

Report on: "Noncoherent Capacity of Underspread Fading Channels" by Durisi, Schuster, Bolcskei and Shamai

This paper studies the capacity of the WSSUS fading channel under the underspread assumption and the assumption that the channel is not known at the receiver or the transmitter (non-coherent capacity).

The problem of characterizing the non-coherent capacity of wideband fading channels has a very long history, starting from the work of Kennedy and Vitrebri in the 60's. More recently, in the early 2000's, the interest in this problem has been revived in order to understand how wideband CDMA systems scale to higher bandwidth. This line of work was initiated by Medard and Gallager, with follow-up work by Telatar and Tse, Subramanian and Hajek, Sethuraman and Hajek, and many others. Basically, the general conclusions of this line of work are two-fold: 1) if peakiness in time and frequency of the transmit signal is allowed, then the coherent capacity where the channel is known at the receiver can be achieved; 2) if the transmit signals are peak-limited in time or frequency, then the non-coherent capacity is strictly less than the coherent capacity; in fact, if the transmit signal is peak-limited BOTH in frequency and time, the non-coherent capacity goes to 0 as the bandwidth grows. Since characterizing the non-coherent capacity exactly for a given bandwidth seems very difficult, these conclusions are usually supported by upper and lower bounds on the capacity

This present paper can be viewed as taking another step in this line of work, performing a similar analysis on the standard wide-sense-stationary uncorrelated scattering fading channel model. As in earlier works, upper and lower bounds on capacity of this model are derived. While the results are useful in the sense that the WSSUS model is widely used, I would say that the qualitative conclusions obtained are not too different from earlier works. As such, I do not think that the amount of innovation in this piece of work makes it competitive for the paper award