**COHERENT MANIPULATION OF A BINARY ATOMIC SYSTEM WITH GAIN**

Lorena Acevedo, University of Valladolid,
Paseo Belén 7, Valladolid, Spain
+34 605065237, cindylorena.acevedo@uva.es
Manuel Donaire, University of Valladolid

We study the optical response of a binary atomic system in which one of the atoms is incoherently pumped while the system is continuously illuminated by a quasi-resonant beam [1]. Based on a fully time-dependent quantum approach we analyze, and eventually optimize, the coherent manipulation of the system [2]. Using a diagrammatic representation we identify all the radiative processes, namely, scattering, absorption, stimulated emission and spontaneous emission, along with the excitation transfer rate. We find that, for certain values of the pump rate and the interatomic distance, the extinction cross section vanishes and eventually becomes negative. In a prospective work this study will be extended to atomic arrays, with the aim of optimizing the scalability of multiple-atom qubits [3].

References

[1] Donaire, M., Phys. Rev. A, 4 (2021) 043704
[2] Lukin, M. D. and Fleischhauer, M. and Cote, R. and Duan, L. M. and Jaksch, D. and Cirac, J. I. and Zoller, P., Phys. Rev. Lett, 3 (2001) 037901
[3] Henriet, L., Beguin, L., Signoles, A., Lahaye, T., Browaeys, A., Reymond, G.-O., & Jurczak, C., Quantum (Online), 4 (2020) 347