

## High Vibration (HV) Receivers

### 1 Introduction

In 2008, NovAtel released high-vibration versions of our OEMV receivers:

- The 1G now comes in two versions, the OEMV-1G, which is the standard version, and the OEMV-1G-HV, which is the high-vibration version.
- The OEMV-3 still only comes in one version but the vibration performance has been improved to the same level as the OEMV-1G-HV.

In this application note, we will refer to the OEMV-1G-HV and the improved version of the OEMV-3 as the HV versions.

The HV versions use a high performance TCXO. Where the vibration specification for NovAtel's standard receivers is 7.7 GRMS random vibration, the HV version is rated at 19.4 GRMS.

For our vibration testing, we have followed the procedures outlined in *MIL-STD-810G Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests*. We have modified MIL-STD-810G method 514.6 category 24: All materiel – minimum integrity tests.

### 2 Test Method

We conducted the testing using our DS2200 vibration system, shown in Figures 1 and 2.



Figure 1 DS2200 Vibration System

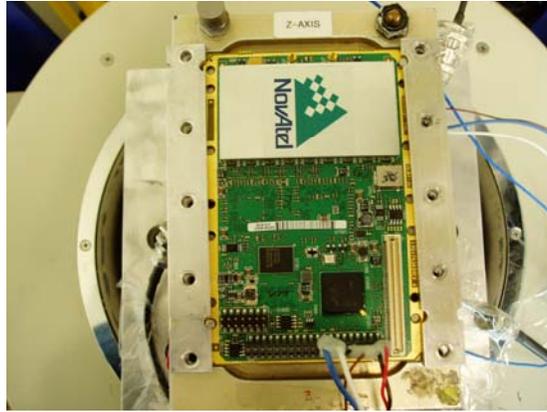


Figure 2 DS2200 Control Panel

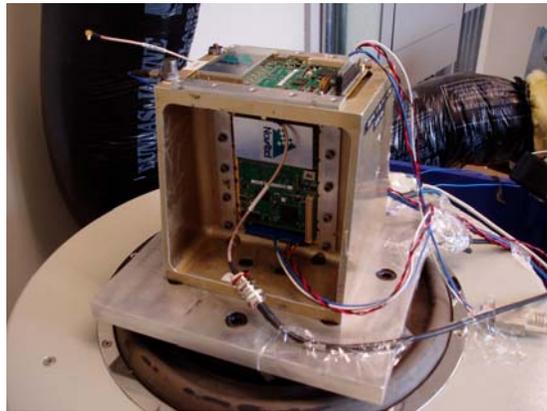
For each HV board variant, three boards were mounted in a test jig, which was installed on the DS2200 vibration system. This allowed simultaneous vibration testing of each board in the x, y and z axes, as illustrated in Figure 3, Figure 4 and Figure 5.

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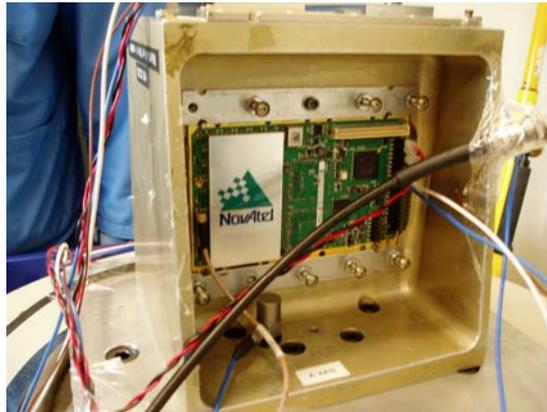
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**Figure 3 OEMV-3 z-axis Mounting**



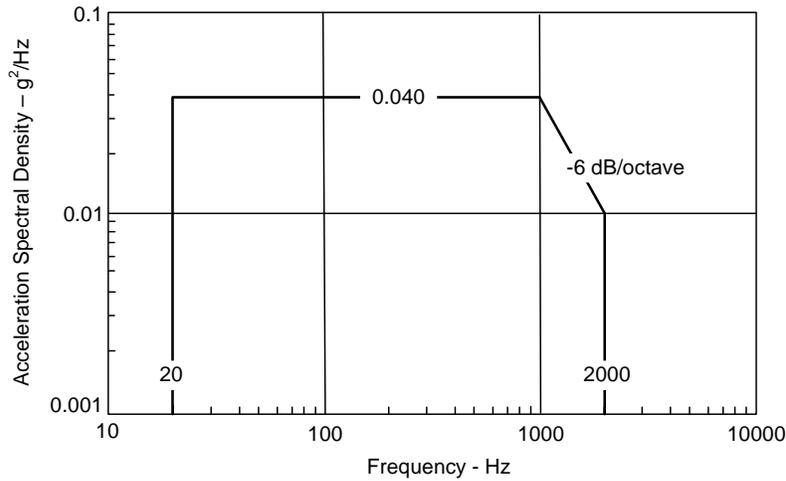
**Figure 4 OEMV-3 y-axis Mounting**



**Figure 5 OEMV-3 x-axis Mounting**

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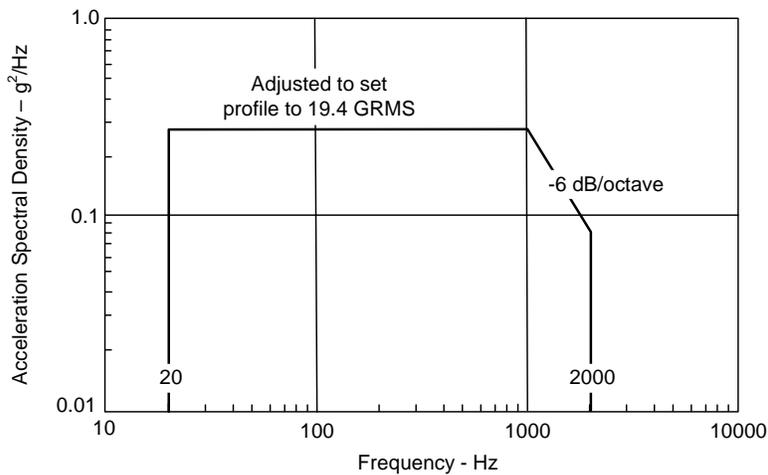
The minimum integrity test profile, taken from MIL-STD-810G method 514.6 category 24, is shown in Figure 6.



**Figure 6 Minimum Integrity Test Profile**

The acceleration spectral density for the minimum integrity test is 0.04  $g^2/Hz$  from 20 to 1000 Hz then it drops off at 6 dB/octave from 1000 to 2000 Hz. The test duration is one hour per axis (x, y and z); rms = 7.7 G.

To test the HV versions, NovAtel modified this minimum integrity test profile, as shown in Figure 7.



**Figure 7 Modified Integrity Test Profile**

The modified profile results in a random vibration level of 19.4 GRMS. This profile was applied to each axis (x, y and z) for duration of 0.5 hour.

### 3 Test Results

As illustrated in Figure 8, the HV receivers locked on all available satellites and maintained this lock through the duration of the 19.4 GRMS vibration test.

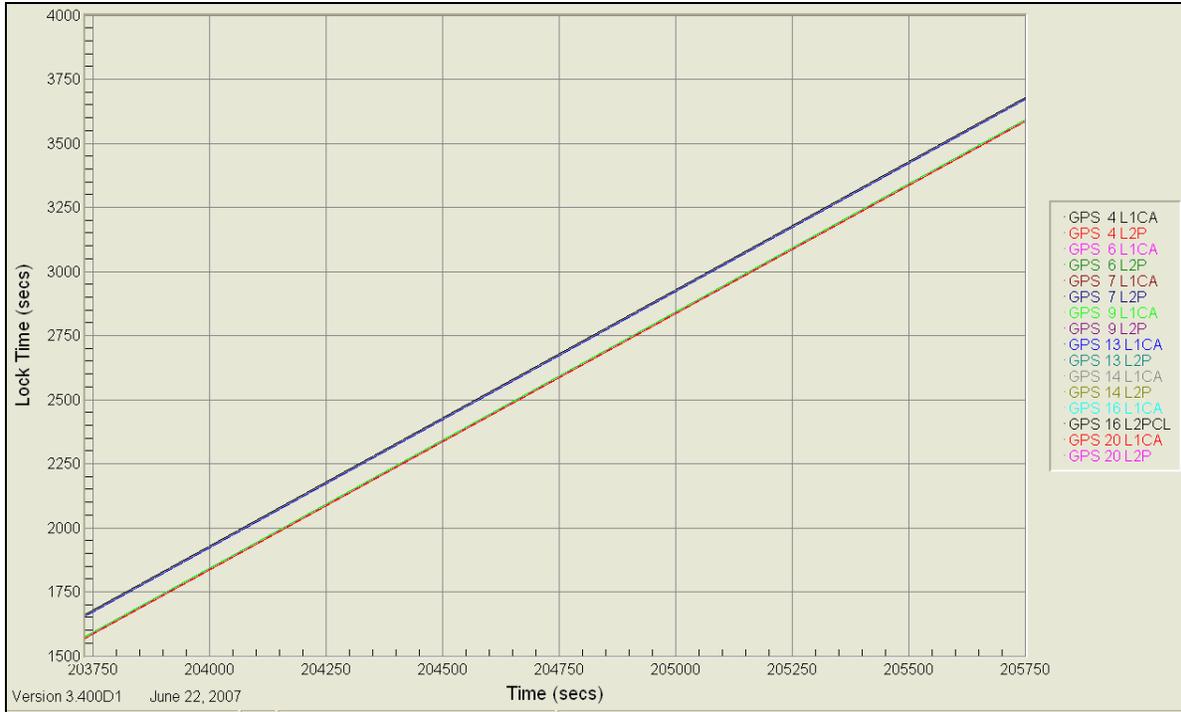


Figure 8 OEMV-3 Lock Time

The OEMV-1G-HV passed the same tests as the OEMV-3.

### 4 Recommendations

Proper mounting of HV receivers is necessary to meet the vibration specification. In particular, HV modules need to be securely anchored along their longer dimension, on both sides. Recommended mounting of the OEMV-3 is illustrated in Figure 9 and Figure 10:

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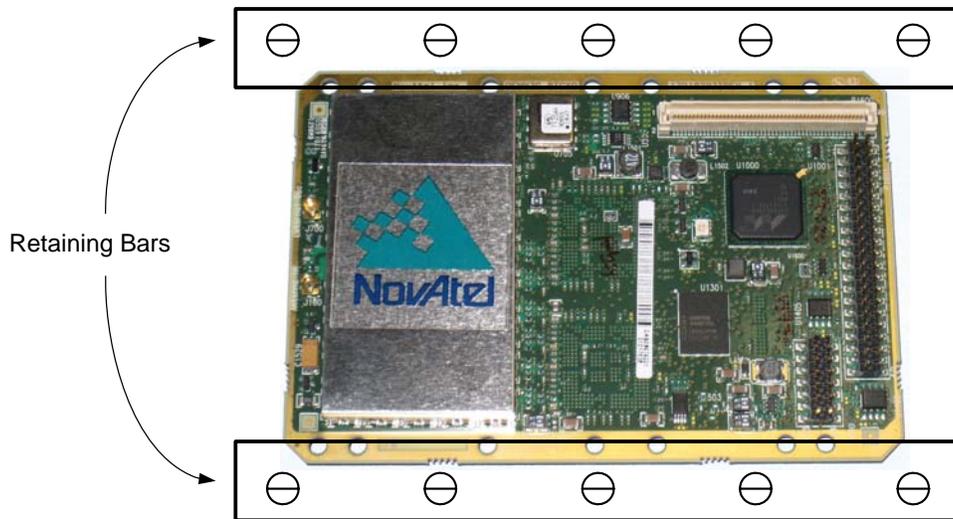


Figure 9 Recommended Mounting – OEMV-3 – Plane View

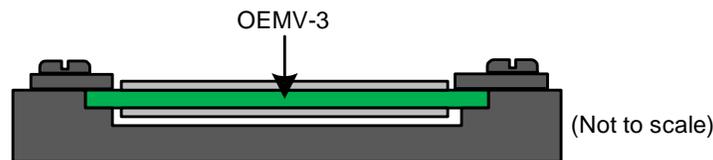


Figure 10 Recommended Mounting – OEMV-3 – Cross-sectional View

As shown, a retaining bar should be run along the full length of the long sides of the OEMV-3 and screwed to the body of the enclosure or fixture to securely anchor the board. Holes in the board should not be used for mounting HV modules to standoffs. Clearance should be provided above and below the board for components and connector headers. As well, the retaining bar should be installed so that it does not short out signal lines on the module; i.e., it should only come into contact with ground lines.

Both the RF connector (connected to J100) and the power/signal connector (connected to P1601) should be secured by clamping them either from the top of the connectors or onto the body of the enclosure as close to the connectors as possible. This will prevent the card from intermittently losing signals/power during high vibration, especially in the z-axis.

Similar mounting is recommended for the OEMV-1G-HV.

## 5 Customer Service Contact Information

If you require any further information regarding the topics covered within this application, please contact:

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