

File Number: 0016-EX-PL-2005
Question 7: Program of research

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Several areas of research will be conducted simultaneously. These include propagation, low data rate transmission and comparison of suitable transmitting antennas.

Propagation: There are significant amounts of data on propagation at frequencies above and below the frequency range of interest. Propagation at frequencies of 60 kHz and below is well documented as well as frequencies in the MF broadcasting range. Much less information is available at 2200 meters. A number of factors affect propagation including time of day, seasonal affects, weather and in particular short, medium and long term effects due to solar activity. Through the use of beacon transmissions monitored by existing receiving sites in the U.S. and around the world, and one/ two way communication (with other Part 5 license holders and foreign amateur radio operators licensed to use the 2200 meter band) significant data can be collected, analyzed and the effects of propagation can be well documented.

Low data rate transmission: Modern narrowband signaling techniques including PSK, BPSK, GPS timing controlled BPSK, FSK, MSK as well as slow-speed Morse code (QRSS) will be used. It is anticipated that the applicant will be involved in testing and assisting in the development of variations of these modes with emphasis toward optimizing transmission data rates for this frequency range.

Comparison of suitable transmitting antennas: Because of the long wavelengths involved most antennas occupy only a very small percentage of a wavelength and therefore are highly inefficient. The two most widely used antennas in this frequency range are the Marconi, and more recently, the loop antenna. To date there has been little comparison work done to determine which antenna type performs best for different distance and propagation conditions. The applicant intends to conduct tests to make these comparisons.

The applicant has already conducted some research in the 160 -190 kHz band under Part 15, which permits one-watt input to the final amplifier and a 15 meter antenna yielding an ERP of less than 1 milliwatt. While those tests have proved worthwhile on a small scale, the low power nature of Part 15 places severe limitations on propagation and data transmission studies over longer distances especially during periods of high solar activity and adverse seasonal (summer) noise periods. The higher ERP that would be authorized will permit reception at greater distances and under adverse propagation and noise conditions.

The data and other information gathered as a result of this program will be made available to other experimenters via the Internet.

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