

## MEMO CP-C/21

Date: September 9, 1977  
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 Subject: I. Derived Resonance Integrals; Dictionary 35  
 II. Fission, Spallation, Proposed LEXFOR entry on  
Reaction Mechanisms

I. Derived Resonance Integrals; Dictionary 35

It was agreed at the Kiev meeting that centres could begin compiling resonance integrals derived from cross sections or resonance parameters. We do not agree, however, that the status code DEP is a good enough way to differentiate these from directly measured values. In some cases, the original cross section values may not be known and, therefore, not coded in EXFOR. In such a case, the DEP code is not legal. In other cases, a directly measured value may appear also as a ratio to its standard. In which case the value itself would have the status code DEP.

We propose the addition of a code 'DERIV' to be added to Dictionary 35 and defined as derived from measured data. This would be useful for other data which the centres may in the future agree to compile, such as thermal cross sections calculated from resonance parameters. It would also be useful for many types of data which currently exist in the, but are not presently differentiated from directly measured values, e.g., angular distributions calculated from fitting coefficients.

II. Fission, Spallation

We propose that high-energy fission be treated differently than fission at lower energies since the reaction mechanism appears to be different, and as a result the product distribution is also different.

We propose adding the code 'FIS' to Reaction subfield 5 (Branch).

Enclosed is a proposed LEXFOR entry Reaction Mechanisms. This would replace Compound-Nucleus and Direct Interaction and Spallation.

  
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REACTION MECHANISMS

Reaction Mechanisms

Definitions

The following reaction mechanisms are defined, based on currently accepted nuclear models.

Compound-Nucleus Interaction: A reaction in which the incident projectile is absorbed by the target nucleus and its initial energy is assumed to be shared by all other nucleons, such that the mode of disintegration of the 'compound nucleus' is independent of the way in which it was produced.

Direct Interaction: A reaction in which there is direct interaction between the incident projectile and single nucleons or clusters of nucleons in the target.

Spallation: A reaction where several particles are ejected from the target nucleus by direct interaction leaving behind a nucleus in an excited state, which then evaporates nucleons or clusters of nucleons.

High-energy Fission (Energies > about 50 MeV): proceeds in essentially the same manner as spallation except that the excited nucleus divides into roughly two fragments.

See Fission for the fission process at lower energies.

Data Specification

1. Compound-Nucleus Interaction and Direct Interaction

Some reactions may proceed by either mode in which case, the total reaction is equal to the sum of the compound-nucleus interaction and direct interaction portions. In this case, the partial cross-sections for the compound-nucleus interaction and direct interaction portions of a reaction may be coded with the modifiers 'CN' and 'DI', respectively, in quantity SF3 (modifier) for the keyword ISO-QUANT, or, in SF5 (branch) for the keyword REACTION.

Examples:	<u>ISO-QUANT</u>	<u>REACTION</u>
	(----,NP,,CN)	(----- (N,P),CN,SIG)
	(----,NP,,DI)	(----- (N,P),DI,SIG)

These partial cross-sections cannot be measured directly but are deduced from theoretical considerations. Therefore, careful explanation in free text is required whenever these modifiers are used.

Note: If the author measures the total (n,p) cross-section and states that this reaction is totally a direct interaction, then the modifier "DI" must not be given, because "DI" and "CN" designate partial cross-sections.

## 2. Spallation and High-energy Fission

The breakup of a nucleus at high energies may, in some cases, proceed by either mode. In this case, the partial quantity for fission or spallation may be coded under the keyword REACTION using the modifiers 'SPL' and 'FIS', respectively, in SF5 (branch). SF3 (Process) will contain the code 'X'.

### Examples:

(6-C-12(P,X),SPL,SIG) Spallation cross section

(6-C-12(P,X),FIS,SIG) High-energy fission cross section

Note: The total breakup will be coded without these modifiers.

For the production of specified product nuclei see Product Yields.