



NOISE | VIBRATION | EXCELLENCE

# Noise & Vibration

Precisely Measured and Visualized

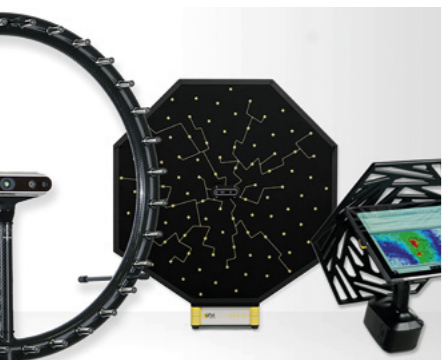


[www.gfai.tech.com](http://www.gfai.tech.com)

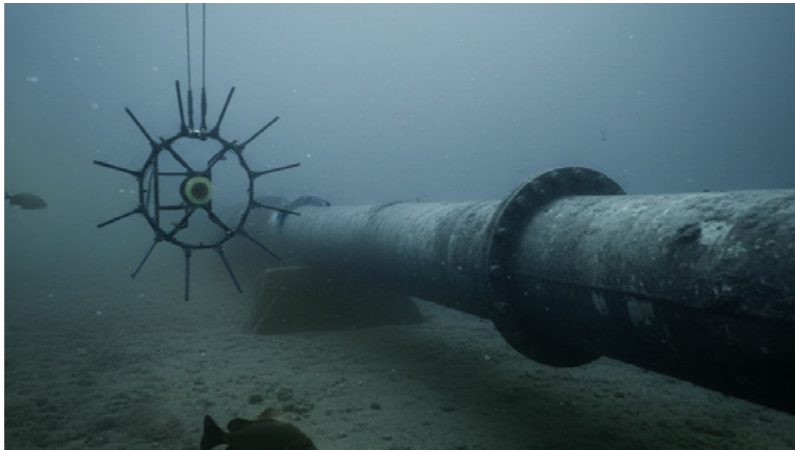




**UNDERWATER  
ACOUSTIC  
CAMERA**



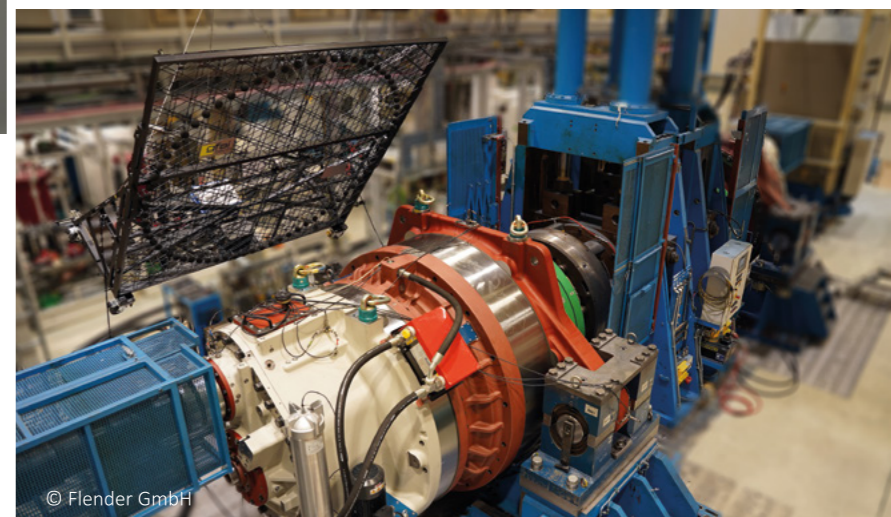
**ACOUSTIC  
CAMERA**



**CUSTOM  
SOLUTIONS**



**STRUCTURAL  
DYNAMICS**



# 1.

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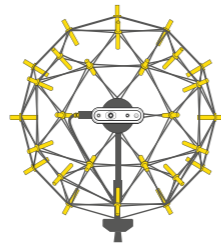
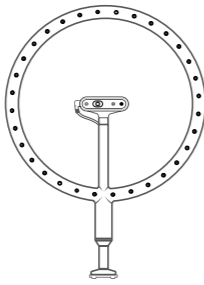
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## Metrics and facts behind the technologies

The name

### „ACOUSTIC CAMERA“

was delivered by the curious mind of Dr. Ochel, science editor of Berliner Zeitung. He inquired about the function of this invention during an exhibition in Hannover in 1997. He proposed the name that would go on to represent our innovation – the „Acoustic Camera“.



One key aspect of our Acoustic Camera is precision. The microphones on the array are placed with an astonishing

### 0.1 mm ACCURACY

allowing the system to localize sound sources as precisely as possible.

Our quality testing system QAlros outpaces human experts in early failure detection by a

### 12-SECOND MARGIN.

Better not take the risk: Sound surpassing the

### 65 dB(A)

threshold for extended periods can gradually raise health issues. Sounds higher than 120 decibels can cause instantaneous hearing loss. Our Acoustic Camera arrays with analog microphones can withstand 130 decibels.



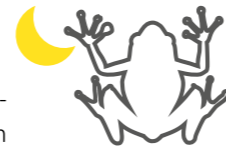
### Our WaveHit<sup>MAX</sup>

is flexible – whether attached to a tripod, a table top, or even carried in hand – it delivers a 360-degree strike capability.

The Acoustic Camera has already been used in the jungle to locate and observe

### NOCTURNAL FROGS

The cold-blooded frogs cannot be distinguished from their surroundings with the infrared cameras that are otherwise used.



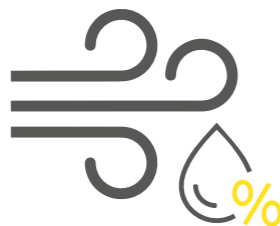
With the remarkable capability to generate a breathtaking

### 192,000 IMAGES PER SECOND

the Acoustic Camera opens up a realm of slow-motion analyses. Thus, phenomena such as the trajectory of a rifle bullet in flight can be acoustically tracked.

The speed of sound has a secret: It tends to quicken its pace as the temperature rises. Generally,

### WIND DIRECTION, TEMPERATURE HUMIDITY



and air pressure influence the propagation of sound.

While our remarkable ears can catch frequencies spanning the vast range of



### 20 – 20,000 Hz,

our Acoustic Camera exceeds this by a range of 10 – 96,000 Hz.

## A journey into noise and vibrations in our daily lives

Have you ever wondered where that elusive hum in your car engine comes from? Or if the bridge you are crossing is moving, even though you can't see it? Sound and vibrations surround us in various forms in our daily lives. What if we could capture, understand and visualize both like never before? Our technology takes you on a journey beyond what you can hear and see — a journey into the hidden dimensions of sound and vibrations.

Our acoustical and structural dynamics solutions provide you with data-driven insights that can be applied to various fields, ranging from automotive engineering and aviation to architecture as well as environmental noise monitoring in urban areas, near highways or on construction sites. Beyond industries, our technology becomes an essential ally in perfecting the sound design of various products. From household appliances to electronic devices and machinery, our solutions ensure that each product meets acoustic standards and requirements.

We go one step further in the field of vibrations. Our powerful analysis tools offer a comprehensive assessment of the condition of machines and systems. By analyzing vibration data, you are able to detect early signs of wear, misalignment and imbalance. This allows you to prevent breakdowns and optimize the performance and longevity of your systems.

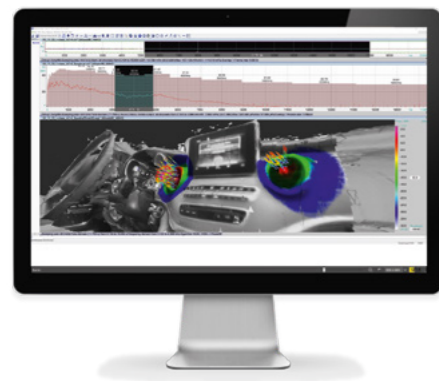
Join us in revealing the unseen world of sound and vibrations within minutes, and discover the endless possibilities our technologies can unveil. Together, we can create positive environments that enhance our well-being and overall quality of life, ensuring the reliability, safety and efficiency of machinery, structures as well as products across a wide range of industries touching our daily lives.



## The power of the Acoustic Camera: Experience sound as never before

The Acoustic Camera is a breakthrough technology that goes beyond the boundaries of audio recording: It not only captures sound but also visualizes it. Sound becomes visible in colour maps similar to thermographic images. These acoustic images or videos offer a detailed view of the acoustic landscape, allowing you to pinpoint the origin of sounds, identify the sources and even see how the sound interacts with the environment. The capabilities of the Acoustic Camera cover a range of measurements from small objects like PCB boards to environmental measurements of vast industrial complexes.

### Components of the Acoustic Camera system AC Pro



#### Capturing sound: The role of microphone arrays

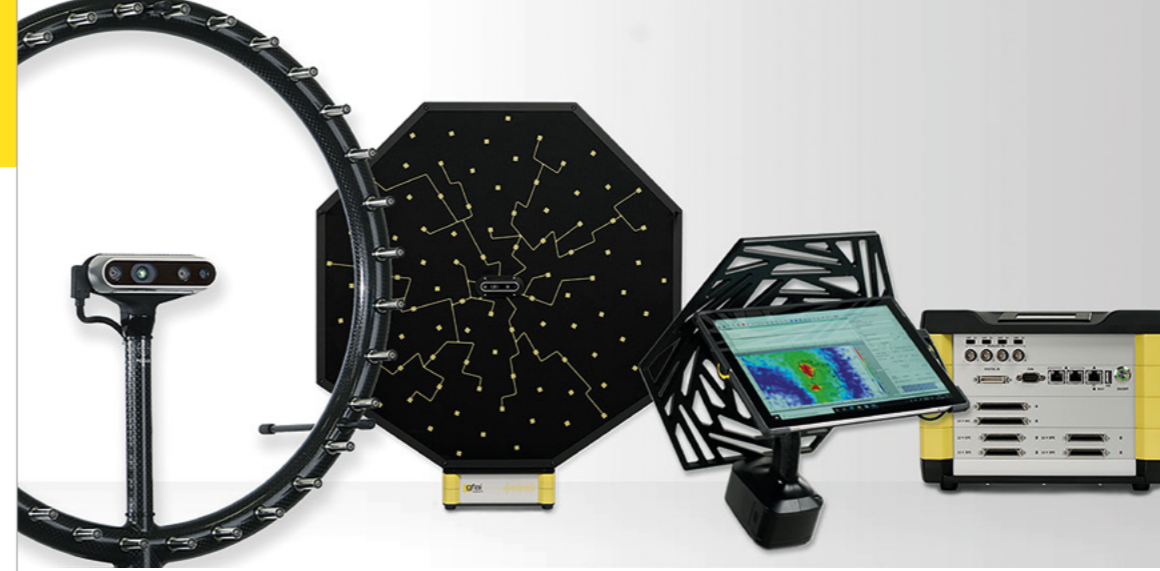
A core element of acoustic imaging is the array of precisely calibrated microphones recording sound below the threshold of human hearing up to the level of jet engines. The microphone distribution is highly optimized to guarantee the highest precision in dynamics and resolution. All the microphone channels are fully synchronized to record the slightest time invariance for mapping of transient noise or fast-moving objects.

#### Recording with precision: Multifunctional devices for data acquisition

Quality of data defines the quality of your results, so we provide data acquisition at highest standards. Analog channel counts of up to 1,000, recorded with highest sampling rates at perfect synchronization guarantee precision and data quality. With our system, you won't miss any transient noise and can analyze up to ultrasound in complex measurement tasks. Our data recorders are designed and produced to seamlessly work within our Acoustic Camera systems. Thus you can benefit from their high data transfer rates and maximum speed.

#### Visualizing complexity: Acoustic analysis software NoiselImage

NoiselImage – The recording and post-processing software of the Acoustic Camera allows you to easily handle complex data of sound, video and other physical parameters. With a few clicks, the sound is visualized in 2D or 3D and exported into various file formats. Any type of spectral analysis can be performed, sound sources can be erased or used for correlating the data and order analysis can be conducted. Moreover, there are several special modules for different applications which are constantly optimized and extended.



### Variations of the Acoustic Camera

In the world of sound exploration, gfai tech offers the greatest variety of expertise and equipment to unlock the full potential of the Acoustic Camera. Our system takes on different forms, presenting varying numbers of microphones and different array sizes for any area of application. Those who require flexibility and mobility, our portable Acoustic Camera is the answer. If extended studies and large-scale noise control efforts are planned, our fixed installations come into play.

#### All-in-one solutions

Our two all-in-one Acoustic Cameras are complete solutions that integrate an advanced microphone array with a high-performance data recorder.

All of our systems are used with our software NoiselImage to offer a solution for precise sound source localization and in-depth acoustic analysis. With user-friendly features and advanced capabilities, NoiselImage simplifies the process of capturing, recording, and visualizing sound.



Find more about our AC Pro system



#### BENEFITS

- High precision sound source localization
- Cost-effective and time-saving measurements
- Detection of low frequencies up to ultrasound
- 2D and 3D acoustic spectral photos and movies
- Complete workflow: measurement, analysis and reporting
- Usable for beginners and experts

#### APPLICATIONS

- Automotive and aeroacoustic testing
- Industrial maintenance and leakage detection
- Acoustic imaging on buildings and structures
- Quality control and product design
- Research & development and bioacoustics
- Troubleshooting for transient noise



Evo AC Pro

## Unlocking a new world of sound with 2D microphone arrays

Experience sound in a whole new dimension with our 2D microphone arrays. With the ability to capture sound along the horizontal and vertical axes, they open up a world to capture sound in two-dimensional acoustic images or videos. An optimized microphone distribution enables the precise localization of sound sources. Paired with our software NoiseImage, captured sound emissions can be analyzed.

Whether you require a compact and light array with 32 microphones for confined spaces or an extensive configuration featuring up to 192 microphones, our arrays can be chosen according to requested applications. Our array Evo AC Pro, for example, is specifically designed to localize effects generated by aeroacoustic phenomena, which makes it ideal for wind tunnel testing applications.



Ring32 AC Pro



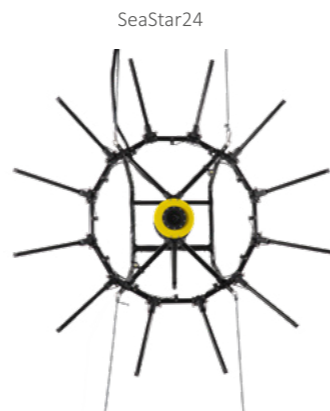
Soundcam Mikado

## Integrated beamforming and near field holography cameras

While beamforming shines in far-field scenarios, near field acoustic holography is primarily used for pinpointing sound sources on or near surfaces. Our beamforming and near-field cameras combine both systems into a single one. This offers flexibility, seamlessly transitioning between far field and near field measurements, allowing diverse acoustic scenarios, even under water.



Fibonacci AC Pro



SeaStar24



## Selected applications of 2D acoustic measurement

2D Acoustic Cameras are commonly used in situations where the exact source of the noise remains uncertain. With just a single measurement, these cameras accurately determine the noise's true origin within minutes. This makes them valuable for noise control, product development, environmental studies and research.



Find more about our microphone arrays for 2D measurement

Our Acoustic Cameras, such as the Ring48 AC Pro, enhance the safety, longevity, and reliability of critical infrastructure including bridges and high-rise buildings. Its 48-channel circular sensor array precisely localizes even the faintest acoustic signals, such as water ingress or material defects, enabling early detection of potential issues.

Designed for long-range acoustic sensing, our Star48 AC Pro can operate effectively over distances of several hundred meters in open-field environments, making it well-suited for applications such as wind turbine monitoring. It precisely localizes acoustic anomalies of wind turbines during operation, indicating variations in performance or mechanical issues at different wind speeds.

Our largest system, the Evo AC Pro, is designed for scalable deployment and can be combined with multiple synchronized arrays to provide full acoustic coverage of large wind tunnels. This enables precise localization and analysis of aerodynamic noise sources across extensive test sections in real time. Thus, airflow noise around aircrafts or vehicles can be studied.

Choosing the right Acoustic Camera is essential for achieving optimal outcomes. Our team of experts gladly assists you in identifying the perfect array for your specific application.



## Unlocking sound in three dimensions

Imagine the ability to capture sound from all directions, unveiling its origin without prior knowledge of its location, and then visualizing its journey.

Our Acoustic Cameras for three-dimensional measurement are precisely designed to do just that: capture sound sources from all angles — front, back, up, and down, and everything in between. These arrays, configured in a spherical shape, have microphones distributed evenly across their surface.

The different positions and heights serve as the key to not only determine the horizontal and vertical direction but also provide depth information about sound sources. The combination of several microphones captures sound sources with remarkable accuracy, much like your eyes perceive depth in the world around you.

Enter a complete new dimension of sound analysis with our spherical Acoustic Camera systems and use our unique features to fully understand sound propagation of complex scenarios.

Furthermore, with DynaBeam we offer a technology to perform a 3D scan while recording sound. This will not only provide 3D models and improved 3D acoustic mapping, but also allows for indicating the directivity of the sound sources with animated arrows.



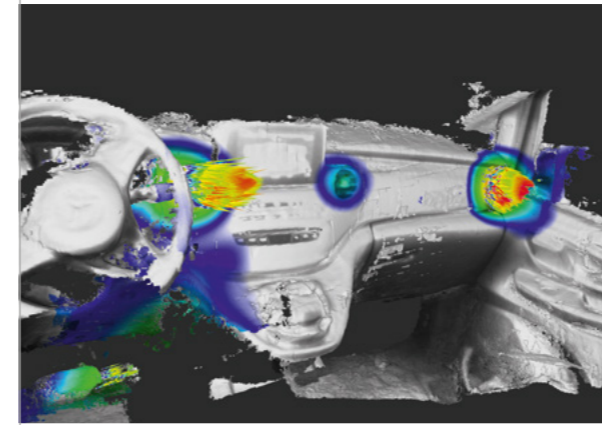
Sphere120 AC Pro



Sphere80 AC Pro



Sphere48 AC Pro



## Selected applications of 3D acoustic measurement

Spherical arrays play a vital role in sound field analysis, enabling a thorough understanding of how sound interacts with the environment. They find significant use in applications where capturing or analyzing sound from all directions simultaneously is essential, eliminating the need of being repositioned or rotated for data collection.

In the fast-paced world of automotive engineering, every decibel, every vibration, and every intricate detail matters. Our small sphere array fits perfectly into the cabin, capturing sound sources from various corners of the vehicle. The 3D acoustic image enables engineers to identify and fine-tune the distinctive characteristics that shape your automotive experience.

In architectural acoustics, our sphere arrays can assess the acoustic properties of complex spaces like auditoriums and concert halls, where sound sources and reflections occur in three dimensions. They can provide support in finding the best environmental noise shape and internal volume as well as suitable type, quantity and positioning of the absorbent materials on the walls and ceilings, even when complex geometries are involved.

In aerospace, these cameras are used to study aircraft noise and understand how sound propagates inside. This leads to innovative solutions like acoustic curtains, sound-absorbent ceiling panels, or revamped air conditioning systems, all of which collectively contribute to a significant reduction of aircraft noise pollution and increase of passenger comfort.



Find more about our microphone arrays for 3D measurement





## Precision meets portability: Our all-in-one soundcam Mikado

Whether it's the tight corners of industrial machinery or the expansive open spaces of outdoor appliances: The portable all-in-one Acoustic Camera Mikado is designed to deliver fast sound localization anytime and anywhere. The wireless design allows you to measure in different positions and angles. 96 MEMS microphones, arranged in a spiral configuration for best acoustic performance, can localize a wide range of frequencies: From 800 Hertz up to above 20,000 Hertz which is above the upper limit of human hearing.

For example, household essentials have become integral parts of our daily lives, where both form and function matters. In order to achieve the best product, the role of sound quality as well as noise standards and limits gain more and more importance. Mikado is an Acoustic Camera which can investigate the sound layers of various everyday products like coffee machines, vacuum cleaners or sewing machines to make them sound as pleasant and quiet as possible.

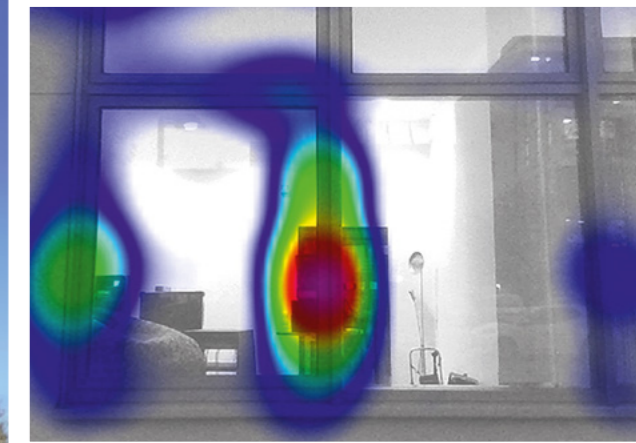
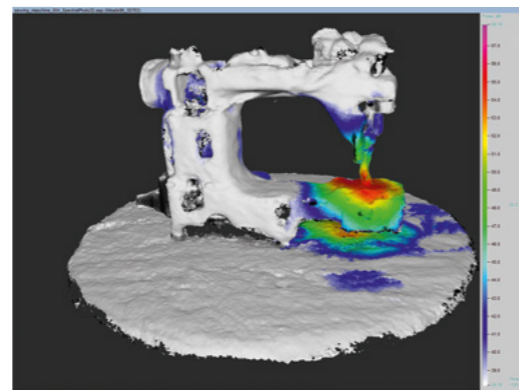
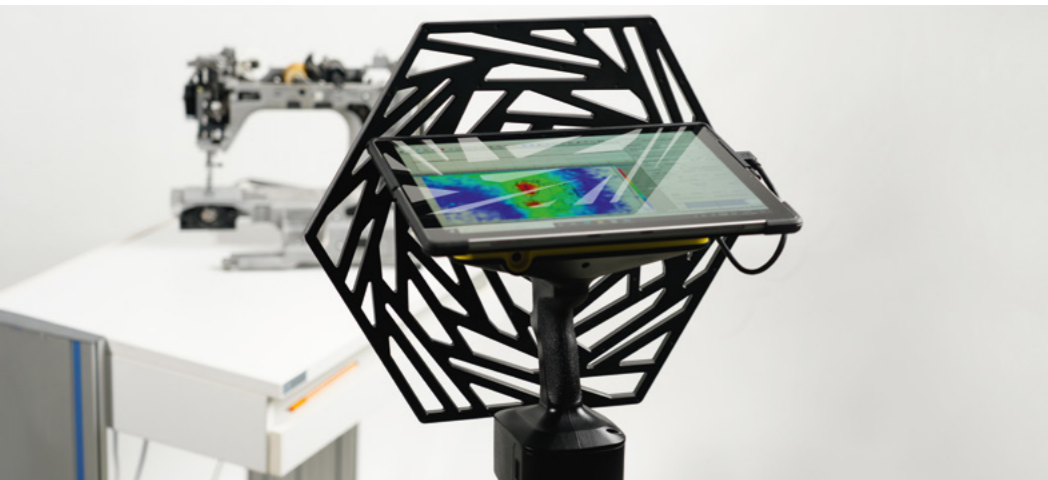
Mikado easily captures each source of noise, empowering manufacturers to pinpoint, identify, and analyze the loudest sources and possible faults. This comprehension of sound emissions lays the foundation for enhancing the sound design of devices and plants by incorporating advanced features such as silent technologies, insulated motors and innovative noise reduction solutions. Mikado plays a crucial role in achieving the optimal balance between operational efficiency and user comfort.

### APPLICATIONS

- Troubleshooting noise and vibration problems
- Quality management of products and components
- Leakage detection
- Research & development
- Close-up measurements in aerospace, automotive, electronics and appliances, education and research



Find more about our soundcam Mikado



## Eight sides of accuracy: Our all-in-one soundcam Octagon

The Octagon is the ideal Acoustic Camera for complex measurements. 192 innovative MEMS microphones detect acoustic emissions in the audible and lower ultrasonic range of 30 to 24,000 Hertz. With an acoustically transparent array design inspired by the Fibonacci spiral, the Octagon effectively mitigates sound reflections, prevents sound pressure doubling at surfaces and minimizes resonance effects between objects and the array.

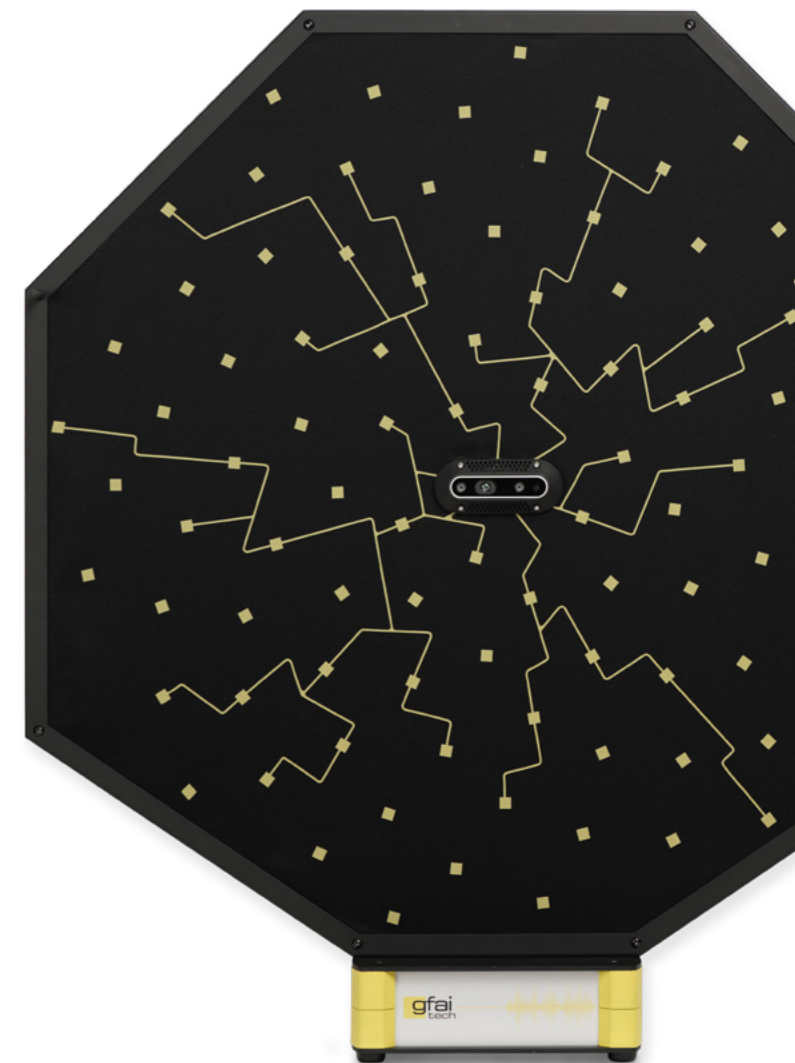
The integrated data acquisition makes it a handy system with no set-up time. The high microphone density makes the Octagon an excellent system for both beamforming and acoustic holography measurements. Air leakages in buildings and pipelines can effortlessly be detected and faults on rotating objects can easily be found. Locate thermal bridges and leaks at windows and doors in the masonry in order to define measures for energy optimization. Thanks to the Power Beamforming method of our software NoiseImage, the measurement results are extremely accurate. The all-in-one soundcam can be used in a wide range of applications in research and development, quality assurance, predictive maintenance or environmental acoustics.

### APPLICATIONS

- Detailed analysis of products and components
- Detection of masked sources
- Leakage detection for buildings and pipes
- Correlating measurements for rotating components
- Measurements in research and development, quality assurance, maintenance or environmental acoustics



Find more about our soundcam Octagon



## Seeing sound beneath the surface

The underwater world is one of the most difficult environments to observe and understand. Visibility is often very limited: light disappears within a few meters below the surface and even in shallow areas, visibility can drop to almost zero because of mud or algae particles.

At the same time, traditional tools like sonar come with their own limitations. They actively send out signals, which can disturb marine life, interfere with sensitive environments, or simply not provide the level of detail which is often needed. On top of that, there's often background noise, reflections and changing conditions in the water, which make it even harder to get a clear and reliable picture of what's actually going on below the surface.



Find more about the  
HydroVision SeaStar24

### HydroVision SeaStar24: First underwater Acoustic Camera

SeaStar24 transforms the invisible underwater soundscape into clear, intuitive 2D and 3D visualizations. By capturing existing acoustic signals and converting them into spatial images, the system provides true situational awareness—without introducing any additional sound into the marine environment.

At its core, SeaStar24 combines a sophisticated 24-channel hydrophone array with advanced digital beam-forming and phase-coherent signal processing. By precisely analyzing the direction and arrival time of acoustic waves across multiple sensors, the system reconstructs the real-time position of sound sources with remarkable accuracy.

The result is a dynamic visual map of underwater activity. Operators can detect, localize, and assess acoustic events instantly—entirely passively. Unlike conventional active sonar, which relies on emitted pulses and returning echoes, SeaStar24 works by interpreting naturally occurring sound, preserving the integrity of the environment.



### Application areas of HydroVision SeaStar24

SeaStar24 enables precise underwater awareness across a wide range of applications where reliability, discretion, and environmental compatibility are essential. Its passive, silent operation allows continuous monitoring without disturbing the surrounding marine environment. Performance and detection capabilities can be adapted depending on system configuration, deployment conditions, and project requirements.

#### Underwater security monitoring

In security-critical maritime areas, SeaStar24 enhances situational awareness by detecting and localizing underwater activity in real time. It enables operators to identify diver movement, equipment operation, vessel presence, and interactions near restricted zones, providing an additional layer of awareness in environments where underwater threats may otherwise remain unseen.

#### Offshore & infrastructure monitoring

Around offshore installations and subsea infrastructure, such as pipelines, communication cables, and energy assets, the system supports continuous monitoring of surrounding activity. It helps detect unusual or unauthorized interactions at an early stage, contributing to the protection and operational resilience of critical underwater networks that form the backbone of modern energy and data supply.

#### Marine research & environmental compatibility

At the same time, SeaStar24 supports marine research and environmental observation by allowing natural underwater processes to be studied without interference. Researchers can observe marine life activity, track behavioral patterns, and monitor environmental changes in real time. Because the system operates entirely without acoustic emission, it preserves the natural soundscape of the ocean, making it especially suitable for long-term ecological studies and use in sensitive or protected marine areas.

#### BENEFITS

- Emission-free underwater surveillance
- Discreet monitoring of sensitive areas
- Reduced environmental impact
- Situational awareness without acoustic signature
- Real-time acoustic source localization
- 2D and 3D acoustic imaging

#### APPLICATIONS

- Underwater Security Monitoring
- Offshore & Infrastructure Monitoring
- Marine research & Environmental compatibility

## Vibration testing – structural dynamics solutions

Mechanical vibrations can be observed in nature and our everyday experiences. Cars, motorcycles, and other vehicles generate vibrations as their engines and moving parts operate, whereas vibrations in buildings and bridges occur due to factors like wind, traffic, or seismic activity. gfaitech provides comprehensive solutions for vibration testing in the field of structural dynamics.

These solutions assess the dynamic behaviour of structures under various conditions. By conducting vibration testing, engineers can analyze and evaluate the structural integrity, performance, and response of components and systems to vibrations and dynamic forces. The results aid in optimizing design, identifying potential issues and ensure the overall reliability and durability of structures.



Find more about our structural dynamics solutions

### WaveCam – non-contact vibration analysis

Dive into a world where the invisible becomes visible: Our WaveCam Vibration Analysis Software employs motion magnification based on simple video data to reveal vibrations that are too small or too subtle to see or feel. WaveCam extracts vibration displacements with sub-pixel precision and visualizes them in intuitive animations, heatmaps and frequency plots for easy interpretation. It is made for experts and beginners alike.



#### Also available as a service:

instead of analysing the data yourself, you can simply record a short video of your machine or structure, upload it, and receive a professional vibration analysis report and result videos from gfaitech experts.

The vibration analysis is performed from recorded video data. The files can be recorded on a multitude of devices ranging from smartphones to professional high-speed cameras. WaveCam uses an algorithm, powered by artificial intelligence (AI), to perform optical flow calculations for image processing. To execute the analysis, we use the pixel-as-sensor technology. Every single pixel of the video data acts as an individual sensor. WaveCam then simultaneously tracks hundreds of thousands of positions of the object in the video over a specified time and can analyze the vibration behaviour in the time and frequency domain, including Operating Deflection Shapes and Operational Modal Analysis

The result? A two-dimensional animation that offers user-friendly heat maps and frequency vs. log magnitude graphs, all of them amplifying and visualizing vibrations that were hidden from your view before.

WaveCam revolutionizes the entire process without any direct physical contact with the measurement object to amplify vibrations in the dynamics of structures and surfaces. Our software speeds up the measurement process while increasing overall accuracy. Complex measurement setups with a large number of vibration sensors and cables, as well as costly measurement techniques are a thing of the past.



### The impact of WaveCam technology

WaveCam plays a crucial role in facilitating damage detection by helping to identify the root causes of vibrations. It not only enhances safety measures but also serves to prolong the life cycle of critical structures of architecture and bridges, machines and other components.

The use of WaveCam extends to tracking mechanical vibrations in various scenarios. In the realm of occupational safety, it reveals shocks and impacts affecting individuals, allowing for the specific minimization of daily stresses on workers and the optimization of tools for future use.

In the context of a car engine, WaveCam amplifies subtle changes in vibration patterns under the hood that may indicate issues such as misalignments, imbalances or wear in critical parts. The analysis process, from measurement to results, is swift and takes only a few minutes.

Moreover, no specialized expertise is required for the analysis. WaveCam applications in automotive settings ensures proactive measures, enhancing safety, reducing downtime and ultimately contributing to the longevity and reliability of car engines.

WaveCam is also ideal for quality control of consumer goods such as loudspeakers. Analysis tests can be used to ensure that loudspeakers offer optimal acoustic performance. They ensure that the desired frequency range is reproduced precisely and accurately without unwanted resonances or distortions. It is possible to animate the currently selected result frequency and to visualise structural modes or local defects directly on the product surface.



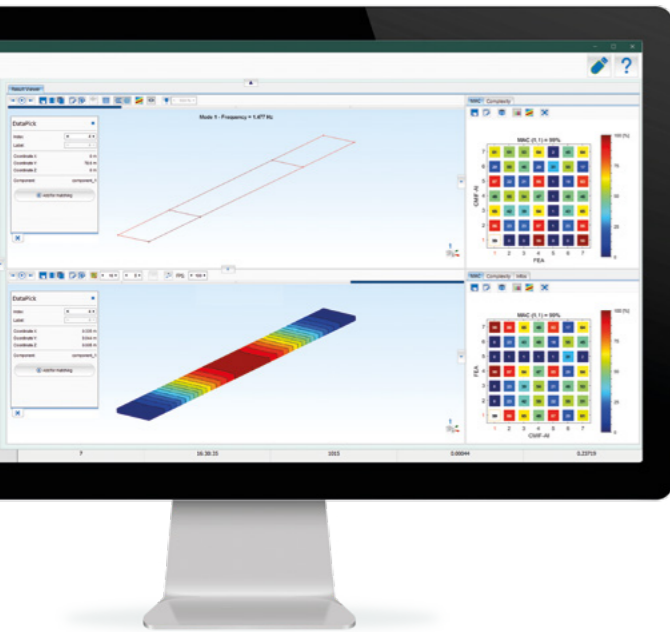
Find more about our software WaveCam

#### 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



## Create a digital twin with our add-on simulation software WaveSim

Are you ready to experiment with new designs, to fine-tune structures and observe their responses to various loads — all before it takes physical form? Thanks to the optimal addition to the vibration measurement software WaveCam, products or services across diverse physical conditions can be predicted fast and easily with our simulation software WaveSim. In combination, they unfold their full potential, enhancing the modal parameters of the finite element model and allowing a Finite Element Analysis (FEA).

With FEA, components of your object are dissected into finite elements, paving the way for a vivid representation of simulations through color scales. FEA visualizes pressure distributions across objects in an animation, calculating natural frequency, mode shape and damping of the structure. Our four different analysis methods provide insight into how structures interact with different static stress and strain as well as the response under external loads.

This powerful tool assists in development processes and prototyping to identify operation-critical or troublesome resonant frequencies. With FEA it is possible to optimize components in the design phase, to minimize the requirement for multiple physical prototypes and to save valuable resources. You can enhance your simulation with real-world data using WaveCam measurements through FE model updating. It is especially useful for safety compliance in automotive engineering, where clear understanding of the cause-and-effect relationships between specific vibration excitations on brake discs is necessary. This nuanced understanding allows for more precise adjustments and refinements.



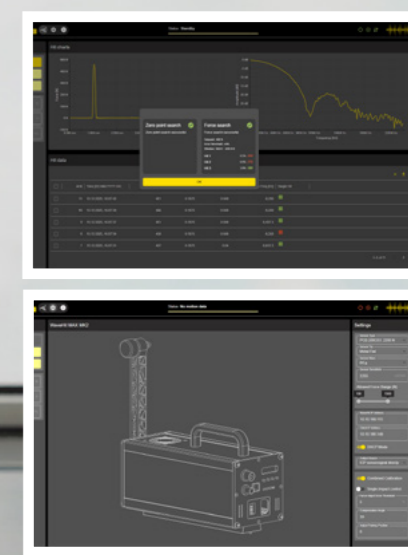
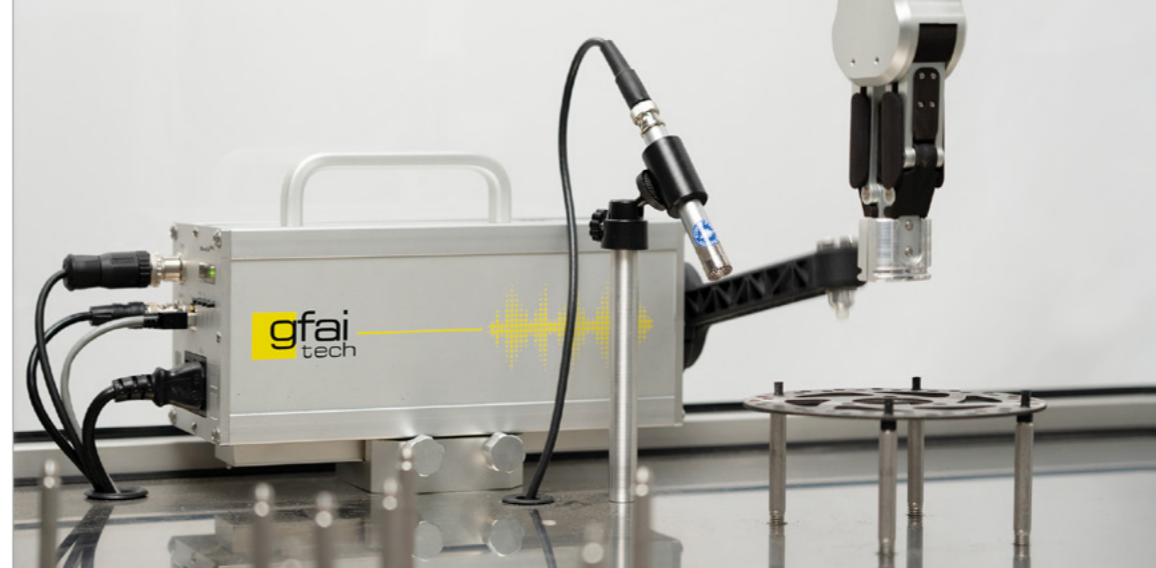
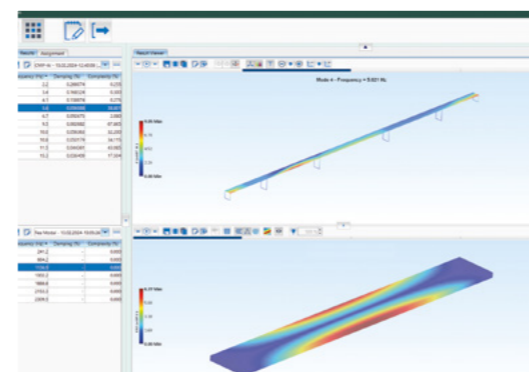
Find more about our software WaveSim

### BENEFITS

- Simplified geometry alignment between camera image and model
- Automatic mesh generation from STL and OBJ files
- Parameter library for most common materials
- Flexible selected boundary conditions and loads
- Diverse function types selectable

### APPLICATIONS

- Prototyping
- Simulation of new designs and external loads
- Static, modal and transient analysis
- Research & development
- Validation and preparation of WaveCam measurements



## The world's first sensor-controlled impulse hammer: WaveHit<sup>MAX</sup>

Step into the future of structural dynamics using our revolutionary impact hammer with sensor-actuator control loop. The sensor signal adapts the motor control optimally to the real environment without any prior knowledge. A single hit on the test object reveals detailed insight into broadband vibration behavior and acoustic properties. This means a leap forward in usability, automation and precision — a unique feature that sets WaveHit<sup>MAX</sup> apart from the rest of classical automated modal hammers.

Customize your impact features by regulating the frequency range based on impact weight, material and force using the included WaveHit<sup>MAX</sup> software. Tailor hits to your needs, whether it's only one hit or continuous hits, a second or half a minute in between — all without the risk of any double hits.

WaveHit<sup>MAX</sup> handles all presets, including zero point calibration and impact force search, automatically for you. However, you can operate it manually via a control menu or by the included software. This adaptability ensures that WaveHit<sup>MAX</sup> fits seamlessly into your workflow, offering a user-friendly interface for both experienced technicians and newcomers to structural testing. It's the ideal choice for structural investigation, particularly in serial testing or scenarios requiring repeated excitation.

In quality assurance, WaveHit<sup>MAX</sup> can be used to quickly inspect, e.g., metal parts like brake discs for cracks or defects. Furthermore, it plays a crucial role in testing during the manufacturing process of sintered structural components for engines, transmissions, or clutches. This ensures the highest quality and reliability in your production.



Find more about our WaveHit<sup>MAX</sup>

### BENEFITS

- Reproducible, high precision single hit excitation
- Automatic and manual zero point search
- Automatic self calibration process (no presetting necessary)
- Internal processing of the sensor signal
- Configuration of magnitude and pulse width using the supplied accessories (weights and tips)
- Start the hit series via trigger, TTL signal or software
- Set impact forces
- Sensor calibration by accredited test laboratory (for MK2)
- Intuitive software with control, hit classification and LDV mode (MK2)

### APPLICATIONS

- Experimental modal analysis
- Acoustic resonance testing
- Condition monitoring
- Material testing
- Impact hammer testing
- Frequency response function testing

## Our engineering support for your individual solution

Whether you are seeking specialized test benches like aeroacoustic wind tunnels or addressing unique applications with exceptionally high sound-pressure levels, our customized hardware and software solutions are designed to meet your exact specifications.

We understand that every project comes with its own goals, challenges, and requirements. That's why we provide tailored support at every stage—from initial planning to final implementation—ensuring a smooth and efficient process throughout. To meet your specific needs, we offer the following services:

### Book on-site training with our team

Our experts will help your team get the most out of our hard- and software. Our on-site seminars and trainings combine the latest knowledge of our technology with hands-on practice. You can choose from one-to three-day training sessions to build your understanding and improve your skills.

### Get calibration and maintenance support

We ensure the highest standards in measurement accuracy and data integrity. Regular calibration in our test laboratories keeps your systems performing at their best. And if issues arise, our experts provide fast diagnostics and reliable repairs.

### Rent our equipment

You are not sure whether one of our sound and vibration solutions is suitable for your application? We offer you to rent our measurement equipment. This enables your engineers to familiarize themselves with the devices in practice and evaluate the results which is a flexible and cost-effective option before you decide to purchase,

### Book our vibration analysis service

With our WaveCam service, you can easily upload your video data, whether recorded on a smartphone or a high-speed camera. We analyze the data and provide detailed insights into vibration patterns, frequencies, and potential issues, helping you understand your system's behavior.



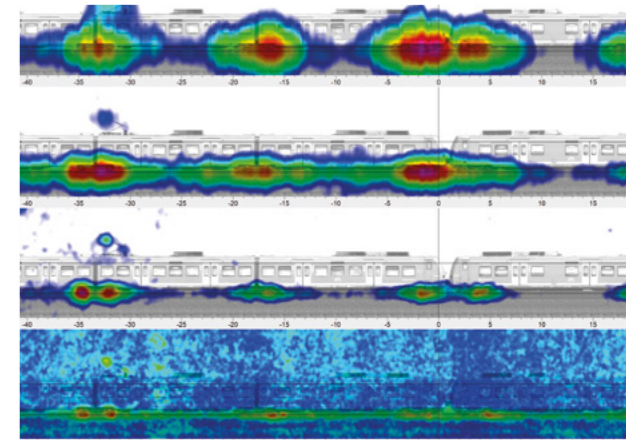
Fig. 1: Customized microphone array Sphere



Fig. 2: WaveCam video analysis service



Book our vibration analysis service!



## Your testing experience with customized solutions

At gfai tech, we understand the critical nature of testing in various industries. Our NoiseImage modules are meticulously designed to meet your unique testing requirements, providing solutions that set new standards in precision and efficiency.



Find more about our engineering services

### Pass-by measurements

Optimize pass-by measurements with our PassBy module. The Acoustic Camera captures sound and visuals simultaneously, creates panoramic images of long vehicles, and uses a smart algorithm to track speed and correct frequency shifts.

### Order analysis

Analyzing rotating machines is complex, but our Order Analysis module simplifies motor diagnostics. It can detect distinct sound emissions from specific parts, even at varying speeds and supports simultaneous recording from additional sensors like accelerometers for detailed testing and troubleshooting of resonance effects.

### Customized wind tunnels

Each wind tunnel has its own unique characteristics, from size and wind speed to specific shear layer dynamics, which guides the design of our 3D acoustic mapping systems.

In 2013, we provided Tongji-SAWTC with their first Acoustic Camera—a custom-built system featuring a single array of 120 microphones. In 2025, we delivered a second system with three arrays totaling 504 microphones.

We also designed a hexagonal wind tunnel system for RWTH Aachen University in Germany, equipped with 168 microphones, fully customized for their acoustic research needs.

### WE OFFER YOU:

- Customized software solutions
- Customized hardware solutions
- Rental of equipment
- Calibration & maintenance

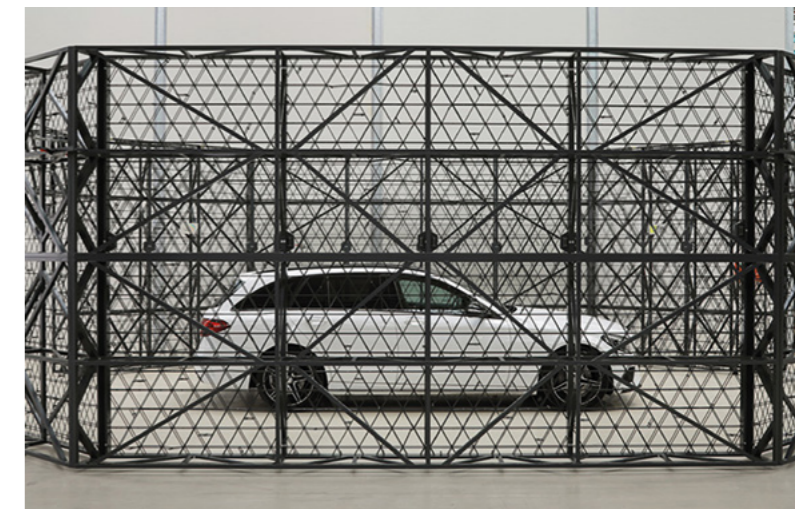


Fig. 1: Customized FlexStar array capturing acoustic emissions of a moving passenger train (top image)

Fig. 2: A newly designed acoustic array for advanced aerodynamics analyses of automobiles

## From noise localization to vibration analysis: gfai tech's journey

More than 20 years ago, our journey to acoustics started with the creation of the first modular and flexible Acoustic Camera, a revolutionary system that redefined sound localization, analysis and beamforming. Our Acoustic Camera was the pioneer in the field and over time, it became a metaphor for beamforming systems. As a true game-changer, the Acoustic Camera set the stage for our ever-evolving portfolio.

Today, our expertise extends far beyond the Acoustic Camera technology encompassing a wide range of solutions. These include experimental modal analysis methods and algorithms up to comprehensive software packages tailored for monitoring, analyzing, and evaluating acoustic and vibration measurement data. Additionally, our capabilities extend into quality testing and pattern recognition. Our fields of application are not limited to just one domain—they span a wide range of applications like

noise reduction, sound design and fault detection. In the automotive sector, our technology takes the lead in advancing safety and design. In product development, we not only meet but set new standards. Engaging in industrial noise and vibration analysis, our technology contributes to improve work environments. When it comes to measuring structures and buildings, our expertise elevates precision and reliability.

The measurement objects for acoustic and vibration measurements are also very diverse. They can be found throughout our everyday life: from the small details in electronic devices like printed circuit boards or household appliances like vacuum cleaners and coffee machines to the huge scale of wind turbines, rail vehicles or aircrafts.

Our goal is simple: to enhance the quality of life by actively contributing to the creation of a quieter, safer and more comfortable world. These aspirations are not mere ideals; they guide every facet of our work, driving us to play a pivotal role in the improvement of our surroundings.

Nikola Tesla's insightful words, „If you want to find the secrets of the universe, think in terms of energy, frequency, and vibration,“ resonate at the heart of our mission. With every sound we capture and every vibration and pattern we analyze, we take a step closer to reveal damages, improve designs or safety.

Whether you are an enthusiast, a professional or someone simply curious about the sounds and vibrations that surround us, there is a place for you to explore. Our journey continues, and we invite you to be a part of it.

**“If you want to find the secrets of the universe, think in terms of energy, frequency, and vibration.”**

**N. Tesla, 1942**

**2001**



The year marks a shift in the world of acoustics as GFal proudly introduced the very first Acoustic Camera. During that year, Porsche recognizes the potential and becomes the first to acquire this innovative technology.

**2001**



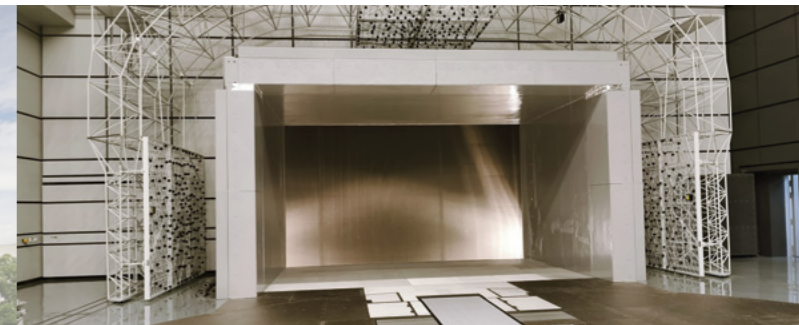
Dr. Hagen Tiedke, Dr. Gerd Heinz, Swen Tilgner, Dirk Döbler and Prof. Dr. Alfred Iwainsky along with Patrick von Pflug (not in the image) are honored with the Otto von Guericke Prize by the AiF in 2001 for their significant contributions to the advancement of acoustic imaging techniques.

**2006**



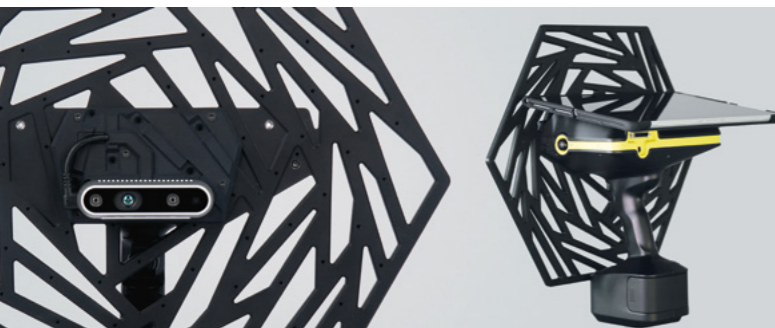
The production and marketing of the Acoustic Camera found a new home under the wing of gfai tech GmbH as a wholly-owned subsidiary of GFal, this transition marked the start of an exciting era for acoustic innovation.

**2017**



gfai tech wins the first wind tunnel in China. It had three microphone arrays, each with 192 microphones, ensuring unprecedented precision in on-site measurements.

**2019**



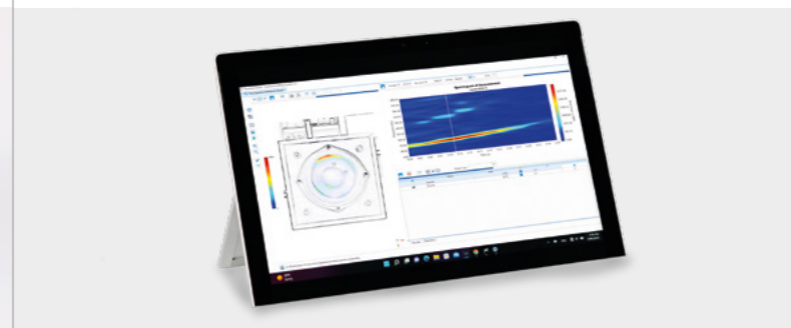
The first mobile all-in-one Acoustic Camera, named Mikado, is presented to the public. This compact microphone array sets a new standard for mobile applications of acoustic and vibration analyses in the field.

**2021**



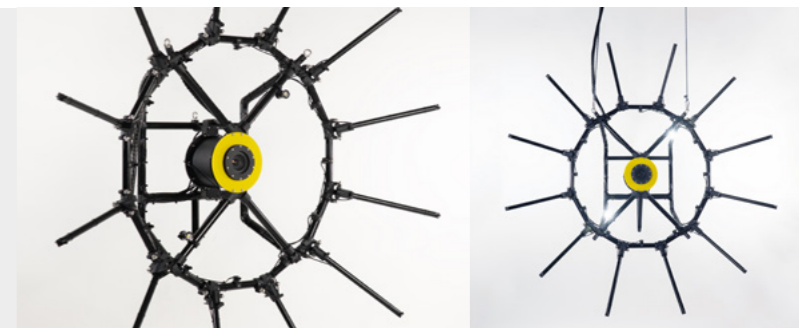
gfai tech introduced WaveHit<sup>MAX</sup>, an innovative impact hammer. This device guarantees fully automatic and highly precise single-hit excitations for testing, thus redefining precision in one powerful strike.

**2022**

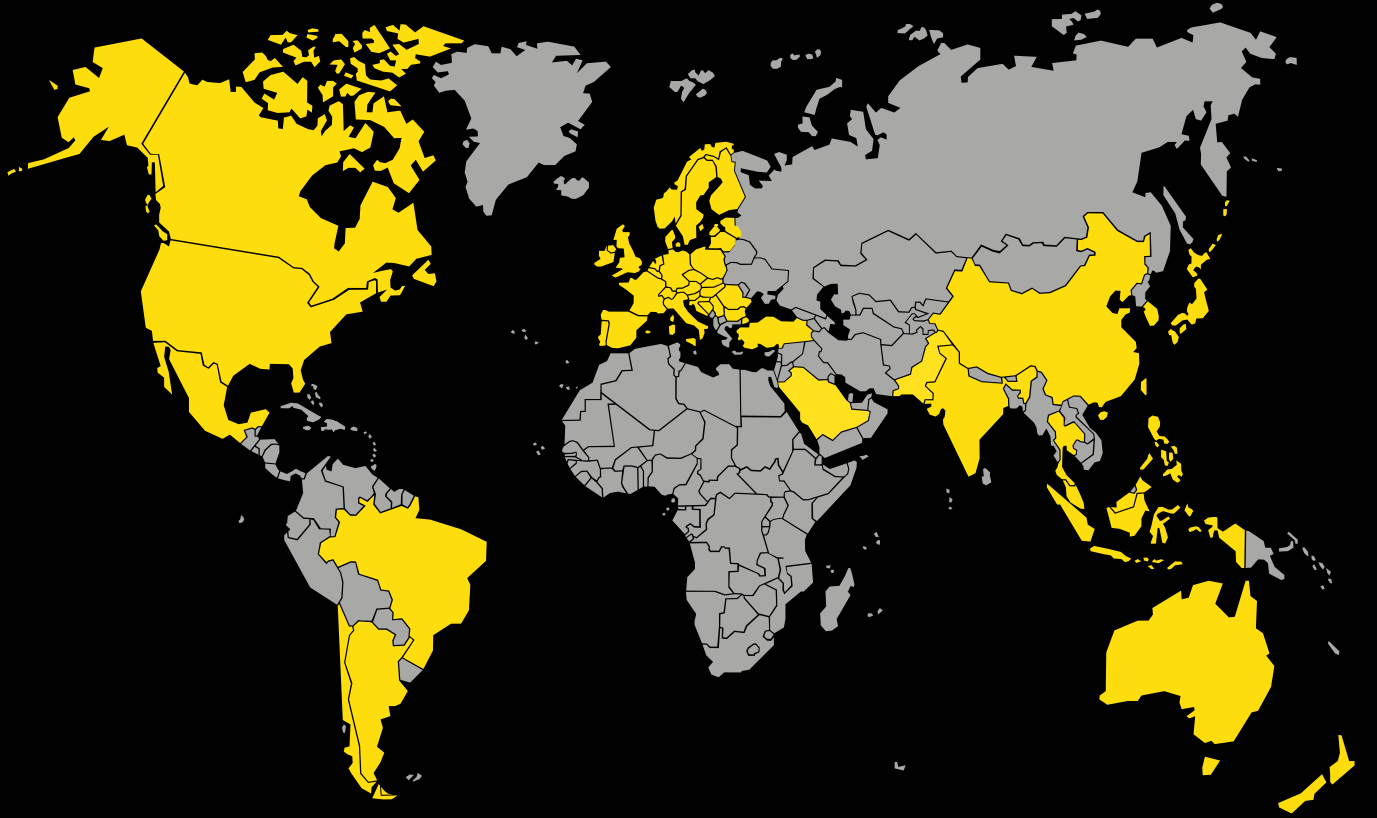


The analysis software WaveCam is offered to the worldwide market. With it, we invite the world to see what was once invisible, to capture the tiniest motion and vibration with precision.

**2025**



The SeaStar24 is being introduced as a novel acoustic underwater camera. In 2026, gfai tech expands its portfolio with a Software-as-a-Service offering: WaveCam vibration analysis.



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