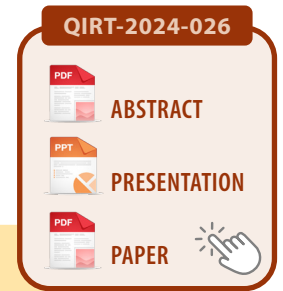




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## NEW COMPENSATION METHOD FOR LOCK-IN THERMOGRAPHY TO ELIMINATE LATERAL HEAT FLUX

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The active thermography (AT) uses heat to detect internal defects in structures. Lock-in thermography (LT) uses sine wave modulated heating to analyse structures phase wise. The heat is induced on the surface of the structure and spreads out into the structure. When inhomogeneities like defects or geometrical properties occur, the spreading heat is reflected differently regarding the homogeneous regions. These reflections can be detected on the surface of the structure by a difference in surface temperature using an IR camera.

Because heat spreads evenly in all directions, reflected heat of inhomogeneities occur blurred on the surface. However, to achieve sharp images with high signal to noise ratio (SNR) the heat flow needs to be controlled in a certain way. That can be done with an amplitude, phase and offset controlled excitation of the surface. This method is based on transferring the temperature contrast measured by the IR camera to an IR projector. Surface areas with a higher temperature are now illuminated with a lower intensity. In addition, the

measured phase shift between excitation and detection is compensated for by a time-adjusted excitation. This process takes place iteratively for about 2 - 10 iterations, whereby the temperature contrast on the component disappears more and more after each iteration, but now reappears more and more clearly in the illumination image of the beamer with a very improved spatial resolution, as the lateral heat flows have been physically eliminated. That means, that the measurement data is now inside the excitation and not as usual in the IR camera. The vanishing lateral gradients convert the problem into a 1D problem, which can be adequately solved by the LT approach. The proposed compensation method can bypass the blind frequency of LT as well and make the inspection largely independent of the excitation frequency. Furthermore, the edge sharpness and separability of features are significantly improved, ultimately improving the feature-detection efficiency. Results have shown, that a SNR increase by a factor of 5 is possible regarding standard LT.