

Vibration Comparison of Overhead Line Pillars at TEST Bk.15 & TEST Bk.11

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Executive Summary

Vibration assessment was performed on **Overhead Line Pillars at TEST Bk.15 & TEST Bk.11** for multiple sensors. The analysis incorporated root mean squared calculation & peak detection and a comparison was made between the two positions. The sensor data are plotted / analyzed under the same time frame (same start time and end time) after omitting the non-traffic hours (defined by no significant vibration detected).

It was found that:-

- a) When looking at the RMS vibration, position TEST Bk.11 have generally higher vibration for Z and Y axis compared with position TEST Bk.15.
- b) When looking at the peak vibration, there is no significant difference for X and Z axis except for Y axis position TEST Bk.11 have generally higher peaks than TEST Bk.15.

Note that all analysis were made relative to each other and this does not constitute that either positions have “abnormally high vibration”. For such comparisons larger samples are needed from similar and different locations along with an understanding of the component fatigue/failure records.

Location	Z RMS (mG)	Y RMS (mG)	X RMS (mG)
TESTBk_15_ID104	44	81	24
TESTBk_15_ID105	45	79	27
TESTBk_11_ID107	110	107	32
TESTBk_11_ID106	113	107	32

- Note: ID104 and ID105 were installed on the same location (1 sensor as backup)
- Similarly, ID106 and ID107 were installed on the same location as well.

Setup

Test date: 10/04/2015 5:20am to 11/04/2015 1:33am

Test locations:

1. TESTBk_11_ID106
2. TESTBk_11_ID107
3. TESTBk_15_ID104
4. TESTBk_15_ID105

VSENSOR 3-axis digital accelerometers were installed and set to 16G Force mode.

Photographs:



Note: Z axis through page, X axis is vertical, Y axis is horizontal.

Analysis Methodology

Vibration is represented by the calculation of the root mean squared & vibration peak. These values are then benchmarked with other measurement locations of the same time frame for comparison purposes.

Data selection

For TEST Bk.15,

From the photographs, ID104 was tilted and the vibration graphs (refer to data plots) show differences in the X and Y axis values (but same values for Z axis).

Thus, ID105 should be used instead.

For TEST Bk.11,

The X,Y,Z data for ID107 and ID106 are the same in both shape form and RMS values.

The peak values are similar although positions of the peak may vary due to slight differences in sensor placement position and millisecond phase shift as the sensors were turned on at different time instant.

Summary of Results

Root mean square vibration ranking for the various tested locations are stipulated below starting from the lowest Z axis vibration:-

Location	Z RMS (mG)	Y RMS (mG)	X RMS (mG)
TESTBk_15_ID104	44	81	24
TESTBk_15_ID105	45	79	27
TESTBk_11_ID107	110	107	32
TESTBk_11_ID106	113	107	32

Note the peak vibration values are shown in the plots.

TESTBk_11_ID106 Vibration Analysis Graphs

The vertical vibration in terms of root mean squared was calculated and used for comparison purposes.

Date	Z Axis Vibration RMS without Acceleration Bias (mG)
10-Apr-2015 02:26:00	113

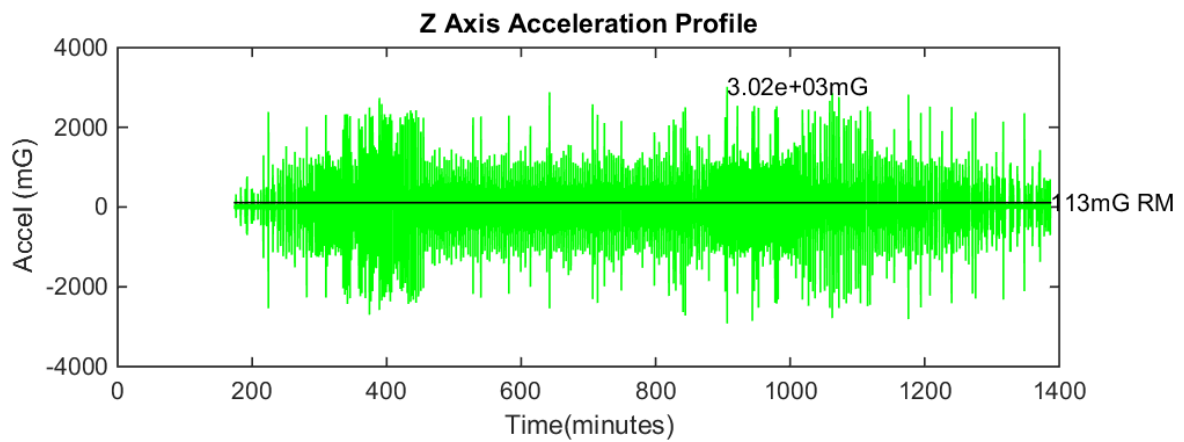


Figure 1 Z axis acceleration plot

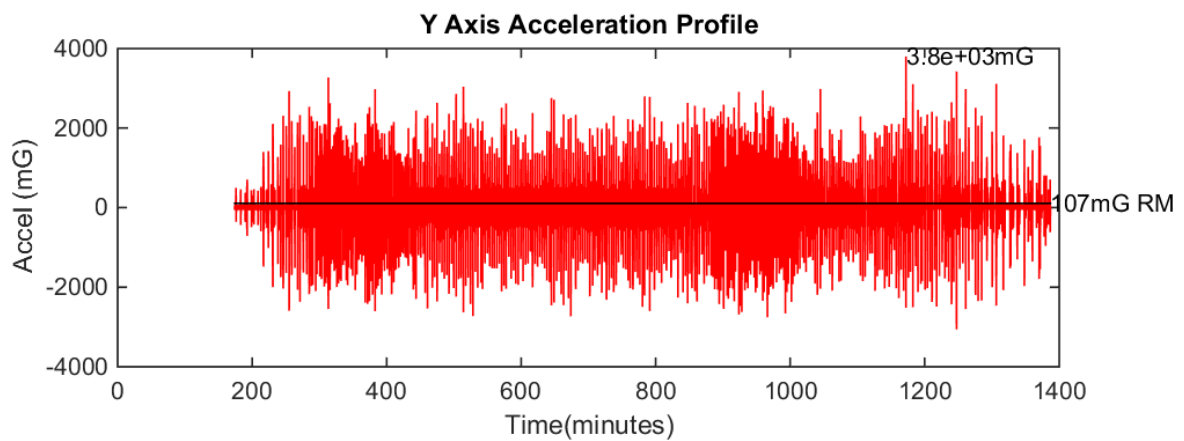


Figure 2 Y axis acceleration plot

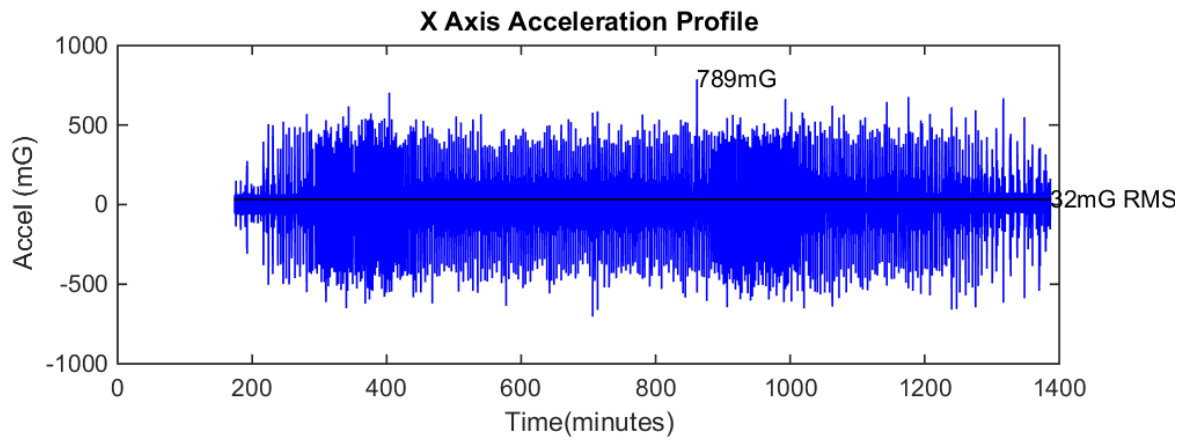


Figure 3 X axis acceleration plot

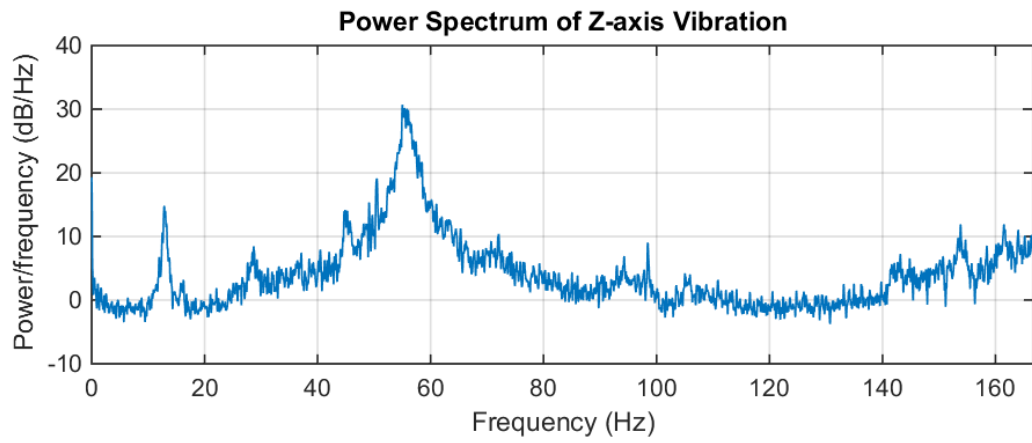


Figure 4 Power Spectrum plot

TESTBk_11_ID107 Vibration Analysis Graphs

The vertical vibration in terms of root mean squared was calculated and used for comparison purposes.

Date	Z Axis Vibration RMS without Acceleration Bias (mG)
10-Apr-2015 02:26:00	110

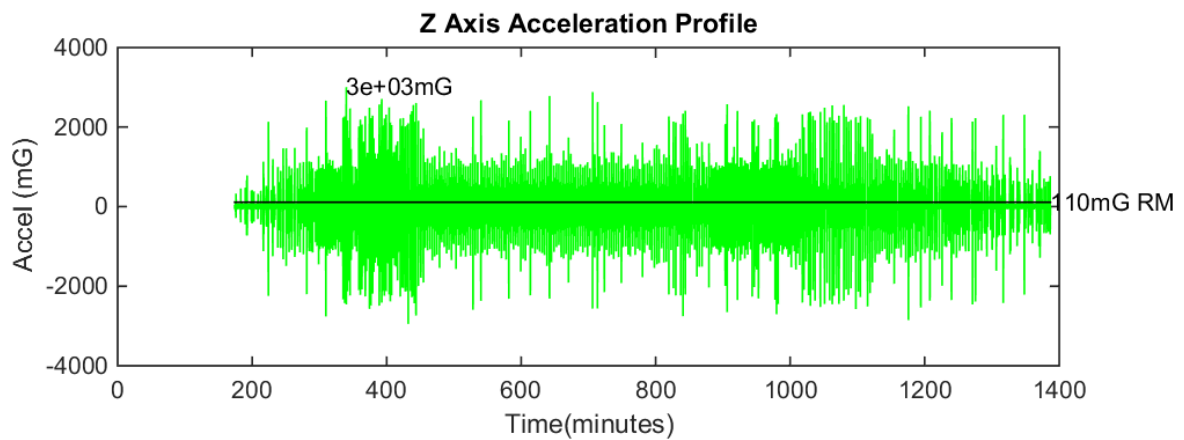


Figure 5 Z axis acceleration plot

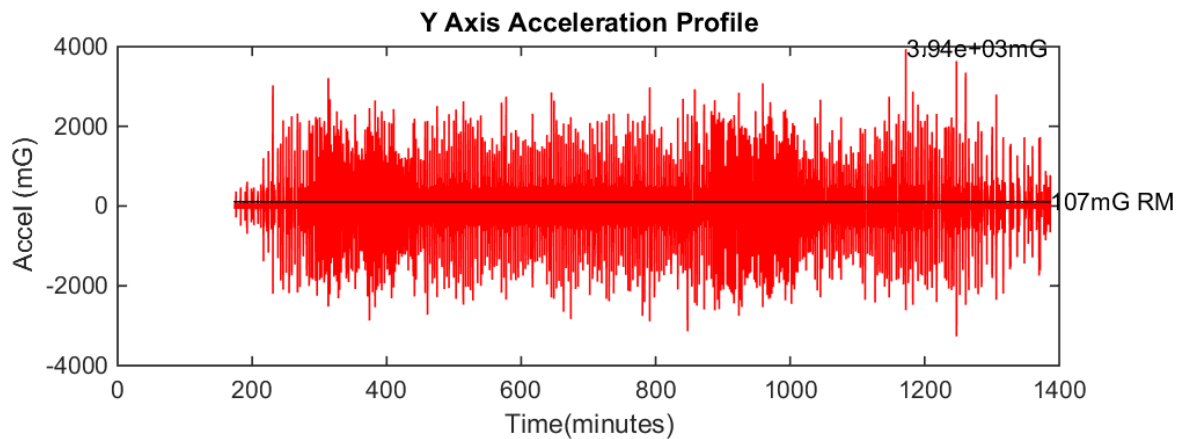


Figure 6 Y axis acceleration plot

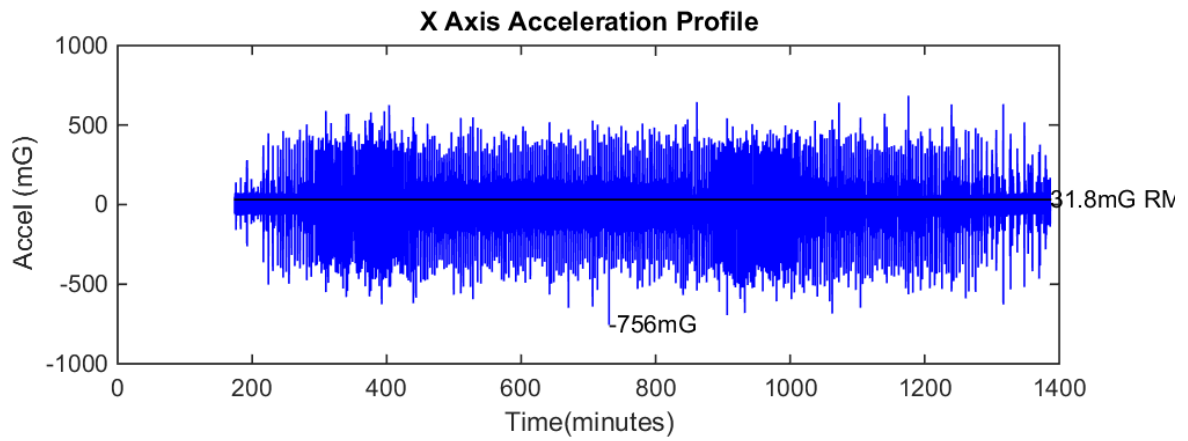


Figure 7 X axis acceleration plot

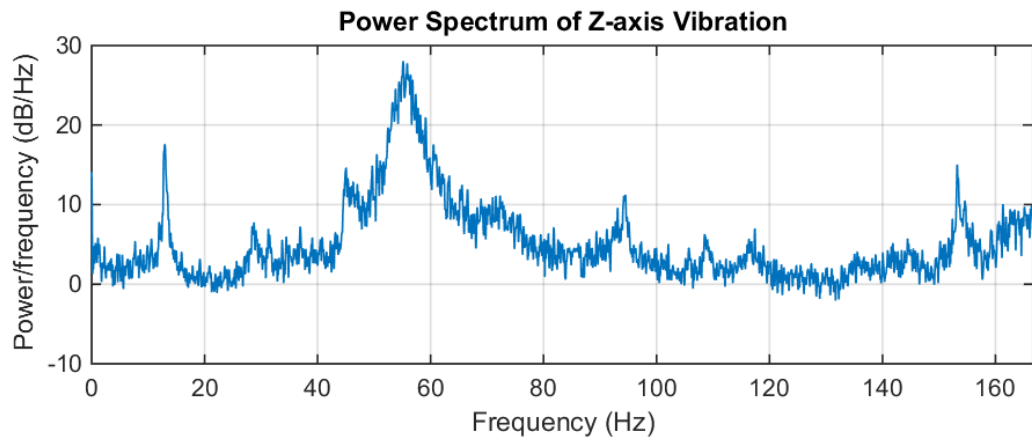


Figure 8 Power Spectrum plot

TESTBk_15_ID104 Vibration Analysis Graphs

The vertical vibration in terms of root mean squared was calculated and used for comparison purposes.

Date	Z Axis Vibration RMS without Acceleration Bias (mG)
10-Apr-2015 02:13:00	44

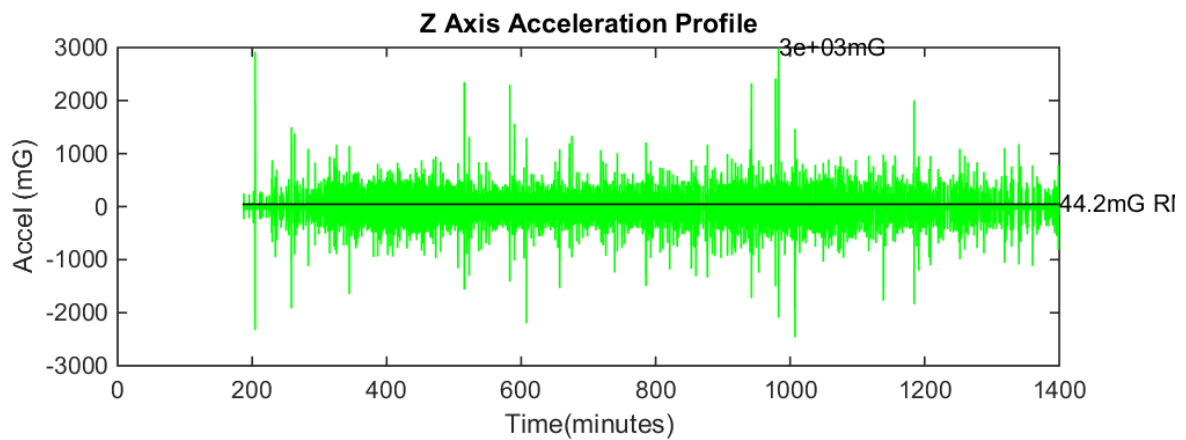


Figure 9 Z axis acceleration plot

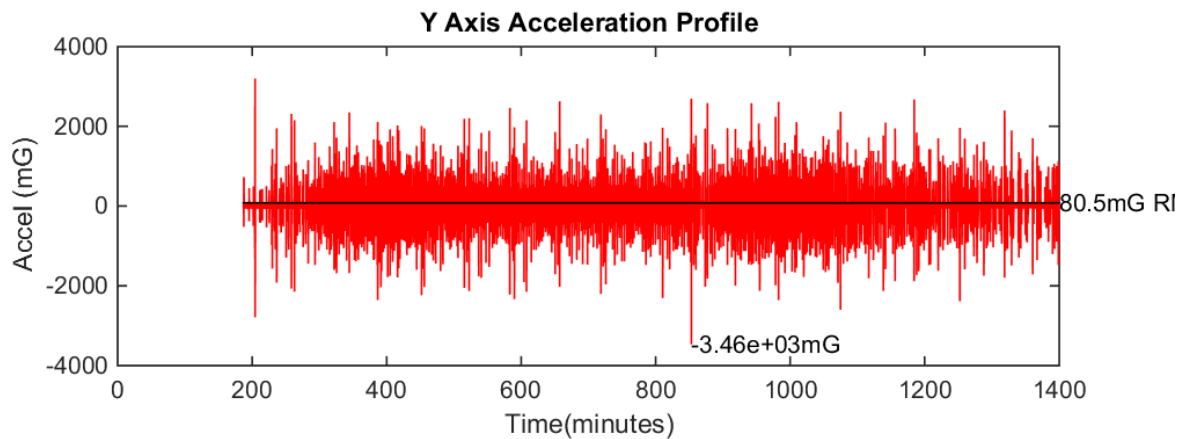


Figure 10 Y axis acceleration plot

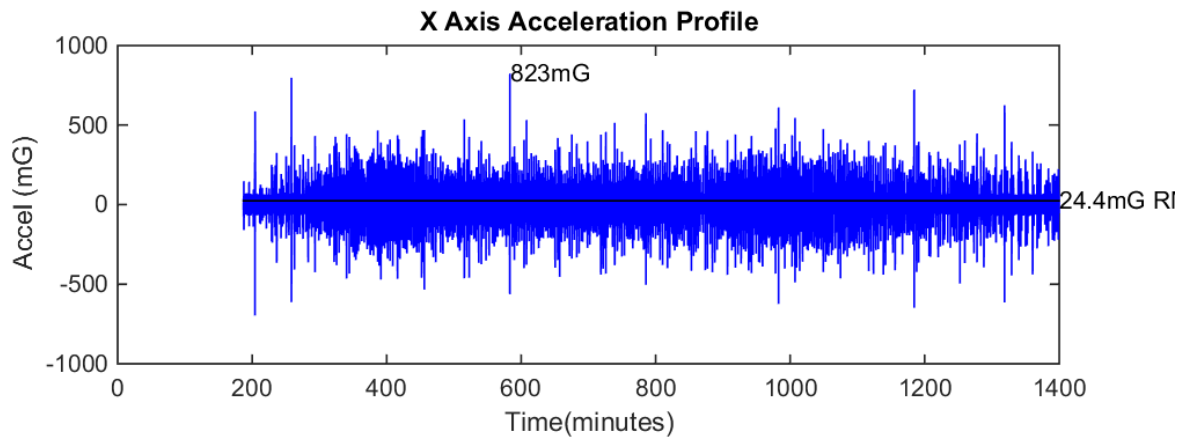


Figure 11 X axis acceleration plot

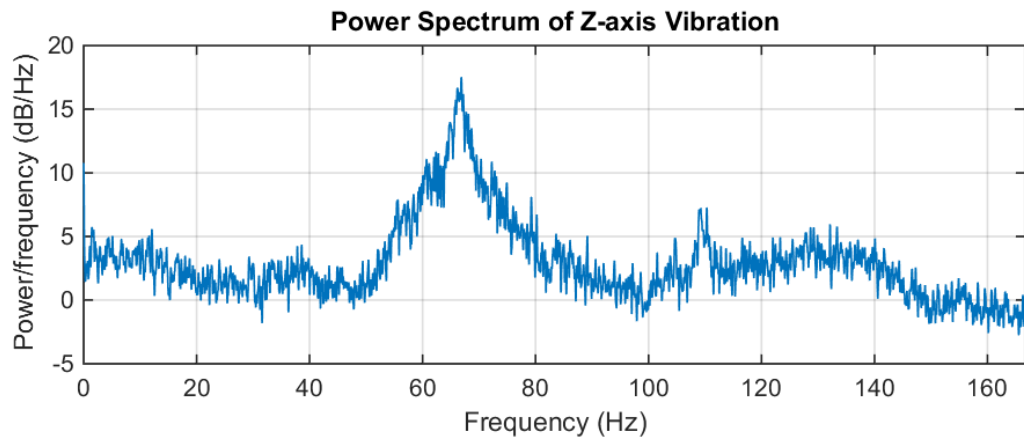


Figure 12 Power Spectrum plot

TESTBk_15_ID105 Vibration Analysis Graphs

The vertical vibration in terms of root mean squared was calculated and used for comparison purposes.

Date	Z Axis Vibration RMS without Acceleration Bias (mG)
10-Apr-2015 02:13:00	45

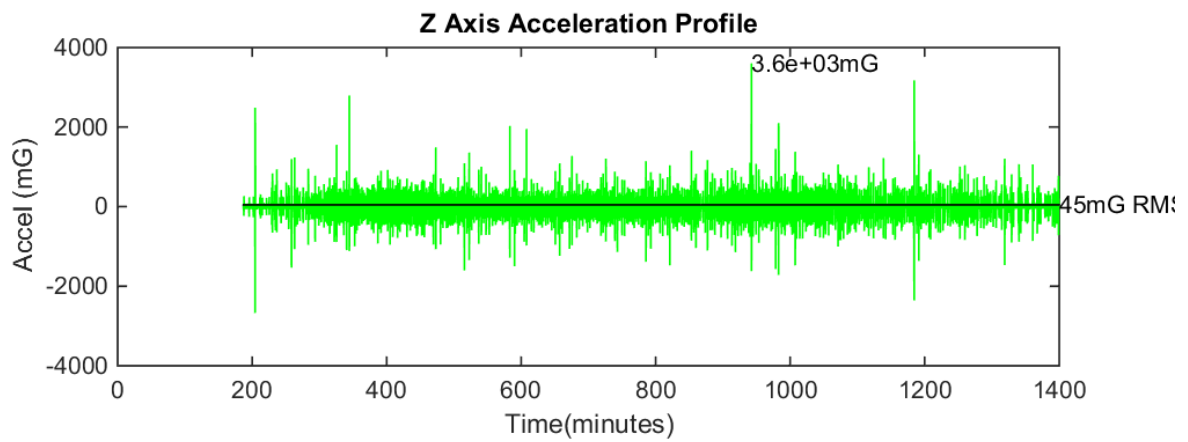


Figure 13 Z axis acceleration plot

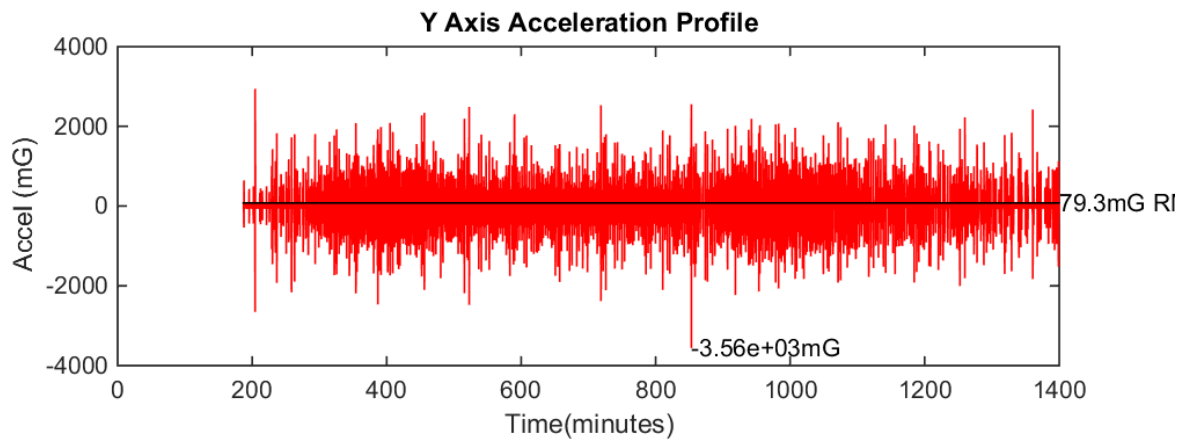


Figure 14 Y axis acceleration plot

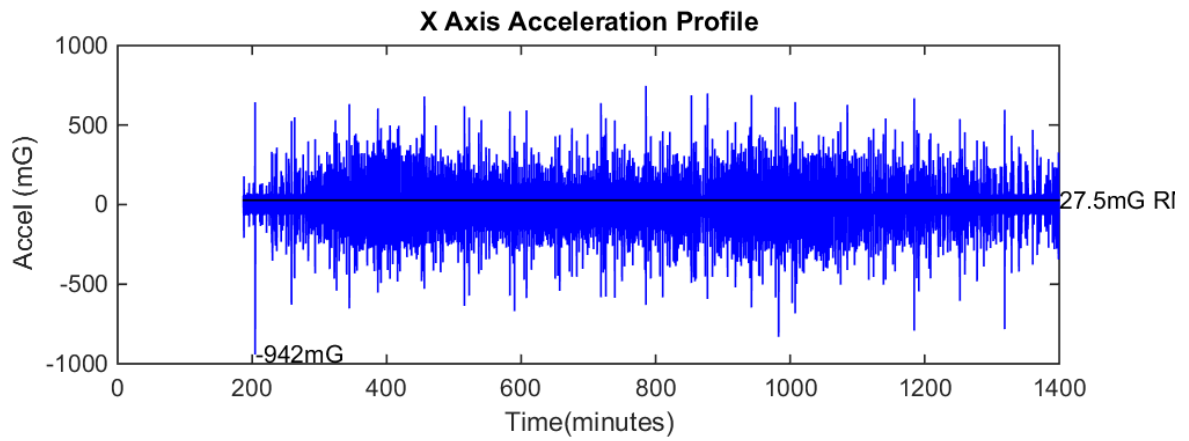


Figure 15 X axis acceleration plot

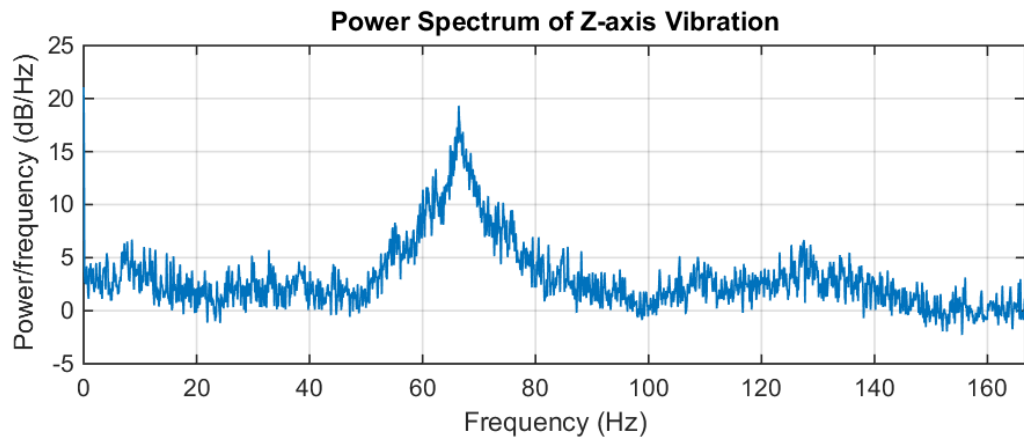


Figure 16 Power Spectrum plot