Vector Meson Spin-Density Matrix Elements

Input/Output Test

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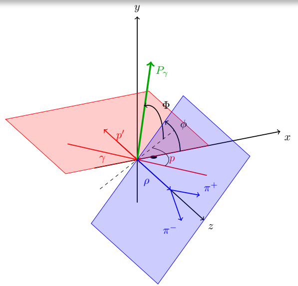
Spin-Density Matrix Elements

Input/Output Test

- 10M signal MC events with $\rho^1_{1-1} = -\rho^2_{1-1} - 0.5$ in 4 orientations, $0.05 < t < 1\,\text{GeV}^2/c^2$
- 100M flat MC events with the same version set
- Fixed degree of polarization $\boldsymbol{P_\gamma} = 0.4$



$$W(\cos\vartheta, \varphi, \Phi) = W^0(\cos\vartheta, \varphi) - P_\gamma \cos(2\Phi) W^1(\cos\vartheta, \varphi) - P_\gamma \sin(2\Phi) W^2(\cos\vartheta, \varphi)$$

$$W^0(\cos\vartheta, \varphi) = \frac{3}{4\pi}\left(\frac{1}{2}(1-\rho^0_{00}) + \frac{1}{2}(3\rho^0_{00}-1)\cos^2\vartheta - \sqrt{2}\text{Re}\rho^0_{10}\sin 2\vartheta\cos\varphi - \rho^0_{1-1}\sin^2\vartheta\cos 2\varphi\right)$$

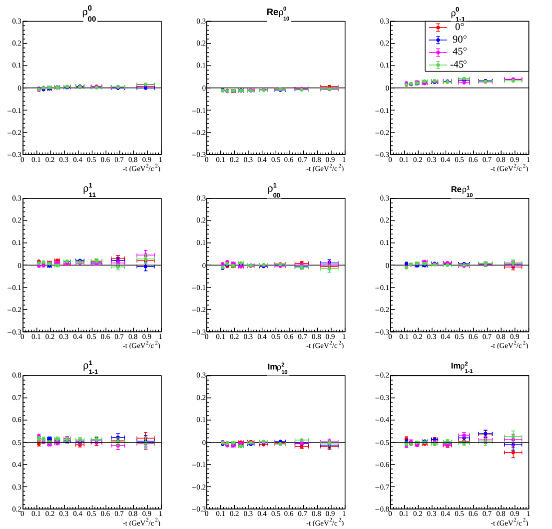
$$W^1(\cos\vartheta, \varphi) = \frac{3}{4\pi}\left(\rho^1_{11}\sin^2\vartheta + \rho^1_{00}\cos^2\vartheta - \sqrt{2}\text{Re}\rho^1_{10}\sin 2\vartheta\cos\varphi - \rho^1_{1-1}\sin^2\vartheta\cos 2\varphi\right)$$

$$W^2(\cos\vartheta, \varphi) = \frac{3}{4\pi}\left(\sqrt{2}\text{Im}\rho^2_{10}\sin 2\vartheta\sin\varphi + \text{Im}\rho^2_{1-1}\sin^2\vartheta\sin 2\varphi\right)$$

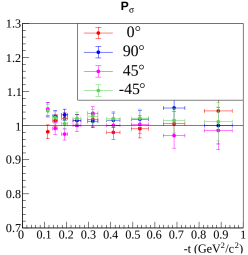
Schilling *et al.* [Nucl. Phy. B, 15 (1970) 397]

Latest Result

$\gamma p \to \rho(770)p$



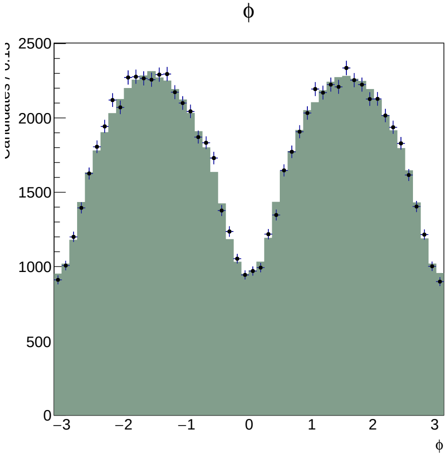
- Excellent agreement between 4 orientations
- Significant deviation from input in ρ^0_{1-1}
- Possible deviation in ρ^1_{1-1} for small t
- Larger signal sample required



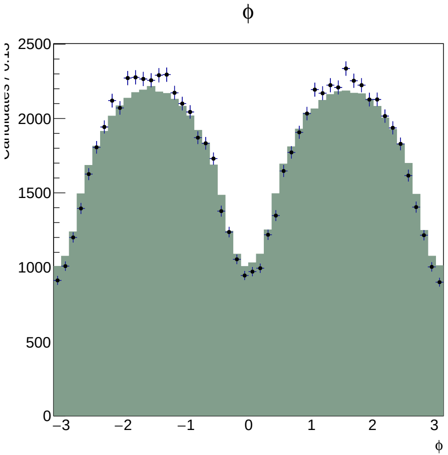
$$P_\sigma = 2\rho^1_{1-1} - \rho^1_{00}$$

Angular distributions

Default fit

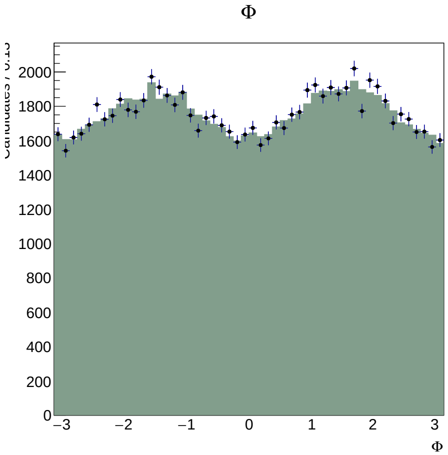


$\rho^0_{1-1} = 0$ fixed



Angular distributions

Default fit



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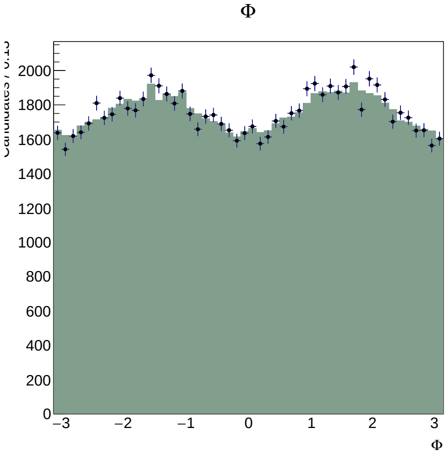

Angular distributions

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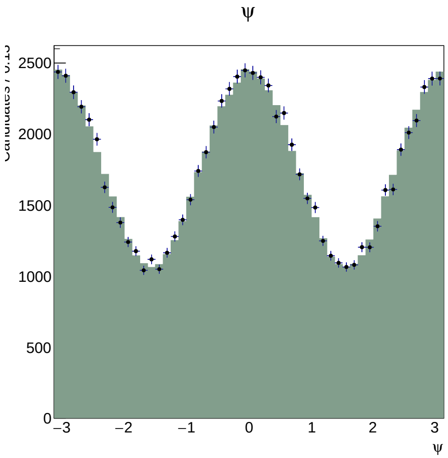

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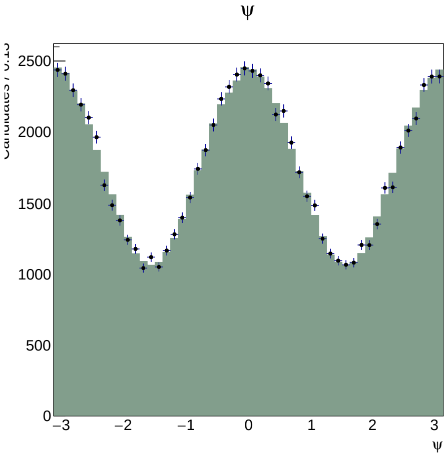

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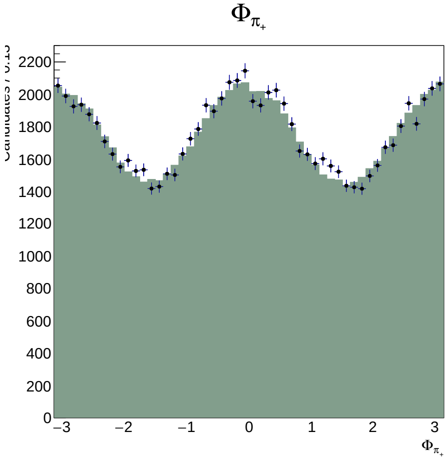

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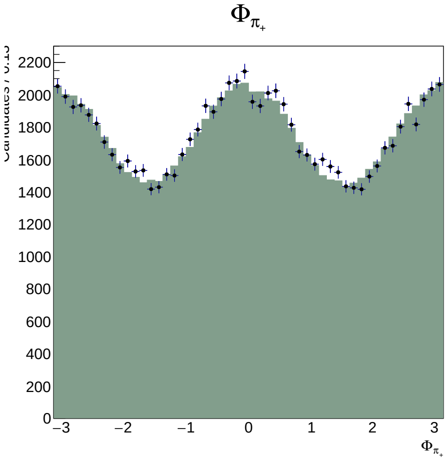

Angular distributions

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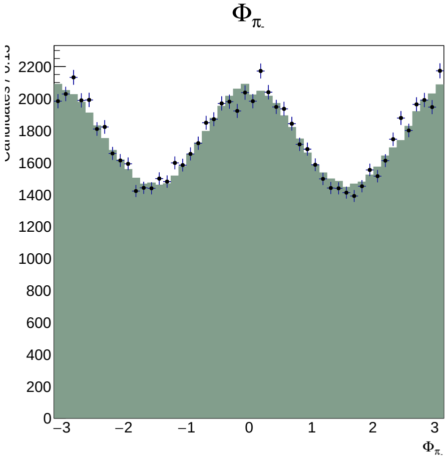

$\rho^0_{1-1} = 0$ fixed