$${}_sY_{lm}(\theta,\phi) = \sqrt{\frac{2l+1}{4\pi}}\, D^l_{-sm}(\phi,\theta,0)$$

$$D^l_{-sm}(\phi,\theta,\psi) = \sqrt{\frac{4\pi}{2l+1}}\, {}_sY_{lm}(\theta,\phi)\, e^{-is\psi}$$

$\boxed{Z_1 - Y_1 - Z_2 \text{ convention}}$

$$= \sum_{lm} {}_0Y_{lm}(\theta_1,\phi_1)\, {}_{-2}Y^*_{lm}(\theta_2,\phi_2)$$

$$= \sum_{lm} \frac{2l+1}{4\pi}\, D^l_{0m}(\phi_1,\theta_1,0)\, D^{l*}_{2m}(\phi_2,\theta_2,0)$$

$$\to D^{J*}_{MM'}(\alpha,\beta,\gamma) = \left[\hat{D}^{-1}(\alpha,\beta,\gamma)\right]^J_{M'M}$$

Varshalovich Pg 72, Eq. 4

$$= D^J_{M'M}(-\gamma,-\beta,-\alpha)$$

Pg 74, Eq. 13

$$= \sum_{lm} \frac{2l+1}{4\pi}\, D^l_{0m}(\phi_1,\theta_1,0)\, D^l_{m2}(0,-\theta_2,-\phi_2)$$

$$= \sum_{lm} \frac{2l+1}{4\pi}\, D^l_{02}(\alpha,\beta,\gamma) = \sqrt{\frac{2l+1}{4\pi}}\, D^{l*}_{20}(-\gamma,-\beta,-\alpha)$$

$$\to D^J_{MM'}(\alpha,\beta,\gamma) = e^{-iM\alpha}\, d^J_{MM'}(\beta)\, e^{-iM'\gamma}$$

Pg 76, eq. 1

$$d^J_{M'M} = (-1)^{M-M'}\, d^J_{MM'}$$

$$\cancel{D^l_{02} = e^{-iM0}}$$

$$= \sum_{lm} \frac{2l+1}{4\pi}\, e^{-i0\alpha}\, d^l_{02}(\beta)\, e^{-i2\gamma}$$

$$= \sum_{lm} \frac{2l+1}{4\pi}\, e^{+i2\gamma}\, d^{l*}_{20}(-\beta)\, e^{+i0\alpha}$$

$$= \sum_{lm} \sqrt{\frac{2l+1}{4\pi}}\, {}_0Y_{l2}(\beta,\alpha)$$

, $q \to e$: Radiating kernel.

$$\sum_{lm} {}_2Y_{lm}(\theta_q,\phi_q)\ {}_0Y^*_{lm}(\theta_e,\phi_e) \quad - A1 \qquad \text{(Radiate)}$$

$EB \to Q, U$

$$\sum \frac{2l+1}{4\pi} D^l_{-2m}(\phi_q,\theta_q,0)\ D^{l*}_{0m}(\phi_e,\theta_e,0)$$

$$\sum \frac{2l+1}{4\pi} D^l_{-2m}(\phi_q,\theta_q,0)\ D^l_{m0}(0,-\theta_e,-\phi_e)$$

$$\sum \frac{2l+1}{4\pi} D^l_{-20}(\alpha_{eq},\beta_{eq},\gamma_{eq}) = \sum \frac{2l+1}{4\pi} D^{l*}_{0-2}(-\gamma_{eq},-\beta_{eq},-\alpha_{eq})$$

$$= \sum \sqrt{\frac{2l+1}{4\pi}}\ {}_0Y^*_{l-2}(-\beta_{eq},-\gamma_{eq}) = \sum \sqrt{\frac{2l+1}{4\pi}}\ Y^*_{l2}(\beta_{eq},\gamma_{eq})$$

$$= \sum \sqrt{\frac{2l+1}{4\pi}}\ Y_{l2}(\beta_{eq},-\gamma_{eq})$$

$Q, U \to E, B$

$$\sum_{lm} {}_0Y_{lm}(\theta_e,\phi_e)\ {}_{-2}Y^*_{lm}(\theta_q,\phi_q) \quad - B1 \qquad \text{(Radiate)}$$

$$\sum_{lm} \frac{2l+1}{4\pi} D^l_{0m}(\phi_e,\theta_e,0)\ D^{l*}_{2m}(\phi_q,\theta_q,0)$$

$$\sum_{lm} \frac{2l+1}{4\pi} D^l_{0m}(\phi_e,\theta_e,0)\ D^l_{m2}(0,-\theta_q,-\phi_q)$$

$$\sum_{lm} \frac{2l+1}{4\pi} D^l_{02}(\alpha_{qe},\beta_{qe},\gamma_{qe}) = \sum_{lm} \sqrt{\frac{2l+1}{4\pi}}\ {}_0Y_{l2}(\beta_{qe},\alpha_{qe})$$

$$B1 = \sum_{lm} {}_0Y^*_{lm}(\theta_e,\phi_e)\ {}_2Y_{lm}(\theta_q,\phi_q) \quad - B2 \quad \text{(convolve)}$$

$$= \sum_{lm} \frac{2l+1}{4\pi} D^{l*}_{0m}(\phi_e,\theta_e,0)\ D^l_{-2m}(\phi_q,\theta_q,0)$$

$$= \sum_{lm} \frac{2l+1}{4\pi} D^l_{-2m}(\phi_q,\theta_q,0)\ D^l_{m0}(0,-\theta_e,-\phi_e)$$

$$= \sum_{lm} \frac{2l+1}{4\pi} D^l_{-20}(\alpha_{eq},\beta_{eq},\gamma_{eq}) = \sum \frac{2l+1}{4\pi} D^{l*}_{0-2}(-\gamma_{eq},-\beta_{eq},-\alpha_{eq})$$

$$= \sum \sqrt{\frac{2l+1}{4\pi}}\ Y^*_{l-2}(-\beta_{eq},-\gamma_{eq}) = \sqrt{\frac{2l+1}{4\pi}}\ Y_{l2}(\beta_{eq},-\gamma_{eq})$$

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EB → QU

$$A1 = \sum_{lm} {}_2Y_{lm}(\theta_q,\phi_q)\, {}_0Y^*_{lm}(\theta_e,\phi_e)$$

$$= \sum_{lm} {}_{-2}Y^*_{lm}(\theta_q,\phi_q)\, {}_0Y_{lm}(\theta_e,\phi_e)$$

$$= \sum_{lm} \frac{2l+1}{4\pi}\, D^{l*}_{2m}(\phi_q,\theta_q,0)\, D^{l}_{0m}(\phi_e,\theta_e,0)$$

$$= \sum_{lm} \frac{2l+1}{4\pi}\, D^{l}_{0m}(\phi_e,\theta_e,0)\, D^{l}_{m2}(0,-\theta_q,-\phi_q)$$

$$= \sum_{lm} \frac{2l+1}{4\pi}\, D^{l}_{02}(\alpha_{qe},\beta_{qe},\gamma_{qe})$$

$$= \sum_{lm} \sqrt{\frac{2l+1}{4\pi}}\, {}_0Y_{l2}(\beta_{qe},\alpha_{qe})$$ → Convolution.