Prof. Stephan Fritzsche
TPI and HI Jena
— Computational Quantum Physics —

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Winter term

Home Work (8)

Task 24: (Reading.)

Read the articles "Experimental quantum teleportation" by D. Bouwmeester *et al.*, Nature 390 (1997) 575 and "Quantum teleportation" by A. Zeilinger, Scientific America (2000) 50 [see also folder: Additional-material].

Task 25: (Stoke's parameters of a single-qubit state.)

We consider the matrix $M = \begin{pmatrix} 5/8 & i/4 \\ -i/4 & 3/8 \end{pmatrix}$;

a) is M a valid density matrix ??

b) if yes, what is the Stoke's parameter representation of this state ??

Task 26: (Schmidt decomposition of two-qubit states.)

Find the Schmidt decomposition for the following two-qubit states:

a) $(|00\rangle + |11\rangle)/\sqrt{2}$ and

b) $(|00\rangle + |01\rangle + |10\rangle + |11\rangle)/2$.

Task 27: (CNOT constructed from a controlled-Z gate.

Construct a CNOT by using the gate

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$$

and two Hadamard gates. Which of the two qubit is the control and the target qubit, respectively ? How looks the corresponding 'wire' diagram ?