16-bit 4-channel 250MSPS A/D board designed for demanding applications

Ultraview Corporation announces a 16-bit 4-channel 250MSPS A/D board for very demanding uses, where repetitive signals on multiple time-aligned channels need to be observed with high SNR, such as NMR, RADAR, ultrasound, time-of-flight imaging, spectroscopy, communications systems and antenna testing and other critical applications.

Based on a hardware averaging engine with near-zero dead-time, implemented in the board's XilinxTM FPGA, the ULTRADYNE16-250Mx2AVE-8GB-50T/155T and ULTRADYNE16-250x4AVE-8GB-50T/155T can each average repetitive signal strings up to 1 million times with record lengths to 16384 samples (-50T model) and 262144-samples (-155T model) uninterruptedly. The precise repetitive summing of each new string of samples onto a running 32-bit average can be triggered by any one of three software-selectable triggering mechanisms:
A TTL input, with selectable –/+ slope, causes waveforms to be acquired or added to a running average, software slider-adjustable level on the incoming signal waveform on any of the 4 channels, with + or – slope, enabling scope-like triggering, with pre-trigger, on a given place on a repeating waveform, Heterodyning trigger input which means triggering will occur on the difference frequency between this input and the sampling clock frequency. This is useful for time-of-flight imaging systems, RADAR and pulsed spectroscopy systems, in which transmit or stimulus waveforms are repeated M-times/second and the A/D samples data at a rate of N samples per sec. The result is that the ULTRADYNE16 will automatically acquire and/or average complete waveforms that repeat M minus N times per second.

In addition to their averaging and unique triggering modes, which include pre-triggering capability, all Ultradyne16-250 models are also high dynamic range general purpose high speed data acquisition boards, each with 8GB of memory, large channel counts, and continuous transfers to the host system at up to 1.4

GB/sec. Mike Ingle, principal hardware architect, states: "The precise time alignment of acquisition all channels to within one sample period, the 32-bit averaging engine, the flexible triggering modes including novel heterodyne trigger, the selectable pre-trigger memory, and the selective recording with fiducial start/stop indicators, make the Ultradyne16 uniquely suited for scientific and other demanding applications"

All models include Windows 7/8 driver packages, as well as comprehensive LabVIEWTM control panel (see figure 2) for Windows. 64-bit Linux 6.2 drivers and command line user programs are also included. Andy Leung, who wrote the LabVIEWTM VI, states: “We included a very simple, yet powerful real-time, adjustable triggering menu and customizable display interface, which allows easy panning and zooming, to examine fine details on extremely sharp, low-noise averaged waveforms in the time and/or frequency domain on a single graph. Our project allows for continuous and single-shot acquisition, as well as the ability to view previously acquired data.”

Figure 1 shows a 4-channel version of board. Figure 3 illustrates the LabVIEW screen display of an Ultradyne16-250x2 fed by a Furaxa Libove-Chacko microwave sampler/pulser TDR spectrometer, displaying the reflection spectrum of microwave bowtie antenna excited by a repeating 15 picosecond 250 million pulse/second train without averaging turned on. Note that the spectrum over 13GHz is not visible, as it is “under water” due to it being under the noise floor at scale of 20 on the display, due to the 80dB dynamic range of the sampler/pulser.

Then, with averaging turned on the acquisition of same signal from 40GHz antenna now shows a vastly increased dynamic range (noise floor down by 40dB at -20 on the display), with usable SNR to now display spectral content all the way to 40GHz. Less than a second of hardware averaging in the Ultradyne 16, has tripled the usable spectral sensitivity of the instrument, and increased the dynamic range to 120dB.

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