Signal Hound®

SM435C Real-Time Spectrum Analyzer & Monitoring Receiver

100 kHz to 43.5 GHz
with 160 MHz BW I/Q Streaming over 10 GbE
3 October 2022

The SM435C is a high-performance spectrum analyzer and monitoring receiver with a 10 Gigabit Ethernet SFP+ port, which enables the SM435C to communicate with a PC over long distances using fiber optic cable. 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 powerful Intel FPGA and an external PC having an Intel Core i7 processor. The Signal Hound SM435C 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 (≤200kHz 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
· ±5 x 10^{-10} when locked to GPS
· holdover of ±5 x 10^{-9} /day for aging (±2 x 10^{-8} first day typ)
· holdover of ±1 x 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

IP_2 +75dBm from 100 kHz to 20 GHz
　　　+50dBm from 20 GHz to 24 GHz
　　　+70dBm from 24 GHz to 43.5 GHz

IP_3 +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

· 10GbE SFP+ port is used to send commands to and stream calibrated IQ data from the SM435C. The USB port is used for firmware upgrades.

· 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. A 10GbE SFP+ port (NIC or Thunderbolt 3 with recommended SFP+ to Thunderbolt 3 adapter) is also required to operate the SM435C. Intel® 8th generation or newer i7 processor (for laptops), or 6th generation or newer i7 processor (for desktops). Refer to SM435C 10GbE Network Configuration Guide for further information.