# Localization of Atomic Populations due to Field of Running Waves

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This work is devoted to investigation of the one aspect of the fundamental problem of an interaction laser radiation with the matter. This problem is spatial localization of atomic populations due to fields of few running waves.

We first propose in our work two - dimensional spatial localization of atomic population in medium with tripod - like configuration of levels under influence of the field only of running waves. Three running waves propagate in one plane with angles equals 120° to each other and form the system of a standing waves in this plane. In the field of thus standing waves one can localize atomic populations. Moreover, the degree of such a localization may achieve a hundreds of the wavelength of the incident radiation.

We demonstrated that an excitation of the central transition of the tripod-like system using a field of multidirectional linearly polarized running waves is the necessary condition of the population dependence from spatial coordinates in the XY - plane. The two - dimensional shapes that appear in this system can have very complicated structure such as "double - craters". Besides, we have demonstrated the possibility to obtain the phenomenon of coherent population trapping (CPT) that shows a good conformity of our method and numerical calculations with existing theory.

**References**

[1] S. Qamar, S.-Y. Zhu, M.S. Zubairy Phys. Rev. A **61**, 063806 (2000)
[2] G.S. Agarwal and K.T. Kapale J. Phys. B: At. Mol. Opt. Phys. **39**, 3437–3446 (2006)
[3] J. Xu and X. Hu J. Phys. B: At. Mol. Opt. Phys. **40**, 1451–1459 (2007)
[4] V. Ivanov and Yu. Rozhdestvensky Phys. Rev. A **81**, 033809 (2010)