

Student Talks

Possible Topics

- 1) Analogue Gravity:
Nature 611, 260 (2022)
- 2) Interaction between gravitational waves and trapped Bose-Einstein condensates
arXiv:2411.15874
- 3) Gravitational analogue to quantum Hall effect and Josephson effect:
PRL 133, 241402 (2024)
- 4) Orbital precession of stars in galactic center:
<https://arxiv.org/pdf/2304.11458>
- 5) Multimessenger observation: rare increase of gamma ray flux in galaxy M87
A&A 692, A140 (2024)
- 6) McVittie metric:
 - a) Exact solution of Einstein field equations describing a black hole or a massive object immersed in an expanding cosmological spacetime.
 - b) Contains both Schwarzschild and Friedmann–Lemaître–Robertson–Walker metric as special cases.
- 7) In general relativity, spacetimes can have black hole event horizons and also cosmological horizons. The de Sitter–Schwarzschild solution is the simplest solution that has both.
- 8) Precision tests in space:
Physik Journal 23 (2), 24 (2024)
- 9) Asymmetry of Andromeda galaxy:
<https://pro-physik.de/nachrichten/satellitengalaxien-von-andromeda-stellen-standard-kosmologie-in-frage>
- 10) Olbers paradoxon: article and book from Harrison
 - a) The dark night sky paradox, Am. J. Phys. 45, 119-124 (1977)
 - b) Darkness at night – A riddle of the Universe (Harvard Press, 1987)
- 11) Distribution of matter in Universe
<https://pro-physik.de/nachrichten/wie-die-materie-im-all-verteilt-ist>
- 12) Gravity from ultrarelativistic matter:
<https://pro-physik.de/nachrichten/schwerkraft-von-ultrarelativistischer-materie>
- 13) Scattering of two black holes:
<https://pro-physik.de/nachrichten/wie-schwarze-loecher-kreisen>
- 14) Kruskal coordinates
- 15) Maximally symmetric space:
Steven Weinberg, Gravitation and Cosmology

Organizational Matters

- 1) Application via Email until June 15, 2025: First come first served → Topic
- 2) Student talk program available on June 22, 2025
- 3) Student talks will take place on July 8, 2025 or later