



### Special Equipment and Instrumentation

- **Radar** with a 1600 MHz and 2700 MHz antenna, odometer and laser position marks for profile measurements
- **Network analyzer** for calibration of measuring equipment and for ultrasound phase spectroscopy
- **Eddy current:** multi-frequency eddy current system for crack detection of metallic objects
- **BondMaster** to identify and characterize delamination and near surface damages in wood and fiber-reinforced materials
- **Videoendoscopy** for visual inspections
- **Simulation algorithms** for modeling the propagation of elastic or electromagnetic waves
- **Moisture analyzer** for the determination of concrete, pavement and wood moisture; microwave devices



The chair is a member of the South German Wind Energy Research Alliance



[www.windfors.de](http://www.windfors.de)

and of the Leading-Edge Cluster



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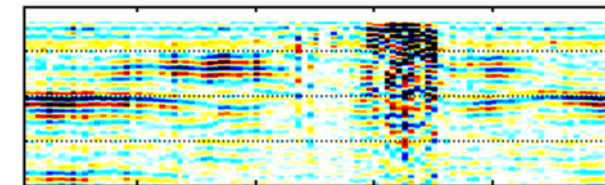
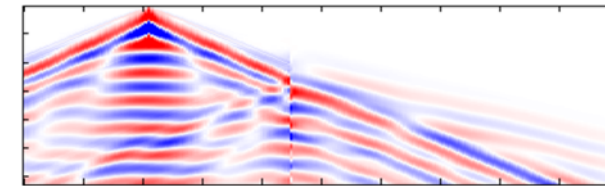
Center for Building Materials



Faculty of Civil, Geo and Environmental Engineering

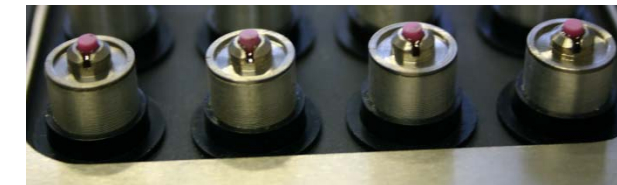


## Chair of Non-destructive Testing: Civil Engineering



### Special Equipment and Instrumentation

- **Wireless sensor nodes** for structural health monitoring measuring e. g. strain, temperature, vibration, humidity, etc.
- **Infrared-Thermography** with a high resolution microbolometer camera and a miniature camera; wide angle, macro and telephoto lenses, active Lockin-Thermography
- **Inductive/capacitive instruments** for measuring the rebar cover as well as conduit and defect tracking
- **Acoustic emission analysis system** with multi-channel transient recorder and calibrated resonant, multi-resonant and broadband acoustic emission sensors for locating micro-fractures
- **Vibration analysis** (multi-channel) with a modal analysis system, a modal analysis hammer and various broadband vibration sensors (1D, 3D); seismometer; laser-vibrometer with interchangeable lenses for non-contact vibration measurements
- **Ultrasonic shear wave array** with point-contact transducers in transmission/reflection; traveltime tomography





## Field of Activities of the Chair

The chair is as working group 6 (AG6) part of the center for building materials in Munich-Pasing and member of both the Faculty of Civil, Geo and Environmental Engineering and the Faculty of Mechanical Engineering. Field of activities are developments and applications of non-destructive testing methods for the investigation of materials, parts, facilities, buildings as well as the education of students in techniques of non-destructive testing as part of bachelor and master programs.

Special Topics:

### Quality control prior to, during and after construction

- Investigation of cementitious materials during setting and hardening
- Assessment of the quality of components and constructions

### Inspection of buildings

- Condition assessment of structures
- Development of strategies for quality assurance and inspection of components and structures
- Failure analysis and recommendations for repair and rehabilitation of buildings
- Success of restoration measures

### Continuous monitoring

- Monitoring of structural elements using *Structural Health Monitoring* (SHM) techniques
- Development of miniature sensors and sensor nodes for SHM applications

### Applications / Materials

- Construction (concrete, steel, timber, natural stone)
- Mechanical engineering (wind turbines, aviation and aerospace structures, automotive)
- Buildings of cultural heritage (condition monitoring and non-destructive testing)
- Biomechanics
- concrete, reinforced concrete, steel, wood, composite materials (e. g. CFRP, GFRP), stone, ceramics, polymers

## Service Range / Techniques

### Ultrasound

- Ultrasound in transmission and in reflection, e.g. for determination of elastic properties (Young's modulus, porosity, etc.)
- Localization of flaws (cracks, voids, honeycombing)

### Infrared-Thermography (active/passive)

- Detection of near-surface defects
- Detection of moisture
- Measurement of heat flow in structures

### RADAR (Georadar)

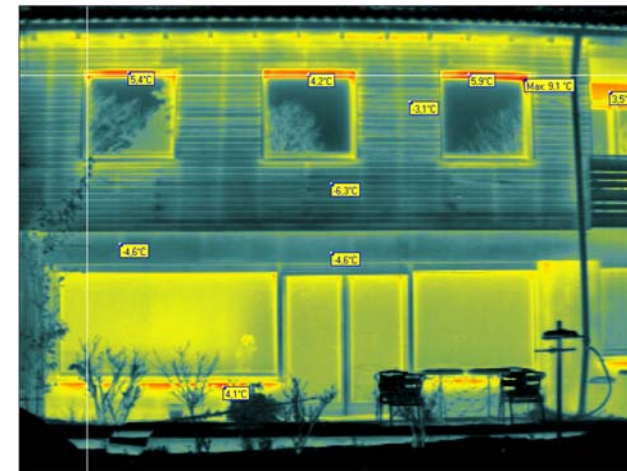
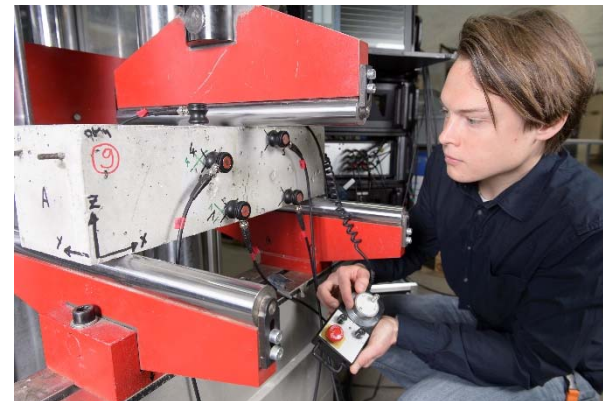
- Localization of reinforcements (weak reinforcements, ducts, pre-stressed elements, defects and moisture)
- Analysis of layered components

### Acoustic emission analysis

- Detection of defects (cracks, delaminations)
- Representation of spatiotemporal damage development
- Localization (1D, 2D, 3D); automatic localization
- Analysis of damage parameters with inversion methods (crack size, fracture type, orientation of the crack planes)

### Modal and vibration analysis

- Determination of modal parameters (resonance frequency, logarithmic decrement, frequency response, etc.) even without contact (laser vibrometry)
- Identification of elastic properties (dynamic Young's modulus) and detection of damage
- Local acoustic resonance spectroscopy for the analysis of components



## Research and Development

- Development of testing and evaluation methods for data analysis and damage assessment
- Method combination and integration of NDT in visual inspection practices and procedures
- Methods for continuous monitoring of structures
- Instruments, sensors and sensor combinations
- Calibration methods for example for sensors

## Cooperation in Committees

- Technical committees of the German Society for Non-destructive testing (DGZfP)
- Technical committees of the International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM)
- Membership of the German Wind Energy Association, the German Geophysical Society, the European Association of Geoscientists and Engineers (EAGE) and the Carbon Composites e. V.

## Consulting Service

- Service for companies, organizations, public administrations and private customers in all areas of non-destructive testing concerning inspection of installations, structural members in civil and mechanical engineering, structural health monitoring and quality assurance
- Damage assessments and preparation of audit reports, as well as evaluating the testability of objects
- NDT methods for lifetime prognosis and life cycle assessment of structures and components

## Teaching

Courses in all areas of non-destructive testing

