ON AN HF DATA COMMUNICATION BROADCAST SYSTEM

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We have designed and implemented an HF data communication system for broad-
cast network applications. With the baseband message data managed and
controlled by a computer, and followed by a quantized frequency modulation
(QFM), the transmitting end of the system can be connected in parallel to
multiple HF transmitters sending messages to receiver stations. Three key
features were emphasized and built-in to the design: time and frequency
diversities, and forward error correction, in order to ensure link-
reliability for the system. HF carrier frequency selection for the link
is conducted initially at the transmitting end by sending frequency acqui-
sition commands (single tones) to align the receiver frequency within a
tolerance of ± 50 Hz. As a result of this frequency acquisition, reception
process is automatic and no operator is required at the receiver end.

In the interest of the effects of channel coding in combination with QFM
modulation, we have made an extensive study on the system by using Reed-
Solomon Code and convolution code.

Extensive field experiments for the system were conducted during 1984.
These field experiments were tested in the geographic region between lati-
tudes of 21 to 25 degrees North and at longitudes between 119 and 124
degrees East. These field experiments provided a single hop link with
frequencies at the low end of the HF band. Two QFM baud rates--50 and 75--
together with different combinations of Reed-Solomon Code and convolutional
code were used in the experiments.

Based on the results of our field experiments, we make the following con-
clusive remarks concerning our implemented HF data communication broadcast
system:

  1. Link reliability is reduced at nighttime. Link reliability
      factors above 90% can be achieved however, with increased
      transmitter power.

  2. A 50 baud rate was always better than a 75 baud rate.

3. Combining convolutional code and Reed-Solomon Code did not increase link reliability or reduce error rate. In fact, a reduction of link reliability was determined. In addition, the experiments indicated that a combination of 50 baud rate and convolutional code was best during the day and the combination of 50 baud rate and Reed-Solomon Code was best at night.

In this paper we will introduce some details on the system design, configuration and implementation. We will describe details of our field experiments and the results. Procedures for HF channel frequency selection, effects on preamble time, synchronization, modem, etc., will be discussed.

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