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Comparison of Image Reconstructions for Gamma Transmission Computed Tomography System by Using MATLAB and i-Gorbit Software

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Abstract

With wide industrial application, computerized tomography CT is rapidly developing technique that is especially useful for imaging and measuring multi-component and multiphase processes. The most important contribution of CT is to greatly improve abilities to distinguish regions with different gamma ray transmittance and to separate over-lying structures. The CT system of single source and detector gamma transmission tomography GORBIT, designed by CANTI, Vietnam, was used to analyze the different density materials. Hardware of the GORBIT CT system consists of two servo motors, data logger, computer, a radiation source and a radiation detector. The measurements in GORBIT system were carried out at the CT Laboratory in Department of Atomic Energy, Yangon. This tomography system operates with a gamma ray source of ^{60}Co 1.85 GBq (50 mCi of intensity) and a NaI(Tl) scintillation detector. Measured gamma transmitted data were used to reconstruct the cross-sectional images of research samples. These images were reconstructed from the measured transmitted data in different image reconstructions algorithms. Analytical methods of back projection (BP), the filtered back projection method (FBP) and iterative algorithms of algebraic reconstruction method (ART) and estimation maximizations (EM) methods were used in i-GORBIT image reconstruction software. Another image reconstruction program GCTS was created by using MATLAB package. In this image reconstruction, different algorithms of back projection (BP) and filtered back projection (FBP) were used. In FBP method, different filters of Ram-lack filter, Sheep-Logan, Hamming, Hann and Cosine filter can be chosen and different interpolation methods can be applied to improve the quality of images. The results of different image reconstructions programs were compared and analyzed for the sample materials. In this research work we will present some results obtained by using tomographic techniques to analyze various samples to check the distribution of various density materials. These samples are made by using different properties of materials with high and low density materials of lead, iron, six holes brick, polymer slab contained in a polymer pipe vessel. These samples are also used to verify the outcome from the CT analysis with different image reconstructions programs i-GORBIT and MATLAB.

Keywords: Industrial Gamma ray computed tomography, transmission measurement, image reconstruction algorithms, MATLAB, linear attenuation coefficients

Country/Organization invited to participate

Myanmar

Primary author: Ms MYAING, Khaing Nyunt (Department of Atomic Energy, Myanmar)

Presenter: Ms MYAING, Khaing Nyunt (Department of Atomic Energy, Myanmar)

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