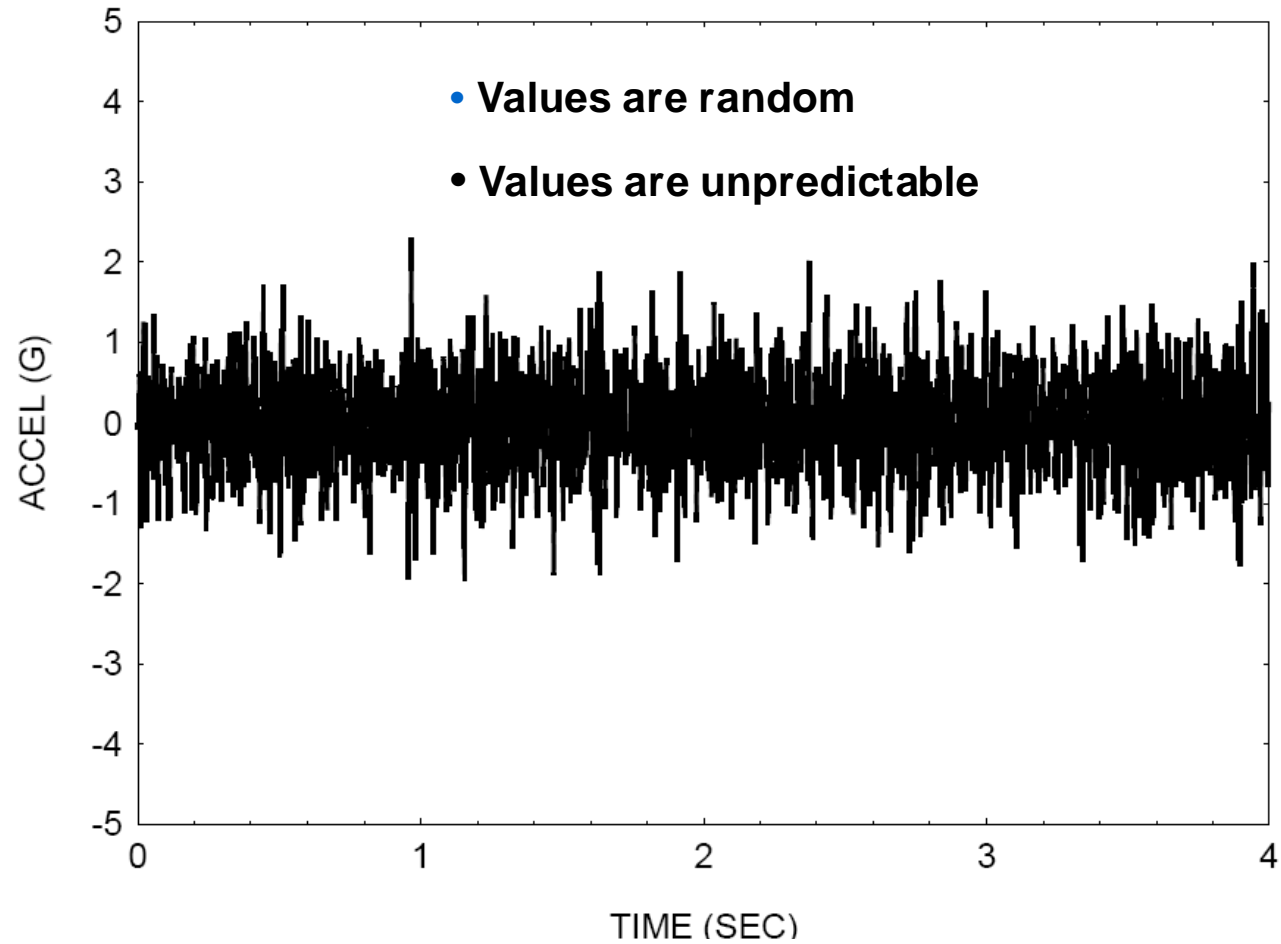
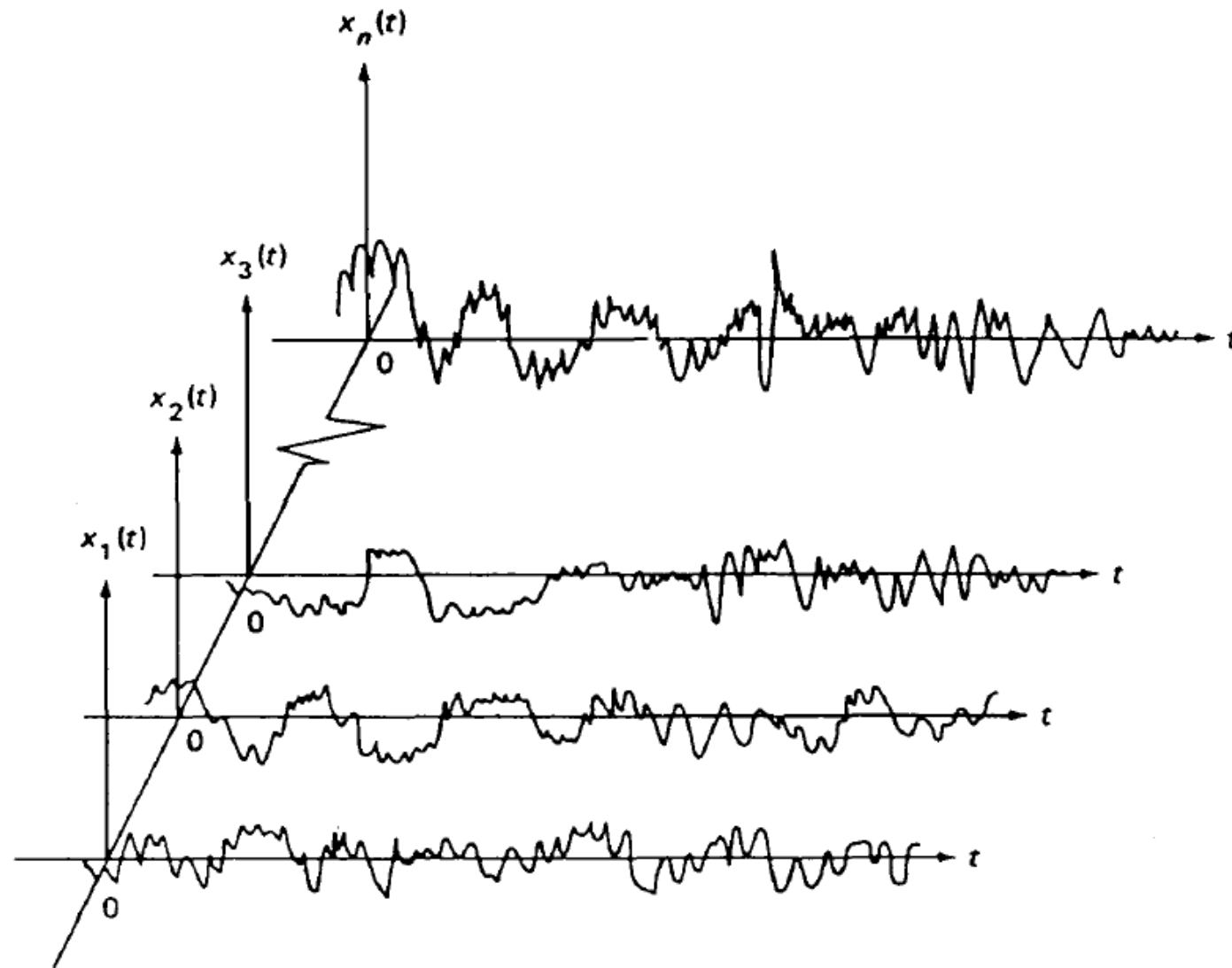


TYPICAL RANDOM VIBRATION

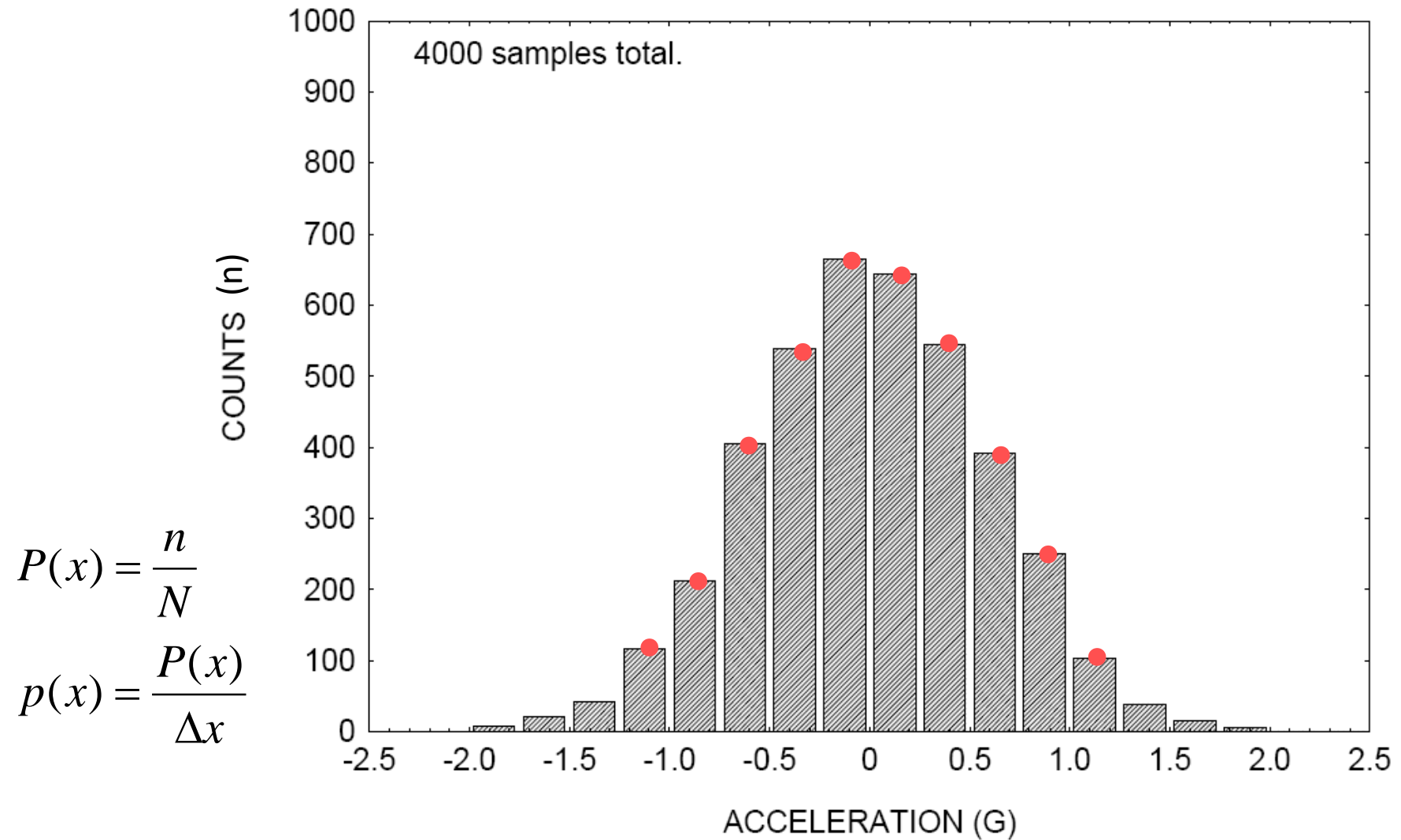
Parameter	Value
Duration	4 sec
Samples	4000
Mean	0.00
Std dev	0.59 G
RMS	0.59 GRMS
Kurtosis	3.04
Maximum	2.30 G
Minimum	-1.96 G



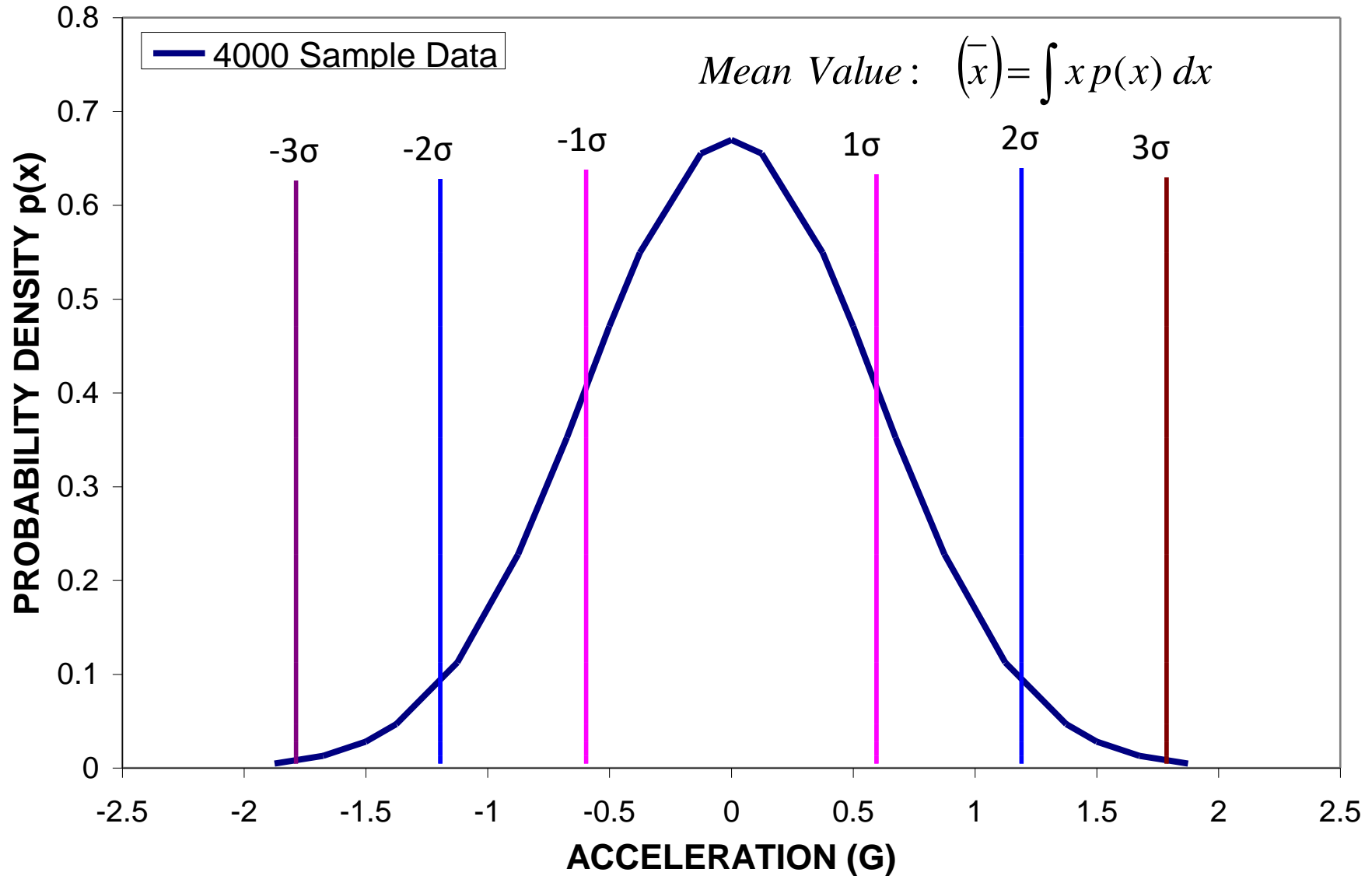
Ensemble of Random Processes



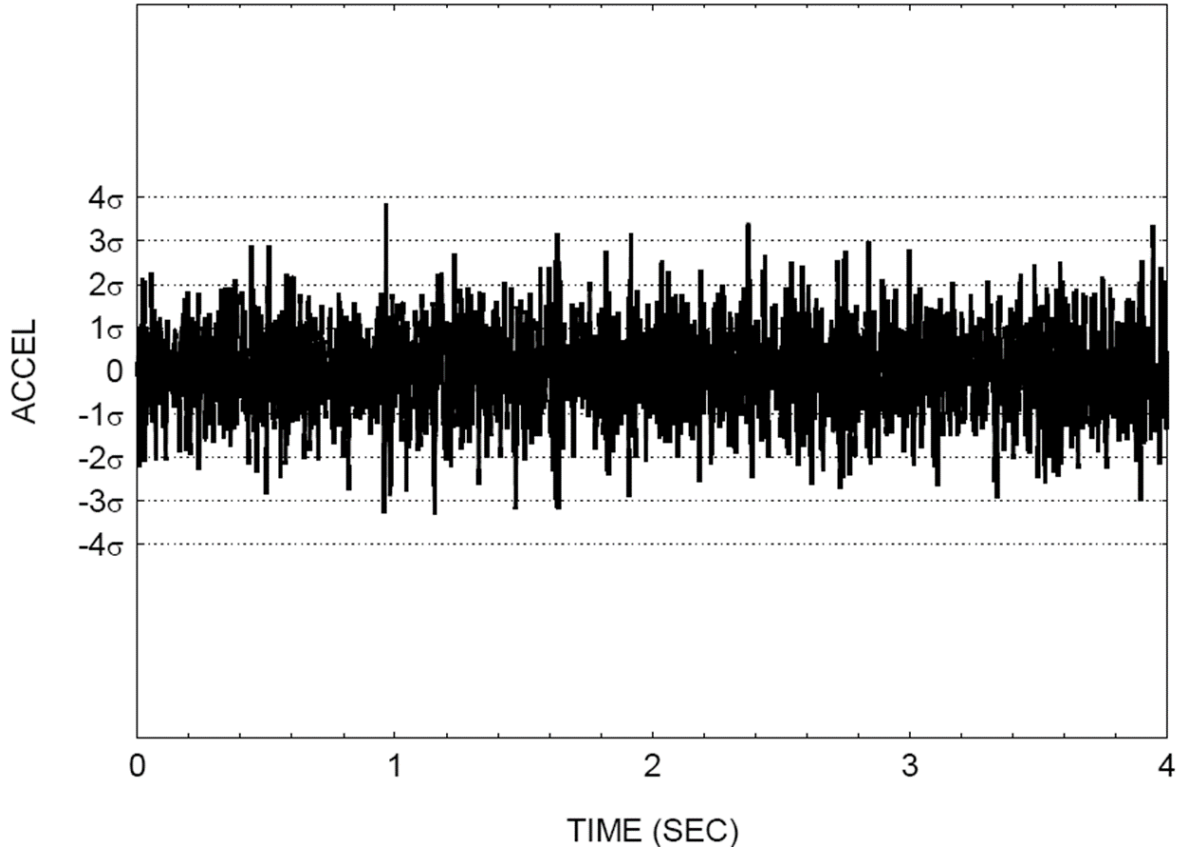
HISTOGRAM OF SAMPLE RANDOM VIBRATION



GAUSSIAN PROBABILITY DENSITY FUNCTION $p(x)$ WITH ZERO MEAN



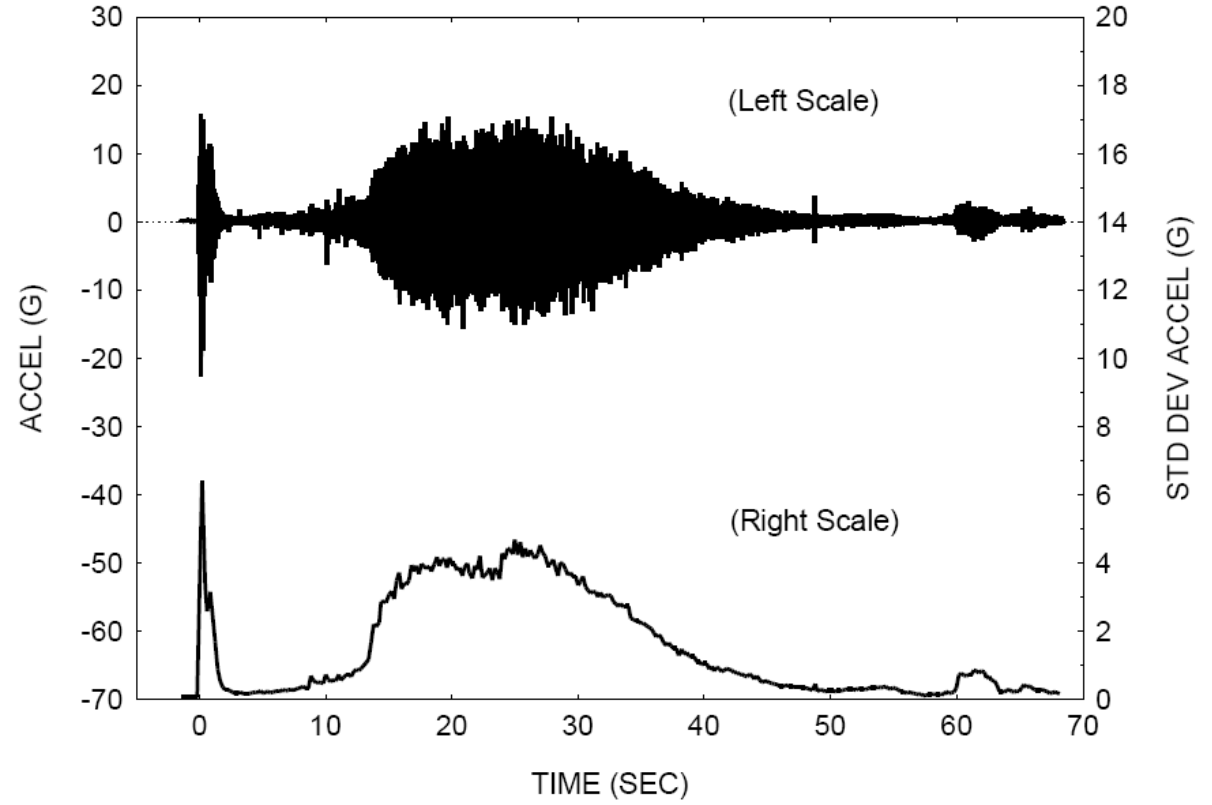
STANDARD DEVIATIONS OF SAMPLE RANDOM VIBRATION



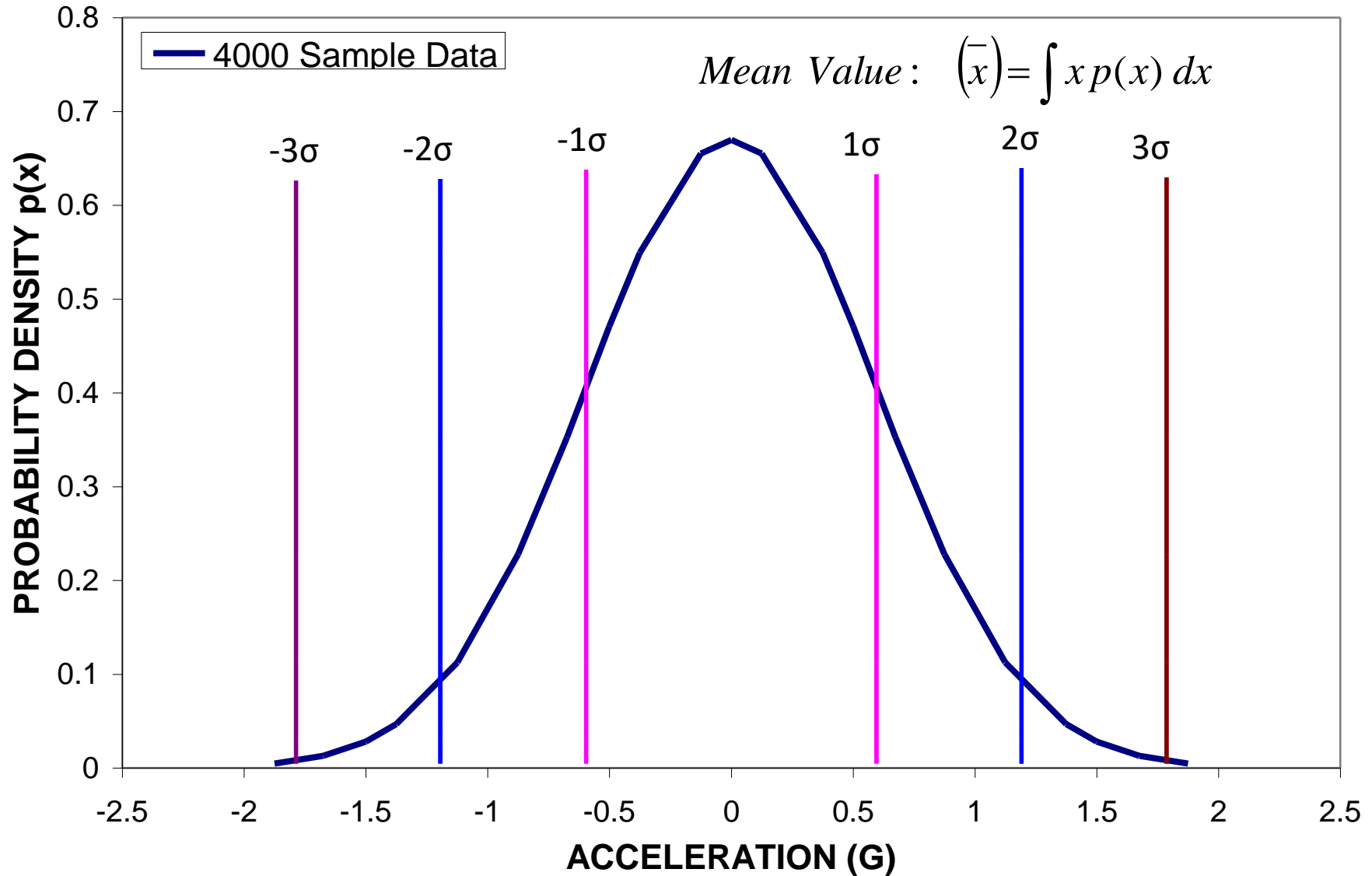
ACCELERATION TIME HISTORY ROCKET VEHICLE

Top Curve is Instantaneous Time History

Bottom Curve is Standard Deviation Time History

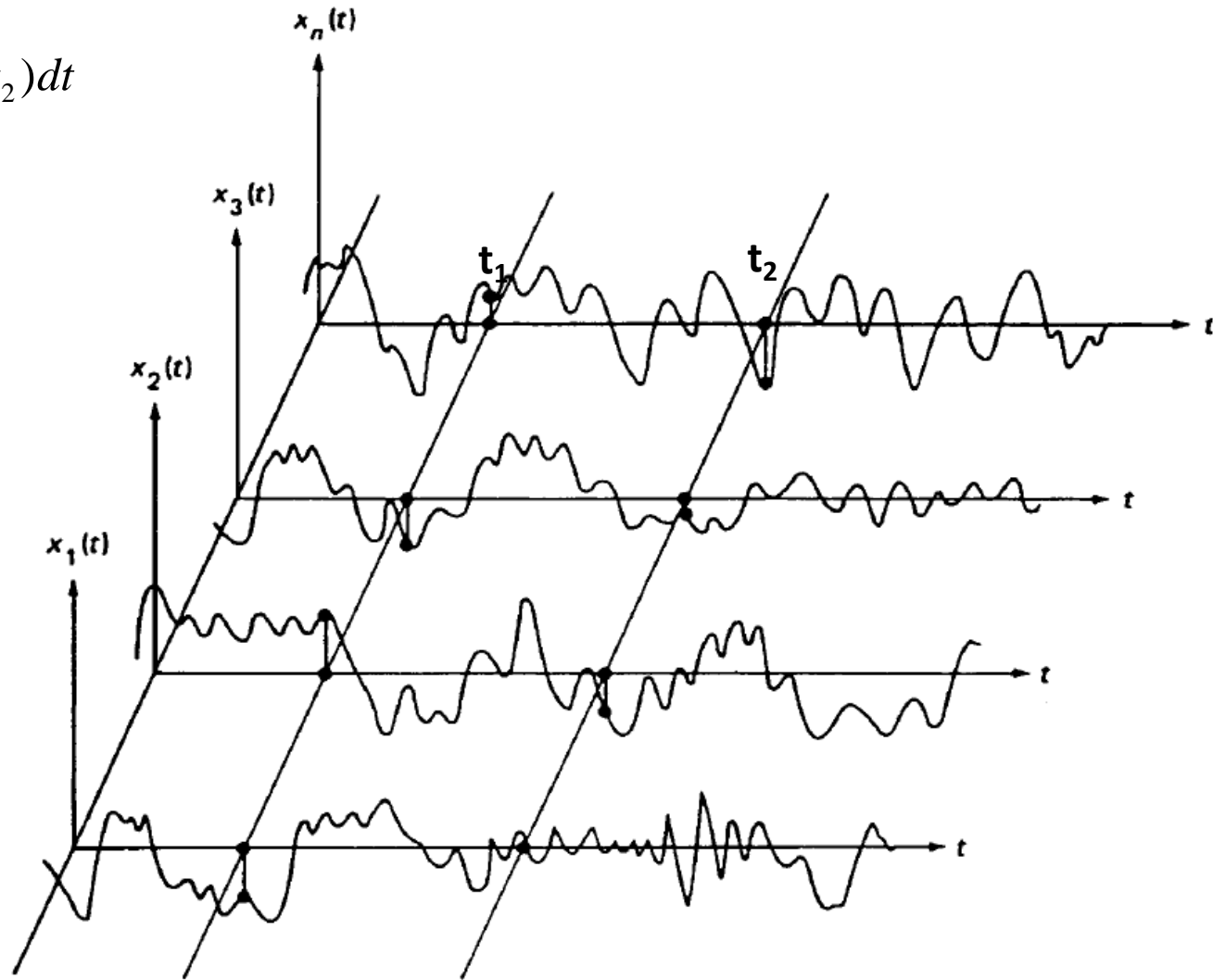


GAUSSIAN PROBABILITY DENSITY FUNCTION $p(x)$ WITH ZERO MEAN

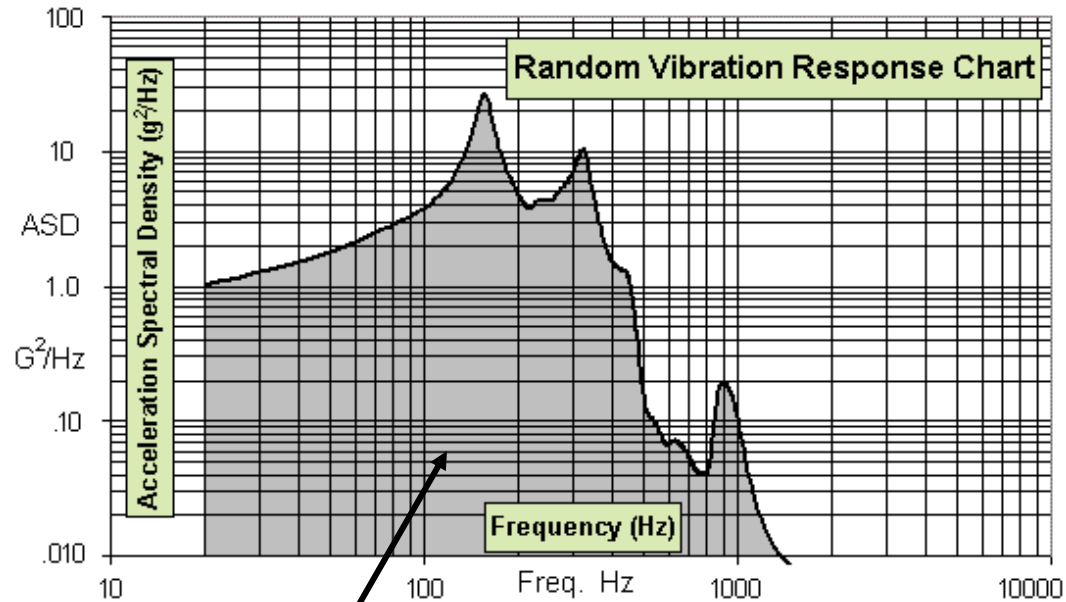


Random Processes - Auto-correlation

$$R(t_2 - t_1) = \text{Lim} \frac{1}{2\pi} \int x(t_1) x(t_2) dt$$

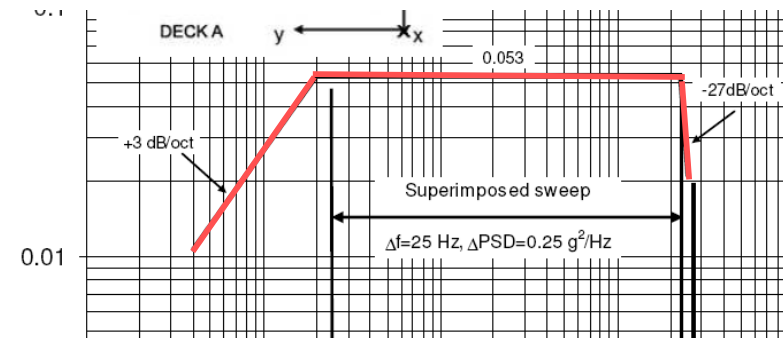


Typical Acceleration Spectral Density (ASD) Curve



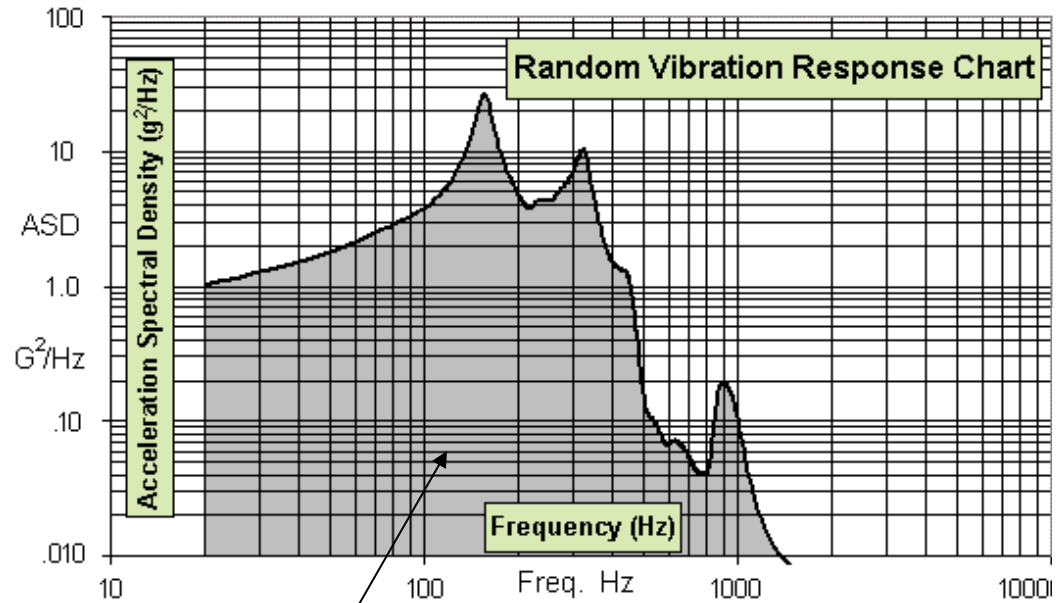
Grey Area = A

$$\text{Mean Square Value: } (G_{rms})^2 = \int S(\omega) d\omega = A$$



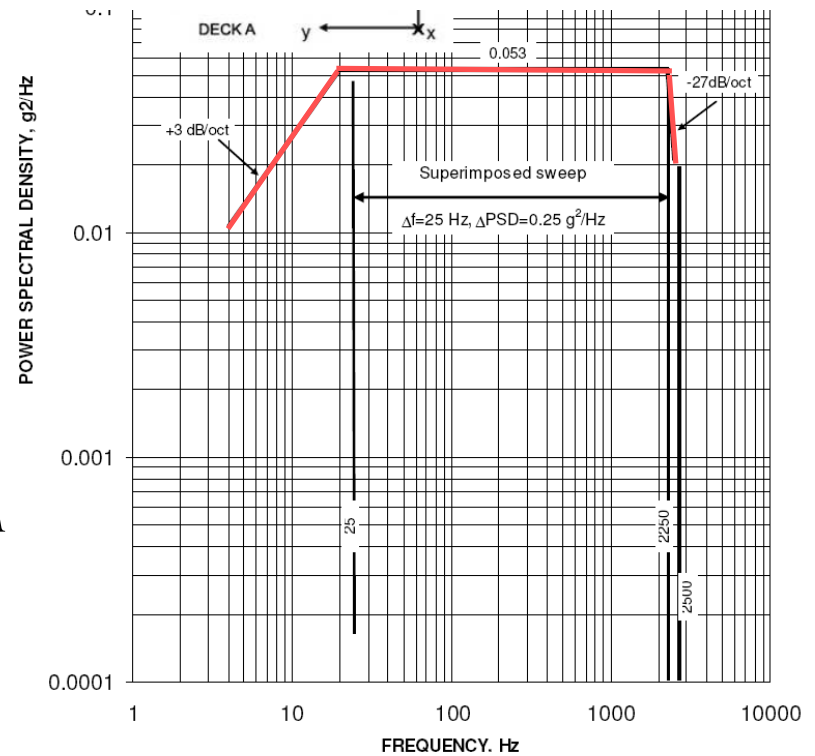
- PSD or ASD – amount of power per **(density)** of frequency **(spectral)** as a function of frequency.
- Describes how the power or energy in a time series is distributed with frequency.
- Gms is the average of the square of the acceleration over frequency or acceleration over time.

Typical Acceleration Spectral Density Curve

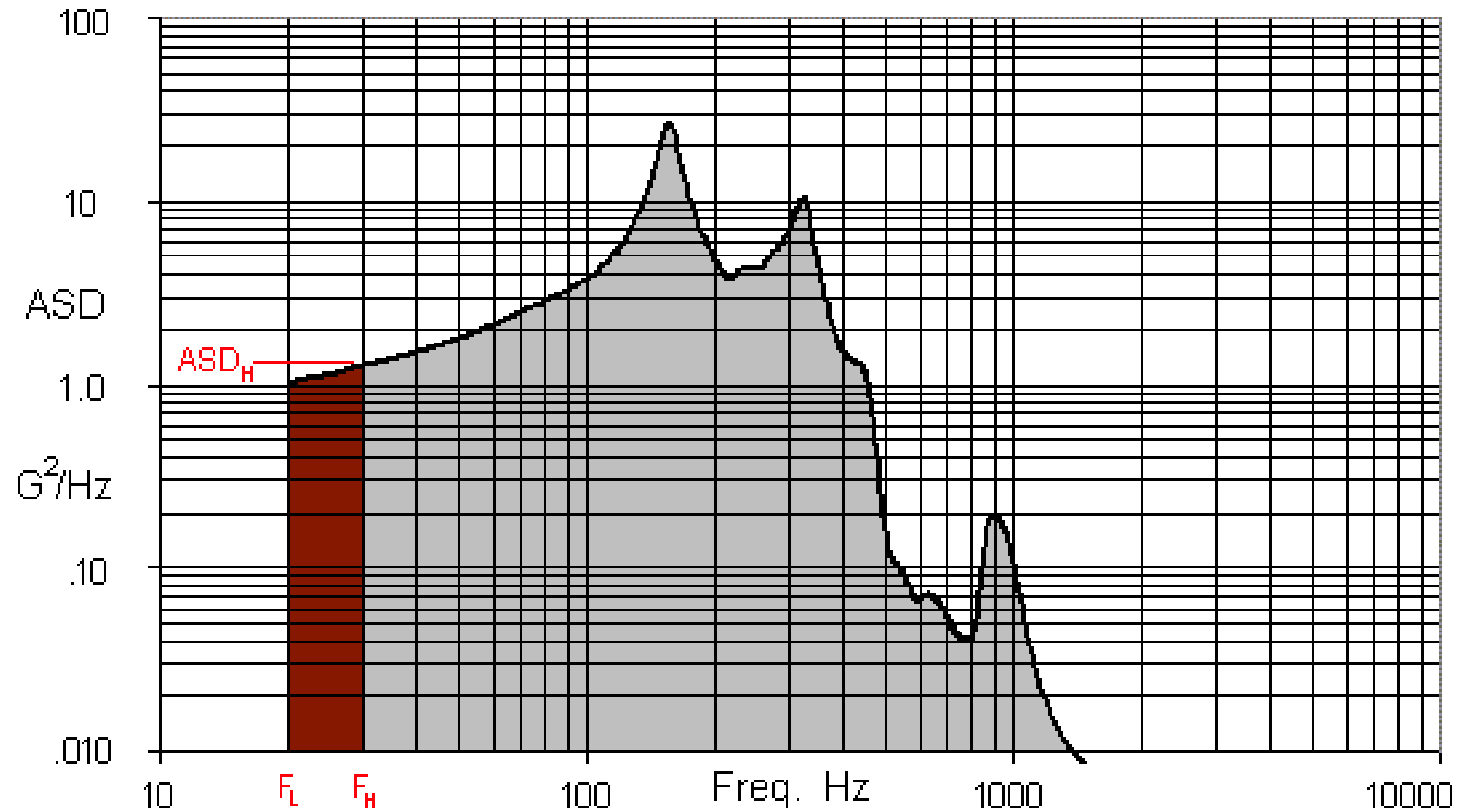


Grey Area A

Mean Square Value: $(G_{rms})^2 = \int S(\omega) d\omega = A$



Typical Acceleration Spectral Density Curve



$$A = 3.01 \frac{ASD_H}{3.01 + m} \left[F_H - (F_L) \left(\frac{F_L}{F_H} \right)^{0.332m} \right] \quad g_{rms} = \sqrt{A}$$