GENERATION OF SPIKY POTENTIAL STRUCTURES ASSOCIATED WITH MULTI-HARMONIC ELECTROSTATIC ION CYCLOTRON WAVES

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A common feature of electric fields observed on satellites in the earths auroral region is their spiky, repetitive nature. These spiky electric field structures appear as either unipolar or bipolar pulses in high resolution time domain waveforms of the potential difference between pairs of spheres deployed from the spacecraft. Time domain waveforms of three different hydrogen-cyclotron wave events observed with the S3-3 satellite [Temerin et al., Phys. Rev. Lett. 43, 1941, 1979] showed examples of both narrow spectral features at a frequency just above the local hydrogen-cyclotron frequency and spiky, bipolar structures with a repetition frequency just above local hydrogen-cyclotron frequency61486;61472;Data obtained from the Fast Auroral Snapshot (FAST) satellite in the upward current northern auroral region showed a multi-harmonic EIC spectrum with corresponding spiky structures in both the perpendicular and parallel electric field waveforms [Ergun, et al., Geophys. Res. Lett. 25, 2025, 1998; Gavrishchaka et al., Phys. Rev. Lett. 85, 4285, 2000]. Spiky electric field structures have also been seen on the Viking satellite and on Cluster. The production of coherent, spiky electrostatic potential structures, similar to the spiky electric field structures that have been observed in the earths auroral region is investigated experimentally. These structures are associated with coherent multi61485;harmonic electrostatic ion cyclotron (EIC) waves in a current61485;free plasma. A multi61485;harmonic EIC spectrum is produced when broadband electrostatic noise, launched into the Q machine plasma from an antenna, propagates through a spatially localized region of parallel (to B) ion flow with a gradient in the direction transverse to B [Kim et al., Phys. Plasmas 11, 4501, 2004]. The spiky potential waveforms result from a linear combination of coherent multi61485;harmonic EIC waves, when the harmonics have comparable amplitudes and are phase61485;locked.

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2. H - Waves in Plasma

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4. I - Invited Paper

5. No special instructions