Dr. Schmidt

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Memo 4C-3/164

To: Distribution 15 April 1976

From: G. Lammer, H.D. Lemmel

Subject: Removal of the Cinda-quantities REM and NPR

Reference: Actions 13 and 14 of the 1975 4C-Meeting

In December 1974, all references indexed under the Cinda-quantities REM or NPR were checked at NDS. It was found that

- most of the REM entries could be converted to ABS-entries, some to individual cross-section quantities (NG,NP,...)
- most of the NPR-entries could be changed to NEM-entries, some to other quantities (like NU,SCT...)

As of January 1976, the remaining entries for these quantities were, apart from 2 private communications:

- the REM-lines of the UKNDL library. These are probably indeed 'disappearance' (or 'parasitic absorption') cross-sections. However, the disappearance cross-sections as given in this library were obtained by summing up all the individual cross-sections contributing to this kind of sum cross-section.

While there are certainly some people interested in special sum cross-sections like NRP and NEM, the indexing and use of them in Cinda is quite difficult and problematic, as is outlined below for the quantity REM:

1., Cinda-indexing:

The cross-sections contributing to the 'removal' ('disappearance') cross-sections can be (depending on isotope and energy-range):

- only (or mainly) $\sigma(n,\gamma)$
- " " " $\sum_i \sigma(n,C_i)$ $i = 1,2$ or more
- $\sigma(n,\gamma) + \sum_i \sigma(n,C_i) = \sigma_{abs}$ (i.e.: no neutron emitting reactions exist in the considered energy-range)
- $\sigma(n,\gamma) + \sum_i \sigma(n,C_i) \neq \sigma_{abs}$.

Only in the latter case the use of the quantity REM would be appropriate.

This means that each time a 'disappearance' cross-section is encountered, the Cinda-indexer should analyze the composition of this cross-section, to see whether it has to be entered under NG,NA,NP,...,ABS or REM. Therefore, the existence of the quantity REM does not ease the task of the indexer.

2., Cinda-users:

Those users who are interested in disappearance cross-sections will, exactly like the Cinda-indexers, have to decide which quantity they should actually look up. Once a user has found out which are the main contributions to the removal cross-section, he will probably be able to get much thorougher information by looking up all the single cross-sections and summing them together himself.

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On the other hand, if e.g. an absorption cross-section has been indeed under REM (because the author had in fact measured the 'disappearance'), this information will be lost for those persons who only search for ABS.

Recommendation: Generally, the number of Cinda quantities for sum cross-sections should be as small as possible. The quantities of main interest to Cinda-users are the individual cross-sections, from which all sum cross-sections may be deduced. In addition, too many quantities increase the confusion rather than to solve it. In the past, for example, a person who needed all information published about thermal $(n,\gamma)$ cross sections should have scanned: SNE,ACT,REM,NG.

Therefore, and for the reasons given above, it is recommended that the quantities REM and NPR be dropped in Cinda. For NPR, a replacement can be found by modifying slightly the definition of NEM:

| | | | | |
|---|---|---|---|---|
| NEM | n Emission | $\sigma_{nP}(E)$ or $\sigma_{nM}(E)$<br>$\sigma_{nP}(E,\theta)$ or $\sigma_{nM}(E,\theta)$<br>$\sigma_{nP}(E;E',\theta)$ or $\sigma_{nM}(E;E',\theta)$ | Definition: The sum cross-section for<br>-all non-elastic processes ($\sigma_{nM}$), or<br>-all processes ($\sigma_{nP}$)<br>from which emergent neutrons can be detected, weighted for the number of neutrons produced: | $\sigma_{nM} = \sigma_{n,n'} + 2\sigma_{n,2n} + 3\sigma_{n,3n} + \bar{\nu}\sigma_{n,f} + \sigma_{n,np} + \ldots\ldots$<br>$\sigma_{nP} = \sigma_{n,n} + \sigma_{nM}$ |

Actions. If agreed,...

NDS will replace all still existing Cinda entries with the quantities REM and NPR.

NDCC should change the input check program as to reject the quantities REM and NPR (except for deletion entries, of course !), and should make the appropriate modifications in the CINDA Manual to be issued.

Other centers should change their check program, if any.