# Time-to-Digital Converter for Timing-Measurement Applications

Agilent Technologies introduced the first time-to-digital converter (TDC) from its Acqiris product line, featuring six independent stopwatches for precise timing measurements from a common start event to multiple stop events at a high resolution. The TC890 is appropriate for time measurement applications, including laser detection and ranging (LIDAR) for 3D mapping and navigation, fluorescence lifetime spectrometry, and ion counting in time-of-flight mass spectrometry (TOFMS). Many pulse-timing measurements, such as period, frequency and time interval analysis (TIA), are suitable for the TDC's precise measurement technology. The TC890 records multiple events or hits on each of its six input channels, with a timing resolution of 50 ps and a mean dead time between sequential pulses on the same input (double pulse resolution) of less than 15 ns. Running at full speed, the instrument offers a massive 25 million events-per-second data-throughput rate. It enables event counting or histogram creation for easy data and spectra comparison. Six of the seven identical input channels are independent stop inputs and the seventh is the common start. The module operates in a multi-start, multi-stop acquisition mode with the timing information of stop events on all independent channels encoded relative to the most recent start event on the common channel. In standard mode, the recording range is up to 10 ms. If one channel can be dedicated to a fiducial signal, the 10 ms recording time can be extended to a much wider range. The large internal buffer allows the recording of up to four million stop-events per module. High-precision time measurement is achieved with a low jitter (<3 ps rms), high stability (±2 ppm) internal clock source or an external 10 MHz reference input. Digitized data is fed directly to the on-board FPGA-based data processing unit. This handles the data and subsequent fast readout with a direct memory access (DMA) mode for increased data throughput to the PC.

**Agilent Technologies**

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[1] http://www.agilent.com/