

# Search for new physics with long-lived neutral particles with the ATLAS experiment at the CERN Large Hadron Collider

## Abstract:

Five years after the discovery of the Higgs boson at the Large Hadron Collider (LHC) at CERN, no unambiguous signal of physics beyond the Standard Model of particle physics has been observed in both conventional direct and indirect searches. Signatures of displaced vertices from the decay of long-lived neutral particles (LLNP) gained considerable interest over the last few years as a novel method to discover new physics signals at the LHC: LLNPs arise in several theory models explaining the open questions in modern particle physics. In particular LLNPs can be produced in exotics hidden decays of the Higgs boson acting as a portal to a new physics sectors at the  $O(100\text{GeV})$  scale, and in the hidden decays of additional resonances which arise in an extended Higgs sector. In this talk I will review the status of the signatures-based searches for LLNPs with the ATLAS experiment at the LHC. I will then discuss the future search directions.