Irreducible angular momentum and spin eigenspaces on atomic subshells

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Reference:

Christian B. Mendl. Efficient algorithm for many-electron angular momentum and spin diagonalization on atomic subshells. arXiv:1409.6860 (2014)

config	sym	L_z	S_z	Ψ
$\wedge^1 V_{\mathrm{s}}$	2 S	0	$\frac{1}{2}$	$ { m s} angle$
$\wedge^2 V_{\rm s}$	$^{1}\mathrm{S}$	0	0	$ {f sar s} angle$
$\wedge^1 V_{\mathrm{p}}$	$^2\mathrm{P}^\mathrm{o}$	1	$\frac{1}{2}$	$ { m p}_1 angle$
$\wedge^2 V_{\rm p}$	$^{1}\mathrm{D}$	2	0	$ { m p}_{ m 1}\overline{ m p}_{ m 1} angle$
	³ P	1	1	$ { m p}_1{ m p}_0 angle$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{\sqrt{3}}\left(-\left p_{1}\overline{p_{n1}}\right\rangle+\left \overline{p_{1}}p_{n1}\right\rangle+\left p_{0}\overline{p_{0}}\right\rangle\right)$
$\wedge^3 V_{\rm p}$	$^2\mathrm{D^o}$	2	$\frac{1}{2}$	$ { m p}_1\overline{ m p}_1{ m p}_0 angle$
	$^2\mathrm{P}^\mathrm{o}$	1	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}\left(\left p_{1}\overline{p_{1}}p_{n1}\right\rangle + \left p_{1}p_{0}\overline{p_{0}}\right\rangle\right)$
	$^4\mathrm{S}^\mathrm{o}$	0	$\frac{3}{2}$	$ \mathrm{p}_1\mathrm{p}_0\mathrm{p}_{n\!1} angle$
$\wedge^4 V_{\rm p}$	$^{1}\mathrm{D}$	2	0	$ \mathrm{p}_1\overline{\mathrm{p}_1}\mathrm{p}_0\overline{\mathrm{p}_0} angle$
	^{3}P	1	1	$ \mathrm{p}_{1}\overline{\mathrm{p}_{1}}\mathrm{p}_{0}\mathrm{p}_{n\!1} angle$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{\sqrt{3}}\left(-\left \mathbf{p}_{1}\overline{\mathbf{p}_{1}}\mathbf{p}_{nl}\overline{\mathbf{p}_{nl}}\right\rangle-\left \mathbf{p}_{1}\mathbf{p}_{0}\overline{\mathbf{p}_{0}}\overline{\mathbf{p}_{nl}}\right\rangle+\left \overline{\mathbf{p}_{1}}\mathbf{p}_{0}\overline{\mathbf{p}_{0}}\overline{\mathbf{p}_{nl}}\right\rangle\right)$
$\wedge^5 V_{\rm p}$	$^2\mathrm{P}^\mathrm{o}$	1	$\frac{1}{2}$	$\ket{\mathrm{p}_1\overline{\mathrm{p}_1}\mathrm{p}_0\overline{\mathrm{p}_0}\mathrm{p}_{n\!1}}$
$\wedge^6 V_{\rm p}$	$^{1}\mathrm{S}$	0	0	$\left p_{1}\overline{p_{1}}p_{0}\overline{p_{0}}p_{n1}\overline{p_{n1}} ight angle$
$\wedge^1 V_{\mathrm{d}}$	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$ { m d}_2 angle$
$\wedge^2 V_{\rm d}$	$^{1}\mathrm{G}$	4	0	$ { m d}_2 \overline{ m d}_2 angle$
	$^3\mathrm{F}$	3	1	$ {\rm d_2d_1}\rangle$
	$^{1}\mathrm{D}$	2	0	$\frac{1}{\sqrt{7}} \left(-\sqrt{2} \cdot \left d_2 \overline{d_0} \right\rangle + \sqrt{2} \cdot \left \overline{d_2} d_0 \right\rangle + \sqrt{3} \cdot \left d_1 \overline{d_1} \right\rangle \right)$
	$^{3}\mathrm{P}$	1	1	$rac{1}{\sqrt{5}}\left(-\sqrt{2}\cdot\ket{ ext{d}_2 ext{d}_{n ext{l}}}+\sqrt{3}\cdot\ket{ ext{d}_1 ext{d}_0} ight)$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{\sqrt{5}} \left(\left d_2 \overline{d_{n2}} \right\rangle - \left \overline{d_2} d_{n2} \right\rangle - \left d_1 \overline{d_{n1}} \right\rangle + \left \overline{d_1} d_{n1} \right\rangle + \left d_0 \overline{d_0} \right\rangle \right)$
$\wedge^3 V_{\rm d}$	$^{2}\mathrm{H}$	5	$\frac{1}{2}$	$\left \mathrm{d_{2}}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\right\rangle$
	$^{2}\mathrm{G}$	4	$\frac{1}{2}$	$\frac{1}{\sqrt{5}} \left(\sqrt{2} \cdot \left d_2 \overline{d_2} d_0 \right\rangle + \sqrt{3} \cdot \left d_2 d_1 \overline{d_1} \right\rangle \right)$
	$^4\mathrm{F}$	3	$\frac{3}{2}$	$ \mathrm{d_2d_1d_0} angle$
	2 F	3	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}} \left(\sqrt{6} \cdot \left d_2 \overline{d_2} d_{n1} \right\rangle - \left d_2 d_1 \overline{d_0} \right\rangle - \left d_2 \overline{d_1} d_0 \right\rangle + 2 \cdot \left \overline{d_2} d_1 d_0 \right\rangle \right)$
	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$\frac{1}{2}\left(-\left d_{2}\overline{d_{2}}d_{n2}\right\rangle-\left d_{2}d_{1}\overline{d_{n1}}\right\rangle+\left d_{2}\overline{d_{1}}d_{n1}\right\rangle+\left d_{2}d_{0}\overline{d_{0}}\right\rangle\right)$
	$^2\mathrm{D}$	2	$\frac{1}{2}$	$\frac{1}{2\sqrt{21}} \left(5 \cdot \left d_2 \overline{d_2} d_{n2} \right\rangle - 3 \cdot \left d_2 d_1 \overline{d_{n1}} \right\rangle - \left d_2 \overline{d_1} d_{n1} \right\rangle + 3 \cdot \left d_2 d_0 \overline{d_0} \right\rangle$
				$+4 \cdot \left \overline{\mathbf{d_2}} \mathbf{d_1} \mathbf{d_{n1}} \right\rangle + 2\sqrt{6} \cdot \left \mathbf{d_1} \overline{\mathbf{d_1}} \mathbf{d_0} \right\rangle \right)$

Table 1: Irreducible LS eigenspaces, showing states with maximal $\mathcal{L}_z, \mathcal{S}_z$ only

config	sym	L_z	S_z	Ψ
	$^4\mathrm{P}$	1	$\frac{3}{2}$	$\frac{1}{\sqrt{5}} \left(-\sqrt{3} \cdot \mathbf{d}_2 \mathbf{d}_1 \mathbf{d}_{n2} \rangle + \sqrt{2} \cdot \mathbf{d}_2 \mathbf{d}_0 \mathbf{d}_{n1} \rangle \right)$
	$^{2}\mathrm{P}$	1	$\frac{1}{2}$	$\frac{1}{\sqrt{210}} \left(4\sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \overline{\mathbf{d}_{n2}} \right\rangle - 2\sqrt{3} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_1} \mathbf{d}_{n2} \right\rangle - 4\sqrt{2} \cdot \left \mathbf{d}_2 \mathbf{d}_0 \overline{\mathbf{d}_{n1}} \right\rangle - \sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_0} \mathbf{d}_{n1} \right\rangle$
				$ -2\sqrt{3} \cdot \left \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_{n2} \right\rangle + 5\sqrt{2} \cdot \left \overline{\mathbf{d}_2} \mathbf{d}_0 \mathbf{d}_{n1} \right\rangle + 3\sqrt{3} \cdot \left \mathbf{d}_1 \overline{\mathbf{d}_1} \mathbf{d}_{n1} \right\rangle + 3\sqrt{3} \cdot \left \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}_0} \right\rangle) $
$\wedge^4 V_{ m d}$	^{1}I	6	0	$\left \mathrm{d_{2}}\overline{\mathrm{d_{2}}}\mathrm{d_{1}}\overline{\mathrm{d_{1}}}\right\rangle$
	³ H	5	1	$\left \mathrm{d_2}\overline{\mathrm{d_2}}\mathrm{d_1}\mathrm{d_0}\right\rangle$
	$^{3}\mathrm{G}$	4	1	$\frac{1}{\sqrt{5}} \left(\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_{n1} \right\rangle + \sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \overline{\mathbf{d}_1} \mathbf{d}_0 \right\rangle \right)$
	$^{1}\mathrm{G}$	4	0	$\frac{1}{\sqrt{3}} \left(- \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \overline{\mathbf{d}_{n1}} \right\rangle + \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_{n1} \right\rangle + \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_0 \overline{\mathbf{d}_0} \right\rangle \right)$
	$^{1}\mathrm{G}$	4	0	$\frac{1}{\sqrt{66}} \left(-\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \overline{\mathbf{d}_{n1}} \right\rangle + \sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_{n1} \right\rangle - 2\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_0 \overline{\mathbf{d}_0} \right\rangle$
				$-3\sqrt{3}\cdot\left d_{2}d_{1}\overline{d_{1}}\overline{d_{0}}\right\rangle+3\sqrt{3}\cdot\left \overline{d_{2}}d_{1}\overline{d_{1}}d_{0}\right\rangle\right)$
	$^{3}\mathrm{F}$	3	1	$\frac{1}{\sqrt{3}} \left(\left \mathbf{d_2} \overline{\mathbf{d_2}} \mathbf{d_1} \mathbf{d_{n2}} \right\rangle + \left \mathbf{d_2} \mathbf{d_1} \overline{\mathbf{d_1}} \mathbf{d_{n1}} \right\rangle + \left \mathbf{d_2} \mathbf{d_1} \mathbf{d_0} \overline{\mathbf{d_0}} \right\rangle \right)$
	$^3\mathrm{F}$	3	1	$\frac{1}{2\sqrt{3}} \left(-2 \cdot \left d_2 \overline{d_2} d_1 d_{n2} \right\rangle + \sqrt{6} \cdot \left d_2 \overline{d_2} d_0 d_{n1} \right\rangle + \left d_2 d_1 \overline{d_1} d_{n1} \right\rangle$
				$+\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}} ight angle)$
	$^{1}\mathrm{F}$	3	0	$\frac{1}{2\sqrt{10}} \left(-2\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_{n2}} \right\rangle + 2\sqrt{3} \cdot \left d_2 \overline{d_2} \overline{d_1} d_{n2} \right\rangle + \sqrt{2} \cdot \left d_2 \overline{d_2} d_0 \overline{d_{n1}} \right\rangle$
				$-\sqrt{2} \cdot \left \mathbf{d_2} \overline{\mathbf{d_2} \mathbf{d_0}} \mathbf{d_{n1}} \right\rangle - \sqrt{3} \cdot \left \mathbf{d_2} \mathbf{d_1} \overline{\mathbf{d_{1}} \mathbf{d_{n1}}} \right\rangle - \sqrt{3} \cdot \left \mathbf{d_2} \overline{\mathbf{d_1}} \mathbf{d_0} \overline{\mathbf{d_0}} \right\rangle$
				$+\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n1}\right\rangle+\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\right\rangle\right)$
	$^5\mathrm{D}$	2	2	$ \mathrm{d}_2\mathrm{d}_1\mathrm{d}_0\mathrm{d}_{n\!1} angle$
	$^3\mathrm{D}$	2	1	$\frac{1}{2\sqrt{21}} \left(4 \cdot \left d_2 \overline{d_2} d_0 d_{n2} \right\rangle + 2\sqrt{6} \cdot \left d_2 d_1 \overline{d_1} d_{n2} \right\rangle - 3 \cdot \left d_2 d_1 d_0 \overline{d_{n1}} \right\rangle$
				$-3 \cdot \left d_2 d_1 \overline{d_0} d_{nl} \right\rangle + \left d_2 \overline{d_1} d_0 d_{nl} \right\rangle + 5 \cdot \left \overline{d_2} d_1 d_0 d_{nl} \right\rangle \right)$
	$^{1}\mathrm{D}$	2	0	$\frac{1}{\sqrt{42}} \left(-\sqrt{2} \cdot \left d_2 \overline{d_2} d_0 \overline{d_{n2}} \right\rangle + \sqrt{2} \cdot \left d_2 \overline{d_2} d_0 \overline{d_{n2}} \right\rangle + 2\sqrt{3} \cdot \left d_2 \overline{d_2} d_{n1} \overline{d_{n1}} \right\rangle$
				$-\sqrt{3}\cdot\left d_{2}d_{1}\overline{d_{1}d_{n2}}\right\rangle - \sqrt{2}\cdot\left d_{2}\overline{d_{1}}d_{0}\overline{d_{n1}}\right\rangle + \sqrt{2}\cdot\left d_{2}\overline{d_{1}}\overline{d_{0}}d_{n1}\right\rangle$
				$+\sqrt{3}\cdot\left \overline{d_{2}}d_{1}\overline{d_{1}}d_{n2}\right\rangle+\sqrt{2}\cdot\left \overline{d_{2}}d_{1}d_{0}\overline{d_{n1}}\right\rangle-\sqrt{2}\cdot\left \overline{d_{2}}d_{1}\overline{d_{0}}d_{n1}\right\rangle$
				$+2\sqrt{3}\cdot\left \mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}} ight angle ight)$
	$^{1}\mathrm{D}$	2	0	$\frac{1}{\sqrt{21}} \left(\sqrt{2} \cdot \left d_2 \overline{d_2} d_0 \overline{d_{n2}} \right\rangle - \sqrt{2} \cdot \left d_2 \overline{d_2} \overline{d_0} d_{n2} \right\rangle + \sqrt{3} \cdot \left d_2 d_1 \overline{d_1} \overline{d_{n2}} \right\rangle$
				$-\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle+\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle-\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n2}\right\rangle$
				$+\sqrt{2}\cdot\left \overline{\mathbf{d}_{2}}\mathbf{d}_{1}\mathbf{d}_{0}\overline{\mathbf{d}_{n1}}\right\rangle - \sqrt{2}\cdot\left \overline{\mathbf{d}_{2}}\mathbf{d}_{1}\mathbf{d}_{0}\mathbf{d}_{n1}\right\rangle + \sqrt{3}\cdot\left \mathbf{d}_{1}\overline{\mathbf{d}_{1}}\mathbf{d}_{0}\overline{\mathbf{d}_{0}}\right\rangle\right)$
	^{3}P	1	1	$\frac{1}{5} \left(2\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_{n1} \mathbf{d}_{n2} \right\rangle + \sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}_{n2}} \right\rangle - \sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \overline{\mathbf{d}_0} \mathbf{d}_{n2} \right\rangle$
				$-\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle - \sqrt{3}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle + \sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle$
				$+\sqrt{3}\cdot\left \mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1} ight angle)$

Table 2: Irreducible LS eigenspaces (continued)

config	sym	L_z	S_z	Ψ
	³ P	1	1	$\frac{1}{5\sqrt{14}} \left(3\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}}_2 \mathbf{d}_{n1} \mathbf{d}_{n2} \right\rangle - 6\sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}}_{n2} \right\rangle + \sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \overline{\mathbf{d}}_0 \mathbf{d}_{n2} \right\rangle$
				$+6\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle+\sqrt{3}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle+5\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle$
				$+4\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\mathrm{d}_{n2} ight angle+4\sqrt{3}\cdot\left \mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1} ight angle ight)$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{5\sqrt{3}}\left(4\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}_{2}\mathrm{d}_{n2}\overline{\mathrm{d}_{n2}}\right\rangle-2\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}_{1}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle+2\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}_{1}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle$
				$+\sqrt{6}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\right\rangle+2\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle-2\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{\mathit{n}1}}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$-\sqrt{6}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\right\rangle+\sqrt{6}\cdot\left \mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle-\sqrt{6}\cdot\left \mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$+ \left \mathbf{d}_1 \overline{\mathbf{d}_1} \mathbf{d}_{nl} \overline{\mathbf{d}_{nl}} \right\rangle + 3 \cdot \left \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}_0} \overline{\mathbf{d}_{nl}} \right\rangle - 3 \cdot \left \overline{\mathbf{d}_1} \mathbf{d}_0 \overline{\mathbf{d}_0} \overline{\mathbf{d}_{nl}} \right\rangle \right)$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{5\sqrt{7}}\left(\left d_{2}\overline{d_{2}}d_{n2}\overline{d_{n2}}\right\rangle+5\cdot\left d_{2}d_{1}\overline{d_{n1}}d_{n2}\right\rangle-3\cdot\left d_{2}\overline{d_{1}}d_{n1}\overline{d_{n2}}\right\rangle$
				$-2 \cdot \left d_2 \overline{d_1 d_{n1}} d_{n2} \right\rangle - 5 \cdot \left d_2 d_0 \overline{d_0 d_{n2}} \right\rangle - \sqrt{6} \cdot \left d_2 \overline{d_0} d_{n1} \overline{d_{n1}} \right\rangle$
				$-2 \cdot \left \overline{\mathbf{d_2}} \mathbf{d_1} \mathbf{d_{n1}} \overline{\mathbf{d_{n2}}} \right\rangle - 3 \cdot \left \overline{\mathbf{d_2}} \mathbf{d_1} \overline{\mathbf{d_{n1}}} \mathbf{d_{n2}} \right\rangle + 5 \cdot \left \overline{\mathbf{d_2}} \overline{\mathbf{d_{n1}}} \mathbf{d_{n1}} \mathbf{d_{n2}} \right\rangle$
				$+5 \cdot \left \overline{\mathrm{d}_2} \mathrm{d}_0 \overline{\mathrm{d}_0} \mathrm{d}_{n2} \right\rangle + \sqrt{6} \cdot \left \overline{\mathrm{d}_2} \mathrm{d}_0 \mathrm{d}_{n1} \overline{\mathrm{d}_{n1}} \right\rangle - \sqrt{6} \cdot \left \mathrm{d}_1 \overline{\mathrm{d}_1} \mathrm{d}_0 \overline{\mathrm{d}_{n2}} \right\rangle$
				$+\sqrt{6}\cdot\left d_{1}\overline{d_{1}}d_{0}}d_{n2}\right\rangle+4\cdot\left d_{1}\overline{d_{1}}d_{n1}\overline{d_{n1}}\right\rangle+2\cdot\left d_{1}d_{0}\overline{d_{0}}d_{n1}\right\rangle$
				$-2\cdot\left \overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle\right)$
$\wedge^5 V_{ m d}$	^{2}I	6	$\frac{1}{2}$	$\left \mathrm{d_2}\overline{\mathrm{d_2}}\mathrm{d_1}\overline{\mathrm{d_1}}\mathrm{d_0}\right\rangle$
	$^{2}\mathrm{H}$	5	$\frac{1}{2}$	$\frac{1}{\sqrt{2}} \left(\left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \overline{\mathbf{d}_1} \mathbf{d}_{n1} \right\rangle + \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}_0} \right\rangle \right)$
	$^4\mathrm{G}$	4	$\frac{3}{2}$	$\left \mathrm{d_{2}\overline{d_{2}}d_{1}d_{0}d_{\mathit{nl}}}\right>$
	$^{2}\mathrm{G}$	4	$\frac{1}{2}$	$\frac{1}{\sqrt{39}} \left(3\sqrt{3} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \overline{\mathbf{d}_1} \mathbf{d}_{n2} \right\rangle - \sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}_{n1}} \right\rangle - \sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \overline{\mathbf{d}_0} \mathbf{d}_{n1} \right\rangle$
				$+2\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\right\rangle\right)$
	$^{2}\mathrm{G}$	4	$\frac{1}{2}$	$\frac{1}{\sqrt{715}} \left(2\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_{n2} \right\rangle + 8\sqrt{2} \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_{n1}} \right\rangle - 5\sqrt{2} \cdot \left d_2 \overline{d_2} d_1 \overline{d_0} d_{n1} \right\rangle$
				$-3\sqrt{2}\cdot\left d_{2}\overline{d_{2}}\overline{d_{1}}d_{0}d_{n1}\right\rangle+13\sqrt{3}\cdot\left d_{2}d_{1}\overline{d_{1}}d_{0}\overline{d_{0}}\right\rangle\right)$
	$^4\mathrm{F}$	3	$\frac{3}{2}$	$\frac{1}{\sqrt{2}}\left(\left d_{2}\overline{d_{2}}d_{1}d_{0}d_{n2}\right\rangle+\left d_{2}d_{1}\overline{d_{1}}d_{0}d_{n1}\right\rangle\right)$
	$^2\mathrm{F}$	3	$\frac{1}{2}$	$\frac{1}{6} \left(-4 \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_{n2}} \right\rangle + 2 \cdot \left d_2 \overline{d_2} d_1 \overline{d_0} d_{n2} \right\rangle + \sqrt{6} \cdot \left d_2 \overline{d_2} d_1 d_{n1} \overline{d_{n1}} \right\rangle$
				$+2\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle-\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{n1}}\right\rangle-\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\right\rangle$
				$+2\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\right\rangle\right)$
	2 F	3	$\frac{1}{2}$	$\frac{1}{6\sqrt{5}} \left(2 \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_{n2}} \right\rangle - \left d_2 \overline{d_2} d_1 \overline{d_0} d_{n2} \right\rangle - 2\sqrt{6} \cdot \left d_2 \overline{d_2} d_1 d_{n1} \overline{d_{n1}} \right\rangle$
				$-\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle-3\sqrt{6}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle-4\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{n1}}\right\rangle$
				$-4\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle+8\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\right\rangle\right)$

Table 3: Irreducible LS eigenspaces (continued)

config	sym	L_z	S_z	Ψ
	$^{4}\mathrm{D}$	2	$\frac{3}{2}$	$\frac{\frac{1}{\sqrt{7}}\left(\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}}_{1}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle+\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}}_{1}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle+\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}}_{0}\mathrm{d}_{n1}\right\rangle\right)}$
	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$\frac{1}{2\sqrt{6}} \left(-\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_{n1} \overline{\mathbf{d}_{n2}} \right\rangle - \sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \overline{\mathbf{d}_{n1}} \mathbf{d}_{n2} \right\rangle + 2\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_{n1} \mathbf{d}_{n2} \right\rangle$
				$+\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}2}\right\rangle -\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle -\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}}\right\rangle$
				$+\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle+\sqrt{2}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle\right)$
	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$\frac{1}{2\sqrt{210}} \left(3\sqrt{2} \cdot \left d_2\overline{d_2}d_1d_{nl}\overline{d_{n2}} \right\rangle - \sqrt{2} \cdot \left d_2\overline{d_2}d_1\overline{d_{nl}}d_{n2} \right\rangle - 2\sqrt{2} \cdot \left d_2\overline{d_2}\overline{d_1}d_{nl}d_{n2} \right\rangle \right.$
				$-7\sqrt{2}\cdot\left d_{2}\overline{d_{2}}d_{0}\overline{d_{0}}d_{\textit{n}2}\right\rangle-8\sqrt{3}\cdot\left d_{2}\overline{d_{2}}d_{0}d_{\textit{n}1}\overline{d_{\textit{n}1}}\right\rangle+3\sqrt{3}\cdot\left d_{2}d_{1}\overline{d_{1}}d_{0}\overline{d_{\textit{n}2}}\right\rangle$
				$-8\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}2}\right\rangle-8\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\right\rangle-5\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}}\right\rangle$
				$+5\sqrt{3}\cdot\left \overline{\mathbf{d_2}}\mathbf{d_1}\overline{\mathbf{d_1}}\mathbf{d_0}\mathbf{d_{n2}}\right\rangle+5\sqrt{2}\cdot\left \overline{\mathbf{d_2}}\mathbf{d_1}\mathbf{d_0}\overline{\mathbf{d_0}}\mathbf{d_{n1}}\right\rangle\right)$
	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$\frac{1}{\sqrt{105}} \left(-2 \cdot \left d_2 \overline{d_2} d_1 d_{n1} \overline{d_{n2}} \right\rangle + 4 \cdot \left d_2 \overline{d_2} d_1 \overline{d_{n1}} d_{n2} \right\rangle - 2 \cdot \left d_2 \overline{d_2} \overline{d_1} d_{n1} d_{n2} \right\rangle$
				$-2\cdot\left d_{2}\overline{d_{2}}d_{0}\overline{d_{0}}d_{n2}\right\rangle+\sqrt{6}\cdot\left d_{2}\overline{d_{2}}d_{0}d_{n1}\overline{d_{n1}}\right\rangle-\sqrt{6}\cdot\left d_{2}d_{1}\overline{d_{1}}d_{0}\overline{d_{n2}}\right\rangle$
				$+\sqrt{6}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n2}\right\rangle-3\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle-5\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{n1}}\right\rangle$
				$+5 \cdot \left d_2 \overline{d_1} d_0 \overline{d_0} d_{nl} \right\rangle \right)$
	$^4\mathrm{P}$	1	$\frac{3}{2}$	$\frac{1}{\sqrt{10}} \left(\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_0 \mathbf{d}_{n1} \mathbf{d}_{n2} \right\rangle + \sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \overline{\mathbf{d}_1} \mathbf{d}_{n1} \mathbf{d}_{n2} \right\rangle + \sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}_0} \mathbf{d}_{n2} \right\rangle$
				$+\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle\right)$
	$^{2}\mathrm{P}$	1	$\frac{1}{2}$	$\frac{1}{2\sqrt{105}} \left(6\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 d_{n2} \overline{d_{n2}} \right\rangle - 5\sqrt{2} \cdot \left d_2 \overline{d_2} d_0 d_{n1} \overline{d_{n2}} \right\rangle + 4\sqrt{2} \cdot \left d_2 \overline{d_2} d_0 \overline{d_{n1}} d_{n2} \right\rangle \right)$
				$+\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle+\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle-2\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle$
				$+\sqrt{3}\cdot\left d_{2}d_{1}d_{0}\overline{d_{0}d_{n2}}\right\rangle+\sqrt{2}\cdot\left d_{2}d_{1}\overline{d_{0}}d_{n1}\overline{d_{n1}}\right\rangle-2\sqrt{3}\cdot\left d_{2}\overline{d_{1}}d_{0}\overline{d_{0}}d_{n2}\right\rangle$
				$+4\sqrt{2}\cdot\left d_{2}\overline{d_{1}}d_{0}d_{n1}\overline{d_{n1}}\right\rangle+\sqrt{3}\cdot\left \overline{d_{2}}d_{1}\overline{d_{1}}d_{n1}d_{n2}\right\rangle+\sqrt{3}\cdot\left \overline{d_{2}}d_{1}d_{0}\overline{d_{0}}d_{n2}\right\rangle$
				$-5\sqrt{2}\cdot\left \overline{\mathbf{d}_{2}}\mathbf{d}_{1}\mathbf{d}_{0}\mathbf{d}_{n1}\overline{\mathbf{d}_{n1}}\right\rangle+6\sqrt{3}\cdot\left \mathbf{d}_{1}\overline{\mathbf{d}_{1}}\mathbf{d}_{0}\overline{\mathbf{d}_{0}}\mathbf{d}_{n1}\right\rangle\right)$
	⁶ S	0	$\frac{5}{2}$	$ \mathrm{d}_2\mathrm{d}_1\mathrm{d}_0\mathrm{d}_{n1}\mathrm{d}_{n2} angle$
	2 S	0	$\frac{1}{2}$	$\frac{1}{\sqrt{210}} \left(4 \cdot \left d_2 \overline{d_2} d_0 d_{n2} \overline{d_{n2}} \right\rangle + 2\sqrt{6} \cdot \left d_2 \overline{d_2} d_{n1} \overline{d_{n1}} d_{n2} \right\rangle + 2\sqrt{6} \cdot \left d_2 d_1 \overline{d_1} d_{n2} \overline{d_{n2}} \right\rangle$
				$-3 \cdot \left d_2 d_1 d_0 \overline{d_{n1}} \overline{d_{n2}} \right\rangle - 3 \cdot \left d_2 d_1 \overline{d_0} d_{n1} \overline{d_{n2}} \right\rangle + 3 \cdot \left d_2 d_1 \overline{d_0} d_{n1} d_{n2} \right\rangle$
				$+ \left \mathbf{d}_{2} \overline{\mathbf{d}_{1}} \mathbf{d}_{0} \mathbf{d}_{n 1} \overline{\mathbf{d}_{n 2}} \right\rangle - \left \mathbf{d}_{2} \overline{\mathbf{d}_{1}} \mathbf{d}_{0} \overline{\mathbf{d}_{n 1}} \mathbf{d}_{n 2} \right\rangle + 3 \cdot \left \mathbf{d}_{2} \overline{\mathbf{d}_{1}} \mathbf{d}_{0} \mathbf{d}_{n 1} \mathbf{d}_{n 2} \right\rangle$
				$+2\sqrt{6}\cdot\left d_{2}d_{0}\overline{d_{0}}d_{n1}\overline{d_{n1}}\right\rangle+5\cdot\left \overline{d_{2}}d_{1}d_{0}d_{n1}\overline{d_{n2}}\right\rangle+\left \overline{d_{2}}d_{1}d_{0}\overline{d_{n1}}d_{n2}\right\rangle$
				$-3 \cdot \left \overline{d_2} d_1 \overline{d_0} d_{n1} d_{n2} \right\rangle - 3 \cdot \left \overline{d_2} \overline{d_1} d_0 d_{n1} d_{n2} \right\rangle + 2\sqrt{6} \cdot \left d_1 \overline{d_1} d_0 \overline{d_0} d_{n2} \right\rangle$
				$+4\cdot\left \mathrm{d_{1}}\overline{\mathrm{d_{1}}}\mathrm{d_{0}}\mathrm{d_{\mathit{n}1}}\overline{\mathrm{d_{\mathit{n}1}}} ight angle ight)$

Table 4: Irreducible LS eigenspaces (continued)

config	sym	L_z	S_z	Ψ
$\wedge^6 V_{ m d}$	^{1}I	6	0	$\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\right\rangle$
	³ H	5	1	$\left \mathrm{d_{2}\overline{d_{2}}}\mathrm{d_{1}}\overline{\mathrm{d_{1}}}\mathrm{d_{0}}\mathrm{d}_{n1}\right\rangle$
	$^{3}\mathrm{G}$	4	1	$\frac{1}{\sqrt{5}} \left(\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 d_{n2} \right\rangle + \sqrt{2} \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_0} d_{n1} \right\rangle \right)$
	$^{1}\mathrm{G}$	4	0	$\frac{1}{2\sqrt{2}} \left(-\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 \overline{d_{\textit{\textit{n2}}}} \right\rangle + \sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} \overline{d_0} d_{\textit{\textit{\textit{n2}}}} \right\rangle \right.$
				$+\sqrt{2}\cdot\left \mathrm{d_{2}}\overline{\mathrm{d_{2}}}\mathrm{d_{1}}\overline{\mathrm{d_{1}}}\mathrm{d_{nl}}\overline{\mathrm{d_{nl}}} ight angle ight)$
	$^{1}\mathrm{G}$	4	0	$\frac{1}{2\sqrt{22}} \left(-\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 \overline{d_{n2}} \right\rangle + \sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 d_{n2} \right\rangle \right.$
				$-3\sqrt{2}\cdot\left d_{2}\overline{d_{2}}d_{1}\overline{d_{1}}d_{nl}\overline{d_{nl}}\right\rangle-4\sqrt{2}\cdot\left d_{2}\overline{d_{2}}d_{1}d_{0}\overline{d_{0}}\overline{d_{nl}}\right\rangle$
				$+4\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1} ight> ight)$
	$^{3}\mathrm{F}$	3	1	$\frac{1}{2\sqrt{2}} \left(\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_{n1} d_{n2} \right\rangle + \sqrt{3} \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_0} d_{n2} \right\rangle \right.$
				$+\sqrt{2}\cdot\left \mathrm{d_{2}}\overline{\mathrm{d_{2}}}\mathrm{d_{1}}\mathrm{d_{0}}\mathrm{d_{\mathit{n}1}}\overline{\mathrm{d_{\mathit{n}1}}} ight> ight)$
	$^{3}\mathrm{F}$	3	1	$\frac{1}{2\sqrt{6}}\left(\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle+\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n2}\right\rangle$
				$-\sqrt{6}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\right\rangle+4\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\right\rangle\right)$
	$^{1}\mathrm{F}$	3	0	$\frac{1}{2\sqrt{10}} \left(-\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_{n1} \overline{d_{n2}} \right\rangle + \sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_{n1} d_{n2} \right\rangle \right.$
				$-\sqrt{3}\cdot\left d_{2}\overline{d_{2}}d_{1}d_{0}\overline{d_{0}}\overline{d_{n2}}\right\rangle+\sqrt{2}\cdot\left d_{2}\overline{d_{2}}d_{1}\overline{d_{0}}d_{n1}\overline{d_{n1}}\right\rangle$
				$+\sqrt{3}\cdot\left d_{2}\overline{d_{2}}\overline{d_{1}}d_{0}\overline{d_{0}}d_{n2}\right\rangle-\sqrt{2}\cdot\left d_{2}\overline{d_{2}}\overline{d_{1}}d_{0}d_{n1}\overline{d_{n1}}\right\rangle$
				$-2\sqrt{3}\cdot\left d_{2}d_{1}\overline{d_{1}}d_{0}\overline{d_{0}}\overline{d_{nl}}\right\rangle+2\sqrt{3}\cdot\left \overline{d_{2}}d_{1}\overline{d_{1}}d_{0}\overline{d_{0}}d_{nl}\right\rangle\right)$
	$^{5}\mathrm{D}$	2	2	$\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}\right\rangle$
	^{3}D	2	1	$\frac{1}{2\sqrt{21}} \left(5 \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_0 \mathbf{d}_{n1} \overline{\mathbf{d}_{n2}} \right\rangle + \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_0 \overline{\mathbf{d}_{n1}} \mathbf{d}_{n2} \right\rangle$
				$-3 \cdot \left \mathrm{d}_2 \overline{\mathrm{d}_2} \mathrm{d}_1 \overline{\mathrm{d}_0} \mathrm{d}_{n1} \mathrm{d}_{n2} \right\rangle - 3 \cdot \left \mathrm{d}_2 \overline{\mathrm{d}_2} \overline{\mathrm{d}_1} \mathrm{d}_0 \mathrm{d}_{n1} \mathrm{d}_{n2} \right\rangle$
				$+2\sqrt{6}\cdot\left d_{2}d_{1}\overline{d_{1}}d_{0}\overline{d_{0}}d_{n2}\right\rangle+4\cdot\left d_{2}d_{1}\overline{d_{1}}d_{0}d_{n1}\overline{d_{n1}}\right\rangle\right)$
	$^{1}\mathrm{D}$	2	0	$\frac{1}{\sqrt{21}} \left(\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_{\textit{1}\textit{2}\textit{2}} \overline{d_{\textit{1}\textit{2}\textit{2}}} \right\rangle - \sqrt{2} \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_{\textit{1}\textit{1}\textit{1}}} d_{\textit{1}\textit{2}\textit{2}} \right\rangle \right.$
				$+\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{0}\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle+\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle$
				$-\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{1}}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}\right\rangle - \sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle$
				$-\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\right\rangle+\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$+\sqrt{2}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}} ight angle ight)$
	$^{1}\mathrm{D}$	2	0	$\frac{1}{\sqrt{42}} \left(-2\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_{n2} \overline{d_{n2}} \right\rangle + \sqrt{2} \cdot \left d_2 \overline{d_2} d_1 \overline{d_0} d_{n1} \overline{d_{n2}} \right\rangle \right.$
				$-\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{0}\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle-\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle$
				$+\sqrt{2}\cdot\left d_{2}\overline{d_{2}}\overline{d_{1}}d_{0}\overline{d_{n1}}d_{n2}\right\rangle-2\sqrt{3}\cdot\left d_{2}\overline{d_{2}}d_{0}\overline{d_{0}}d_{n1}\overline{d_{n1}}\right\rangle$
				$-\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{n2}}\right\rangle-\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle$
				$+\sqrt{3}\cdot\left \overline{d_{2}}d_{1}\overline{d_{1}}d_{0}\overline{d_{0}}d_{n2}\right\rangle+\sqrt{2}\cdot\left \overline{d_{2}}d_{1}\overline{d_{1}}d_{0}d_{n1}\overline{d_{n1}}\right\rangle\right)$

Table 5: Irreducible LS eigenspaces (continued)

config	sym	L_z	S_z	Ψ
	³ P	1	1	$\frac{1}{5\sqrt{2}} \left(2\sqrt{3} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_0 \mathbf{d}_{n2} \overline{\mathbf{d}_{n2}} \right\rangle + \sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_{n1} \overline{\mathbf{d}_{n1}} \overline{\mathbf{d}_{n2}} \right\rangle \right.$
				$+2\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle -\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle$
				$-\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle+3\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle\right)$
	³ P	1	1	$\frac{1}{5\sqrt{7}} \left(-\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 d_0 d_{n2} \overline{d_{n2}} \right\rangle - 3\sqrt{2} \cdot \left d_2 \overline{d_2} d_1 d_{n1} \overline{d_{n1}} d_{n2} \right\rangle \right.$
				$-5\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}\right\rangle-\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle$
				$-2\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}}_{1}\mathrm{d}_{0}\overline{\mathrm{d}}_{n\!1}\mathrm{d}_{n\!2}\right\rangle-2\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}}_{1}\mathrm{d}_{0}\mathrm{d}_{n\!1}\mathrm{d}_{n\!2}\right\rangle$
				$+\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{nl}\overline{\mathrm{d}_{nl}}\right\rangle+5\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{nl}\mathrm{d}_{n2}\right\rangle\right)$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{\sqrt{55}} \left(2 \cdot \left d_2 \overline{d_2} d_1 \overline{d_{n1}} d_{n2} \overline{d_{n2}} \right\rangle - 2 \cdot \left d_2 \overline{d_2} d_1 d_{n1} d_{n2} \overline{d_{n2}} \right\rangle$
				$+\sqrt{6}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}}\right\rangle-\sqrt{6}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$+\sqrt{6}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}\mathrm{d}_{0}}\mathrm{d}_{\mathit{n2}}\overline{\mathrm{d}_{\mathit{n2}}}\right\rangle+\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{\mathit{n1}}\overline{\mathrm{d}_{\mathit{n1}}}\overline{\mathrm{d}_{\mathit{n2}}}\right\rangle$
				$+\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle+\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle$
				$-2\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle - \sqrt{6}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n2}\overline{\mathrm{d}_{n2}}\right\rangle$
				$-\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle-2\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle$
				$+\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle+\left \overline{\mathrm{d}_{2}\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle$
				$-3\cdot\left \mathrm{d_{1}}\overline{\mathrm{d_{1}}}\mathrm{d_{0}}\overline{\mathrm{d_{0}}}\mathrm{d_{nl}}\overline{\mathrm{d_{nl}}}\right\rangle\right)$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{\sqrt{1155}} \left(9 \cdot \left d_2 \overline{d_2} d_1 \overline{d_{n1}} d_{n2} \overline{d_{n2}} \right\rangle - 9 \cdot \left d_2 \overline{d_2} \overline{d_1} d_{n1} d_{n2} \overline{d_{n2}} \right\rangle$
				$-11 \cdot \left \mathrm{d}_2 \overline{\mathrm{d}_2} \mathrm{d}_0 \overline{\mathrm{d}_0} \mathrm{d}_{\mathit{n2}} \overline{\mathrm{d}_{\mathit{n2}}} \right\rangle - \sqrt{6} \cdot \left \mathrm{d}_2 \overline{\mathrm{d}_2} \mathrm{d}_0 \mathrm{d}_{\mathit{n1}} \overline{\mathrm{d}_{\mathit{n1}} \mathrm{d}_{\mathit{n2}}} \right\rangle$
				$+\sqrt{6}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\mathrm{d}_{\mathit{n}2}\right\rangle - \sqrt{6}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}2}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle$
				$-12\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}}\right\rangle-12\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}}\right\rangle$
				$+10\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle+2\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$+\sqrt{6}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}2}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle+12\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}1}}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$+2\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle+10\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$-12\cdot\left \overline{d_{2}d_{1}}d_{0}\overline{d_{0}}d_{\mathit{n}1}d_{\mathit{n}2}\right\rangle-8\cdot\left d_{1}\overline{d_{1}}d_{0}\overline{d_{0}}d_{\mathit{n}1}\overline{d_{\mathit{n}1}}\right\rangle\right)$
$\wedge^7 V_{ m d}$	$^{2}\mathrm{H}$	5	$\frac{1}{2}$	$\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\right\rangle$
	$^{2}\mathrm{G}$	4	$\frac{1}{2}$	$\frac{1}{\sqrt{5}} \left(\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 \overline{d_0} d_{n2} \right\rangle + \sqrt{2} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 d_{n1} \overline{d_{n1}} \right\rangle \right)$
	$^4\mathrm{F}$	3	$\frac{3}{2}$	$\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{\mathit{n}1}\mathrm{d}_{\mathit{n}2}\right\rangle$

Table 6: Irreducible LS eigenspaces (continued)

config	sym	L_z	S_z	Ψ
	2 F	3	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}\left(2\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle-\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle$
				$-\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}\mathrm{d}_{0}}\mathrm{d}_{n\mathrm{l}}\mathrm{d}_{n2}\right\rangle+\sqrt{6}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n\mathrm{l}}\overline{\mathrm{d}_{n\mathrm{l}}}\right\rangle\right)$
	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$\frac{1}{\sqrt{15}} \left(\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 d_{\textit{n}2} \overline{d_{\textit{n}2}} \right\rangle + \sqrt{2} \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_0} d_{\textit{n}1} \overline{d_{\textit{n}2}} \right\rangle \right.$
				$-\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{nl}}\mathrm{d}_{n2}\right\rangle+2\sqrt{2}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{nl}\overline{\mathrm{d}_{nl}}\right\rangle\right)$
	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$\frac{1}{\sqrt{70}} \left(-\sqrt{6} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 d_{n2} \overline{d_{n2}} \right\rangle - 5 \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_{n1} \overline{d_{n1}} d_{n2} \right\rangle$
				$-2\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{\mathit{n}1}\overline{\mathrm{d}_{\mathit{n}2}}\right\rangle-3\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\overline{\mathrm{d}_{\mathit{n}1}}\mathrm{d}_{\mathit{n}2}\right\rangle$
				$+5\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle+\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle\right)$
	$^4\mathrm{P}$	1	$\frac{3}{2}$	$\frac{1}{\sqrt{5}} \left(-\sqrt{2} \cdot \left \mathbf{d}_2 \overline{\mathbf{d}_2} \mathbf{d}_1 \mathbf{d}_0 \mathbf{d}_{n1} \overline{\mathbf{d}_{n1}} \mathbf{d}_{n2} \right\rangle + \sqrt{3} \cdot \left \mathbf{d}_2 \mathbf{d}_1 \overline{\mathbf{d}_1} \mathbf{d}_0 \overline{\mathbf{d}_0} \mathbf{d}_{n1} \mathbf{d}_{n2} \right\rangle \right)$
	$^{2}\mathrm{P}$	1	$\frac{1}{2}$	$\frac{1}{\sqrt{210}} \left(3\sqrt{3} \cdot \left \mathbf{d_2} \overline{\mathbf{d_2}} \mathbf{d_1} \overline{\mathbf{d_1}} \mathbf{d_{n1}} \mathbf{d_{n2}} \overline{\mathbf{d_{n2}}} \right\rangle + 3\sqrt{3} \cdot \left \mathbf{d_2} \overline{\mathbf{d_2}} \mathbf{d_1} \mathbf{d_0} \overline{\mathbf{d_0}} \mathbf{d_{n2}} \overline{\mathbf{d_{n2}}} \right\rangle$
				$+5\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\overline{\mathrm{d}_{n2}}\right\rangle - \sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle$
				$-4\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle-2\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\right\rangle$
				$-2\sqrt{3}\cdot\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle+4\sqrt{3}\cdot\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle\right)$
$\wedge^8 V_{ m d}$	$^{1}\mathrm{G}$	4	0	$\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\right\rangle$
	$^{3}\mathrm{F}$	3	1	$\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\mathrm{d}_{n2}\right\rangle$
	$^{1}\mathrm{D}$	2	0	$\frac{1}{\sqrt{7}} \left(-\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 \overline{d_0} d_{n2} \overline{d_{n2}} \right\rangle - \sqrt{2} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 d_{n1} \overline{d_{n1}} d_{n2} \right\rangle \right.$
				$+\sqrt{2}\cdot\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle\right)$
	³ P	1	1	$\frac{1}{\sqrt{5}} \left(-\sqrt{3} \cdot \left d_2 \overline{d_2} d_1 \overline{d_1} d_0 d_{n1} d_{n2} \overline{d_{n2}} \right\rangle + \sqrt{2} \cdot \left d_2 \overline{d_2} d_1 d_0 \overline{d_0} d_{n1} \overline{d_{n1}} d_{n2} \right\rangle \right)$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{\sqrt{5}}\left(\left \mathrm{d}_{2}\overline{\mathrm{d}_{1}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n2}}\overline{\mathrm{d}_{n2}}\right\rangle+\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\mathrm{d}_{1}\mathrm{d}_{0}\overline{\mathrm{d}_{0}\mathrm{d}_{n1}}\mathrm{d}_{n2}\overline{\mathrm{d}_{n2}}\right\rangle$
				$-\left \mathrm{d}_{2}\overline{\mathrm{d}_{2}}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\mathrm{d}_{n2}\overline{\mathrm{d}_{n2}}\right\rangle-\left \mathrm{d}_{2}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\overline{\mathrm{d}_{n2}}\right\rangle$
				$+\left \overline{\mathrm{d}_{2}}\mathrm{d}_{1}\overline{\mathrm{d}_{1}}\mathrm{d}_{0}\overline{\mathrm{d}_{0}}\mathrm{d}_{n1}\overline{\mathrm{d}_{n1}}\mathrm{d}_{n2}\right\rangle \right)$
$\wedge^9 V_{ m d}$	$^{2}\mathrm{D}$	2	$\frac{1}{2}$	$\left \mathrm{d_2}\overline{\mathrm{d_2}}\mathrm{d_1}\overline{\mathrm{d_1}}\mathrm{d_0}\overline{\mathrm{d_0}}\mathrm{d_{\mathit{nl}}}\overline{\mathrm{d_{\mathit{nl}}}}\mathrm{d_{\mathit{n2}}}\right\rangle$
$\wedge^{10}V_{ m d}$	$^{1}\mathrm{S}$	0	0	$\left \mathrm{d}_2 \overline{\mathrm{d}_2} \mathrm{d}_1 \overline{\mathrm{d}_1} \mathrm{d}_0 \overline{\mathrm{d}_0} \mathrm{d}_{n1} \overline{\mathrm{d}_{n1}} \mathrm{d}_{n2} \overline{\mathrm{d}_{n2}} \right\rangle$
$\wedge^1 V_{ m f}$	$^2\mathrm{F}^\mathrm{o}$	3	$\frac{1}{2}$	$ { m f}_3 angle$
$\wedge^2 V_{\mathrm{f}}$	^{1}I	6	0	$\left f_{3}\overline{f_{3}}\right\rangle$
	³ H	5	1	$ { m f}_3{ m f}_2 angle$
	$^{1}\mathrm{G}$	4	0	$\frac{1}{\sqrt{11}} \left(-\sqrt{3} \cdot \left \mathbf{f}_3 \overline{\mathbf{f}_1} \right\rangle + \sqrt{3} \cdot \left \overline{\mathbf{f}_3} \mathbf{f}_1 \right\rangle + \sqrt{5} \cdot \left \mathbf{f}_2 \overline{\mathbf{f}_2} \right\rangle \right)$

Table 7: Irreducible LS eigenspaces (continued)

config	sym	L_z	S_z	Ψ
	$^{3}\mathrm{F}$	3	1	$\frac{1}{\sqrt{3}}\left(-\ket{\mathrm{f}_3\mathrm{f}_0}+\sqrt{2}\cdot\ket{\mathrm{f}_2\mathrm{f}_1}\right)$
	$^{1}\mathrm{D}$	2	0	$\frac{1}{\sqrt{42}} \left(\sqrt{5} \cdot \left \mathbf{f}_3 \overline{\mathbf{f}_{n1}} \right\rangle - \sqrt{5} \cdot \left \overline{\mathbf{f}_3} \mathbf{f}_{n1} \right\rangle - \sqrt{10} \cdot \left \mathbf{f}_2 \overline{\mathbf{f}_0} \right\rangle + \sqrt{10} \cdot \left \overline{\mathbf{f}_2} \mathbf{f}_0 \right\rangle + 2\sqrt{3} \cdot \left \mathbf{f}_1 \overline{\mathbf{f}_1} \right\rangle \right)$
	³ P	1	1	$\frac{1}{\sqrt{14}} \left(\sqrt{3} \cdot \mathbf{f}_3 \mathbf{f}_{n2}\rangle - \sqrt{5} \cdot \mathbf{f}_2 \mathbf{f}_{n1}\rangle + \sqrt{6} \cdot \mathbf{f}_1 \mathbf{f}_0\rangle \right)$
	$^{1}\mathrm{S}$	0	0	$\frac{1}{\sqrt{7}}\left(-\left f_{3}\overline{f_{n3}}\right\rangle+\left \overline{f_{3}}f_{n3}\right\rangle+\left f_{2}\overline{f_{n2}}\right\rangle-\left \overline{f_{2}}f_{n2}\right\rangle-\left f_{1}\overline{f_{n1}}\right\rangle$
				$+\left \overline{\mathrm{f}_{1}}\mathrm{f}_{n1} ight angle +\left \mathrm{f}_{0}\overline{\mathrm{f}_{0}} ight angle ig)$
$\wedge^3 V_{\mathrm{f}}$	$^2\mathrm{K}^\mathrm{o}$	8	$\frac{1}{2}$	$\left {{\rm f}_3 \overline {{\rm f}_3} {\rm f}_2} \right\rangle$
	$^2\mathrm{J^o}$	7	$\frac{1}{2}$	$\frac{1}{2\sqrt{2}}\left(\sqrt{3}\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{3}}\mathbf{f}_{1}\right\rangle+\sqrt{5}\cdot\left \mathbf{f}_{3}\mathbf{f}_{2}\overline{\mathbf{f}_{2}}\right\rangle\right)$
	$^4\mathrm{I}^\mathrm{o}$	6	$\frac{3}{2}$	$ { m f}_3{ m f}_2{ m f}_1 angle$
	$^2\mathrm{I}^\mathrm{o}$	6	$\frac{1}{2}$	$rac{1}{\sqrt{21}}\left(3\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{3}}\mathbf{f}_{0} ight angle - \sqrt{2}\cdot\left \mathbf{f}_{3}\mathbf{f}_{2}\overline{\mathbf{f}_{1}} ight angle - \sqrt{2}\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{2}}\mathbf{f}_{1} ight angle$
				$+2\sqrt{2}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{2}\mathbf{f}_{1} ight angle$
	² H ^o	5	$\frac{1}{2}$	$rac{1}{\sqrt{6}}\left(\sqrt{2}\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{3}}\mathbf{f}_{n1} ight angle-\left \mathbf{f}_{3}\overline{\mathbf{f}_{2}}\mathbf{f}_{0} ight angle+\left \overline{\mathbf{f}_{3}}\mathbf{f}_{2}\mathbf{f}_{0} ight angle$
				$+\sqrt{2}\cdot\left \mathbf{f}_{2}\overline{\mathbf{f}}_{2}\mathbf{f}_{1} ight angle$
	² H ^o	5	$\frac{1}{2}$	$\frac{1}{\sqrt{273}} \left(-\sqrt{5} \cdot \left f_3 \overline{f_3} f_{n1} \right\rangle - 3\sqrt{10} \cdot \left f_3 f_2 \overline{f_0} \right\rangle + 2\sqrt{10} \cdot \left f_3 \overline{f_2} f_0 \right\rangle \right.$
				$+6\sqrt{3}\cdot\left \mathbf{f}_{3}\mathbf{f}_{1}\overline{\mathbf{f}_{1}}\right\rangle+\sqrt{10}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{2}\mathbf{f}_{0}\right\rangle+2\sqrt{5}\cdot\left \mathbf{f}_{2}\overline{\mathbf{f}_{2}}\mathbf{f}_{1}\right\rangle\right)$
	$^4\mathrm{G}^\mathrm{o}$	4	$\frac{3}{2}$	$\frac{1}{\sqrt{11}} \left(-\sqrt{5} \cdot \mathbf{f}_3 \mathbf{f}_2 \mathbf{f}_{n1}\rangle + \sqrt{6} \cdot \mathbf{f}_3 \mathbf{f}_1 \mathbf{f}_0\rangle \right)$
	$^2\mathrm{G}^\mathrm{o}$	4	$\frac{1}{2}$	$\frac{1}{7\sqrt{5}} \left(5\sqrt{3} \cdot \left f_3 \overline{f_3} f_{n2} \right\rangle + \sqrt{5} \cdot \left f_3 f_2 \overline{f_{n1}} \right\rangle - 3\sqrt{5} \cdot \left f_3 \overline{f_2} f_{n1} \right\rangle \right)$
				$-\sqrt{6}\cdot\left \mathbf{f}_{3}\mathbf{f}_{1}\overline{\mathbf{f}_{0}}\right\rangle+\sqrt{6}\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{1}}\mathbf{f}_{0}\right\rangle+2\sqrt{5}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{2}\mathbf{f}_{n1}\right\rangle$
				$+2\sqrt{10}\cdot\left \mathbf{f}_{2}\overline{\mathbf{f}_{2}}\mathbf{f}_{0}\right\rangle+4\sqrt{3}\cdot\left \mathbf{f}_{2}\mathbf{f}_{1}\overline{\mathbf{f}_{1}}\right\rangle\right)$
	$^2\mathrm{G}^\mathrm{o}$	4	$\frac{1}{2}$	$\frac{1}{7\sqrt{429}} \left(-18\sqrt{6} \cdot \left \mathbf{f}_3 \overline{\mathbf{f}_3} \mathbf{f}_{n2} \right\rangle + 16\sqrt{10} \cdot \left \mathbf{f}_3 \mathbf{f}_2 \overline{\mathbf{f}_{n1}} \right\rangle + \sqrt{10} \cdot \left \mathbf{f}_3 \overline{\mathbf{f}_2} \mathbf{f}_{n1} \right\rangle \right)$
				$-32\sqrt{3}\cdot\left \mathbf{f}_{3}\mathbf{f}_{1}\overline{\mathbf{f}_{0}}\right\rangle - 17\sqrt{3}\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{1}}\mathbf{f}_{0}\right\rangle - 17\sqrt{10}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{2}\mathbf{f}_{n1}\right\rangle$
				$+49\sqrt{3}\cdot\left \overline{f_3}f_1f_0\right\rangle+15\sqrt{5}\cdot\left f_2\overline{f_2}f_0\right\rangle+15\sqrt{6}\cdot\left f_2f_1\overline{f_1}\right\rangle\right)$
	⁴ F ^o	3	$\frac{3}{2}$	$\frac{1}{2} \left(f_3 f_2 f_{n2}\rangle - f_3 f_1 f_{n1}\rangle + \sqrt{2} \cdot f_2 f_1 f_0\rangle \right)$
	$^2\mathrm{F}^\mathrm{o}$	3	$\frac{1}{2}$	$\frac{1}{\sqrt{6}}\left(\left f_{3}\overline{f_{3}}f_{n3}\right\rangle + \left f_{3}f_{2}\overline{f_{n2}}\right\rangle - \left f_{3}\overline{f_{2}}f_{n2}\right\rangle$
				$-\left f_{3}f_{1}\overline{f_{n1}}\right\rangle + \left f_{3}\overline{f_{1}}f_{n1}\right\rangle + \left f_{3}f_{0}\overline{f_{0}}\right\rangle\right)$
	$^{2}\mathrm{F}^{\mathrm{o}}$	3	$\frac{1}{2}$	$\frac{1}{2\sqrt{33}} \left(7 \cdot \left f_3 \overline{f_3} f_{n3} \right\rangle - 3 \cdot \left f_3 f_2 \overline{f_{n2}} \right\rangle - 2 \cdot \left f_3 \overline{f_2} f_{n2} \right\rangle$
				$+3 \cdot \left f_3 f_1 \overline{f_{n1}} \right\rangle - \left f_3 \overline{f_1} f_{n1} \right\rangle - 2 \cdot \left f_3 f_0 \overline{f_0} \right\rangle$
				$+5 \cdot \left \overline{f_3} f_2 f_{n2} \right\rangle - 2 \cdot \left \overline{f_3} f_1 f_{n1} \right\rangle + \sqrt{15} \cdot \left f_2 \overline{f_2} f_{n1} \right\rangle$
				$-\sqrt{2}\cdot\left f_{2}f_{1}\overline{f_{0}}\right\rangle - \sqrt{2}\cdot\left f_{2}\overline{f_{1}}f_{0}\right\rangle + 2\sqrt{2}\cdot\left \overline{f_{2}}f_{1}f_{0}\right\rangle\right)$

Table 8: Irreducible LS eigenspaces (continued)

config	sym	L_z	S_z	Ψ
	$^4\mathrm{D^o}$	2	$\frac{3}{2}$	$rac{1}{\sqrt{21}}\left(\sqrt{10}\cdot \mathbf{f}_{3}\mathbf{f}_{2}\mathbf{f}_{n3} angle-\sqrt{6}\cdot \mathbf{f}_{3}\mathbf{f}_{1}\mathbf{f}_{n2} angle+\sqrt{5}\cdot \mathbf{f}_{3}\mathbf{f}_{0}\mathbf{f}_{n1} angle ight)$
	$^{2}\mathrm{D^{o}}$	2	$\frac{1}{2}$	$\frac{1}{2\sqrt{42}} \left(2\sqrt{5} \cdot \left f_3 f_2 \overline{f_{n3}} \right\rangle - \sqrt{5} \cdot \left f_3 \overline{f_2} f_{n3} \right\rangle - 2\sqrt{3} \cdot \left f_3 f_1 \overline{f_{n2}} \right\rangle$
				$-\sqrt{3}\cdot\left f_{3}\overline{f_{1}}f_{n2}\right\rangle+\sqrt{10}\cdot\left f_{3}f_{0}\overline{f_{n1}}\right\rangle+\sqrt{10}\cdot\left f_{3}\overline{f_{0}}f_{n1}\right\rangle$
				$-\sqrt{5}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{2}\mathbf{f}_{n3}\right\rangle+3\sqrt{3}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{1}\mathbf{f}_{n2}\right\rangle-2\sqrt{10}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{0}\mathbf{f}_{n1}\right\rangle$
				$+2\sqrt{5}\cdot\left \mathbf{f}_{2}\overline{\mathbf{f}_{2}}\mathbf{f}_{n2}\right\rangle -\sqrt{5}\cdot\left \mathbf{f}_{2}\overline{\mathbf{f}_{1}}\mathbf{f}_{n1}\right\rangle +\sqrt{5}\cdot\left \overline{\mathbf{f}_{2}}\mathbf{f}_{1}\mathbf{f}_{n1}\right\rangle$
				$+\sqrt{6}\cdot\left \mathbf{f_{1}}\overline{\mathbf{f_{1}}}\mathbf{f_{0}} ight angle$
	$^{2}\mathrm{D^{o}}$	2	$\frac{1}{2}$	$\frac{1}{6\sqrt{154}} \left(-14\sqrt{5} \cdot \left f_3 f_2 \overline{f_{n3}} \right\rangle + 7\sqrt{5} \cdot \left f_3 \overline{f_2} f_{n3} \right\rangle + 14\sqrt{3} \cdot \left f_3 f_1 \overline{f_{n2}} \right\rangle \right.$
				$-13\sqrt{3}\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{1}}\mathbf{f}_{n2}\right\rangle-\sqrt{10}\cdot\left \mathbf{f}_{3}\mathbf{f}_{0}\overline{\mathbf{f}_{n1}}\right\rangle+5\sqrt{10}\cdot\left \mathbf{f}_{3}\overline{\mathbf{f}_{0}}\mathbf{f}_{n1}\right\rangle$
				$+7\sqrt{5}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{2}\mathbf{f}_{n3}\right\rangle -\sqrt{3}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{1}\mathbf{f}_{n2}\right\rangle -4\sqrt{10}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{0}\mathbf{f}_{n1}\right\rangle$
				$+6\sqrt{5}\cdot\left \mathbf{f}_{2}\overline{\mathbf{f}_{2}}\mathbf{f}_{n2}\right\rangle -12\sqrt{5}\cdot\left \mathbf{f}_{2}\mathbf{f}_{1}\overline{\mathbf{f}_{n1}}\right\rangle +3\sqrt{5}\cdot\left \mathbf{f}_{2}\overline{\mathbf{f}_{1}}\mathbf{f}_{n1}\right\rangle$
				$+12\sqrt{5}\cdot\left \mathbf{f}_{2}\mathbf{f}_{0}\overline{\mathbf{f}_{0}}\right\rangle+9\sqrt{5}\cdot\left \overline{\mathbf{f}_{2}}\mathbf{f}_{1}\mathbf{f}_{n1}\right\rangle+9\sqrt{6}\cdot\left \mathbf{f}_{1}\overline{\mathbf{f}_{1}}\mathbf{f}_{0}\right\rangle\right)$
	$^{2}\mathrm{P}^{\mathrm{o}}$	1	$\frac{1}{2}$	$\tfrac{1}{2\sqrt{21}}\left(\sqrt{6}\cdot\left f_{3}\overline{f_{1}}f_{n3}\right\rangle+\sqrt{3}\cdot\left f_{3}f_{0}\overline{f_{n2}}\right\rangle-2\sqrt{3}\cdot\left f_{3}\overline{f_{0}}f_{n2}\right\rangle$
				$-\sqrt{10}\cdot\left \mathbf{f}_{3}\mathbf{f}_{n1}\overline{\mathbf{f}_{n1}}\right\rangle-\sqrt{6}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{1}\mathbf{f}_{n3}\right\rangle+\sqrt{3}\cdot\left \overline{\mathbf{f}_{3}}\mathbf{f}_{0}\mathbf{f}_{n2}\right\rangle$
				$-\sqrt{10}\cdot\left f_{2}\overline{f_{2}}f_{n3}\right\rangle-\sqrt{6}\cdot\left f_{2}f_{1}\overline{f_{n2}}\right\rangle+\sqrt{6}\cdot\left f_{2}\overline{f_{1}}f_{n2}\right\rangle$
				$+\sqrt{5}\cdot\left f_{2}f_{0}\overline{f_{n1}}\right\rangle-\sqrt{5}\cdot\left \overline{f_{2}}f_{0}f_{n1}\right\rangle-\sqrt{6}\cdot\left f_{1}\overline{f_{1}}f_{n1}\right\rangle$
				$-\sqrt{6}\cdot\left \mathrm{f_{1}f_{0}}\overline{\mathrm{f_{0}}}\right\rangle \right)$
	⁴ S ^o	0	$\frac{3}{2}$	$\frac{1}{\sqrt{7}} \left(-\left f_3 f_0 f_{n3} \right\rangle + \sqrt{2} \cdot \left f_3 f_{n1} f_{n2} \right\rangle + \sqrt{2} \cdot \left f_2 f_1 f_{n3} \right\rangle \right.$
				$-\ket{\mathrm{f}_2\mathrm{f}_0\mathrm{f}_{n2}}+\ket{\mathrm{f}_1\mathrm{f}_0\mathrm{f}_{n1}})$

Table 9: Irreducible LS eigenspaces (continued)