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Compact Modules for Wireless Communication Systems in the E-Band (71–76 GHz)

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Abstract

The millimeter-wave spectrum above 70 GHz provides a cost-effective solution to increase the wireless communications data rates by increasing the carrier wave frequencies. We report on the development of two key components of a wireless transmission system, a high-speed photodiode (HS-PD) and a Schottky Barrier Diode (SBD). Both components operate uncooled, a key issue in the development of compact modules. On the transmitter side, an improved design of the HS-PD allows it to deliver an output RF power exceeding 0 dBm (1 mW). On the receiver side, we present the design process and achieved results on the development of a compact direct envelope detection receiver based on a quasi-optical SDB module. Different resonant (meander dipole) and broadband (Log-Spiral and Log-Periodic) planar antenna solutions are designed, matching the antenna and Schottky diode impedances at high frequency. Impedance matching at baseband is also provided by means of an impedance transition to a 50 Ohm output. From this comparison, we demonstrate the excellent performance of the broadband antennas over the entire E-band by setting up a short-range wireless link transmitting a 1 Gbps data signal.