G-Link2™-LXRS®

Resonance Sweep

Overview

The G-Link2™-LXRS® Wireless Accelerometer Node is a high resolution, high accuracy accelerometer measurement system for use in any number of vibration sensing and sustained acceleration data collection scenarios. As such, it is necessary to quantify the natural frequency and harmonic behavior of the G-Link2™-LXRS® package for use in these applications.

Testing

Testing was accomplished on a Labworks dynamic shaker table, utilizing a Labworks control unit and amplifier, and VibrationVIEW software. A **2*g* peak-to-peak sine signal swept from 10 – 2200 Hz** was used as the reference test acceleration magnitude and bandwidth respectively. Initial acceleration data was collected solely on the calibration baseplate and system to measure reference harmonic behavior prior to mounting any electronics. Calibration baseplate harmonic data was collected for each axis of excitation.

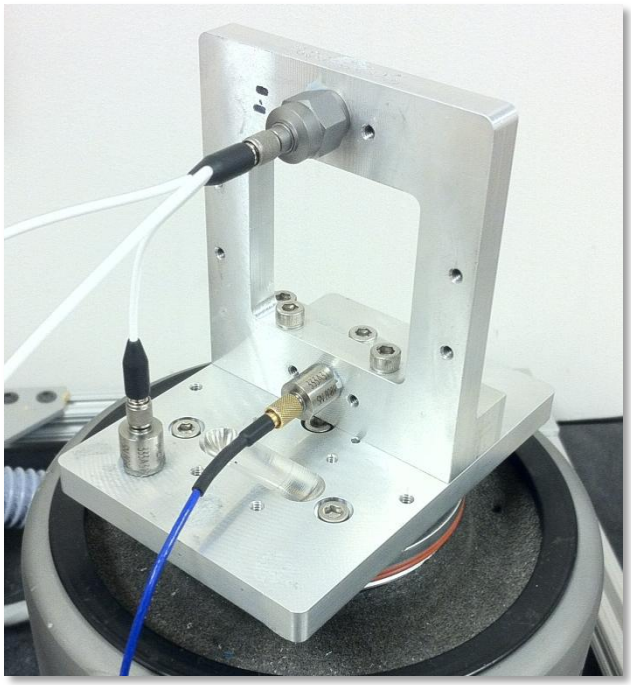

Figure 1: *Collecting Reference Acceleration Data on Calibration Fixture*

Accelerometer measurements were then taken for each of the three axes of use for the G-Link2™-LXRS®. The resultant acceleration data was plotted against the baseplate reference acceleration data as shown below.

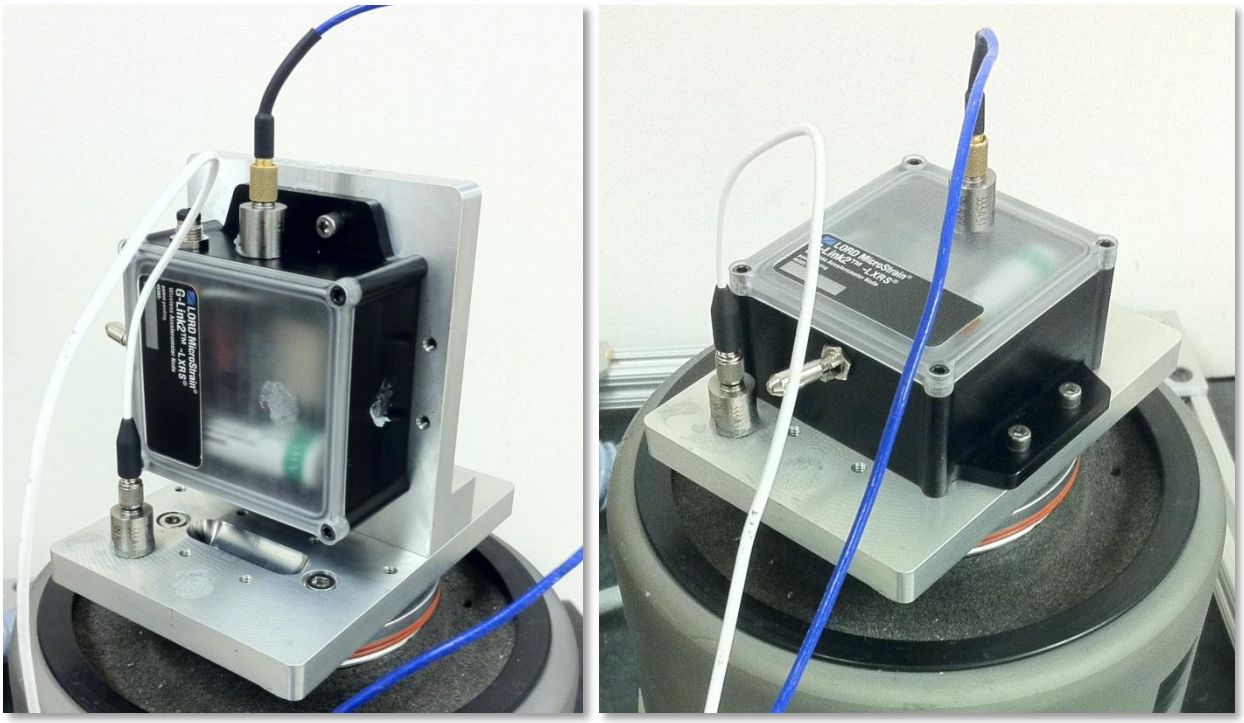

Figure 2: *G-Link2™-LXRS® Axis 2 (left) and Axis 3 (right) Resonance Testing*

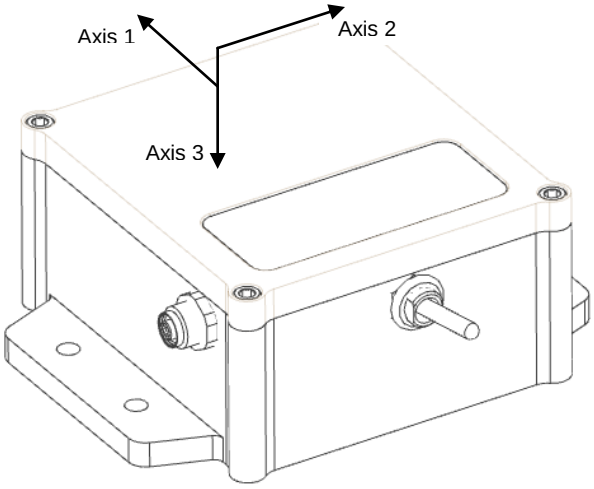

Figure 3: *G-Link2™-LXRS® Axis Convention*

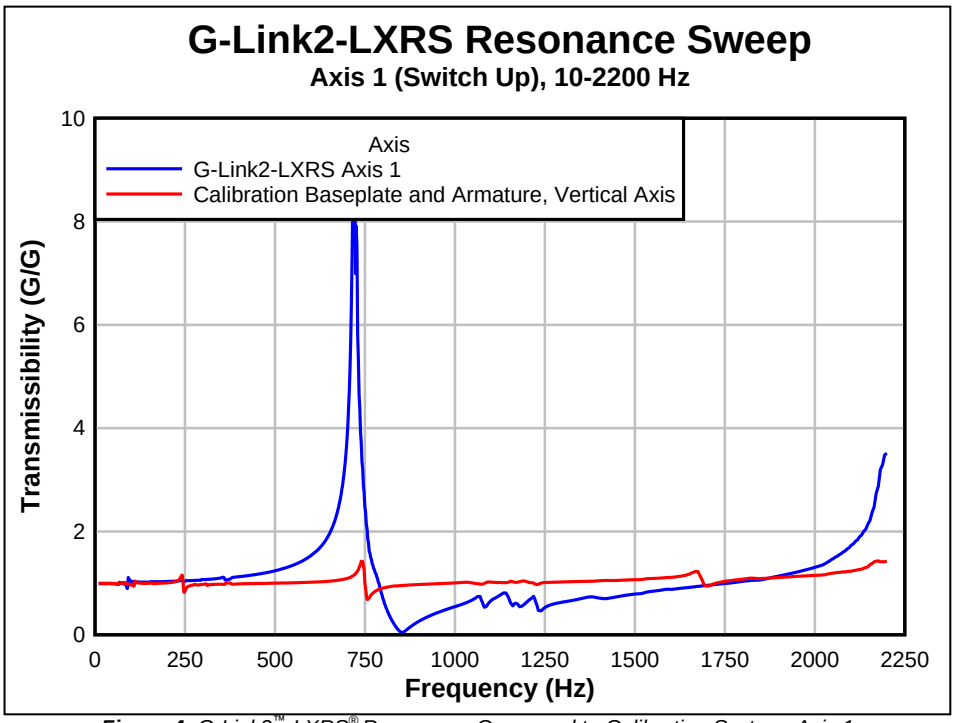

Figure 4: *G-Link2™-LXRS® Resonance Compared to Calibration System, Axis 1*

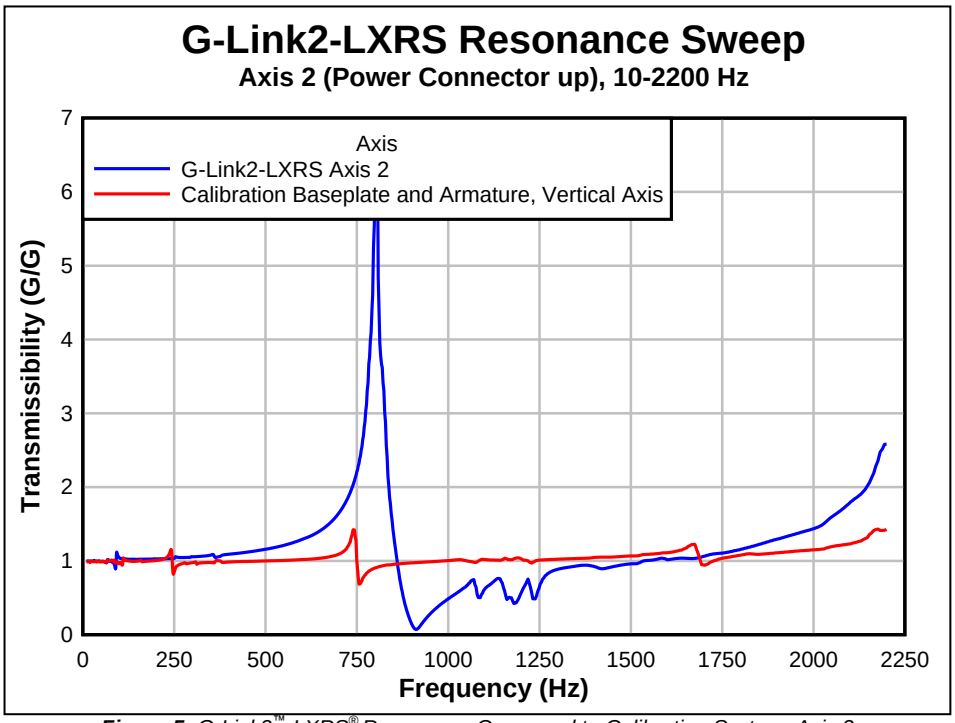

Figure 5: *G-Link2™-LXRS® Resonance Compared to Calibration System, Axis 2*

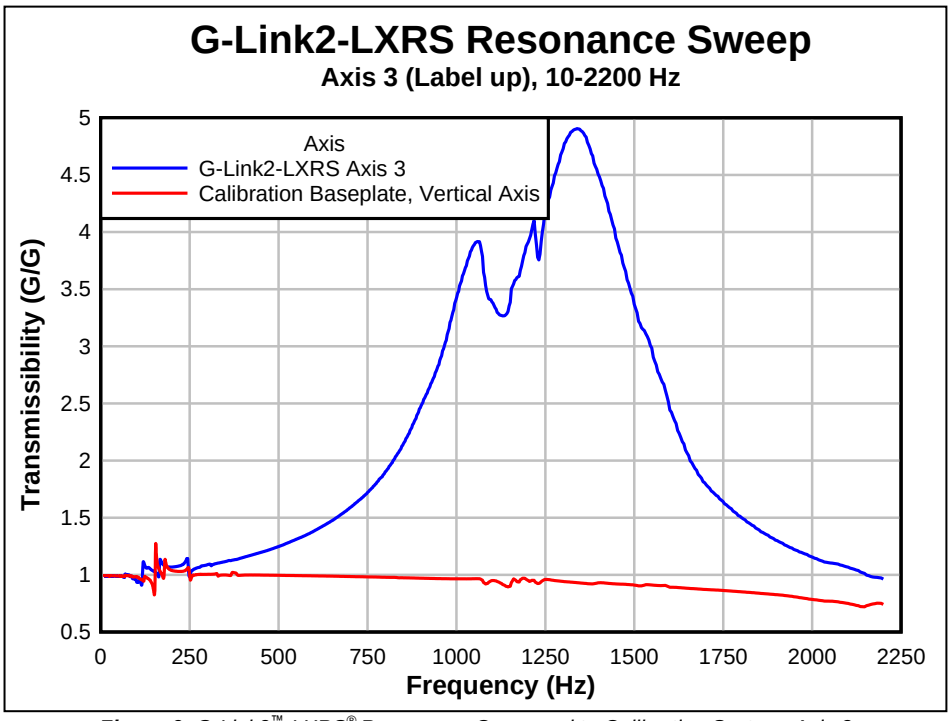

Figure 6: *G-Link2™-LXRS® Resonance Compared to Calibration System, Axis 3*

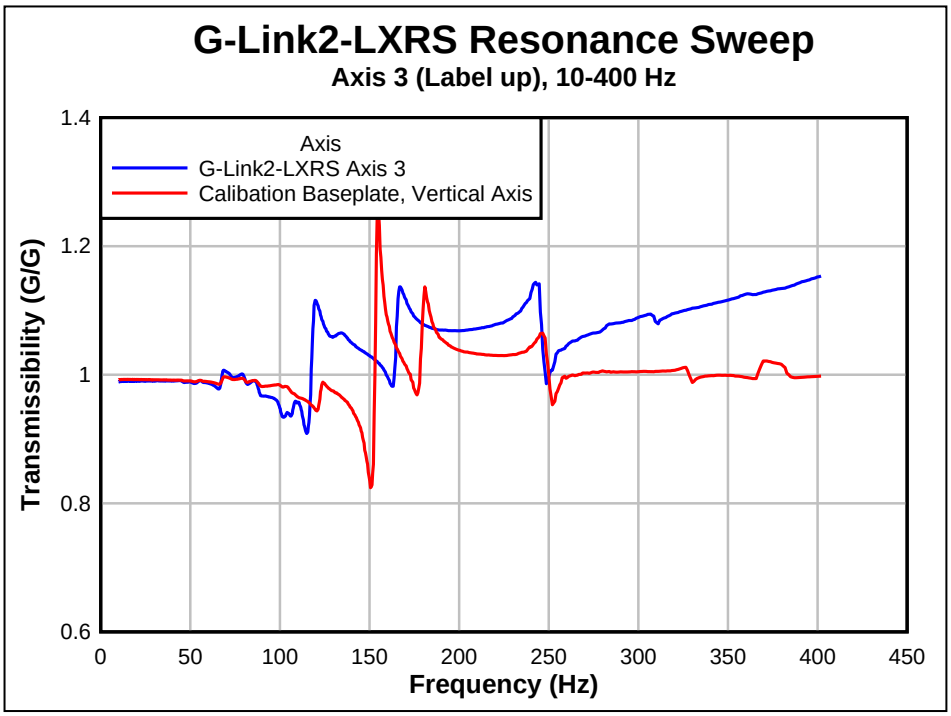

Figure 7: *Reference System Harmonics and Phase Shift*

Axis	Fundamental Frequency (Hz)
1	718
2	806
3	1058

Table 1: *G-Link2™-LXRS® Sensor Fundamental Frequencies per Axis*

Harmonic activity within ~100 to 250 Hz bandwidth was attributed to calibration system excitation behavior. This activity is shown in Figure 7, where calibration baseplate fundamental excitation is characterized in both data sets. The phase shift in characteristic behavior is a result of system mass and stiffness change once the G-Link2™-LXRS® module is mounted to the baseplate. Typically, increasing system mass alone results in a decrease in natural frequency, and an increase in system stiffness results in a higher natural frequency. In this case, system mass had a larger effect on fundamental frequency than system stiffness; this resulted in a lower total system natural frequency with the G-Link2™-LXRS® module installed on the calibration baseplate.

The lowest resonance exhibited by the G-Link2™-LXRS® module was 718 Hz; however the accelerometer bandwidth -3db point is 100 Hz. Customers should plan to capture meaningful data based on the accelerometer specification bandwidth.

The standard G-Link2™-LXRS® product offering is factory calibrated at one half of its acceleration dynamic range at a target frequency of 25 Hz.

Support

LORD MicroStrain® support engineers are always available to expand on this subject and support you in any way we can. Please contact Dan O'Neil daniel.oneil@lord.com.

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