Electromagnetically Induced Transparency of Magnetized Plasma

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It is well known that electromagnetic radiation with a frequency equal to the cyclotron frequency of plasma electrons is strongly absorbed by magnetized plasma. It is shown here that this absorption does not occur in the presence of a second, properly detuned, electromagnetic pump pulse. The plasma can thus be made transparent at the cyclotron frequency. The pump is detuned from the probe by the plasma frequency. Transparency occurs because the currents induced at the cyclotron frequency by sideband of the pump can cancel the currents induced by the probe. This effect is very similar to electromagnetically-induced transparency (EIT) of atomic vapours. The essential difference is that the plasma considered here is completely classical, and no quantum mechanical effects are invoked to produce the EIT. The plasma system is significantly more complex than the three-level quantum system--in particular, a non-local interaction, the plasma oscillation, corresponds to one of the levels. Potential applications of the EIT in plasma will be discussed.

Plasma Physics at Terakelvin Temperatures

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The quark-gluon plasma being sought in high-energy accelerator experiments may bear some resemblance to electromagnetic plasmas. I will review signals by which the former might be (or may have been) detected.