

**Advanced Processing Techniques for IR Thermography NDE:
Static and Robotized Configurations for Modern Aerospace Composite Structures**

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In this paper, Pulse Phase Thermography (PPT) and other processing techniques will be presented in the context of IR Thermography NDE. It is recalled PPT was proposed in 1996 as a new mean to look at thermographic data obtained from pulsed experiments. Up to that time, two stimulation approaches were common for thermographic NDT. Pulsed thermography (PT) which consists in flash-heating specimens and lockin thermography (LT) which consists in modulated heating. In PT, images were generally processed in the time domain by mean of a basic thermal contrast. Such temperature differences observed on the specimen surface corresponds to how well or not the heat flow propagates within the bulk of the specimen. A subsurface defect acts as a thermal barrier, hence the «heat accumulates» just over it translating as a higher surface temperature. In LT, the images were processed in the phase domain. Phase is related to the propagation delay of the thermal waves propagating into the specimens. A careful choice of the stimulation modulated frequency yields to thermal waves propagating at the depth corresponding to possible defects (for example the glue line in a laminate). By analyzing the PT data in the frequency domain thanks to the Fourier transform, PPT enabled PT data to be analyzed as LT data and thus unified somehow these two approaches. Moreover, such analysis enhanced significantly the results by reducing the noise (optical heating and infrared effects).As stated above, before PPT, the main processing technique was the basic «thermal contrast». After the release of PPT, others processing techniques have emerged as well such as TSR (Thermographic Signal Reconstruction), PCT (Principal Component Thermography), and more recently PLST (Partial Least Square Thermography). Since then, these techniques have been adopted by the community and are common tools nowadays however, it is difficult to evaluate them quantitatively in a particular context. In this paper, these techniques will be presented and their capabilities will be compared using a newly developed quantitative tool.