Memo CP-D/305 24 March 1999

To: Distribution
From: V.G. Pronyaev, M. Lammer, O. Schwerer

Subject: **New theoretical quantities for CINDA-2000**

In fulfilment of Action 28 of the 1998 NRDC meeting we are submitting in a PostScript attachment a proposal for new theoretical quantities.

Specific Theoretical (Model Dependent) Quantities for CINDA-2000.

V.G. Pronyaev, M. Lammer, O. Schwerer
Nuclear Data Section , IAEA

14th NRDC Meeting[1] requested under Action A28 to investigate which specific theoretical quantities should be added for the CINDA-2000 publication. The reason for this request is explained by the fact that presently the quantities for CINDA compilation do not include some well established and fixed theoretical model parameters usually extracted at the stage of the analysis of experimental data. The inclusion of these parameters in the list of compiled quantities may provide for a simple search and retrieval of the related references from the CINDA database.

A list of theoretical quantities (parameters) widely used in modern theoretical model analysis and for the description of the nuclear cross sections may be taken, for example, from [2]. Usually the parameters are model dependent. It means that a set of parameters is closely related to the model used for reaction data analysis. After comparing this list with the 54 quantities currently included in the CINDA dictionary, and taking into account that CINDA-2000 would extend the list of incident particles for reaction data, we propose to add in CINDA-2000 the following specific theoretical quantities:

SOM Parms (SOM) **Definition:** Parameters of the Spherical Optical Model derived by search or adjusted by fitting to the integral and/or differential cross sections, and/or strength functions for specified target nucleus, incident particle, and energy range.

Examples:

```
AFE056  N               SOM    USABNLN001 2T 1.0+6  2.0+7  1
JPR C51 1386            199901SMITH+TOT,DIF EL,NONEL CS ANLZD

ACR052  A               SOM    RUSFEIJ021 5T 1.0+7  6.0+7  1
JPRL 351 15             199902IVANOV.DIF EL CS ANALYZED
```

CCM Parms (CCM) **Definition:** Parameters of the Coupled Channel Model derived by search or adjusted by fitting to the integral and/or differential cross sections, and/or strength functions for specified target nuclei, incident particle and energy range.

Example:

```
APB208  P               CCM    RUSFEIN011 1T 1.0+7  9.0+7  1J
PR C51 1186             199901SIDOROV+DIF EL CS,6 COLL LVL
ANLZD
```

CCM could be combined with SOM in one common quantity: OMP (optical model parameters)

DFM Parms (DFM) **Definition:** Deformation Parameters of the ground and/or exited states (including also deformation lengths, transitional densities, potentials or B(EL) values) derived from analysis of direct excitation of states in a reaction for specified target nuclei, incident particle and energy range.

Examples:

```
ACA040  P,P             DFM    RUSFEIN011 1T 2.4+7          1
JPR C51 1186            199901PETROV+DIF INL CS,MEAN SQ ROOT
DEF PAR FOR 6 LVLS EXTR
ACA040  E,E             DFM    RUSFEIN011 1T 1.3+8          1
JPR C51 1186            199901PETROV+DIF INL SCAT, TRANS DENS
FOR 3 2+ LVLS EXTR
```

DFM bibliography compilation may be considered as belonging to the NSR.

GMR Parms (GMR) **Definition:** Parameters (Characteristics) of Giant Multipole Resonance derived from analysis of direct excitation of this collective state in reaction for specified target, particle and incident energy range.

Example:

```
ASN120  A,A             GMR    RUSFEIN011 1T 2.4+7          1
JPR C51 1186            199901POPOV+% OF EWSR FOR ISOSCALAR
L=0,SMALL ANGLE SCATT.
```

GMR, as specific collective states laying in continuum, could be combined with DFM in one quantity which could be also called DFM. GMR bibliography compilation may be considered as belonging to the NSR.

Strn Fnctn (STF) **Definition:** Strength Function (ratio of average width to average distance between states for a channel with fixed quantum numbers) obtained from the analysis of average resonance parameters in the resolved or average cross sections in the unresolved resonance region for a specified target (compound) nucleus, incident (outgoing) particle and energy averaging interval. The reduced strength function is normally used for particles with mass to remove strong dependence of the strength function from the particle energy due to barrier penetration.

Strength Function was defined before in CINDA only for neutrons.

The introduction of these theoretical quantities will allow users to make search and retrieval of references on the works containing the determination of these quantities. The additional theoretical quantities would SOM, CCM, DFM and GMR, or the combined quantities OMP and DFM.

References

1. Report INDC(NDS)-383, Co-ordination of the Nuclear Reaction Data Centers. Report of an IAEA Advisory Group Meeting, IAEA Headquarters, Vienna, 11 - 15 May 1998, ed. by V.G. Pronyaev, O. Schwerer, IAEA, 1998.
2. Report IAEA-TECDOC-1034, Handbook for calculations of nuclear reaction data. Reference input parameter library, IAEA, 1998.
3. CINDA2000 Manual, Preliminary Version by V. McLane, November 1998.