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Solving CT reconstruction with a particle physics tool (RooFit)

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Abstract

Spectral X-ray CT makes use of novel detector technologies that provide energy information. This information can be naturally included in the reconstruction phase when the algorithm is based on a statistical formulation. In this framework, the full dataset can be described in terms of a likelihood function whose expectation values are the density vectors of the different materials present in the sample. The problem of image reconstruction is thus translated into a problem of multivariate maximization.
From the formal point of view, the same type of problem is often encountered in the analysis of large amounts of data in particle physics. For this purpose, the RooFit tool was developed during the years by the high energy physics community. In this work, we present first studies and results on the possibility to employ RooFit to implement a spectral CT reconstruction algorithm.

Key words: Spectral X-ray CT, maximum likelihood reconstruction.