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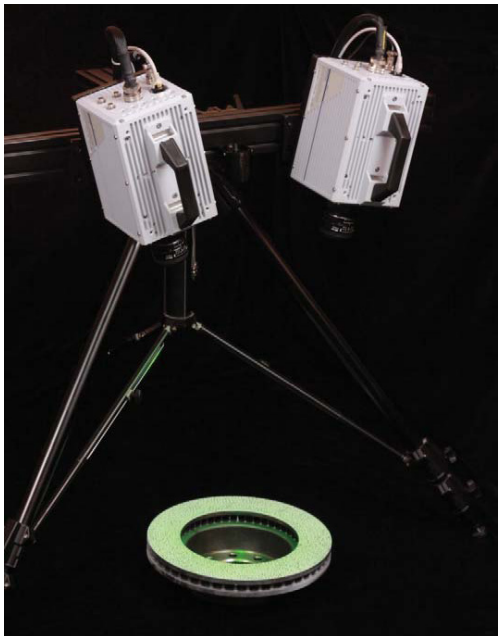
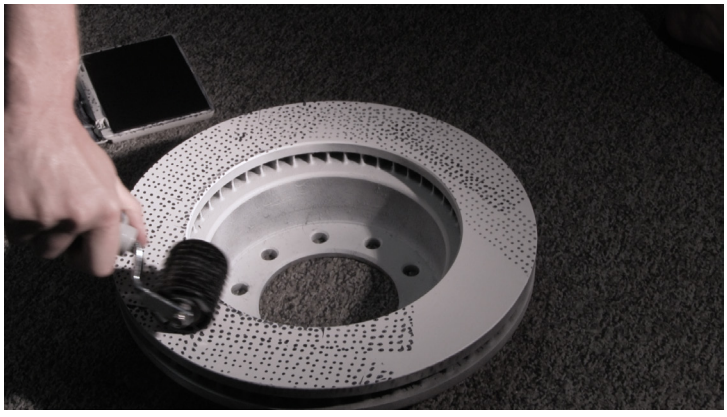
VIC-3D with *iris*
High-Speed Vibration Analysis (FFT)

Correlated Solutions has led advances in digital image correlation since inventing the technology more than 35 years ago. Recently, the industry-leading VIC-3D system was updated to revolutionize the measurement of vibration. While DIC has traditionally been used mostly for quasi-static and dynamic applications, enhancements in our analysis software provide a capability for dynamic vibration ODS measurements using high-speed image data to characterize vibration behavior utilizing a Fast Fourier Transformation (FFT). This can generate amplitude/phase vs. frequency data with full-field 3D visualization.



VIC-3D Vibration Analysis (FFT) Features

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



There are many advantages of DIC over traditional vibration measurements with a laser vibrometer. Some of these include:

- No scanning required (no LASERs) - takes time
- No frequency sweep needed
- Easy set up and fast acquisition (< 1 second)
- Identify multiple ODSs & frequencies in one test
- Precise excitation frequency is NOT required which removes the need for expensive excitation equipment
- Measures vibrations during transient events e.g., door slams, engine start up, etc.
- Less expensive than 3D laser systems
- Large dynamic range
- Simultaneously computes strain data
- Significant time saving

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sales@correlatedsolutions.com
1.803.926.7272

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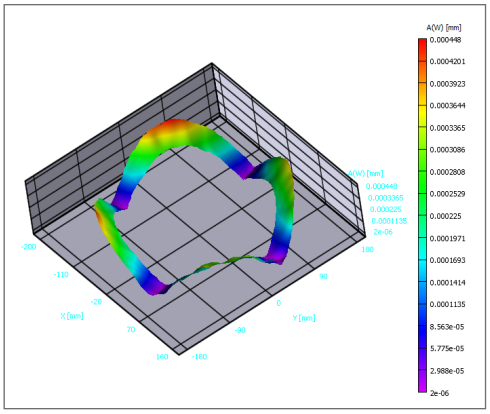
CASE STUDY

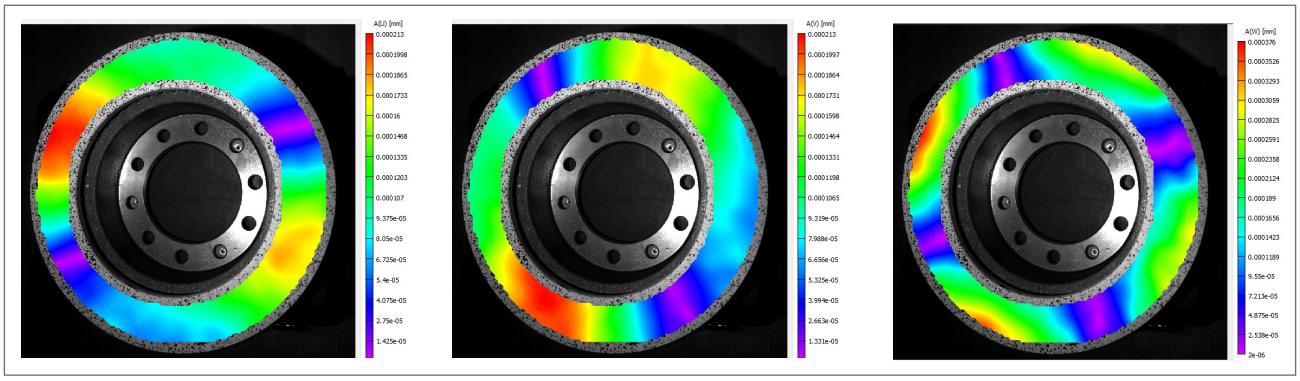
Vibration Analysis of a Brake Disc

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 modal hammer to measure the vibration shapes of the rotor. The three-dimensional operational deflection shapes were easily identified and measured using the VIC-3D Vibration Analysis (FFT) 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.



3D plot of the amplitude in the z direction

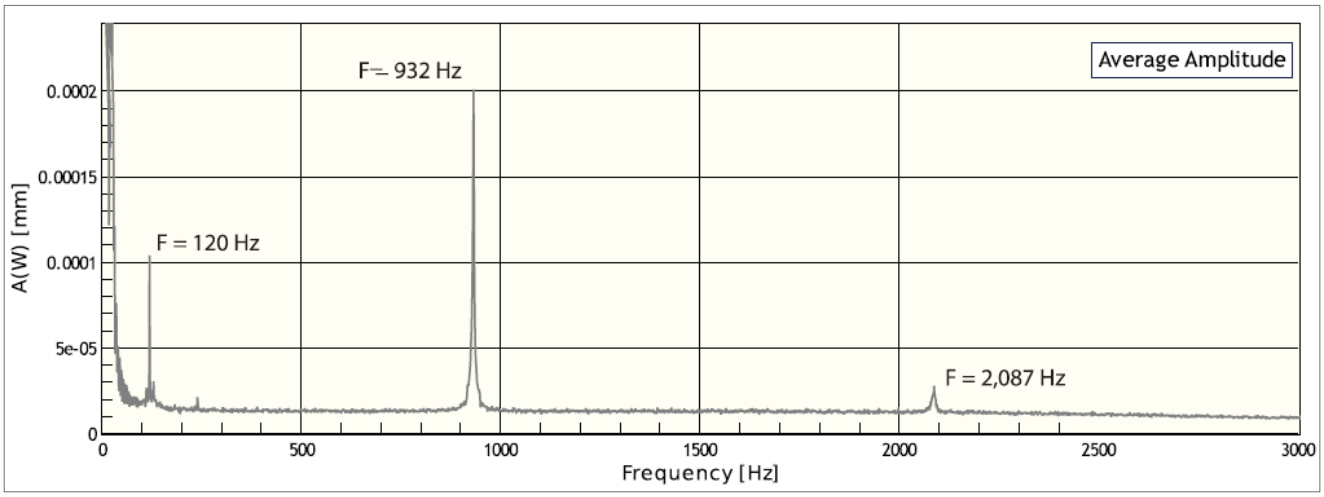
ODS at 932Hz showing full-field contour plots of the x, y, and z amplitudes



Amplitude (mm) in the x direction

Amplitude (mm) in the y direction

Amplitude (mm) in the z direction



Amplitude (W) [mm] vs. Frequency [Hz] Plot

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