1163-92-1515 **James Webber** (james.webber@tufts.edu), 161 College Ave., Medford, MA 02155, **Eric Todd Quinto*** (todd.quinto@tufts.edu), 503 Boston Ave., Medford, MA 02155, and **Eric Miller** (eric.miller@tufts.edu), 161 College Ave., Medford, MA 02155. *Microlocal Analysis of Joint Reconstruction in X-ray+Compton Tomography.*

We present a new joint reconstruction method for the simultaneous reconstruction of attenuation coefficient and electron density from X-ray transmission and Compton-scattered backscattered data. We use microlocal analysis to show that the Compton and X-ray CT data set are complementary–this ensures that most wavefront directions of the object are visible from the combined data. We use a Lambda tomography penalty term in the regularization procedure of the algorithm to integrate the two data sets together. We evaluate our reconstruction method on the "parallel line segment" acquisition geometry of [arXiv:1907.00418, 2019] which is motivated by a specific architecture for airport security screening. We first present a novel microlocal analysis of this data acquisition geometry which explains the nature of image artefacts when the attenuation coefficient and electron density are reconstructed separately. We introduce a new joint reconstruction scheme for low effective atomic number imaging characterized by a regularization strategy whose structure is derived from lambda tomography principles and motivated directly by the microlocal analysis results. Finally, we show the effectiveness of our method in combating the noise and image artefacts on simulated phantoms. (Received September 15, 2020)