Title: Physical-layer security in intelligent reflecting surface assisted dual function radar and communication systems

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The emergence of mobile communications has resulted in portions of radar spectrum being re-allocated for dual-use with communications. Consequently, efforts towards joint bandwidth access within the same RF spectrum by coexisting communications systems and radars have significantly increased. To facilitate such joint bandwidth access, dual-function radar communications (DFRC) systems have emerged as a popular approach because it allows both transmissions to use the same hardware over the same frequency band. Since identical waveforms are used in both radar and communication services, delivery of information to communication nodes has become more susceptible to unauthorized users sensing or intercepting it. Even though cryptographic techniques were effective for secure communication, modern day computation power can break cryptographic codes. In this realm, physical layer security has become a complementary option, since these techniques seek to facilitate communication to the intended users, while ensuring that the unauthorised nodes are kept ignorant about the ongoing transmission to the maximum possible extent. In this proposal, we seek to explore two key physical layer security functionalities in a DFRC system assisted by an intelligent reflecting surface (IRS): secure communication via secrecy and covert communication in a DFRC system. These security requirements will be met by developing suitable algorithms for precoding at the DFRC unit and reflection coefficient optimization of the IRS. The precoding scheme and IRS reflection coefficient design scheme will be adaptive to the wireless propagation environment.