X-ray Computed Tomography

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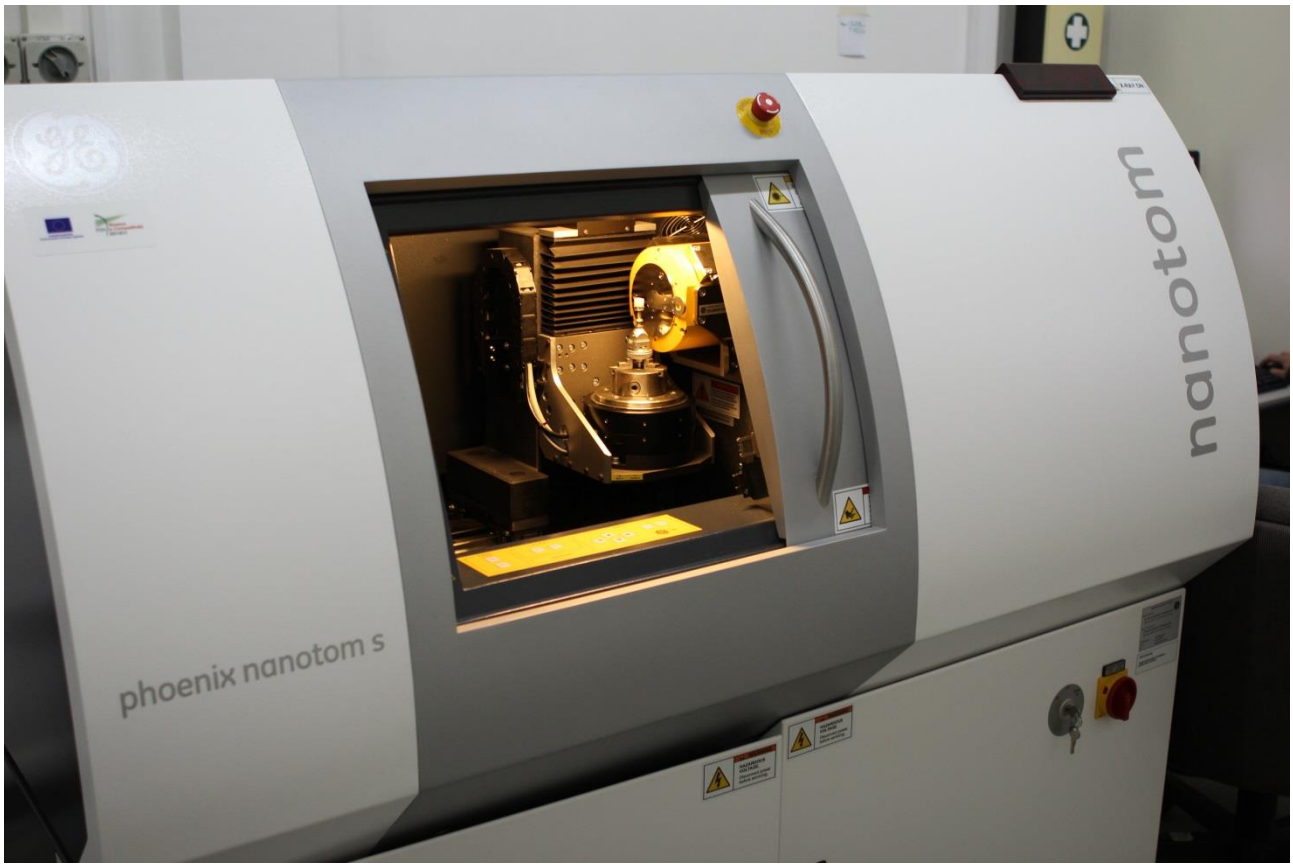
Areas of expertise: X-ray computed tomography; Image analysis; Porosity measurement and analysis for metal additive manufacturing; Polymer composites; Polymeric foams; Texture analysis; Mechanical properties.

Short list of most relevant papers

1. De Pascalis F., Nacucchi M. (2019) Relationship between the anisotropy tensor calculated through global and object measurements in high-resolution X-ray tomography on cellular and composite materials. *Journal of Microscopy* 273, 65 – 70. doi: 10.1111/jmi.12762
2. De Pascalis F., Nacucchi M. (2019) Volume orientation: a practical solution to analyse the orientation of fibres in composite materials. *Journal of Microscopy* 276, 27 – 38. doi: 10.1111/jmi.12832
3. Tagliabue, S., Andena L., Nacucchi M., De Pascalis F. (2021) An image-based approach for structure investigation and 3D numerical modelling of polymeric foams. *Journal of Polymer Research* issue 3. doi: 10.1007/s10965-021-02438-9
4. De Pascalis, F., Lionetto, F., Maffezzoli, A., Nacucchi, M. (2023) A general approach to calculate the stiffness tensor of short-fiber composites using the fabric tensor determined by X-ray computed tomography. *Polymer Composites* 44, 917 – 31. https://doi.org/10.1002/pc.27143
5. Leo, P., Renna, G., Soni, N., De Pascalis, F., Primo, T., Del Prete, A. (2024) On the Effect of Exposure Time on Al-Si10-Mg Powder Processed by Selective Laser Melting. *Metals* 14, 76. https://doi.org/10.3390/met14010076

Instruments



X-ray nano-CT Scan system GE Phoenix Nanotom

Brief description of the instrument

Model: GE Phoenix Nanotom s
Date of installation: February 12, 2014.
Location of the instrument: ENEA Research Centre of Brindisi
X-ray tube: open design, transmission target, maximum 180 kV high tension and maximum 15 W power on target. Two different targets are available to access different needs of photonic energy: Tungsten on Diamond and Molybdenum on Beryllium (for low absorbing materials).
Detector : Hamamatsu flat panel sensor C7942SK-05, having a Gadolinium oxysulfide (GOS) scintillator and 2316 x 2316 active pixels.
Manipulator: 5-axis precision manipulator (3-axis sample and 2-axis detector); installation on special granite base for long-term stability; the rotary table is on air bearings in order to optimise the precision movement.
Software: dedicated data acquisition and reconstruction software, GE proprietary. Furthermore, the reconstruction workstation has the powerful 3D analysis software for scientific and industrial applications “Avizo Fire” of Visualization Sciences Group (now Thermo Fisher Scientific).
Typical sample size: less than 1 cm diameter for high resolution acquisitions (voxel size equal to 1 – 3 μm for light samples, 10 – 30 μm for metallic samples).

Gilardoni 450 kV industrial computed tomography system

Brief description of the instrument

Model: Gilardoni Cabina Tomografica XE-L HE
Date of installation: Jennary 20, 2021
Location of the instrument: ENEA Casaccia Research Centre (Rome)
X-ray tube: Close design, 450 KV 3,5 mA 1500 Watt, Focus 0,4 - 1 mm
Detector : Area Perkinelmer 4096 x 4096 Pixel, 400 x 400 mm, Linear 3072 Pixel 614 mm
Manipulator: 8 axis, Cartesian XYZ, Tilt Xray and Dector, the rotary table
Software: Melissa and Delfis acquisition and VG Studio Tomography Recostruction software
Typical sample size: ϕ=400mm e H= 960 mm

Ultrasonic Mapping

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Areas of expertise: Automatic Inspection Ultrasonic Test, Metallic and Composite material, 3D printed material, Echograph Map software C-scan, D-scan, B-scan and A-scan

Short list of most relevant papers

Cañadas, I., Candelario, V.M., De Aloysio, G., Fernández, J., Laghi, L., Cuesta-López, S., Chen, Y., James Marrow, T., Rinaldi, A., Sanchez, A.M., Tatì, A., Testani, C.
Characterization of solar-aged porous silicon carbide for concentrated solar power receivers
(2021) Materials, 14 (16), art. no. 4627, .

Roccella, S., Dose, G., Barrett, T., Cacciotti, E., Dupont, L., Gallay, F., Greuner, H., Richou, M., Tatì, A., Visca, E., You, J.-H.
Ultrasonic test results before and after high heat flux testing on W-monoblock mock-ups of EU-DEMO vertical target
(2020) Fusion Engineering and Design, 160, art. no. 111886, . Cited 6 times.

Pagliaroli, T., Pagliaro, A., Patanè, F., Tatí, A., Peng, L.
Wavelet analysis ultra-thin metasurface for hypersonic flow control
(2020) Applied Acoustics, 157, art. no. 107032, . Cited 9 times.

Roccella, S., Reale, A., Tatì, A., Visca, E., Palermo, M., Gavila, P.
ENEA ultrasonic test on plasma facing units
(2019) Fusion Engineering and Design, 146, pp. 2356-2360. Cited 5 times.

D'Accardi, E., Palano, F., Tamborrino, R., Palumbo, D., Tatì, A., Terzi, R., Galietti, U.
Pulsed Phase Thermography Approach for the Characterization of Delaminations in CFRP and Comparison to Phased Array Ultrasonic Testing
(2019) Journal of Nondestructive Evaluation, 38 (1), art. no. 20, . Cited 18 times.

Palumbo, D., Tamborrino, R., Galietti, U., Aversa, P., Tatì, A., Luprano, V.A.M.
Ultrasonic analysis and lock-in thermography for debonding evaluation of composite adhesive joints
(2016) NDT and E International, 78, pp. 1-9. Cited 74 times.

Instruments

System Motion ENEA Brindisi

Omniscan Olympus MX2 phased array 64 element, Tofd (Time OF Difraction)
System Motion Probe: Newport M4006 5 Axis: 3 cartesian 1 rotative probe and the rotary table
ENEA Brindisi

System Motion ENEA Csaccia

Panametrics 5073PR 75 MHz, Pobes UT 1 MHz - 75 MHz
System Motion Probe: Gilardoni 5 Axis: 3 cartesian 1 tilt probe and the rotary table ENEA Casaccia
Omniscan Olympus MX phased array 64 element, Tofd (Time OF Difraction)

Projects involving X-ray CT and UT mapping:

- MATISSE “Materials’ Innovations for a Safe and Sustainable nuclear in Europe” - FP7
- FANTASIA “Flexible and Near-Net-Shape Generative Manufacturing Chains and Repair Techniques for Complex Shaped Aero Engine Parts” - FP6 - subcontractor of AVIO spa
- AWFORS - Advanced Welding Technologies For Repair And Salvage Of High Value Engine Components On Nickel And Titanium Based Alloys - FP5
- INSPIRATION “Integrate and Sustainable Processes and Materials for smart on demand laser additive manufacturing” – National RTD project, end: June 30, 2024.
- SIADD “Soluzioni innovative per la qualità e la sostenibilità della manifattura additive” (Innovative solutions for the quality and sustainability of additive manufacturing) – Nationale RTD project, end December 31, 2022.