

# Broadband Millimeter-Wave and Terahertz On-Chip Antennas

Communications & Information

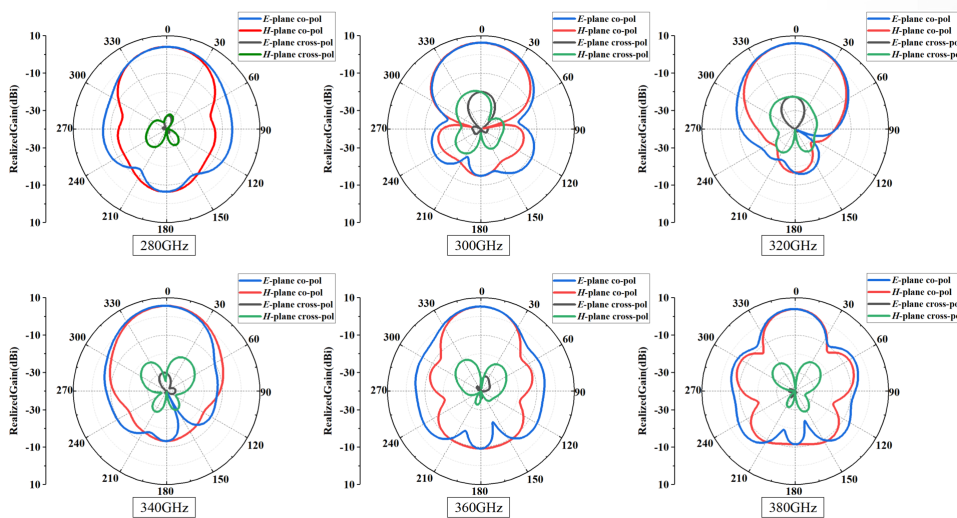
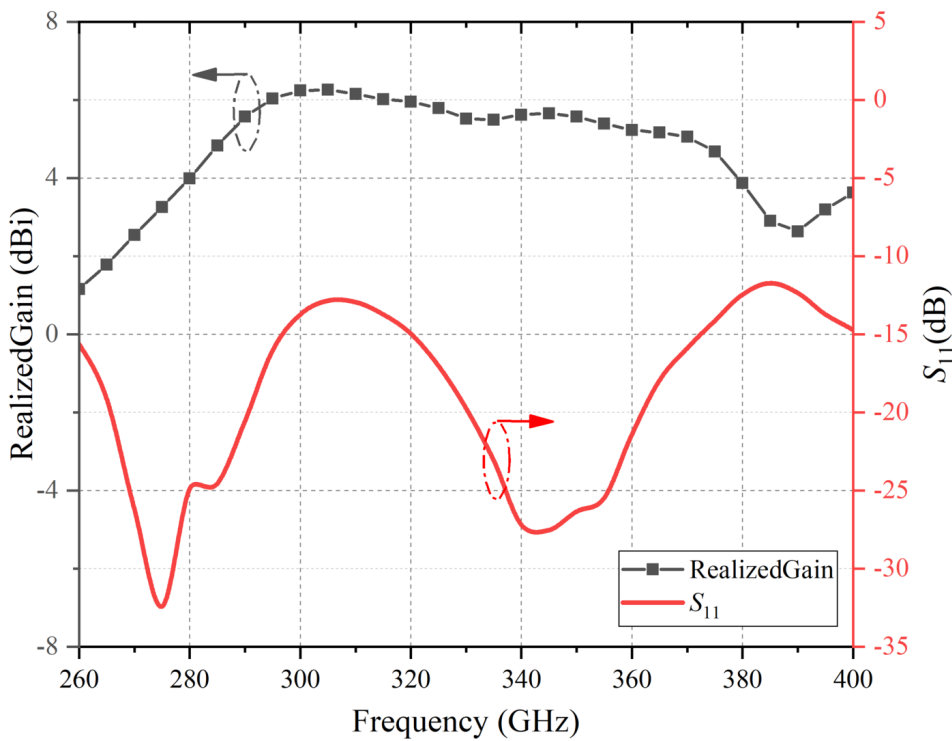
Health & Wellness

Biomedical and Genetic Engineering

Consumer Electronics

Digital Broadcasting, Telecommunication and Optoelectronics

Smart Mobility and Electric Vehicle



## IP Status

Patent filed



Technology Readiness Level (TRL) ?

4

Inventor(s)

Mr. KONG Shangcheng

Dr. SHUM Kam Man

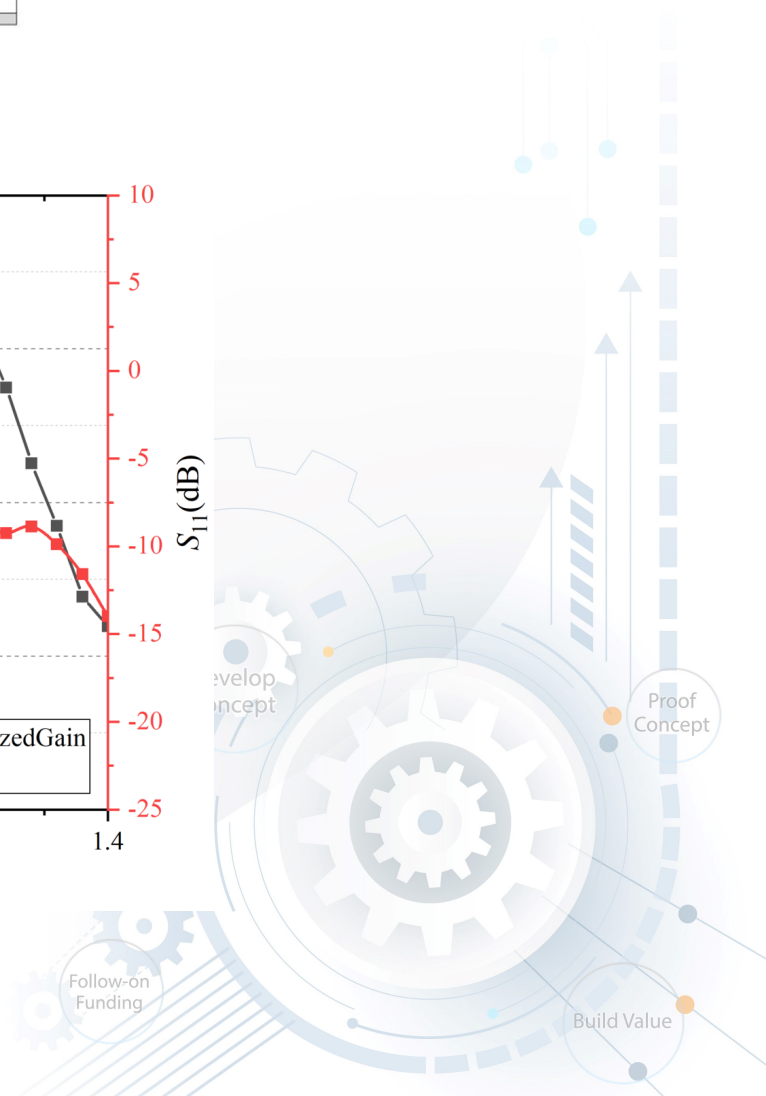
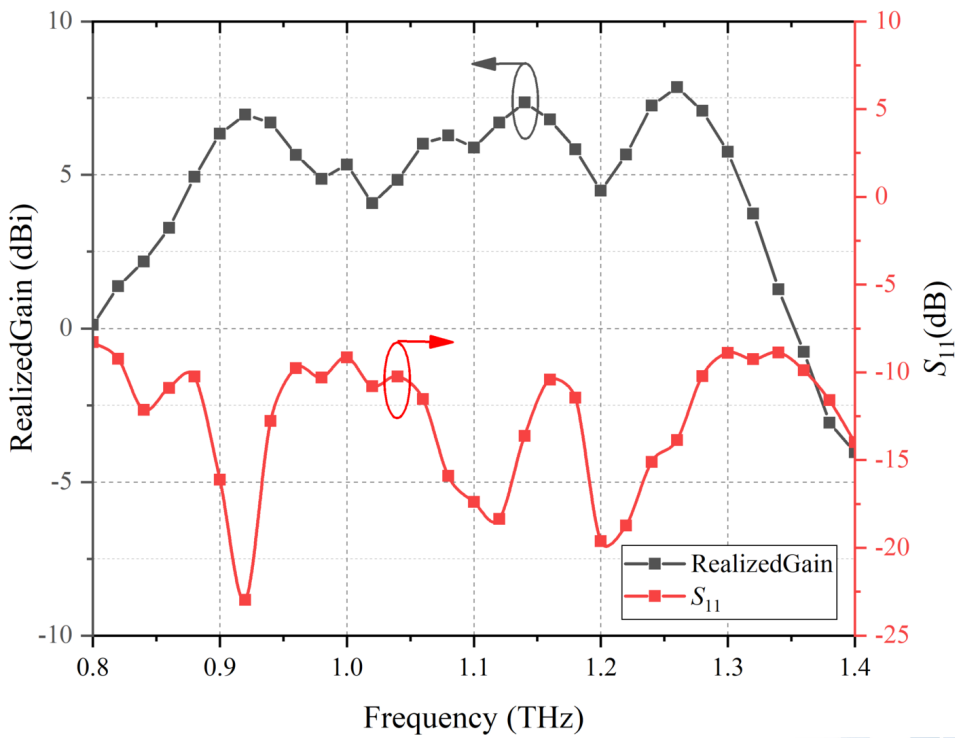
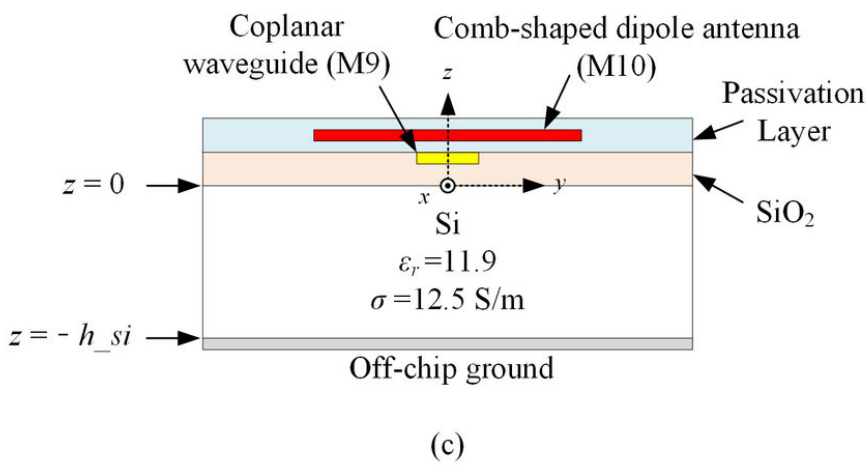
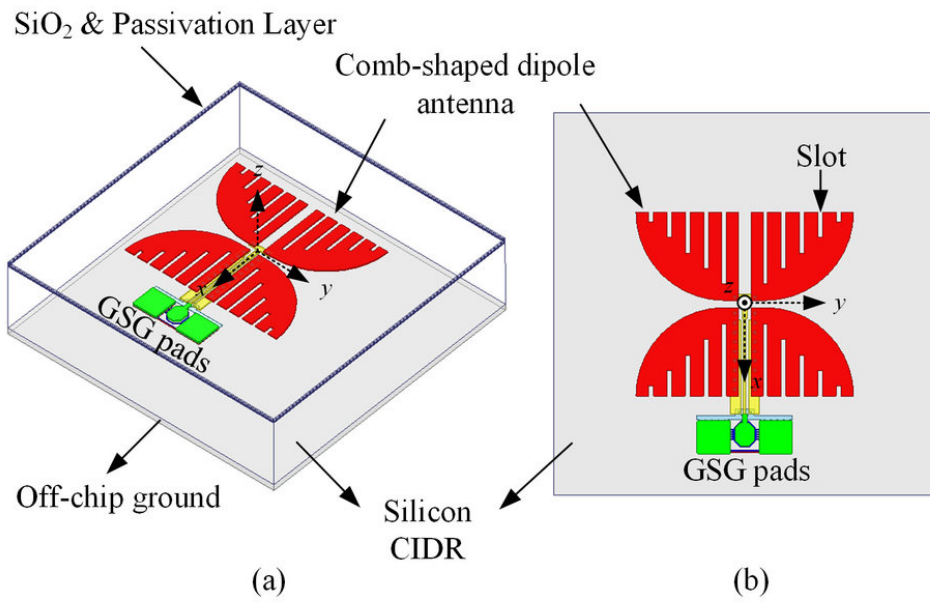
Prof. CHAN Chi Hou

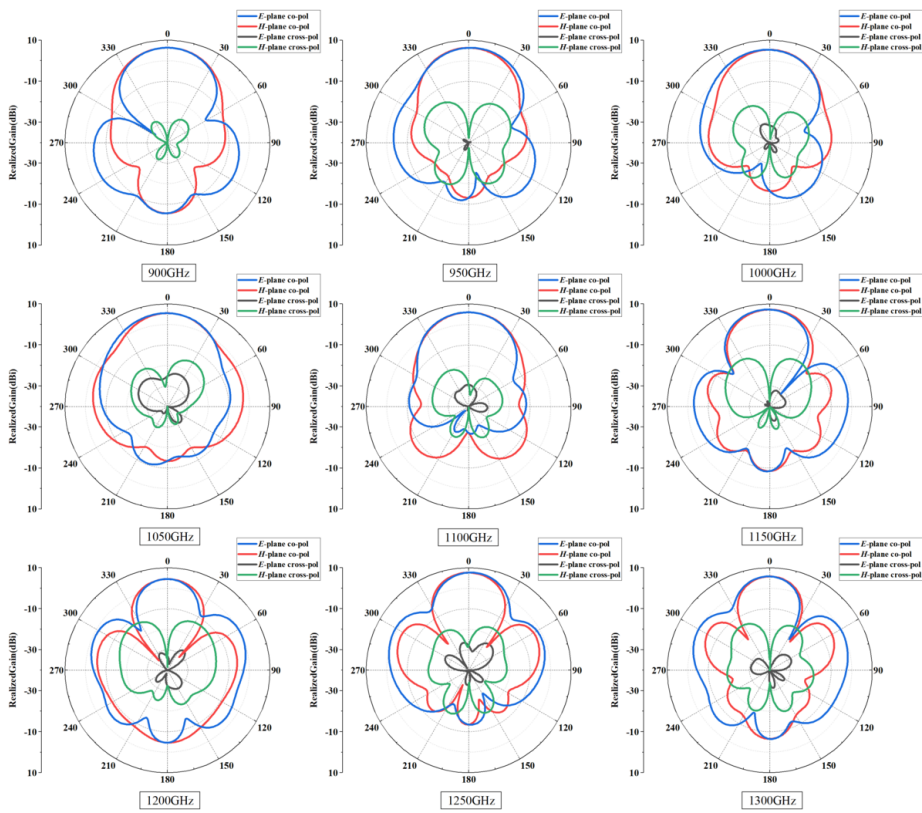
Enquiry: [kto@cityu.edu.hk](mailto:kto@cityu.edu.hk)

Follow-on Funding

Proof Concept

Build Value





## Opportunity

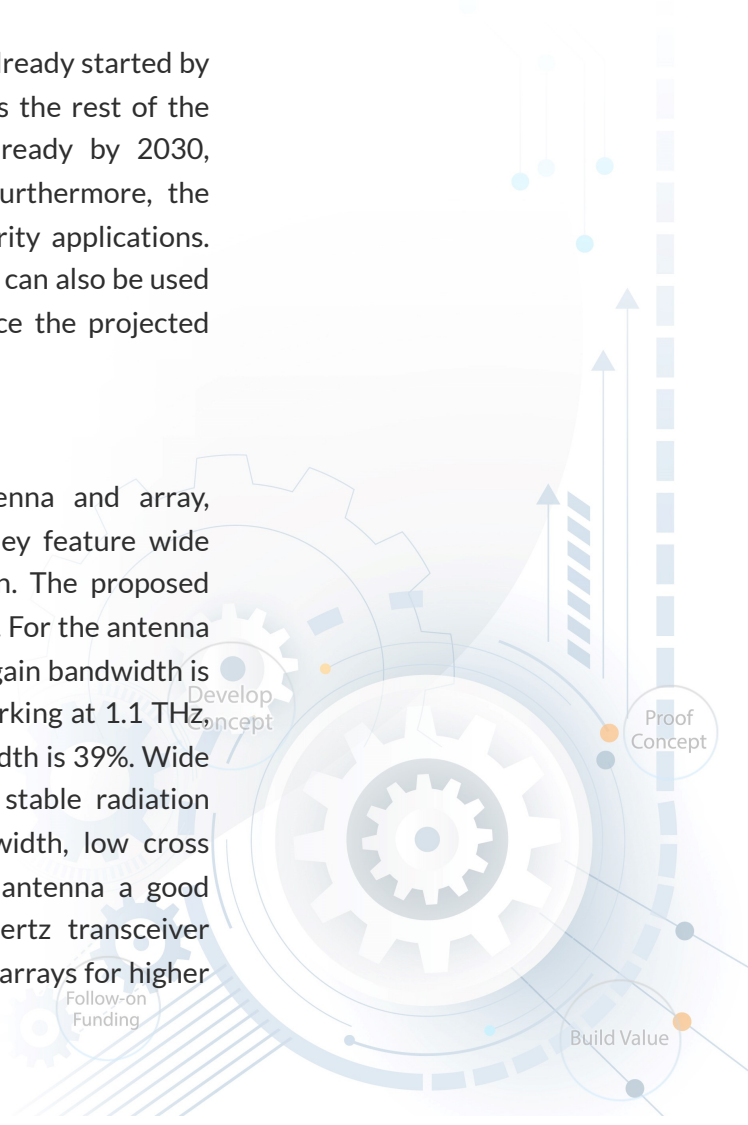
While 5G has not been fully deployed, the research on 6G already started by many companies in the Pearl River Delta region as well as the rest of the world. Although the deployment of 6G would not be ready by 2030, companies have to be ready way ahead of the time. Furthermore, the invention can also be used in terahertz imaging and security applications. THz IC for short range but high speed data communications can also be used to replace optical fibers for data centre application. Hence the projected market size for 6G would be huge.

## Technology

This invention describes linearly-polarized on-chip antenna and array, operating either in millimeterwave or terahertz band. They feature wide band, low cross polarization level and relatively high gain. The proposed antenna element is simulated both at 320 GHz and 1.1 THz. For the antenna working at 320 GHz, simulated results show that the 3-dB gain bandwidth is about 34% with a peak gain of 6.2 dBi. For the antenna working at 1.1 THz, the simulated peak gain is 7.8 dBi and the 3 dB gain bandwidth is 39%. Wide impedance bandwidth, low cross polarization levels and stable radiation patterns are also observed. The features of wide bandwidth, low cross polarization and relatively high gain make the invented antenna a good candidate in fully integrated millimeter-wave and terahertz transceiver systems. The antenna element can be employed in antenna arrays for higher gain.

## Advantages

- Impance bandwidth wider than 50% and gain bandwidth wider than 30%.



- Fully on-chip design by making dielectric resonator antenna embedded on the chip.
- High peak gain of 6.2 dBi at 320GHz and 7.8 dBi at 1.1 THz.

## Applications

- on-chip antennas
- 6G wireless mobile communications
- Data centre

