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Sommario/riassunto	The advent of high-precision antihydrogen spectroscopy has opened up the possibility of direct tests with unprecedented accuracy of some of the most fundamental principles of physics, notably Lorentz and CPT symmetry and the Einstein equivalence principle. This book reviews these principles, emphasising their interconnections in quantum field theory and general relativity and the special role of antimatter, and explores how they may be tested in current and forthcoming experiments on antihydrogen. Original research results relevant to the experimental programme of the ALPHA collaboration at CERN are presented, together with the implications for antihydrogen of proposed theories featuring novel 'fifth-force' interactions.