

SIGNAL GENERATION IN CODE DIVISION MULTIPLE ACCESS

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INTRODUCTION

Code Division Multiple Access is a Spread Spectrum System which uses a pseudo random code with unique properties. The main property of a Spread Spectrum System is that the electromagnetic signal generated to carry the message allocated in a particular bandwidth is spread in a frequency domain. Hence as the signal is spread, it results in a wider bandwidth.

CODE DIVISION MULTIPLE ACCESS

The Code Division Multiple Access,(CDMA), 2000 Radio Transmission Technology is a wide band spread spectrum radio interface that uses CDMA technology to satisfy the needs of third generation, [3g], wireless communication systems. It is a system which has been implemented to satisfy the requirements for indoor office, indoor-to-outdoor pedestrian, and vehicular environments.

As any other Spread Spectrum System, CDMA provides a good immunity to interference and jamming of multiusers accessing the system, or intentional jamming to learn the message content through clandestine means and the possibility to hide the transmission within a background noise. The resulting higher bandwidth of this kind of transmission is the spreading process of a code which is independent of the data being transmitted. The receivers are synchronized to this independent code allowing the users to access the same frequency at the same time. Also the code usually called a Pseudo Random or Pseudo Noise code is a sequence used to protect the signal. Figure No. 1 is a bandwidth comparison between a Spread Spectrum System and a traditional communication system.

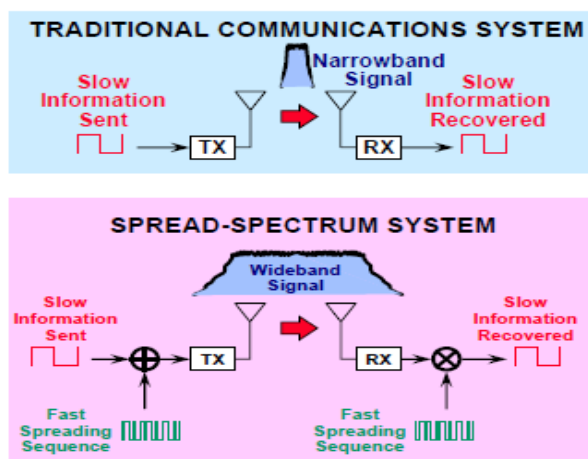


Figure No 1. Bandwidth transmission comparison

X-OR OPERATION

As has been said above, the receiver must be synchronized to the PN-Code. However if the correlation of the X-ORed signal at the receiver is high the receiver can extract the message from the code. Otherwise, if the signal and the desired receiver have a low correlation, then the signal is rejected and the receiver will not extract the

message from the X-ORed signal. The X-ORed signal must be in high correlation with the PN-Code at the receiver. Then the X-ORed signal and the code at the receiver are said to be in cross-correlation. In simple terms, the PN-Code has a randomness property which is available when there is the cooperation of the transmitter and the receiver, a cooperation which is not associated to any other user. Figure No. 2 is detailed as to the X-ORed operation with the input message signal.

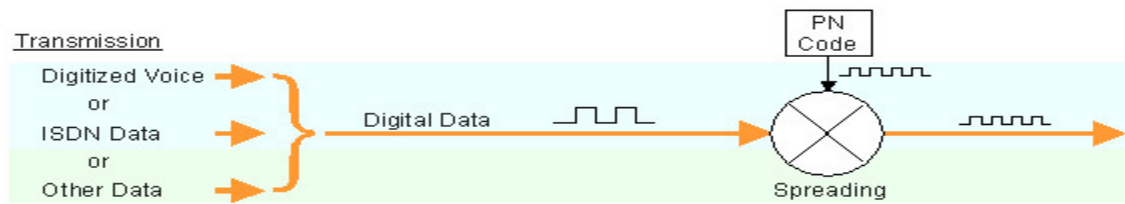


Figure 2: X-OR operation

In conclusion we define a CDMA Spread Spectrum System as;

A means of transmission in which the signal occupies a bandwidth which exceeds the minimum required to send the information message attending the Nyquist Criteria, being this message the digitized result of voice, an Internet Service Digital Network or any other quantified data including video. The band spread is done by means of a Pseudo Random code independent of the data message with the code at the synchronized receiver for despreading and subsequent message recovery.

Finally, CDMA as a Spread Spectrum System offer the benefits of;

- Multiple users interference rejection.
- High resolution ranging.
- An extremely low mathematical probability of signal interception.
- Accurate universal timing.
- Antijamming.
- Multiple user random access communications with selective addressing capability.
- The data of CDMA can be hidden behind background noise making it more difficult to learn its content.

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