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Ion Bernstein mode instability with ring velocity distribution function. (English)

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Summary: The Bernstein mode instability plays a vital role in tokamaks and space plasma regimes like Jovian planets and interstellar space. We introduce the contributions of ions along with electrons with the help of a ring velocity distribution function. We conclude that the ions play a significant role in shifting the threshold frequency value toward the lower-wavelength regime. In comparison with the electron Bernstein mode, it is concluded that the electron mode becomes unstable for higher wavelengths, but on the contrary the ion Bernstein mode tries to be more stable at low frequencies. The growth rate has been calculated analytically as well as numerically. A graphical comparison provides us with a detailed view of the unstable regions. The growth rates demonstrate that the mode becomes more unstable, while increasing the value of the frequency ratio $(\omega_{pi}/\Omega_c)^2$.

MSC:

85A20 Planetary atmospheres

85A40 Astrophysical cosmology

76X05 Ionized gas flow in electromagnetic fields; plasmic flow

76E20 Stability and instability of geophysical and astrophysical flows

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