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Numerical simulation of constrained and unconstrained emission from an electron horseshoe distribution A.W. CROSS, K.M. GILLESPIE, D.C. SPEIRS, K RONALD, A.D.R. PHELPS, S.L. MCCONVILLE, C.G. WHYTE, C.W. ROBERTSON, University of Strathclyde, R. BINGHAM, B.J. KELLET, Rutherford Appleton Laboratory, I. VORGUL, R.A. CAIRNS, University of St. Andrews, SUPA DEPARTMENT OF PHYSICS TEAM, SPACE PHYSICS DIVISION TEAM, SCHOOL OF MATHEMATICS & STATISTICS TEAM — When an electron beam is subject to significant magnetic compression, conservation of the magnetic moment results in the formation of a horseshoe shaped velocity distribution. It has been shown that such a distribution is unstable to cyclotron emission and may be responsible for the generation of Auroral Kilometric Radiation (AKR) – an intense RF emission sourced at high altitudes in the Earth's magnetosphere. We present results from a numerical investigation of RF emission from an electron beam with predefined horseshoe distribution injected into radially bounded and unbounded geometries. Both 2D and 3D versions of the particle-in-cell (PiC) code KARAT were used to conduct the analysis. RF emission was observed at a frequency close to the relativistic electron cyclotron frequency. 3D results from the bounded case show a backward wave instability which is more resilient to Doppler broadening than forward wave coupling. This has important implications where a cold tenuous plasma is present.

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