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Milimeter Wave Vacuum Electronic Devices Using Azimuthally Travelling Waves ALYSSON VRIELINK, Stanford University, SAMI TANTAWI, SLAC National Laboratory — With recent improvements in communications and imaging technology, the need for ultra high bandwidth, high frequency devices has grown significantly in the past decade. Unfortunately, the scaling laws of current vacuum electronic technologies prohibits extension of these devices to the mm-wave regime due to the complex manufacturing processes required for fabrication and the low efficiency and achievable output power at these frequencies. We propose a novel series of devices operating on a completely different beam-wave interaction mechanism than current devices. Through an interaction between an azimuthally bunched beam and spherical electromagnetic modes, traditional scaling laws and their associated issues can be circumvented. Based on preliminary analytical calculations, these devices could operate at frequencies from 80GHz to 250 GHz with tens of kiloWatts of output power while the expected efficiency of these devices would scale from 60Various possible device configurations are presented, including the basic theory and preliminary simulation results.

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