

## Clarifications on Product Yields and Thick Target Yields

O.Schwerer

Clarifications on these quantities were requested in memo CP-D/332, because current definitions of the various data types and the related units are inconsistent or missing. No replies were received.

It should be noted also that in many (but not all) existing entries, compiled in different centers, the quantity , TTY (with SF8 = blank) is used with units MUCI/MUAHR or KBQ/MUAHR which, according to our current definitions, require DT in SF8. This might be due to an earlier change of our definitions in the dictionary.

Examples are C0095, C0188, A0326, S0032, R0008, D4034.

I propose the following actions:

- 1) Clarify quantity definitions and related units (see memo below)
- 2) Improve/modify related LEXFOR entries (see memo below)
- 3) Update dictionaries accordingly
- 4) Check master file for inconsistencies between reactions and units and correct.

### Memo CP-D/332

28 January 2002

From: O. Schwerer

To: Distribution

Subject: Quantities, Units and LEXFOR pages for Product Yields and Thick Target Yields

#### 1. Problem

Some clarifications, additions and corrections are needed concerning the quantities and units for product yields and thick target yields, affecting the dictionaries and relevant LEXFOR pages. Starting point of my review was entry D4063 of TRANS D023 where the REACTION quantity as transmitted does not match the units, which was discussed in several e-mails between NDS and NNDC in last November.

Subentry D4063003:

REACTION (52-TE-122 (D,N) 53-I-123, , PY, , , EXP)

Units: MBQ/MUAHR

These units do not match the REACTION. SF6 = PY (with blank SF8) requires units of type YLD such as PRT/INC or PRD/INC.

Other REACTIONS proposed by NNDC for this subentry were PY, , TT and TTY, , DT.

However, I believe now that the correct REACTION coding might be PY, , DT though I have no clear definition of this quantity (see below).

It is difficult to find the correct coding for such quantities because of shortcomings in both the dictionaries and LEXFOR.

The following is based on the latest transmitted version of the dictionaries (which included the new units proposed in CP-C/294) and the May 2001 draft version of LEXFOR.

## 2. Quantities in the dictionaries and their units

In Daniel/Archive dictionary 36, the class of units that must go with a quantity is defined by the "Unit Family Code" which is used also in Daniel/Archive dictionary 25 to match the appropriate units. The various Unit Family Codes are collected in Daniel/Archive dictionary 26. The following table lists the basic quantity types and their units.

**Table: Basic types of Product Yields and Thick Target Yields in Dictionary 36**

Quantity	Explanation	Unit Family Code	Units	Remarks
, PY and similar (SF8 = blank)	Product Yield	YLD	PRD/INC, PRT/INC and similar	Definition is <b>missing in LEXFOR</b>
, PY, , TT and similar (SF8 = TT)	Product Yield for thick target	YLD	PRD/INC, PRT/INC and similar	
, PY, , DT and similar (SF8 = DT)	Product Yield per unit time	TTT	DPS/MUAHR, MBQ/MUAHR, MUCI/MUAHR and similar	<b>Missing in LEXFOR</b> Is this different from , TTY, , DT ? There may be an inconsistency but I have no definition.
, TTY and similar (SF8 = blank)	Thick Target Yield	TTY	MCI/MUA, MUCI/MUA, PRD/MUAHR	
, TTY, , DT and similar (SF8 = DT)	Thick Target Yield per unit time	TTT	DPS/MUAHR, MBQ/MUAHR, MUCI/MUAHR and similar	
, TTY/DA and similar	Thick Target Yield diff.with angle of outgoing particle	1/A	PRT/INC/SR (Note: Unit Fam.Code 1/A allows also units 1/SR which is the same dimension)	<b>Inconsistent coding!</b> Units correspond to "YLD/sr", therefore should be coded as , PY/DA, , TT <b>Missing in LEXFOR</b>
, TTY/DA, , DT		TTDA (?)	?	Not found in file To be deleted?
, TTY/DA/DE and similar	Double-diff. Thick Target Yield with respect to angle and energy of outgoing particle	1/AE	P/IN/MEVSR (Note: Unit Fam.Code 1/AE allows also units 1/SR/MEV which is the same dimension)	<b>Inconsistent coding!</b> Units correspond to "YLD/sr/MeV", therefore should be coded as , PY/DA/DE, , TT <b>Missing in LEXFOR</b>
, TTY/DE	(Diff. Thick Target Yield with respect to energy of outgoing particle)	(1/E)	(PRT/IN/MEV)	Not found in file Missing in LEXFOR To be changed to , PY/DE, , TT ? (Similar case as above)

### Remarks on the table:

- 1) The Unit Family Codes in dictionary 36 for these quantities are not yet consistent, this is why the check program CHEX often reports errors which are not real. Appropriate corrections in the dictionary will be made.
- 2) "SF8 = blank" does, of course, not exclude the use of general purpose modifiers such as REL or MXW.

### 3. Clarifications needed for the sake of consistency

- Is , PY, , DT different from , TTY, , DT ?  
(There is a number of subentries in the file, with units of TTT type.)  
If there is a difference, then the distinction of PY-related quantities (Unit Family Code YLD) and TTY-related quantities (Unit Family Codes TTY, TTT) *only by their dimension* is not kept, and a clear explanation in LEXFOR, when to use PY and when to use TTY, is needed.  
If there is no difference, , PY, , DT should be made obsolete and the corresponding subentries changed to TTY, , DT.
- TTY/DA and TTY/DA/DE: Do we agree to change these quantities to , PY/DA, , TT and , PY/DA/DE, , TT ? (In particular if it is decided that , PY, , DT should be removed, this would restore full consistency.) The same applies to TTY/DE if there are such entries.

### 4. Proposed changes in LEXFOR

Part of the following proposals were included already in my comments on the draft LEXFOR manual which I sent to Vicki McLane on 19 June 2001.

#### 4.1 LEXFOR Page "Product Yields"

The title of this page is misleading. It does not define the quantity "Product yield" (SF6 =PY), and none of the coding examples is a product yield.

Actually this page explains the use of the SF5 codes CUM, IND, M+, (CUM), M-, (M), which can be used for cross sections as well as for fission-, thick target- and product yields.

I propose to rename this page to "**Cumulative and Independent data**".

It may be useful having also a page "Independent data" containing only a cross-reference to the page "Cumulative and Independent data".

#### 4.2 LEXFOR Page "Production Cross Sections"

This is a completely different topic, one of the main issues being the difference between "emission" and "production" cross sections.

I propose to rename this page to "**Production vs. Emission Cross Sections**".

It may be useful having also a page "Emission Cross Sections" containing only a cross-reference to the page "Production vs. Emission Cross Sections".

#### **4.3 New LEXFOR Page "Product Yields"**

I propose to write a new LEXFOR page "Product Yields" with different contents from the old one. It should contain:

- Definition of Product Yields (SF6=PY) explaining also the difference to thick-target yields
- Definition of PY, , TT
- Definition of PY, , DT (unless it is decided that this quantity should be canceled)

All definitions with coding examples and required unit types.

If it is agreed that the quantities now compiled as TTY/DA and TTY/DA/DE should be compiled using PY in SF6 and TT in SF8, those quantities should also be included here. The same applies to TTY/DE if this is needed.

Cross references to the LEXFOR pages "Thick Target Yields", "Cumulative and Independent Data", and (perhaps) "Production vs. Emission Cross Sections" should be included.

#### **4.4 LEXFOR page "Thick Target Yields"**

Typographical error: In the formula, in several places E must be replaced by E' .

The definition should explicitly state the difference between Thick Target Yield and Product Yield.

Section 4 on Thick-target product yields: should be moved to the new proposed page on "Product Yields". "tt" should read "TT". Units NUC/PART are now obsolete, replace by new units.

If the quantities TTY/DA and TTY/DA/DE are kept, their definitions, along with coding examples, must be added here.

Cross-reference to the new page "Product Yields" is needed.

### **5. Proposed changes in dictionaries**

**Dictionary 36** (Unit Family Codes apply only to Archive/Daniel dictionary):

- Change everywhere Unit Family Code PY (superseded) to YLD.
- Quantities PY, , DT and similar (if not made obsolete): Change Unit Family Code to TTT
- Quantities with SF6 = TTY/DA: Change Unit Family Code to 1/A; if approved, change SF6 to PY/DA and add TT to SF8.
- Quantities with SF6=TTY/DA/DE: if approved, change SF6 to PY/DA/DE and add TT to SF8.
- TTY/DE : Not found in master file. If needed, may need to be changed to PY/DE, , TT.

- Delete , TTY/DA, , DT (not in master file, unclear definition, no appropriate units in dictionary 25).

#### **Archive/Daniel Dictionary 26:**

- Delete PY
- Add YLD
- Swap explanations for TTT and TTY
- Delete TTD (not used anywhere)

#### **6. Required corrections of EXFOR entries**

- If it is decided to replace PY, , DT by TTY, , DT: Correct REACTIONs in entries B0167 and B0175.
- If it is decided to replace TTY/DA and TTY/DA/DE by PY/DA, , TT and PY/DA/DE, , TT respectively: Correct REACTIONs in entries A0388, C0108, C0118, M0036, A0527, O0100 (subentries 34 -53).
- D0463.003: Change REACTION to either PY, , DT or TTY, , DT depending on decision on item 3.