Multiple electron beam generation with plasmon resonance field

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In fast ignition approach of inertial confinement fusion, high-energy electron driver is one of important components to additionally heat the fuel core. Recently nano structured targets have been recognized to increase the total number of fast electrons and expected to be applied for cone device.

An experiment was conducted at, TIFR (Tata Institute of Fundamental Research). Intense pulse ($I = 10^{19}$ W/cm$^2$, $t_L = 30$ fs, $\lambda = 800$ nm) was obliquely incident to a grating target. The accelerated fast electrons are detected at the back of the target with IP (Imaging Plate). Fig. 1 shows the results for different line density grating (500 and 1000 lines/mm) and plane target. The horizontal lines represent the emission angles, where 0° and 180° indicates target surface. Although strong peaks appeared near the laser axis in all cases, only 500 lines/mm shows 2nd peak around 40°. The strong surface field is considered to affect for generating additional peak due to plasmon resonance for this case.

Fig. 1 Angle distribution of signal for (a) 500 lines/mm (b) 1000 lines/mm (c) foil