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Substrate Edge Antennas

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Motivation

Electromagnetic (EM) emission from substrate edges is increasing significantly when the communication systems move from the first generation to the fifth generation using millimetre waves. It is reasonable and very interesting to utilize the substrate edge to design antennas. Substrate edge antennas (SEAs) are easy to form arrays with multiple beams or steering beams, and also very suitable to be employed together with packaging technologies. SEAs and the arrays are very promising in the next generation communication systems, like in handset terminals, indoor mmWave stations and unmanned aerial vehicles (UAVs).

Research Fronts

H-plane horn antennas are one example of SEAs, which are implemented in commercial substrates using the substrate integrated waveguide (SIW) technology. H-plane SIW horns have the advantages of low profile, good gain, and little EM interactions due to the closed structure. In addition, radiation from the substrate edges also can be in leaky waves, which features simple feedings, good impedance matching and high gain.

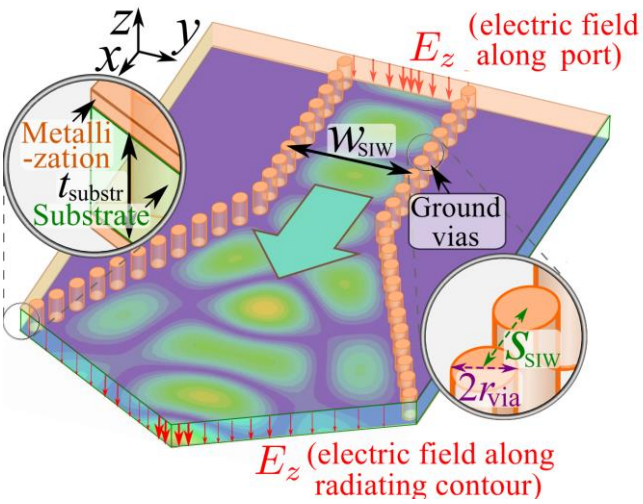

Fig. 1 Illustration of the implementation of substrate edge antennas by using substrate integrated waveguide technologies.

Researchers

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Selected Publications

- L. Wang and X. Yin, "Substrate Edge Antennas," in Substrate-Integrated Millimeter-Wave Antennas for Next-Generation Communication and Radar Systems, IEEE, pp.259-285, 2021.
- L. Wang and Q. Liao, "Wideband Multibeam SIW Horn Array with High Beam Isolation and Full Azimuth Coverage," IEEE Trans. Antennas Propag., April 2021.
- J. Zhang et al., "Dual-Polarized Phased Array with Endfire Radiation for 5G Handset Applications," IEEE Trans. Antennas Propag., vol. 68, no. 4, pp. 3277-3282, April 2020.
- D. Dahl et al., "Efficient Simulation of Substrate-Integrated Waveguide Antennas Using a Hybrid Boundary Element Method," IEEE Journal Multiscale Multiphysics Computational Techniques, vol. 4, pp. 180-189, 2019.
- L. Wang et al., "Wideband H-plane Dielectric Horn Antenna," IET Microwaves, Antennas & Propagation, vol. 11, no. 12, pp. 1695-1701, 2017.
- L. Wang et al., "Phase Corrected H-Plane Horn Antenna in Gap SIW Technology," IEEE Trans. Antennas Propag., vol. 65, no. 1, pp. 347-353, 2017.
- L. Wang et al., "Phase Corrected Substrate Integrated Waveguide H-Plane Horn Antenna with Embedded Metal-Via Arrays," IEEE Trans. Antennas Propag., vol. 62, no. 4, pp. 1854-1861, April 2014.

Prototype Demonstrations