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Towards quantitative small-scale thermal imaging

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Abstract. Quantitative thermal imaging has the potential of reliable temperature measurement across an entire field-of-view. This non-invasive technique has applications in aerospace, manufacturing and process control. However, robust temperature measurement on the sub-millimetre ($30\text{ }\mu\text{m}$) length scale has yet to be demonstrated. Here, the temperature performance and size-of-source (source size) effect of a $3\text{ }\mu\text{m}$ to $5\text{ }\mu\text{m}$ thermal imaging system have been assessed. In addition a technique of quantifying thermal imager non-uniformity is described. An uncertainty budget is constructed, which describes a measurement uncertainty of 640 mK ($k = 2$) for a target with a size of 10 mm . The results of this study provide a foundation for developing the capability for confident quantitative sub-millimetre thermal imaging.

Keywords: thermal imaging, small-scale, sub-millimetre

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