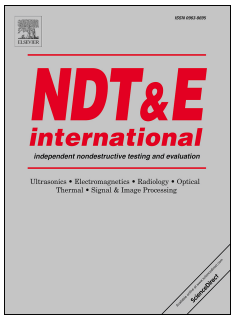
Accepted Manuscript



Theoretical study of a simplified implementation model of a dual-energy technique for computed tomography

Sergei Osipov, Sergei Chakhlov, Andrey Batranin, Oleg Osipov, Van Bak Trinh, Juriy Kytmanov

PII: S0963-8695(17)30133-0

DOI: 10.1016/j.ndteint.2018.04.010

Reference: JNDT 1978

To appear in: *NDT and E International*

Received Date: 25 February 2017

Revised Date: 10 February 2018

Accepted Date: 16 April 2018

Please cite this article as: Osipov S, Chakhlov S, Batranin A, Osipov O, Trinh VB, Kytmanov J, Theoretical study of a simplified implementation model of a dual-energy technique for computed tomography, *NDT and E International* (2018), doi: 10.1016/j.ndteint.2018.04.010.

Theoretical Study of a Simplified Implementation Model of a Dual-Energy Technique for Computed Tomography

Sergei Osipov[a], Sergei Chakhlov[a,*], Andrey Batranin[a], Oleg Osipov[a], Van Bak Trinh[a], Juriy Kytmanov[a]

[a] *Tomsk Polytechnic University, Savinykh Street, 7, 634028, Russia*

Abstract

The article describes a theoretical study of the simplified implementation of dual energy technique (DET) for computed tomography (CT). The implementation is based on the X-ray pre-filter. Two sets of projections, acquired for two maximal X-ray energies, are transformed to the projections of DET parameters. The density and effective atomic number of the test object fragments are estimated after a separate recovery of the internal structure of the test object for each of the DET parameters. The choise of pre-filter thickness is discussed. An example of the initial projections simulation and the estimation of the internal structure of cylindrical objects are shown.

Keywords: X-ray radiation, dual energy technique, computed tomography, pre-filter X-ray tube

1. Introduction

The dual energy technique (DET) was originally developed for the CT to compensate the X-ray beam hardening in case an attenuating object thickness increases [1, 2, 3]. DET is based on a representation of mass attenuation coefficient (MAC) by a sum of members consisted of two multiplicative components.

*Corresponding author, tel. +7 913 822 2194

Email addresses: osip1809@rambler.ru (Sergei Osipov), chakhlov@tpu.ru (Sergei Chakhlov), batranin@tpu.ru (Andrey Batranin), ososipov@sibmail.com (Oleg Osipov), vanbac1008@gmail.com (Van Bak Trinh), Yuriykytmanov@gmail.com (Juriy Kytmanov)