

Gravitational Wave Physics: From Fundamental Principles to Next-Generation Observatories

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Abstract

This school aims to provide the next generation of physicists with a comprehensive foundation in gravitational wave science, seamlessly integrating theoretical modeling, data analysis, and advanced experimental techniques. On the theoretical side, students will explore gravitational radiation theory, compact binary source modeling, and the cosmological gravitational wave background. On the experimental side, the program covers the fundamental principles and cutting-edge technologies of laser interferometers, including thermal and Newtonian noise mitigation, quantum squeezing, and active control systems. By bridging fundamental theory, precision instrumentation and signal analysis, the school will foster essential collaborations between theorists and experimentalists, collaborations that are crucial for analyzing current data and shaping the future directions of third-generation and space-borne observatories such as the Einstein Telescope and LISA.

Speakers

- **Nils Andersson**
(University of Southampton)
- **Sebastiano Bernuzzi**
(Jena University)
- **Mattia Boldrini**
(Sapienza University, Rome)
- **Geppo Cagnoli**
(Universit  Claude Bernard Lyon)
- **Neil J. Cornish**
(Montana State University)
- **Sibilla Di Pace**
(Sapienza University, Rome)
- **Daniel Figueroa**
(Valencia University)
- **Rossella Gamba**
(UC Berkeley and SNS, Pisa)
- **Michele Punturo**
(INFN Perugia)
- **Fulvio Ricci**
(Sapienza University, Rome)
- **Lucia Trozzo**
(INFN - Napoli)
- **Bill Weber**
(University of Trento)

Topics

- “Introduction to GW theory”
- “Modelling of GW sources and compact binaries”
- “Control schemes: error signals, loop, modern control, TCS”
- “Introduction to experimental aspects of GW detection, II part”
- “Science Inference”
- “Quantum noise and squeezing”
- “GWs and the cosmological background”
- “Modelling of GW sources with specific applications to 3G detectors”
- “ET and 3G detectors”
- “Introduction to experimental aspects of GW detection, I part”
- “Low frequency suspension, Newtonian noise”
- “LISA and GW detection in space”

Organizers

Annalisa Allocca (University of Napoli), Jerome Degallaix (LMA-CNRS), Matteo Di Giovanni (SNS - Pisa), Andrea Maselli (GSSI - L'Aquila), Andrea Mitridate (Imperial College London), Albino Perego (University of Trento), Michele Redi (INFN - Firenze)

