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Nota di contenuto	Preface; Contents; 1. The Standard Model of Electroweak Interactions; 1.1 Weak interactions in the original Fermi approach; 1.2 Weak interactions and the intermediate vector bosons; 1.3 The Higgs mechanism in the local SU(2) gauge symmetry case; 1.4 Unification of weak and electromagnetic interactions in the Standard Model; 1.4.1 The SU(2) U(1) description of electroweak interactions; 1.4.2 Gauge boson masses in the SU(2)L U(1)YL scheme; 1.4.3 The (W; Z) mass relationship and the 0 parameter; 1.4.4 Electroweak unification and weak neutral currents 1.4.5 Numerical prediction for the gauge boson masses in the Minimal Standard Model 1.5 Z physics as a test of the MSM; 1.5.1 The Higgs scalar mass in the MSM; 1.5.2 A more complete formulation of the MSM; 1.5.2.1 Inclusion of strong interactions; 1.5.2.2 Masses of leptons and quarks; 1.5.2.3 Family replication; 1.5.3 Tests of the MSM at LEP1/SLC; 1.5.4 Universality of weak interactions and number of fermion families; 2. Z Physics at Tree Level; 2.1 Conventions, spinors and basic cross sections; 2.2 Chiral fermions and polarized cross

sections in the one-photon exchange

2.3 Interaction involving a Z boson 2.4 Computation of Z partial widths; 2.5 Angular and polarization asymmetries; 2.6 Asymmetries in the vicinity of the Z pole; 3. Z Physics at One Loop for Final Leptonic States; 3.1 Definition of physical input parameters and removal of infinities at one loop in e+e annihilationon Z resonance; 3.1.1 The theoretical description at tree level; 3.1.2 Renormalizability and gauge transformations in the MSM; 3.1.3 Treatment of formally divergent quantities in e+e; 3.1.4 The dimensional regularization method
3.1.5 Definition of physical parameters: renormalization of mWmZ; 3.1.6 Charge renormalization and definition in the MSM; 3.1.7 The `running'' of QED in the MSM; 3.2 Theoretical description of the Z physics observables at one loop in the MSM; 3.2.1 Choice of the most convenient input parameters: definition of the physical GF; 3.2.2 Derivation of Sirlin''s equation: introduction and definition of the fundamental parameter r; 3.2.3 Calculation of r(f): identification of four classes of physical effects; 3.2.4 Numerical estimate of   (m2 Z)(f)
3.2.5 Determination of rW and calculation of the W mass 3.2.5.1 Numerical estimate of 1(0); 3.2.5.2 Numerical estimate of 3(m2 Z); 3.2.5.3 Numerical estimate of 2; 3.2.5.4 Calculation of the W mass; 3.3 Formulation of Z physics at one loop: introduction of the effective weak parameter sin2 W; eff; 3.3.1 Operative definition of the electroweak mixing angle: the longitudinal polarization asymmetry; 3.3.2 Calculation of sin2 W; eff at one loop: fermion pairs contributions to self-energies; 3.3.3 Relationship between sin2 (f) and mZ
3.3.4 The Z leptonic width at one loop in the `fermion pairs'' approximation

Sommario/riassunto

This book describes the memorable theoretical work that motivated the construction of the electron-positron accelerators at CERN and SLAC, and the monumental experimental effort that led to a verification of the main theoretical expectations at these laboratories and at Fermilab. The aim is to provide a description of the theoretical work, as well as a synthesis of the experimental effort, which makes interesting reading for both theorists and experimentalists. In particular, the experimental measurements, discussed in the second part of the book, are systematically related to the theoretical