

## **Debris free, zero taper ultrafast laser cutting of sapphire with a tailored beam filamentation**

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Sapphire plates with random orientation and C axis were cut with a femtosecond laser for potential industrial applications. A Bessel beam was used in this study, Debris free and zero taper were achieved. Additionally, the effect of linear polarization with different angles related to crystal direction was investigated. The effects of laser cutting parameters and cleavage breaking force on cut cross section roughness, top/bottom surface quality were analysed. To achieve high efficiency laser cutting for industrial application, a rapid cleavage device was designed and implemented for both line and curve cutting, as well as removing closed geometry materials.