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Undulator Induced Transparency in Magnetized Plasma: Microwave pulse compression and power switching MIKHAIL TUSHENTSOV, GENNADY SHVETS, The University of Texas at Austin — Numerical modeling of a plasma-microwave interaction in the Undulator Induced Transparency (UIT) regime is presented. UIT is a phenomenon originating from the coupling between the transverse and the longitudinal electromagnetic waves (EM) in a magnetized plasma in the presence of a static helical magnetic undulator, which eliminates the absorption of an EM wave at the cyclotron frequency. This coupling yields ultra-slow hybrid EM waves with a group velocity substantially less than the speed of light in vacuum, causing extreme compression of the wave energy in the UIT plasma. Direct application of UIT to electron and ion acceleration is suitable because the polarization of the compressed waves is primarily longitudinal and their phase velocity is controllable by the undulator period. We are also envisioning a microwave pulse compressor in the plasma based on rapid change of plasma or undulator parameters. In the specific range of parameters the UIT medium exhibits a peculiar phenomenon where the wave with the slow group velocity is accompanied by the one with negative group velocity. The analytical model of the EM wave propagation in the inhomogeneous UIT medium (plasma column in the combined axial and undulator magnetic field) based on the vector WKB theory and amplitude scattering matrix description is developed and agrees well with the numerical modeling results.

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