



INTERNATIONAL ATOMIC ENERGY AGENCY

NUCLEAR DATA SERVICES

DOCUMENTATION SERIES OF THE IAEA NUCLEAR DATA SECTION

IAEA-NDS-47

Rev. 2

4 Nov. 1993

ATOMIC MASSES 1993

The 1993 atomic mass evaluation
by G. Audi and A.H. Wapstra

Abstract: The 1993 atomic mass evaluation by G. Audi and A.H. Wapstra is documented. The resulting data files containing recommended values of atomic masses, obtained by experiment or systematics, and related data such as reaction and separation energies are described. The data files can be obtained through online services from several nuclear data centers or on magnetic tape, free of charge.

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THE 1992 ATOMIC MASS EVALUATION
BY G. Audi and A.H. Wapstra (November 4, 1993)

A - GENERAL INFORMATION
(November 4, 1993)

I - INTRODUCTION

The table of masses (part I) and the table of nuclear reaction and separation energies (part II) of:

"THE 1993 ATOMIC MASS EVALUATION"
by G. Audi and A.H. Wapstra
Nuclear Physics A565 (1993) 1 and 66.
(to appear December 6, 1993)

are available electronically at the Nuclear Data Centers.

A total of six files can be obtained. The first file, `mass_exp.mas93`, contains the table of masses as printed in part I. The next two files correspond to the table of reaction and separation energies in two parts of 6 entries each, as in part II:

`rct1_exp.mas93` for S_{2n} , S_{2p} , $Q(a)$, $Q(2B)$, $Q(ep)$, $Q(B-n)$
`rct2_exp.mas93` for S_n , S_p , $Q(4B)$, $Q(d,a)$, $Q(p,a)$, $Q(n,a)$

The last three files with names `mass_rmd.mas93`, `rct1_rmd.mas93` and `rct2_rmd.mas93` are identical to the first three files except that the values resulting from the few experimental data, listed in table B of part I of our publication, are replaced by values that we recommend based upon estimates from systematic trends.

Values in these files are exact (unrounded) copy of the published ones.

- * They can conveniently be used for calculations.
- * None of them should be copied in a publication as given in these files, but instead, the rounded values published in the above Journal should be used.

II - VALUES FOR THE MOST PRECISE MASSES:

	Mass excess (keV)		Atomic mass (micro-u)	
1 n	8071.32311	0.00221	1008664.92358	0.00229
1 H	7288.96917	0.00077	1007825.03190	0.00057
2 H	13135.71957	0.00114	2014101.77795	0.00062
3 H	14949.79430	0.00170	3016049.26767	0.00136
3 He	14931.20331	0.00161	3016029.30942	0.00123
4 He	2424.91111	0.00141	4002603.24970	0.00150
13 C	3125.01132	0.00457	13003354.83834	0.00490
14 C	3019.89432	0.00396	14003241.99059	0.00425
14 N	2863.41905	0.00171	14003074.00743	0.00183
16 O	-4736.99810	0.00239	15994914.62231	0.00253
20 Ne	-7041.92927	0.00283	19992444.17639	0.00298
40 Ar	-35039.88949	0.00539	39962383.12350	0.00505

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III - REFERENCES:

"THE 1993 ATOMIC MASS EVALUATION" by G.Audi and A.H.Wapstra

Part I: Nuclear Physics A565 (1993) 1
for files:

mass_exp.mas93 masses experimental
mass_rmd.mas93 masses recommended

Part II: Nuclear Physics A565 (1993) 66
for files:

rct1_exp.mas93 reaction energies experimental, table 1
rct2_exp.mas93 reaction energies experimental, table 2
rct1_rmd.mas93 reaction energies recommended, table 1
rct2_rmd.mas93 reaction energies recommended, table 2

IV - FORMAT:

All files are 2650 lines long with 124 character per line (originally in fixed format). Headers are 40 lines long.

Record Format:

1 - For mass-files:

Column	Format	Quantity
1:1	A1	fortran control character (a)
2:4	I3	N-Z neutron excess
5:9	I5	N neutron number
10:14	I5	Z atomic number
15:19	I5	A mass number
20:20	1X	
21:23	A3	Chem Symbol
24:27	A4	origin
28:28	1X	
29:39	F11.3	mass
40:48	F9.3	mass accuracy
49:59	F11.3	binding energy
60:68	F9.3	binding energy accuracy
69:72	4X	
73:74	A2	B+ or B-
75:85	F11.3	beta decay energy
86:94	F9.3	beta decay energy accuracy
95:96	2X	
97:110	I3,1x,F10.3	atomic_mass
111:119	F9.3	atomic mass accuracy

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2 - For rct-files:

Column	Format	Quantity
1:1	A1	fortran control character (a)
2:4	I3	A mass number
5:5	1X	
6:8	A3	Chem Symbol
9:11	I3	Z atomic number
12:12	1x	
13:30	F10.2,F8.2	energy 1, accuracy 1
31:48	F10.2,F8.2	energy 2, accuracy 2
49:66	F10.2,F8.2	energy 3, accuracy 3
67:84	F10.2,F8.2	energy 4, accuracy 4
85:102	F10.2,F8.2	energy 5, accuracy 5
103:120	F10.2,F8.2	energy 6, accuracy 6

Notes:

- a - Fortran control character: 1 = page feed
0 = line feed
- b - decimal point is replaced by # for values derived from systematical trends (see publications).
- c - * in place of value means 'not calculable'

V - CORRECTIONS AND SUGGESTIONS

If you find errors or omissions in the present documentation, or, if you have a suggestion to make it clearer, please send a message to the following electronic address. Thanks in advance.

internet: audi@frcpn11.in2p3.fr
bitnet : audi@frcpn11

THE 1992 ATOMIC MASS EVALUATION
BY G. Audi and A.H. Wapstra (November 4, 1993)

B - NNDC (USA and Canada)

I - COPYING OF FILES THROUGH NETWORKS:

The six mass files may be obtained via an anonymous account on the NNDC VAX Alpha computer, through TCP/IP or DECNET networks.

These six files along with a "READMASS.ME" file will be located in the subdirectory SA0:YSCR.MASSESo. These may then be copied on to the user's computer using the FTP "GET" command, or the DECNET "COPY" command.

The user name of the anonymous account is BNLND2.

- * TCP/IP: use the 'FTP' command, to connect to BNLND2:
ex: ftp bnlnd2.dne.bnl.gov (or 130.199.112.132)
User (identify yourself to the host): bnlndc
Command: cd masses
Command: get mass_exp.mas93
Command: quit
- * DECNET: use the DEC 'DIRECTORY' and 'COPY' commands,
for BNLND2 (or 44436 or 43.404).
ex: \$dir bnlnd2"bnlndc":sa0:Yscr.masseso
\$copy bnlnd2"bnlndc":sa0:Yscr.masseso mass_exp.mas93 *

II - ATOMIC MASSES FROM NNDC ON-LINE SYSTEM:

1 - Access to the On-Line service:

One can access the NNDC (National Nuclear Data Center, Brookhaven National Laboratory, USA) On-Line service through a network or a remote modem. The service is available on an NNDC VAX Alpha computer. Presently, there is no charge for the On-Line service.

Via modem:

The NNDC VAX Alpha computer can be accessed via modem using the telephone number 516-282-5390.

After getting the connect signal, type a carriage return, wait and then type a second carriage return. The VAX login prompt should then appear on your terminal.

Via networks:

- * TCP/IP (internet): use the 'TELNET' command to access the computer node BNLND2. Its address is BNLND2.DNE.BNL.GOV (or 130.199.112.132)
- * DECNET: use the 'SET HOST' command with address BNLND2 (or 44436 or 43.404)

The VAX login prompt will appear and you should proceed as follows:

- * Username: NNDC
- * Enter NNDC assigned authorization code(or GUEST):GUEST
(or your authorization code if you have one)

The authorization code "GUEST" allows a new user limited amount of CPU time to become acquainted with the system.

THE 1992 ATOMIC MASS EVALUATION
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2 - Retrievals or Copying of files:

Once you are logged into NNDC online service you can retrieve from various different numerical or bibliographic data bases, or simply copy files containing computer codes, documentation, or mass tables.

In order to copy files containing mass tables you will proceed as the following:

After successful login select the option FILES. Within this option select the data item MASSES and indicate which of the six files and documentation you will like to copy over to your computer. After the selection of file(s) you will automatically be in SEND option and you will be asked which network you will want to use to transfer your file(s). After that the system will query you about your destination address, your password (it does not echo), and the file name that you are transferring. The system will respond if the transfer was successful. You can then choose to do further retrievals or logout.

3 - Logout:

When terminating a retrieval session, enter or select LOGOUT.

4 - Authorization:

For authorization for access to NNDC online service, user can supply the necessary information while logged in with 'GUEST' authorization as indicated above or write to NNDC at the following address:

Address: On-Line access
National Nuclear Data Center
Brookhaven National Laboratory
Building 197D
P.O. Box 5000
Upton, NY 11973-5000 (U.S.A.)

Telephone: 516-282-2901.
Telefax: 516-282-2806

E-mail: nndc@bnl.gov (internet)
nndc@bnl (bitnet)
bnl:nndc (hepnet)

Please give your name, postal and e-mail addresses, telephone number, your affiliation, and a personal code of six or fewer characters which will serve as your authorization code.

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C - NEA-DB (Western Europe and Japan)

I - COPYING OF FILES THROUGH NETWORKS:

File transfer options

Upload Kermit protocol to transfer files to NEA
Download Kermit protocol to transfer files from NEA
Capture Screen capture to transfer ASCII files from NEA
Binary Bitnet
 To send binary files through BITNET
Binary Internet (FTP)
 To send or receive binary files through INTERNET

II - ATOMIC MASSES FROM NEA ON-LINE SERVICES:

1 - Access to the On-Line service:

Logging on: logon as NEADB and give your assigned user name and password or use the GUEST name for a limited time.

Internet: DB.NEA.FR old (numeric = 130.84.216.5)
 new (numeric = 193.51.64.1)

X25: (2080) 921607751 or in France: (1) 921607751

2 - Retrievals or Copying of files:

On logging-on to our On-Line service, the user has to select first the option "Nuclear Data". Under "Nuclear Data" there is a menu called MASSES. When this option is selected, the description of the files and their content will appear on the screen, ending with a question asking: "Which file or files would you like to retrieve?" The selected files will automatically be transmitted to the user home computer.

3 - Logout:

When terminating a retrieval session, enter or select LOGOUT.

4 - Authorization:

Address: Nuclear Energy Agency - Data Bank
 O.E.C.D.
 Le Seine Saint Germain
 12, boulevard des Iles
 92130 Issy-les-Moulineaux
 France

Telephone: +33 (1) 45.24.10.71

Telefax: +33 (1) 45.24.11.10

E-mail: nea@nea.fr (internet)
 nea@frneab51 (earn/bitnet)

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D - IAEA (other countries)

I - COPYING OF FILES THROUGH NETWORKS:

The six mass files may be obtained via an anonymous account on the NDS VAX 4200 computer through TCP/IP network. These six files along with a "README.MAS93" file will be located in the subdirectory {SCR.MASSES}. These may then be copied on to the user's computer using the FTP "GET" command.

Use the 'FTP' command to connect to: `iaeand.iaea.or.at` (or `161.5.2.2`)

The user name of the anonymous account is "NDSOPEN".

```
Ex:  ftp iaeand.iaea.or.at (or 161.5.2.2)
      User (identify yourself to the host): ndsopen
      Command: cd masses
      Command: get mass_exp.mas93
      Command: quit
```

II - ATOMIC MASSES FROM IAEA ON-LINE SERVICES:

Note: This service will not be available
until spring/summer 1994.

1 - Access to the On-Line service:

```
Use the TCP/IP (internet) network.
TELNET iaeand.iaea.or.at
Username: IAEANDS
Enter NDS assigned authorization code (or GUEST): GUEST
(or your authorization code if you have one)
```

2 - Retrievals or Copying of files:

Identical to the system of the US National Data Center.
(see B - II - 2 above)

3 - Logout:

When terminating a retrieval session, enter or select LOGOUT.

4 - Authorization:

As a "GUEST", you will have 30 seconds of CPU allocated. At the end of a GUEST session, you may sign up directly for an authorization code for full access service. Or you may contact the IAEA Nuclear Data Section for assignment of an authorization code.

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