Princip och tillämpningar av aktiv vibrotemografi

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FOP Temadagar på Högskolan Väst i Trollhättan
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MONIT SHM

Spin-off company of **AGH – University of Science and Technology** in Krakow

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Knowledge

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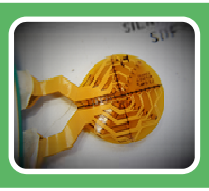
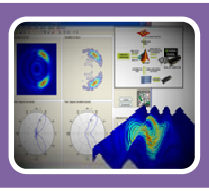
Active Thermography Measurement Systems



Guided Wave Propagation Technique
Hardware & Software Solutions

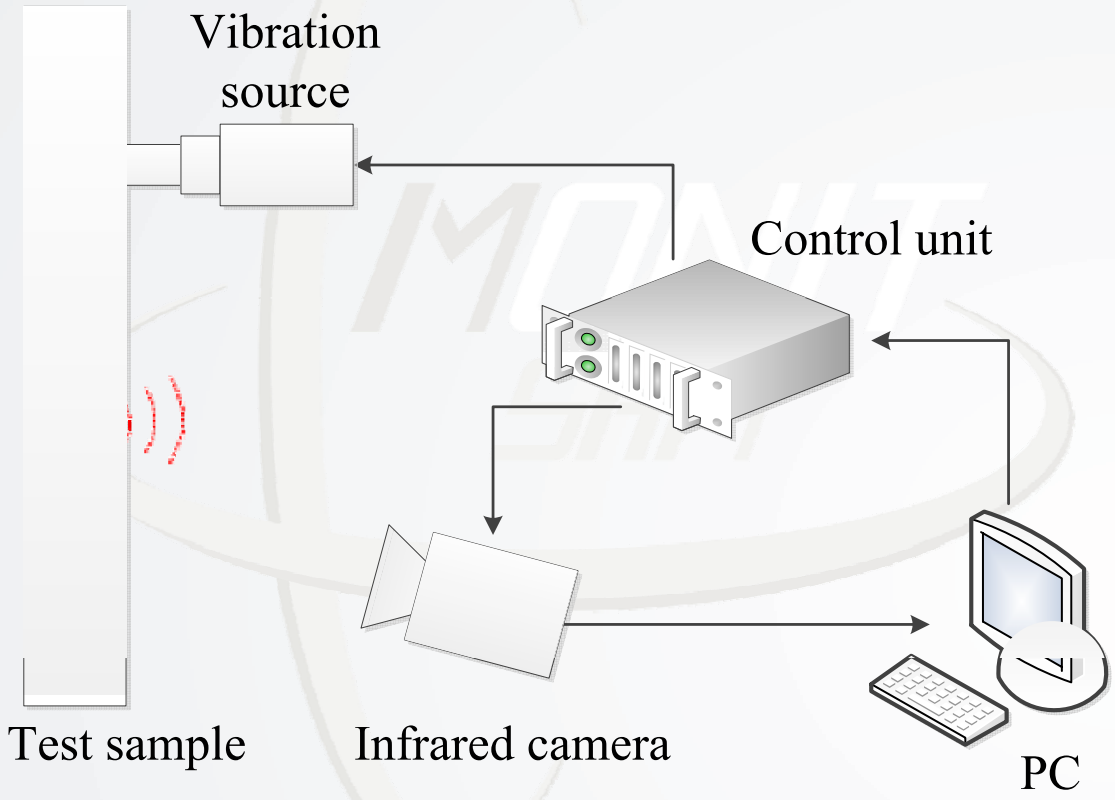
SHM System Based on Electromechanical
Impedance Measurement

Modal Analysis Based Monitoring System

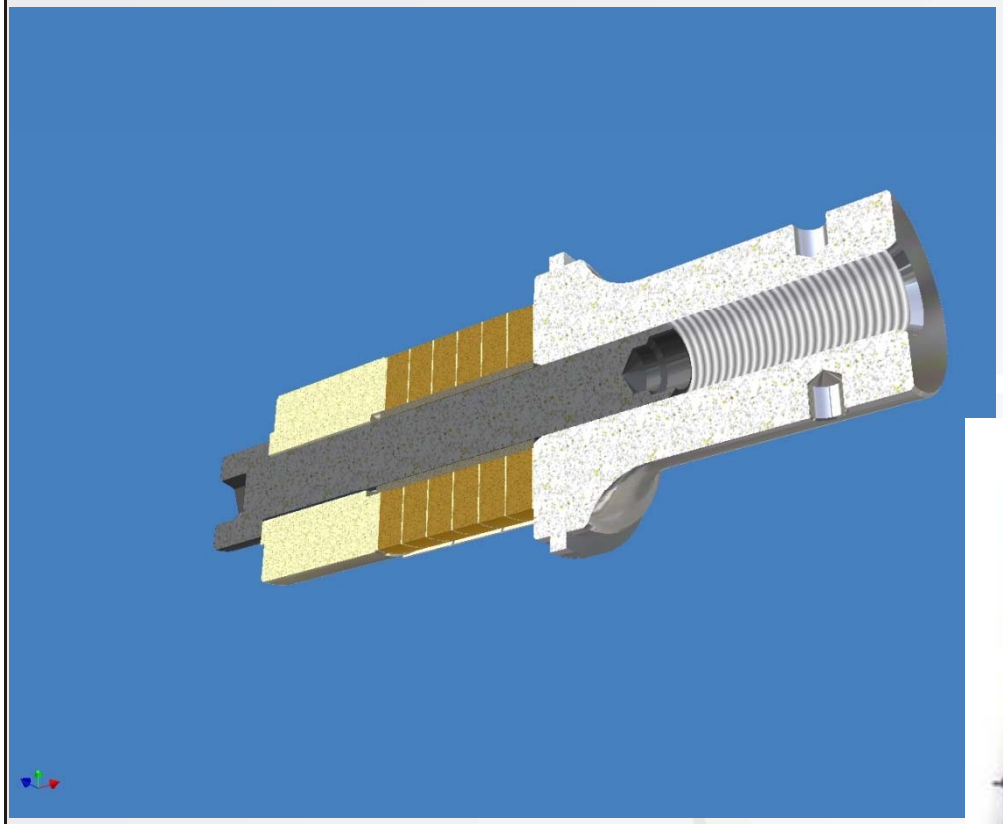


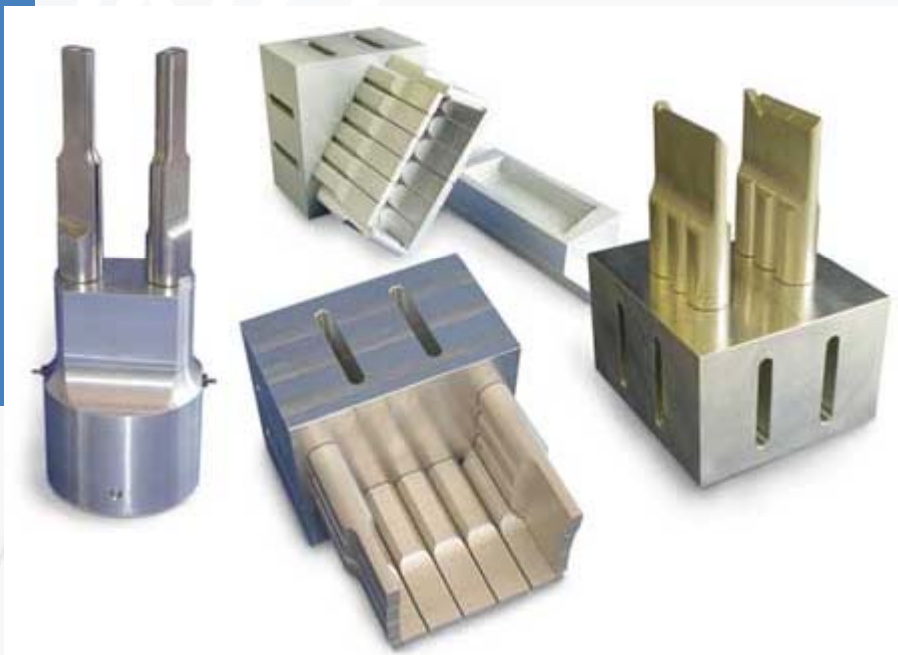
Elastic Wave Propagation Simulation System
Based on Parallel Processing Architecture

Active thermography with ultrasound excitation

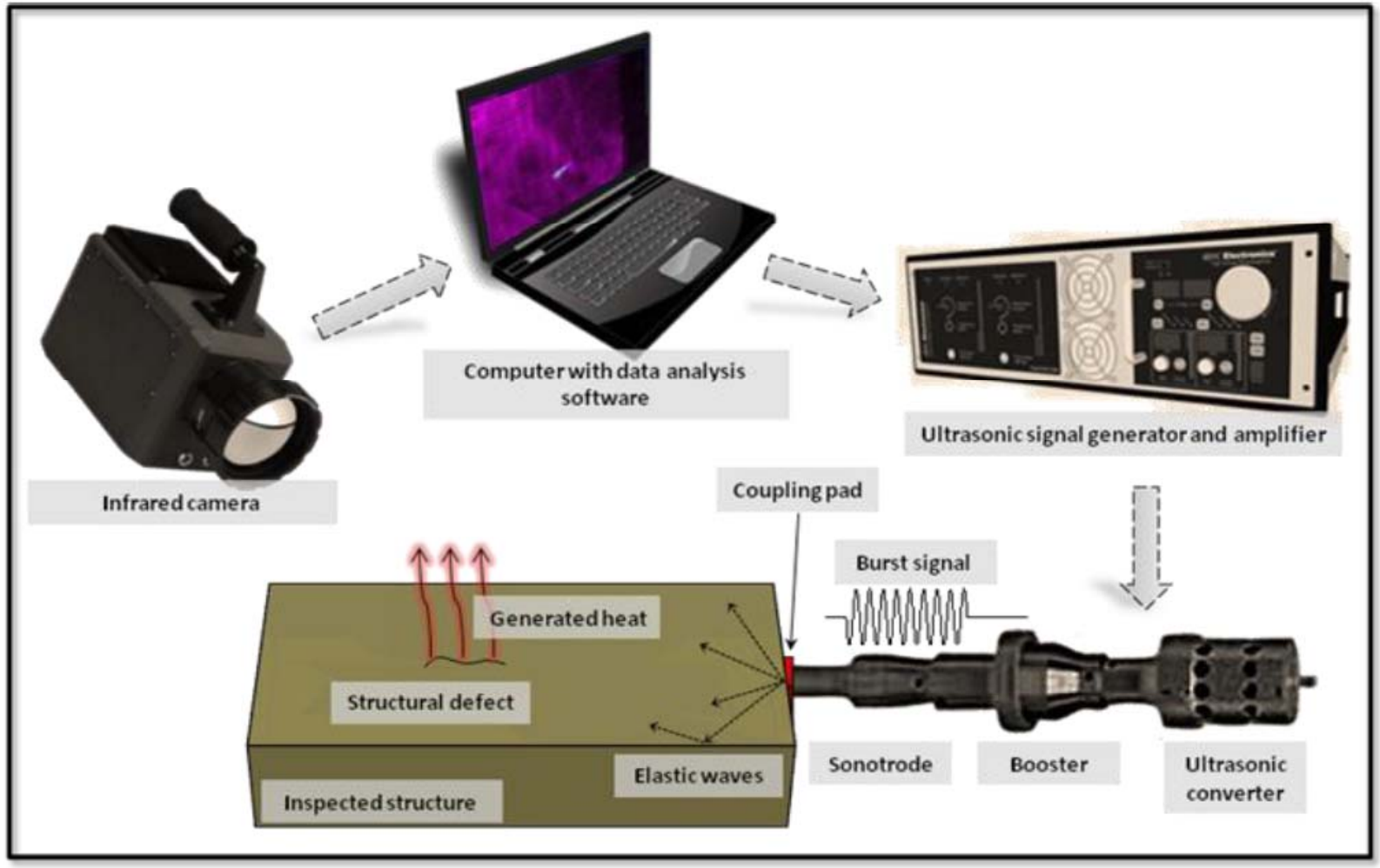


Sonotrode
– power ultrasound excitation





Active thermography with ultrasound excitation



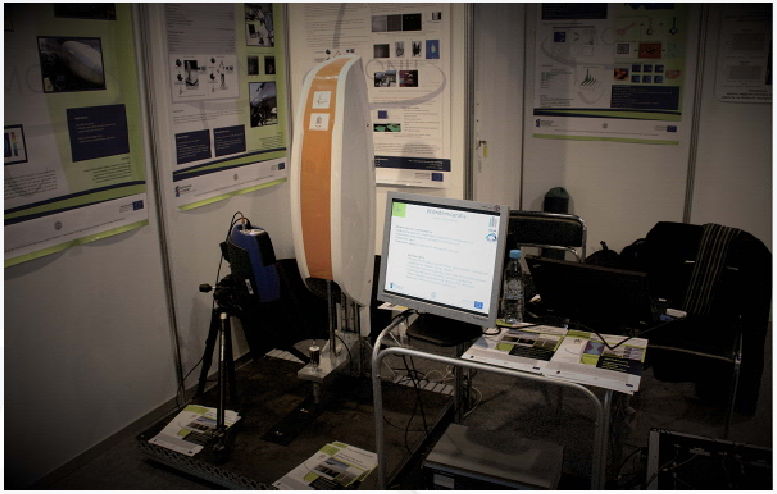
Active Thermography Technique

Main application areas

- Detection of cracks in composites, metals and ceramics
- Impact damage detection in composites;
- Welded joints testing
- Quality assessment of bolted joints, rivets and glued joints

Main advantages

- Nondestructive and noncontact measurement - apart from the excitation point in vibrothermography
- Large inspection area
- Short measurement time - typically from few seconds to few minutes
- Detection, localization and quantification of damage
- Easy interpretation of results - damage visualized on the structure with image overlay technique.



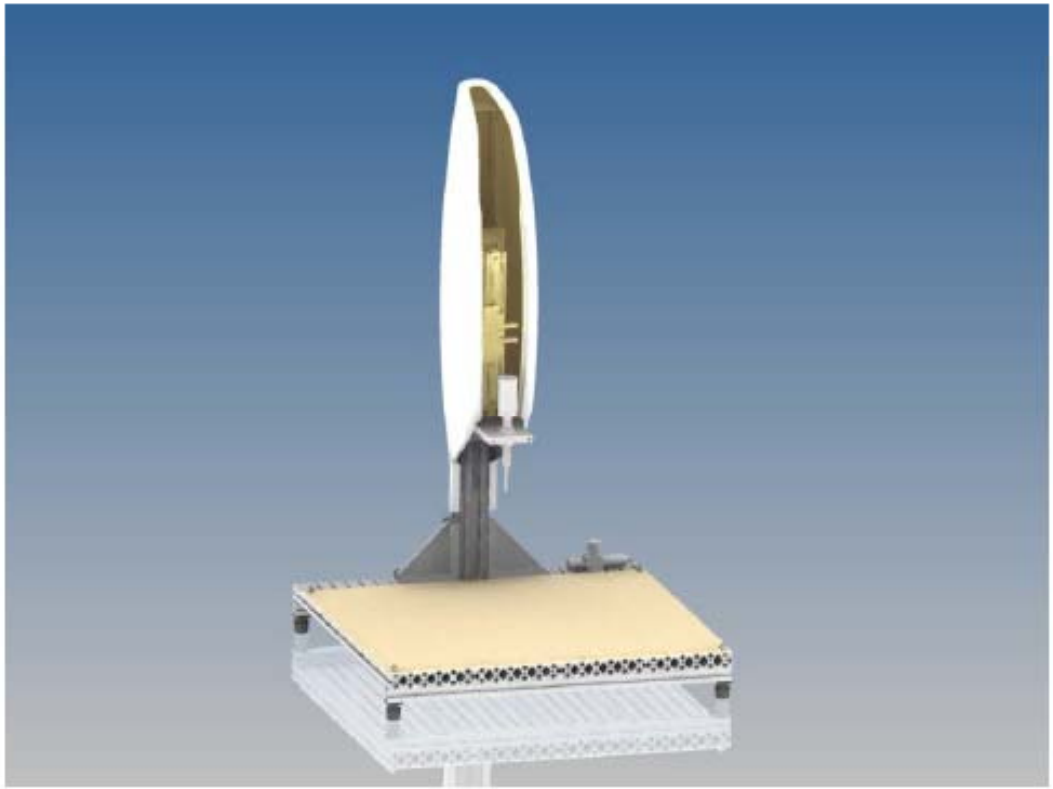
Active thermography with ultrasound excitation

Handheld instrument

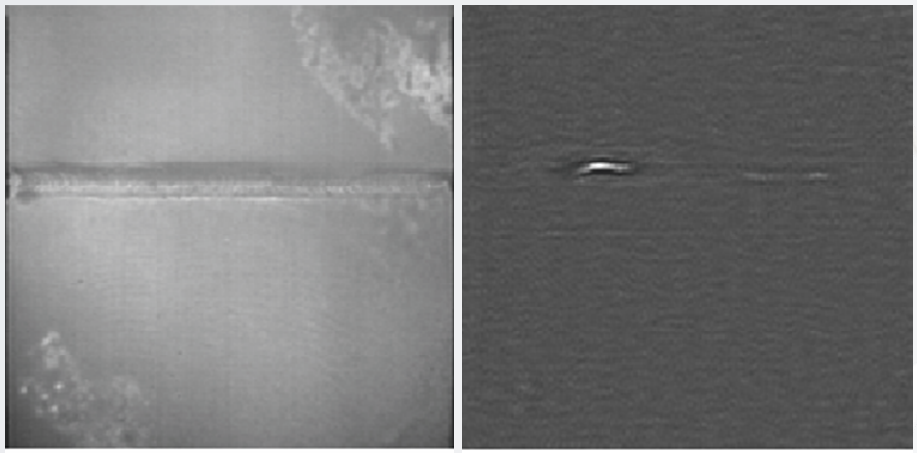
Active thermography with ultrasound excitation

Laboratory instrument

with pneumatic control of the clamping force between excitation module and tested component.



Example of crack detection in carbon steel weld test specimen



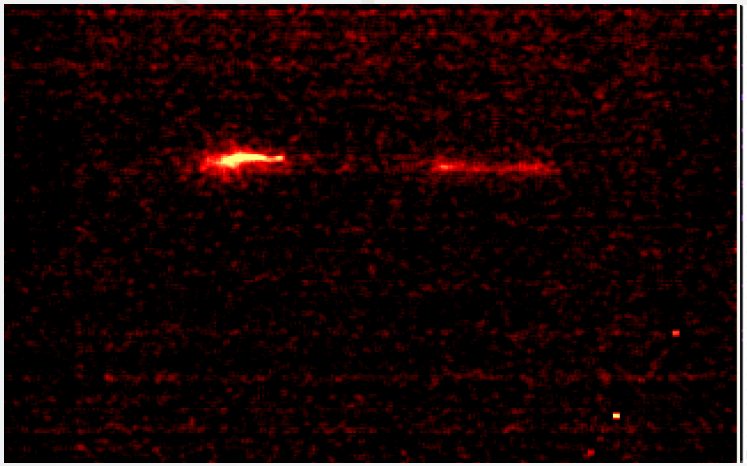
Weld test specimens

Two different defects:

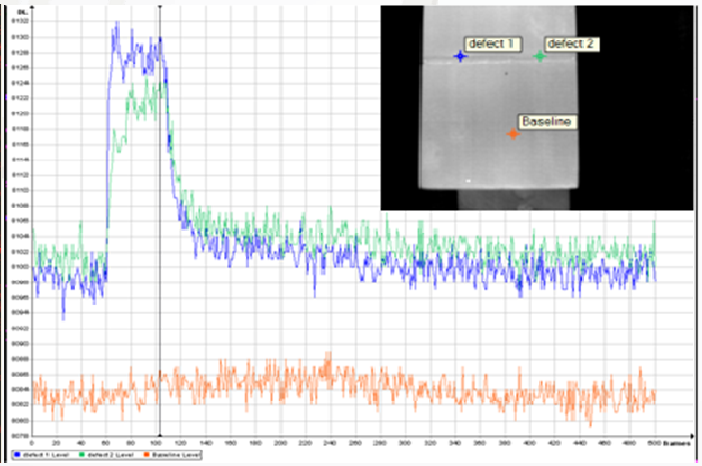
- root crack and lack of fusion

have been detected and confirmed by standard ultrasonic inspection.

Thermographic image



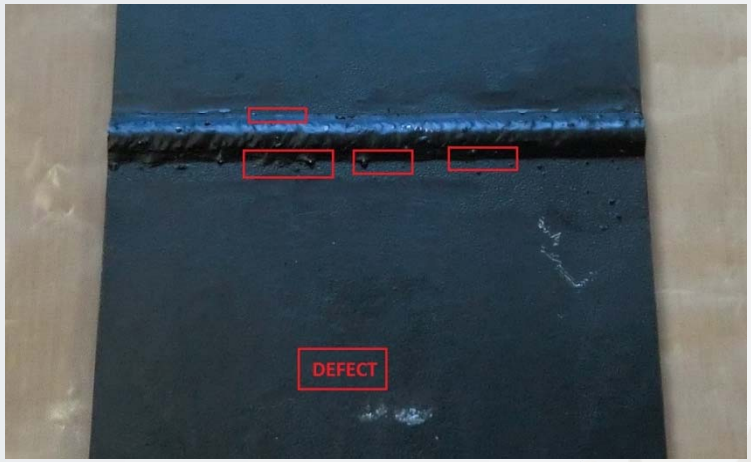
Temperature profile



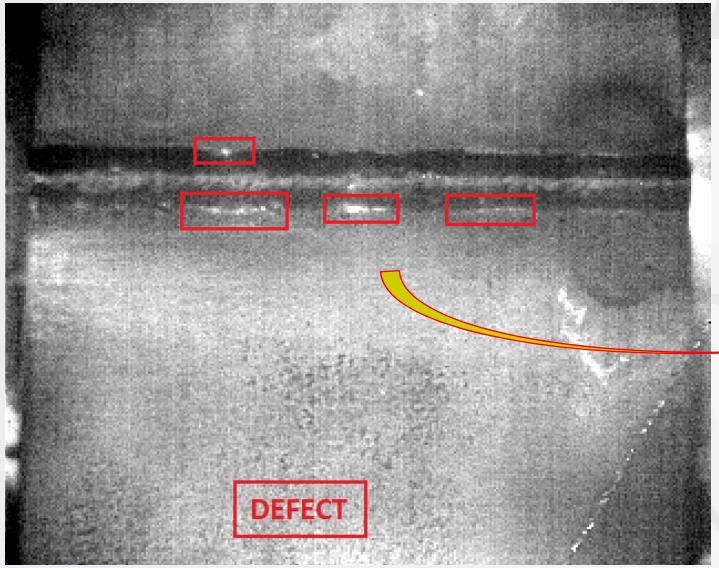
Example of flaw detection in carbon steel weld test specimen

Weld test specimens – cold laps in weld

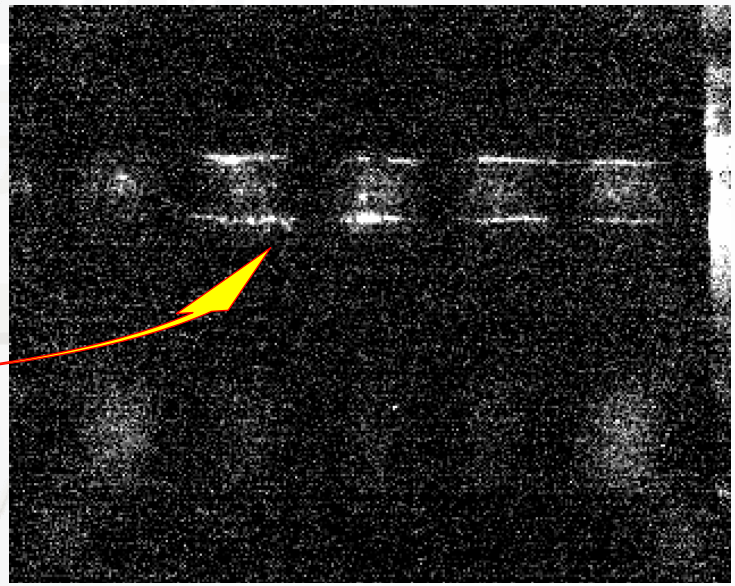
Example of flaw detection in carbon steel weld test specimen



Weld test specimens – cold laps in weld

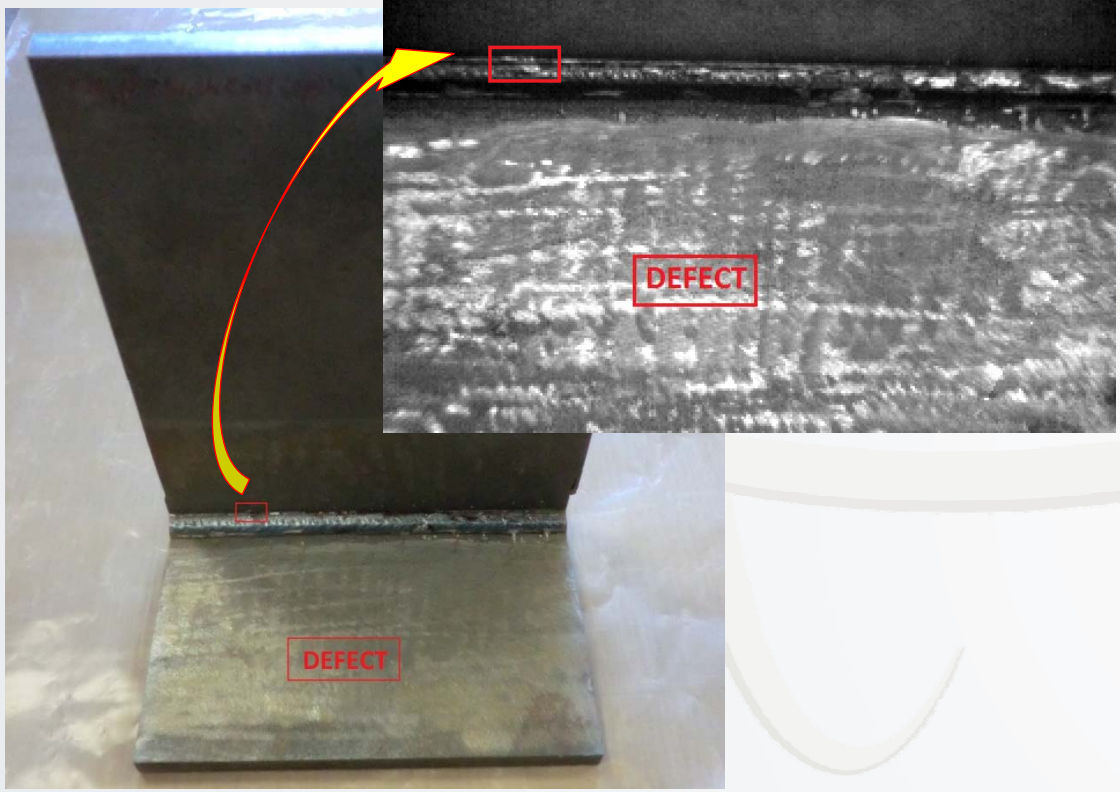


Thermographic image

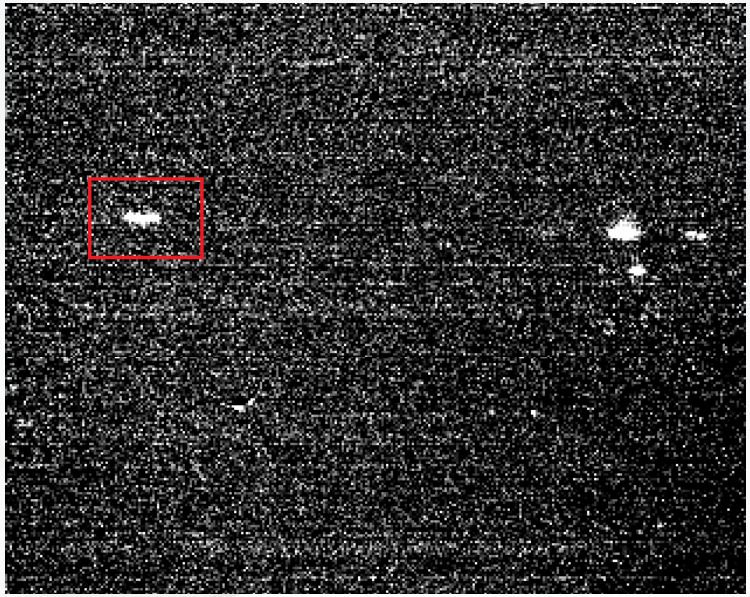


Example of flaw detection in carbon steel weld test specimen

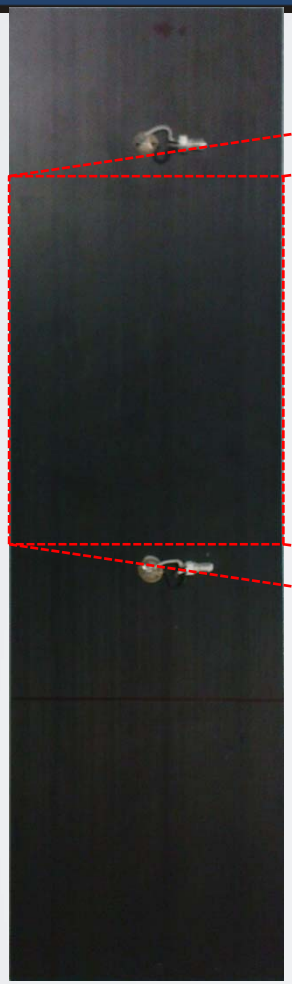
Weld test specimens – cold laps in weld



Thermographic image

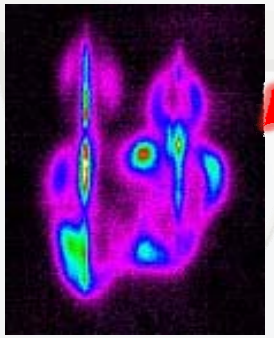


Damage identification in carbon epoxy plate



Vibrothermography

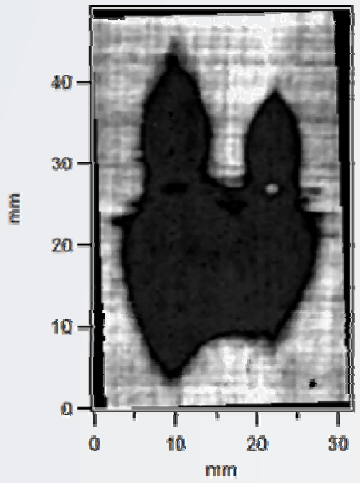
Identified damage



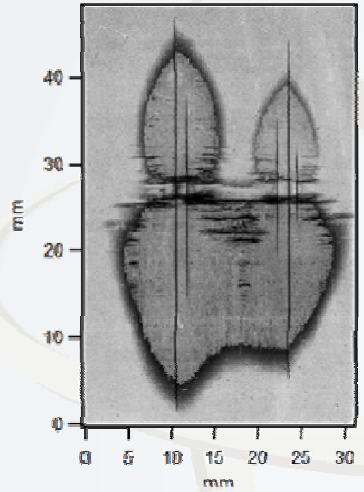
Playback – slow motion 4x (total real time=2.5 s)

Damage identification in carbon epoxy plate

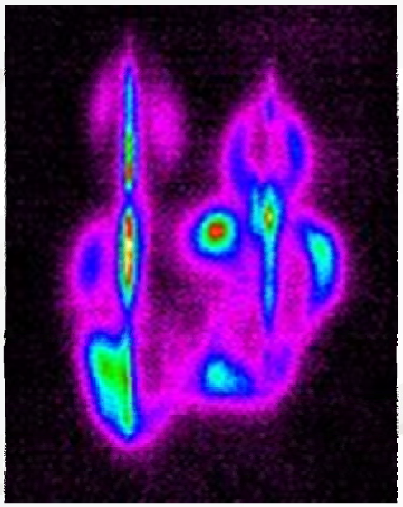
A **carbon epoxy prepreg plate** with barely visible impact damage has been tested with use of a handheld ultrasonic excitation system.



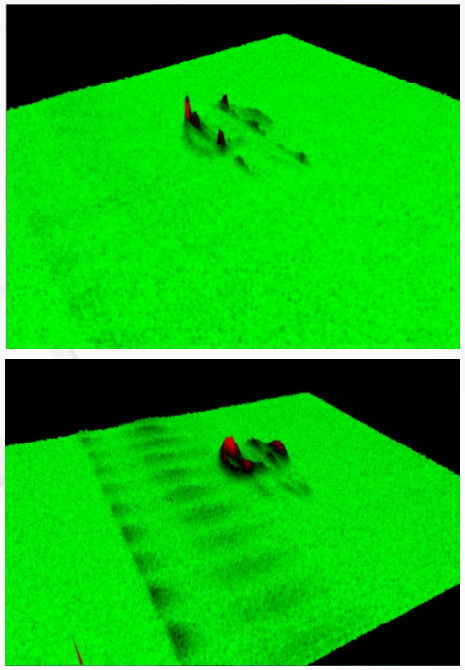
UT C-Scan



X-Ray

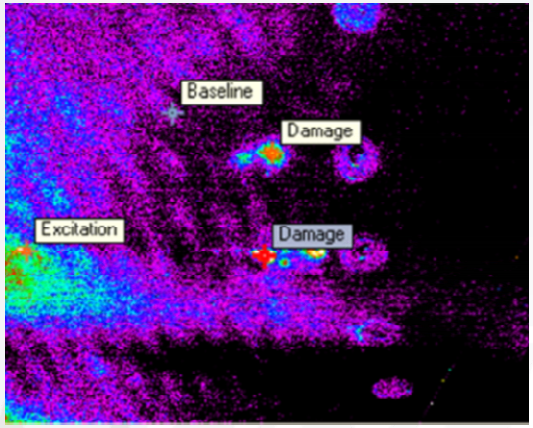


3D image of damaged area

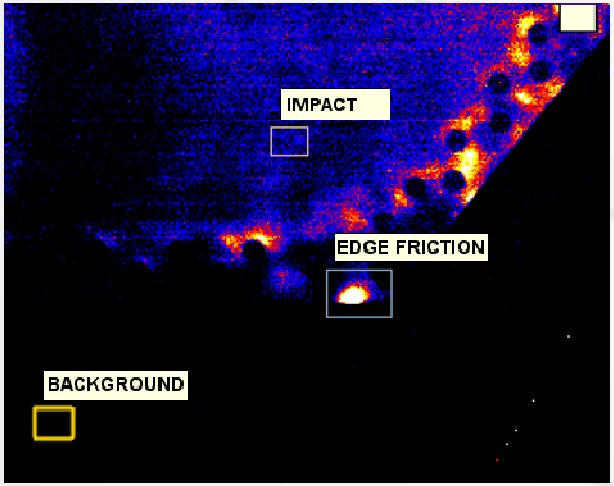


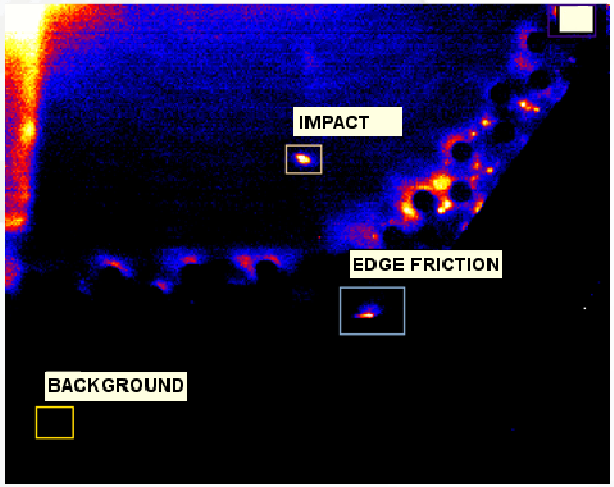
Result of the image processing technique

System tests on MIG29 aircraft



Tested element of the MIG-29 airplane wing





Thank you for your attention !

CERTIFICATE
Level 1 Thermographer

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