Analysis of the measured iron opacity data

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Hohlraum had been used to convert the energy of high-powered lasers into thermal x-ray field which heated the sample into the uniform plasma. Another laser beam had been used to produce backlit which combined with slit and gated spectrometer to detect the sample plasma. In this way a film that contains detailed spectroscopy information of hot dense matter in one dimension and x-ray radiography in another dimension can be obtained. Experiments for iron opacity had been done in Shengguang II laser facility in China. Films recording the spectroscopy information of iron plasma with temperature about 60eV and density of 20mg/cc were obtained. When the backlit is not small enough to be thought as a point-projected or the measured hot material has intense self-emission, it will be an uneasy task to get quantitative opacity data from the measured spectroscopy. To address this we made use of the information from the x-ray radiography in the film to extract the information of backlit intensity spatial distribution, and then using them to fit the spectroscopy data to get opacity data. This improved method is helpful to extract self-consistent opacity data from one experimental shot.

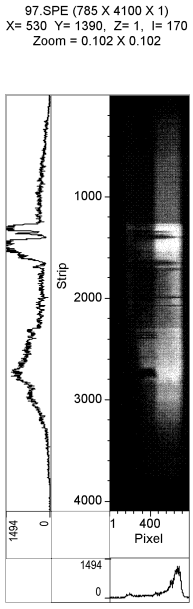

Fig. 1: The experimental spectroscopy film of iron plasma with temperature about 60eV and density of 20-50mg/cc.

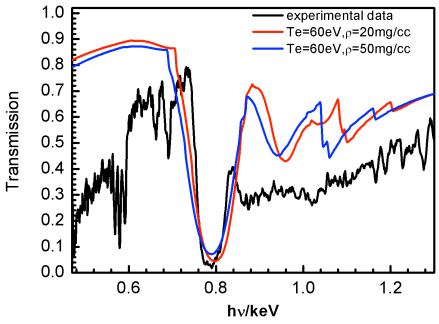

Fig. 2: The experimental data may be affected by the uncertainty of the backlit intensity.