A novel probe of new physics in $e^+e^- \rightarrow Z\gamma$

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One could compare the discovery of a new particle to a big shining firework, lighting up the night sky. But sometimes discoveries can be subtle, less flamboyant, and still point to the existence of new particles in an *indirect* way. For example, consider how the discovery of neutral currents by the Gargamelle collaboration in 1973 [1] was followed, a long decade later, by the discovery of the massive W and Z bosons by the UA1 and UA2 collaborations [2]. In this example, indirect evidence for new physics preceded and guided the direct discovery of new particles. These discoveries were momentous, marking the beginning of a golden era for Particle Physics, and sparking the long search for the missing Higgs boson that culminated in 2012 [3].

In ref. [4], the authors propose to exploit the power of lepton colliders, their precision and energy range capabilities, to probe new phenomena in trilinear couplings of neutral gauge bosons, known as nTGCs. As in the Gargamelle example, the authors propose to probe indirectly new physics via precise measurements of known particles, a Z boson and a photon. Were those to deviate from Standard Model expectations, they would constitute evidence for New Physics and could pave the way to the discovery of unknown particles and

principles. To achieve these goals, the authors have adopted the well-established approach of Effective Field Theory [5] to identify possible sources of nTGCs. They then explored ways to measure their effect at lepton colliders, making use of the steep energy dependence and the angular correlations of these effects.

Their results [4] show the potential for lepton colliders to reach indirectly scales in the multi-TeV range, and certainly motivate further work into nTGCs as sensitive probes for new physics.

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