Prediction of beam hardening artefacts in computed tomography using Monte Carlo simulations - DTU Orbit (17/12/2018)

**Prediction of beam hardening artefacts in computed tomography using Monte Carlo simulations**

We show how radiological images of both single and multi material samples can be simulated using the Monte Carlo simulation tool McXtrace and how these images can be used to make a three dimensional reconstruction. Good numerical agreement between the X-ray attenuation coefficient in experimental and simulated data can be obtained, which allows us to use simulated projections in the linearisation procedure for single material samples and in that way reduce beam hardening artefacts. The simulations can be used to predict beam hardening artefacts in multi material samples with complex geometry, illustrated with an example. Linearisation requires knowledge about the X-ray transmission at varying sample thickness, but in some cases homogeneous calibration phantoms are hard to manufacture, which affects the accuracy of the calibration. Using simulated data overcomes the manufacturing problems and in that way improves the calibration. (C) 2014 Elsevier B.V. All rights reserved.

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