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LOCATION-AWARE CHANNEL ESTIMATION FOR CAPACITY GAINS ON MIMO SATELLITE LINKS

Abstract

Bandwidth is an expensive and scarce resource, thus its efficient exploitation is of great interest. Recent communication satellites feature sophisticated spatial access strategies through spot beams providing total throughputs approaching 100 Gigabit per second. Next generations of communication satellites, as postulated in the *Satellite Communications Network of Experts* (SatNEx) activity, funded by the *European Space Agency* (ESA), require technological developments enabling throughputs of 1 Terabit per second. *Multiple-input multiple-output* (MIMO) system architectures, formed by a central gateway, a multibeam satellite, and an aggressive frequency reuse strategy can meet such ambitious design goals; interference problems are tackled by appropriate countermeasures such as (joint) precoding and beamforming on the forward link as well as multi-user detection on the return link; these methods require accurate and timely knowledge of the channel state information which in turn necessitates adequate channel estimation.

This paper addresses performance issues related to channel state estimation on the symbol-synchronous forward link and the frame-synchronous return link; it highlights for both links the potential performance gain by presuming *a priori* knowledge of the user position, as referred to as location-aware channel estimation.

Keywords— MIMO satellite links, channel estimation, location-awareness, precoding, multi-user detection