

REVIEW OF PARTICLE PHYSICS*

Particle Data Group

Abstract

The *Review* summarizes much of particle physics and cosmology. Using data from previous editions, plus 3,324 new measurements from 878 papers, we list, evaluate, and average measured properties of gauge bosons and the recently discovered Higgs boson, leptons, quarks, mesons, and baryons. We summarize searches for hypothetical particles such as supersymmetric particles, heavy bosons, axions, dark photons, etc. Particle properties and search limits are listed in Summary Tables. We give numerous tables, figures, formulae, and reviews of topics such as Higgs Boson Physics, Supersymmetry, Grand Unified Theories, Neutrino Mixing, Dark Energy, Dark Matter, Cosmology, Particle Detectors, Colliders, Probability and Statistics. Among the 120 reviews are many that are new or heavily revised, including a new review on High Energy Soft QCD and Diffraction and one on the Determination of CKM Angles from B Hadrons.

The *Review* is divided into two volumes. Volume 1 includes the Summary Tables and 98 review articles. Volume 2 consists of the Particle Listings and contains also 22 reviews that address specific aspects of the data presented in the Listings.

The complete *Review* (both volumes) is published online on the website of the Particle Data Group (pdg.lbl.gov) and in a journal. Volume 1 is available in print as the *PDG Book*. A *Particle Physics Booklet* with the Summary Tables and essential tables, figures, and equations from selected review articles is available in print and as a web version optimized for use on phones as well as an Android app.

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HIGHLIGHTS OF THE 2020 EDITION OF THE REVIEW OF PARTICLE PHYSICS

All PDG data and review articles are available online at pdg.lbl.gov.

878 new papers with 3,324 new measurements

- 411 new papers from *LHC* experiments (ATLAS, CMS and LHCb).
- Extensive up-to-date *Higgs boson* coverage from 117 new papers with 201 measurements, including latest results on mass, couplings, decay width and branching ratios, plus searches for other neutral and charged Higgs bosons.
- *Supersymmetry*: 83 new papers with major exclusions.
- *Top quark*: 36 new papers provide latest results on mass, coupling, and constraints on various models of physics beyond the Standard Model involving top-quark production and decay.
- Latest from *B-meson physics*: 85 papers and 356 measurements, including observations of new excited Λ_b baryons and new pentaquark states.
- 5 new sections including limits of cross sections in *WIMP and Dark Matter Searches* for masses in the GeV range (65 new entries, including also older results).
- *Heavy Neutral Lepton* Listings reorganized and extended.
- New *proton charge radius* measurements appear to resolve charge radius puzzle.

120 reviews (most are revised)

- New reviews on:
 - *High Energy Soft QCD and Diffraction*.
 - *Determination of CKM Angles from B Hadrons*.
- Significant update/revision to reviews on:
 - Major revision of *Physical Constants* following the 2019 redefinition of units in the International System of Units.
 - *Electroweak Model* and *CKM* reviews provide latest fits of Standard Model parameters.
 - *Structure Functions* review includes new discussion on transverse momentum dependent distributions (TMDs).
 - *Top Quark* review summarizes latest results and constraints on new physics from top quark.
 - $D^0-\bar{D}^0$ *Mixing* summarizes latest results and discusses implications of first observation of CP violation in D^0 decays.
 - Completely rewritten review on *Neutrino Masses, Mixing and Oscillations* discusses latest results from solar, atmospheric, reactor and accelerator-based neutrino experiments and provides global fit values for mixing parameters and mass spectrum.
 - *Pentaquarks* review updated based on new LHCb measurement of hidden-charm pentaquarks.
 - *Monte Carlo Neutrino Generators* includes new extensive discussion on nuclear scattering.
 - Completely rewritten review on *Dark Matter*.
 - *Experimental Tests of Gravitational Theory* revised and extended to include gravitational waves.