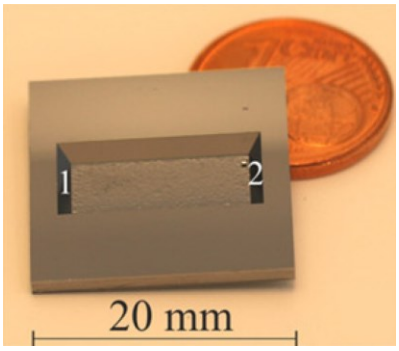
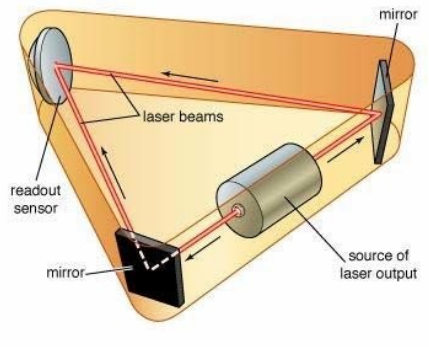
Development of a Micro-Optical Gyroscope

Bachelor-, Studien-, oder Masterarbeit

This work is a part of the MORe-G II project, which aims to develop a micro-optical gyroscope prototype. A gyroscope is a device mounted on a frame and able to sense angular momentum. Therefore, they are used in many applications such as smartphone, video game controllers, robotics and aerospace for detecting the rotational motion along with accelerometers which are used for detecting the translational motion. The operating principle of an optical gyroscope relies on the circulation of two light beams in a cavity in opposite directions. The circulating light beams experience different path lengths in the presence of a rotation. Rotational motion is, then, determined by analyzing the difference in the frequencies of the light beams.





(Left: A double mirror fabricated at IMT, Right: A passive resonator)

In our concept, a passive ring resonator is realized by silicon mirrors which are fabricated at IMT by means of optical lithography and chemical wet etching. A (100) silicon wafer is etched in potassium hydroxide (KOH) forming two {111} silicon planes inclined at 54.73° towards the wafer acting as mirrors, which is the essence of the project. To evaluate the quality of mirrors, surface characterization through profilometer and atomic force microscope, and optical characterization such as the reflectivity measurement are employed.

Tasks *(chosen by the exact topic)*:

- Literature research of gyroscopes and silicon processing by KOH etching.
- Fabrication of mirrors in the clean room.
- Characterization of the fabricated mirrors.
- Documentation of results.

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