Error propagation α_{dB}

$$\alpha_{dB} = \frac{1}{L} \cdot 10 \log_{10} \frac{P_{in}}{P_{out}}$$

$$\cdot \frac{\partial \alpha_{dB}}{\partial P_{in}} = \frac{1}{L} \cdot 10 \cdot \frac{1}{\frac{P_{in}}{P_{out}} \cdot \ln(10)} = \frac{10}{L} \cdot \frac{P_{out}}{P_{in} \cdot \ln(10)}$$

$$\frac{\partial \alpha_{dB}}{\partial P_{out}} = \frac{\partial}{\partial P_{out}} \left(-\frac{1}{L} \cdot 10 \cdot \log_{10} \frac{P_{out}}{P_{in}} \right) = -\frac{1}{L} \cdot 10 \cdot \frac{1}{\frac{P_{out}}{P_{in}} \cdot \ln(10)}$$

Single photon

Detector InGaAs $\longrightarrow$ 1550 nm

$\downarrow$

generato con SPDC (heralded)

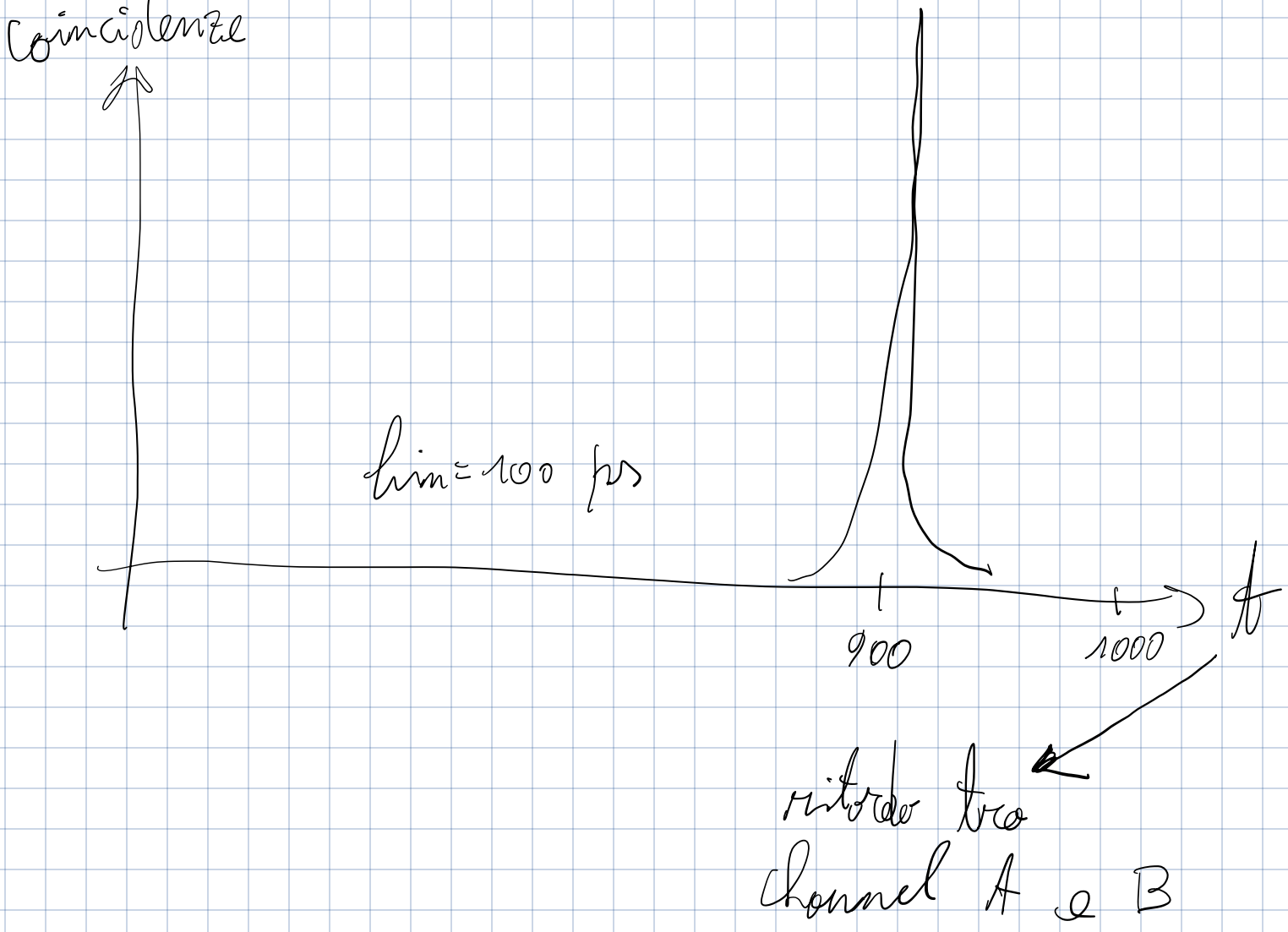
pompato con luce verde

Counts A Counts B coinc.

heralding

fotone usato per QKD

Coincidenze quindi soppiono quando c'è un single photon state



ritardo tra Channel A e B

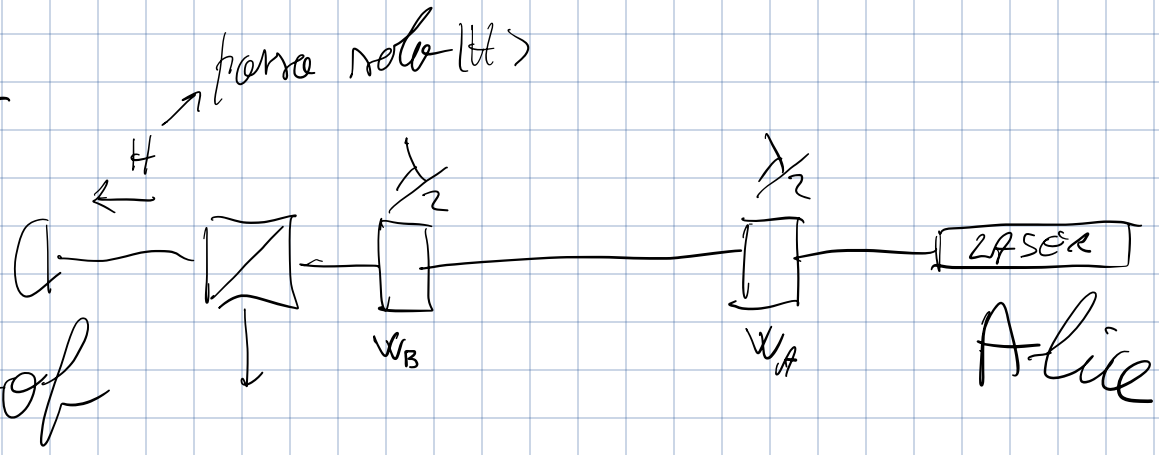
Calcolare differenza di percorso tra A e B:

$n \approx 1,5$

$\Delta t = 90$ ns

$$space = \frac{c}{n} \Delta t = \frac{3 \cdot 10^{8} \cdot 90 \cdot 10^{-9}}{1,5} = 180 \cdot 10^{-1} = 18 \text{ m}$$

BB84



FILO NAILO:

WAVEPLATE ANGLES:

$H_a - H_b \longrightarrow W_B = 90^\circ \quad W_A = 60^\circ$

(Alice: H_a, Bob: H_b; W_B → Bob, W_A → Alice)

$V_a - H_b \longrightarrow W_B = 90^\circ \quad W_A = 15^\circ$

$V_a - D_b \longrightarrow W_B = 67{,}5^\circ \quad W_A = 15^\circ$

$H_a - D_b \longrightarrow W_B = 67{,}5^\circ \quad W_A = 60^\circ$

$D_a - D_b \longrightarrow W_B = 67{,}5^\circ \quad W_A = 37{,}5^\circ$

$D_a - A_b \longrightarrow W_B = 112{,}5^\circ \quad W_A = 37{,}5^\circ$

$A_a - A_b \longrightarrow W_B = 112{,}5^\circ \quad W_A = 82{,}5^\circ$

$A_a - H_b \longrightarrow W_B = 90^\circ \quad W_A = 82{,}5^\circ$

$A_a - V_b \longrightarrow W_B = 90^\circ \quad W_A = 82{,}5^\circ$

$D_0 - V_h \longrightarrow W_B = 45^\circ \quad W_A = 37{,}5^\circ$

$D_0 - V_h \longrightarrow W_B = 45^\circ \quad W_A = 37{,}5^\circ$

$QBER^{(+)} = \dfrac{HH}{HH + HV}$ o $\dfrac{VV}{VV + VH}$

↓

Stesso coso anche per hore ✕

Si può anche calcolare un QBER medio.