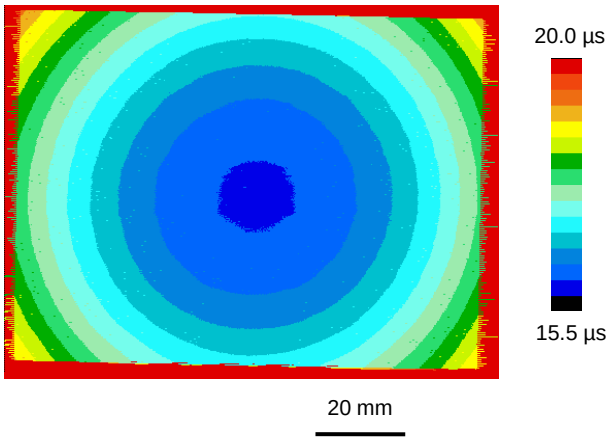
Investigation of the Surface Topography with Ultrasound

Procedure

The surface of the object to be tested is scanned in immersion technique (liquid or air). The topography can be determined quantitatively out of the time of flight Δt of the surface echo. It can be represented as a D-scan. The transformation into a height d is done with the formula d = 0.5 c Δt, where c is the sound volocity in water. Surface structures also modulate the echo amplitude. That's why the corresponding C-scan gives a qualitative image of the topography.

Example: Convex-Shaped Ceramic Surface

- Sample: 1 mm Al_2O_3 plate soldered on 1.25 mm FeNi plate
- Ultrasonic frequency = 50 MHz, liquid immersion technique
- Sound velocity in water c = 1.48 km/s
- Data evaluation: D-scan → Total convexity: Δt = 3.4 µs → d = 2.5 mm



Example: Swiss 5 Franc Coin

- Frequency = 20 MHz, liquid immersion technique
- Evaluation: C-scan