



Wednesday, December 06, 14:00-15:00

Physics Department/ H Block Seminar Hall (Tea & coffee at 13:45)

## Geometric Fifth Force: Implications for Dark Matter and Black Holes

Credit: EHT Collaboration

In this talk, we will show a purely geometric vector field in the metric-Palatini gravity which can be claimed as a fifth force. We will show that metric-Palatini gravity, extended with the antisymmetric part of the affine Ricci tensor and extended also with a matter sector involving the affine connection, reduces dynamically to general relativity plus a geometric massive vector field such that the geometric vector couples to fermions in a universal fashion. We show that due to its geometrical origin this geometric vector, the geometric  $Z'$ , does not couple to scalars and vector bosons. It couples only and only to fermions in a universal fashion. We show that this geometric  $Z'$  could well be a viable dark matter candidate. We also show that this geometric  $Z'$  hampers black hole formation, and its matter couplings worsens the situation. We will briefly discuss the possible black hole solutions in the Einstein-geometric Proca model in the AdS background and in Symmergent gravity.

### Related Publications

- [1] Demir *et al.* (2020), "Geometric Dark Matter", (Q1) Journal of Cosmology and Astroparticle Physics, 04 (2020) <https://doi.org/10.1140/epjc/s10052-022-10986-7>.
- [2] Demir *et al.* ((2022), "Geometric Proca with matter in metric-Palatini gravity", (Q1) European Physical Journal C, 82 (2022) <https://doi.org/10.1140/epjc/s10052-022-10986-7>.
- [3] Ghorani *et al.* (2023), "Probing Geometric Proca with Black Hole Shadow and Photon Motion", (Q1) European Physical Journal C, 83, 318 (2023) <https://doi.org/10.1140/epjc/s10052-023-11490->
- [4] Pulıçe *et al.* (2023), "Constraints on charged Symmergent black hole from shadow and lensing", (Q1) Classical and Quantum Gravity, <https://doi.org/10.1088/1361-6382/acf08c>



### Speaker: Dr. Beyhan Pulıçe

Beyhan Pulıçe is a postdoctoral researcher at Faculty of Engineering and Natural Sciences, Sabancı University. She obtained her Ph. D. in 2020 in Physics from İzmir Institute of Technology. She has been working in particle physics and gravitation. Her research is theoretical and phenomenological.