

\* symmetry operation

Table 1: Symmetry operations for 3d polar vector.

| No. | tag                 | matrix (polar)  | det | TR |
|-----|---------------------|---|-----|----|
| 1   | $\{1 0\}$           | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$   | 1   | 1  |
| 2   | $\{2_{100} 0\}$     | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$ | 1   | 1  |
| 3   | $\{2_{010} 0\}$     | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$ | 1   | 1  |
| 4   | $\{2_{001} 0\}$     | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$ | 1   | 1  |
| 5   | $\{3_{111}^+ 0\}$   | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$   | 1   | 1  |
| 6   | $\{3_{111}^- 0\}$   | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$   | 1   | 1  |
| 7   | $\{3_{1-1-1}^- 0\}$ | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 8   | $\{3_{1-1-1}^+ 0\}$ | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 9   | $\{3_{-11-1}^- 0\}$ | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 10  | $\{3_{-11-1}^+ 0\}$ | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 11  | $\{3_{-1-11}^- 0\}$ | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 12  | $\{3_{-1-11}^+ 0\}$ | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 13  | $\{-4_{100}^+ 0\}$  | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$ | -1  | -1 |

*continued ...*

Table 1

| No. | tag                                   | matrix (polar)  | det | TR |
|-----|---------------------------------------|---|-----|----|
| 14  | $\{-4_{100}^{-\prime} 0\}$            | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$                     | -1  | -1 |
| 15  | $\{-4_{010}^{+\prime} 0\}$            | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$                     | -1  | -1 |
| 16  | $\{-4_{010}^{-\prime} 0\}$            | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$                     | -1  | -1 |
| 17  | $\{-4_{001}^{+\prime} 0\}$            | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$                     | -1  | -1 |
| 18  | $\{-4_{001}^{-\prime} 0\}$            | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$                     | -1  | -1 |
| 19  | $\{m_{110}^{\prime} 0\}$              | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                     | -1  | -1 |
| 20  | $\{m_{1-10}^{\prime} 0\}$             | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                       | -1  | -1 |
| 21  | $\{m_{011}^{\prime} 0\}$              | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$                     | -1  | -1 |
| 22  | $\{m_{01-1}^{\prime} 0\}$             | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$                       | -1  | -1 |
| 23  | $\{m_{101}^{\prime} 0\}$              | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$                     | -1  | -1 |
| 24  | $\{m_{-101}^{\prime} 0\}$             | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$                       | -1  | -1 |
| 25  | $\{1 0\frac{1}{2}\frac{1}{2}\}$       | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$   | 1   | 1  |
| 26  | $\{2_{100} 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 27  | $\{2_{010} 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |

continued ...

Table 1

| No. | tag                                       | matrix (polar)  | det | TR |
|-----|---|---|-----|----|
| 28  | $\{2_{001} 0\frac{1}{2}\frac{1}{2}\}$     | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 29  | $\{3_{111}^+ 0\frac{1}{2}\frac{1}{2}\}$   | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$   | 1   | 1  |
| 30  | $\{3_{111}^- 0\frac{1}{2}\frac{1}{2}\}$   | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$   | 1   | 1  |
| 31  | $\{3_{1-1-1}^- 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 32  | $\{3_{1-1-1}^+ 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 33  | $\{3_{-11-1}^- 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 34  | $\{3_{-11-1}^+ 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 35  | $\{3_{-1-11}^- 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 36  | $\{3_{-1-11}^+ 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 37  | $\{-4_{100}^+' 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 38  | $\{-4_{100}^-' 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 39  | $\{-4_{010}^+' 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 40  | $\{-4_{010}^-' 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 41  | $\{-4_{001}^+' 0\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |

continued ...

Table 1

| No. | tag                                       | matrix (polar)  | det | TR |
|-----|---|---|-----|----|
| 42  | $\{-4_{001}^- 0\frac{1}{2}\frac{1}{2}\}$  | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 43  | $\{m_{110}' 0\frac{1}{2}\frac{1}{2}\}$    | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 44  | $\{m_{1-10}' 0\frac{1}{2}\frac{1}{2}\}$   | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$   | -1  | -1 |
| 45  | $\{m_{011}' 0\frac{1}{2}\frac{1}{2}\}$    | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 46  | $\{m_{01-1}' 0\frac{1}{2}\frac{1}{2}\}$   | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$   | -1  | -1 |
| 47  | $\{m_{101}' 0\frac{1}{2}\frac{1}{2}\}$    | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 48  | $\{m_{-101}' 0\frac{1}{2}\frac{1}{2}\}$   | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$   | -1  | -1 |
| 49  | $\{1 \frac{1}{2}0\frac{1}{2}\}$           | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$   | 1   | 1  |
| 50  | $\{2_{100} \frac{1}{2}0\frac{1}{2}\}$     | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 51  | $\{2_{010} \frac{1}{2}0\frac{1}{2}\}$     | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 52  | $\{2_{001} \frac{1}{2}0\frac{1}{2}\}$     | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 53  | $\{3_{111}^+ \frac{1}{2}0\frac{1}{2}\}$   | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$   | 1   | 1  |
| 54  | $\{3_{-111}^- \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$   | 1   | 1  |
| 55  | $\{3_{1-1-1}^- \frac{1}{2}0\frac{1}{2}\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |

continued ...

Table 1

| No. | tag  | matrix (polar)  | det | TR |
|-----|--|---|-----|----|
| 56  | $\{3_{-1-1}^+ \frac{1}{2}0\frac{1}{2}\}$   | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 57  | $\{3_{-11-1}^- \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 58  | $\{3_{-11-1}^+ \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 59  | $\{3_{-1-11}^- \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 60  | $\{3_{-1-11}^+ \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 61  | $\{-4_{100}^+' \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 62  | $\{-4_{100}^-+' \frac{1}{2}0\frac{1}{2}\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 63  | $\{-4_{010}^+' \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 64  | $\{-4_{010}^-+' \frac{1}{2}0\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 65  | $\{-4_{001}^+' \frac{1}{2}0\frac{1}{2}\}$  | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 66  | $\{-4_{001}^-+' \frac{1}{2}0\frac{1}{2}\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 67  | $\{m_{110}' \frac{1}{2}0\frac{1}{2}\}$     | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 68  | $\{m_{1-10}' \frac{1}{2}0\frac{1}{2}\}$    | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$   | -1  | -1 |
| 69  | $\{m_{011}' \frac{1}{2}0\frac{1}{2}\}$     | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |

continued ...

Table 1

| No. | tag                                       | matrix (polar)  | det | TR |
|-----|---|---|-----|----|
| 70  | $\{m_{01-1}' \frac{1}{2}0\frac{1}{2}\}$   | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$   | -1  | -1 |
| 71  | $\{m_{101}' \frac{1}{2}0\frac{1}{2}\}$    | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 72  | $\{m_{-101}' \frac{1}{2}0\frac{1}{2}\}$   | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$   | -1  | -1 |
| 73  | $\{1 \frac{1}{2}\frac{1}{2}0\}$           | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$   | 1   | 1  |
| 74  | $\{2_{100} \frac{1}{2}\frac{1}{2}0\}$     | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \end{bmatrix}$ | 1   | 1  |
| 75  | $\{2_{010} \frac{1}{2}\frac{1}{2}0\}$     | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \end{bmatrix}$ | 1   | 1  |
| 76  | $\{2_{001} \frac{1}{2}\frac{1}{2}0\}$     | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$ | 1   | 1  |
| 77  | $\{3_{111}^+ \frac{1}{2}\frac{1}{2}0\}$   | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix}$   | 1   | 1  |
| 78  | $\{3_{111}^- \frac{1}{2}\frac{1}{2}0\}$   | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \end{bmatrix}$   | 1   | 1  |
| 79  | $\{3_{1-1-1}^- \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 80  | $\{3_{1-1-1}^+ \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 81  | $\{3_{-11-1}^- \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 82  | $\{3_{-11-1}^+ \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 83  | $\{3_{-1-11}^- \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \end{bmatrix}$ | 1   | 1  |

continued ...

Table 1

| No. | tag                                       | matrix (polar)  | det | TR |
|-----|---|---|-----|----|
| 84  | $\{3^+_{-1-11} \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \end{bmatrix}$ | 1   | 1  |
| 85  | $\{-4^+_{100}' \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \end{bmatrix}$ | -1  | -1 |
| 86  | $\{-4^-_{100}' \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix}$ | -1  | -1 |
| 87  | $\{-4^+_{010}' \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \end{bmatrix}$ | -1  | -1 |
| 88  | $\{-4^-_{010}' \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \end{bmatrix}$ | -1  | -1 |
| 89  | $\{-4^+_{001}' \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \end{bmatrix}$ | -1  | -1 |
| 90  | $\{-4^-_{001}' \frac{1}{2}\frac{1}{2}0\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \end{bmatrix}$ | -1  | -1 |
| 91  | $\{m_{110}' \frac{1}{2}\frac{1}{2}0\}$    | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$ | -1  | -1 |
| 92  | $\{m_{1-10}' \frac{1}{2}\frac{1}{2}0\}$   | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$   | -1  | -1 |
| 93  | $\{m_{011}' \frac{1}{2}\frac{1}{2}0\}$    | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \end{bmatrix}$ | -1  | -1 |
| 94  | $\{m_{01-1}' \frac{1}{2}\frac{1}{2}0\}$   | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix}$   | -1  | -1 |
| 95  | $\{m_{101}' \frac{1}{2}\frac{1}{2}0\}$    | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \end{bmatrix}$ | -1  | -1 |
| 96  | $\{m_{-101}' \frac{1}{2}\frac{1}{2}0\}$   | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \end{bmatrix}$   | -1  | -1 |