

# Japan Charged-Particle Nuclear Reaction Data Group

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## Memo CP-E/065

**Date:** February 24, 2005  
**To:** Distribution  
**From:** OTSUKA Naohiko and Victoria McLane  
**Subject:** IPA as parameter code and short-hand nuclide code in SF7  
**Reference:** CP-C/354

We have studied the procedure of C1118.003 (Fig. 5 a-c, p024609-5) and 006 (Fig. 9, 10, 13 and 14), because we found many theoretists from JCPRG in the citation list of this article.

- 1) We can find an example of the intermediate state before break up in LEXFOR "Partial Reaction - Reactions that lead by the same particle sequence to the same reaction products"

*Examples:*

- a.)  $^{12}\text{C}(n,n')^{12*}\text{C} \rightarrow \alpha + ^8\text{Be} \rightarrow 2\alpha$
- b.)  $^{12}\text{C}(n,n')^{12*}\text{C} \rightarrow 3\alpha$

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REACTION	1 ( 6-C-12 (N, N+2A) 2-HE-4 , PAR , SIG )
	2 ( 6-C-12 (N, N+2A) 2-HE-4 , PAR , SIG )
EN-SEC	1 ( E-LVL , 4-BE-8 )
	2 ( E-LVL , 6-C-12 )

So SF3="3A" (We can use INL in C1118.002, 004 and 005 because the degrees of freedom of  $^8\text{Be}$  and  $\alpha$  does not appear in these subentries).

- 2) We agree on the use of short-hand nuclide code BE8 in SF7. We may add this code in Dict. 33.
- 3) Use of IPA in SF6 looks to be good. We can link IPA and particle considered easily.
- 4) IPA refers angle between  $^{12}\text{C}$  and beam axis (not two  $^{12}\text{C}$ ), so IPA is referred by RSD.
- 5) PAR is characterized by levels of  $^8\text{Be}$  and  $^{12}\text{C}$  in final state and  $^{12}\text{C}$  before break up. So we must specify these three levels (LEVEL-PROP can specify these levels).
- 6) The 2nd angle given, between  $^8\text{Be}$  and  $\alpha$  is for the projection of the relative velocity if the 2 particles. Therefore, we recommend using MSC in SF8 until such time as we may encounter

more such data.

We propose one heading in addition to two headings proposed in CP-C/354:

**Dictionary 24 (Headings)**

ANG1-CM-MN	Lower limit of 1st angle in c.m. system
ANG1-CM-MX	Upper limit of 1st angle in c.m. system
ANG2-RL-CM	2nd angle between 2 outgoing particles in c.m. system

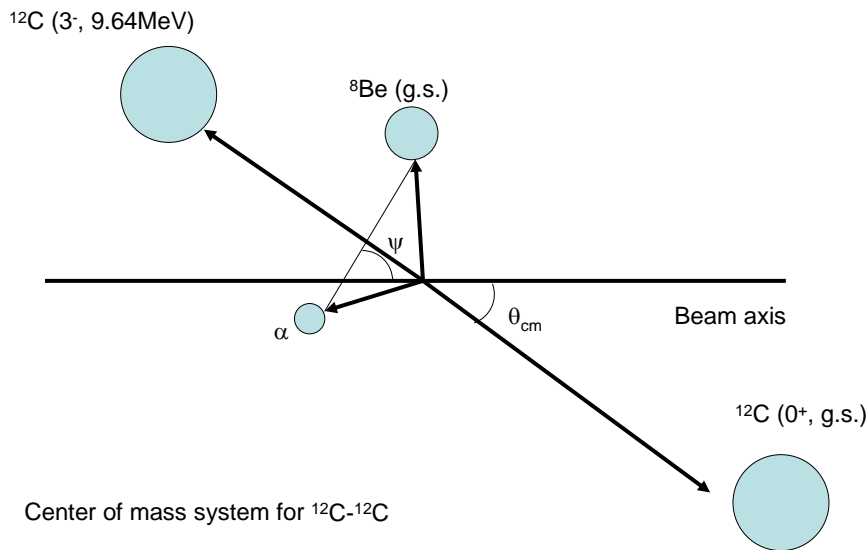
**Coding sample based on comments:**

SUBENT	C1118003	20050111				C1118	3	1
BIB	4	7				C1118	3	2
REACTION	(6-C-12(6-C-12,3A)6-C-12,PAR,IPA/DA,RSD/A+BE8,MSC)					C1118	3	3
	- ANG1-CM is angle between outgoing 12C and beam in the center of mass system between two 12C.					C1118	3	4
	- ANG2-RL-CM is angle between relative velocity of alpha-8Be and beam in the center of mass system between alpha and 8Be.					C1118	3	5
						C1118	3	6
						C1118	3	7
EN-SEC	(E-LVL1,6-C-12) Intermediate state					C1118	3	8
	(E-LVL2,4-BE-8)					C1118	3	9
	(E-LVL3,6-C-12)					C1118	3	10
LEVEL-PROP	(6-C-12,E-LVL=0.00,SPIN=0,PARITY=+1.)					C1118	3	11
	(6-C-12,E-LVL=9.64,SPIN=3,PARITY=-1.)					C1118	3	12
ERR-ANALYS	(DATA-ERR) No information given					C1118	3	13
STATUS	Data taken from Fig. 5 of the journal article					C1118	3	14
ENDBIB	7	0				C1118	3	15
COMMON	2	3				C1118	3	16
E-LVL1	E-LVL2	E-LVL3	ANG1-CM-MN	ANG1-CM-MX	ANG2-RSL	C1118	3	17
MEV	MEV	MEV	ADEG	ADEG	ADEG	C1118	3	18
9.64	0.0	0.0	40.0	95.0	10.0	C1118	3	19
ENDCOMMON	3	0				C1118	3	20
DATA	5	39				C1118	3	21
ANG2-RL-CM	EN-CM	DATA-CM	DATA-ERR			C1118	3	22
ADEG	MEV	MU-B/SR	MU-B/SR			C1118	3	23
5.	2.540E+01	3.054E+03	2.181E+02			C1118	3	24
5.	2.579E+01	2.727E+03	1.818E+02			C1118	3	25
5.	2.698E+01	6.145E+03	5.090E+02			C1118	3	26

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### **Geometry:**

- $\theta_{cm}$  and  $\psi$  are given under headings ANG1-CM and ANG2-RL-CM, respectively.
- $^{12}\text{C}$  ( $3^-$ ),  $^8\text{Be}$  (g.s.), and  $^{12}\text{C}$  ( $0^+$ ) levels are given under E-LVL1, 2 and 3, respectively.



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