LadyBug Technologies
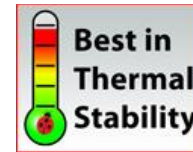## Peak Performance in Power Sensors

Santa Rosa, CA, USA

LadyBug Vision

Provide the highest value
RF & Microwave power
measurement solution in
the market place

Worlds First USB Pulse Sensor

Introduced to the market in 2007, the LB479A was the worlds first USB Power Sensor capable of making Peak and Pulse Power measurements.

Typical PowerSensor+™ Measured Power over Temperature at 1 GHz
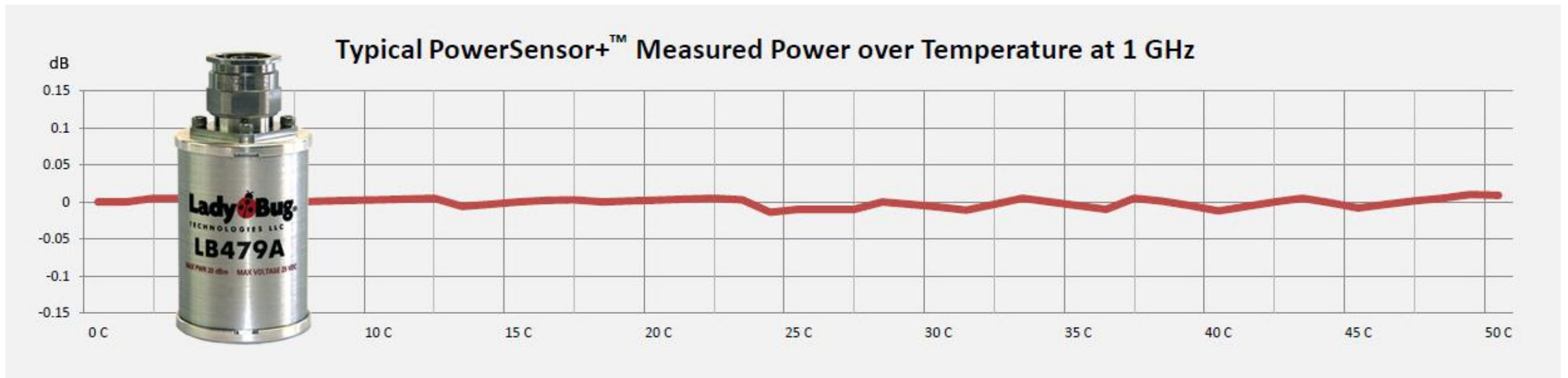
LadyBug History

- Measurements in November 2004
- Legally formed in October 2005
- First MTT conference in June 2006
- Angel funding Nov 2006, six investors
- First LB479A shipments 2007
- Profitable in 2010
- And profitable ever since

Patented No-Zero No-Cal

LadyBug's patented technology allows Power Sensors to make accurate low level RF power measurements without zeroing or calibration prior to use.

Typical PowerSensor+™ Measured Power over Temperature at 1 GHz
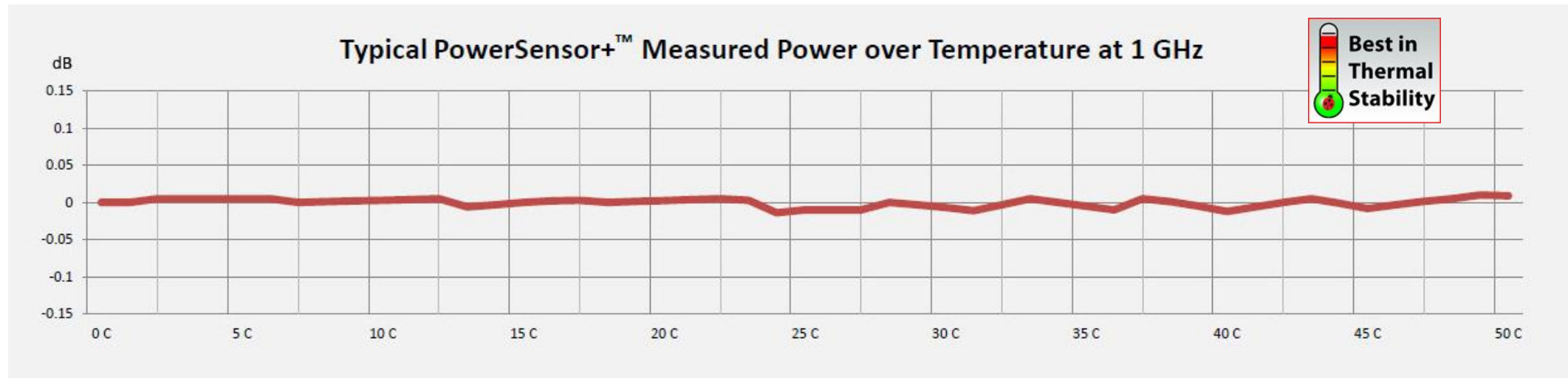
Thanks to our patented dynamic calibration system, LadyBug Sensors deliver full accuracy without user internal or external zeroing processes.

We recommend annual calibration.

ZERO-AWARE

Part of LadyBug's No-Zero No-Cal patented technology, the ZERO-AWARE icon is a marketing term designed to help explain to the engineer / customer the concept of the technology. Often, seasoned power sensor users are unaware of the concept and always expect to zero and cal a sensor before use.

LadyBug sensors do not have internal zeroing circuitry, they are zero aware and do not drift, shift or otherwise change.

We recommend annual calibration, however LadyBug sensors remain stable for may years.

Other Patents & Intellectual Property

- Specialized internal calibration processes
- Patented True average correction using non-linear detectors
- Dynamic correction design eliminates sensitivity to temperature – Including very low level measurements
- Path selection technology eliminates user path selection required by some other sensors.

First Tier NIST Traceable Calibration

LadyBug's Primary Standards are Calibrated directly by NIST.

No better calibration is available.
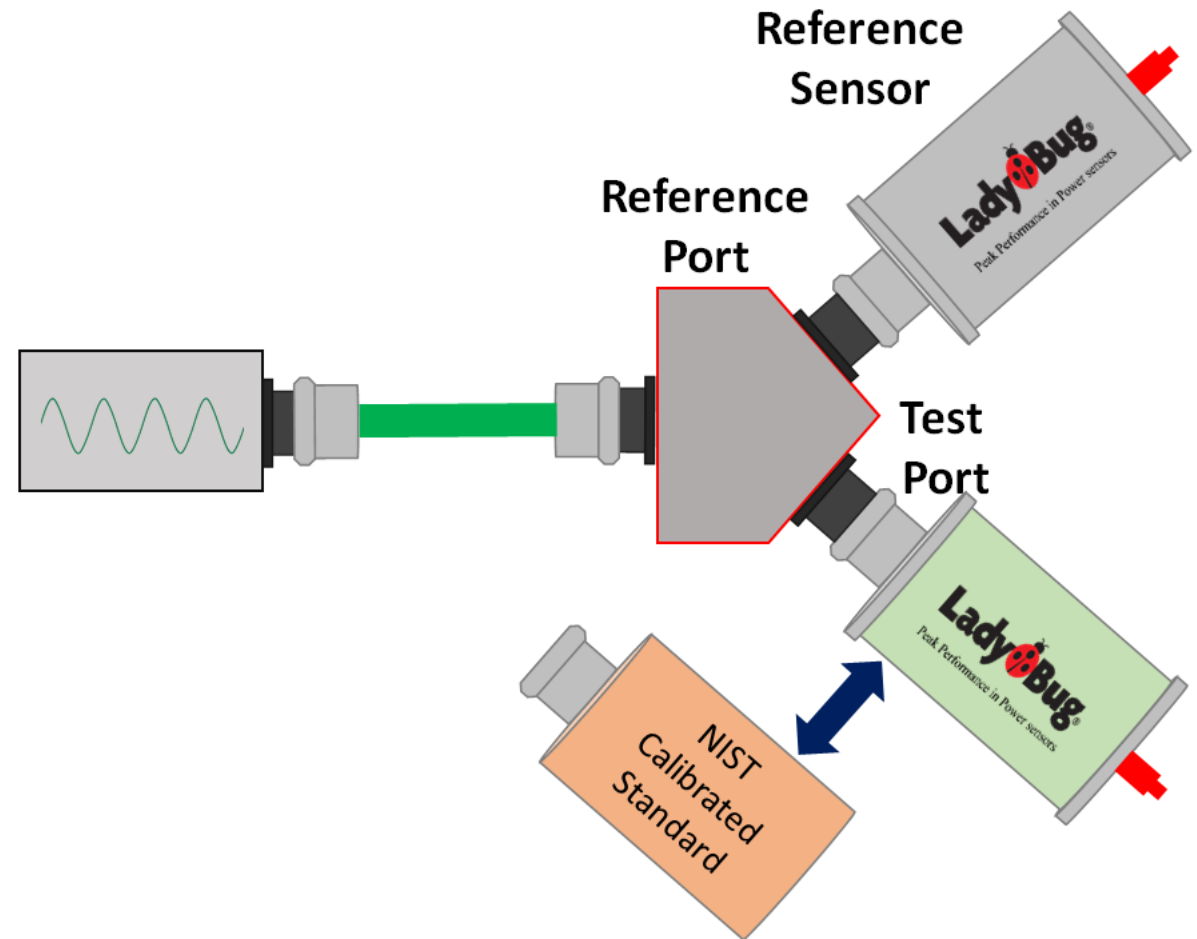
A full line of Products

A Power Sensor for Any Signal

- LB5900 Series General Purpose True RMS Sensors measure average power on any signal from 9kHz to 40 GHz regardless of modulation bandwidth.

- LB479A & LB679A Demodulating Peak and Pulse sensors for statistical measurements.

- LB480A & LB680A Demodulating Pulse profiling for time domain pulse examination.

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LadyBug Power Sensors

Have it Your Way Connectors

Power sensors are relied upon for calibration of high accuracy equipment such as spectrum analyzers, network analyzers, sources and other RF and microwave test equipment. Each cable or adaptor that is inserted in between a DUT and a Power Sensor adds uncertainty.

LadyBug offers a wide variety of connectors for its Power Sensors; order sensors with a 2.92mm, Type-N or SMA male or female and place the sensor directly on the DUT for a high accuracy measurement.

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LB479A, LB679A Peak and Pulse Sensors
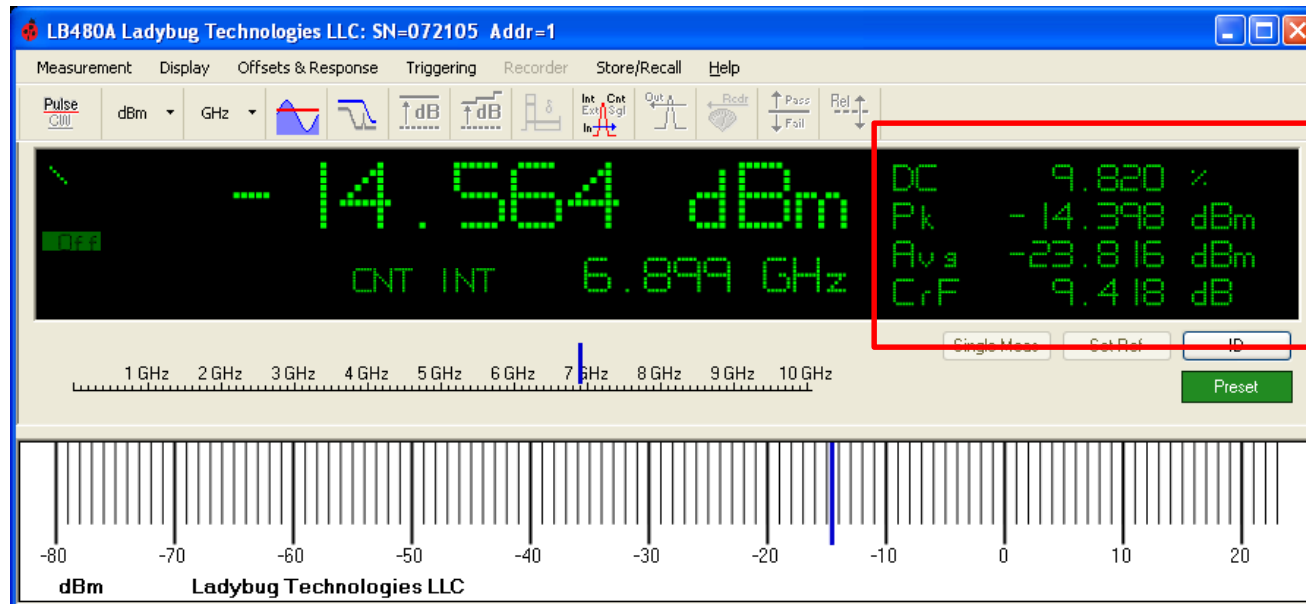
Statistical Pulse Measurements Peak and Pulse Power plus Average and Crest Factor.

No Setup required.

The LB479A and LB679A Power Sensors demodulate the pulsed signal and provide statistical pulse measurements. No triggering is required, however the measurement can be time gated if desired. LB480A and LB680A also provide this capability.

LB480A, LB680A Pulse Profiling Sensors
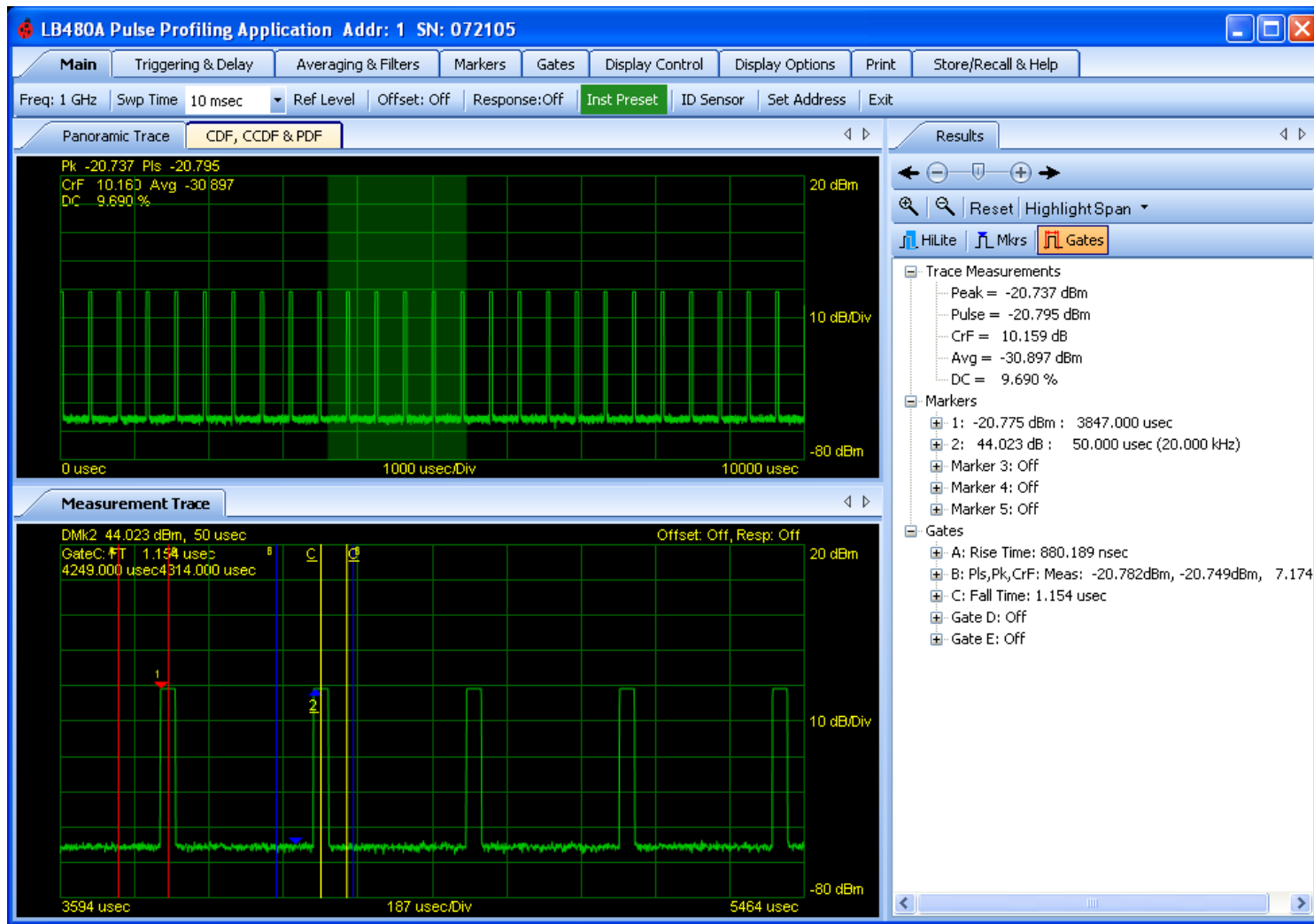
LB480A and LB680A sensors add pulse profiling capability. These sensors are capable of making triggered pulse measurements and include time information such as pulse width and pulse repetition time. Markers and gates are also available.

LB5900 Series True-RMS Sensors

- 5 Different Sensors *plus* low frequency options.
    - 8 GHz
    - 12.5 GHz
    - 18 GHz
    - 26.5 GHz
    - 40 GHz

- L Versions measure down to 9 kHz

- All LB5900 Sensors offer
    - USBTMC
    - USB HID
    - SPI / I2C Options
    - Optional Unattended Operation
    - Triggering Options
    - Connector Options

LB5900 True-RMS Power Sensors

- Programmatically similar to Keysight sensors
  - Responds to same SCPI commands
  - Utilizes USBTMC & VISA IO Libraries
  - Drop in replacement in most ATE systems

- Compatible with Keysight U2000

- Better than U2000 in many ways
  - User zero not required, even for low level measurements
  - Both paths processed simultaneously resulting in faster measurements
  - Does not interrupt measurements to zero and calibrate

LB5900 Compared to U2000

Parameter	LB5918A	U2000A
Un-buffered Measurement Speed. Normal Detector Fast.	>500 Readings/Second	110 Readings/Second
Frequency Range	1 MHz to 18 GHz – Options 9 kHz to 40GHz	10 MHz to 18 GHz Options 9 kHz to 26 GHz
Measurement Range	80dB (-60dBm to +20dBm)	80dB (-60dBm to +20dBm)
Maximum Power	+27dBm; +30dBm pulse; 16VDC	+25dBm; +33dBm pulse; 5VDC or add DC Block
Thermal Stability	0° C to 55° C Patented Dynamic Correction	Must stop measuring to re-calibrate
Measurement Paths	2 - Simultaneous processing. Full dynamic range in one measurement. Adds no time.	2 - User selection for fast measurements. Automatic selection increases measurement time.
Triggering included	Yes	Yes
Includes Trigger Out	Yes	No
Uses Standard SCPI Measurement Commands	Yes	Yes
USB Interface: USBTMC	Yes	Yes
USB interface: USB HID	Yes	No
Can use VISA IO Libraries	Yes	Yes
Recorder Output available	Yes	No
Direct Control (SPI or I2C)	Yes	No
Unattended operation capable	Yes	No
Must be zeroed before use (Manually or automatically)	No	Yes
Full featured software included	Yes	Limitations

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LB5900 Strengths

- High Quality Measurement

- 9 kHz to 40 GHz Measurements

- Exceptional Dynamic Range in a Single Sample
  - Competitors employ individual path sampling, then selection, this can slow down the measurement. Using patented methods, we sample both paths at once and splice them into a single measurement

- SPI and I2C Direct control

- Unattended Autonomous Operation

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Unattended Autonomous Operation (UOP)

- Customer can make measurements with no computer attached to the sensor

- LB5900 Sensors can store over 50,000,000 measurements

- LB5900 Sensors can store measurements at up to 1,000 per second.

- LB5900 Sensors have a backed up real time clock to time stamp measurements.

UOP – Basic Features

- If UOP is active, each time the sensor is powered up, it will begin appending memory with additional measurements.

- The sensor can be powered by wall wart, battery, or other source through USB connector or SPI/I2C cable.

- Connect the sensor to a computer, turn off UOP & read in the measurements - up to years in volume. Stored in EXCEL compatible format.

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UOP – Analog / Recorder Out

- If the sensor has Option 001, the Analog Output will function in Unattended Mode with or without a computer.

- Sensor video bandwidth 40HZ. Analog Recorder sampling and output update rate 1,000 per second.

- Secondary filter on the analog output operates from 30Hz to 0.001Hz, this gives the user flexibility to match rate to the system.

Option MIL – Security Option

Option MIL is a security option that disallows writing to the sensors non volatile memory. This reduces the sanitization requirement in many military applications. When Option MIL is installed, the real-time-clock cannot be set and any user settings will be lost when the sensor is powered down.

SPI and I2C

Option SPI includes I2C and SPI capability.

SPI (Serial Peripheral Interface buss) and I2C (Inter-Integrated Circuit) are serial communication interfaces that are used for short distance communication. SPI is a 4 wire interface (3 lines plus select). I2C uses software addressing and is a two wire system. Each I2C sensor has two select lines that allow identification of up to 4 sensors.

Applications for SPI & I2C

- Manufacturing Test Set Designers

- Ultra Small Test Sets

- Unmanned Systems

- Portable Test Set Designers

- Firmware Designers That Need Direct Control of Sensors

- Strong Interest for Military Test Sets

- Compatible with Option MIL (security option)

Can your power sensor make an accurate -60dBm measurement without zeroing first ?

Typical LB479 PowerSensor+™ Measured Power over Temperature at 1 GHz
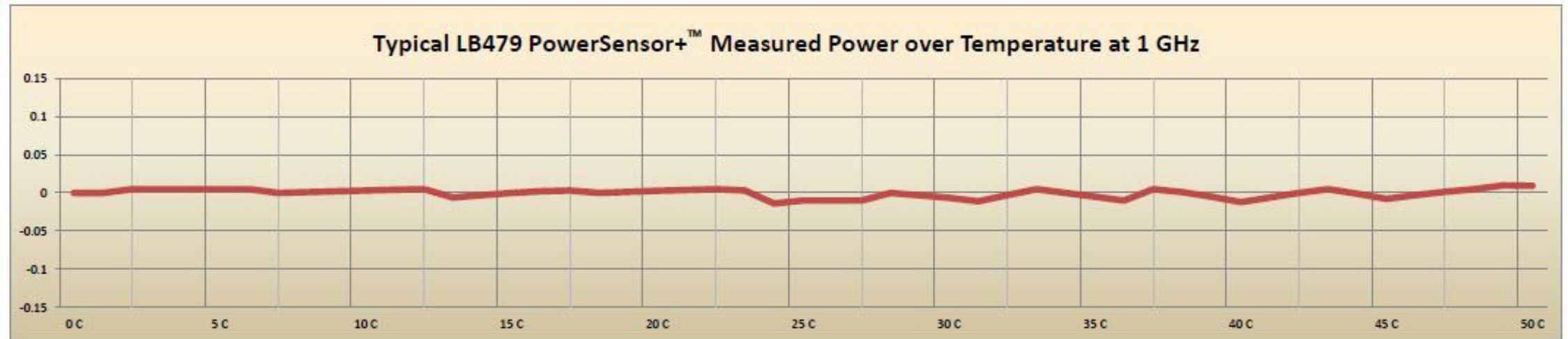
The answer is yes - if it's a LadyBug Sensor.