Keysight Technologies
Modulation Domain and Time Interval Analyzers Pulse Analyzer System (PAS)
Z2090B-170

Technical Overview

Extreme speed ...
- 1 M events/sec capture rate
- 25 M events/sec data throughput

Extreme accuracy ...
- 50 picoseconds

KEYSIGHT TECHNOLOGIES

Introduction

The Keysight Technologies, Inc. PAS, pulse analyzer system provides precise, fast and efficient frequency and time interval analysis measurements for your RADAR Systems. Pulsed RF signal parameters are easily viewed and analyzed providing a comprehensive view of your RADAR system operation. See precise measurements, statistics, and histograms for RF pulse width and pulse repetition interval over time, clearly showing the timing accuracy and mode changes in your system.

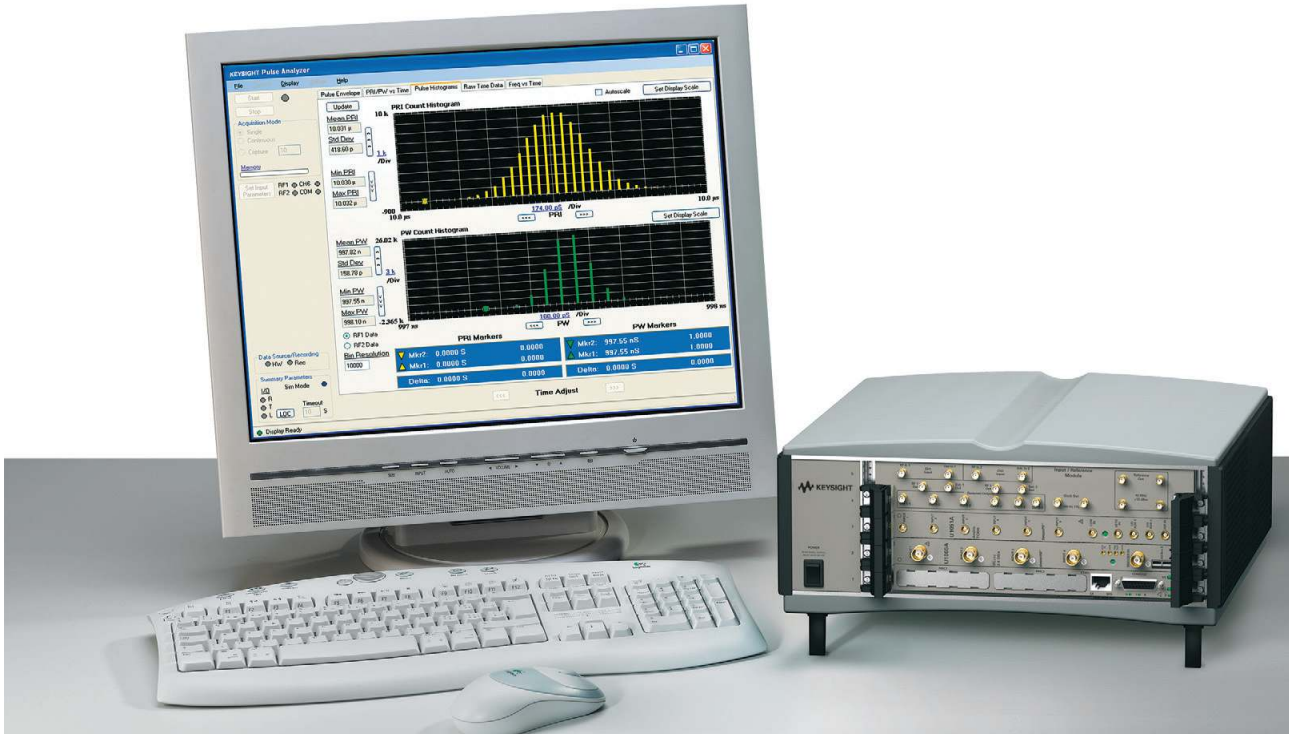


Figure 1. Keysight pulse analyzer system

Extreme measurement efficiency

The advantages are clear when performing time interval analysis based on zero dead time, time-to-data-converter (TDC) technology. Extreme efficiency in memory use and data transfer can be achieved by eliminating the dead time when measuring pulsed RF signals. By storing only the precise times for rising and falling edges of the RF pulse, the PAS makes optimal use of the 4M event memory in the Keysight TDC. The dual memory architecture of this TDC supports unrestricted time capture length at rates as high as 1M events per second. Extreme accuracy and time resolution of 50 ps is achieved independent of time record length. The PAS system provides a wide bandwidth, 2 channel RF input reference module (IRM) with built-in detectors and an ultra low noise/low jitter 10 MHz reference oscillator. This IRM combines all of the necessary signal routing, TDC clock and 10 MHz reference outputs. These features along with the flexible internal and external triggering functions allow you to synchronize the PAS and other measurement instruments with your RADAR system operation.

Time interval analysis using the Keysight pulse analyzer system

For applications focused on time interval analysis of RADAR signals, use the PAS system to make measurements such as:

- RF pulse width (PW) versus time
- RF pulse repetition interval (PRI or PRF) versus time
- PW and PRI histograms and statistics (min/max, mean, std deviation)
- Raw time interval data and frequency versus time data
- Flexible internal and external triggering functions
- Markers and zooming features

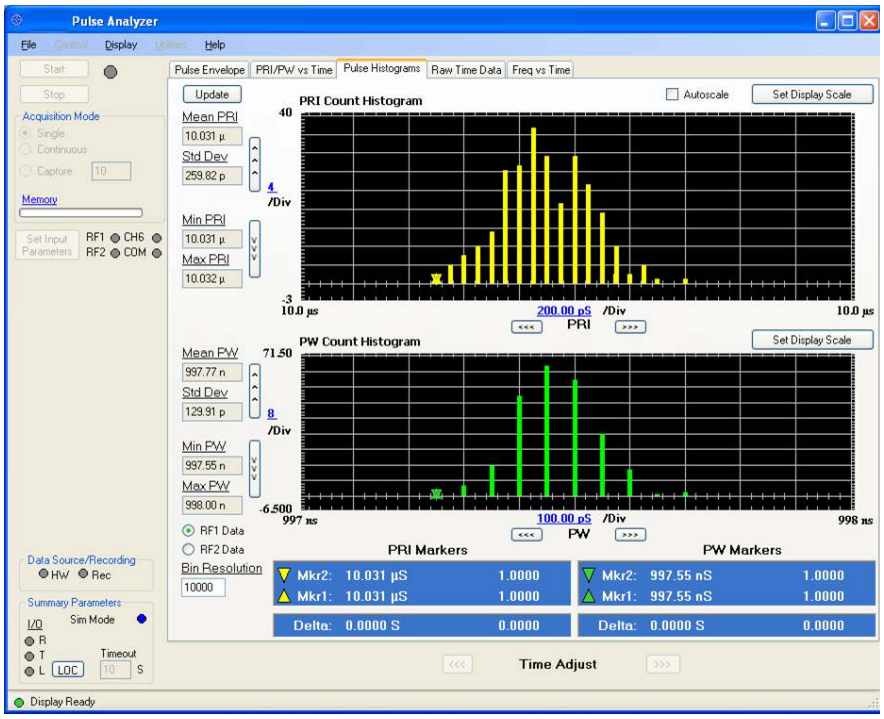


Figure 2. Histogram and statistics on PRI (yellow) and PW (green)

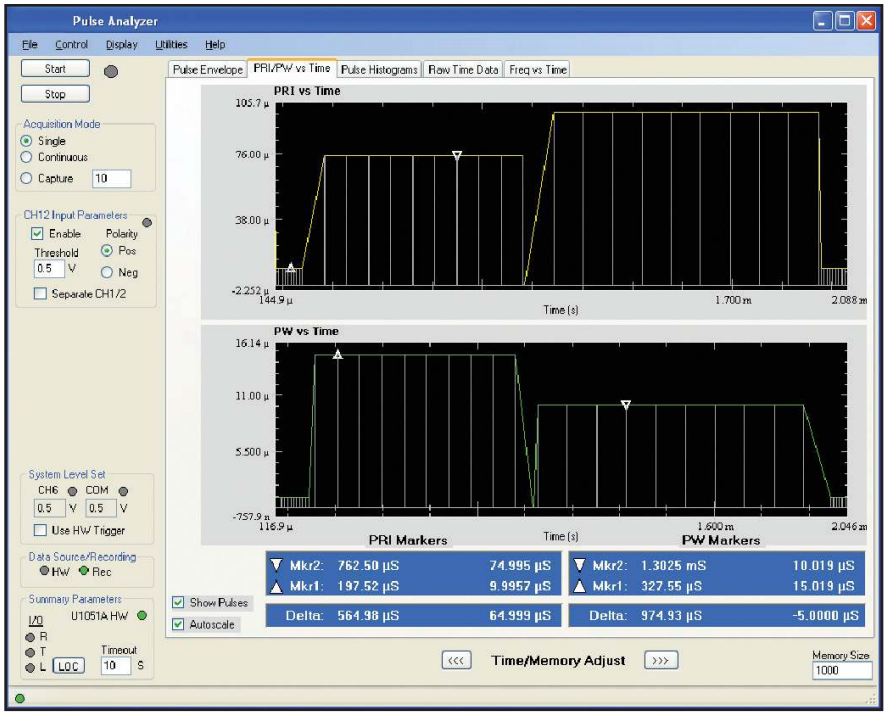


Figure 3. PAS system shows the RADAR mode changes with PRI vs time and PW vs time

Add the 4-channel digitizer for up to 8 GS/sec sampling with 10-bit resolution

The digitizer option includes a 4-channel digitizer with 2 of the channels available as direct inputs and 2 channels connected through the IRM in parallel to the TDC for simultaneous operation in both measurement modes. Capture and store digitized samples (to a file) for off-line analysis or for direct control via the 89601A VSA software. This enables measurements such as:

- Detected pulse envelope vs time
- Pulse power measurements
- Measure RF power (peak and average) of an input pulsed RF signal

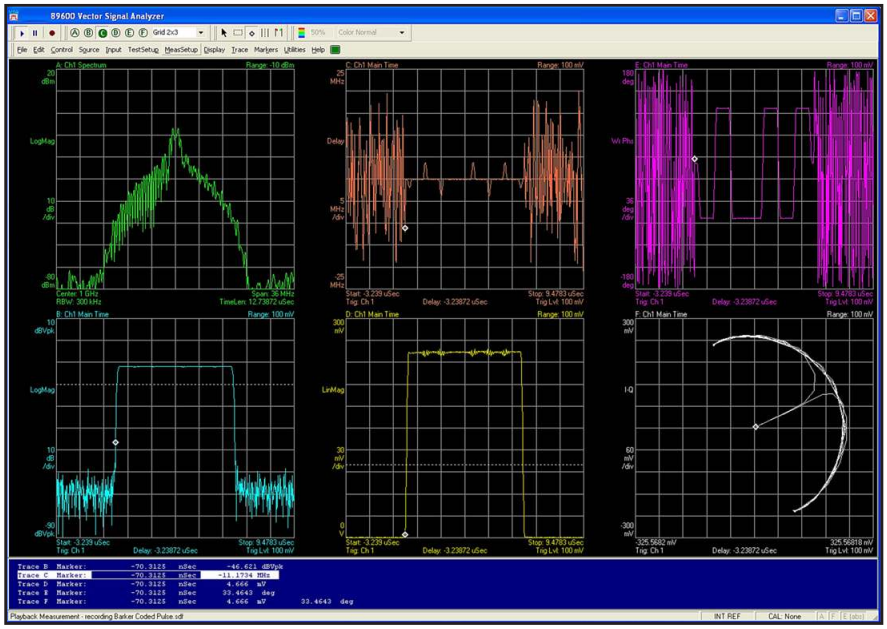


Figure 4. Barker coded pulsed RF showing frequency, delay, phase, time (log), time (linear), and I/Q

Add VSA software for extensive demodulation and analysis capability

With the Keysight 89601A VSA software, the PAS has extensive signal demodulation and analysis capability for a wide variety of RADAR signal and modulation types. This unique combination of extreme efficiency, accuracy, speed, and signal analysis capability make the Keysight PAS ideal for your modern RADAR system testing needs. Make additional measurements such as:

- Pulse carrier frequency measurements
- Pulse amplitude and power vs time (peak, average, overshoot)
- Modulation on pulse measurements (FM chirp, barker, Doppler, etc.)

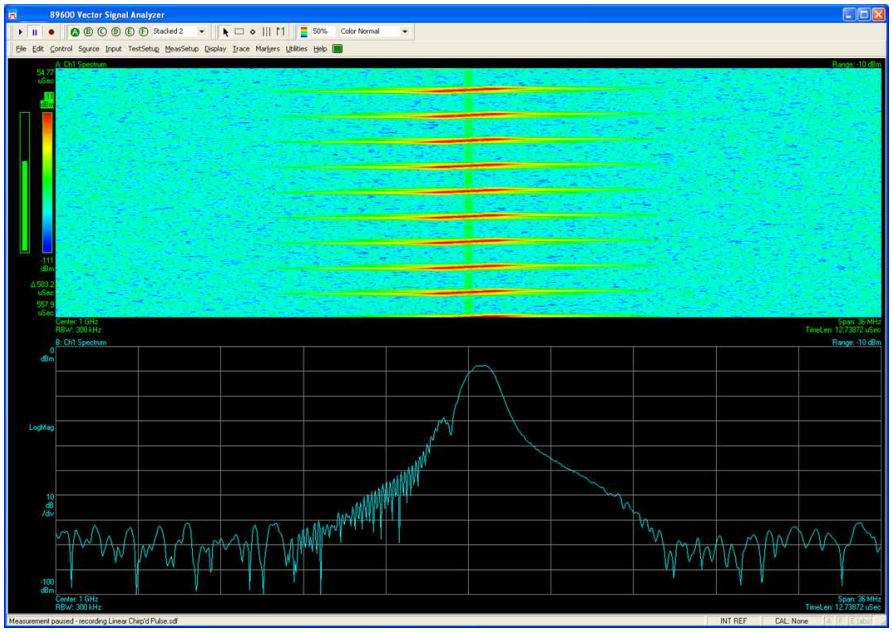


Figure 5. Pulsed RF linear chirp with spectrogram and frequency spectrum

Keysight PAS System Characteristics Compared to Legacy HP Systems

System characteristics	Keysight PAS system	HP 5371A / 5372A	HP 53310A
Channels	2 channel TDC; optional 4 channel digitizer	2 channel; optional 3rd channel	2 channel; optional 3rd channel
Frequency range	18 GHz (TDC via IRM detector) 2 GHz on digitizer	500 MHz/2 GHz; 3rd channel optional; external mixer/detector and LO source for 2 to 18 GHz	200 MHz/2.5 GHz 3rd channel optional; external mixer/detector and LO source for 2 to 18 GHz
Bandwidth	80 MHz (TDC) 2 GHz (digitizer)	500 MHz/2 GHz optional	200 MHz/2.5 GHz optional
Time interval and resolution	Unrestricted time capture with 50 ps resolution	Up to 8 seconds with 150 ps resolution	Up to 1 second with 200 ps resolution
Sustainable system capture rate	1 M events/second	N/A; accumulate statistics and histogram data only	N/A; accumulate statistics and histogram data only
Data transfer rate	25M events/second over PCI bus	25k measurements/second over GPIB	25k measurements/second over GPIB
System controller	Embedded compact PCI controller	External via GPIB	External via GPIB
Measurement memory	4M events (TDC) 1 Gsample (digitizer)	8k measurements	8k measurements; 32k optional
Minimum PW	250 ps	1 ns	1 ns
Minimum PRI	15 ns	75 ns	75 ns
Measurement functions	PW, PRI, PRF vs time, statistics, and histograms; Raw frequency and time interval data; Extensive vector modulation analysis with VSA option	PW, PRI, PRF vs time, statistics, histograms, duty cycle; Jitter and Allan variance Raw frequency and time interval data (very limited capture time) Basic modulation analysis	PW, PRI, PRF vs time, statistics, histograms, duty cycle jitter and Allan variance Raw frequency and time interval data (very limited capture time) Basic modulation analysis
Triggering functions	Internal and external	Internal and external; some advanced arming functions to optimize use of limited time capture	Internal and external; some advanced arming functions to optimize use of limited time capture

Keysight PAS System Ordering Information — Model no.

Standard pulse analyzer system (PAS) — Z2090B-170

- Multi-stop time-to-digital converter with multi-start acquisition mode
- 50 pico second timing resolution
- Large internal memory buffer, with up to 4 million events
- External 10 MHz reference input
- Fast DMA readout mode for increased data throughput
- Data streaming mode allows continuous acquisition and readout
- Low power consumption (< 24 W)
- Time to digital converter card
- PAS application software
- Embedded controller card
- Keyboard, 17-inch LCD, mouse
- Modular 5-slot PXI/Compact PCI mainframe

Add 4 channel, 10-bit digitizer card — Z2090B-171

- Up to 8 GS/s sampling rate with 10-bit ADC resolution
- 2 GHz bandwidth, 50 Ω, DC or AC coupled, with internal DC calibration
- 1 GSample acquisition memory
- High-resolution trigger time interpolator (TTI) for accurate timing measurements
- Sustained data transfer rates up to 400 MB/s
- Compatible with 89601A vector signal analysis software

Add VSA software — Z2090B-172

- Extensive signal demodulation analysis
- Additional RADAR signal analysis capability

Custom configurations available to meet your specific application needs.

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