

Debris free, zero taper ultrafast laser cutting of tempered glass using a tailored laser beam

Zhaoqing Li¹, Lin Li¹, Wei Guo¹, Olivier Allegre¹, Junlong Wang², Benhai Li², Xuefeng Wang²

¹*Laser Processing Research Centre, School of Mechanical, Aerospace and Civil Engineering, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK*

²*Beijing Institute of Aerospace Control Devices, 52 Yongding Road, Beijing, 100039, Peoples Republic of China.*

Corresponding author: zhaoqing.li@manchester.ac.uk

In this work, tempered glass sheets of 1.15 mm in thickness was cut using a Ti: Sapphire femtosecond non-diffraction zero order Bessel beam. The Bessel beam was generated by passing the laser beam through an axicon lens with a physical angle $\alpha=20.0^\circ$. Based on the physical angle and the refractive index of the fused silica under 800 nm wavelength, the central core radius and depth of focus of the generated Bessel beam were calculated and determined experimentally. Straight lines as well as curves cuts were achieved with zero kerf width, free of debris and micro cracks; Cut surface roughness achieved was 1 μm Ra. By applying a mechanical force, closed geometry material remove was achieved.