$$2\,\langle \sin(\phi - \phi_S)\rangle = A_{UT}^{\sin(\phi-\phi_S)}$$

$$\equiv 2\,\frac{\displaystyle\int \mathrm{d}\phi\,\mathrm{d}\phi_S\,(\mathrm{d}\sigma^{\uparrow} - \mathrm{d}\sigma^{\downarrow})\,\sin(\phi - \phi_S)}{\displaystyle\int \mathrm{d}\phi\,\mathrm{d}\phi_S\,(\mathrm{d}\sigma^{\uparrow} + \mathrm{d}\sigma^{\downarrow})}$$