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PROGRESSES IN THE FREQUENCY REUSE OPTIMISATION: INNOVATIVE APPROACHES AND PERSPECTIVES

Abstract

The need for an optimised use of the Radio frequency bandwidth in satellite communications is representing a challenge for the new satellite communications systems. In the last years, new theoretical approaches have being investigated, investigating on one side the physical property of EM waves to propagate not only as planar, but also as twisted waves (Orbital Angular Momentum) and on the other side analysing the possibilities offered by intense use of new techniques based on the availability of FPGA and ASIC technologies. In general these research fields (driven by LTE, MIMO and in general wireless communications) have become popular for the emerging saturation of the radio frequency spectrum and the potential capability of such systems to produce a multiplication of the frequency reuse. This general trend could have a very meaningful impact on satellite communications, allowing to increase the possible number of feeder links of the satellite transponder on the same angular slot. The paper is focussed on the analysis of using these techniques to define a number of properties, advantages and potential limitations. In fact the knowledge of the twisted waveforms lasted since 100 years and the use of them to increase the frequency reuse of the satellite link has never been clearly investigated and the results presented in the paper are completely new. Preliminary simulated results are presented and look promising in term of bandwidth reutilisation in a reasonably short time frame. In conclusion the availability of the technology is presented defining possible scenarios in the short-medium term with respect to the possible area of satellite communications.