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Large-amplitude circularly-polarized electromagnetic waves in magnetized plasma

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We consider large-amplitude circularly-polarized electromagnetic waves propagating along the uniform background magnetic field. In the absence of particles trapped by the wave there are four well-known branches of plasma oscillations. The presence of trapped particles modifies wave dispersion curves. For low-frequency waves (which frequency is smaller than the electron gyrofrequency) the presence of trapped particles results in the shift of dispersion curves to shorter wavelengths. Thus, the wave cannot have an arbitrary large wavelength. For high-frequency waves the presence of trapped particles results in the decrease of the wave phase velocity. For sufficiently large amount of trapped particles the phase velocity becomes smaller than the speed of light.