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O5.204 Nonlinear dynamics of plasma grating in a static ponderomotive potential

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The plasma devices can stand for much larger energy fluency than solid optical devices. Thus plasma devices become a hot topic recently, as the laser power is promoted to Petawatt order. Plasma grating is one of these appealing plasma devices. Plasma grating can act as laser polarizer and waveplate for both long, moderately intense laser[1, 2, 3] and short, superintense laser[4]. And it also can be used as photonic crystal[5]. On the surface of solid target, it is generated as plasma hologram for ultraintense laser[6]. It is also used for coupling the laser into surface plasma wave instead of solid grating[7].
The growth of the plasma grating is thought to be brought by the deepening of the ion velocity. Its collapse is also believed to be induced by the X-type breaking of the grating[8, 9]. Forslund et al. compares the momentum of ions with initial velocity distribution to the maximum possible thermal potential, to explain the X-type breaking[10].
Here in this work, we analyze the plasma grating grows in a static ponderomotive potential generated by two identical counterpropagating lasers. The details of the building and collapsing process are shown with both fluid and PIC simulation. The mechanism is discussed in details. We find good agreement between fluid and PIC simulation.

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