

#### Feature Overview-

#### Long Term Evolution (LTE) analysis in Spike™

# Key features of Spike's LTE analysis module —

- Support for FDD/TDD downlink LTE signals up to 20 MHz bandwidth
- Fast scanning of selected LTE bands
- Automatic bandwidth and duplex detection
- RSSI/RSRP/RSRQ power measurements
- Visualize impairments and channel response with several measurement windows

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2 731.50 MHz 5035.0 -65.70 dBm -86.45 dBm -6.65 dB 21885718 304 5 MHz FDD	4 2 310/260 United States/T-Mobile Mon January 10/22 11:42/11 am 1							
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4 2127.50 MHz 2125.0 -69.45 dBm -100.07 dBm -11.86 dB 78142230 409 15 MHz FDD	4 1 311/480 United States/Verizon Wireless Mon January 10 22 11:42:03 am 1							
5 1970.00 MHz 1000.0 -70.10 dBm -91.45 dBm -4.02 dB 78142232 409 10 MHz FDD	4 1 311/480 United States/Verizon Wireless Mon January 10 22 11:42:01 am 1							
6 1937.50 MHz -70.16 dBm -108.33 dBm -19.41 dB 245 15 MHz FDD	4 Mon January 10 22 11:41:59 am 1							
7 1987-50 MHz 1175.0 -87.25 dBm -106.86 dBm -5.62 dB 21885808 304 SMH+ FDD	4 2 310/260 United States/T-Mobile Mon January 10 22 11:42-02 avv 1							
Loaded Preset 1		SM200C - 404Hz IBW INT REF SN - 70100002 FW 7.7.5 41.57 C - 24.91 W GPS Unlocked						

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#### Overview

The Long Term Evolution wireless standard, commonly known as LTE, is a ubiquitous wireless standard with implementations around the globe. The widespread availability of LTE makes it a popular segment of the electronics development industry, enabling a variety of technological and economic opportunities.

Signal Hound's RF analysis software, Spike, offers an LTE analysis mode. The LTE measurements in Spike provide scanning capability for LTE downlink signals, and are designed for cellular monitoring, network validation, antenna testing, and basic troubleshooting. The measurements support both FDD and TDD duplex modes up to 20 MHz bandwidth.

The LTE measurements are compatible with Signal Hound's BB60, SM200, and SM435 series spectrum analyzers. The BB60C and BB60D receivers offer an excellent price to performance ratio and superb mobility requiring only a USB 3.0 connection to the PC or laptop. The SM200 and SM435 receivers are the ideal choice when you have access to AC power and need unrivaled performance.

The LTE measurements can perform single frequency and scanning measurements. Users can select a sequence of LTE bands to scan or define custom frequency ranges to scan. At each frequency, the software performs a full cell search and if a cell is detected, demodulation of the MIB and SIB1 occurs.

## Scan Options

Configuring an LTE scan in Spike offers the following options:

- Select 1 or more bands to scan.
- Bands can be chosen from defined LTE bands or custom frequency ranges can be chosen.
- For any band, the channel raster, or step size, can be chosen.
- This sequence of bands can be scanned once or continuously.

🛴 LTE Scan Config	juration		?	×
LTE Quick Select Band Name Band Start Freq Band Stop Freq Band Step Freq	- Select Band - LTE Band 2 1.930000 GHz 1.990000 GHz 500 000000 kHz	LTE Band 2 [1930.0, 1990.0] MHz :	500 kł	łz
	Add Band Clear All Bands			
Import	Export	ОК	Cance	ł

### Scan Operation

Spike uses the PSS and SSS for the cell search. If the PSS and SSS are detected, Spike uses this to determine the duplex mode, cyclic prefix length, and decodes the MIB. If the MIB is successfully decoded, the measurement is considered valid, and the software will attempt to decode the SIB1. If the SIB1 cannot be decoded, the measurement completes without SIB1 information available.

This entire measurement process occurs on roughly 40ms worth of captured I/Q data from the analyzer. The I/Q data is captured at the highest bandwidth possible to allow all possible cell bandwidths. Only 1 frame is measured and displayed.

#### Scan Results

The results of the scan are added to the cell search results list. This list provides a sortable view of all detected cells and measurements. Entries can be sorted by RSSI, frequency, or time. The measurements can be grouped by frequency, resulting in a list of all cells detected with a count of the times they have been measured, or not grouped, resulting in a list that shows cell behavior and performance vs time. Up to 10k entries may be in the list. The list can be exported for further analysis and reporting purposes.

	LTE Cell Search Results														
	File														
	Freq	EARFCN	RSSI	RSRP	RSRQ	Cell Identity	Physical CellID	BW	Duplex	Antennas	PLMN Count	MCC/MNC	Country/Network	Time	Count
1	751.00 MHz	5230.0	-50.90 dBm	-75.22 dBm	-7.32 dB	1342210	409	10 MHz	FDD	4	1	311/480	United States/Verizon Wireless	Fri January 28 22 1:10:13 pm	3
2	1970.00 MHz	1000.0	-64.19 dBm	-95.83 dBm	-14.61 dB	78142232	409	10 MHz	FDD	4	1	311/480	United States/Verizon Wireless	Fri January 28 22 1:09:55 pm	3
3	1937.50 MHz		-64.79 dBm	-100.77 dBm	-15.45 dB		304	15 MHz	FDD	4				Fri January 28 22 1:09:31 pm	3
4	2127.50 MHz	2125.0	-66.47 dBm	-96.32 dBm	-11.09 dB	78142230	409	15 MHz	FDD	4	1	311/480	United States/Verizon Wireless	Fri January 28 22 1:10:07 pm	4
5	1987.50 MHz	1175.0	-70.52 dBm	-94.31 dBm	-7.13 dB	21885808	304	5 MHz	FDD	4	2	310/260	United States/T-Mobile	Fri January 28 22 1:09:56 pm	3
6	2145.00 MHz		-70.85 dBm	-109.37 dBm	-18.38 dB		245	20 MHz	FDD	4				Fri January 28 22 1:10:19 pm	4
7	763.00 MHz		-72.53 dBm	-117.25 dBm	-27.69 dB		418	10 MHz	FDD	4				Fri January 28 22 1:10:03 pm	2

#### **Reported Measurements**

- Physical Cell ID
- Bandwidth
- Duplex mode
- Cyclic prefix length
- Number of antenna ports
- PHICH duration
- Ng
- Frame number
- Metrics
  - » RSSI
  - » RSRP
  - » RSRQ
  - » Channel power
  - » PAPR
  - » Frequency error
  - » PSS/PBCH EVM

LTE Metrics	
Frequency	1970.00 MHz
Channel Power	-64.96 dBm
Pk Power	-53.82 dBm
PAPR	11.15 dB
RSSI	-65.75 dBm
RSRP	-93.67 dBm
RSRQ	-10.90 dB
Freg Error	-588.733547 Hz
PSS Corr Result	0.84
PSS EVM	87.89 % -1.12 dB
PBCH EVM	22.24 % -13.06 dB

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#### Reported Measurements, cont'd

- SIB1
  - » EARFCN
  - » MCC/MNC pairs
  - » Country/Network (strings) pairs
  - » TAC
  - » Cell identity
  - » Cell barred
  - » Rx level min
- » Freq band indicator
- AM vs time
- Spectrum
- Waterfall plot
- PSS/PBCH constellation
- Cell search results
  - » List of all scan results
  - » Sort by amplitude, frequency, or time
  - » Group results to create an aggregate list
  - » Export results

### Specifications

Number of input channels	1
Maximum input level into spectrum analyzer	+20dBm
Frequency Lock Range	+/- 7.5 kHz
Search length (per measurement)	40ms
LTE bandwidth support	1.25, 2.5, 5, 10, 15, or 20 MHz
Duplex mode support	FDD/TDD
Scan speed, 500 kHz raster, 1 cell detected, 10 MHz bandwidth	30 scans/s
Scan speed, 100 kHz raster, 1 cell detected, 10 MHz bandwidth	55 scans/s
Compatible Signal Hound spectrum analyzers	BB60C, BB60D, SM200A, SM200B, SM200C, SM435B, SM435C



Learn more about LTE analysis and all of Spike's software features at signalhound.com/spike.

LTE SIB1 Info		×	
EARFCN MCC/MNC #1 Country/Network #1 Tracking Area Code Cell Identity Cell Barred Intra Freq Reselection Rx Level Min Rx Level Min Offset p-Max Freq Band Indicator	1000.0 311/480 United States/Verizon Wireless 1289 78142232 Not Barred Allowed -62 1 0		•
SIB1 Bits	0 100 10000 100 1 1000 1000 1 10 100 10		-

### About Signal Hound

Signal Hound designs and builds powerful, affordable spectrum analyzers and signal generators for engineers and RF professionals around the globe. Whether you're needing EMC precompliance capabilities in a small two-person shop or spectrum monitoring on a national scale, our test equipment is designed with you in mind. Accurate and powerful enough for mission-critical RF analysis, priced at a point accessible to most, and supported by a talented group of engineers committed to what they do – we truly believe that our devices offer unrivaled value in the test equipment industry.

In business since 1996 and selling our own line of Signal Hound test equipment since 2010, we've built the foundation of our company on years of test equipment repair, service, hardware and software development, and manufacturing experience. Signal Hound is a small company with big goals – and an even bigger commitment to providing our customers with an outstanding experience when purchasing and using our products.

