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# About the possibility of visualizing scattering areas of a medium using random lasing

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This work investigates random lasing (RL) in confined clusters of strongly scattering media using Monte Carlo method (MCM). The study include calculations of the photon distribution for both pumping and RL within such clusters, as well as the visualization of media containing these clusters.

The MCM demonstrates that the maximum photon density of RL is concentrated at the center of the clusters and gradually decreases toward the edges. This behavior is characteristic of confined scattering areas with a uniform particle distribution.

The calculations also highlight the importance of considering boundary reflection in such clusters, which influence the photon distribution. Boundary reflectivity partially smooth out the photon density distribution increasing it toward the edges, though the most significant effect is observed with decreasing cluster size. However, the multiple scattering at internal structure of the cluster plays the most crucial role, where it retains RL radiation and contributes to the formation of a central photon density maximum.

Computational results show that clusters can be clearly visualized due to multiple scattering when they illuminated by intense pump radiation, producing an RL photon distribution that can be used for imaging heterogeneous objects. This opens new possibilities for producing detailed images of complex media, such as biological tissues or other non-uniform systems.

By combining the computing of RL energy distribution within confined regions and its impact on visualization, this research provides new tools for simulating and optimizing RL in heterogeneous media. The results may find applications in various fields, including biomedical research and optical technologies.

## Type of presence

Presence at Taras Shevchenko National University

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