In momentum twistor language we have the n momentum twistors Z_i, which together form the $4 \times n$ matrix

$$K = \begin{pmatrix} z_{11} & \dots & z_{n1} \\ z_{12} & \dots & z_{n2} \\ z_{13} & \dots & z_{n3} \\ z_{14} & \dots & z_{n4} \end{pmatrix}. \tag{1}$$

As long as the first 4 columns are non-singular, we can row reduce K in to the form

$$K' = \begin{pmatrix} 1 & 0 & 0 & 0 & y_{51} & \dots & y_{n1} \\ 0 & 1 & 0 & 0 & y_{52} & \dots & y_{n2} \\ 0 & 0 & 1 & 0 & y_{53} & \dots & y_{n3} \\ 0 & 0 & 0 & 1 & y_{54} & \dots & y_{n4} \end{pmatrix}. \tag{2}$$

The columns of K' define a new set of momentum twistors Z'_i, where for example $Z'_1 = \{1, 0, 0, 0\}$ and $Z'_5 = \{y_{51}, y_{52}, y_{53}, y_{54}\}$. It is easy to check that

$$y_{ij} = (-1)^j \langle \{1, 2, 3, 4\} \setminus \{j\}, i\rangle / \langle 1234\rangle, \tag{3}$$

$$\langle abcd\rangle' = \det(Z'_a Z'_b Z'_c Z'_d) = \langle abcd\rangle / \langle 1234\rangle. \tag{4}$$

The Sklyanin bracket on these y_{ij} is given by

$$\{y_{ij}, y_{ab}\} = (\mathrm{sgn}(a - i) - \mathrm{sgn}(b - j))y_{ib}y_{aj}. \tag{5}$$

This extends to a bracket on functions of the y_{ij} via

$$\{f(y), g(y)\} = \sum_{i,a=1}^{n} \sum_{j,b=1}^{4} \frac{\partial f}{\partial y_{ij}} \frac{\partial g}{\partial y_{ab}} \{y_{ij}, y_{ab}\}. \tag{6}$$

What we commonly refer to as "the Poisson bracket" between two $\mathcal{X}$-coordinates, $\{\mathcal{X}_1, \mathcal{X}_2\}$ is then calculated via

$$\{\mathcal{X}_1, \mathcal{X}_2\} = \frac{1}{2\mathcal{X}_1 \mathcal{X}_2} \{\mathcal{X}'_1, \mathcal{X}'_2\} \tag{7}$$

where $\mathcal{X}'_i = \mathcal{X}_i$ with $\langle ijkl\rangle \to \langle ijkl\rangle'$.