

The relationship between geophysical conditions and ELF amplitude in modulated heating experiments at HAARP: Modeling and experimental results

George Jin¹, Maria Spasojevic¹, Morris B. Cohen¹, Umran S. Inan^{1,2}, and Nikolai G. Lehtinen¹

¹Department of Electrical Engineering, Stanford University, 350 Serra Mall, Stanford, CA 94305, USA, gj36@stanford.edu

²Koç University, Rumelifeneri Yolu, Sarıyer 34450, Istanbul, Turkey, inan@stanford.edu

Abstract

Extremely Low Frequency (ELF) wave generation using the ionospheric heater at the High Frequency Active Auroral Research Program facility in Gakona, Alaska depends on electrojet currents. We use diagnostics from a radar, riometer, ionosonde, and magnetometer chain to understand how natural conditions affect ELF generation. We then present results of statistical models that show ELF amplitude is proportional to magnetometer measurements for a fixed value of riometer absorption, and that the proportionality constant decreases as riometer absorption increases. Numerical simulations using several ionospheric density profiles verify that denser profiles result in smaller gains for ELF generation than for electrojet current.