

How do you measure actual power output (dbM) of a transmitter using a Tiny SA?

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Measuring the actual power output (dBm) of a transmitter using a TinySA (or TinySA Ultra) is a common and straightforward procedure, but it requires a critical piece of external equipment: a high-power RF attenuator (and preferably a dummy load).

CRITICAL WARNING: The TinySA's input is extremely sensitive and can be permanently damaged by directly connecting it to a transmitting radio. The absolute maximum input for the TinySA is typically +10 dBm (Basic) or +6 dBm (Ultra), which is a tiny fraction of what even a low-power handheld radio transmits.

Here is the step-by-step procedure:

1. Calculate Required External Attenuation (dB)

First, you must determine how much the transmitter's power needs to be reduced to protect the TinySA and ensure an accurate reading. For best accuracy, the signal entering the TinySA should be in the range of -25 dBm to -10 dBm.

Transmitter Power	dBm Equivalent	Min. Attenuation Needed (to reach -10 dBm)
1 Watt	+30 dBm	$30\text{ dB} - (-10\text{ dBm}) = 40\text{ dB}$
10 Watts	+40 dBm	$40\text{ dB} - (-10\text{ dBm}) = 50\text{ dB}$
100 Watts	+50 dBm	$50\text{ dB} - (-10\text{ dBm}) = 60\text{ dB}$

You must use an external attenuator (or a stack of them) with an attenuation rating that meets or exceeds this minimum value, and that can safely handle the full power of your transmitter.

2. Connect the Equipment

The correct setup for safety and accuracy is:

Transmitter → Dummy Load with Signal Tap OR High-Power Attenuator → Lower-Power Attenuator (if needed) → TinySA Input

Dummy Load/Sampler (Ideal): Connect the transmitter to a dummy load that is rated for its full power. Use a directional coupler or a resistive tap/sampler on the dummy load to safely siphon off a small, attenuated portion of the signal.

High-Power Attenuator (Common): Connect the transmitter output directly to a high-power attenuator that meets your calculated dB and Watt requirements.

3. Configure the TinySA

You need to tell the TinySA about the external attenuation so it can correctly calculate the true transmitter power.

Turn on the TinySA and set the Center Frequency to the frequency your transmitter will be operating on, and set the Span to zero (to use it as a power meter) or a narrow range (to check for spurs/harmonics).

Go to the LEVEL menu.

Set the EXTERNAL ATTENUATION (or EXTERNAL AMP) value to the total dB of attenuation you are using (e.g., 50 dB).

Optionally, go to the LEVEL menu and then UNIT to change the readout from dBm to Watt for a direct power reading.

4. Perform the Measurement

Transmit: Briefly key the transmitter (using a momentary transmission, if possible, to prevent overheating the external components).

Read the Level:

The signal should appear as a spike on the screen.

Place a Marker on the peak of the signal.

The value next to the marker (e.g., Marker 1) will display the actual power output of the transmitter in the unit you selected (dBm or Watt), as the TinySA has automatically added back the external attenuation value you entered.

For example, if you are using 50 dB of external attenuation and the TinySA's marker reads -10 dBm, the actual power output is:

Actual Power=Measured Level+External Attenuation

Actual Power=-10 dBm+50 dB=+40 dBm (or 10 Watts)