## By Tom Irvine Email: tomirvine@aol.com

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Figure 1.

Table 1. MIL-STD-1540C, PSD, 6.1 GRMS	
Frequency (Hz)	Accel (G <sup>2</sup> /Hz)
20	0.0053
150	0.04
600	0.04
2000	0.0036

## Example 1

Synthesize a 10 second time history to satisfy the PSD.

Enter the coordinates in Table 1 into an ASCII text file called: psd.in. The acceleration may be separated from the corresponding frequency by a space or tab.

Run psdgen.exe version 3.0.

The input file is: psd.in

Call the output acceleration file: accel\_10.dat

The names of the output velocity and displacement are unimportant for this exercise.

The duration is 10 seconds.

The sample rate is 20000 samples per second.

The resulting time history is plotted in Figure 1.

The histogram is shown in Figure 2. Note that the histogram is a bell-shaped curve.

Next run poweri lite.exe version 3.1.

The input file is: accel\_10.dat

The output file is: psd\_10.dat

Select 8192 samples per segment, which yields 48 statistical-degrees-of-freedom. You may also experiment with other values. In each case, there are trade-offs between spectral line bandwidth and statistical accuracy.

Select mean removal and the Hanning window, although these parameters are unimportant for this example.

The resulting PSD is shown in Figure 3 along with the specification.



Figure 1.



Figure 2.

The amplitude step is 1 G for the histogram.



Figure 3.

Again, the PSD is calculated with 8192 samples per segment, yielding 48 degrees-of-freedom.

The corresponding frequency increment is 2.44 Hz. This is also the spectral line bandwidth.

The error at 20 Hz is due to error in the PSD calculation itself rather than error in the synthesized time history. Greater compliance at 20 Hz can be demonstrated by increasing the samples per segment to a higher value with a corresponding increase in the spectral line resolution. Again, there are always trade-offs.

## Example 2

Synthesize a 0.5 second time history to satisfy the PSD.

Enter the coordinates in Table 1 into an ASCII text file called: psd.in. The acceleration may be separated from the corresponding frequency by a space or tab.

Run psdgen.exe version 3.0.

The input file is: psd.in

Call the output acceleration file: accel\_0p5.dat

The names of the output velocity and displacement are unimportant for this exercise.

The duration is 0.5 seconds.

The sample rate is 20000 samples per second.

The resulting time history is plotted in Figure 4.

The histogram is shown in Figure 5. Note that the histogram is a bell-shaped curve but the quality is affected by the short duration.

Next run poweri lite.exe version 3.1.

The input file is: accel\_0p5.dat

The output file is: psd 0p5.dat

The statistical processing options are less favorable for this example.

Select 4096 samples per segment, which yields 4 statistical-degrees-of-freedom.

Select mean removal and the Hanning window, although these parameters are unimportant for this example.

The resulting PSD is shown in Figure 6 along with the specification.

The PSD calculation is repeated for two other processing options in Figures 7 and 8.



Figure 4.



Figure 5.

The amplitude step is 1 G for the histogram.



Figure 6.



Figure 7.



Figure 8.