Module 1: Introduction to Waveguides

1.1. Introduction

1.2. Anatomy of an optical fibre

1.3. Propagation of light through an optical fibre

- ❖ Geometrical Optics
- ❖ Physical Optics

1.4. Singlemode fibres. Step index fibres

1.5. Multimode fibres. Step and graded index fibres

Module 2: Optical fibres main parameters and lab set-ups for their measurement

2.1. Attenuation

2.2. Transmission

2.3. Focal Ratio Degradation (FRD)

2.4. Modal noise

2.5. Polarization

2.6. Scrambling

2.7. Filtering. Interferometry

Module 3: Optical fibres and spectral interval

3.1. Fibres for ultraviolet

3.2. Fibres for visible and near infrared

3.3. Fibres for mid infrared

Module 4: New waveguides and technologies

4.1. Tapered fibres

4.2. Photonic crystal fibres: solid and hollow core

4.3. Bragg grating fibres

4.4. Photonic lanterns

4.5. Active fibres

Module 5: Fibre links in Astronomy

5.1. Fibre link definition

5.2. F-number requirements

5.3. Impact on FRD

5.4. Matching fibre NA

5.5. Fibre connectors

5.6. Integral field units (IFU)

5.7. Microlenses gluing process

5.8. Pseudoslits

Module 6: Multi Object Spectroscopy. Fibre positioning technologies

6.1. Pick and place positioners

6.2. Tilting spines

6.3. Radial arms positioners

6.4. Starbugs positioners

Module 7: Manufacturing process

7.1. Fibres requirements and specifications

7.2. Fibres and microlenses manufacturers

7.3. Manufacturing planning and process

7.4. Manufacturing and shipping times

7.5. Recommended quality reports

7.5. Tubing

Module 8: Integration and tests at the telescope

8.1. Packaging and shipping

8.2. Integration at the telescope

8.3. Tests for a fibre fed instrument at the telescope

8.4. Fibre fed instrument tests and characterization on sky

Module 9: Software and tools

9.1. Robot arrangement tool

9.2. Data reduction tips

9.3. Data cube visualization

Summary

The course, based on practical experience and containing several examples of real instruments, is focused on the application of optical fibres in Astronomy, reviewing the diverse materials used for different spectral windows from UV to MIR. This course describes the main parameters used to characterize a fibre-fed astronomical instrument (focal ratio degradation, modal noise, scrambling, etc.), that have a direct impact in the final instrument performance, as well as the lab set-ups required to measure them. The course goes over the fibre links requirements detailing the microlens - fibre gluing process. Finally, the course provides an overview of the Multi Object Spectrograph positioners technologies, together with the manufacturing process and software tools used in fibre-fed instruments.

To whom this course is addressed

The course is targeted for physicists, engineers and astronomers working in instrumental projects that involve the use of optical fibres.

Previous knowledge

A basic grounding in Physics is required

By attending the course, you will

(a) Learn how the properties of the optical fibres impact the instrument performance **(b)** Know the current fibres technologies and developments **(c)** Learn how to define a fibre link and the microlens-fibre gluing process **(d)** Understand the manufacturing requirements and timelines **(e)** Get a global knowledge of the software techniques used in fibre-fed instruments

FRACTAL training

FRACTAL offers courses in Project Management, System Engineering, Optics, Mechanics, Detectors and Software.

General courses

Our open courses are given in Madrid. The calendar is updated in our web page.

The courses last 1, 2 or 3 consecutive days.

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We offer ad-hoc courses, to be given at our customer's offices, adapted in dates and duration to each particular need.

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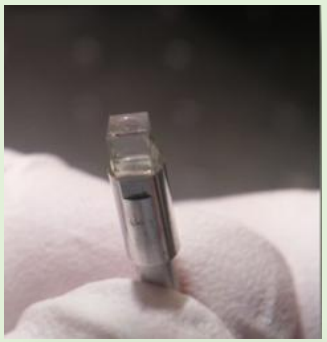
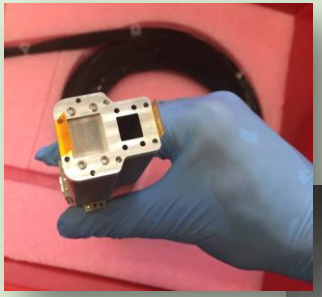
We provide consultancy services to allow our customers to implement e-learning tools with their own materials.

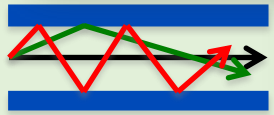
The services could include:

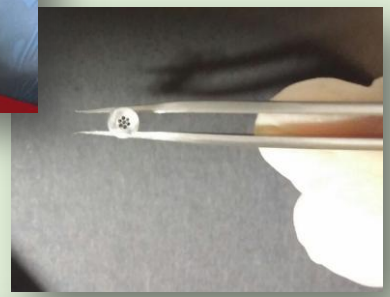
- Integration of an e-learning platform in the client web page
- Training in both, installation and use
- Organizing the e-classes

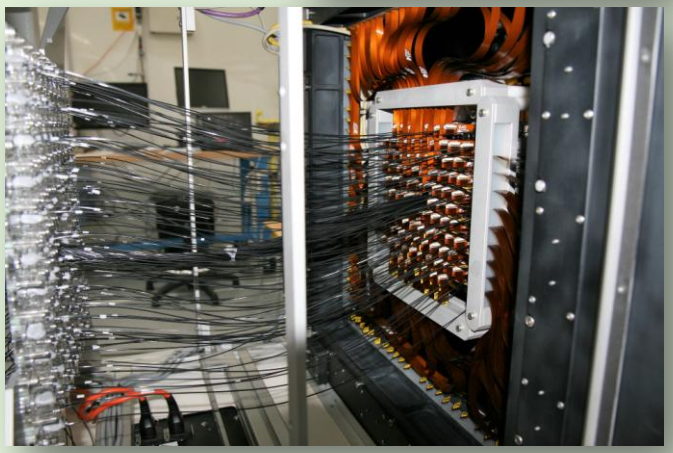
Optical Fibres in Astronomy











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Training

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