

## **Impurity induced kinetic micro-electromagnetic instabilities in toroidal plasmas**

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### **Abstract**

New kinetic micro-electromagnetic instabilities are found in magnetically confined toroidal plasmas in the presence impurity ions with gyrokinetic simulations [1]. The instabilities are induced by impurity ion density gradient, which is parallel (negative) or opposite (positive) to the gradient of electrons, and finite (plasma pressure/magnetic pressure) effect even in the absence of ion temperature gradient and trapped electrons. The requirements of dual critical impurity density gradients (one positive and one negative), finite impurity charge concentration and plasma are identified for the instabilities to be excited. The instabilities are identified as kinetic shear Alfvén and kinetic ballooning types, respectively, and are unstable in the first and second stable regimes of the ideal MHD ballooning modes and may have significant influence on plasma confinement. Possible relevance with the recent experimental observation in the pedestal of H-mode plasmas on HL-2A tokamak and further experimental investigations [2-4] are discussed.

### **References**

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