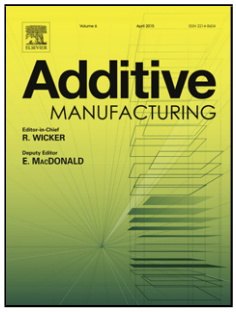

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An interlaboratory comparison of X-ray computed tomography measurement for texture and dimensional characterisation of additively manufactured parts

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Highlights
ISO 25178-2 surface texture from X-ray CT, interlaboratory comparison, is presented
Less than 0.5% *Sa* areal roughness between metrology CT and focus variation values
Artefact design allows separation of surface determination and scaling errors

Abstract

This paper presents the results of the CT-STARR (CT-Surface Texture for Additive Round Robin) Stage 1 interlaboratory comparison. The study compared the results obtained for the extraction of areal surface texture data per ISO 25178-2 from five X-ray computed tomography (CT) volume measurements from each of four laboratories. Two Ti6Al4V ELI (extra low interstitial) components were included in each of the CT acquisitions. The first component was an additively manufactured (AM) cube manufactured using an Arcam Q10 electron beam melting (EBM) machine. Surface texture data was extracted from CT scans of this part. The values of selected parameters per ISO 25178-2 are reported, including *Sa*, the arithmetic mean height, for which the values from the Nikon MCT 225 metrology CT measurements were all within 0.5% of the mean reference focus variation measurement. CT resolution requirements are discussed. The second component was a machined dimensional test artefact designed to facilitate independent analysis of CT global voxel scaling errors and surface determination errors. The results of mathematical global scaling and surface determination correction of the dimensional artefact data is reported. The dimensional test artefact errors for the XT H 225 commercial CT for length, outside diameter and inside diameter reduced from -0.27%, -0.83% and -0.54% respectively to less than 0.02% after performing mathematical correction. This work will assist the development of surface texture correction protocols, help define surface-from-CT measurement envelope