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Memo CP-D/414

Date: 19 September 2004
To: Distribution
From: O. Schwerer
Subject: Probability for emission of N particles, EM/NUM,PY and quantity code SIG/DN
Reference: CP-E/047, CP-A/154, CP-D/400, e-mail of V. McLane of 9 September

There are two issues:

- 1) I agree to drop the quantity DN because it can be replaced by the branch code NUM.
- 2) I agree with CP-E/047 that there is an inconsistency with the units currently used for probabilities for emission of a number of particles (quantities EM/NUM, PY and PR/NUM, NU). Dimension YLD (for SF6=PY) and FY (for SF6=NU) are suitable for **multiplicities** but not for the **probability of emission of a certain number of particles**.

Artificial example:

No.of emitted X-particles	Probability (%)	No.of produced particles
1	20	20
2	15	30
3	12	36
4	45	180
5	8	40
SUM	100	306

The **average number** of emitted X-particles is 3.06 per reaction, or 306 per 100 reactions. This is to be compiled with dimension YLD or FY. Units are e.g. particles per reaction or particles per 100 fissions.

However, the **probability of emission of 3 particles** in one reaction is 12%. To compile this number (12.), no units of dimension FY or YLD are suitable. This is not "*12 particles per 100 reactions*" or similar; it is "the probability for emitting 3 particles is 12 %", or "in 12 out of 100 reactions, precisely 3 particles (but not more) are emitted".

Since we allow units PER-CENT only for errors, I propose to use NO-DIM for such data because other, newly-invented units may perhaps add to the confusion.

In entry O1086, as mentioned in CP-E/047, units PC/REAC are used. The abbreviation PC/REAC was originally deduced from "Percent per Reaction" but the definition was then modified to mean "particles per 100 reactions". For multiplicities this makes no difference but for the probabilities as given here it is wrong.

For discussion at the NRDC meeting.

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