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Plasma targets for the laser-plasma driven undulator x-ray source LUX

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Laser-plasma accelerator are promising candidates to provide ultra-relativistic electron beams for compact light sources. However, the generation of stable, high quality electron beams which are necessary to drive such a compact light source is challenging. The main determining factors are thereby the plasma properties which are given by the structure of the cm-scaled plasma target itself. Here, wepresent the design process of the LUX plasma targets. Based on computational fluid dynamic simulations, targets were produced allowing to control the plasma properties and to set stable, repeatable conditions. Raman spectroscopy measurements of the gas density in the target confirm these simulations. Furthermore, results from target machining in sapphire crystals using a femtosecond laser system with KHZ repetition rate are presented and compared to the machining with state of the art milling machines.

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