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Recent PhDs



Zelimir Marojewic obtained his PhD on 12.09.18 at the University of Bremen.

Vojtech Witzany obtained his PhD on 04.10.18 at the University of Bremen.

Kris Inken Schroven obtained her PhD on 19.10.18 at the University of Bremen.

Dennis Philipp obtained his PhD on 20.12.18 at the University of Bremen.

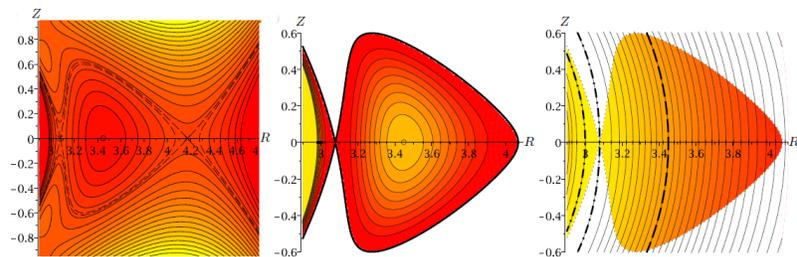


Group photo from our RTG summer workshop in Bremen

The role of electric charge in relativistic accretion onto compact objects - an analytical approach

Kris Inken Schroven

This thesis is dedicated to the discussion of the role of electric charge in relativistic accretion onto compact objects. Many high-luminosity phenomena in the observed universe can be traced back to accretion processes, in which electromagnetic fields play an important role. These fields are either produced within the accreted matter or they enter the stage as external fields like interstellar magnetic fields or fields, produced by the accreting object.



The discussion is proceeded as far as possible analytically. One aspect of the thesis examines the accretion process of hydrogen plasma onto a black hole with a realistically small electric charge. An analytical model describes a stationary accretion process of plasma onto a rotating and charged black hole. The plasma particle motion is described within the test-particle approach. It could be shown, that even very small black hole charges may have a non-negligible effect onto accretion processes, as long as the electromagnetic field of the plasma is negligible. Another aspect of the thesis concerns charged thick accretion discs around spinning compact objects, which are affected by an external magnetic dipole field. The situation is described in an idealized way by the Kerr metric and a magnetic dipole "test-field" in Kerr spacetime. Pressure equations describe the charged fluid structures. The self-consistency of the model and integrability conditions of the pressure equations lead to restrictions on the fluid conductivity and the charge distribution in the structures. Since previous publications already discussed the limiting case of a non-rotating central object, this thesis focuses on the influence of the central object's spin on the existence and locations of the charged structures. Frame dragging effects result in the existence of rigidly rotating polar clouds, which do not exist in the non-rotating case and in a preference for counter-rotating equatorial tori.



Upcoming events

RTG Colloquia

23.01.19: ZARM, Bremen

RTG Networking Workshop

04.-08.03.19: Leibniz University,
Hannover

Bremen-Oldenburg Symposium

30.01.19: Oldenburg

Publications

K. Eickhoff, S. Reimers, *Dynamics of test particles in the five-dimensional Gödel spacetime* [Phys. Rev. D 98, 044050 \(2018\)](#) arXiv:1801.02250 [gr-qc]

J. L. Blazquez-Salcedo, C. Knoll, *Solutions of the massive Dirac equation in the near-horizon metric of the extremal five dimensional Myers-Perry black hole with equal angular momenta* arXiv:1808.00503 [gr-qc]

J. L. Blazquez-Salcedo, C. Knoll, *Quasinormal modes of Dirac spinors in the background of rotating black holes in four and five dimensions* arXiv:1811.02014 [gr-qc]

J. L. Blazquez-Salcedo, X. Y. Chew, J. Kunz, *Scalar and axial quasinormal modes of massive static phantom wormholes* [Phys. Rev. D 98, 044050 \(2018\)](#) arXiv:1806.03282 [gr-qc]

Z. A. Motahar, J. L. Blazquez-Salcedo, B. Kleihaus, J. Kunz, *Axial quasinormal modes of scalarized neutron stars with realistic equations of state* [Phys. Rev. D 98, 044032 \(2018\)](#) arXiv:1807.02598 [gr-qc]

J. L. Blazquez-Salcedo, Z. A. Motahar, D. D. Doneva, F. S. Khoo, J. Kunz, S. Mojica, K. V. Staykov, S. S. Yazadjiev, *Quasinormal modes of compact objects in alternative theories of gravity* e-Print: arXiv:1810.09432 [gr-qc]

22. German Conference of Women in Physics

As most of you noticed, the 22nd Women in Physics Conference took place on September 27 - 30 in Oldenburg. It gave over 160 women and men in physics at various career stages a forum to present their work and discuss their experiences.



Our guest of honor was Prof. Mary K. Gaillard, who gave a very inspiring talk about her scientific journey during a time, when women in physics were an exception. Further highlights were plenary talks from invited speakers, like the talks from the Gustav-Hertz-Preis laureate Lavinia Heisenberg and the Hertha-Sponer-Preis laureate Karin Everschor-Sitte. Also the inspiring evening talk by Silke Britzen about observations of black holes drew quite a huge crowd despite the time.

Parallel to the scientific talks there were lots of opportunities to network during breaks and organized mentoring tables. Also, a lot of women in non-academic jobs presented their work and gave valuable insights on how to follow in their footsteps. Of course we also took the opportunity to take the conference participants on a tour through the city center of Oldenburg and enjoyed a great conference dinner.



The members of the organisation committee would like to thank everyone involved for contributing to the very interesting and successful conference in Oldenburg and are looking forward to the next DPT (especially since we do not have to invest so many hours to prepare for such an event)!





Publications

C. Hoffmann, E. G. Charalampidis, D. J. Frantzeskakis, P. G. Kevrekidis, *Peregrine solitons and gradient catastrophes in discrete nonlinear Schrödinger systems* *Phys. Lett. A* 382 (2018)

E. Castellanos, J. C. Degollado, C. Lämmerzahl, A. Macias, and V. Perlick, *Bose-Einstein condensates in charged black-hole spacetimes* *J. Cosm. Astropart. Phys.* 2018, 043 (2018)

G. A. Gonzalez, B. Kleihaus, J. Kunz, S. Mojica, *Innermost stable circular orbits of neutron stars in dilatonic-Einstein-Gauss-Bonnet theory* arXiv:1812.02686 [gr-qc]

S. Grunau, H. Neumann, and S. Reimers, *Geodesic motion in the five-dimensional Myers-Perry-AdS spacetime* *Phys. Rev. D* 97, 044011 (2018)

C. Hoffmann, T. Ioannidou, S. Kahlen, B. Kleihaus, and J. Kunz, *Wormholes Immersed in Rotating Matter* *Phys. Lett. B* 778 (2018) 161

V. Dzhunushaliev, V. Folomeev, B. Kleihaus, and J. Kunz, *Wormhole solutions with a complex ghost scalar field and their instability* *Phys. Rev. D* 97 (2018) no.2, 024002

S. Fedoruk, E. Ivanov, O. Lechtenfeld, and S. Sidorov, *Quantum $SU(2|1)$ supersymmetric Calogero-Moser spinning systems* *J. High Energ. Phys.* (2018) 2018: 43

A second chance for the Galileo satellite

Due to a malfunction of the Sojus-stage of the rocket two Galileo-satellites did not achieve the correct height needed after their lift-off in August 2014. As a result, instead of achieving their intended circular orbit these ended up in an elliptical orbit, where their distance from earth changes by about 8,700 kilometers twice each day. Scientists of ZARM then proposed to use the data from these satellites to do important [research on gravity](#).



In particular, they proposed using the high-precision atomic clocks to test gravitational redshift as being predicted by General Relativity. Together with partners from the TU Munich they managed to improve the accuracy of this test of GR by a factor of 4. A french team came to a similar result. The redshift is very important regarding global positioning systems and navigation, the definition of international time and geophysics.

Merry Christmas and a Happy New Year

We want to wish all of you happy holidays with your friends and loved ones and will see you back in the new year!



"A BLACK HOLE, IT'S WHAT I'VE ALWAYS WANTED"

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