Japan Charged-Particle Nuclear Reaction Data Group

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Memo CP-E/117

Date: May 24, 2007
To: Distribution
From: OTSUKA Naohiko
Subject: Definition of spectrum averaged cross section

All entries in the transmission K002 (K2021, K2022, K2023, K2024, K2025) give cross sections averaged over Bremsstrahlung spectrum (BRA). So far no definition of BRA is given in LEXFOR. In K002, all data with BRA are defined as follows:

Bremsstrahlung Spectrum Average: Modifier BRA

$$\sigma_{\mathrm{BRA}}(E_{\max}) = \frac{\int_0^{E_{\max}} n(E,E_{\max})\,\sigma(E)dE}{\int_0^{E_{\max}} (E/E_{\max})\,n(E,E_{\max})dE} \quad \text{with } n = \int_0^{E_{\max}} n(E,E_{\max})\,dE\,,$$

where $n(E, E_{\max})$ is Bremsstrahlung spectrum distribution normalized to the total number of photon n. The denominator is the definition of total number of "equivalent quanta", which is the total energy divided by the maximum energy. This cross section is often given in the unit of [barn/equivalent quantum].

I would like to know my usage (definition) of BRA is consistent with that in other centres.

Distribution:

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Date: Fri, 25 May 2007 22:43:25 +0900
From: OTSUKA Naohiko <ohtsuka@nucl.sci.hokudai.ac.jp>
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Dear Otto,

thank you for your remarks. I prepared a revised Memo CP-E/118
because I also made another mistake in the date field yesterday.

I agree with you about BRA and BRS. Before I joined in checking of entries from other centres, I mixed up two modifiers. So I think explanation about BRS in LEXFOR is very useful to compilers.

Two years ago, I asked Vladimir the explanation about difference between BRA and BRS. He kindly explained me:

1.There is no direct relation like "BRA" ->"EN-MAX", "BRS" -> "EN".

... so "BRA" is some times applied to cross section averaged over a part of Bremsstrahlung spectrum.

2.If energy bin is enough narrow, we can use BRS, otherwise use BRA.

Maybe the border between BRA and BRS is chracterized by "width of energy bin/maximum energy in Bremsstrahlung distribution"). But I do not know the border... In addition, I think we can use "AV" if energy bin is very narrow so that photon spectrum is approximated to be flat.

Therefore I still does not understand difference between "BRA" and "BRS" well and hope that Vladimir give some explanations for LEXFOR. In area M, there are some entries of "BRS" which data were measured at 2JPNTOH. So maybe I will meet "BRS" data in my compilation, the I will have discussion again with Vladimir.

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Photonuclear data people in Japan are very kind to me. In K002, 4 entries were proofread by authors. They are in chemistry, and have very good log books. So they are ready well to answer my various questions (IND or CUM, with or without chemical separation etc.) even if ther are for past experiments...

Best regards,
Nao

>Dear Noahiko,
>
>thank you for the 3 new PRELIM files E045, E046 and K002 and the related
>memos CP-E/116 through 118.
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>I appreciate in particular your clarification of the headings for
>polarization quantities.
>
>I have 2 small remarks:
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>CP-E/117: It would be useful to mention both varieties of Bremsstrahlung
>averages, BRA and BRS, in this definition.
>Of course, Vladimir Varlamov should comment on it.
>
>CP-E/118: please remember that the current quantity dictionary is no.
>236. Dictionary 36 is no longer updated.
>
>Best regards,
>
>Otto
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