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## Nonlinear coupling of two nonlinear coupled plasmonic nanowires in the presence of Kerr and two-photon absorption in the modes of $TM_{00}$ and $TM_{10}$

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### Abstract

The nonlinear interactions of coupled nanowires are regarded as important phenomena in the data processing of integrated photonic circuits. In this paper, we investigate the nonlinear coupling of two silver nonlinear coupled plasmonic nanowires for  $TM_{00}$  and  $TM_{10}$  modes under different amplitudes in the presence of the Kerr effect; in the other case, the medium has the Kerr and two photon absorption (TPA) effect too. The results show that in the presence of the TPA effect, the nonlinear optical effects appear in lower input amplitudes than the Kerr effect. The Kerr effect occurs in upper intensities than the TPA effect; also, the nonlinear optical effect leads to the decrease of the exchange of plasmonic waves between two nanowires. The coupling length ( $L_c$ ), which means the characteristic length of the structure has a lower coupling distance and through propagating in the medium the transfer of the wave is complete, in the  $TM_{00}$  mode is lower than that in the  $TM_{10}$  mode. Also, the results show that for different values of the initial amplitudes of field in a fixed value of  $L_c$ , the coupling efficiency is increased with raising the value of intensity.

**Keywords:** two-photon absorption effect, Kerr effect, nanowire, nonlinear coupling

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