Evolution of Very High Frequency Power Supplies

The ongoing demand for smaller and lighter power supplies is driving the motivation to increase the switching frequencies of power converters. Drastic increases however come along with new challenges, namely the increase of switching losses in all components. The application of power circuits used in radio frequency transmission equipment helps to overcome those. However those circuits were not designed to meet the same requirements as power converters. This paper summarizes the contributions in recent years in application of very high frequency (VHF) technologies in power electronics, shows results of the recent advances and describes the remaining challenges. The presented results include a self-oscillating gate-drive, air core inductor optimizations, an offline LED driver with a power density of 8.9 W/cm³ and a 120 MHz, 9 W DC powered LED driver with 89 % efficiency as well as a bidirectional VHF converter. The challenges to be solved before VHF converters can be used effectively in industrial products are within those three categories: components, circuit architectures and reliability testing.