

## High Frequency Active Auroral Research Program (HAARP)

**Overview:** The objectives of the High Frequency Active Auroral Research Program (HAARP) include theoretical and experimental investigations to characterize the interactions of radio waves in the ionosphere and the subsequent effects on communications, radar and navigation systems. Included in the program is the development of a modern facility in Gakona, Alaska to conduct the experimental research required to meet this objective.

The facility includes a high frequency (HF) radio transmitter consisting of 180 antenna elements and directs energy into the ionosphere and space. Radio and optical diagnostic instruments at the facility provide real-time data on geophysical parameters that characterize the state of the ionosphere and magnetosphere, including observations of the earth's magnetic field, electron densities and radio wave absorption, under both normal and solar-related disturbed conditions. The research involves the space environment beginning at about 100 km altitude (~60 miles) out to tens-of-thousands kilometers, far above the jet stream or the atmosphere that affects terrestrial weather.



Power for the HAARP HF transmitter is equivalent to that obtained from three or four generators of diesel-locomotive size. The transmitter's narrow radiating beam is upward pointing and illuminates a relatively small volume in space, producing effects so weak that extremely sensitive diagnostic instruments are required to detect and measure them. When the transmitter is turned off, the effects disappear within a few seconds, most within a small fraction of a second. Compared to nature's ability to produce the same physical effects, HAARP's are very small. Nevertheless, the use of such research tools as HAARP is valuable because the effects that are produced can be repeated in a controlled way, i.e. "where" and "when," so that systematic observations and measurements can be made to characterize and understand them. Military interest in HAARP is due to its capability to perform basic research on radio wave interactions in the ionosphere, and to assess the effects of the physical processes they create on present communications, radar, and surveillance systems and to be able to assess the viability of exploiting them in next generation radio systems.

HAARP is fully described in a number of documents, including a two-volume Environmental Impact Statement and its Record of Decision, which were completed in strict compliance with the National Environmental Policy Act.