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现代应用光学

环形激光器双光路椭圆度测量系统

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摘要：针对通过测量输出光椭圆度对环形激光器进行调控的要求, 研究并建立了环形激光器双光路椭圆度测量系统。计算分析了无源环形腔对S线偏光和P线偏光的频率响应特性, 得出S线偏光谐振峰频率特性更适于无源环形腔的稳频。采用S线偏光作为外部输入光来提高稳频精度, 搭建了环形激光器双光路稳频与测量系统。环形激光器稳频系统在10 s内就能完成稳频, 稳频效率高, 稳频后光强波动幅度为1.8%。提出的椭圆度测量方法使椭圆度变化幅度约为0.65%, 减小了光强波动对测量精度的影响。实验显示, 构建的测量系统可满足椭圆度测量的要求。

关键词：环形激光器 环形谐振腔 稳频 椭圆度测量 模式分析

Ellipticity measurement system with double beam paths for ring laser gyroscope

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Abstract: On the basis of the requirements of cavity adjustment completed by measurement ellipticity, an ellipticity measurement system with double beam paths was researched for adjusting the cavity of a ring gyro laser. The frequency response characteristics of a square ring resonator to the S line polarized light and P line polarized light were analyzed, and the S line polarized light was chosen to stabilize the frequency of a positive resonant cavity. By inputting the S polarized beam to improve the frequency stability accurately, a frequency stabilization system and a ellipticity measurement system with double beam paths were established. By utilizing the new frequency-stabilization system and measurement methods, the frequency stabilization of the system can be realized in 10 s and the stabilization accuracy is better than 1.8%. Furthermore, the fluctuation of ellipticity has been 0.65% by the proposed method, which reduces the effect of light fluctuation on the measurement accuracy. In conclusion, the proposed system meets the needs of ellipticity measurement.

Keywords: ring laser ring resonator frequency stabilization ellipticity measurement mode analysis

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