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Parametric Excitation of Very Low Frequency (VLF) Electromagnetic Whistler Waves by Transformation of Lower Oblique Resonance Waves on Density Perturbations in the Vicinity of a Loop VLF Antenna T. KIM, V. SOTNIKOV, D. MAIN, Sensors Directorate, Air Force Research Laboratory, Wright-Patterson AFB, OH 45433, E. MISHIN, Space Vehicles Directorate, Air Force Research Laboratory, Kirtland AFB, NM 87117, N. GERSHENZON, T2Sys Inc., Beavercreek, OH 45433 — Concept of a parametric antenna in the ionospheric plasma is analyzed. Such antennas are capable of exciting electromagnetic radiation fields, specifically the creation of whistler waves generated at the very low frequency (VLF) range, which are also capable of propagating large distances away from the source region. The mechanism of whistler wave generation is considered a parametric interaction of quasi-electrostatic low oblique resonance (LOR) oscillations excited by conventional loop antenna. The transformation of LOR waves on quasi-neutral density perturbations generated by a dipole antenna gives rise to electromagnetic whistler waves on combination frequencies. In this approach extended plasma volume around a loop antenna represents a parametric antenna. Simulation to demonstrate excitation and spatial structure of VLF waves excited by a loop antenna using a PIC code LSP will be presented as well. Possible applications including the wave-particle interactions to mitigate performance anomalies of Low Earth Orbit (LEO) satellites, active space experiments, communication via VLF waves, and modification experiments in the ionosphere will be discussed.

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