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Memo CP-E/051 (Revised)

Date: August 30, 2004
To: Distribution
From: OTSUKA Naohiko
Subject: Differential data (Definition of mean energy and mean linear momentum)
Reference: CP-C/346, 348, 350, CP-D/409, CP-E/049

I appreciate the revision of LEXFOR entry in CP-C/350 and CP-D/409.

- Non-coplanar angular correlations:

Unit type of angular correlation function $W(\theta_a,\theta_b,\phi)$ should be `ARB-UNITS` rather than `NO-DIM`.

- Energy distribution for a correlated pair:

"The angle is given …" should be "The energy is given…".

What is the definition of *mean energy* E_m given under `E-MN-CM`? Does it mean "energy of relative motion of correlated pair" (= center-of-mass energy) E_{rel}?

$$E_{rel} = \boldsymbol{p}_{rel}^2/2\mu^2$$
$$= \boldsymbol{p}_a^2/2m_a + \boldsymbol{p}_b^2/2m_b \quad \text{(in c.m.s. of correlated pair)} \quad (1)$$

, where momentum of relative motion $\boldsymbol{p}_{rel}$ and reduced mass μ of correlated pair are defined as

$$\boldsymbol{p}_{rel} = (m_b\,\boldsymbol{p}_a - m_a\,\boldsymbol{p}_b) / (m_a + m_b)$$
$$= \boldsymbol{p}_a = -\boldsymbol{p}_b \quad \text{(in c.m.s. of correlated pair)} \quad (2)$$
$$\mu = m_a m_b / (m_a + m_b) \quad (3)$$

If so, alternative heading codes would be `E-RL` etc. We must avoid the confusion with "energy of outgoing particle given in center-of-mass system" (e.g. `E-CM`). c.f. CP-A/121. Examples o f this energy distribution can be found in E1748.020-045. Note that E_{rel} is Galilei invariant.

Concerning WP2002-5, I try to check the definition of "`,ECO`" (Energy correlation). However I cannot find any entries of "`,ECO`" in our database.

~~- Linear momentum distribution:~~

~~Unit type should be DP rather than DA.~~

- Linear momentum for a correlated pair:

"distribution" is needed between "momentum" and "for" in the title.

Unit type should be `DP` rather than `DA`.

What is the definition of *mean linear momentum* p_m? Does it mean "momentum of relative motion" ($|\boldsymbol{p}^{rel}|$ given in Eq. (2)), or "momentum difference between two particles" $|\boldsymbol{p}_a - \boldsymbol{p}_b|$? There would be alternative heading codes, e.g. `MOM-SEC-RL` for $|\boldsymbol{p}^{rel}|$.

Concerning WP2002-5, I study the possibility of replacing `MCO` (Linear momentum correlation) by "`DP,a+b`". Two subsections, M0035.022 and M0054.002, use this code:

- M0035.022:

  Data shown in Fig.4 of main reference gives counts as a function of momentum difference between proton and neutron $|\boldsymbol{p}_p - \boldsymbol{p}_n|$ for ^{4}He(γ,p+n)^{2}H (we can find the definition in p.934 of the article). We could code M0035.002 using "`,DP,N+P,REL`" as a function of momentum difference given under appropriate data heading.

- M0054.002 (I check the English translation Sov. J. Nucl. Phys.**34** (1981) 789):

  Data shown in Fig.1 of main reference gives counts as a function of $|\boldsymbol{p}_d| = |\boldsymbol{p'}_p + \boldsymbol{p'}_n - \boldsymbol{p}_\gamma|$ for ^{12}C(γ,p+n)^{10}B, where $\boldsymbol{p'}_p$ and $\boldsymbol{p'}_n$ are the momenta of proton and neutron in ^{12}C. These momenta are obtained by applying final state interaction correction to measured momenta $\boldsymbol{p}_p$ and $\boldsymbol{p}_n$ (authors are interested in the momentum of quasi-deuterons in ^{12}C). We could code M0054.002 using "`,DP,D,REL`" or "`,DP,N+P,REL`" as a function of momentum of quasi-deuterons $|\boldsymbol{p}_d|$ given under `MOM-SEC`. In this case, the definition of this quasi-deuteron's momentum should be clarified under information identifier `MOM-SEC`.

Additional remark on M0054.002 :

Fig.1 considers the correction of momenta due to final state interaction by assuming various average depth for proton and neutron. In current compilation, heading `E1` is assigned for this potential depth and `PAR` is used in SF5. This is probably incorrect. Average depths should be given under `MISC`, and `PAR` in SF5 should be removed.

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