

$$\begin{aligned}
A_{UT}(\phi, \phi_S) &= \frac{1}{P_T} \frac{d\sigma(\phi, \phi_S) - d\sigma(\phi, \phi_S + \pi)}{d\sigma(\phi, \phi_S) + d\sigma(\phi, \phi_S + \pi)} \\
&= A_{UT}^{Collins} \sin(\phi + \phi_S) + \\
&\quad A_{UT}^{Sivers} \sin(\phi - \phi_S) + \\
&\quad A_{UT}^{Pretz} \sin(3\phi - \phi_S)
\end{aligned}$$