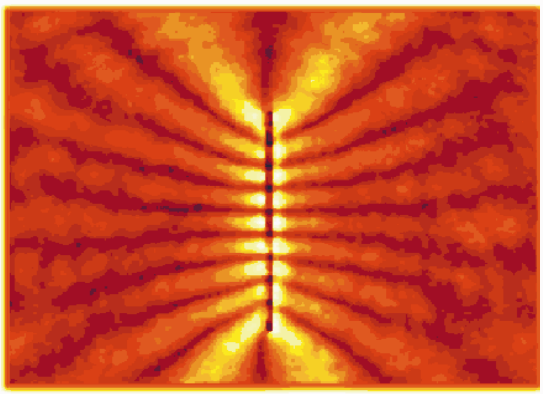
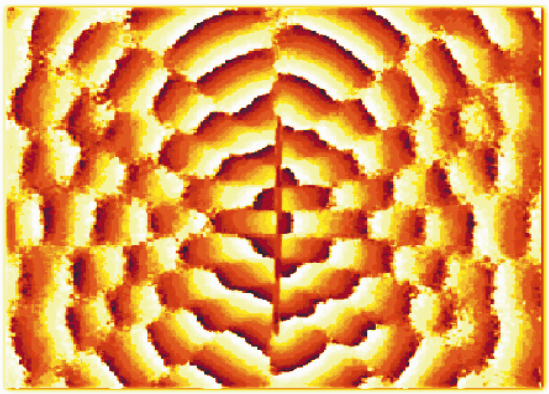
VibroMap 1000

Application note: Sound field measurements

Sound field from vibrating steel plate in air

The figures show sound waves from a 10 cm steel plate vibrating at 17,000 Hz. The plate is excited by a piezoelectric transducer. The plate is hanging in a thin wire, and we see the plate from the side, so it appears like a vertical line in the figures. The left figure

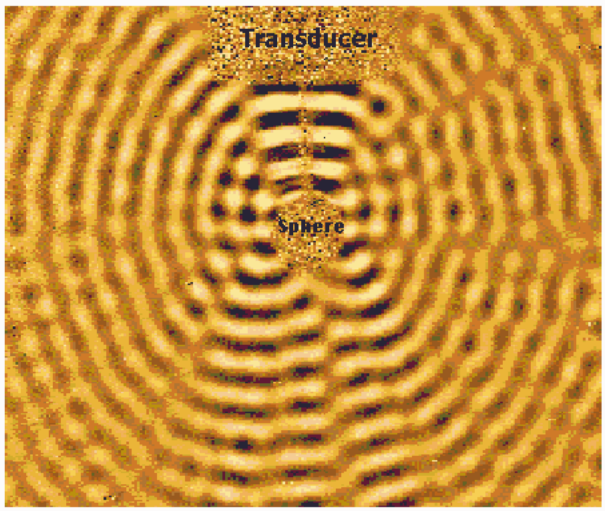




shows the sound wave amplitude distribution, and the right figure shows the phase distribution of the same sound wave. The VibroMap 1000 software can also show an animated display of the result.

Sound fields from transducer in water

The figure below shows 140 kHz sound waves in water from an underwater transducer. A metallic sphere is hanging in a thin wire below the transducer, and we can see reflections from the sphere in the surrounding water. A standing wave appears between the transducer and the sphere, and we also see interference patterns below the sphere.



The figure is a combination of the sound wave amplitude distribution and the sound wave phase distribution (see the two figures on top of page). At the Optonor web home page http://www.optonor.no, you can also see an animation of this recording.

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About Sound Field Measurements with the VibroMap 1000

When sound waves propagate in air or water, the sound pressure gives changes in the refractive index of the air or water, and this can be detected and measured by the VibroMap 1000. The VibroMap 1000 measures sound waves at one frequency at a time, and the instrument normally controls the vibration excitation of the sound source.

The sound field measurements with the VibroMap 1000 are non contact, and the VibroMap 1000 does not influence the sound waves like microphones do by reflection of sound waves etc. Therefore, the VibroMap 1000 can measure sound waves very close to object surfaces as well as in open space.

The measurements presented here are one-dimensional projections of the sound fields. To measure quantitative sound pressure values in each point in a 3D sound field, a tomographic recording and processing algorithm can be used.

Typical applications

- To see sound directivity from loudspeaker drivers and loudspeaker cabinets
- To see focus, collimation and directivity from underwater transducers
- To investigate the acoustic impedance etc. of materials by measurement of sound close to surfaces, measurement of sound reflections etc.
- To measure refractive index of liquids and gases
- In research and industrial applications

Advantages and properties

- Non contact
- Full field information
- Sound directivity can be measured
- Far distance measurements possible
- Measurements on other side of windows and transparent materials possible
- Microscopic measurements on ultrasonic waves possible

Optonor AS
Harald Hårfagres gate 5 7041 Trondheim Norway
Phone: +47 73 50 20 20 Fax: +47 73 50 20 22
email: optonor@online.no http://www.optonor.no

optonor
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