# Performance evaluation of a model-based iterative image reconstruction algorithm (DIRA): processing of raw data produced by a dual-energy computed tomography scanner

Clinical usage of model-based iterative image reconstruction (MBIR) algorithms of computed tomography (CT) had, for a long time, been hampered by their large demands on computing power. Only recently the situation has changed; a clinically approved MBIR algorithm for single-energy CT is already on the market, and the development of MBIR algorithms in dual-energy computed tomography (DECT) is a hot topic. Our research group is developing an MBIR algorithm called DIRA. We target radiation treatment planning in brachytherapy, where DIRA can improve accuracy of dose delivery by providing additional information about elemental composition of imaged tissues. So far, we have evaluated the performance of DIRA via simulations using computer-generated projections of mathematical phantoms. As a next step, we want to evaluate DIRA's performance on a set of DECT data obtained from a CT scanner. Format of projection data (also called raw data) is not simple; special software provided by the manufacturer is needed to convert the data to a form more suitable for processing in Matlab.

**The task:**

1. Help with the preparation of phantoms, obtain raw data from a Siemens Somatom Definition Flash DECT scanner at CMIV, reconstruct the data with DIRA, and evaluate the performance of DIRA
2. Simulate the measurement on a computer using simulation software from Siemens and compare measured and simulated results.

**Requirements:**

The student should be familiar with general principles of computed tomography and interactions of x- rays (10 – 150 keV) with matter. Knowledge of Matlab is needed. Suitable for medical physics, biomedical engineering and electrical engineering students.

The work will consist of data acquisition and processing, performance evaluation, and computer simulations. The student will learn about the Siemens Somatom Definition Flash scanner and dual-energy computed tomography in general. Active approach to problem solving will be encouraged; results will be discussed in a research group. Student's location: the Division of Radiological Sciences, Linköping University.

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