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激光技术

腔内波片产生的Nd:YAG激光纵模分裂规律研究

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摘要 简要介绍了激光纵模分裂的基本原理，研究了腔内含有1个和2个1/4波片时产生Nd:YAG激光纵模分裂的规律。实验结果表明：在1064nm Nd:YAG激光的腔内放置一个1/4波片时，每一激光纵模分裂为2个正交的线偏振模，在波片表面垂直于激光光线的条件下，纵模分裂量（即频率差或波长差）恰好等于激光纵模间隔的一半；当在Nd:YAG激光腔内沿垂直光线方向平行放置2个1/4波片时，也能产生纵模分裂现象，其纵模分裂量取决于2波片快（慢）轴之间的夹角。在0°～ 90°范围内调节角度，可使纵模分裂量在一个激光纵模间隔内线性调谐。实验结果与理论分析相吻合。

关键词 Nd:YAG激光 1/4波片 双折射 激光纵模分裂

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Study of Nd:YAG laser longitudinal mode splitting caused by intracavity wave plates

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Abstract The basic principle of the laser longitudinal mode splitting is introduced briefly, and the Nd:YAG laser longitudinal mode splitting produced by placing one and two quarter-wave plates in the cavity of a Nd:YAG laser is investigated experimentally. The results show that each longitudinal mode is split into two orthogonally and linearly polarized modes, and the splitting magnitude (i.e., frequency difference or wavelength difference) is just equal to one half of the laser longitudinal mode interval if the end surface of the quarter-wave plate is perpendicular to the laser beam when a quarter-wave plate is placed in the cavity of Nd:YAG laser at 1064nm. The mode splitting phenomenon can also take place when the Nd:YAG laser cavity contains two pieces of parallel placed quarter-wave plates along the direction normal to the laser beam, and its mode splitting magnitude is dependent on the angle between the fast (or slow) axes of both quarter-wave plates. The magnitude can be linearly tuned in one longitudinal mode interval when the angle is adjusted between 0 to 90 degrees. The results obtained experimentally agree with those of the theoretical analysis quite well.

Key words Nd:YAG laser quarter-wave plate birefringence laser longitudinal mode splitting

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