National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Performance Analysis of Ambient Backscatter Systems under Hardware and Channel Impairments
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Venue	: EC-303, Seminar Room, EC Department
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Abstract	: In backscatter communications systems (BCSs), a backscatter transmitter modulates and reflects received radio frequency (RF) signals to transmit data instead of generating RF signals by itself. Thus this technique is used in many practical applications such as radio-frequency identification (RFID), tracking devices, remote switches, medical telemetry, and low-cost sensor networks etc. There are mainly three component in any BCS, namely an RF source, backscatter device (BD) that also called as tag, and a reader. Based on the location of the RF source, BCSs are categorize in three category as monostatic BCSs (MBCSs), bistatic BCSs (BBCSs), and ambient BCSs (ABCSs). ABCSs have many advantages in terms of cost, complexity, spectrum, and power as compared to conventional BCSs. Hence in this report, we consider a multitag ABCS where a single reader receives information from a selected tag using RF signals broadcasted by the ambient sources such as TV towers, cellular base stations, radio towers, etc. For the first work, we assume that the considered Ambient backscatter system (AmBS) model is constrained by RF hardware impairments (RFHIs). Specifically, we consider that the ambient source and the reader nodes are affected by the RFHIs. An opportunistic tag selection policy is used to select the tag based on best link between tag and reader. For this set-up, we derive the ergodic capacity of the considered system over Nakagami-m fading channels. Next, for this setup, we derive outage probability (OP) and corresponding asymptotic OP by employing end-to-end SNR based tag selection policy. We further consider that the CSI for the links between the multiple tags and the reader is outdated due to feedback delay, etc. For this set-up, by employing a practical tag selection scheme based on outdated CSI, we derive the outage probability (OP) and corresponding asymptotic OP of the considered AmBS over mixed fading channels. Next, for the considered AmBS by assuming perfect mitigation of direct link distortion noise we investigated the OP for perfect/outdated CSI conditions. We verify our theoretical results by simulations and reveal essential insights.