# High Data Rate Multi-Path Transmit/Receive System with On-site Coding

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In the near future, wireless communications systems will require much higher data rates. Additionally, there is significant interest to make such communication devices portable and also reduce the power consumption below a certain level. As an example, antenna arrays where each antenna element must have its own RF backend and Analog-to-Digital Converters (ADCs) are not attractive due to their high power requirements.

To address such challenges, we propose a high data rate system that can operate at an instantaneous bandwidth of 10 GHz. To do so, we introduce multiple coding stages. More specifically, we propose a hybrid channel coding and a code division multiplexing technique to achieve up to 40 dB of coding gain by ensuring that no Signal-to-Noise degradation occurs. Further, to cover a 10 GHz bandwidth, we propose a signal channelization process using many individual channels/bands each spanning the spread bandwidth. This is achieved by up-converting the signals to different frequencies (channels) using a set of local oscillators (LO). At the front-end, the signals are amplified and frequency multiplexed into a single ultra-wideband (UWB) signal prior to transmission.

In this paper, a detailed system evaluation of the proposed high data rate transceiver is conducted. More specifically, we examine the impact of CDMA and on-site coding on the system's signal-to-noise ratio (SNR). To do so, bit error rate (BER) curves are generated using different set of orthogonal and non-orthogonal codes. Preliminary results show minimal SNR degradation using orthogonal Walsh-Hadamard codes with ideal filters and high resolution DAC/ADCs. Further analyses that examine the trade-offs using non-orthogonal codes with more realistic components (e.g. filters) and finite resolution digitizers will be presented at the conference.