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Signal Generation for Trapped Ion Quantum Gates

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In order to manipulate quantum information in trapped ion systems it is necessary to mediate the interaction between qubits with electromagnetic fields in a precisely controlled fashion. As ion crystals become larger and enhanced fidelities demand increasingly sophisticated pulse schemes, dynamic signal generation for quantum gates becomes a difficult task.

The talk discusses various digital signal processing (DSP) techniques for signal generation using field programmable gate arrays (FPGAs) and data converters (DACs). Some basic signal processing concepts and modern techniques based on recent advances in telecommunications are presented. They allow an interpretation of current challenges in the light of digital data transmission and potentially offer intriguing solutions for quantum gates and for scaling up the qubit count.

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