Phase Conjugation Technology for Wireless and Imaging (Keynote Address)

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Phase Conjugation Technology for Wireless and Imaging (Invited)

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In this paper the author will summarize the work at QUB on phase conjugation technology at microwave frequencies. The talk will include a discussion on the principles of Self Tracking Phase conjugate systems. Applications of the technology will given for physical layer secure Terrestrial Mobile to Satellite Broadband SatCoM terminals, for close defense RADAR, sub-wavelength limit imaging and sensor communication including wireless powering in multipath rich or blocked line of sight environments.

Phase conjugating antenna arrays can dramatically improve the functional characteristics of wireless communication systems due to their intrinsic auto-correcting and auto-phasing properties, [1]. The study of phase conjugating (PC) antenna arrays for microwave wireless communications using retrodirective arrays has been reported in [1-3], and their inherent physical layer security properties discussed in [4]. The fundamental feature of this technology is that a two-way communication link is possible when a pilot tone is present and the retrodirective array acts as a phase conjugating mirror capable of encoding (on re-transmit) and or extracting (on receive) data.

A radar system constructed using this technology has the ability to automatically switch from surveillance mode to tracking mode when presented with a target. The acquisition time for such a system is much faster than for a conventional phased array system making it particularly useful in the detection of fast projectiles launched close in, [5].

In addition phase conjugation technology at microwave frequencies lends itself to the creation of active lenses which have the ability to image in both the near and far fields and to concentrate energy into very tight localised regions allowing the possibility for (i) sub-wavelength imaging, [6], and (ii) efficient wireless sensor communication including wireless power delivery in multipath rich environments, [7].

More details on the work to be presented can be found in the references above. It is hoped this talk will encourage others to develop an interest in this topic.

<u>References</u>

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