Common tools for quantitative pulse and step-heating thermography - Part I: theoretical basis

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Abstract

Several advanced pre- and post-processing tools have been developed over the last two decades, to enhance the performances of pulse thermography, in terms of defect detection and characterization. Two of the most efficient techniques are the Thermographic Signal Reconstruction (TSR), proposed by Shepard *et al.* in 2001, including a recent development based on the use of the polynomial coefficient images proposed by Roche *et al.* in 2014, and the early detection at emerging contrast, proposed by Krapez *et al.* in 1994. The stake of this work is to show how these tools, commonly used for pulse-heating, can be applied to step-heating.

The work was divided in two parts: the theoretical and analytic study is reported in the present article; the matching experimental results are discussed in a second, separate article.