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## Wideband Leaky-Wave Antennas and Arrays

### Microwaves and Antenna Engineering Group

<https://microwaves.site.hw.ac.uk>

## Motivation

New communication systems require high-speed data transfer and need high frequency, wideband, and directive antennas. Leaky-wave antennas are a desirable type of antennas for millimetre and sub-millimetre waves since they can produce a high directive radiation with a single feeding. The latter is an enormous advantage to reducing the cost and losses at high frequency. Despite these advantages, their dispersive nature inherently produces a beam squint effect in their radiation patterns.

In this research, we are aiming to make the high directive LWAs broadband for high throughput point-to-point communication by reducing the beam squint of LWAs. A first demonstration with the scenario of prism lens has been carried out by different like the substrate integrated waveguide and groove gap waveguide technologies.

## Research Fronts

The research team has proposed a theoretical and experimental approach by loading prism lens to the LWA aperture to reduce the beam squint. The prism lens is implemented by metasurfaces which are integrated with the LWAs. Fig. 1 illustrates the operating principle of this scenario from the radiation directions.

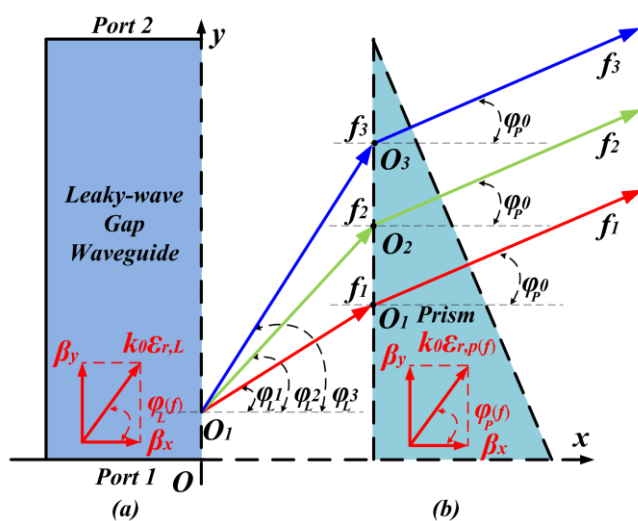


Fig. 1 Illustration of the proposed principle of operation, (a) Radiation angles in a leaky-wave antenna; (b) Correction of rays with different angular directions depending on the frequency by a dispersive prism.

## Achievements

1. >20% 3-dB gain bandwidth.
2. >18% bandwidth with  $<1^\circ$  beam squint.

## Selected Publications

- ❖ L. Wang, et al., "Substrate Integrated Waveguide Leaky-Wave Antenna With Wide Bandwidth via Prism Coupling," in IEEE Transactions on Microwave Theory and Techniques, vol. 66, no. 6, pp. 3110-3118, June 2018.
- ❖ L. Wang, et al., "Low-Dispersive Leaky-Wave Antenna Integrated in Groove Gap Waveguide Technology," in IEEE Transactions on Antennas and Propagation, vol. 66, no. 11, pp. 5727-5736, Nov. 2018.
- ❖ J. Chen, et al., "Wideband Leaky-Wave Antennas Loaded with Gradient Metasurface for Fixed-Beam Radiations With Customized Tilting Angles," in IEEE Transactions on Antennas and Propagation, vol. 68, no. 1, pp. 161-170, Jan. 2020.

## Researchers

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## Prototype Demonstrations

