WP2000-10

Proposed new partial data types

CP-C/252	CUM/PAR,DA CUM/PAR,SIG	
CP-C/250	PAR,DA,,SFC	S-factor for partial diff. cross section (with revised LEXFOR entry; note spelling of modifier SFC)

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Memo CP-C/252

DATE: June 28, 1999
TO: Distribution
FROM: V. McLane
SUBJECT: Dictionary additions

Please make the following dictionary updates.

Add to Dictionary 21 (Method)

DSCAT	Double scattering
SFLIP	Spin flip
LRASY	Left-right asymmetry

Add to Dictionary 36 (Quantities)

CUM/PAR,DA	Cumulative partial differential cs d/dA
CUM/PAR,SIG	Cumulative partial cross section

I don't think these last two need a special LEXFOR entry, but if anyone disagrees, please let me know.

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Memo CP-C/250

DATE: June 3, 1999
TO: Distribution
FROM: V. McLane
SUBJECT: Dictionary additions

Please make the following dictionary updates.

Add to Dictionary 25 (Units)

B-MEV/SR	b-MeV/steradian	EDA	1.E+6

Add to Dictionary 36 (Quantities)

PAR,DA,,SFC	S-factor for partial diff. cross section

A LEXFOR entry update is attached.

Astrophysical S-factor

For nonresonant reactions between low-energy charged particles, the steepest dependence of σ(E) is contained in the penetration factor for the Coulomb and angular momentum barrier. For incident energies small compared to the height of these barriers, it is convenient to factor out the energy dependence, and an additional factor of 1/E. The cross section can then be written:

in terms of the Coulomb parameter

$$\sigma(E) = \frac{S(E)}{E} \exp(2\pi\eta)$$

$$\eta = Z_1 Z_2 e^2 / h v$$

where v = relative velocity
Z_1, Z_2 = charge of incident ion and target, respectively

or in terms of the Gamow energy

$$\sigma(E) = S(E) \exp[\beta/\sqrt{E}] / E$$

$$\beta = 0.98948\, Z_1 Z_2 m^{1/2} \quad [\text{units MeV}^{1/2}]$$

where E = center-of-mass incident energy (MeV)
Z_1, Z_2 = charge of incident ion and target, respectively
m = reduced mass of system: $m = m_1 m_2/(m_1 + m_2)$

REACTION Coding: (.....,SIG,,SFN)

Data Units: data are usually given in units of eV b and coded with the data unit B*EV.

Occasionally, the S-factor may be given at one angle where: S(E,2) = S(E)/4B. The units are given as eV b /sr and are coded as B*EV/SR.

See also **Thermonuclear Reaction Rates**.