Analysis of the Laser Beam Trajectory and its Impact on the Cut in Material PMMA

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This article investigates the influence of laser beam trajectory on the final dimension of machined parts using the ILS 3NM CO_2 laser system, operating at a wavelength of 10.6 μm with a maximum power output of 100 W and a maximum feed rate of 1524 mm $\cdot$ s^{-1}. The study is conducted on 3 mm and 5 mm thick PMMA sheets using focusing lenses with focal lengths of 1.5 and 2.5 inches. Machining precision is evaluated by comparison circular and linear beam paths. The primary objective is to asses the impact of motion interpolation on machining quality and to determine how different focal lengths and material thicknesses influence the final dimensions of the workpiece.