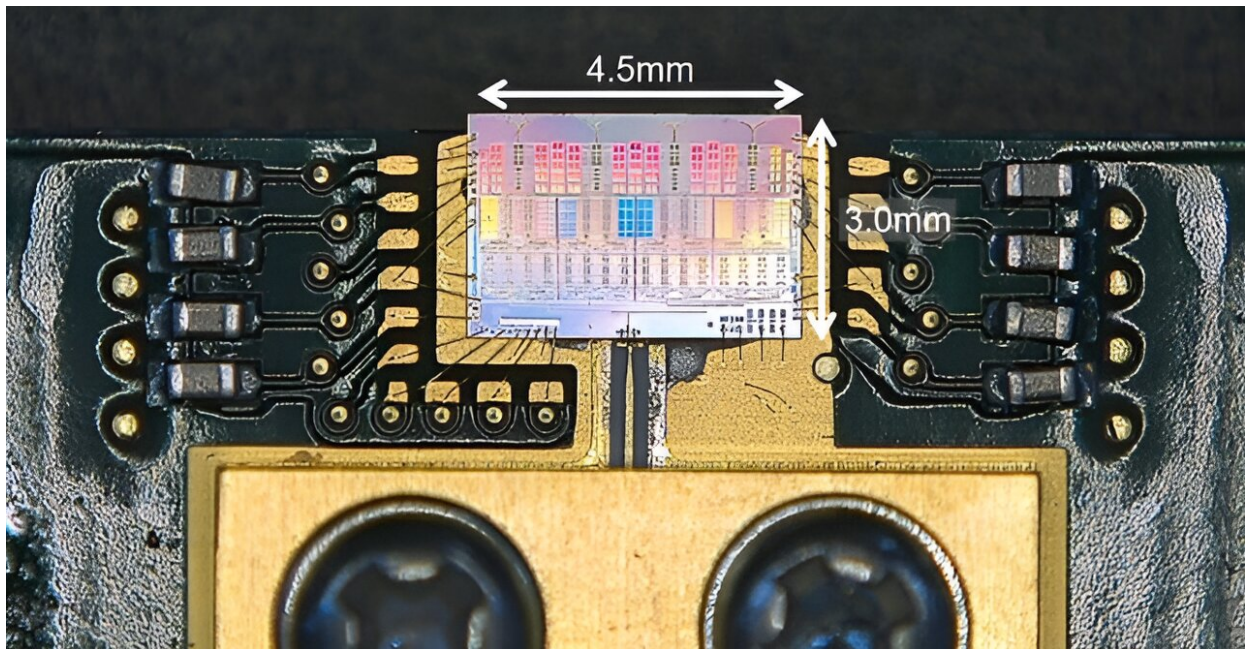


# 150 GHz antenna-on-chip transmitter IC chip for beyond 5G/6G radio equipment

October 12 2023



Development of a 150 GHz transmitter IC chip and supporting technologies.  
Credit: NEC Corporation

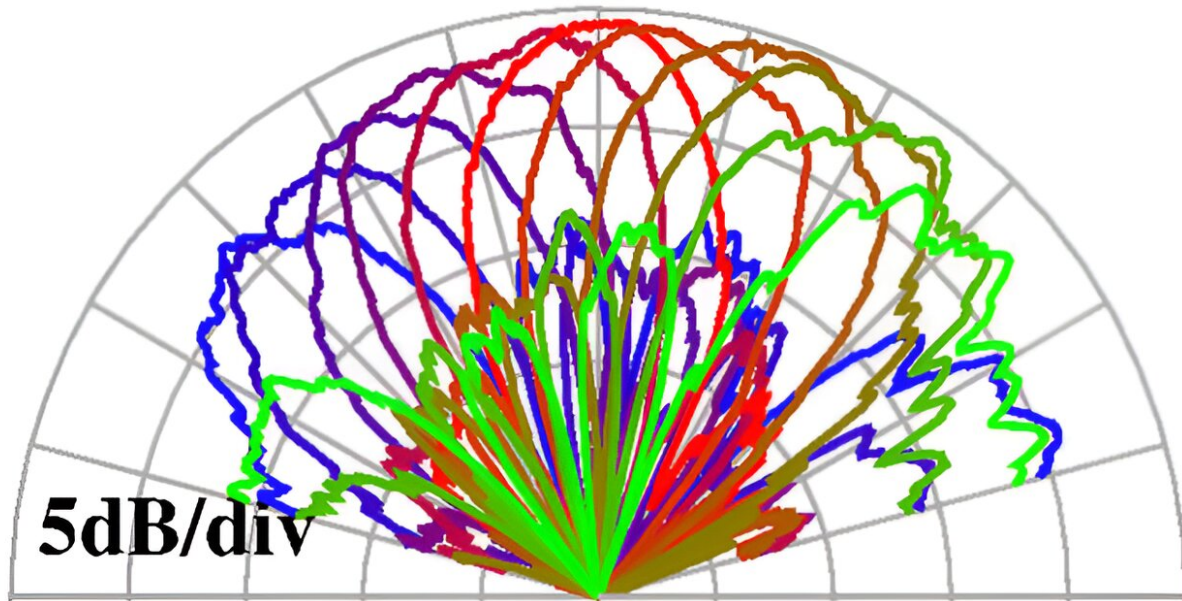
NEC Corporation has developed a 150 GHz transmitter IC chip and supporting technologies in preparation for Beyond 5G and 6G mobile access radio communication systems. According to an NEC survey, this is the first demonstration of preferred beam steering performance with 4-channel Antenna-on-Chip (AoC) IC technology using On the Air (OTA) radiation pattern measurement.

Based on innovative RF circuit design technology, it has become possible to integrate 150 GHz phased array antenna elements, phase shifters and transmission amplifiers into a [single chip](#). The 22-nm SOI-CMOS technology used for manufacturing this IC is cost effective, suitable for [mass production](#), and has the ability to support large scale integration of digital, analog and RF functionalities in a chip.

This allows for both higher frequencies and smaller sizes, which also contributes to lower Total Cost of Ownership (TCO) and potentially accelerates social implementation.

Beyond 5G and 6G are expected to provide 100 Gbps class broadband communications that are more than ten times faster than 5G. To achieve this, it is effective to utilize the sub-terahertz band (100GHz to 300GHz), which can secure a wide bandwidth of 10GHz or more. In particular, the D-band (130 GHz to 174.8 GHz), which is already assigned for fixed wireless communication systems worldwide, is expected to contribute to early social implementation.

However, since the sub-terahertz band is subject to large propagation losses, large interconnection losses and device performance is near its limit, there is a need for the development of highly directional, high-gain antenna technology and its beam steering technology.



4-channel antenna radiation pattern measurement results (150GHz). Credit: NEC Corporation

To overcome these challenges, NEC developed a new IC chip that supports the 150GHz band. Going forward, NEC will continue to develop advanced technologies with the aim of contributing to the commercialization of 6G that is expected in the 2030s.

NEC will present further details on this technology at the 2023 IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium ([BCICTS](#)) in Monterey, CA, U.S., October 15 to 18, 2023. NEC also presented the key principle and implementation of the "Switching Gain based Phase Shifter" at the [European Microwave Integrated Circuits Conference 2023](#) held in Berlin, Germany, in September 2023.

Provided by NEC Corporation

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