1) Title of the tutorial

Efficient Spectral Access for Radar and Communications

2) Instructors name and affiliation

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3) a 300 word abstract describing the proposed topic and including an outline of the contents

Abstract

The electromagnetic spectrum (EMS) is a precious resource that connects and protects our societies across the globe. However, the spectrum has become increasingly congested with no end in sight. To mitigate this congestion, it is vital that future users of the spectrum do so in an *efficient* manner. As radar and communication systems pose the greatest demand on spectrum access, their future designs must make use of all degrees-of-freedom (DoF): time, frequency, space, coding and polarization. Technologies for efficient radar-communications spectral access can be grouped into two broad categories: co-design and coexistence. Coexistence is where radar and communications systems must share a set band while a co-designed radar/communications system uses a single, flexible RF aperture to time-multiplex or emit dual-function waveforms.

Successful co-existence and co-design of radar and communication systems both rely on fundamental understanding of the design goals, constraints, and performance metrics of both types of systems, which are not related to each other in a mathematically tractable fashion. Therefore, this tutorial will provide a first-principles examination of the design goals and metrics of both radar and communications. We will explore the motivation and history of spectrum access and examine the practical requirements for utilizing the available DoFs. Specific examples of coexistence and co-design techniques will be explored based on the DoF(s) they use to enable efficient spectrum access. Implications of hardware constraints on these techniques will be illustrated. To narrow the focus radar detection will be the primary radar application.

4) target audience and assumed knowledge

We hope this tutorial will provide a strong foundation to introduce both experienced and novice practitioners of both radar and communications research into the area of efficient spectrum access. The congested spectrum is our new reality, and future RF engineers will have to understand and operate within this reality.