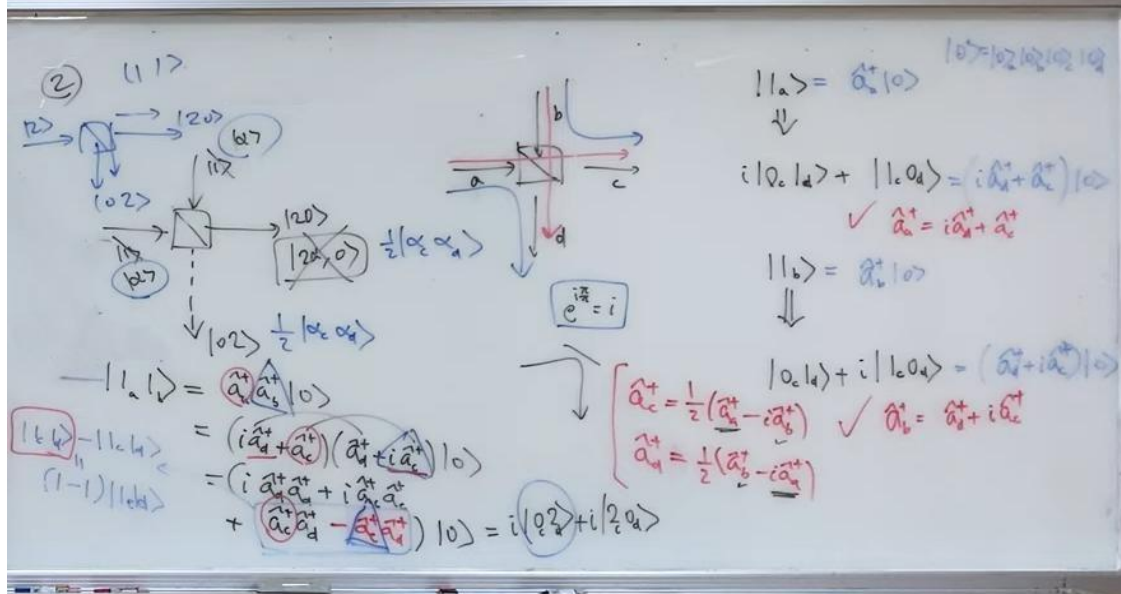
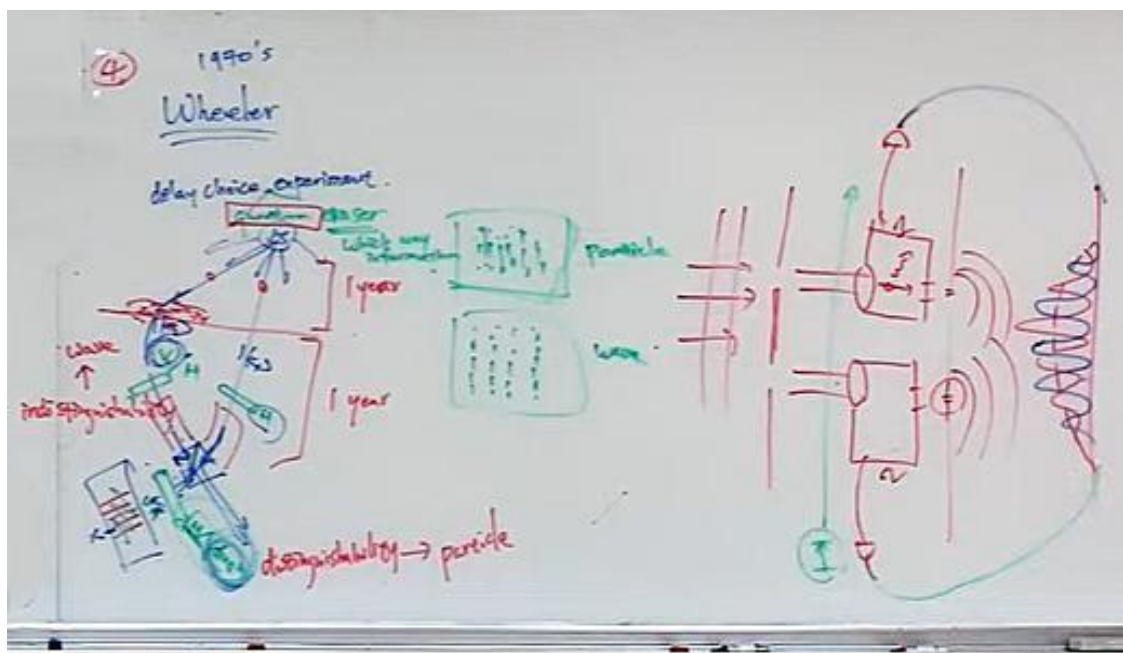
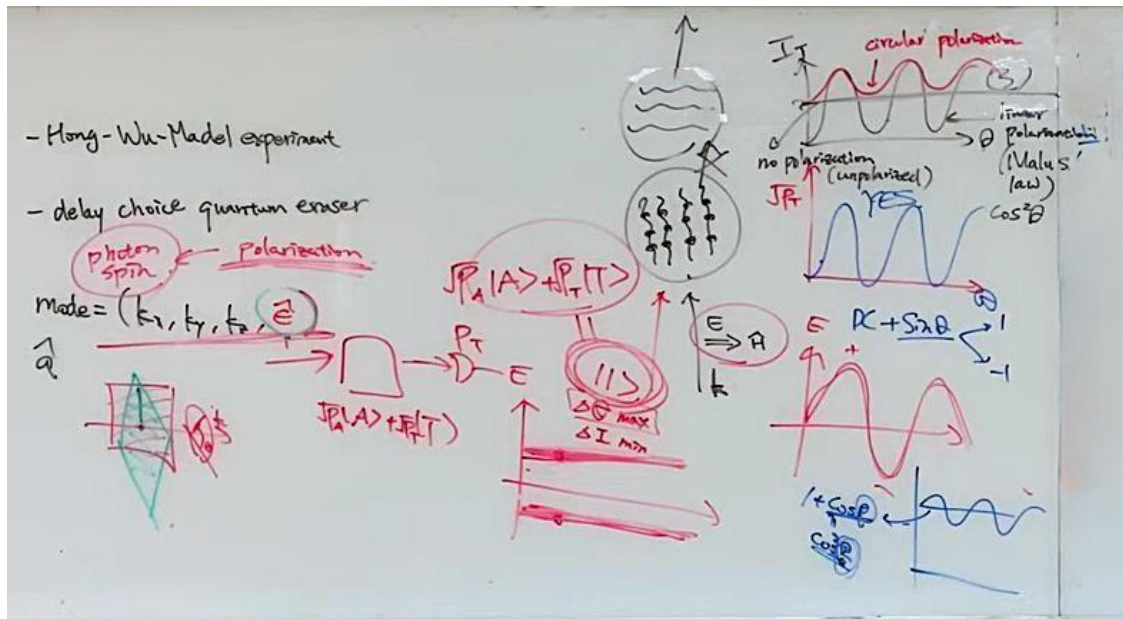


Lecture11 Delayed-choice quantum



eraser





V - Hong-Wu-Mandel experiment

- delay choice quantum eraser

$$\rho = |\psi\rangle\langle\psi| = \frac{1}{4}(|k_1+k_2\rangle + |k_1-k_2\rangle)(\langle k_1+k_2| + \langle k_1-k_2|)$$

$$= \frac{1}{4}(|k_1+k_2\rangle\langle k_1+k_2| + |k_1+k_2\rangle\langle k_1-k_2| + |k_1-k_2\rangle\langle k_1+k_2| + |k_1-k_2\rangle\langle k_1-k_2|)$$

(1 2 3) →	$\begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 3 & 3 \end{pmatrix}$	=	$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 3 & 6 & 9 \end{pmatrix}$
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Quantum state evolution:
 $|H\rangle = |a\rangle + |b\rangle$ (Symmetric)
 $|V\rangle = |a\rangle - |b\rangle$ (Antisymmetric)

Density matrix calculation:
 Full density matrix: $\hat{\rho} = |k_1\rangle\langle k_1|[H]\langle[H] + |k_2\rangle\langle k_2|[V]\langle[V]$
 Reduce density matrix: $\hat{\rho}_A = Tr_B(\hat{\rho}) = |k_1\rangle\langle k_1| + |k_2\rangle\langle k_2|$

