Effects of magnetic curvature on the lower-hybrid-drift instability

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A local dispersion relation is derived for the lower-hybrid-drift instability including the effects of magnetic curvature associated with transverse electromagnetic perturbations. It is found that the previous treatment, i.e., simulating the curvature drift by a virtual gravitational drift, is considerably inaccurate. When an ambient magnetic field has a curvature so that the curvature drift is directed opposite the grad-B drift, the maximum growth rate increases as long as the radius of curvature is larger than a certain value, while the rate decreases for a sharper magnetic field curvature.

A local dispersion relation is derived for the lower-hybrid-drift instability including the effects of magnetic curvature associated with transverse electromagnetic perturbations. To account for the curvature drift, an alternative method proposed by Nakamura [Phys. Plasmas 4, 3765 (1997)] is applied to obtain the perturbed distribution function. It is found that the previous treatment, i.e., simulating the curvature drift by a virtual gravitational drift, is considerably inaccurate. When an ambient magnetic field has a curvature so that the curvature drift is directed opposite the grad-B drift, the maximum growth rate increases as long as the radius of curvature is larger than a certain value, while the rate decreases for a sharper magnetic field curvature. At the same time, the wavenumber giving the maximum growth decreases monotonically. The growth rate is increased by a curvature drift coincident with the grad-B drift. The effects of the magnetic curvature become larger in high-beta plasmas.