Fundamentals of Coherent Photonics
Lab Reports

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Introduction

A lot of time has been spent developing the template used to make this LaTeX document, I want others to benefit from this work so the source code for this template is available on GitHub [**?**].

1 Lab One - Optical Fibres Splices & Losses

1.1 Measurement One: Observation and Cleaning of the FC-PC Connectors

Given that the core diameter is 125μm the core is estimated to be around 50μm in diameter (25μm in radius) meaning this is likely a multi-mode fibre.

After touching the end of the connector with ones finger, dirt and oil can be seen and the light is not propagating clearly.

Given that the core diameter is 125μm the core is estimated to be around 5 10μm in diameter meaning this is likely a single-mode fibre.

1.2 Measurement Two: Light Injection into an Optical Fibre

1.3 Measurement Three: Study of the Operation of the Thorlabs Optical Power Metre

1.3.1 Calibration of the Power Metre

Note the calibration wavelength on power meter, justify its value.

Note the value of the power on meter, in dBm and mW.

Change the calibration wavelength, and measure the power in dBm and mW for each.

Return the calibration wavelength to 633nm and check power in dBm seems correct.

1.3.2 Measurement of Power Variation or Losses Using the "Power Difference Δ" Mode of the Power Metre

Press Δ on the power metre, why is the power now "0dB", why have the units changed from "dBm" to "dB"?

Comment on the evolution of the power as the launching conditions of light into the optical fiber are modified slightly. (by playing, for instance, with one of the 3-axes of the fiber holder).

1.4 Measurement Four: Realisation of a Splice between Two Multi-mode Fibres

After splicing fibre no.2 and no.1, measure the optical power at the output of the second fibre, P_3 (dBm).

Deduce the insertion loss, noted A_1(dB), of the fibre made by "fiber splice + fiber no.2".

1.5 Measurement Five: Measurement of the Linear Propagation Loss as well as the Fibre Length Using an OTDR

Measure, for the two working wavelengths of the OTDR (850nm & 1300nm); the linear loss (dB/km) of each fiber drum, the length of each fiber, the splicing loss (dB).

1.6 Measurement Six: Measurement of the Linear Propagation Loss Using the Cut-Back Technic

Measure the power at the output of fibre No.2. If the value measured is not equal to P_3, re-optimize the launching conditions into Fibre No.1.

After cutting the fibre 15cm downstream of the splice, measure the optical power, P_2 (dBm).

Knowing the length of fibre No.2 (obtained with the OTDR), calculate for $\lambda = 633nm$ the average linear propagation loss (dB/km), compare this calculated value with that obtained with the OTDR.

1.7 Measurement Seven: Measurement of the Splicing Loss Using the Cut-Back Technique

After cutting the fibre 1cm upstream of the splice, measure the optical power(dBm), ensure this power corresponds to P_1.

Deduce the insertion loss of the splice, i.e. the splicing loss, expressed in dB. Compare the measured value with that of the OTDR.