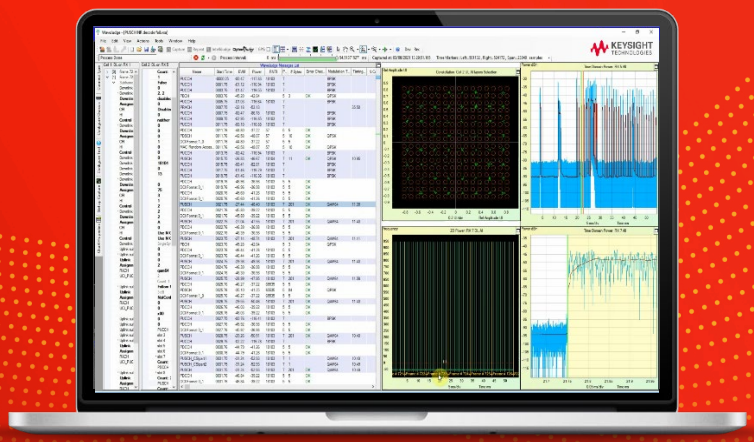

TECHNICAL OVERVIEW

SJ001A WaveJudge Wireless Analyzer Toolset

Introduction

Testing 5G requires diagnosing the root causes of problems between layers, which often takes hours, days or even weeks.

SJ001A WaveJudge Wireless Analyzer Toolset provides visibility into protocol and physical layer interaction in wireless transmissions, with the ability to record and review the conditions when performance is optimal and compare when the results are less than expected.

5G

The SJ001A WaveJudge Wireless Analyzer Toolset, ultimate authority in wireless testing, is your essential tool for troubleshooting wireless development and deployment issues

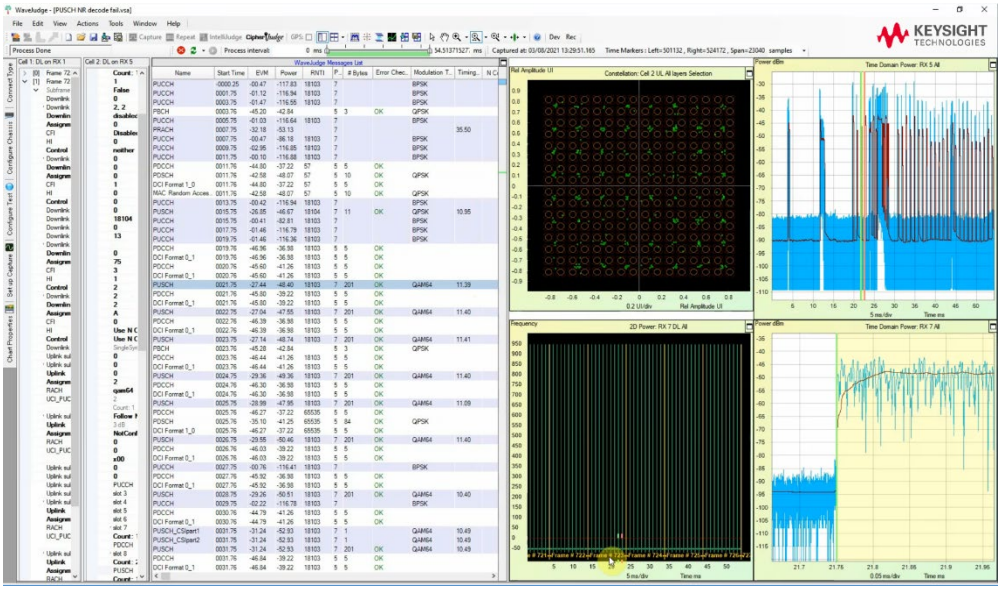

Figure 1. Protocol messages correlation relative to PHY events allows troubleshooting functional and interoperability issues

KEYSIGHT TECHNOLOGIES

The Best Wireless Troubleshooting Solution Just Got Better

The SJ001A WaveJudge Wireless Analyzer Toolset, the first air monitor solution to give you real-time visibility into the interaction between protocol and physical layers in wireless transmissions, is now more scalable, customizable, and cost effective than ever.

Building on the power of the capabilities of the SJ001A WaveJudge Wireless Analyzer Toolset/IntelliJudge product line, the SJ001A WaveJudge Wireless Analyzer Toolset features a modular chassis that enables you to customize your troubleshooting platform to address specific challenges.

- *Multiple ports to test higher order MIMO* - The SJ001A WaveJudge Wireless Analyzer Toolset can support up to 16 truly synchronized ports. Test up to 8×8 MIMO configurations and incorporate multiple layers beyond the current two-layer scheme.
- *High bandwidth to test Carrier Aggregation* - The SJ001A WaveJudge Wireless Analyzer Toolset can support up to eight Component Carriers of CA with up to 800 MHz channels.
- *High memory for data capture to troubleshoot timing or functionality* - The SJ001A WaveJudge Wireless Analyzer Toolset memory modules can store hours of IQ data with flexible configuration options.
- *Large number of antennas* - The SJ001A WaveJudge Wireless Analyzer Toolset ports are truly synchronized, allowing you to avoid time-consuming tangents such as troubleshooting alignment issues between devices.

These capabilities are complemented by advanced features including:

- Programmable frequency (from 380 MHz to 11.4 GHz) to facilitate systems development for multiple markets.
- The latest in DSP cores, FPGA density, and technology-specific accelerators to enable real-time testing.

As wireless technology marches forward to 5G, technologies such as Carrier Aggregation, higher-order MIMO, coordinated multipoint, and beamforming arise to meet the ever-increasing demand for speed, quality, and reliability in wireless communications. The SJ001A WaveJudge Wireless Analyzer Toolset keeps your test solution at the front of the technology curve by maximizing bandwidth and spectrum.

With a cost-effective, proprietary, modular platform that maximizes flexibility and scalability, the SJ001A WaveJudge Wireless Analyzer Toolset has the ability to cover the RF profiles of today's *5G/*LTE networks and the flexibility to adapt to new spectrum as the RF industry continues to evolve.

Benefits of the SJ001A WaveJudge Wireless Analyzer Toolset Modular Architecture

- *Flexible:* Tailor the system to your specific test requirements
- *Scalable:* Start small and add the modules you need when you need them
- *Powerful:* Up to 800 MHz channels, sub-6 and mmWave frequencies, allow you to test high-port-density solutions such as MIMO, CA (up to 8 carriers), and beamforming
- *Cost-effective:* Purpose-built proprietary architecture in a small footprint is more efficient.
- *Future-proof:* Architecture can adapt to the transformation of the wireless industry, protecting your investment.

The SJ001A WaveJudge Wireless Analyzer Toolset, the ultimate authority in wireless testing, is your essential tool for troubleshooting wireless development and deployment issues.

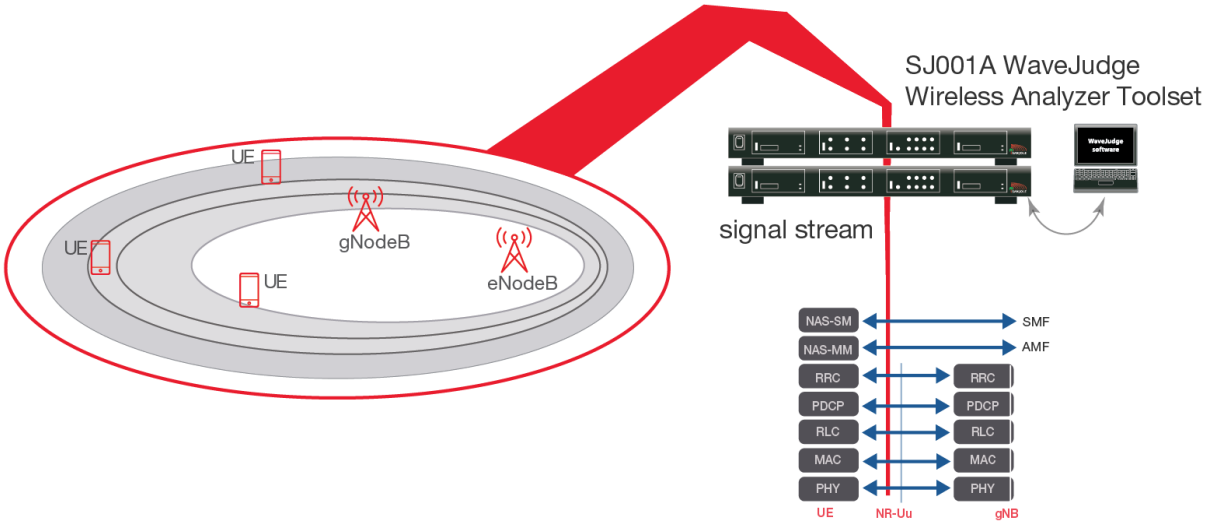

Figure 1. SJ001A WaveJudge Wireless Analyzer Toolset air monitor provides real-time visibility into interaction between physical and protocol layers in wireless communications.

SJ001A WaveJudge Wireless Analyzer Toolset

Modular architecture

By moving from a single-use box to a modular system, the SJ001A WaveJudge Wireless Analyzer Toolset transfers the components of the system from fixed motherboards and daughterboards to a selection of modules (cards) that can be installed or removed as the application requires.

Up to 256 modules can be employed in a single SJ001A WaveJudge Wireless Analyzer Toolset test system, enabling massive scalability (including ports and memory) and welcomed flexibility in system configuration to meet specific or demanding test situations.

This flexibility is enhanced by the SJ001A WaveJudge Wireless Analyzer Toolset's system-wide port synchronization, enabling faster and easier module installation.

From a practical point of view, this proprietary, purpose-built, modular architecture is much more targeted and cost effective than a one-size-fits-all standard platform, and so allows maximized coverage of your testing budget.

Use SJ001A WaveJudge Wireless Analyzer Toolset to:

Identify & Analyze

- DL assignment and UL grant analysis
- Scheduling errors
- DL/UL timing offsets
- Resource block assignments
- Subcarrier energy usage
- L1–L3 usage
- MIMO type and rank comparison
- MIMO decodes
- Handover issues
- Synchronization and reference signal errors
- Attach process failures

Solve

- Interference questions
- Attach process failures
- Cell synchronization
- Handover issues
- Optimization and efficiency issues
- Finger pointing /engineering confusion
- Deployment delays

Modules

RXJudge 4-port RF Receive Module

RXJudge 4-port RF receive modules feature superior sensitivity and dynamic range enabling you to test in the lab and in the field. Each module features four independent, configurable 40 MHz receivers.

All ports in a system are truly synchronized and are sample- and phased-locked (coherent). By providing synchronized, coherent ports right out of the box, the SJ001A WaveJudge Wireless Analyzer Toolset does not rely on independent synchronization lock per test device that can drift with respect to a common source. This saves you the time required up front to assure all devices are synchronized, or in the case of some multibox solutions, calibrated. You also save the time lost in troubleshooting synchronization and coherence issues during testing.

RXJudge2 Digital IF (800 MHz Module)

This module features single channel digital baseband IF interface module with 2400 Mhz sampling rate. The RXJudge2 Digital IF (800 MHz Module) provides 800 MHz Module analysis over a 1x800 channel BW and 1024 MSample capture buffer and connectivity for 2-11.4 Ghz RF/IF testing. It has controls and interfaces with external Remote mmWaveJudge module.

IntelliJudge2 Module

The latest in DSP cores, FPGA density, dynamic RAM and technology-specific accelerators power the IntelliJudge2 modules and provide real-time testing. Cost effectively analyze, trigger, filter, log, and chart everything in the wireless channel for any amount of time.

Because the IntelliJudge2 modules are now completely integrated into the SJ001A WaveJudge Wireless Analyzer Toolset platform, you can configure your system to take advantage of real-time analysis with no time constraints, triggering on lower and upper layer events, errors, messages, and message content. This gives you the powerful ability to isolate problem areas regardless of the layer in which they occur, to detect and eliminate transient errors and bypass the finger pointing between vendors that can delay release dates by weeks or months.

SynthJudge 2-OCXO Clock Module

Dual frequency, from 380 MHz to 6 GHz, is particularly useful when developing systems for multiple markets. Leverage your testing investment to cover multiple spectrum bands.

Some test solutions require multiple boxes, which must synchronize to a common external clock (typically 10 MHz) received via cables for sampling. Sample count alignment is typically handled by either field calibration or GPS timestamp correlation between boxes. In the SJ001A WaveJudge Wireless Analyzer Toolset, there is only one primary clock module, which is derived from a selection of internal OCXO, external user clock, or GPS. This sample clock, along with the exact sample count, is distributed to all chassis and modules in a SJ001A WaveJudge Wireless Analyzer Toolset system. There is never a need to worry about sample count or timestamp misalignment.

StoraJudge IQ SSD Storage Module

You can customize your system for analysis/troubleshooting of short captures or for tracking long-term trends or to isolate intermittent anomalies.

In addition, down-converted analog IQ signals are now stored on the memory modules instead of a fixed 4 GB cache, allowing you to extend the capture timeframe for enhanced troubleshooting.

Depending on your application, IQ captures can be invaluable in recreating the wireless channel and providing in-depth physical analysis. The IntelliJudge2 modules share dynamic RAM for short captures of seconds or minutes depending on your module arrangement, while StoraJudge IQ SSD Storage modules store hours of IQ capture. This flexibility addresses your application requirements without breaking your budget.

mmWaveJudge (External Module)

The mmWaveJudge module interfaces with the RXJudge2 Digital IF (800 MHz Module) and provides basic 2x2 MIMO or massive MIMO applications at mmWave bands. Its output range is from 2.5GHz to 11.5GHz; mmWave input range 24-30GHz and 37-42.5GHz; mmWave bandwidth 1.4GHz.

Management

The SJ001A WaveJudge Wireless Analyzer Toolset, is controlled by a laptop or desktop PC running SJ001A WaveJudge Wireless Analyzer Toolset, software connected to the test network via an Ethernet port. The user-friendly software control package, with its strong visual emphasis, greatly simplifies test set up and provides quick graphic confirmation of the test configuration. This feature is very valuable when dealing with complex scenarios.

Learn more at: www.keysight.com

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

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