Memo CP-E/067

Date: March 24, 2005
To: Distribution
From: OTSUKA Naohiko
Subject: Polarization quantities
Reference: CP-E/064, CP-C/353 (Rev.), CP-D/320

1) Expansion of branch LL, LS, NN, SL, SS and NL

I propose corrections of expansions for branch codes `LL`, `LS`, `NN`, `SL`, `SS` and `NL` (as a complement of CP-E/064).

Dictionary 31 (Branch codes)

`LL`	Longitudinal-longitudinal (zz) component
`LS`	Longitudinal-sideward (zx) component
`NN`	Normal-normal (yy) component
`SL`	Sideward-longitudinal (xz) component
`SS`	Sideward-sideward (xx) component
`NL`	Normal-longitudinal (yz) component (Proposed in CP-C/353, see below)

2) Spin correlation parameter or tensor analyzing power?

CP-C/353 Rev. proposed "`NL,POL/DA,,ANA`" with "spin correlation parameter A(NL)". We have similar codes "ij,`POL/DA,,ANA`" (i, j=S, N, L). These are expanded as "spin correlation parameter A(ij)", however often applied to "tensor analyzing power". We must distinguish between these two quantities.

CP-C/353 is prepared for "D.L. Adams *et al*., Nucl. Phys. **A480** (1988)530" (=C0786 in TRANS.C071) which measures "spin correlation parameter". Therefore the proposed expansion is correct for this reference. I am not against the addition of "`NL,POL/DA,,ANA`" with "spin correlation parameter A(NL)" into dictionary 36 as a temporally step in order to keep consistency with other similar codes. However investigation into existing entries and update of LEXFOR entry are necessary. Use of "`ANA`" for "spin correlation parameter" may be misleading.

We have good LEXFOR entry for polarization quantities. However sometimes compilers specify quantity codes by symbols used in articles. *Compilers should specify quantity codes not by symbols but by definitions, because there may be various notations for one quantity (as shown in Table 1).*

Table 1: Typical polarization quantities and corresponding EXFOR quantity codes

Quantity	Setup[1]	Typical symbol [2]	EXFOR code (for d/dA)
Polarization	$A(b,\vec{c})D$	$\boldsymbol{P_y}$	`,POL/DA` …
	$A(b,c)\vec{D}^{*)}$		
Vector analyzing power (spin $\geq$ 1/2)	$A(\vec{b},c)D$	$\boldsymbol{A_y}$, A_{00n0}, …	`,POL/DA,,ANA` …
		$\boldsymbol{iT_{11}}$, …	`,POL/DA,,VAP` …
	$\vec{A}(b,c)D^{*)}$	A_{000n}, …	
Tensor analyzing power (spin $\geq$1, deuteron etc.)	$A(\vec{b},c)D$	$\boldsymbol{A_{yy}}$, …	`NN,POL/DA,,ANA (!)`…
		$\boldsymbol{T_{20}}$, …	`20,POL/DA,,TAP` …
	$\vec{A}(b,c)D^{*)}$		
Initial state spin correlation Parameter	$\vec{A}(\vec{b},c)D$	A_{yy}, A_{NN}, A_{nn}, $\boldsymbol{C_{NN}}$, $C_{y,y}$, A_{00nn} ,…	`NN,POL/DA,,ANA (!)`…
Final state spin correlation Parameter	$A(b,\vec{c})\vec{D}^{*)}$	C_{nn}, C_{NN}, $C_{n,n}$, C_{nn00} , …	`NN,POL/DA,,C` …
Spin rotation-depolarization parameter	$A(\vec{b},\vec{c})D$	D, $\boldsymbol{D_{NN}}$, $\boldsymbol{K_y^{y'}}$, D_{n0n0}, …	`NN,POL/DA,,D` …
	$\vec{A}(b,c)\vec{D}^{*)}$	D_{NN}, D_{0n0n}, …	
Spin transfer parameter	$\vec{A}(b,\vec{c})D^{*)}$	K_{n00n}, …	
	$A(\vec{b},c)\vec{D}^{*)}$	D_t, K_{NN}, K_{0nn0}, …	`NN,POL/DA,,K` …

*) Rarely measured   [2] *y* or *yy* component for the most part. Bold means "often used".

[1] $\vec{A}$: Polarized target used (`POLTR` in `INC-SOURCE`)

$\vec{b}$: Polarized beam used (`POLNS` or `POLIS` in `INC-SOURCE`)

$\vec{c}$: Polarization of detected outgoing particle and measured (`DSCAT` in `METHOD`)

$\vec{D}$: Polarization of detected recoil measured (`DSCAT` in `METHOD`)

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