

MSG No. 230.147  $Ia'3'd$  [ Type III, cubic ]

\* 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   | $\{2_{100} 00\frac{1}{2}\}$                        | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$                     | 1   | 1  |
| 3   | $\{2_{010} \frac{1}{2}00\}$                        | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$                     | 1   | 1  |
| 4   | $\{2_{001} 0\frac{1}{2}0\}$                        | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$                     | 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   | $\{3^-_{1-1-1} \frac{1}{2}00\}$                    | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$                     | 1   | 1  |
| 8   | $\{3^+_{1-1-1} 0\frac{1}{2}0\}$                    | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix}$                     | 1   | 1  |
| 9   | $\{3^-_{-11-1} 0\frac{1}{2}0\}$                    | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \end{bmatrix}$                     | 1   | 1  |
| 10  | $\{3^+_{-11-1} 00\frac{1}{2}\}$                    | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$                     | 1   | 1  |
| 11  | $\{3^-_{-1-11} 00\frac{1}{2}\}$                    | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$                     | 1   | 1  |
| 12  | $\{3^+_{-1-11} \frac{1}{2}00\}$                    | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$                     | 1   | 1  |
| 13  | $\{-4^+_{100} \frac{1}{4}\frac{1}{4}\frac{3}{4}\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{3}{4} \end{bmatrix}$ | -1  | 1  |

continued ...

Table 1

| No. | tag   | matrix (polar)  | det | TR |
|-----|---|---|-----|----|
| 14  | $\{-4_{100}^-  \frac{3}{4} \frac{1}{4} \frac{1}{4}\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & -1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{1}{4} \end{bmatrix}$ | -1  | 1  |
| 15  | $\{-4_{010}^+  \frac{3}{4} \frac{1}{4} \frac{1}{4}\}$ | $\begin{bmatrix} 0 & 0 & -1 & \frac{3}{4} \\ 0 & -1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$ | -1  | 1  |
| 16  | $\{-4_{010}^-  \frac{1}{4} \frac{3}{4} \frac{1}{4}\}$ | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{3}{4} \\ -1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$ | -1  | 1  |
| 17  | $\{-4_{001}^+  \frac{1}{4} \frac{3}{4} \frac{1}{4}\}$ | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & -1 & \frac{1}{4} \end{bmatrix}$ | -1  | 1  |
| 18  | $\{-4_{001}^-  \frac{1}{4} \frac{1}{4} \frac{3}{4}\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{3}{4} \end{bmatrix}$ | -1  | 1  |
| 19  | $\{m_{110}  \frac{3}{4} \frac{1}{4} \frac{1}{4}\}$    | $\begin{bmatrix} 0 & -1 & 0 & \frac{3}{4} \\ -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$ | -1  | 1  |
| 20  | $\{m_{1-10}  \frac{1}{4} \frac{1}{4} \frac{1}{4}\}$   | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$   | -1  | 1  |
| 21  | $\{m_{011}  \frac{1}{4} \frac{3}{4} \frac{1}{4}\}$    | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{3}{4} \\ 0 & -1 & 0 & \frac{1}{4} \end{bmatrix}$ | -1  | 1  |
| 22  | $\{m_{01-1}  \frac{1}{4} \frac{1}{4} \frac{1}{4}\}$   | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{1}{4} \end{bmatrix}$   | -1  | 1  |
| 23  | $\{m_{101}  \frac{1}{4} \frac{1}{4} \frac{3}{4}\}$    | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$ | -1  | 1  |
| 24  | $\{m_{-101}  \frac{1}{4} \frac{1}{4} \frac{1}{4}\}$   | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$   | -1  | 1  |
| 25  | $\{4_{100}^+  \frac{1}{4} \frac{1}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{3}{4} \end{bmatrix}$  | 1   | -1 |
| 26  | $\{4_{100}^-  \frac{3}{4} \frac{1}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{1}{4} \end{bmatrix}$  | 1   | -1 |
| 27  | $\{4_{010}^+  \frac{3}{4} \frac{1}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 0 & 0 & 1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$  | 1   | -1 |

continued ...

Table 1

| No. | tag  | matrix (polar)   | det | TR |
|-----|--|--|-----|----|
| 28  | $\{4_{010}'  \frac{1}{4} \frac{3}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$   | 1   | -1 |
| 29  | $\{4_{001}'  \frac{1}{4} \frac{3}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$   | 1   | -1 |
| 30  | $\{4_{001}'  \frac{1}{4} \frac{1}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 31  | $\{2_{110}'  \frac{3}{4} \frac{1}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 0 & 1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{1}{4} \end{bmatrix}$   | 1   | -1 |
| 32  | $\{2_{1-10}'  \frac{1}{4} \frac{1}{4} \frac{1}{4}\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{1}{4} \end{bmatrix}$ | 1   | -1 |
| 33  | $\{2_{011}'  \frac{1}{4} \frac{3}{4} \frac{1}{4}\}$  | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \end{bmatrix}$   | 1   | -1 |
| 34  | $\{2_{01-1}'  \frac{1}{4} \frac{1}{4} \frac{1}{4}\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & -1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{1}{4} \end{bmatrix}$ | 1   | -1 |
| 35  | $\{2_{101}'  \frac{1}{4} \frac{1}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 36  | $\{2_{-101}'  \frac{1}{4} \frac{1}{4} \frac{1}{4}\}$ | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{4} \\ 0 & -1 & 0 & \frac{1}{4} \\ -1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$ | 1   | -1 |
| 37  | $\{-1' 0\}$  | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \end{bmatrix}$                               | -1  | -1 |
| 38  | $\{\text{m}_{100}' 00\frac{1}{2}\}$                  | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$                       | -1  | -1 |
| 39  | $\{\text{m}_{010}' \frac{1}{2}00\}$                  | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                       | -1  | -1 |
| 40  | $\{\text{m}_{001}' 0\frac{1}{2}0\}$                  | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \end{bmatrix}$                       | -1  | -1 |
| 41  | $\{-3_{111}' 0\}$                                    | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{bmatrix}$                               | -1  | -1 |

continued ...

Table 1

| No. | tag   | matrix (polar)  | det | TR |
|-----|---|---|-----|----|
| 42  | $\{-3_{111}^- 0\}$                                | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & 0 & 0 & 0 \end{bmatrix}$                            | -1  | -1 |
| 43  | $\{-3_{1-1-1}^- \frac{1}{2}00\}$                  | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$                    | -1  | -1 |
| 44  | $\{-3_{1-1-1}^+ 0\frac{1}{2}0\}$                  | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & 0 \end{bmatrix}$                    | -1  | -1 |
| 45  | $\{-3_{-11-1}^- 0\frac{1}{2}0\}$                  | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \end{bmatrix}$                    | -1  | -1 |
| 46  | $\{-3_{-11-1}^+ 00\frac{1}{2}\}$                  | $\begin{bmatrix} 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$                    | -1  | -1 |
| 47  | $\{-3_{-1-11}^- 00\frac{1}{2}\}$                  | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$                    | -1  | -1 |
| 48  | $\{-3_{-1-11}^+ \frac{1}{2}00\}$                  | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$                    | -1  | -1 |
| 49  | $\{1 \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$         | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 50  | $\{2_{100} \frac{1}{2}\frac{1}{2}0\}$             | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & 0 \end{bmatrix}$         | 1   | 1  |
| 51  | $\{2_{010} 0\frac{1}{2}\frac{1}{2}\}$             | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$         | 1   | 1  |
| 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  | $\{3_{111}^+ \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 54  | $\{3_{111}^- \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | 1   | 1  |
| 55  | $\{3_{-1-1-1}^- 0\frac{1}{2}\frac{1}{2}\}$        | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$         | 1   | 1  |

continued ...

Table 1

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

continued ...

Table 1

| No. | tag   | matrix (polar)   | det | TR |
|-----|---|--|-----|----|
| 70  | $\{m_{01-1}   \frac{3}{4} \frac{3}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{3}{4} \end{bmatrix}$    | -1  | 1  |
| 71  | $\{m_{101}   \frac{3}{4} \frac{3}{4} \frac{1}{4}\}$   | $\begin{bmatrix} 0 & 0 & -1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{3}{4} \\ -1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$  | -1  | 1  |
| 72  | $\{m_{-101}   \frac{3}{4} \frac{3}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 0 & 0 & 1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$    | -1  | 1  |
| 73  | $\{4_{100}'   \frac{3}{4} \frac{3}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & -1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \end{bmatrix}$   | 1   | -1 |
| 74  | $\{4_{100}'   \frac{1}{4} \frac{3}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{3}{4} \\ 0 & -1 & 0 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 75  | $\{4_{010}'   \frac{1}{4} \frac{3}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{3}{4} \\ -1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 76  | $\{4_{010}'   \frac{3}{4} \frac{1}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 0 & 0 & -1 & \frac{3}{4} \\ 0 & 1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 77  | $\{4_{001}'   \frac{3}{4} \frac{1}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 0 & -1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \\ 0 & 0 & 1 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 78  | $\{4_{001}'   \frac{3}{4} \frac{3}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 0 & 1 & 0 & \frac{3}{4} \\ -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \end{bmatrix}$   | 1   | -1 |
| 79  | $\{2_{110}'   \frac{1}{4} \frac{3}{4} \frac{3}{4}\}$  | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{4} \\ 1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & -1 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 80  | $\{2_{1-10}'   \frac{3}{4} \frac{3}{4} \frac{3}{4}\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{3}{4} \\ -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & -1 & \frac{3}{4} \end{bmatrix}$ | 1   | -1 |
| 81  | $\{2_{011}'   \frac{3}{4} \frac{1}{4} \frac{3}{4}\}$  | $\begin{bmatrix} -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & 1 & \frac{1}{4} \\ 0 & 1 & 0 & \frac{3}{4} \end{bmatrix}$   | 1   | -1 |
| 82  | $\{2_{01-1}'   \frac{3}{4} \frac{3}{4} \frac{3}{4}\}$ | $\begin{bmatrix} -1 & 0 & 0 & \frac{3}{4} \\ 0 & 0 & -1 & \frac{3}{4} \\ 0 & -1 & 0 & \frac{3}{4} \end{bmatrix}$ | 1   | -1 |
| 83  | $\{2_{101}'   \frac{3}{4} \frac{3}{4} \frac{1}{4}\}$  | $\begin{bmatrix} 0 & 0 & 1 & \frac{3}{4} \\ 0 & -1 & 0 & \frac{3}{4} \\ 1 & 0 & 0 & \frac{1}{4} \end{bmatrix}$   | 1   | -1 |

continued ...

Table 1

| No. | tag   | matrix (polar)   | det | TR |
|-----|---|--|-----|----|
| 84  | $\{2_{-101}' \frac{3}{4}\frac{3}{4}\frac{3}{4}\}$   | $\begin{bmatrix} 0 & 0 & -1 & \frac{3}{4} \\ 0 & -1 & 0 & \frac{3}{4} \\ -1 & 0 & 0 & \frac{3}{4} \end{bmatrix}$ | 1   | -1 |
| 85  | $\{-1' \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$         | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 86  | $\{\text{m}_{100}' \frac{1}{2}\frac{1}{2}0\}$       | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \end{bmatrix}$             | -1  | -1 |
| 87  | $\{\text{m}_{010}' 0\frac{1}{2}\frac{1}{2}\}$       | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$             | -1  | -1 |
| 88  | $\{\text{m}_{001}' \frac{1}{2}0\frac{1}{2}\}$       | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \end{bmatrix}$             | -1  | -1 |
| 89  | $\{-3^+_{111}' \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 90  | $\{-3^-_{111}' \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & -1 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ | -1  | -1 |
| 91  | $\{-3^-_{1-1-1}' 0\frac{1}{2}\frac{1}{2}\}$         | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$             | -1  | -1 |
| 92  | $\{-3^+_{1-1-1}' \frac{1}{2}0\frac{1}{2}\}$         | $\begin{bmatrix} 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & \frac{1}{2} \end{bmatrix}$             | -1  | -1 |
| 93  | $\{-3^-_{-11-1}' \frac{1}{2}0\frac{1}{2}\}$         | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \end{bmatrix}$             | -1  | -1 |
| 94  | $\{-3^+_{-11-1}' \frac{1}{2}\frac{1}{2}0\}$         | $\begin{bmatrix} 0 & 0 & -1 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & 0 \end{bmatrix}$             | -1  | -1 |
| 95  | $\{-3^-_{-1-11}' \frac{1}{2}\frac{1}{2}0\}$         | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \\ 1 & 0 & 0 & 0 \end{bmatrix}$             | -1  | -1 |
| 96  | $\{-3^+_{-1-11}' 0\frac{1}{2}\frac{1}{2}\}$         | $\begin{bmatrix} 0 & 0 & 1 & 0 \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \end{bmatrix}$             | -1  | -1 |