Fatigue & Vibration Synchronization Module

by Correlated Solutions, Inc.

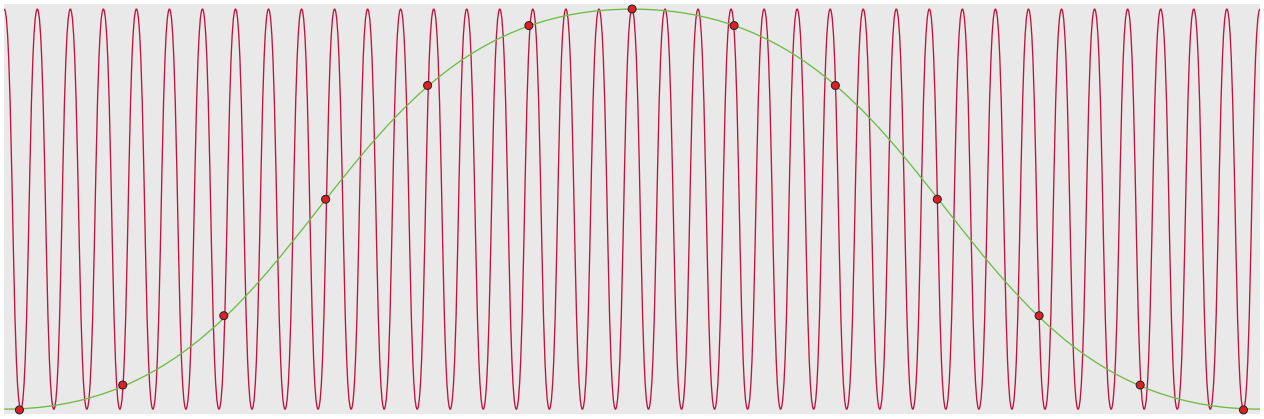
Technology Overview

The VIC-3D™ System's Fatigue and Vibration Synchronization Module by Correlated Solutions, Inc. is the ideal measurement solution for fatigue and vibration applications. This module provides an accurate, inexpensive alternative to high-speed cameras and other traditional measurement techniques. The Fatigue and Vibration Synchronization Module can easily measure large & small vibration amplitudes up to test frequencies of 50,000 Hertz.

Background

With this module, low-speed cameras can be precisely triggered to acquire images at arbitrary phase intervals or peaks and valleys from a driving frequency. Our post-processing software then analyzes the sequence of images, creating accurate shape and deformation data. Displacements and strains across the specimen's surface are displayed and can be exported for FEA validation. Some of the system's features are outlined below:

Light Source	Minimum Exposure Time	Recommended Frequency Range	Max Frequency
Standard LED	10ms	0 - 50Hz	100Hz
High Powered LED	30µs	50 - 200Hz	500Hz
Stroboscope	1µs	200 - 4,000Hz	10,000Hz
Ultra-Bright Strobe	40ns	4,000 - 10,000Hz	50,000Hz



This module can be purchased either as a turn-key system or as an add-on module to existing VIC-2D™ or VIC-3D™ systems. Some ideal application examples are listed below:

- Fatigue testing
- Tire and wheel testing
- Crack Growth
- Flow-induced vibration
- Rotating Machinery
- Engine test stands
- Crack Tip Opening Displacement
- Nearly any periodic high-speed event

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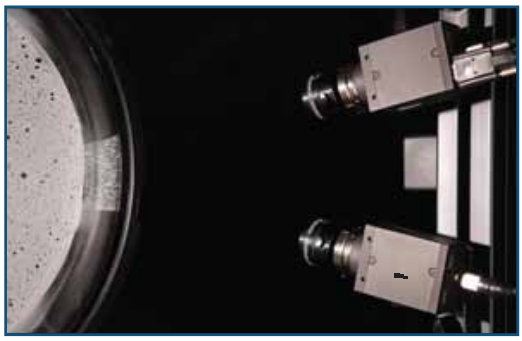
Application Example

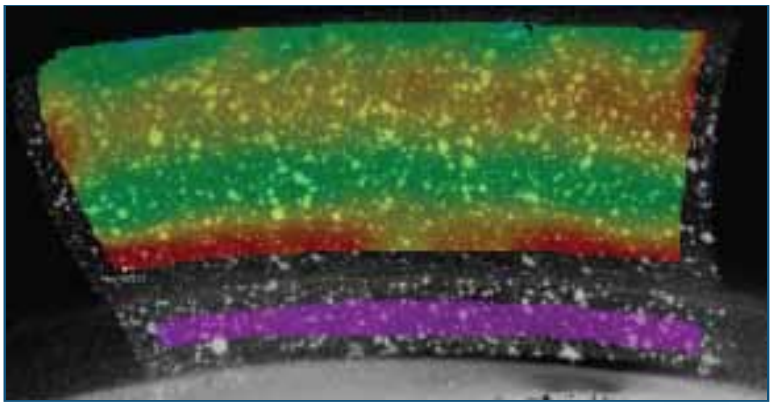
The VIC-3D™ System's Fatigue and Vibration Synchronization Module by Correlated Solutions, Inc. was used to successfully measure speaker surrounds during a constant vibration event. Surrounds attach the cone of the speaker to its outer frame and are designed to be pliable enough for the woofer to travel freely, yet strong enough to guide and control cone movement without twisting. They are the part of the speaker most susceptible to mechanical failure, so by measuring the movement and strain of the surround, an optimal design can be produced.

The Testing Parameters included a driving frequency of 30Hz, a driver voltage of 9.1 Vpp, and a pair of images taken at every 10 degrees of the 360 degree cycle. There were 37 image pairs recorded of the movement of the speaker surround to help clarify the full field displacements and strains on the rubber material.

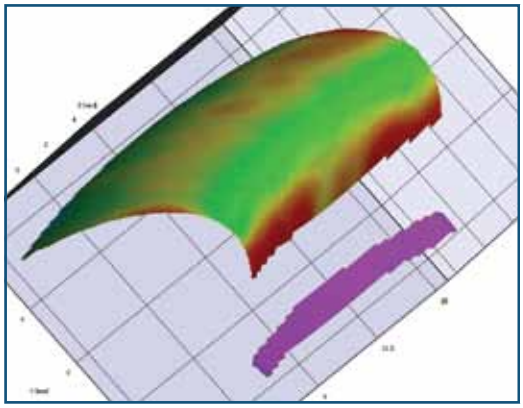


The VIC-3D™ Fatigue & Vibration Synchronization system

The Results showed the maximum out of plane displacement for the surround and cone to be 2mm at 180° and the maximum principal strain on the speaker surround to be 7,675 microstrain at 180°. With this type of data collection, products can be designed with all frequencies analyzed which will lead to more robust designs, fewer failures, and more cost effective merchandise.



2D overlay of major strain at 180°



3D graph of major strain at 180°

Various configurations of the VIC system are available including: high resolution, high speed, infrared capability, microscopy, transient vibration analysis, full field real-time, and post-processing software. Contact us today to find out if the Fatigue & Vibration Synchronization System is right for your application!

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