Combination of Particle Codes and Their Order in REACTION SF7

(N. Otsuka and O. Schwerer, 2021-04-26, Memo CP-D/1014)

1. Particle order in SF7

In Dictionary 236, * stands for a single particle code while *+* stands for a combination of particle codes (e.g., DA,* and DA,*+*).

Example

Code in Dict.	Expansion	Actual code (example)
,DA,*	Angular distribution of particle specified	,DA,N
,DA,*+*	Angular distribution of particle pair specified	,DA,N+P

Memo CP-C/487 discusses the advantage and disadvantage to allow a wildcard (*) to express both a particle code (e.g., N) and a combination (e.g., N+P).

- Advantage: Keep dictionary 236 as compact as possible (We do not have to define ,DA,* and ,DA,*+* separately.)

- Disadvantage: Loose consistency in actual REACTION strings (Both ,DA/DA,N/N+P and ,DA/DA,N+P/N will be allowed for the same quantity $d\sigma/d\Omega(n)/d\Omega(n-p)$.)

We reviewed Dictionary 236 and EXFOR Master Ver. 2021-04-15 for the inconsistencies due to

1. presence of two quantity codes in Dictionary 236 with */*+* and *+*/* for the same quantity (e.g. Only one of ,DA/DA,*/*+* and ,DA/DA,*+*/*);

2. order of the particle codes combined by + for the same quantity (e.g., DA,N+P and DA,P+N);

3. order of the particle codes combined by / for the same quantity (e.g., DA/DA,N/P and DA/DA,P/N stand for the same quantity, but only one of them should be allowed. DA/DE,P/N and DA/DE,N/P stand for different quantities and both of them are allowed.)

based on the lists appended to this memo. Our observations for these questions are

1. There are **two** quantity codes which repeat the same parameter code for differentiation and has the particle combination before slashes: ,DA/DA,*+*/* and PAR,DA/DA,*+*/*. Only two entries use these quantity codes – E1711 and E1748. This is against the instruction given in LEXFOR "Differential data – angular correlation" as pointed out by CP-C/487.

2. There is **one** entry where particle combination separated by + is coded with the heavier particle first (D+G in C2138.002).

3. There are **37** entries where particle combination separated by / is coded with the heavier particle first (1 in area 2, 1 in area A, 2 in area C, 7 in area D, 6 in area E, 17 in area F, 1 in area O, 1 in area S, 1 in area T).

From these observations, we conclude that it is realistic to introduce the following rules for better consistency in the REACTION spelling, and update the affected entries for REACTION SF7:

1. Place the particle combination after the slash when the same parameter code for differentiation appears twice (e.g., DA/DA,*/*+* rather than DA/DA,*+*/*)

2. Place the heavier particle after the lighter particle when they are combined by + or / (e.g., N/P rather than P/N and N+P rather than P+N).

We propose revision of the affected entries (See **Appendices 1** and **2** of this memo).

Dictionary 236 (Quantities)

,DA/DA,*+*/*   (*Obsolete*)
PAR,DA/DA,*+*/*   (*Obsolete*)
PAR,DA/DA,*/*+*   Partial double differential cross sections d/dA(*)/dA(*+*)

2. Revision of EXFOR Formats Chapter 6 "REACTION Specification"

The current Formats Manual explains / and + in REACTION SF7 as follows:

> <u>SF7 Particle Considered.</u> Provides particle or nuclide code(s) indicating to which of several outgoing particles or nuclides the quantity refers.[3] <u>When more than one particle/nuclide is entered, e.g., for a quantity describing the correlation between outgoing particles, all codes are entered, separated by a slash. For the case where a variable is given for a correlated pair, e.g., the centre-of-mass energy of two or more emitted particles, the codes are separated by a plus sign (+).</u> Contains a code from Dictionary 33 with an "allowed SF7 flag" (7) (see **LEXFOR, Outgoing Particles**)[4]. The code RSD is used in SF7 when the reaction product (SF4) is the particle considered.
>
> 3. Note that the particle considered is not necessarily identical to the particle detected, e.g., the angular distribution of an outgoing particle that has been deduced from a recoil particle detected.
>
> 4 For particles heavier than α, codes in the form Z-S-A-X have been used in SF7 and may still exist in older entries; currently, short nuclide codes (for exclusive use in REACTION SF7) such as BE10, C14, CA40, LI6 are introduced, and are being added to dictionary 33 as needed.

To describe the new rule on the order of particles separated by a slash and plus sign, and also to clarify when we use a slash and when we use a plus sign, the following revised text is proposed:

> <u>SF7 Particle Considered.</u> Provides particle ~~or nuclide~~ code(s) indicating to which of several outgoing particles and/or reaction product the quantity refers.[3] When the dataset is characterized by independent variable(s) associated with the two or more outgoing particles and/or reaction product they must be indicated by this subfield.
>
>   a) If there are several parameters, their particles considered are ordered starting with the lightest and combined by a slash (/).
>
>   *Example*:
>   (6-C-12(P,N+P)6-C-11,,DA/DA,N/P) Double differential cross sections with respect to the outgoing angles of the neutron and proton ($d\sigma/d\Omega_n/d\Omega_p$)
>
>   b) If a parameter is defined with several particles considered, their particle codes are ordered starting with the lightest and combined by a plus sign (+).
>
>   *Example*:
>   (6-C-12(P,N+P)6-C-11,,DE,N+P) Differential cross section with respect to the relative energy between the outgoing neutron and proton ($d\sigma/dE_{n\text{-}p}$).
>
> Contains a code from Dictionary 33 with an "allowed SF7 flag" (7) (see **LEXFOR, Outgoing Particles**)[4]. The code RSD is used in SF7 when the reaction product (SF4) is the particle considered.

3. Addition to LEXFOR "Differential Data"

Addition of the following paragraph to LEXFOR "Differential Data" is proposed.

<div style="border:1px solid">

Separators in REACTION SF7

When differentiation involves parameters associated with two or more particles, they may be combined by a slash (/) or plus sign (+). A slash is used when several parameters are associated with several particles, while a plus is used when a parameter is associated with several particles.

Examples:

,DA/DA,N/P: Differential for the outgoing angles of neutron and proton ($d\sigma/d\Omega_n/d\Omega_p$)

,DE,N+P: Differential for the relative energy between neutron and proton ($d\sigma/dE_{n\text{-}p}$).

</div>

4. New keyword – ANG-SEC

In order to define the several headings for angles in a computer readable form, we propose addition of a new keyword ANG-SEC (Secondary angle).

Dictionary 2 (Information identifiers)

ANG-SEC   Secondary angle

<div style="border:1px solid">

ANG-SEC.   Gives information about secondary angle, and defines secondary angle fields given in the data table. See also **LEXFOR, Secondary Particles**.

1. Must be present with coded information when the data headings ANG1, ANG2, *etc.*, are used in the data. Otherwise its presence is optional and free text or coded information, with or without free text, may be given.

2. The format of the coded information is: (heading,particle)

    Heading Field: the data heading or root[1] of the data heading to be defined.

    Particle Field: the particle or nuclide to which the data heading refers. The code is:

    either   a particle code from Dictionary 33 with a D in the 1st position of the allowed subfields flags,

    or   a nuclide coded in the standard format as described on 6.2.

3. When more than one linear-momentum data heading is to be defined, each must be coded on a separate record, starting in column 12.

    Example: `ANG-SEC      (ANG1,N)`
    `                 (ANG2,P)`
    `                 (ANG-RL,N+P)`

</div>

5. Relation between particle codes in REACTION SF7 and headings

The relation between particle codes in REACTION SF7 and headings described in LEXFOR "Differential data" are summarized below:

	θ_a	θ_b	θ_{ab}	E_a	E_b	E_{ab}
,DA/DA,a/b	ANG1	ANG2				
,DA/DA,a/a+b	ANG1		ANG-RL			
,DA/DA/DE,a/b/a	ANG1	ANG2		E1		
,DA/DA/DE,a/b/b	ANG1	ANG2			E2	
,DA/DA/DE,a/b/a+b	ANG1	ANG2				E-RL
,DA/DE/DE,a/a/b	ANG1			E1	E2	
,DA/DE/DE,b/a/b		ANG2		E1	E2	

(A heading with -CM may replace the heading in the table, e.g. ANG2-CM may replace ANG2.)

We propose addition of this table to LEXFOR "Differential Data".

6. Illegal repetition of the same particle code in SF3
When the multiplicity of an outgoing particle is two or more, it must be coded with a multiplicity factor instead of repetition of the particle code (e.g., 2N rather than N+N). There are 11 entries (2 from area A, 3 from area D, 5 from area E and 1 from area F) using the illegal repetition of the same particle code, and I propose revisions of these entries (See **Appendix 3** of this memo).

Appendix 1: REACTIONs for replacement of *+*/* with */*+*

Dataset	REACTION
E1711.006	(36-KR-84(13-AL-27,2P+F)MASS,,DA/DA,P+P/FF,REL)
E1711.007	(36-KR-84(13-AL-27,2P+F)MASS,,DA/DA,P+P/FF,REL)
E1711.008	(36-KR-84(13-AL-27,2P+F)MASS,,DA/DA,P+P/FF,REL)
E1711.009	(36-KR-84(13-AL-27,2P+F)MASS,,DA/DA,P+P/FF,REL)
E1711.010	(36-KR-84(13-AL-27,P+A+F)MASS,,DA/DA,P+A/FF,REL)
E1711.011	(36-KR-84(13-AL-27,P+A+F)MASS,,DA/DA,P+A/FF,REL)
E1711.012	(36-KR-84(13-AL-27,P+A+F)MASS,,DA/DA,P+A/FF,REL)
E1711.013	(36-KR-84(13-AL-27,P+A+F)MASS,,DA/DA,P+A/FF,REL)
E1711.014	(36-KR-84(13-AL-27,2A+F)MASS,,DA/DA,A+A/FF,REL)
E1711.015	(36-KR-84(13-AL-27,2A+F)MASS,,DA/DA,A+A/FF,REL)
E1711.016	(36-KR-84(13-AL-27,2A+F)MASS,,DA/DA,A+A/FF,REL)
E1711.017	(36-KR-84(13-AL-27,2A+F)MASS,,DA/DA,A+A/FF,REL)
E1748.015	(28-NI-58(3-LI-7,T+A)28-NI-58,PAR,DA/DA,T+A/LI6)
E1748.016	(40-ZR-90(3-LI-7,T+A)40-ZR-90,PAR,DA/DA,T+A/LI6)
E1748.017	(50-SN-120(3-LI-7,T+A)50-SN-120,PAR,DA/DA,T+A/LI6)
E1748.018	(69-TM-169(3-LI-7,T+A)69-TM-169,PAR,DA/DA,T+A/LI6)
E1748.019	(82-PB-208(3-LI-7,T+A)82-PB-208,PAR,DA/DA,T+A/LI6)
E1748.046	(30-ZN-64(3-LI-7,T+A)30-ZN-64,,DA/DA,T+A/LI6)
E1748.047	(30-ZN-64(3-LI-7,T+A)30-ZN-64,,DA/DA,T+A/LI6)
E1748.048	(40-ZR-90(3-LI-7,T+A)40-ZR-90,,DA/DA,T+A/LI6)
E1748.049	(40-ZR-90(3-LI-7,T+A)40-ZR-90,,DA/DA,T+A/LI6)
E1748.050	(62-SM-144(3-LI-7,T+A)62-SM-144,,DA/DA,T+A/LI6)
E1748.051	(62-SM-144(3-LI-7,T+A)62-SM-144,,DA/DA,T+A/LI6)
E1748.052	(79-AU-197(3-LI-7,T+A)79-AU-197,,DA/DA,T+A/LI6)
E1748.053	(79-AU-197(3-LI-7,T+A)79-AU-197,,DA/DA,T+A/LI6)

Appendix 2: REACTIONs for sorting of particle codes in SF7

Dataset	REACTION
21601.002	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.003	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.004	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.005	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.006	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.007	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.008	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.009	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.010	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.011	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.012	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.013	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.014	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.015	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.016	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.017	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.018	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.019	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.020	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.021	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.022	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.023	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.024	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.025	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.026	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.027	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.028	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.029	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.030	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.031	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.032	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.033	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.034	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
21601.035	(1-H-2(N,2N)1-H-1,,DA/DA/DE,P/N/N)
A0883.003	(12-MG-24(A,INL)12-MG-24,,DA/DA,A/G,REL)
A0883.004	(12-MG-24(A,INL)12-MG-24,,DA/DA,A/G,REL)
A0883.005	(12-MG-24(A,INL)12-MG-24,,DA/DA,A/G,REL)
C0806.004	(50-SN-124(HE3,T+N)51-SB-123,SEQ,DA/DA/DE,T/N/RSD)
C0806.005	(50-SN-124(HE3,T+N)51-SB-123,SEQ,DA/DA/DE,T/N/RSD)
C1755.002	(14-SI-28(HE3,A+P)13-AL-26-M,SEQ/PAR,DA/DA,A/P,REL)
C1755.003	(14-SI-28(HE3,A+P)13-AL-26-M,SEQ/PAR,DA/DA,A/P,REL)
C2138.002	(64-GD-154(P,D)64-GD-153,PAR,DA,D+G,REL)
D5013.002	(1-H-3(A,N+D)2-HE-4,,DA/DA/DE,A/D/A,REL)
D5015.003	(1-H-3(A,N+D)2-HE-4,,DA/DA/DE,A/D/D,REL)
D5023.002	(1-H-3(A,N+T)2-HE-3,,DA/DA/DE,HE3/T/N,REL)
D5025.002	(1-H-3(A,N+D)2-HE-4,,DA/DA/DE,A/D/D,REL)
D5029.004	(3-LI-7(D,D+T)2-HE-4,,DA/DA/DE,A/T/A,REL)
D5029.005	(3-LI-7(D,D+T)2-HE-4,,DA/DA/DE,A/D/A,REL)
D5098.002	(3-LI-7(D,D+T)2-HE-4,,DA/DA/DE,A/D/A,REL)

D5098.003	(3-LI-7(D,D+T)2-HE-4,,DA/DA/DE,A/T/A,REL)
D5110.002	(3-LI-6(HE3,D+HE3)2-HE-4,,DA/DA,HE3/D)
D5110.003	(3-LI-6(HE3,T+HE3)2-HE-3,,DA/DA,HE3/T)
D5110.007	(3-LI-6(A,D+A)2-HE-4,,DA/DA,A/D)
D5110.008	(3-LI-6(A,T+HE3)2-HE-4,,DA/DA,A/T)
E0735.004	(1-H-2(P,N+P)1-H-1,,POL/DA/DA,P/N,ANA)
E0814.002	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.003	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.004	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.005	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.006	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.007	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.008	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.009	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.010	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.011	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.012	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.013	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.014	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.015	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.016	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.017	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.018	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.019	(6-C-12(D,N+P)6-C-12,PAR,DA/DA/DE,P/N/P)
E0814.020	(6-C-12(D,N+P)6-C-12,PAR,DA/DA,P/N)
E0814.021	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.022	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.023	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.024	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.025	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.026	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.027	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.028	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.029	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.030	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.031	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.032	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.033	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.034	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.035	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.036	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.037	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.038	(23-V-51(D,N+P)23-V-51,PAR,DA/DA/DE,P/N/P)
E0814.039	(23-V-51(D,N+P)23-V-51,PAR,DA/DA,P/N)
E0814.040	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.041	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.042	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA,REL)
E0814.043	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.044	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.045	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.046	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.047	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)

E0814.048	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.049	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.050	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.051	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.052	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.053	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.054	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.055	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA/DE,P/N/P)
E0814.056	(50-SN-118(D,N+P)50-SN-118,PAR,DA/DA,P/N)
E0818.006	(50-SN-119(A,N+A)50-SN-118,,DA/DA/DE,A/N/A)
E0818.007	(50-SN-119(A,N+A)50-SN-118,,DA/DA/DE,A/N/A)
E0818.008	(50-SN-119(A,N+A)50-SN-118,,DA/DA/DE,A/N/A)
E0818.009	(50-SN-119(A,N+A)50-SN-118,,DA/DA/DE,A/N/A)
E0818.010	(50-SN-119(A,N+A)50-SN-118,PAR,DA/DA,A/N)
E0818.011	(50-SN-119(A,N+A)50-SN-118,PAR,DA/DA,A/N)
E1308.002	(2-HE-3(A,P+D)2-HE-4,,DA/DA/DE,A/P/A)
E1308.003	(2-HE-3(A,P+D)2-HE-4,,DA/DA/DE,A/P/A)
E1308.004	(2-HE-3(A,P+D)2-HE-4,,DA/DA/DE,A/P/A)
E1308.005	(2-HE-3(A,P+D)2-HE-4,,DA/DA/DE,A/P/A)
E1678.002	(3-LI-6(A,T+HE3)2-HE-4,,DA/DA/DE,A/HE3/A)
E1678.003	(3-LI-6(A,T+HE3)2-HE-4,,DA/DA/DE,A/HE3/A)
E1678.004	(3-LI-6(A,T+HE3)2-HE-4,,DA/DA/DE,A/HE3/A)
E1678.005	(3-LI-6(A,T+HE3)2-HE-4,,DA/DA/DE,A/HE3/HE3)
E1678.006	(3-LI-6(A,T+HE3)2-HE-4,,DA/DA/DE,A/HE3/HE3)
E1678.007	(3-LI-6(A,T+HE3)2-HE-4,,DA/DA/DE,A/HE3/HE3)
E1678.008	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/HE3)
E1678.009	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/HE3)
E1678.010	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/HE3)
E1678.011	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/HE3)
E1678.012	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/HE3)
E1678.013	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/A)
E1678.014	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/A)
E1678.015	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/A)
E1678.016	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/A)
E1678.017	(3-LI-6(A,D+HE3)2-HE-5,,DA/DA/DE,A/HE3/A)
E2569.003	(2-HE-4(A,2D)2-HE-4,,DA/DA/DE,A/D/A)
F0202.003	(6-C-12(P,INL)6-C-12,,DA/DA/DE,P/G/G)
F0272.002	(6-C-12(A,INL)6-C-12,PAR,DA/DA,A/G,REL)
F0272.003	(9-F-19(P,A)8-O-16,PAR,DA/DA,A/G,REL)
F0575.002	(3-LI-6(HE3,P+A)2-HE-4,,DA/DA/DE,A/P/A)
F0597.002	(14-SI-28(A,INL)14-SI-28,PAR,DA/DA,A/G,REL)
F0664.004	(12-MG-24(A,P)13-AL-27,PAR,DA/DA,P/G,REL)
F0683.002	(12-MG-24(A,N)14-SI-27,PAR,DA/DA,N/G,REL)
F0684.005	(12-MG-24(A,P)13-AL-27,PAR,DA/DA,P/G,REL)
F0684.006	(12-MG-24(A,P)13-AL-27,PAR,DA/DA,P/G,REL)
F0686.004	(16-S-32(A,P)17-CL-35,PAR,DA/DA,P/G,REL)
F0747.004	(6-C-12(P,INL)6-C-12,PAR,DA/DA,P/G,NCP/REL)
F0750.004	(9-F-19(A,T)10-NE-20,PAR,DA/DA,T/G,NCP/REL)
F0839.006	(6-C-12(D,INL)6-C-12,PAR,DA/DA,D/G,NCP/REL)
F0894.004	(6-C-13(HE3,A)6-C-12,PAR,DA/DA,A/G,REL)
F1148.004	(5-B-11(HE3,D)6-C-12,PAR,DA/DA,D/G,REL)
F1148.005	(5-B-11(HE3,D)6-C-12,PAR,DA/DA,D/G,REL)

F1228.002	(12-MG-24(D,INL)12-MG-24,PAR,DA/DA,D/G,NCP/REL)
F1228.003	(12-MG-24(D,INL)12-MG-24,PAR,DA/DA,D/G,NCP/REL)
F1310.002	(12-MG-24(P,INL)12-MG-24,PAR,DA/DA,P/G,NCP/REL)
F1343.002	(7-N-14(A,D)8-O-16,PAR,DA/DA,D/G,NCP/REL)
F1343.003	(7-N-14(A,D)8-O-16,PAR,DA/DA,D/G,NCP/REL)
F1343.004	(7-N-14(A,D)8-O-16,PAR,DA/DA,D/G,NCP/REL)
F1343.005	(7-N-14(A,D)8-O-16,PAR,DA/DA,D/G,NCP/REL)
F1344.004	(14-SI-28(A,INL)14-SI-28,PAR,DA/DA,A/G,NCP/REL)
F1344.005	(14-SI-28(A,INL)14-SI-28,PAR,DA/DA,A/G,NCP/REL)
F1344.006	(14-SI-28(A,INL)14-SI-28,PAR,DA/DA,A/G,NCP/REL)
F1344.007	(14-SI-28(A,INL)14-SI-28,PAR,DA/DA,A/G,NCP/REL)
F1344.008	(14-SI-28(A,INL)14-SI-28,PAR,DA/DA,A/G,NCP/REL)
O2175.002	(20-CA-48(A,INL)20-CA-48,PAR,DA/DA,A/G)
O2175.003	(20-CA-48(A,INL)20-CA-48,PAR,DA/DA,A/G)
O2175.004	(20-CA-48(A,INL)20-CA-48,PAR,DA/DA,A/G)
S0127.002	(90-TH-232(6-C-12,F)1-H-1,,DA/DA/DE,FF/P/P)
S0127.003	(90-TH-232(6-C-12,F)2-HE-4,,DA/DA/DE,FF/A/A)
T0230.002	(14-SI-28(A,INL)14-SI-28,,DA/DA,A/G,REL)
T0230.007	(8-O-16(A,INL)8-O-16,PAR,DA/DA,A/G,REL)

Appendix 3: REACTIONs for update of SF3

Dataset	REACTION
A1137.002	(2-HE-3(HE3,P+P)2-HE-4,,SIG,,SFC,EXP)
A1311.002	(1-H-3(T,N+N)2-HE-4,,SIG,,SFC,EXP)
D5015.002	(1-H-3(A,D+D)1-H-3,,DA/DA/DE,D/D/D,REL)
D5054.002	(1-H-3(A,D+D)1-H-3,,DA/DA/DE,D/T/D,REL)
D5114.002	(28-NI-64(A,D+D)28-NI-64,,DA/DA/DE,D/D/D)
D5114.003	(28-NI-64(A,D+D)28-NI-64,,DA/DA/DE,D/D/D)
D5114.004	(28-NI-64(A,D+D)28-NI-64,,DA/DA/DE,D/D/D)
D5114.005	(28-NI-58(A,D+D)28-NI-58,,DA/DA/DE,D/D/D)
D5114.006	(28-NI-58(A,D+D)28-NI-58,,DA/DA/DE,D/D/D)
D5114.007	(28-NI-64(A,D+D)28-NI-64,,DA/DA/DE,D/D/D)
E1133.002	(2-HE-3(P,P+P)1-H-2,,DA/DA/DE,P/P/P)
E1133.003	(2-HE-3(P,P+P)1-H-2,,DA/DA/DE,P/P/P)
E1133.004	(2-HE-3(P,P+P)1-H-2,,DA/DA/DE,P/P/P)
E1133.005	(2-HE-3(P,P+P)1-H-2,,DA/DA/DE,P/P/P)
E1133.006	(2-HE-3(P,P+P)1-H-2,,DA/DA/DE,P/P/P)
E1133.007	(2-HE-3(P,P+P)1-H-2,,DA/DA/DE,P/P/P)
E1140.002	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1140.003	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1140.004	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1140.005	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1140.006	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1140.007	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1140.008	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1140.009	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1152.002	(6-C-12(10-NE-20,A+A)12-MG-24,PAR,DA/DA,A/A,REL)
E1166.002	(8-O-16(10-NE-20,A+A)14-SI-28,PAR,DA/DA,A/A,REL)
E1166.003	(8-O-16(10-NE-20,A+A)14-SI-28,PAR,DA/DA,A/A,REL)
E1166.004	(8-O-16(10-NE-20,A+A)14-SI-28,PAR,DA/DA,A/A,REL)

E1166.005	(8-O-16(10-NE-20,A+A)14-SI-28,PAR,DA/DA,A/A,REL)
E1166.006	(8-O-16(10-NE-20,A+A)14-SI-28,PAR,DA/DA,A/A,REL)
E1166.007	(8-O-16(10-NE-20,A+A)14-SI-28,PAR,DA/DA,A/A,REL)
E1203.009	(2-HE-4(P,P+P)1-H-3,,DA/DA/DE,P/T/T)
E1203.010	(2-HE-4(P,P+P)1-H-3,,POL/DA/DA/DE,P/T/T,ANA)
E1203.011	(2-HE-4(P,P+P)1-H-3,,DA/DA/DE,P/T/T)
E1203.012	(2-HE-4(P,P+P)1-H-3,,POL/DA/DA/DE,P/T/T,ANA)
E1203.013	(2-HE-4(P,P+P)1-H-3,,DA/DA/DE,P/T/T)
E1203.014	(2-HE-4(P,P+P)1-H-3,,POL/DA/DA/DE,P/T/T,ANA)
E1203.015	(2-HE-4(P,P+P)1-H-3,,DA/DA/DE,P/T/T)
E1203.016	(2-HE-4(P,P+P)1-H-3,,POL/DA/DA/DE,P/T/T,ANA)
F0084.012	(6-C-12(HE3,P+P)6-C-13,PAR,DA/DA/DE,P/P/P)
F0084.013	(6-C-12(HE3,P+P)6-C-13,PAR,DA/DA/DE,P/P/P)