



# ACOUSTIC CAMERA LISTENING WITH THE EYES

## ACOUSTIC CAMERA

The Acoustic Camera is a lightweight, modular and flexible system used to locate sound sources. It is possible to analyse noise in a location-, time- and frequency-selective manner.

Research in this topic was taken up in the 1990s by the signal processing group of GFaI e. V. Today there are about 30 scientific employees working on the development of this technology.

## APPLICATIONS

The application areas for the Acoustic Camera are varied and range from applications in the free field to acoustic labs as well as harsh industrial environments.

Since 2001 the Acoustic Camera is successfully used in the automotive industry, for household appliances, in aircraft and mechanical engineering, for the analysis of wind turbines, in zoological applications and for room and building acoustics as well as for psychoacoustic analysis. Objects as small as a dice but also as big as whole industrial plants are measured and analyzed with the Acoustic Camera.



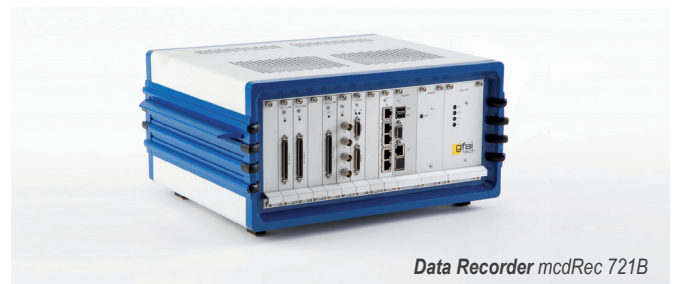
*Typical Acoustic Camera system configuration: Microphone array, data recorder, laptop with NoiseImage (software for recording and post-processing)*

## THE ACOUSTIC CAMERA IN DETAIL:

### Data Recorder

A data recorder (mcdRec) and several data acquisition cards were designed specifically for the Acoustic Camera. The mcdRec features high sampling frequencies at a high channel count (max. 168 microphones/data recorder).

It is also possible to record additional analog or digital parameters parallel to the microphone signals. The transfer rate of the data to the computer used for post-processing is via Gigabyte Ethernet.



*Data Recorder mcdRec 721B*

## CONTACT

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### Microphone Arrays

Depending on the application, various arrays that differ in microphone number and geometry are used. Besides well-established standard geometries and sizes (ring-array with 32/48/72 microphones, sphere array with 48/80/120 microphones, stern array with 32/48 microphones spiral array with 120 Microphones, paddle with 48 microphones), customized, application-optimized array developments are also available.

GFaI provides the complete development (simulation, technical drawing, design, production) or subtasks. For customers with changing measurement tasks and array requirements, a special automatic array calibration tool (ADECO) to determine the microphones positions was developed.



Different microphone arrays: Paddlex24, Sphere120, Sphere48, Ring32

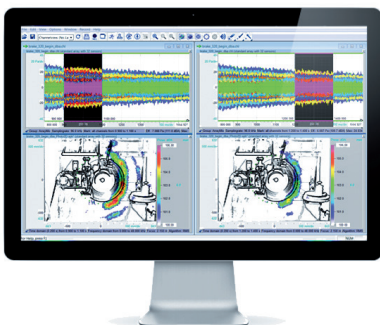
### Software NoiseImage

NoiseImage allows for a variety of analysis methods and their simultaneous display – time-, frequency-, rpm- or place-selective. When developing the software great emphasis was placed to ensure that it is easy to use, responds to the user's questions and is running stable at a high quality.

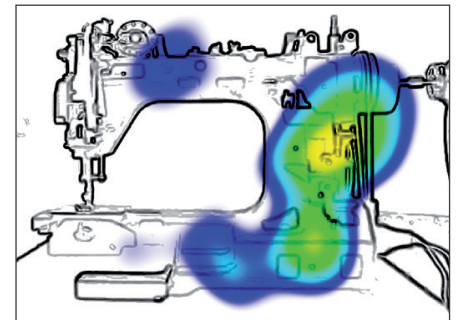
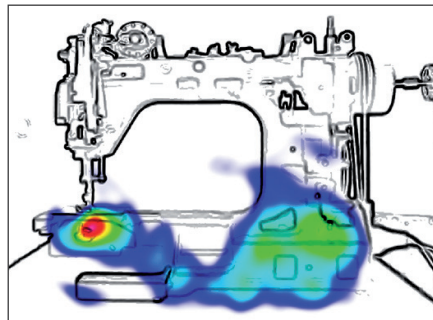
In addition to the classic analysis functions (Photo 2D / 3D, spectral analysis), NoiseImage offers the opportunity to evaluate measurements according to psychoacoustic parameters. Furthermore, there is a pass-by function where single photos of a passing object (e.g. train) are combined to an overview image of the entire object.

On-going development of the intuitive graphical user interface is based on user feedback. The complete software is organized as a plug-in concept. The basic module can be extended by application-specific plugins. Thus, the user can decide which functions are actually needed and so put together a tailor-made software system.

A - very important - by-product of this function is the speed curve which reflects a very precise velocity profile of the object. All modules are continuously extended to the latest level of knowledge so the user can take advantage of the latest developments in the market.



NoiseImage  
for recording & analysis of acoustic data



Acoustic photo of a sewing machine  
Before (left) and after (right) adding damping material