GR 14: Postersitzung

Zeit: Donnerstag 14:00–16:00 Raum: SFG 0150

GR 14.1 Do 14:00 SFG 0150

Relativistic Effects in Spectroscopic Binary Stars - Paving the way to precise stellar mass determinations — •Vanessa Fahrenschon[1,2,3], Roberto Saglia[2,1], and Luca Pasquini[3] — [1]University Observatory Munich, Ludwig-Maximilians-Universität München, Germany — [2]Max Planck Institute for extraterrestrial Physics, Garching, Germany — [3]European Southern Observatory, Garching, Germany

High-resolution spectroscopy is one of the most powerful tools of modern observational astrophysics. With the incorporation of new measurement and calibration techniques, e.g. laser frequency combs, precisions will soon reach the 1m/s level and allow for direct measurements of relativistic effects in nearby stellar systems.

In this work, radial velocities (RVs) of double-lined spectroscopic binaries (SB2s) are used to detect periodic redshifts due to special and general relativistic effects. Simulations of all expected redshift contributions, depending on the binary system's parameters, are presented. A comparison with state-of-the-art measurements is made to show the necessity to take relativistic effects into account in the future.

Due to the availability of more RV curve fit parameters in SB2 systems than in other systems, it will soon be possible to determine the masses of both stellar components separately in a very precise way. This can be done without having to use additional information from astrometry or other measurements, making this a very important tool for all fields of astrophysics.

GR 14.2 Do 14:00 SFG 0150

Sector models of a plane gravitational wave — Ute Kraus and •Corvin Zahn — Universität Hildesheim

We present sector models that visualize the properties of a plane gravitational wave. These include the spatial curvature and the motion of free particles within the wave.

Sector models can provide an intuitive understanding of the intrinsic geometry of curved spaces or spacetimes. They are built by dividing curved space or spacetime into small blocks with Euclidean or Minkowski geometry respectively.

GR 14.3 Do 14:00 SFG 0150

Relativistic Interactive Flight Simulation — •Stephan Preiss — Universität Hildesheim

To visualize relativistic phenomena like length contraction, time dilation and the aberration of light in an interactive simulation, we construct a virtual world with a drastically reduced speed of light. This was done in an interactive flight simulator developed by Christoph Keller. Here, the observer can move at relativistic velocities and sees the resulting images that are calculated with ray tracing methods. This program was now extended to support a surround view environment (CAVE).

GR 14.4 Do 14:00 SFG 0150

Visualizing a Rotating Black Hole — •Thomas Reiber — Universität Hildesheim

The Kerr solution of the Einstein field equation describes the spacetime around a rotating Black Hole. It can be extended over the event horizons to connect distant regions of spacetime. Ray tracing in the maximal analytic extension of Kerr spacetime is used to calculate the view of an observer in the interior region of a black hole.

GR 14.5 Do 14:00 SFG 0150

Black hole conserved charges via “solution phase space method” — •Kamal Hajian and Mohammad Mehdi Sheikh-Jabbari — Institute for Research in Fundamental Sciences (IPM), Tehran, Iran

I will present a method for calculating black hole conserved charges associated with exact symmetries in the context of covariant gravitational theories. The method is called “solution phase space method,” and is based on covariant phase space formulation of charges. Introducing the notion of “solution phase space”, which is the phase space built by family of solutions parametrized by some free parameters, one can calculate the mass, angular momentum, electric charge, and entropy of a given black hole, by a single formulation, in any dimension, and with any asymptotics. Moreover, the codimension-2 surfaces of integration are almost relaxed to be chosen arbitrarily in the bulk. We have applied the formulation to find conserved charges and first law(s) of thermodynamics for the Kerr-dS black holes, unifying them with the Kerr and Kerr-AdS black holes. Refs. for more details: “Phys.Rev. D93, (2016), 4, 044074, arXiv:1512.05584”, and “Gen.Rel.Grav. 48, (2016), no.8, 114, arXiv:1602.05575”.

GR 14.6 Do 14:00 SFG 0150

The Question of Dark Energy — •Albrecht Giese — Taxusweg 15, 22605 Hamburg

Dark energy is considered to be one of the great mysteries of present-day physics. From measurements of the motion of type Ia supernovae, it has been concluded that the universe is undergoing accelerated expansion. To explain this acceleration, the universe is assumed to be filled with some type of (”dark”) energy.

However, there is a very unspectacular explanation for this measurement. There are indications that the speed of light 'c' was higher in the past. If this higher value is inserted into the Doppler equation to determine the speed from red-shifts, higher speeds are found for early stars. So there is no acceleration.

Mainstream physics objects to this, however, arguing that according to Einstein's theory of relativity, c has always been the known constant. However, this is not clearly stated by Einstein.

A variation of c will also explain the so called phenomenon of cosmological inflation in a very straight way. The underlying horizon problem, i.e. the apparent logical connection of parts of our universe far apart from each other can be the consequence of a very high 'c' at early times. There is no need for any other explanation.

GR 14.7 Do 14:00 SFG 0150

Galilean relativity with relativistic gamma factor — •Osvaldo Domann — Stephanstr. 42, D- 85077 Manching

SR as derived by Einstein is the product of an approach of 1905 when the interactions between light and the measuring instruments were still not well understood. SR is a rough undifferentiating heuristic approach which omits the origin of the constancy of light speed in inertial frames, arriving to wondrous results about time and space. With the findings made during the last 100 years by experimentalists, a critical revision of Einstein*s theoretical approach is more than overdue. Based on these findings, a theoretical approach is presented which takes into consideration the interactions between light and optical lenses and electric antennas of the measuring instruments, explaining why always *c* is measured in the frame of the instruments. Relativity is treated as a speed problem with absolute time and space variables resulting equations of Galilean relativity multiplied with the gamma factor. GR is the theory of gravitation of the SM and is based on time and space distortions and consequently a revision is also needed. An approach is also presented for gravitation based on the reintegration of migrated electrons and positrons to their nuclei. More at www.odomann.com

GR 14.8 Do 14:00 SFG 0150

Lorentz interpretation of GRT - comments, possible experimental proof — •Jürgen Brandes — Karlsruhe, Germany

Ludwig Neidhart reviewed book [1] and recommends it even to those who are critical against Lorentz interpretation (LI) of GRT: "Auch wer dem Standpunkt der Autoren kritisch gegenübersteht, wird es mit Gewinn lesen können, weil ...[2]". The well-known gravitational physicist Kip S. Thorne accepts the two standpoints as correct, the curved spacetime paradigm or classical GRT and the flat spacetime paradigm or LI of GRT. He asks: "Is spacetime really curved? Isn't it conceivable that spacetime is actually flat, but the clocks and rulers with which we measure it ...are actually rubbery?" and his answer is: "Yes." [2]. The poster presents these ideas and the first steps in calculating supermassive stellar objects (black holes) using TOV equation. Application of this equation on neutron stars and black holes using LI of GRT leads to results different from classical GRT possibly testable by astronomical observations of these stars and galactic centers.

[1] J. Brandes, J. Czerniawski: *Spezielle und Allgemeine Relativitätstheorie für Physiker und Philosophen - Einstein- und Lorentz-Interpretation, Paradoxien, Raum und Zeit, Experimente*, 4. Aufl., VRI 2010, [2] Website www.grt-li.de

GR 14.9 Do 14:00 SFG 0150

Derivation of the Schwarzschild metric from Special Relativity — •Carmesin Hans-Otto — Gymnasium Athenaeum, 21680 Stade, Harsefelder Straße 40 — Studienseminar Stade, Bahnhodstraße 5, 21682 Stade — Universität Bremen, Fachbereich 1, Pf 330440, 28334

The well known Schwarzschild metric is derived with especially few assumptions: A falling object increases its velocity v. So its energy is increased by the Lorentz factor. Due to the conservation of energy, the energy must decrease by another factor that describes the energy due to gravitation. A formula for this factor is derived. From this expression the blue-shift of a falling photon is obtained. The Schwarzschild metric is derived as a consequence.

GR 14.10 Do 14:00 SFG 0150

Where Einstein had failed: New Physics - logic and experimental checks — •Claus Birkholz — Seydelstr. 7, D-10117 Berlin

Einstein's bottom-up approach to GR by differential geometry prevented him from identifying its 4 invariants: He just succeeded in presenting an incomplete subset of its 2nd-order invariant giving rise to his detailed metric, while his energy-momentum tensor had been left on the level of a rough suggestion. The rest of parameters, which he arbitrarily subsumed under his cosmological "constant", then, had become a matter of enduring speculation.

The higher invariants got lost completely. The specific situation of time to stop running at the event horizon and reversing its sign, there, is not supported by Lagrangians of the variation calculus. With decreasing angular momentum, heavy mass will increase. This is the Dark-Matter phenomenon missing in Einstein's truncated version. The interior of a black hole is free of singularities. Leptons turn out to be composed structures.

Based on how an experimentalist is collecting data, the poster outlines a more realistic top-down construction giving a "ToE" - with Quantum Gravity, the 4-dimensionality of space-time, chiral "internal" substructures (of a GUT), the quark confinement, the composition of leptons, and the individual values of coupling constants being outputs resulting from theory. Einstein's curvilinear metric is fully quantised.

By calculating the fine-structure constant, its resulting deviation of only 0.08% (theory from experiment) is confirming the ToE details entering.