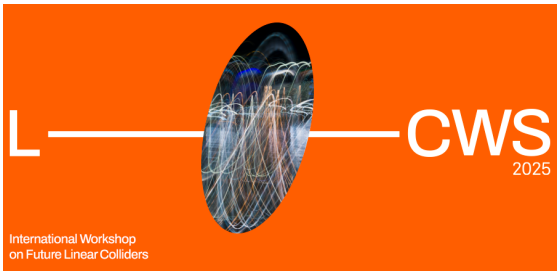


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# Search for dark photons at future e+ e– colliders

*Tuesday 21 October 2025 12:10 (20 minutes)*

In a class of theories, dark matter is explained by postulating the existence of a dark sector', which interacts gravitationally with ordinary matter. If this dark sector contains a U(1) symmetry, and a correspondingdark' photon ($A_D$) , it is natural to expect that this particle kineticly mix with the ordinary photon, and hence become a 'portal' through which the dark sector can be studied. The strength of the mixing is given by a mixing parameter ($\epsilon$). This same parameter governs both the production and the decay of the $A_D$ back to SM particles, and for values of $\epsilon$ not already excluded, the signal would be a quite small, and quite narrow resonance: If $\epsilon$ is large enough to yield a detectable signal, its decay width will be smaller than the detector resolution, but so large that the decay back to SM particles is prompt. For masses of the dark photon above the reach of Belle II, future high energy $e^+e^-$ colliders are ideal for searches for such a signal, due to the low and well-known backgrounds, and the excellent momentum resolution and equally excellent track-finding efficiency of the detectors at such colliders.
This contribution will discuss a study investigating the dependency of the limit on the mixing parameter and the mass of the $A_D$ using the $A_D \to \mu^+\mu^-$ decay mode in the presence of standard model background, using fully simulated signal and background events in the ILD detector at the ILC Higgs factory. Some emphasis will be made on the importance of a more than superficial description of the experimental modelling is of great importance for this kind of signals. In addition, a more general discussion about the capabilities expected for generic detectors at $e^+e^-$ colliders operating at other energies will be given.

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