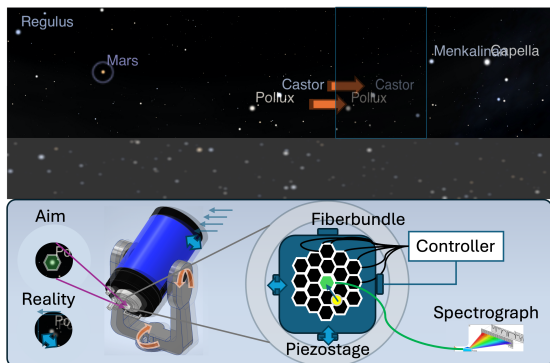




Telescope-Fiber-Spectrograph interface for Spectroscopy on bright Stars



SUMMARY.

Fiber-fed spectrographs are widely used in stellar astrophysics due to their ability to provide stable and repeatable illumination of the spectrographs slit. A compact fiber-fed interface intended for seeing-limited stellar spectroscopy with a ground-based telescope has been developed but needs further testing.

The system is designed to couple a seeing-broadened stellar image into a multimode optical fiber using a mechanically stable and optically robust assembly. A 19-fiber hexagonal bundle was developed, consisting of a central science fiber surrounded by identical fibers used for alignment feedback. To maintain stable coupling under atmospheric and mechanical disturbances, the fiber bundle is mounted on a bi-axial piezoelectric positioning stage. The logic ensures that for small-scale corrections, the piezo-stage moves the fiber bundle, while for large-scale drifts, the telescope mount is adjusted. This "dual-stage" approach keeps the science fiber aligned with the target star throughout the exposure

OBJECTIVES

What will student learn?

- Astrophysical Instrumentation
- Theory of seeing and its effect on fiber-coupling
- Theory of fiber-coupled spectrographs

What will students learn to do?

- Set up a fiber-coupling
- Stabilize the coupling of starlight into the fiber
- Coupling to a spectrograph
- Analyze spectra generated with the telescope-fiber-spectrograph setup

INSTITUTE

University of Applied sciences Emden / Leer
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The working group develops components for calibration of (astrophysical) spectrographs. Prof. Huke is responsible for the design and develop-

ment of the Calibration Unit(s) for ANDES, the Armazones high Dispersion Echelle Spectrograph.

THEORY

by PHILIPP HUKÉ

Light guiding with fibers seems to be a convenient choice for modern astrospectroscopy. Large telescopes (ELT, VLT, KECK to be named a few) sport fiber-fed spectrographs like ESPRESSO, HIRES and in the future ANDES. CARMENES is also an example. To build a fiberlink requires a detailed knowledge about light (coherence) and light guiding, telescopes, spectrographs and their targeted sciences..

APPLICATIONS

by PHILIPP HUKÉ

- We will work on
- Coupling light with different étendu into fibers
 - Light-guiding
 - Observation of modal noise
 - Using a small-scale (10") telescope to couple starlight into fibers
 - Spectroscopic measurements.

MAIN PROGRESSION STEPS

- **Week 1-3:** courses Light Guiding & Advanced Metrology, Introduction into the laboratories, simula-

- tion software, starting the project
- **Weeks 4-9:** project

EVALUATION

- **Theory grade [30%]**
 - Simulation project (70%)
 - Presentation of an article (30%)
- **Practice grade [30%]**
 - Exercises (20%)
 - Project (80%)
- **Defense grade [40%]**
 - Oral and slides quality
 - Context
 - Project / Personal work
 - Answers to questions

BIBLIOGRAPHY & RESOURCES

Any reference or web page that students can read to have a better idea of the topic

- SPIE Telescope & Instruments 2026: Watch-out for the respective publication (we can show it to you after the conference)

CONTACT

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