Signal Enhancement and Background Suppression Using Interference and Entanglement

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We describe a two-photon absorption process that is excited by entangled pairs but not non-entangled pairs with the same energy and polarization. Photon states can be selected so that in t non-entangled process, there is destructive interference between different orders of absorption and intermediate state contributions. A non-zero entangled absorption cross section is obtain by varying the entanglement time and/or pair delay parameters. As an example, the destructively interfering energy and polarization states and the resulting entangled absorption cross secti for Rb 5S1/2 --> 5D3/2 transitions are computed. This effect can be used to construct an entangled photon detector with applications in sensing, cryptography, and lithography.

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