Abstract

In this thesis, a study of the erbium-doped fiber amplifier (EDFA) with optical feedback is described. The characterization of the amplifier performance concerns the effects of the existence of wavelength selective element in the cavity and different feedback schemes, namely counter-feedback, co-feedback and regenerative-feedback. Comparison with the conventional EDFA system without feedback is presented. Existence of oscillating laser in the cavity either improves or degrades the amplifier performance, depending on the feedback scheme. Gain-clamping effect is exhibited in the system with optical feedback. Laser-induced saturation is observed in the counter-feedback scheme, resulting in deterioration of the noise figure. In contrast, the oscillating laser in co-feedback and regenerative-feedback scheme suppresses the amplified spontaneous emission (ASE) induced self-saturation and significantly improves the noise performance. The thesis ends with the conclusions of the results presented. Suggestions for future work are also given.

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Abstrak

Dalam tesis ini, penyelidikan terhadap sistem pembesar gentian berdop erbium dengan suap-balik dihuraikan. Pencirian prestasi pembesar gentian adalah mengenai kesan wujudnya elemen pemilihan panjang gelombang di dalam rongga dan skim-skim suap-balik yang berlainan. Perbandingan dengan konfigurasi konvensional tanpa suap-balik telah dibuat. Bergantung kepada jenis skim suap-balik, kewujudan laser di dalam rongga samada memperbaiki atau memburukkan prestasi sistem. Kesan gandaan tercengkam dapat diperhatikan di dalam system dengan suap-balik. Penepuan akibat daripada ayunan laser dalam arah bertentangan dengan suap-balik telah memburukkan prestasi kebisingan. Sebaliknya, ayuanan laser di dalam suap-balik bersama dan penjananan semua telah menekan pancaran spontan terganda dan memperbaiki prestasi kebisingan. Tesis ini diakhiri dengan kesimpulan dari keputusan-keputusan yang dilaporkan. Cadangan-cadangan untuk kerja masa depan juga diberikan.