§9

1. $|S_3\rangle = \frac{1}{\sqrt{2}}(|ud\rangle + |du\rangle)$

(1) $|e_1^+\rangle = |u\rangle \qquad |e_2^-\rangle = \begin{pmatrix} \sin\frac{\pi}{8} \\ -\cos\frac{\pi}{8} \end{pmatrix} = \sin\frac{\pi}{8}|u\rangle - \cos\frac{\pi}{8}|d\rangle$

$$\begin{aligned} \therefore p(e_1^+, e_2^-) &= |\langle e_1^+ e_2^- | S\rangle|^2 \\ &= \frac{1}{2}\left|\langle e_1^+|u\rangle\langle e_2^-|d\rangle + \langle e_1^+|d\rangle\langle e_2^-|u\rangle\right|^2 \\ &= \frac{1}{2}\left|1\cdot(-\cos\frac{\pi}{8}) + 0\cdot(\sin\frac{\pi}{8})\right|^2 \\ &= \frac{1}{2}\cos^2\frac{\pi}{8} = \frac{1}{4}(2\cos^2\frac{\pi}{8} - 1) + \frac{1}{4} \\ &= \frac{1}{4}\cos\frac{\pi}{4} + \frac{1}{4} = \frac{2+\sqrt{2}}{8} \end{aligned}$$

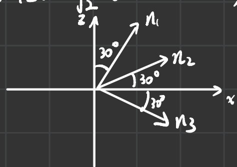
(2) $\because |e_1^-\rangle = |d\rangle$

$$\begin{aligned} \therefore p(e_1^-, e_2^-) &= |\langle e_1^- e_2^- | S\rangle|^2 \\ &= \frac{1}{2}\left|\langle e_1^-|u\rangle\langle e_2^-|d\rangle + \langle e_1^-|d\rangle\langle e_2^-|u\rangle\right|^2 \\ &= \frac{1}{2}\cdot\sin^2\frac{\pi}{8} \\ &= -\frac{1}{4}(1 - 2\sin^2\frac{\pi}{8}) + \frac{1}{4} \\ &= -\frac{1}{4}\cos\frac{\pi}{4} + \frac{1}{4} = \frac{2-\sqrt{2}}{8} \end{aligned}$$

$\therefore p(e_2^-) = p(e_1^-, e_2^-) + p(e_1^+, e_2^-) = \frac{4}{8} = \frac{1}{2}$.

∴ 右侧检测屏上下各约 500 个.

2. (1) $|S\rangle = \frac{1}{\sqrt{2}}(|ud\rangle - |du\rangle)$



令 $\vec{n}_1 = (\frac{1}{2}, 0, \frac{\sqrt{3}}{2})$

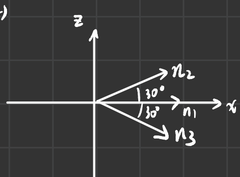
则 $p(A,\neg B) = p(n_1^+, n_2^+) = \frac{1}{2}\sin^2\frac{\pi}{12} < 0.04 < \frac{1}{8}$

$p(B,\neg C) = p(n_2^+, n_3^+) = \frac{1}{2}\sin^2\frac{\pi}{6} = \frac{1}{8}$

$p(A,\neg C) = p(n_1^+, n_3^+) = \frac{1}{2}\sin^2\frac{\pi}{4} = \frac{1}{4}$

$\therefore p(A,\neg B) + p(B,\neg C) < p(A,\neg C)$. 违反

(2)



令 $\vec{n}_1 = (1,0,0)$

则 $p(A,\neg B) = p(n_1^+, n_2^+) = \frac{1}{2}\sin^2\frac{\pi}{12}$

$p(B,\neg C) = p(n_2^+, n_3^+) = \frac{1}{2}\sin^2\frac{\pi}{6} = \frac{1}{8}$

$p(A,\neg C) = p(n_1^+, n_3^+) = \frac{1}{2}\sin^2\frac{\pi}{12}$

$\therefore p(A,\neg B) + p(B,\neg C) > p(A,\neg C)$ 遵循.

3.

黑	√		√		√		√	√		√	√				√
酒	√	√		√			√			√	√		√		
团		√				√			√	√			√		√
黑		√		√		√			√			√	√	√	
酒			√		√	√		√	√			√		√	√
团	√		√	√	√		√	√			√	√		√	

小娟

(1) $M_1 = 4$

(2) $M_2 = 4$

(3) $M_3 = 6$

$M_1 + M_2 > M_3$.