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A Comparison of Piezoelectric Transformer Technologies for HVDC Converter Applications

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Piezoelectric transformer-based power converters are ideally suited for uses in applications where compact form factor and high voltage isolation are major considerations. Piezoelectric transformers are resonant electromechanical devices that use mechanical vibrations to induce polarization throughout the bulk of their constituent material. Two types of piezoelectric transformer, one type composed of lithium niobate and the other composed of a lead-zirconate-titanate, were operated into a multi-stage voltage multiplier for a side-by-side comparison. The performance characteristics, including input impedance, output voltage and current, and power conversion efficiency were investigated and reported. The lead-zirconate-titanate transformers exhibited wider input bandwidth, making them suitable for tandem operation from a single source of stimulus, whereas the lithium niobate was able to produce higher voltage with lower losses.

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