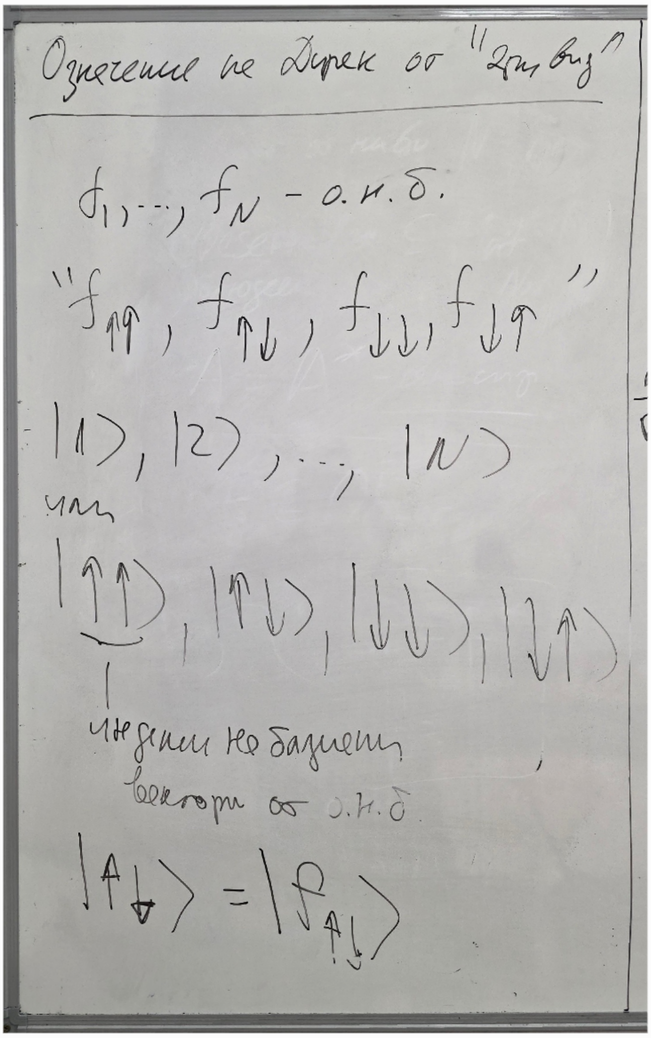
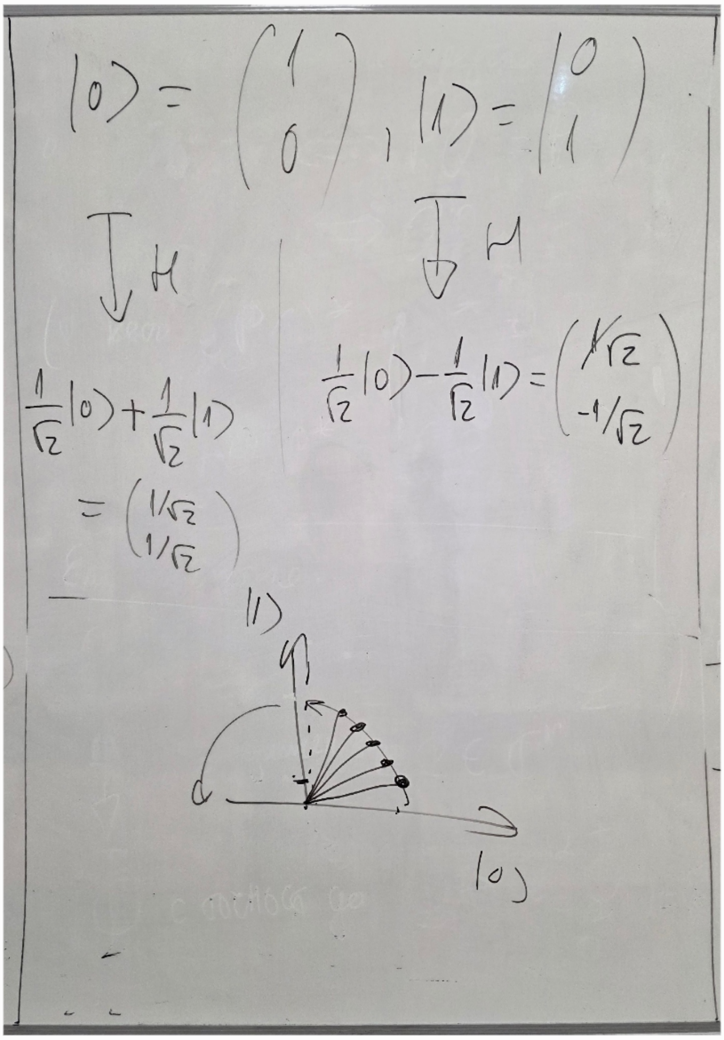
Квантови трансформации и мисления бомбен тест на Елицур-Вайдман





Съставни системи

Kronecker

$A \otimes B$ – умнож. по Крьонекер

– [illegible] произв. [illegible]

Св-ва: 1)

$$(A_1 \otimes B_1)\cdot(A_2 \otimes B_2)$$

$$= (\underbrace{A_1 A_2}) \otimes (\underbrace{B_1 B_2})$$

ако са опр.

Св-во: 2) $(A \otimes B)^* = A^* \otimes B^*$

$$|\Phi\rangle|\Psi\rangle \equiv \Phi \otimes \Psi$$

$$\underbrace{\begin{pmatrix}\phi_1\\ \vdots\\ \phi_N\end{pmatrix}}_{1\times N} \otimes \underbrace{\begin{pmatrix}\psi_1\\ \vdots\\ \psi_M\end{pmatrix}}_{1\times M} = \begin{pmatrix}\phi_1\psi_1\\ \vdots\\ \phi_1\psi_M\\ \phi_2\psi_1\\ \vdots\\ \phi_2\psi_M\\ \vdots\\ \phi_N\psi_1\\ \vdots\\ \phi_N\psi_M\end{pmatrix}$$

$$1\cdot 1\times N\cdot M$$

$$\begin{array}{c}\\ k\\ \\ \end{array}\begin{pmatrix}0\\ \vdots\\ 1\\ \vdots\\ 0\end{pmatrix} \otimes \begin{pmatrix}0\\ \vdots\\ 1\\ \vdots\\ 0\end{pmatrix}\begin{array}{c}\\ \\ \\ j\end{array} = \begin{pmatrix}0\\ \vdots\\ 1\\ \vdots\\ 0\end{pmatrix}\begin{array}{c}\\ \\ \leftarrow kj\\ \\ \end{array}$$

разложими $\leftrightarrow$ несплетени

неразложими $\leftrightarrow$ сплетени entangled

$$\phi\,\psi^T = \begin{pmatrix}\phi_1\\ \vdots\\ \phi_N\end{pmatrix}(\psi_1 \dots \psi_M)$$

$$= \begin{pmatrix}\phi_1\psi_1 & \cdots & \phi_1\psi_M\\ \vdots & & \vdots\\ \phi_N\psi_1 & \cdots & \phi_N\psi_M\end{pmatrix}$$

$$\mathrm{Tr}(A \otimes B) = \mathrm{Tr}A\ \mathrm{Tr}B$$

<u>Извод</u>: В несплетени състояния всяка двойка $A \in \mathcal{A}$, $B \in \mathcal{B}$ са независими в общата система

$$\underline{X}\,\underline{Y} \neq \underline{Y}\,\underline{X}$$

$$\underline{X}_{(1)}\,\underline{Y}_{(2)} = \underline{Y}_{(2)}\,\underline{X}_{(1)}$$