7 Reasons to Migrate from HP/Agilent E4418/4419B to Agilent N1913/1914A EPM Series Power Meter

Migration Guide

Agilent Technologies

Contents

A New Power Meter for Average or Complex Modulation Power Measurement

Continuous average power is the most common power measurement that users make. Therefore, the power meter and the power sensor must achieve accurate power measurement. Agilent Technologies is introducing the N1913/1914A EPM Series power meter, a low-cost power meter that replaces its legacy E4418/4419B EPM Series power meter. The new N1913/1914A offers more features, including compatibility with existing Agilent power sensors, multi-channel power measurement, and a more intuitive graphical user interface.

This document compares the specifications of the legacy E4418/4419B to those of the new N1913/1914A. It also outlines seven reasons to migrate from the E4418/4419B to N1913/1914A.

Introduction

Agilent Technologies is introducing the N1913/1914A. It is a replacement for the E4418/4419B, and is based on the N1911/1912A platform. The N1913/1914A offers all average measurement capabilities, comparable to those of the E4418/4419B. The new N1913/1914A is geared to low-cost average power measurement and offers the single-channel (N1913A) and dual-channel (N1914A) power measurement.

The N1913/1914A provides enhanced features such as four-channel power measurement by using two conventional power sensors and two USB power sensors, improved connectivity (USB slave and LXI-Class C, on top of the existing GPIB), an enhanced user interface (numeric keypad, color LCD, and VGA output), portable smart battery pack, and faster frequency/power sweep measurement. The N1913/1914A is also a platform for obtaining the measurement from the USB power sensor without a PC controller.

Figure 1. The new N1913/1914A display

Key Specifications and Features

Key Specifications

Table 1. Comparison of the new N1913/1914A and E4418/4419B

Specification	N1913/1914A	E4418/4419B
Frequency range	9 kHz to 110 GHz	
Power range	–70 to +44 dBm (sensor dependent)	
Dynamic range	90 dB (single sensor)	
Maximum power	+25 dBm	
Measurement speed	Fast mode: 400 rdgs/s (sensor dependant)	Fast mode: 200 rdgs/s (sensor dependant)
External interface	GPIB, USB, and LAN (LXI-Class C)	GPIB and RS-232
HP437/438B emulation	Yes	
Display	Color LCD	Monochrome
Instrumentation accuracy	±0.5%	
1 mW reference accuracy	±0.4%	
Type of measurement	Average and pulse power	
Supported sensors	E441x, E930x, 848x, and N848x	
USB power sensor compatibility	Yes	No
Battery life	7.4 hrs (backlight off) 6 hrs (backlight off) Fully charged in 2.2 hrs	5.5 hrs (backlight off) 3.5 hrs (backlight on) Fully charged in 2 hrs
Physical dimensions (W x H x D)	212.6 mm x 88.5 mm x 348.3 mm 8.5 in x 3.5 in x 13.7 in	
Weight	N1913A: 3.6 kg (8.2 lb) N1914A: 3.7 kg (8.4 lb)	E4418B: 4.0 kg (8.8 lb) E4419B: 4.1 kg (9.0 lb)

Power Meter Dimensions

The N1913/1914A has the same form factor as the existing E4418/4419B. The N1913/1914A measures 212.6 mm x 88.5 mm x 348.3 mm (excluding front panel and rear panel protrusions). The size is well suited to manufacturing environment because it is only half of the standard rack width. This makes it easier to replace the existing power meter and eases system integration for manufacturing use.

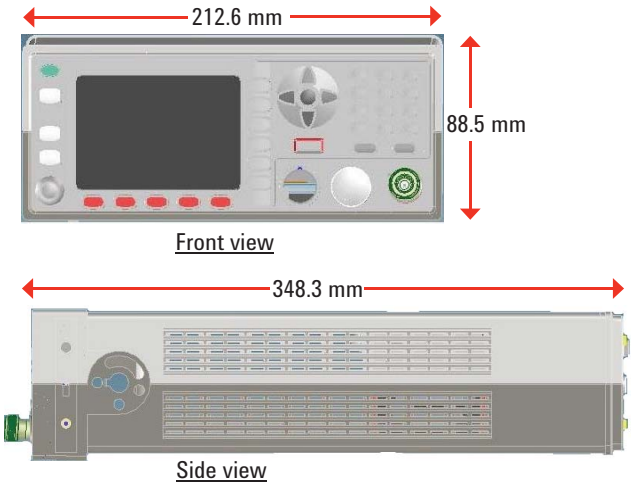

Figure 2. The front view and side view dimensions of the N1913/1914A

Power Sensor Compatibility

To protect users' investments in the E4418/4419B, the new N1913/1914A is designed to be compatible with 848x, N848x, E930x, and E441x Series power sensors as well as the U2000 Series USB power sensor (with power meter USB port option). The compatibility of power sensors with the N1913/1914A allows full functionality with a minimum of software modification.

Figure 3. The Agilent 848x, N848x, E930x, E441x, and U2000 Series USB power sensors that are supported by the N1913/1914A

SCPI/Programming Compatibility

The N1913/1914A provides SCPI backward compatibility with the E4418/4419B. It will make it easier for the users to replace the existing E4418/4419B with the new N1913/1914A easily. The N1913/1914A uses the same remote commands or SCPI as the E4418/4419B for instrument configuration and measurement settings.

The N1913/1914A also provides code compatibility or an emulation mode for conventional 436A, 437B, and 438A power meter. For further information about emulation mode, please refer to *Agilent EPM Series 437B and 438A Compatibility Application Note, literature number 5968-4519B.*

The existing IVI-COM driver of the E4418/4419B has been modified to function with the N1913/1914A. This driver support is important for customers who want to replace the E4418/4419B with N1913/1914A.

USB Power Sensor SCPI Compatibility

The U2000 Series USB power sensor can be operated on the PC Windows platform via the Agilent N1918A Power Analysis Manager software. It can also be controlled through the N1913/1914A's front panel. Alternatively, SCPI compatibility with the N1913/1914A allows the users to control the USB power sensor remotely.

Subsystems such as `SENSe`, `SERVice`, `TRIGger`, and `CALibration` are applicable and allow N1913/1914A to communicate with the USB poweri sensors connected to Channel C & D via SCPI. To communicate with the USB power sensor that is connected to Channel C, refer to `SENS3`, `SERV3`, `TRIG3`, or `CAL3`. To communicate with the USB power sensor that is connected to Channel D, refer to `SENS4`, `SERV4`, `TRIG4`, or `CAL4`.

Table 2 shows the IEEE 488.2 Common Commands that are not applicable for the USB power sensor when it is connected to Channel C or D of the N1913/1914A. The Common Commands apply only to the N1913/1914A, except the `*RST`. This command will reset the N1913/1914A and the USB power sensor as well.

Table 2. The IEEE 488.2 Common Commands that are not supported by USB power sensors through the N1913/1914A power meter

IEEE 488.2 Common Commands	Description
`*CLS`	Clear status
`*ESE and *ESE?`	Event status enable
`*ESR?P`	Event status register
`*IDN?P`	Identify
`*OPC and *OPC?P`	Operation complete
`*OPT?P`	Options
`*RCL`	Recall
`*SAV`	Save
`*SRE and *SRE?P`	Service request enable
`*STB?`	Status byte
`*TRG`	Trigger
`*TST?`	Test
`*WAI`	Wait

Seven Reasons to Migrate from E4418/4419B to N1913/1914A

1 Four-Channel Power Measurement

The new N1913/1914A supports up to four channels for power measurement compared to the conventional dual-channel power meters that only provide up to two channels for power measurement. The four-channel power measurement on the N1913/1914A can be achieved with two conventional power sensors and two USB power sensors. The four-channel power meter offers:

- Configurable measurement display
- Up to four different measurements with sensor input (A, B, C, and D)
- Average, minimum, and maximum measurement
- Mathematical operations (difference and ratio)

The N1913/1914A is capable of measuring more than two inputs simultaneously with two additional USB power sensors that provide multi-channel capability in manufacturing. Scalar power measurements require two or more power sensors in most cases, so multi-channel power measurement can be used for scalar power applications. This will minimize the test equipment needed and be more cost efficient.

By default on preset, the N1913/1914A will display Ch A (upper window upper measurement) and Ch B (lower window upper measurement) when two conventional power sensors are connected to the meter (see Figure 4). Ch C and Ch D will be displayed as upper window lower measurement and lower window lower measurement when two USB power sensors are connected to the meter (see Figure 5). The N1913/1914A is able to display four-channel power measurement (average only) readings if all four channels are connected to the power sensor.

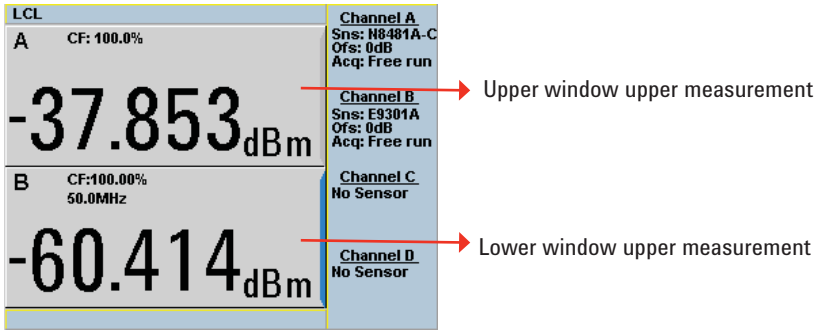

Figure 4. Dual-channel power measurement screenshot

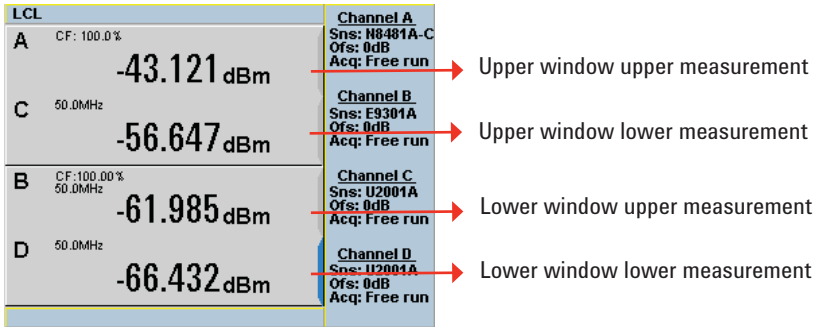

Figure 5. Four-channel power measurement screenshot

Two USB master interfaces are provided, with two configurations: one in front panel and one at the rear panel, or both at the rear panel. For the front panel and rear panel configuration, the front panel is designated as Ch C and the rear panel is designated as Ch D (see Figure 6). The rear panel only configuration has the following designation: Ch C on the left and Ch D on the right (see Figure 7).

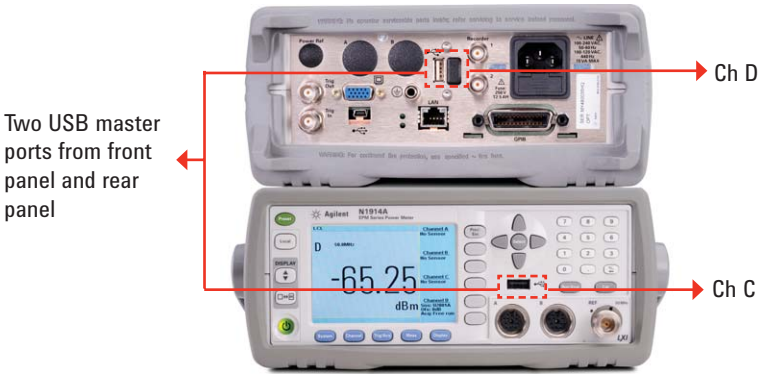

Figure 6. Two USB master ports from front panel and rear panel configuration

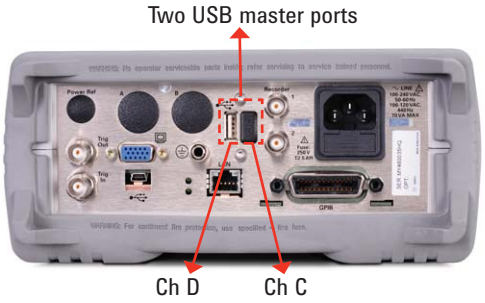

Figure 7. Two USB master ports from rear panel configuration only

Configuring USB Power Sensor Settings

To configure the settings of USB power sensor, it can be done by remotely controlling the USB sensor via SCPI or from the front panel of the N1913/1914A. Users can change the settings of USB power sensors such as frequency and channel offset before making the measurement. The N1913/1914A is also a platform for obtaining the measurement from USB power sensor without a PC controller.

Figure 8. The USB power sensor connected to the N1914A

2 Fast Measurement Speed

High measurement speed is essential in high-volume manufacturing of RF and microwave components and systems. Faster test time will improve the productivity by enabling users to test more devices in a shorter time.

Measurement time can be improved by switching the measurement speed. There are three types of measurement speed settings: NORMAL (by default), DOUBLE (x2), and FAST. In NORMAL and DOUBLE modes, full sensor functionality is available. In FAST mode, averaging limits are disabled and set to 1, which allows fast measurement with uncompromised accuracy.

The SCPI backward compatibility of N1913/1914A, FAST mode measurement speed is retained at 200 readings/second (rds/s) so that N1913/1914A can be used directly by users of the existing E4418/4419B without the need for software modification. The actual performance measurement speed of the E930x/E441x Series power sensor connected to the N1913/1914A is 400 rds/s in FAST mode measurement, whereas the E4418/4419B can only achieve 200 rds/s (as shown in Table 3).

Table 3. The measurement speed of power sensors that are supported by N1913/1914A and E4418/4419B

Power Sensor	Measurement Speed (rds/s)					
	E4418/4419B			N1913/1914A		
	Normal	x2	Fast	Normal	x2	Fast
848x	20	40	-	20	40	-
N848x	20	40	-	20	40	-
E930x	20	40	200	20	40	400
E441x	20	40	200	20	40	400
U2000 Series	-	-	-	20	40	110

3 Faster Frequency/ Power Sweep Measurement

In conventional frequency/power sweep measurement, users have to manually change the frequency/power of signal source before measurements are displayed on the front panel of the power meter. Completing the frequency sweep (from 1 GHz to 10 GHz) requires a longer test time, but in manufacturing it is test-time efficiency that is the main factor in purchasing decisions. Faster frequency/power sweep measurement via external triggering capability in CW mode will improve the test time without compromising the measurement accuracy. Faster frequency/power sweep measurement can be ordered as an option and functions only with average/CW power sensor. The USB power sensor can also perform the frequency/power sweep measurement when it is connected to the N1913/1914A. For more information about USB power sensor frequency/power sweep measurement, please refer to the *Agilent U2000 Series USB Power Sensor Programming Guide.*

The fast frequency/power sweep measurement of the N1913/1914A allows the signal source to trigger the power meter via an external TTL signal for measurement (see Figure 9). Every triggered measurement will be stored in a user-defined sized buffer in the power meter. The size of the buffer can be captured in the range of 1 to 2,048 measurements, and triggered measurement can be retrieved using SCPI. Users can define the number of measurement in a buffer (GPIB buffer mode) and retrieve the measurement results from the instrument for later analysis. This eliminates the need for real-time reading of the results.

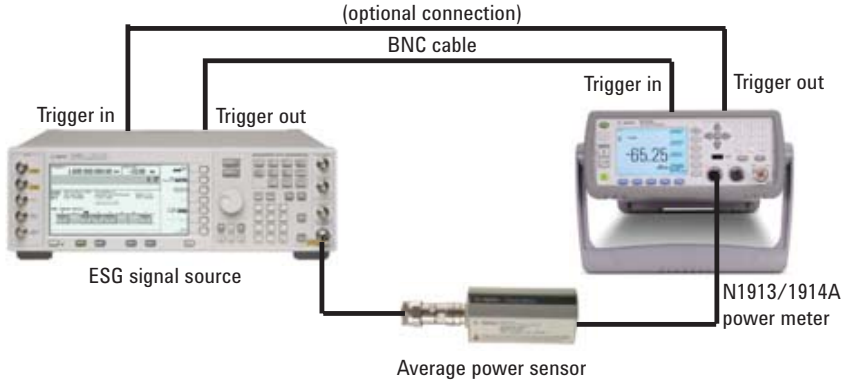

Figure 9. One way/two way communication of frequency/power sweep of signal source and power meter

Frequency sweep mode

Frequency sweep is a measurement whereby the amplitude of the power level is constant and the frequency varies. In this type of measurement, the frequency of the signal generator and the power meter needs to be changed point by point via SCPI before each power measurement is taken. This mode is used to determine the measurement response between two different signals in accordance with the increment of the frequency set.

Power sweep mode

Power sweep is a measurement whereby the frequency of the signal is constant and the amplitude varies. In this type of measurement, the amplitude of the signal generator needs to be changed point by point via SCPI and each power measurement is taken using a power meter. This mode is usually used to determine the 1 dB gain compression point of a DUT at a particular/constant frequency.

For more information about fast measurement of frequency/power sweep, refer to *Agilent Maximizing Measurement Speed Using P-Series Power Meters Application Note, literature number 5989-7678EN.*

4 Instrument I/O Connectivity and LXI-Class C Compliance

Conventionally, the E4418/4419B remote interfaces consist of GPIB and RS232/422. The GPIB interface is mostly used for automated testing in manufacturing rather than the RS232/422 interface; it is used less frequently with slow performance.

The N1913/1914A introduces additional USB and LAN connectivity ports on top of the existing GPIB interface. The USB and LAN interface are growing in popularity as PC interfaces and their use is in line with the direction of other Agilent instruments (see Figure 10). The USB 2.0 host interface provides PC connectivity via USB cable.

The LAN interface can be configured by users and provides enhanced LXI-Class C compliance. The unrivalled connectivity of USB and LAN enables users to cope with the majority of PC control applications, and allows the test system to be easily integrated into the modern test environment.

N1913/1914A rear panel

E4418/4419B rear panel

Figure 10. I/O connectivity of N1913/1914A versus E4418/4419B

The N1913/1914A is a LXI-Class C compliance instrument that combines the advantages of Ethernet with simplicity and familiarity of GPIB. Having a web browser over the LAN connection allows the users to view and control the N1913/1914A remotely (see Figure 11 and 12). The web browser contains key information such as the manufacturer, model number, serial number, description, hostname, MAC address, and IP address.

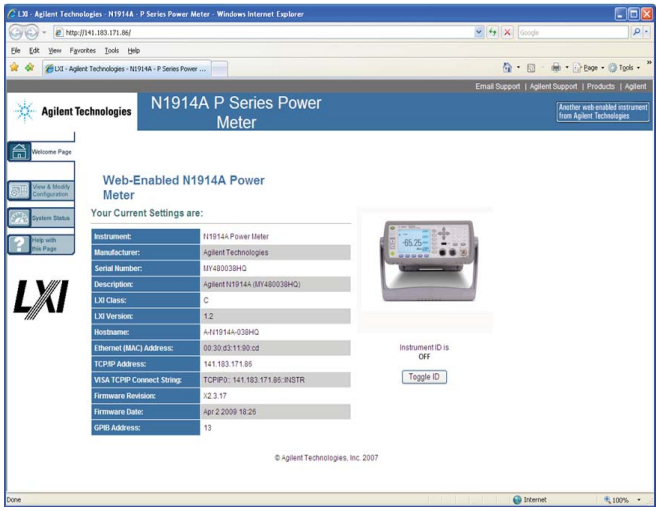

Figure 11. Instrument webpage browser shows instrument settings at a glance and enables remote access/control

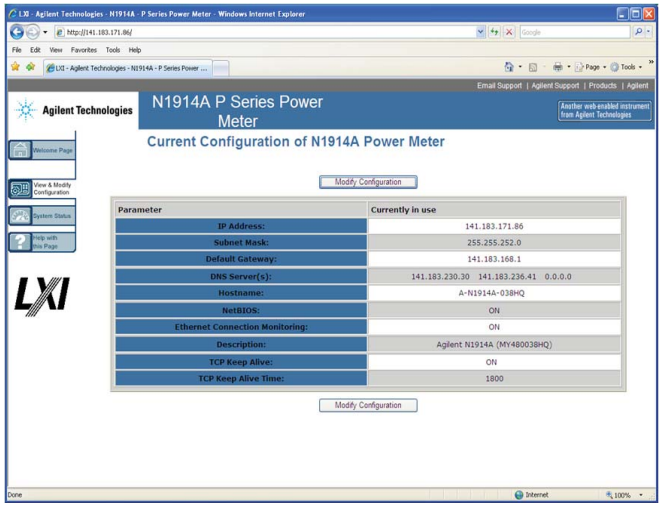

Figure 12. The webpage browser allows user to view and modify the LAN configuration

5 Smart Battery Pack

The N1913/1914A's build-in internal battery option allows the power meter to be operated in areas where AC outlets are unavailable or not easily accessible. It supports the outdoor user who requires portability for applications such as satellite tower or field power-measurement testing.

The smart battery pack is designed with a lithium-ion battery and has an LED power level indicator to show the battery supply duration. Battery life is longer than that of the E4418/4419B battery option. The smart battery pack of the N1913/1914A can be installed easily. The smart battery pack fully-charged time is approximately two hours when the N1913/1914A is in standby mode. Table 4 shows the smart battery pack operation duration for single-channel N1913A and dual-channel N1914A with backlight on and off.

Table 4. The battery duration for single-channel N1913A and dual-channel N1914A

Condition	Single-Channel N1913A (mins)	Dual-Channel N1914A (mins)
Backlight off	330	240
Backlight on	210	150

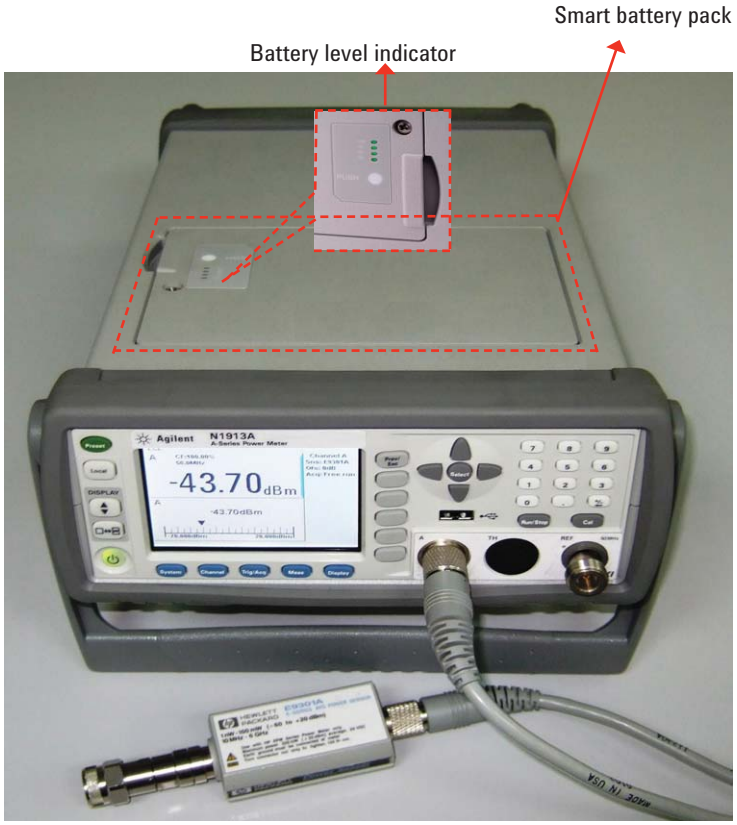

Figure 13. The N1913/1914A's smart battery pack with battery level LED indicator

6 Enhanced User Interface: Numeric Keypad

Changing and controlling the settings via the front panel of the power meter are the most common steps before measurement can be taken. The E4418/4419B offers arrow keys only and allows positioning of the cursor for editing and character selection. The user moves the cursor, selects the fields for editing, and edits alphanumeric characters.

The N1913/1914A offers arrow keys and numeric keypad, and allows positioning of the cursor for character selection and editing. The arrow keys are used to navigate around the parameter entry screens. The numeric keypads are easier to use for entering numerical values.

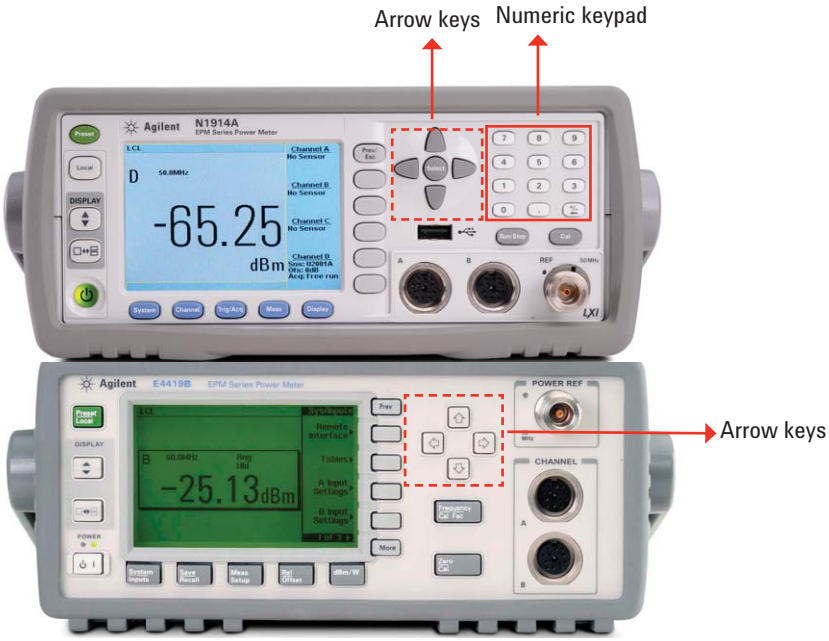

Figure 14. Arrow keys and numeric keypad of N1913/1914A (top) versus E4418/4419B (bottom)

7 Enhanced User Interface: High-Resolution Color LCD Display and VGA Output

The E4418/4419B front panel comes with a conventional monochrome display. The N1913/1914A is designed to enhance the view of measurement data. It offers high-resolution color LCD display.

Figure 15. The N1913/1914A LCD display (top) versus E4418/4419B monochrome display (bottom)

VGA output is one of the options fot the N1913/1914A, giving the customer the choice of projecting meter's screen to a bigger display via monitor or projector. Full VGA is achieved by doubling the pixel count of the 320 x 240 resolution.

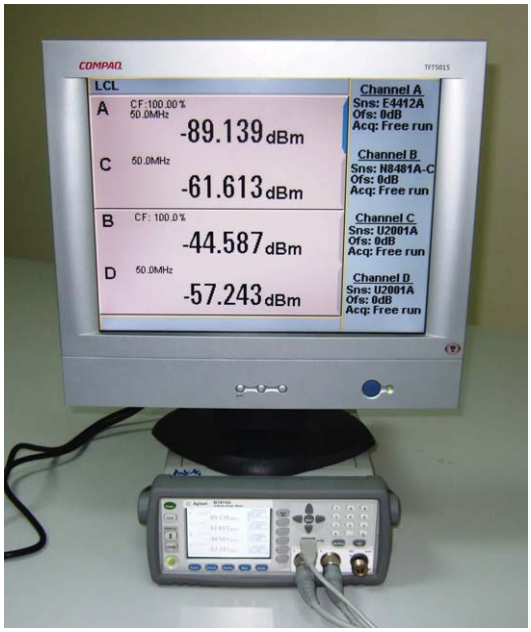

Figure 16. The N1913/1914A's VGA output display on external monitor

Conclusion

Migrating the E4418/4419B to the N1913/1914A is a simple process that has been outlined in this document. Customers will benefit from the following new features added to the N1913/1914A.

- Power sensor backward compatibility
- SCPI/programming compatibility
- A platform for USB power sensor to obtain a measurement without PC.
- Four-channel power measurement with two conventional power sensors and two USB power sensors.
- Fast measurement up to 400 rdgs/s with E-Series power sensors.
- Faster frequency/power sweep measurements via external triggering capability, improving measurement test time.
- Enhanced instrument I/O connectivity and LXI-Class C compliance.
- Built-in smart battery pack for outdoor power measurement.
- Enhanced user interface: numeric keypad, high resolution color LCD display, and VGA output.

References

- Agilent N1913/1914A EPM Series Power Meter Data Sheet, literature number 5990-4019EN
- Agilent N1913/1914A EPM Series Power Meter Configuration Guide, literature number 5990-4173EN

Related Literatures

- Agilent EPM Series 437B and 438A Compatibility Application Note, literature number 5968-4519E
- Agilent 4 Steps for Making Better Power Measurements Application Note 64-4D, literature number 5968-4519E
- Agilent U2000 Series USB Power Sensors Programming Guide, literature number U2000-90411

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