



Софийски университет „Св. Климент Охридски“  
Физически факултет

## ФАКУЛТЕТЕН СЕМИНАР

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*Computing with quanta:  
promise, problems and possible solutions*

The "Digital Revolution" that transformed our lives and our economy is based on the ubiquity of information-processing devices whose processing power increased exponentially, following Moore's law. As this trend is approaching fundamental physical limits, new directions are explored for even more powerful computational devices based on quantum mechanical systems, which store the information in superpositions of quantum states. The main difficulty for the physical implementation of quantum computers is the fragility of information stored in coherent superpositions of quantum mechanical eigenstates. Achieving reliable and scalable quantum computing requires therefore the implementation of techniques for protecting quantum information against noisy environments and experimental imperfections. These schemes include active and passive protection schemes, quantum error correction, and robust control operations that perform reliably even if the available control fields deviate from the ideal ones, due to experimental imperfections.