

# **NBUTC-PD Based transmitter-mixer for photonic-network-compatible high data rate wireless communication and high-resolution 3-dimensional radar imaging**

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**Abstract :** In this talk, recent progress in high-speed/power near-ballistic uni-traveling carrier photodiode (NBUTC-PD) with ultra-fast switching speed used for (sub-) millimeter-wave (MMW) photonic Gigabit wireless communication and high resolution radar imaging is reviewed. The photonic technique is attractive for such two applications due to that the (sub-) MMW signal can be easily distributed in the whole system through the use of a low-loss optical fiber and the optical signal processing becomes feasible for the (sub-) MMW signal generation with complex waveform, such as the broadband chirped pulse signal, which is the key for ultra-high resolution radar imaging. Furthermore, the photonic approach can provide an excellent isolation in the short-pulse radar system. Where, the delivery of short-pulse with amazing high peak-power (kW) for long-range (> hundreds of km) object detection is necessary.

A (sub-) MMW photonic transmitter (PT), comprised of high-power photodiodes (PDs) with integrated (sub-) MMW waveguide and antennas for optical-to-electrical (O-E) signal conversion and MMW broadcasting thus play important roles in this kind of photonic-MMW system. The high available power of NBUTC-PD can release the burden imposed on the gain and saturation power performance of sub-THz power amplifier. The development of several different high-power NBUTC-PD based PTs/PDs for MMW/THz pulse generation through MMW waveguide or free space is summarized. The performance of photonic wireless links and radar imaging system developed based on these key components with extremely high data rate (> 25Gbit/sec) and ultra-high range-resolution, respectively, will also be reviewed.