

# Electron Acceleration and Ionization Production in High-Power Heating Experiments at HAARP

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## Abstract

Recent ionospheric modification experiments with the 3.6 MW transmitter at the High Frequency Active Auroral Research Program (HAARP) facility in Alaska led to discovery of artificial ionization descending from the nominal interaction altitude in the background F-region ionosphere by ~60 km [1]. Artificial ionization production is indicated by significant 427.8 nm emissions from the 1st negative band of  $N_2^+$  and the appearance of transmitter-induced bottomside traces in ionosonde data during the periods of most intense optical emissions. We present a physical model of an ionizing wavefront created by suprathermal electrons accelerated by the HF-excited plasma turbulence [2]. The artificial plasma sustaining interaction with the transmitted HF beam is created via enhanced ionization by accelerated electrons near the critical altitude. As soon as the interaction region is ionized, it shifts toward the upward-propagating HF beam, thereby creating an ionizing wavefront, which closely resembles the observed descending artificial ionospheric layers.

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## References

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