

## Phenomenology 2022 Symposium: From Virtual to Real



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### Probing Invisible Vector Meson Decays with NA64 and LDMX

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Electron beam fixed target experiments such as NA64 and LDMX use missing energy-momentum to detect the production of dark matter and other long-lived states. The most studied production mechanism is dark Bremsstrahlung through a vector mediator. In this talk, we introduce a complementary source of missing energy-momentum signals: Bremsstrahlung photons can convert to hard vector mesons in exclusive photo-production processes, which then decay to dark matter or other invisible particles, such as neutrinos. We find that existing NA64 data can improve the leading constraints on invisible light vector meson decays, while a future run of LDMX could improve them by up to 5 orders of magnitude. For the examples of a dark photon and a  $U(1)_B$  gauge boson mediator, accounting for meson decays substantially enhances these experiments' sensitivity, especially to thermal relic dark matter of mass above 0.1 GeV.

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