Report on the Meeting of the CODATA Task Group on Fundamental Constants
17 June 2011, BIPM, Sèvres, France
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The subject meeting was held at the BIPM in Sèvres. In attendance were the following Task Group members: F. Cabiati, J. Fischer, J. Flowers, S. G. Karshenboim, P. J. Mohr, D. B. Newell, F. Nez, K. Pachucki, T. J. Quinn, B. N. Taylor, B. M. Wood (Chair), and Z. Zhang. Representing the BIPM were M. Kühne (Director) and C. Thomas (Liaison). Present as observers were F. Biraben, C. Bordé, M. Bradley, R. Davis, N. Fletcher, Q. Jifeng, E. de Mirandes, A. Picard, and M. Stock.

The agenda of the meeting is included as the last page of this report, and the following summary is numbered according to the corresponding agenda item.

1. The meeting opened at 9:30 and introductions were made.

2. The agenda of the meeting was reviewed and accepted. B. Wood gave a presentation on the concepts and philosophy of least-squares analysis (LSA) of the fundamental constants (see document TGFC/11-10). B. Taylor noted that the gathering of the data through contact and interactions with the researchers takes a great deal of time. C. Bordé inquired about the expansion factors being a regular part of the LSA. In general they are not used except as a possible method for dealing with discrepant data (B. Wood). T. Quinn stated there was an issue with contrasting the LSA to Key Comparison (KC) and how KC's are exploring different ways to deal with discrepancies; There is no known KC that uses expansion factors (C. Thomas), the LSA is better suited for a scientific approach whereas a KC is more conservative (S. Karshenboim). B. Taylor gave the example of the compilation of the atomic weights of the elements (IUPAC) and how the philosophy was to not have the values change from one compilation to the other. J. Fischer suggested considering alternative approaches (later giving a presentation - see document TGFC/11-13). B. Wood stated that the method used needs to be clear and understandable to the Task Group and users of the LSA.

3. The report of the Task Group meeting on 13 September 2010 at the BIPM was reviewed with no comments.

4. Review of the 2010 LSA by technical sub-group. B. Wood gave an overview presentation (see documents TGFC/11-07 and TGFC/11-12):

    a. Rydberg and muonic hydrogen. This was a case where data were omitted. C. Bordé noted that this was an inconsistent treatment of data. S. Karshenboim commented that we should not rely too heavily on the scattering data.
    b. Alpha. There were no comments on the treatment of alpha. It was pointed out (B. Taylor) that the TG followed the example of the particle data group in it's treatment of a_μ, using only the experimental value. S. Karshenboim commented

that the experiment has had pressure to lower it's uncertainty with each publication and in the future we should also include the theoretical values.

c. R and k. J. Flowers stated the NPL results will be repeated and J. Fischer stated there are more measurements to follow. The question was raised as to why the NIM AGT result was not used. Only a preliminary, incomplete draft was available by 31 Dec. 2010. A complete version was submitted 23 January, 2011 (J. Fischer).

d. Planck constant and N_A. There was some discussion as to why the natural silicon result for the molar volume of silicon was not used, however the IAC had requested that it not be used. There was some concern that there was only one molar mass value used in the determination of N_A with highly enriched Silicon (A. Picard); M. Kühne stated that NIST should also have a molar mass measurement soon. All of the data contributing to h and N_A had an expansion factor of 2 applied to their uncertainties. It was suggested that a short description about the expansion factors be posted on the website.

e. Gravitational constant. A datum that was previously excluded from previous adjustments was put back in (NIST 82). The details are to be given in the long paper

f. Others. B. Taylor described the motivation and impact of not including the results from the h/m_n result. There were no comments from the committee.

There was some general discussion about the CODATA TGFC website. R. Davis asked if relative uncertainties, expansions factors, and plots could be posted and it was questioned whether to post graphs and plots before the data were published (F. Nez). It was pointed out that the values were already posted and it will be a long before any paper would be published giving the details of the analysis (N. Fletcher). Two causes to the delay in publishing details are that relevant data arrived at the very last minute and it has been a time consuming process with the publisher (P. Mohr). It was suggested to put a short summary of the adjustment on the website, but not the plots (T. Quinn) along with a public version of the TGFC minutes.

5. General discussions about alternative analysis techniques. J. Fischer gave a presentation on alternative data analysis methods on the input data for the Planck constant and the gravitational constant (see document TGFC/11-13). It was pointed out that the Birge ratio or any other statistical tool can't really be used when dealing with discrepant data (S. Karshenboim, B. Wood). What should be investigated is the results with the smallest uncertainties with totally different measurement techniques such as the UWash and U-Zurich results (T. Quinn). It is fundamentally flawed to not take into consideration the experiments and hiding behind a "statistical curtain" such as dismissing N points in the fixed effect model (M. Bradley). For example the dismissal of a point in the h data shift's the value towards the CODATA-06 value and away from the new IAC determination of N_A – is this real (N. Fletcher)? F. Cabiati gave a presentation on additive expansion procedures (see document TGFC/11-15). With the additive expansion the most accurate data are now less important (S. Karshenboim). It was questioned whether one would put in the covariances with the additive uncertainty and how we would transmit the new method to the public (B.

Wood). B. Taylor presented the analysis from Rüdiger Kessel (see document TGFC/11-11) which has a criteria the compatibility index, $E_n<2$, otherwise it's basically the same as F. Cabiati's analysis. It was commented that pair wise statistics would ruin a perfectly good data set (S. Karshenboim and P. Mohr). The question was asked if a Birge ratio was actually one, should we accept it – i.e. are all uncertainties over estimated (B. Wood)? We need to have proof one system is better than what we used now (T. Quinn). S Karshenboim stated we first need to discuss how to include or exclude data before the method is chosen. We need to look at the past at how our estimates are consistent (T. Quinn), need continuity, and need to explain why we changed methods if we do (Kühne).

6. Other topics. It was suggested to P. Mohr that after the new SI is adopted, the TGFC give a fixed value of the IPK and the triple point of water. P. Mohr suggested that the TGFC should not do so and the consensus was no. It was also agreed that it was OK to publish alternative data analysis methods except on data that have not been officially released yet.

7. Task Group Administration. It was suggested for each member to look on the website and submit any necessary changes to the membership information. The report from CODATA states we are the highest ranking Task Group, and CODATA has requested any additional information for publicity. It was also suggested that we should expand the membership to include a young member three years from his or her Ph.D.

8. Date and location of the next Task Group meeting. Two possible meetings: CPEM 2012 and before the CCU. Informal for CPEM 2012 and formal for the CCU (October 1, 2012).

9. Adjournment

DRAFT AGENDA

CODATA Task Group on Fundamental Constants

9:30 am Friday, 17 June 2011

BIPM

1. Opening of the meeting and introductions
2. Review of the agenda
3. Review of the report of the Task Group meeting held on September 13, 2010 at BIPM
4. Review of the 2010 LSA by technical sub-group
    4.1. Rydberg and muonic hydrogen
    4.2. Alpha
    4.3. R and k
    4.4. Planck constant and N_A
    4.5. Gravitational constant
    4.6. Others
5. General discussions about alternative analysis techniques
6. Other topics
7. Task Group administration
8. Date and location of the next Task Group meeting
9. Adjournment