

## The High Frequency Active Auroral Research Program

# HAARP

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### Purpose and Objectives of the HAARP Program

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[infohaarp@haarp.alaska.edu](mailto:infohaarp@haarp.alaska.edu)

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#### As stated in the Environmental Impact Statement

The High-frequency Active Auroral Research Program (HAARP) is a congressionally initiated program jointly managed by the U.S. Air Force and U.S. Navy. The program's goal is to provide a state-of-the-art U.S. owned ionospheric research facility readily accessible to U.S. scientists from universities, the private sector and government. This facility would be the most advanced in the world and would attract international scientists and foster cooperative research efforts. The program's purpose is to provide a research facility to conduct pioneering experiments in ionospheric phenomena. The data obtained from the proposed research would be used to analyze basic ionospheric properties and to assess the potential for developing ionospheric enhancement technology for communications and surveillance purposes.

The layer of the earth's atmosphere called the ionosphere begins approximately 30 miles above the surface and extends upward to approximately 620 miles. In contrast to the layers of the atmosphere closer to the earth, which are composed of neutral atoms and molecules, the ionosphere contains both positively and negatively charged particles known as ions and electrons. These ions and electrons are created naturally by radiation from our sun.

The ionized gas in the ionosphere behaves much differently from the neutral atmosphere closer to the earth. A major difference is that although radio signals pass through the lower atmosphere undistorted, the signals directed through the ionosphere may be distorted, totally reflected or absorbed. For example, communication links from the ground to earth-orbiting satellites can experience fading due to ionospheric distortion; an AM radio signal sometimes can reflect, or "skip", off the ionosphere and be heard at locations hundreds of miles distant from the broadcasting radio station; the characteristic fading on the high-frequency (HF) or "shortwave" band is due to ionospheric interference. Because of its strong interaction with radio waves, the ionosphere also interferes with U.S. Department of Defense (DOD) communications and radar surveillance systems, which depend on sending radio waves from one location to another.

Ionospheric disturbances at high latitudes also can act to induce large currents in electric power grids; these are thought to cause power outages. Understanding of these and other phenomena is important to maintain reliable communication and power services. HAARP is needed to continue and expand basic research efforts on the properties and potential uses of the ionosphere for enhanced communications and surveillance. To meet the project's research objectives, the HAARP facility would utilize powerful, high frequency (HF) transmissions and a variety of associated observational instruments to investigate naturally occurring and artificially induced ionospheric processes that support, enhance or degrade the propagation of radio waves.

Investigations conducted at the HAARP facility are expected to provide significant scientific advancements in understanding the ionosphere. The research facility would be used to understand, simulate and control ionospheric processes that might alter the performance of communications and surveillance systems. This research would enhance present civilian and DOD capabilities because it would facilitate the development of techniques to mitigate or control ionospheric processes.

Civilian applications from the program's research could lead to improved local and world-wide communications such as satellite communication. Furthermore, and possibly more significant is the potential for new technology that could be developed from a better understanding of ionospheric processes.

A potential DOD application of the research is to provide communications to submerged submarines. These and many other research applications are expected to greatly enhance present DOD technology.

There are several HF transmitters located throughout the world which conduct research similar to that

proposed by HAARP. However, no facility, located either in the U.S. or elsewhere, has the transmitting capability needed to address the broad range of research goals which HAARP proposes to study. The most capable HF transmitters currently operating are located in Russia and Norway and have effective radiated powers (ERP) of roughly one billion watts (1 gigawatt). One gigawatt of ERP represents an important threshold power level, allowing significant radio wave generation and analysis of key ionospheric phenomena. The HAARP facility is designed to have an ERP above one gigawatt. This would elevate the United States to owning and operating the world's most capable ionospheric research instrument.

*Pioneering Ionospheric Radio Science Research for the Twenty-First Century*



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