# Tension maps in AMG-9 alloy with defects. Laser ultrasound analysis

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Most relevant additive manufacturing techniques commonly use a powder/wire/sheet as a precursor material, consolidated layer-by-layer to fabricate a part. The laser ultrasound (LU) diagnostic method is a contact inspection technique that demonstrates potential for evaluating the metallic AM process [1].The operating principle of the experimental setup was based on laser thermo-optical excitation of ultrasonic pulses of longitudinal acoustic waves in a special broadband optoacoustic transducer and measurement of the propagation velocity of these pulses in the investigated sample with one-sided access [2]. LU testing results of ribbed AMG-9 panels (Al-Mn alloy) with defectoscope UDL-2M and PLU-6N-02 transducer were presented. The panels were tested using automated 3D scanning system and components $\sigma_{xx}$ and $\sigma_{yy}$ were measured. The measurement of the acoustoelastic coefficient was reduced to the investigation of the dependence of the ultrasound velocity in the investigated material on the applied tensile or compressive stress. Acoustoelastic coupling coefficient was measured with uncertainty of 9% with a reliability of 0.95 and this value was used to build a pattern of stress distribution in panels. The numerical values of the stress tensor components calculated from variations in the ultrasound velocities in the near-surface (up to 1-2 mm deep) zone of the panels and tensions maps of the investigated panels were presented

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[2] Bychkov A, Simonova V, Zarubin V, Cherepetskaya E and Karabutov A 2018 *Appl. Sci.* **8** 1931