VERONA, 15-19 JUNE

ECNDT 14th 2026 ITALY

EUROPEAN CONFERENCE ON NON-DESTRUCTIVE TESTING

SPECIAL SESSION

Nonlinear Ultrasonics

ORGANIZED AND CHAIRED BY: Dr. Serge DOS SANTOS, Prof. Yoshikazu OHARA

ORGANIZATION: INSA Centre Val de Loire, FRANCE, Tohoku University, JAPAN

CONTACT EMAIL: serge.dossantos@insa-cvl.fr , y-ohara@tohoku.ac.jp

OBJECTIVE AND TOPICS: The Special session will be focused on nonlinear ultrasonics for non-destructive testing (NDT).

Keywords: nonlinear ultrasonics, sensors, damage detection, NDT, material nonlinearity, imaging delamination, nonlinear guided waves, numerical modelling,

A fast-growing interest in the application of nonlinear ultrasonics to NDT has been demonstrated in recent years at the international conferences on ultrasonics, nonlinear acoustics, and NDT. Extensive research on nonlinear ultrasonics in materials characterization and defects detection has been conducted including both fundamental and application aspects. Investigation of nonlinear ultrasonic detection of contacts and interfaces (non-classical nonlinearity), detection of lack of fusion defects, kissing bonds in friction stir welds are difficult to find using the classical NDT techniques.

Nonlinear ultrasonics deal with a broad range of nonlinear phenomena of mechanical vibrations and wave propagation in fluids and solids. Recent development of new promising techniques that can overcome some of the existing shortcomings is in particular interest, particularly those using Machine Learning, Deep Learning and other advanced data processing tools (Neural Networks) leading to ground-breaking innovations in the field of NDT. The application of machine learning has been rapidly changing how NDT data are collected and analysed. Nonlinear acoustic/ultrasonic testing is an emerging area of NDT with great promise in revealing early damage (i.e., microcracking).

Papers are invited from various aspects of nonlinear ultrasonics-based sensing techniques. Nonlinear ultrasonics techniques such as higher harmonic generation, sub-harmonic generation, frequency modulation, nonlinear resonant ultrasonic spectroscopy and different wave-coding techniques. How these techniques are used for NDT will be one research focus area of this special session. The other focuses area will be those proposed within the Nonlinear-UT SIG group of ICNDT. Papers dealing with the advantages as well as shortcomings of various nonlinear ultrasonics while implementing these techniques experimentally or numerically are of interest for this session.

Areas of interest include, but are not limited to:

- fundamentals of nonlinear ultrasonics in NDT,
- nonlinear propagation of ultrasonic beams in real structures for structural identification
- nonlinear ultrasonic detection of contacts and interfaces.
- experimental setups for nonlinear ultrasonic inspection
- signal processing, image processing, and data processing for Nonlinear-UT
- novel methods and applications

All the instructions for paper submission are included in the conference website: https://www.ecndt2026.org