

1. Record Nr.	UNINA9910427690703321
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Titolo	Superradiance : New Frontiers in Black Hole Physics / / by Richard Brito, Vitor Cardoso, Paolo Pani
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2020
ISBN	3-030-46622-1
Edizione	[2nd ed. 2020.]
Descrizione fisica	1 online resource (XXI, 293 p. 100 illus., 68 illus. in color.)
Collana	Lecture Notes in Physics, , 1616-6361 ; ; 971
Disciplina	535
Soggetti	Gravitation Cosmology Elementary particles (Physics) Quantum field theory Classical and Quantum Gravity Elementary Particles, Quantum Field Theory
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Milestones -- Superradiance in Flat Spacetime -- Superradiance in Black-Hole Physics -- Black Holes and Superradiant Instabilities -- Black Hole Superradiance in Astrophysics -- Conclusions and Outlook.
Sommario/riassunto	This book focuses on one mechanism in black hole physics which has proven to be universal, multifaceted and with a rich phenomenology: rotational superradiance. This is an energy extraction process, whereby black holes can deposit their rotational energy in their surroundings, leading to Penrose processes, black-hole bombs, and even Hawking radiation. Black holes are key players in star formation mechanisms and as engines to some of the most violent events in our universe. Their simplicity and compactness make them perfect laboratories, ideally suited to probe new fields or modifications to the theory of gravity. Thus, black holes can also be used to probe some of the most important open problems in physics, including the nature of dark matter or the strong CP problem in particle physics. This monograph is directed to researchers and graduate students and provides a unified view of the subject, covering the theoretical machinery, experimental

efforts in the laboratory, and astrophysics searches. It is focused on recent developments and works out a number of novel examples and applications, ranging from fundamental physics to astrophysics. Non-specialists with a scientific background should also find this text a valuable resource for understanding the critical issues of contemporary research in black-hole physics. This second edition stresses the role of ergoregions in superradiance, and completes its catalogue of energy-extraction processes. It presents a unified description of instabilities of spinning black holes in the presence of massive fields. Finally, it covers the first experimental observation of superradiance, and reviews the state-of-the-art in the searches for new light fields in the universe using superradiance as a mechanism.

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