GR 14: Poster

Zeit: Montag–Donnerstag 0:00–24:00 Raum: Foyer KGI

GR 14.1 Mo–Do 0:00 Foyer KGI

Emission of massless spin-1/2 fermions by Kerr black holes — •Christian Röken, Ian Lerche, and Reinhard Schlickeiser — Institut für Theoretische Physik, Lehrstuhl IV: Weltraum und Astrophysik, Ruhr-Universität Bochum, Deutschland

Quantum theory predicts that a black hole is an emitter of various forms of radiation. Relativistic quantum theory anticipates that a Kerr black hole emits a spectrum of spin-1/2 fermions in its surrounding space-time region. As a consequence of this particle emission the black hole loses angular momentum and mass. Detection of the characteristic radiation can help to localize rotating, uncharged black holes.

Employing a dyadic Newman-Penrose spinor formalism on a Kerr manifold a generalized Dirac equation can, under the assumption of axial symmetry, be separated leading to two 1-dimensional wave equations for functions of the radial component and two differential equations for functions of the polar angle.

In this poster a new analytical approach is presented to solve the derived wave equations. Using an asymptotic substitution approach they can be transformed into Whittaker differential equations in an elementary way. Solutions are also obtained for the polar angle-dependent differential equations in the limits of small polar angles and negligible particle masses (e.g. neutrinos), so that asymptotic expressions for the fluxes of the number of fermions, energy and angular momentum in a solid angle element can be derived.

GR 14.2 Mo–Do 0:00 Foyer KGI

Special Relativity Derived from the Structure of Matter — •Albrecht Giese — Taxusweg 15, 22605 Hamburg

Historically, the phenomena of relativity gave us a great chance for a better understanding of the structure of matter. Some of the founders of SR like H. Lorentz proceeded on this >physical< way.

This chance, however, was given away when Einstein presented a theory, which solved the relativity related problems with an abstract concept of structures, without any relation to matter. We can excuse Einstein by the fact that at his time there was only a limited knowledge about matter. Stimulated by the deadlock in present physics, we should re-develop the process of understanding relativity. We should use the contraction of fields (Lorentz) rather than the contraction of space; and as well the slow down of elementary oscillators (Ziegler, Schrödinger) rather than the dilation of time.

We arrive at the same mathematics like with Einstein (= Lorentz Transformation), but have based it on truly physical facts, and we have gained knowledge about other areas of physics (i.e. particle structure). We win a theory of relativity which is so easy to comprehend, that it can be taken into physics lessons at school.

And we find an easily understandable mechanism that explains the increase of mass at motion and the mass-energy-relation, without any use of abstract principles.

For further information refer to www.ag-physics.org/relat

GR 14.3 Mo–Do 0:00 Foyer KGI

Is the Speed of Light 'c' a True Constant? — •Albrecht Giese — Taxusweg 15, 22605 Hamburg

Einstein has - in his structure-based theory of relativity - stated that the speed of light 'c' is a true constant under all circumstances. The physical community has accepted this up to now in spite of the problems arising from this paradigm; see the deadlock situation of present physics (Quantum Gravity).

The constancy of the speed of light has 3 aspects:

1.) Is 'c' the same for an observer in motion or at rest?

Einstein says: YES - Lorentz says NO; only the measured 'c' is constant resulting from the contraction of measuring rods and the desynchronization of clocks during motion.

2.) Is 'c' the same inside and outside a gravitational field?

Einstein says: YES - We can say: NO; 'c' is reduced in a grav. field, and not the space is curved but fields are; gravity is not force # 4 but a side effect of other forces

3.) Was 'c' a constant during the development of the universe?

Einstein says: YES - Magueijo says: NO; if we accept an (adapting) decrease of 'c', we can avoid the inflation in cosmology and the landscape of 10**100 universes.

The remarkable point of the alternative approaches mentioned above is that they yield the same mathematical results as the traditional version of Einstein, to the extent as they are confirmed by observations and experiments.

For further info see www.ag-physics.org/relat and /gravity

GR 14.4 Mo–Do 0:00 Foyer KGI

Ein Pseudo-Random Time-of-Flight Verfahren für das Atomstrahl-Spinecho Experiment — •Manuel Vedovelli, Felix Laux, Ulrich Schmidt und Maarten DeKieviet — Physikalisches Institut der Universität Heidelberg, Philosophenweg 12, 69120 Heidelberg

Bei der experimentellen Überprüfung des Gravitationspotentials im Submikrometer-Bereich auf einen nicht-Newtonischen Beitrag ist für Atome ein quantitatives Verständnis der Casimir-Kraft unentbehrlich. Mit unserer 3He-Atomstrahl-Spinecho-Methode haben wir gezeigt, dass dies auf einem Prozent-Niveau gegeben ist. Um Grenzen für Yukawa-Korrekturen zu setzen, vergleichen wir nun die Atom-Oberfläche-Wechselwirkungspotentiale von 3He und 4He auf diesem Niveau. Hierzu muss die Wellenlängenverteilung für jedes der beiden Isotope genauestens bekannt sein. Für 3He kann sie mit der Methode der Spin-Rotation präzise bestimmt werden. Für eine Messung der Wellenlängenverteilung von 4He wurde die Atomstrahl-Spinecho-Methode durch ein Pseudo-Random-Flugzeitmesssystem erweitert. Details des Experiments, seine Systematik und erste Resultate werden auf diesem Poster präsentiert.

GR 14.5 Mo–Do 0:00 Foyer KGI

How strong is the evidence for accelerated expansion? — •Marina Seikel and Dominik J. Schwarz — Universität Bielefeld

We test the present expansion of the universe using supernova type Ia data without making any assumptions about the matter and energy content of the universe or about the parameterization of the deceleration parameter. Using two different SN Ia data sets, two different fitting methods and two different calibrations, we observe large systematic effects. Nevertheless, the null hypothesis that the universe never expanded accelerated can be rejected at a high confidence level. The same test can be done in a calibration-free way, i.e. without assuming certain values for the Hubble constant and the absolute magnitude of the supernovae. But in this case the obtained evidence for acceleration is weaker than that obtained by the previous test.