Flexible Duplex Transceivers for 5G and Beyond Wireless Access

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There is now significant interest in the use of signal cancellation based architectures in an attempt to replace frequency domain filtering within the duplexing function for next generation wireless transceivers. This approach can potentially eliminate the need for band specific filters, which inhibits global operation of LTE handsets due to the diverse band plan. Further, using such methods in-band full-duplex communications is also possible, thus potentially doubling the spectrum efficiency when compared with conventional techniques.

Such architectures (IEEE J. Sel. Areas Commun., vol. 32, no. 9, Sep. 2014) can be based on (1) separate transmit and receive antennas or (2) Electrical Balance Isolation (EBI) in order to provide the necessary and demanding transmit to receive port isolation. At Bristol were are addressing the single antenna EBI based architecture as illustrated in fig 1. Dynamically matching the balancing impedance (Z_{bal}) to that offered by the antenna is fundamental to the operation of this system. This 'balancing' must also compensate for any user or environmental changes to the antenna impedance, with our measurements indicating some 25dB variation in the levels of isolation achievable.

This presentation will describe our use-case specific antenna measurement campaigns and the use of this data in the simulation of the EBI architecture. We provide an overview of our test-bed based on a pair of National Instruments Vector Signal Transceivers (see figs 2 & 3) alongside our recent results. Here we have combined both EBI and transmit signal cancellation in the receive path, achieving 82dB of isolation in the initial set-up.

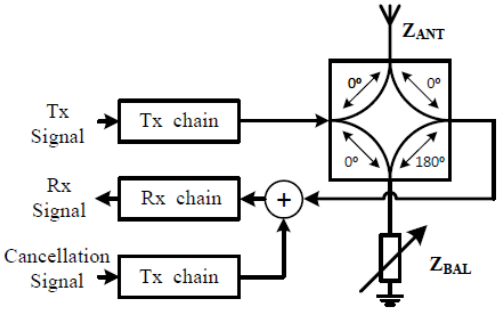

Fig 1: EBI based Signal Cancellation Duplexer

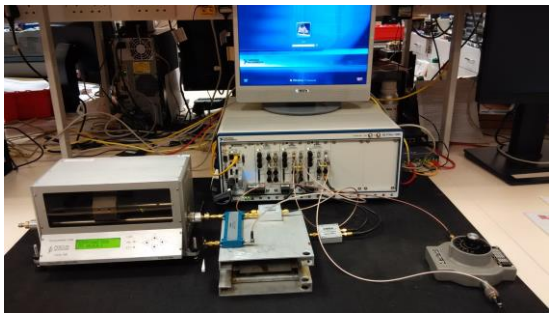

Fig 2: Bristol's Full Duplex Test-bed

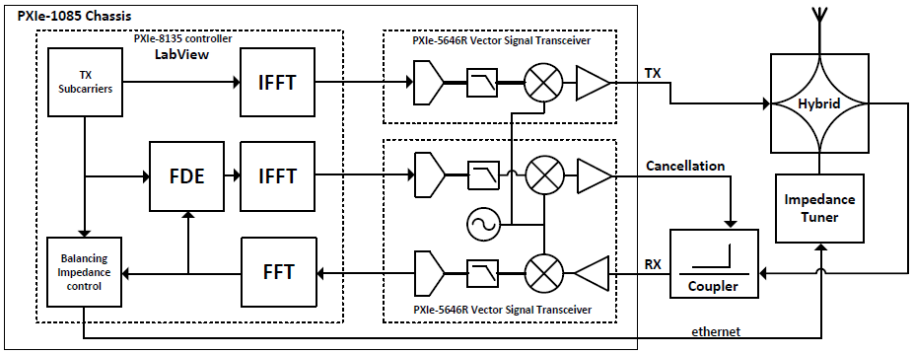

Fig 3: Bristol's EBI and Analogue Transmit waveform cancellation architecture