# Aquila - Vibration Profile Creation

What is Aquila?

Aquila is a vibration profile creation tool with a simplified user interface that converts measured accelerometer data into Power Spectral Density (PSD) profiles for use in mechanical vibration testing. It makes mission profile tailoring and test planning simple and efficient, whilst maintaining a high level of customization. It utilizes advanced damage equivalent methods (such as the Fatigue Damage Spectrum) without the requirement for complex software, or proprietary hardware. Aquila allows test specifications to be rapidly updated by the systems engineer to provide agile test planning and execution.
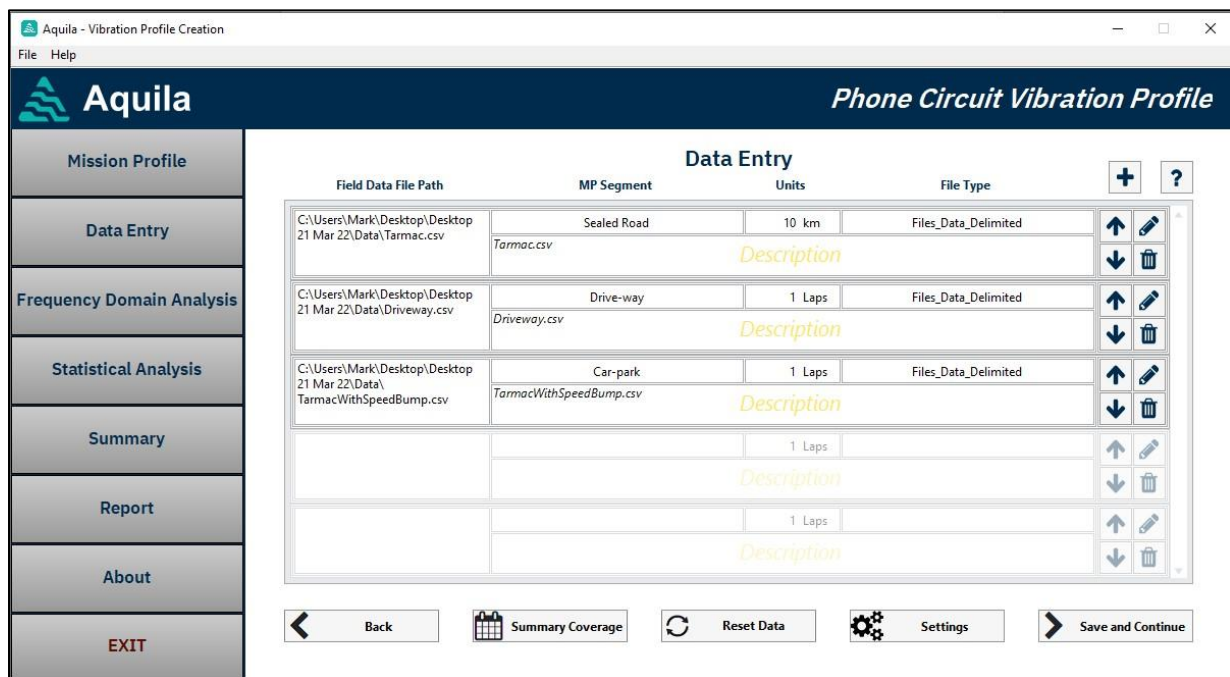
Mission Profile Screen, Real data can be associated with each segment of the mission and will be automatically scaled to the target number of field units.

Existing Methods

- Vibration testing using default severities offered in standards such as DEF-STAN 00-035/MIL-STD 810H have been shown to be inaccurate and overly conservative (Warren & Joiner, 2019)
- These standards recommend using tailored vibration severities where available however the methods to convert measured accelerometer data to PSD profiles are complex, leading to over-reliance on default severities
- Some of these methods may be inaccurate when used for complex data (Warren et al., 2021)
- Over-testing can lead to a reduction in capability as it often leads to false failures of suitable equipment or wasted resources developing fixes to problems that don't exist in the real world
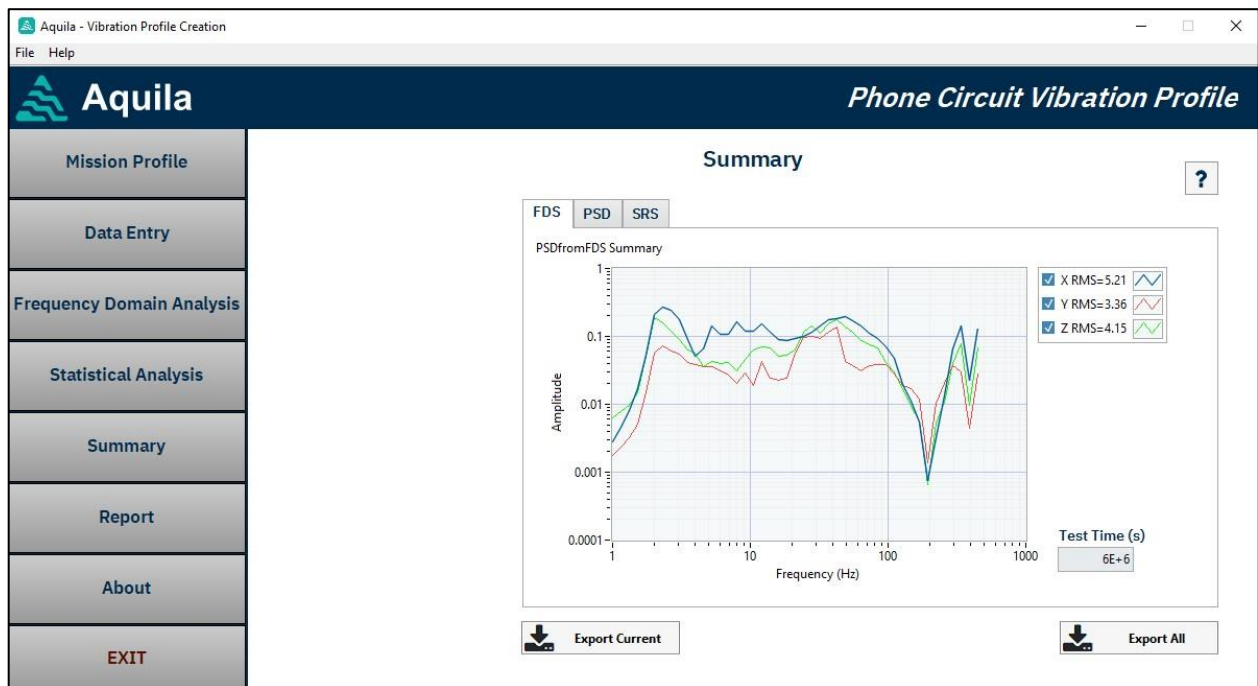
Output PSDs generated using two common fatigue exponents. Producing multiple PSDs allows for a conservative test profile to be generated covering a range of material/payload types. Equivalent test time can be updated in real-time to optimise the test acceleration level vs test accuracy.

Aquila Features

- Simple mission profile entry and automated test severity tailoring
- Profile creation with multiple fatigue/dynamic properties that automatically combine using statistical analysis to allow for conservative profile specification across a range of material types
- Comparison with traditional PSD creation methods (Welch's method)
- Instantaneously modify the equivalent damage test time to balance testing duration with recommended severity amplification levels
- Automated and customizable report generation
- Shock Response Spectrum (SRS) creation functionality
- Inputs and outputs in generic CSV format for easy importation of data, and universal export format for use in a range of shaker controllers
- Access to expertise and advise on test profile generation methods/limitations and applications
- Regular updates and feature improvement based on customer feedback

REFERENCES:

Warren, M., & Joiner, K. F. (2019). Improving Vibration Test Methods and Profile Selection for Complex Land Vehicle Payloads. *Australian Journal of Multi-Disciplinary Engineering, 15*(1), 75–83. https://doi.org/10.1080/14488388.2019.1668202

Warren, M., Joiner, K. F., & Tahtali, M. (2021). Damage accumulation comparison for various vibration test profile generation methods applied to a complex payload. *JVC/Journal of Vibration and Control*. https://doi.org/10.1177/10775463211010535