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Improving RL performance by random media size adjustment

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Strongly scattered amplifying media are sources of stimulated emission and consequently random lasing (RL). These environments are very convenient, but effects at their boundaries can lead to different behaviors of the emission. Competing processes that depend on the boundaries properties can both catastrophically weak or significantly enhance the emission making RL impossible or highly intensified [1].

The highly scattering sample is pumped to create an active area. The size of the area depends on the pump's beam diameter, the sample's dimensions, its absorption value and the bulk scattering rate. Transmission and scattering of the photons were simulated by a Monte Carlo method.

If the concentration of scattering centers in the sample is low, the RL is evenly distributed over the sample. A change of boundaries' reflection rate does not affect the distribution of RL photons.

However the RL photons are distributed unevenly in the sample's volume in case of high scattering. A maximum of the RL can form inside the sample. Therefore the strong bulk scattering and the high boundaries reflection rate under the same pump intensity lead to the RL energy increasing. Experiments confirm this.

The RL energy maximum and its dependence on the sample size and the boundaries reflection rate are simulated by computer modeling. Shown that it is possible to vary the sample's sizes to lead the RL energy maximization for the current pump and the boundaries reflection rate.

Topics

Session B. Laser physics and modern optoelectronics

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