Theoretical analysis on Langmuir flow effects in ring laser

Jiang Yanan

(Qinghua University, Beijing)

Liao Fuzhong

(National Institute Metrology, Beijing)

Gas flow in gain tube is one of the main errors in ring laser gyro. In this paper, a quatitative discussion is given on the beat frequency shift of oppositely directed travelling waves due to the flow of active and nonactive atoms in gain tube. It has been shown that the flow of active atoms causes a split of gain curves of the oppositely directed travelling waves, and the differences of mode pulling, mode pushing and the effects of radiation trapping will cause a beat frequency shift.

By using the third order theory, the theoretical analysis and expressions of Langmuir flow are given, and several numerical results concerned are also given.

The paper presents a statistical method to process the beat frequency shift when a Gaussian beam passes through gain field and flow velocity field. The calculating formula have been given for all the possible cases.

环激光中 Langmuir 流效应的理论分析

姜亚南

（清华大学）

廖复中

（中国计量科学研究院）

增益管中气体的流动是激光陀螺中的一项主要误差源。本文定量地讨论了在增益管中激活原子和非激活原子的流动所带来的反向行波频差的漂移。前者是由于激活原子的流动引起反向行波增益曲线的分裂，再由于模牵引、推斥及辐射捕获效应的差值而引入的。本文给出在三阶理论下的 Langmuir 流的理论公式及计算值。用统计的方法处理了高斯光束通过增益场和流速场时的频差漂移。并给出各种情况下的计算公式。