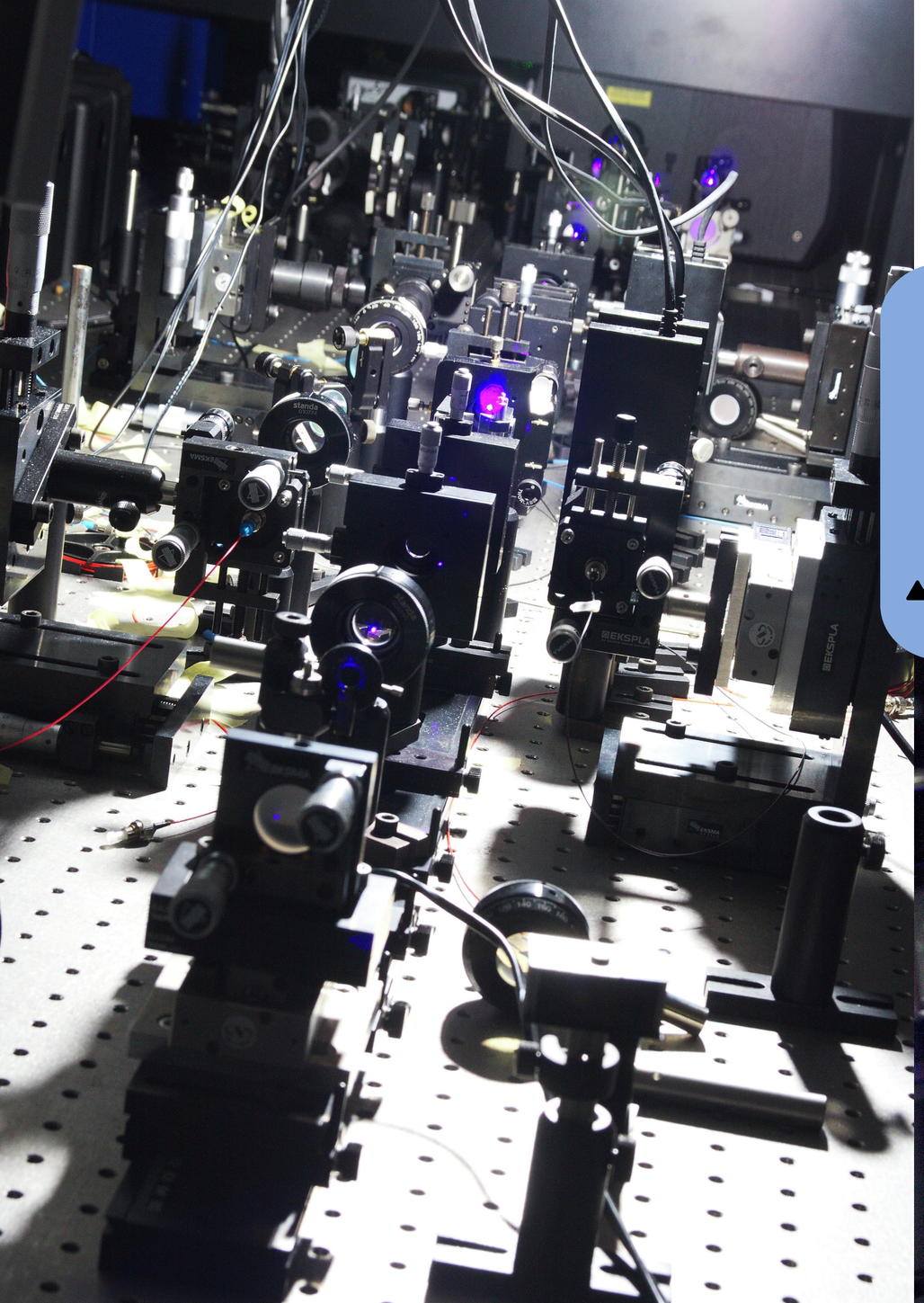
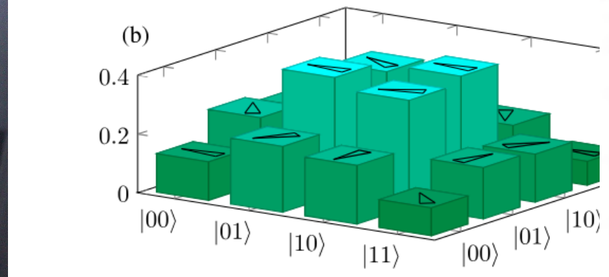
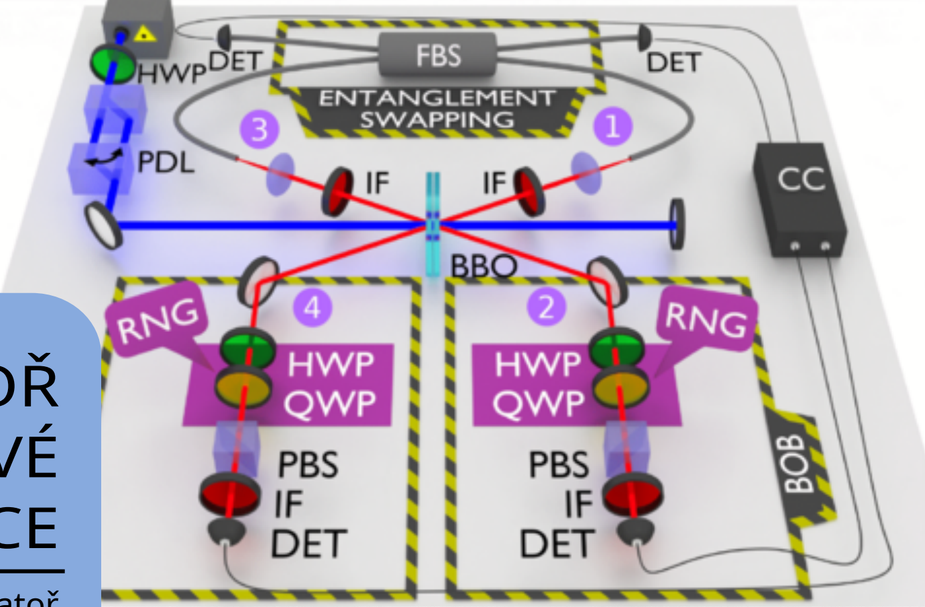
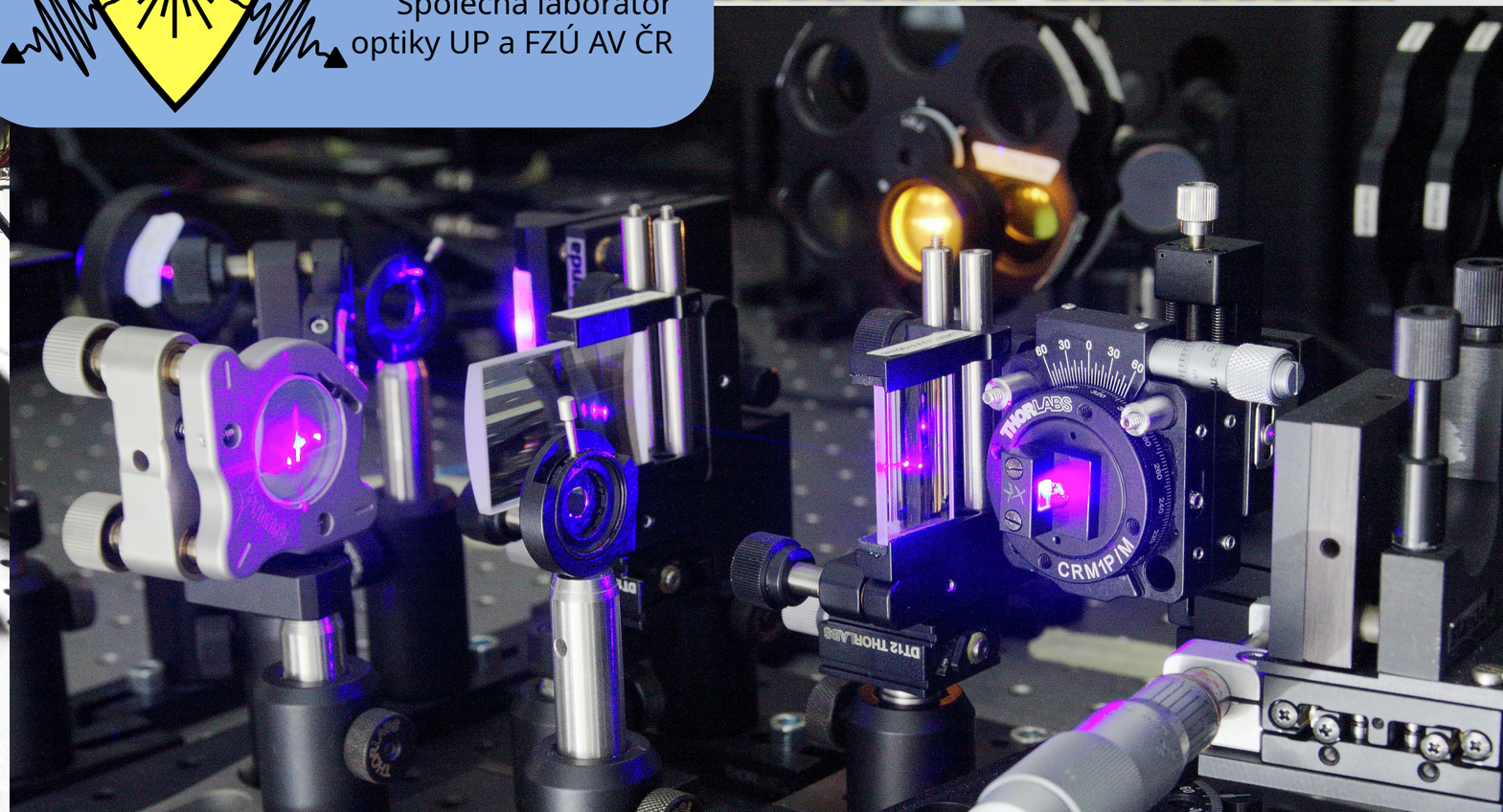




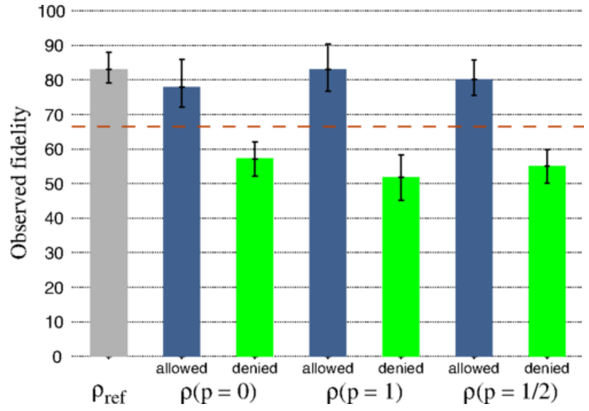


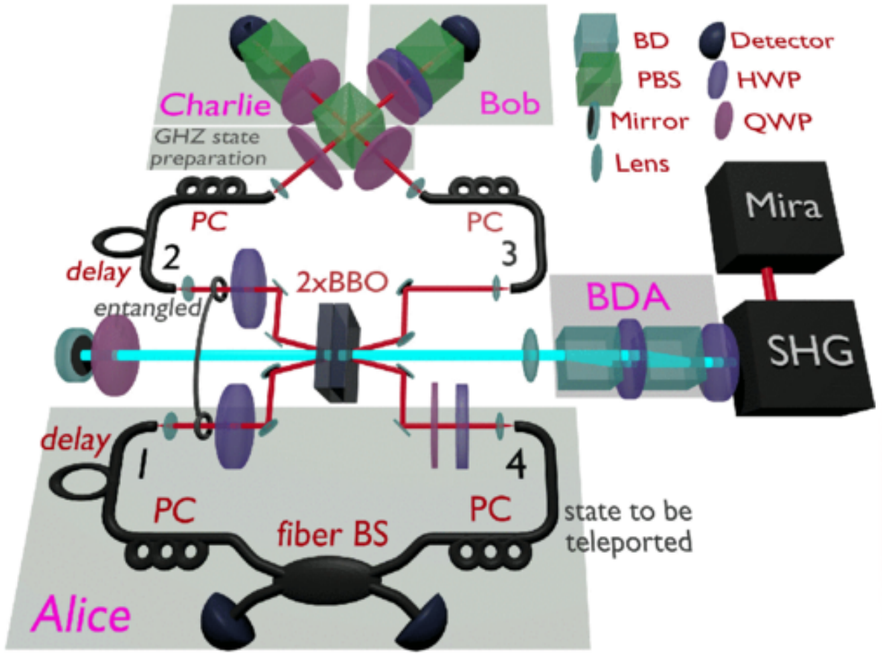
LABORATOŘ KVANTOVÉ INFORMACE

Společná laboratoř optiky UP a FZÚ AV ČR



Kvantová teleportace:





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Demonstration of Controlled Quantum Teleportation for Discrete Variables on Linear Optical Devices

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We report an experimental implementation of tripartite controlled quantum teleportation on quantum optical devices. The protocol is performed through bi- and tripartite entangled channels of discrete variables and qubits encoded in the polarization of individual photons. The experimental results demonstrate successful controlled quantum teleportation with a fidelity around 83%, well above the classical limit. By realizing the controlled quantum teleportation through a biseparable state, we show that tripartite entanglement is not a necessary resource for controlled quantum teleportation, and the controller's capability to allow or prohibit the teleportation cannot be considered to be a manifestation of tripartite entanglement. These results open new possibilities for further application of controlled quantum teleportation by lowering the teleportation channel's requirements.

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Byly měřeny dvě sady dat (počty fotonů):
A: 323 191 244 228
B: 135 116 104 121

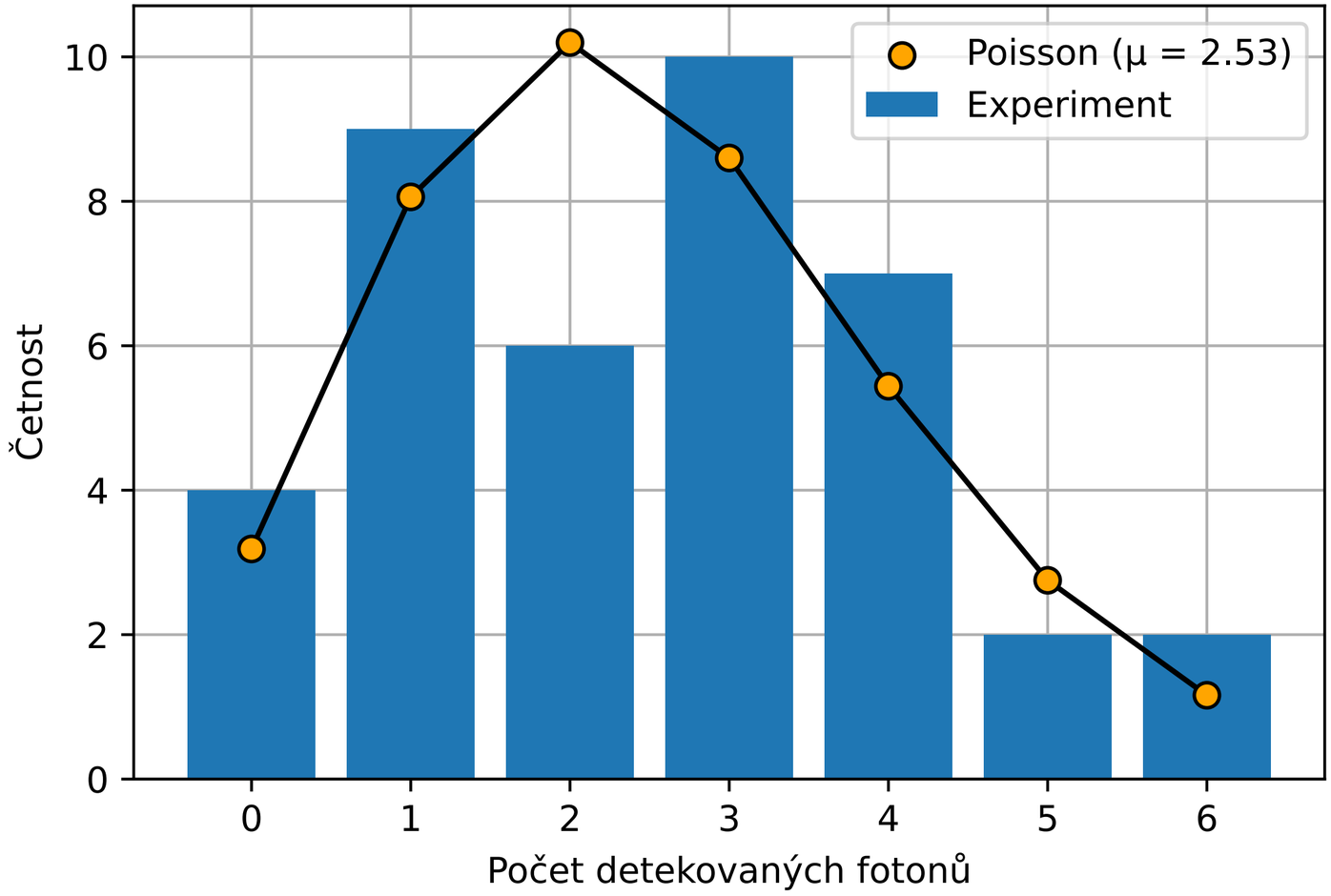
(1) Ověřte H_o: $\bar{A} = 2\,\bar{B}$
(2) Ověřte H_o: $V_A = V_B$

(3) Detektory zjišťují přítomnost fotonu každých 10 ns. Uvedené počty jsou akumulovány po dobu 100 s. Jaké očekáváte rozdělení počtu fotonů?

(4) Určete nejistoty podílů počtů fotonů:
$P_A = 191 / 323$
$P_B = 116 / 135$

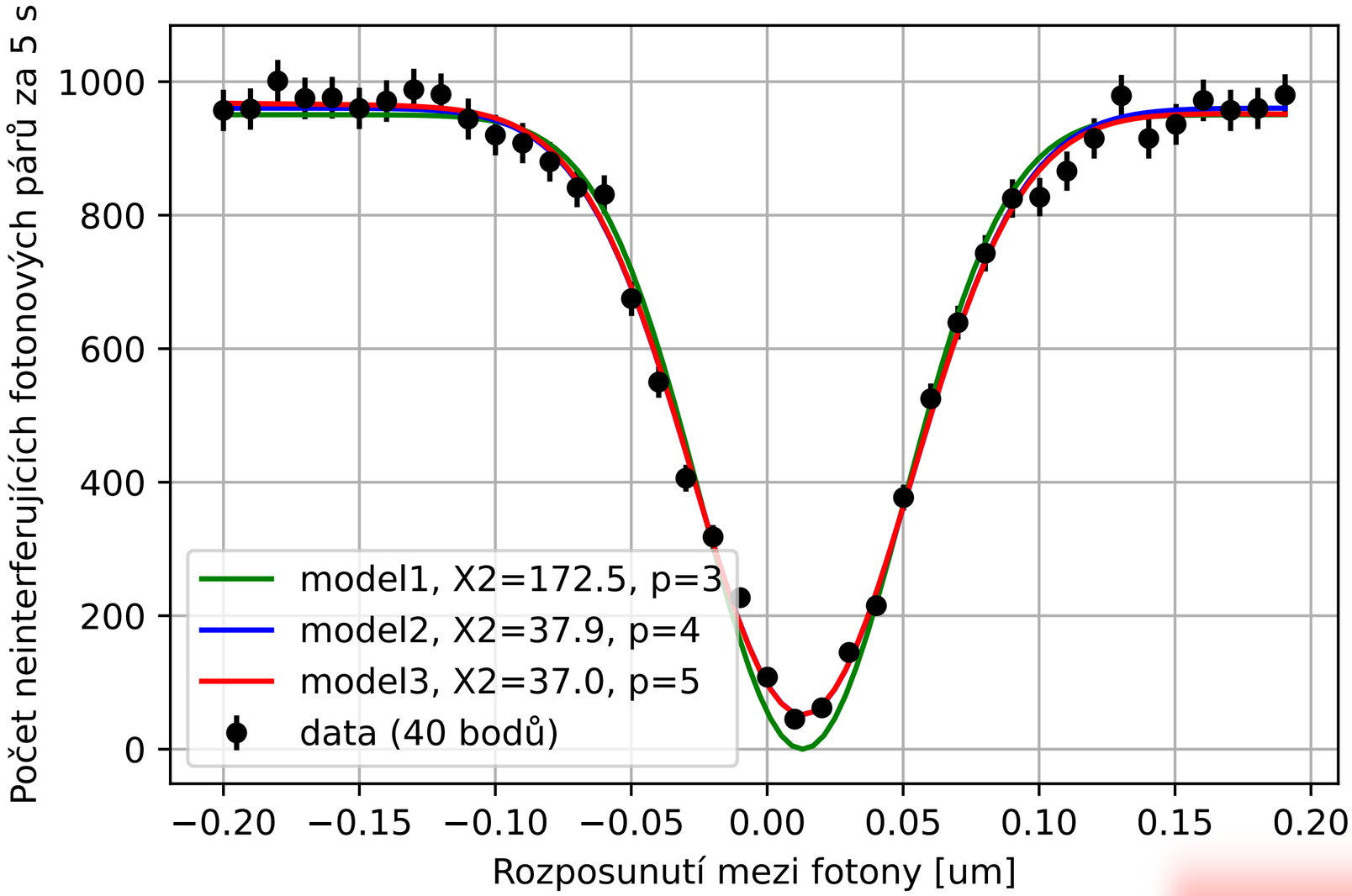
Detekce fotonů:

Počet fotonů:	0	1	2	3	4	5	6	
Četnost události (experiment):	4	9	6	10	7	2	2	
Pravděpodobnost události (teorie):	8	21	26	21	14	7	3	[%]



(1) Otestujte H_0: počty detekovaných fotonů v experimentu mají očekávané Poissonovo rozdělení.

Interference fotonových párů:



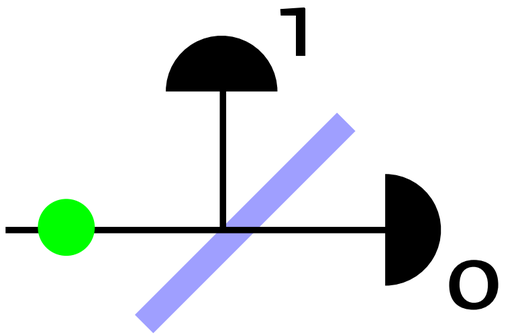
M1: A (1-exp[-(x-c)²/2s²])

M2: A (1- B exp[-(x-c)²/2s²])

M3: A (1- B exp[-(x-c)²/2s²]) + Dx

(1) Proveďte χ^2 test pro všechny modely.
(2) Porovnejte modely 2 a 3 F testem.

Kvantová generace náhodných čísel:



Hrubá data:

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 0 0
1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
1 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0
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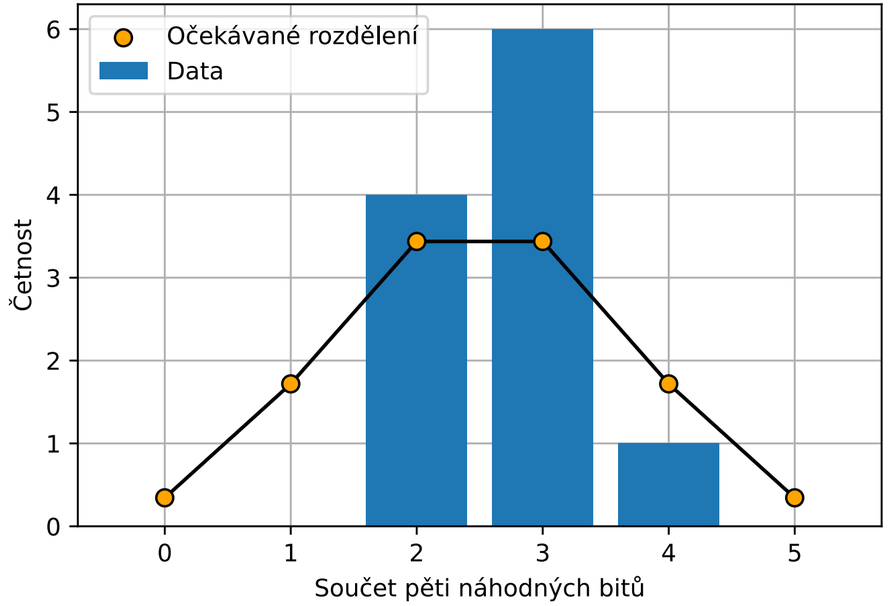
0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 1 0 0 0 0 1 0 0 0 0 1 0 1 1 1 0 0 0 0 0 0 (
1 0 1 0 0 1 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0



Náhodné bity:

1 1 1 1 0
1 1 1 0 0
0 1 0 1 0
0 1 1 1 0
0 0 1 0 1
0 1 1 0 0
1 0 0 1 1
1 0 0 1 1
1 0 0 1 1
0 1 0 1 0
1 1 0 0 1

(1) Jaké očekáváte rozdělení součtů 5 po sobě jdoucích náhodných bitů?
(2) Otestujte H_0: generované náhodné bity vyhovují rozdělení z bodu (1).