

V PARAMETER AND PROGRAM LIBRARIES

The Management — Retrieval Code of the Sub- Library of Atomic Mass and Characteristic Constants for Nuclear Ground State

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The management-retrieval code of the sub-library of atomic mass and characteristic constants for nuclear ground state (MCC) is used for displaying the basic information on the MCC sub-library on the screen, and retrieving the required data. The retrieved results are put into the data file OUTMCC.DAT. The code was finished at Chinese Nuclear Data Center (CNDC), and has widely been used in nuclear model calculations of nuclear data and other fields.

1 Basic Information

The MCC management-retrieval code could retrieve the following data :

ME : Mass excess ($M-A$). Most of mass excesses are the experimental data, compiled by A. H. Wapstra et al.^[1]. An appended "s" denotes that the value is from systematics^[1]. An appended "t" denotes that the value is calculated by P. Moller et al.^[2].

J, *P* and *T/2* : Spin, parity and half-life of ground state. Most of these values were taken from the Evaluated Nuclear Structure Data File (ENSDF)^[3].

AB : Abundance. Taken from Ref. [4].

The others, such as atomic mass *M*, total binding energy *B*; separation energies of some particles and particle groups and beta-decay energies; nuclear reaction energy *Q* and the corresponding threshold energy *E_t* for some reaction channel up to the third reaction process can also be derived by the combi-

nations of different mass excesses by using this code.

The MCC data file contains the data of 4800 nuclides ranging from $Z = 0, A = 1$ to $Z=122, A=318$. Most of these data are from the references mentioned above, and a few are collected and compiled by us.

2 Retrieval Ways

This code provides two retrieval ways . One is for single nucleus (SN), and another is for a neutron reaction (NR). The latter contains four kinds of retrieval types corresponding to four types of different neutron calculation codes respectively. They are :

1) The first type (FUP code)

1st process	2nd process	3rd process
$(n,\gamma) (Z, A+1)$	$(n,2n) (Z, A-1)$	$(n,3n) (Z, A-2)$
$(n,n) (Z, A)$		

2) The second type (emitted particles without d, t, ^3He)

1st process	2nd process	3rd process
$(n,\gamma) (Z, A+1)$	$(n,2n) (Z, A-1)$	$(n,3n) (Z, A-2)$
$(n,n) (Z, A)$	$(n,np) (Z-1, A-1)$	$(n,2np) (Z-1, A-2)$
$(n,p) (Z-1, A)$	$(n,n^4\text{He}) (Z-2, A-4)$	$(n,2n^4\text{He}) (Z-2, A-5)$
$(n,^4\text{He}) (Z-2, A-3)$	$(n,pn) (Z-1, A-1)$	
	$(n,2p) (Z-2, A-1)$	
	$(n,p^4\text{He}) (Z-3, A-4)$	
	$(n,^4\text{He} n) (Z-2, A-4)$	
	$(n,^4\text{He} p) (Z-3, A-4)$	
	$(n,2^4\text{He}) (Z-4, A-7)$	

3) The third type (UNF code)

1st process	2nd process	3rd process
$(n,\gamma) (Z, A+1)$	$(n,2n) (Z, A-1)$	$(n,3n) (Z, A-2)$
$(n,n) (Z, A)$	$(n,np) (Z-1, A-1)$	
$(n,p) (Z-1, A)$	$(n,n^4\text{He}) (Z-2, A-4)$	
$(n,d) (Z-1, A-1)$	$(n,pn) (Z-1, A-1)$	
$(n,t) (Z-1, A-2)$	$(n,2p) (Z-2, A-1)$	
$(n,^3\text{He}) (Z-2, A-2)$	$(n,^4\text{He} n) (Z-2, A-4)$	
$(n,^4\text{He}) (Z-2, A-3)$		

4) The fourth type (MUP code, 49 kinds of channel)

1st process	2nd process	3rd process
$(n,\gamma) (Z, A+1)$	(n,nx)	$(n,3n) (Z, A-2)$
$(n,n) (Z, A)$	(n,px)	$(n,2np) (Z-1, A-2)$
$(n,p) (Z-1, A)$	(n,dx)	$(n,2nd) (Z-1, A-3)$
$(n,d) (Z-1, A-1)$	(n,ix)	$(n,2nt) (Z-1, A-4)$
$(n,t) (Z-1, A-2)$	$(n,^3\text{He} x)$	$(n,2n^3\text{He}) (Z-2, A-4)$
$(n,^3\text{He}) (Z-2, A-2)$	$(n,^4\text{He} x)$	$(n,2n^4\text{He}) (Z-2, A-5)$
$(n,^4\text{He}) (Z-2, A-3)$	$(x = n, p, d, t, ^3\text{He}, ^4\text{He})$	

The retrieved results are classified and put into data file "OUTMCC.DAT".

3 Conclusion

The MCC sub-library (Version 1) has been set up at CNDC, and has been used to provide the atomic masses and characteristic constants of nuclear ground states for the nuclear model calculations, nuclear data evaluations and other fields.

There are the mass excesses of 4800 nuclides including exotic nuclei quite far from the stability valley in the MCC data file, therefore this sub-library could satisfy requirements of different users.

It is very simple and convenient to retrieve atomic masses and related data by using the management retrieval code, because of adopting the man-computer interaction and providing various choice.

As the next step, the data of the MCC sub-library, such as *ME* and the data relative to *ME*, will be updated, and the management-retrieval code should further be perfected for wider applications.

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References

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- [2] P. Moller, M. J. Swiatecki and J. Treiner, *At. Nucl. Data Tables* 39, 225(1988)
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Discrete Level Schemes and Their Gamma Radiation Branching Ratios (CENPL-DLS) (I)

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The DLS data file, which is a sub-library (Version 1) of Chinese Evaluated Nuclear Parameter Library (CENPL), consists of data and information of discrete levels and gamma radiations. The data and information of this data file are translated from the Evaluated Nuclear Structure Data File (ENSDF)¹, which is maintained by the National Nuclear Data Center (NNDC) at Brookhaven National Laboratory based on evaluation from the International