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Descrizione fisica	1 online resource (125 pages)
Collana	IOP Ebooks Series
Soggetti	Causality (Physics) Dispersion relations
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
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Nota di contenuto	Intro -- &lt; -- named-book-part-body& -- #62 -- &lt; -- p& -- #62 -- It is the theory that decides what we can observe.&lt; -- /p& -- #62 -- &lt; -- p& -- #62 -- & -- #x002013 -- &lt; -- italic& -- #62 -- Albert Einstein&lt; -- /italic& -- #62 -- &lt; -- /p& -- #62 -- &lt; -- p& -- #62 -- This book is about powerful relations due to causality, often in combination with other general principles, such as unitarity and space& -- #x002013 -- time symmetries. These general relations are widely used in many fields of physics, from optics and atomic theory to gaining insights into quantum gravity. Yet, they are rarely a part of the sta -- Acknowledgements -- Author biography -- Vladimir Pascalutsa -- Chapter Introduction -- References -- Chapter Some rules for sum rules -- 2.1 Causality and analyticity -- 2.2 Derivation of dispersion relations -- 2.2.1 An elementary example: the inverse square root -- 2.3 Crossing symmetry -- 2.4 Unitarity -- 2.5 Low-energy theorems and sum rules -- 2.5.1 The good, the bad, and the ugly? -- 2.6 Relaxing the convergence condition -- 2.6.1 An elementary example: the logarithm -- 2.7 Divergencies, subtractions, and renormalization -- 2.8 An approximate sum rule for the proton charge -- References -- Chapter The Kramers-Kronig relation -- 3.1 Refraction in a relativistic medium -- 3.2 The low-frequency limit: the Lorentz-Lorentz

relation -- 3.3 CMB refraction index -- Chapter Sum rules for Compton scattering -- 4.1 Forward kinematics: helicity amplitudes for any spin -- 4.2 Optical theorem: dispersion relation -- 4.3 Low-energy expansion and sum rules -- 4.4 Empirical evaluations for the nucleon -- References -- Chapter Virtual Compton scattering and quasi-real sum rules -- 5.1 VVCS and structure functions -- 5.2 Elastic versus Born contributions -- 5.3 The Burkhardt-Cottingham sum rule. 5.4 The Schwinger sum rule -- 5.5 Generalized Baldin sum rules -- 5.6 Longitudinal amplitude: to subtract or unsubtract? -- 5.7 The Bernabéu-Tarrach sum rule -- 5.8 Validation in the parton model -- 5.9 Further spin-dependent relations -- References -- Chapter Sum rules for light-by-light scattering -- 6.1 Compton scattering off a photon -- 6.2 Symmetries, unitarity, and dispersion relations -- 6.3 Effective field theorems -- 6.4 The sum rules -- 6.5 Perturbative verification -- 6.6 Non-perturbative verification: bound state -- 6.7 Implications for mesons -- 6.8 Composite Higgs -- References -- Chapter Virtual light-by-light scattering -- 7.1 Forward scattering amplitudes -- 7.1.1 General decomposition of the forward LbL amplitude -- 7.1.2 Unitarity -- 7.1.3 Dispersion relations -- 7.1.4 Low-energy expansion via an effective Lagrangian -- 7.2 Sum rules in perturbation theory -- 7.2.1 Scalar QED -- 7.2.2 Spinor QED -- References -- Chapter Compton-scattering sum rules for vector bosons -- 8.1 Electromagnetic moments: natural values -- 8.2 Gauge symmetries and spin degrees of freedom -- 8.3 Tree-level unitarity: GDH sum rule -- 8.4 Forward VVCS and virtual LbL scattering -- References -- Chapter Vacuum polarization and g_2 of the muon -- 9.1 Vacuum polarization in QED -- 9.2 Unitarity and sum rules -- 9.3 Introduction to the muon anomaly -- 9.4 Hadronic vacuum polarization in the muon anomaly -- 9.5 Muon anomaly via the Schwinger sum rule -- References -- Chapter Dispersion theory of hydrogen-like atoms -- 10.1 Quantum-mechanical Coulomb problem -- 10.2 One-photon exchange in dispersive representation -- 10.3 Vacuum polarization contributions to the Lamb shift -- 10.3.1 The first-order effect -- 10.3.2 Second-order effect -- 10.4 Finite-size effects -- 10.4.1 Lamb shift -- 10.4.2 Hyperfine splitting. 10.5 Two-photon exchange and polarizability effects -- 10.6 Radiative corrections -- 10.6.1 VP2 correction -- 10.6.2 VP1 correction to the Lamb shift -- 10.6.3 VP1 correction to HFS (figure 10.1(c)) -- 10.6.4 Combining VP1 and VP2 -- 10.7 Proton self-energy and the charge-radius definition -- References.

Sommario/riassunto

Causality: Cause and effect. In classical physics, an effect cannot occur before its cause. In Einstein's theory of special relativity, causality means that an effect cannot occur from a cause that is not in the back (past) light cone of that event.
