GR 23: Poster (permanent)

Zeit: Freitag 14:45–14:45 Raum: HS 6

GR 23.1 Fr 14:45 HS 6

New materials for low noise measurements — •Gerd Hofmann[1], Christian Schwarz[1], Julius Komma[1], Daniel Heinert[1], Paul Seidel[1], Andreas Tünnermann[2], and Ronny Nawrodt[1] — [1]FSU Jena, Institut für Festkörperphysik, Helmholtzweg 5, D-07743 Jena, Germany — [2]FSU Jena, Institut für Angewandte Physik, Albert-Einstein-Strasse 15, D-07745 Jena, Germany

High precision applications like length measurements in gravitational wave oberservatories, laser stabilization, or micro-mechanical systems often suffer from disturbances due to thermal noise. There are two ways to overcome this problem, lowering the temperatures or the mechanical loss in the system. Silicon, sapphire, and gallium arsenide as crystaline materials are of great interest in these communities but not yet fully characterized.

We present a comparision of silicon, sapphire, and gallium arsenide in a wide temperature range from 5 to 300 K. Our measurements on silicon bulk samples show a peak in the mechanical loss around 120 K. A potential loss mechanism is discussed. We further show that Sapphire exhibits a low temperature limit according to the interaction of phonons i.e. Akhiezer damping. In gallium arsenide illumination with light in the visible range increases the mechanical loss. At low temperatures a hysteresis like behaviour can be observed. We link this with the creation of electrons and their interaction with acoustic phonons.

This work is supported by the DFG under contract SFB TR7.

GR 23.2 Fr 14:45 HS 6

Mechanical loss of ion-implanted tantala layers — •Bastian Walter, Julius Komma, Gerd Hofmann, Christian Schwarz, Daniel Heinert, Paul Seidel, Claudia Schnohr, and Ronny Nawrodt — Institut für Festkörperphysik, FSU Jena, Helmholtzweg 5, D-07743 Jena

The sensitivity of future gravitational wave detectors will be limited by Brownian thermal noise of the optical components. One approach is to utilize low mechanical loss materials for the substrates and coatings as well as cryogenic temperatures. However, high performance dielectric layers for high-reflectivity coatings - like tantala or silica - show large mechanical losses and thus high Brownian thermal noise at low temperatures due to their amorphous nature. It was found that co-doping of tantala layers with titania significantly reduces the mechanical loss and thus the Brownian thermal noise.

We present detailed studies of the mechanical loss of post-deposition ion-implanted tantala coatings and of the influence of heat treatments. These measurements give evidence that it is possible to reduce the mechanical loss of the tantala layers by ion-implantation.

This work is supported by the German science foundation DFG under contract SFB TR7.

GR 23.3 Fr 14:45 HS 6

Optical absorption of silicon around the fundamental band gap at low temperatures — •Philip Pastrik, Julius Komma, Gerd Hofmann, Christian Schwarz, Daniel Heinert, Paul Seidel, and Ronny Nawrodt — Institut für Festkörperphysik, FSU Jena, Helmholtzweg 5, D-07743 Jena

Silicon is a promising candidate material for the test masses of future gravitational wave detectors operated at cryogenic temperatures. Any optical absorption will introduce heat into the detector's substrates and, thus, should be minimized. For this reason a laser wavelength of 1550 nm is used with an energy well below the fundamental band gap of silicon. Nevertheless, multiple phonon processes will even lead to an absorption at 1550 nm and can influence the working temperature of the detector.

We studied the optical absorption of silicon near its band gap in a wide temperature range from 5 K to 300 K. In their fine structure these measurements reveal information on the emission and absorption of phonons. We also report a strong temperature dependence of these effects. Thus our results will be valuable for a systematic understanding of the absorption in silicon at 1550 nm.

This work is supported by the German science foundation DFG under contract SFB TR7.

GR 23.4 Fr 14:45 HS 6

Optical absorption measurements of silicon at 1550 nm — •Julius Komma[1], Gerd Hofmann[1], Christian Schwarz[1], Daniel Heinert[1], Jessica Steinlechner[2], Roman Schnabel[2], Paul Seidel[1], and Ronny Nawrodt[1] — [1]Friedrich-Schiller-Universität Jena, Institut für Festkörperphysik, Helmholtzweg 5, D-07743 Jena, Germany — [2]Institut für Gravitationsphysik, Universität Hannover, Callinstraße 38, D-30167 Hannover, Germany

Silicon is a common material for semiconductors and because of many applications in integrated circuits or devices like solar cells object of many investigations. In the last few years it became also - together with sapphire - one of the most interesting materials for the usage as a bulk material for optics in low noise applications like cryogenic gravitational wave detectors. The desired wavelength in such detectors is 1550 nm because of the low absorption. For this wavelength and the intended low temperatures in the region around 20 K there exists no measured data for the optical absorption in silicon.

We present a comparison of different measurement methods. One is based on the deflection of a probe laser beam due to the creation of a thermal lens created by the absorbed light. Another method is the thermal absorption measurement where the temperature rise of a sample of silicon is measured. Advantages, problems and accuracies of this two methods will be discussed.

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GR 23.5 Fr 14:45 HS 6

Monolithic silicon grating reflectors - Current status, chances and challenges for future gravitational wave detection — •Stefanie Kroker, Thomas Käsebier, Stefan Steiner, Ernst-Bernhard Kley, and Andreas Tünnermann — Friedrich-Schiller-Universität Jena Institut für Angewandte Physik, Abbe Center of Photonics, Max-Wien-Platz 1, 07743 Jena, Germany

In order to enhance the sensitivity of future gravitational wave detectors (GWDs), particularly the Brownian coating thermal noise of the optical components in the GWD has to be reduced. Besides an improvement of well-established highly reflective amorphous multilayer stacks two alternative approaches are under investigation: crystalline coatings based on $Al_xGa_{1-x}As$ or $Al_xGa_{1-x}P$ and monolithic resonant high-contrast gratings made of crystalline silicon. We discuss possibilities and current achievements of silicon reflectors with respect to feasible reflectance, spectral, angular bandwidth and thermal noise. To optimize the optical performance of the gratings we evaluate the impact of structure deviations on the maximum specular reflectance. It is distinguished between an enhanced transmittance and scattered light. Both result from fabrication processes, whereas the latter might severely disturb the signal in a GWD. It is found, that different parts of the grating structure exhibit significant differences in their sensitivity concerning structural imperfections. These results allow the optimization of fabrication for an improved optical performance. Concluding we compare the current status of crystalline coatings and silicon reflectors for applications in future gravitational wave detectors.

GR 23.6 Fr 14:45 HS 6

Book: Special and general theory of relativity — •Jürgen Brandes — Karlsbad

Exact and comprehensible are discussed [1]: The experimental proofs of relativity theory, the solutions of the paradoxies, the theses of the four-dimensional space-time-continuum of special relativity as well as the theses of curved, expanding and closed spacetime of general relativity. Included are the general relavistic solution variant of the twin paradox and the paradoxies of BELL, EHRENFEST and SAGNAC.

The so-called LORENTZ-interpretation was initiated by LORENTZ, POINCARÉ, BELL, SEXL and many others. It connects EINSTEIN's principle of relativity with the concept of a three-dimensional space and a one-dimensional time

An important point in [1] concerns energy conservation. Within NEWTON's theory there is a negative gravitational potential, on account of the famous relation $E = mc^2$ this means negative masses. Negative masses don't exist. Neither NEWTON's nor EINSTEIN's theory are able to explain the meaning of the negative energy of particles resting in the gravitational field. In spite of this, in certain limiting cases there exist contradictious formulas of total energy. In both of the cases LORENTZ-interpretation gives a clear, experimentally verifiable answer.

[1] J. Brandes, J. Czerniawski: *Spezielle und Allgemeine Relativitätstheorie für Physiker und Philosophen - Einstein- und Lorentz-Interpretation, Paradoxien, Raum und Zeit, Experimente*, VRI: 2010

GR 23.7 Fr 14:45 HS 6

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

The Michelson-Morley experiment has at the first glance given the impression that 'c' is a constant in relation to any system. However, at the second glance this constancy turns out to be pure measurement result.

H. Lorentz had pointed out that this apparent constancy is the result of well understood field behaviour. Einstein accepted this as a viable explanation, but he disliked it as it made an ether necessary, which he didn't want. He insisted in a theory with a constant 'c' with respect to any system. To achieve this, he had to assume a variation of space and time depending on the actual conditions of motion.

Einstein extended this principle about 'c' to gravitational fields. Even though it can be directly measured that 'c' is reduced there, Einstein again stated its constancy and explained the measurement result as a change of space-time (which is not directly measurable).

It is logically possible to transform Einstein's equations based on a constancy of 'c' and a variable space-time into a model, where space and time are fixed as always assumed but 'c' variable. This results in a much more straight understanding of physics with predominantly similar results as with Einstein.

Further information: www.ag-physics.org/gravity

GR 23.8 Fr 14:45 HS 6

The Question of Dark Energy — •ALBRECHT GIESE — Taxusweg 15, 22605 Hamburg

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

To shed light on this problem, we will give a survey of the concepts currently being discussed by the physics community. Furthermore, we will present an alternative solution which is on the one hand very straightforward and simple, but on the other hand contradicts some common assumptions of present-day physics, particularly regarding relativity. We will discuss to what extent these conflicts are critical in that they may exclude an otherwise viable solution.

Further information: www.ag-physics.org/gravity

GR 23.9 Fr 14:45 HS 6

Why Current Field Theories Are Doomed to Failure — •CLAUS BIRKHOLZ — Seydelstr. 7, D-10117 Berlin

Current field theories developed historically, in a bottom-up way. By appending one balcony after the other to old conceptions, the grand direction seems to have got lost meanwhile. This poster is outlining another, a top-down procedure starting with the most fundamental group-theoretical implications on general relativity (GR) and on quantum field theories (QFT's). Thus, it stopped systematically to preclude physics from answering the great questions.

Field theories are demonstrated to tumbling from one inconsistency to the next one, culminating in the "standard model", which is fitting hosts of parameters without scrutinizing if there is no better system to be fitted.

The most obvious example is quantum gravity, whose installation of a fully quantized GR failed since a century by the only reason that a bent space-time has not yet been accepted to be the simple result of a non-linear condition (2nd-order SU(2,2)-Casimir) leaving untouched the superposition principle of linear quantum theories.

And QFT's are suffering under their ignorance of (Kronecker-) singlets.

GR 23.10 Fr 14:45 HS 6

Die große Vereinigung der Kräfte ist geschafft. — •DIETER GROSCH — Seyferthstr 25 06618 Naumburg

In Newtons Gravitationstheorie findet man vergeblich die nach seinem 3. Axiom notwendige Antigravitation Meine *Dynamischen Gravitationstheorie*, vorgetragen auf der DPG-Tagung 2007 (1), schließt diese Lücke, indem sie die Fliehkraft, die man heute als Scheinkraft bezeichnet, zur realen abstoßenden elektrischen Ladung als Antigravitation macht. Leider hat Coulomb diesen Schluss noch nicht gezogen, weshalb man nach 250 Jahren diese Lücke immer noch nicht schließen konnte In meinem Poster ist nun beschrieben, dass Bewegung einer Masse zur Erzeugung einer elektrischen Ladung führt, so wie es meine Theorie vorhersagt Daraus ergibt sich, das die gesamte Physik dann nur noch eine einzige Konstante, die der Masse eines *Elementaren Teilchens* mit 2,78E-28 kg, benötigt Das beschriebene, und beim Besuch selbst durchführbare, Experiment beweist die in der Theorie gemachte Behauptung und bestätigt damit, das elektrische Ladung Antigravitation ist, und alle Erscheinungsformen der Natur nur unterschiedliche Verhältnisse zwischen Gravitation und Antigravitation, also unterschiedliche Bewegungszustände, darstellen (1) www.grosch.homepage.t-online.de