**ELF/VLF Wave-injection Experiments and Magnetospheric Probing with the HAARP HF Heater**

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The newly upgraded HAARP HF Heater facility provides for an unprecedented set of opportunities for the conduct of ELF/VLF wave-injection experiments to study the physics of cyclotron resonance wave amplification and triggering in the magnetosphere. ELF/VLF wave generation with HAARP at its new power level is extremely robust, with detectable signals observed at nearby sites under nearly all conditions, even in the presence of very weak electrojet activity. Magnetospheric wave-injection experiments are carried out with observations at multiple distributed sites in Alaska, on Buoy(s) in the geomagnetically conjugate region and on the DEMETER satellite, in a 670-km polar orbit. In view of the sensitive dependence of the wave growth and amplification on the frequency-time format of the injected signals, a wide variety of ELF/VLF transmission formats are utilized, to probe different aspects of the cyclotron resonant wave-particle interaction physics. Experiments are carried out in near real time, by viewing the natural activity as well as the HAARP-injected ELF/VLF signals with 1-minute latency, in order to determine the frequencies of natural magnetospheric emission activity and adjust the HAARP modulation formats to maximize wave growth. Under typical conditions, magnetospheric chorus and hiss emissions are observed in limited bands of ~1-2 kHz bandwidth, indicating that the energetic particle population in the magnetosphere is conducive amplification of waves in that bands. When such conditions are observed in near real time, HAARP transmission formats are rapidly changed, often leading to the observation of amplification and emission triggering of the HAARP-injected signals. Magnetospheric amplification of the HAARP-injected ELF/VLF signals is evidenced in observations of two-hop whistler-mode signals at ground-based sites, as well as triggered emissions observed on DEMETER when it is in the conjugate region as well as in the northern hemisphere.