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Quantum memory of single γ -ray photon by Doppler Frequency Comb XIWEN ZHANG, Texas A&M University, WEN-TE LIAO, Max Planck Institute for Nuclear Physics, ALEXEY KALACHEV, Kazan Federal University, OLGA KOCHAROVSKAYA, Texas A&M University — We propose to store and retrieve a single γ -ray photon by a series of resonant Mössbauer targets each moves with different velocities. Such velocity spectrum forms a frequency comb due to Doppler effect, which we name as Doppler frequency comb (DFC). The performance of this γ -ray photon quantum memory scheme is similar to the usual atomic frequency comb (AFC) which is used for optical quantum storage. However, instead of burning comb structure in a broad inhomogeneous broadening profile, which is not available in Mössbauer solids, DFC utilizes very narrow resonant line-width to achieve quantum memory of energetic single γ -ray photon. Depending on the motion direction of the Mössbauer targets, a series of input γ -ray signals can be retrieved in either the same or reversed order of the input signals.

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