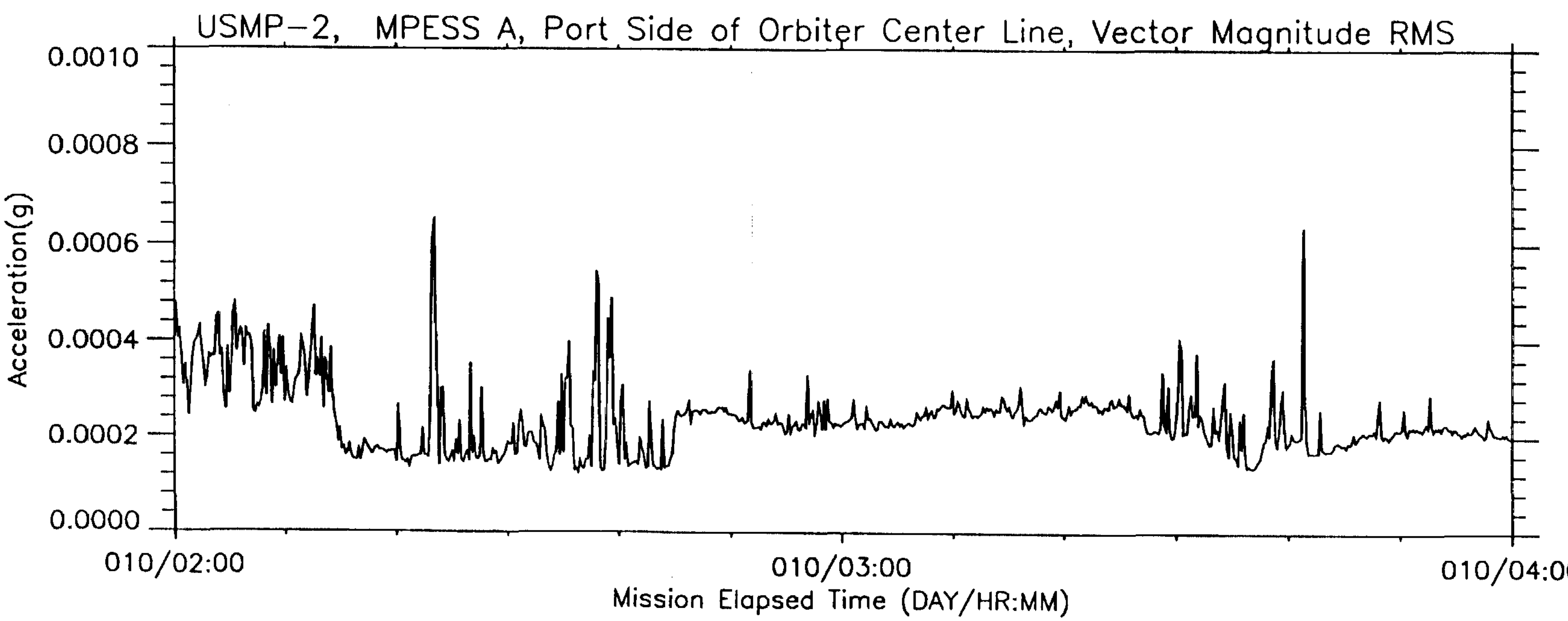


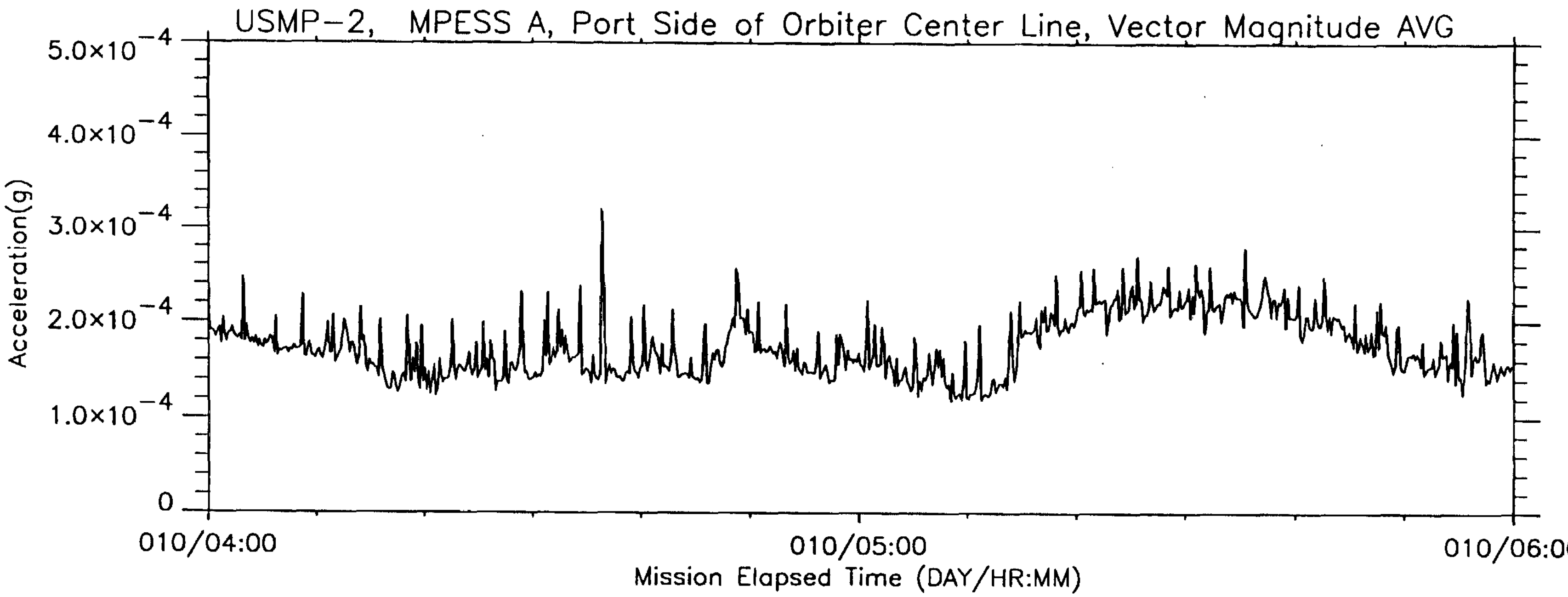
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
010/00:00
010/01:00
010/02:00
Mission Elapsed Time (DAY/HR:MM)

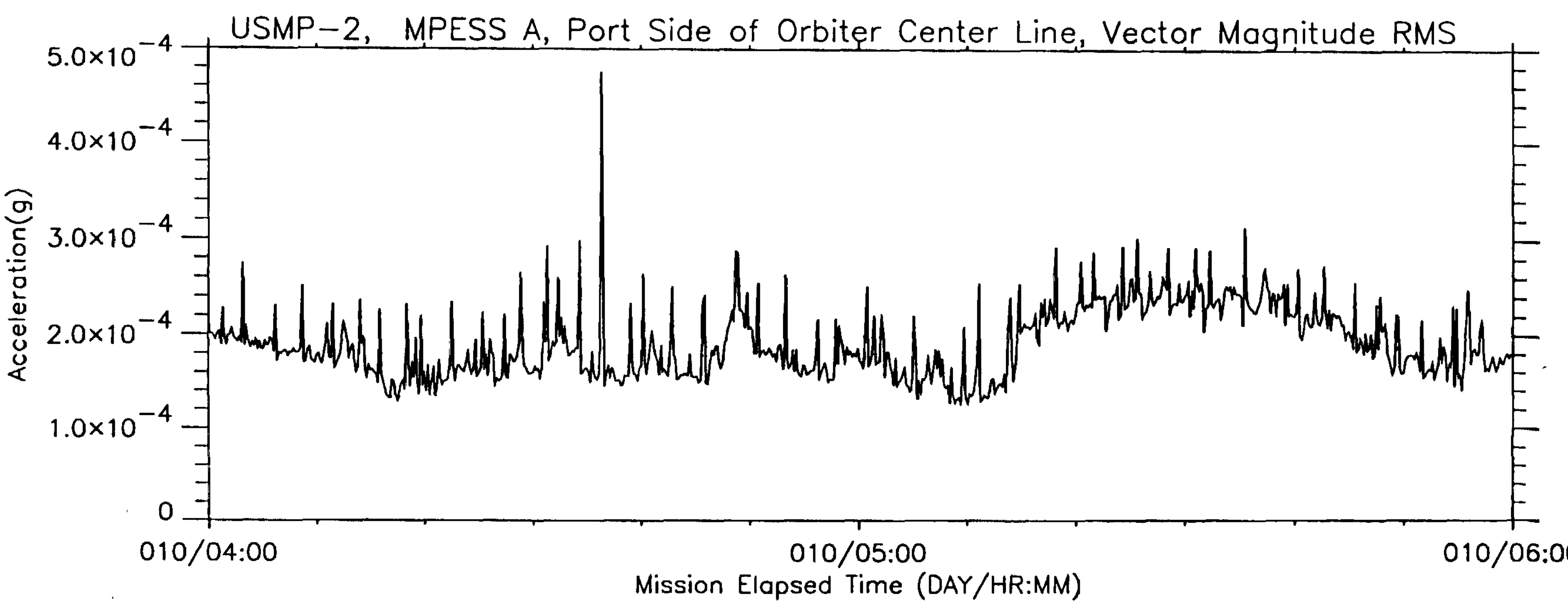


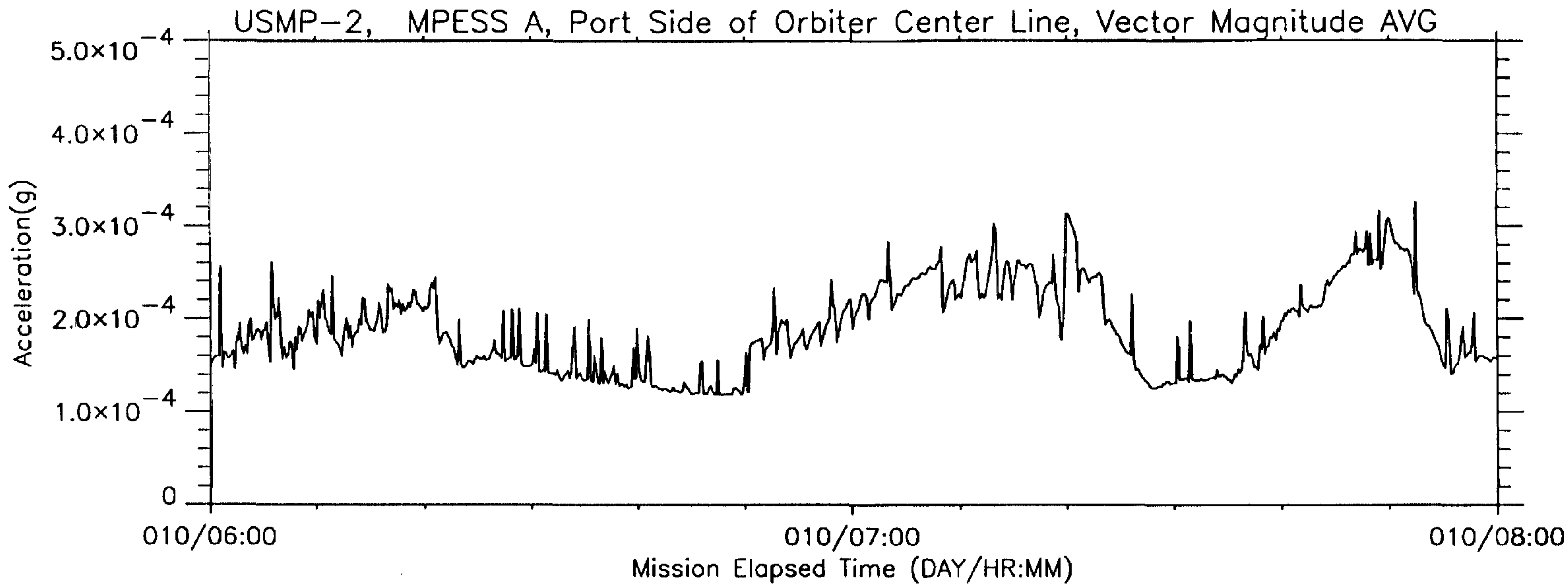
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.010
0.008
0.006
0.004
0.002
0.000
010/00:00
010/01:00
010/02:00
Mission Elapsed Time (DAY/HR:MM)

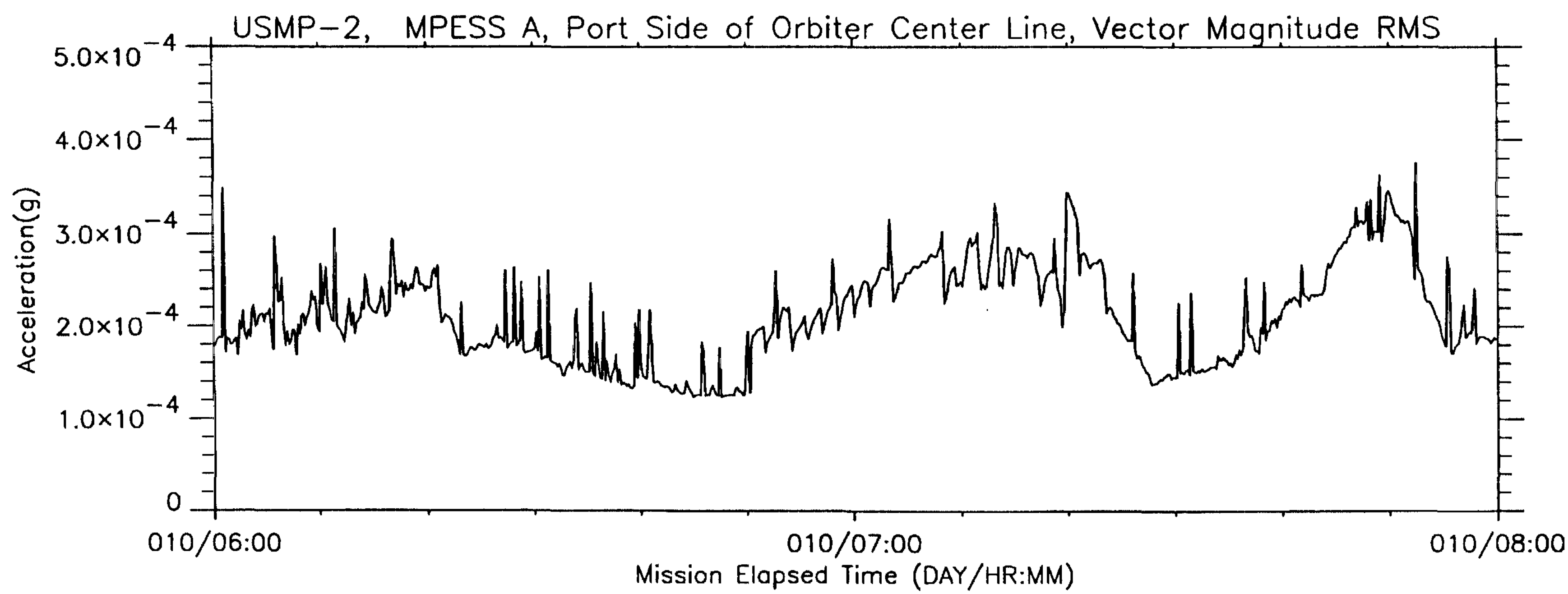

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
−0.0002
010/02:00
010/03:00
010/04:00
Mission Elapsed Time (DAY/HR:MM)

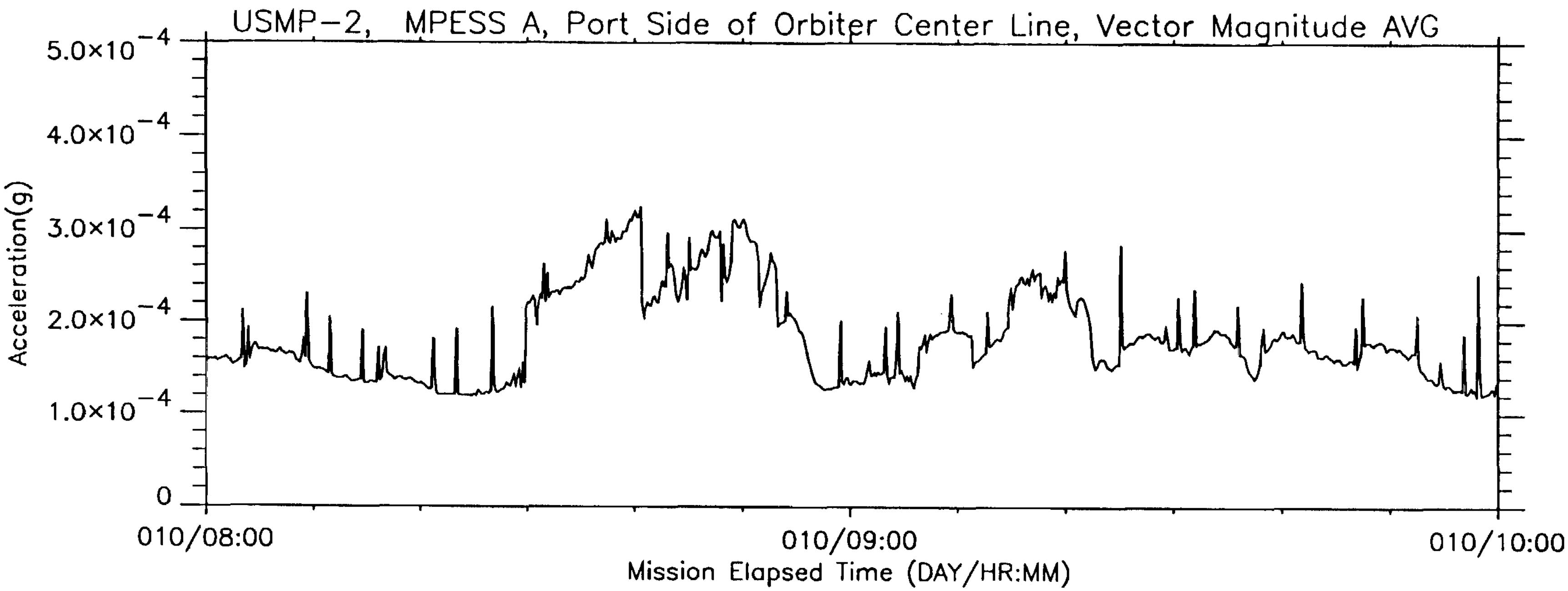

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
010/02:00
010/03:00
010/04:00
Mission Elapsed Time (DAY/HR:MM)

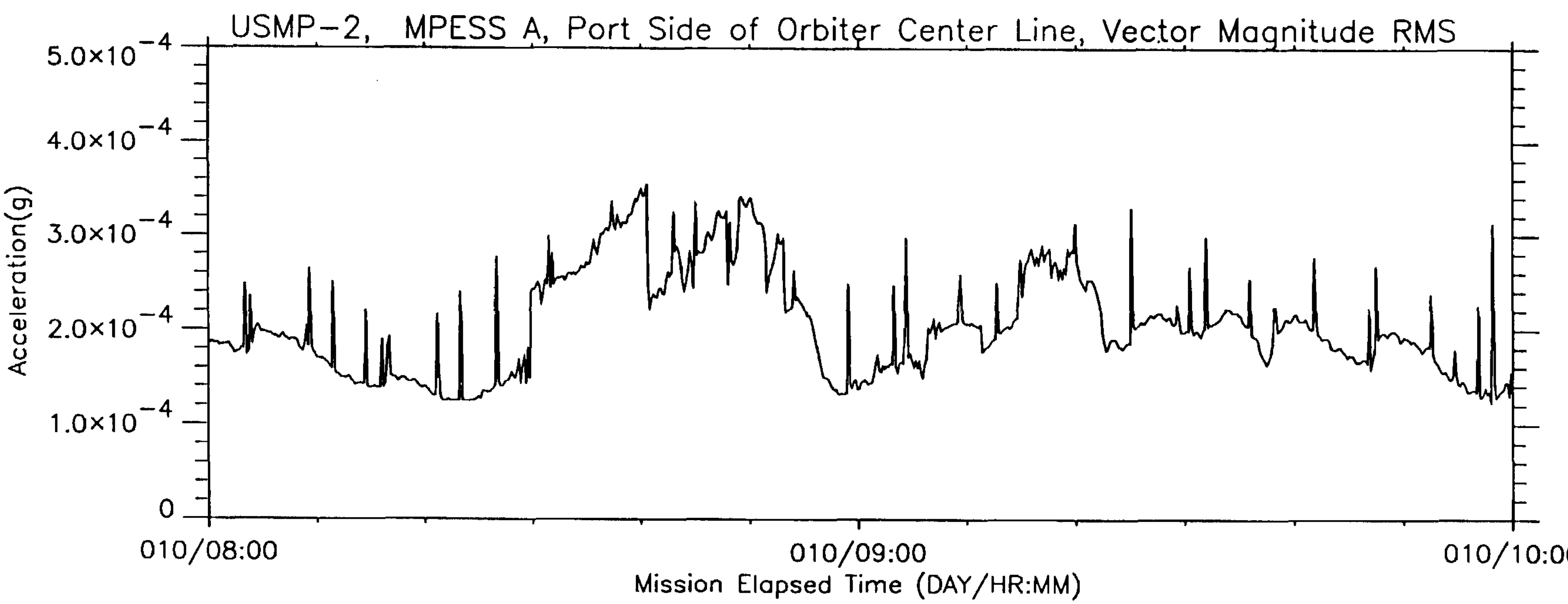

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0x10^{-4}
4.0x10^{-4}
3.0x10^{-4}
2.0x10^{-4}
1.0x10^{-4}
0
010/04:00
010/05:00
010/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0x10^{-4}
4.0x10^{-4}
3.0x10^{-4}
2.0x10^{-4}
1.0x10^{-4}
0
010/04:00
010/05:00
010/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
010/06:00
010/07:00
010/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
010/06:00
010/07:00
010/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
010/08:00
010/09:00
010/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
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1.0×10^{-4}
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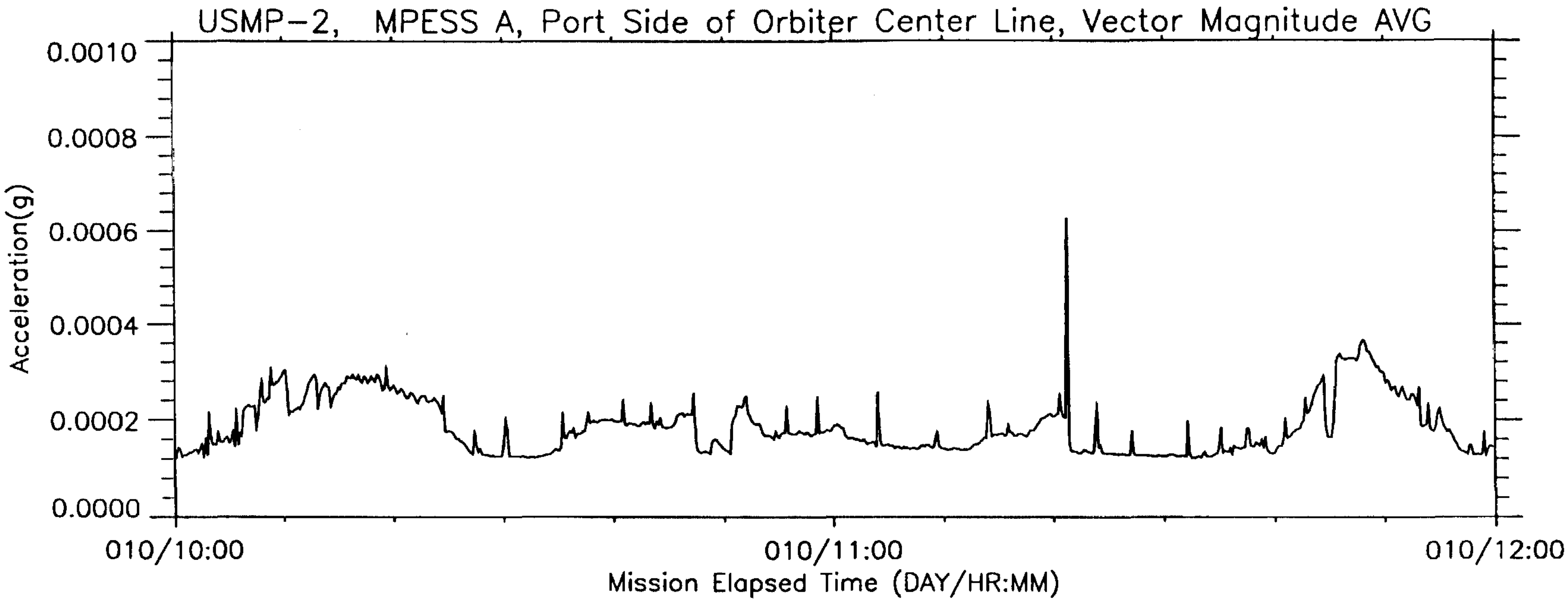
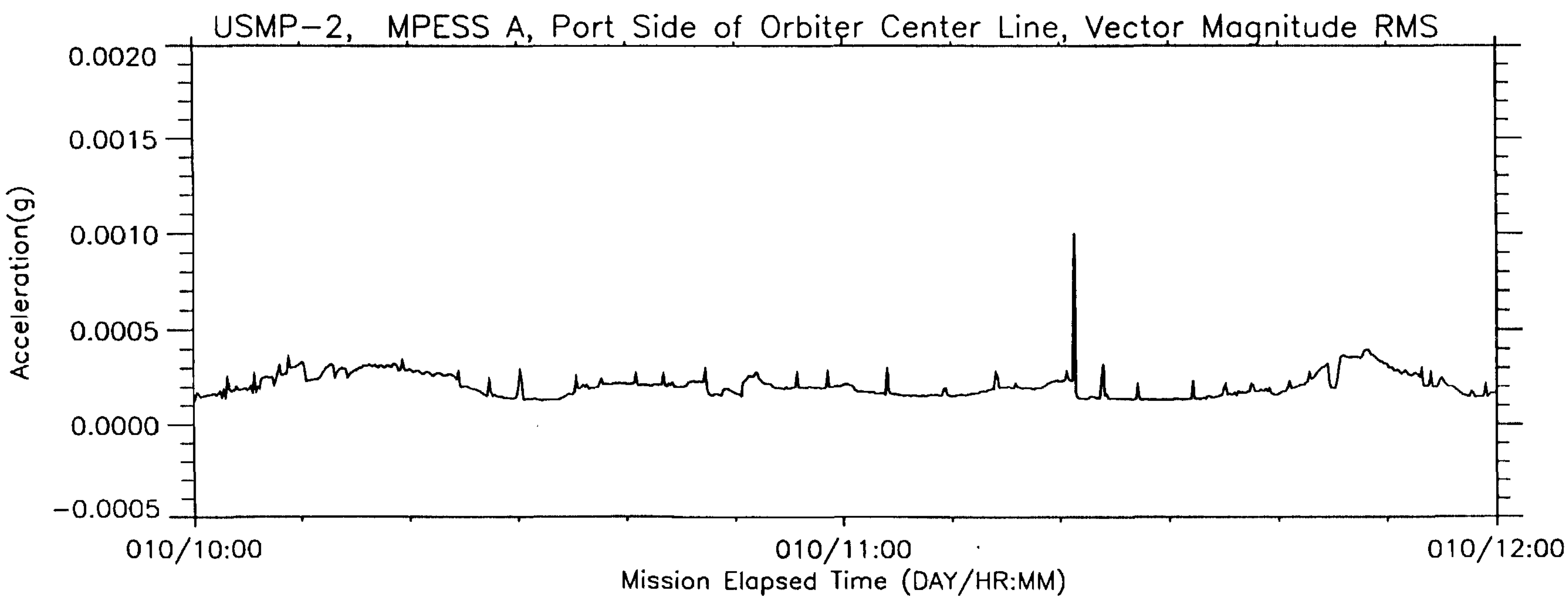
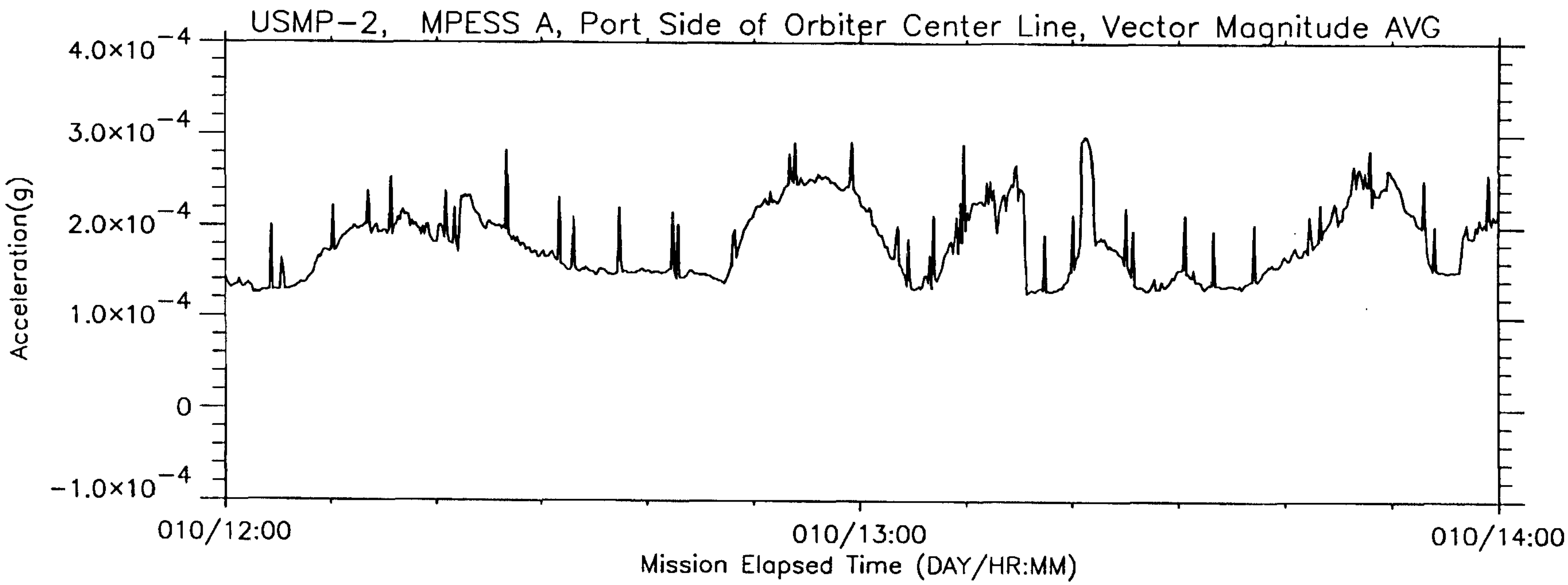
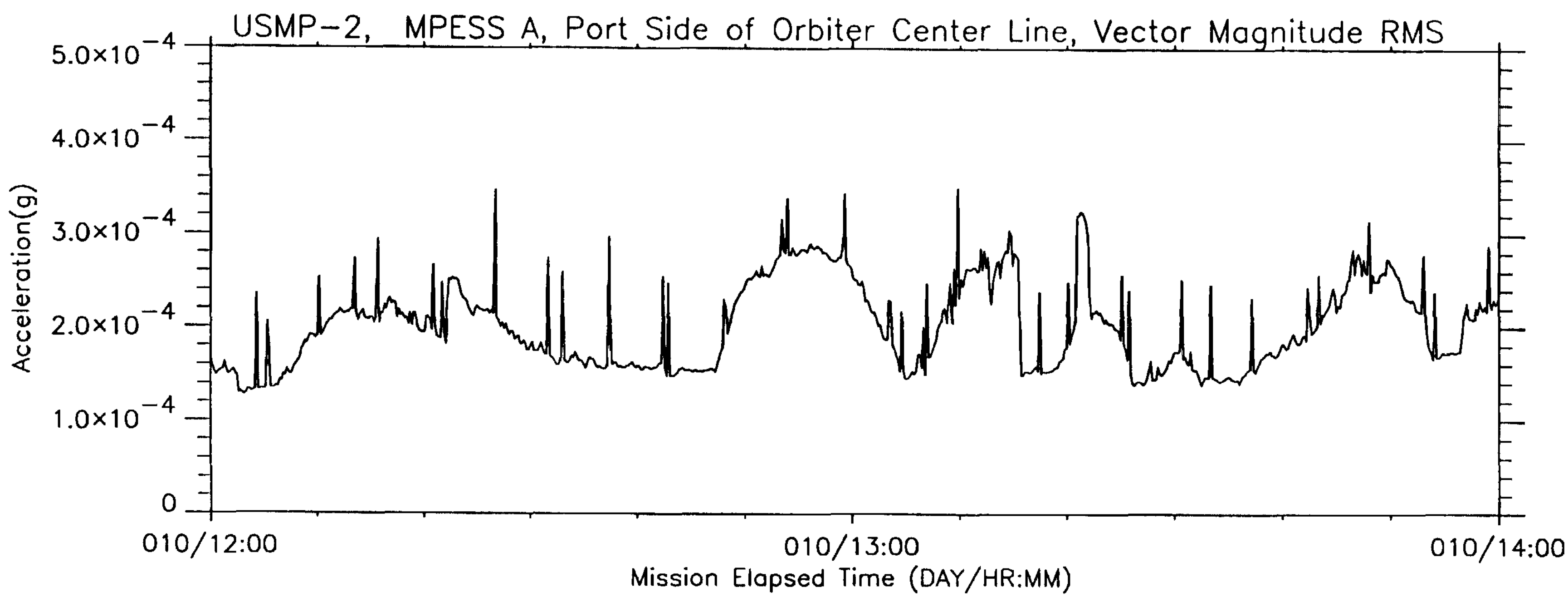
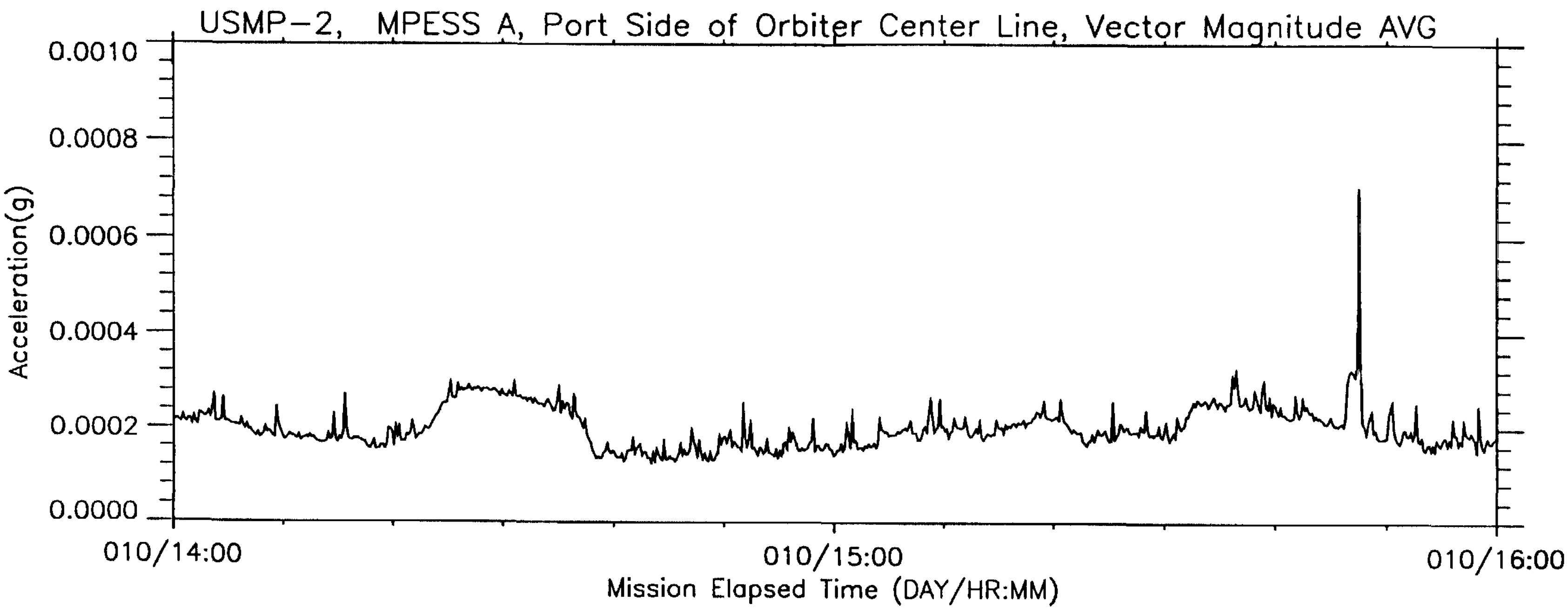
010/09:00
010/10:00
Mission Elapsed Time (DAY/HR:MM)

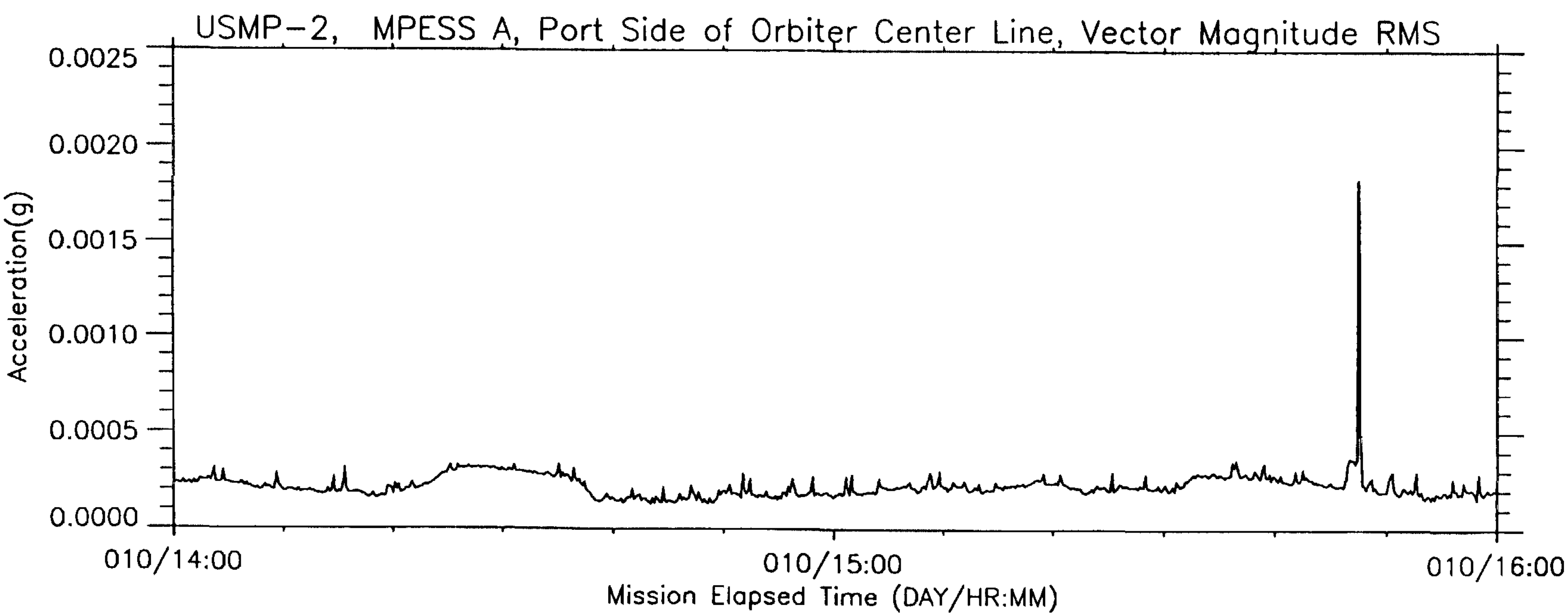

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
010/10:00
010/11:00
010/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0020
0.0015
0.0010
0.0005
0.0000
−0.0005
010/10:00
010/11:00
010/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
−1.0×10^{-4}
010/12:00
010/13:00
010/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
010/12:00
010/13:00
010/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
010/14:00
010/15:00
010/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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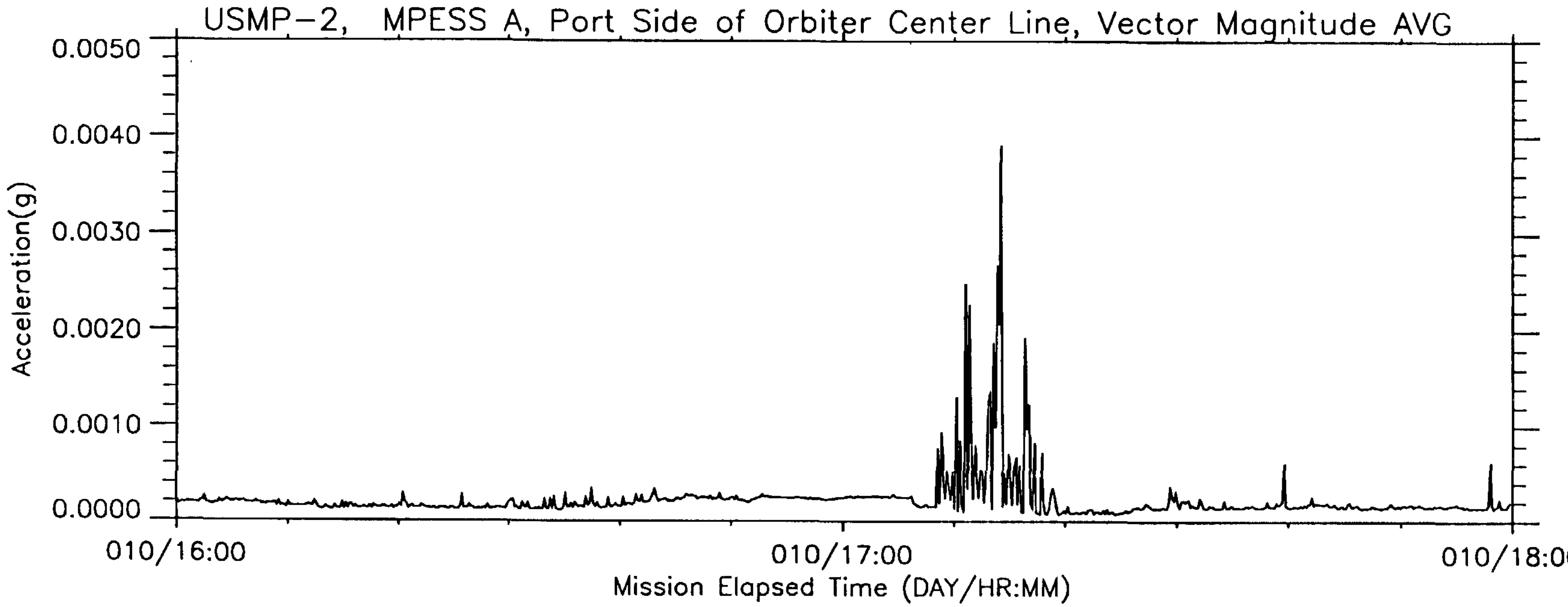
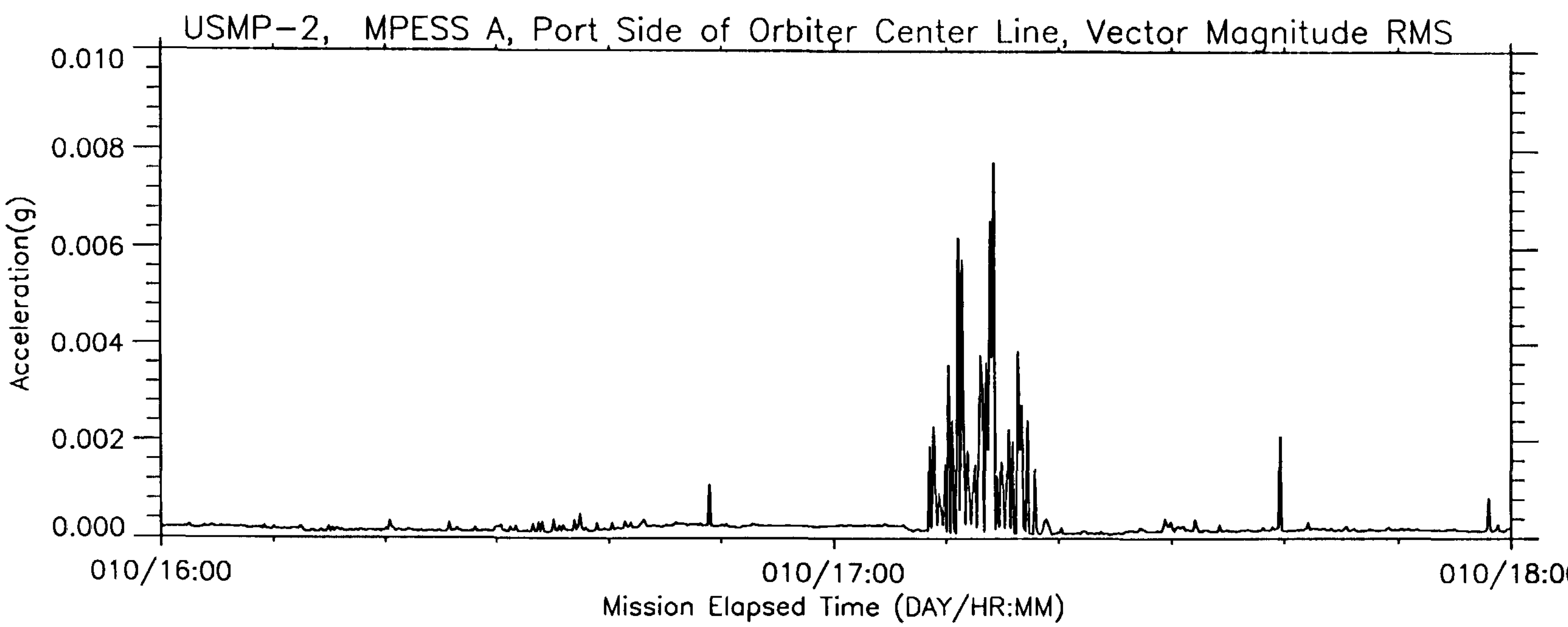
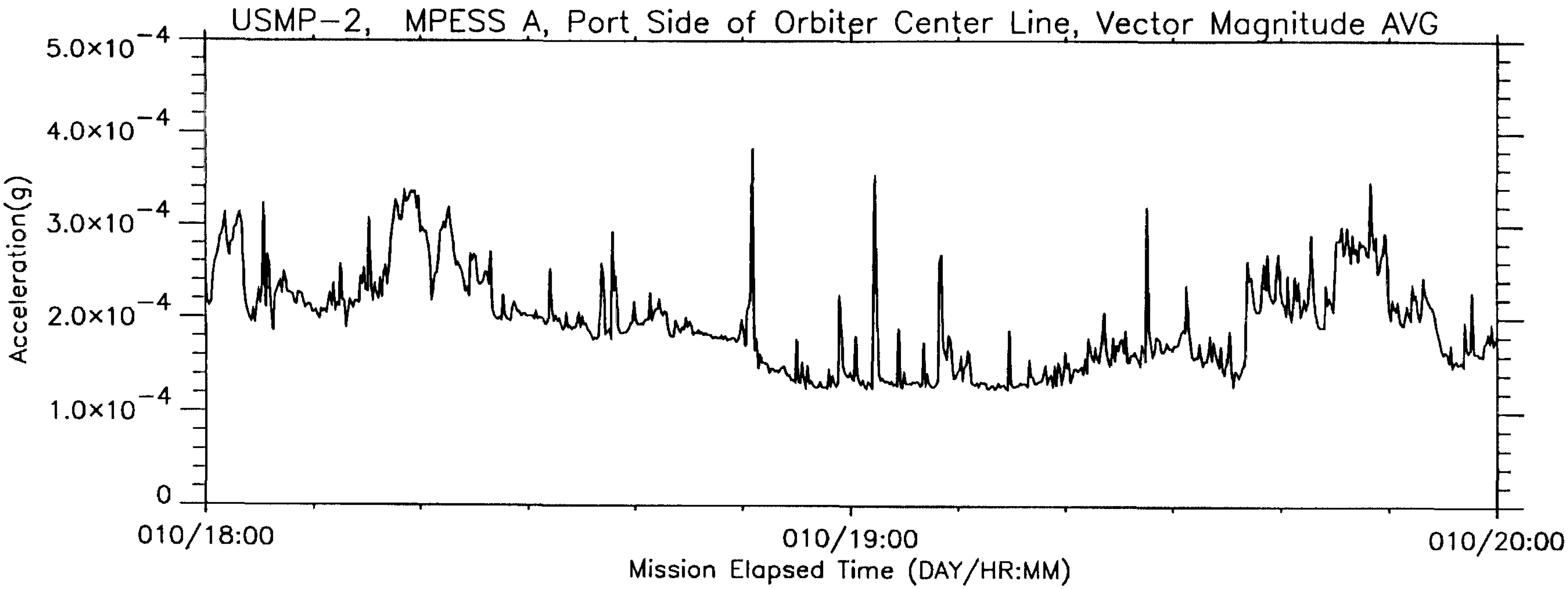
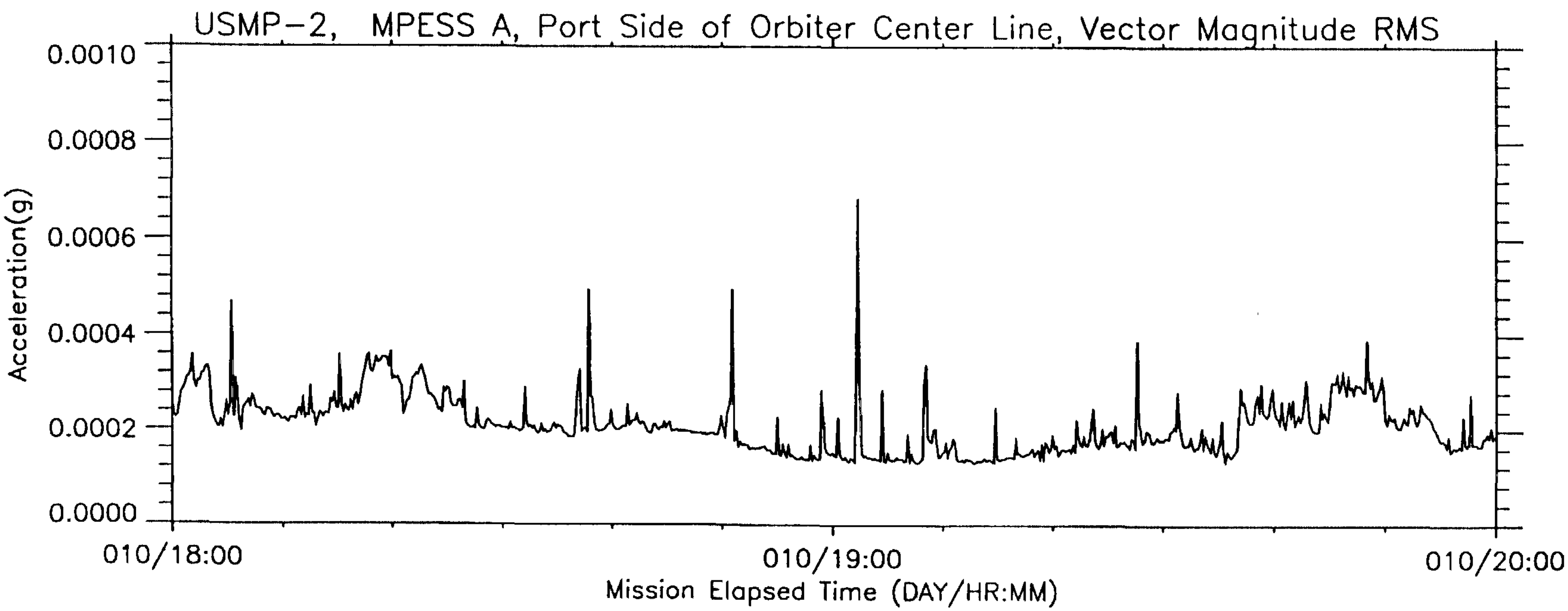
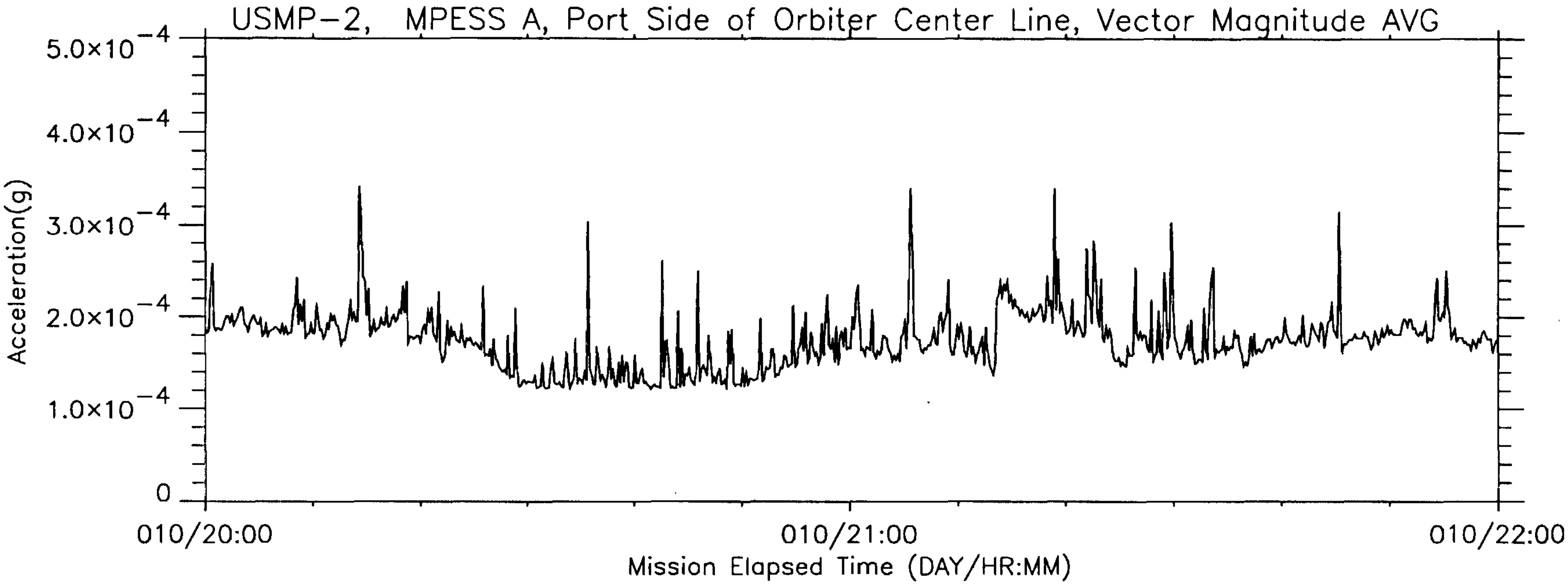
0.0015
0.0010
0.0005
0.0000
010/14:00
010/15:00
010/16:00
Mission Elapsed Time (DAY/HR:MM)

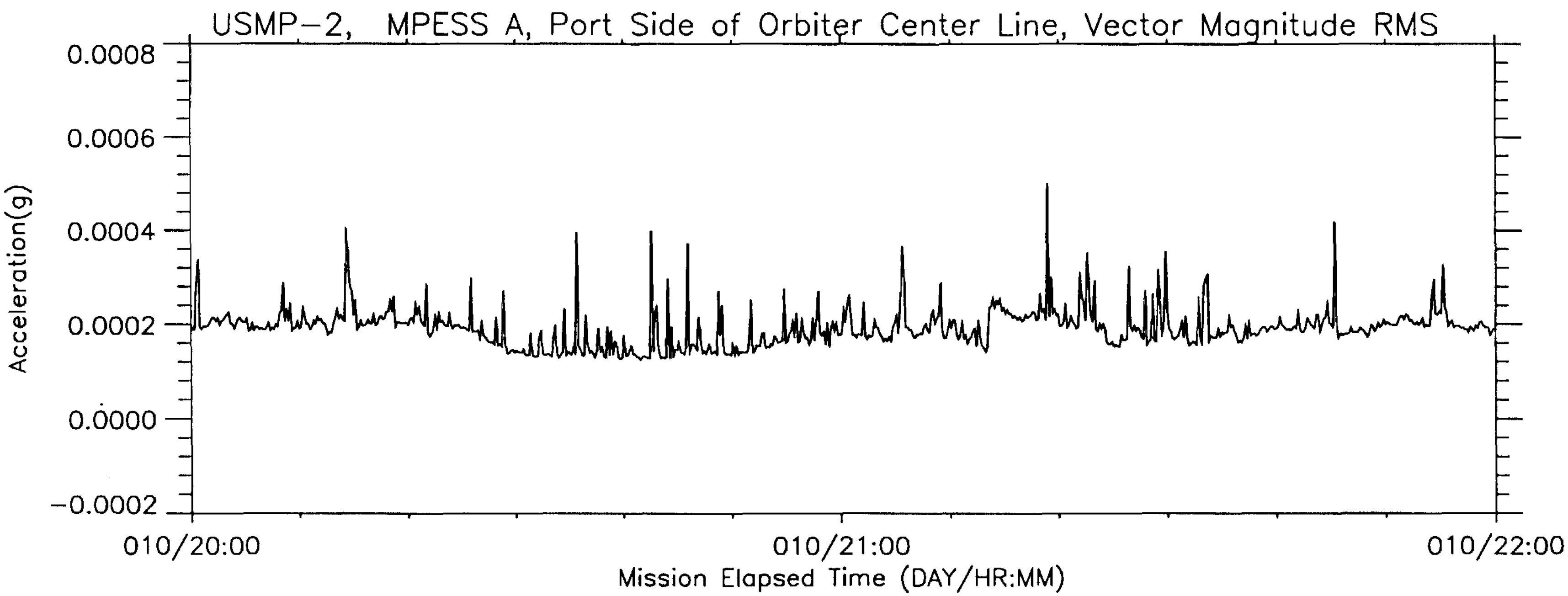

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
010/16:00
010/17:00
010/18:00
Mission Elapsed Time (DAY/HR:MM)

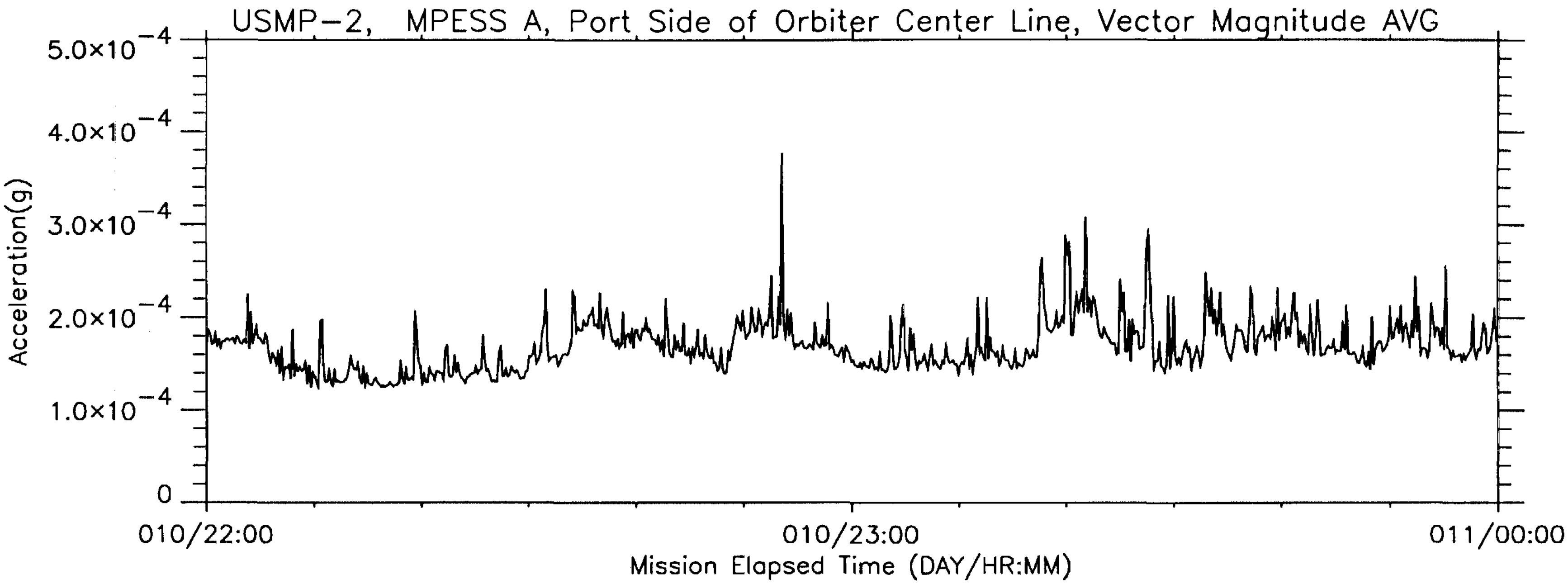

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.010
0.008
0.006
0.004
0.002
0.000
010/16:00
010/17:00
010/18:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10⁻⁴
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
010/18:00
010/19:00
010/20:00
Mission Elapsed Time (DAY/HR:MM)

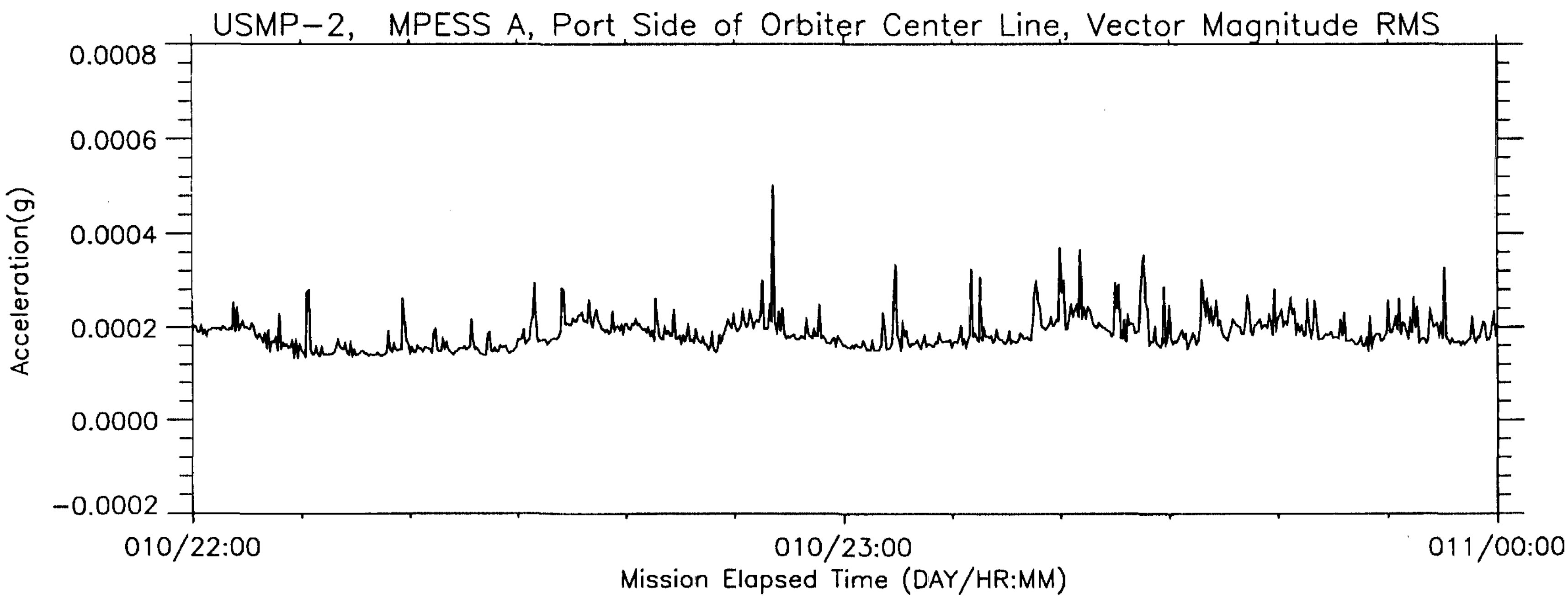

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
010/18:00
010/19:00
010/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10⁻⁴
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
010/20:00
010/21:00
010/22:00
Mission Elapsed Time (DAY/HR:MM)


USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
−0.0002
010/20:00
010/21:00
010/22:00
Mission Elapsed Time (DAY/HR:MM)

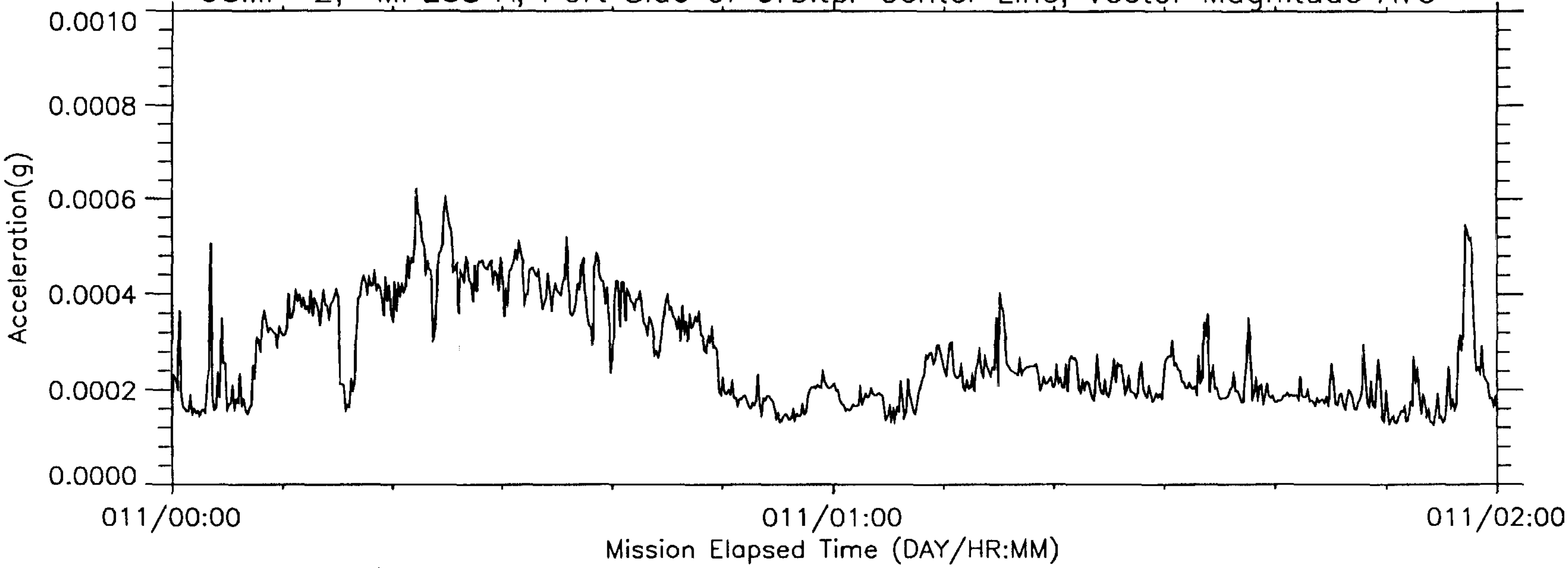


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0x10^-4
4.0x10^-4
3.0x10^-4
2.0x10^-4
1.0x10^-4
0
010/22:00
010/23:00
011/00:00
Mission Elapsed Time (DAY/HR:MM)

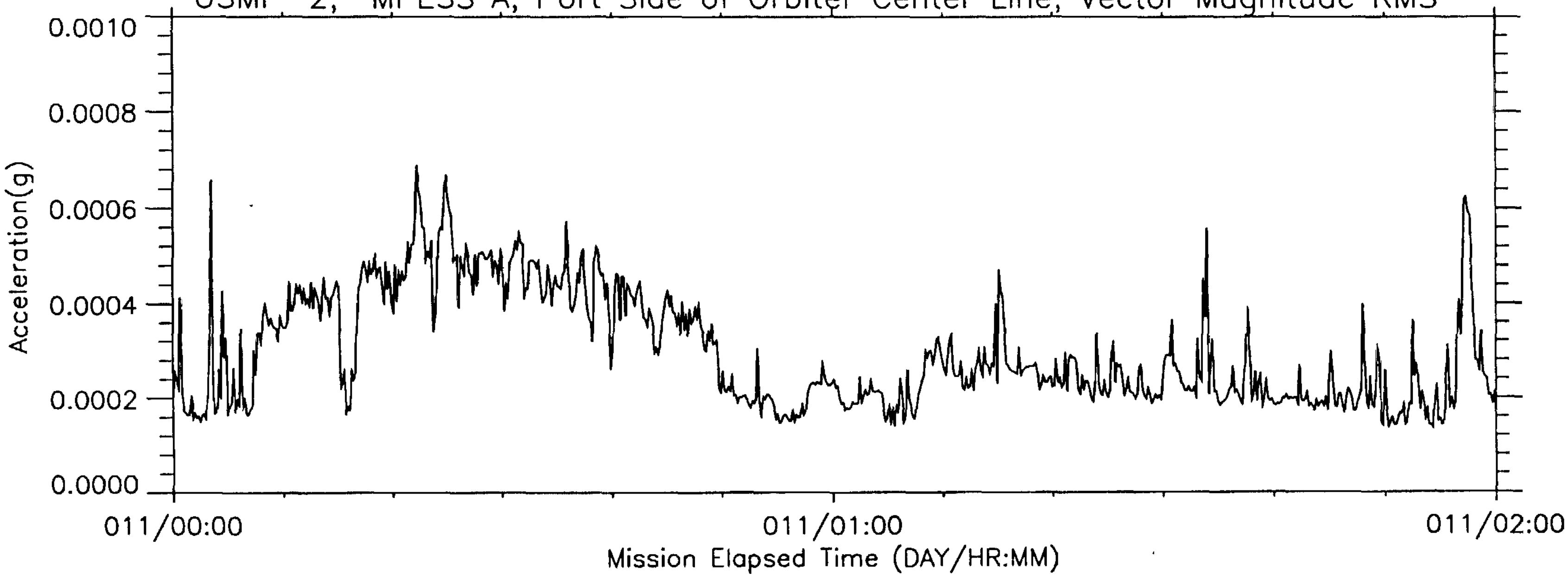


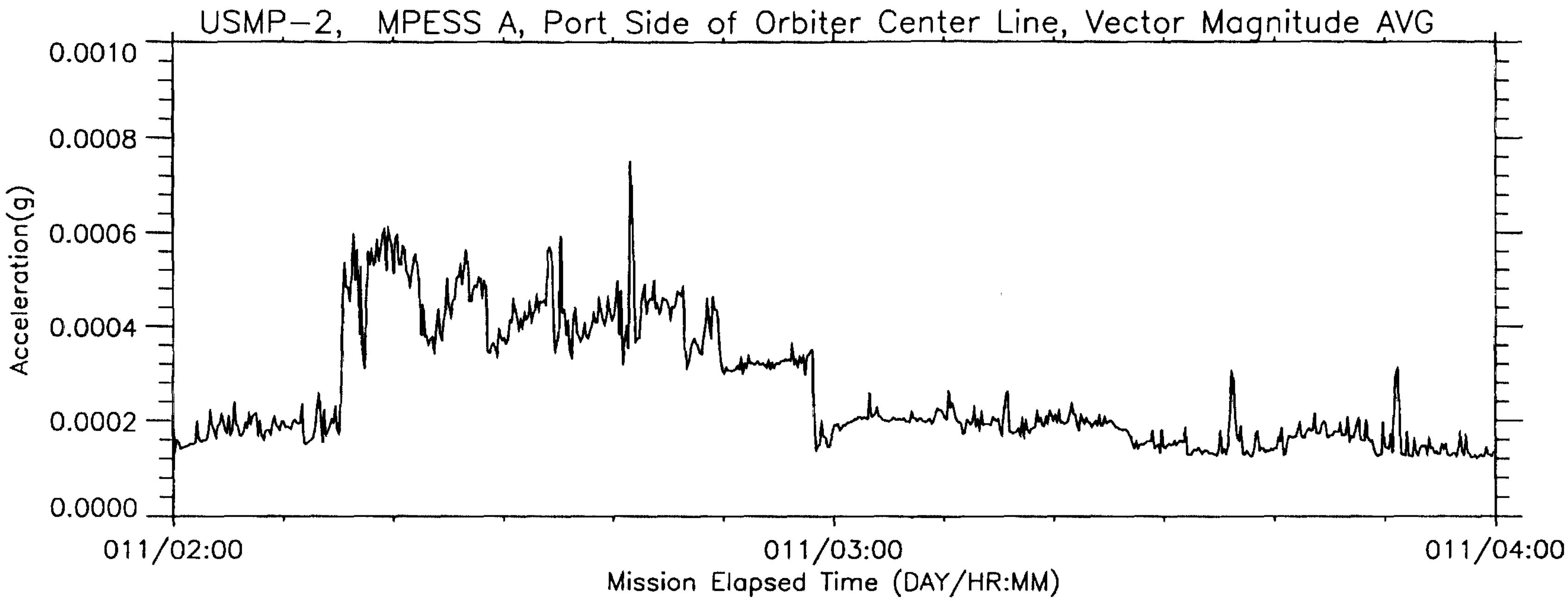
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0008
0.0006
0.0004
0.0002
0.0000
-0.0002
010/22:00
010/23:00
011/00:00
Mission Elapsed Time (DAY/HR:MM)

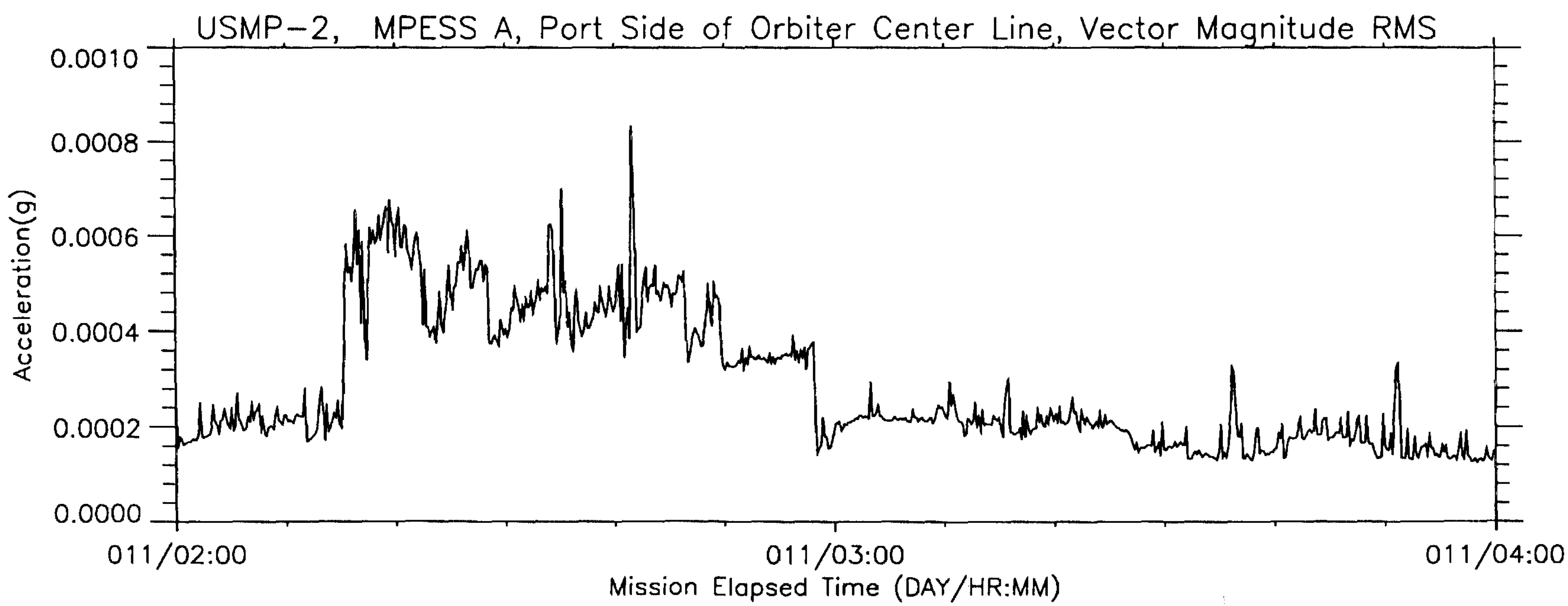
USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG

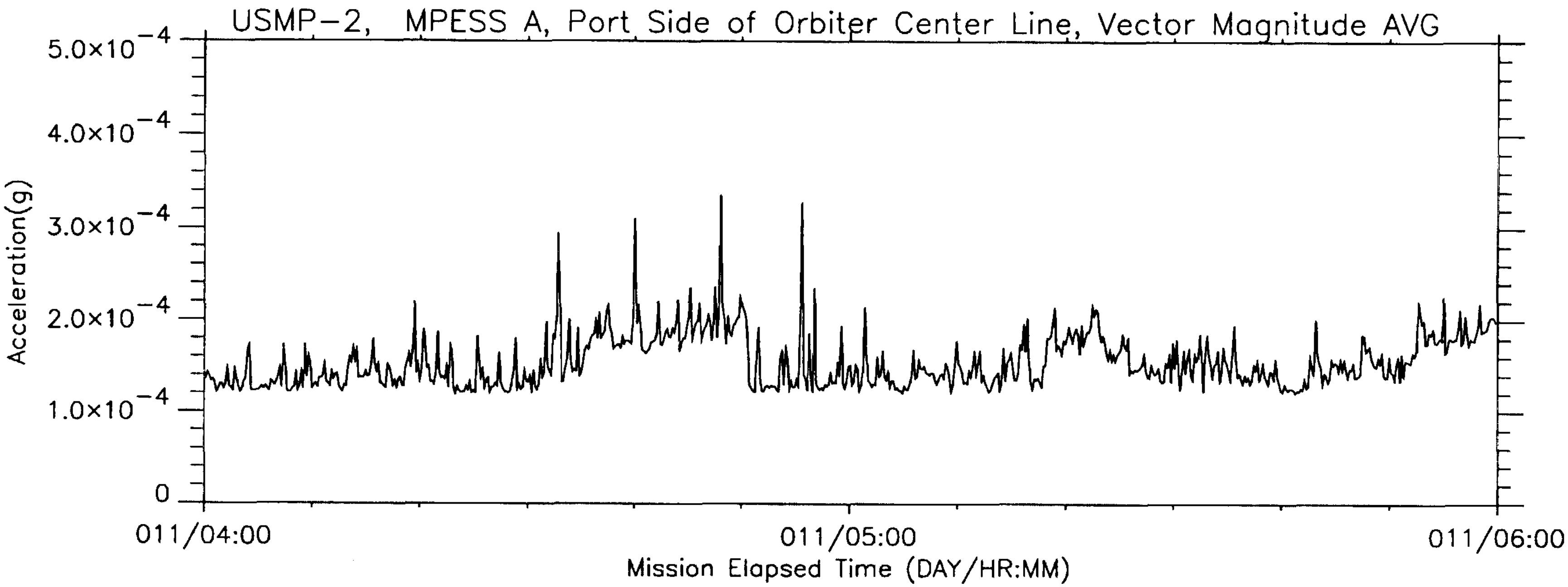


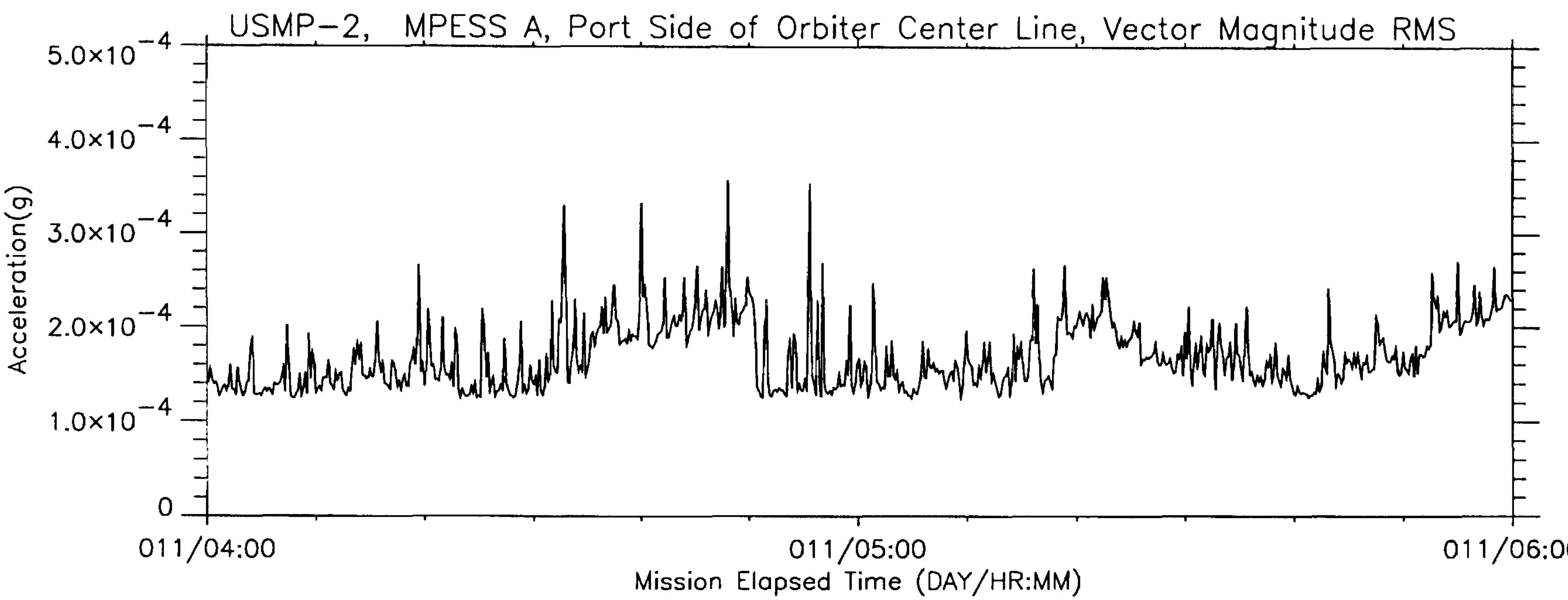
USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS

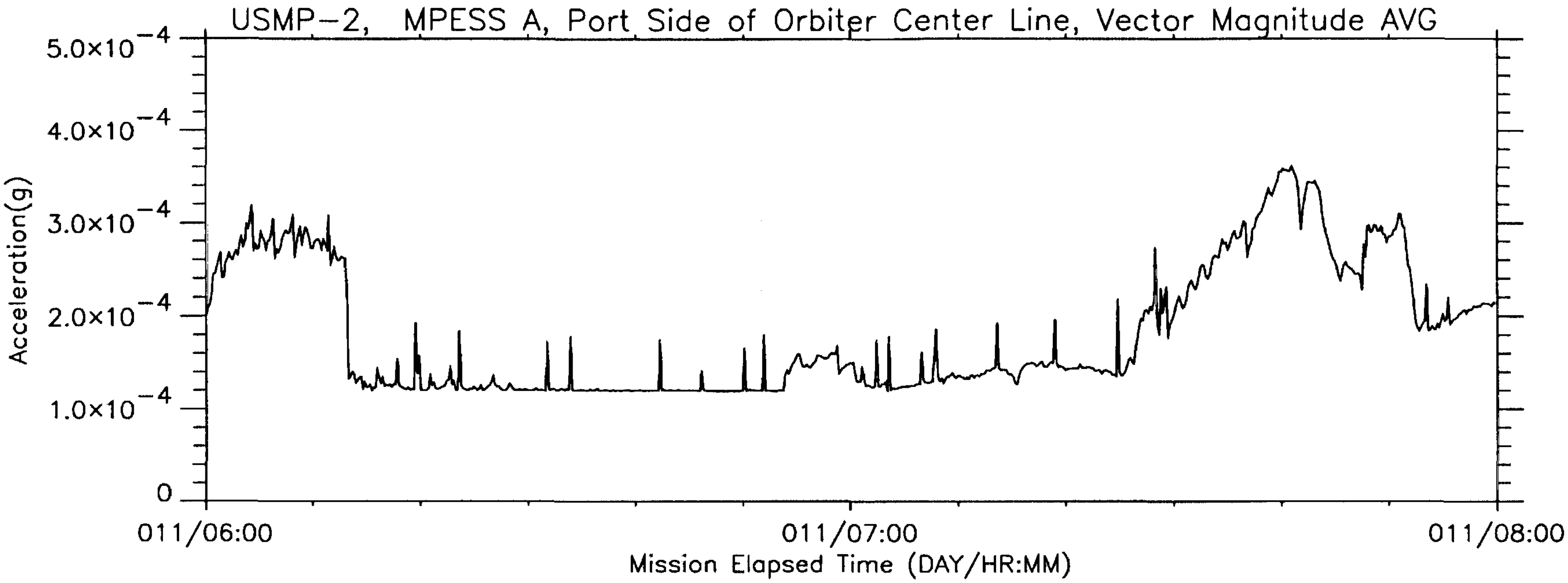



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
011/02:00
011/03:00
011/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
011/02:00
011/03:00
011/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
011/04:00
011/05:00
011/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
011/04:00
011/05:00
011/06:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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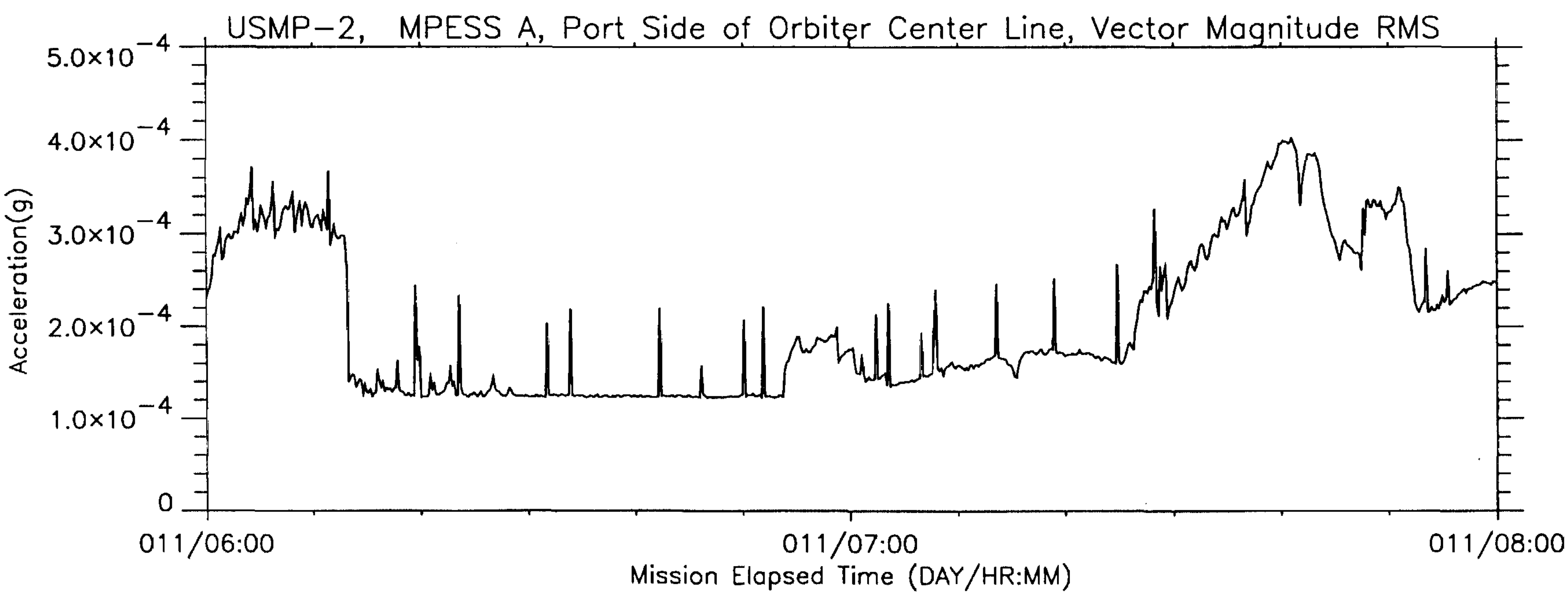
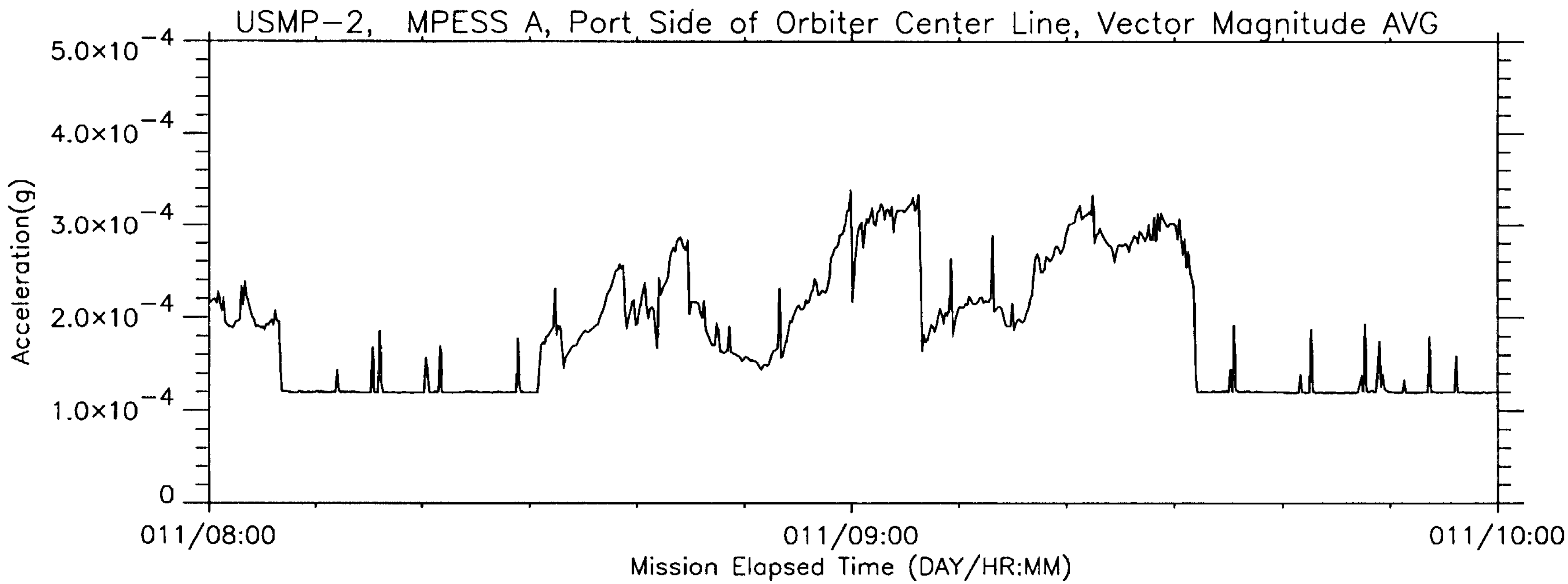
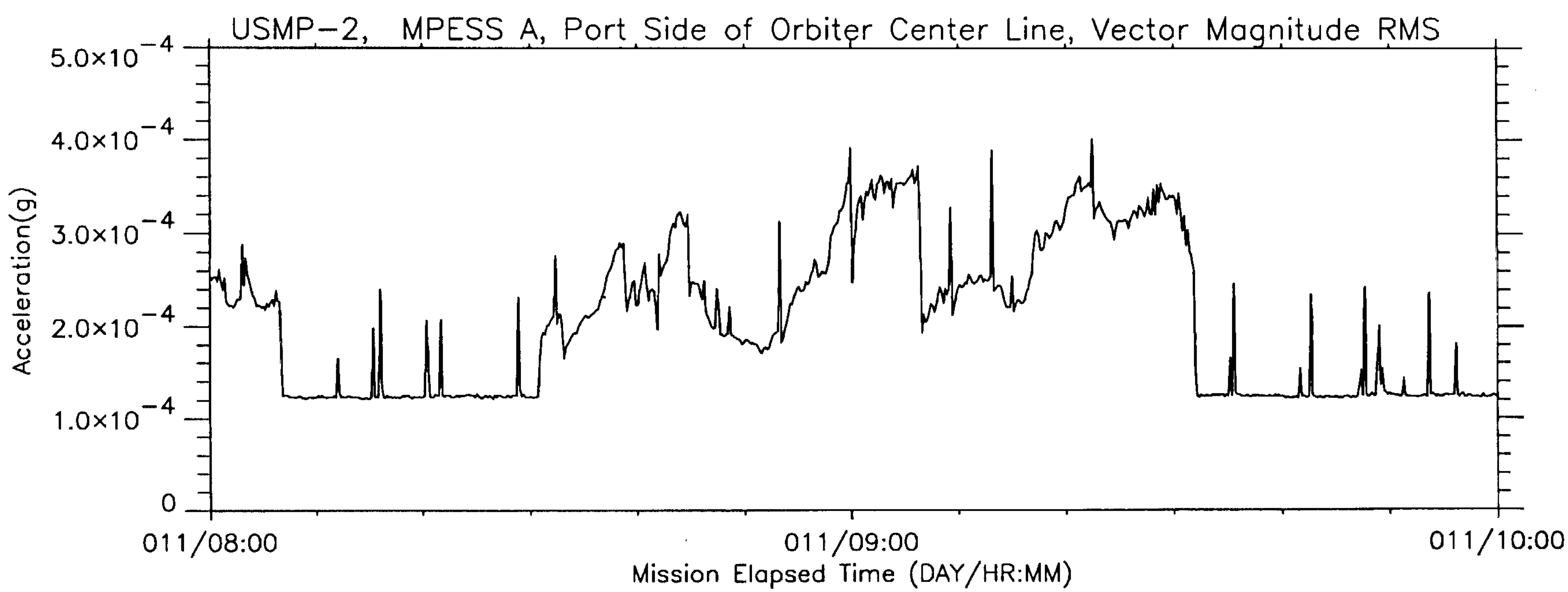
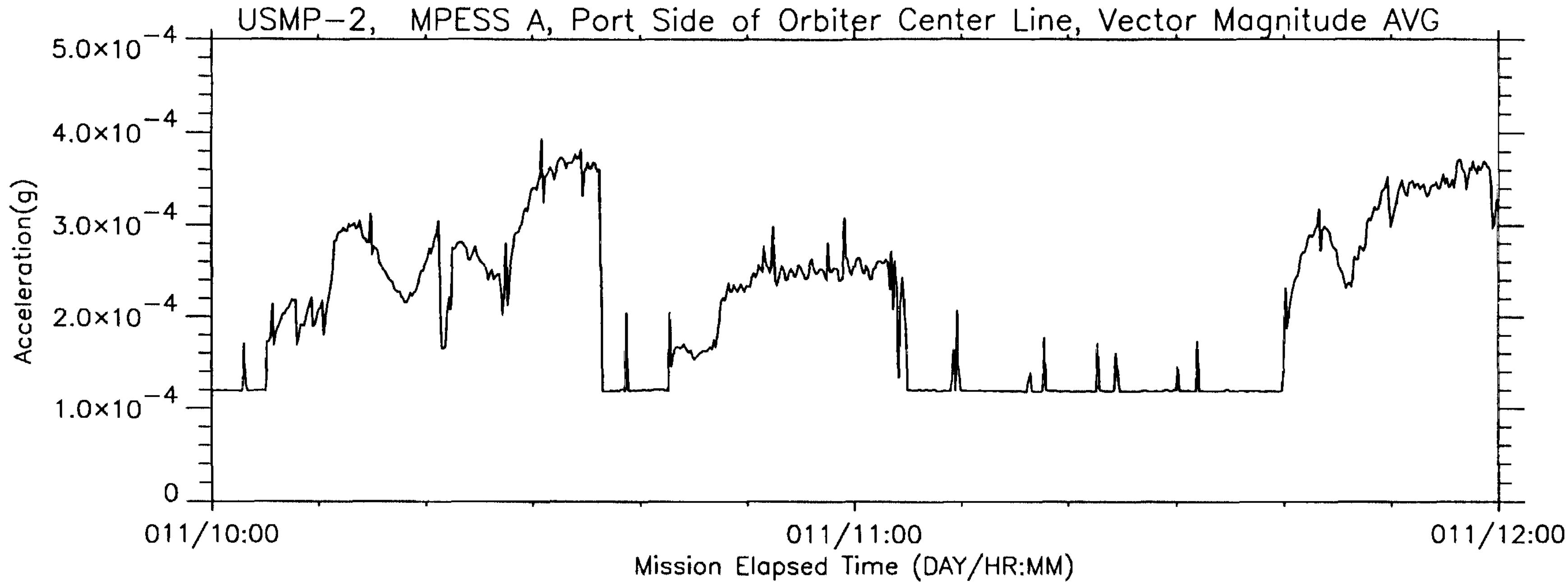
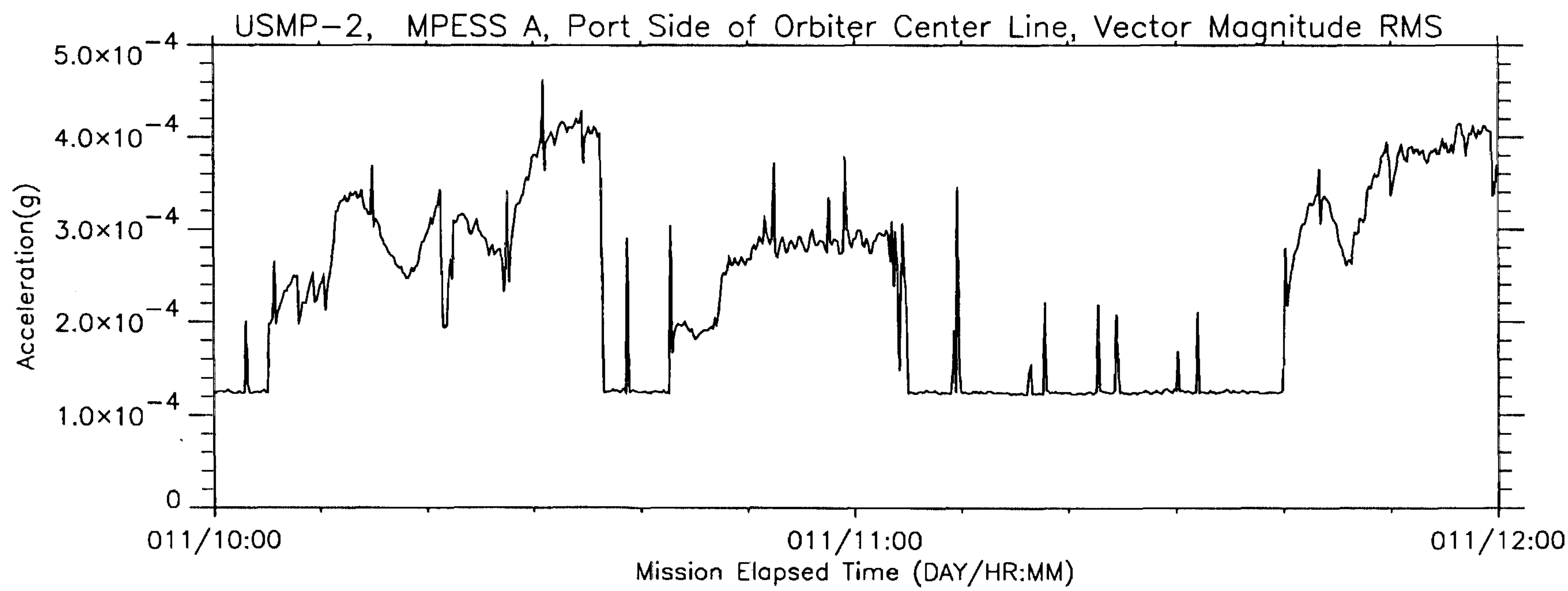
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
011/06:00
011/07:00
011/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
011/06:00
011/07:00
011/08:00
Mission Elapsed Time (DAY/HR:MM)


USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
011/08:00
011/09:00
011/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
011/08:00
011/09:00
011/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10⁻⁴
4.0×10⁻⁴
3.0×10⁻⁴
2.0×10⁻⁴
1.0×10⁻⁴
0
011/10:00
011/11:00
011/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10⁻⁴
4.0×10⁻⁴
3.0×10⁻⁴
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1.0×10⁻⁴
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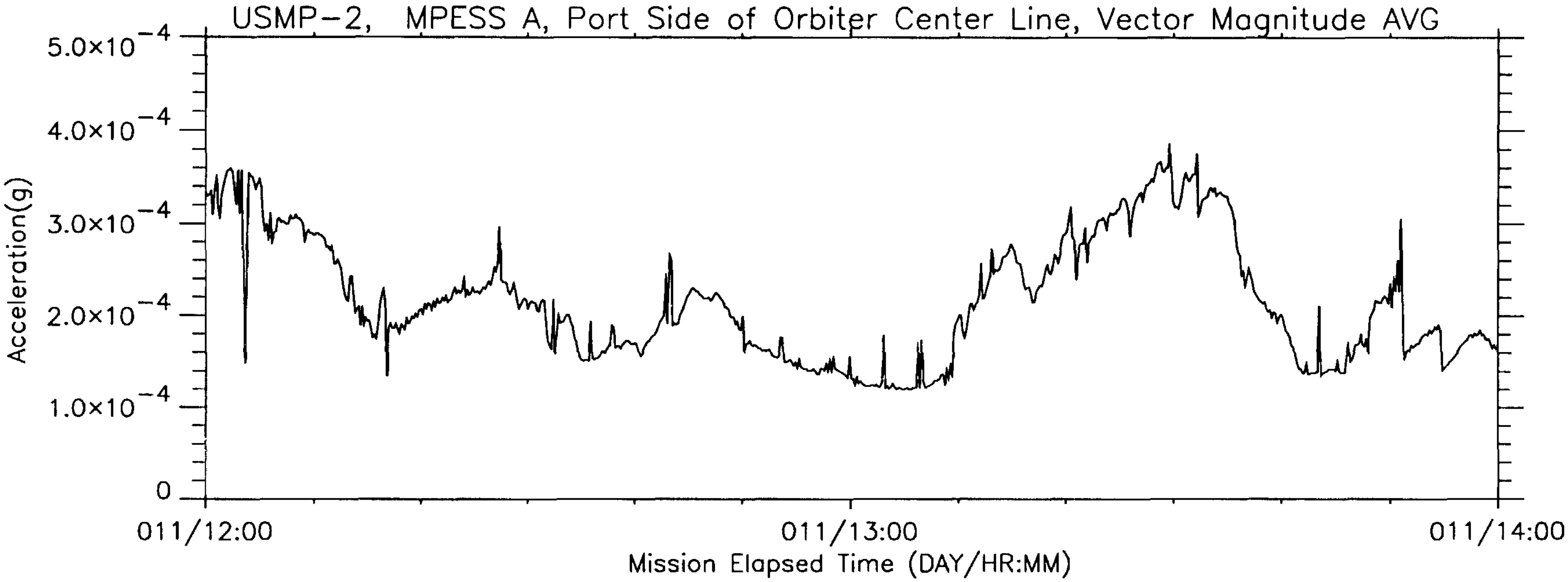
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
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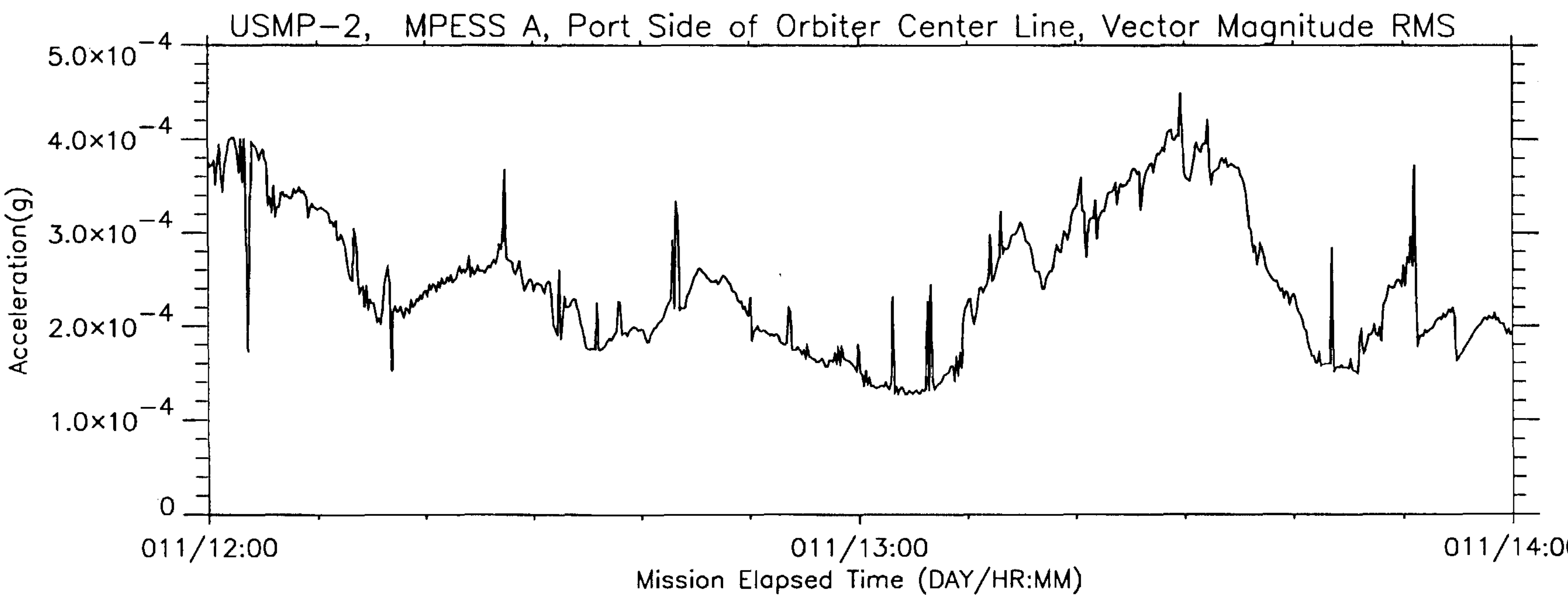
011/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
5.0×10^{-4}
4.0×10^{-4}
3.0×10^{-4}
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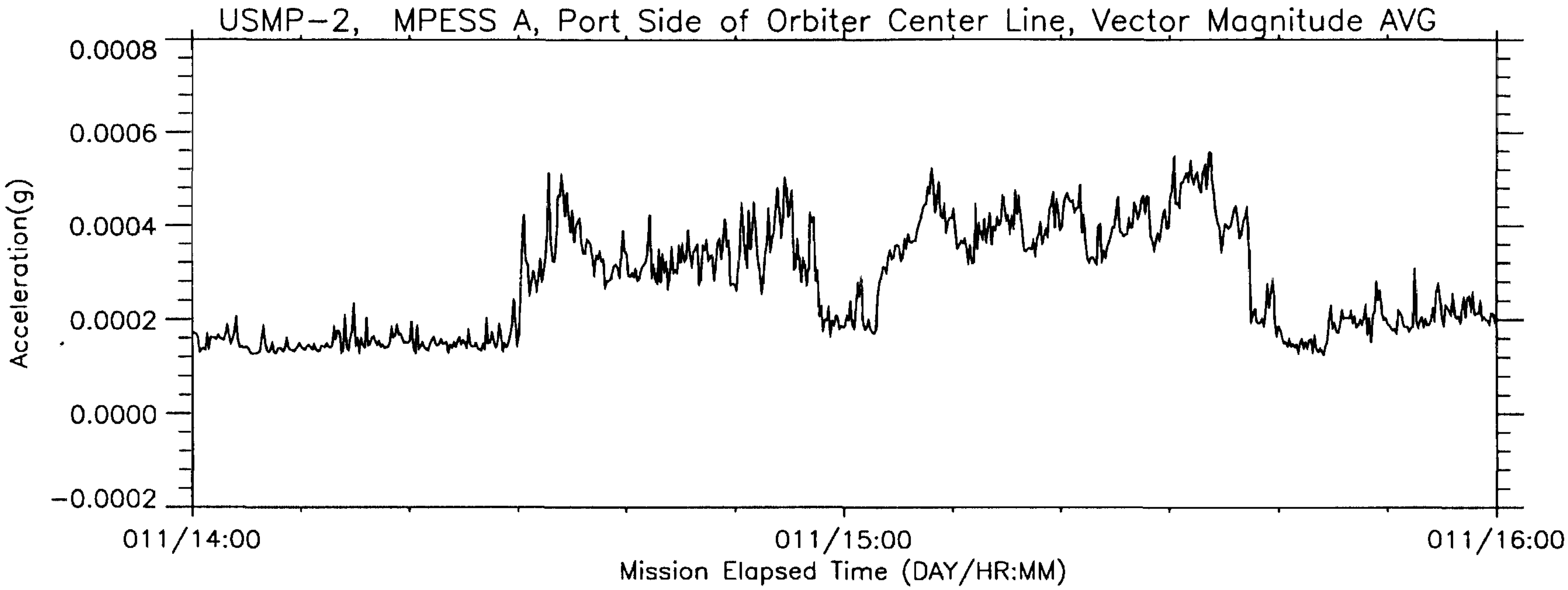
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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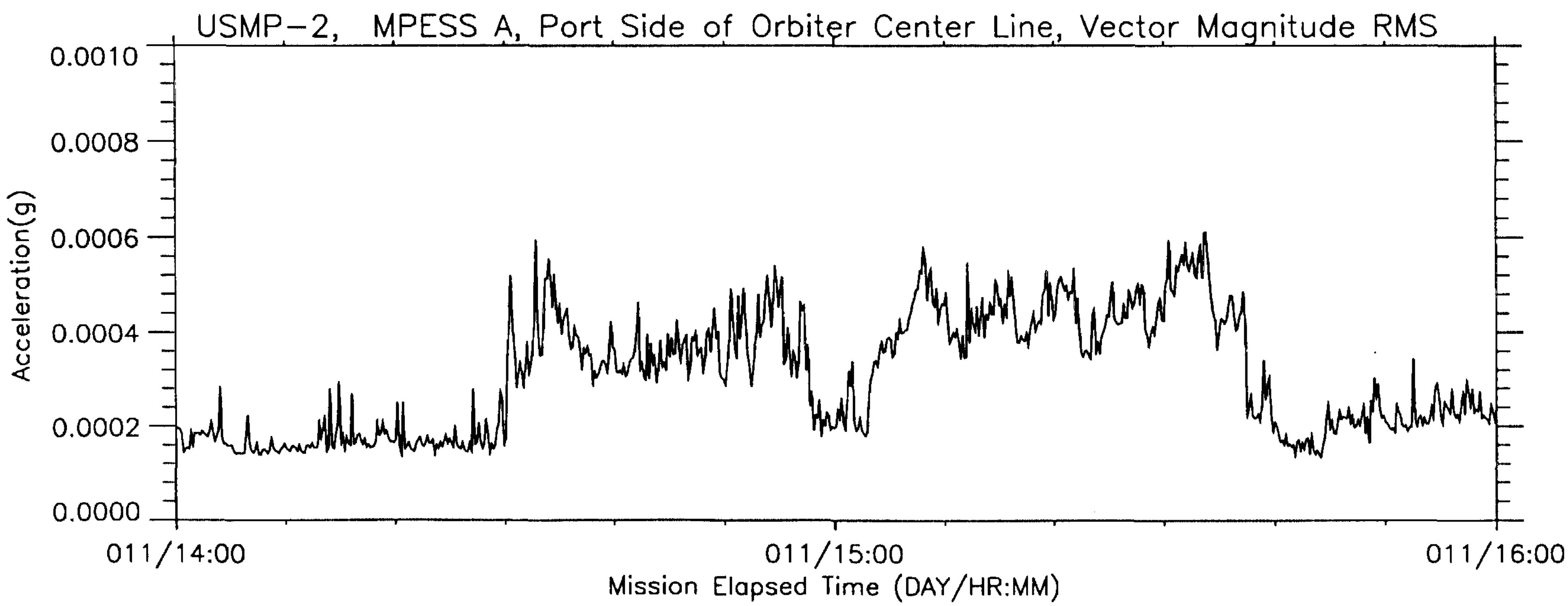
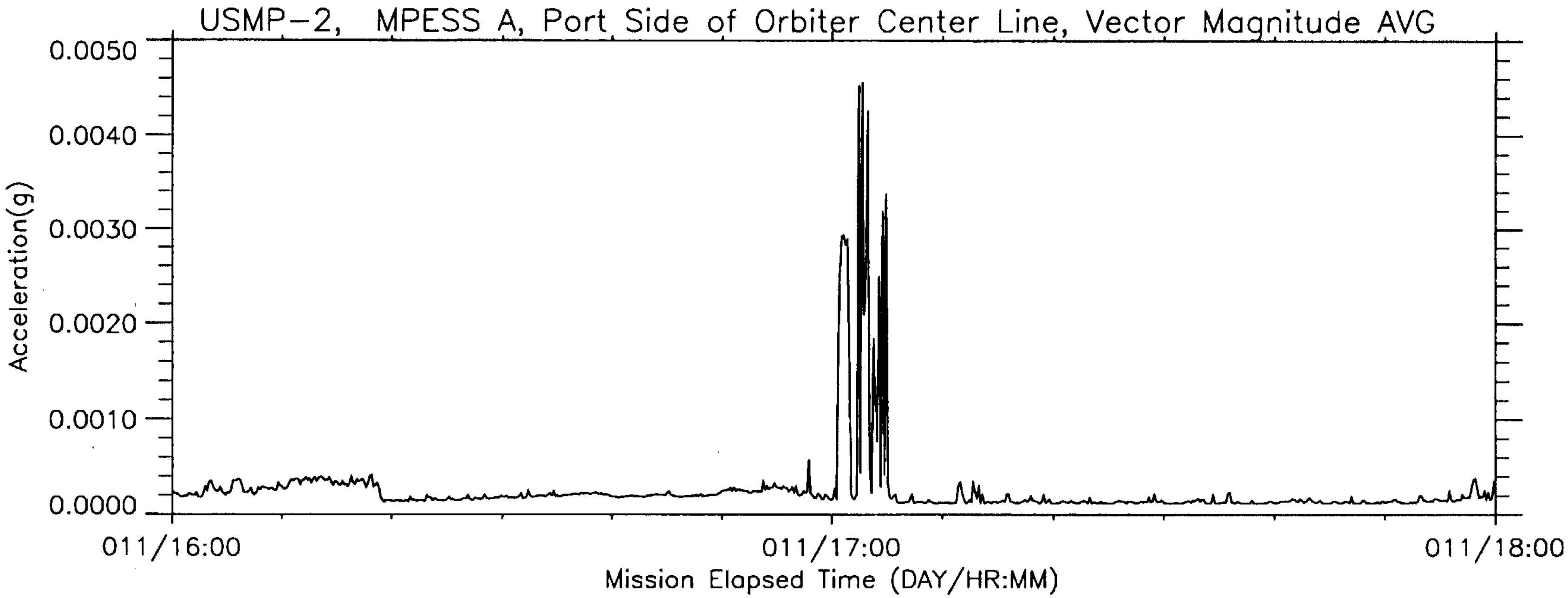
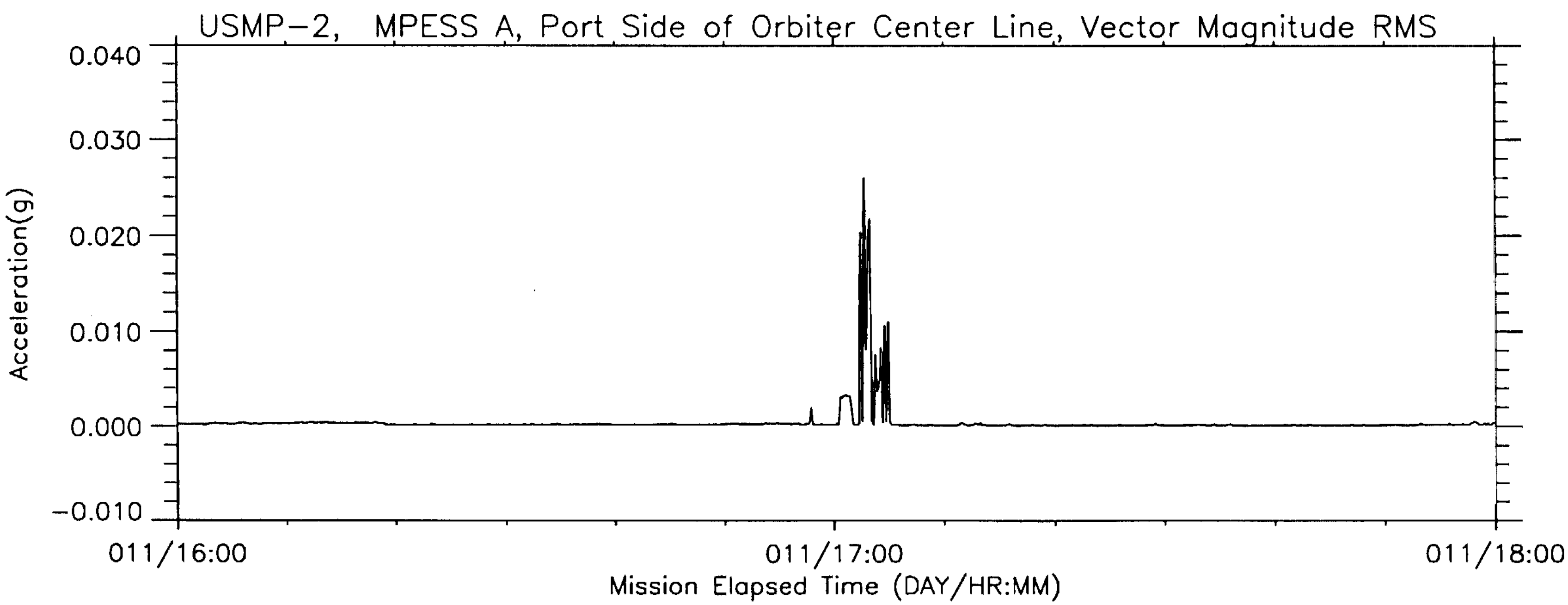
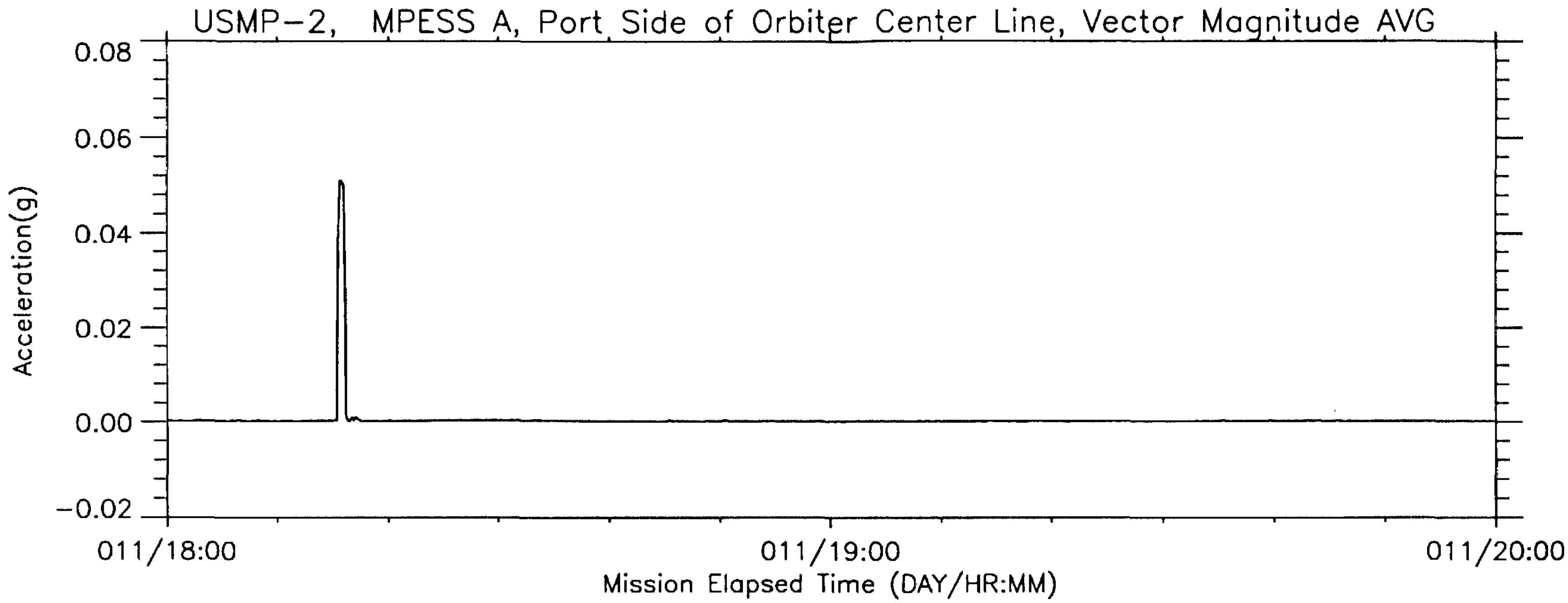
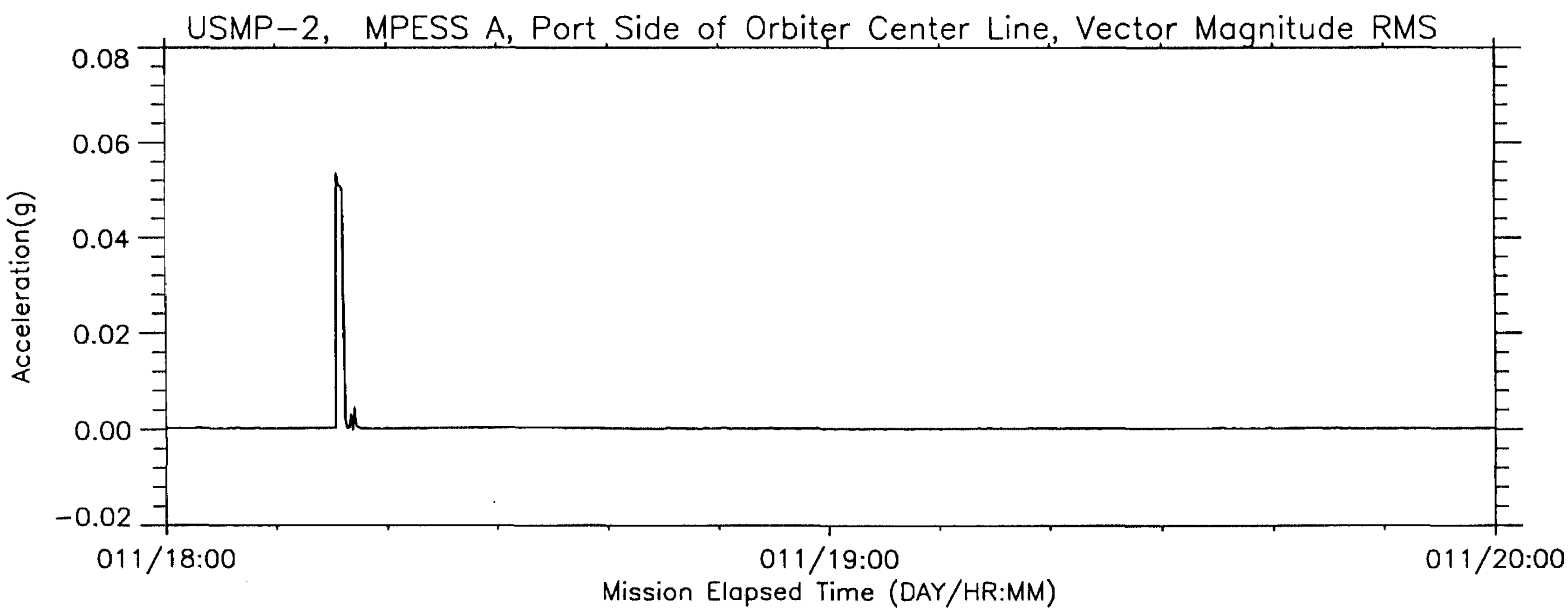
0.0006
0.0004
0.0002
0.0000
−0.0002
011/14:00
011/15:00
011/16:00
Mission Elapsed Time (DAY/HR:MM)

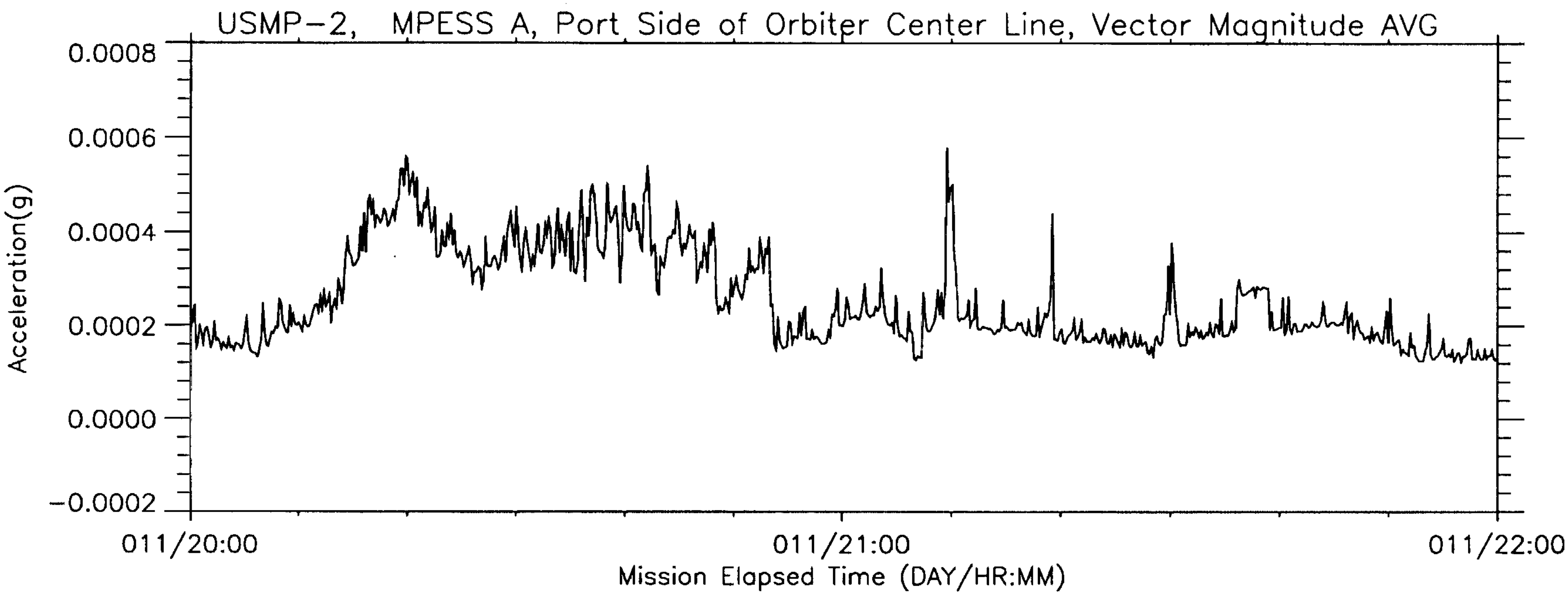

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
011/14:00
011/15:00
011/16:00
Mission Elapsed Time (DAY/HR:MM)

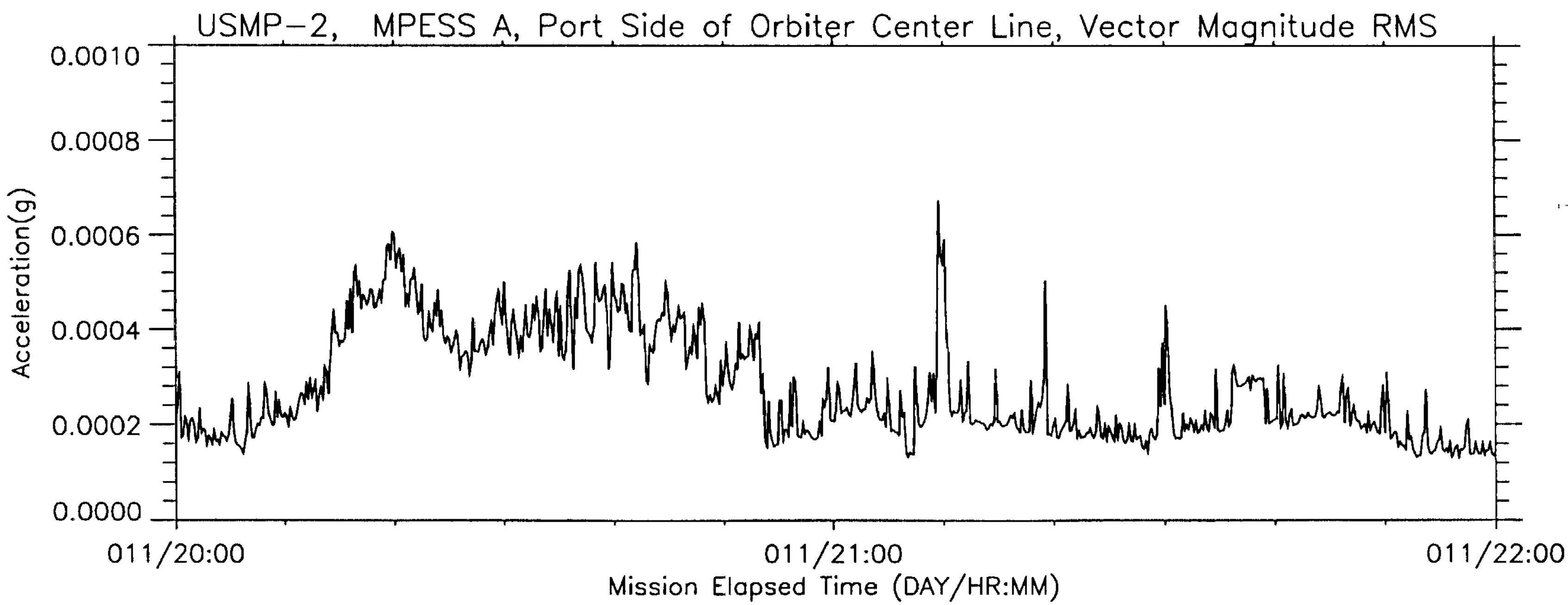

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Acceleration(g)
011/16:00
011/17:00
011/18:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
0.040
0.030
0.020
0.010
0.000
−0.010
Acceleration(g)
011/16:00
011/17:00
011/18:00
Mission Elapsed Time (DAY/HR:MM)

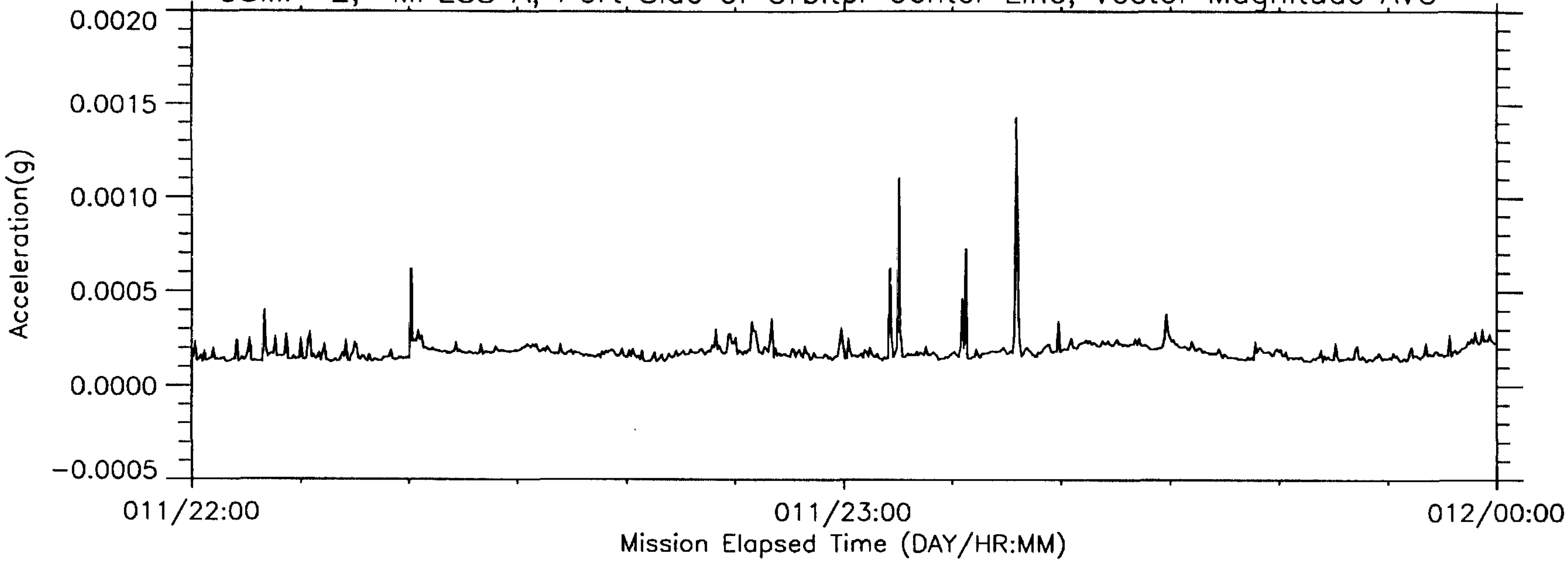

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
0.08
0.06
0.04
0.02
0.00
−0.02
011/18:00
011/19:00
011/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
0.08
0.06
0.04
0.02
0.00
−0.02
011/18:00
011/19:00
011/20:00
Mission Elapsed Time (DAY/HR:MM)

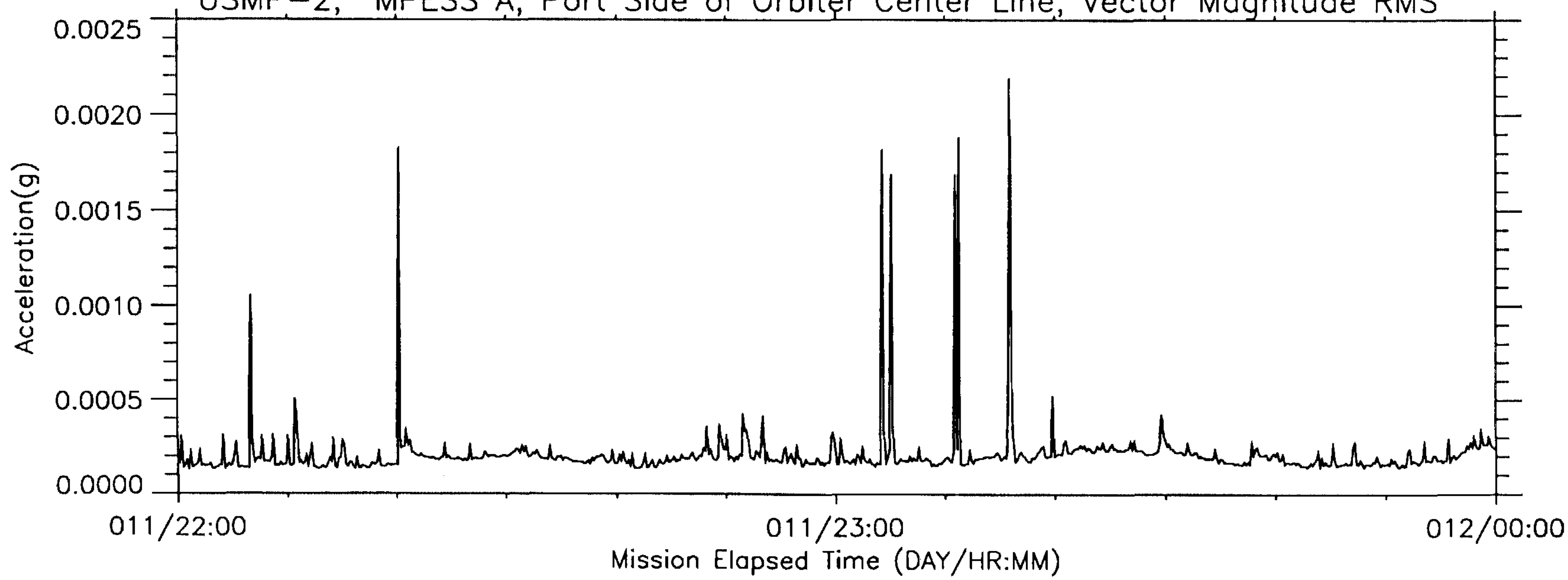

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
0.0008
0.0006
0.0004
0.0002
0.0000
-0.0002
Acceleration(g)
011/20:00
011/21:00
011/22:00
Mission Elapsed Time (DAY/HR:MM)

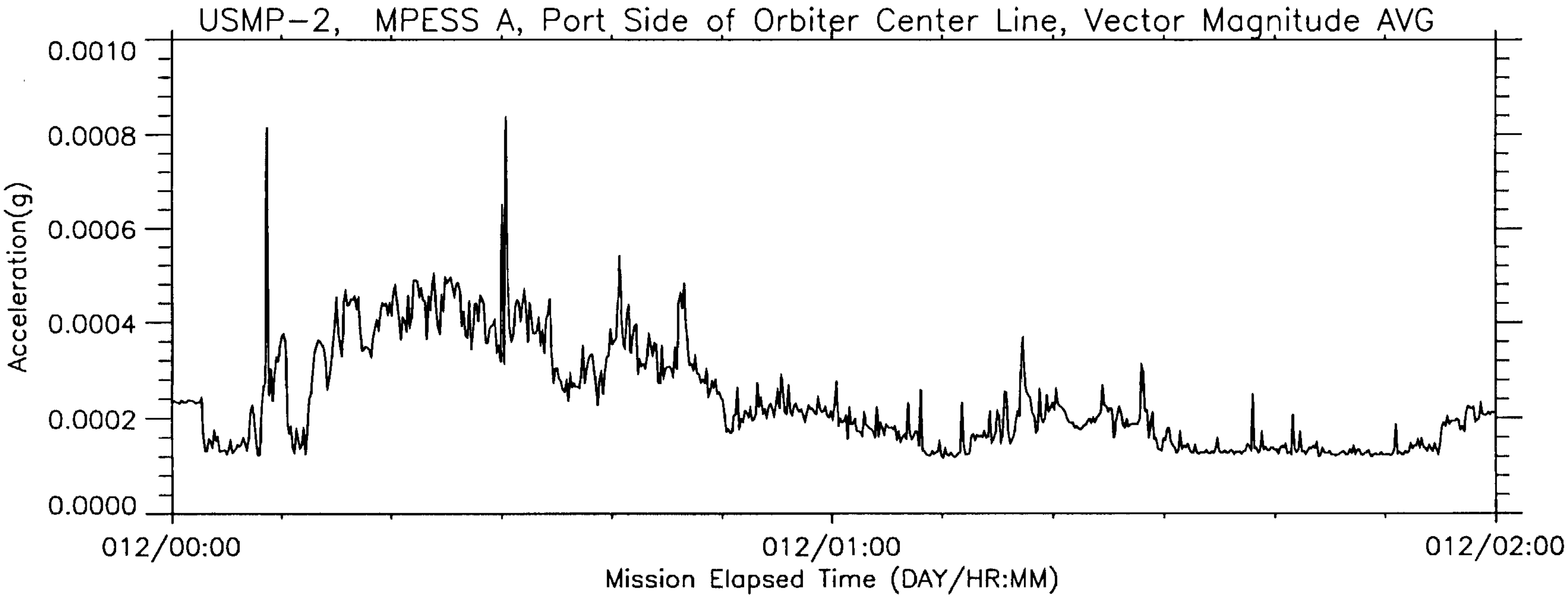

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
Acceleration(g)
011/20:00
011/21:00
011/22:00
Mission Elapsed Time (DAY/HR:MM)

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS

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0.0004
0.0002
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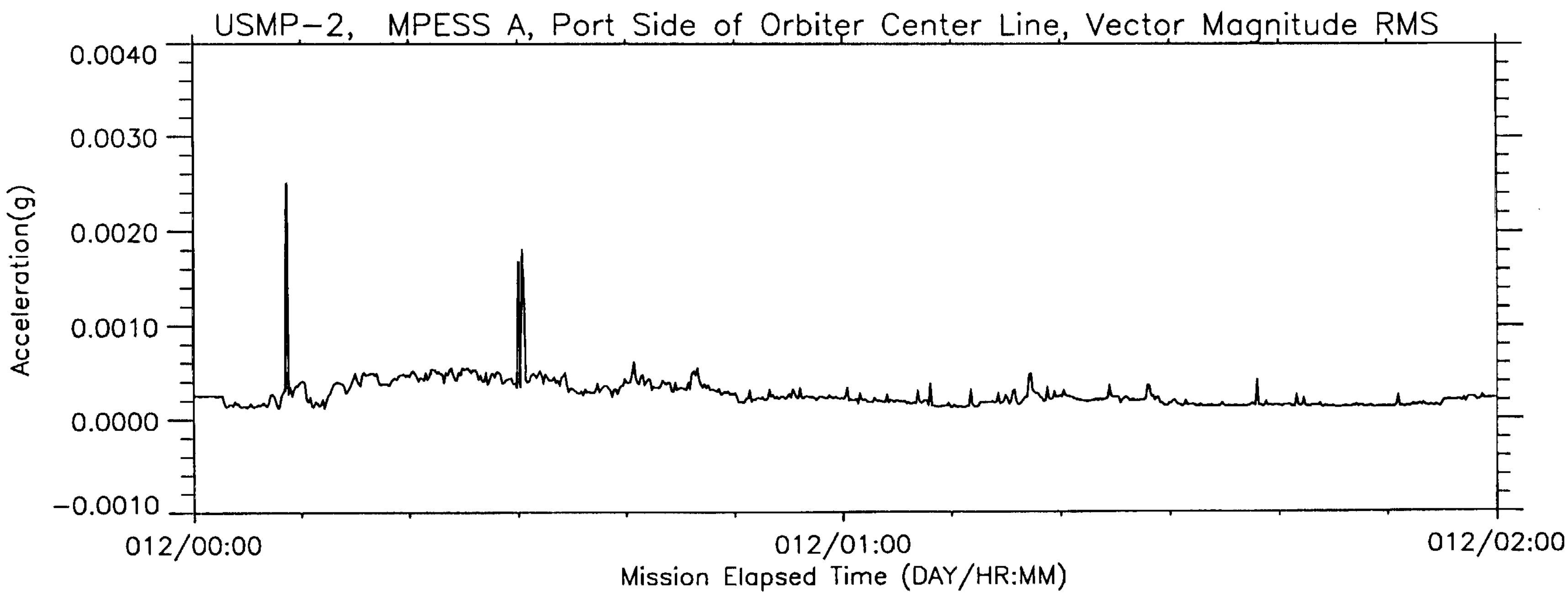
012/01:00
012/02:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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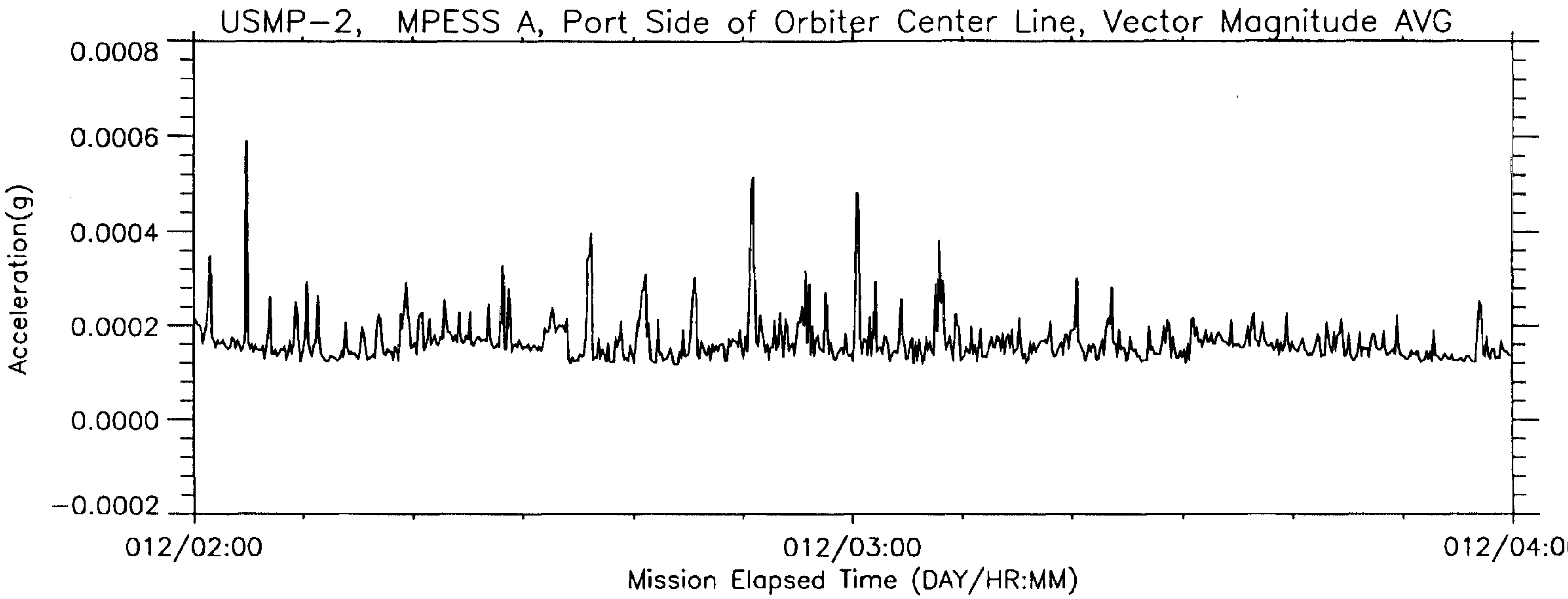
012/02:00
Mission Elapsed Time (DAY/HR:MM)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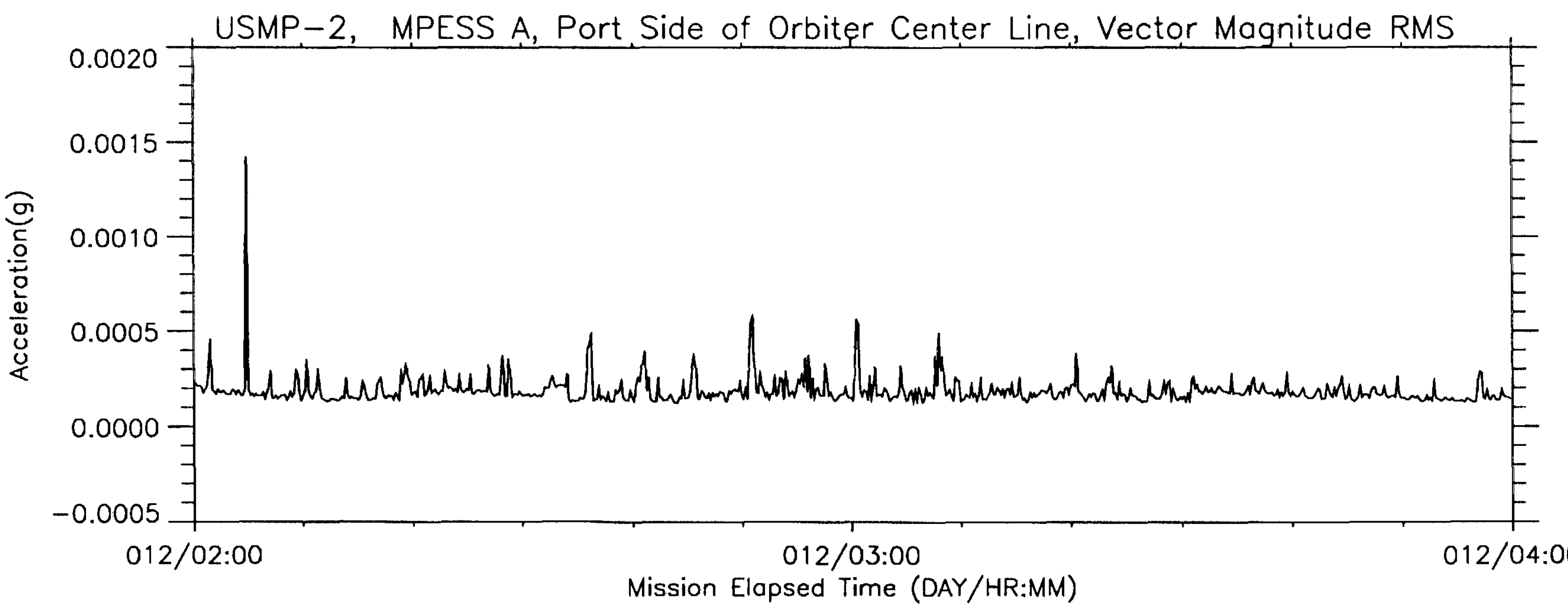
012/03:00
012/04:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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0.0010
0.0005
0.0000
-0.0005
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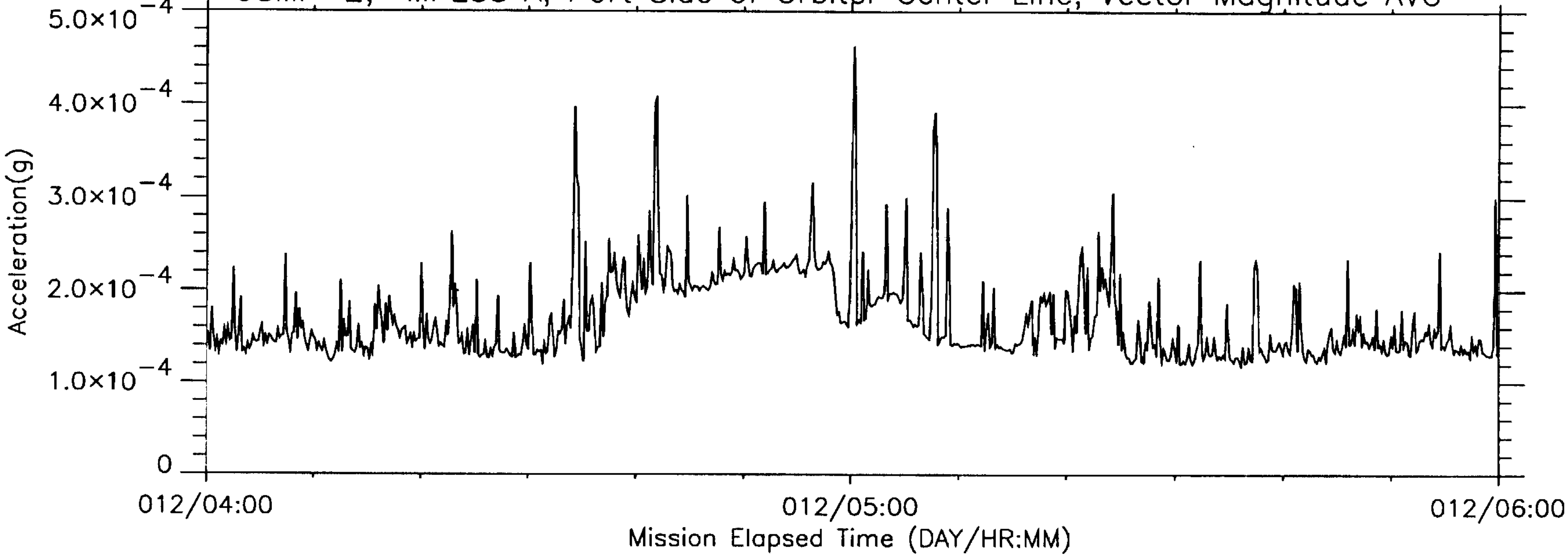
012/04:00
Mission Elapsed Time (DAY/HR:MM)

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG



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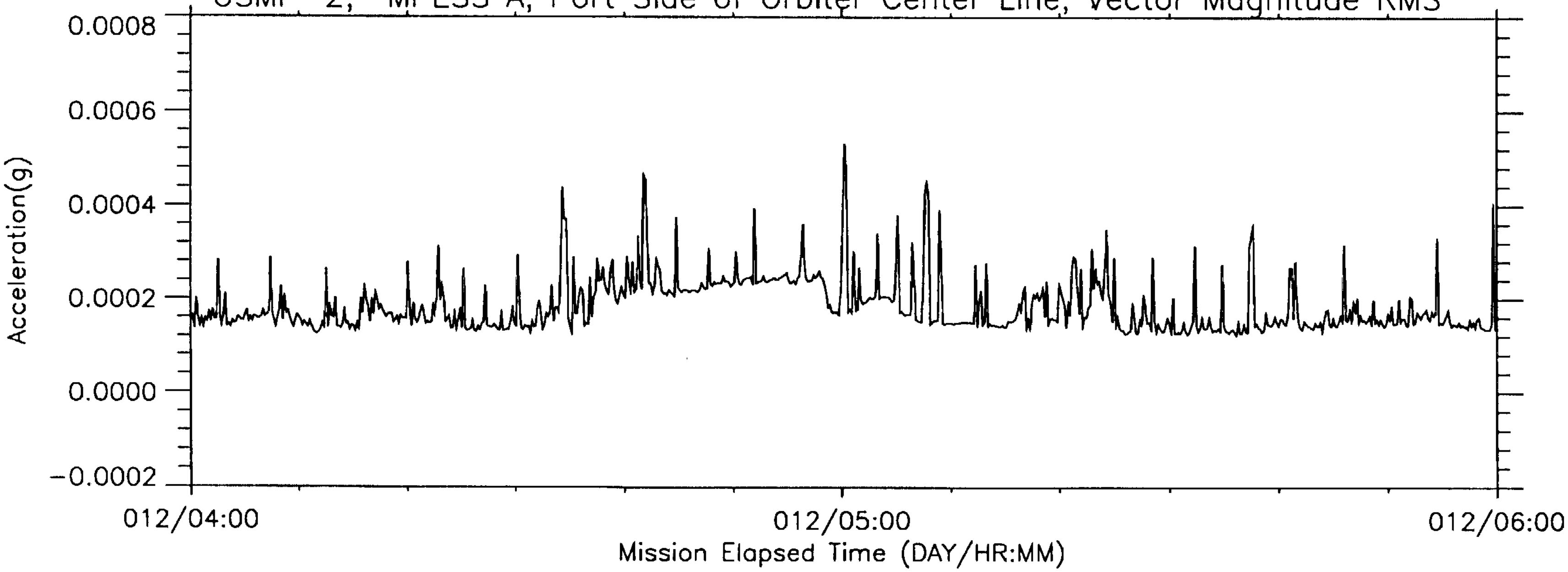
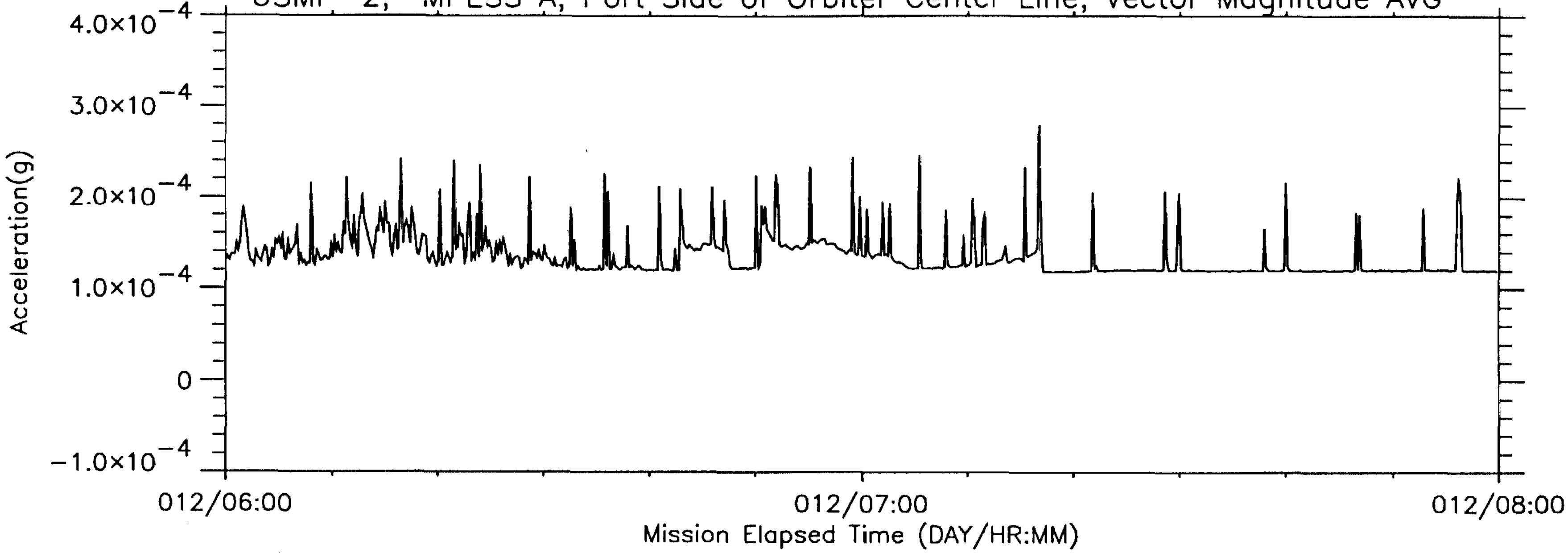
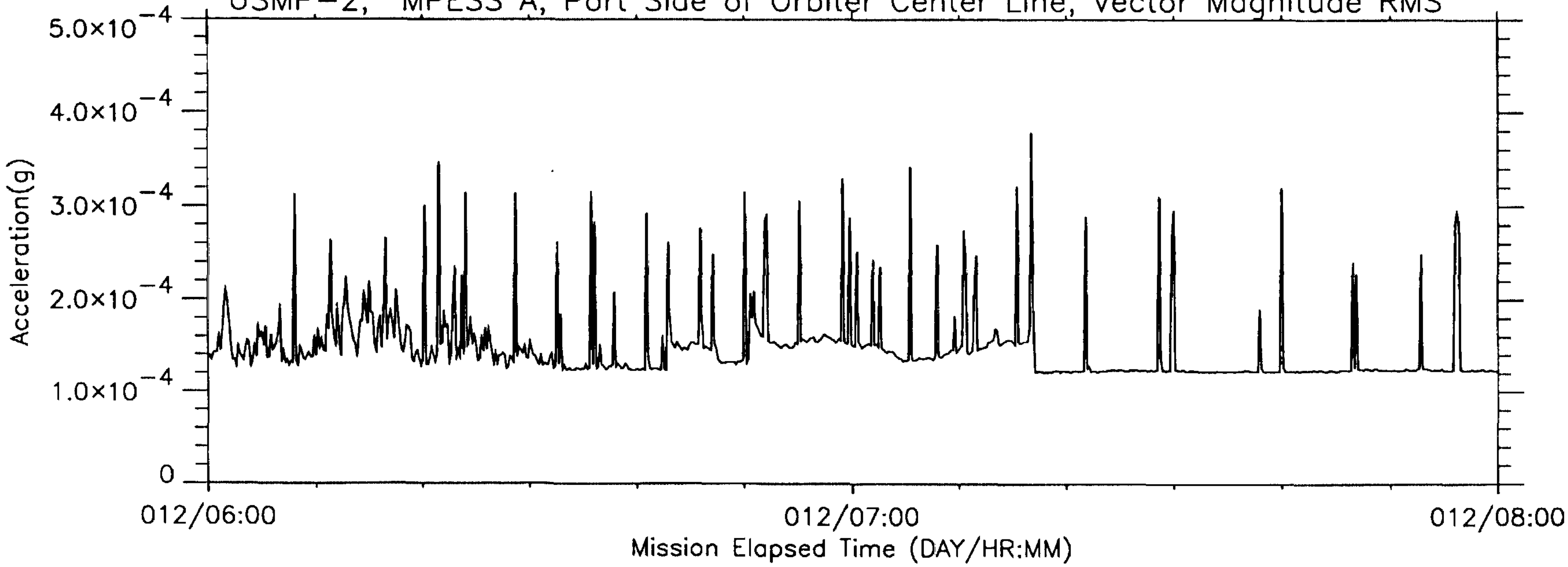
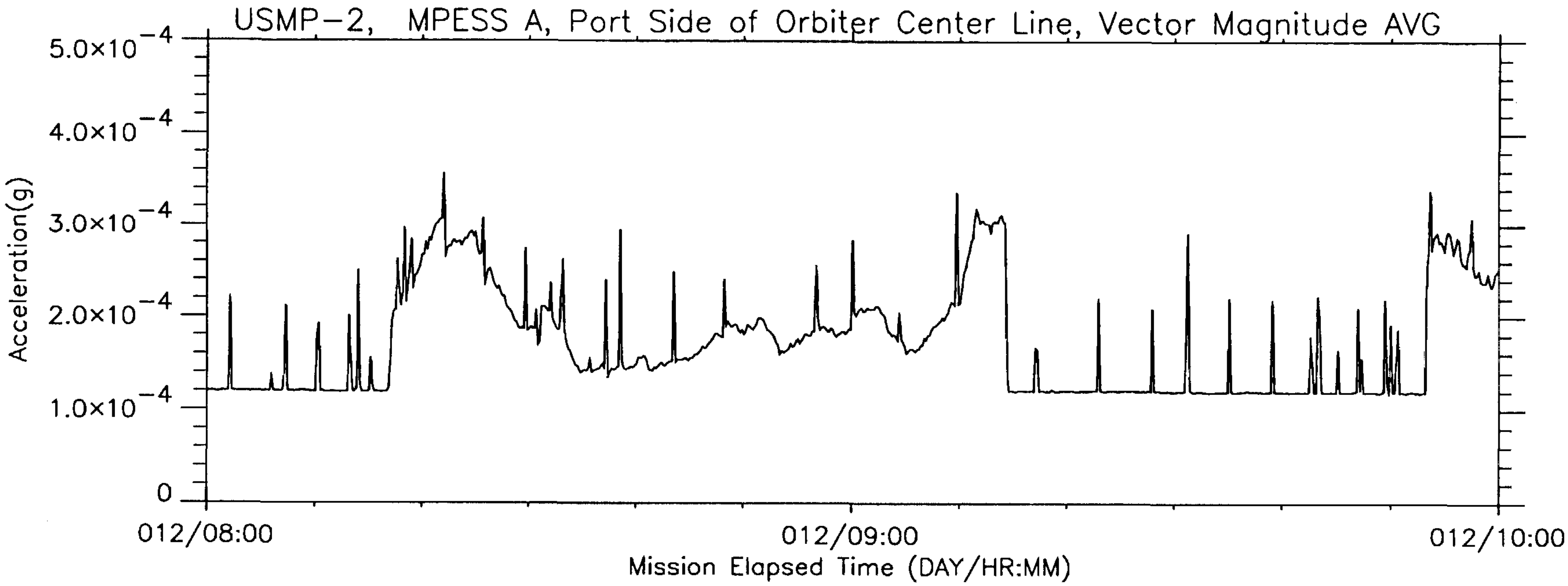


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS

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4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
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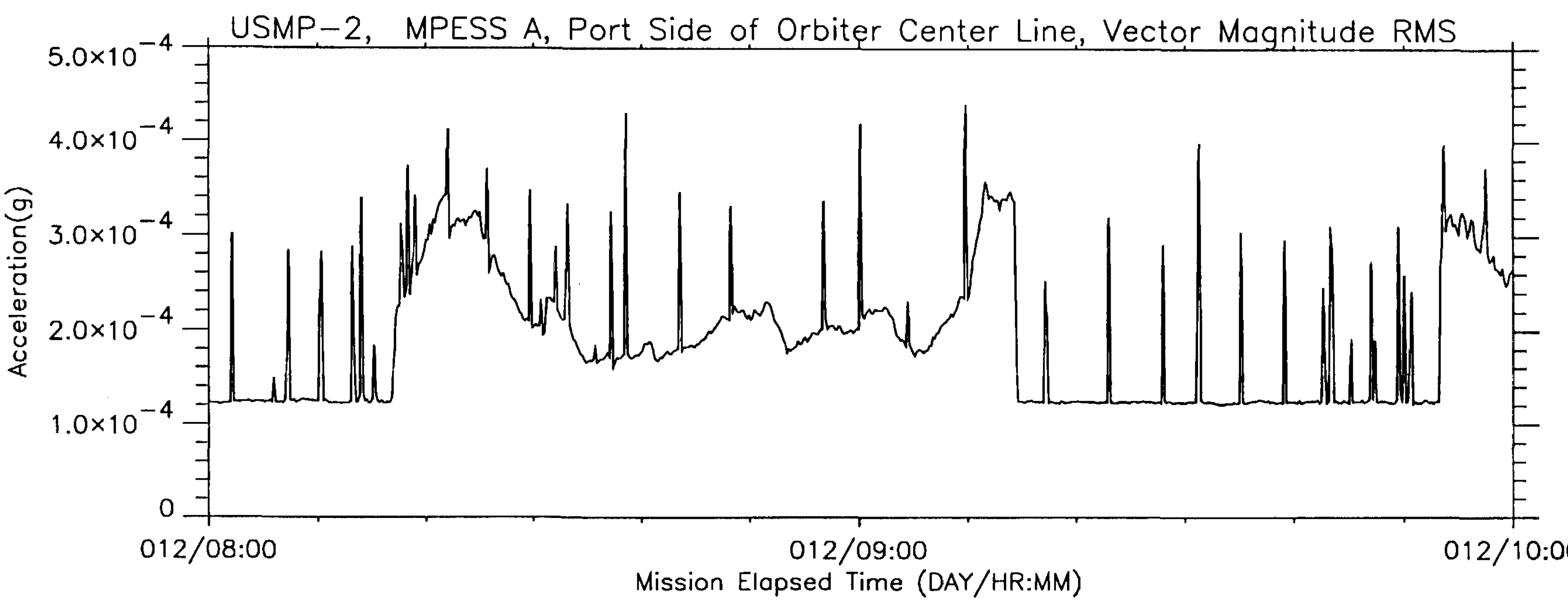
012/09:00
012/10:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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3.0×10^{-4}
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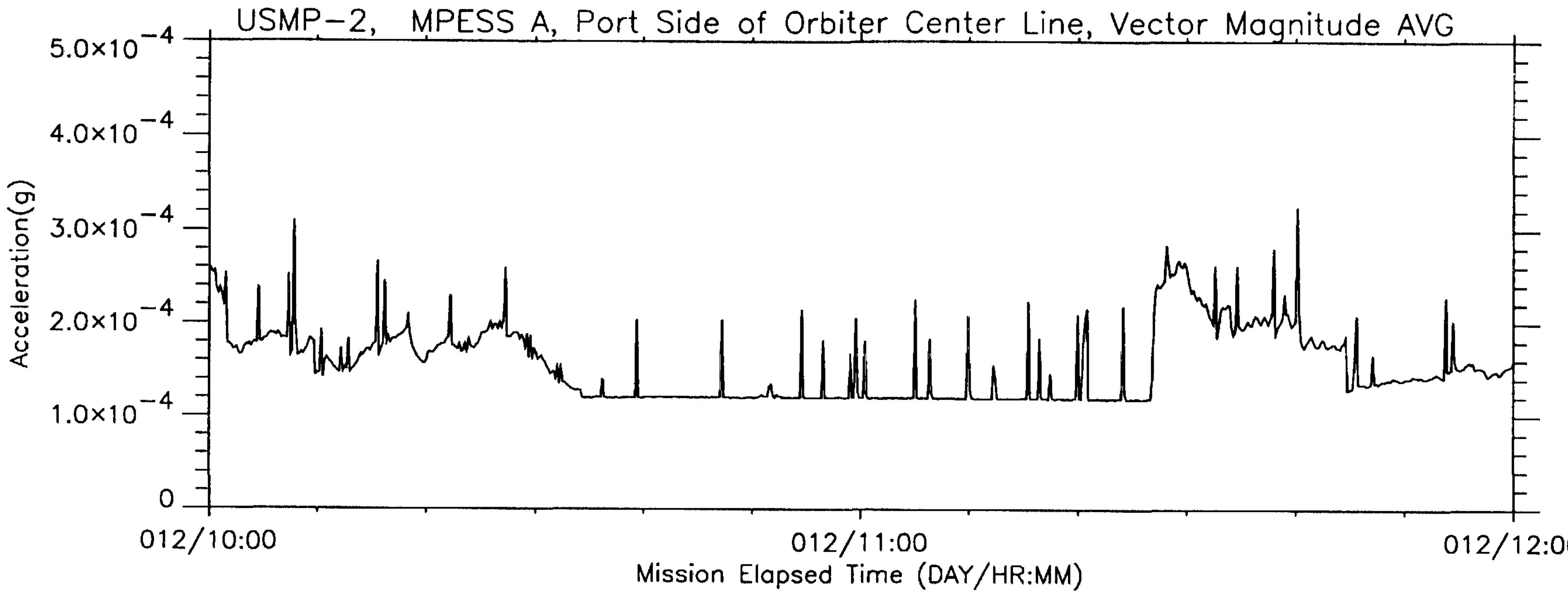
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
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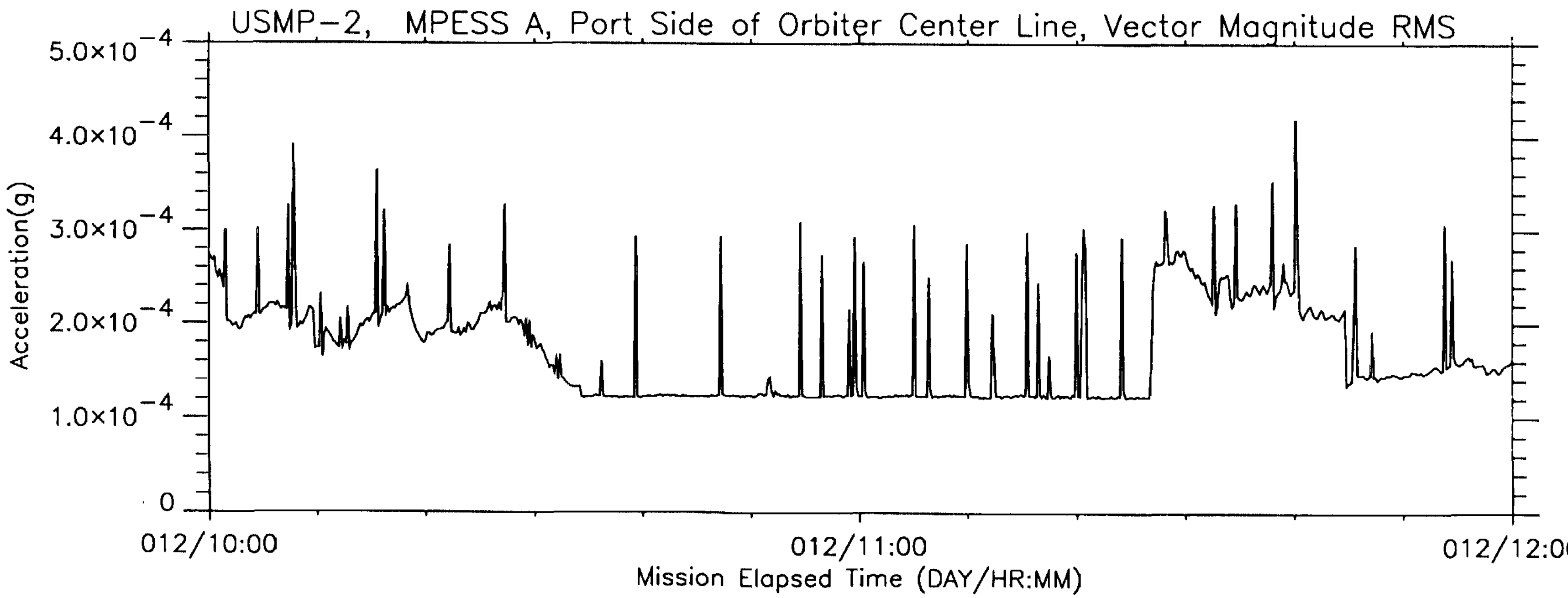
012/11:00
012/12:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
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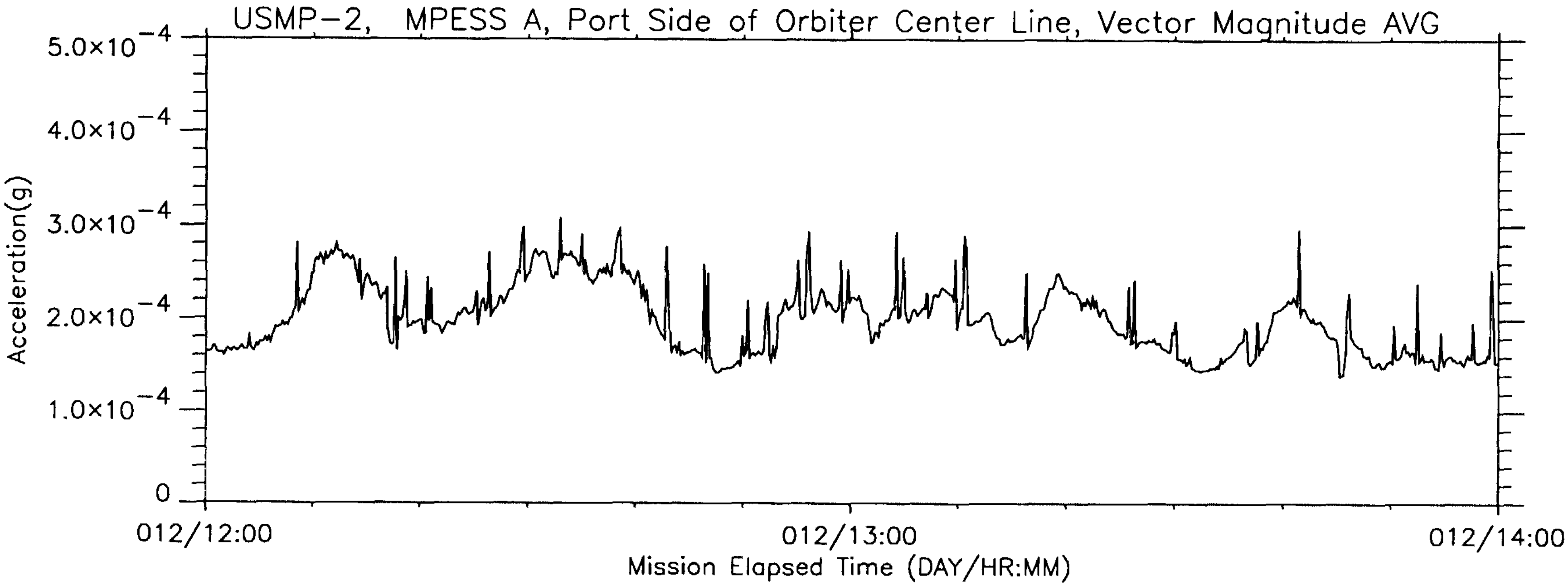
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
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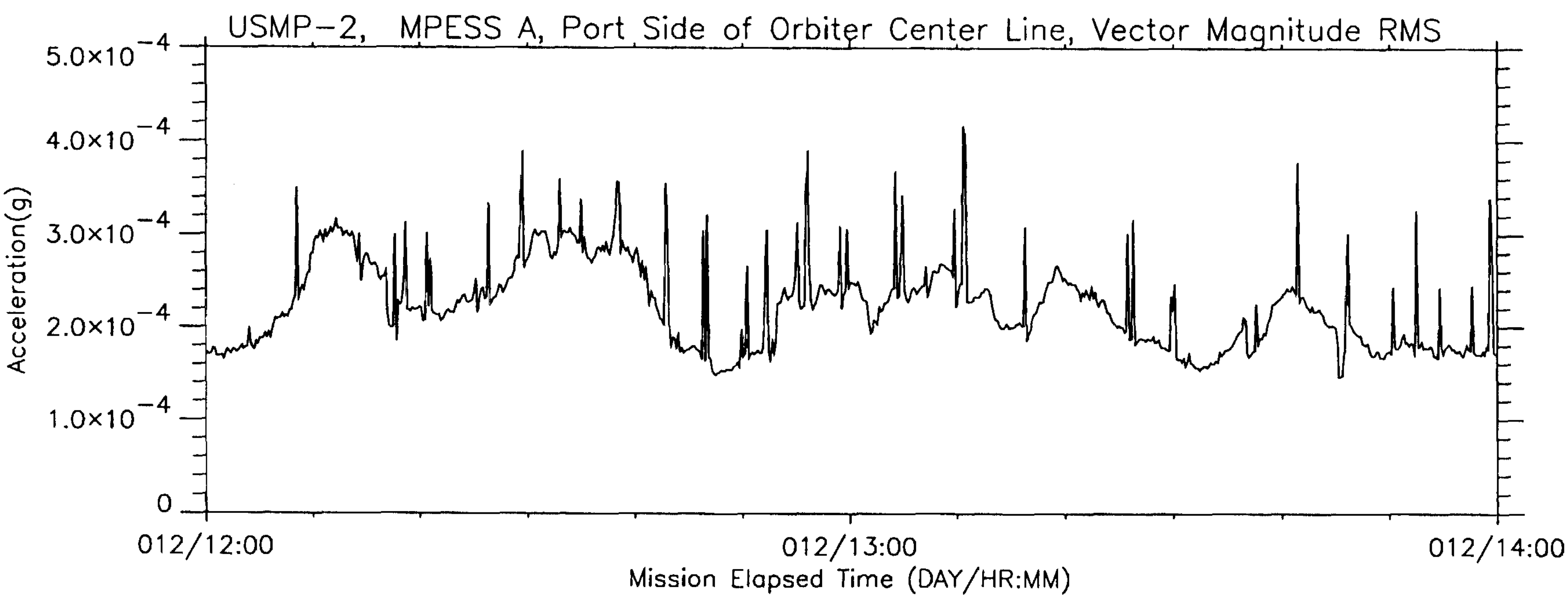
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
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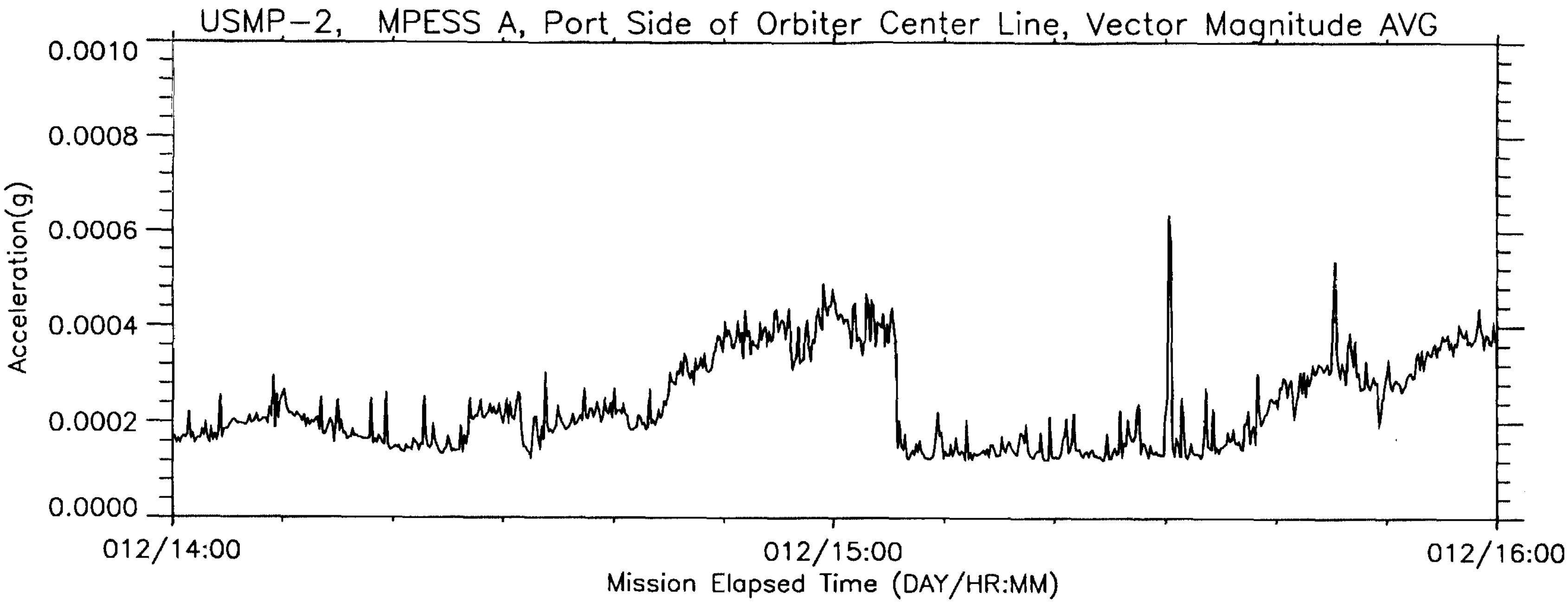
012/13:00
012/14:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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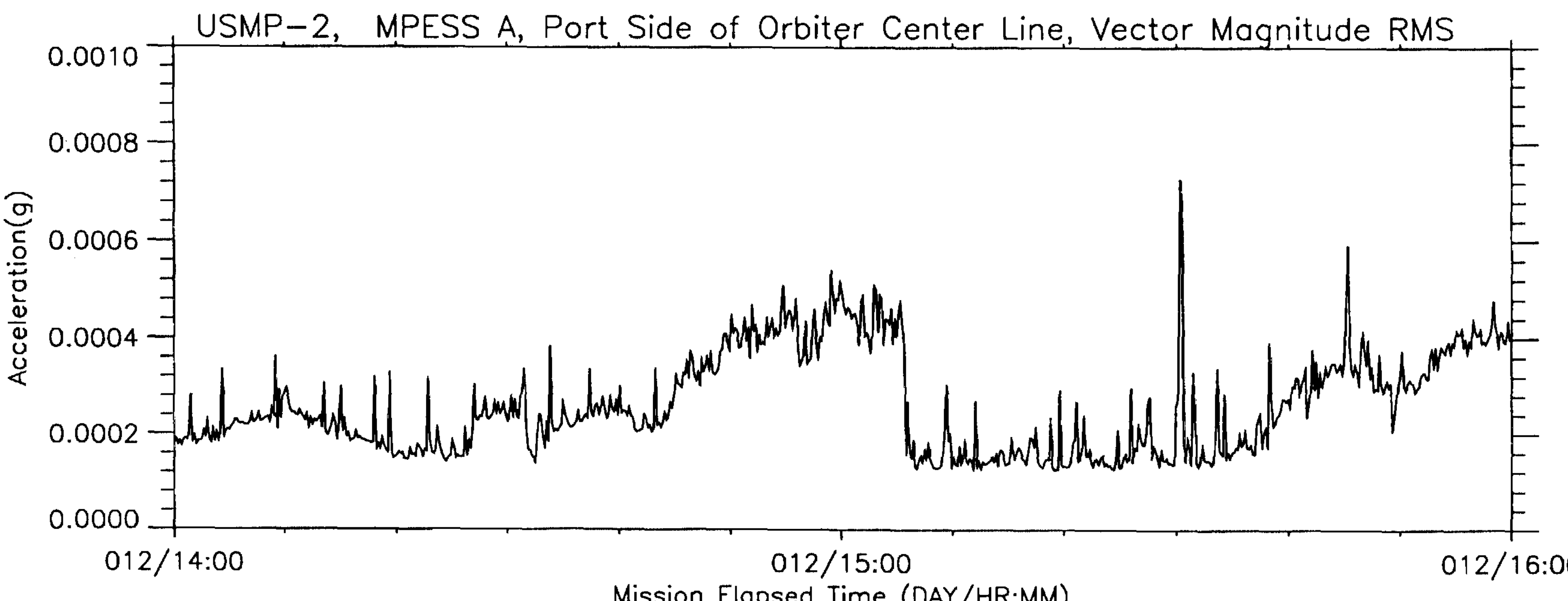
012/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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0.0006
0.0004
0.0002
0.0000
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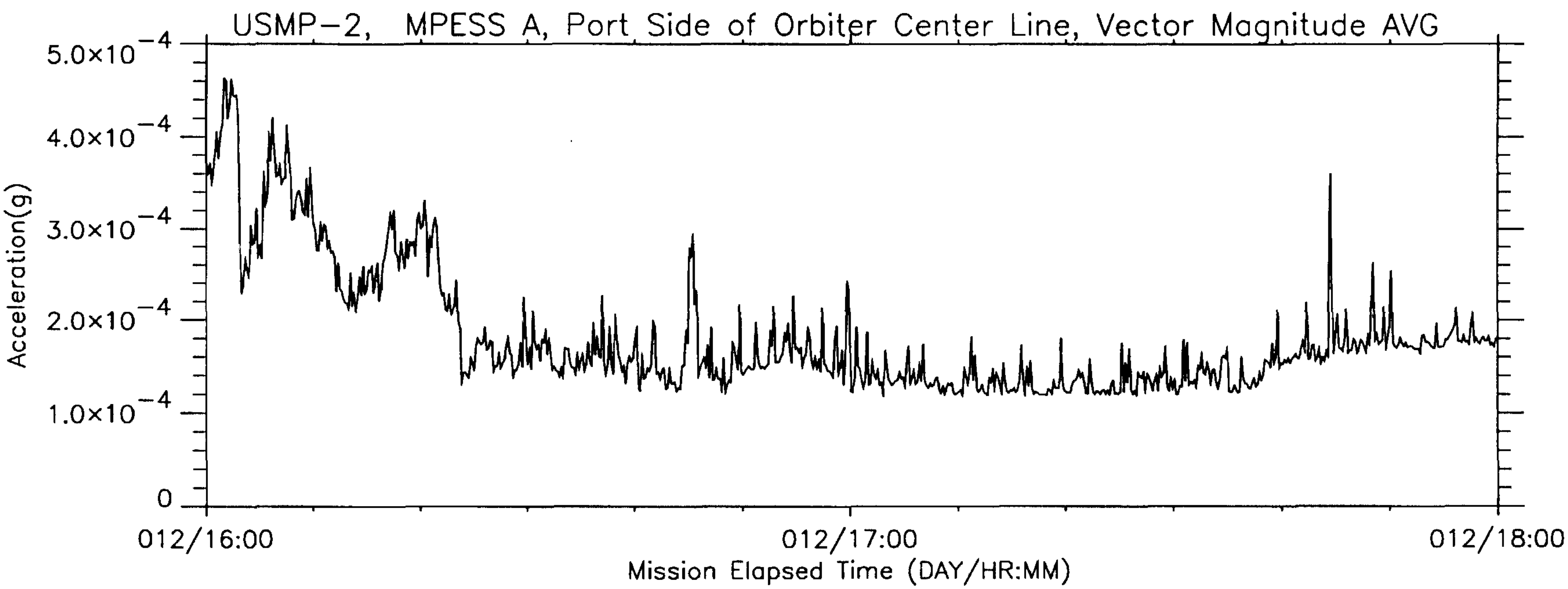
012/15:00
012/16:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
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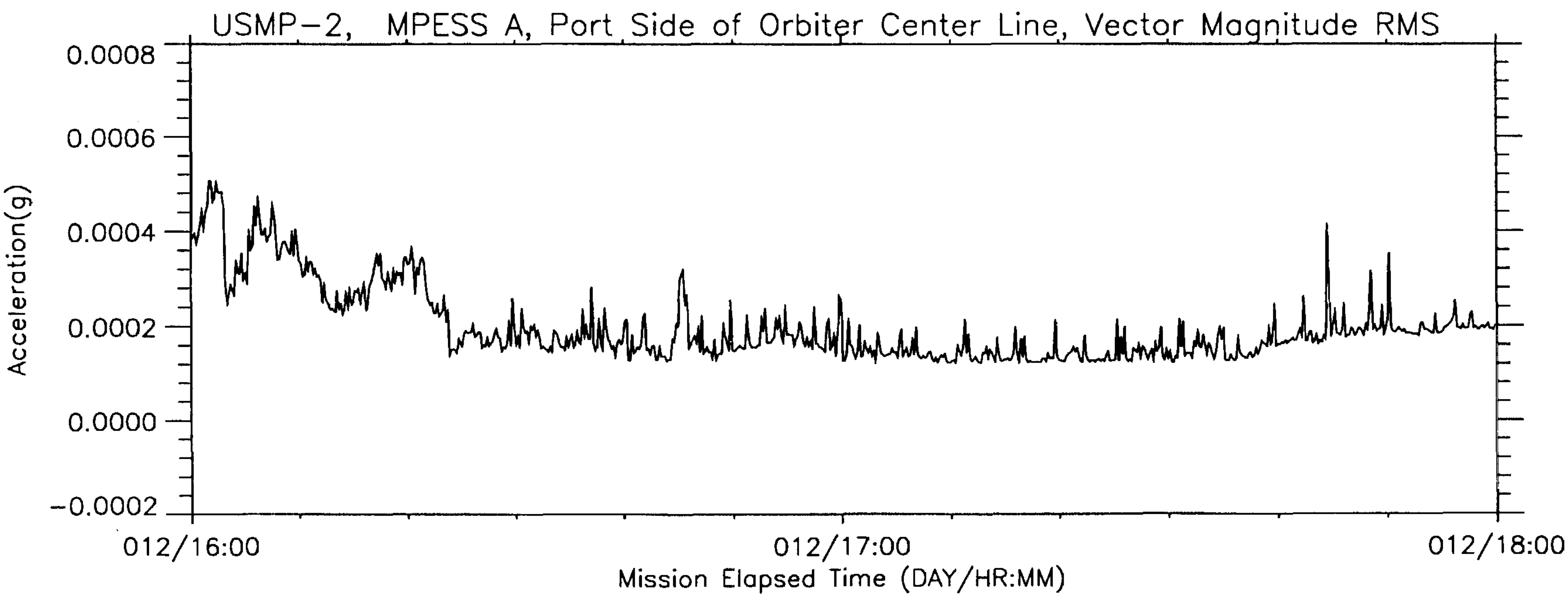
012/18:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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0.0004
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0.0000
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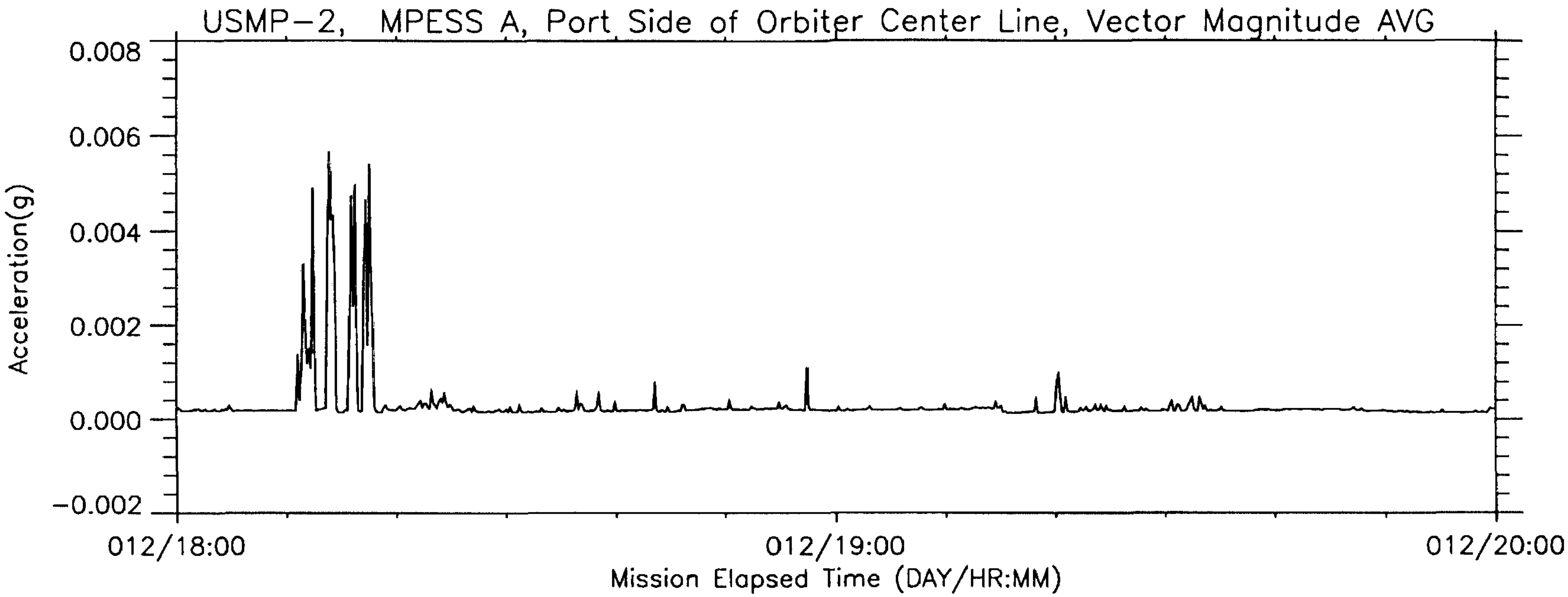
012/17:00
012/18:00
Mission Elapsed Time (DAY/HR:MM)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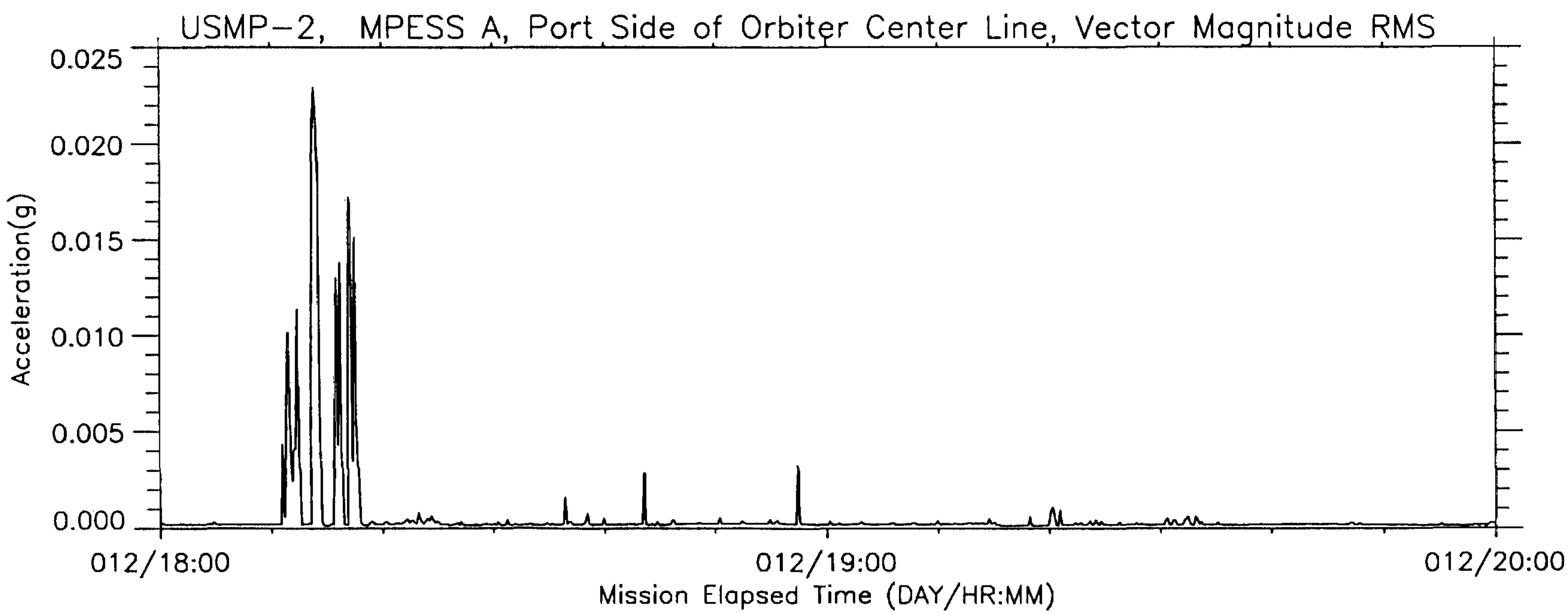
012/19:00
012/20:00
Mission Elapsed Time (DAY/HR:MM)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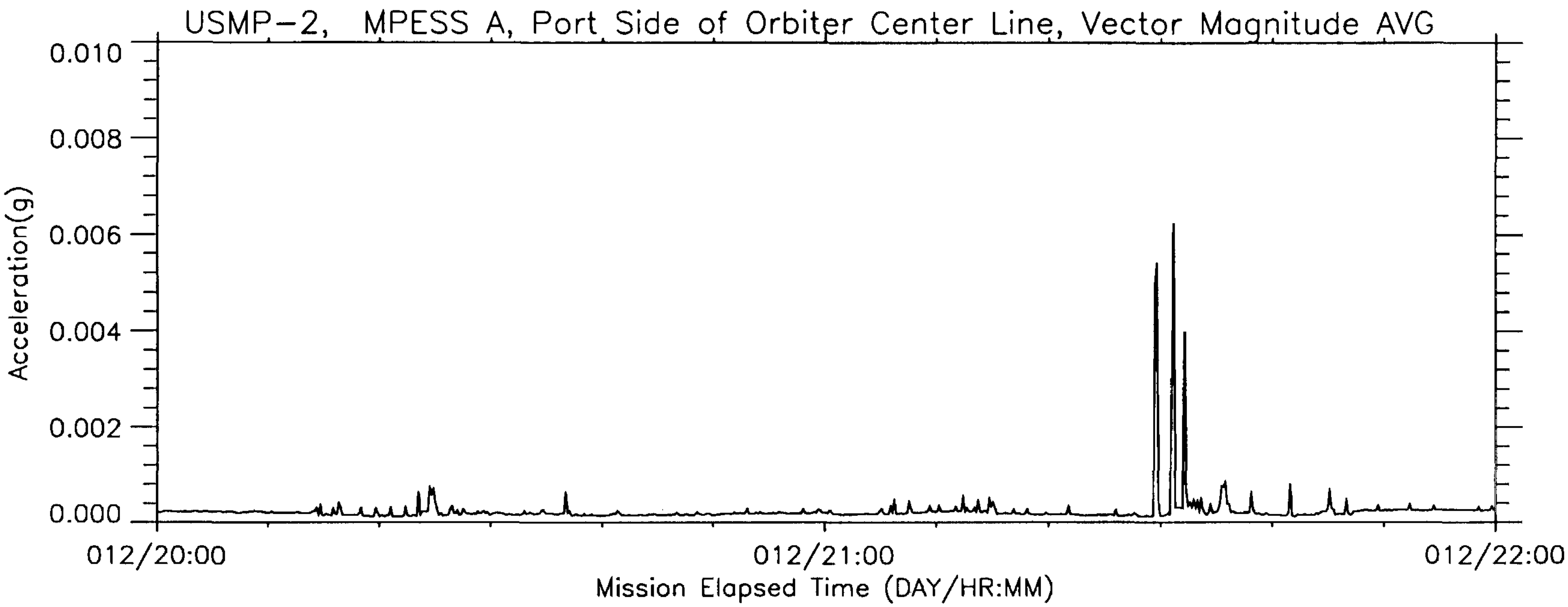
012/19:00
012/20:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
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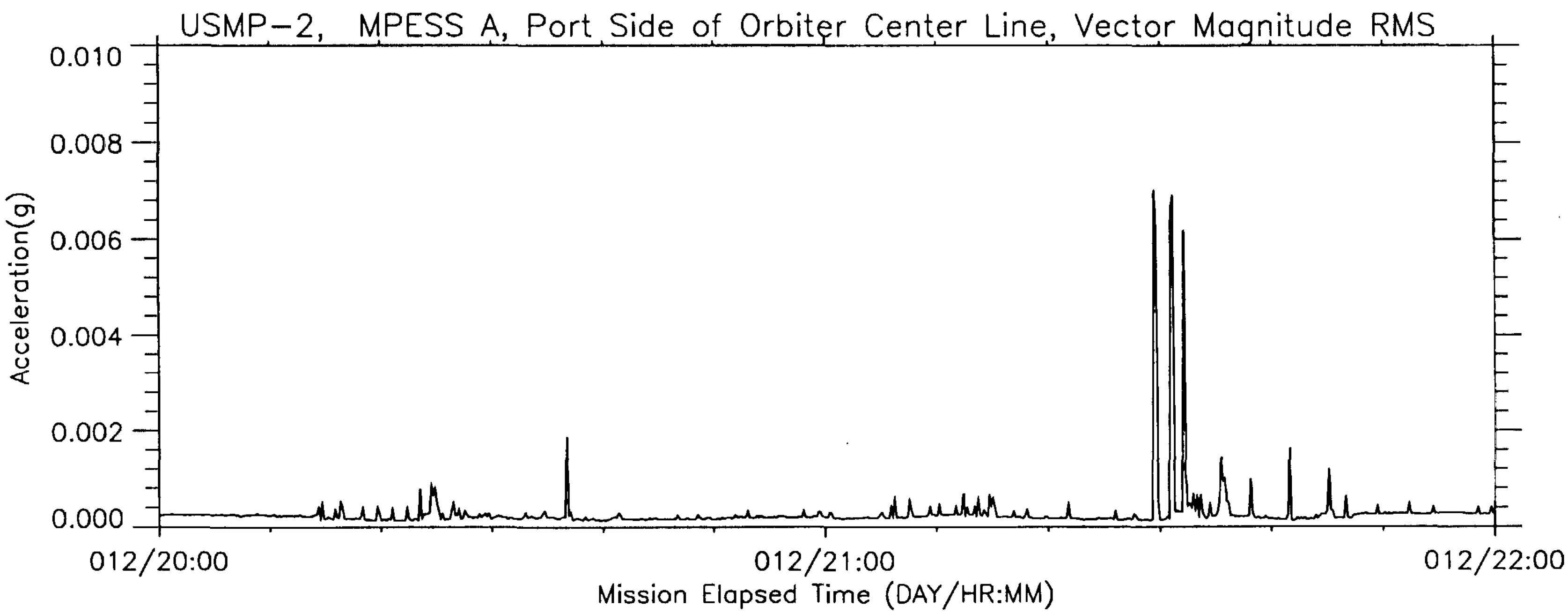
012/22:00
Mission Elapsed Time (DAY/HR:MM)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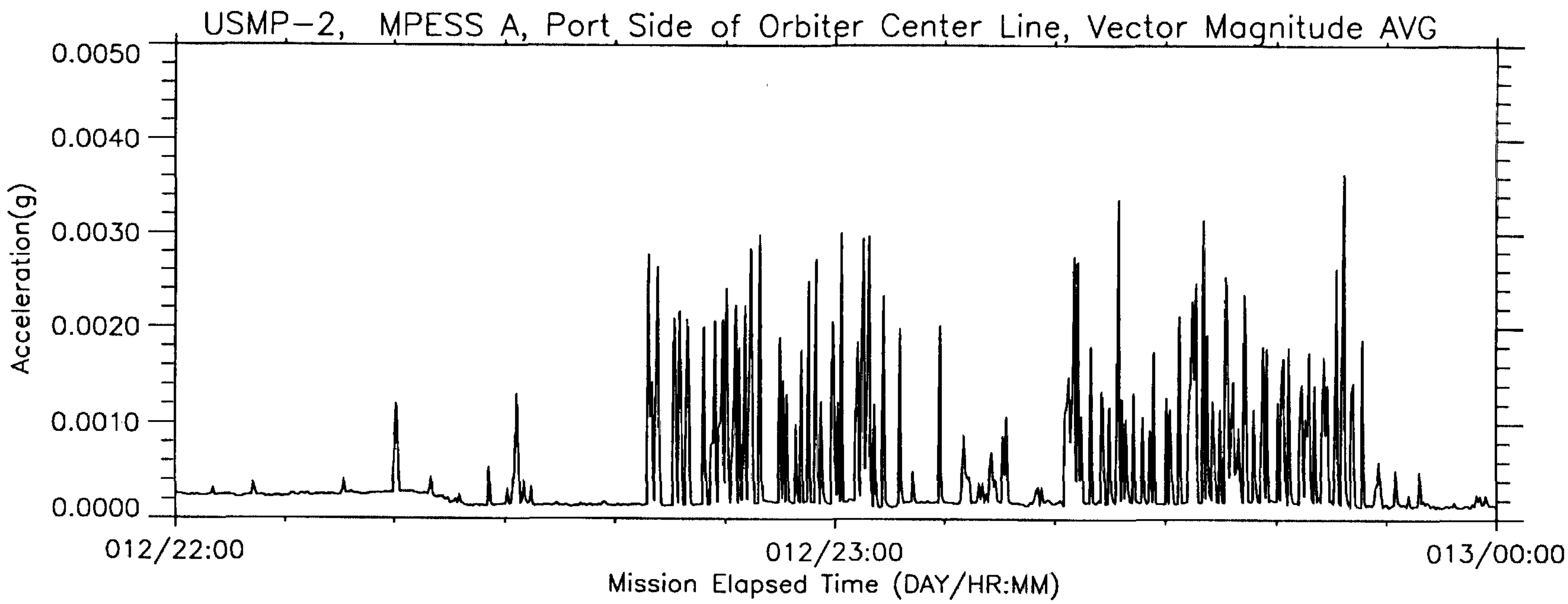
Mission Elapsed Time (DAY/HR:MM)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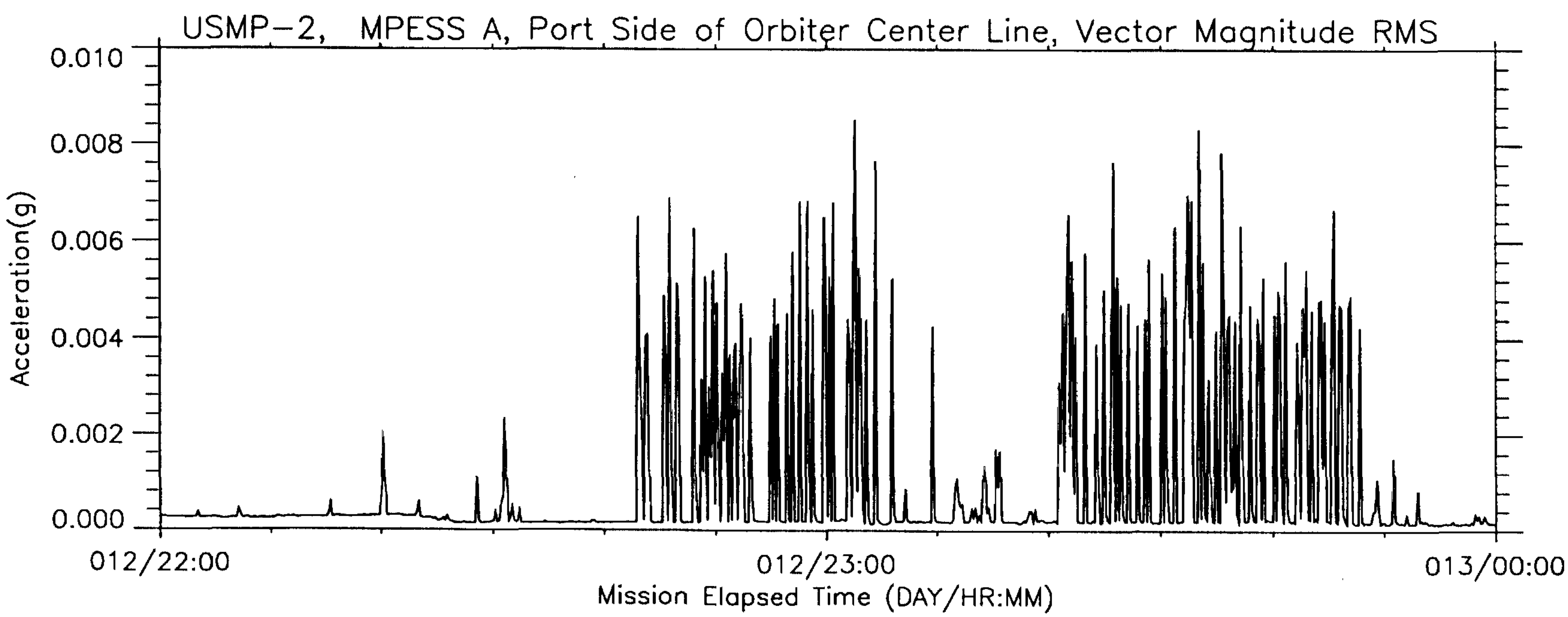
USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
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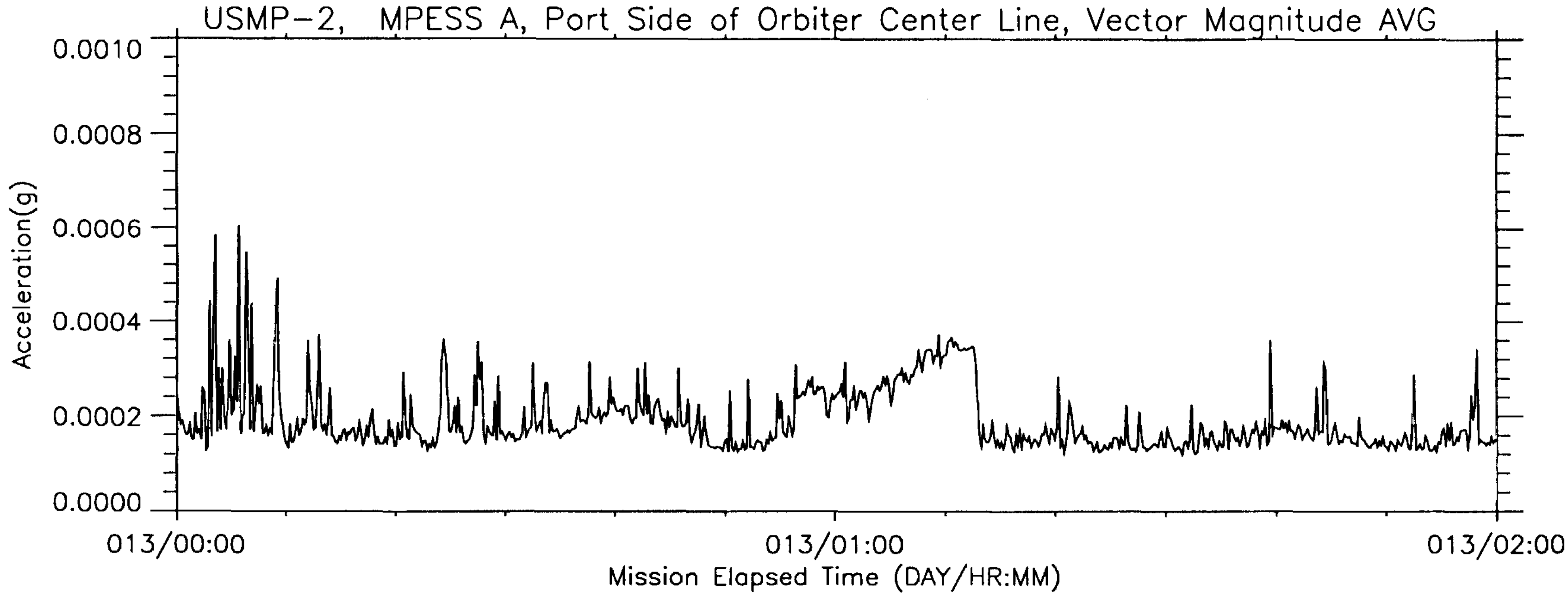
012/23:00
013/00:00
Mission Elapsed Time (DAY/HR:MM)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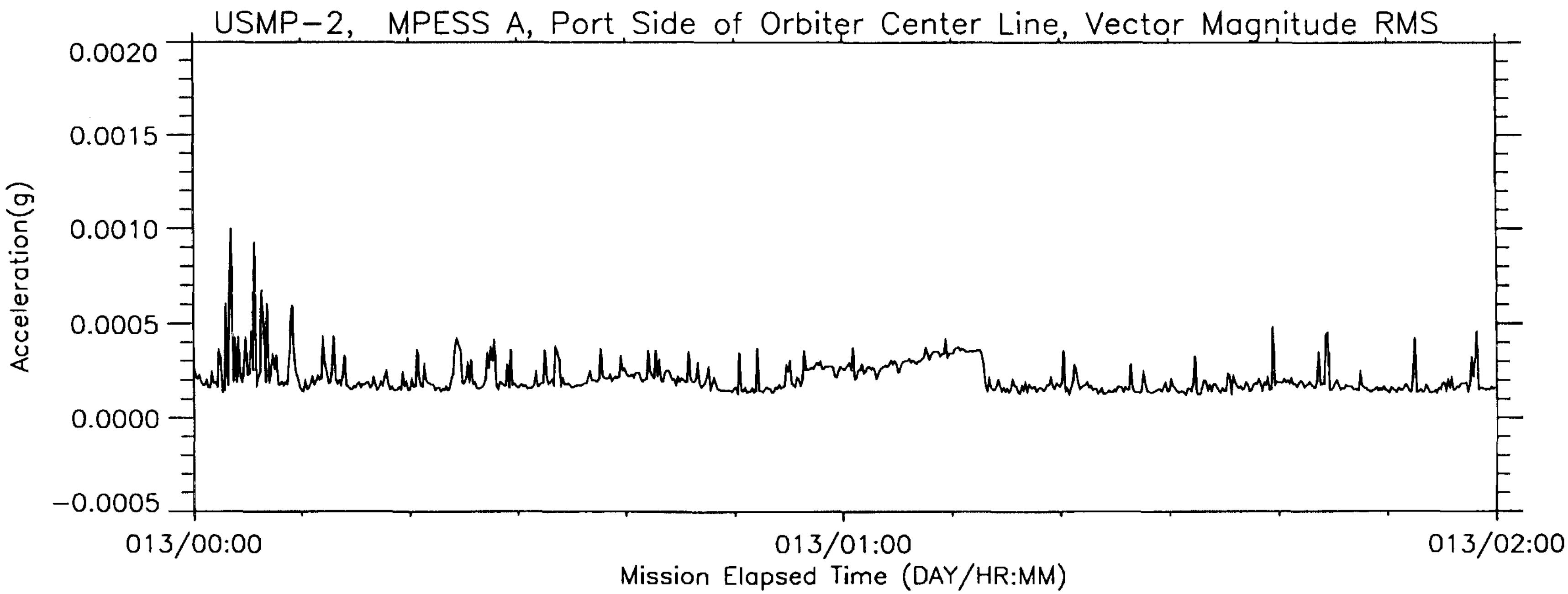
013/02:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
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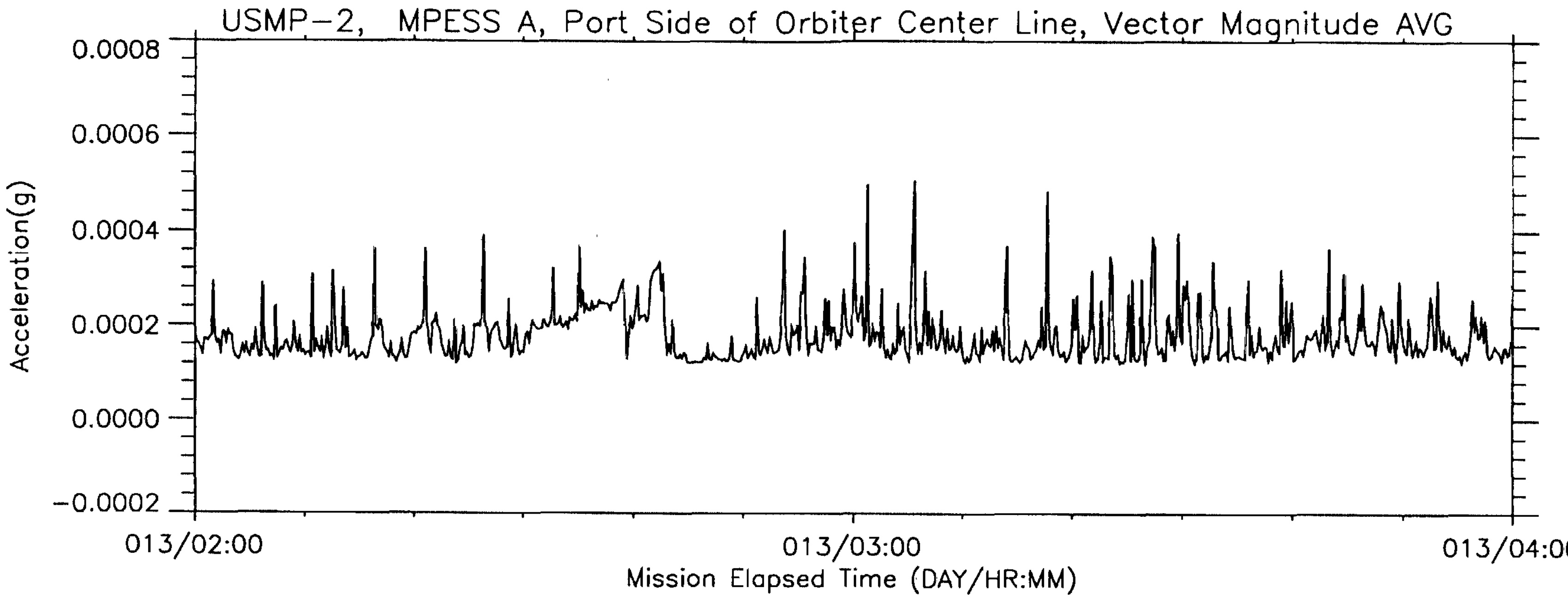
013/02:00
Mission Elapsed Time (DAY/HR:MM)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Acceleration(g)
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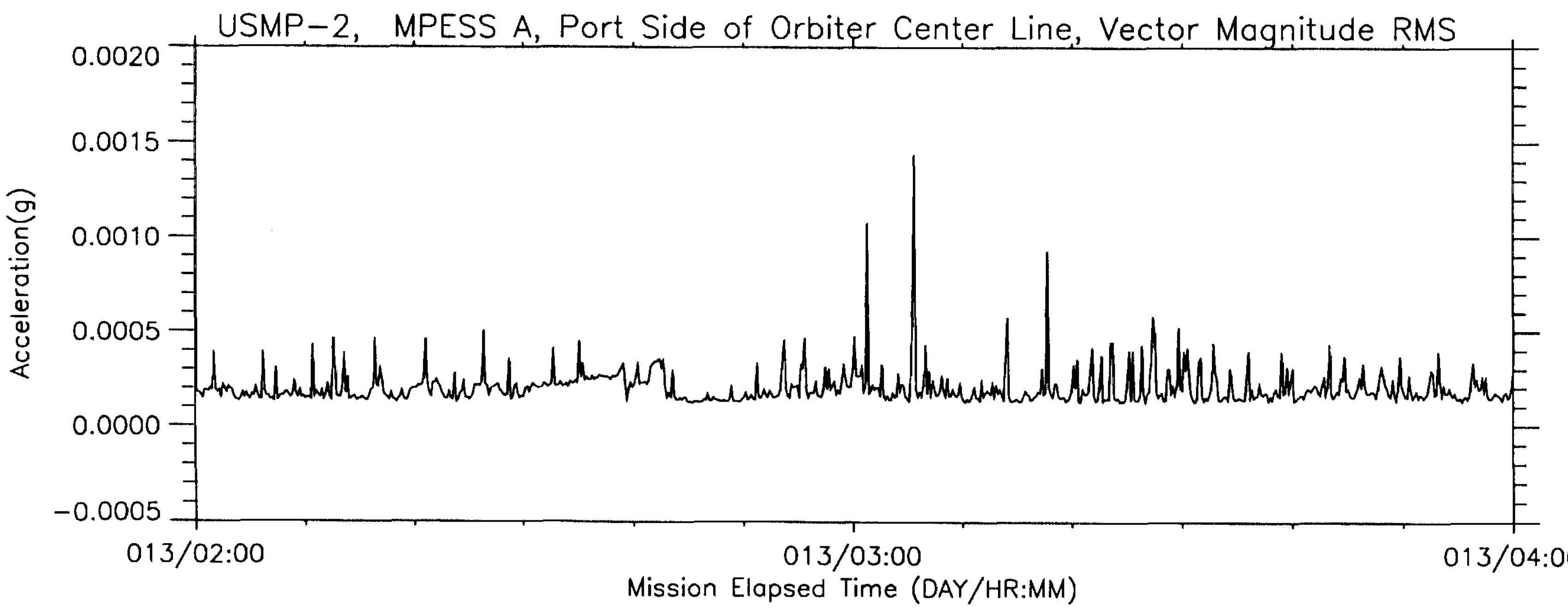
013/04:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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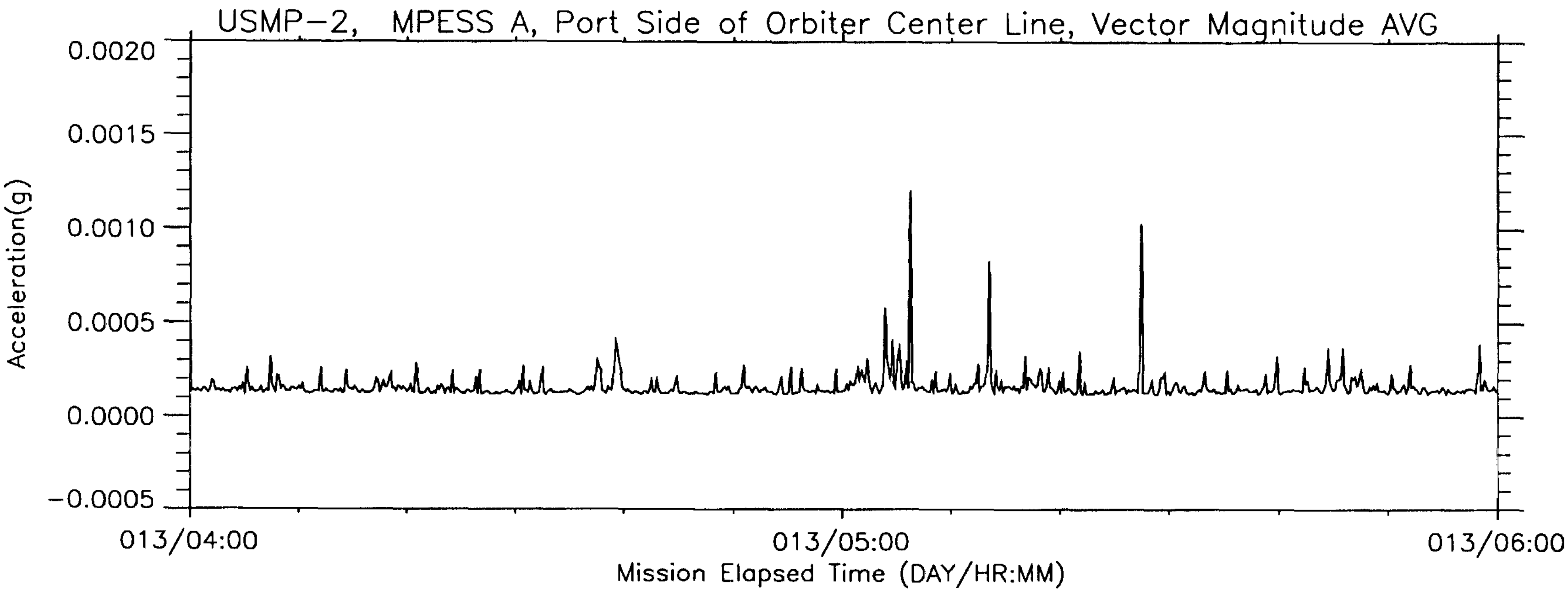
013/03:00
013/04:00
Mission Elapsed Time (DAY/HR:MM)



USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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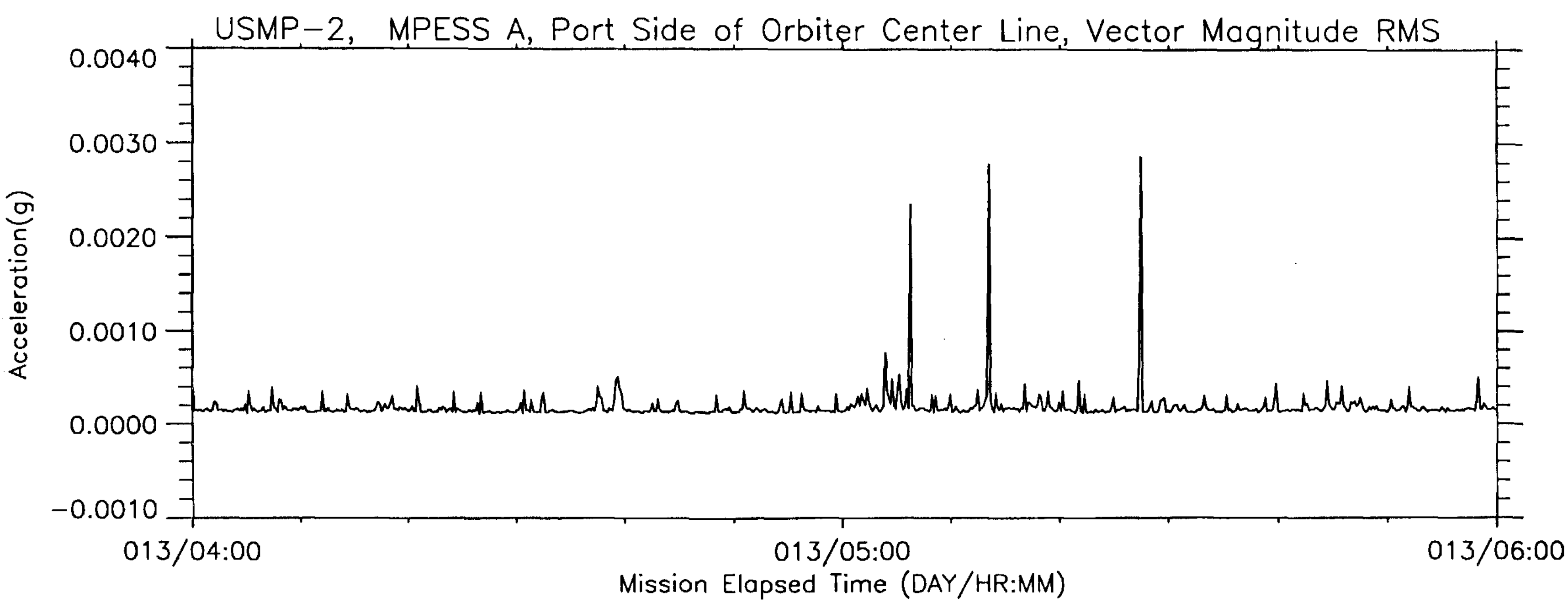
013/05:00
013/06:00
Mission Elapsed Time (DAY/HR:MM)



USMP−2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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0.0030
0.0020
0.0010
0.0000
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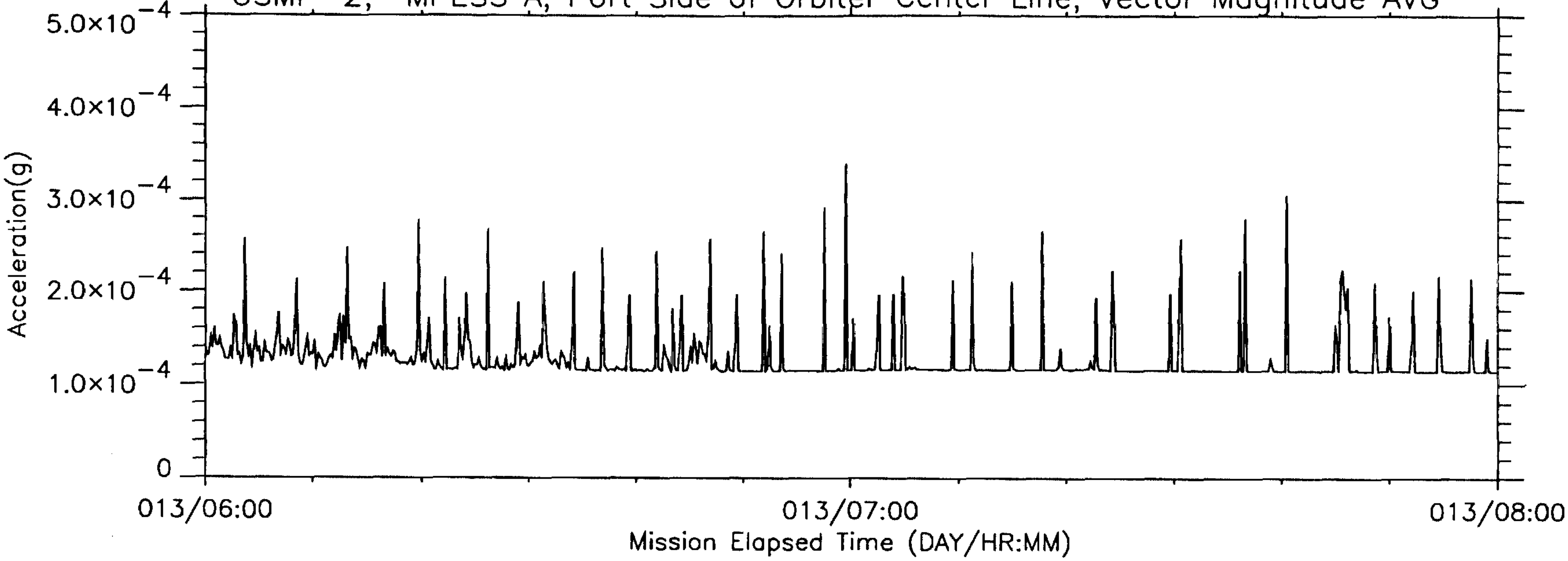
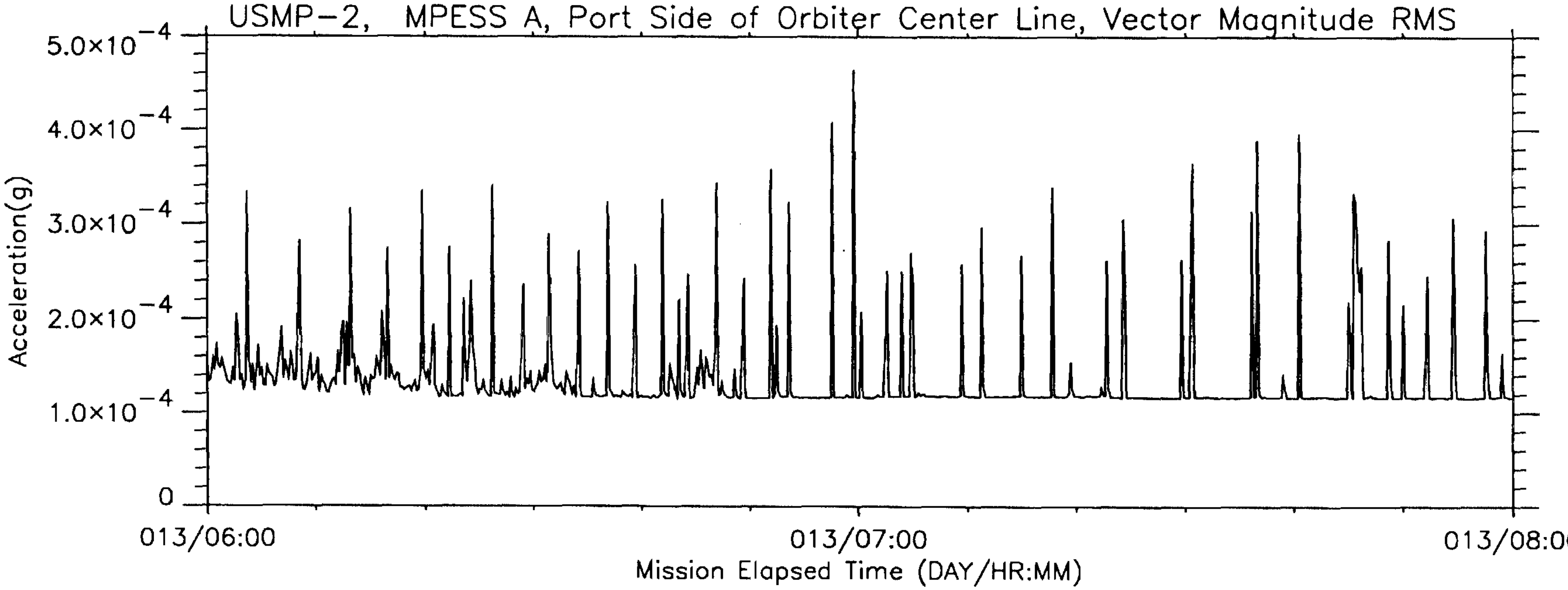
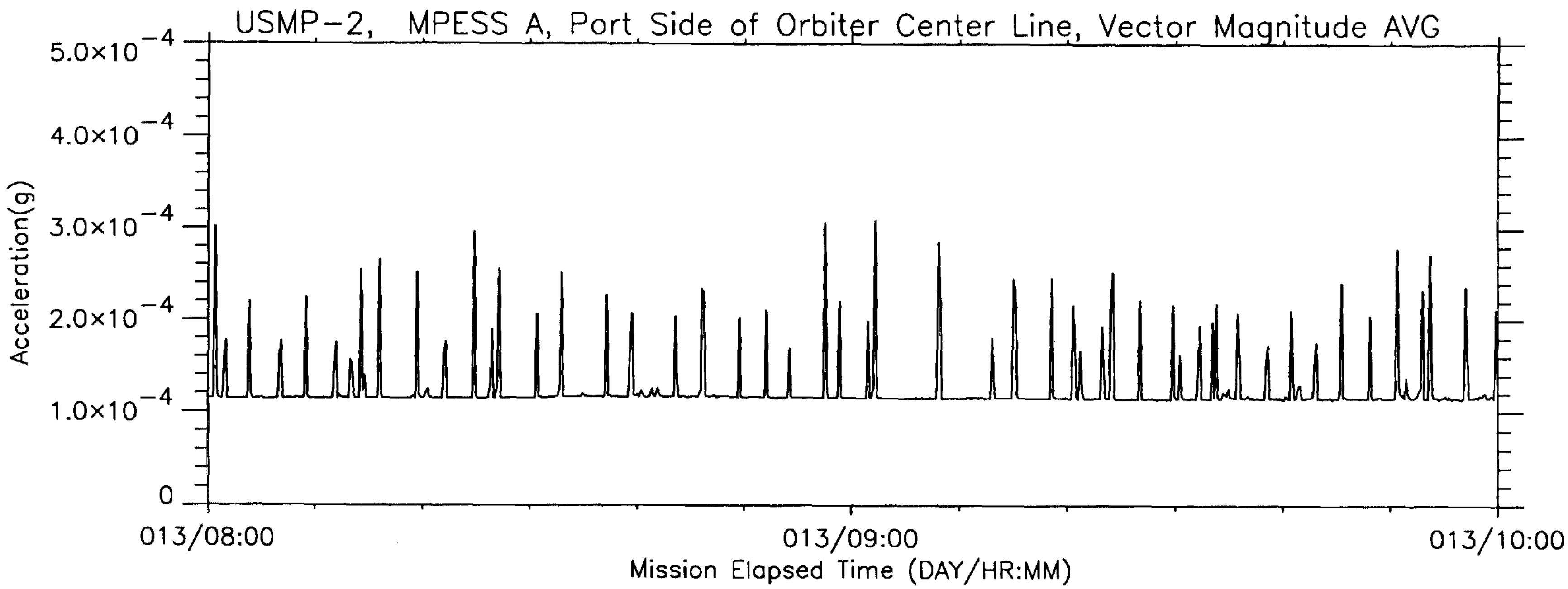
013/04:00
013/05:00
013/06:00
Mission Elapsed Time (DAY/HR:MM)

USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG



USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS




USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude AVG
Acceleration(g)
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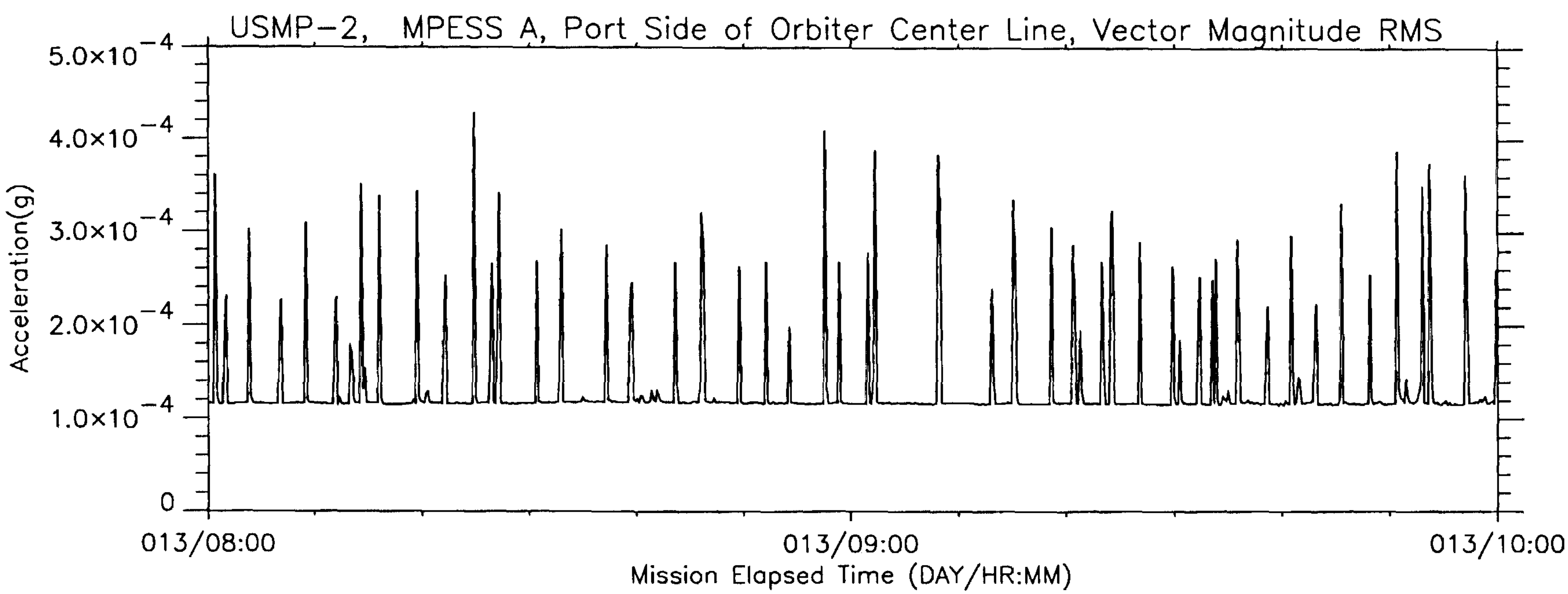
4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
013/08:00
013/09:00
013/10:00
Mission Elapsed Time (DAY/HR:MM)


USMP-2, MPESS A, Port Side of Orbiter Center Line, Vector Magnitude RMS
Acceleration(g)
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4.0×10^{-4}
3.0×10^{-4}
2.0×10^{-4}
1.0×10^{-4}
0
013/08:00
013/09:00
013/10:00
Mission Elapsed Time (DAY/HR:MM)

APPENDIX C SAMS COLOR SPECTROGRAMS

Accelerometer data collected on Orbiter missions are generally analyzed by the PI or experiment team responsible for the system. The PI Microgravity Services (PIMS) project at the NASA Lewis Research Center was formed in part to support microgravity PI's in the evaluation of acceleration effects on their experiments and to characterize the vibrational environment of the Space Shuttle Orbiters. The primary continual source of accelerometer data from mission to mission is SAMS. Some of the SAMS data from STS-62 are presented in Appendices B and C to provide PI's with an overview of the environment during mission.

The raw data recorded by SAMS are processed to compensate for temperature and gain related errors of bias, scale factor, and axis misalignment. The processing utilizes a fourth order temperature model to compensate the data and convert the raw digitized data into engineering units (Thomas, et al., 1992). The data are transformed to the shuttle structural coordinate system and formatted into files for distribution via CD-ROM and file server. See Appendix A for information on file server access to SAMS data.

The SAMS data have been further processed to produce the plots shown here. Color spectrograms are provided as an overview of the frequency characteristics of the SAMS data during the mission. Each spectrogram is a two-hour composite of amplitude spectra for consecutive ten second intervals. These plots should be used to identify times when the frequency character of the acceleration environment changes.

The color spectrograms were produced using STS-62 SAMS Unit F, Head B data. The data were taken in two hour periods and an amplitude spectrum was calculated for consecutive ten second intervals. *The frequency bandwidth for the spectra is 0.1 Hz.

The spectral data were scaled by taking the log of each data point and assigning a color to the integer result. Eight colors were used for eight intervals between 1 ± 10^{-7} g and 1 ± 10^{-3} g. In using this method, a range of acceleration values are assigned to the same color.

References

Thomas, J. E., R. B. Peters, B. D. , Finley, Space Acceleration Measurement System triaxial head error budget NASA Technical Memorandum -105300, January 1992.

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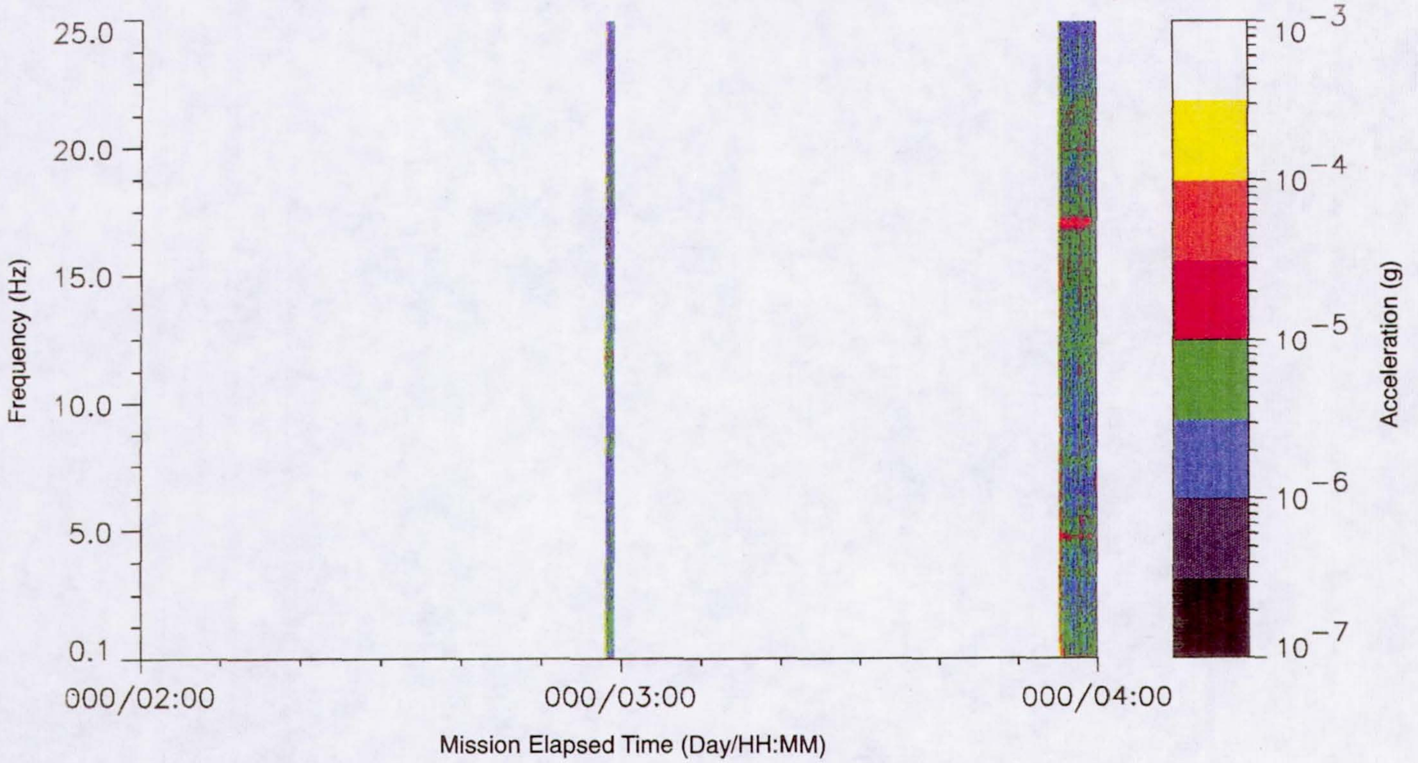
Figure C-1 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

FROM MET 000/04:00:00 - 001/02:22:00

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PAGE C-2 INTENTIONALLY BLANK

Figure C-2 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

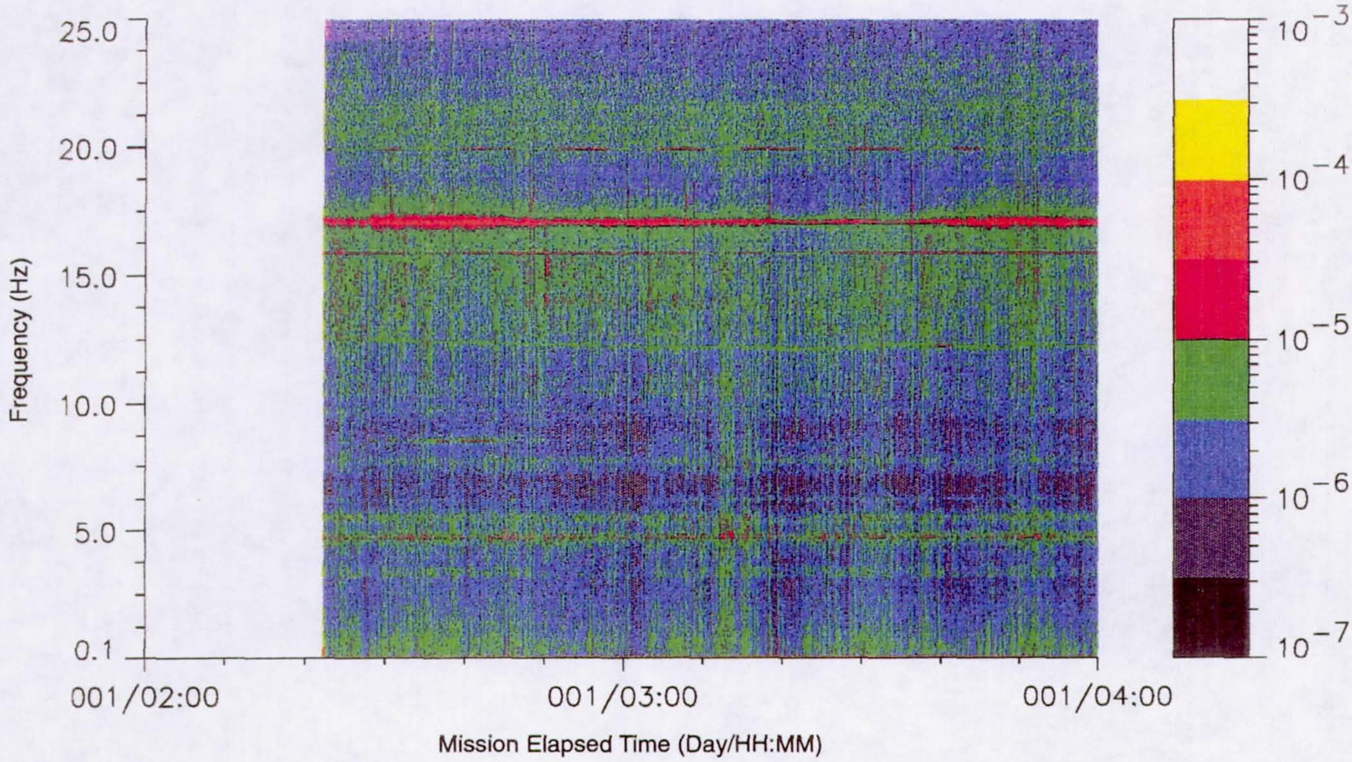

Figure C-3 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

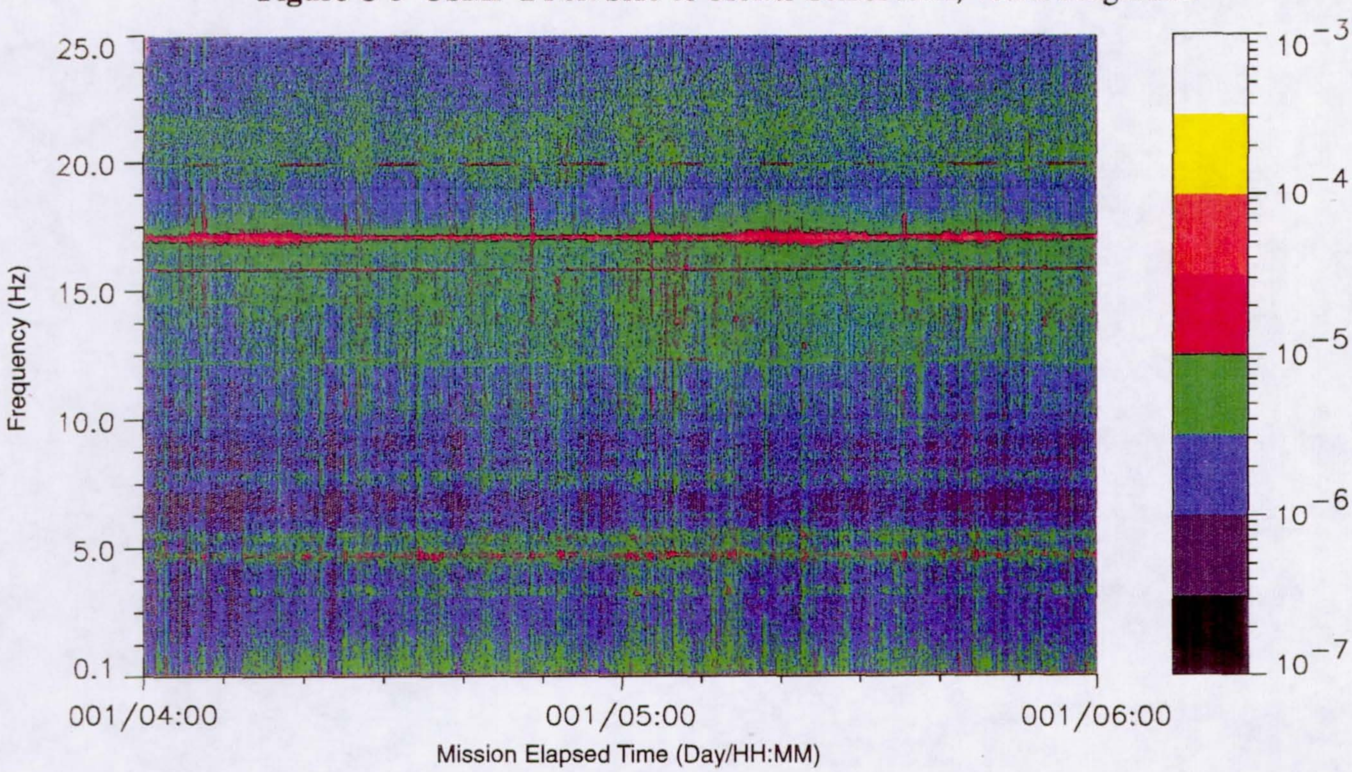

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Figure C-4 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

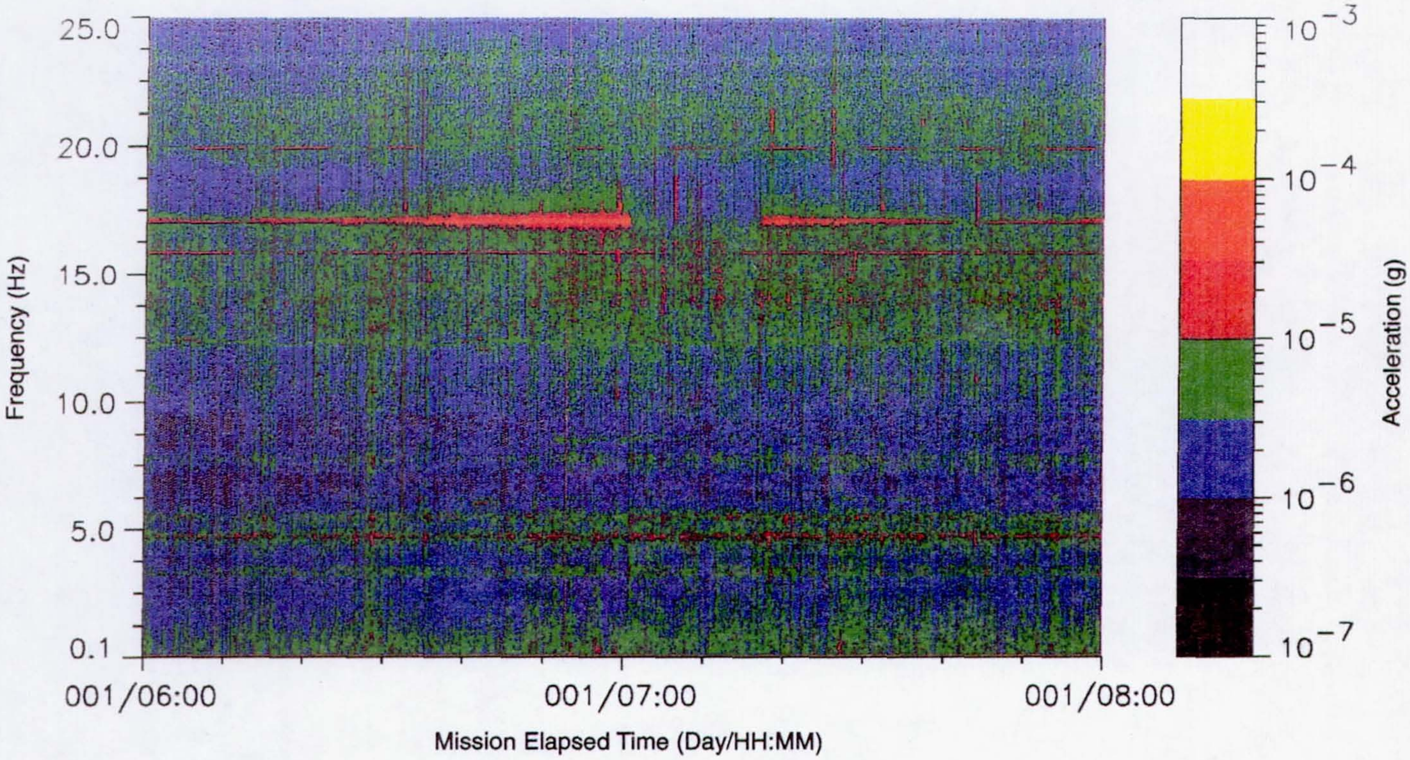

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Figure C-5 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

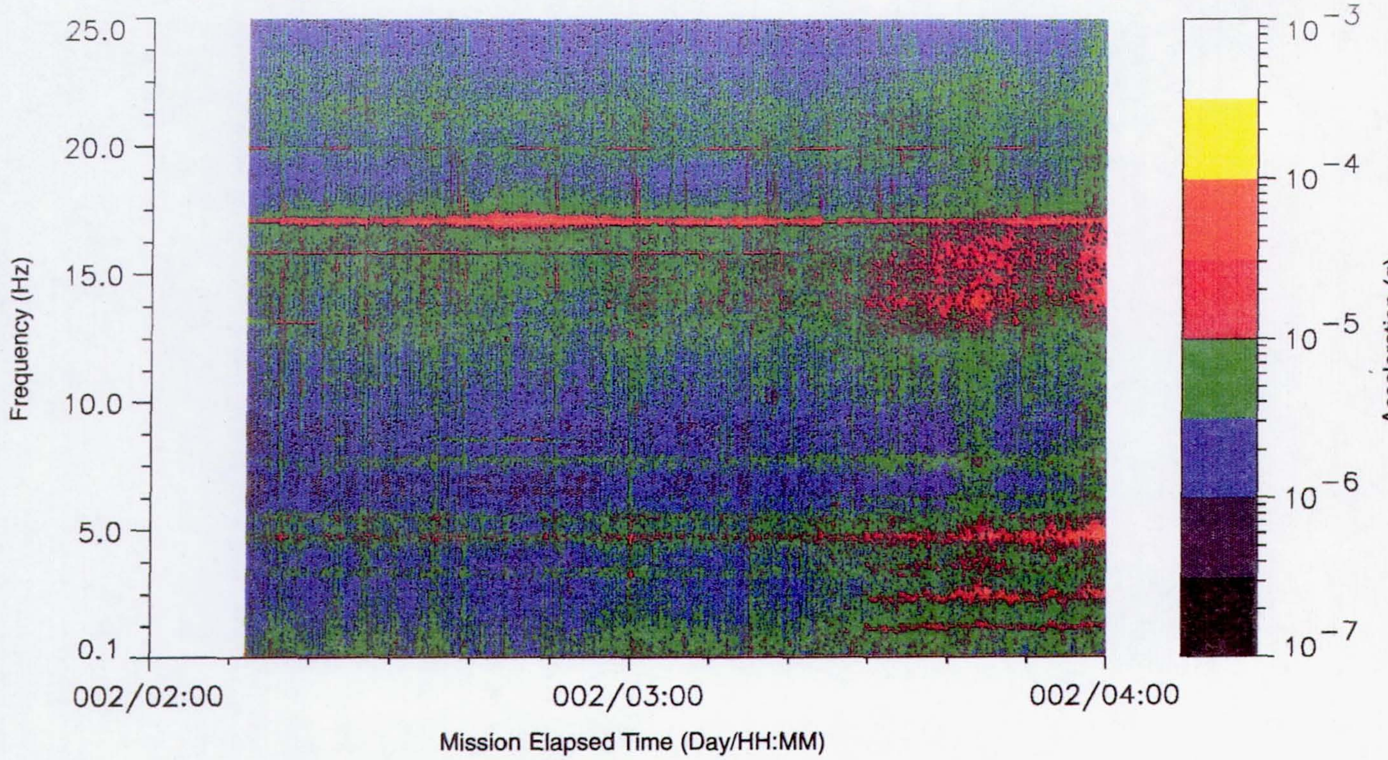

Figure C-6 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

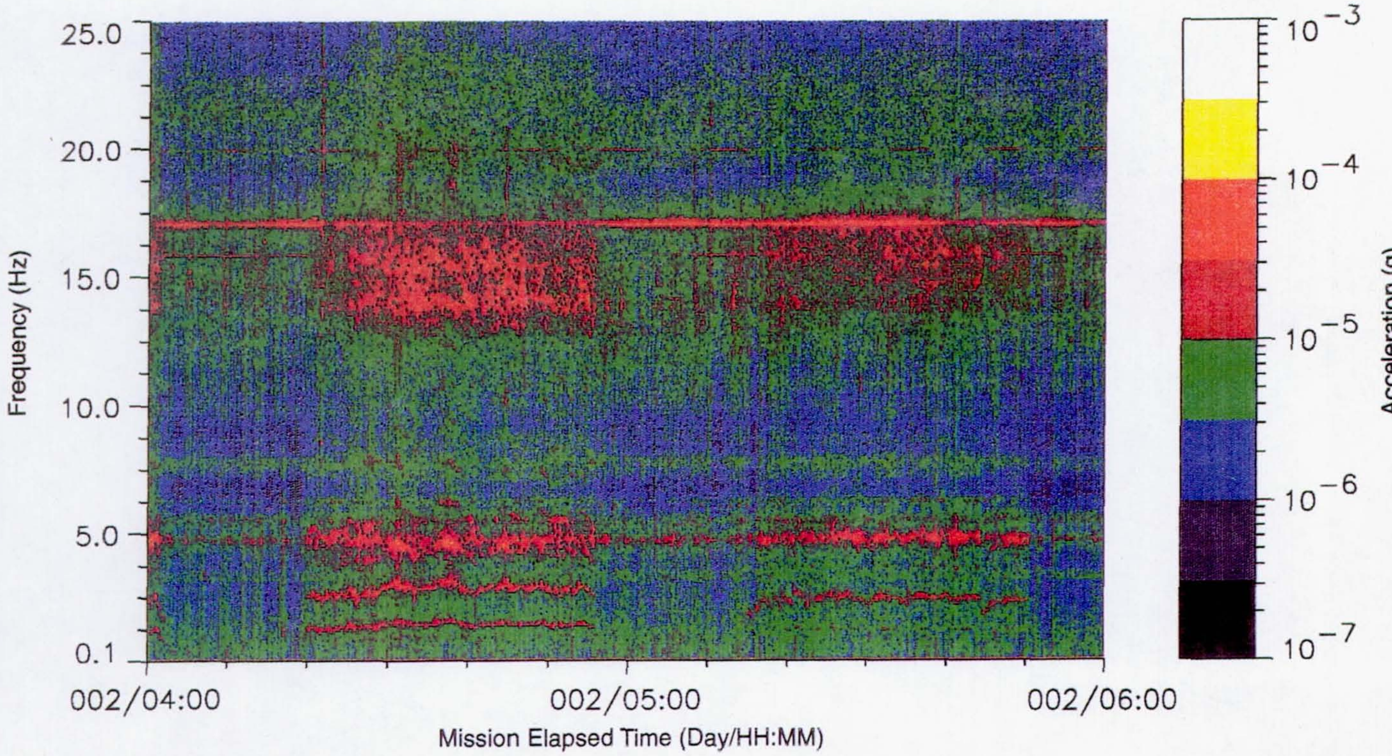

Figure C-7 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

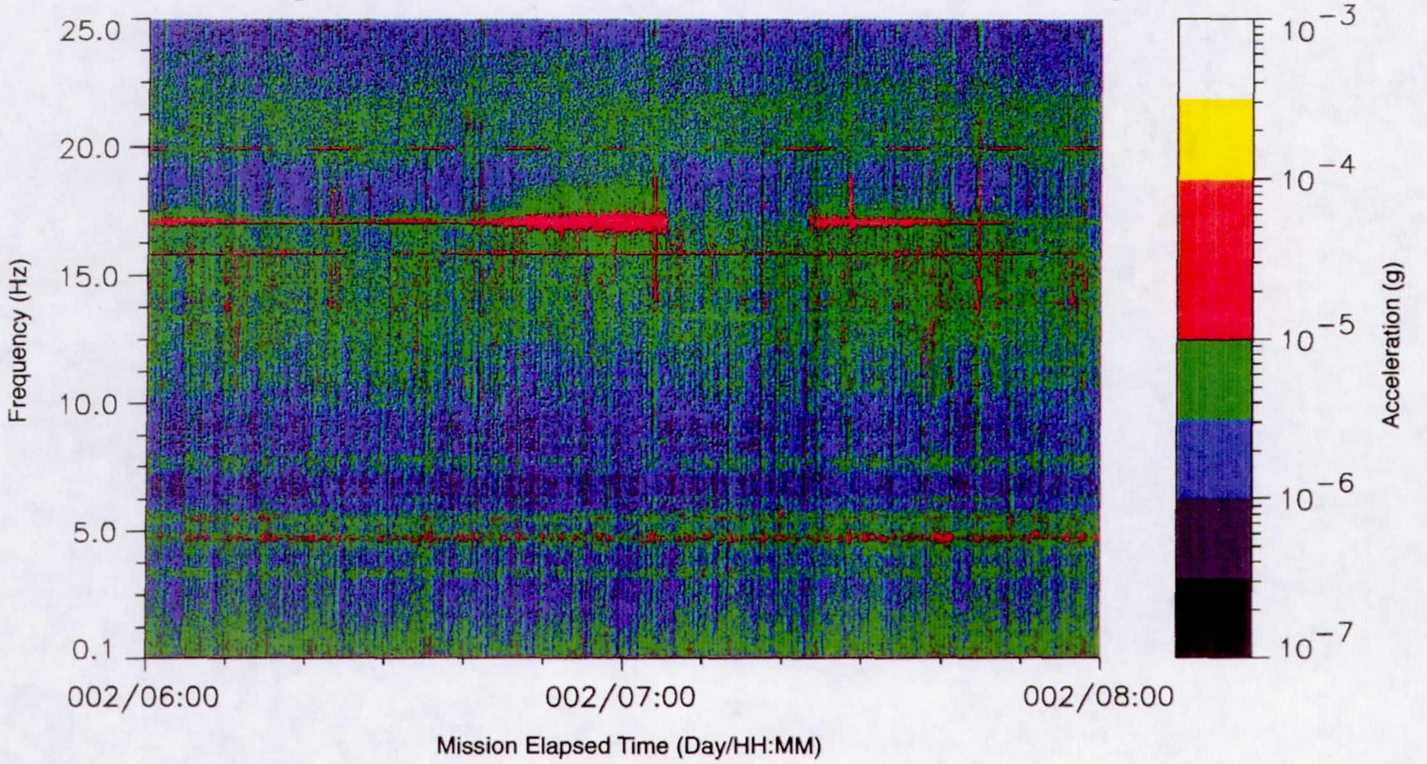

Figure C-8 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

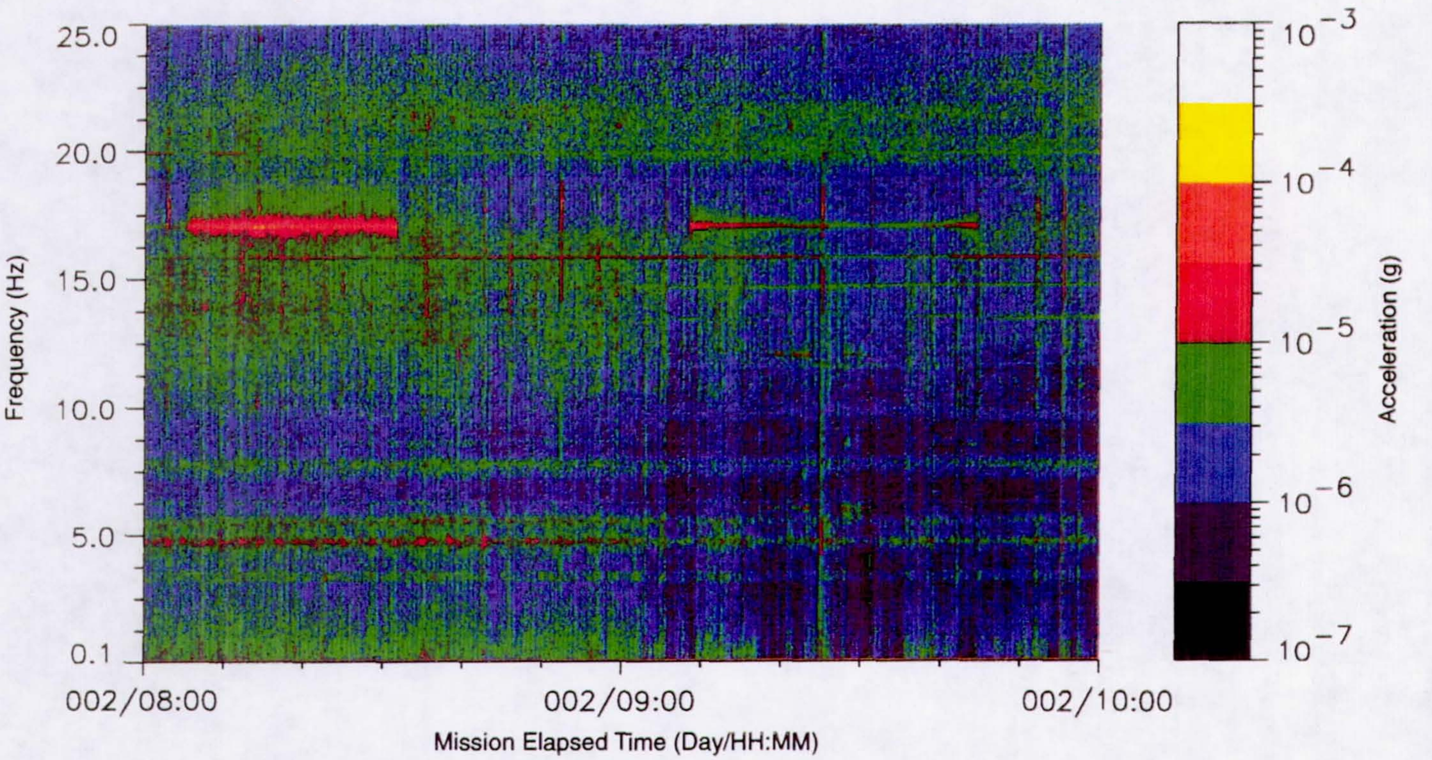

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Figure C-9 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

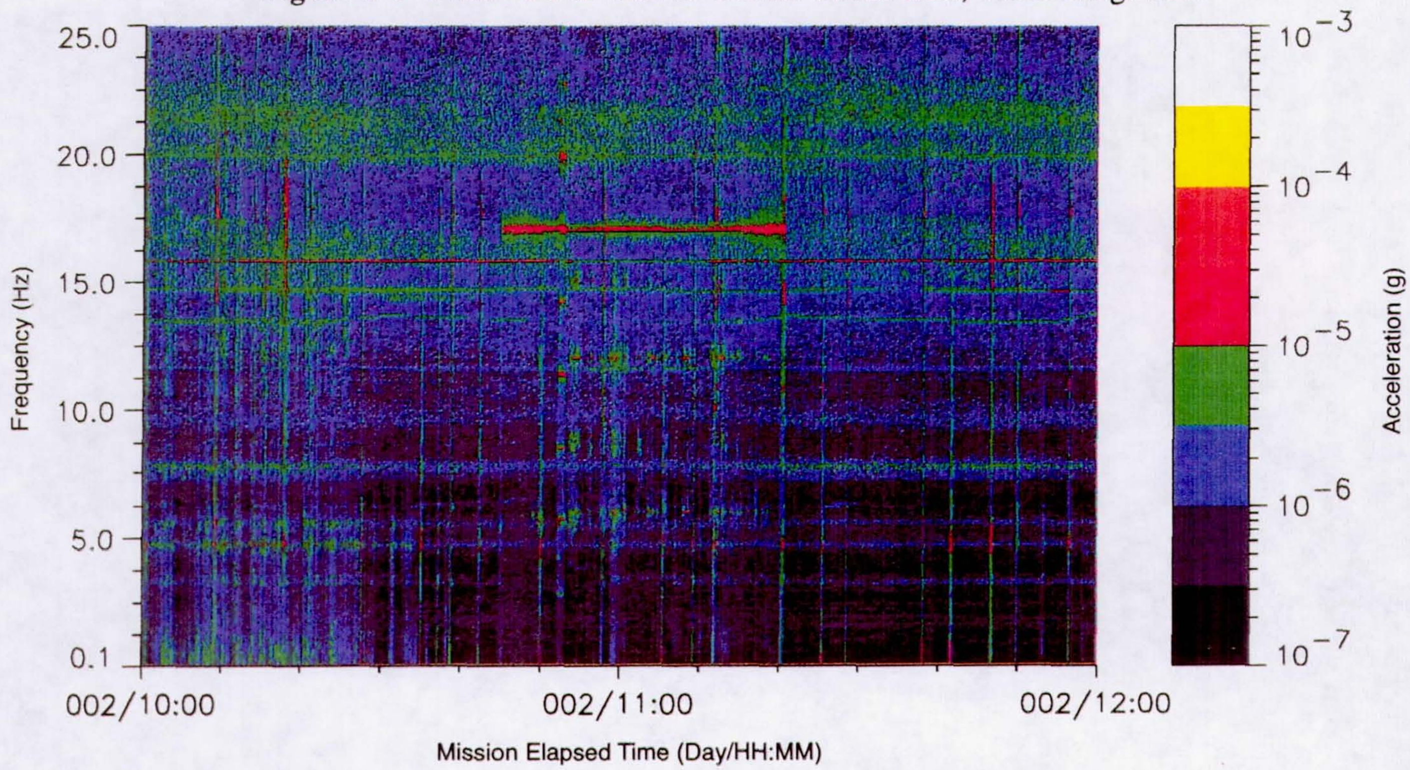

Figure C-10 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

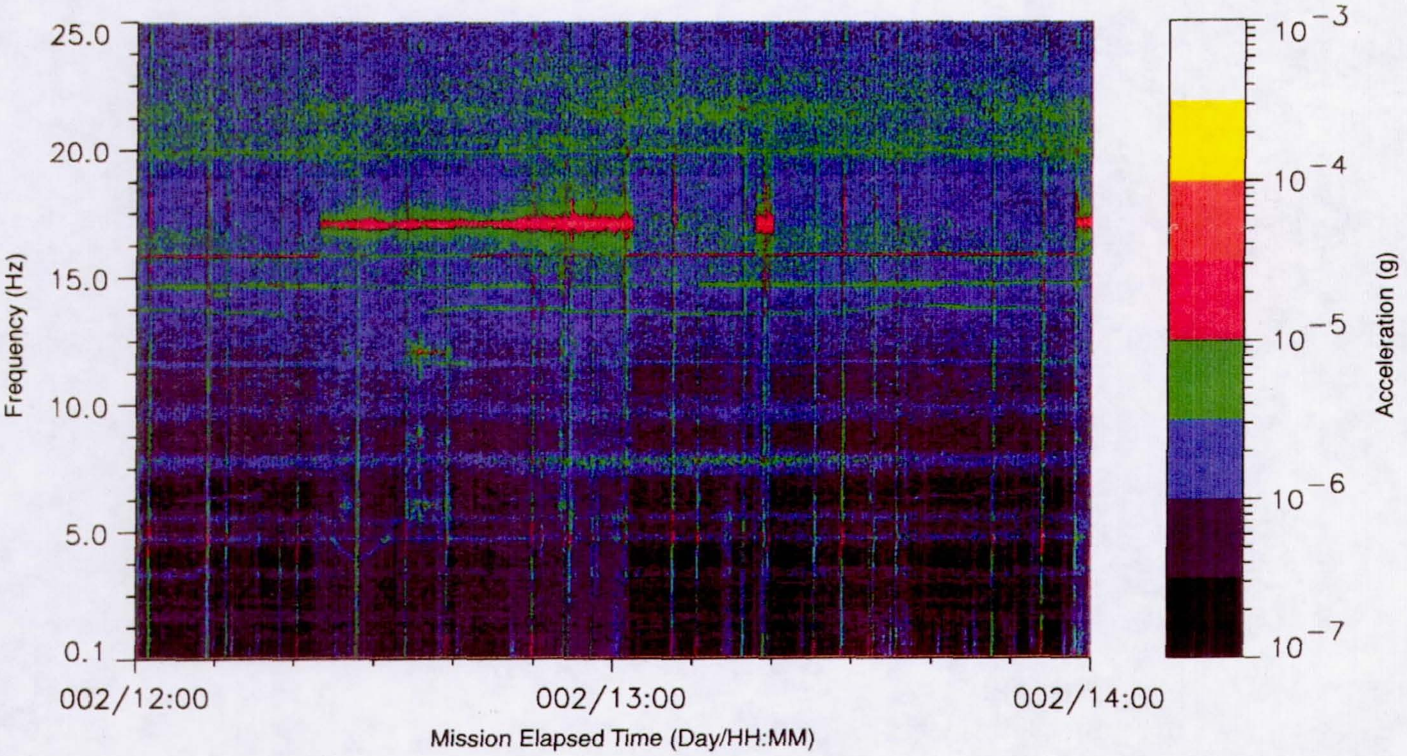

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Figure C-11 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

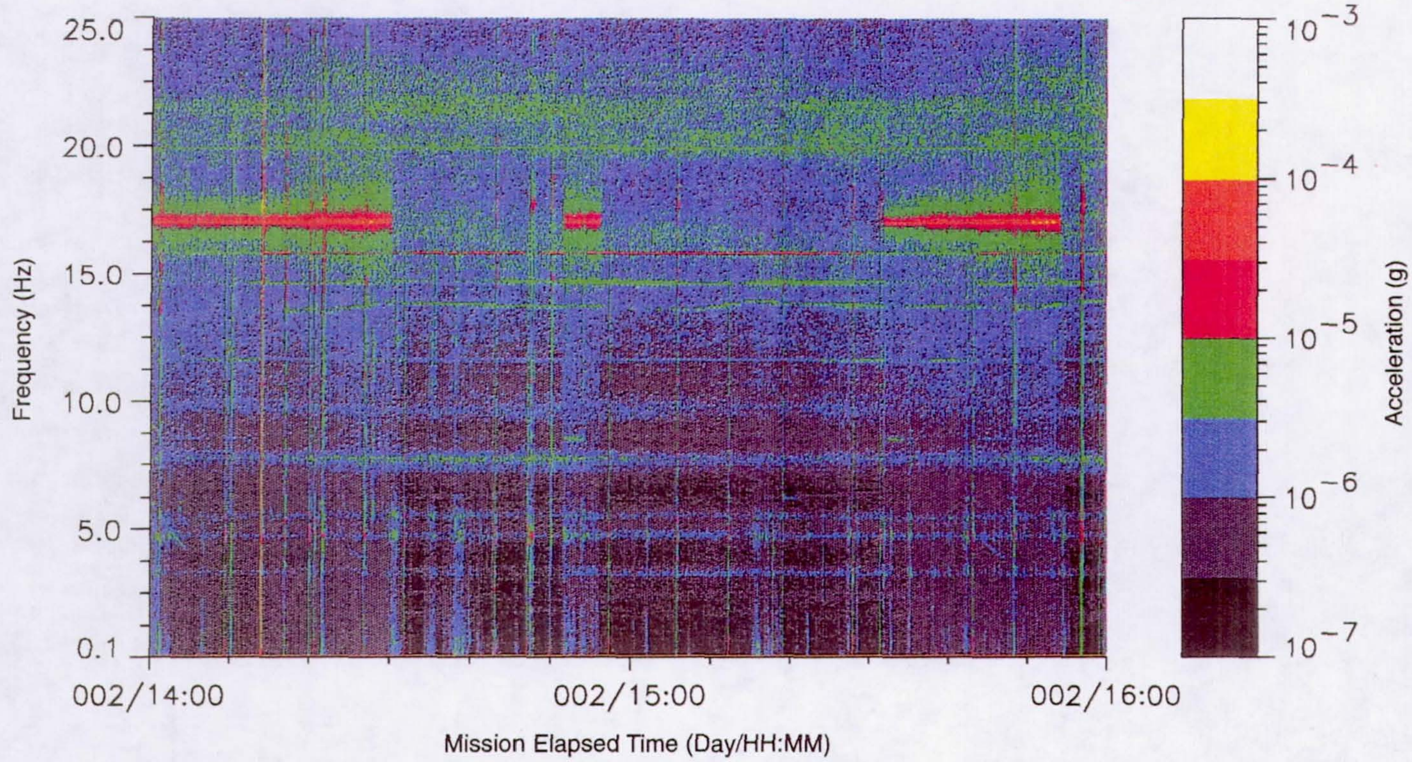

Figure C-12 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

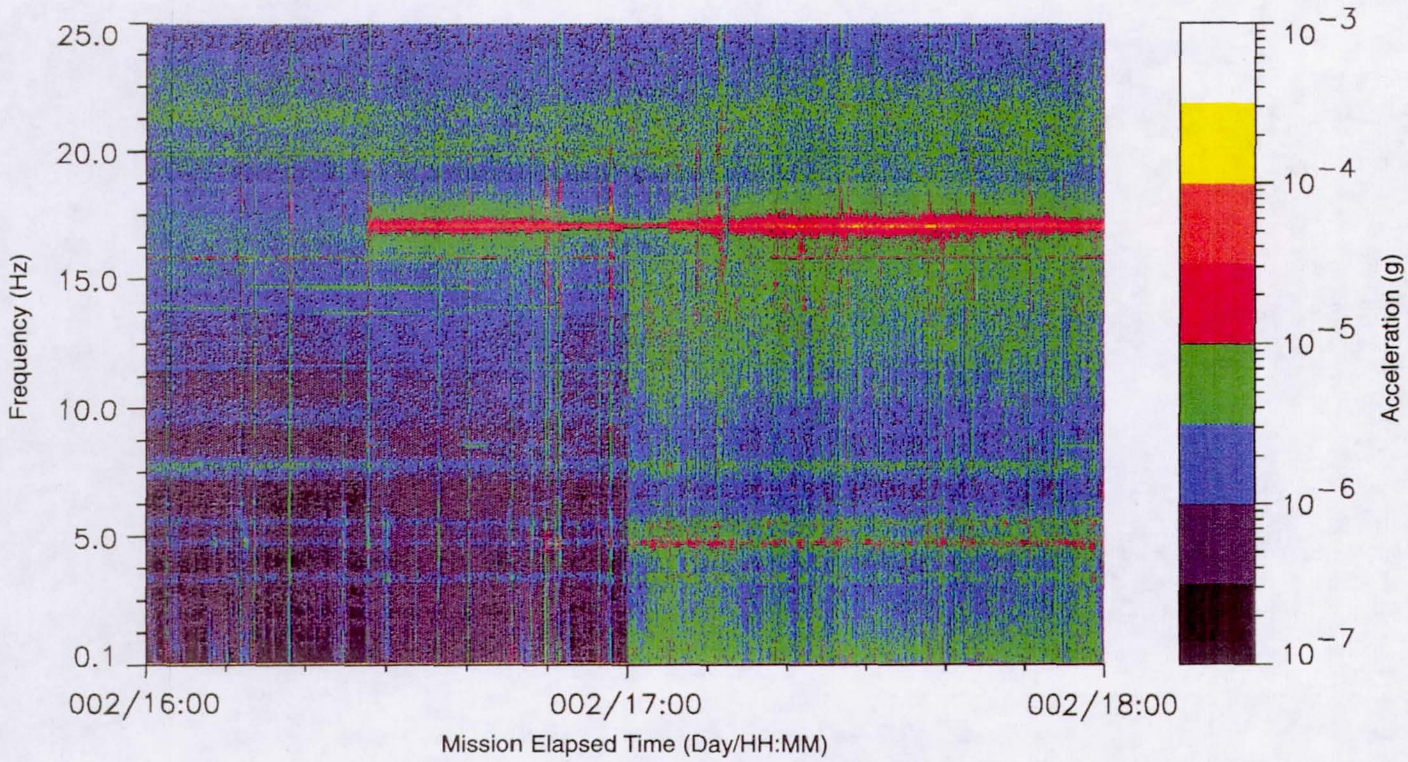

Figure C-13 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

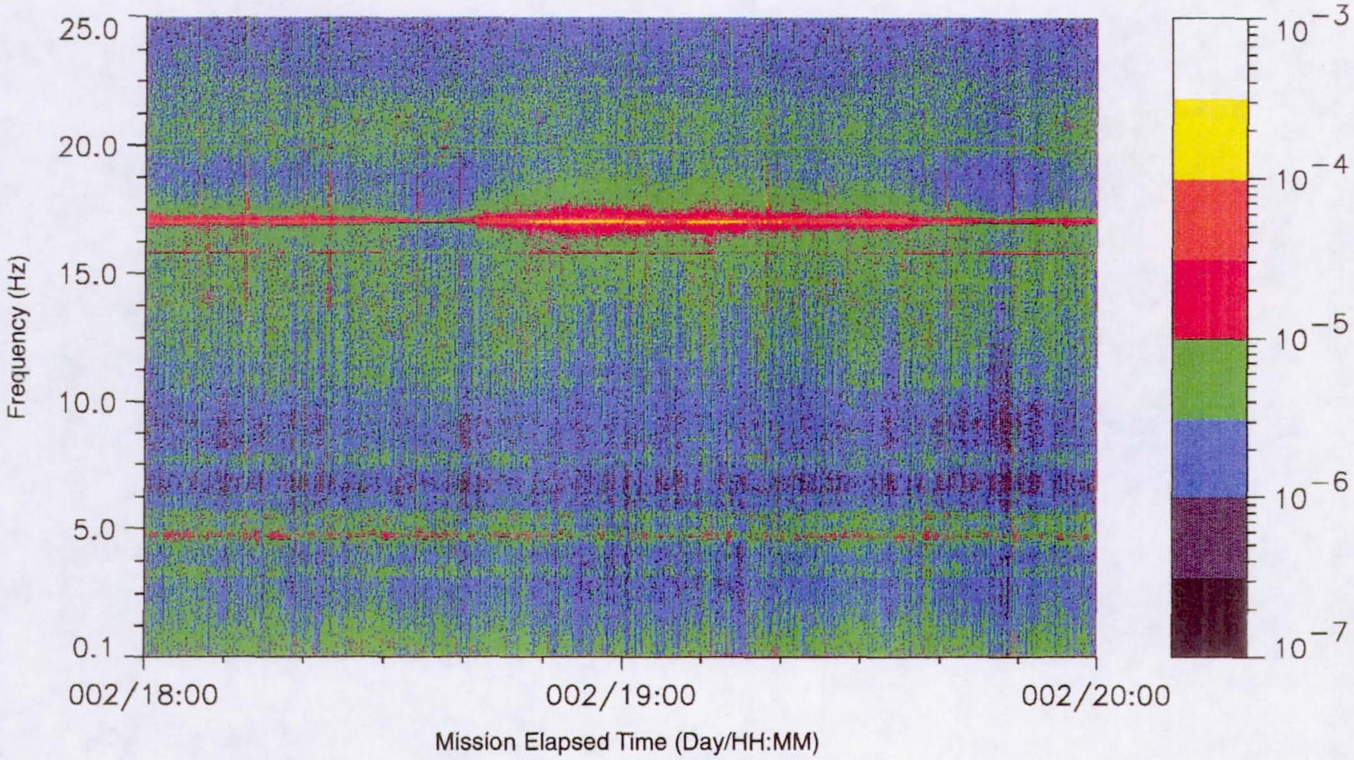

Figure C-14 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

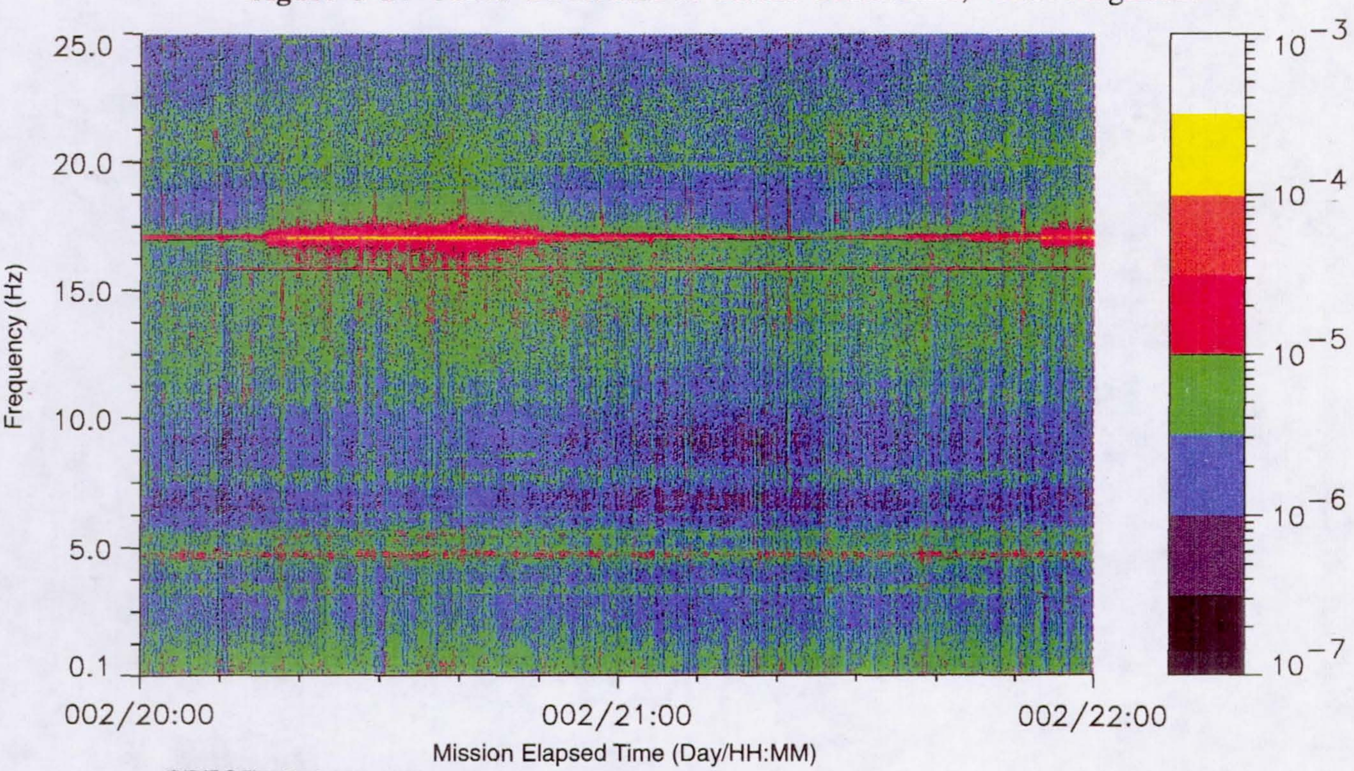

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Figure C-15 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

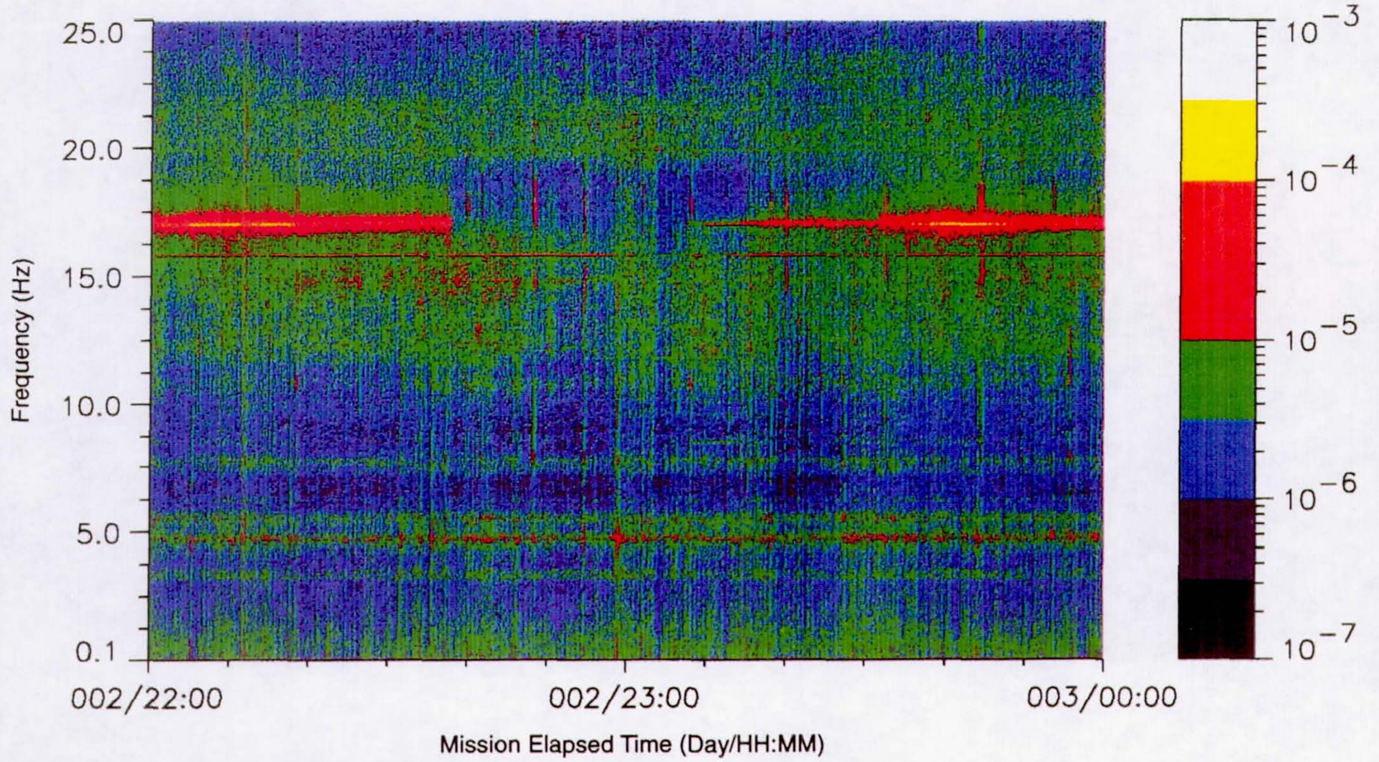

Figure C-16 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

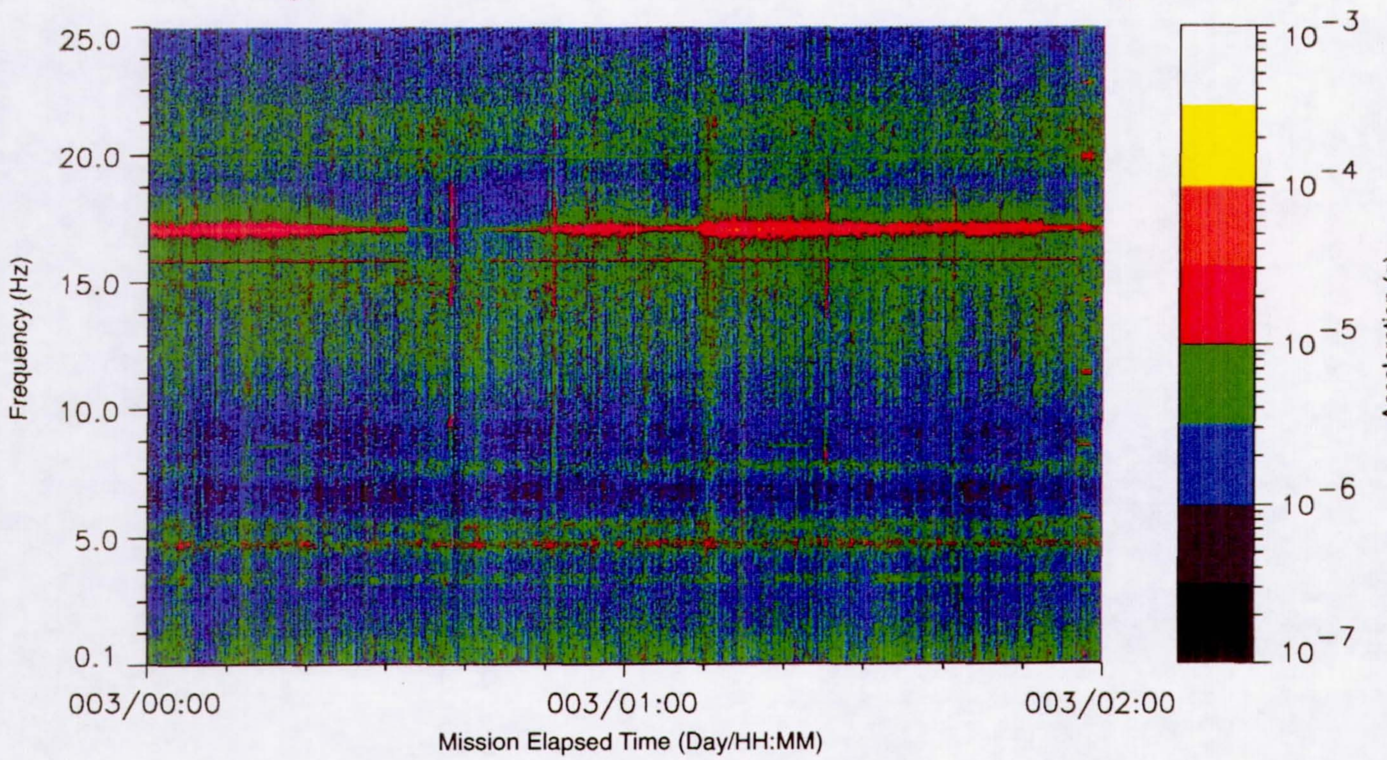

Figure C-17 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

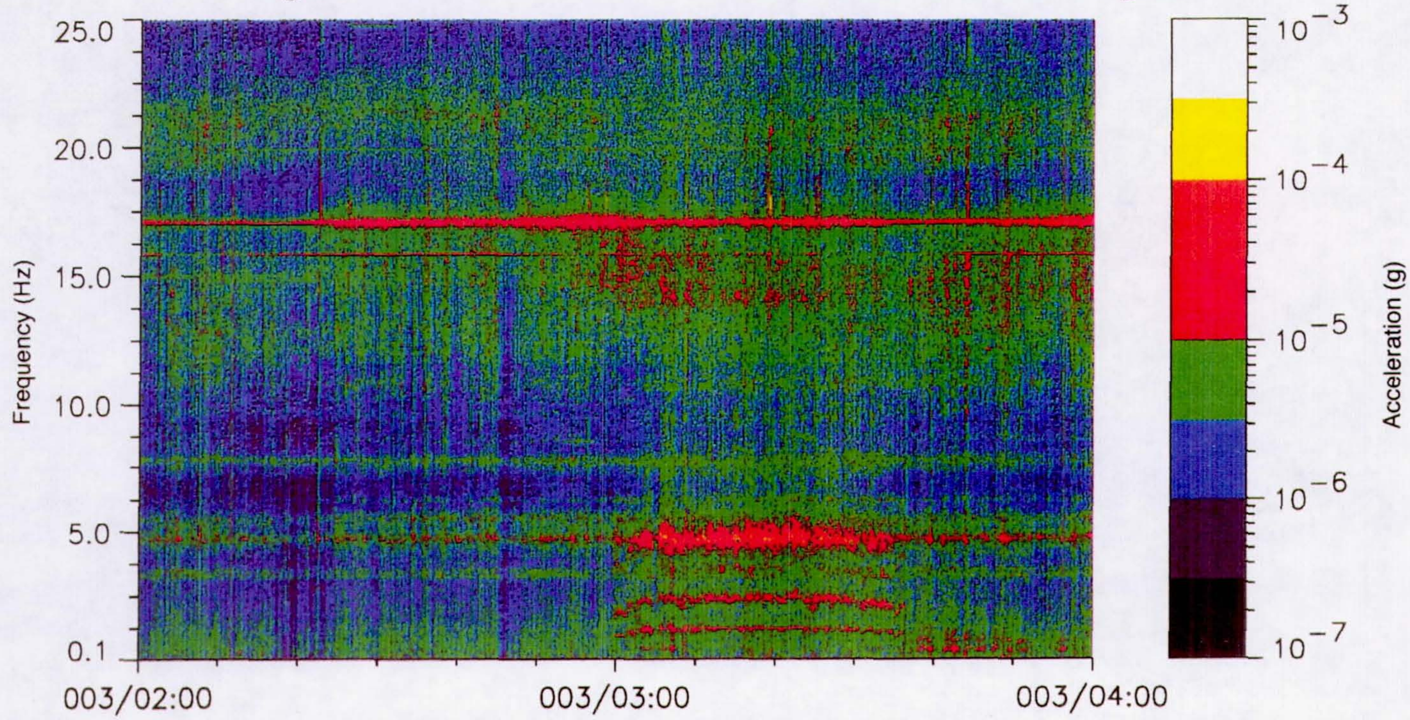

Figure C-18 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

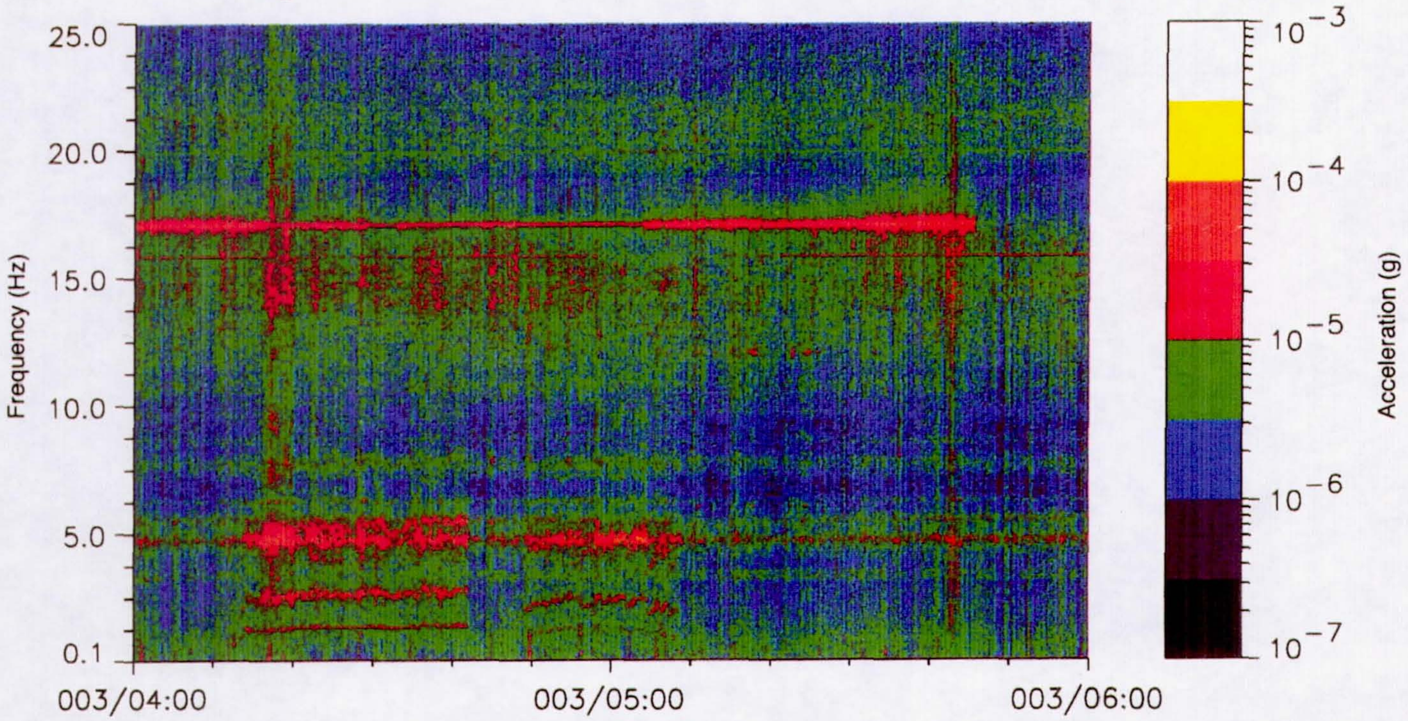

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Figure C-19 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

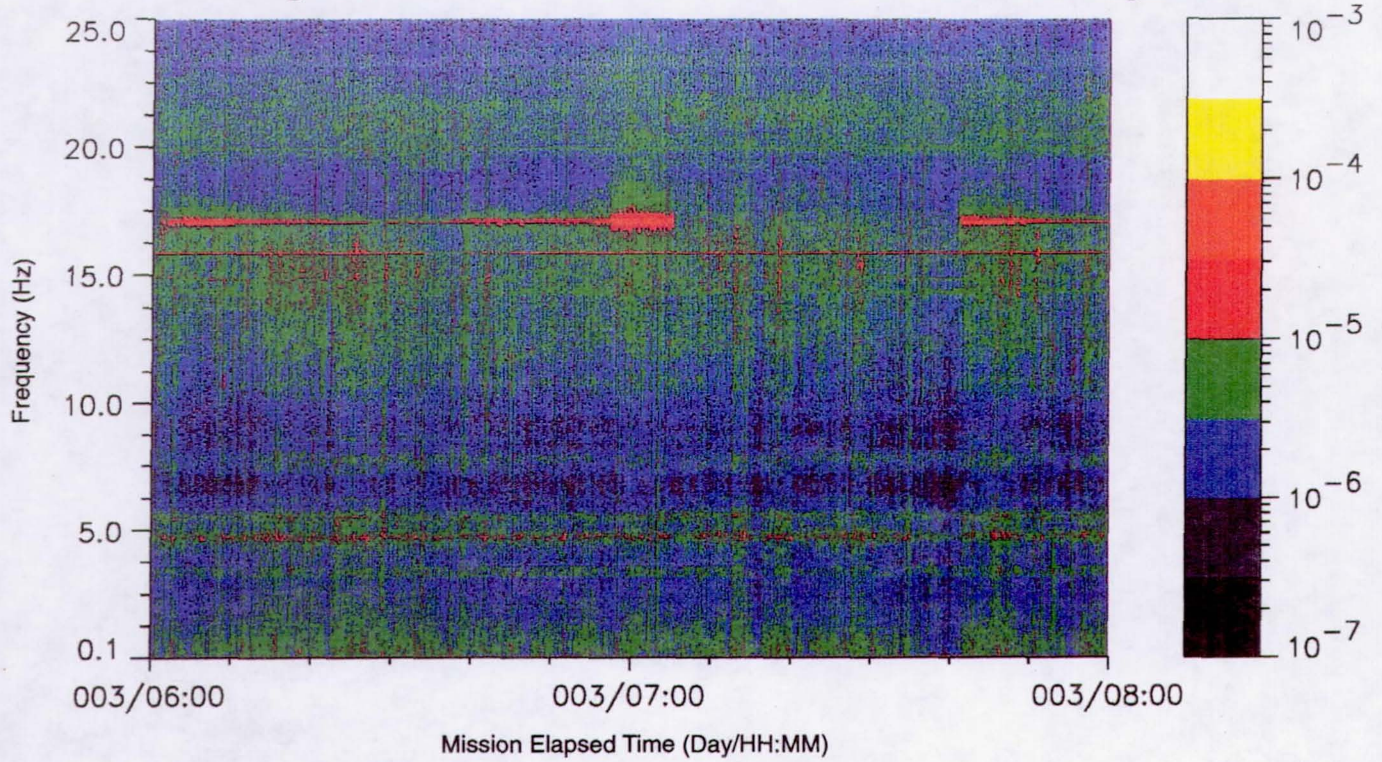

Figure C-20 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

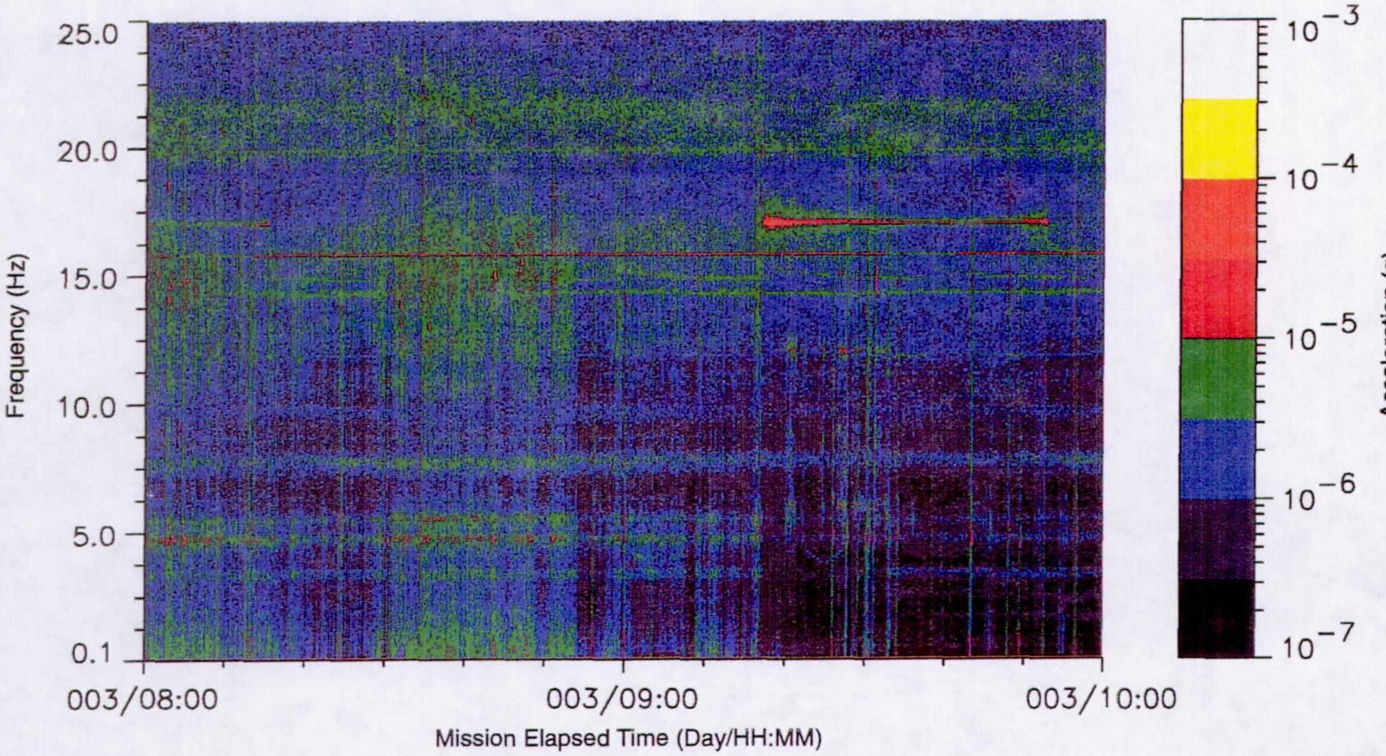

Figure C-21 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

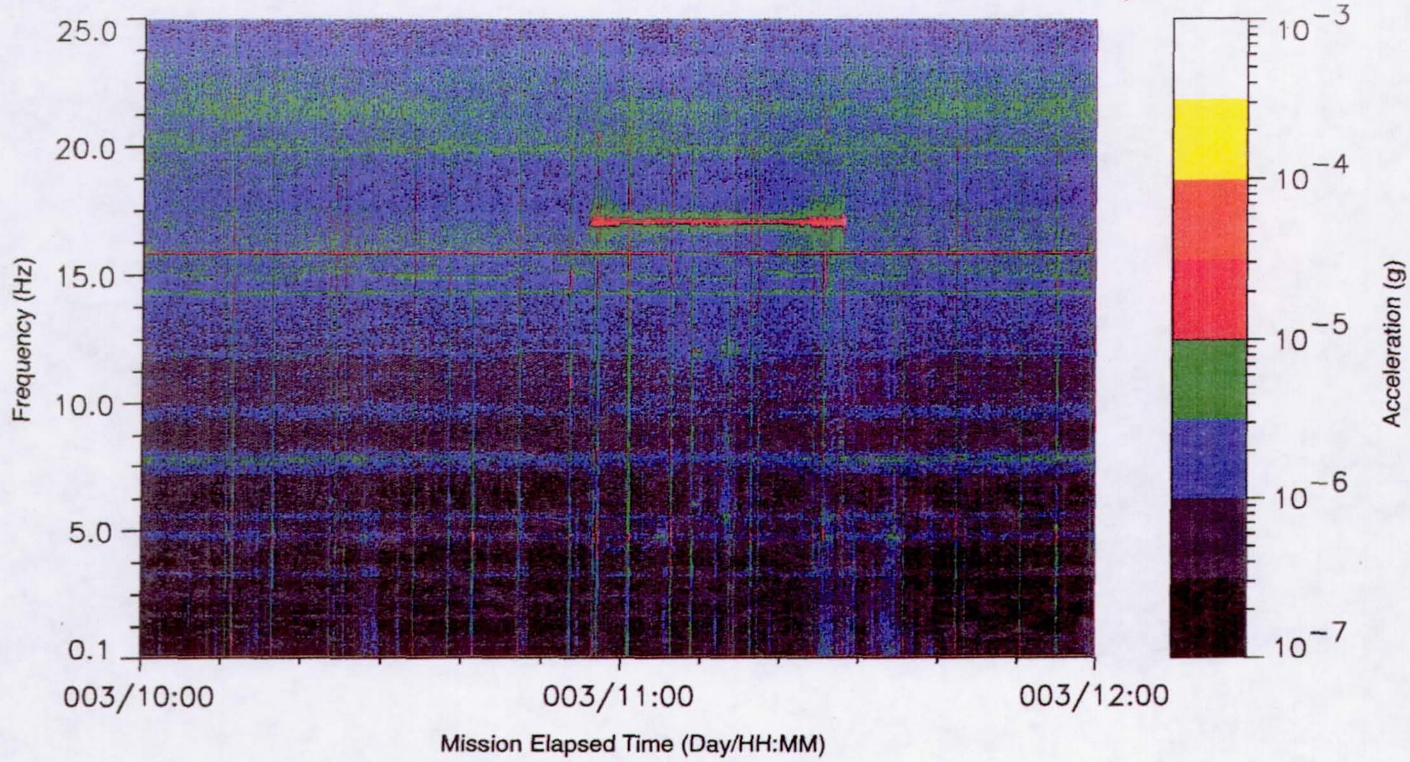

Figure C-22 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

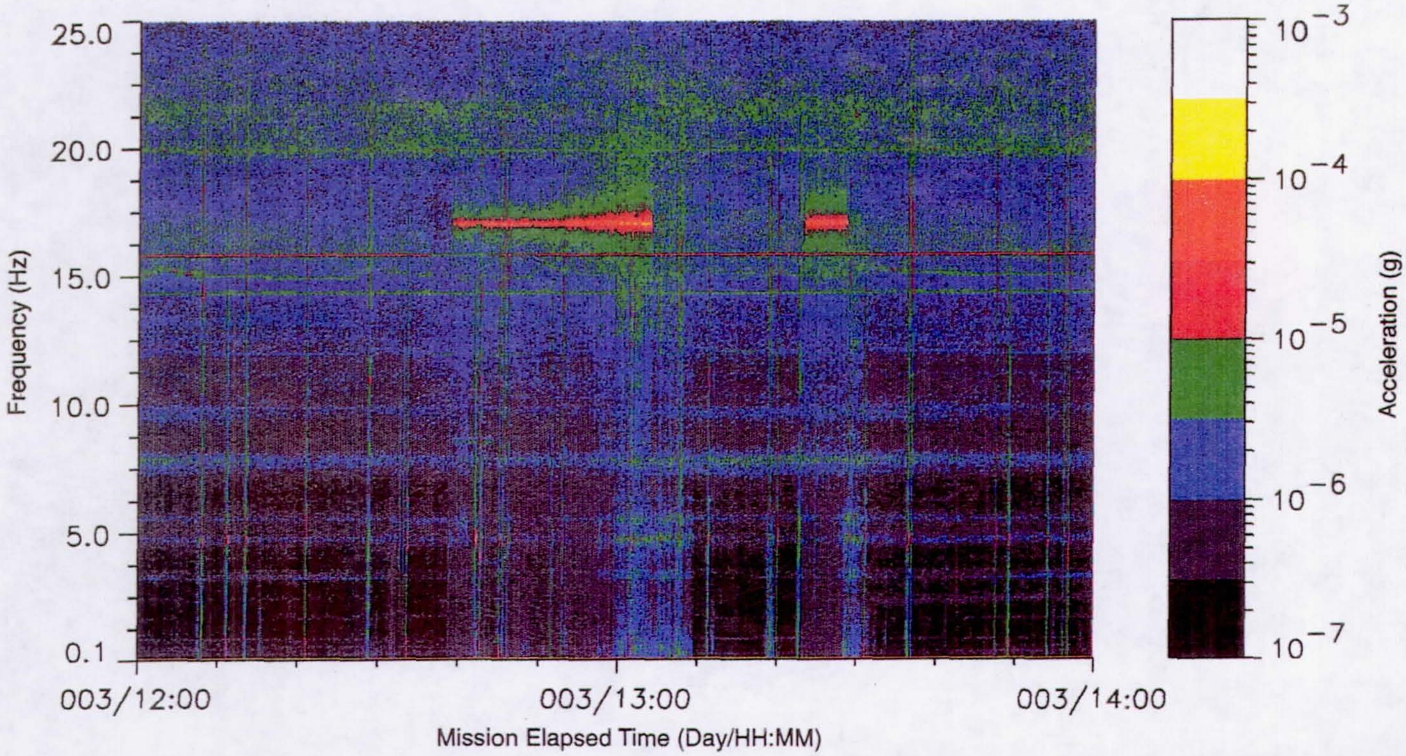

Figure C-23 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

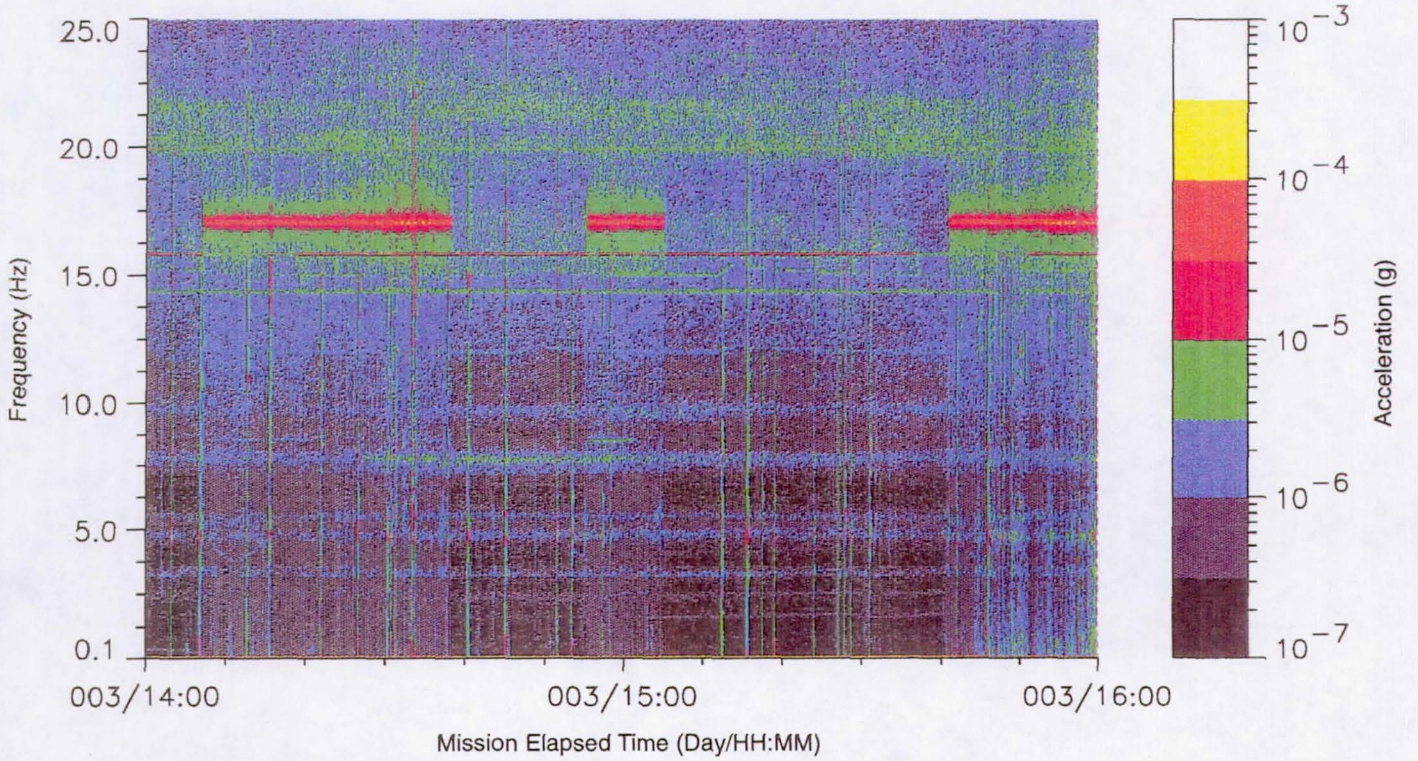

Figure C-24 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

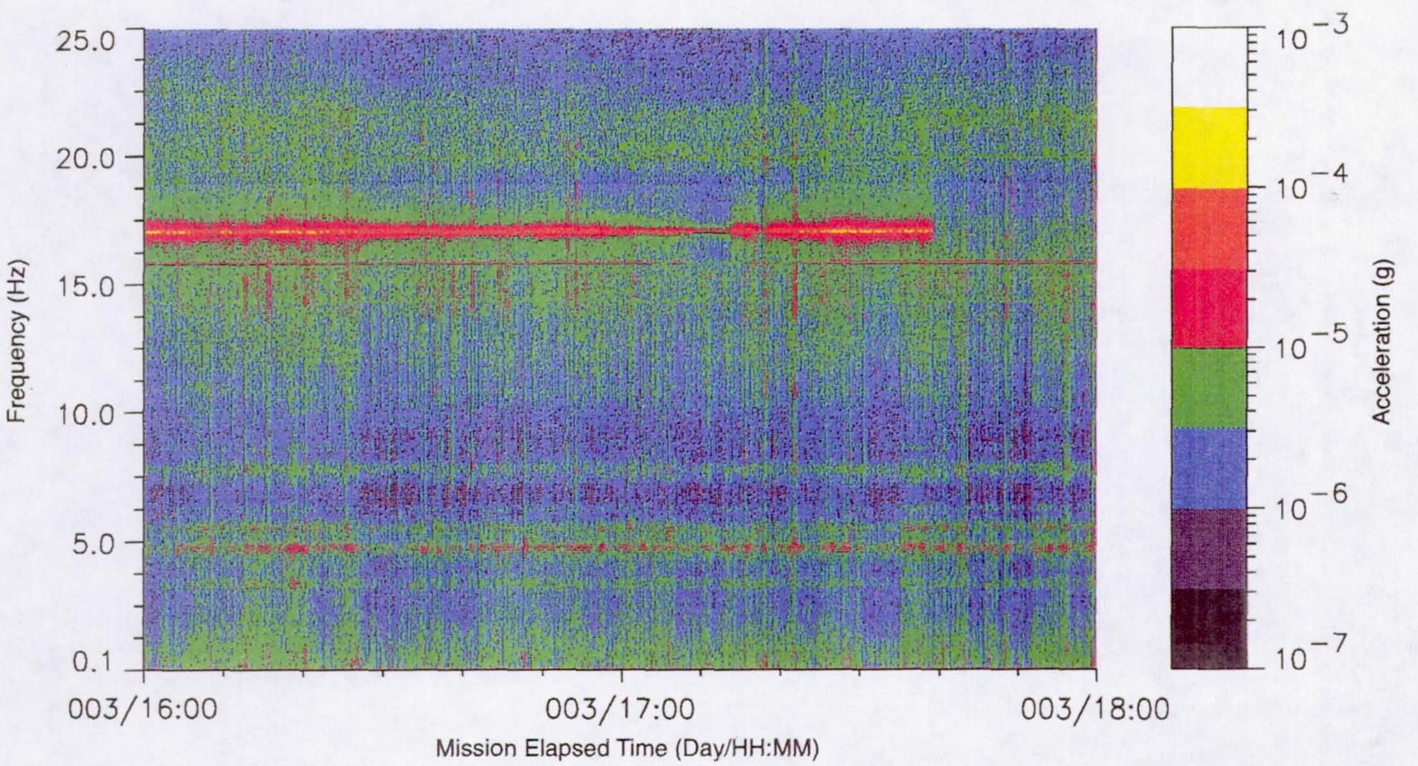

Figure C-25 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

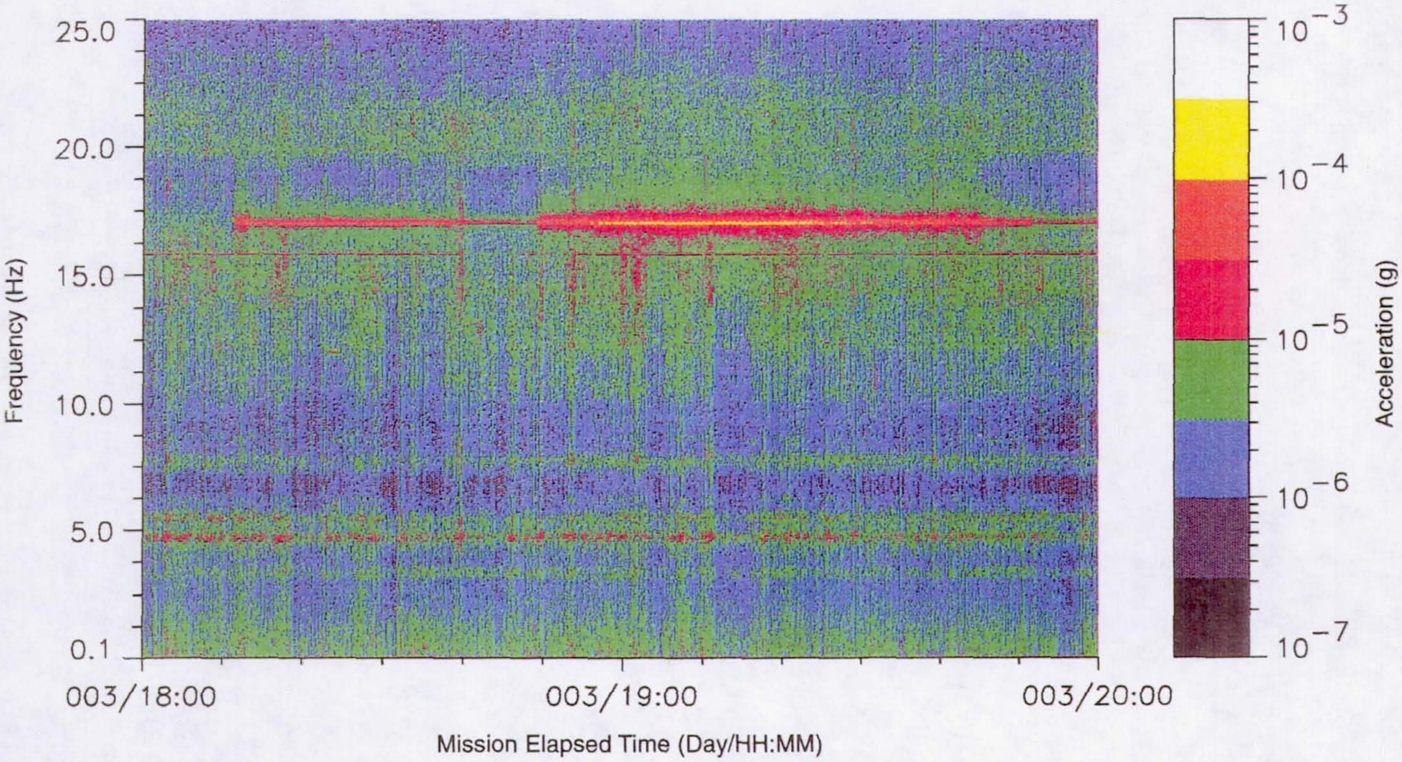

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Figure C-26 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

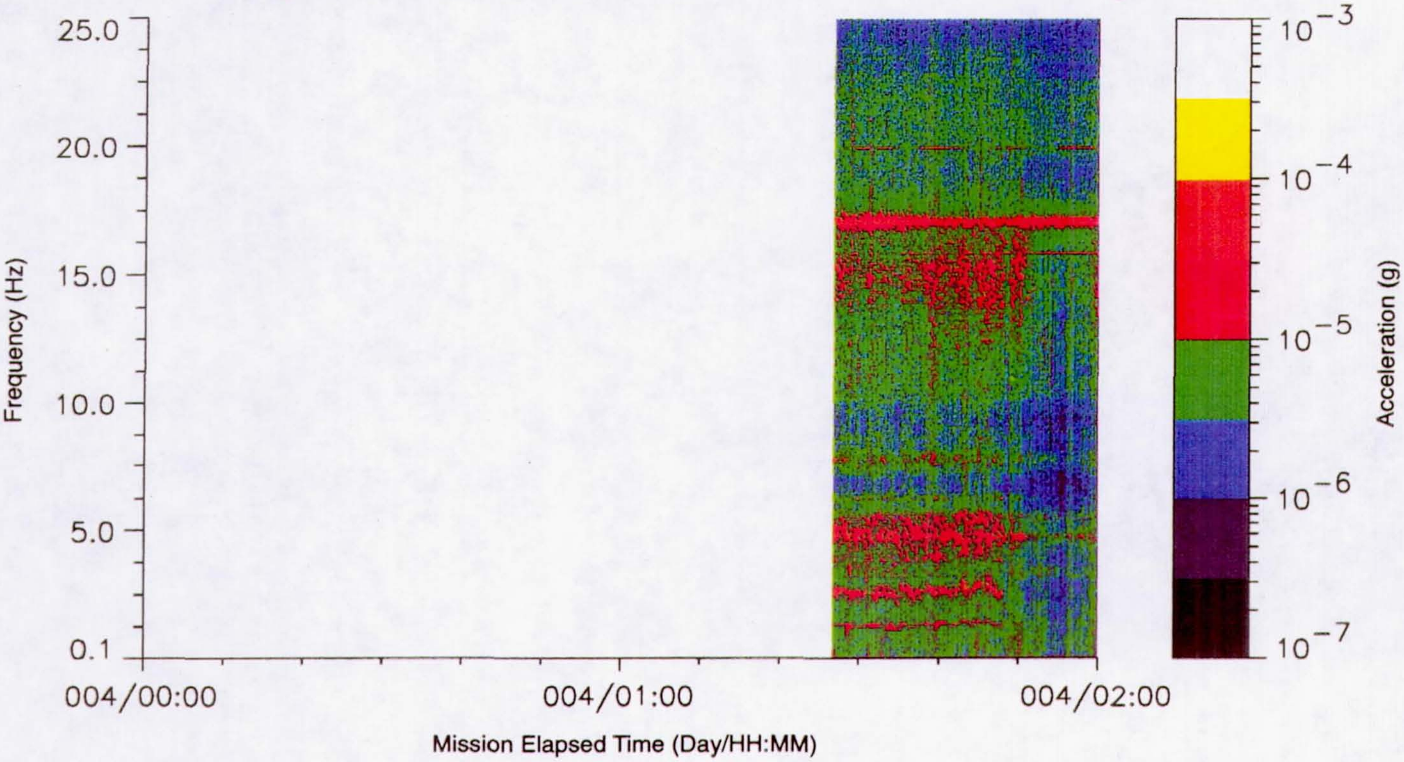

Figure C-27 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

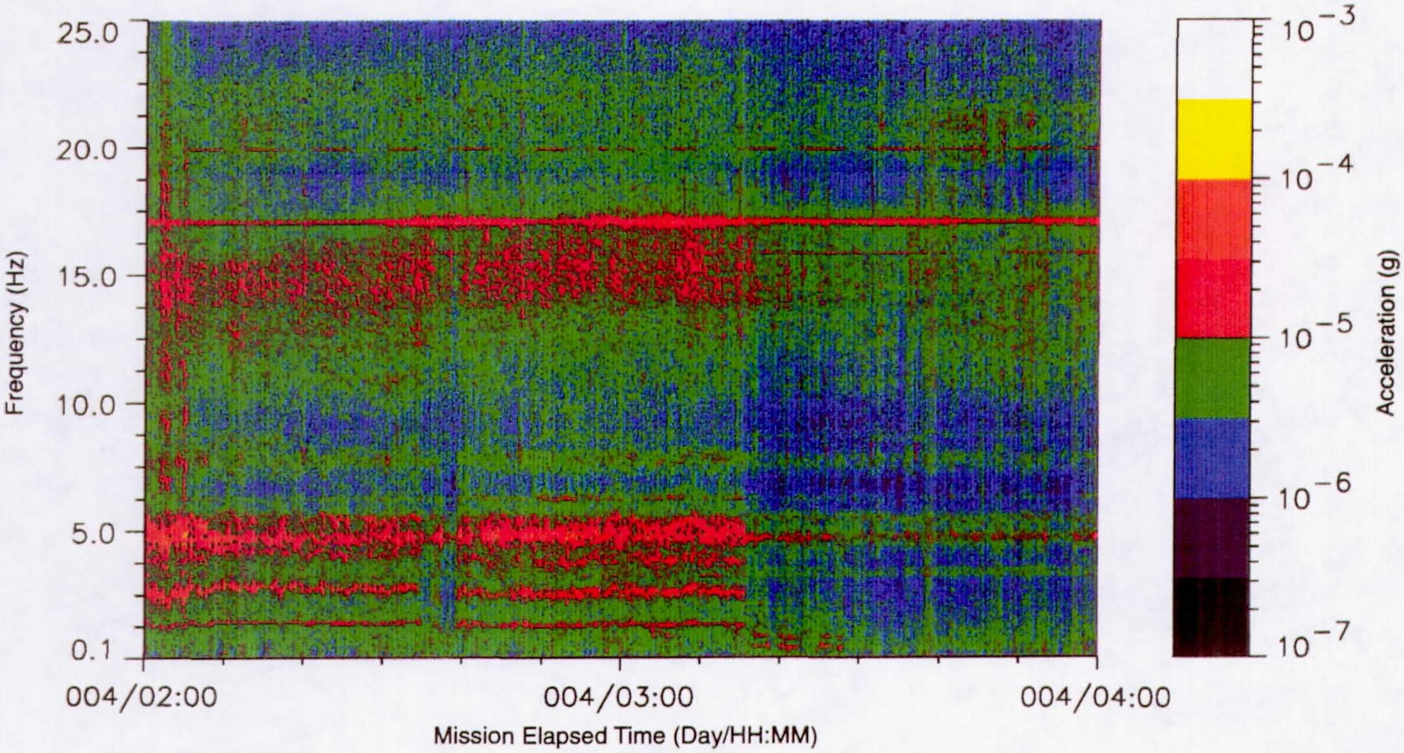

Figure C-28 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

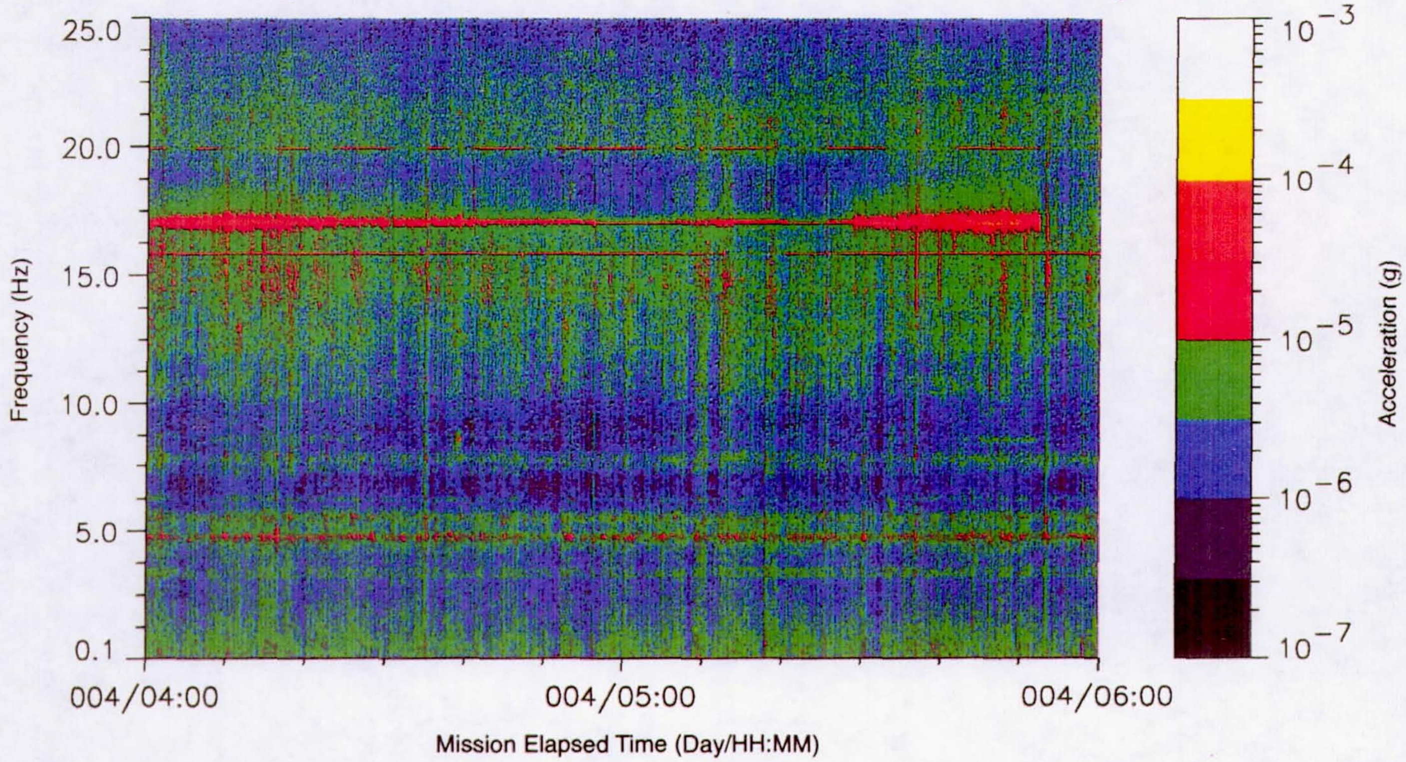

Figure C-29 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

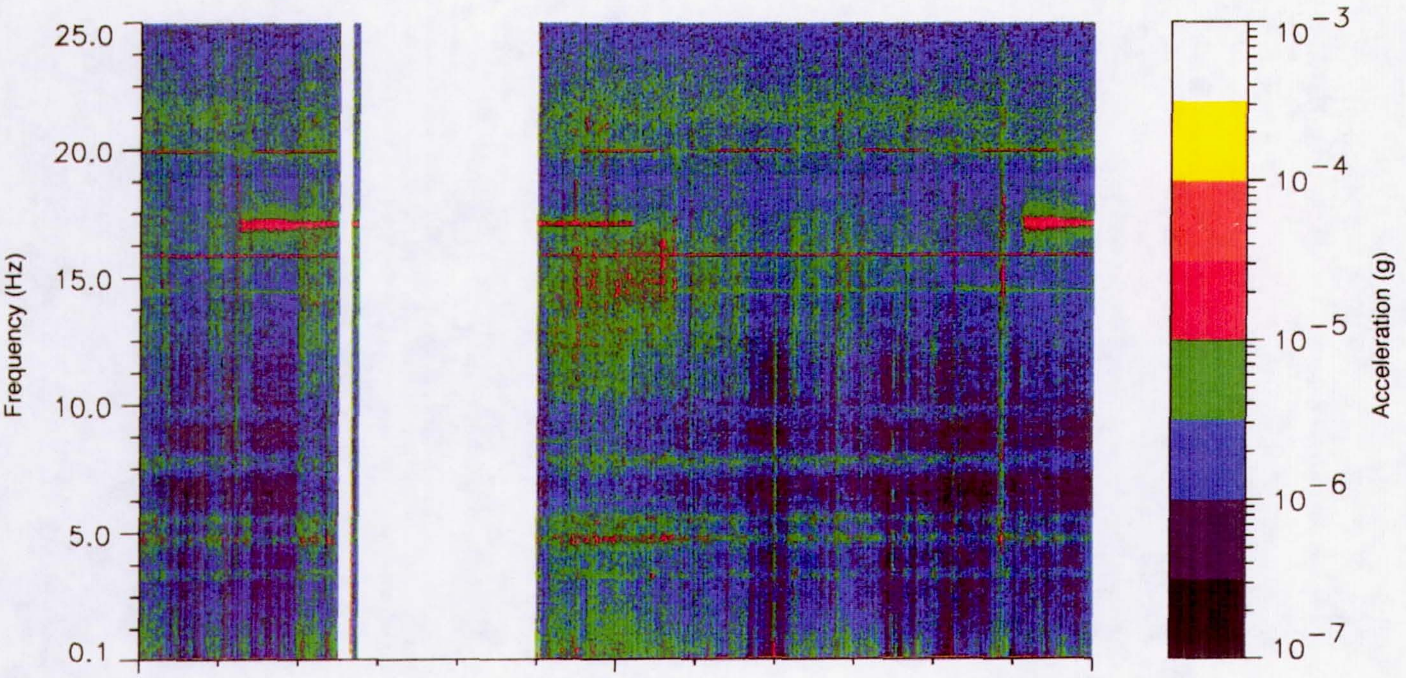

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Figure C-30 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

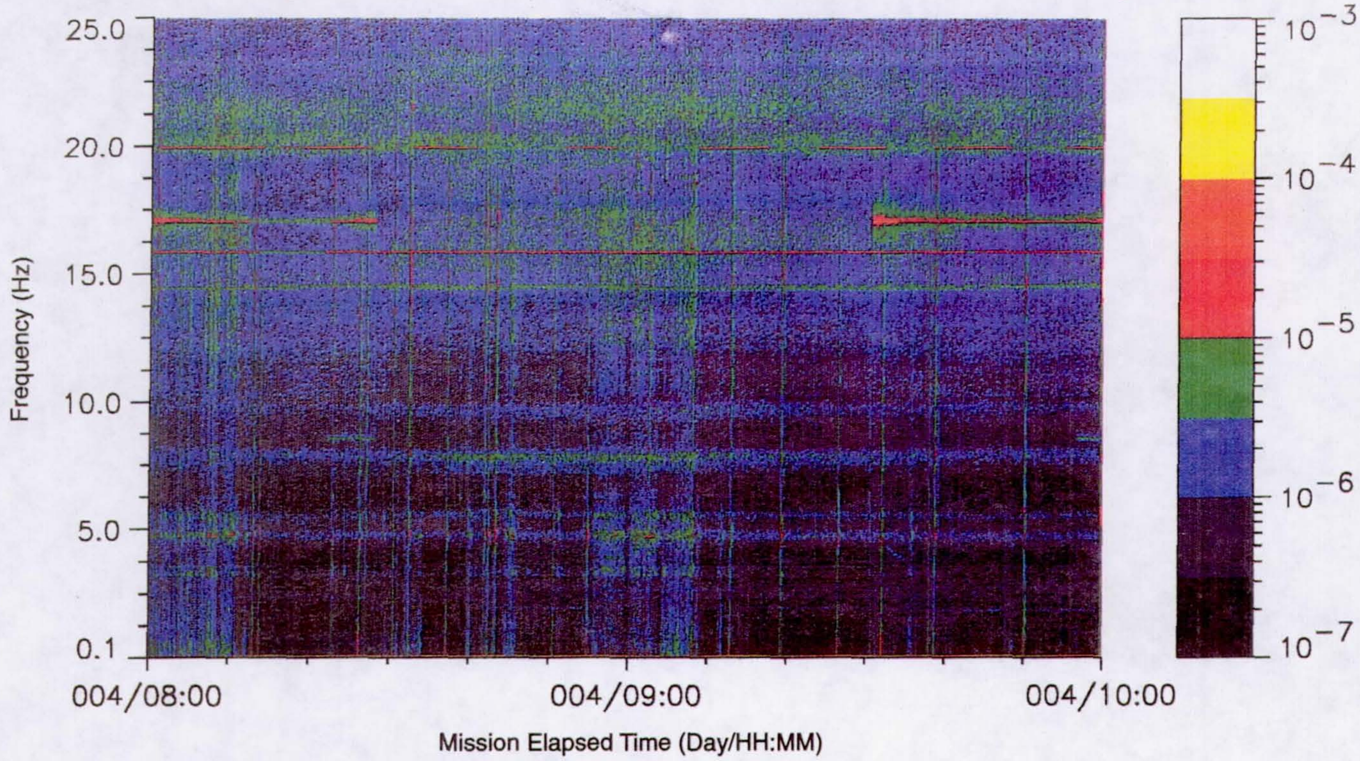

Figure C-31 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

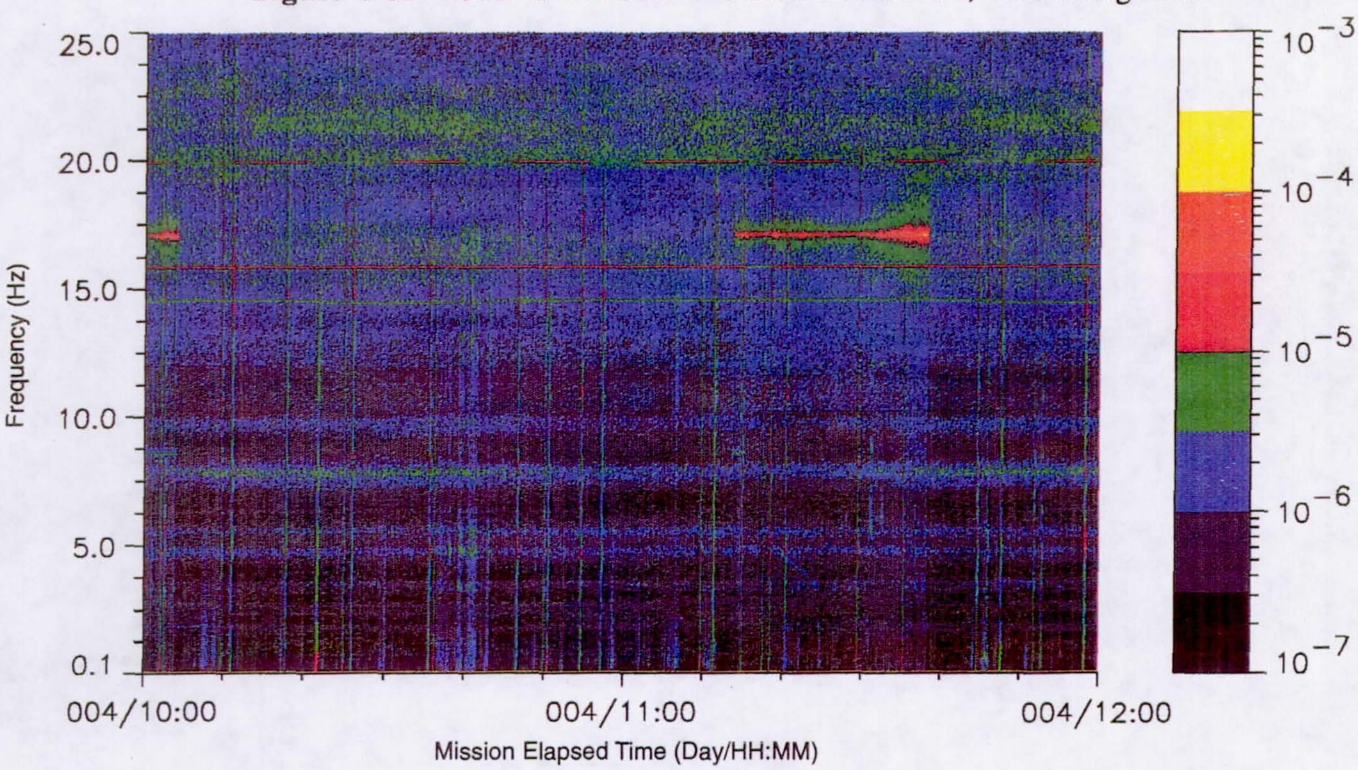

Figure C-32 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

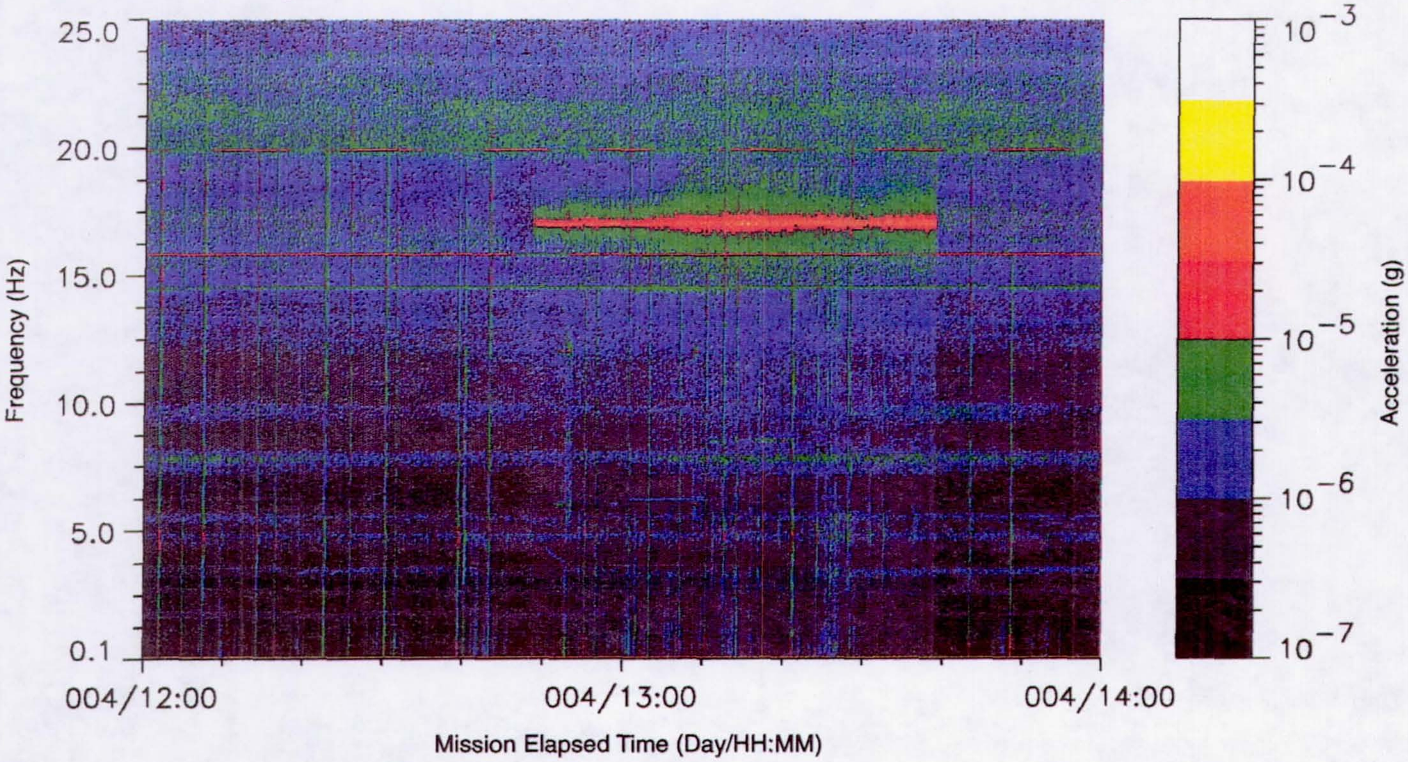

Figure C-33 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

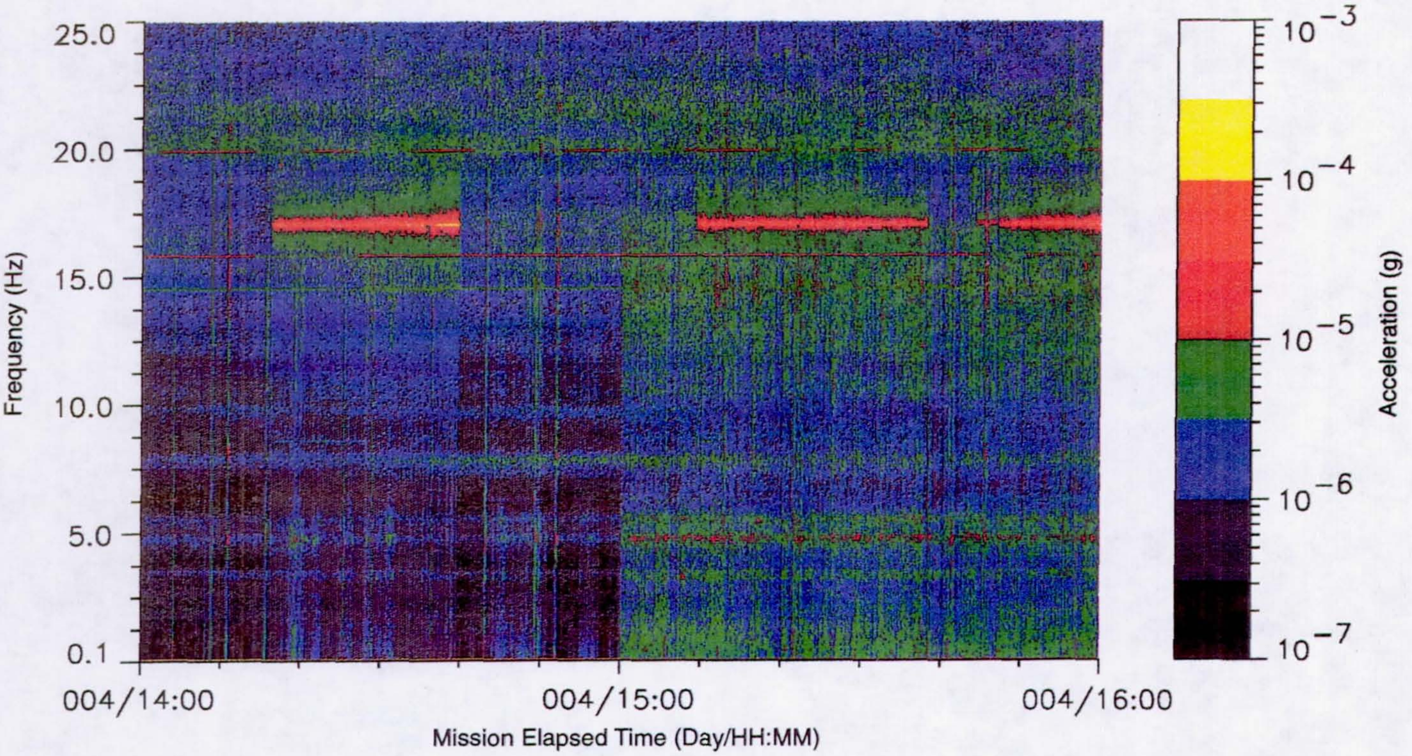

Figure C-34 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

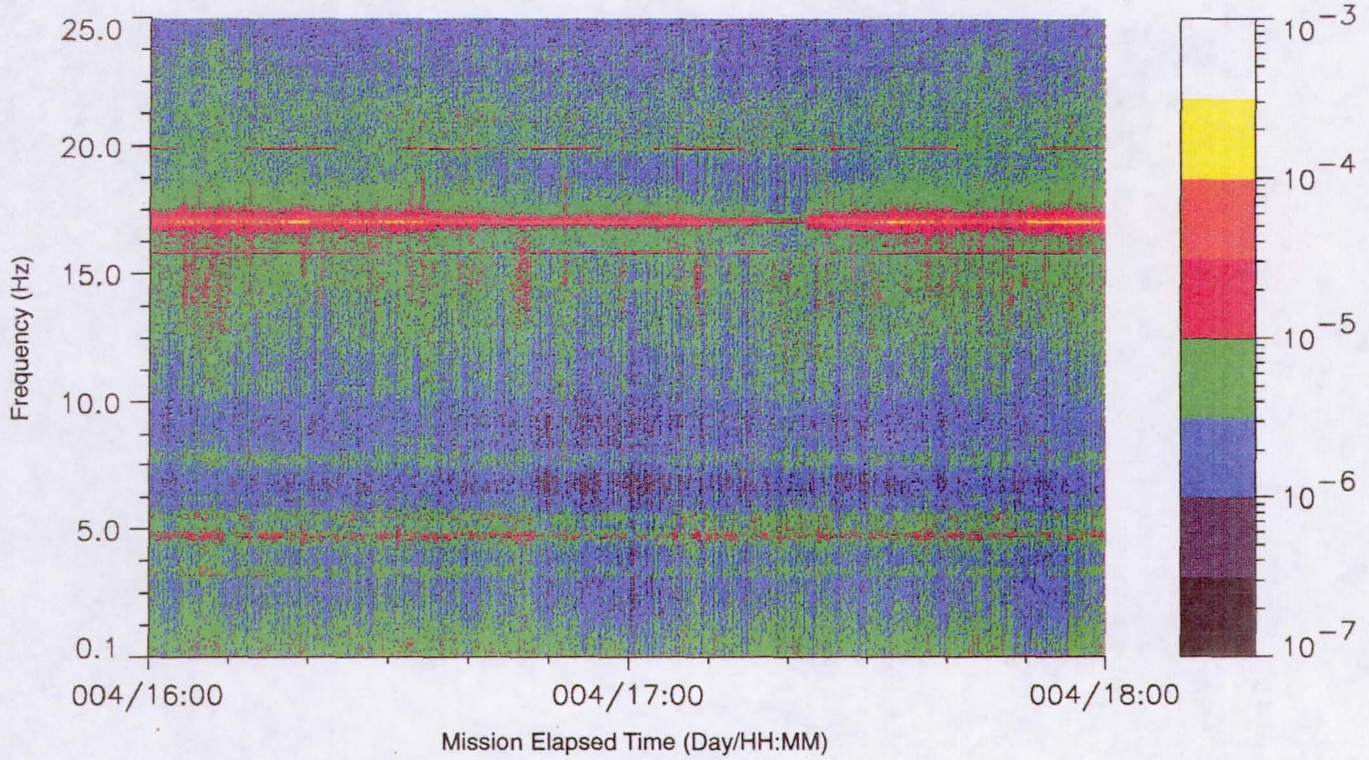

Figure C-35 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

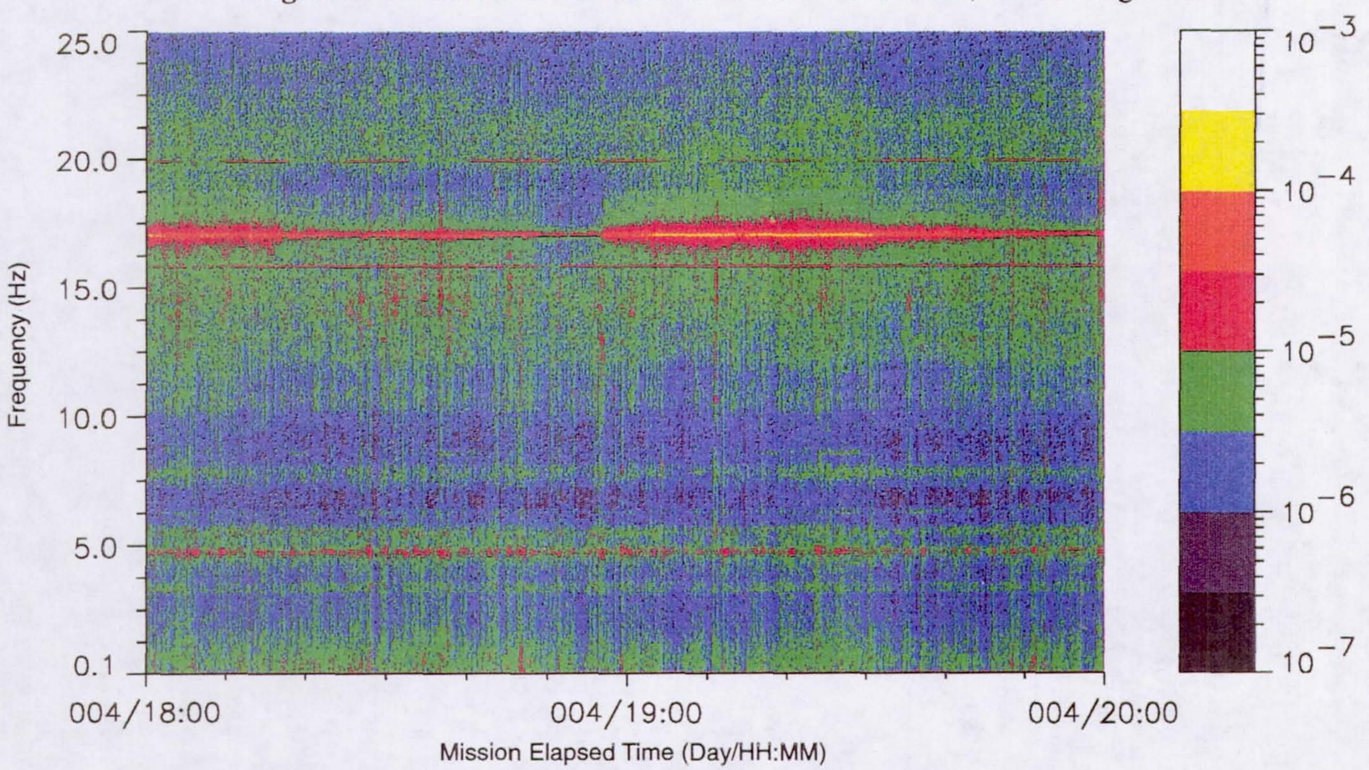

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Figure C-36 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

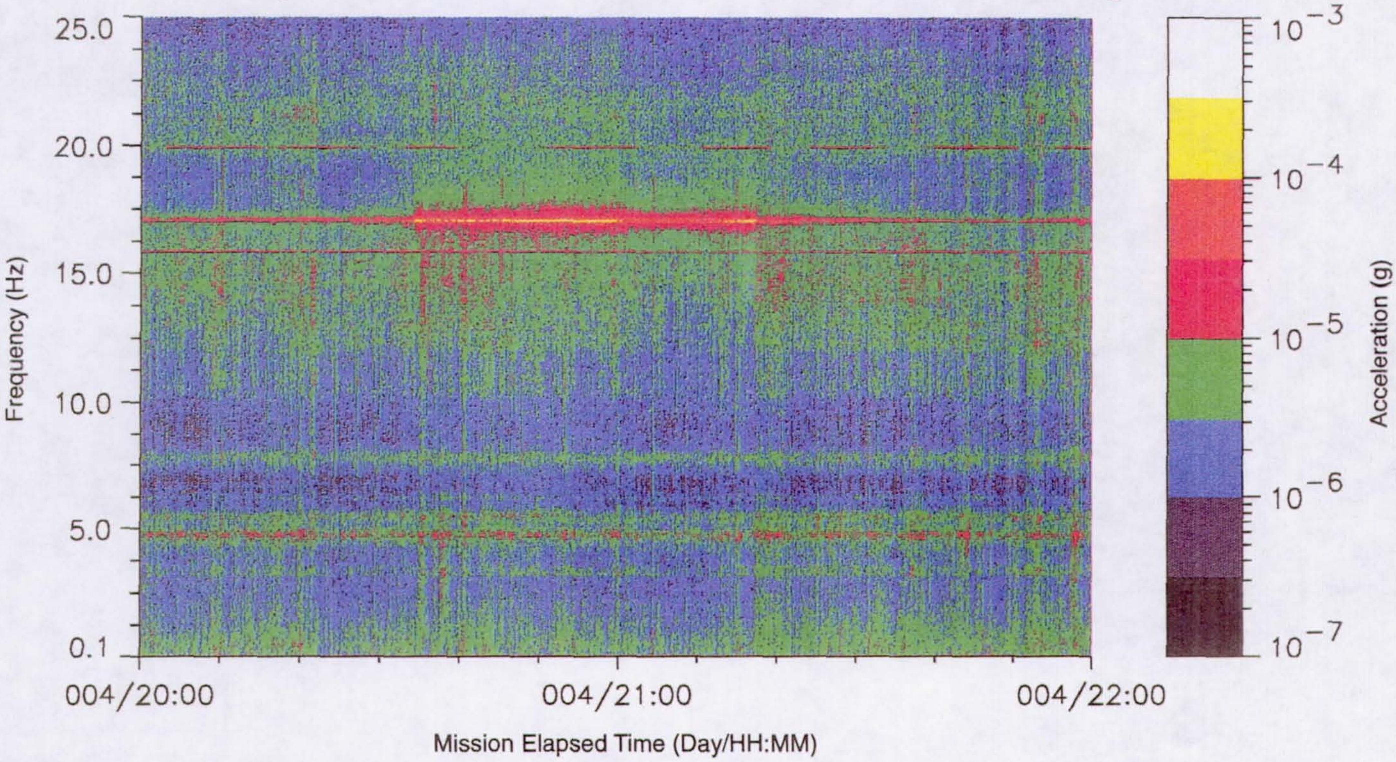

Figure C-37 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

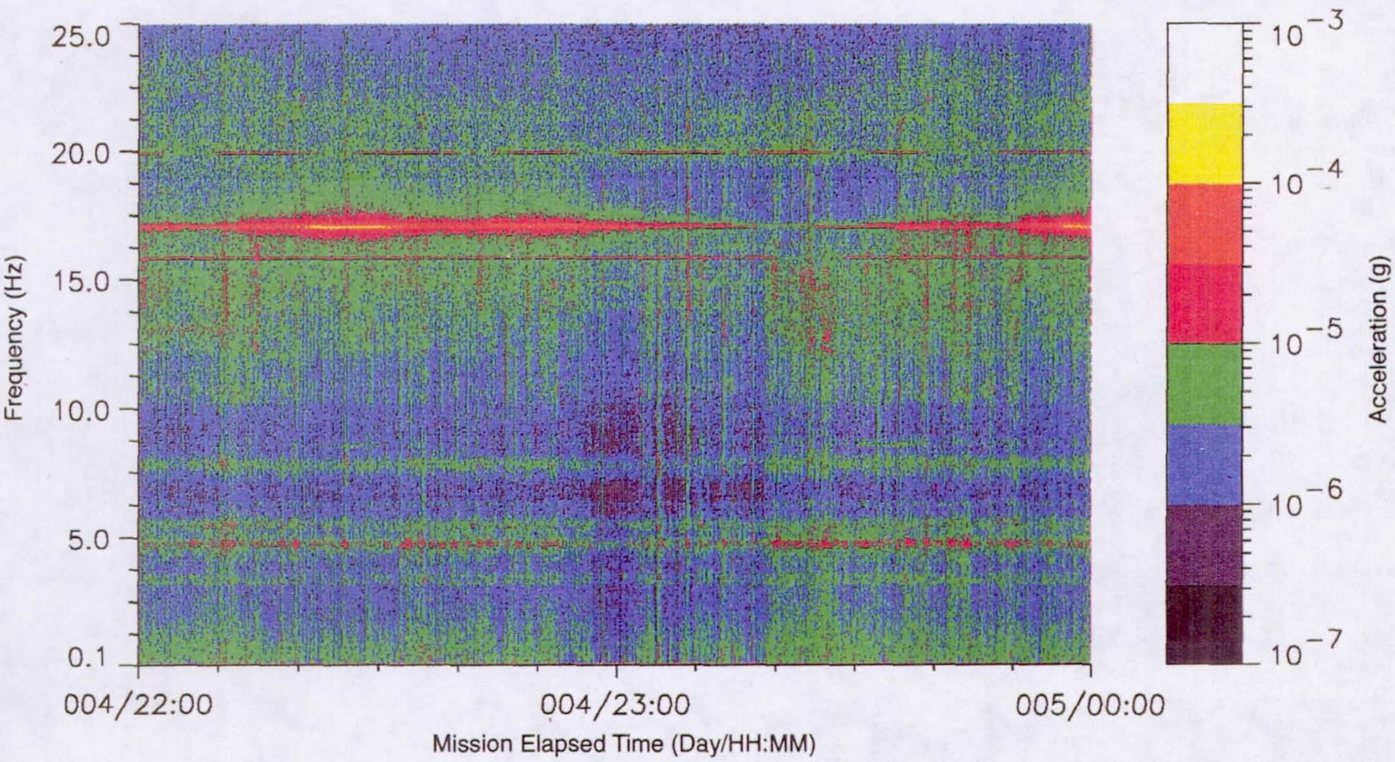

Figure C-38 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

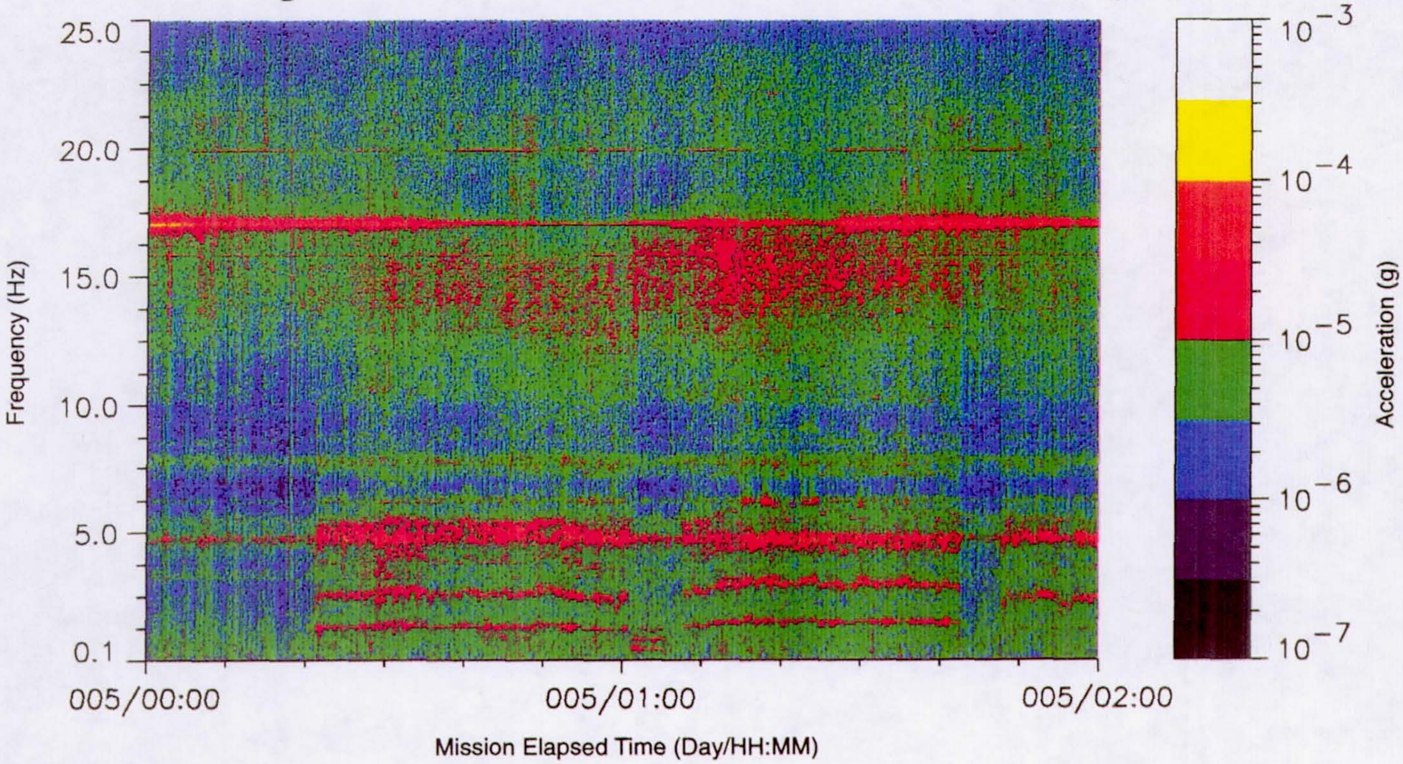

Figure C-39 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

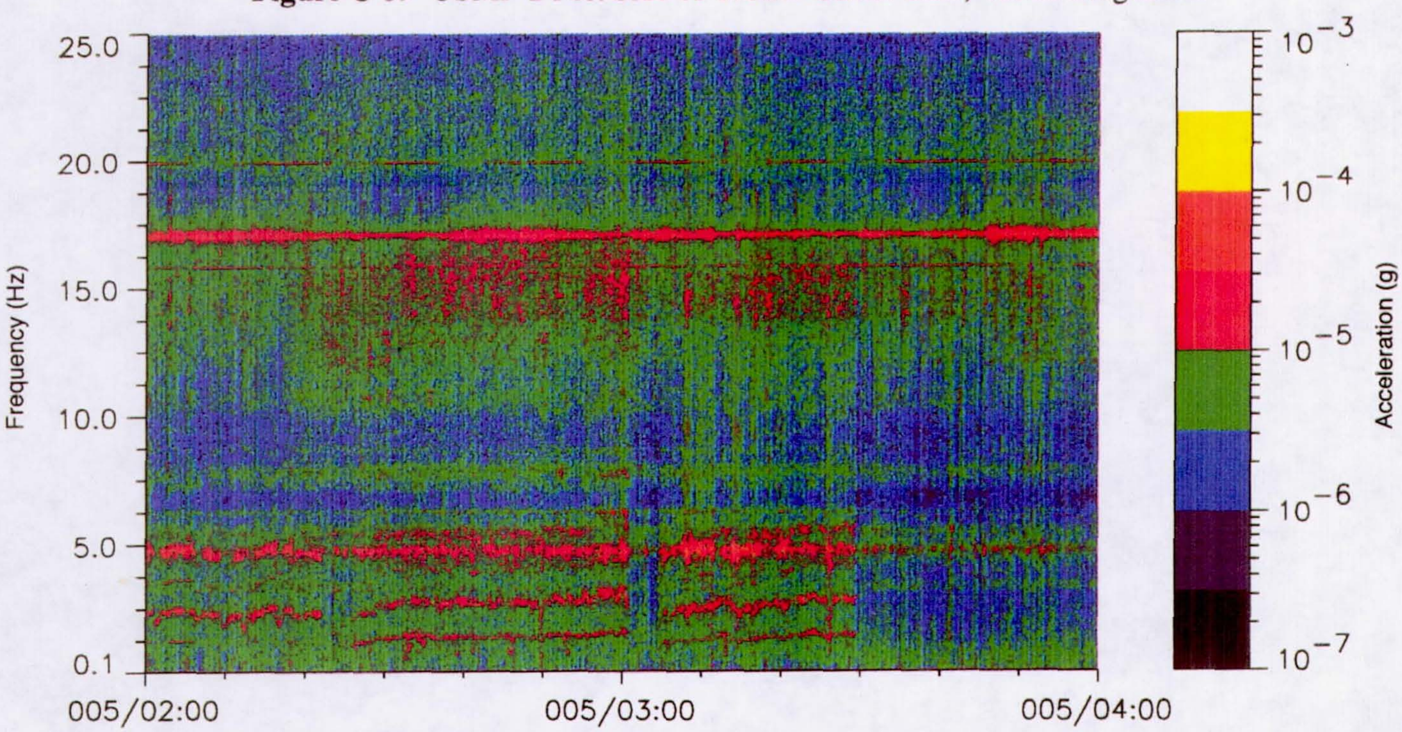

Figure C-40 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

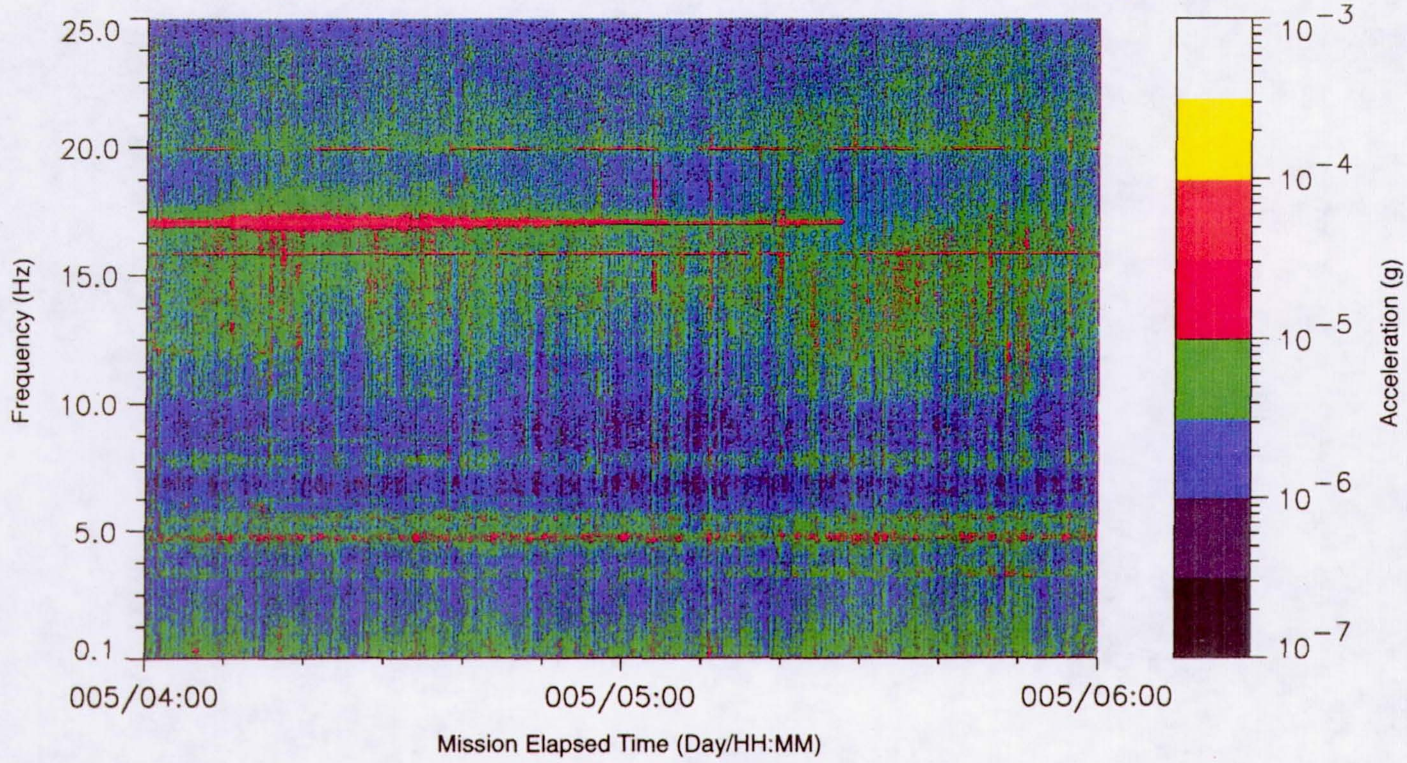

Figure C-41 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

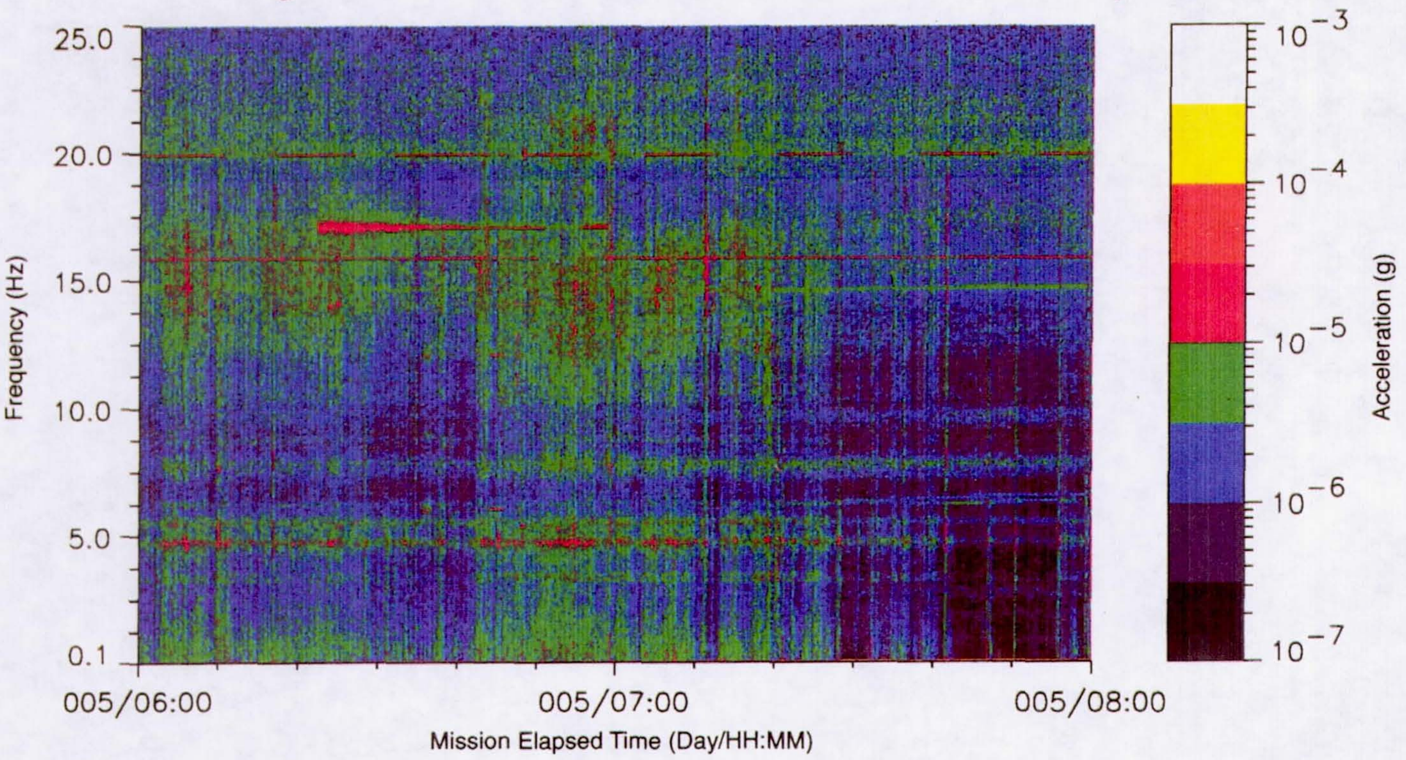

Figure C-42 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

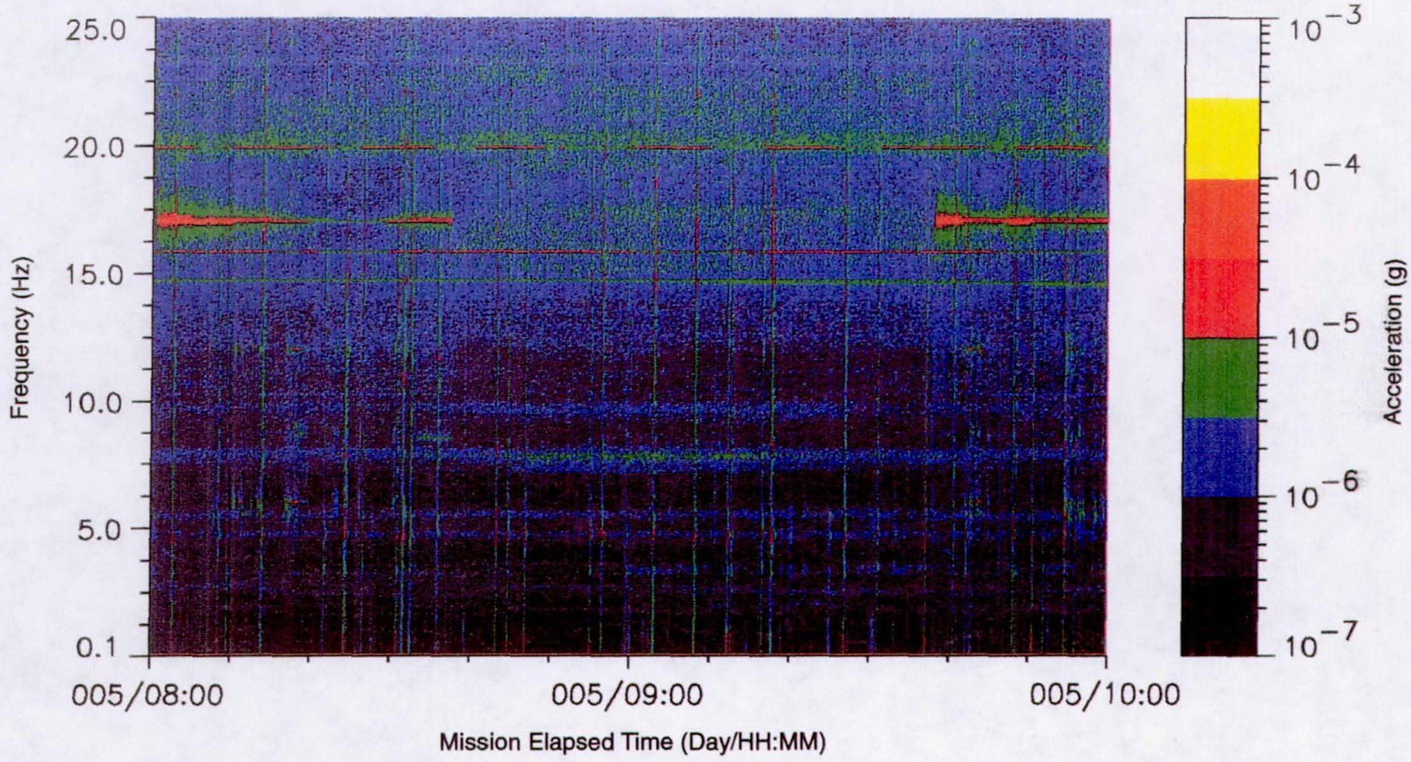

Figure C-43 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

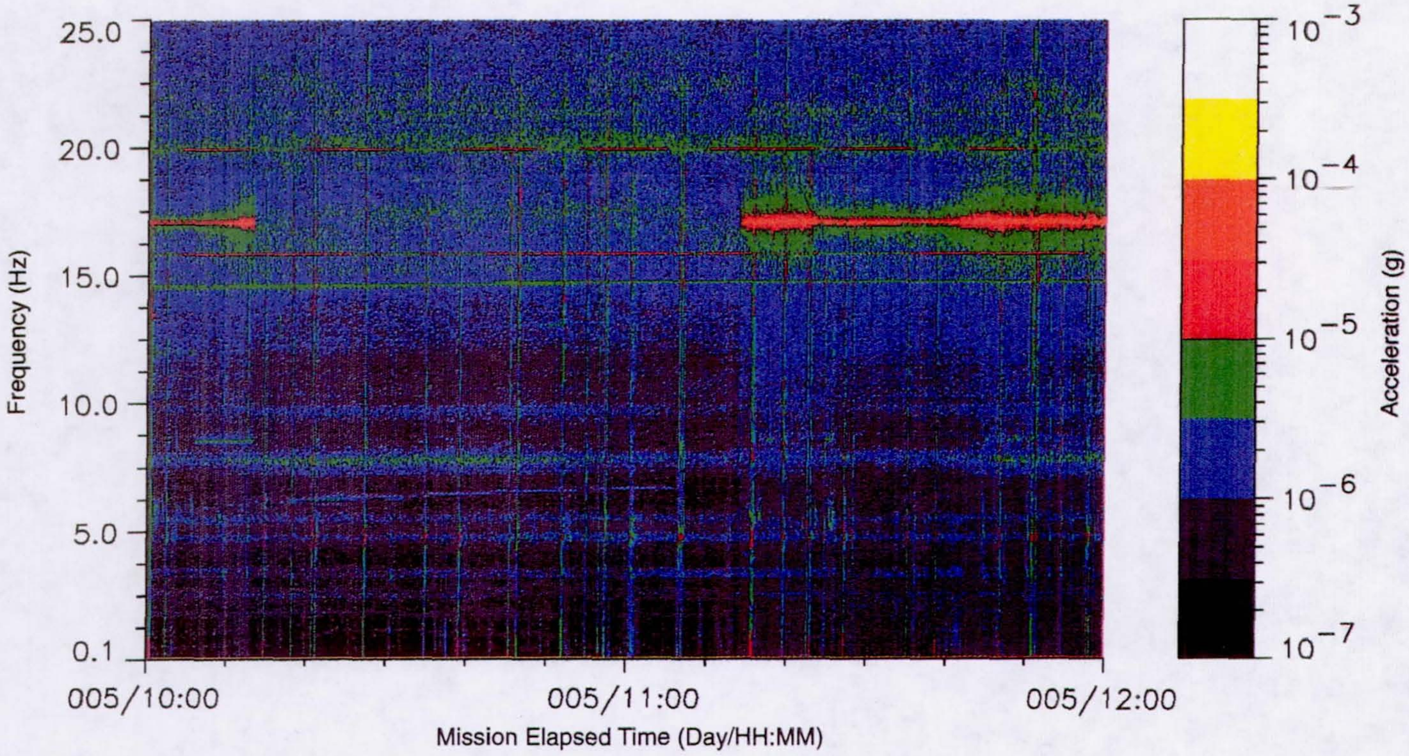

Figure C-44 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

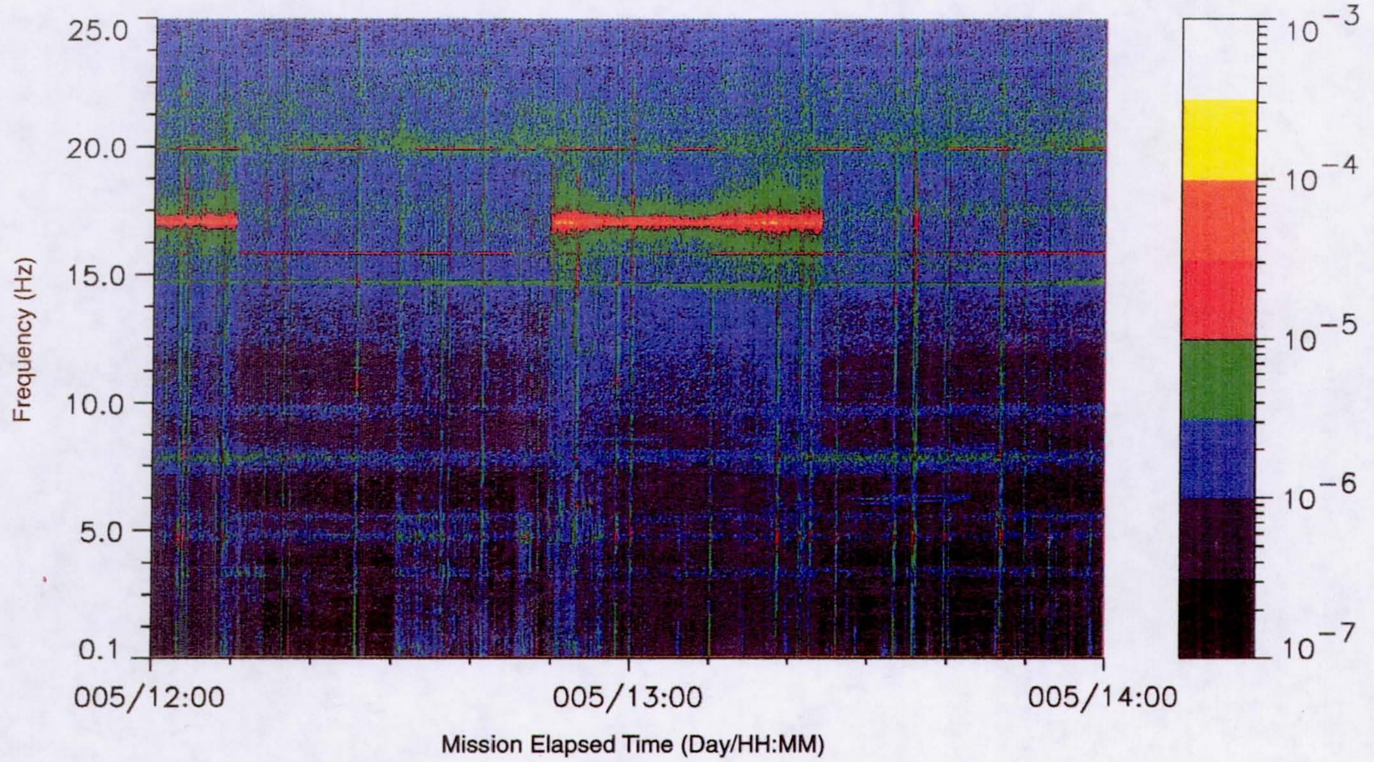

Figure C-45 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

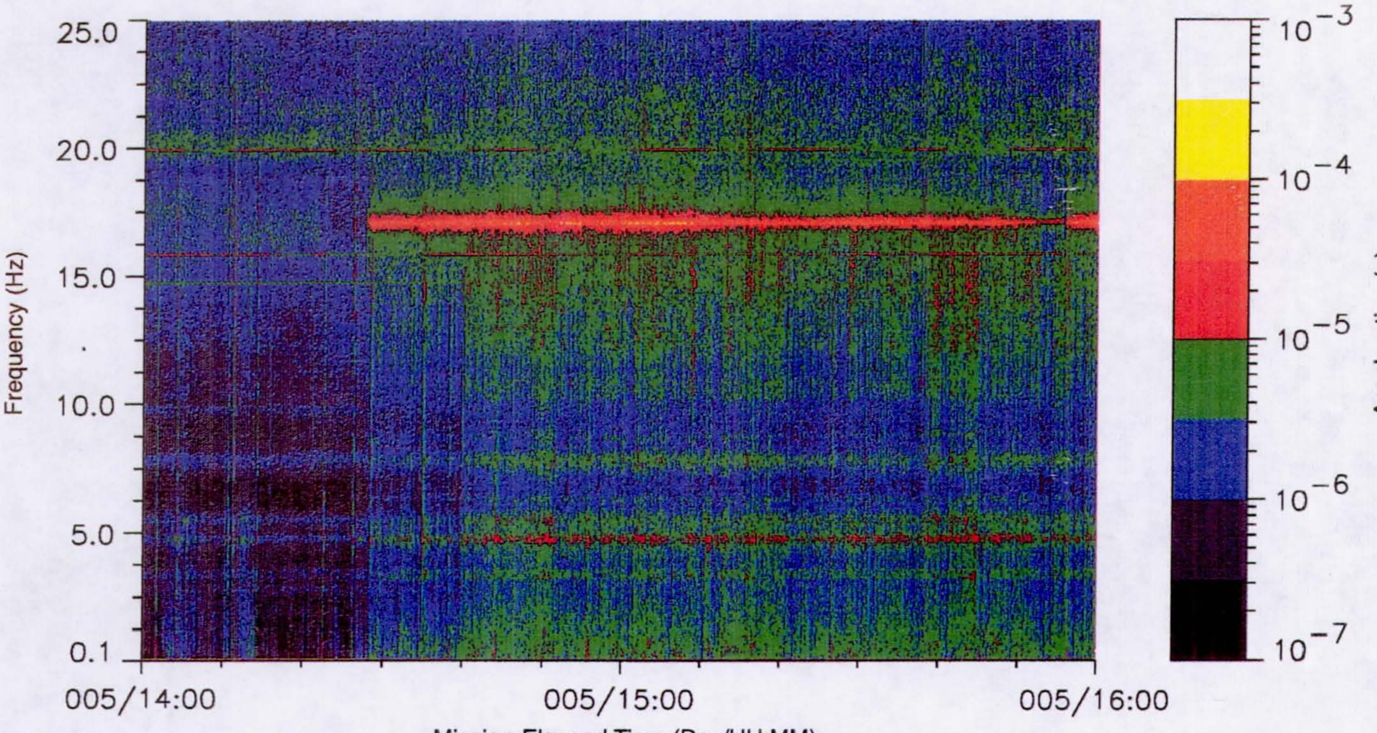

Figure C-46 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

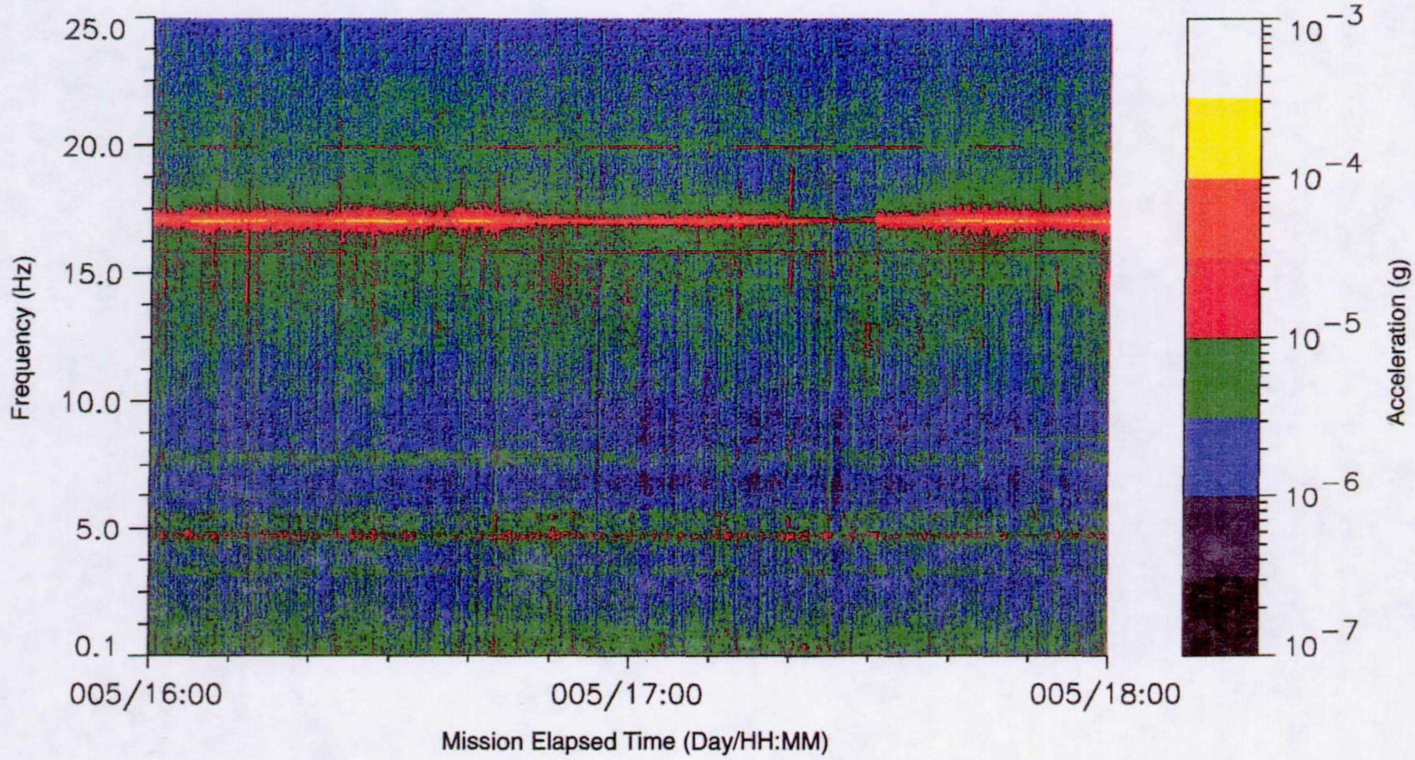

Figure C-47 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

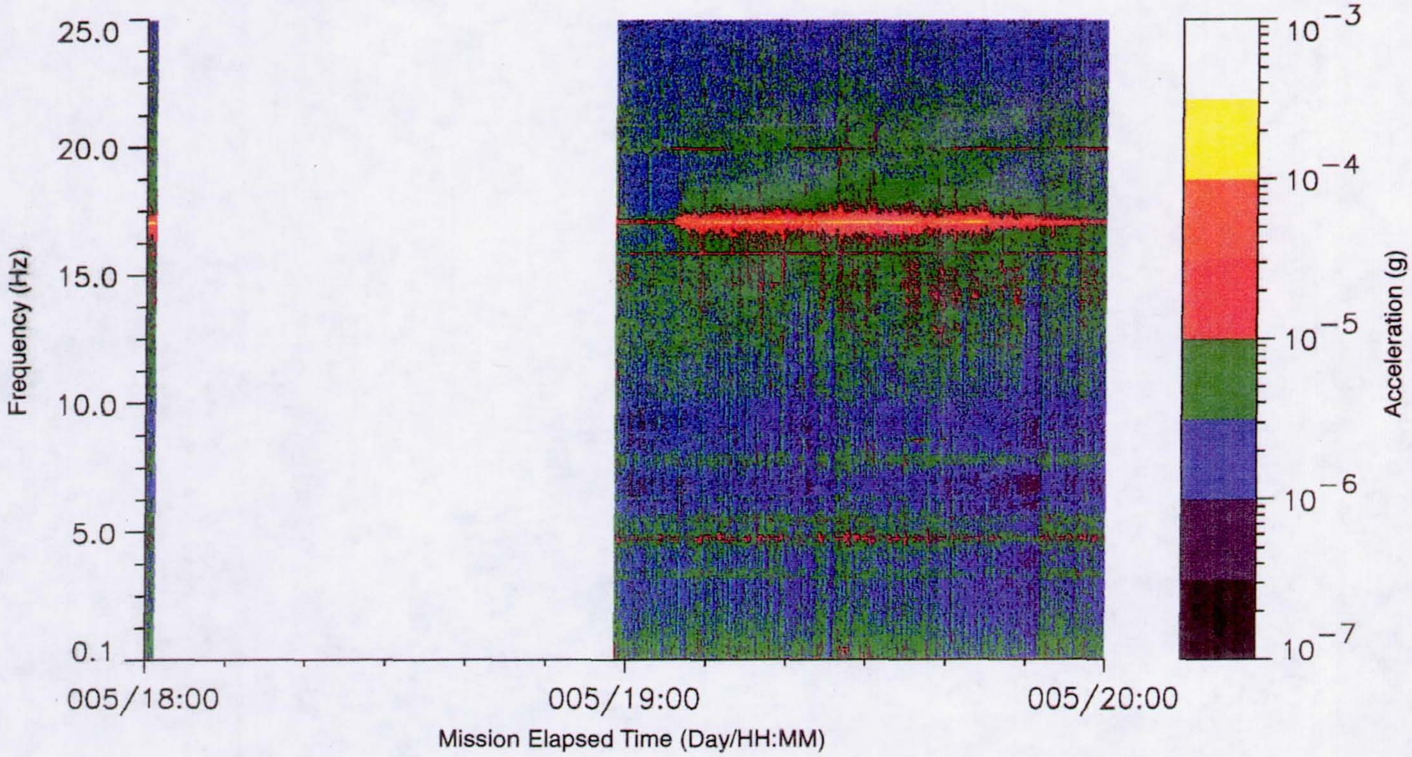

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Figure C-48 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

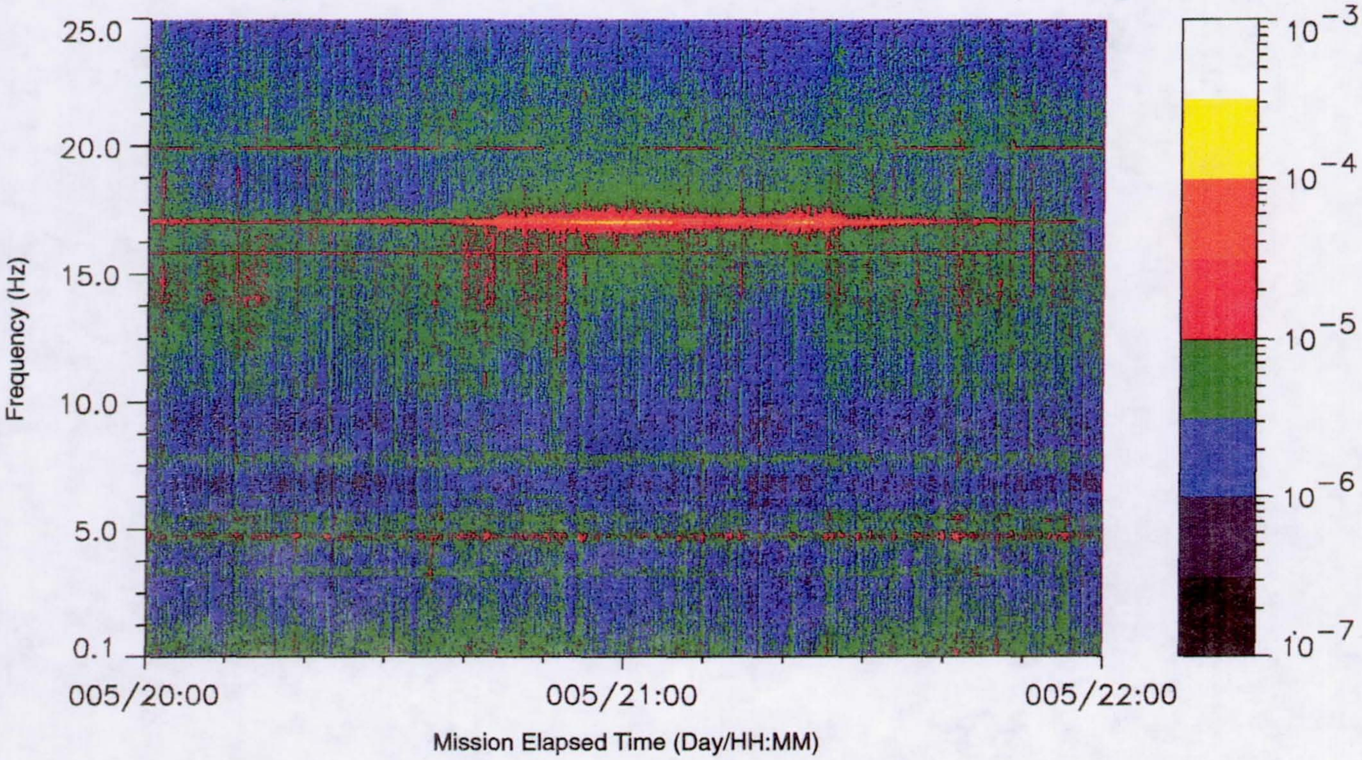

Figure C-49 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

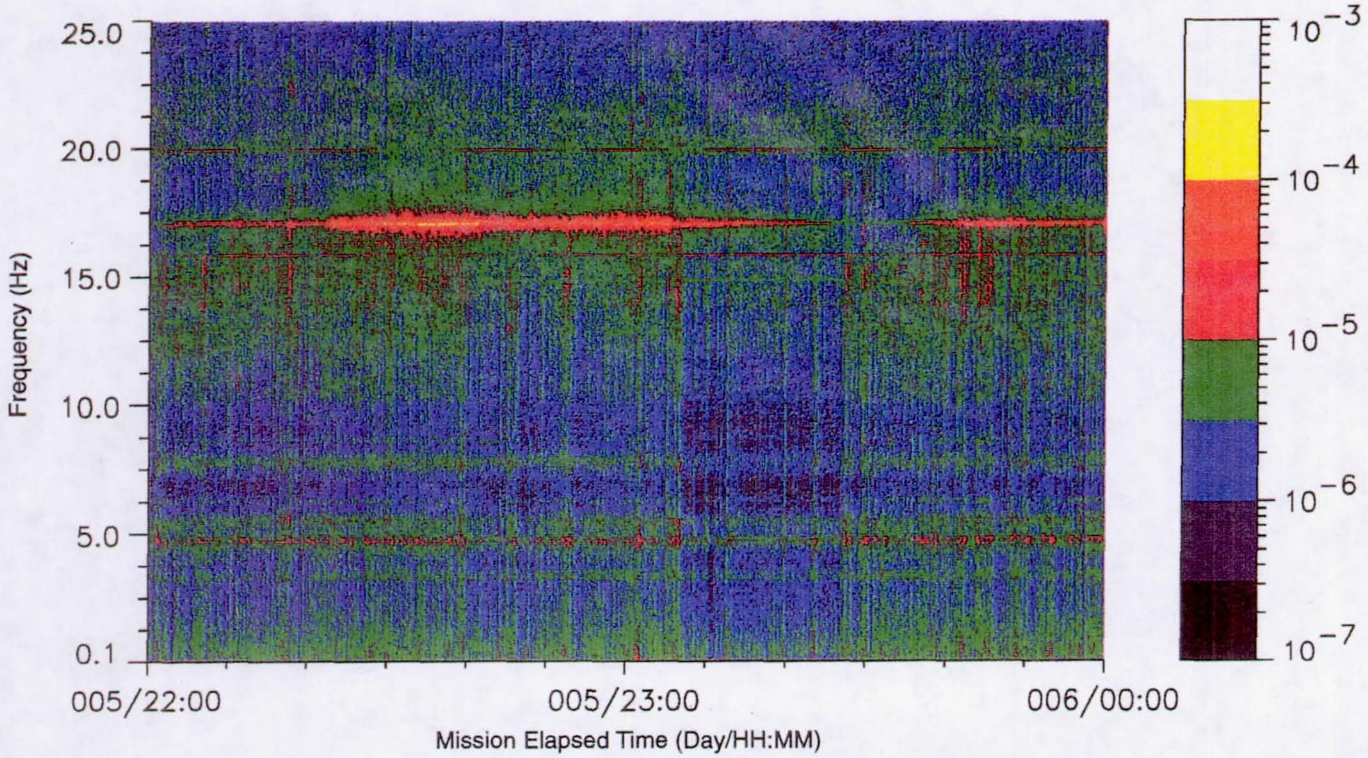

Figure C-50 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

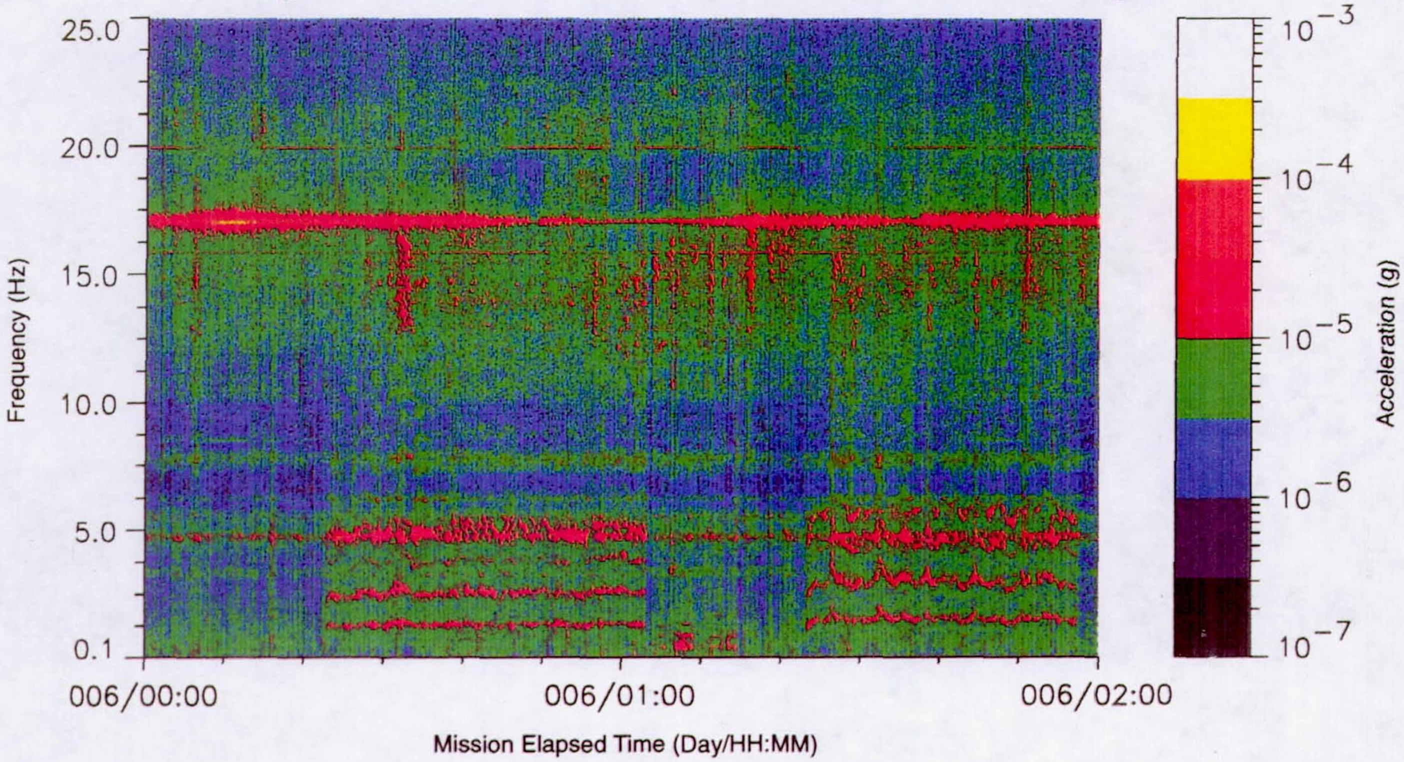

Figure C-51 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

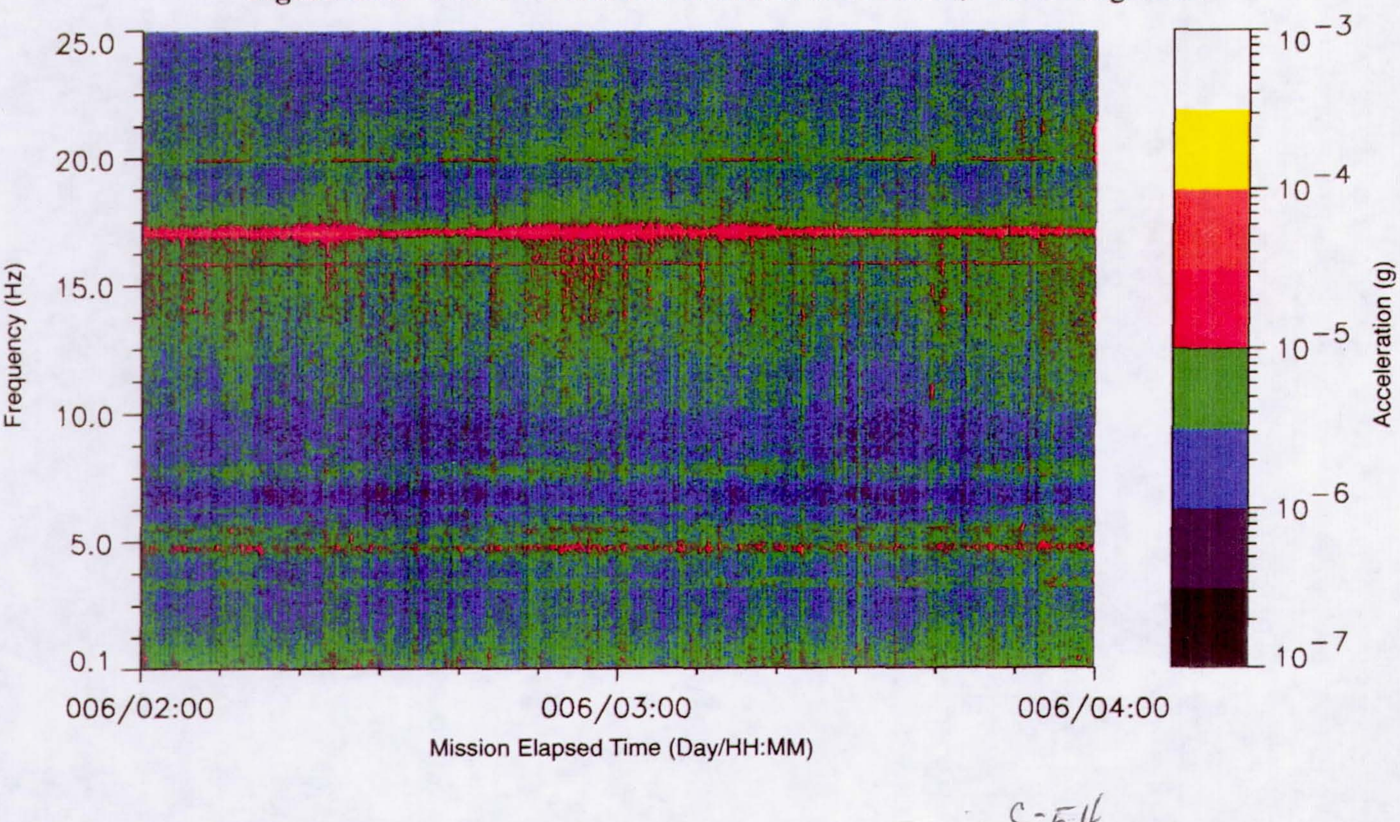

Figure C-50 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

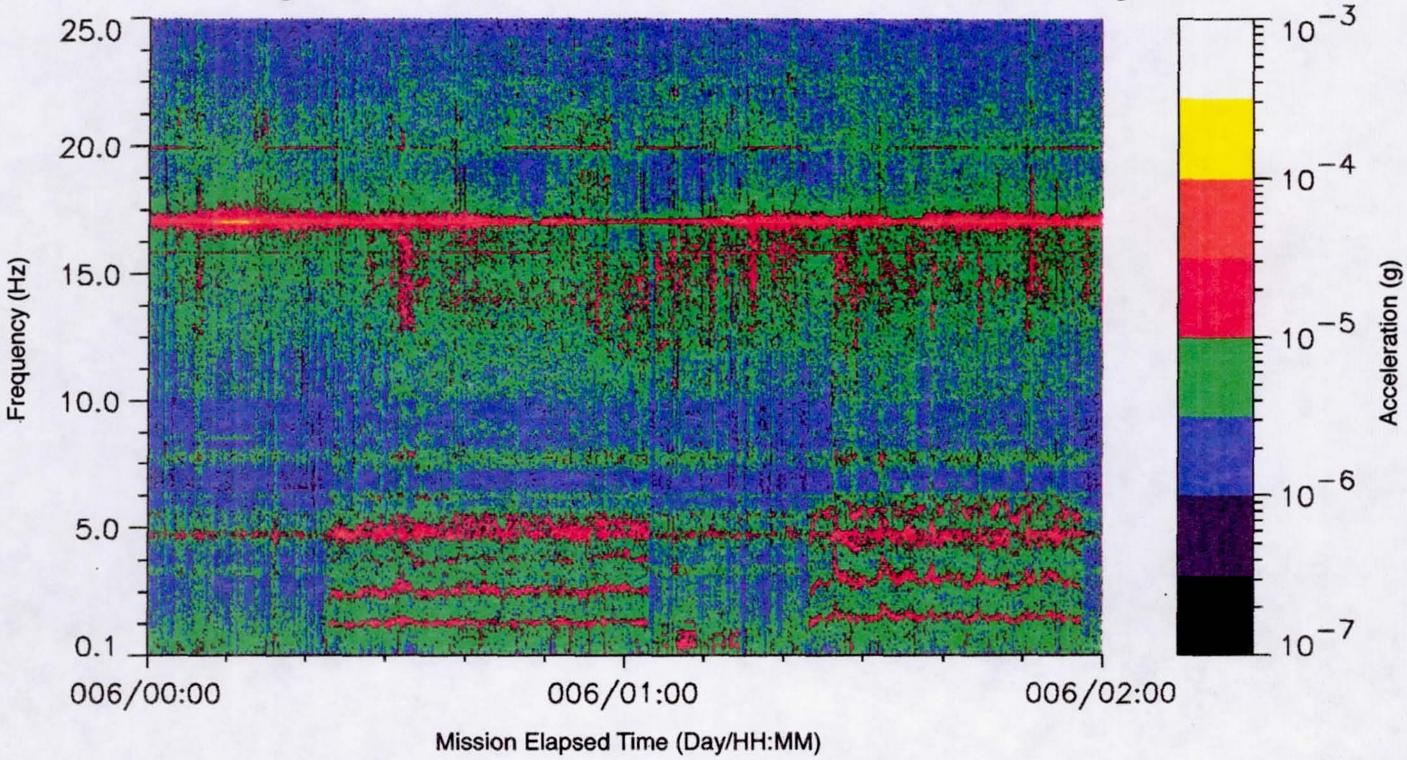

Figure C-51 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

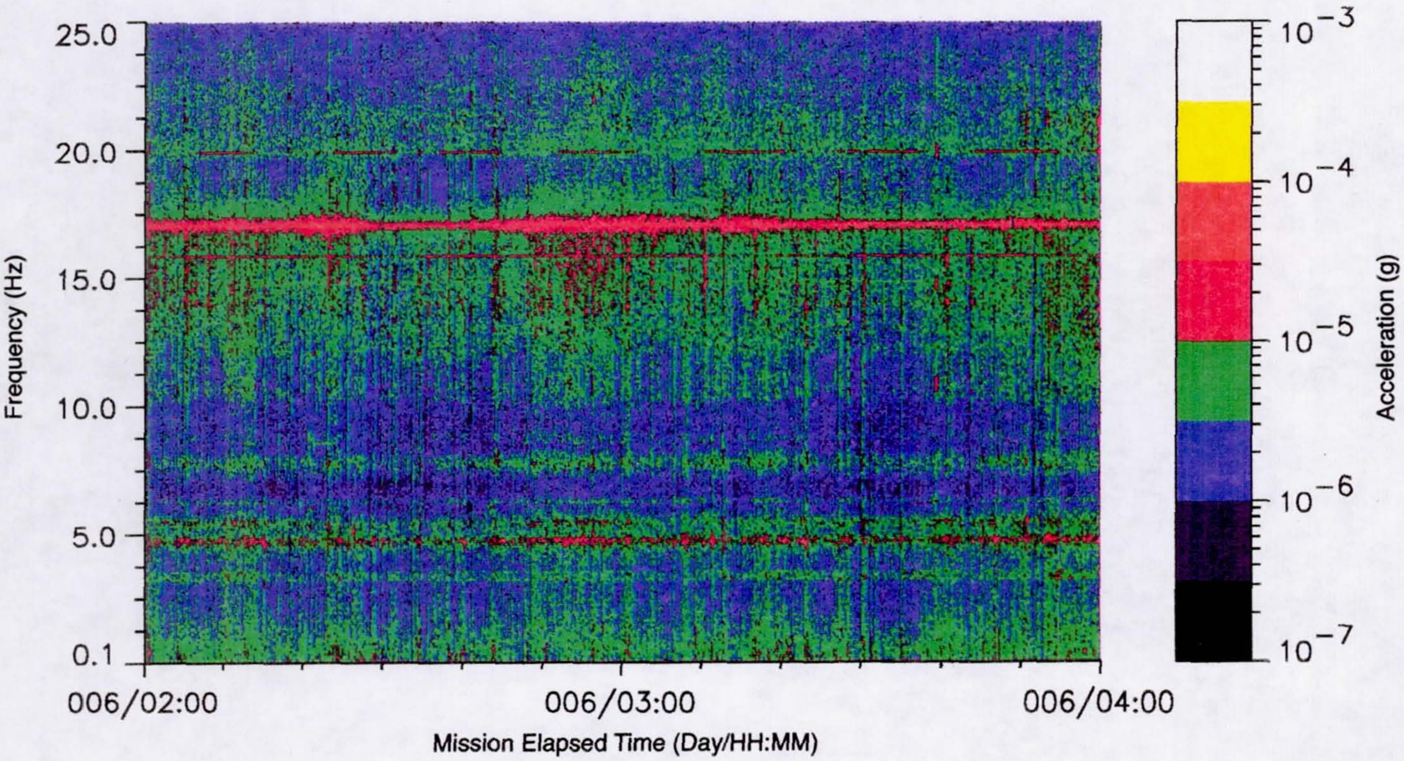

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Figure C-52 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

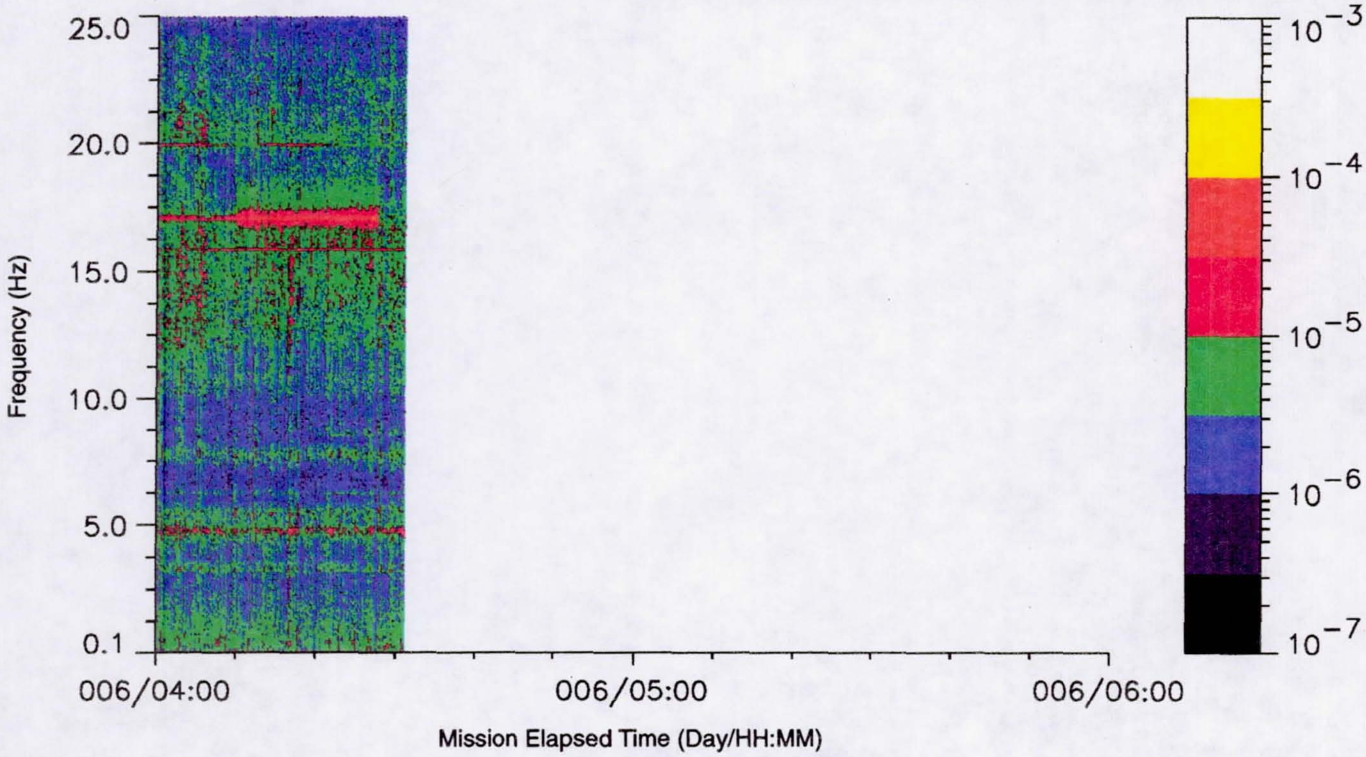

Figure C-53 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

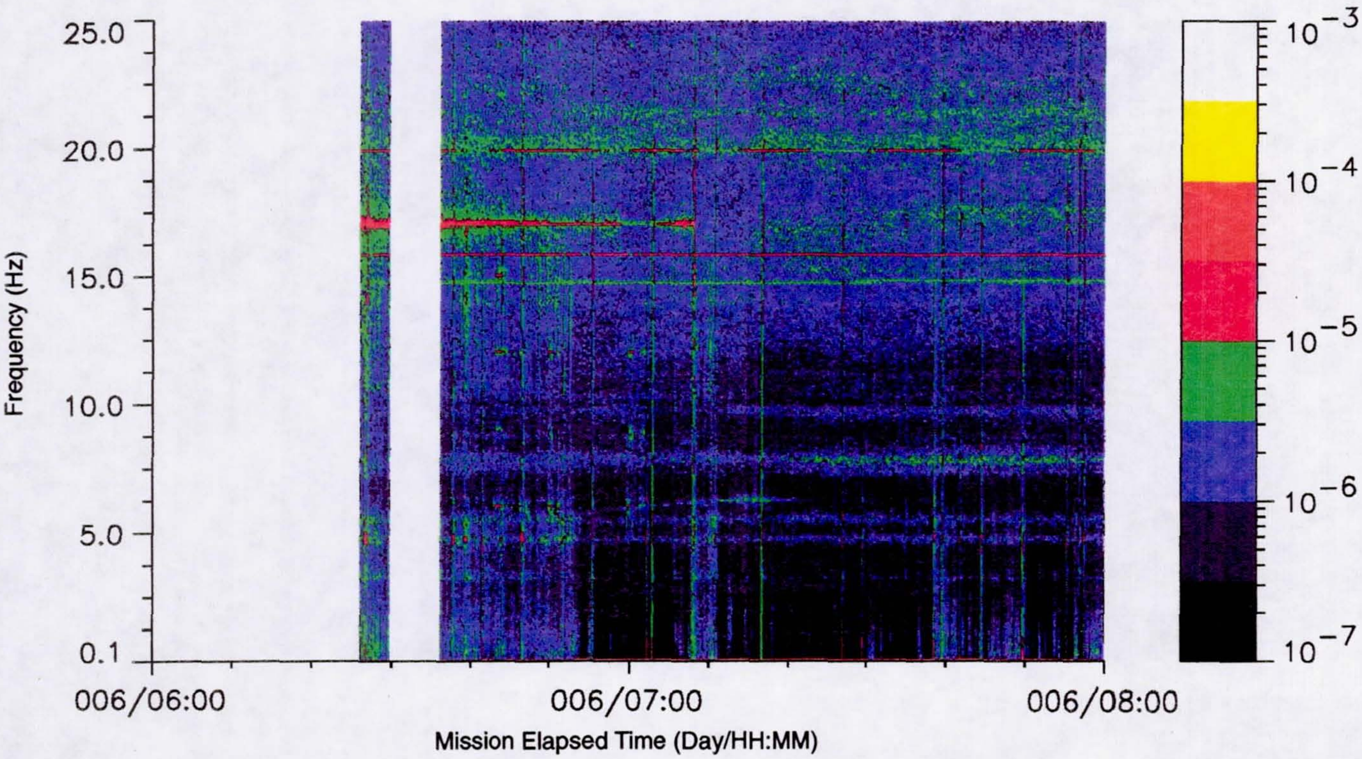

Figure C-54 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

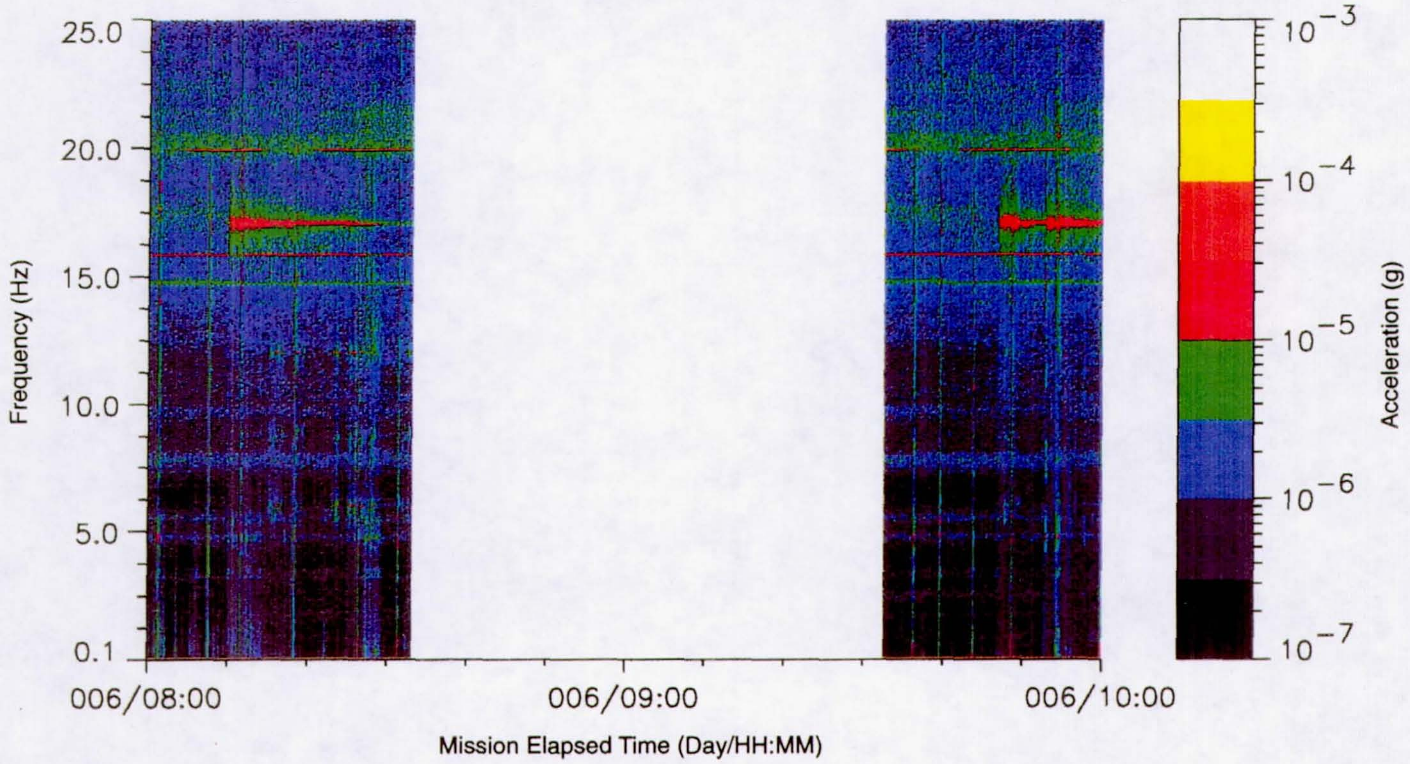

Figure C-55 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

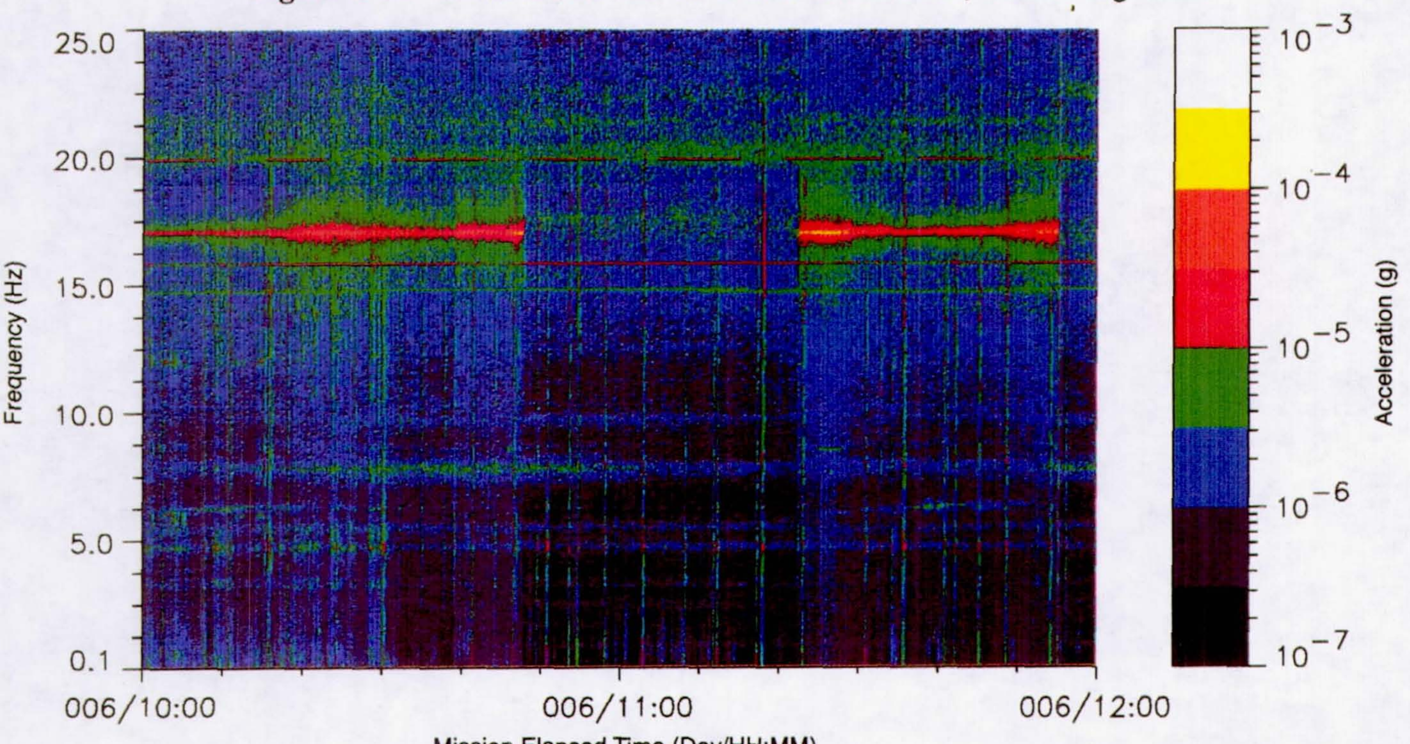

Figure C-56 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

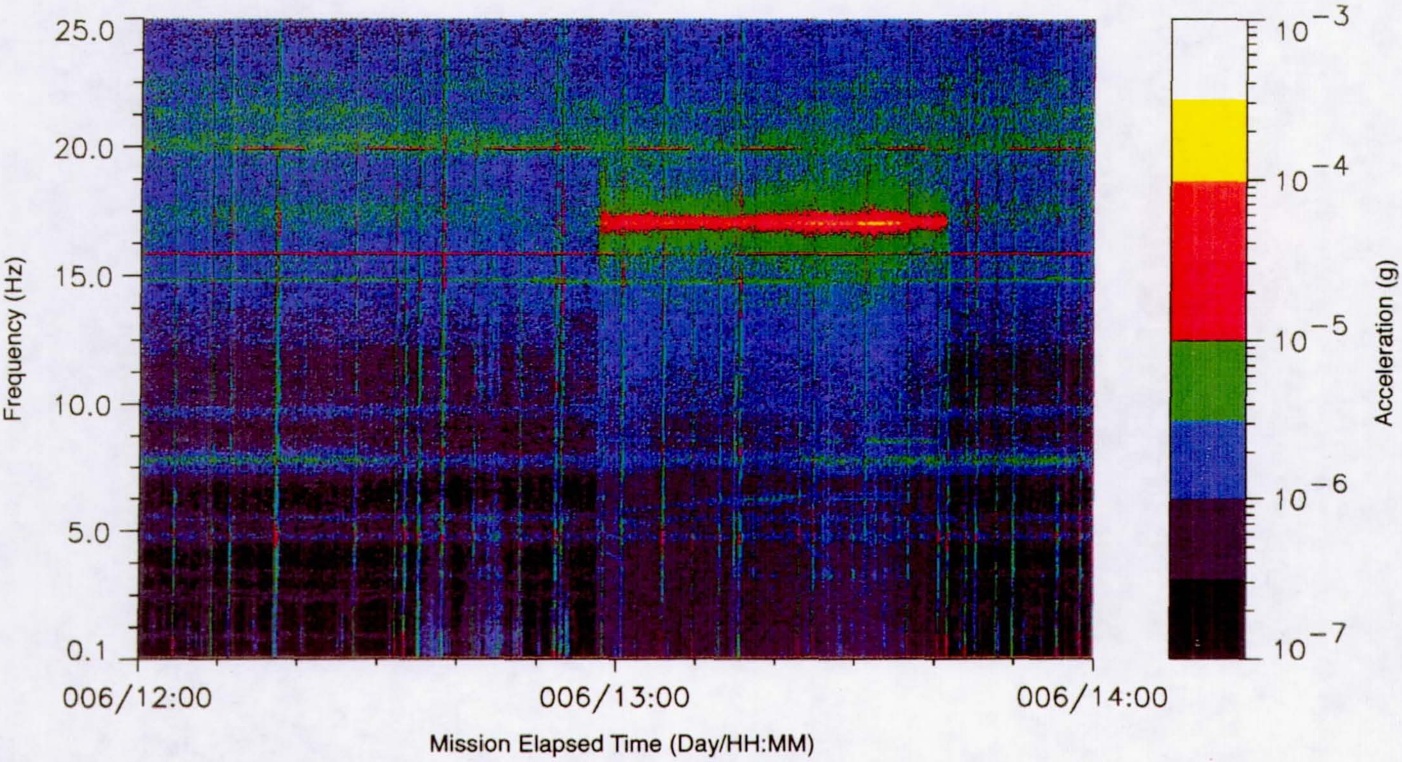

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Figure C-57 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

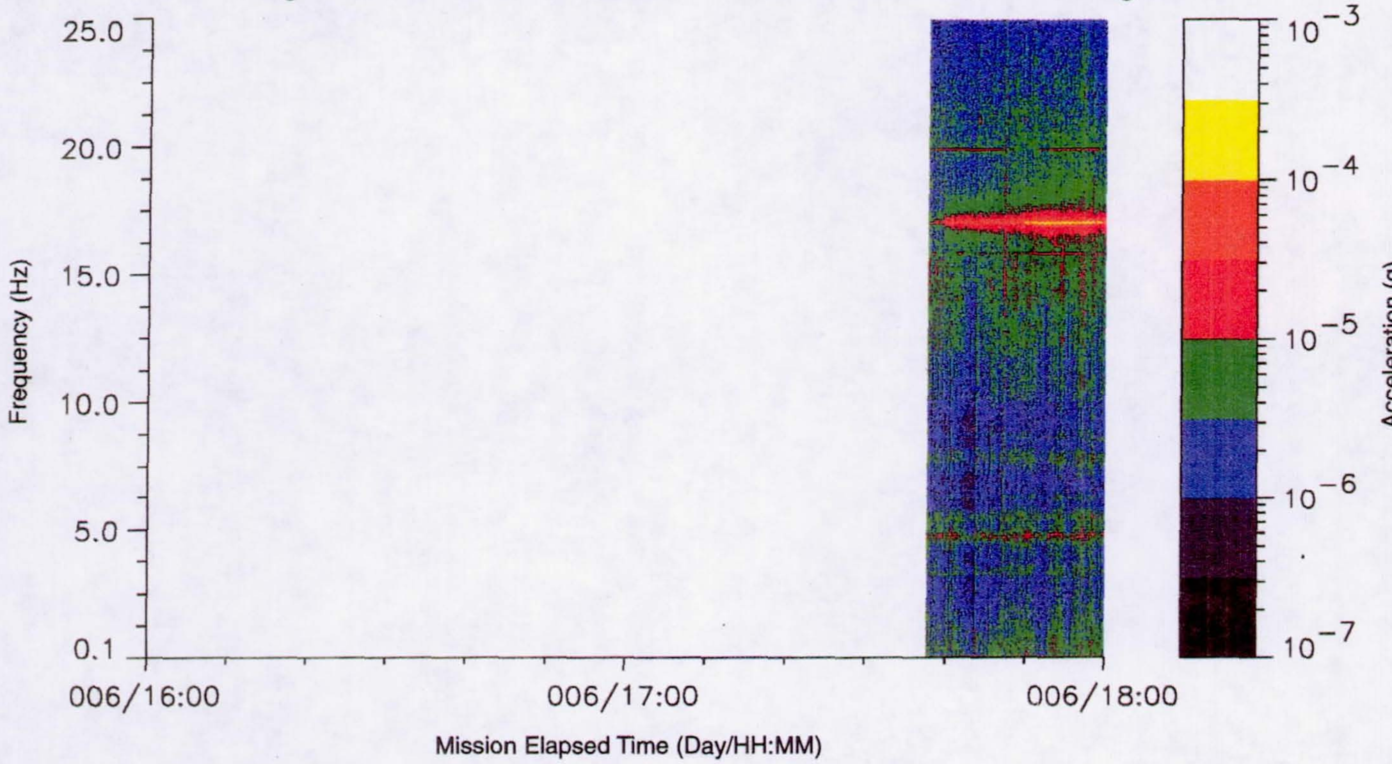

Figure C-58 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

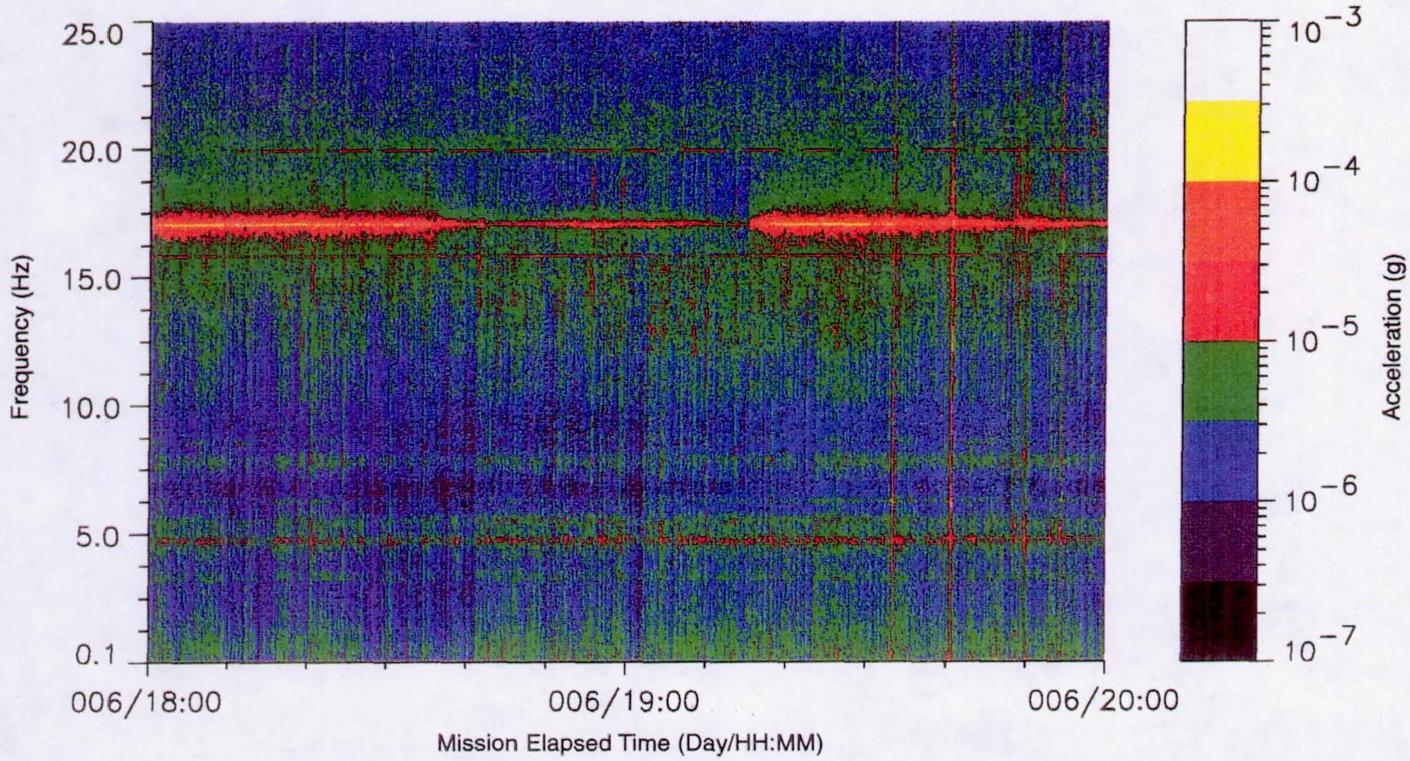

Figure C-59 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

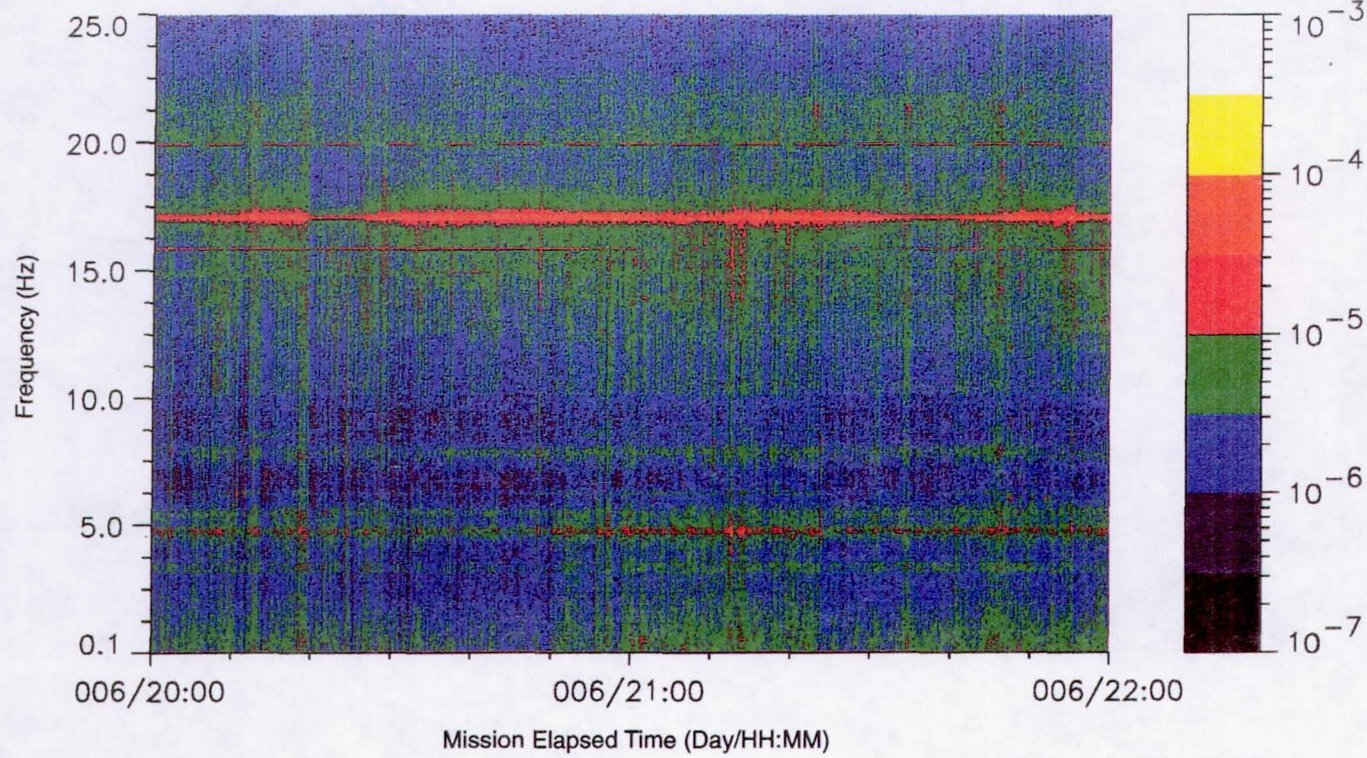

Figure C-60 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

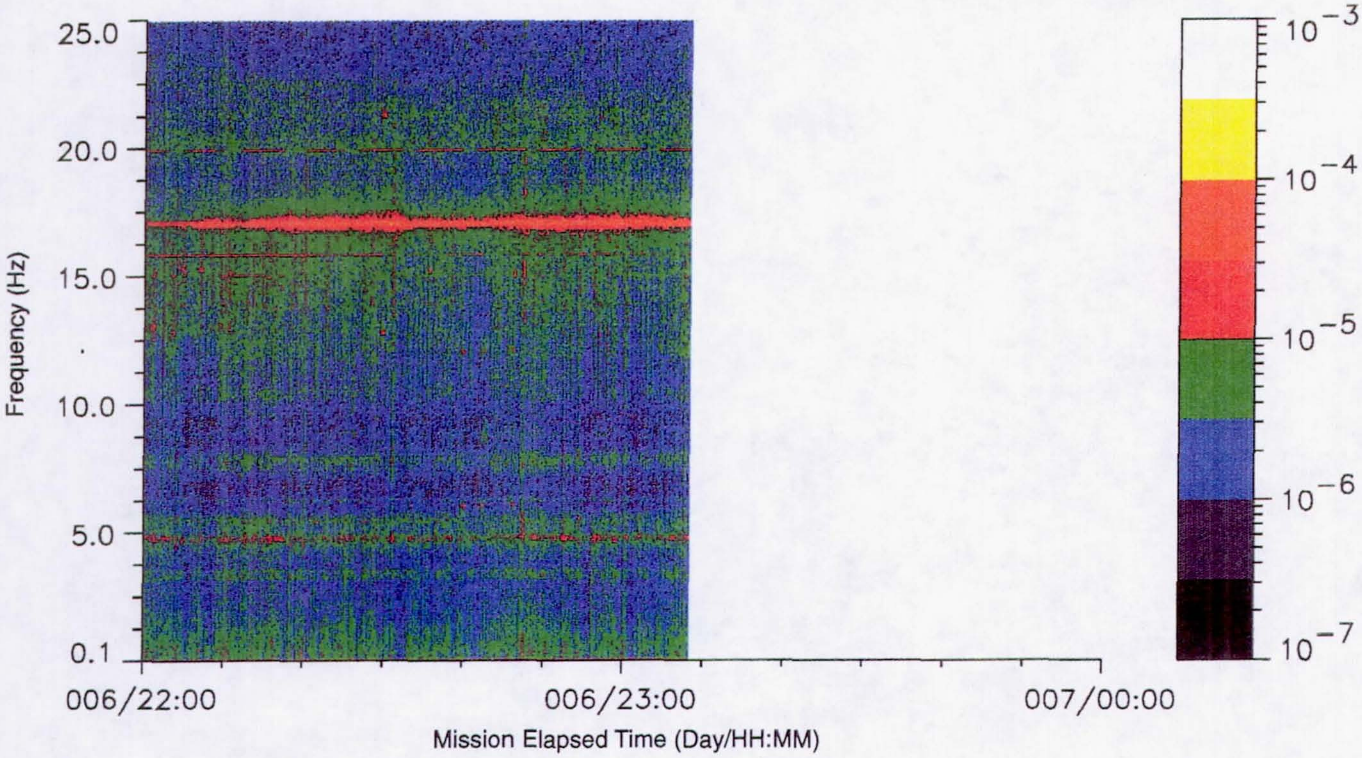

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Figure C-61 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

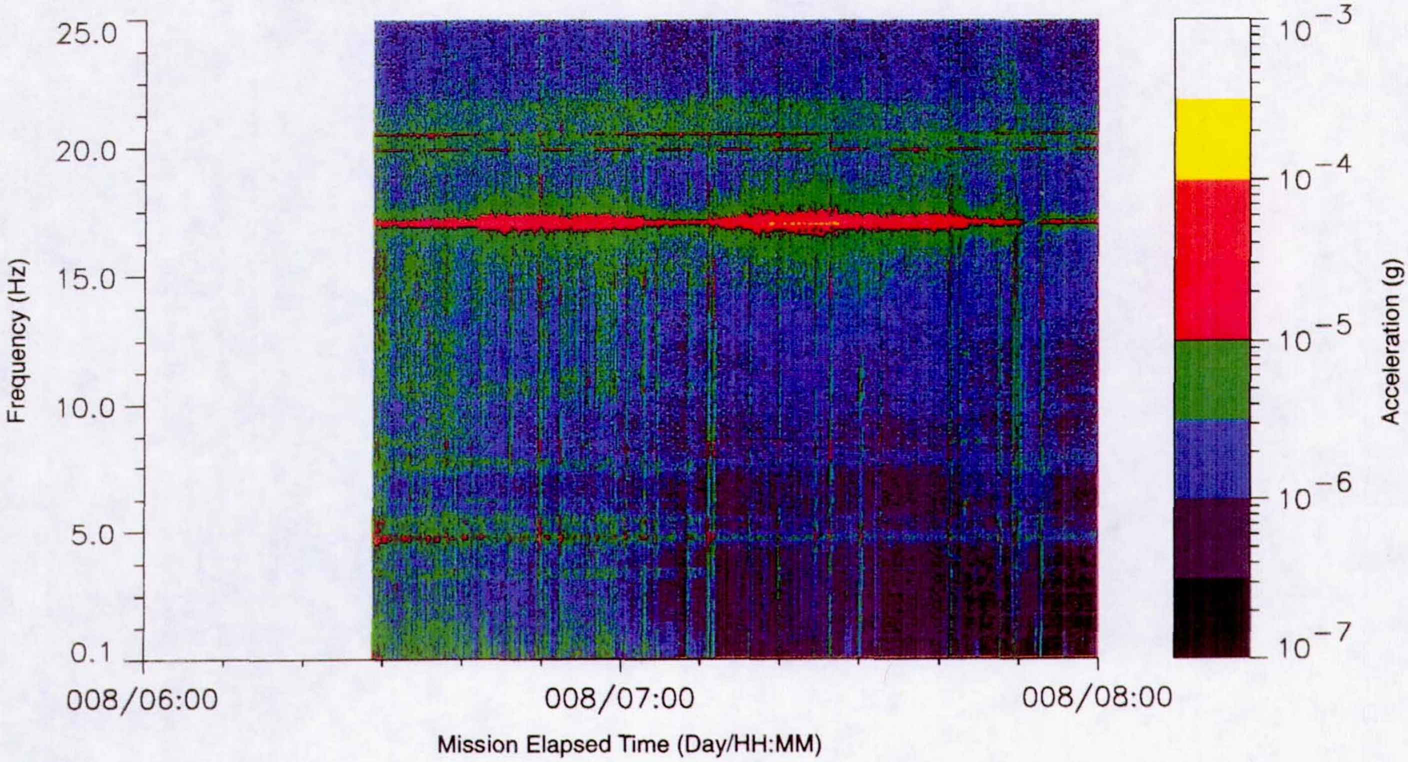


Figure C-62 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

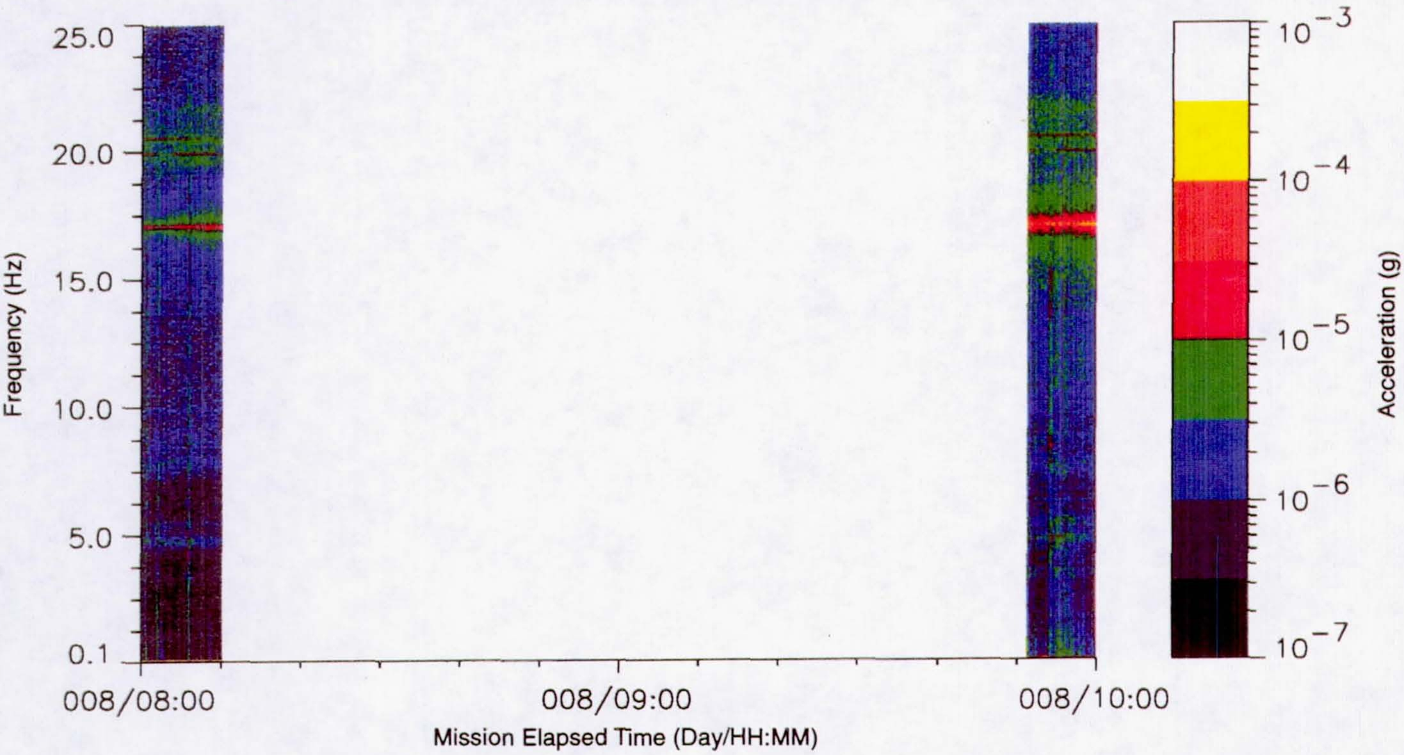


Figure C-63 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

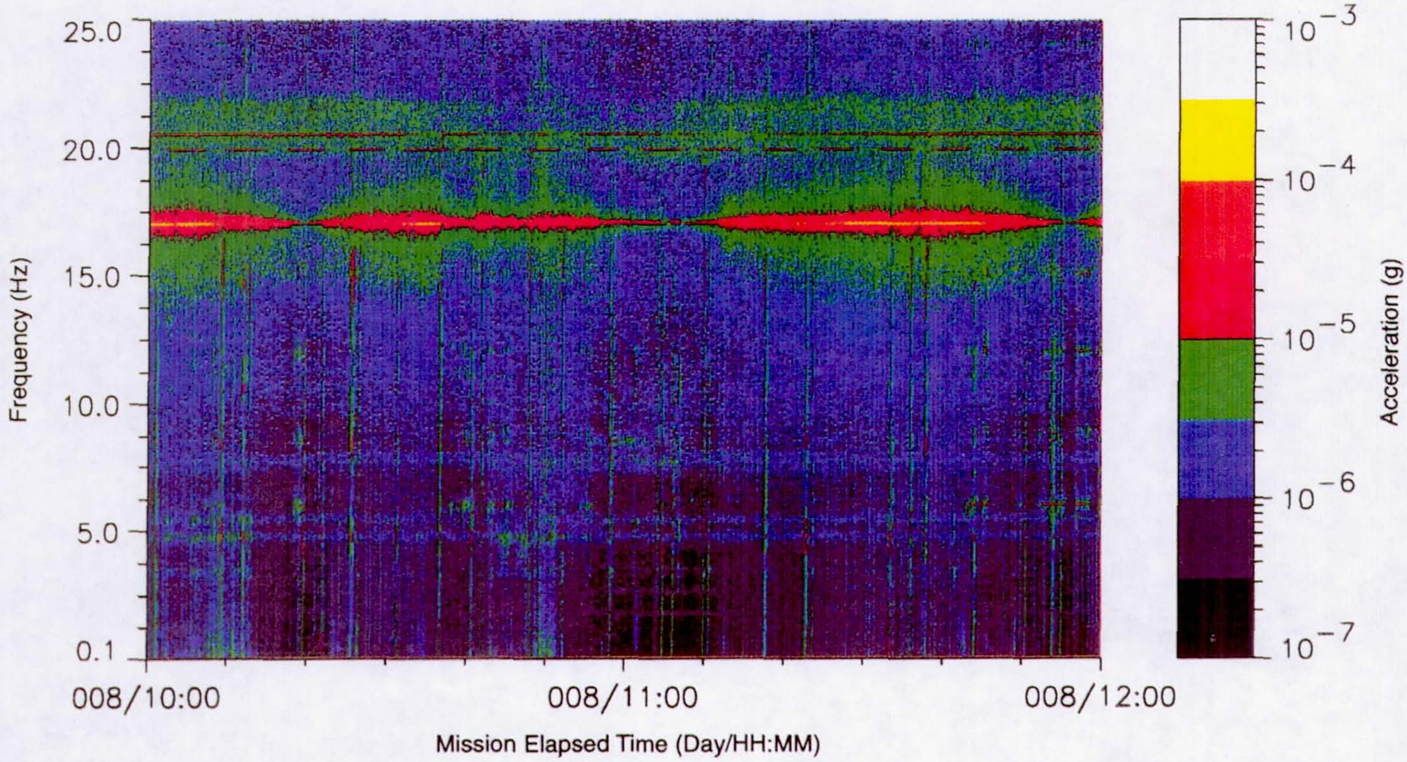
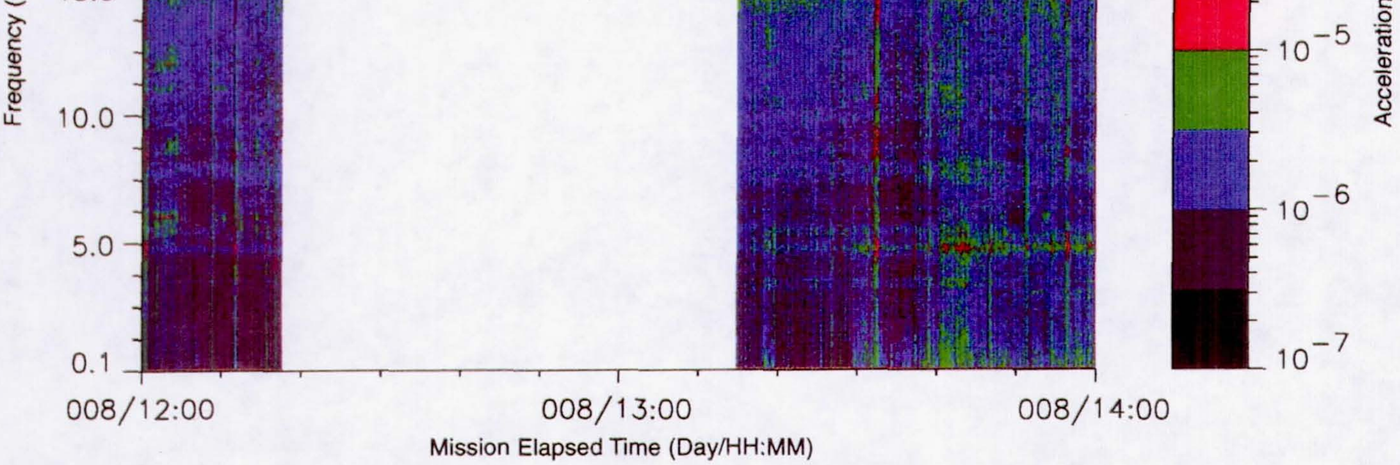


Figure C-64 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



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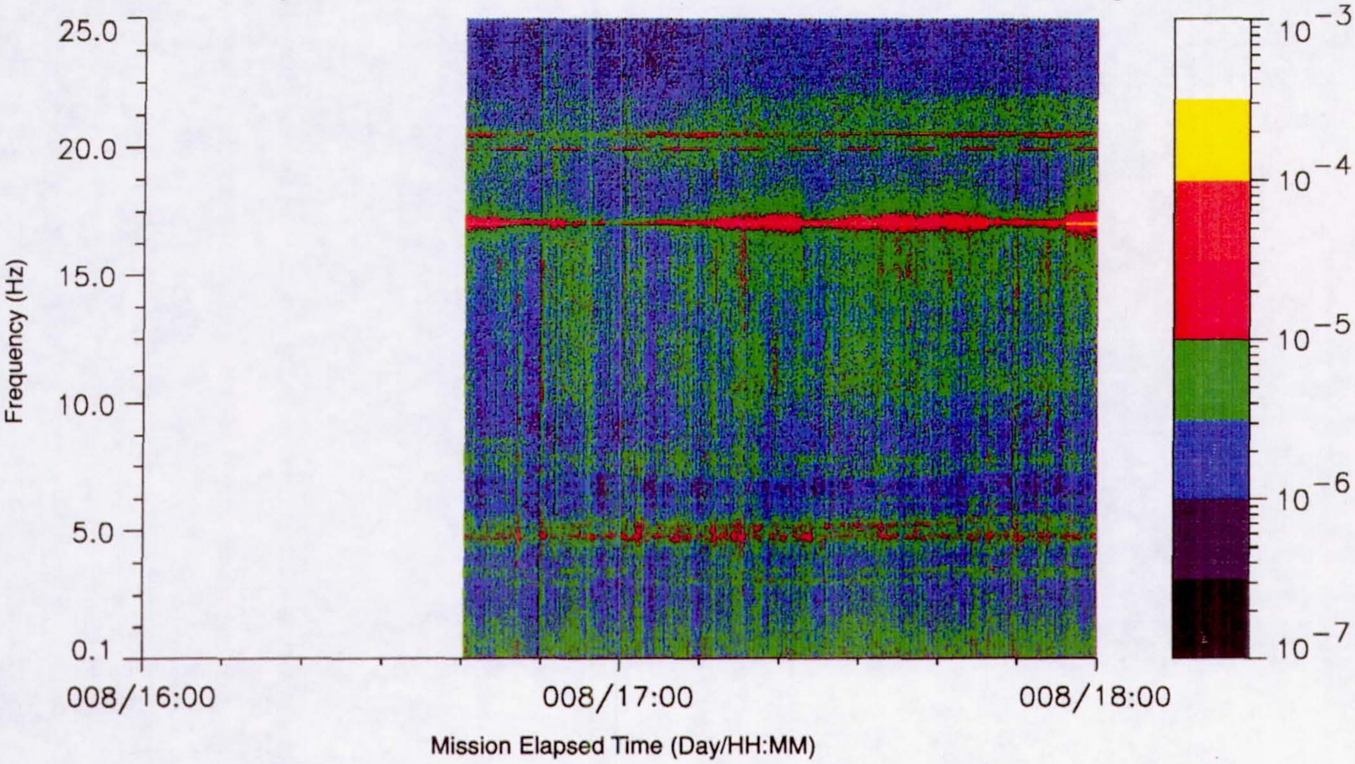
FROM MET 008/14:00:00 - 008/16:40:00

Figure C-65 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

FROM MET 008/18:00:00 - 009/00:57:00

Figure C-66 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

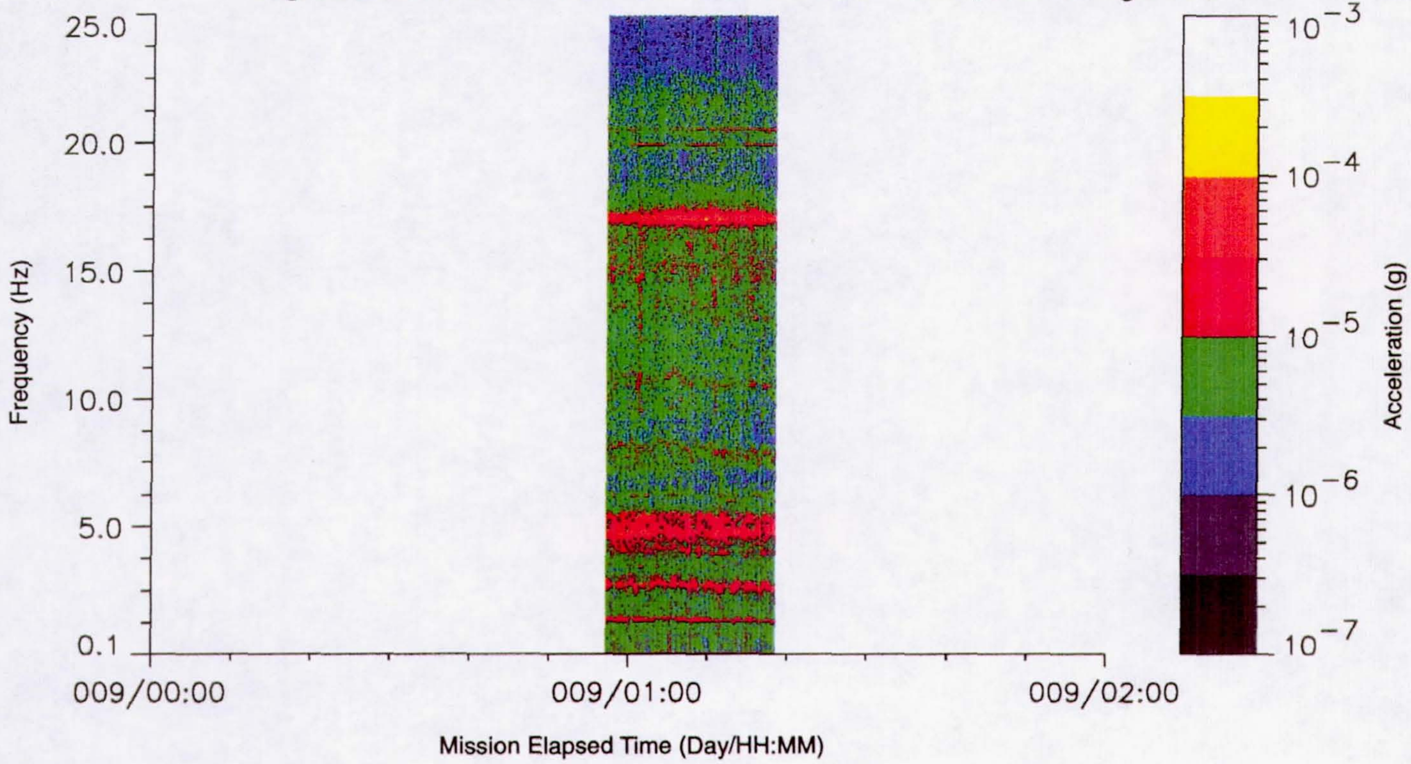


Figure C-67 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

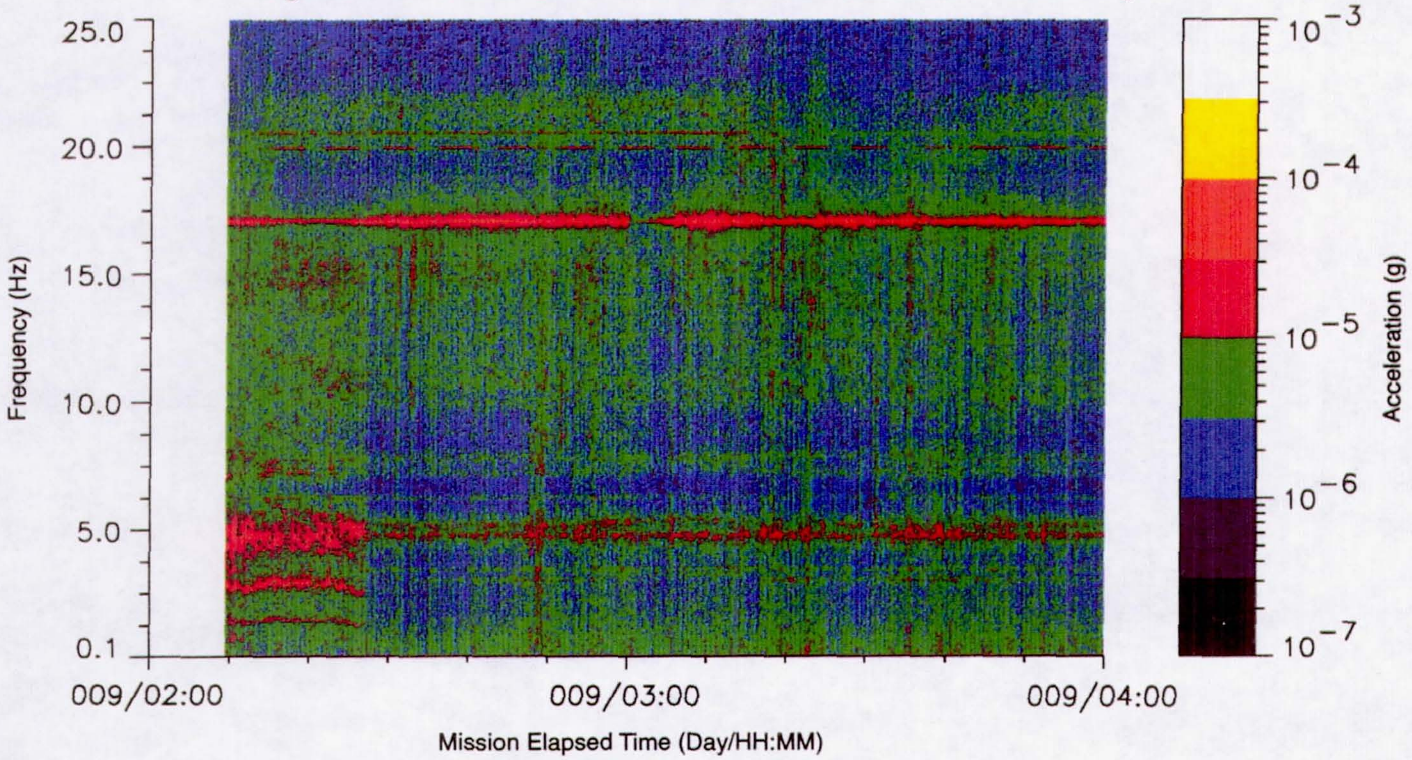


Figure C-68 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

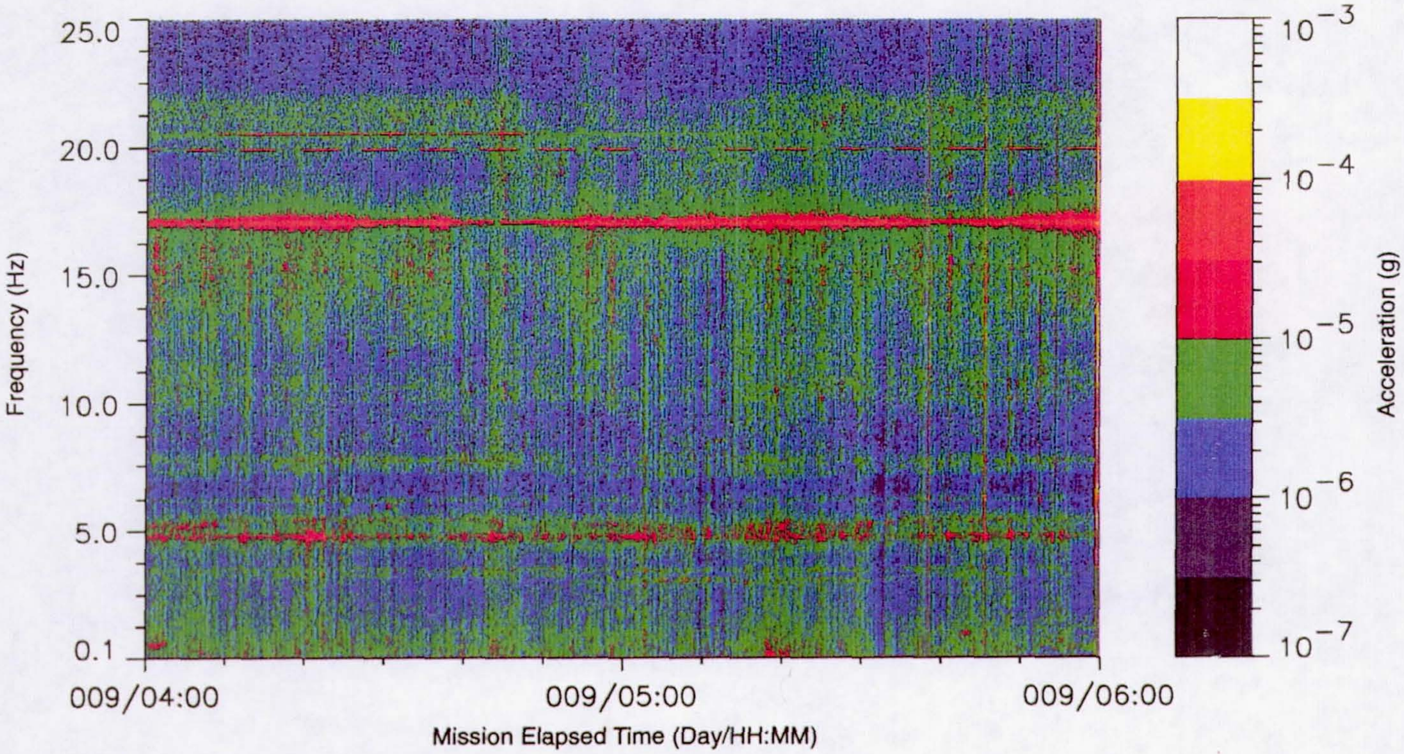
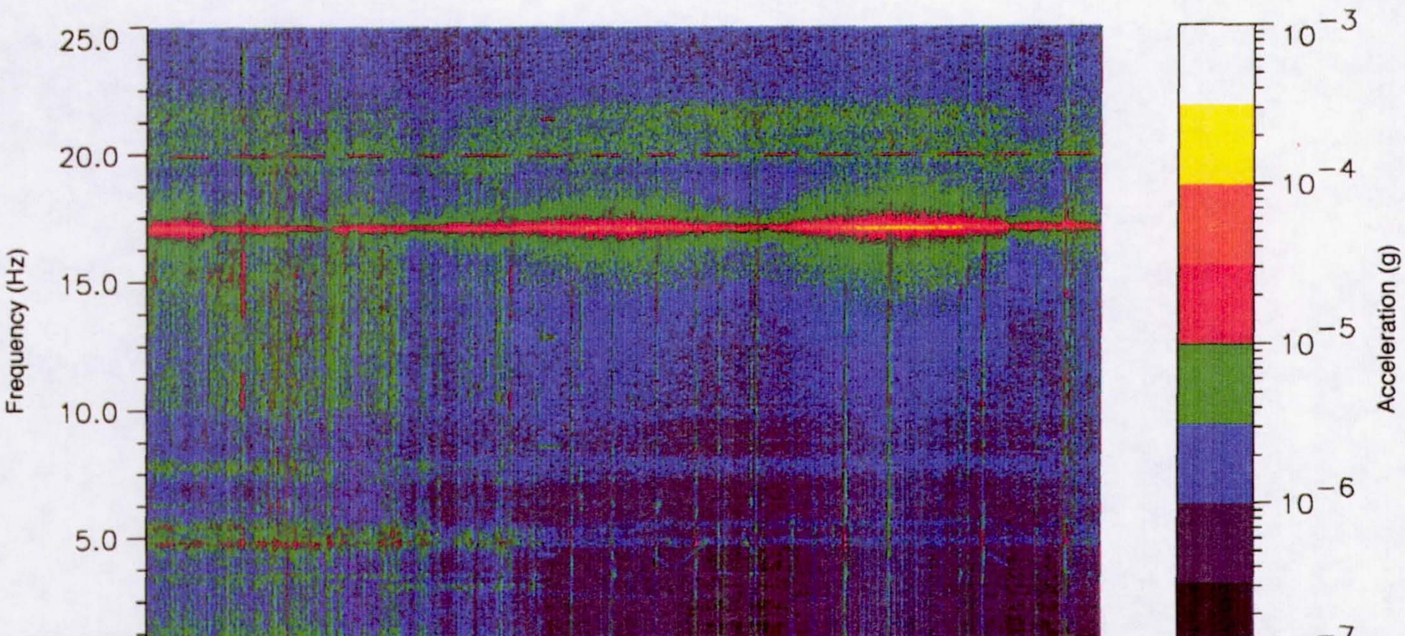


Figure C-69 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



NO DATA AVAILABLE FOR USMP-2, UNIT F, HEAD B

FROM MET 009/08:00:00 - 009/18:04:00

Figure C-70 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

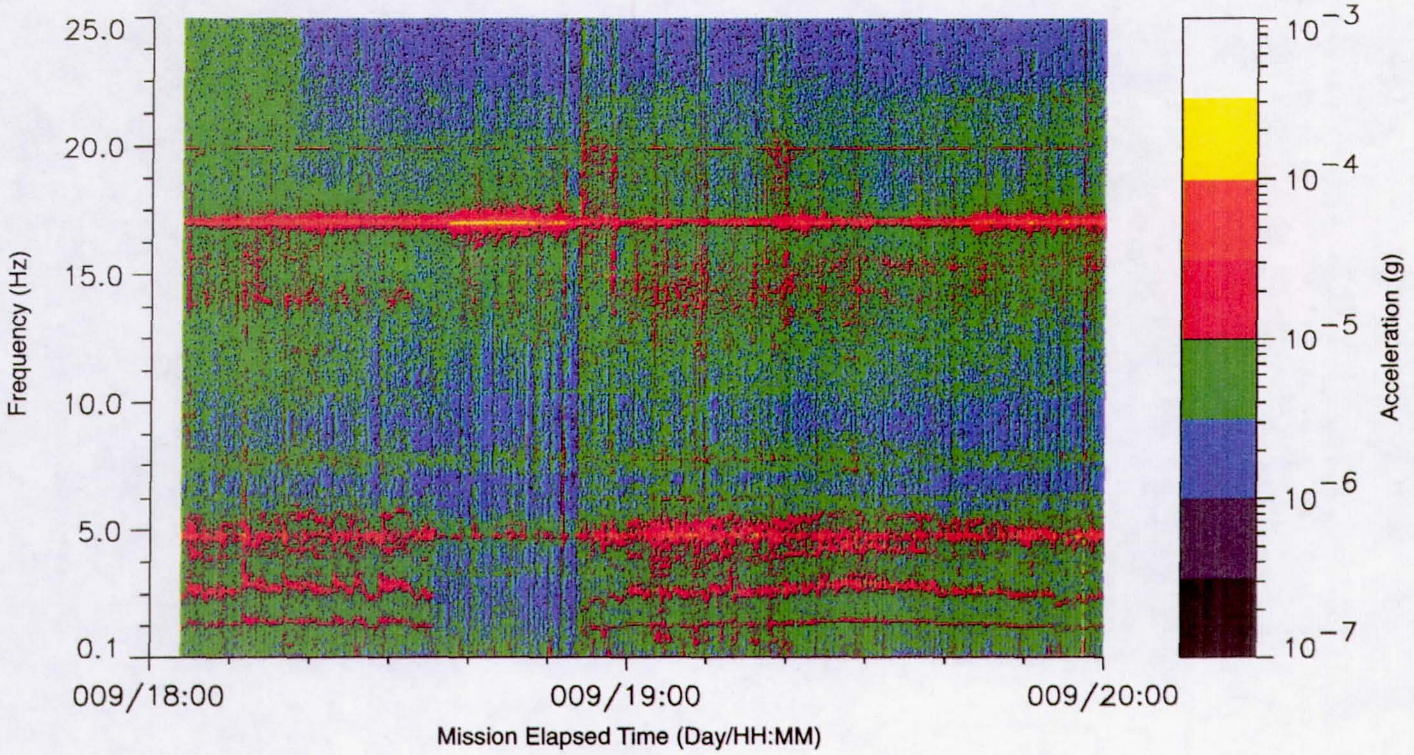


Figure C-71 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

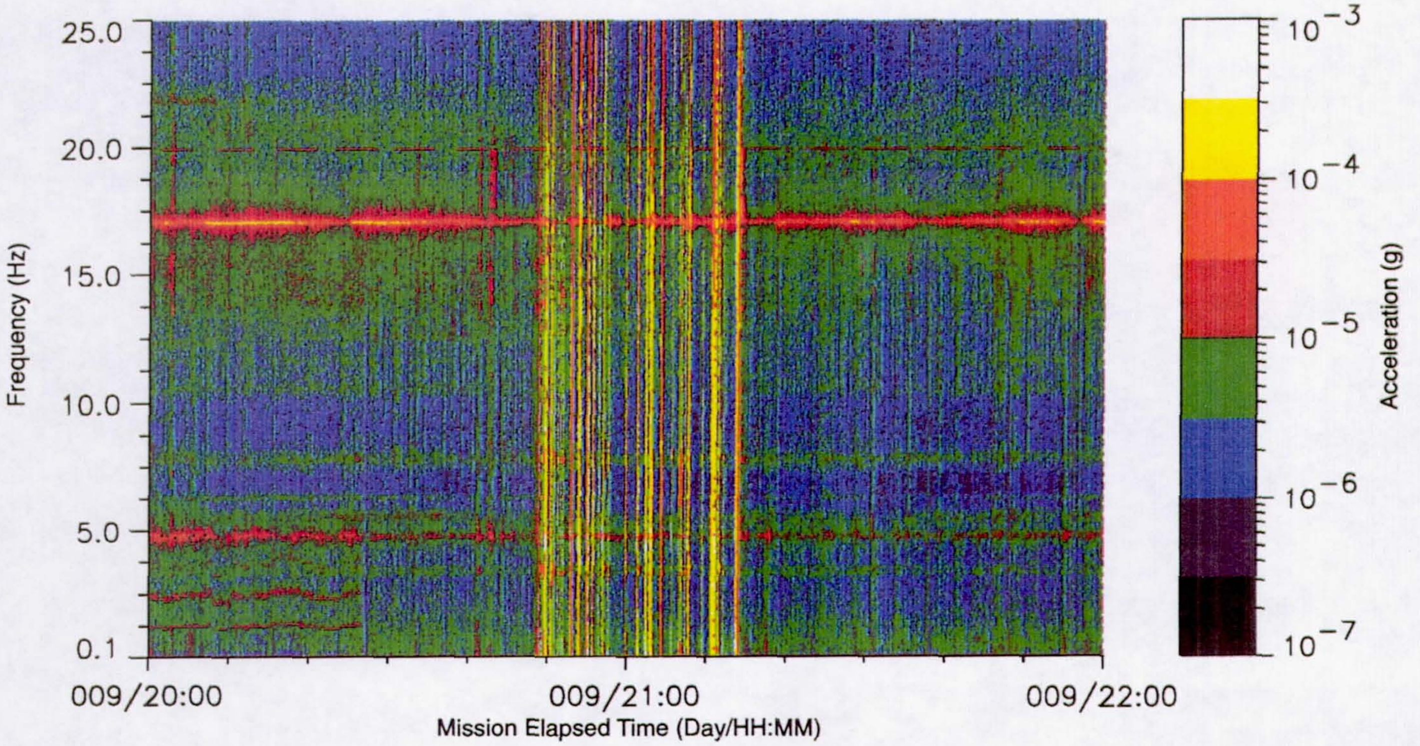


Figure C-72 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

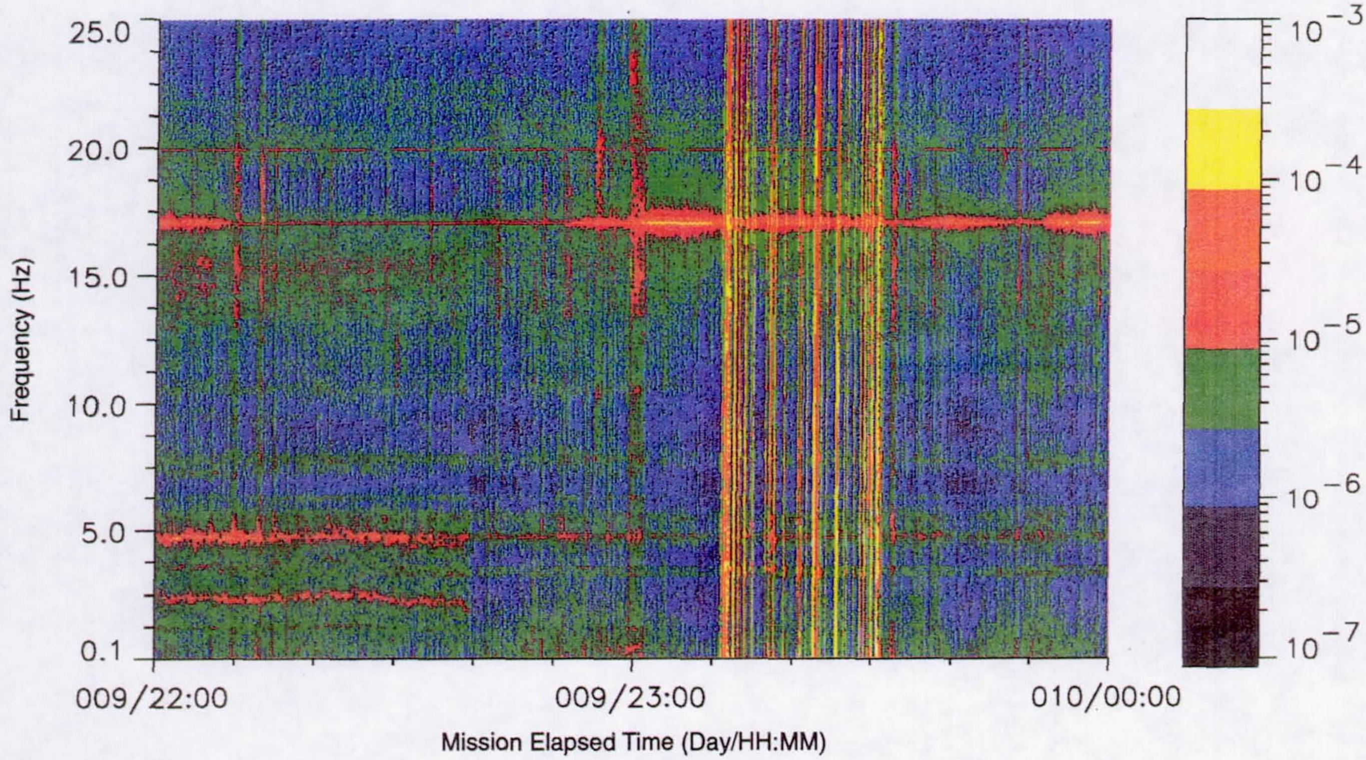


Figure C-73 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

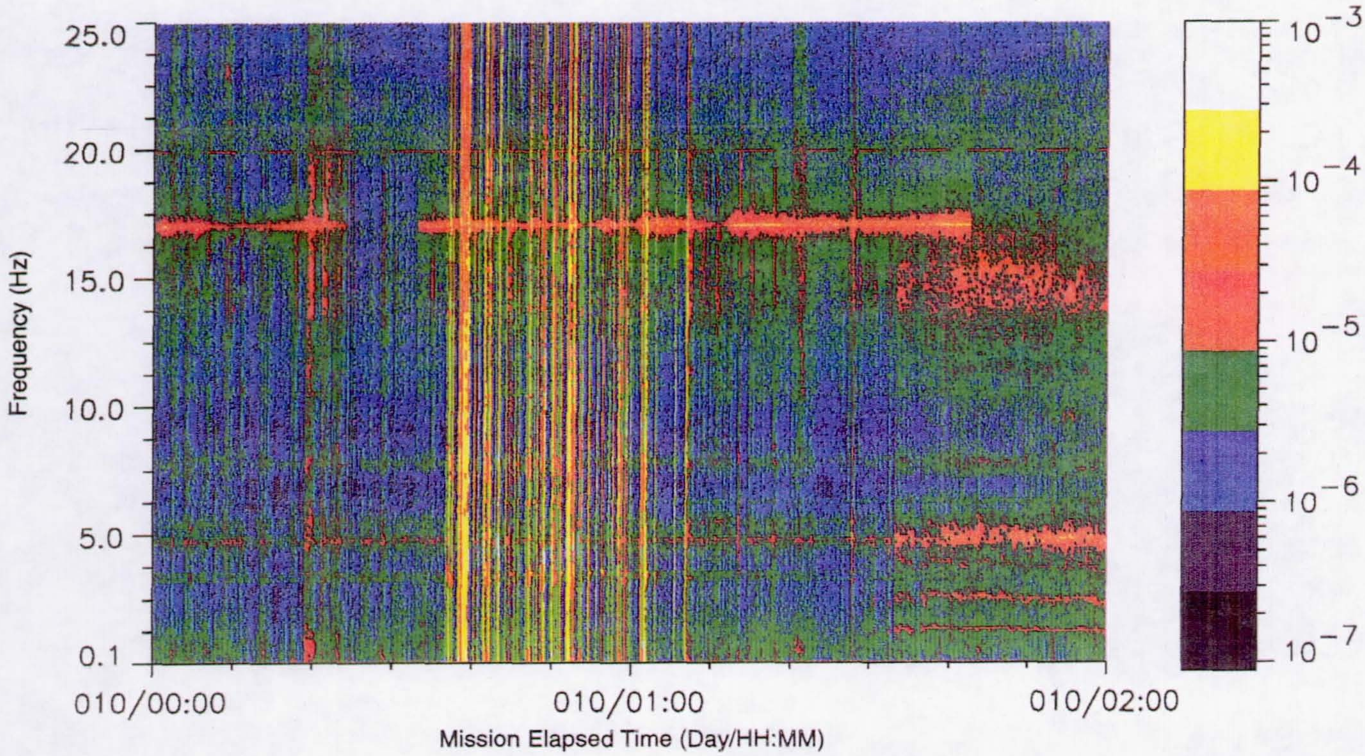


Figure C-74 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

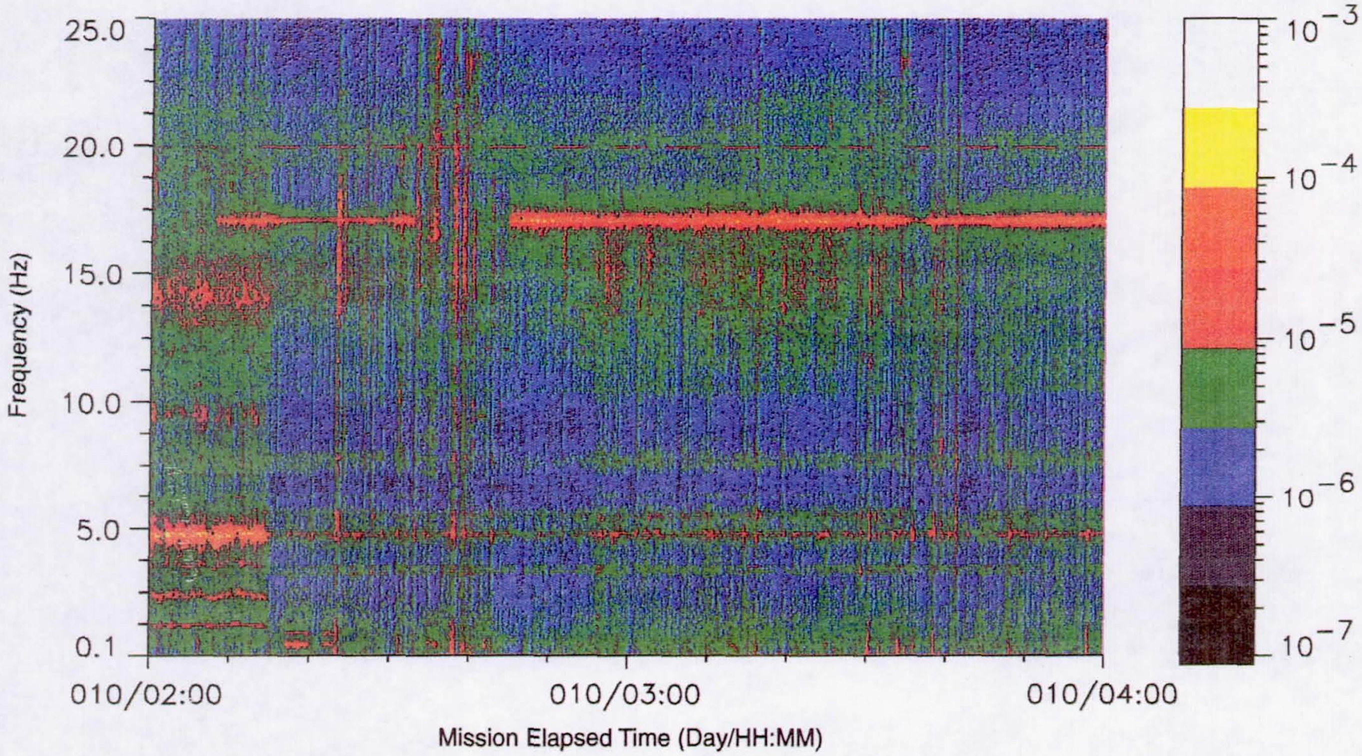


Figure C-75 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

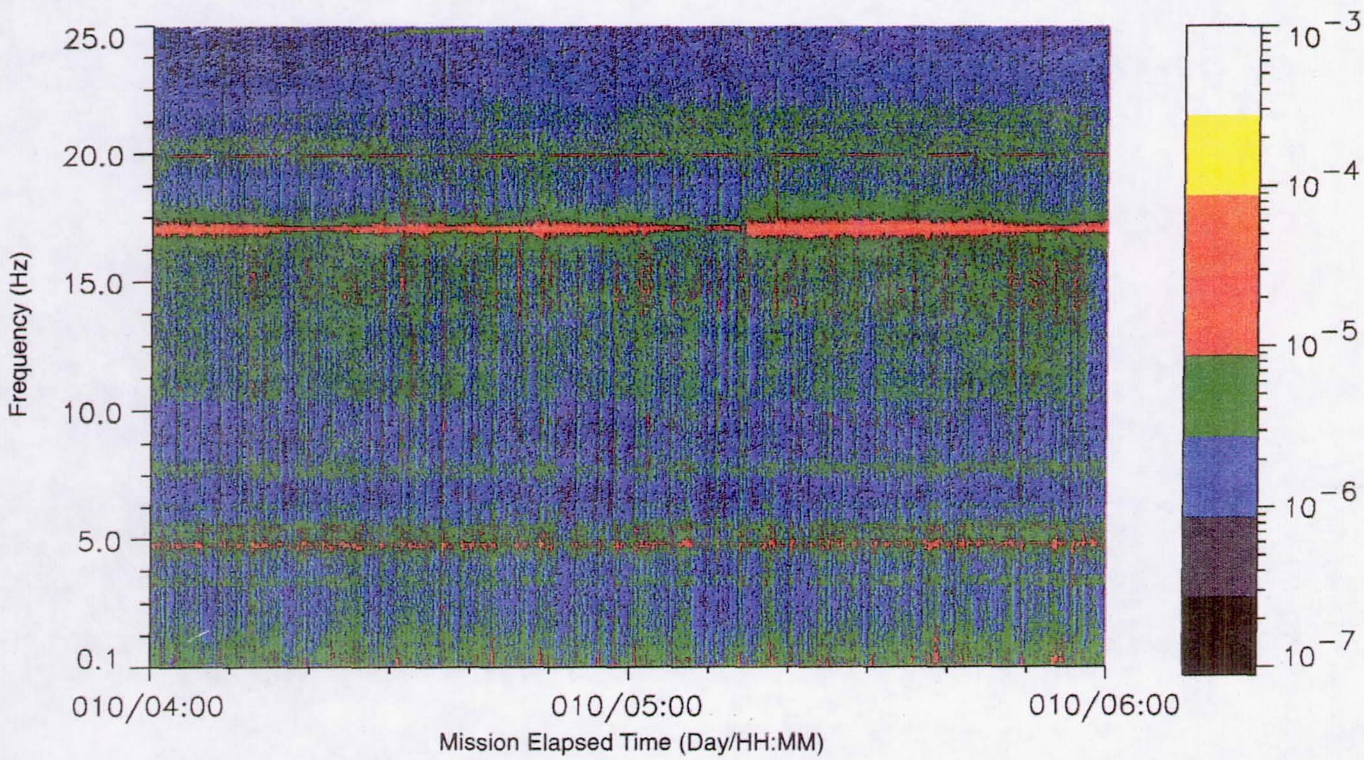


Figure C-76 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

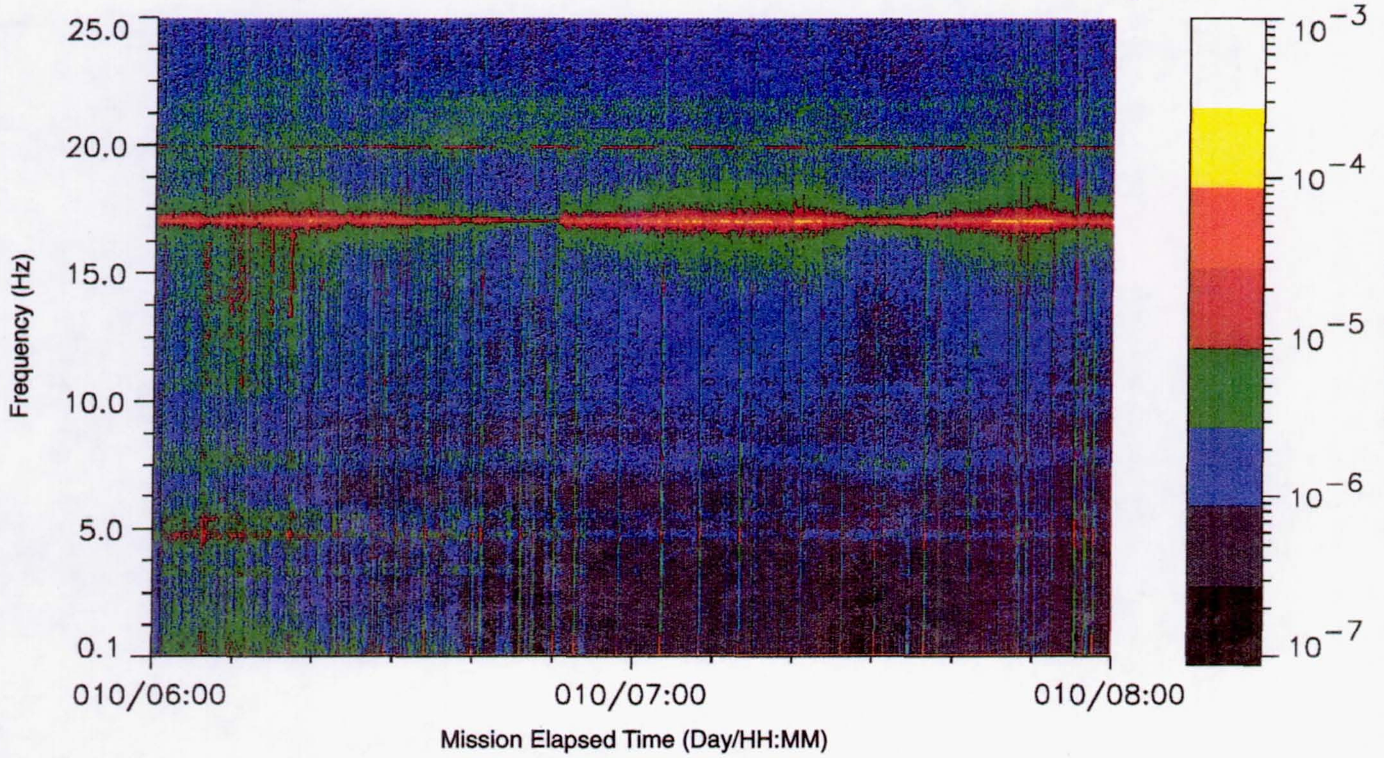


Figure C-77 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

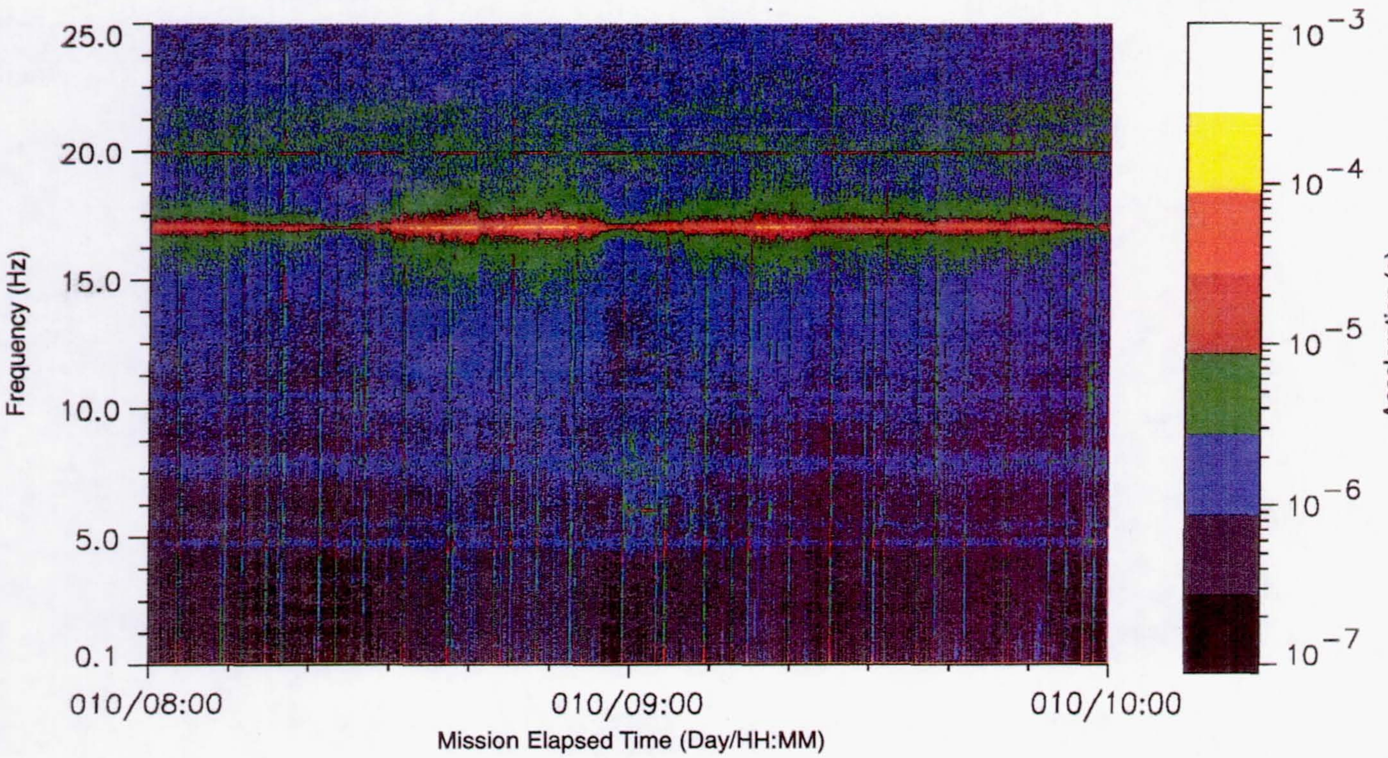


Figure C-78 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

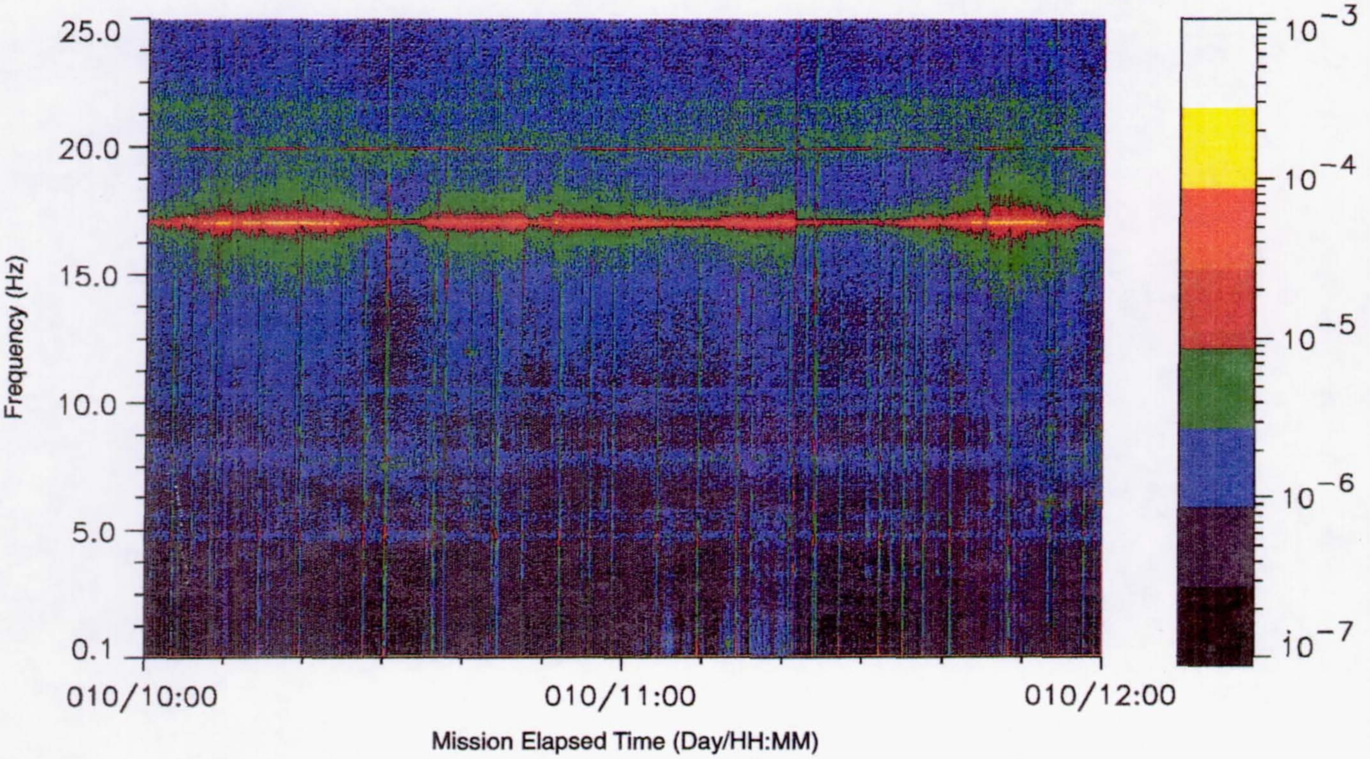


Figure C-79 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

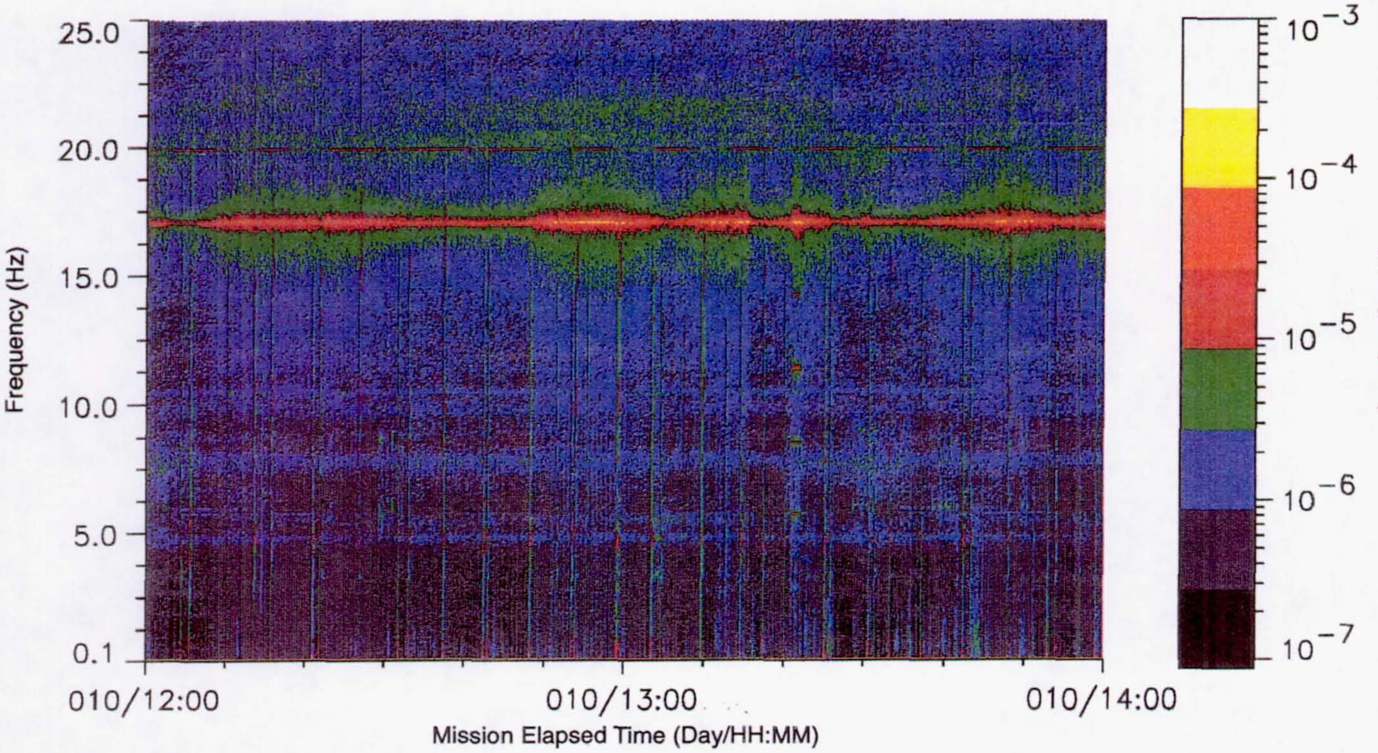


Figure C-80 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

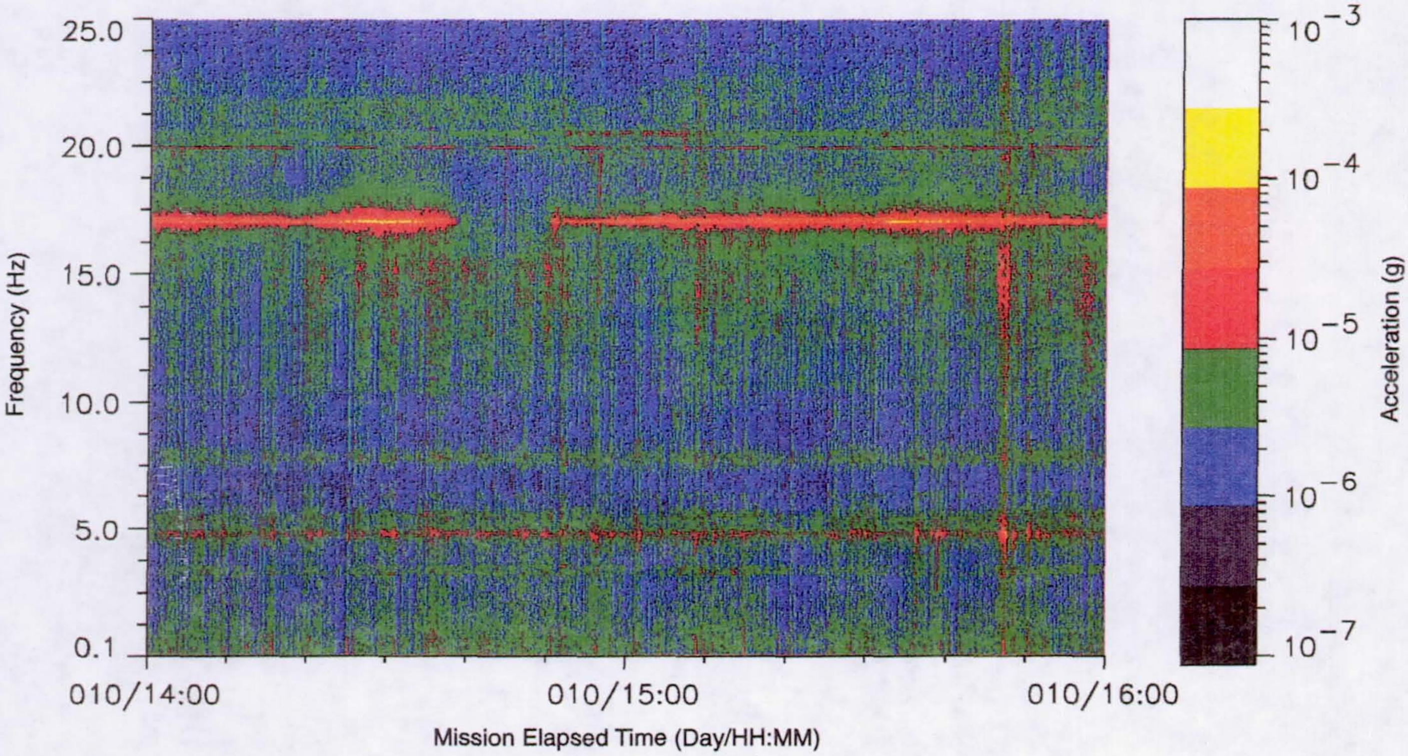


Figure C-81 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

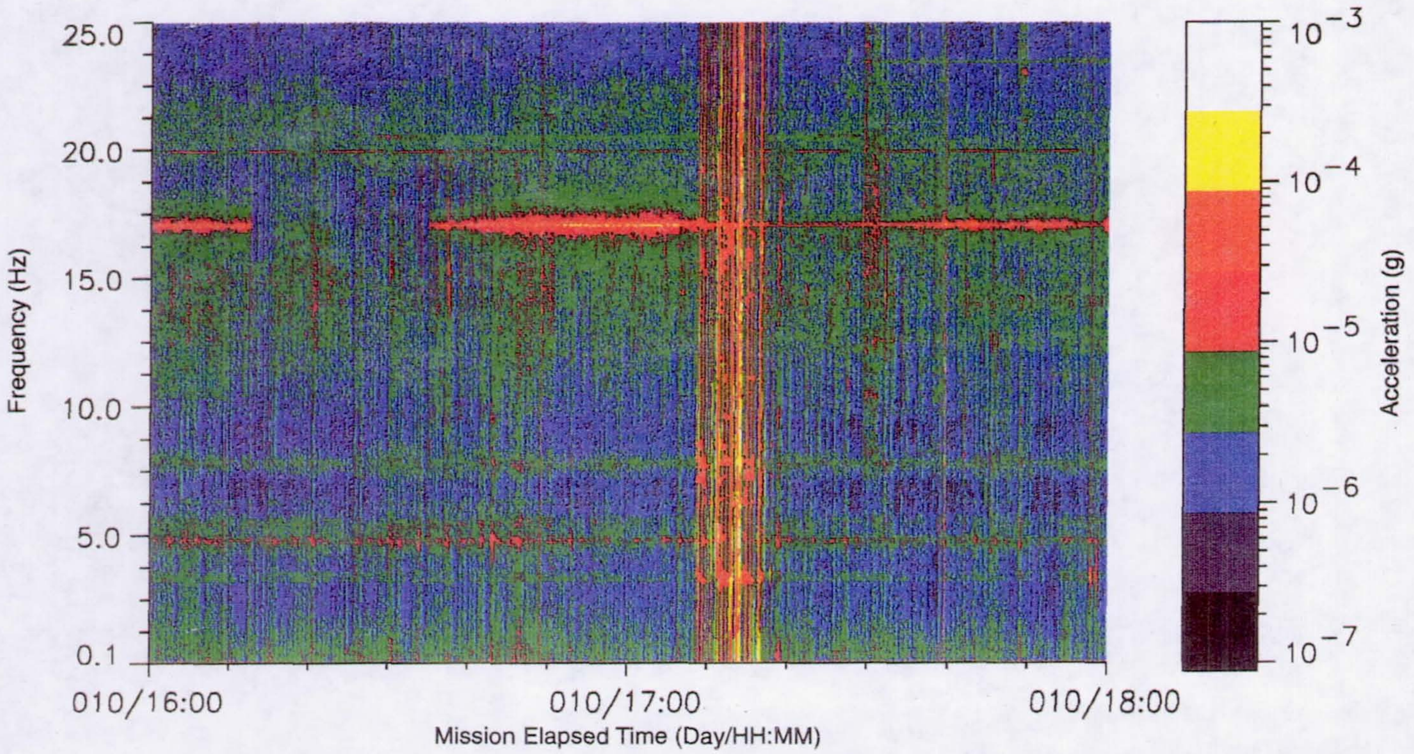


Figure C-82 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

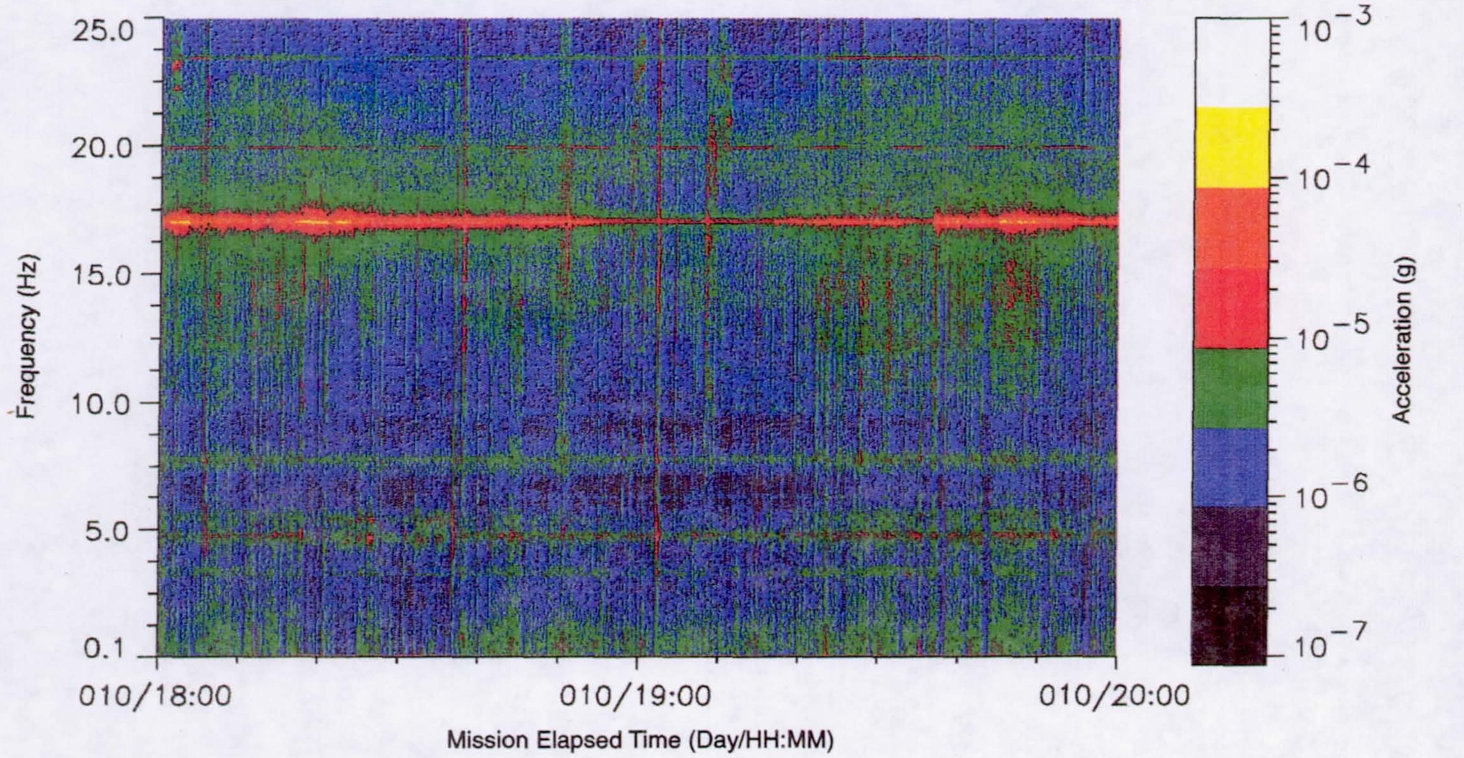


Figure C-83 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

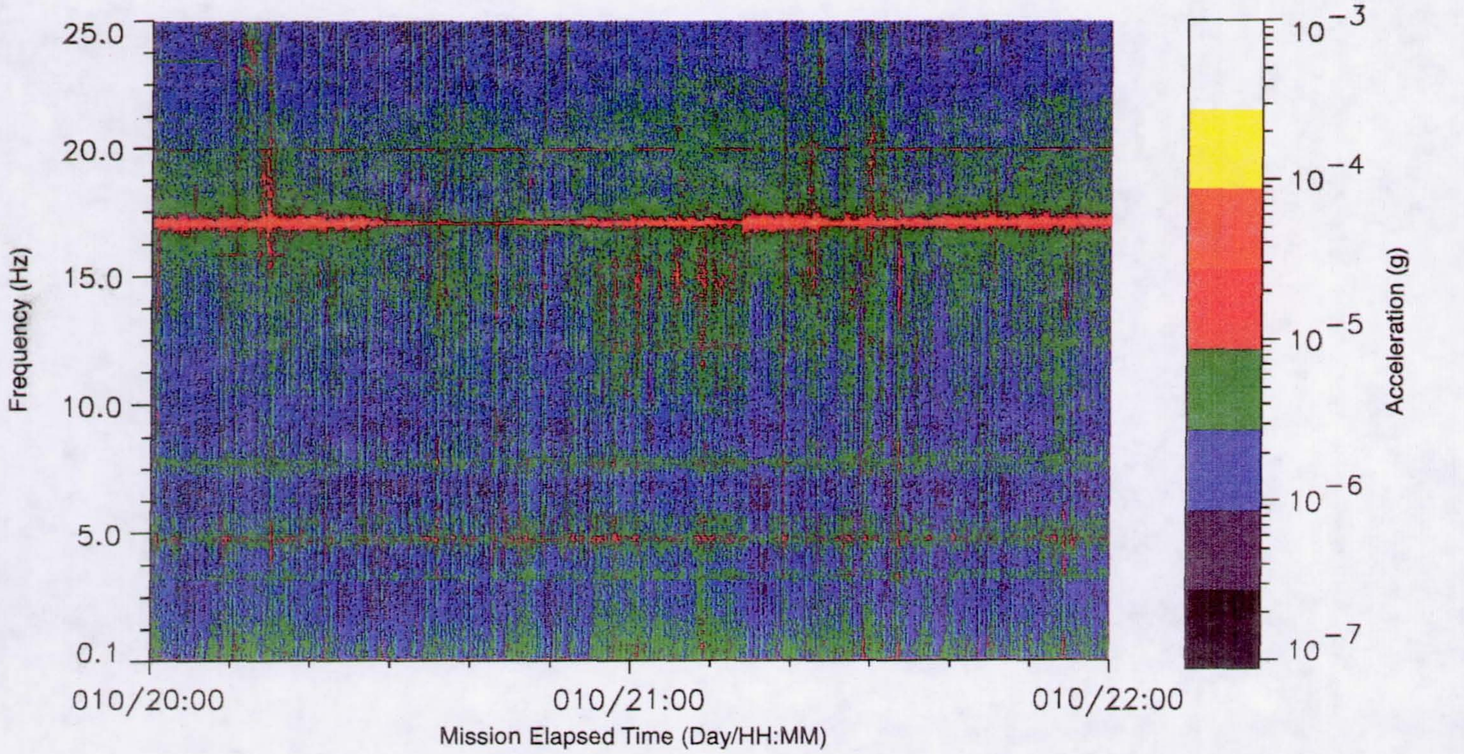


Figure C-84 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

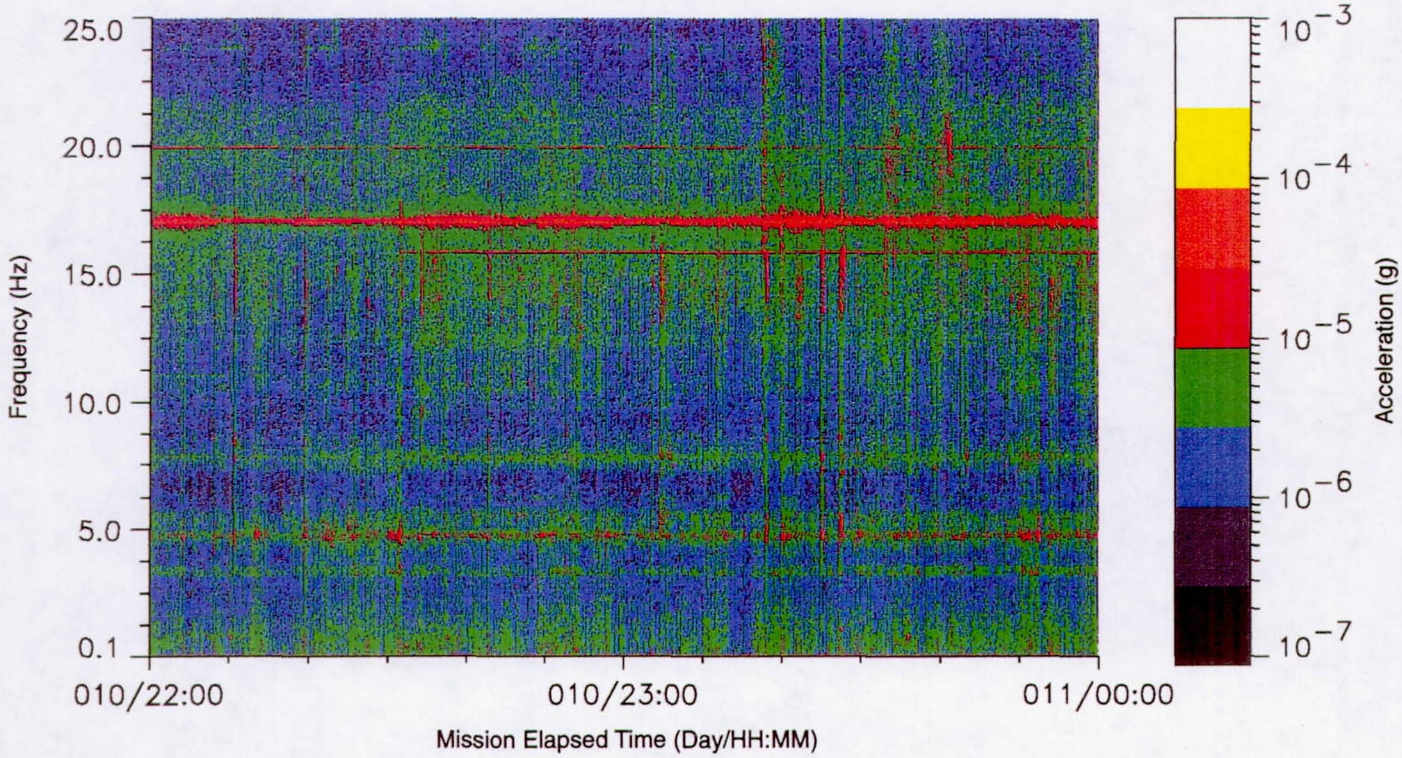


Figure C-85 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

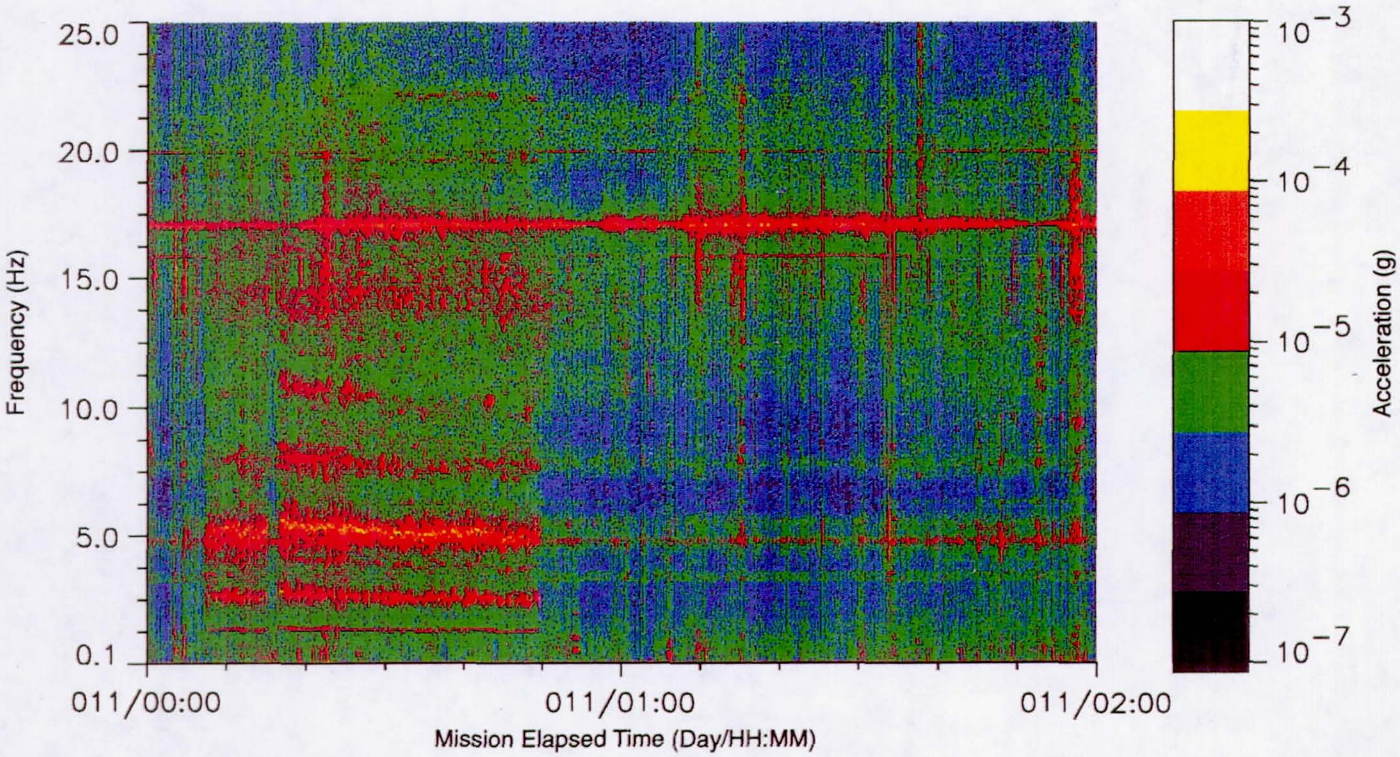


Figure C-86 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

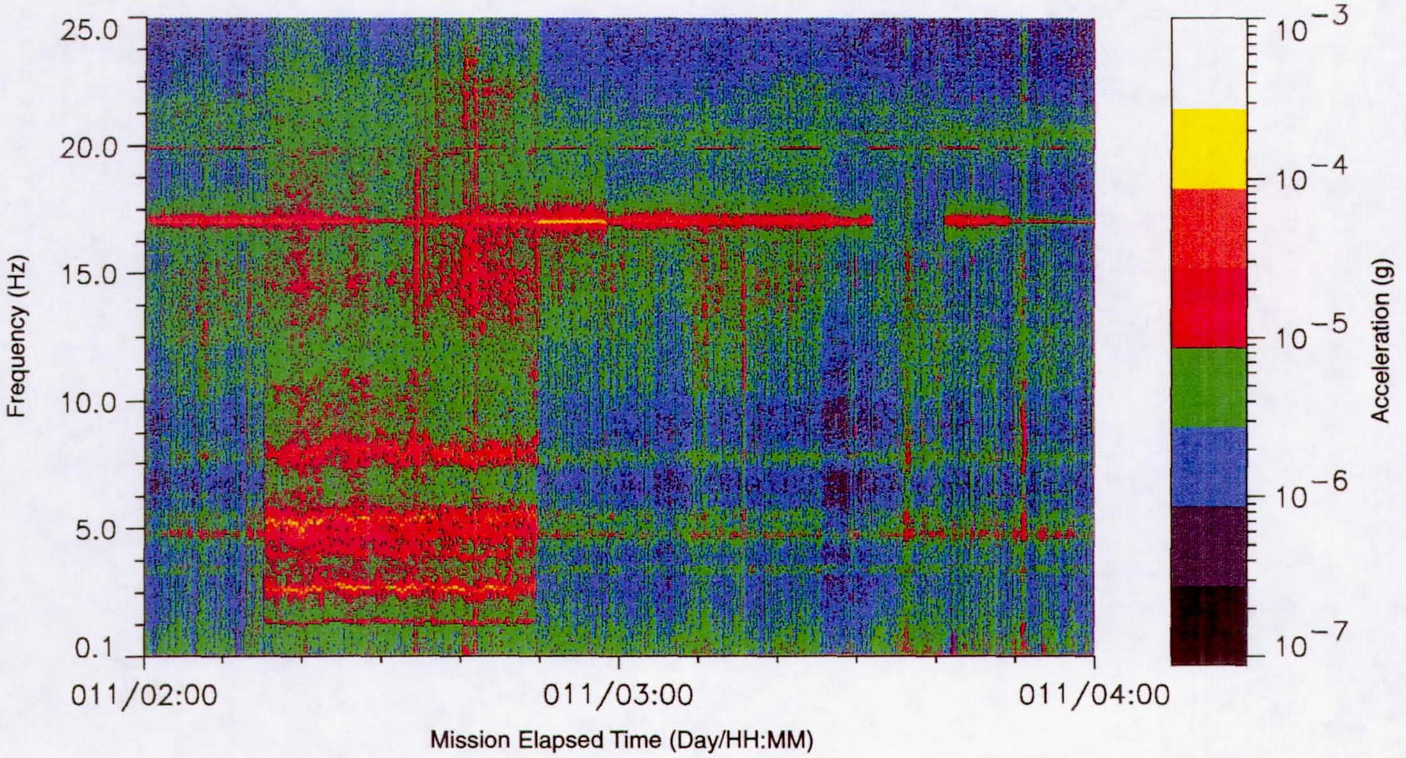


Figure C-87 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

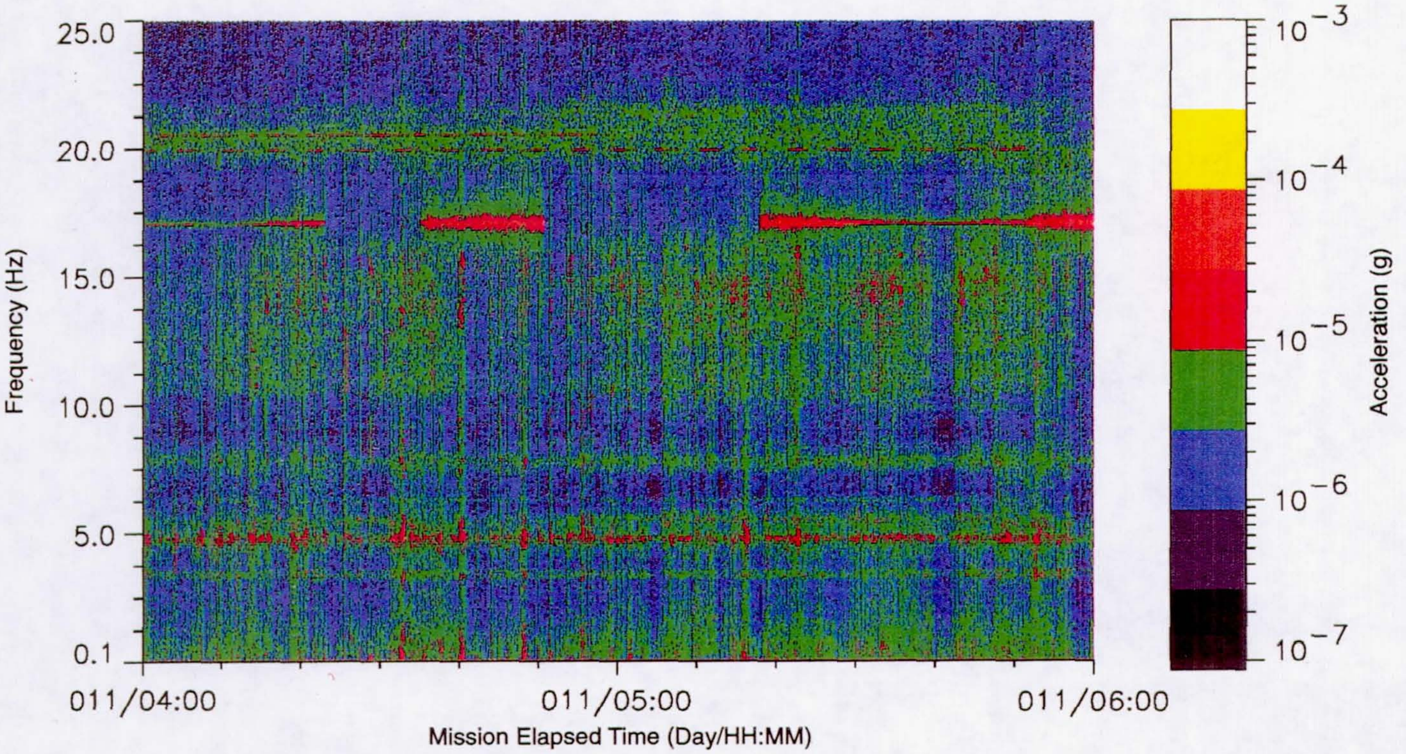


Figure C-88 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

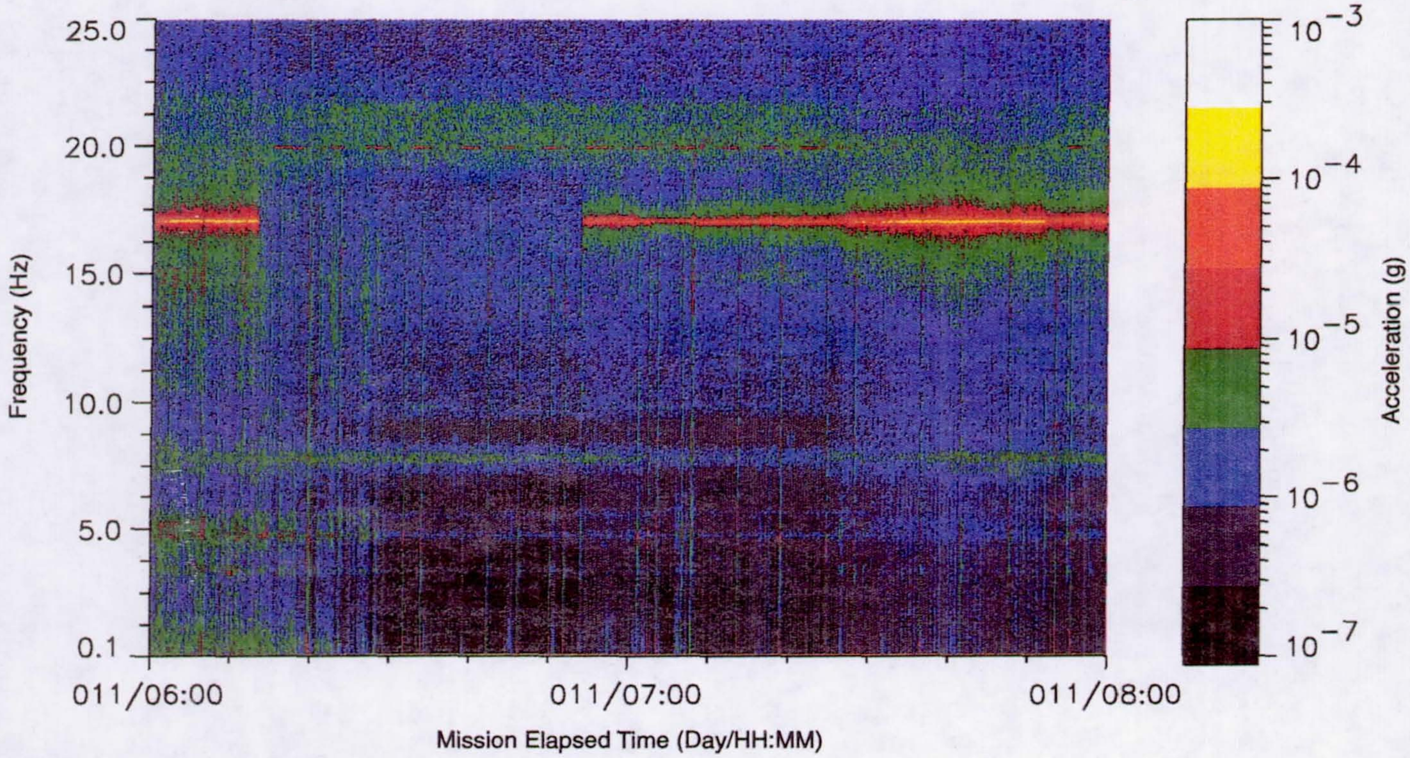


Figure C-89 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

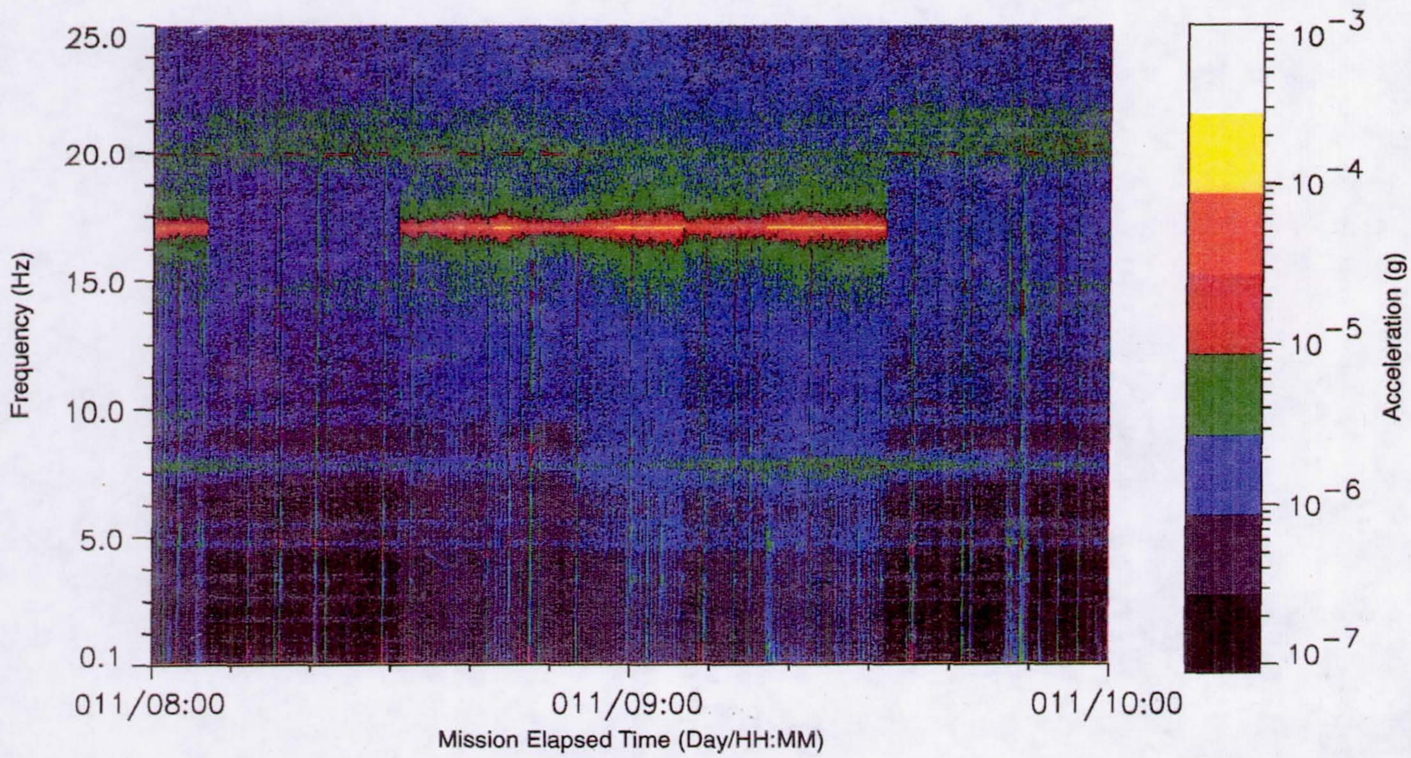


Figure C-90 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

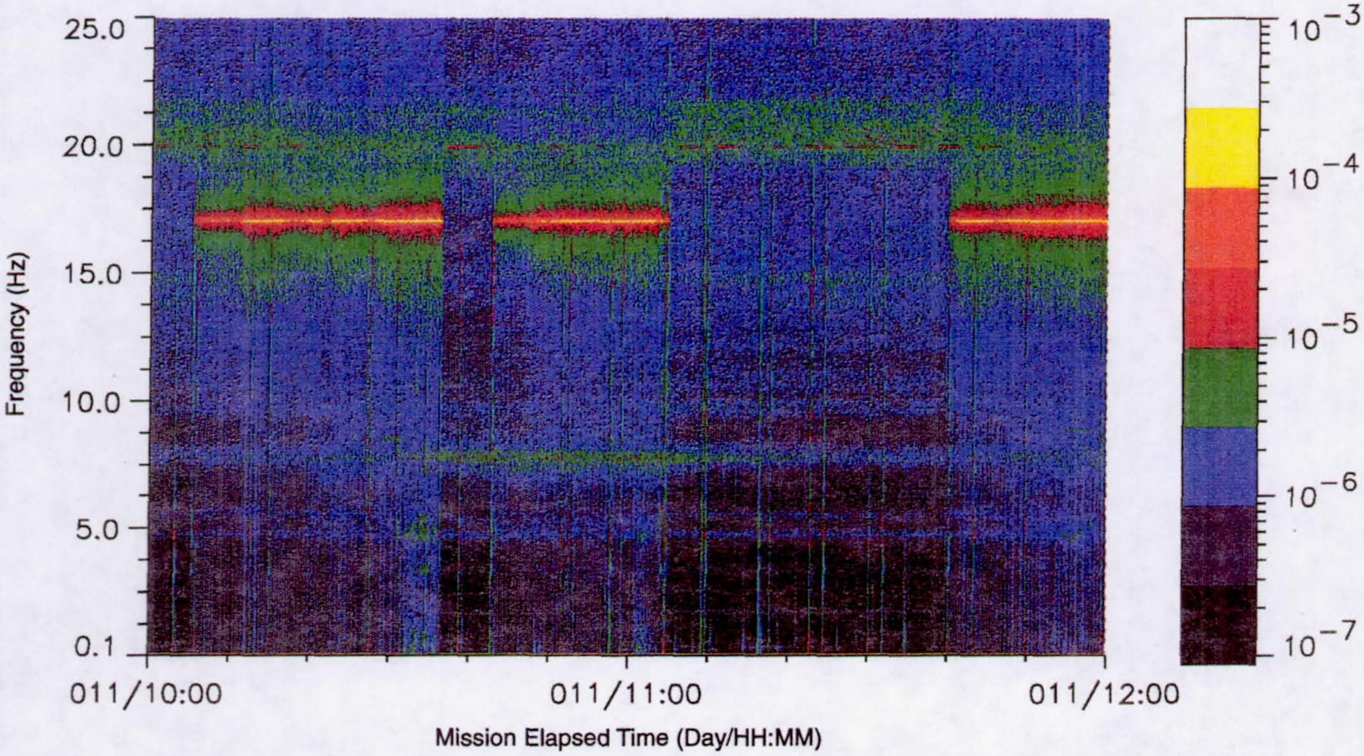
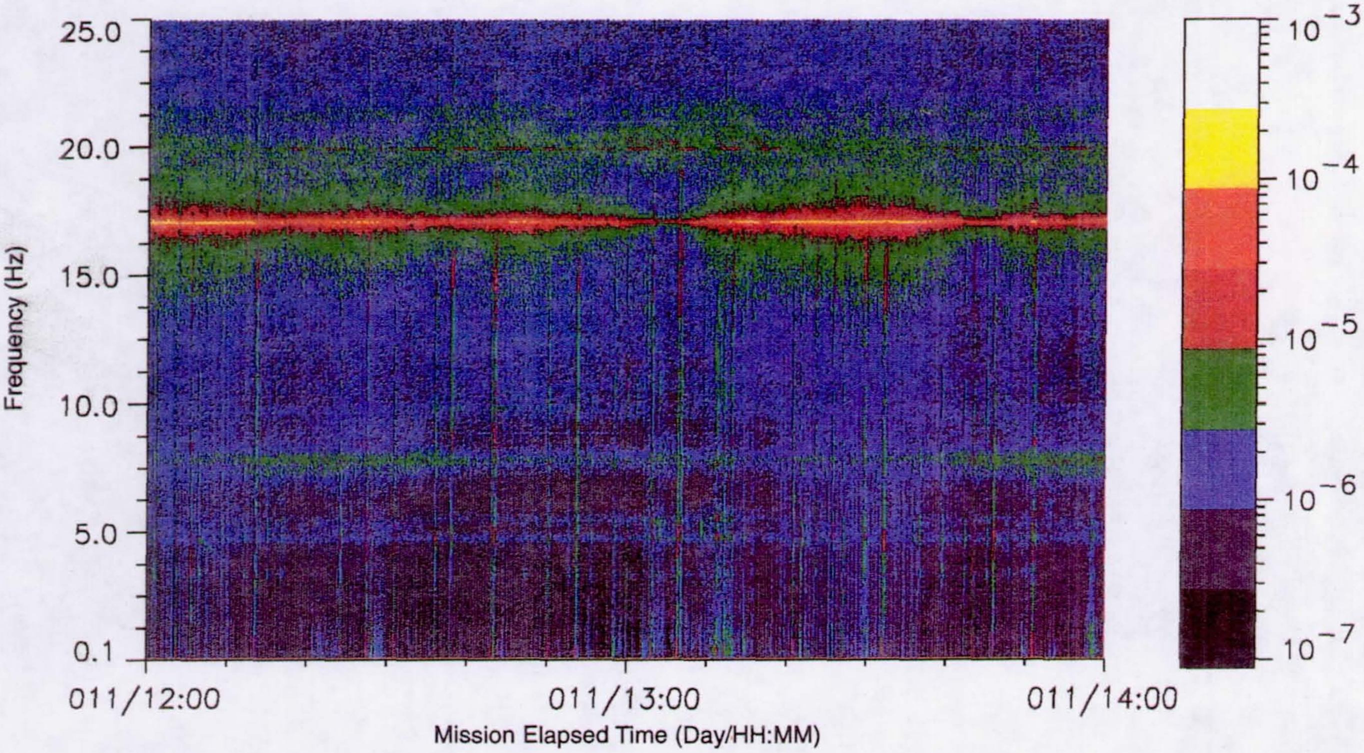


Figure C-91 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



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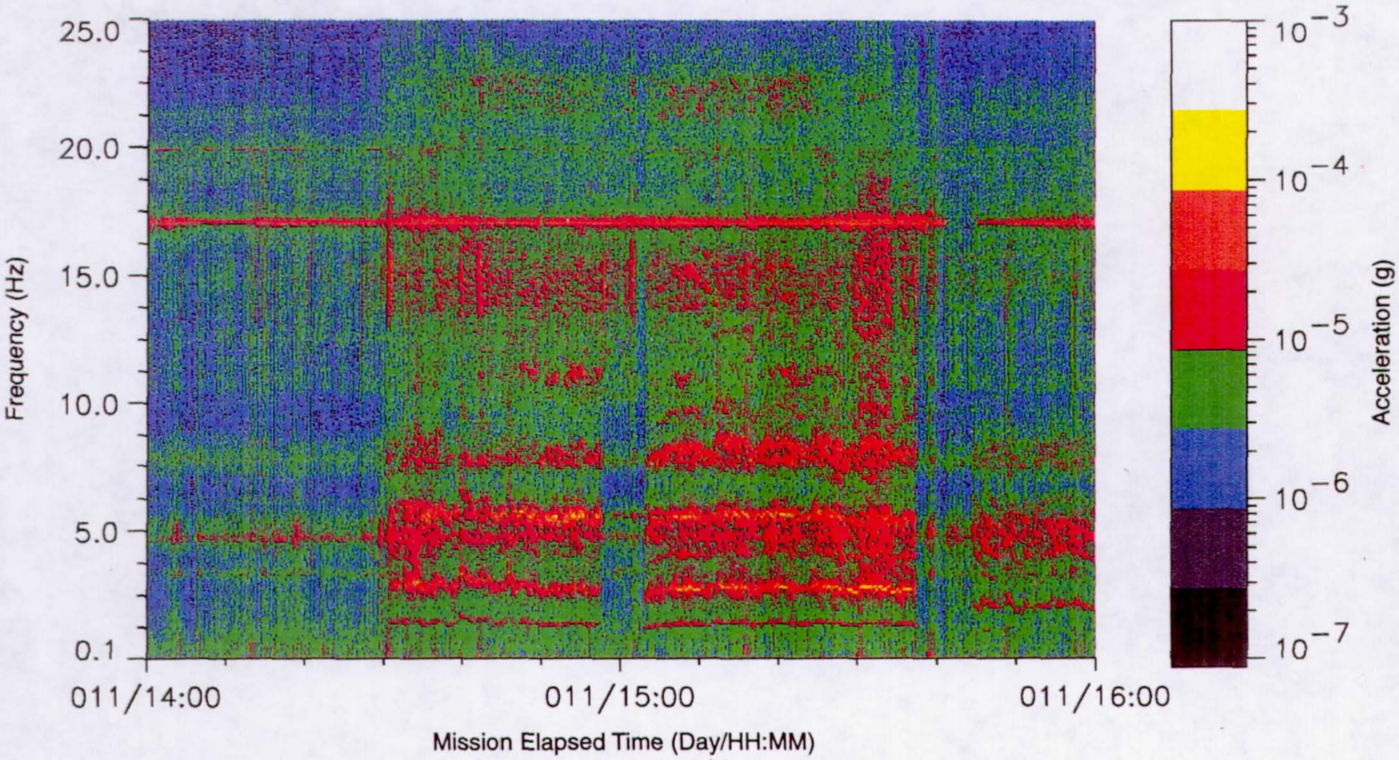

Figure C-93 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

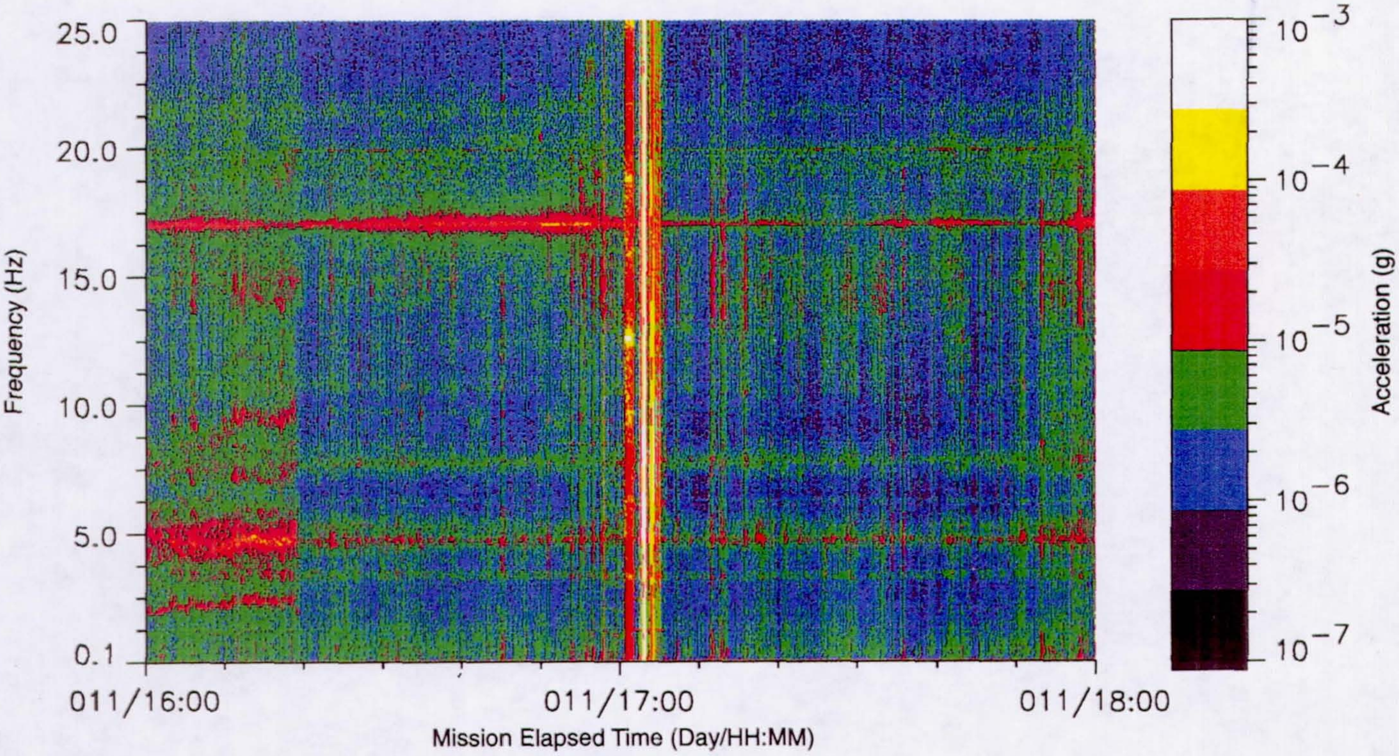

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Figure C-94 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

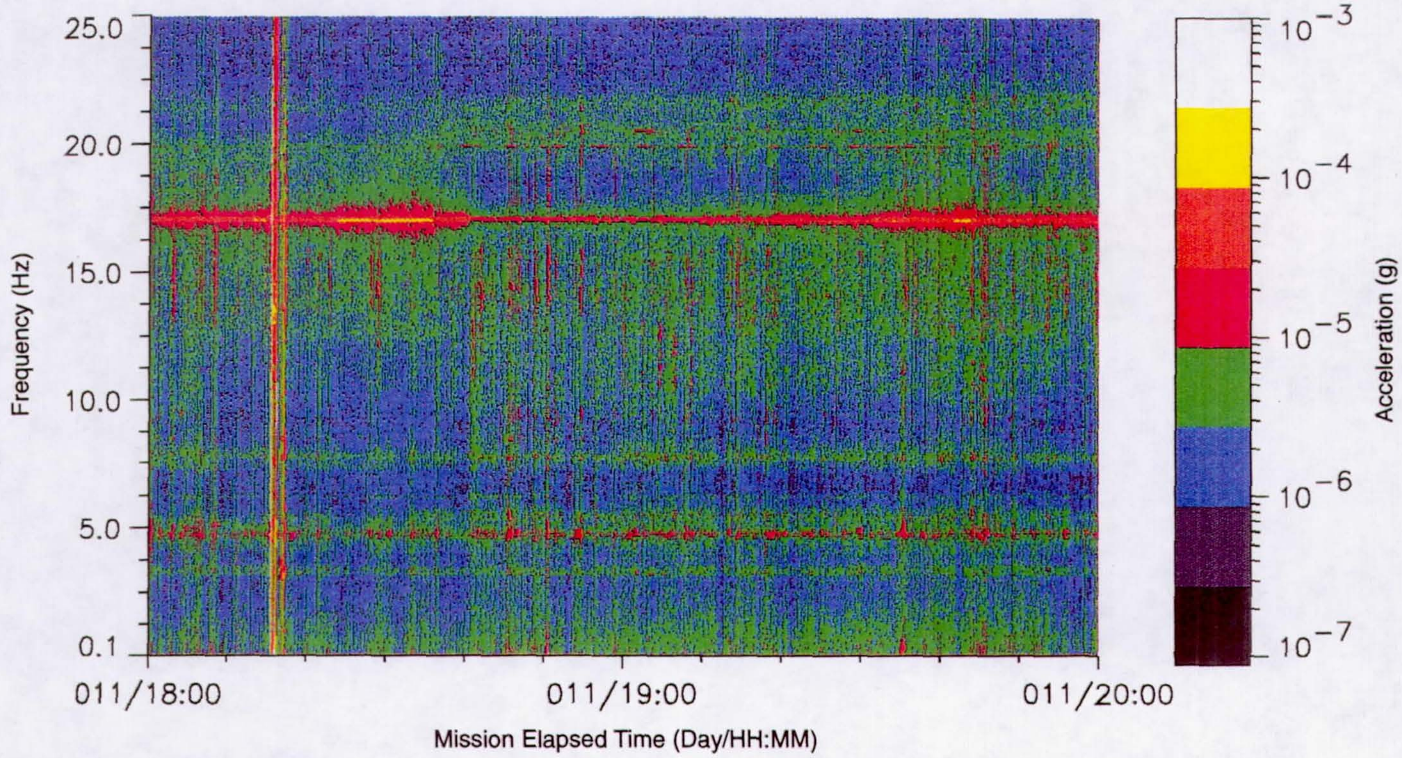
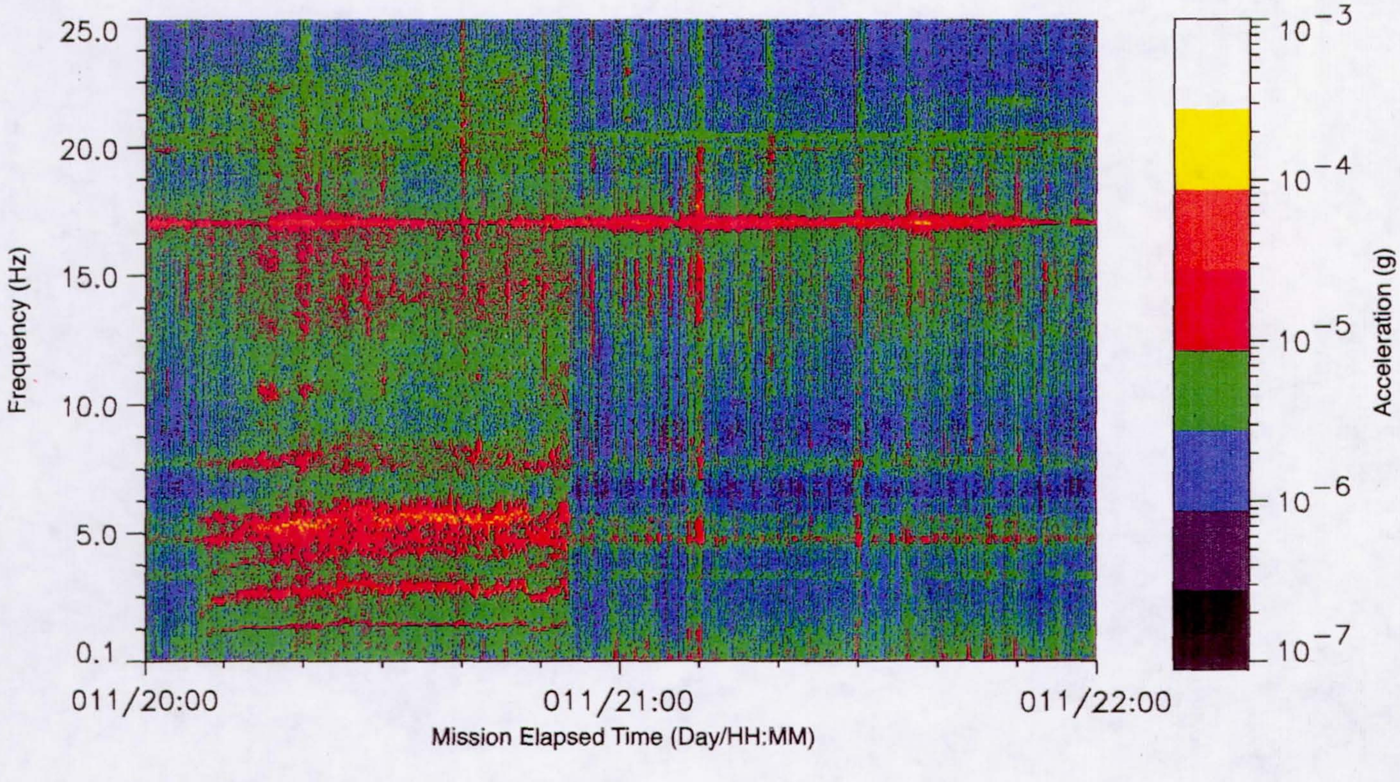


Figure C-95 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



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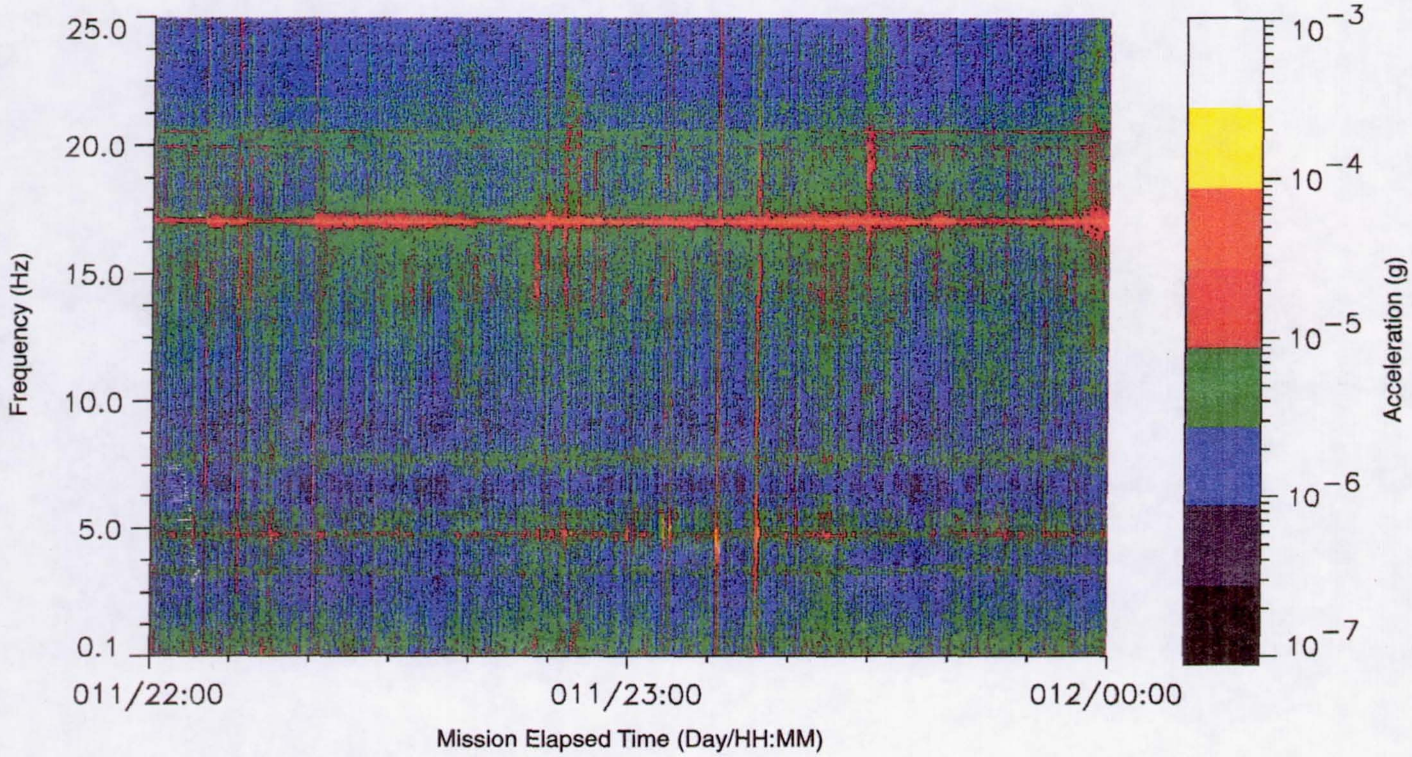
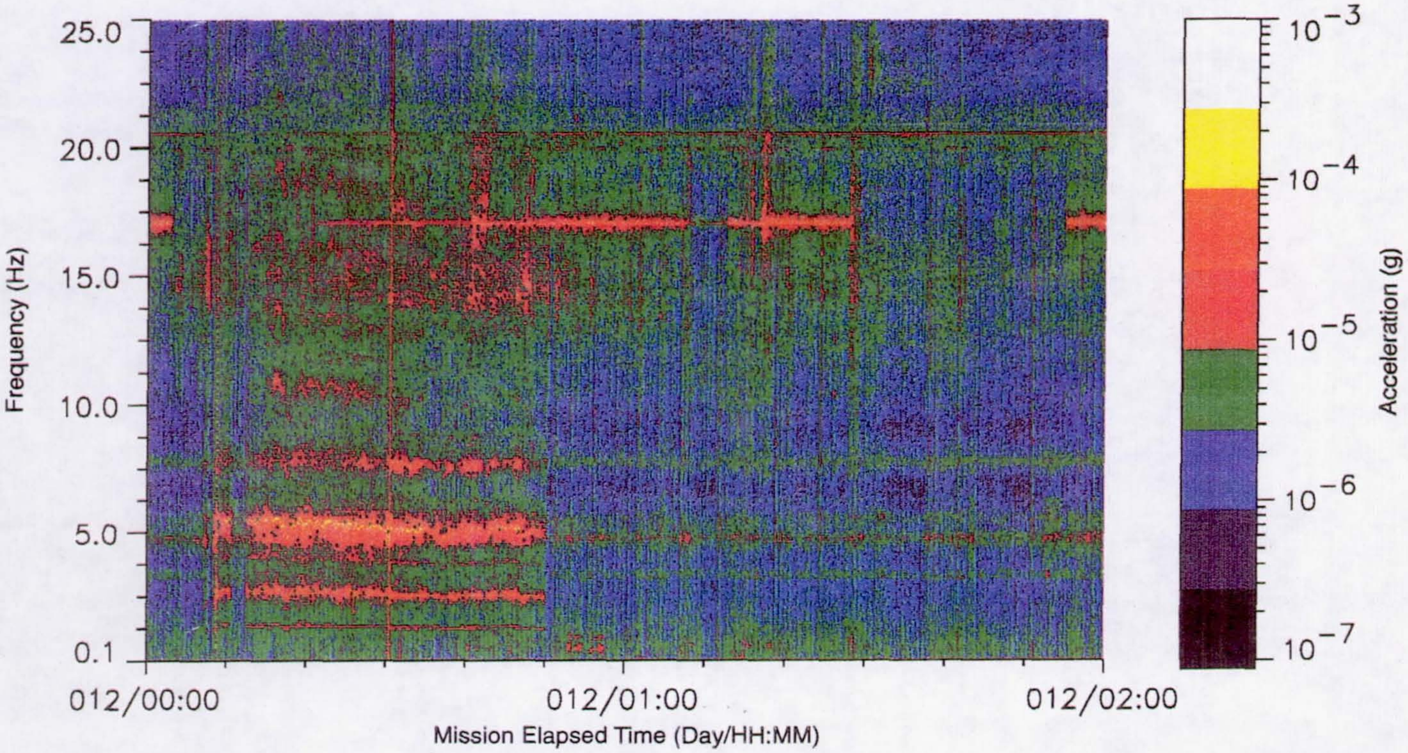


Figure C-97 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



C-108

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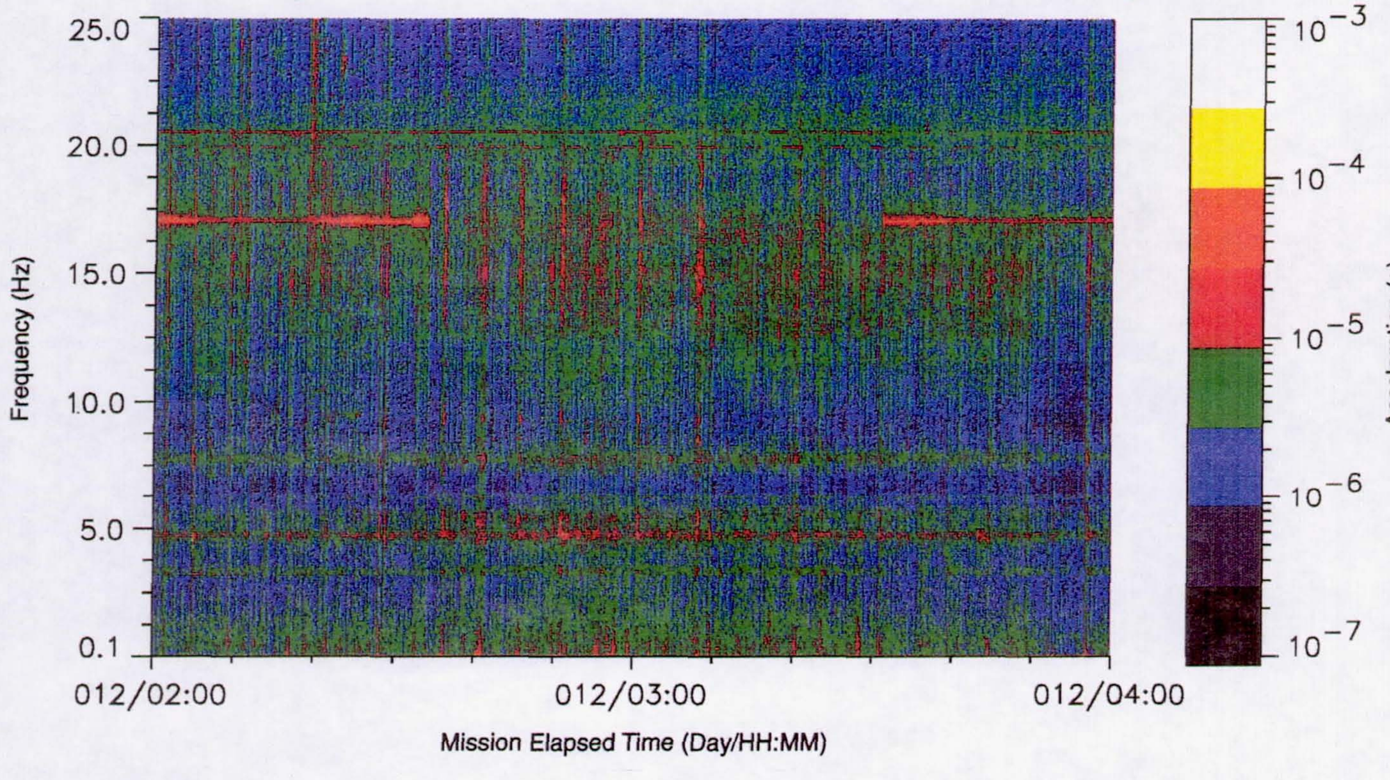

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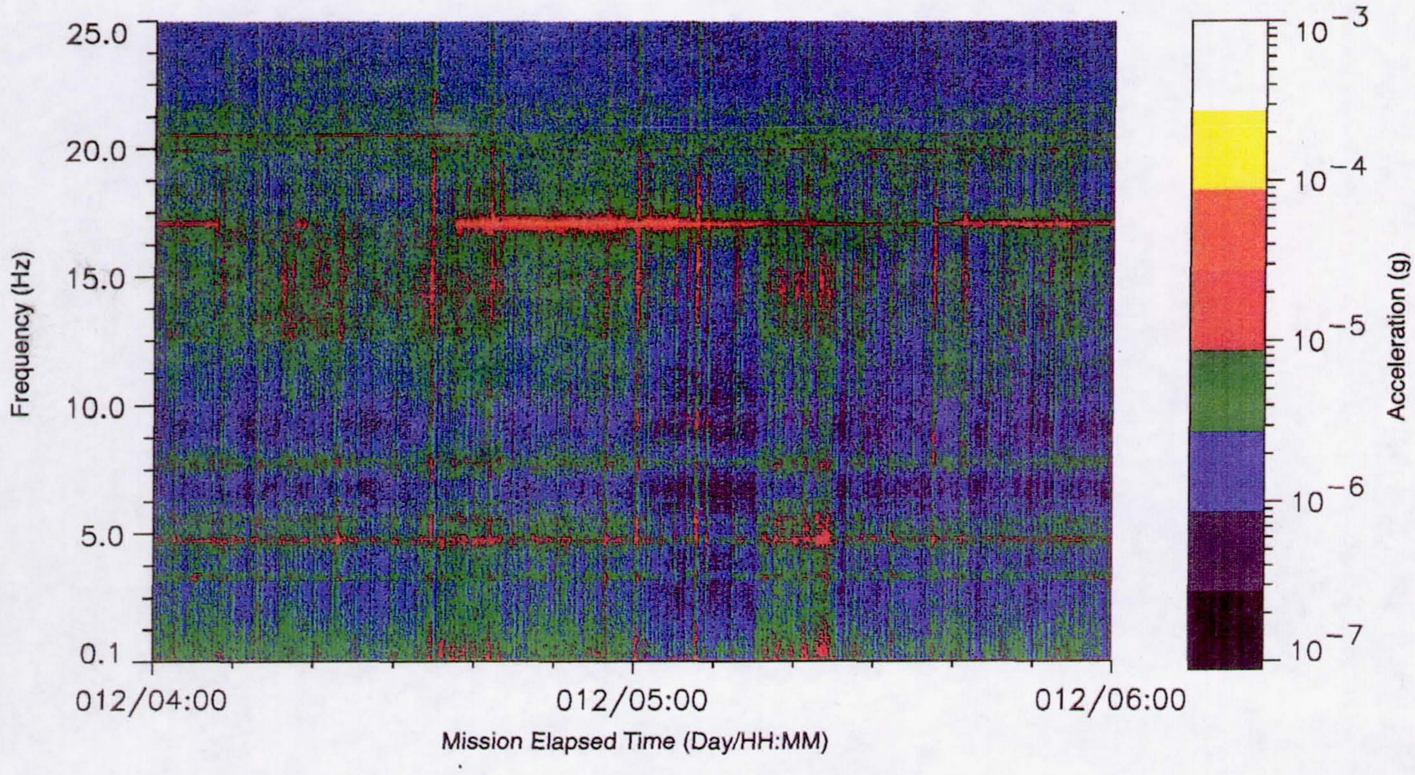


Figure C-100 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

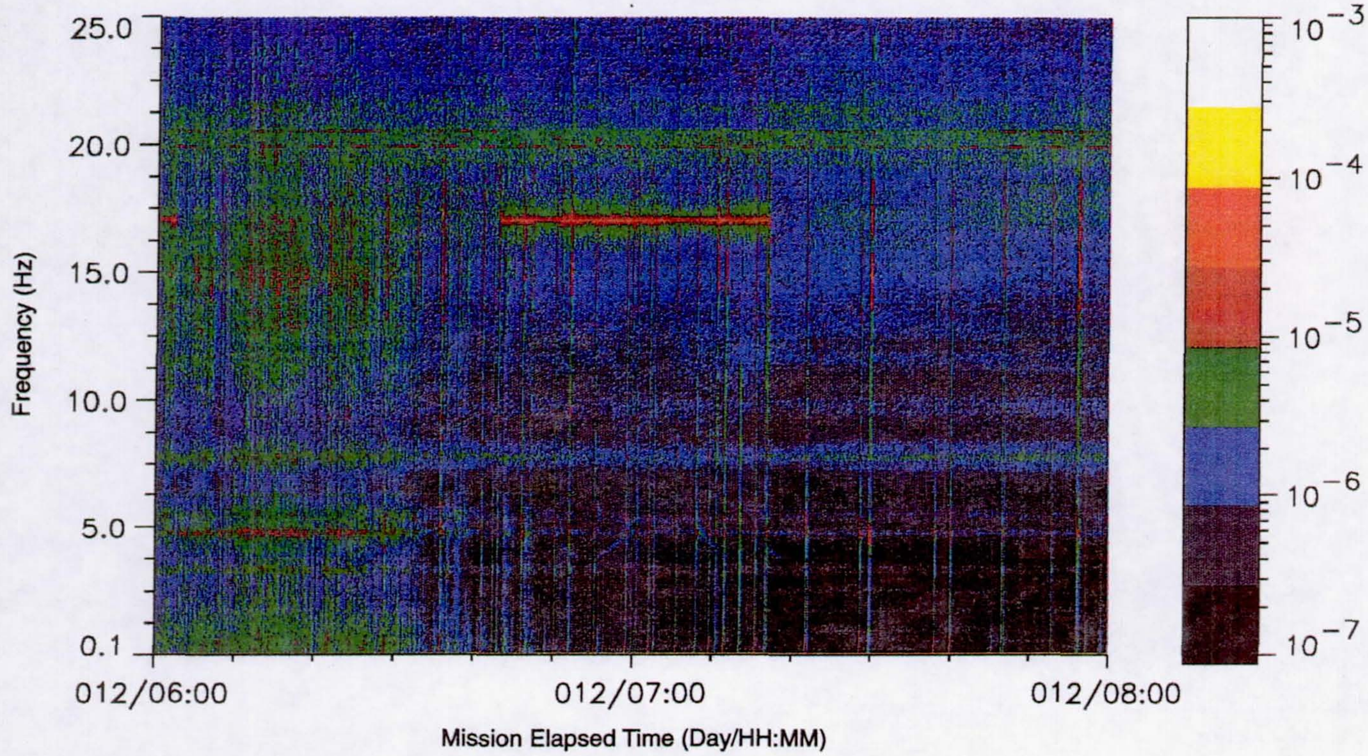
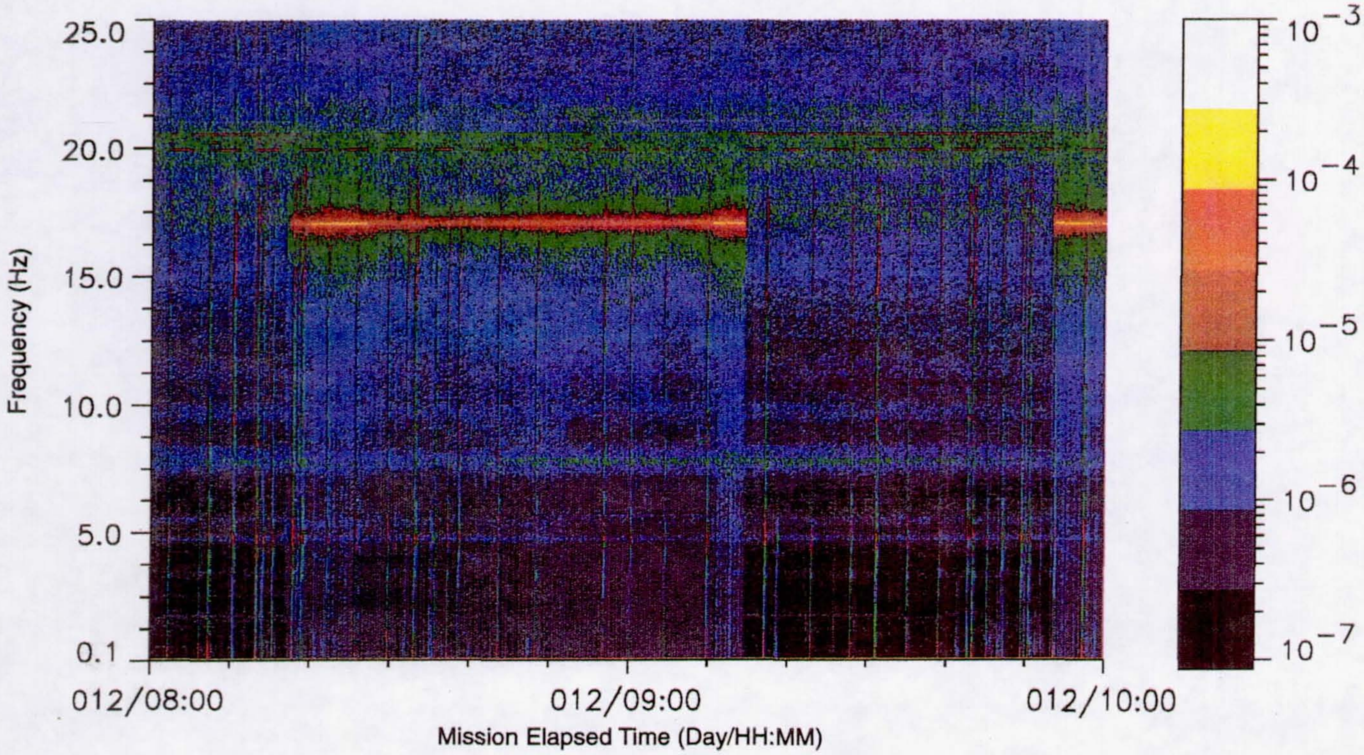


Figure C-101 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



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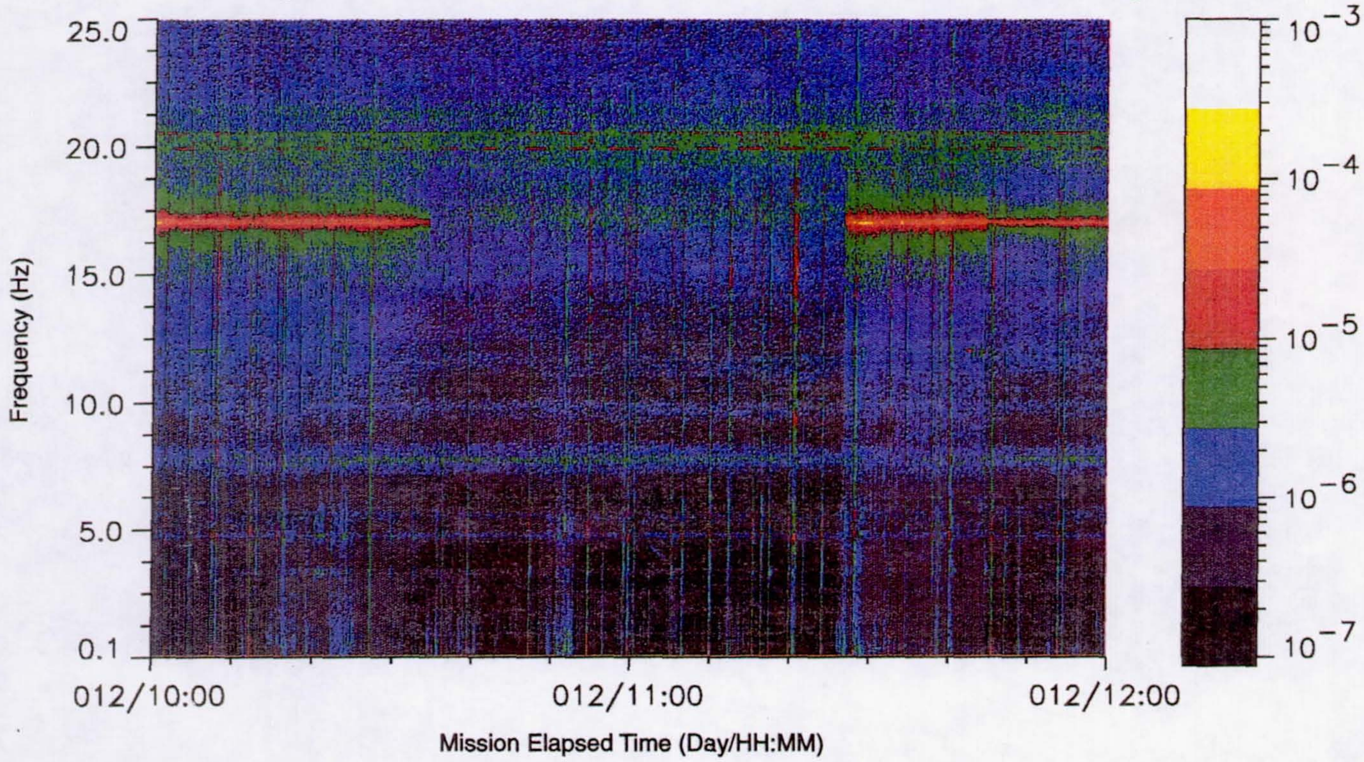

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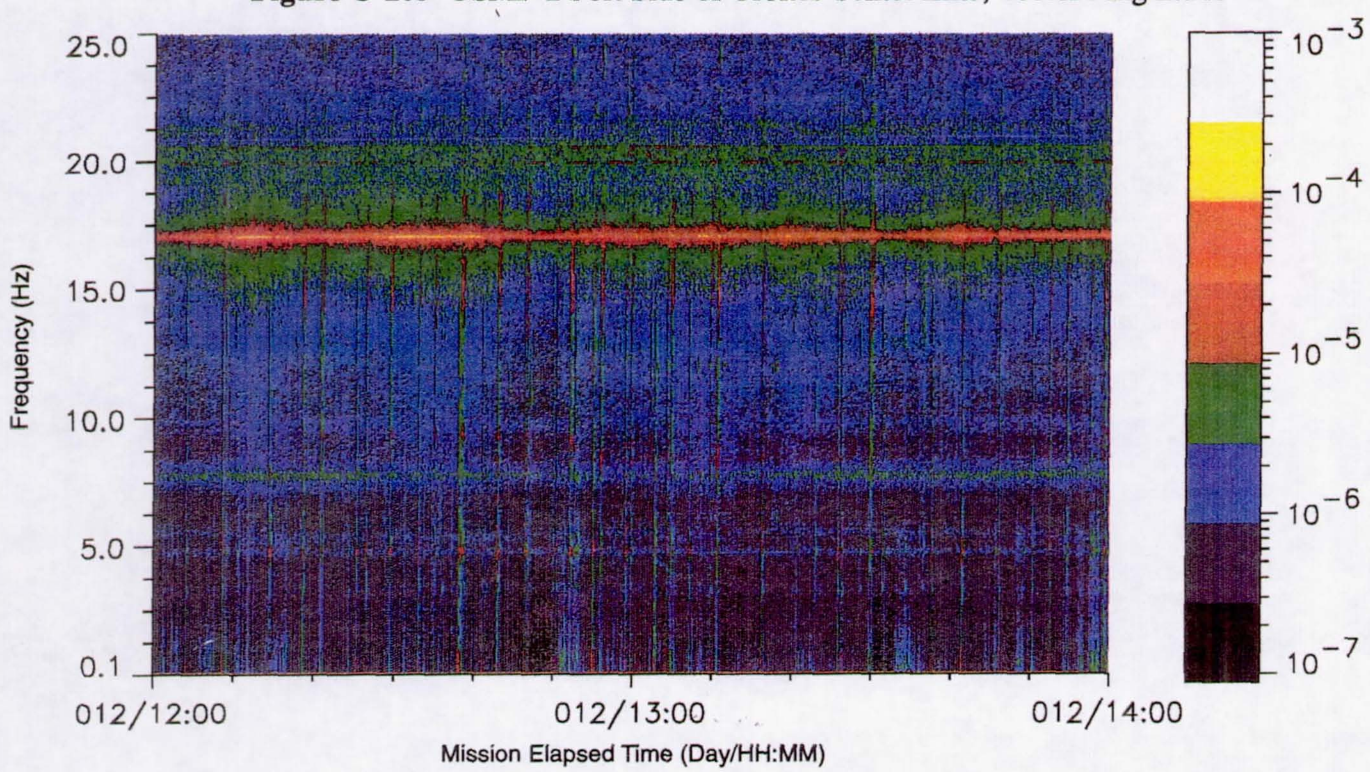


Figure C-104 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude

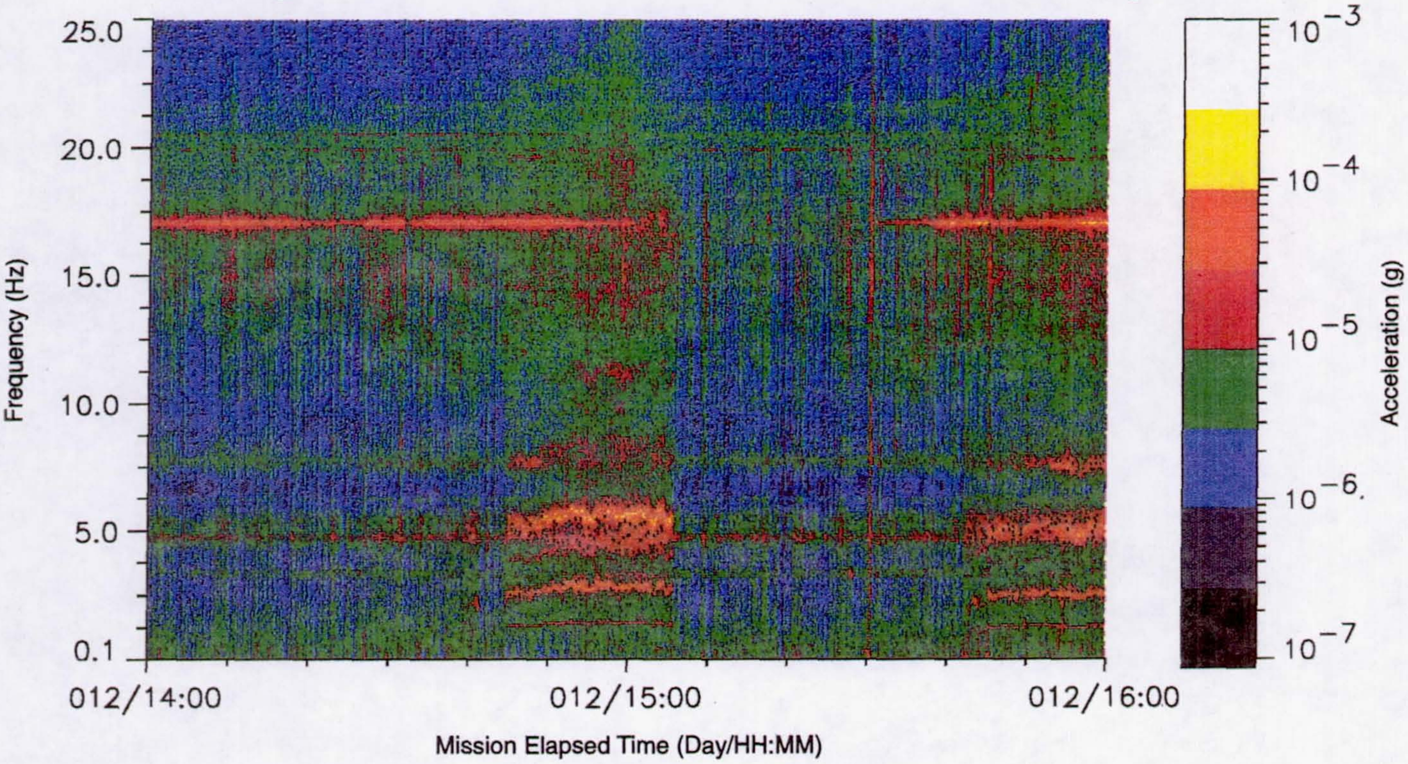
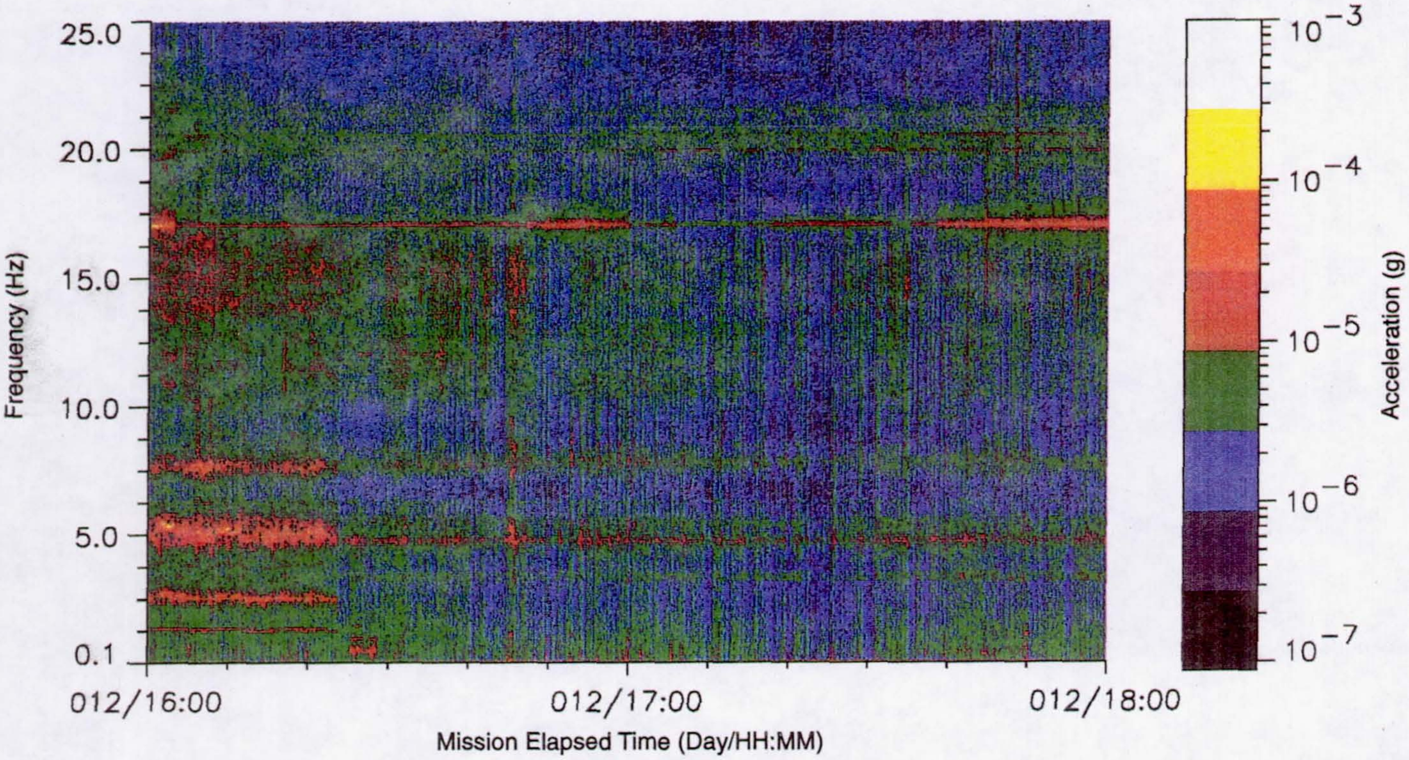


Figure C-105 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



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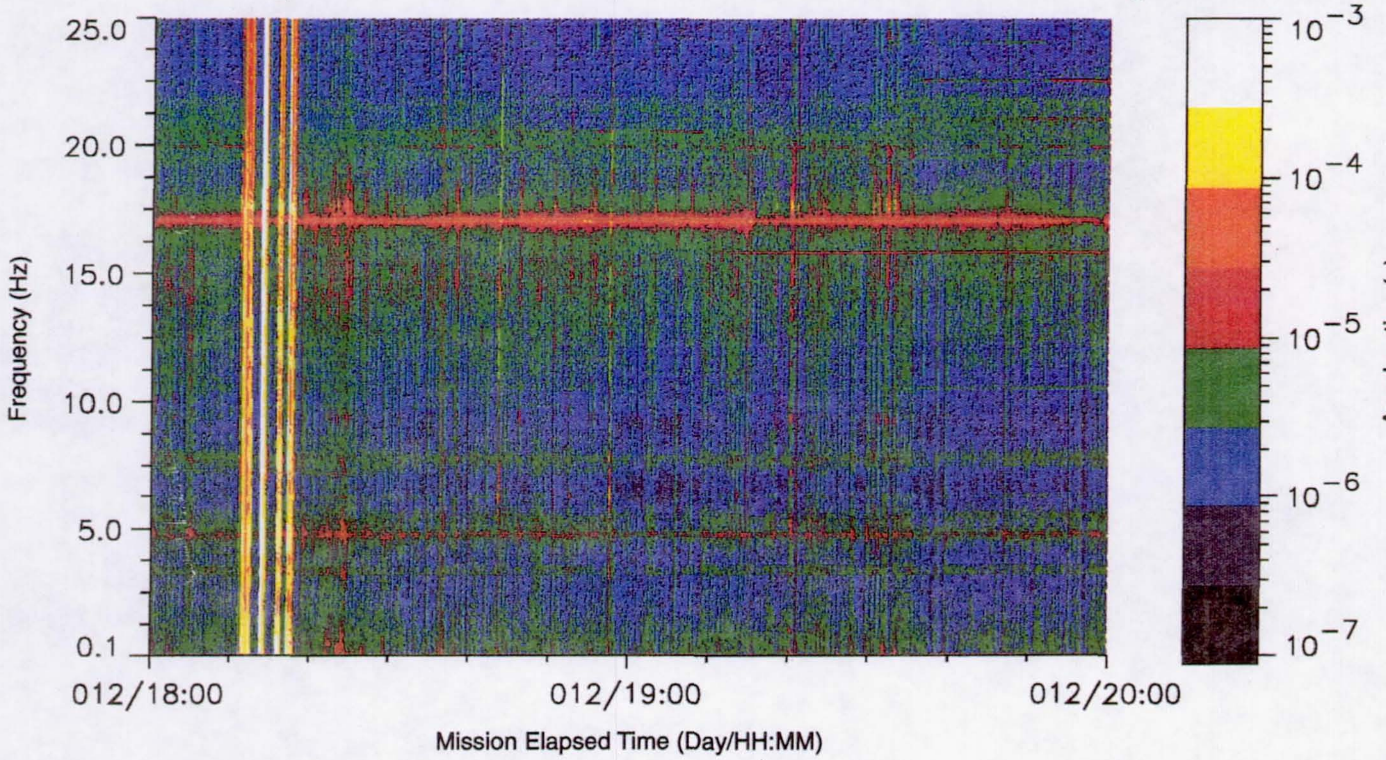

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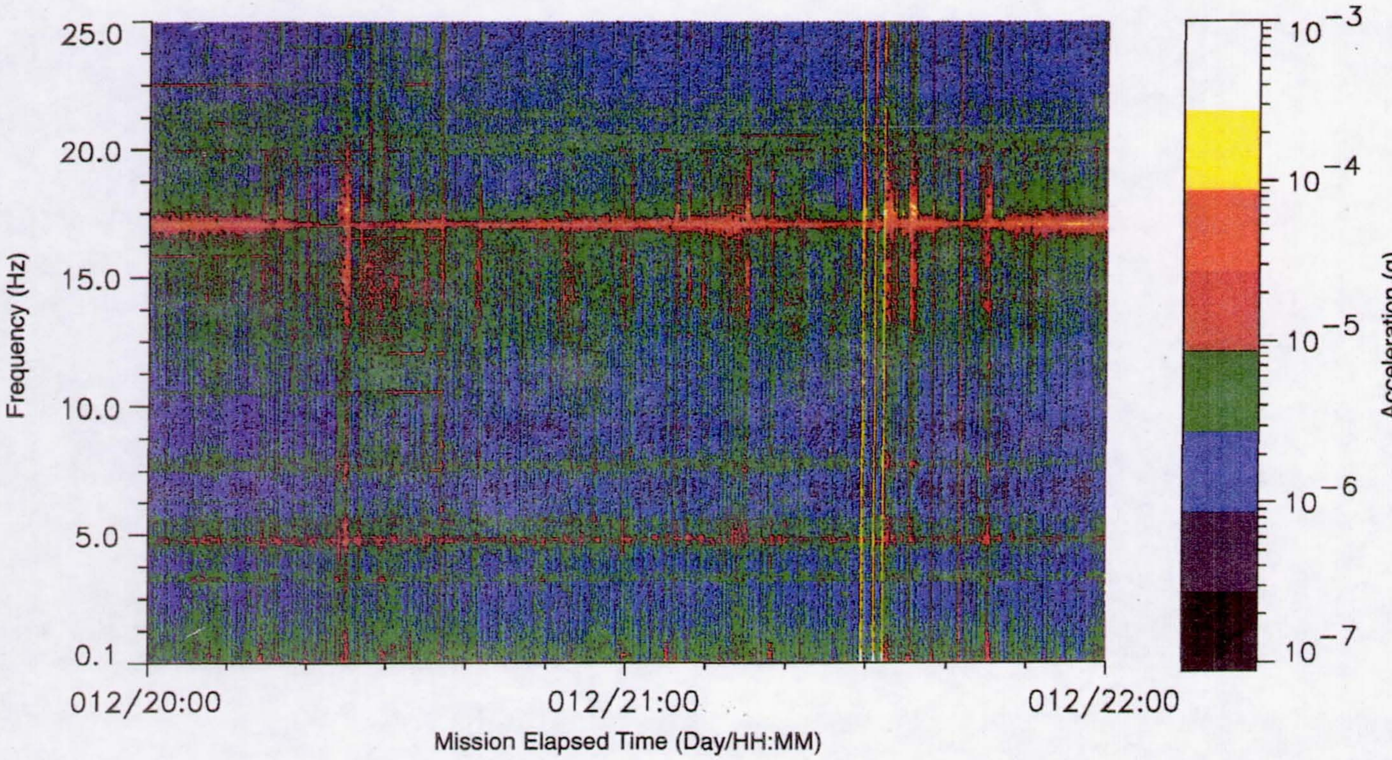

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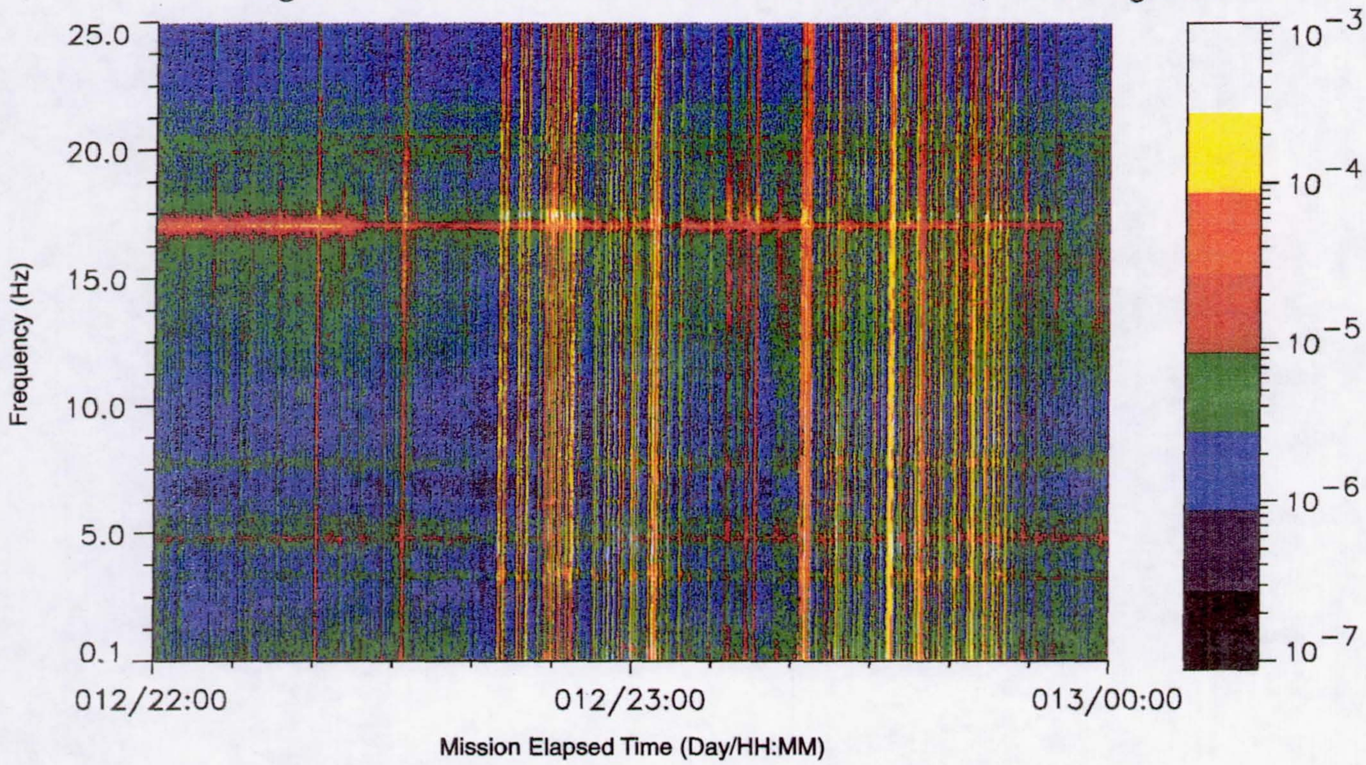

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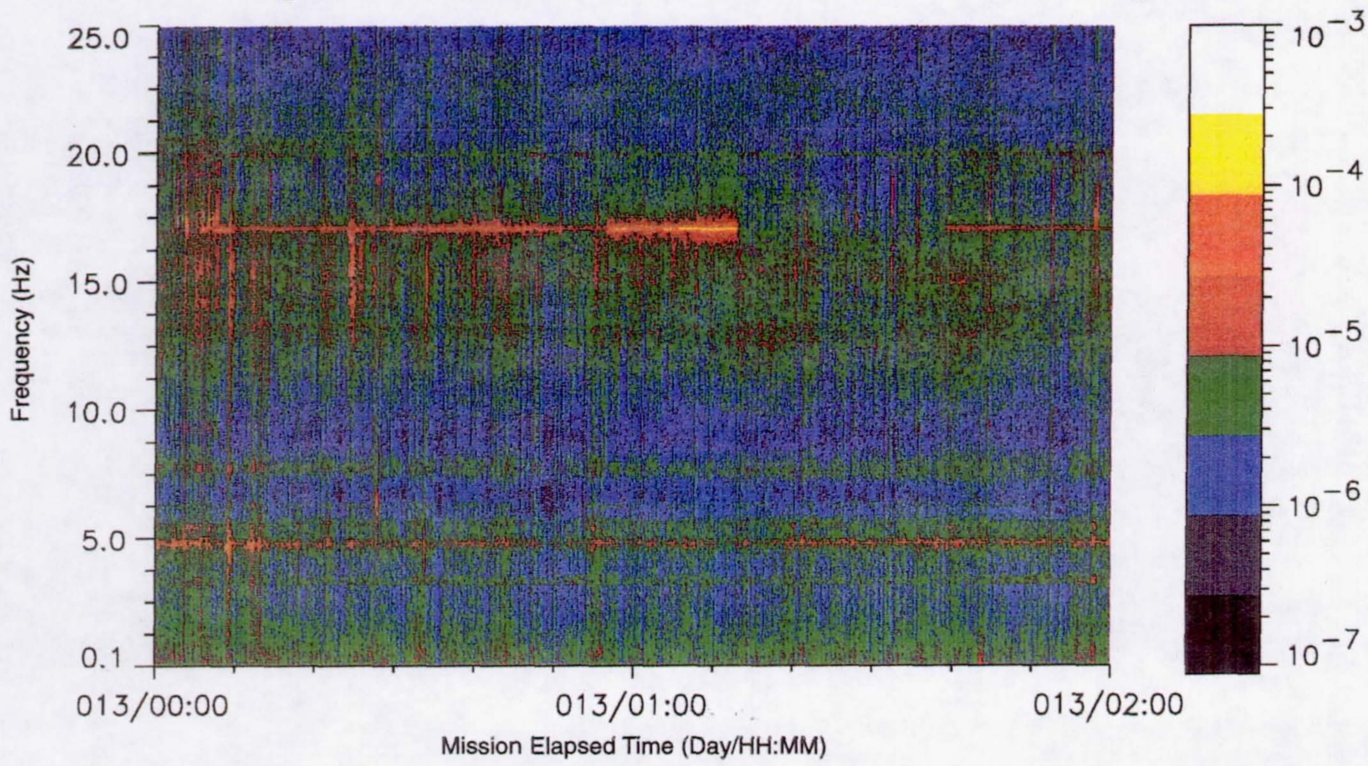

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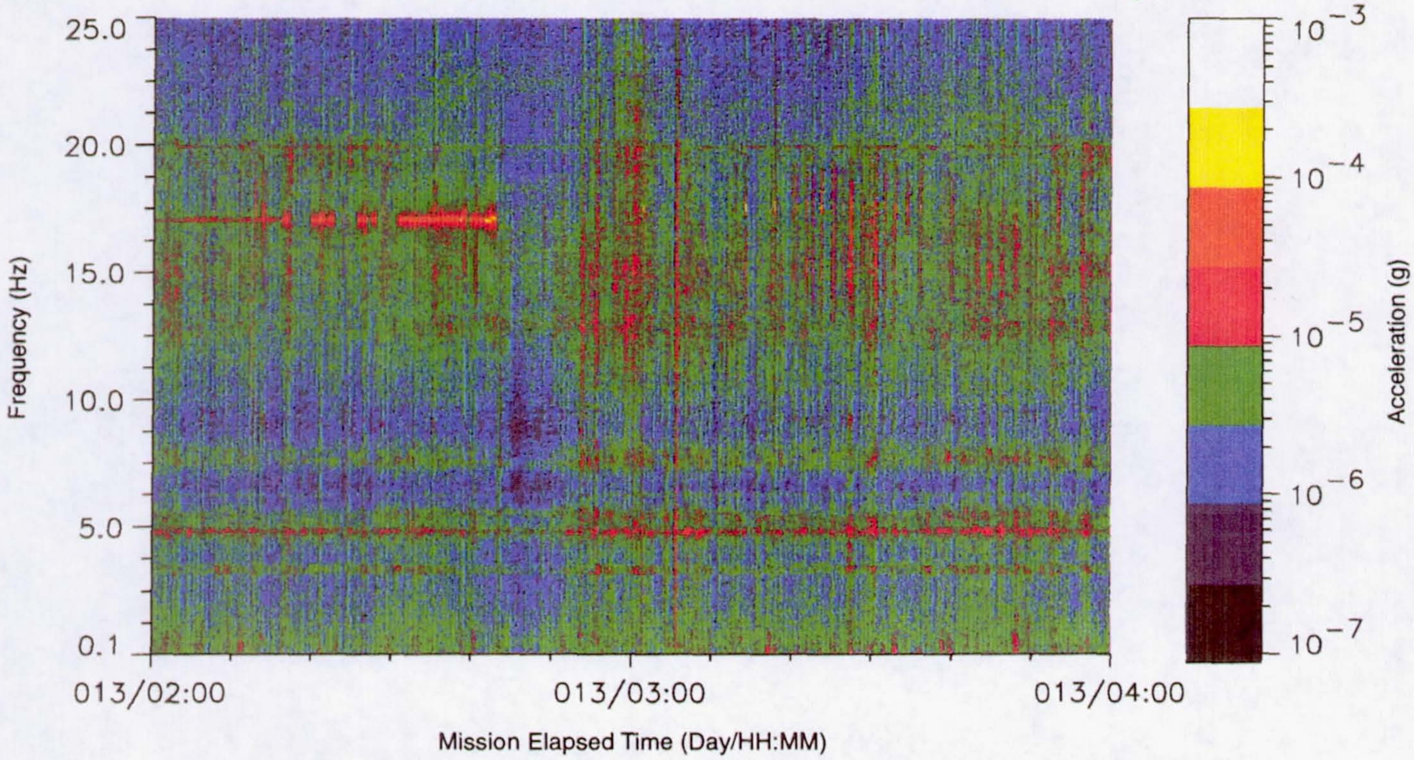

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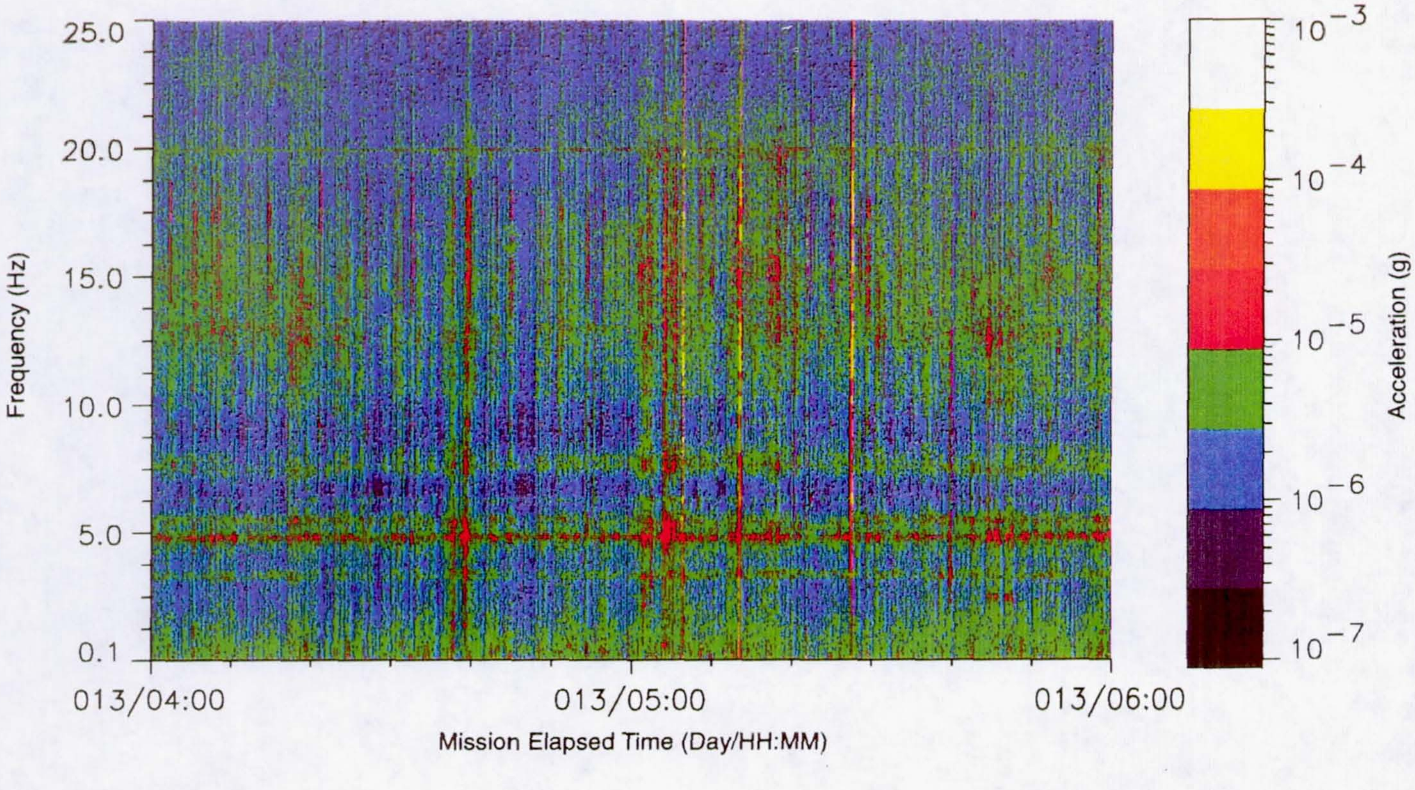

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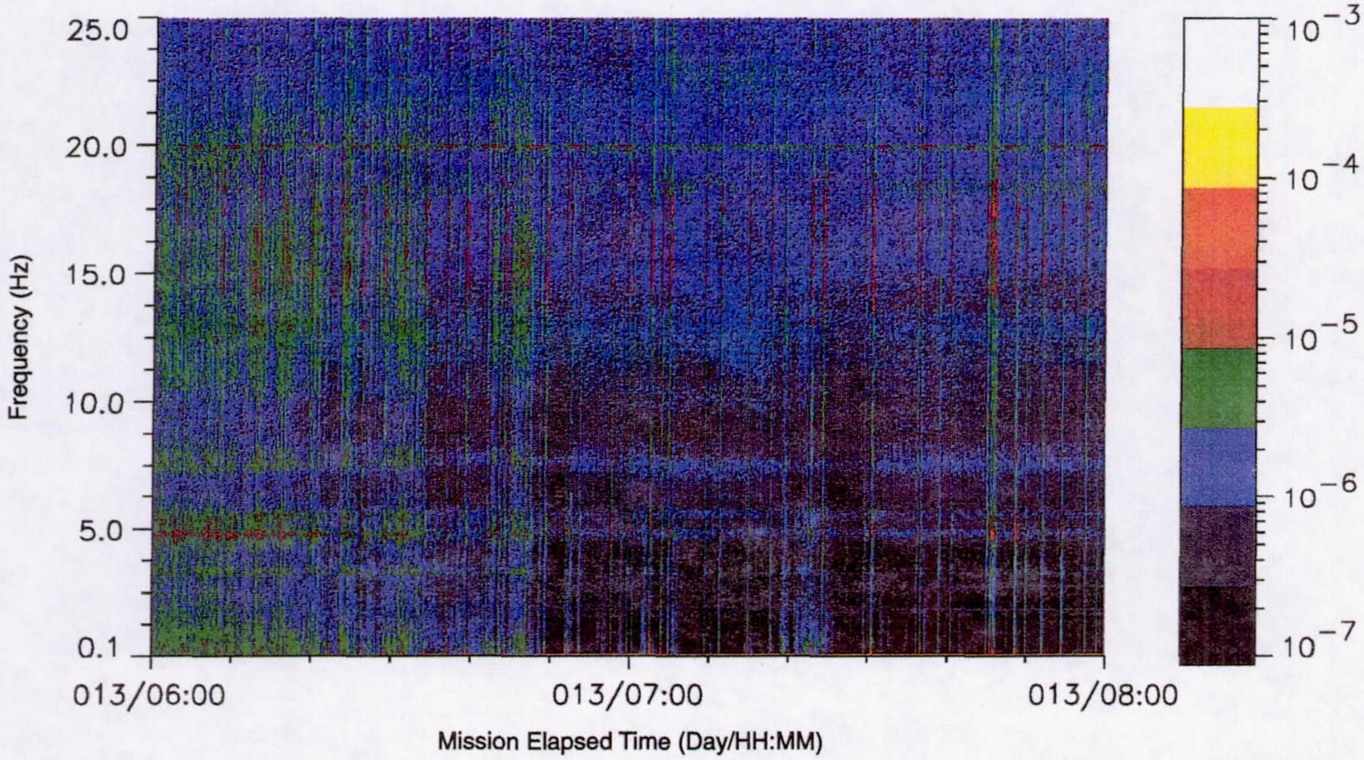
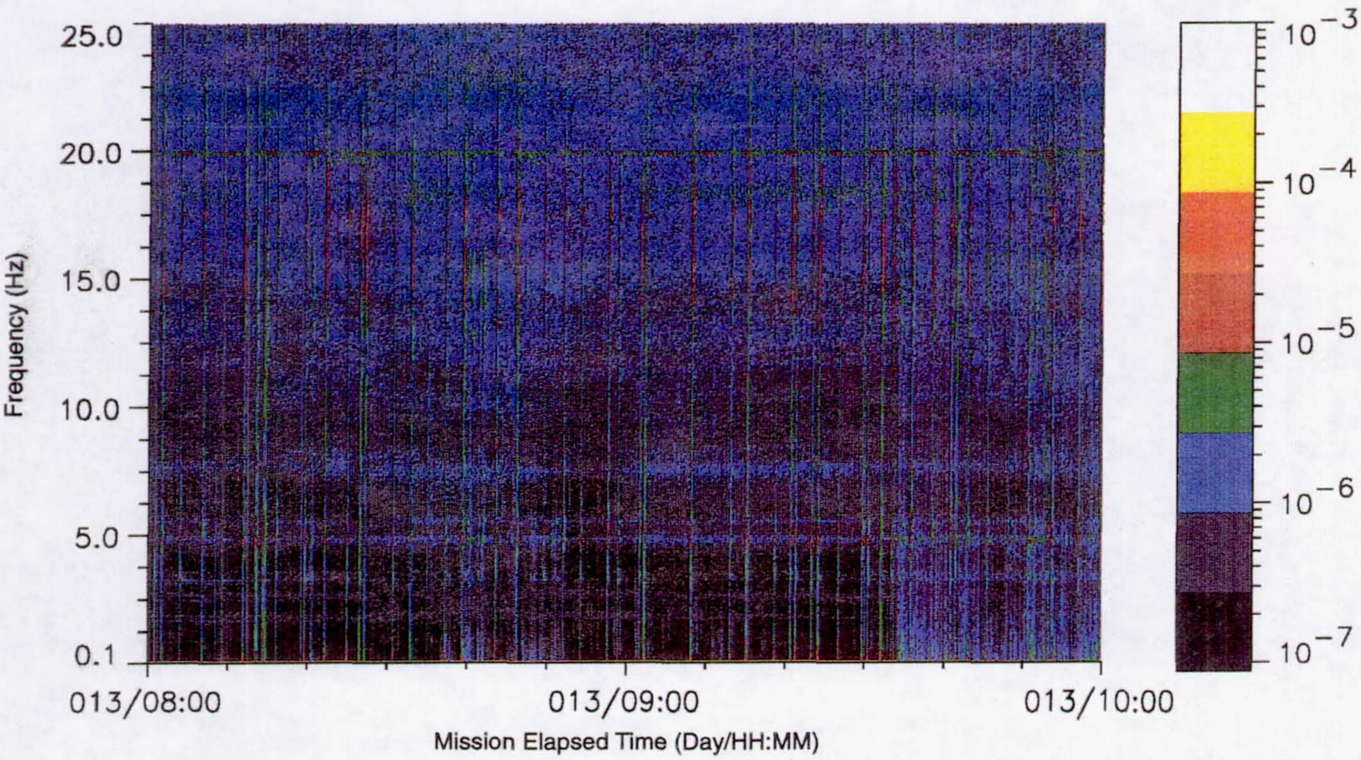


Figure C-113 USMP-2 Port Side of Orbiter Center Line, Vector Magnitude



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APPENDIX D OARE TIME HISTORIES

Accelerometer data collected on Orbiter missions are generally analyzed by the PI or experiment team responsible for the system. The PI Microgravity Services (PIMS) project at the NASA Lewis Research Center (LeRC) was formed in part to support microgravity PIs in the evaluation of acceleration effects on their experiments and to characterize the vibrational environment of the microgravity carriers and vehicles. OARE data collected during STS-62 are presented in Appendix D to provide PIs with an overview of the quasi-steady environment during the mission. The OARE data presented in this report are data saved to EEPROM during the mission and compensated post-flight by Canopus Systems, Inc. for scale factor and bias. The data are presented in Orbiter body coordinates. OARE data in this form are available via a NASA LeRC file server. See Appendix A for information on file server access of OARE data.

Fig. D1 shows the environment recorded by OARE during the extent of the mission. Notable features of the data in Fig. D1 are the differences in acceleration levels between periods when the crew was active and inactive and between the USMP-2 (up to about MET 230 hours) and OAST-2 (after MET 230 hours) portions of the mission. The vibration environment is reduced during crew sleep periods compared to periods of crew activity because some equipment is turned off and crew push-off forces are minimal or non-existent. Fig. D2 is a fifty hour segment of data from Fig. D1. The difference between crew sleep and crew wake periods is evident in this figure. The peaks in the data at about MET 76 hours and the data shift at the same time are related to flash evaporator systems and water dump operations. This is discussed in the body of this report. Fig. D3 is a four hour segment of data from Fig. D1. Detailed interpretation of OARE data and comparison with modeled data are done at this time scale.

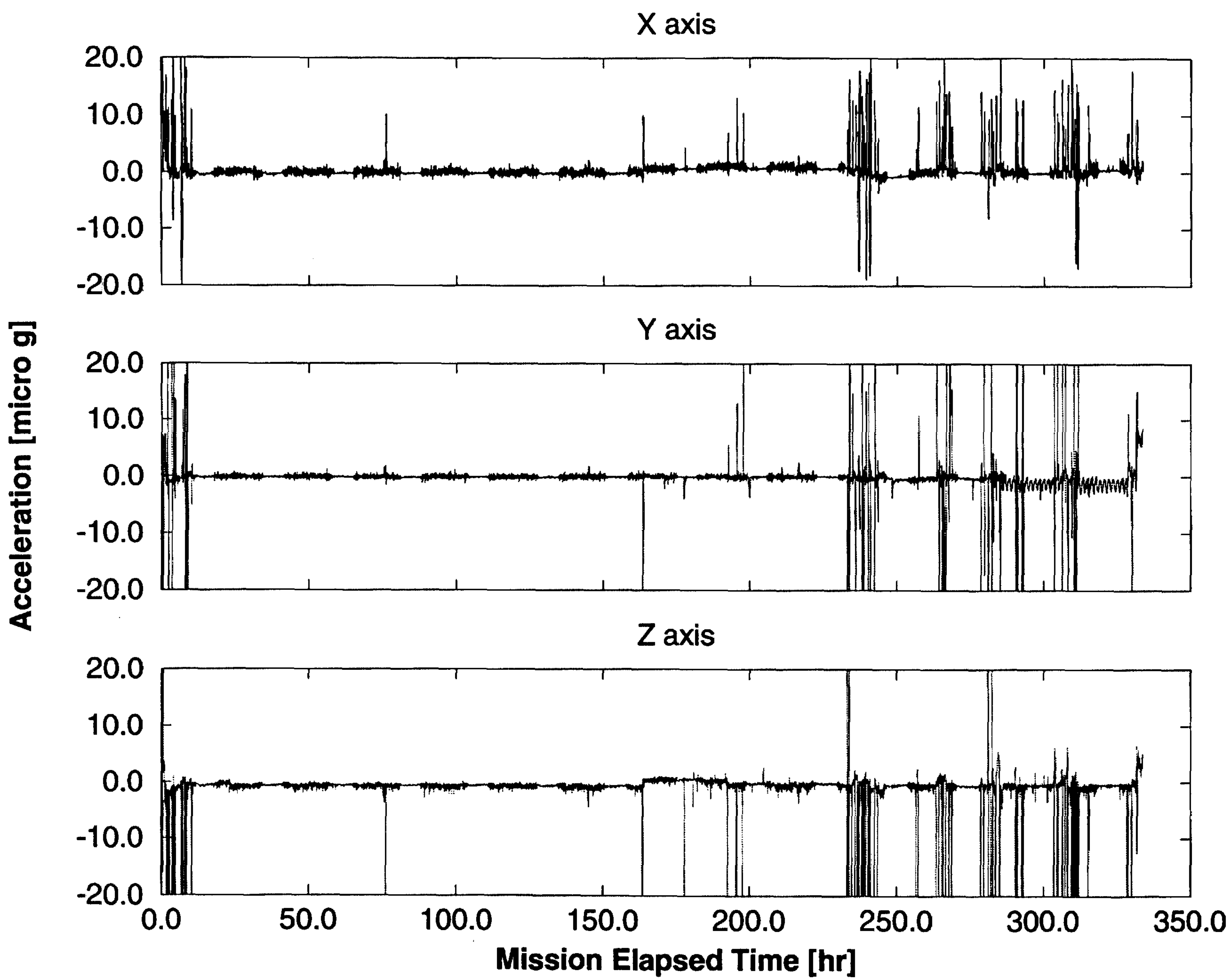
X axis
Y axis
Z axis
Acceleration [micro g]
20.0
10.0
0.0
-10.0
-20.0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
Mission Elapsed Time [hr]

Figure D1

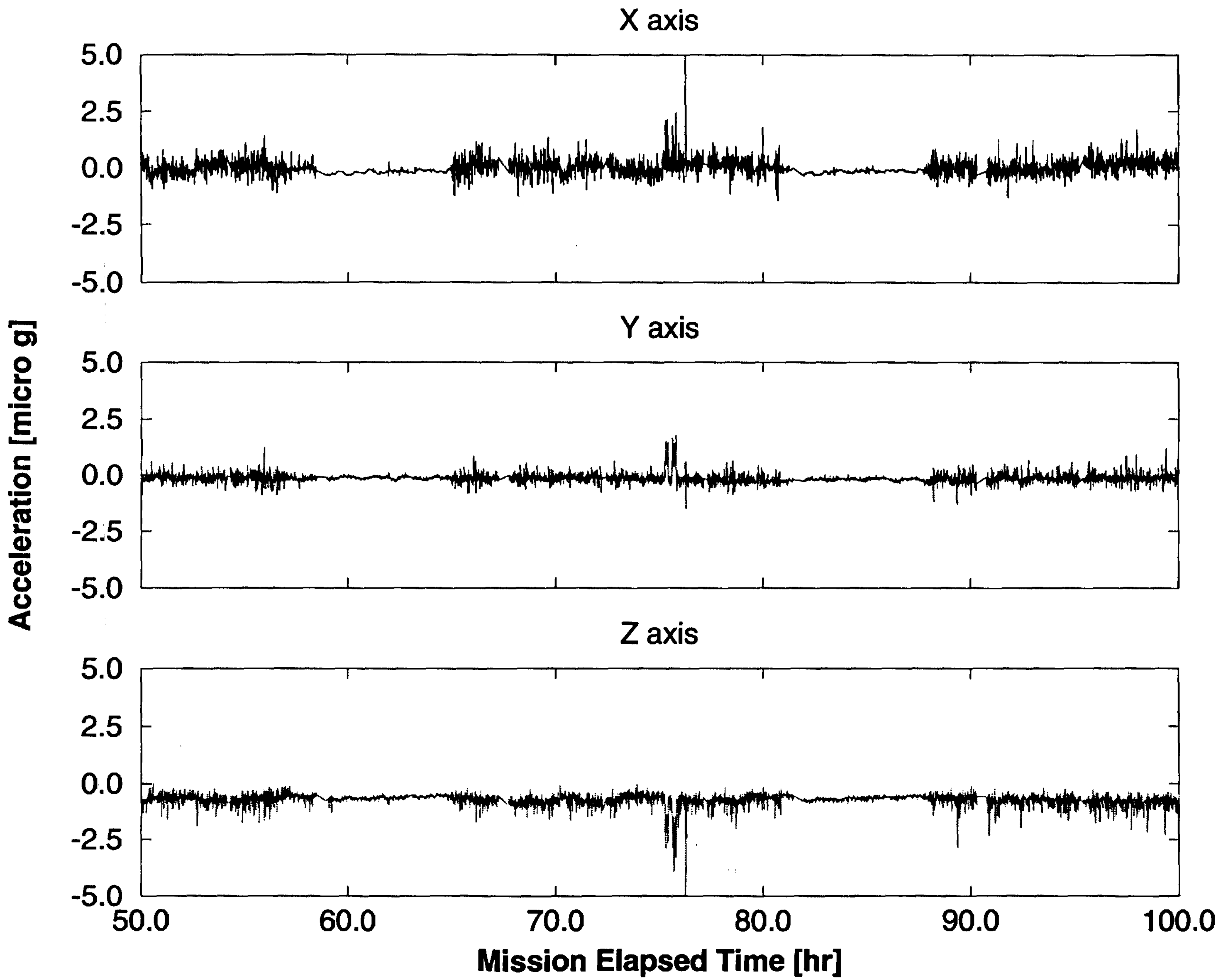
X axis
Y axis
Z axis
5.0
2.5
0.0
-2.5
-5.0
Acceleration [micro g]
50.0
60.0
70.0
80.0
90.0
100.0
Mission Elapsed Time [hr]

Figure D2

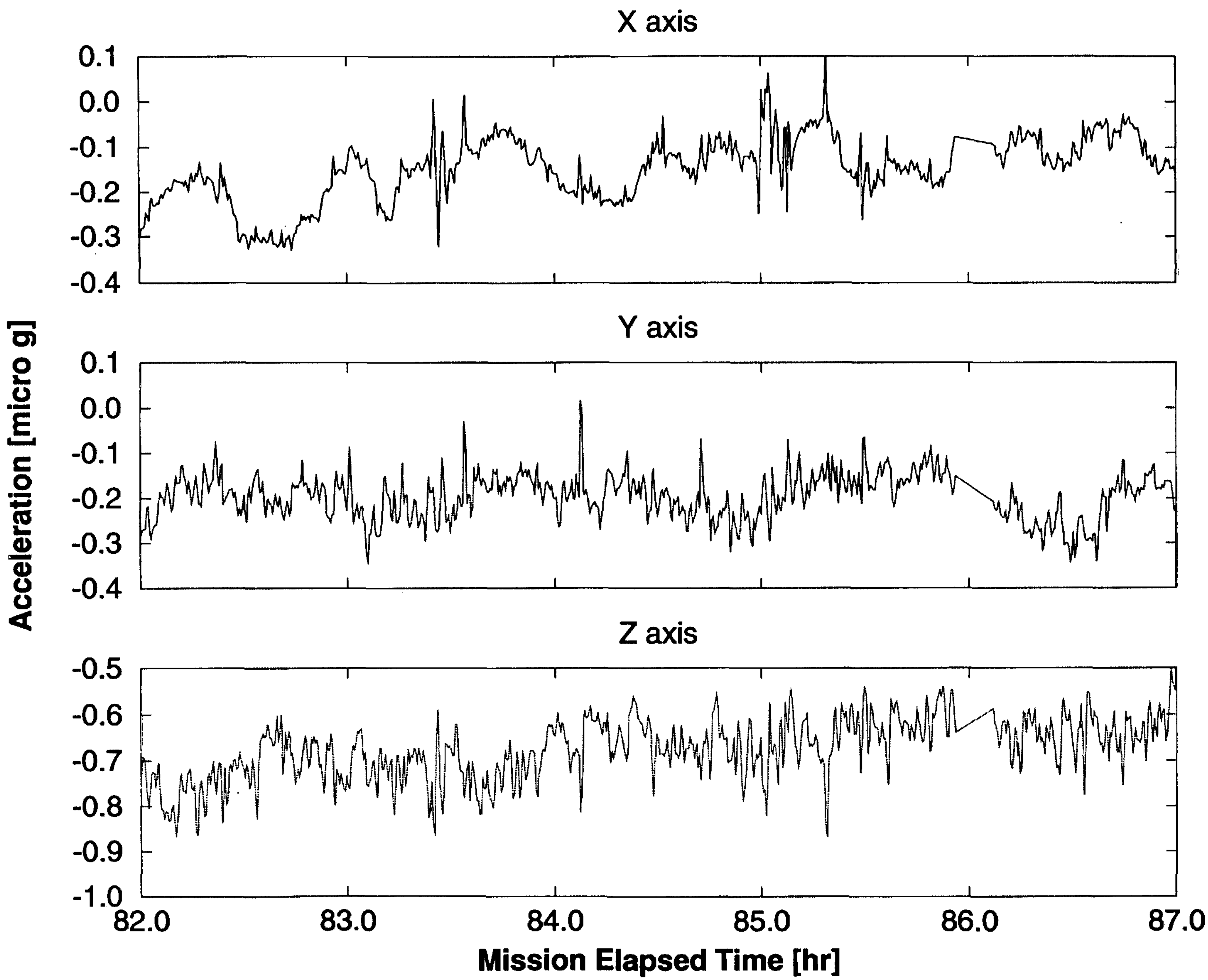
X axis
Y axis
Z axis
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
Acceleration [micro g]
82.0
83.0
84.0
85.0
86.0
87.0
Mission Elapsed Time [hr]

Figure D3

APPENDIX E USER COMMENTS SHEET

We would like you to give us some feedback so that we may improve the Mission Summary Reports. Please answer the following questions and give us your comments.

1. Do the Mission Summary Reports fulfill your requirements for acceleration and mission information? ______Yes ______No If not why not?

Comments:

____

____

2. Is there additional information which you feel should be included in the Mission Summary Reports? ______Yes ______No If so what is it?

Comments:

____

____

3. Is there information in these reports which you feel is not necessary or useful?

______Yes ______No If so, what is it?

Comments:

____

____

4. Do you have internet access via: ____ ftp ____ mosaic ____ gopher ____ other? Have you already accessed SAMS data or information electronically?

______Yes ______No

Comments:

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12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 words)***

The second mission of the United States Microgravity Payload on-board the STS–62 mission was supported with three accelerometer instruments: the Orbital Acceleration Research Experiment (OARE) and two units of the Space Acceleration Measurements System (SAMS). The March 4, 1994 launch was the fourth successful mission for OARE and the ninth successful mission for SAMS. The OARE instrument utilizes a sensor for very low frequency measurements below one Hertz. The accelerations in this frequency range are typically referred to as quasi-steady accelerations. One of the SAMS units had two remote triaxial sensor heads mounted on the forward MPESS structure between two furnace experiments, MEPHISTO and AADSF. These triaxial heads had low-pass filter cut-off frequencies at 10 and 25 Hz. The other SAMS unit utilized three remote triaxial sensor heads. Two of the sensor heads were mounted on the aft MPESS structure between the two experiments IDGE and ZENO. These triaxial heads had low-pass filter cut-off frequencies at 10 and 25 Hz. The third sensor head was mounted on the thermostat housing inside the IDGE experiment container. This triaxial head had a low-pass filter cut-off frequency at 5 Hz. This report is prepared to furnish interested experiment investigators with a guide to evaluating the acceleration environment during STS–62 and as a means of identifying areas which require further study. To achieve this purpose, various pieces of information are included, such as an overview of the STS–62 mission, a description of the accelerometer systems flown on STS–62, some specific analysis of the accelerometer data in relation to the various mission activities, and an overview of the low-gravity environment during the entire mission. An evaluation form is included at the end of the report to solicit users' comments about the usefulness of this series of reports.

14. SUBJECT TERMS

Microgravity environments; Shuttle mission; Acceleration measurements; STS–62; USMP–2; OAST–2

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