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Features of the RL radiation distribution in a limited random medium

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The confinement of light in multiple scattering media (MSM) leads to the stimulated emission appearance, which called random lasing. Multiple scattering of light plays the role of nonresonant positive feedback which replaces the cavity mirrors in conventional laser. In real MSM having limited size, boundary reflection significantly affect the feedback.
In the presented work we held numeric modeling of RL with Monte Carlo method in dependence on MSM parameters: concentration of scattering particles, boundary reflectivity and sample's thickness. The active area in MSM was computed as result of absorption, scattering and boundary reflection of external pump the weight and direction of the photons of which change due to these effects. Preliminary the pump photon sequence (pulse) has been divided into separate packages which photon weights change due to these effects step-by-step between scattering acts or due to reflecting from the boundaries. The same computation was made for the package of RL photon which initial distribution in the MSM defined by calculated distribution of absorbed pumping.
The computation shows the RL photons' density in a MSM sample was distributed unevenly, forming a maximum. The boundaries reflectivity increases RL photon density with the sample thickness decreasing. By combining bulk scattering of a sample with a certain length and its boundaries reflection, one can achieve a significant RL energy without increasing the pump intensity. Experimental results confirm the simulation. Thus both effects substantially influence energy parameters of RL and are decisive for the selection of a sample suitable for a random laser.

Topics

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