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The series of high performance multichannel digitizers ADC4x250

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The series of high performance multichannel digitizers ADC4x250 have been developed at BINP SB RAS. There are three devices in the series: four-, two- and one-channel with a sampling rate of 250 MSPS, 500 MSPS, 1 GSPS, respectively designed to recording of waveforms with duration ranges from tens of nanoseconds.

The main feature of this series is the common hardware base with all the devices building on. Different variants of digitizers are obtained by replacing the input amplifier and software reconfiguration of a clock circuit while the common part of the circuit and software remains unchanged. The common hardware base consists of four ADCs with sampling rate of 250 MSPS, digital control logic, calibration circuit, synchronization and timing circuit.

In the four channels module all ADCs are driven by synchronous clocks and work independently. For the two channels device with a sampling rate of 500 MSPS, ADC pairs are connected to the same analog channel and clocked with a phase shift of 180°. In the case of one channel 1 GSPS device all ADC receive the same input signal and clocked with a phase shift of 90°. The bandwidth of the input signal is determined by the bandwidth of the input amplifier. 300 MHz, 200 MHz and 80 MHz for ADC4x250-1CH 2CH and 4CH are selected respectively.

Inequality of signal and clock path delays brings an additional error source in case of considered ADC interleaving. This delay depend on the multitude of external factors, and therefore, non-stationary. In this connection, periodic calibration of each ADC delays is required. Subsequently, the firmware performs data correction.

The report describes the structure of the hardware and software parts and discloses a calibration method and ADC output correction. In addition, analog-digital conversion path characteristics are represented.

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