

TEMPO 2D
MULTI-COMPONENT RECEIVER

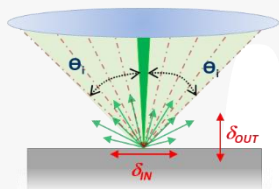
Laser
Ultrasonics

TECHNOLOGY

The **Tempo 2D** was born from a research and development grant from the National Science Foundation.



Our **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 Θ_i 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



$$I_i - L_{-i} \propto \left(\frac{4\pi\delta_{IN}}{\lambda} \right) \sin(q_i) \rightarrow \text{In-plane}$$

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

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. The out-of-plane information therefore becomes insufficient to determine the quality of mechanical bonding. Due to motion perpendicular to the direction of propagation, the coupling of shear waves does not occur if there is no mechanical contact. The in-plane information is therefore used to determine the quality of bonding between two layers.

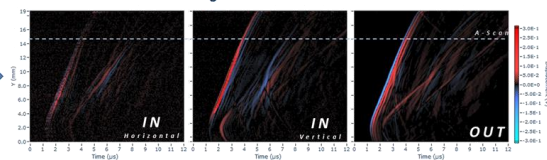
Remote shear waves inspection

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.



45° Angle Beam Transducer
Tru-Sonics: ABC-0445 (4MHz)

B-Scan on 2 different Angle Beam Transducers with a 4MHz resonance



SPECIFICATIONS

Technology
Two-Wave mixing

Detection
In-Plane & Out-Of-Plane

Configuration
Free-Space

Internal Laser power
500mW @532nm

NESD (out-of-plane motion)
 $2.10 \text{ nm} \cdot (\text{W/Hz})^{1/2}$

Detection bandwidth
20MHz

Dimensions
492 x 302 x 114 mm³

Weight
16kg

Electrical requirements
110V / 220V
50Hz / 60Hz