Exercises for decoherence and open quantum systems
Sheet 7

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Exercise 22

Calculate the conditional operator $\rho^{A|B} = exp(\sigma_{AB})$ with $\sigma_{AB} = \mathbb{1}^A \otimes log(\rho^B) - log(\rho)$ for the Werner state (see exercise 8):

$$\rho_w = \lambda\rho^- + \frac{1-\lambda}{4}\mathbb{1}$$

Further calculate the values of λ for which ρ_w is separabel using the corresponding properties of σ_{AB}.

Exercise 23

What are the Krauss - Operators of the Depolarizing Channel $\mathcal{C}_{dp}$?

$$\rho \quad \xrightarrow{\mathcal{C}_{dp}} \quad (1-p)\rho + p\frac{1}{2}\mathbb{1}_2$$

Exercise 24

What are the Krauss - Operators of the Bitflip Channel $\mathcal{C}_b$?

$$\begin{aligned} |\uparrow\rangle &\xrightarrow{\mathcal{C}_b} |\downarrow\rangle \\ |\downarrow\rangle &\xrightarrow{\mathcal{C}_b} |\uparrow\rangle \end{aligned}$$

Exercise 25

What are the Krauss - Operators of the Phaseflip Channel $\mathcal{C}_{ph}$?

$$\begin{aligned} |\uparrow\rangle &\xrightarrow{\mathcal{C}_{ph}} |\uparrow\rangle \\ |\downarrow\rangle &\xrightarrow{\mathcal{C}_{ph}} -|\downarrow\rangle \end{aligned}$$

Exercise 26

What are the Krauss - Operators of the Bit-Phaseflip Channel $\mathcal{C}_{bph}$?

$$\begin{aligned} |\uparrow\rangle &\xrightarrow{\mathcal{C}_{bph}} i|\downarrow\rangle \\ |\downarrow\rangle &\xrightarrow{\mathcal{C}_{bph}} -i|\uparrow\rangle \end{aligned}$$