1 Introduction

1.1 Beamsplitter

$$\hat{a}_H^\dagger \hat{b}_V^\dagger \ket{0} \to \frac{1}{2}(\hat{c}_H^\dagger \hat{c}_V^\dagger - \hat{c}_H^\dagger \hat{d}_V^\dagger + \hat{d}_H^\dagger \hat{c}_V^\dagger - \hat{d}_H^\dagger \hat{d}_V^\dagger) \ket{0}$$

$$\hat{a}^\dagger \hat{b}^\dagger \ket{0} \to \frac{1}{\sqrt{2}}(\ket{2}_c - \ket{2}_d)$$

1.2 two-photon interference

$$\ket{\psi}_{in} = \ket{1}_{a,H} \ket{1}_{b,V} = \ket{H}_a \ket{V}_b = \hat{a}_H^\dagger \hat{b}_V^\dagger \ket{0}$$

$$\ket{\Psi^+}_{ab} \to (\hat{c}_H^\dagger \hat{c}_V^\dagger - \hat{d}_H^\dagger \hat{d}_V^\dagger) \ket{0}$$

$$\ket{\Psi^-}_{ab} \to (\hat{c}_H^\dagger \hat{d}_V^\dagger - \hat{d}_H^\dagger \hat{c}_V^\dagger) \ket{0}$$

$$\ket{\Phi^\pm}_{ab} \to ((\hat{c}_H^\dagger)^2 \pm (\hat{c}_V^\dagger)^2 - (\hat{d}_H^\dagger)^2 \mp (\hat{d}_V^\dagger)^2) \ket{0}$$

1.3 time measurement

$$N_c = C(T^2 + R^2)(1 - \frac{2RT}{R^2 + T^2}e^{-(\Delta\omega\delta\tau)^2})$$

2 Application

$$\ket{\Psi^+}_{ab} \to \frac{1}{\sqrt{2}}(\ket{1}_{c,H} \ket{1}_{c,V} - \ket{1}_{d,H} \ket{1}_{d,V})$$

$$\ket{\Psi^-}_{ab} \to \frac{1}{\sqrt{2}}(\ket{1}_{c,H} \ket{1}_{d,V} - \ket{1}_{d,H} \ket{1}_{c,V})$$

$$\ket{\Phi^\pm}_{ab} \to \frac{1}{2}(\ket{2}_{c,H} \pm \ket{2}_{c,V} - \ket{2}_{d,H} \pm \ket{2}_{d,V})$$

$$\ket{\psi} = \alpha \ket{0} + \beta \ket{1} + \gamma \ket{2}$$

$$\to \ket{\psi'} = \alpha \ket{0} + \beta \ket{1} - \gamma \ket{2}$$