

**Site Survey Report
Vibration, EMI and Acoustics**

Prepared for

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◆ Introduction

The purpose of this measurement survey was to establish the floor vibration, the electromagnetic interference (EMI) and the acoustic intensity levels at the candidate locations for the proposed Scanning Electron Microscope.

◆ Instrumentation

The instrumentation utilized to conduct the testing is itemized below:

Spectrum Analyzer:	Data Physics ACE DP-104
Accelerometer:	Wilcoxon 731 seismic accelerometer, Serial Number 791, 100 Volt per G.
EMI coil:	MSI Magcheck 95, 1.0 millivolt per milligauss
Microphone:	RS 33-2050

All instrumentation and the spectrum analyzer are currently calibrated with documentation in place traceable to the National Institute of Standards and Technology.

The analyzer has a low range sensitivity to -130 DB.

◆ Test Procedures

Vibration measurements were made on the floor in three directions at the locations where the scanning electron microscope is proposed to be located. The EMI and sound pressure measurements were made approximately four feet above the floor.

The Peak-Peak acceleration measurements were first made at a bandwidth of 312 hertz. Power spectra functions of displacement are produced from the acceleration measurements by double integration. The displacement spectra with 312 hertz bandwidth, were taken and recorded on the disk of the analyzer.

The RMS EMI measurements were performed at a bandwidth of 625 hertz. Power spectra functions of EMI in three directions were recorded on disk for later processing and plotting.

The acoustic levels were measured with a calibrated microphone and the dBA and dBC levels were recorded and reported for each site.

All measurements were recorded on the internal disk of the analyzer for later processing. Measurements were taken under normal operating conditions.

The integrated displacement is calculated from the acceleration spectra by first dividing each amplitude value by the circular frequency ($\omega = 2\pi \cdot \text{frequency}$) squared to obtain the displacement spectra from the acceleration spectra and then integrating by computing the area

under the curve. This method of calculation closely approximates the results obtained from an integrating analog displacement meter. It also accounts for both the broadband and narrow band displacement energy present in the floor spectra.

The test results are further summarized in the table(s) via peak to peak displacement, EMI (rms) values calculated from the power spectra functions and sound pressure level.

The measurement type, direction and measurement bandwidth are shown on each graph.

◆ **Conclusions**

Vibration: Meets the published specification.

EMI: Fails to Meet the published specification.

Acoustics: Meets the published specification.

DC field change: Meets the published specification.

Vibration, EMI and Acoustical Levels

Site 1

Vibration Levels

Direction	Largest Displacement Microns peak-peak	RMS	Save
X North - South	0.30 @ 1 hz	0.56	2
Y East - West	0.27 @ 1 hz	0.50	3
Z Vertical	0.80 @ 1 hz	0.57	4

EMI

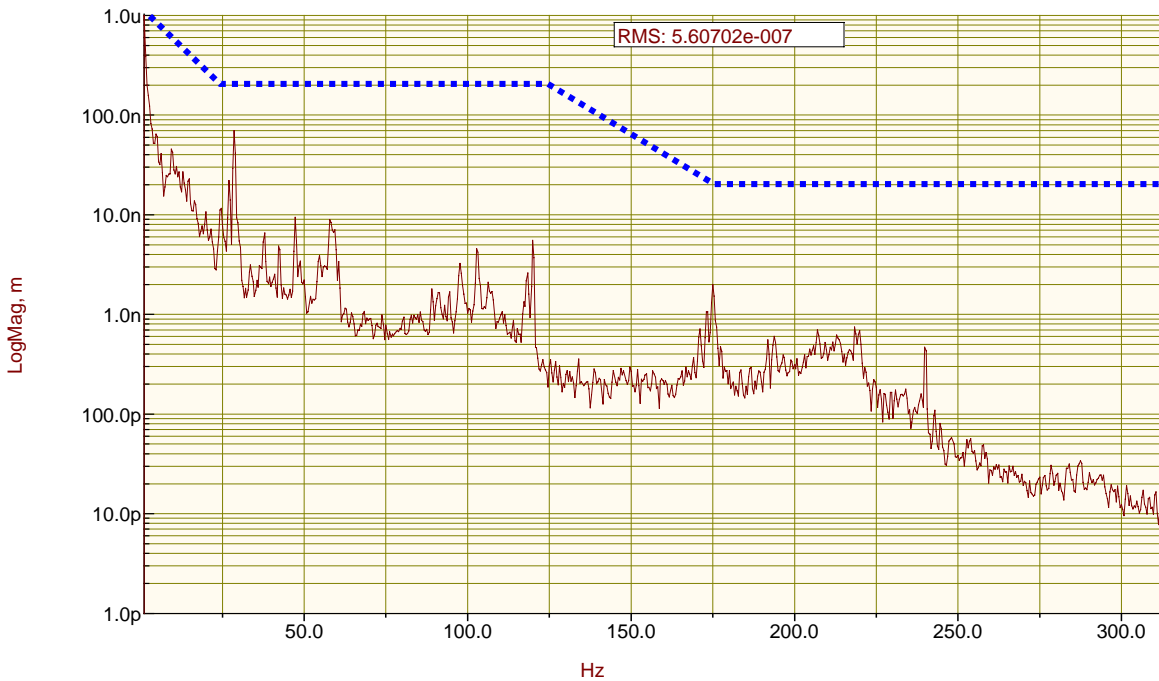
	60 RMS Milligauss	180 Hz RMS Milligauss	RMS Milligauss	Save
X	0.27	0.10	0.37	2
Y	0.44	0.07	0.53	3
Z	0.20	0.04	0.21	4

Acoustics

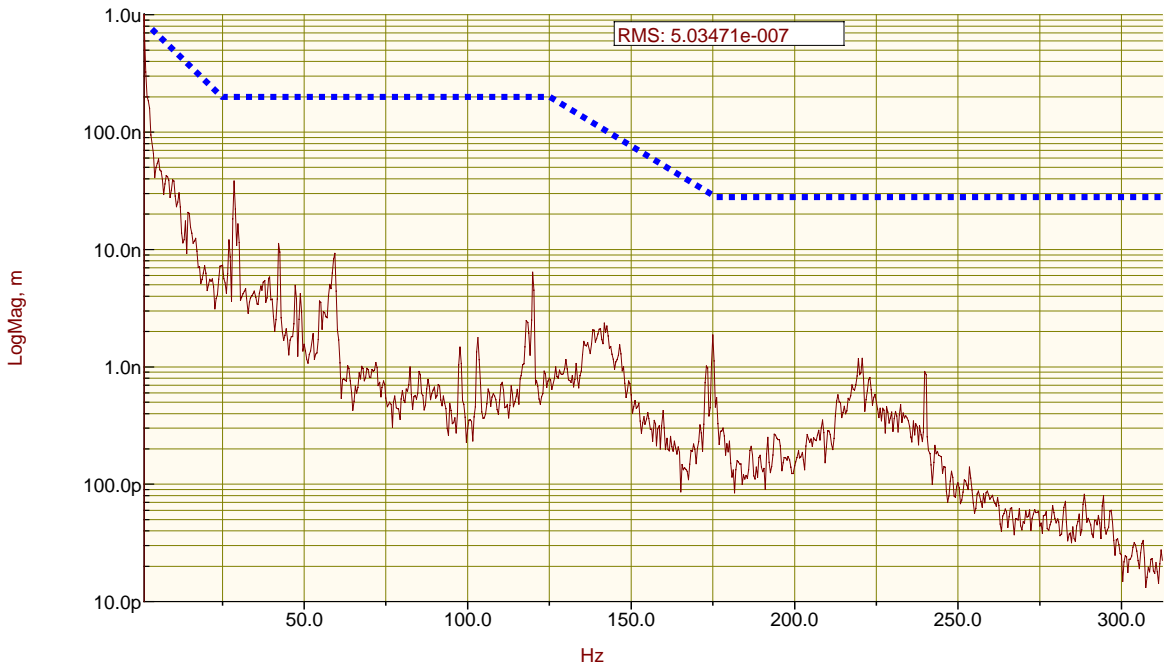
Level	64 dBA	74 dBC	2

DC Magnetic Field change : 0.3 mg

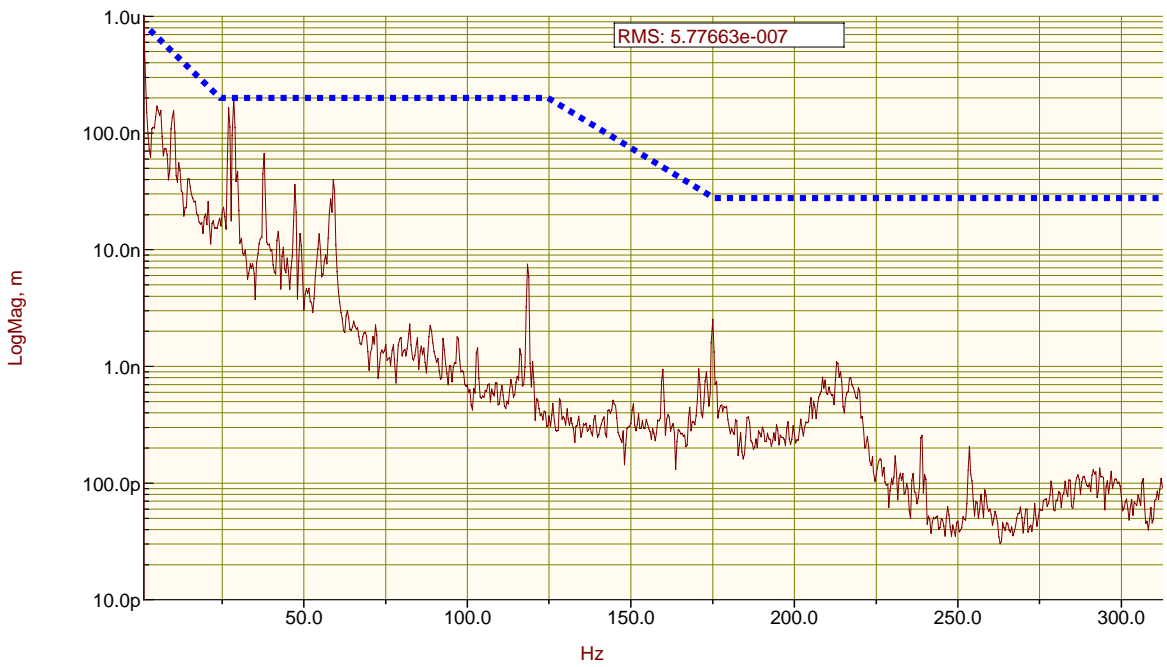
Site 1 - Peak-Peak DISPLACEMENT X



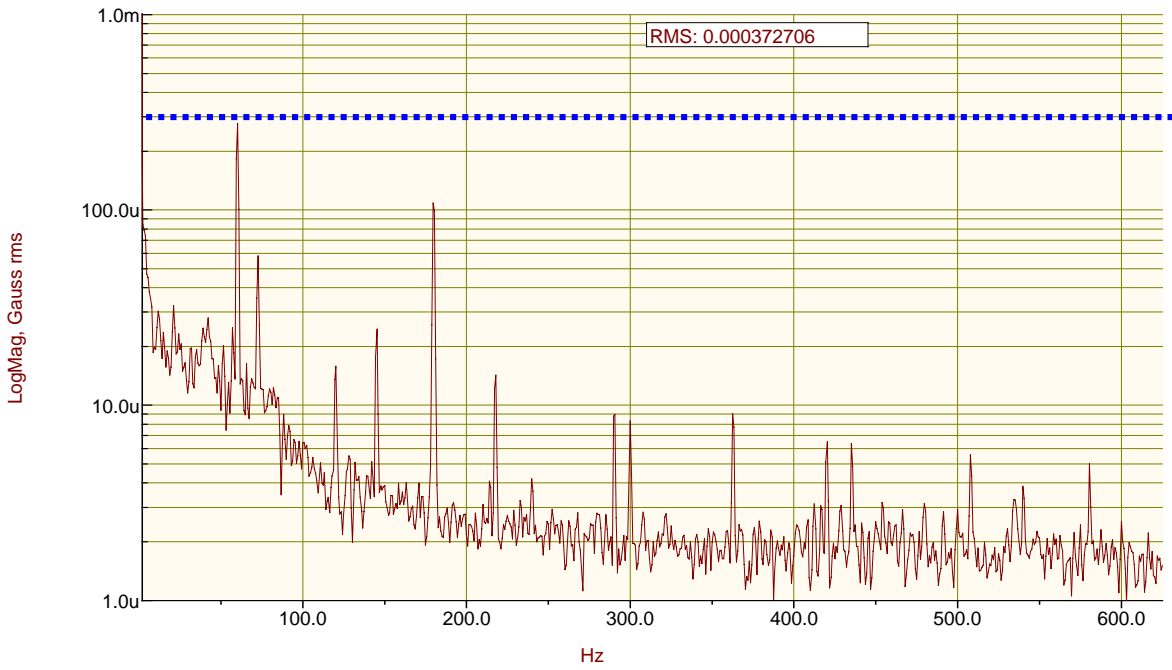
Site 1 – Peak-Peak DISPLACEMENT Y



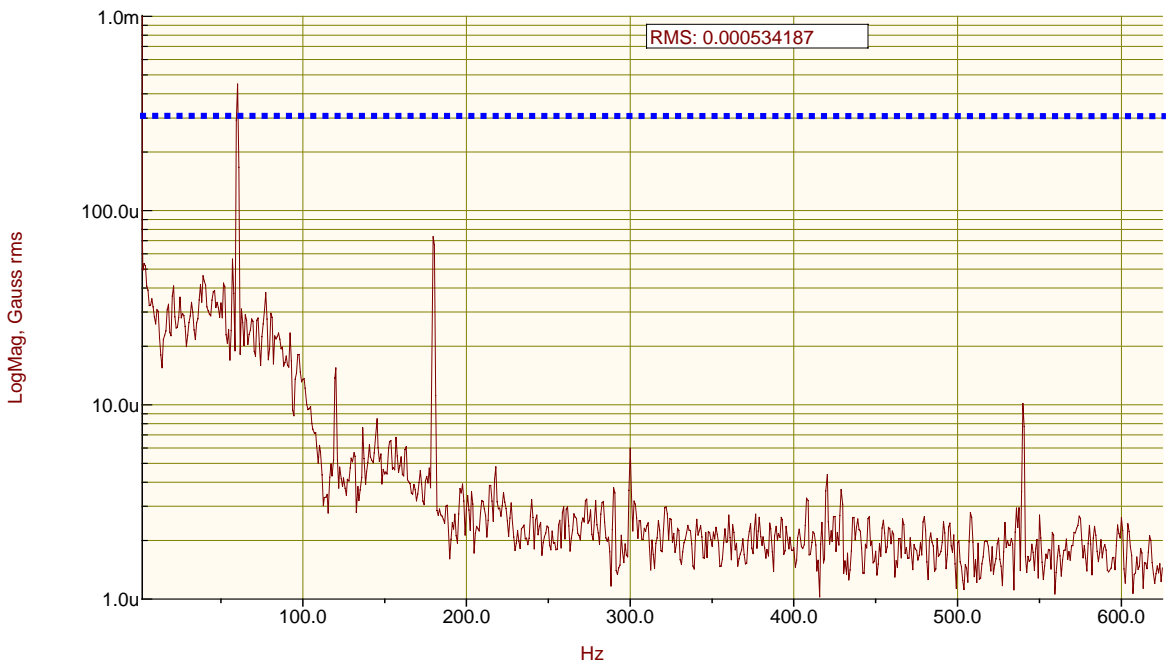
Site 1 – Peak-Peak DISPLACEMENT Z



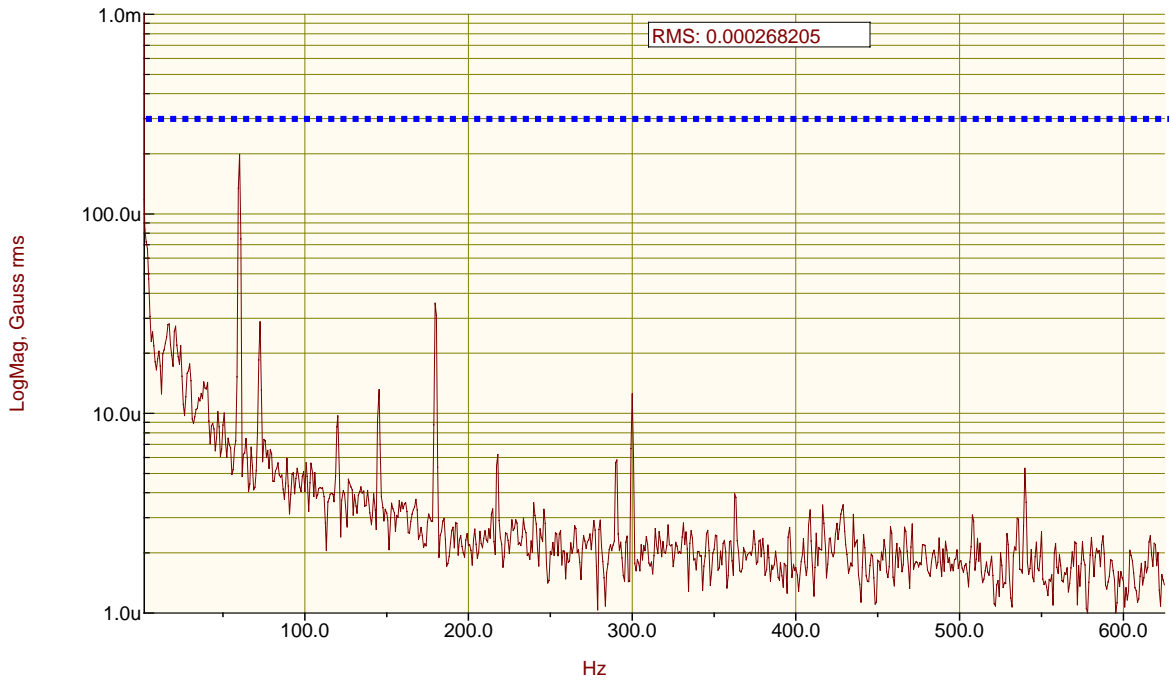
Site 1 – RMS EMI X



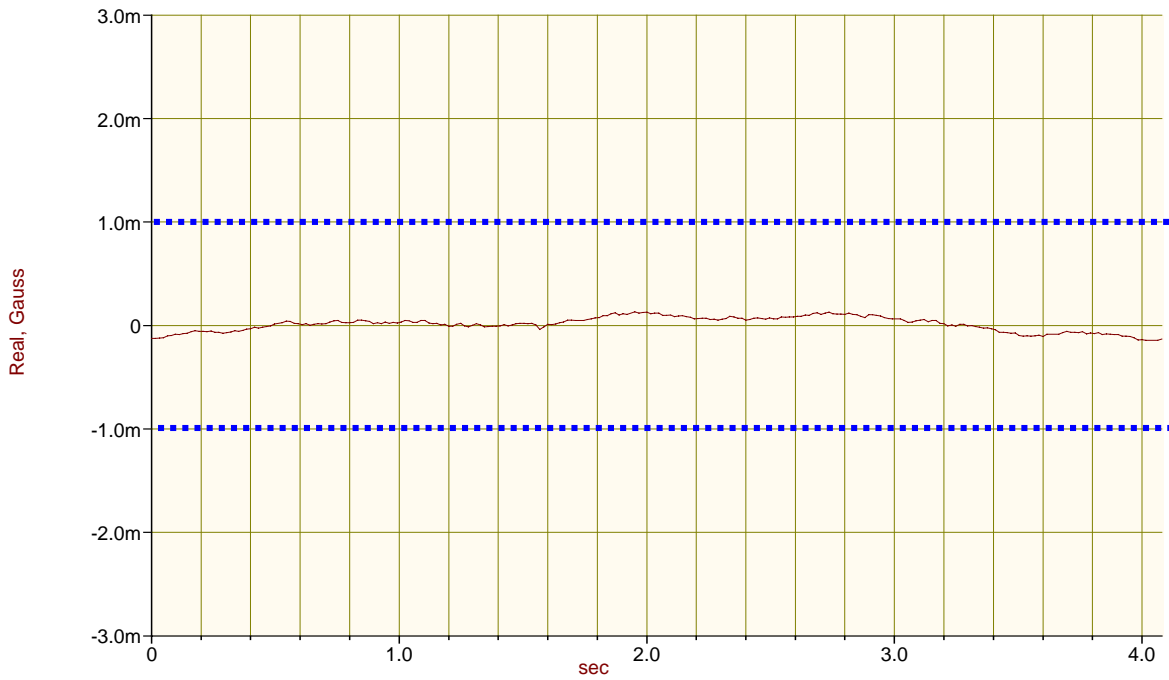
Site 1 – RMS EMI Y



Site 1 – RMS EMI Z



Site 1 – DC Field Change



Site 1 – RMS ACOUSTICAL LEVEL

