



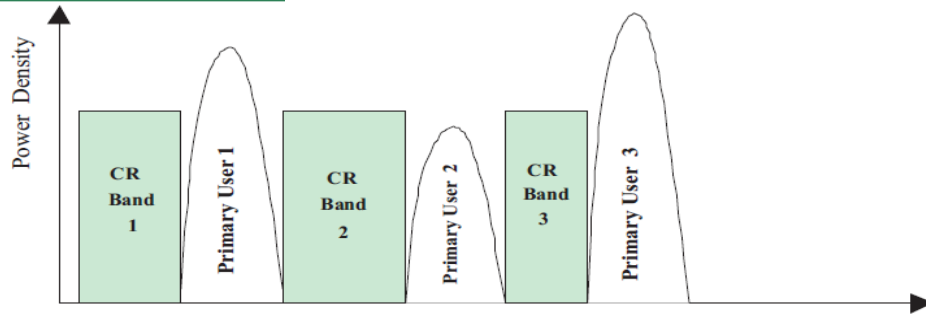
Software Defined Radio (SDR) Implementation of Spectrally Modulated Spectrally Encoded (SMSE) Based Overlay Cognitive Radio (CR)

Ruolin Zhou (WSU)
Clifton Bullmaster (AFRL)

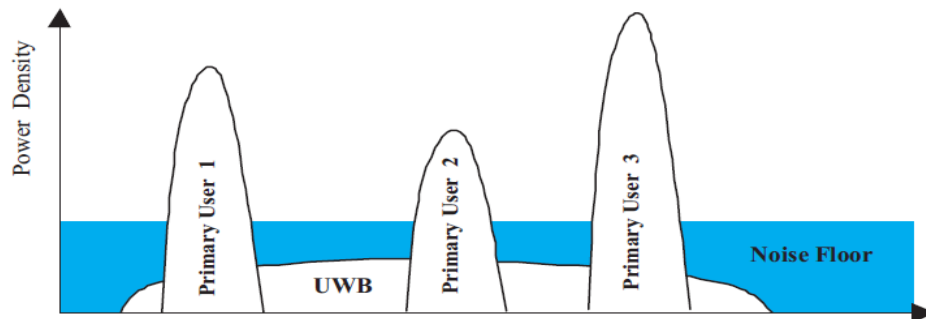
DySPAN2010
04/07/10



Cognitive Radio

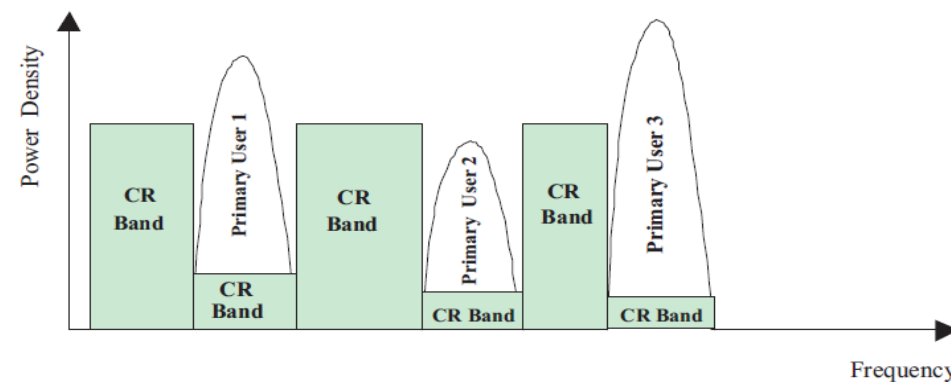


Overlay CR – utilizes the white space (unused spectrum)



Underlay CR – UWB

$$B > 500 \text{ MHz}$$

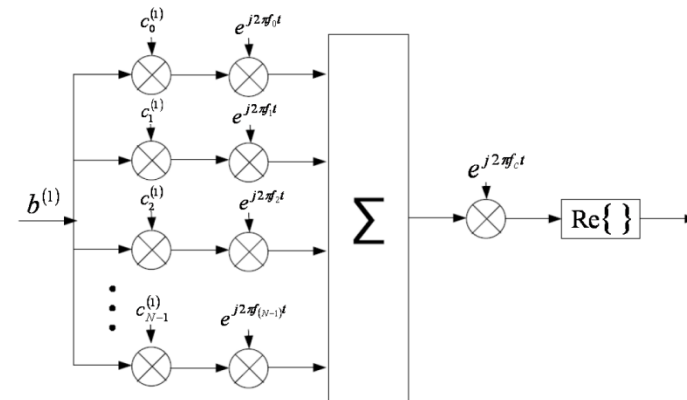
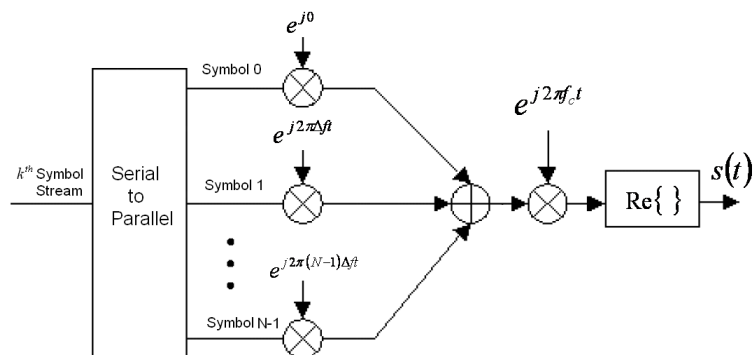
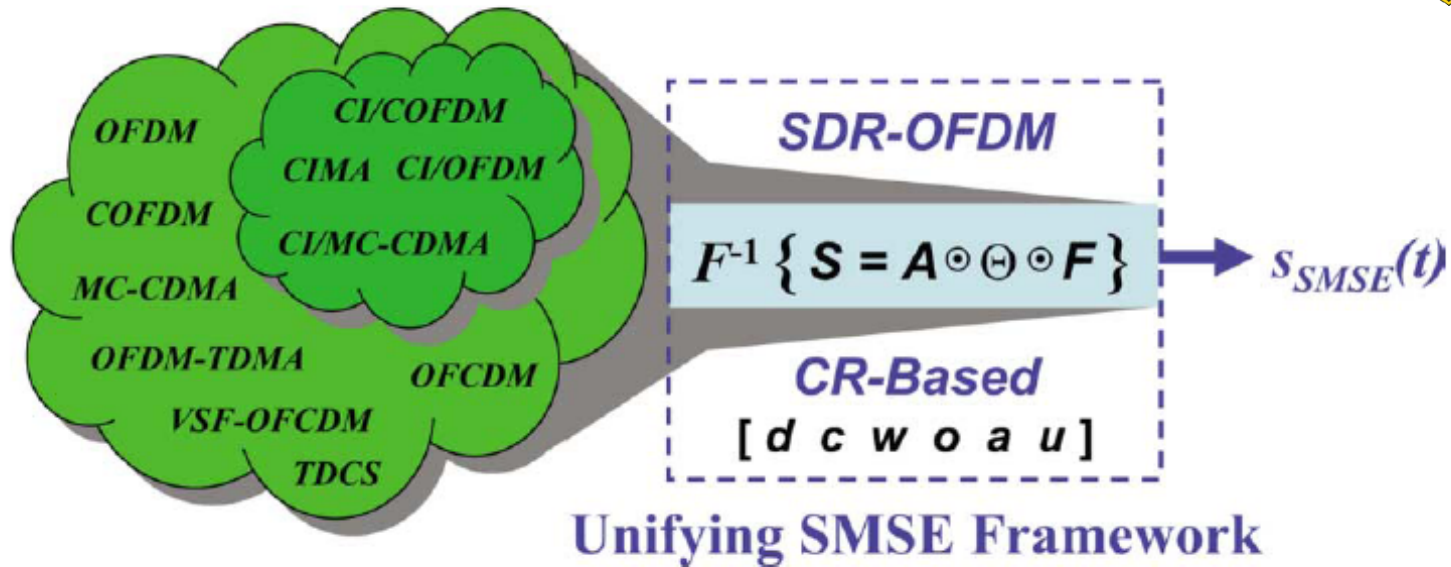


Hybrid Overlay/Underlay CR – utilizes both the white space and the gray space. Do not need UWB for underlay

V. Chakravarthy, Z. Wu, M. Temple, and F. Garber, "Novel Overlay/Underlay Cognitive Radio Waveforms Using SD-SMSE Framework to Enhance Spectrum Efficiency - Part I: Theoretical Framework and Analysis in AWGN Channel," *IEEE Transactions on Communications*, vol. 57, no. 12, pp. 3794-3804, December 2009



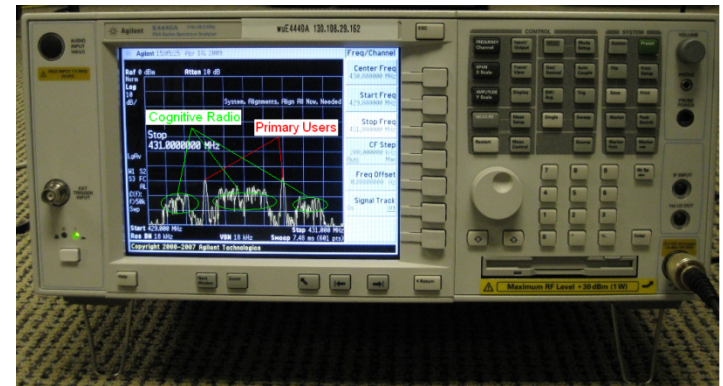
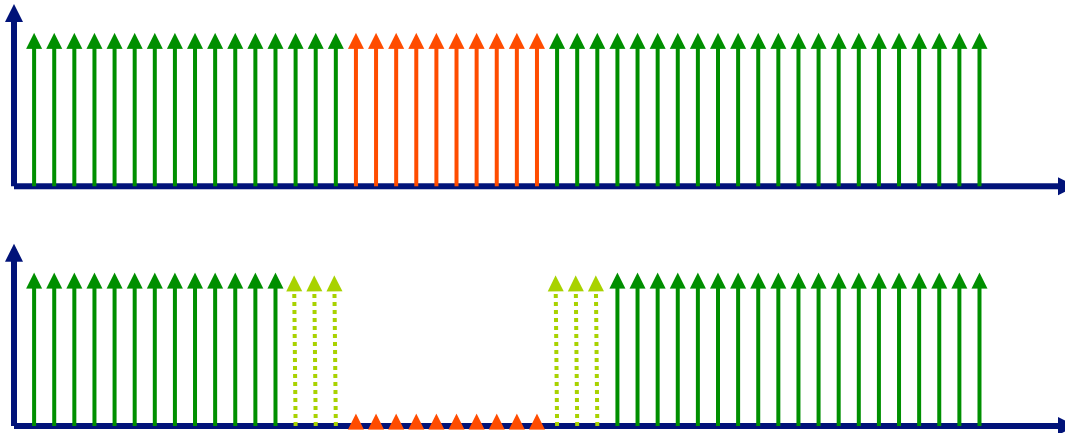
SMSE Framework



M. L. Roberts, M. A. Temple, R. A. Raines, R. F. Mills, and M. E. Oxley, "Communication Waveform Design Using an Adaptive Spectrally Modulated, Spectrally Encoded (SMSE) Framework," *IEEE Journal of Selected Topics in Signal Processing*, June 2007



Demonstration



- Flexibly generates SMSE based non-contiguous OFDM, MC-CDMA, CI/MC- CDMA, and TDCS waveforms to take advantage of multiple spectrum holes
- Adaptively avoids interference from and to the primary users, and intelligently provides coexistence
- Future Work - "SD-SMSE Based Hybrid Overlay/Underlay CR"