



KEYSIGHT
WORLD 2019

ETSI WLAN Power Measurement Compliance Testing using USB/LAN Power Sensor

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What is ETSI?

- Stand for European Telecommunications Standards Institute (ETSI)
- Independent & non-profit organization to produce telecommunications standards for today and the future and standardization of information and communication technologies (ICT) within Europe. (telecommunications, broadcasting, and related areas such as intelligent transportation and medical electronics).
- Manufacturers of wideband data transmission systems used in wireless local area networks (WLAN) and *Bluetooth*® devices have to prove compliance to the specifications defined by ETSI.
- The EN 300 328 v1.8.1 (2.4 GHz) and EN 301 893 v1.7.1 (5 GHz) test standards specify new MIMO, beamforming, and adaptivity test requirements.
- Defined new multi-channel synchronous power measurement procedures for a single test system, as well as procedures to support test cases and dynamic frequency selection (DFS).
- R&D and test labs need a regulatory test system for wireless devices operating in the 2.4 GHz and 5 GHz bands

RF Power Measurement Requirement

The WLAN multiple-input-multiple-output (MIMO) wireless connectivity method has been widely used in today's broadband data transmission equipment. The ETSI test standard defined multi-channel RF power measurement requirement and the test challenges:

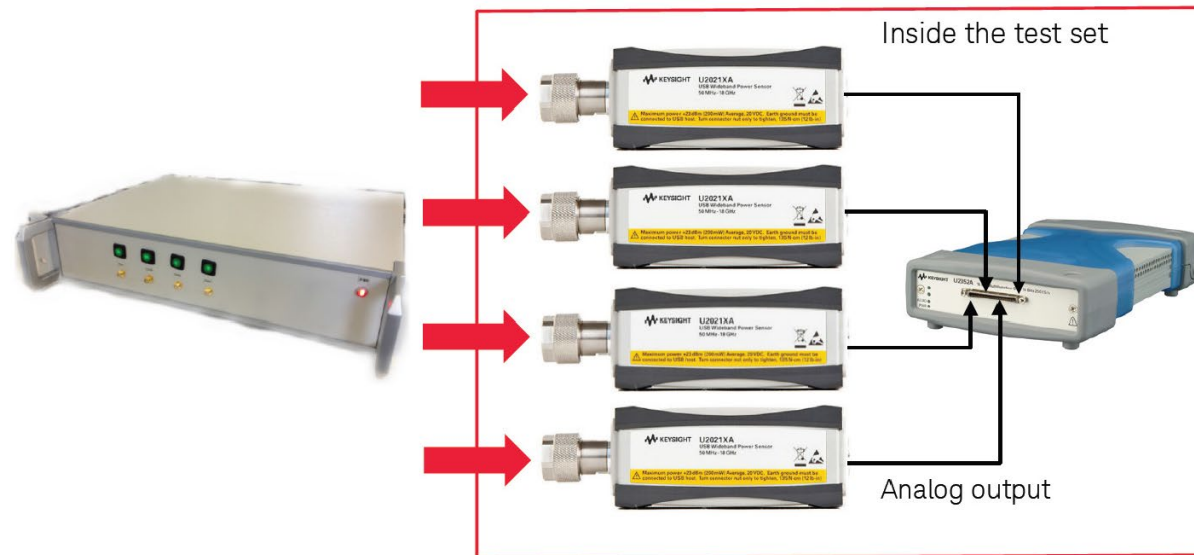
- Up to 4/8/16 measurement channels have to be synchronous at all antenna outputs
- At least a 1 MSa/s measurement rate has to be used
- Up to 4/8/16 million data samples of detection power of the burst signal have to be obtained

RF Power Measurement Challenges

- Power measurement must be fully time-synchronized and in compliance with the standard for up to 4/8/16 channels and have up to 4/8/16 million power detection data samples for the burst signal, allowing it to characterize devices with multiple input multiple output (MIMO) and beamforming capability.
- The power measurement rate must be > 1 Msa/s and support at least 1s measurement time
- Defines a power measurement procedure to be measured: RF output power, duty cycle, Tx sequence, Tx gap, and the medium utilization (MU) factor based on the RF power samples data within burst analysis.

Conventional Test Solution Block Diagram

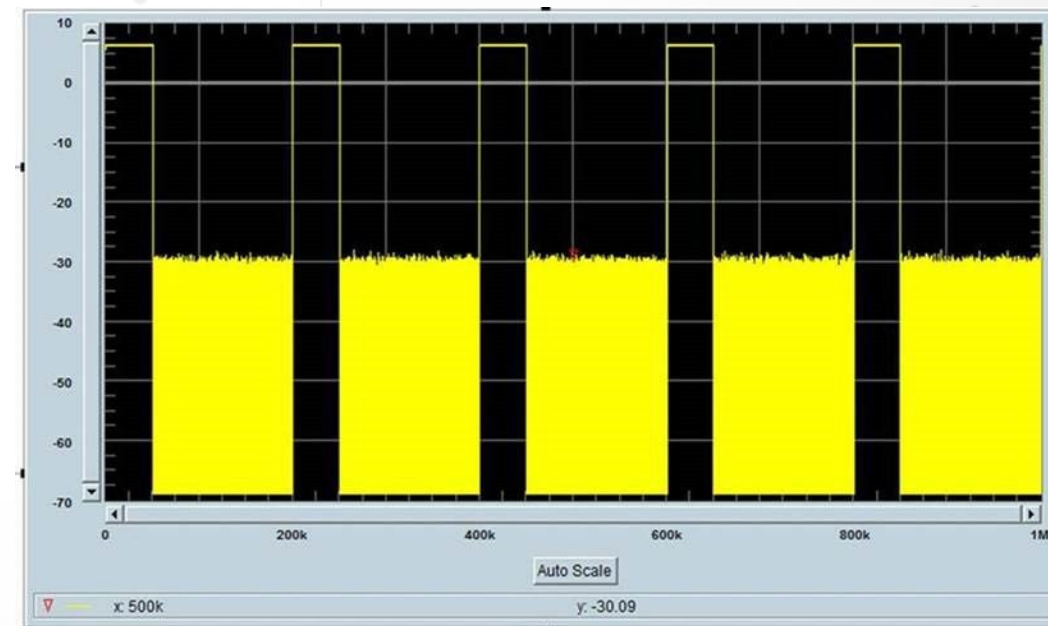
- Consists of U2020 X-Series USB peak power sensor & U2531A USB modular DAQ units
- U2020 X-Series USB peak power sensor has a 96 K memory with an 80 MSa/s capability, limiting its ability to capture un-decimated data for up to just 1.2 ms.
- USB peak power sensor has an analog video output and automatically converts the AC level without the trigger, thus U2531A USB modular DAQ units are used to record the data.
- The U2020 X-Series USB peak power sensor captures the maximum, peak, and average power points, whereas the U2531A USB modular DAQ measures the duty cycle and timing sequence check.



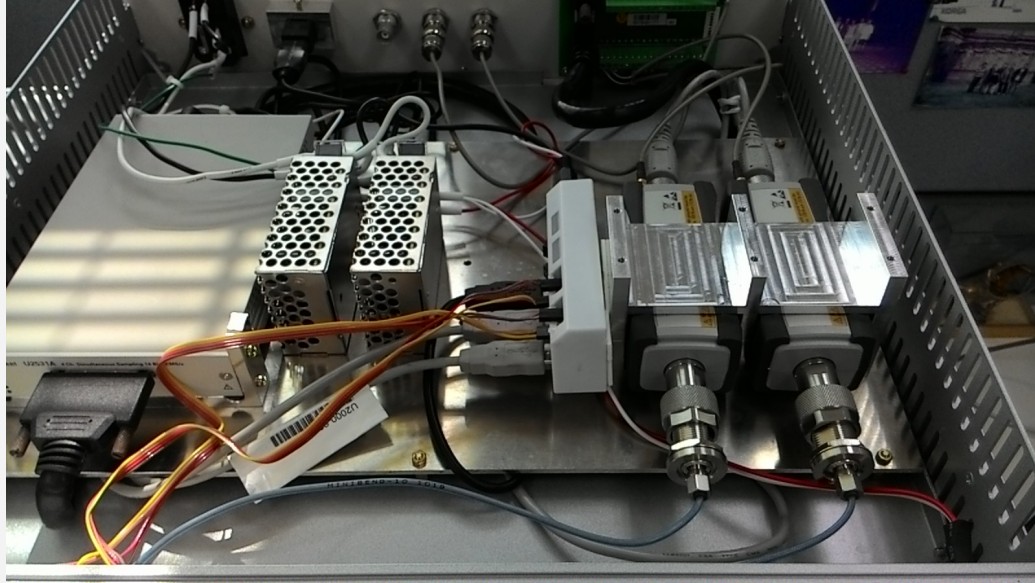
Breakthrough RF Power Measurement Solution



- U/L206x X-series USB/LAN peak power sensor designed to meet the ETSI power measurement requirement capturing 1 M sampling waveforms from the power sensor and requires at least 1 MB memory per second.
- Adjustable sampling rate up to 1 Msa/s and long internal memory up 1 MB. The variable sampling rate function slow down the measurement from the default 20 Ms/s to 1M Sa/s, and the internally can hold data up to 1 M data samples.
- Eliminate the need of additional USB modular DAQ unit and simplified the measurement setup without the need of customize solution.
- Multi-channel synchronous power measurement can be extended and setup easily with multiple U/L206x X-Series power sensors and using external triggering time synchronization.
- The output data samples are stored and kept for offline power measurement analysis as specified by standard.



Simple Measurement Setup



Custom 2 Channel MIMO setup



Simplify 2 Channel MIMO setup and cost

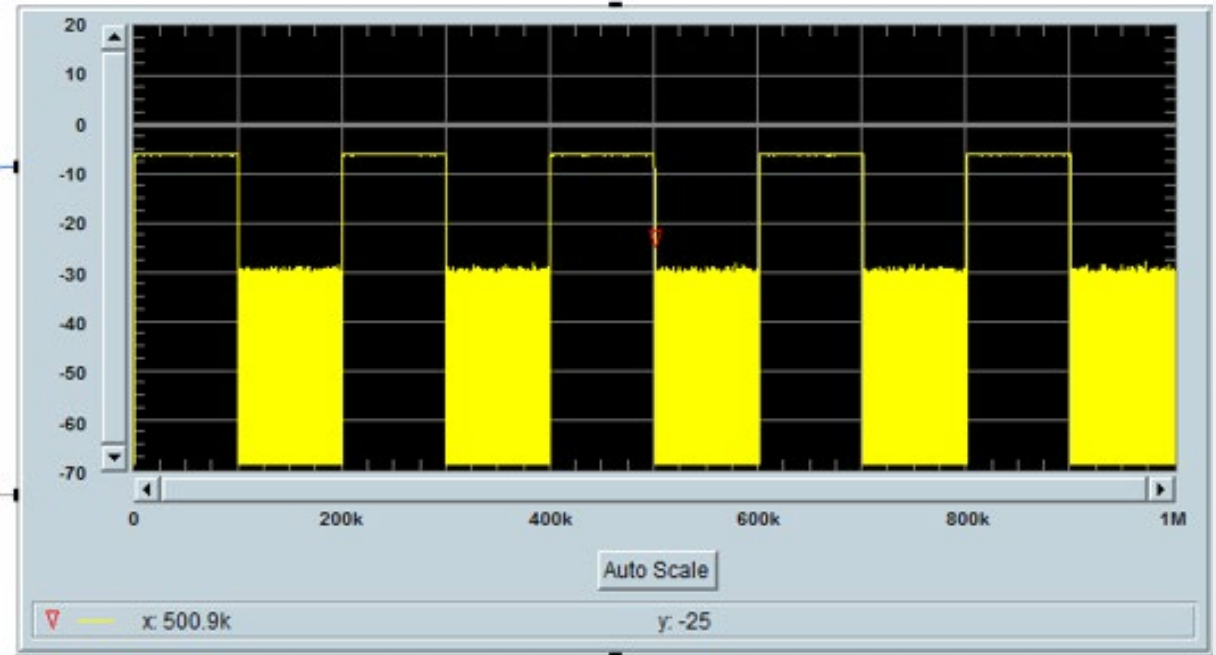


Simple Measurement SCPI

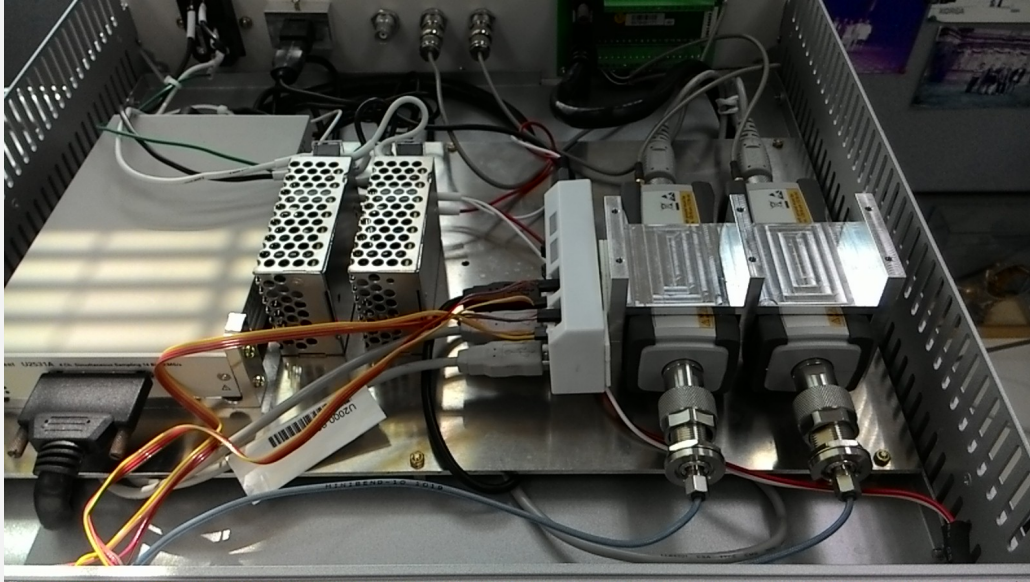
Simplify measurement SCPI/programming

Without Preset	
SENS:DET:FUNC NORMAL	Configure the sensor to peak mode
TRIG:SOUR EXT	Set to external triggering
SENS:AVER:STAT OFF	Turn off averaging
INIT:CONT OFF	Set the sensor single trigger
TRACE:STAT ON	Enable trace capture
SENS:TRACE:TIME 1	Set the trace capture to 1sec
SENS:TRACE:MEM:SIZE LMEM	Enable allocation of memory size 1M byte
INIT	Initialize the measurement
TRAC? LMEM	Querying the 1M samples/sec data

With Preset LMEMACQ	
SYST:PRES LMEMACQ	Configure the sensor to predefined setting of 1M samples/sec acquisition
TRIG:SOUR EXT	Set to external triggering
INIT	Initialize the measurement
TRAC? LMEM	Querying the 1M samples/sec data



Cost Effective Solution



Custom 2 Channel MIMO setup

Equipment Needed

- USB power sensor (x2)
- USB modular DAQ (x1)
- Custom test set (consists of wiring, connector & etc)



Simplify 2 Channel MIMO setup and cost

Equipment Needed

- ***USB power sensor (x2) ONLY***

Keysight USB/LAN Power Sensor Portfolio

Performance



Handheld Avg

- 10M to 6GHz
- -63 to +20dBm



U2000A Series USB Diode Avg

- Freq up to 24GHz
- -60 to +20dBm



U8480 Series USB Thermocouple Avg

- Freq up 120GHz
- -35 to +20dBm



U2040 X-Series USB Wide Dynamic

- Freq up to 6/18GHz (USB) & 33GHz (LAN)
- -70 to +23dBm
- Avg/Peak capability
- 5MHz VBW
- 33GHz LAN w. TVAC



U/L2050/60 X-Series USB/LAN Wide Dynamic

- Freq up to 6/18/33GHz
- -70 to +26dBm
- Avg/Peak power
- 5MHz VBW



U2020 X-Series USB Wideband

- Freq up to 18/40GHz
- -45 to +20dBm
- Avg/Peak power
- 30MHz VBW

Price

U/L2050/60X-Series USB/LAN Peak/Average Power Sensor

- Launched Oct 2018.
- Offer USB/LAN interface power sensor with more freq break from U2040X-Series:
 - USB: U2053XA (33GHz average) & U2063XA (33GHz peak)
 - LAN: L2051/52/53XA (6/18/33GHz average) & L2061/62/63XA (6/18/33GHz peak)
- World widest dynamic range, -70 to +26dBm
- Average and peak power measurement capability, 5MHz VBW

Target Applications

- AD, Wireless Chipset, Satellite Communication
- Instruments and test system calibrations, general purpose scalar power measurements to 33GHz

Key Features:

- Fast & accurate measurements for wide range of signals
- Integrated trigger input/output for simplified measurement setup
- Patented internal zero and cal for accuracy in remote operation
- Real time measurement with zero dead time
- Super fast measurement speed, 10k rdgs/sec
- Long Memory Acquisition up to 1MB & Variable Sampling rate up to 1MSa/s (applicable for USB/LAN peak sensor only) for ETSI measurement application
- Preset setting of Long Memory Acquisition simplified the measurement setup/

NEW

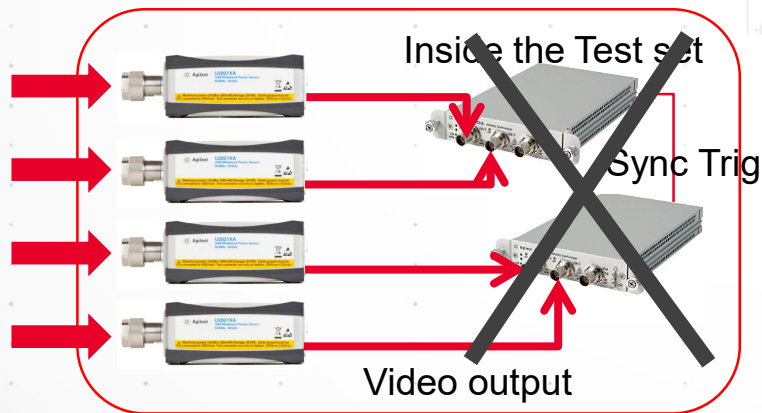


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Key Take Away

- U/L206x X-Series peak power sensor offers one box solution for RF power measurement of multi-antenna MIMO transmission as compared to conventional custom solution which require U2020 X-Series peak power sensor, USB module DAQ and custom test application software.
- The U/L206x X-Series meets the measurement requirements defined in the ETSI EN 300 328 v1.8.1 test standard and shown advantages against the conventional solution.
- U/L206x X-Series power sensor offers adjusted sampling rate up to 1 MSa/s and internal long memory storage up to 1 MB
- Eliminates the need of USB modular DAQ and simplified the measurement setup
- No custom test application software is required and user could capture data samples easily for offline power measurement analysis
- Cost effective solution with minimum hardware and software requirement



No DAQ needed

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