

GENERATION OF VLF WAVES IN THE IONOSPHERE WITH COHERENT MULTIPLE-SITE EXCITATION

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HIPAS and HAARP are two radiating facilities in the Arctic region. The distance between these two radiating facilities is 287 km, which is on the order of the ELF/VLF wavelengths. The electrojet in the E region of the ionosphere above each facility can be modulated to radiate ELF/VLF waves via HF heating. These two facilities are link together to transmit HF heating power in a manner that can enhance the efficiency of excitation of ELF/VLF by both low frequency modulations and high frequency beam interactions. The electrojet radiates electromagnetic waves at its modulation frequency in the ELF/VLF band and thus becomes a wave source. When both HIPAS and HAARP are radiating with amplitude modulation (AM) at the same ELF/VLF frequency, the wave sources formed above the two sites become coherent. Coherent excitations by these two facilities can create constructive interference which is sensitive to the phase difference between these two sources. Density irregularities, or striations, generated by high power radio frequency heating, can be modeled as a vertical conducting surface in ionospheric region directly above each radiating facility. Since a conducting surface reflects electromagnetic waves, ELF/VLF waves will be reflected and will propagate within the ionospheric region between HIPAS and HAARP in a manner dependant upon the reflection coefficient of the surfaces. The multiple reflections between these two wave sources above HIPAS and HAARP create the equivalent of a large antenna source for ELF/VLF signals. Generalization of this result to N sites for ELF/VLF excitation could imply that it is more advantageous to distribute a given amount of power among N sites as opposed to a single site concentration.

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