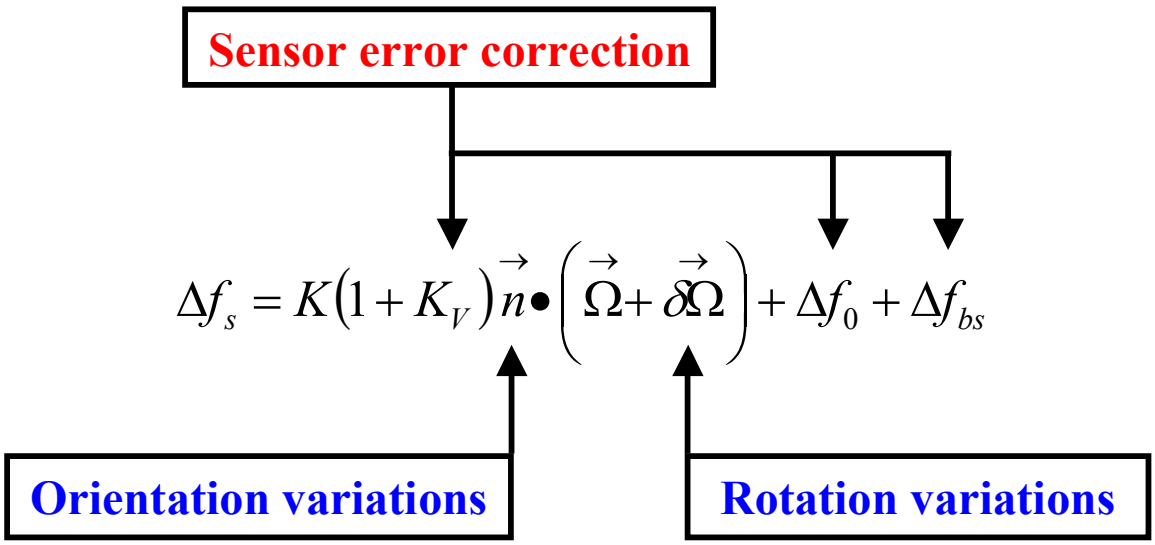
The Ring Laser Gyroscope output signal components



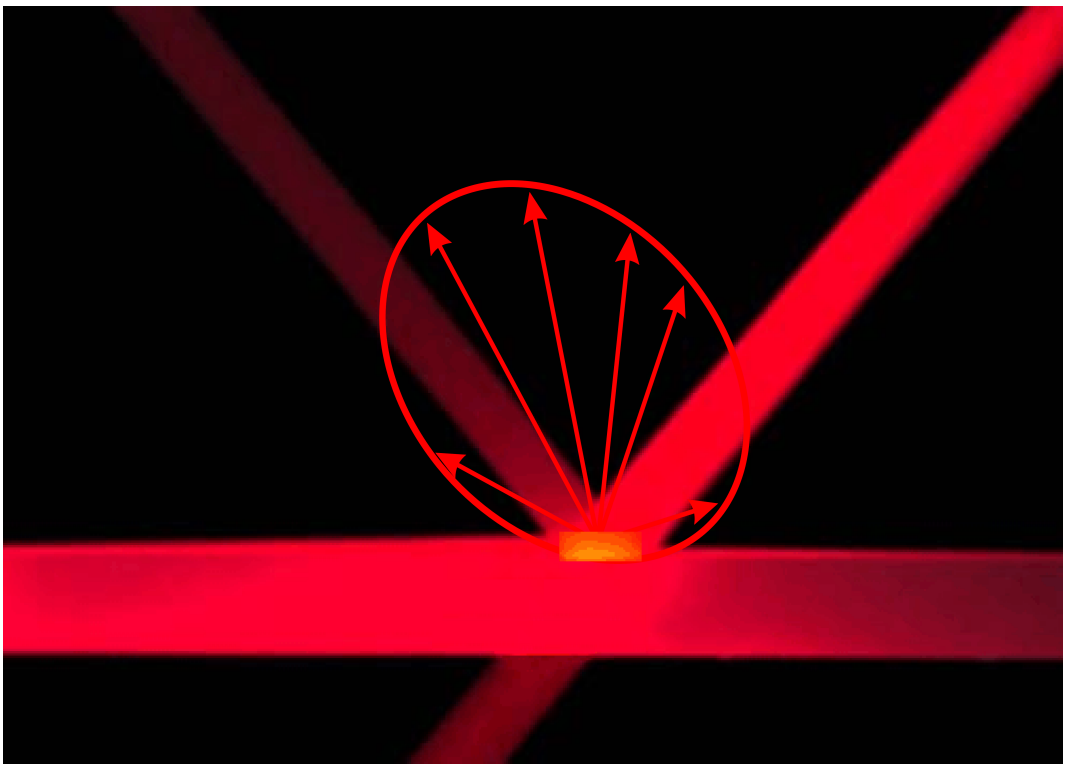
Ring Laser Error components:

- **Scale Factor correction K_V**
- **Null schift Δf_0**
- **Backscatter Δf_{bs}**

RLG Error Sources:

- **Fluctuations of amplification, gas temperature and pressure; optical frequency detuning; resonator losses**
- **Counter-propagating beam non-reciprocity**
- **The counter-propagating waves coupling due to the scattering; mirror quality**

Backscattering



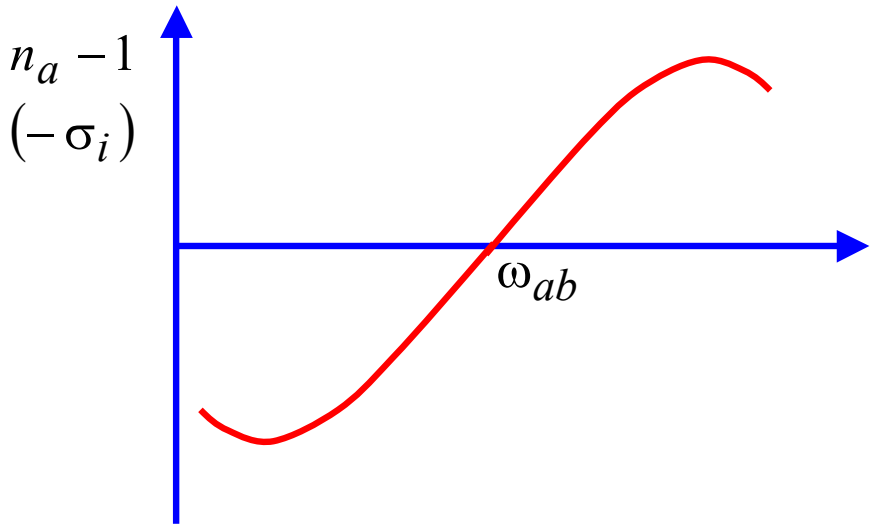
The value of backscatter contribution to the total RLG error depends on:

- **Mirror reflecting surface quality (particles, deposits, scratches, impurities etc.)**
- **Reciprocal variations of the mirror separation**

G Ring Laser has no detectable backscattering due to the superior mirror quality and environmental condition steadiness, i.e. the perimeter stability

Scale factor correction source

Frequency Pulling – the laser frequency is "pulled" toward the center line due to the variations of the resonator optical length.



The resonator longitudinal mode eigenfrequency:

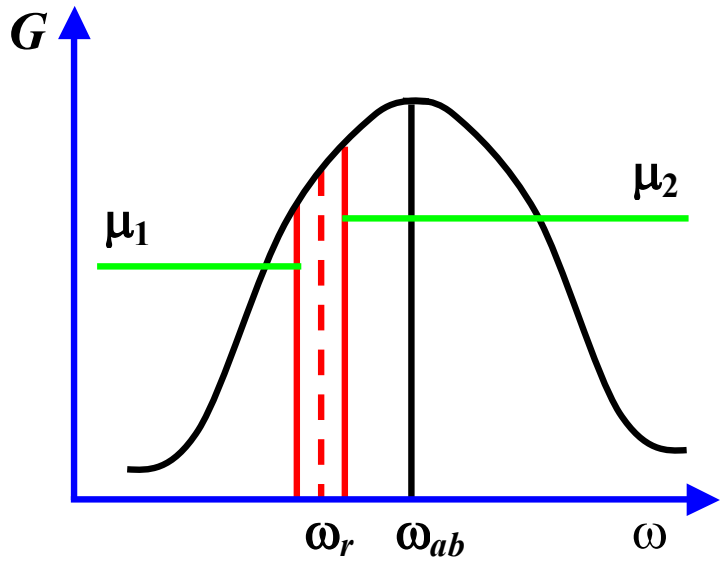
$$\nu_q = q\frac{c}{L_{OPT}} = q\frac{c}{\sum_k l_k n_k} = q\frac{c}{L + l(n_a - 1)}$$

Scale factor correction:

$$K_V = \left(\frac{c}{2L}\right)\cdot\left(\frac{G}{kU}\right)\frac{Z'_r(\xi)}{Z_i(0)}$$

Null schift

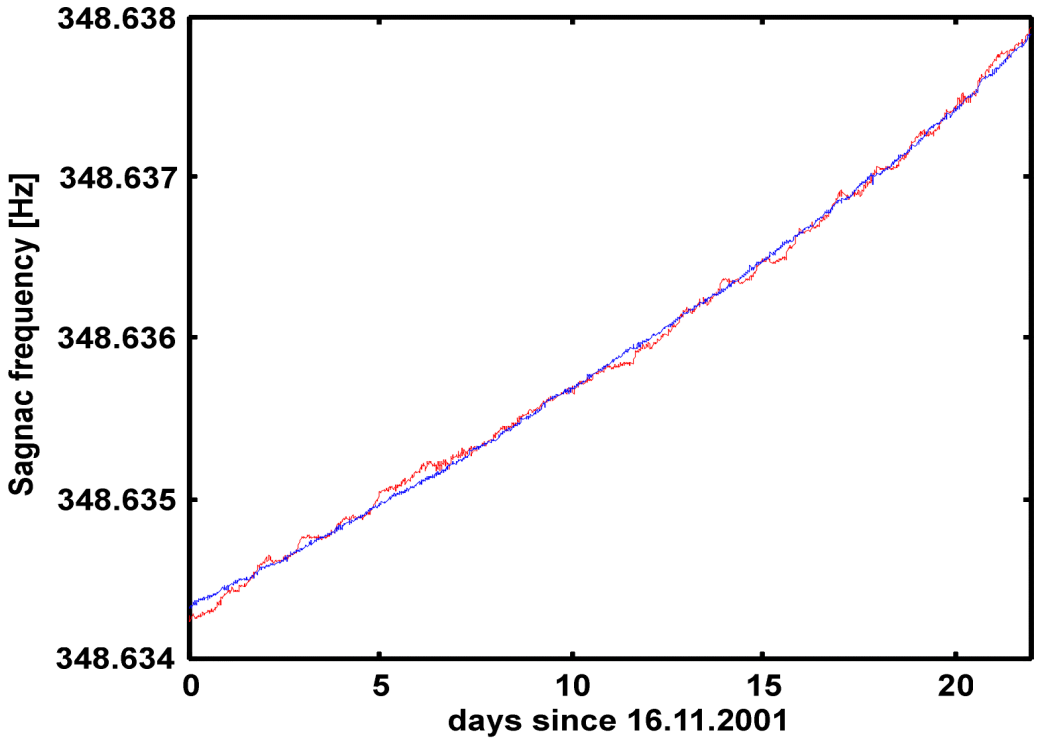
Null shift is a contribution to the index of refraction for the two counterrotating beams. Its sources are nonreciprocal saturation effects in the active gain medium which cause loss difference for the two beams (anisotropic scattering effects, magnetooptic interactions)

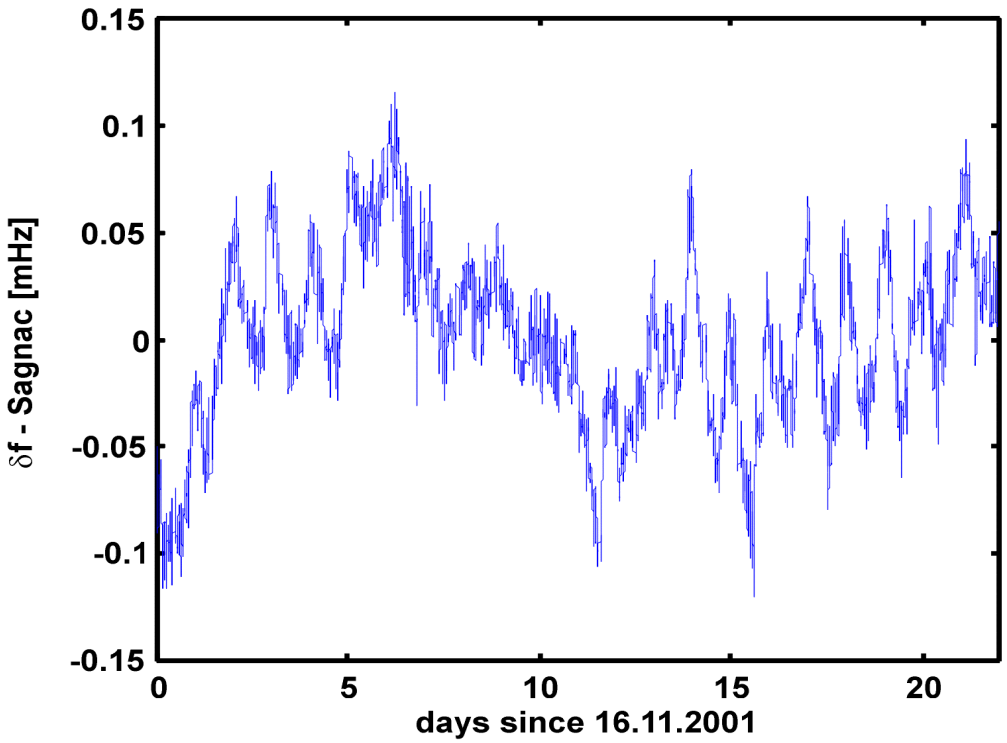


Null schift correction:

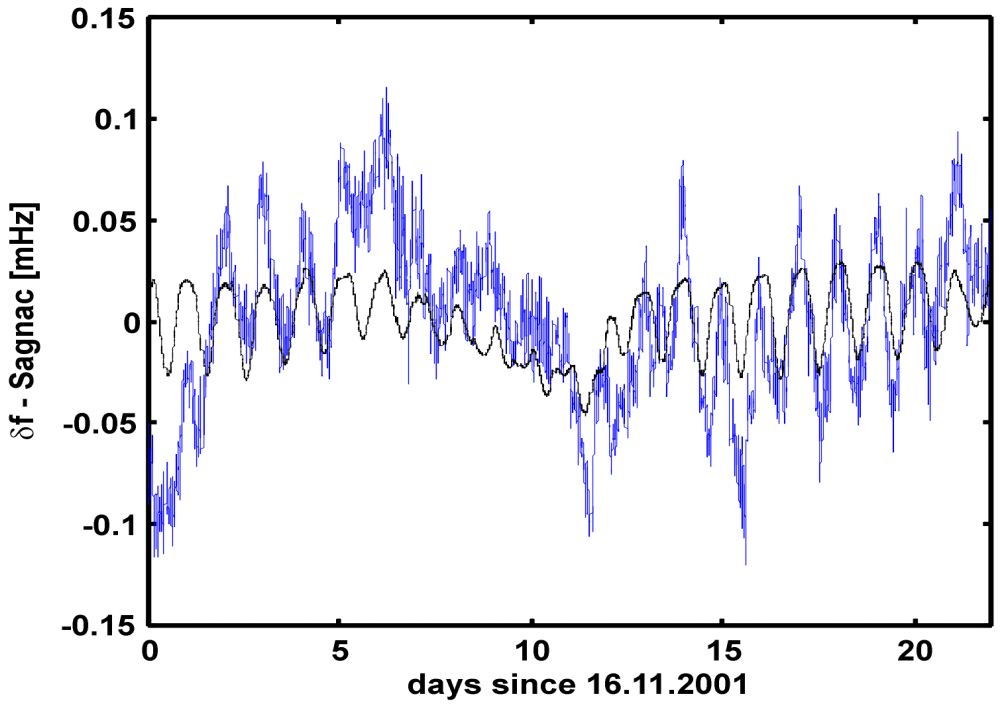
$$\Delta f_0 = [c/2L] \cdot \left(G \, \frac{\xi}{\eta} L(\xi) Z_i(\xi) \Big/ Z_i(0) \right) \cdot \Delta I$$

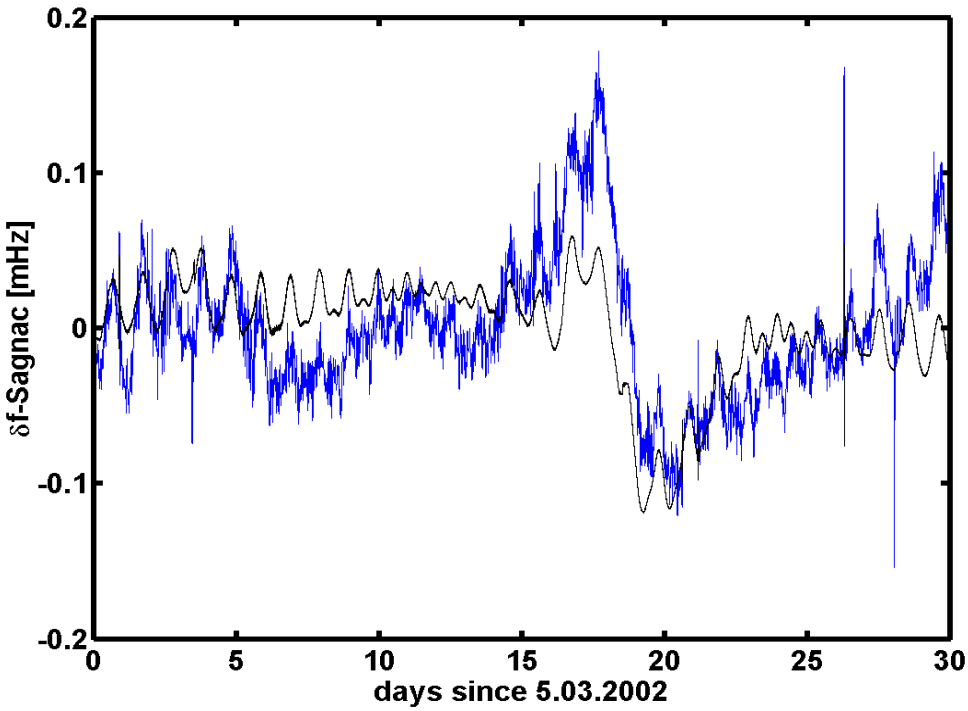
G ring error modeling 2001





Comparison of the corrected for instrumental errors RLG data with Orientation model





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