Performance evaluation of CT measurements made on step gauges using statistical methodologies - DTU Orbit (08/11/2017)

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In this paper, a study is presented in which statistical methodologies were applied to evaluate the measurement of step gauges on an X-ray computed tomography (CT) system. In particular, the effects of step gauge material density and orientation were investigated. The step gauges consist of uni- and bidirectional lengths. By confirming the repeatability of measurements made on the test system, the number of required scans in the design of experiment (DOE) was reduced. The statistical model was checked using model adequacy principles; model adequacy checking is an important step in validating the applicability of a model to fitting experimental results. If the residuals after fitting the model are normally distributed (normality test), then the residuals represent random errors in the data. If the normality test is not satisfied, the model is said to fit the data poorly. If the model fit to the data were correct, the residuals would approximate the random errors (also called normality). The most common significance level is $\alpha = 0.05$; for normality to be satisfied, the P value for the residuals must not be smaller than 0.05. The initial results show that the residuals failed the normality test due to a small P value (P

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