



RX1200

Single-Channel 200 MHz Digital Spectrometer



General Description

RX1200 is a single-channel, 200 MHz digital data acquisition system designed for radiation detection and spectroscopy. RX1200 can be used with almost any type of radiation detector. With 12-bit sampling resolution, RX1200 is well suited for spectroscopy applications with scintillation detectors. Since the pulse integration is implemented digitally in the FPGA, no preamplifier is required with scintillation detectors. RX1200 can be reprogrammed via high-speed USB port in a small fraction of second. This feature along with 24-pin user interface (0.1") and eight LED's on board, makes the RX1200 a perfect solution for developing customized firmware for digital radiation measurement and spectroscopy.

RayCode

RayCode is a FPGA firmware (200 MHz) developed for RX1200 to capture and digitally processes signal pulses from scintillation detectors. It includes a scope module to capture radiation pulses and a MultiChannel Analyzer (MCA) module to reconstruct the energy spectrum. The MCA is implemented in a 4K, 32-bit memory configuration. The on-board PROM is shipped with RayCode.

RayPanel

RayPanel is a Graphical User Interface (GUI) application to use RX1200 as a high-performance digital spectrometer for scintillation detectors. Using the RX1200 programmed with the RayCode, the user will be able to graphically set various operational and processing parameters including input offset, ADC offset, trigger threshold, amplification gain, DAC output (to adjust detector high voltage power supply) collection time (real time), collection time (live time), integration duration, region of interest, energy calibration and more. The detector signal traces and energy spectrum are displayed in two separate panels: the Scope and MCA panels, respectively.

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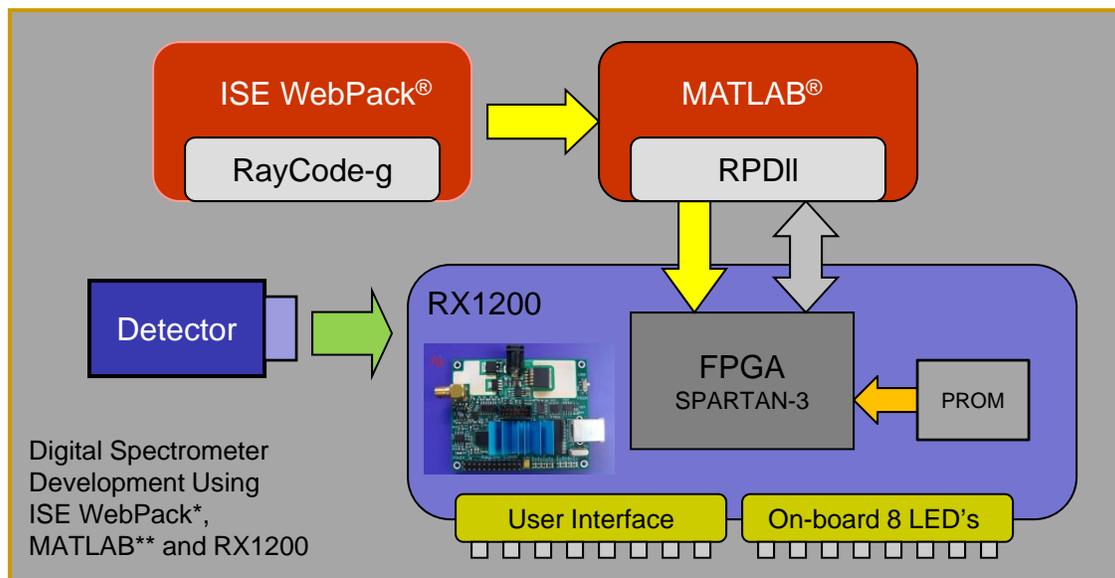
Hardware (RX1200) Specifications

<i>RX1200 (Hardware)</i>					
<i>Parameter</i>	<i>Minimum</i>	<i>Typical</i>	<i>Maximum</i>	<i>Unit</i>	<i>Comments</i>
Sampling Rate	50	200	210	MSPS	-
Sampling Resolution	12			Bit	-
Gain	-14		46	dB	4096 steps
Input Offset	-330	0	+330	mV	4096 steps
ADC Offset	-625	-	+625	mV	4096 steps
DAC Output	0	-	+3.3	V	4096 steps
Input Impedance	50			Ohm	-
Input Bandwidth	90			MHz	Third-order Bessel filter
Supply Voltage	4.2	5.0	5.5	V DC	-
Interface	High-Speed USB2.0 (480 Mbps)				
FPGA Device	Xilinx SPARTAN-3, XC3S1000-5FTG256C				
FPGA Configuration	Via USB port, on-board PROM or JTAG				
User Interface	24-pin header and 8 on-board LEDs				



Firmware (RayCode) Specifications

<i>RayCode (FPGA Firmware)</i>					
<i>Parameter</i>	<i>Minimum</i>	<i>Typical</i>	<i>Maximum</i>	<i>Unit</i>	<i>Comments</i>
MCA Memory Length	4,096			Channel	-
MCA Memory Width	32			Bit	-
Dead Time (MCA)	30			Nanosecond per event	6 clock periods
Trace Capture Size	1,024			Sample	@ 12 bits
Time between samples	5			Nanosecond	1 clock period
Trigger Threshold	0	-	65,535	ADC unit	-
Trigger Filter Peaking Time	75			Nanosecond	30-tap triangular filter
Integration Time	0	-	327,675	Nanosecond	5 nanosecond increments
Time Measurement Resolution (TMR)	0.655			Millisecond	2 ¹⁷ clock period
Live Time	0	-	781.875	Hour	TMR increments
Real Time	0	-	781.875	Hour	TMR increments



Development and Prototyping

- If you are at the development or prototyping stage, RX1200 is a perfect fit for you to develop your customized digital processing FPGA firmware and your software application for radiation detection and spectroscopy.
- You start with our open-source and generic VHDL code (RayCode-X) as a platform to develop your FPGA design in the ISE WebPack (a free ISE version from Xilinx Inc.). A programming file (BIT file) is generated at the end of this stage.
- “ConfigureFPGA” function from our “RPDII” library lets you to easily program the on-board FPGA from your BIT file via high-speed USB port in a small fraction of second. One other alternative to configure the on-board FPGA at the power-up is to use the on-board PROM. Using ISE WebPack, the PROM can be programmed via JTAG port.
- After programming the FPGA, the USB port on the RX1200 is ready to receive and send control signals and data from/to your PC.
- The “RPDLL” library makes all of your communications between your PC and RX1200. The library has 10 functions by which the user can: program the device from a BIT file, detect and select the active devices connected to the USB port, send and receive 16-bit wide signal data, send and receive 16-bit wide trigger data, send and receive 16-bit wide array data.
- Our software package also includes a complete set of MATLAB API functions which makes your development easier.

*ISE WebPack is a product of Xilinx Inc.

**MATLAB is a product of Mathworks.