



**QUEEN'S
UNIVERSITY
BELFAST**

CWI

**CENTRE
FOR
WIRELESS
INNOVATION**

LOW COMPLEXITY RF FRONT-END FOR HYBRID MMWAVE MIMO 5G MOBILE NETWORKS

Need

5G NR standards were set in 2018 and worldwide deployment started in 2019. Extensive research has shown that the multi-input multi-output (MIMO) antenna technology has the capabilities to meet the high data rate demand of 5G mobile users. Many scenarios have been tested, but the telecoms industry is still facing three main challenges in optimizing millimetre wave massive MIMO solutions.

The first challenge is the huge losses faced by the electromagnetic waves while propagating through the free space in millimetre wave frequencies, hence highly directive radiation is desirable.

The second challenge is to add steering capability in an array, a network of phase-shifters and power dividers is required, which is generally lossy and expensive in mm-Wave frequencies.

Finally the third challenge, the theoretical principles of MIMO require each antenna to be connected separately to the baseband processing unit, making the overall system cost prohibitively high, especially when we talk about 64 or 128 element massive MIMO system.

Approach

The CWI researchers developed a two-stage Rotman lens-based uniform rectangular array (URA) beamformer, as an RF front-end solution for hybrid mm-Wave MIMO base stations. This solution attempts to find the best trade-off between cost, complexity and performance.

Their design represents a full end-to-end mm-Wave hardware. The basic requirements considered in developing the beamformer are in line with the ITU standards for mm-Wave 5G. Unlike existing solutions that require dedicated RF chains per antenna, their approach massively reduces the complexity and the cost of mm-Wave MIMO RF front-ends in 5G base stations of mobile networks.

Results

1. The world's first low cost RF front end for 5G mobile networks.
2. Grand winner of the GSMA Mobile World Scholar Challenge 2019, a global award presented during MWC19 in Barcelona.

Video

<http://go.qub.ac.uk/CWI-DrBabarAbbasi>

Publications

European Conference on Antennas and Propagation (EuCAP), April 2019

IEEE 16th International Symposium on Wireless Communication Systems (ISWCS), Oct. 2019, DOI: 10.1109/ISWCS.2019.8877186

Patents

n/a

Researchers

QUB:

Dr Muhammad Ali Babar Abbasi – m.abbasi@qub.ac.uk

Prof Vince Fusco – v.fusco@ecit.qub.ac.uk

Dr Michalis Matthaiou – m.matthaiou@qub.ac.uk

Dr Harsh Tataria – harsh.tataria@eit.lth.se

Commercial contact

Norbert Sagnard – n.sagnard@qub.ac.uk

Technology readiness level

