

q-бит

$$A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} = A^*$$

$$= \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

$a = r+z, d = r-z$
 $r = \frac{1}{2}(a+r), z = \frac{1}{2}(a-d)$

$$A = \begin{pmatrix} r+z & x-iy \\ x+iy & r-z \end{pmatrix}$$

Spec $A = \{ \lambda_1, \lambda_2 \}$
 - собств.

$$\lambda_{1,2} = r \pm \sqrt{x^2 + y^2 + z^2}$$

A е обращим $\Leftrightarrow A = A^* = A^{-2}$

$\Leftrightarrow A = A^*$ и собств. со. 0 и 1

($x = x^2$)

1 сл.) $A = \hat{0}$ нулево
 2 сл.) $A = \hat{1}$ единично
 3 сл.) $\lambda_1 < \lambda_2$ (+)
 $\begin{matrix} \parallel & \parallel \\ 0 & 1 \end{matrix}$

$\lambda_1 + \lambda_2 = 2r = 1 \Rightarrow r = \frac{1}{2}$
 $\begin{matrix} \parallel & \parallel \\ 0 & 1 \end{matrix}$

$$\begin{pmatrix} \frac{1}{2} + z & x - iy \\ x + iy & \frac{1}{2} - z \end{pmatrix}$$

\downarrow

$x \mapsto \frac{1}{2}x$
 $y \mapsto \frac{1}{2}y$
 $z \mapsto \frac{1}{2}z$

$$A = \frac{1}{2} \begin{pmatrix} 1+z & x-iy \\ x+iy & 1-z \end{pmatrix}$$

обращим

Но $\lambda_2 = \frac{1}{2} \left(1 + \sqrt{x^2 + y^2 + z^2} \right) = 1$

$\Rightarrow x^2 + y^2 + z^2 = 1$

Композит

$SU(2) \cong SO(3)$

("2")
 $A, B, C, D \quad SO(2m+1)$

$A = |\Psi\rangle\langle\Psi|$

$\|\Psi\| = 1$

$A = \frac{1}{2} \begin{pmatrix} 1+z & x-iy \\ x+iy & 1-z \end{pmatrix} = \begin{pmatrix} \Psi_1 \\ \Psi_2 \end{pmatrix} \begin{pmatrix} \bar{\Psi}_1 & \bar{\Psi}_2 \end{pmatrix}$

$$A = \begin{pmatrix} \psi_1 \bar{\psi}_1 & \psi_1 \bar{\psi}_2 \\ \psi_2 \bar{\psi}_1 & \psi_2 \bar{\psi}_2 \end{pmatrix}$$

Състоятели или мeр. на изход

$$\hat{\rho} := A = A^* = \frac{1}{2} \begin{pmatrix} r+z & x-iy \\ x+iy & r-z \end{pmatrix}$$

1)

2) $\hat{\rho}$ е нормал. гeдо

$$\lambda_{1,2} \geq 0$$

$$3) \text{Tr} \hat{\rho} = 1 = \lambda_1 + \lambda_2 = r$$

$$\lambda_{1,2} = \frac{1}{2} \left(r \pm \sqrt{x^2 + y^2 + z^2} \right)$$

$$\hat{\rho} = \frac{1}{2} \begin{pmatrix} 1+z & x-iy \\ x+iy & 1-z \end{pmatrix}$$

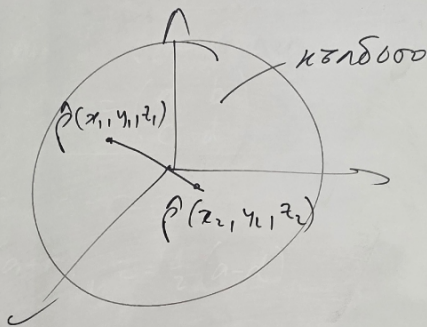
- оду бeг ке $\hat{\rho}$ е оcтoнoнe нe 1) и 3)

$$2) \Leftrightarrow \lambda_1 \geq 0$$

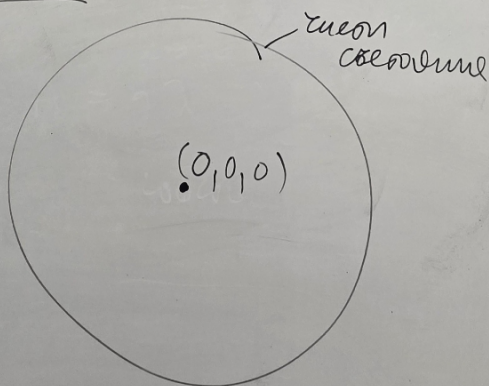
$$\frac{1}{2} \left(1 - \sqrt{x^2 + y^2 + z^2} \right)$$

$$\Leftrightarrow x^2 + y^2 + z^2 \leq 1$$

Състоятели като изходно мeр.



Зaкoнoчeнe:



$$\hat{\rho}(0,0,0) = \frac{1}{2} \begin{pmatrix} 1+0 & 0-i0 \\ 0+i0 & 1-0 \end{pmatrix} = \begin{pmatrix} 1/2 & 0 \\ 0 & 1/2 \end{pmatrix} = \frac{1}{2} \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$= \frac{1}{2} |f_1\rangle \langle f_1|$$

$$+ \frac{1}{2} |f_2\rangle \langle f_2|$$

- квeнтoвo pавнo-вepoятнo пaрaм.

- cмeшeнo cъcтoянe