CJD / Proposal 2
(received 9 March 1999)

<u>Action A.72. Responsible - Maev : Submit proposals (including LEXFOR entry) for self-indication.</u>

<u>Proposals for Self-Indication.</u>

Having in mind that

For reactor projecting purposes some cynergic quantities may be of use and that several dosens of works are published which contain such type of data;

Previous AGV meeting in May 1998 has definitely fesolved to discuss the possibility of inclusion of self-indication mesurements data in EXFOR Data system -
following is proposed to discuss during the coming NRDC meeting in May 1999.

<u>I t e m 1.</u> Addition to Dictionaries.

Diction 34. Modifiers (Reaction SF8)

Add to Dictionary:

SIF (Self-Indication function)

Diction 36. Quantities (Reaction SF5 - SF8)

Add to Dictionary:

,SIG,,SIF/AV Averaged self-indicarion function for corresponding process

I t e m 2. LEXFOR Entry

LEXFOR. -- **Self-Indication**

For elements of interest in reactor physics it is often necessary to know some energy averaged characteristics of these elements. One of such characteristics are transmission functions and their dependence on the sample thickness. They are determined as

$$T_t(x) = \frac{\int_{\Delta E} \varphi(E)\varepsilon(E)\exp(-\sigma_t(E)\cdot x)dE}{\int_{\Delta E} \varphi(E)\varepsilon(E)dE} \quad \textbf{(1)}$$

where φ (E) is neutron spectrum in ΔE energy interval, ε (E) is detector efficiency, $\sigma_t(E)$ is total neutron cross-section and 'x' - sample thickness.

"Partial" transmission function $T_p(x)$ are defined as follows:

$$T_p(x) = \frac{\int_{\Delta E} \varphi(E)\sigma_p(E)\exp(-\sigma_t(E)x)dE}{\int_{\Delta E} \varphi(E)\sigma_p(E)dE} \quad \textbf{(2)}$$

where $\sigma_p(E)$, p = f, inl, γ, . . . - cross-section of the 'p' process.

For known ε (E) and $T_t(x)$, $T_p(x)$ equations (1) and (2) represent a set of decoupled integral equations of the first kind for determining cross-sections $\sigma_t(E)$ and $\sigma_p(E)$, p = f, inl, γ, . . . After measuring of the functions $T_t(x)$ by the well-known experimental pro-cedures [1] one may obtain $\sigma_t(E)$ from equation (1). Then, measuring $T_p(x)$, one can obtain $\sigma_p(E)$ from eqn. (2). Quantities $T_t(x)$, $T_p(x)$, p = f, inl, γ, . . . , are called also "Self-Indication Functions" (SIF).

Using energy subgroup formalism for energy group approximation one may obtain explicit expressions for self-indication functions [2]:

$$f_t(\sigma_0) = \frac{1}{\langle\sigma_t\rangle} \left[\frac{\langle 1/(\sigma_t + \sigma_0)\rangle}{\langle 1/(\sigma_t + \sigma_0)^2\rangle} - \sigma_0 \right]$$

$$\textbf{(3)}$$

$$f_p(\sigma_0) = \frac{1}{\langle\sigma_p\rangle} \frac{\langle \sigma_p/(\sigma_p + \sigma_0)\rangle}{\langle 1/(\sigma_p + \sigma_0)\rangle} \quad , \ p = f, \text{inl}, \ \gamma, ...,$$

where $f_t(x)$, $f_p(x)$ are subgroup representations of self-indication functions $T_t(x)$,

$T_p(x)$, p = f, inl, γ, . . ., angular brackets < > denote the averaging over the energy inter-

val in question, σ_0 is the so-called "dilution cross-section" [2] i.e. cross-section of all admixture isotopes in sample. Values f_t , f_p are those which are obtained in experiments.

CODING RULES.

Total and "partial" self-indication functions are coded as :

Total self-indication function

(Z-S-A(N,TOT),,SIG,,SIF/AV) - with or without free text

Tautology -

(Z-S-A(N,TOT),,SIG,,RAW/AV) Transmission

"Partial" self-indication functions.

Fission self-indication function

(Z-S-A(N,F),,SIG,,SIF/AV) - with or without free text

Radiation capture self-indication function

(Z-S-A(N,G)Z-S-A+1,,SIG,,SIF/AV) - with or without free text

Inelastic scattering self-indication function

(Z-S-A(N,INL)Z-S-A,,SIG,,SIF/AV) - with or without free text

etc.

REFERENCES.

[1] H.I.Liou et.al. Phys.Rev.,vol.C7,#2, p.823,1973, and references therein.
[2] L.Abagjan et.al. Group constants for nuclear reactor calculations.
USSR, Atomizdat, ? . 1964; Consulting bureau, USA, New York, 1964.