

# SM435B Real-Time Spectrum Analyzer & Monitoring Receiver

100 kHz to 43.5 GHz

with 2-seconds of 160 MHz BW Block Transfer Buffer

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The SM435B is a high-performance spectrum analyzer and monitoring receiver. Tuning from 100 kHz to 43.5GHz, the analyzer has 160 MHz of instantaneous bandwidth (IBW), 110 dB of dynamic range, 1THz/sec sweep speed at 30kHz RBW (using Nuttall windowing), and ultra-low phase noise to rival even the most expensive spectrum analyzers on the market.

Signal processing is distributed between a very powerful Altera FPGA and an external PC having an Intel Core i7 processor. The Signal Hound SM435B can be readily interfaced, using its local API, to an automated monitoring system or to automated test equipment. The SM435B API provides customers the access needed to insert their own DSP algorithms into a calibrated stream of I/Q data.

## PRELIMINARY SPECIFICATIONS

### FREQUENCY

- **Range:** 100 kHz to 43.5 GHz
- **RF Input Impedance (2.4mm connector):** 50Ω
- **RF Input VSWR:** <1.6 typical (Reference Level = 0 dBm)
- **Calibrated Streaming I/Q:** 5 kHz to 40 MHz of selectable I/Q streaming bandwidth
- **Up to 2 seconds of Calibrated I/Q Capture** at 160 MHz bandwidth

- **Resolution Bandwidths (RBW):** 0.1Hz ( $\leq 200$ kHz span) to 3MHz (any span) using 40 MHz IBW; 30 kHz to 10 MHz using 160 MHz IBW

- **Timebase Accuracy:** GPS disciplined OCXO remains within
- $\pm 5 \times 10^{-10}$  when locked to GPS;
- holdover of  $\pm 5 \times 10^{-9}$  /day for aging ( $\pm 2 \times 10^{-8}$  first day typ);
- holdover of  $\pm 1 \times 10^{-8}$  for temperature over -40°C to 65°C (typ)

### SYSTEM NOISE FIGURE (Typical)

- 12dB over 700 MHz to 2.7 GHz;
- 15dB from 2.7 GHz to 4.5 GHz;
- 18dB from 4.5 GHz to 15 GHz;
- 20dB from 15 GHz to 33 GHz;
- 22dB above 33 GHz;

**IP<sub>2</sub>** +64dBm from 100 kHz to 43.5 GHz

- IP<sub>3</sub>** +28dBm from 100 kHz to 4 GHz;
- +23dBm from 4 GHz to 6 GHz
- +20dBm from 6 GHz to 43.5 GHz

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## SWEEP SPEED

Speed	RBW
1THz/sec	1MHz
1THz/sec	100kHz
1THz/sec	30kHz
160GHz/sec	10kHz
18GHz/sec	1kHz

## AMPLITUDE ACCURACY (+10 dBm TO DISPLAYED AVERAGE NOISE LEVEL (DANL))

100 kHz to 6 GHz	Above 6 GHz	RBW filter shape
±2.0 dB	±3.0 dB	Flat-Top windowing
+2.0 dB/-2.6 dB	+3.0/-3.6 dB	Nuttall windowing

## DISPLAYED AVERAGE NOISE LEVEL (DANL)

Input Frequency Range	dBm/Hz (Typical)
100 kHz to 700 MHz	-156 dBm
700 MHz to 2.7 GHz	-159 dBm
2.7 GHz to 4.5 GHz	-157 dBm
4.5 GHz to 15 GHz	-155 dBm
15 GHz to 33 GHz	-151 dBm
33 GHz to 43.5 GHz	-147 dBm

## RESIDUAL RESPONSES: REF LEVEL ≤ -20 dBm, 0 dB ATTENUATION, 50-ohm load on RF input

Input Frequency Range	Residual Level
100 kHz to 80 MHz	-110 dBm
80 MHz to 15 GHz	-100 dBm
15 GHz to 24 GHz	-90 dBm
24 GHz to 40 GHz	-85 dBm
40 GHz to 43.5 GHz	-80 dBm

**LO LEAKAGE @ RF INPUT:** -82 dBm from 100 kHz to 5 GHz; -65 dBm from 5 GHz to 6 GHz; -47 dBm above 6 GHz

## SUB-OCTAVE PRESELECTOR FILTERS 20 MHz-43.5 GHz

**SPURIOUS MIXER RESPONSES (any ref level (RL) from +10 dBm TO -20 dBm, in 5 dB increments, input 10 dB less than RL, RBW ≤30kHz, IBW ≤40MHz):**

Input Freq. Range	Image Reject Off	Image Reject On
100 kHz to 6 GHz	-58 dBc	-75 dBc(typ)
6 GHz to 24 GHz	-50 dBc	-75 dBc(typ)
24 GHz to 43.5 GHz	-30 dBc(typ)	-65 dBc(typ)

**Note:** Signal ID/image reject can be activated and deactivated, by toggling the F3 key on keyboard, to allow low level mixer spurs to be differentiated from RF Input signals. Above 24 GHz, spurs above -50 dBc typically > 5 GHz from signal

All specifications are preliminary and subject to change without notice.

## SYSTEM REQUIREMENTS

Intel i7, 4<sup>th</sup> generation or later with a quad core processor, Windows 7 or later, one USB 3.0 port. **Note:** RF recording using streaming I/Q bandwidths > 8MHz requires the computer's mass storage drive to have at least 250MB/sec of sustained write speed such as an SSD, RAID-0, or RAID-5.

## SYNCHRONIZATION

GPS data in each packet with ± 40ns timestamping

## SSB PHASE NOISE AT 1 GHz CENTER FREQUENCY

Offset Frequency	dBc/Hz
10 Hz	-76
100 Hz	-108
1 kHz	-125
10 kHz	-136
100 kHz	-138
1 MHz	-138

## FPGA

Intel 10AX027 has 1660 multipliers, provides selectable decimation, 160 MHz of instantaneous bandwidth from FFT processing w/ resources to spare for future growth

## OPERATING TEMPERATURE (AMBIENT)

- Standard (passive cooling) 32°F to 122°F (0°C to +50°C)
- Option-1 (active cooling & extended temperature) -40°F to 149°F (-40°C to +65°C)

## SIZE AND WEIGHT

- 10.2" x 7.2" x 2.15" (259mm x 183mm x 55mm) passive cooling 7.77 lbs. (3.52 kg) passive cooling **plus** 0.90 lbs. (0.41 kg) for AC power module and AC power cord
- 10.2" x 7.2" x 2.80" (259mm x 183mm x 71mm) active cooling 9.13 lbs. (4.14 kg) active cooling **plus** 1.43 lbs. (0.65 kg) for AC power module and AC power cord

## POWER CONSUMPTION

< 40 watts (when sweeping or streaming I/Q) sourced from the AC wall adapter which is included or from an external supply of 9VDC to 16VDC when using the Option-12 LEMO Pigtail.

## CONNECTIVITY

- Local external computer with Microsoft Windows 7 or later and a USB 3.0 port is required to operate the SM435B (minimum of Intel 4<sup>th</sup> Gen i7 processor or equivalent equipped with SSD for rapid mass data storage during IQ recording).

## GPIO PORT

- Used for antenna switching and in/out triggering.