



Contribution ID: 236

Type: Oral Presentation

Dark photons search with the ATLAS detector at the LHC

Thursday 10 July 2025 10:50 (20 minutes)

Many extensions to the Standard Model (SM) introduce a hidden or a dark sector rising from an additional $U(1)_d$ gauge symmetry, to provide candidates for dark matter in the universe and a possible explanation to astrophysical observations such as the positron excess observed in the cosmic radiation flux. The gauge boson of the dark sector would be either a massless or a massive dark photon that can either kinetically mix with the SM photon, or couple to the Higgs sector via some mediators. If dark photons decay back to the SM particles with a significant branching ratio, we could either observe measurable deviations in some Higgs decay channels or new exotic signatures that would be accessible at the LHC energies. An overview of current results on dark photon searches with the ATLAS detector will be presented, targeting a wide range final states using different data analysis techniques. Finally, new ideas for dark photon searches using Run 3 data and their current status will be discussed.

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Primary author: MAZINI, Rachid (School of Physics, The University of the Witwatersrand)

Co-authors: Ms TAU, Karabo (School of Physics, The University of the Witwatersrand); KUMAR, Mukesh (School of Physics and Institute for Collider Particle Physics, University of the Witwatersrand); LEPOTA, Thabo James (School of Physics and Institute of Collider Particle Physics, University of the Witwatersrand)

Presenter: MAZINI, Rachid (School of Physics, The University of the Witwatersrand)

Session Classification: Nuclear, Particle and Radiation Physics-2

Track Classification: Track B - Nuclear, Particle and Radiation Physics