60. Title: Microfabrication of diamond-based slow-wave circuits for mm-wave and THz vacuum electronic sources

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Abstract: Planar and helical slow-wave circuits for THz radiation sources have been made using novel microfabrication and assembly methods. A biplanar slow-wave circuit for a 650 GHz backward wave oscillator (BWO) was fabricated through the growth of diamond into high aspect ratio silicon molds and the selective metallization of the tops and sidewalls of 90 mu m tall diamond features using lithographically created shadow masks. Helical slow-wave circuits for a 650 GHz BWO and a 95 GHz traveling wave tube were created through the patterning of trenches in thin film diamond, electroplating of gold half-helices, and high accuracy bonding of helix halves. The development of new techniques for the microfabrication of vacuum electronic components will help to facilitate compact and high-power sources for terahertz range radiation.