

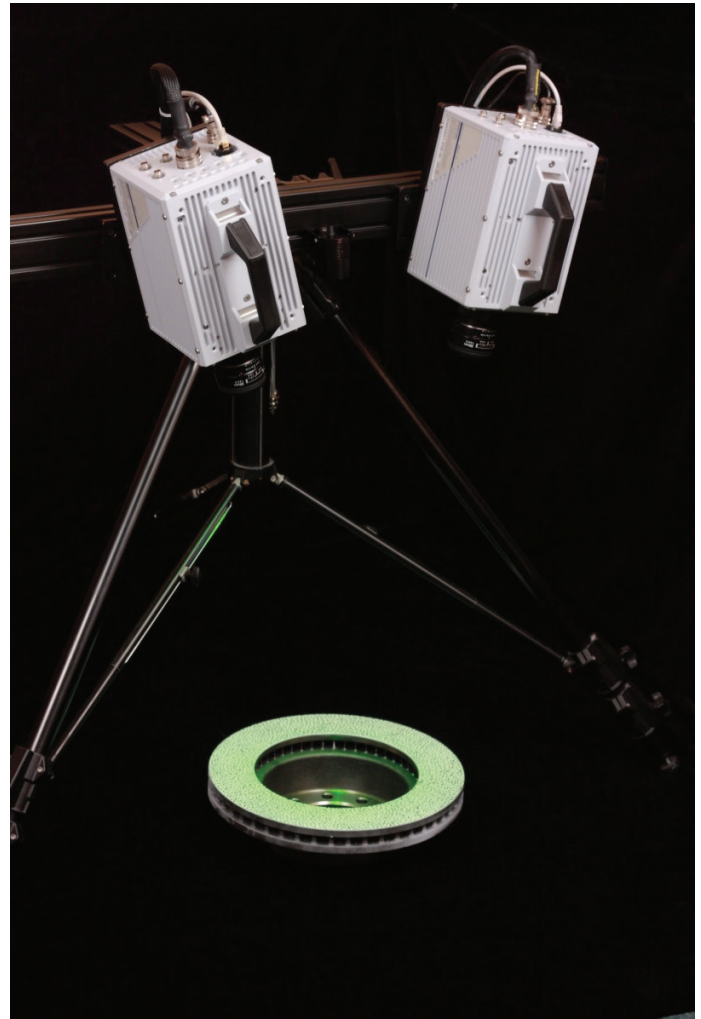
VIC-3D HS Vibration & Strain Measurement System

by Correlated Solutions

The VIC-3D™ HS Vibration Analysis DIC System by Correlated Solutions, Inc. is a new addition to the VIC-3D™ product line of measurement solutions. This Turn-Key High-Speed Digital Image Correlation system can measure full-field, three-axes displacements during vibration events. Since the acquisition time is very short, the system is capable of measuring operational deflection shapes during transient events as well as the impulse response to an impact. The system achieves resolution in the nanometer range and provides full-field three-axis displacement as well as strain data.

Background

The VIC-3D™ Digital Image Correlation System has found widespread popularity with scientists, researchers and engineers across the globe due to its accuracy, robustness, versatility, flexibility and overall ease of use. More recently, there has been an increasing interest to accurately measure vibration shapes using the VIC-3D™ HS System, which utilizes high-speed digital cameras. These systems are widely used for measuring surface deformation of materials under high-rate tensile/compression, Kolsky Bar, ballistic, explosive, and vibration applications to name a few. The VIC-3D™ HS Vibration Analysis System takes the vibration analysis to the next level by seamlessly integrating the capability to measure operational deflection shapes with visualization. Since the technique provides full-field displacement data, no scanning of the object surface is required, which results in very short acquisition times. The acquired images are then post-processed to compute full-field amplitude/phase vs. frequency data.



The VIC-3D™ HS Vibration Analysis System

VIC-3D™ HS Vibration Analysis Features (not all listed)

- Up to 50kHz vibration shape measurements
- Measurement range from 0.8mm to 100m
- Non-contact full-field vibration measurements
- Torsion, in-plane, & out-of-plane vibration
- Graphically driven & easily controlled workspace
- Easily analyze complex geometry & excitation

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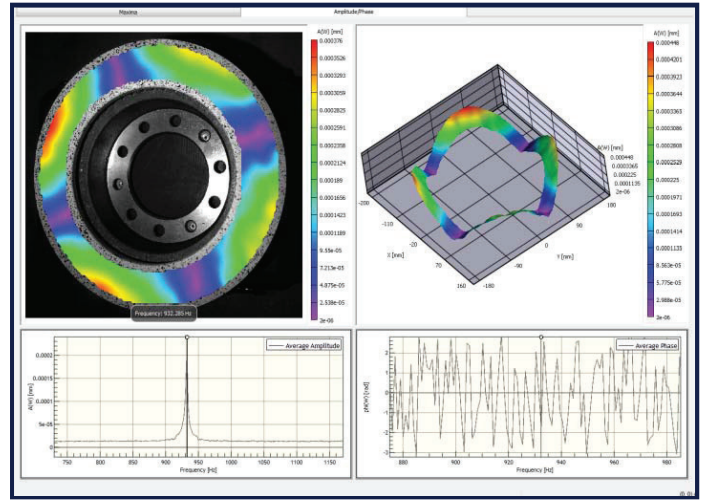
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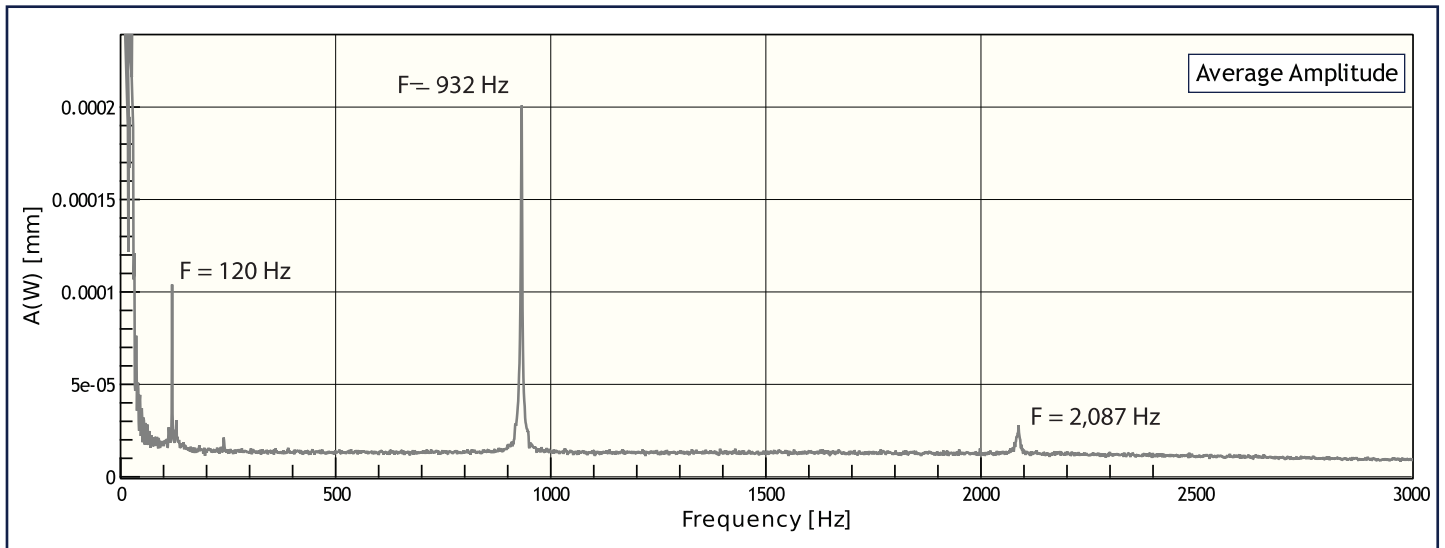
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Application Example: Vibration Analysis of a Brake Disc

Automobiles are subject to many forces during operation. Vibrations from the engine or the road-surface transmit through the vehicle's chassis and suspension to the most essential mechanical component of the vehicle, the brake system. In this example, a 14" diameter brake disc from a heavy-duty truck was excited using a small hammer to measure the vibration shapes of the rotor. The three-dimensional operational deflection shapes were easily identified and measured using the VIC-3D™ HS Vibration Analysis System. Amplitudes as small as 40 nanometers were measured at a frequency of approximately 2,000 Hz. The graph below illustrates the average out-of-plane amplitude $A(w)$ as a function of frequency. Three unique shapes can easily be identified at 120, 932 and 2,087 Hz.



VIC-3D™ HS Vibration Analysis Workspace
Data shown 932Hz



Amplitude (w) [mm] Vs. Frequency [Hz] Plot

Correlated Solutions, Inc. provides turn-key systems that allow users to quickly and accurately make extremely detailed measurements of shape, 3D motion, deformation, and strain over the entire surface of any object under any load condition. Full-field 3D data can be extracted in the form of graphs, contour plots, animations, and other various formats for easy FEA validation. Turn qualitative data into quantitative data!

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