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The development of optical delay lines has been a quite active field during the last decade, especially in the field of time-domain optical coherence tomography (TD-OCT) where one is striving for high scan repetition rates to achieve real-time imaging. Important parameters for optical delay lines are: scan range, scan velocity, duty cycle, linearity, dispersion, and polarization effects. For the mass production of optical delay lines and/or for continuous use in medical or industrial environments, there are two important additional criteria often less considered: the ease of optical alignment and the robustness of the delay line.

Various delay line descriptions can be found in the literature: simple translation of a retroreflective element, galvanometer-mounted retroreflectors, stretched fibers, rotating elements, or grating-based systems. A review of delay lines can be found in Ref. [1]. All these delay lines have their advantages, but they also suffer to various degrees from one or many of the followings: low-duty cycle, nonlinearity, difficult alignment, and lack of robustness.

In this paper, we propose a novel optical delay line that relies on the use of an ensemble of rhombic prisms on a rotating disc with re-injection of light. The rhombic prism is a very forgiving optical element since it can be used even when slightly misoriented. An optical delay line using rhombic prisms is thus very easy to align and quite robust. By having the ensemble of prisms on a rotating disk, one can obtain a stable and high repetition rate with commercially available high-speed rotating motors. Additionally, by using re-injection of the optical ray and by wisely positioning and orienting the prisms on the rotating disc, one can obtain good linearity and high duty cycle.

The delay line is currently routinely operated at a scanning rate of a few kilohertz, but higher rates are achievable in principle. The principles of operation of the delay line will be presented along with demonstration of its use in profiling with low-coherence interferometry and in cross-section imaging with optical coherence tomography.

[1] A.M. Rollins and J. A. Izatt in *Handbook of optical tomography* (E.Bouma and G.J. Tearney Editors, Marcel Dekker, New-York), p.99 (2003)