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**Dynamic Manipulation of Electromagnetic Waves in Magnetized Plasmas: Compression, Frequency Shifting, and Release**[1] YOAV AVITZOUR, GENNADY SHVEYS, The University of Texas at Austin — A new approach to manipulating the duration and frequency of microwave pulses using magnetized plasmas is demonstrated. The plasma accomplishes two functions: (a) slowing down and spatially compressing the incident wave, and (b) modifying the propagation properties (group velocity and frequency) of the wave in the plasma during a uniform in space adiabatic in time (USAT) variation of the magnitude and/or direction of the magnetic field. The increase of the group velocity results in the shortening of the temporal pulse duration. Although it has long been recognized that electromagnetic pulses can be slowed down and compressed in plasma, it was also understood that the outgoing pulses are going to return to their original length upon exiting the plasma. We show here that it is possible to dynamically change plasma conditions during the time period when the pulse is traveling in the plasma in such a way that the pulse emerges from the plasma compressed and/or frequency shifted. It is demonstrated that the simplest plasma geometries (electromagnetic wave propagating either at a small angle to the magnetic field in an infinite plasma, or inside a plasma-filled metallic waveguide) enable such dynamic manipulation of a microwave pulse using USAT variation of the external magnetic field B0.
[1] Y. Avitzour and G. Shvets, Phys. Rev. Lett. 100, 065006 (2008).

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