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Abstract

Title

Underwater Wireless Communication using Acoustic OFDM

In this thesis, we design and experiment an acoustic OFDM system for underwater wireless communication. (1) We disclose experimental results on Underwater Acoustic Communication (UAC) using acoustic OFDM, with data taken in sea in Okinawa and Shizuoka through many experiments since Oct. 2013. (2) We propose a symbol-by-symbol Doppler estimation and compensation for acoustic OFDM systems. The proposed system is robust to time varying Doppler rate and outperforms the conventional re-sampling method when velocity changes roughly over OFDM symbols. Overall, the proposed system utilizes a center frequency of 24 kHz, and a bandwidth around 8kHz. The sub-carrier space is 93.75Hz and 46.875Hz for mode 2 and mode 3, respectively. The number of sub-carrier of mode 2 and mode 3 are 81 and 161, respectively. Experimental results taken in Okinawa, Shizuoka, Japan, show our system using QPSK, 16QAM, and 64QAM achieved a data throughput of 7.5Kbit/sec with a transmitter moving at maximum 2m/s, in a complicated trajectory, over 30m vertically. (3) In addition, we propose an iterative channel estimation and ICI cancellation for mobile OFDM receivers. This method is applicable to mobile OFDM systems, in which there are many multipath and each path has a different Doppler shift provided that the maximum Doppler shift is less than 10% of the sub-carrier space

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