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Doppler cooling of two-level systems by frequency comb MAHMOUD AHMED, EKATERINA ILINOVA, ANDREI DEREVIANKO, University of Nevada — We explore the possibility of decelerating and Doppler cooling of an ensemble of two-level atoms by a coherent train of short, non-overlapping laser pulses. We developed a simple analytical model for describing the dynamic of a two-level system interacting with the resulting frequency comb field. Supporting numerical calculations were carried out to verify the predictions of the model. We find that the effective scattering force mimics the underlying frequency comb structure. The force pattern depends strongly on the ratio of the atomic lifetime to the repetition time. For example, in the limit of short lifetimes, the frequency peaks of the optical force wash out. We derive analytical expressions for the optimal parameters of the pulse train and study compression of velocity distribution.

Andrei Derevianko
University of Nevada

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