

Mass Yield (MAS,FY and SEC,FY)

(N. Otsuka, O. Schwerer, 2017-04-23, Memo CP-D/929)

The definitions of two quantities MAS,FY (Mass yield of fission fragment as sum of independent yields) and SEC,FY (Post-neutron-emission fission-product) are the same as discussed in Memo CP-D/710. After this memo, we have looked for a reason to keep these two quantity codes in the dictionary, but could not find a clear evidence describing the original idea of Meinhart Lammer who proposed MAS,FY in 1998 in Memo CP-D/298. It could be for two different derivations (*e.g.*, direct measurement of the mass yield, or summing up the independent yield for a given mass chain). However the measurement method should not be reflected in different REACTION coding.

There are still only 5 entries having REACTION codes with SF5=MAS, and one possible solution could be to make this modifier and two quantity codes (MAS,FY and PAR/MAS,FY,LF) obsolete and to add “mass yield” in the expansion of SEC,FY.

Dictionary 31 (Branches)

MAS (Obsolete)

Dictionary 236 (Quantities)

MAS,FY (Obsolete. Used in 13981, 14088, A0108 and O1442)

PAR/MAS,FY,LF (Obsolete. Used only in 14044.003)

SEC,FY (Addition of “(mass yield)” in its expansion)

EXFOR #	REACTION (SF5-SF8)	Comments
13981.002	MAS,FY	Use PRE,FY (declared as <i>pre-neutron-emission mass-yield</i> by authors)
14044.003	PAR/MAS,FY,LF,REL/MXW	Use SEC,FY/DE,*F,MXW/MSC (declared as <i>post-neutron-emission masses</i> by authors)
14088.002	MAS,FY	? (The source article is not available at NDS.)
14088.003	MAS,FY	? (The source article is not available at NDS)
A0108.245	MAS,FY	Use SEC,FY (online separation at GSI)
O1442.002	MAS,FY	Use SEC,FY (Time-of-flight at JINR)

Because SEC,FY means the mass yield, we expect MASS is always in REACTION SF4 when SEC,FY is used. The following table summarizes the EXFOR data sets where REACTION SF5=*SEC* and SF6=FY but MASS is not in SF4 (*: wildcard). Note that the presence of MASS in SF4 is not always required if FY is accompanied by another parameter code in SF6 (*e.g.*, 92-U-235(N,F),SEC,FY/DE,HF).

List of EXFOR data sets where SF5=*SEC* and SF6=FY but MASS is not in SF4

EXFOR #	REACTION	SF5-SF8 must be	Remark
14063.002	92-U-235(N,F)42-MO-99,SEC,FY	SEC → CUM or (CUM)	⁹⁹ Mo decay gamma counting by an NaI(Tl) crystal.
14063.003	92-U-238(N,F)42-MO-99,SEC,FY	SEC → CUM or (CUM)	
21544.012	94-PU-239(N,F),SEC,FY,,MXW/MS	(No correction proposed because MSC in SF8.)	Relative mass yield of the light fragment at a given kinetic energy range.
22119.002	92-U-232(N,F)ELEM/MASS,SEC,FY,,SPA	SEC → CUM, (CUM) or IND	Decay gamma counting by a HPGe detector
22425.028	95-AM-241(N,F)ELEM/MASS,SEC,FY,,MXW,DERIV	SEC → CUM, (CUM) or IND	Decay gamma counting by a HPGe detector
22425.029	95-AM-241(N,F)ELEM/MASS,SEC,FY,,EPI,DERIV	SEC → CUM, (CUM) or IND	
22792.002	92-U-235(N,F)ELEM/MASS,SEC,FY,,MXW	SEC → CUM, (CUM) or IND	Decay gamma counting by a Ge(Li) detector
22792.003	(90-TH-232(N,F)ELEM/MASS,SEC,FY,,FST)/ (92-U-235(N,F)56-BA-140,SEC,FY,,FST)	SEC → CUM, (CUM) or IND	
22792.004	90-TH-232(N,F)ELEM/MASS,SEC,FY,,FST	SEC → CUM, (CUM) or IND	
A0108.025	82-PB-0(92-U-238,F)ELEM,SEC,FY	SEC → CHG	Online mass spectrometry (FRS, GSI)