

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Technologies for Space Communications and Navigation (3)

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SATELLITE COMMUNICATION SYSTEM ADOPTS CDMA-OFDM SIGNALING

Abstract

A CDMA signaling scheme is commonly featured with a high channel capacity. However, considering the multipath delay (channel fading) that induces inter-symbol-interference (ISI), as well as multi-access interference among multi users in mobile communication environment, CDMA with few carrier can not support higher data rate, such as a merely 10kbps of audio rate adopted in the GlobalStar mobile communication system. Developing a new signaling scheme which allows higher data rate and endures channel fading environment is becoming increasingly important.

An OFDM signaling scheme has been widely applied in terrestrial wireless communication system, which is generally regarded as one of the most popular concept in the 4th generation (4G) wireless communication. OFDM was originally developed to solve the multipath delay problem, and supports much higher data rate, such as an over 100Mbps of multimedia rate in the wireless LAN/MAN system. Hence, considering a hybrid of CDMA and OFDM, a novel signaling scheme is proposed as CDMA-OFDM, which is able to improve the data transmission performance, provide higher channel capacity, as well as cope with channel fading environment and other interferences.

An introduction to the CDMA-OFDM system will be presented and studied in this paper, the newly proposed signaling scheme could be implemented by a DSSS plan firstly, to transform the signal from serial to parallel, and spread spectrum of each channel through a group of specified orthogonal pseudo noise code, such as PN code or Gold code, and then applying an OFDM scheme secondly, to modulate the signal by a number ($2^n, n \in \mathbb{N}$) of orthogonal multi carriers via FFT algorithm, finally synthesize each channel and form a multiplexing transmitting signal. For receiving and demodulating such signal, a joint estimation method should be adopted to solve the problems of channel fading, multipath delay and multi-access interference. Besides, considering the high speed of relative moving between satellite and target, a large doppler spread interference ought to be taken into account, fortunately, some widely used solutions such as inter-carrier-interference (ICI) self-cancellation technique would be conveniently referred during the study of this paper.

The proposed signaling scheme is practical, affordable, and commercially viable, which can be vastly applied by a great many fields of communication application, such as the terrestrial mobile communication and multimedia broadcasting system, and satellite mobile communication and fixed broadcasting system. Moreover, it can be also introduced into the inter-satellite-link (ISL) transmission in GEO's TDRS system and LEO's Iridium constellation communication system.