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On the estimation of spectral density of X-ray sources using attenuation measurements CLAUDIA HUERTA, LUIS VAZQUEZ, MARIAN MANCIU, TEODOR VULCAN, FELICIA MANCIU, Physics Department, University of Texas at El Paso,, ROBERT WAGGENER, Radiation Oncology Department, University of Texas Health Science Center San Antonio — The high energy X-rays typically used in Medical Physics (100s kV -20 MeV) have such short wavelengths, that creating a diffraction grating is impossible. Because the absorption coefficient depends on the wavelength, one can use transmission data through filters of various thicknesses to obtain information about the spectral density of the X-ray source. Neglecting non-linear processes, there is a linear dependence of the transmission data on the spectral distribution. Unfortunately, the corresponding underdetermined system is ill-conditioned, and traditional methods used to solve inverse problems (such as Singular Valued Decomposition) typically fails, even for very small levels of noise affecting the attenuation data (much lower than is typically obtained in an experiment). We will present a very robust algorithm for detecting the bremsstrahlung spectrum, which seek for a smooth function that minimizes the distance to the experimental transmission data. We will show that the algorithm works very well even for very noisy attenuation data, even when no prior knowledge of spectral distribution is available.

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