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Optical assembly of Free Space Optics communication unit

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Abstract – The optical assembly of FSO unit for modern optical wireless communication was designed with an emphasis on its applicability for terrestrial (horizontal) links with a range up to 1 km. The unit is designed to be optically transparent.

The Keplerian refraction telescope is used for receiving the signal and navigation optical beams. An achromatic doublet with a focal length of 250 mm and a diameter of 76 mm was used as receiving lens. The first channel (1550 nm) serves for signal transmission and for aiming the beam spot into the receiving optical fibre's core with maximal efficiency using a fast-steering mirror. The measured coupling efficiency for single-mode fibre SMF-28, with a core diameter of 8.2 μm and a numerical aperture of 0.14, is 0.08 (10.9 dB). The measured coupling efficiency for gradient index multi-mode fibre with a core diameter of 62.5 μm and a numerical aperture of 0.275, was 0.67 (1.8 dB). The second channel (850 nm) is used for coarse alignment of the receiving terminal.

Fig. 1: 3D model and the optical assembly during tests.