DynaTronic Corporation Ltd.
Rm. 19C, Lockhart Ctr., 301-307 Lockhart Rd., Wan Chai, Hong Kong
Email: sales@DTC-solutions.com
Web Site: www.DTC-solutions.com

How to implement SRS test without data measured?

--according to MIL-STD-810G method 516.6 procedure I

Purpose of Shock Test

Shock tests are performed to:
a. provide a degree of confidence that materiel can physically and functionally withstand the relatively infrequent, non-repetitive shocks encountered in handling, transportation, and service environments. This may include an assessment of the overall materiel system integrity for safety purposes in any one or all of the handling, transportation, and service environments;

b. determine the materiel's fragility level, in order that packaging may be designed to protect the materiel's physical and functional integrity; and

c. test the strength of devices that attach materiel to platforms that can crash.

SRS Profile-the illustration for complex transient

Shock is the term applied to a comparatively short time (usually much less than the period of the fundamental frequency of the materiel) and moderately high level (above even extreme vibration levels) force impulse applied as an input to the material. Generally the force impulse input is distributed to the materiel (over the materiel surface or into the materiel body) and difficult if not impossible to measure directly in terms of force magnitude. Materiel response acceleration will generally be the variable for measurement and used in characterization of the effects of the shock.

The response acceleration time history can be characterized in several ways. Analysis of the time history as a digital sequence can be performed using the Shock Response Spectra (SRS), Energy Spectral Density (ESD), Fourier Spectra (FS), Time Domain Moments (TDM) or Energy Methods (EM). We will discuss SRS method in the following pages.

SRS Test conditions

Derive the test SRS and Te from statistical processing of
(1) time history measurements of the materiel's functional environment,
(2) from a carefully scaled measurement of a dynamically similar environment,

(3) from prediction, or
(4) from a combination of sources. For tailoring purposes, every attempt needs to be made to obtain measured data under conditions similar to service environment conditions in the Life Cycle Profile.

In test SRS and Te derivation and subsequent execution rank from the most desirable to the least desirable as follows:
- Measured data summarized and shock created by way of direct reproduction of the measured data under exciter waveform control (see Method 525);
- Measured data summarized and shock synthesized by way of a complex transient making sure that measured Te is approximately the test Te, and the measured waveform is similar to the synthesized waveform, i.e., amplitude and zero crossing similarity.
- No measured data but previous SRS estimates available and shock synthesized by way of a complex transient with Te specified in some reasonable way taking into consideration the natural frequency response characteristics of the materiel;
- No measured data but classical pulse shock descriptions available for use in reproducing the shock. (The use of classical pulse description is unacceptable unless use of such pulses can be justified on the basis of analysis.

How to implement SRS test without measured data?

This paper will emphasize on the condition that measured data not available, then for Procedure I - Functional
Shock, and Procedure V - Crash Hazard Shock Test, employ the applicable SRS spectrum from Figure 1 as the test spectrum for each axis, provided Te of the test shock time history falls between the values in the accompanying Table 1.

Test Category	Peak Acceleration (g's)	T_e (ms) [1]	Cross-over Frequency (Hz)
Functional Test for Flight Equipment	20	15-23	45
Functional Test for Ground Equipment	40	15-23	45
Crash Hazard Shock Test for Flight Equipment	40	15-23	45
Crash Hazard Shock Test for Ground Equipment	75	8-13	80

Table 1 Test shock response spectra for use if measured data are not available.

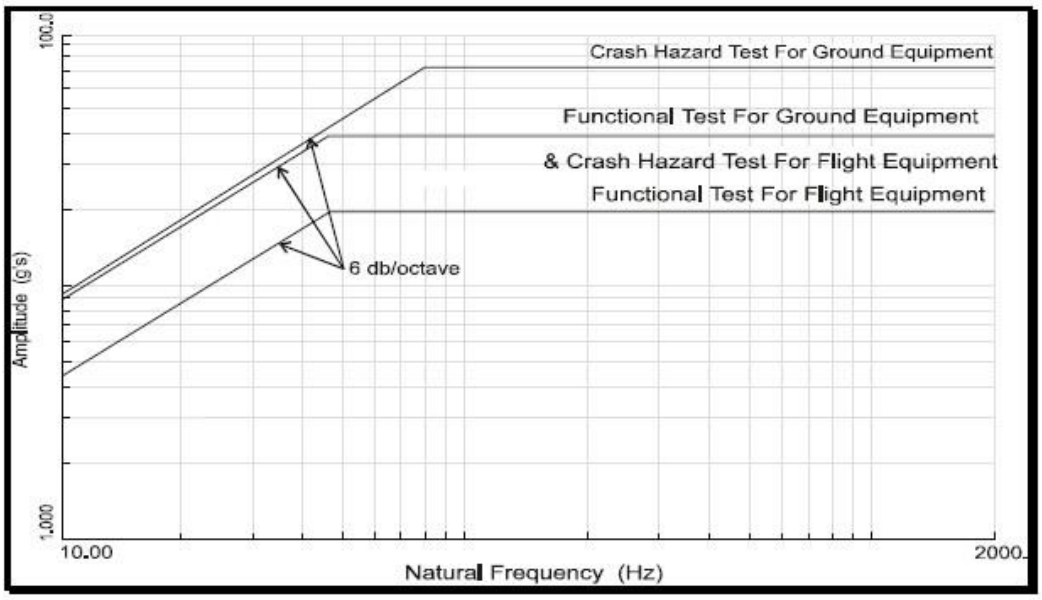

Figure 1 Test SRS for use if measured data are not available (for Procedure I – Functional Shock & Procedure V - Crash Hazard Shock Test).

Implement method 516.6 procedure I with VENZO controller

1, The SRS test according to MIL-STD 810G method 516.6 procedure I will implement with VENZO 880 Vibration Controller. First click icon to open VibExpert control software, as Figure 2:

Figure 2 Start page of VibExpert control software

2, Click Shock Response Spectrum and enter into the main interface. According to table 1 and figure 1 (MIL—STD—810G), click icon  edit the test profile, see Figure 3:

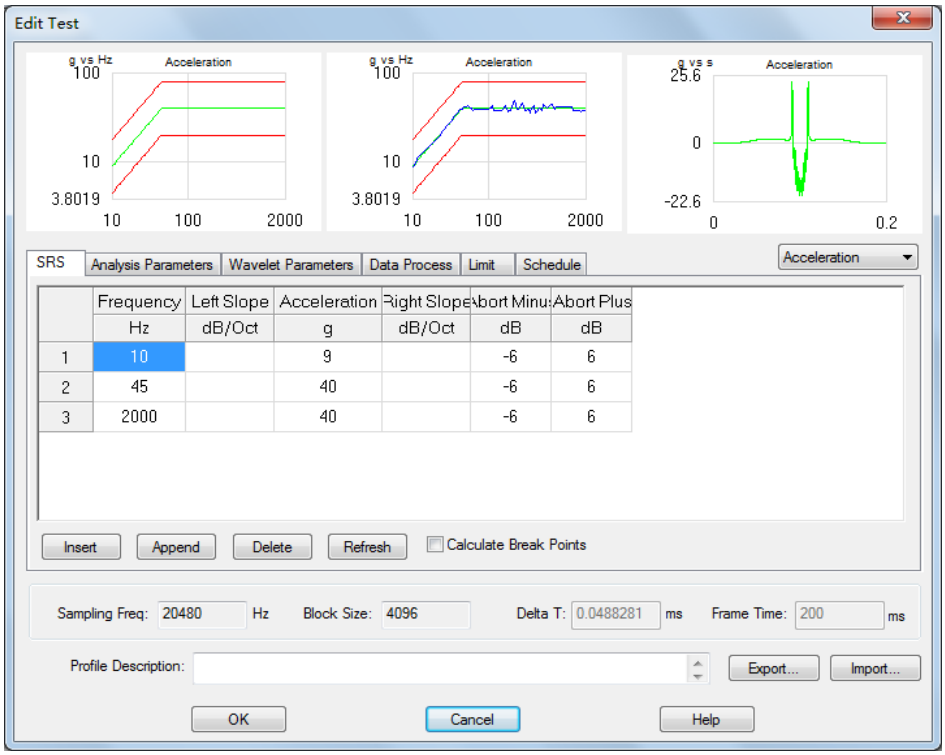

Figure 3 Edit Test

3, Set the effective shock duration Te. According to standard, the effective shock duration Te is 15~23ms, set value between them, in this case, we set the minimum value 11ms, see Figure 4.

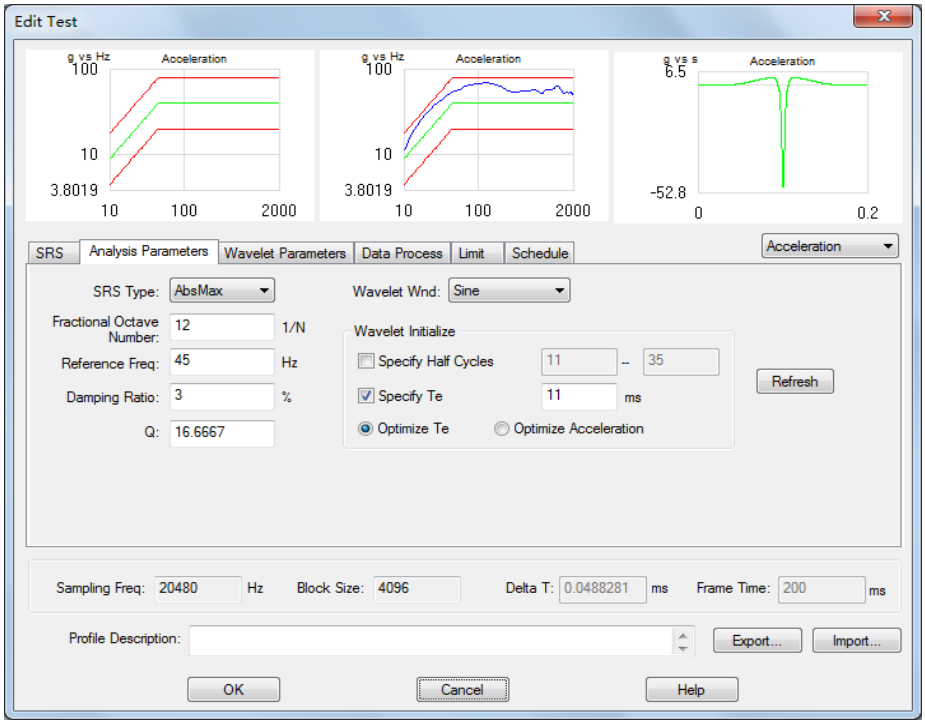

Figure 4 Set Te

4, Wavelet optimization

Choose Auto Optimize or Manual Optimize to synthetize the shock response spectrum. Either optimization method can use multiply, in order to make the fitting curves be well constant with the target curves. See Figure 5:

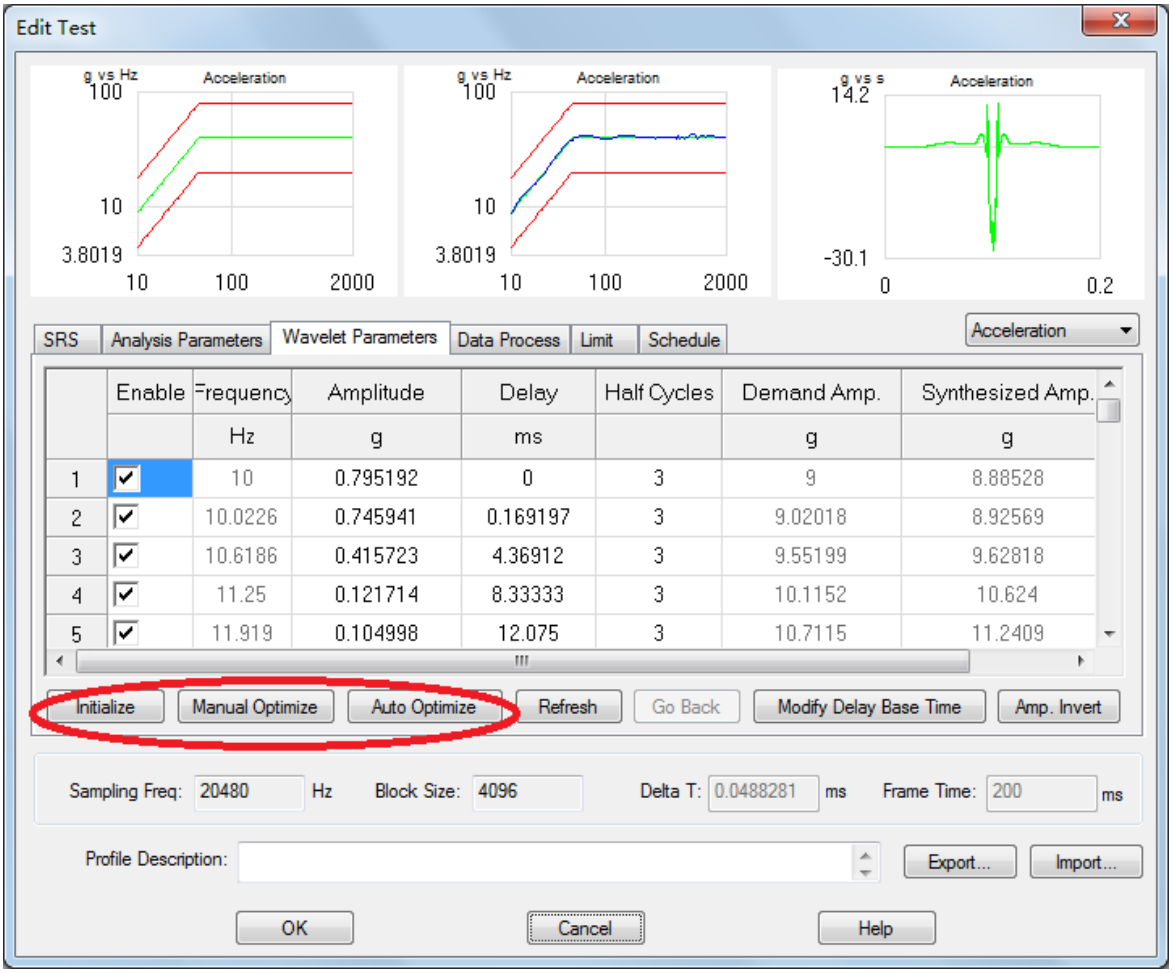

Figure 5 Wavelet optimization

Test Result

Before test, make sure the shaker acceleration is higher than 40g; commonly the shock pulse is lower than 40g. See following figure, the max acceleration in time-domain is about 27.8g.

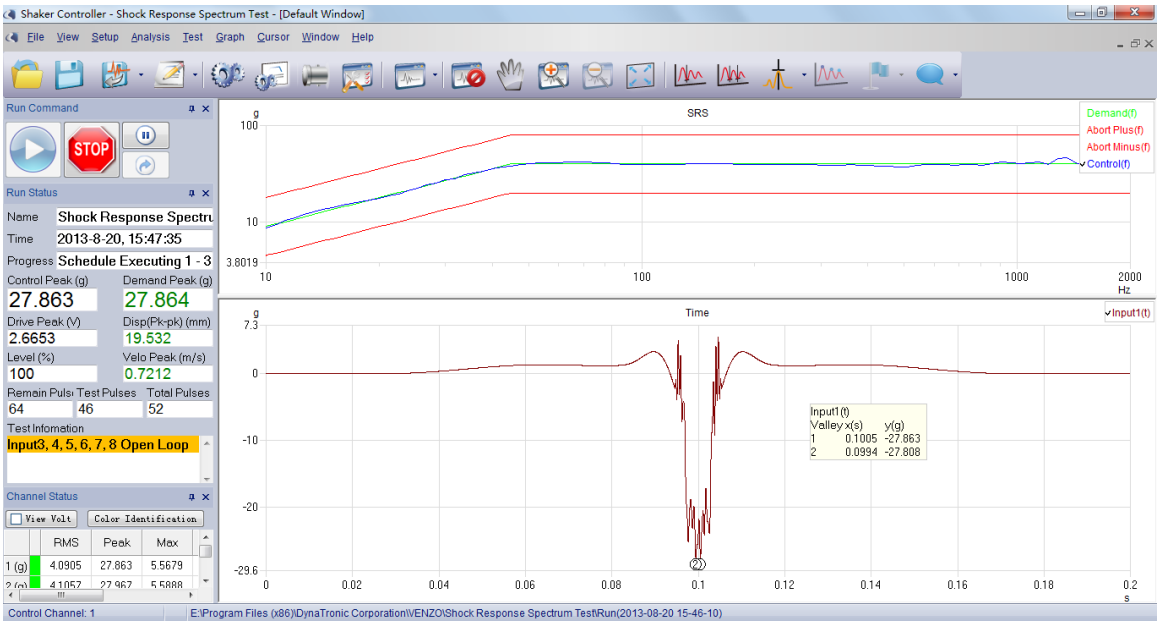

Figure 6 Test result