ICFO Colloquium Series: Next-generation gravitational wave detectors - a (quantum) metrological challenge

MICHELE HEURS

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12:00 to 13:00
ICFO Auditorium

BIO

Born in 1975, Michele studied physics in Hannover (diploma thesis at the ?Institut für Atom und Molekülphysik, Abteilung Spektroskopiei¿½ on the topic of ?Long-term frequ ncy stabilisation of a Nd:YAG laser system for GEO600i¿½). She defended her PhD in Dec 2004 at the Institute for Gravitational Physics on ?Gravitational waves in a new light: novel stabilisation schemes for solid state lasersi¿½and was a PostDoc at the Max Planck I stitute for Gravitational Physics from 2005 to 2007. From 2007 to 2010, she was a PostDo at the University of New South Wales (Australia) in the group of Elanor Huntington. In July 2

10, she returned to Hannover to take up a junior professorship on ?Fundamental Noise So rces in Laser Interferometersi¿½ within the Centre of Excellence QUEST (Quantum Engin ering and Space-Time Research). Since 2016 she is a professor of experimental physics t Leibniz Universitat Hannover (LUH) and works in the field of ?Non-classical laser interfe ometryi¿½ and i¿½Quantum Controli¿½. In 2017 she received the teaching award of LUH and the faculty of Mathemati
s and Physics). Michele is a long-time member and, since 2015, a council member of the LIGO Scientific Collaboration (LSC). She is Dean of QUEST Leibniz Forschungsschule, an i terdisciplinary faculty at LUH, and principal investigator in two Centres of Excellen e, PhoenixD and QuantumFrontiers. She is a founding member of the German Centre or Astrophysics (Deutsches Zentrum für Astrophysik, DZA). Her research interests are no -classical light sources (?squeezed lighti¿½), in particular at high frequencies, quantum radiation pressure noise reduction techniques (such as Coherent Quantum Noise Can ellation), quantum optomechanics, precision metrology, and novel laser stabilisation techniq es, metamaterials, as well as high-bandwidth high-efficiency photodetection and controls.

ABSTRACT:

Since the first direct detection of gravitational waves in 2015, we have gained an entirely new observation window to the universe. The sensitivity of these interferometers is so incredible that the quantum effects of the laser light have become limiting. Ultra-precisely stabilise lasers do not suffice; non-classical light is already routinely employed in the curren generation of gravitational wave detectors (e.g. aLIGO & AdVirgo). Other noise sources, suc as seismic and thermal noise, pose further challenges for next-generation detectors To achieve ever-higher detection rates for meaningful gravitational wave astronom , ever-greater detection sensitivity is required. I will briefly introduce the principle o interferometric gravitational wave detection (for any students present) and highlight some of the advanced technologies implemented. The European Project ?Einstein Telescopei¿ ?, a third-generation observatory, will also feature. I will conclude my talk by showing some further possibilities related to this, as well as options for quantum noise reduction in aser interferometry and the broader field of quantum op
ics. At the end of the talk, I'll also be happy to talk a bit about the newly-funded German C ntre for Astrophysics (Deutsches Zentrum für Astrophysik,

ZA). Hosted by: Prof. Dr. Adrian Bachtold

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