

A review of the HAARP facility and research program

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The HAARP (**H**igh frequency **A**ctive **A**uroral **R**esearch **P**rogram) facility is a major new observatory for upper atmospheric and ionospheric research. It is located at Gakona, Alaska that provides a wide variety of geophysical conditions, viz auroral, sub-auroral ionospheric trough structures, and mid-latitude type ionospheres. The primary instrument is a high-power, high frequency (2.8 - 10 MHz) phased-array radio transmitter that is used to stimulate well-defined overhead volumes of the ionosphere. The existing HF array consists of 48 crossed dipoles and transmits a total maximum power of 960 kW. Long-term plans call for a final array configuration expanded to a maximum size of 180 antenna elements, arranged in 15 columns by 12 rows with a maximum power of 3.6 MW.

A number of complementary instruments enable the facility to be used as a general ionospheric research observatory as well as supporting ionospheric modification experiments. Scientific instruments currently operating at the site are: a flux-gate magnetometer, induction magnetometer, all-sky riometer, imaging riometer, digital ionosonde, a GPS-based total electron content monitor, VLF/UHF scintillation monitors, broadband VLF receiver, a 139 MHz turbulence-scatter radar, and an optical imager. These on-site instruments are supplemented by (a) an HF backscatter radar at Kodiak, Alaska that obtains data on the occurrence of ionospheric irregularities over a large region of Alaska, including Gakona, and (b) a 50 MHz auroral backscatter radar at Anchorage, Alaska that may be used to monitor the auroral boundary and its movements.

This presentation reviews the current status of the existing facility and instruments, recent science projects, and future plans for a UHF incoherent-scatter radar that is planned for installation at Gakona.