FPGA integration for data processing of quantum transport measurements

The characterization of spin quantum bits (qubits) is a complex task involving both the precise synchronization of short radio-frequency pulses and the acquisition and processing of sizeable amounts of data. This project concerns the implementation of an analog-to-digital conversion protocol using a digitizer recently installed in the setup for measurement spin qubits at the NanoElectronics group. For that, an FPGA integrated in the digitizer will be programmed to perform tasks such as data decimation, down-sampling by averaging, and synchronization with external RF sources. The FPGA features are expected to enable fast on-the-fly processing of the data acquired by the digitizer. This will override the need for slower software data processing and reduce the amount of data transferred to the computer used for data storage, thus increasing measurements performance and speed. FPGA images will be developed using Keysight Pathwave FPGA and Vivado HLS tools and tested in a quantum transport device operated at cryogenic temperatures.

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