Sound & bright

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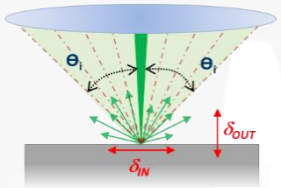
MULTI-COMPONENT LASER RECEIVER

Laser
Ultrasonics

TECHNOLOGY

The **Multi-Component Laser Receiver** was born from a research and development grant from the National Science Foundation.

The **Multi-component** receiver is based on photorefractive two-wave mixing combined with a custom multi-detector technology allowing the detection of the complete ultrasonic field. The large collection angle of scattered light is divided in elementary angles Θi which information contributes to the ultrasonic field reconstruction. Each elementary angle carries phase information of both in-plane and out-of-plane contributions. The collected light is focused on a linear array of N elements using a vertical cylindrical lens



$$I_i - I_{-i} \propto \left(\frac{4\pi\delta_{IN}}{\lambda}\right)\sin(q_i)$$ → **In-plane**

$$I_i + I_{-i} \propto \left(\frac{4\pi\delta_{OUT}}{\lambda}\right)\cos(q_i)$$ → **Out-of-plane**

The signals are processed in pairs of the same incidence angle. For each pair, the two normalized signals are added to each other in order to obtain the elementary out-of-plane component, while their subtraction yields the elementary in-plane component.

FEATURES

-> Simultaneous detection of in-plane and out-of-plane components of the surface displacement
-> Large étendue interferometer
-> High sensitivity on all surface types and materials
-> Continuous detection laser

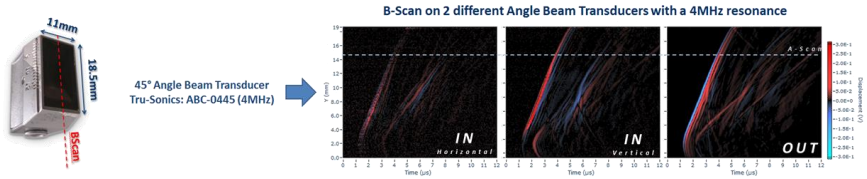
EXAMPLES OF APPLICATIONS

Bonding quality

Compressional waves can easily go through kissing bonds between two layers. Thus, the out-of-plane information becomes not sufficient to determine the quality of mechanical bonding. Due to their motion perpendicular to the direction of propagation, coupling of shear waves does not occur if there is no mechanical contact. Thus, the in-plane information is used to determine the quality of bonding between two layers.

Remote shear waves inspection

When propagating through a specimen, the ultrasonic waves carry information about the inner structure. Similarly, when propagating along a surface, the information about the surface quality and surface coatings can be extracted.



SPECIFICATIONS

Technology Two-Wave mixing	Detection In-Plane & Out-Of-Plane	Configuration Free-Space
Internal Laser power 500mW @532nm	NESD Out: 2.10^{-7} nm. $(W/Hz)^{1/2}$ In: 1.10^{-6} nm. $(W/Hz)^{1/2}$	Detection bandwidth 20MHz
Dimensions 492 x 302 x 114 mm^3	Weight 16kg	Electrical requirements 110V / 220V 50Hz / 60Hz

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