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Effects of four-wave mixing on light propagating in an EIT medium NIKOLAI LAUK, CHRISTOPHER O'BRIEN, MICHAEL FLEISCHHAUER, Department of Physics and Research Center OPTIMAS, TU Kaiserslautern, Germany — The typical EIT media consist of Λ type atoms where a propagating signal field is resonant with an optical transition which is coupled by a strong resonant laser to an adjacent transition. Quantum interference makes the medium transparent to the signal. In many EIT experiments, the driving laser also acts as a far-detuned field on the signal transition, which for high optical depth causes a four-wave mixing (FWM) process. The far-detuned field generates a new co-propagating idler field which gives rise to gain for the signal field. The presence of gain introduces noise on the signal field, due to both spontaneous emission as well as a vacuum contributions of the idler. Using the Heisenberg-Langevin approach and solving the corresponding Maxwell-Bloch equations for the propagating field operators in a EIT FWM medium, we find analytic expressions for the noise and discuss the effect of FWM on EIT experiments, such as those done for EIT based quantum memories.

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