$$\epsilon_{ll'L'} = \frac{1+(-1)^{l+l'+L'}}{2} \tag{1}$$

$$\beta_{ll'L'} = \frac{1-(-1)^{l+l'+L'}}{2i} \tag{2}$$

This is the original formula for the lensed field in Hu's paper.

$$\delta X_l^m \approx \sum_{L'M'} \sum_{l'm'} \phi_{L'}^{M'} (-1)^{m'} \begin{pmatrix} l & l' & L' \\ m & -m' & -M' \end{pmatrix} F_{ll'L'}^{s_x} \left[\epsilon_{ll'L'} X_{l'}^{m'} + \beta_{ll'L'} \overline{X}_{l'}^{m'}\right] \tag{3}$$

$$\begin{aligned} \delta X_l^m &\approx \sum_{L'M'} \sum_{l'm'} \phi_{L'}^{M'} (-1)^{m'} \begin{pmatrix} l & l' & L' \\ m & -m' & -M' \end{pmatrix} F_{ll'L'}^{s_x} \left[\epsilon_{ll'L'} X_{l'}^{m'} + \beta_{ll'L'} \overline{X}_{l'}^{m'}\right] && (4) \\ &= \sum_{L'M'} \sum_{l'm'} \phi_{L'}^{-M'} (-1)^{M'} (-1)^{m+m'+M'} \begin{pmatrix} l & l' & L' \\ m & m' & M' \end{pmatrix} F_{ll'L'}^{s_x} \left[\epsilon_{ll'L'} (-1)^{m'} X_{l'}^{-m'} + \beta_{ll'L'} (-1)^{m'} \overline{X}_{l'}^{-m'}\right] && (5) \end{aligned}$$

We know that

$$(-1)^{M'} \phi_{L'}^{-M'} = \phi_{L'}^{M'*} \tag{6}$$

$$(-1)^{m'} X_{l'}^{-m'} = X_{l'}^{m'*} \tag{7}$$

$$(-1)^{m'} \overline{X}_{l'}^{-m'} = \overline{X}_{l'}^{m'*} \tag{8}$$

Then I'll manipulate the formular to give a form easier to use. ...

(9)

$$B_{\ell_1 m_1}^{\mathrm{len}} = \sum_{\ell_1' m_1' \ell' m'} f_{\ell_1 \ell_1' \ell'}^{EB} \begin{pmatrix} \ell_1 & \ell_1' & \ell' \\ m_1 & m_1' & m' \end{pmatrix} \left(E_{\ell_1' m_1'}^{*} \phi_{\ell' m'}^{*} + \right) \tag{10}$$

$$B_{\ell_1 m_1}^{\mathrm{len}} = \sum_{\ell_1' m_1' \ell' m'} f_{\ell_1 \ell_1' \ell'}^{EB} \begin{pmatrix} \ell_1 & \ell_1' & \ell' \\ m_1 & m_1' & m' \end{pmatrix} \left(E_{\ell_1' m_1'}^{*} \phi_{\ell' m'}^{*} + \right) \tag{11}$$