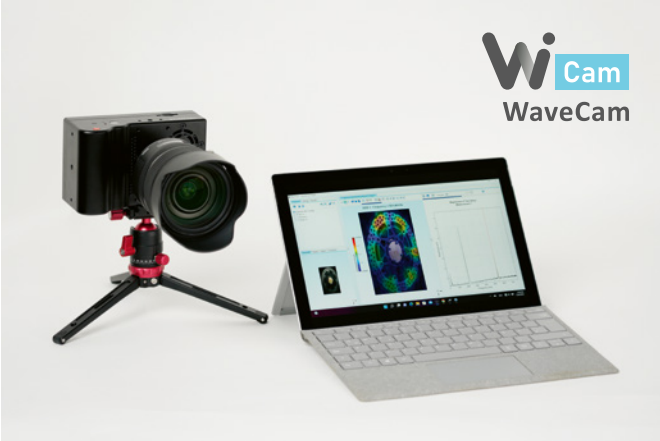
Vibration Analysis with WaveCam

Optical Flow Based Time and Frequency Analysis



Highspeed camera Chronos 2.1 with WaveCam software by gfai tech

BENEFITS

- WaveCam makes vibrations visible with motion magnification
- Analyze data in the time and frequency domain
- Compatibility with various video formats, regardless of the camera used
- Measurement resolution of 10^{-3} pixel possible with use of artificial intelligence (AI)
- Measurement from small (e. g. circuit board) to large structures (e. g. buildings)
- Cross-validation with finite element analyses and traditional vibration measurement methods

APPLICATIONS

- Operating Deflection Shapes (ODS)
- Modal Analysis (OMA)
- Quality assurance
- Research & development
- Troubleshooting, root-cause analysis
- Predictive maintenance
- Structural vibration
- Transient events

WaveCam is your ideal solution for non-contact and high-resolution vibration analysis in the time and frequency domain – for experts and beginners alike. All you need to get started is a camera and our software to process the data.

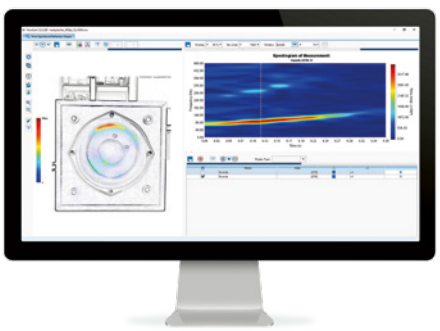
Operating deflection shape or full modal analysis can be performed with a single broadband excitation. This eliminates the need for repeated excitation at different positions, significantly saving measurement and test bench time.

To capture the highest frequency of interest f_{max}, your camera must operate at a minimum frame rate of $FPS = 2.5 \times f_{max}$. Vibration displacements down to 100 nm can be captured.

Every single pixel serves as an individual sensor, allowing you to simultaneously measure hundreds of thousands of positions. Time signals and frequency spectra can be extracted at arbitrary points of interest. Results have been validated with calibration systems, conventional sensors such as laser Doppler vibrometers (LDV), accelerometers, acoustic holography and finite element analysis.

WaveCam also allows the import of measurement data from traditional vibration sensors, which can be used to complement and validate the optical measurements. Furthermore, results from frequency ODS or modal analysis can be compared directly with simulation data.

Visualize modal or deflection shapes under operational, manual, ambient, or automated excitation – such as with the WaveHit^{MAX} impulse hammer – or during transient events. Various display options support intuitive interpretation and enable vivid, conclusive exports. This solution is designed as a full-field complement to classical vibration sensors, combining the strengths of both worlds – but it can also be used entirely on its own.



Software WaveCam – Time ODS module

Vibration Analysis with WaveCam

WaveCam Software Specifications	
Frequency range	0 – 20 kHz
Minimum displacement	100 nm (at 1 m with 50 mm lens)
Supported video file formats	avi, m4v, mj2, mov, mp4, mpg, wmv
Supported image file formats	dng, png, jpg, bmp, tif, tiff
Data analysis domains	■ Frequency Operational Deflection Shapes ■ Time Operational Deflection Shapes ■ Operational Modal Analysis
Signal analysis	■ Time waveforms (velocity, displacement) for each channel ■ Spectra (overall and for each channel) ■ Spectrogram (overall and for each channel) ■ Import of the reference sensor signal (uff)
Frequency filtering	Bandpass in Time waveforms and animation
Spectrogram	■ Window type and size ■ Overlap settings
Motion visualisation	■ Color coded motion maps ■ Amplitude and phase angle visualisation ■ Overall motion or single frequencies ■ Best sensor point visualisation with arrows
Data export	■ Waveforms (csv, uff, png) ■ Spectra (csv, uff, png) ■ Mode shapes (uff) for comparison with simulation results (WaveSim) ■ Animation Videos (avi, mp4)
Pre-processing of the video	■ Video player ■ Adjustments of the video (cropping, trimming, rotating), view point convertion, time cutting ■ Spatial filtering ■ Pre validation (heat map view)
Batch processing	■ User configured analysis ■ Sequential calculation of all batches

Vibration measurement data extraction requires uncompressed video files that can be recorded with all available high-speed cameras as well as smartphone cameras. We recommend using a high-speed camera by Chronos.

Find more about WaveCam & highspeed cameras

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