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Experimental observation of induced Compton scattering in laser produced plasmas

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Pulsars and also Fast Radio Bursts emit the coherent radiation and their observed brightness temperature is extremely exceed 10^{35} Kelvin for some cases. The radiation mechanism of such astrophysical phenomena is a long-standing problem. We do not even know the physical situation of the emission regions and induced Compton scattering is studied to constrain the environment of the emision region [1]. We model this extreme phenomena in the universe using ultra intense lasers in laboratories. In the presence of extremely high brightness temperature such as pulsars and also intense lasers, the induced Compton scattering can be dominant in the interactions between light and rarefied plasma particles. It is theoretically predicted that the spectra of scattered light will be red shifted and show soliton like feature [2, 3]. We have conducted the proof-of-principle experiment of the induced Compton scattering with extremely high brightness temperature radiation relevant to pulsars. Our results, proving the induced Compton scattering, will give significant information for the mechanism of pulsar radiations and also for other high-energy astrophysical phenomena.

References

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