





**Fig. 2.** Sketch of experimental setup. An SPDC source is used as a heralded single-photon source. The two optical paths  $R_1$  and  $R_2$  correspond to the outer cycle of the nested Zeno effect in the Michelson interferometer setup, while the paths  $R_2$  and  $R_3$  (the transmission channel) correspond to the inner cycle interferometer. Alice's and Bob's boxes are separated by 50 cm.  $D_0$ ,  $D_1$ , and  $D_t$ , SPD; HWP, half-wave plate; PBS, PBS reflecting vertically polarized photons; QWP, quarter-wave plate.