

**9100 Handheld Spectrum Analyzer Series in zero-span mode:  
Taking measurements on a burst or clocked signal**



boosting wireless efficiency

Burst or clocked signals combine the characteristics of modulated signals with those of discontinuous signals. Modulated signals, on the one hand, have a wider spectrum that may vary to a certain extent. On the other hand, discontinuous signals appear and disappear, so the right moment for taking measurements is important.

The spectrum of a modulated signal does not have a constant single peak but consists of a wider lobe (e.g. about 50 kHz for a typical FM radio signal, 800 kHz for a GSM signal or 1.2 MHz for an IS-95 CDMA signal). As the information transmitted on the carrier isn't always the same, the spectrum slightly varies. So if the typical spectrum is of importance, it is a good idea to average the spectrum measurements. If, however, the worst-case spectral components shall be measured, you will want to view the peaks from several spectrum measurements and hence the max hold mode should be selected.

Periodic, discontinuous signals can be measured, but require additional settings to ensure that the measurements include the active part of the signal; otherwise the Willtek 9100 Handheld Spectrum Analyzer Series could measure during time intervals when the signal is not present. In addition to the modulation spectrum, the burst length and shape are important parameters. These can be measured in the time domain, not in the frequency domain.

The following considerations should be made when measuring time-domain parameters:

- Measuring in the time domain means that the spectrum analyzer displays the signal over time, not over frequency, that means the frequency span is zero.
- The start of the measurement should be triggered by the rising edge of the signal, that means a signal level threshold must be defined that is above the noise floor and below the level when the signal is active (on).
- The duration of the measurement (sweep time) must be equal to or exceed the length of the burst, otherwise only a part of the burst will be shown.

Measuring frequency-domain parameters requires slightly different considerations when setting up the spectrum analyzer:

- Defining a video trigger in the frequency domain makes no sense because the frequency observed by the spectrum analyzer is changing permanently.
- The duration of the measurement (sweep time) should be so high that for each measurement point, the interval of at least two bursts is measured to ensure that the measurement includes the wanted signal. Note that the spectrum measured this way includes both modulation and switching components.

The following example is the measurement of a burst signal from a GSM mobile phone transmitting on channel 63, that means on a carrier frequency of 902.6 MHz. The signal level at the input of the spectrum analyzer is -10 dBm.

To take measurements, proceed as follows:

1. Press **PRESET** to set the 9100 to a known state. The start and stop frequencies are 0 and 3.6 GHz, respectively.
2. Press the **CENT** function key and enter the center frequency of **902.6 MHz**.
3. Press the **SPAN** function key and enter a span of **1 MHz**.  
A chopped version of the spectrum appears.
4. Change the sweep time to the maximum: Select **Main > SWT** and enter **5 s**.  
The spectrum appears; the positive/negative peak detector is enabled and thus the display shows both values with a black line between peaks for each frequency point.
5. To eliminate the black lines, select the positive peak detector: Press **Trace > Detect > Detector: Pos. Peak**.  
A curve appears as shown in Figure 1.

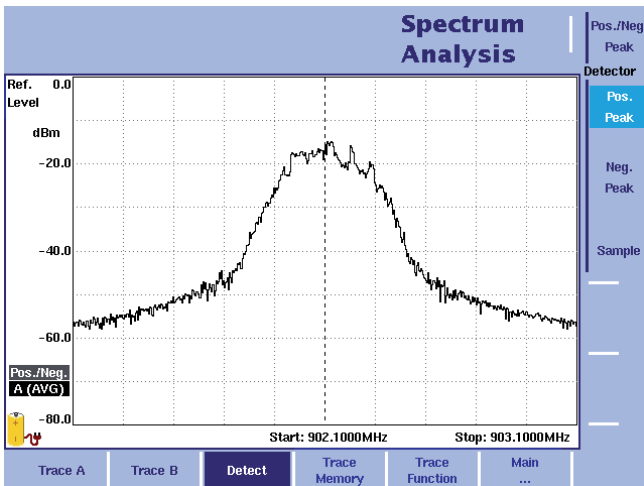


Figure 1: Spectrum after peak detection

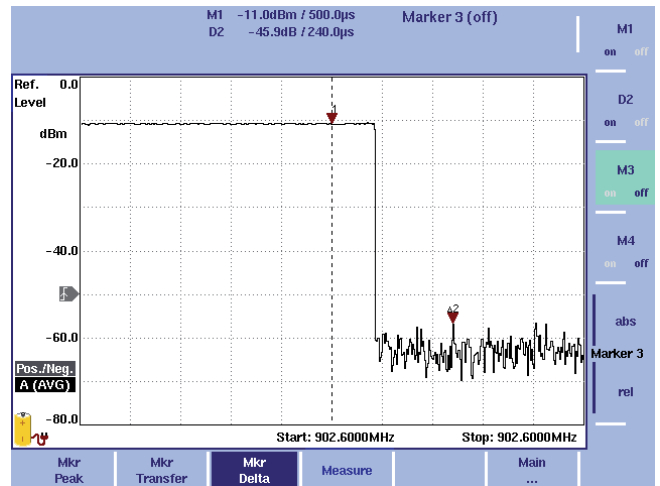


Figure 2: Burst measurement in the time domain

6. To measure the level over time, press **SPAN** and select **0 MHz**.
7. Set a measurement bandwidth that includes the significant spectrum components: Press **Main > RBW** and enter **1 MHz**.
8. Select a sweep time slightly higher than the burst length: Press **Main > SWT** and select **1 ms**.
9. Set the video bandwidth to a high level to avoid smoothing to corrupt the signal shape: Press **VBW** and enter **1 MHz**.  
Burst measurements appear in arbitrary intervals.
10. Enable the video trigger with a trigger threshold of about 40 dB below the burst level: Press **Freq > Trigger > Video** and enter **-50 dBm**.  
Burst measurements appear frequently.
11. Burst flatness: Use a marker and a delta marker to view variations of the power level in the active part of the burst.
12. Burst versus noise level: Use a marker and a delta marker to view the difference between the signal level and the noise level (in Figure 2, the difference is 45.9 dB).

13. Burst length: Place a marker at the beginning of the burst and a delta marker at the end of the burst. Read the burst length (582  $\mu$ s in the example below).

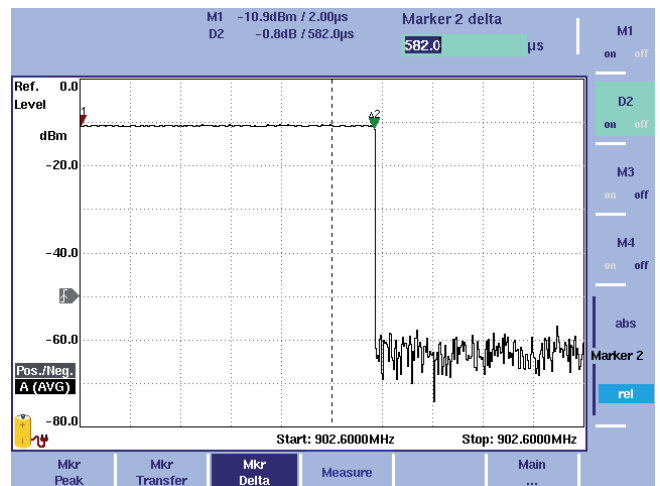


Figure 3: Reading the burst length



Willtek Communications GmbH  
85737 Ismaning  
Germany  
Tel: +49 (0) 89 996 41-0  
Fax: +49 (0) 89 996 41-440  
info@willtek.com

Willtek Communications UK  
Cheadle Hulme  
United Kingdom  
Tel: +44 (0) 161 486 3353  
Fax: +44 (0) 161 486 3354  
willtek.uk@willtek.com

Willtek Communications SARL  
Roissy  
France  
Tel: +33 (0) 1 72 02 30 30  
Fax: +33 (0) 1 49 38 01 06  
willtek.fr@willtek.com

Willtek Communications Inc.  
Parsippany  
USA  
Tel: +1 973 386 9696  
Fax: +1 973 386 9191  
willtek.cala@willtek.com  
sales.us@willtek.com

Willtek Communications  
Singapore  
Asia Pacific  
Tel: +65 6827 9670  
Fax: +65 6827 9601  
willtek.ap@willtek.com

Willtek Communications Ltd.  
Shanghai  
China  
Tel: +86 21 5835 8039  
Fax: +86 21 5835 5238  
willtek.cn@willtek.com

© Copyright 2007  
Willtek Communications GmbH.  
All rights reserved.  
Willtek Communications, Willtek  
and its logo are trademarks of  
Willtek Communications GmbH.  
All other trademarks and registered  
trademarks are the property of their  
respective owners.

**Note:** Specifications, terms and con-  
ditions are subject to change without  
prior notice.

will'tek