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Ultra-high quality through-transmission micro-welding and cutting of glass with ultrashort pulse lasers

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Abstract

In recent years, glass has seen a renaissance of sorts, expanding into a wide variety of thicknesses, shapes, compositions and uses. Novel forms of glass are now widely used in microelectronics packaging, mobile device, automotive and bio-medical applications. Technologies to process glass have evolved as well, with ultrashort pulse (USP) laser technology becoming an important capability. Ultrashort pulse widths offer precision processing with controlled heat input that can minimize or even eliminate chipping and cracking. Combined with Bessel beam optics, high quality cutting of ultrathin glass (UTG) down to 100 μm thick can be realized. Operating at high pulse repetition frequencies, controlled thermal phenomena allows micro-welding of glass-to-glass and other materials. In this work, we demonstrate UTG cutting with roughness in the 10s of nm and ~ 1 m/s throughput as well as glass-glass and glass-aluminum micro-welding, with throughput approaching 500 mm/s and line widths of 10s of μm .

Keywords: Ultrashort pulse lasers; micro welding; glass materials

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