

ELECTRICAL ENGINEER

A CODED ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING SIMULATION OF A HIGH DATA RATE, LINE-OF-SIGHT, DIGITAL RADIO FOR MOBILE MARITIME COMMUNICATIONS

David V. Roderick-Civilian

B.S.E.E., University of New Haven, 1987

M.S.E.E., University of Maryland, 1982

Electrical Engineer-June 1997

Advisor: Paul H. Moose, Department of Electrical and Computer Engineering

Second Reader: R. Clark Robertson, Department of Electrical and Computer Engineering

The Naval Command, Control and Ocean Surveillance Center (NCCOSC), Research Development Evaluation (RDT&E) Division's (NRaD) Communications Department is conducting applied research toward the development of a high-data-rate (HDR), line-of sight (LOS), digital modem for ship-to-ship, ship-to-shore, and ship-to-relay communications. Development of bandwidth efficient HDR communications in a maritime radio environment is a challenging research problem due to the time-varying propagation effects within the marine layer. Marine layer propagation typically causes fading of the signal spectrum due to RF interference effects, and intersymbol interference because of multipath induced time spreading. The use of adaptive equalization to overcome distortions is difficult in this environment because of the dynamic nature of the signal propagation caused by transmitter and/or receiver motion and the maritime layer atmospheric effects. An alternative to channel equalization is the application of Coded Orthogonal Frequency Division Multiplexing (COFDM) which overcomes distortion effects without equalization through its orthogonality properties. This thesis explores the application of COFDM toward a HDR LOS maritime communications modem. The modem model is emulated in a high level programming language (MATLAB) and simulations are performed. Analysis of the simulations are conducted and evaluated as to the feasibility of a COFDM implementation in the presence of known noise and signal fading conditions.