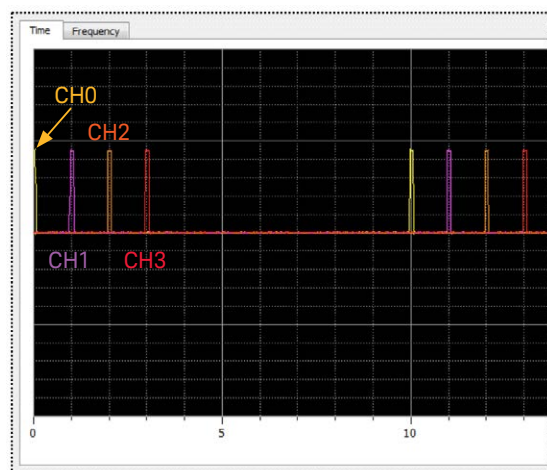


## Application Brief

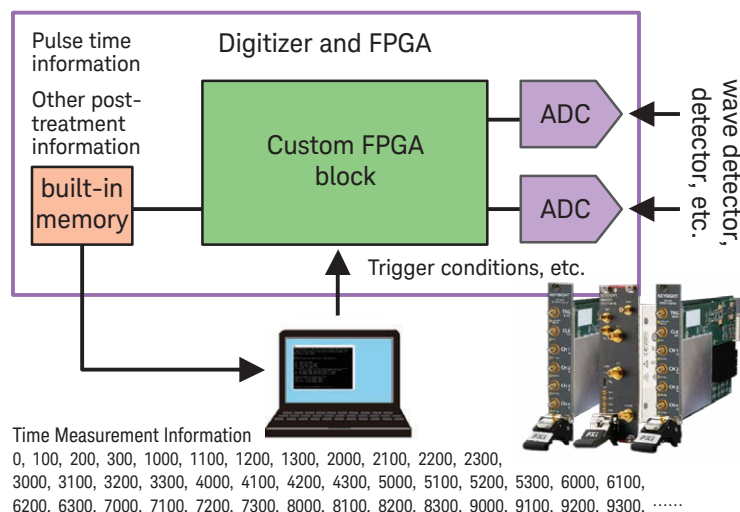
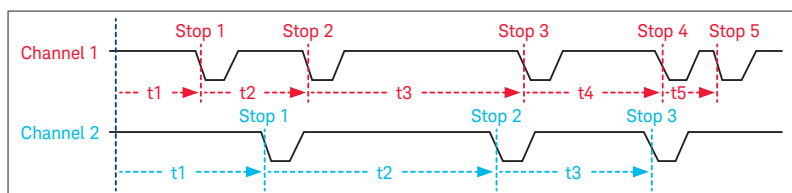
# BUILDING a Time-to-Digital Converter (TDC)

Using PXIe Digitizers with the FPGA programmable option enabled and the FPGA Programming Environment Software to create a custom TDC block.



A time-digital converter (TDC) is used in mass spectrometry such as TOF and physical experiment applications. While a TDC helps obtain high time-resolution at low cost, information is lost when preparing dedicated hardware.

A multi-channel digitizer with user accessible FPGA allows simplified multi-channel time difference measurements with high accuracy and preservation of necessary waveform and amplitude data and signal processing results. Pulse time information can also be continuously input to the PC. (pulse-rate dependent)



## Number of Channels, Number of Bits, and Time Resolution of Various Digitizers

Product Number	Sample Rate	Standard	No. of Channels	No. of Bits	Time resolution
M3100A	100 MSa/s	PXIe	8	14	10 ns
M3102A	500 MSa/s	PXIe	4	14	2 ns
M9203A	1.6 GSa/s 3.2 GSa/s	PXIe	>2	12	625 ps 312 ps
M9703B	1.6 GSa/s 3.2 GSa/s	AXIe	>4	12	625 ps 312 ps
M9709A	1 GSa/s	AXIe	>32	8	1 ns

## FPGA development Services

Keysight Technologies not only sells hardware and software products, but may also provide services according to customers' requests for hardware implementation, software and application development.\*

## Consulting Services \*

1. Sample codes
2. Turnkey software (project) contracts
3. IP development and delivery

\* Consulting Services may be provided by means of an integration partner. Consult with your Account Manager the options that are available in your region.

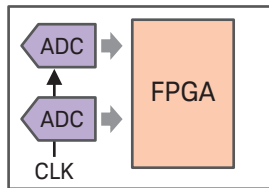
## Keysight high-speed digitizer series



M9203A PXIe 1.6 GSa/s (2 ch) 3.2 GSa/s (1 ch) 12-bit digitizer  
M9703B AXIe 1.6 GSa/s (8 ch) 3.2 GSa/s (4 ch) 12-bit digitizer  
M9709A AXIe 1 GSa/s (32 ch) 8-bit digitizer

- Select from various interfaces according to applications and uses
- Excellent SNR and SFDR performance
- User-customizable Virtex 6 installed
- Various application firmware (averaging, DDC, SS-OCT, etc.)

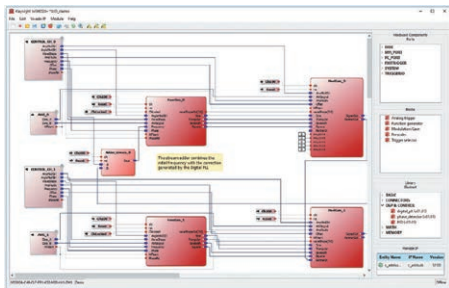
## M3100A and M3102A PXIe digitizers



M3100A PXIe 14-bit digitizer 100 MSa/s (4/8 ch)  
M3102A PXIe 14-bit digitizer 500 MSa/s (2/4 ch)

- User-programmable area built in FPGA (Xilinx Kintex 7)
- Optional HVI technology allows synchronous phase coherent operation across multiple channel / chassis Digitizers and combo units.
- Combo analyzer has both ADC digitizer and AWG allowing desired signal output with low delay to the analysis signal (M3300A and M3302A series)

## M3602A Graphical FPGA Development Environment (exclusive for M3xxxA modules)



The user-customized area and the measurement area are clearly separated, allowing you to focus solely on the custom processing of AWG generation and Digitizer acquisition signals without having to implement the control of measurement.

- The user-friendly graphical environment simplifies the development of custom DSP for the FPGA device enabling special modes of operation or new control structures.
- Easily import FPGA codes and external IP
  - VHDL, Verilog, and VIVADO/ISE projects, MATLAB/SIMULINK, Xilinx IP core
- Fast one-click compilation
- Reduced development time and compiling time together with hot programming enable dynamically-reconfigurable instruments.

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:

[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)