After modification:

The fundamental physics of anomalous and normal doppler resonances between electron and electromagnetic waves is analyzed using a quantum model incorporating angular momentum conservation. This work extends prior theory by explicitly linking the resonant integer m to the EM wave's angular momentum quantum number. Numerical simulations based on the Volume Preserving Algorithm (VPA) confirm this relationship. Furthermore, a direct comparison of the energy transfer ratio from translation energy to gyrokinetic energy during resonance between classical dynamics and quantum results is presented and verified numerically.

Origin:

A quantum model incorporating angular momentum conservation is developed to analyze the Normal and Anomalous Doppler Effects, demonstrating that the resonance condition is strongly influenced by the angular momentum of the wave. The resonance condition involving wave angular momentum is examined numerically, and the energy exchange ratio between the electron’s parallel and gyro-kinetic motion during resonance with the electromagnetic wave is simulated, exhibiting strong agreement with quantum theoretical predictions.

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