

# Seminarium Astrofizyczne

wtorek 19.10.2021 godz. **12:30**

<https://www.gotomeet.me/NCBJmeetings/seminarium-astrofizyczne>

ID 349-387-373 Password: AstroSemi

## Alexandr Zakharov

(BLTP, JINR, Dubna, Russia)

### **Orbits of bright stars as a tool to test gravity theories and to choose the suitable model for the Galactic Center**

Observations of bright stars near the Galactic Center demonstrated that the preferable model for the Galactic Center is the supermassive black hole. These observations of VLT and Keck telescopes got a high recognition among a scientific community and R. Genzel (VLT) and A. Ghez (Keck) were awarded the Nobel prize in physics in 2020. We discuss opportunities to evaluate parameters of the supermassive black hole and extended mass distribution from these observations. Similarly, these observations give a possibility to find constraints on alternative theories of gravity such as  $f(R)$  theory, Yukawa gravity and theories with massive graviton. Graviton mass limits found with the approach is comparable constraints obtained with other techniques including gravitational wave observations with LIGO—Virgo detectors. Our constraints on graviton from trajectories of bright stars near the black hole at the Galactic Center mass was included in PDG reviews (2019 update, 2020).

In a last few years a self-gravitating dark matter core–halo distribution was suggested by Ruffini, Argüelles, Rueda (RAR) and this model was actively used in consequent studies. In particular, recently it has been claimed that the RAR-model provides a better fit of trajectories of bright stars in comparison to the conventional model with a supermassive black hole. The dark matter distribution with a dense core having a constant density as it was suggested in the RAR-model leaves trajectories of stars elliptical like in Kepler's two-body problem. However, in this case not the foci of the ellipses coincide with the Galactic Center but their centers while the orbital periods do not depend on semi-major axes. These properties are not consistent with the observational data for trajectories of bright stars.

Serdecznie zapraszam,  
Agnieszka Majczyna