Appendix 6

The coefficients $\mathscr{A}_{l'm'}(lm)$

The coefficients $\mathscr{A}_{l'm'}(lm)$ involved in the parity-invariance relations amongst the dynamical reaction parameters (subsection 5.3.1(v)) are given, for a spin-s particle, in terms of vector addition coefficients as follows.

If both $(-1)^{m\pm m'+2s} = 1$ and $|m \pm m'| \leq 2s$ then

$$\mathscr{A}_{l'm'}(lm) = e^{i\pi(m'-m)/2}\sqrt{\frac{2l'+1}{2l+1}}\left\langle l, m \middle| s, \frac{m+m'}{2}; s, \frac{m-m'}{2}\right\rangle \times \left\langle l', m' \middle| s, \frac{m+m'}{2}; s, \frac{m'-m}{2}\right\rangle.$$

Otherwise $\mathscr{A}_{l'm'}(lm) = 0$.

The following symmetry properties reduce drastically the number of computations required:

$$\mathscr{A}_{l'm'}(lm) = (-1)^{2s}\frac{2l'+1}{2l+1}\mathscr{A}_{lm}(l'm')$$
$$\mathscr{A}_{l'-m'}(lm) = (-1)^{l+m}\mathscr{A}_{l'm'}(lm)$$
$$\mathscr{A}_{l'm'}(l-m) = (-1)^{l'+m'}\mathscr{A}_{l'm'}(lm).$$

We list the independent, non-zero, coefficients for spins 1/2, 1 and 3/2.

Spin 1/2:

$$\mathscr{A}_{10}(11) = -\frac{i}{\sqrt{2}} \qquad \mathscr{A}_{00}(11) = -\frac{i}{\sqrt{6}}.$$

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Spin 1:

$$\mathscr{A}_{20}(22) = -\frac{1}{\sqrt{6}} \qquad \mathscr{A}_{10}(22) = -\sqrt{\frac{3}{10}} \qquad \mathscr{A}_{00}(22) = -\frac{1}{\sqrt{15}}$$

$$\mathscr{A}_{21}(21) = \frac{1}{2} \qquad \mathscr{A}_{11}(21) = \frac{1}{2}\sqrt{\frac{3}{5}} \qquad \mathscr{A}_{00}(20) = -\frac{1}{3}\sqrt{\frac{2}{3}}$$

$$\mathscr{A}_{20}(20) = \frac{2}{15} \qquad \mathscr{A}_{11}(11) = \frac{1}{2} \qquad \mathscr{A}_{00}(00) = \frac{1}{3}.$$

Spin 3/2:

$$\mathscr{A}_{30}(33) = \frac{i}{2\sqrt{5}} \qquad \mathscr{A}_{20}(33) = \frac{i\sqrt{5}}{2\sqrt{7}} \qquad \mathscr{A}_{10}(33) = \frac{i3\sqrt{3}}{2\sqrt{35}}$$

$$\mathscr{A}_{31}(32) = -\frac{i}{\sqrt{10}} \qquad \mathscr{A}_{21}(32) = -\frac{i\sqrt{5}}{2\sqrt{7}} \qquad \mathscr{A}_{11}(32) = -\frac{i3}{2\sqrt{35}}$$

$$\mathscr{A}_{30}(31) = -\frac{i3\sqrt{3}}{10} \qquad \mathscr{A}_{22}(31) = \frac{i}{\sqrt{14}} \qquad \mathscr{A}_{20}(31) = -\frac{i\sqrt{3}}{2\sqrt{7}}$$

$$\mathscr{A}_{10}(31) = \frac{i3}{10\sqrt{7}}$$

$$\mathscr{A}_{11}(30) = -\frac{i3\sqrt{3}}{5\sqrt{14}}$$

$$\mathscr{A}_{21}(22) = -\frac{i}{2}$$

$$\mathscr{A}_{10}(11) = -\frac{i}{5\sqrt{2}}.$$

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