

## Contribution submission to the conference Karlsruhe 2024

### Search for long-lived axion-like particles in top production

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We investigate the discovery potential for long-lived axion-like particles produced in association with a top quark-antiquark pair at the (High-Luminosity) LHC. Compared to inclusive searches for a displaced vertex, top quark associated signals offer new trigger options and an extra handle to suppress background. The search strategy includes axion-like particle decays to a displaced di-muon vertex which further contributes to the suppression of prompt background. For axion-like particles with masses above the di-muon threshold, we find that the (High-Luminosity) LHC can probe effective top-quark couplings as small as  $|c_{tt}|/f_a = 0.03(0.002)$  TeV and proper decay lengths as long as 20 (300) m, assuming a cross section of 1 fb, with data corresponding to an integrated luminosity of  $150 \text{ fb}^{-1}$  ( $3 \text{ ab}^{-1}$ ). Our predictions suggest that searches for top quark associated displaced di-muons will explore new terrain in the current sensitivity gap between searches for prompt di-muons and missing energy.

In this talk I will present the results of our phenomenology study, and the first results of the CMS analysis searching for this same signature.

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