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Runaway electron driven high frequency kinetic instabilities during quiescent phase of KSTAR discharge

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In a reactor level device such as ITER, a disruption mitigation system is necessary because a considerable level of magnetic energy is transferred to runaway electrons (REs), which seriously damages the tokamak device. Massive material injection techniques considered as a disruption mitigation method in ITER are based on pitch-angle scattering through the Coulomb collision. However, this method has many technical difficulties because it must achieve a high level of density in a plasma disruption situation. As an alternative to this, research on pitch-angle scattering based on wave particle interaction has been actively conducted recently [1][2]. In KSTAR, high frequency kinetic instabilities of several GHz range caused by REs were measured through electron cyclotron emission (ECE) and radio frequency signals in low density Ohmic discharges where a significant amount of REs were present. These instabilities were observed to cause instantaneous scattering of REs in ECE signal. In this work, we will present the characteristics of these kinetic instabilities such as their frequency, frequency gap, and wave number. Possible mechanisms of excitation condition will be discussed as well.
[1] T. Fülöp et al., PHYSICS OF PLASMAS 13, 062506 (2006).
[2] D.A. Spong et al., PHYSICAL REVIEW LETTERS 120, 155002 (2018).

Country or International Organization

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