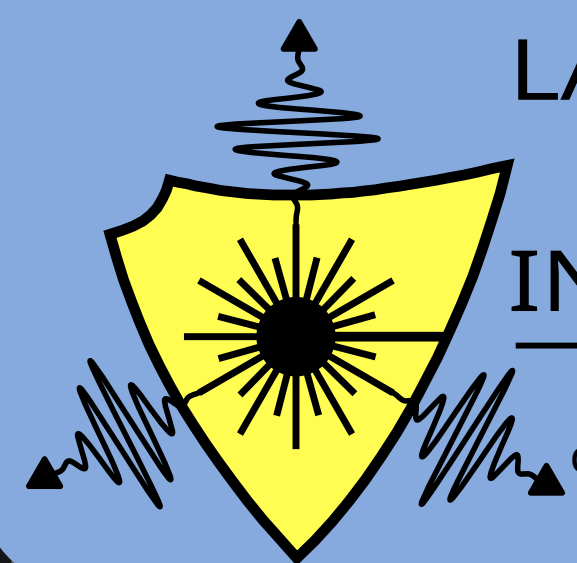
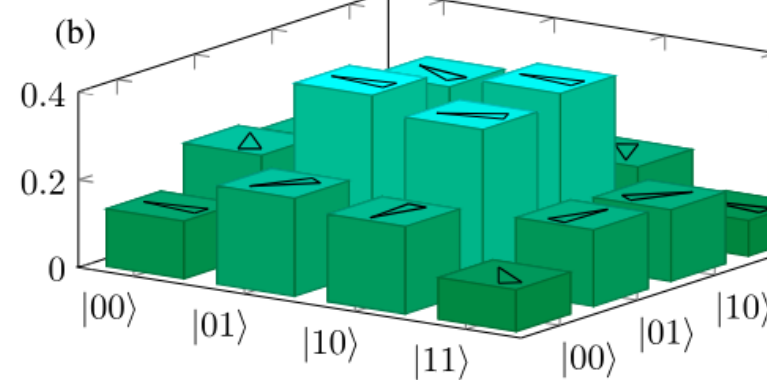
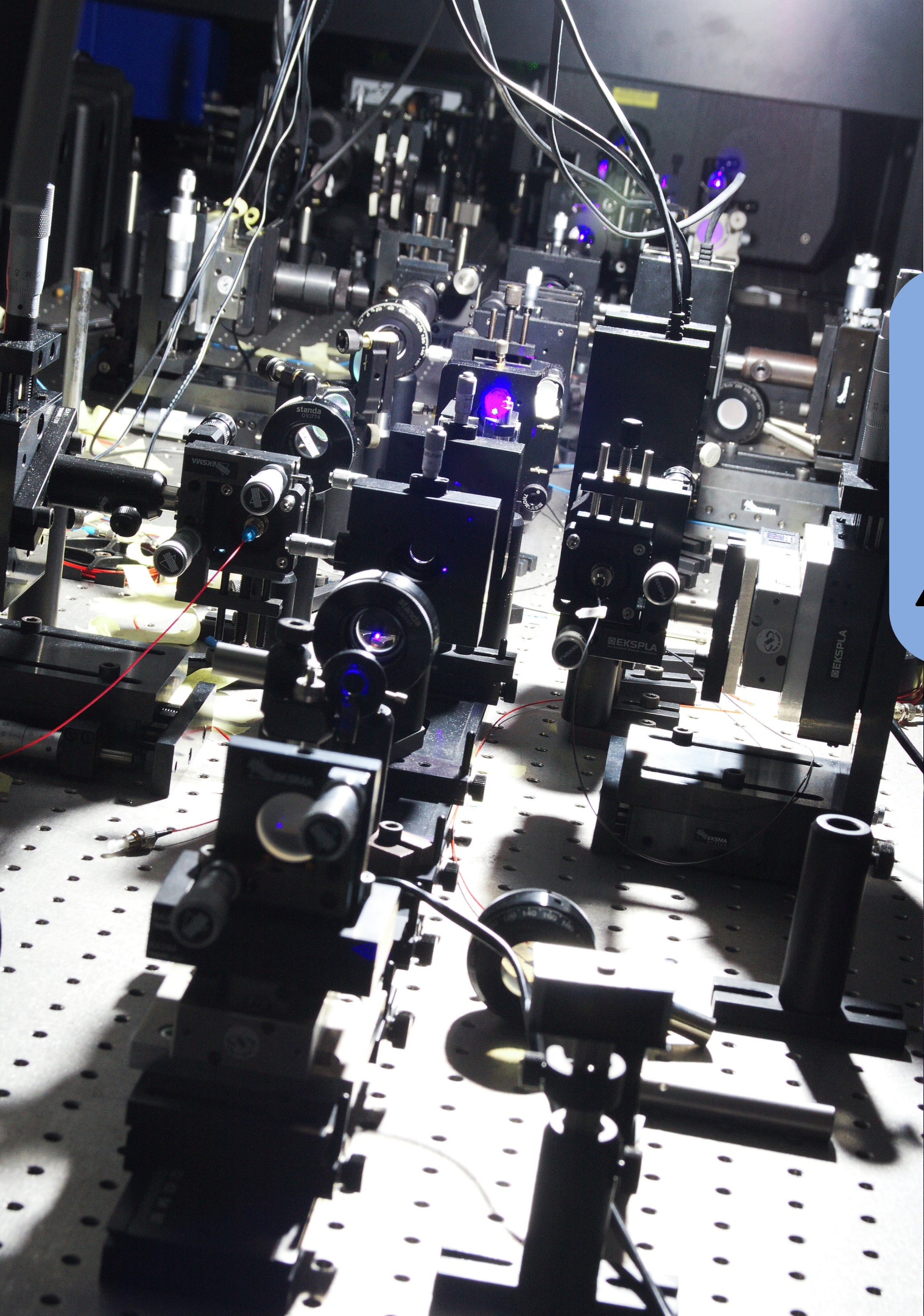
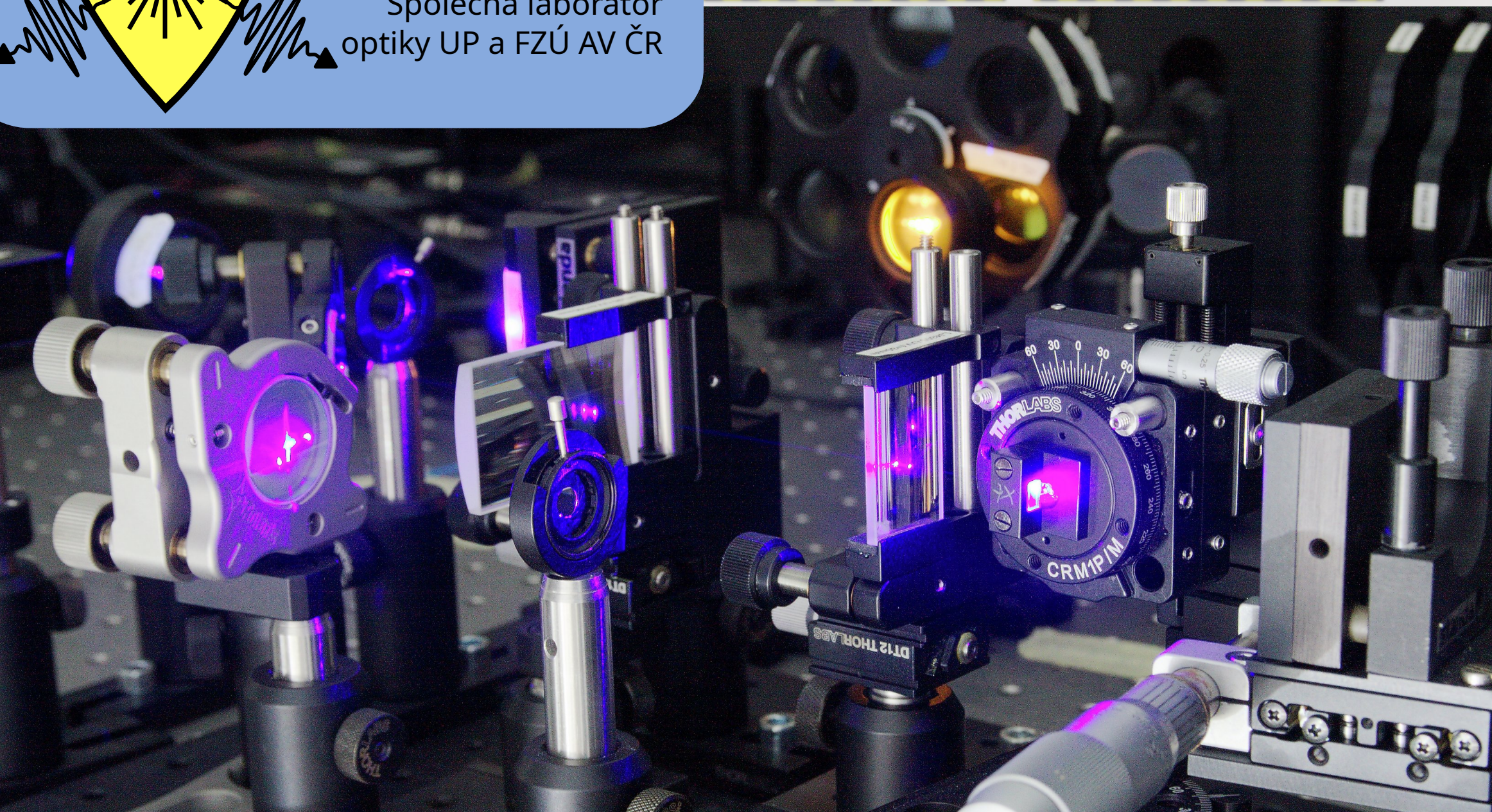
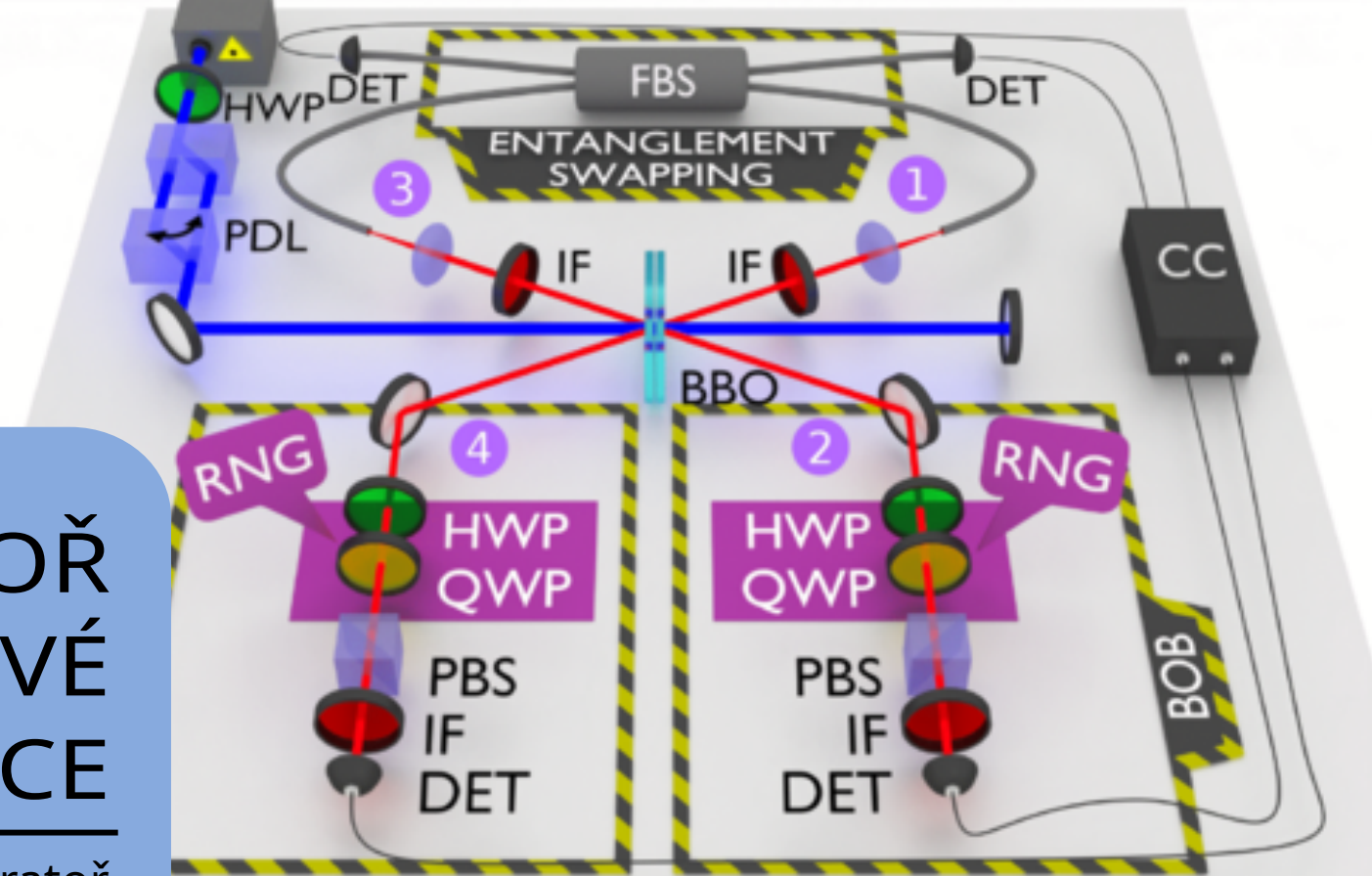


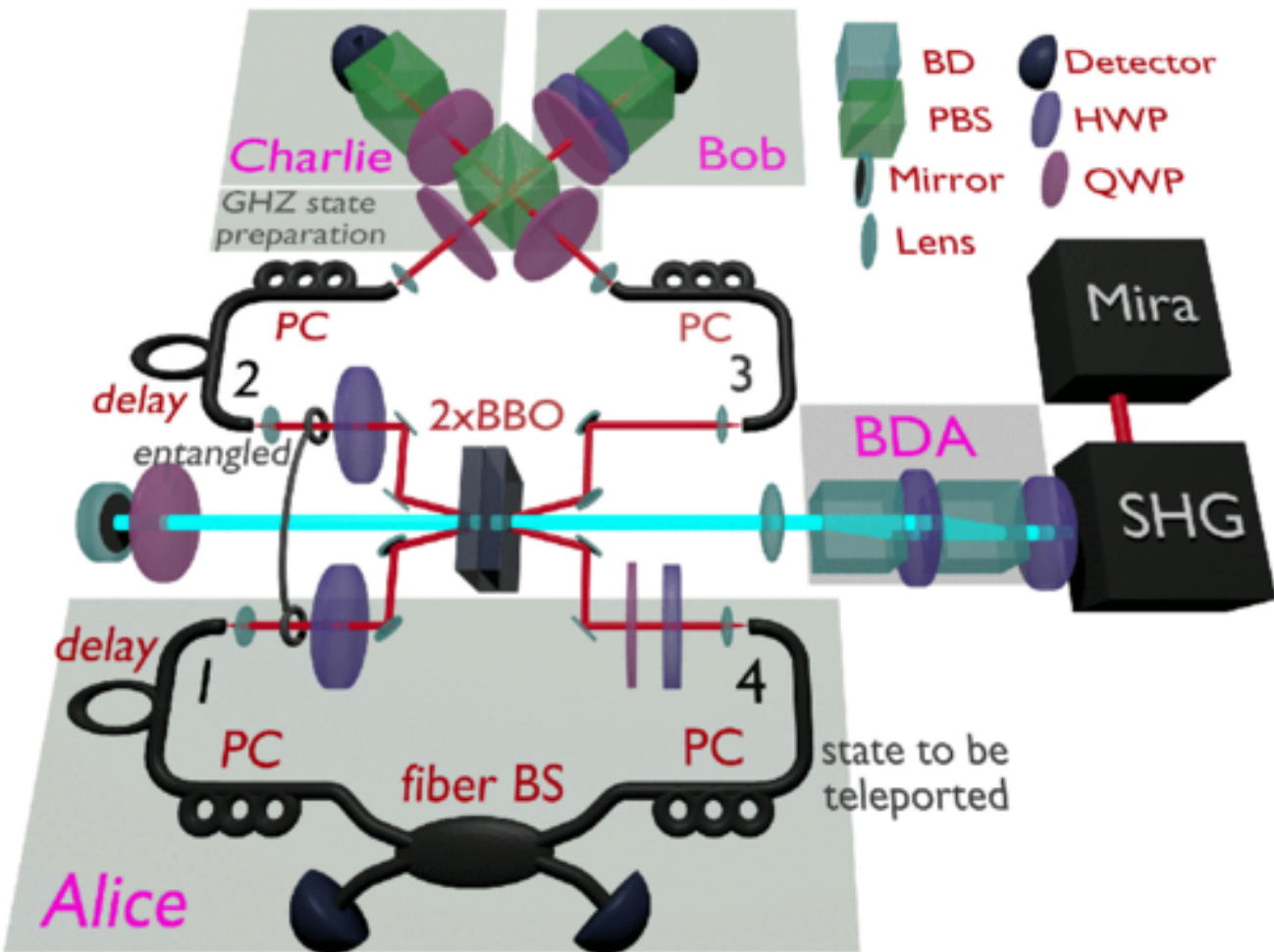
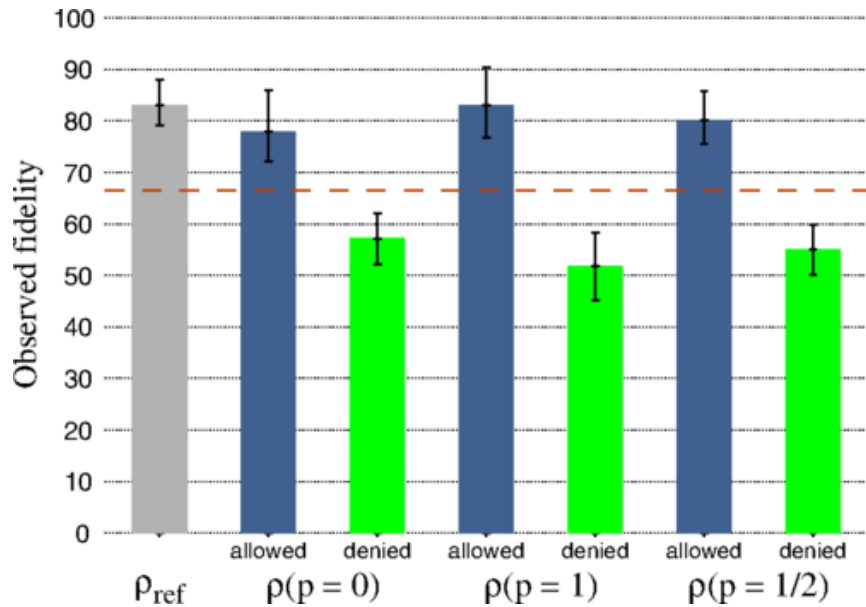


LABORATOŘ KVANTOVÉ INFORMACE

Společná laboratoř
optiky UP a FZÚ AV ČR



Kvantová teleportace:



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

Artur Barasiński,^{1,2,*} Antonín Černoš,^{3,†} and Karel Lemr^{1,‡}

¹RCPTM, Joint Laboratory of Optics of Palacký University and Institute of Physics of CAS, Faculty of Science, Palacký University, 17. listopadu 12, 771 46 Olomouc, Czech Republic

²Institute of Physics, University of Zielona Góra, Z. Szafrana 4a, 65-516 Zielona Góra, Poland

³Institute of Physics of the Czech Academy of Sciences, Joint Laboratory of Optics of Palacký University and Institute of Physics of CAS, 17. listopadu 50A, 772 07 Olomouc, Czech Republic

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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 $H_0: \bar{A} = 2 \bar{B}$

(2) Ověřte $H_0: V_A = V_B$

(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:

$$P_A = 191 / 323$$

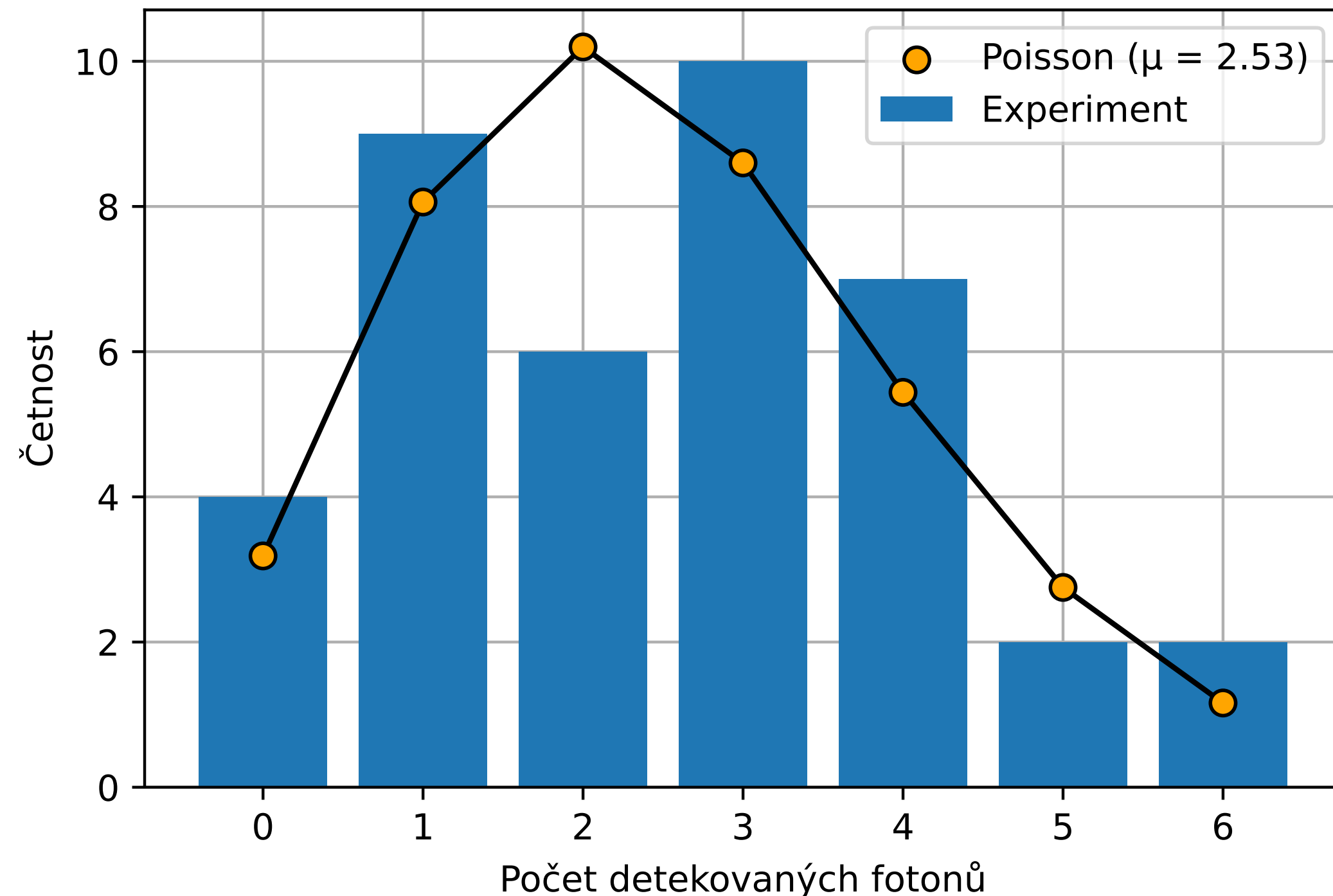
$$P_B = 116 / 135$$

Detekce fotonů:

Počet fotonů: 0 1 2 3 4 5 6

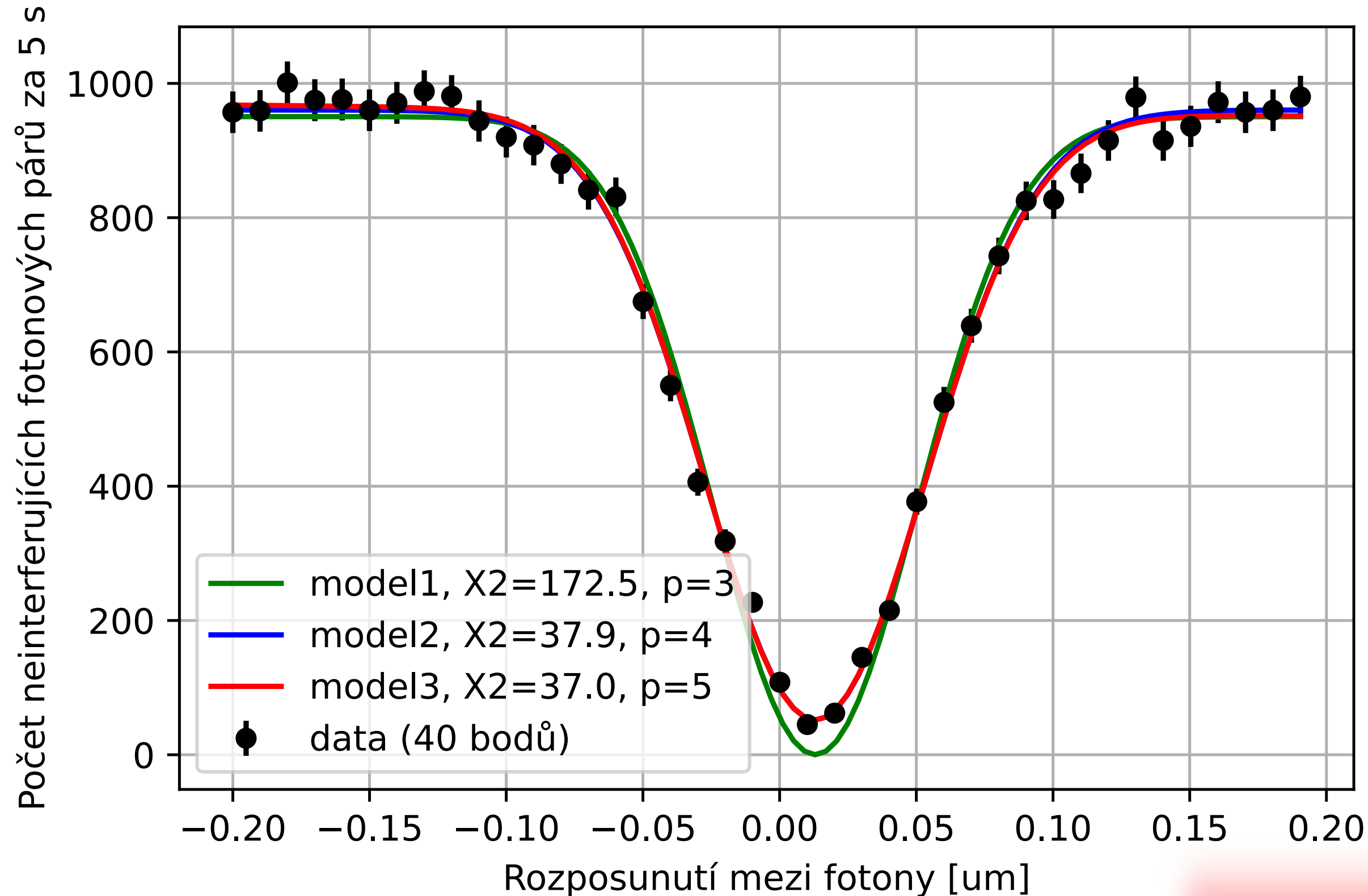
Četnost události (experiment): 4 9 6 10 7 2 2

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:



$$M1: A (1 - \exp[-(x-c)^2/2s^2])$$

$$M2: A (1 - B \exp[-(x-c)^2/2s^2])$$

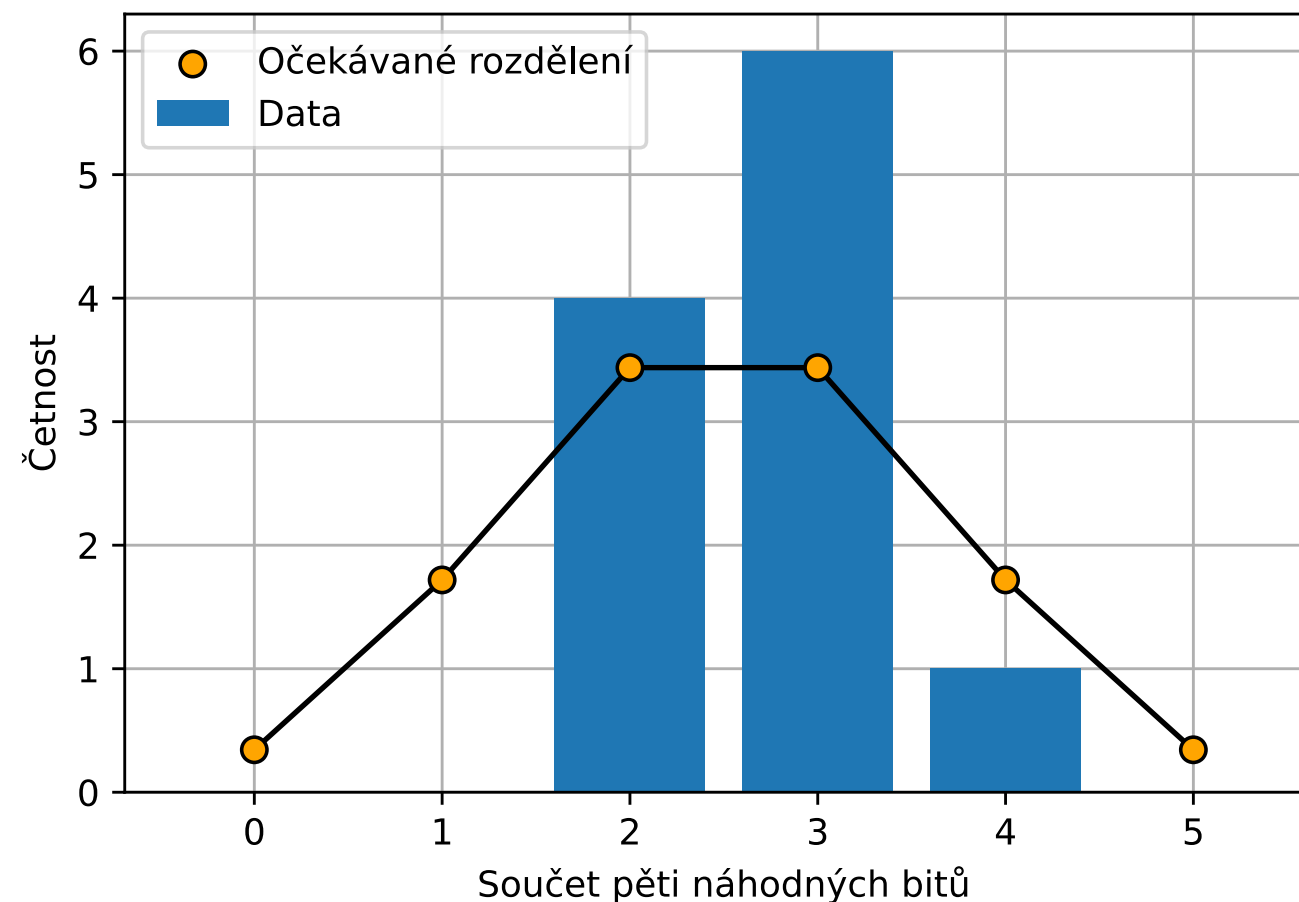
$$M3: A (1 - B \exp[-(x-c)^2/2s^2]) + Dx$$

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

The diagram shows a quantum circuit with a single qubit. It starts with a Hadamard gate (represented by a semi-circle with a vertical line), followed by a CNOT gate (represented by a dot on a vertical line connected to a cross on a horizontal line), and finally a measurement gate (represented by a meter symbol). The qubit is initialized to the state $|0\rangle$ (indicated by a circle with a 0). The output of the measurement is labeled 1.

The figure displays a 15x30 grid of binary digits (0s and 1s). The first row contains a '1' in the first column and a '0' in the second column, both highlighted in green. The second row contains a '0' in the 10th column, highlighted in red. The third row contains a '0' in the 10th column, highlighted in red. The fourth row contains a '1' in the 10th column, highlighted in red. The fifth row contains a '1' in the 10th column, highlighted in red. The sixth row contains a '0' in the 10th column, highlighted in red. The seventh row contains a '0' in the 10th column, highlighted in red. The eighth row contains a '0' in the 10th column, highlighted in red. The ninth row contains a '0' in the 10th column, highlighted in red. The tenth row contains a '0' in the 10th column, highlighted in red. The eleventh row contains a '0' in the 10th column, highlighted in red. The twelfth row contains a '0' in the 10th column, highlighted in red. The thirteenth row contains a '0' in the 10th column, highlighted in red. The fourteenth row contains a '0' in the 10th column, highlighted in red. The fifteenth row contains a '0' in the 10th column, highlighted in red. The histogram on the right shows the frequency of 0s and 1s. The x-axis is labeled 'Součet písmen' and the y-axis is labeled 'Četnost'. The legend indicates 'Očekávané rozdělení' (Expected distribution) as orange dots and 'Data' as blue bars.

Součet písmen	Četnost
0	4
1	1
2	3
3	6



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).