

Speeding Up High-Volume Testing

Trusted, efficient IP in PathWave measurements toolkit

Enabling Customized Test Environments with Faster Execution

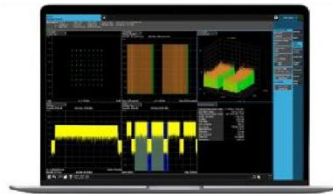
High-volume test environments demand efficiency. Measurement blocks must focus on execution speed. Interconnects should scale with data streams from a variety of instruments. For optimizing tests, developers need control over everything. Test engineers are familiar with several barriers to optimization:

- Instrumentation solutions may come from more than one manufacturer.
- Pre-configured analysis routines often lack speed and flexibility.
- Test software applications carry along more measurements than needed.
- Equipment utilization with parallel analysis can be difficult and inefficient.

Advanced Keysight measurement solutions like PathWave vector signal analysis (89600 VSA), PathWave X-Series measurement applications (X-apps), and WaveJudge wireless analysis application software feature powerful analysis. What if these analyses could work in an optimized, high-volume test environment?



Pathwave vector
signal analysis
(89600 VSA)



Pathwave X-Series
measurement
applications (X-apps)



WaveJudge wireless
analysis application
software

PathWave Measurements provides a test software framework using trusted Keysight measurement science and analytics designed for high-volume testing. It works with any instruments, Keysight or non-Keysight, acquiring data. Developers can include only the features needed with nothing extra, building on state-of-the-art signal analysis software intellectual property (IP). By decoupling acquisition from analysis, many streams of data can come to one platform, helping to scale testing.

Manufacturing test engineers, DVT engineers, test SW developers and architects enjoy 2 to 4 times faster test execution after developing customized, streamlined applications using PathWave Measurements. Add advantages of no instrument lock-in and easy-to-use development tools, and it's a breakthrough for high-volume test.

What is PathWave measurements?

A software toolkit for creating custom test solutions using routines backed by Keysight measurement science in streamlined software IP.

Who needs PathWave measurements?

- Manufacturing test engineers
- DVT and NPI engineers
- Test SW developers and architects

Architecting Test Configurations with PathWave Measurements

Analysis IP in PathWave Measurements is the same found in the Keysight VSA and X-apps, optimized and repackaged in a lean format for easy integration. This unshackles the IP from unnecessary overhead, essential for creating efficient tests.

Application code comes in a set of .NET libraries with various plugins. Each plugin performs a specific function, such as acquiring data from a file or instrument, or demodulating a 5G NR signal. A plugin defines a transform between its input and output pins. Settings exposed by each plugin's application programming interface (API) control the plugin operation.

A measurement creates instances of required plugins and connects them together. In this way, data outputs from a given plugin can be used as data inputs to a subsequent plugin, creating a measurement data flow. Test application code can define measurements directly, or load measurements previously configured and saved in a setup file for reuse. Creating and editing measurements is easy in the graphical PWM Measurement Designer tool or a command line interface.

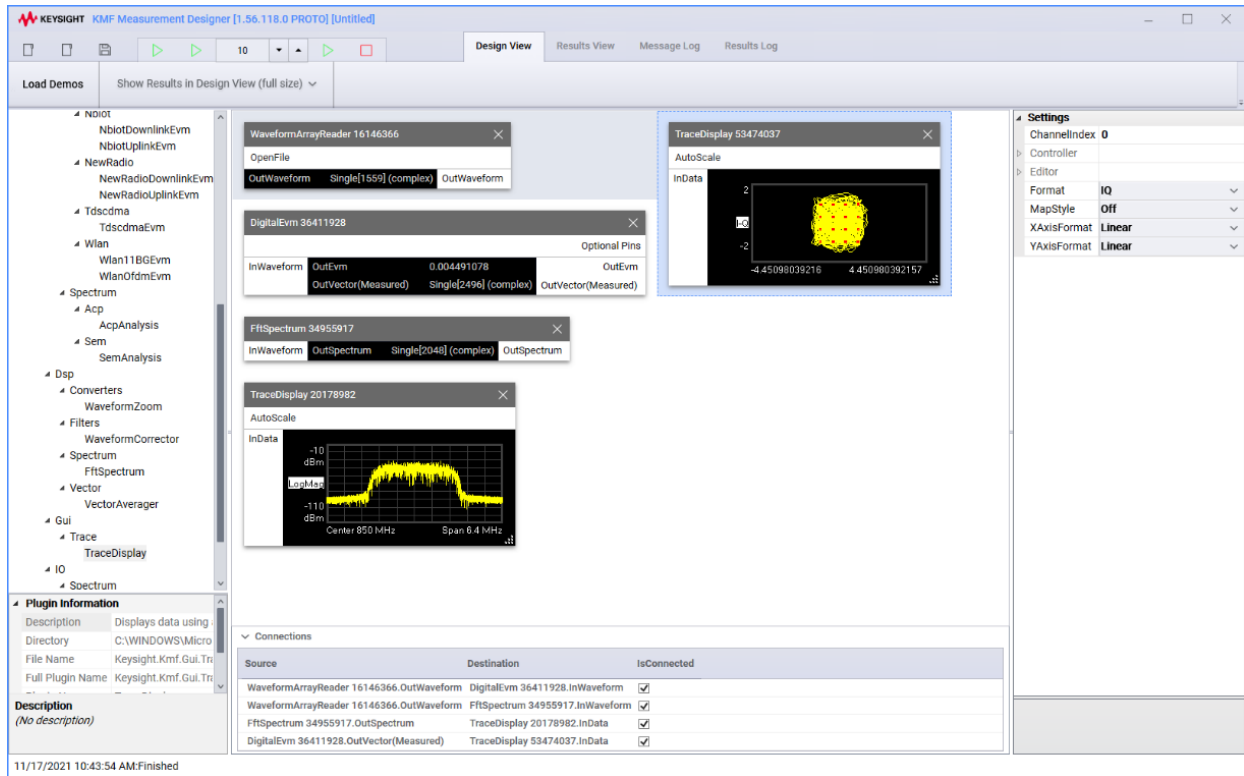


Figure 1. Simple measurement data flow in design view of PWM Measurement Designer

Plugins allow separation of data acquisition from analysis. Acquisition plugins bring in data from live instruments, pre-recorded signals, simulations, or custom algorithms. Analysis is agnostic of its source. This makes switching between data sources easy while moving from design to validation to manufacturing. More importantly, a data flow can be set for asynchronous operation. Acquiring in parallel with analysis improves test throughput and makes efficient use of valuable test hardware.

Any plugin output can feed more than one plugin for different analyses. For example, one IQ data capture may feed an EVM calculation, SEM measurement, and ACP measurement. Most analysis plugins can operate on many input data sets simultaneously, and leverage multi-core CPUs.

Optimizing Measurements with Built-in Performance Monitoring

Full control of all aspects of a measurement solution is important. With so many degrees of freedom, it might seem overwhelming to know which levers to pull to make a test application run faster.

To aid developers, the PathWave Measurements infrastructure is fully instrumented. It gathers microsecond-resolution performance information about an application while running. Developers can visualize a test system using the PWM Performance Monitor. It displays exactly how long each plugin takes to perform its function and helps to highlight where there might be bottlenecks in a configuration.

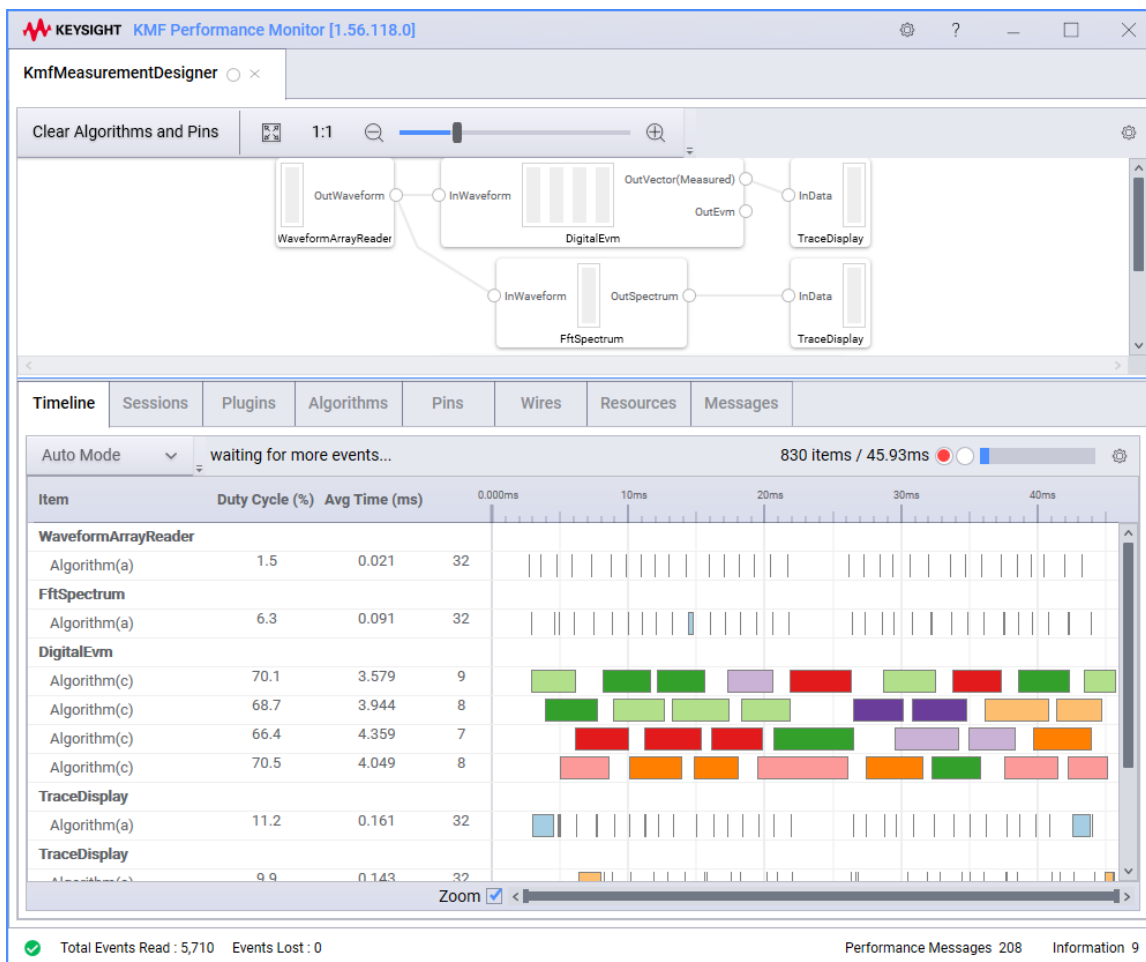


Figure 2. Example showing measurement execution timeline in PWM Performance Monitor

Evolving with New Instruments and Devices Under Test (DUTs)

PathWave Measurements makes it easier to move existing tests to new DUTs and new instruments. Instruments have long life cycles but still do become obsolete over time. When a test lab depends on instrument-based measurements, obsolescence of any one instrument means rewriting and requalifying tests. Connectivity to the DUT may also change over its life cycle.

Instruments and DUTs are data sources for PathWave Measurements. When a newer instrument becomes available, all that changes is a resource adapter – Keysight instruments come with ready-made adapters. Similarly, DUT connectivity updates by modifying a resource adapter. With modifications made easy, test developers can concentrate on scalability and performance.

Extending Test Configurations for More Scalability

Two test configurations are possible: a PWM direct configuration or a PWM client / server configuration. In the PWM direct configuration, a .NET measurement application performs in-process API calls to PWM .NET plugin assemblies. No interprocess communication occurs, providing fast measurements. Data acquisition can overlap with analysis. Different analyses can run on a single acquisition, or many analyses can run in parallel. Developers can flexibly write the code coordinating these activities.

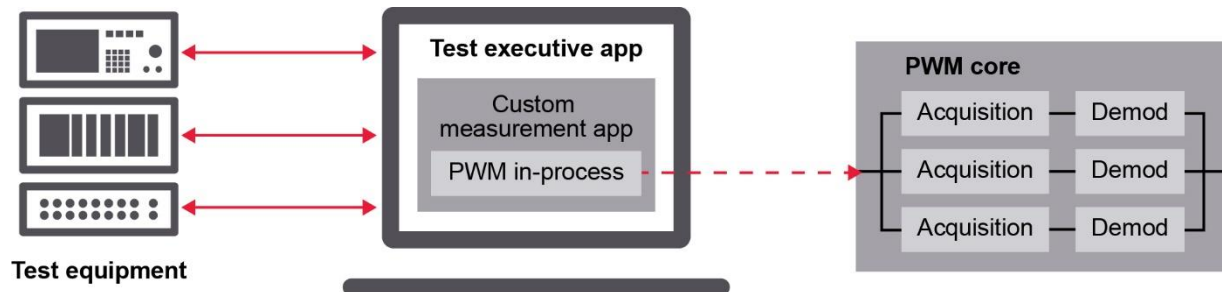


Figure 3. A simple PWM direct configuration with parallel measurements

In the PWM client / server configuration, a client application acquires data and sends it to a licensed instance of the PWM server as an API measurement request. The PWM server runs in its own separate process, gracefully managing simultaneous requests from one or more clients. The requests to the server are asynchronous. A test application is free to start the next acquisition while the server is processing the data from the previous acquisition. Measurement results return as soon as they are ready.

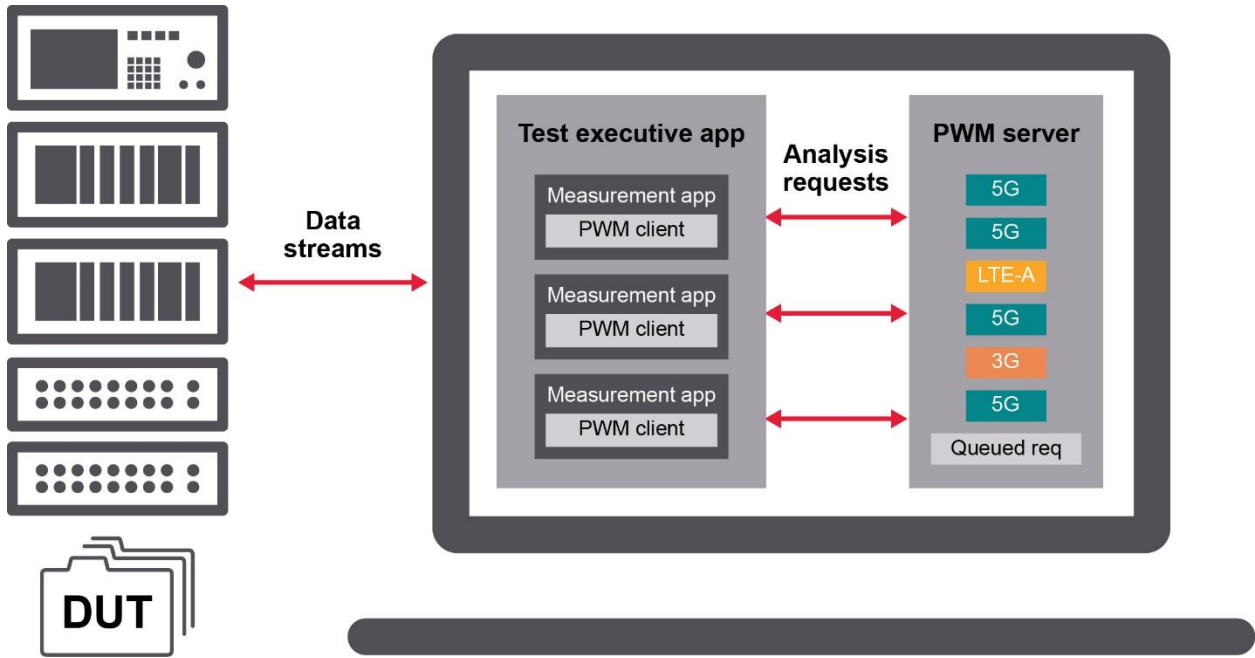


Figure 4. A more flexible PWM client / server configuration scales data streams, clients, and analysis requests

PWM direct	PWM client / server
Fastest execution	Reduced cost-of-test (license sharing)
Smallest footprint	Commercial server support, provides scalable concurrency
.NET API (simplest) Runs inside customer's .NET test executive	.NET or Java Client API on Windows or Linux "Cloud-ready API"
Supports asynchrony & parallelism	Supports asynchrony & parallelism
Per-process licensing	Licenses shared across all client processes

PathWave Measurements - Ordering Information and Licensing

PathWave Measurements licenses are available in node-locked 12-month subscriptions and other flexible licensing formats. Development requires a Base Pack, and add-on packs provide plugins for specific tests.

Model	Name	Description
KS9801BP2B	PathWave Measurements Base Pack	Includes Core, Measurement Server, Waveform Array Reader, Waveform File Reader, VmuResample, FFTSpectrum, WaveformZoom, WaveformCorrector, TraceDisplay, WPFTraceGraph, VectorAverager
KS9801M51B	PathWave Measurements 5G NR EVM Pack	Includes 5G NR Uplink & Downlink
KS9801PV5B	PathWave Measurements 5G NR Downlink PvT Pack	Includes 5G NR Downlink Power v Time
KS9801ML1B	PathWave Measurements LTE-A FDD EVM Pack	Includes LTE-A FDD Uplink & Downlink (and LTE)
KS9801ML3B	PathWave Measurements LTE-A TDD EVM Pack	Includes LTE-A TDD Uplink & Downlink (and LTE)
KS9801PV4B	PathWave Measurements LTE-A TDD Downlink PvT Pack	Includes LTE-A TDD Downlink Power v Time
KS9801MN1B	PathWave Measurements NB-IoT EVM Pack	Includes NB-IoT Uplink & Downlink
KS9801UWBB	PathWave Measurements UWB Analysis Pack	Includes HRP UWB Analysis
KS9801CP1B	PathWave Measurements Mature Cellular EVM Pack	Includes WCDMA (Uplink & Downlink), CDMA2000 (Reverse & Forward), TD-SCDMA, EV-DO (Reverse & Forward), and GSM
KS9801SP1B	PathWave Measurements PowerSuite Analysis Pack	Provides spectrum measurements including Channel Power, ACP, SEM, and OBW
KS9801MW3B	PathWave Measurements WLAN EVM Pack	Includes WLAN legacy (802.11a/b/g/af/ah) and WLAN N+ (802.11n/ac/ax/be)
KS9800M01B	PathWave Measurements Digital Modulation Analysis	Includes DigitalEvm (vector demodulation) personalities

The bundled KS9801BP3B PathWave Measurements Cellular Analysis Pack includes all the following:

- KS9801BP2B, PathWave Measurements Base Pack
- KS9801M51B, PathWave Measurements 5G NR EVM Pack
- KS9801PV5B, PathWave Measurements 5G NR Downlink PvT Pack
- KS9801ML1B, PathWave Measurements LTE-A FDD EVM Pack
- KS9801ML3B, PathWave Measurements LTE-A TDD EVM Pack
- KS9801PV4B, PathWave Measurements LTE-A TDD Downlink PvT Pack
- KS9801MN1B, PathWave Measurements NB-IoT EVM Pack
- KS9801CP1B, PathWave Measurements Mature Cellular EVM Pack
- KS9801SP1B, PathWave Measurements PowerSuite Analysis Pack

Integrating with PathWave Test Automation (TAP)

Test developers using PathWave Measurements can leverage Keysight IP for system-level tests of cutting-edge communications technology. Test development time shortens, and confidence in complex testing increases. Developers can integrate PathWave Measurements with other Keysight signal analysis and simulation software including PathWave Test Automation (TAP).

TAP leverages an open source test sequencing engine called OpenTAP. Using TAP's GUI's, a DVT engineer can develop, optimize, and manage tests. Once tests complete, one can easily visualize, compare, and share test results. Migration to PathWave Measurements is easy, as measurements integrate as test steps in TAP.

For More Information on PathWave Measurements

Visit the PathWave Measurements product page online: <https://www.keysight.com/find/pwm>

PathWave Measurements is often paired with [PathWave Test Automation](#) (TAP). Other Keysight signal analysis and simulation software:

- [PathWave Vector Signal Analysis](#) (89600 VSA)
- [PathWave X-Series Measurement Applications](#) (X-apps)
- [PathWave System Design](#)