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Nota di contenuto	Atomic clocks, cold atoms and gravitational waves -- Part 1: Cavities for Optical Atomic Clocks -- Thermal-noise-limited room-temperature ULE cavity -- Isolation from external perturbations -- Measuring resonator stability -- Part 2: Cavities for Atom Interferometry -- Cavity atom optics -- Fundamental limitations of cavity-assisted atom interferometry -- Gravitational wave detection with cavity-assisted atom interferometry -- 4-mirror large-waist cavity with tuneable stability for enhanced atom interferometry -- Part 3: Cavities for Gravitational-wave Detection -- Near-unstable cavities for future gravitational wave detectors -- Modelling parametric instabilities at Advanced LIGO and ET -- Summary and conclusions -- Appendix.

Sommario/riassunto

Devised at the beginning of the 20th century by french physicists Charles Fabry and Alfred Perot, the Fabry-Perot optical cavity is perhaps the most deceptively simple setup in optics, and today a key resource in many areas of science and technology. This thesis delves deeply into the applications of optical cavities in a variety of contexts: from LIGO’s 4-km-long interferometer arms that are allowing us to observe the universe in a new way by measuring gravitational waves, to the atomic clocks used to realise time with unprecedented accuracy which will soon lead to a redefinition of the second, and the matterwave interferometers that are enabling us to test and measure gravity in a new scale. The work presented accounts for the elegance and versatility of this setup, which today underpins much of the progress in the frontier of atomic and gravitational experimental physics.