Compilation of the zeroth order Legendre coefficients

(M. Mikhailiukova, 2023-04-26, Memo 4C-4/0233 Rev.)

In CP-D/1021 (=WP2022-30) there is a proposal:

"(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."

In LEXFOR (last version), page F.19 and in EXFOR dictionary 236 there is the formula for this coding:

d-Sig/d-Omega = a(0) + Sum(a(L)*P(L))), where

P(L) – Legendre polynomials, P(0)=1;

a(L) – Legendre polynomial coefficients.

In the articles authors use this formula for fitting of measured absolute angular distributions DA (point-wise, usually are on figures only in the article) and present only Legendre coefficients in a table. These coefficients (in units like mb/sr) are compiled with coding DA,,LEG in (e.g.) Subent2. If point-wise DA are available for compiler (sent by authors or digitized from figure), then they are compiled in other (e.g) Subent3 with coding DA. Subents are connected by code (DEP,Subent3) in Subent2 STATUS line. But some times point-wise data are not available and only Legendre coefficients are compiled.

If a(0) would be presented in other Subent4 then user could be mistaken by usage formula for fitting without a(0) to calculate the fitting curve of measured data and would obtain wrong result.

Really a(0) is a constant value what means some average and a(1), a(2),… are coefficients for contribution of sum(a(L)*P(L)) as deviation of DA from this constant value a(0).

a(0) could be determined by different ways – estimated from literature, estimated as average of measured absolute data, and so on. And then a procedure of fitting could be different – a(0) could be fixed or varied at fitting.

Typical example is given in EXFOR 40584(J.Sov.Nucl.Phys.,v.37,p.641,1983)

Conclusions:

1) a(0) value is reported by the authors as a fitting coefficient (not as $\sigma/4\pi$), and we should compile a(0) and higher order coefficients a(L) in the same data Subent,

2) a(0)*4π can be used as cross-section only if a(0) was obtained as the parameter varied at fitting, but not fixed (e.g. determined as averaging of other experiments data as average cross section divided by 4π) .