SALUKI TECHNOLOGY

SX-H30 Handheld Radio Monitoring & Direction-Finding System

Datasheet

http://www.salukitec.com

1 Overview

The SX-H30 is a handheld radio monitoring and direction-finding system specifically designed for portable and mobile applications. It integrates the antenna, receiver, display, and control into a single host unit, allowing for convenient one-handed operation. With its advanced software features, the SX-H30 is well-suited for various scenarios requiring radio monitoring and direction-finding capabilities.

2 Design

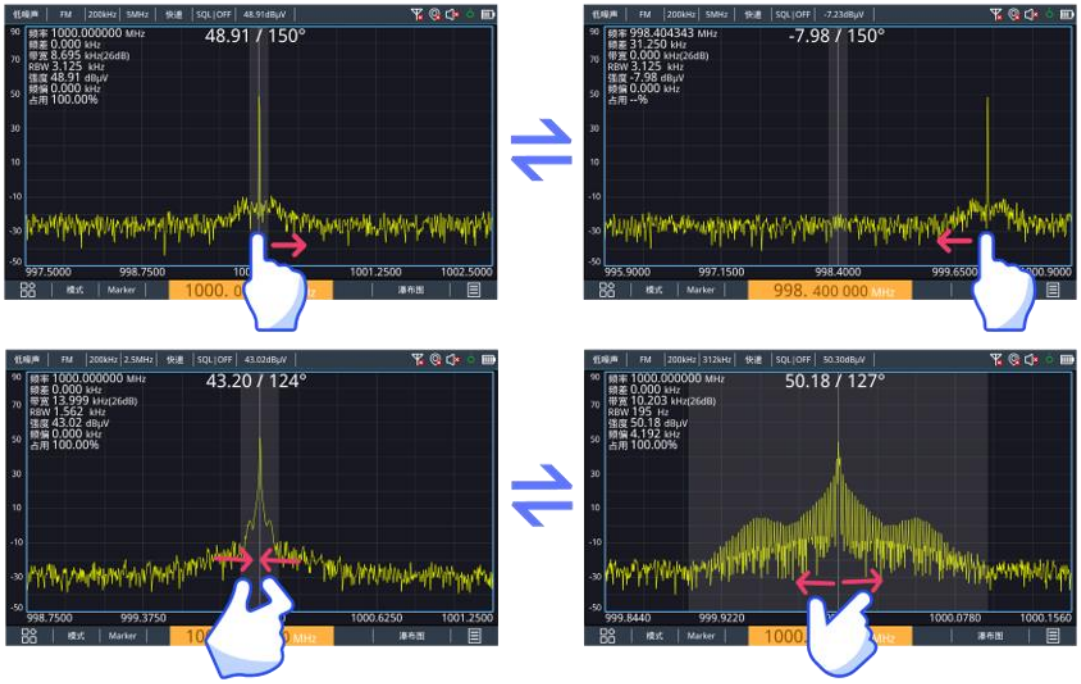
SX-H30 handheld radio monitoring & direction-finding system is mainly composed by host, antenna and battery. The entire system is compact enough to fit into a small equipment case, making it easily transportable by one person.

2.1 Host Unit & Batteries

The host of SX-H30 includes: wideband receiver, digital IF unit, embedded processor, operation system, internal storage, electronic compass (automatic

calibration), gyroscope, GPS module, display screen and high-efficiency power system. Thanks to its high-density integration, the SX-H30 is totally cable-free. With its built-in touch screen and front panel buttons, the host no longer requires additional terminals for operating complex functions as previous models did. SX-H 30 still features small size, light weight and low power consumption. More important is, the host of the SX-H30 is actually lighter than previous designs.

Benefiting from its touch screen, SX-H30 offers intuitive gesture-based operations f or quick parameter adjustments, such as the frequency and bandwidth, making the system more user friendly. Most important is, the system retains keyboard operations, ensuring full control capabilities in hostile environments.

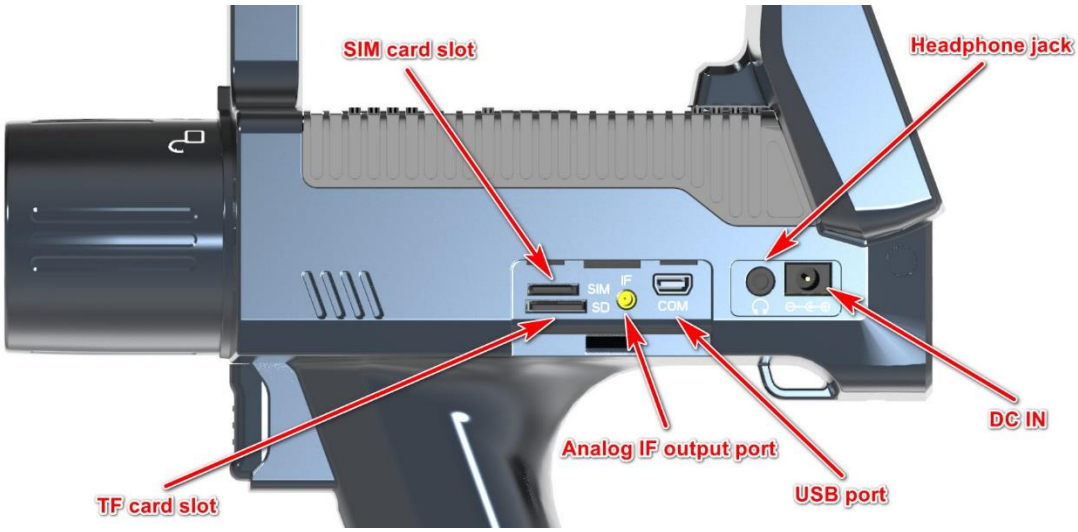


SX-H30 supports power-saving features such as screen light off and system hibernate (with quick wake-up). Additionally it offers touch screen lock function and provides buttons on panel to prevent misoperation.

SX-H30 also added several ports and slots to expand features. Includes:

- SIM card slot
- TF card slot
- Analog IF output port

- USB port
- Headphone jack



A Wi-Fi module is also included in the SX-H300 host, enhancing its network cap abilities.

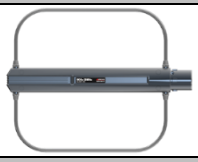
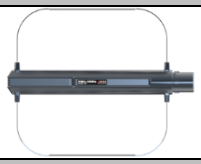
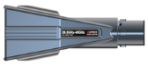
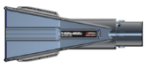
The SX-H30 host enables direct power cable connection for charging, while the b atteries feature independent power input slots for separate charging.

2.2 Antennas

The antenna of SX-H30 is designed to be easily replaceable. The host supports the antenna to be plugged in a horizontal or vertical direction as desired by users. Various antennas are provided for different frequency bands, so that customer may select the most suitable combination according to their specific tasks.

Each antenna has a unique ID which allows the host to automatically detect its polarization and frequency band range, and also enables the system to load the correct build-in gain table accordingly. In addition to detection of the plug in direction, the host may utilize its built-in gyroscope to update the displayed polarization

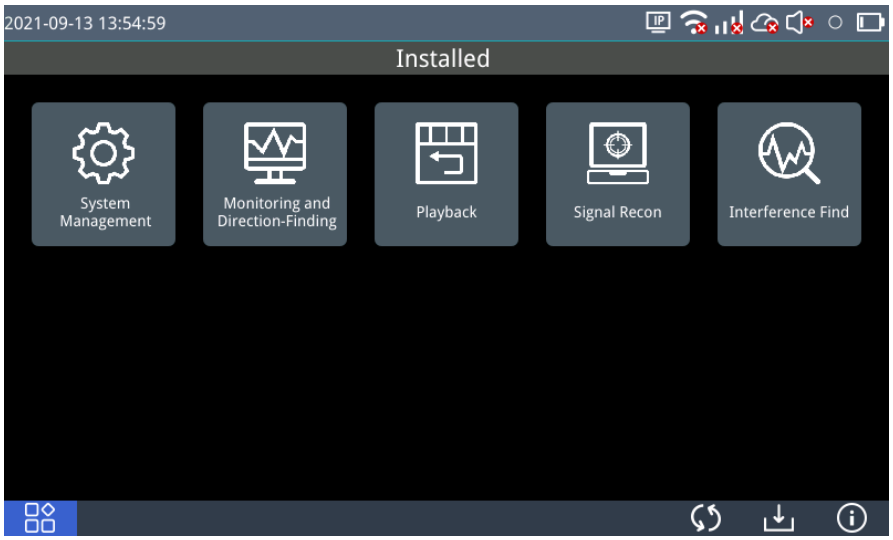
state on screen when the holding gesture changes.

9 kHz ~ 30 MHz (Optional)	20 MHz ~ 200 MHz	200 MHz ~ 500 MHz	500 MHz ~ 8 GHz
			
8 GHz ~ 26.5 GHz (Optional)	26.5 GHz ~ 40 GHz (Optional)	8 GHz ~ 40 GHz (Optional)	
			

3 Functions

3.1 Platform

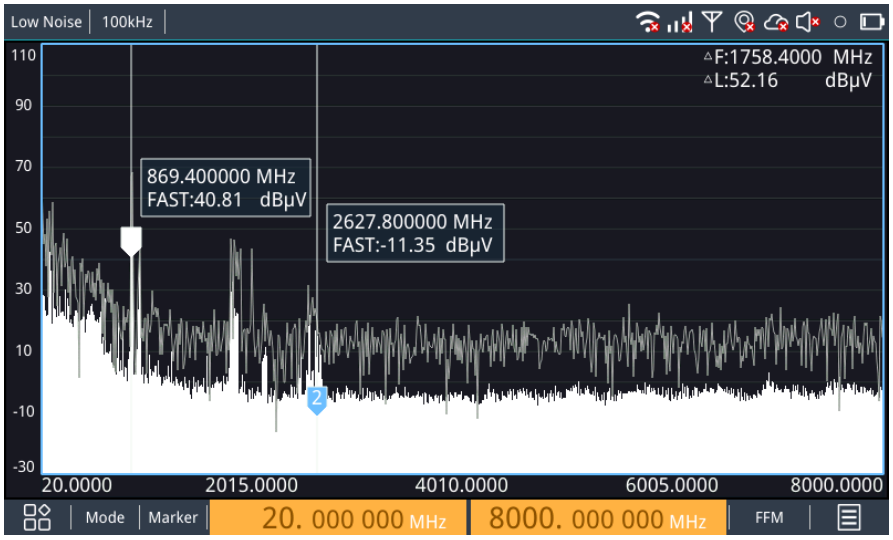
The software system of SX-H30 is built as a platform, supports install a variety of a pps (such as Monitoring, Playback, Interference Locating, UAV Locating, etc.), to meet requirements of different scenarios.



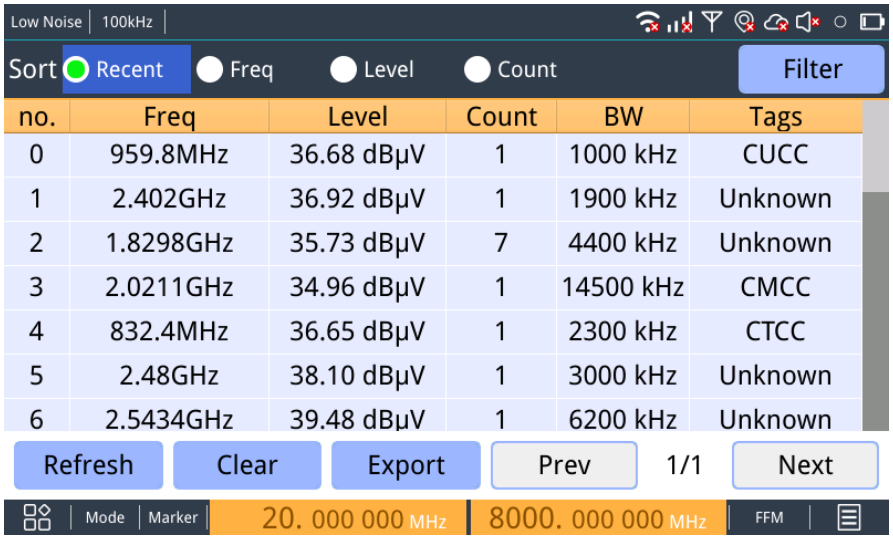
3.2 Signal Searching

3.2.1 Panorama Scanning

Once the start frequency, stop frequency, and step for Panorama Scanning are configured, all signals in the set frequency band are displayed as spectrum. User could open markers to select interested signals, then click the FFM button for bring selected frequency to the FFM (Fixed Frequency Monitoring) mode.



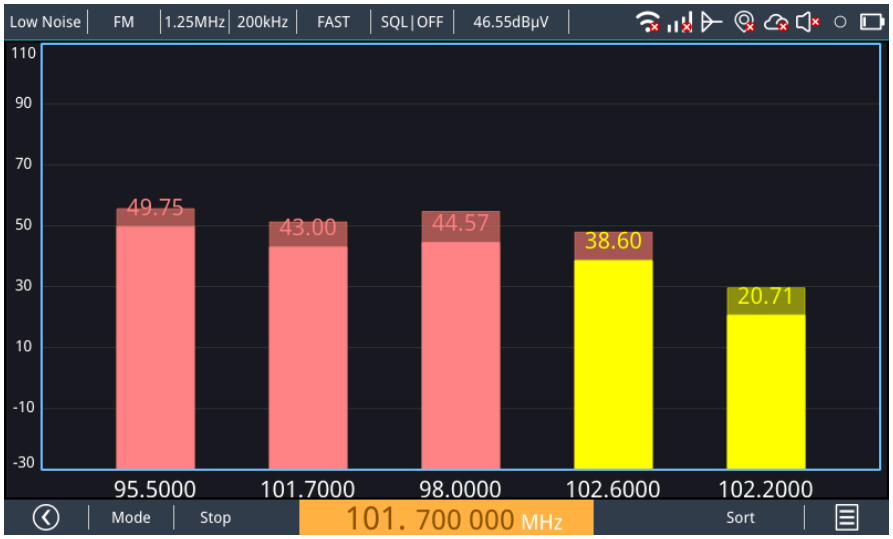
By selecting a pre-saved background spectrum sample in Panorama Scanning mode, the system will compare current scanned signals with this background sample. If there is any discrepancy over the threshold, the system will add these signals into the "Newly Found Signal List". This list can be displayed on-screen or exported as a text file. Additionally, users can further classify signals as legal, illegal, or unknown based on their choice. Depending on this classification, the signal will either be merged into the background or highlighted for further attention.



The Panorama Scanning also also provides the capability to suppress non-interested frequency bands.

3.2.2 Memory Scanning

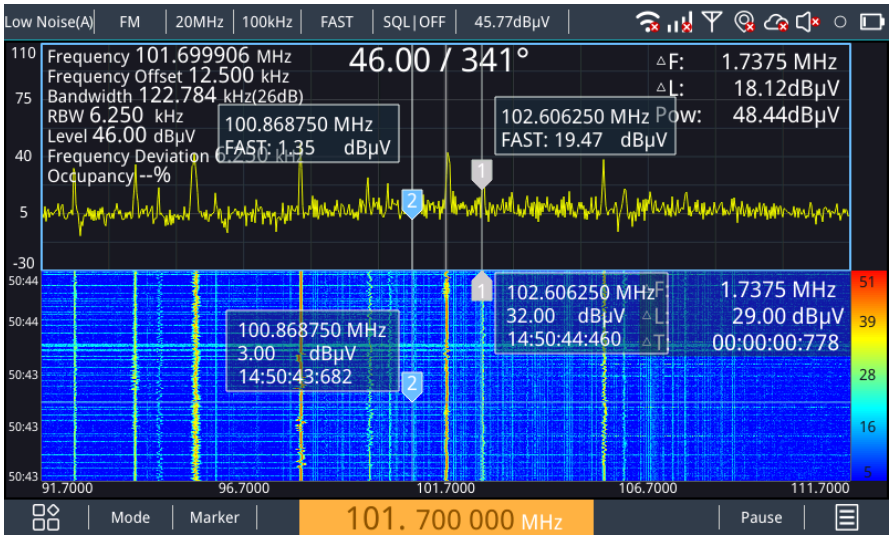
SX-H30 supports saving user-interested frequencies to a channel table, each with d ifferent parameters. Memory Scanning mode allows the instrument to switch receiving parameters between those channels, and displayed as the real-time strength of signals graphically.



3.3 Signal Analysis

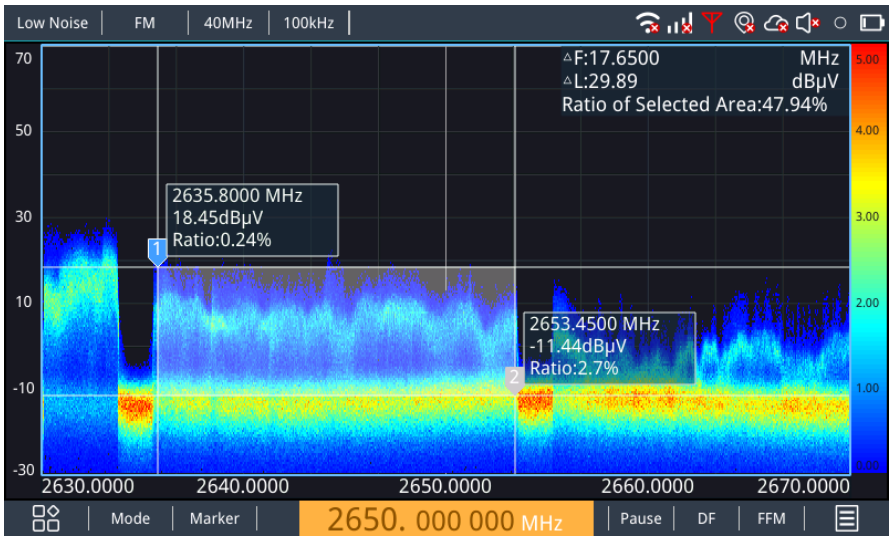
3.3.1 Fixed Frequency Mode

The fixed frequency measurement of SX-H30 supports the display of different trace li nes, Includes: real-time, peak and average, as well as waterfall diagram. Except the spectrum traces refreshing, analog signals can be demodulated simultaneously. Additionally, user may enable the options of ITU recommended monitoring parameters, such as: frequency, level, bandwidth, modulation, etc. Those measurement results would be updated automatically and frequently during FFM mode operation. Furthermore, the system provides optional capabilities like "Modulation Auto Identification" and "Digital Trunking and Walkie-talkie Demodulation".



3.3.2 Digital Phosphor Spectrum

Digital Phosphor Spectrum has been introduced into SX-H30, which is capable to run FFT up to 100000 frames per second, and generating Digital Phosphor Spectrum images. Digital Phosphor Spectrum images using pixels of different color to demonstrate occurrence ratio across different frequencies and levels. Through these images, multiple signals within same frequency range shall be clearly observed and effectively separated. User may resolve co-frequency interferences by means of the Direction Finding function under Digital Phosphor Spectrum.



3.4 Signal Locating

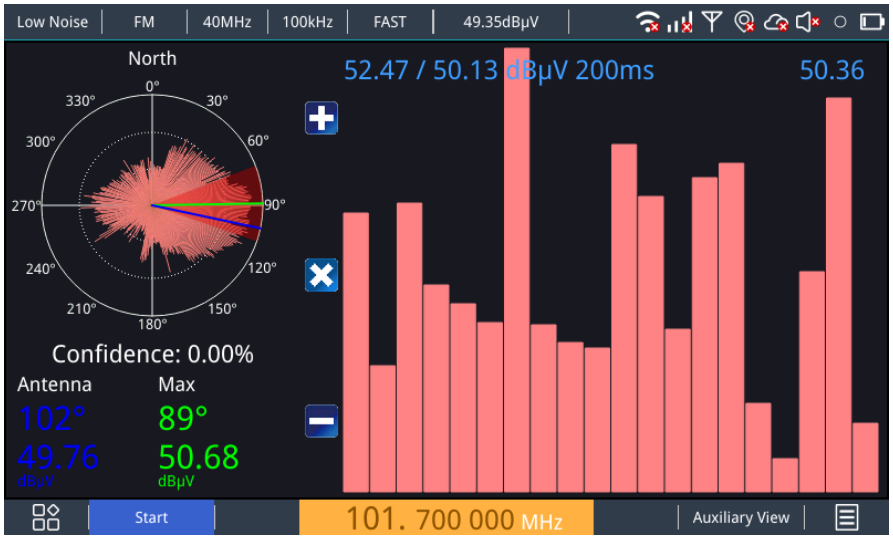
SX-H30 adopts amplitude comparison mechanism, the system incorporates three k ey features for signal source searching and locating:

- Vector Diagram of Strength: displays the 360° distribution of signal amplitude;
- Time-Strength Histogram: visualizes the signal amplitude changes over time dynamically;
- Tone of Strength: adjusts the frequency of pitch according to signal amplitude variations.

Making use of these three functions appropriately will significantly increase efficiency.

The "Vector Diagram of Strength" is particularly useful for signal direction-finding under the environment without obstacle and reflective surfaces (such as open fields or rooftops). Operators simply need to hold the host and rotate it in a full circle; the system will automatically capture azimuth and strength data from the compass and receiver. The received signal level values from each direction can be arranged on the screen, with different lengths determined by different signal amplitudes. In the ideal environment, this diagram can be considered as pattern of the antenna itself.

When signal source positioning in the building or under other complex environmental conditions, SX-H30 provides the "Time-Strength Histogram". Histogram bars will continuously move from right to left along with the time, and display varying colors and heights to follow changes of signal amplitude. This function may visualize the relationship between signal strength and the position of antenna for operators.



The "Tone of Strength" function allows different signal amplitudes to be converted into sound with corresponding frequencies. As the signal amplitude grows stronger, the tone's pitch also increases. This feature eliminates the need for operators to continuously observe the display screen to read the real-time signal levels, they can simply listen to the tone to learn signal level changes. The system adapots convenient tone setting where users can adjust it manually as desired or press one button to automatically return to default reference tone.

Offline digital maps are introduced into the SX-H30 system. By reading GPS position, the system is able to visualize the entire signal source searching process on the maps. This function helps user to determine intersection via triangulation and provides an overall understanding of the signal strength distribution for the target transmitter. It's the most suitable feature for locating signal sources in large outdoor areas.

SX-H30 displays following items on the map:

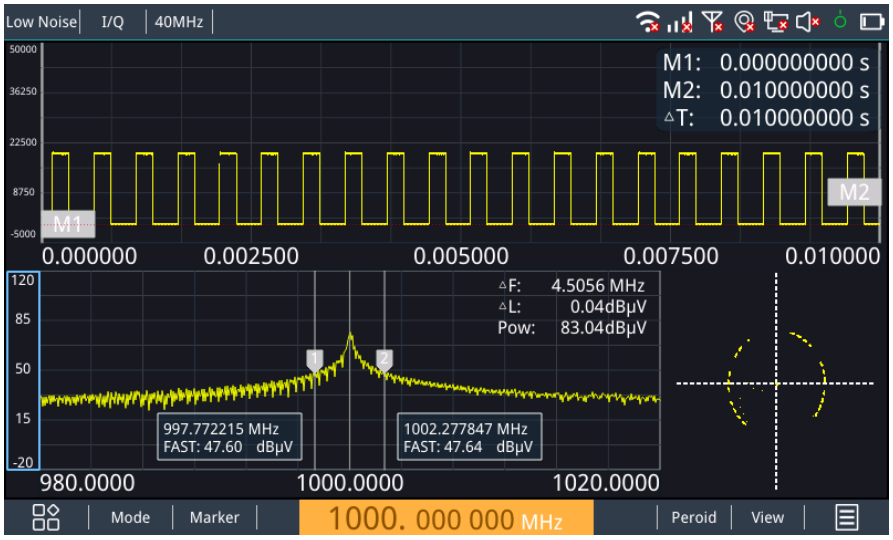
- Flexible-length lines generated from the direction-finding output which point to the signal source;
- Colorful spots correspond to different signal amplitudes along the searching route.

3.5 Recording and Playback

The SX-H30 host provides a TF card slot, and by default, a 512 GB TF card is shipped with this instrument. Therefore, all process data generated by SX-H30 can b e recorded automatically. To realize the process reproduction, a playback app is also provided by default. Following data types are supported in the system:

- Spectrum and demodulated audio (Dynamical, Includes signal parameters)
- I/Q data stream
- Bearing Lines (Direction-finding results)
- Way Points (Routes containing signal amplitude values)
- Screenshots

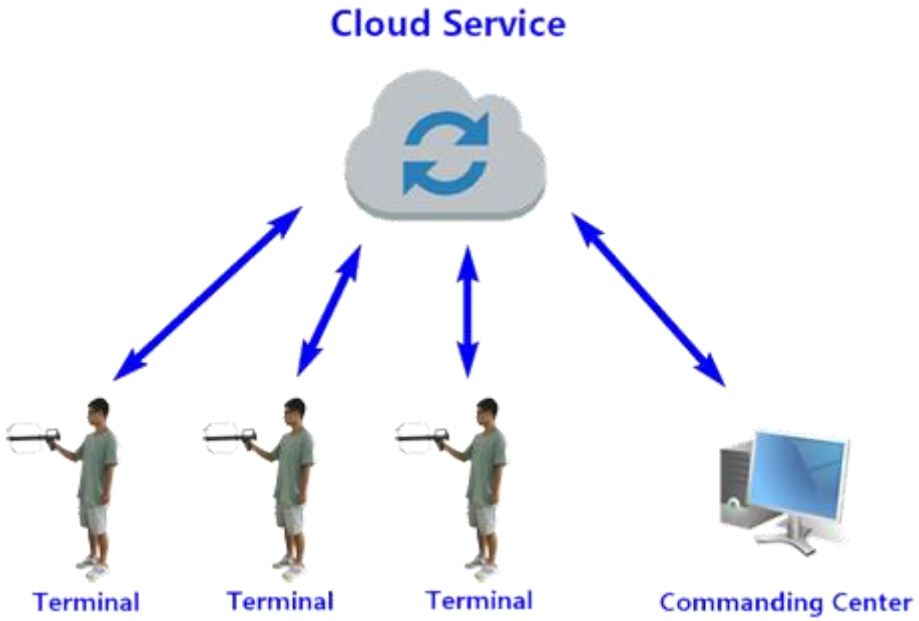
I/Q data stream can be captured and analyzed in Time Domain mode of SX-H30 system, the maximum bandwidth of I/Q data stream recording is 1.25 MHz. Additionally, the sytem supports recording I/Q data of wide bandwidth in a short time, this feature is called "Triggered I/Q". If this function is enabled, once the input signal level reaches the set threshold level, system will start the I/Q recording automatically. The maximum bandwidth of Triggered I/Q data is 80 MHz.



3.6 Cloud Sharing

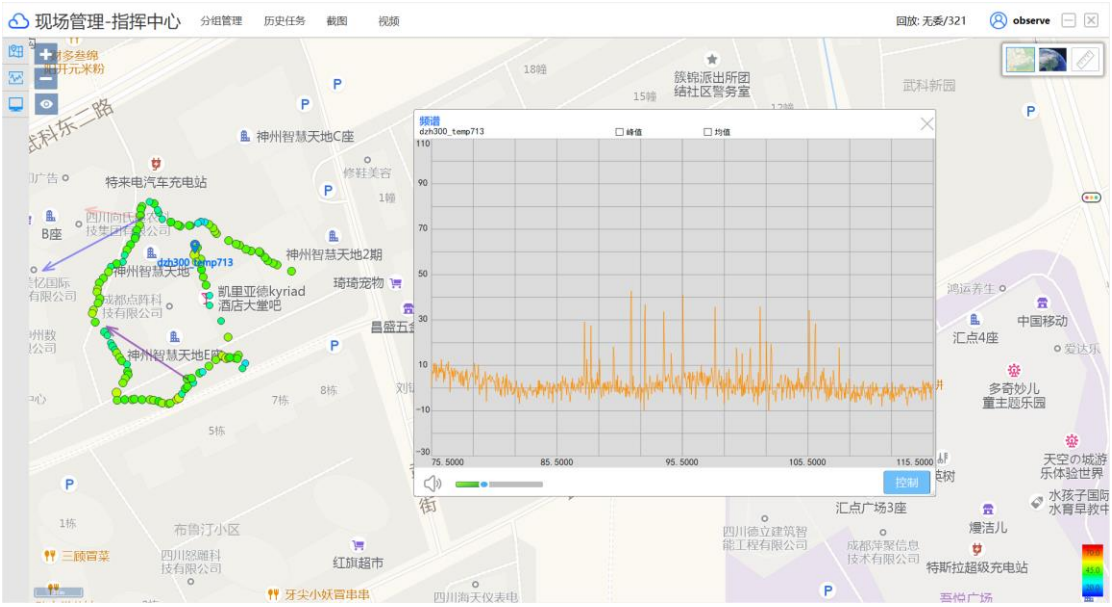
The SX-H30 host features a SIM card slot, which gives 4G network support for the s ystem. By connecting to the internet, SX-H30 is able to access a cloud service, thereby extending more enhanced abilities.

Through the cloud service, multiple SX-H30 units can collaborate for signal source l ocating. Information about position, direction-finding, and signal strengths from each unit can be synchronized. All shared data is delivered in the background and automatically displayed on the host's screen, users won't be required to perform additional steps. Therefore, each SX-H30 user can aware other user's activities, and l earn the field situation more comprehensively!



For enhancing efficiency, experience of locating signal sources now has been converted to an algorithm, and integrated into the cloud service. Based on data from each host, this algorithm will calculate and estimate the location of the signal source, subsequently pass final results back to hosts.

Additionally, a separated Commanding Center software is provided, which can run on a PC. This software is able to fetch positions, field spectrum & audio data from SX-H30 units via the cloud service. Experts may use the Commanding Center software to guide on-field operators by assisting them with analysis and decision-making on complex situations.



Furthermore, the cloud service can record the direction-finding results and waypoints along with signal strengths automatically. Those recorded mission data can be reloading for post-event review, analysis, and summary etc.

4 Specifications

Item	Specification
Frequency range	20 MHz ~ 8 GHz Optional: 9 kHz ~ 20 MHz 8 GHz ~ 26.5 GHz 26.5 GHz ~ 40 GHz 8 GHz ~ 40 GHz
Frequency tuning resolution	≤ 10 Hz
Frequency accuracy	≤ 0.5 ppm (2 MHz ~ 26.5 GHz) ≤ 1 ppm (26.5 GHz ~ 40 GHz)
IF bandwidth	80 MHz
Scan speed	≥ 100 GHz/s (step = 25 kHz, 2 MHz ~ 8 GHz) ≥ 60 GHz/s (step = 25 kHz, 8 GHz ~ 40 GHz)
Level measurement accuracy	≤ 2 dB
Level measurement range	-120 dBm ~ +10 dBm (2 MHz ~ 8 GHz) -120 dBm ~ -30 dBm (8 GHz ~ 26.5 GHz)

	-110 dBm ~ -30 dBm (26.5 GHz ~ 40 GHz)
DANL	-150 dBm/Hz (typical)
Pre-amplifier	integrated in the host
Attenuation	50 dB (maximum)
Demodulation modes	FM, AM, LSB, USB, CW
Demodulation bandwidths	6.25 kHz ~ 200 kHz
Available detectors	FAST (Sample/Clear&Write), PEAK (Positive Peak), NEG (Negative Peak), AVG (Average), RMS
Noise factor	≤12 dB (low noise mode, 2 MHz ~ 8 GHz) ≤15 dB (low noise mode, 8 GHz ~ 26.5 GHz) ≤18 dB (low noise mode, 26.5 GHz ~ 40 GHz)
Phase noise	≤ -98 dBc/Hz @ 10 kHz (fc = 1501 MHz, 2 MHz ~ 8 GHz) ≤- 80 dBc/Hz @ 10 kHz (fc = 12001 MHz, 8 GHz ~ 40 GHz)
Third order intercept point (IIP3)	≥ 12 dBm (low distortion mode, 2 MHz ~ 8 GHz) ≥ 2 dBm (low distortion mode, 8 GHz ~ 26.5 GHz) ≥ -5 dBm (low distortion mode, 26.5 GHz ~ 40 GHz)
Second order intercept point (IIP2)	≥ 60 dBm (low distortion mode, 2 MHz ~ 8 GHz) ≥ 40 dBm (low distortion mode, 8 GHz ~ 40 GHz)
IF rejection	≥ 90 dB (normal mode, 2 MHz ~ 26.5 GHz) ≥ 75 dB (normal mode, 26.5 GHz ~ 40 GHz)
Image rejection	≥ 90 dB (normal mode, 2 MHz ~ 26.5 GHz) ≥ 70 dB (normal mode, 26.5 GHz ~ 40 GHz)
Screen size	5 inches
Screen resolution	800 x 480 pixels
Interfaces	USB (can be adapted to a LAN port and a Type-A USB port), WiFi, TF card slot, SIM card slot, Headphone jack, Power input.
Working weight	≤ 2.5 kg (host+battery+1 antenna)
Battery working time	≥ 3 hours (per battery)
Operating temperature	-10 ℃ ~ + 50 ℃

5 Configuration

No.	Suit Name/Code	Item	Model	Descriptions
Standard				
1	Baisc Set (SX-H30-1G)	Host	SX-H30.1U	Frequency range: 20 MHz ~ 8 GHz
		Standard Software	SX-H30.1S	Includes major monitoring features (embedded in host)
		VHF Antenna (20 MHz ~ 200 MHz)	SX-A30.2A	Standard Antenna #1
		UHF Antenna (200 MHz ~ 500 MHz)	SX-A30.3A	Standard Antenna #2
		Log-Periodic Antenna (500 MHz ~ 8 GHz)	SX-A30.4A	Standard Antenna #3
2	Accessories (SX-H30-KIT)	/	/	Charger * 1 Battery * 2 (SX-H30.3U)T F Card and Reader * 1 Type-N Connecter * 1 Wristband * 1 User Manual * 1 Case * 1
Optional				
3	Low Band Expand (SX-H30-2G)	Frequency Band Expand of Host	SX-H30.1R	Expand the frequency range of host to 9 kHz (embedded in host)
		HF Antenna (9 kHz ~ 30 MHz)	SX-A30.1A	Includes 1 piece of antenna (9 kHz ~ 30 MHz)

No.	Suit Name/Code	Item	Model	Descriptions
4	/	Frequency Band Expansion Unit (8 GHz ~ 26.5 GHz)	SX-A30.6A	Includes antenna and down converter (in one-piece)
5	/	Frequency Band Expansion Unit (26.5 GHz ~ 40 GHz)	SX-A30.7A	Includes antenna and down converter (in one-piece)
6	/	Frequency Band Expansion Unit (8 GHz ~ 40 GHz)	SX-A30.8A	Includes antenna and down converter (in one-piece)
7	GNSS Interference Locating (SX-H30-3G)	Vehicle-mounted Unit	SX-H30.2U	1156 MHz ~ 1289 MHz and 1553 MHz ~ 1610 MHz
		GNSS Antenna #1	SX-A30.1P	1156 MHz ~ 1289 MHz
		GNSS Antenna #2	SX-A30.2P	1553 MHz ~ 1610 MHz
		Software Application	SX-H30.3E	
8	/	Modulation Auto Identification (Software Module)	SX-H30.2S	Supports: FM, AM, ASK, 2FSK, 4FSK, BPSK, QPSK, 8PSK, 16QAM, 64QAM
9	/	Digital Trunking and Walkie-talkie Demodulation (Software Module)	SX-H30.3S	Supports: TETRA, DMR/PDT, dPMR, NXDN
10	/	Drone/Pilot Locating (Software Application)	SX-H30.2E	Supports: detecting, identifying and locating drones and remotes signals from mainstream brands/models