Can we trust measured and evaluated data published & sited

Vladimir Ezhela
on behalf of the COMPAS IHEP(Ru) group

Sketch of the current system of "formalized" scientific knowledge exchange in Atomic-, Nuclear-, Particle-, Astro- Physics

Developing "e-science" arXiv.org of scientific paper drafts curated by cornell.edu

⇩

INSPIRE→ Bibliography of the peer reviewed scientific papers
SLAC, DESY, CERN, FNAL, IHEP(Ch), …

⇩

Systemized Measured Numerical Data
FCDC, AMDC, NNDC, PDG, HEPDATA, CNS, NDS-IAEA , …

All above activities are coordinated by
ICSU → IUPAP, CODATA, ….

Unfortunately there is no Metrology in World Fundamental Science.
ISO and national metrology systems are doing nothing to control the quality of scientific products. Some their regulations are harmful.
Leading metrology systems of USA and USE are different to some extent.

JCGM 100:2008
GUM 1995 with minor corrections

Evaluation of measurement data — Guide to the expression of uncertainty in measurement

Évaluation des données de mesure — Guide pour l'expression de l'incertitude de Mesure

First edition September 2008

ISU CODATA — The NIST Reference on Constants, Units, and Uncertainty

AMDC Atomic Mass Data Center

IMP 中国科学院近代物理研究所 Institute of Modern Physics, Chinese Academy of Sciences

NNDC National Nuclear Data Center — BROOKHAVEN NATIONAL LABORATORY

International Atomic Energy Agency — Nuclear Data Services

CNS Center for Nuclear Studies — Data Analysis Center

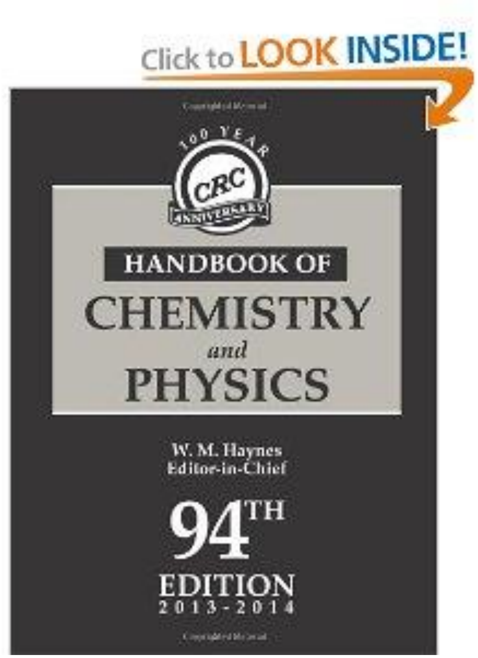
UNIVERSITÉ LIBRE DE BRUXELLES
INSTITUT D'ASTRONOMIE ET D'ASTROPHYSIQUE
BRUSLIB
the Brussels Nuclear Library for Astrophysics Applications

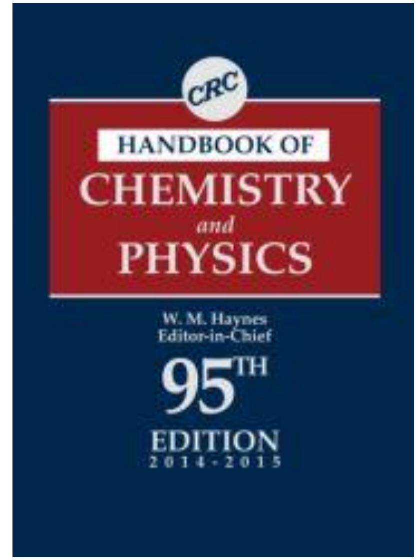
PDG particle data group Live

Review of Particle Physics http://pdg.lbl.gov/
Chinese Physics C vol.40, No.10,100001 (2016)

Welcome to the Handbook of Chemistry & Physics Online!

> 100 years of information support of Sci. & Tech. In USA





http://www.nucleide.org/DDEP_WG/DDEPdata.htm

SpringerMaterials The Landolt-Börnstein Database

Springer

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ISO GUM, ISO GUM-JCGM

1. Guide to the Expression of Uncertainty in Measurement (*1995*)

- Correlation matrix presented in the section “Annex H: Examples” Tables H.3 and H.4 is non positive semi-definite. Formula for non-linear uncertainty propagation in clause 5.1.2 is incorrect. Recommendation in clause 7.2.6 on rounding correlation matrix is incorrect (see details in DSJ.,IHEP_2006-28)

2. Guide to the Expression of Uncertainty in Measurement (*2008*)

- Матрицы корреляций, в разделе “Annex H: Examples”, в таблицах H.3 и H.4 имеют отрицательные собственные значения.
- Формула для переноса неопределенностей в нелинейном случае в рекомендации 5.1.2 некорректна.
- Рекомендация 7.2.6 по округлению матриц корреляций некорректна.

(Подробный разбор представлен в публикациях:

DSJ https://www.jstage.jst.go.jp/article/dsj/6/0/6_0_S676/_pdf

IHEP_2006-28 http://web.ihep.su/library/pubs/prep2006/ps/2006-28.pdf

5.1.2 The combined standard uncertainty $u_c(y)$ is the positive square root of the combined variance $u^2_c(y)$, which is given by

$$u_c^2(y) = \sum_{i=1}^{N}\left(\frac{\partial f}{\partial x_i}\right)^2 \cdot u^2(x_i) \qquad (10)$$

where f is the function given in Equation (1). Each $u(x_i)$ is a standard uncertainty evaluated as described in 4.2 (Type A evaluation) or as in 4.3 (Type B evaluation). The combined standard uncertainty $u_c(y)$ is an estimated standard deviation and characterizes the dispersion of the values that could reasonably be attributed to the measurand *Y (see 2.2.3).*

Equation (10) and its counterpart for correlated input quantities, Equation (13), both of which are based on a first-order Taylor series approximation of $Y = f(X_1, \ . \ . \ . \ , X_N)$, express what is termed in this *Guide* the law of propagation of uncertainty (see E.3.1 and E.3.2).

NOTE When the nonlinearity of f is significant, higher-order terms in the Taylor series expansion must be included in the expression for $u^2_c(y)$, Equation (10). When the distribution of each X_i is normal, the most important terms of next highest order to be added to the terms of Equation (10) are

$$\sum_{i,j=1}^{N}\left[\frac{1}{2}\left(\frac{\partial^2 f}{\partial x_i \partial x_j}\right)^2 + \frac{\partial f}{\partial x_i}\cdot\frac{\partial^3 f}{\partial x_i\left(\partial x_j\right)^2}\right]\cdot u^2(x_i)\cdot u^2(x_j)$$

See H.1 for an example of a situation where the contribution of higher-order terms to $u^2_c(y)$ needs to be considered.

IOP PUBLISHING METROLOGIA
Metrologia **49** (2012) 702–705 doi:10.1088/0026-1394/49/6/702

Revision of the '*Guide to the Expression of Uncertainty in Measurement*'

Walter Bich, Maurice G Cox, Ren´e Dybkaer, Clemens Elster
W Tyler Estler, Brynn Hibbert, Hidetaka Imai, Willem Kool
Carine Michotte, Lars Nielsen, Leslie Pendrill, Steve Sidney
Adriaan M H van der Veen, and Wolfgang Woger

References

[1] JCGM 100:2008 Guide to the Expression of Uncertainty in Measurement **JCGM 100:2008**

[2] JCGM 200:2012, International Vocabulary of Metrology—Basic and General Concepts and Associated Terms (VIM), **JCGM 200:2012**

[4] JCGM 101:2008, Propagation of distributions using a Monte Carlo method, **JCGM 101:2008**

[5] JCGM 102:2011 Supplement 2 to the 'Guide to the Expression of Uncertainty in Measurement'—Extension to any number of output quantities, **JCGM 102:2011**

CODATA ISU — The NIST Reference on Constants, Units, and Uncertainty

FCDC

1. **Reviews of Modern Physics 72 (2000) 351, "CODATA recommended values of the fundamental physical constants: 1998"**
   - Correlation coefficients posted on the NIST site are inaccurate. No **LSA** files

2. **Reviews of Modern Physics 77 (2005) 1, "CODATA recommended values of the fundamental physical constants: 2002"**
   - Correlation coefficients for derived constants posted on the NIST site are inaccurate. Full correlation matrix for basic constants posted for the first time is accurate. **(LSA files)** are posted.

3. **Reviews of Modern Physics 80 (2008) 633, "CODATA recommended values of the fundamental physical constants: 2006"**
   - Correlation coefficients posted on the NIST site are inaccurate. No **LSA** files

4. **Reviews of Modern Physics 84 (2012) 1527, "CODATA recommended values of the fundamental physical constants: 2010"**
   - Correlation coefficients posted on the NIST site are inaccurate. No **LSA** files

5. **Reviews of Modern Physics 88 (2016) 035009-1, "CODATA recommended values of the fundamental physical constants: 2014"**
   - Correlation coefficients posted on the NIST site are inaccurate. No **LSA** files

Precise energies of highly excited hydrogen and deuterium

Svetlana Kotochigova, Peter J. Mohr, and Barry N. Taylor

Can. J. Phys. 80 1373-1382 (2002)

Precise Calculation of Transition Frequencies of Hydrogen and Deuterium Based on a Least-Squares Analysis

Ulrich D. Jentschura, Svetlana Kotochigova, Eric-Olivier Le Bigot, Peter J. Mohr, and **Barry N. Taylor,**

PRL 95, 163003 (2005)

"The energy level E_i of state *i* can be written as a function of the fundamental constants and an additional adjusted constant δ_i which takes into account the uncertainty in the theory [27,30,31]. For example, for the case in which *i* is a state of hydrogen, we have

$$E_i = H_i\,(R,\ A_r(\mathrm{e}),\ A_r(\mathrm{p}),\ R_\mathrm{p}) + \delta_\mathrm{i} \qquad (1)$$

where the constants that appear as arguments of the function H_i are listed in Table II. Because the values of the constants in Eq. (1), including result from a least squares adjustment, they are correlated, particularly those for R and R_p, which have a correlation coefficient of **0.996**.

The uncertainty of the calculated value for the 1*S*-2*S* frequency in hydrogen is increased by a factor of about 500 if such correlations are neglected."

NOTE: values of these additional adjusted constants δ_i i=1,2,..,30 were never reported. It is strange, these constants would be very helpful for higher order QED calculations.

Chronology of FCDC evaluations

CODATA: 1986 (1987)	Symbol	Unit	Value(Uncertainty)·Scale	Correlations		
Elementary charge	*e*	C	1.602 177 33(49) · 10^{-19}	*e*	*h*	*me*
Planck constant	*h*	J s	6.626 075 5(40) · 10^{-34}	0.997		
Electron mass	*me*	kg	9.109 389 7(54) · 10^{-31}	0.975	0.989	
1/(Fine struct. const.)	1/α(0)		137.035 989 5(61)	−0.226	−0.154	−0.005

CODATA: 1998 (2000)			Basic constant symbols are in red			
Elementary charge	*e*	C	1.602 176 462(63) · 10^{-19}	*e*	*h*	*me*
Planck constant	*h*	J s	6.626 068 76(52) · 10^{-34}	0.999		
Electron mass	*me*	kg	9.109 381 88(72) · 10^{-31}	0.990	0.996	
1/(Fine struct. const.)	1/ α(0)		137.035 999 76(50)	−0.049	−0.002	0.092

CODATA: 2002 (2005)			Basic constant symbols are in red			
Elementary charge	*e*	C	1.602 176 53(14) · 10^{-19}	*e*	*h*	*me*
Planck constant	*h*	J s	6.626 0693(11) · 10^{-34}	1.000		
Electron mass	*me*	kg	9.109 3826(16) · 10^{-31}	0.998	0.999	
1/(Fine struct. const.)	1/ α(0)		137.035 999 11(46)	−0.029	−0.010	0.029

CODATA: 2006 (2008)			Basic constant symbols are in red			
Elementary charge	*e*	C	1.602 176 487(40) · 10^{-19}	*e*	*h*	*me*
Planck constant	*h*	J s	6.626 068 96(33) · 10^{-34}	0.9999		
Electron mass	*me*	Kg	9.109 382 15(45) · 10^{-31}	0.9992	0.9996	
1/(Fine struct. const.)	1/ α(0)		137.035 999 679(94)	−0.0142	−0.0005	0.0269

CODATA: 2010 (2012)			Basic constant symbols are in red			
Elementary charge	*e*	C	1.602 176 565(35)· 10^{-19}	*e*	*h*	*me*
Planck constant	*h*	J s	6.626 069 57(29)· 10^{-34}	1.0000		
Electron mass	*me*	Kg	9.109 382 91(40)· 10^{-31}	0.9998	0.9999	
1/(Fine struct. const.)	1/ α(0)		137.035 999 074(44)	−0.0145	−0.0072	0.0075

Over-rounding and improper uncertainty propagation for derived quantities {*me*, *e*, *1/* α(0), *h*}

Eigenvalues of correlation matrices for { e, h, m_e, $1/\alpha(0)$ }

1986:	{ 2.99891, 1.00084, 0.000420779, -0.000172106 }
1998:	{ 2.99029, 1.01003, -0.000441572, 0.000123580 }
2002:	{ 2.99802, 1.00173, 0.000434393, -0.000183906 }
2006:	{ 2.99942, 1.00006, 0.000719993, -0.000202165 }
2010:	{ 2.99983, 1.00022, -0.0000451921, -5.92939 · 10^{-6} }
2014:	{ 2.99371, 1.00156, 0.00499569, -0.000262372 }

COMPAS (post published) peer review of e-FPC-2014 recommended by CODATA.
Reviews of Modern Physics 88 (2016) 035009-1

Quality test of the full correlation matrix	335x335
Positive eigenvalues	**192**
Negative eigenvalues	**143**

APONAMAT !!! Matrix is badly over-rounded. Adjustment is inconsistent. FPC-2014 cannot be recommended for high precision tests.

The NIST Reference on
Constants, Units, and Uncertainty

Independent regular readjustments of FPC is urgently needed

Review of Particle Physics http://pdg.lbl.gov/
Chinese Physics C vol.40, No.10,100001 (2016)

PDGLive-2016 released numerical data of the "constrained fit information" that allows to "taste" the statictical quality of the results obtained.

COMPAS (post released) numerical peer review show :

total number of correlation matrices reported -- 49

positive definite correlation matrices -- 30
correlation matrices with negative eigenvalues – 19

repaired by truncation the last reported digit -- 16
possible problems with adjustment procedure -- 3

Partial-Wave Covariance Matrices

This page provides covariance matrices associated with single-energy sets of partial-wave amplitudes.

The use of these matrices in fits is described in:

`Correlations of pion-nucleon partial-waves for multi-channel reaction analyses',

M. Doring, J. Revier, D. Ronchen, R. Workman, arXiv:1603.07265

README FILE Instructions regarding the file format

Covariance Matrix Matrices ordered in energy

Data Input Test Example Fortran 90 file to read the matrices

COMPAS (post published) numerical peer review results:

Number of covariance matries tested	**75**
Number of positive definite correlation matrices	**11**
Number of matrices with multiple negative eigenvalues	**64**
Repaired by truncation the last reported digit	**1**
Possible problems with adjustment procedure	**63**

NO COMMENTS!

AMDC
Atomic Mass Data Center

1961--1964--1971--1977--1983--1993--1995--2003-

1. **Nuclear Physics A729, (2003) 3–128,**
   The Nubase evaluation of nuclear and decay properties

2. **Nuclear Physics A729, (2003) 129-336,**
   The AME2003 atomic mass evaluation: (I).
   Evaluation of input data, adjustment procedures

3. **Nuclear Physics A729 (2003) 337-676,**
   The **AME2003 Atomic Mass Evaluation (II).**
   Tables, Graphs and References

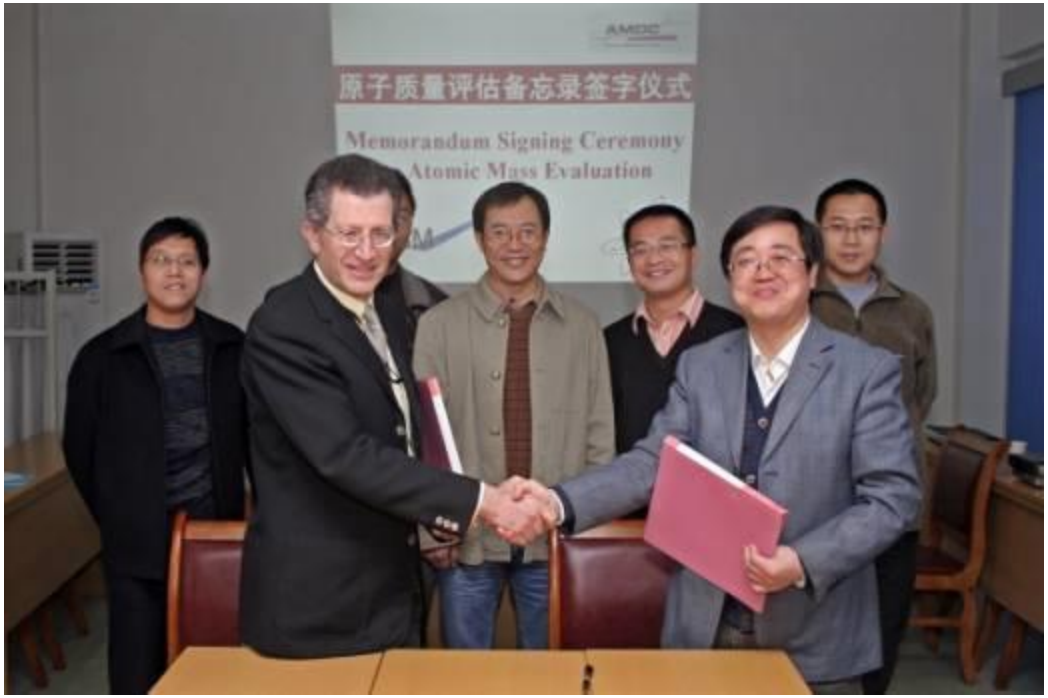
Uncertainties of the main results presented in articles are incomplete.

Small fragments of the correlation matrix are presented with argumentation:
"…A complete representation would require reproduction of a matrix of correlation coefficients. Since this matrix contains N(N+1)/2 elements in which N=847, this is not very attractive. …" (See page 341).

Memorandum Signing Ceremony on Transfer of Atomic Mass Evaluation to IMP held in Lanzhou

(November 25, 2008)

On 17 November 2008, Professor XIAO Guoqing, Director of the Institute of Modern Physics (IMP), CAS and Dr. Georges Audi, Head of the Atomic Mass Evaluation (AME) and the Atomic Mass Data Center (AMDC) signed a memorandum on transfer of the AME from the CNSMS (Orsay, France) to IMP.
The signing ceremony was held at IMP in Lanzhou.



According to the memorandum, IMP will be responsible for the AME in future. IMP will first assign one person to learn and get trained at CNSMS and then focus on the AME in full time.
After the preparation of two or three years, CSNSM will transfer all of the relevant materials to IMP and IMP will host the AMDC as well. IMP will establish a core group for the AME and attach importance to the collaboration with institutes and universities around the world accordingly.

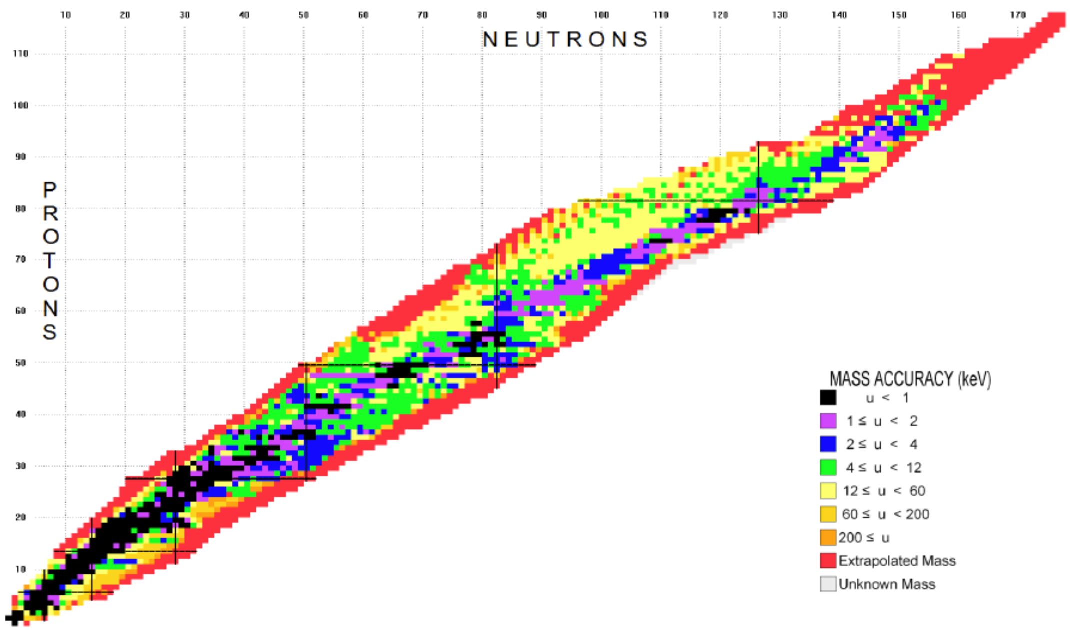
All of the data of AME will be open to the whole nuclear physics community.

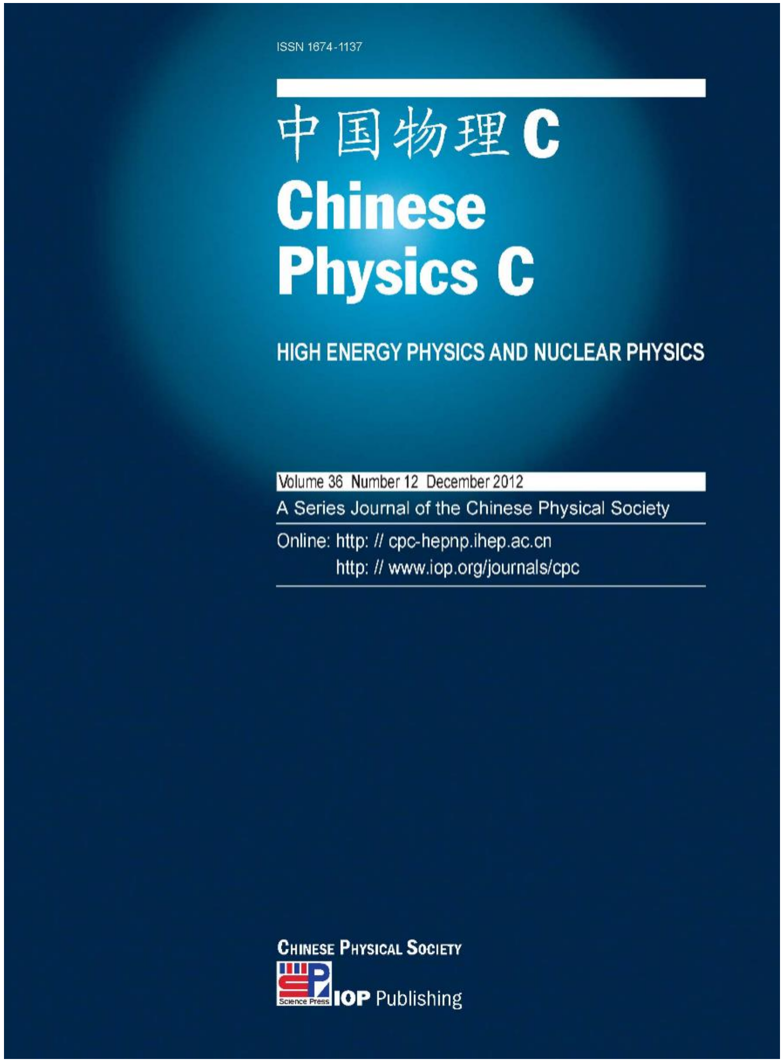
AME-2003 → AME-2012

NUBASE-2003 → NUBASE2012

AMDC Atomic Mass Data Center

IMP 中国科学院近代物理研究所 Institute of Modern Physics, Chinese Academy of Sciences




ISSN 1674-1137

中国物理 C

Chinese Physics C

HIGH ENERGY PHYSICS AND NUCLEAR PHYSICS

Volume 36 Number 12 December 2012

A Series Journal of the Chinese Physical Society

Online: http: // cpc-hepnp.ihep.ac.cn

http: // www.iop.org/journals/cpc

Chinese Physical Society

IOP Publishing

AME-2012+NUBASE-2012 published in three parts of the special issue:

Chinese Physics C36 (2012) -- / 1157, -- 1287, \ 1603

The information presented in NUBASE2012 fulfills several user-demanded requirements, namely that it is:

a) **Complete** → includes all measured quantities and their uncertainties;
b) **Up-to-date** → results from the most recent publications are included;
c) **Credible and reliable** → identifies and resolves contradictory results that exist in the scientific literature, as well as in other nuclear physics databases;
d) **Properly referenced** → provides comprehensive information on the validity of all included data.

STATISTICS

3353 nuclides, derived from all available experimental results, together with some values estimated by extrapolating neighboring ones.

1256 nuclides which have one, or more, excited isomers in accordance with our definition.

12437 experimental data compressed by pre-averaging and separation of secondary data give
1947 equations with 1176 parameters.

$$X^2 / ndf = 0.996$$

Table B. Correlation matrices for the most precisely known very light nuclei (in squared nano atomic mass units).

variance-correlation

	n	H	D	^{4}He	^{13}C	^{14}N	^{15}N	^{16}O	^{28}Si
n	0.316817								
H	−0.007978	0.010689							
D	0.124508	0.002709	0.127243						
^{4}He	0.000000	0.000000	0.000000	0.004011					
^{13}C	0.125909	−0.007584	0.118352	0.000000	0.954145				
^{14}N	−0.008911	0.012558	0.003645	0.000000	−0.008470	0.384729			
^{15}N	0.094981	0.016262	0.111262	0.000000	0.090285	0.019496	0.558755		
^{16}O	−0.001022	0.001377	0.000355	0.000000	−0.000972	0.005718	0.002100	0.027039	
^{28}Si	0.227453	0.008282	0.235786	0.000000	0.216210	0.010584	0.653732	0.001078	3.761099

	n	H	D	^{3}H	^{3}He	^{16}O	^{20}Ne	^{23}Na	^{28}Si
n	0.316817								
H	−0.007978	0.010689							
D	0.124508	0.002709	0.127243						
^{3}H	0.008197	0.000942	0.009139	6.116907					
^{3}He	0.009704	0.001116	0.010822	5.694194	6.743975				
^{16}O	−0.001022	0.001377	0.000355	0.000122	0.000144	0.027039			
^{20}Ne	0.326227	0.014358	0.340650	0.024965	0.029563	0.001866	3.687126		
^{23}Na	−0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	8.587458	
^{28}Si	0.227453	0.008282	0.235786	0.017163	0.020325	0.001078	0.633419	0.000000	3.761099

?

variance-correlation

Table B. Correlation matrices for the most precisely known very light nuclei (in squared nano atomic mass units)

	n	H	D	^{4}He	^{13}C	^{14}N	^{15}N	^{16}O	^{28}Si
n	**0.241418**								
H	– 0.006094	**0.008708**							
D	0.012274	0.002612	**0.014891**						
^{4}He	0.000000	0.000000	0.000000	**0.004011**					
^{13}C	0.004869	– 0.006656	– 0.001785	0.000000	**0.051325**				
^{14}N	– 0.001079	0.001890	0.000811	0.000000	0.037139	**0.040928**			
^{15}N	– 0.000790	0.013496	0.012707	0.000000	– 0.005664	0.006929	**0.413749**		
^{16}O	– 0.000749	0.002027	0.001279	0.000000	0.010791	0.013155	0.005573	**0.029467**	
^{28}Si	– 0.003321	0.006777	0.003455	0.000000	0.028736	0.030353	0.036443	0.016784	**0.193341**

	n	H	D	^{3}H	^{3}He	^{16}O	^{20}Ne	^{23}Na	^{28}Si
n	**0.241418**								
H	– 0.006094	**0.008708**							
D	0.012274	0.002612	**0.014891**						
^{3}H	0.000000	0.000000	0.000000	**5.632850**					
^{3}He	0.000000	0.000000	0.000000	5.553019	**6.271468**				
^{16}O	– 0.000749	0.002027	0.001279	0.000000	0.000000	**0.029467**			
^{20}Ne	0.027477	0.012383	0.039872	0.000001	0.000001	0.005511	**2.830803**		
^{23}Na	– 0.000001	0.000003	0.000001	0.000000	0.000000	0.000001	0.000024	**3.782120**	
^{28}Si	– 0.003321	0.006777	0.003455	0.000000	0.000000	0.01678 4	0.014612	0.000011	**0.193341**

?

AME-2012

A complete representation would require reproduction of a matrix of correlation coefficents. Since this matrix contains N(N +1) /2 elements in which N = 1176, this is not very attractive. For the first time in this AME2012, and following the suggestion of B.N. Taylor we made available at the AMDC Web-site in directory masstables/Ame2012 a full list of correlation coefficients [10].

Posted covariance matrix is accurate but it size is 1174 x 1174 instead of 1176 x 1176 .
This difference is not commented in the texts

The Ame2016 atomic mass evaluation.

Chinese Physics C Vol. 41, No. 3 (2017)

030001 The NUBASE2016 evaluation of nuclear properties

030002 (I). Evaluation of input data; and adjustment procedures

030003 (II). Tables, graphs and references

Obtained by request covariance matrix is accurate but it size is 1205 x 1205 instead of 1207 x 1207 This difference is not commented in the texts

variance-correlation

Table B. Correlation matrices for the most precisely known very light nuclei (in squared nano atomic mass units).

	n	H	D	^{4}He	^{13}C	^{14}N	^{15}N	^{16}O	^{28}Si
n	0.241391								
H	−0.006172	0.008794							
D	0.012177	0.002620	0.014802						
^{4}He	0.000000	0.000000	0.000000	0.004011					
^{13}C	0.004685	−0.006200	−0.001514	0.000000	0.053148				
^{14}N	−0.001300	0.002355	0.001055	0.000000	0.039083	0.042986			
^{15}N	−0.001181	0.013972	0.012791	0.000000	−0.003234	0.009421	0.416385		
^{16}O	−0.000837	0.002306	0.001470	0.000000	0.011842	0.014288	0.007047	0.030065	
^{28}Si	−0.005085	0.009502	0.004416	0.000000	0.041404	0.043532	0.051304	0.024329	0.274560

	n	H	D	^{3}H	^{3}He	^{16}O	^{20}Ne	^{23}Na	^{28}Si
n	0.241391								
H	−0.006172	0.008794							
D	0.012177	0.002620	0.014802						
^{3}H	0.006005	0.011413	0.017422	0.053335					
^{3}He	0.006005	0.011413	0.017422	0.048435	0.048435				
^{16}O	−0.000837	0.002306	0.001470	0.003776	0.003776	0.030065			
^{20}Ne	0.027152	0.012479	0.039644	0.052123	0.052123	0.006215	2.829718		
^{23}Na	0.000000	0.000001	0.000001	0.000001	0.000001	0.000004	0.000007	3.781636	
^{28}Si	−0.005085	0.009502	0.004416	0.013918	0.013918	0.024329	0.019401	0.000047	0.274560

HepData data reviews

Elastic and Total CS in p(bar)-p Interactions
Quarkonia data in Hadronic Interactions
Structure functions in DIS
Single photon production in hadronic interactions
Two-photon reactions leading to hadron final states
Drell-Yan cross-sections
Inclusive particle production data in e+e- interactions
Hadronic total cross-sections (R) in e+e- interactions
Low-energy neutrino cross-sections
Event shapes in lepton-lepton and lepton-nucleon interactions

CONTENTS

HEPDATA ON-LINE DATA REVIEW

Measurement of Elastic and Total Cross Sections in P-P and PBAR-P interactions.

HEPDATA ON-LINE DATA REVIEW

An up-to-date archive of PP and PbarP data elastic and inelastic cross sections

data from a specific experiment

BNL	CERN	FNAL	SERP	SLAC
BNL-755	CERN-ISR	FNAL-004	SERP-E-004	SLAC-BC-064
BNL-838	CERN-LHC-ATLAS	FNAL-069A	SERP-E-122	
BNL-RHIC-PP2PP	CERN-LHC-TOTEM	FNAL-069		
BNL-UNKNOWN	CERN-NA-008	FNAL-0823		
	CERN-PS-172	FNAL-118A		
	CERN-PS-UNKNOWN	FNAL-177A		
	CERN-R-210	FNAL-381		
	CERN-R-211	FNAL-396		
	CERN-R-420	FNAL-570		
	CERN-R-608	FNAL-577		
	CERN-R-704	FNAL-710		
	CERN-R-UNKNOWN	FNAL-741		
	CERN-T-237	FNAL-742		
	CERN-T-UNKNOWN	FNAL-743		
	CERN-UA-001	FNAL-760		
	CERN-UA-004-2	FNAL-775		
	CERN-UA-004	FNAL-811		
	CERN-UA-005			
	CERN-UA-006			
	CERN-UNKNOWN			
	CERN-WA-006			
	CERN-WA-007			
	CERN-WA-031			
	CERN-WA-042			
	CERN-WA-074			

LANDOLT-BORNSTEIN

Numerical Data and Functional Relationships in Science and Technology

New Series, Group I, Volume 19

Nuclear States from Charged Particle Reactions*: *Z=2-18

S.I. Sukhoruchkhin, Z.N.Soroko

Publication Date: **August, 2004**

New Series, Group I, Volume 19A, Part 2

Nuclear States from Charged Particle Reactions*: *Z=19-83

Z.N.Soroko, S.I. Sukhoruchkhin,

Publication Date: A**pril, 2005**

New Series, Group I, Volume 19B, Part 2

Nuclear States from Charged Particle Reactions*: *Z=37-62

Z.N.Soroko, S.I. Sukhoruchkhin,

Publication Date: **January, 2007**

New Series, Group I, Volume 19B, Part 3

Nuclear States from Charged Particle Reactions*: *Z=63-99

Z.N.Soroko, S.I. Sukhoruchkhin,

Publication Date: **January, 2007**

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Numerical Data and Functional Relationships in Science and Technology

New Series, Group I, Volume 22A

Nuclear Binding Energies and Atomic Masses: Z=1…54

Sergey I. Sukhoruchkhin, Zoya N.Soroko

Publication Date **March, 2009**

"One of the characteristics of Landolt-Börnstein is that data are evaluated before they are accepted for compilation. The idea is to present 'best values' which can be used with confidence by non-experts. Volume I/22B contains the data for **1111** nuclei with Z ranging from 55 to 100."

New Series, Group I, Volume 22B

Nuclear Binding Energies and Atomic Masses: Z=55…100

Sergey I. Sukhoruchkhin, Zoya N.Soroko

Publication Date **March, 2009**

"The idea is to present 'best values' which can be used with confidence by non-experts. Volume I/22B contains the data for **1194** nuclei with Z ranging from 55 to 100."

AMC2012:	**3556** nuclides:	**2522** ground states, and	**1043** isomers
AME2012:	**3353**		**1256**
L-B2009:		**2305**	

?

LANDOLT-BÖRNSTEIN

Numerical Data and Functional Relationships in Science and Technology

New Series, Group I, Volume 25A

Excited Nuclear States **:** ***Z = 1-29***

By Sergey I. Sukhoruchkin, Zoya N. Soroko, Herwig Schopper

Publication Date: **January 2012**

New Series, Group I, Volume 25B

Excited Nuclear States **:** ***Z = 30-47***

By Zoya N. Soroko, Sergey I. Sukhoruchkin, Ulrich Kneissl, Pierre Descouvemont

Publication Date: **January 2012**

New Series, Group I, Volume 25C

Excited Nuclear States **:** ***Z = 48-60***

By Zoya N. Soroko, Sergey I. Sukhoruchkin, Herwig Schopper

Publication Date: **January 2013**

New Series, Group I, Volume 25D

Excited Nuclear States **:** ***Z = 61-73***

By Zoya N. Soroko, Herwig Schopper

Publication Date: **February 2013**

New Series, Group I, Volume 25E

Excited Nuclear States **:** ***Z = 74-103***

By Zoya N. Soroko, Sergey I. Sukhoruchkin, Herwig Schopper(Edited by)

Publication Date: **January 2013**