

Abstract Submitted  
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**Newly Discovered Parametric Instabilities Excited by High Power Radio Waves in the Ionosphere**<sup>1</sup> PAUL BERNHARDT, Naval Research Laboratory — A powerful electromagnetic wave can decay into a large number of low frequency electrostatic waves and a scattered electromagnetic wave by generalized stimulated Brillouin scatter (GSBS). The generalization occurs in the F-layer ionosphere because of the presence of the magnetic field supporting a large number of plasma waves not present in an unmagnetized plasma. Stimulated Brillouin scatter excites the ion acoustic mode. In addition, GSBS can excite slow MHD, Alfvén, fast MHD, ion cyclotron, whistler, lower hybrid, ion Bernstein waves. The first detection of this process during ionospheric modification with high power radio waves was demonstrated using the HAARP transmitter in Alaska in 2009. Subsequent experiments have provided additional verification of the GSBS process with quantitative measurements of the scattered electromagnetic waves with low frequency offsets from the pump wave. Relative to ground-based laboratory experiments with laser plasma interactions, the ionospheric HF wave interactions experiments are more completely diagnosed into terms of understanding the basic decay process of the magnetized plasma. Applications of the GSBS observations included remote sensing of the plasma state and launching propagating wave modes.

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