Master Thesis:
Construction of a fiber-optic Michelson interferometer

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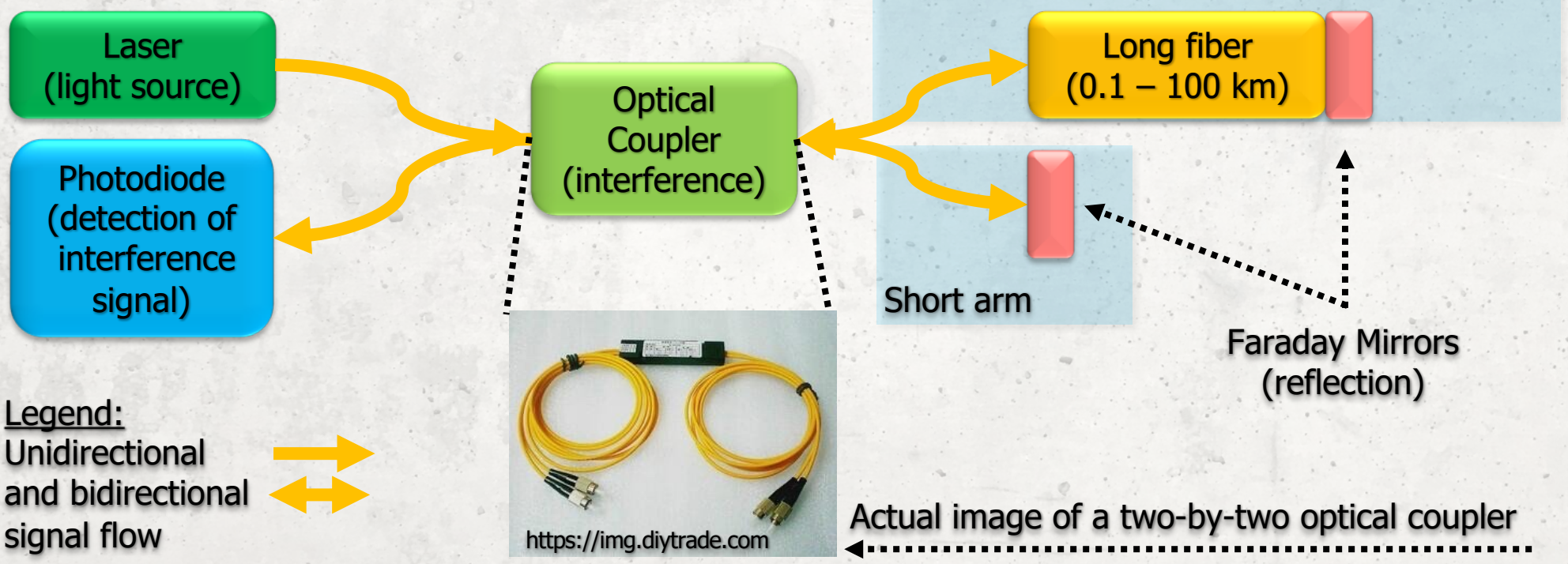
Research in fundamental physics uses high-precision, spatially separated optical atomic, molecular and ion clocks to search for a time variation of fundamental constants or indications for dark matter. Such searches are based on a comparison of the (possibly time-dependent) clock frequencies in so-called clock networks. The connections between clocks are fiber-optic cables for long-distance data transmission for the exchange of laser signals at a wavelength of 1.5 µm.

Overview of the setup:



Sufficient stability of the fiber-optic connections against a range of effects (change in the refractive index or cable length due to seasonal temperature changes; disturbances due to vibrations) is achieved by a correction process in which a small proportion of the laser signal is reflected back from the transmitter and compared with the original signal in a Michelson interferometer. As part of the thesis, a fiber-optic Michelson interferometer is to be constructed. Fiber optics means that all laser signals propagate in fiber-optic cables (and not in air) and that the manipulation of the laser light (mirror, beam splitter) also takes place directly in the glass fiber.

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