



Contribution ID: 846

Type: **Experimental poster**

## Long-lived dark photons at ATLAS: a search for unconventional signatures at the LHC

*Tuesday, 17 May 2022 19:00 (1 hour)*

Long-lived particles represent a well motivated approach for beyond-Standard Model (SM) physics searches. An interesting scenario is the one in which light vector mediators (dark photons), weakly coupled to the SM photon, can be produced by an exotic decay of the SM Higgs boson and decay back to SM particles after travelling a macroscopic distance. This study presents a search for light, neutral long-lived particles decaying in collimated jet-like structures containing pairs of leptons or quarks (Dark-Photon-Jets, DPJs). The search is performed on  $139 \text{ fb}^{-1}$  of pp collision data at  $\sqrt{s} = 13 \text{ TeV}$  collected during the Run-2. Both the gluon-gluon fusion (ggF) and associated production with a W boson are considered for the Higgs production and dark photon decays are identified, among the overwhelming QCD and non-collision background, thanks to a selection involving dedicated triggers and deep-learning classifiers. The results obtained are interpreted in the context of simplified long-lived particle models such as the Hidden Abelian Higgs Model (HAHM) and the Falkowsk-Ruderma-Volansky-Zupan (FRVZ) model.

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**Session Classification:** Poster Session I

**Track Classification:** Feeble Interactions BSM