



Phased Array Probes for Non-contact Air-coupled Ultrasonic Testing

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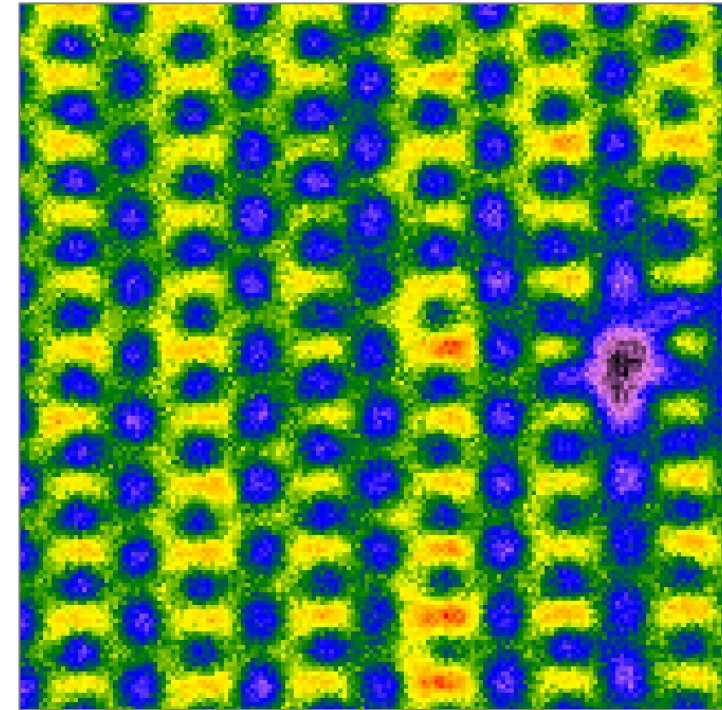
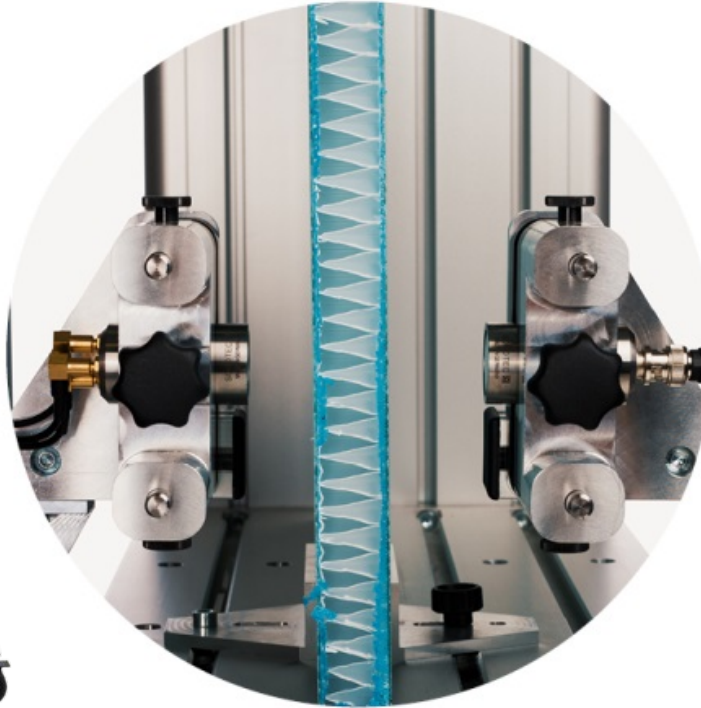


1. Application
2. Phased Array Probe Design
3. Probe Characteristics
4. Validation Example
5. Conclusion



1. Application

Non-contact Ultrasonic Testing





1. Application

Probe Requirements

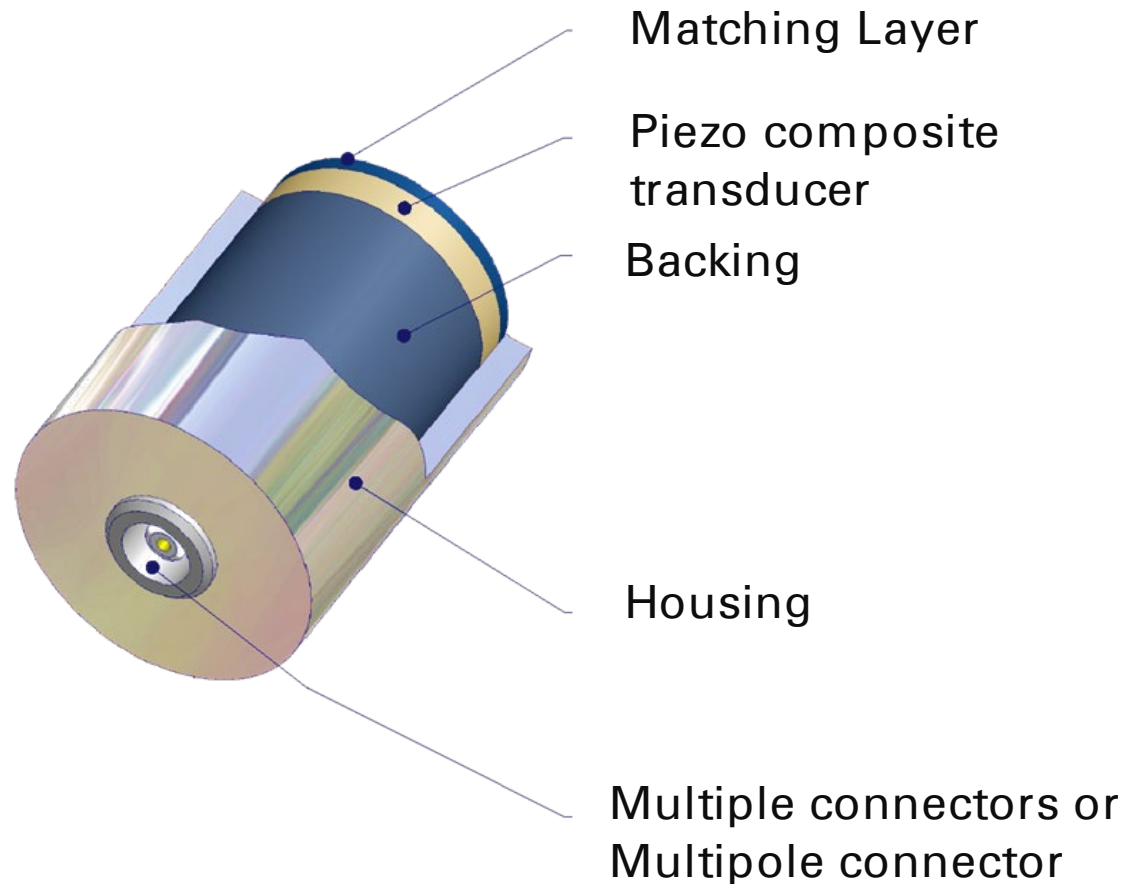
- Frequency corresponding to test object
- High sensitivity, low noise
- Small focal spot
- Low interference level
- Variable distance to test object





2. Phased-Array Probe Design

Probe Requirements

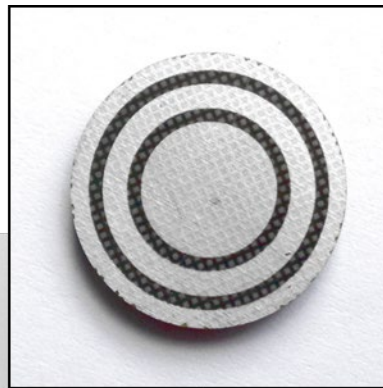




2. Phased-Array Probe Design

Probe Requirements

▀ Piezocomposite Transducer



▀ 3 Elements
▀ Equally sized

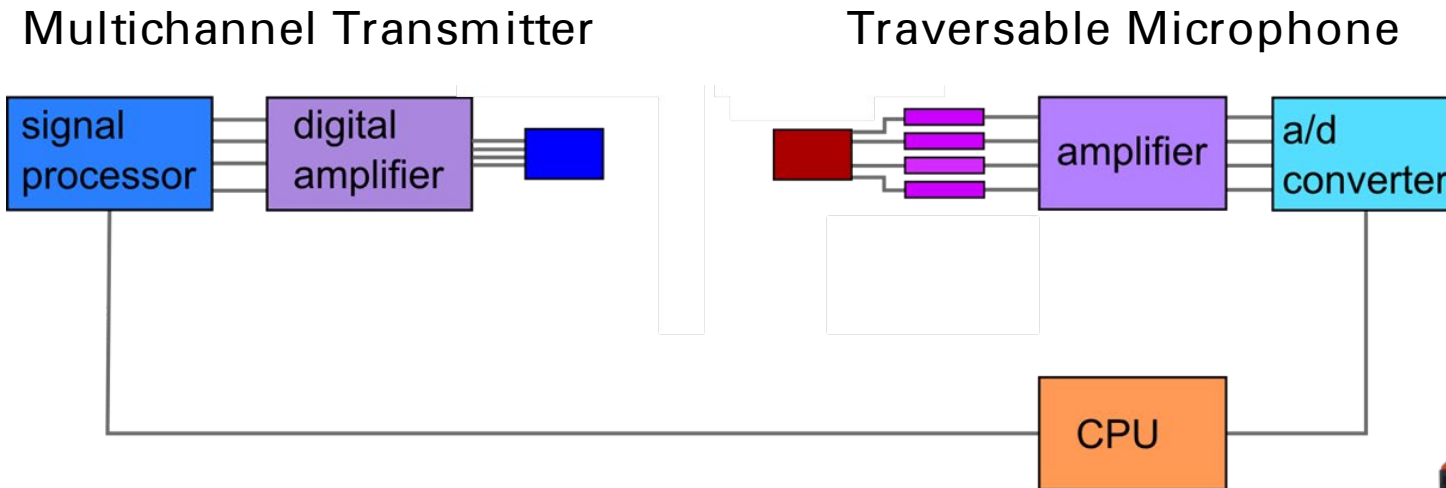


▀ Structured Electrode
▀ Annular Array

SONOSCAN CF400 3E



3. Test Setup



- Multichannel Ultrasonic Instrument
- Axis Controller
- Digitizer
- Data Storage and Viewer





3. Test Setup

▶ Pulser

- ▶ Rectangular Bursts
- ▶ 100 Vpp
- ▶ 400 kHz
- ▶ 5 Cycles

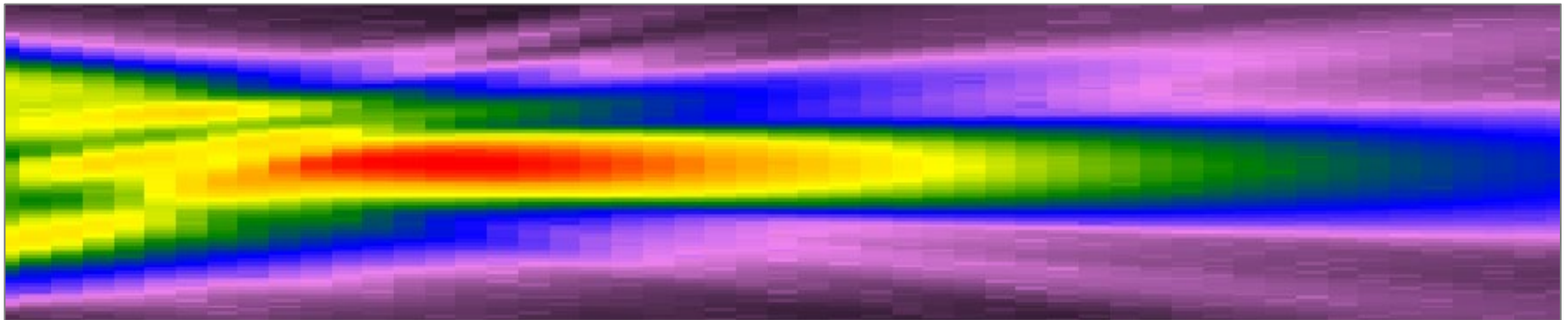
▶ Receiver

- ▶ Modified SONOSCAN CF 400 Microphone
- ▶ Low-noise Amplifier



4. Test Results

Soundfield – Conventional Focussed Probe

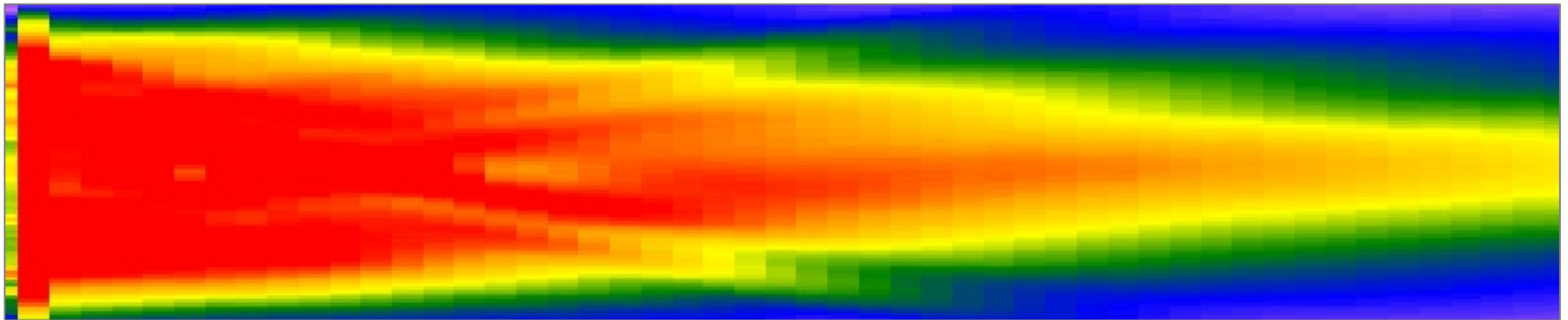


- ▀ Scan Area: 100 mm x 20 mm
- ▀ Focal Zone: 15 ... 60 mm
- ▀ Focal Width: 3.6 mm



4. Test Results

Soundfield – Phased Array Probe

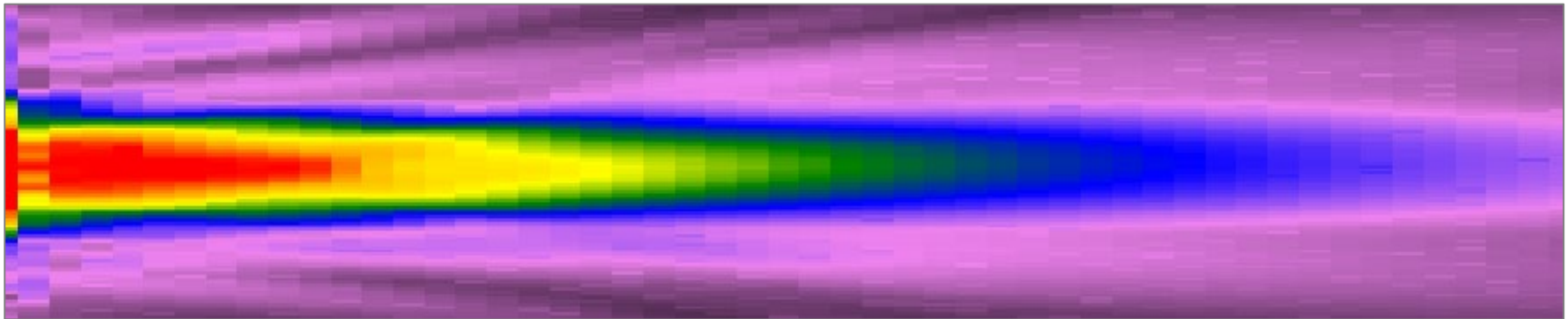


- ▣ Delay Law: 0 ns / 0 ns / 0 ns
- ▣ Scan Area: 100 mm x 20 mm
- ▣ Focal Zone: 40 ... 100 mm
- ▣ Focal Width: 9.8 mm



4. Test Results

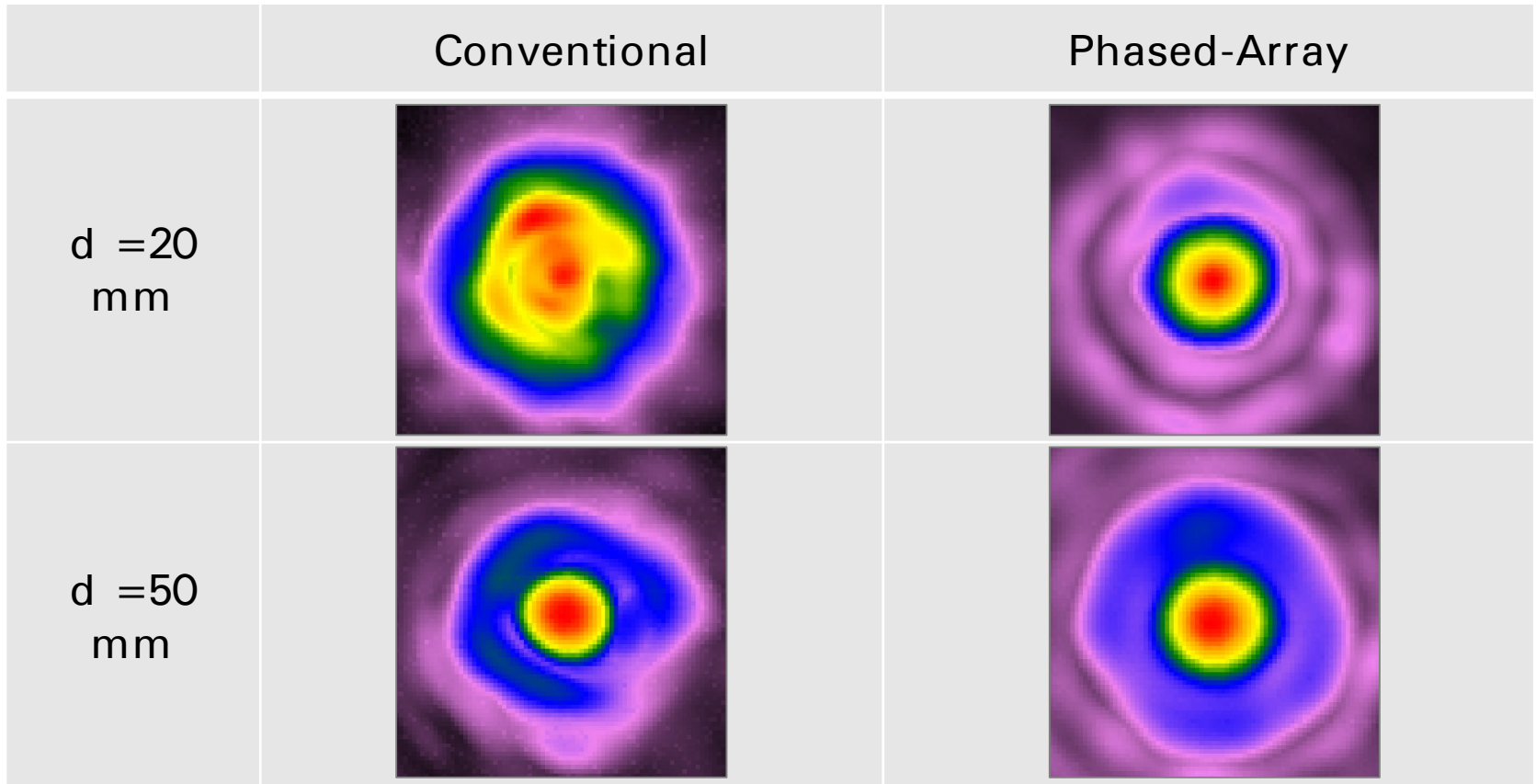
Soundfield – Phased Array Probe



- ▴ Delay Law: 0 ns / 900 ns / 1800 ns
- ▴ Scan Area: 100 mm x 20 mm
- ▴ Focal Zone: 5 ... 30 mm
- ▴ Focal Width: 3.2 mm



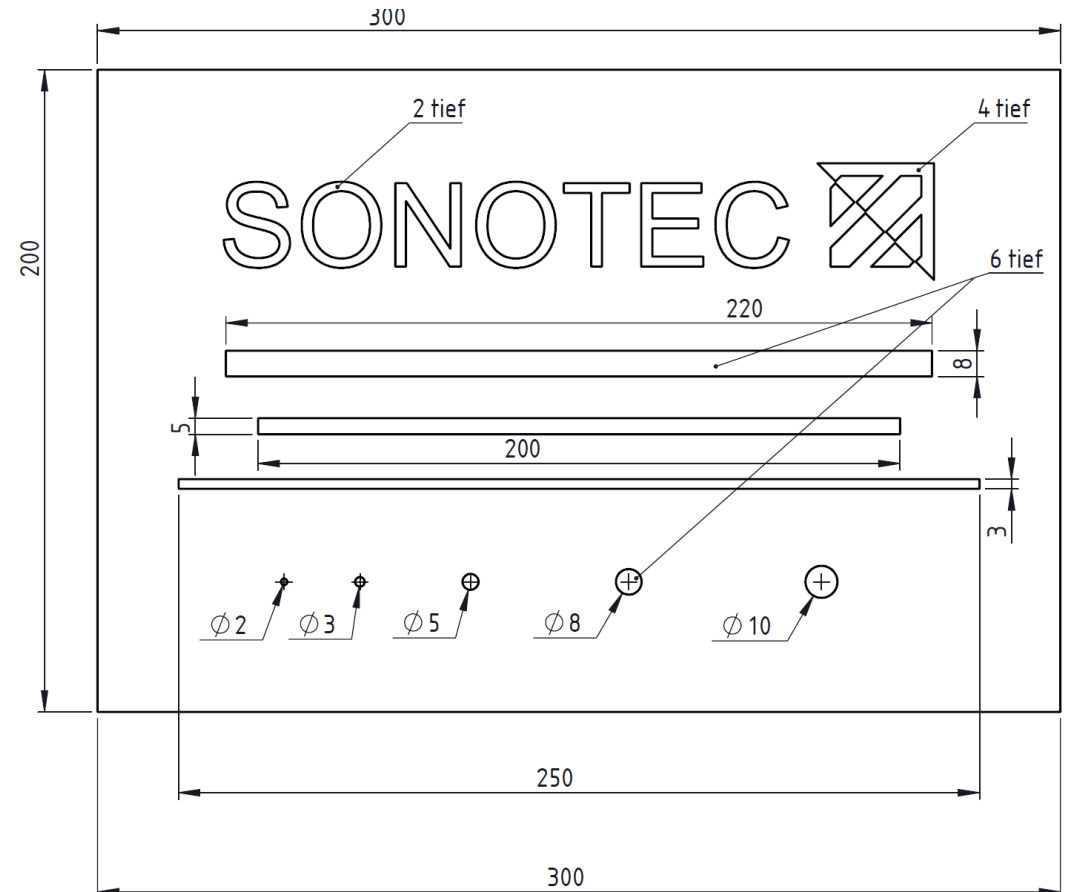
4. Test Results





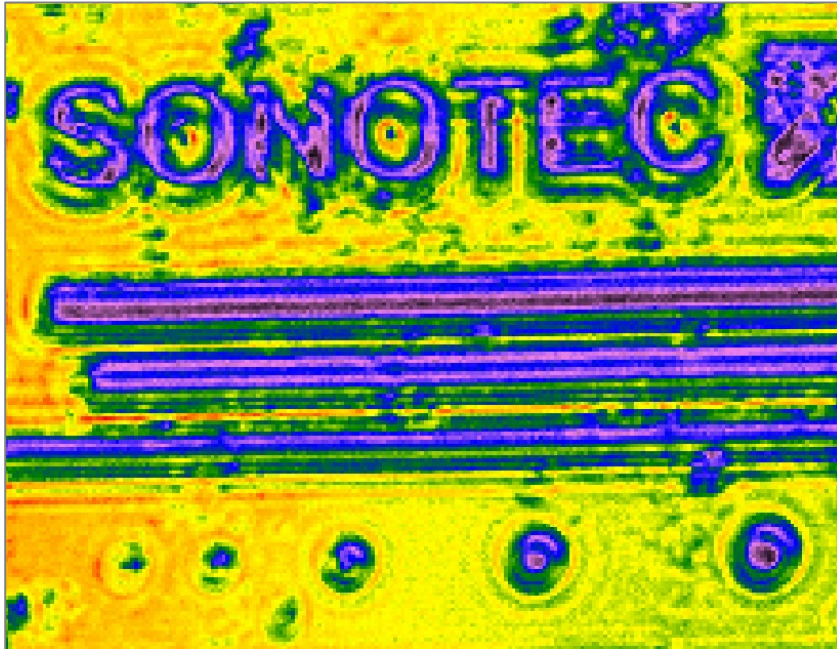
5. Validation Example

- ▶ PMMA
- ▶ Internal artificial imperfections
- ▶ Closed surface

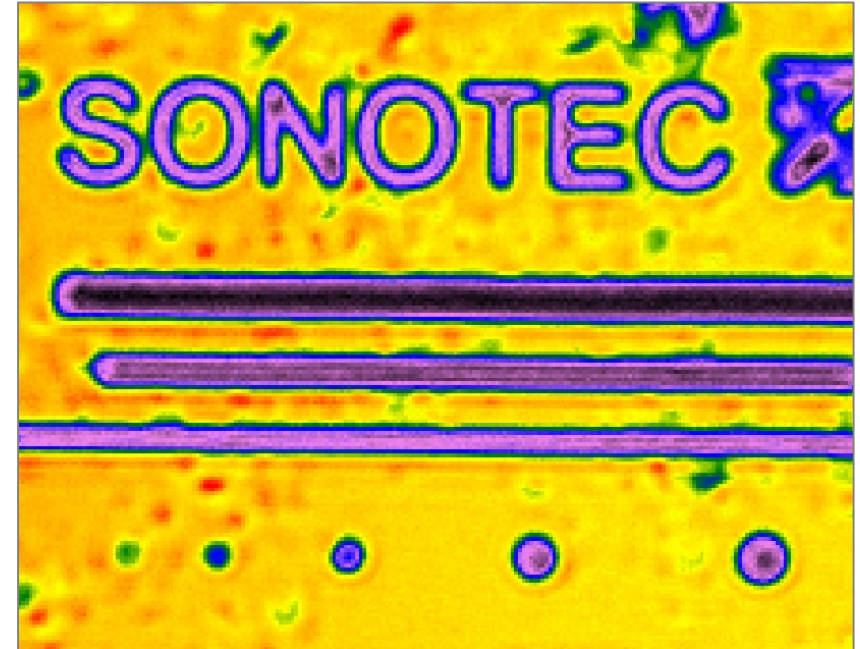




5. Validation Example



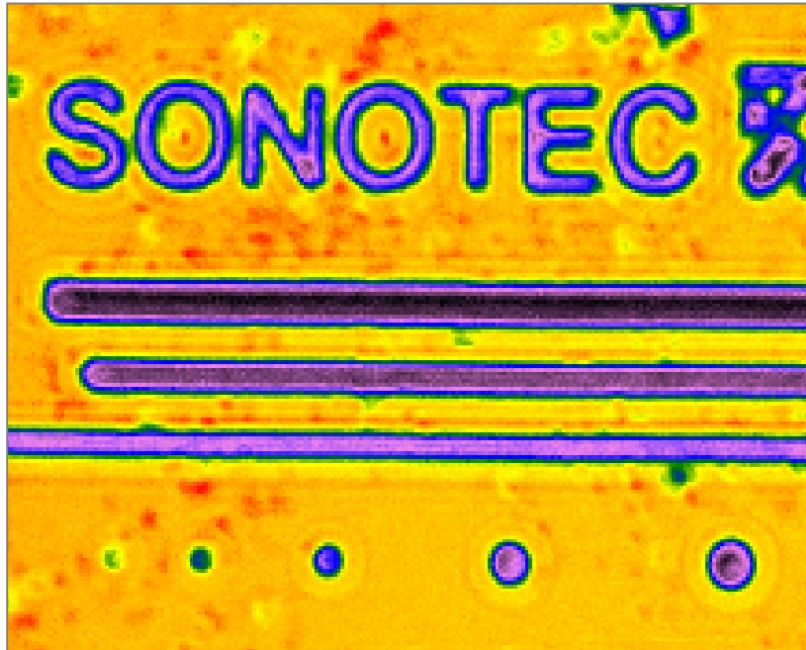
Conventional Probe (gap 20 mm)



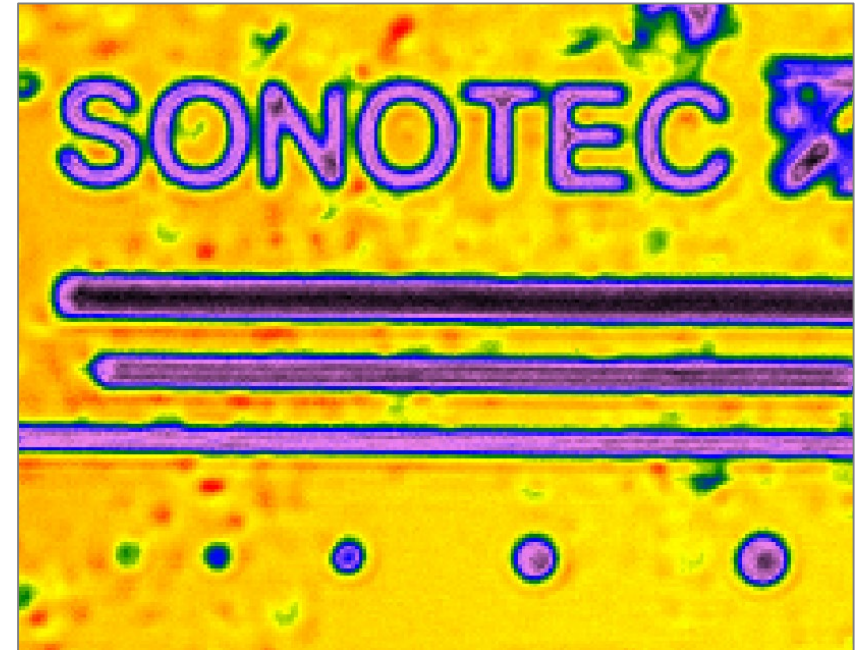
Phased Array Probe (gap 20 mm)



5. Validation Example



Conventional Probe (gap 50 mm)



Phased Array Probe (gap 20 mm)



6. Conclusion

- ▶ Novel Contact-free Phased Array Probe
- ▶ Focussing in very short distances
- ▶ Avoiding side lobes
- ▶ High Resolution



Thank you for your attention!

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