

A week ago we purchased a complex system from Brüel & Kjær for sound analysis. The system allows merging/fusing of information from the different modality sensors – microphone array and camera. Acoustic Holography and Beamforming techniques are used for localizing sound sources. Two patented innovations are embedded in the system microphone technology and irregular (random) antenna array. The system measures the acoustic noise in indoor and outdoor applications and visualizes them. The measurement objects can be very tiny as well as very huge.









Brüel & Kjær is a world-leading manufacturer and supplier of sound and vibration test and measurement solutions.







IICT





Microphone description

4958 - 20 kHz precision array microphone



Type 4958 is a ¼" prepolarized microphone suited for use in systems requiring a large number of microphones, for example, beamforming arrays, STSF measurements, and non-stationary STSF measurements. These microphones have excellent amplitude and phase-matching over wide ranges of temperature and humidity.

Uses

- Measurements using:- Spatial Transformation of Sound Fields (STSF) Type 7688- Non-stationary STSF Type 7712- Beamforming Type 7768
- Hand-held array measurements
- Simultaneous recording of time signals in medium to large microphone arrays, for example, simulated pass-by measurements
- Cost-effective, in-car measurements

Features

- Sensitivity: 11.2 mV/Pa (-39 dB re 1 V/Pa)
- Frequency range: 10 20 000 Hz
- Dynamic range: 28 140 dB
- Built-in CCLD preamplifier with TEDS IEEE 1451.4 V.1.0
- · Excellent amplitude and phase-matching
- Clips directly into existing Brüel & Kjær array systems
- Detachable cable with SMB coaxial plug
- Dimensions: 34 mm long, 7 mm diameter
- Temperature: 10 to + 55°C (+ 14 to + 131°F)





Planar wheel arrays

Usage: Indoor, outdoor

Our innovative wheel arrays come in many diameters and microphone configurations, depending on the application. They are used with PULSE beamforming software, and are designed to produce produce optimal results while maintaining maximum ease of use and handling.

Mainly used for beamforming measurements, the same arrays can also be used for acoustical holography measurements, provided that the array can be moved close enough to the source.









Power supply

An integral transformer connects a 90 - 264 AC, 47 - 63Hz mains power supply, or the unit can be powered from a 10 - 32V DC supply. In addition, each frame can house up to two battery modules, which are capable of powering nine input/output modules for up to 40 minutes. Batteries can be hot-swapped to extend operation time.

DC output and additional PoE ethernet port





Computer Dell







Computer Dell Latitude E6430. Equipped with a 14" display, the Latitude E6430 strikes the perfect balance of mobility, performance, and durability. Armored with a MIL-STD 810G tested Tri-Metal™ casing, anodized aluminum display back, magnesium alloy wrapped corners, steel hinges, and a powder-coated base, the Latitude E6430 can handle work's tough demands. StrikeZone[™] shock absorber, Fast Response Free-Fall Sensor, and rubber hard drive isolation help protect data from drops and vibration, while the spill-resistant keyboard and LCD protective seal further help protect the system from bumps and spills.





Software 1





Beamforming - Type 8608



Beamforming enables noise sources to be mapped by measuring the directions from which the sounds originate, using a delay-and-sum algorithm. The method quickly allows a full sound map to be calculated and displayed from a single-shot measurement. A wide range of optimised acoustic arrays facilitates use indoors, outdoors, in wind tunnels and on moving sources.





Acoustic Holography - Type 8607



Near-field acoustic holography maps noise sources using a complete sampling of the sound field. The method is very accurate and allows any property of the sound-field - like sound pressure, sound intensity or particle velocity - to be calculated in any plane parallel to the measurement plane. This method has excellent resolution and maintains its source separation capabilities even at low frequencies.





Acoustic Test Consultant - Type 7761

Overview	Accessories	Services

A PULSE[™] application to simplify multi-point acoustic measurements and produce reliable test data, this reduces test time and works with PULSE to support all aspects of the measurement process.

The basic Acoustic Test Consultant software has a separate robot option that makes the measurement process fully automatic, and a position detection option to determine the positions of microphones in a hand-held microphone array.





FFT Analysis - Type 7770



Allows real-time, multi-channel FFT spectrum analysis, whether you want to perform mobility measurements, vibration diagnostics, or narrow-band analysis of acoustic signals.







Time Data Recording - Type 7708



Gathers data in the field for later post-processing and analysis on a standard laptop, making it a stand-alone, multi-channel data acquisition tool.

Recording at the same time as performing real-time analysis is possible with PULSE Data Recorder Type 7701, which can be embedded into a PULSE project to archive time histories while simultaneously analysing the data.





- Noise pollution
 - Airport noise
 - Urban/Street noise
 - Instrument noise





- Noise identification. Find the source of specific noise
 - Sound quality analysis
 - Data/music recording
 - Multimedia product analysis





- Production testing and machine diagnostics by spectral analysis, time-frequency analysis, trend detection in sound intensity signals, noise intensity analysis, shock response analysis, etc.
 - machine noise localization and analysis (turbines, car engine, etc.)
 - vibration testing;





- Occupational health
 - Noise exposure
 - Hearing protection
 - Human vibration
 - Noise reduction
 - Factory hall acoustic





- Military/security applications
 - noise barrier detectors
 - noise localization
 - noise recognition





- Scientific tool for research in
 - beamforming
 - random antenna array development
 - acoustic signal analysis
 - acoustic holography
 - signal processing/filtering
 - etc.





Educational

 The system can be used by PhD students and MSc students as a tool for practical experiments and solution of different real problems











Working like a camera, beamforming can map large objects from a distance

24.10.2013







- Noise Source Identification is an important method for optimising noise emission from wide range of mechanical and electromechanical products ranging from full vehicles to mobile phones.
- The goal of NSI is to identify the most important subsources on an object in term of position, frequency content and sound power. Sub-sources may be ranked to identify where design changes will most effectively improve the overall noise radiation.
- In addition, selective intensity may be used to further identify the internal root sources and radiation mechanism involved.

