

PDG Responses to Comments of 2010 PDG Advisory Committee

3. Review articles

Many review articles were revised for the 2010 edition of the RPP. The committee wishes to applaud the PDG and the authors of the review articles for attaining a large number of reviews of superb quality. The reviews comprehensively cover a large fraction of the issues at the current frontier of particle physics.

We noted, however, that the policy for including preliminary results in the review articles was not followed consistently between reviews. As an example, the Higgs boson review includes preliminary Tevatron results whereas the leptoquark review does not. It is very important that the policy be uniform to avoid even the appearance of partiality in the reviews. We urge the leadership of PDG to enforce the rules on the uniform coverage in all the review articles.

We did include the latest preliminary results (after Moriond this year) in the reviews: for example: W' , Z' , and leptoquarks. We agree that the policy should be uniform and do try to accomplish this, but sometimes it is hard to even get reviews back in time.

In the following the committee wishes to point out several articles that, based on the best judgment of its members, if revised, could provide more benefit to our community:

a) Given the new emphasis in the field of low energy neutrino measurements, a review of low energy neutrino properties would be appropriate. For example, not only the total cross section, but the quasi-elastic cross section (as a function of neutrino energy), and also the ratio of pion production cross section to quasi-elastic cross section (for charged and neutral pion production) would be extremely valuable. The information on neutrino cross sections in the current RPP reflects the knowledge and priorities in the field in 1990s and there is considerable room for improvement.

We have added a new review on low energy neutrino measurements. The author of the review is Geralyn (Sam) Zeller from Fermilab. Her review covers neutrino total cross section, quasi-elastic, pion/kaon production, and other low energy neutrino measurements.

b) Cosmological limits on neutrino masses: the current set of papers to be read for inclusion in the RPP is identified by searches on journal article titles and abstracts. However, sometimes useful information, for example, on neutrinos, is included in the text of the document but not the title or abstract. This procedure has the risk of missing this information. We recommend that a third reader be assigned in this area, this would be helpful so that articles that discuss neutrinos in the text but not in the title or abstract can be included in the PDG Review.

It is certainly true that several papers would be missed if all we did is go by the literature scan that is sent to encoders. Keith Olive independently adds a fair fraction of the papers to the listing that are not picked up in the scans. While that's not really a third reader, he tries to set aside any relevant paper he sees for encoding, and then also take the ones he finds and checks the papers that are referenced in them. We actually doubt we miss much (if anything) at the end.

c) We would suggest that a table of neutrino beamline parameters be included in the RPP. It could be listed, for example, along with the High Energy Collider Parameters tables. The table could include the beamlines that served the experiments such as NuTeV, CHORUS, NOMAD, K2K, T2K, MINOS, MINERvA, MiniBooNE and SciBooNE. We note that Dr. Sacha Kopp put together a thorough review article on accelerator-based neutrino beams including parameters like proton power, proton energy, target material, decay pipe length, baseline length, and type of focusing elements (horns, quadrupoles, etc.) (Sacha E. Kopp, Phys. Rept. 439:101-159, 2007). He might be a good candidate as either an author or a reviewer of such a table.

We have added a new table in RPP2012 to list the various neutrino beamline parameters.

d) We were pleased to learn that there will be a review article on event generators. We would like to see some discussion of neutrino event generators (for example, GENIE) included in this article.

We have two new authors for the proposed neutrino event generators: Hugh Gallagher and Yoshinari Hayato. They are actively working on the article. However, their draft was not ready in time for the RPP2012 edition. We will incorporate their review in the next update.

e) We wish to recommend a more didactic approach to the Electroweak review article, following the example of the new QCD review, to make it even more useful to the intended audience. One possibility is to put the theoretical framework all at the beginning, and then follow up with the fits and the searches for new physics at the end. We note that in the 2010 review article there is a more detailed description of the corrections that were made to the NuTeV result. The statement that the full analysis is still pending is, we find, helpful for describing the correct status of the measurement.

This has been implemented following your suggestion. Regarding NuTeV, during this year's update one of the authors (Jens Erler) spent a half day at Fermilab to discuss with the spokespeople about how best to present the current situation (Paul Langacker participated via conference call). Later, they communicated to Jens and Paul that they were "very happy with what came out".

f) We concur with Guenther Dissertori's proposal to write a short review article introducing lattice QCD. In addition, we suggest adding introductions to Heavy Quark Effective Theory and Soft Collinear Effective Theory. They deserve to be on a similar footing of importance, in part because we are not aware of many introductions to these topics. Depending on the authors, we think there might be two or three review articles on these topics.

This was implemented.

g) We suggest that a short segment be added to the QCD review on neutrino deep inelastic scattering, introducing F_3 and maybe referencing some experimental results.

The QCD authors concluded that it is more appropriate for the F_3 discussions to appear in the Structure Functions review. The discussion of F_3 is in section 18.2 of the Structure Functions review.

h) We think it would be useful to add a short segment to the structure function review on Generalized Parton Distributions, but emphasize that this should be short and mostly point the interested reader to other introductions.

This was implemented, see: Review 18, section 6

i) Given the importance of a value (and error) of α_s , we recommend reference to the paper by S. Bethke (Eur.Phys.J.C64:689-703,2009) be given in Table for Physical Constants.

We use our own value of α_s from the QCD review (of which Bethke is an author).

j) We note, regrettably, that our previous recommendation on the Higgs review article was not followed up. We reiterate our strong recommendation that the size of the Higgs review article be reduced.

Some example of overly long descriptions include:

- On p.3 (of the stand-alone pdf version), it is sufficient to say that LEP reached a center-of-mass energy of 209 GeV.
- The list of higher order corrections to the Higgs production cross-section could be shortened by dropping the descriptions of the smaller corrections and listing all the references with “other, smaller corrections.”
- The description of the LEP analyses, starting in the middle of p.9 and ending at the bottom of p.11 seems excessively detailed. This could certainly be shortened by a page.
- Similarly, the description of the Tevatron searches, pp. 12-18, includes a (heavy) itemization of all channels which could be given in a much more succinct way in a Table.
- The combined Figure could be used rather than Figs. 6 and 7.

Similar considerations apply to the BSM Higgs part.

The committee’s recommendations were given to the authors of this review. Some parts were removed but more essential material was added. Given the prominence and active nature of the Higgs results, we felt that a substantial review was in the best interest of our community.

k) We find that the dark matter review is too qualitative, especially regarding the direct detection. We recommend that the authors add a plot that summarizes the current bounds from the leading experiments (such as CDMS, XENON, DAMA etc...) on the cross sections for the spin-dependent and spin-independent cases. The authors may wish to describe more clearly the assumptions regarding the dark matter density and velocity distribution (with corresponding references). Also, we suggest a brief description (and references) for how to calculate the direct detection scattering rate be added to help the readers understand the plot.

The Dark Matter review has been extensively revised in accord with the committee's comments and suggestions. While the theory has received only minor revisions, the experimental discussion has been considerably expanded, and was up to date as of September 2011. The results of more than 10 published experiments are discussed, and compared in three new figures. As a result, the review is a bit longer.

l) There are some indications that some class of strong dynamics models can be qualitatively described via extra dimension models. Specifically Higgsless models of warped extra dimension might be similar to Technicolor models, and Randall-Sundrum models to Composite Higgs ones. While the former is mentioned in the Dynamical Electroweak Symmetry Breaking review the latter is not. We recommend that a comment (and relevant references) be added. Furthermore, this should also be mentioned in the new version of the Extra Dimension review. The two reviews should cross-reference each other consistently in order to maintain the integrity of the RPP. We suggest some communications between the two groups of authors should be established.

There is some coverage now in the Extra Dimensions review. Not everything can be accomplished with authors who are not paid and are very busy with other obligations. We will continue pursue this for the next edition.

m) The review article on cosmology is excellent and serves the particle physics community well. It is our judgment that the scope of PDG's role on covering cosmology and related astrophysics is appropriate at the level of the current review.

Thank you.

4. Preparedness for the LHC era

The LHC experiments seem to be ramping up to a high rate of publications, at least equivalent to that of Belle and Babar. The literature search and the data encoding are likely to be significantly more complex than that of Babar and Belle. There needs to be a stronger connection between PDG and the physics working groups of the LHC experiments. The committee notes, however, that it is important to avoid any appearance of partiality in working with the physics working groups of the collaborations, for example, ATLAS vs CMS.

We have continued and enhanced our connections with working groups. At this time there are a limited number of combined LHC working groups. The Higgs working group is the major exception. We have a good working relationship with the ATLAS and CMS physics groups. We sent our encodings for review by the experiments, and we received some good feedback (for example for top quark and heavy bosons sections). We are fully able to deal with any discoveries – via listings and reviews. Our handling of the very last second (for us) discovery of a Higgs-like boson is an outstanding example.

A procedure for finding the right place (or name) for listing new particles/signatures at LHC needs to be developed. Narrow resonances are reasonably easy to pin down as far as a particle listing is concerned, other signatures may not be as easy. For example, there may be a dilepton resonance that could be listed in a standard JPC listing, but other signatures might just merit a mini-review that sticks to the facts and stays away from speculation about the interpretation--this would get clarified as more data accumulates.

We do not think, for now, there is a way to provide a generic description of how to list new signatures that may be seen at LHC.

5. Operations

The committee was pleased to see that PDG has started writing up a document that describes the procedures and policies, and the committee looks forward to viewing the document in advance of the next review.

Given intensive, time-consuming work by group members on the major computing upgrade, further work on this document has been postponed, but will be addressed in the coming year.

The committee learned that the contribution of three retirees, Orin Dahl, Don Groom, and Charles Wohl, has been indispensable for the PDG operation, in particular, a timely completion of each RPP edition. Their knowledge and experience have been the key to the PDG's continuing success. The committee urges that the Physics Division support the PDG to retain these valuable human resources.

Until now, the Physics Division has been successful in getting the lab to continue the appointments of the retirees. It is however a year by year renewal

The committee heard the status of the computing upgrade. The computing upgrade was scheduled to take 6 person years (including contingency) and four of those have already been spent. The project has 9 months before the end date of a 3-year project. The PDG is now providing the first user test, although a fully operational user interface is not yet available. The statement was made that the computing upgrade was on time and would end 3-4 months before the funding runs out. The committee found it credible. Nevertheless, the committee would like to point out that it is not guaranteed and vigilance is needed to assure that the upgrade is completed while the programmers are still available.

The transition to operations seems to be in good shape since the PDG can keep a half-time programmer. We encourage the Computing Division to make sure that this programmer be one of the three people who developed the system to ensure maximum effectiveness.

Thanks to the computing infrastructure upgrade, the PDG management will have better tools in place to oversee the project including the tools to give the management early warnings of delinquent contributions.

The Computing upgrade was completed on time and budget (and our funding agencies are extremely happy). This is a truly a major success for which Juerg Beringer deserves much credit. We retained one of the original developers as a maintenance person who will also continue improvements as needed.

The book and the booklets were somewhat late this year due to the publisher. In the future, we recommend past performance be a criterion for vendor qualification. The PDG should evaluate the delivery schedule history of each of the vendors it is considering, and factor that history into the choice of future publishers. The PDG should evaluate whether or not to include a journal's activity in particle physics in the vendor qualification process. The PDG could also organize a review to inquire about the price that people would be ready to pay to get the Review of Particle Physics printed version. It would solve the issue of choosing the publisher upon the best-price offer only, and it would give an accurate estimate of the number of books to print.

We did indeed use journals' activity in particle physics in the vendor qualification process this year. We must follow DOE rules in other respects, so not all criteria can be followed. PDG does not wish to consider asking people to pay to receive a printed version. This would cause substantial problems and considerable extra effort and may not be possible given legalities. We also see no benefit from this since the cost of publication is a small fraction of the PDG budget.

The committee notes that the booklets ordered by CERN, which were supposed to last 2 years, were gone in 2 weeks. As the reasons for this fast exhaustion of the stock become clear, we recommend appropriate measures be taken to prevent this from happening in the future.

We believe that CERN has addressed this.

Finally, the committee looks forward to hearing a long-term vision for the PDG in terms of its organization and mission in the future meetings.

PDG has expanded its coverage and improved its quality continuously for 55 years. We are always fine-tuning and improving our organization, our operations, and our content. A good example of how this works can be seen from the agenda items for our 6 October collaboration meeting.