

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 Intel 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.

PRELIMINARY SPECIFICATIONS

FREQUENCY

- **Range:** 100 kHz to 43.5 GHz
- **RF Input Impedance:** 50Ω (2.4mm connector)
- **RF Input VSWR (Ref Lvl = 0 dBm):** 1.45 from 50 MHz to 10 GHz
1.7 from 10 to 20 GHz
2.0 from 20 to 43.5 GHz
- **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 (≤ 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 2.5 GHz;
- 15dB from 2.5 GHz to 24 GHz;
- 18dB + 0.5dB/GHz from 24 GHz to 40 GHz;
- 26dB + 2.0dB/GHz from 40 GHz to 43.5 GHz

- IP₂** +75dBm from 100 kHz to 20 GHz
+50dBm from 20 GHz to 24 GHz
+70dBm from 24 GHz to 43.5 GHz
- IP₃** +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 |
|-----------------------|----------------------------|
| 100 kHz to 160 MHz | -156 dBm |
| 160 MHz to 2.2 GHz | -159 dBm |
| 2.2 GHz to 24 GHz | -155 dBm |
| 24 GHz to 36 GHz | start -153 dBm + 0.5dB/GHz |
| 36 GHz to 43.5 GHz | start -147 dBm + 1.1dB/GHz |

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

| Input Frequency Range | Residual Level |
|-----------------------|----------------|
| 100 kHz to 6 GHz | -110 dBm |
| 6 GHz to 15 GHz | -100 dBm |
| 15 GHz to 44 GHz | -90 dBm |

LO LEAKAGE @ RF INPUT: -80 dBm from 100 kHz to 6 GHz; -50 dBm from 6 GHz to 24 GHz; -75 dBm from 24 to 43.5 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 | -55 dBc | -75 dBc (typ) |
| 6 GHz to 24 GHz | -45 dBc | -75 dBc (typ) |
| 24 GHz to 43.5 GHz | -45 dBc | -65 dBc (typ) |

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 |

SSB PHASE NOISE AT 20 GHz CENTER FREQUENCY

| Offset Frequency | dBc/Hz |
|------------------|--------|
| 1 MHz | -112 |
| 10 MHz | -131 |

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

- 10.45" x 7.20" x 2.15" (265mm x 183mm x 55mm) passive cooling 8.15 lbs. (3.70 kg) passive cooling **plus** 1.45 lbs. (0.65 kg) for AC power module and AC power cord
- 10.45" x 7.20" x 2.80" (265mm x 183mm x 71mm) active cooling 9.51 lbs. (4.31 kg) active cooling **plus** 1.43 lbs. (0.65 kg) for AC power module and AC power cord

POWER CONSUMPTION

< 33 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 4th Gen i7 processor or equivalent equipped with SSD for rapid mass data storage during IQ recording).
- Option-80 replaces 10MHz output port with 800MHz BW IF output providing 24GHz to 43.5GHz IF out centered at 1.5GHz.

GPIO PORT

- Used for antenna switching and in/out triggering.

All specifications are preliminary and subject to change without notice.

SYSTEM REQUIREMENTS

External PC with Microsoft® Windows® 10, Ubuntu® 18.04/20.04, one USB 3.0 port. Intel® 8th generation or newer i7 processor (for laptops), or 6th generation or newer i7 processor (for desktops).