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$P_{yPWA} \rightarrow$ Reflectivity
GJ Frame

$\sigma_P \rightarrow \rho_P \rightarrow \pi_P \rho_P$

$$A_{\pm} = |m\rangle \pm P(-1)^{(J-m)} | -m\rangle$$

$$A_{em} \quad A_{11} = -\sqrt{\frac{3}{8\pi}} \sin\theta e^{i\phi}$$

$$A_{1-1} = \sqrt{\frac{3}{8\pi}} \sin\theta e^{-i\phi}$$

$$A_+ = A_{11} - A_{1-1} = -\sqrt{\frac{3}{8\pi}} \sin\theta e^{i\phi} - \sqrt{\frac{3}{8\pi}} \sin\theta e^{-i\phi}$$

$$A_+ = -\sqrt{\frac{3}{8\pi}} \sin\theta (e^{i\phi} + e^{-i\phi}) = -\sqrt{\frac{3}{8\pi}} \sin\theta \cdot 2 \cos\phi$$

$$A_- = A_{11} + A_{1-1} = -\sqrt{\frac{3}{8\pi}} \sin\theta (e^{i\phi} - e^{-i\phi}) = -\sqrt{\frac{3}{8\pi}} \sin\theta \cdot 2i \sin\phi$$

$$\hat{P} : \begin{pmatrix} 1 + P \cos 2\alpha & +iP \sin 2\alpha \\ -iP \sin 2\alpha & 1 - P \cos 2\alpha \end{pmatrix}$$

$$I = P_{++} A_+ A_+^* + P_{+-} A_+ A_-^* + P_{-+} A_- A_+^* + P_{--} A_- A_-^*$$

$$A_+ A_+^* = \frac{3}{8\pi} 4 \sin^2\theta \cos^2\phi$$

$$A_+ A_-^* = -\frac{3}{8\pi} 4i \sin^2\theta \sin\phi \cos\phi$$

$$A_- A_+^* = \frac{3}{8\pi} 4i \sin^2\theta \sin\phi \cos\phi$$

$$A_- A_-^* = \frac{3}{8\pi} 4 \sin^2\theta \sin^2\phi$$

$$I = \frac{4 \cdot 3}{8\pi} \sin^2\theta \left[(1 + P \cos 2\alpha) \cos^2\phi + iP \sin 2\alpha (-i \sin\phi \cos\phi) \right. \\ \left. + (-iP \sin 2\alpha) (i \sin\phi \cos\phi) \right. \\ \left. + (1 - P \cos 2\alpha) \sin^2\phi \right]$$

$$I = \frac{3}{2\pi} \sin^2\theta \left[\cos^2\phi + P \cos 2\alpha \cos^2\phi - P \cos 2\alpha \sin^2\phi \right. \\ \left. + 2P \sin 2\alpha \sin\phi \cos\phi \right]$$

$$I = \frac{3}{2\pi} \sin^2\theta \left[1 + P \cos 2\alpha (\underbrace{\cos^2\phi - \sin^2\phi}_{\cos 2\phi}) + 2P \sin 2\alpha \underbrace{\sin\phi \cos\phi}_{\sin 2\phi} \right]$$

$$I = \frac{3}{2\pi} \sin^2\theta \left[1 + P \cos 2(\alpha - \phi) \right]$$