Use of NUMBER-CM and compilation of 0th order Legendre coefficients

(N. Otsuka, S. Dunaeva, 2021-08-18, Memo CP-D/1021)

> This paper seeks an approval to (1) use the heading NUMBER for the fitting coefficients given in the centre-of-mass system, (2) make the heading NUMBER-CM obsolete, and (3) compile the 0th order Legendre coefficients (DA,,LEG) with a new quantity code ,SIG,,D4PI (cross section divided by 4pi) separately from the coefficients of higher orders.

1. Do we need heading NUMBER-CM?

It is obvious that the fitting coefficients are to express an angular dependent quantity in the centre-of-mass system when the coefficients are coded under the heading DATA-CM. We propose to make the heading NUMBER-CM obsolete, and to always use the heading NUMBER for indication of the order of the coefficient.

The historical background is not clear. In the archive dictionary 24, NUMBER-CM and ANG-CM are defined with "198202" while DATA-CM is defined with "198503". There might be discussion on addition of DATA-CM in the NRDC 1984 meeting. However, its meeting summary (Memo CP-D/131) is not available at NDS.

2. Compilation of 0th order Legendre coefficients

Our current rule is to compile the 0th order Legendre coefficient ($=\sigma/4\pi$) with ,DA,,LEG and NUMBER=0. Its relation with the cross section is not clear from the quantity code. It can be compiled with higher order coefficients in the same subentry, and it is not trivial for end users to plot the compiled 0th order coefficients with the usual cross sections.

Example – ^{11}B(n,n0)^{11}B elastic scattering cross sections (EXFOR 10093.139)
EXFOR 10093 does not provide a (5-B-11(N,EL)5-B-11,,SIG) dataset, but the 0th order Legendre coefficients in 10093.139 multiplied by 4π can be compared with the elastic scattering cross sections in other EXFOR entries in a plot.
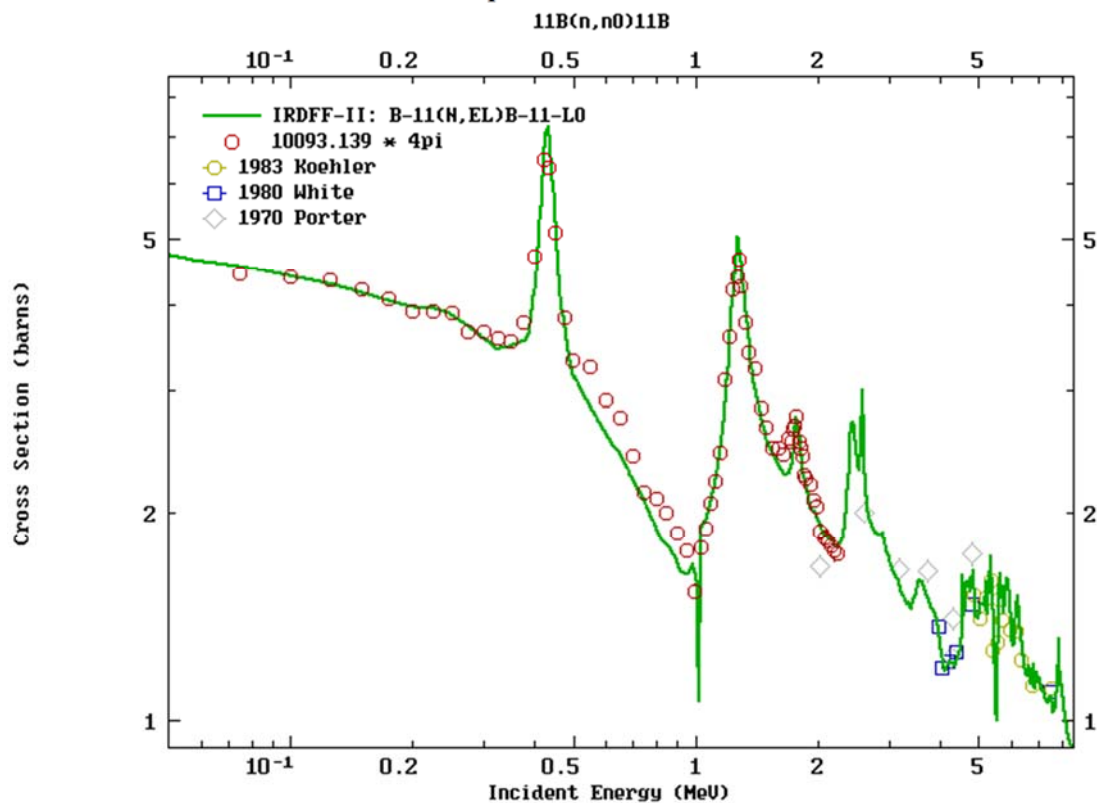
The 0th order coefficients must be more utilized by this way.

In order to make to the 0th order Legendre coefficients more usable for end users (e.g., through conversion to normal cross section in end-user outputs such as C4 and C5), we would like to propose a new quantity code for their compilation separately from higher order coefficients.

Dictionary 34 (Modifiers)

D4PI   Divided by 4pi

Dictionary 236 (Quantities)

,SIG,,D4PI   Cross section divided by 4pi