

State-of-the-art in 60 GHz Integrated Circuits and Systems for Wireless Communications

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Abstract:

This tutorial presents an overview of the technological advances in millimeter-wave circuit components, antennas, and propagation that will soon allow 60 GHz transceivers to provide multi gigabit per second (Gbps) wireless communication data transfers in the consumer marketplace. Our goal is to help engineers understand the convergence of communications, circuits, and antennas, as the emerging world of Terahertz and sub-Terahertz wireless communications will require understanding at the intersections of these areas. This paper covers trends and recent accomplishments in a wide range of circuits and systems topics that must be understood to create massively broadband wireless communication systems of the future. In this paper, we present some evolving applications of massively broadband wireless communications, and use tables to show research progress from the literature on various radio system components, including on-chip and inpackage antennas, RF power amplifiers, low noise amplifiers, voltage controlled oscillators, mixers, and analog-to-digital converters. We focus primarily on silicon-based technologies, as these provide the best means of implementing very low cost, highly integrated 60 GHz millimeter-wave circuits. In addition, the paper illuminates characterization techniques that are required to competently design and fabricate millimeter-wave devices in silicon, and illustrates effects of the RF channel at 60 GHz communication for both in-building and outdoor use. The paper concludes with an overview of the standardization and commercialization efforts for 60 GHz multi-Gbps devices.