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University of Applied Sciences
HOCHSCHULE EMDEN·LEER

Technical project / Bachelor-thesis

Vorname Name, Matr.-Nr. 700 (xy CPs)

Wavemeter

Valid in 2022 / 2023

Background

Spectroscopy is one of the most important fields in astrophysics as it delivers many physical quantities of distant sun-systems. A typical example is the radial velocity method, that can be used to detect exoplanets. However, spectroscopic instruments are never stable enough and calibration methods are required.

One of the most prominent type of calibrators are Fabry-Perots (FP). They are simple to build, cost-effective and easy to use. Nonetheless, they must be put into a stabilized environment to be stable enough to suite as a relative calibrator. The bandwidth of the FP is typically on the order of 100 nm - 400 nm depending on the reflectivity and configuration of the mirrors. The large bandwidth can only be achieved with dielectric coatings, which are typically stacked, so that different wavelengths are reflected in different depth of the coating. Accordingly, a high dispersion can be observed, i.e. the group velocity dispersion is high, which makes it difficult to predict the position of each resonance of the FP.

Due to these shortcomings and the impossibility to use the reflected light of the FP without higher losses, we developed a triple-mirror FP as shown in figure 1. The triple-mirror FP prototype is currently in the students laboratory of the group.

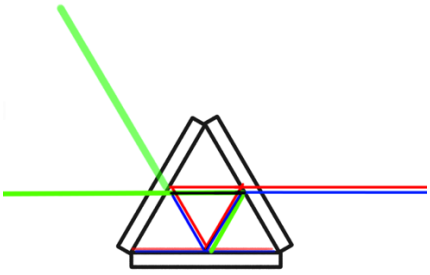

Figure 1: Triple FP. The light enters from the left. The retroreflected light goes to the top. The light inside the FP makes several round-trips and leaves the FP to the right. The mirrors are coated dielectrically. The lower mirror can be a Gires-Tournois mirror to compensate the dispersion.

Purpose

The purpose of this work is to investigate the physical properties of a triple-mirror FP.

Scope

The realized setup must be optimized with regard to its mechanical stability. The triple-mirror FP shall be tested with a scanning laser.

Beginn: tbd
Erstprüfer
Name

Ende / Abgabe: tbd
Zweitprüfer / Betreuer
Name

Stand: 01.12.2021

Steps

The following steps are necessary parts of the project

- Phase A:
    - Pursuing Project in Redmine
    - Time planning with a Gantt-chart
    - Literature review (Bachelor thesis from L. Weiss)
    - Improve design
    - Improve test setup
- Phase B:
    - Choosing, purchasing of components
    - Setup & Alignment
    - Experiments with a stabilized /scanning laser
- Report

Contacts to other institutes or industrial companies can be developed during the project.

Beginn: tbd
Erstprüfer
Name

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Zweitprüfer / Betreuer
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