

A: The complete program of research and experimentation proposed including description of equipment and theory of operation.

This request is for a Part 5 experimental license to operate a transmitting station in the frequency range of 180.000 to 190.000 kHz. The proposed operation of this station is to investigate the performance of small limited-space antennas, low frequency propagation studies, and to experiment with low data rate digital modes, primarily slow speed CW and narrow shift FSK. Availability of freely available software for reception of such modes, along with a growing interest among and increase in the number of operators of low frequency receiving stations will make these proposed tests possible as well as productive. Experiments to determine maximum usable data rate under various propagation conditions, path length, and ERP (up to the maximum permitted ERP allowed by the license grant) are also proposed to be investigated. Regular CW for aural reception will also be used. This station will be operated in attended beacon mode. Also two way communications will be attempted with other Part 5 experimental stations as permitted.

The higher ERP which would be authorized under this grant would permit reception at greater distances than that possible under part 15 rules (limitation of 1 watt DC input power and 15 meter total antenna length under section 15.217 limit the ERP realistically to less than 1 milliwatt) , thereby increasing the number of available receiving sites. Also a greater variety of propagation conditions than would be possible within the Part 15 rules (sec. 15.217) could be explored. Data and observations collected during the proposed operation will be available via the Internet for the use of other experimenters.

This program is expected to take 36 months.

The transmitter and other equipment used for this experiment is and will be built by me, Mark B. Dittmar. I am the applicant for this license and the owner/operator of the experimental station. The transmitter frequency will be determined by a quartz crystal and operated at LF through division of the crystal frequency or via direct digital synthesis. The transmitter is a class-E design using power MOSFETs. Operation will be either automatic (computer controlled) or hand keying for CW Morse code and computer generated low speed Morse or narrow shift FSK.

The antenna will be an existing 15 meter total length inverted L antenna, inductively loaded at the base, as shown in sketch 1. This antenna has previously been used for low frequency experimental transmissions in the 180 - 190 khz range under Part 15 rules (sec. 15.217).

B: The specific objectives sought to be accomplished.

Objectives to be accomplished are:

- Study and evaluation of effective communication in this band using the techniques and antennas as stated above
- Optimization of modern narrowband signaling techniques for long distance low frequency propagation.
- Study of propagation and suitability of this band for one- and two-way communication.
- Study of effects of solar cycle, weather, season, time of day, and radiated power

C. How the program of experimentation has a reasonable promise of contribution to the development, extension, expansion or utilization of the radio art, or is along line not already investigated.

Modern narrowband signaling techniques have not been thoroughly studied for application to the low frequency range of the radio spectrum. The advent of digital modes and digital signal processing has created many new possibilities for the use of this spectrum. This program will test both aural and automatic transmission / reception techniques, and detail their effectiveness. The manner in which these techniques are influenced by sunspot cycle, weather, season, time of day, radiated power, and antenna configuration will be determined. Results of my experiments, signal reports received and operating schedules will be published on the internet for public use.