

Influence of the cavity impedance in a passive resonant laser gyroscope

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The optical ring cavity is the core component of a laser gyroscope. A higher finesse and narrower linewidth cavity are required. However, the property of cavity impedance matching is another key parameter for a passive resonant gyroscope (PRG). For a free-space PRG, the laser is injected into the cavity and the laser frequency is locked to the cavity resonance by using the Pound-Drever-Hall (PDH) method. The discriminant slope in the PDH scheme plays an important role in reaching a better locking performance and hence a higher sensitivity of the gyroscope. We find the cavity finesse and the cavity impedance matching factor affect the discriminant slope differently. The balance of high finesse and low impedance matching factor can be optimized through the relationship of the discriminant slope with respect to the mirror parameters. Moreover, the lower impedance matching factor allows a higher intra-cavity laser power, which can increase the ultimate sensitivity of the gyroscope.

Primary author: ZHONG, Yuhong (Huazhong University of Science and Technology)

Co-authors: ZHANG, Haobo (Huazhong University of Science and Technology); LIU, Kui (Sun Yat-sen University); Ms FENG, Xiaohua (Huazhong University of Science and Technology); Mr CHEN, Yuxuan (Huazhong University of Science and Technology); Ms YAO, Jinpei (Huazhong University of Science and Technology); Ms LIU, Yawen (Huazhong University of Science and Technology); Prof. LU, Zehuang (Huazhong University of Science and Technology); Prof. ZHANG, Jie (Huazhong University of Science and Technology)

Presenter: ZHONG, Yuhong (Huazhong University of Science and Technology)

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