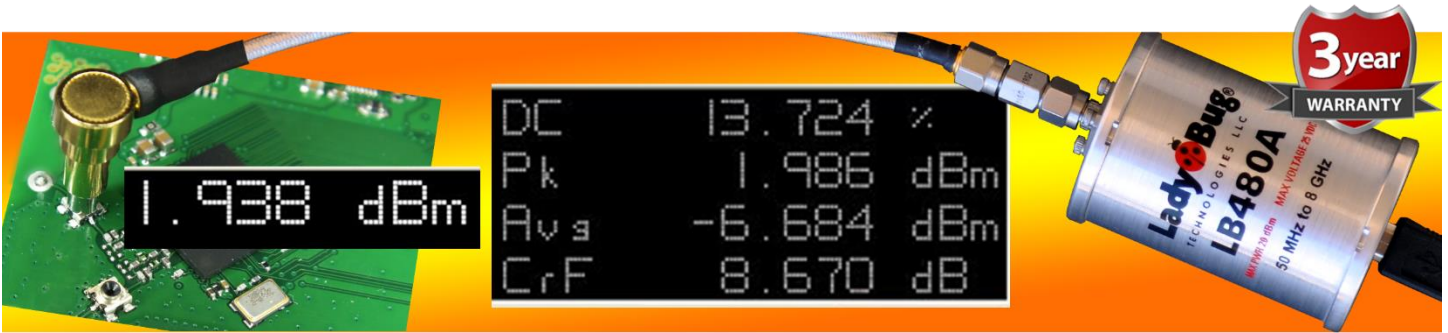


802.15.1 Bluetooth Testing using LadyBug LB479A and LB480A Power Sensors



Bluetooth is a global wireless standard for simple, secure connectivity over limited distances. The standard lists several power level ranges that must be strictly adhered to. Bluetooth devices are divided into Power Classes. Power is specified as Peak Power and Average Power. All classes except BLE (Bluetooth Low Energy) specify a peak power of +23dBm (200mW), BLE specifies +13dBm (20mW). Class 1 is the highest power level Bluetooth Class and BLE is the lowest. Table 1, lists the general power specifications.

BLE (Bluetooth Low Energy) is designed to transfer small bursts of data using appropriate modulation methods. BLE is not suitable for voice communication and is currently intended to send short pieces of data. Low power consumption is achieved largely by keeping its radio off most of the time. BLE scans only three advertising channels, and its radio is active only to send or receive short bursts of data. The packet size varies from 8 to 27 octets. BLE also sets up connections very quickly, which reduces the radio's on-time further. BLE can transmit authenticated data in as little as 3ms, versus the 1000ms typical for Bluetooth. Time gated triggering measurements are helpful in measuring BLE signals.

Bluetooth Specifications				Sensor	
Bluetooth Device -Power Class	Max Peak Power	Average Power	BT Power Control	Recommended Sensor	Recommended Attenuator
Class 1	+23 dBm	0 dBm to +20 dBm	Required	LB479A /LB480A	10 dB
Class 2	+23 dBm	-6 dBm to +4 dBm	Optional	LB479A /LB480A	6 dB
Class 3	+23 dBm	Less than 0 dBm	Optional	LB479A /LB480A	6 dB
BLE	+13 dBm	-20 dBm to +10dBm	Optional	LB479A /LB480A	Optional

Table 1 General Power Specifications

LadyBug LB479A and LB480A power Sensors are ideal for making accurate measurements on the Bluetooth signal. The sensors are first tier NIST traceable; this means the transfer calibration was done with a sensor calibrated directly by NIST, no better calibration is available. The sensors are ideal for Bluetooth development and manufacturing test systems. The LB479A can make statistical pulse measurements including peak and average power, plus crest factor on active signals. Internal and external triggering is standard on the LB480A, making flexible time gated measurements possible.

The LB479A and LB480A have very good sensitivity and speed when measuring average and pulse power. This makes them ideal for radiated measurements as well as for the direct measurement of BT devices. Statistical measurements down to -60dBm can be achieved with averaging.

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When connecting directly to the Bluetooth transmitter, an attenuator is recommended. Proper attenuator assures that the sensor will not be overloaded and that the signal will be in the ideal measurement range for the average and peak power levels. Refer to Table 1 for recommended attenuators.

LadyBug LB479A & LB480A Sensor Features & Primary Specifications

- The best thermal stability in the power sensor industry.
- Trusted and tested, thousands in use in ATE systems around the world.
- No need to zero before use, without compromising accuracy, even at low power levels.
- Very strong programmatic support, including example code for C, VB, LabVIEW drivers etc.
- The sensor's patented dynamic calibration system allows continuous measurements. It will not stop measuring to zero in automated systems like competitive sensors.

Property / Sensor	LB479A	LB480A	Competitive Sensors ⁷
Frequency Range	10 MHz to 8 GHz	50 MHz to 8 GHz	Less
Bandwidth	10 MHz	10 MHz	5 MHz Typical ⁸
Dynamic Range	80 dB	80 dB	Typically 50 dB
Triggering Capability	Optional	Internal/Ext In & Out	Not available
Thermally stable ⁶	Yes	Yes	No
Requires Zero before use	No	No	Yes ¹
Interrupts to zero	No	No	Yes ²
Settled Meas. Rate	2000/sec	2000/sec	33+/sec Varies ⁵
First Tier Calibration ³	Yes	Yes	No
Connector Options	Yes	Yes	No
Warranty ⁴	3 years	3 Years	1 Year

1-No Zero before use: Stated for low power high accuracy measurements, competitive sensors may not recommend (or support) zeroing depending upon quality. 2-Quality competitive sensors will stop measuring to zero, this interrupts automated measurements; LadyBug Sensors dynamically adjust and do not pause or stop to zero, however they do maintain full accuracy. 3-Transfer Calibration directly from a National Primary Standard's lab such as NIST, NPL, PTB, ETC. 4-Anritsu & Minicircuits 1yr; Keysight & RS 3yrs; 5-Unbefferred reading & settled measurement speed-competitively priced sensors. 6-LadyBug Sensors employ patented active thermal management. 7-Sensors in the similar price range. 8-Varies. For similarly priced competitive sensors.