



PEGASOS Refinement Project

Probabilistic Seismic Hazard Analysis for Swiss Nuclear Power Plant Sites

Volume 2 - Results Addendum - Alternative with $M_{min} = 5$

by

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Chapter 1

Introduction

This volume contains the full suite of hazard results as specified by the Project Plan (see PMT-TB-1012) based on the minimum integration magnitude $M_{min} = 5.0$ in the form of figures. The figure sets consist of hazard curves (main results and sensitivity analyses), hazard spectra, deaggregation plots and sensitivity histograms.

In this section, the computational setting used to obtain the figures in each figure set is described. (Remark: The $M_{min}=4.5$ result were evaluated with the FRISK software version v66.1.1 and the results based on $M_{min} = 5.0$ with the version v66.1.3.)

- **Rock Hazard Curves:** Out of the 99 fractiles calculated, five are shown in these main figures for the horizontal and vertical components. Figures are presented for the nine project spectral frequencies.
- **Rock Uniform Hazard Spectra:** The figures with uniform hazard spectra (UHS), including the sensitivity figures, were only produced if the mean hazard existed at all frequencies for the given level of annual probability of exceedance. Any requirement for extrapolation of the data to cover a missing value for a particular level of exceedance probability led to the exclusion of the associated figure. Similarly, in the case of the retained figures, the fractiles were not extrapolated towards the UHS level of probability of exceedance. This means that in a few cases, a few spectra of lower fractiles and of the median do not cover the full frequency range.
- **Soil UHS:** The soil hazard UHS (both for the horizontal and the vertical components) are shown with the vectors of 57 frequencies chosen as to optimally sample the frequency dependence of the soil amplification function.
- **Mmin Comparison:** The mean rock hazard results based on $M_{min}=4.5$ and $M_{min}=5.0$ are compared together with their fractiles.

For the $M_{min} = 5.0$ evaluation no deaggregation figures and hazard sensitivities were evaluated, as they can be assumed to be the same as for $M_{min} = 4.5$. Thus, this volume does not contain deaggregation figures, figures showing the main contributors, expert comparisons, sensitivity for the horizontal and vertical component, and sensitivity histograms.

1.1 Mmin Comparison

This volume includes also after the presentation of the site specific horizontal component results, in the sections X.3.1, a comparison of mean hazard curves based on $M_{min}=4.5$ and $M_{min}=5.0$ together with their fractiles. As expected, the differences between the two result sets are not very large. Mainly, differences between the hazard curves can be observed at larger frequencies (e.g. ≥ 5 Hz). This is easily understood if the magnitude scaling of modern GMPEs is remembered. For larger magnitudes ($M > 5.5$) the slope of the hazard curve is stable over frequencies. For the smaller magnitudes (e.g. $M = 4.5$) the low frequencies lead to a much steeper hazard curve as at high frequency. Thus, even if more frequent, the steeper magnitude scaling for the lower magnitudes leads to not see a difference in hazard between the $M_{min}=4.5$ and $M_{min}=5.0$ curve at low frequencies.

Chapter 2

BEZNAU

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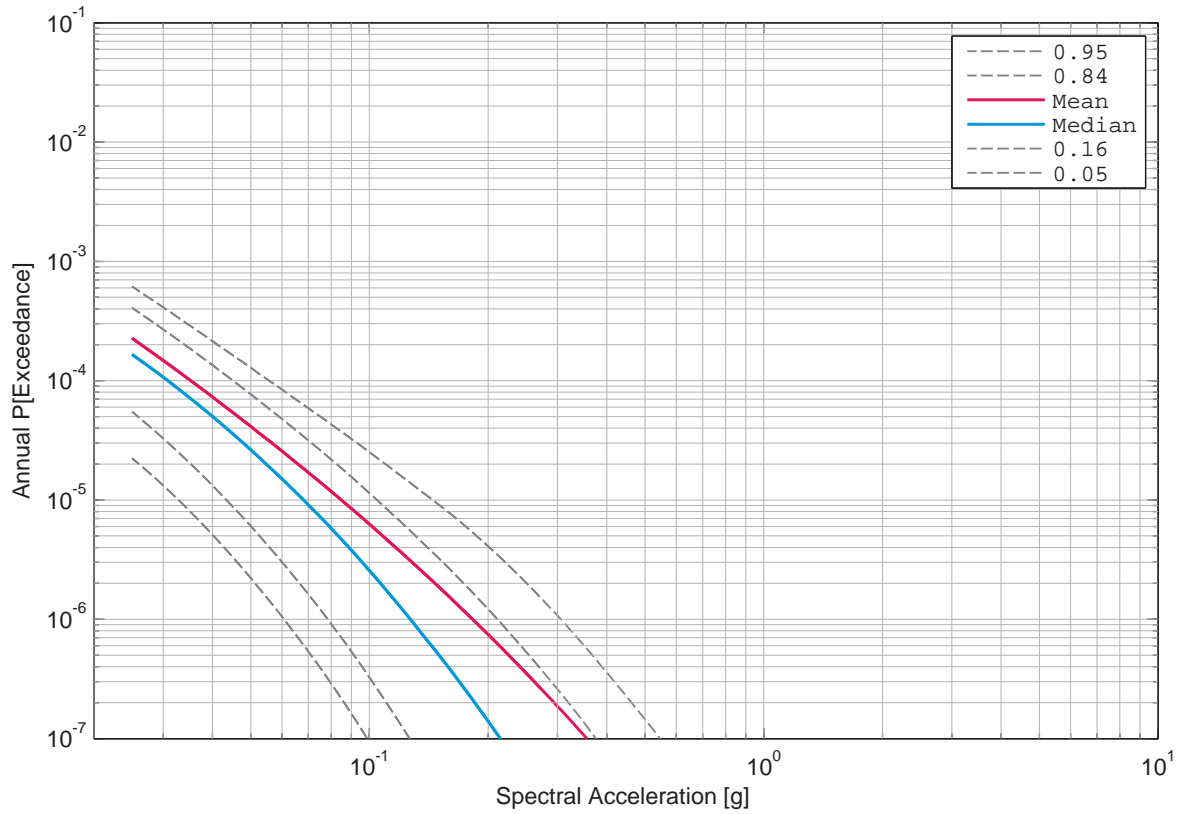


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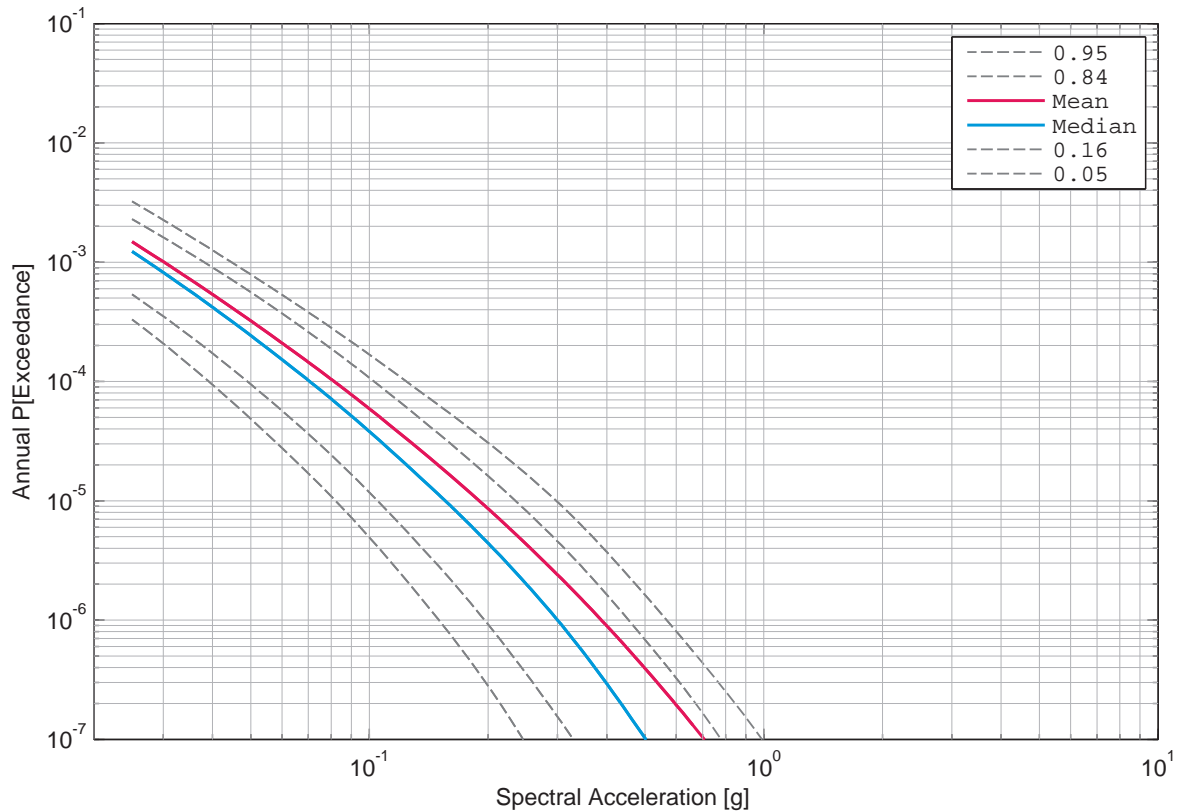


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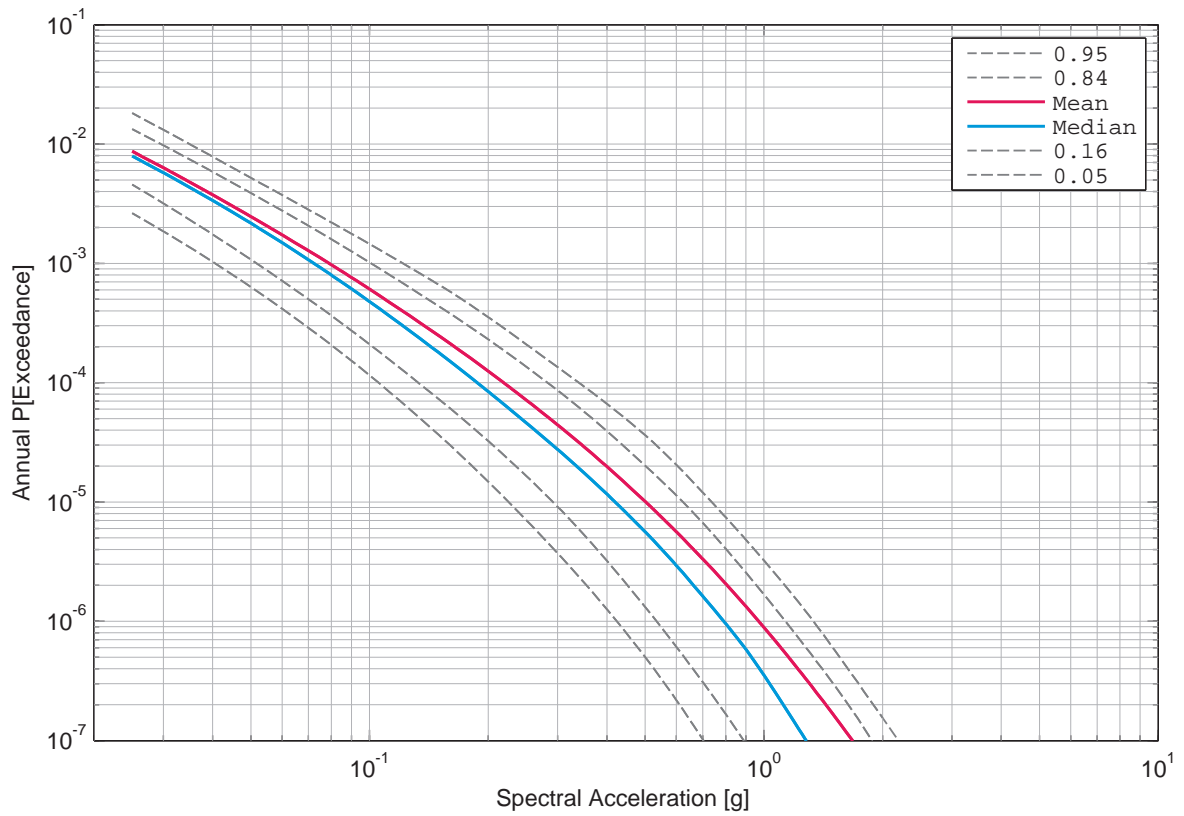


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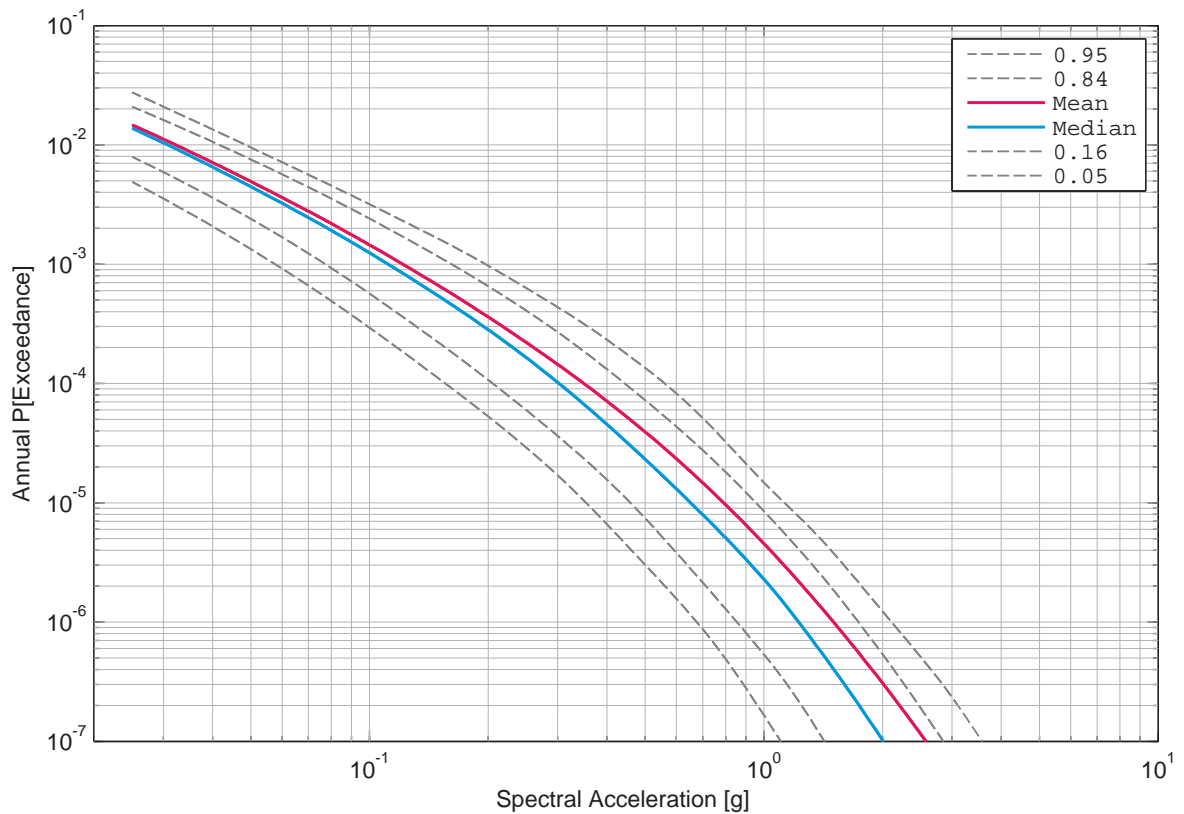


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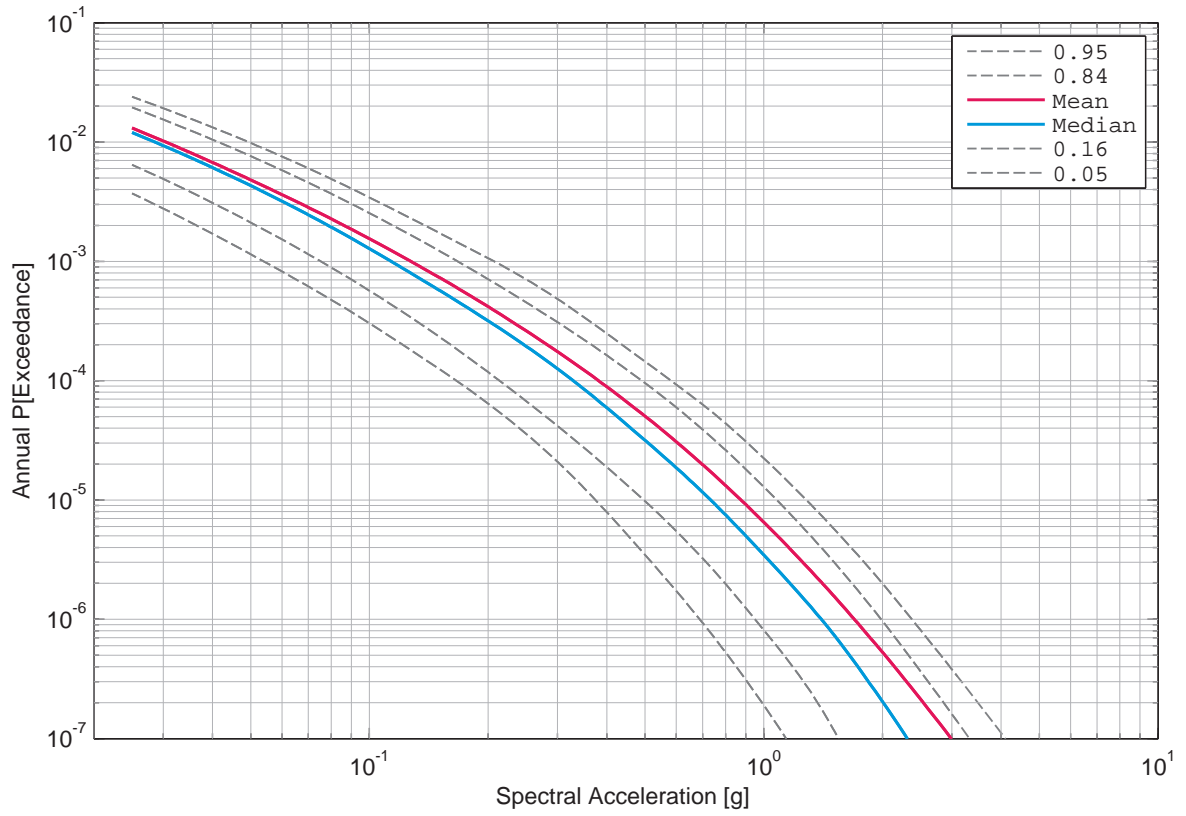


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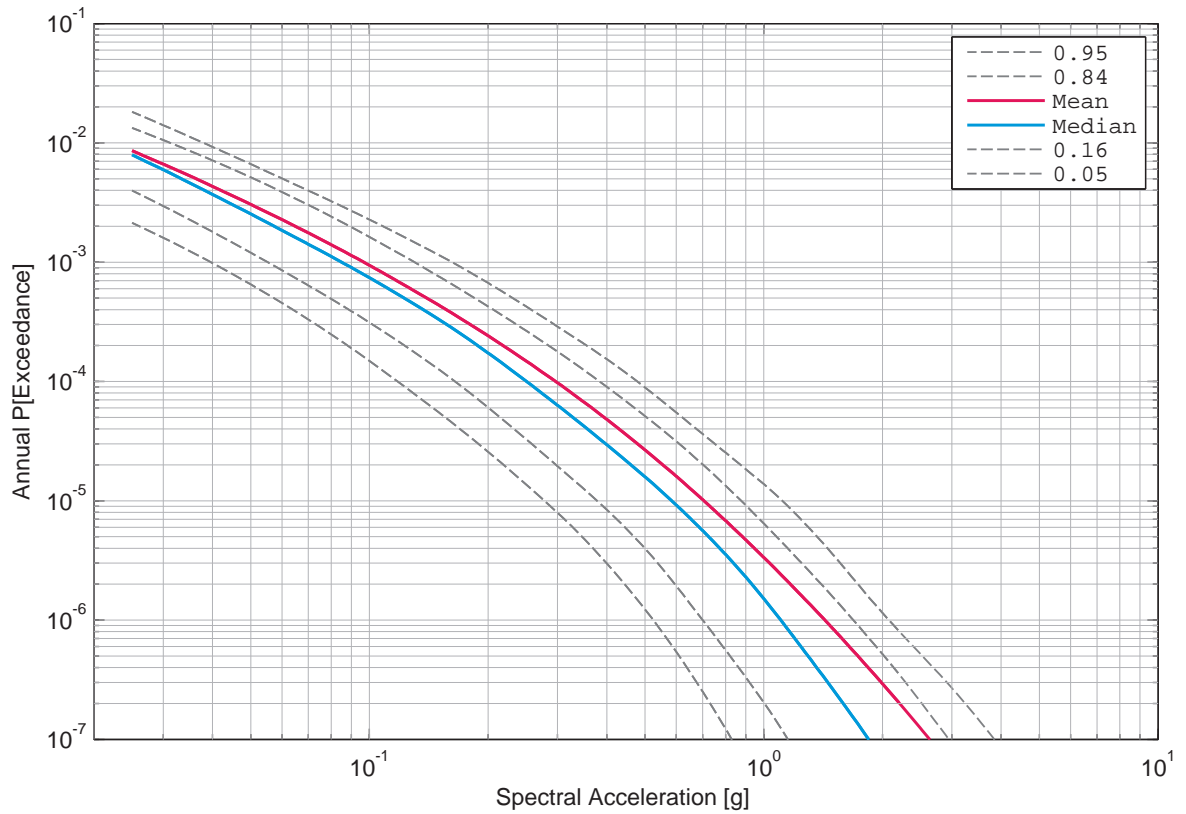


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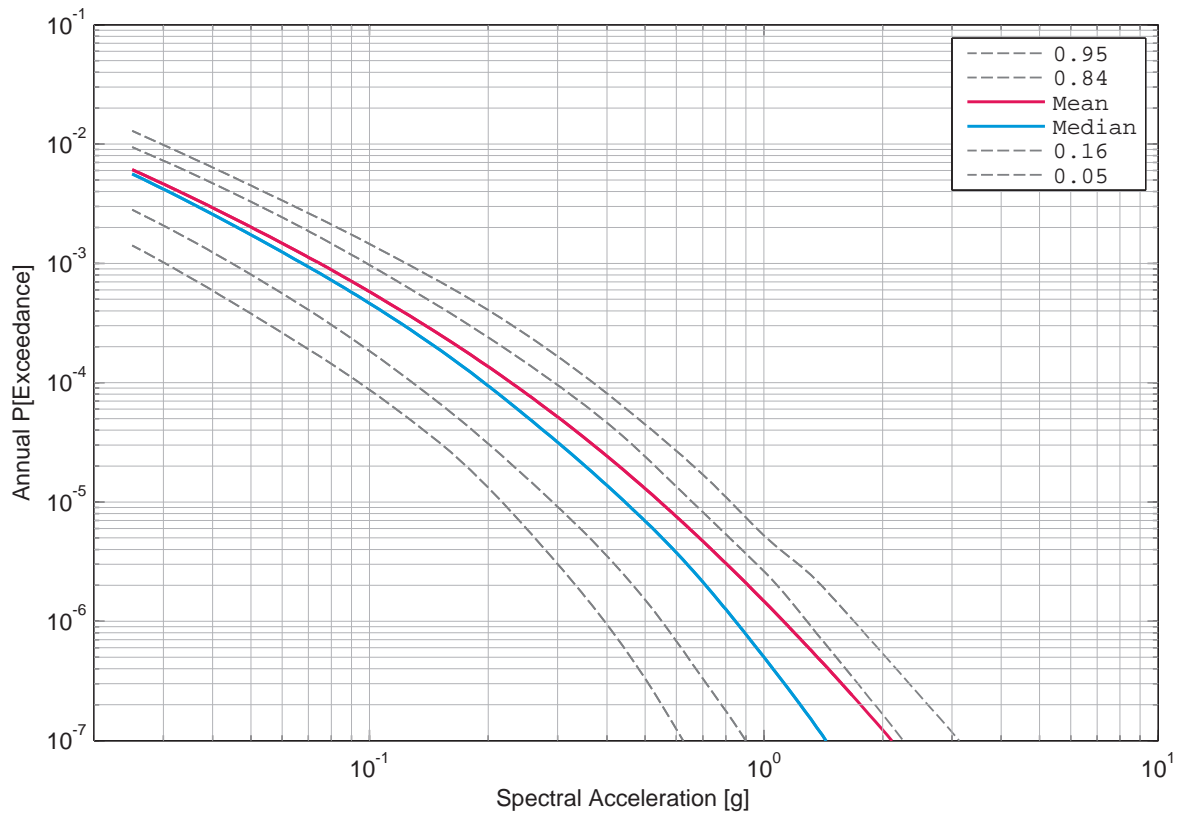


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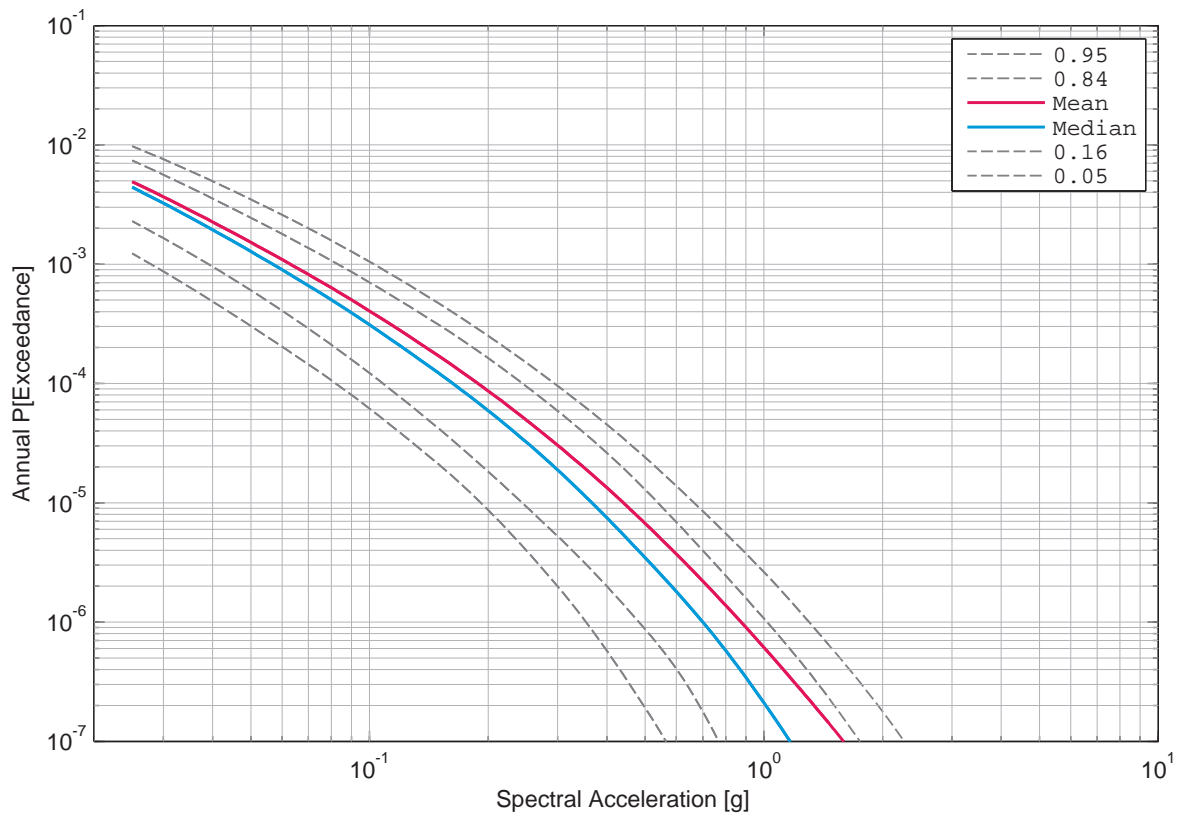


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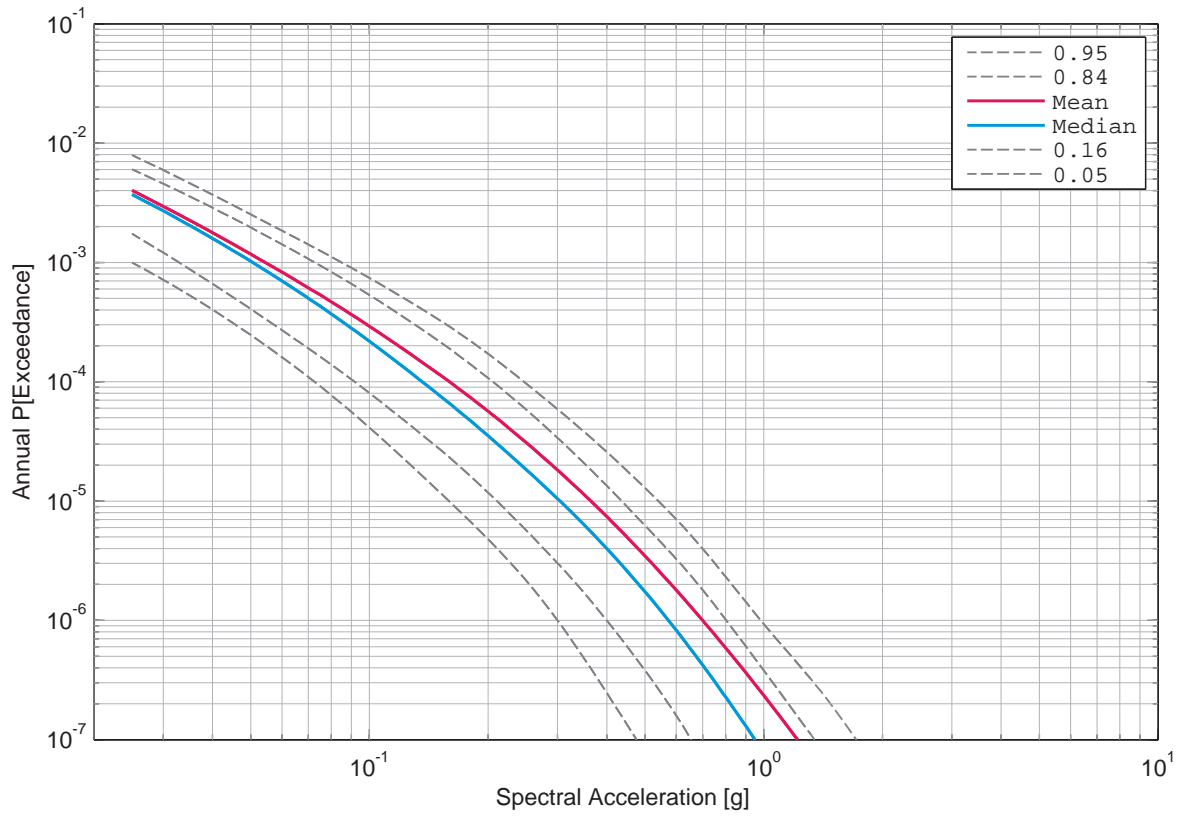


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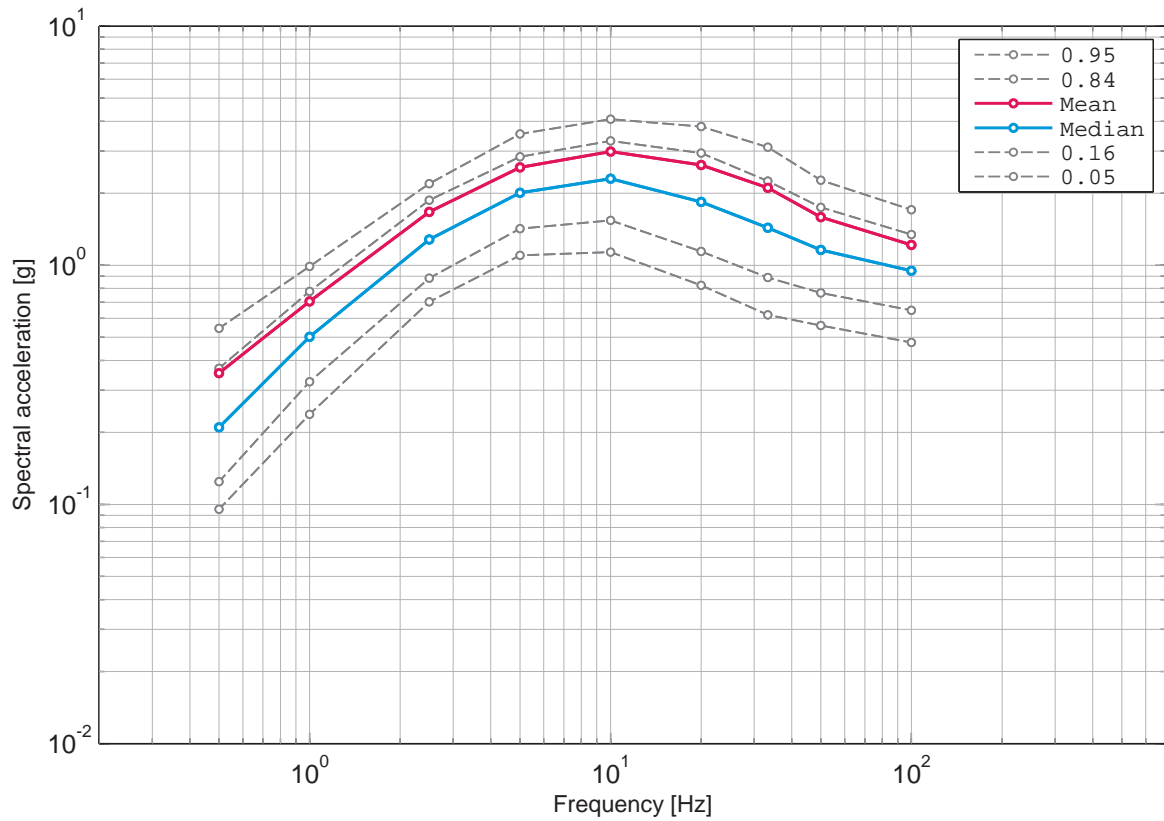


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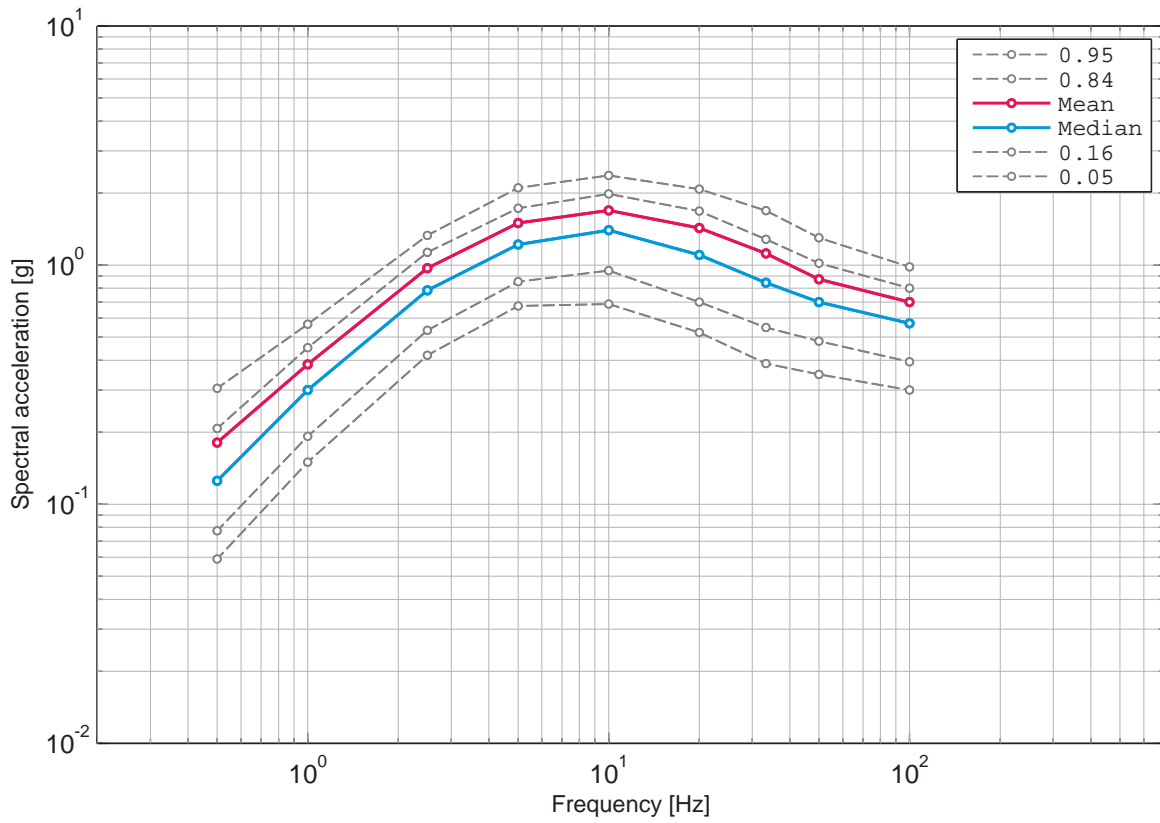


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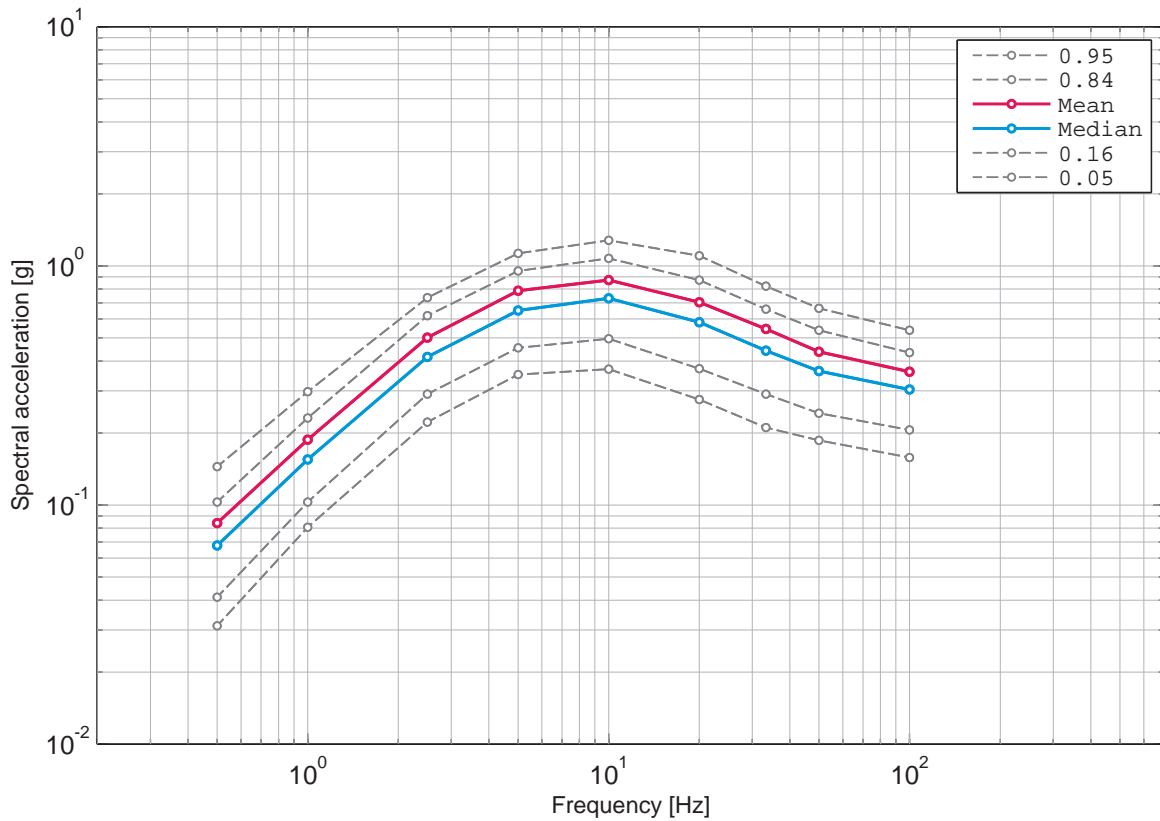


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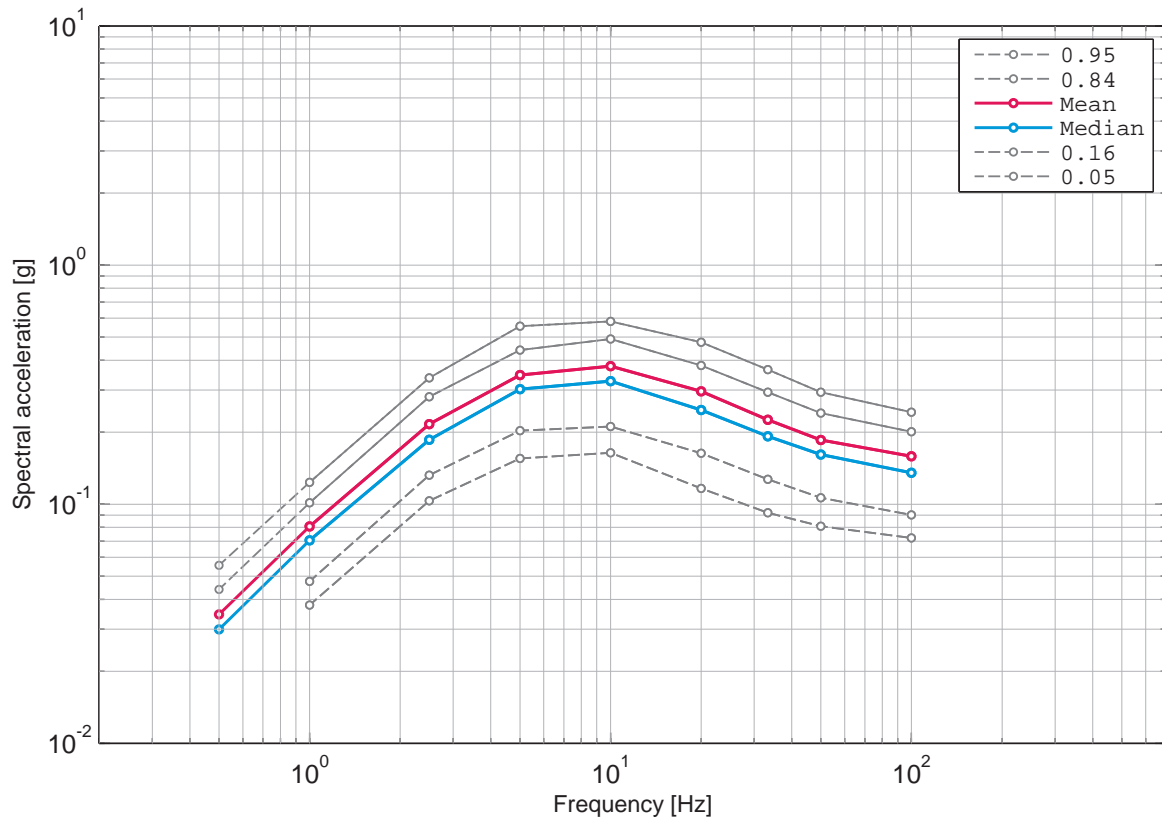


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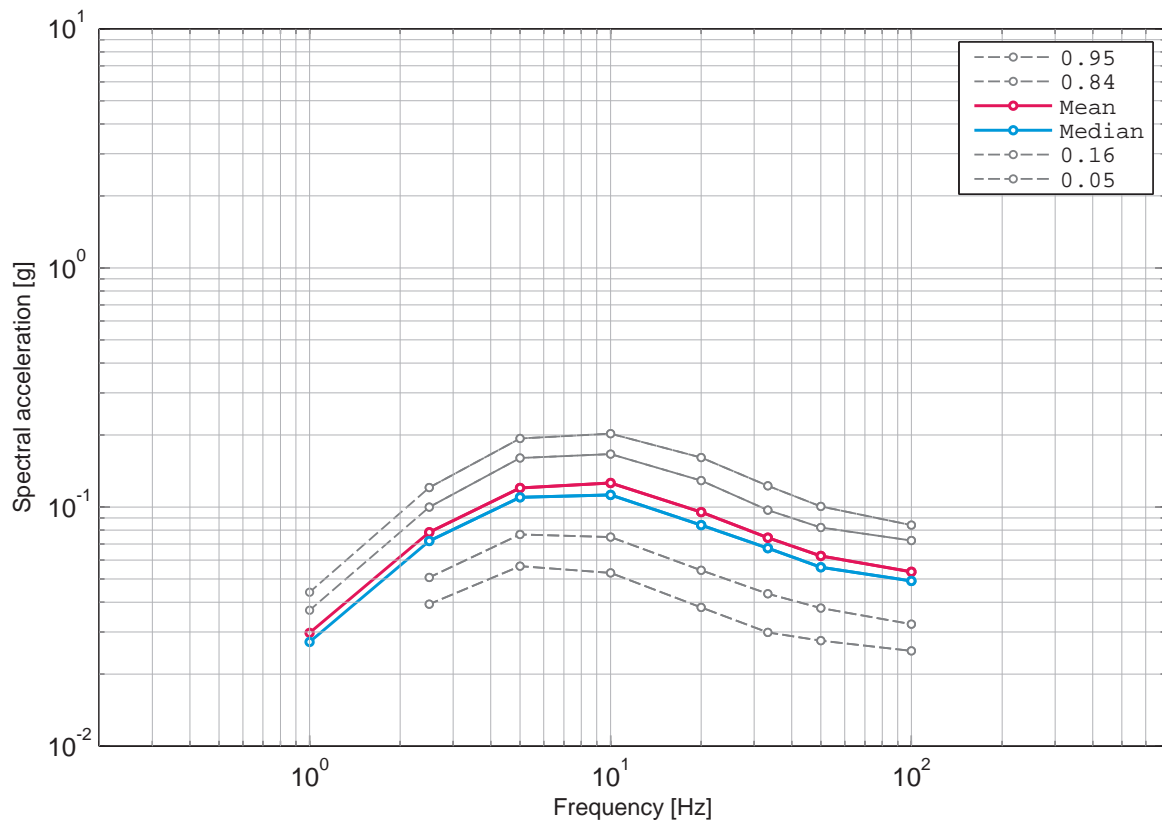


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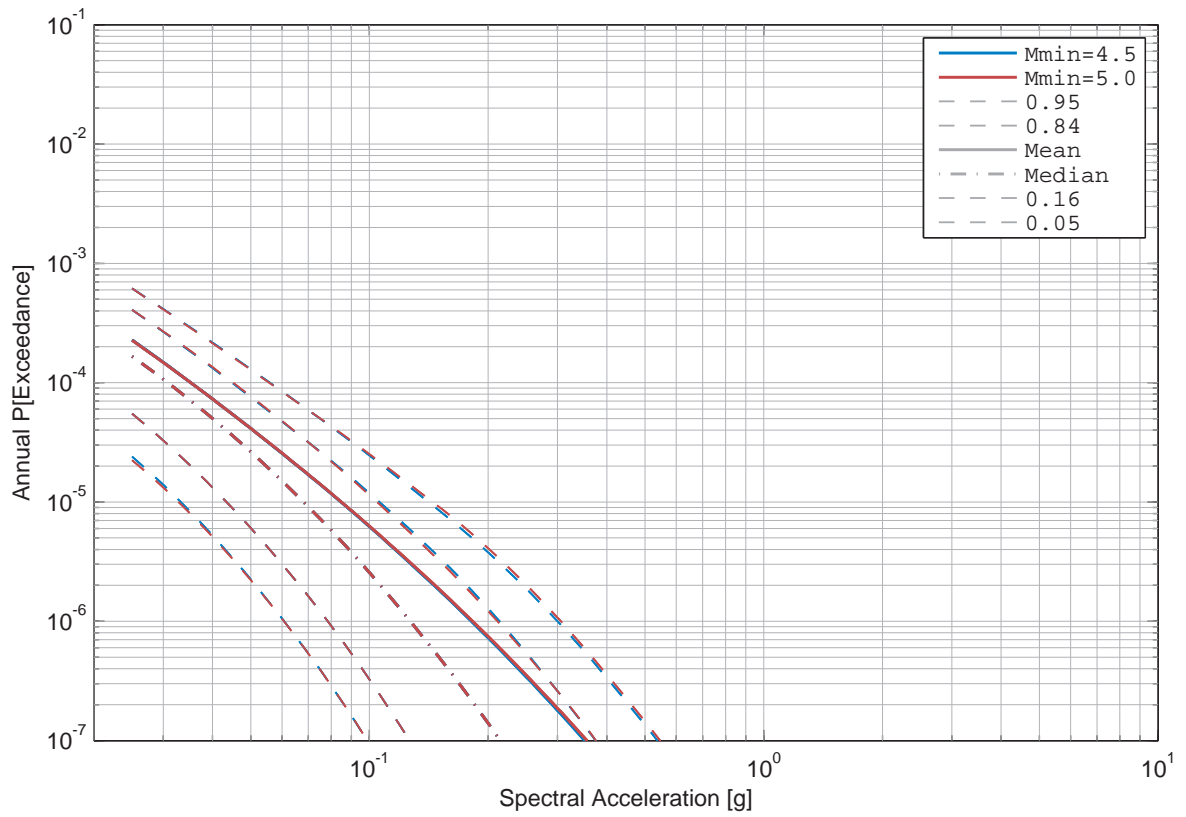


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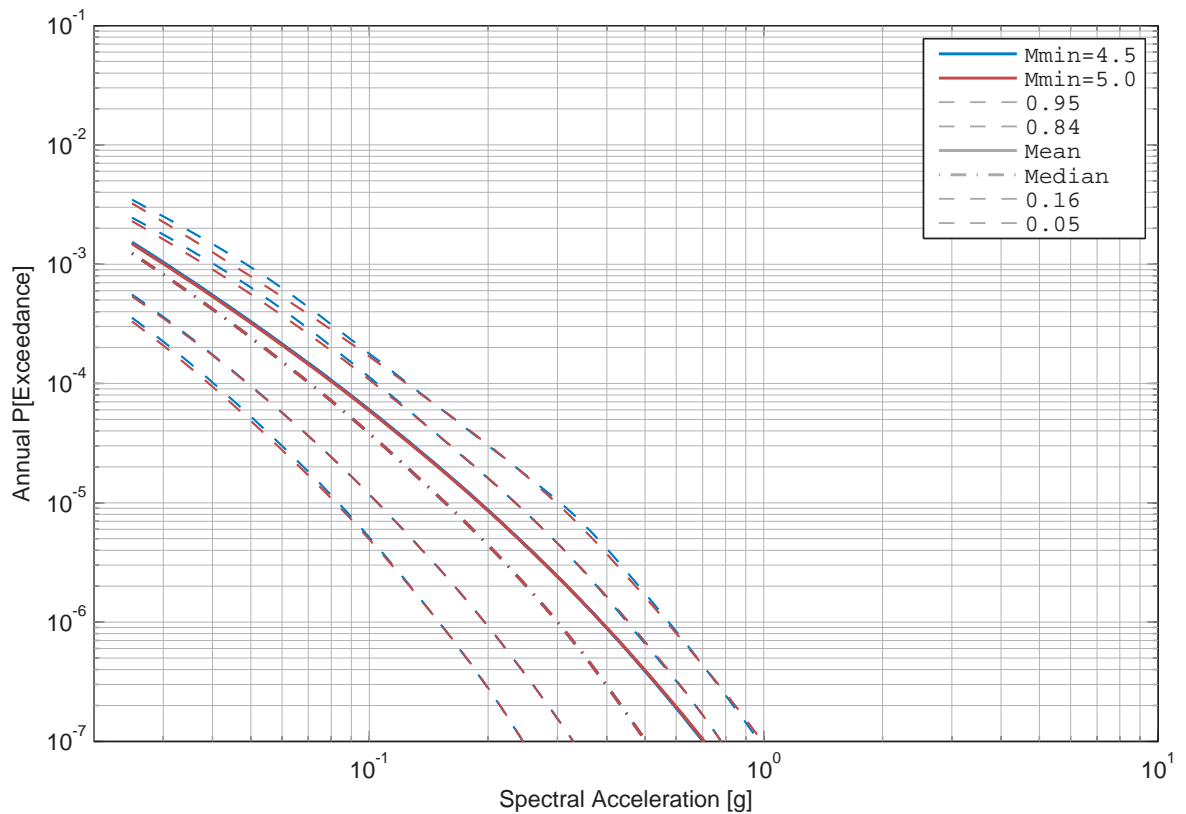


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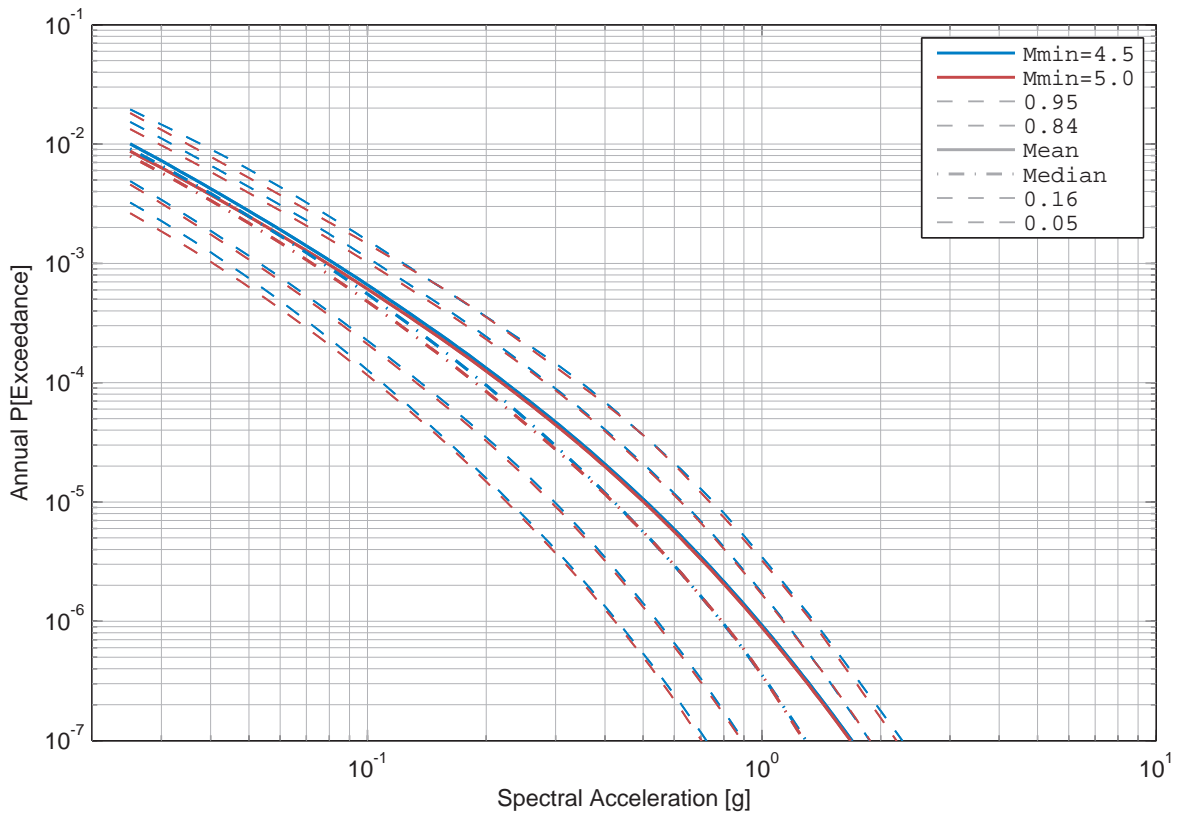


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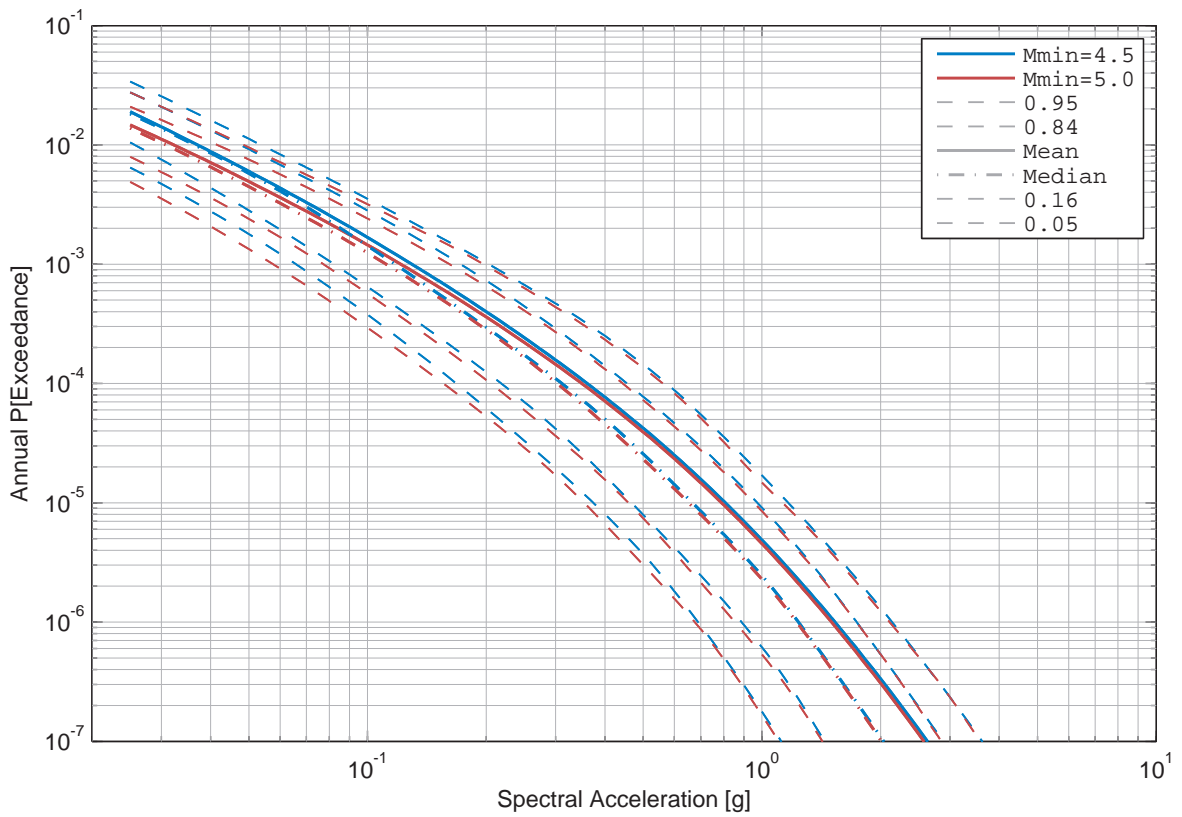


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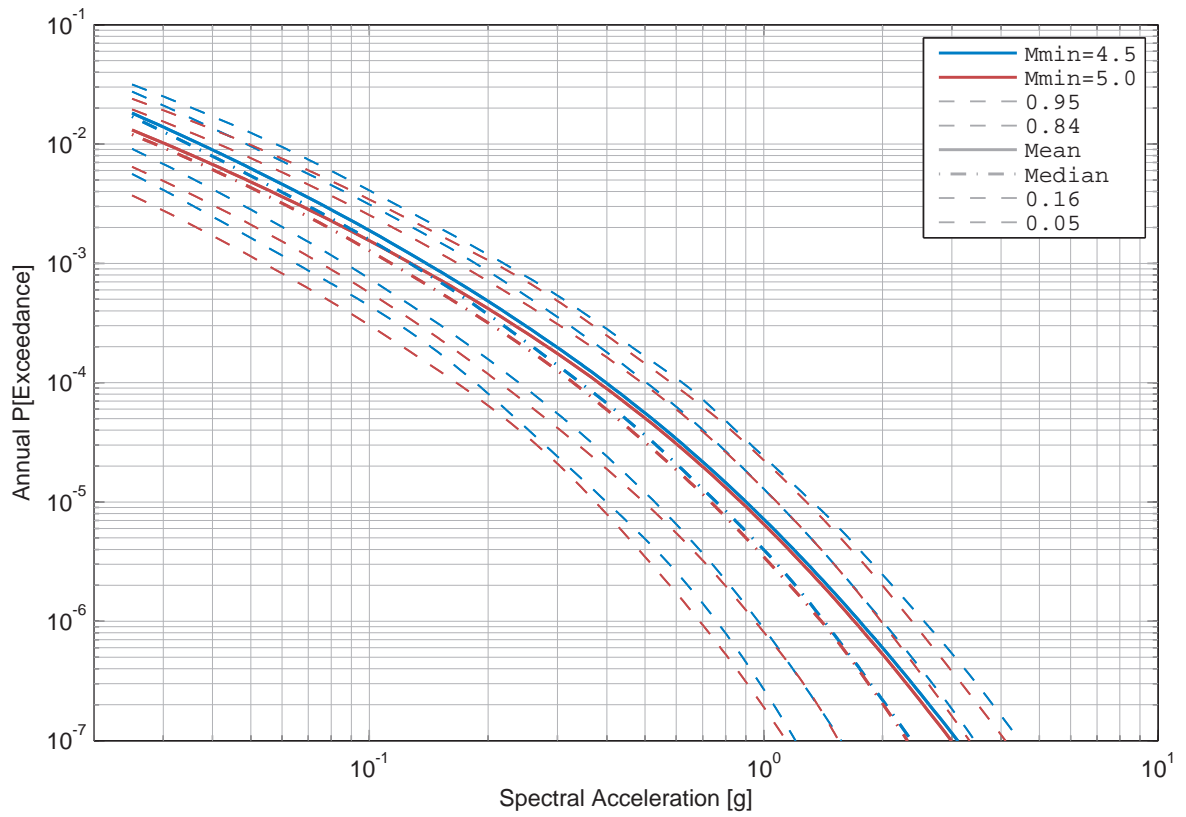


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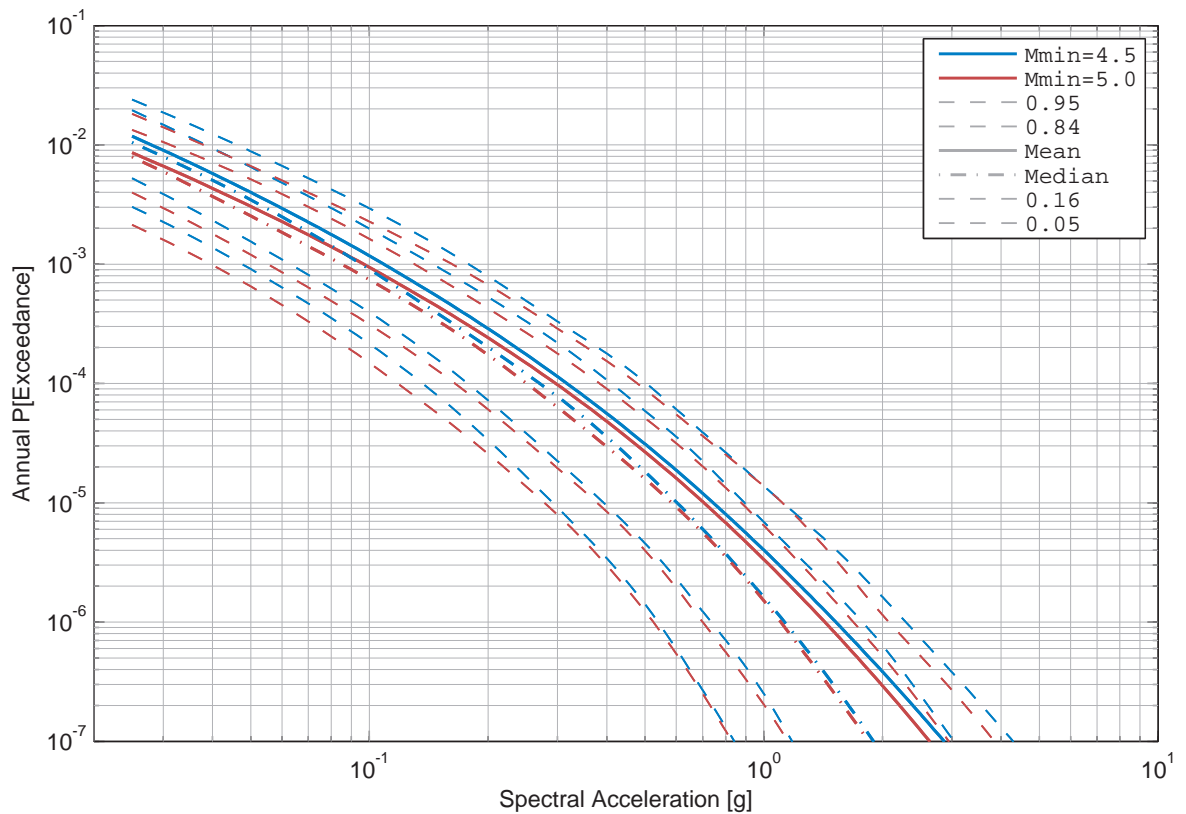


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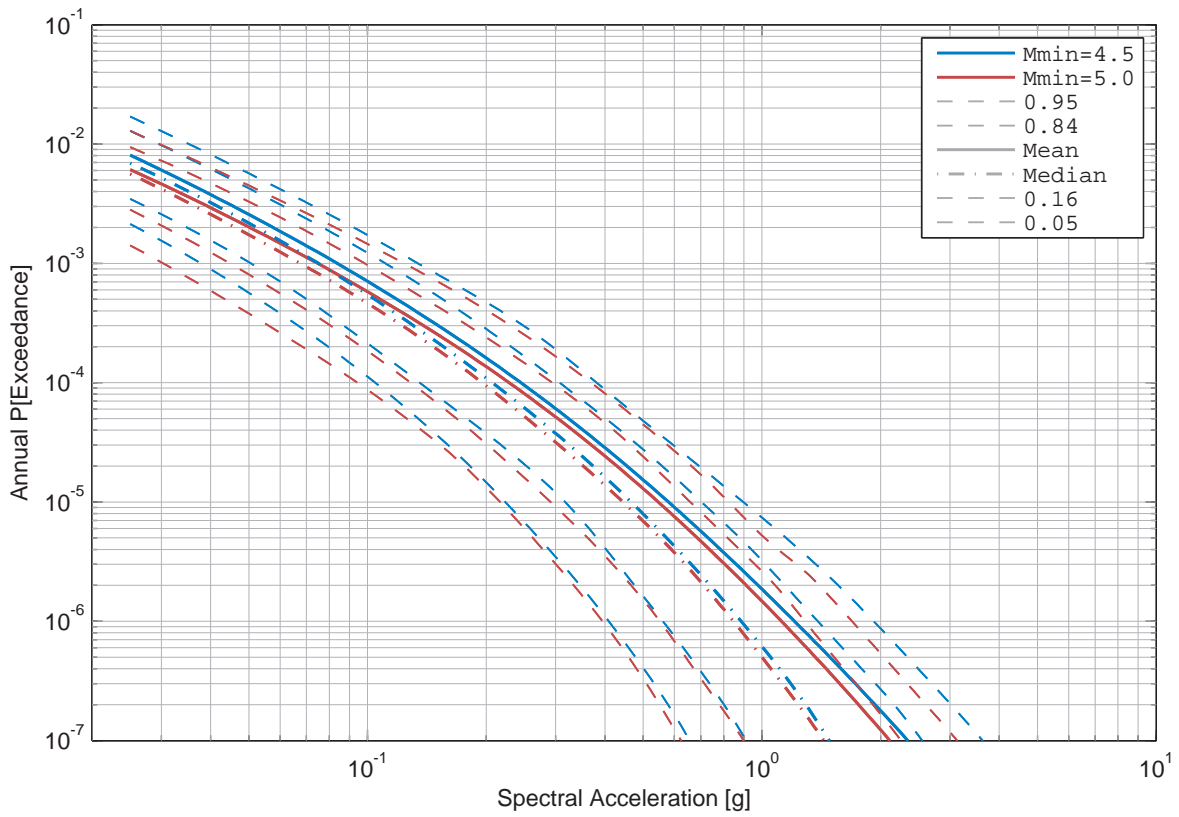


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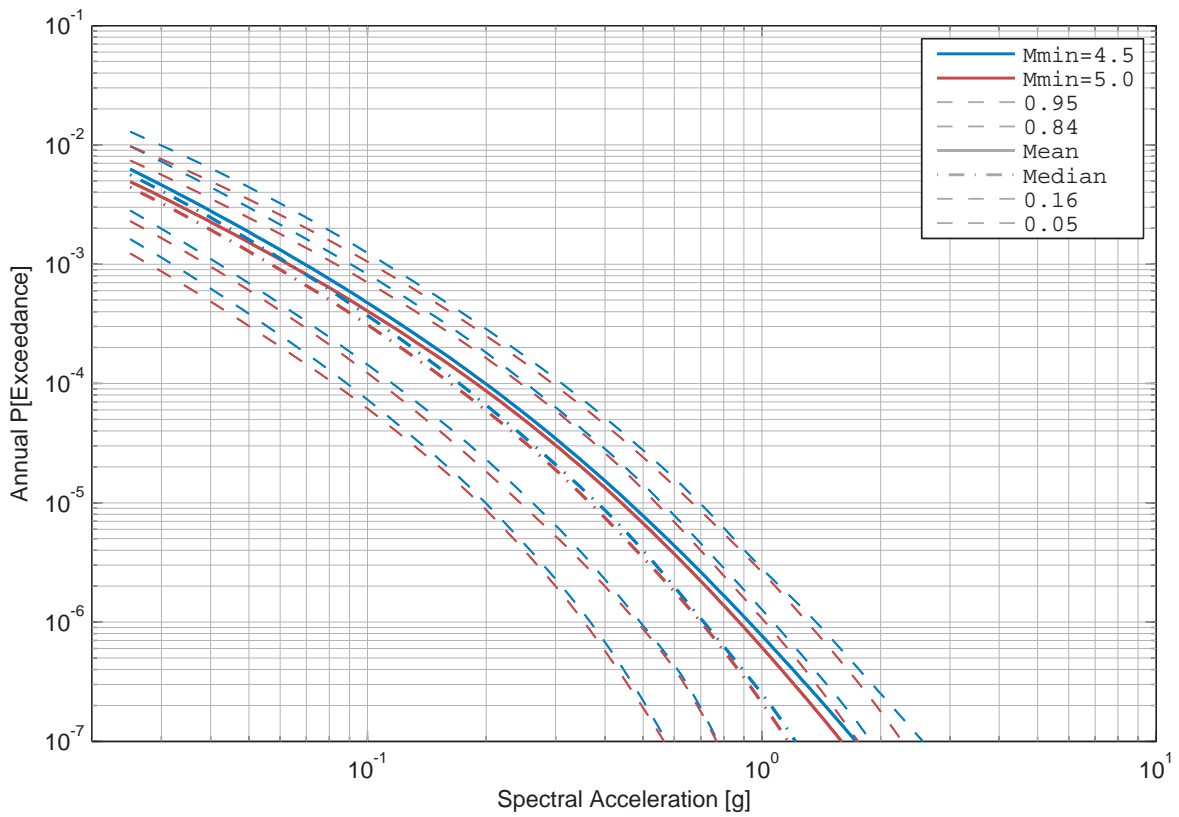


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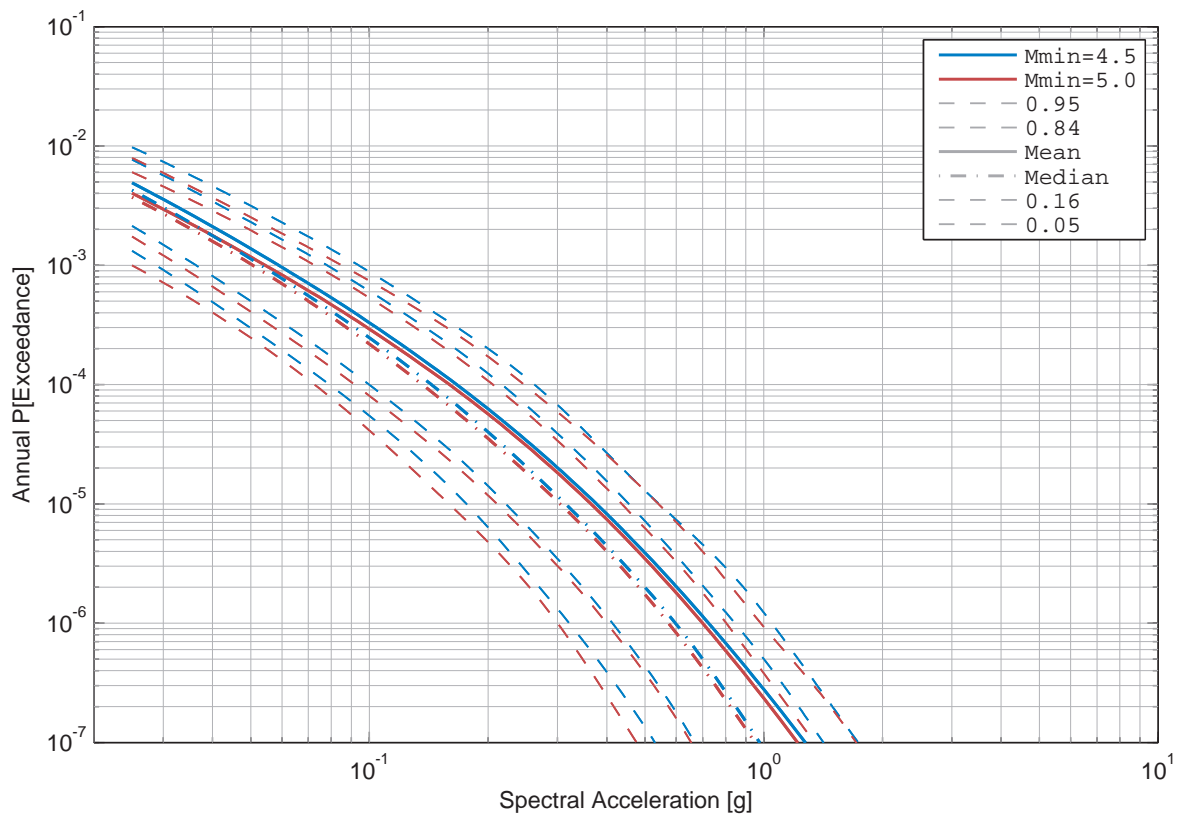


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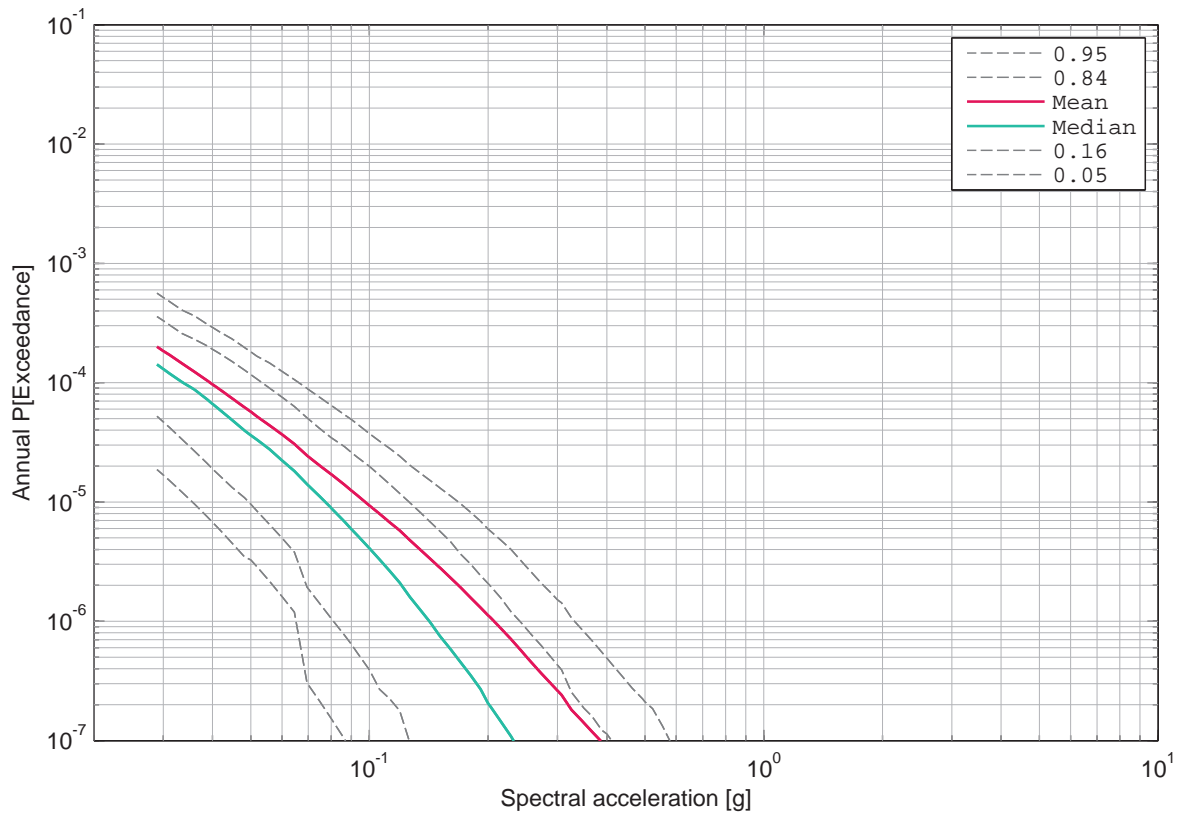


Figure 2.2.1: Beznau, horizontal component, soil, surface, mean hazard and fractiles, 0.5 Hz.

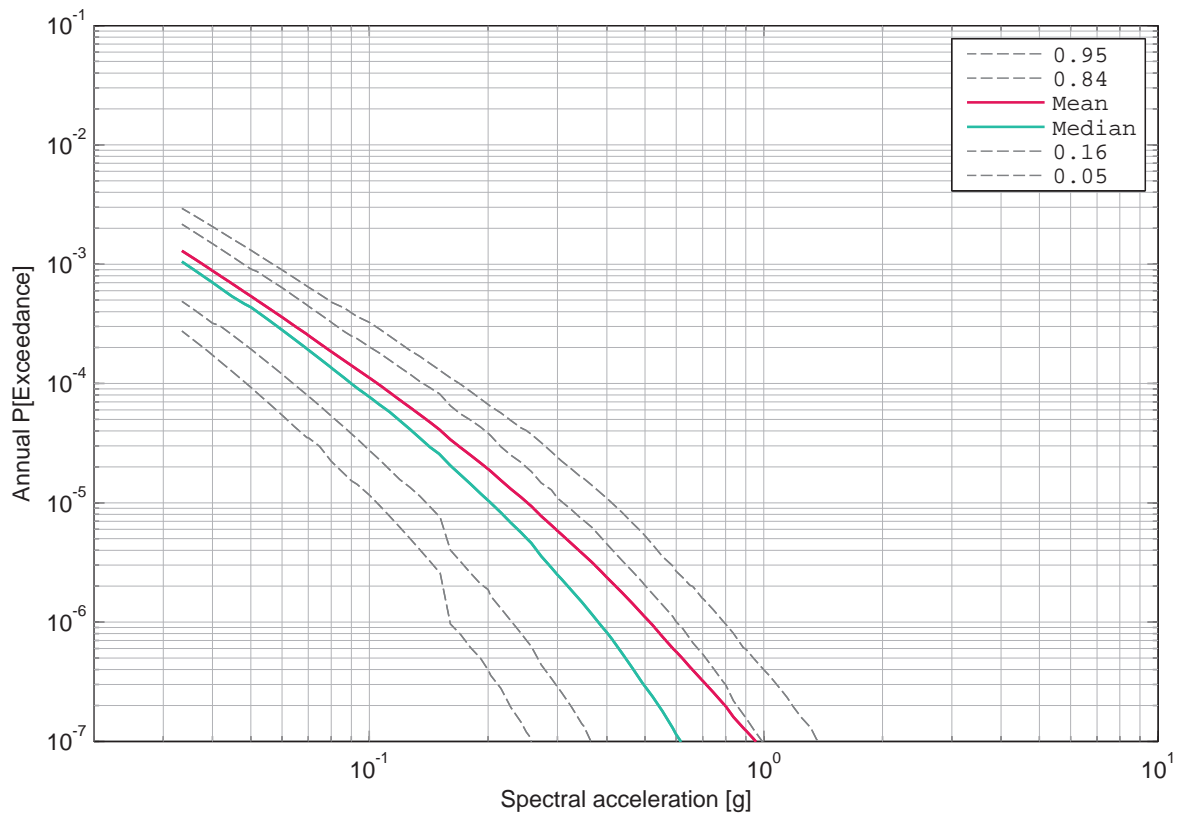


Figure 2.2.2: Beznau, horizontal component, soil, surface, mean hazard and fractiles, 1 Hz.

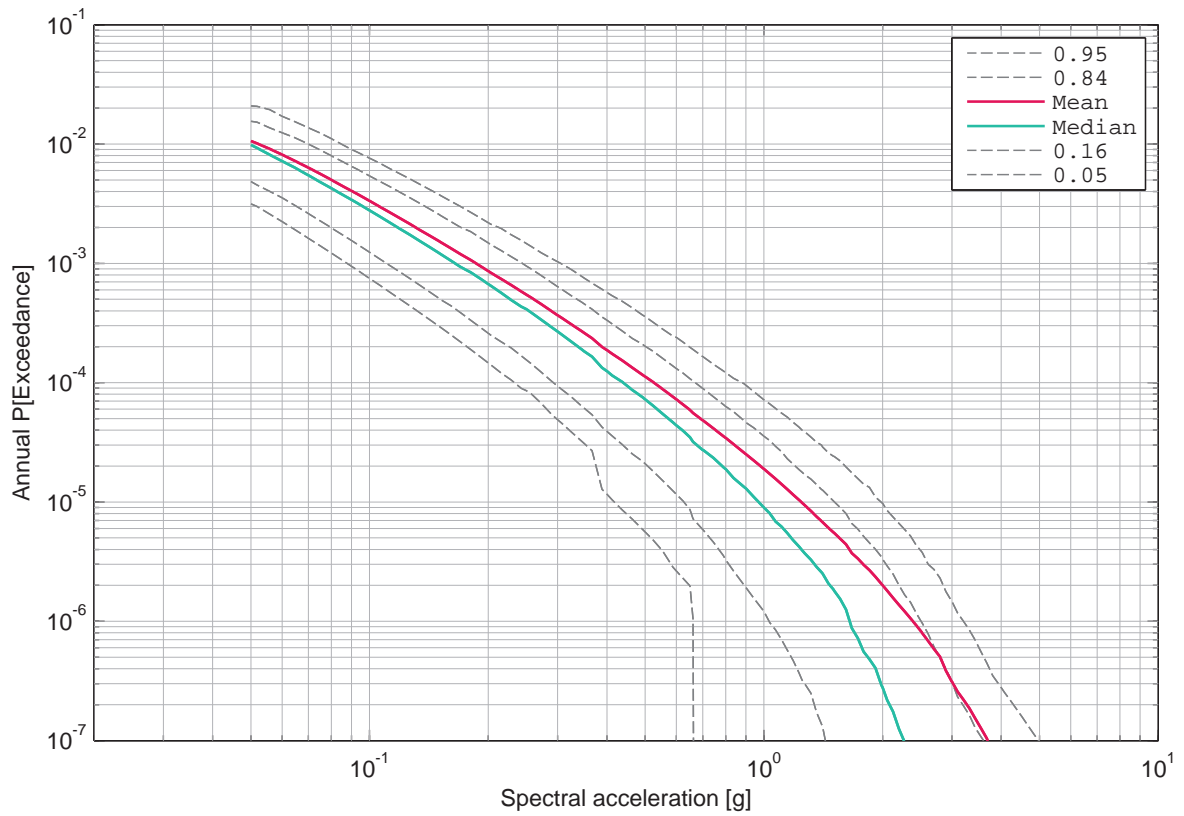


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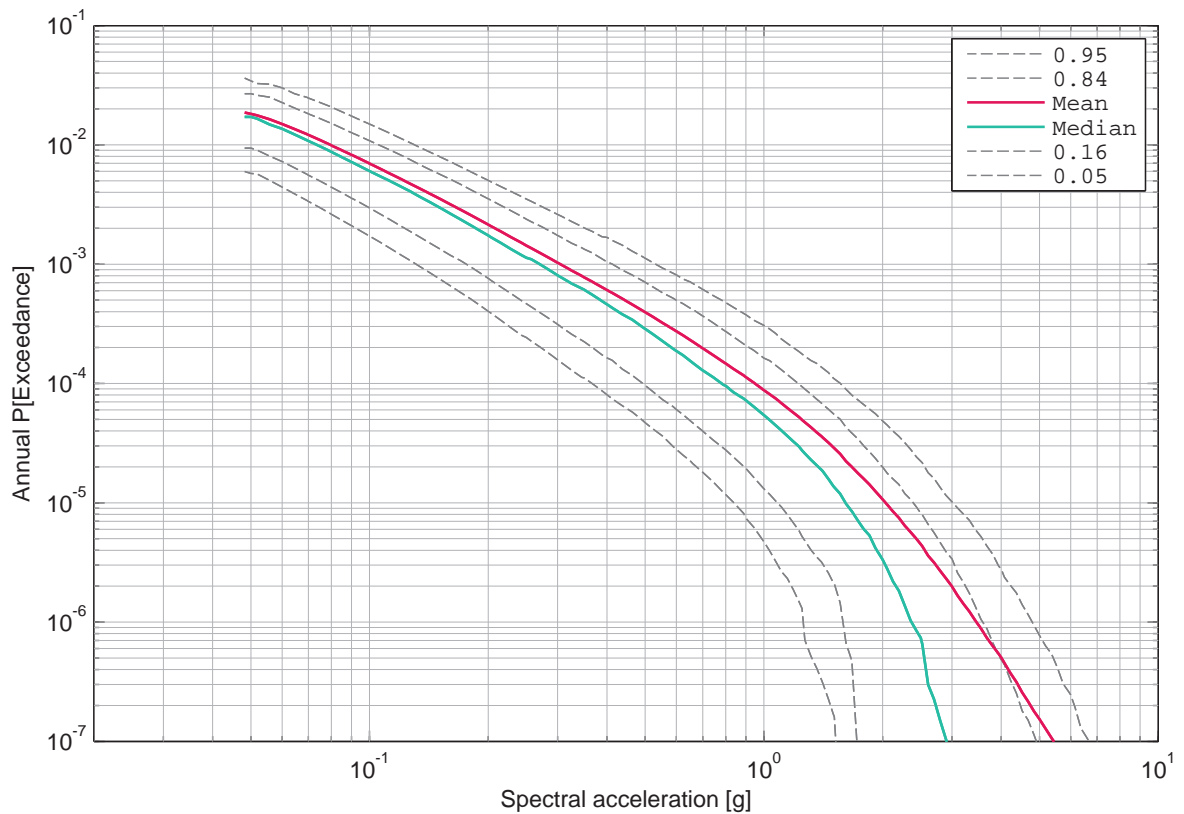


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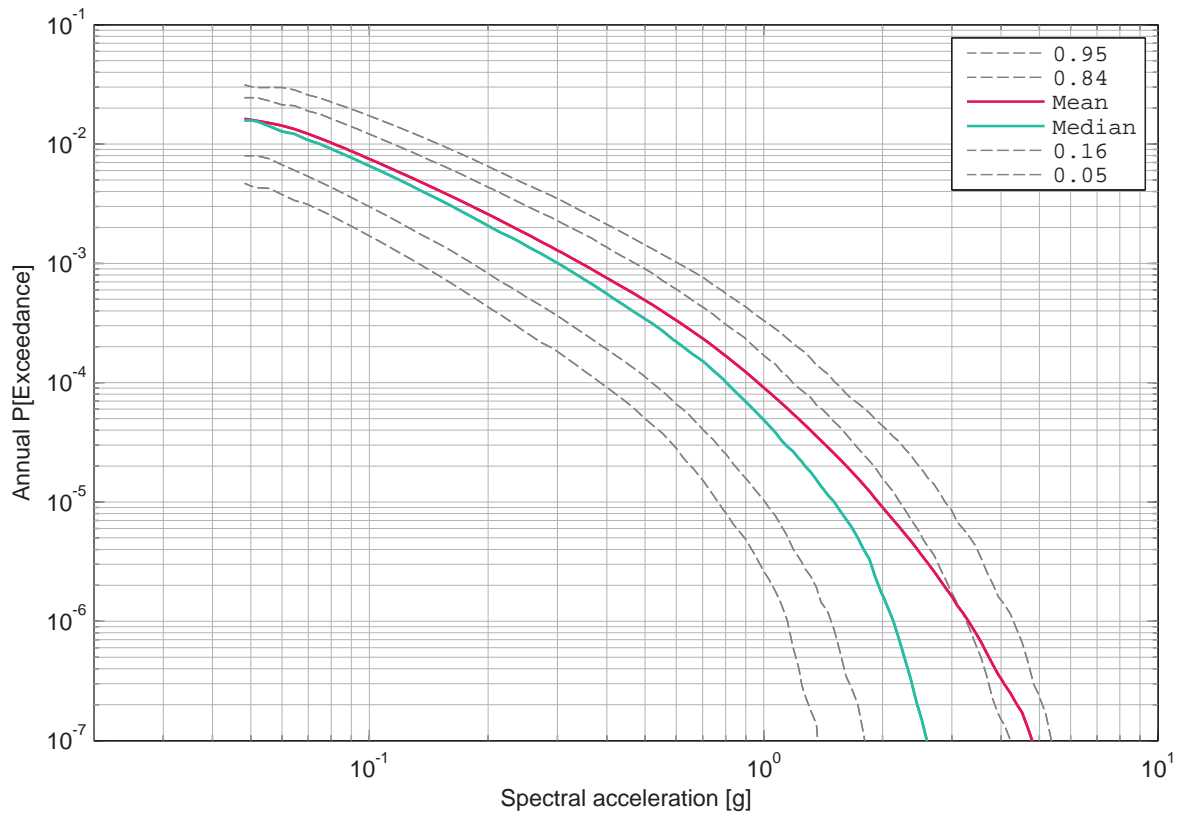


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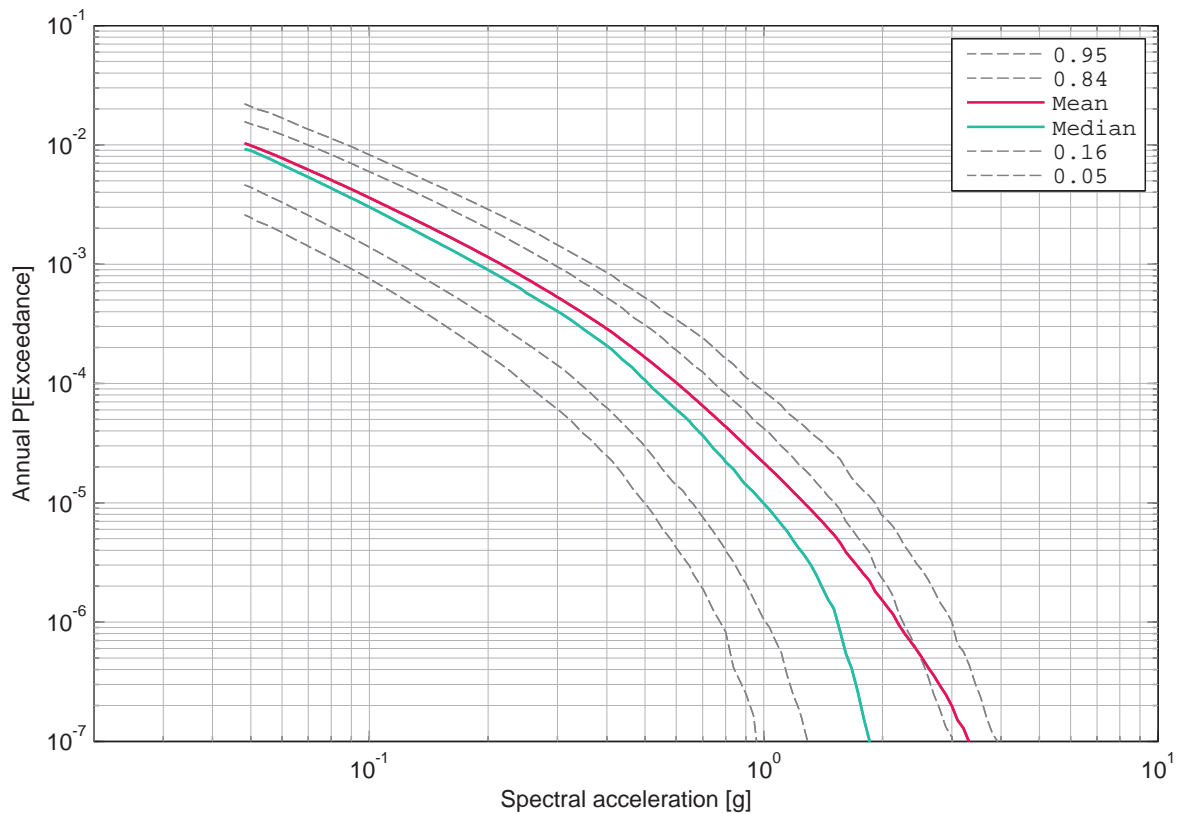


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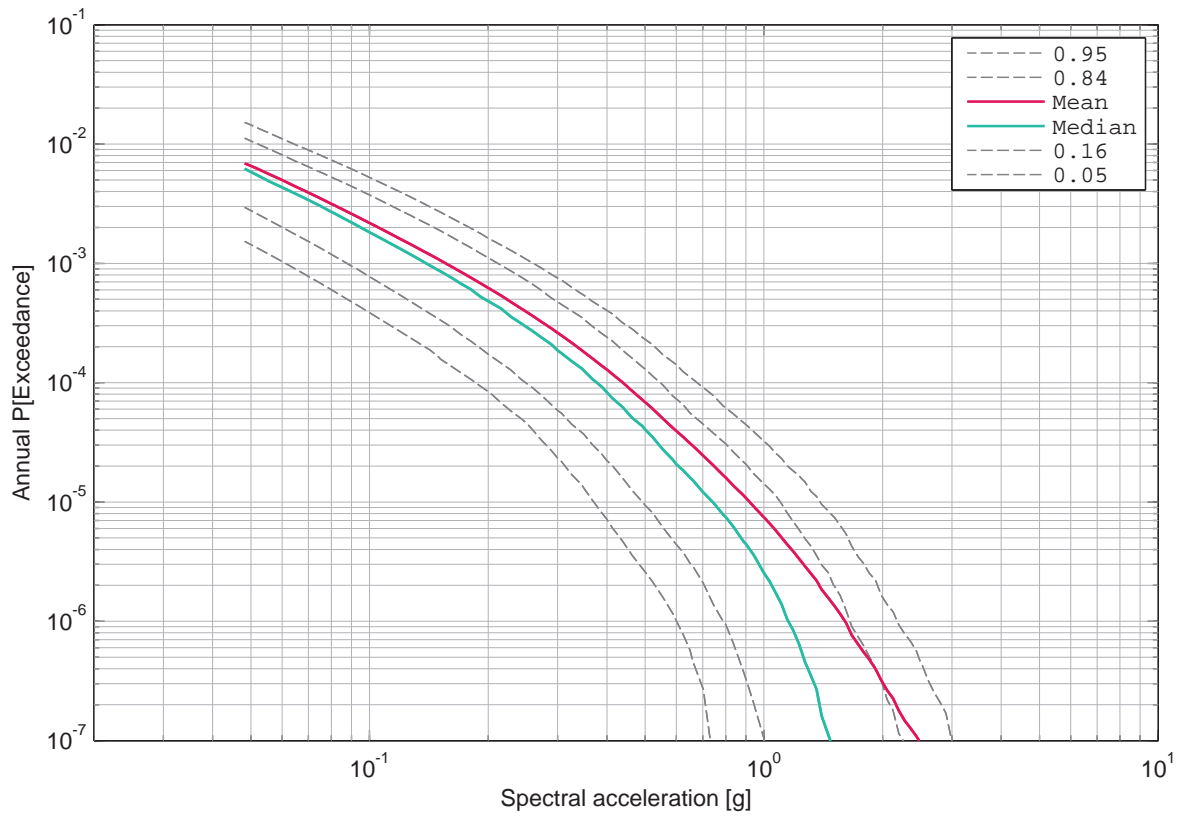


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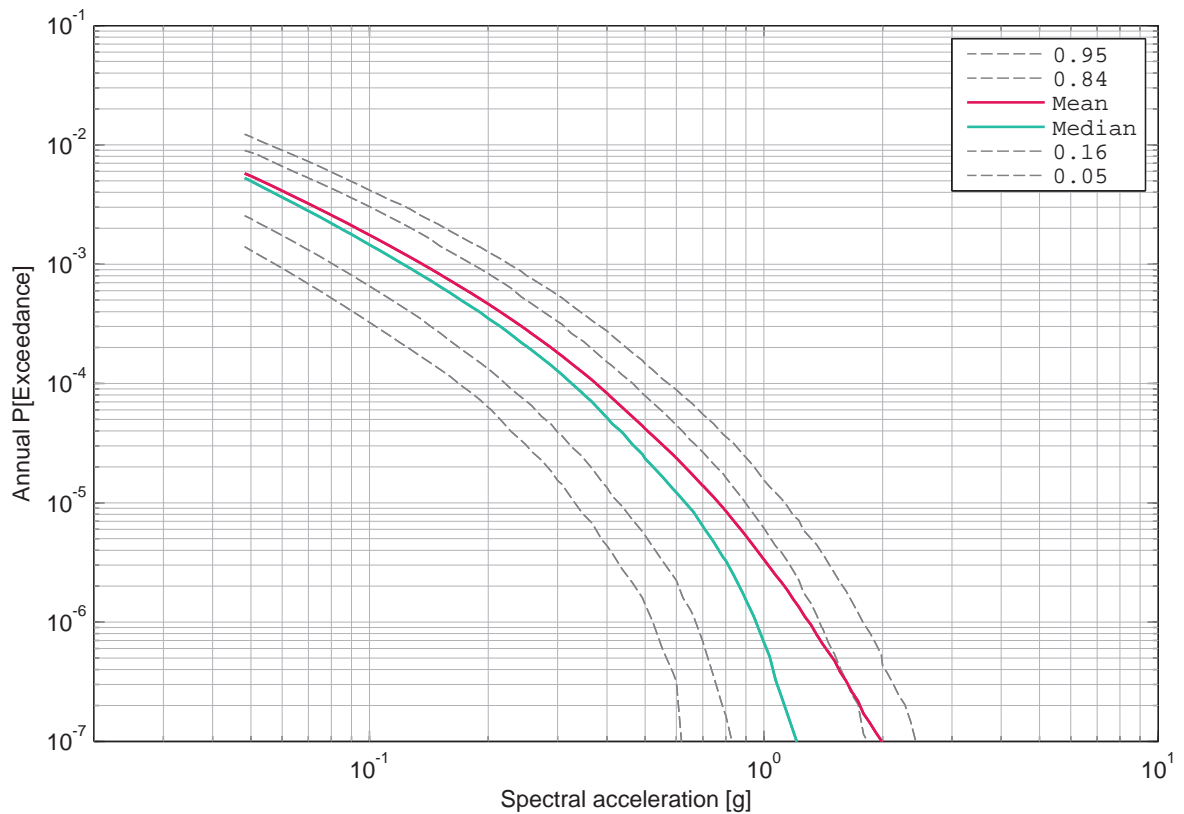


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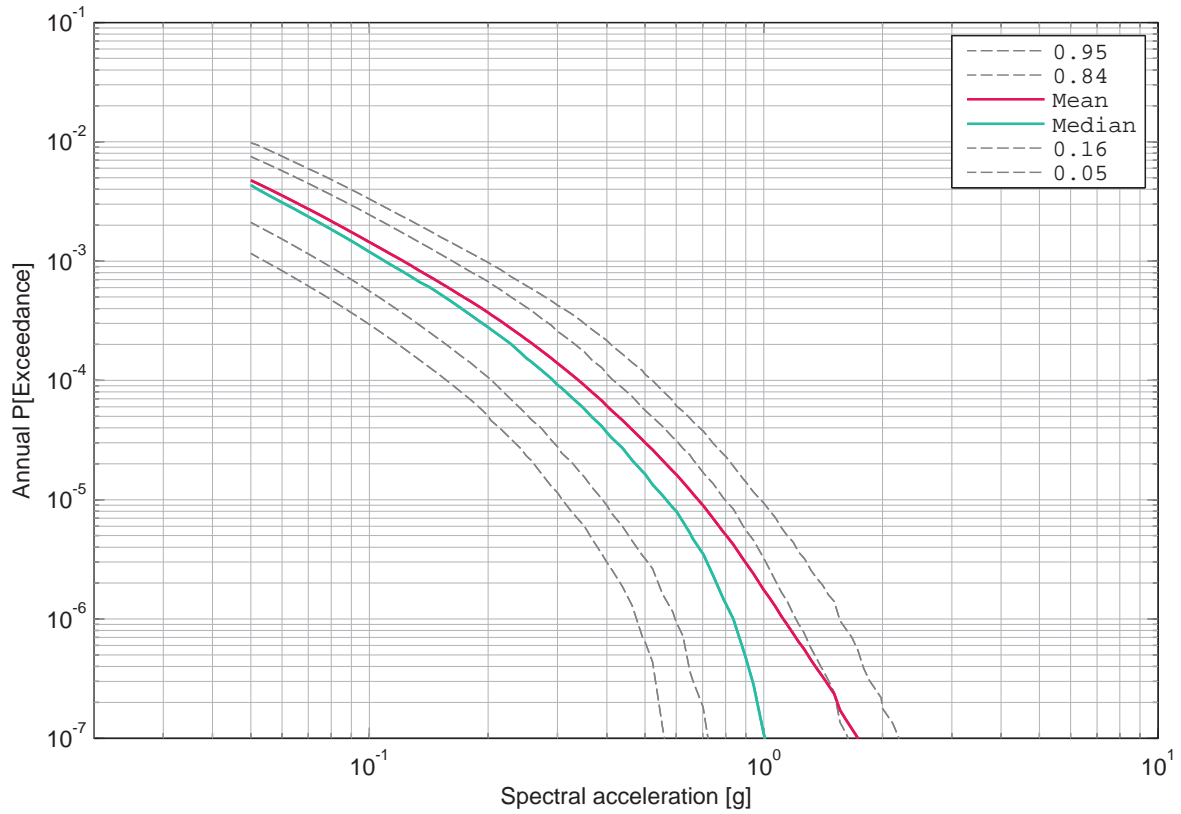


Figure 2.2.9: Beznau, horizontal component, soil, surface, mean hazard and fractiles, 100 Hz.

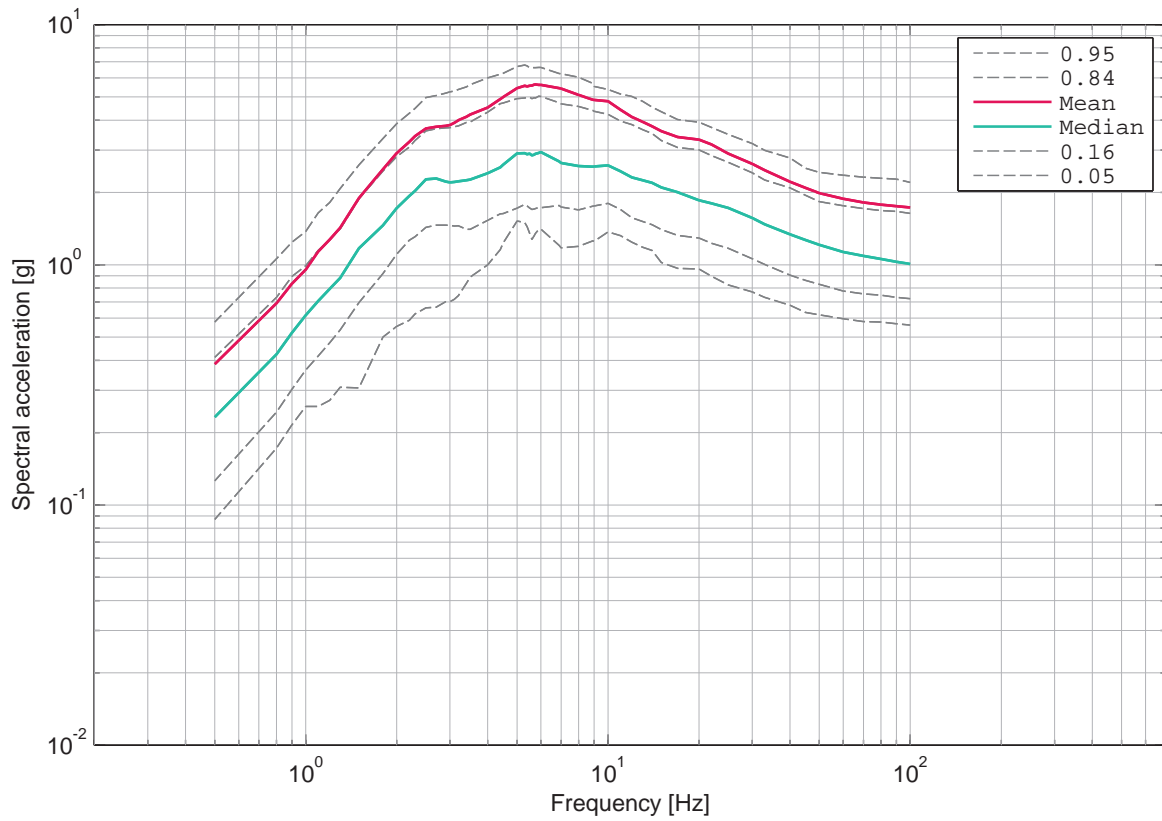


Figure 2.2.10: Beznau, horizontal component, soil, surface, UHS for an annual probability of exceedance of 1E-07 and 5% damping.

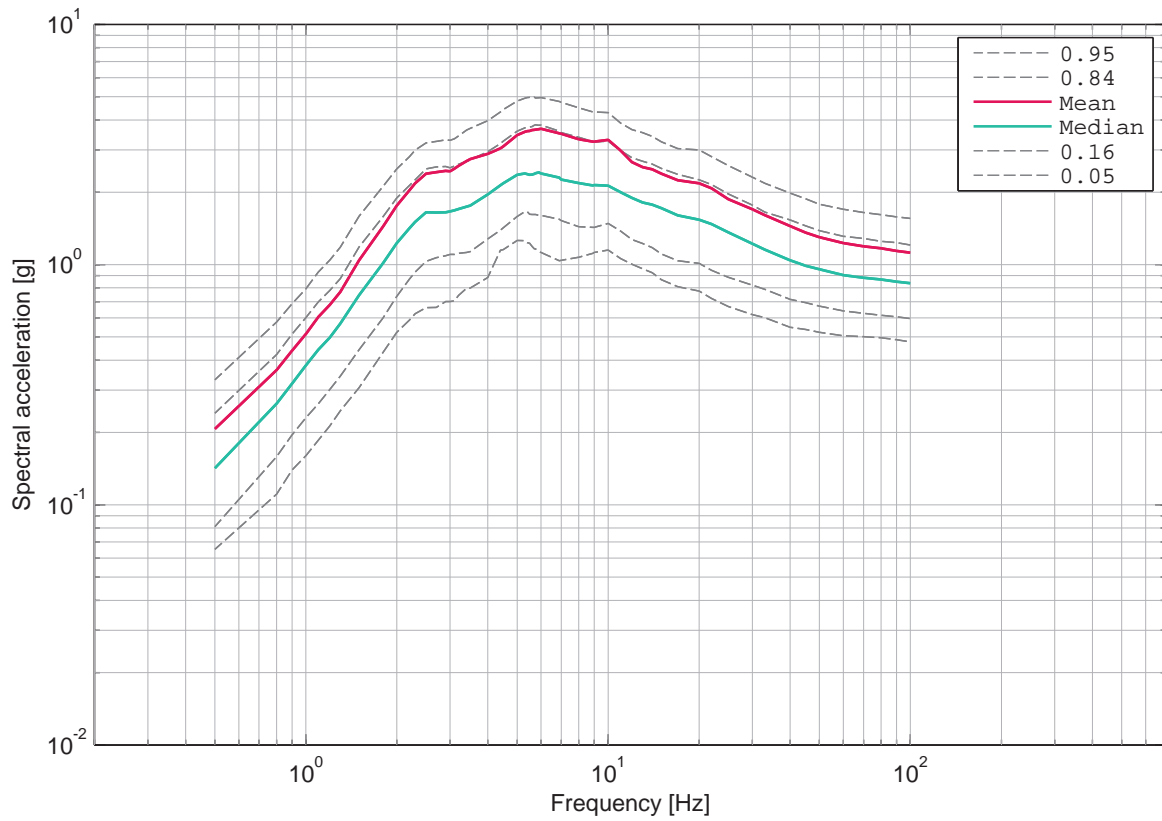


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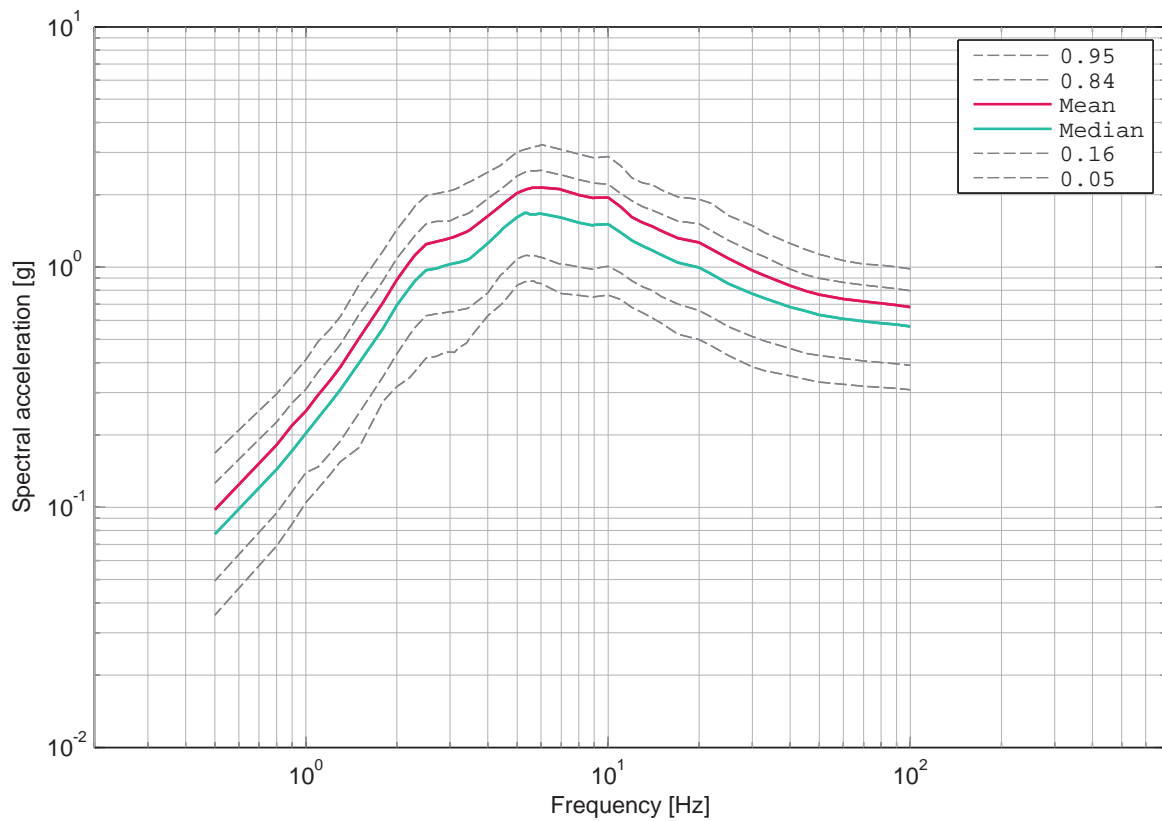


Figure 2.2.12: Beznau, horizontal component, soil, surface, UHS for an annual probability of exceedance of 1E-05 and 5% damping.

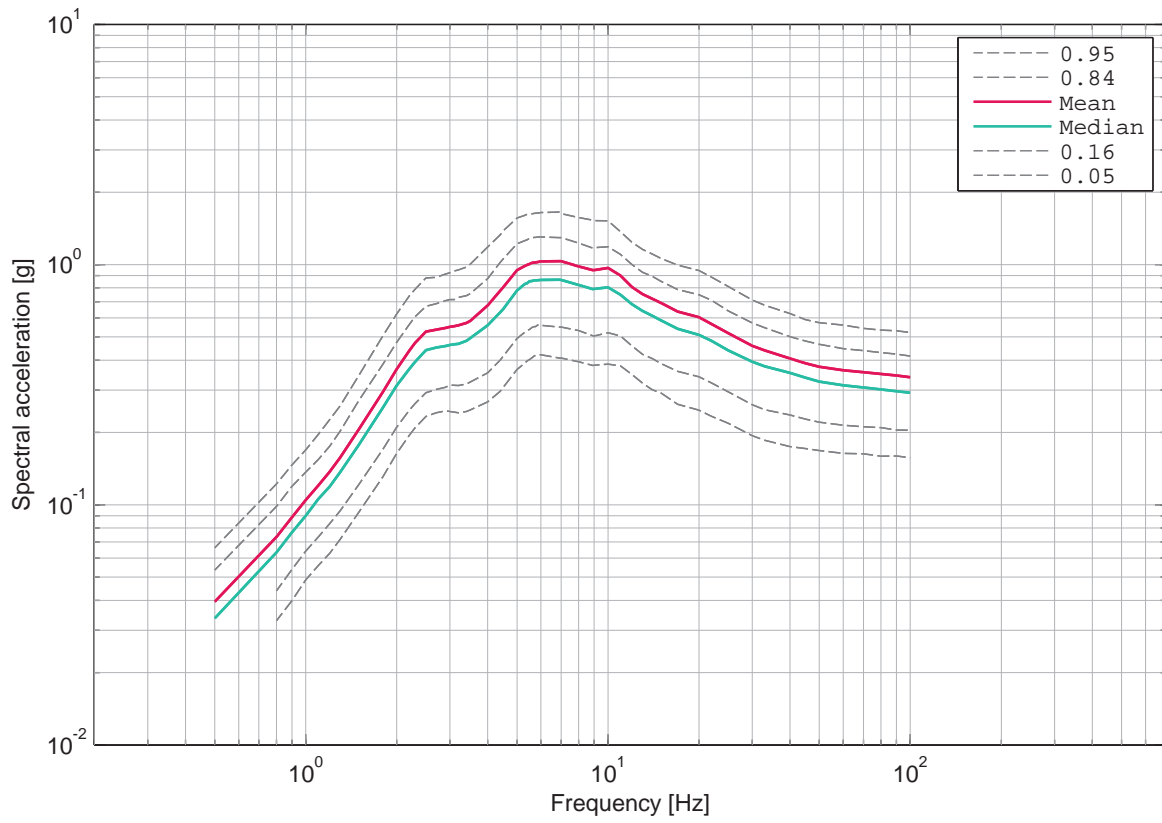


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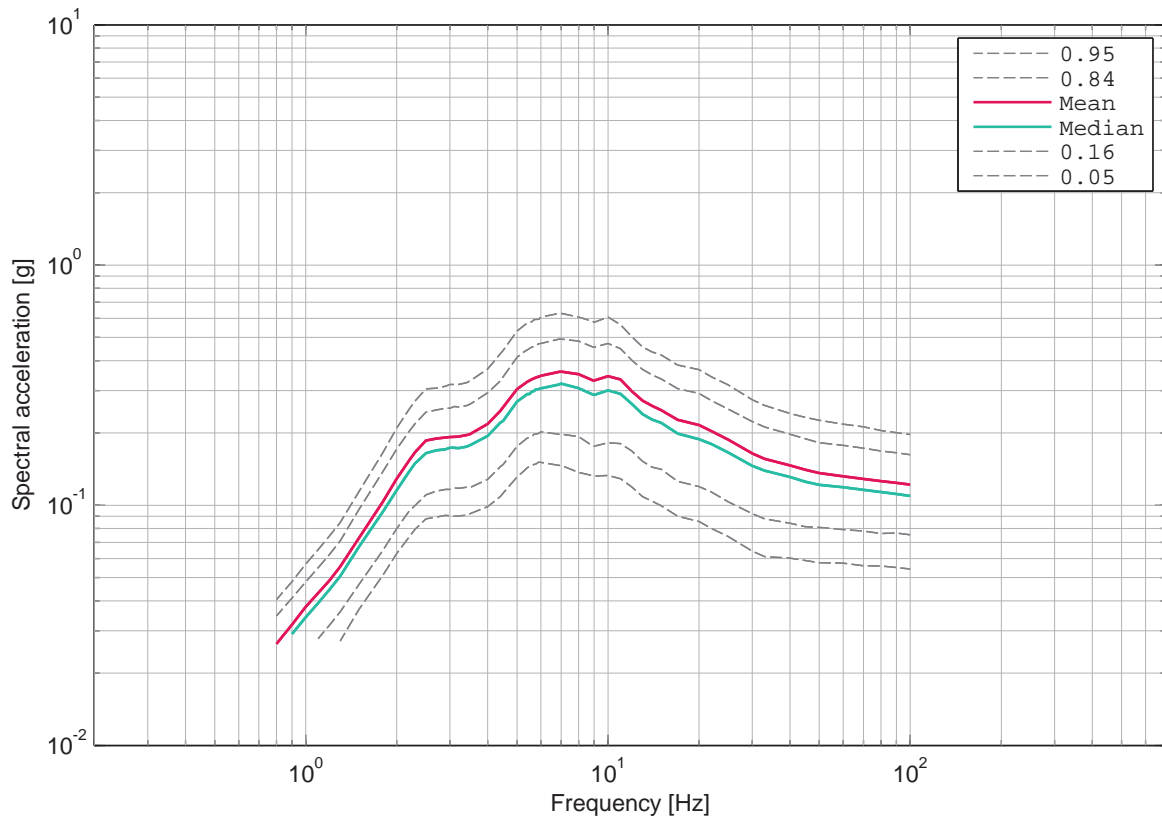


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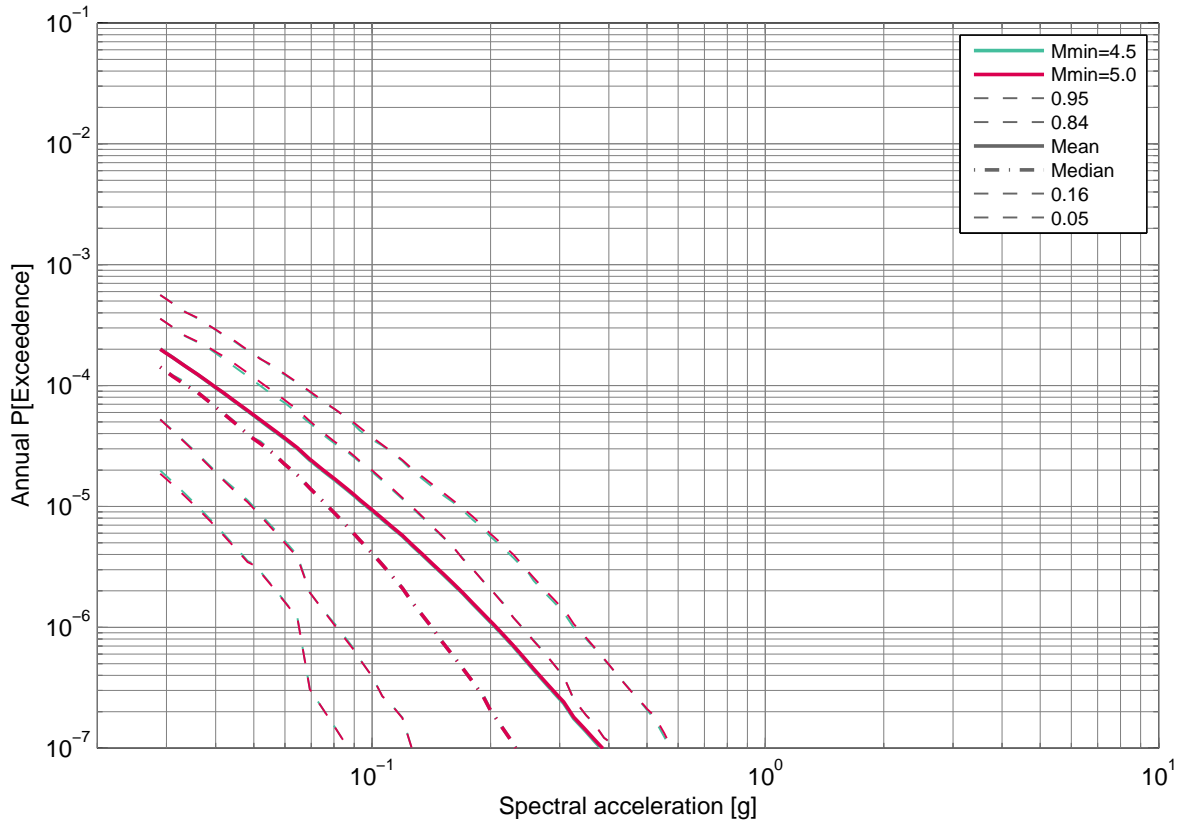


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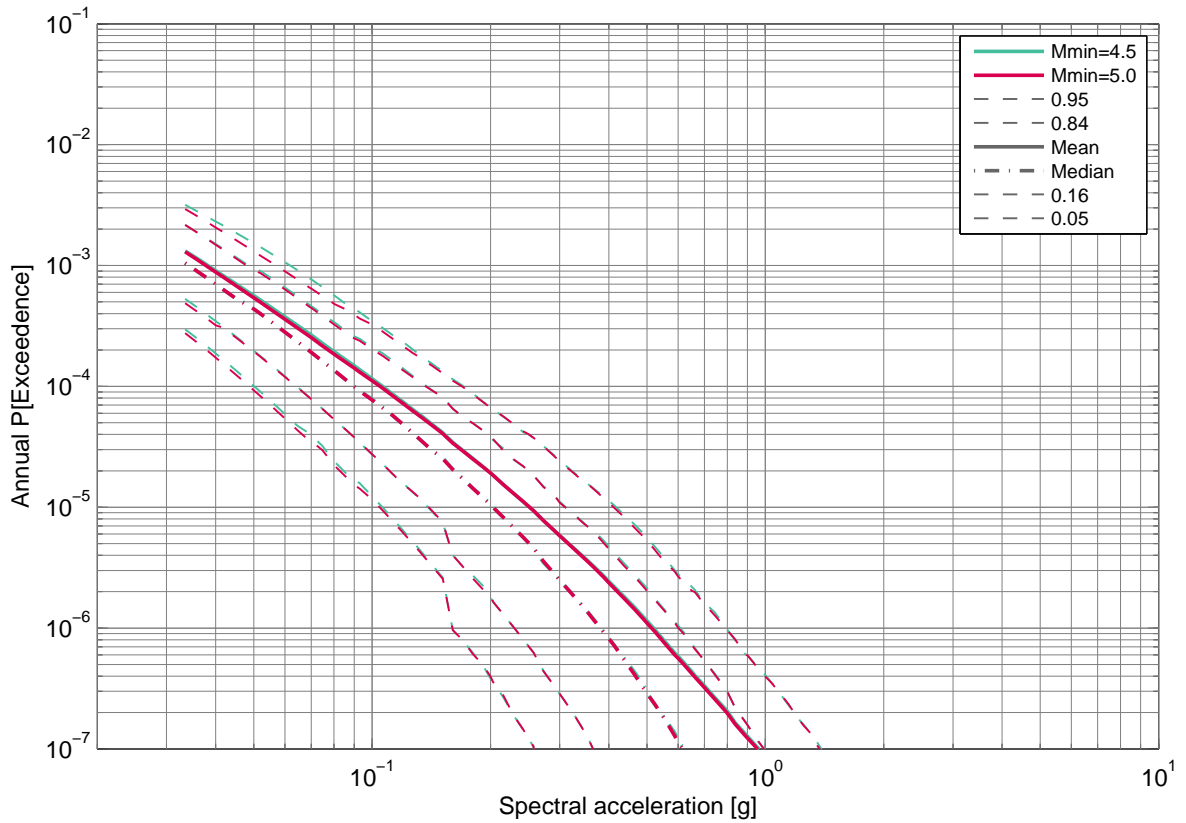


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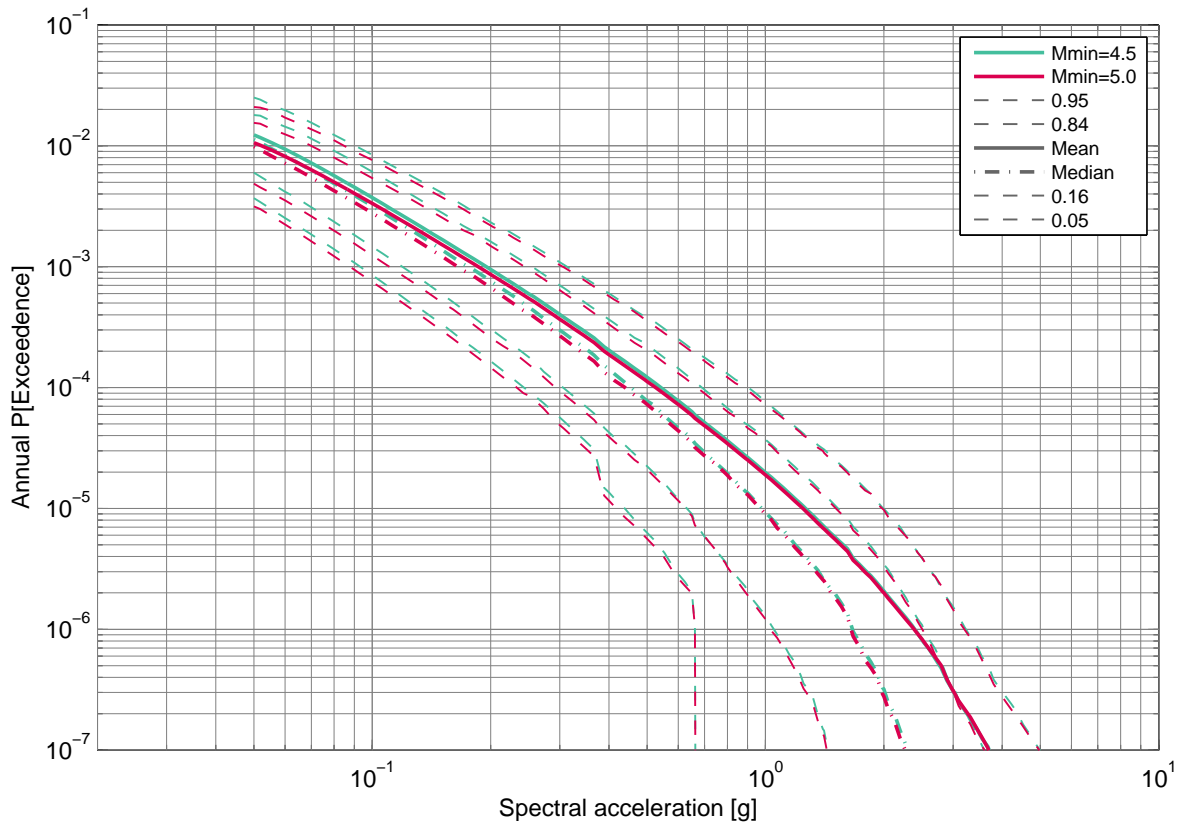


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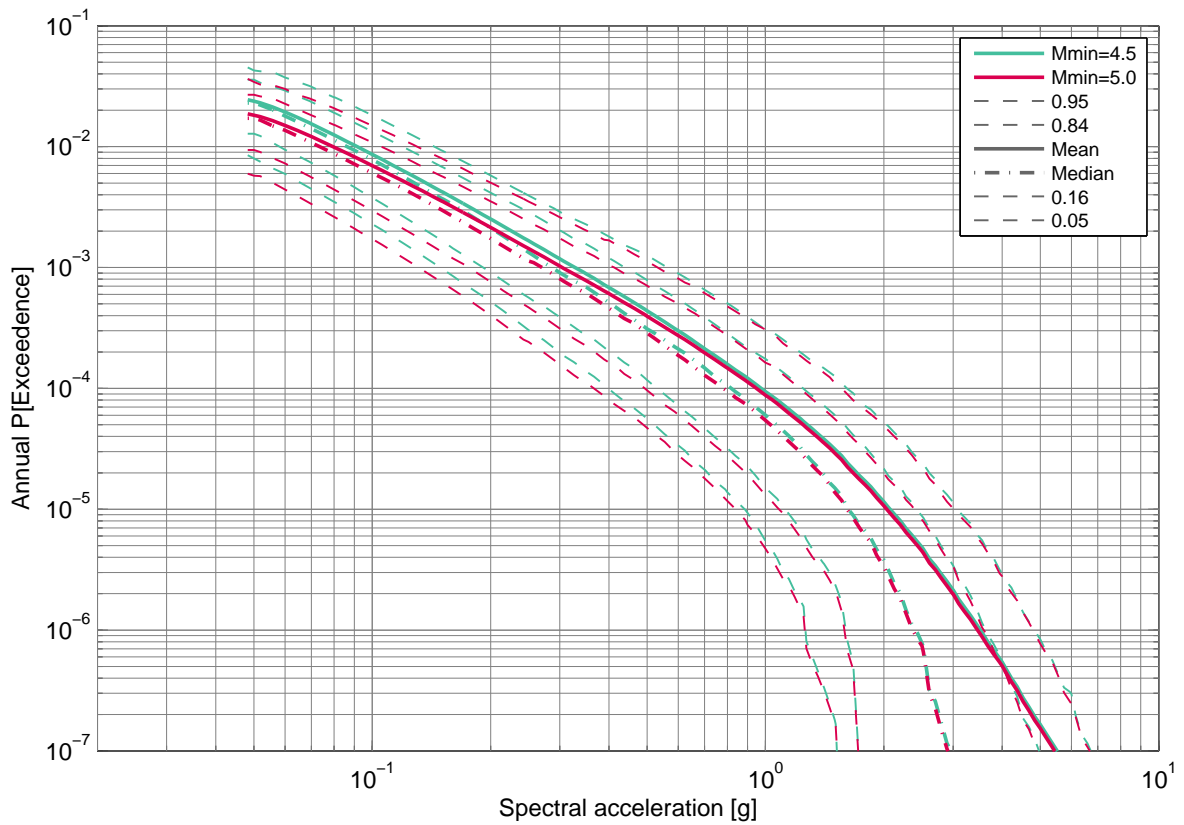


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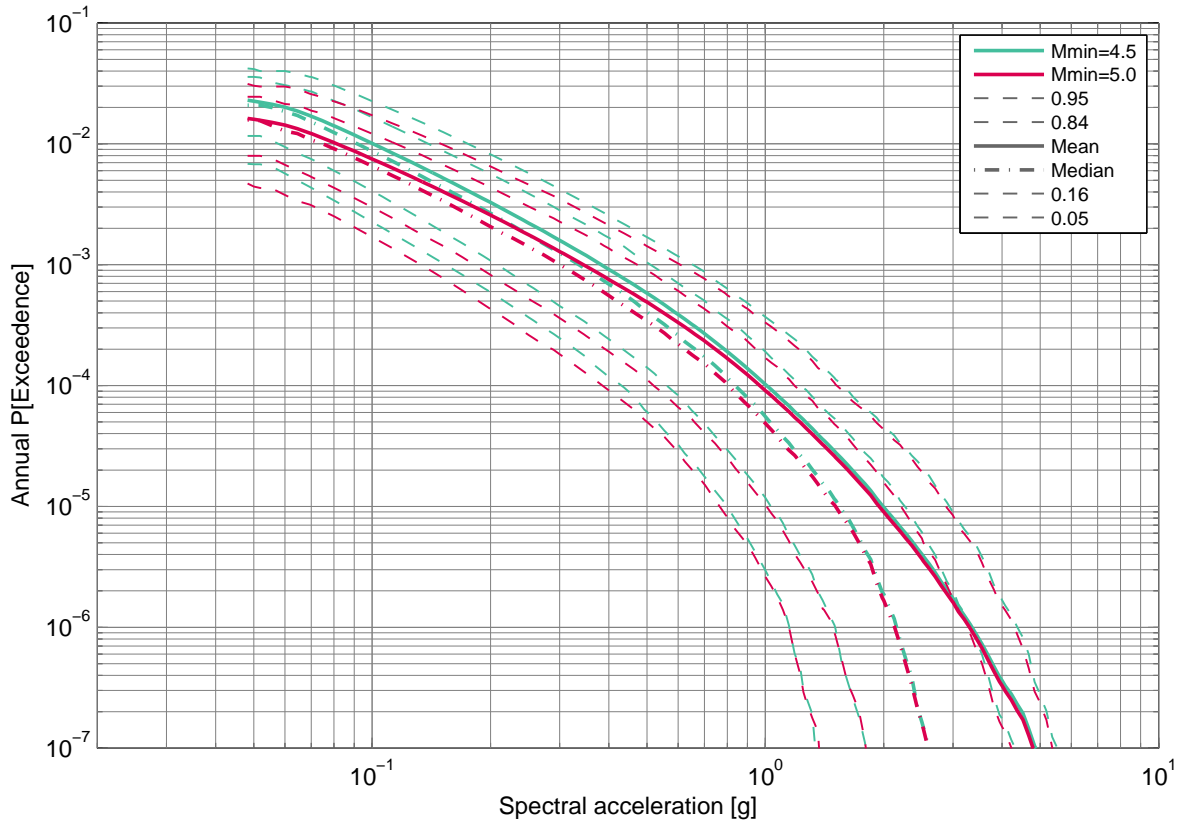


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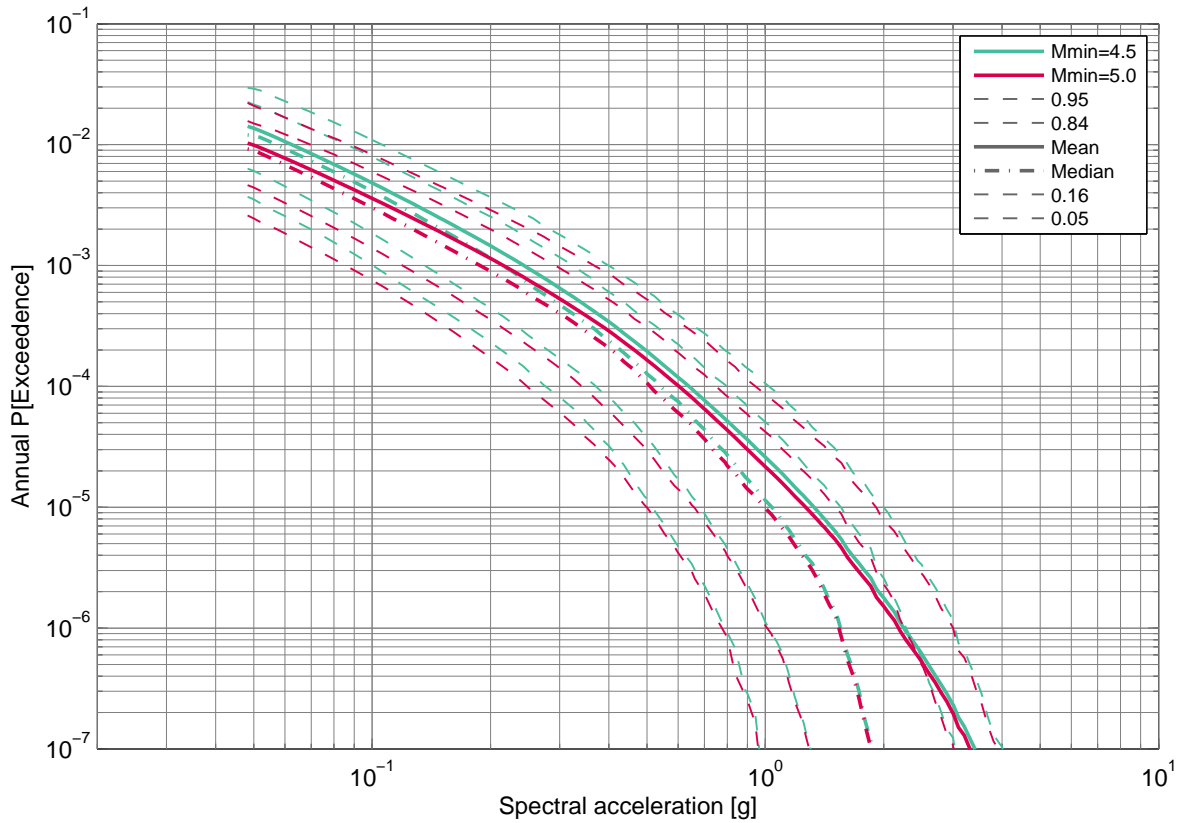


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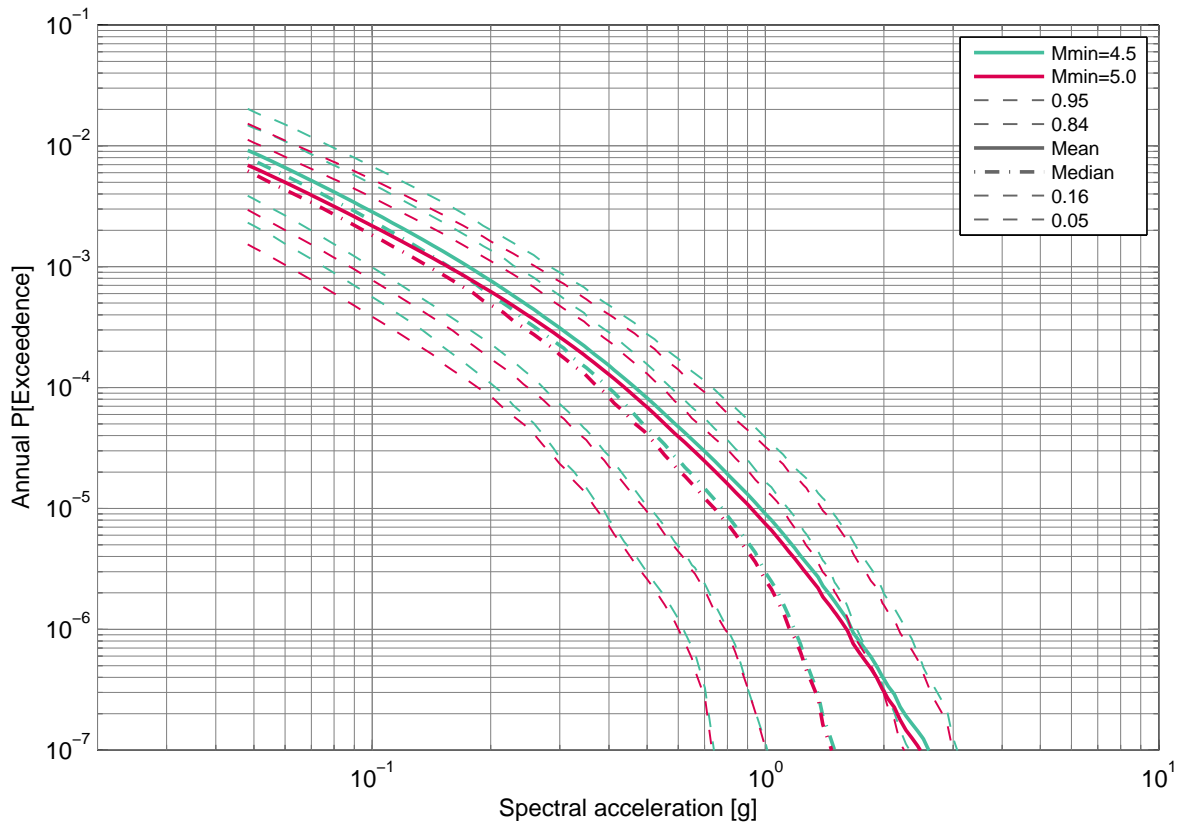


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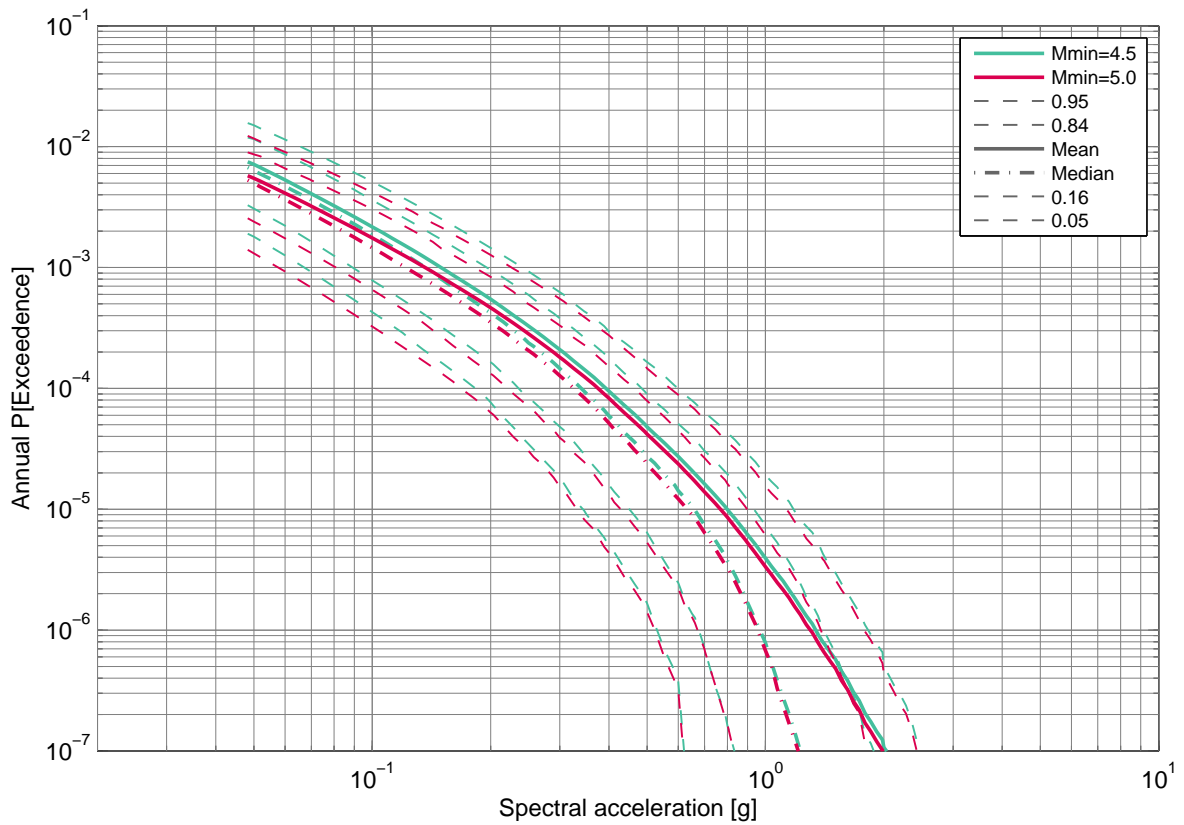


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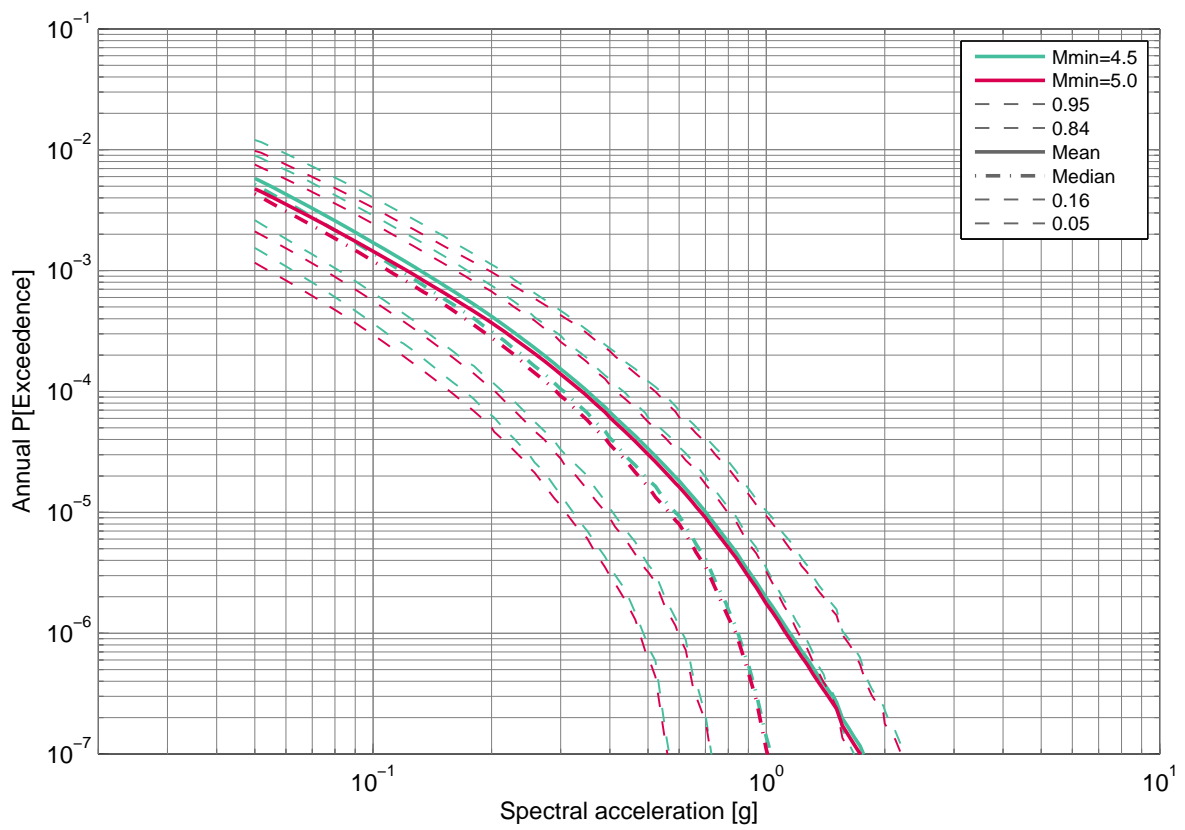


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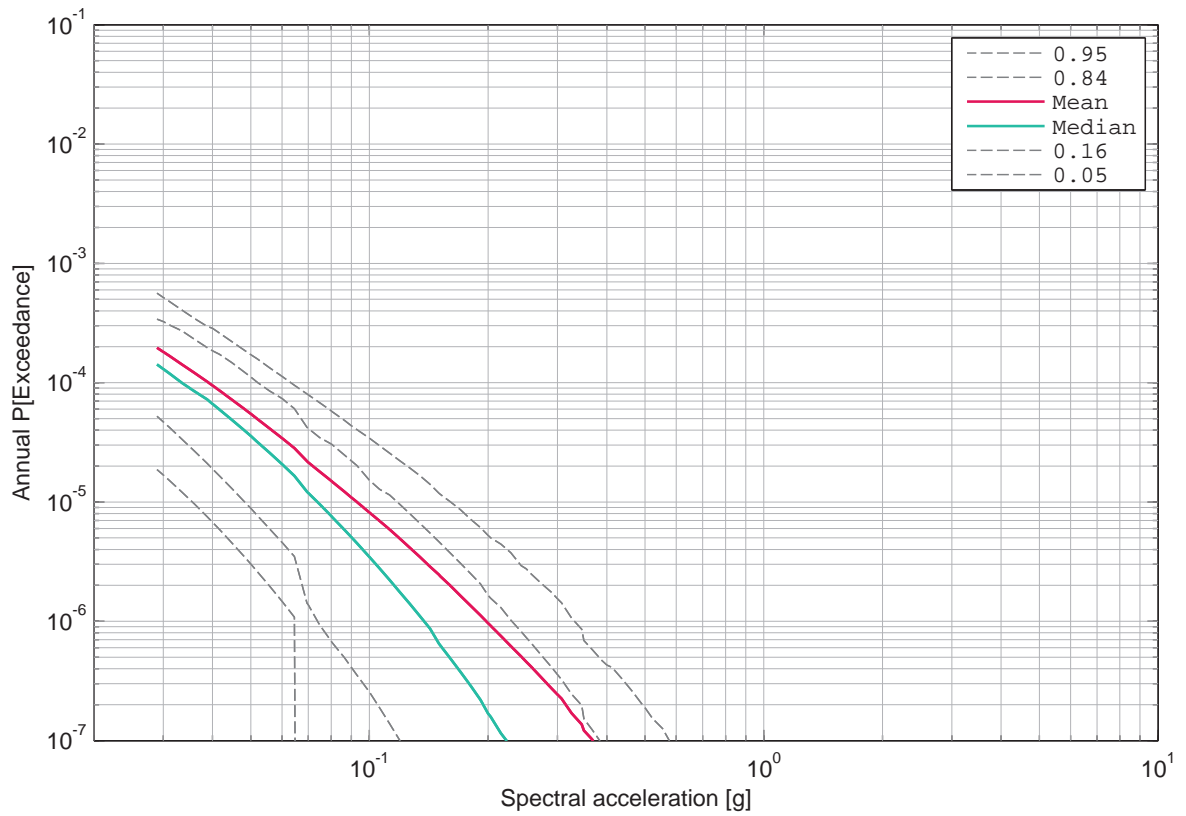


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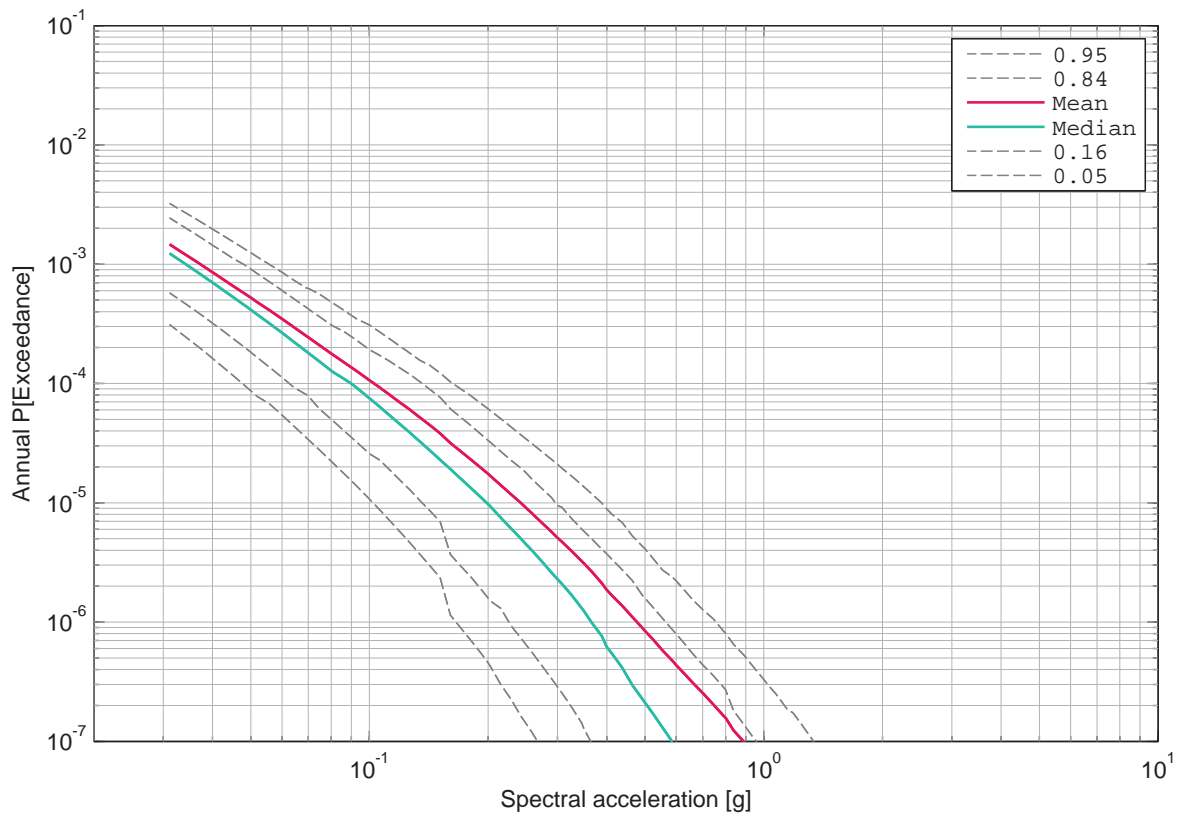


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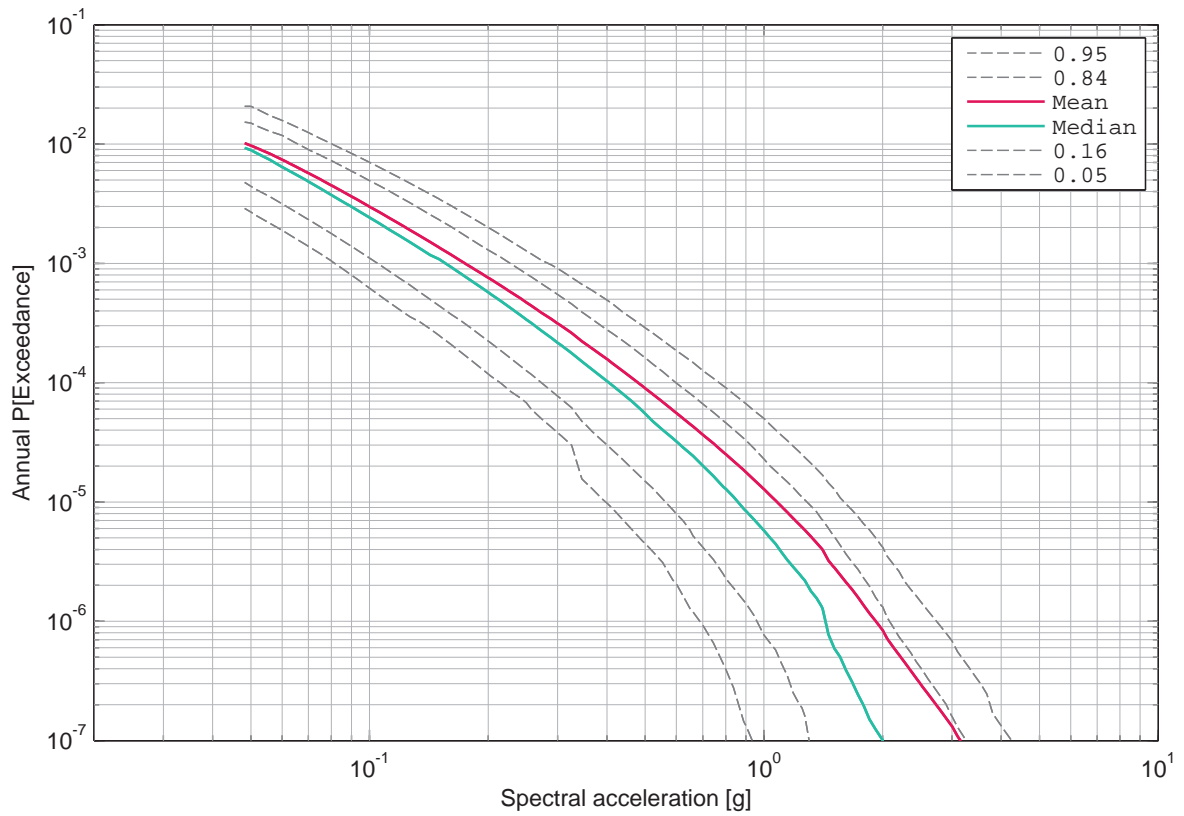


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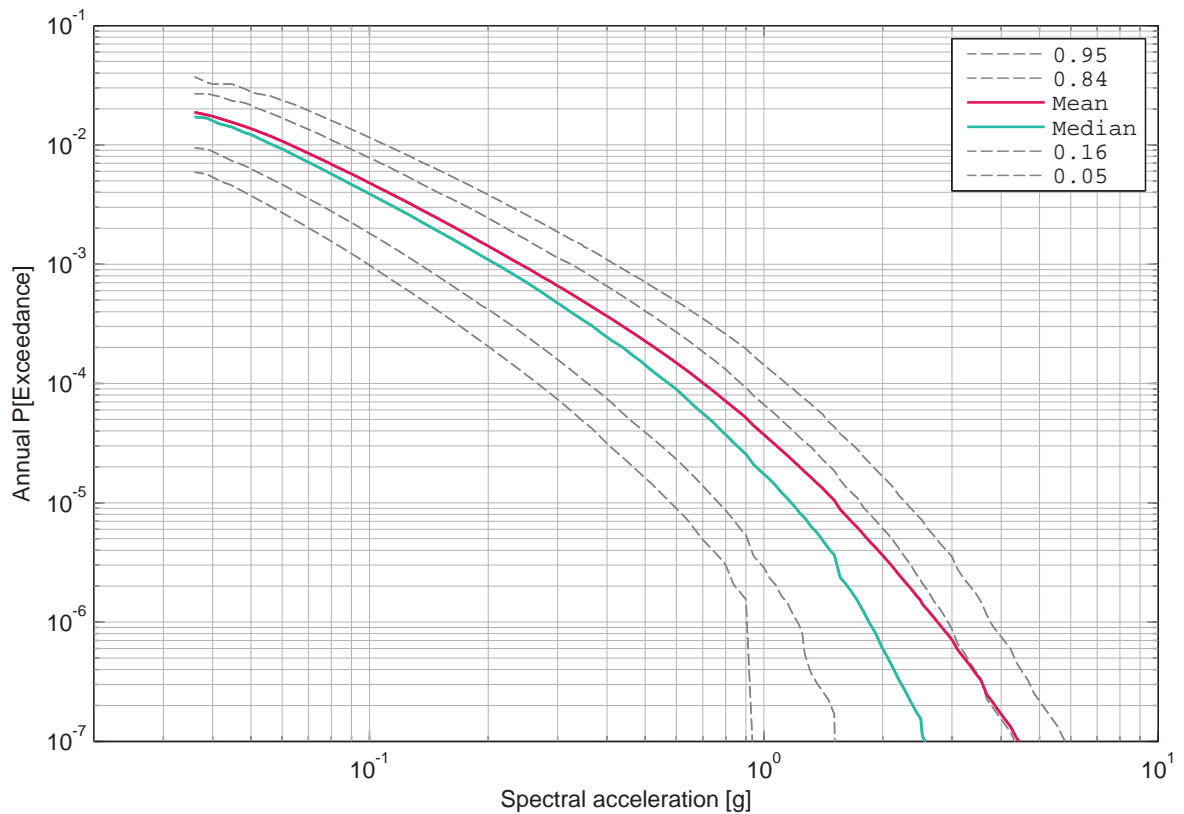


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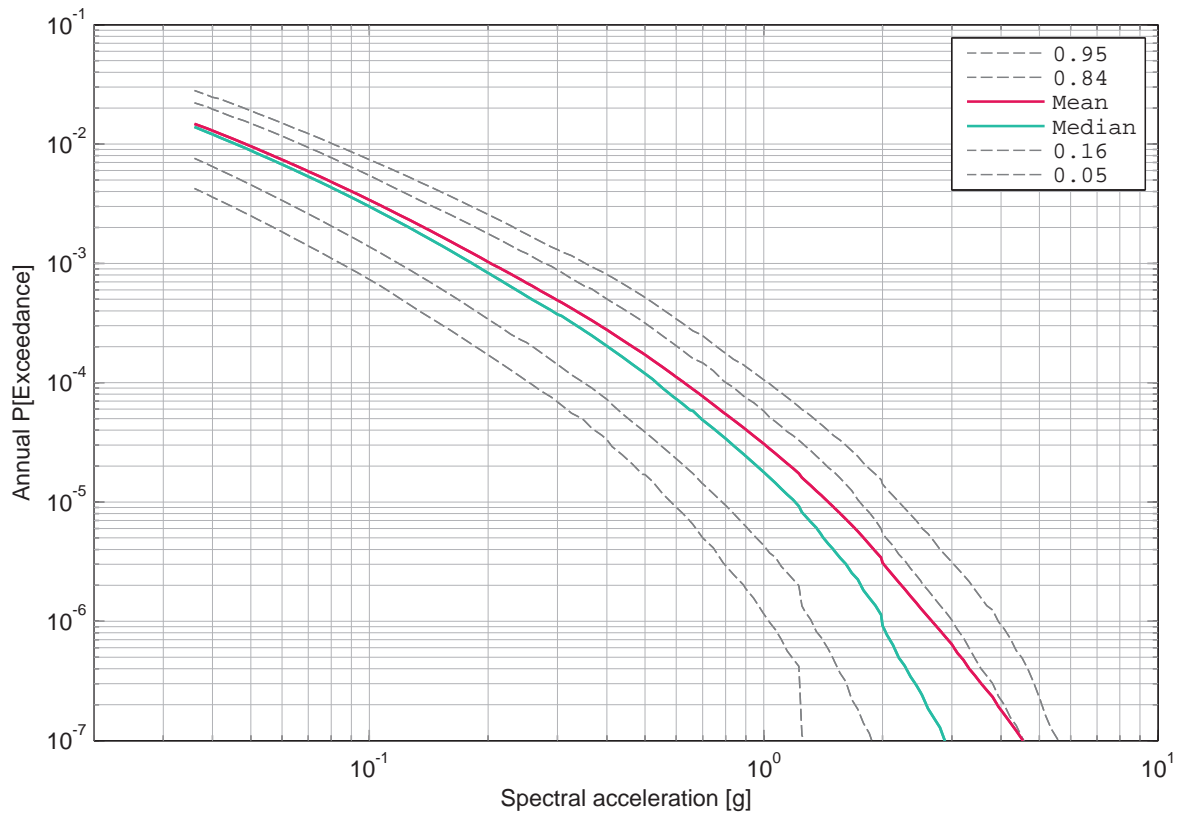


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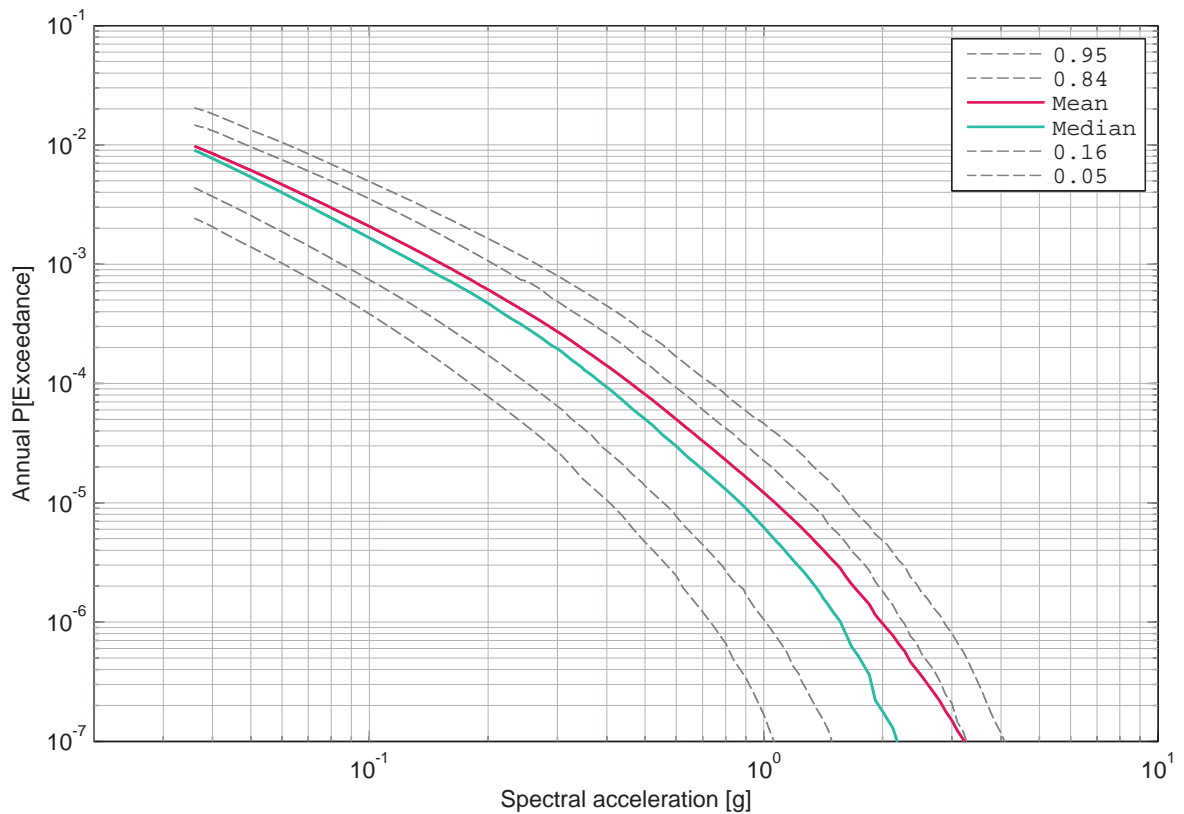


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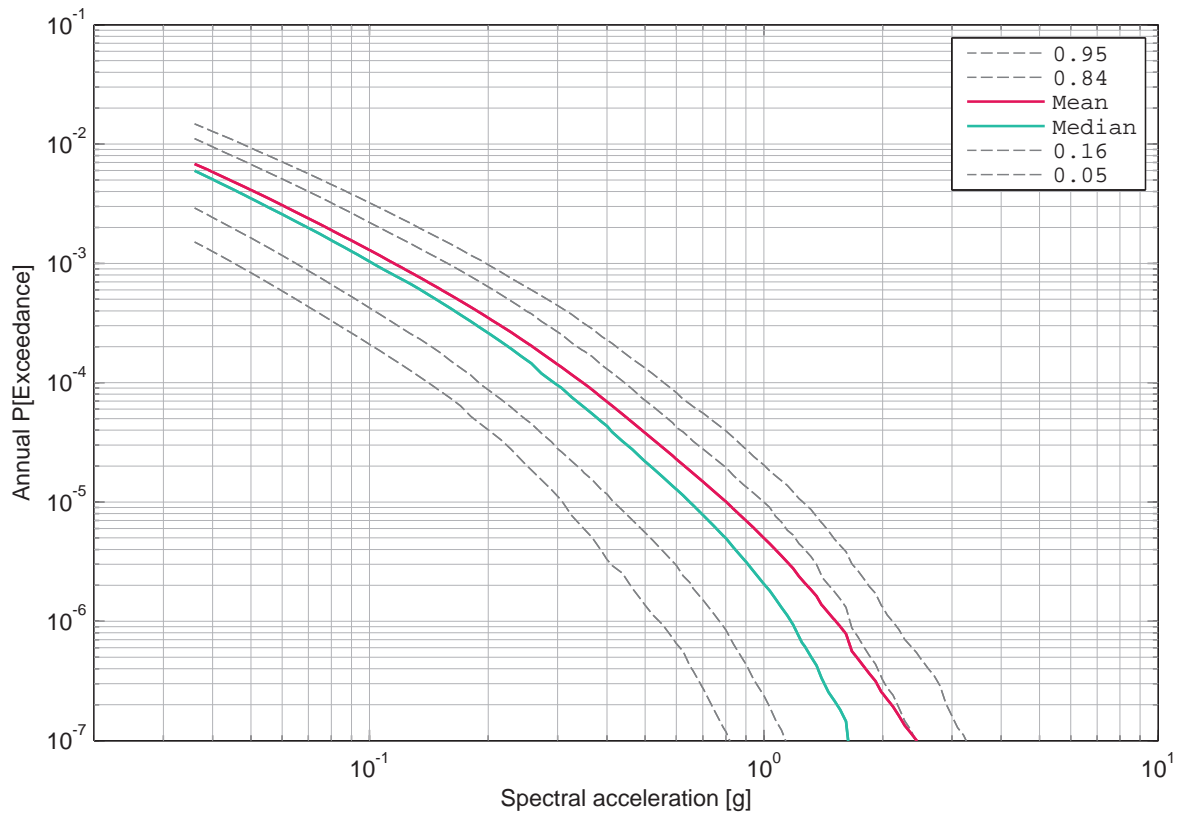


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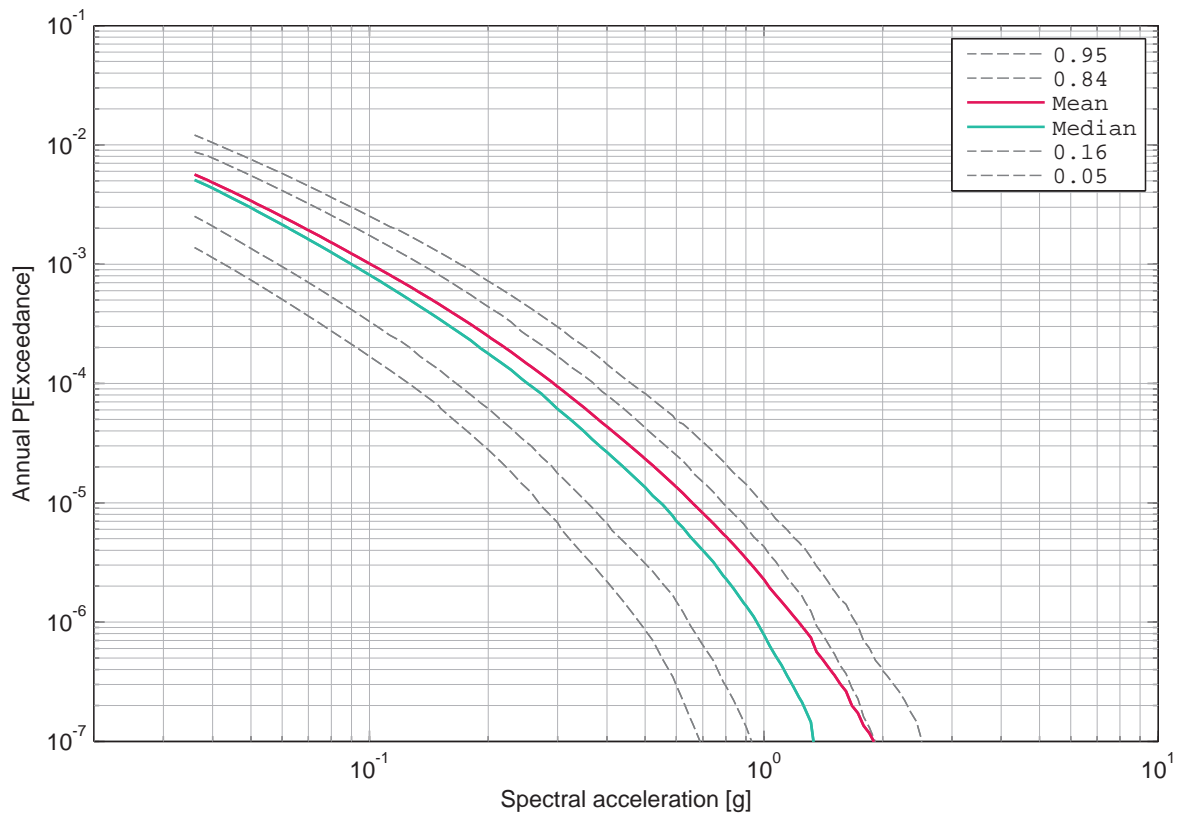


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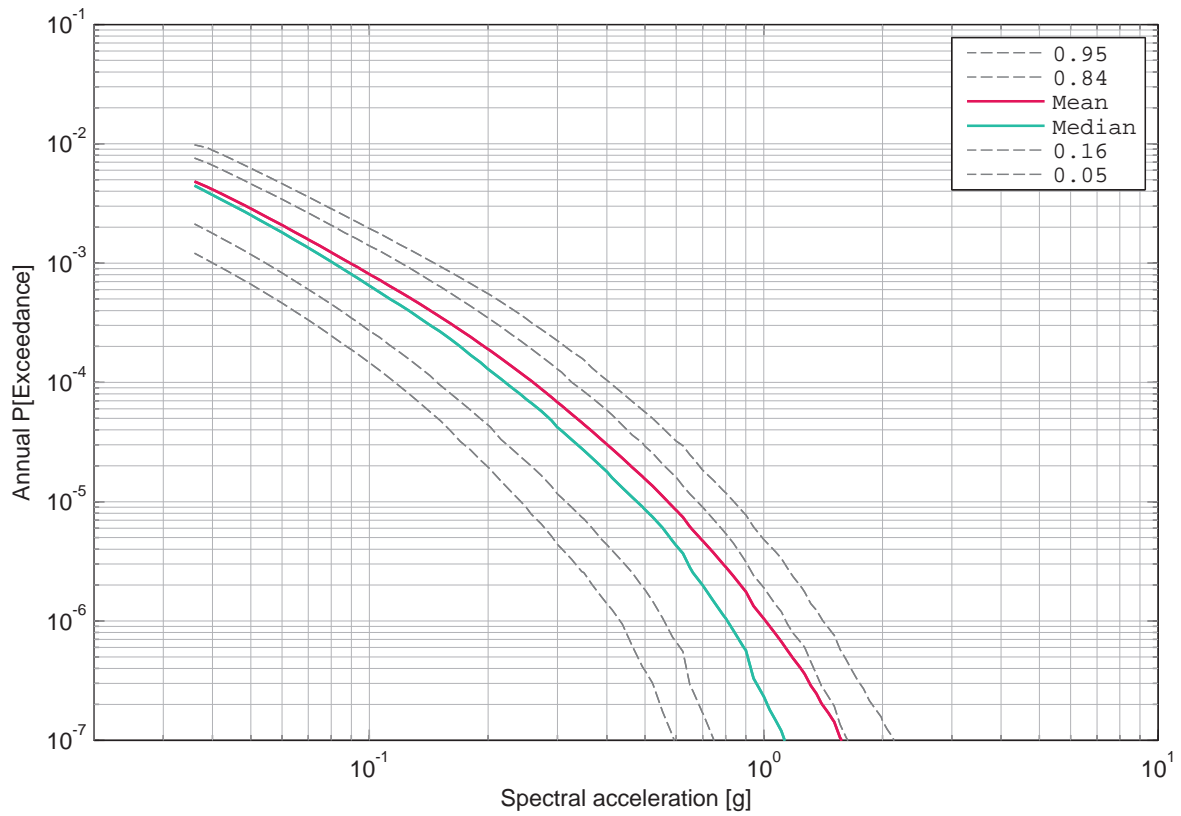


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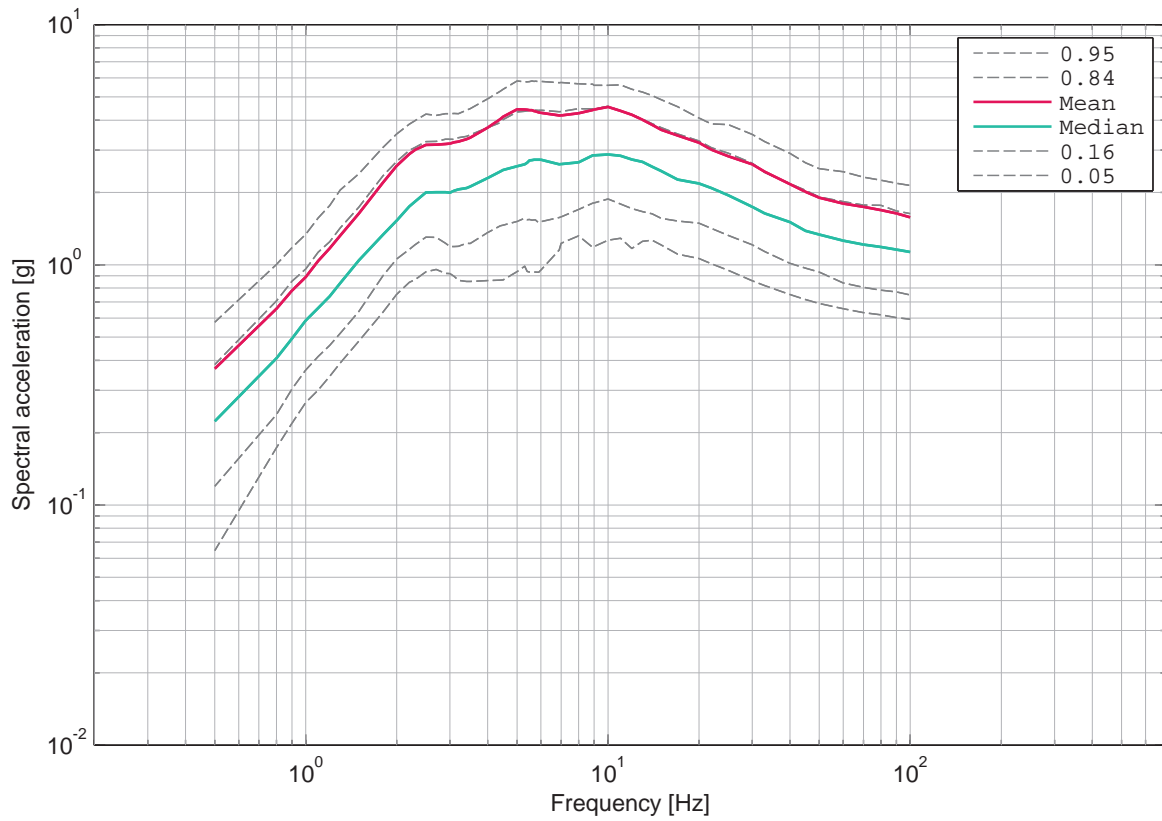


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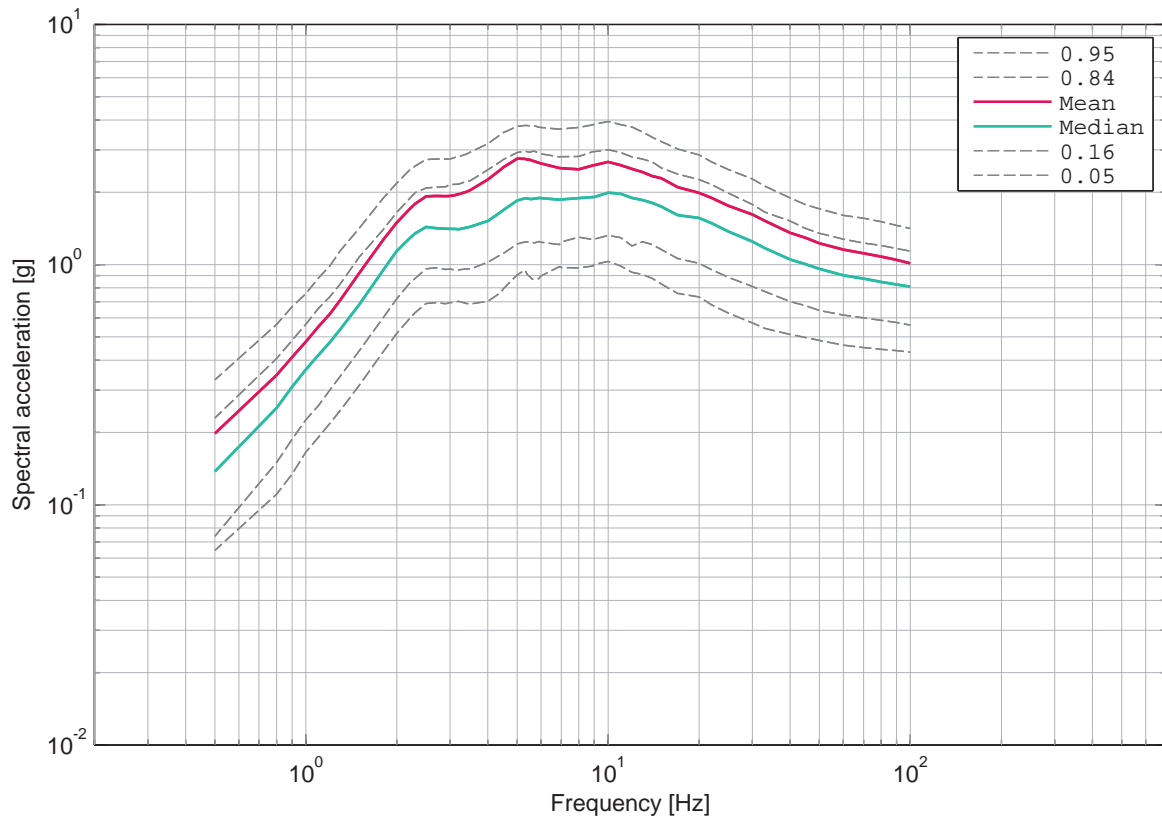


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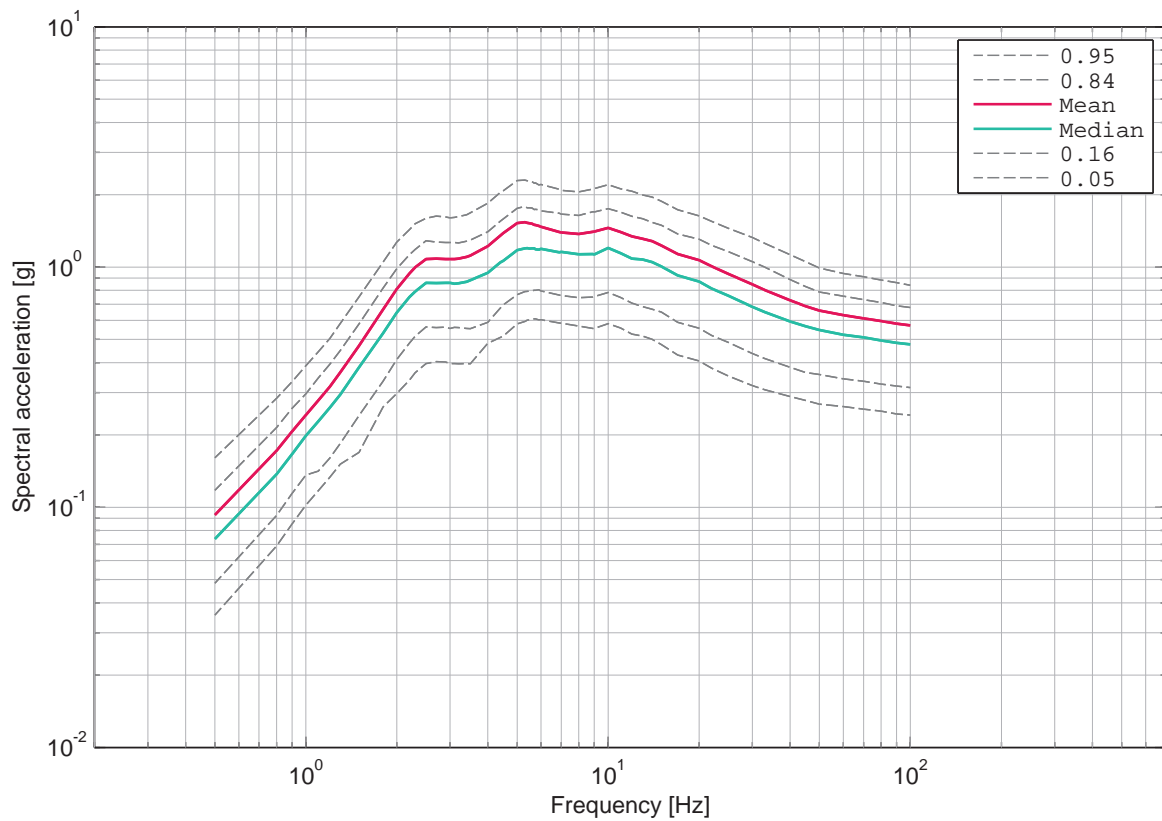


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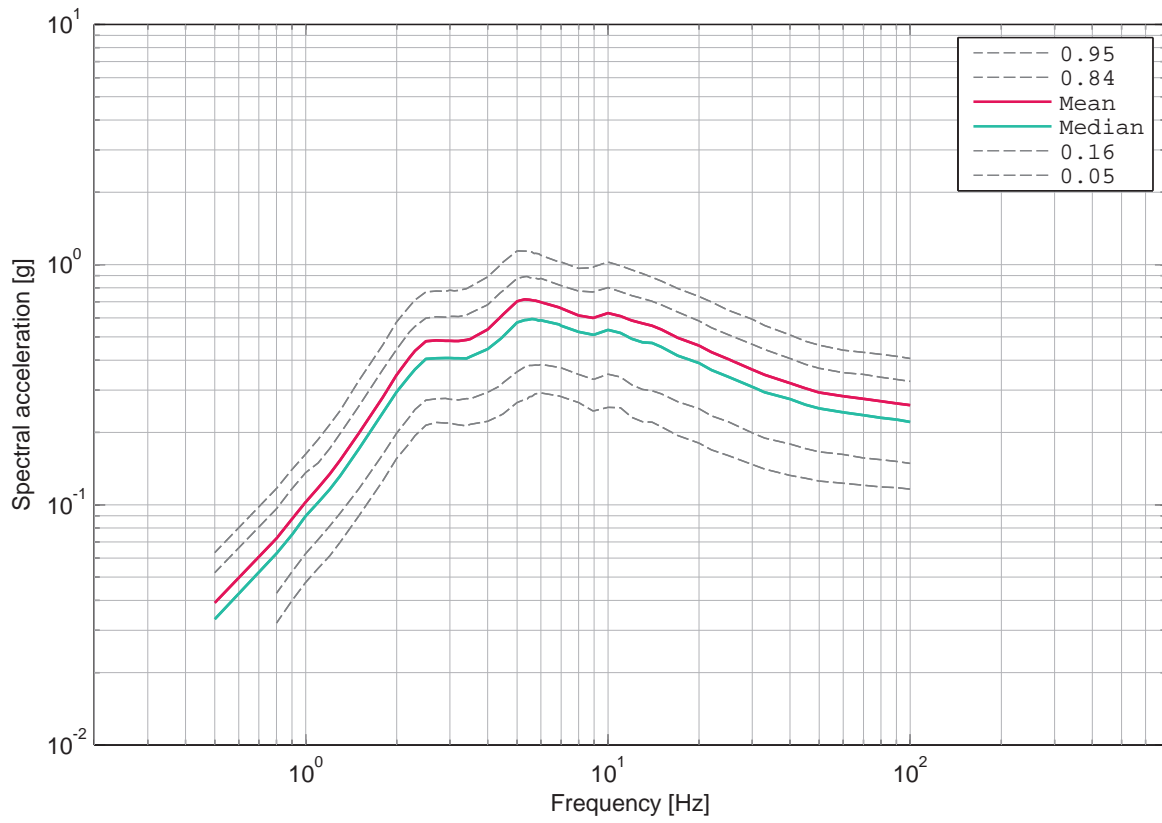


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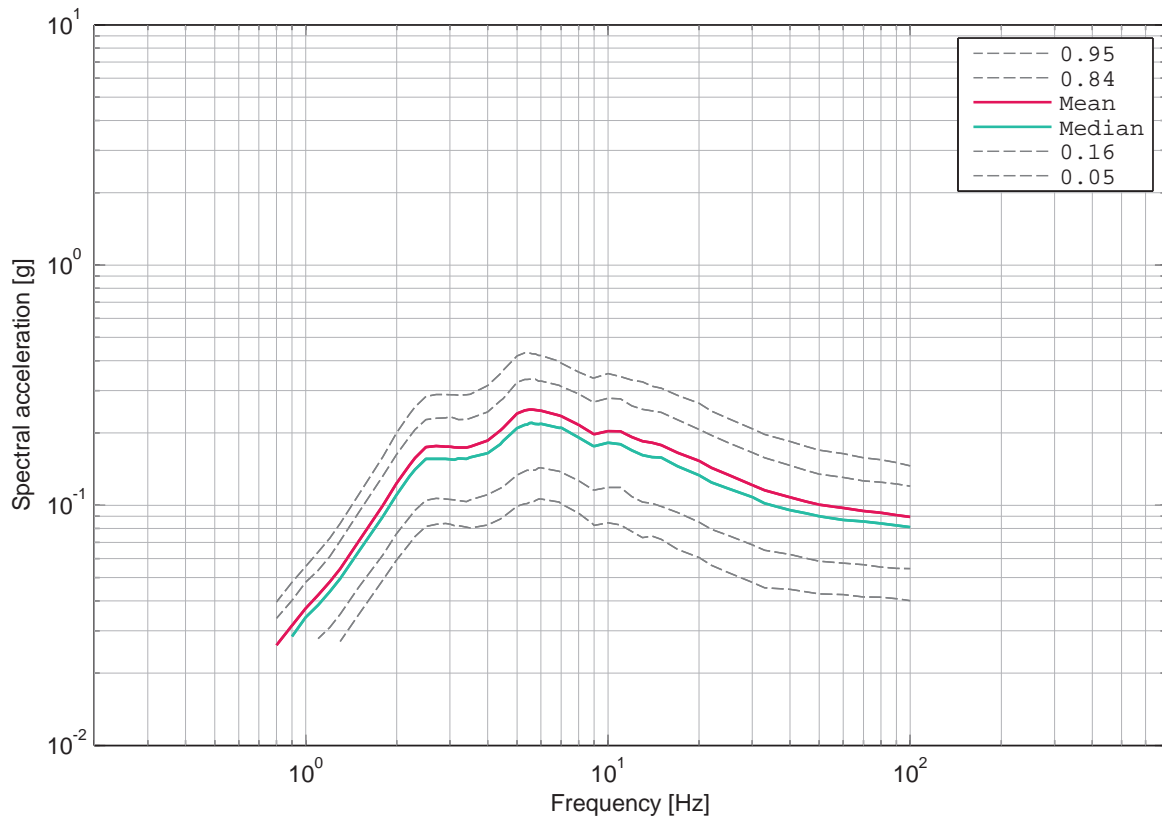


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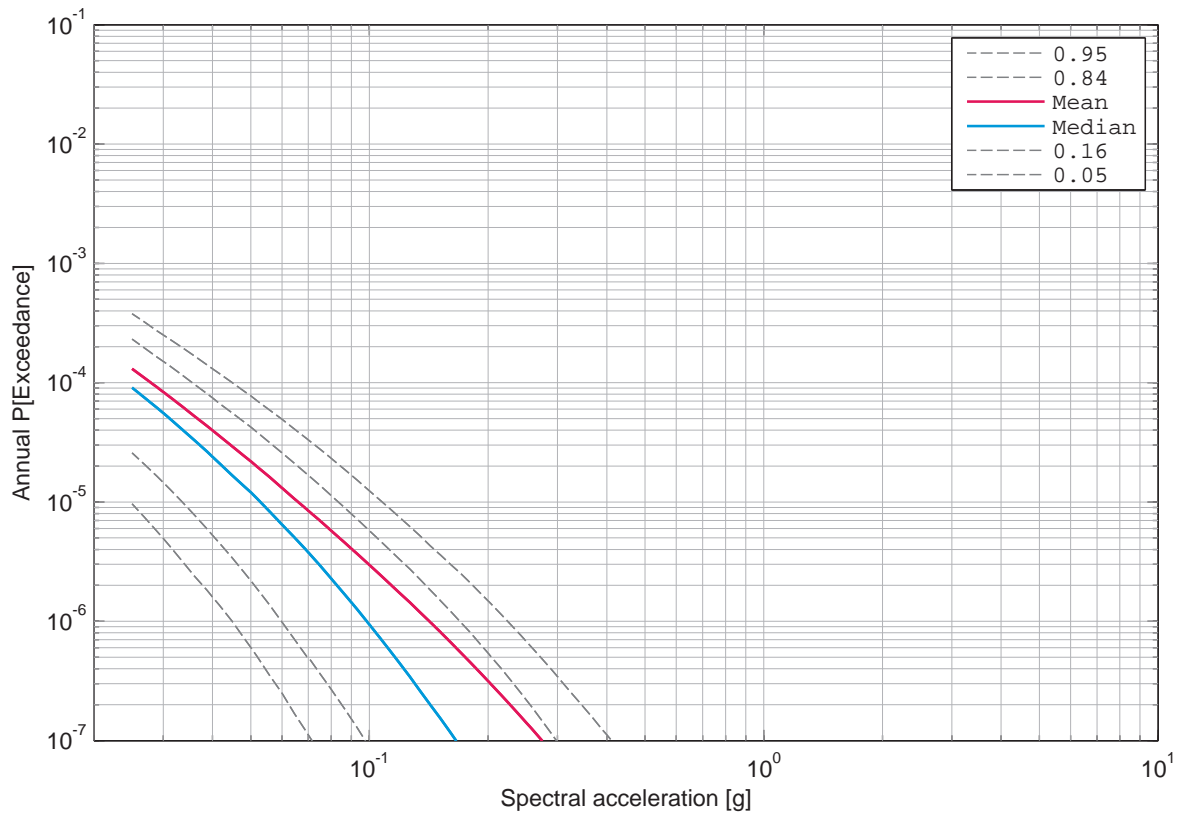


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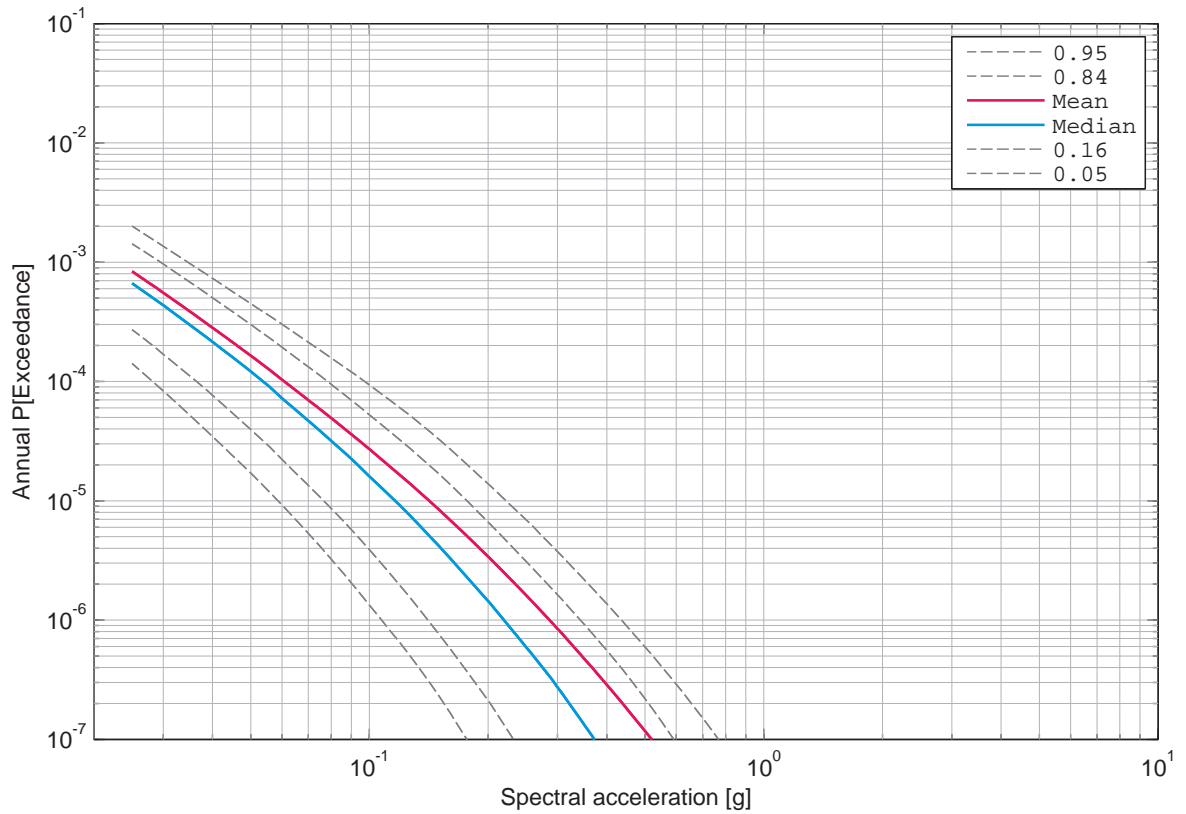


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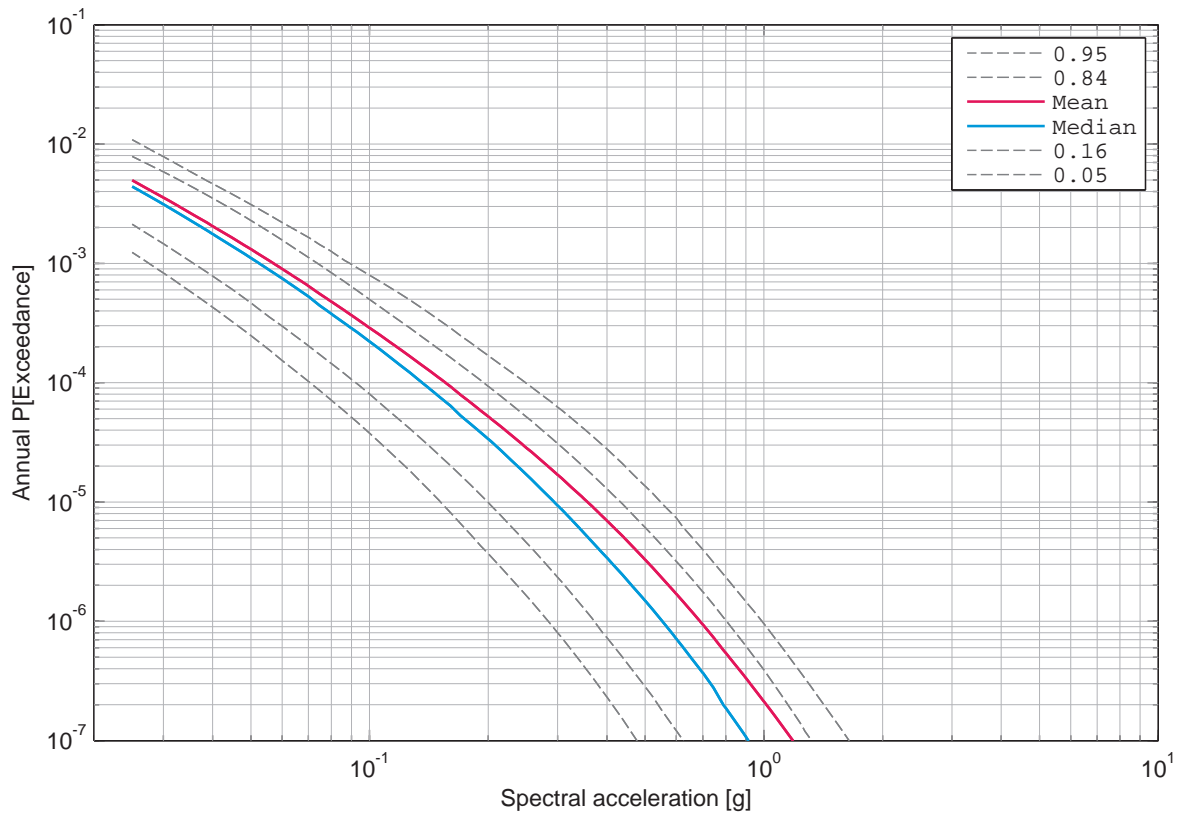


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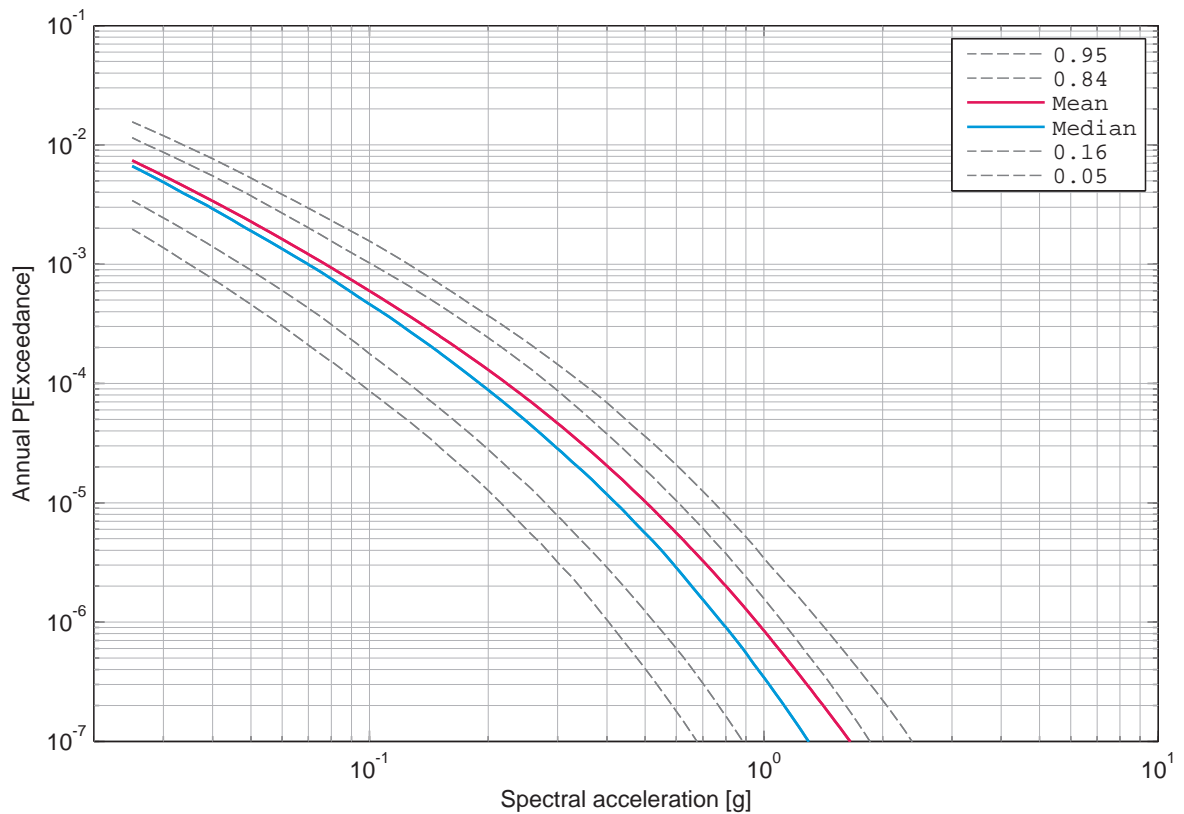


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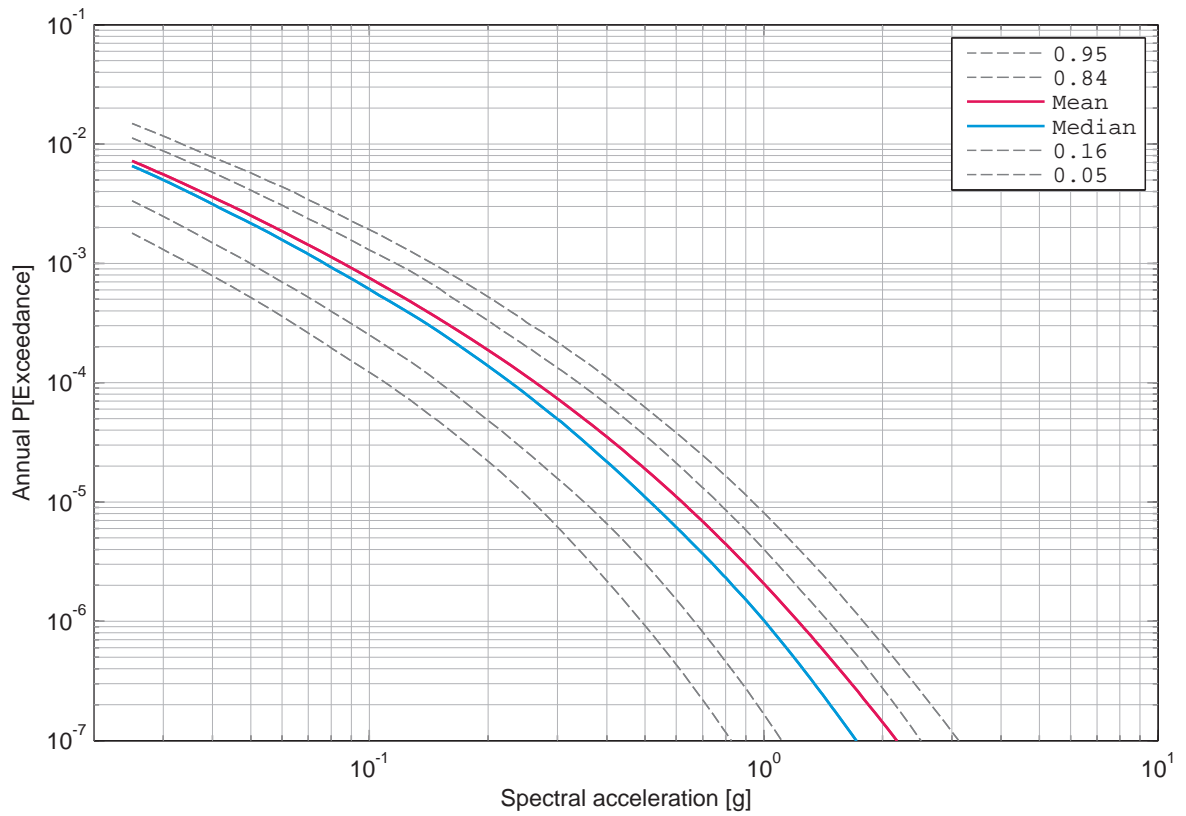


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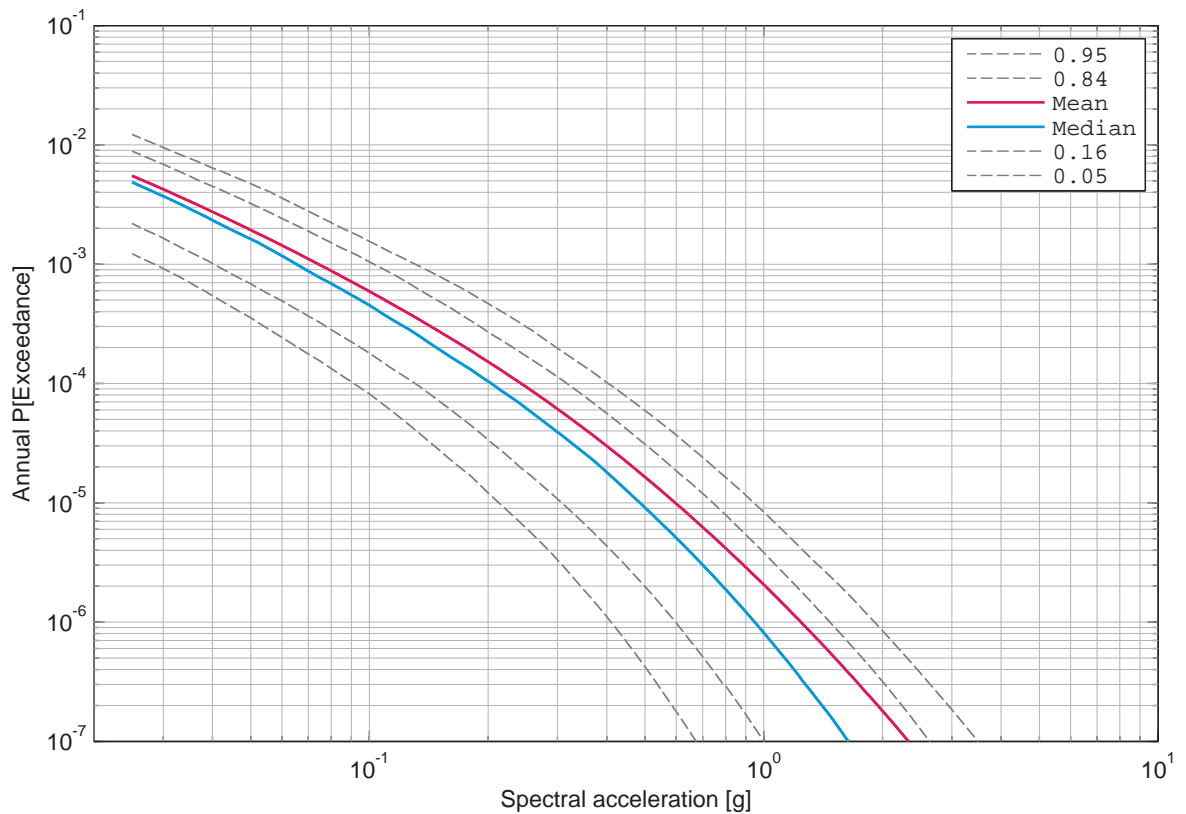


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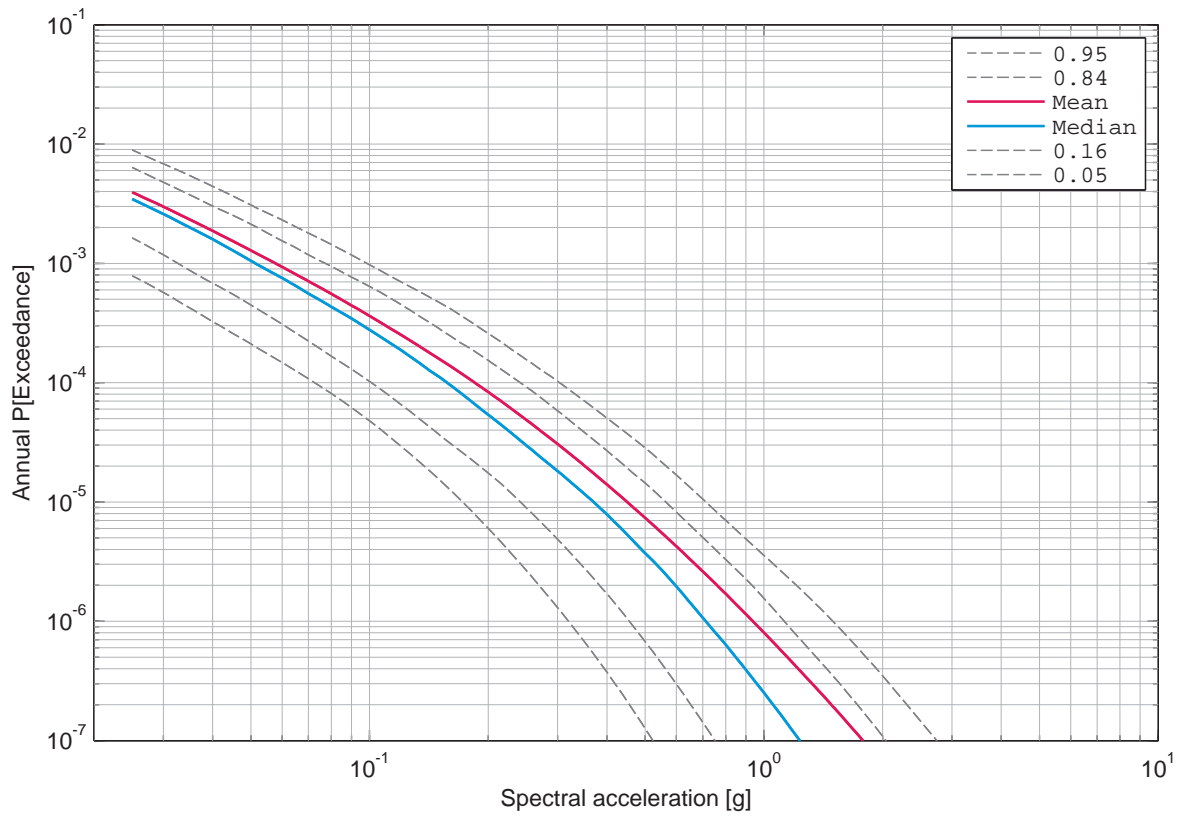


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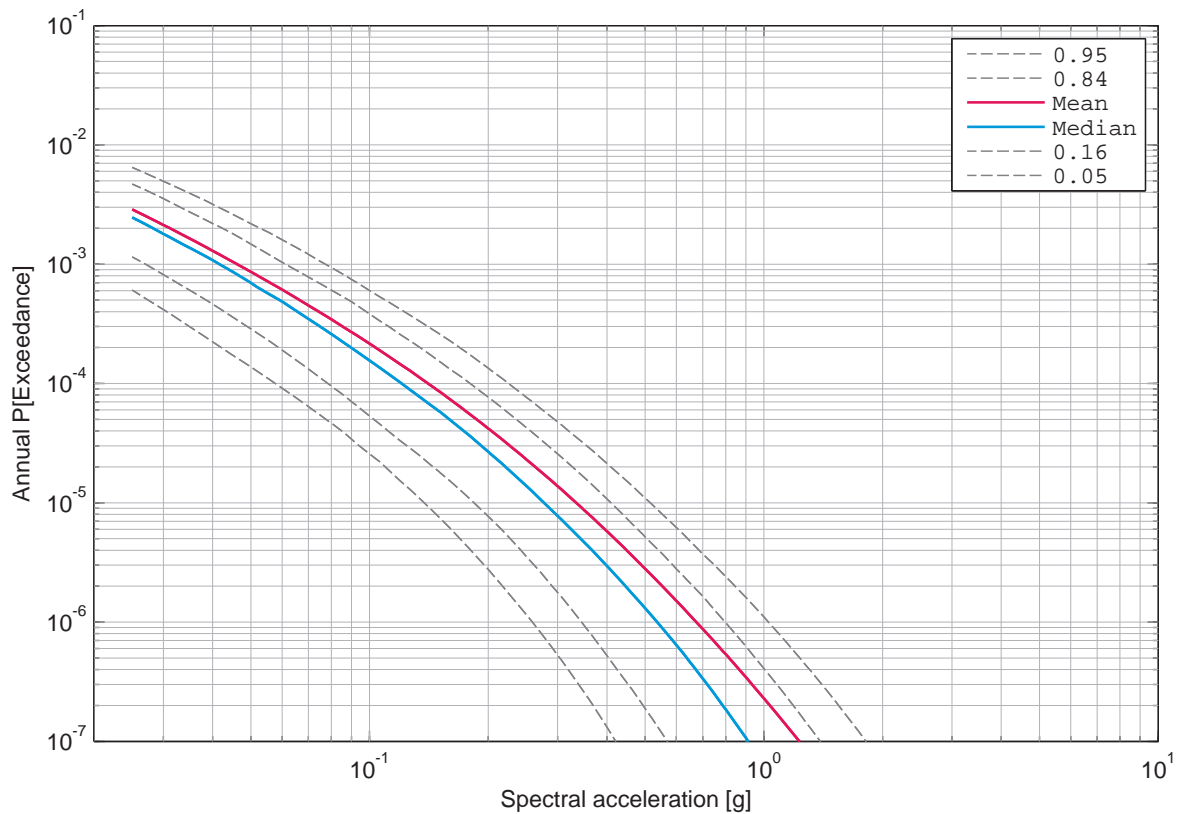


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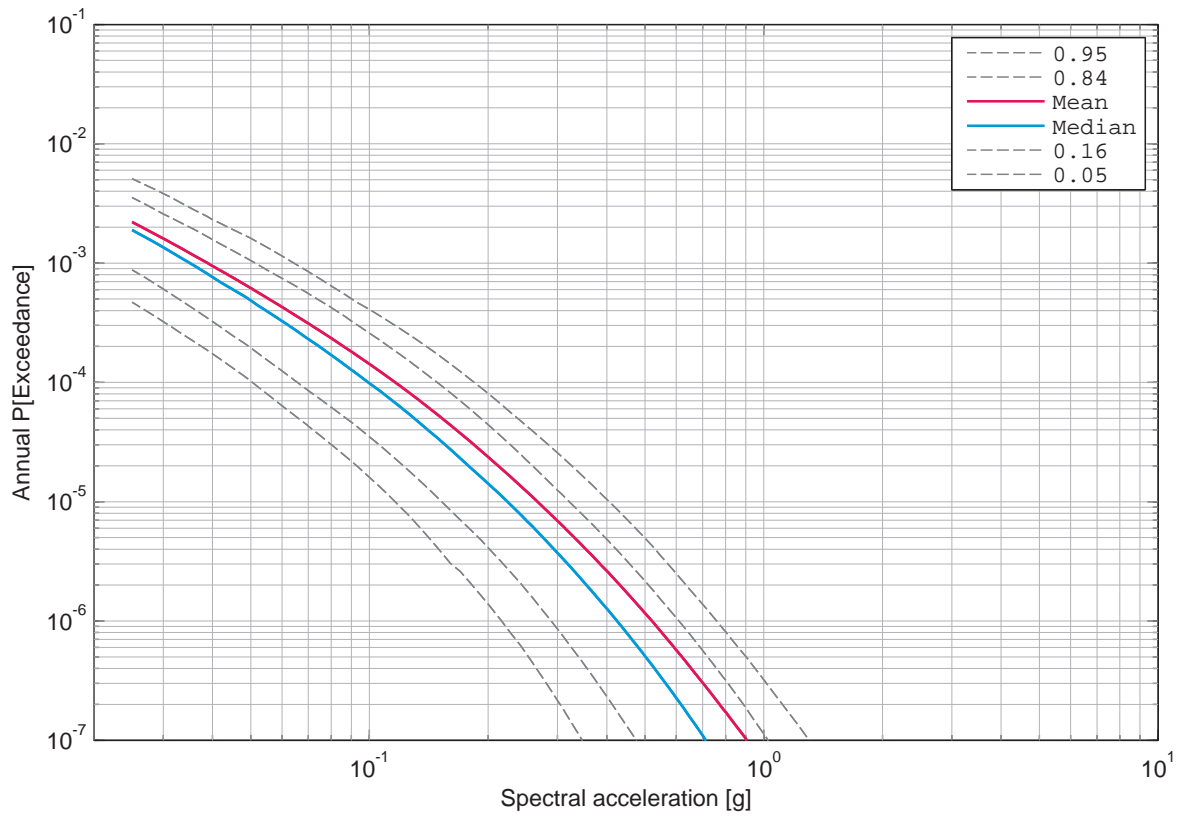


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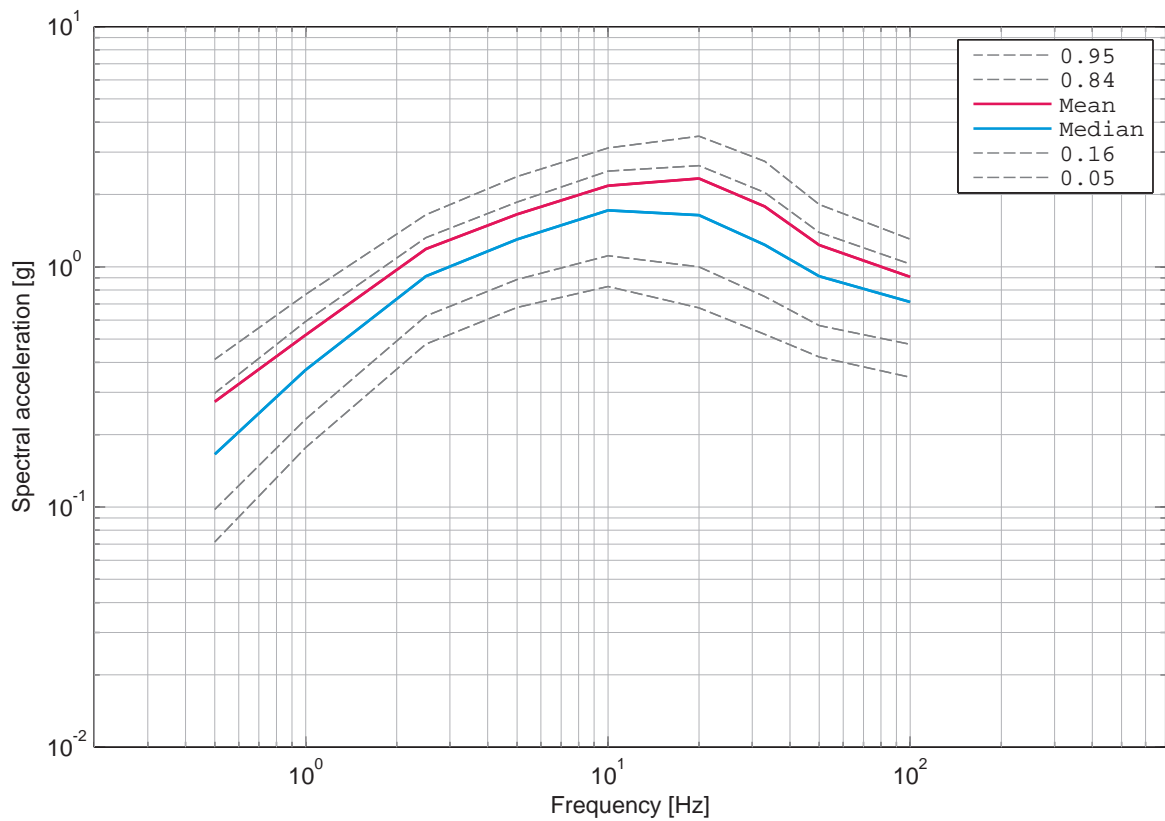


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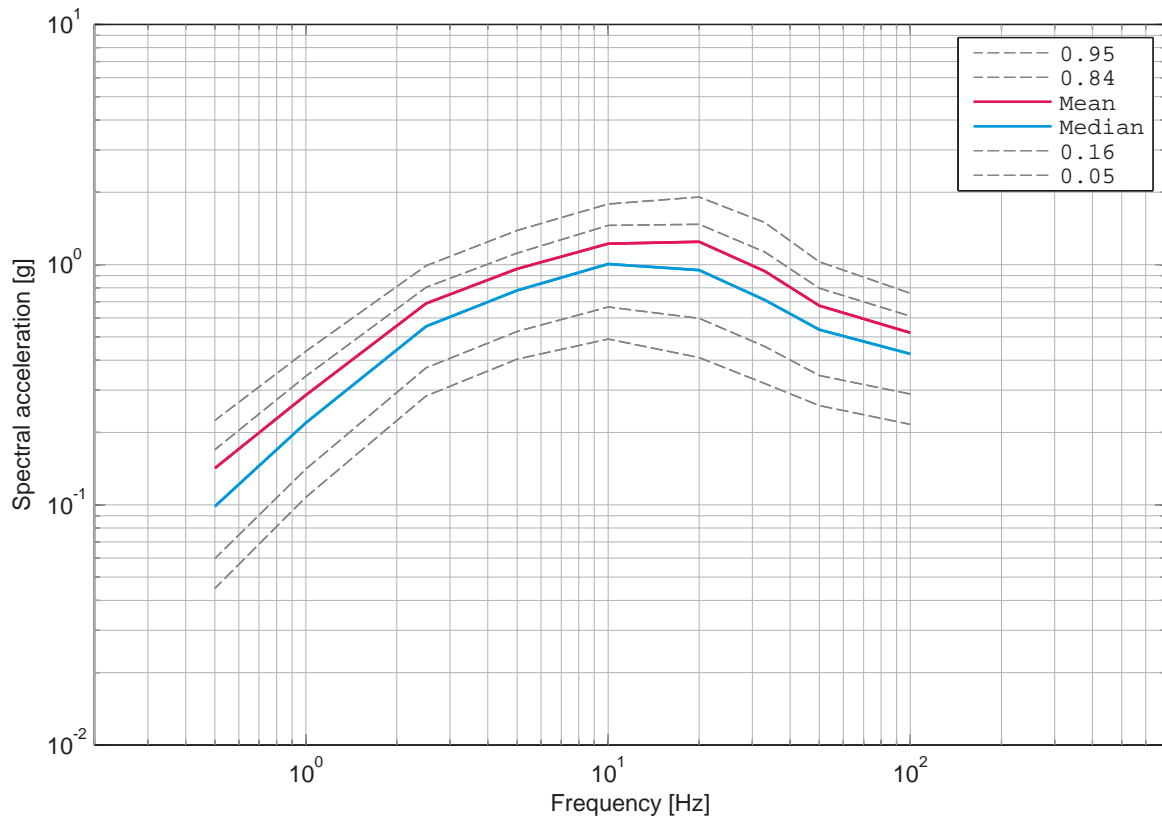


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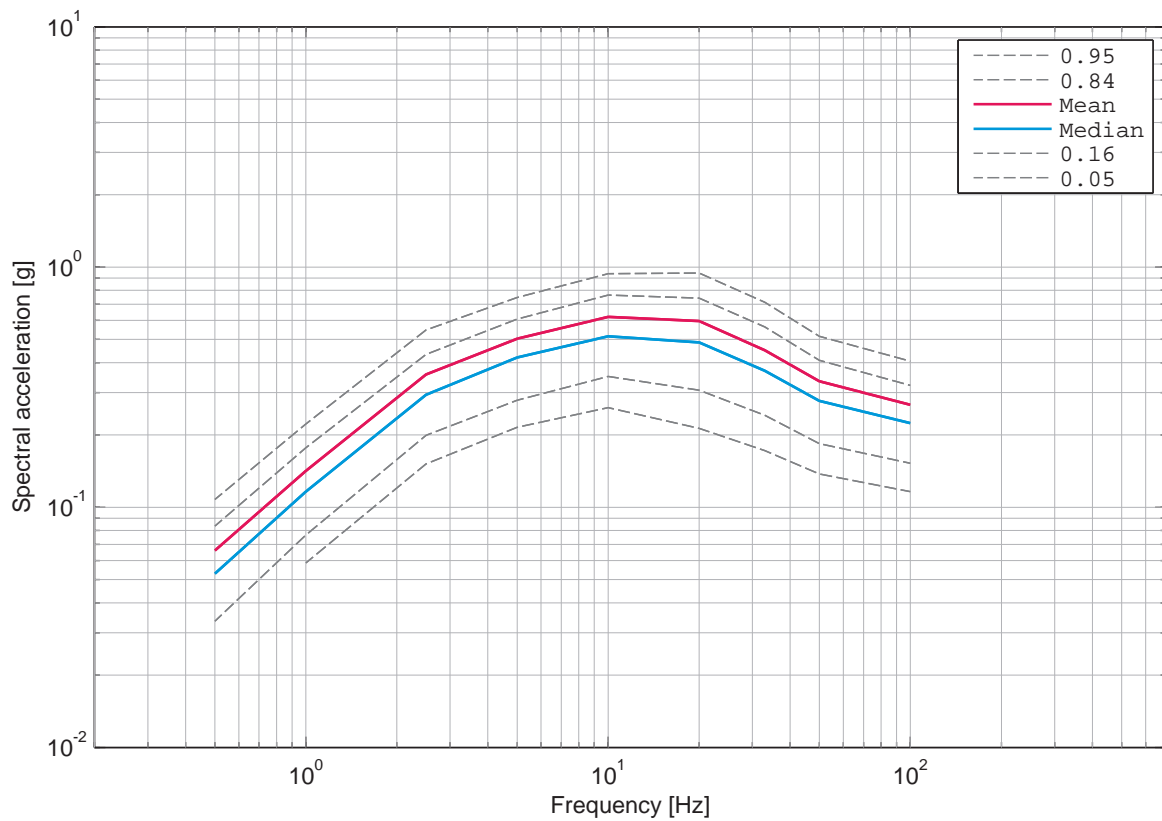


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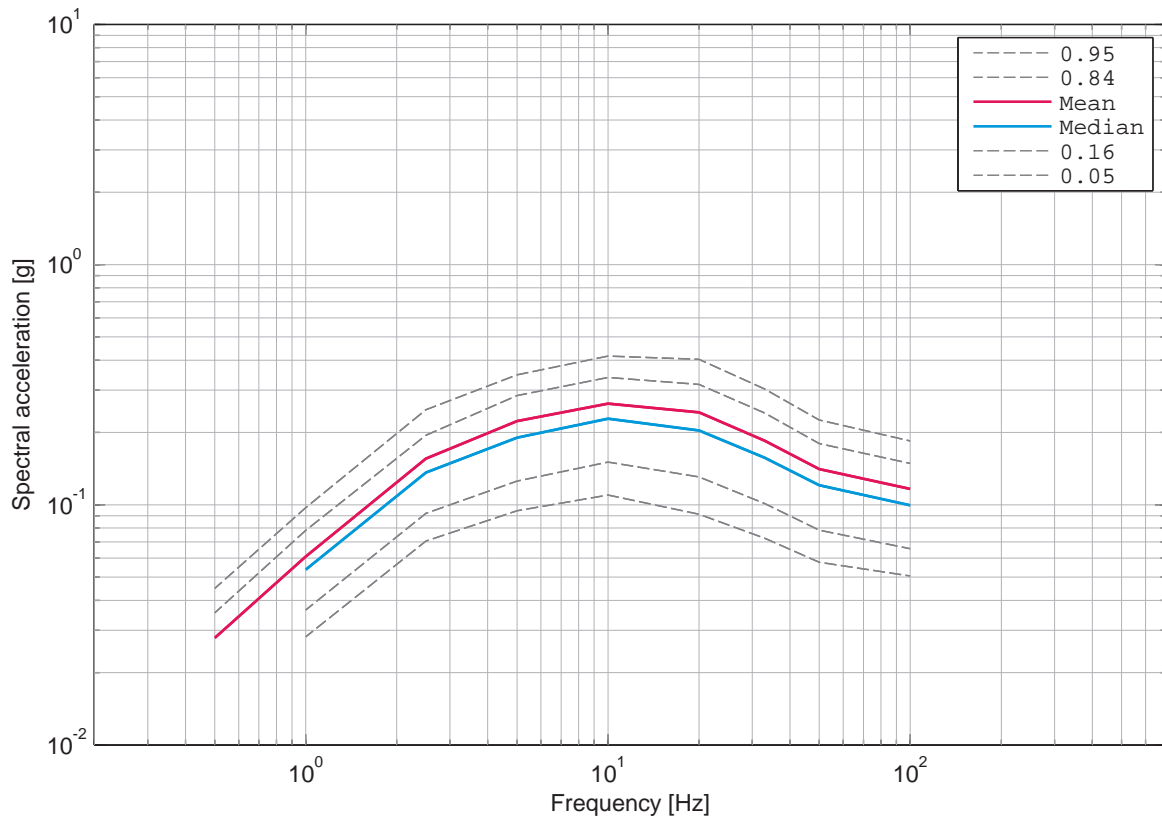


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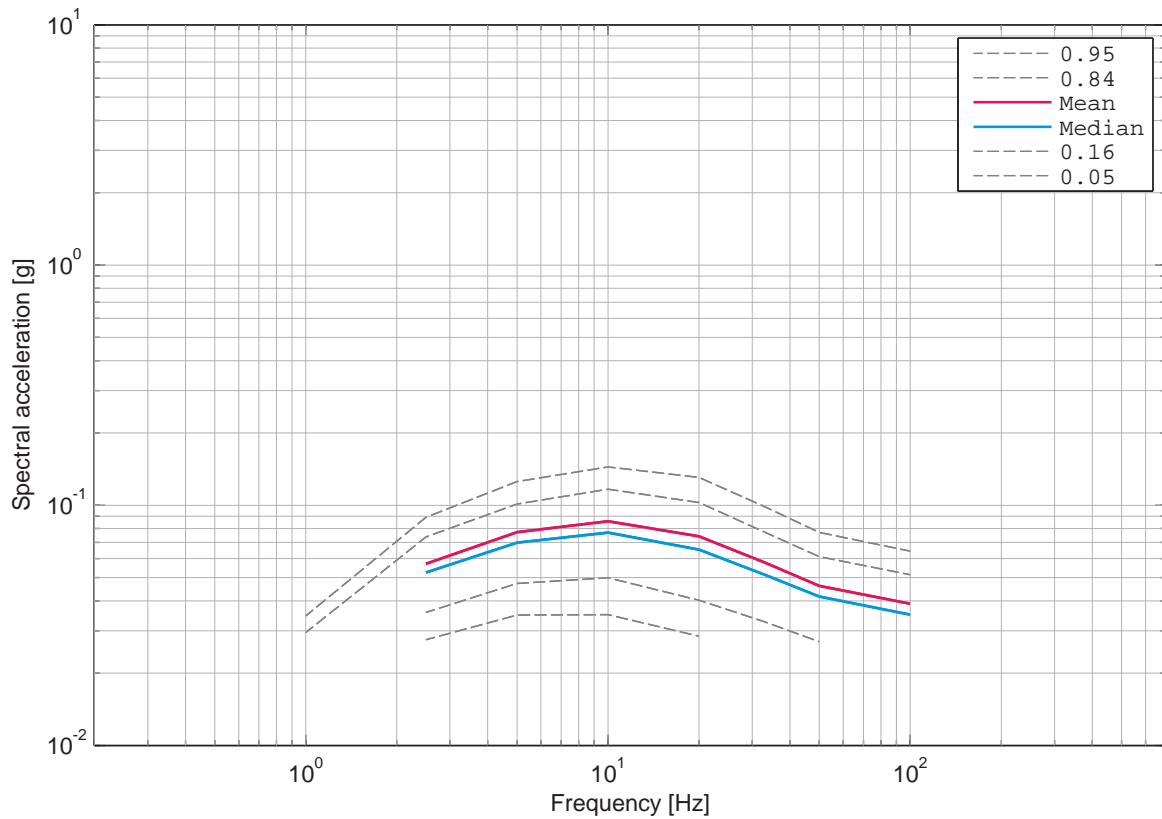


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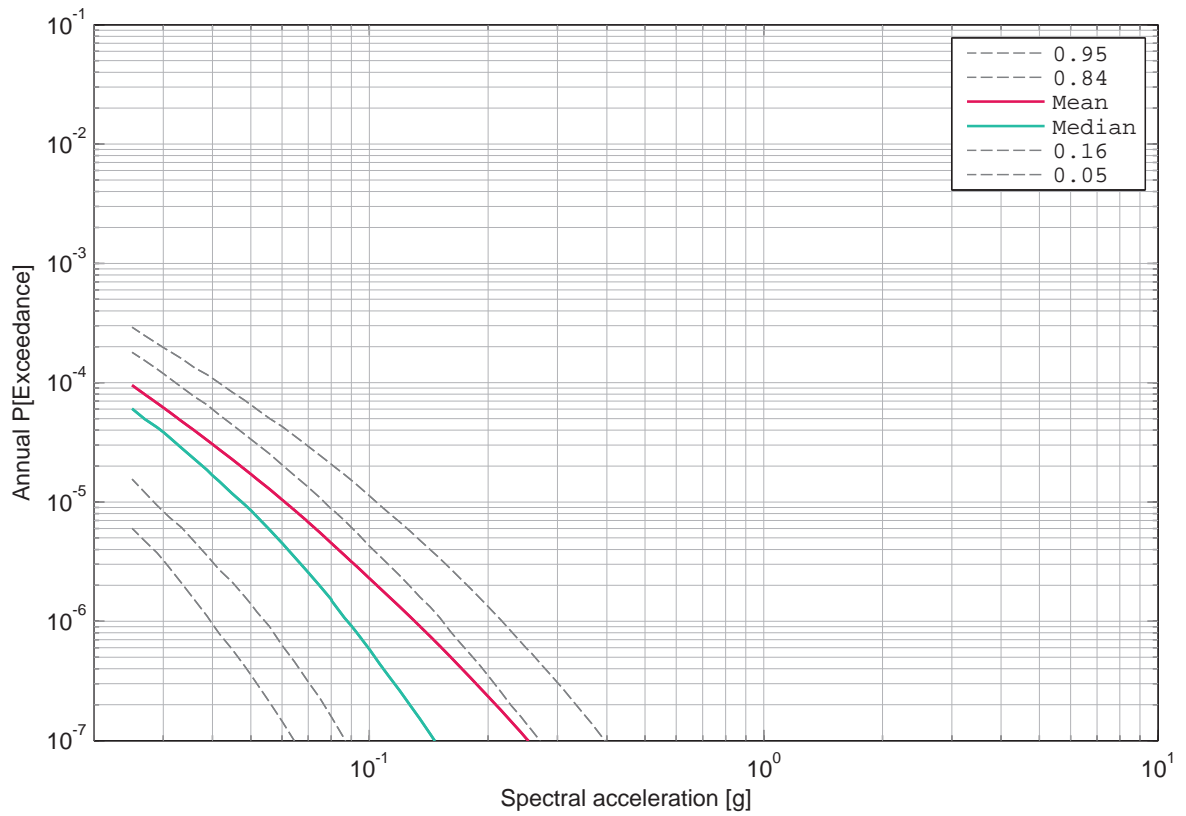


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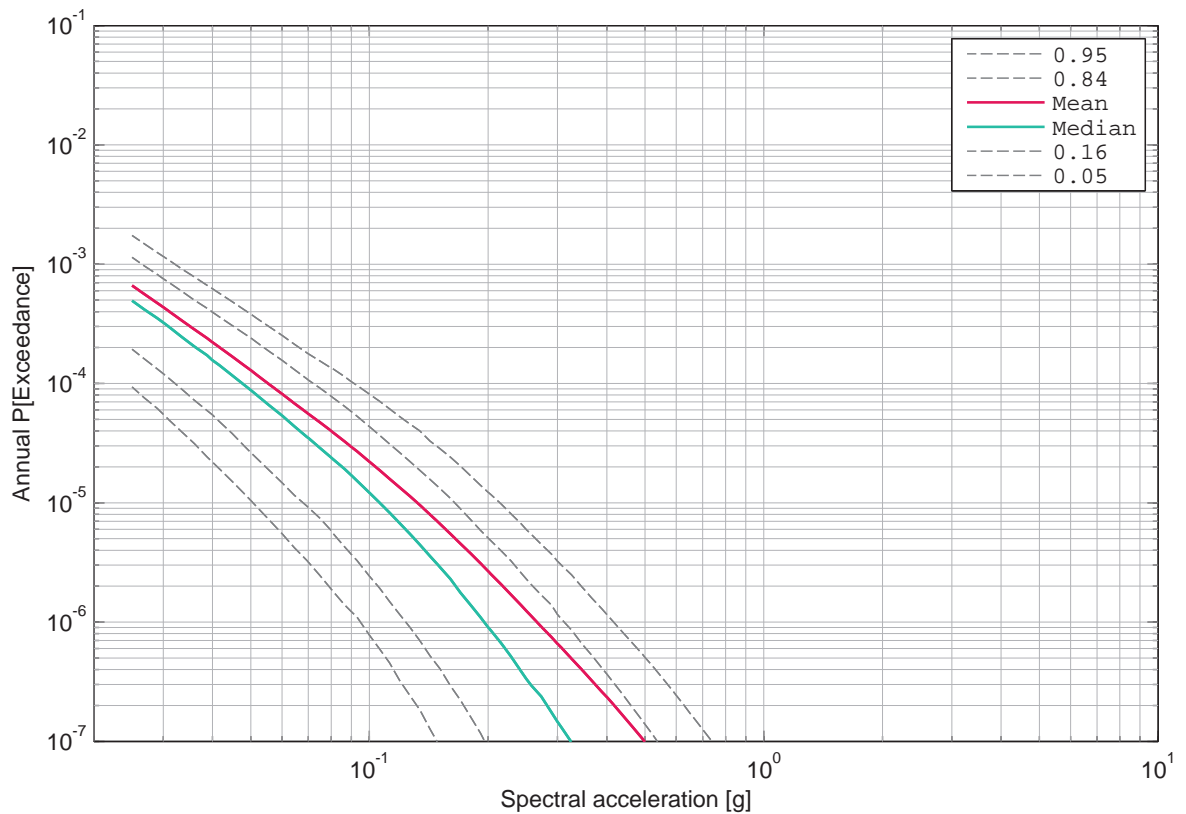


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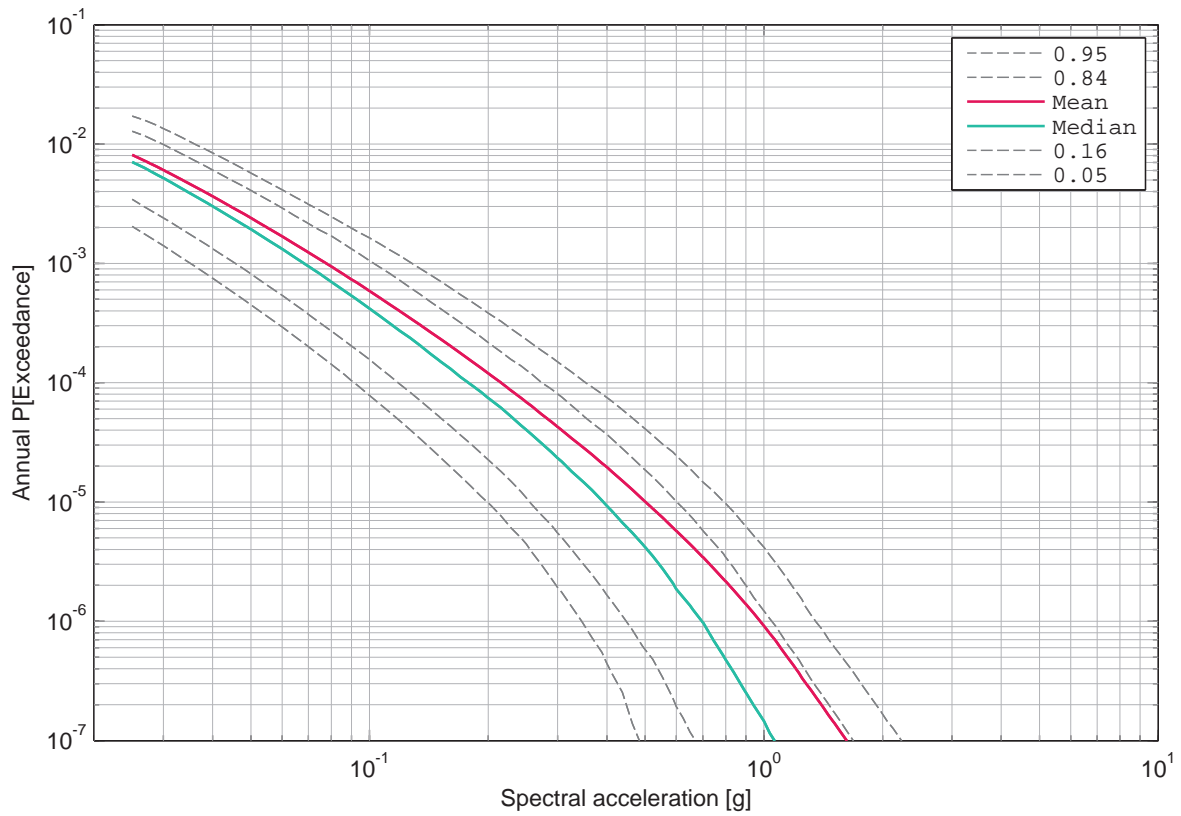


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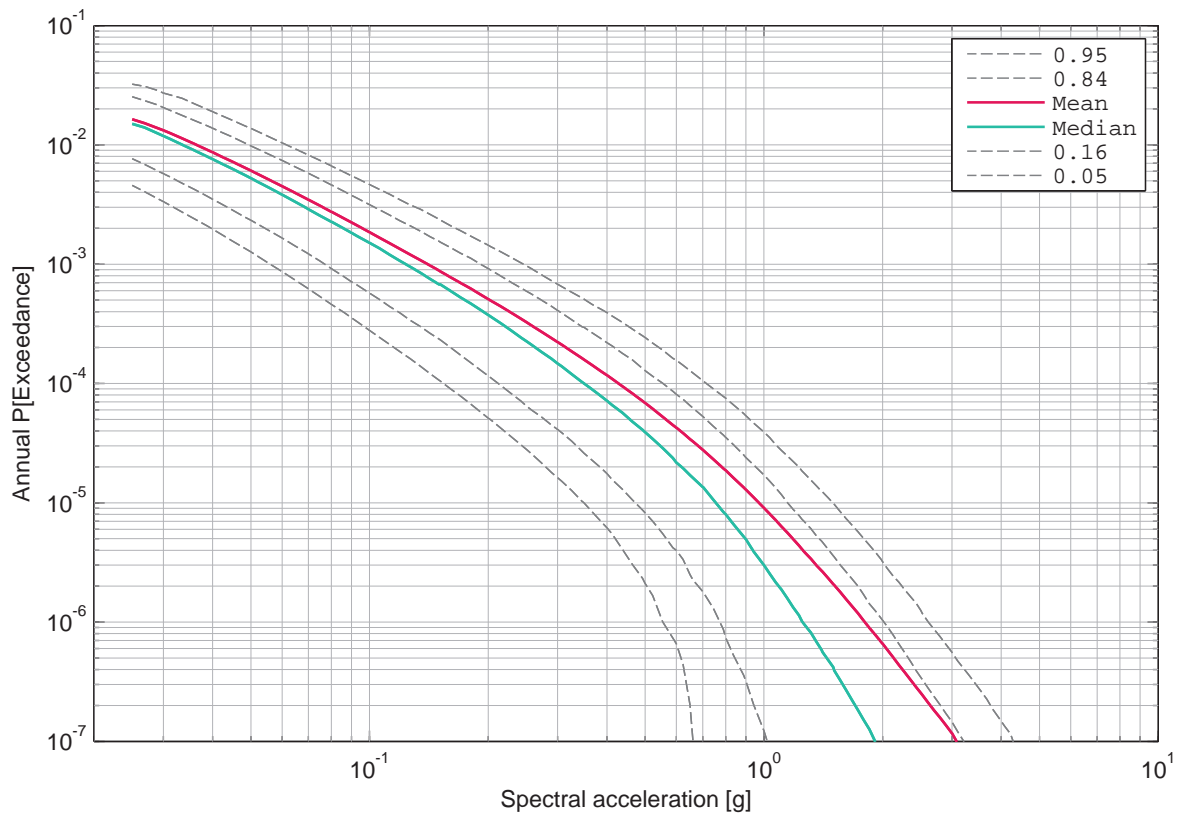


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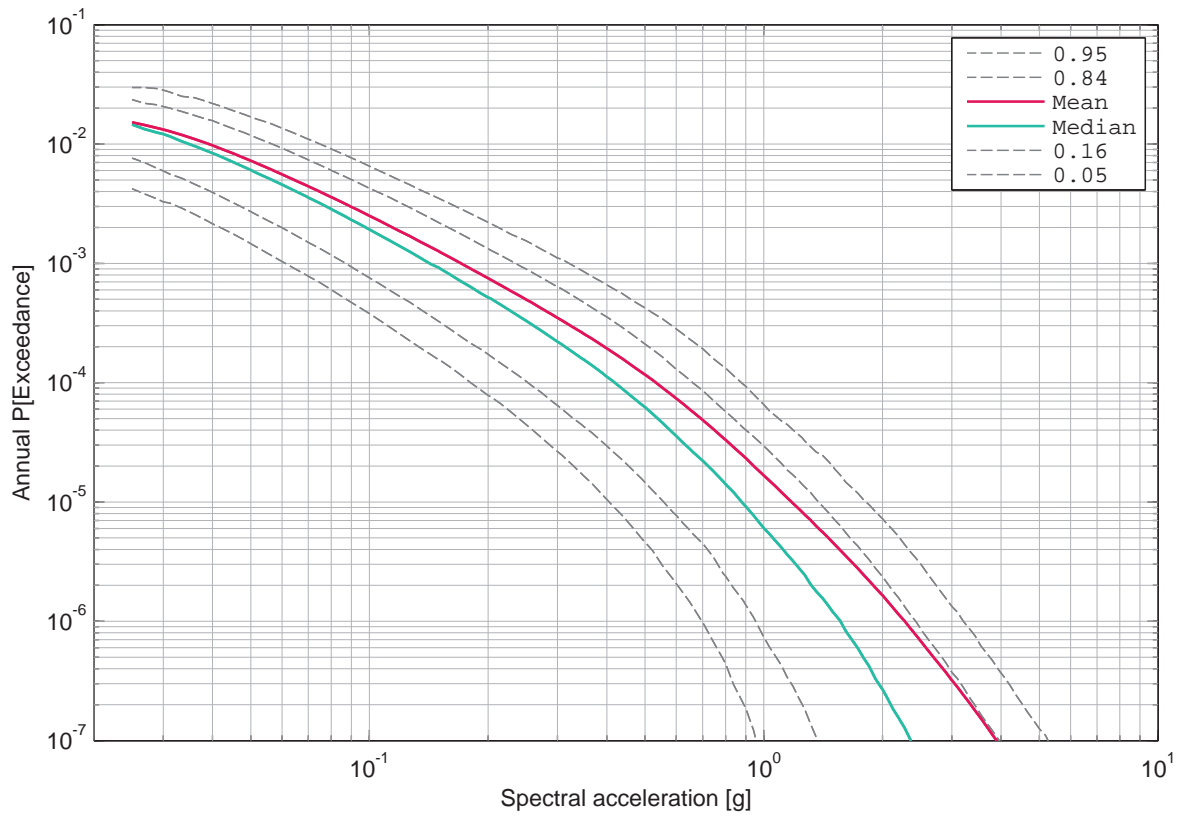


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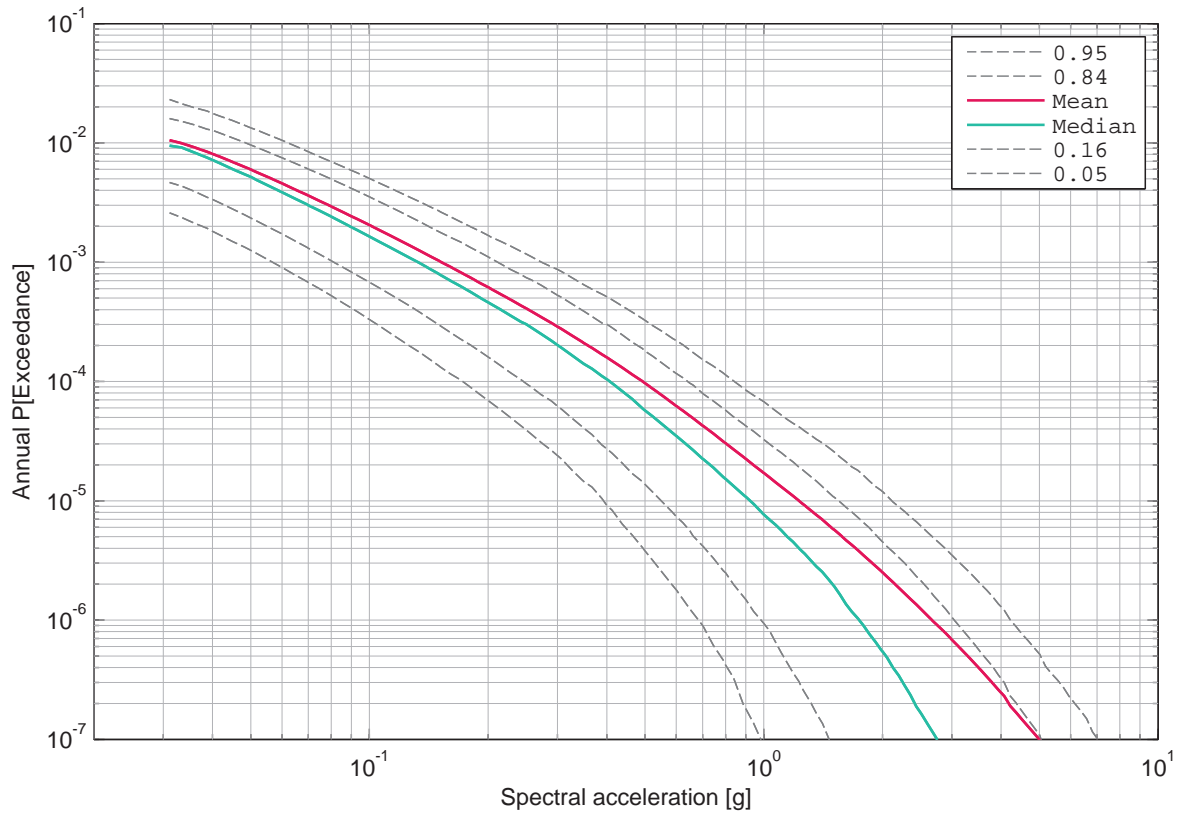


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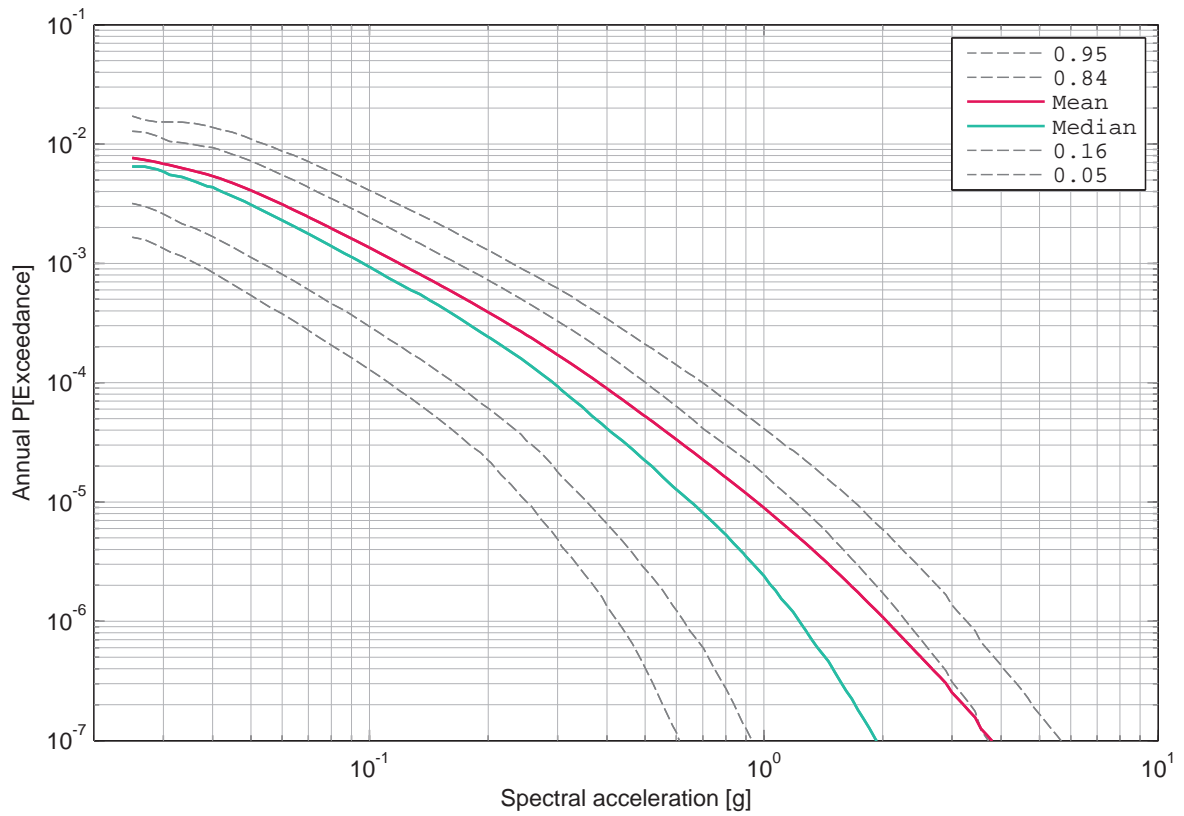


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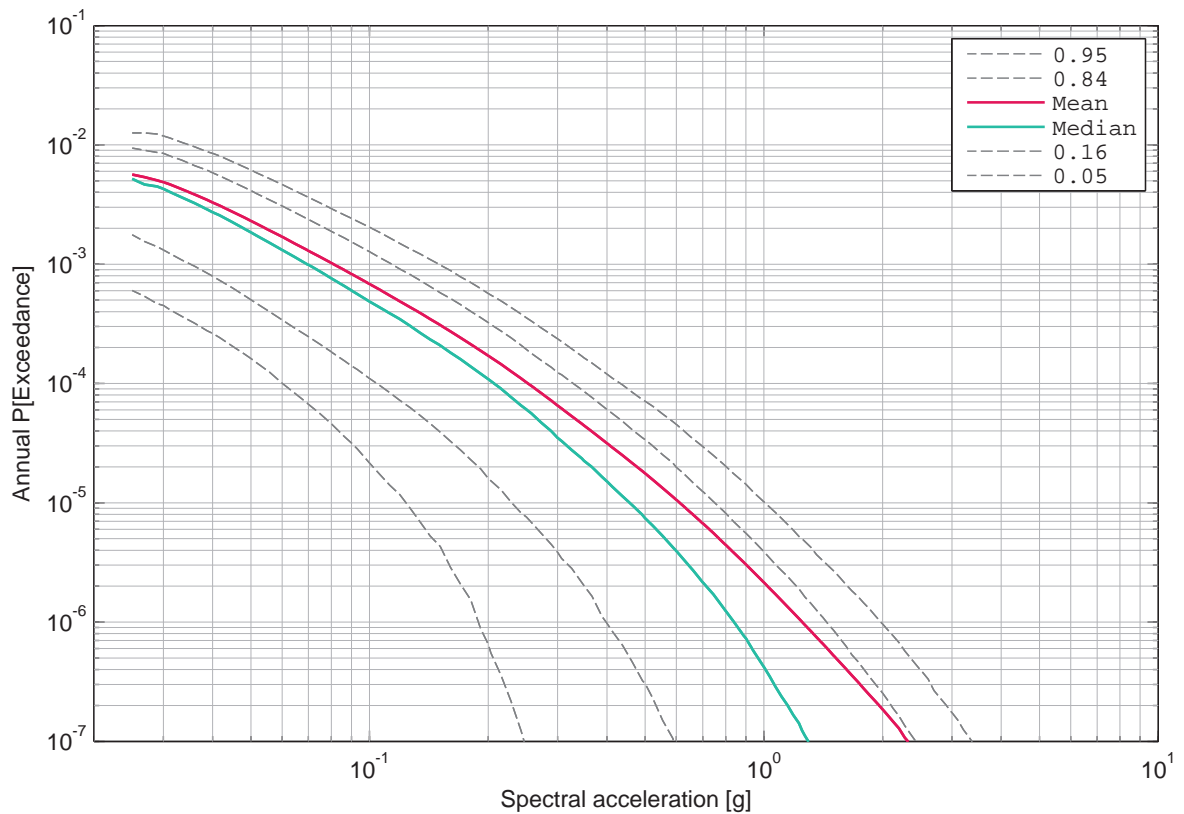


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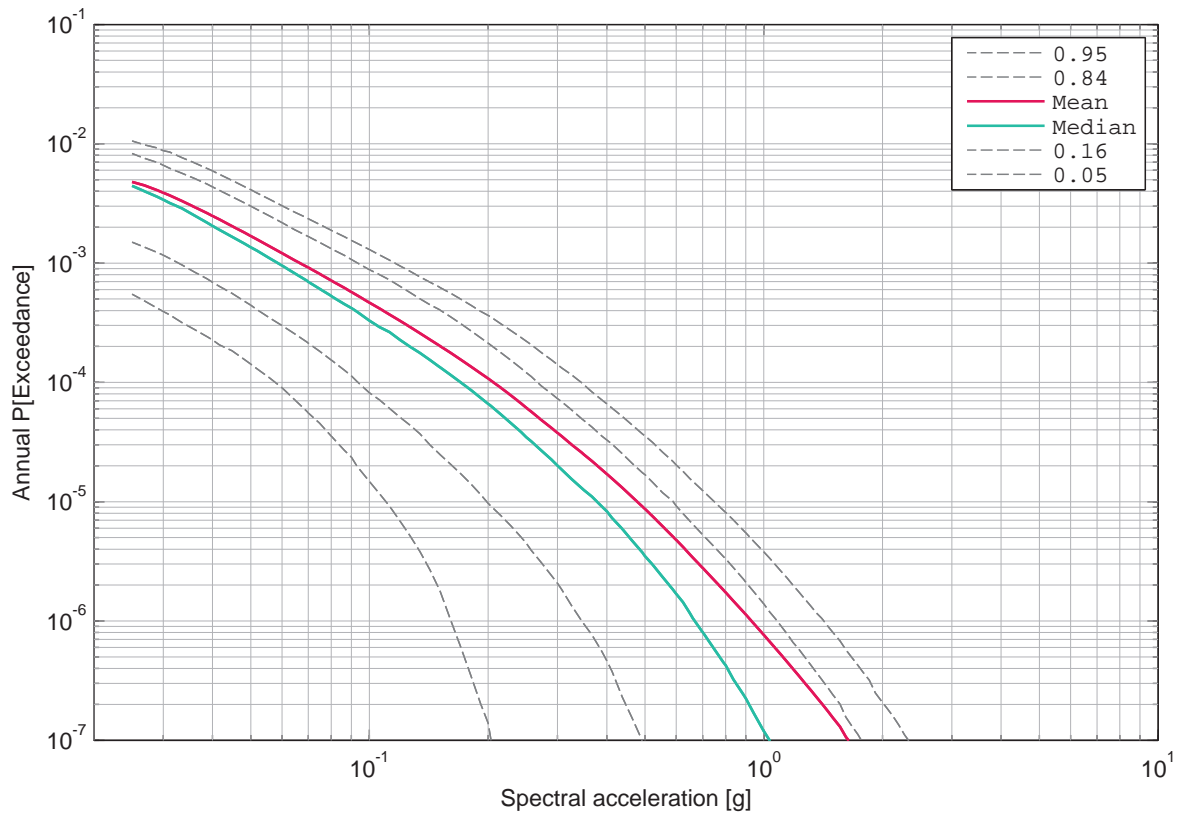


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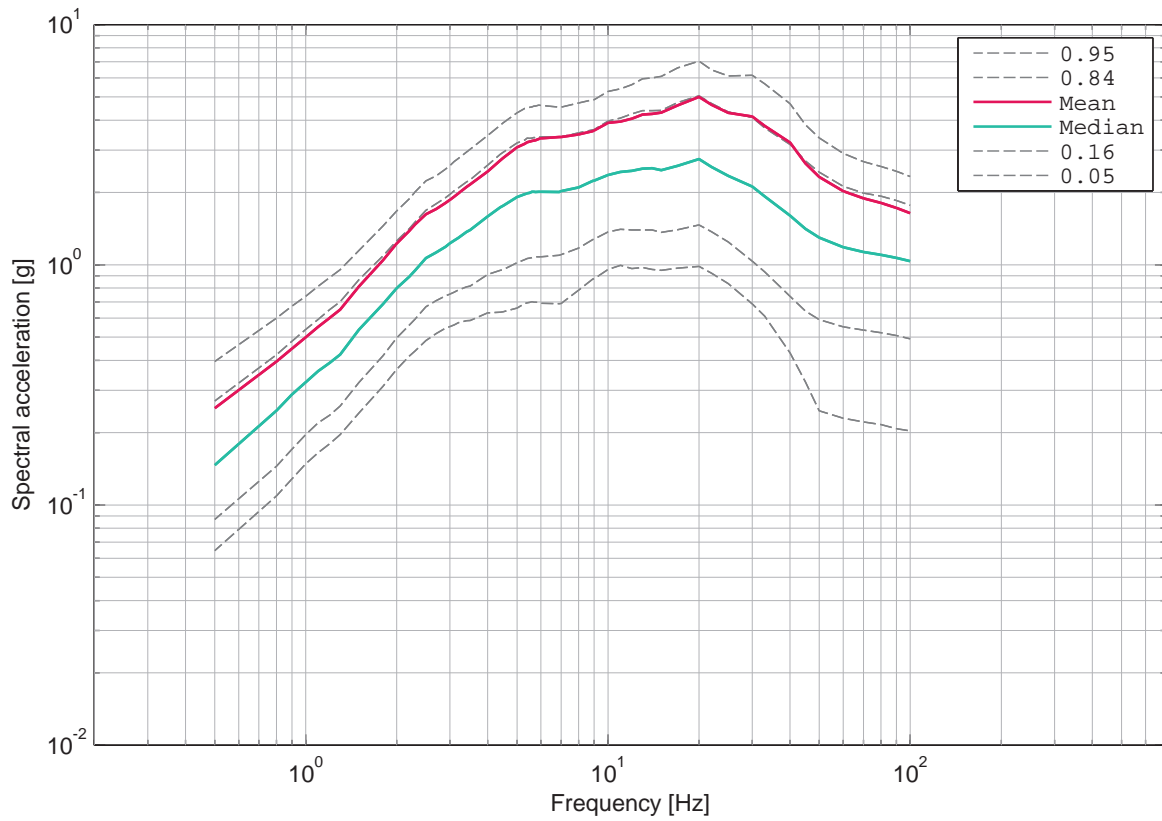


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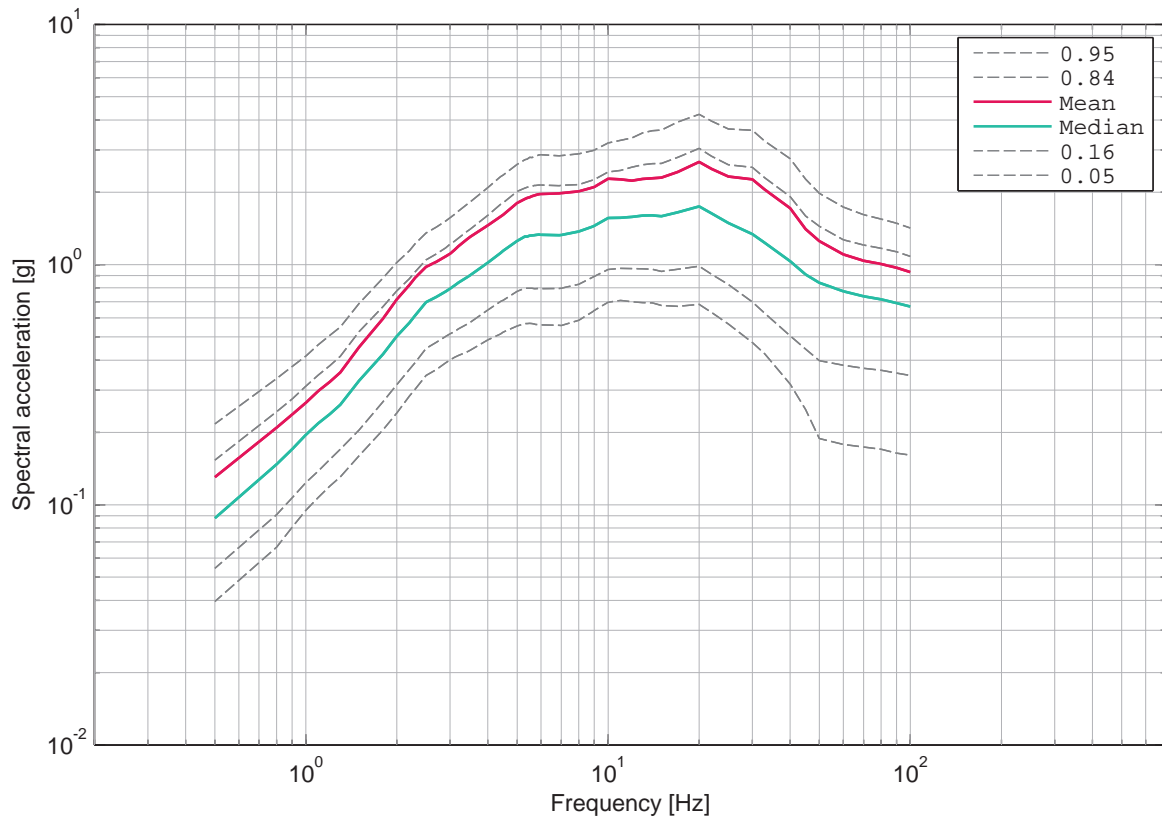


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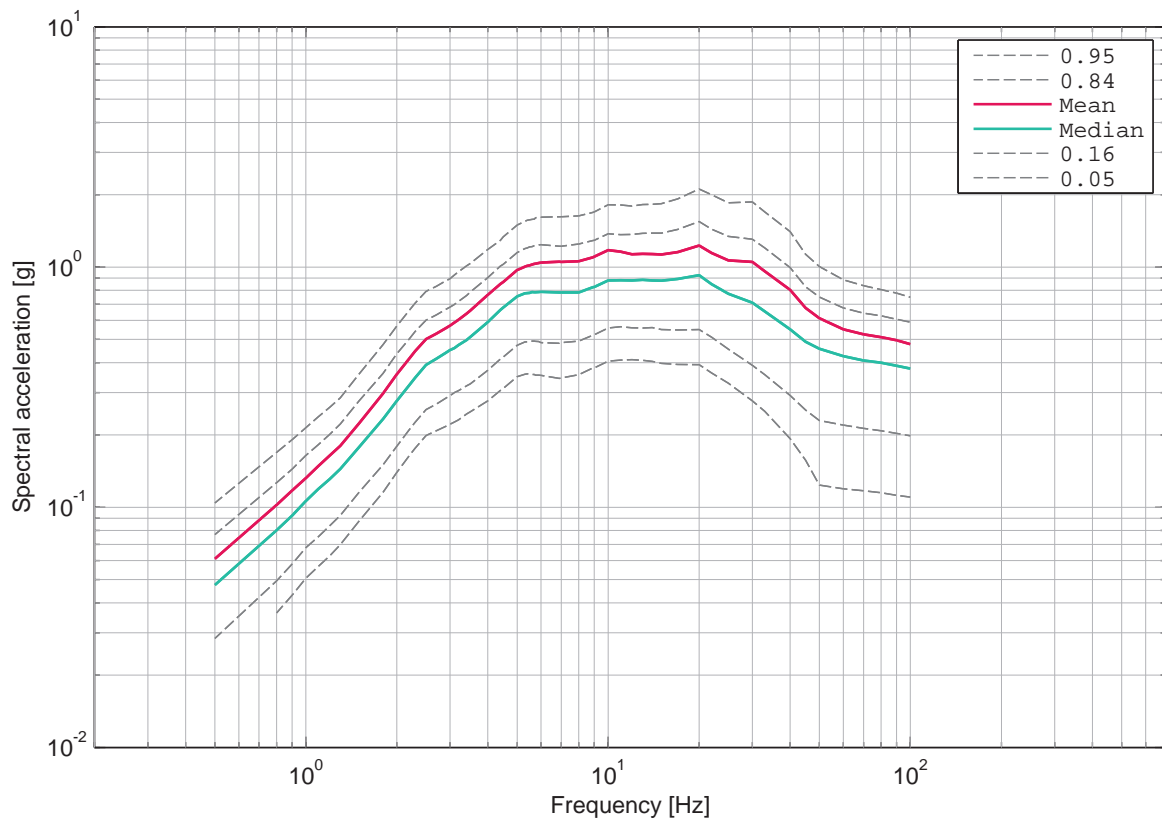


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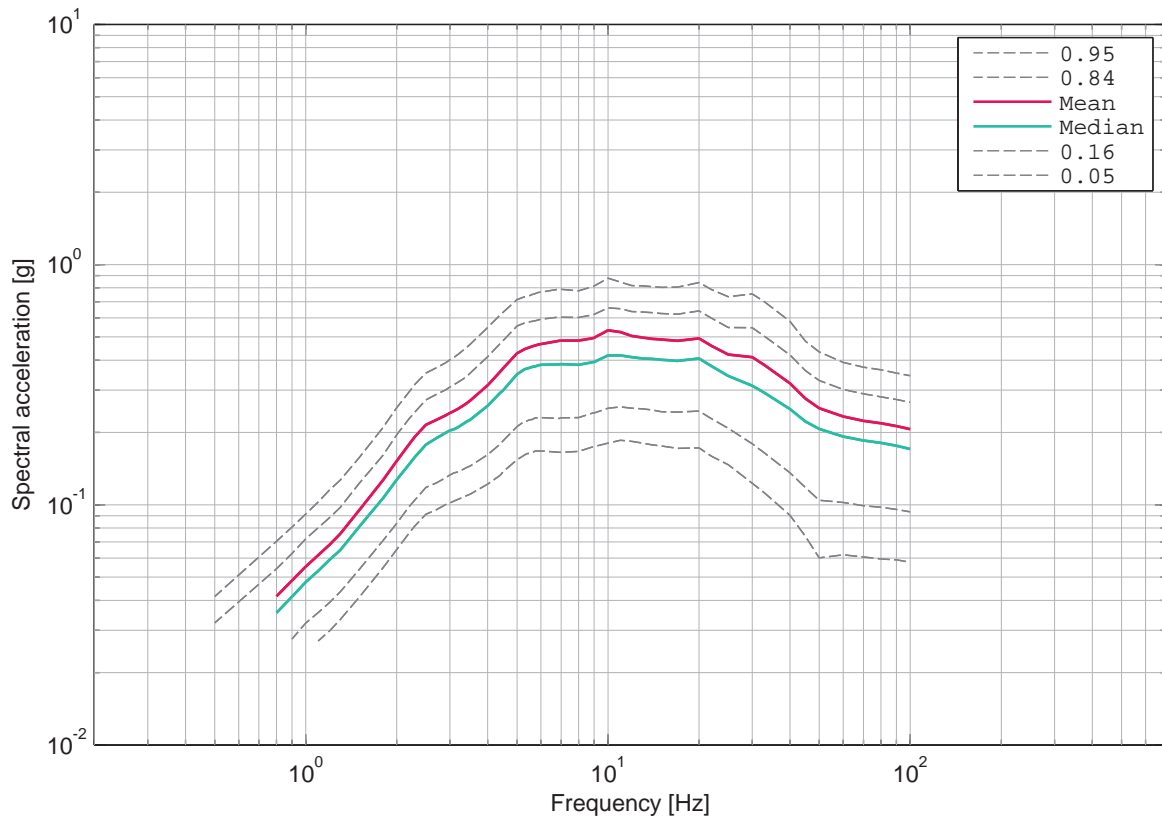


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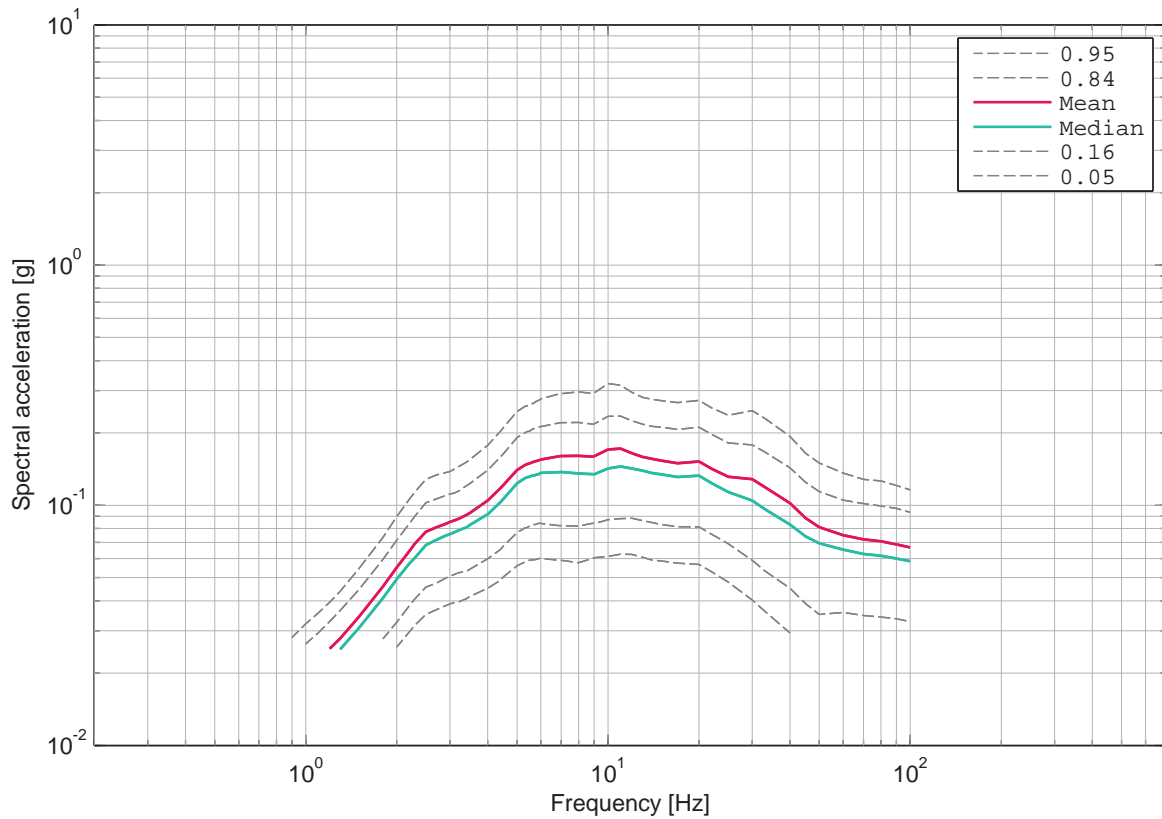


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2.5.1 Beznau, M_{min} Comparison, Soil, Surface

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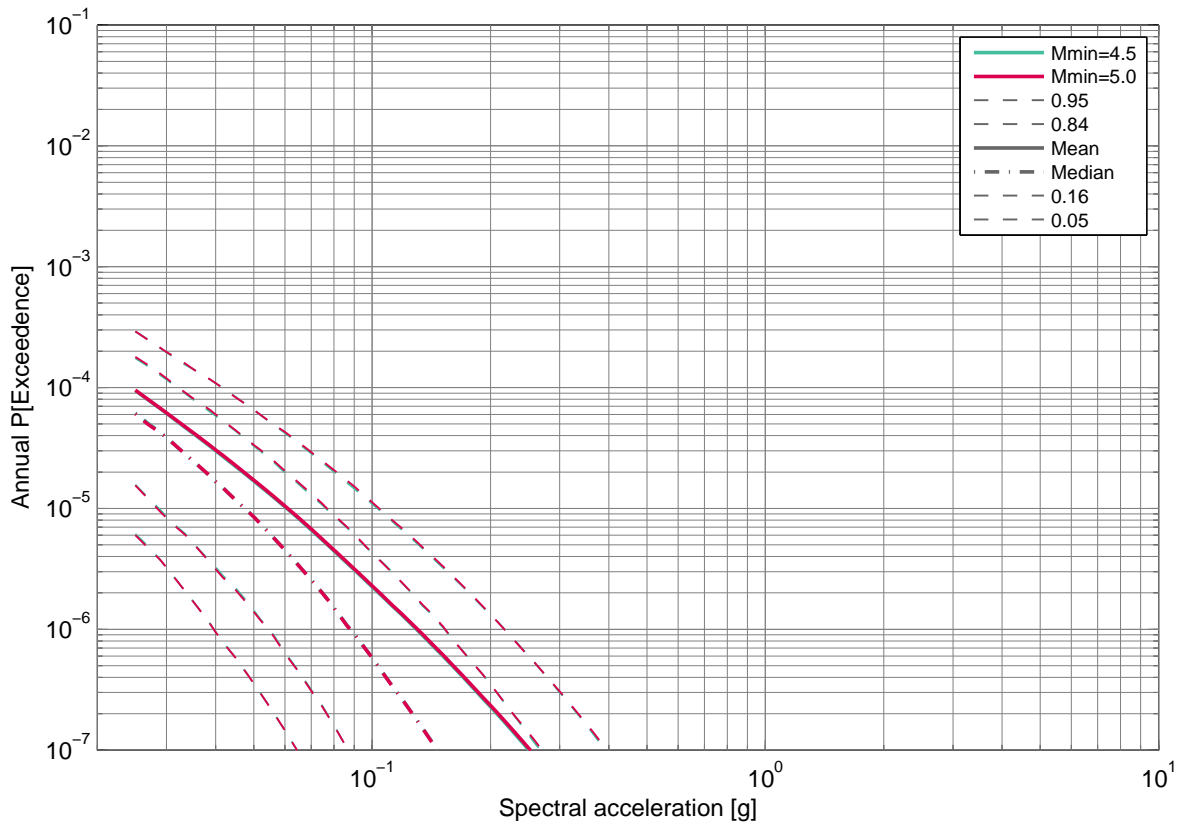


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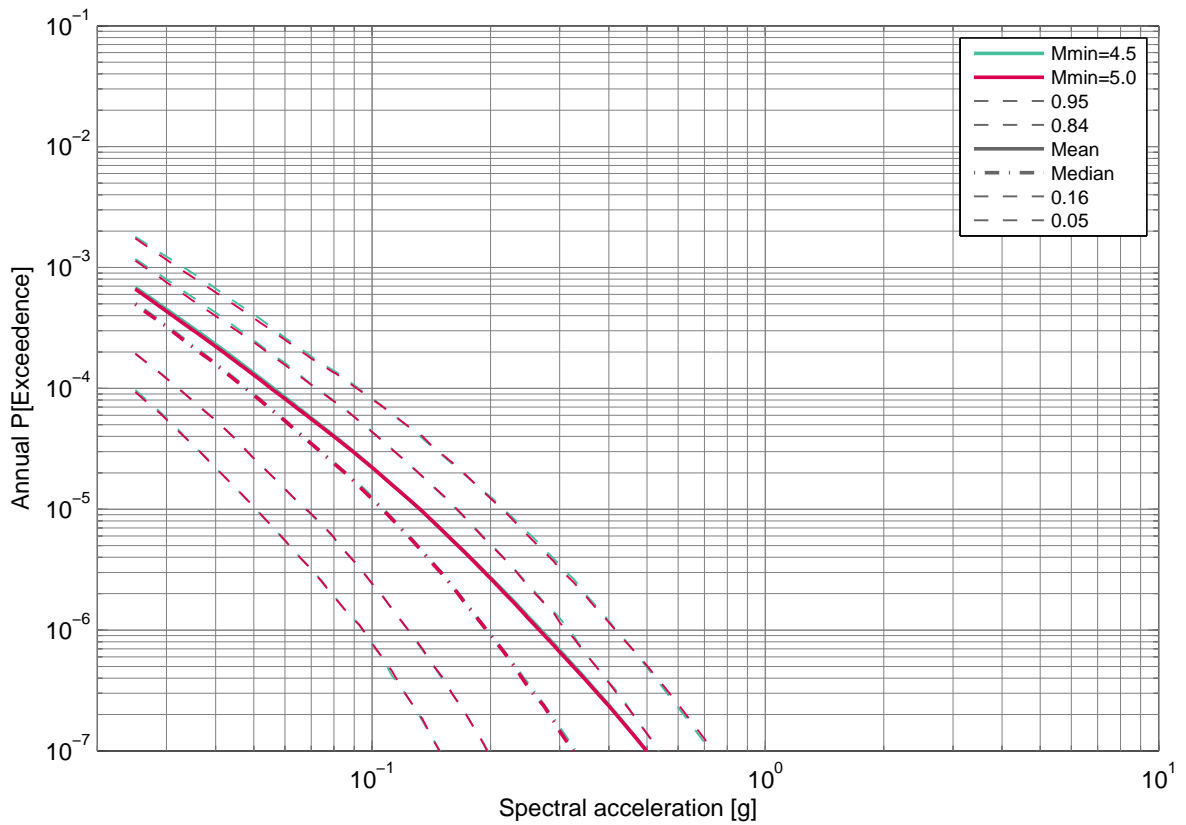


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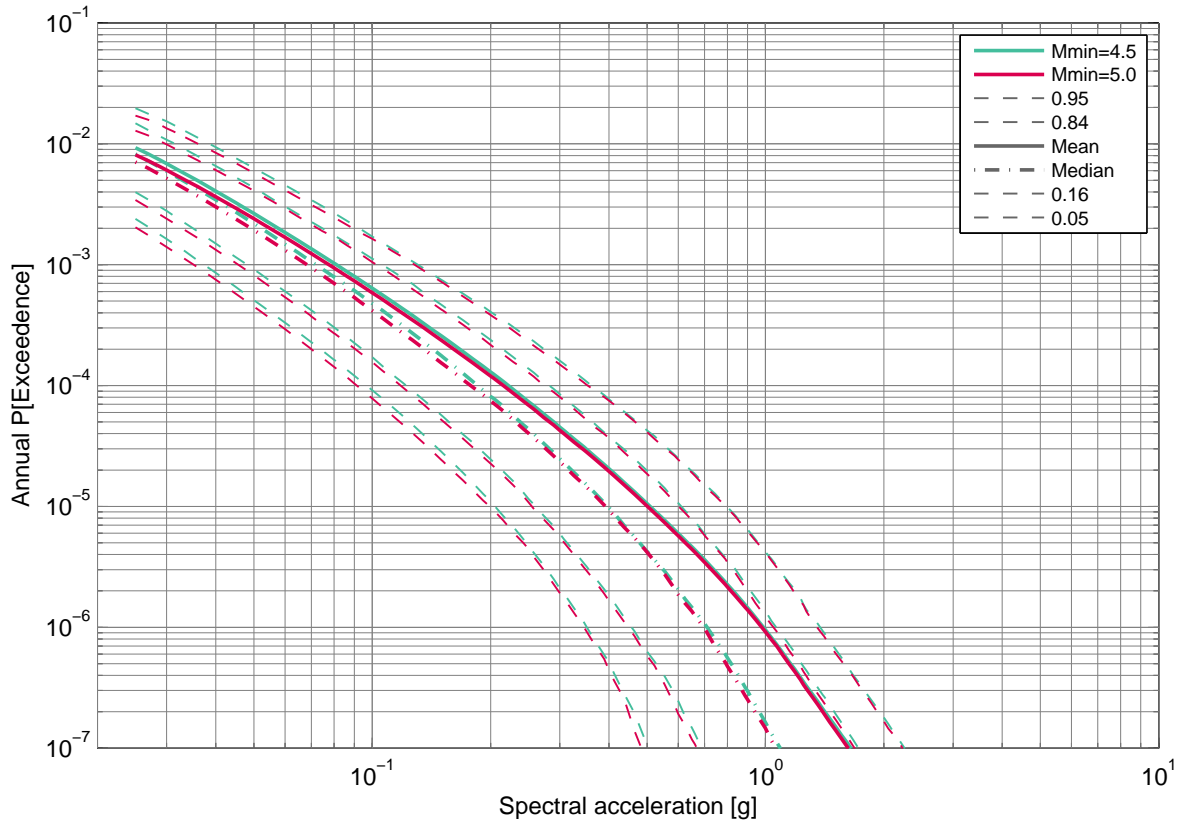


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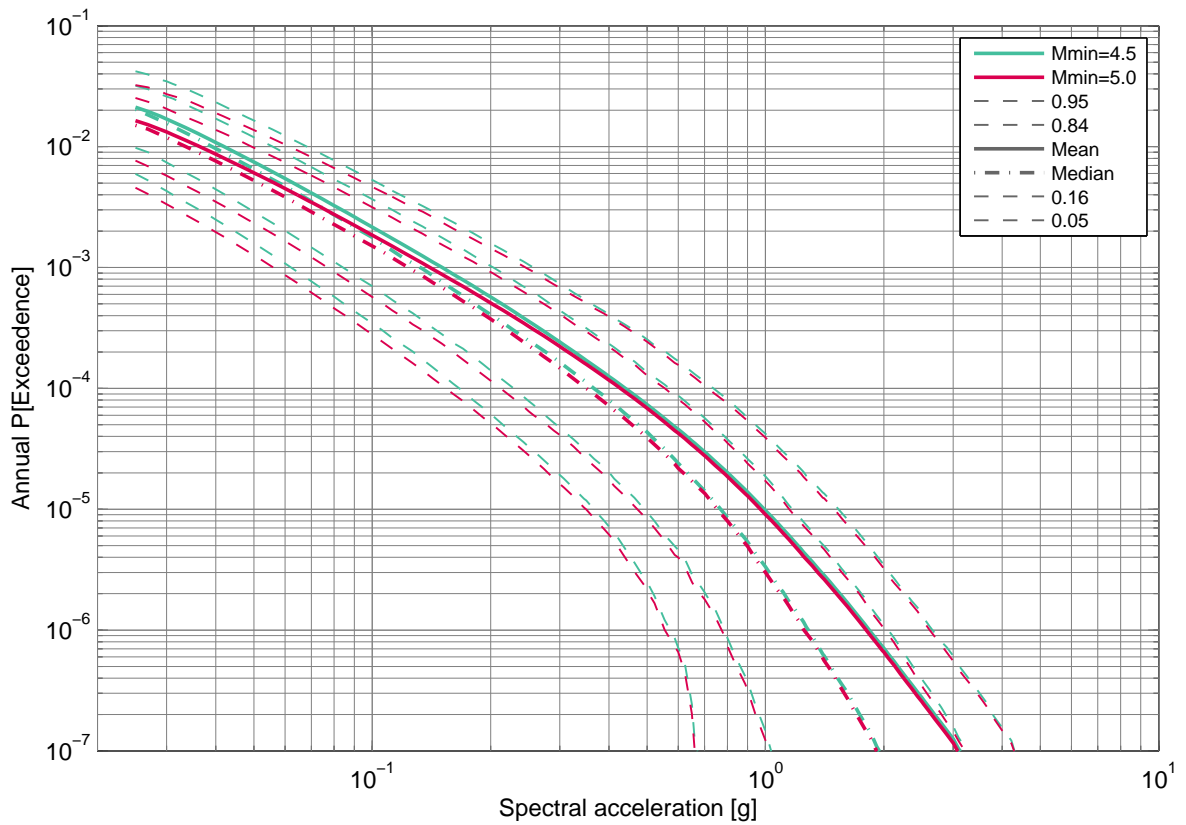


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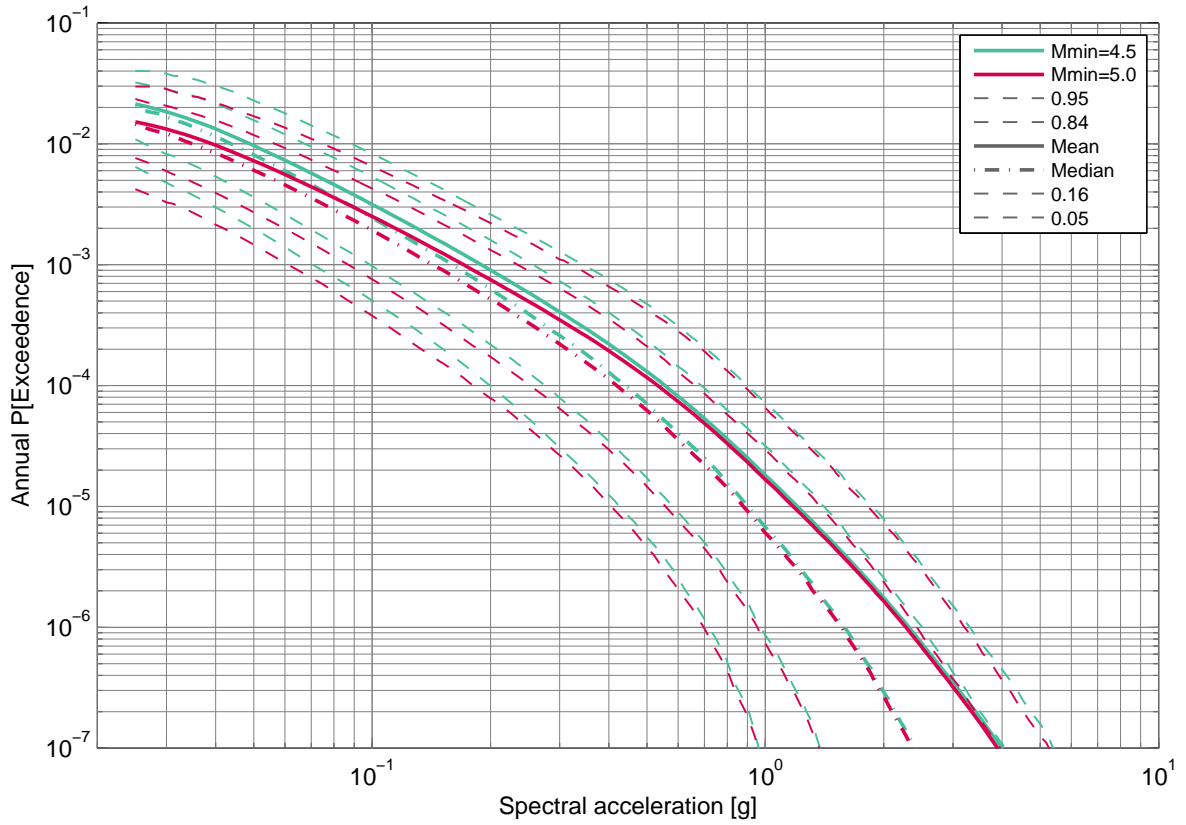


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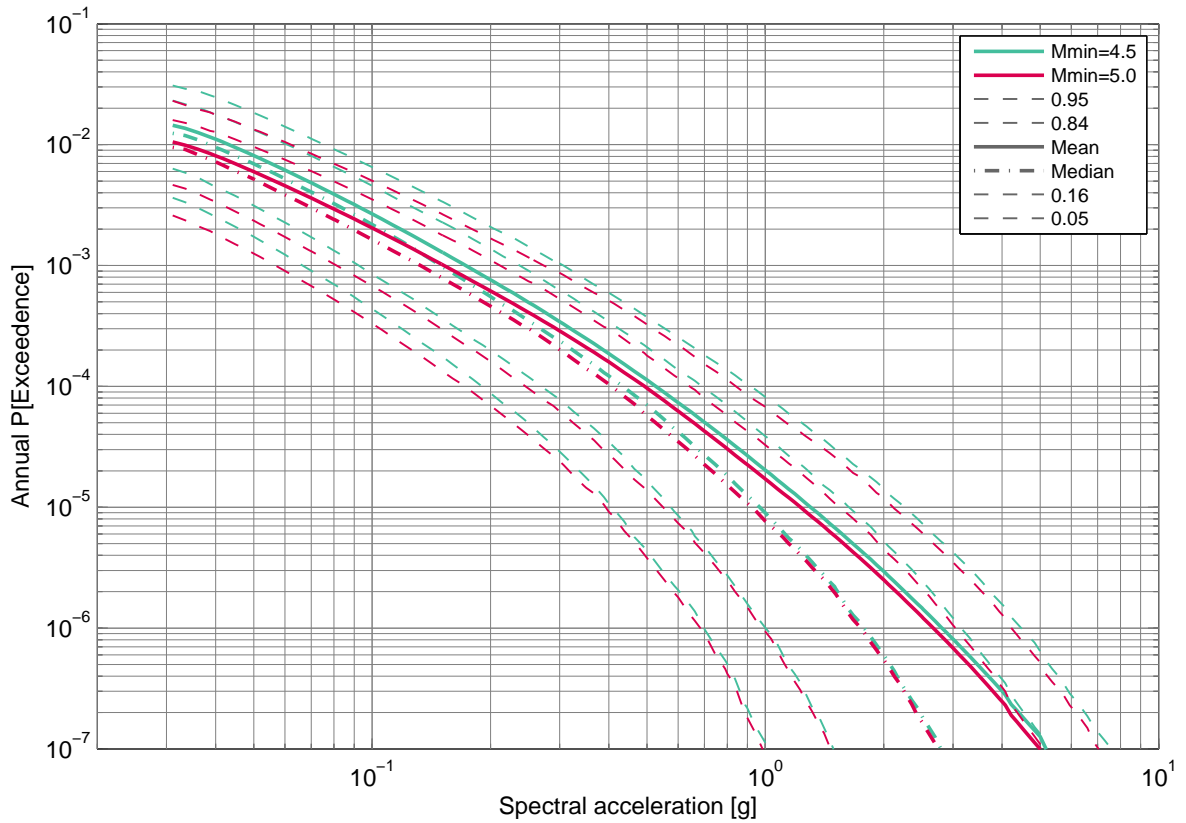


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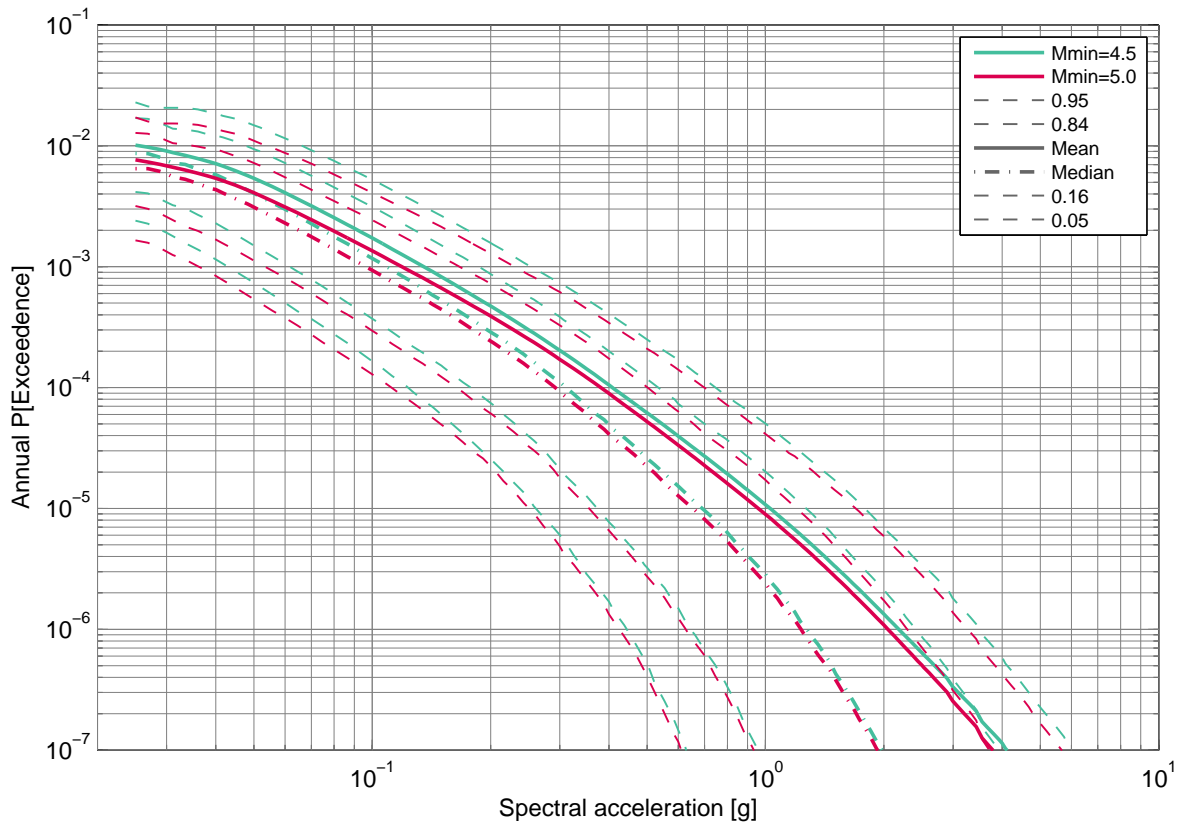


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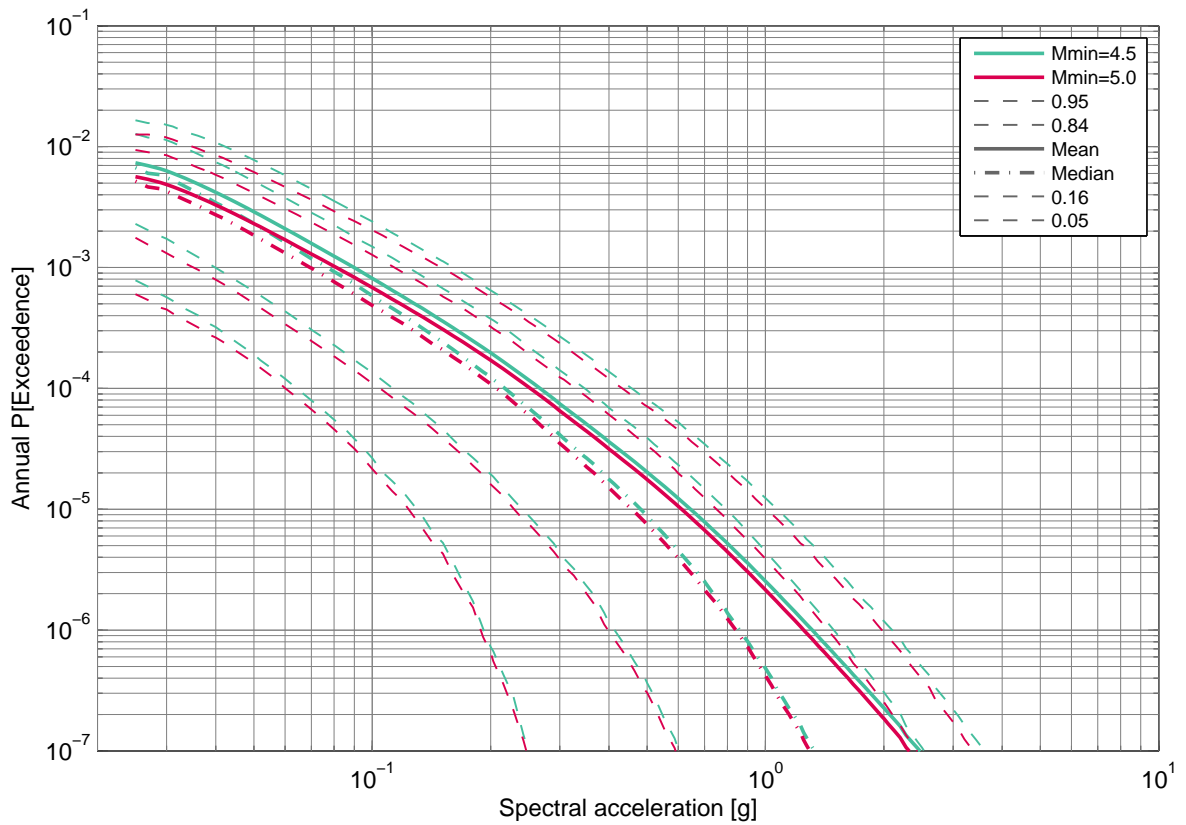


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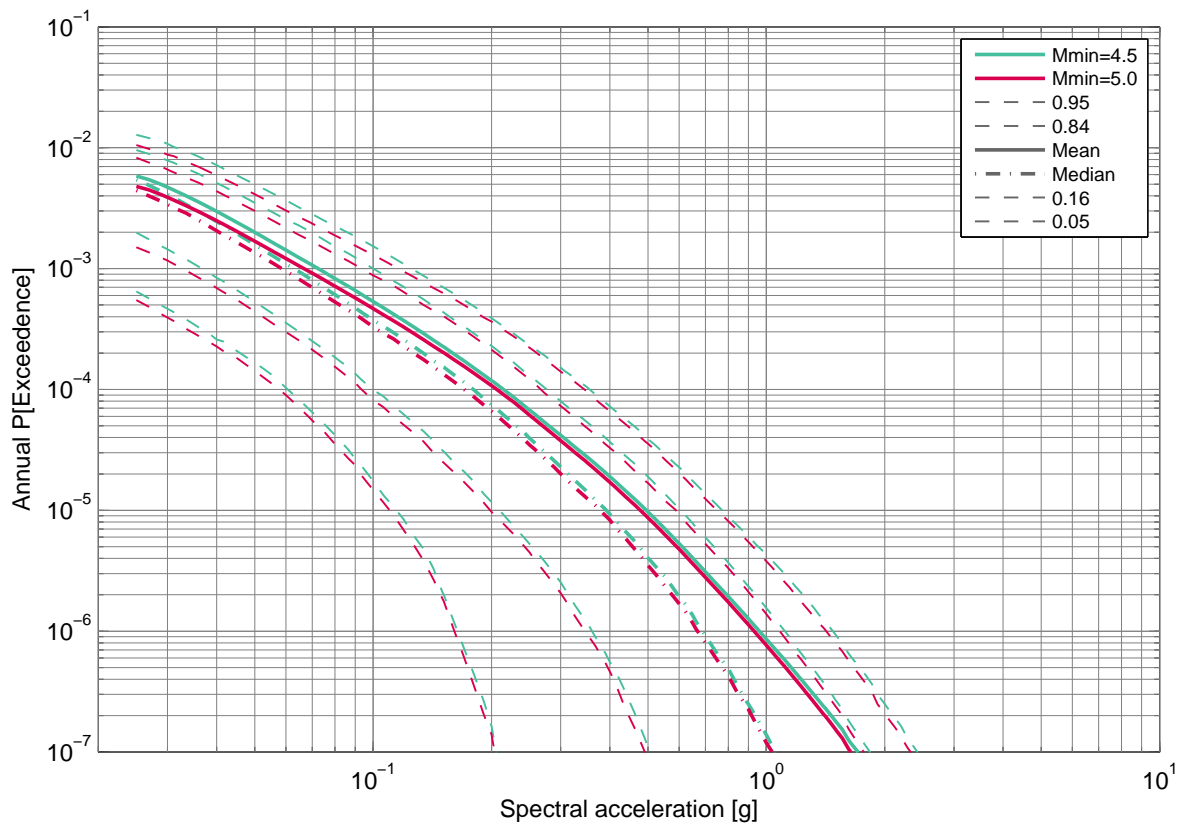


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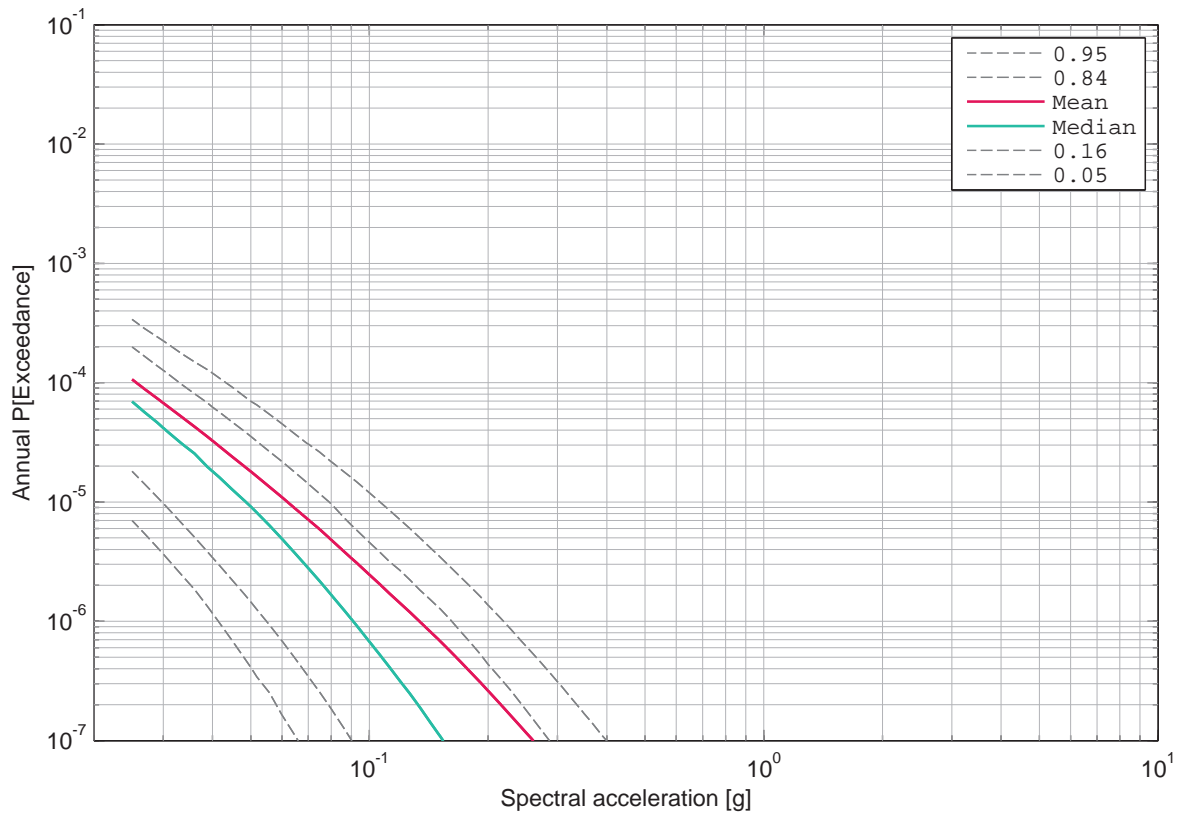


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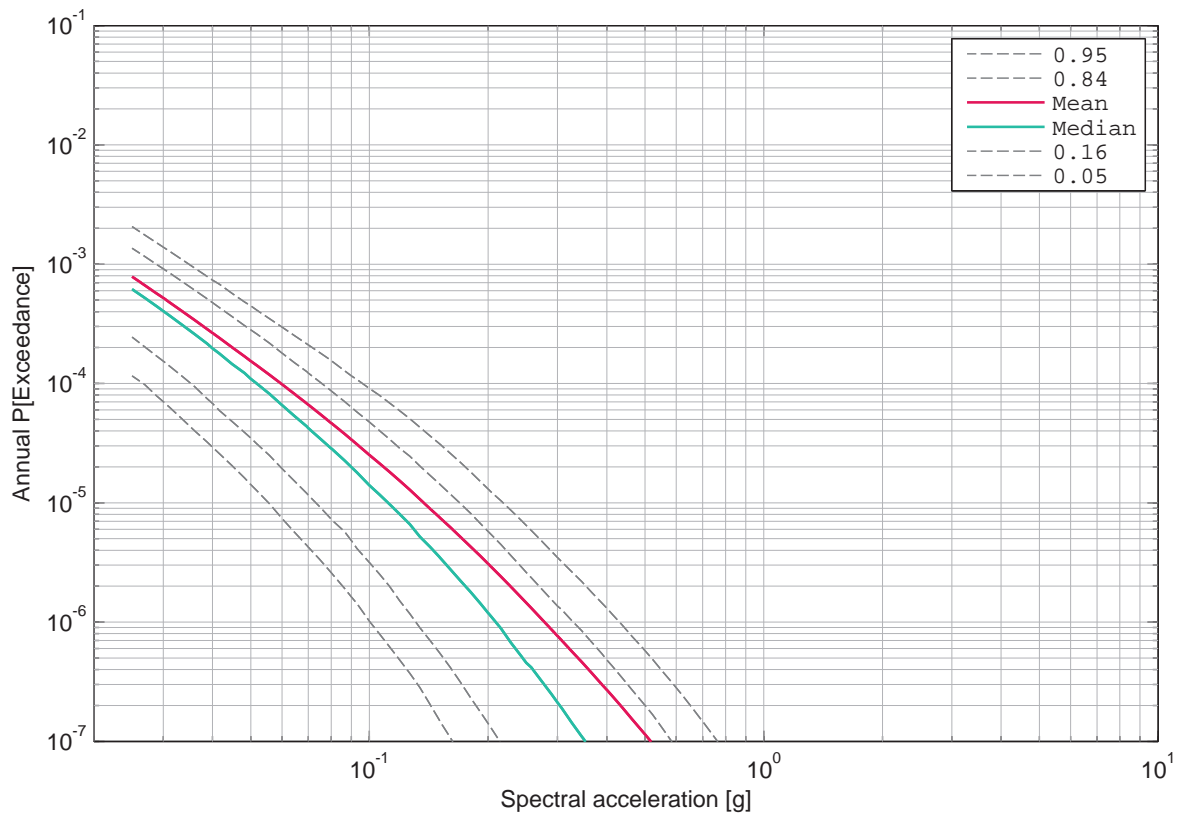


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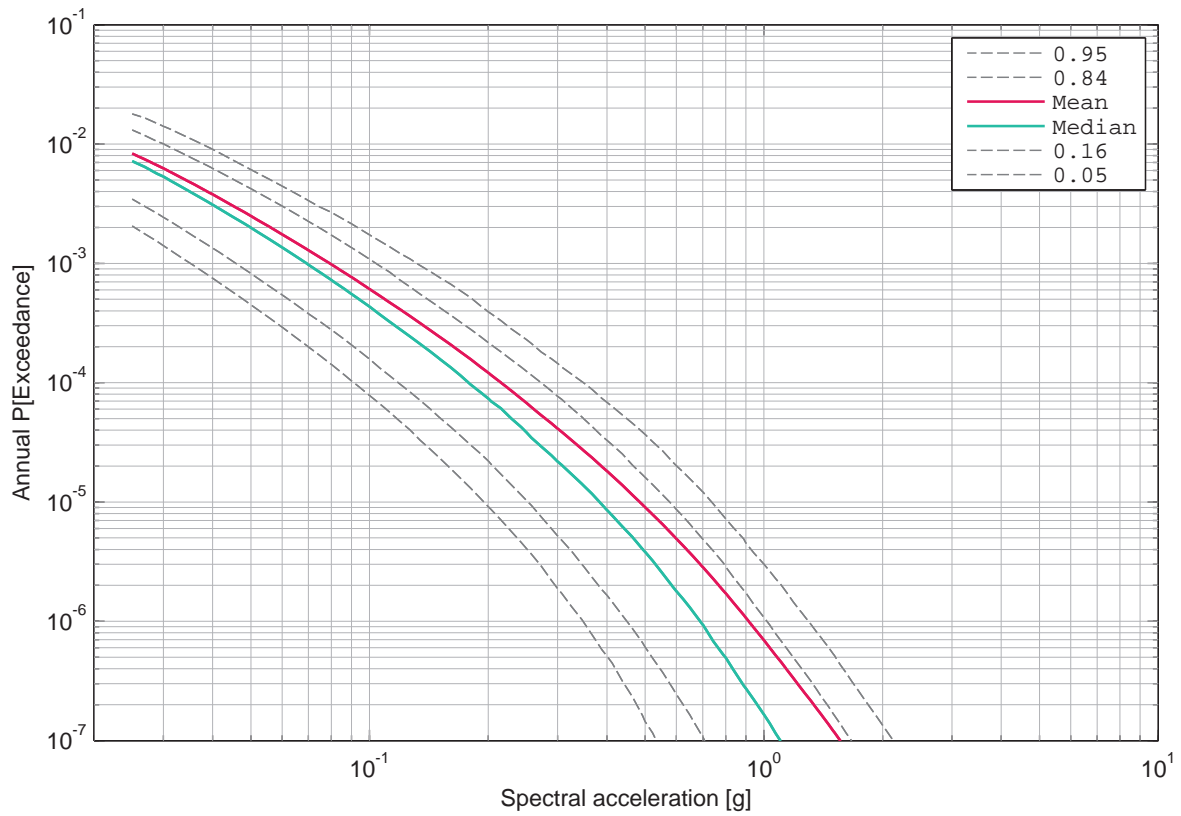


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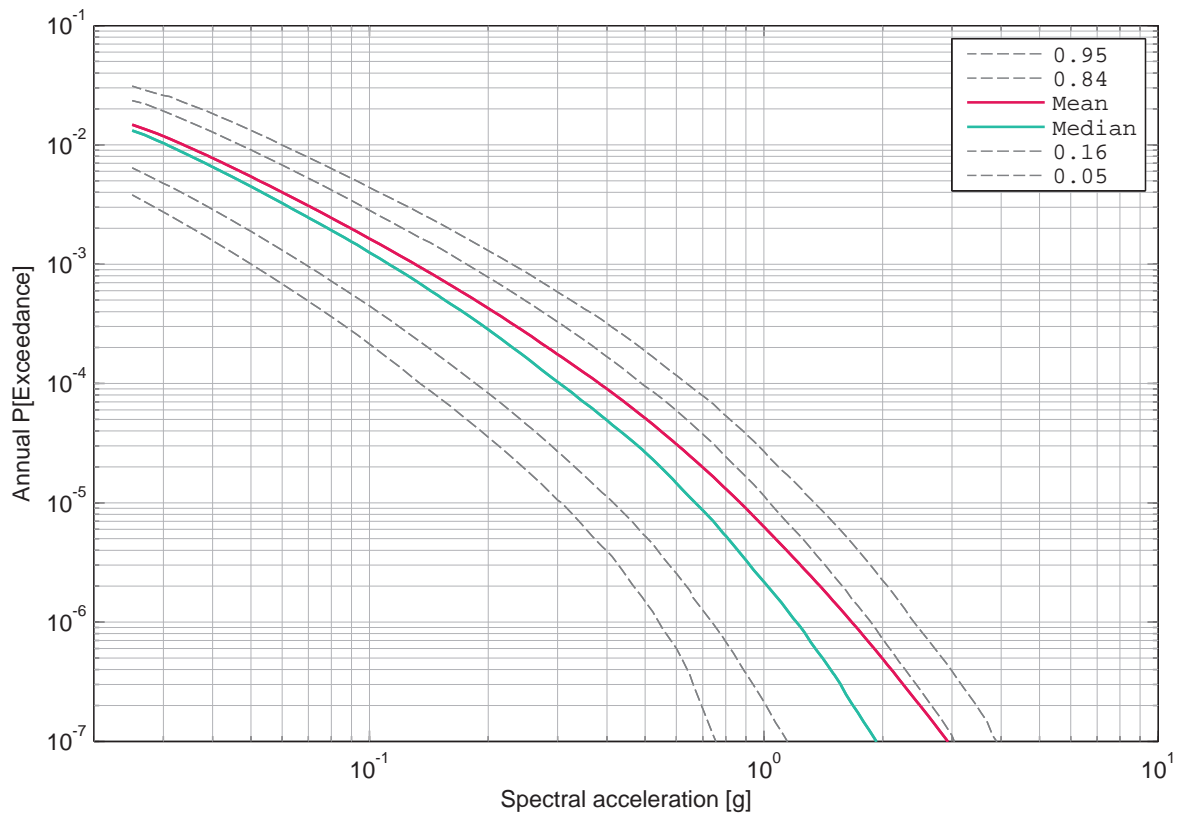


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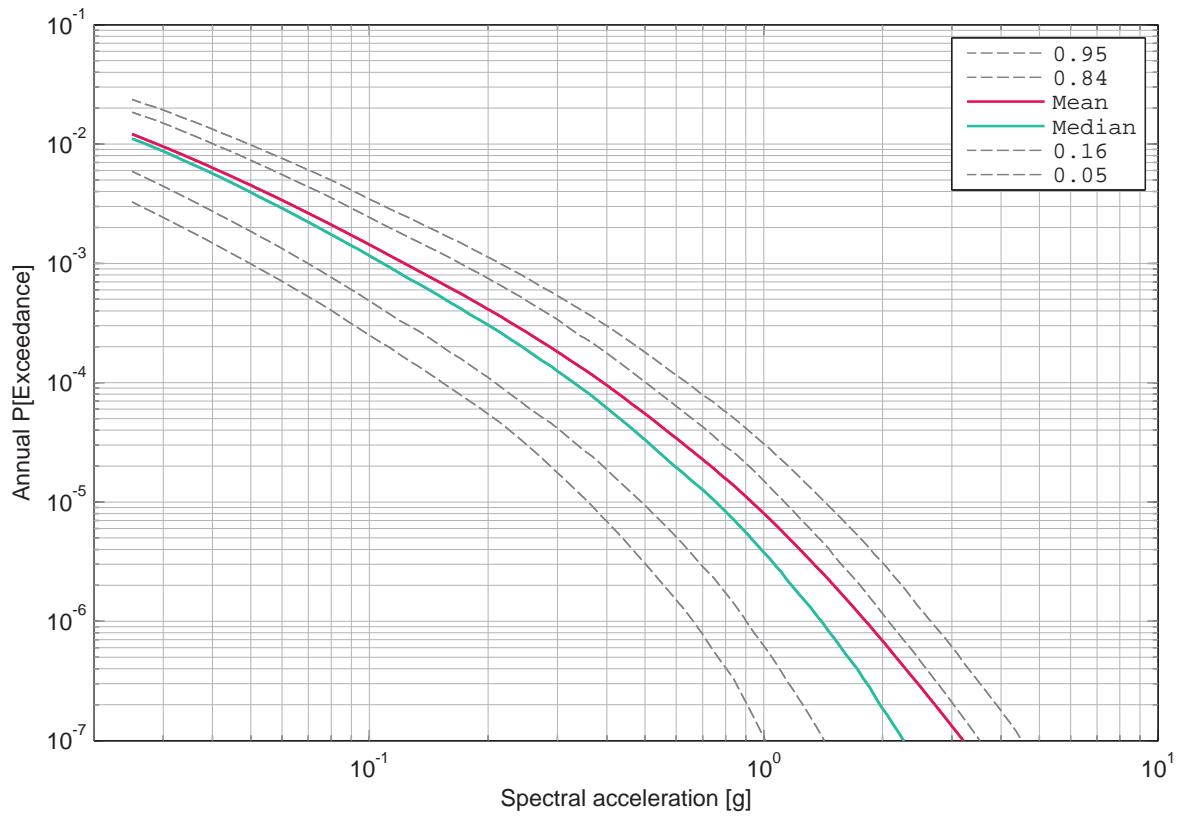


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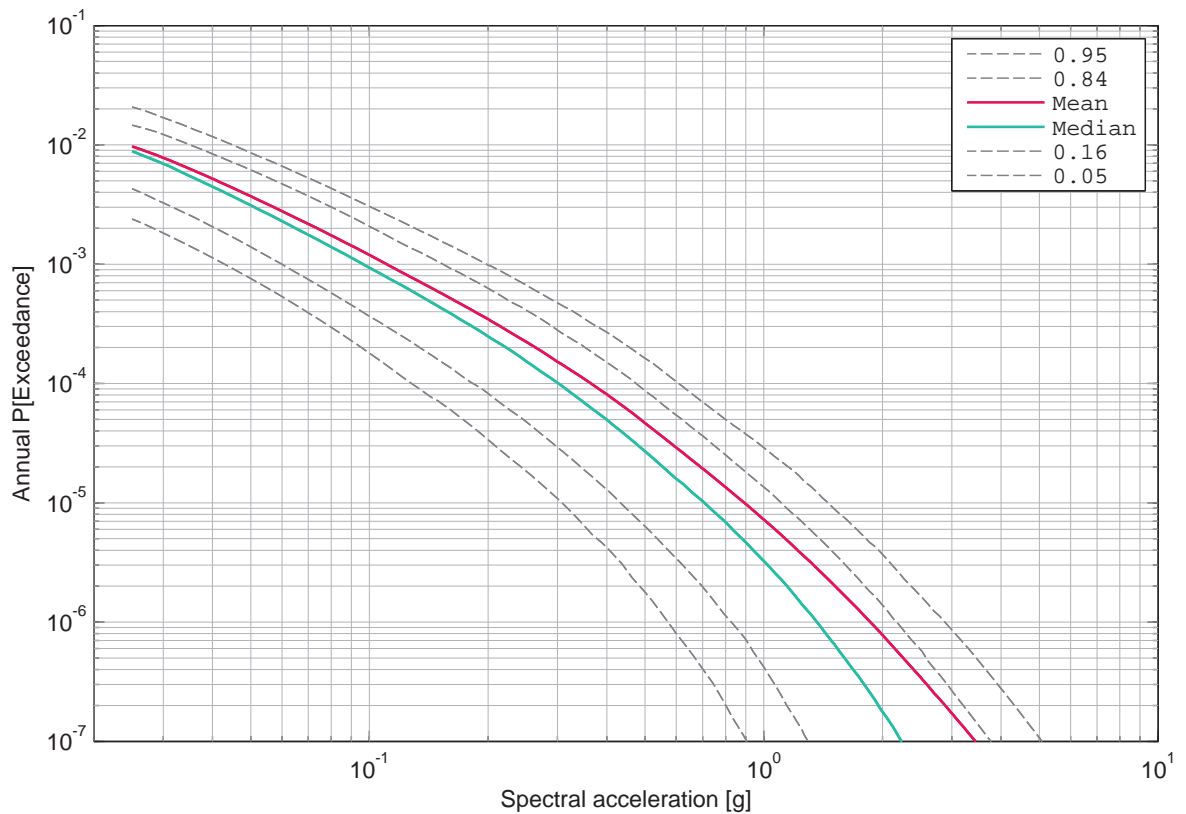


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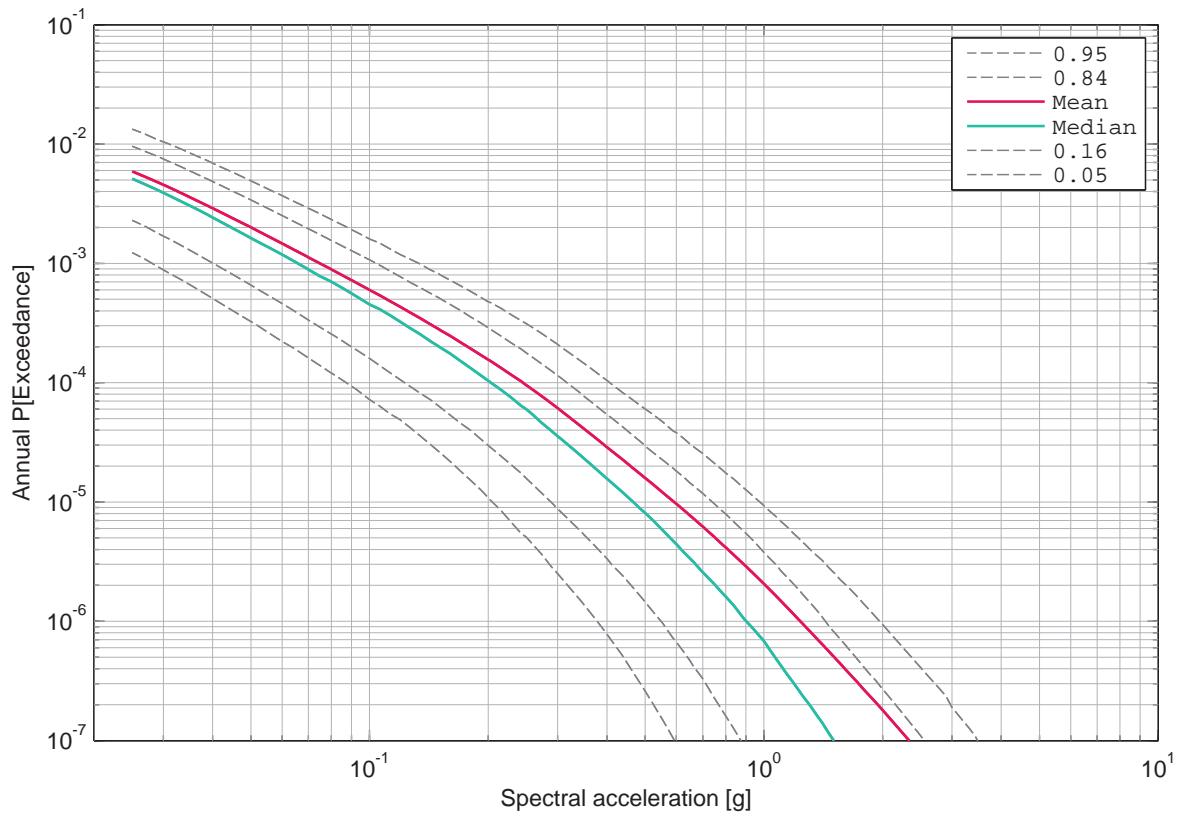


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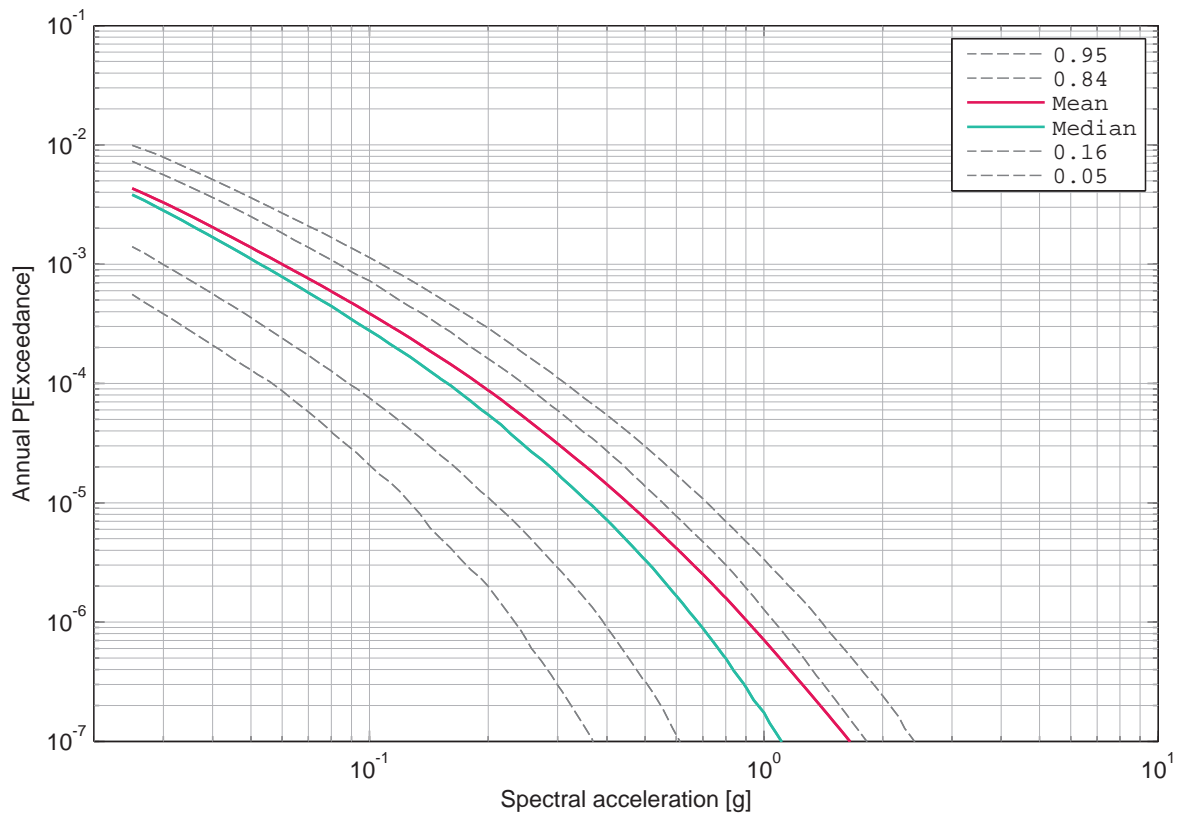


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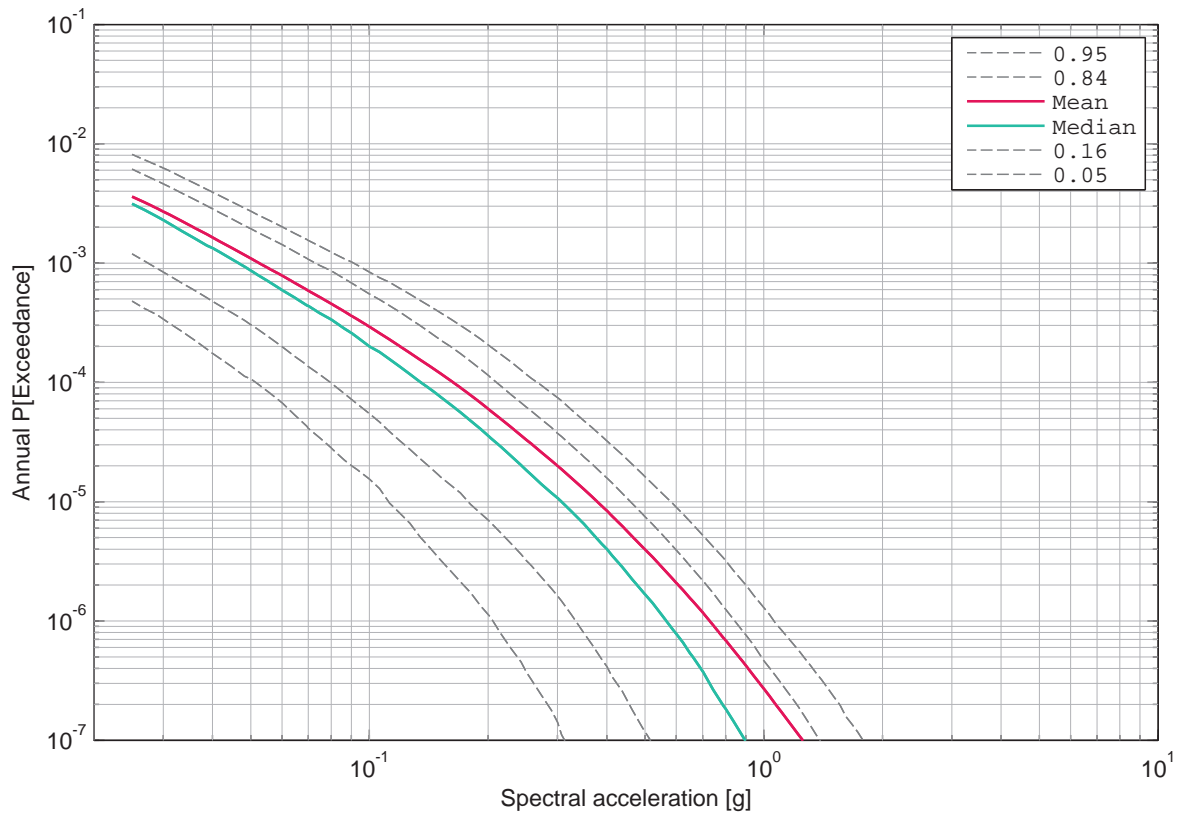


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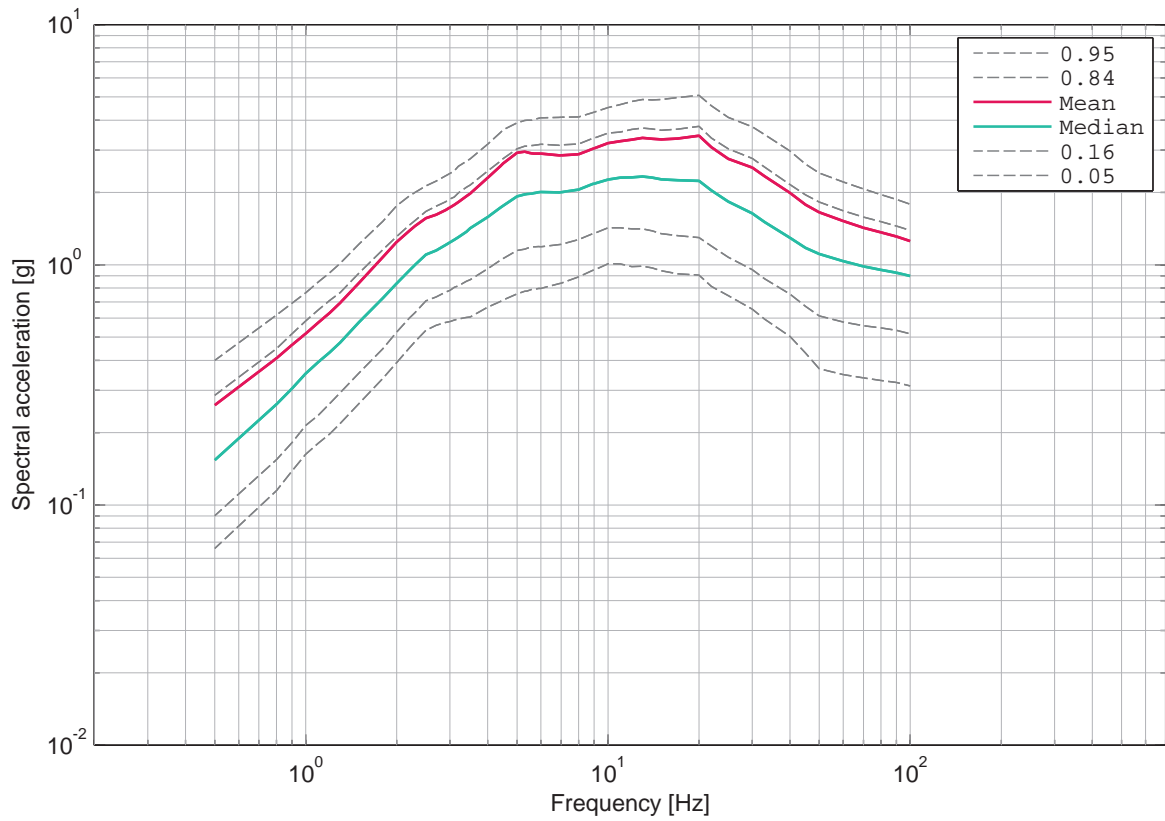


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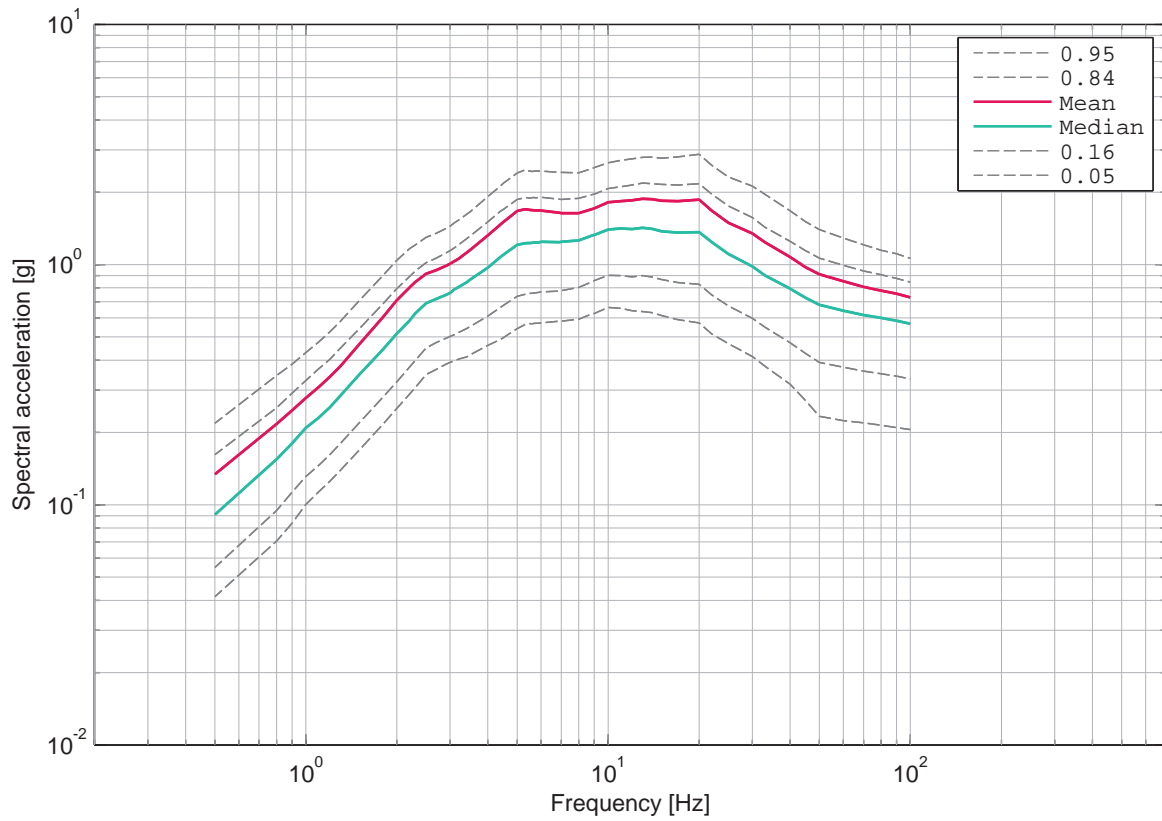


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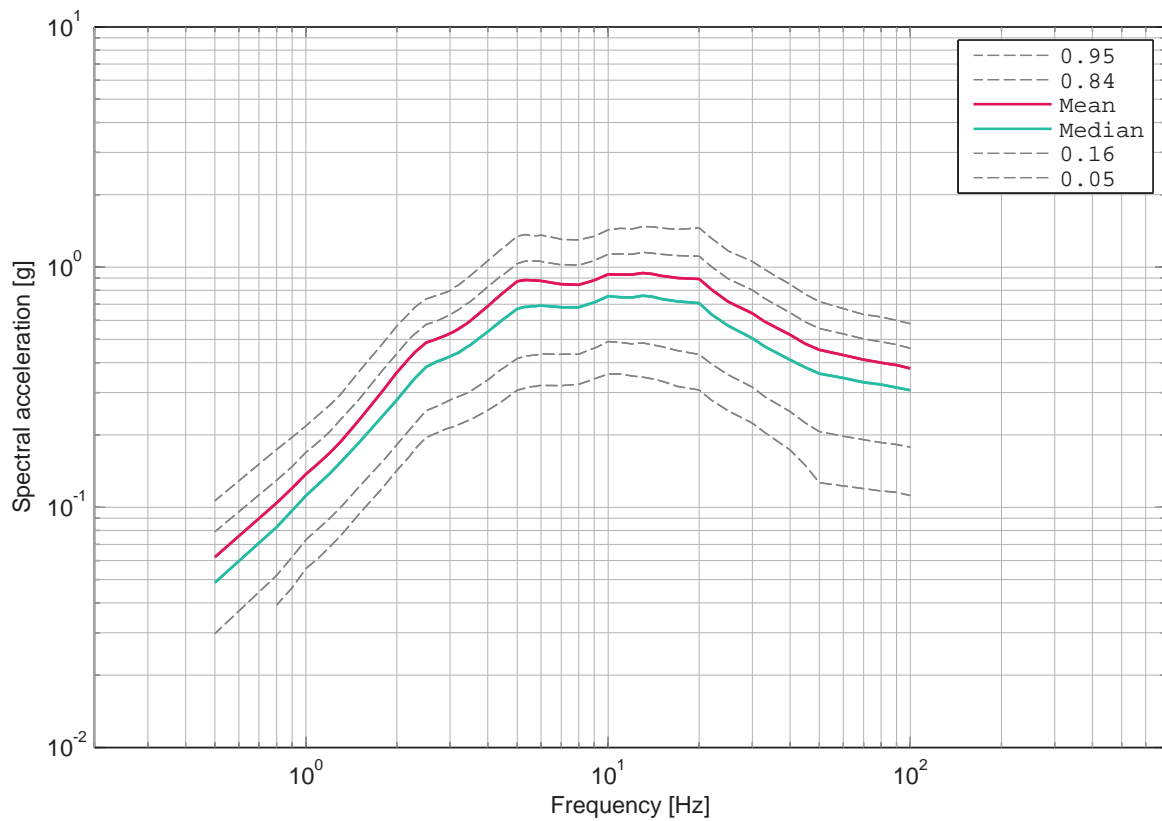


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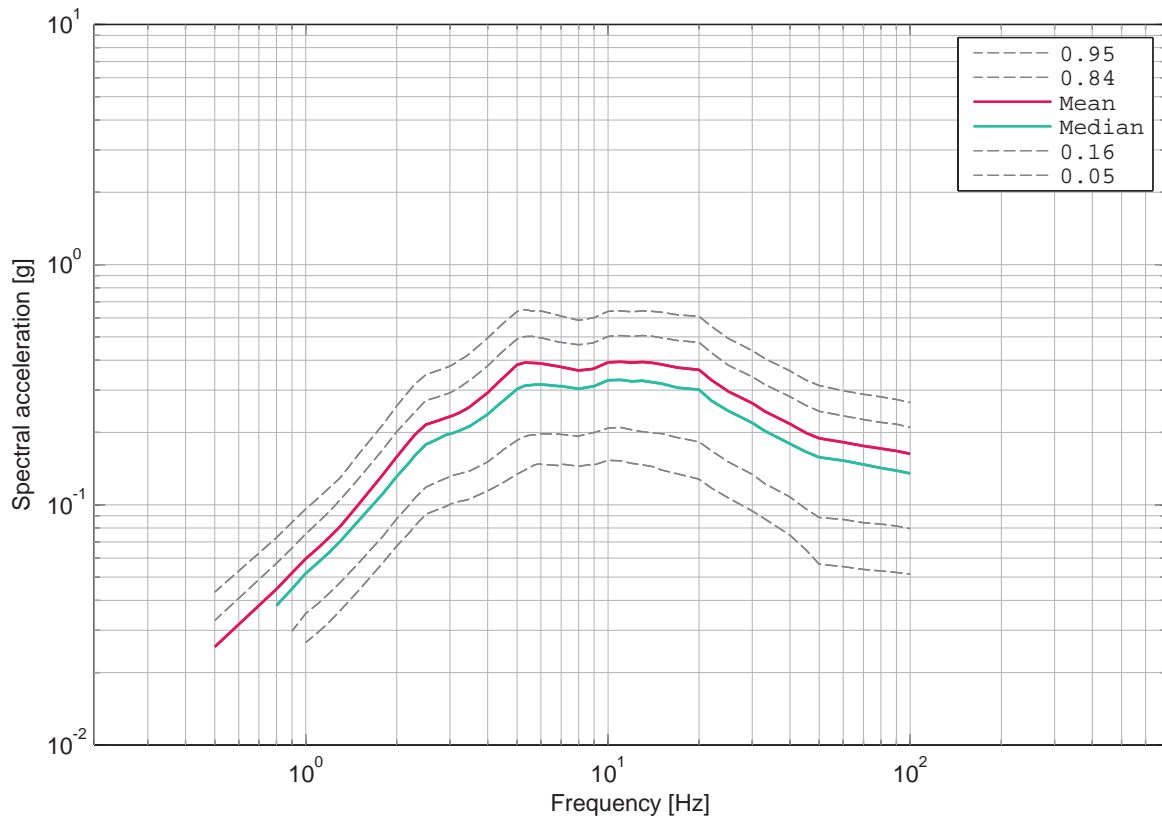


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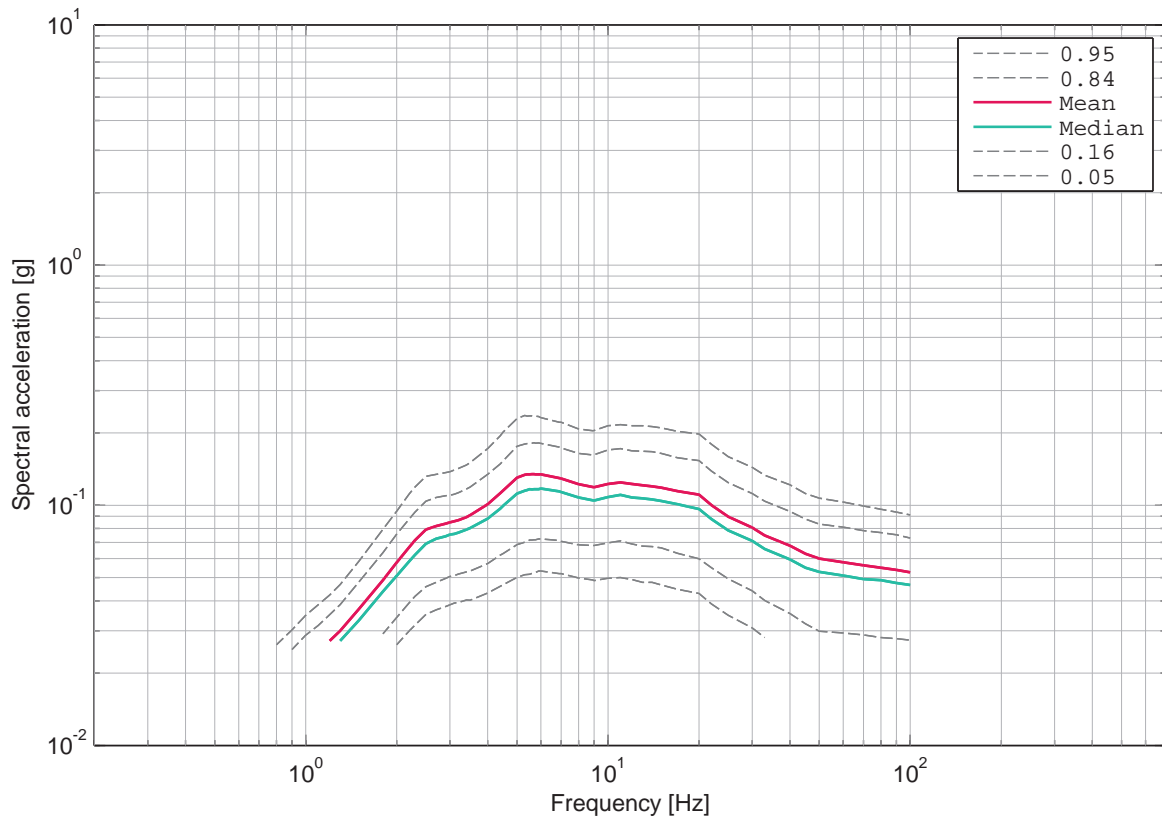


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Chapter 3

GÖSGEN

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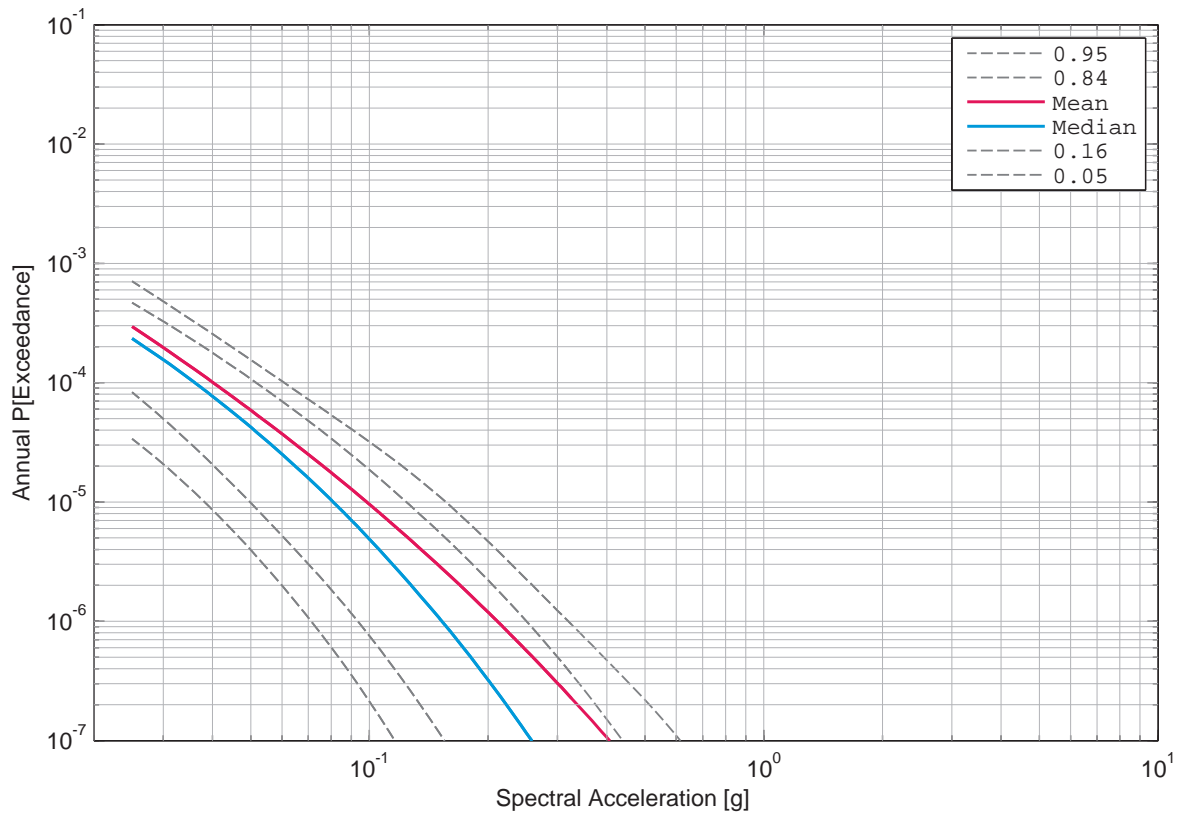


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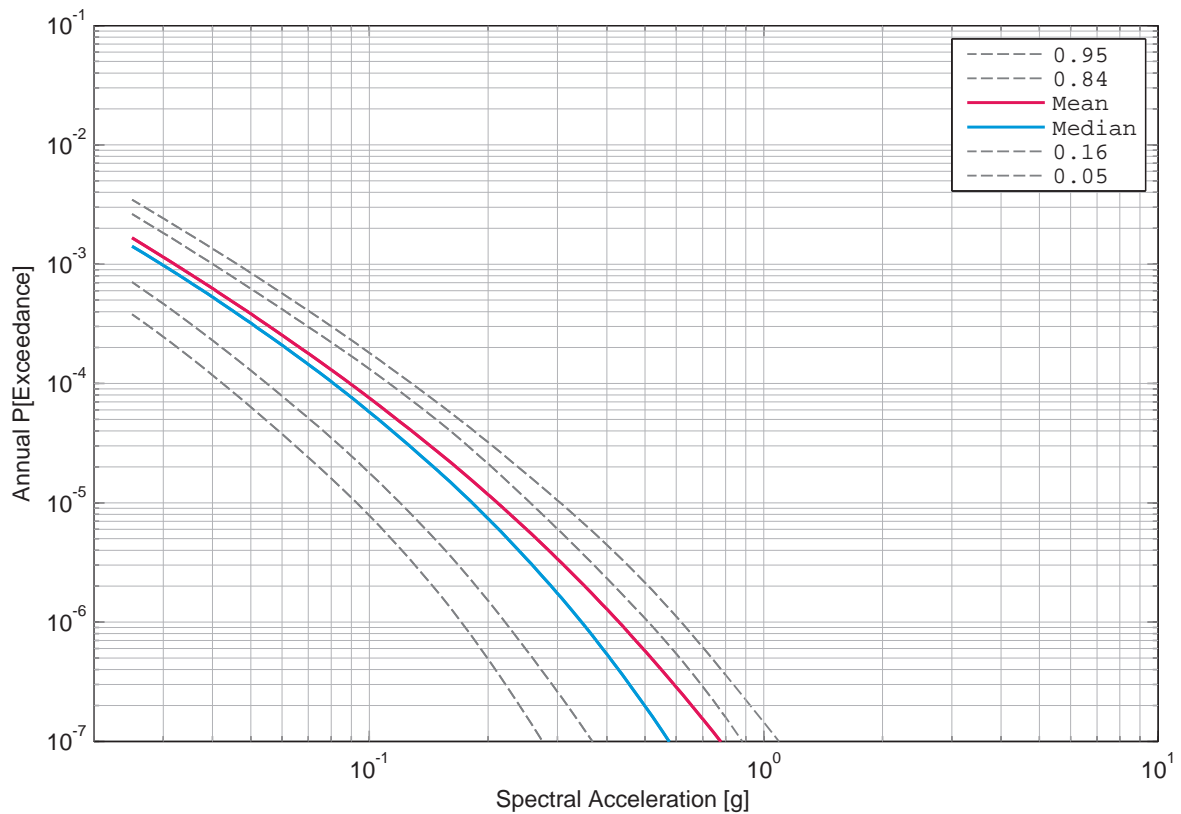


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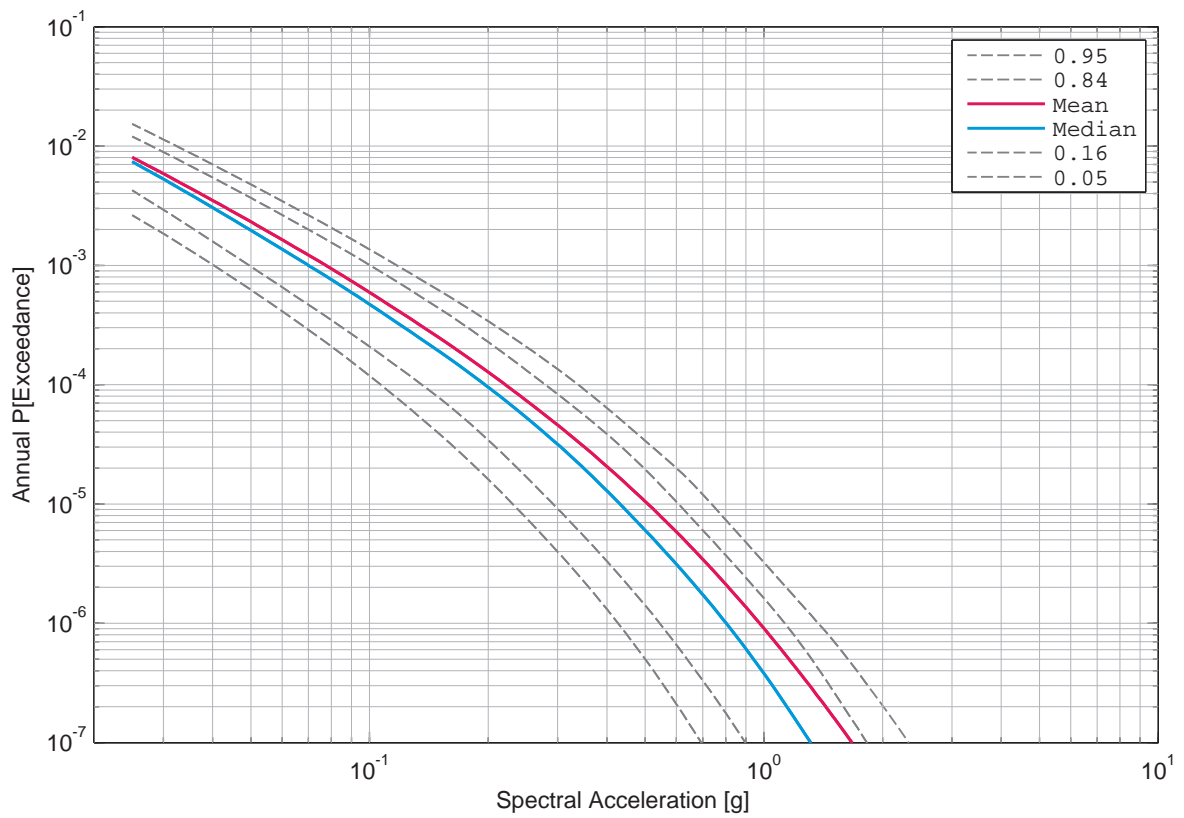


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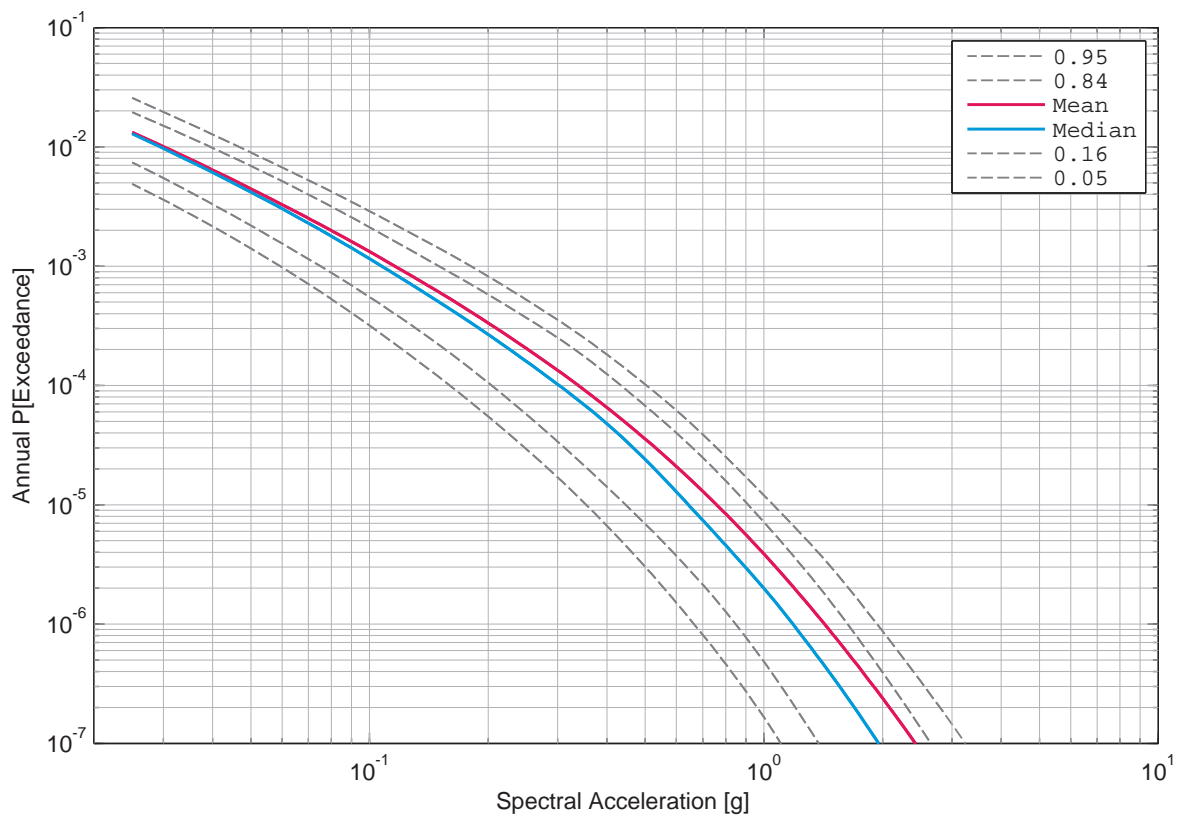


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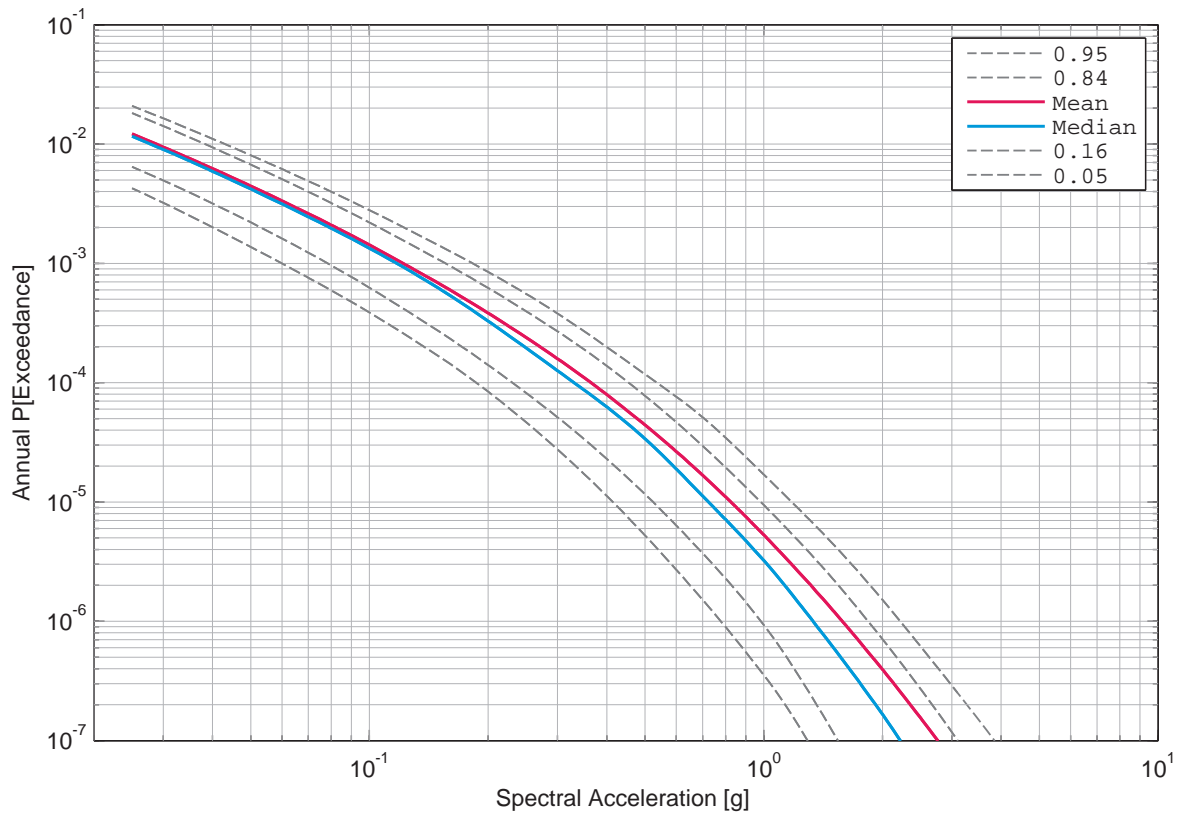


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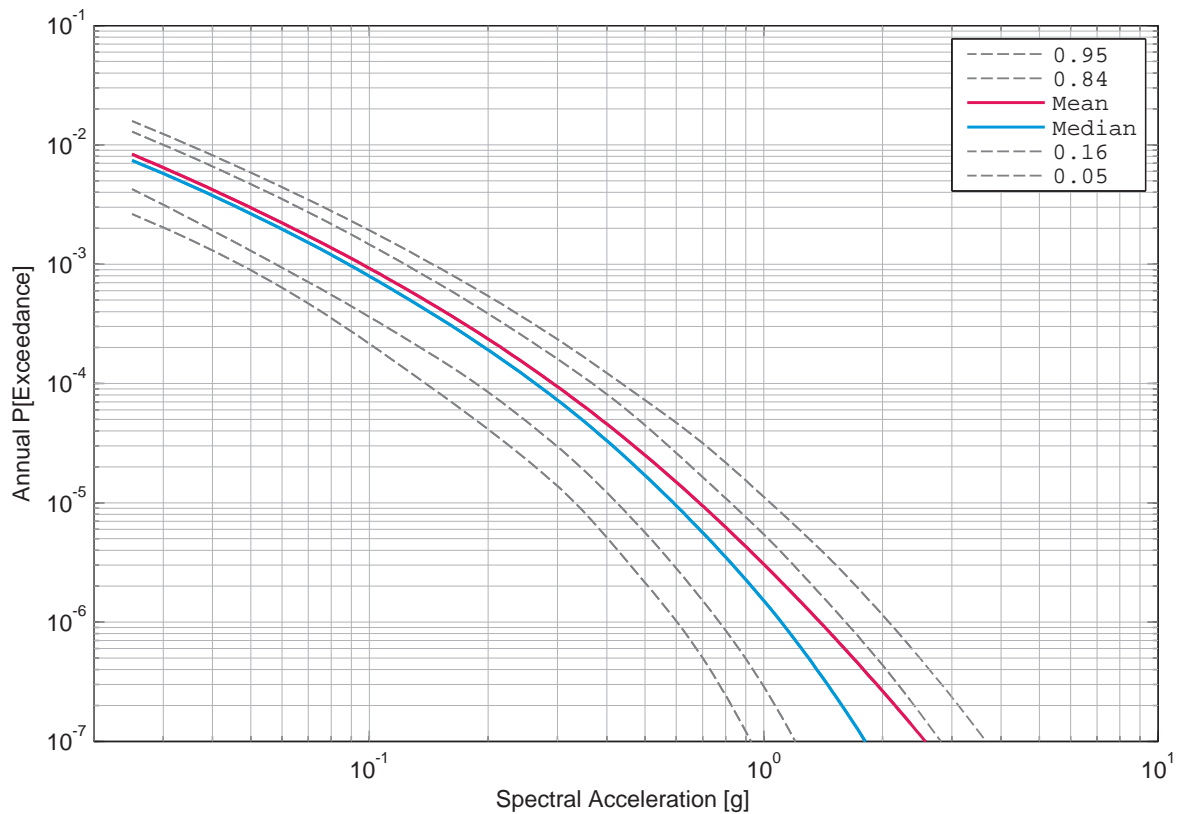


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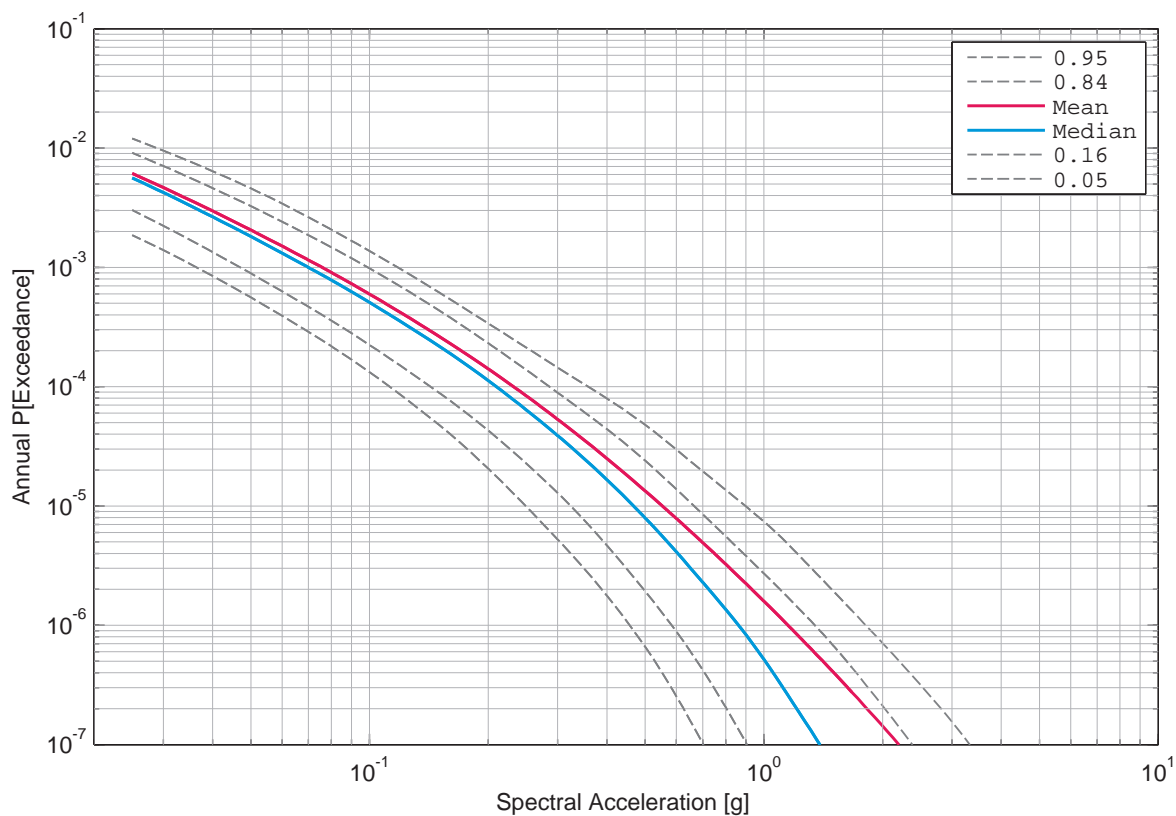


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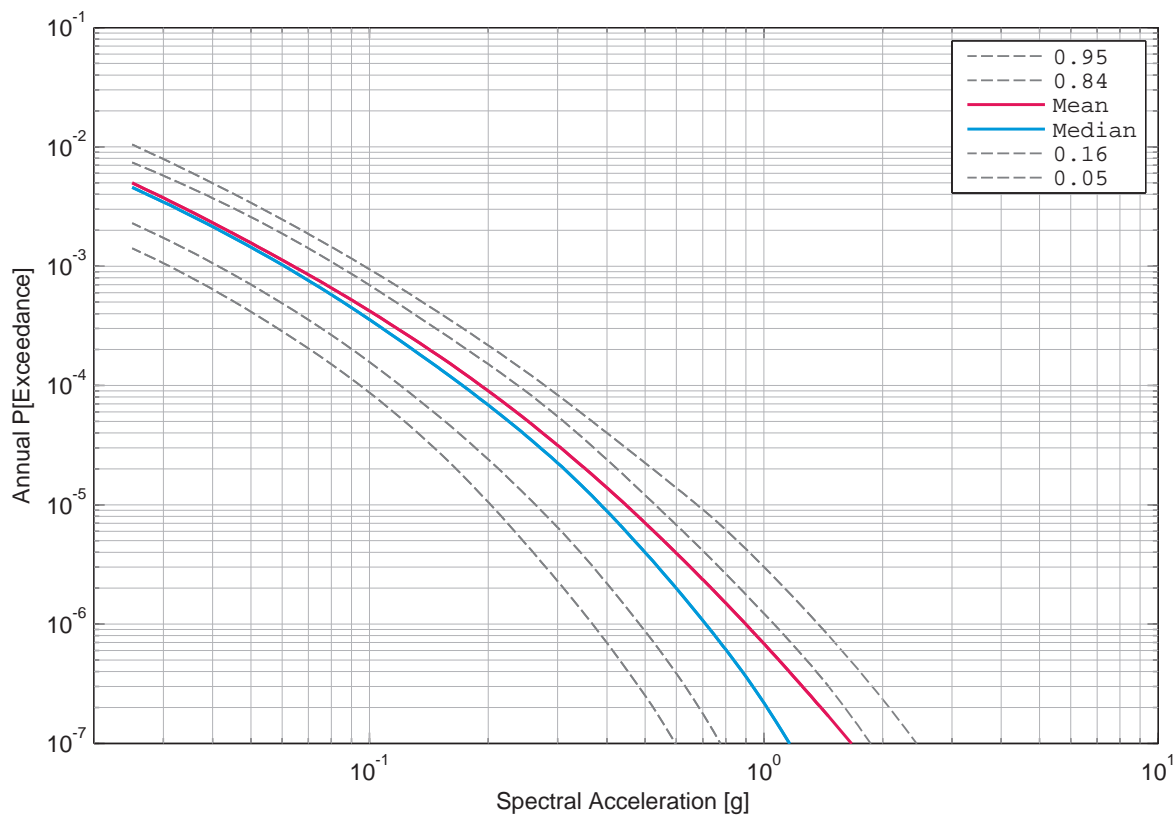


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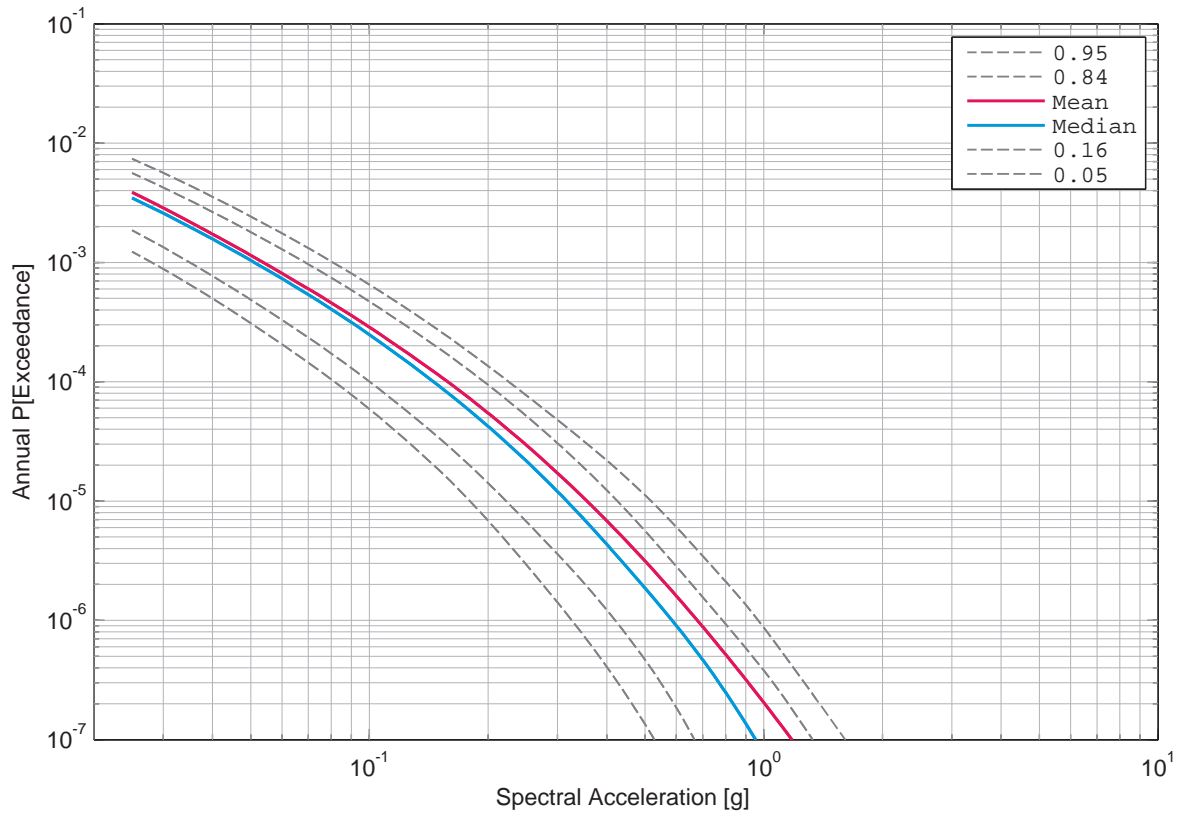


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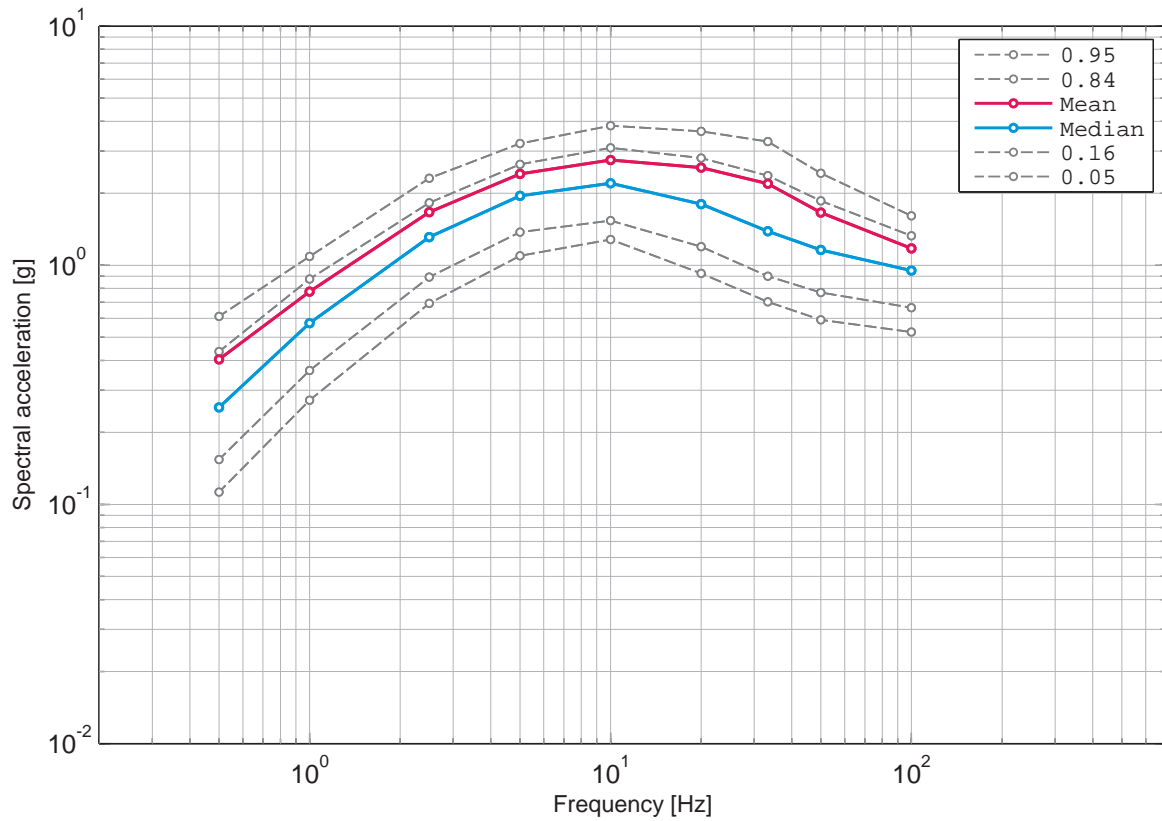


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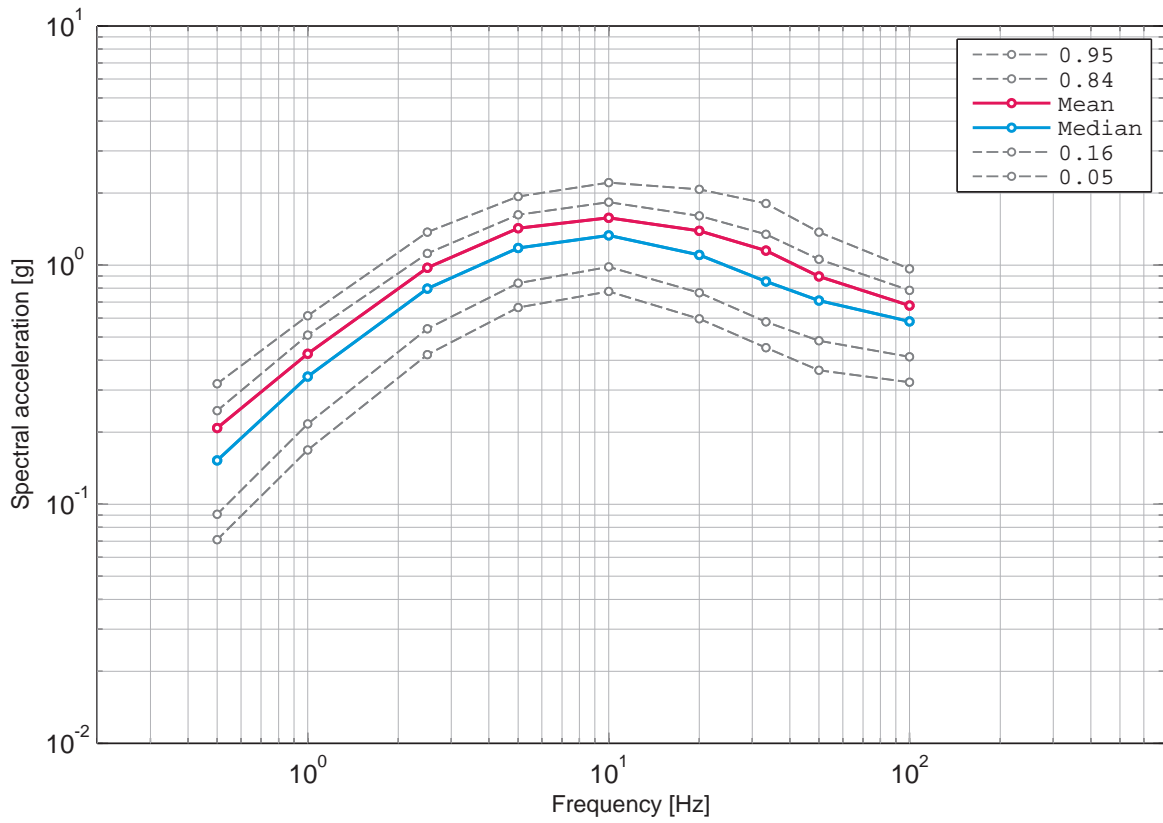


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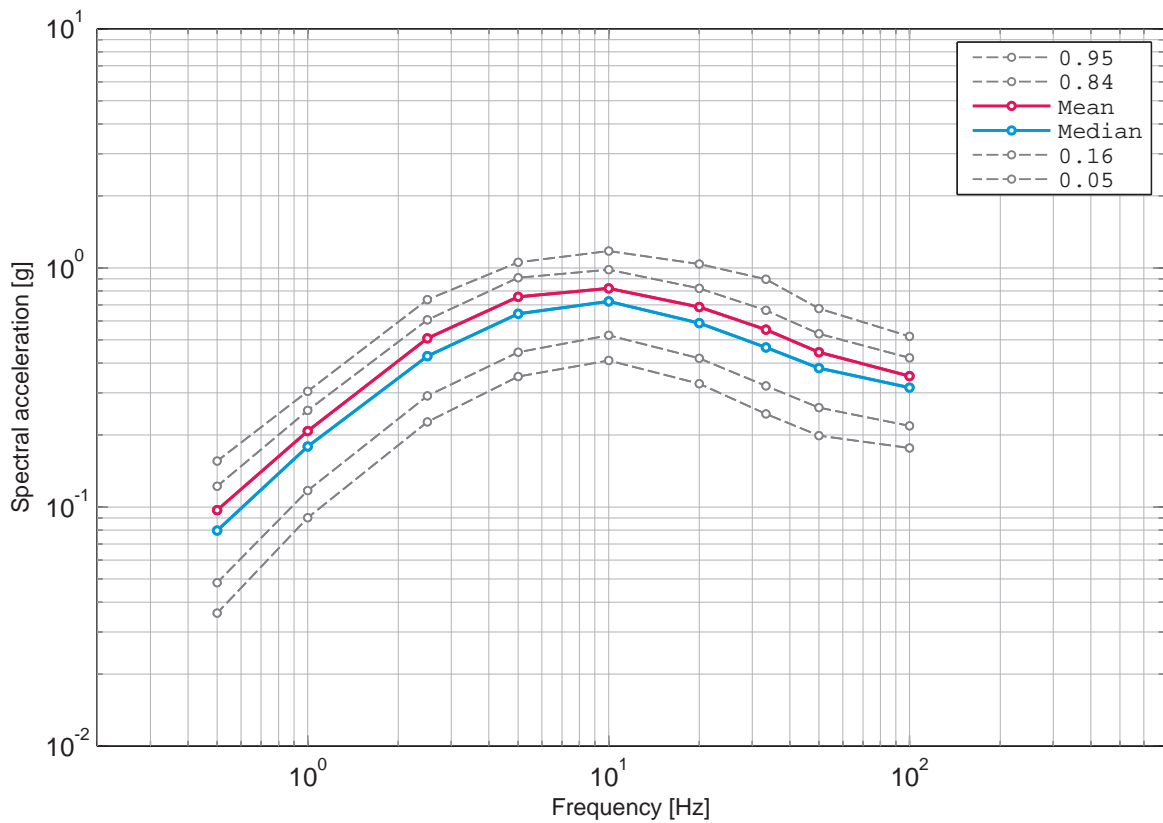


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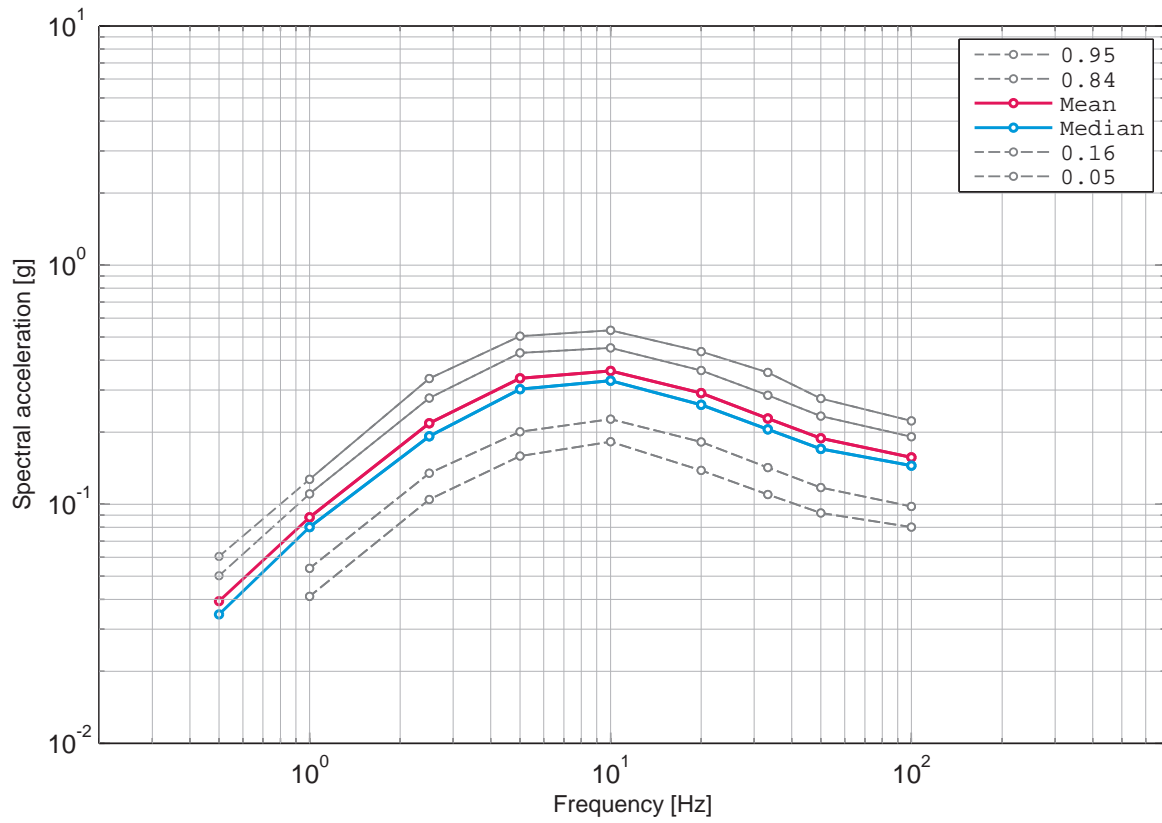


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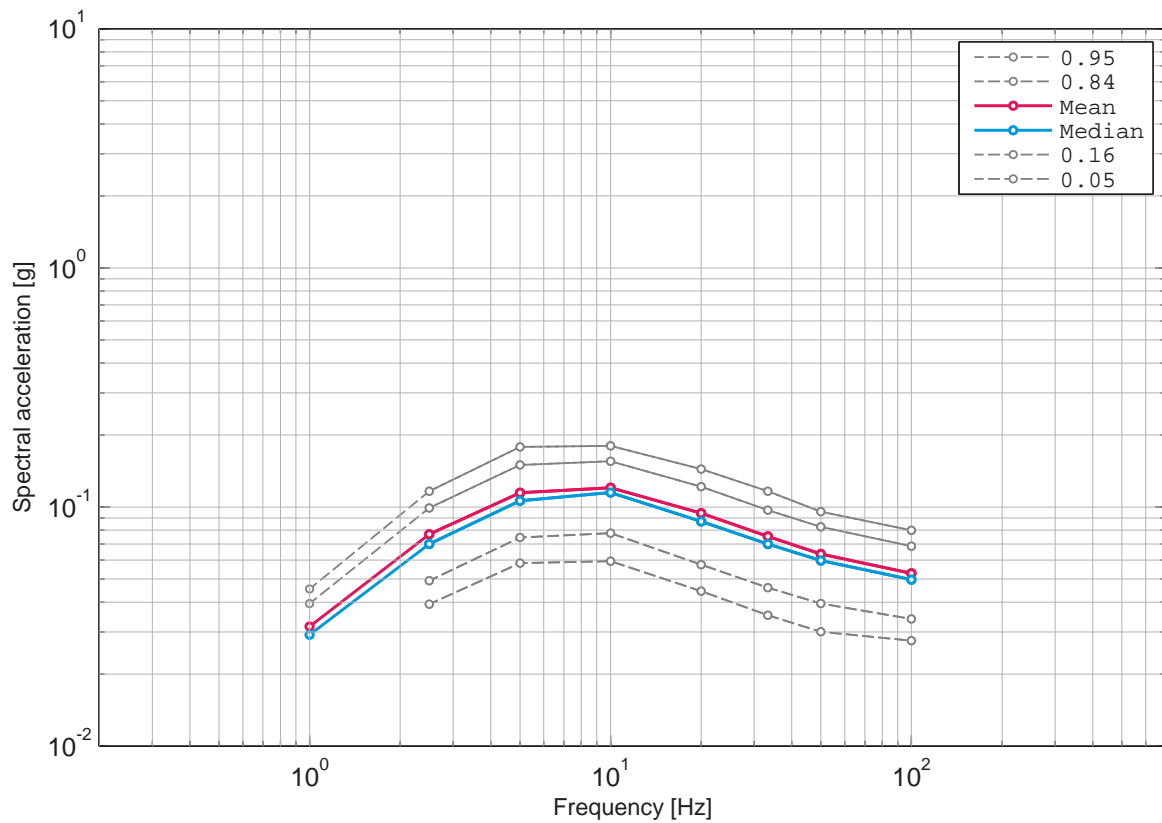


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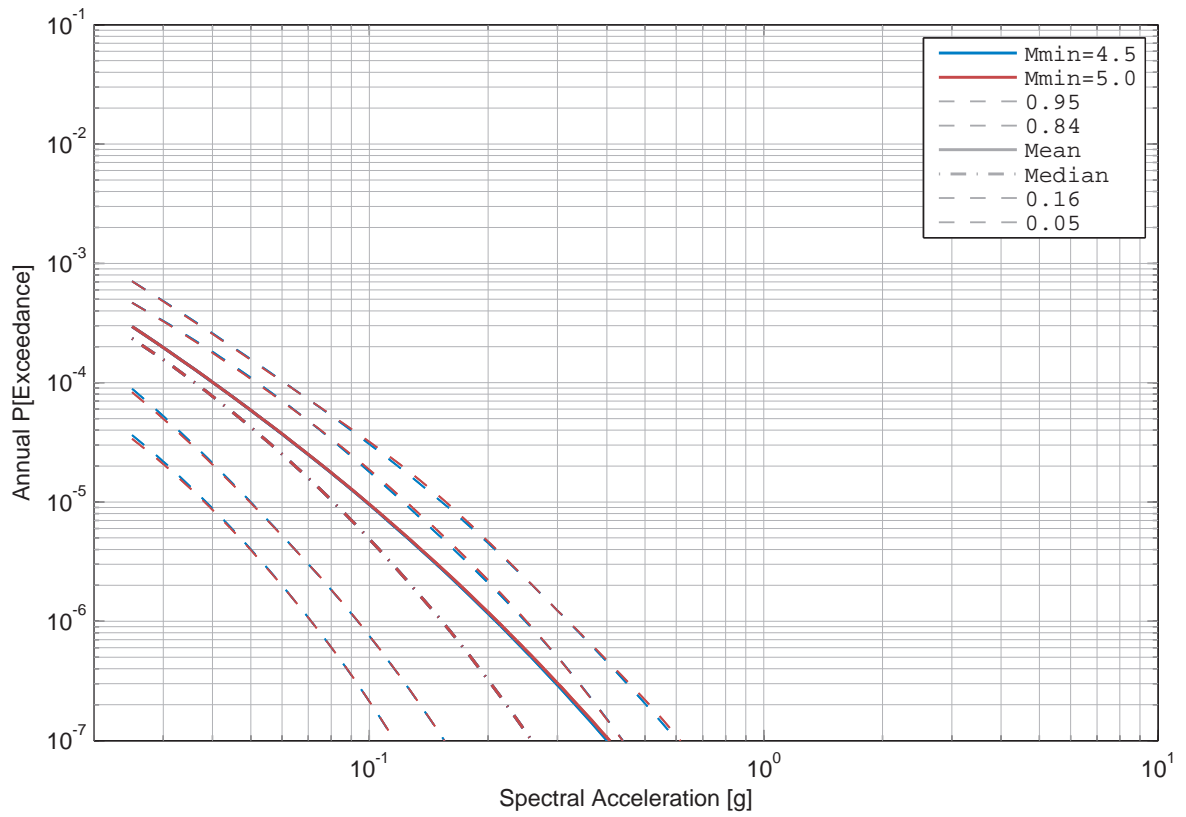


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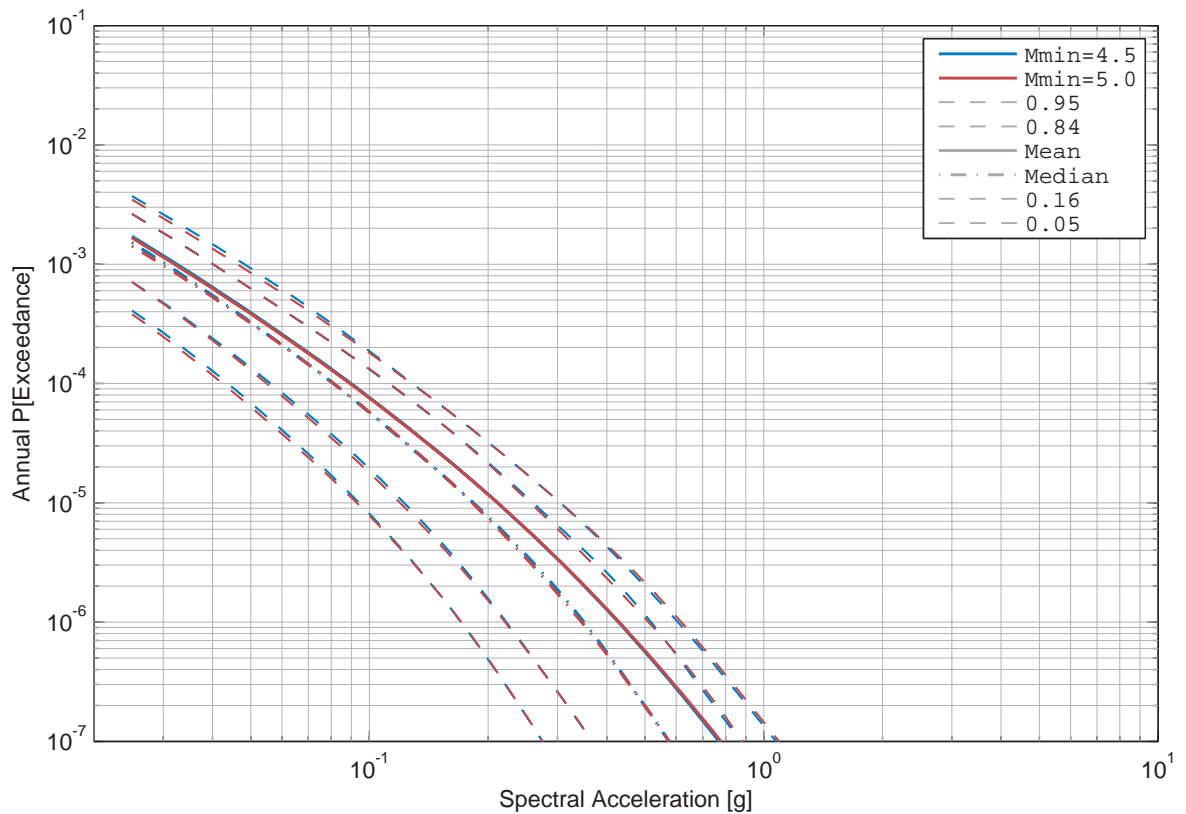


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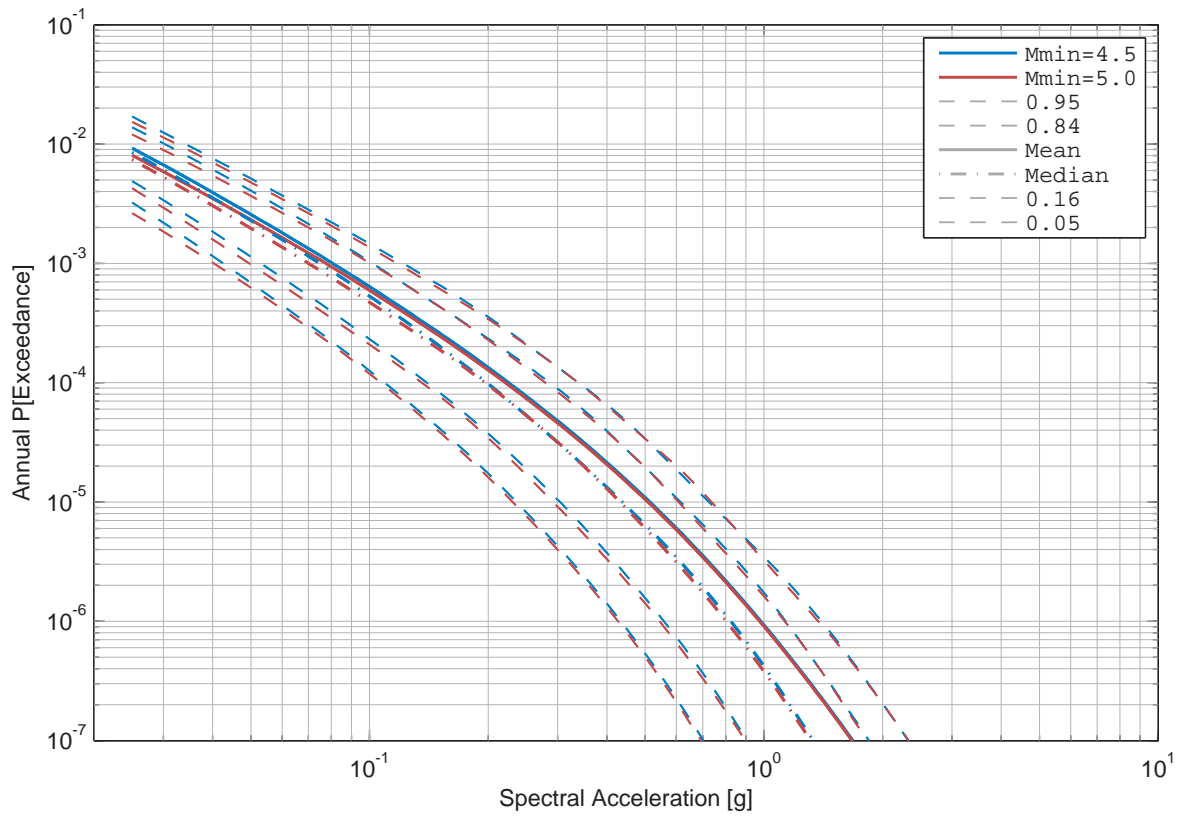


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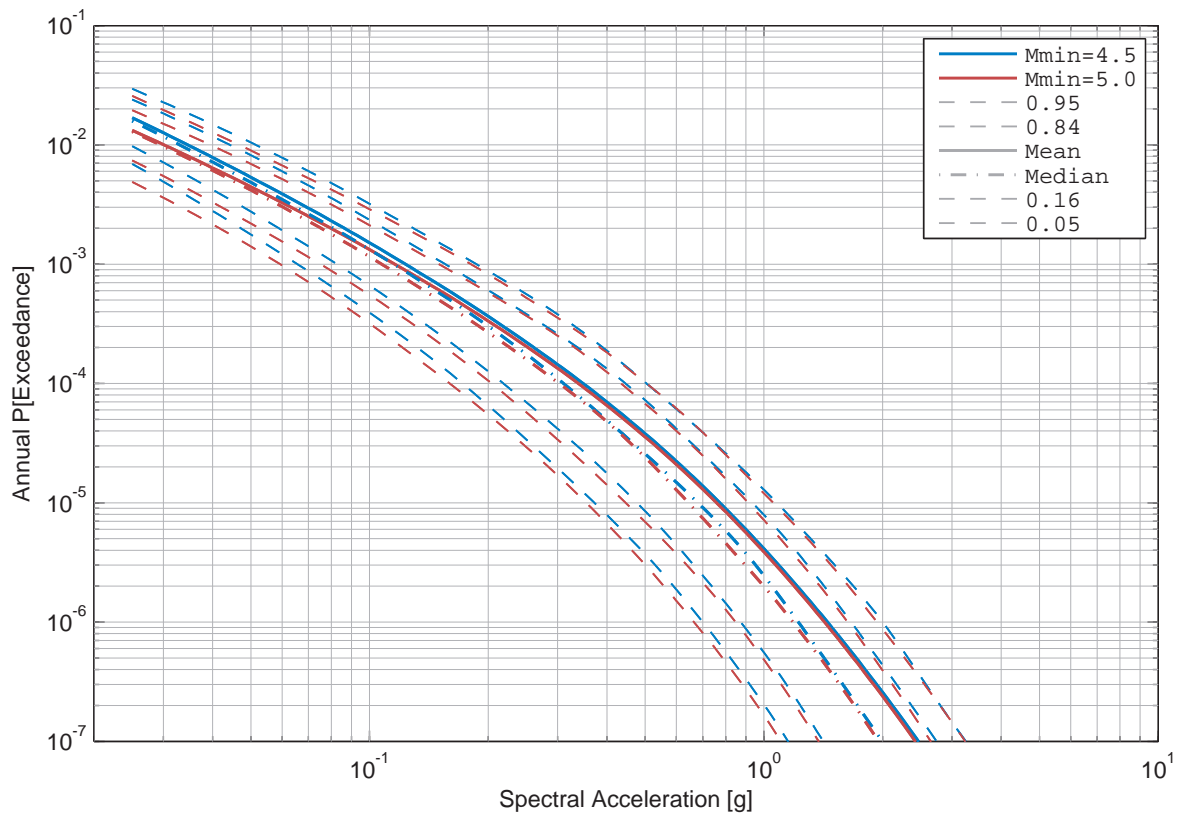


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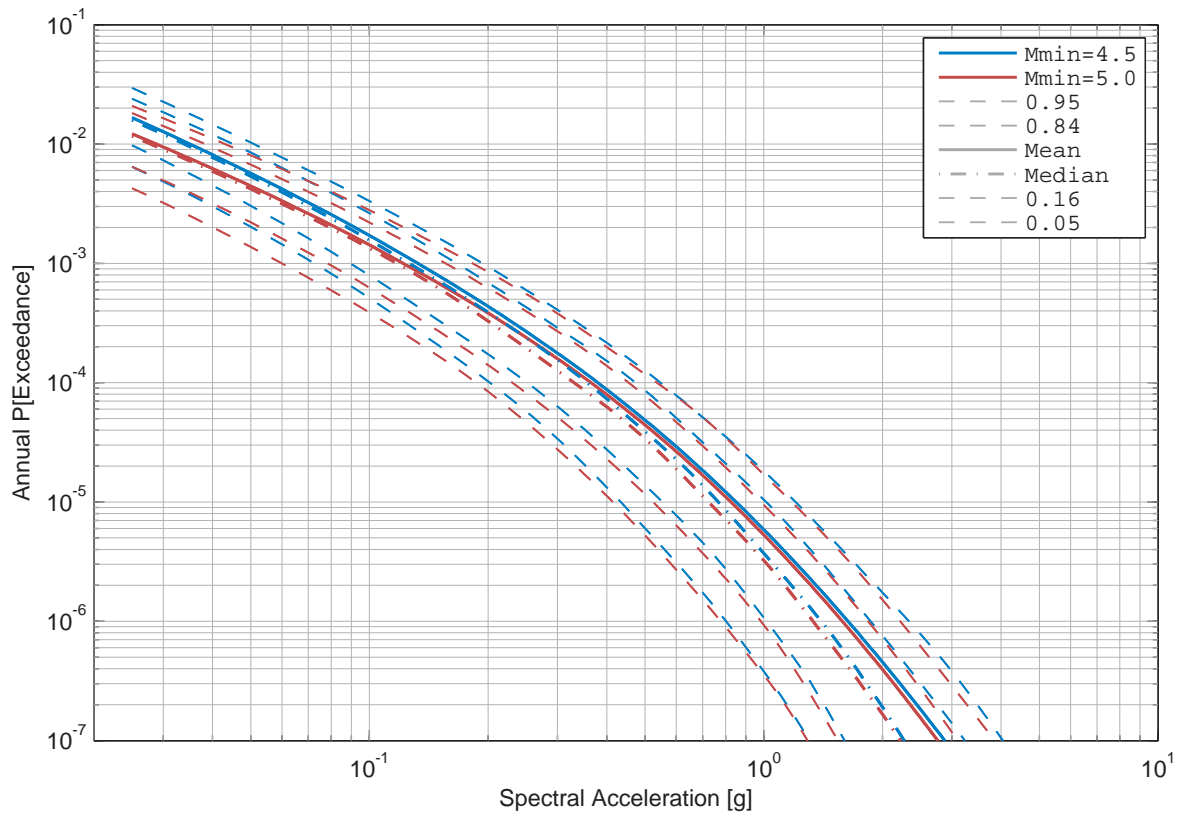


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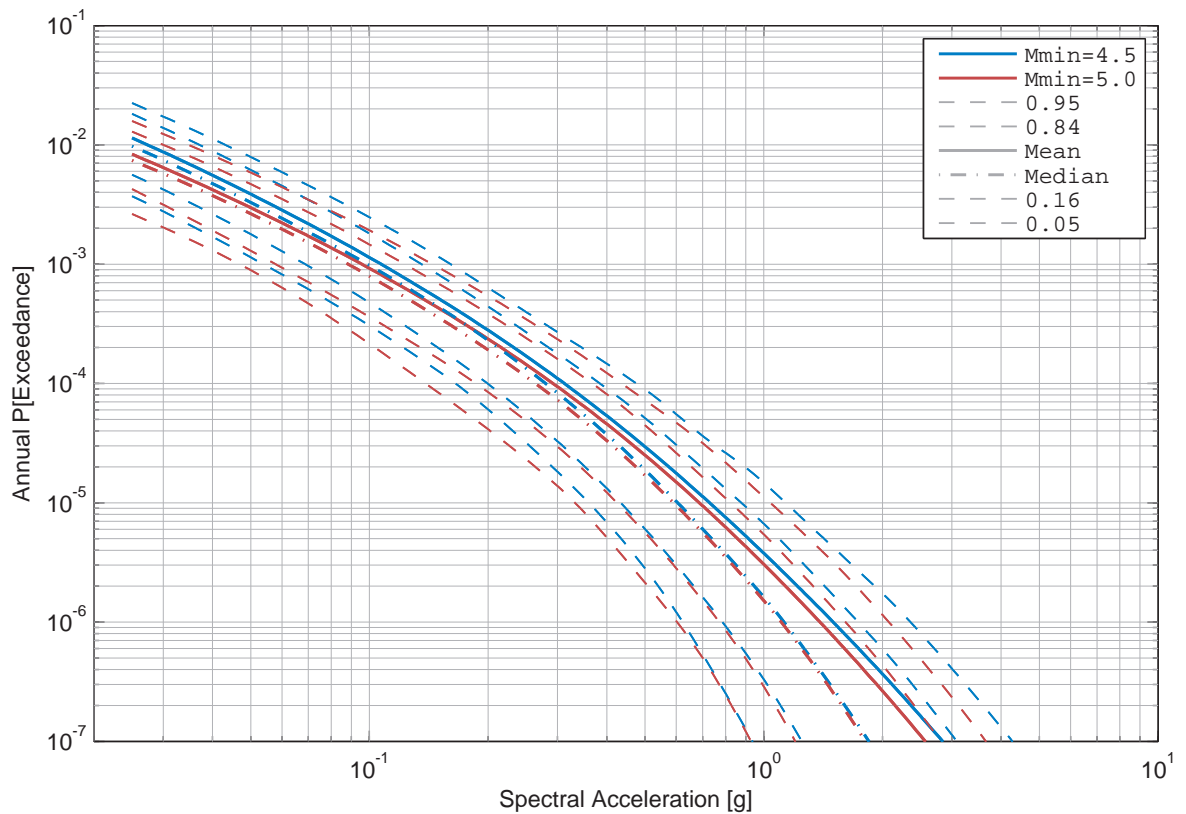


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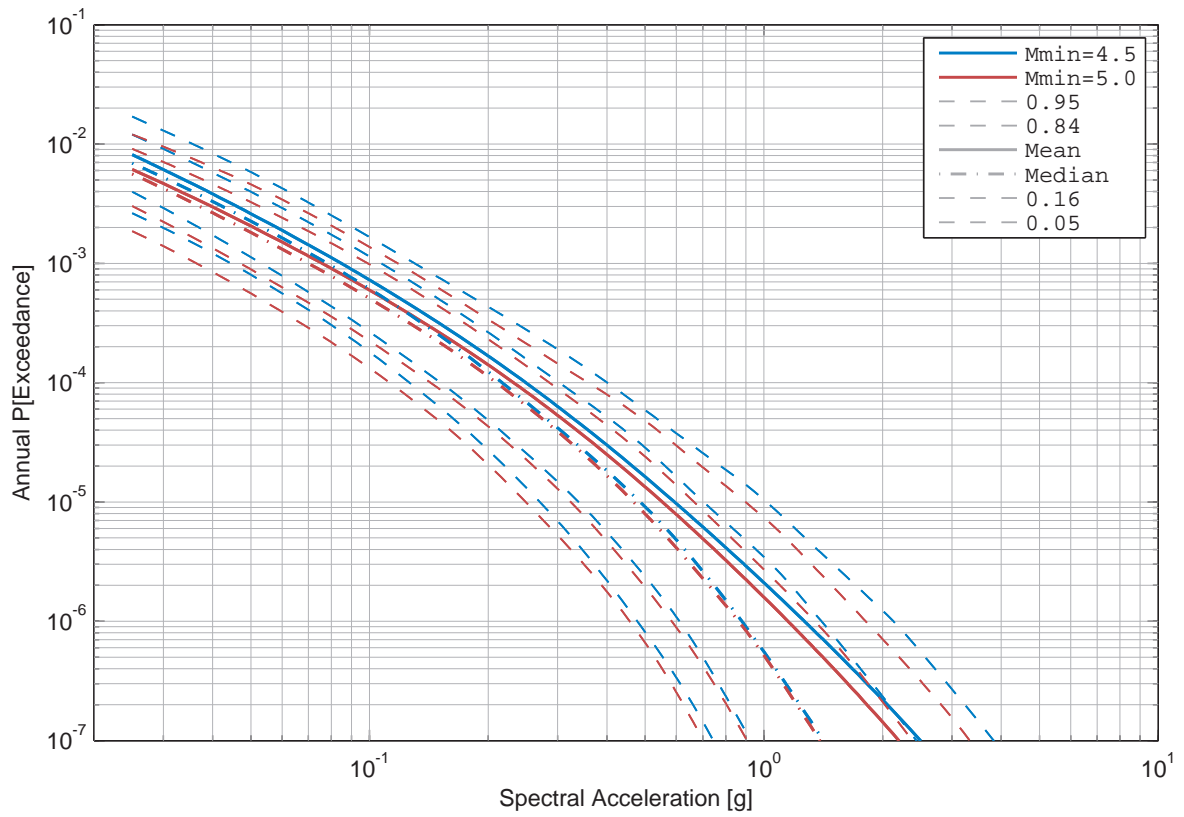


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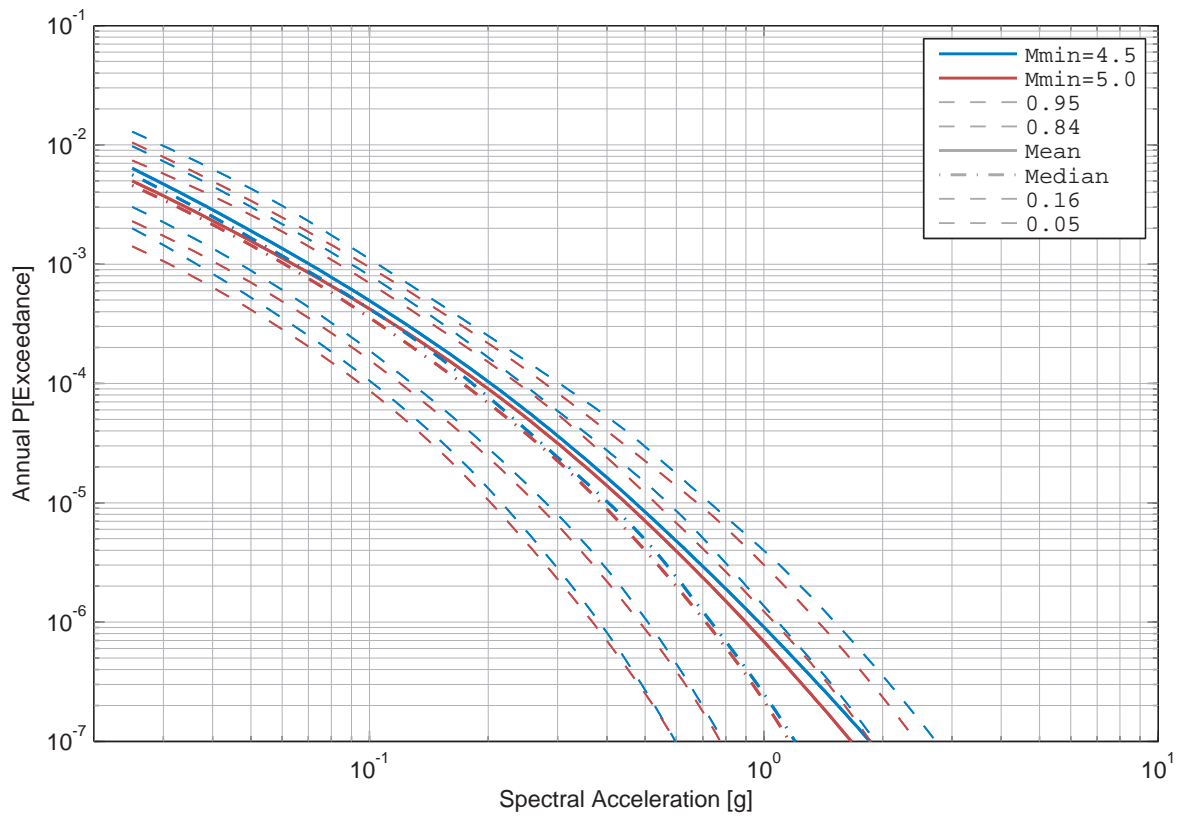


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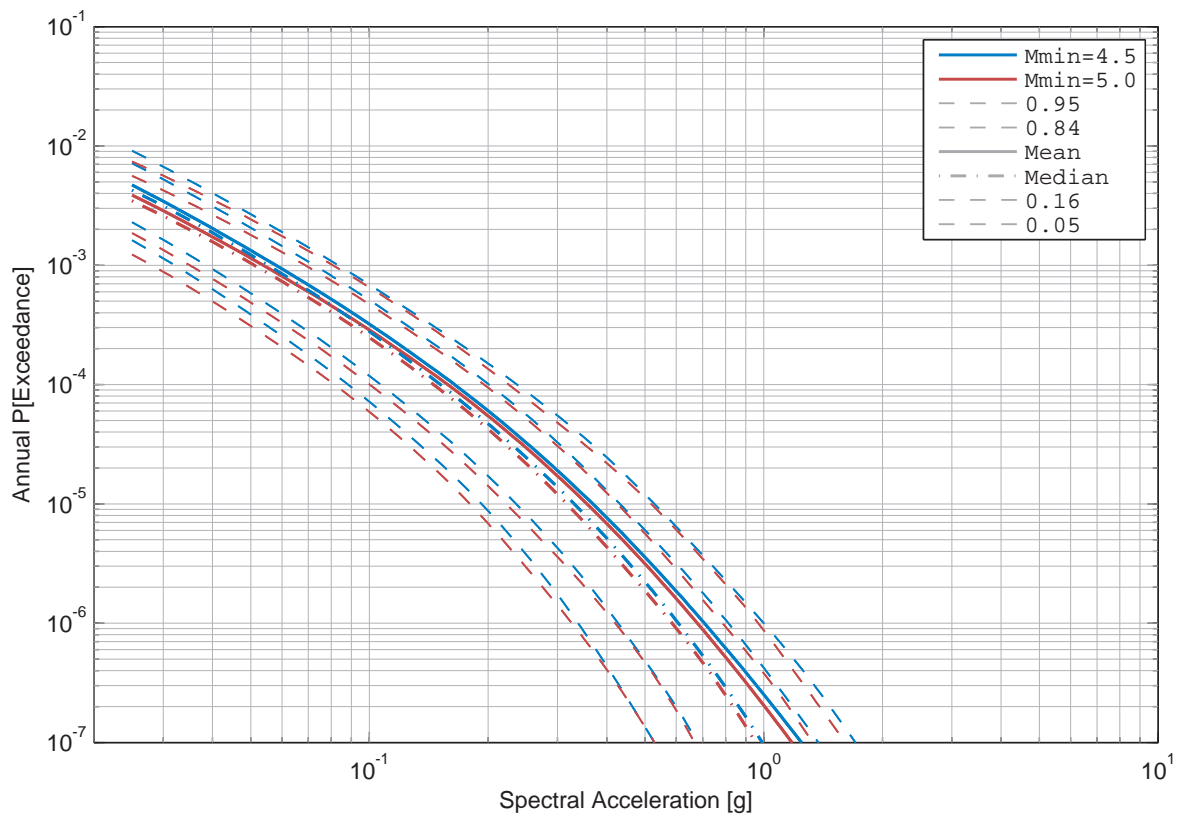


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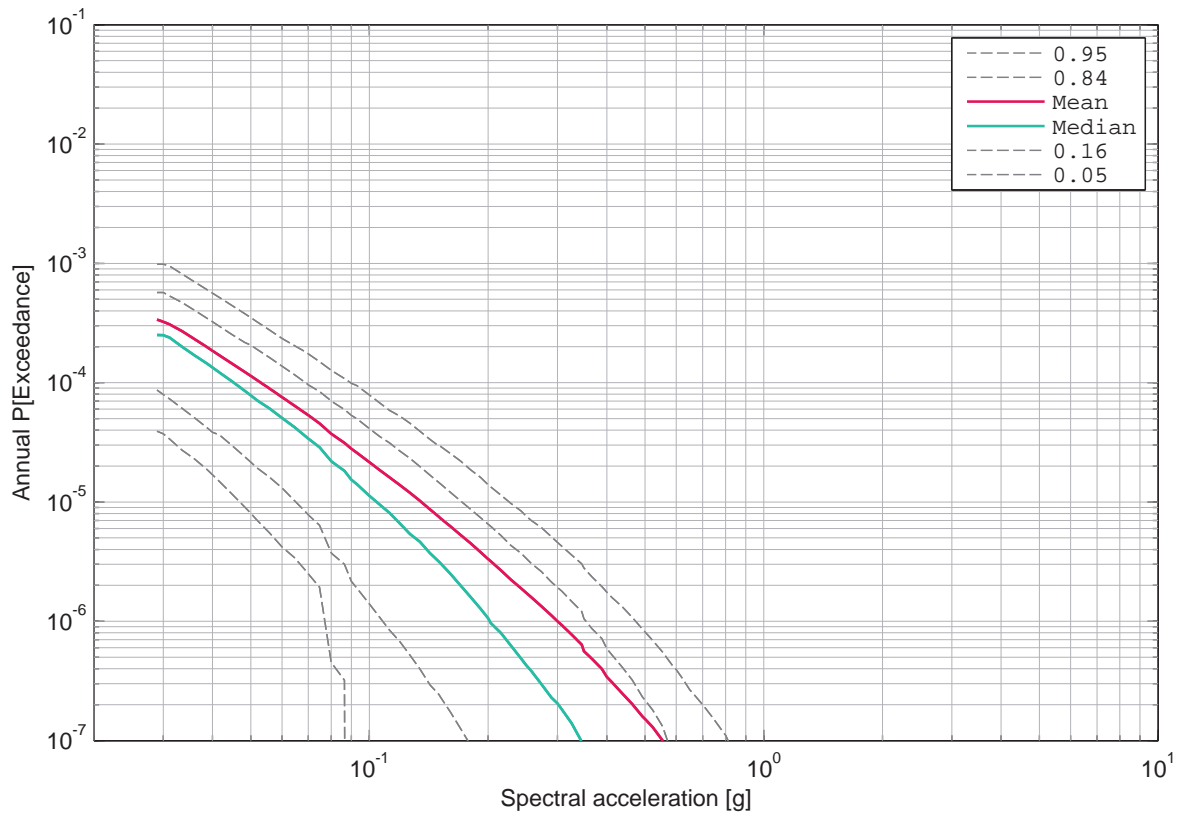


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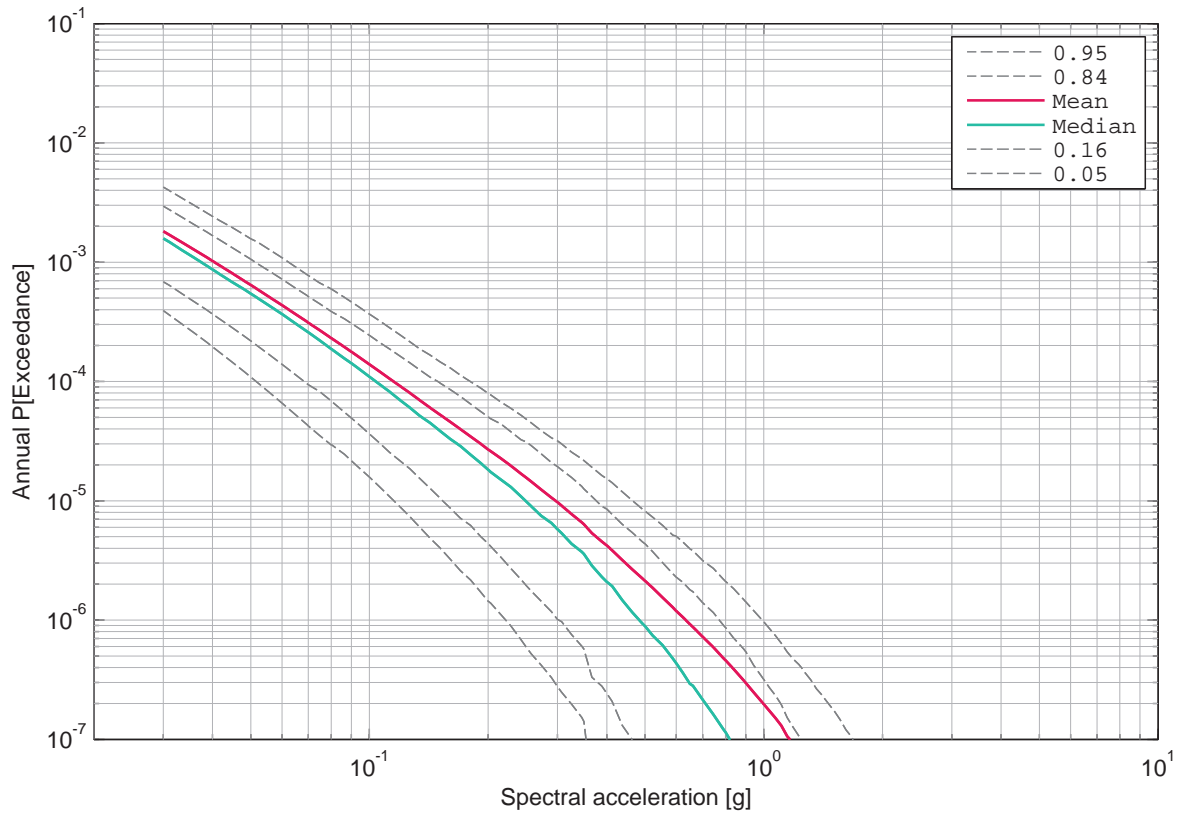


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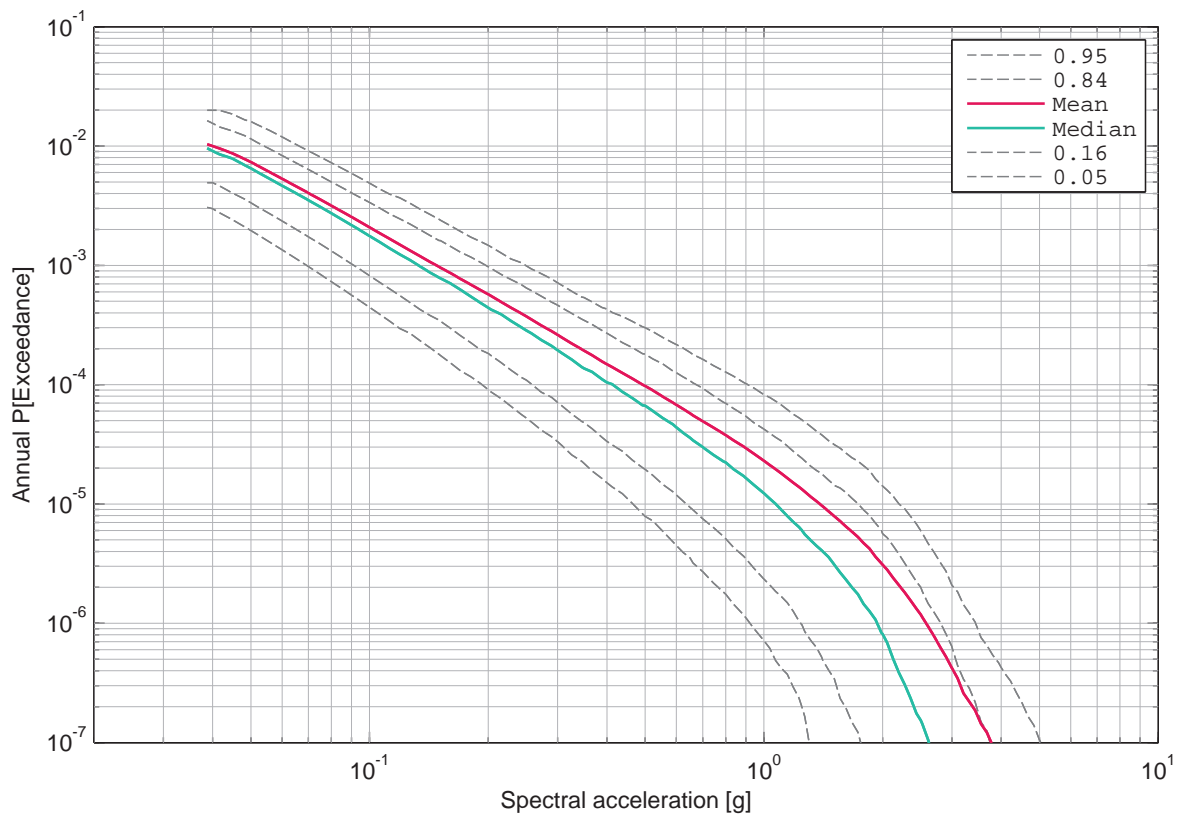


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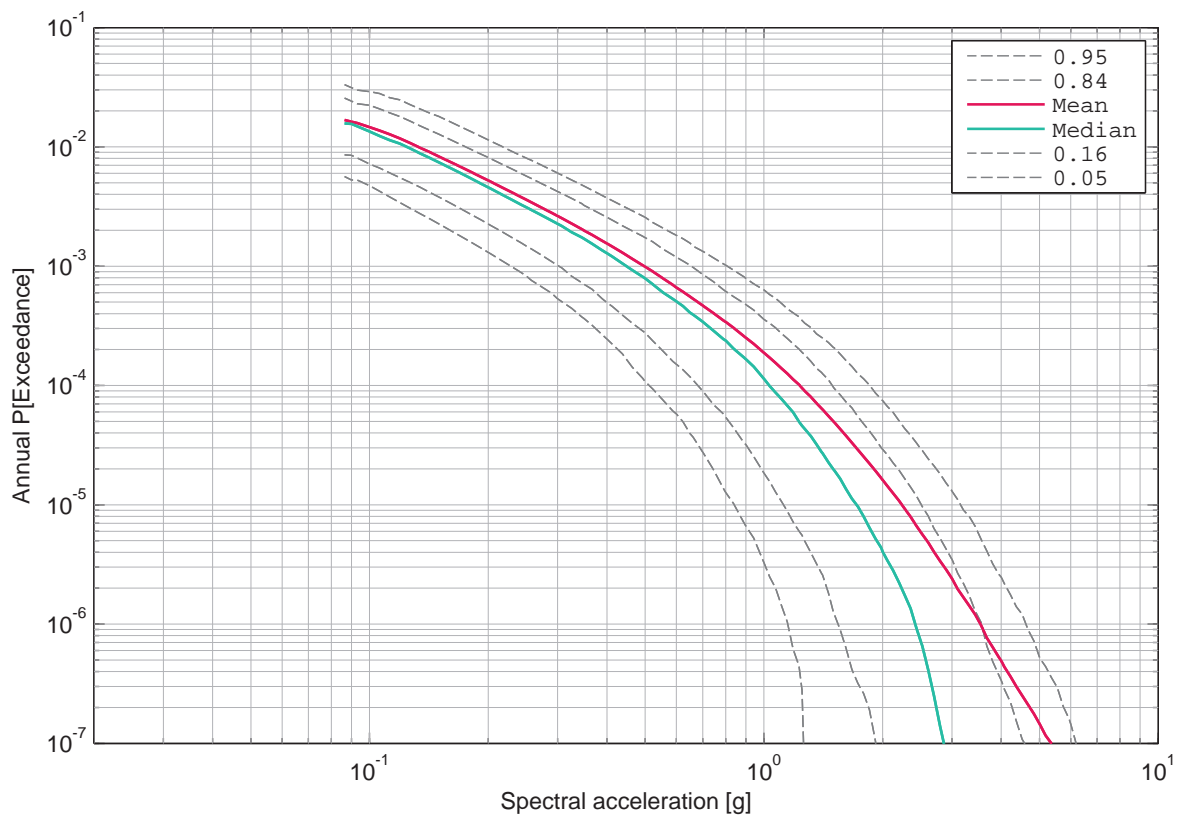


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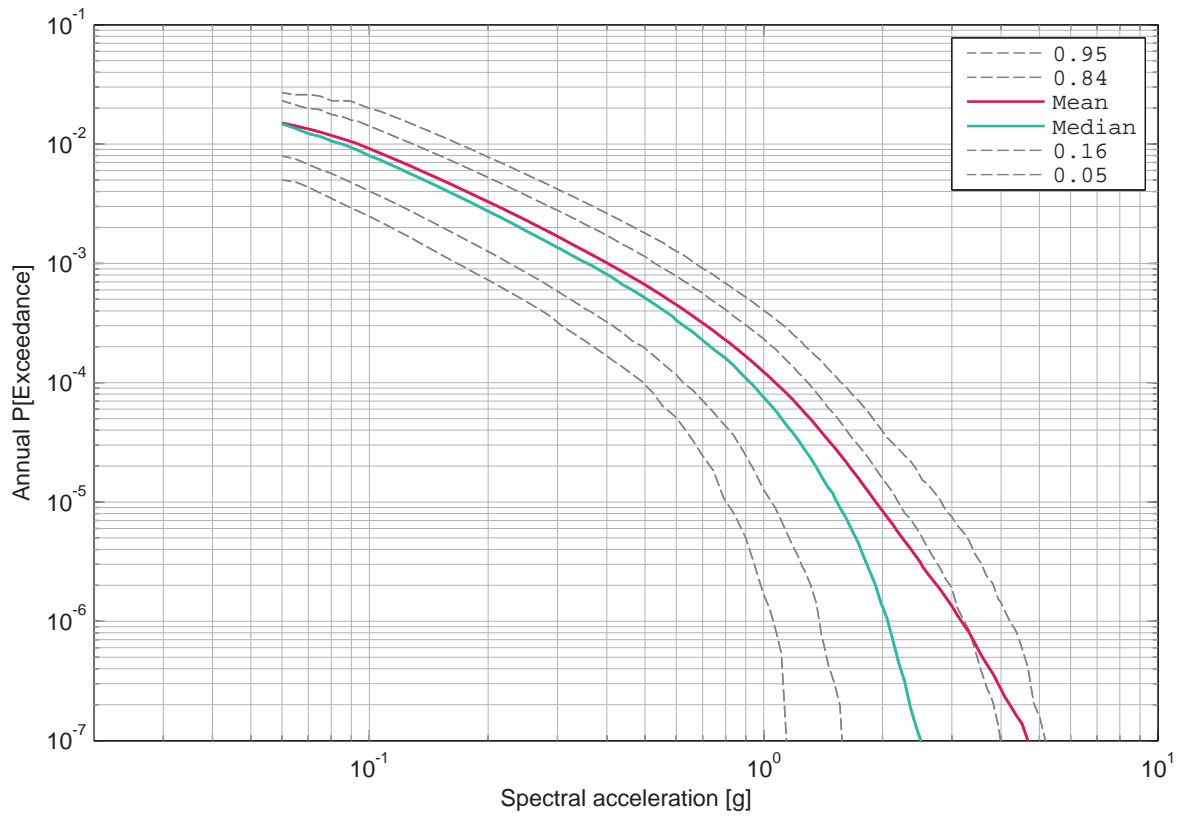


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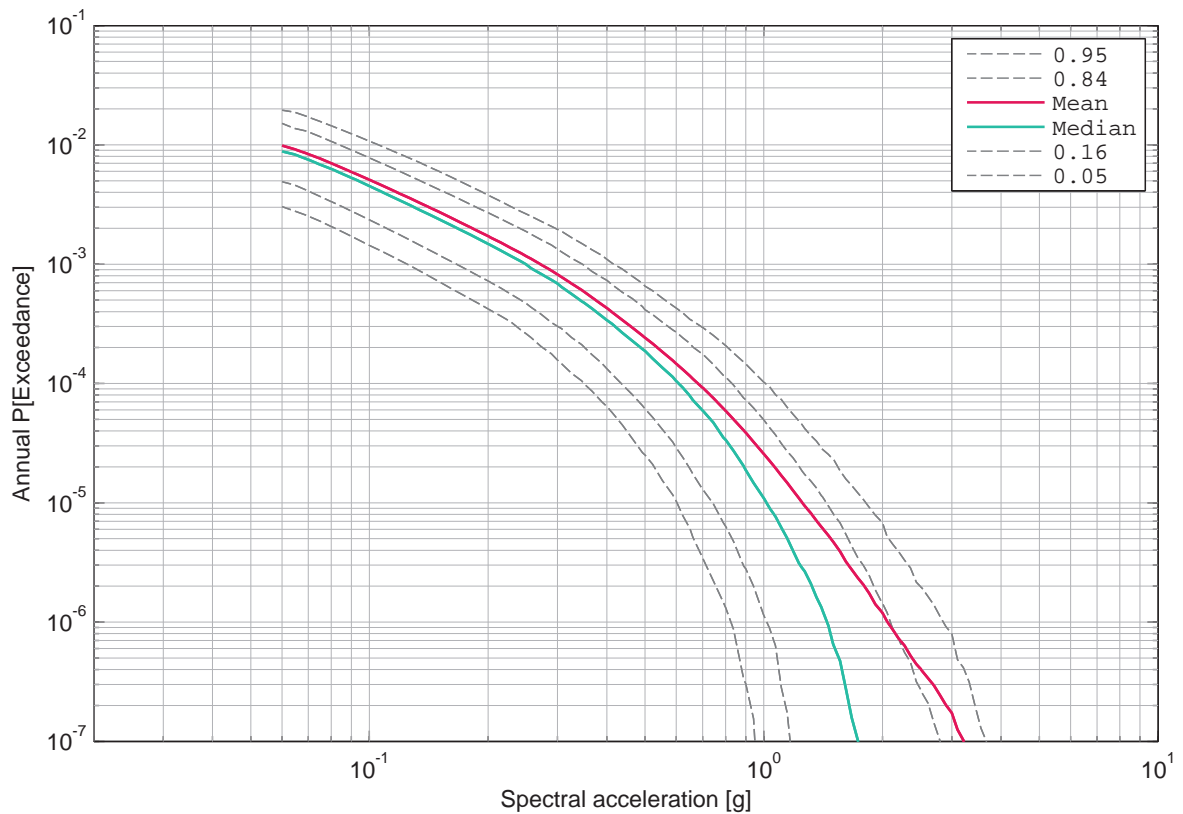


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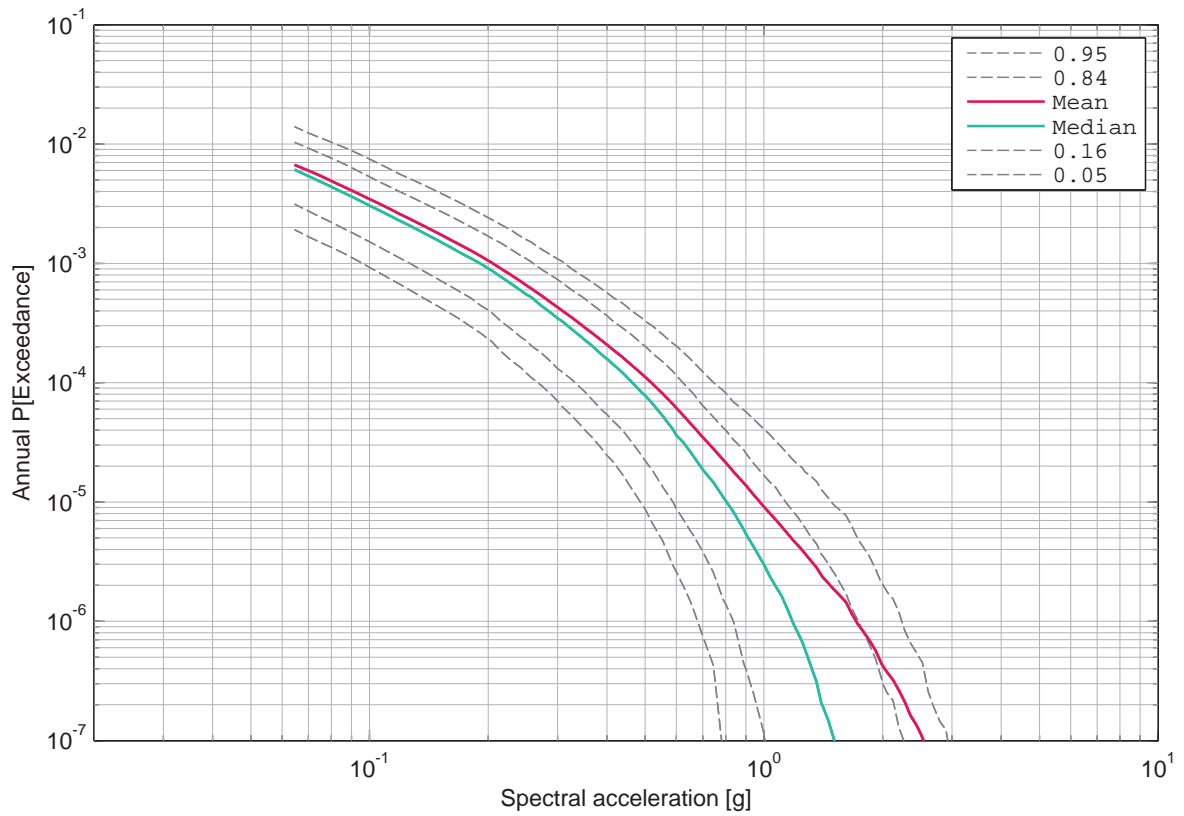


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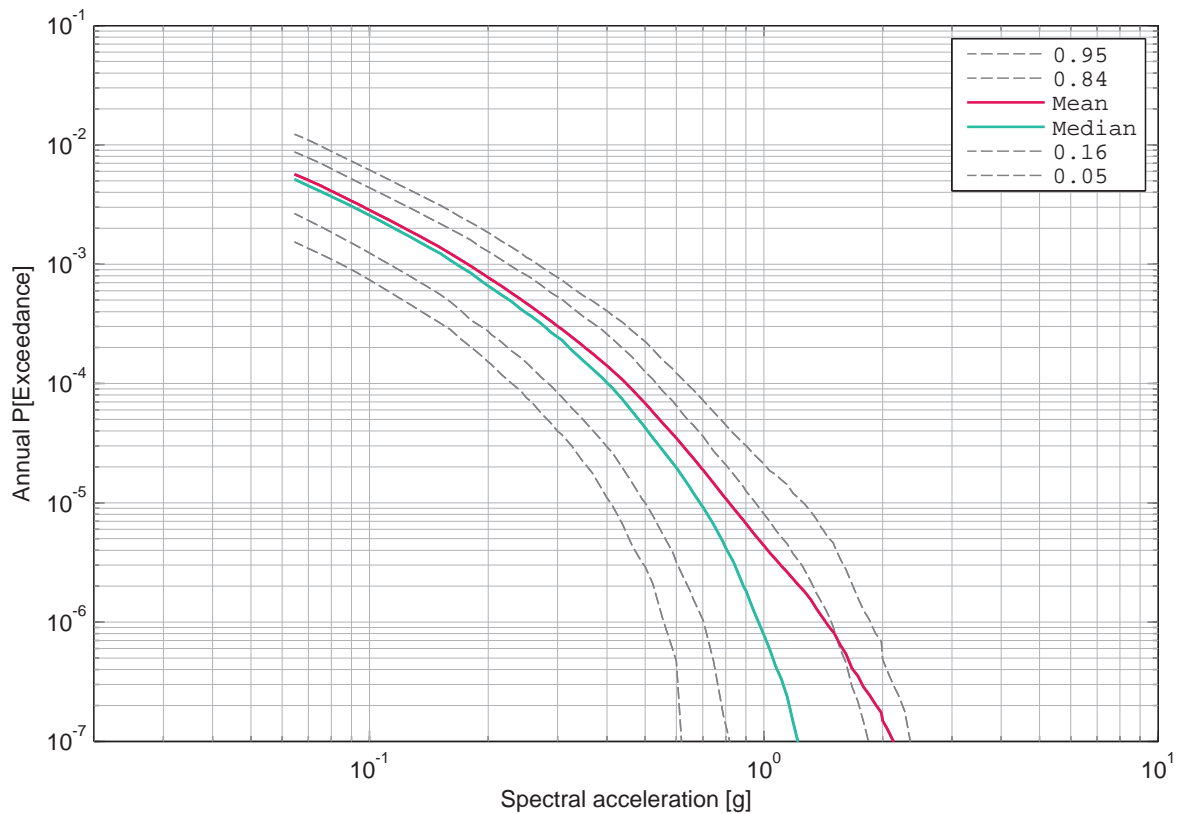


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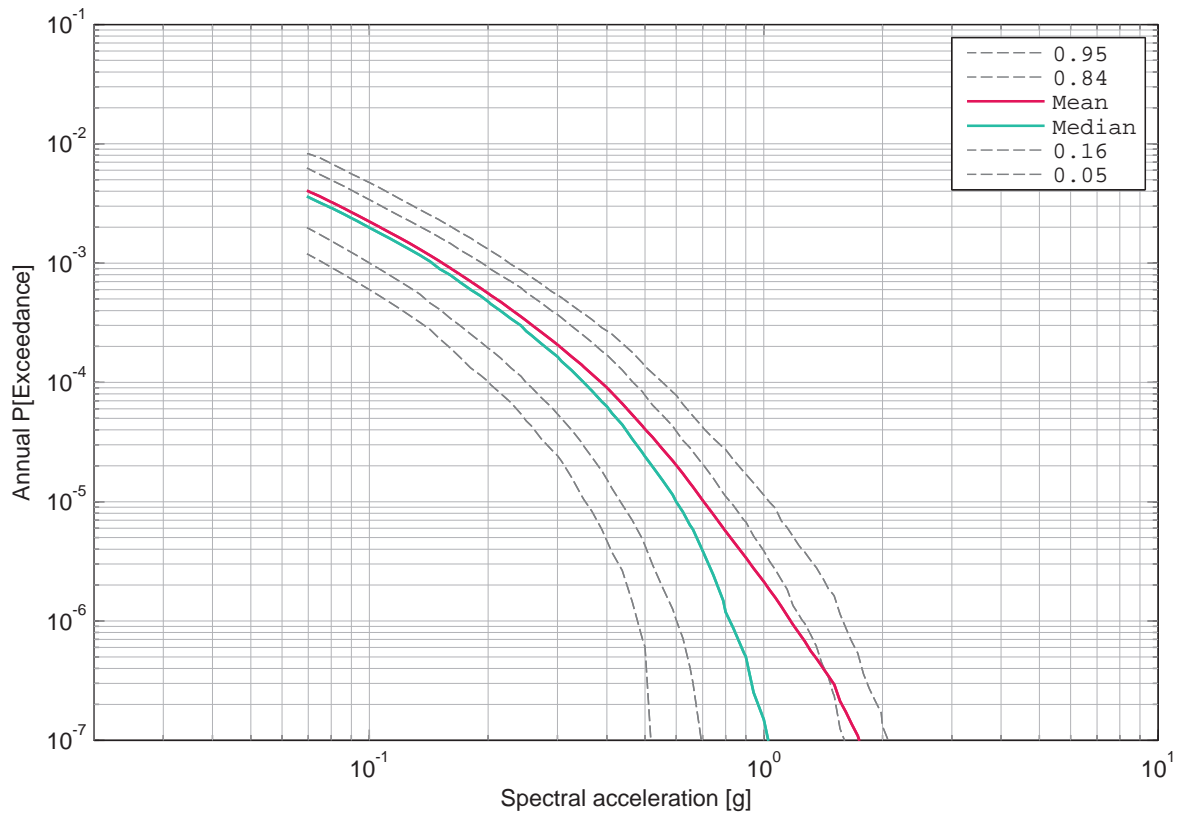


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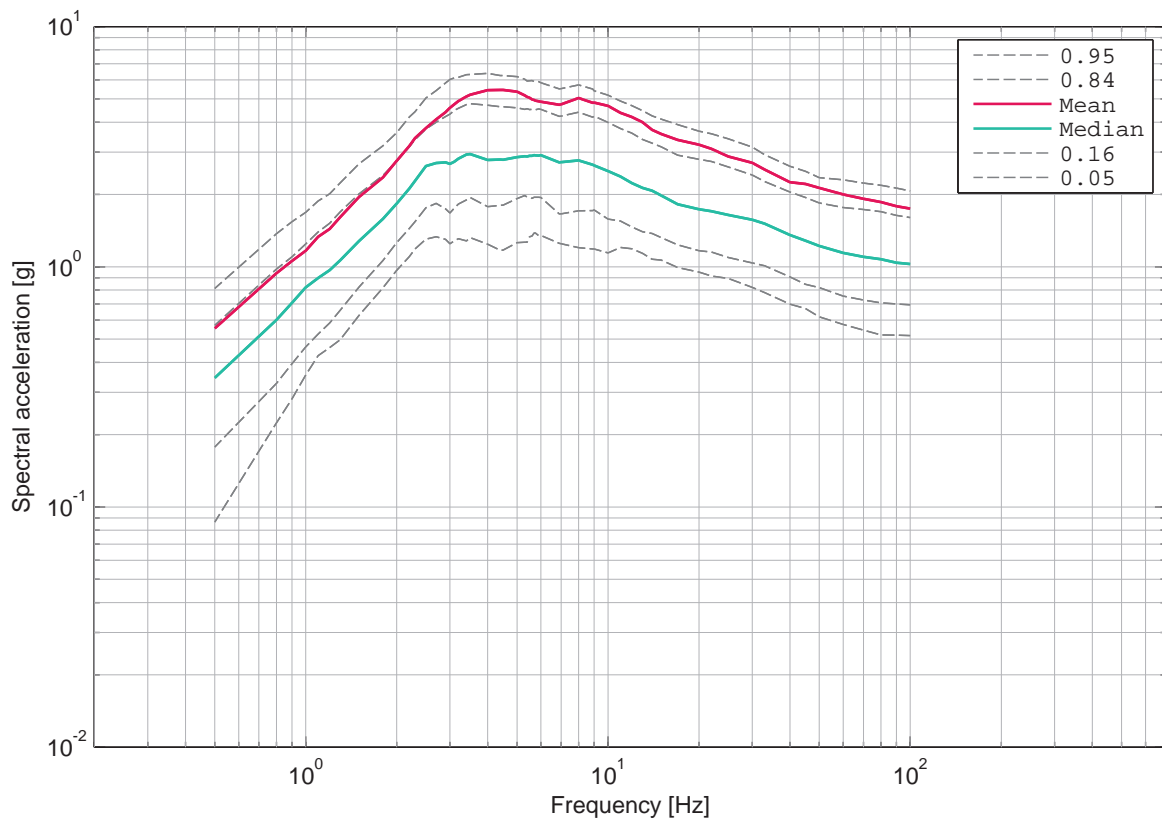


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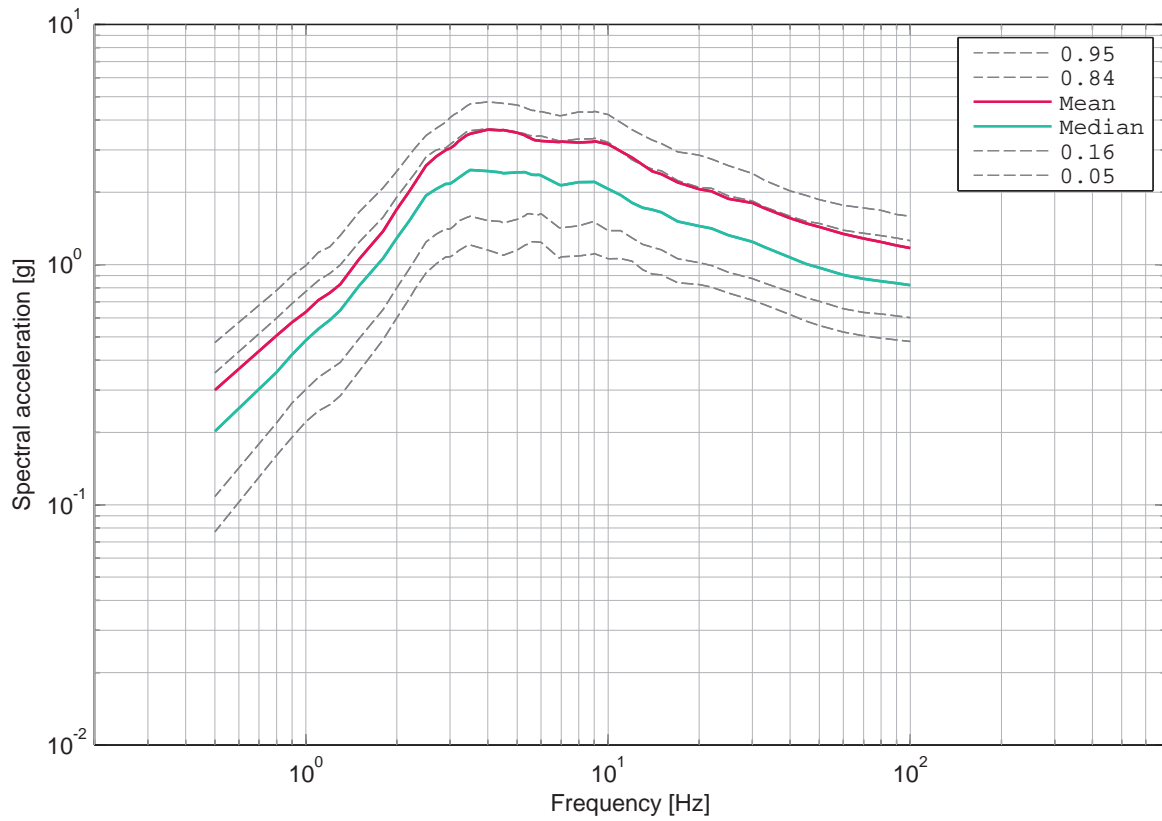


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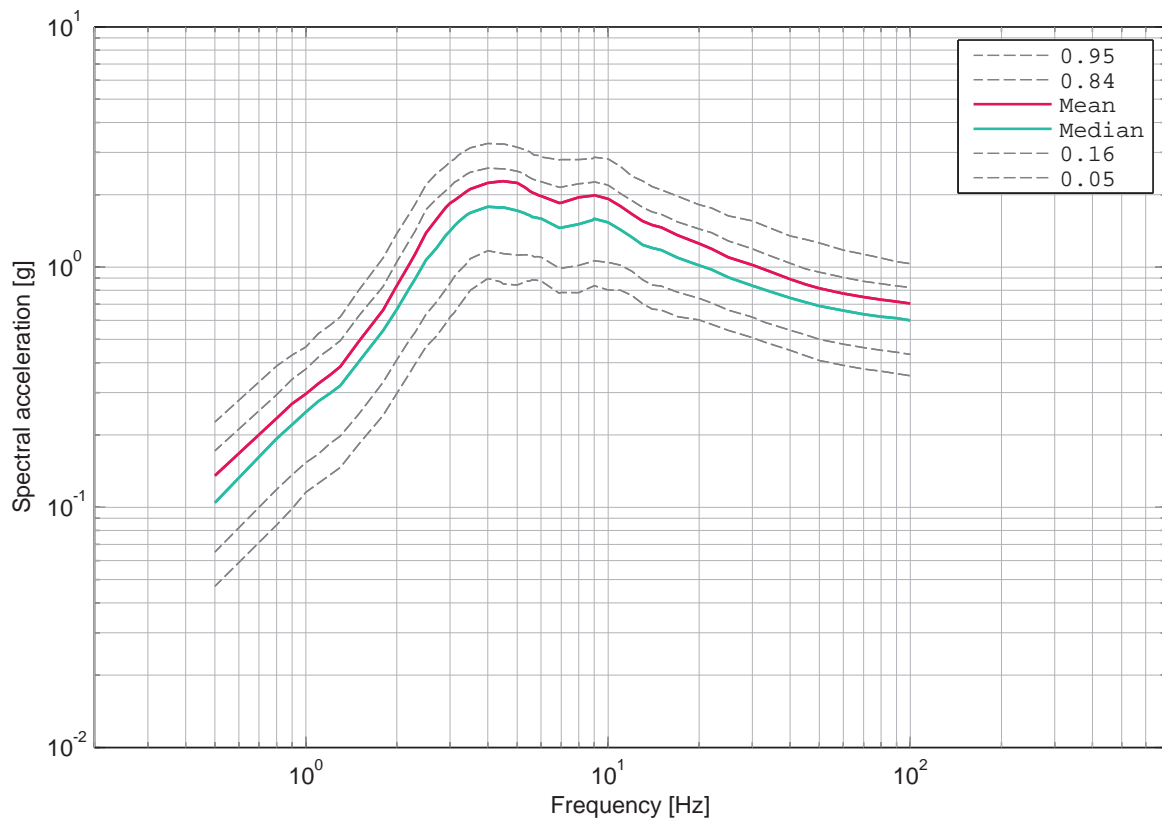


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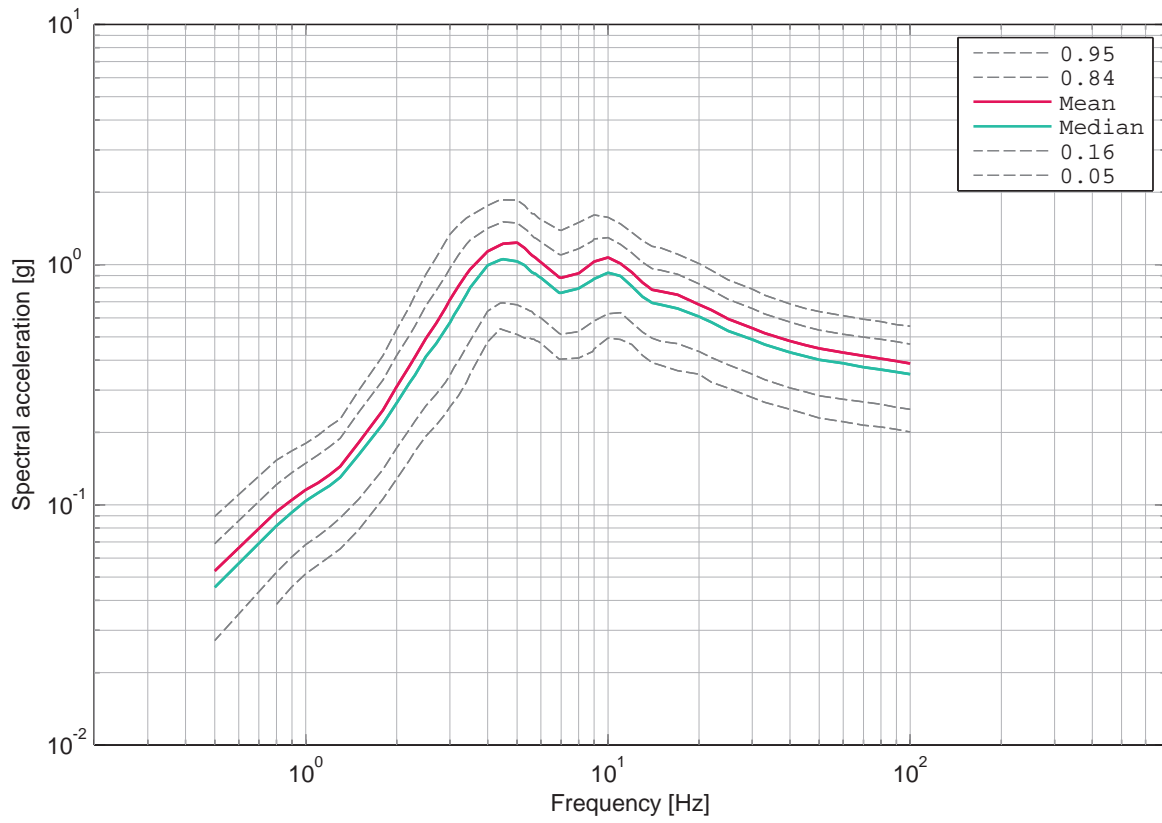


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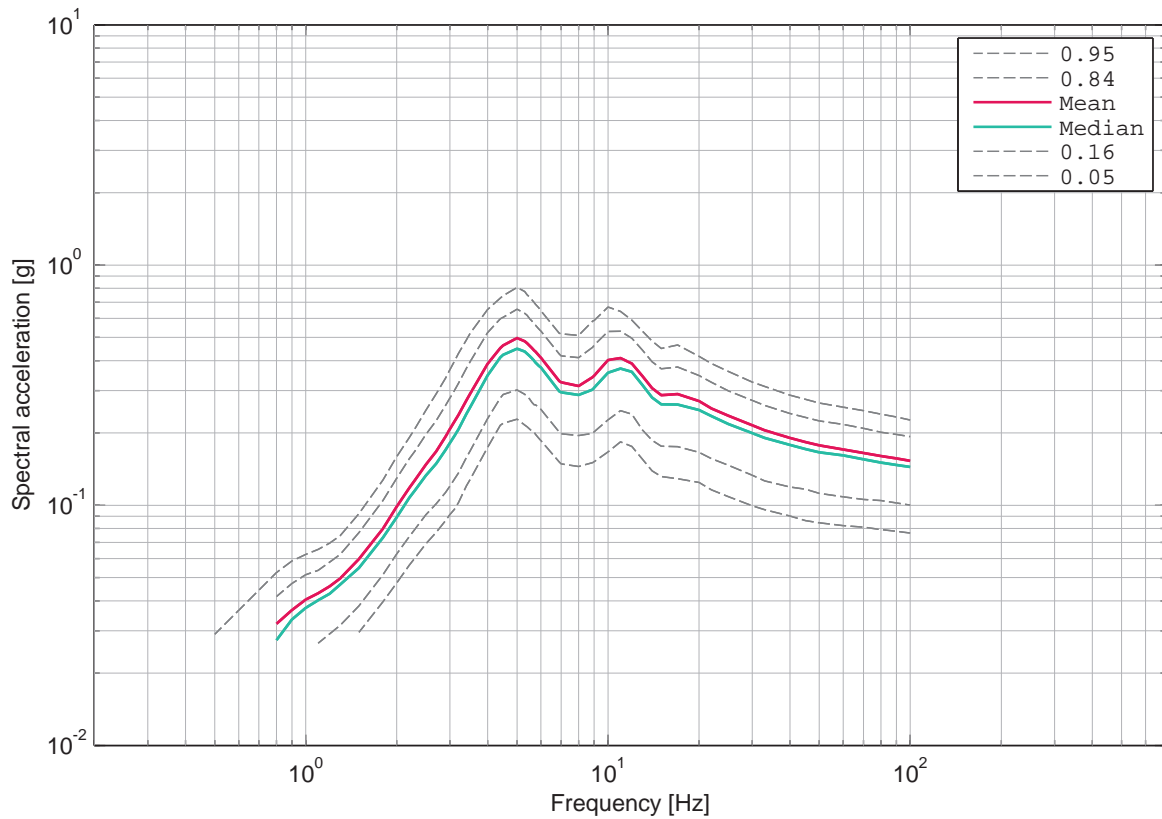


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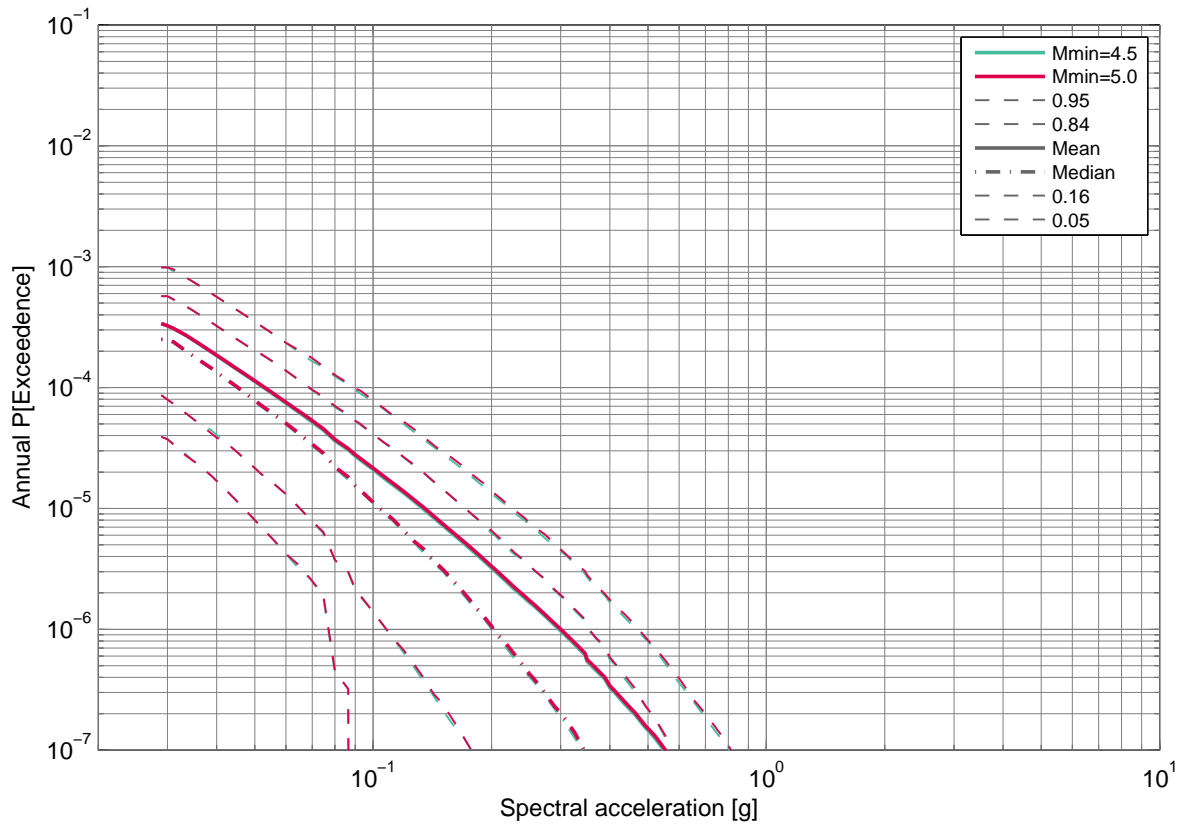


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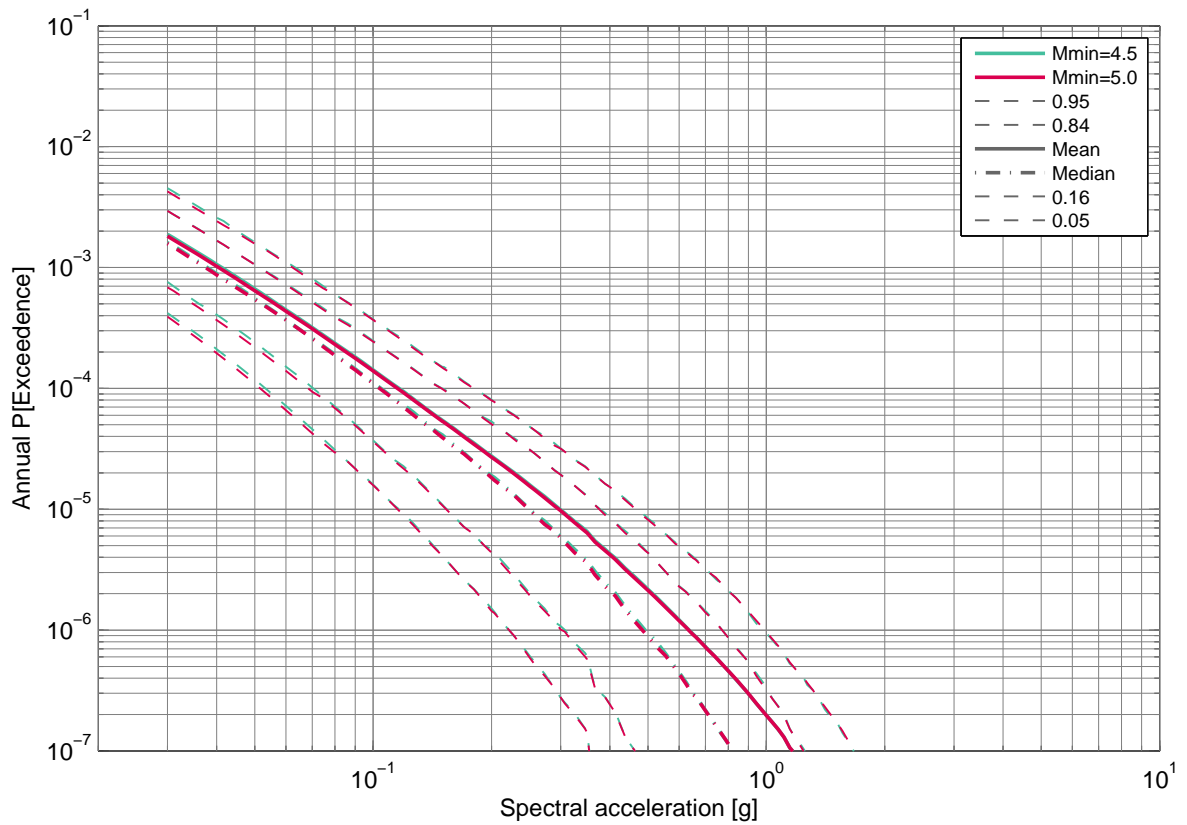


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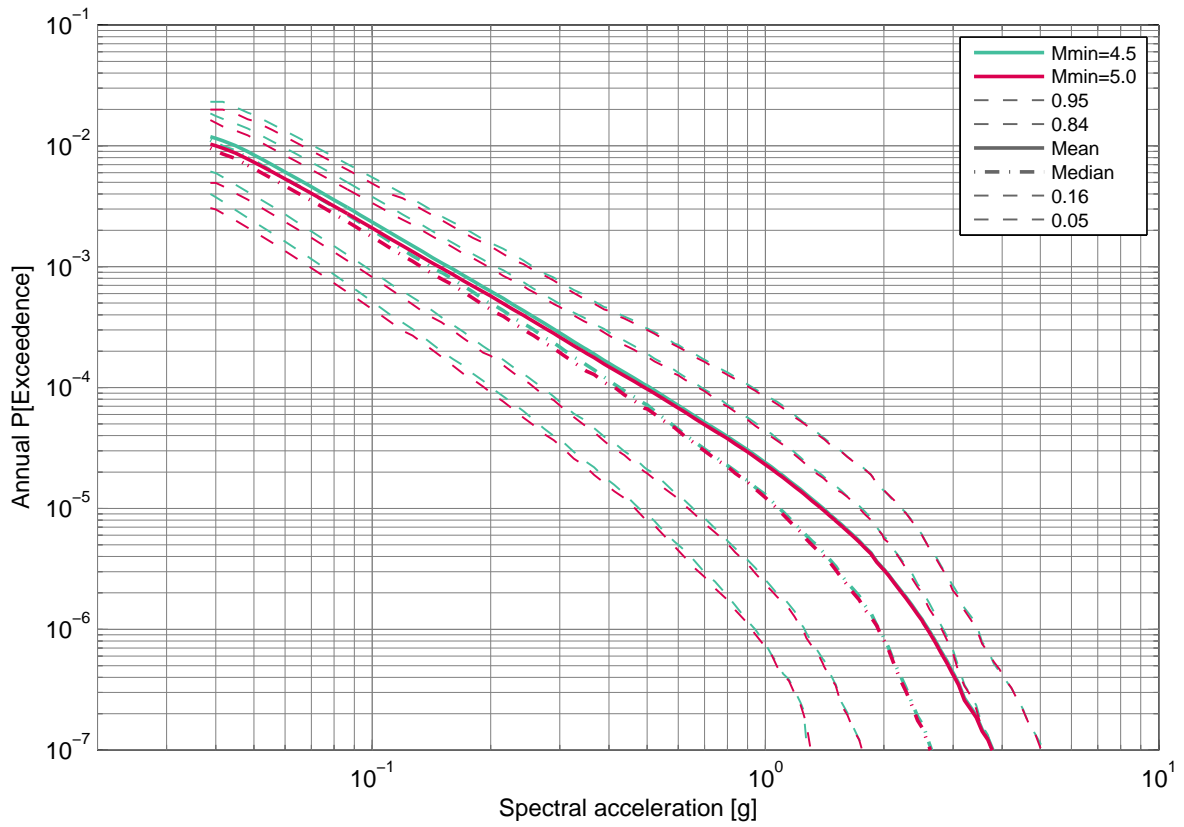


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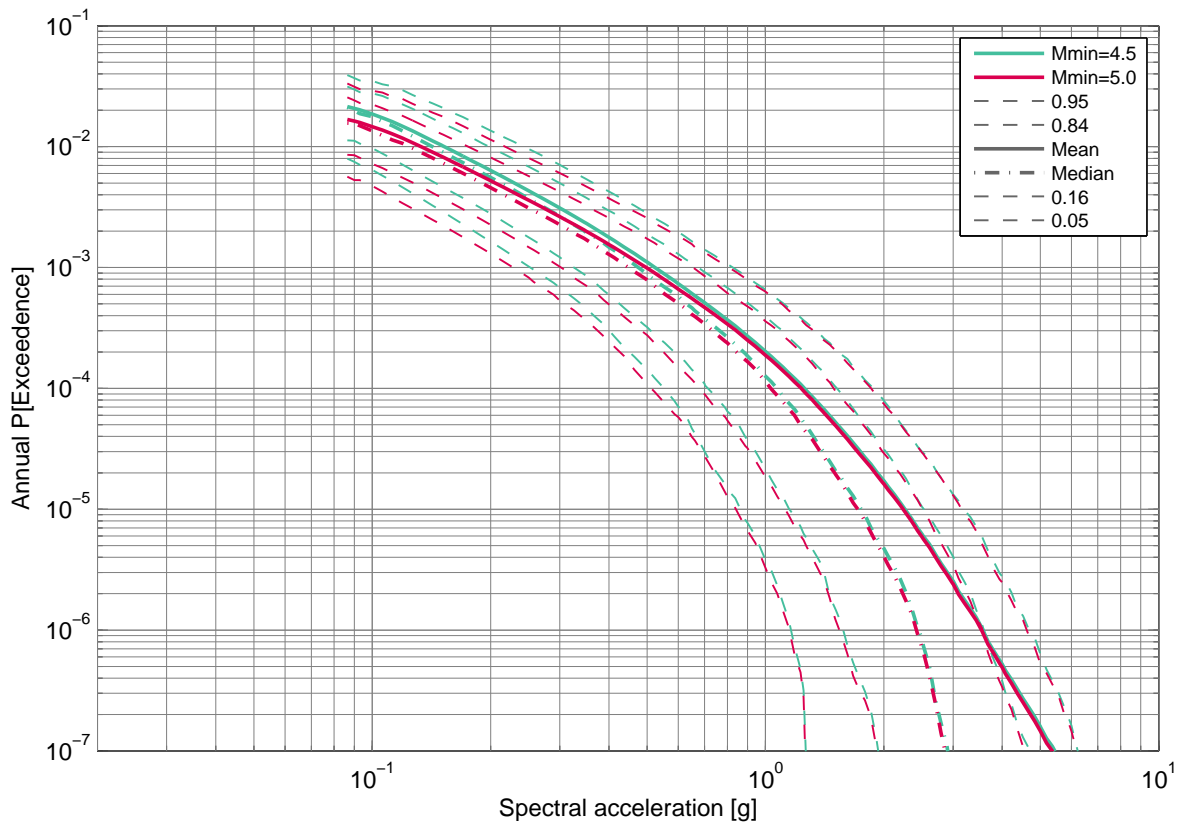


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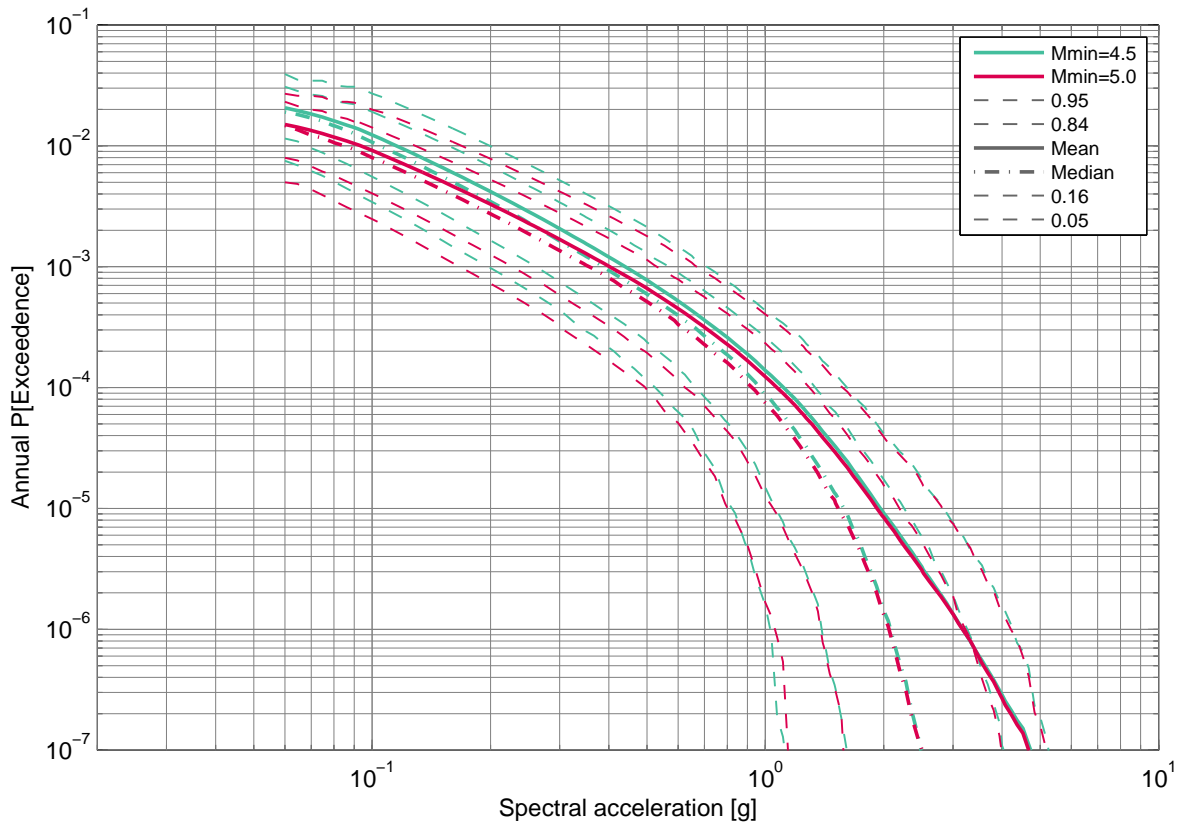


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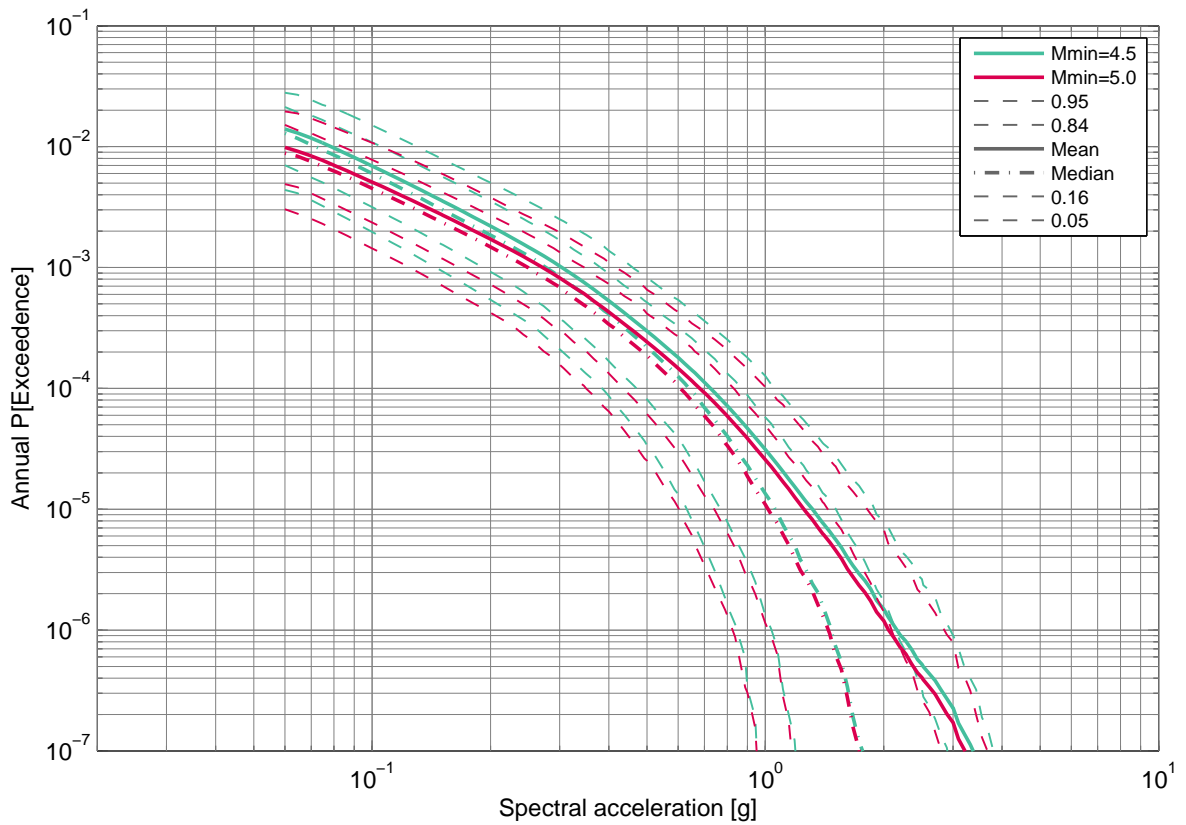


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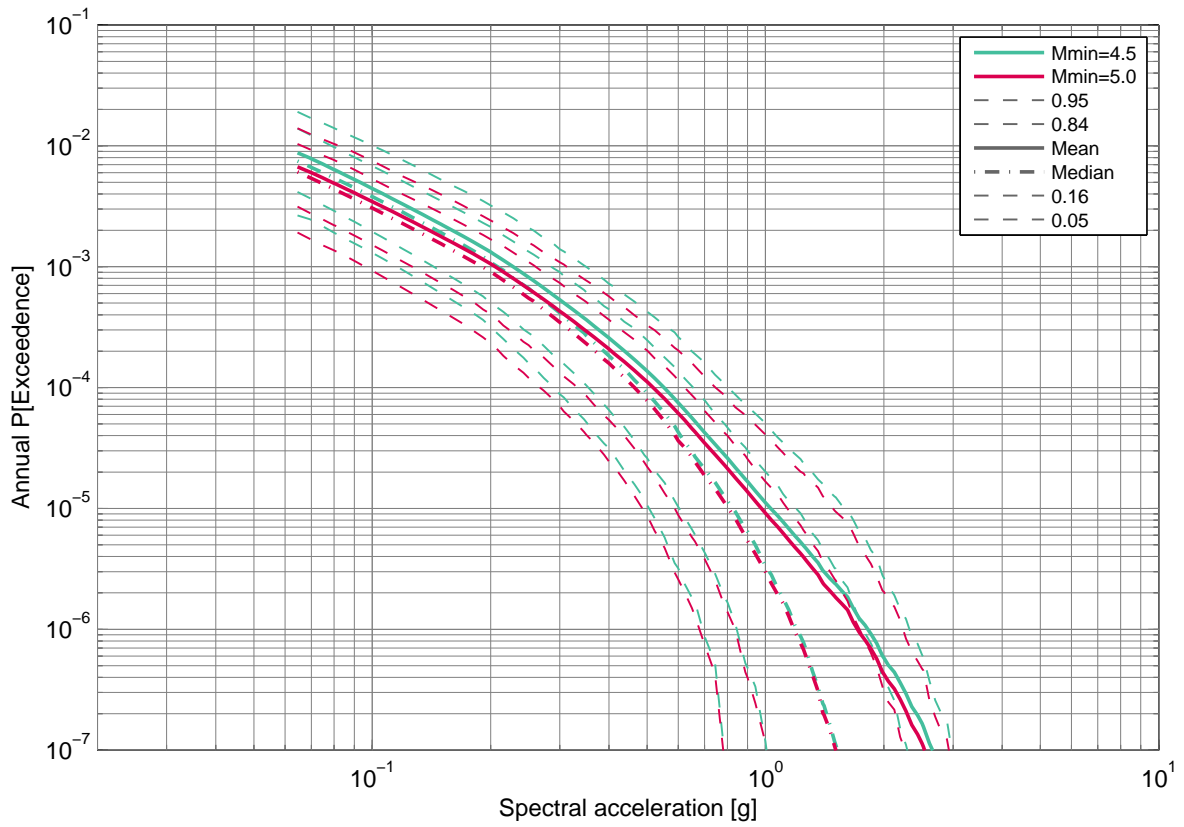


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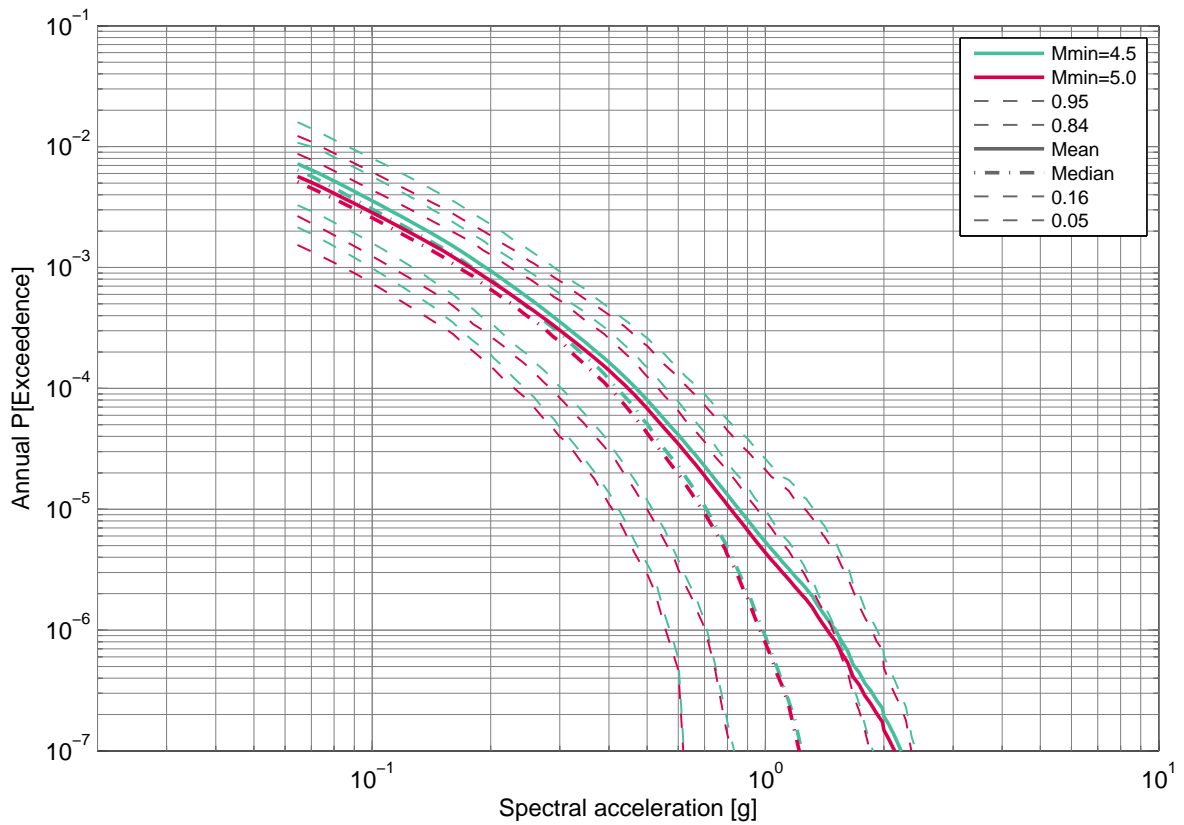


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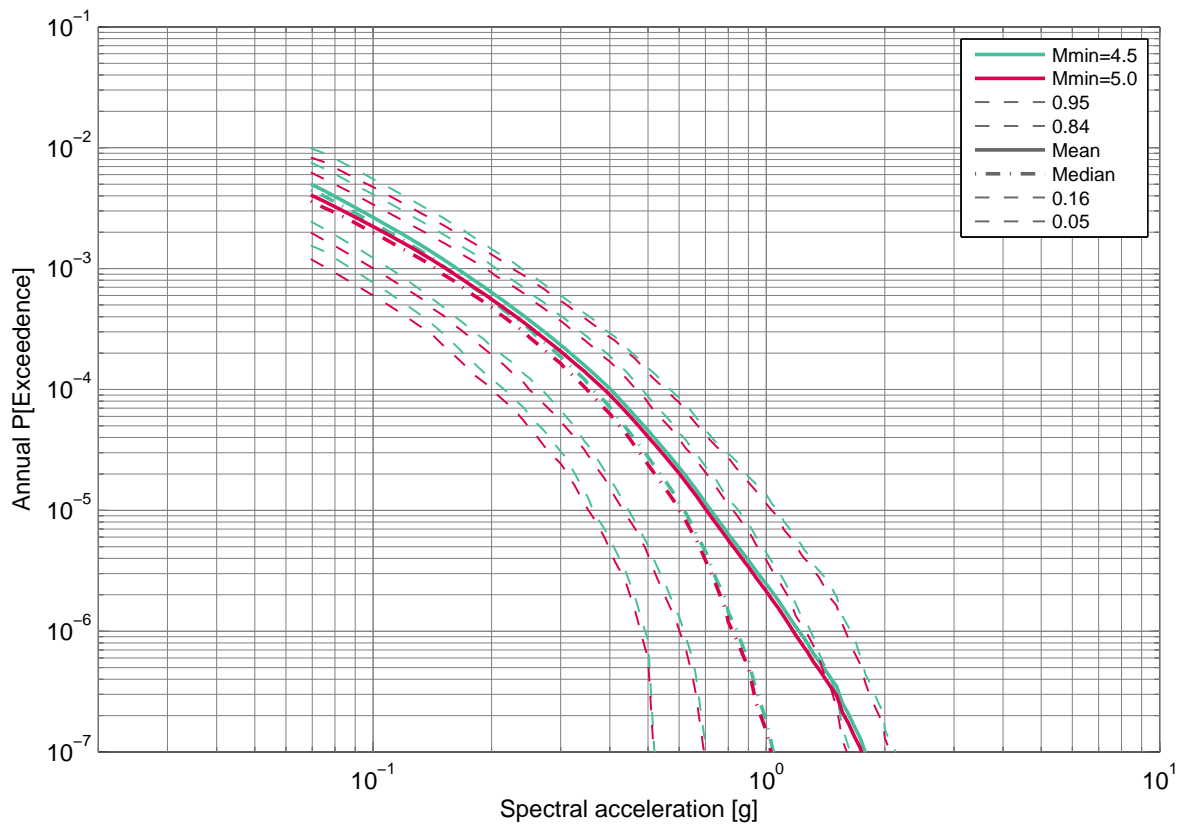


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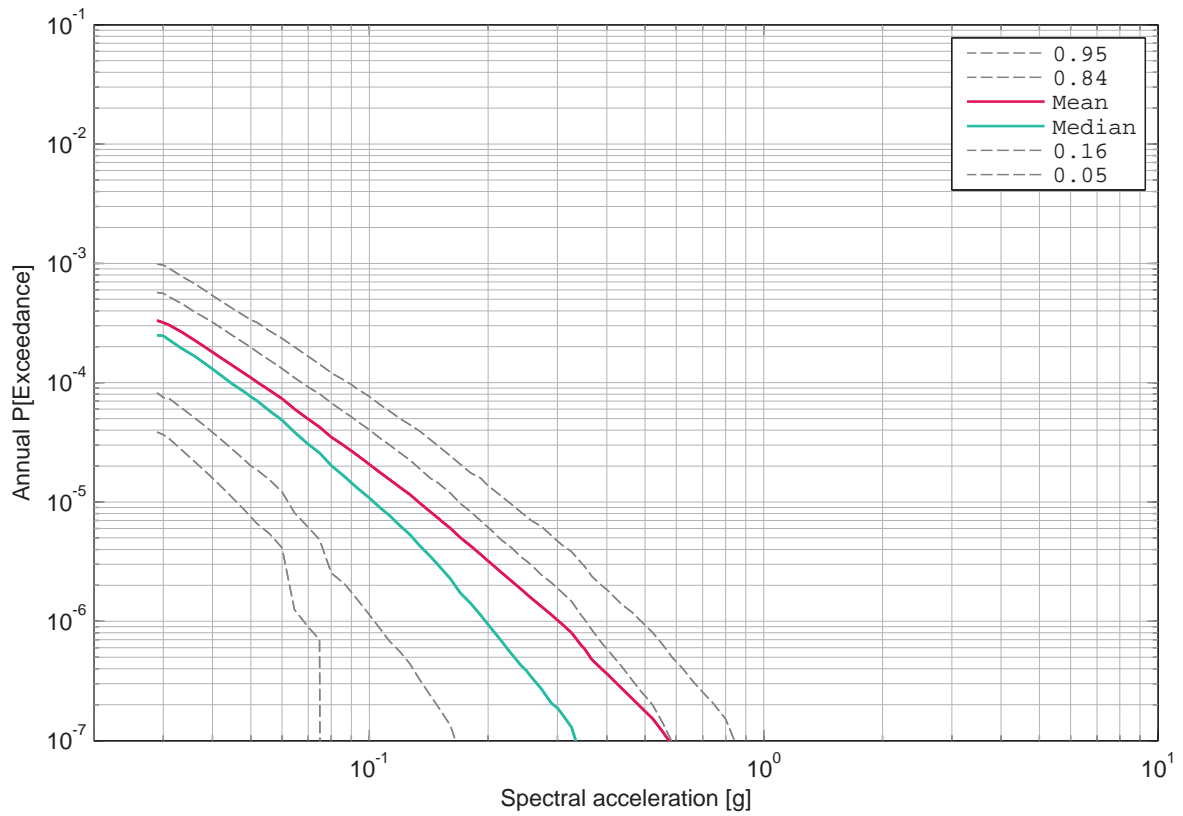


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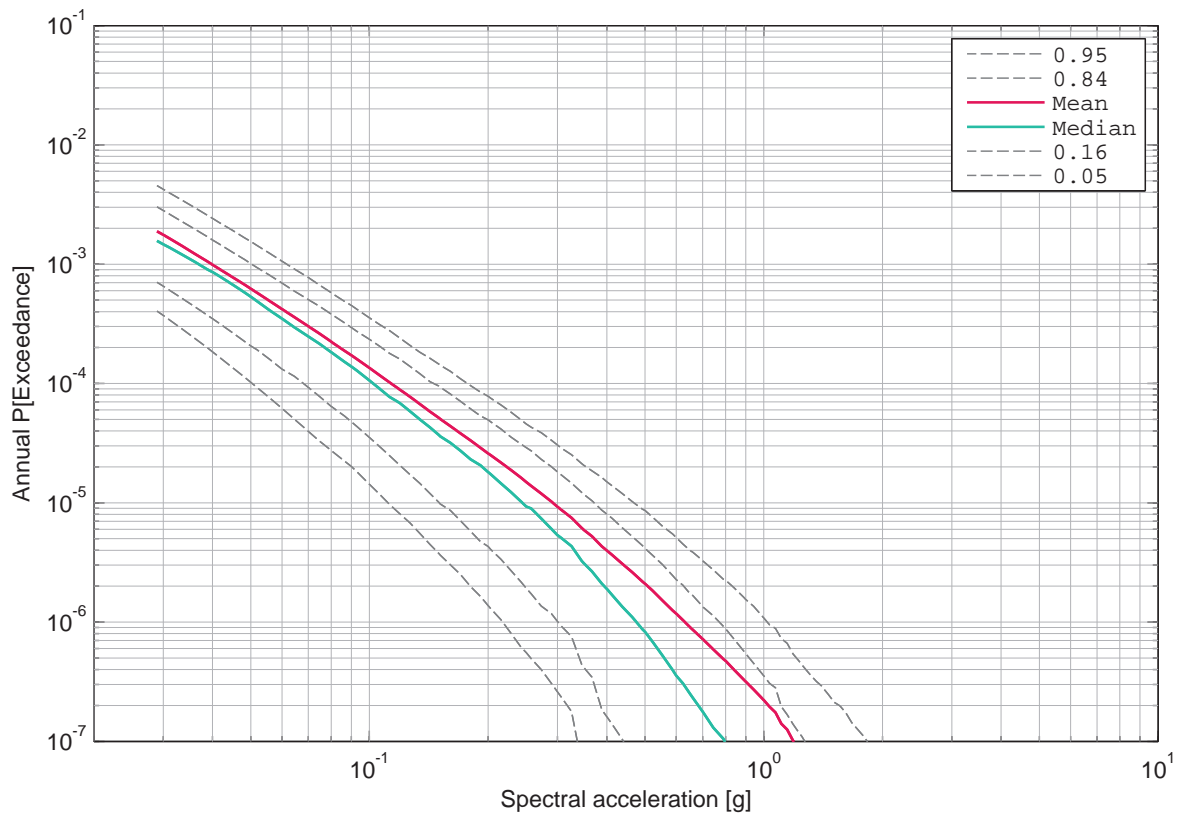


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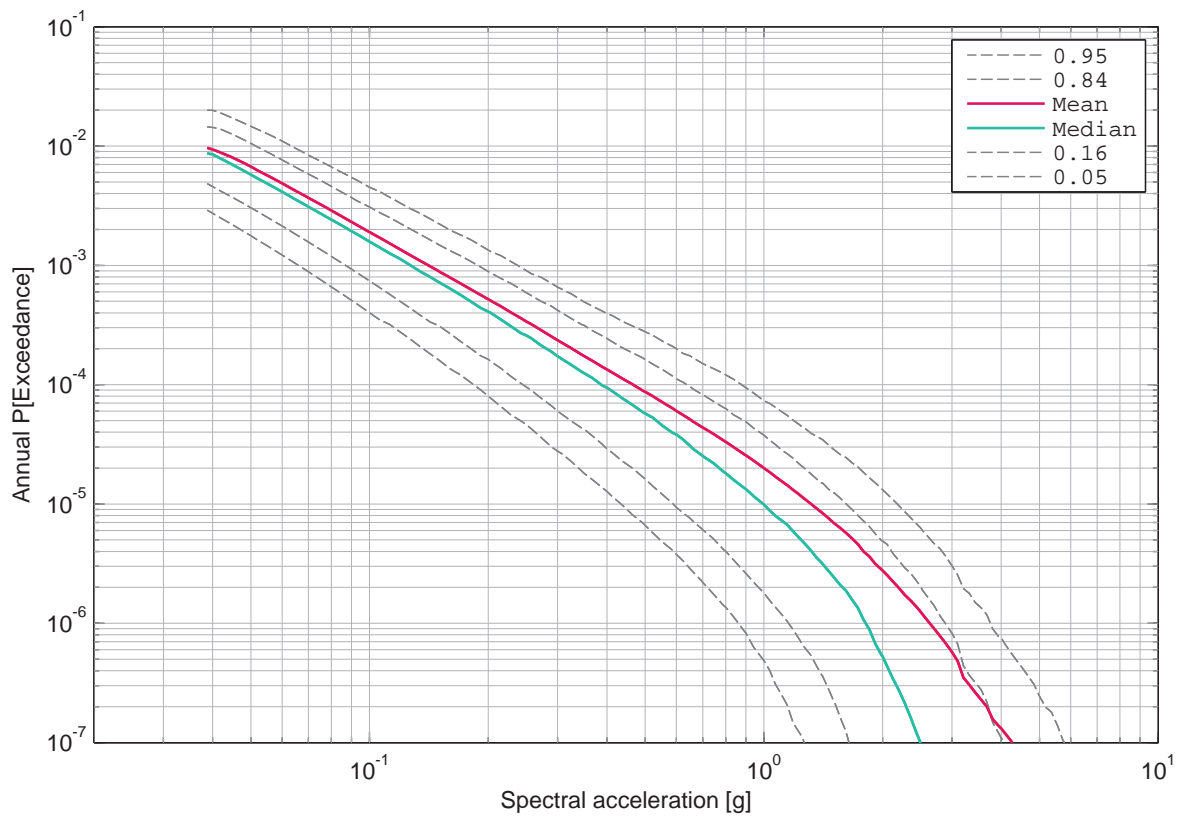


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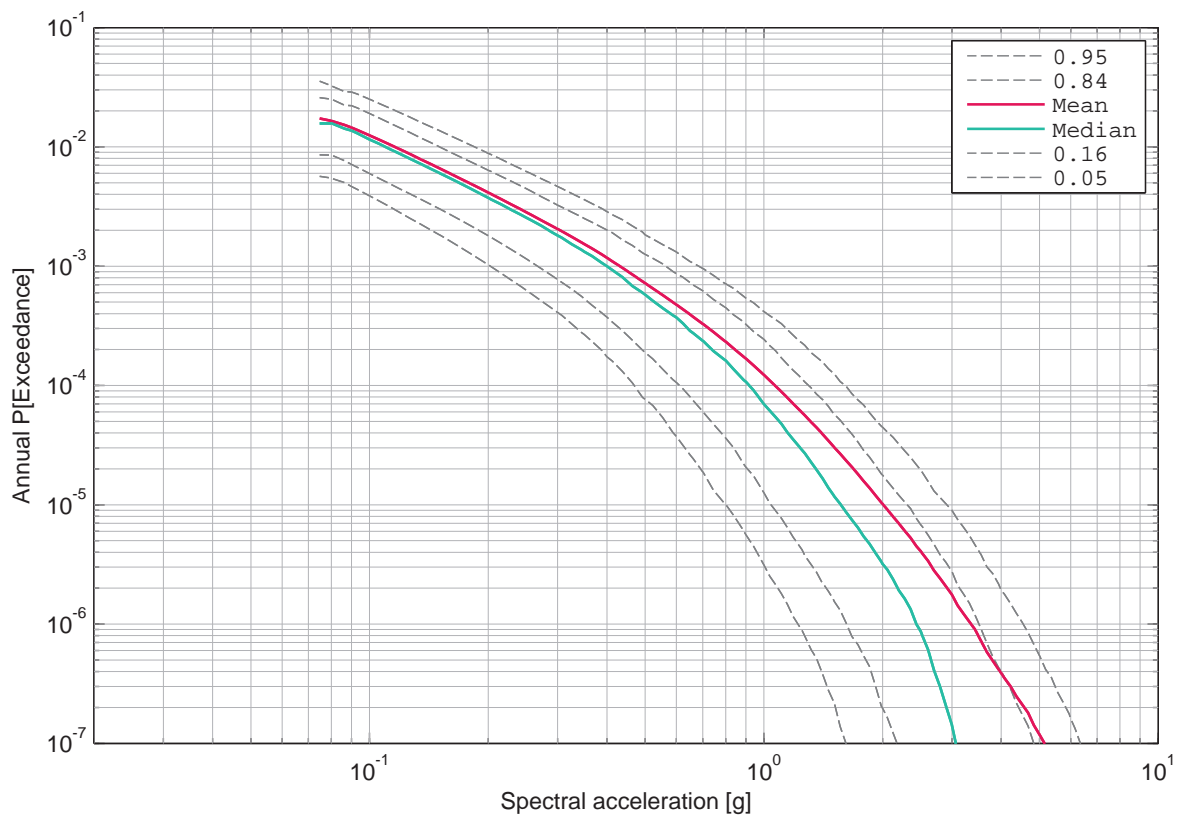


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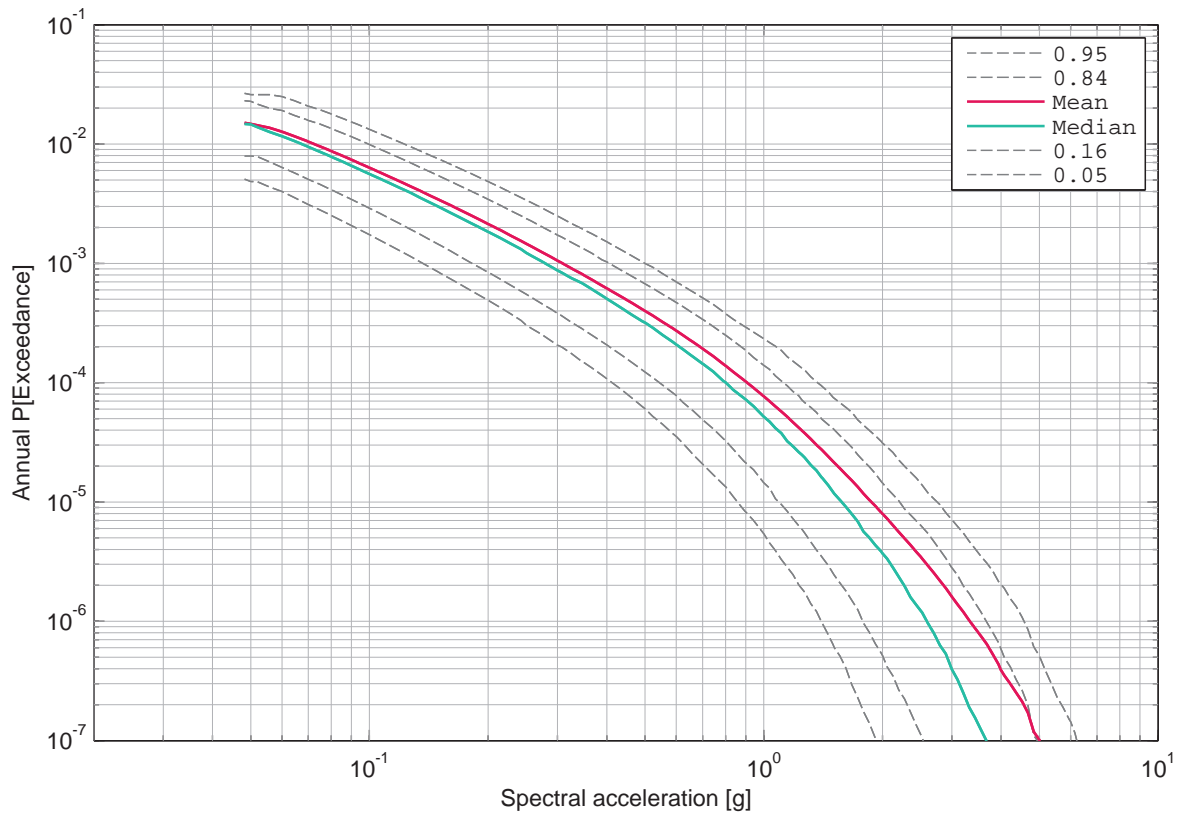


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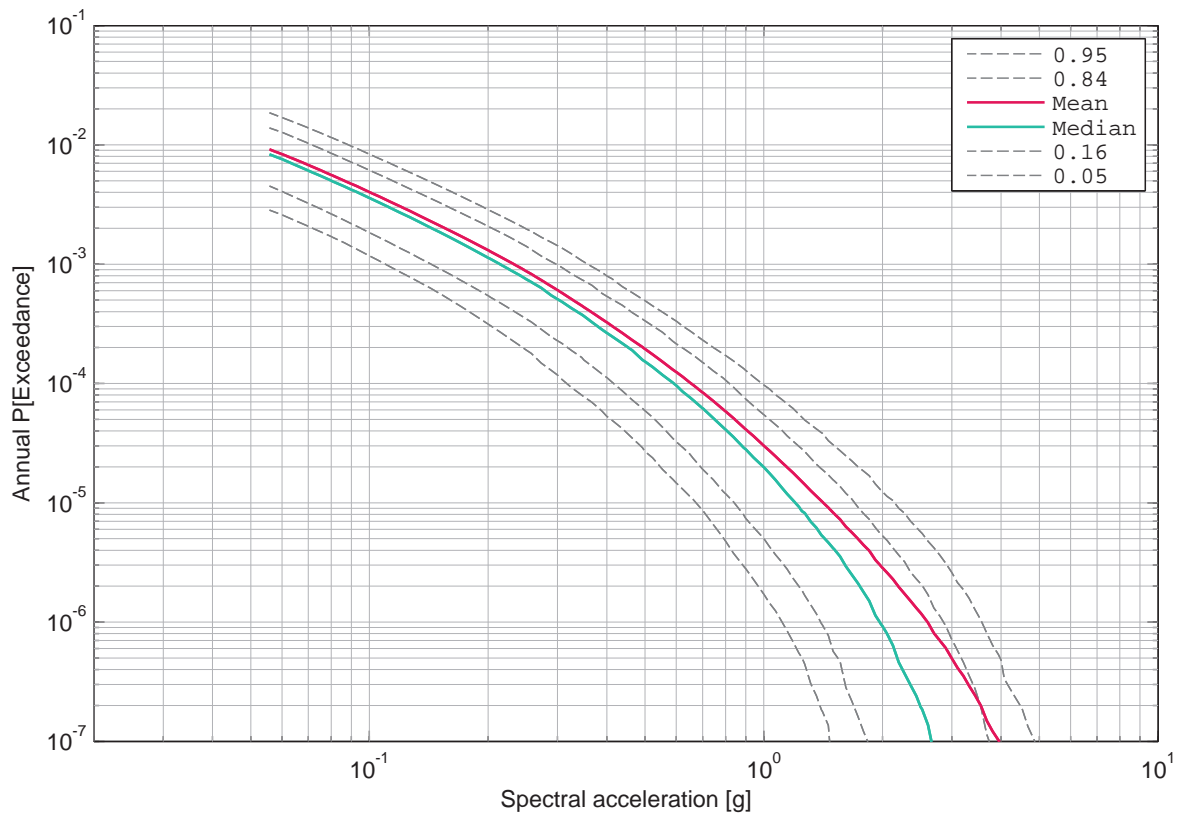


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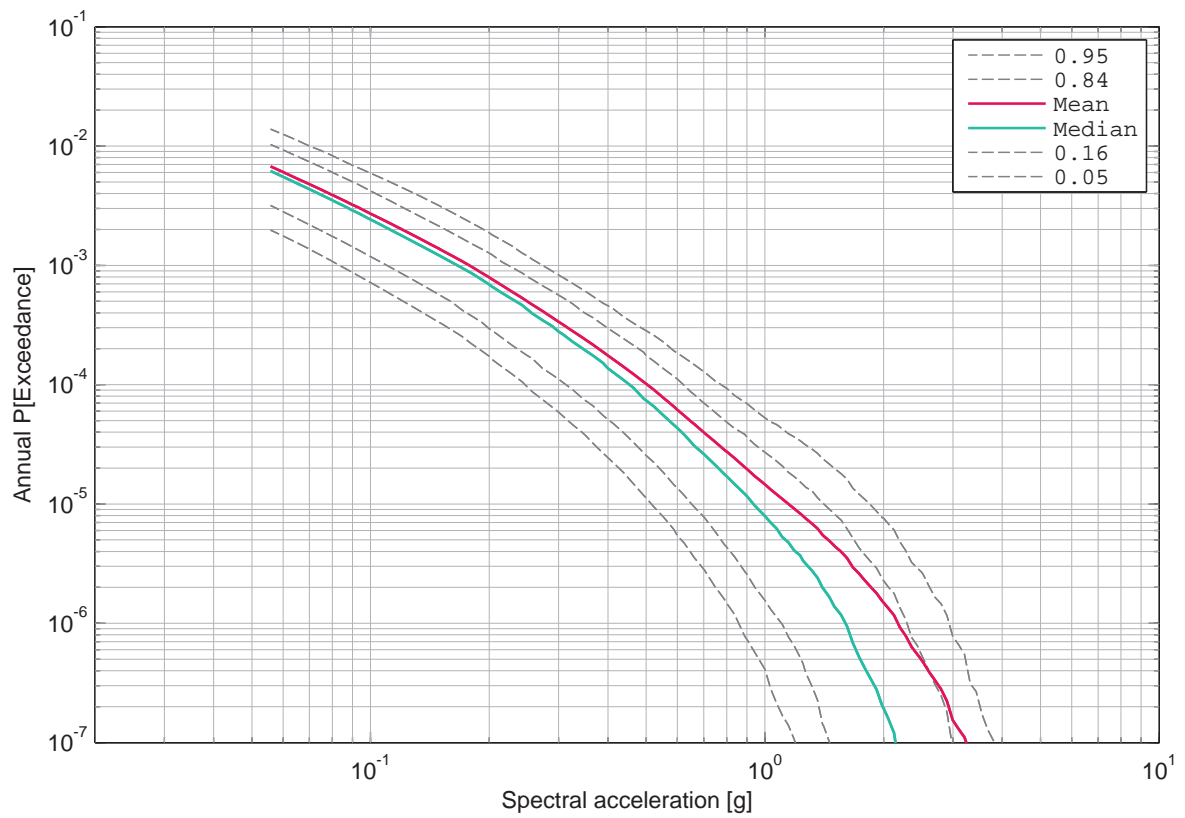


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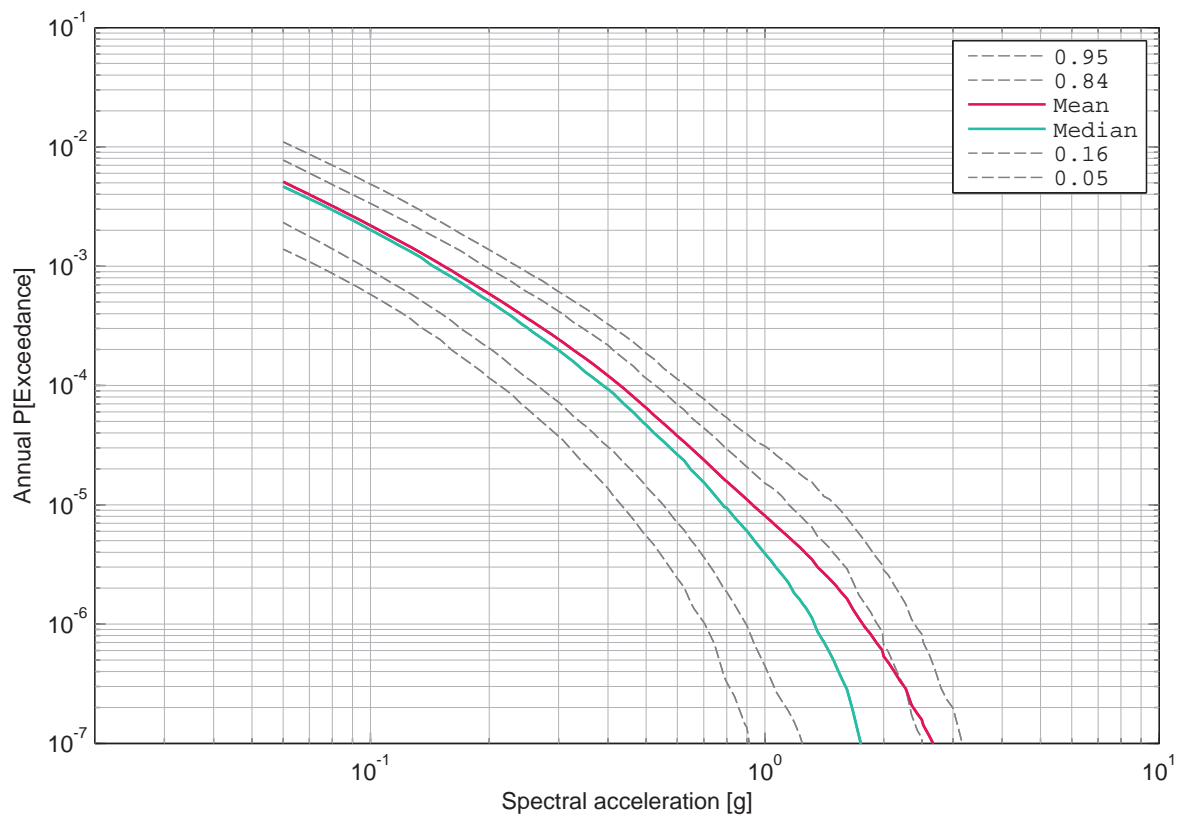


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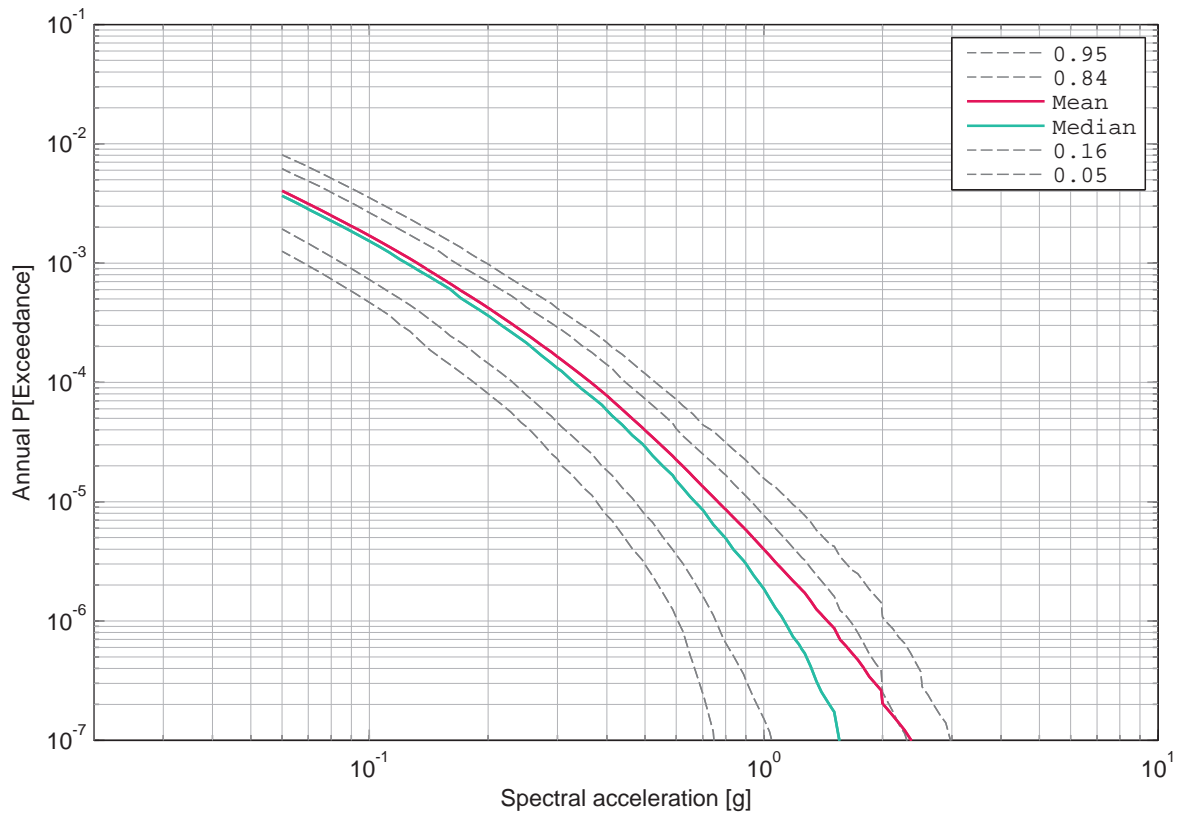


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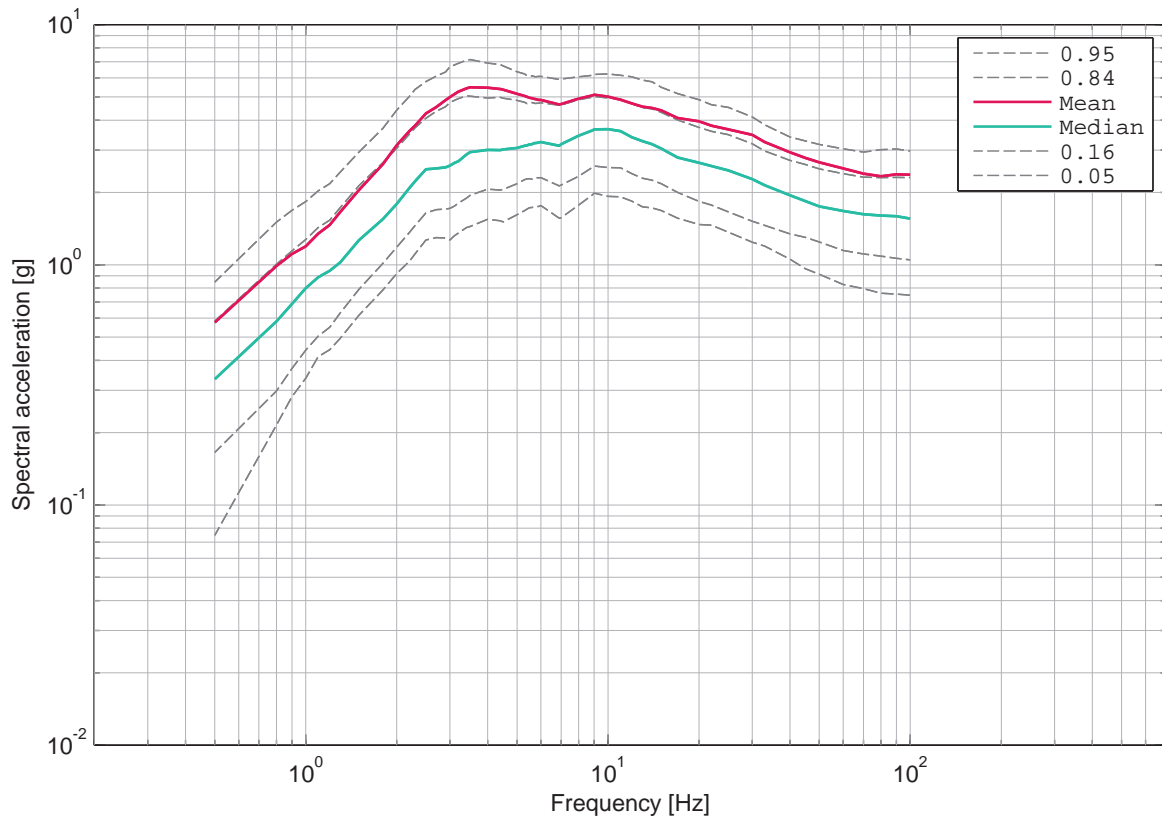


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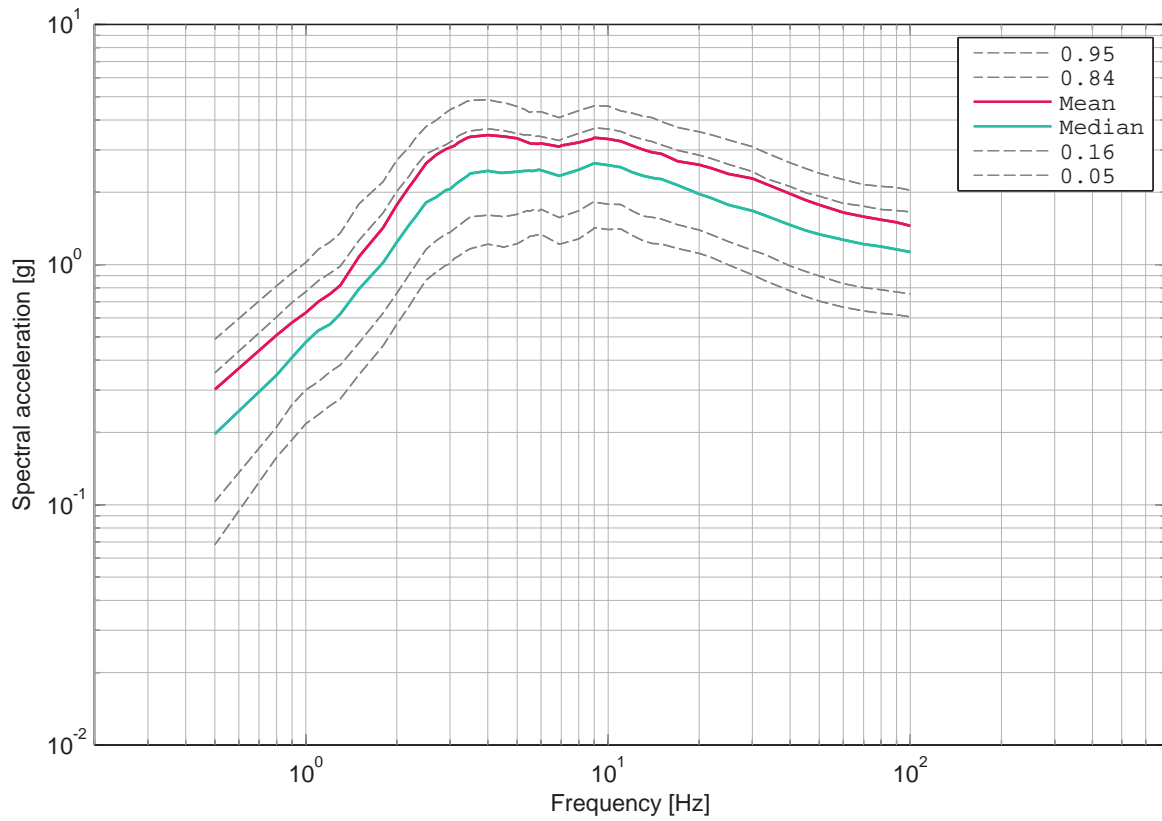


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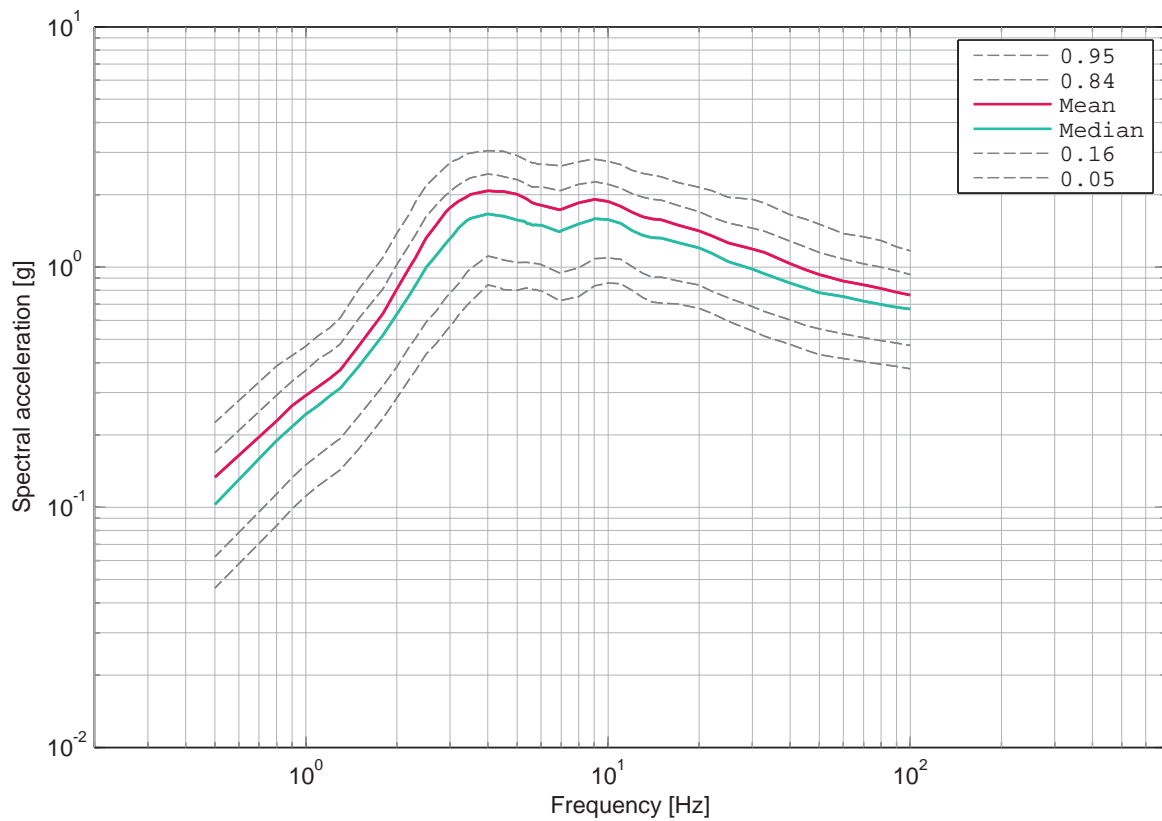


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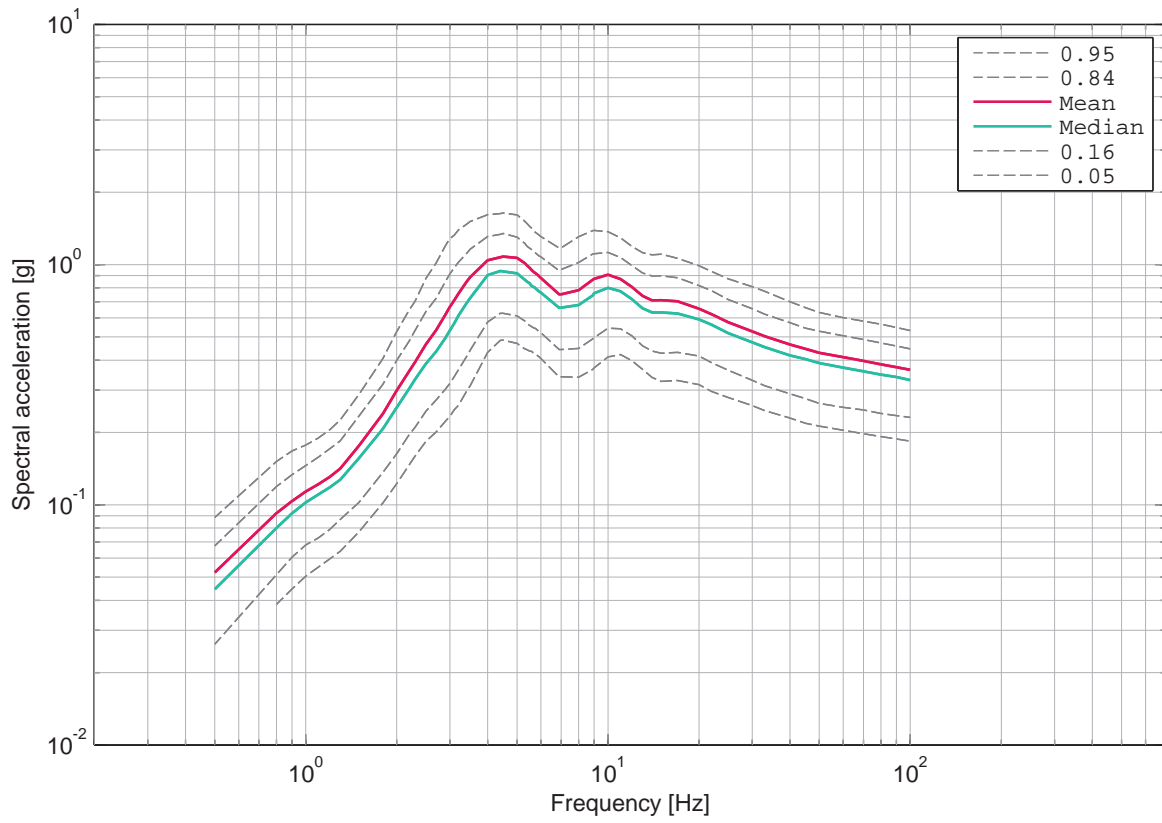


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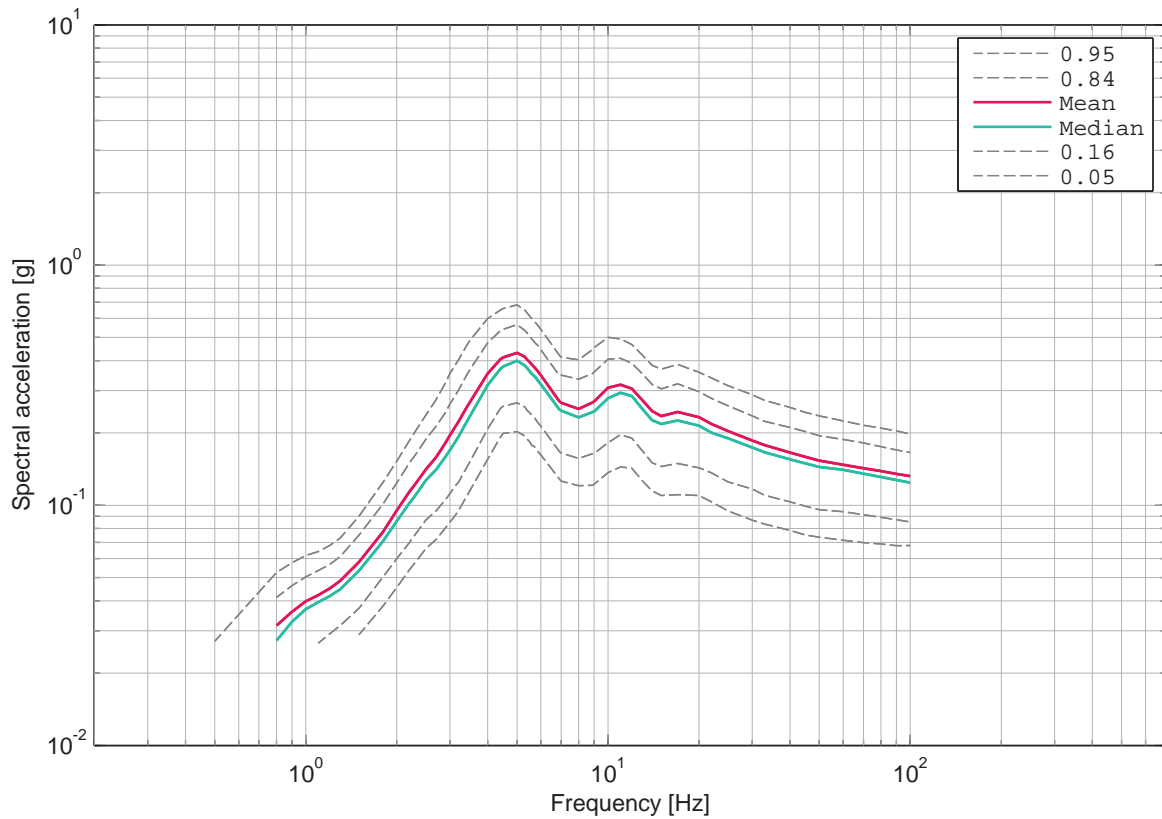


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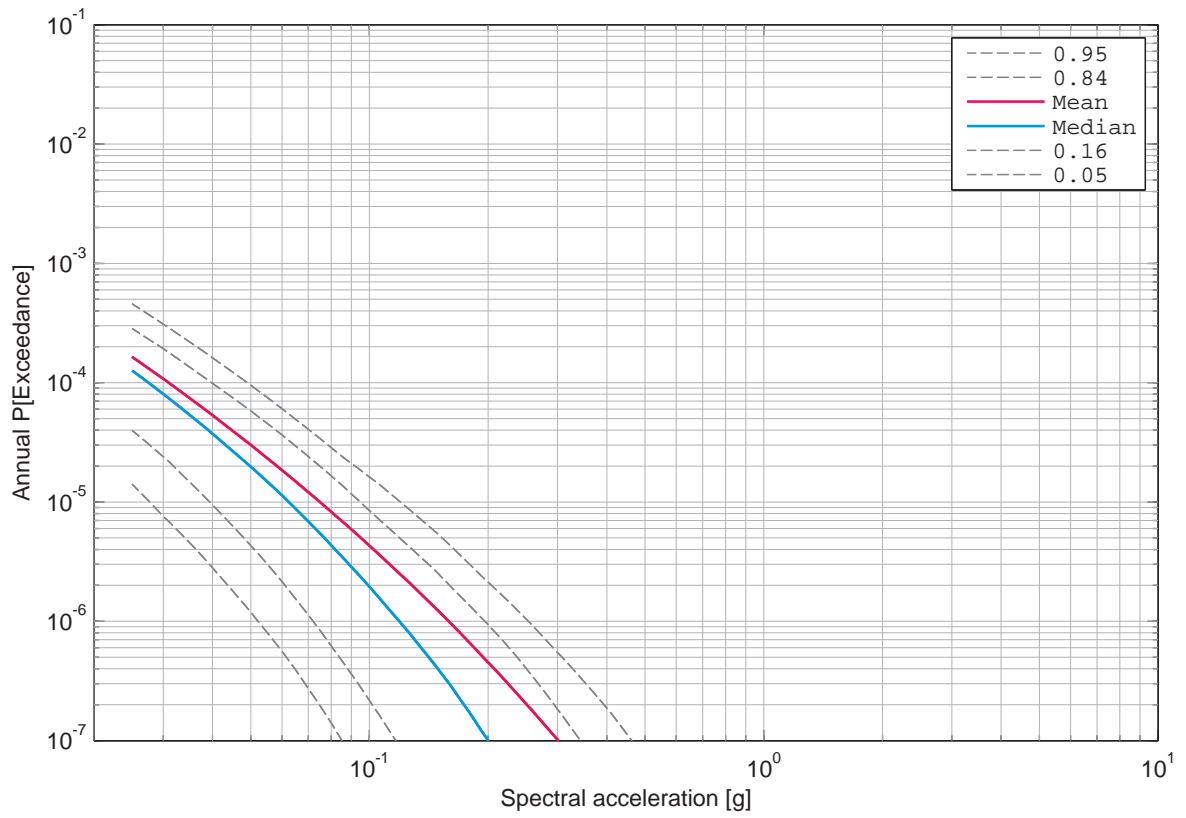


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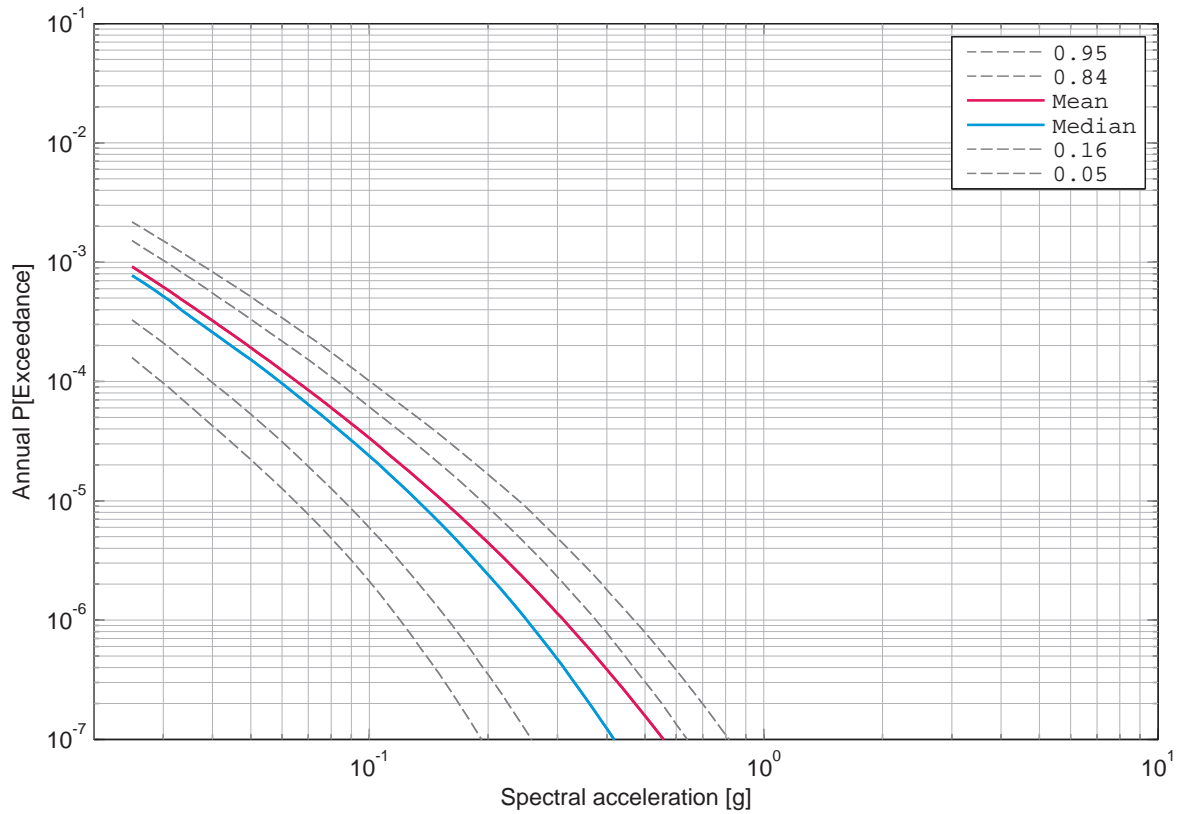


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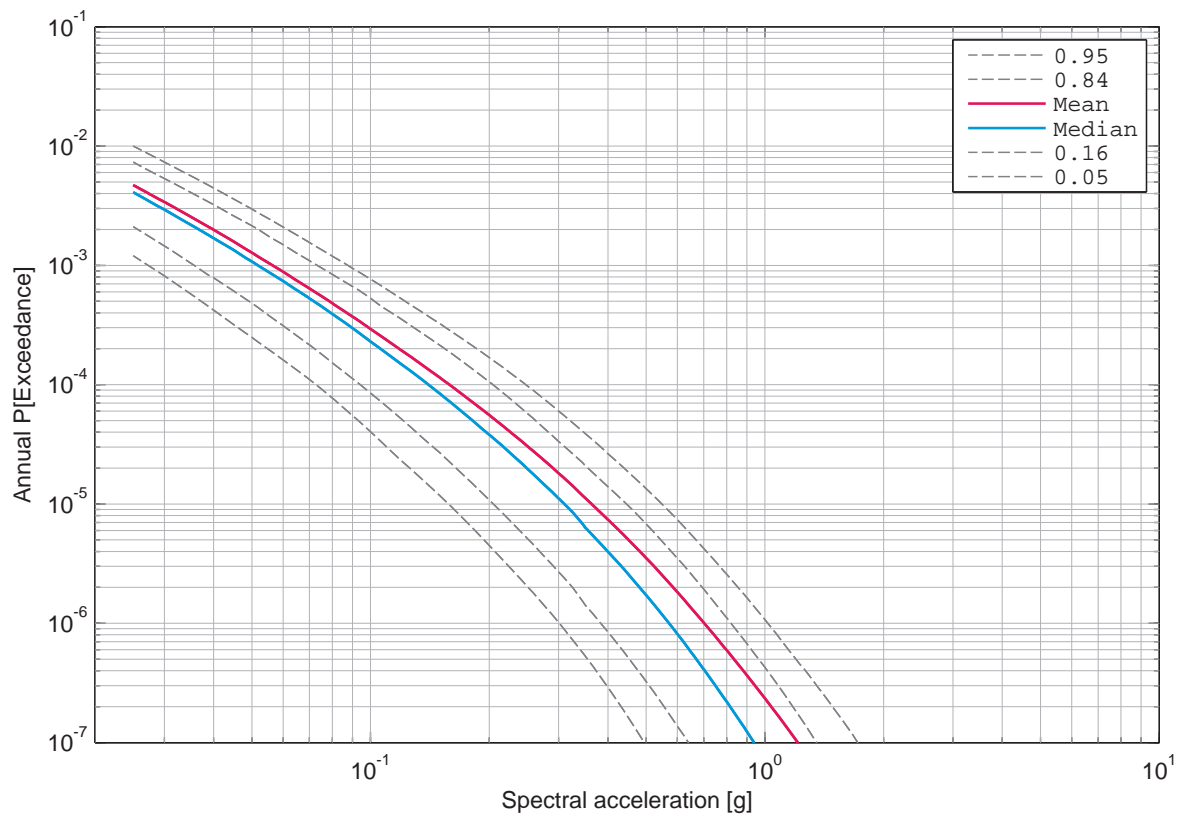


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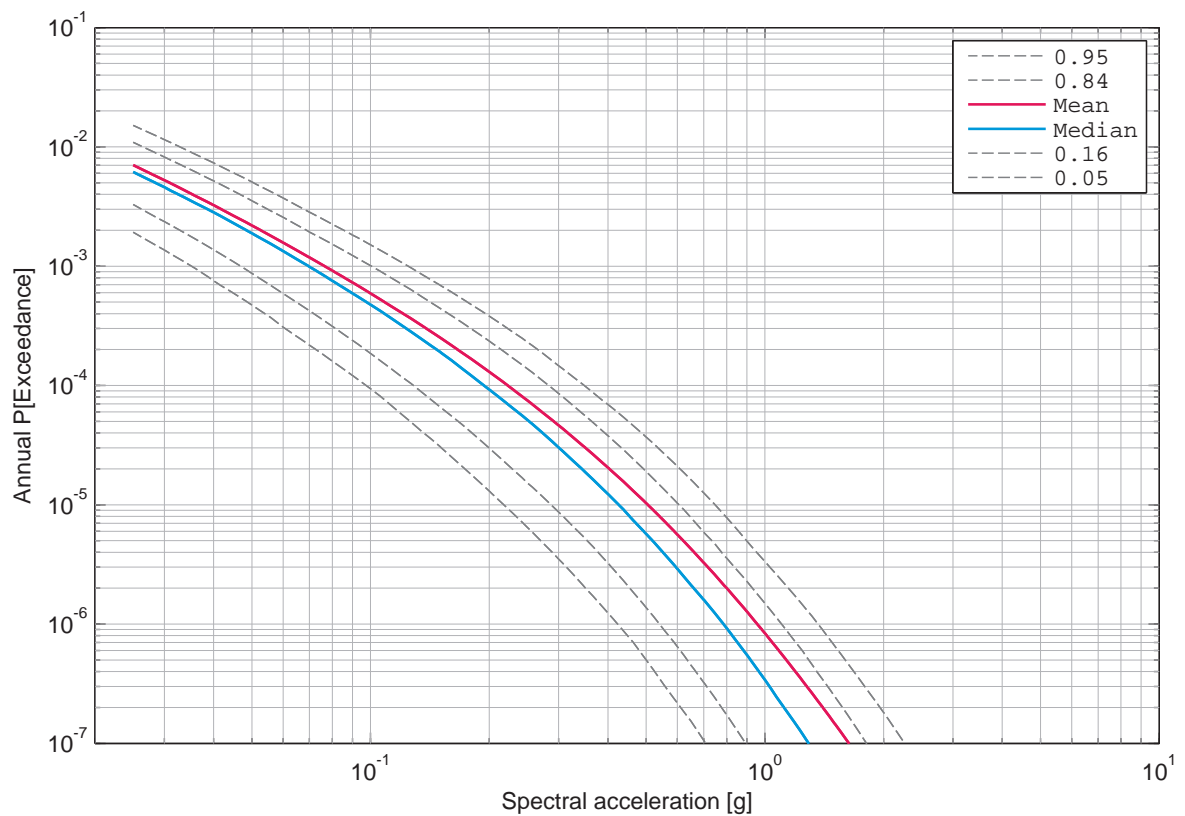


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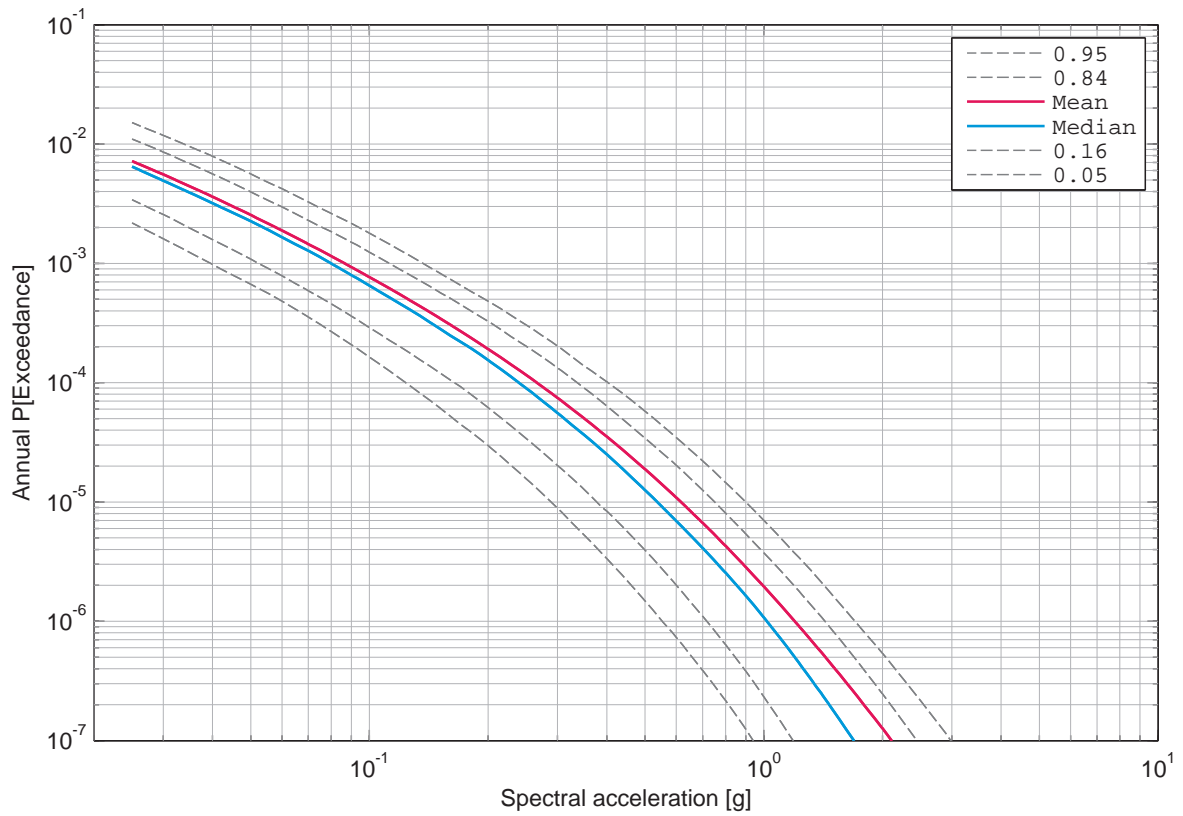


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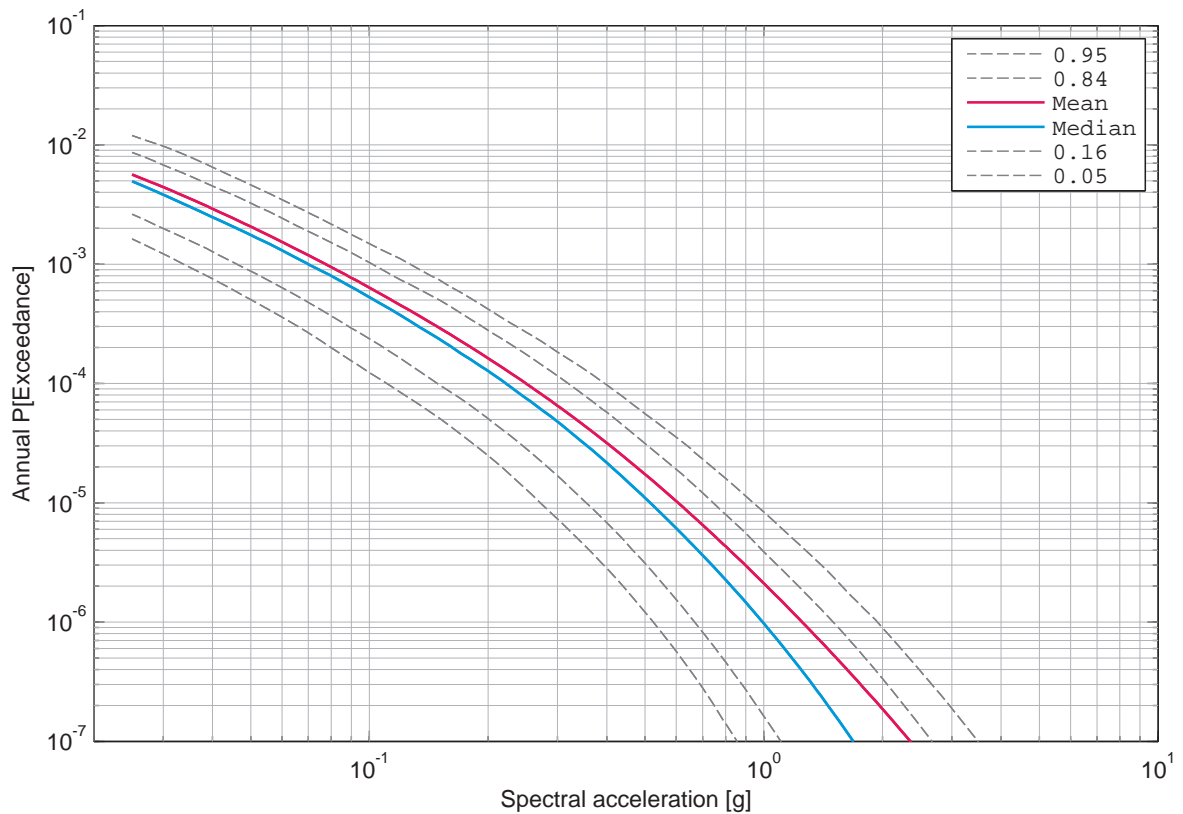


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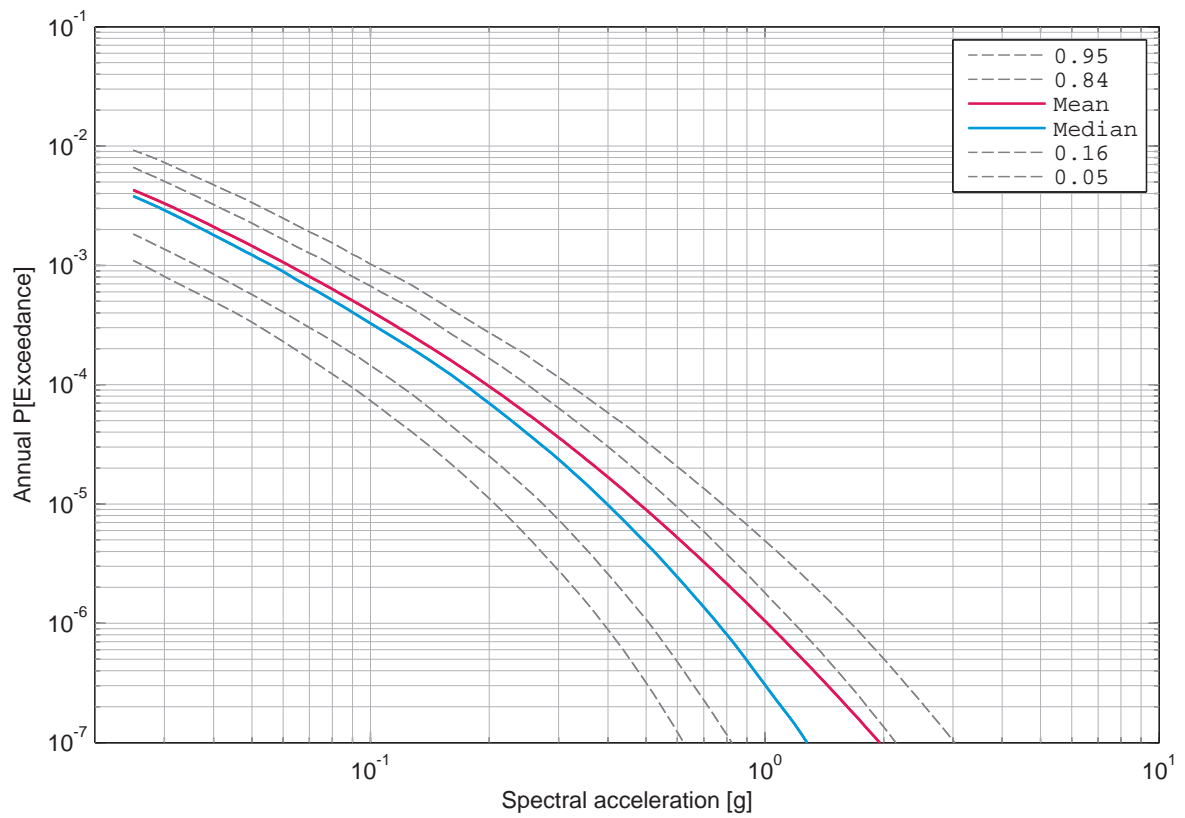


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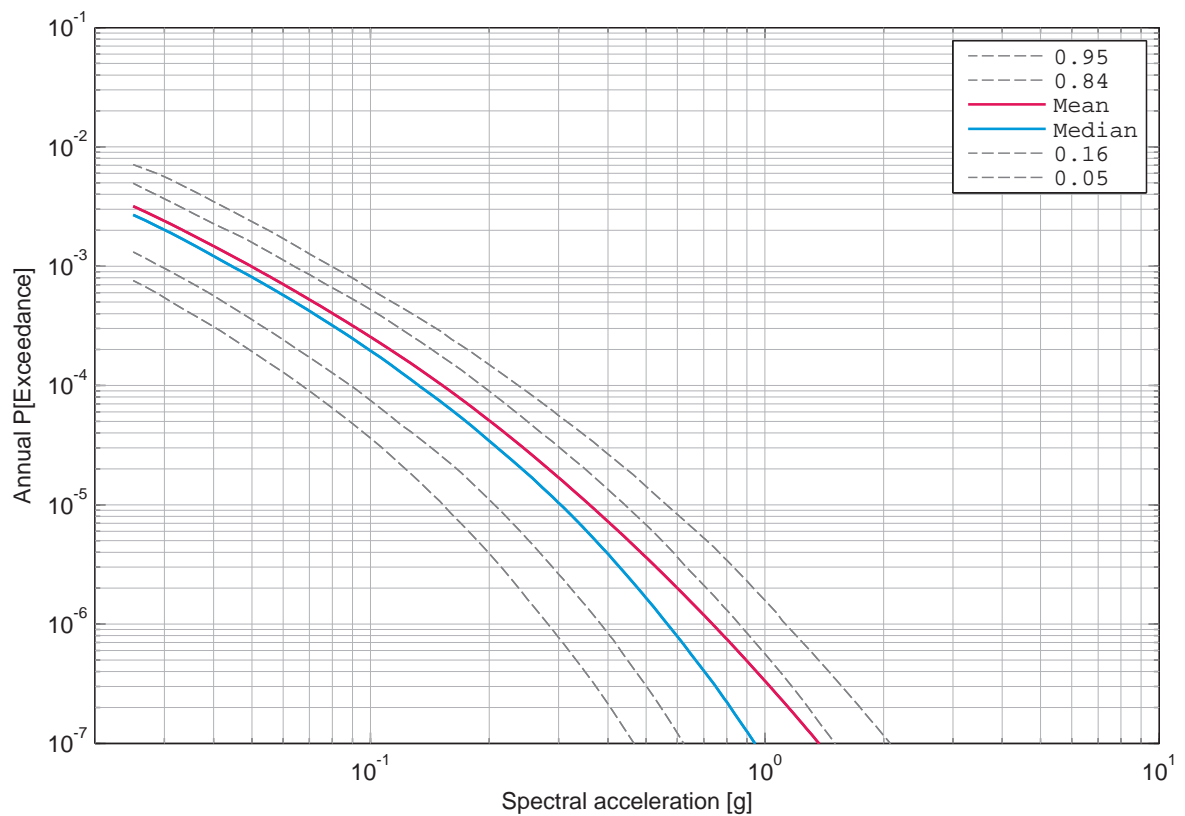


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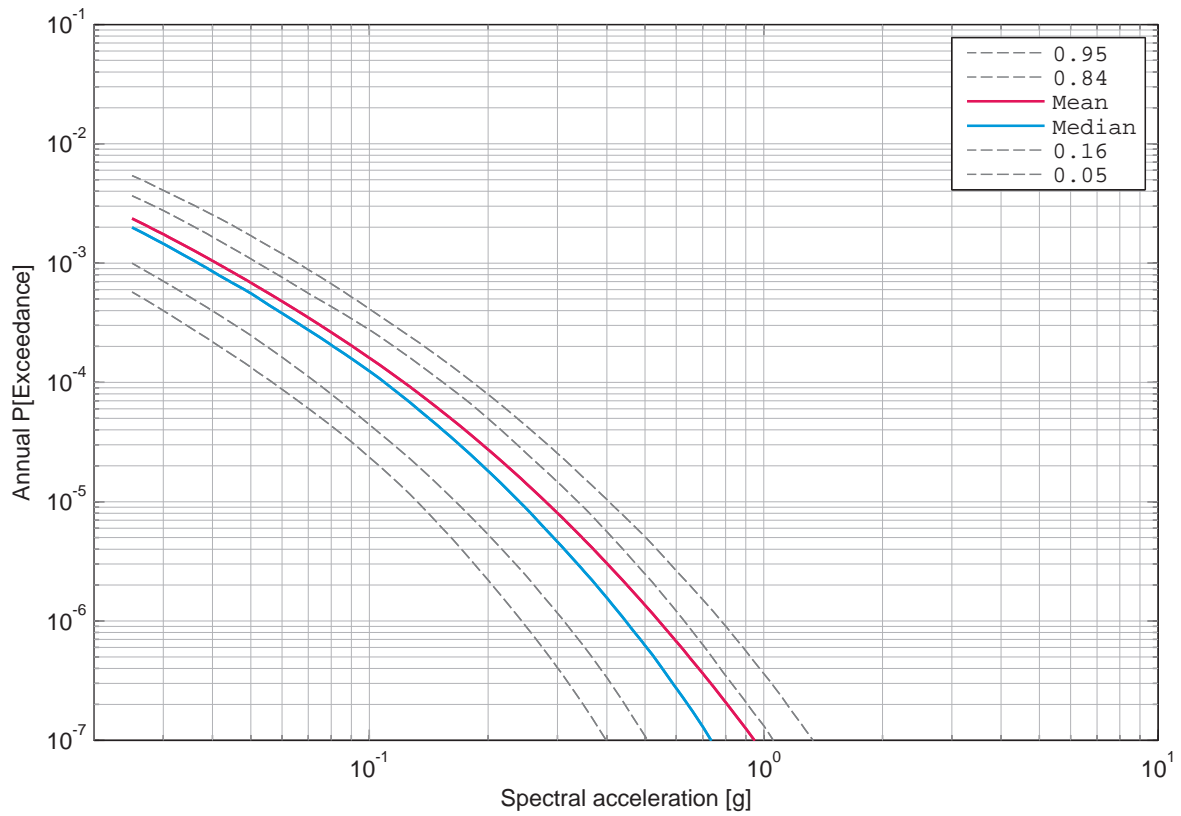


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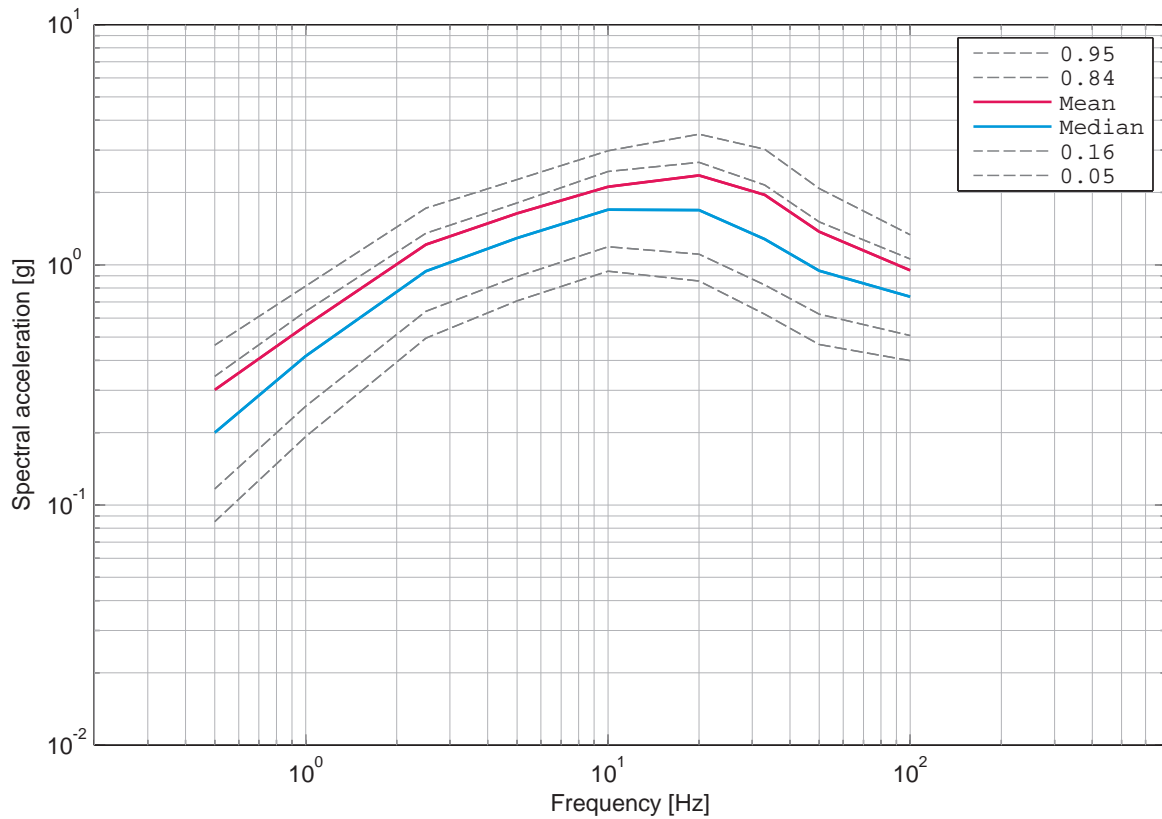


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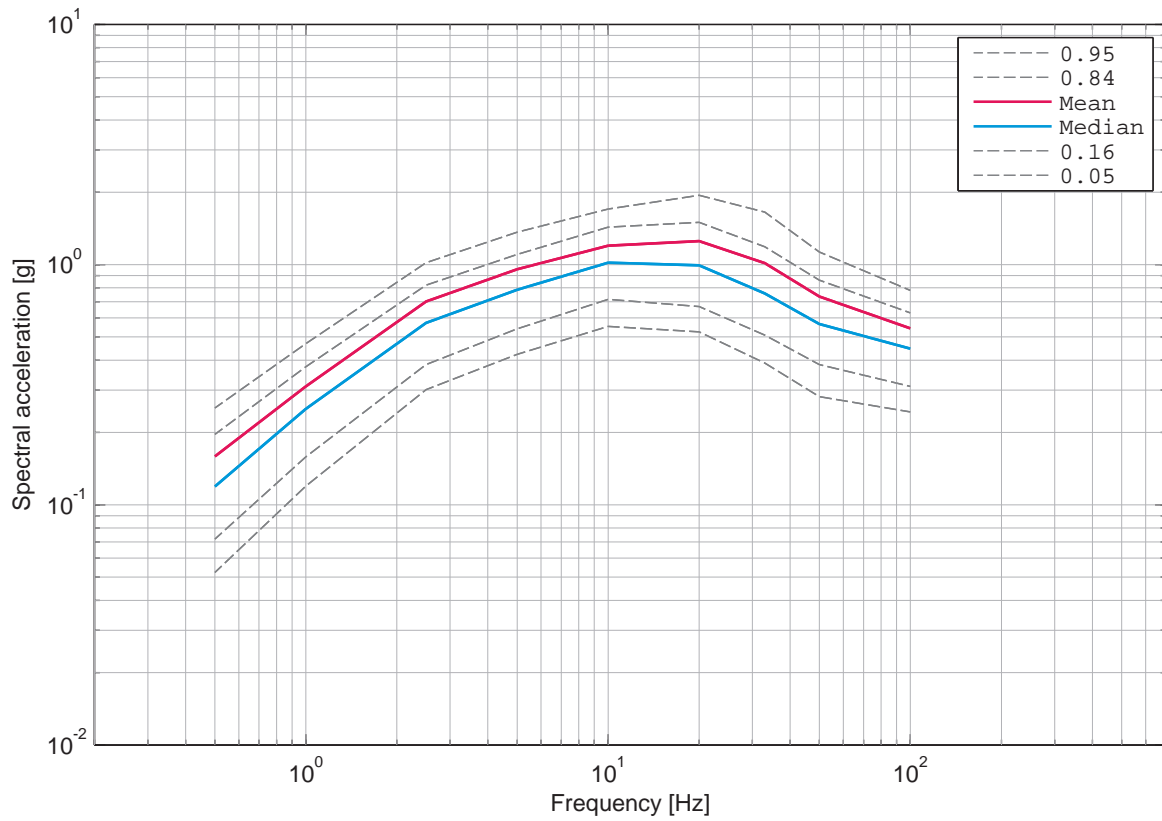


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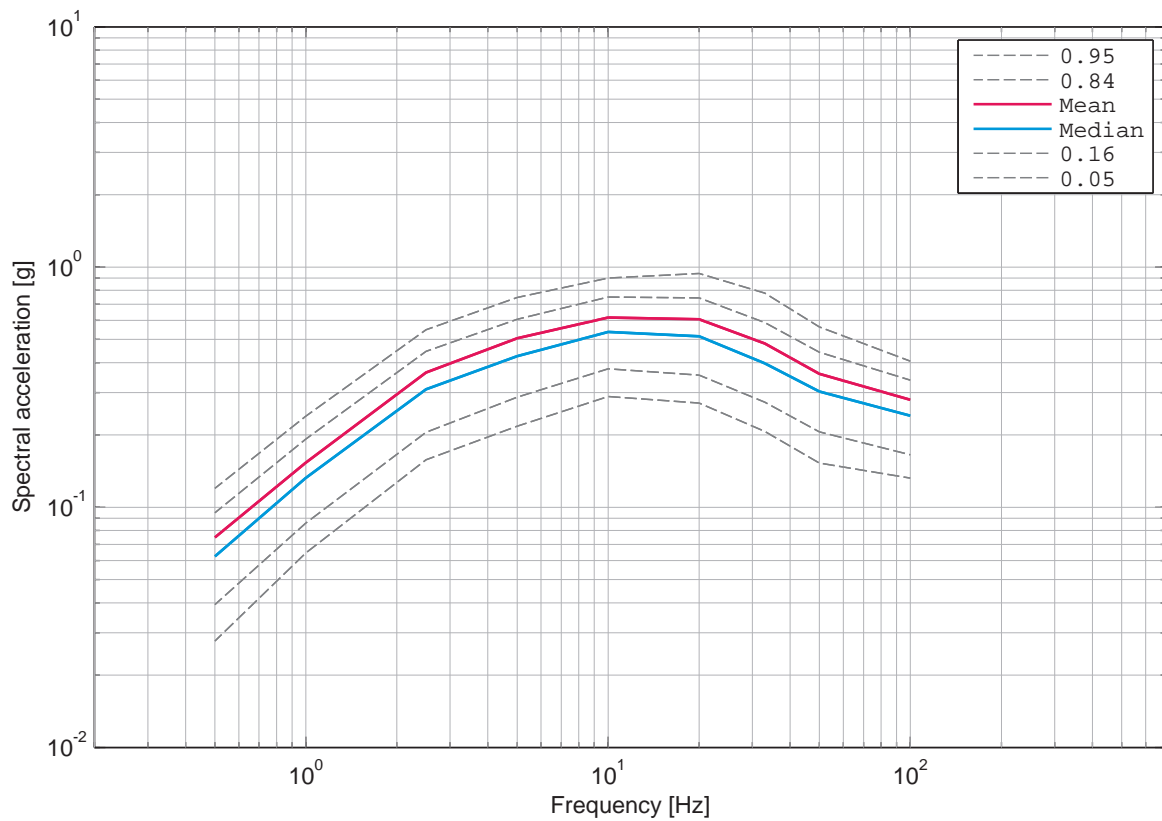


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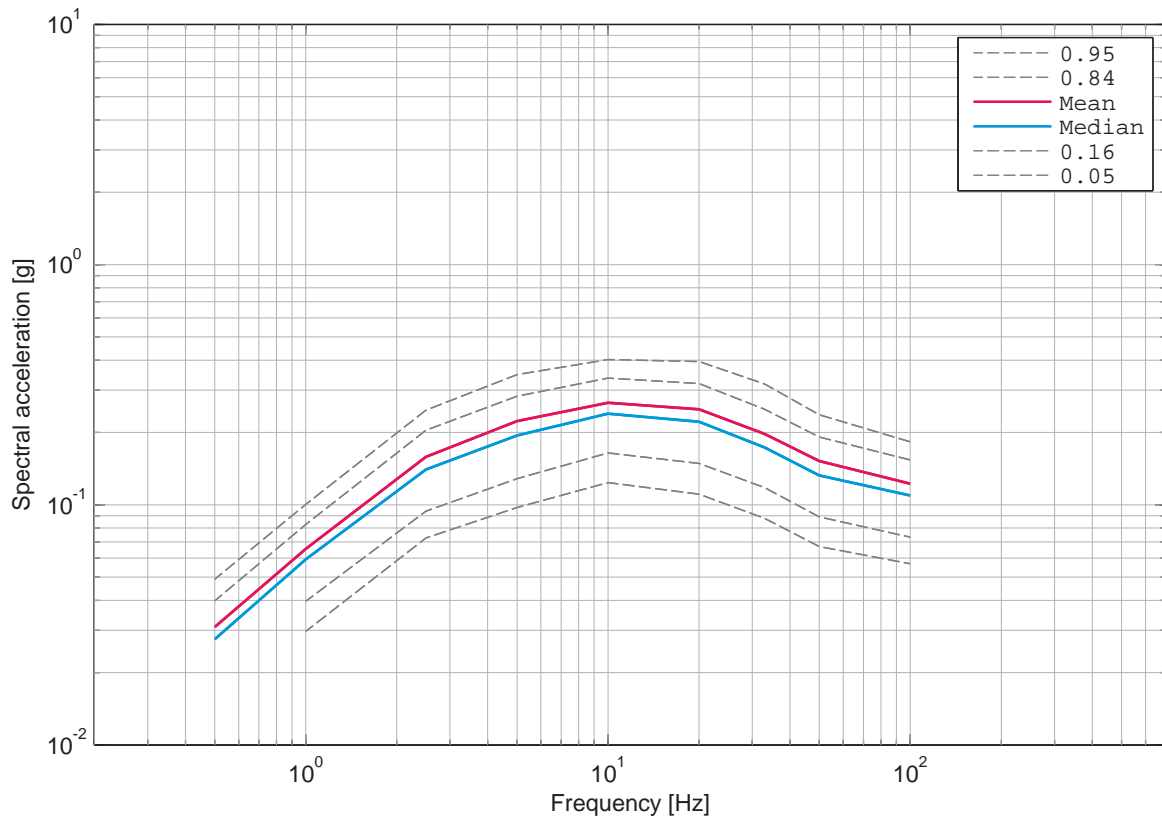


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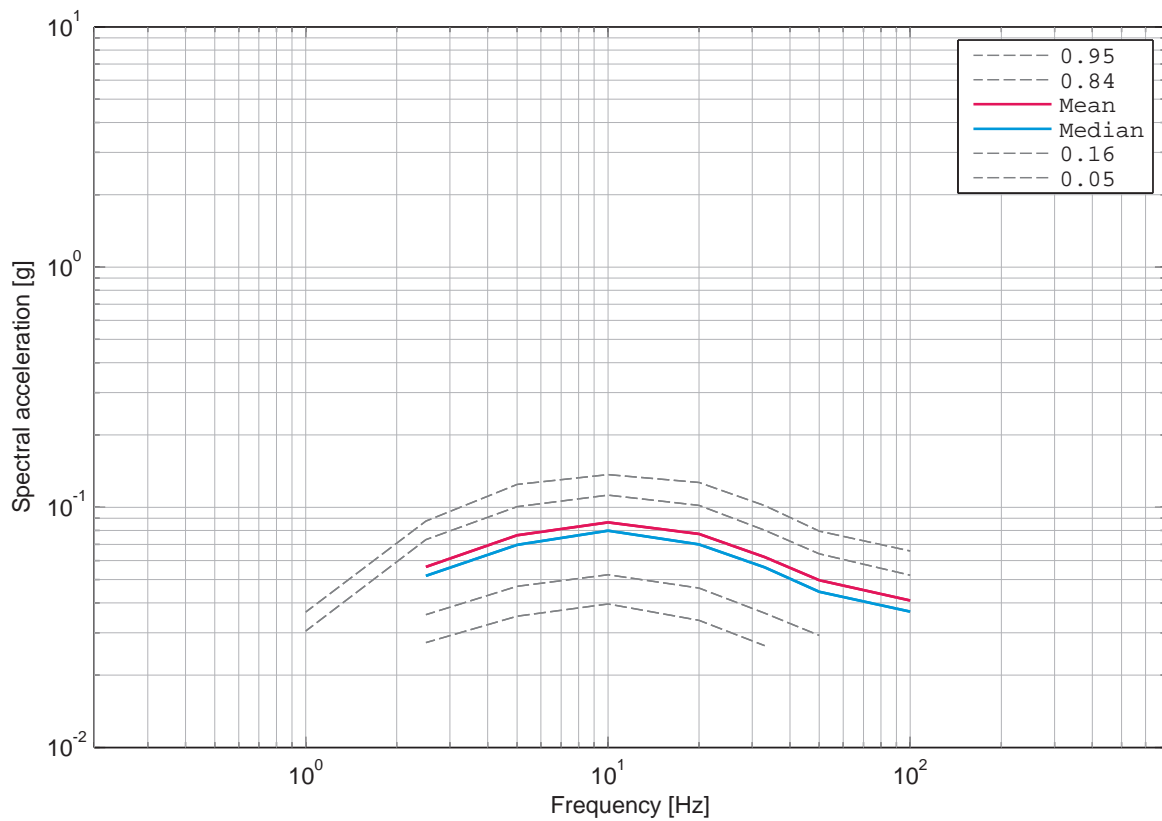


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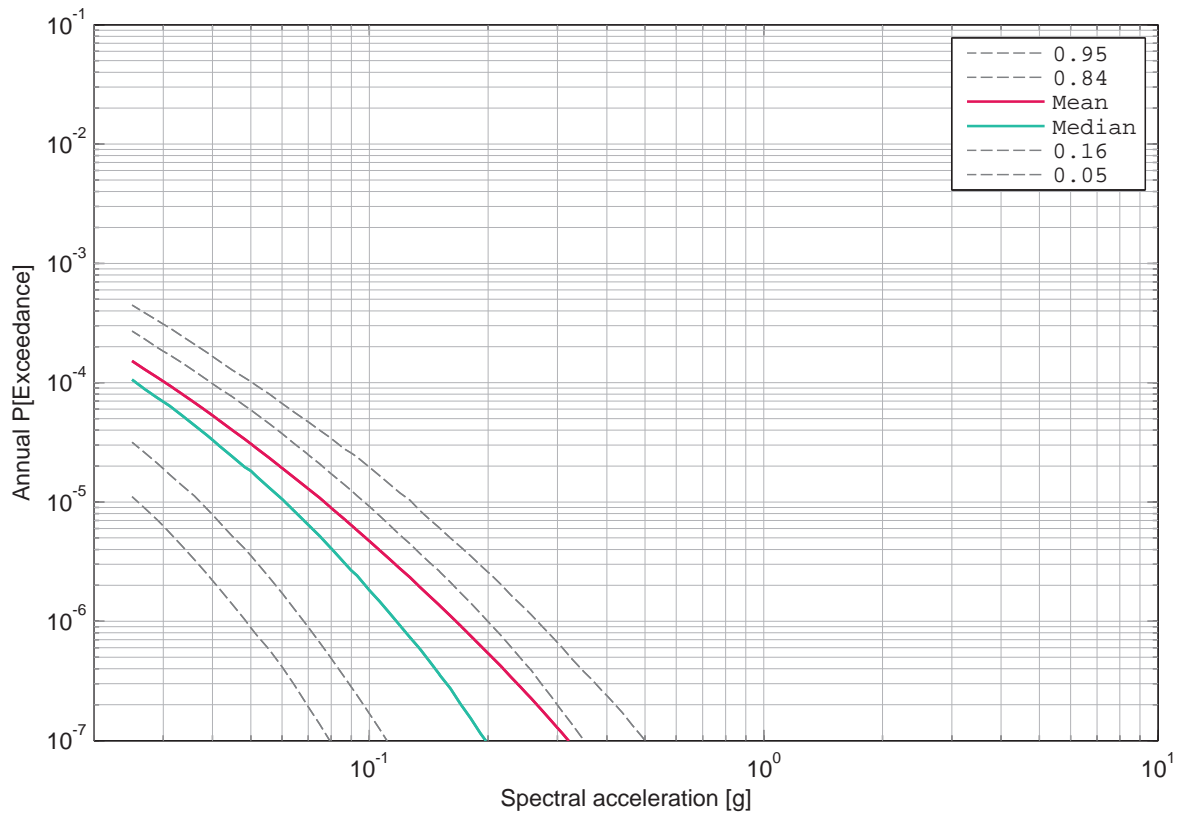


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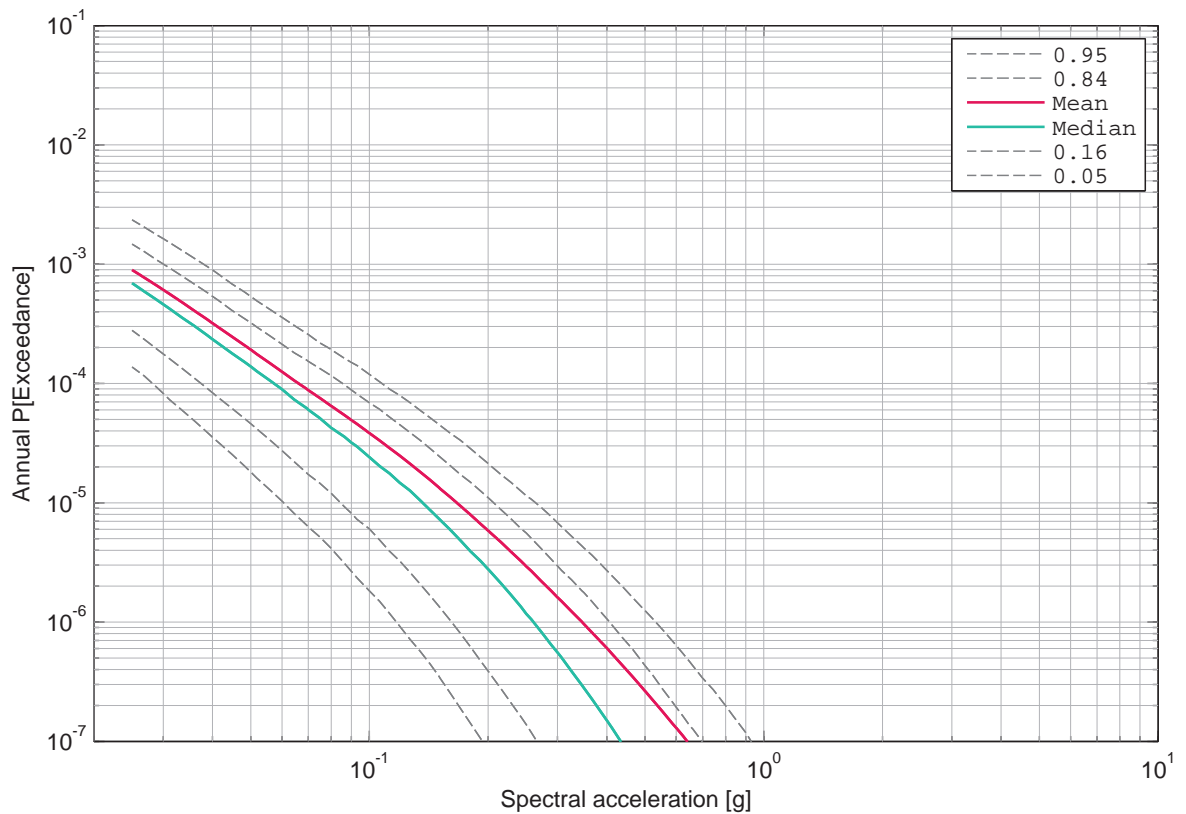


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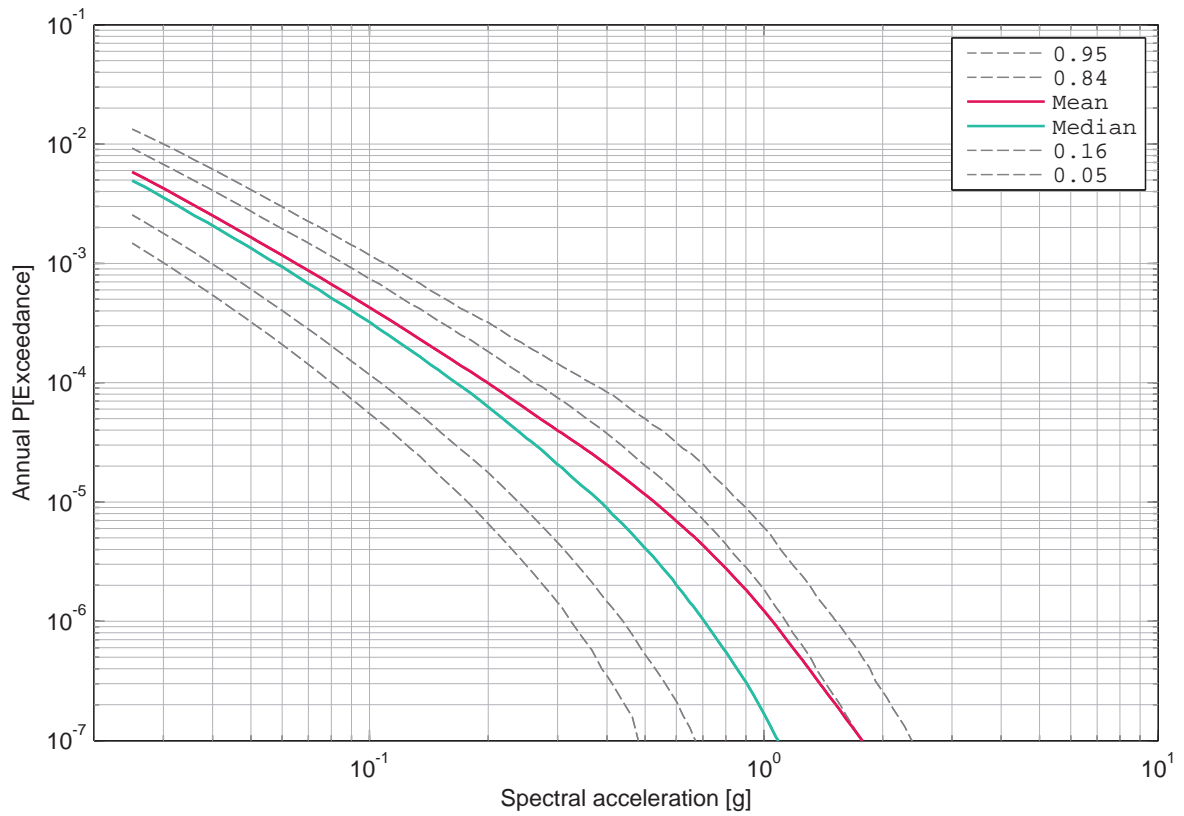


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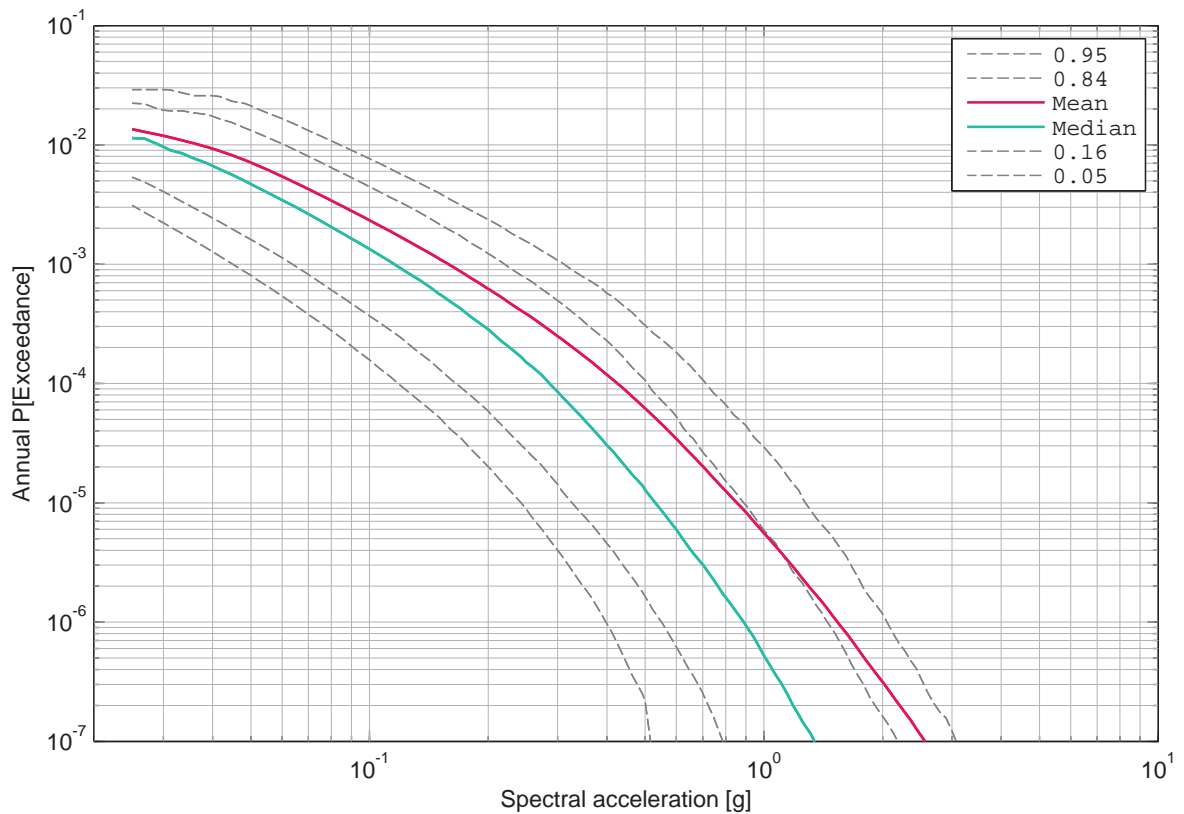


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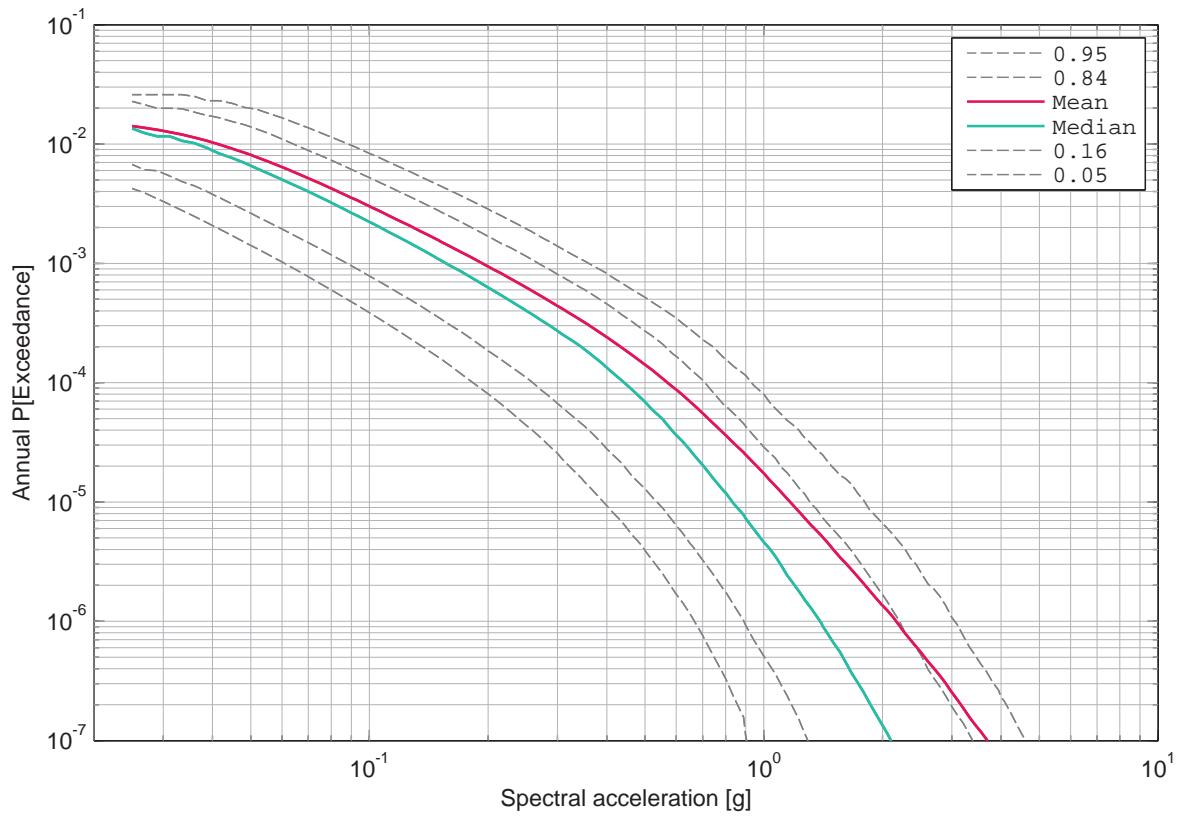


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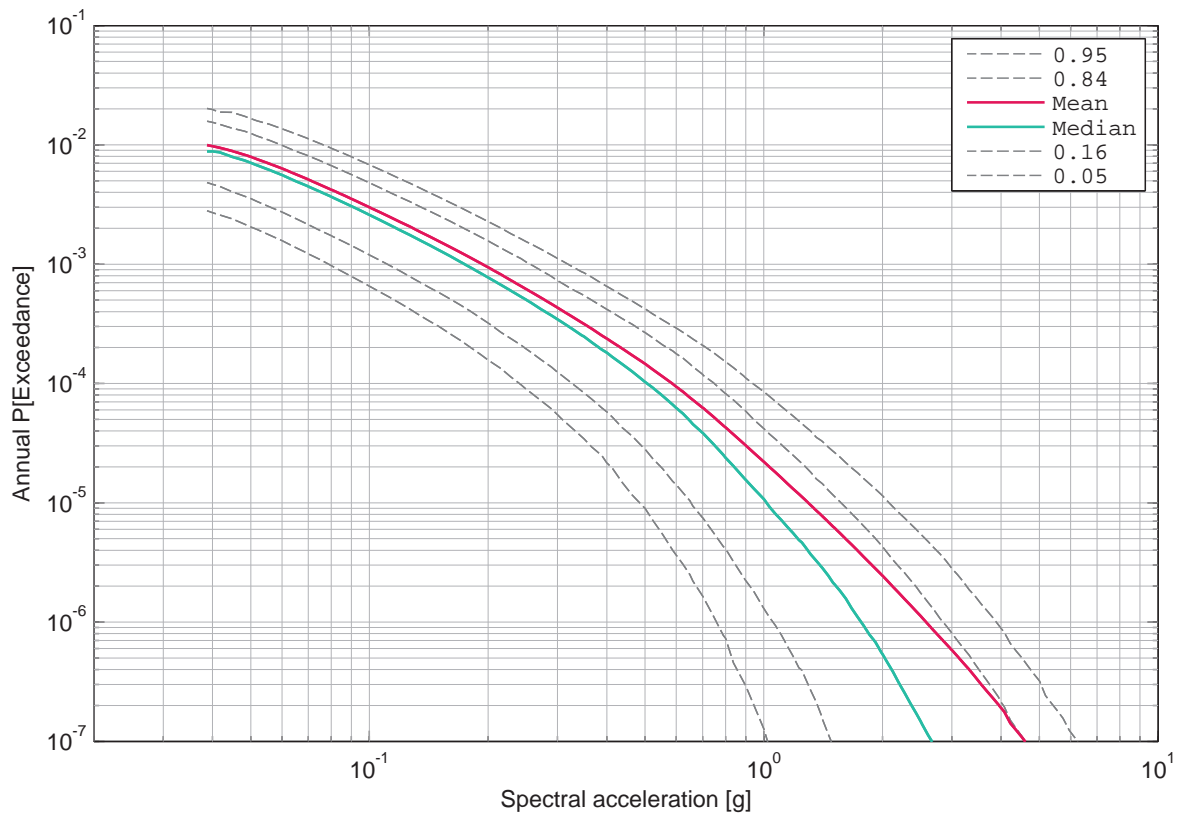


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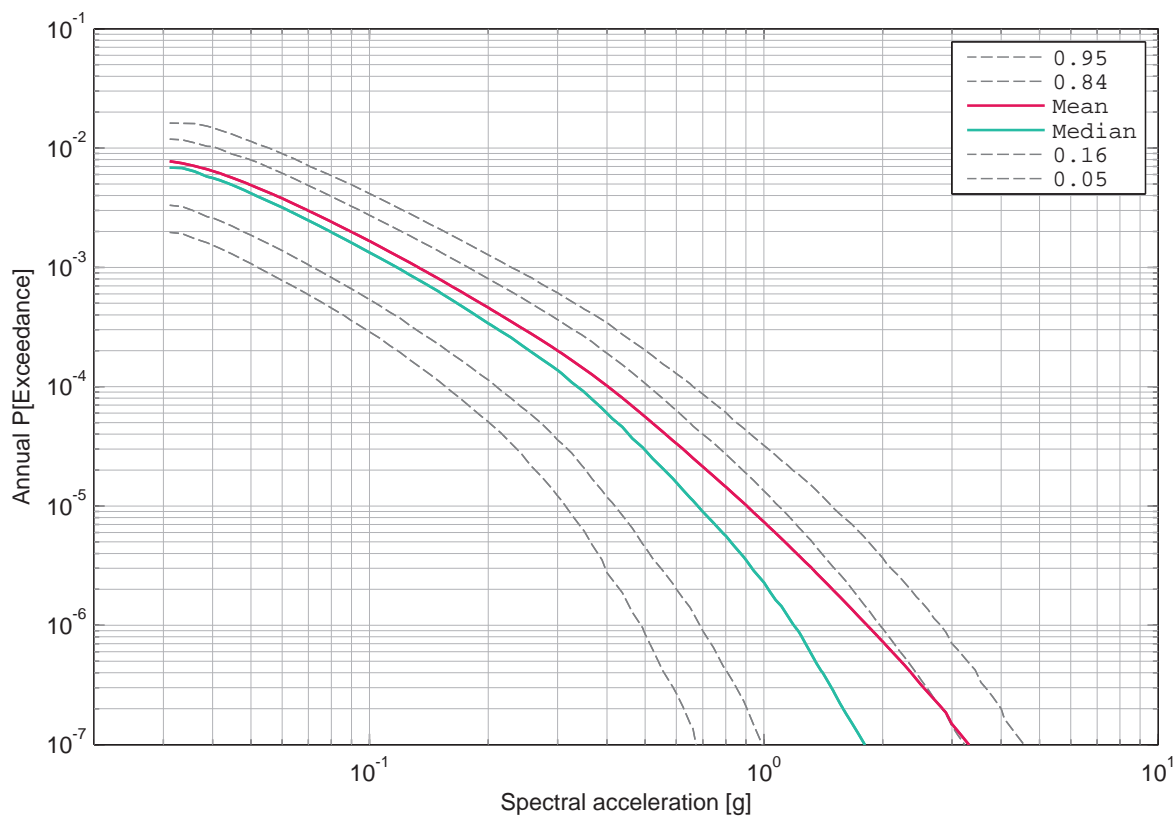


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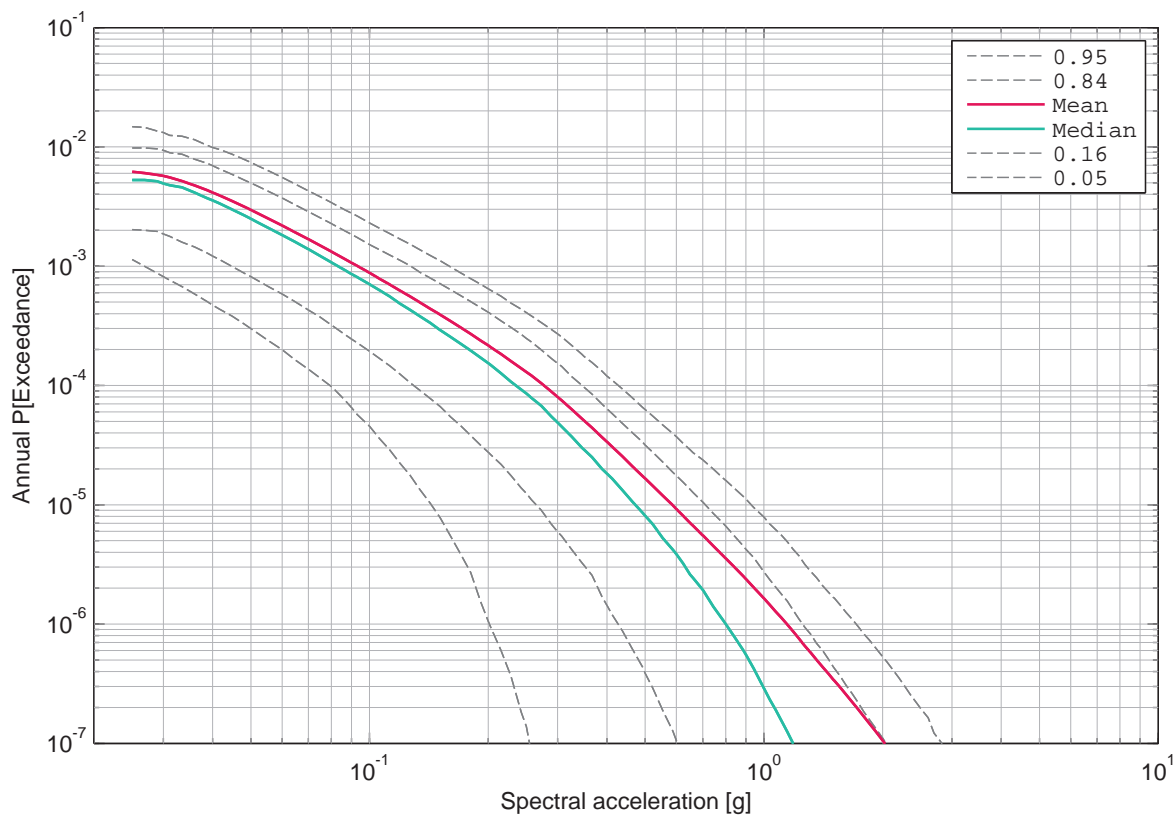


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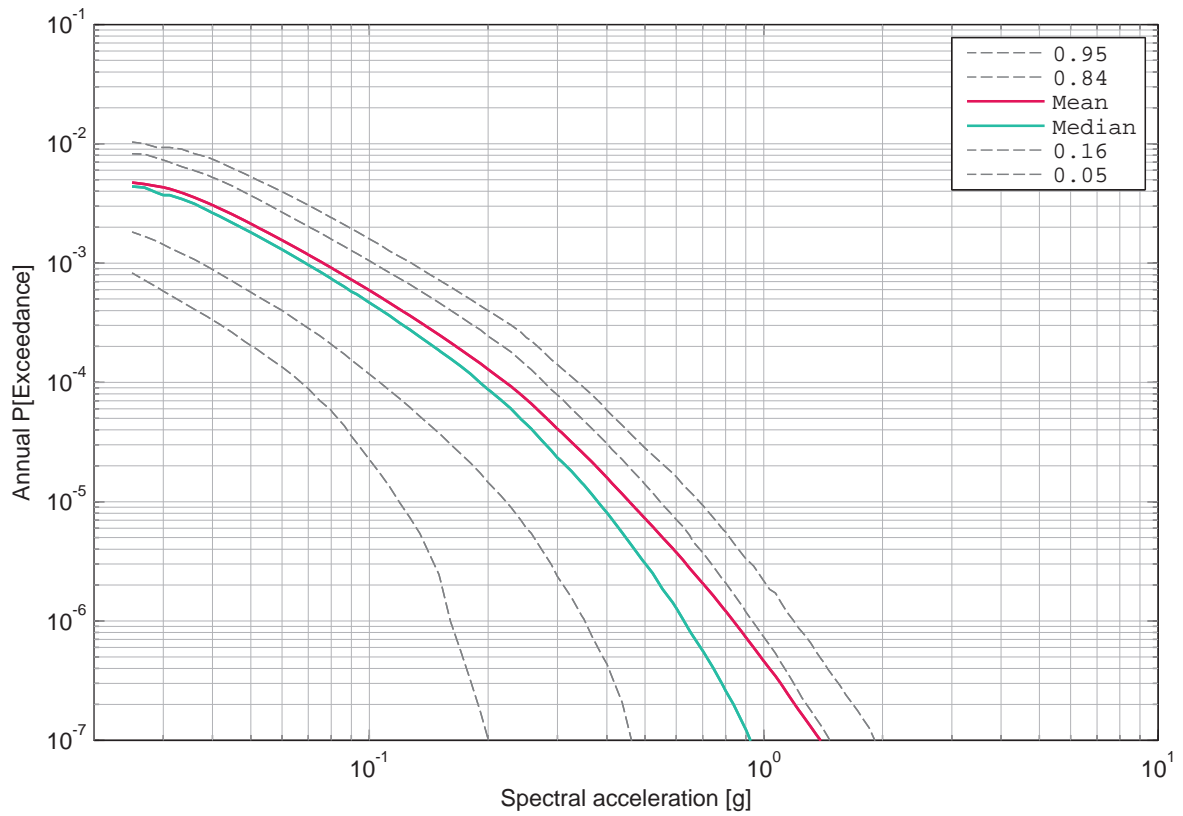


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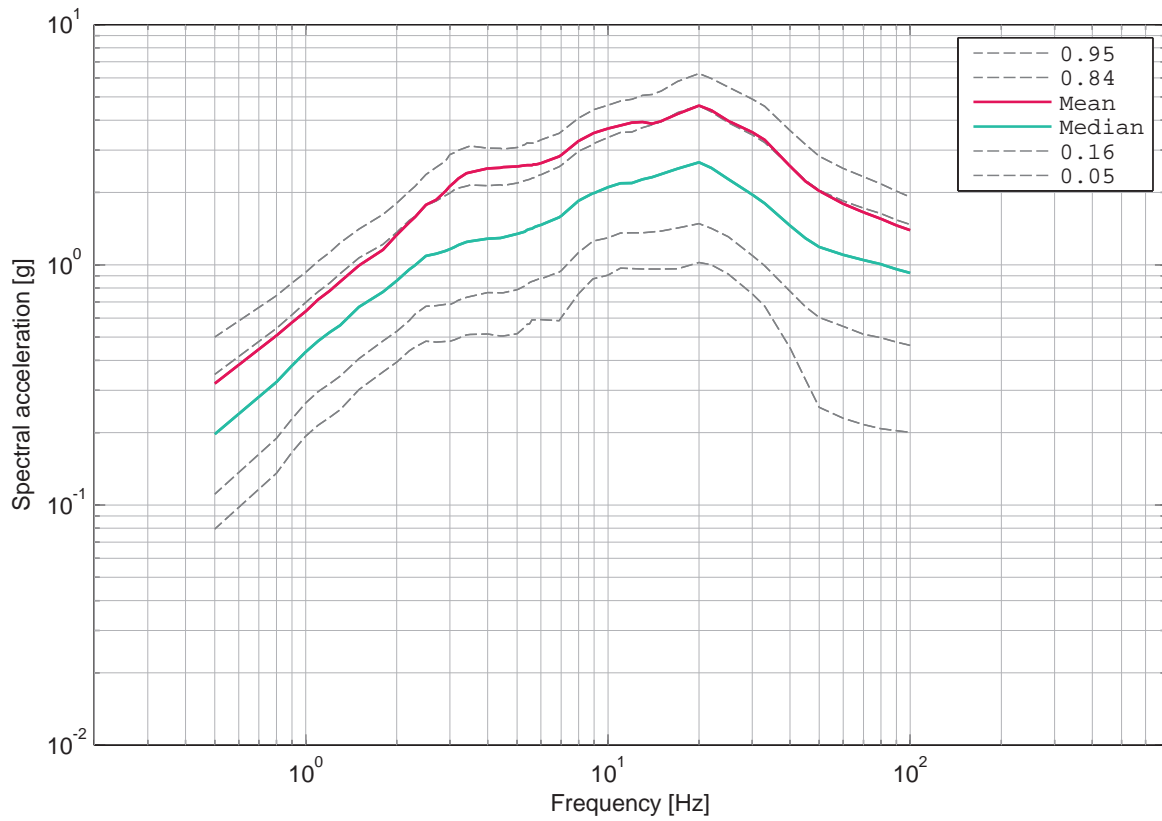


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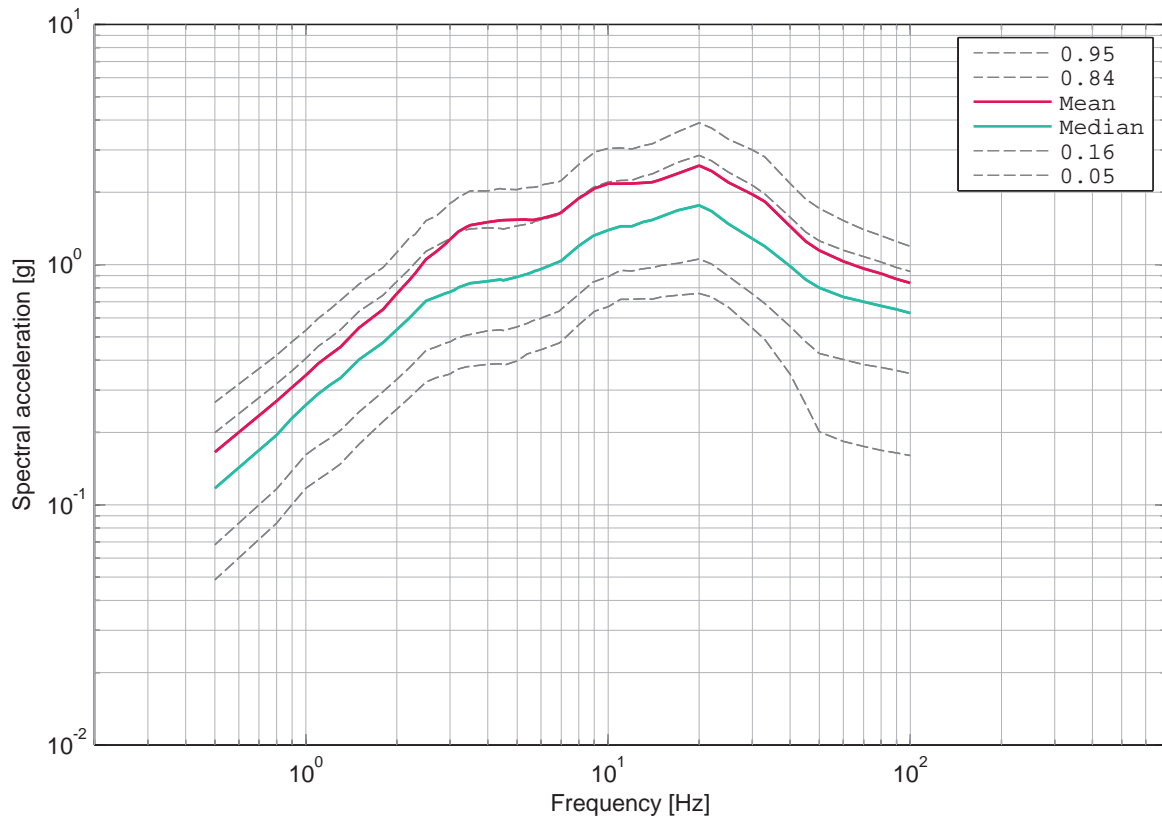


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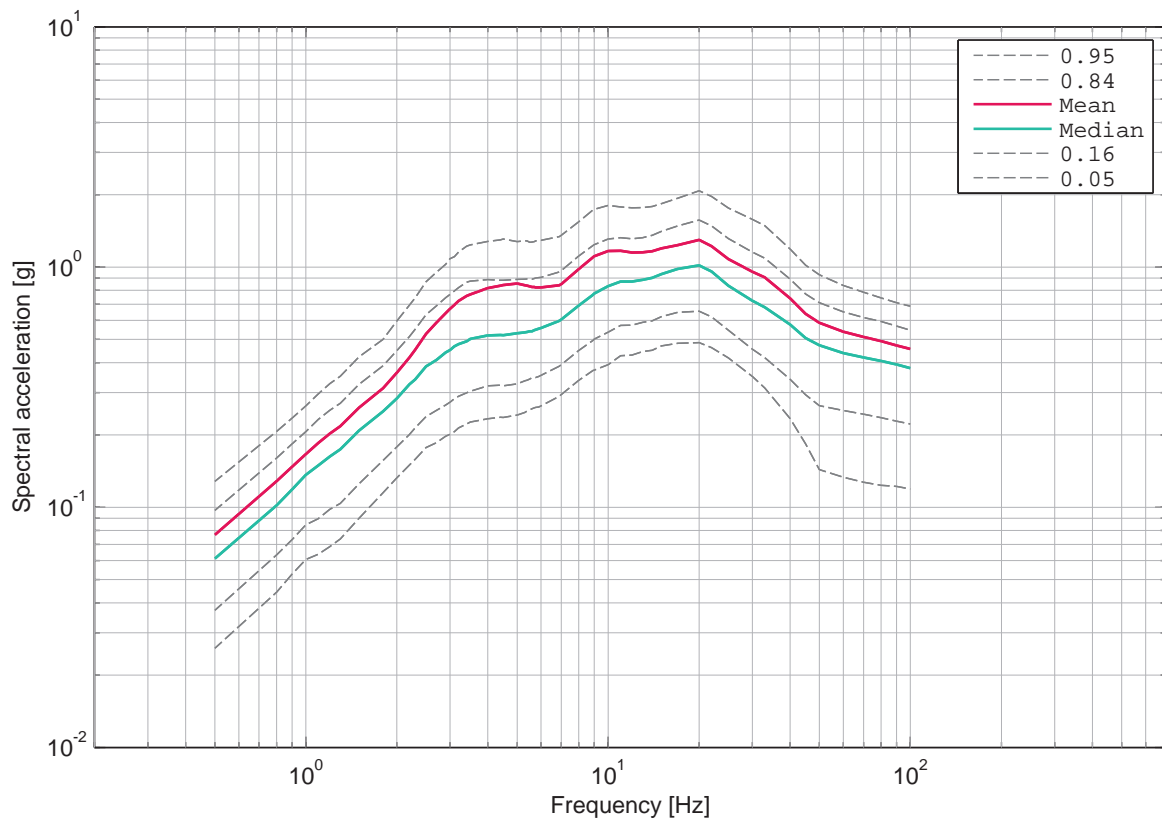


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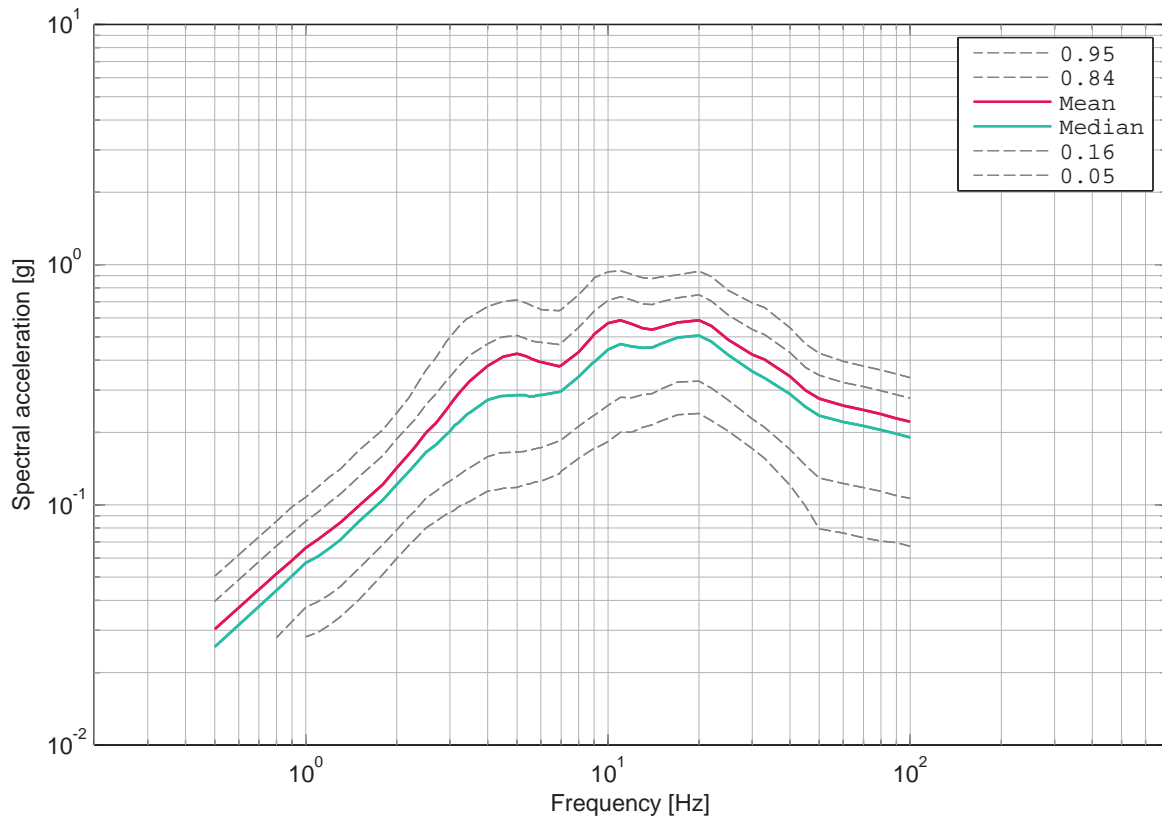


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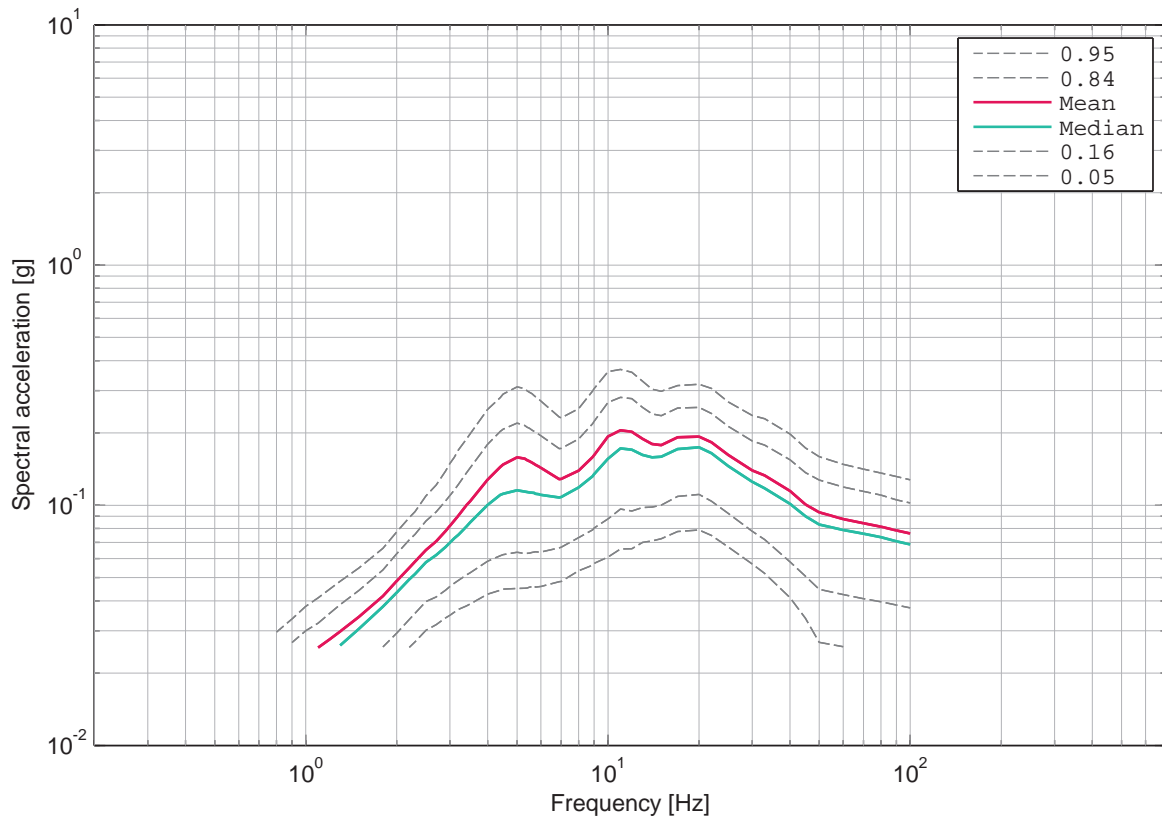


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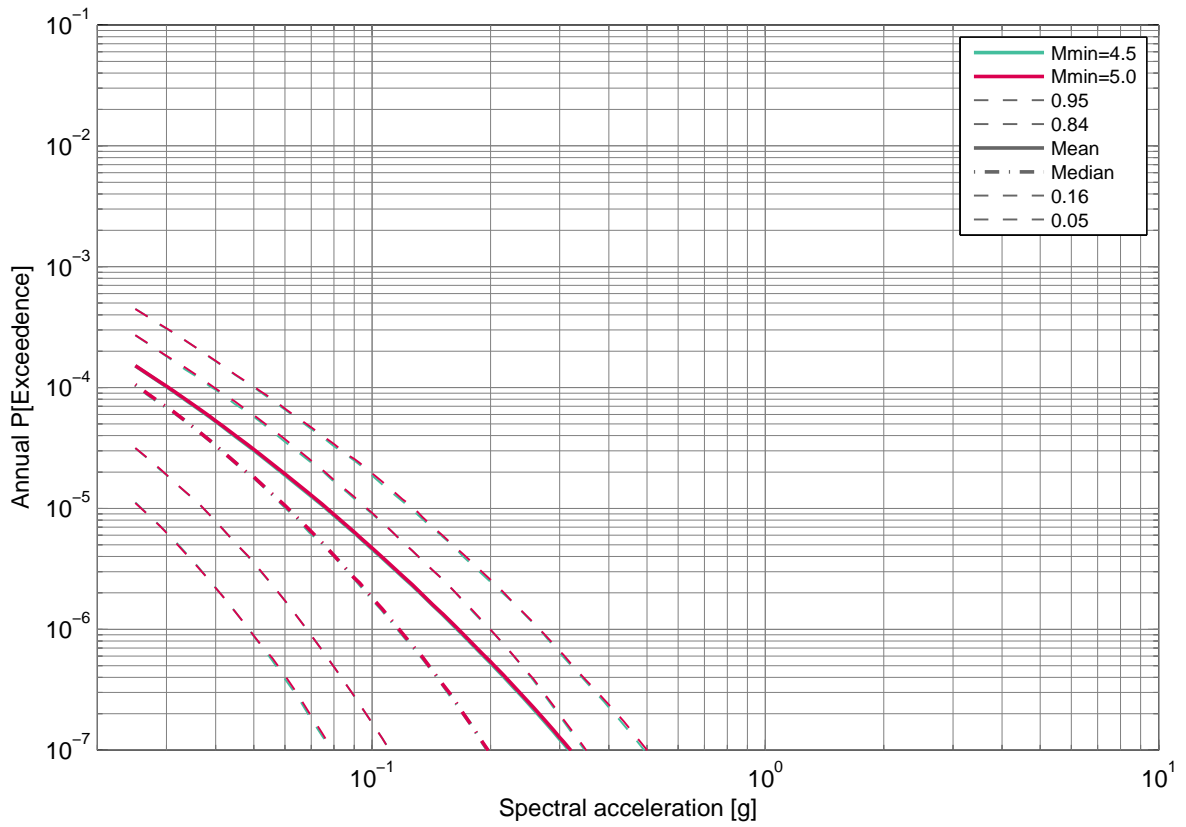


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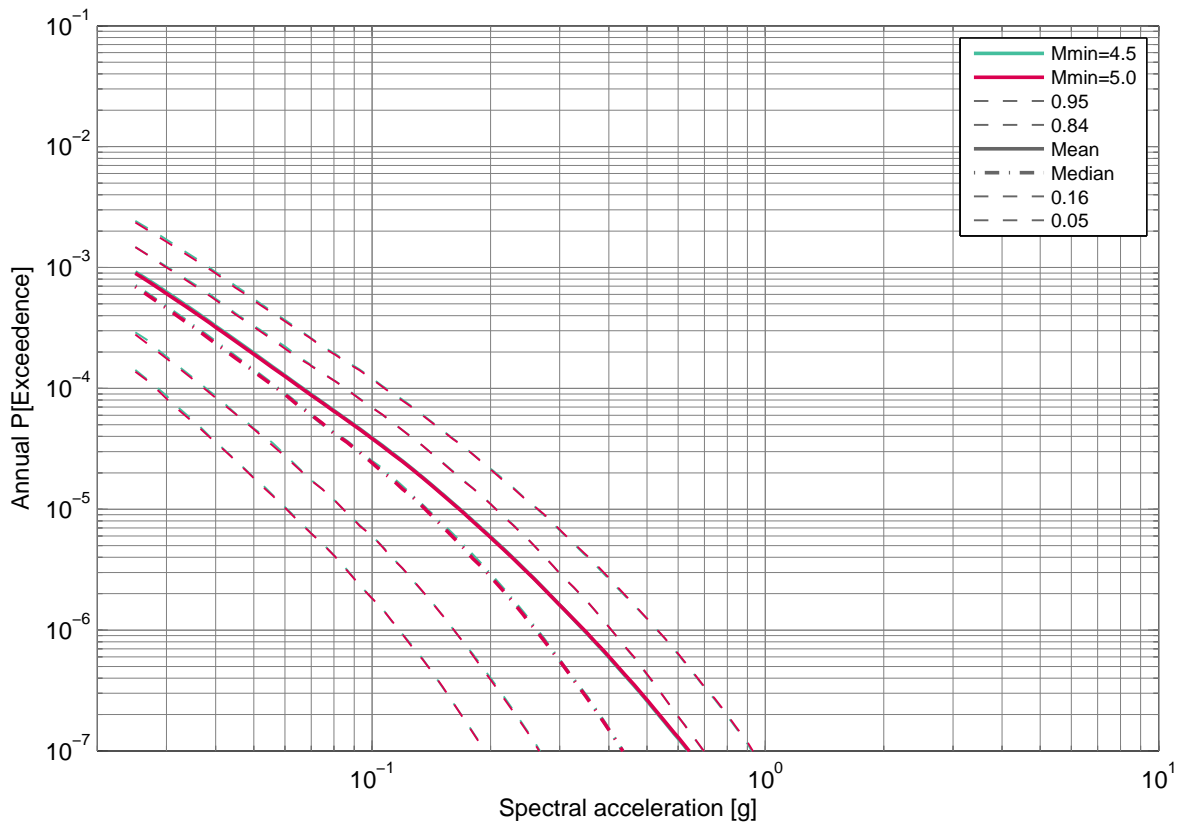


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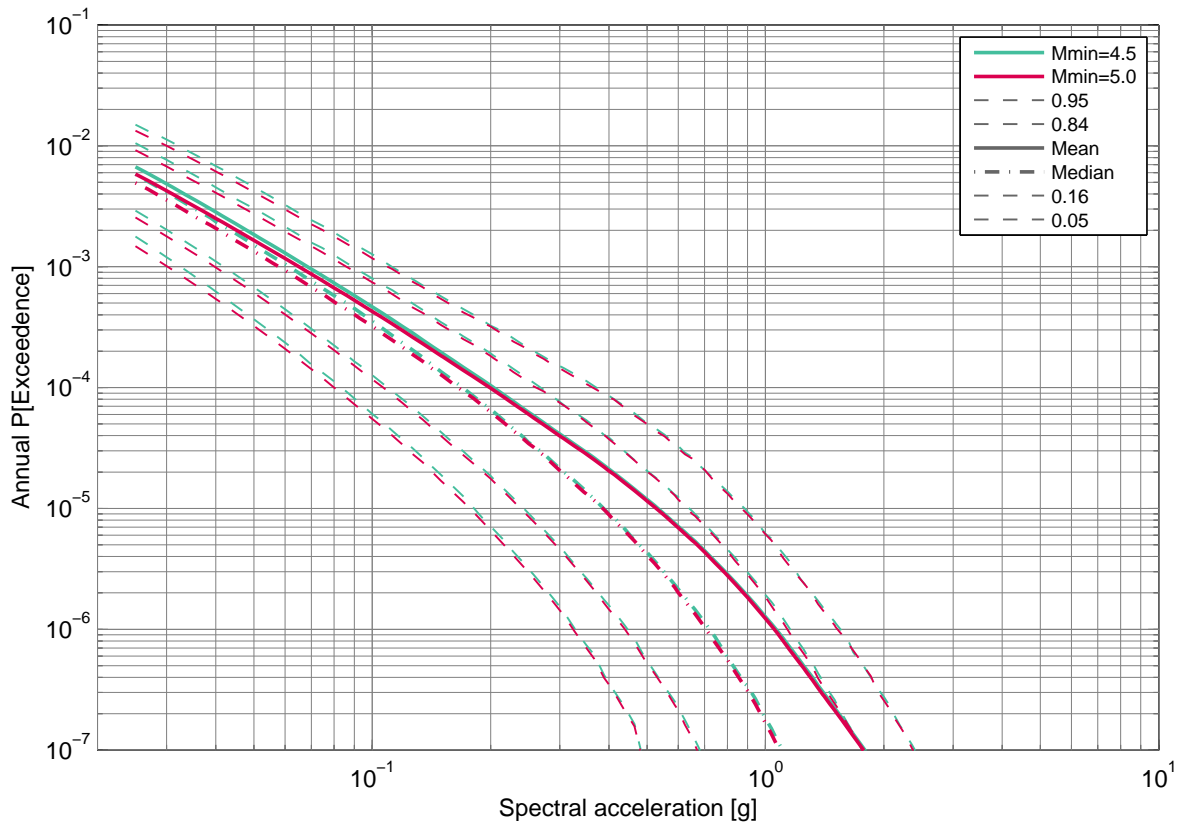


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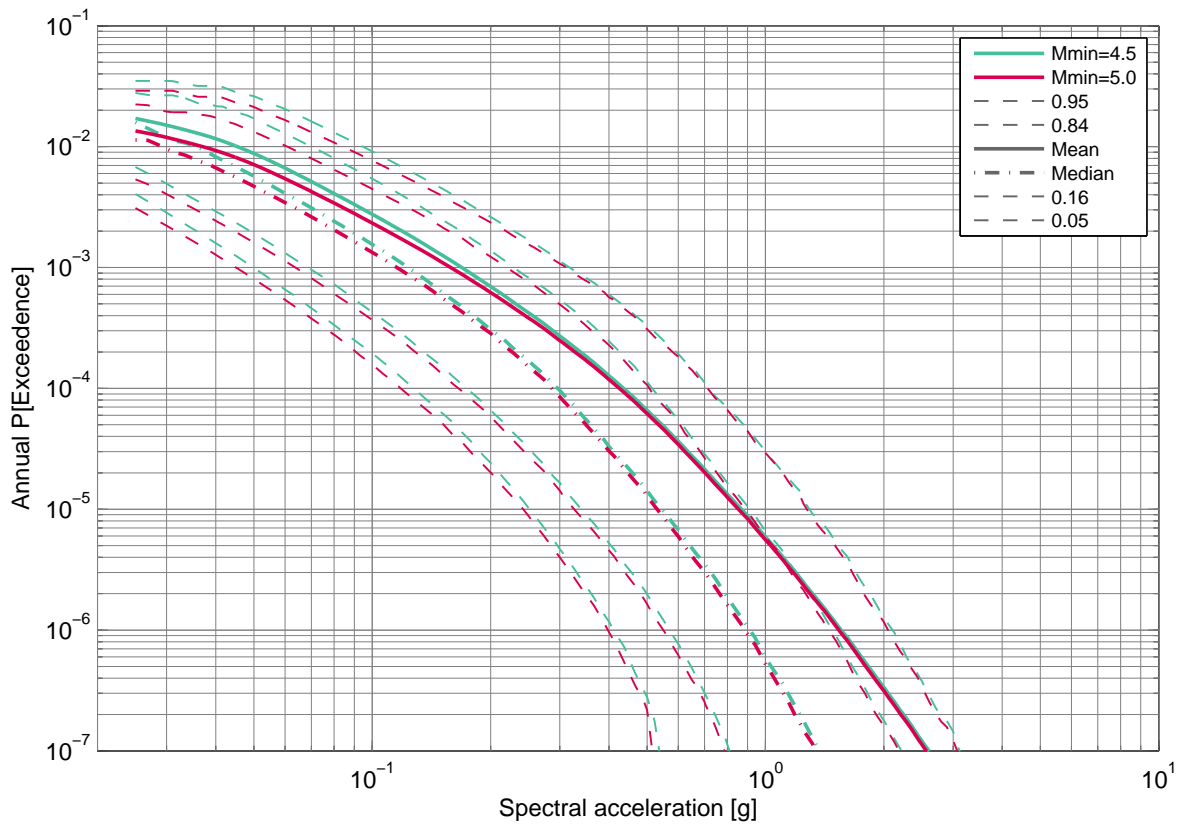


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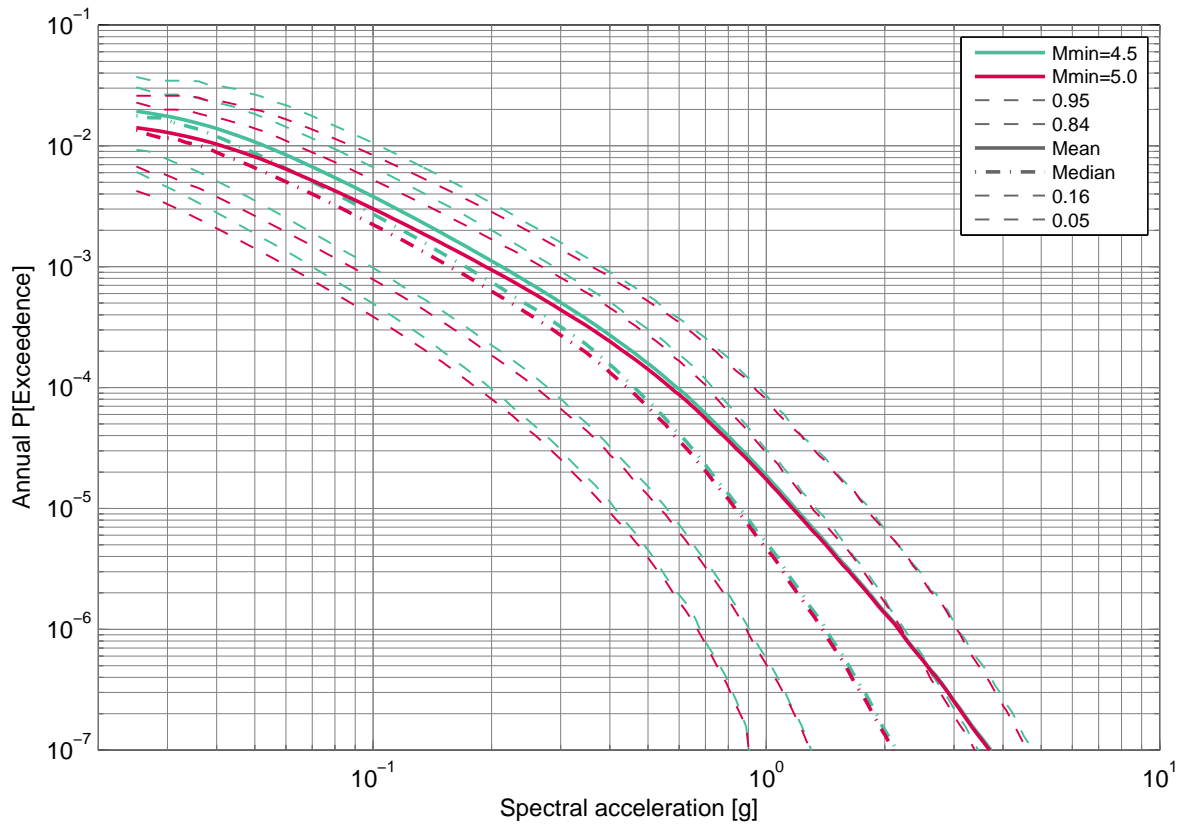


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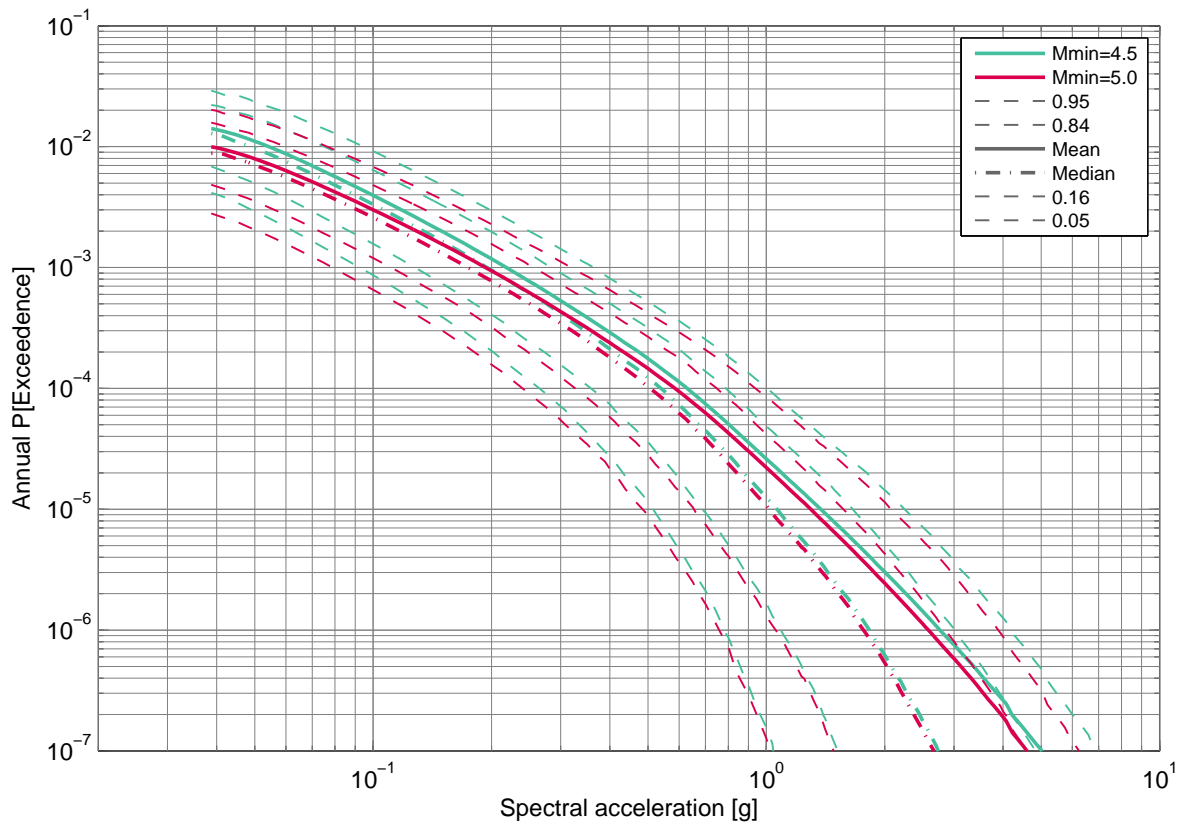


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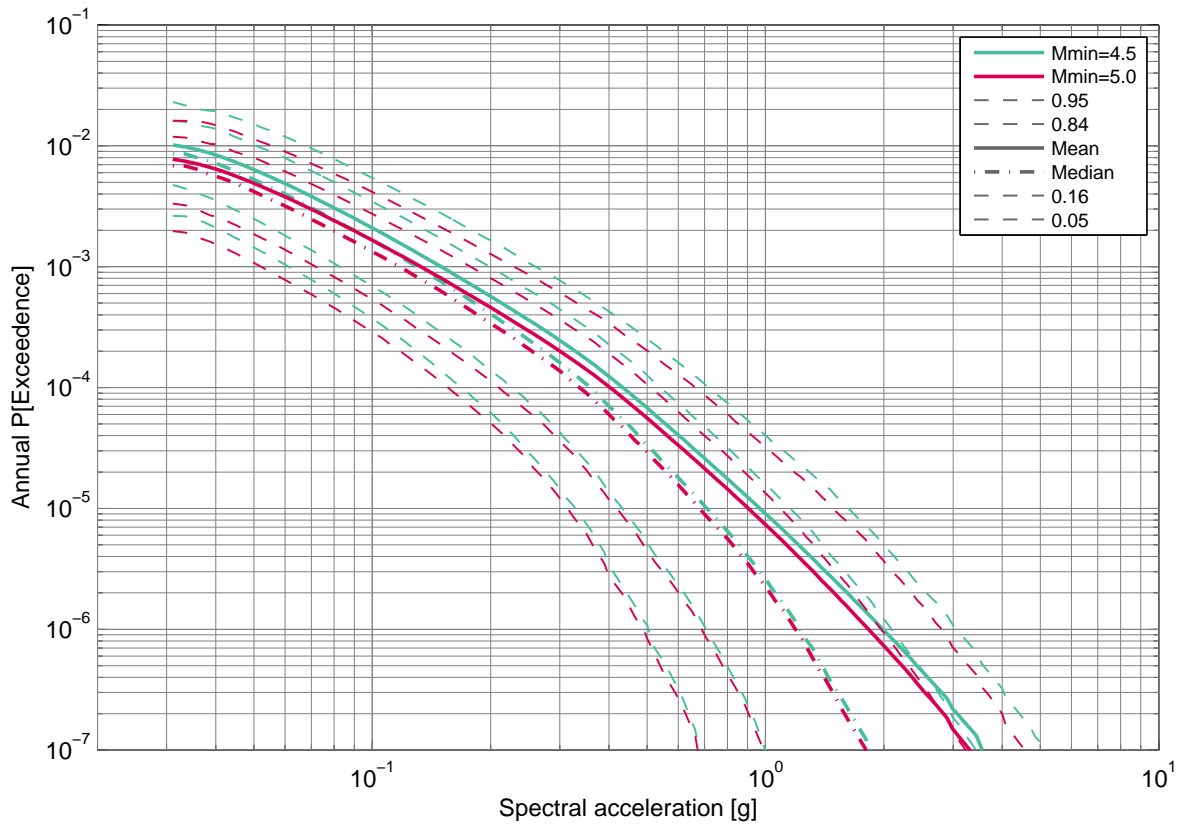


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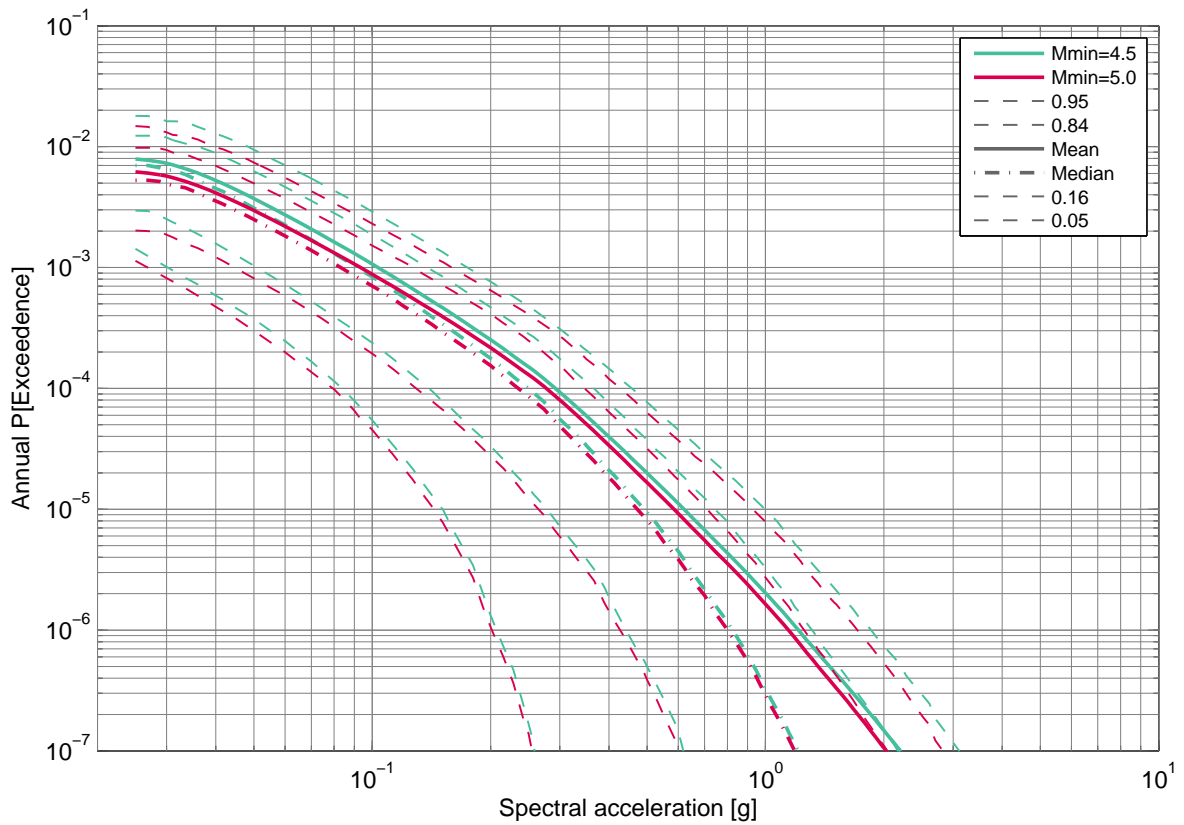


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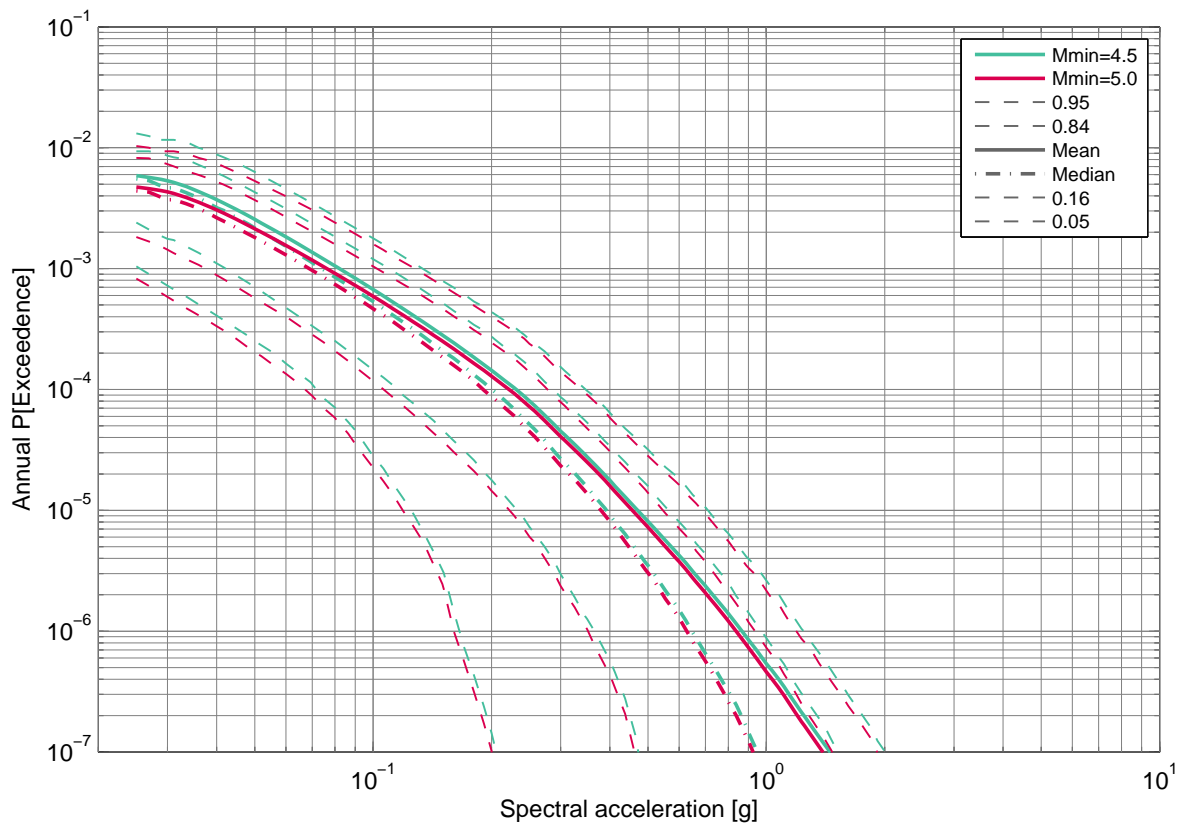


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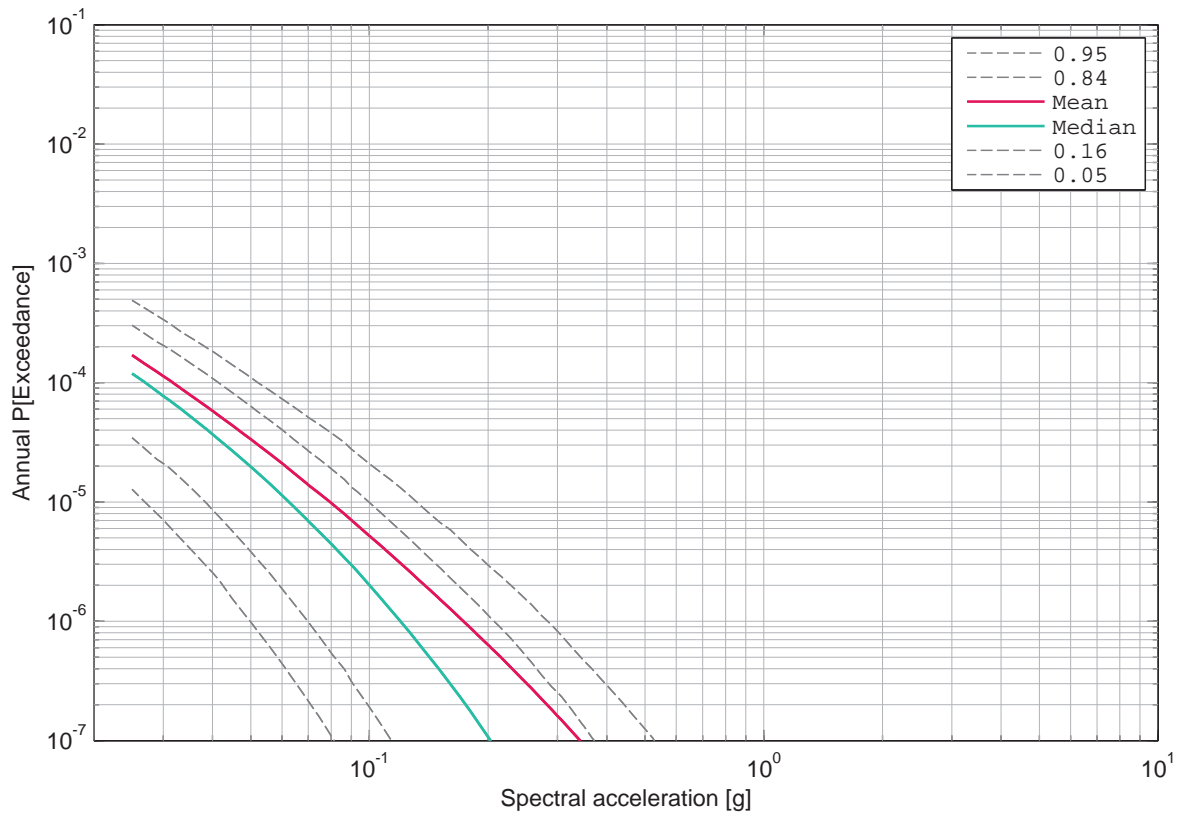


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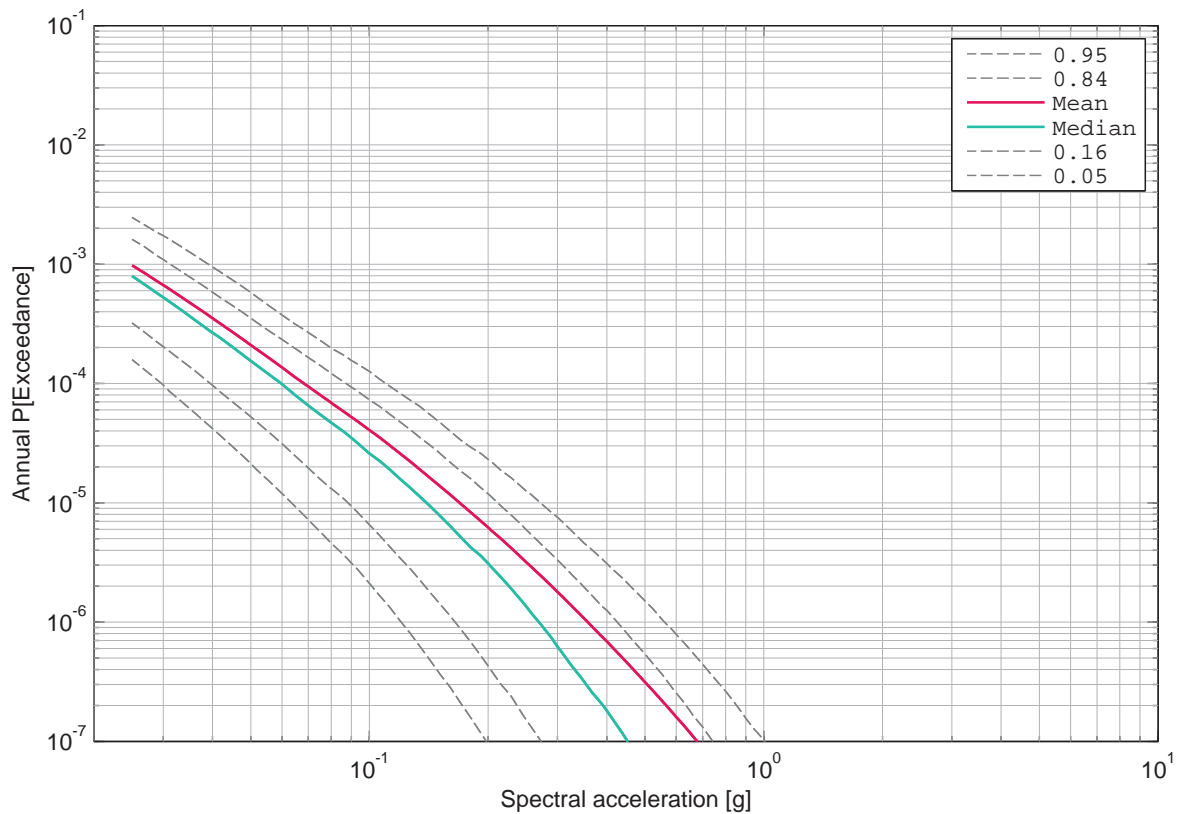


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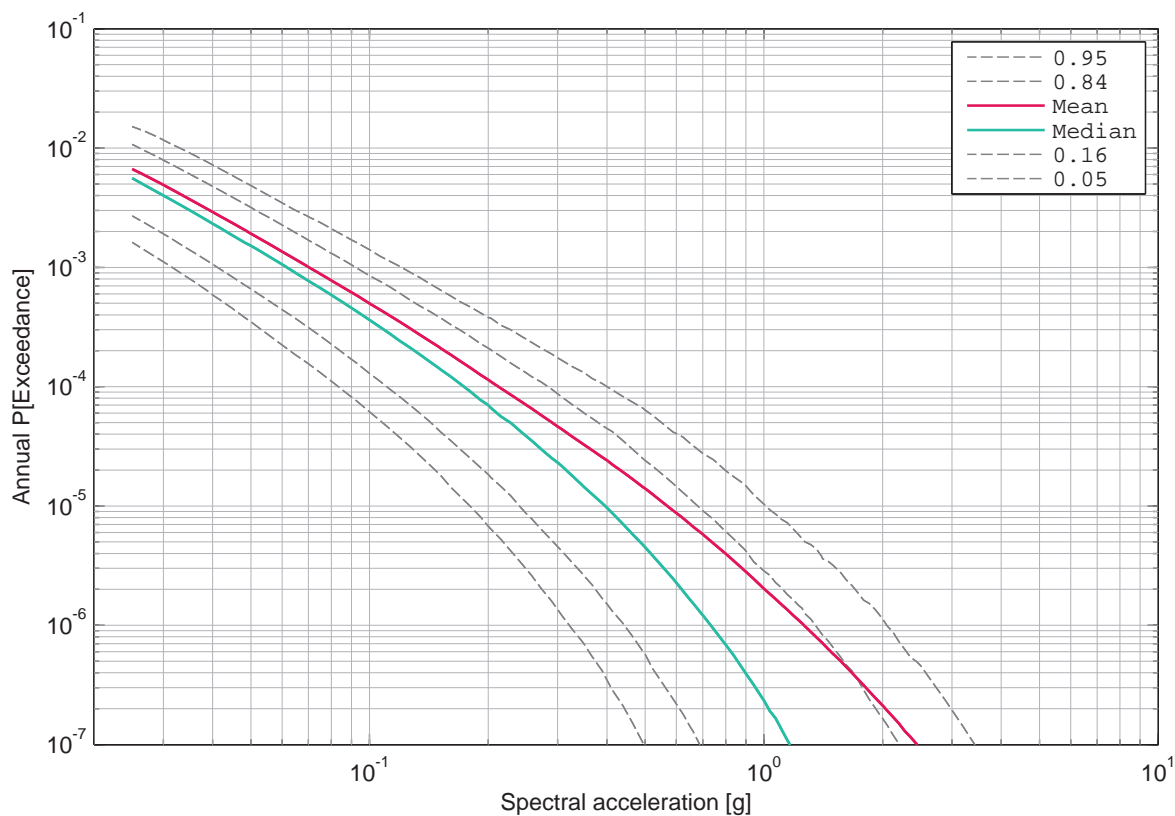


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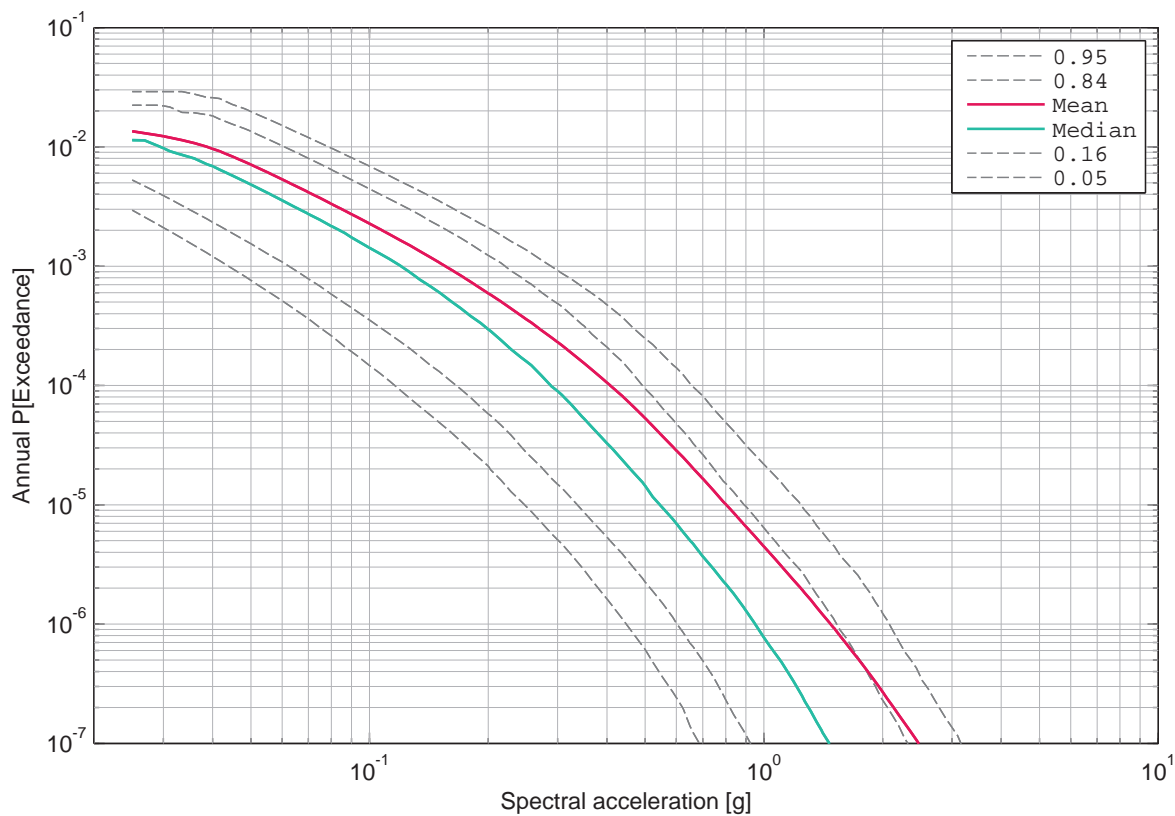


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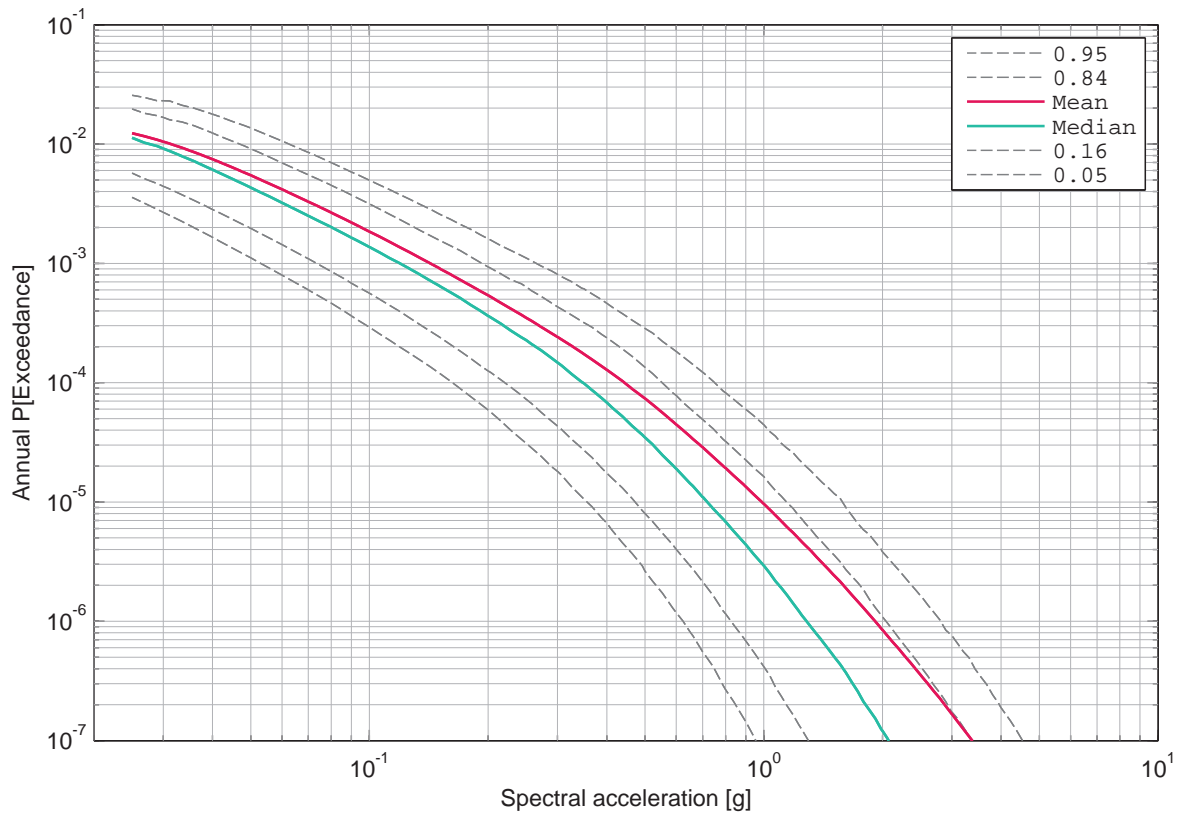


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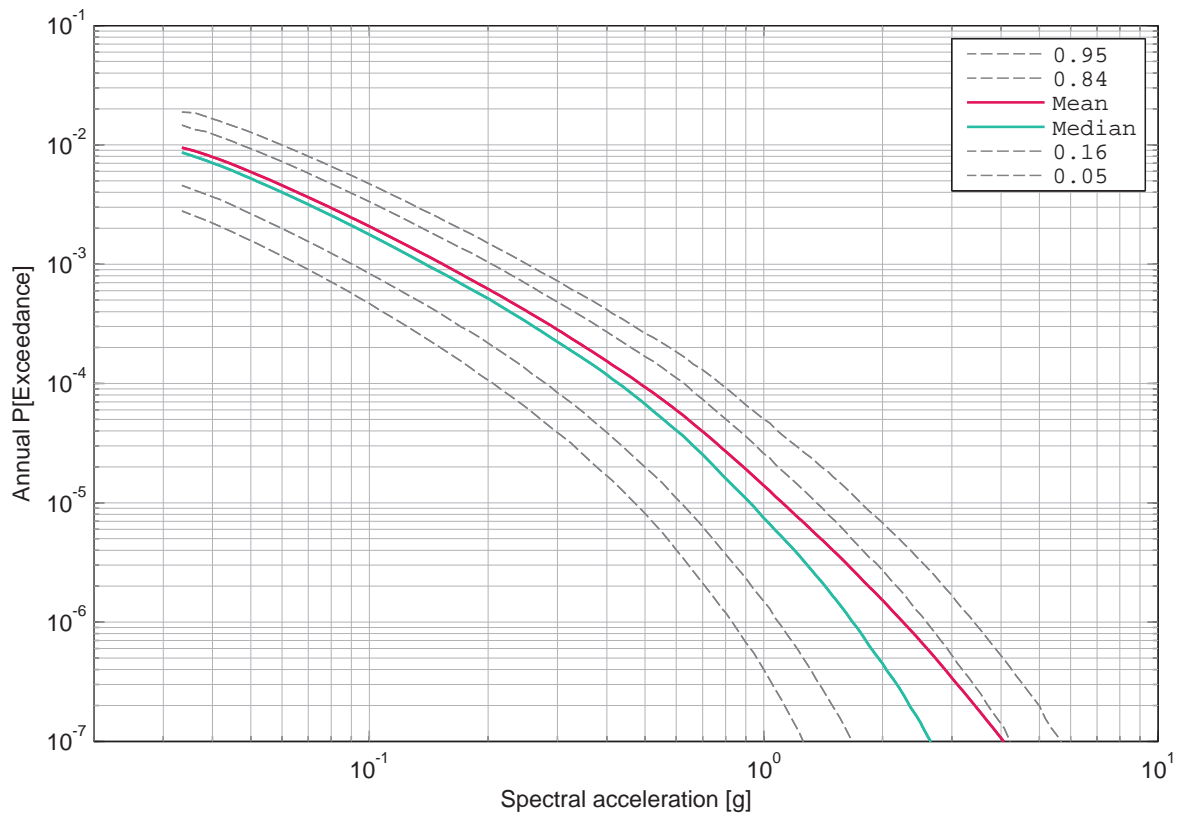


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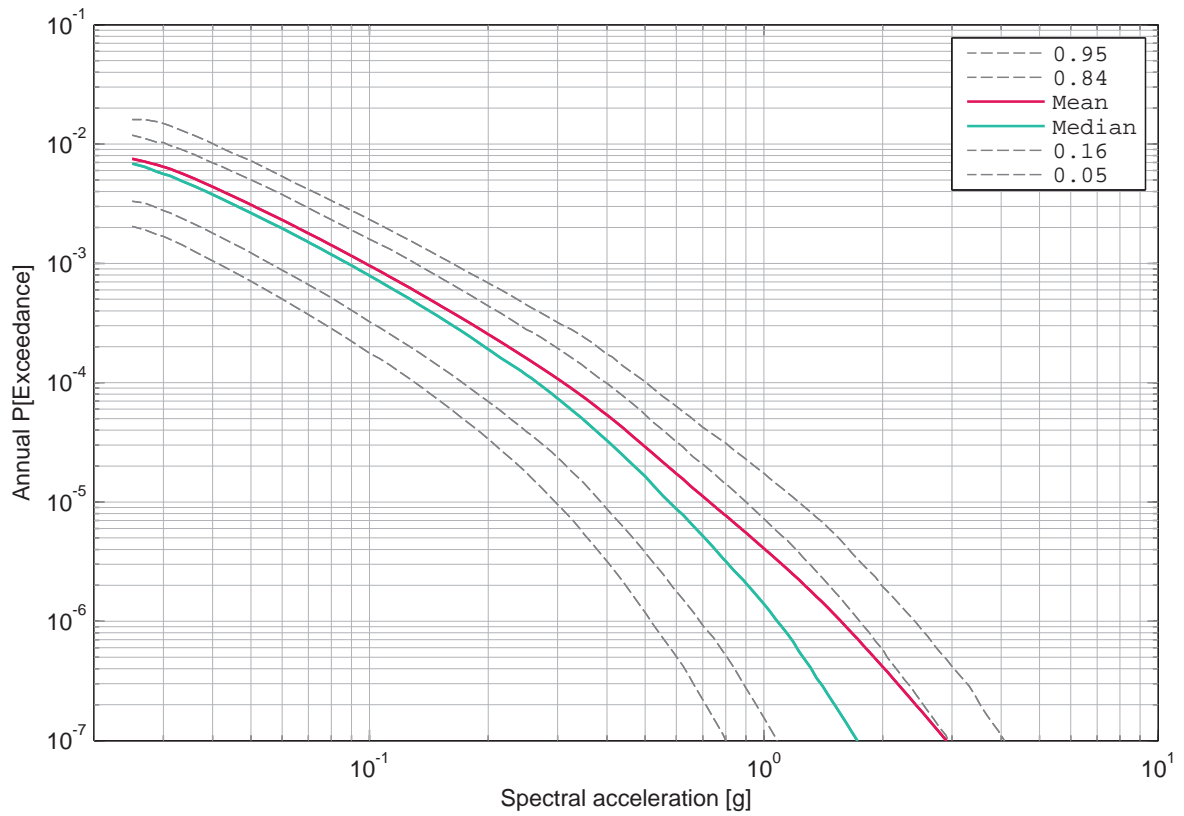


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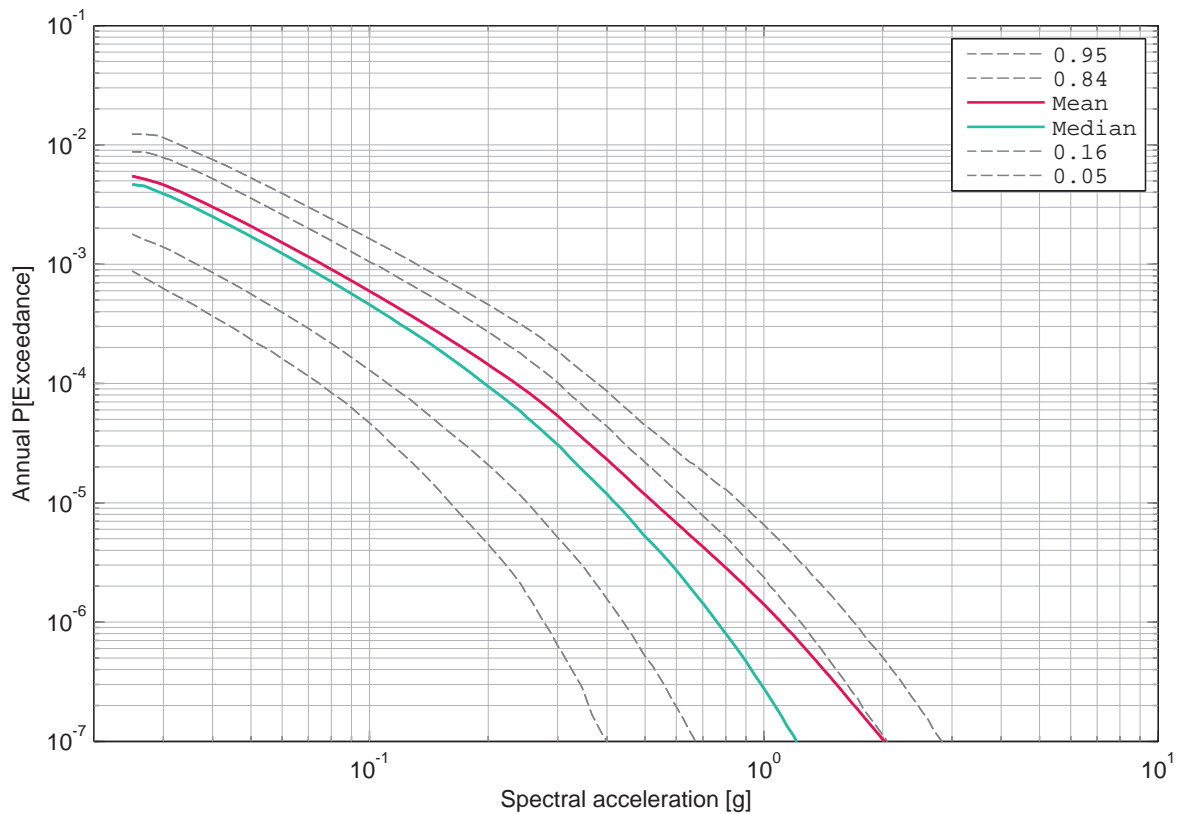


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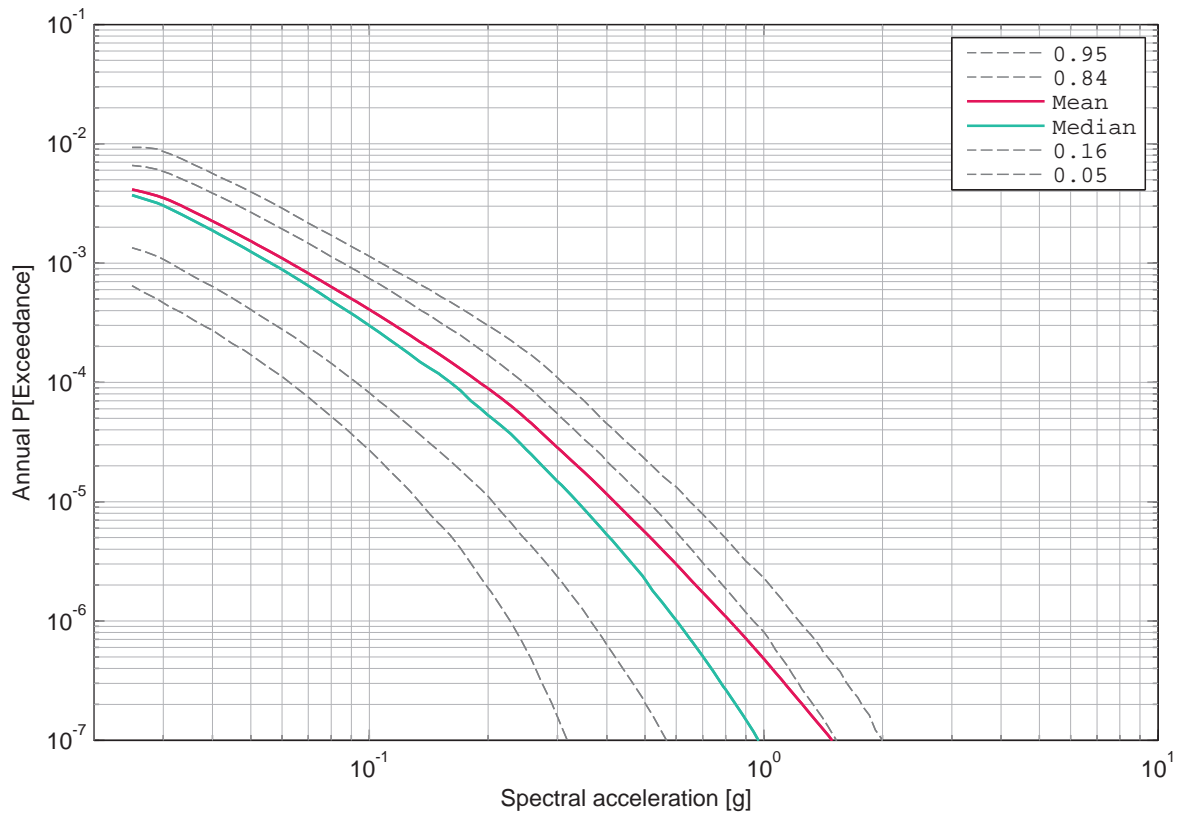


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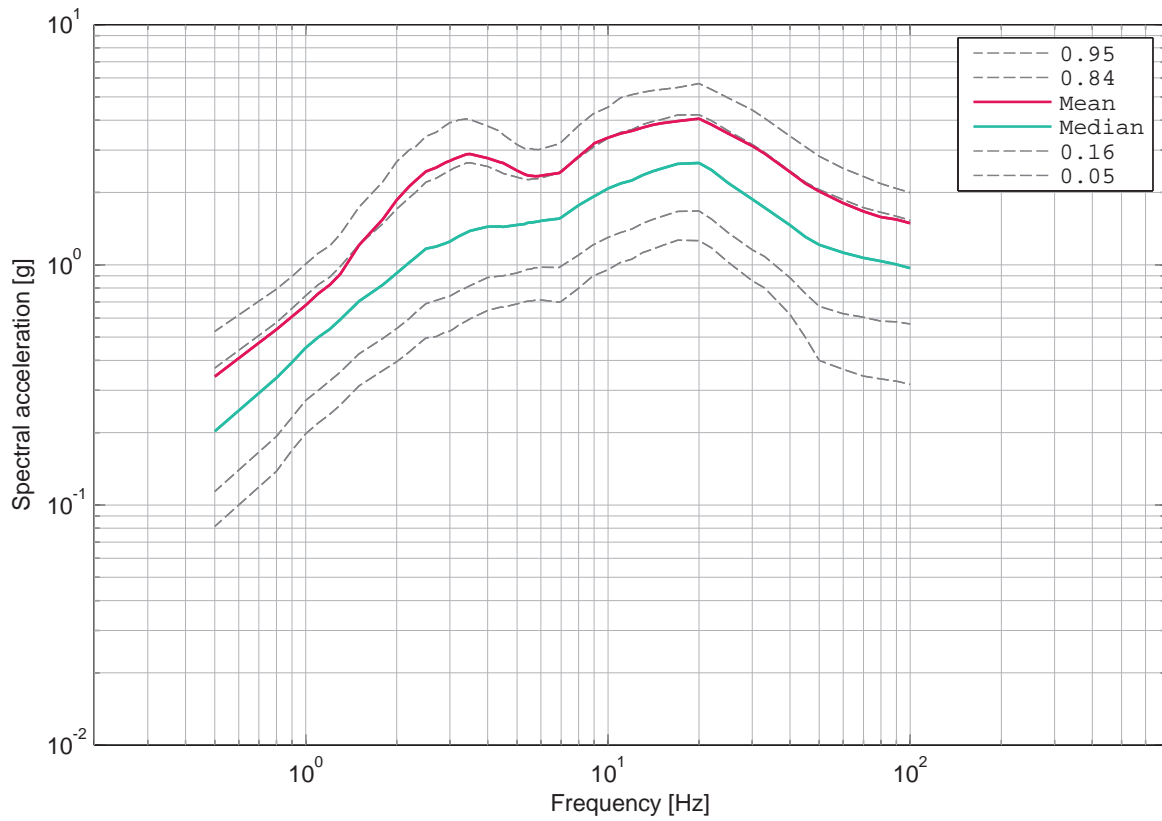


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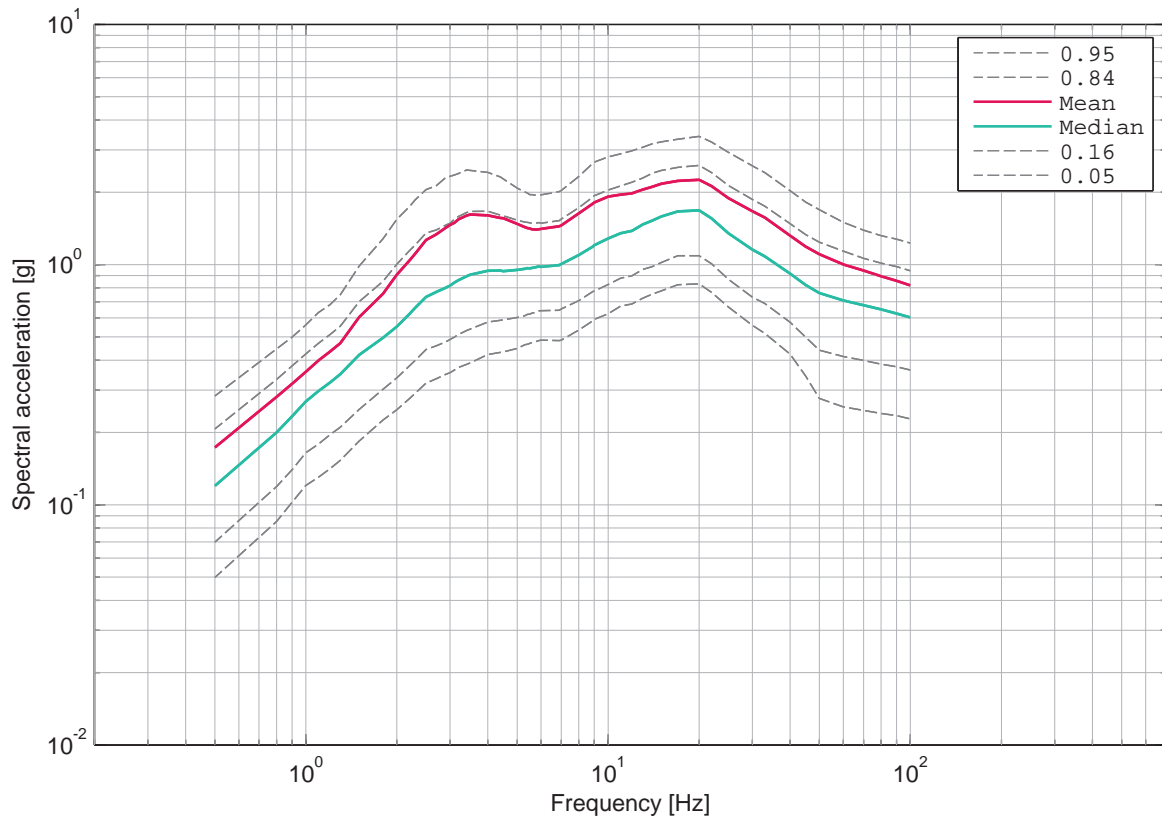


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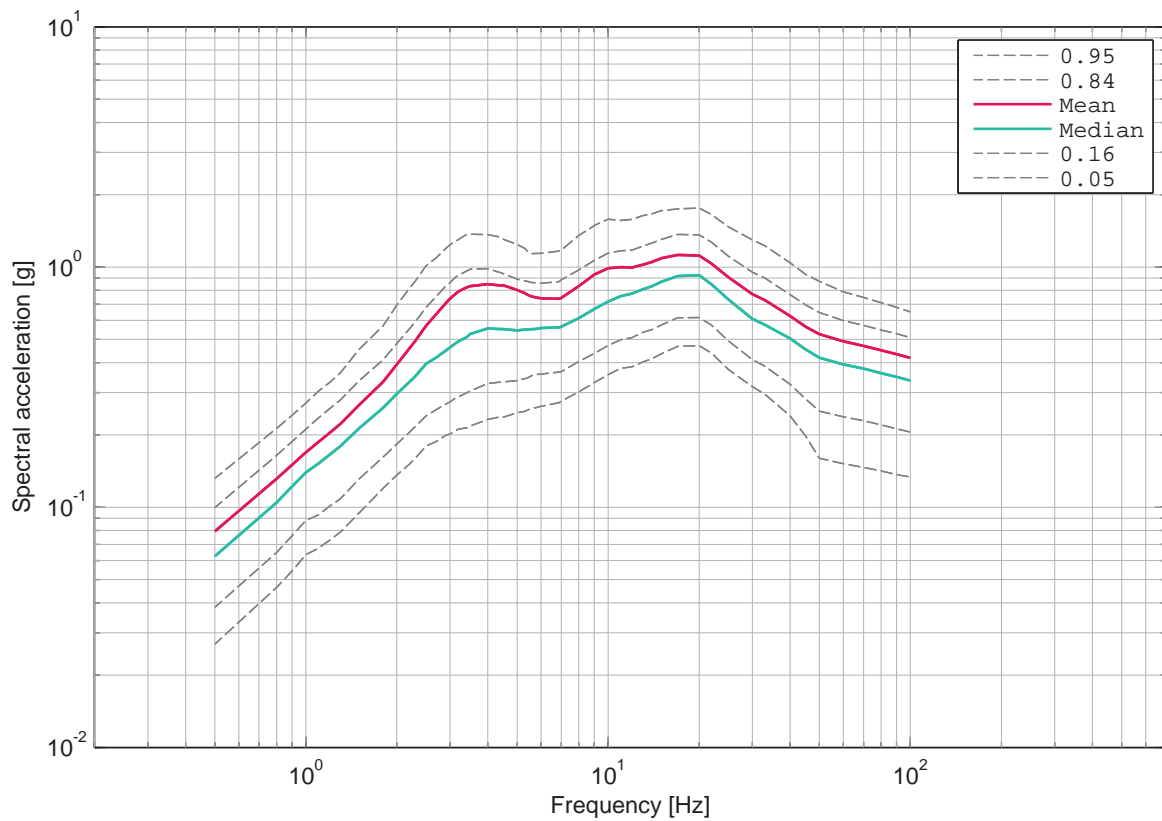


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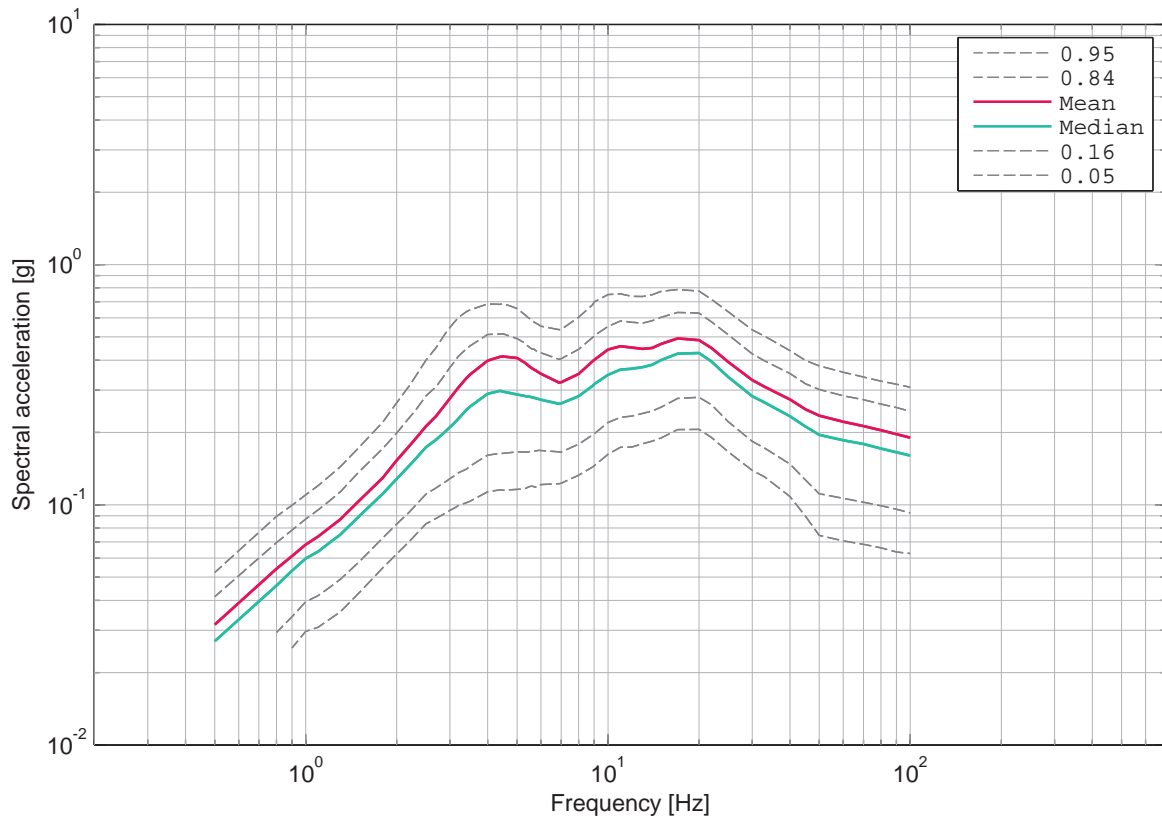


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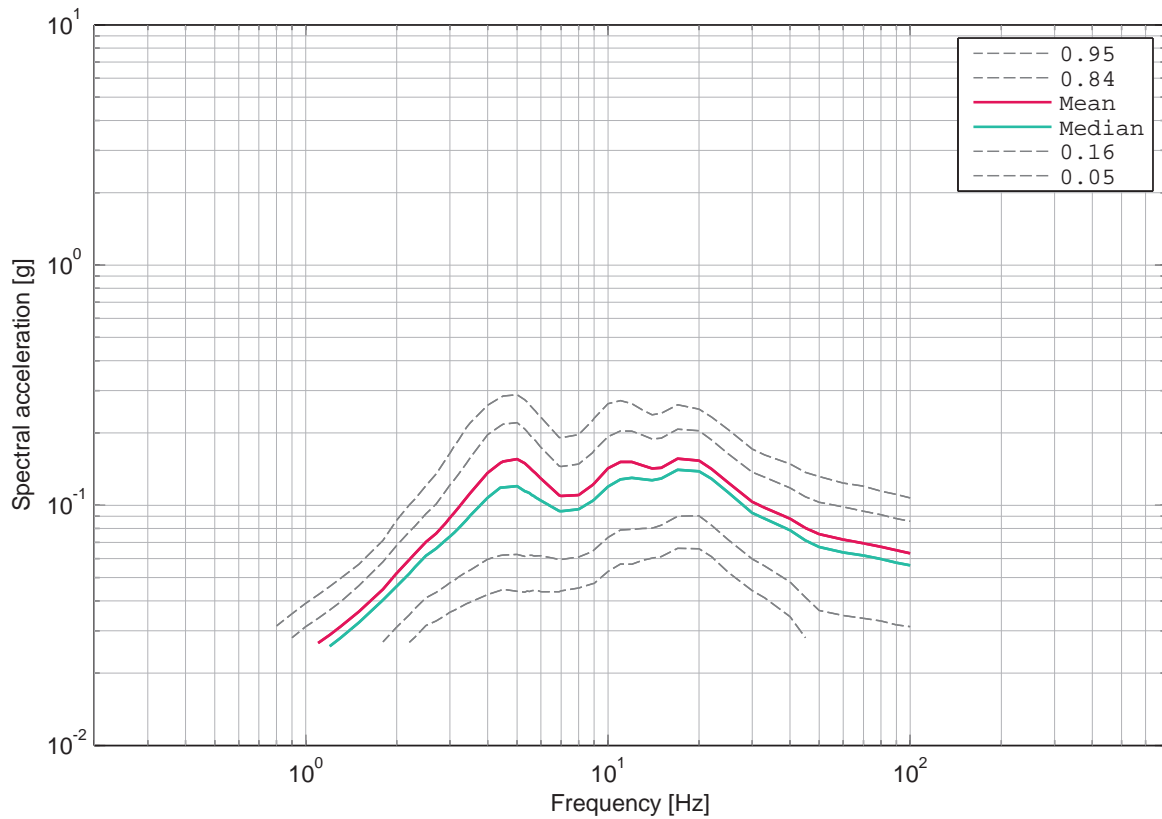


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Chapter 4

LEIBSTADT

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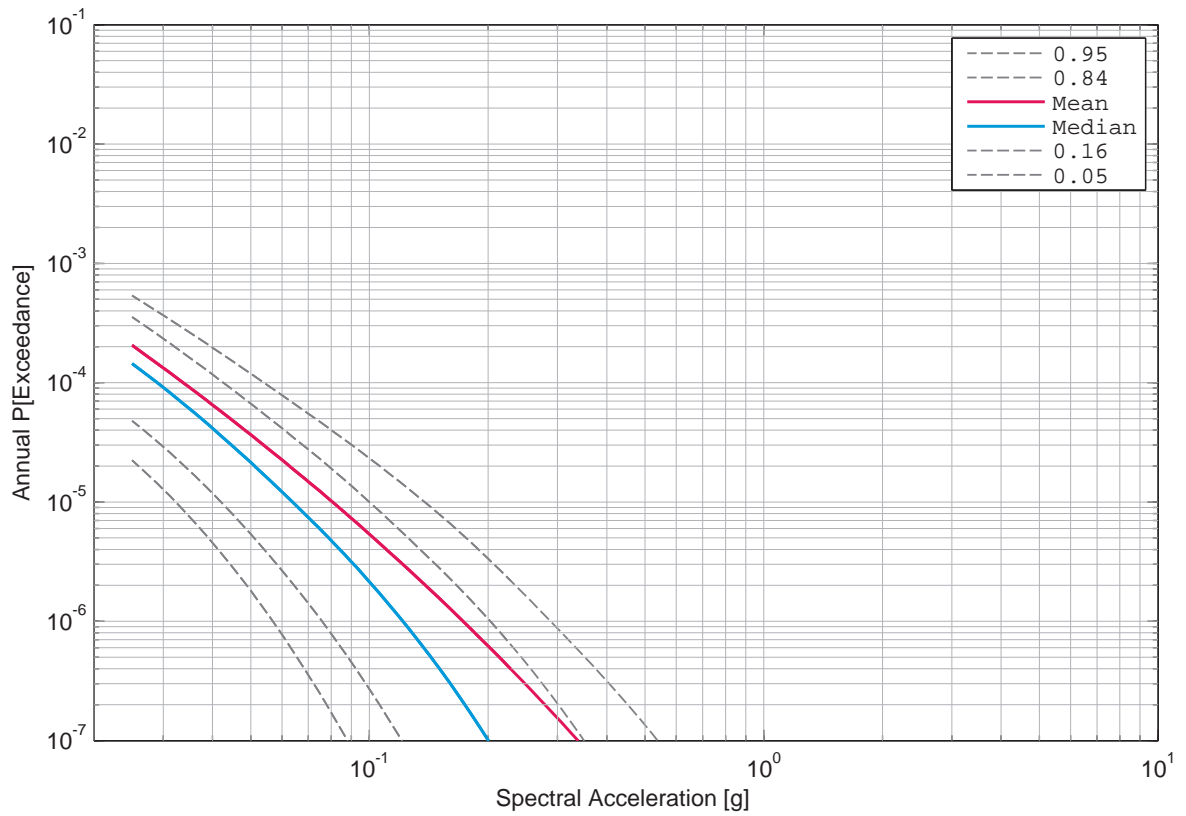


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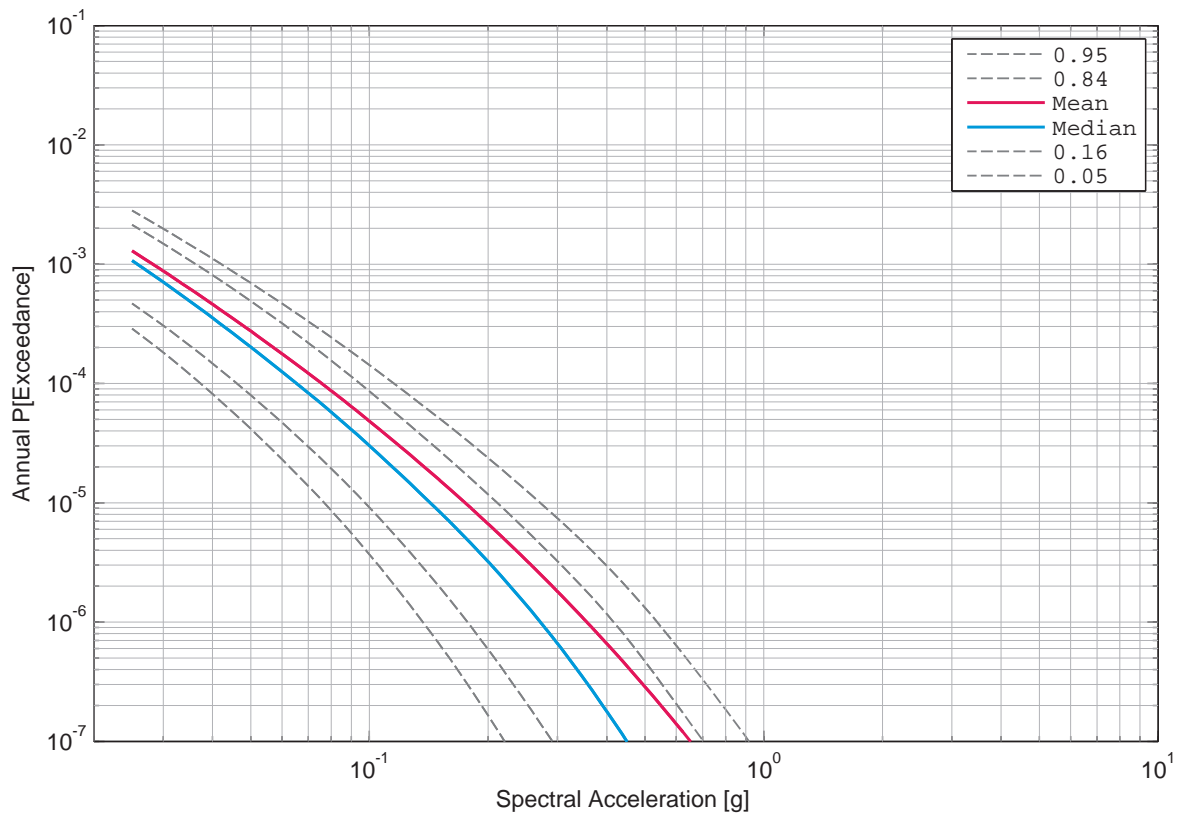


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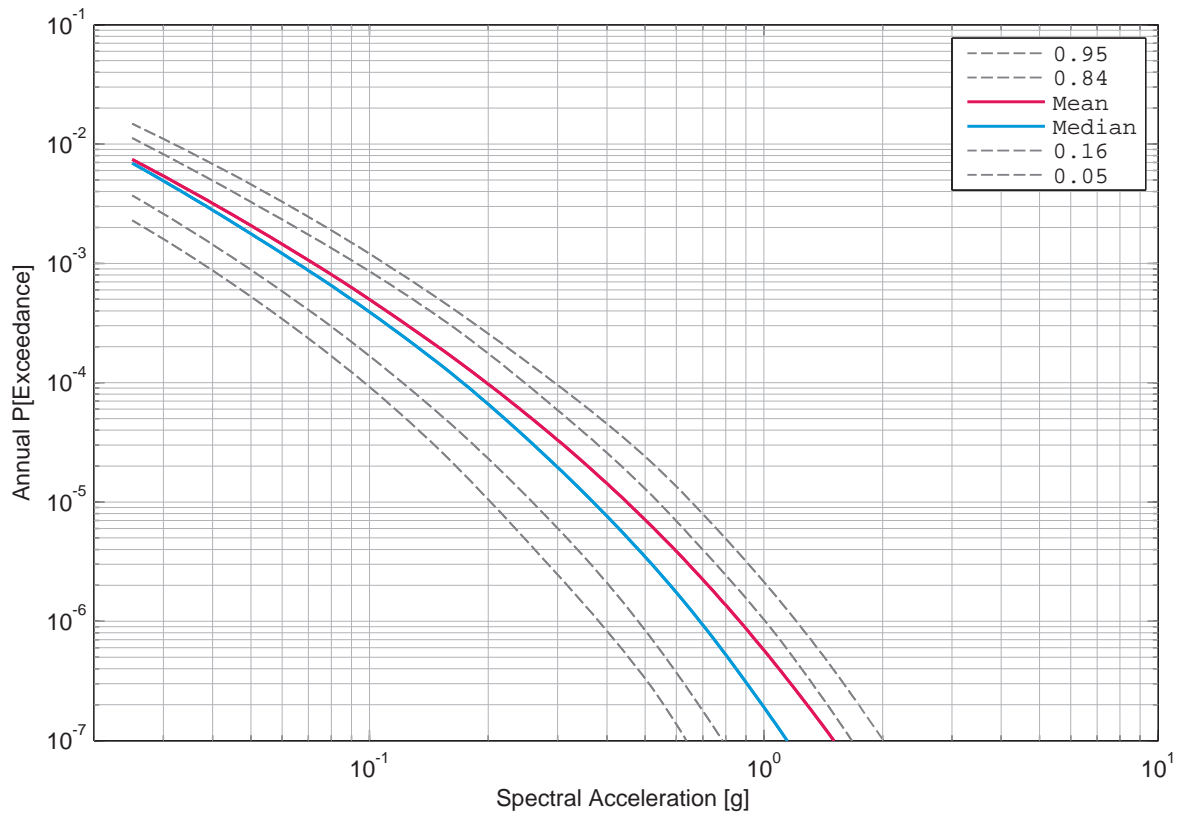


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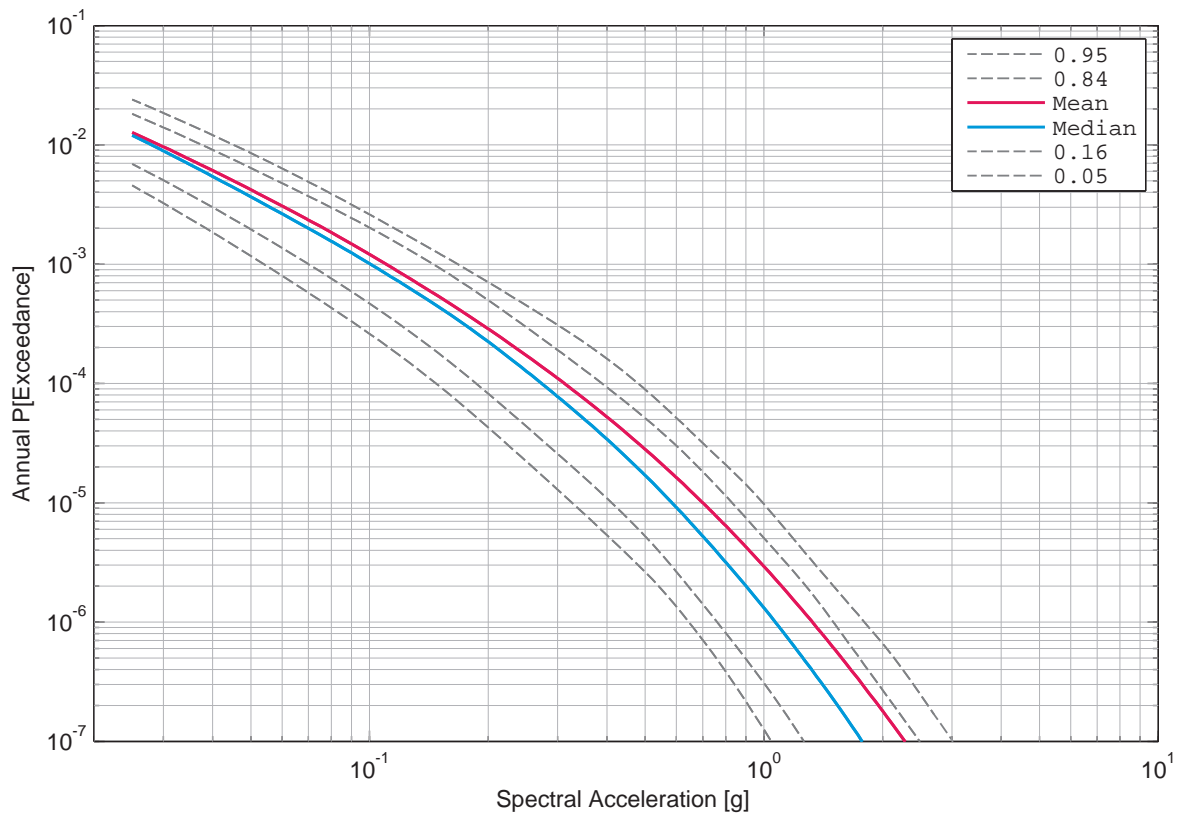


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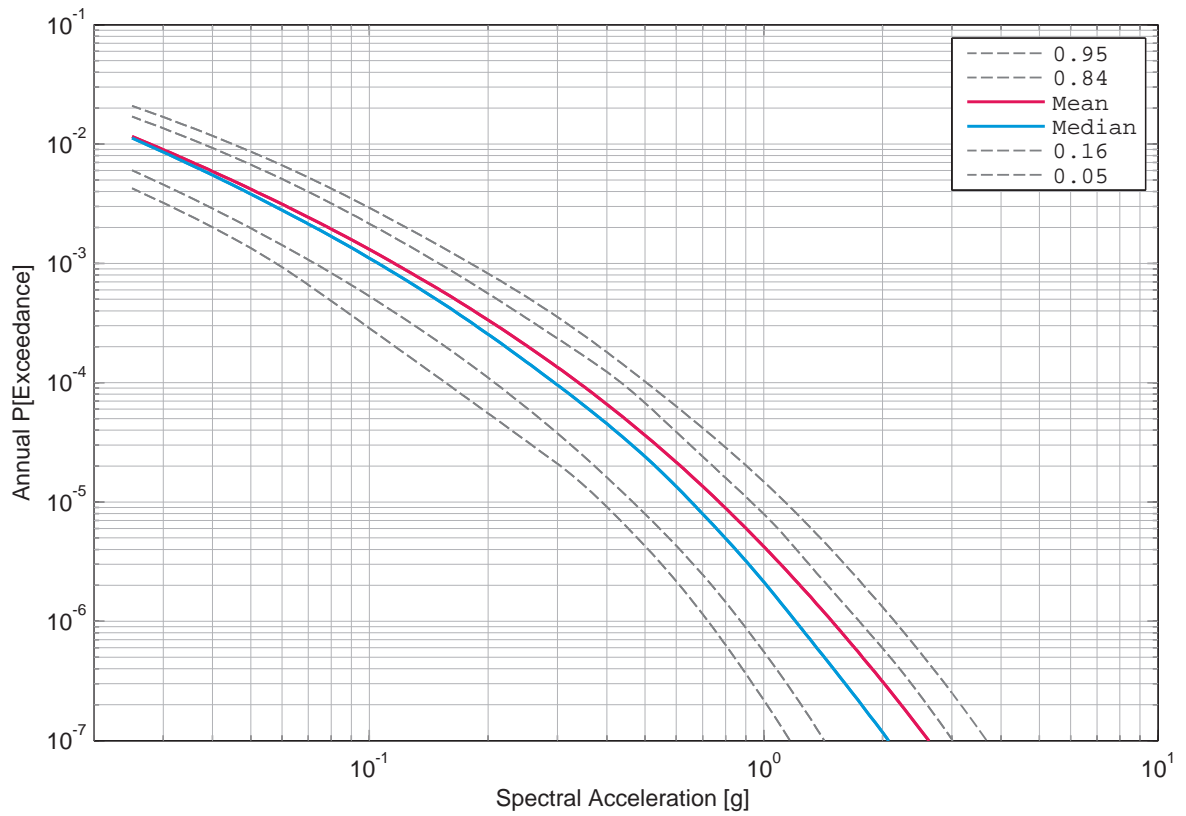


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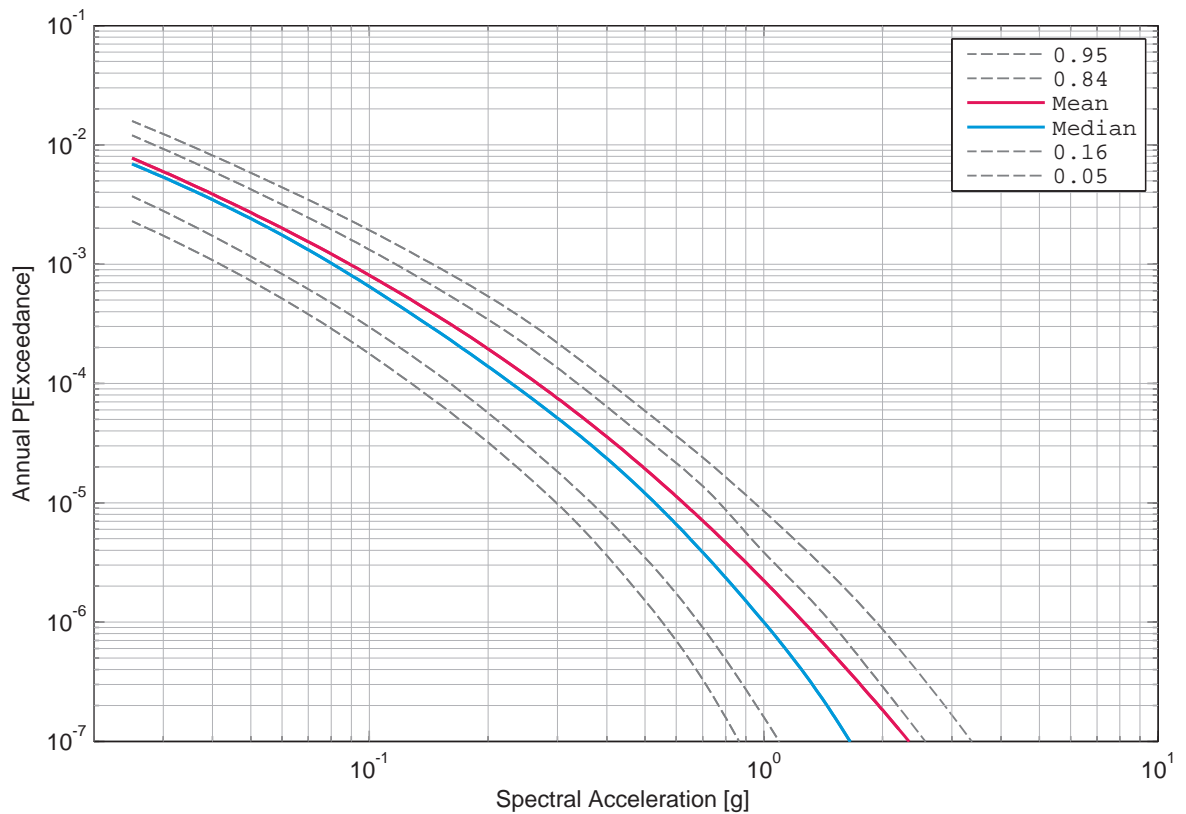


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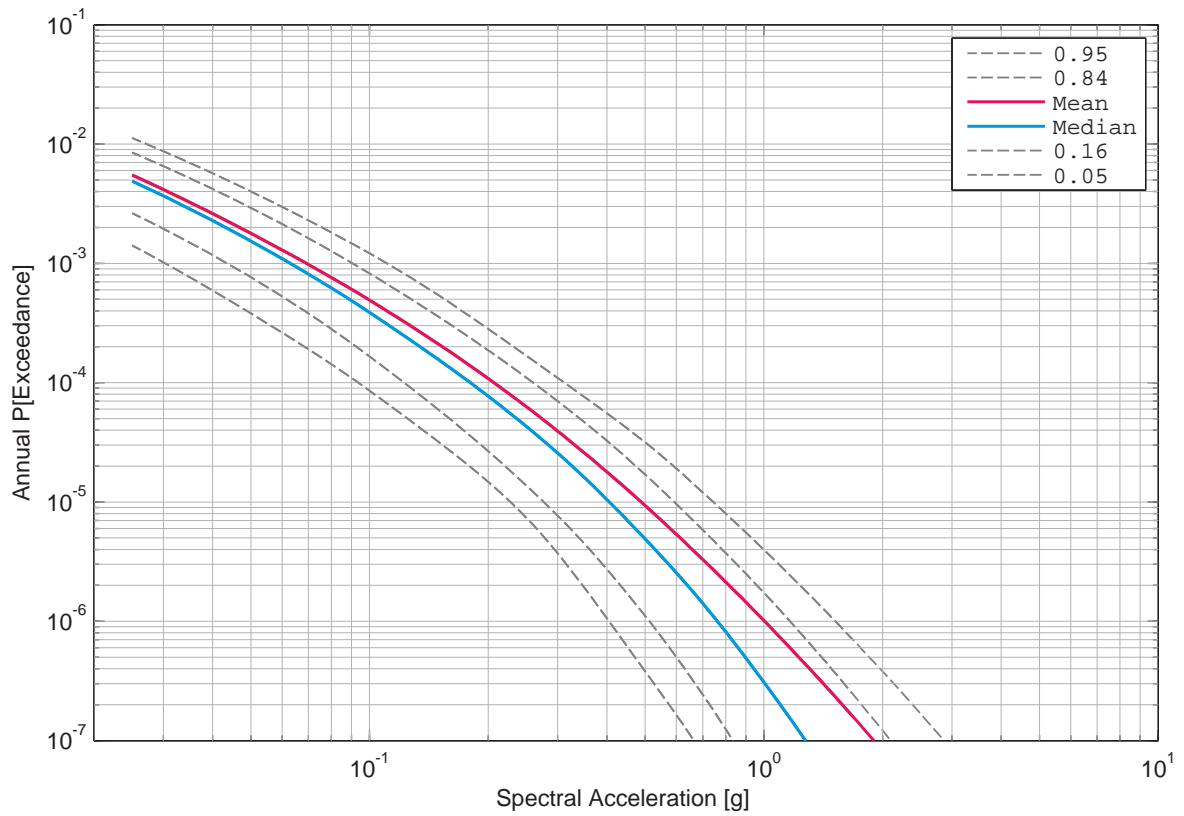


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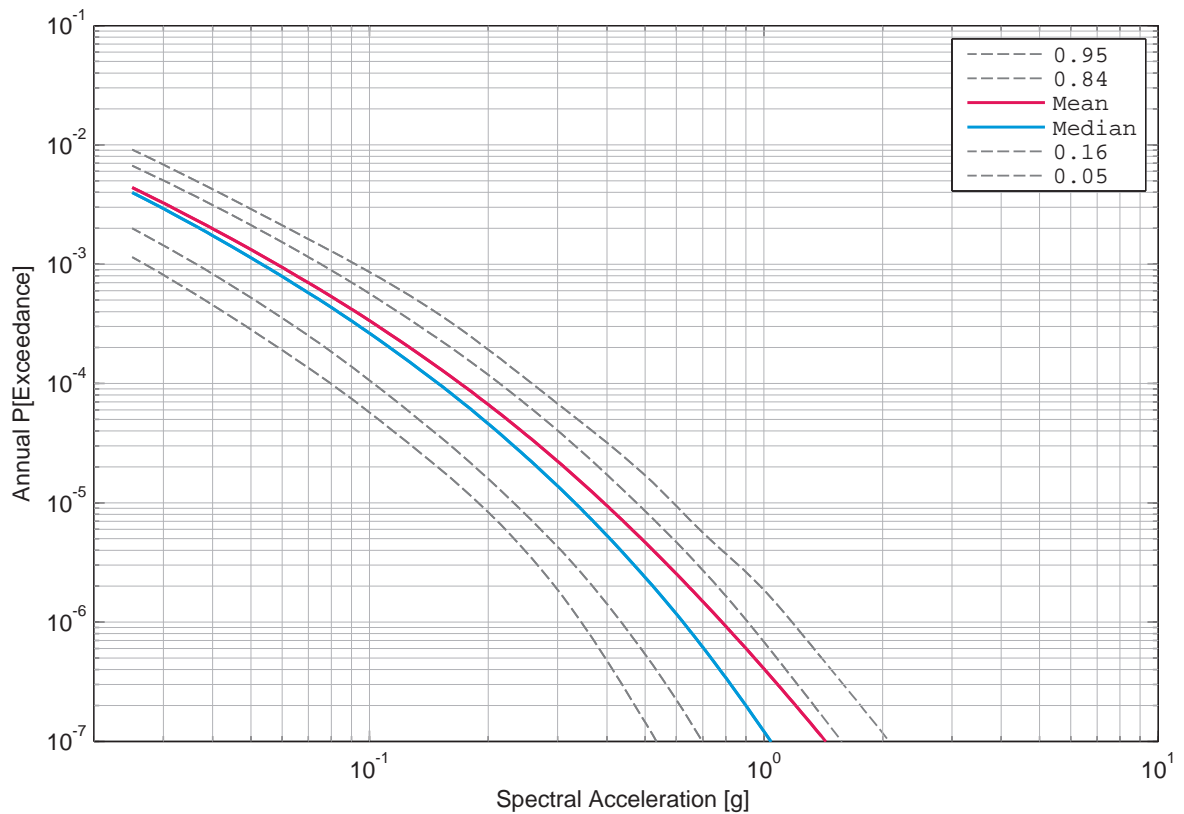


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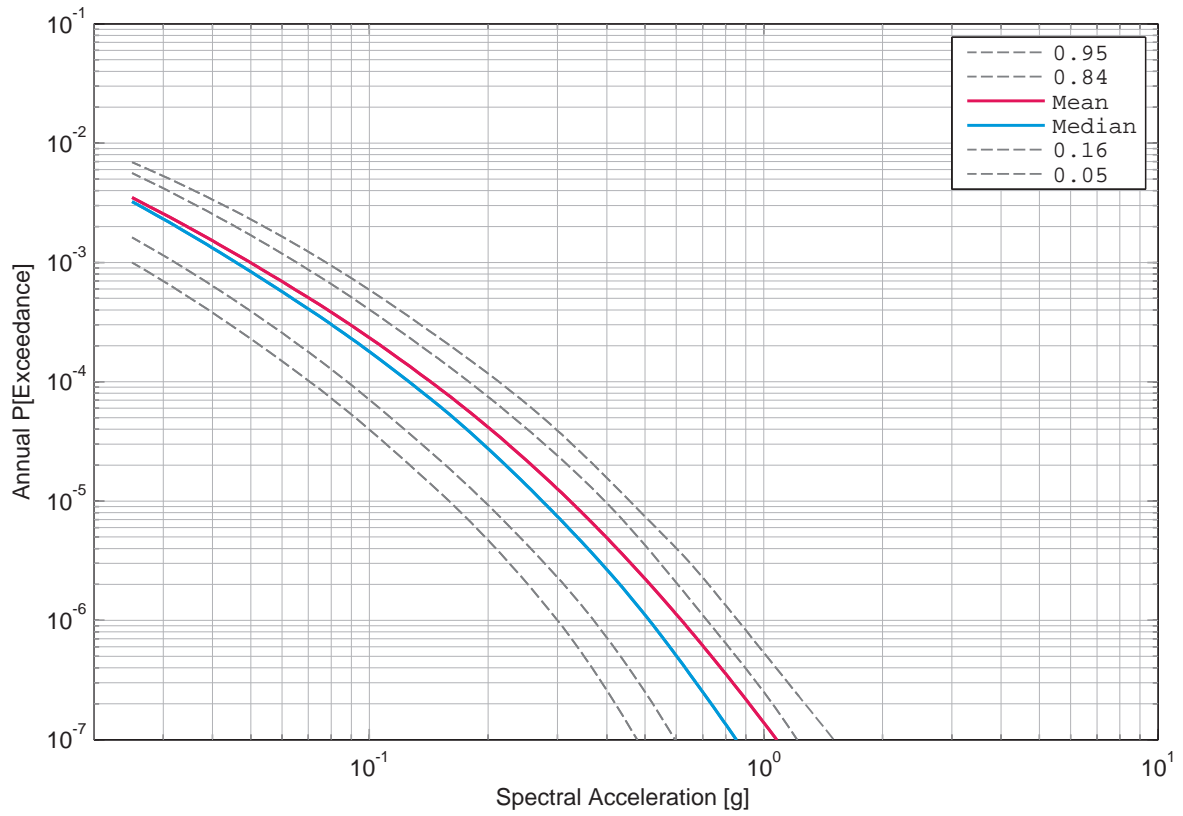


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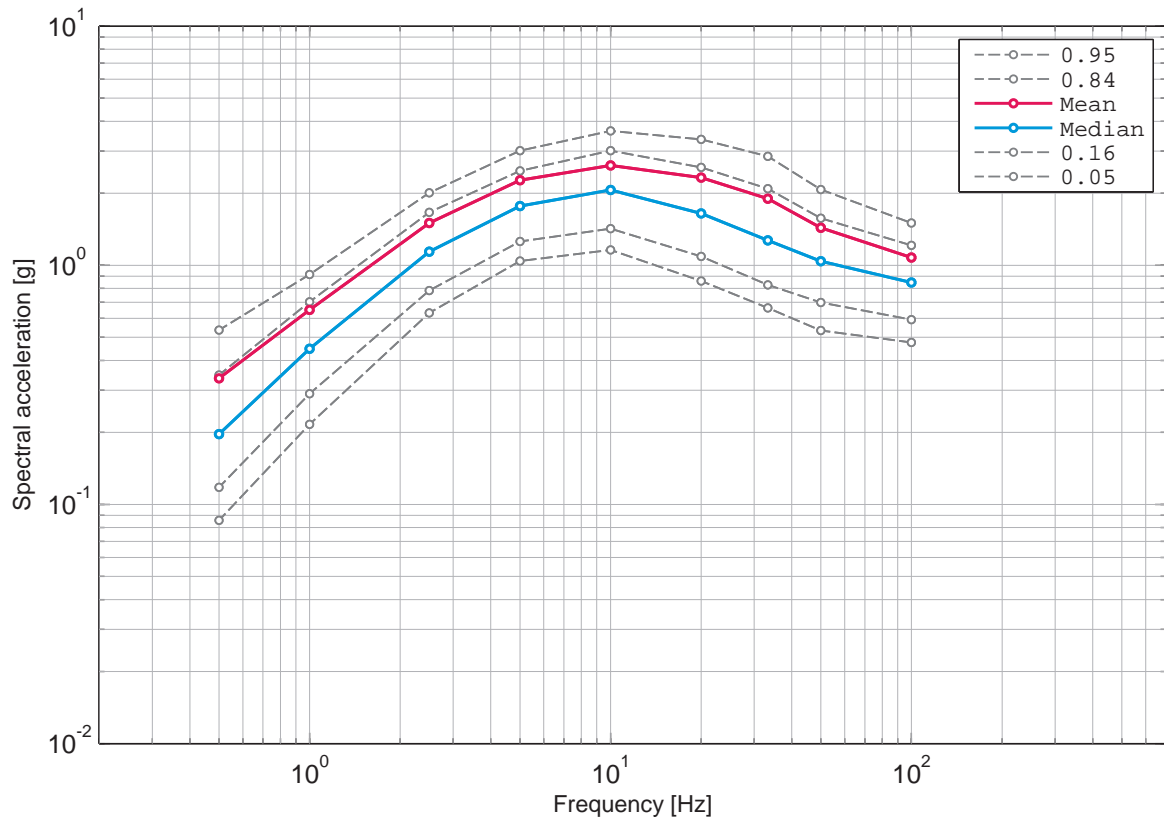


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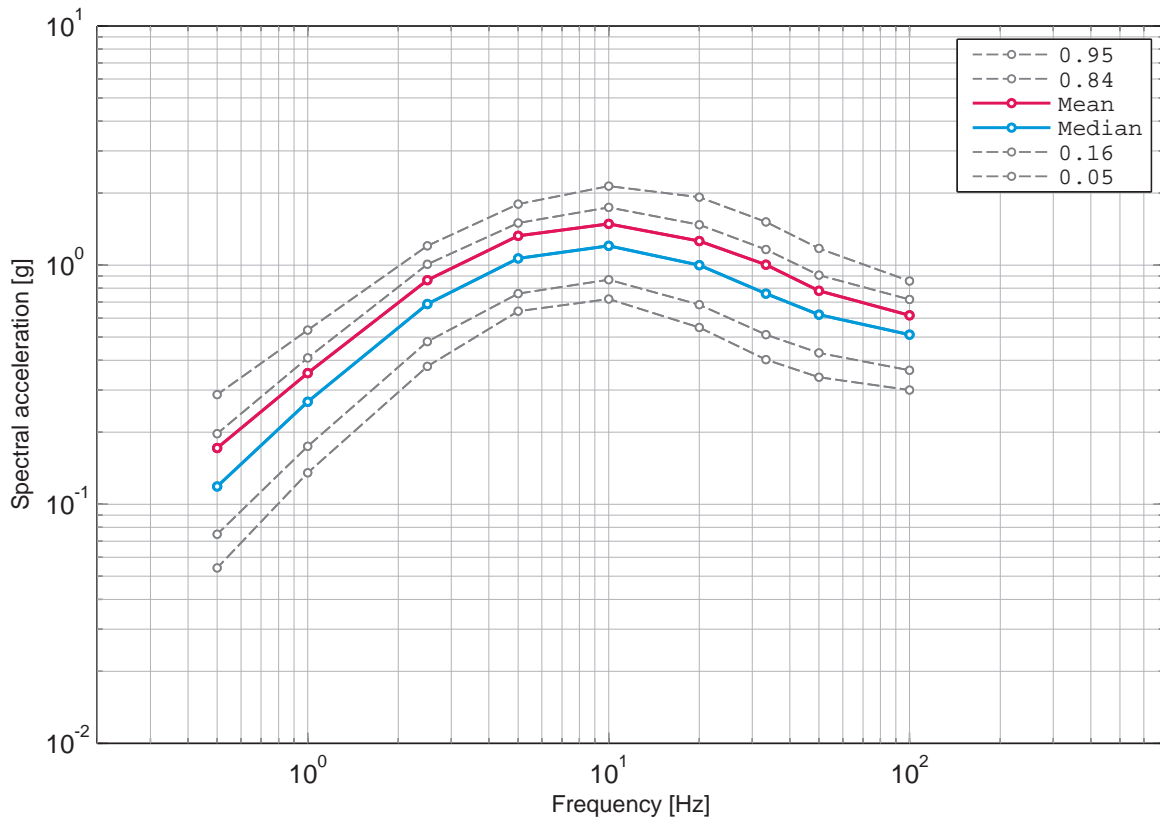


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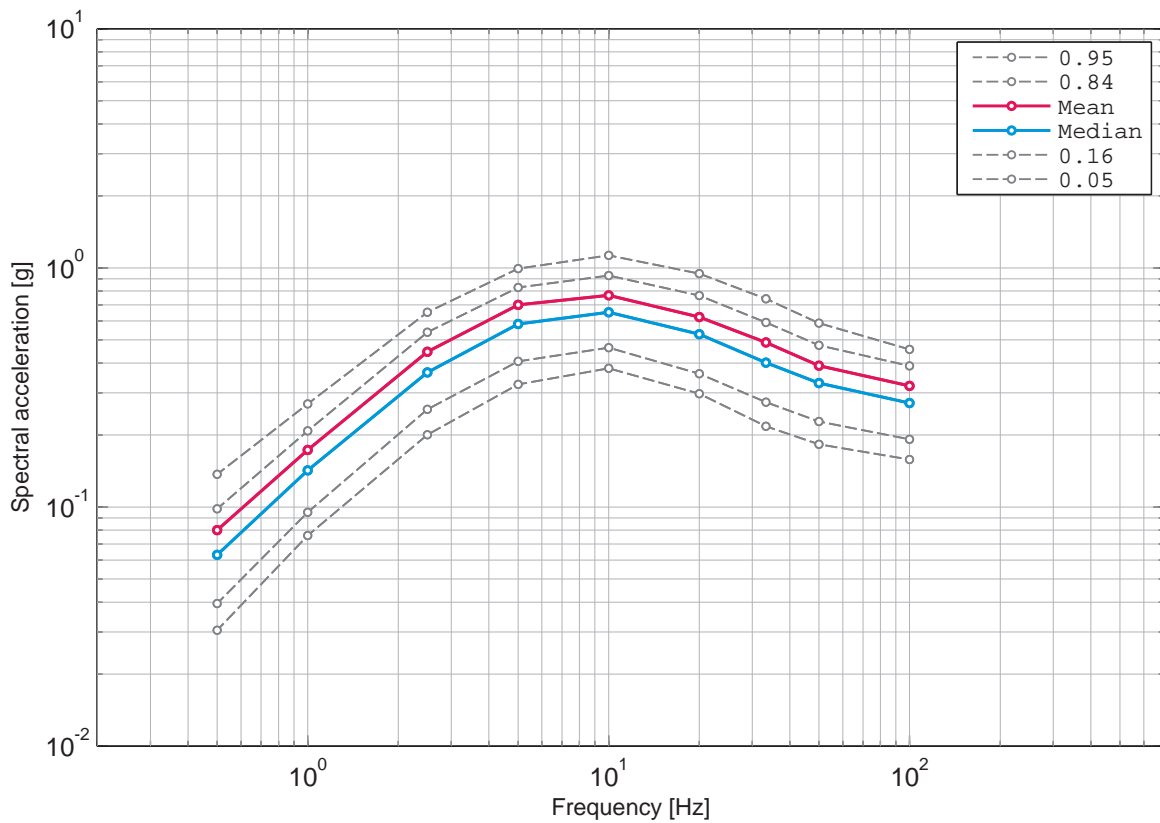


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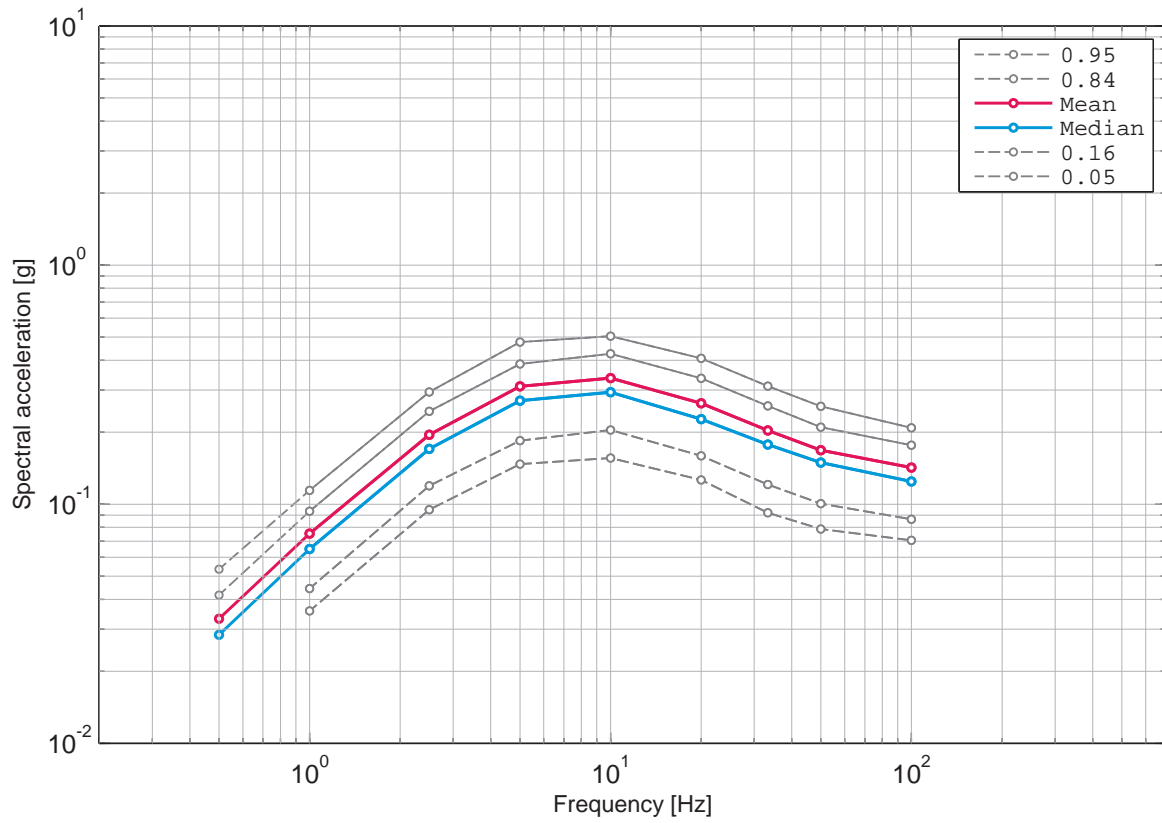


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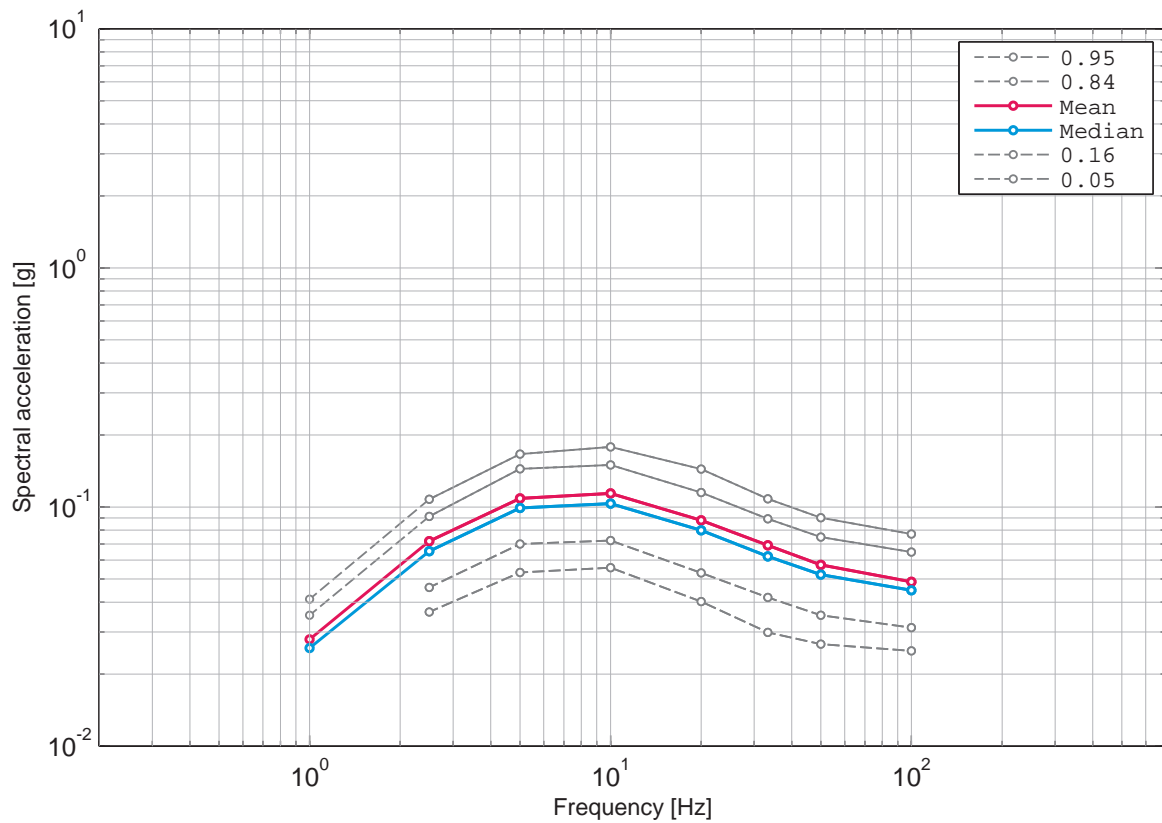


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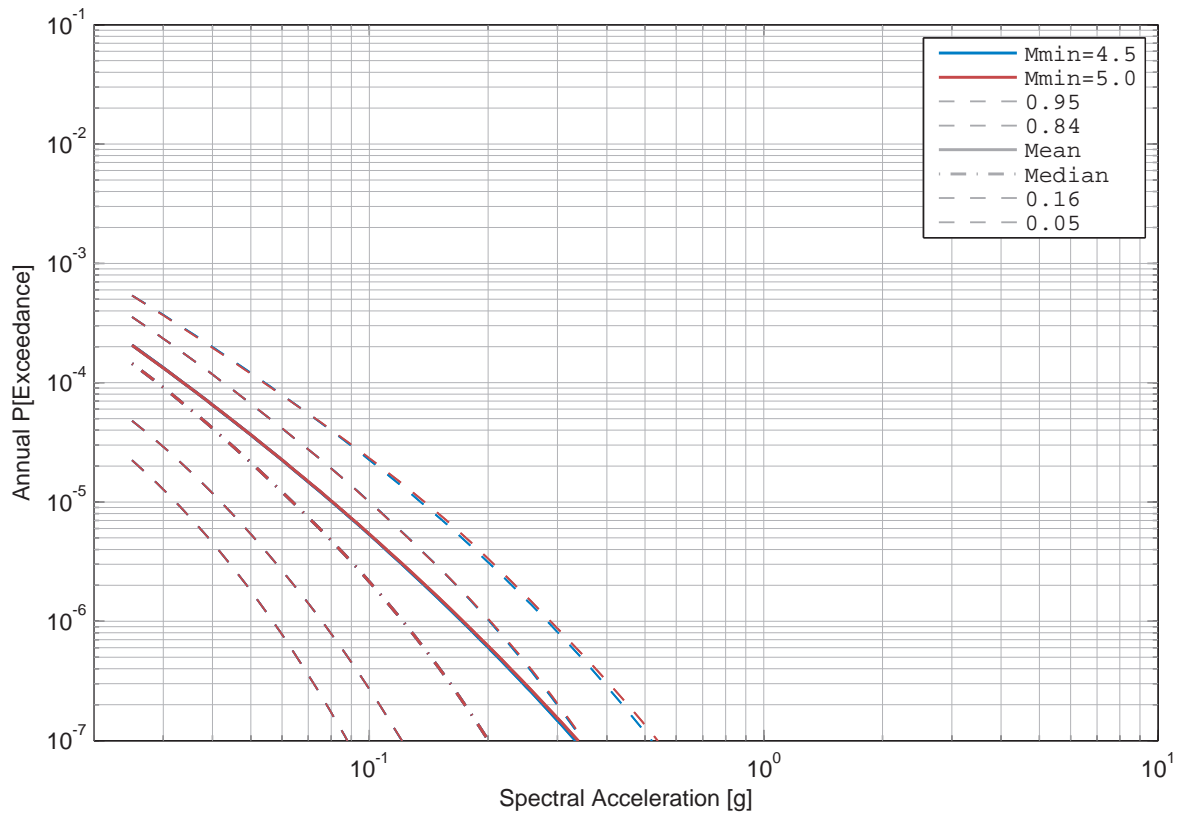


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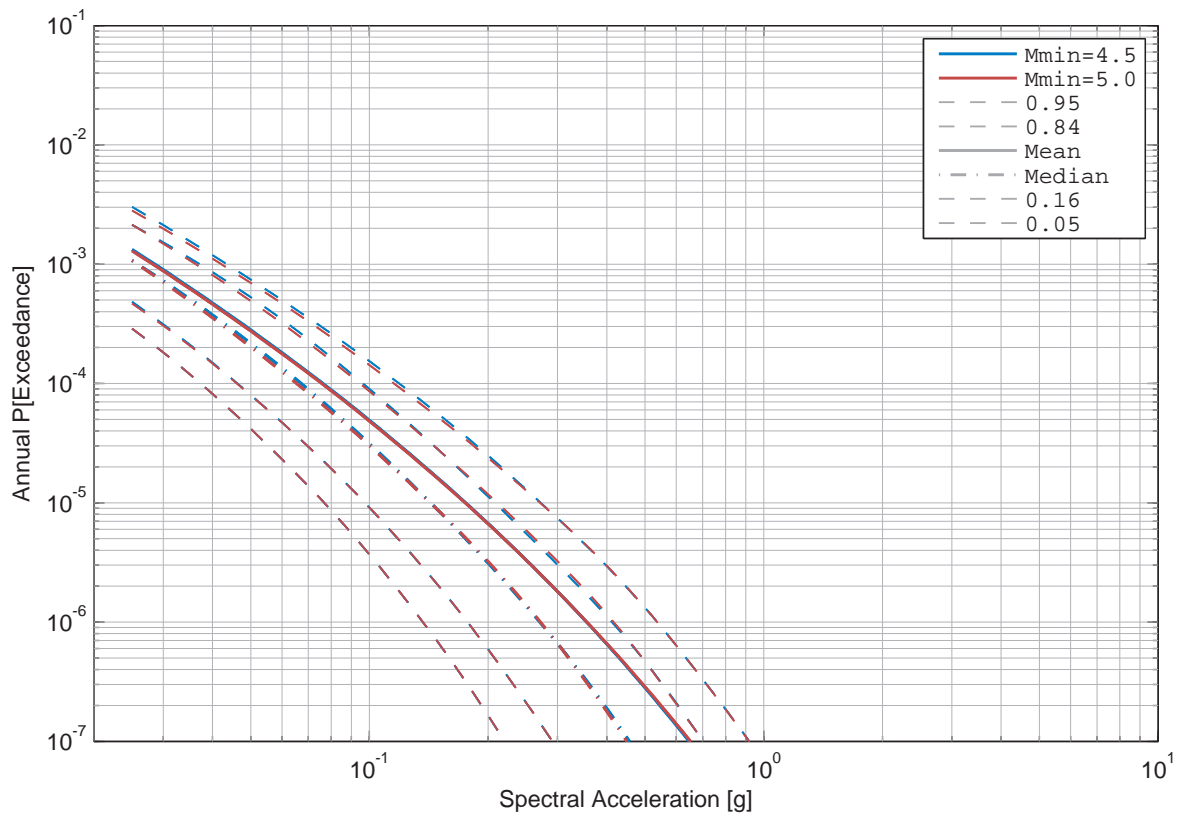


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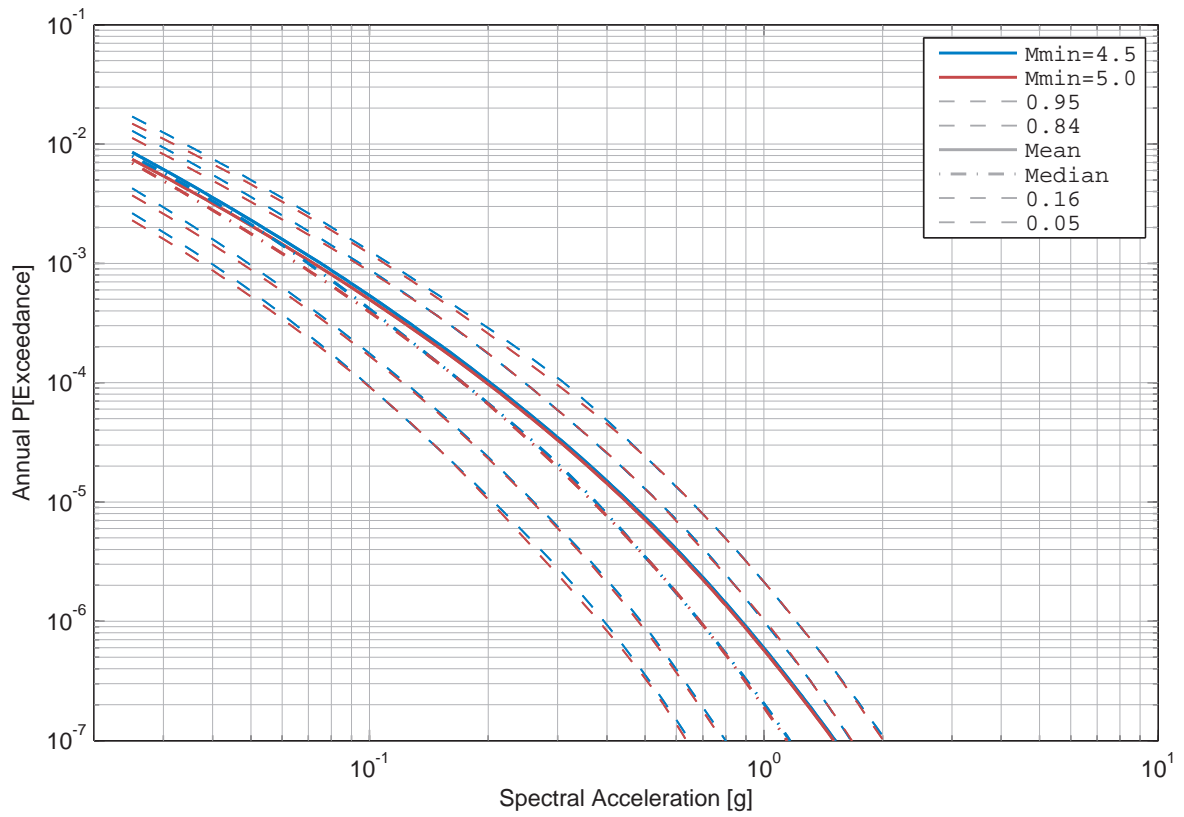


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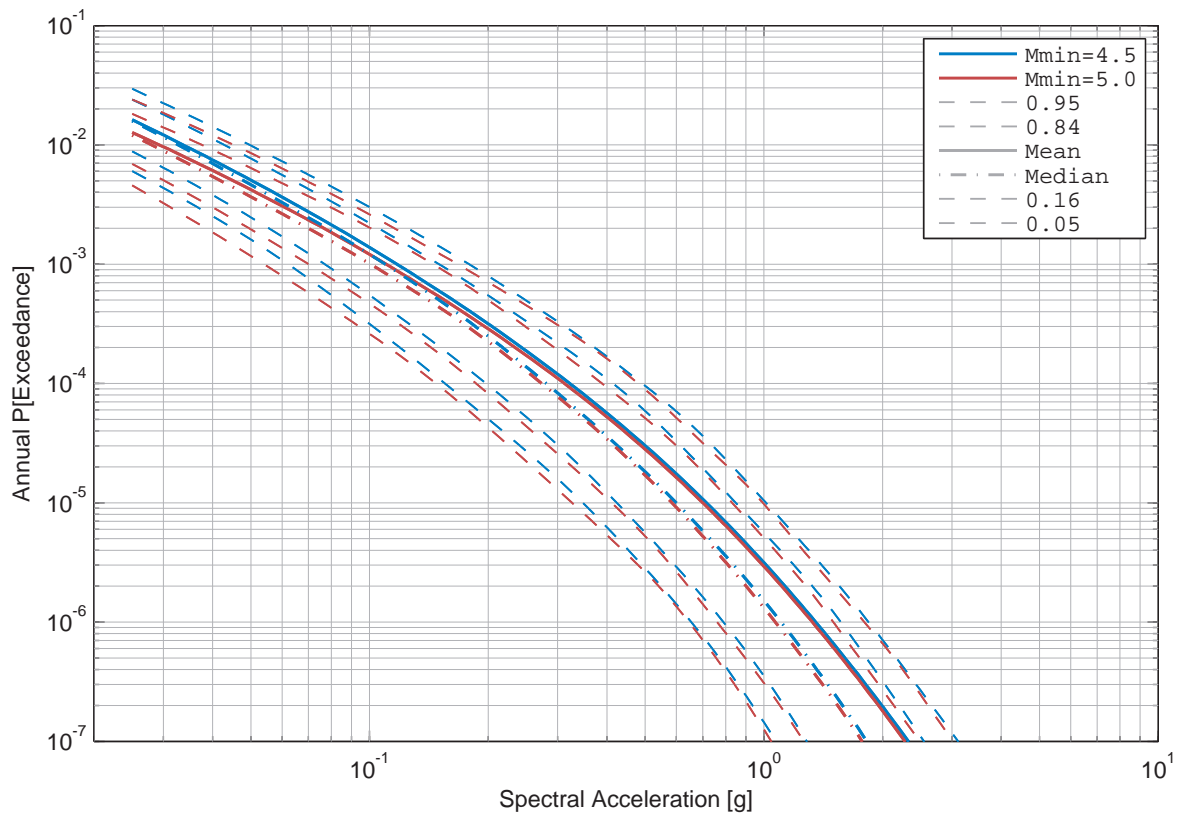


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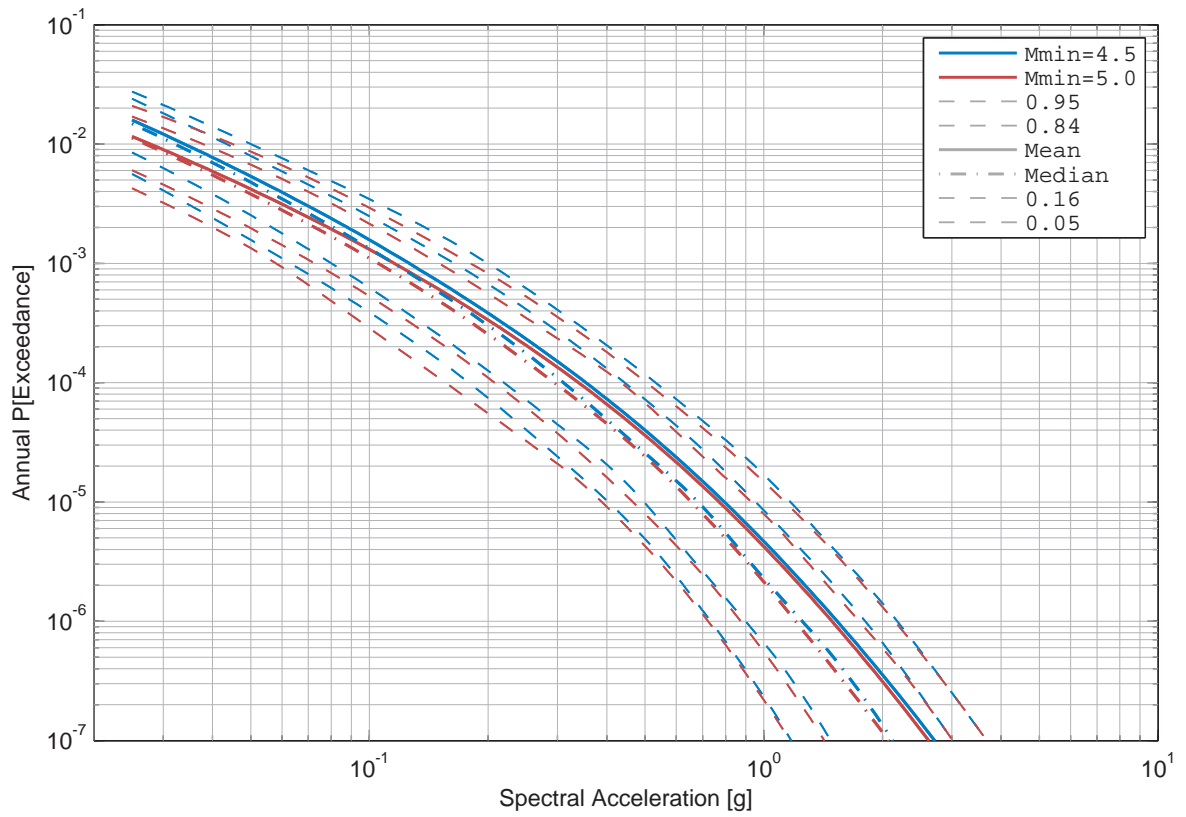


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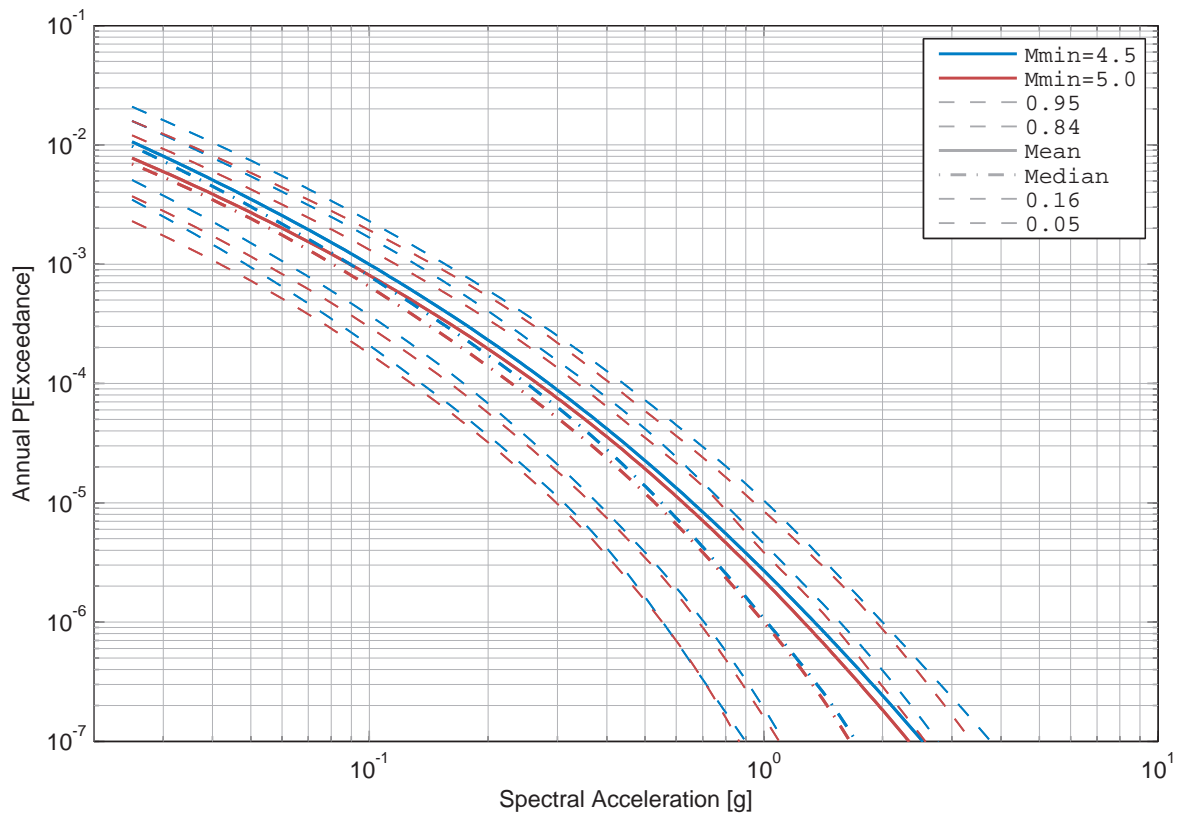


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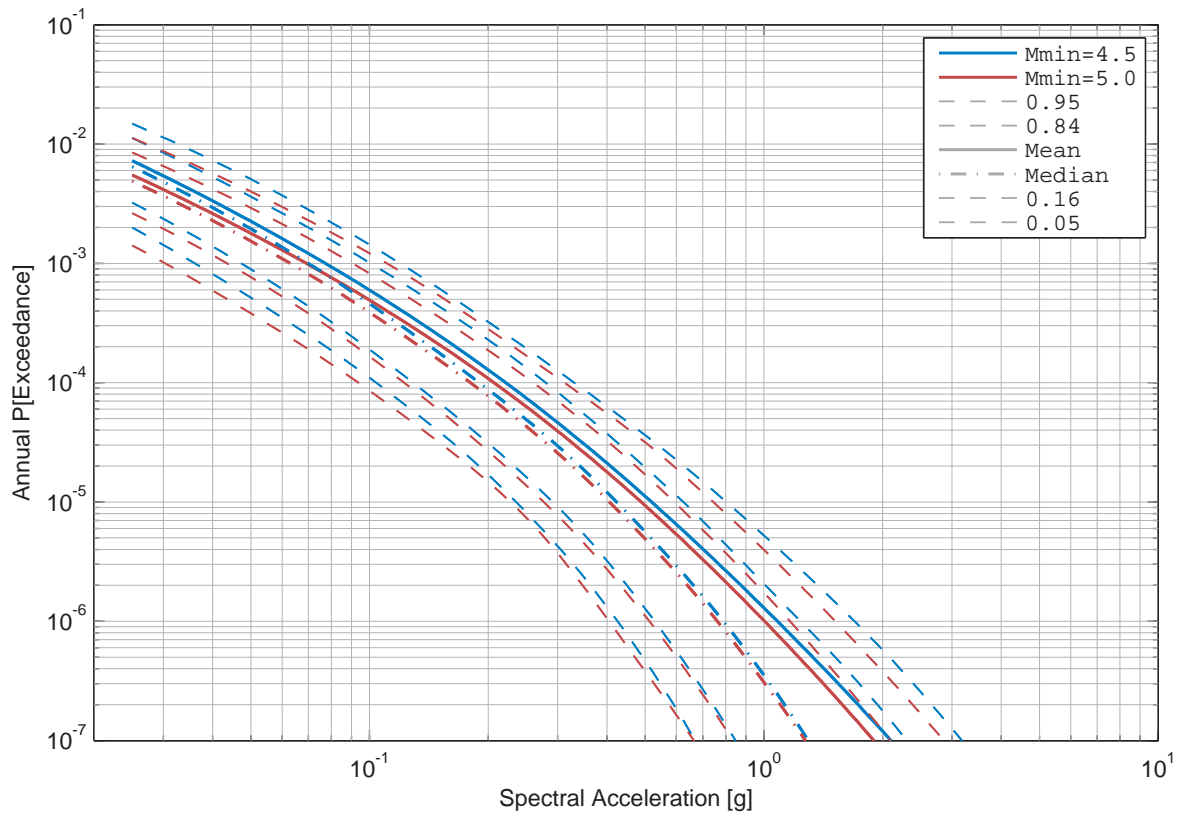


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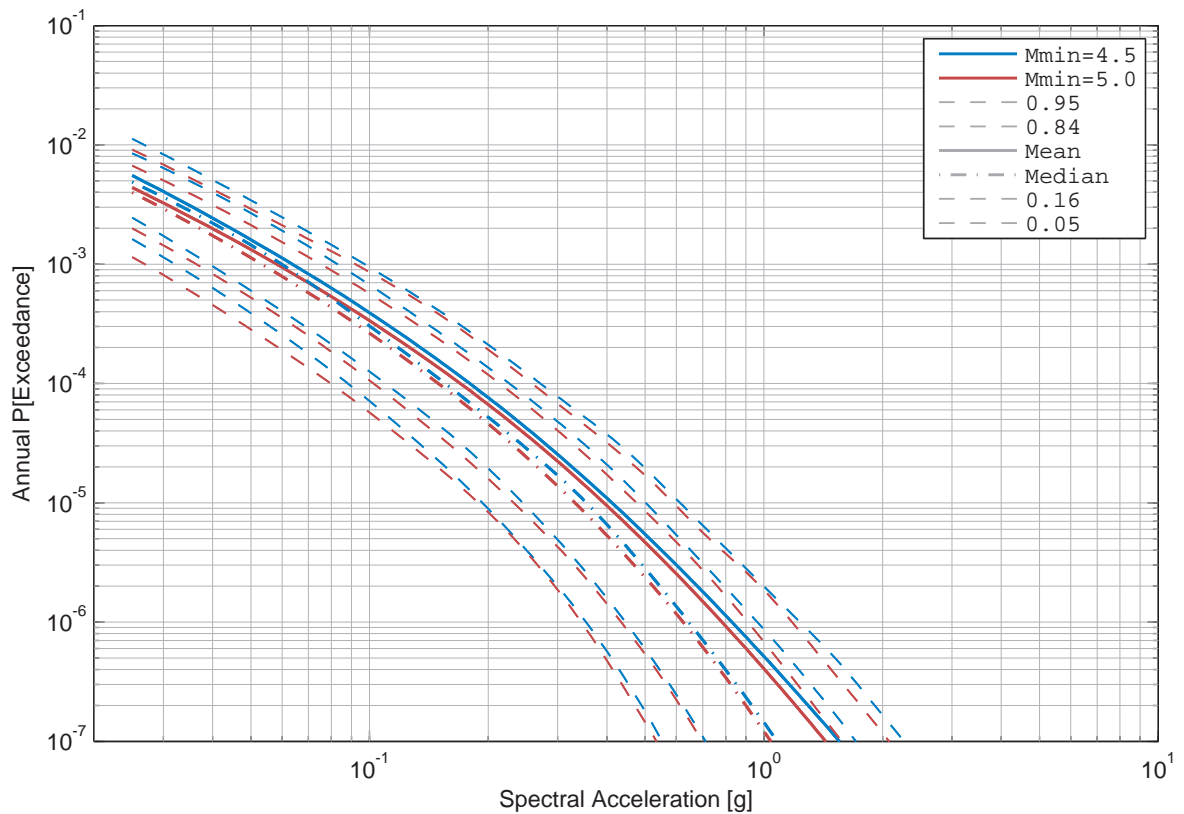


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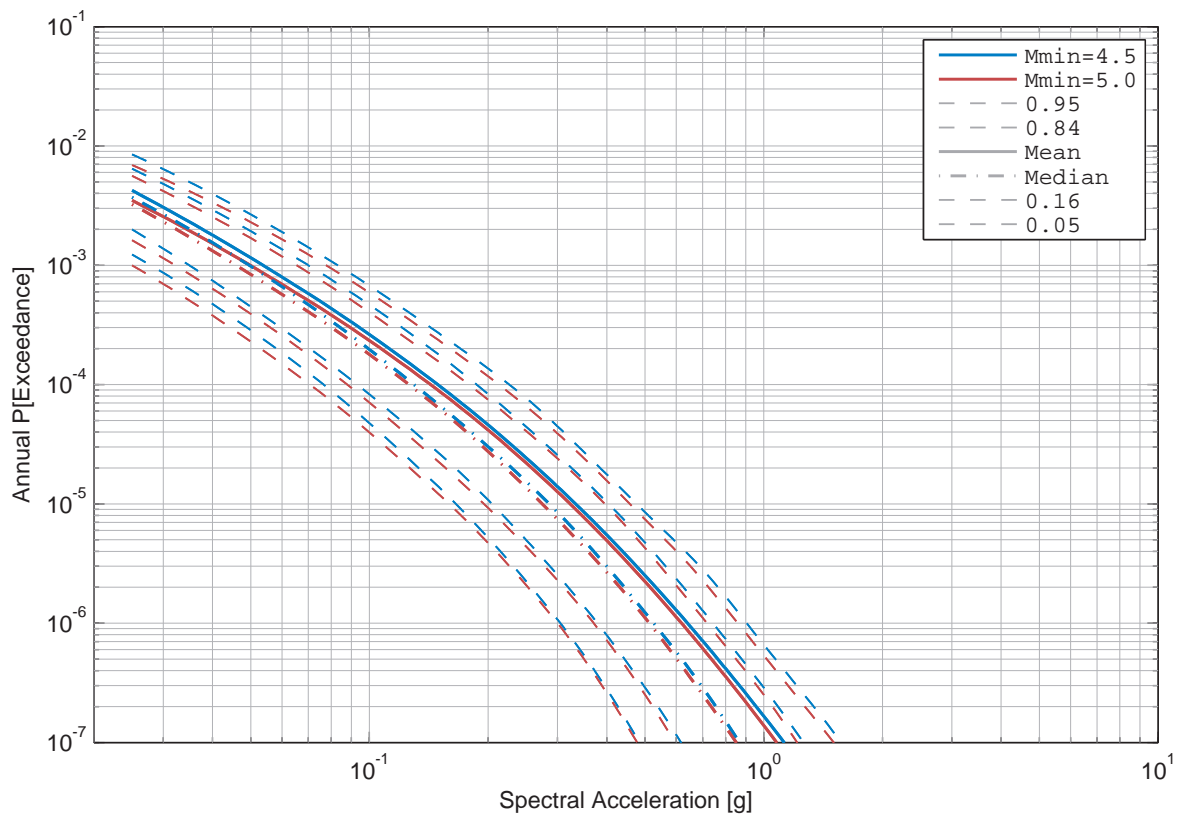


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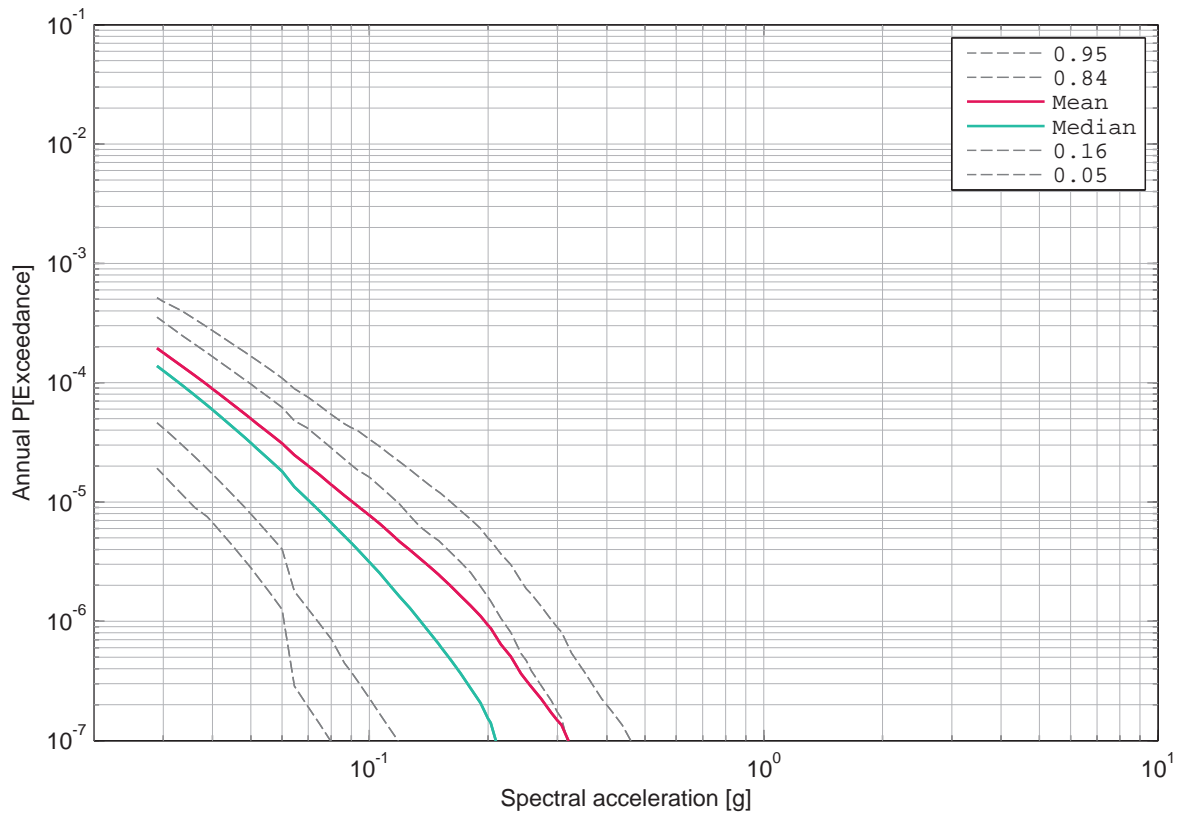


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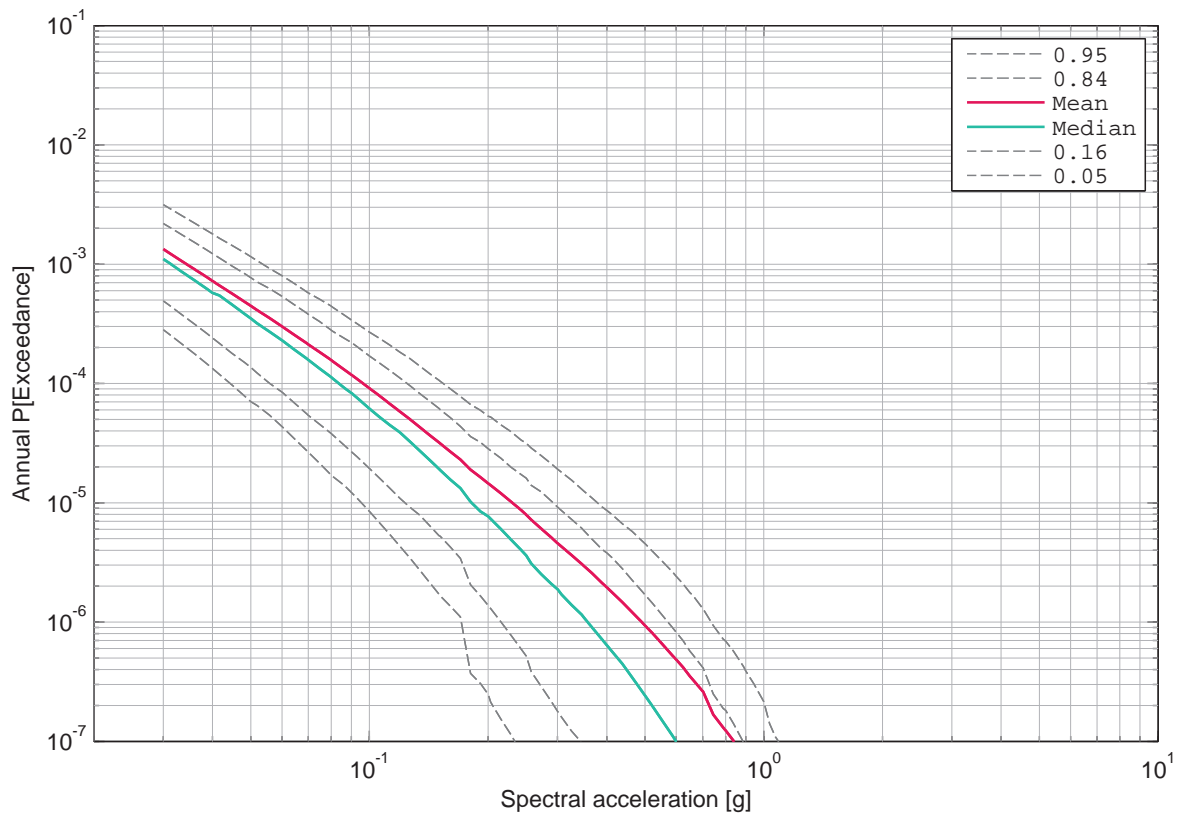


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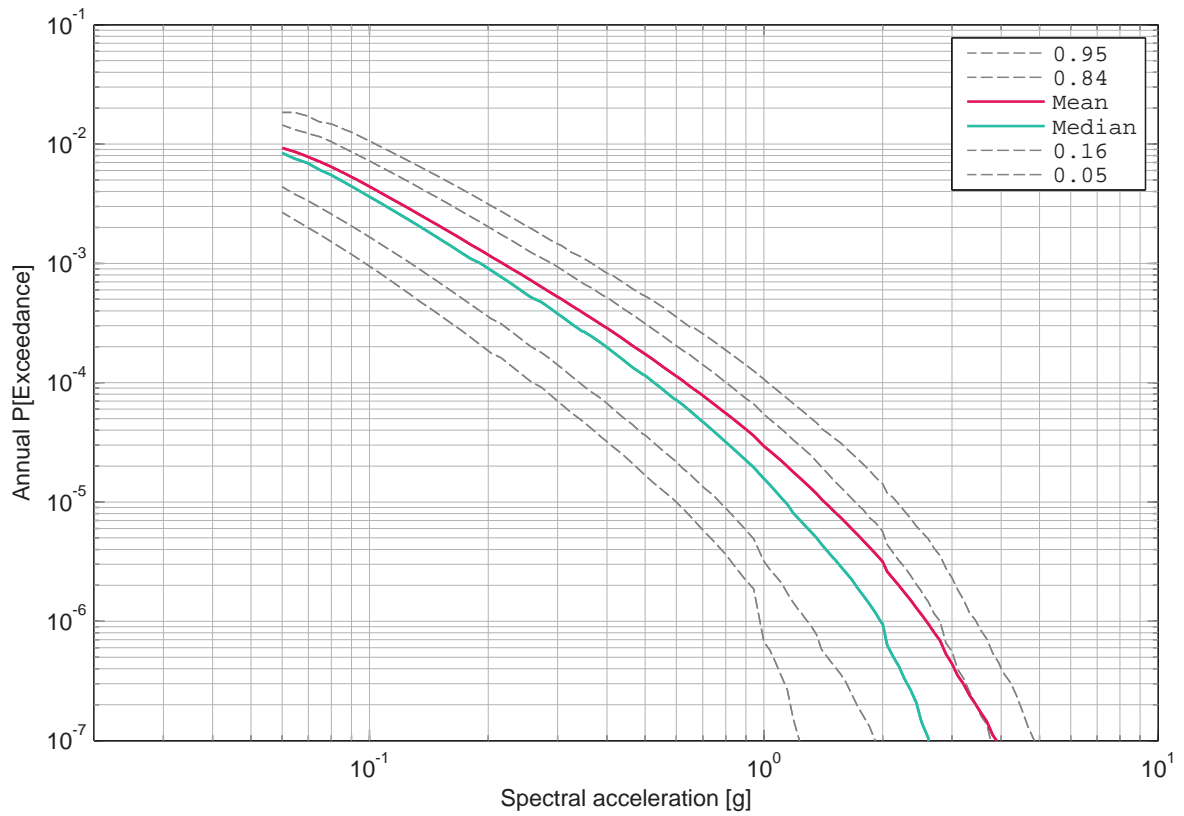


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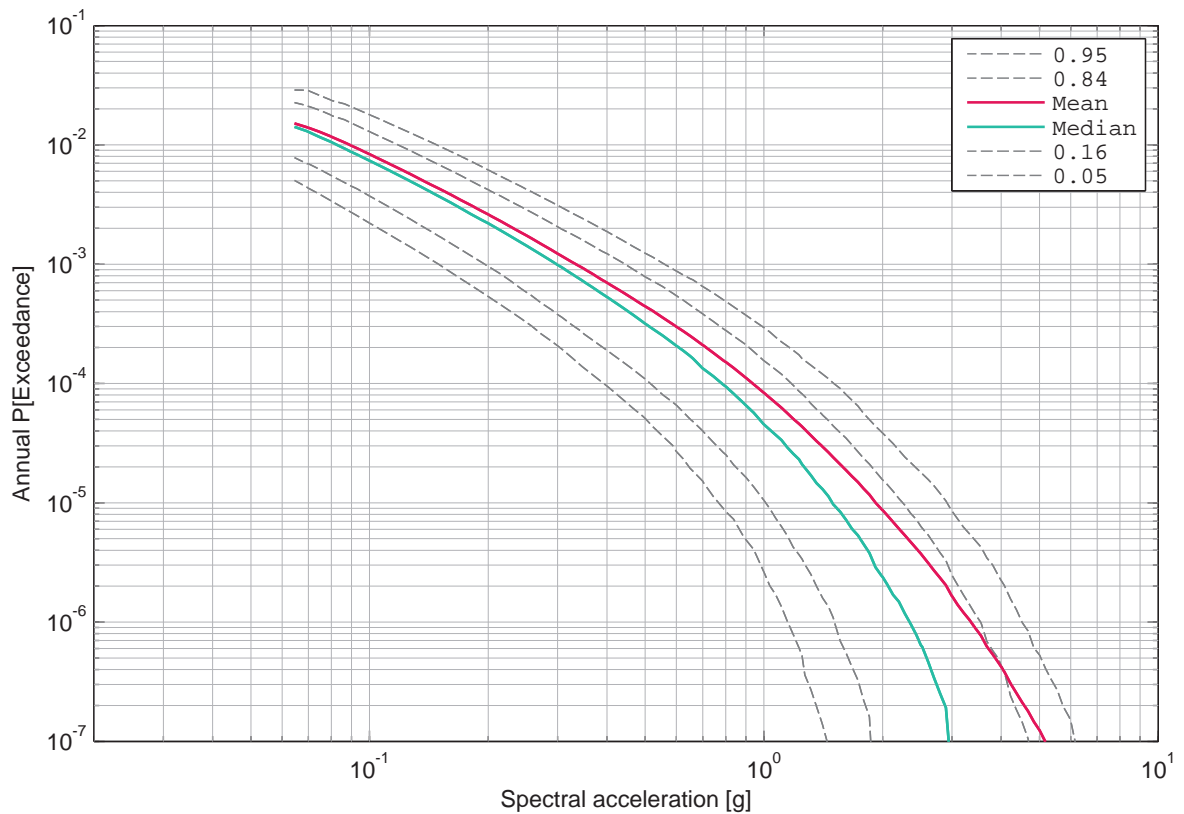


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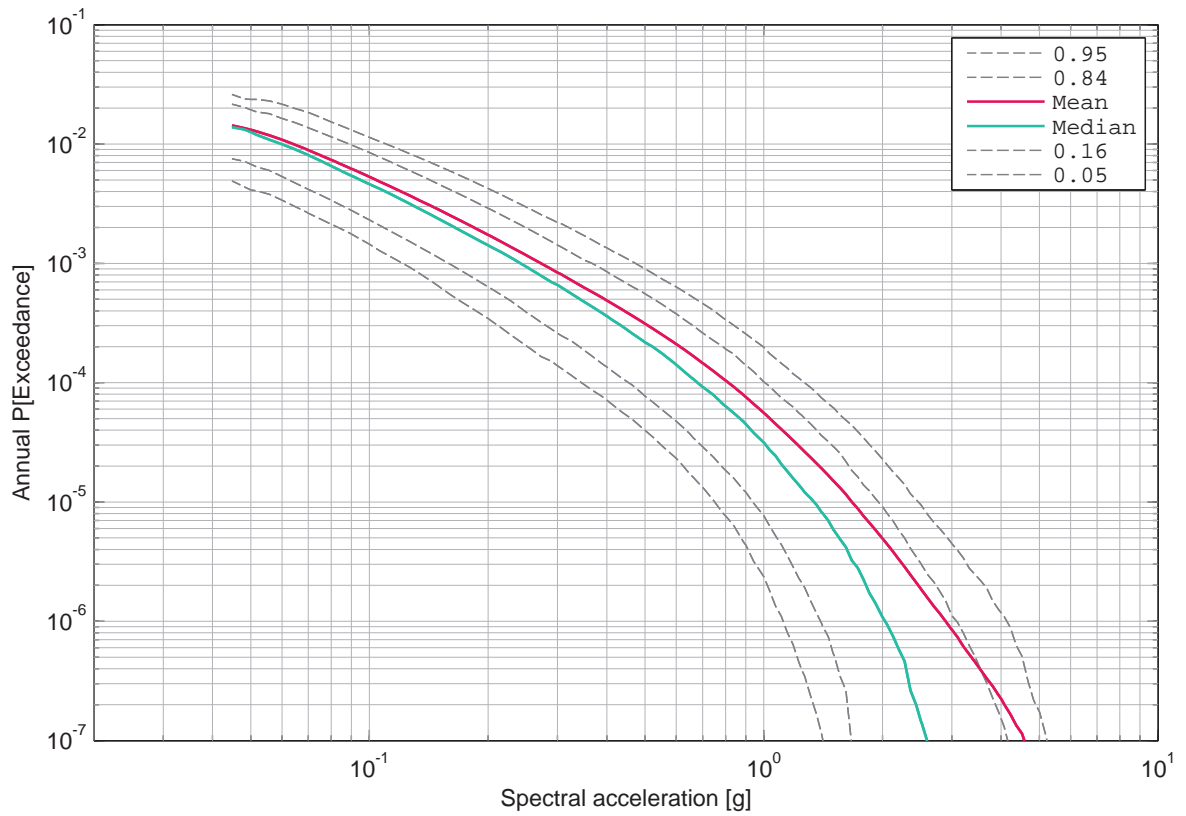


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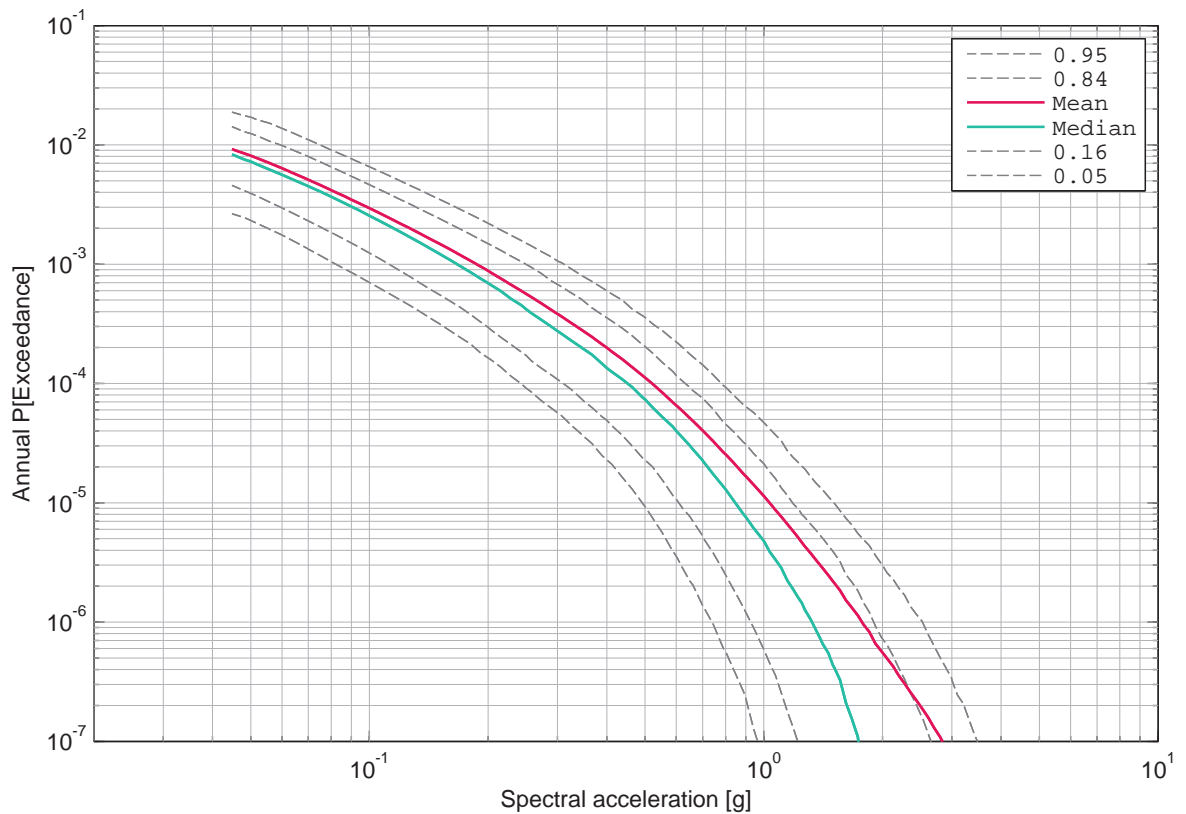


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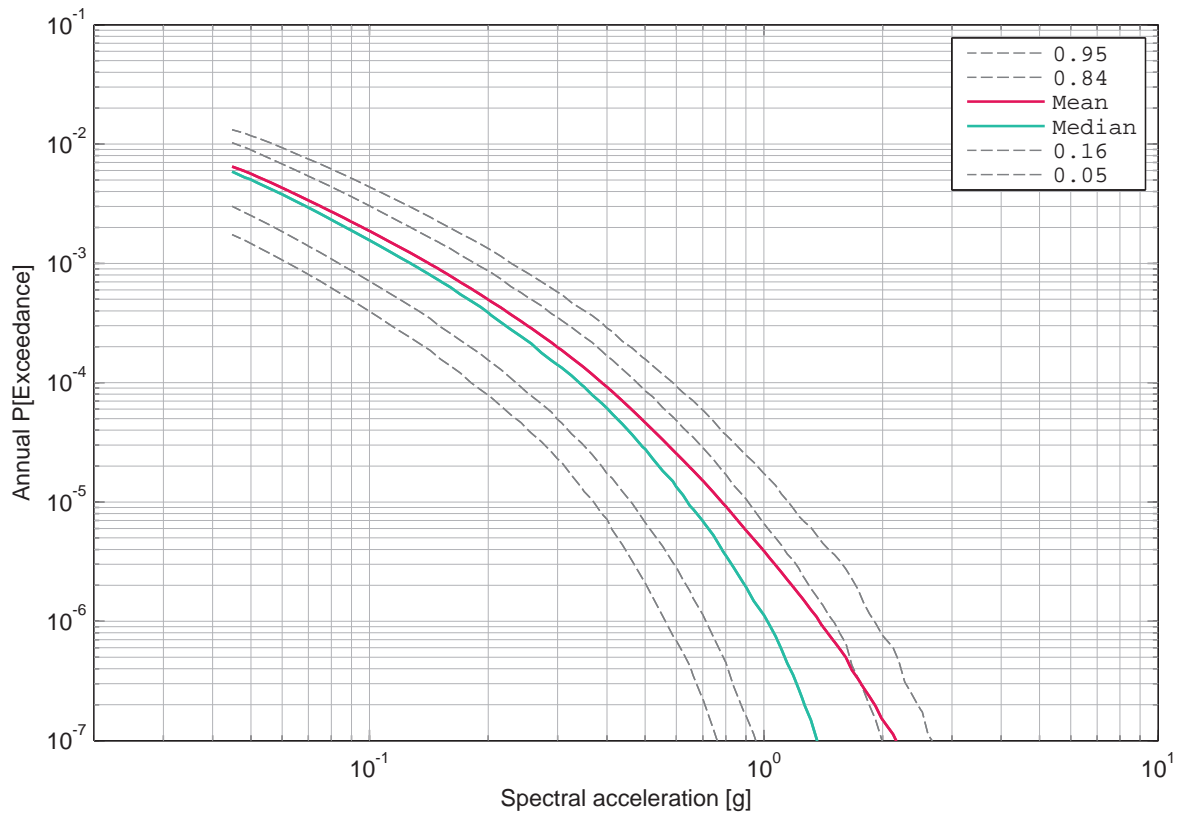


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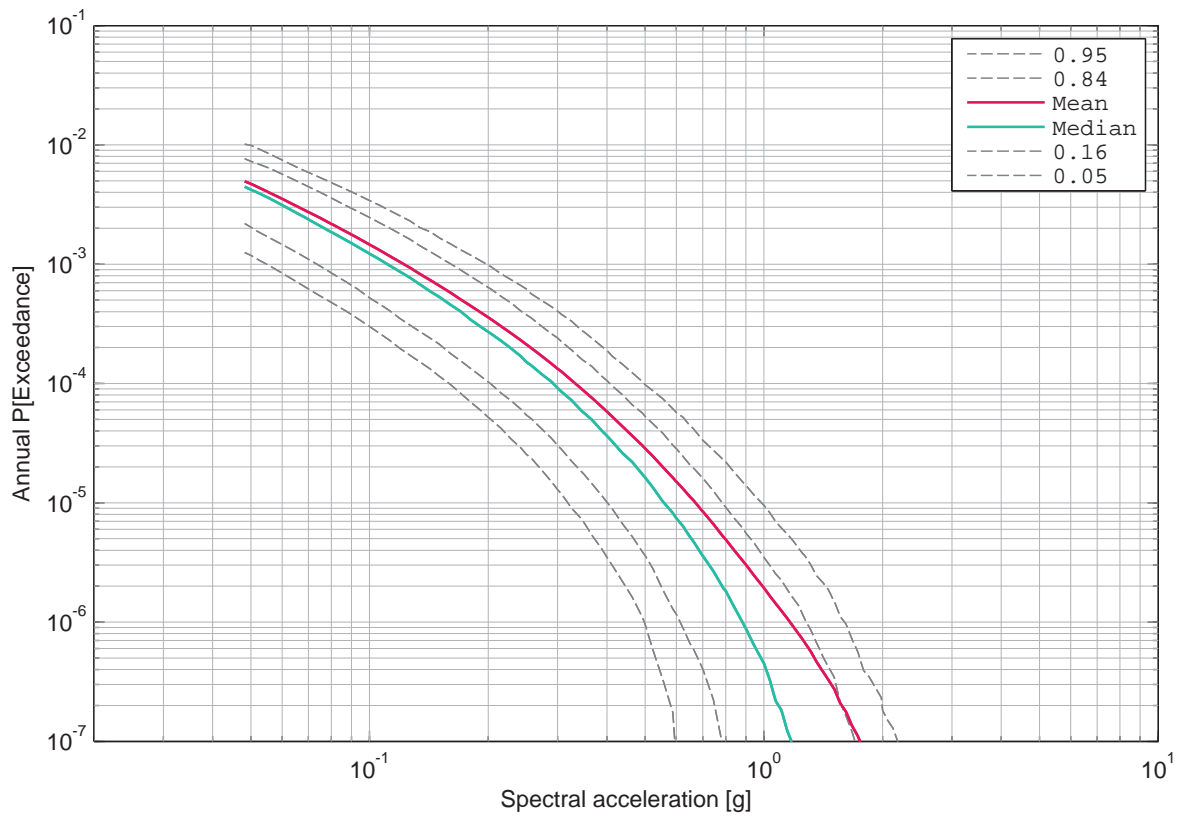


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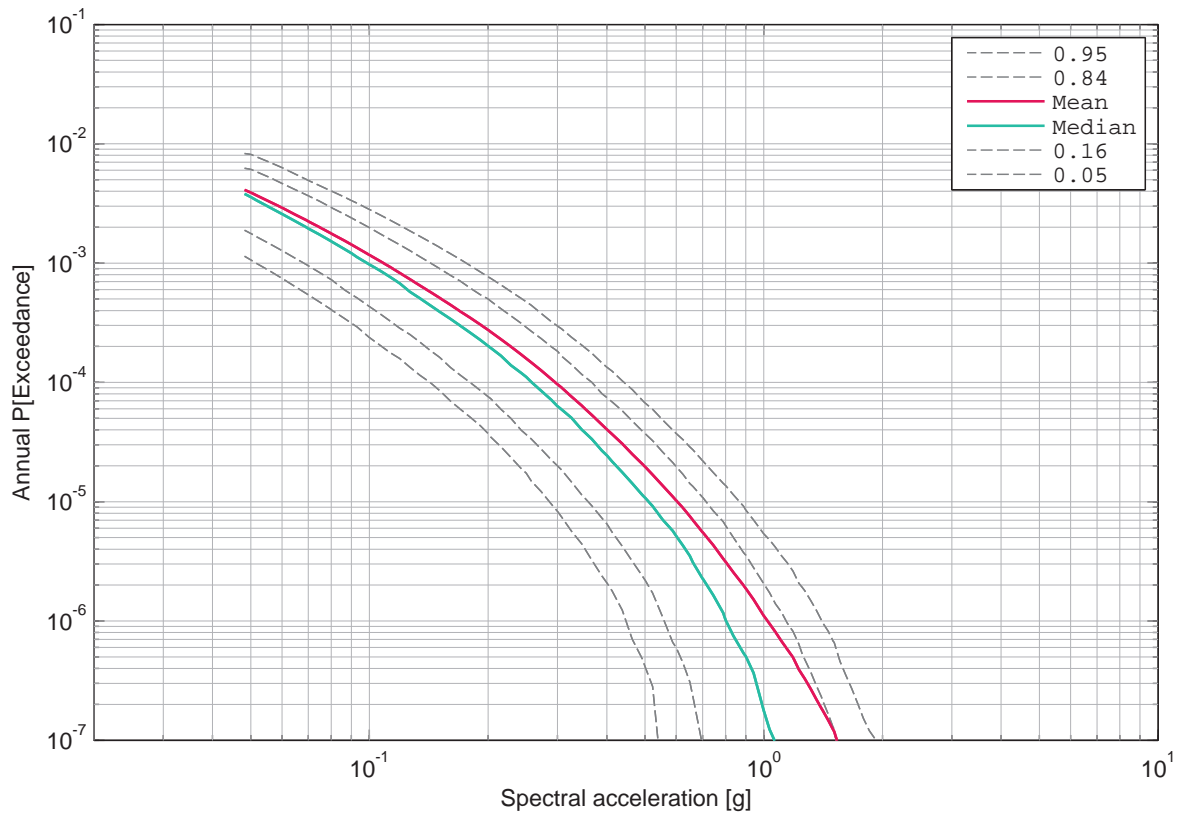


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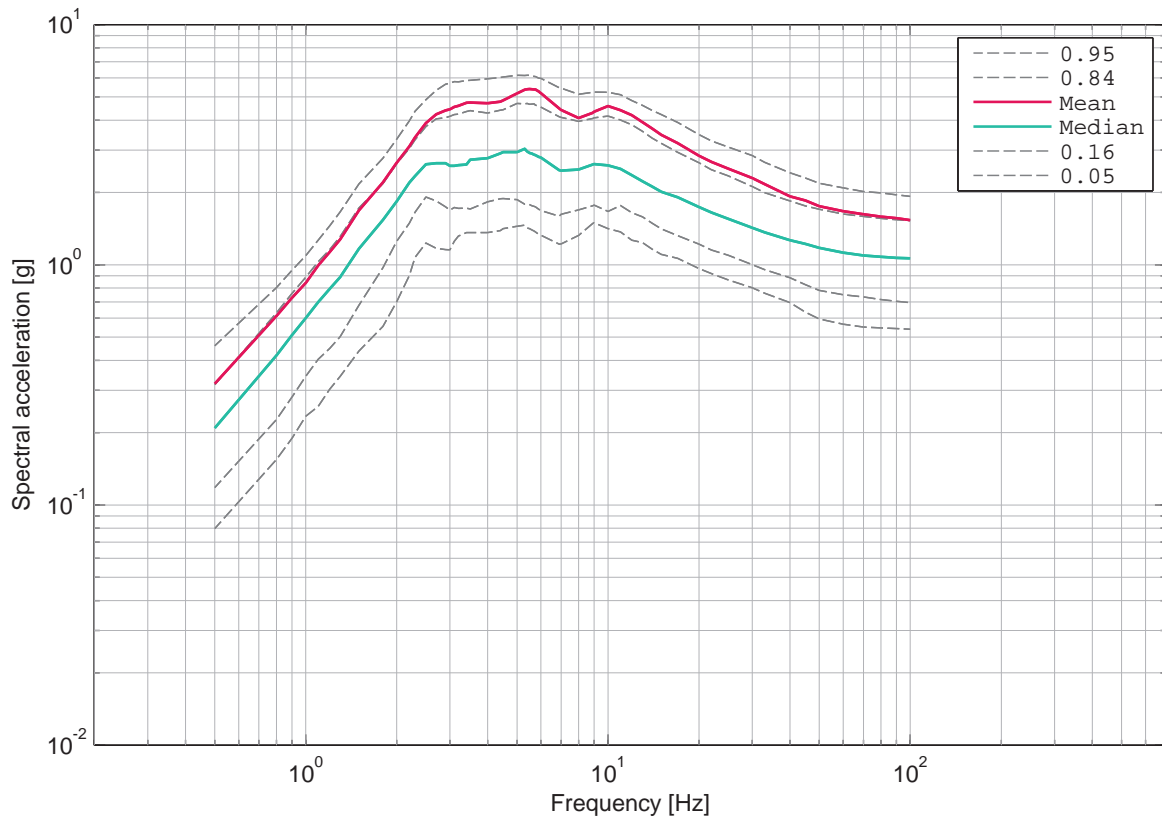


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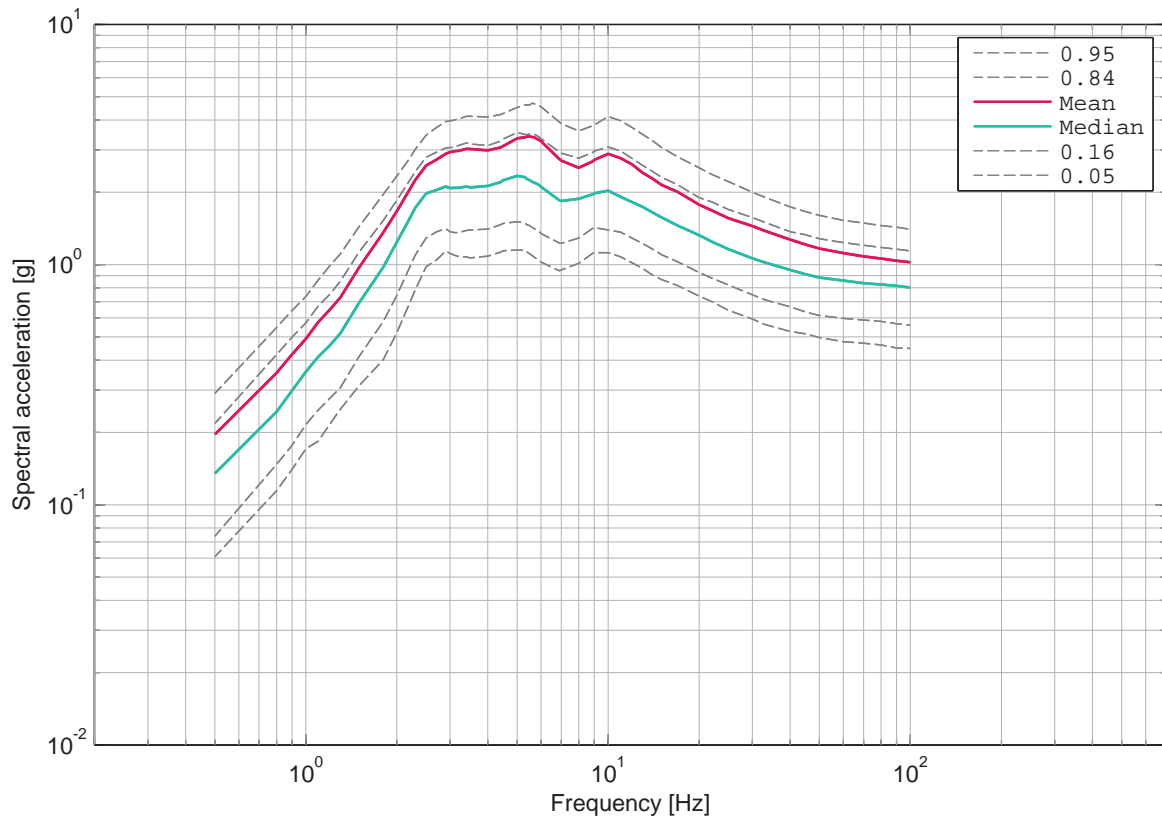


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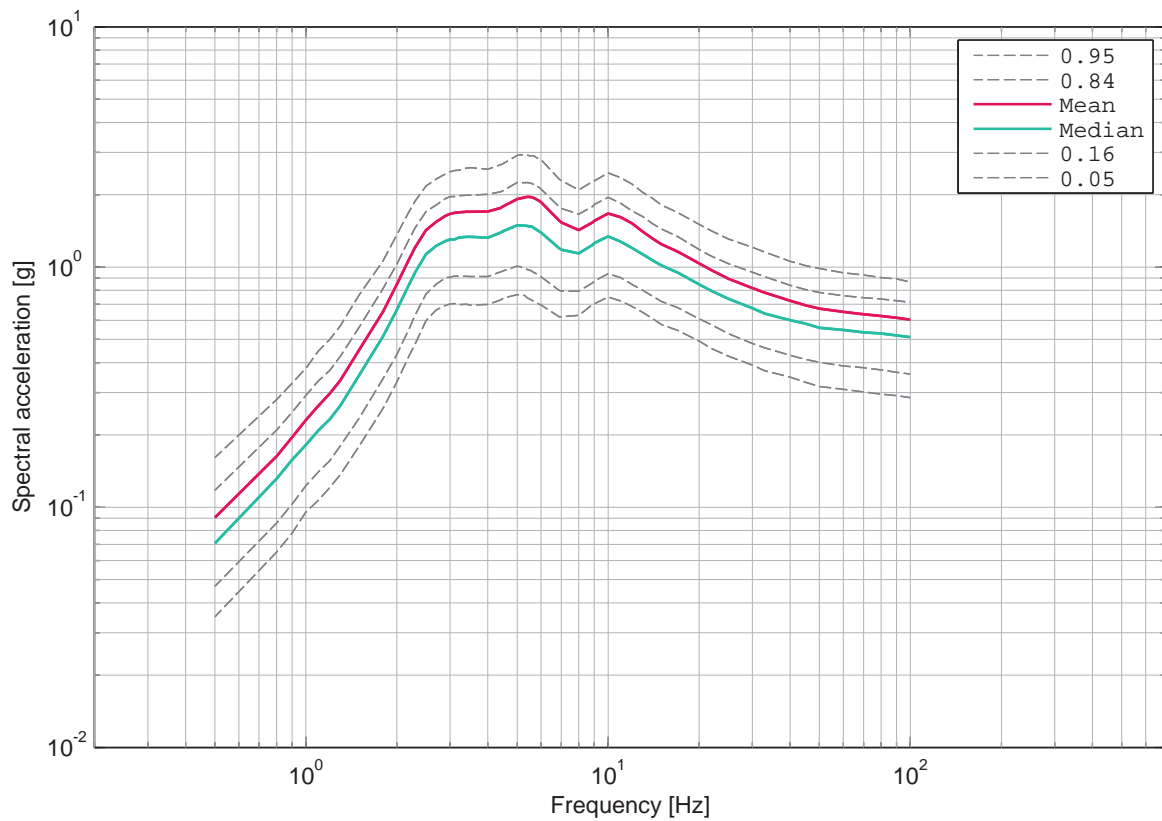


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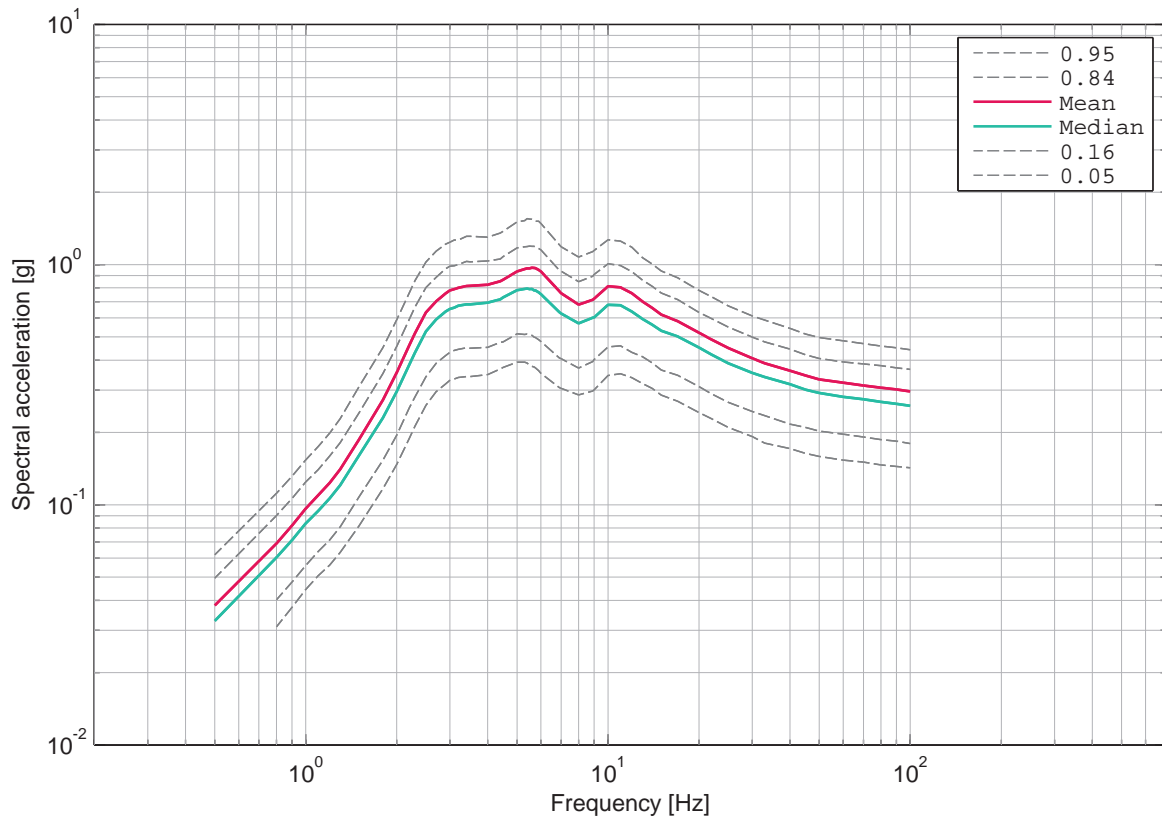


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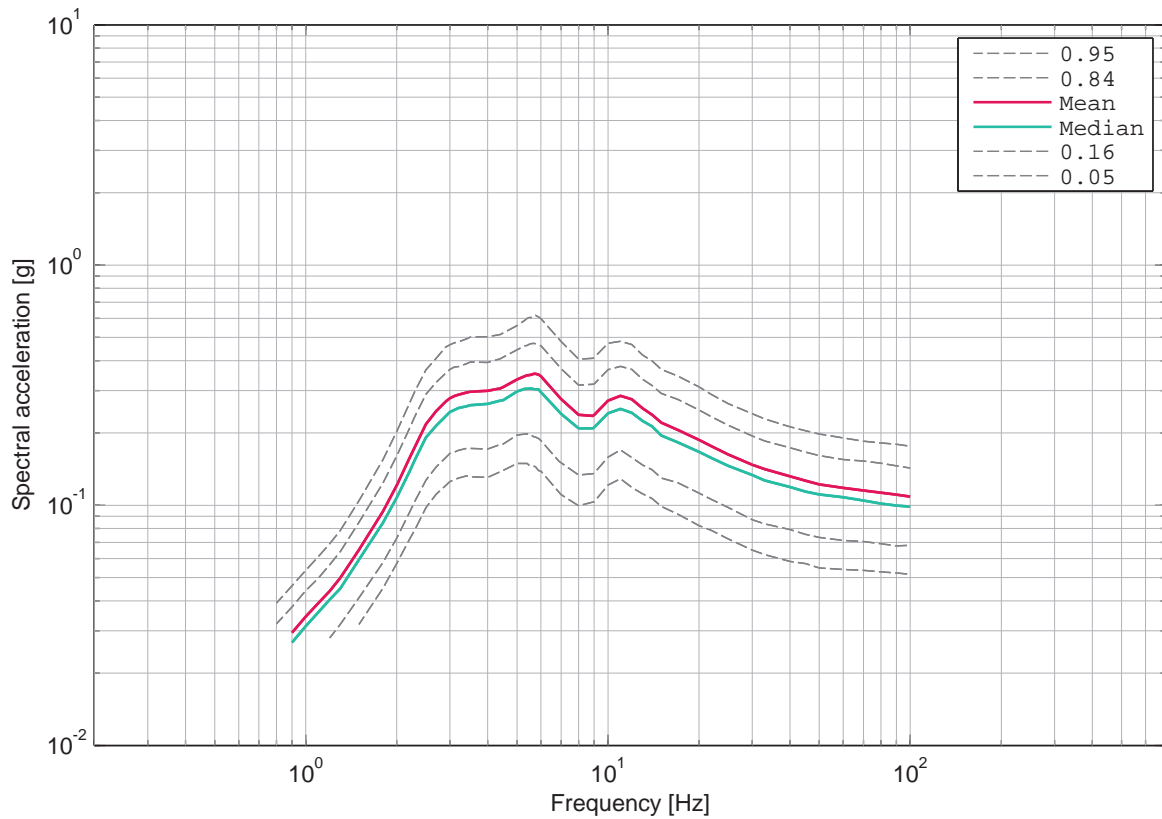


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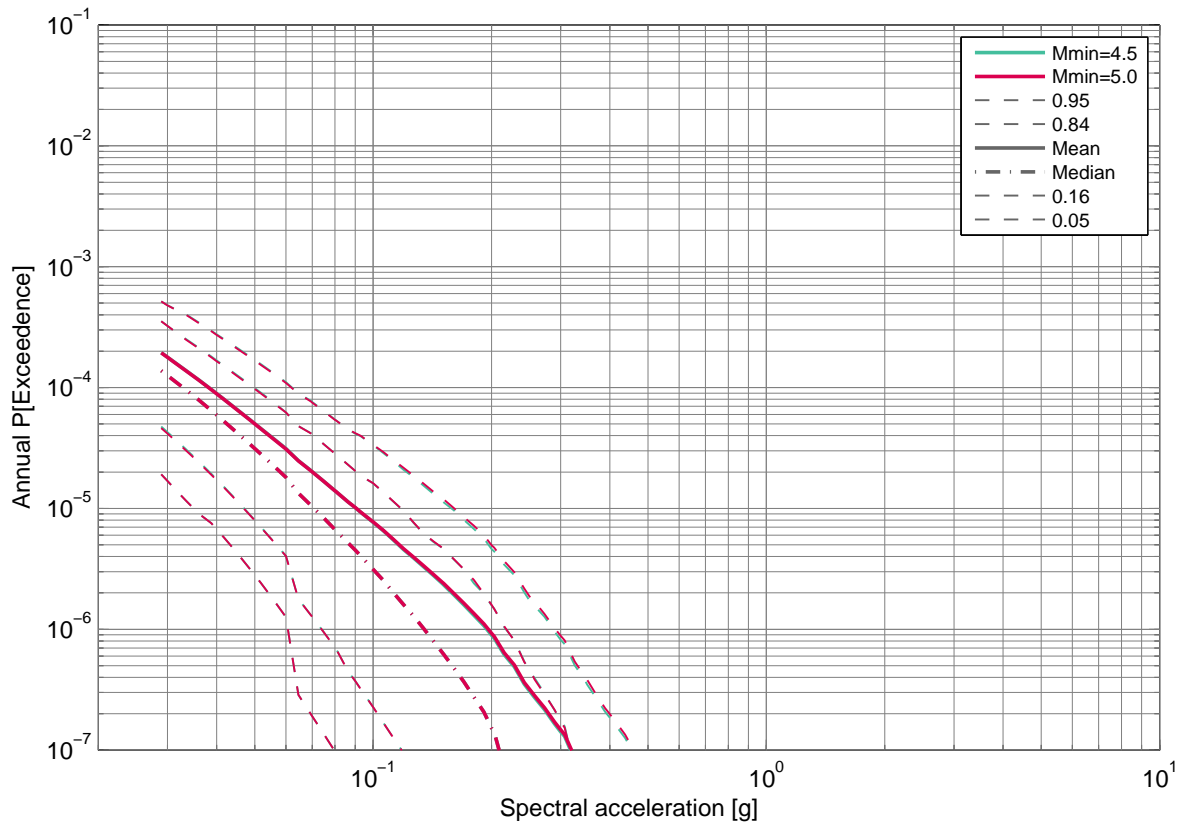


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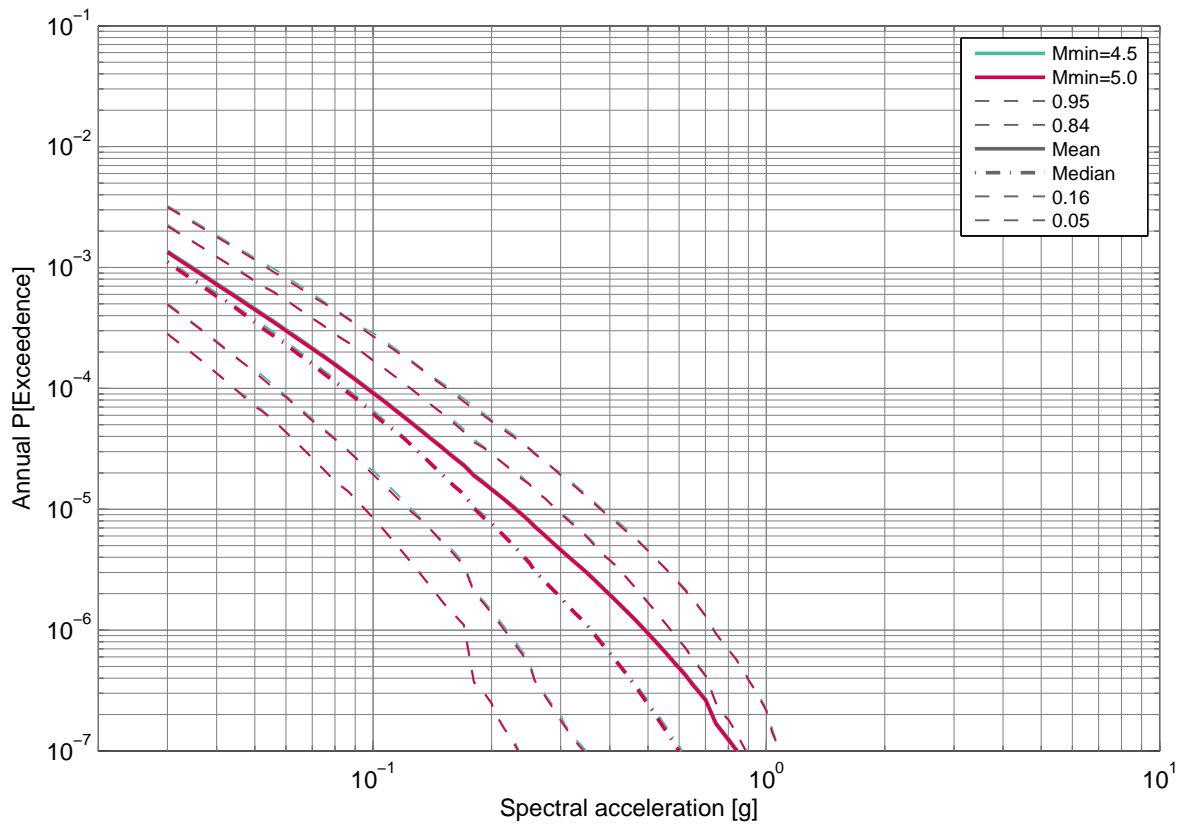


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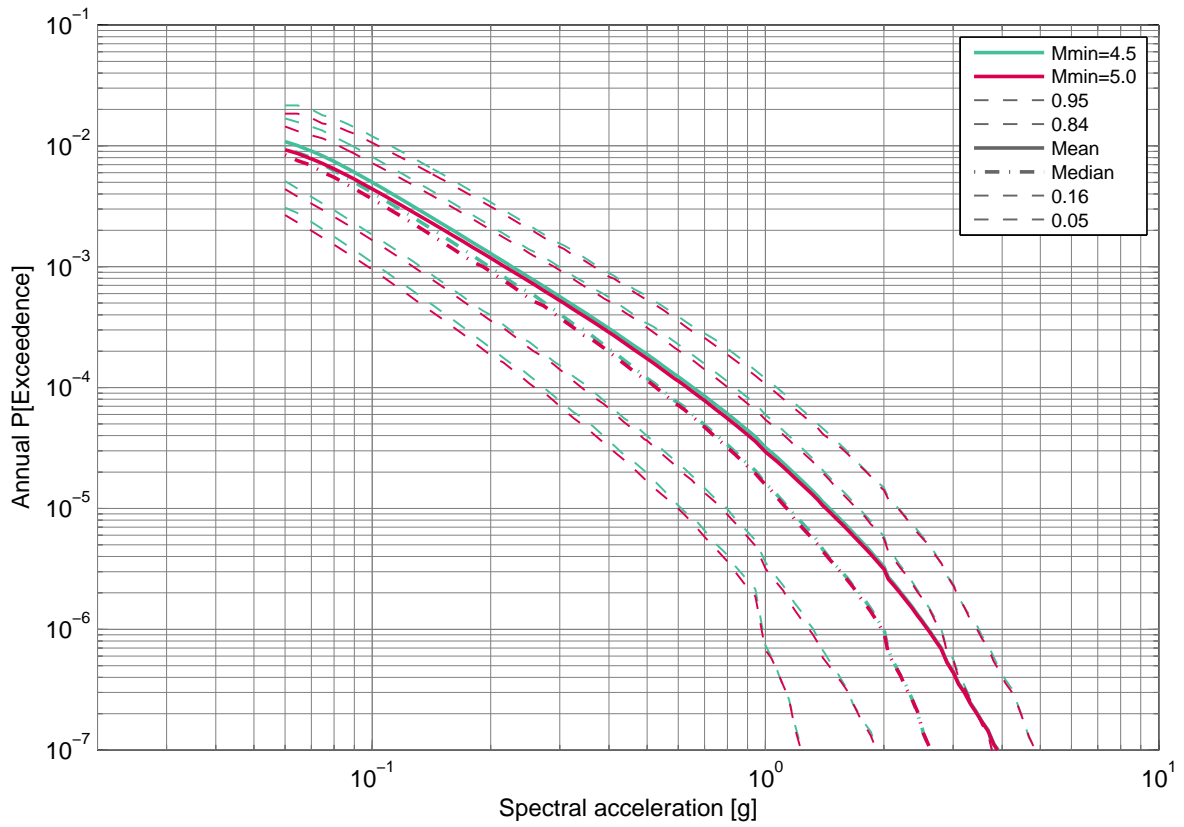


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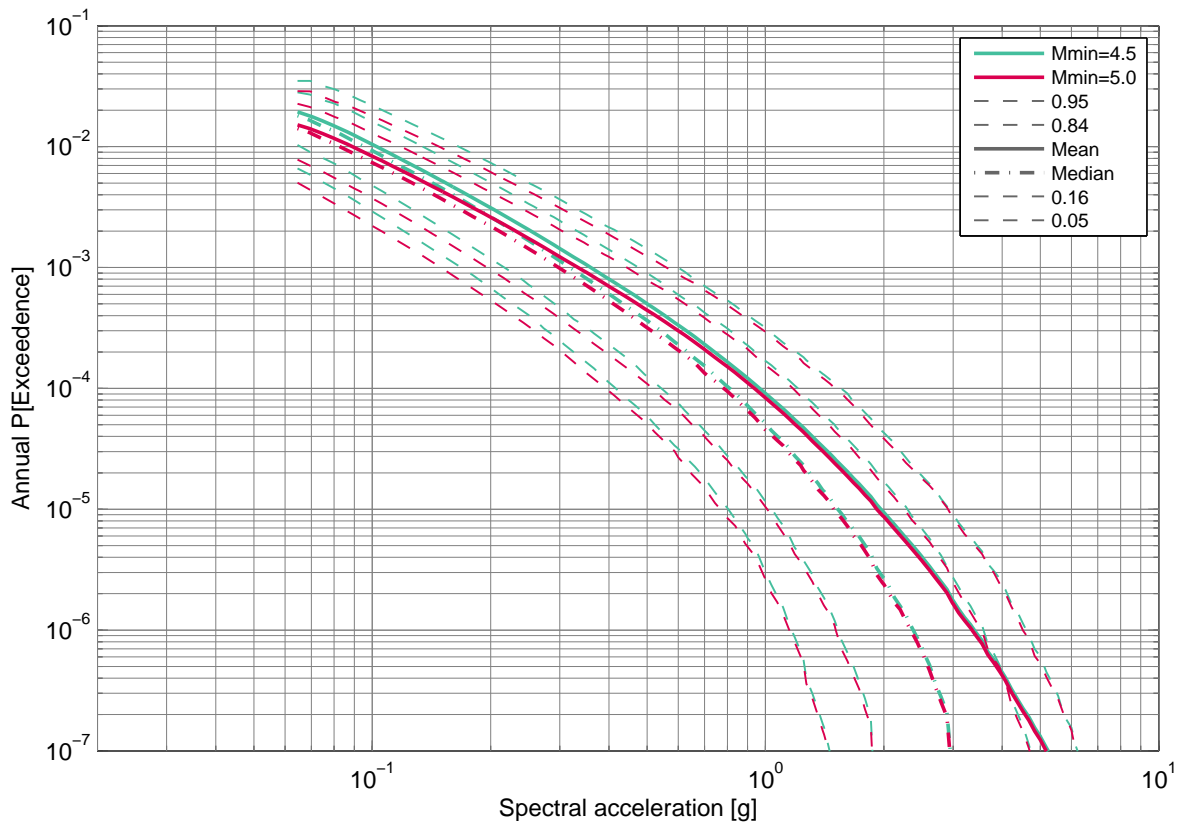


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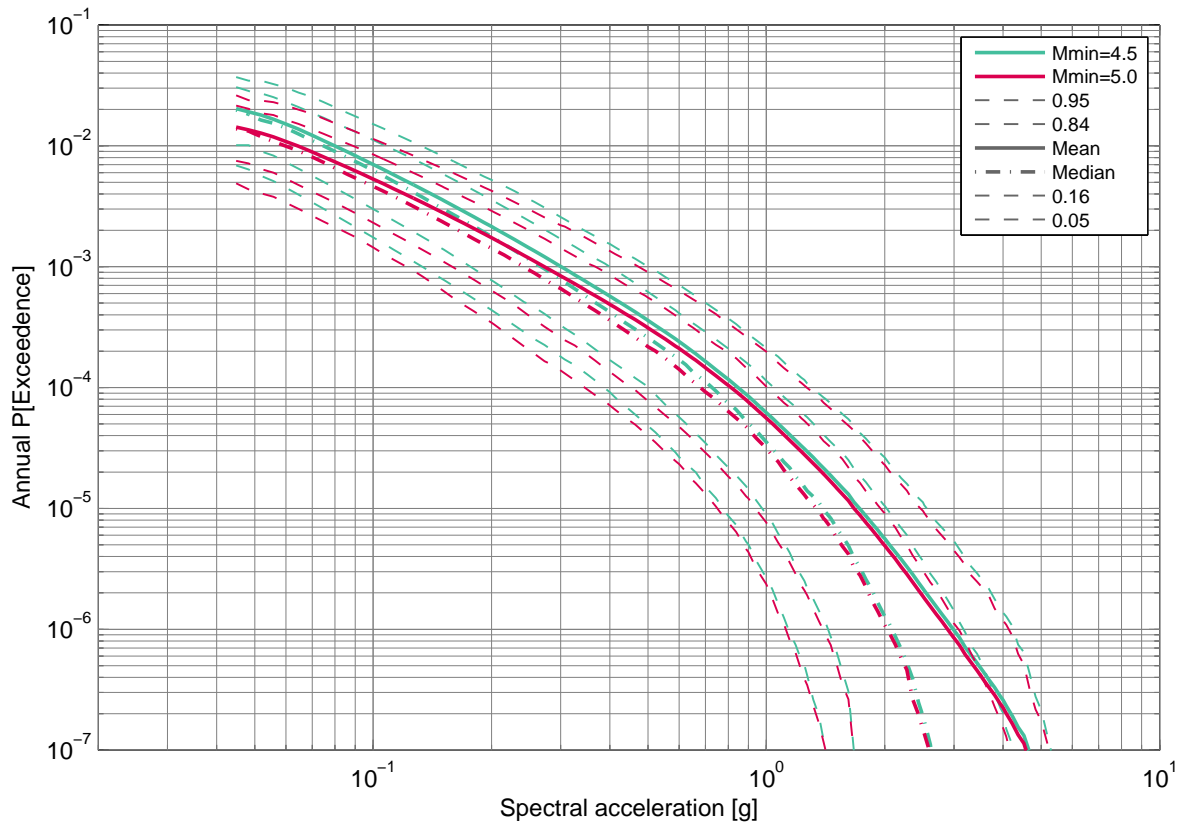


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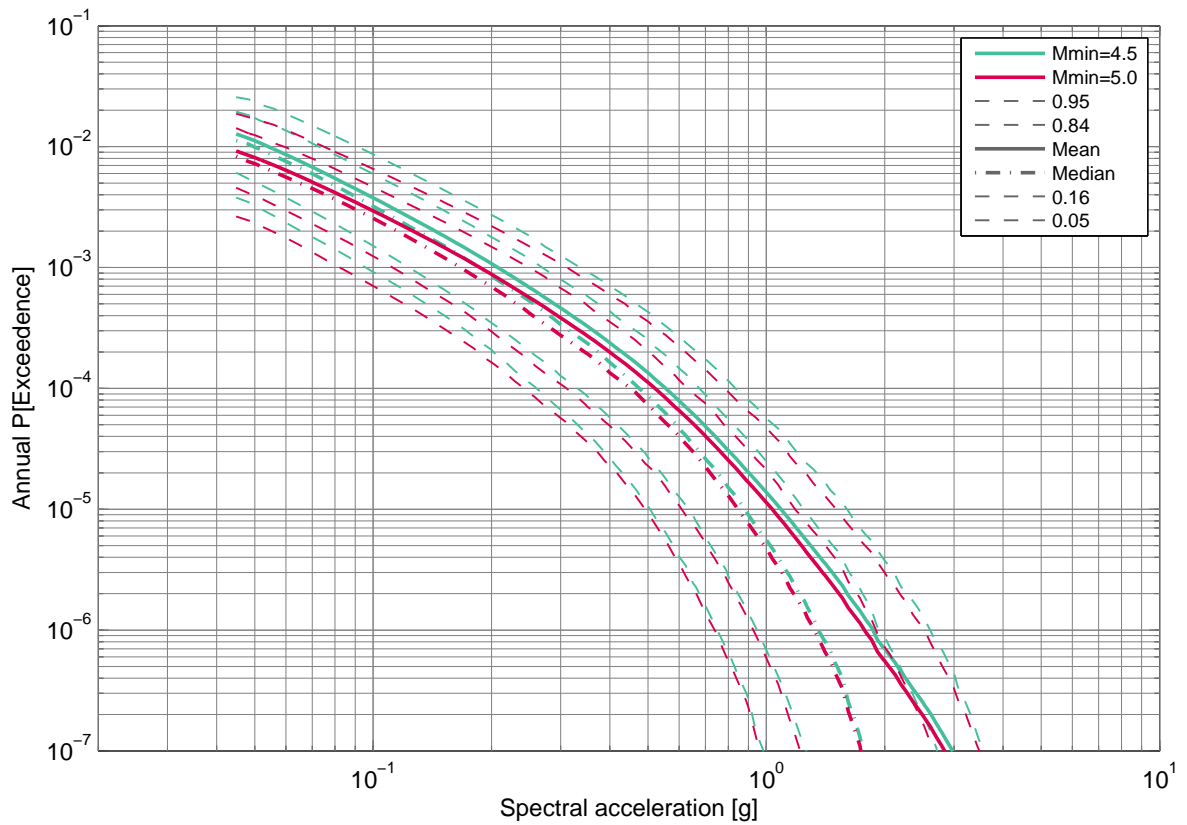


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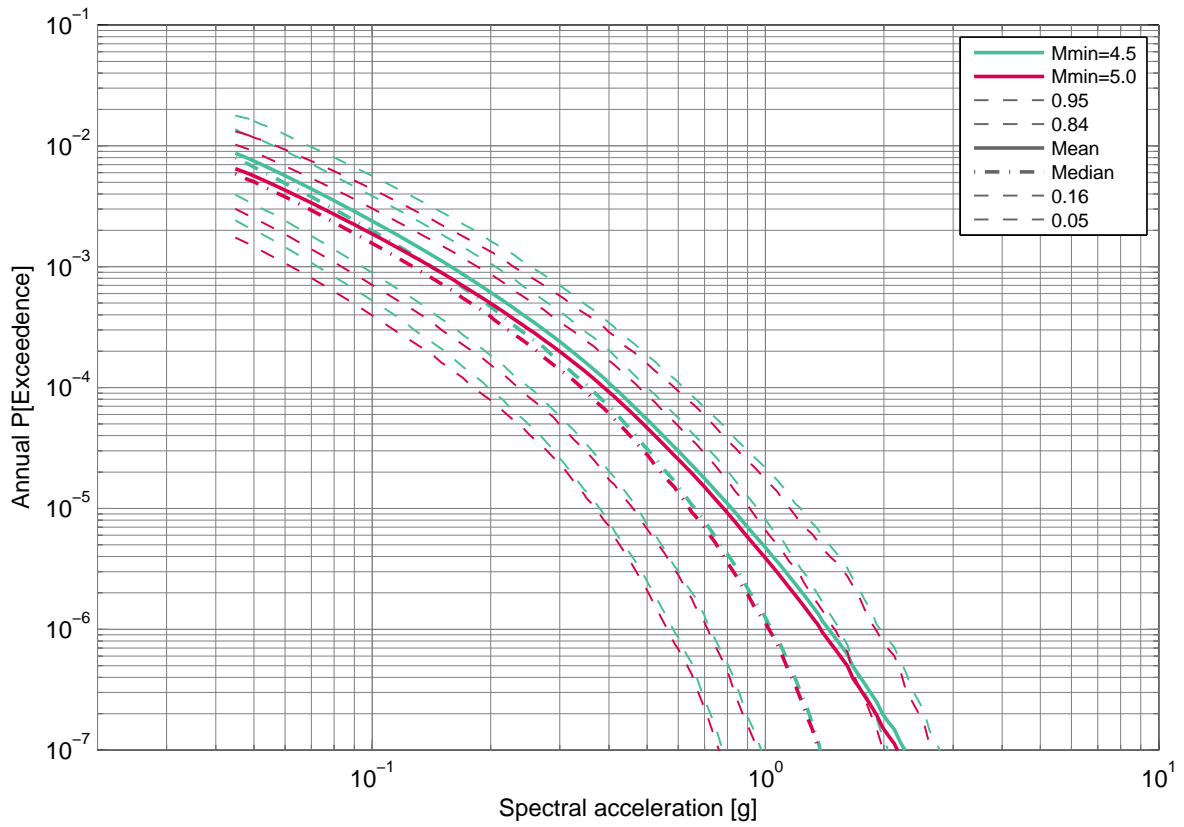


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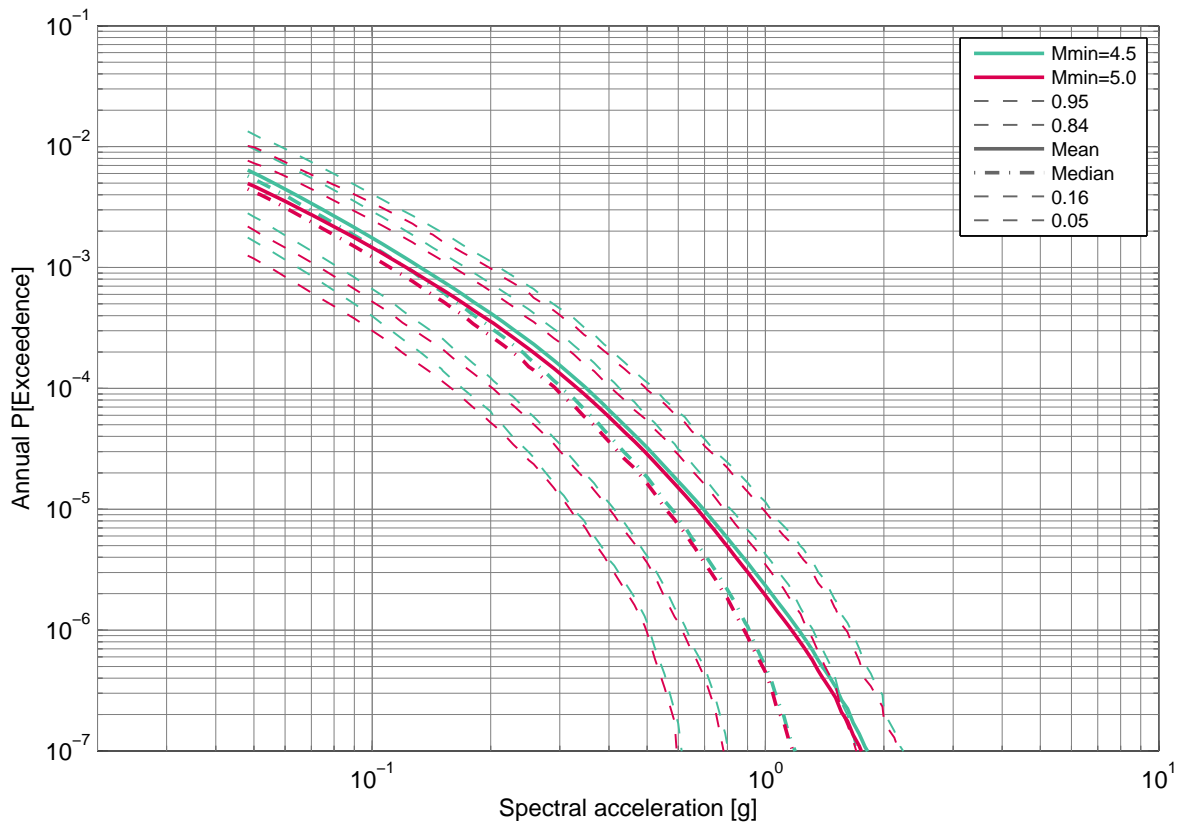


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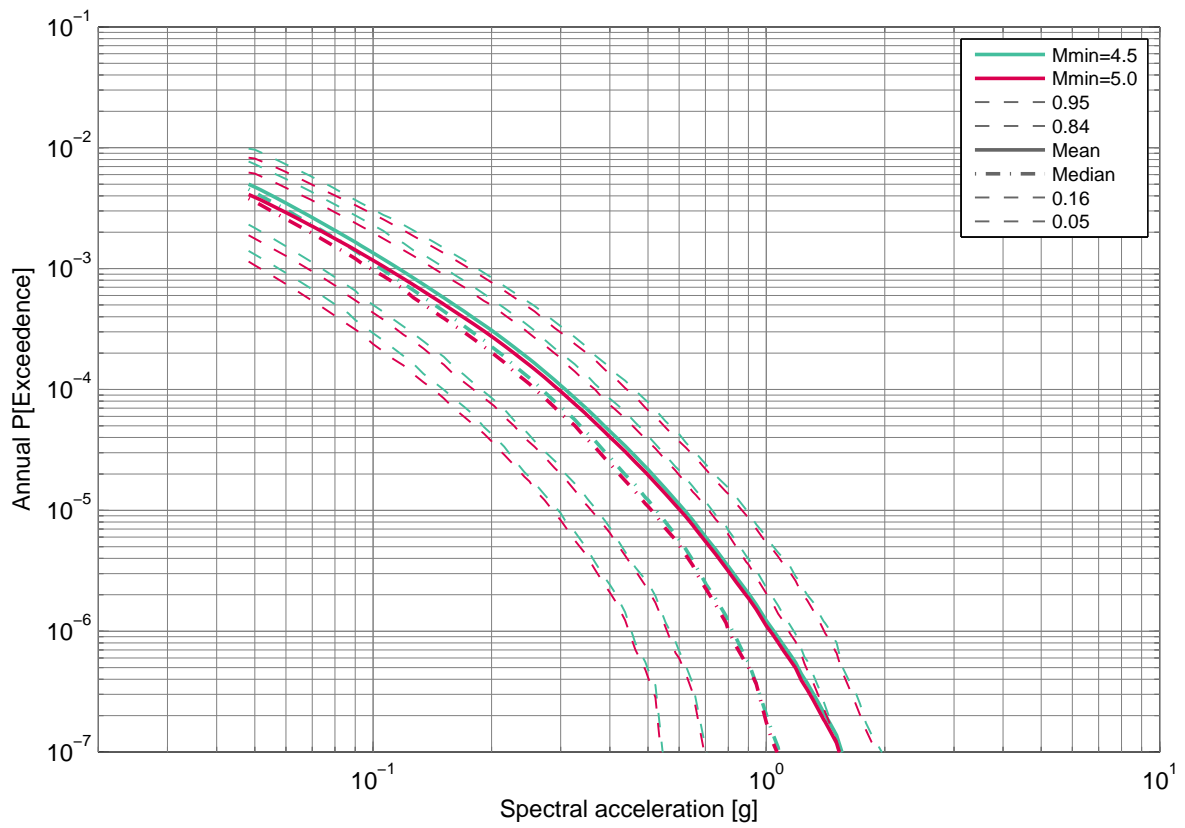


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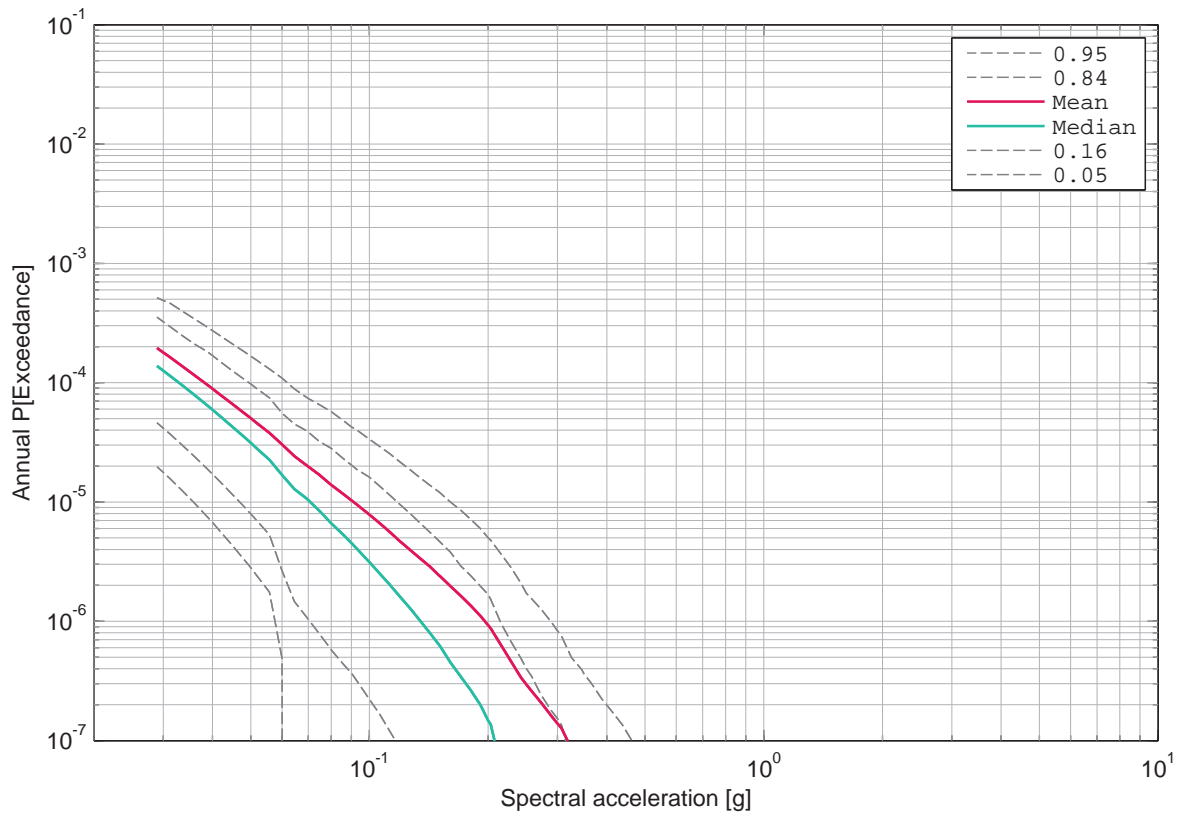


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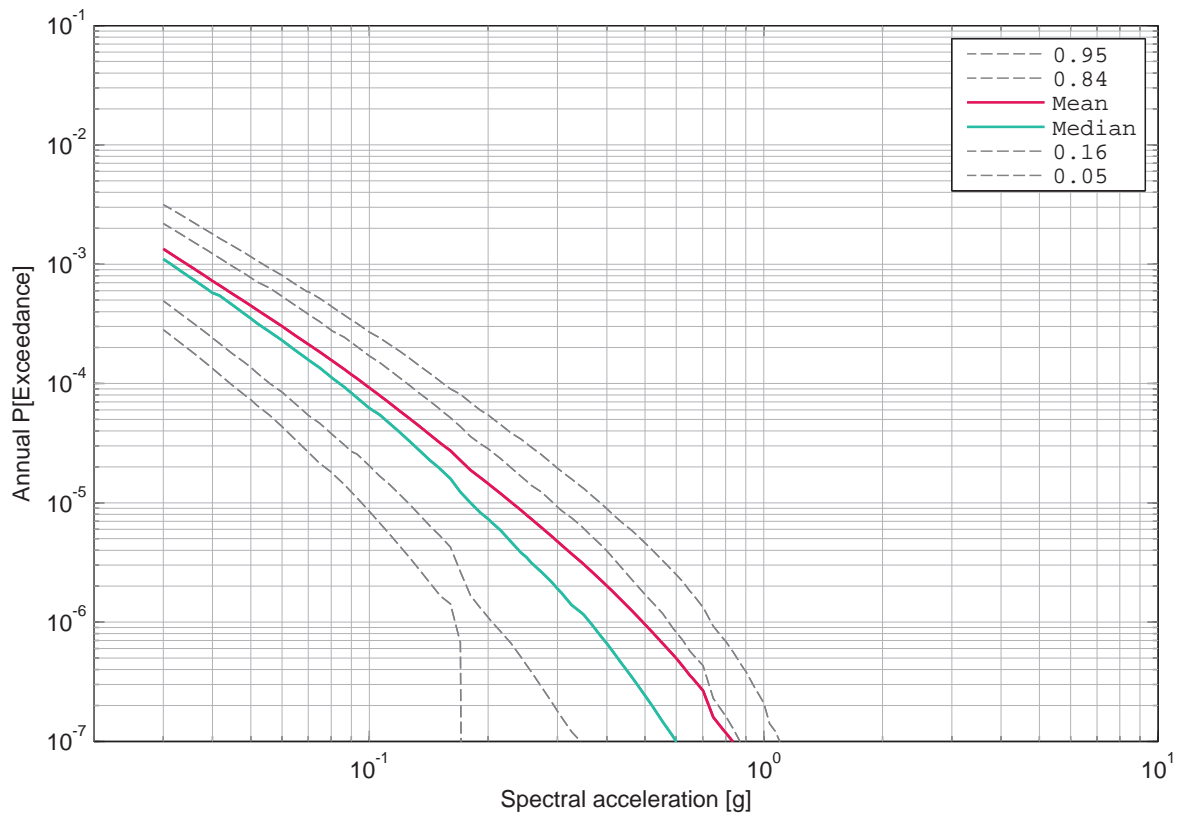


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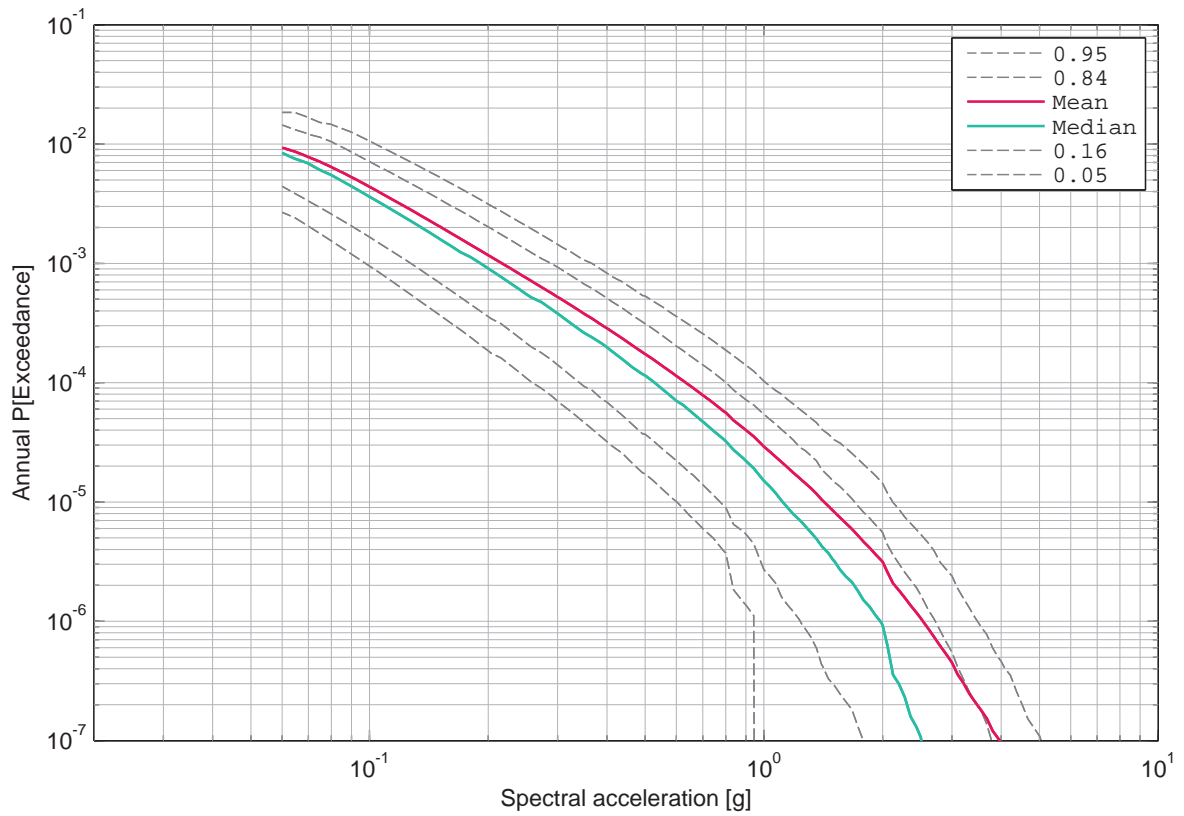


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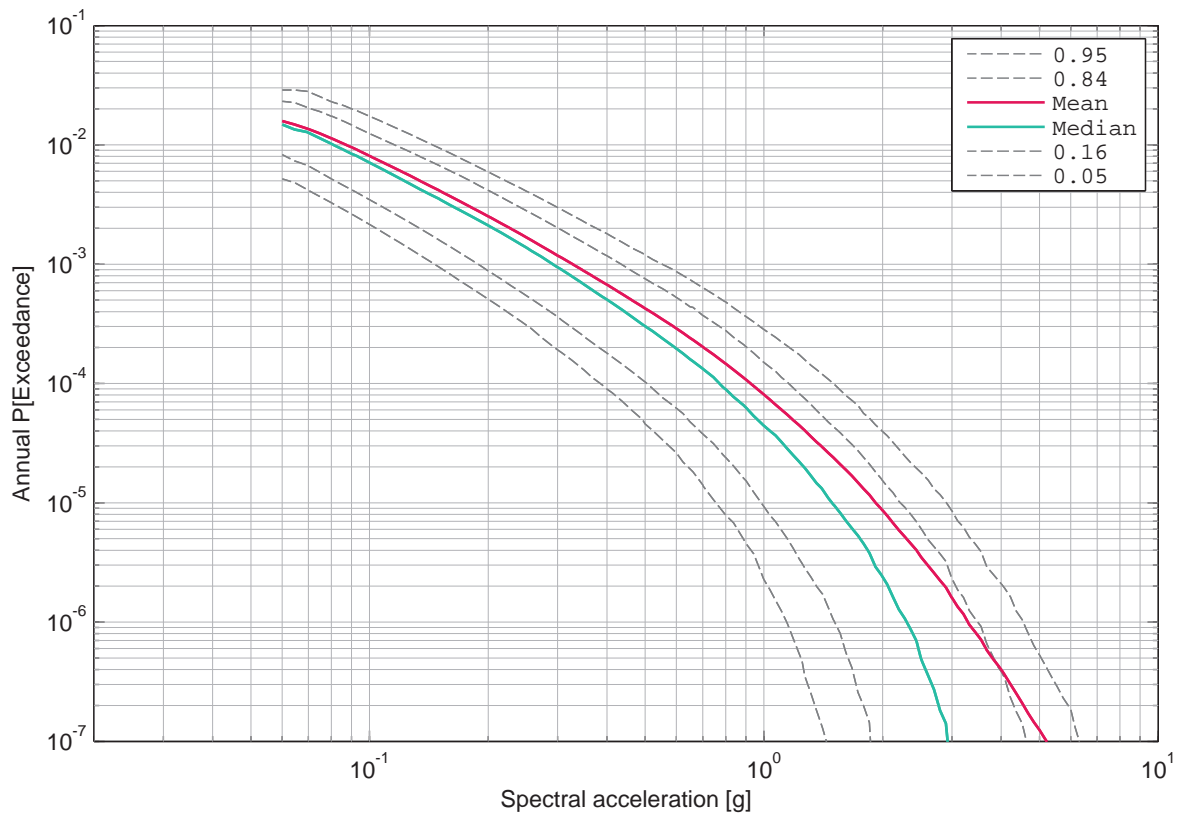


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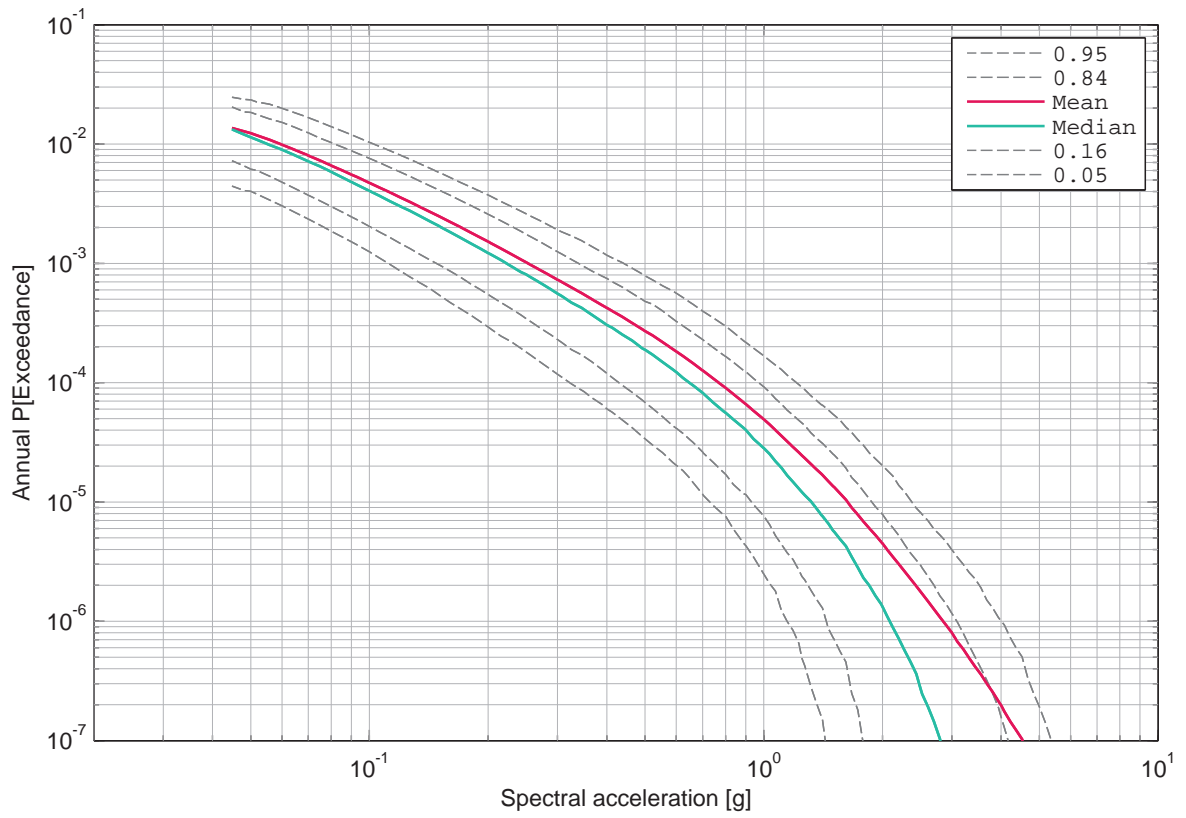


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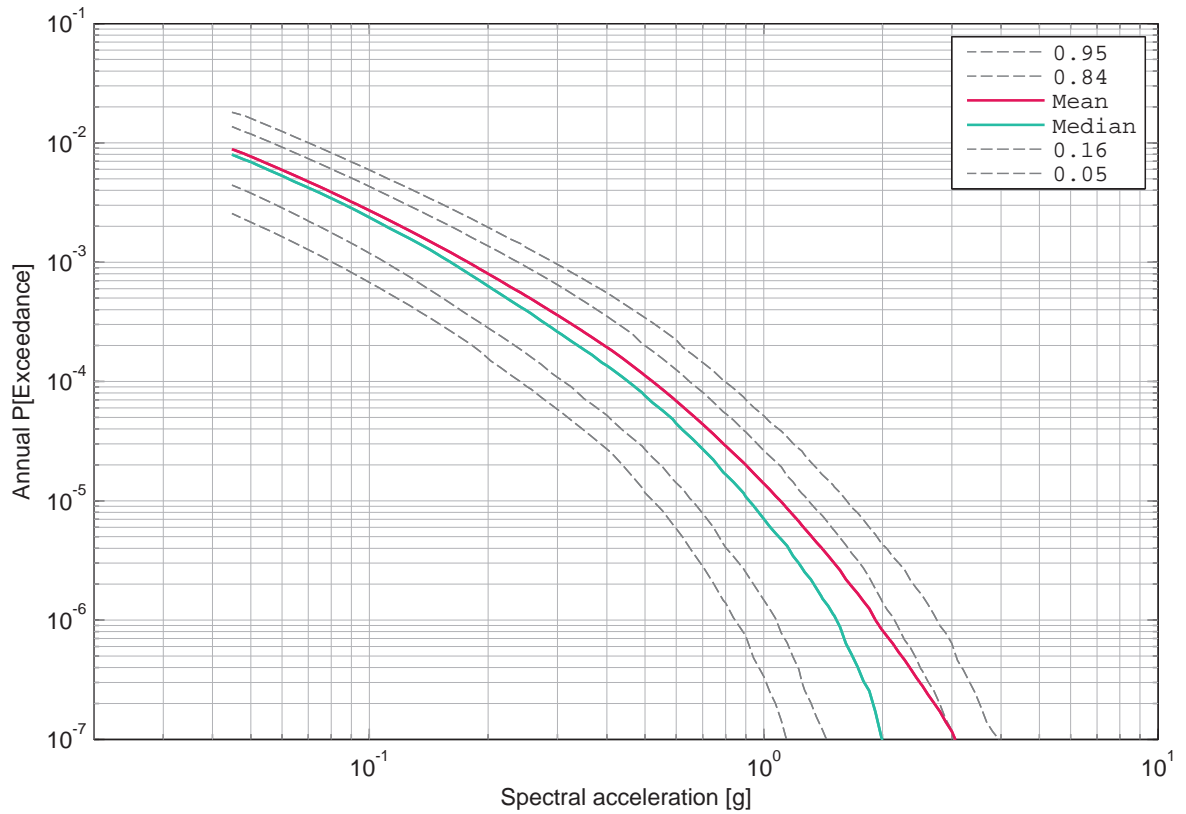


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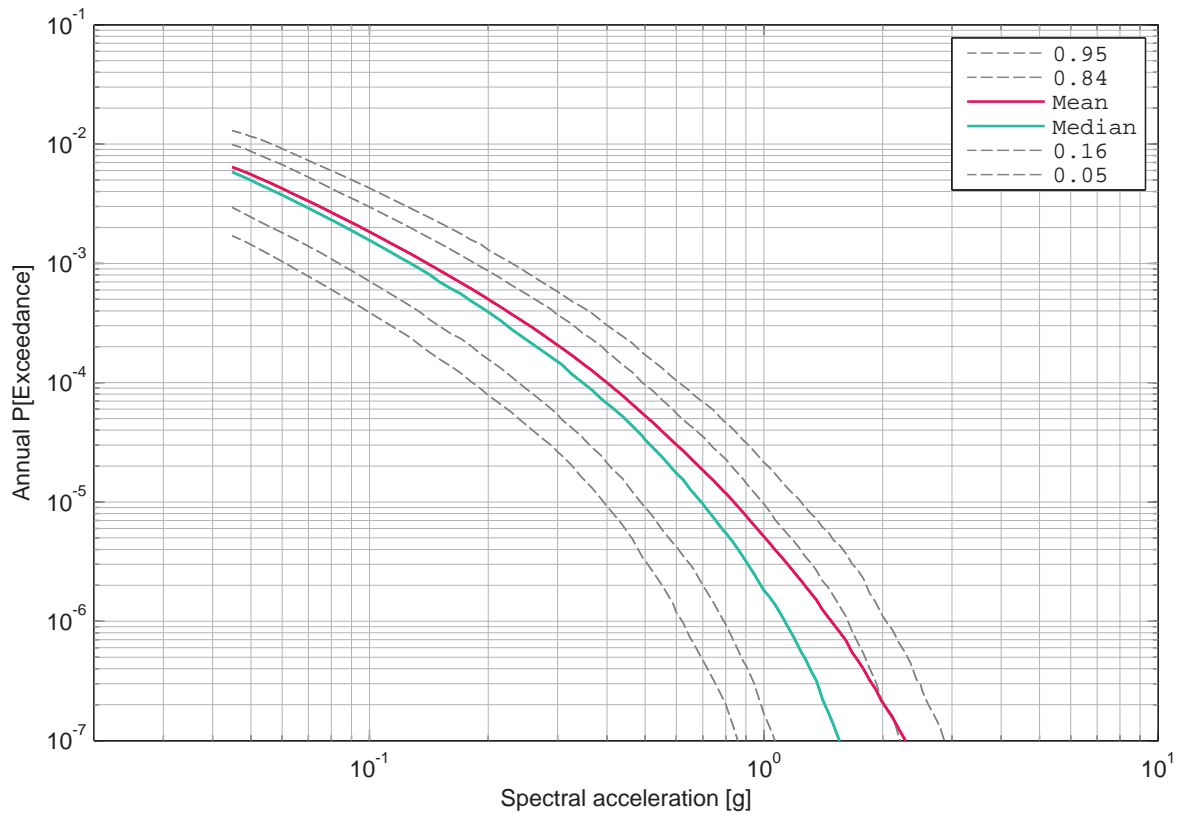


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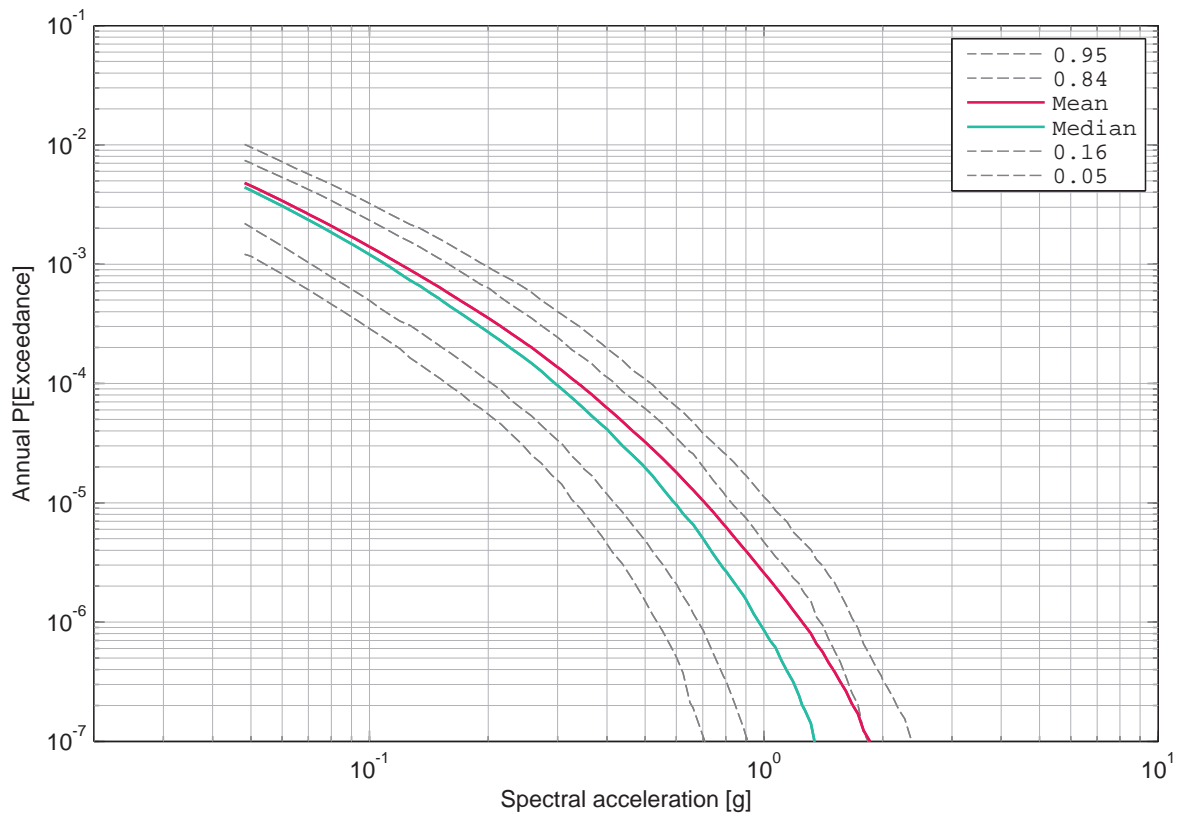


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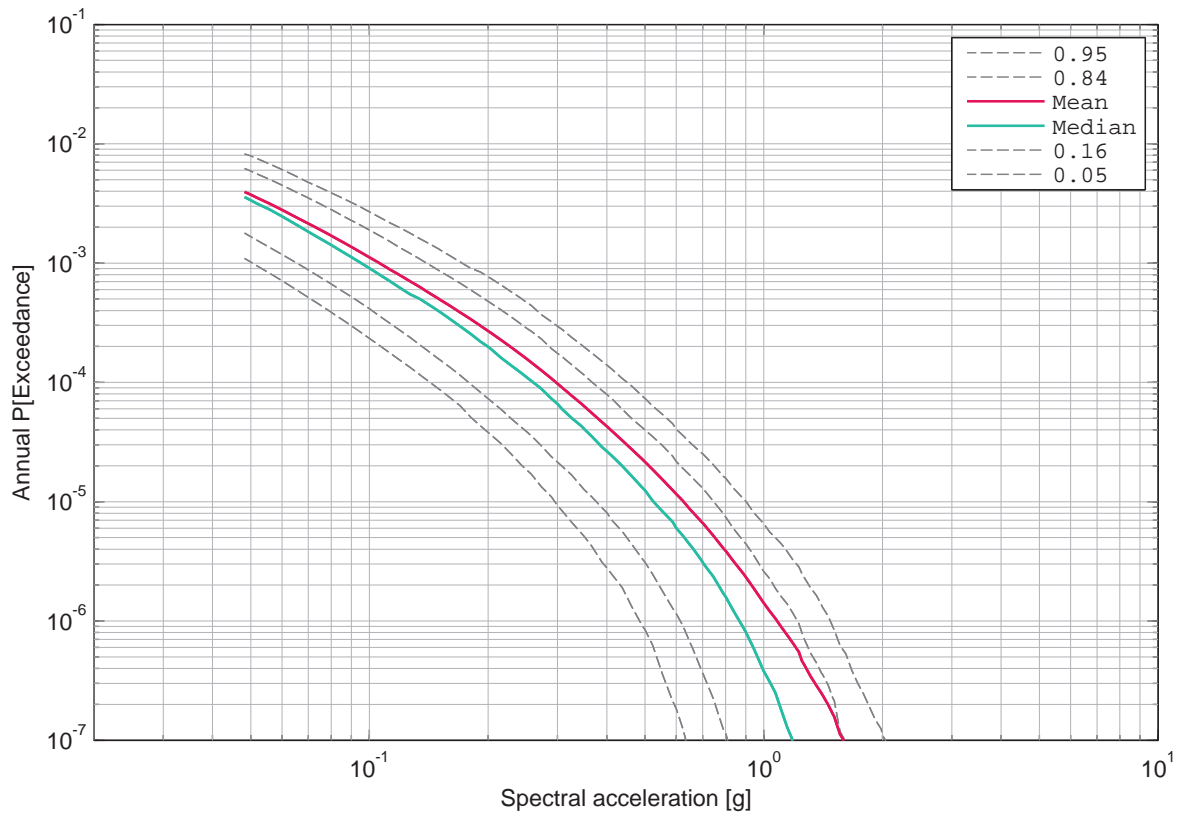


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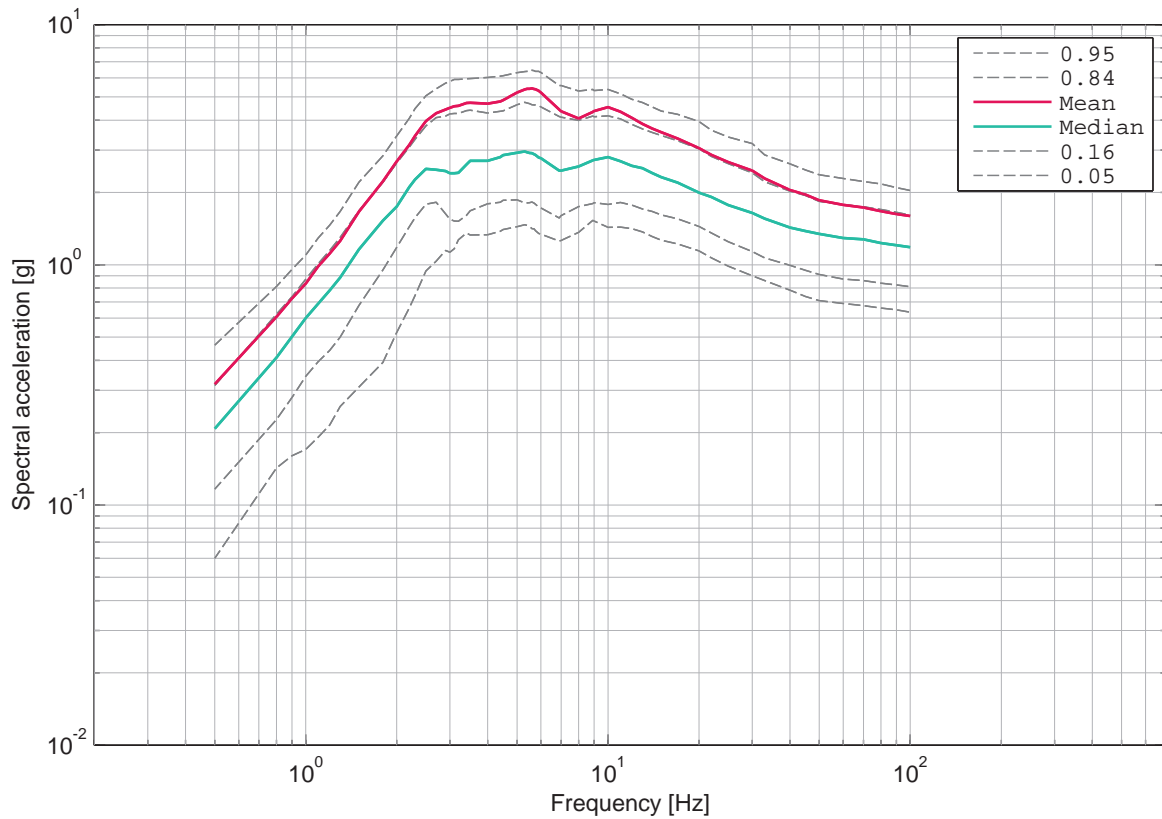


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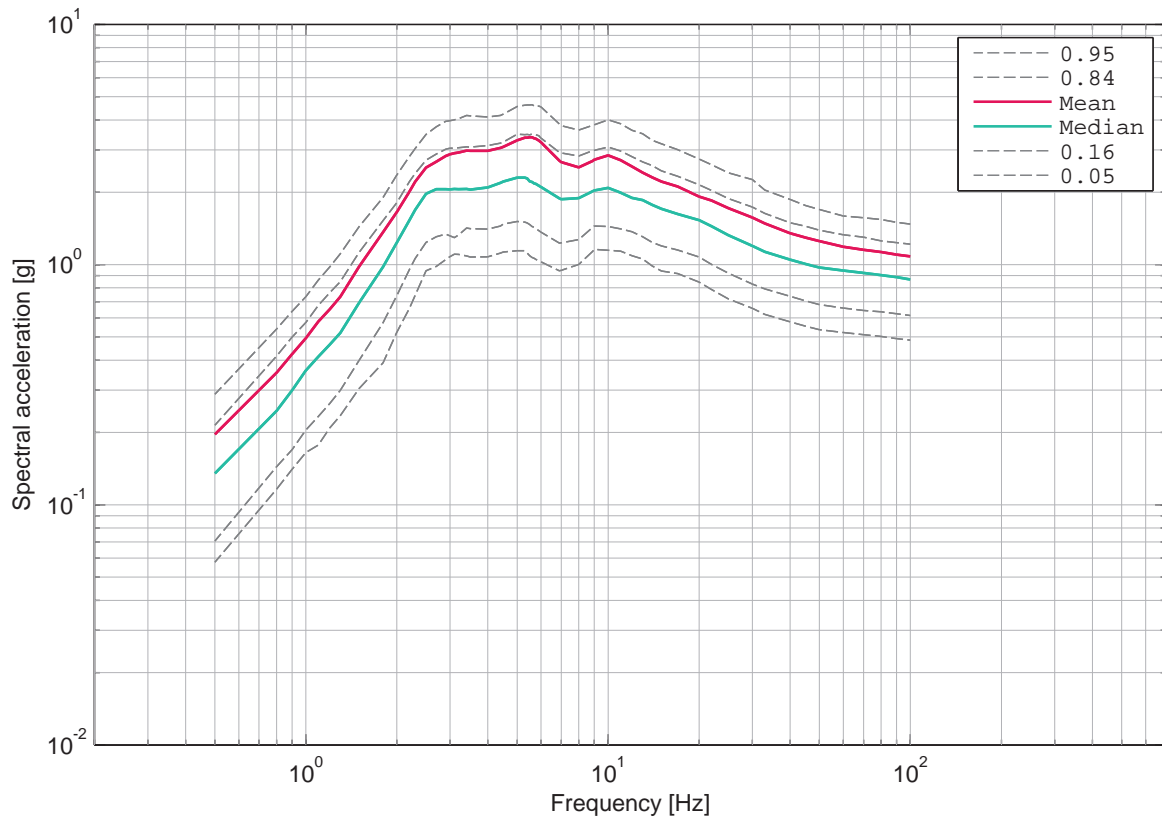


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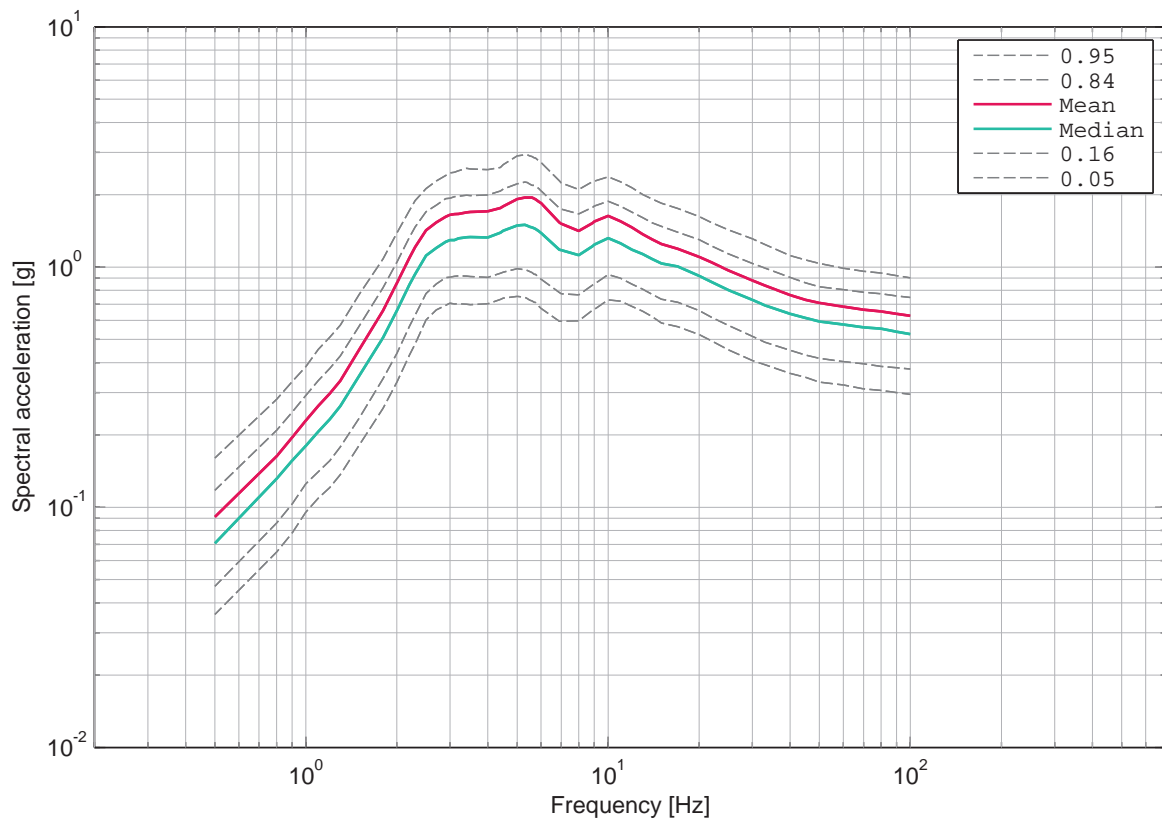


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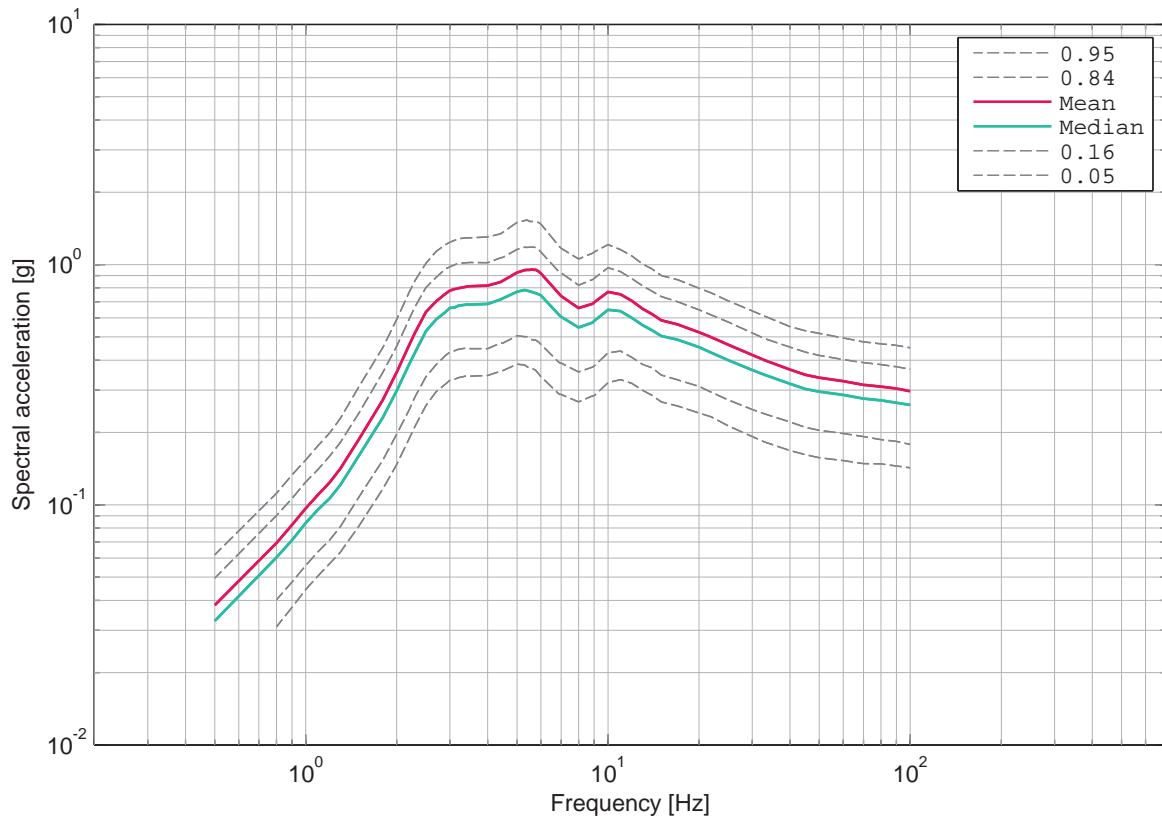


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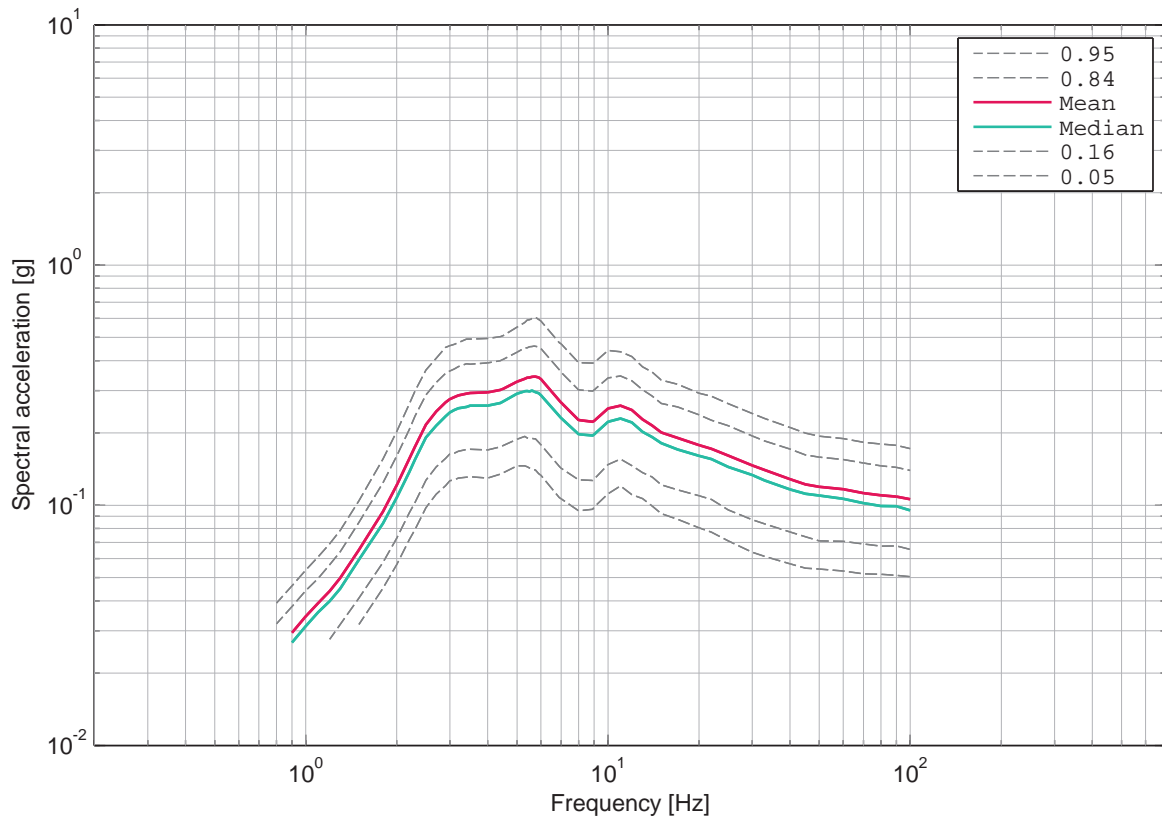


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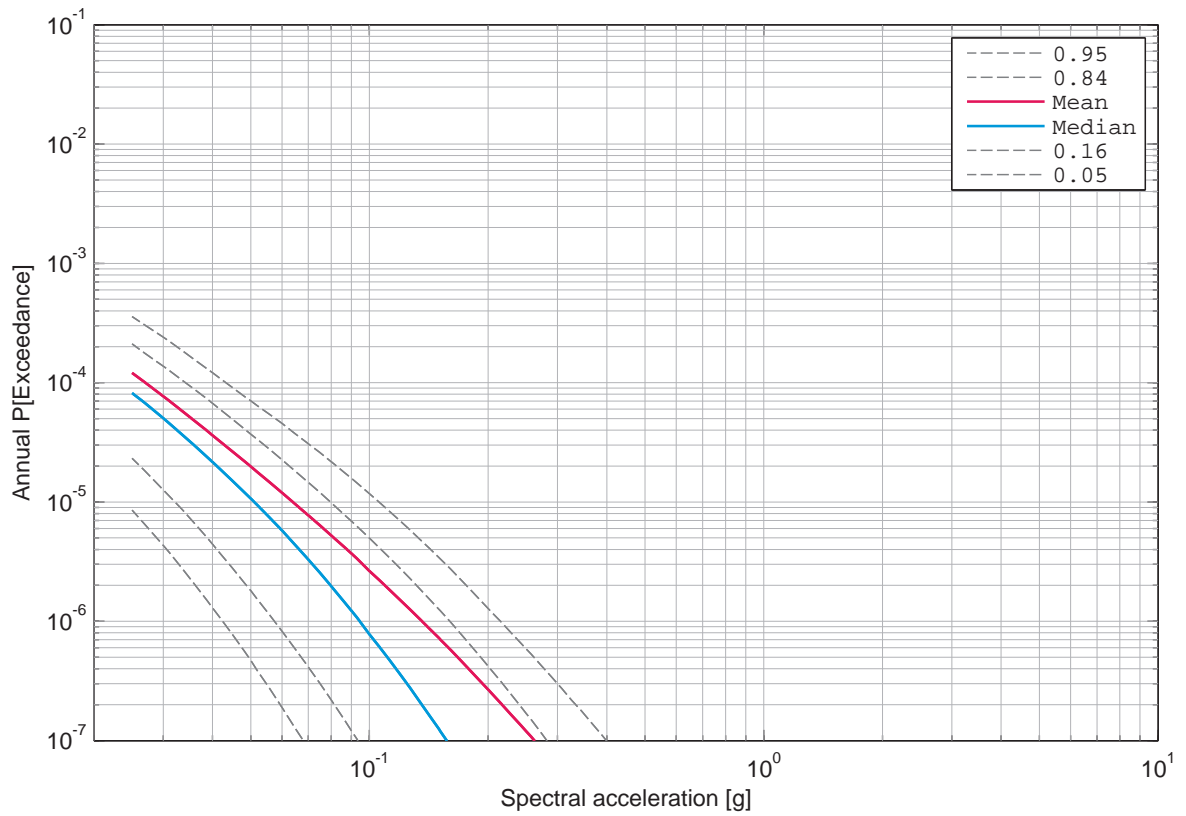


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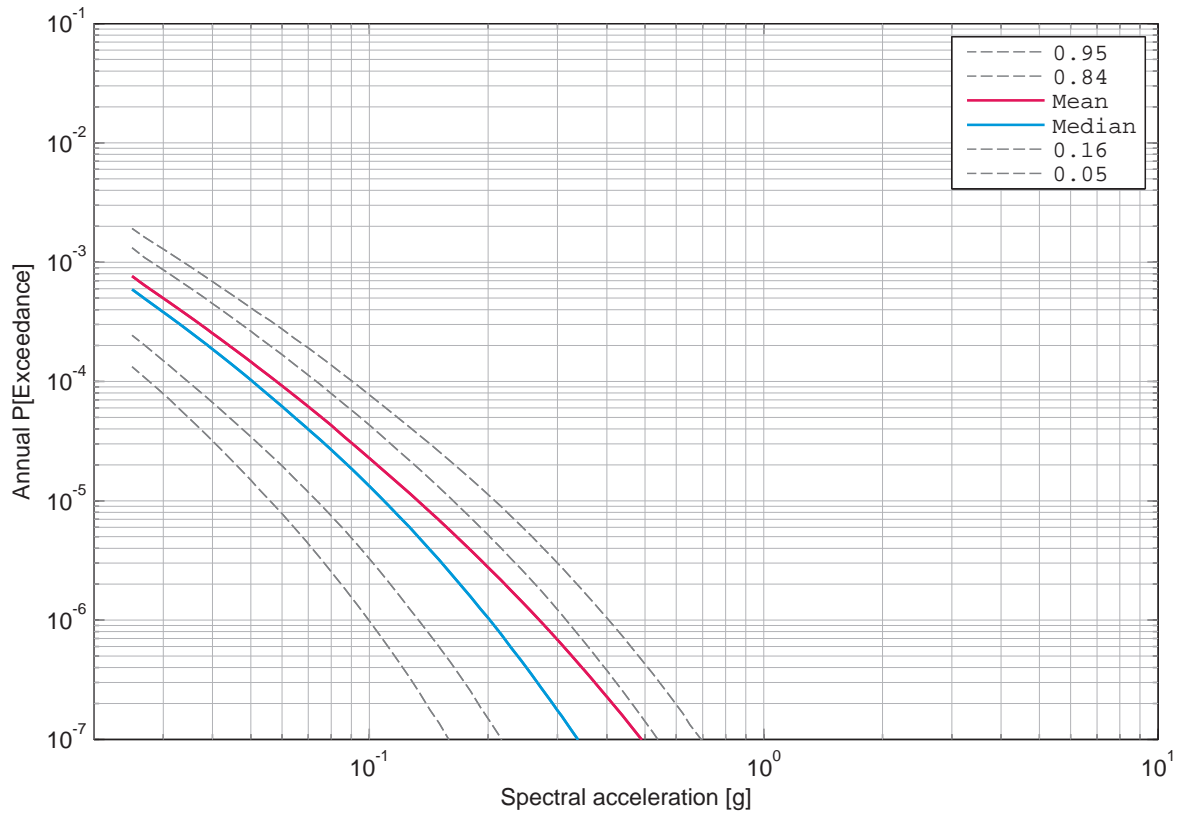


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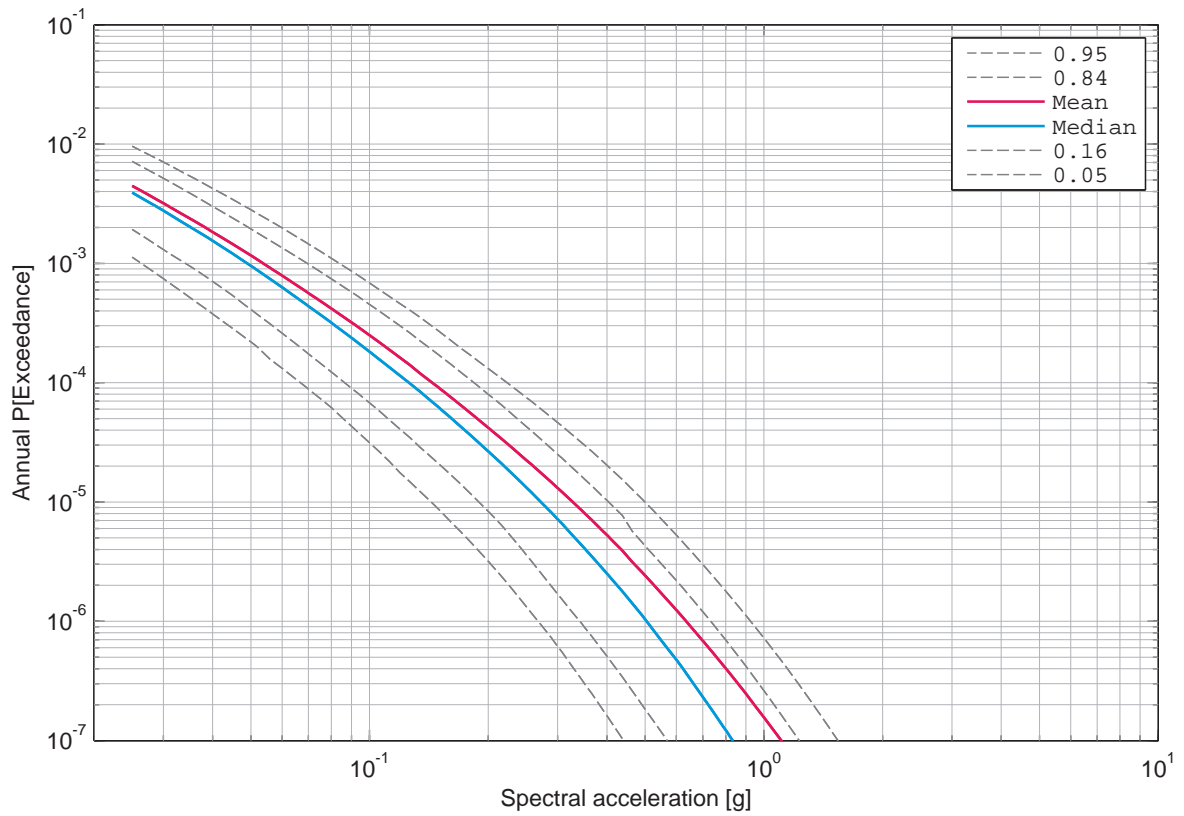


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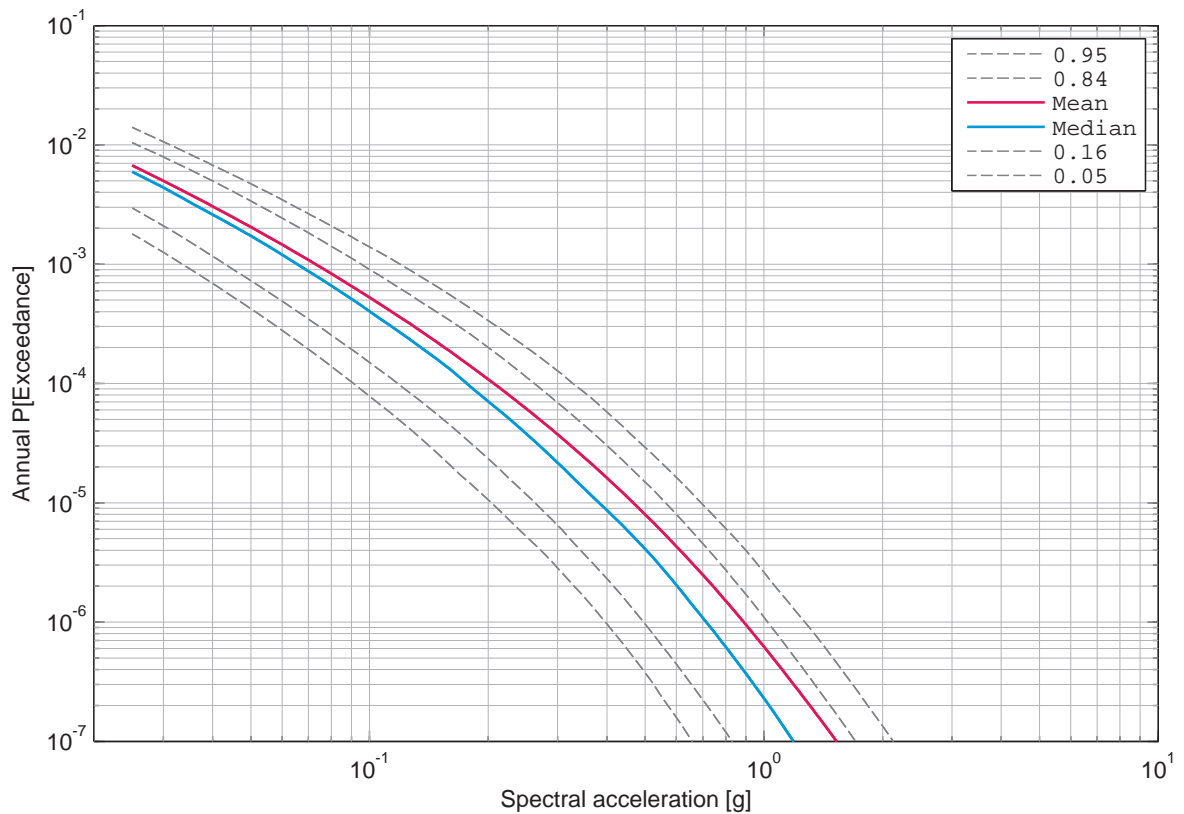


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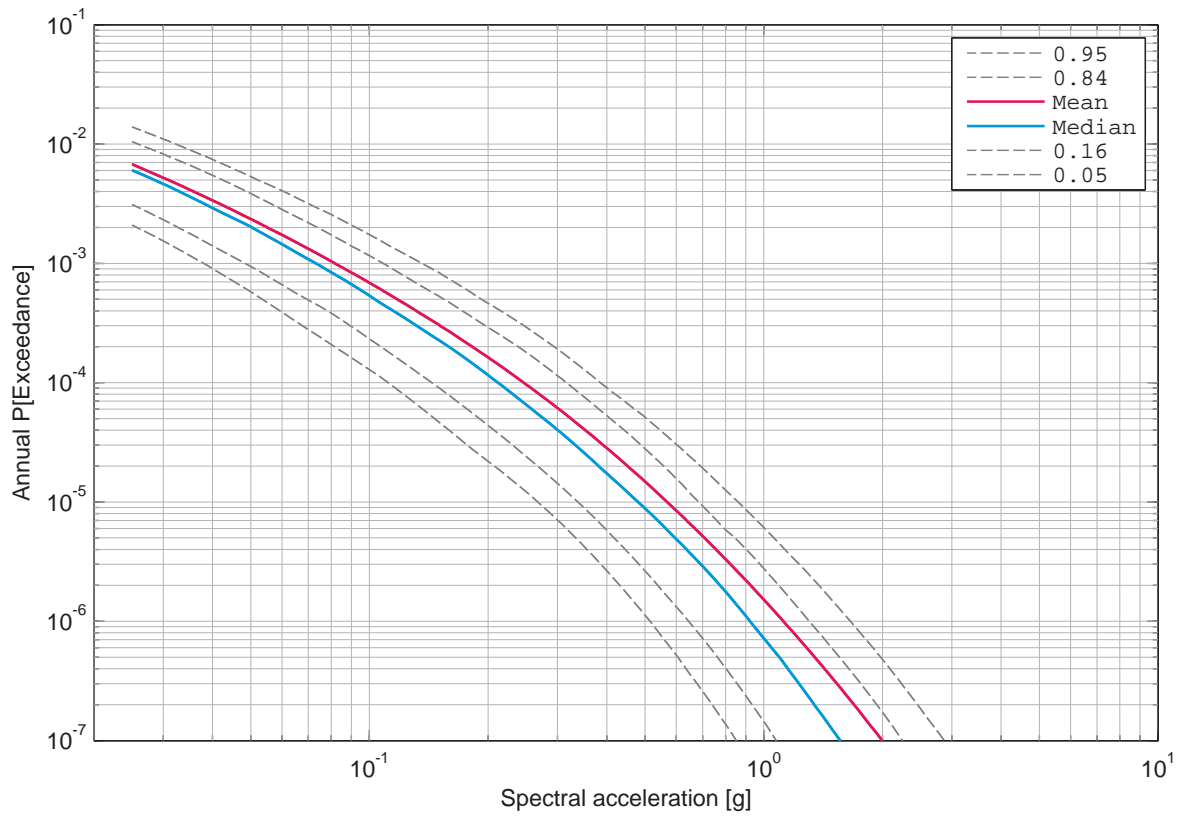


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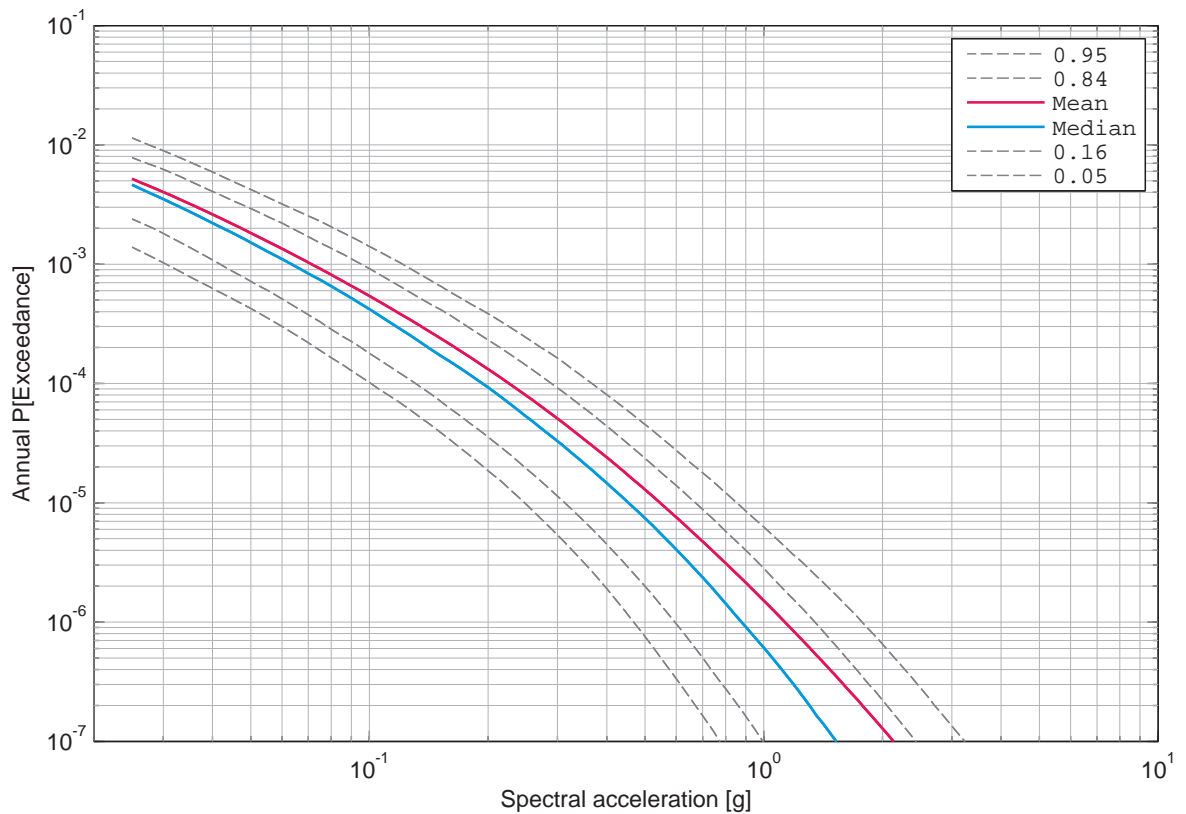


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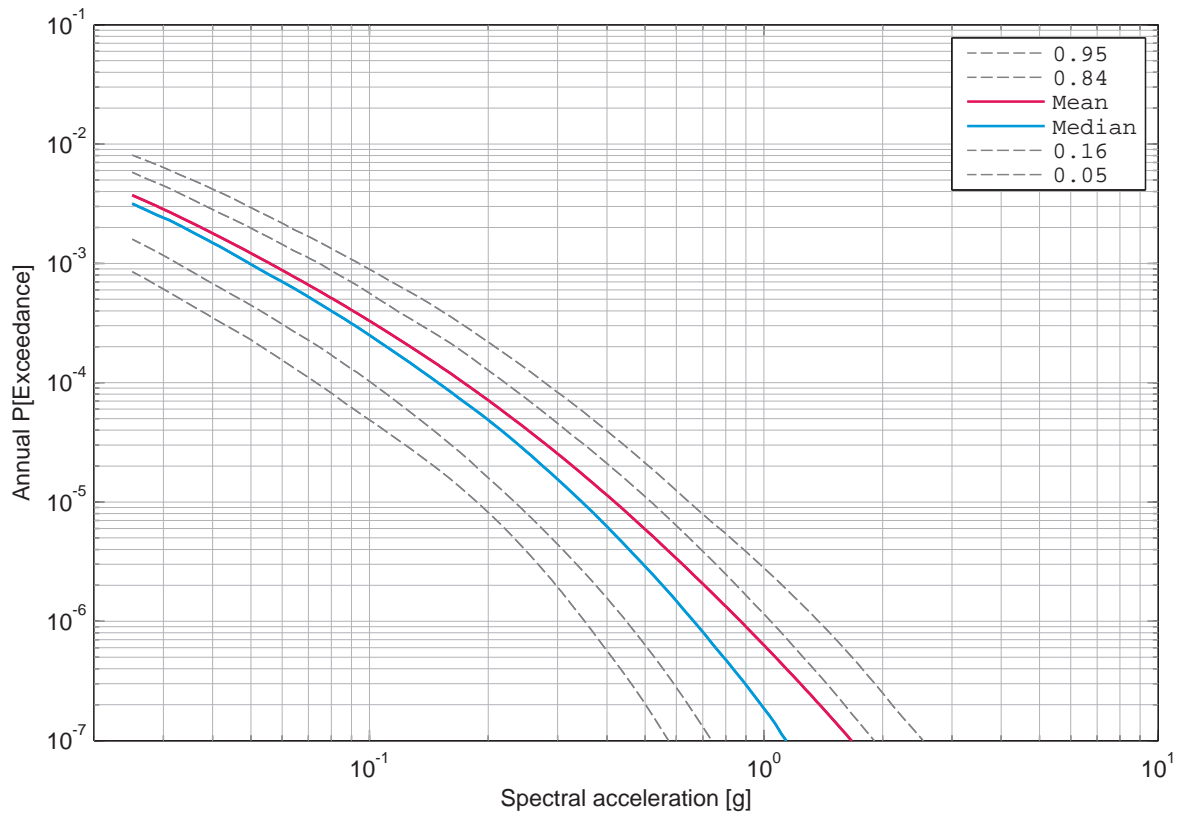


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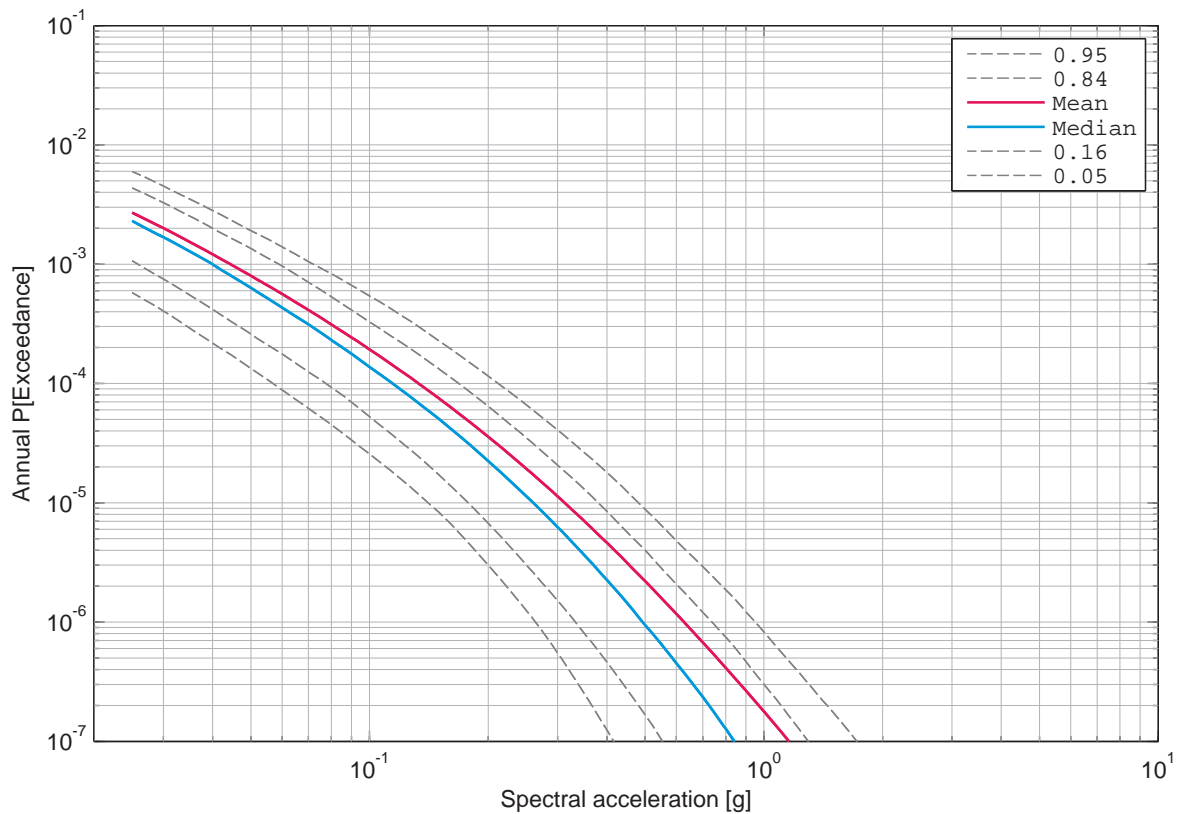


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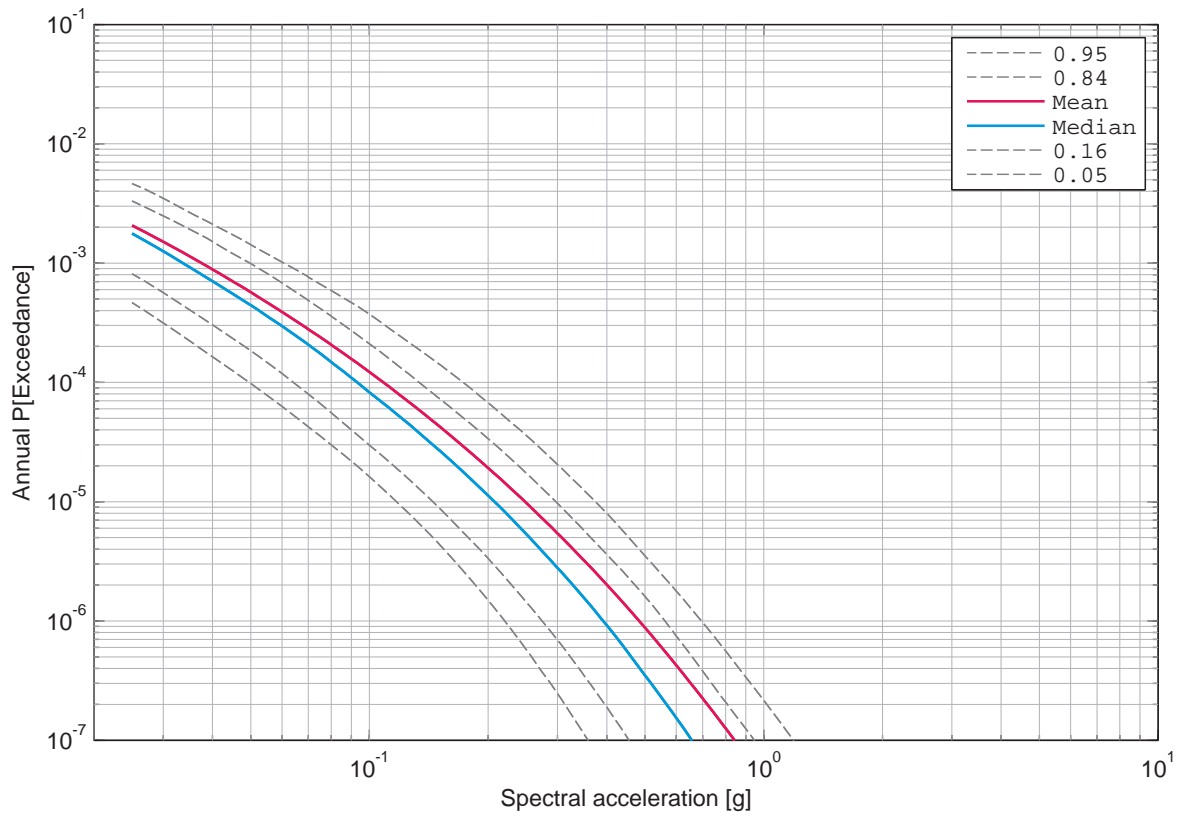


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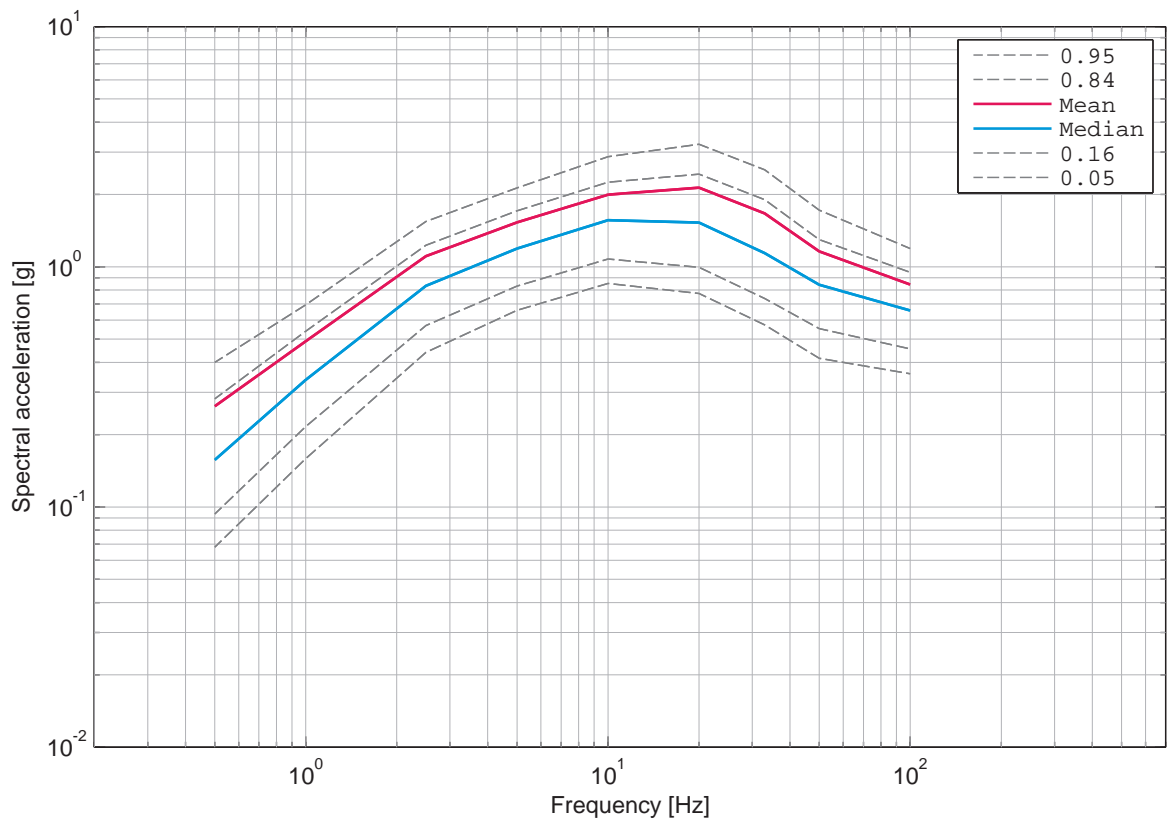


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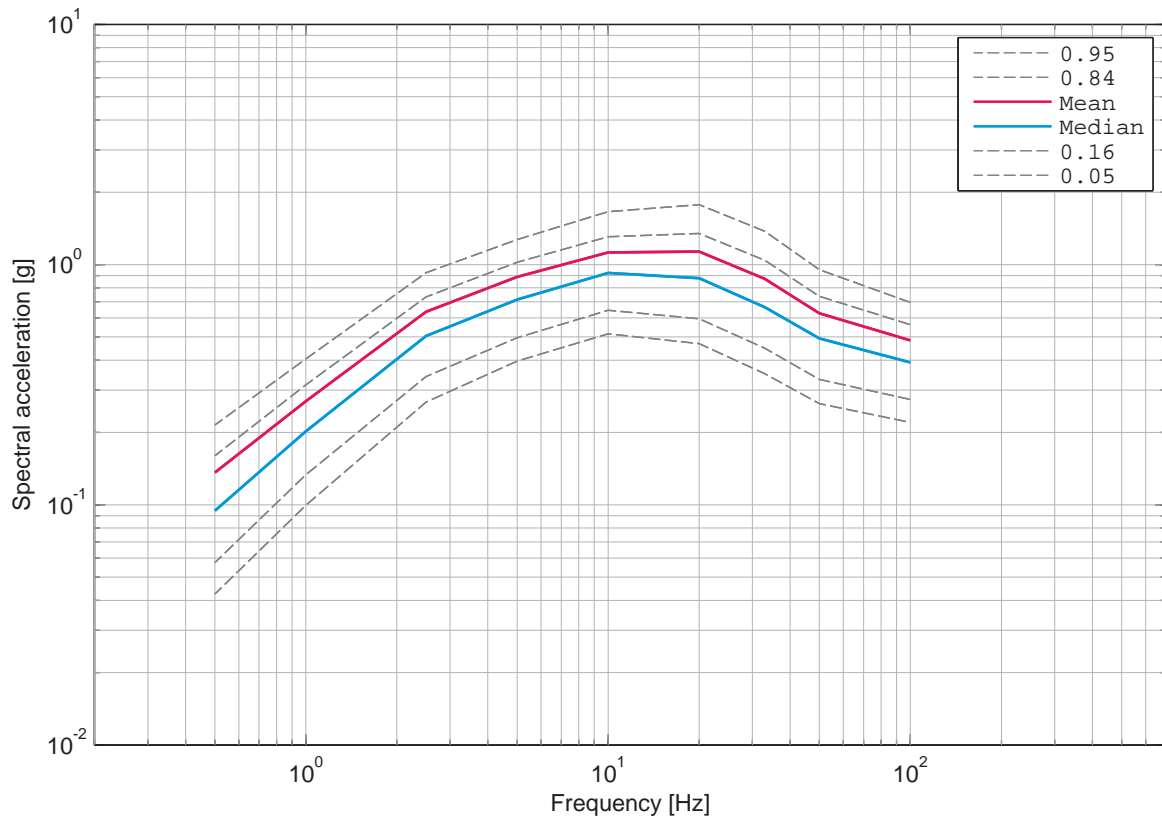


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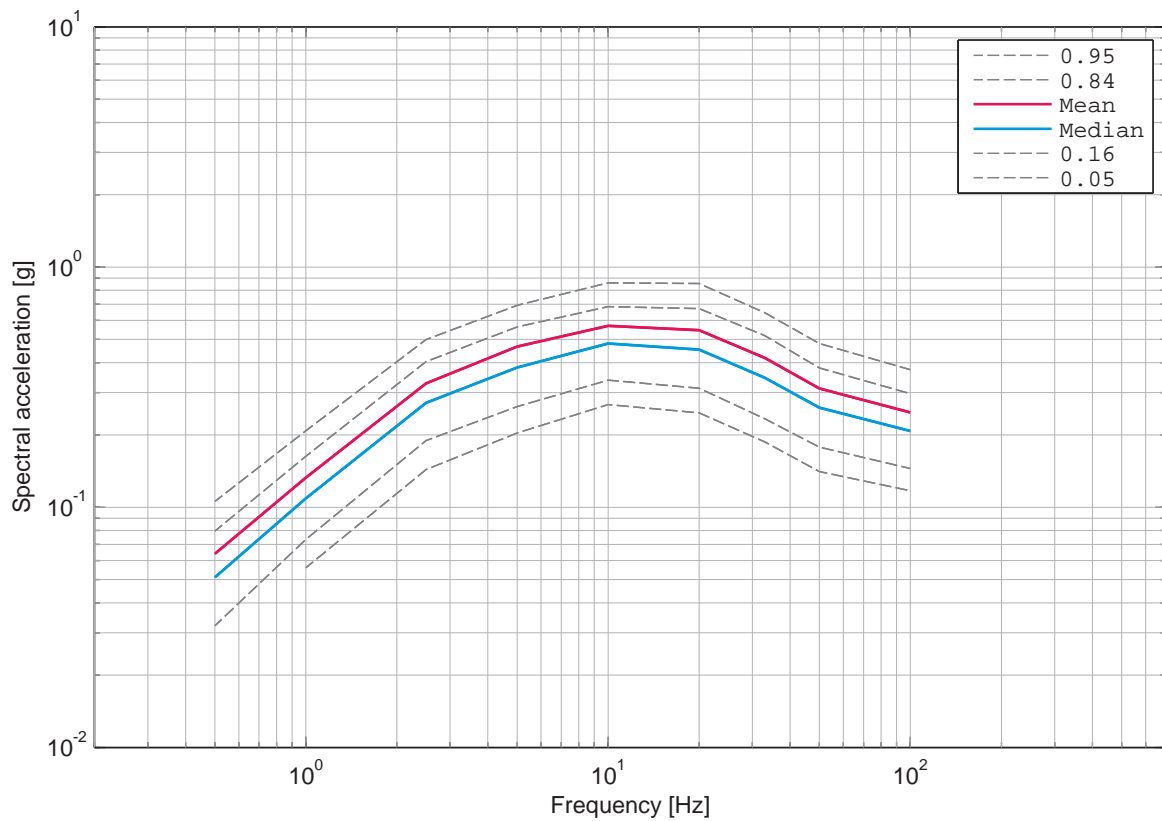


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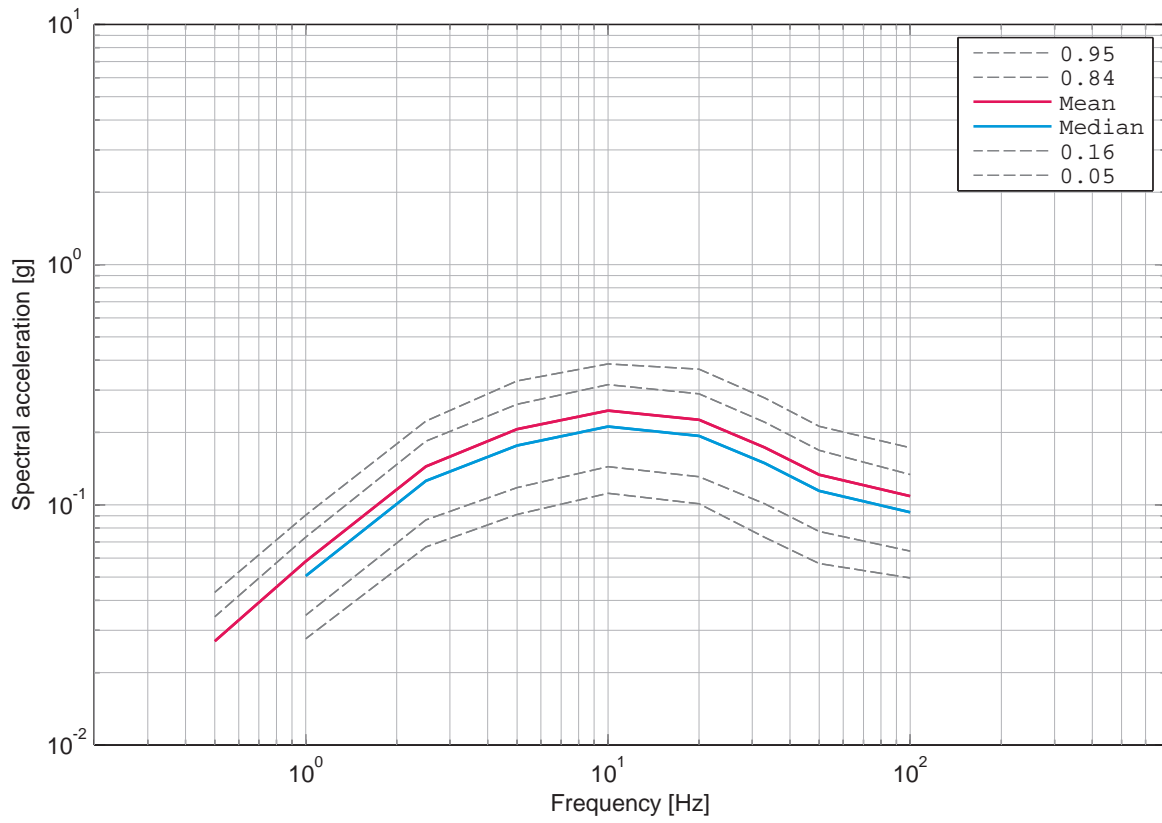


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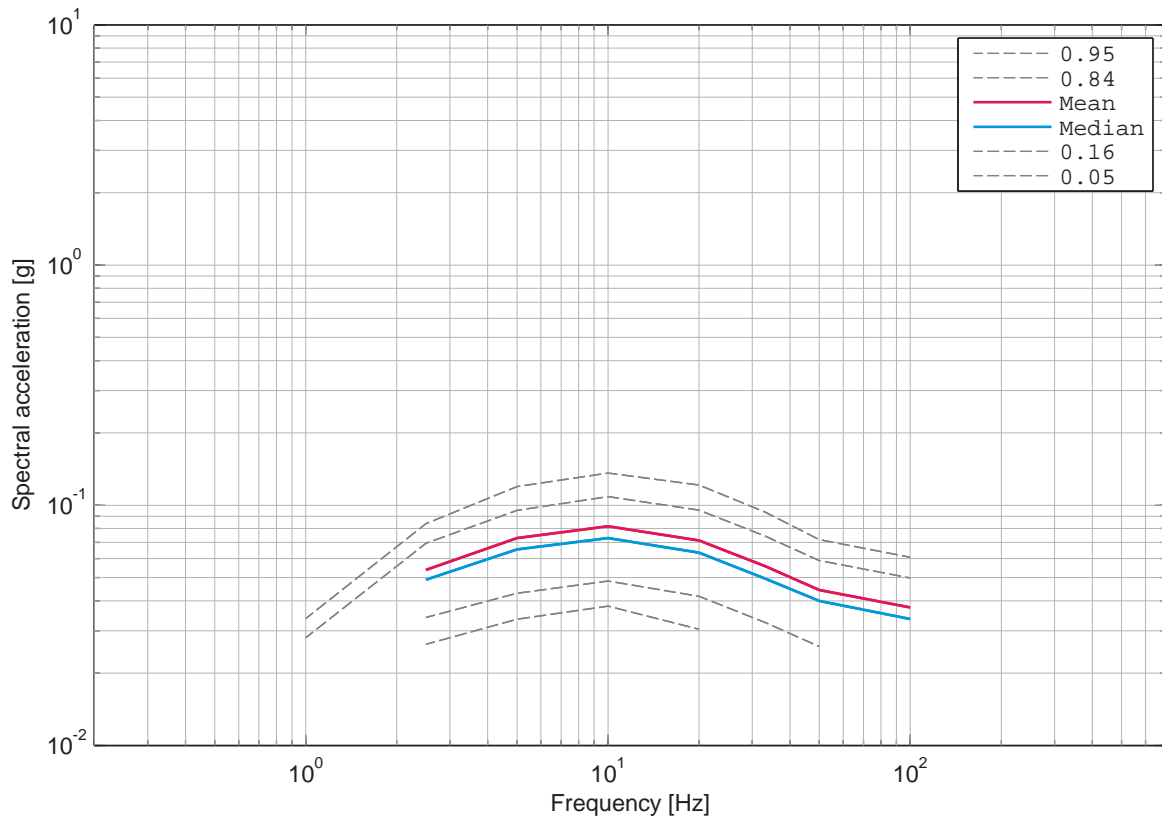


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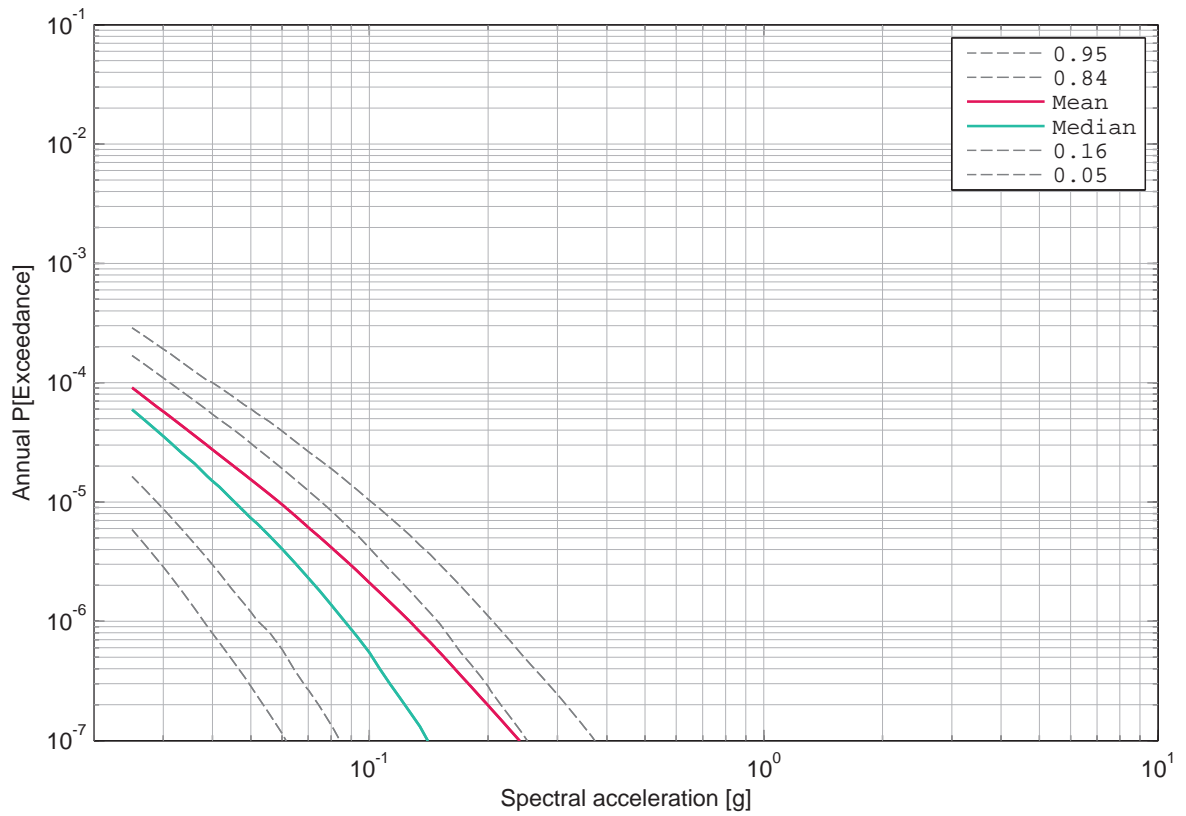


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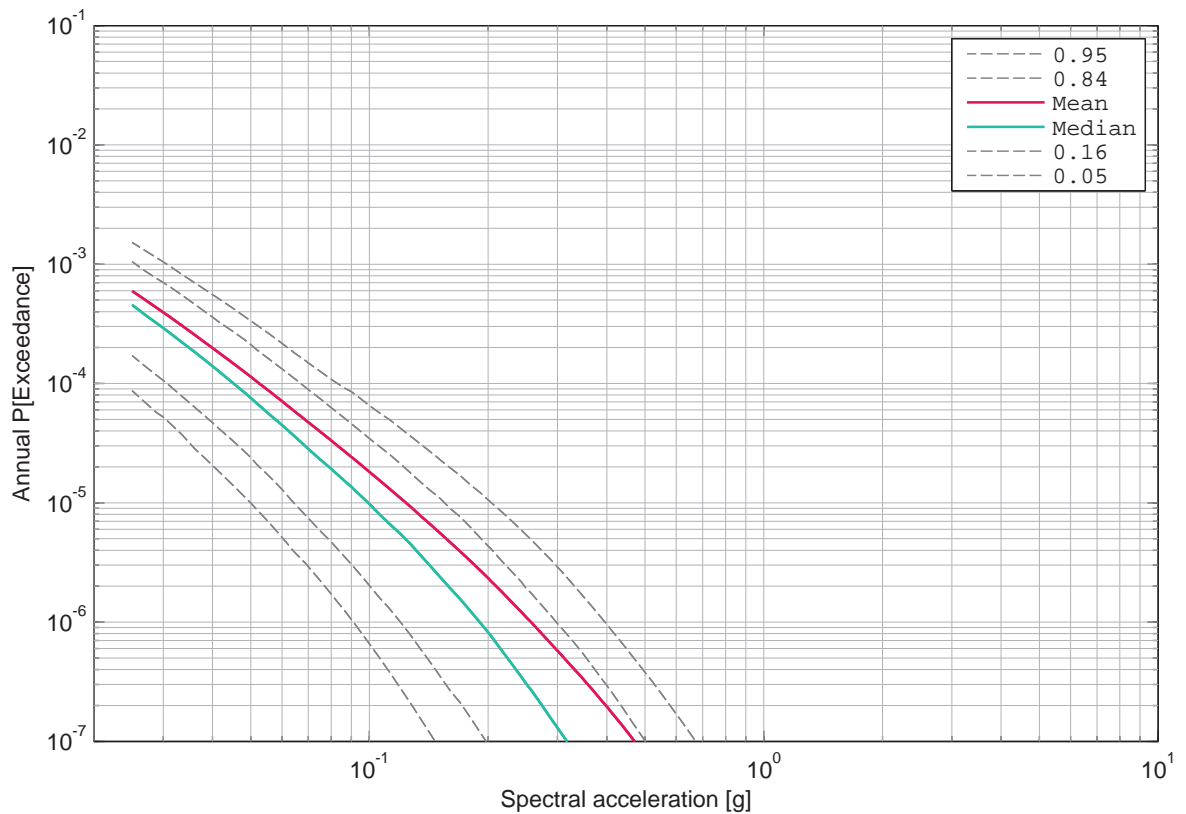


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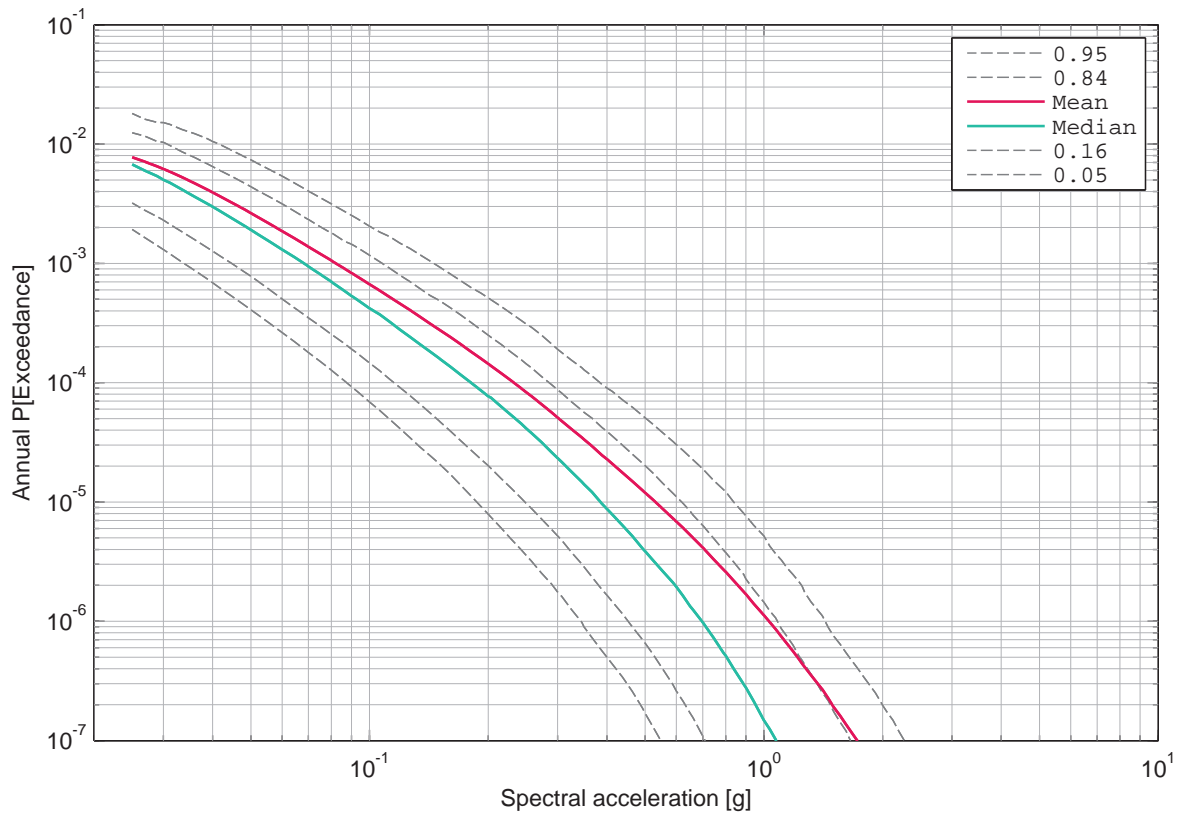


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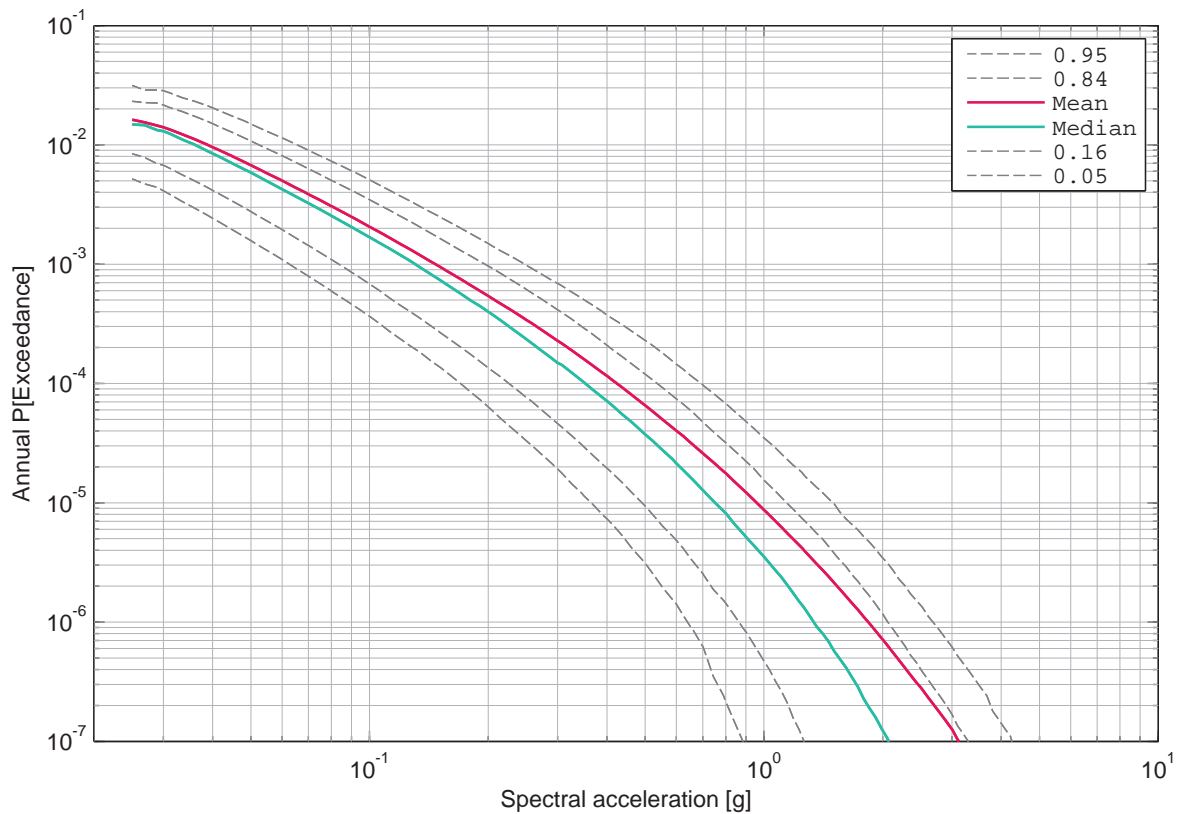


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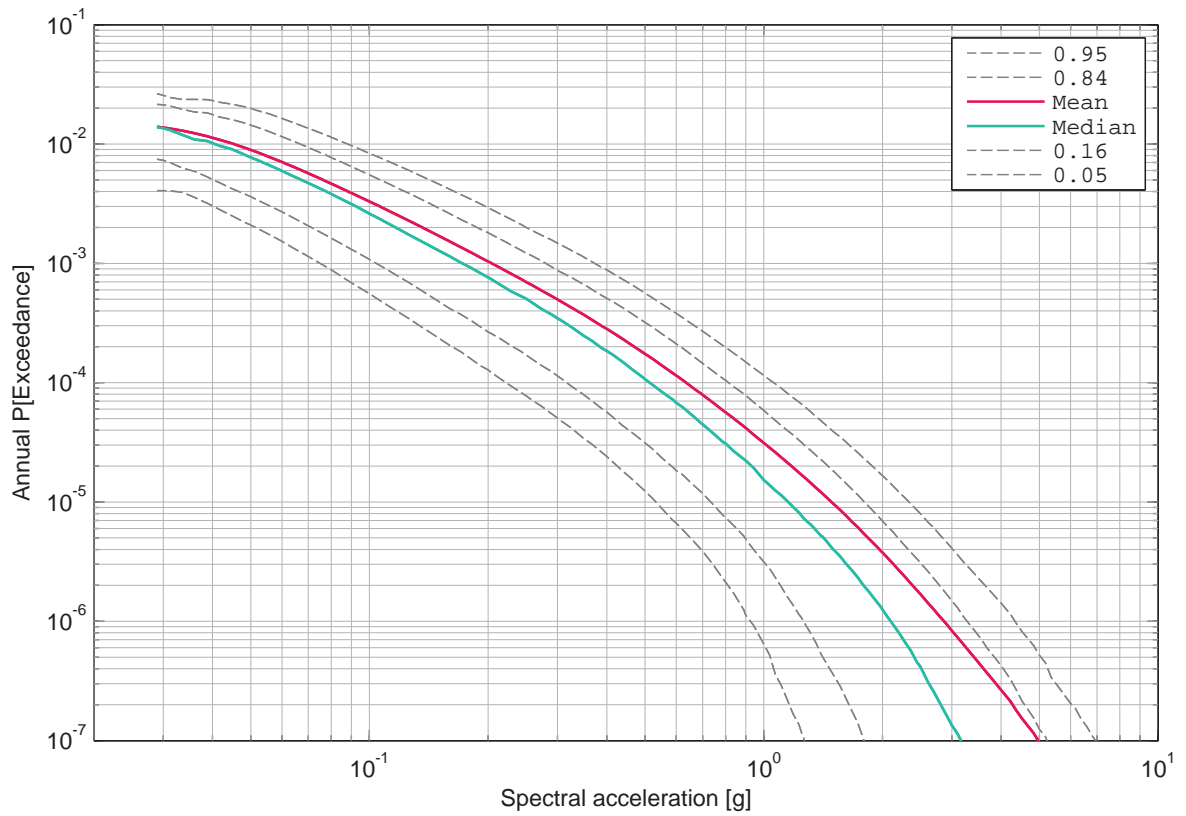


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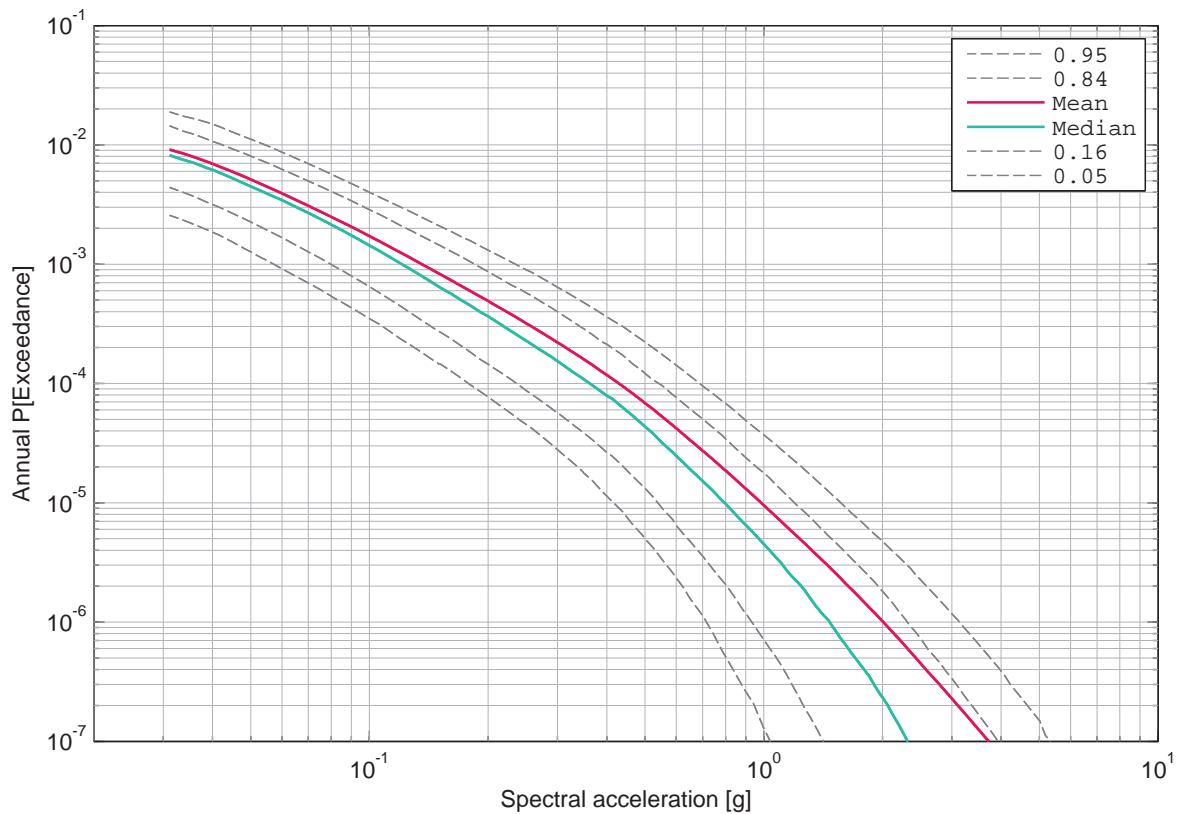


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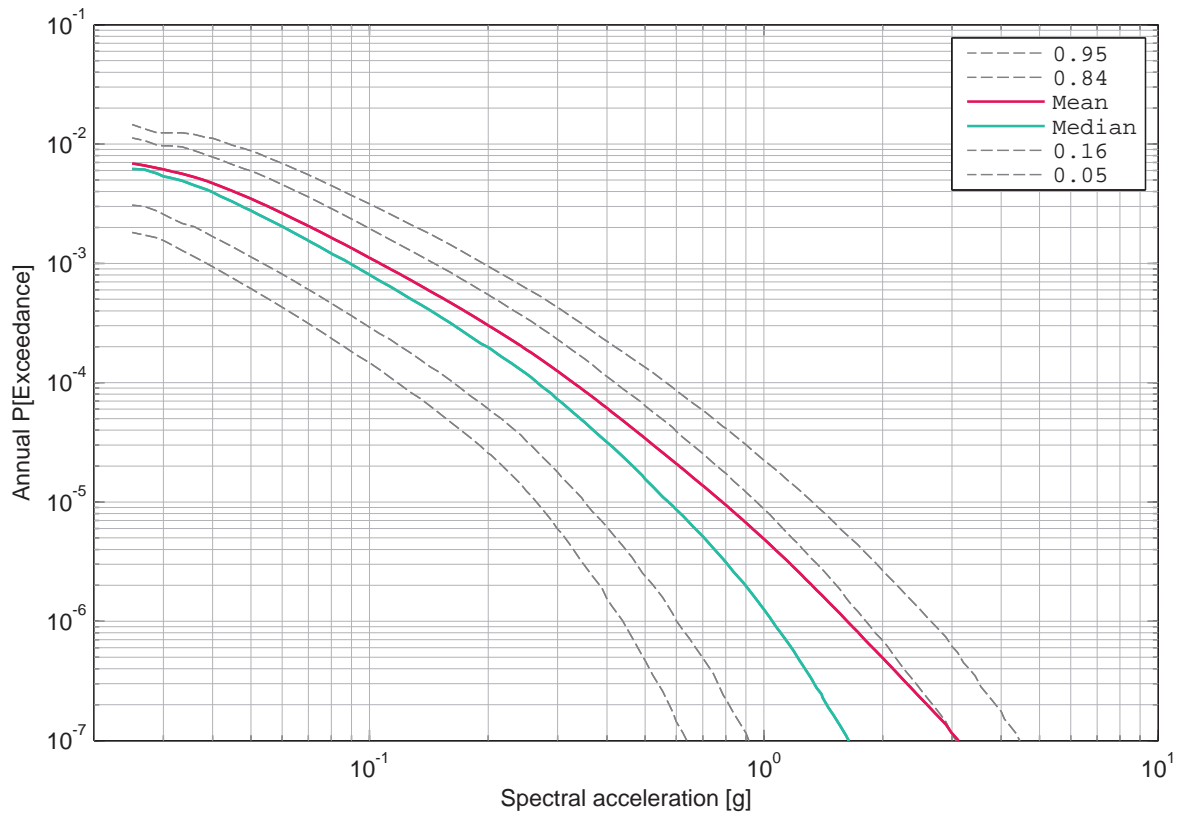


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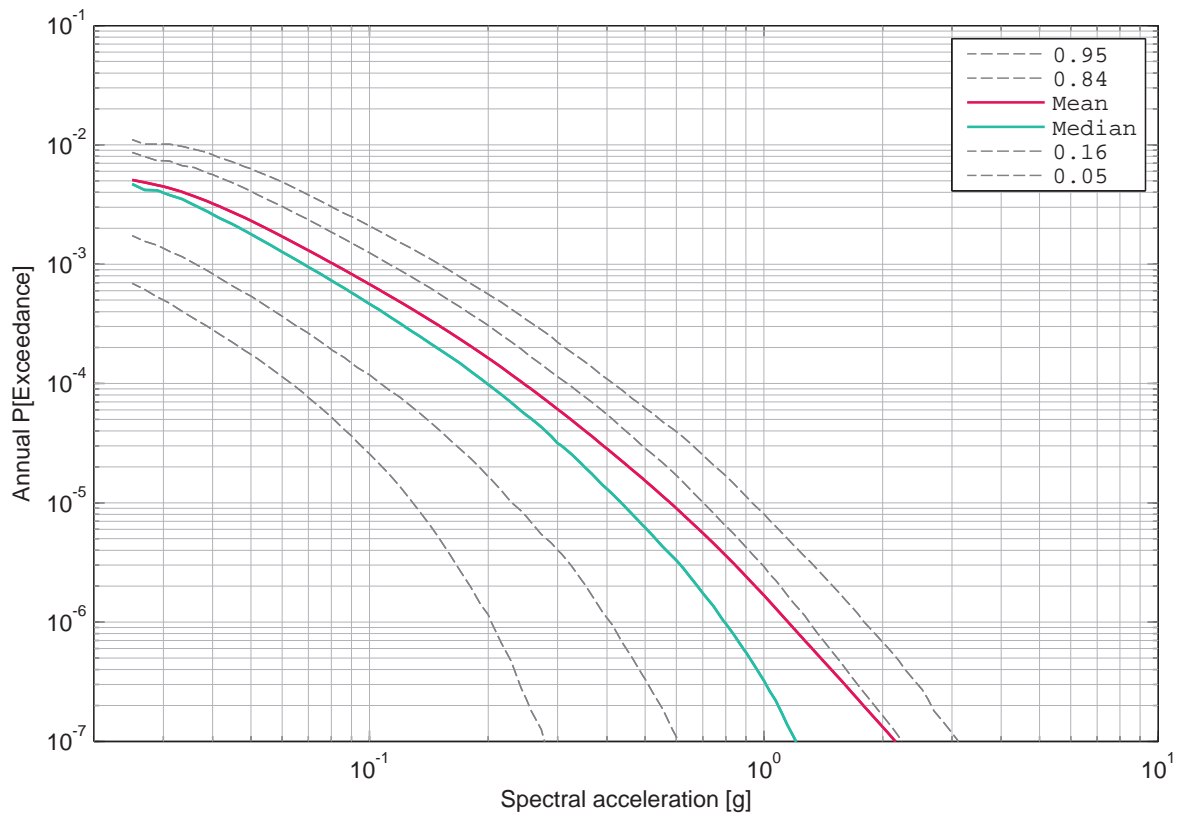


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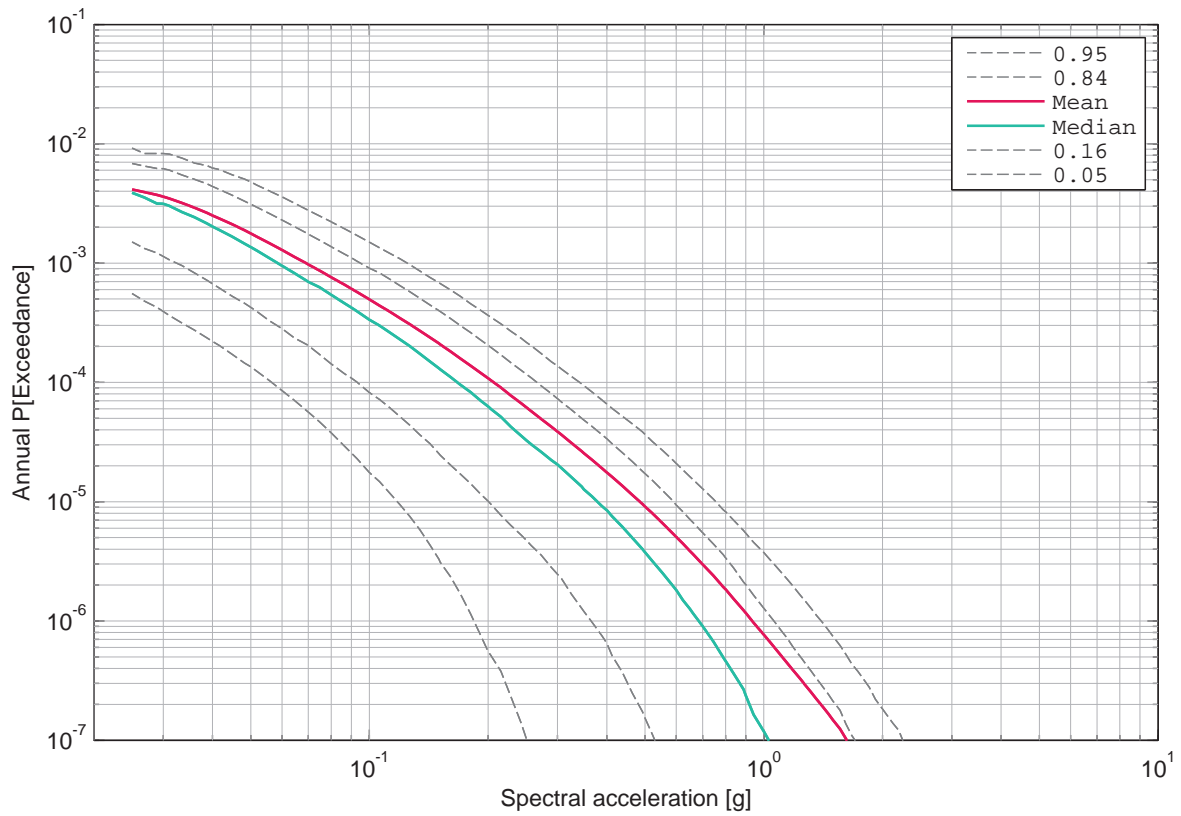


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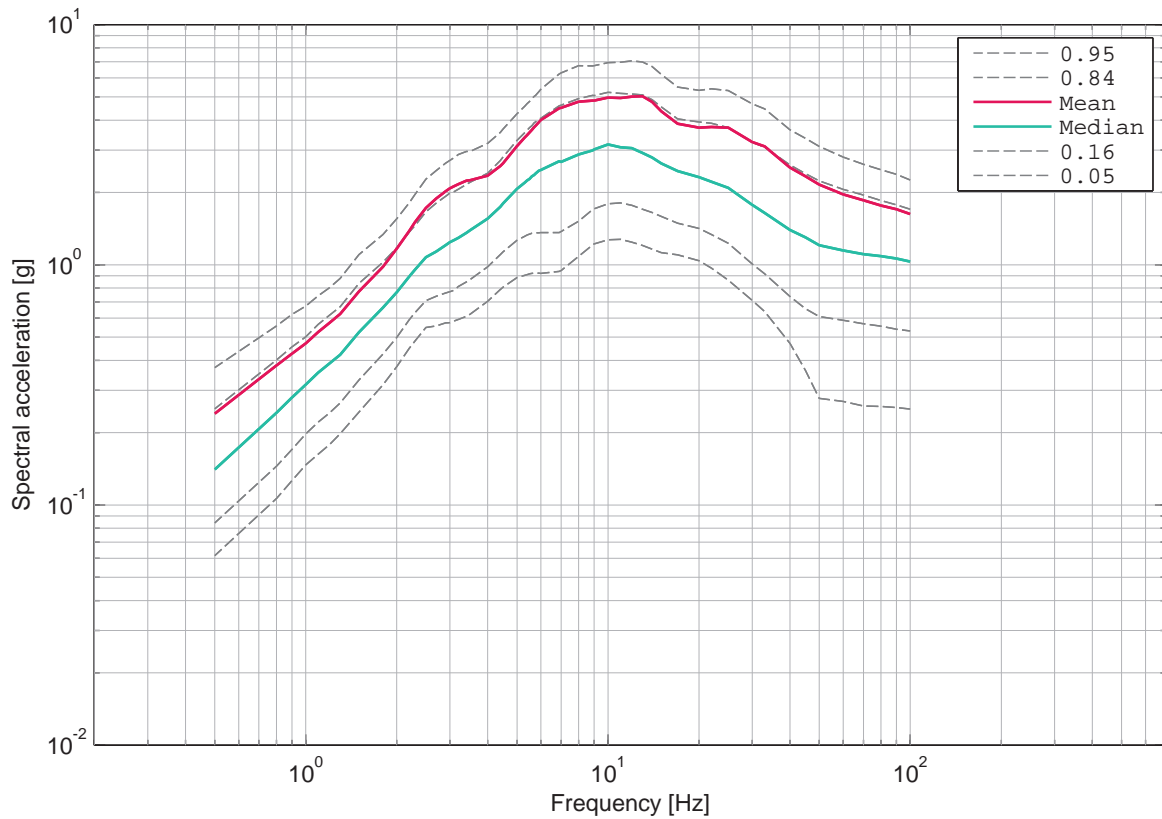


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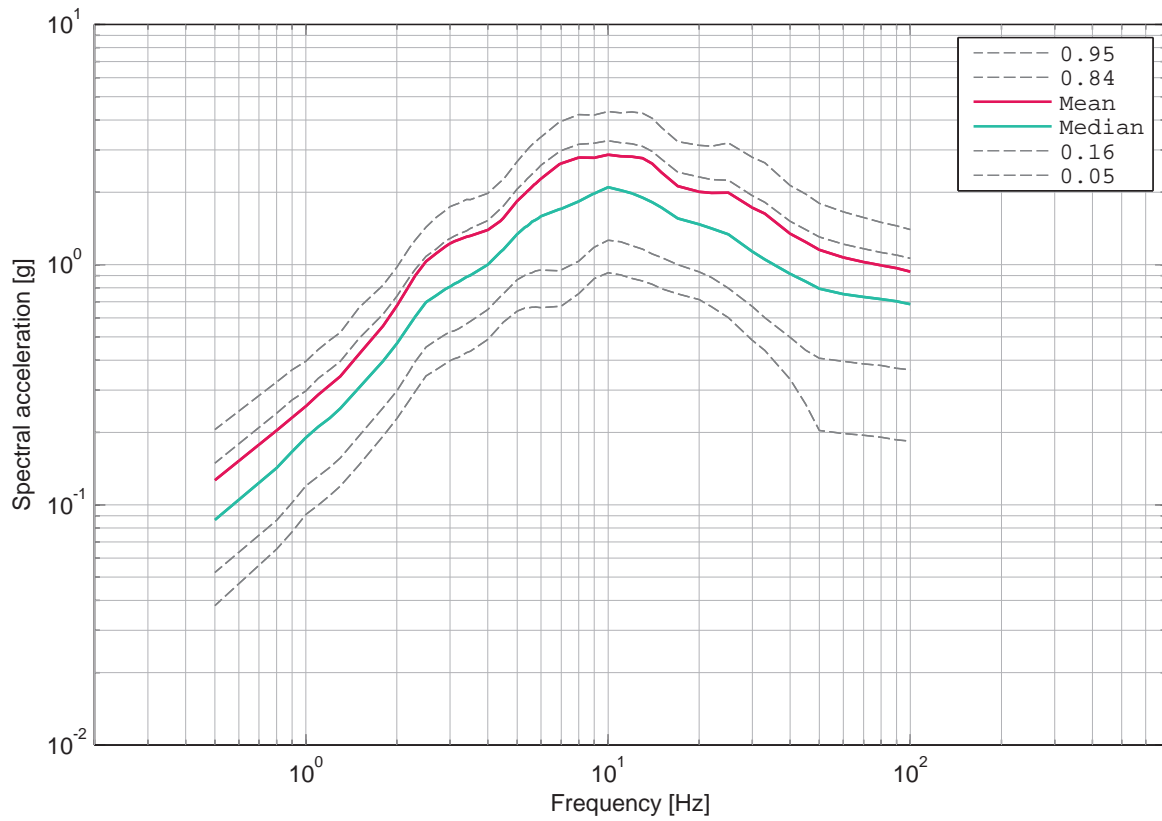


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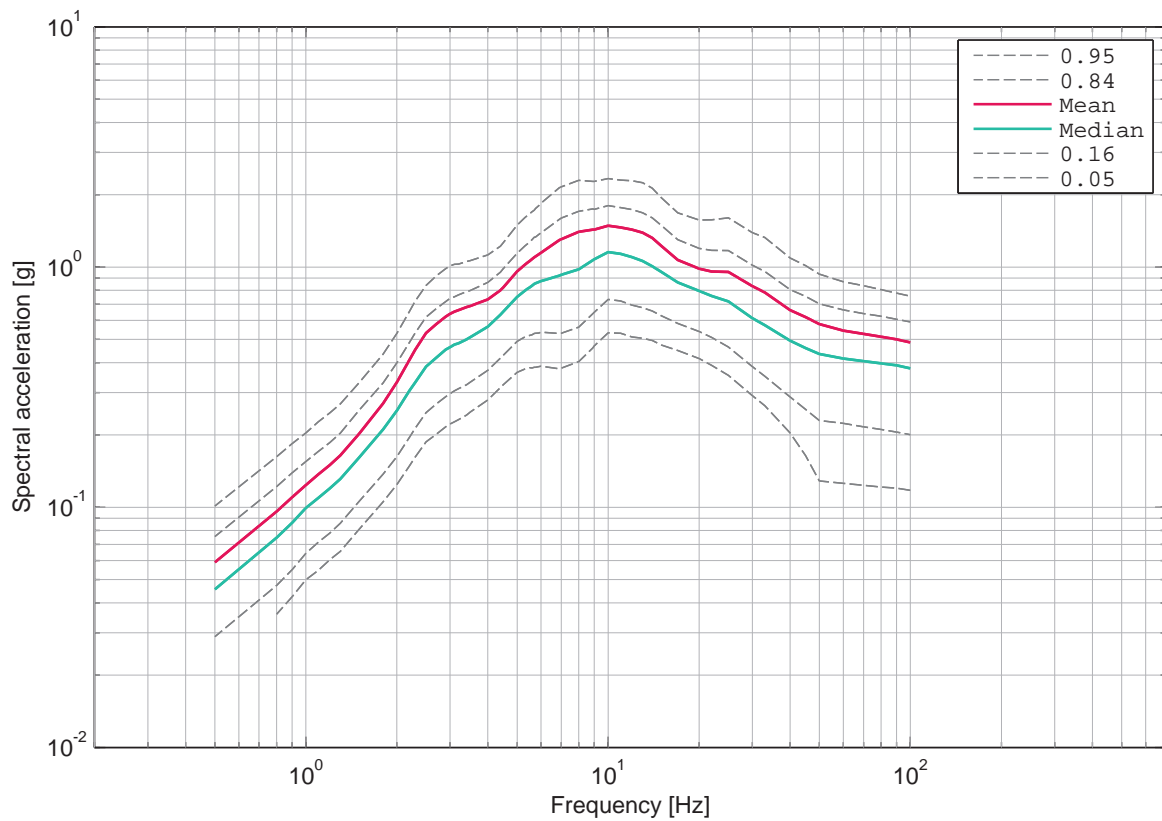


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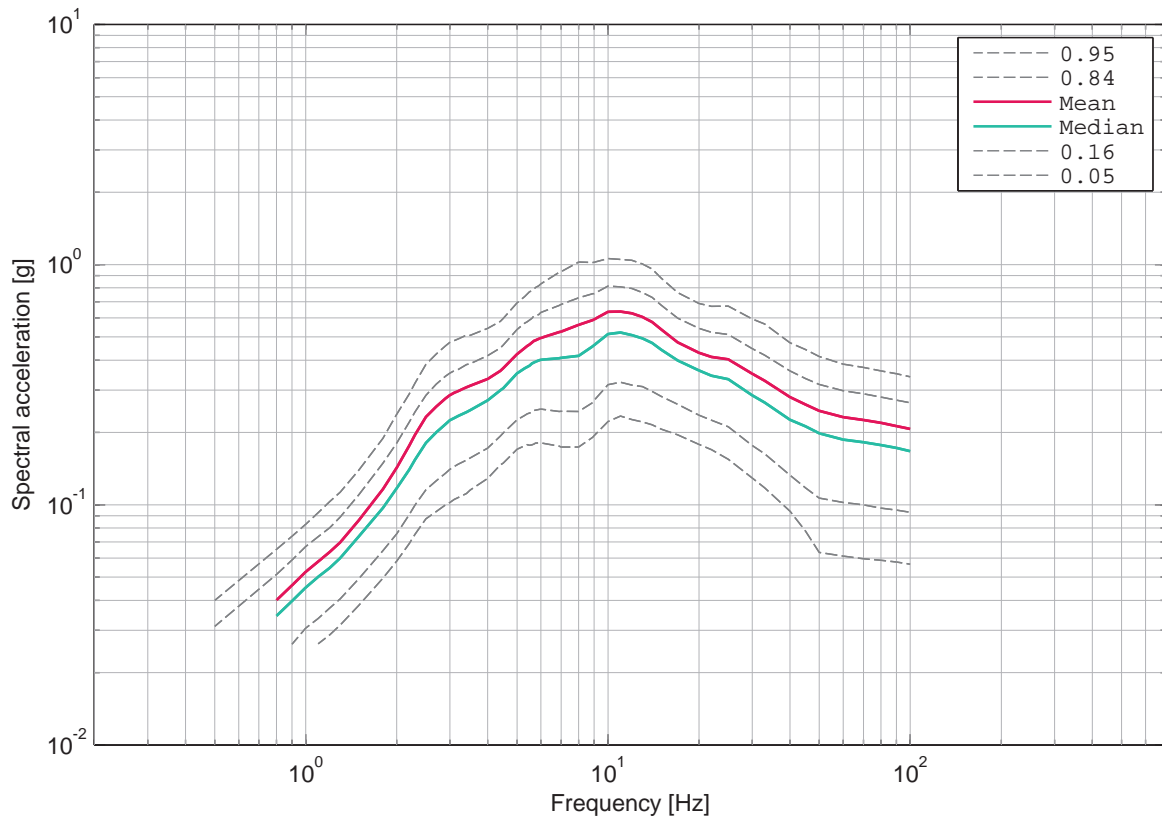


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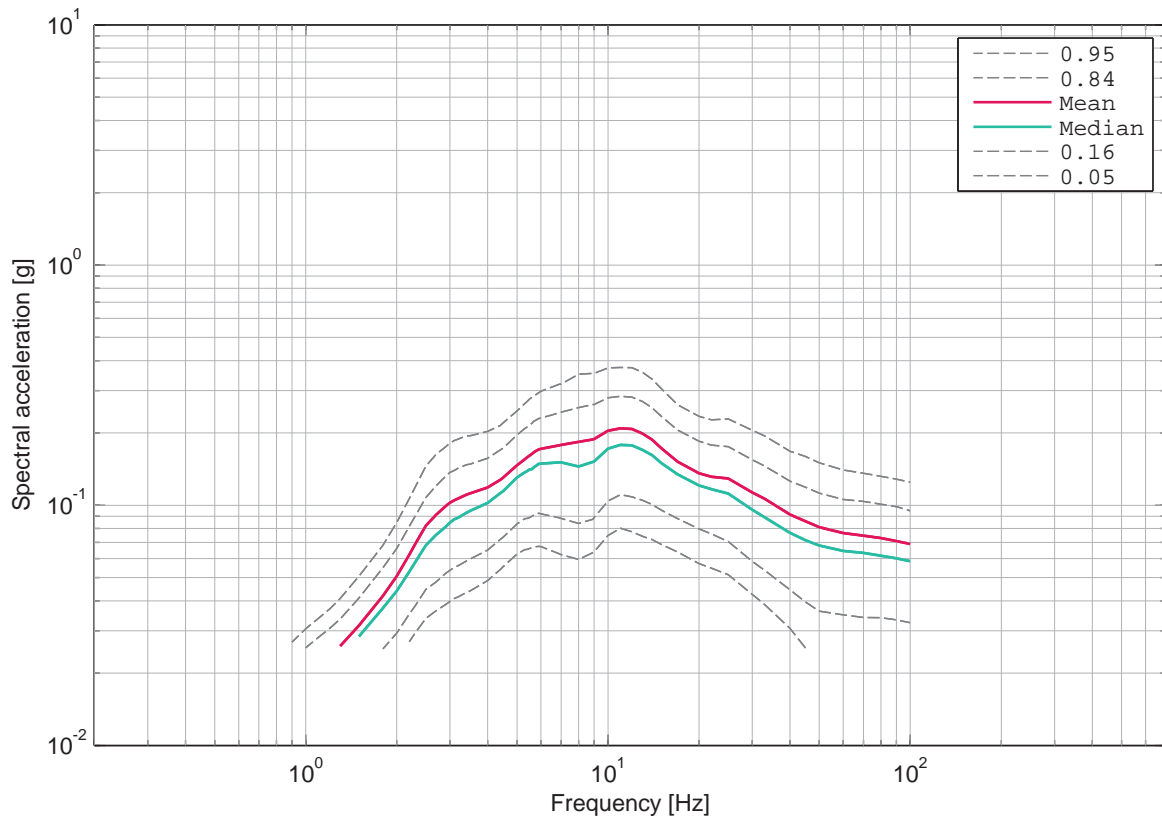


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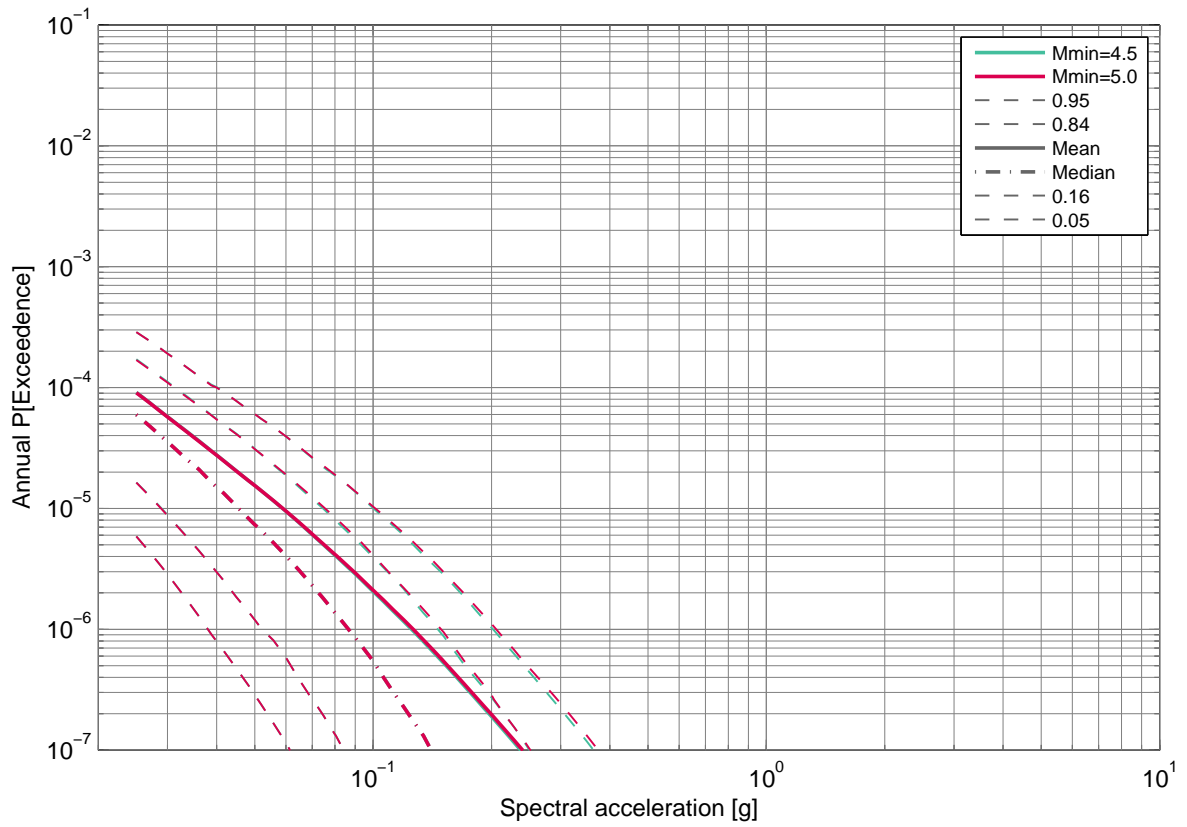


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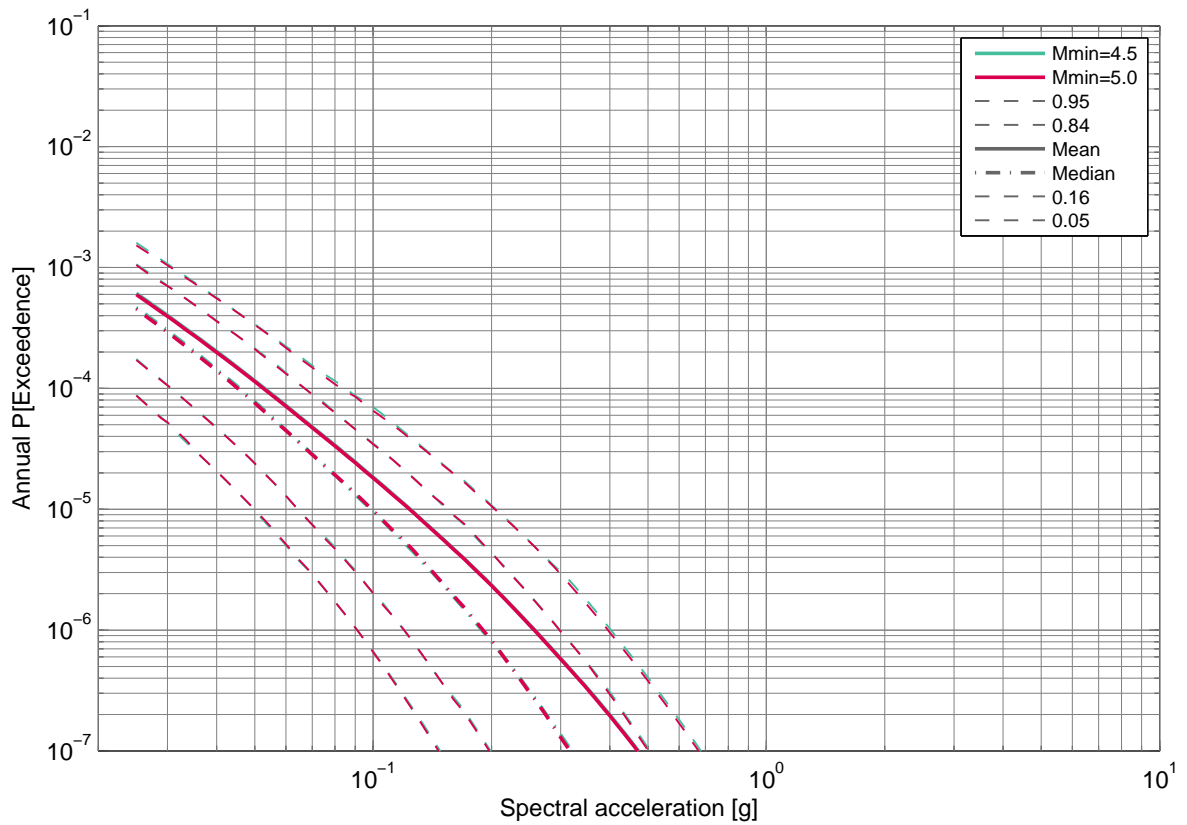


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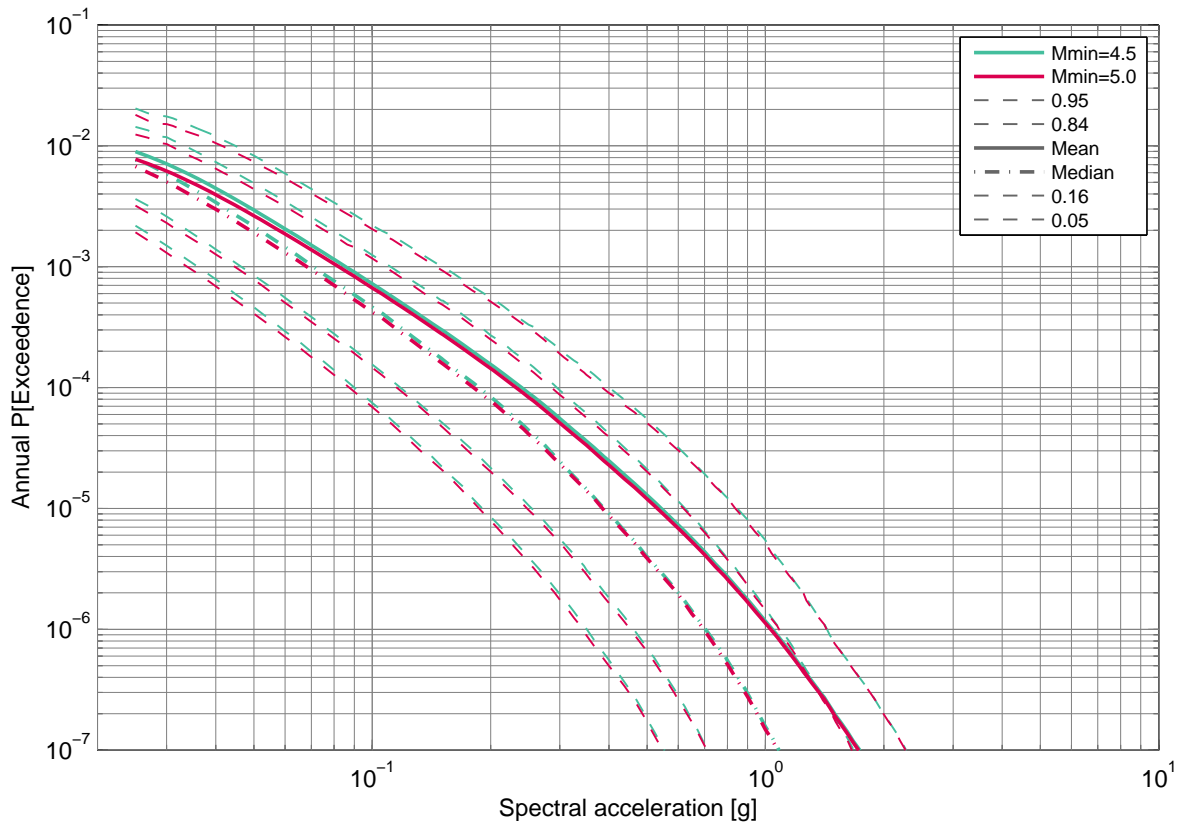


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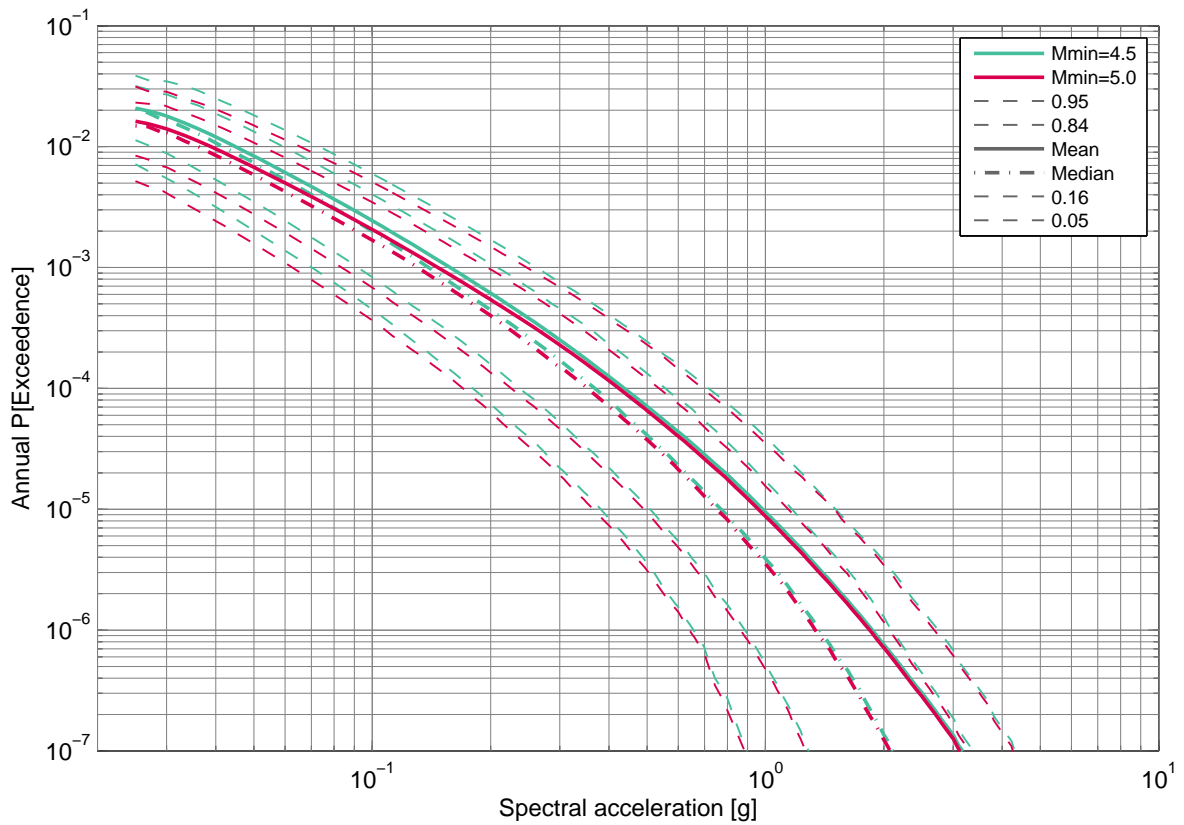


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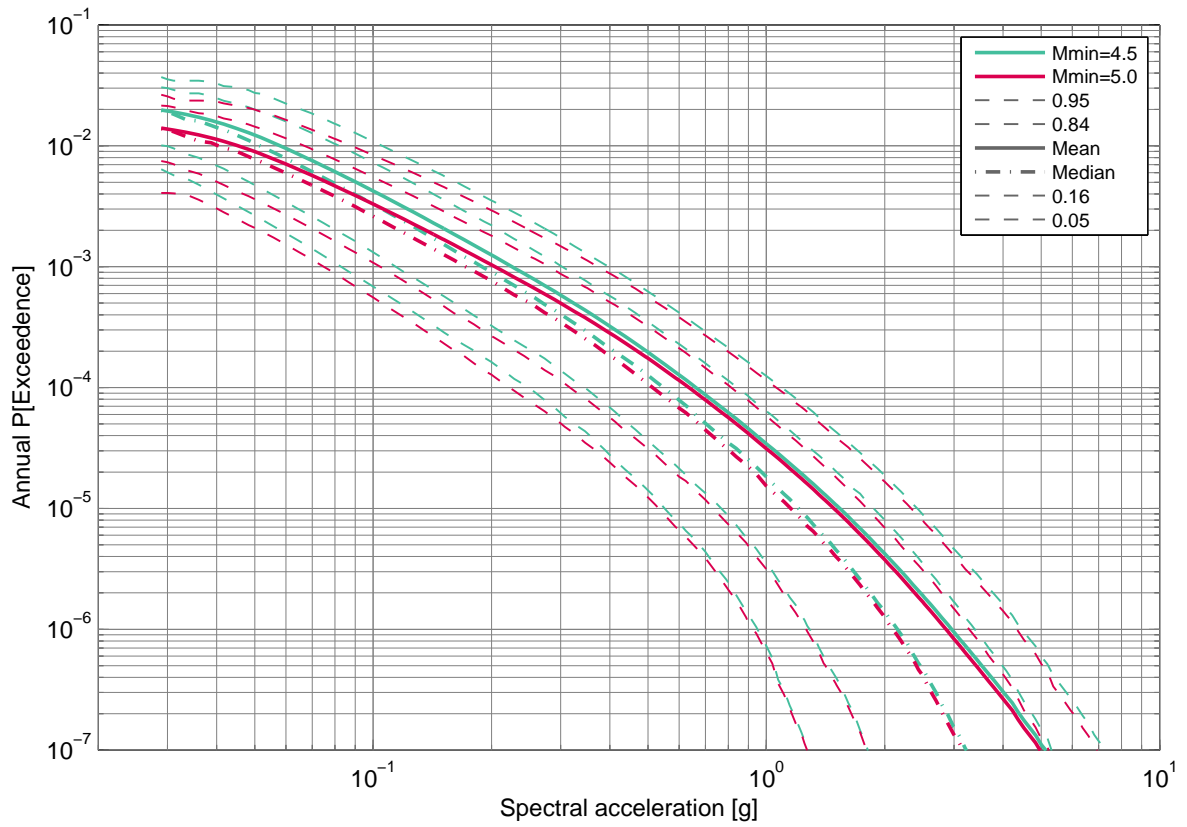


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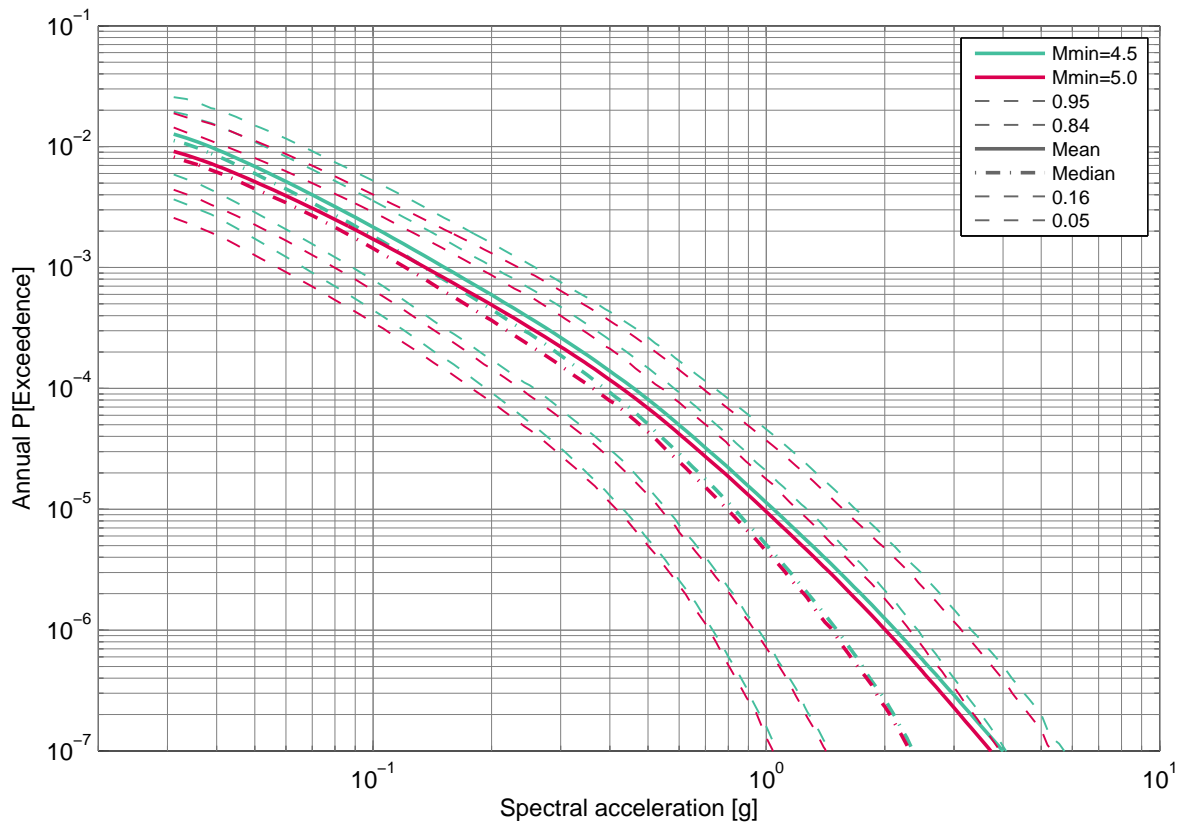


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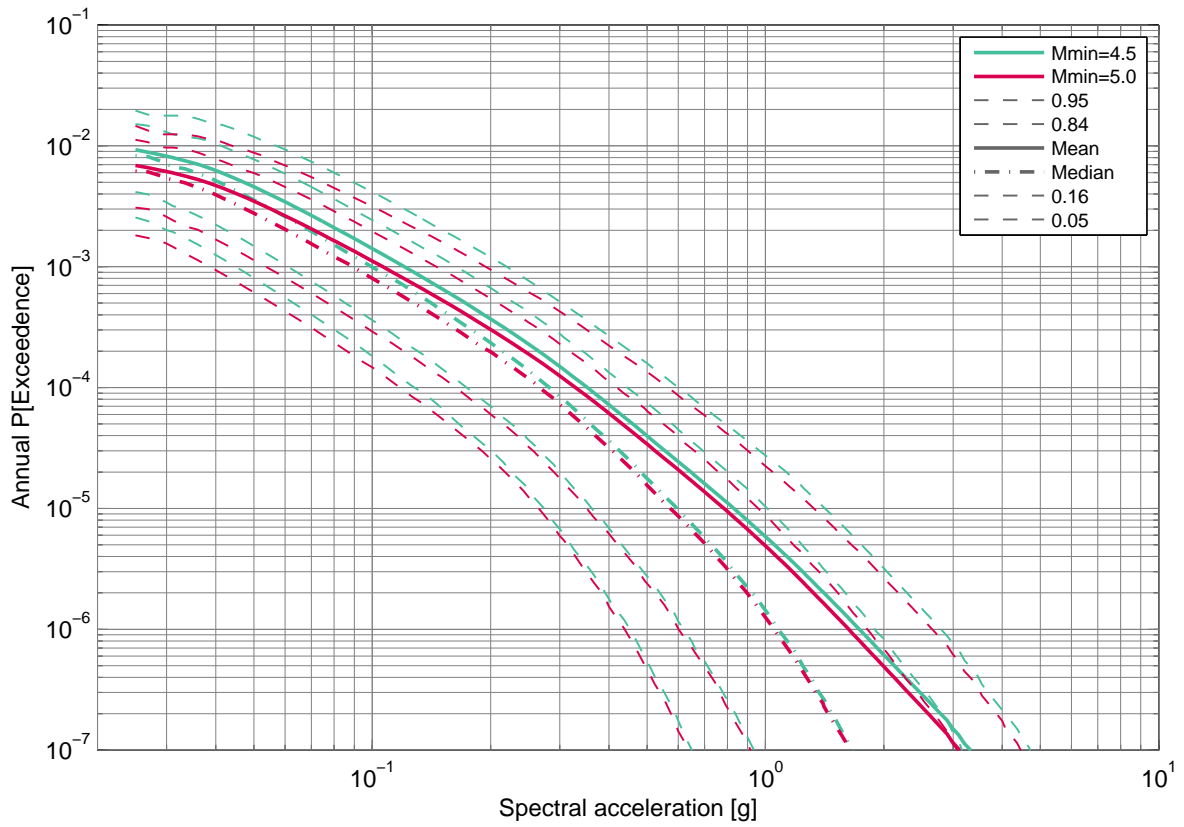


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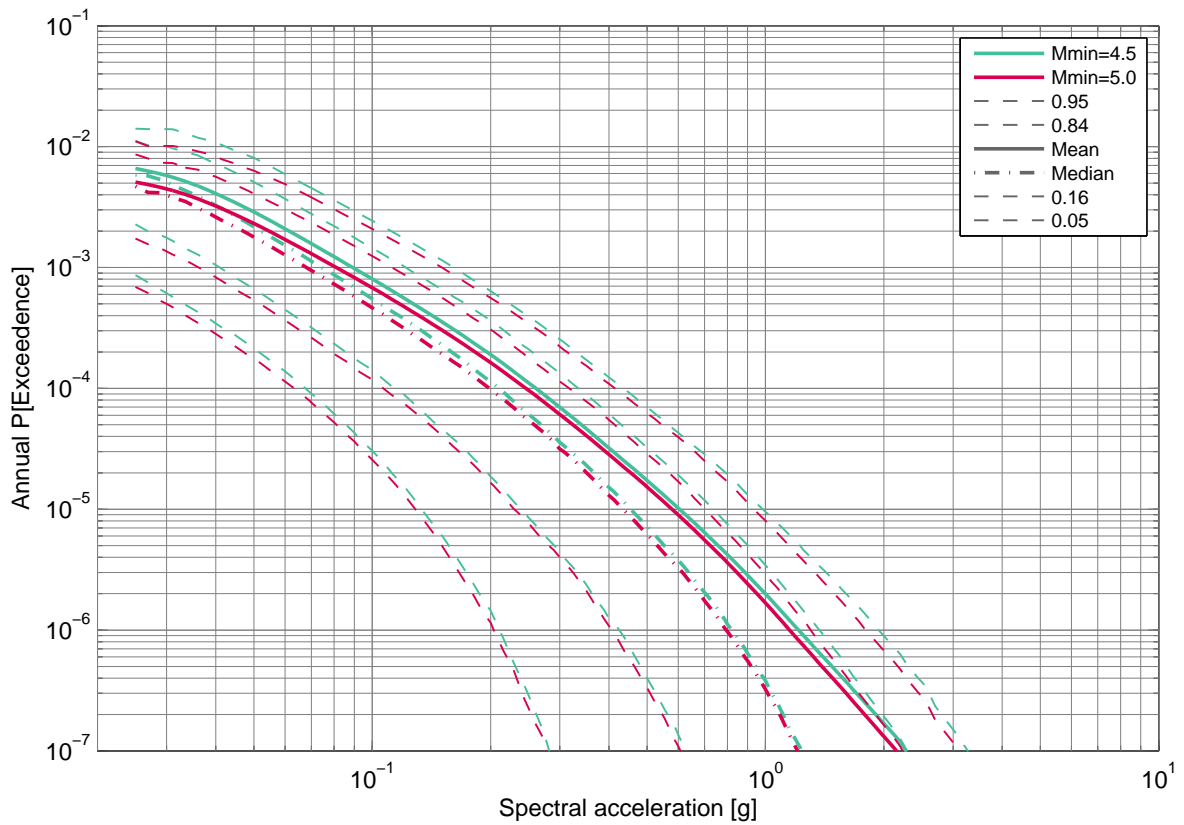


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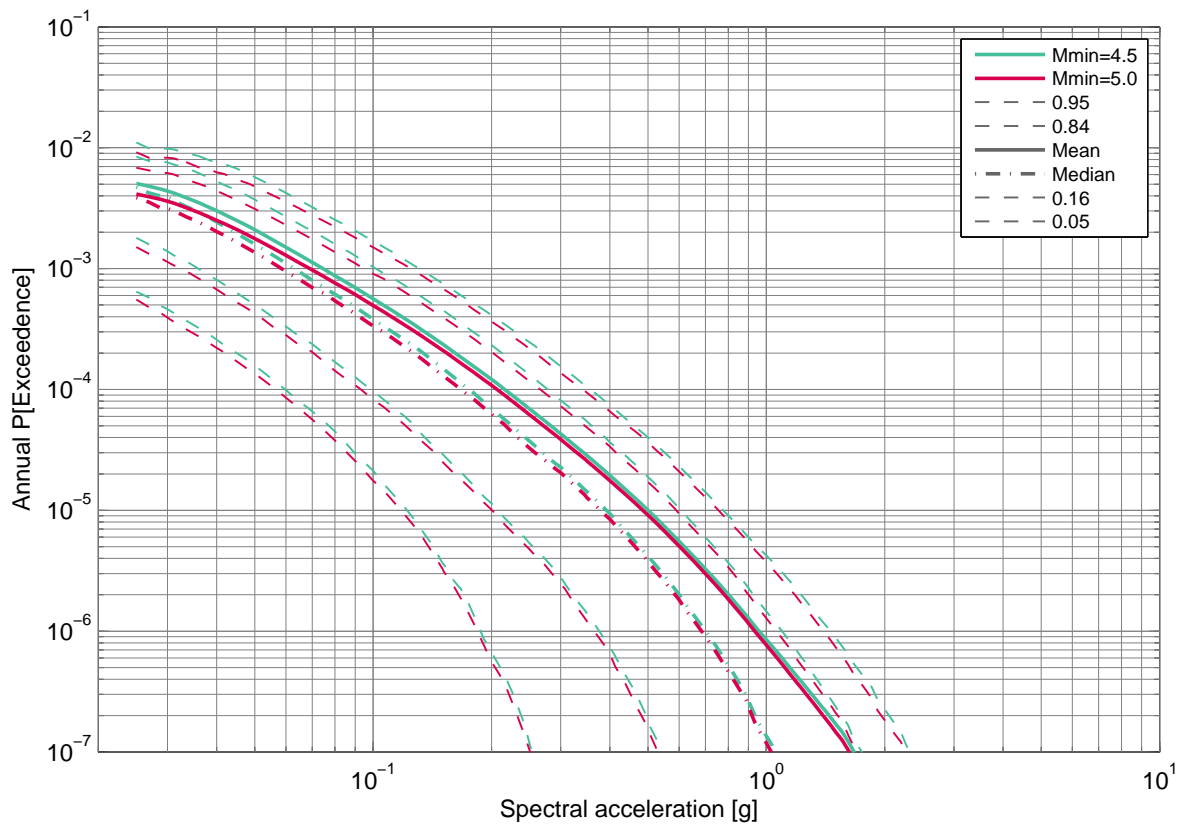


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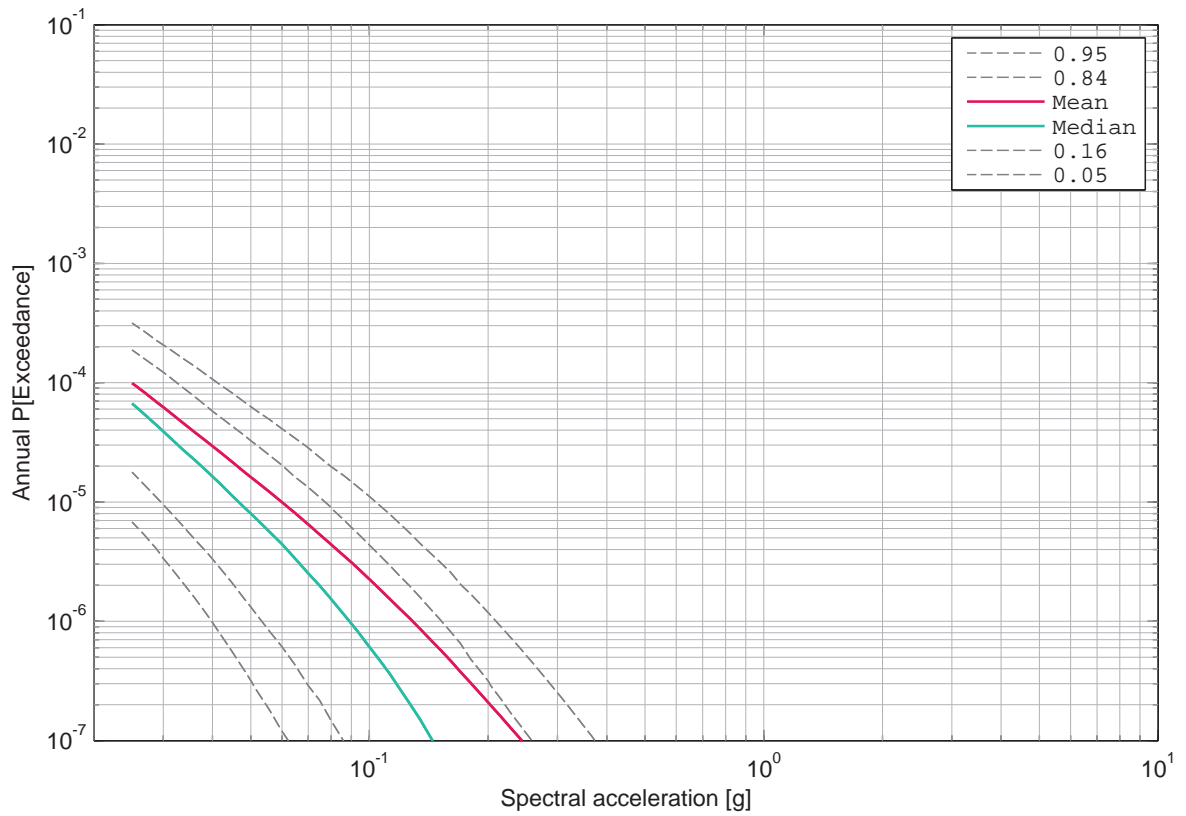


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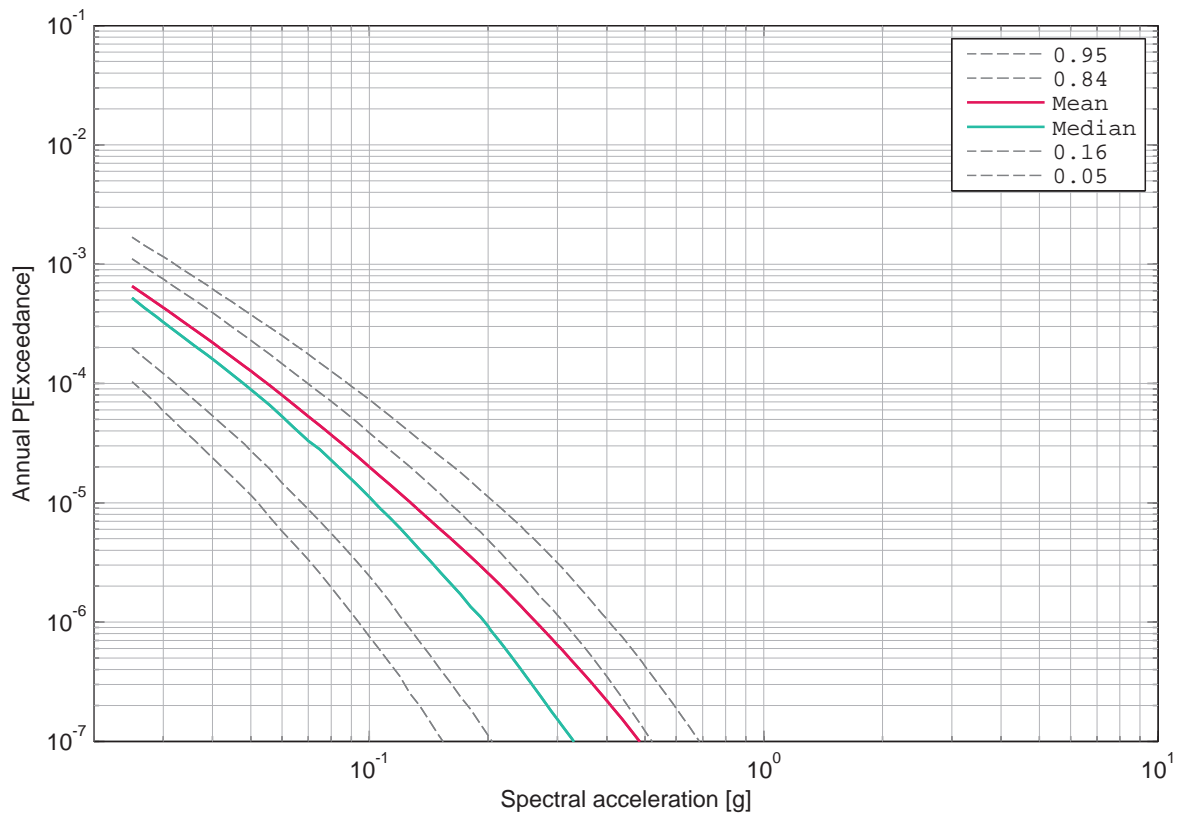


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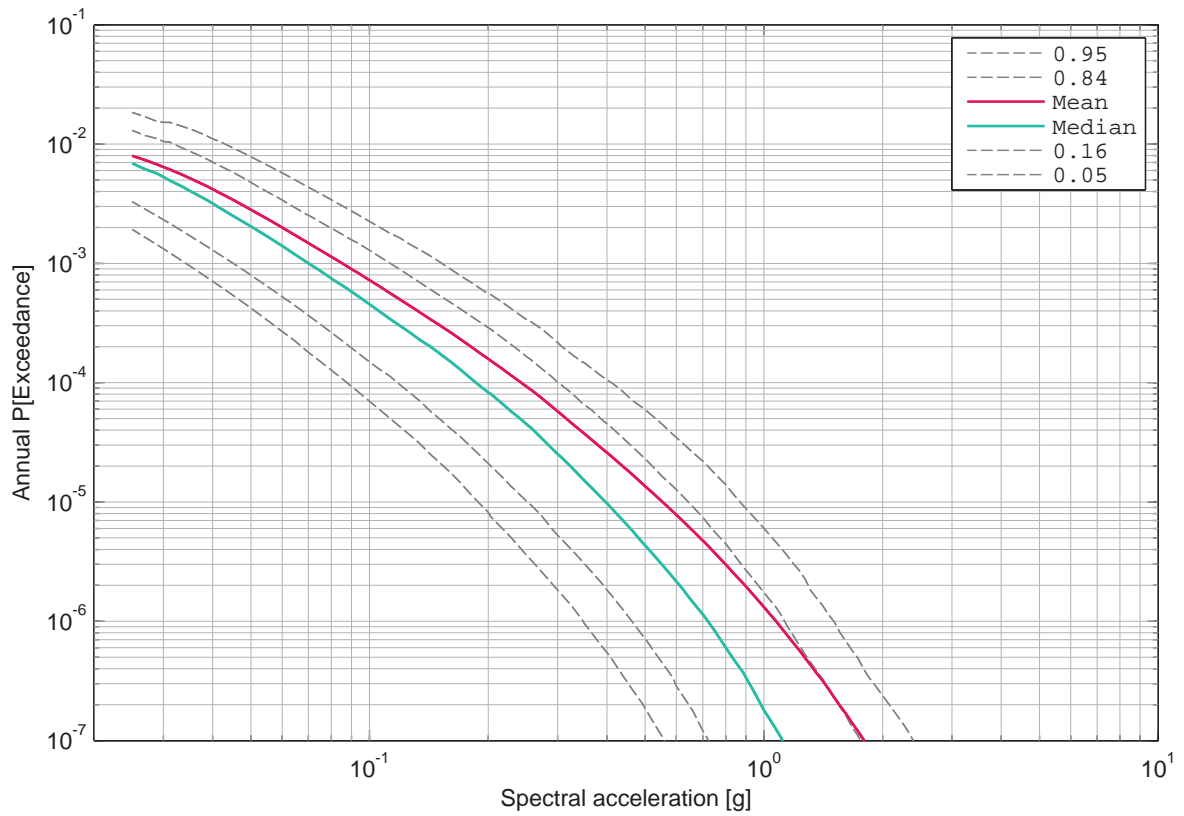


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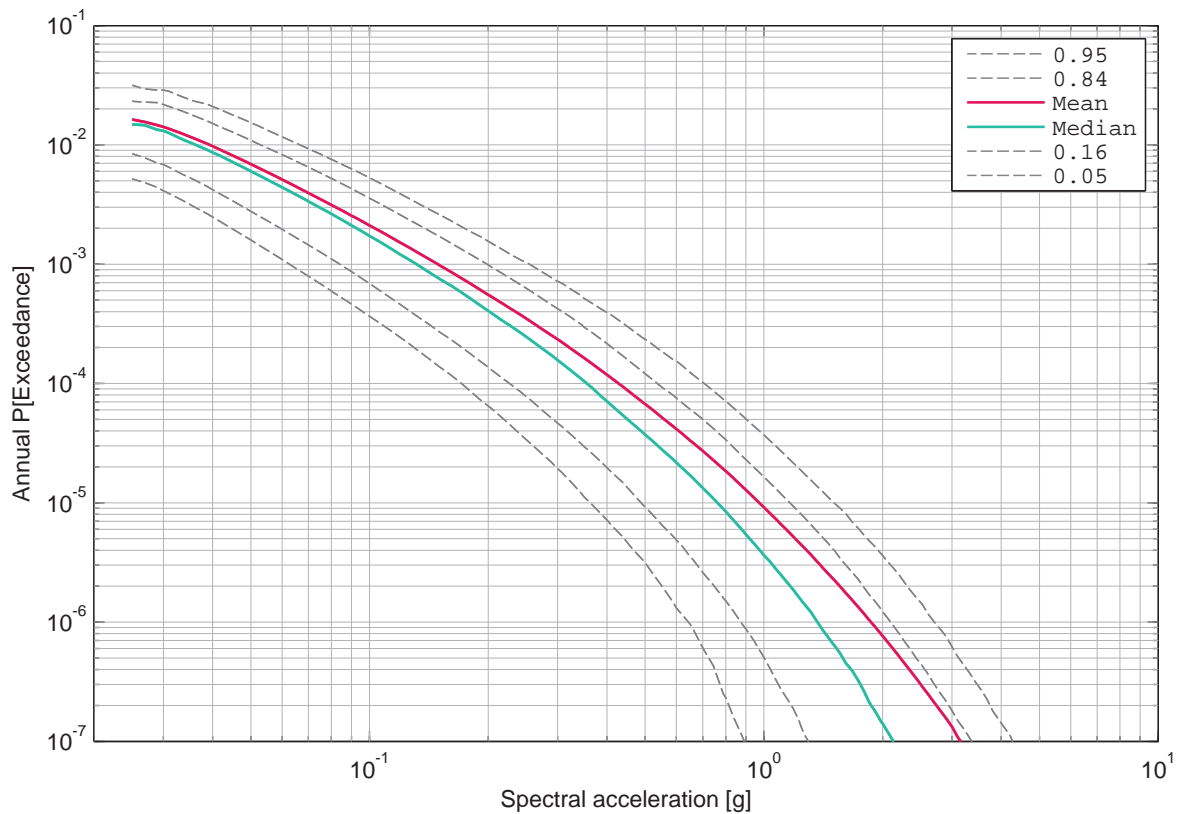


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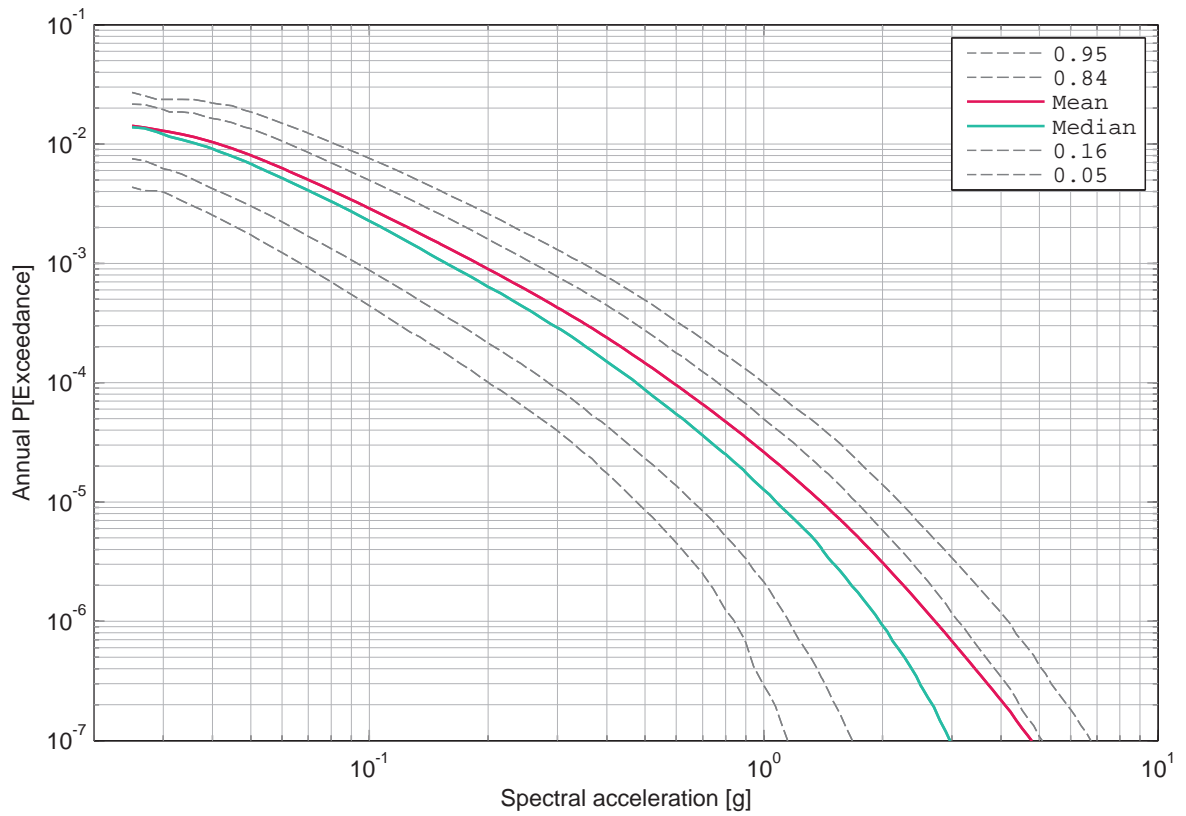


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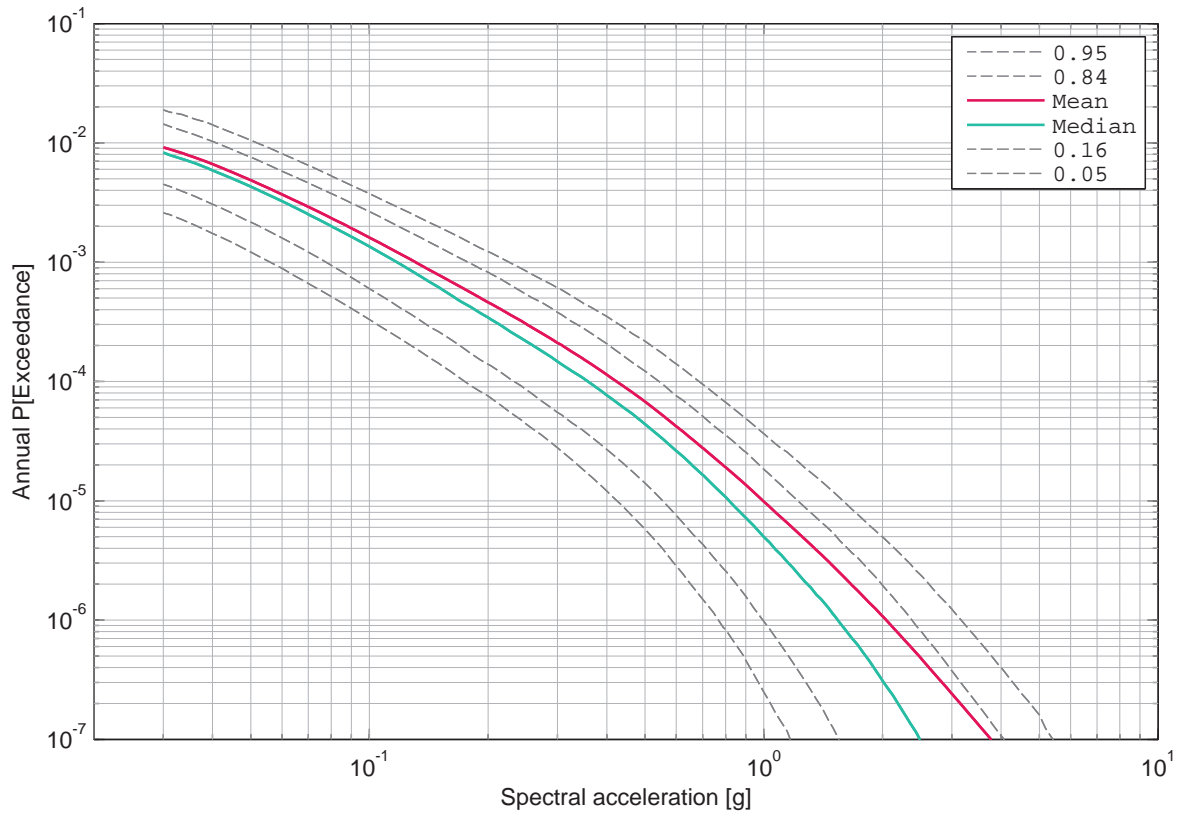


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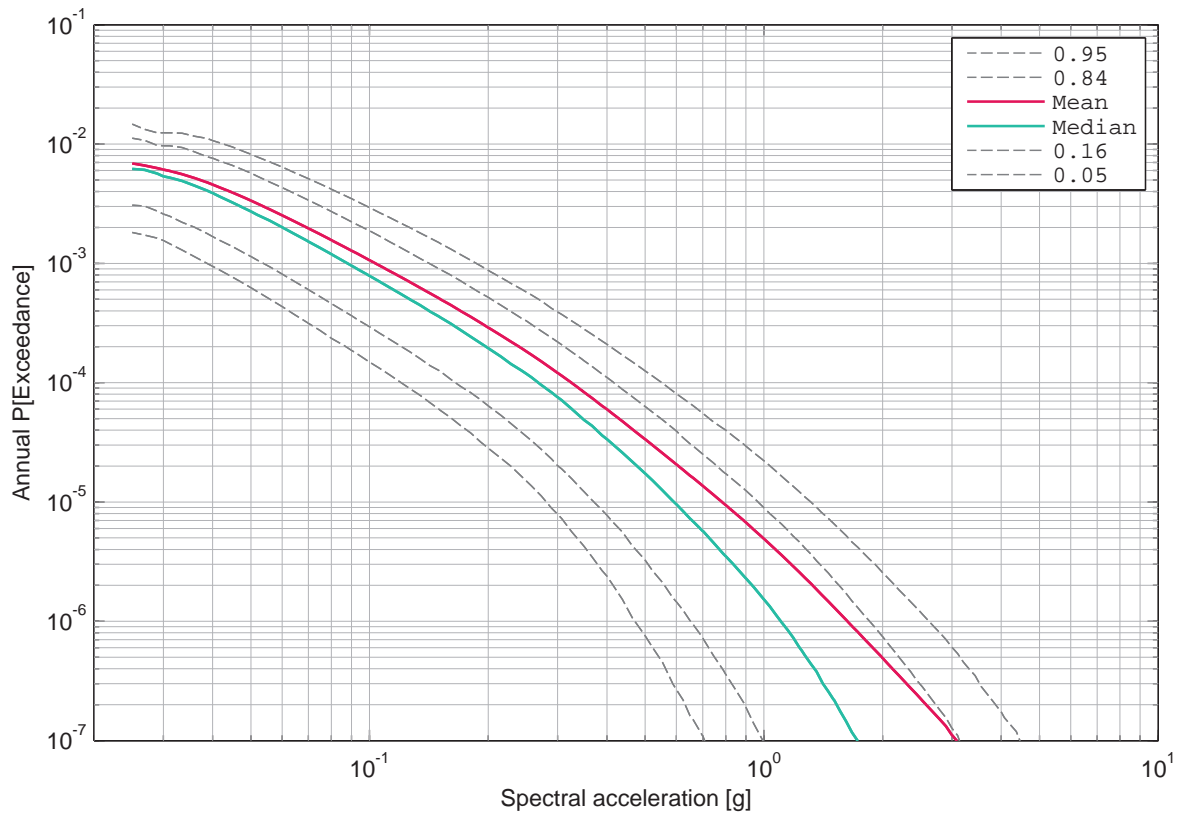


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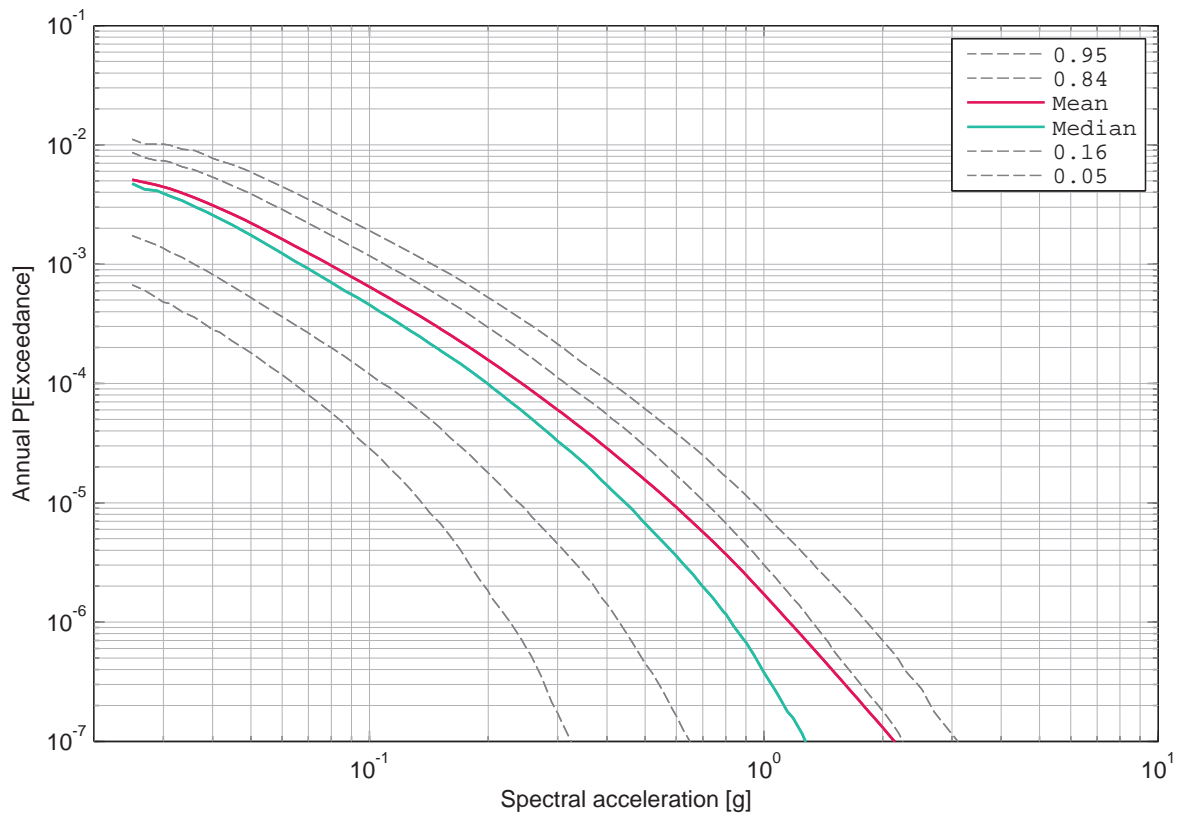


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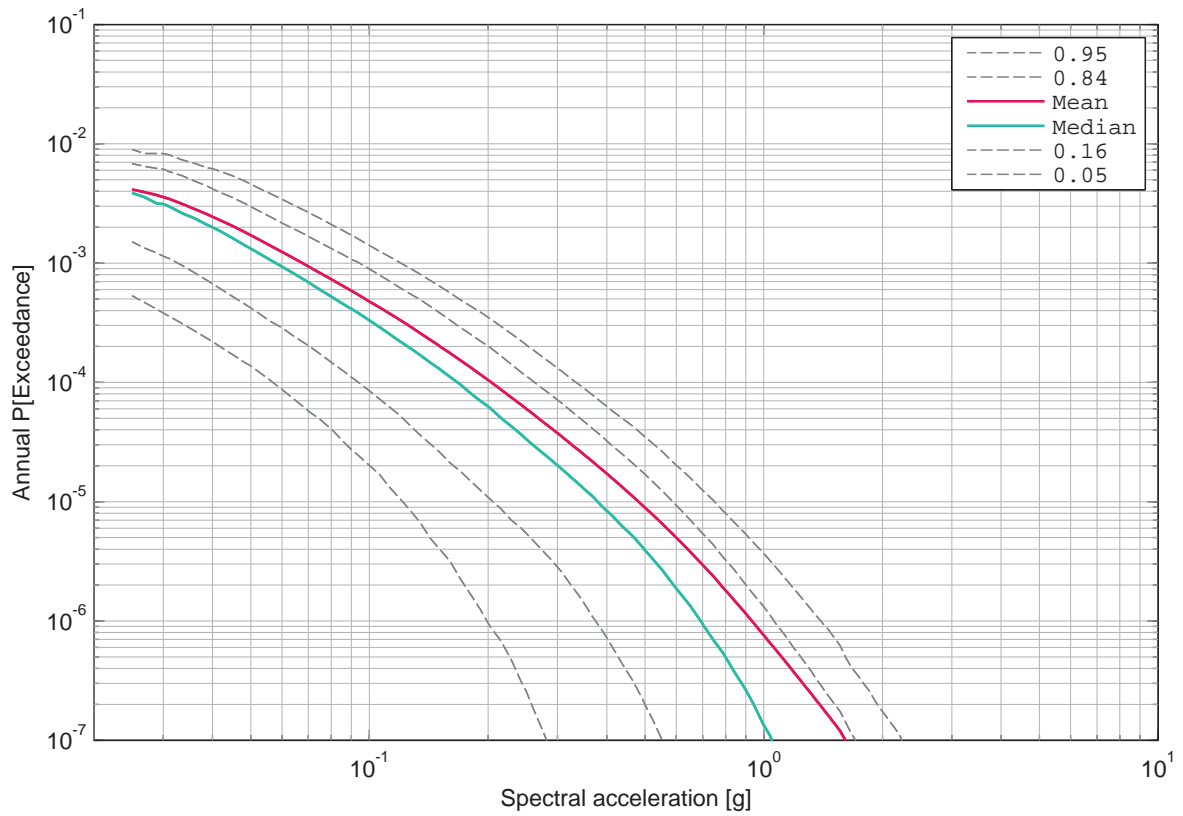


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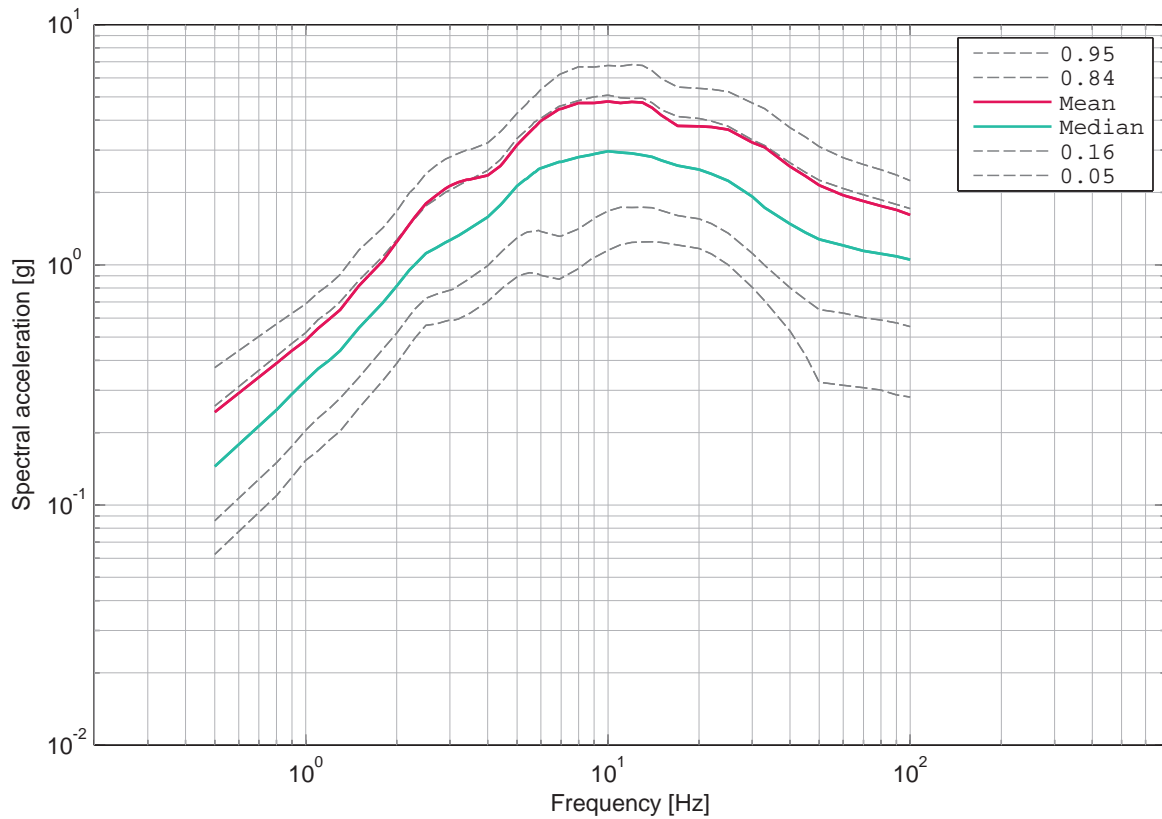


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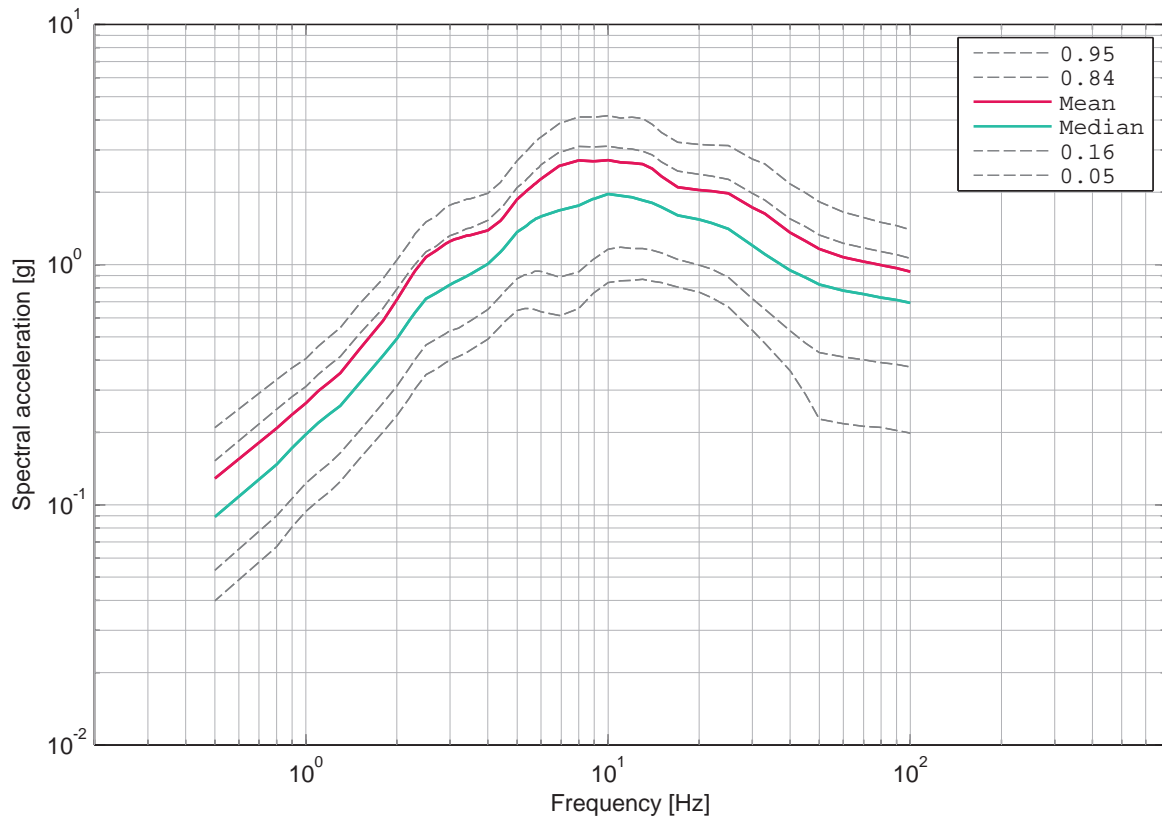


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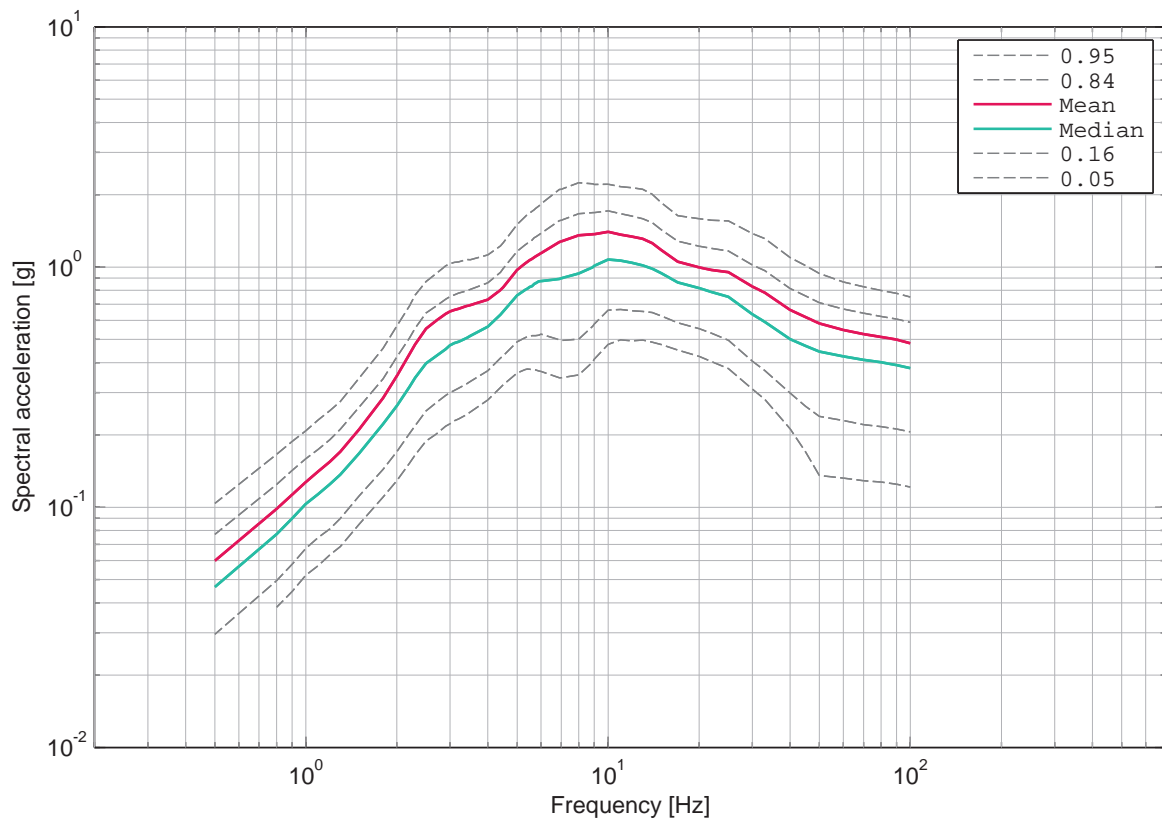


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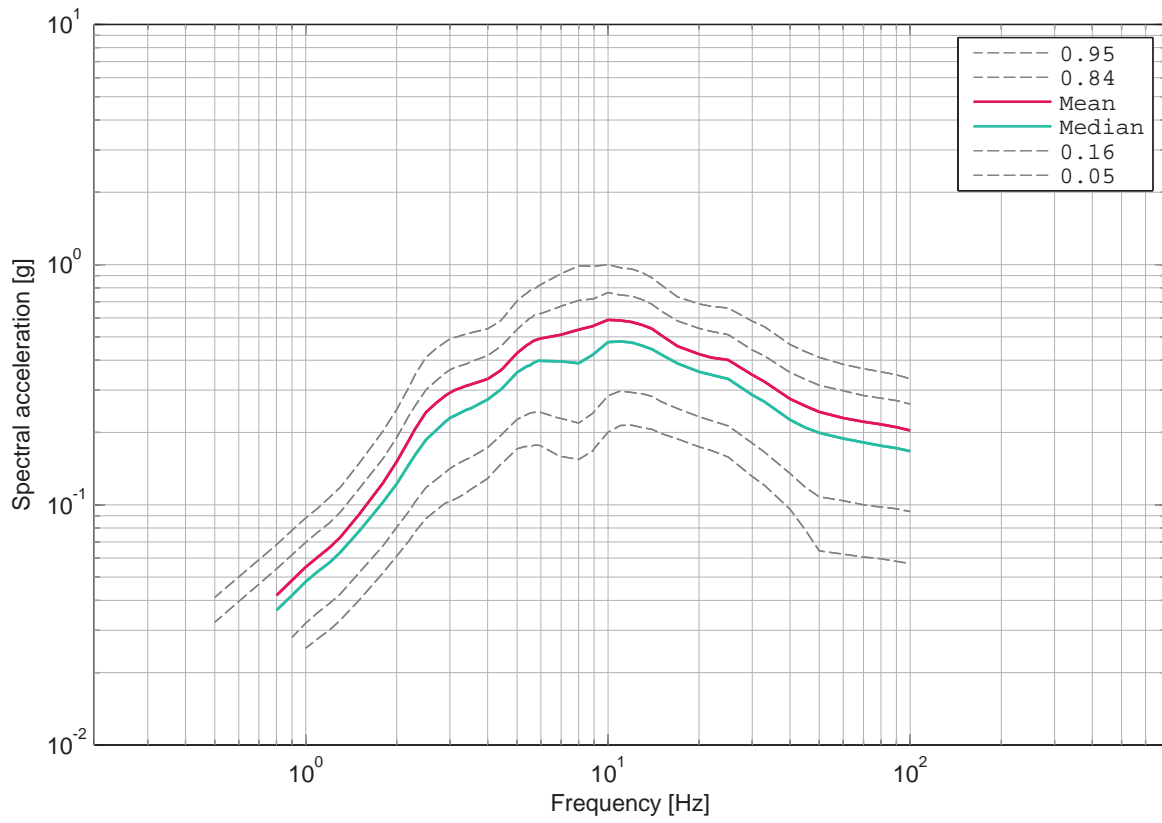


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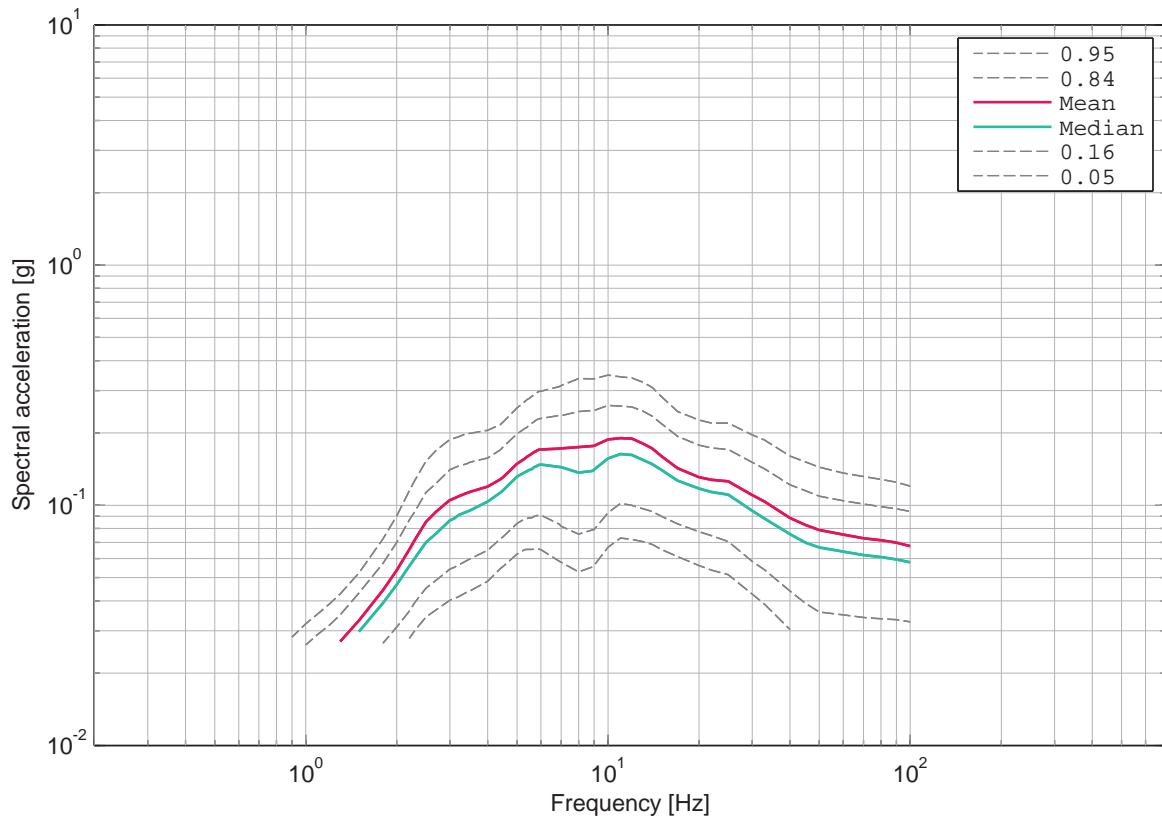


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Chapter 5

MÜHLEBERG

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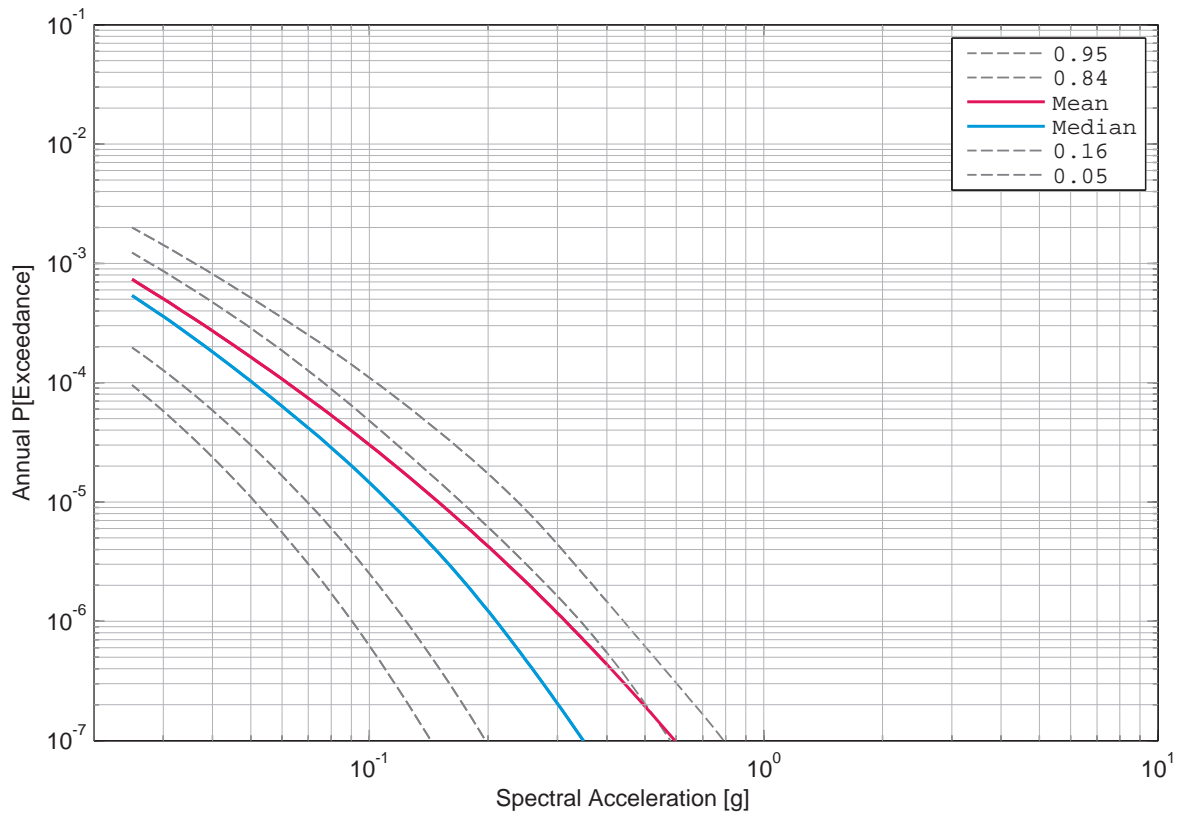


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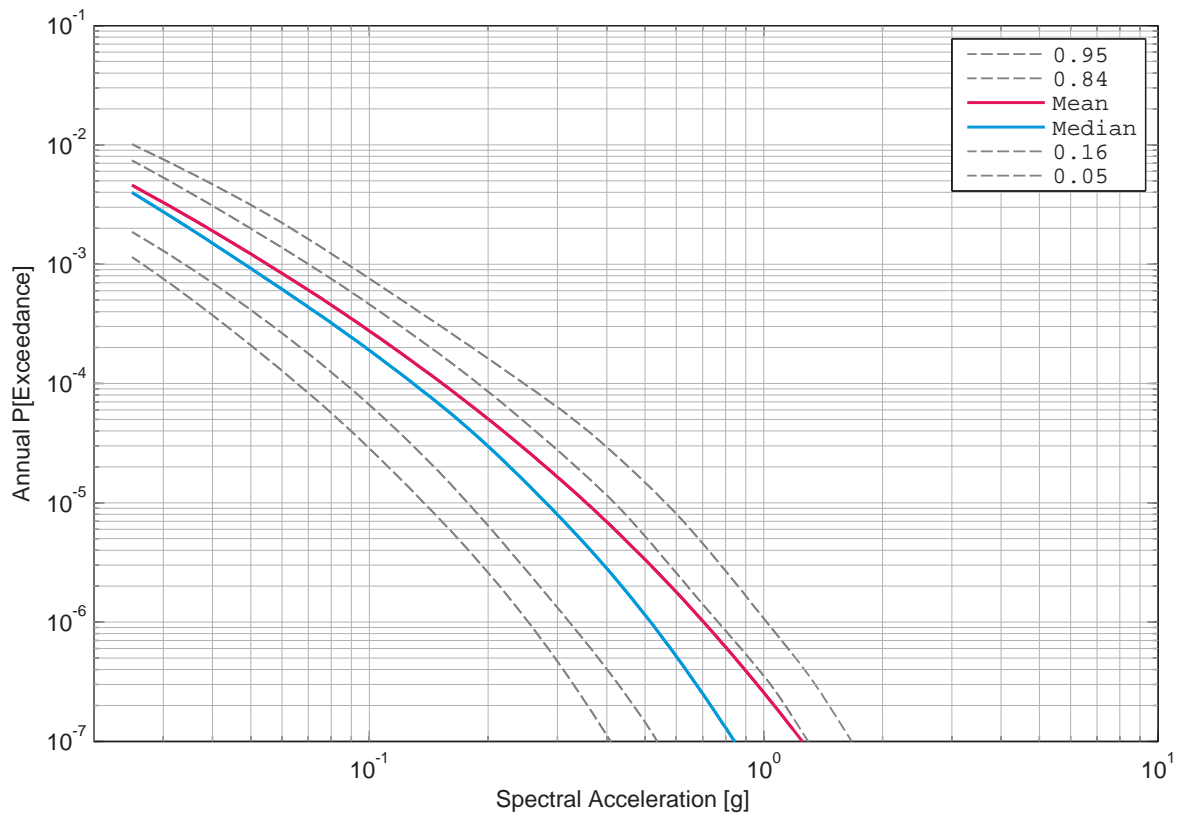


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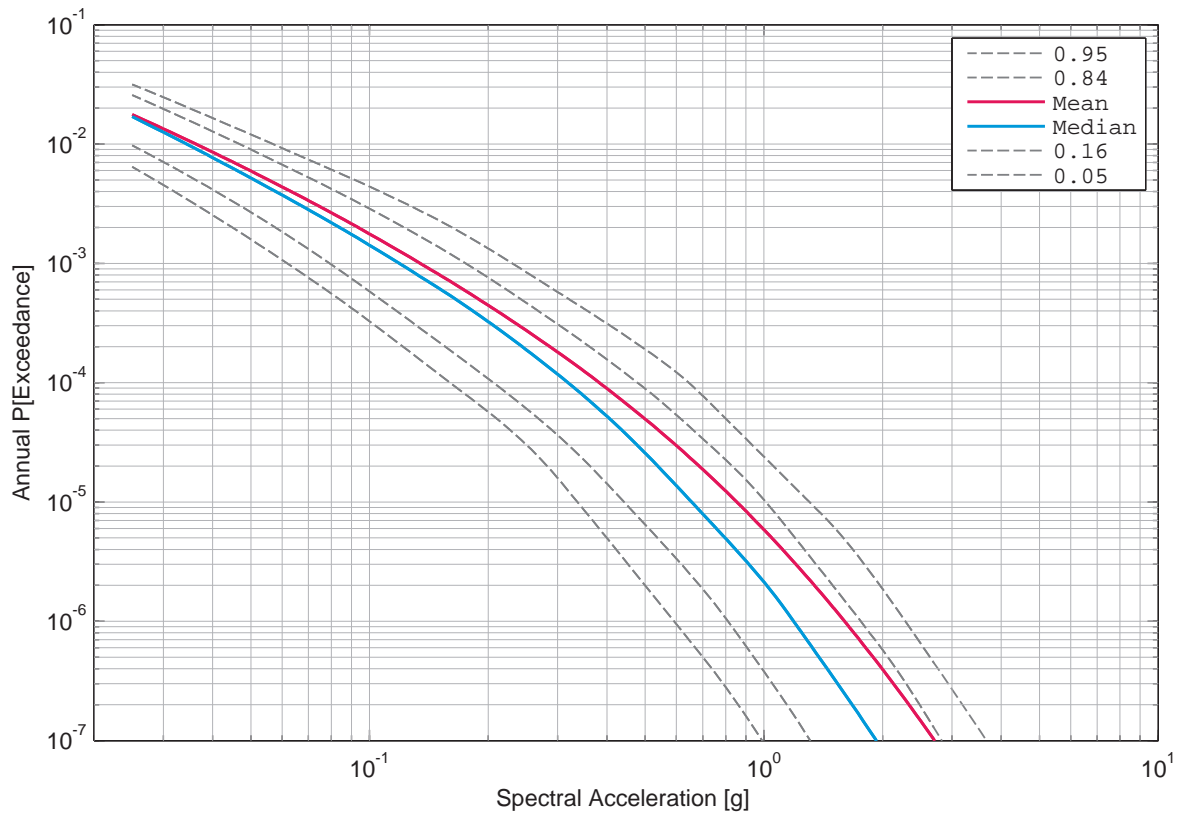


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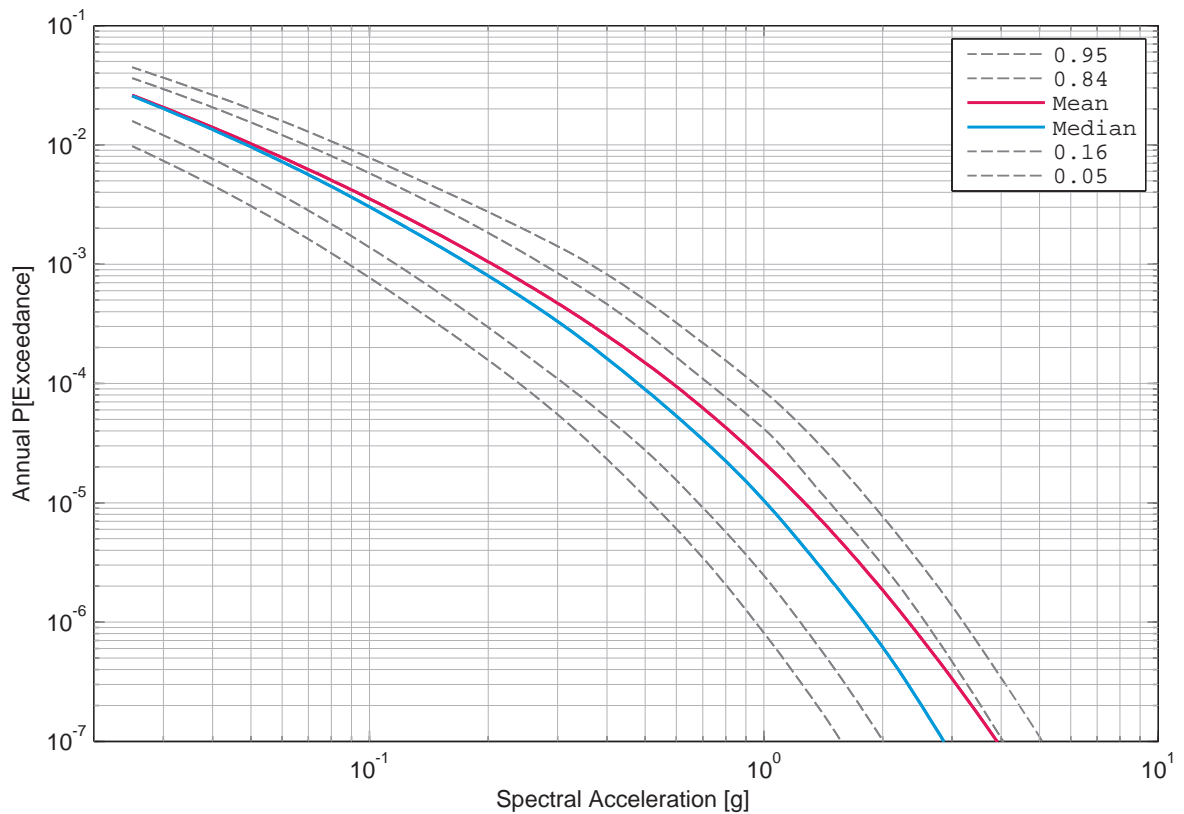


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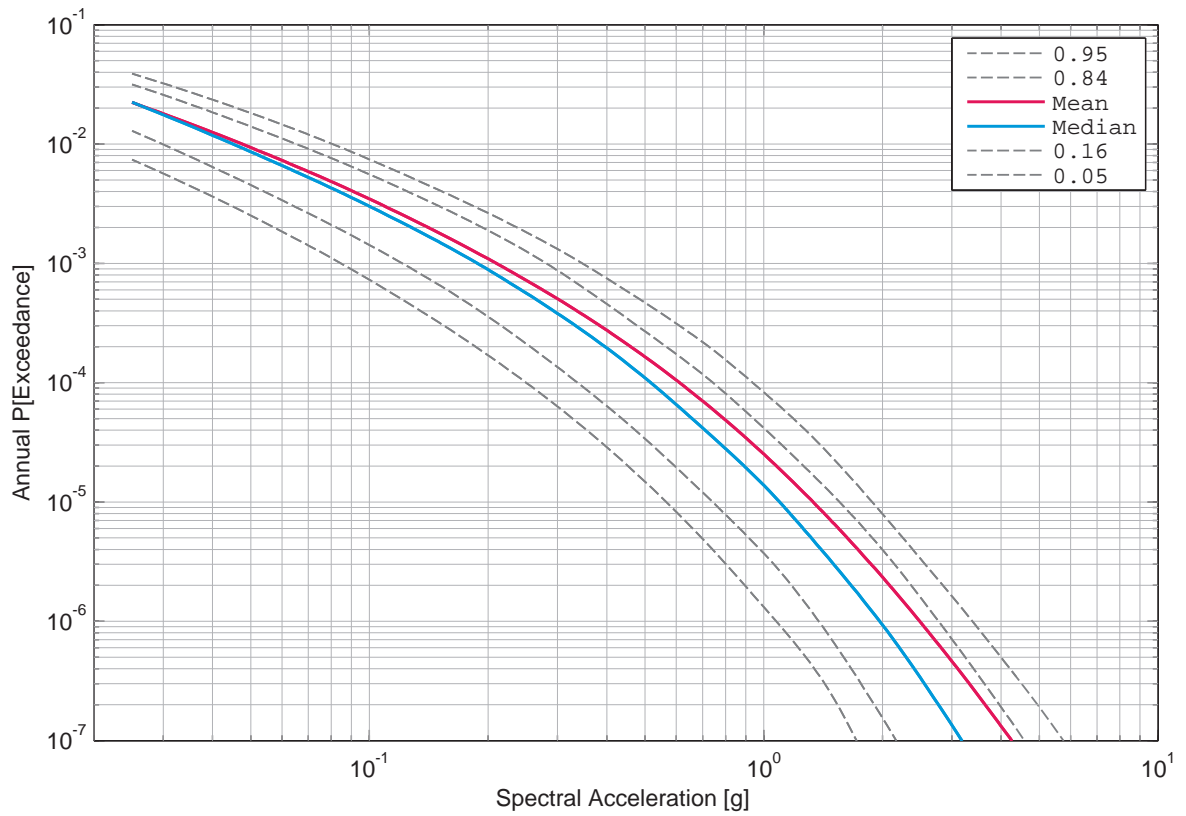


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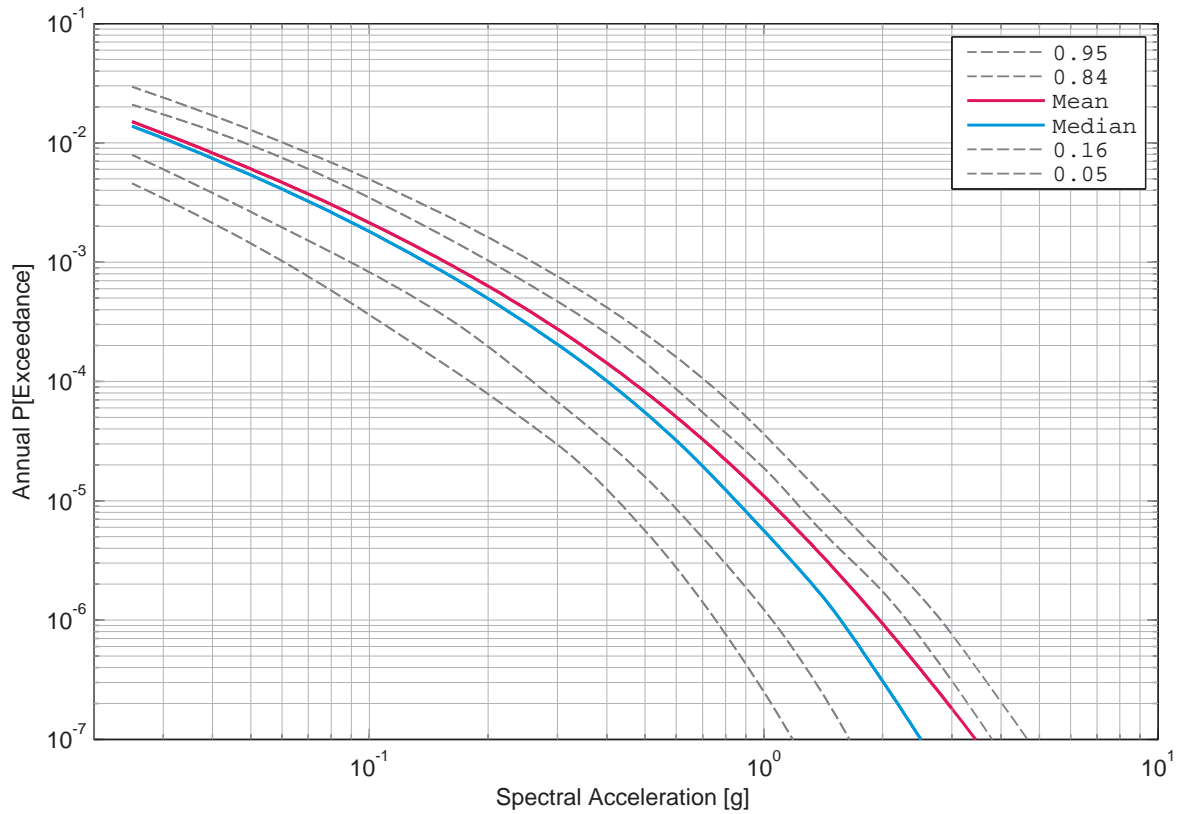


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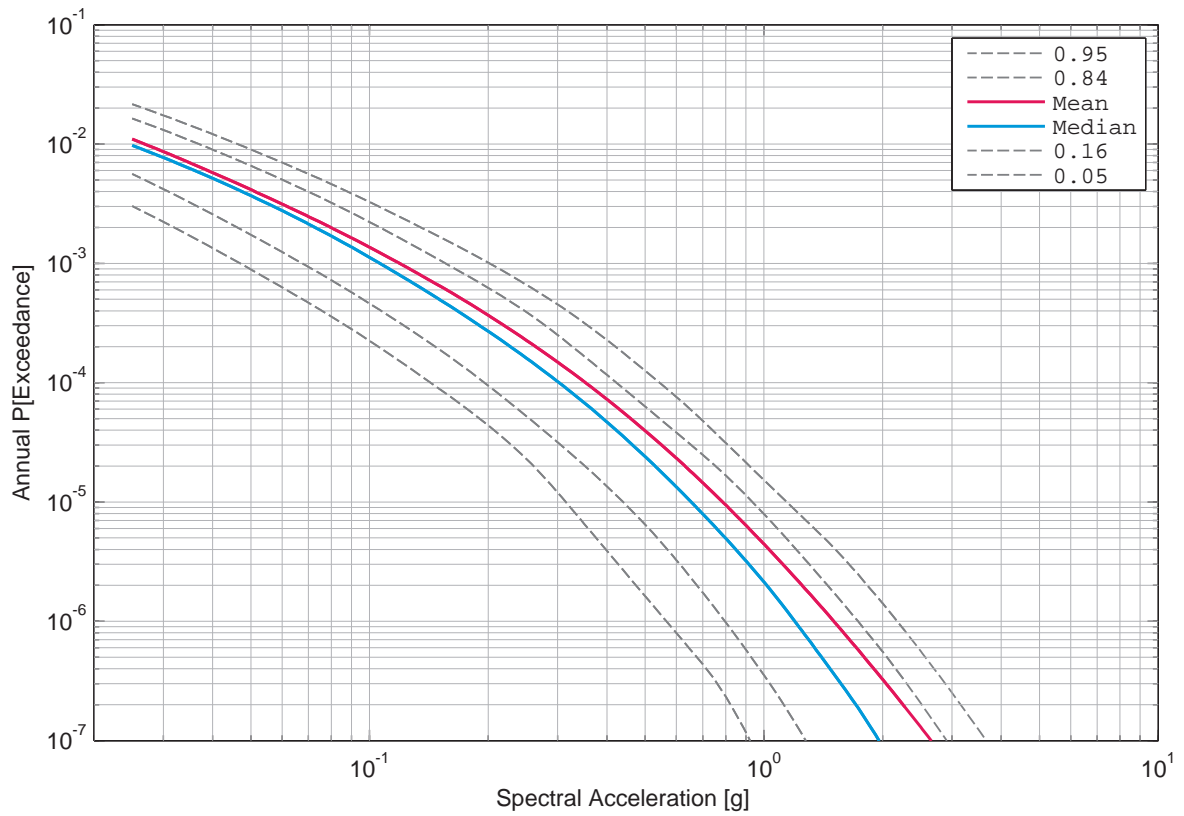


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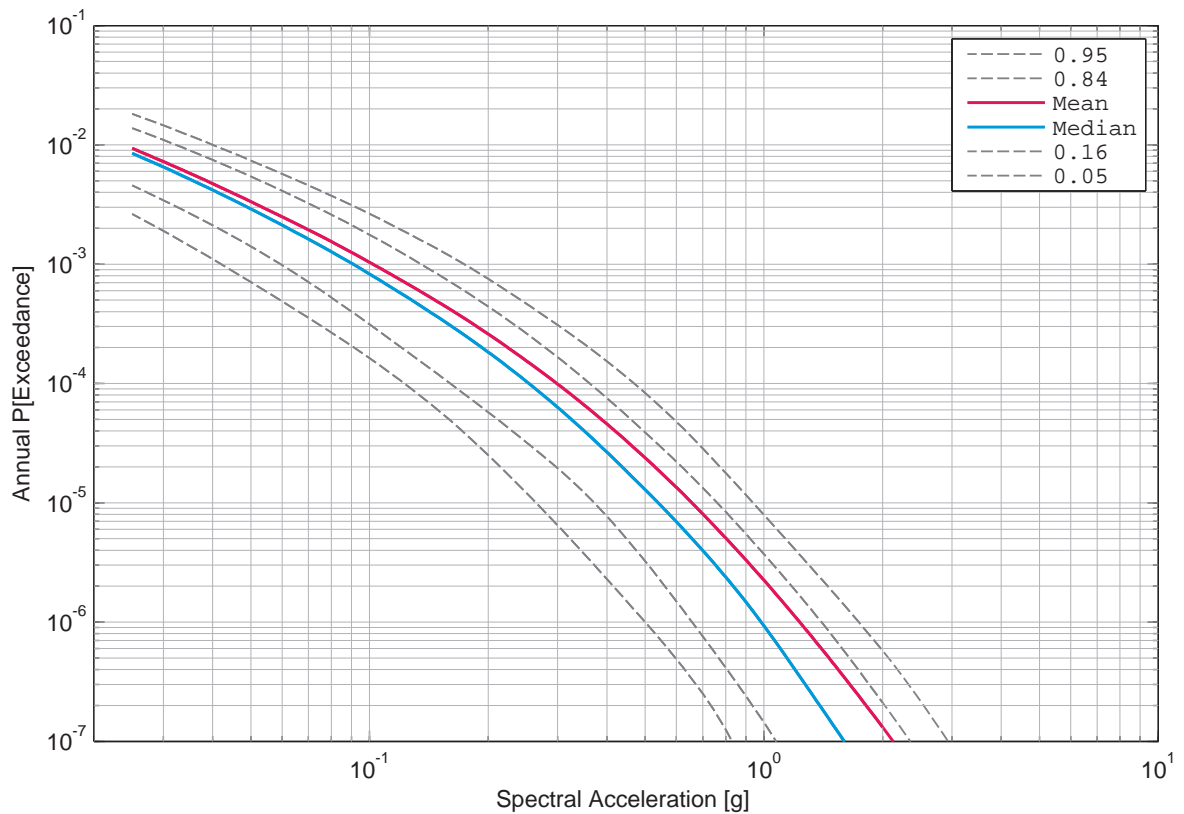


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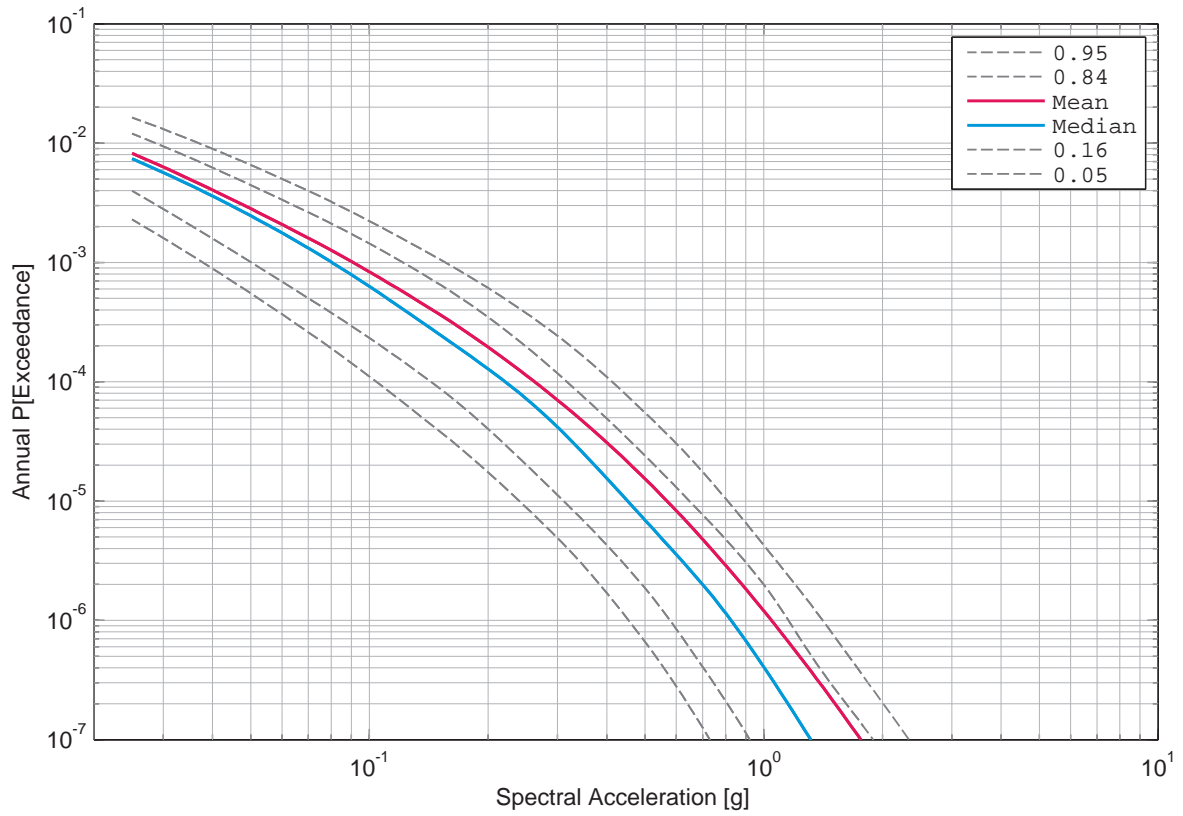


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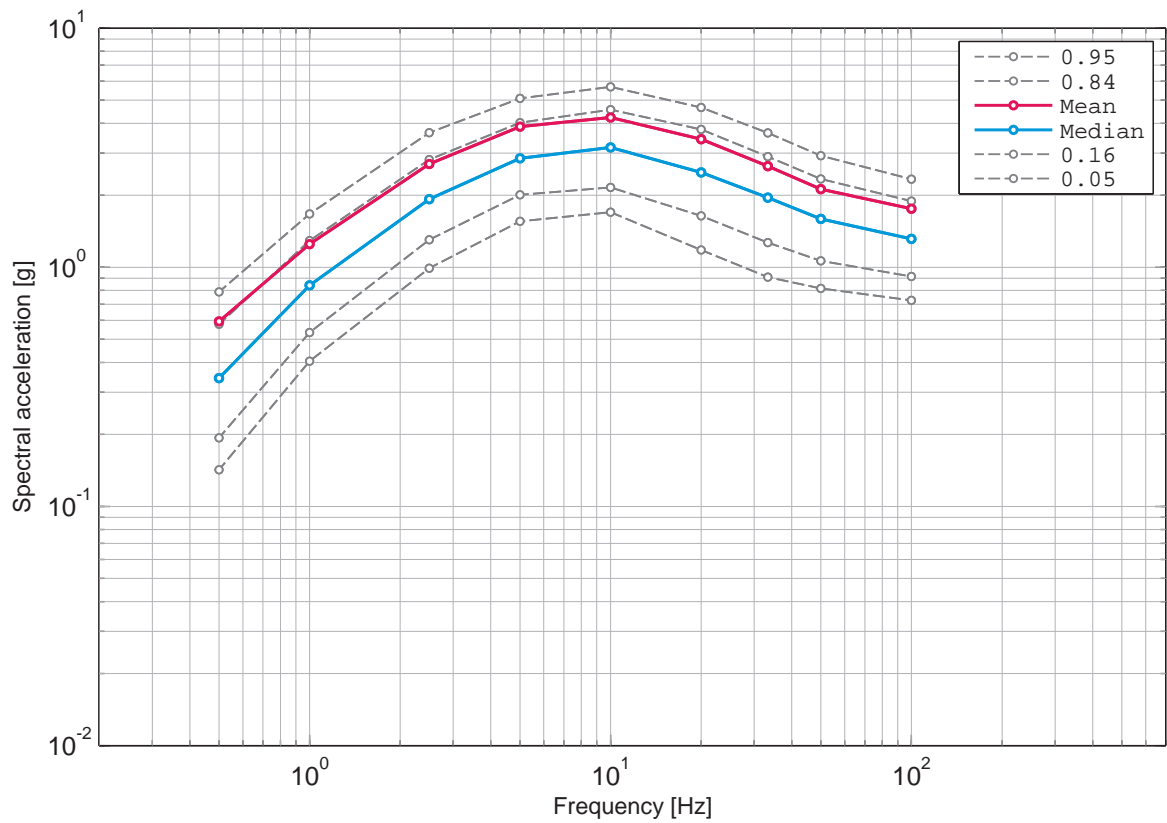


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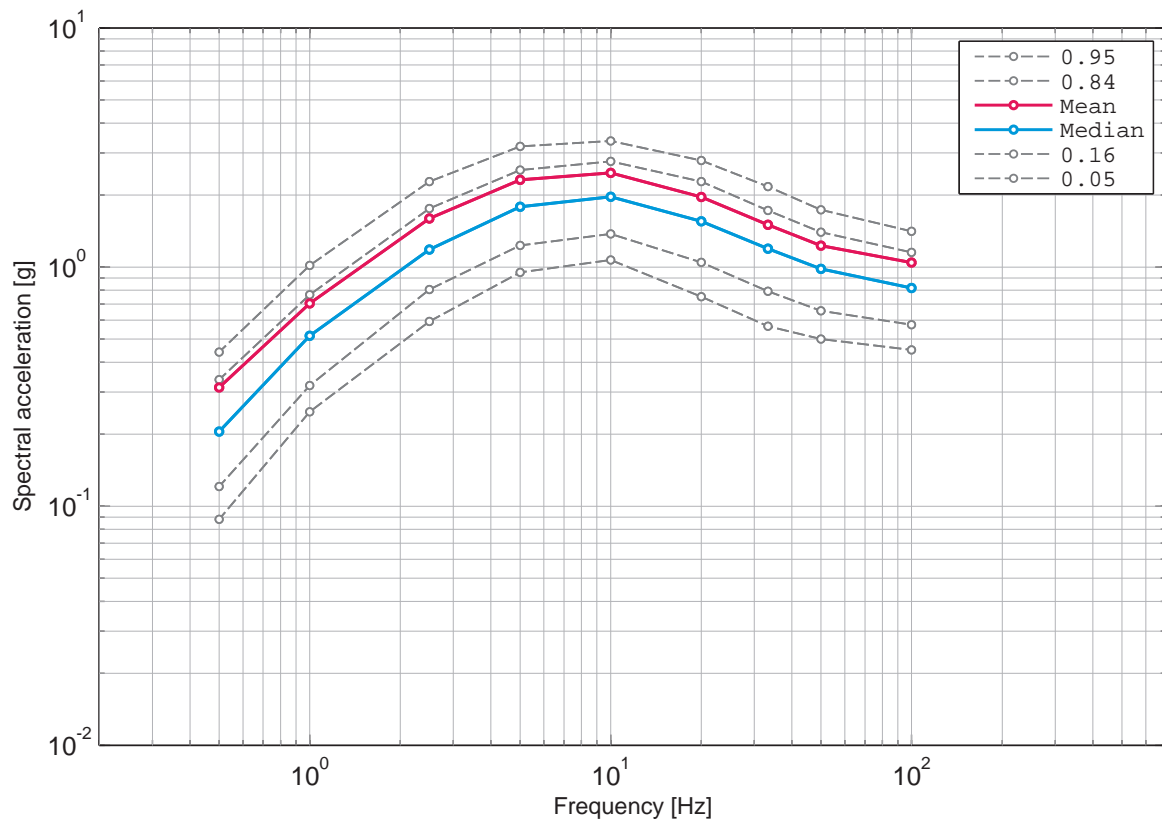


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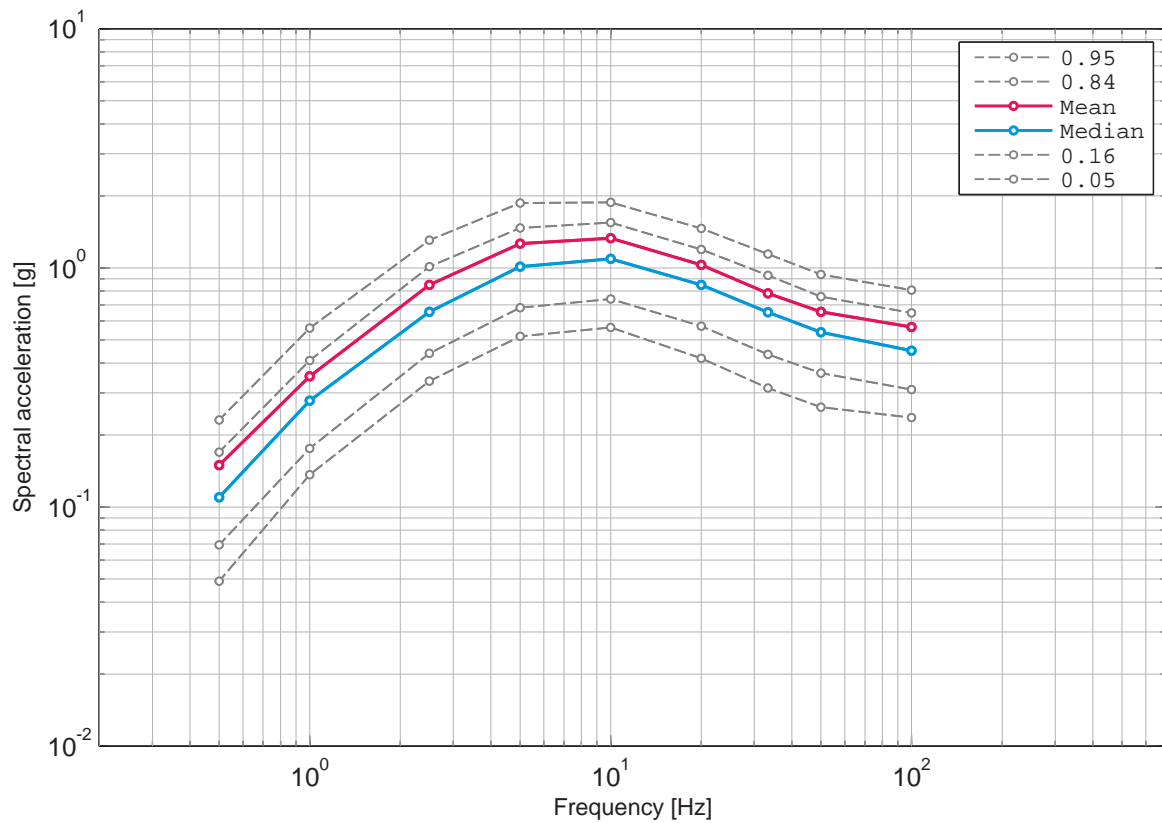


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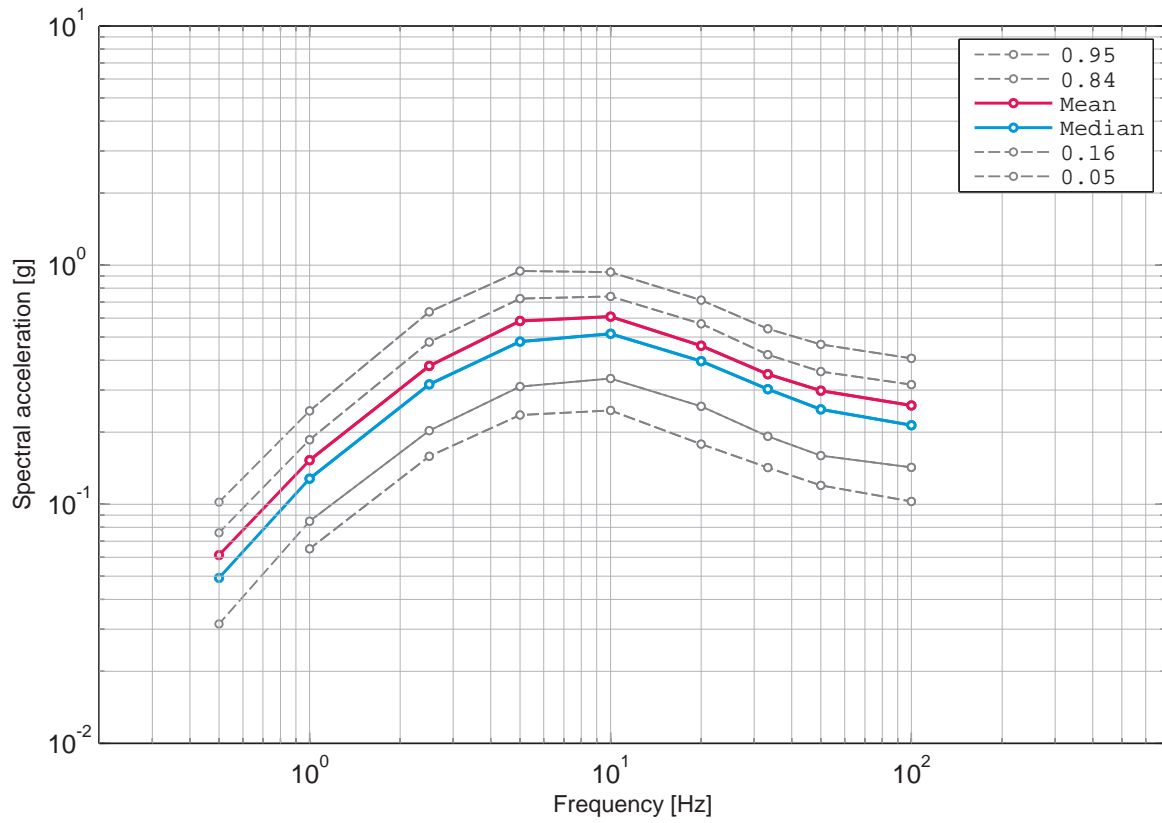


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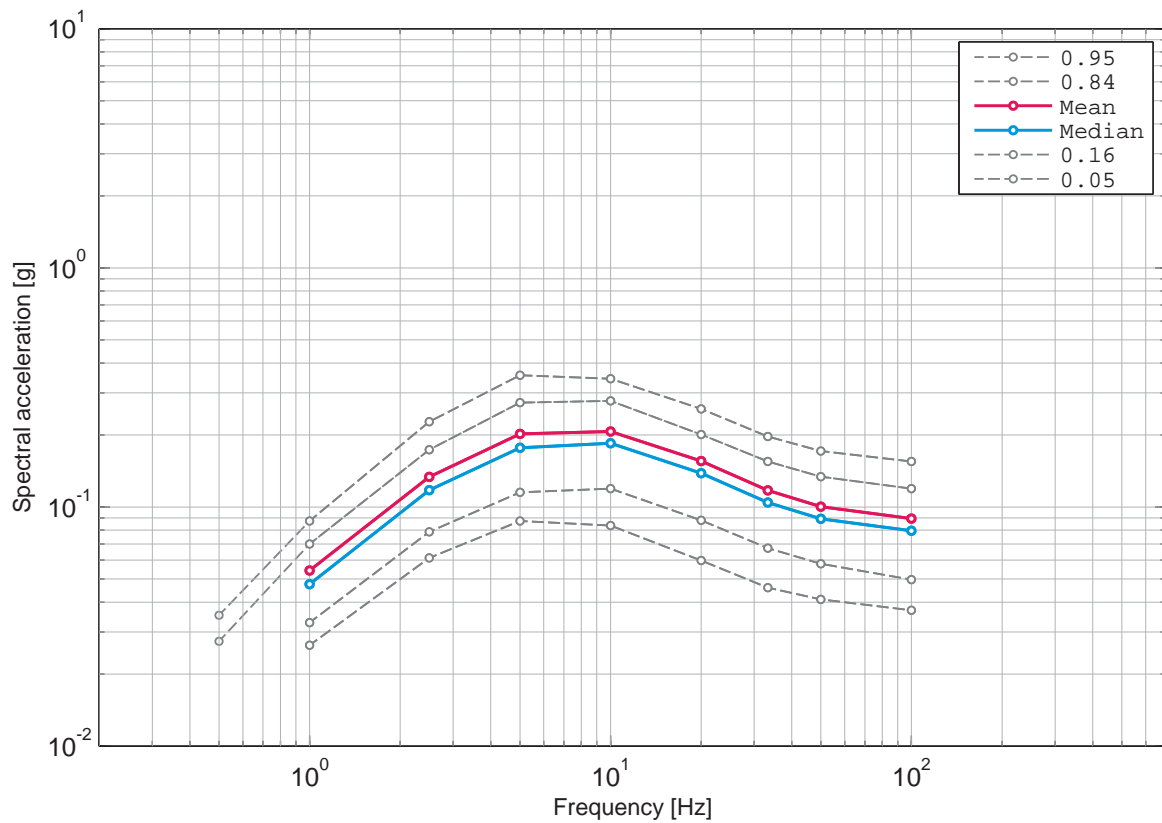


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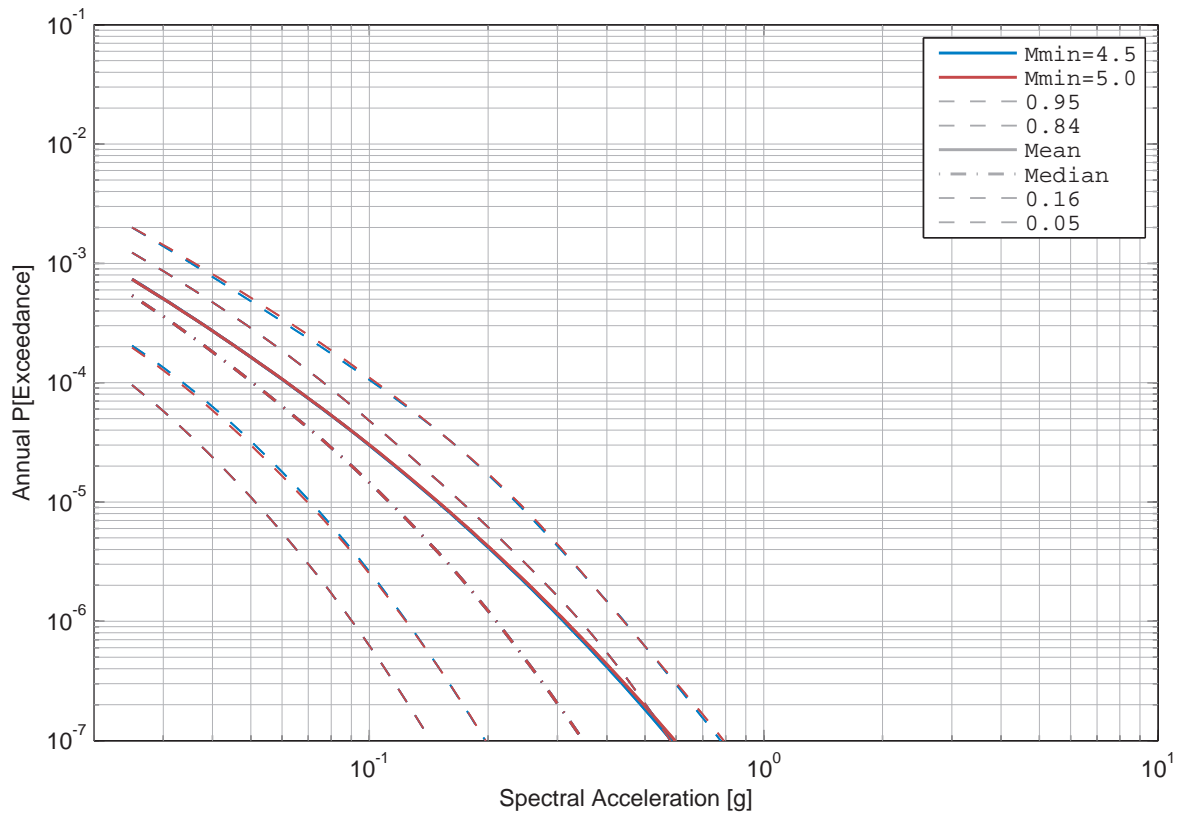


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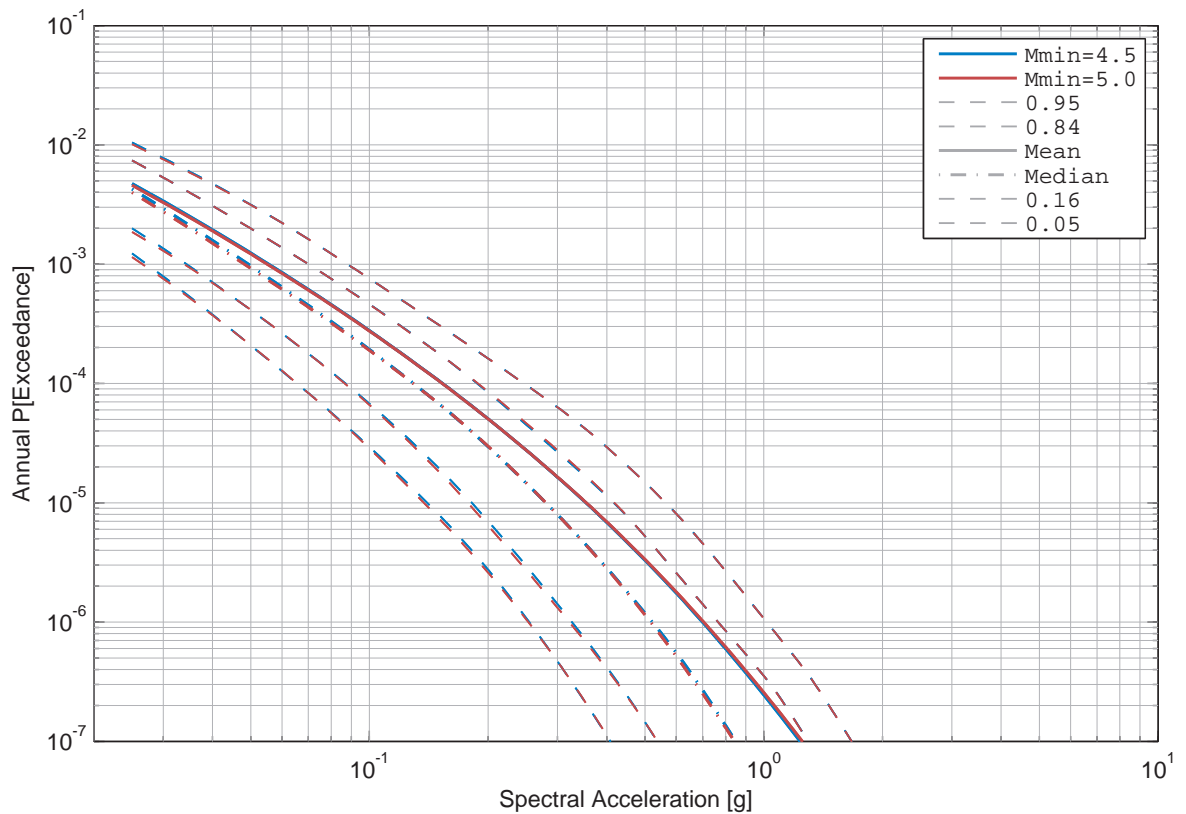


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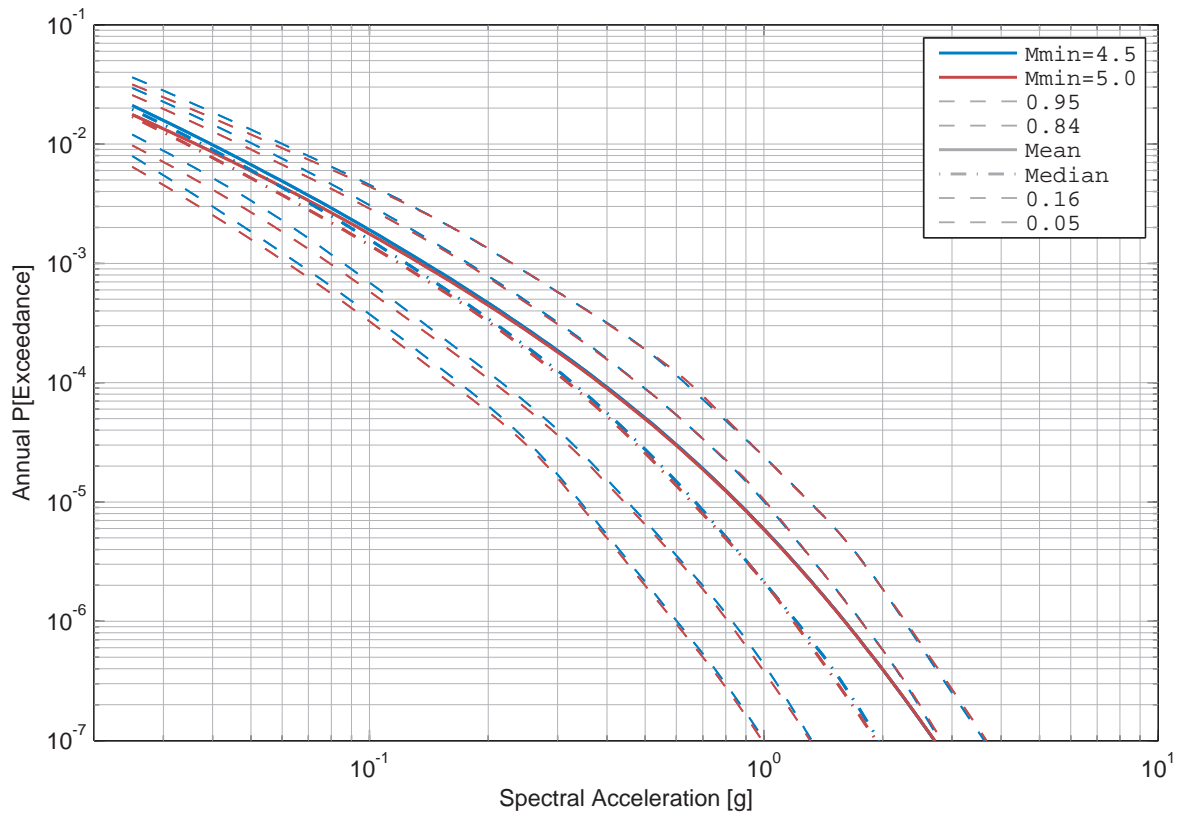


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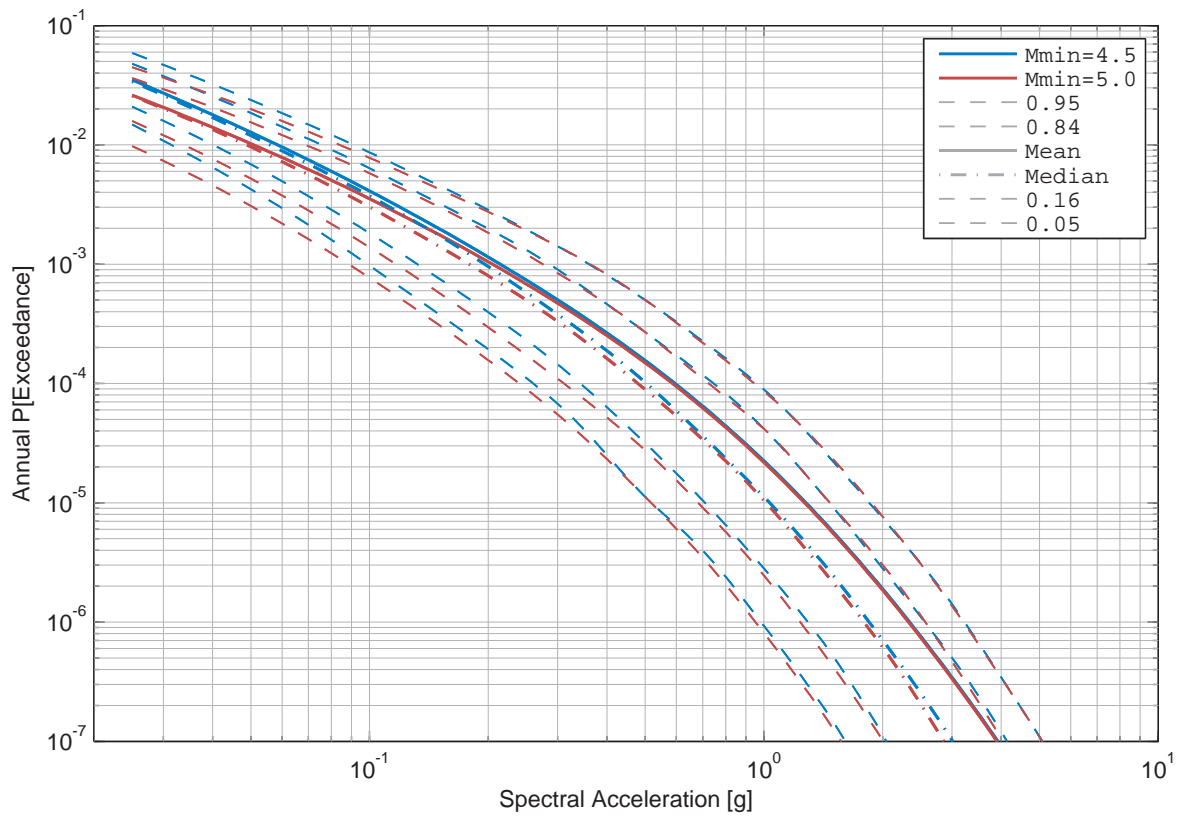


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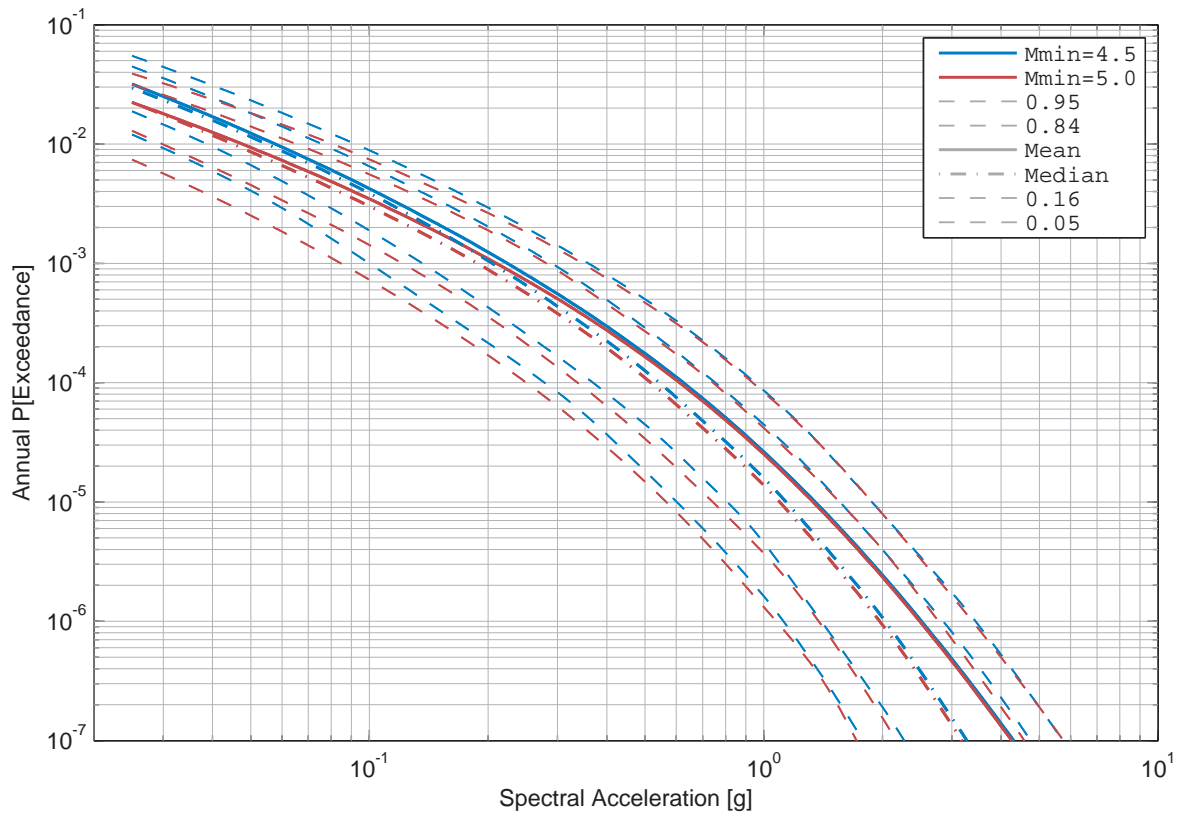


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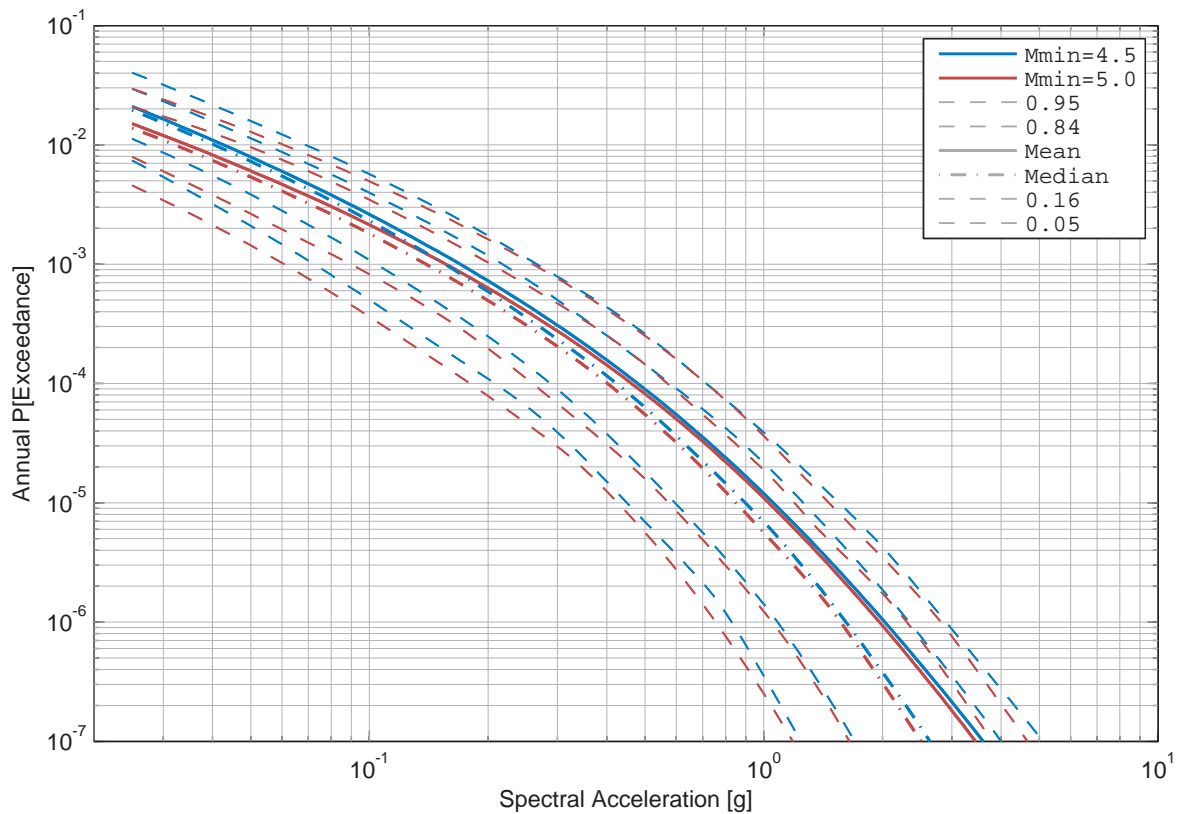


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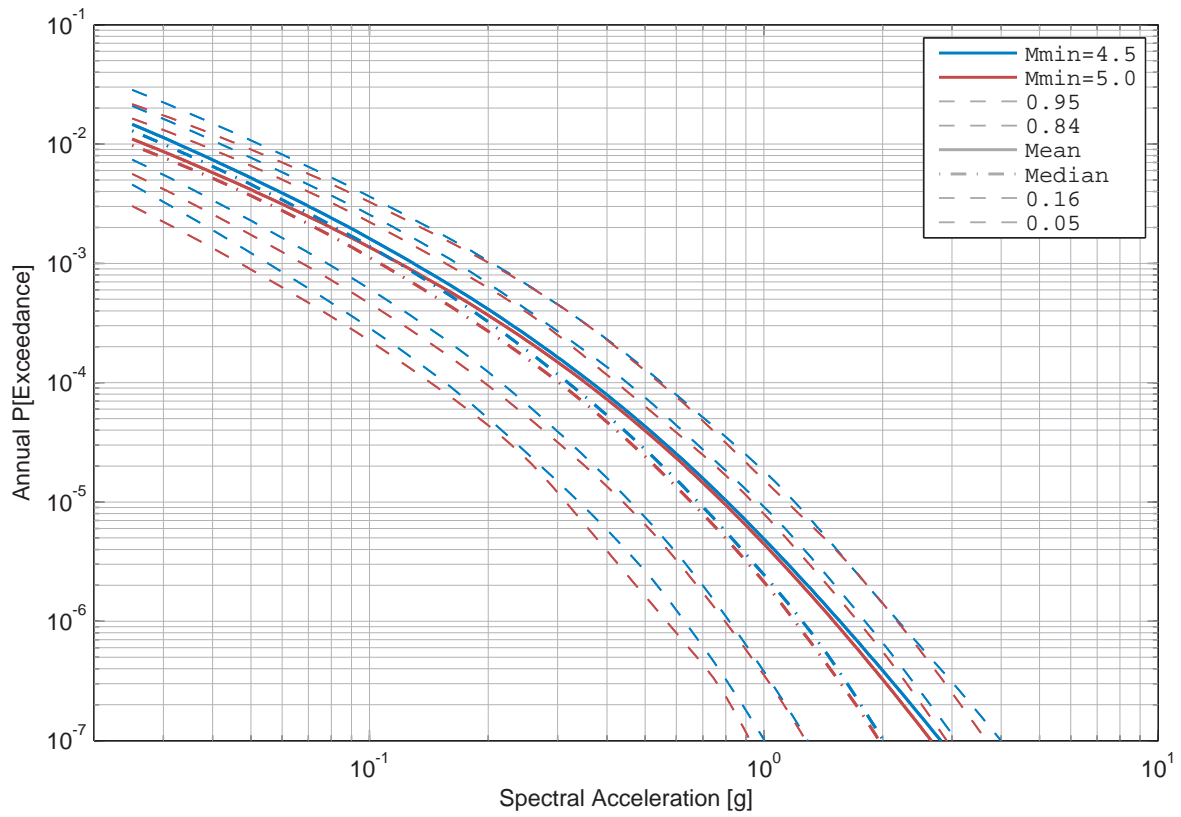


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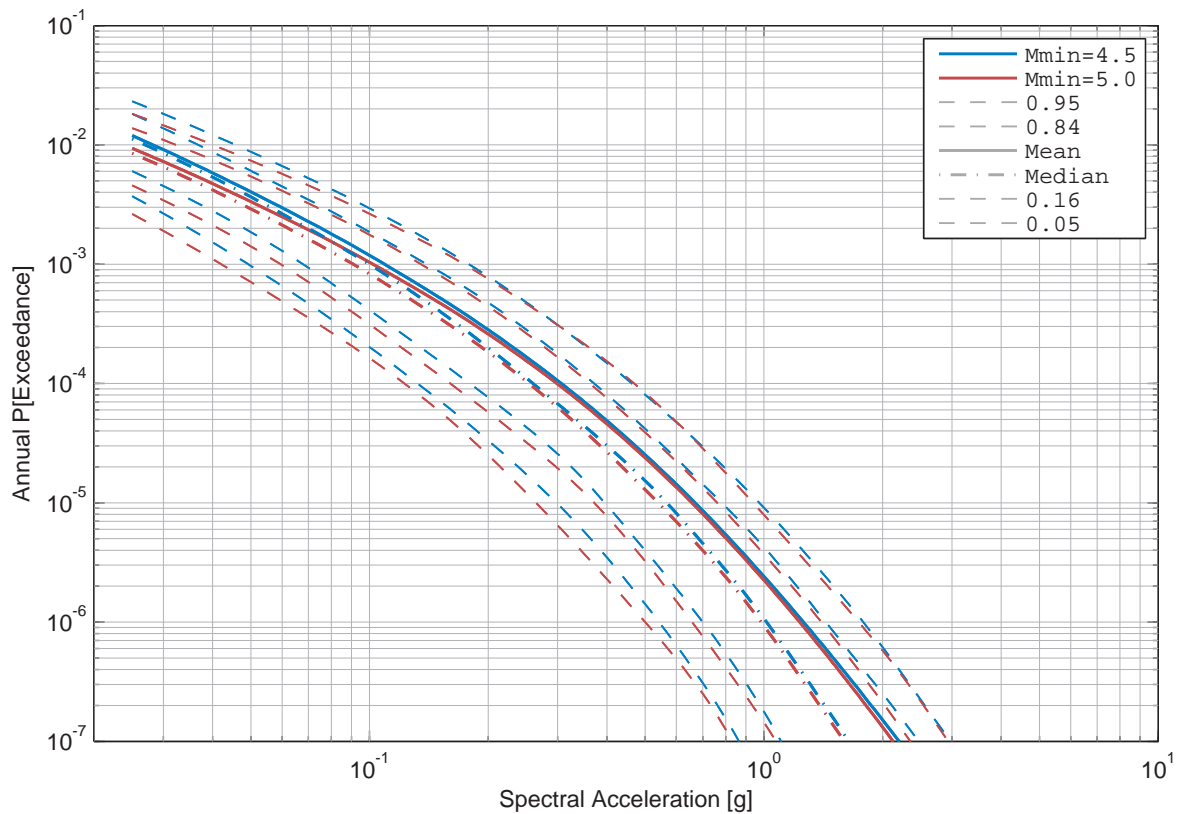


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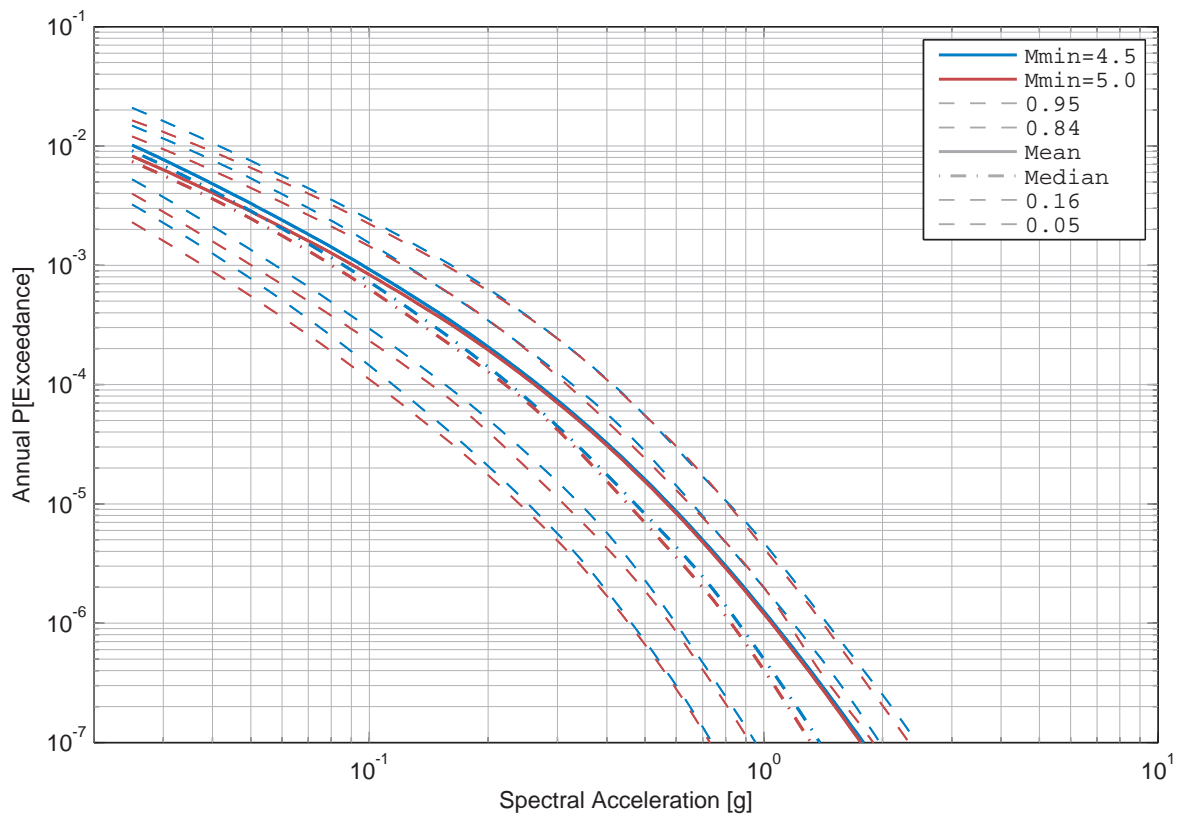


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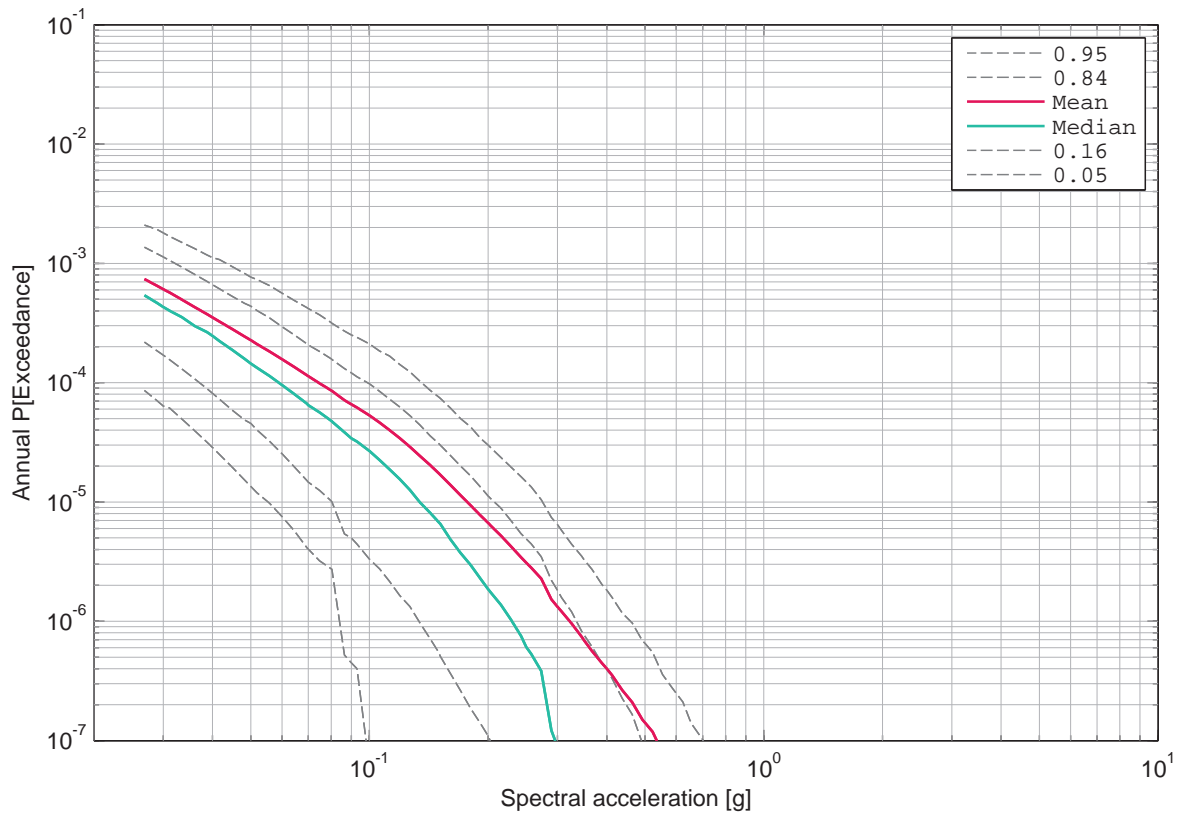


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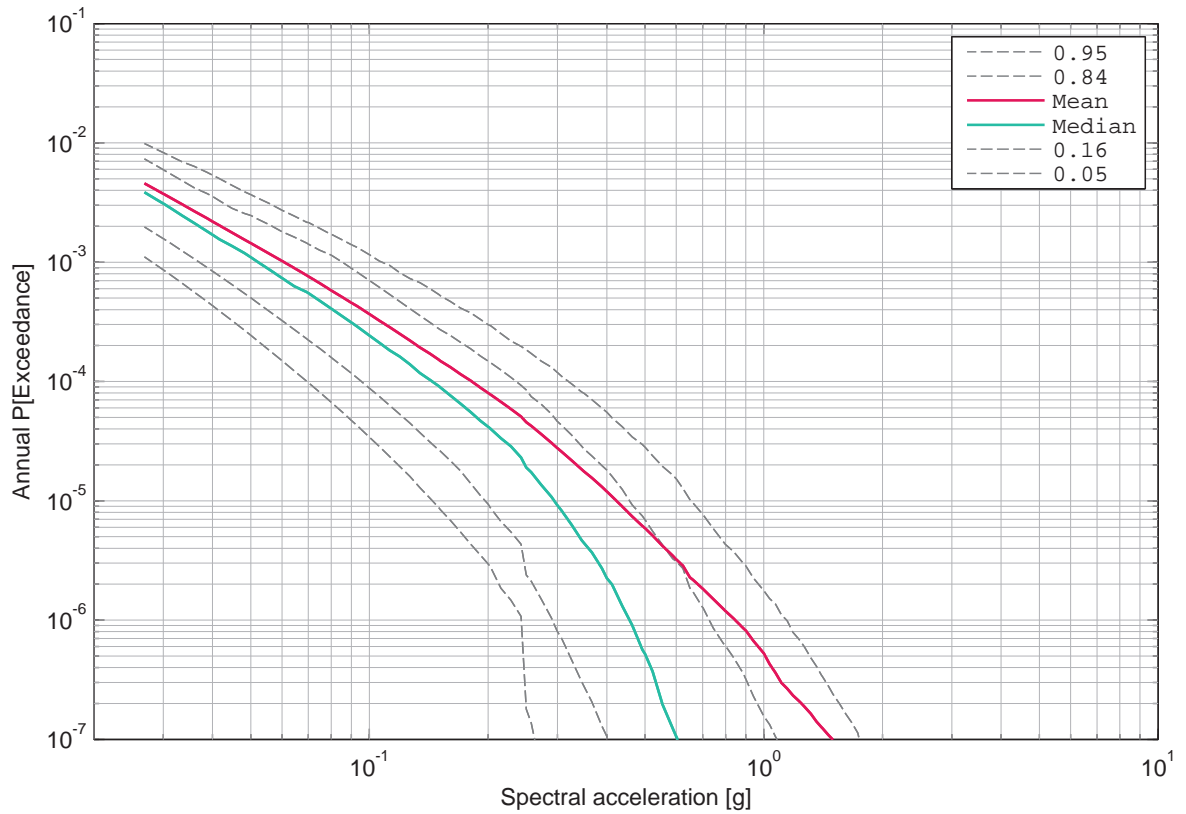


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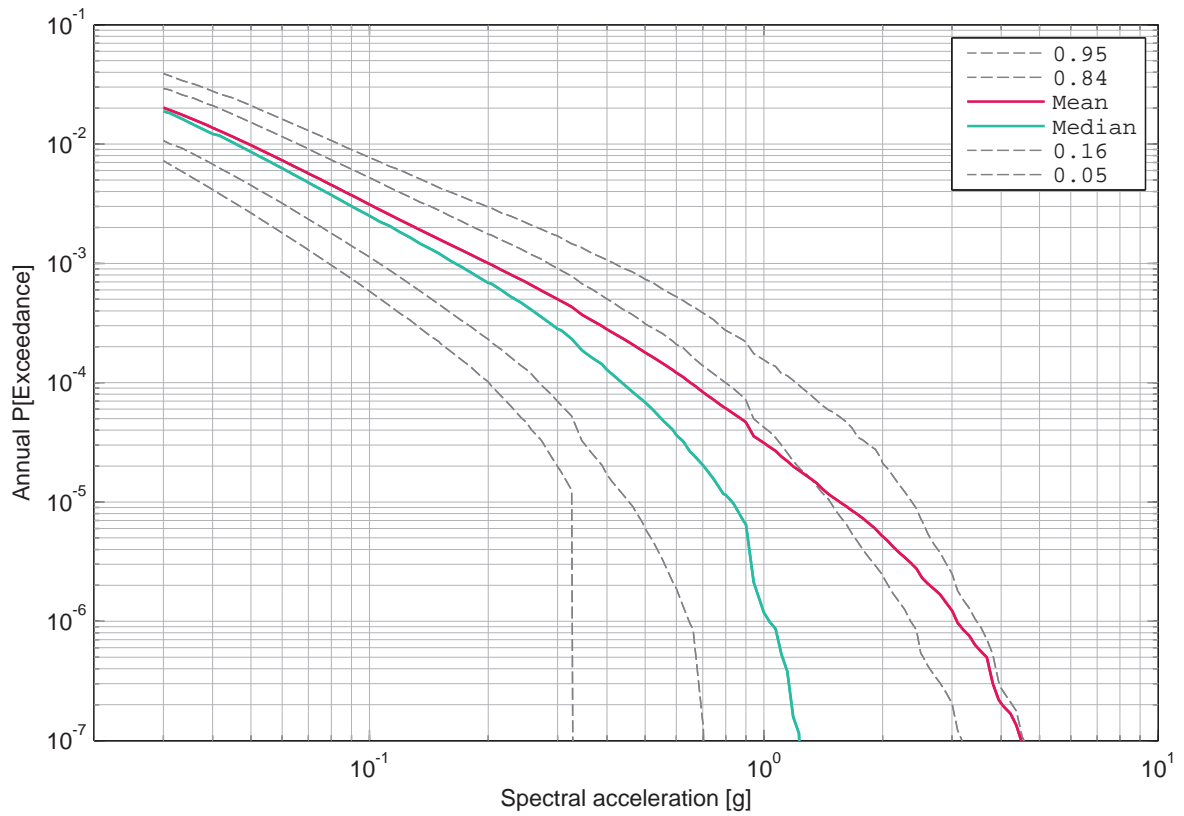


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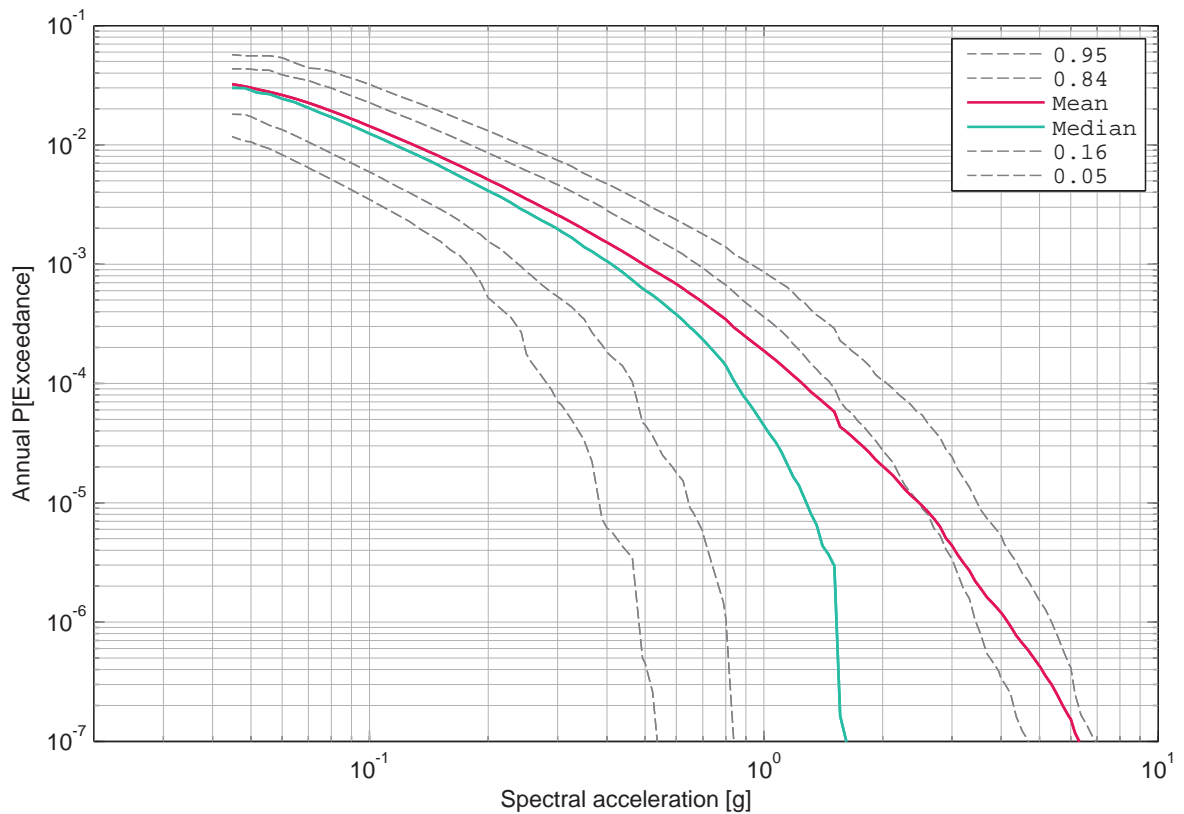


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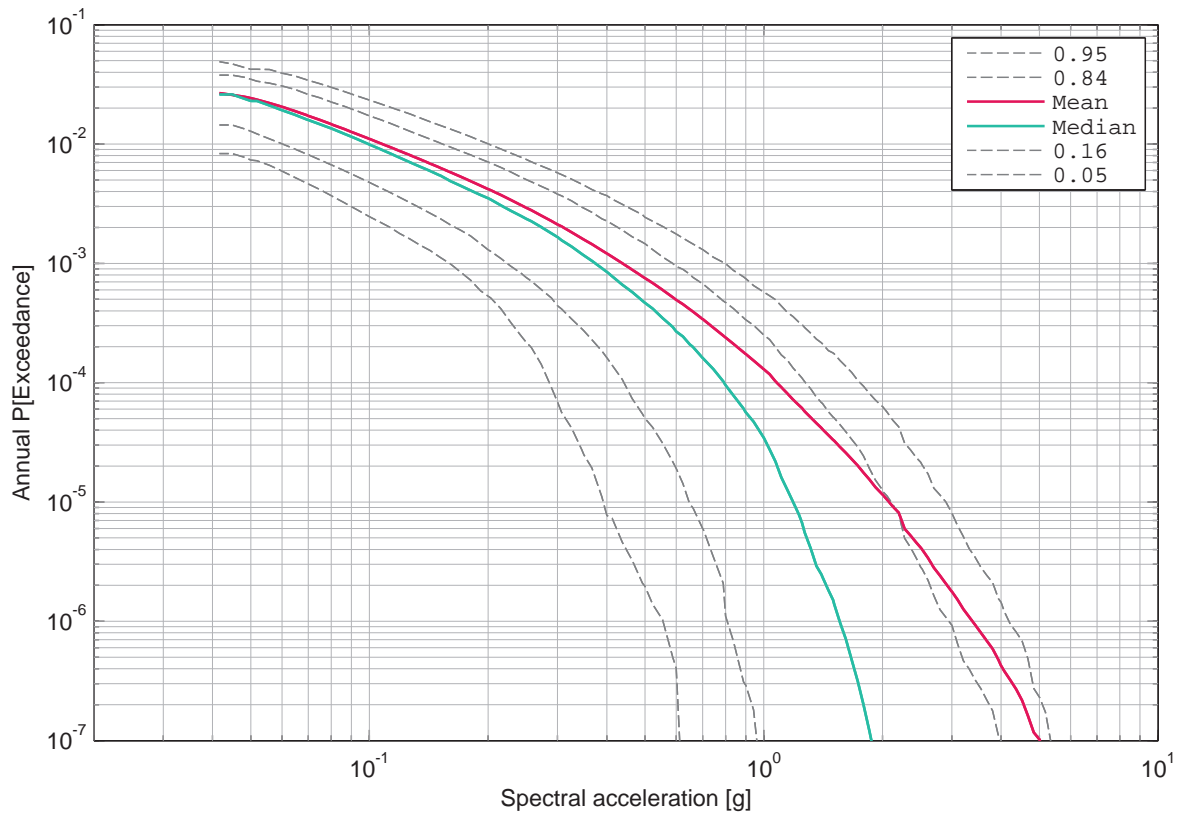


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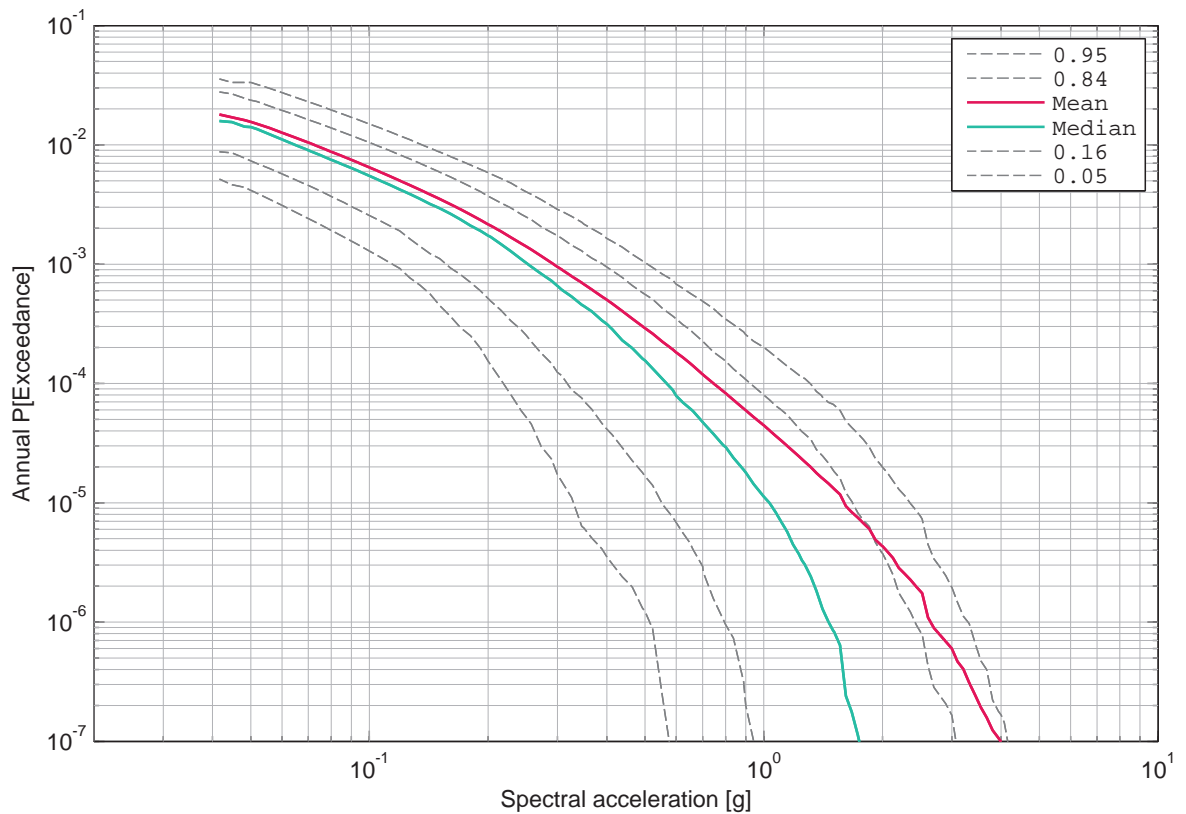


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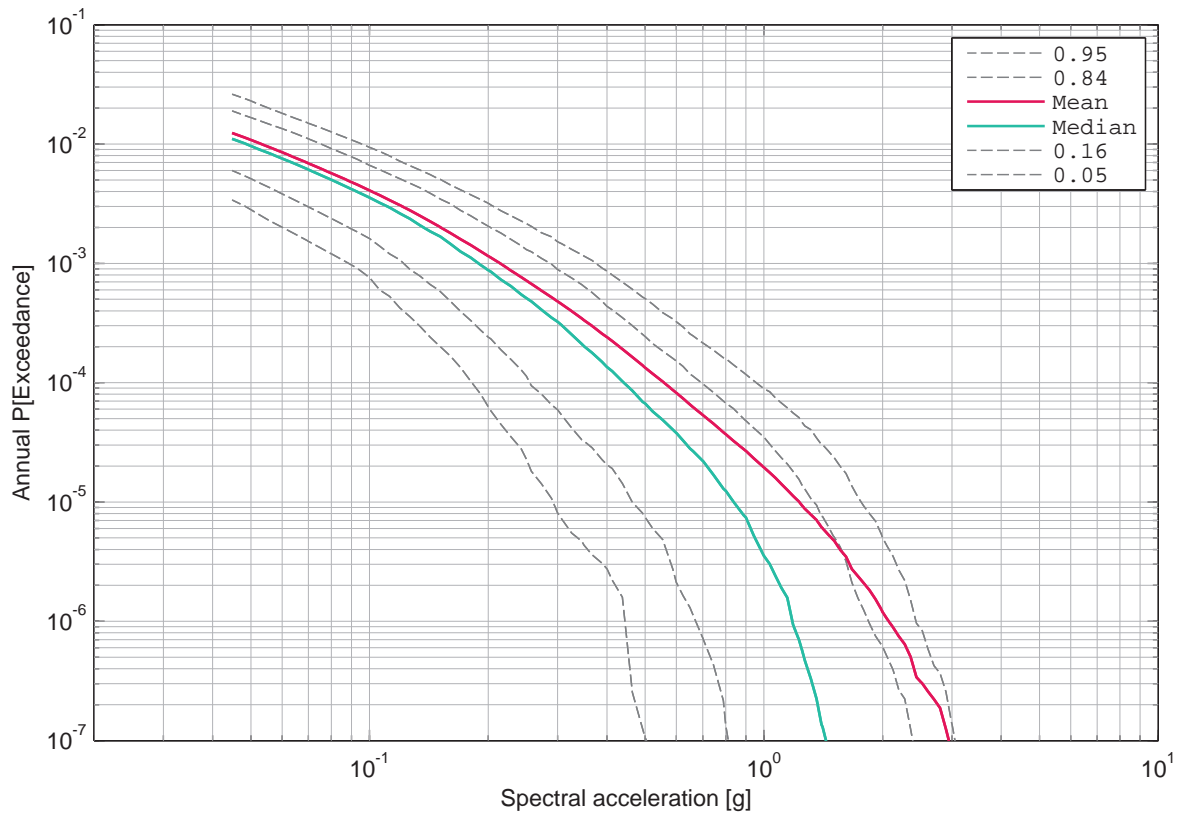


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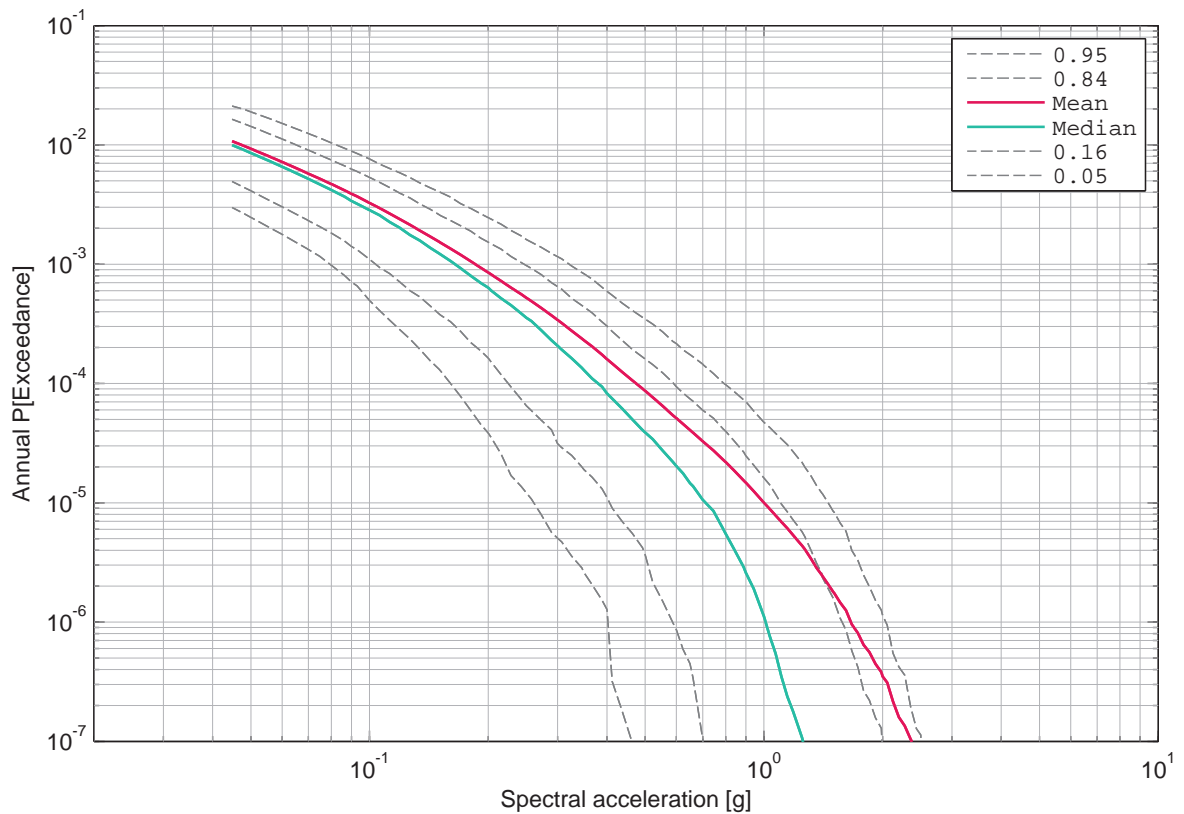


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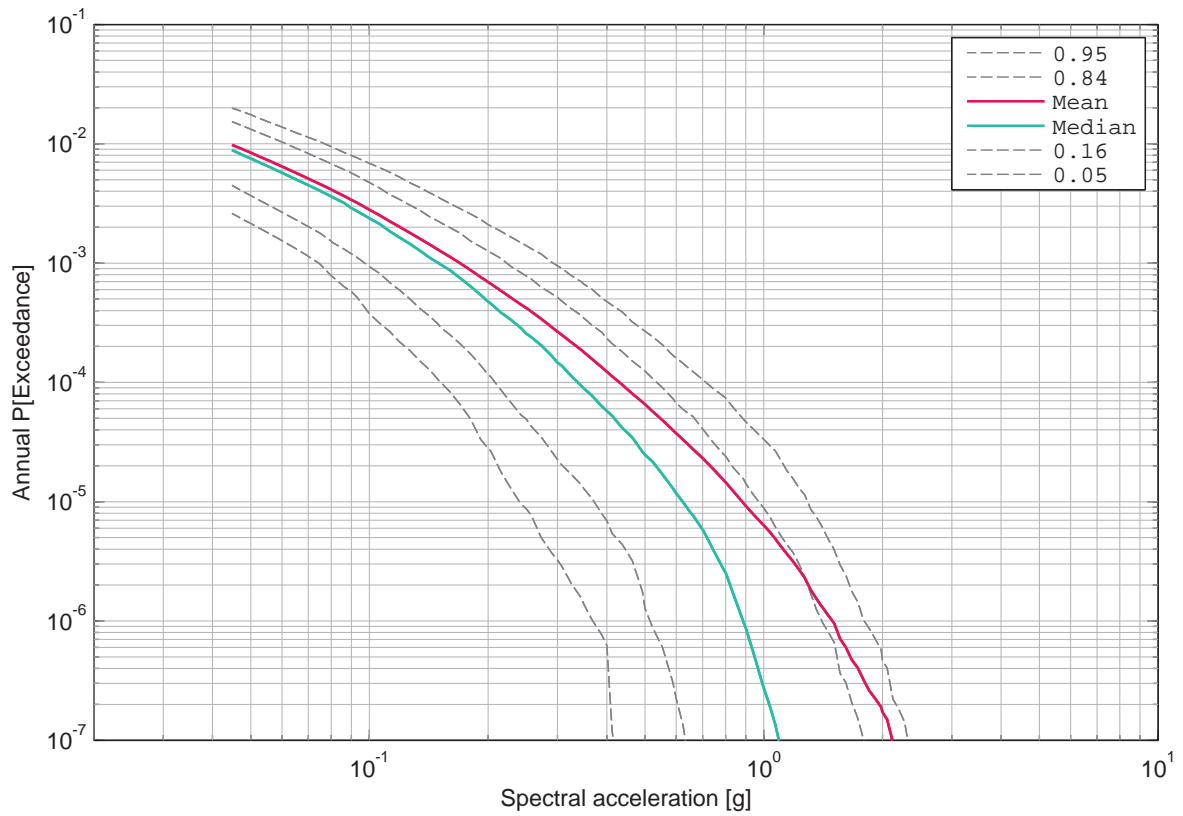


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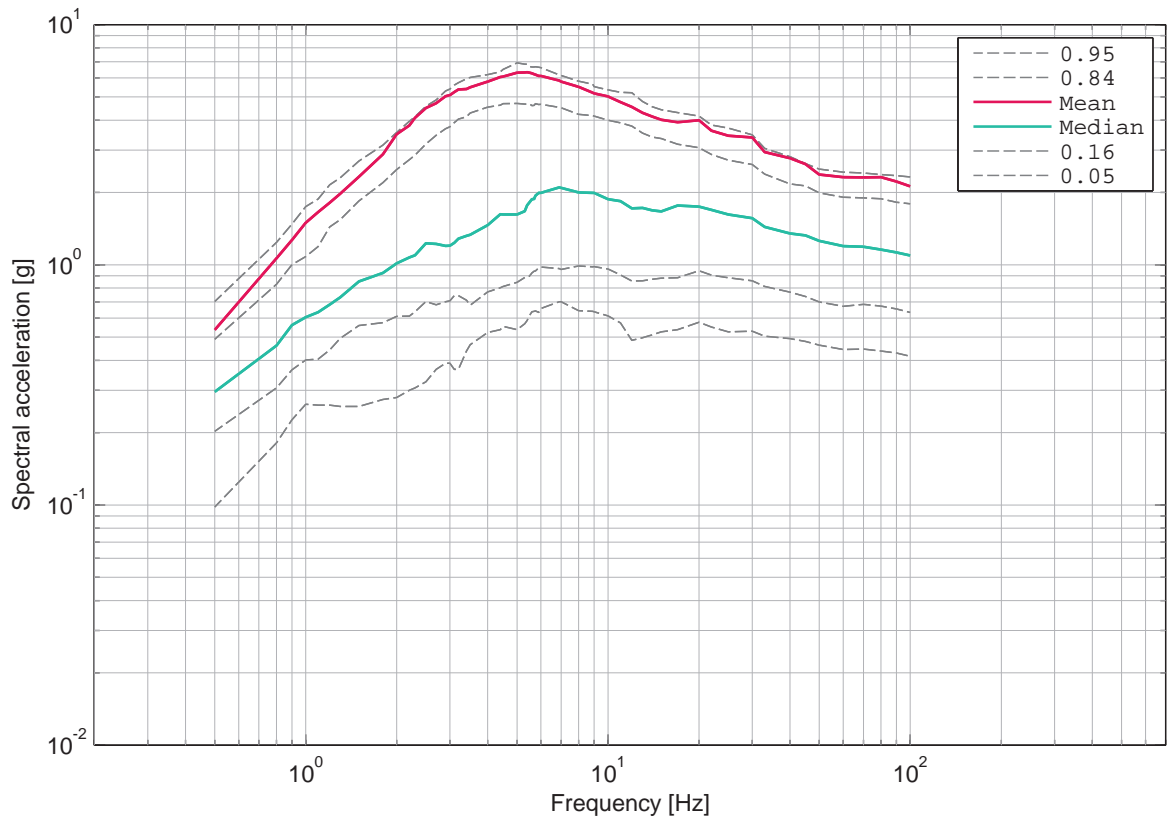


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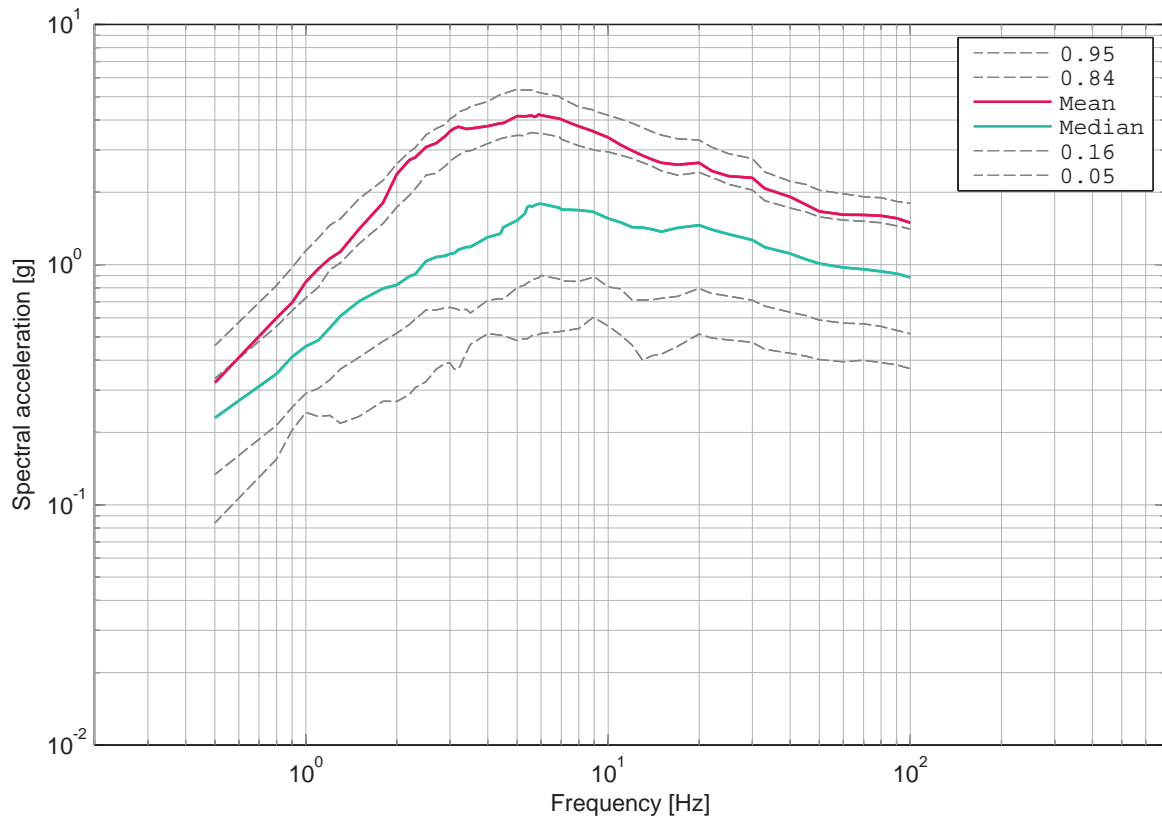


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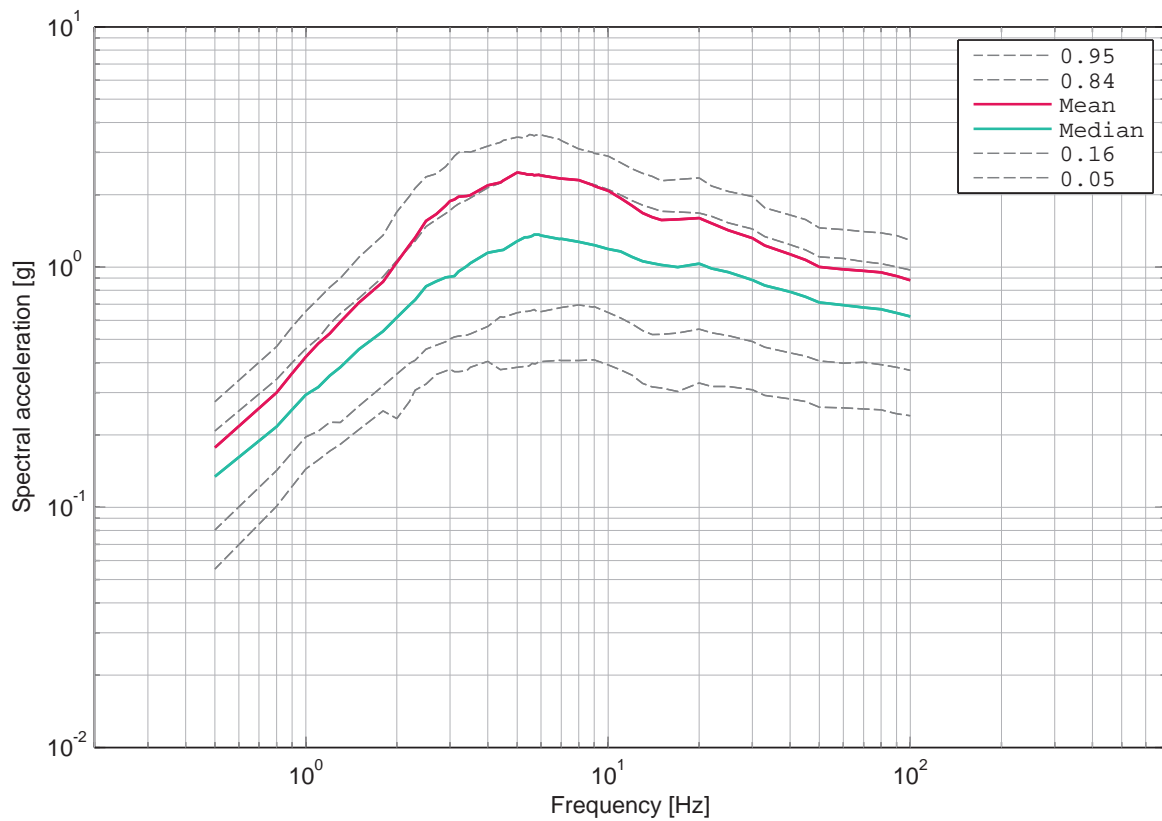


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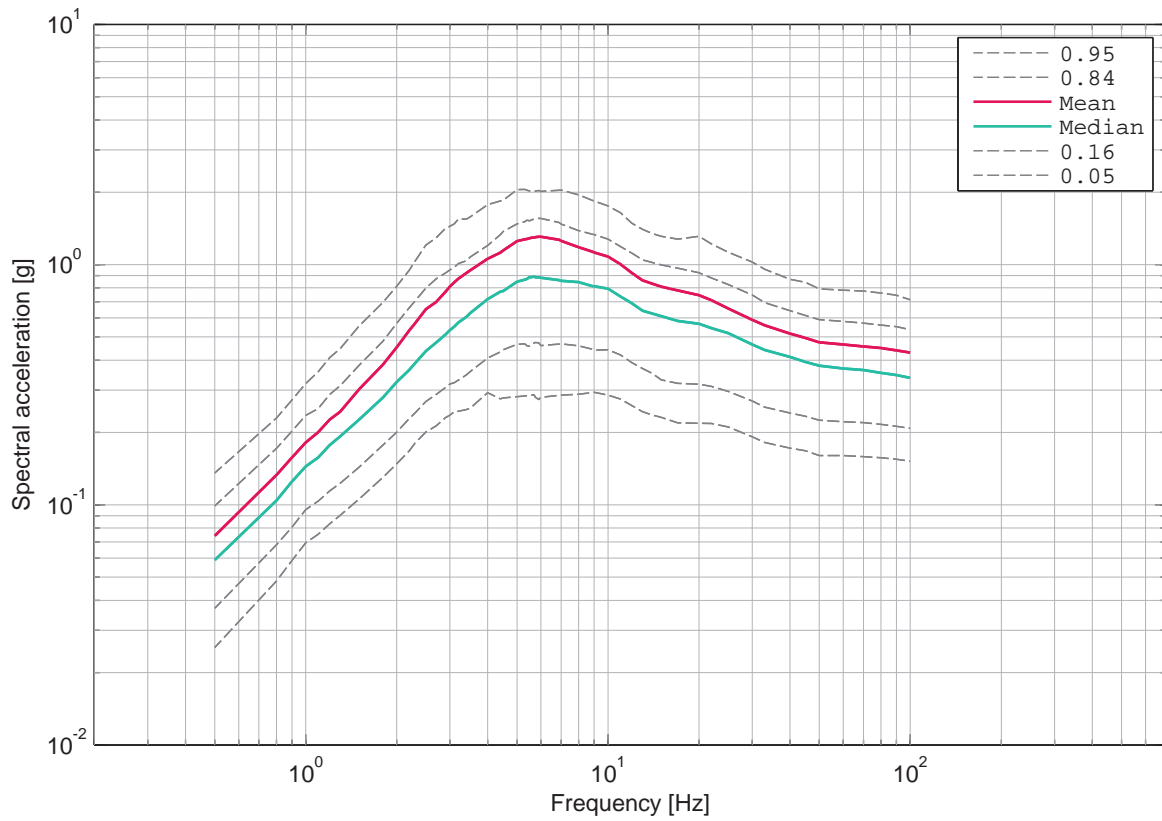


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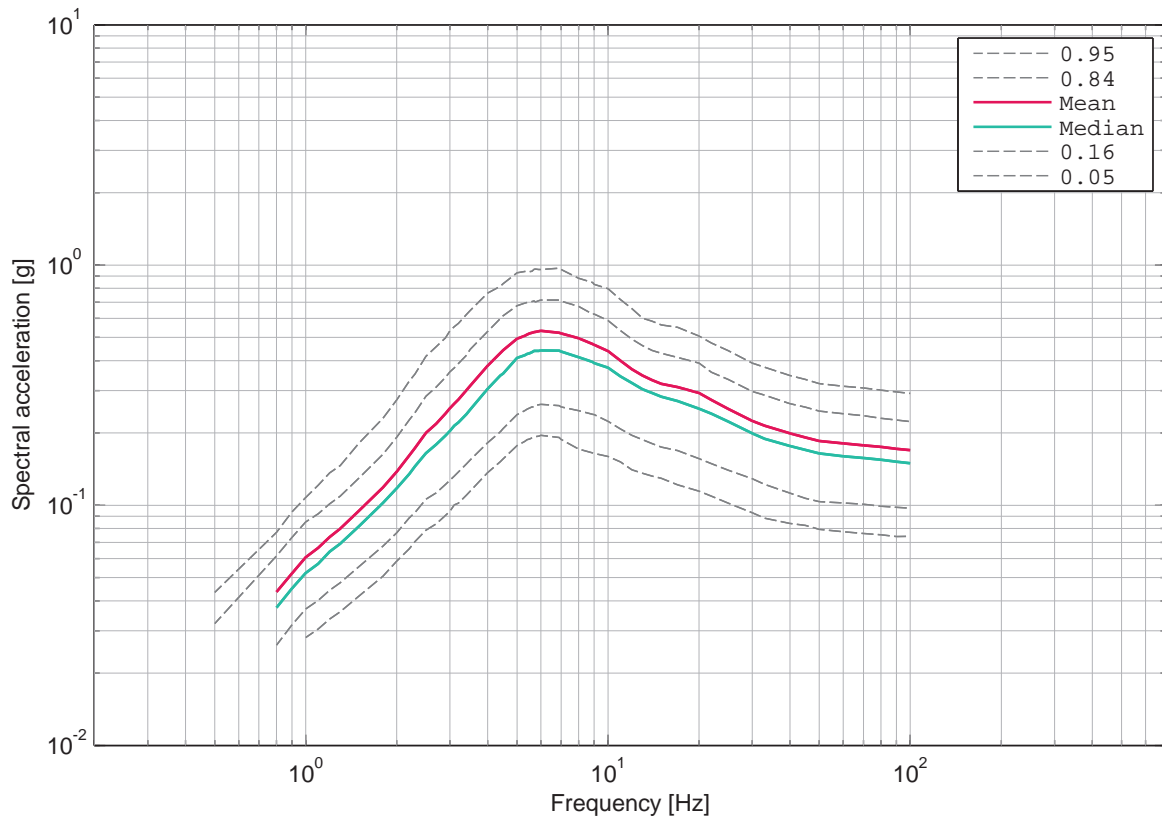


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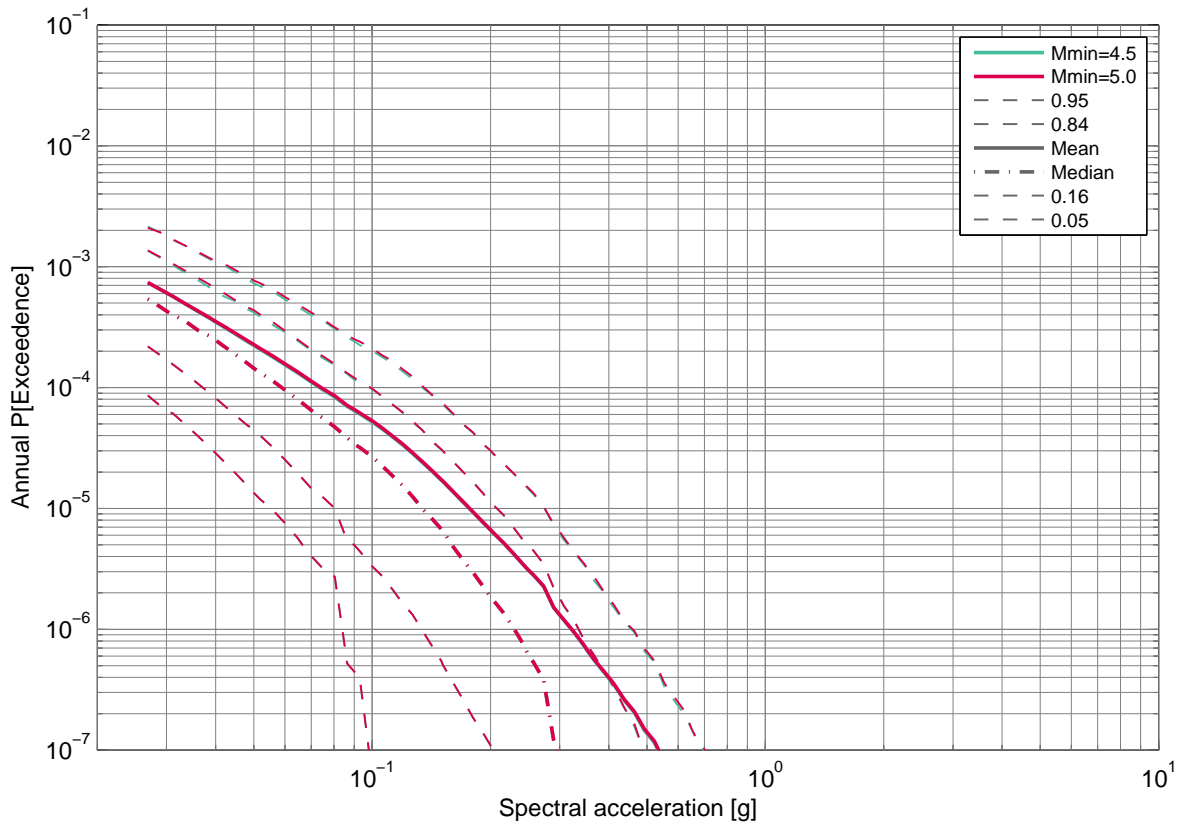


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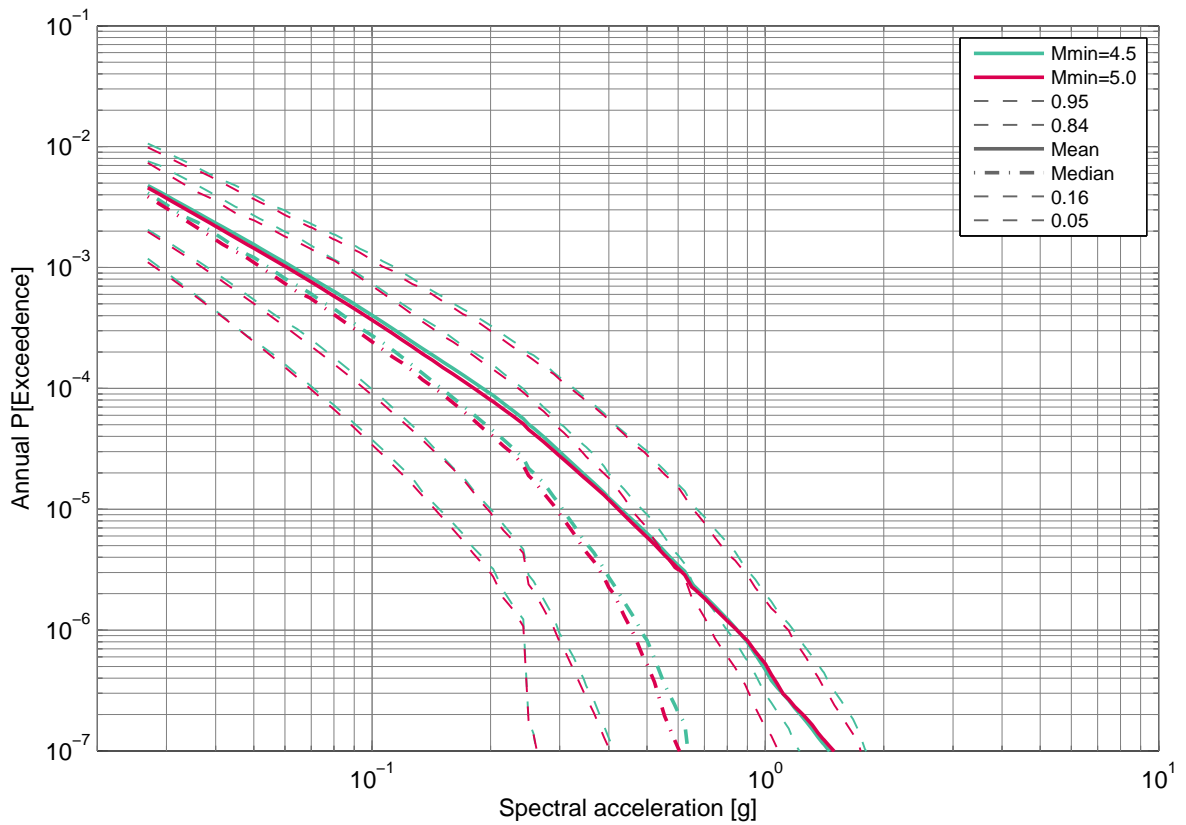


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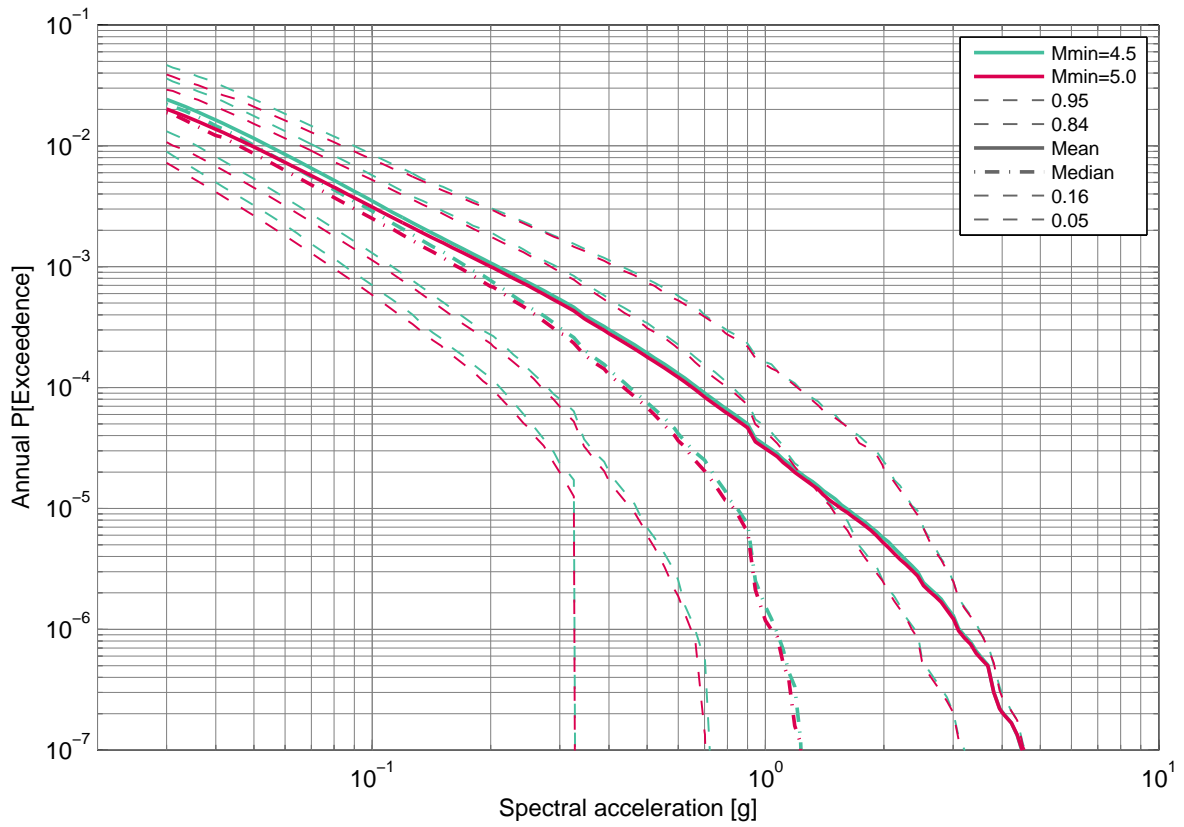


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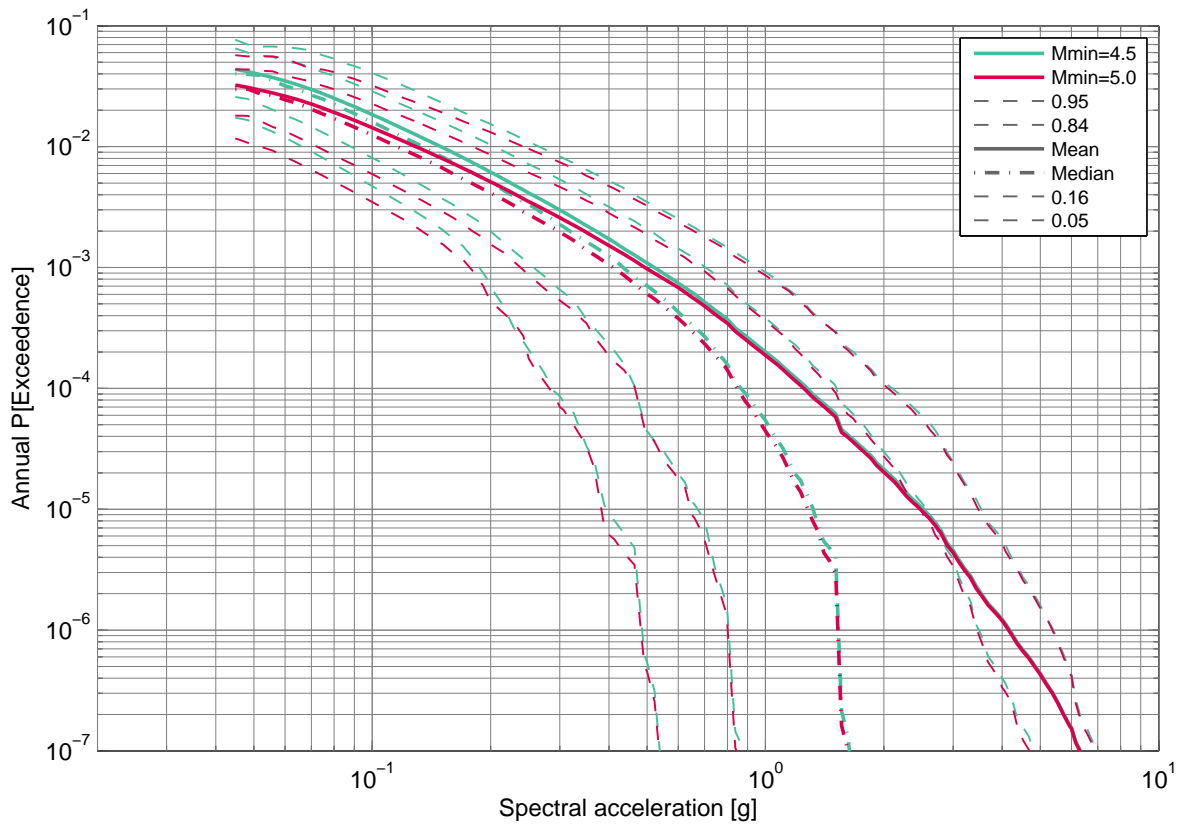


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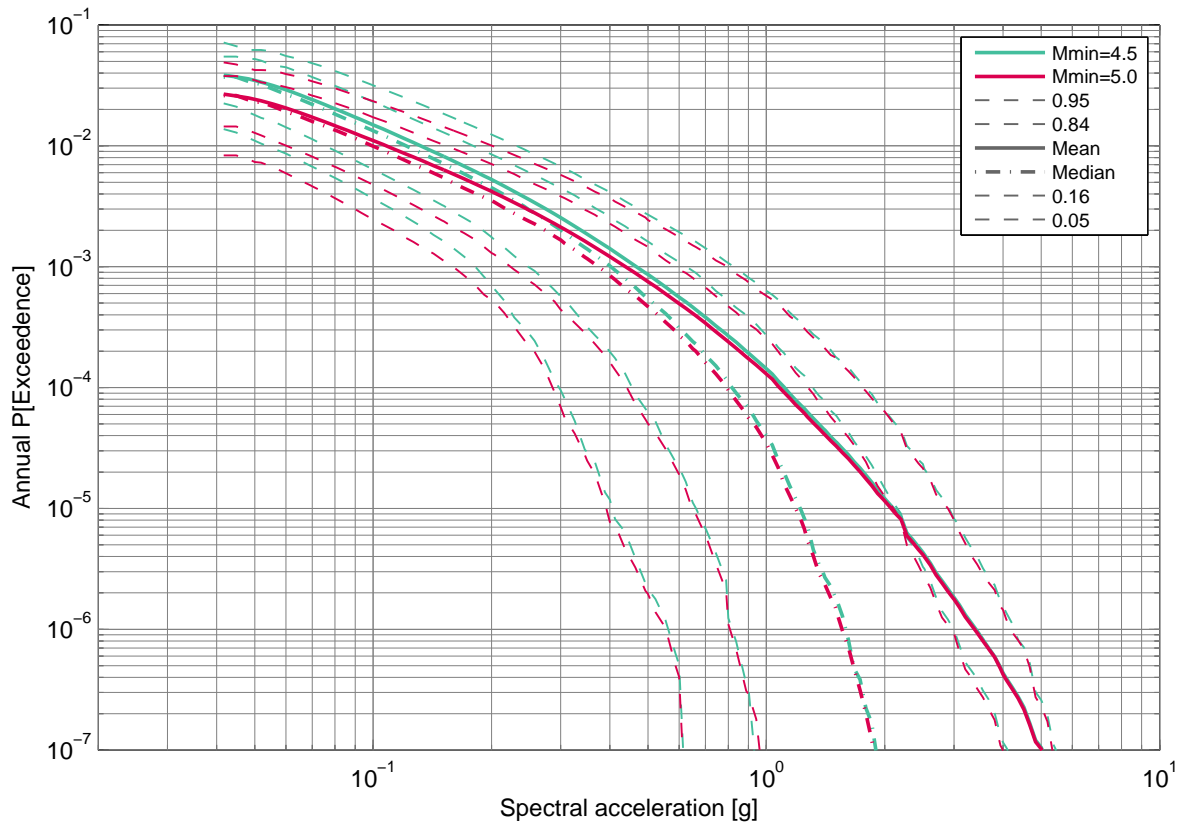


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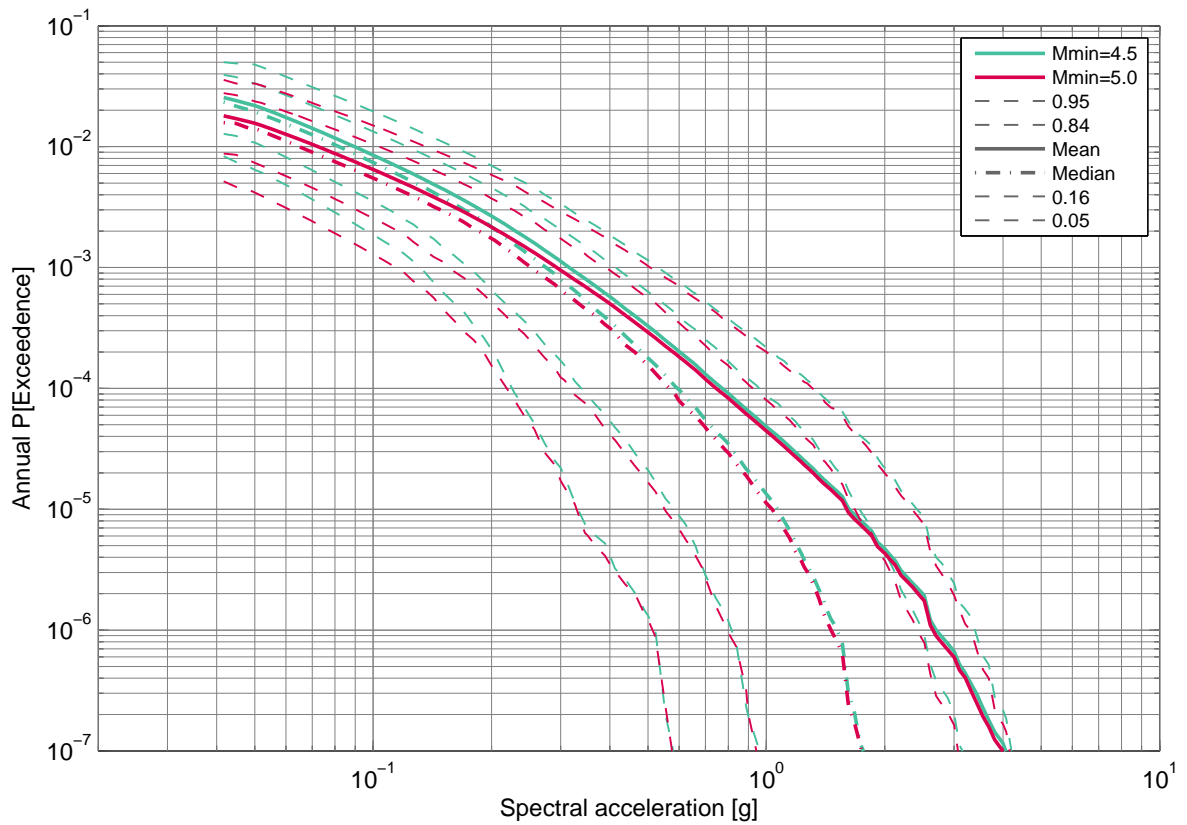


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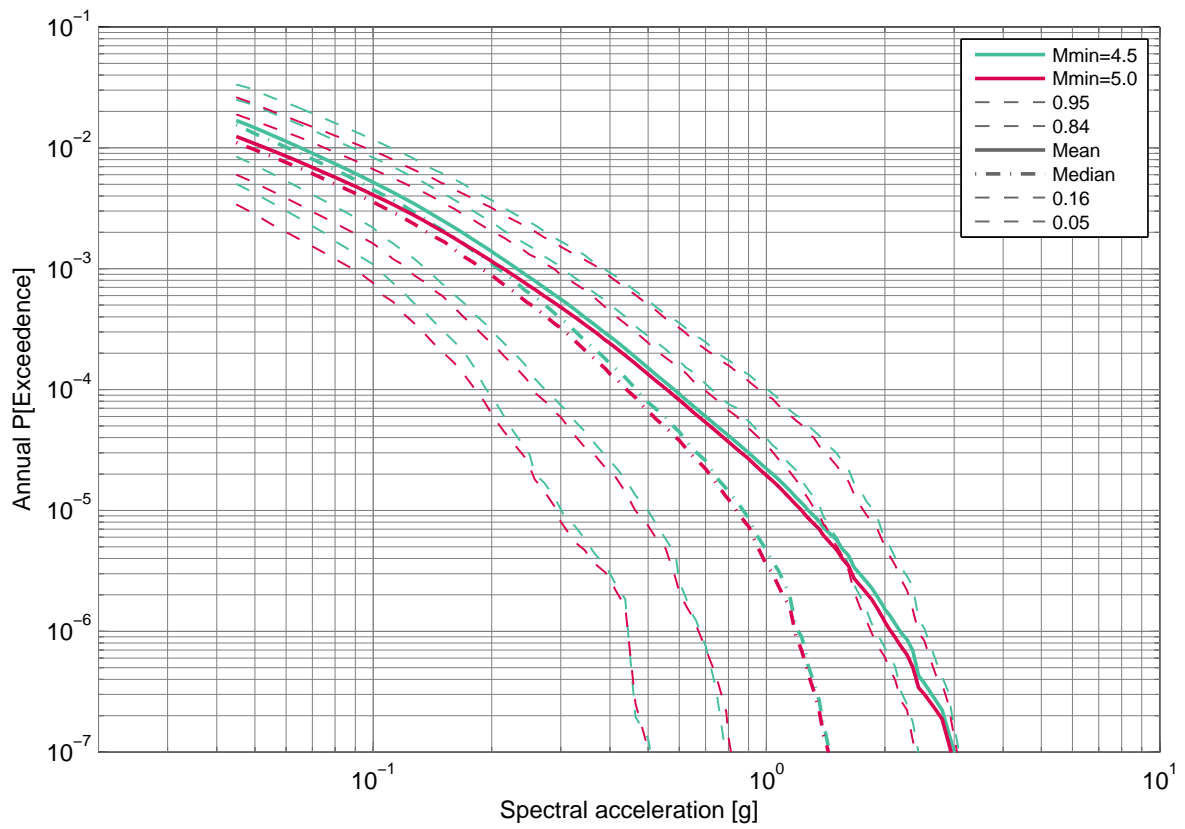


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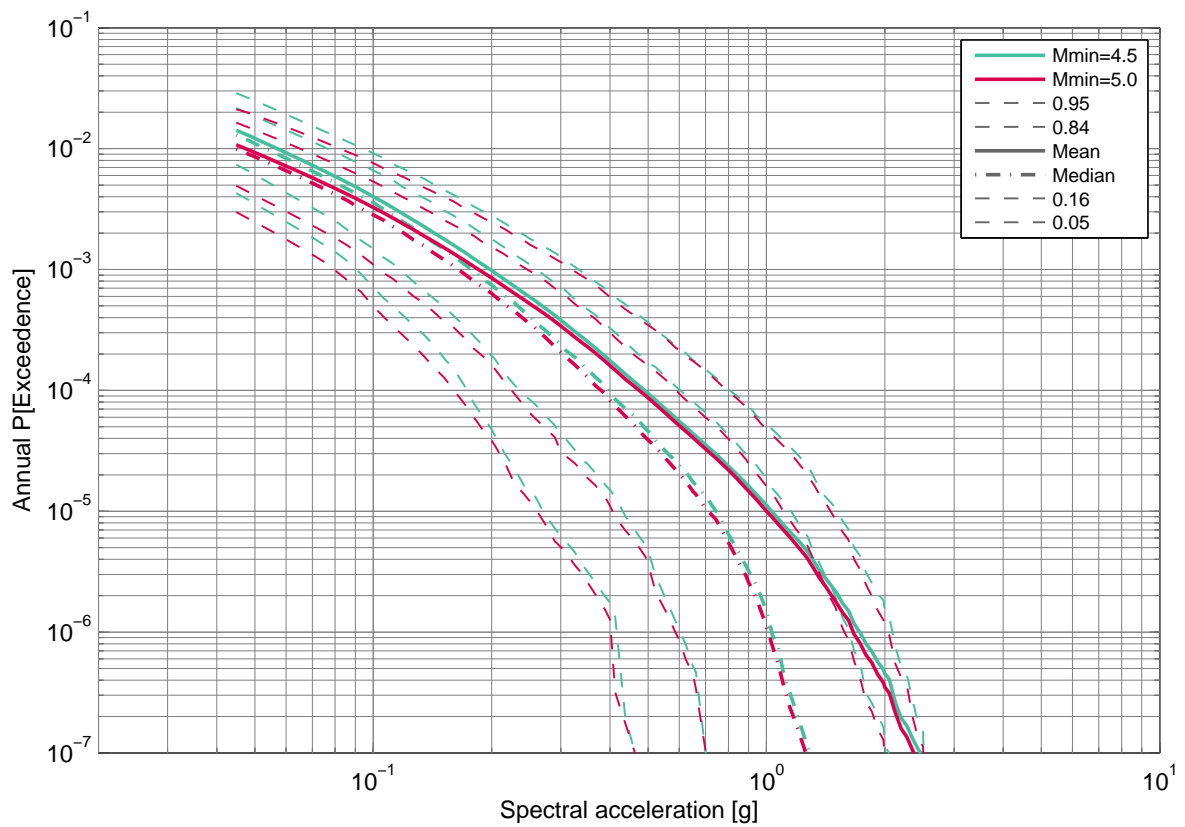


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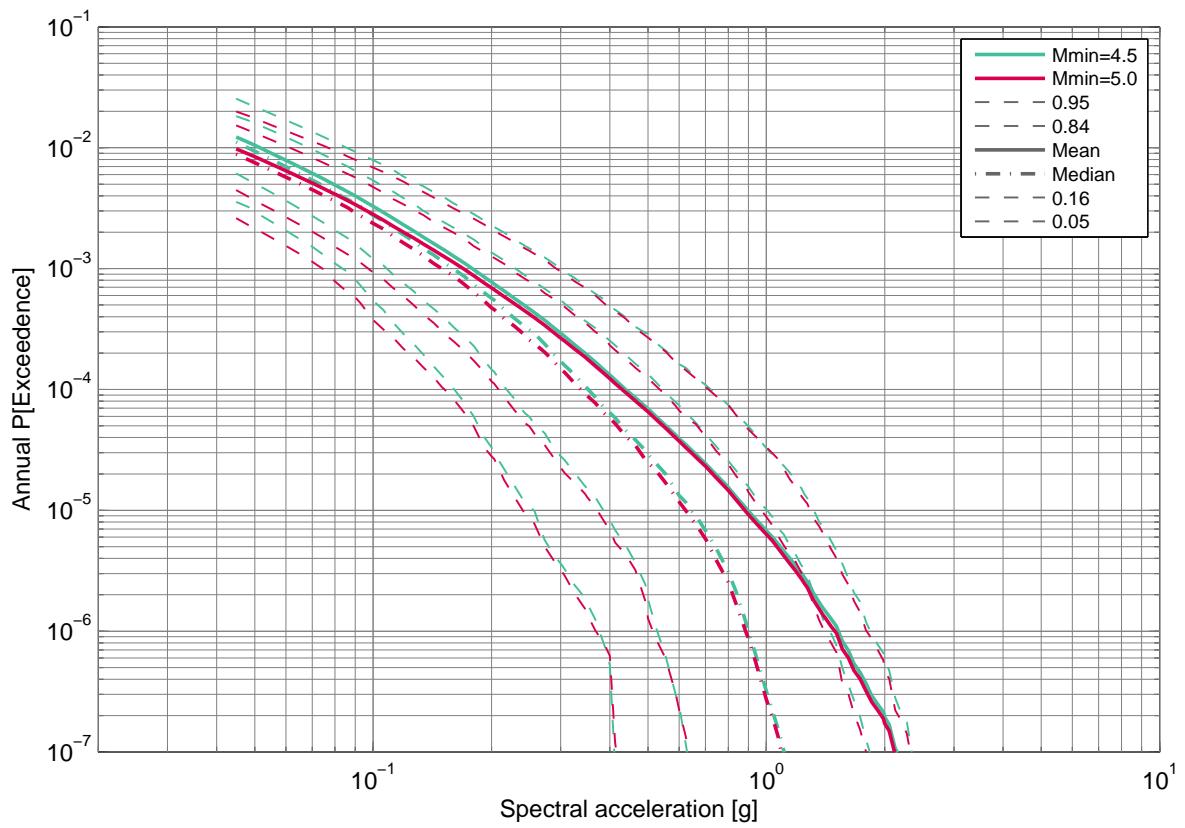


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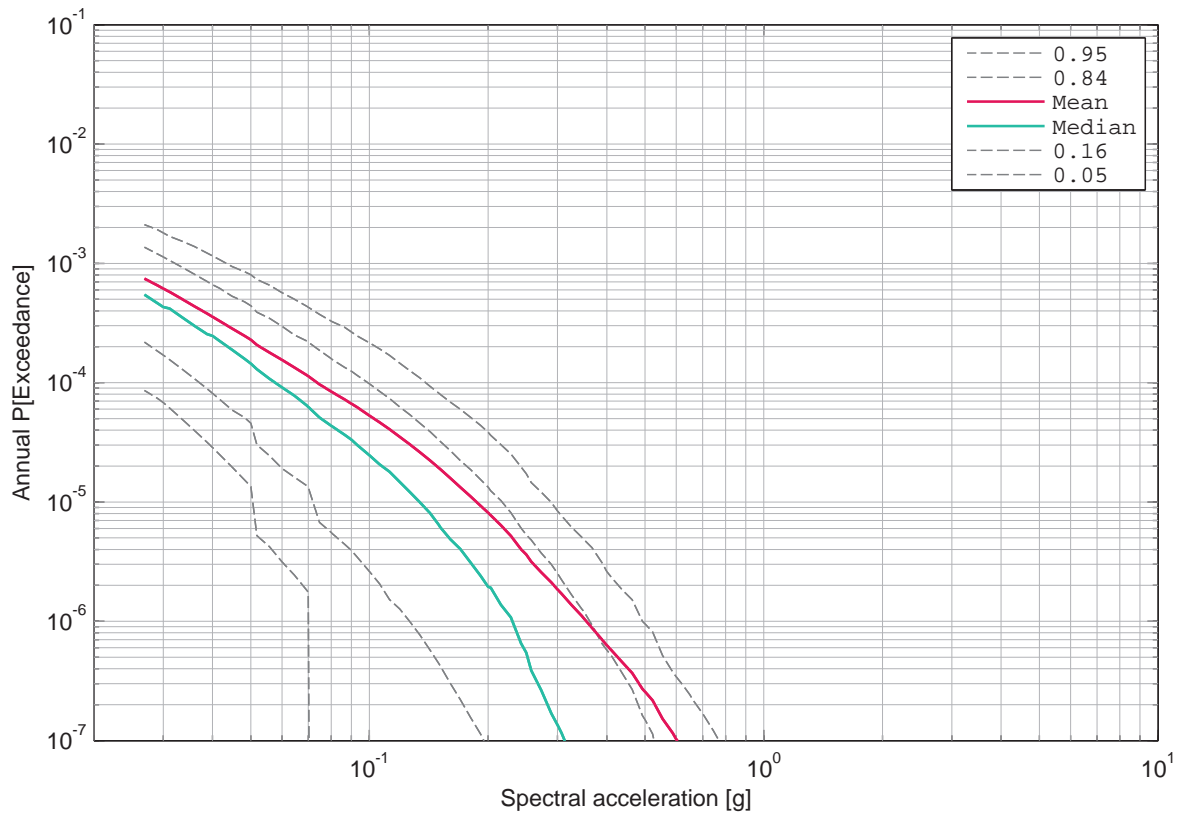


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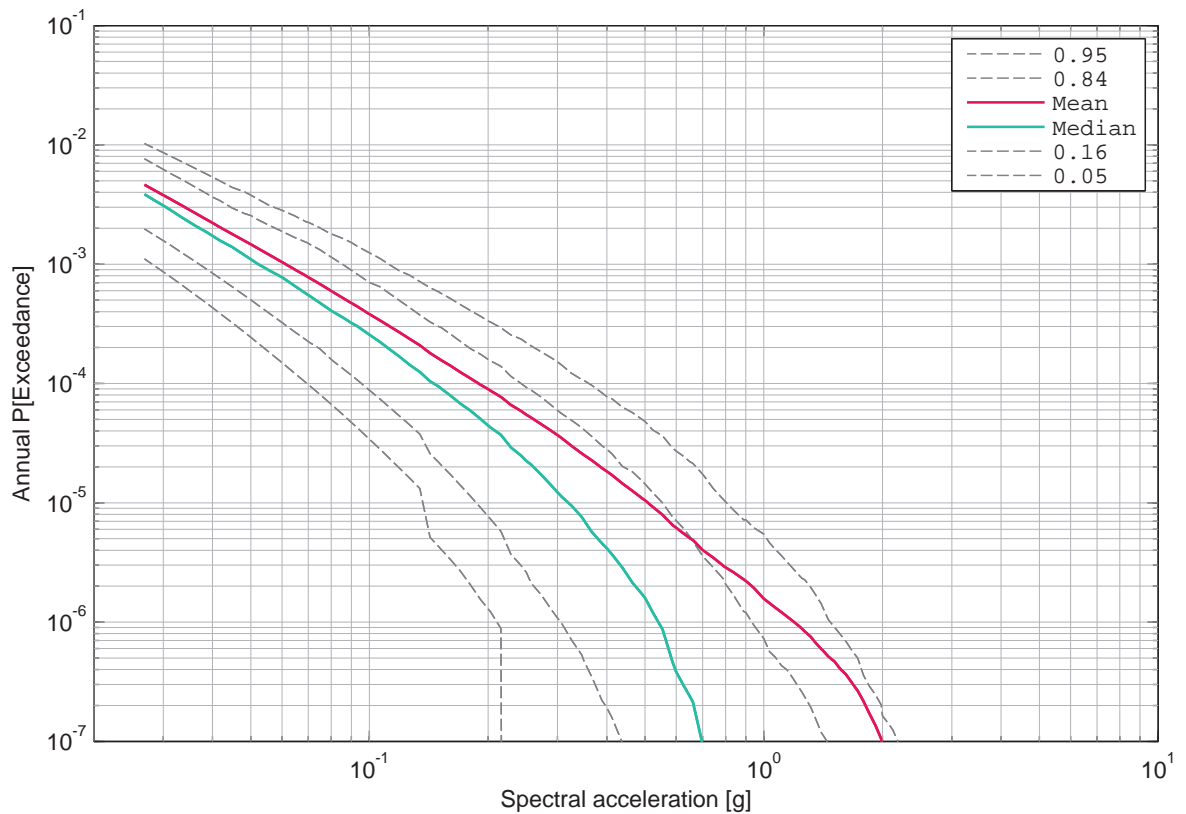


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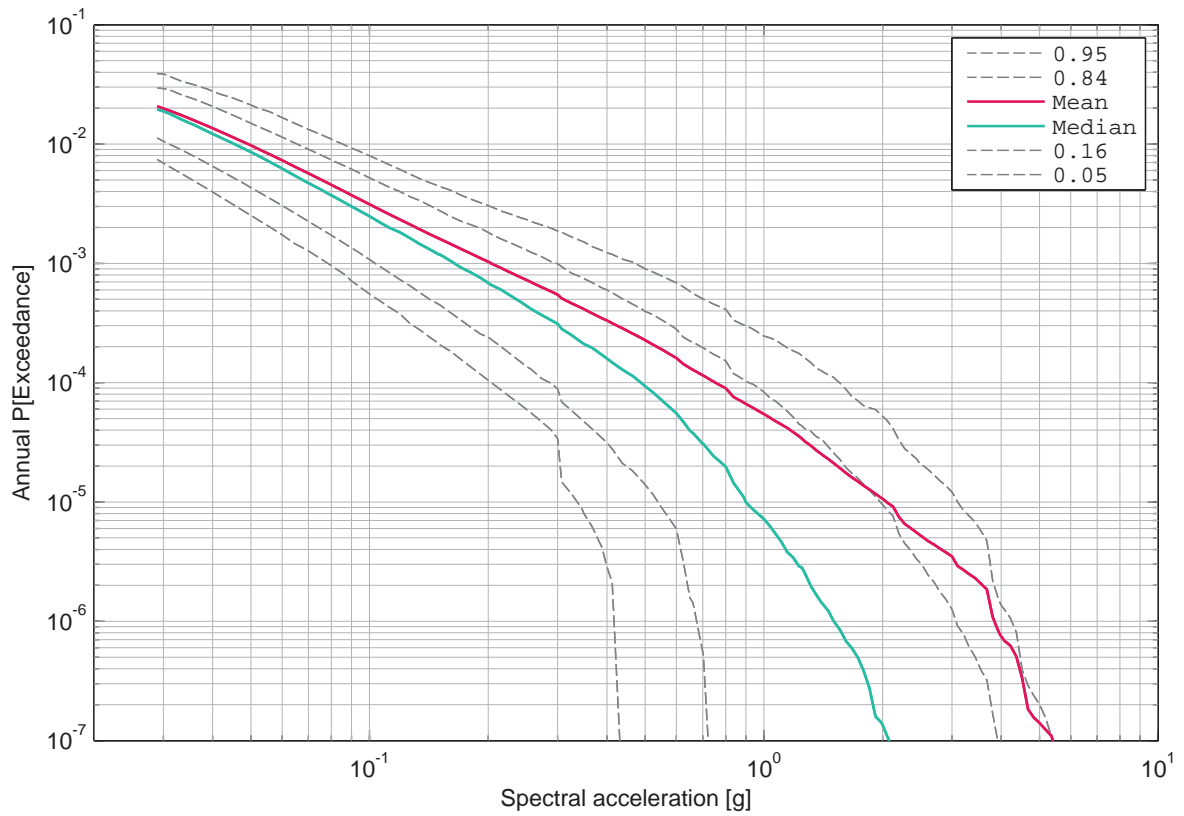


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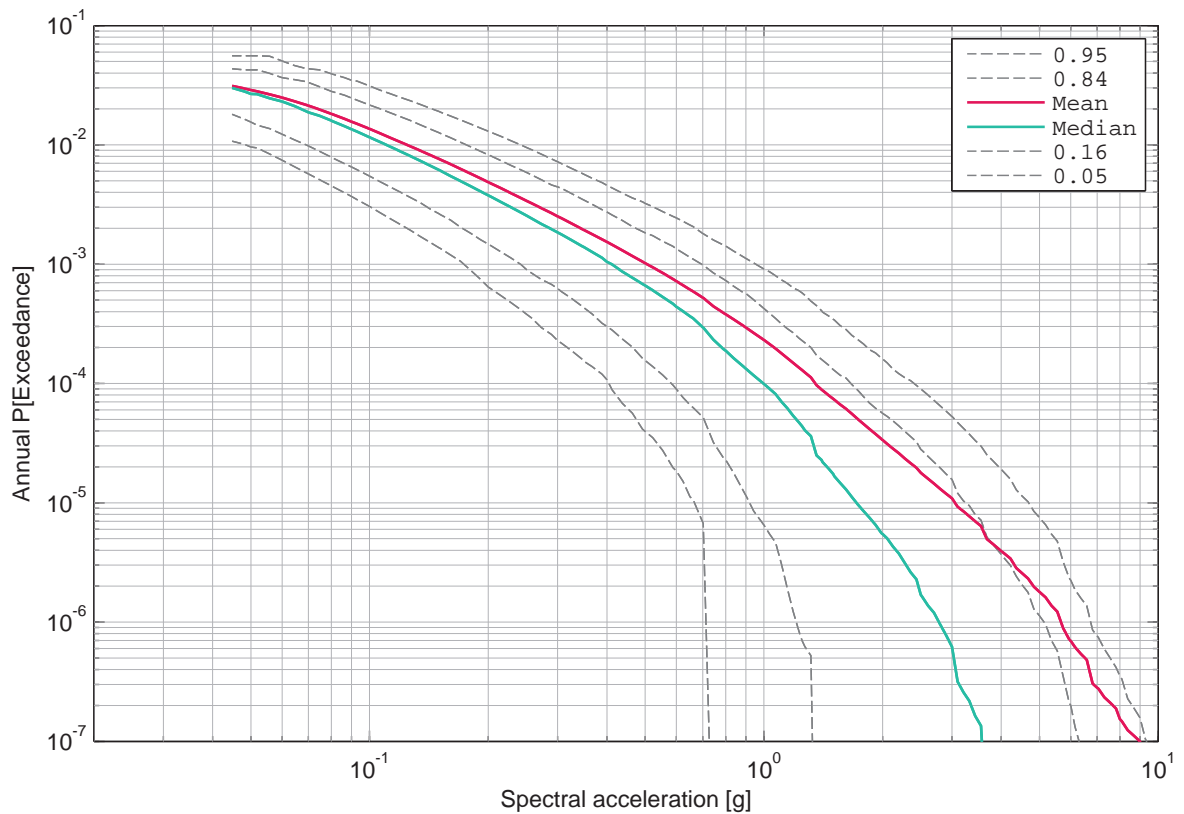


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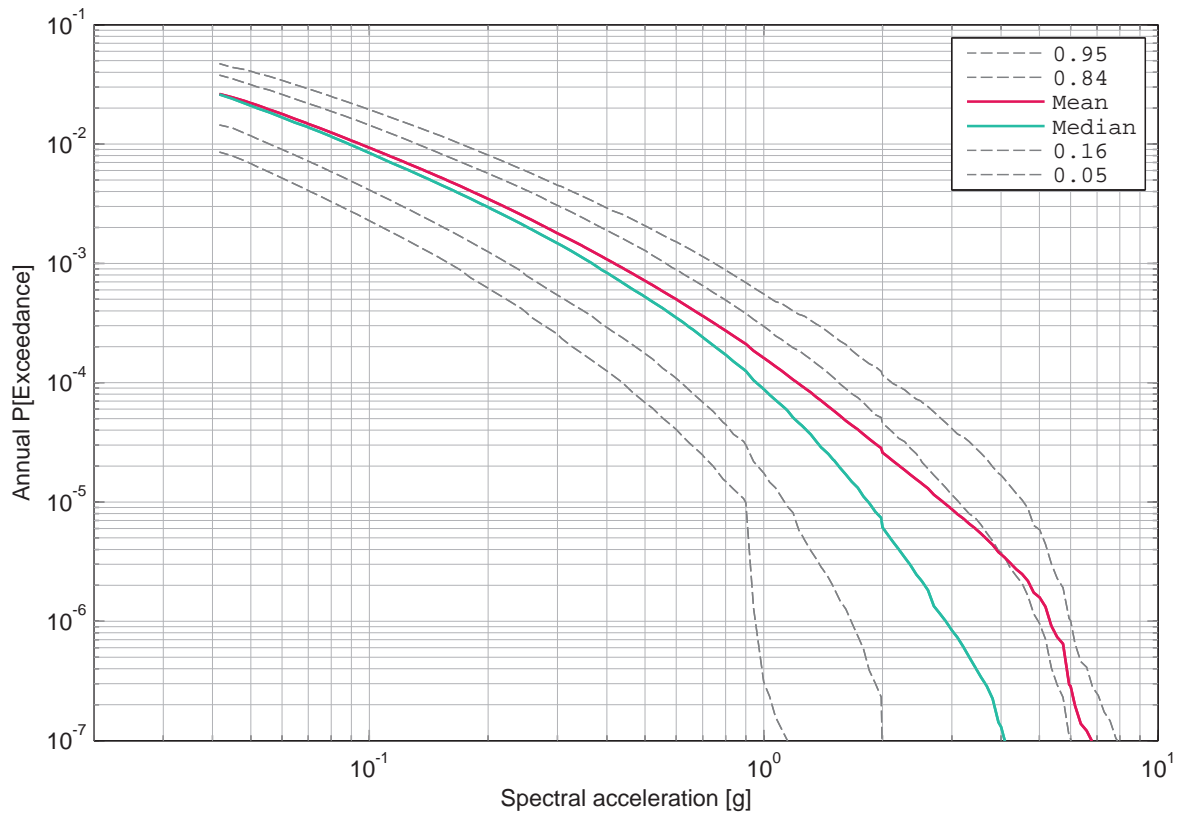


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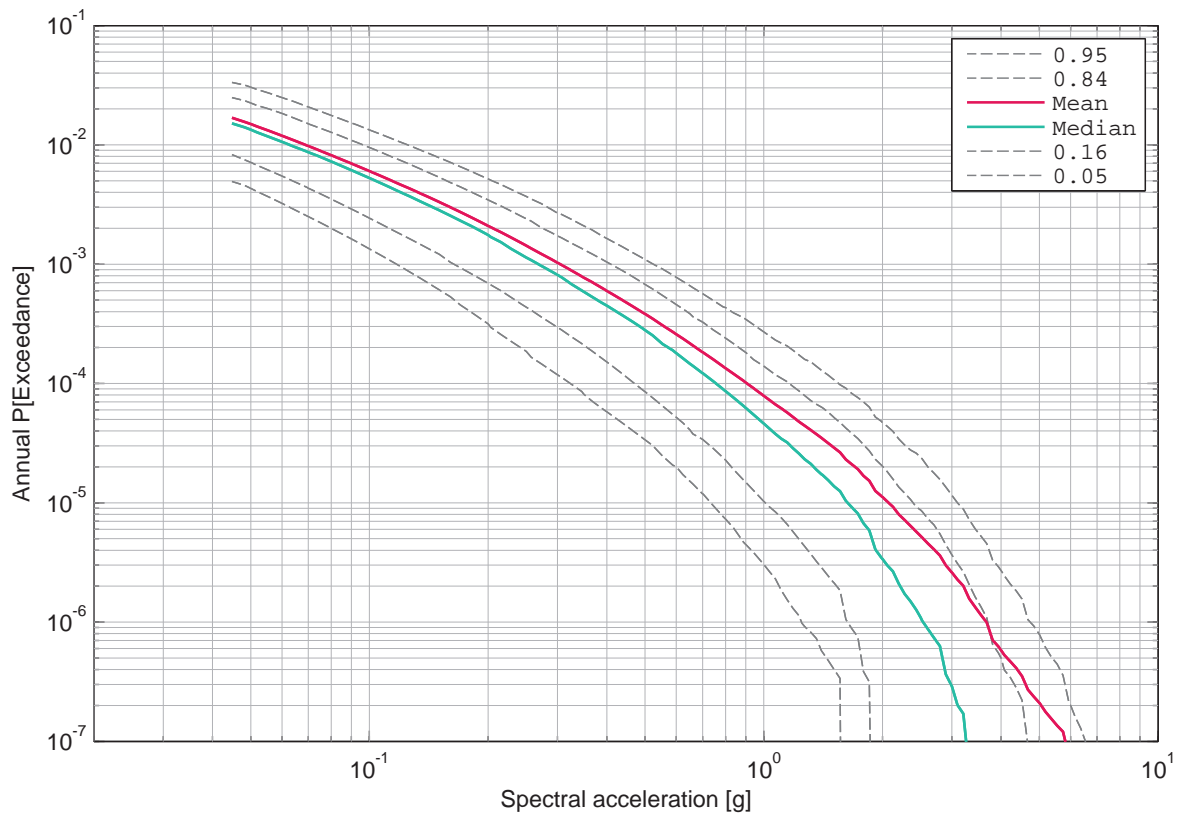


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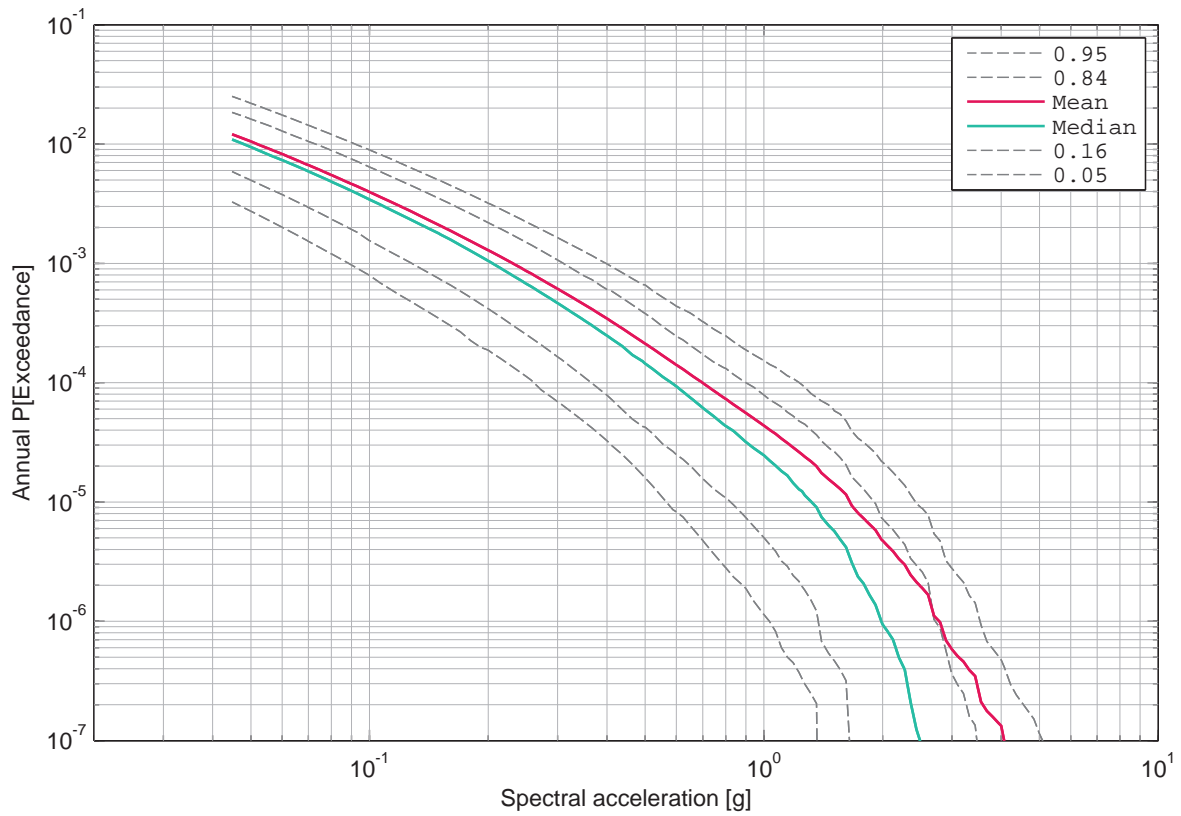


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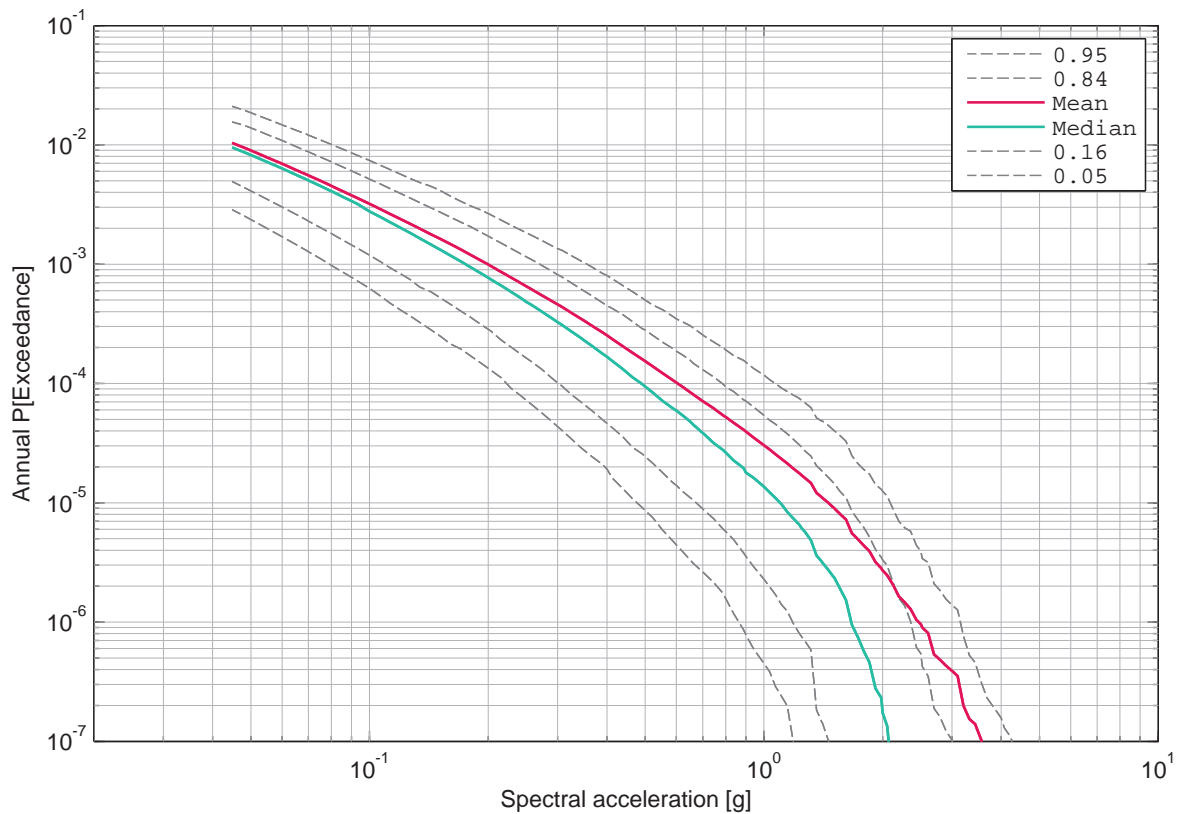


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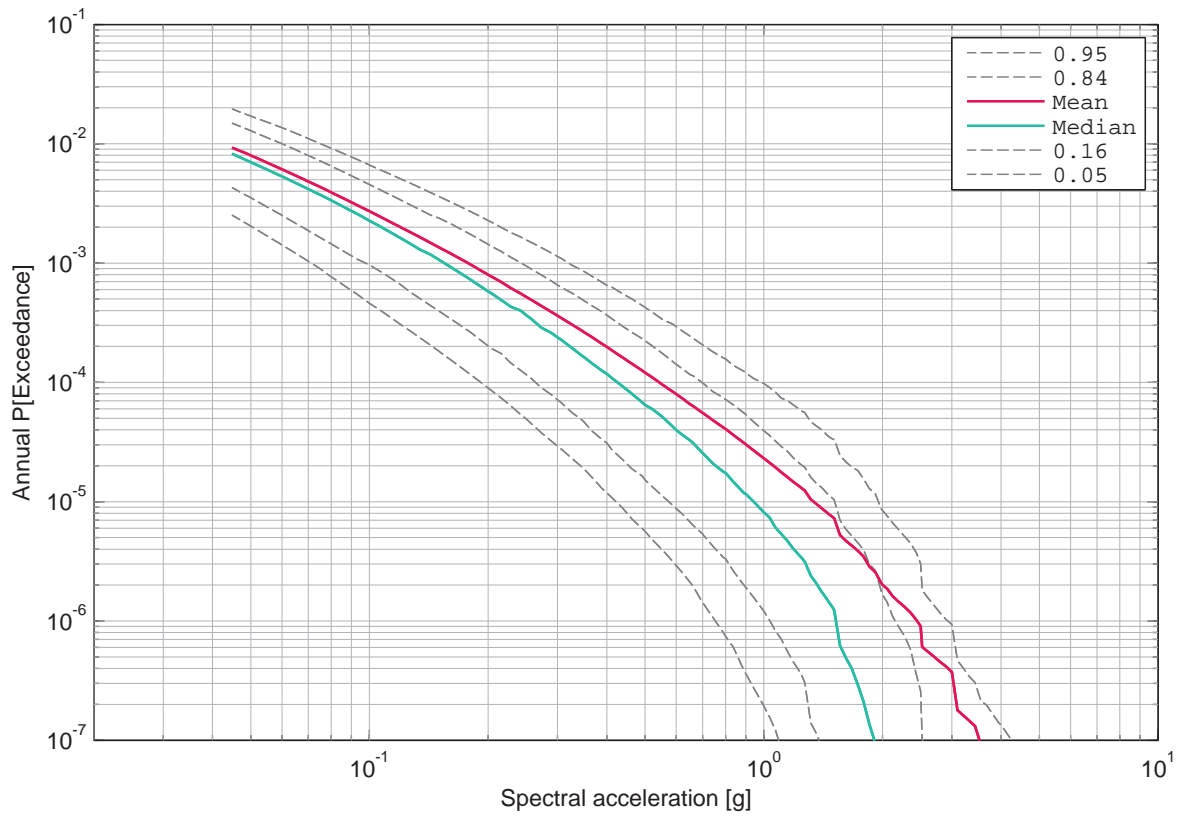


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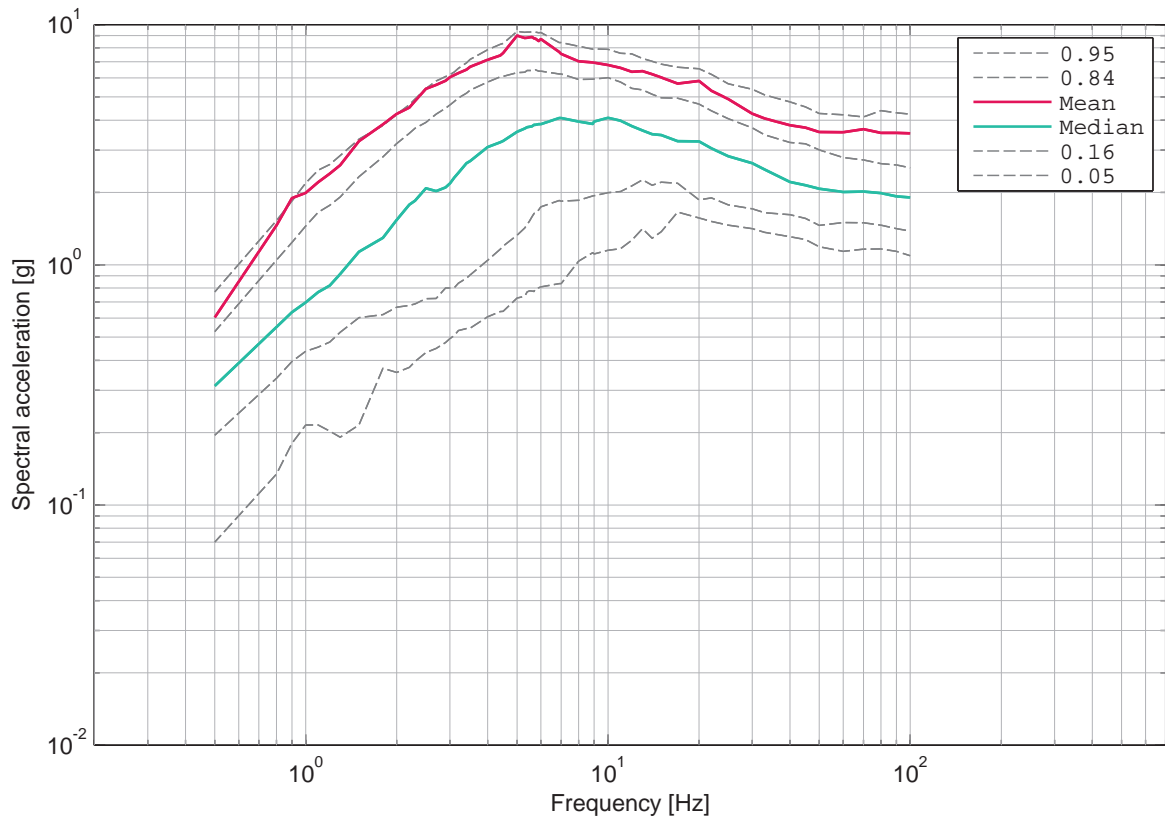


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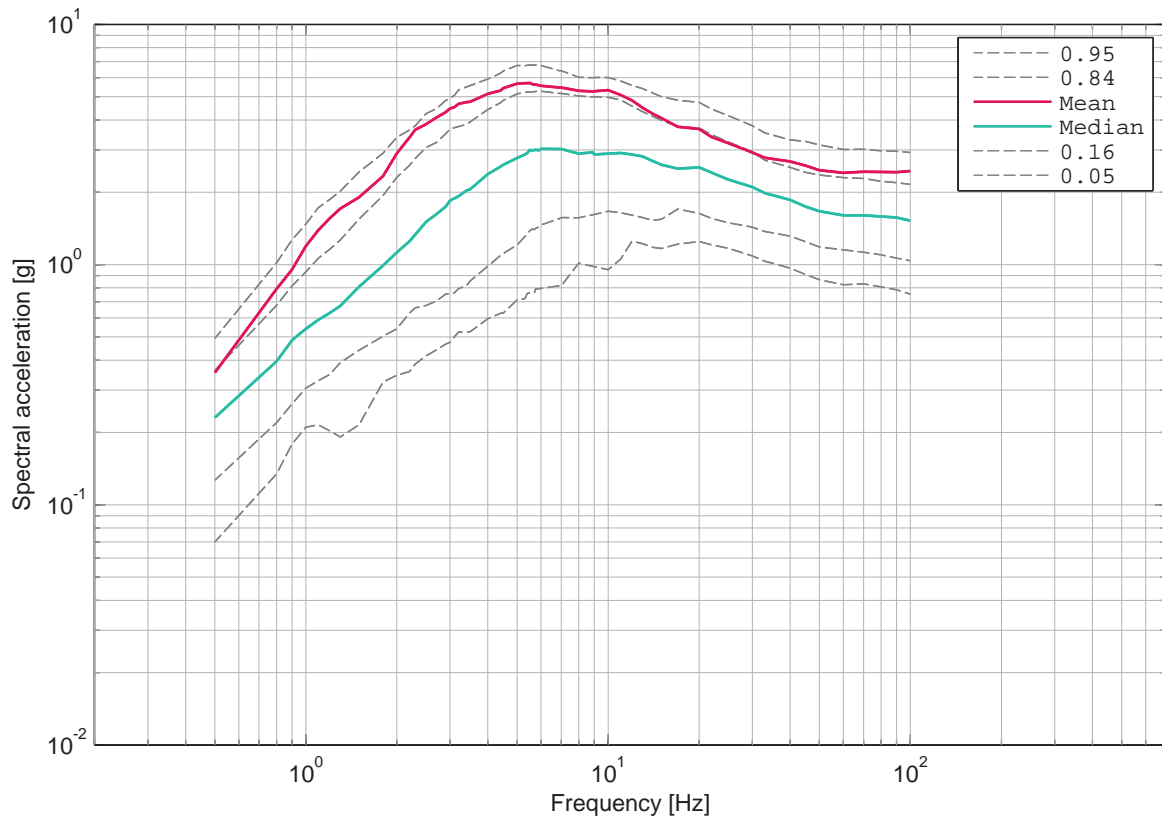


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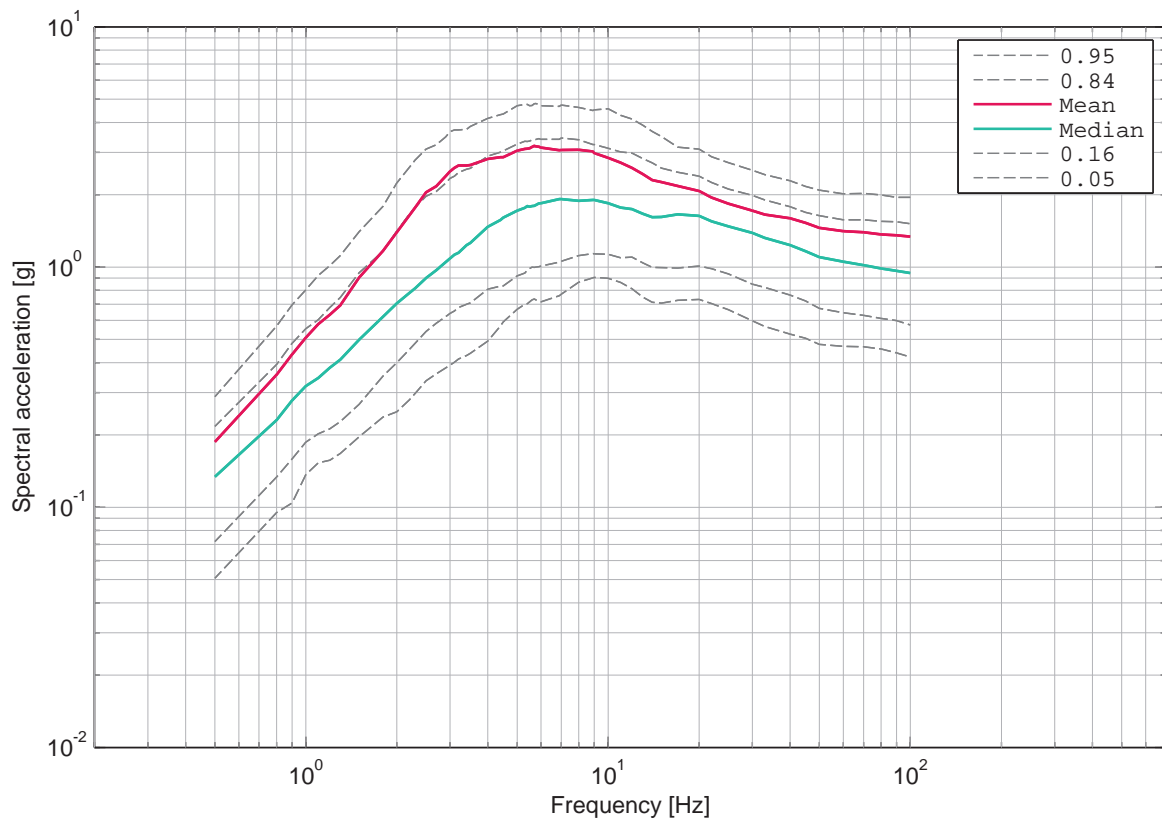


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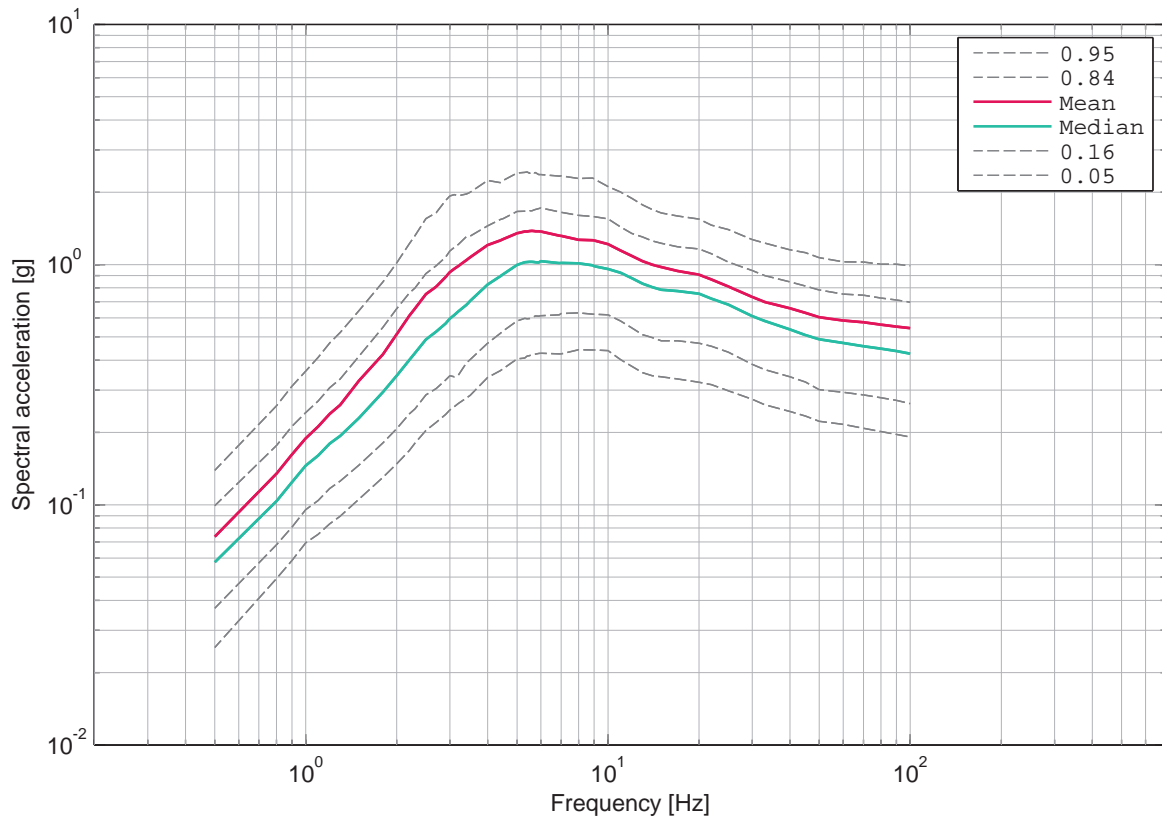


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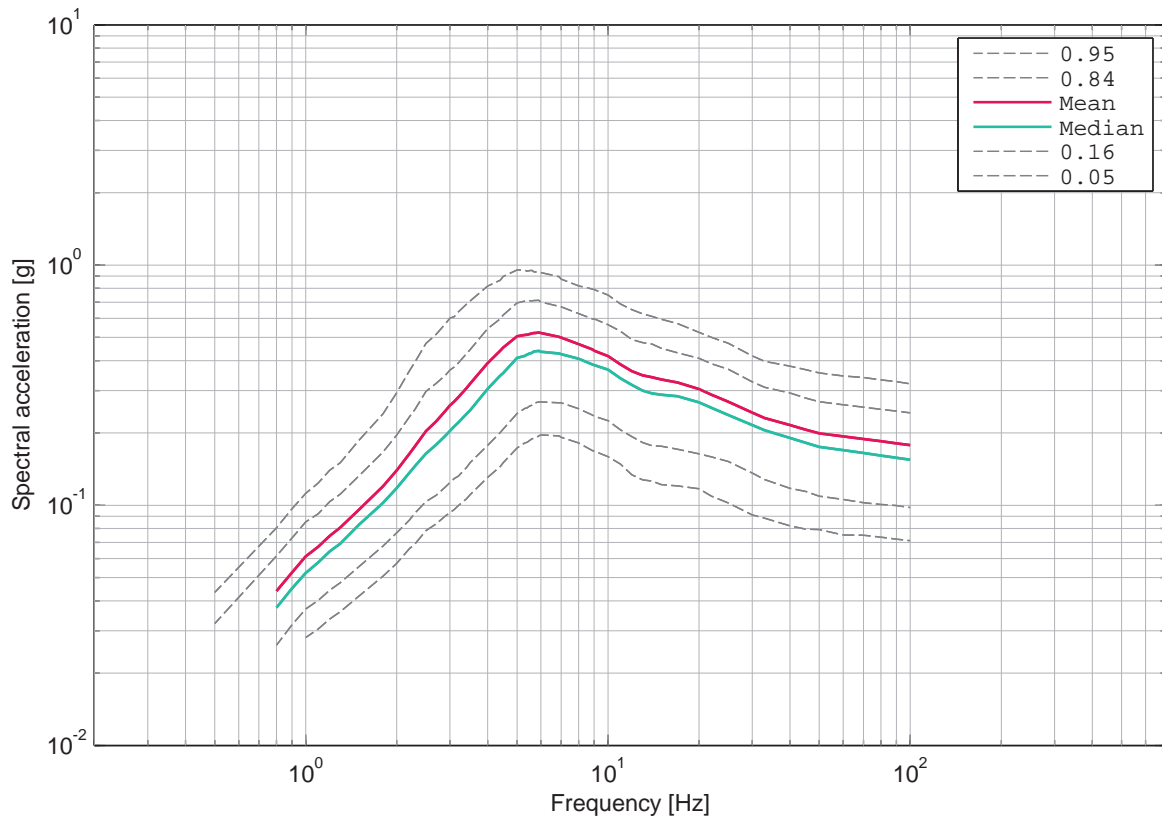


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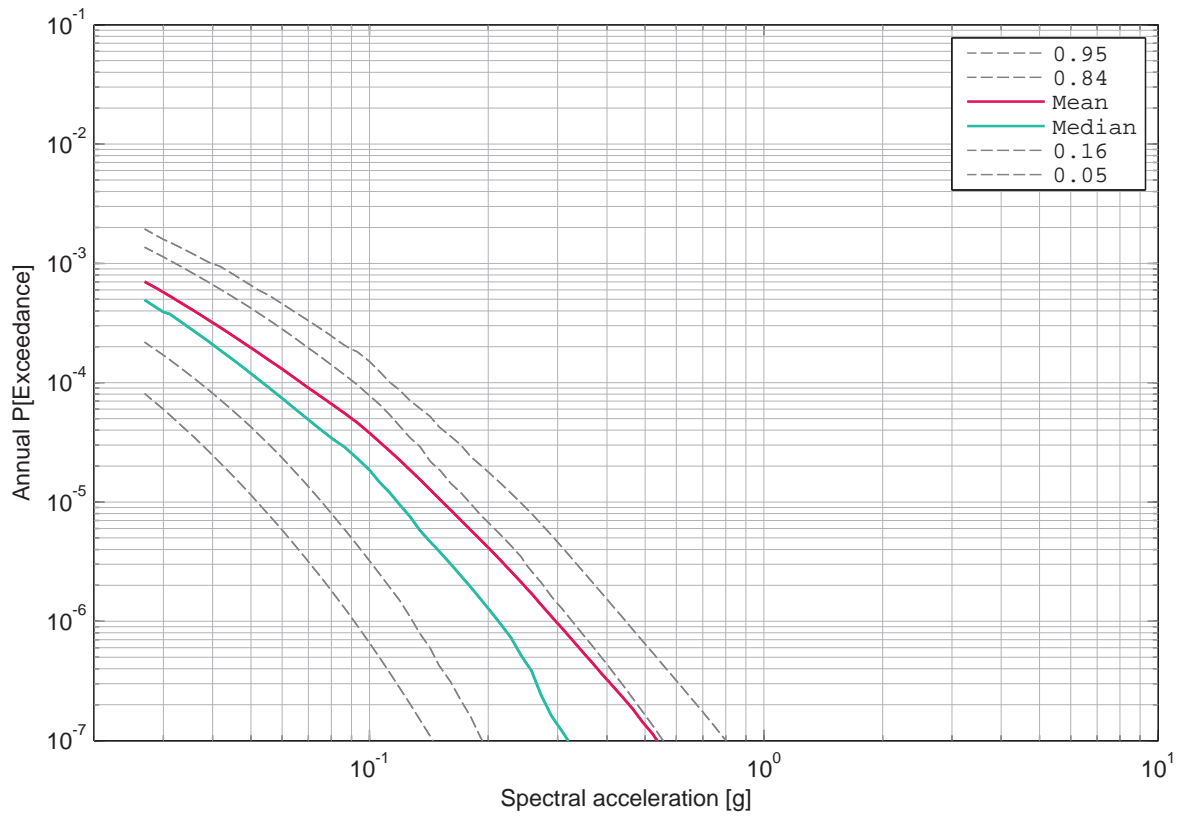


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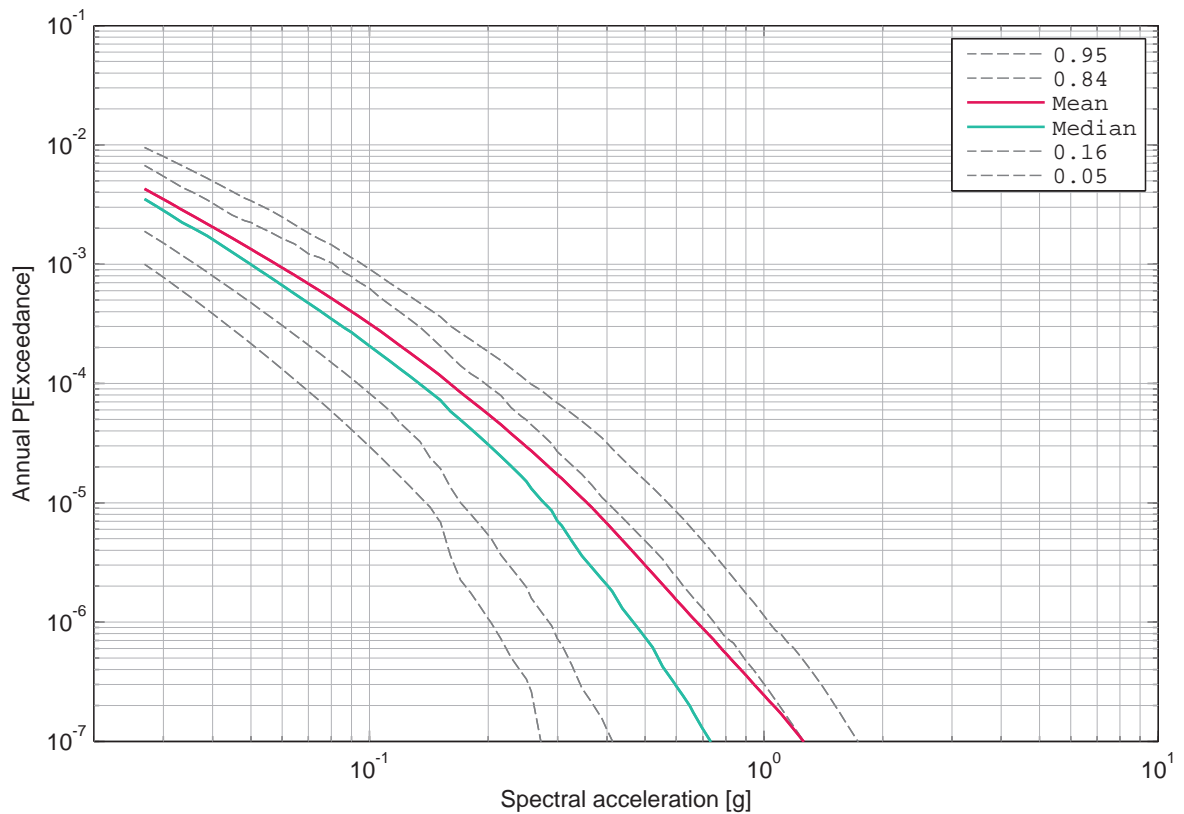


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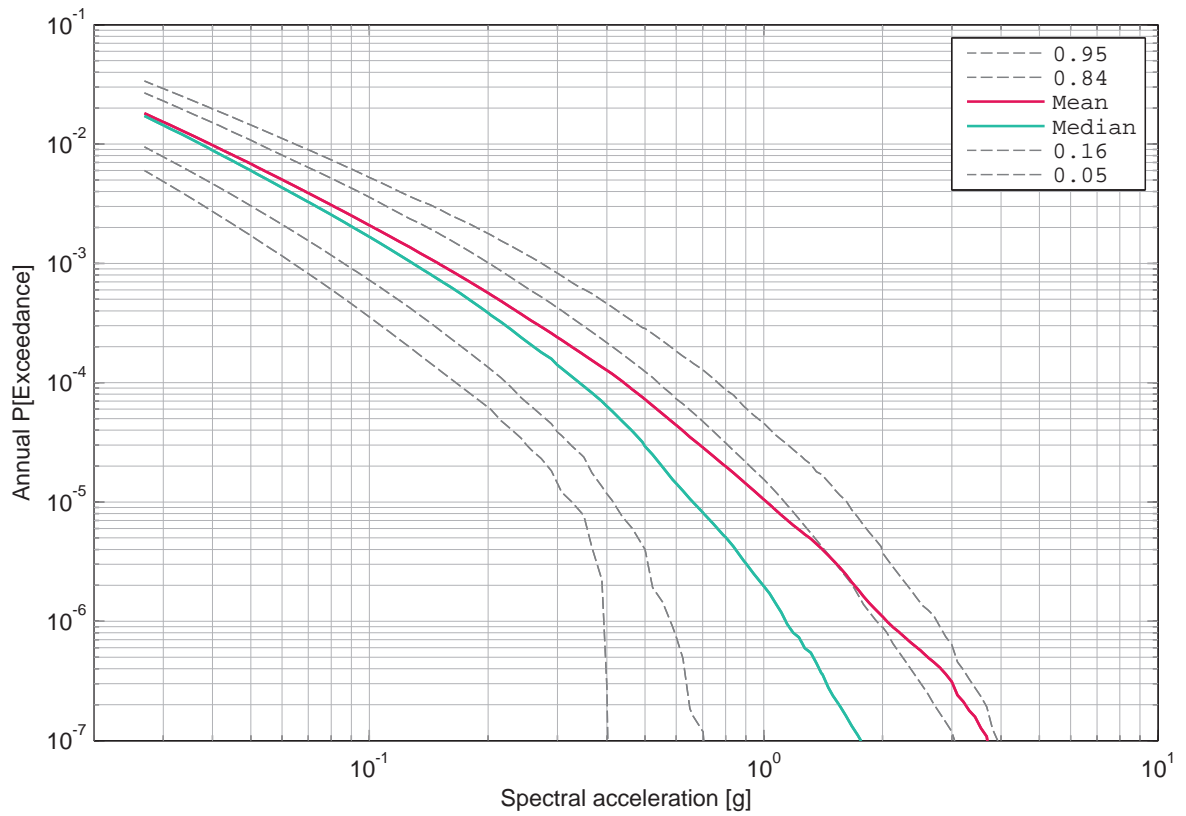


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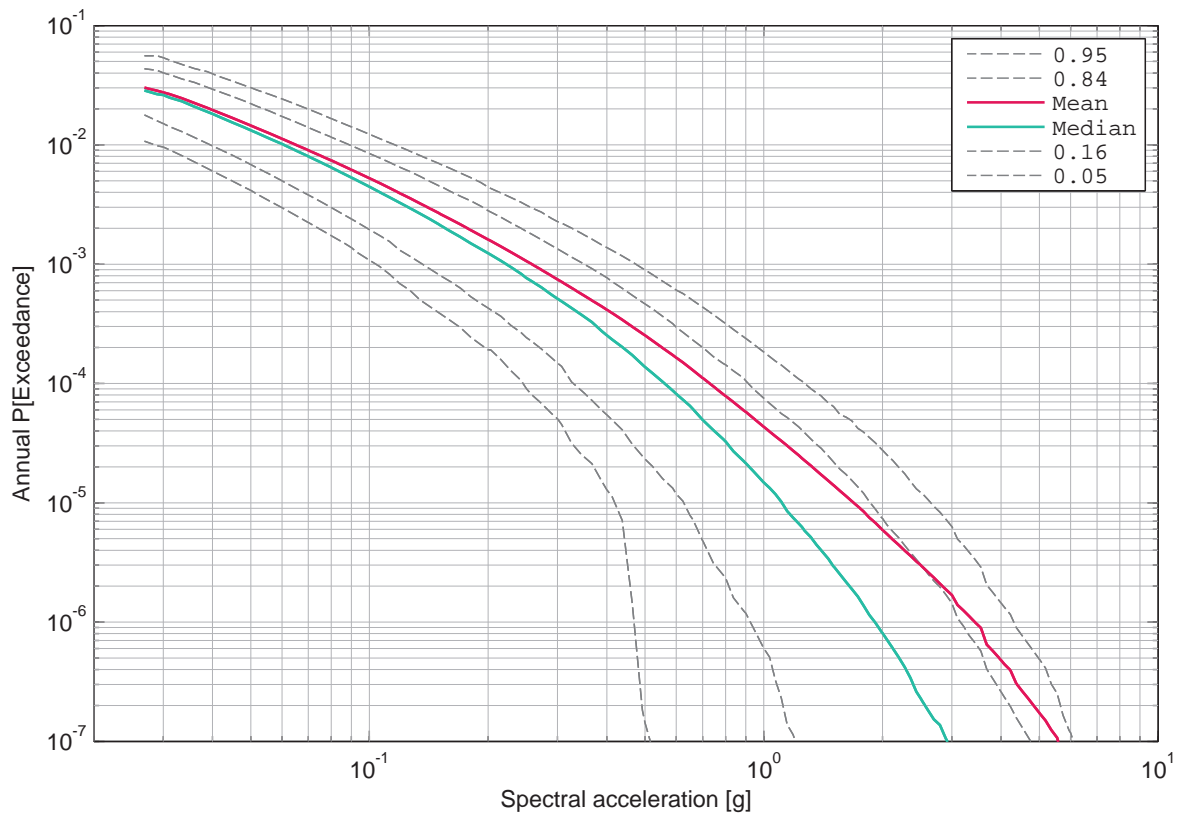


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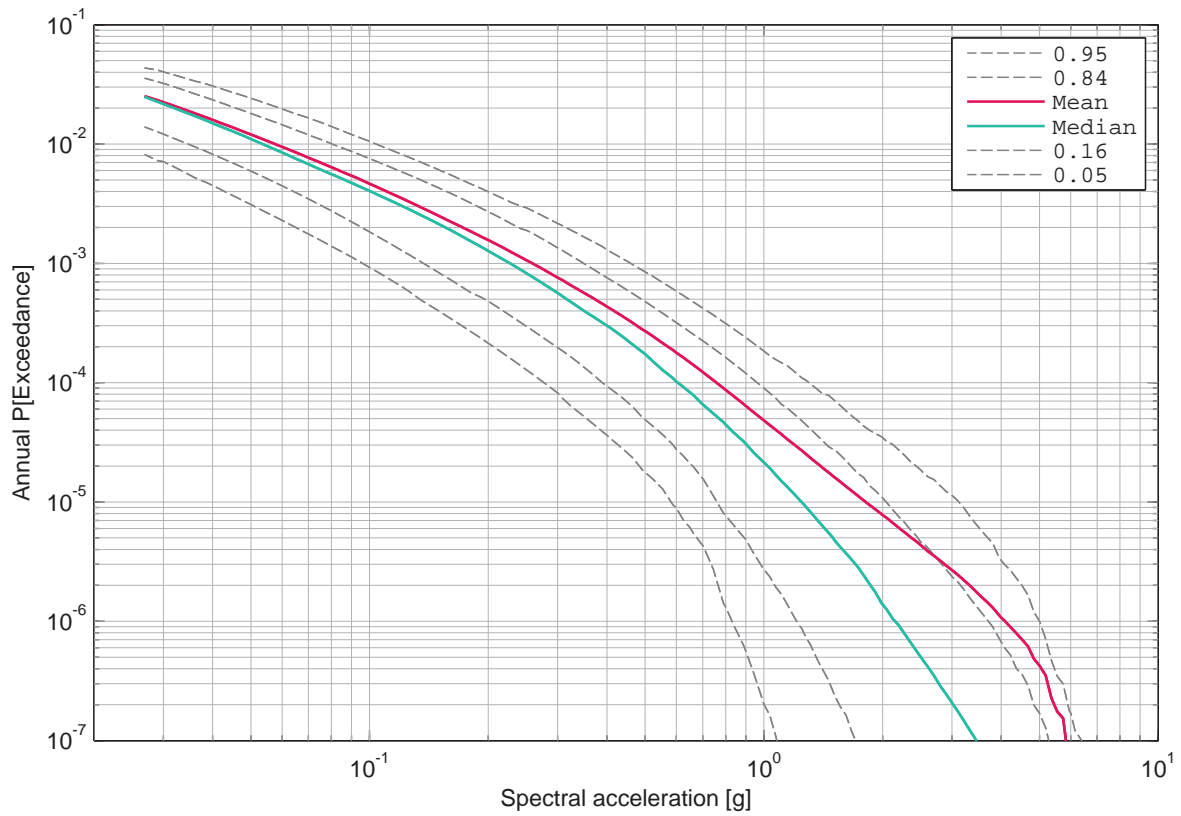


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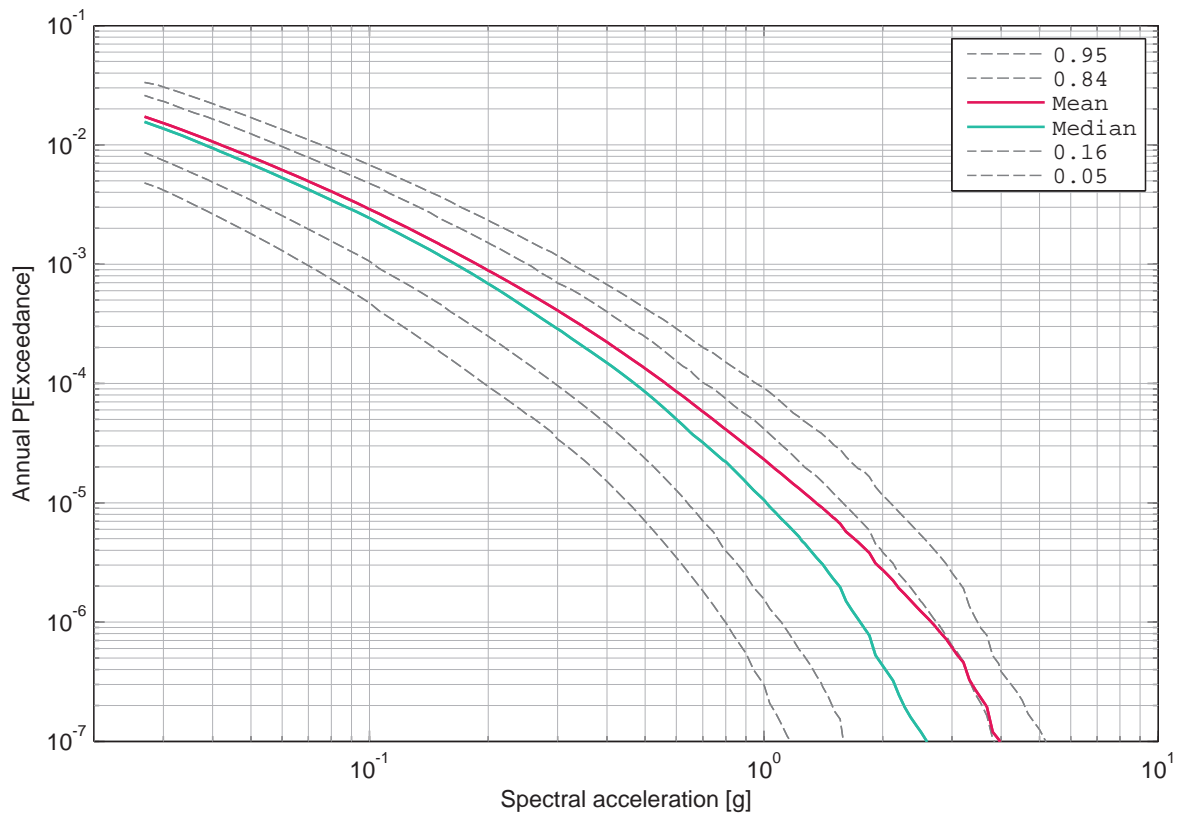


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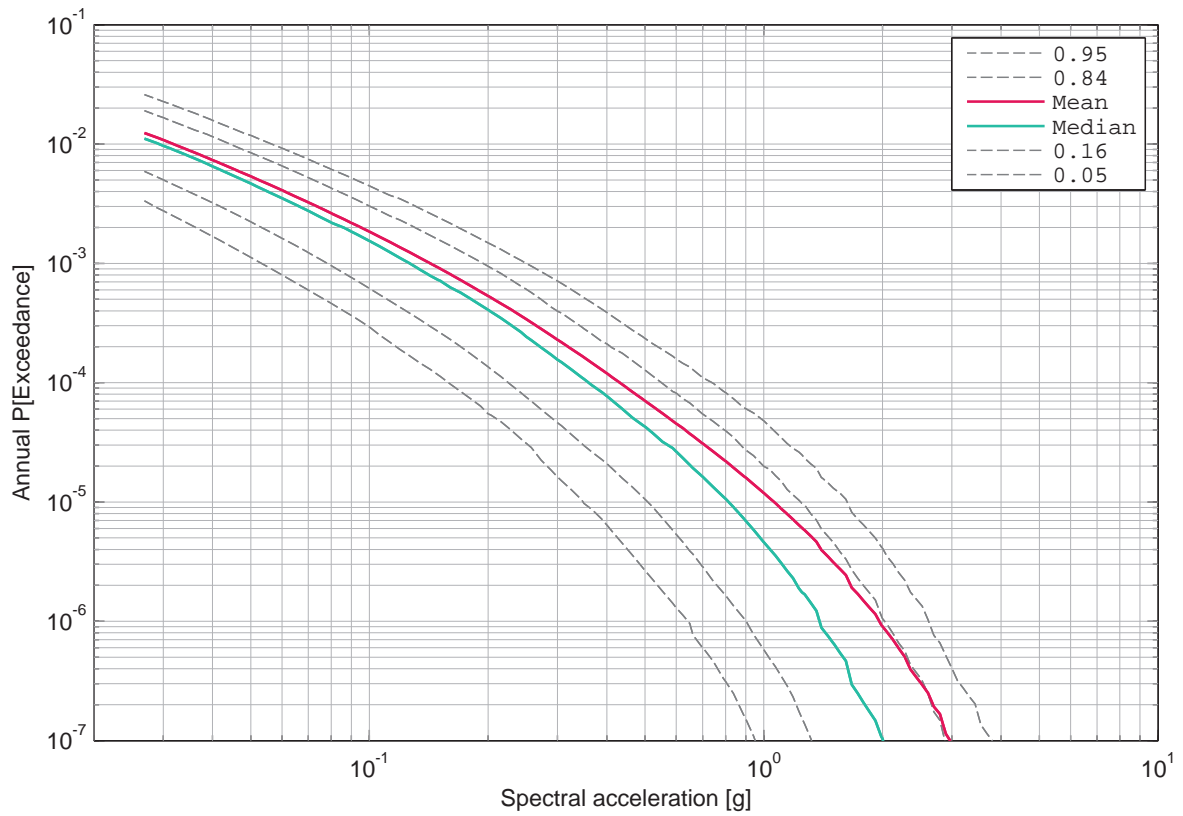


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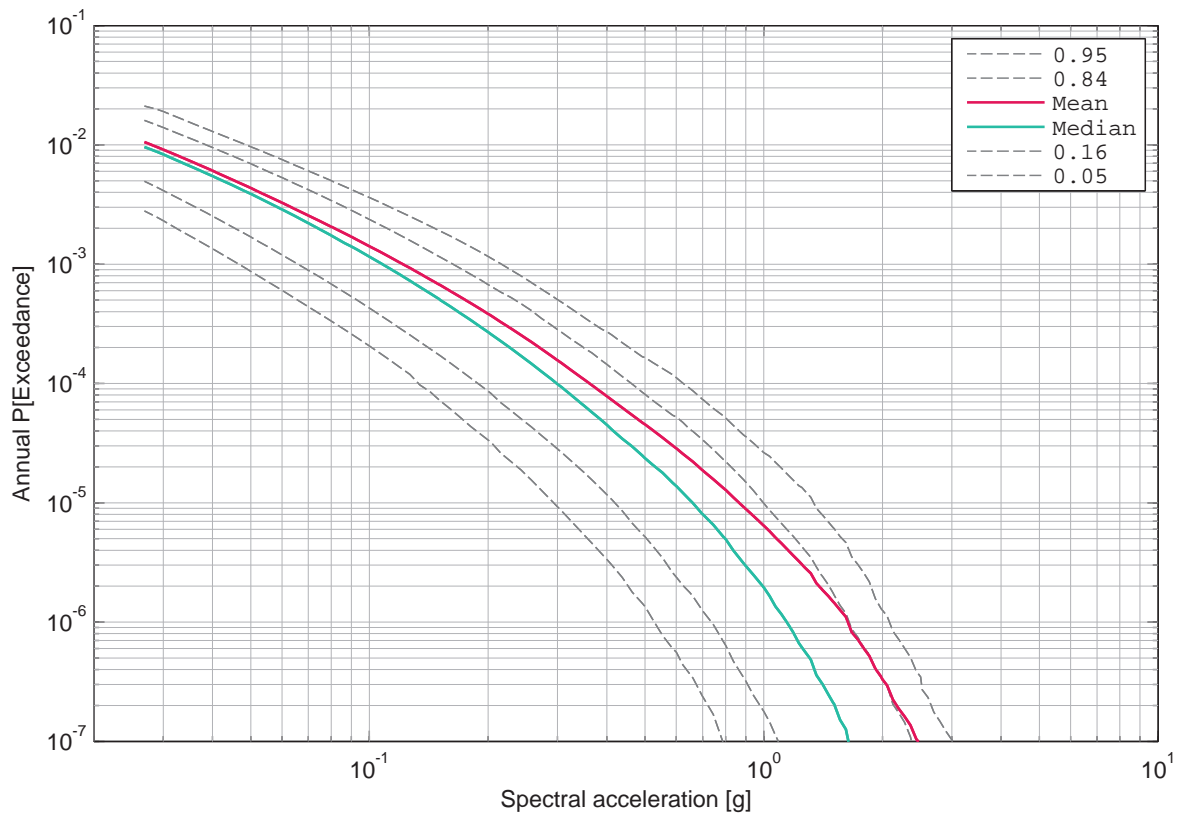


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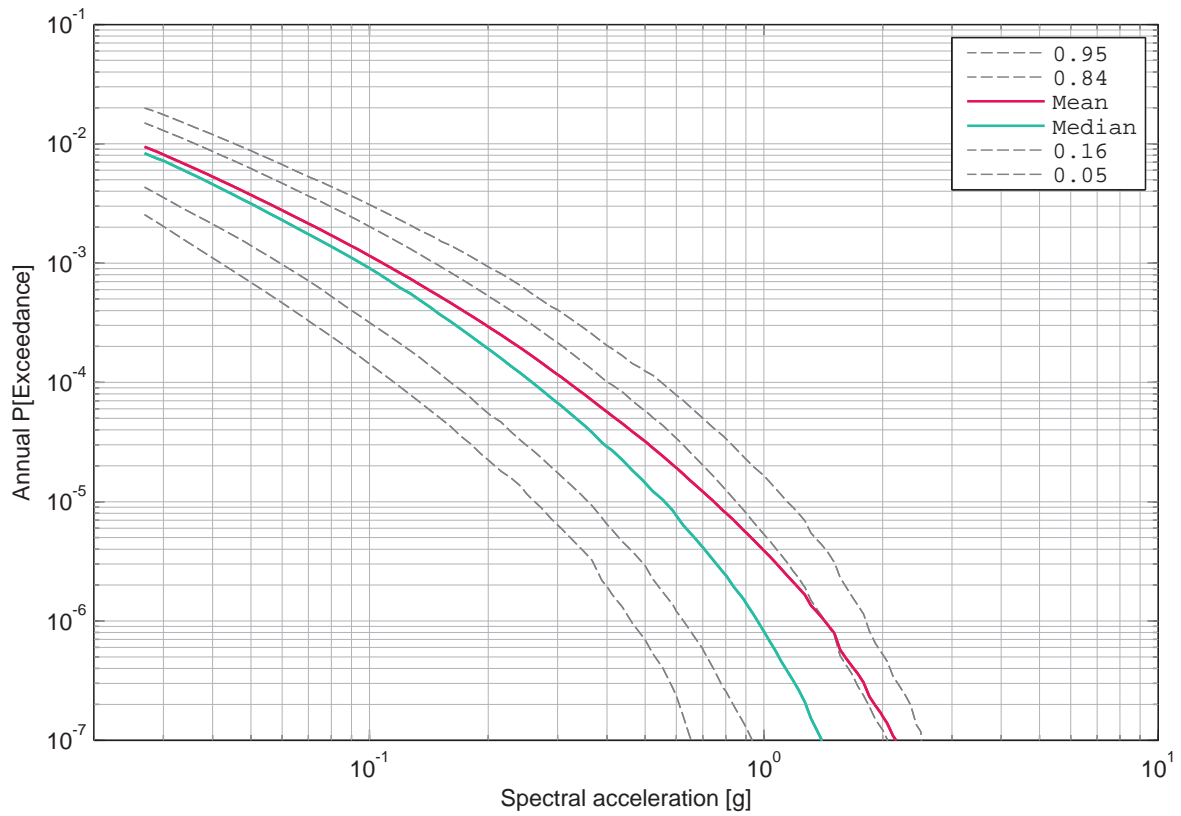


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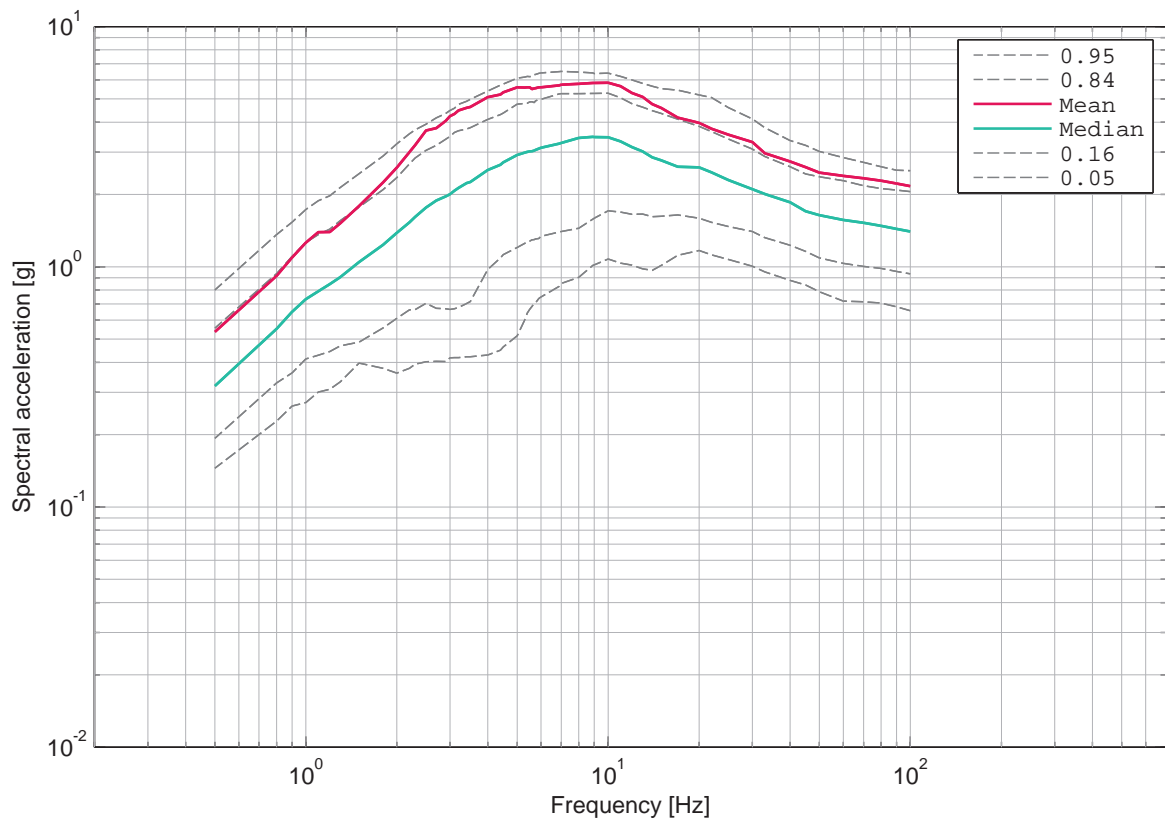


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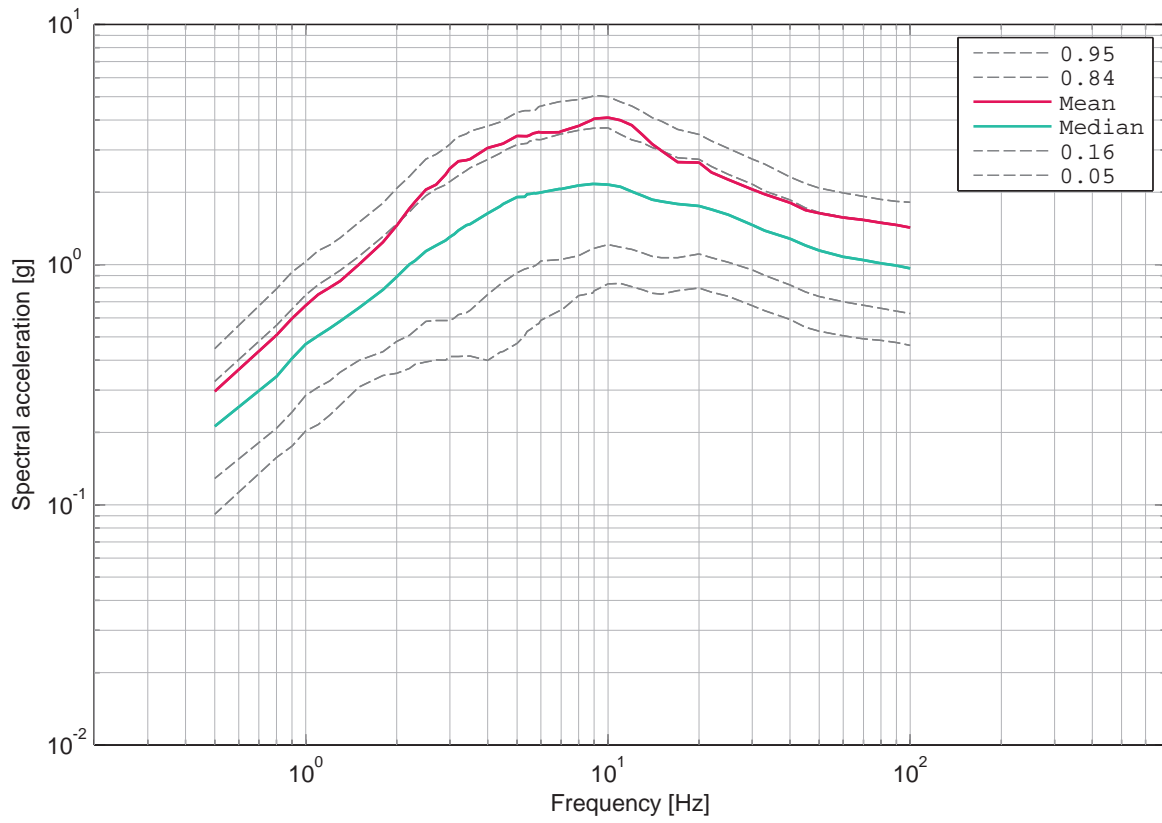


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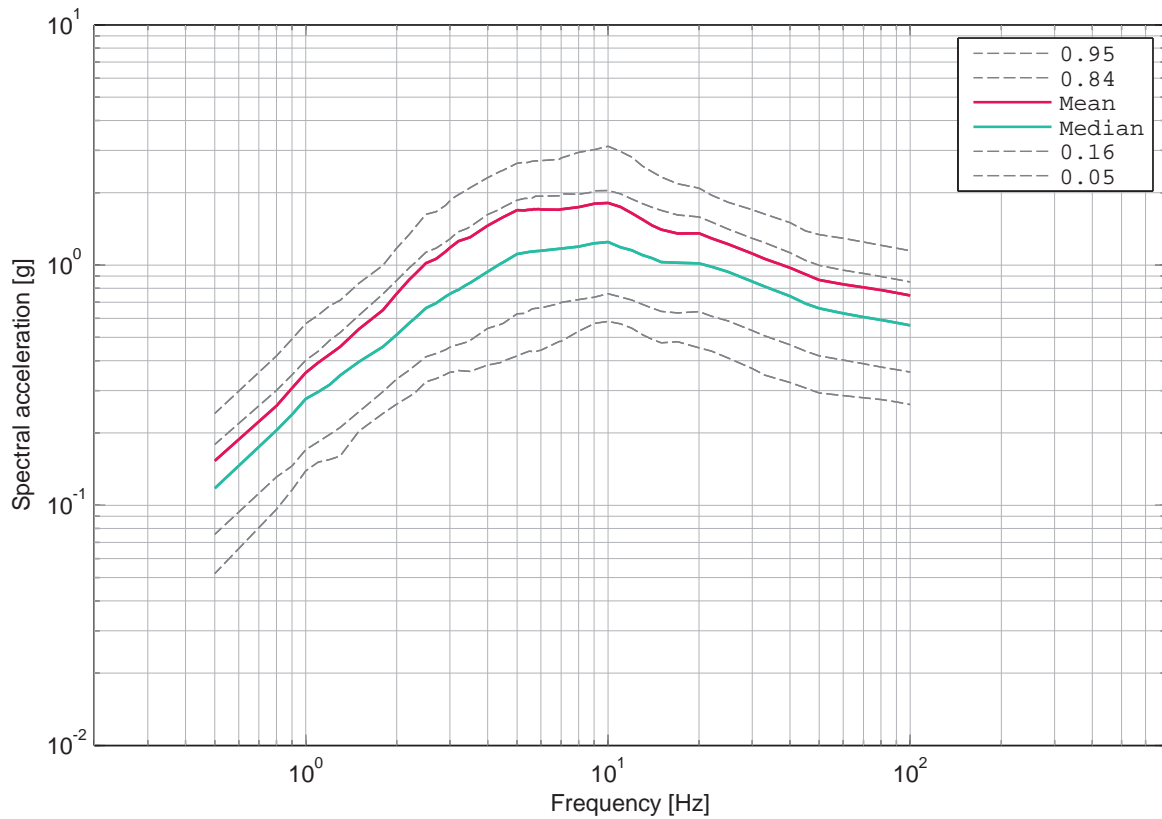


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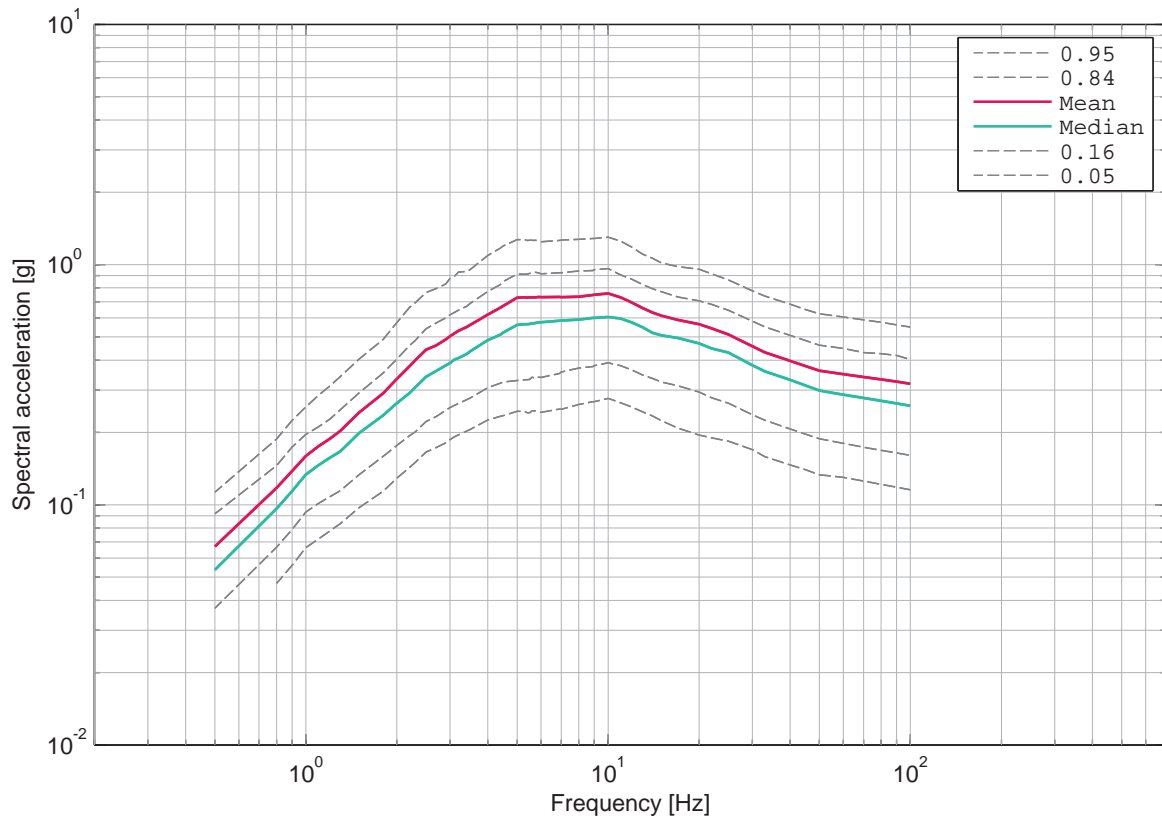


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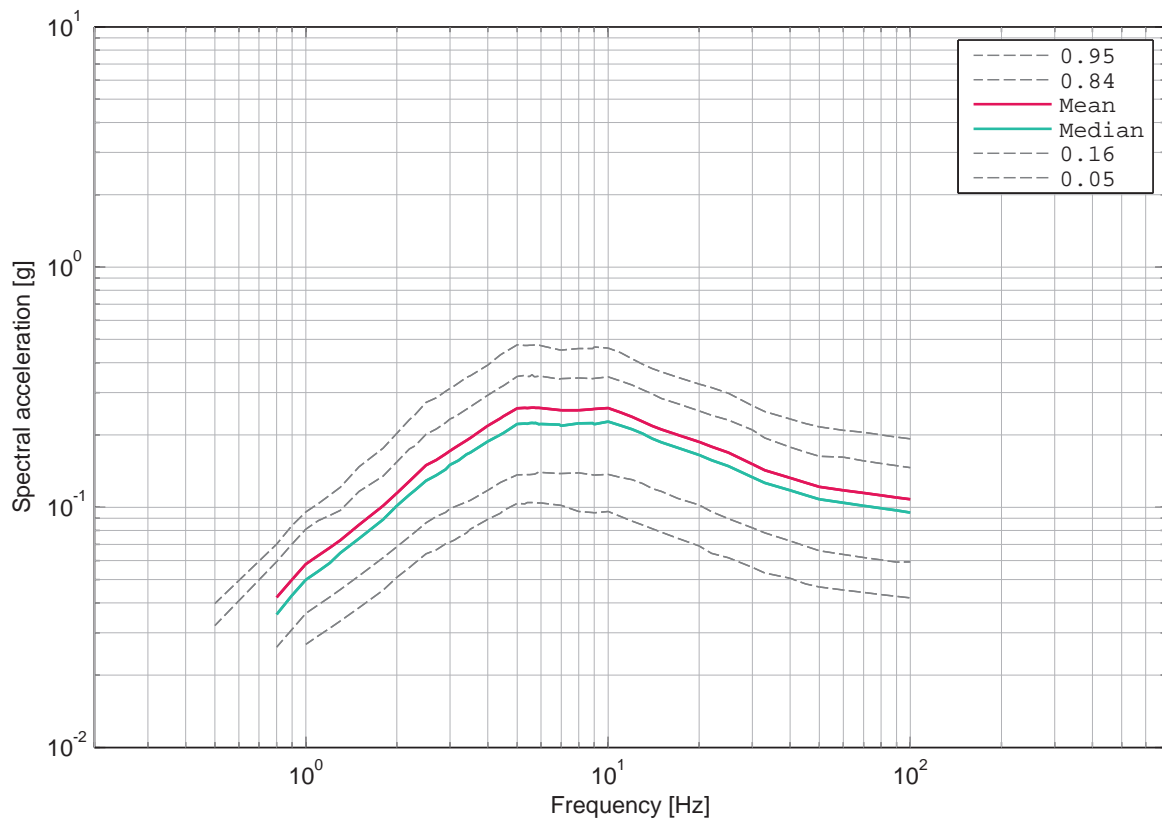


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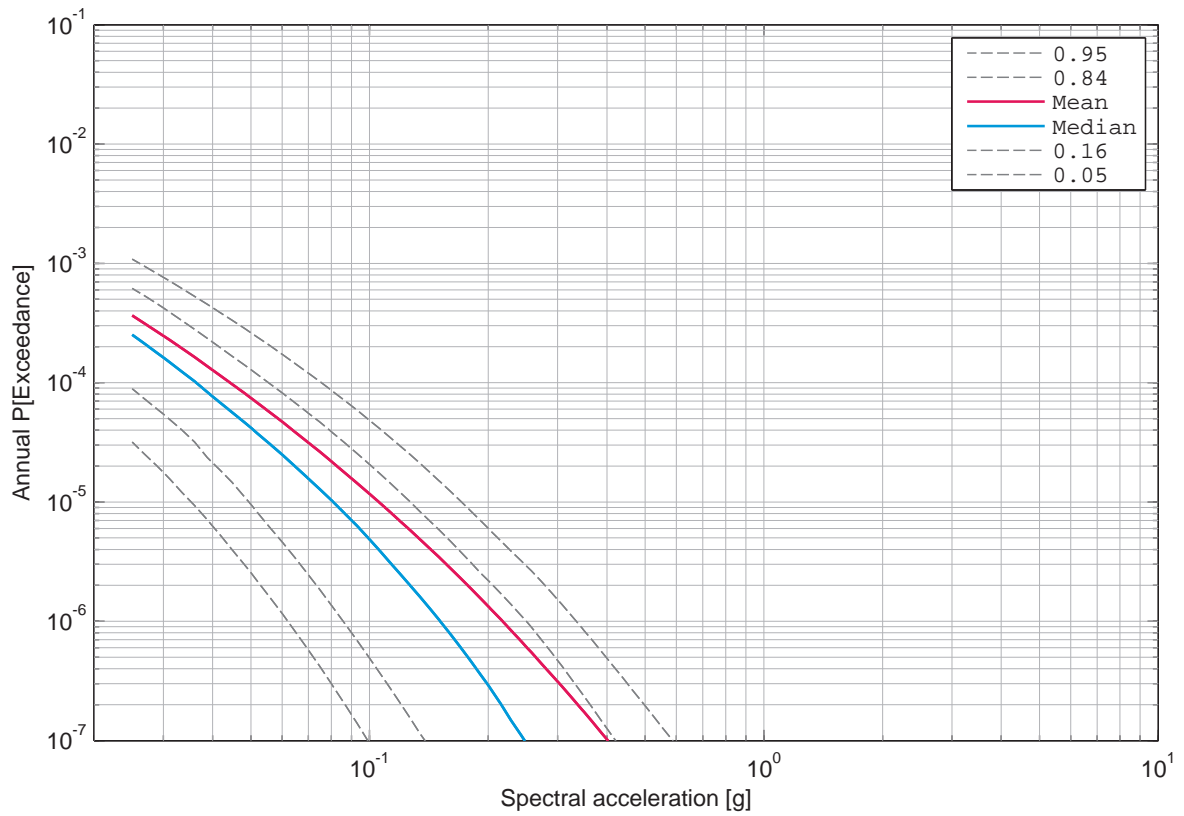


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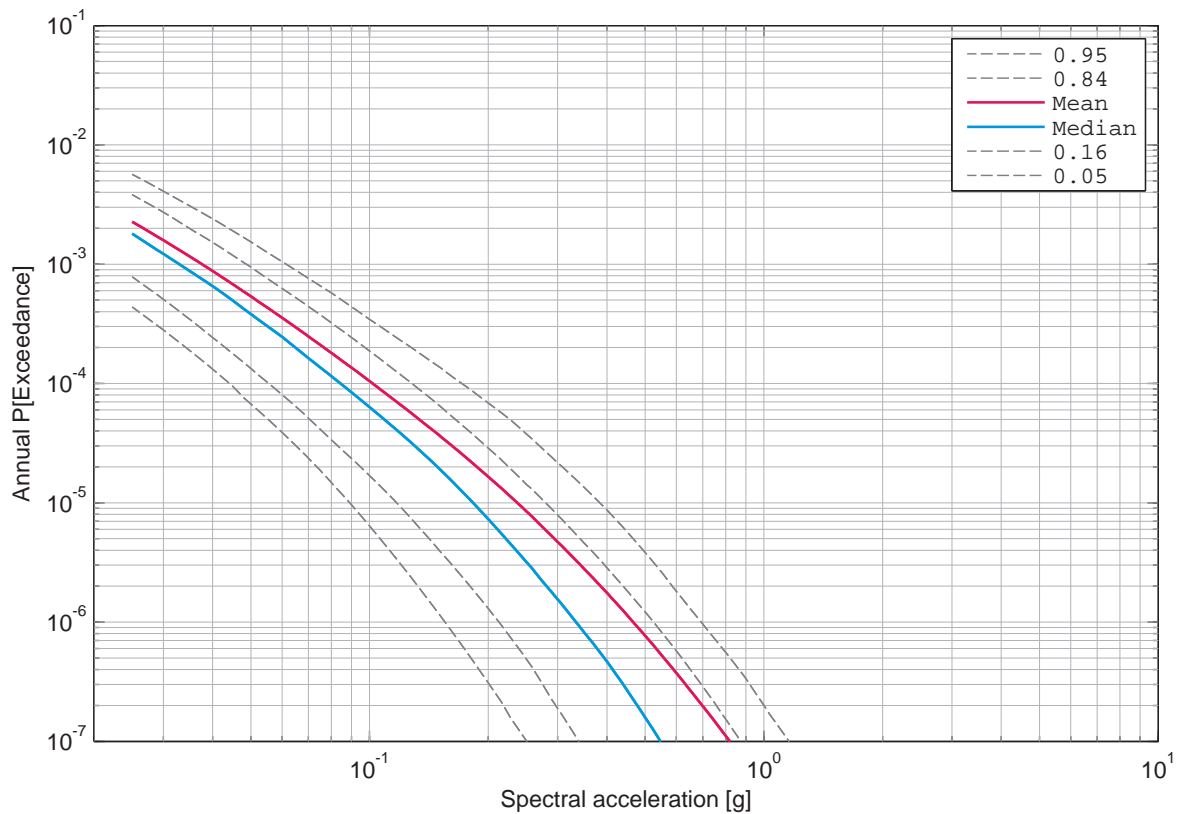


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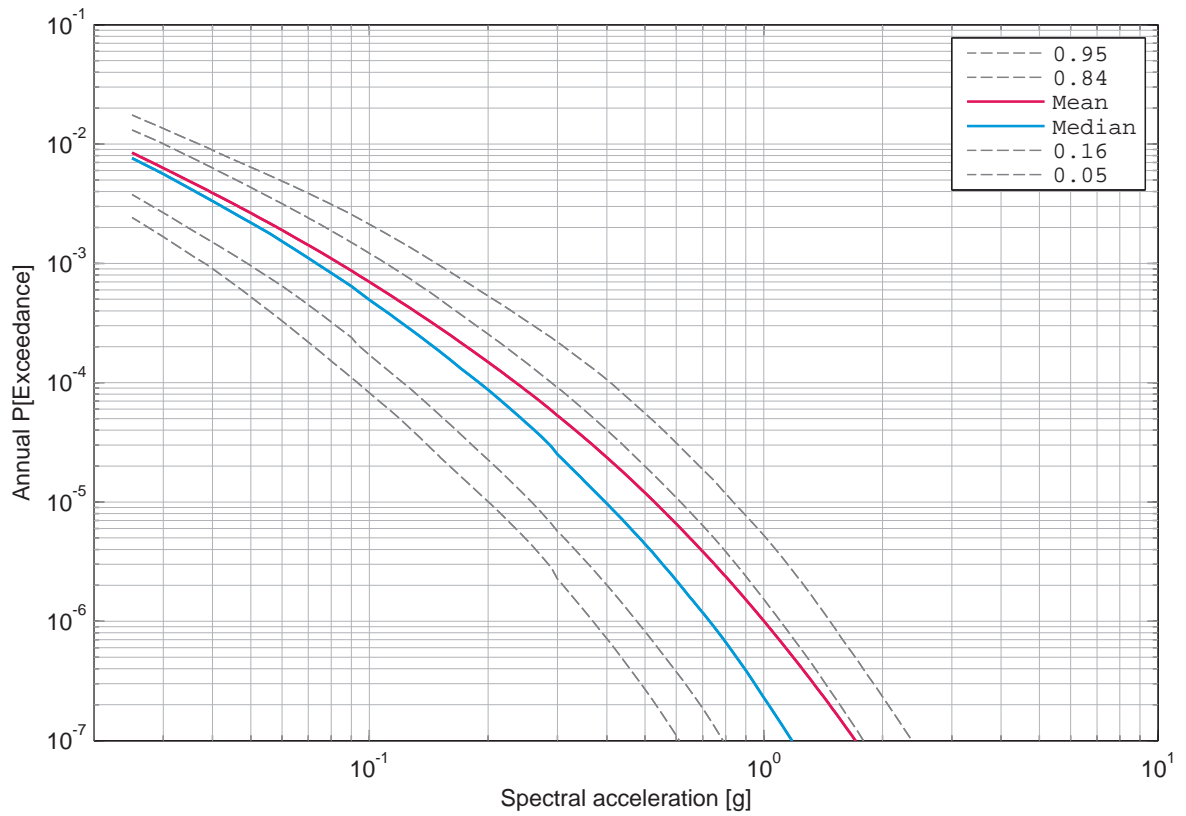


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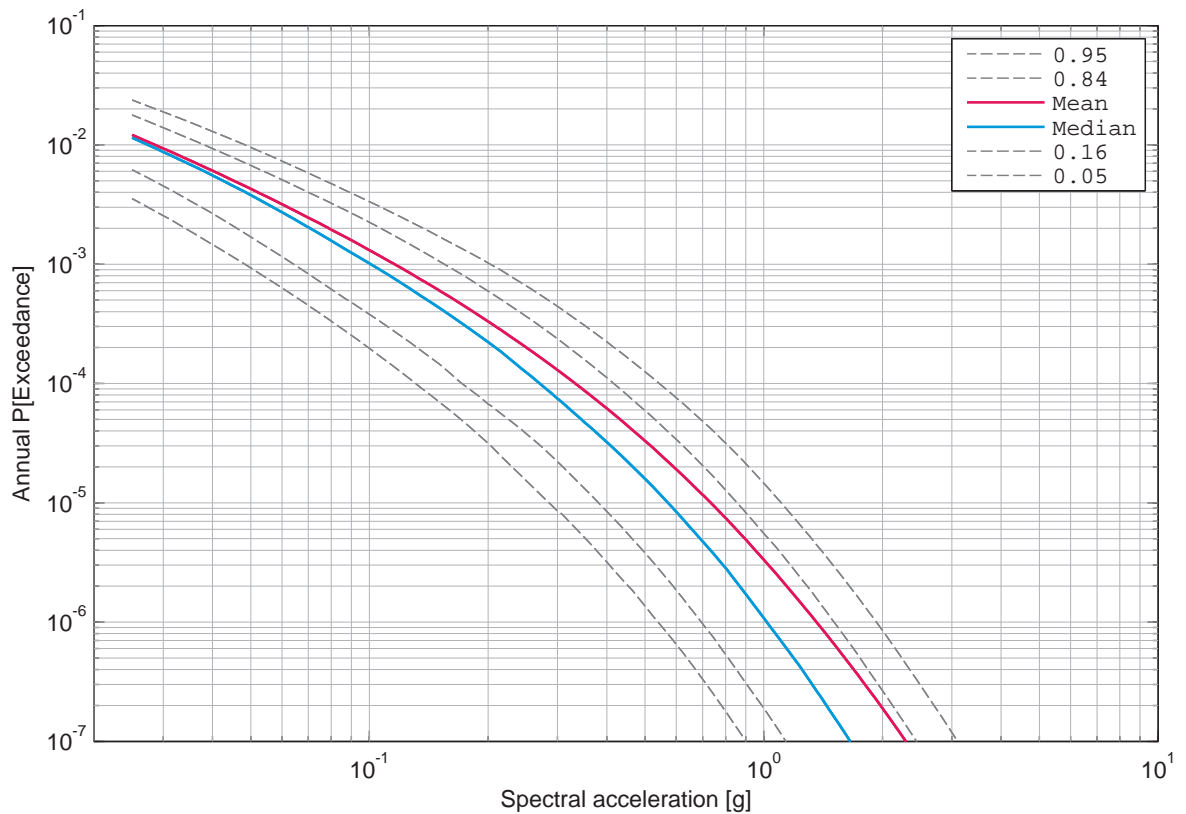


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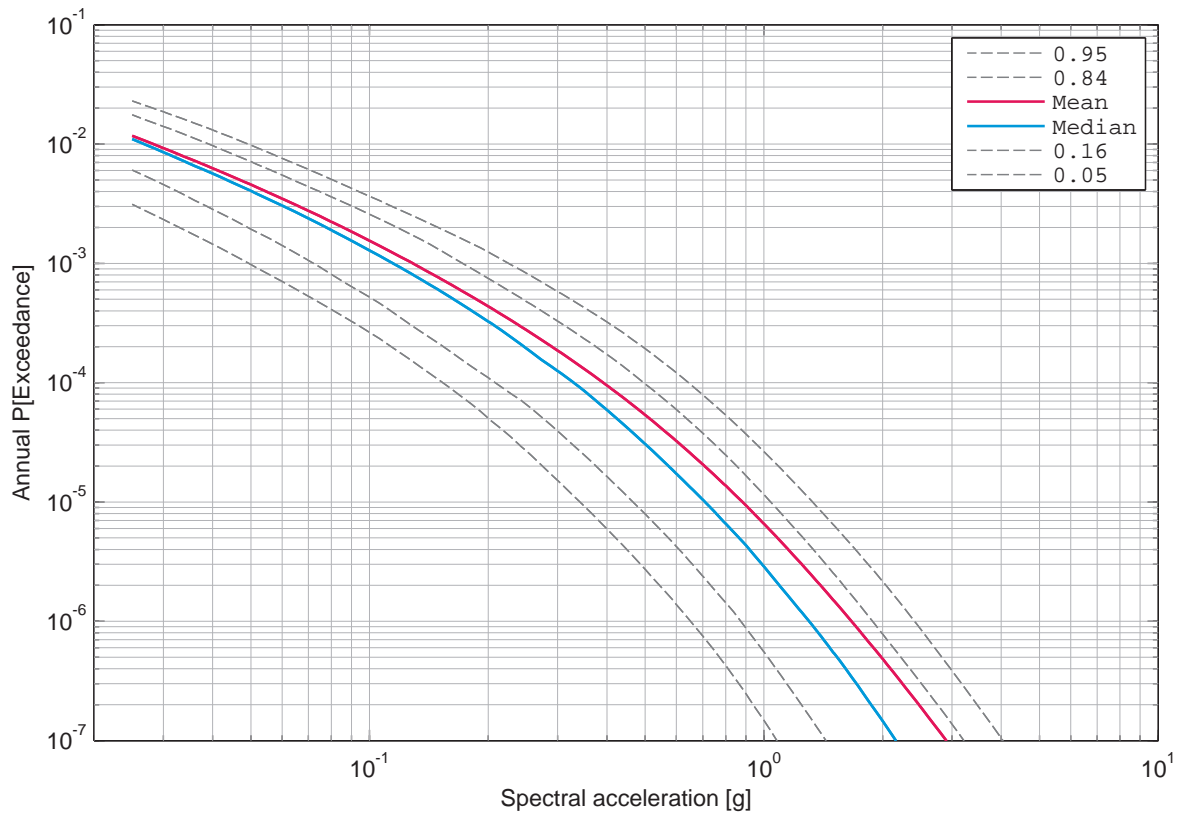


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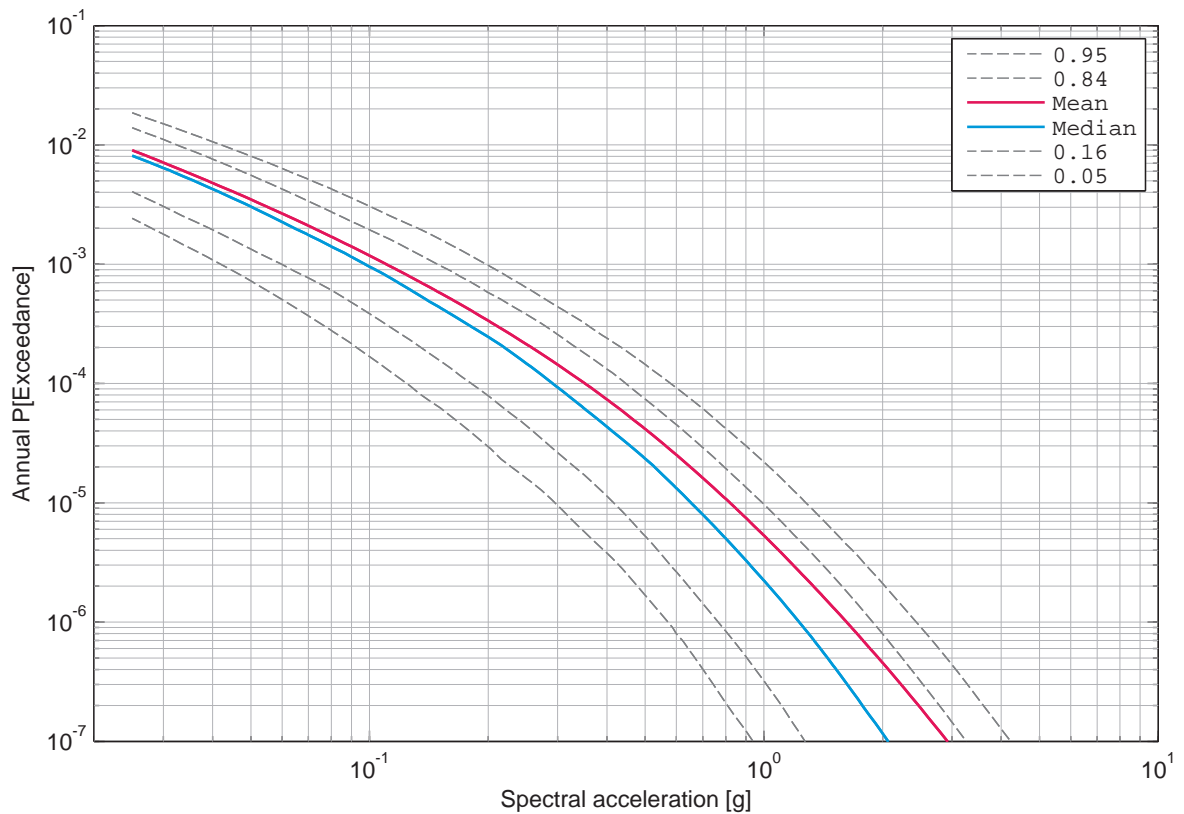


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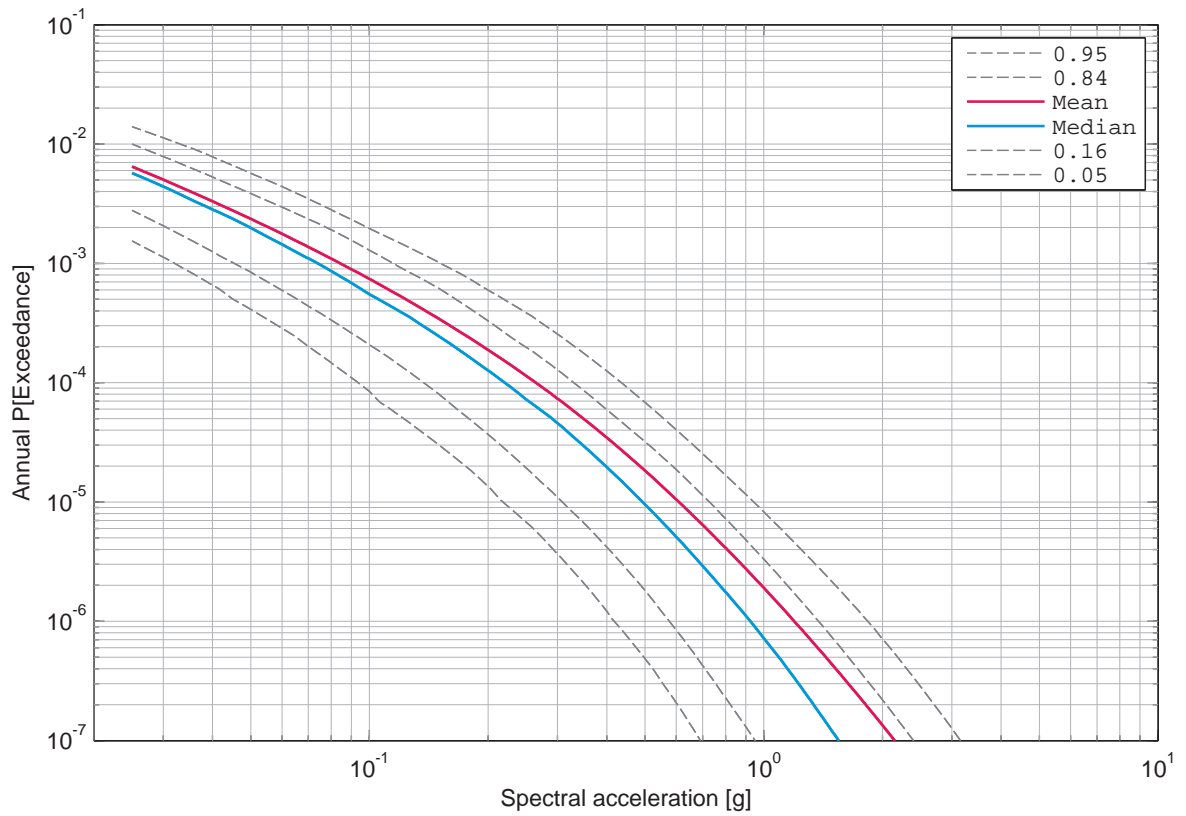


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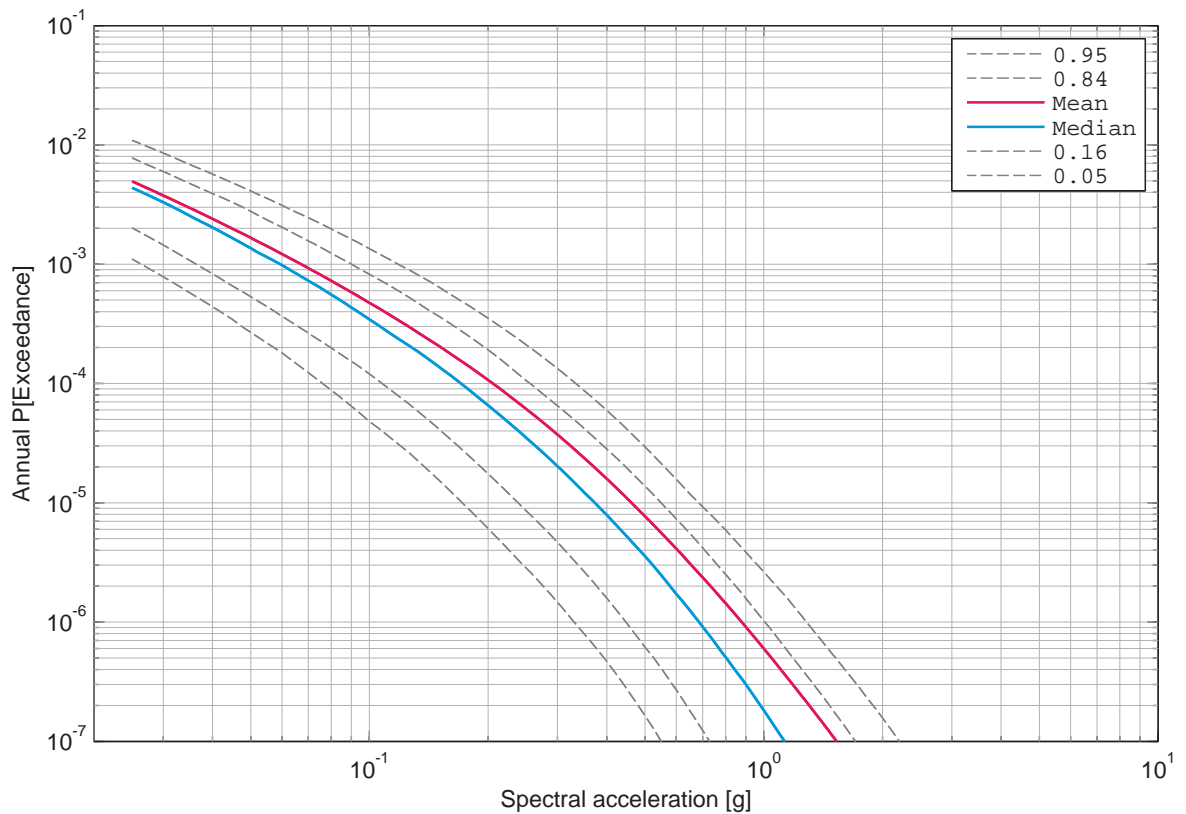


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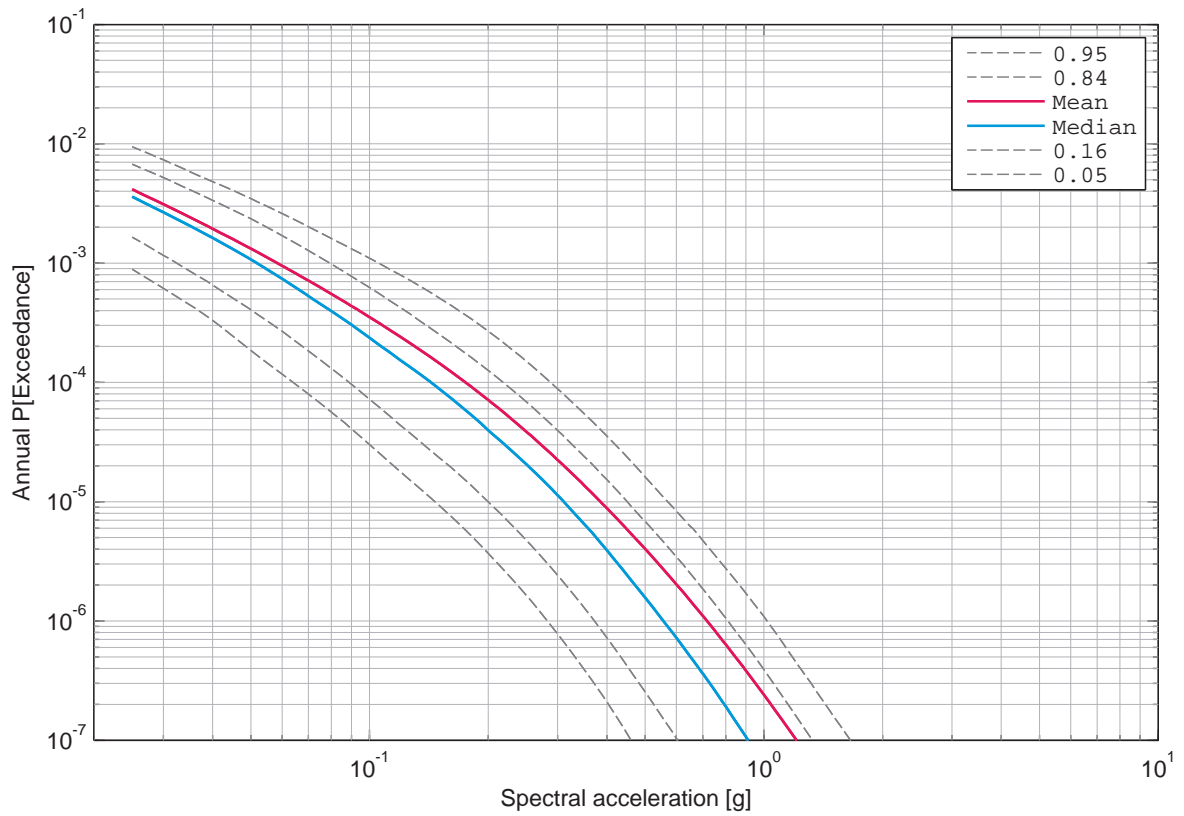


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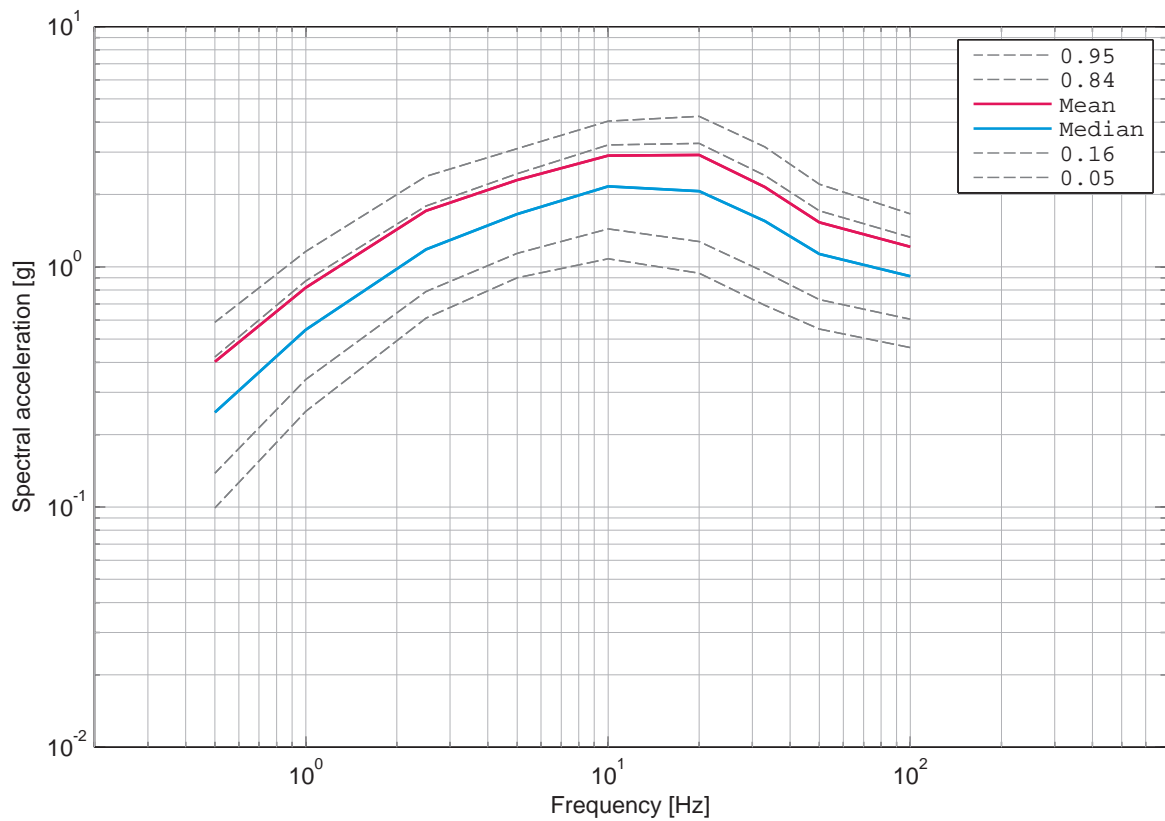


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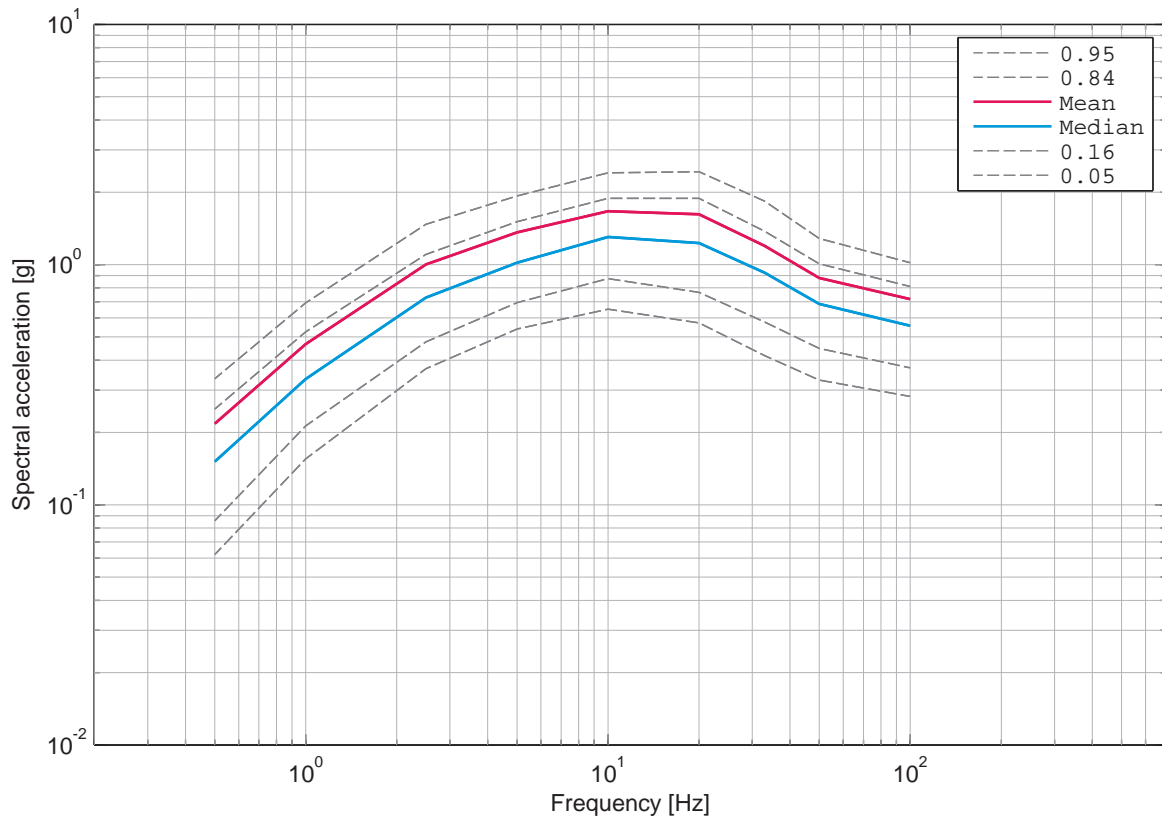


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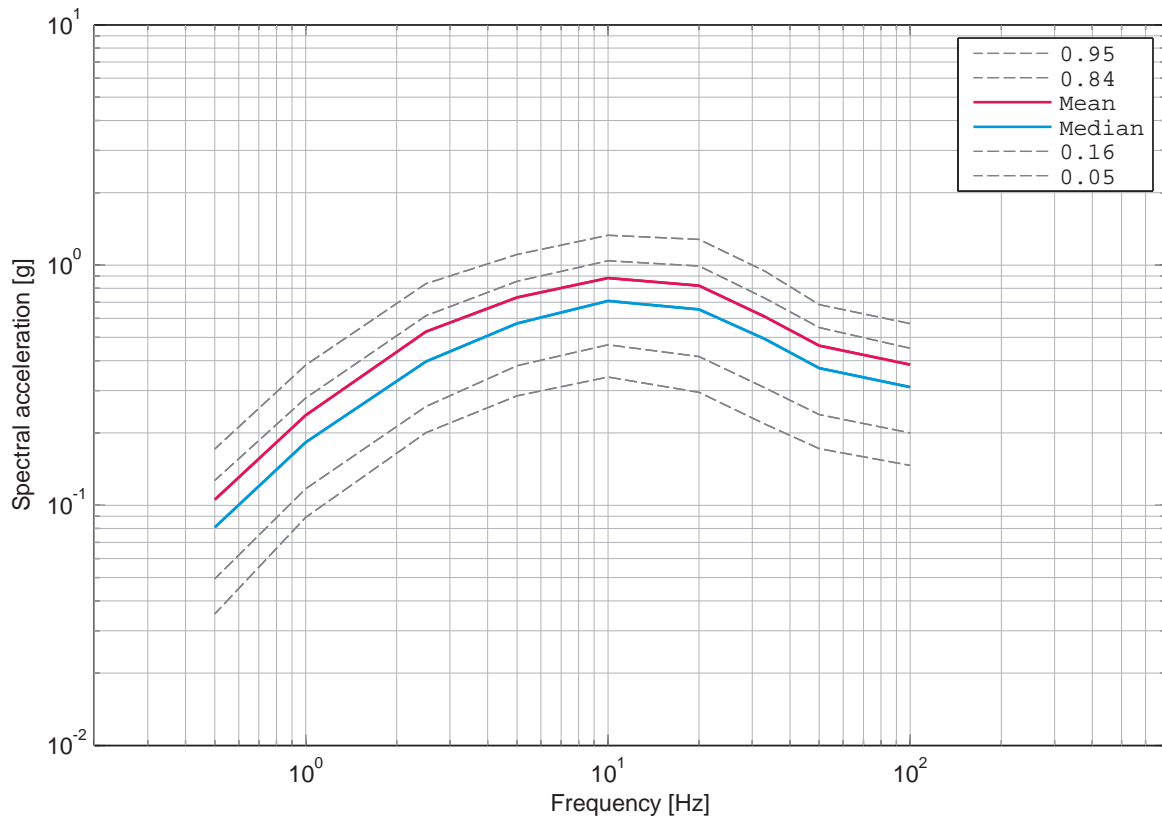


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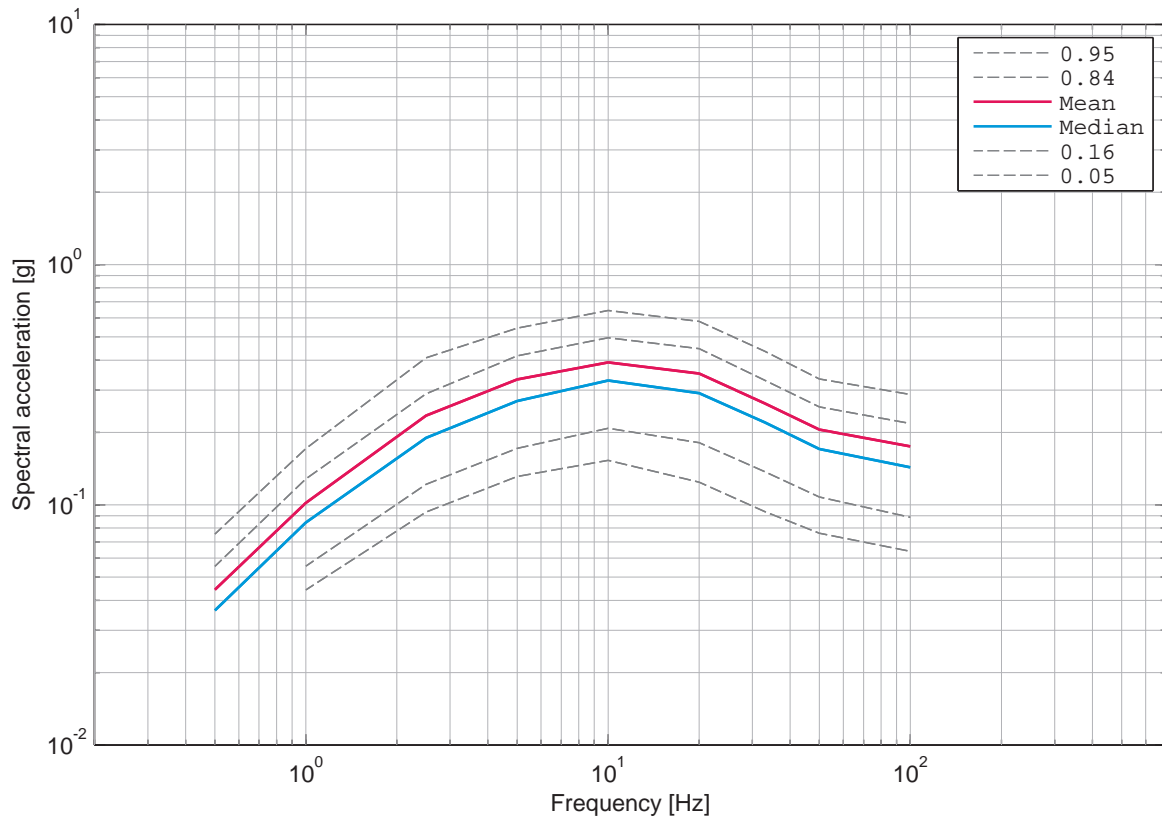


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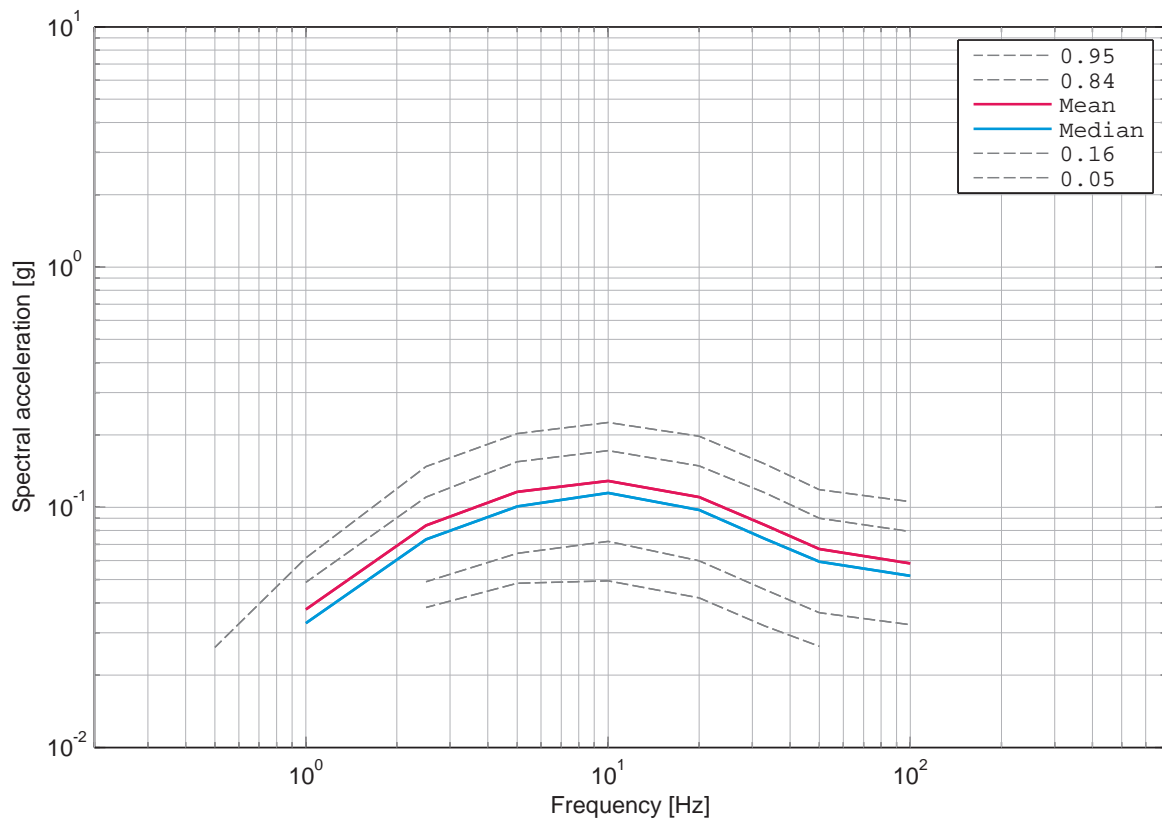


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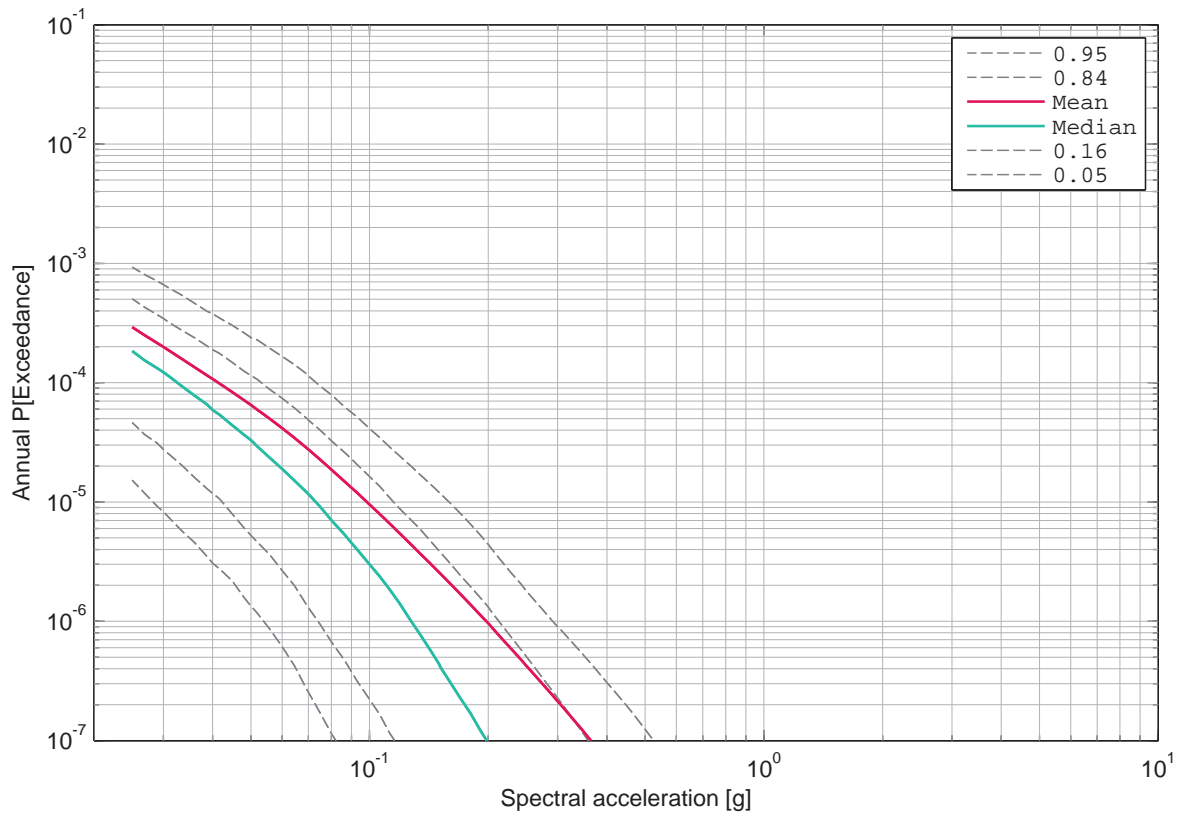


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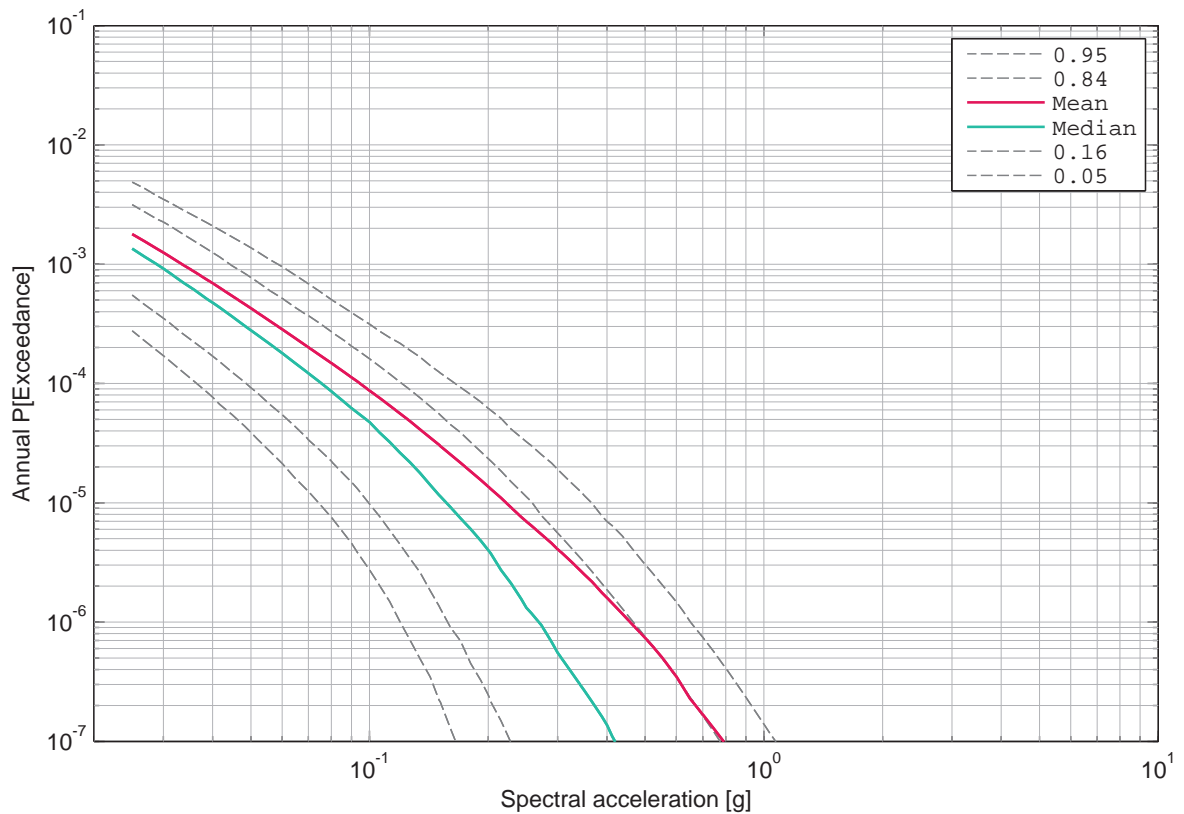


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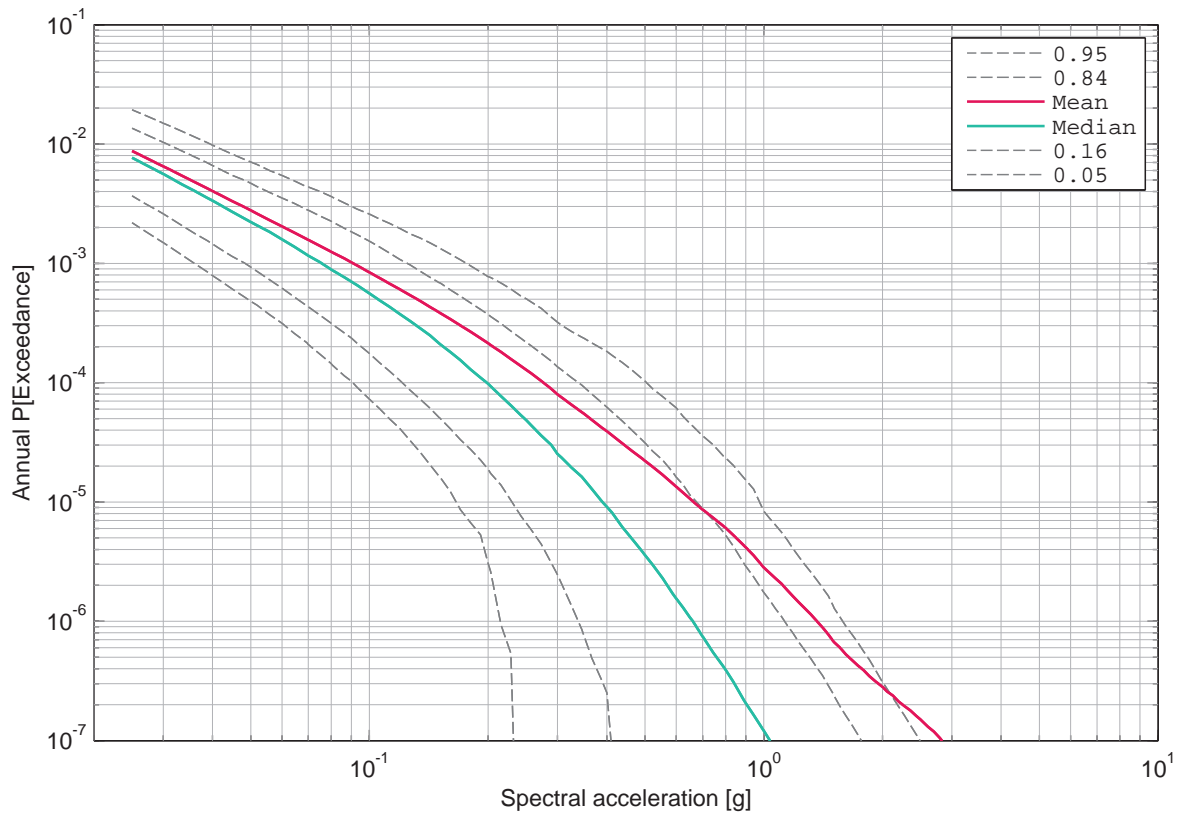


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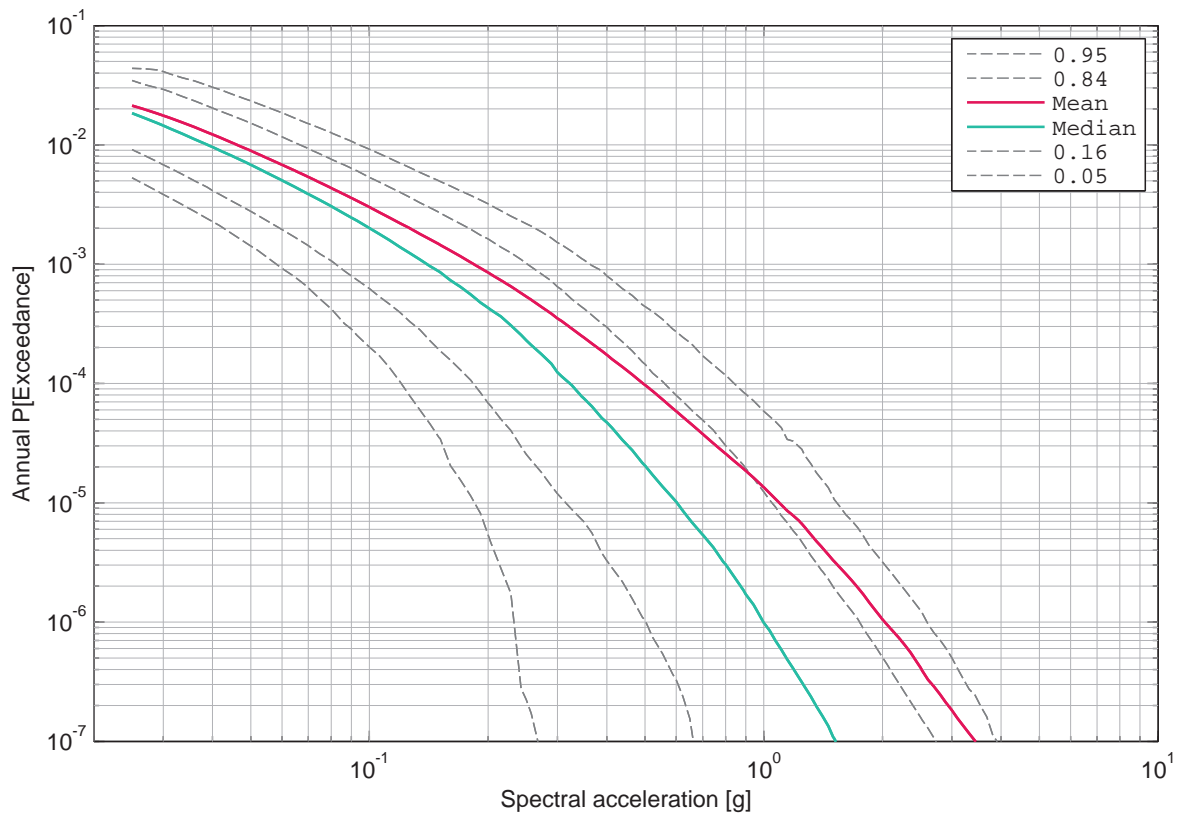


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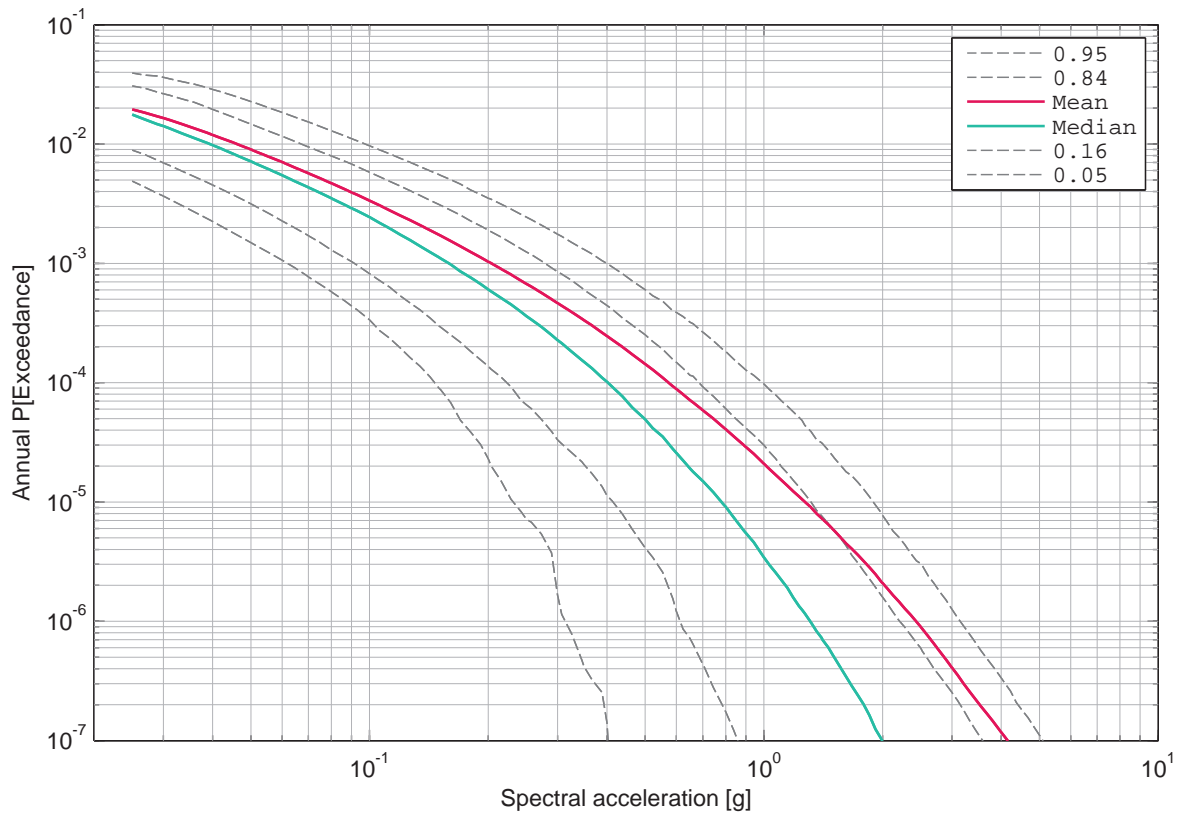


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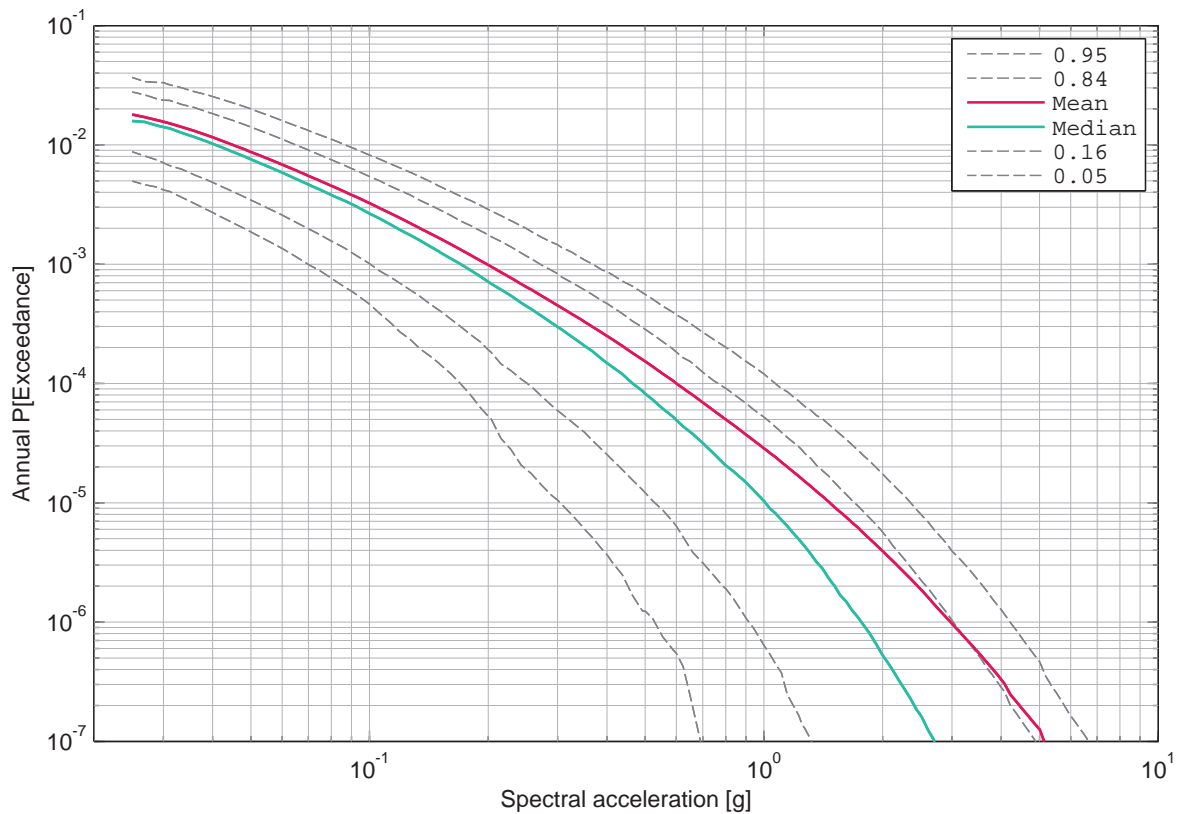


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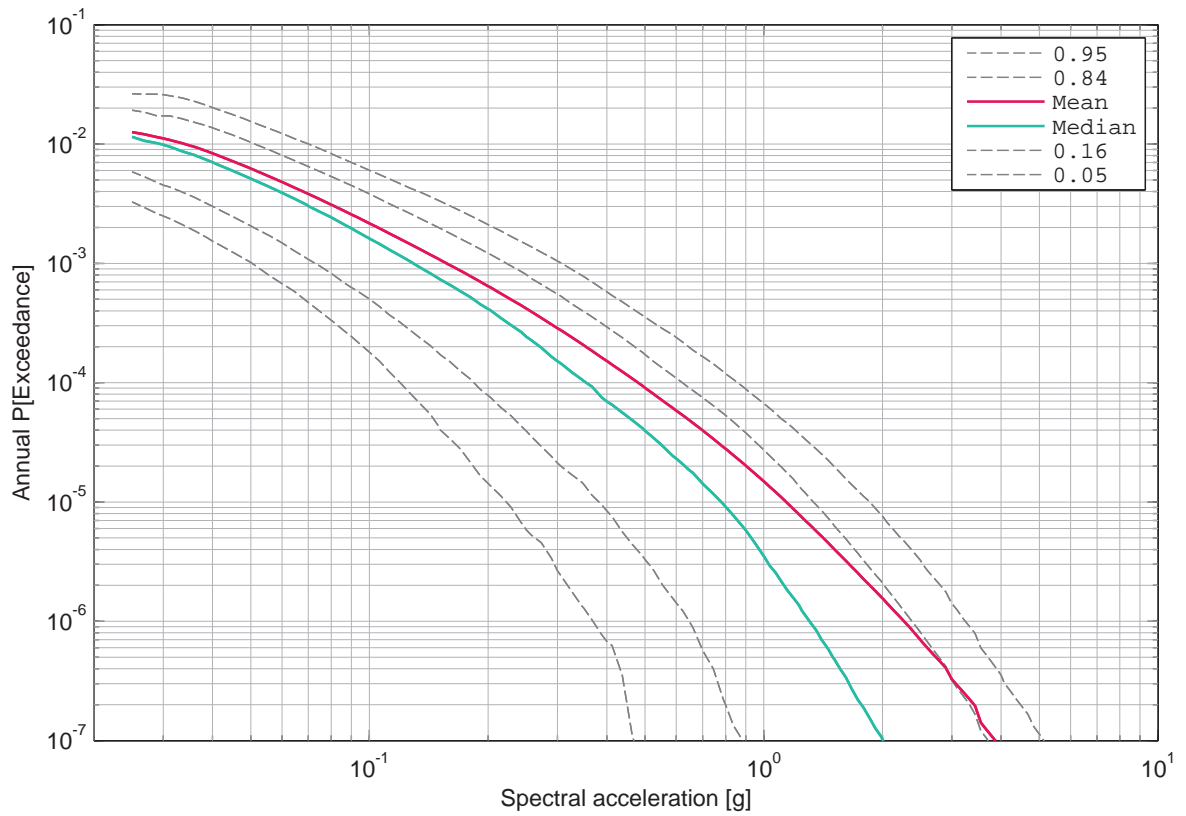


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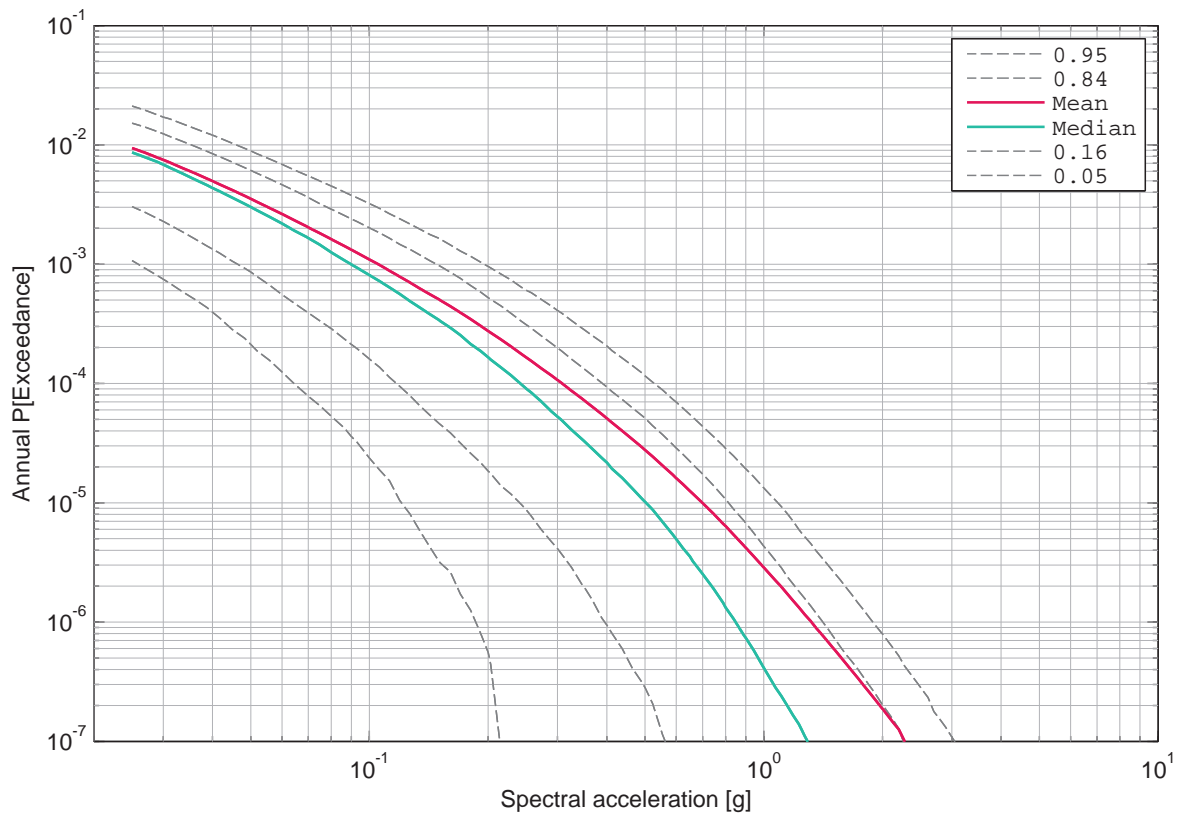


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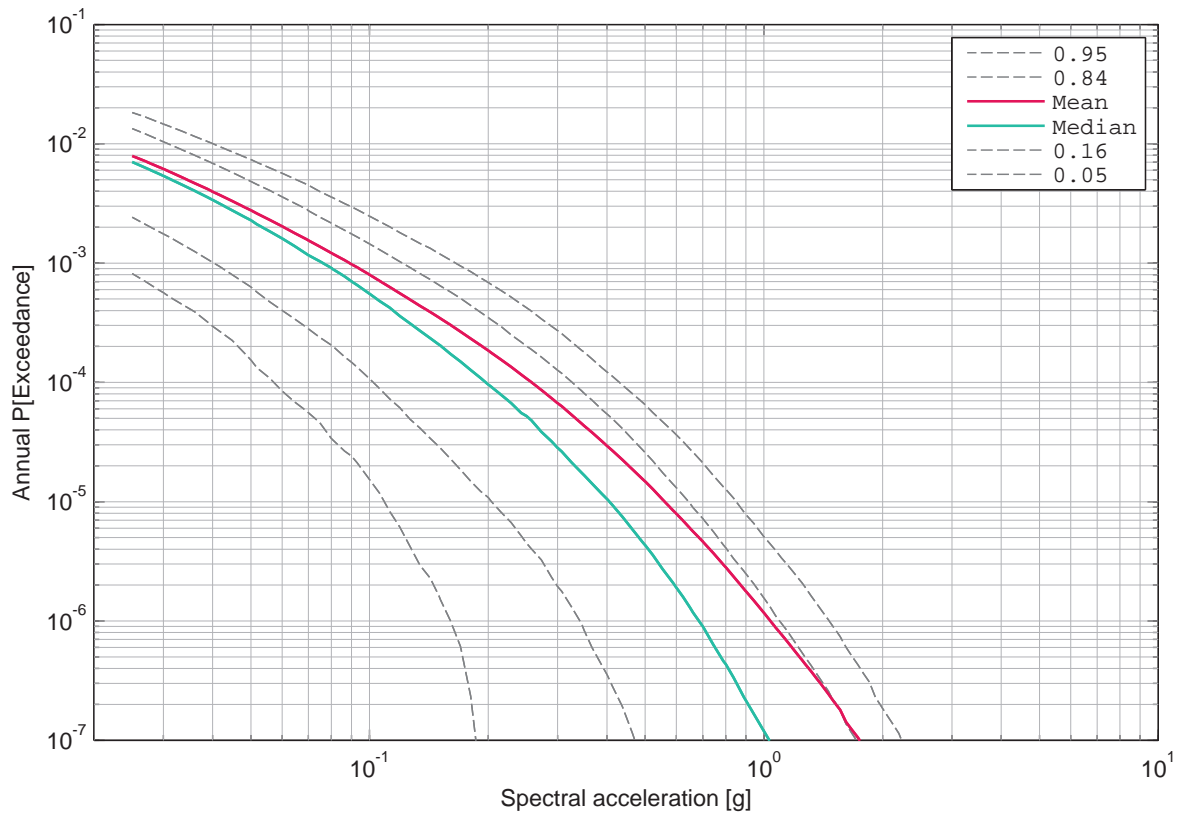


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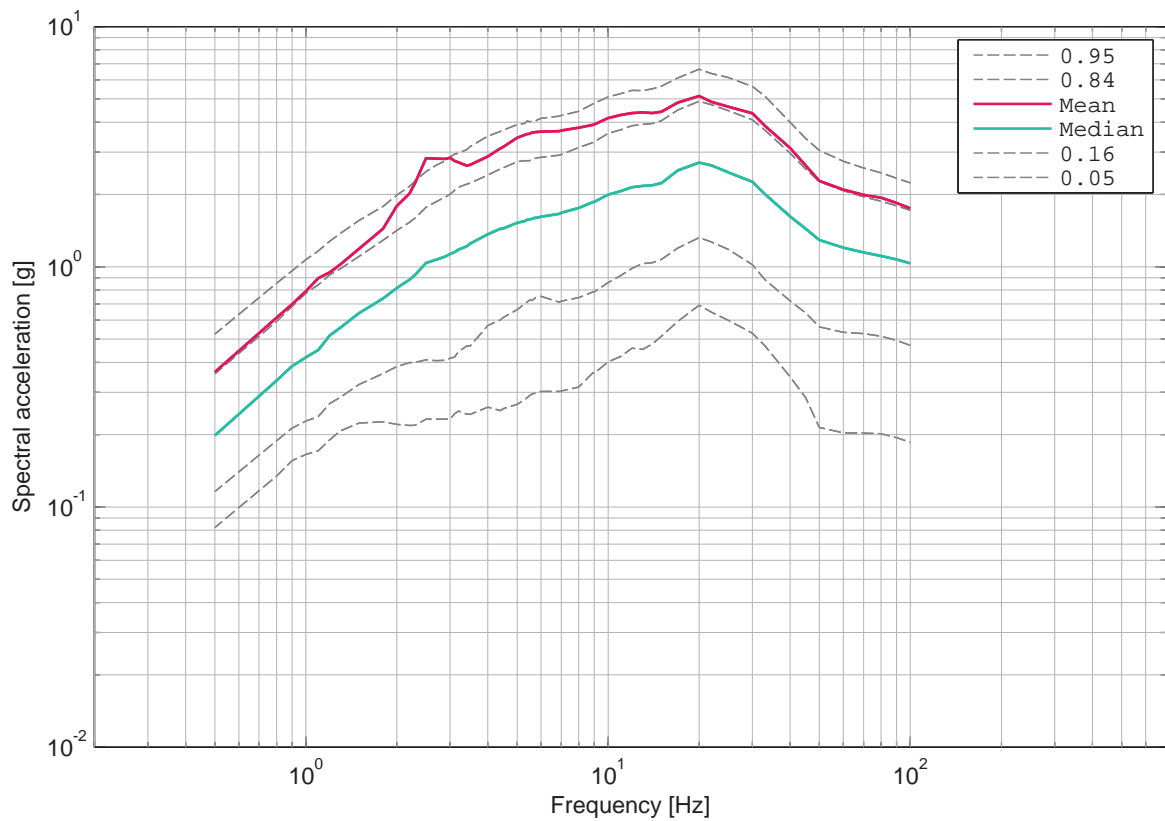


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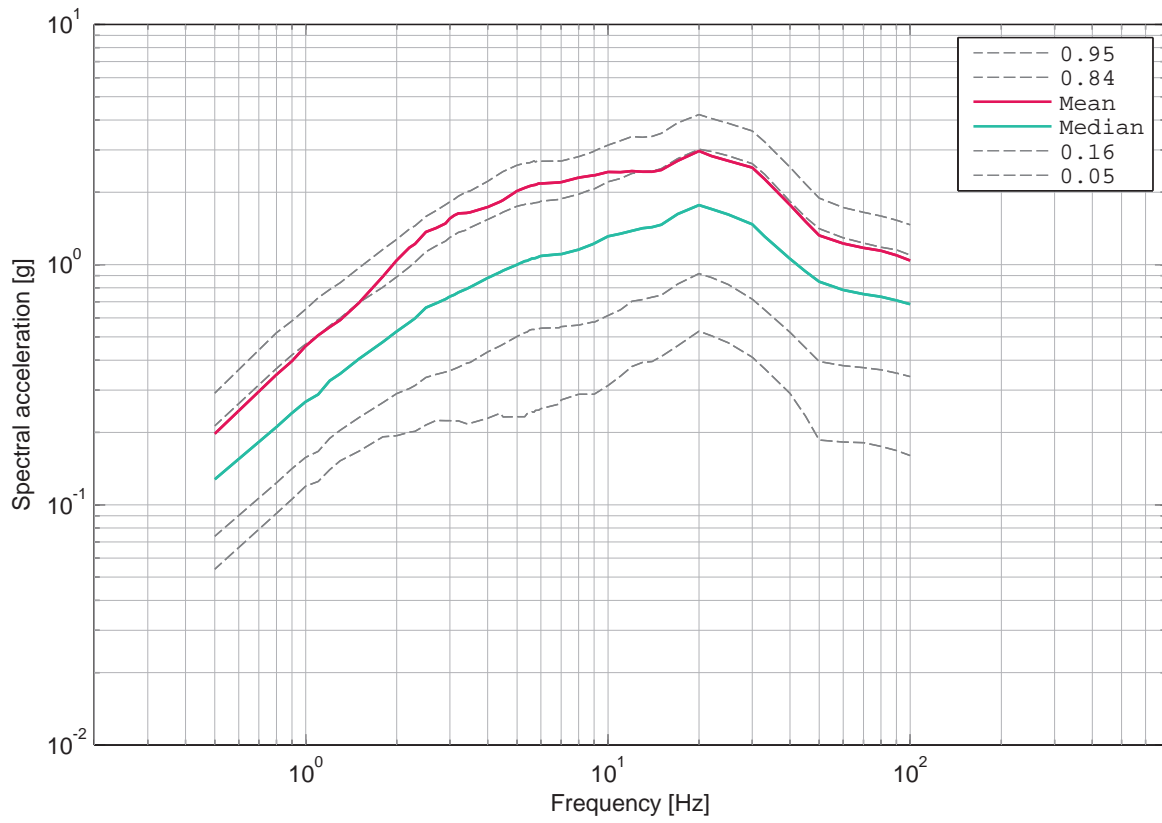


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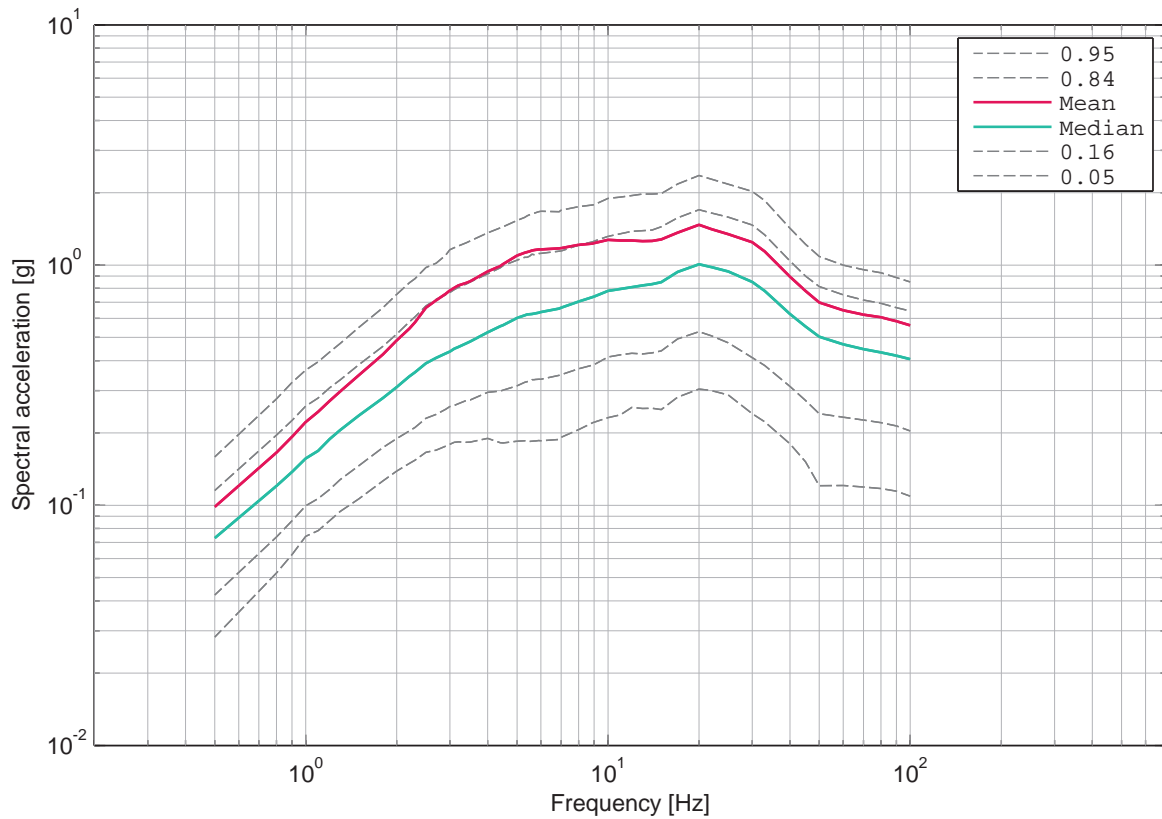


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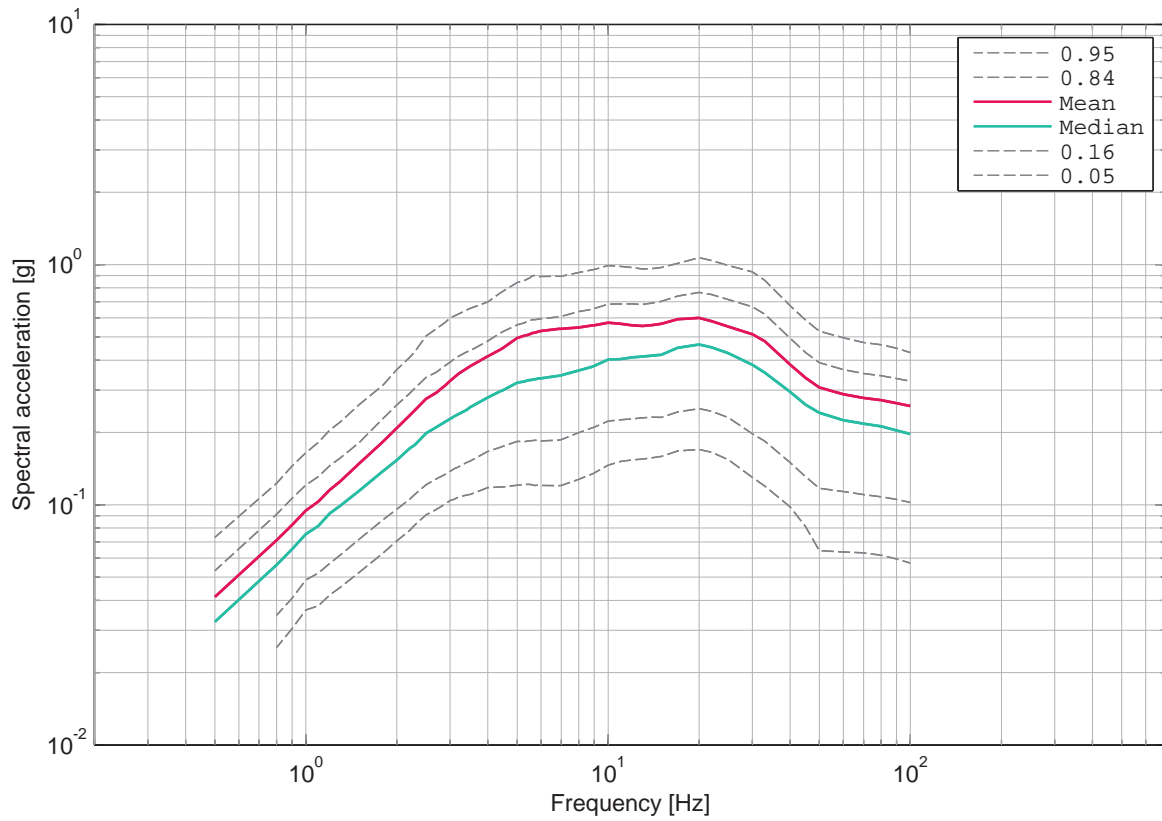


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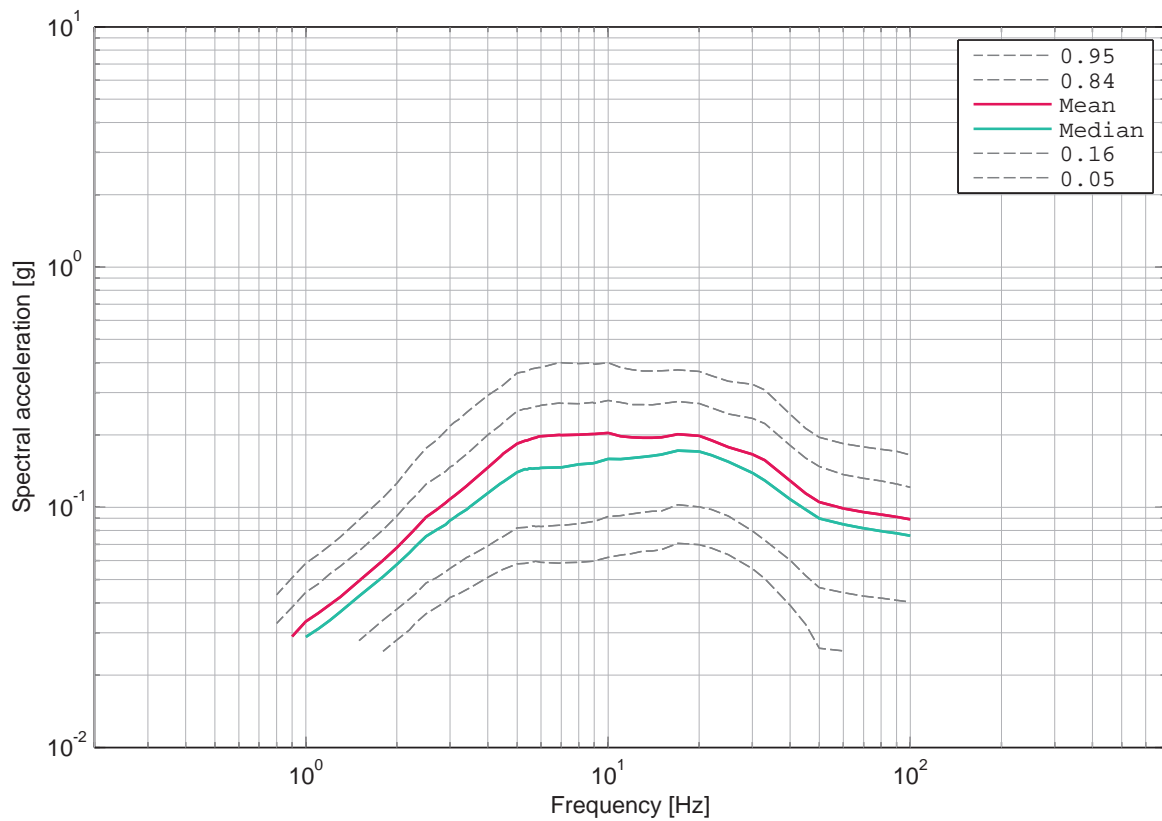


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5.6.1 Mühleberg, M_{min} Comparison, Soil

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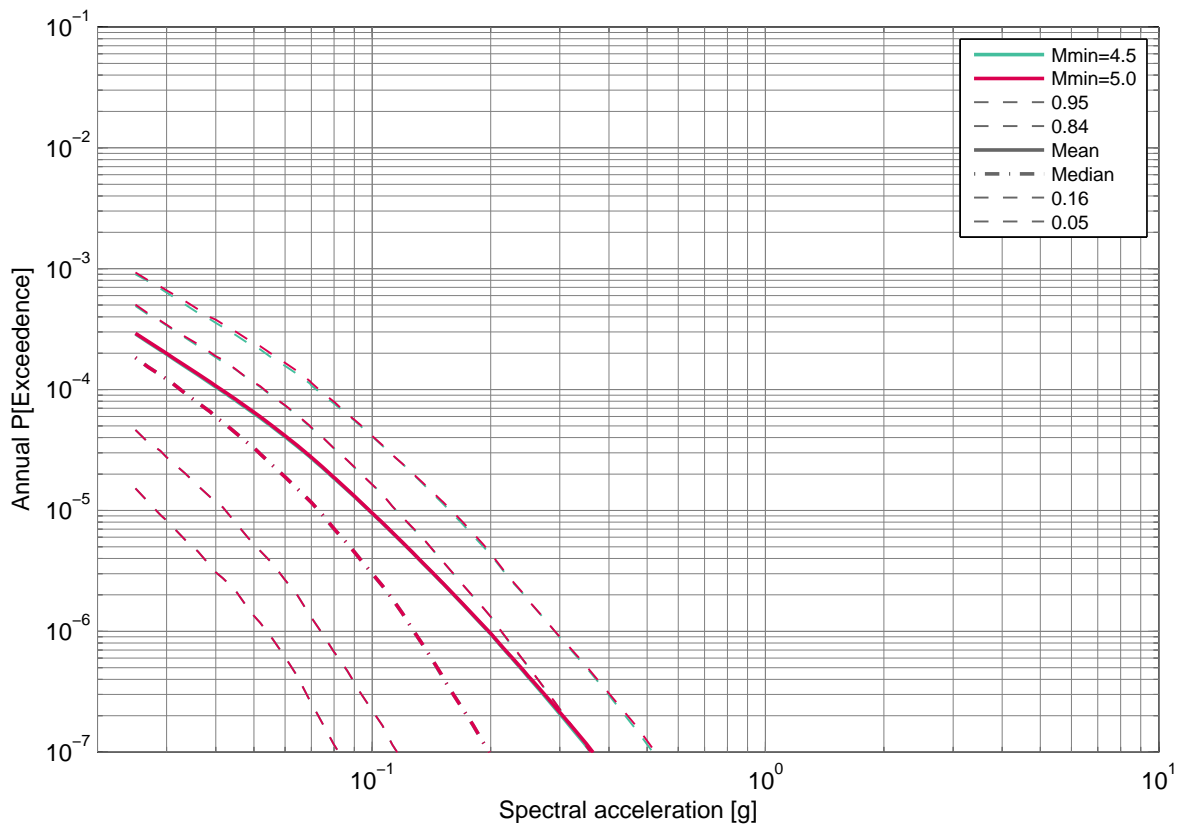


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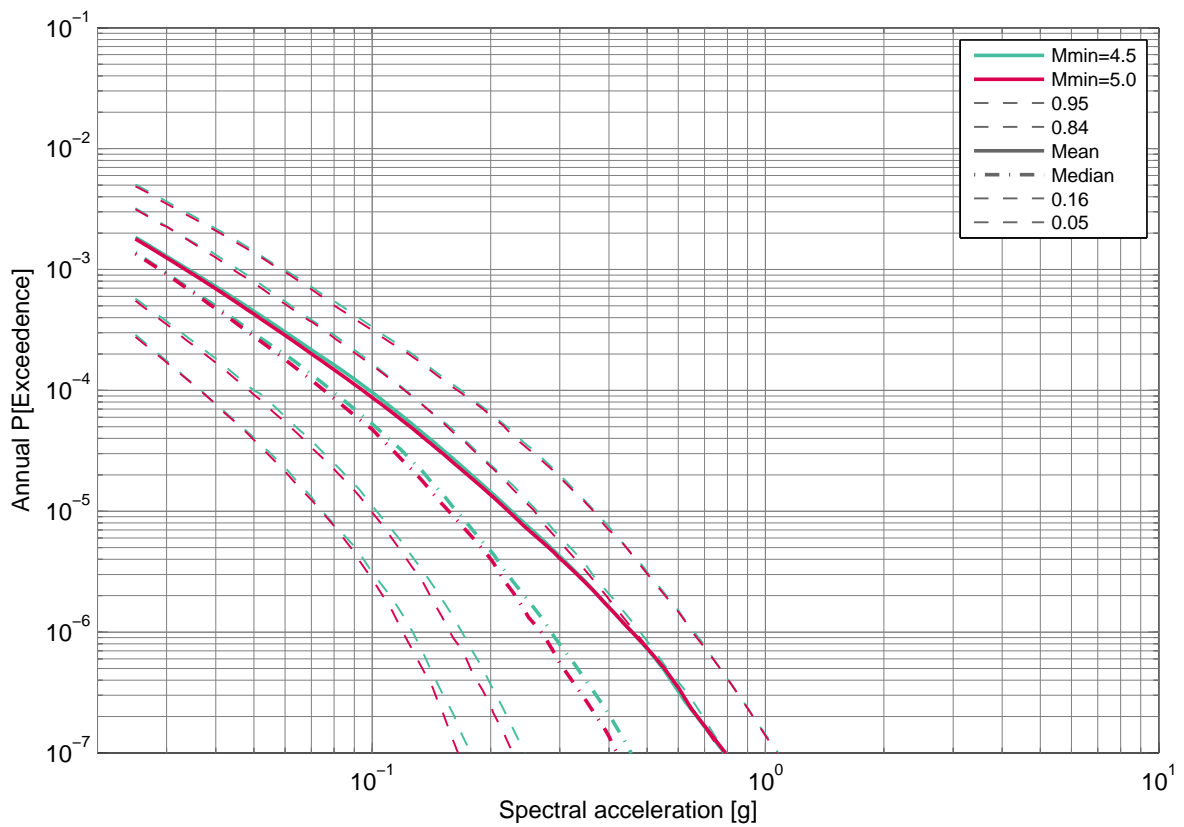


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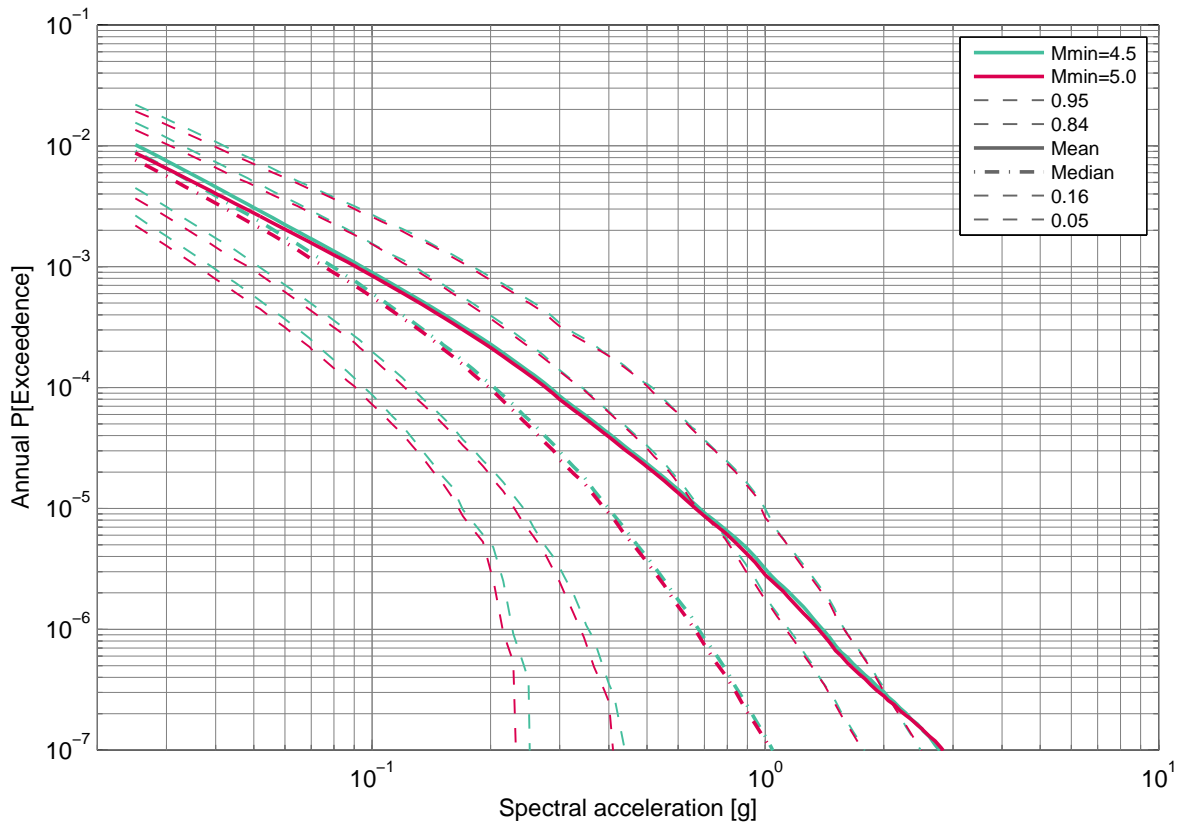


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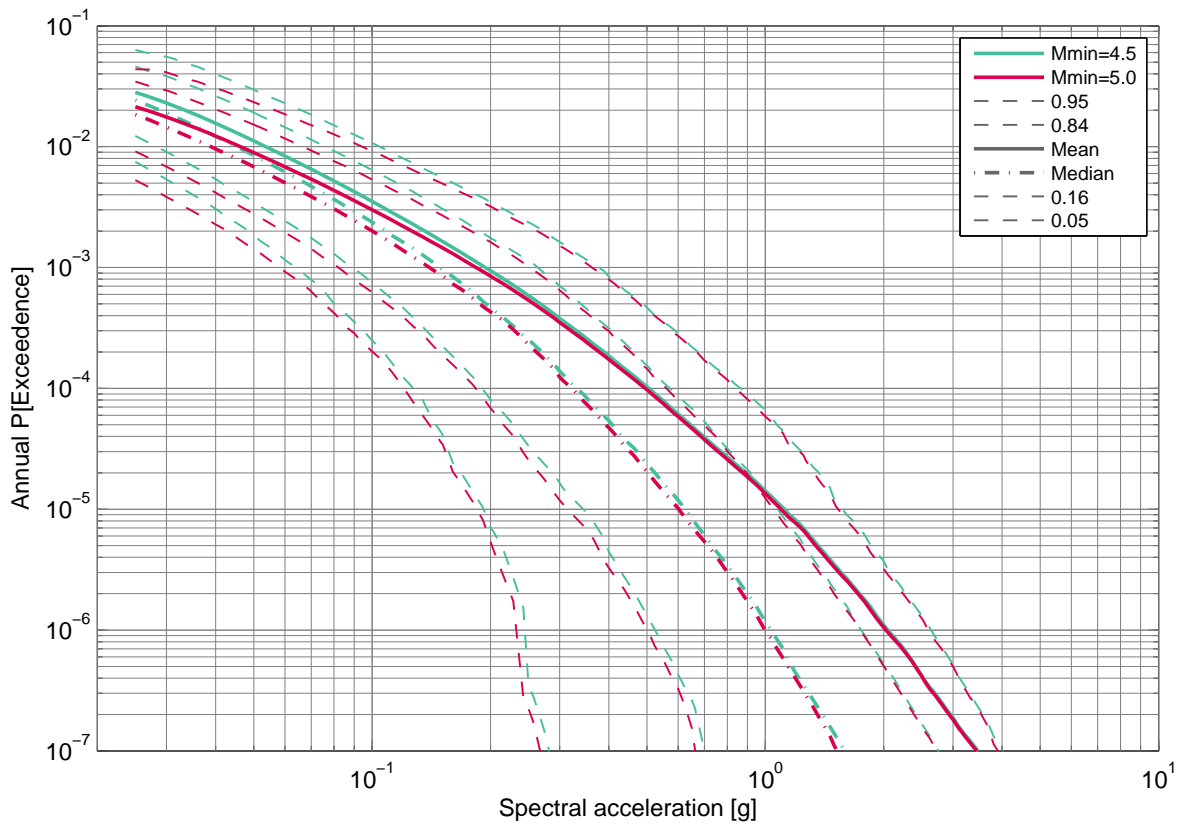


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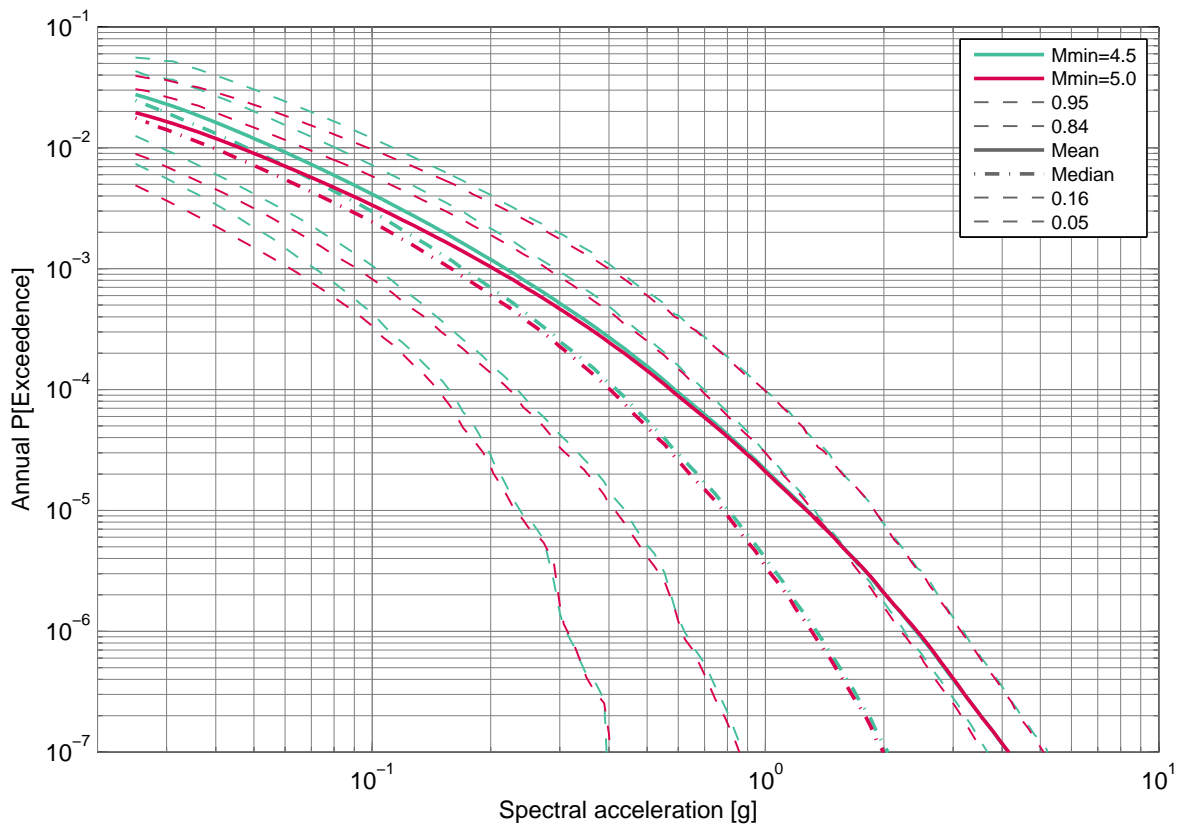


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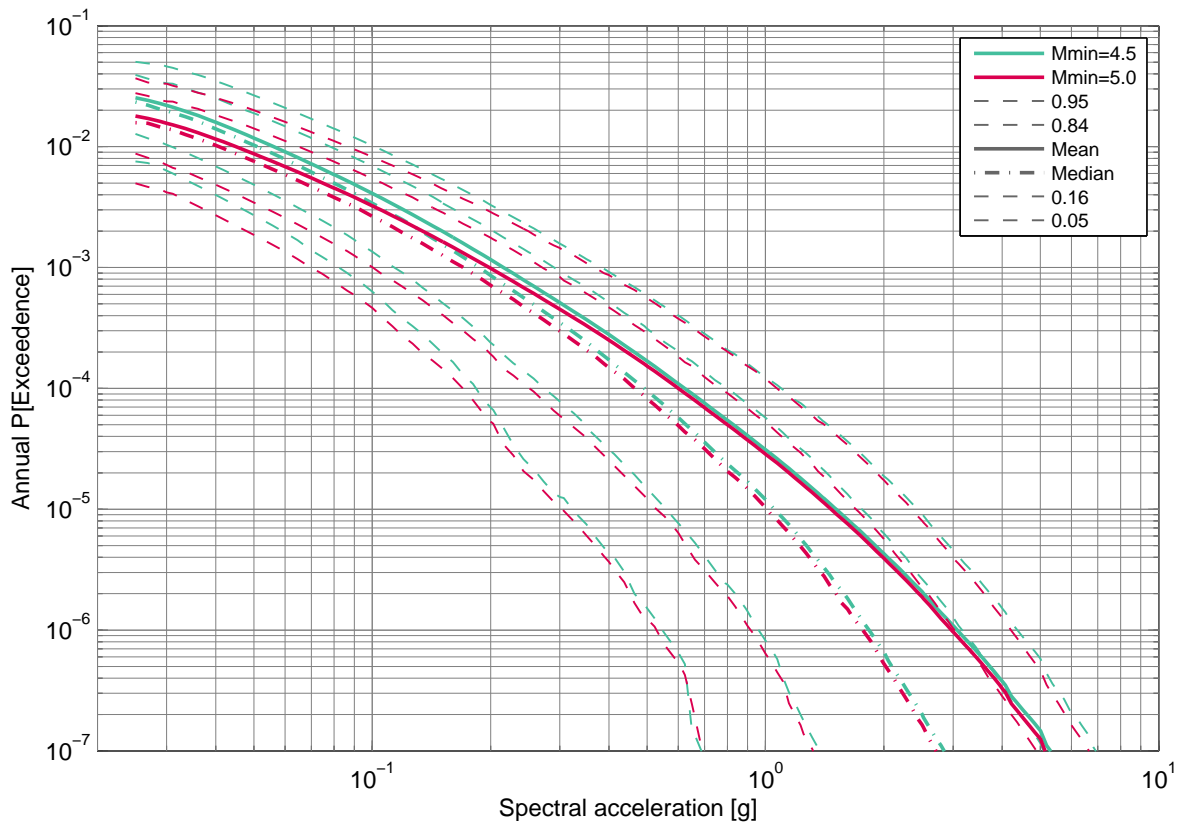


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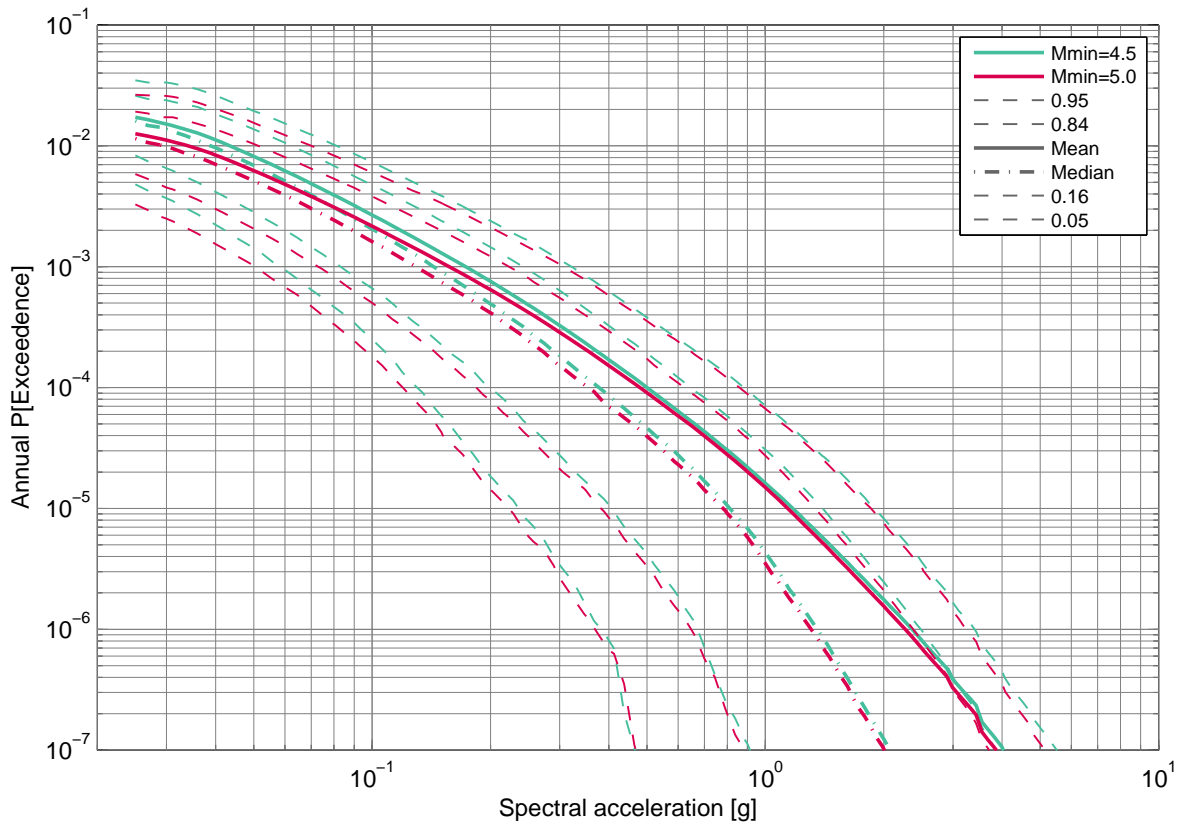


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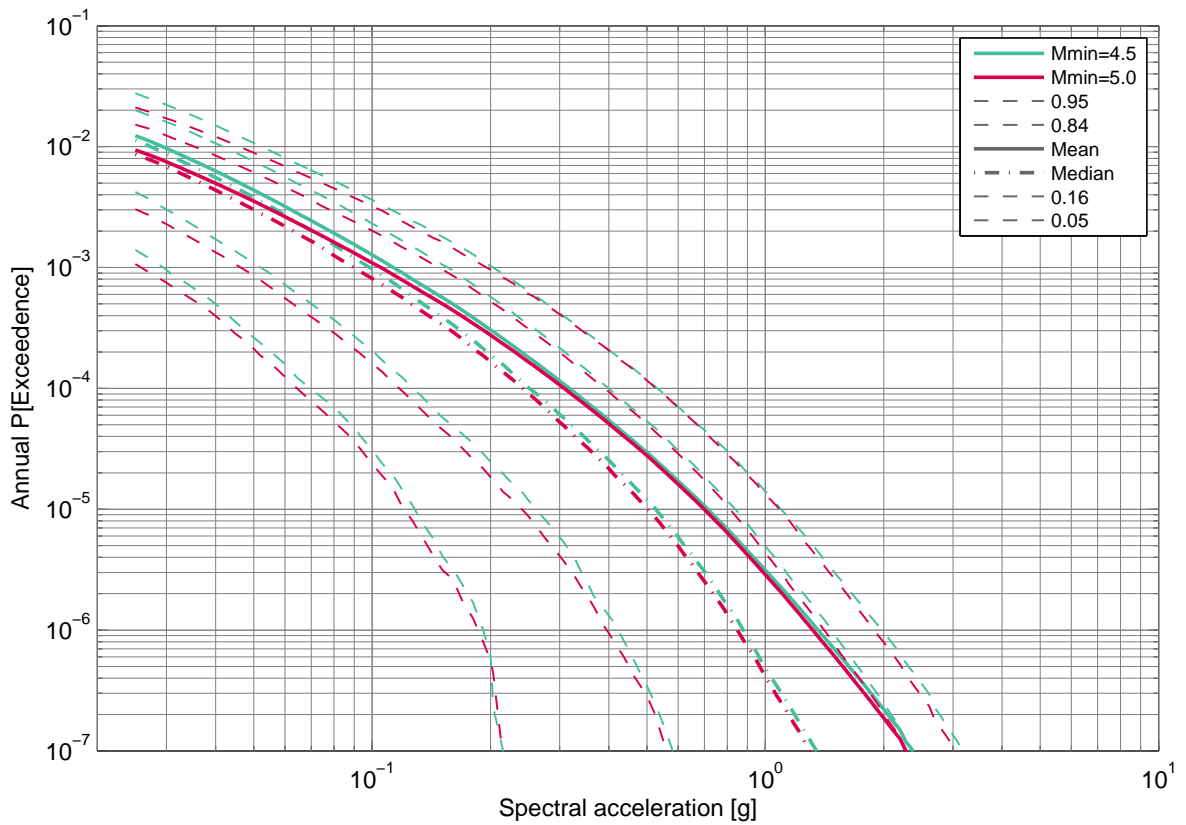


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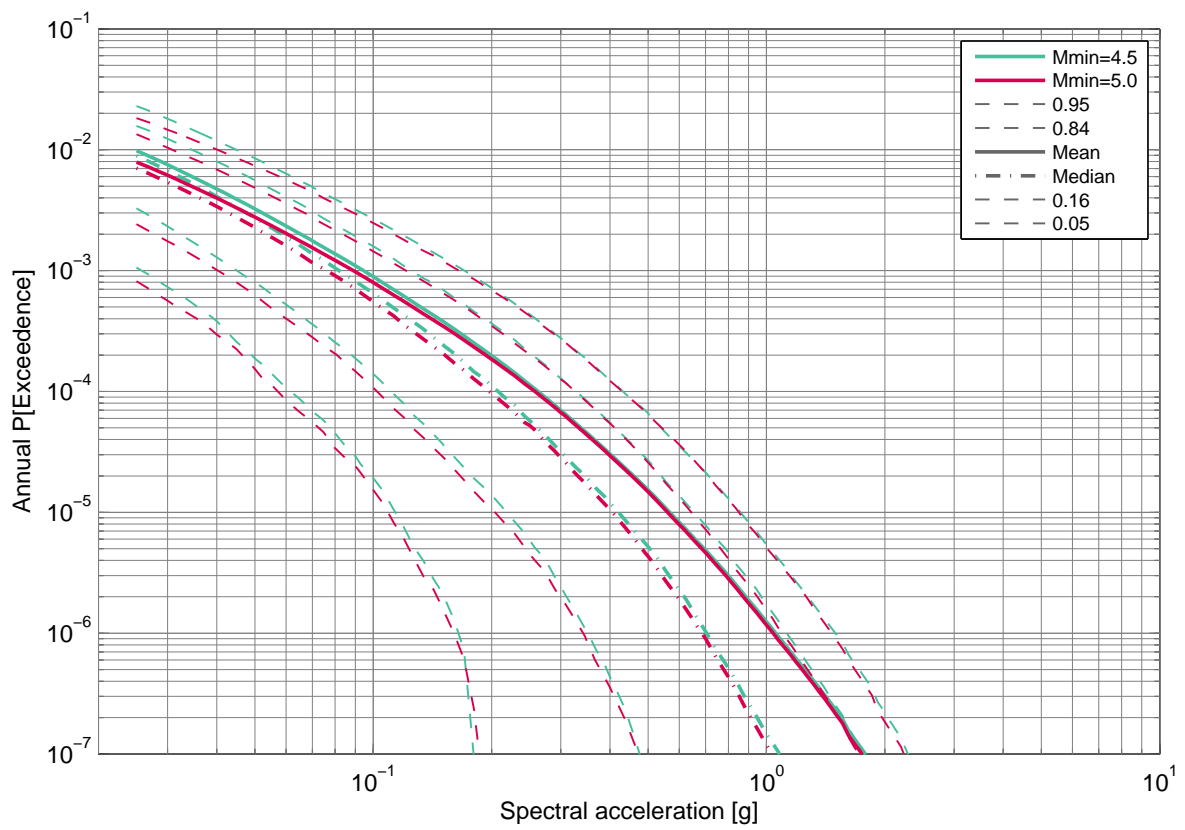


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5.7 Mühleberg, Soil Hazard, Vertical Component, -7 m

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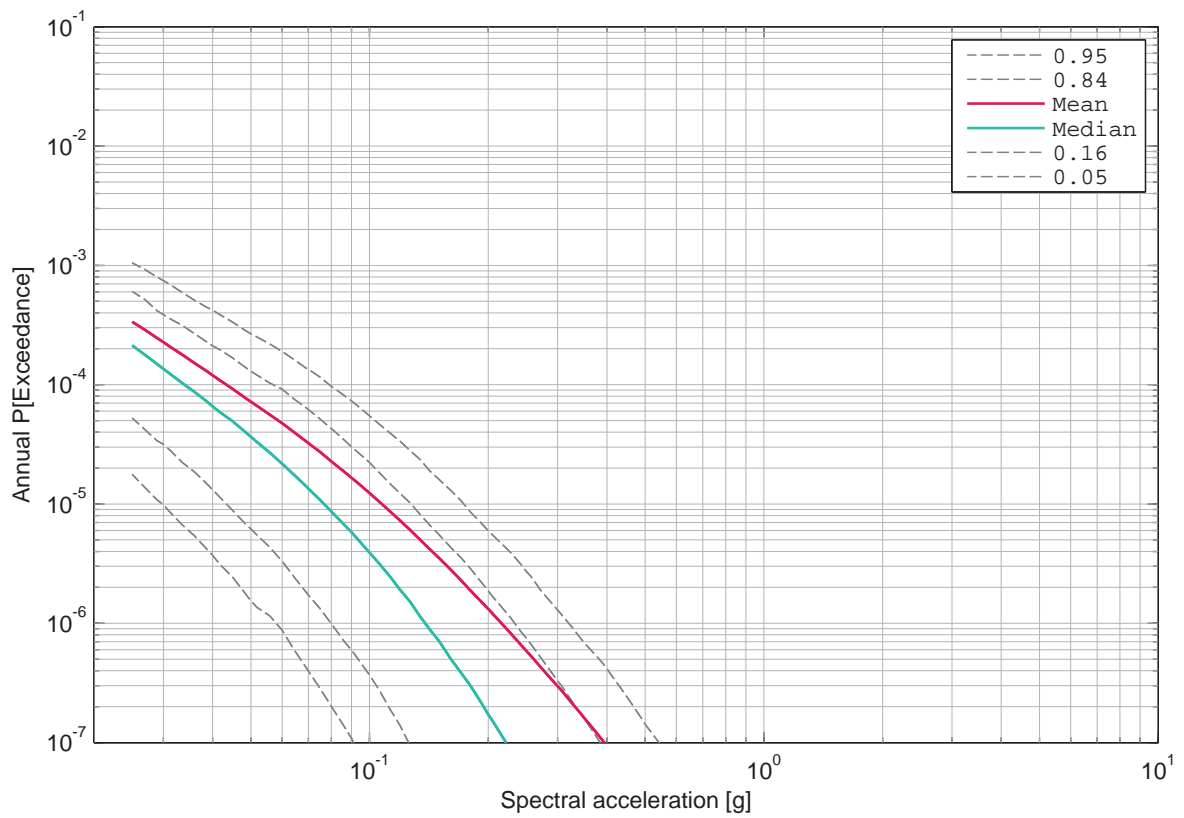


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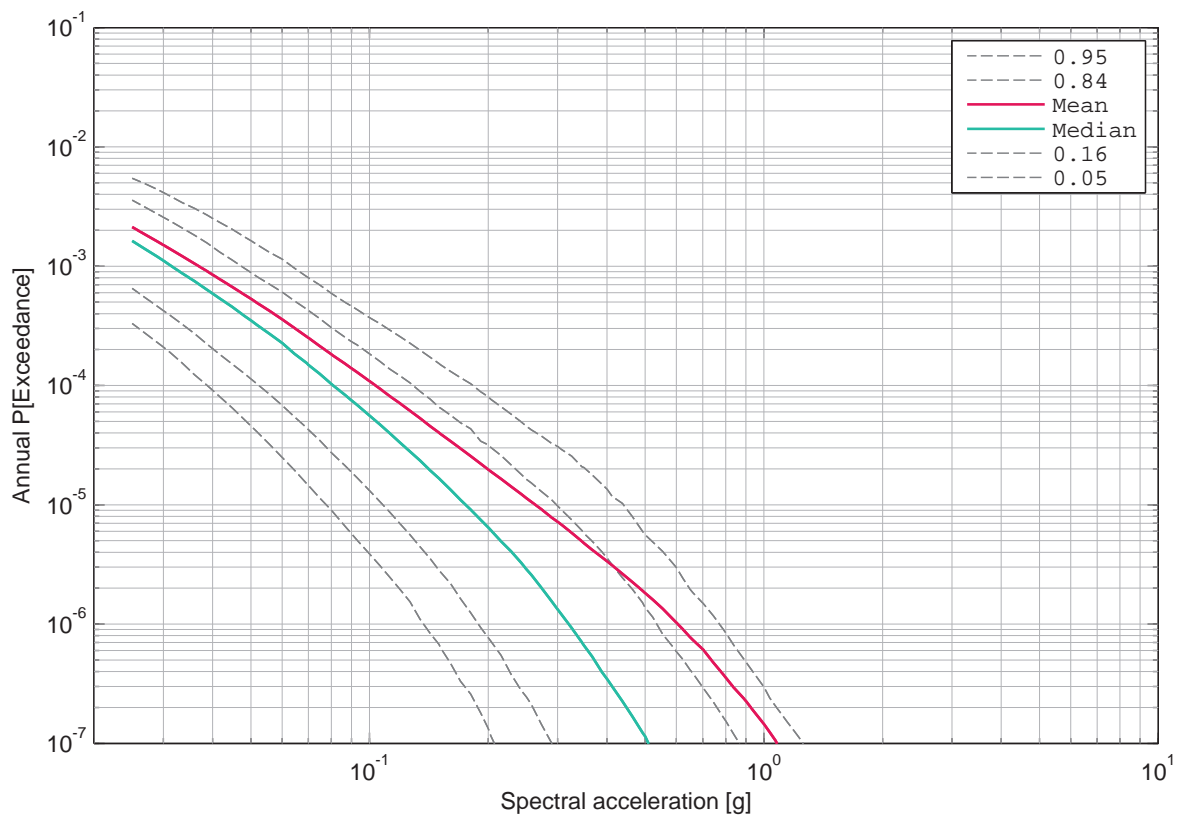


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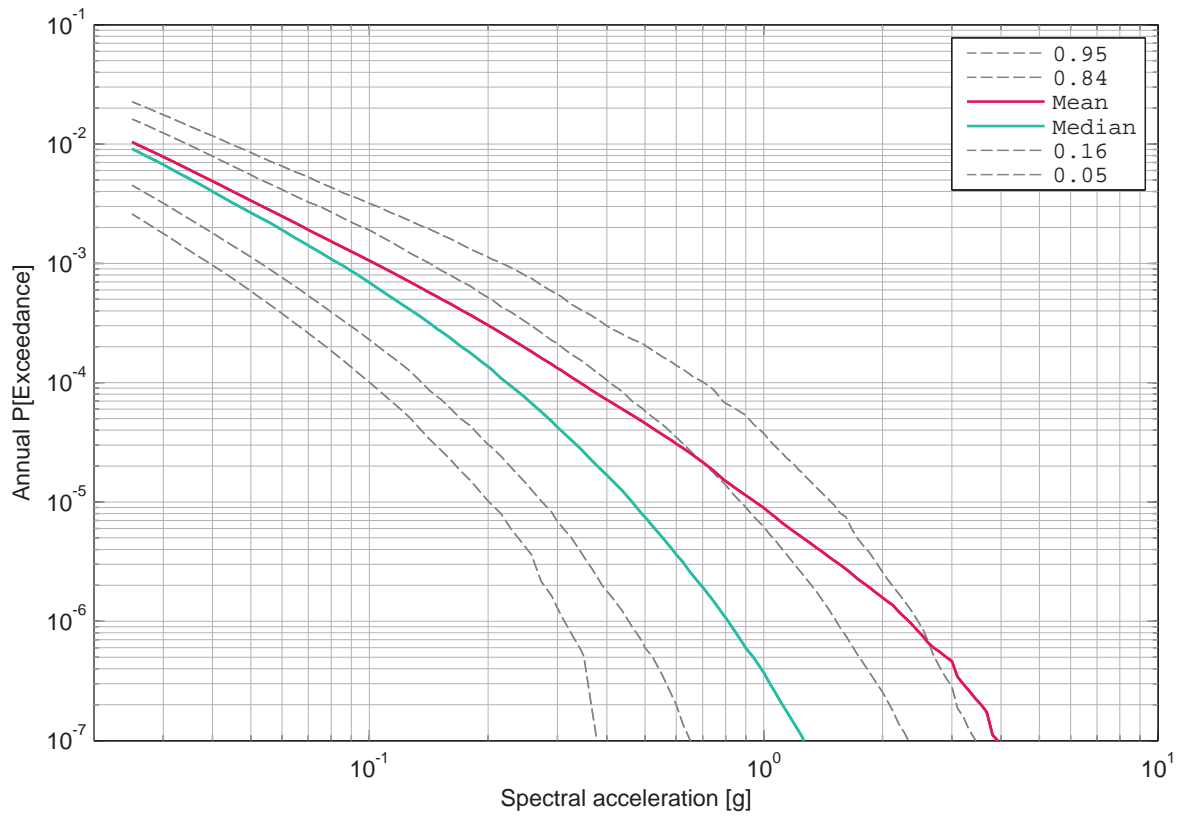


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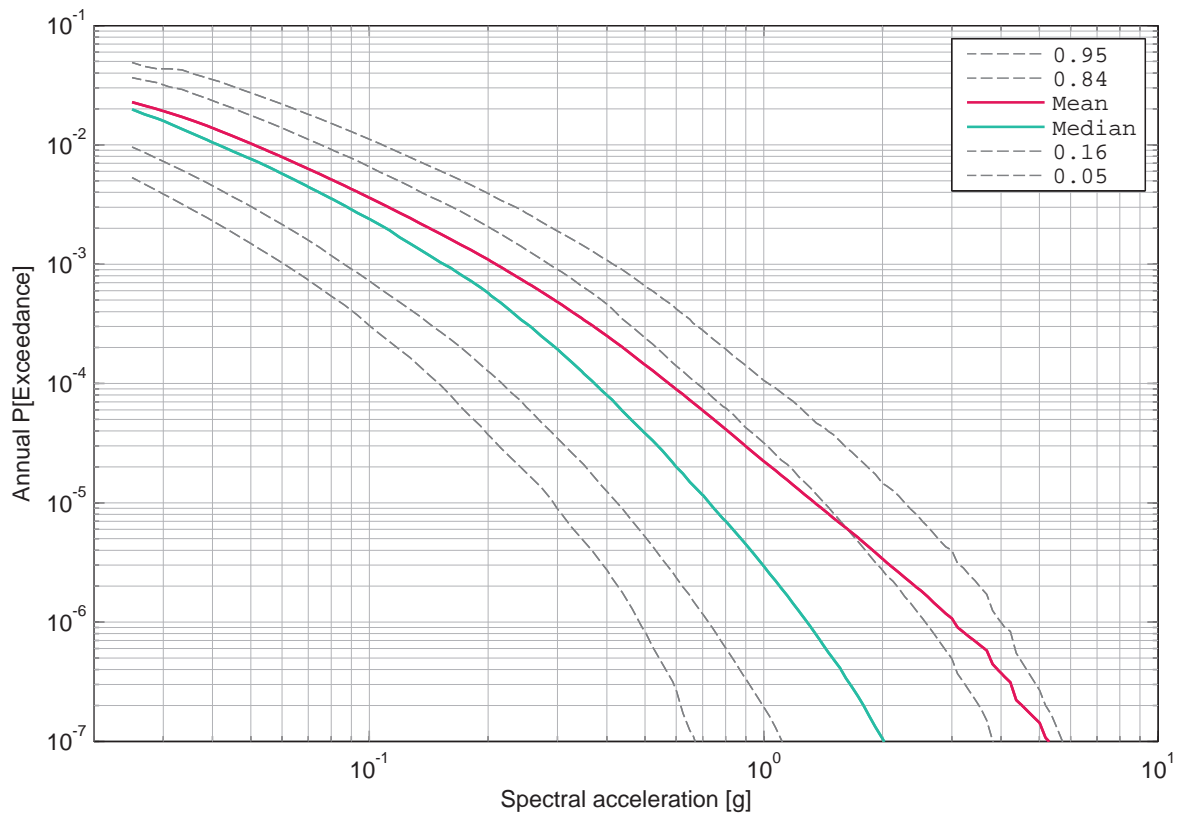


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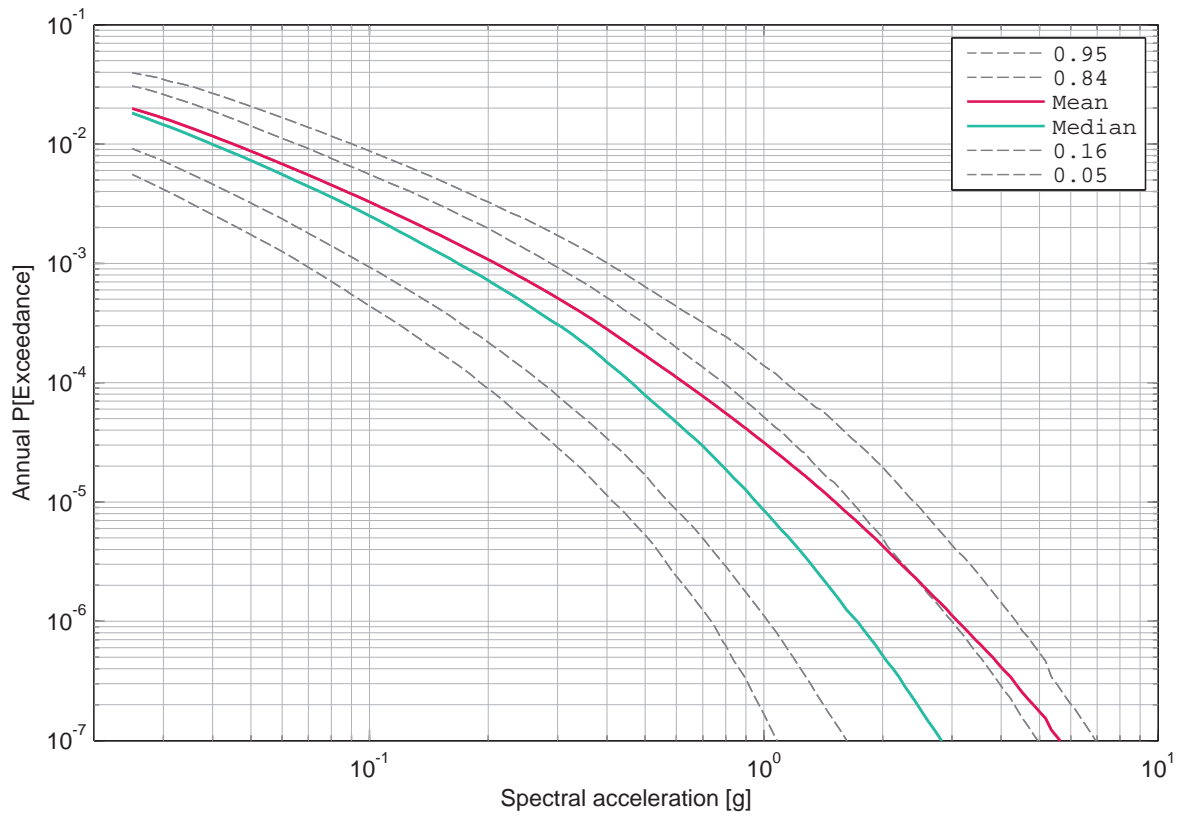


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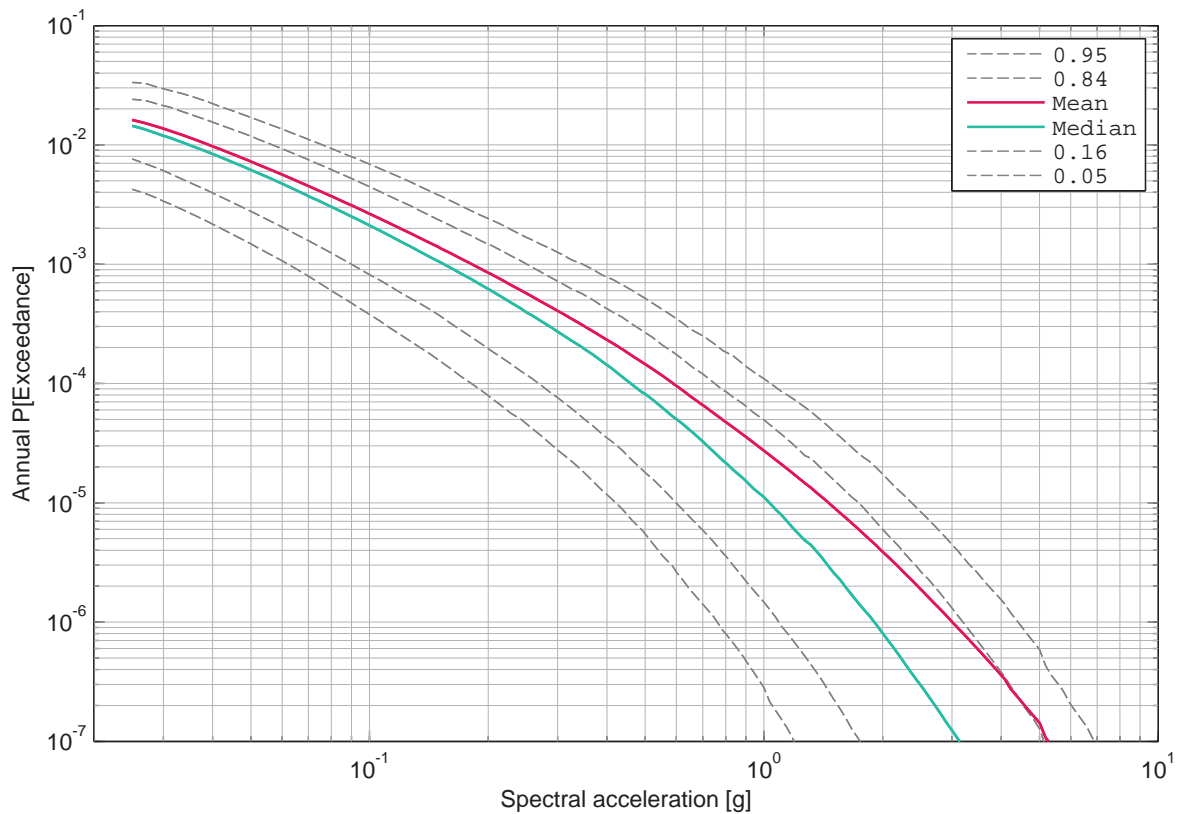


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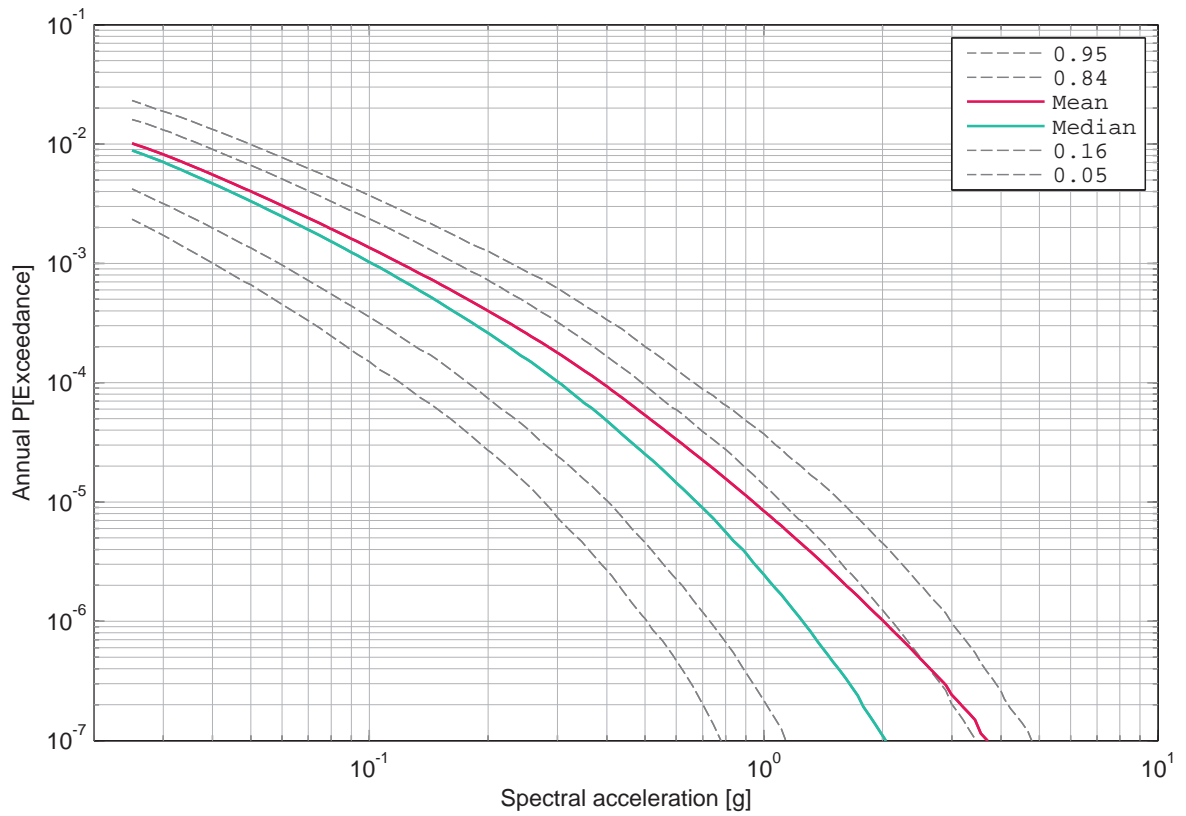


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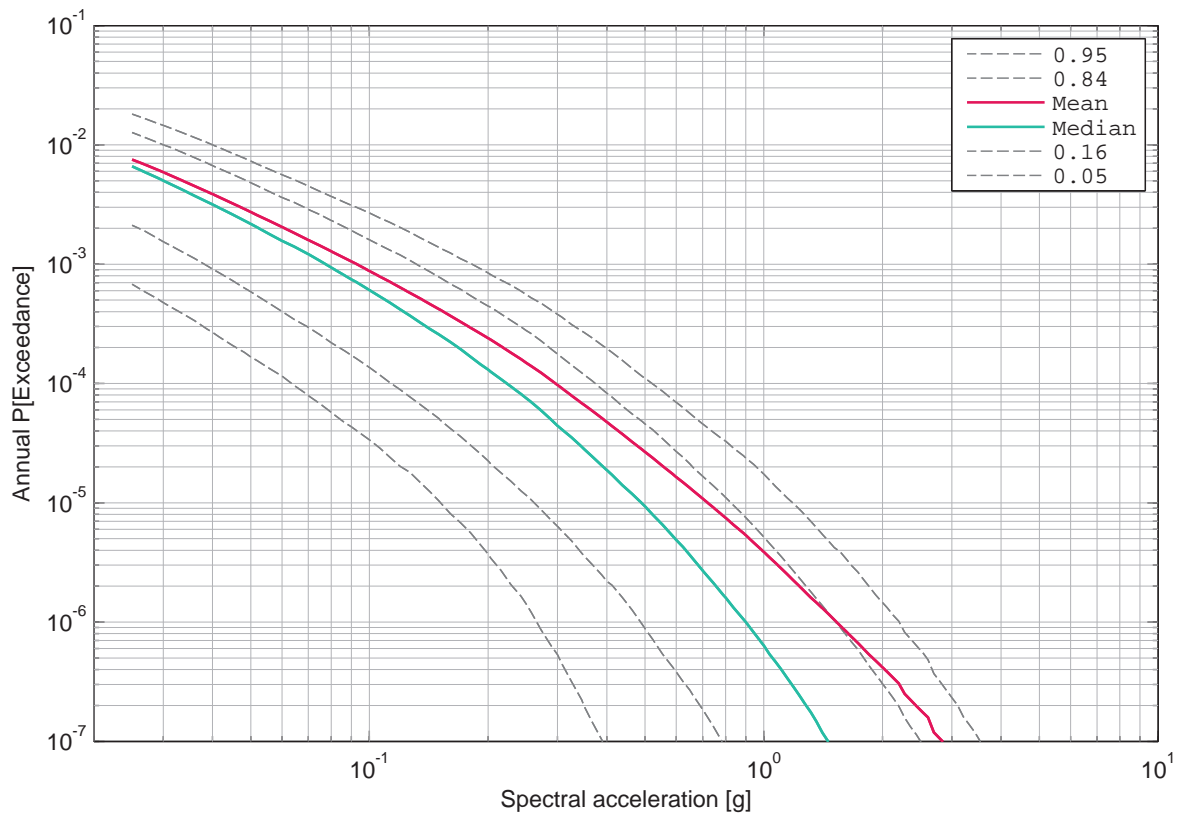


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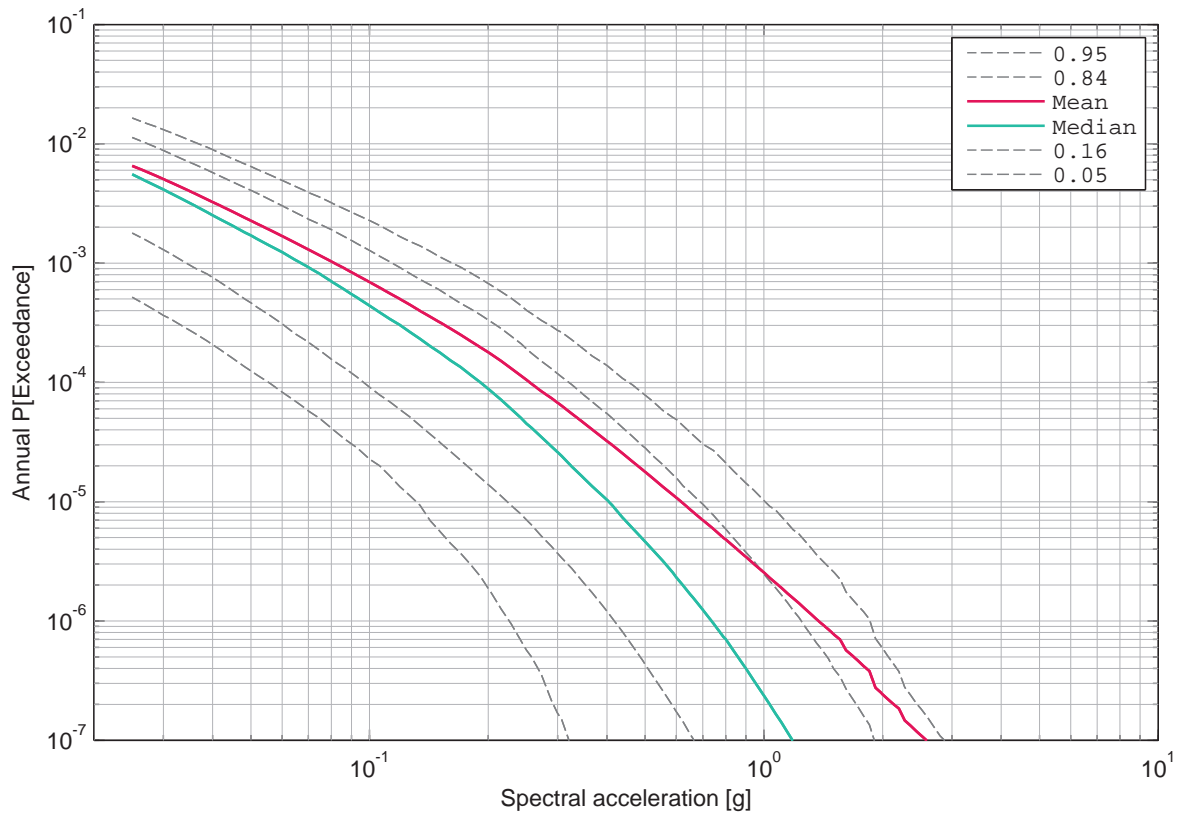


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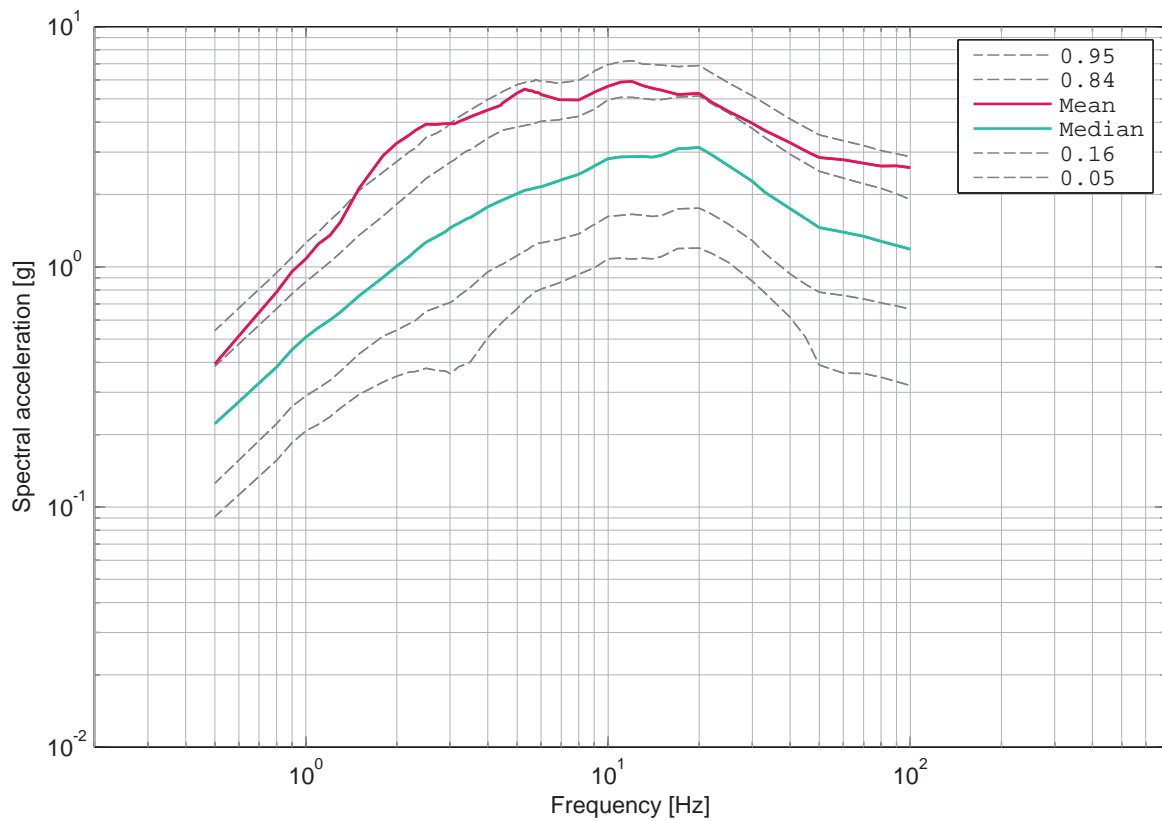


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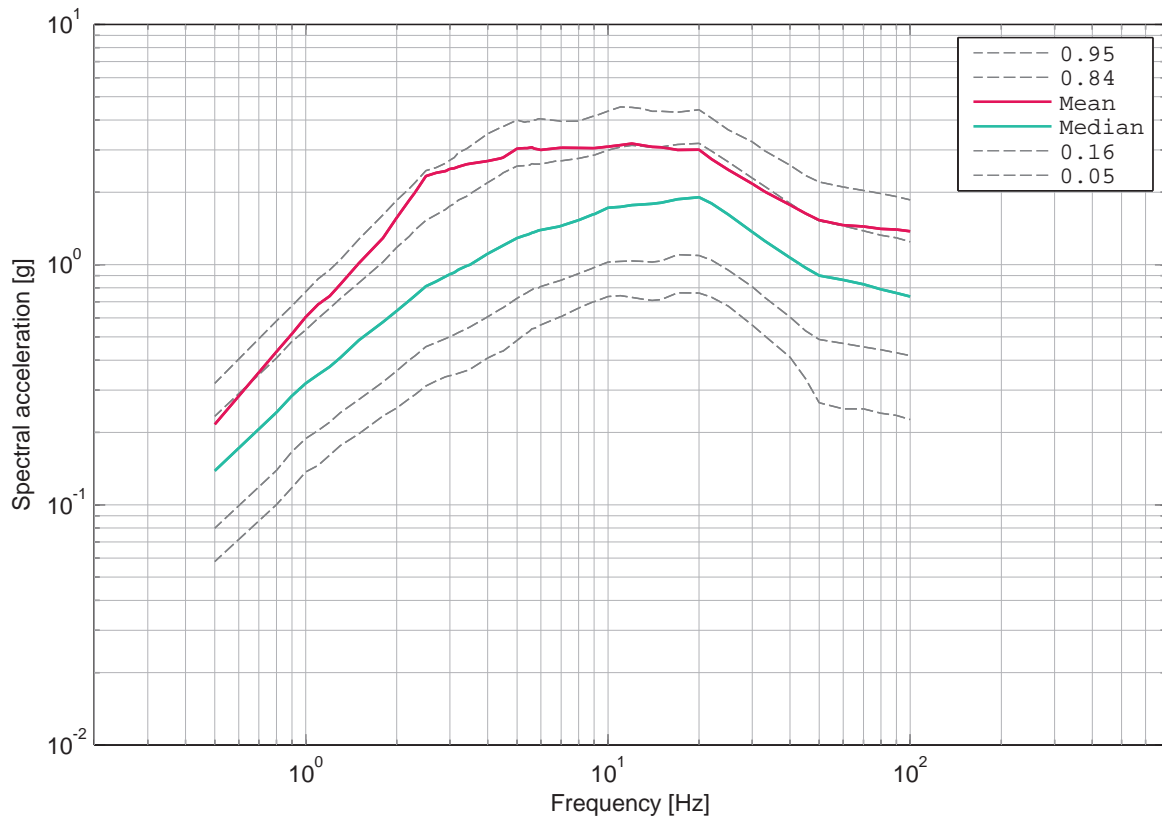


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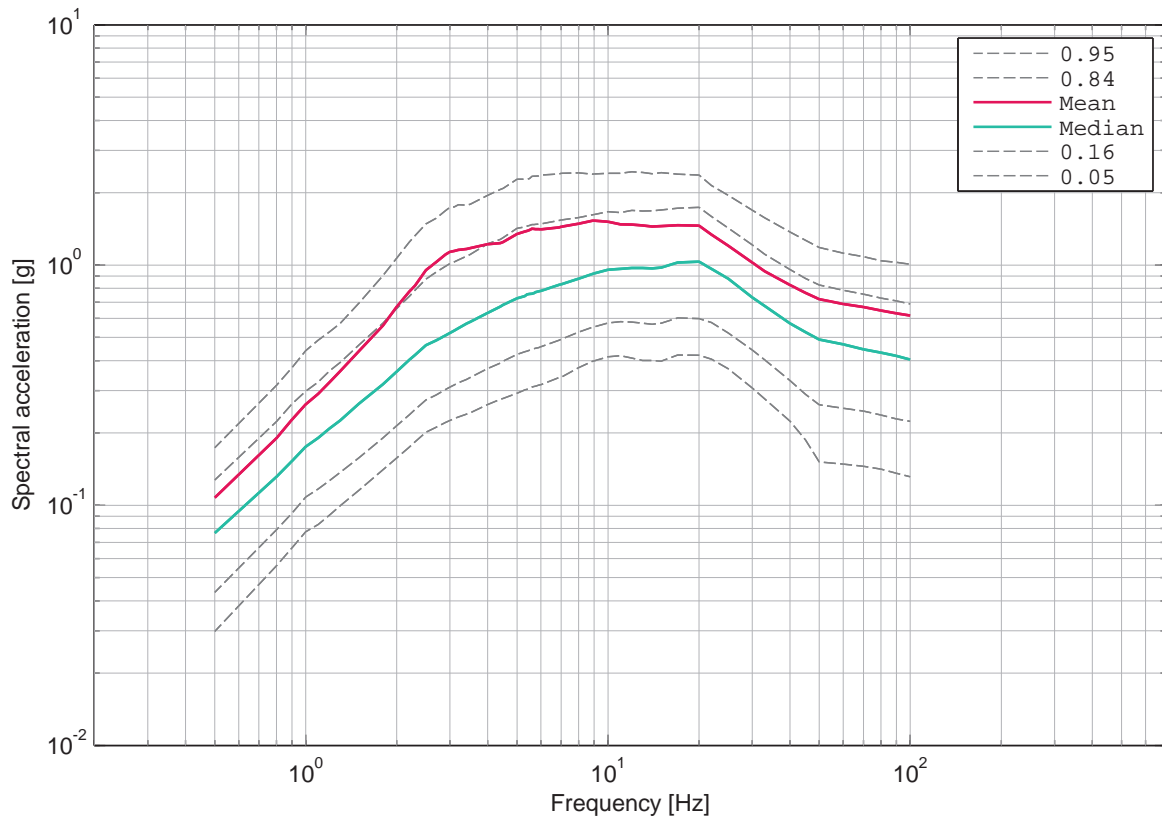


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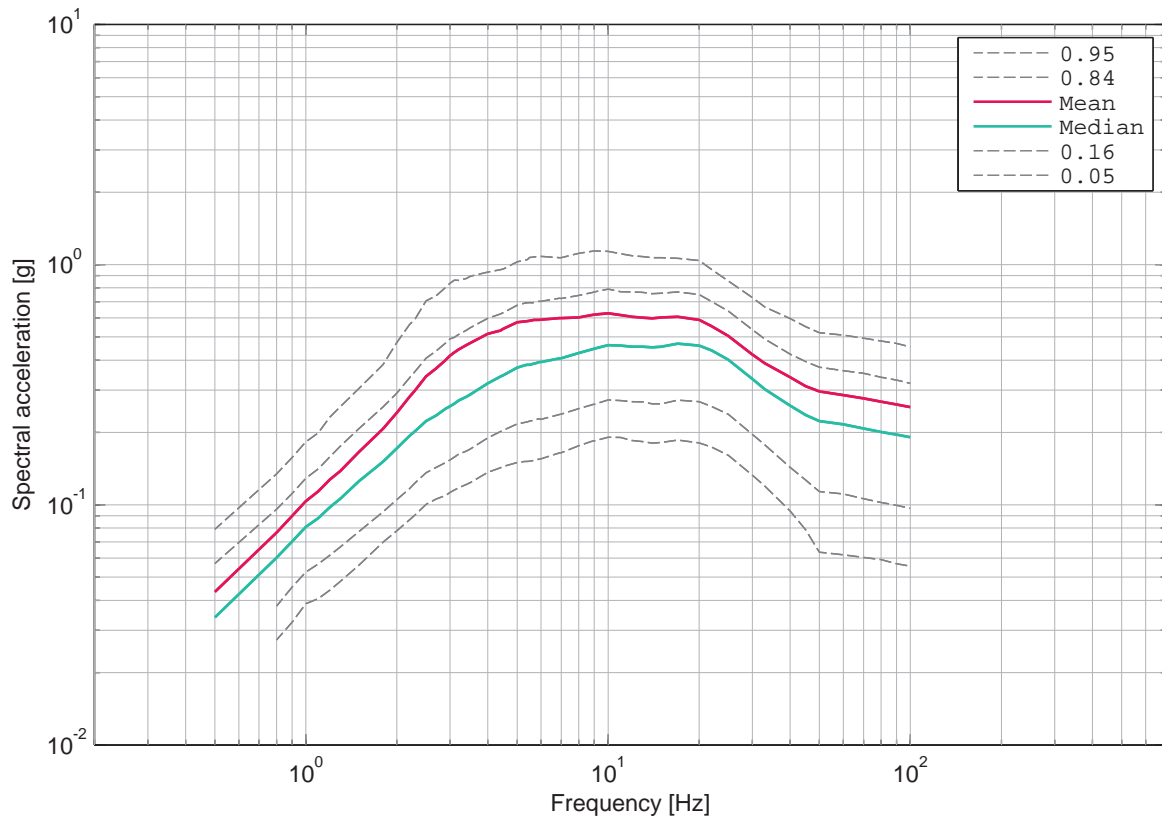


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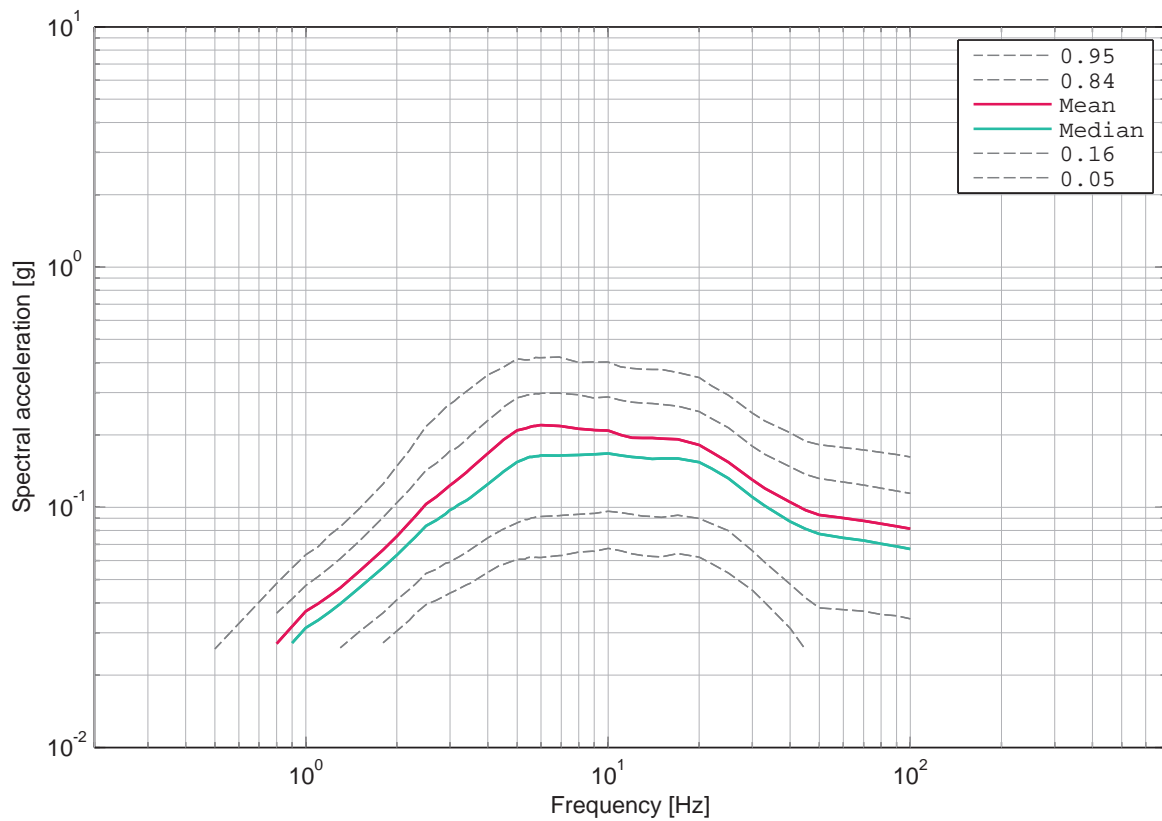


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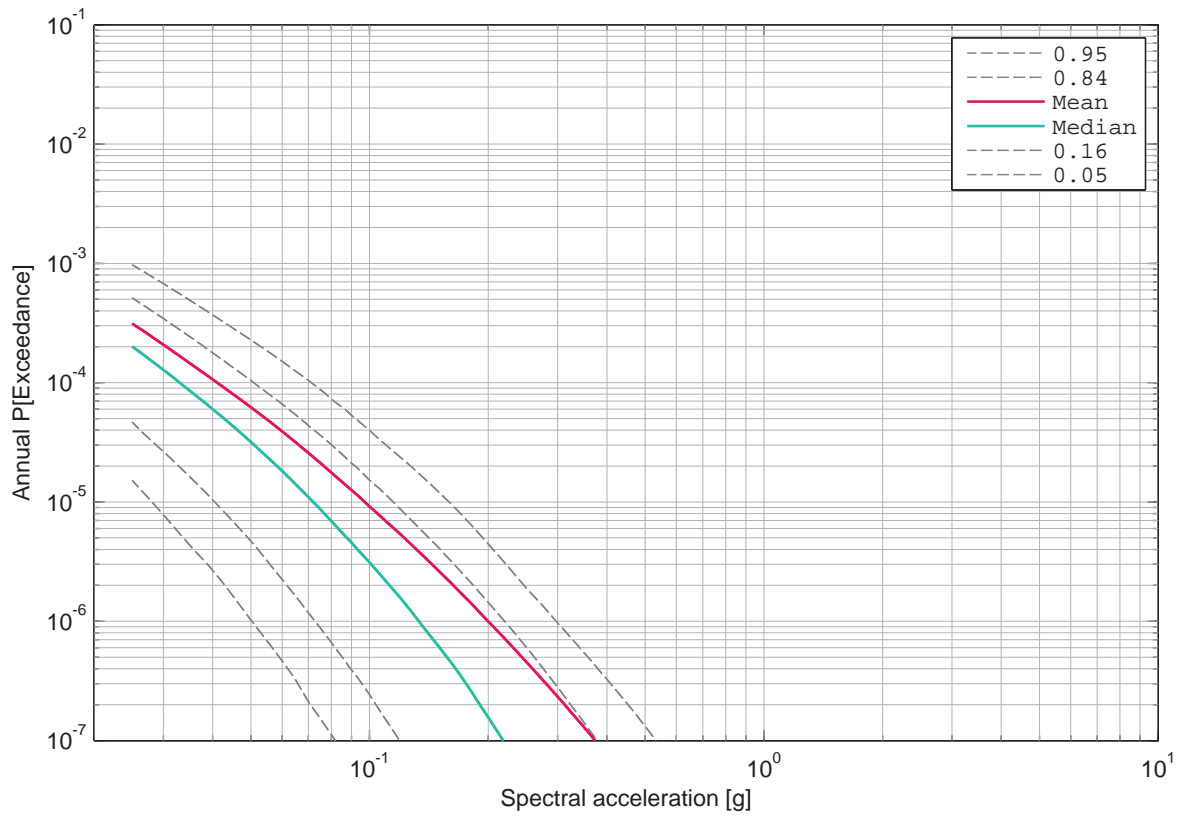


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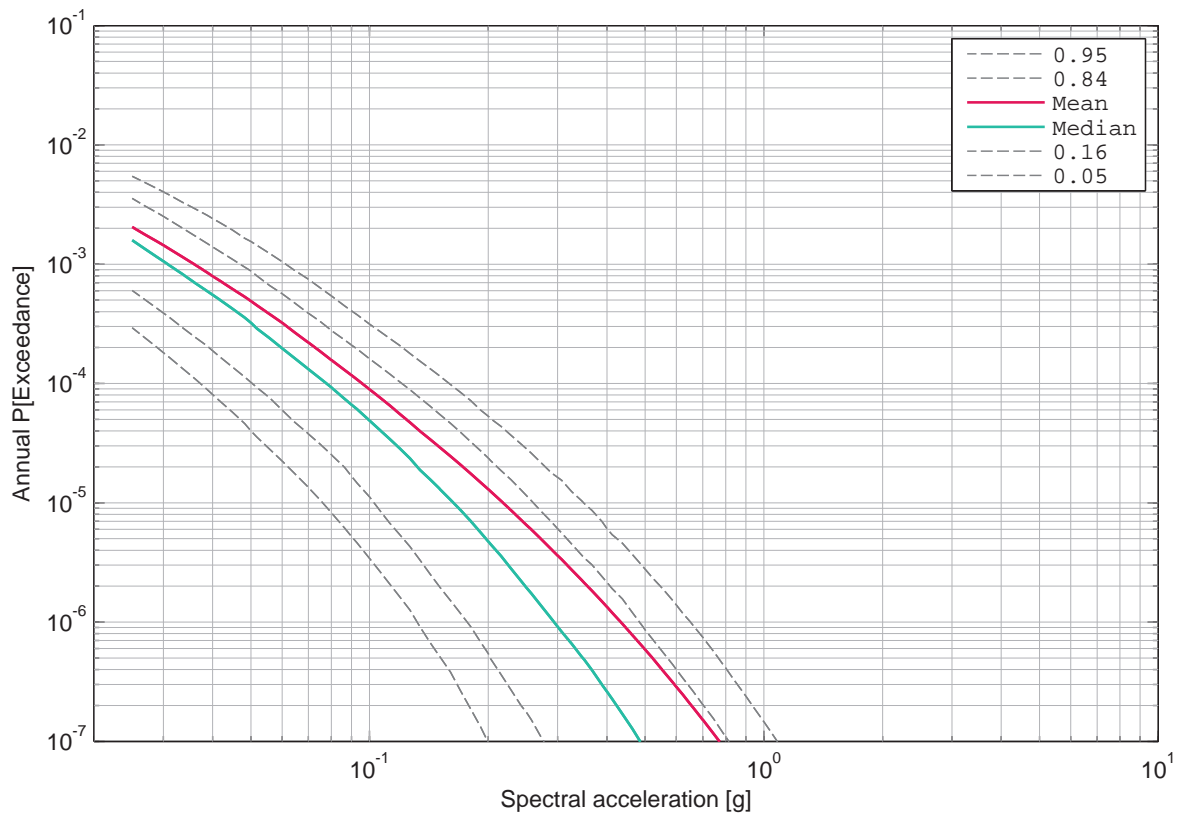


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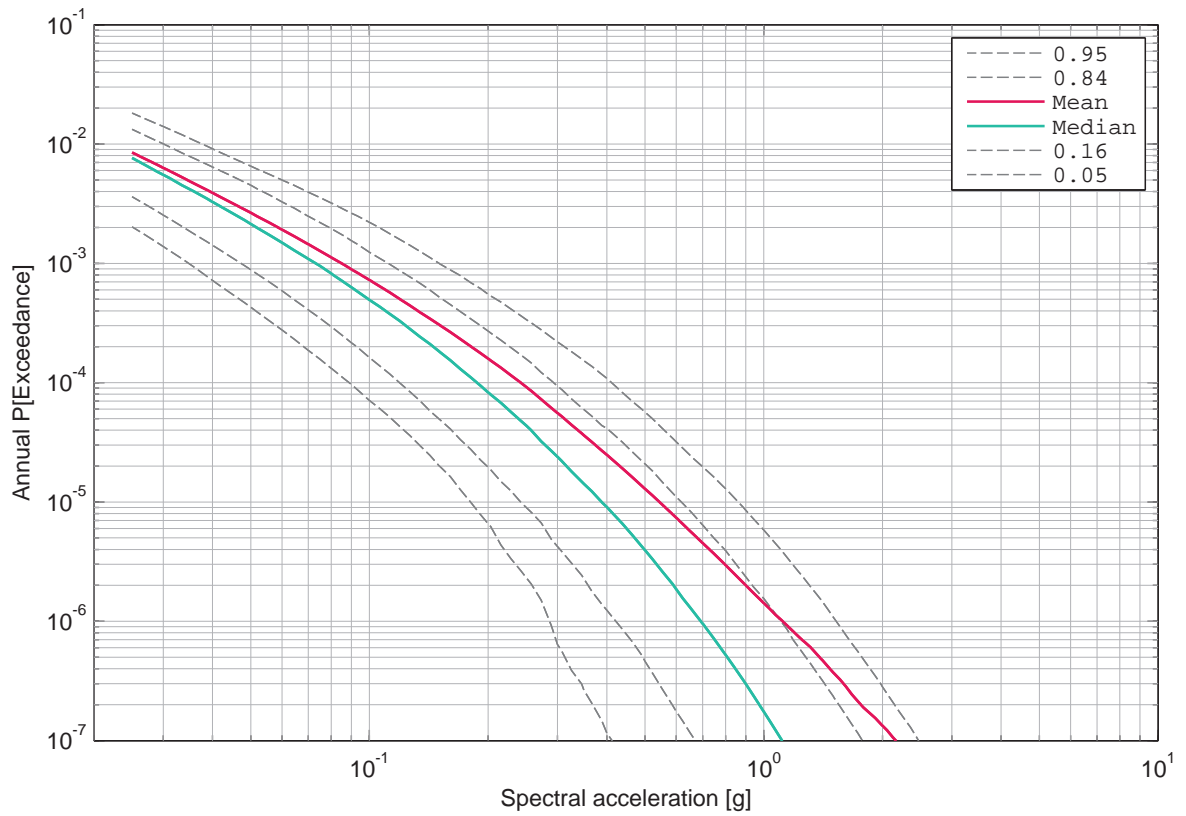


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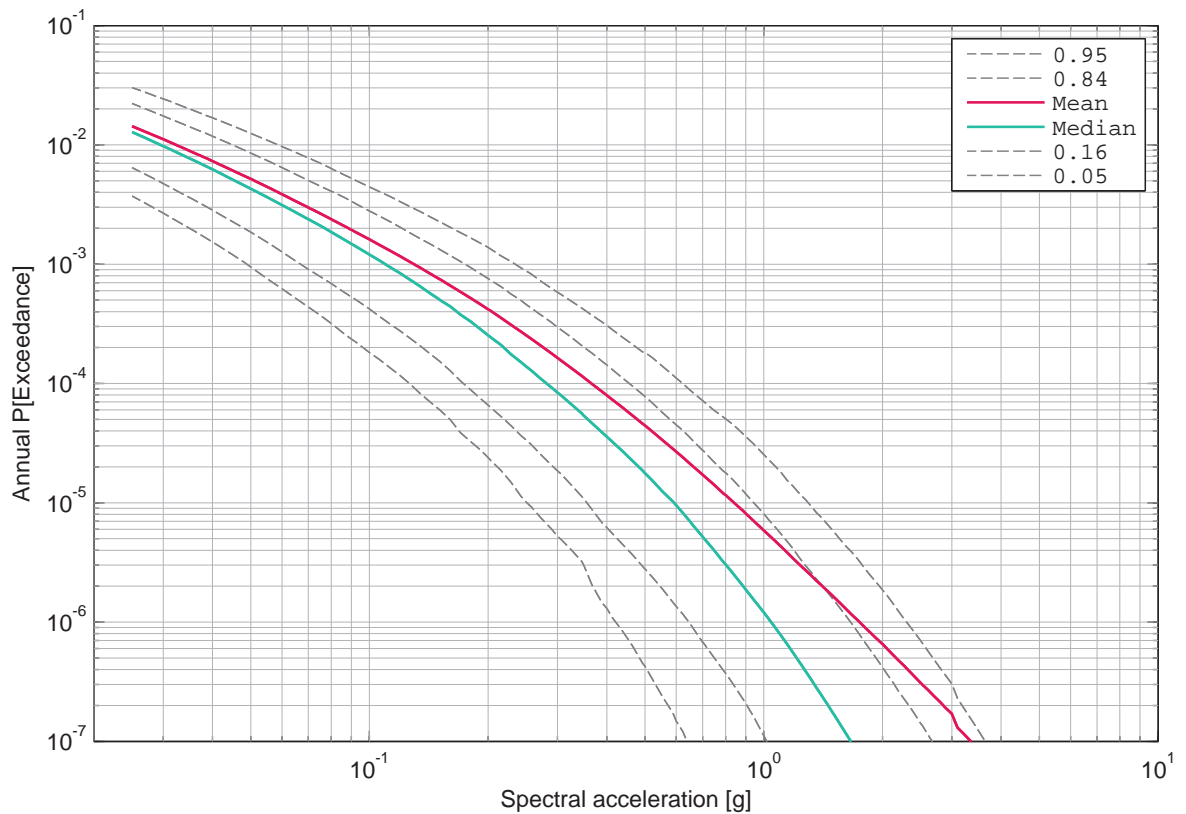


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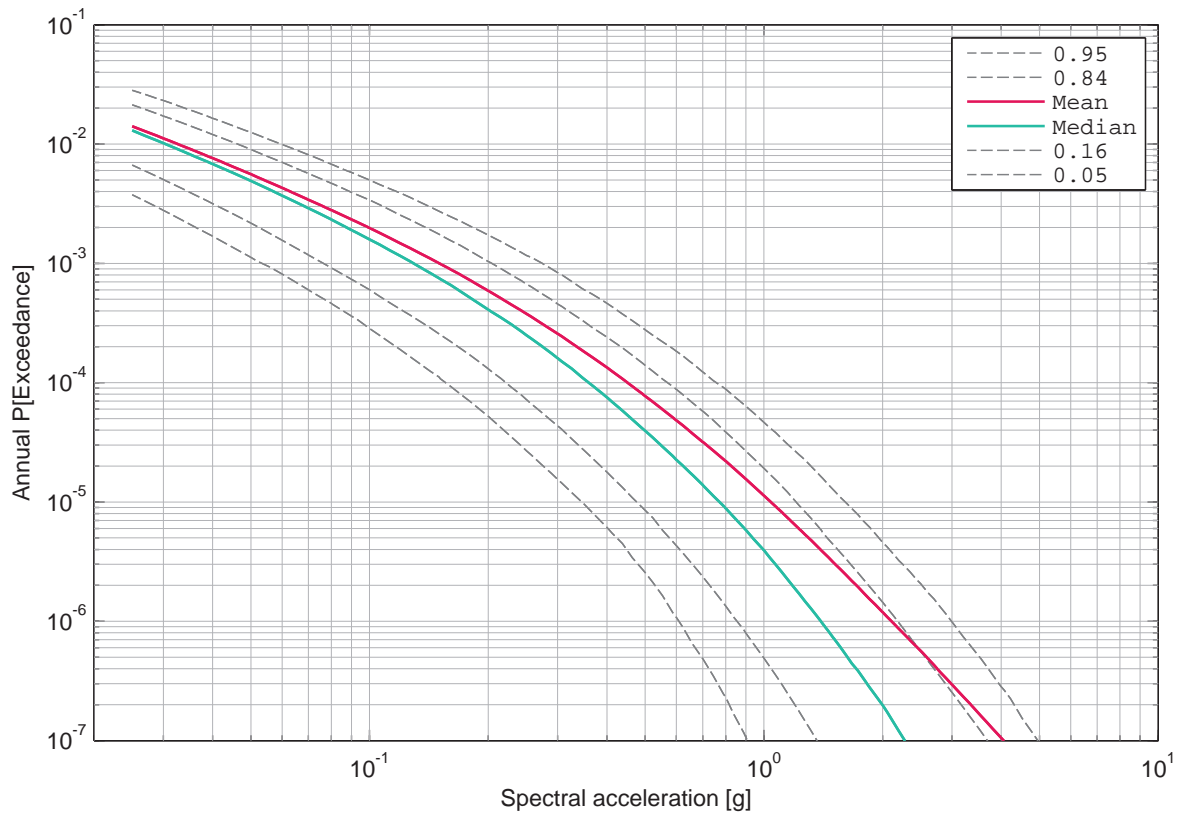


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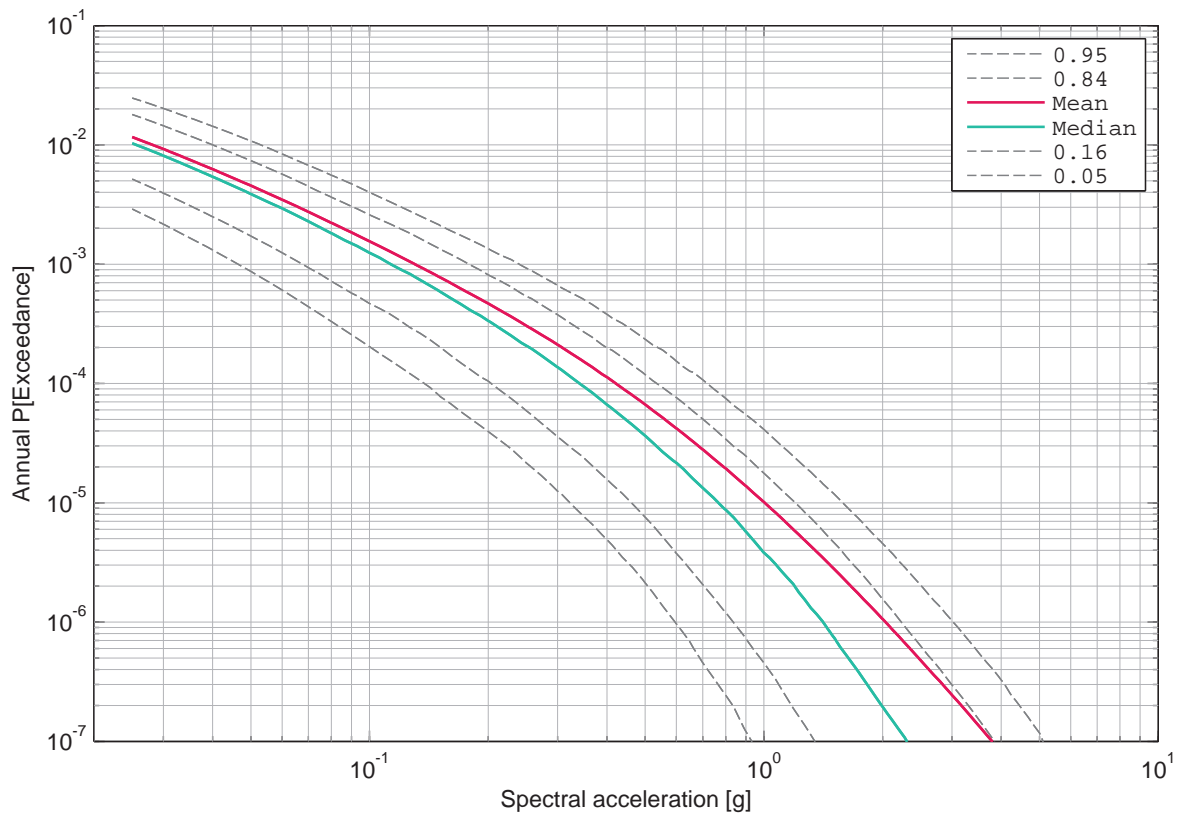


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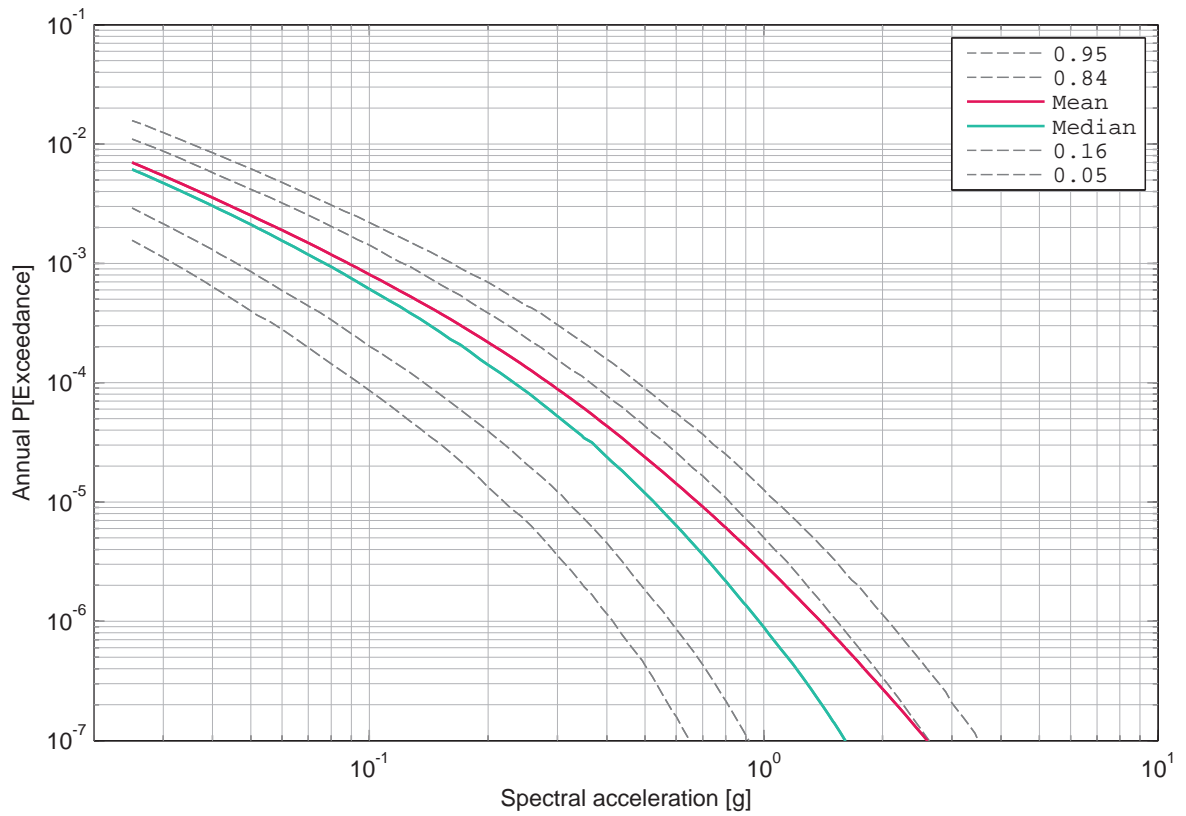


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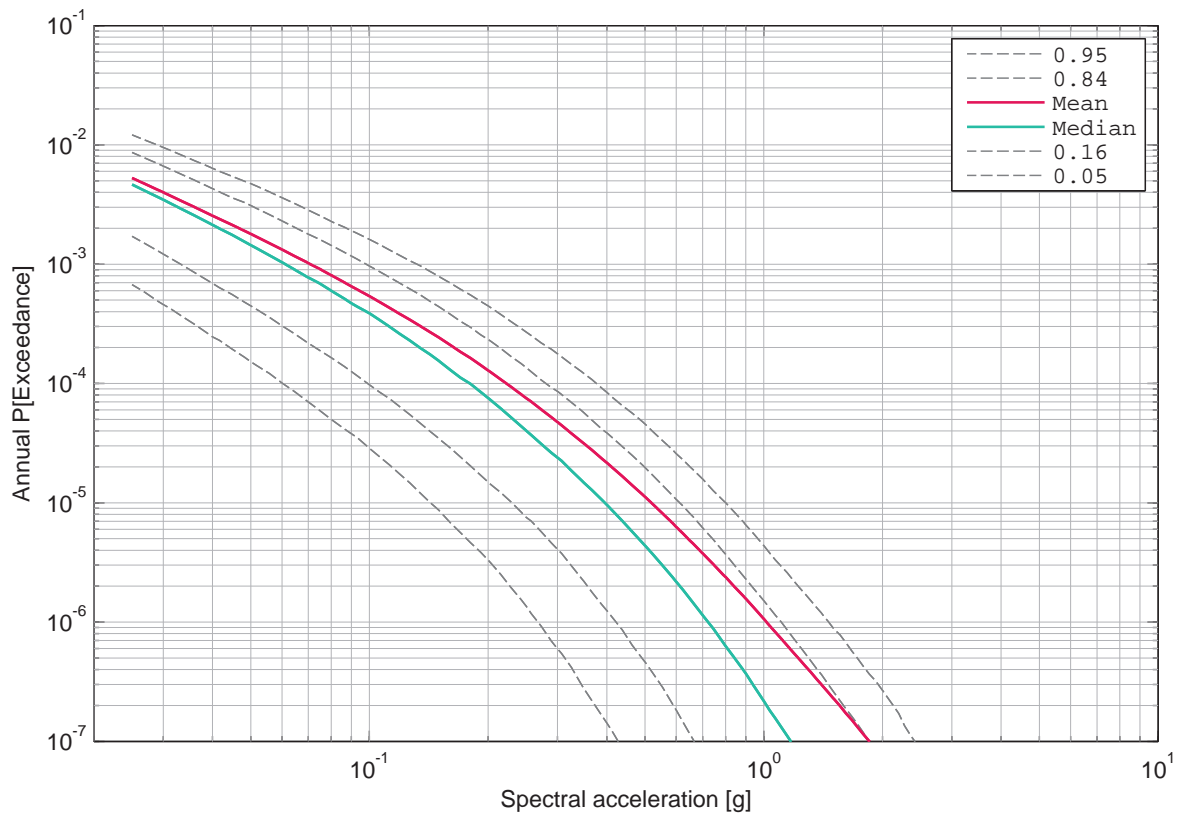


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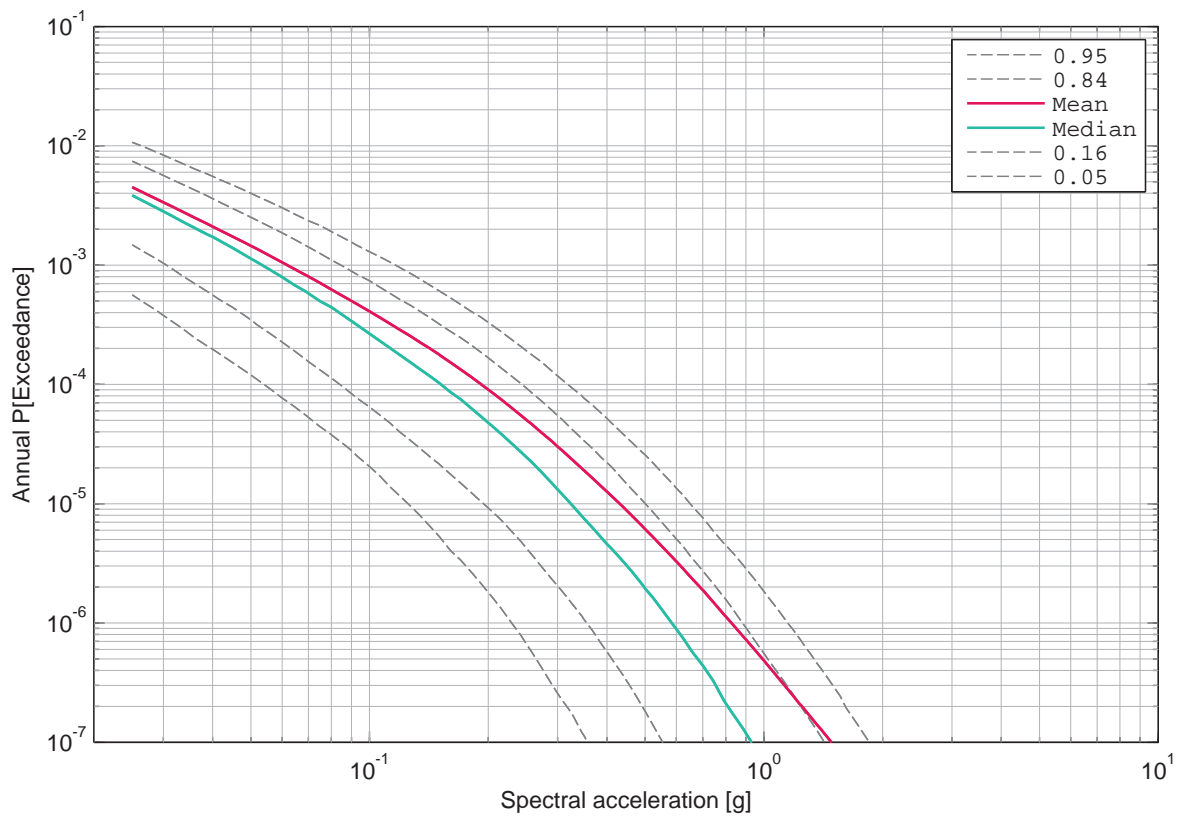


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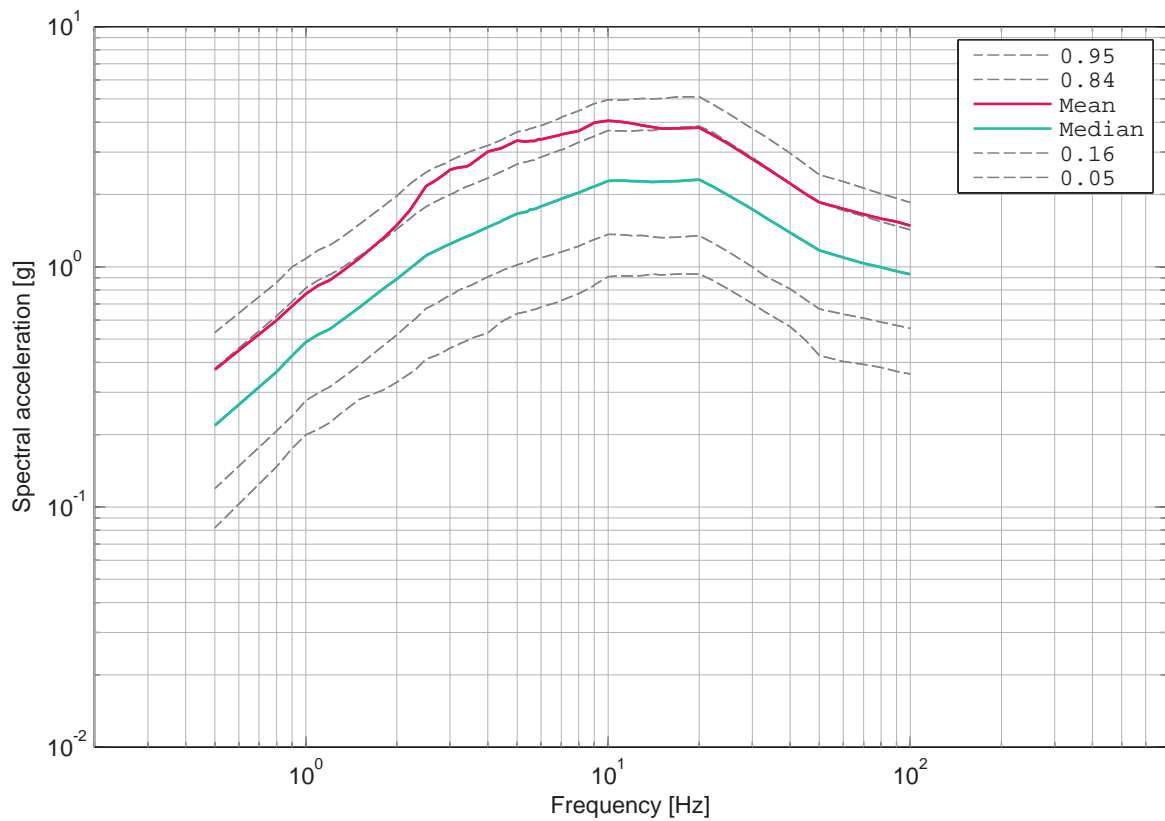


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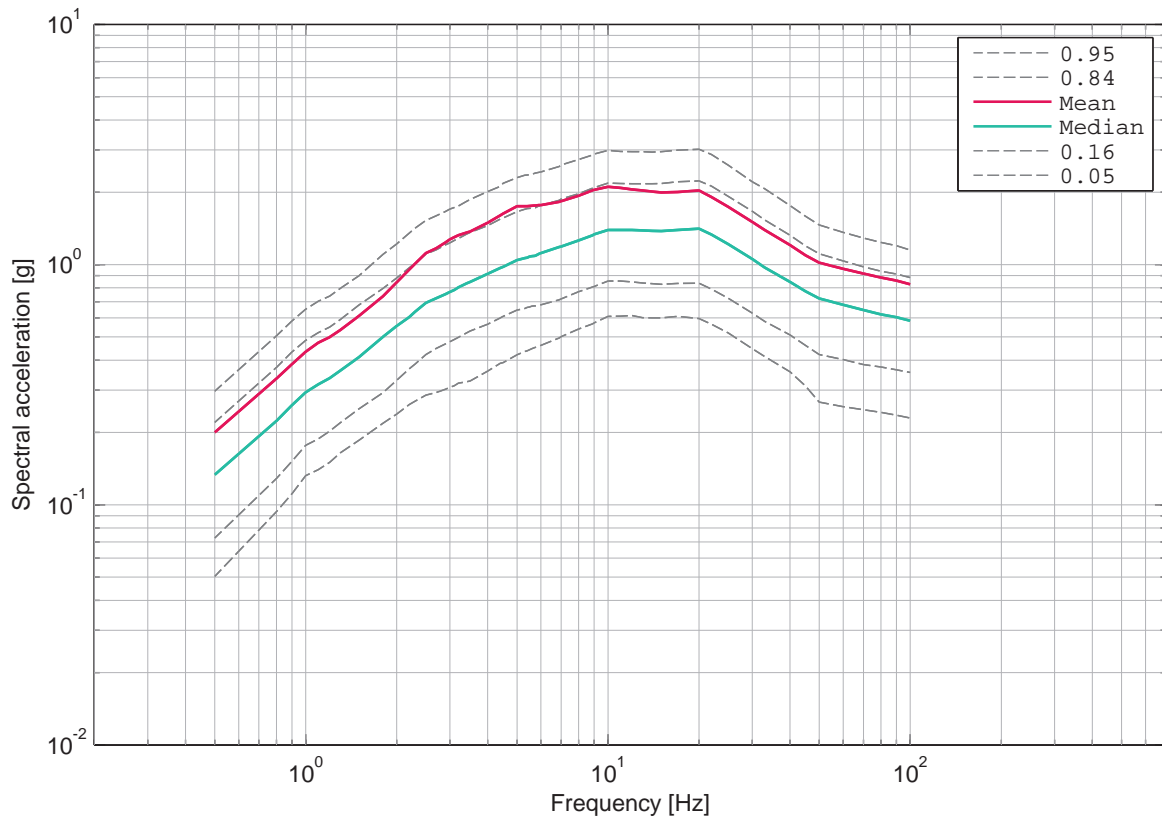


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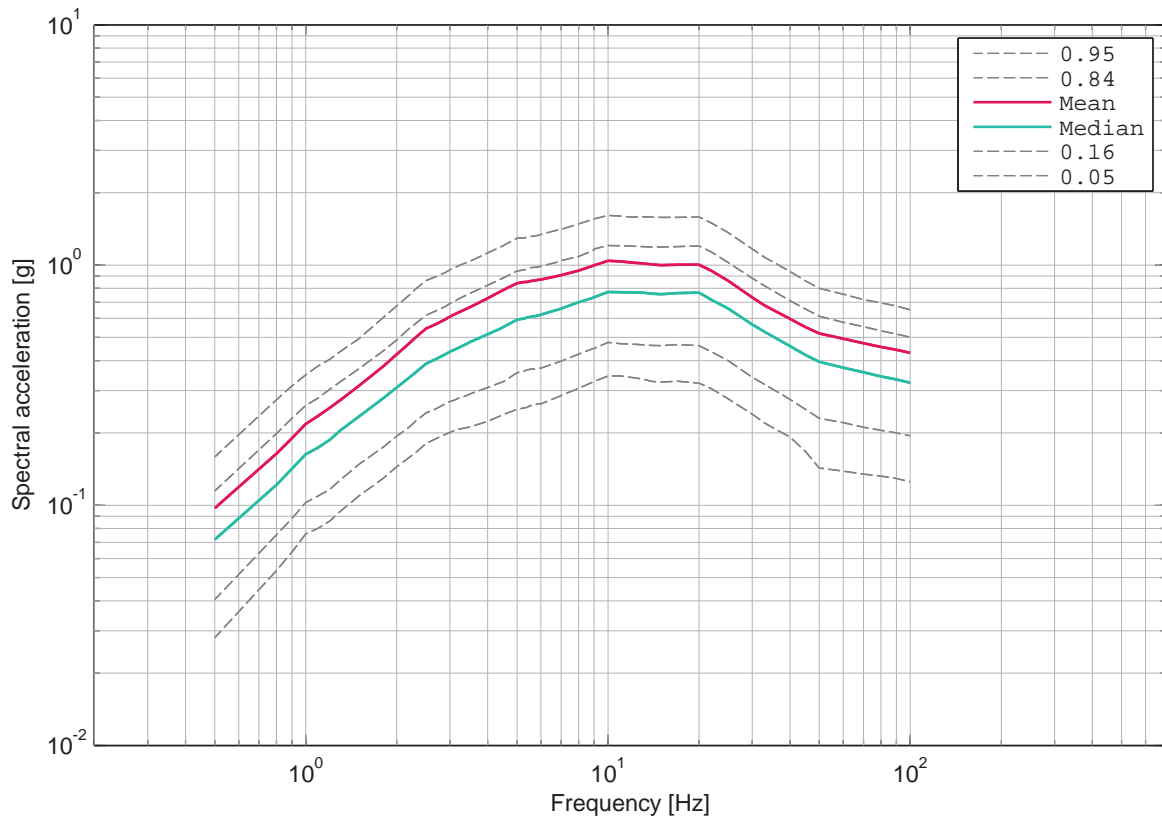


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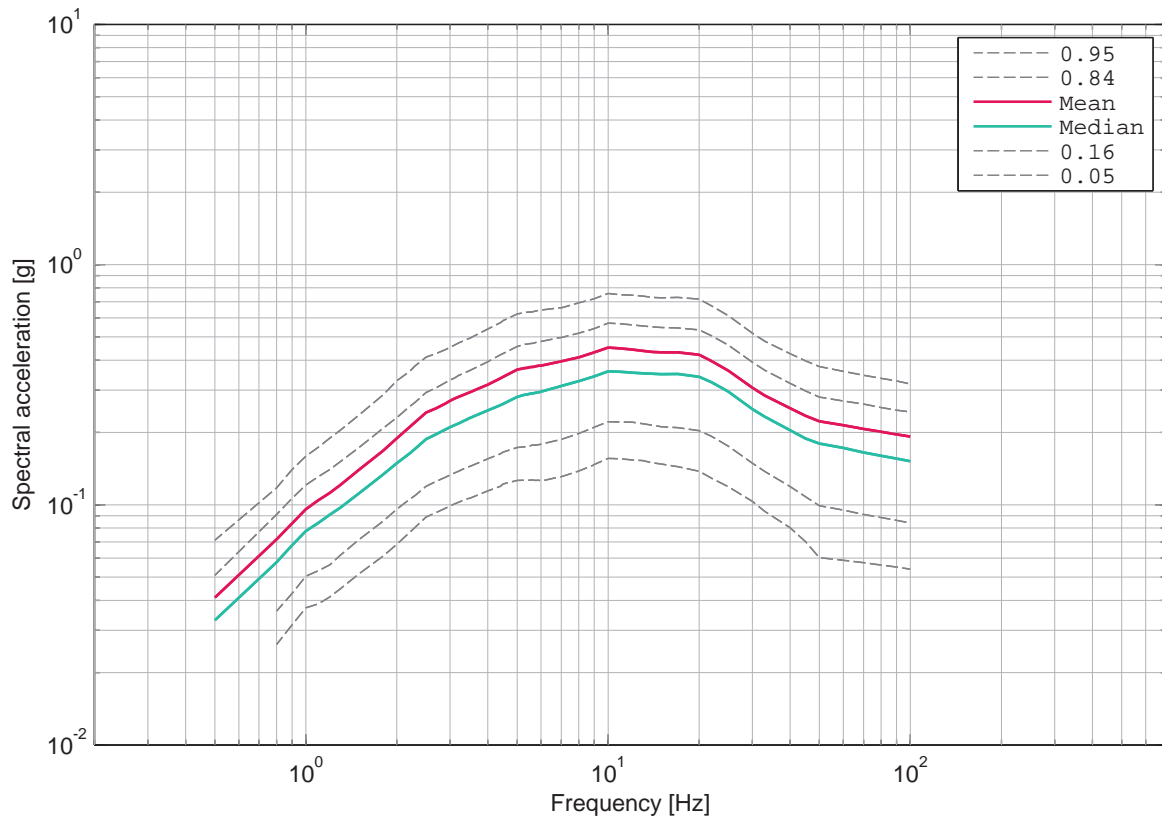


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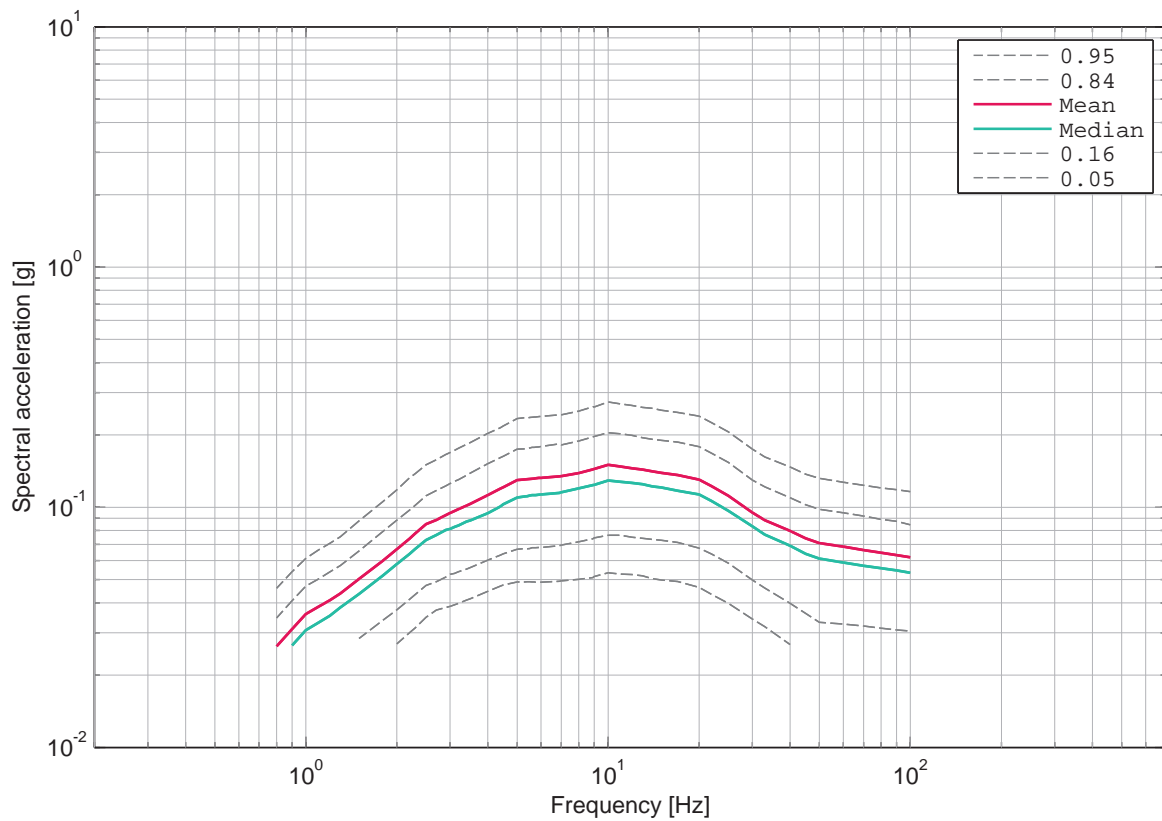


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