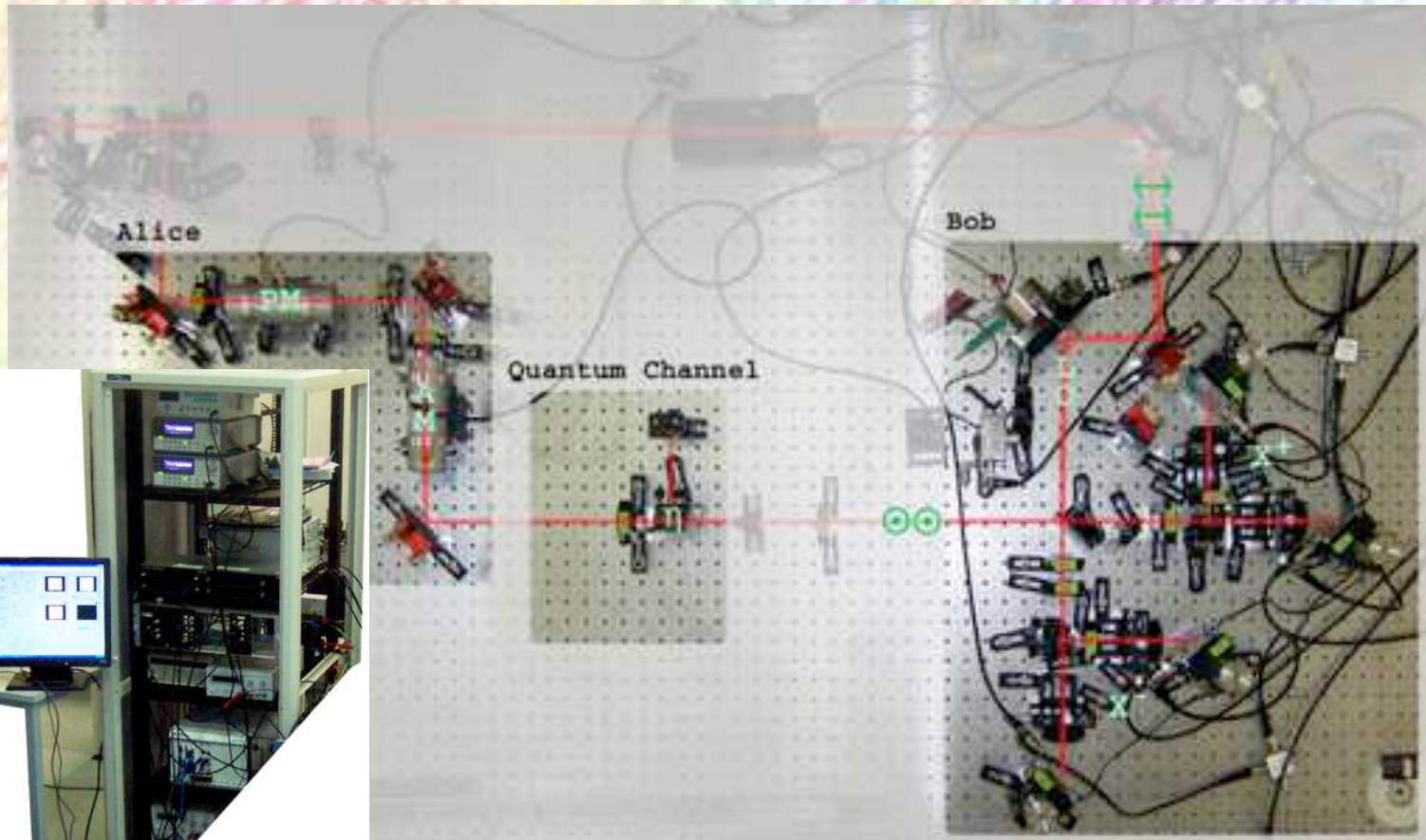


# Experimental setup



**White noise generator with 50MHz bandwidth**  
**Acquisition system 2\*2 channels at 100Mb/s**

# Signal processing

- Temporal raw data
- Raw data Power spectrum
- Band Pass filtering
- Demodulation at 40MHz
- Down Sampling at 10MHz
- Transfer function correction

$$C_{in,out}=0.395$$

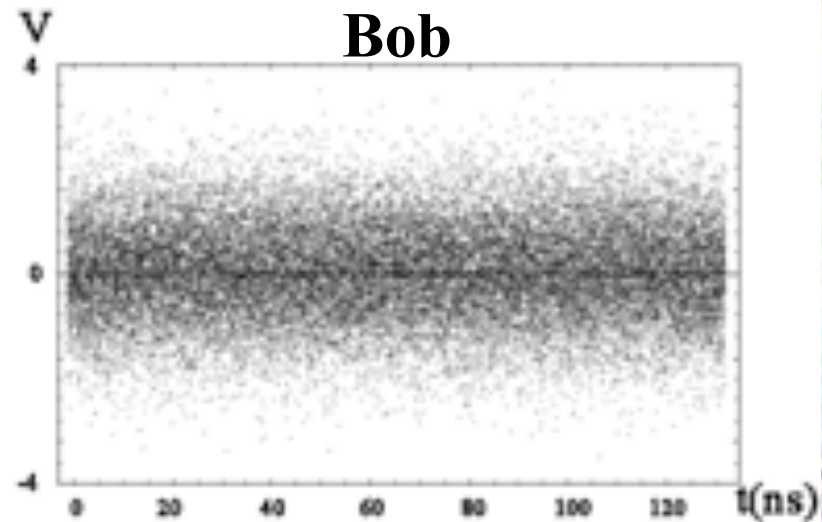
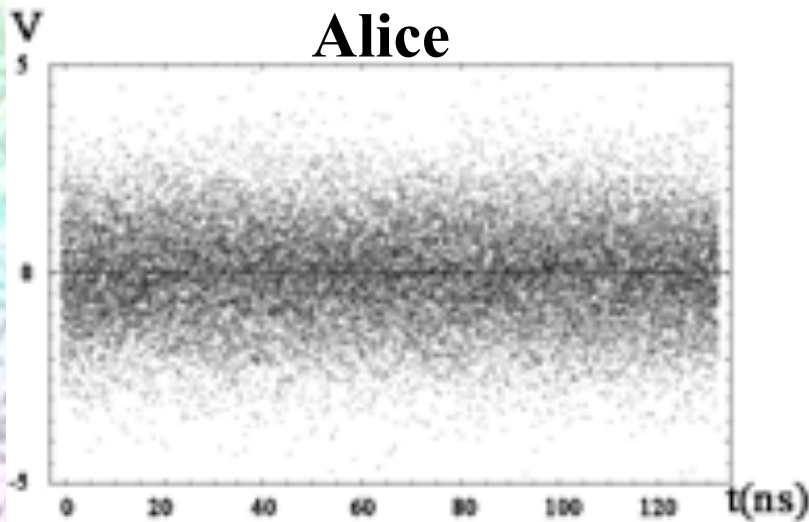
$$C_{in,out}=0.395$$

$$C_{in,out}=0.674$$

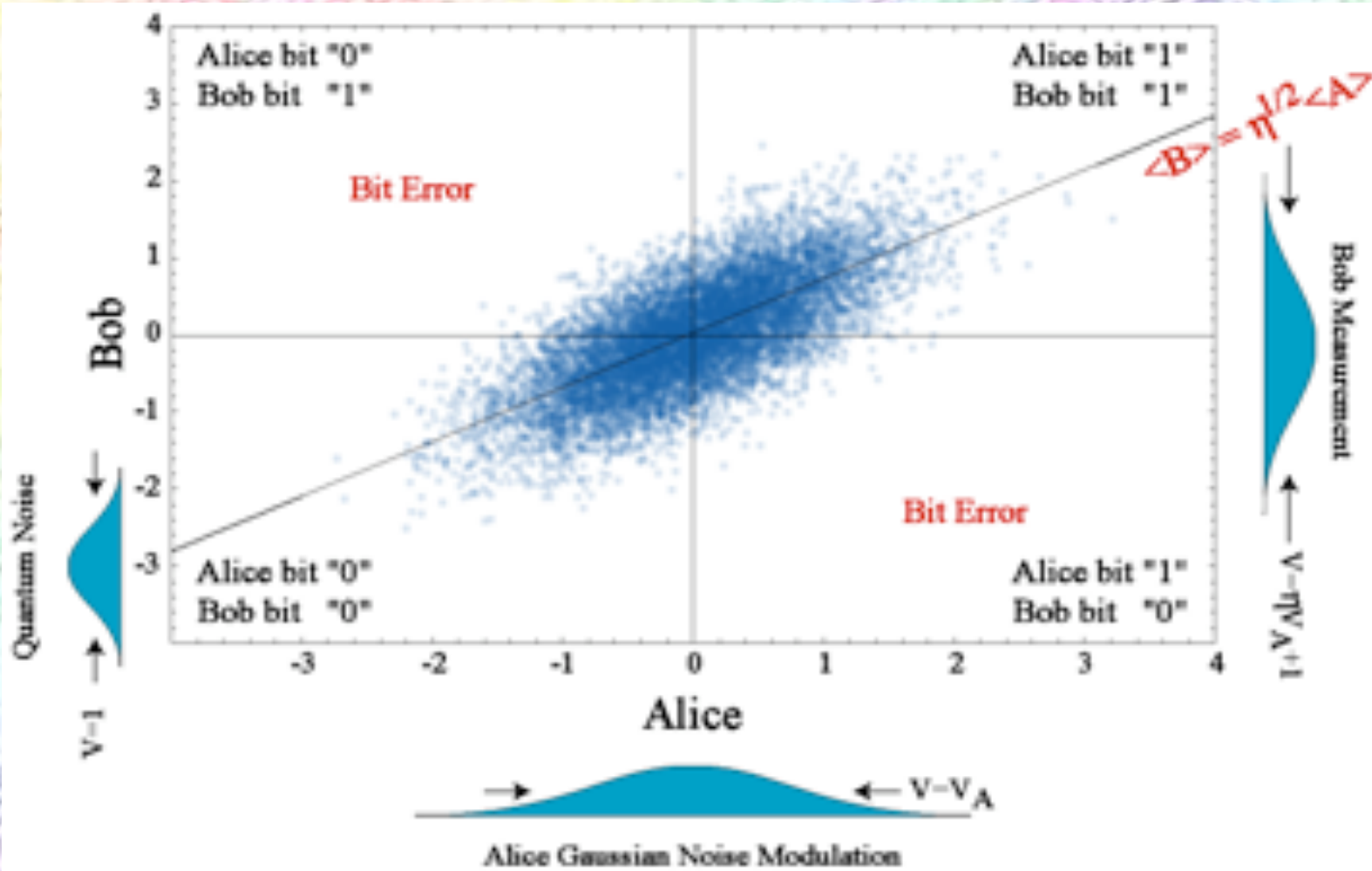
$$C_{in,out}=0.674$$

$$C_{in,out}=0.674$$

$$C_{in,out}=0.679$$

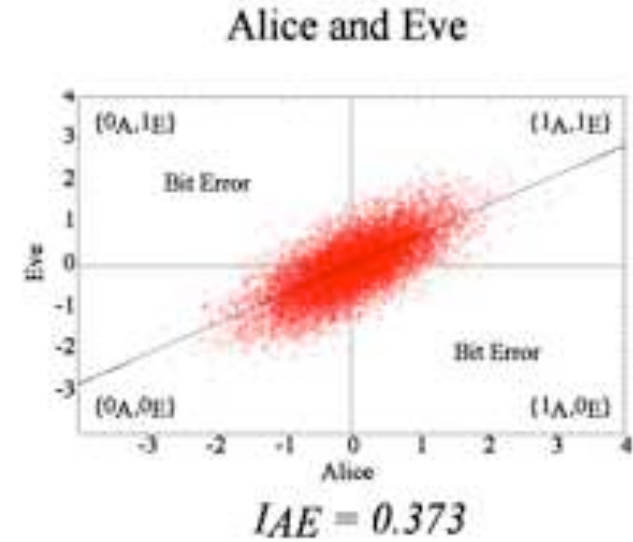
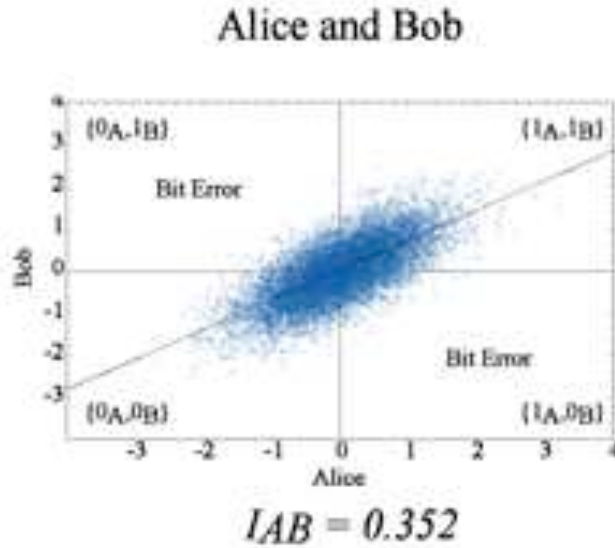


# Scatter diagram

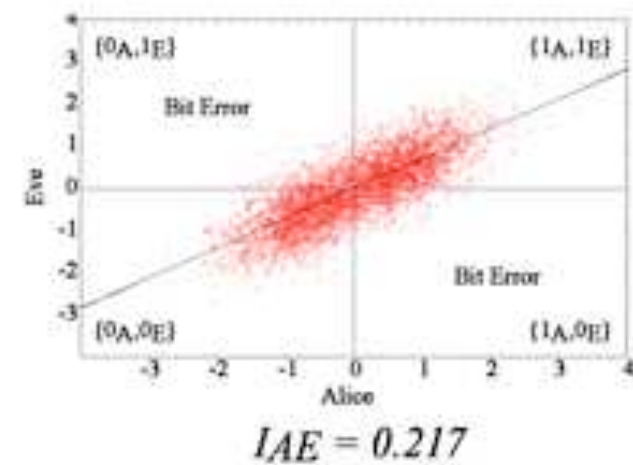
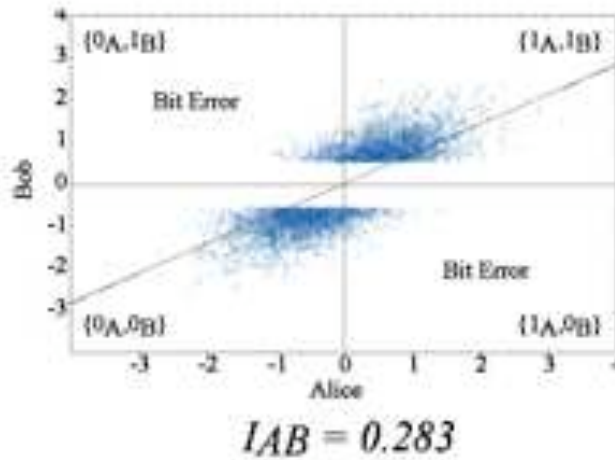


# Why does PostSelection work ?

Without  
Post-selection  
 $\Delta I < 0$

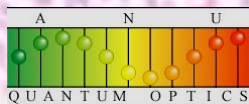
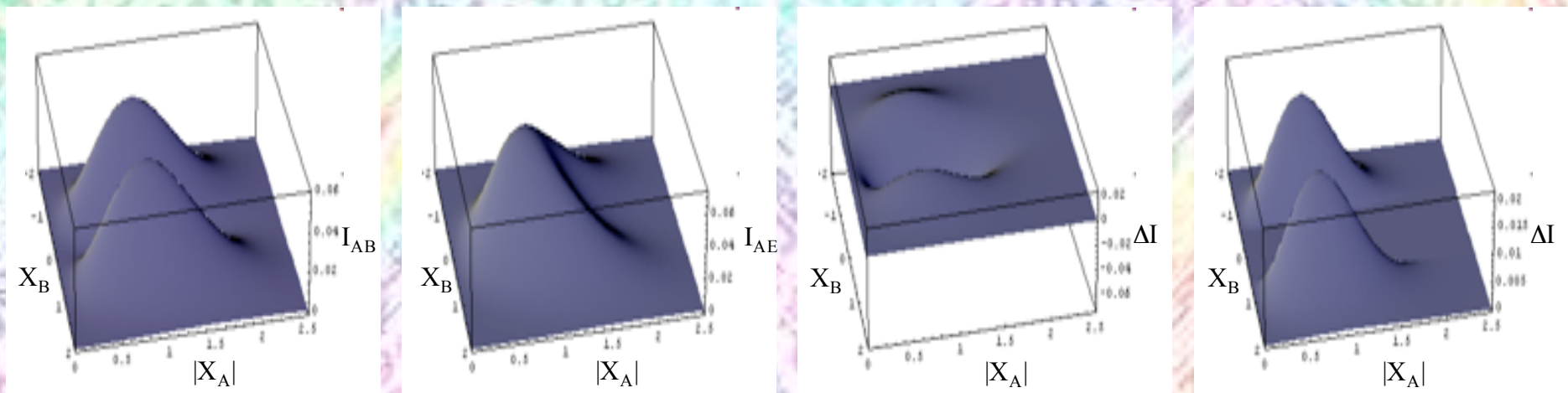


With  
Post-selection  
 $\Delta I > 0$



# Security of postselection

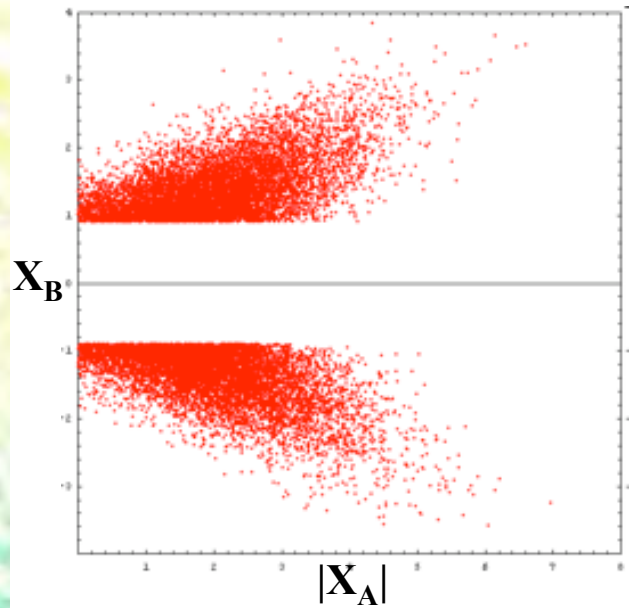
- Unconditional security proved for coherent states
- In order to bound Eve's information, Alice's has to publish the absolute values of the projection on the phase and amplitude axes of the state she is sending
- Given his own measurement Bob can estimate the maximum amount of information intercepted by Eve



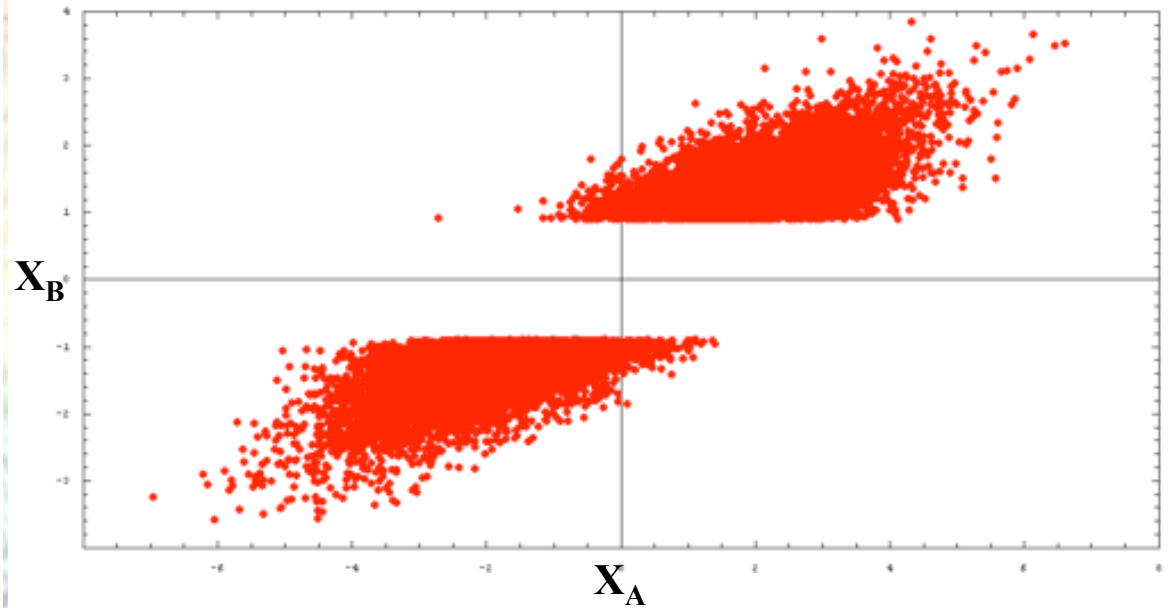
C. Silberhorn et al. PRL 89, 16, p. 167901, (2002)

# Raw key extraction

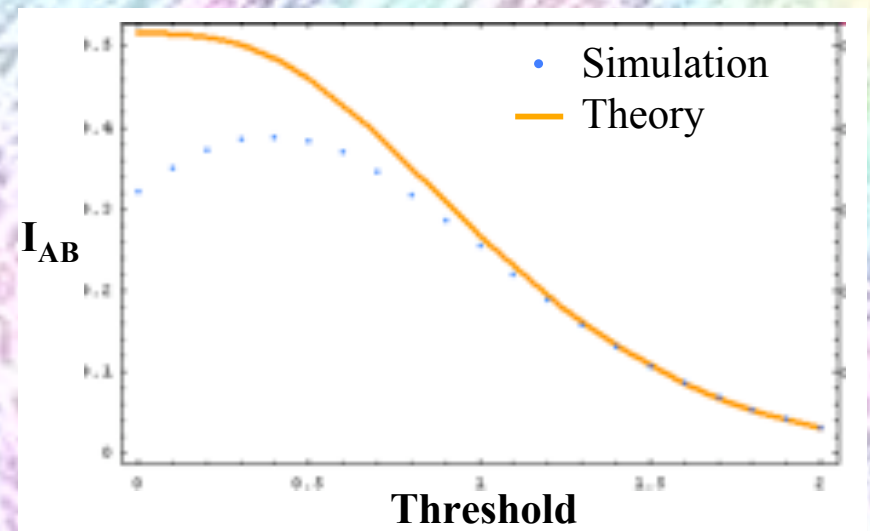
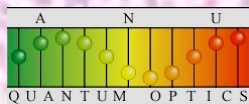
Bob



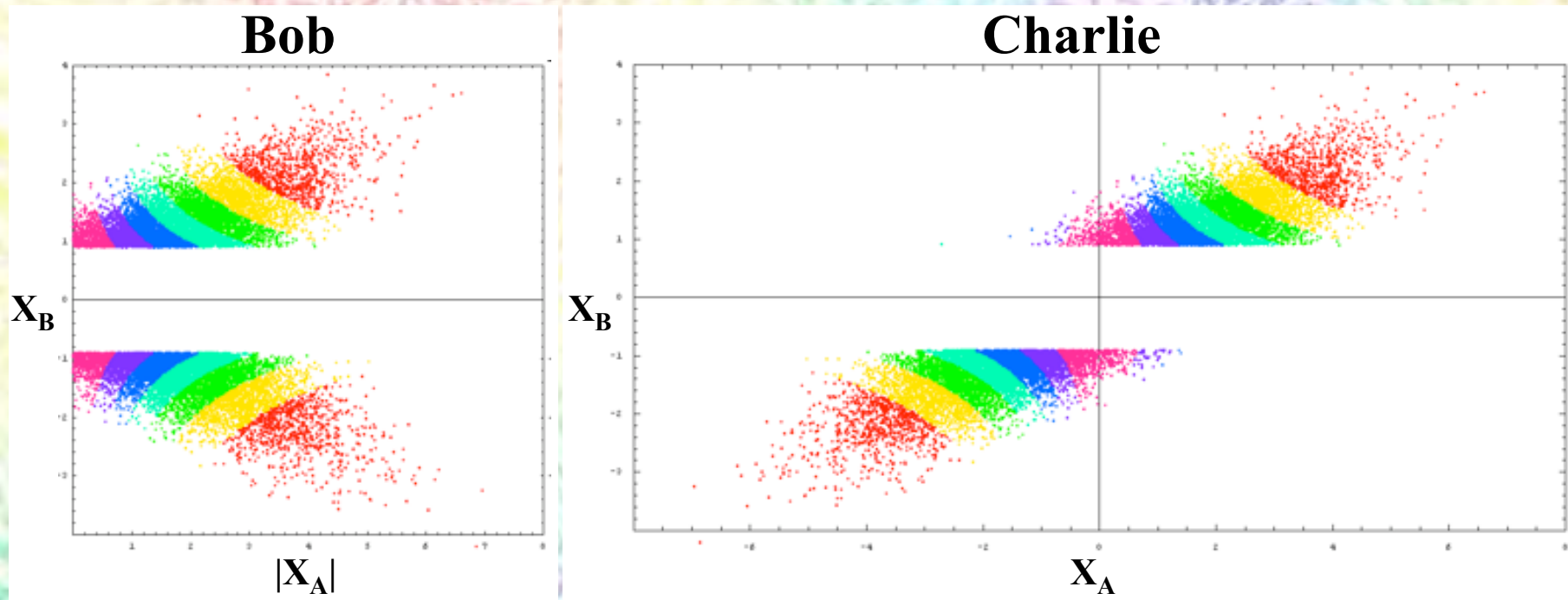
Charlie



The information rate is given by :

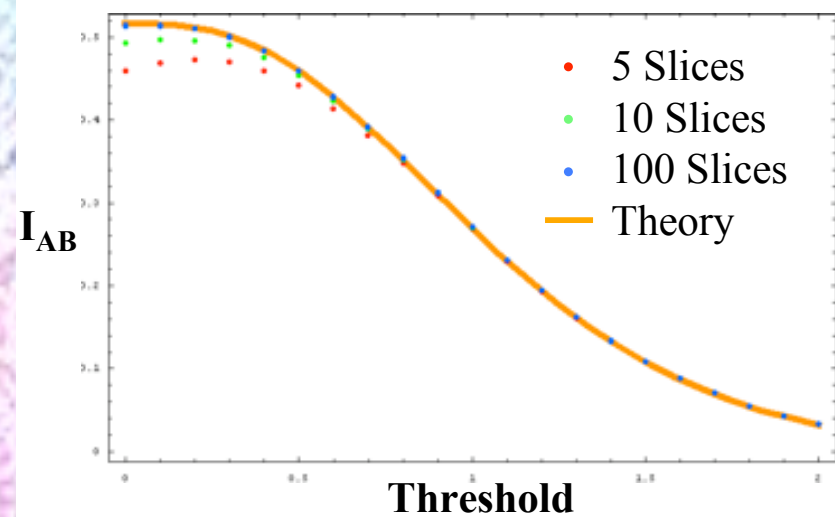


# Towards the Shannon limit



Alice-Bob space is divided in  $k$  channels  $C_k$ .  
 The state  $S_i(|X_A|, X_B)$  is kept if  $P_k < P_e(X_A, X_B) \leq P_{k+1}$ ,

$$\text{i.e. } \frac{\log\left(4\sqrt{\frac{1-P_k}{P_k}}\right)}{\sqrt{2}|X_A|} < |X_B| \leq \frac{\log\left(4\sqrt{\frac{1-P_{k+1}}{P_{k+1}}}\right)}{\sqrt{2}|X_A|}$$

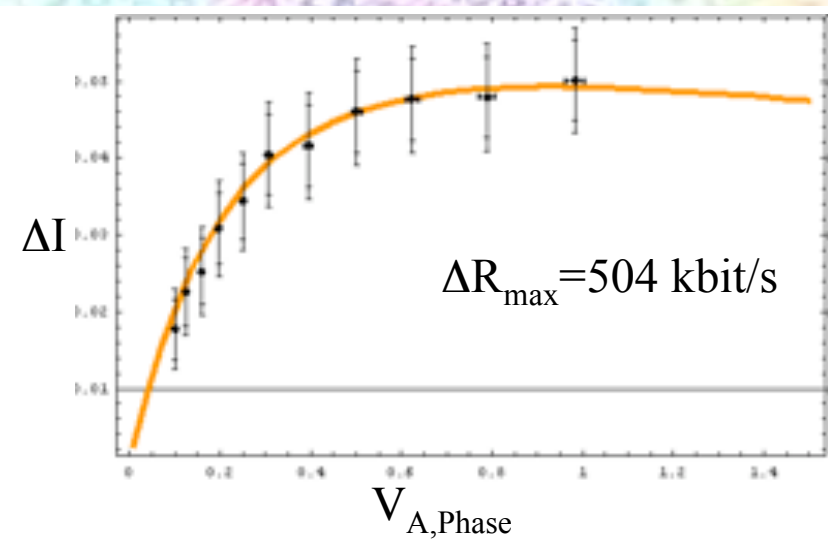
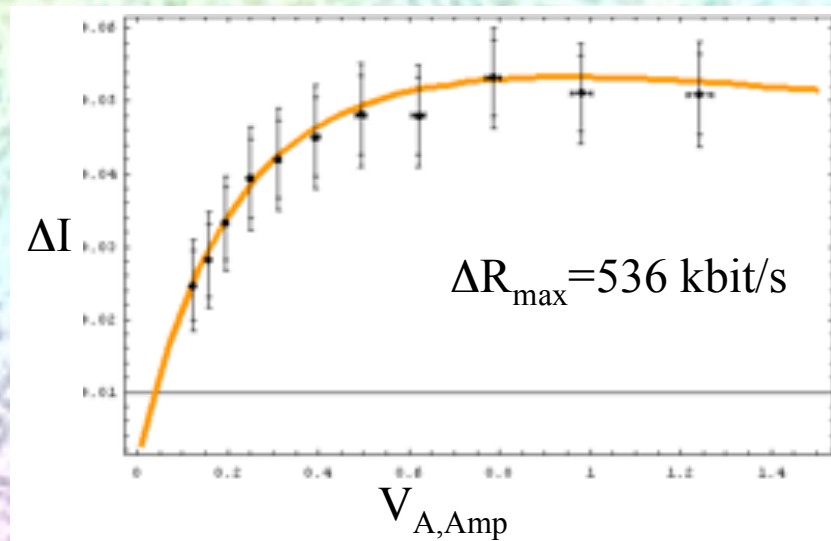
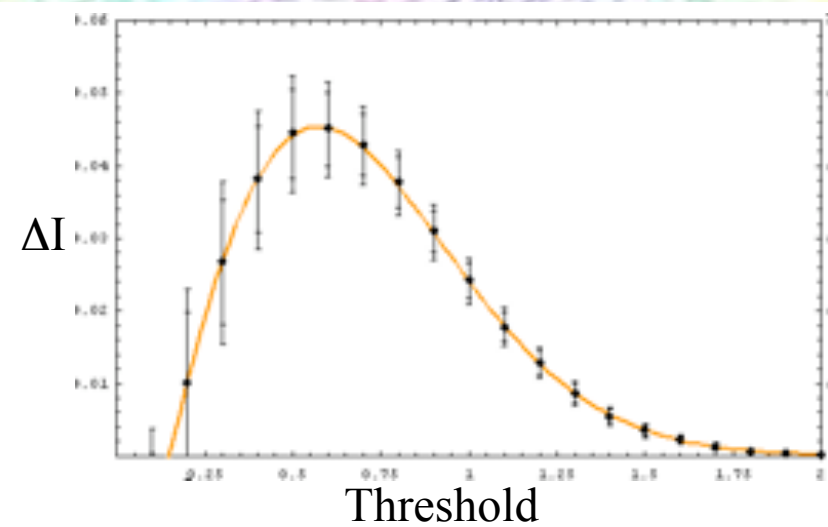
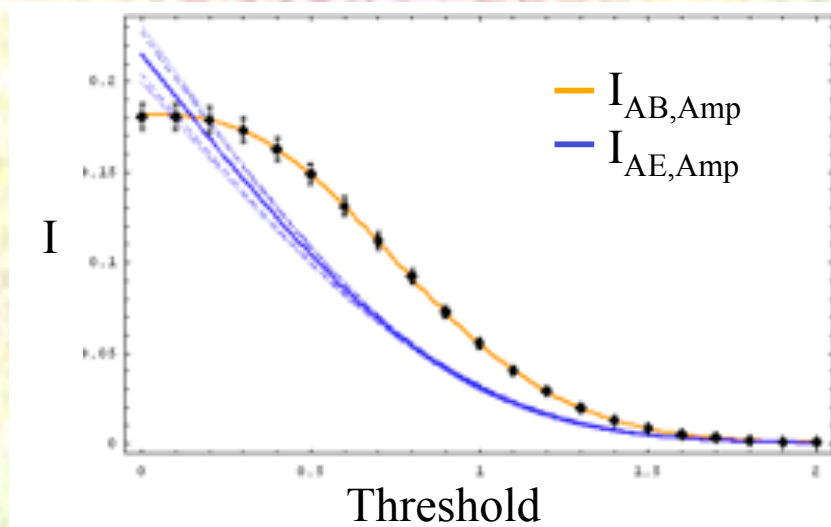


# Experiment analysis

- **Check presence of virtual entanglement using Duan's inseparability criterion**
- **Check that distribution and power of quantum channel's noise correspond to vacuum port**
- **Determine line efficiency using a subset of the data**
- **Extract raw key and calculate differential information rate**



# Results with line loss of 53%



# Conclusion

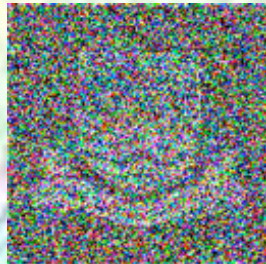
- **Method to reach the Shannon limit for Postselection with continuous variables**
- **First demonstration of Simultaneous Quadrature Measurement Continuous Variable Quantum Key Distribution using postselection**
- **Maximum bit-rate of 1Mbit/s with 53% losses in the line**

# Developments

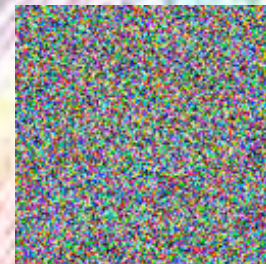
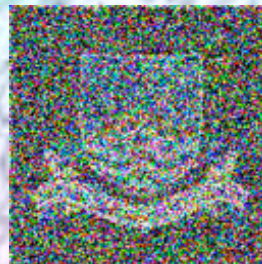
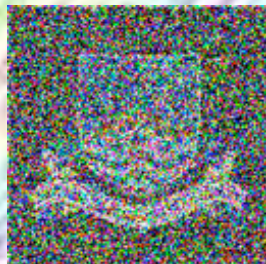
Alice



Bob



Eve



Raw

Post-  
selection

Distillation

Privacy  
amplification