

# Week 1 | Starting and Rhythm Establishment

2025-08-04 – 2025-08-10

## 1: Weekly Highlights

- Successfully applied for a personal domain name and built a personal blog website
- Course study: MIT OCW Quantum Mechanics 1–3; Basics of Qiskit (circuits/gates/measures)
- Project progress: Organized and summarized the experiment report on CNN optical flow algorithms
- Reading: 《Semiconductor Spin Qubits》

## 2: Insights & Takeaways

- Gains: Preliminary understanding of the operating principle of quantum dots, and initial mastery of basic skills in front-end web development
- Reflection: Need to systematically learn prerequisite foundational courses such as electrodynamics and discrete mathematics

## 3: Challenges & Open Questions

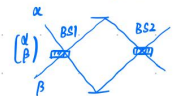
- Unable to fully understand the reading of 《Semiconductor Spin Qubits》 due to a lack of necessary knowledge accumulation
- Reading impediments caused by differences in the notation system of papers
- Insufficient technical skills for website building, resulting in a necessary change in technical approach

## 4: Next Week Plan

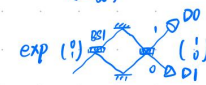
- Study MIT 18.06 Lec 1-3 and MIT 8.01SC Lec 2-10
- Complete learning and practice of NumPy vectors and matrix operations
- Continuously maintain the website

## 1. Example of notes:

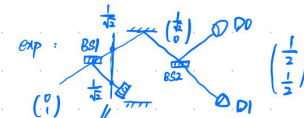
$BS2 = \frac{1}{\sqrt{2}} \begin{pmatrix} -1 & 1 \\ 1 & 1 \end{pmatrix};$



$Output = (BS2)_{\text{out}} (BS1)_{\text{in}} \begin{pmatrix} \alpha \\ \beta \end{pmatrix}$   
 $= \frac{1}{\sqrt{2}} \begin{pmatrix} -1 & 1 \\ 1 & 1 \end{pmatrix} \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} \alpha \\ \beta \end{pmatrix}$   
 $= \begin{pmatrix} \beta \\ -\alpha \end{pmatrix}$



$exp \begin{pmatrix} \alpha \\ \beta \end{pmatrix} \rightarrow \begin{pmatrix} \alpha \\ \beta \end{pmatrix} \rightarrow \begin{pmatrix} \alpha \\ \beta \end{pmatrix}$



$(BS1) \begin{pmatrix} \alpha \\ \beta \end{pmatrix} = \begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix}$   
 $(BS2) \begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix} = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ \frac{1}{2} \end{pmatrix}$

Summary:
 

Outcome (blocked lower beam)	P
photon at the block.	$\frac{1}{2}$
photon at D0	$\frac{1}{4}$
photon at D1	$\frac{1}{4}$

@ Outcome (all open)
 

Outcome (all open)	P
photon D0	1

$\begin{pmatrix} \alpha \\ \beta \end{pmatrix} \rightarrow \begin{pmatrix} u \\ v \end{pmatrix}$   
 $|u|^2 + |v|^2 = 1$   
 $S, t, u, v$  describe the beam splitter

$\Rightarrow \begin{pmatrix} \alpha \\ \beta \end{pmatrix} = a \begin{pmatrix} 1 \\ 0 \end{pmatrix} + b \begin{pmatrix} 0 \\ 1 \end{pmatrix}$   
 $= a \begin{pmatrix} s \\ t \end{pmatrix} + b \begin{pmatrix} u \\ v \end{pmatrix}$   
 $= \begin{pmatrix} as + bu \\ at + bv \end{pmatrix}$   
 $= \begin{pmatrix} s & u \\ t & v \end{pmatrix} \begin{pmatrix} \alpha \\ \beta \end{pmatrix}$   
 $\underline{\underline{BS}}$

## 2. The first page of blog website:

