

Progress in NDT System Engineering Through Sensor Physics and Integrated Efficient Computing

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NDT system engineering comprises different technologies, primarily measurement physics, computing, electronics, mechanical engineering and automation. The state-of-the-art in sensor physics, microelectronics and computing has made significant progress in the last decade and will change both, the quality and the application of NDT.

We present examples on intelligent sensor technologies and on integrated efficient computing structures for signal processing. Key words are: sensor-on-chip, quantum physical sensing effects and efficient scheduling of optimized algorithms including ill posed problems. Our first systems designed on these principles allow for high-speed imaging with real-time quantitative assessment of inspection results. Multi-sensor systems, which communicate and add their information for smarter processing, have been also developed. These principles will contribute to the current efforts for process integrated NDT, quantitative NDT and Structural Health Monitoring (SHM).

We discuss ultrasonic inspection systems featuring distributed apertures, the use of optimized algorithms and computing structures for the processing of microwave and thermal data, and the health monitoring of lightweight structures with integrated ultrasonic sensor networks.