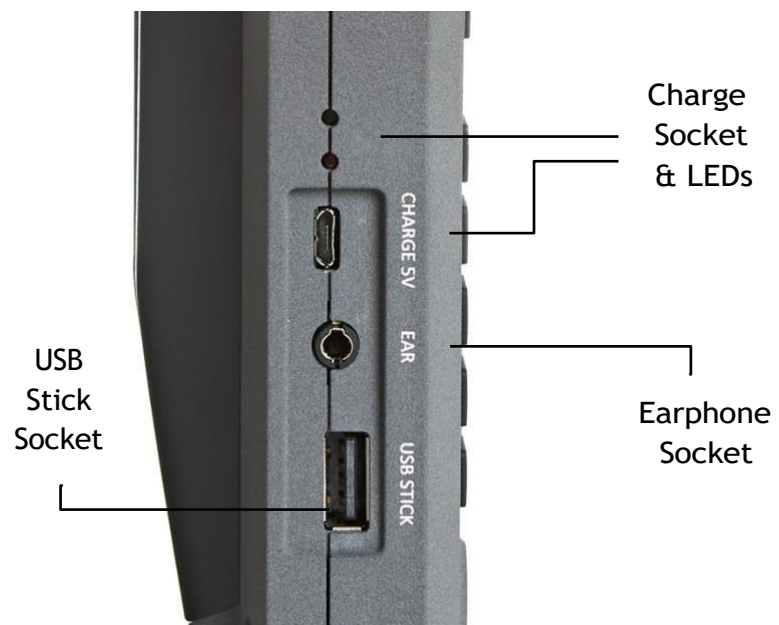


HSA-Q1

Handheld RF Spectrum Analyser – 1 MHz to 13.44GHz

Instruction Manual





INTRODUCTION

The HSA-Q1 is a fully integrated portable RF Spectrum Analyser designed specifically for professional countermeasures use (TSCM). It has been designed with the highest possible technical specification to ensure maximum detection capability and has a range of invaluable features to aid countermeasures RF detection or 'Sweeps'. Despite its technical capability the HSA-Q1 remains easy to operate with an intuitive user friendly interface.

CHARGING THE BATTERY

The HSA-Q1 has an internal Lithium Polymer battery pack. Before use connect the supplied 5V (Micro USB) charger to the socket marked 'CHARGE 5V' on the side of the unit. If possible charge the HSA-Q1 whilst the power is off as this will result in a faster charge. When charging the red charge LED will illuminate. When the charge is complete the green LED will illuminate. Depending on the condition of the battery the charge will take up to 4 hours. Use only the specified charger and cable provided with the unit.

For prolonged use the charger can be permanently connected to the HSA-Q1.

PLEASE NOTE: This may result in some low frequency noise being detected (below approx 100 MHz) which is caused by the switched mode power supply.

RETRACTABLE STAND

The HSA-Q1 is a truly portable handheld RF Spectrum Analyser. For desktop use it features a rear retractable stand that can be extended. Use the finger slot at the base of the unit to pull the stand out from its stowed position.

OPERATING THE UNIT

POWER ON/OFF

To switch on the HSA-Q1 press and hold the Power Symbol button for more than 1 second. The display will momentarily show the start-up screen and then the main live monitoring screen. To switch off the unit press the Power Symbol button for more than 2 seconds.

SETTING TIME & DATE

Before use set the Time & Date by pressing the SETTINGS button to select the SETTINGS Menu. Highlight the 'Time/Date' using the ▲ ▼ buttons and then press the OK button. Using the numerical keypad, key in the time in 24 Hour format HH/MM followed by the date in format DD / MM / YY. When complete select OK from the custom keys below the screen to confirm. Then press EXIT to return to the main screen.

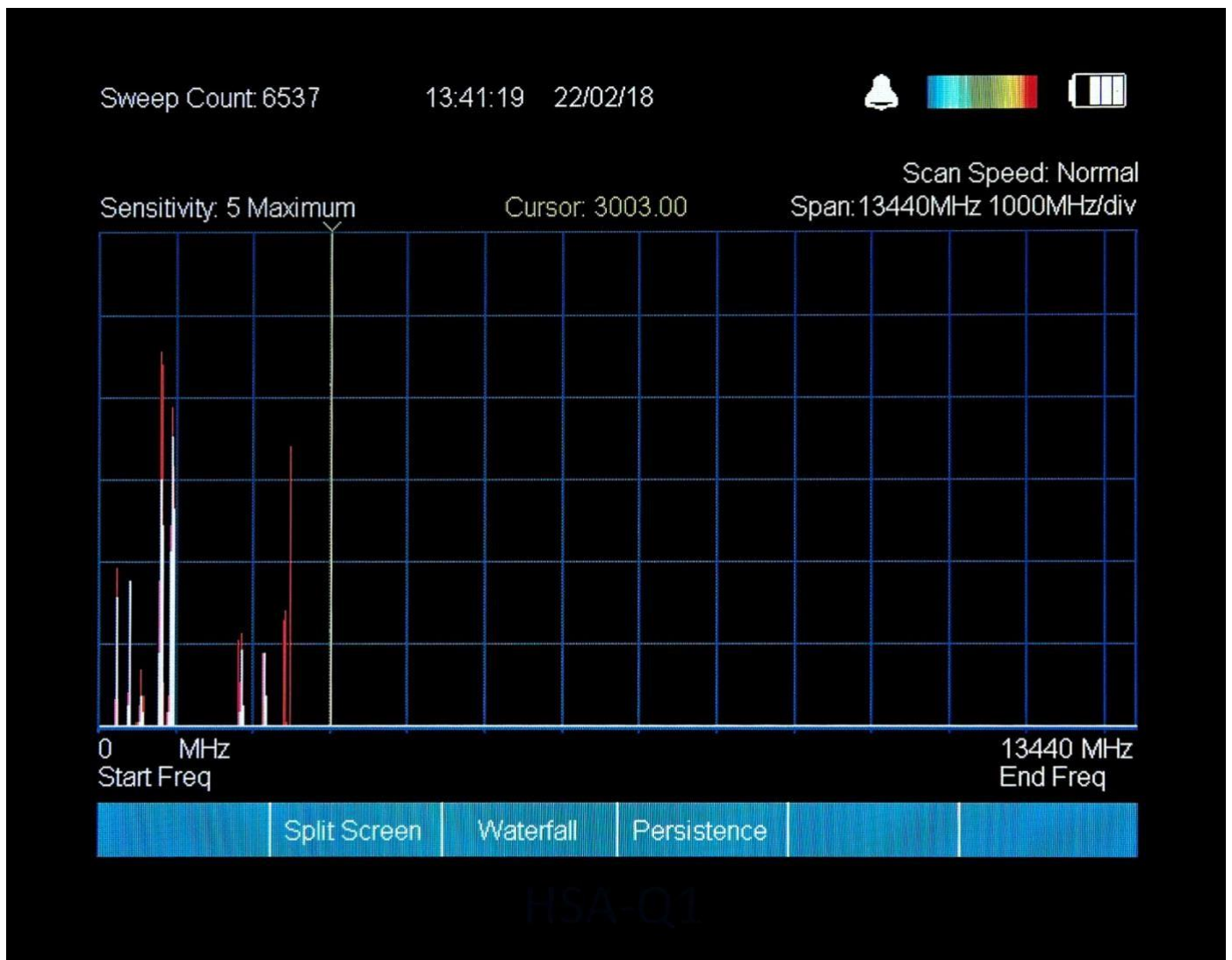
ANTENNA SELECTION

The HSA-Q1 is supplied with two antennae for connection to the Antenna Socket (TNC type)

1. Multi-Element 13.44GHz - Length 220mm x Dia. 17mm - This is the main antenna and recommended for general use.
2. Telescopic Whip Antenna - This antenna is designed for low frequency use - approx 200 MHz or less.

Screw the selected antenna to the TNC socket and turn until finger tight.

MAIN SCREEN



Main Screen - default setting showing full 0 to 13.44 GHz detection span

The main HSA-Q1 screen displays any live detected signals as well as historical signals that have occurred in the current sweep. Live signals are shown as white vertical line. Historical signals are shown as red vertical lines. The stronger the detected signal the higher the vertical line will be.

The frequency range selected (default at power on - 0 to 13.44GHz) is shown at the bottom left and right of the screen: 'Start Freq' and 'End Freq'.

The cursor is a yellow vertical marker line that can be moved left or right (using the circular ◀ ▶ buttons) to highlight and detected signal/frequency. The frequency that the cursor is set to is displayed in yellow just above the centre of the graph.

The Frequency Span is shown on the top right along with the number of MHz per division. Each division is made up of a blue vertical line.

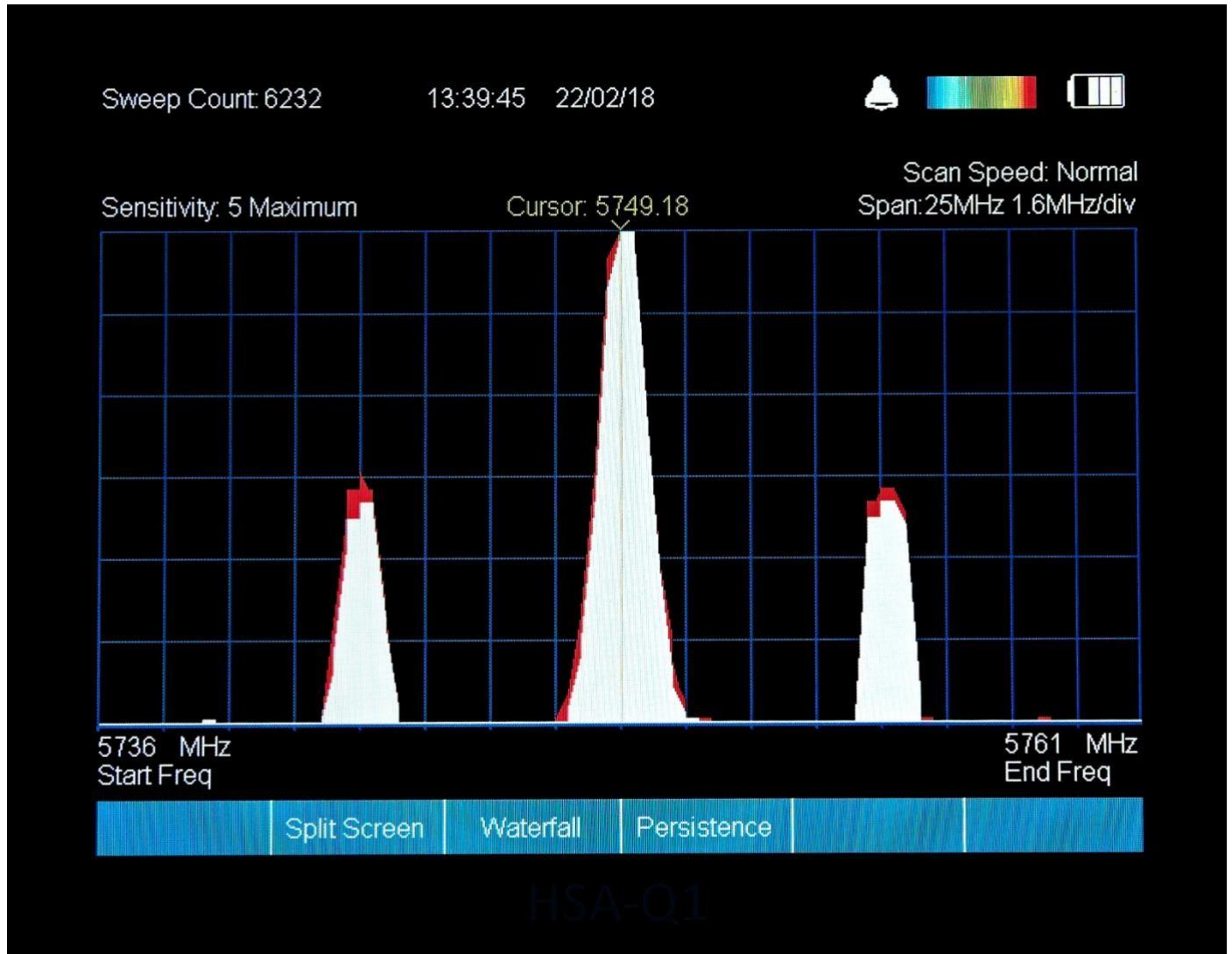
The Scan Speed (default Normal) shows the rate of scan.

At the top left of the screen, the number of sweeps that have taken place (since power on) is counted. The time and date is shown at the top centre of the screen. To the top right of the screen the bell symbol indicates that the button press beep function is on (changeable in settings). The colour spectrum pattern is displayed to use as a reference for the spectrogram waterfall function signal strength.

To the far right the battery level indicator is shown. When the battery is almost exhausted the battery symbol will change colour from white to red.

At the bottom of the screen there are six blue custom 'buttons' which correlate to the actual buttons just below the screen. These buttons have various functions that will change depending on what mode and functions are being used.

ZOOM FUNCTION



Main Screen Zoom to 5.750 GHz with a 25 MHz Span

The HSA-Q1 features a ZOOM function to enable the user to quickly zoom in to any detected signal or frequency for further analysis.

To select the signal of interest move the yellow cursor line (using the circular ◀ ▶ buttons) until it is in line with the signal. If preferred you can also use the numerical keypad to directly enter the frequency required followed by the OK button.

Press the ZOOM button and the displayed frequency span will have halved. To zoom in further press the ZOOM button again. Each time the frequency span will halve until maximum Span (25 MHz) is reached. At any time during this process the cursor can be moved to re-centre the signal or alter the cursor frequency.

If you wish to move up or down in frequency spans whilst zoomed in you can use the ZOOM ◀ ▶ buttons. For example if viewing 950 to 1050 MHz (100 MHz span) then pressing the ◀ ZOOM button will reduce the viewed range from 850 to 950 MHz. Likewise pressing the ZOOM ▶ button will increase the viewed range from 1050 to 1150 MHz.

Once maximum zoom is reached (25 MHz span) to zoom out use the custom key ZOOM OUT. You can also use the ZOOM IN custom key rather than using the actual ZOOM button at any time if preferred.

SENSITIVITY

The HSA-Q1 has five sensitivity levels (1 Minimum to 5 Maximum).

The default sensitivity is set to 5 Maximum upon power on. The sensitivity can be adjusted by pressing the SENSITIVITY button to scroll through the 5 settings.

At Sensitivity 5 Maximum the maximum detection sensitivity is approximately -80 dBm.

At Sensitivity 1 Minimum the maximum detection sensitivity is approximately -55 dBm.

During initial use in a sweep it is recommended that the sensitivity 5 maximum is used to detect all possible signals, then gradually reducing the sensitivity once innocent signals have been eliminated to home in on the strongest signals for further analysis.

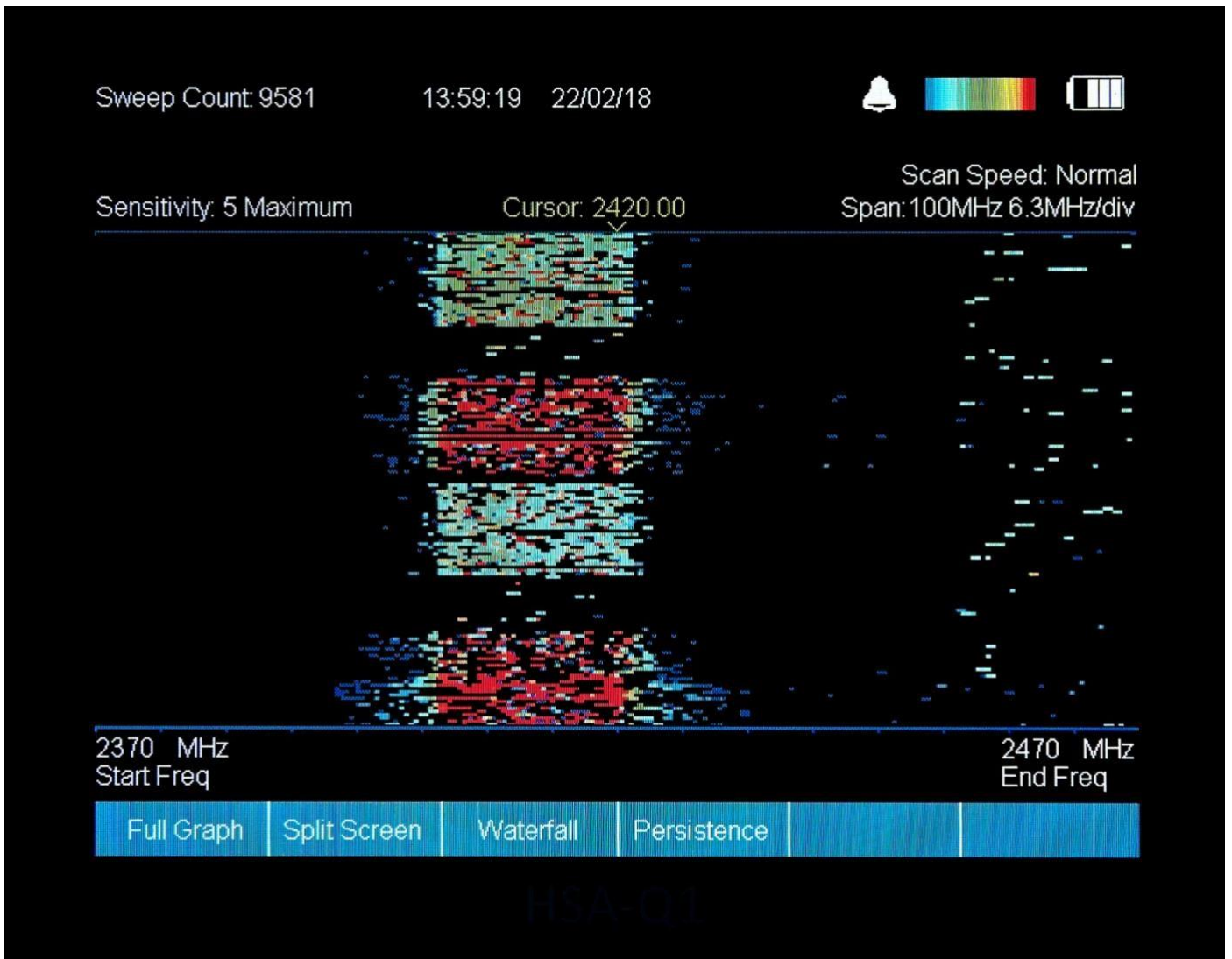
SCAN SPEED

Depending on the Frequency Span selected the scan speed can be increased. This is especially useful for analysis of fast pulsing digital signals such as those in Wifi, Cellular, GPS devices etc some of which may potentially be missed at lower scan speeds.

If set in a Span of between 100 MHz and 3200 MHz pressing the SCAN SPEED button will increase the scan speed. There are three Scan Speeds - Normal (Default), Fast and Fastest. The selected Scan Speed is shown at the top right of the display.

PLEASE NOTE: in spans below 100 MHz or above 3200 MHz the Scan Speed remains fixed at Normal.

WATERFALL (SPECTROGRAM) FUNCTION



Full Screen Waterfall of 2400 MHz WiFi Router

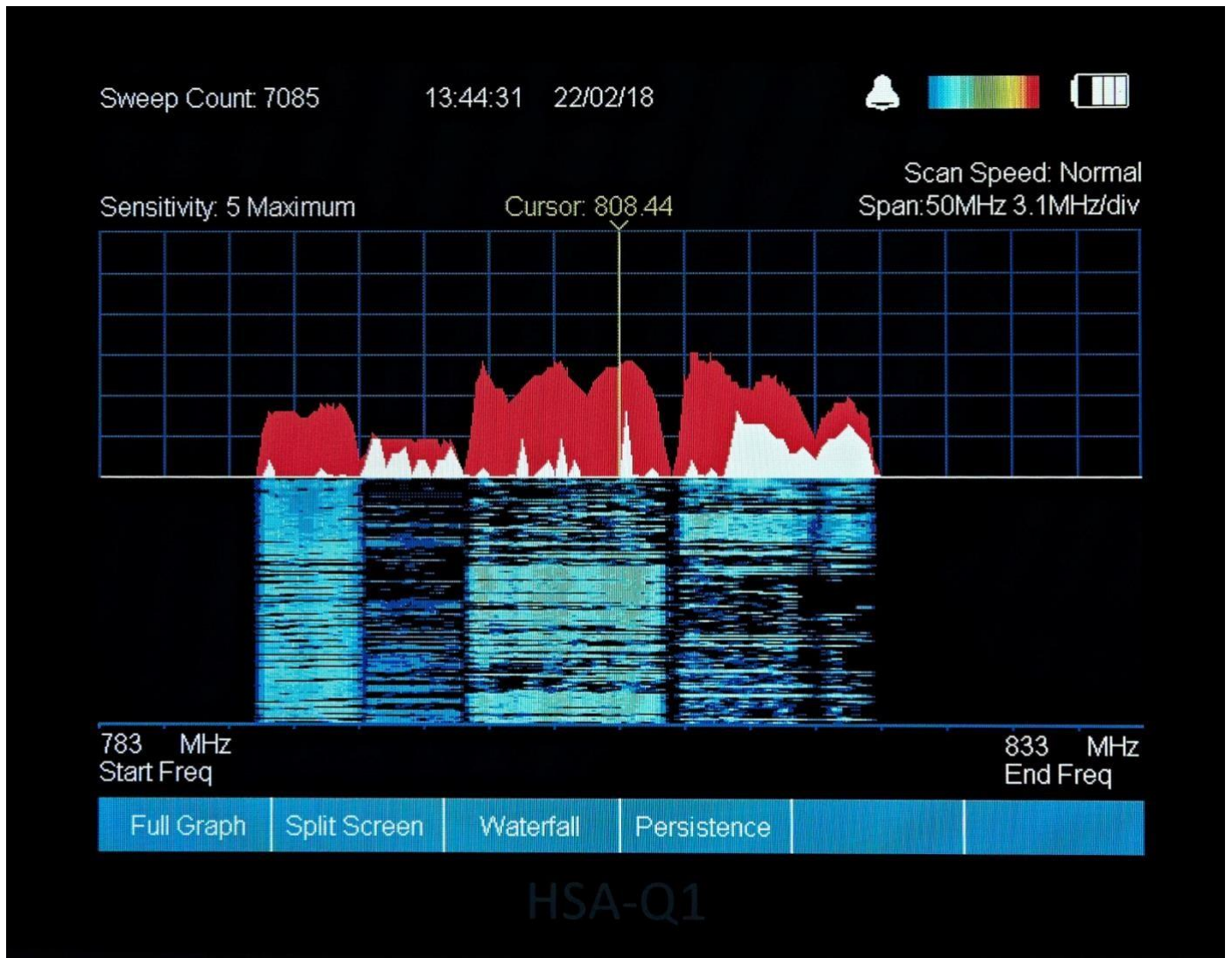
The HSA-Q1 features a full colour graphical Waterfall function to enable the user to further analyse live signals over time. This is especially useful in analysing modern pulsed digital signals (or frequency hopping signals) such as those from Cellular, Wifi, Burst and GPS based devices.

Once you have found a detected signal to analyse further, select the Waterfall Function from the main screen using the custom key 'Waterfall'.

The grid will disappear and the detected signal will now be displayed over time scrolling vertically from the top of the screen down to the bottom. Live signals will appear at the top, then scroll down the screen and disappear after about 80 seconds. The colour of the detected signals will range from blue for the weakest signals through to red for the strongest. Use the colour reference spectrum at the top right of the screen to help if required.

To exit the Waterfall function, press the custom key 'Full Graph'.

SPLIT SCREEN WATERFALL

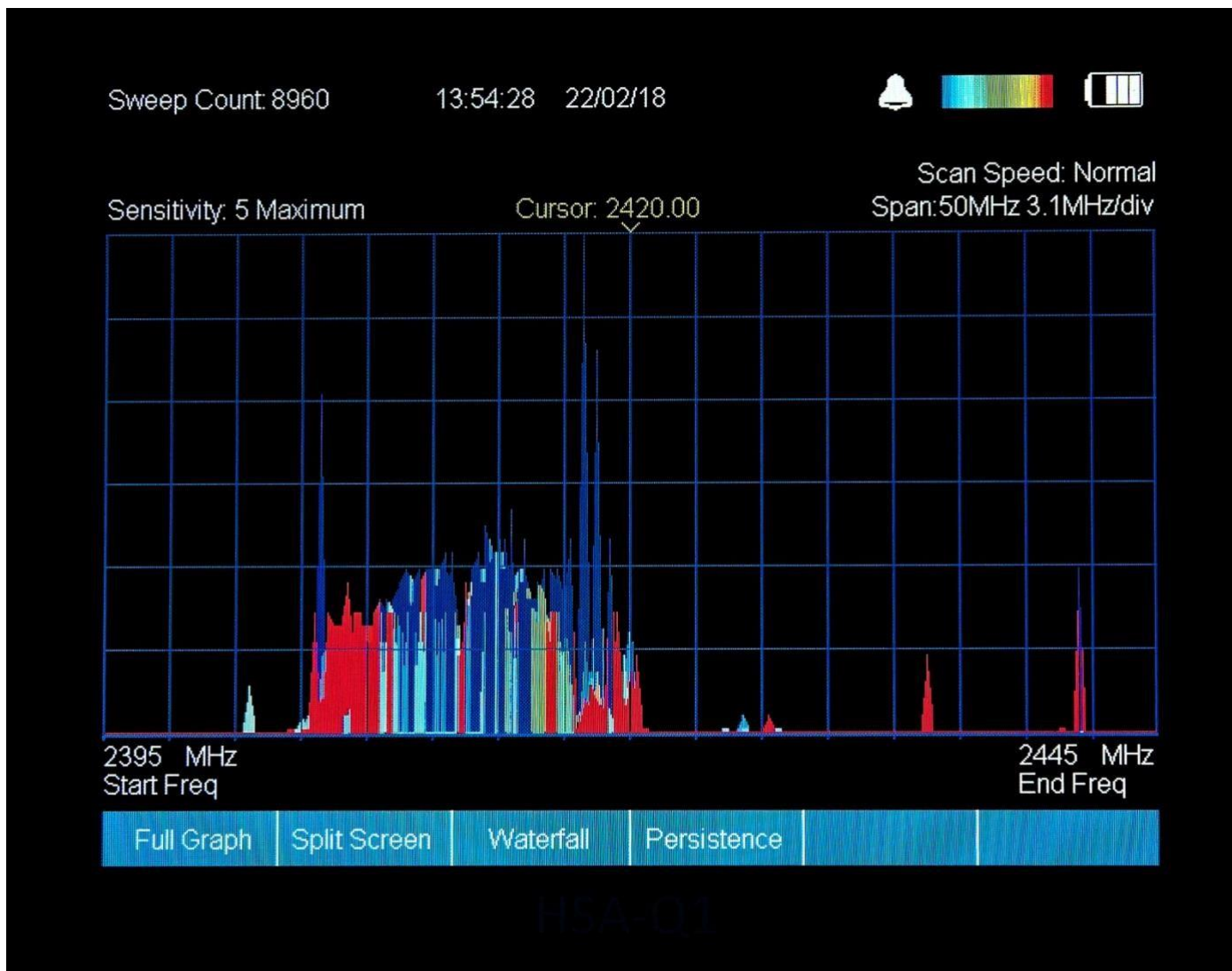


Split Screen (Half Waterfall) – Zoomed in to 50 MHz Span showing 4G Cellular Activity 800 MHz

The split screen Waterfall function splits the screen into two halves: The top half representing the main graphical screen and the bottom half representing the scrolling Waterfall function. This can be useful as it allows the user simultaneous analysis of both screens without needing to switch between them.

To select the Split Screen Waterfall Function from the main screen using the custom key ‘Split Screen’.

To exit the Spilt Screen Waterfall function, press the custom key ‘Full Graph’.



Persistence Mode – Blue signals are the least persistent, running through to Red for the most persistent.

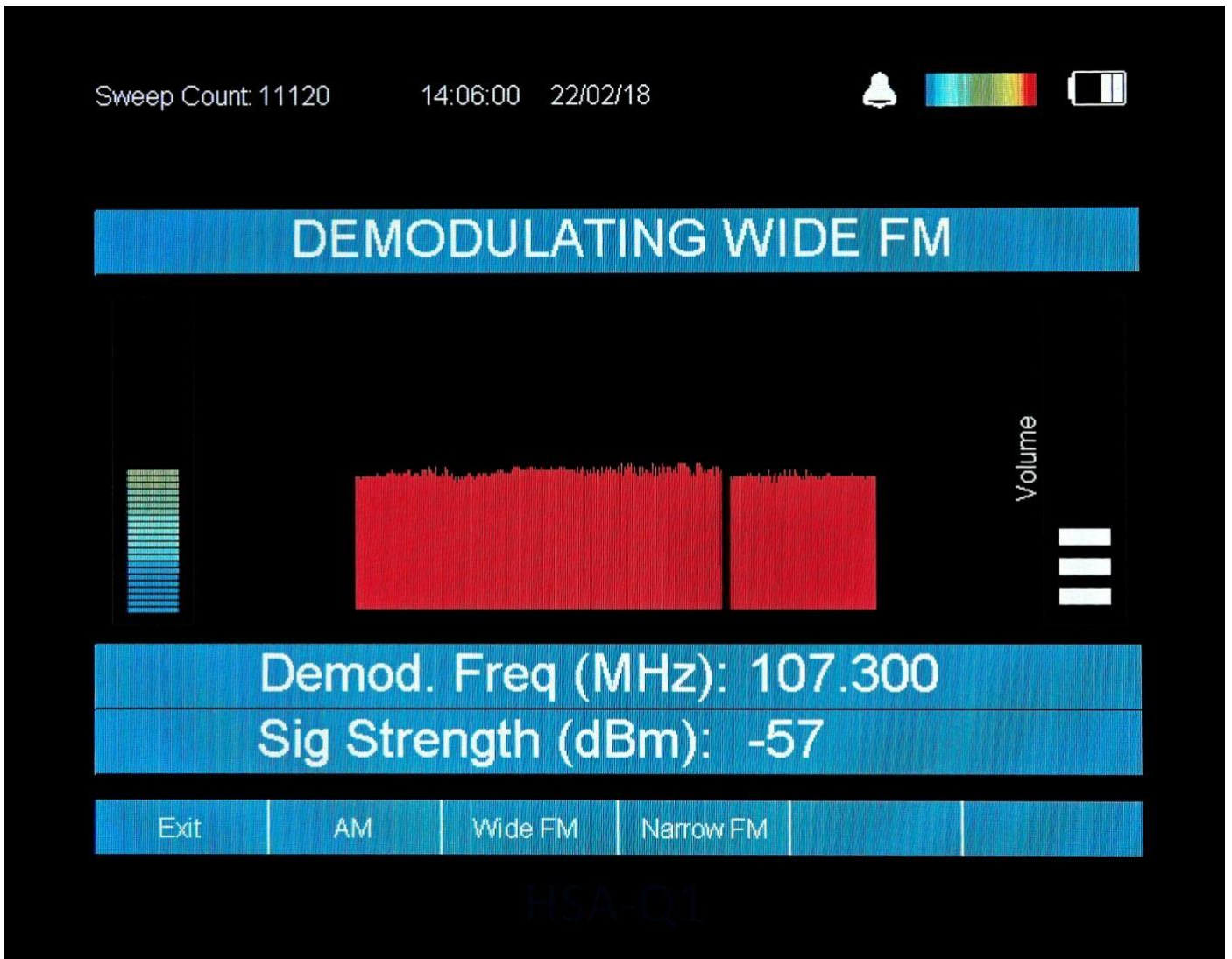
Persistence mode offers further analysis of any detected signal.

To select Persistence mode, from the main screen using the custom key 'Persistence'.

The more 'persistent' the signal is (the longer it remains detected) its colour will change from blue through the colour spectrum to red for the longest present signals (use the colour reference spectrum at the top right of the screen to help). This can be used to identify persistent signals that might otherwise be hidden in a noisy RF environment. For example: In a busy pulsing RF environment such as WiFi (2400 MHz) signals will generally take quite a long time to change in colour from blue through to red as they are pulsing and not very 'persistent'. If however within the detected range a single signal has a high level of persistence (ie changes to red colour quickly) this could indicate the presence of another detected signal within the range - for example: from a wireless (2400MHz) camera.

To exit Persistence Mode, press the custom key 'Full Graph'.

TUNE - LISTEN MODE



Tune Listen Mode – Signal at 107.3 MHz (-57 dBm signal strength) - Demodulated Audio in Wideband FM

The HSA-Q1 features a Tune-Listen function where at the press of a button the user can direct tune into any detected signal.

Once a signal is detected, before entering Tune - Listen Mode, it is recommended to use the Zoom function to ascertain its frequency as accurately as possible. Then move the yellow cursor to the very centre of the detected signal.

Press the TUNE - LISTEN button to enter Demodulating mode.

The frequency of the detected signal (Demod Freq.) will be displayed in MHz with a resolution down to 0.001 MHz (or 1 KHz). If you wish to trim the frequency up or down, use the circular ◀ ▶ buttons to trim in 1KHz steps.

The live signal strength of the detected signal will be shown numerically (in dBm) down to a minimum of -100 dBm.

For visual reference a live signal strength bar is shown on the left hand side of the screen that ranges from Blue in colour through to Red for maximum signal strength. The peak detected signal strength is shown in a grey background colour within the signal bars.

In the centre of the screen the signal strength is also shown as a signal trace running from left to right in red. The trace runs along the screen approximately once every 4 seconds and

shows the amplitude of the detected signal. This can be useful when trying to determine the detected signal type, whether it be analogue, digital, pulsing bursts from a tracking device etc. Gaps in the trace indicate a pulsing digital signal, large gaps potentially pointing towards a 'burst' type device such as a GPS tracker. A smooth flat trace with no gaps indicates an analogue constant carrier signal such as that from a conventional audio bugging device or wireless camera.

To listen to the detected signal use the circular ▲ ▼ buttons to adjust the audio volume level. The volume level is indicated by the Volume bar on the right hand side of the screen. The detected signal will be heard through the built in loudspeaker. If preferred the user can connect a pair of earphones via the EAR socket which will automatically mute the internal loudspeaker.

The default Demodulation setting is WFM (Wide FM). The user can also select NFM (Narrow NFM) and AM using the custom keys at the bottom of the screen. These settings enable the user to listen to the different demodulation modes to help further identify a signal type. This can be especially useful in identifying conventional bugs with microphones or eliminating other innocent detected signals such as broadcast radio.

To leave Tune _ Listen Mode press the custom key 'Exit'

MEMORY LOGGING TO USB STICK

If required the HSA-Q1 can store sweeps to USB for later viewing. Use the supplied USB memory stick and ensure the stick has no saved files on it before use. Otherwise use an empty USB stick with at least 4GB of memory space.

To start logging to the USB stick, connect the USB stick to the 'USB STICK' socket on the side of the unit.

At the top of the screen you should now see the letters 'USB' in red colour. This indicates that the USB stick has been recognised and the memory logging process has now started.

The HSA-Q1 will store whatever live data is being viewed on the main screen for recalling later with a time & date stamp. This can be useful when it is not always possible to be present during a sweep and to observe at what specific time detected signals have occurred.

To recall stored files, with the USB stick connected, select the custom key 'View Log'. This will open the Log Screen which will display all stored sweeps listed in Date & Time format in hourly increments. Select the required Date and Hour using the circular ▲ ▼ buttons and press OK to view.



Recalled sweeps are shown in Split Screen format with the start time shown in large characters at the top left of the screen. As per a live scan the red historical vertical lines represent signals detected within that period. The lower half of the screen shows the Waterfall trace of the same period. To scroll up and down through stored sweeps use the circular ▲ ▼ buttons noting the start time of that particular screen. Each stored screen represents one full screen of Waterfall data, the time of which will vary according to the Span and Scan Speed at the time of storage.

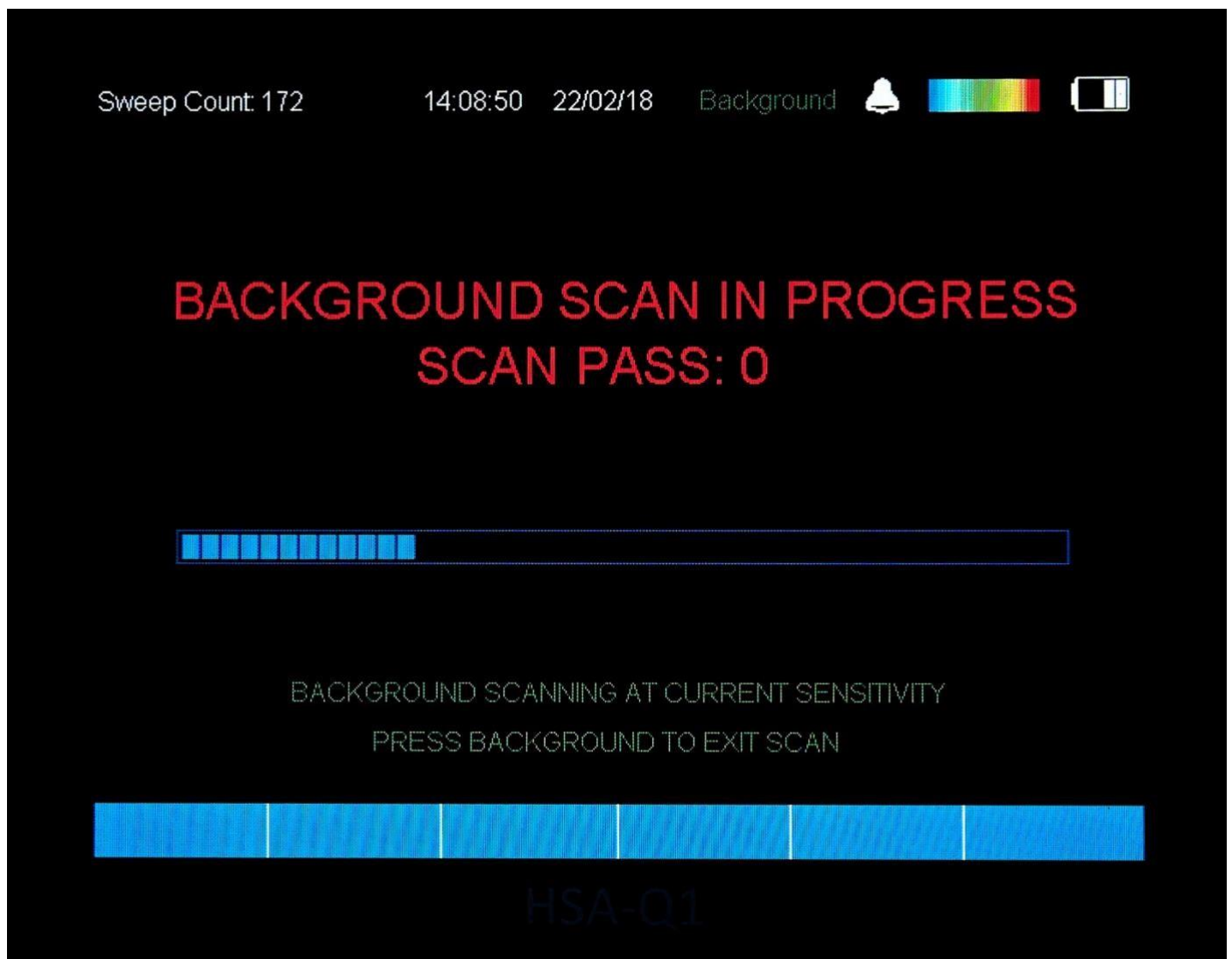
PLEASE NOTE: The HSA-Q1 will stop recording live data to USB whilst the memory Log is being viewed.

We recommend that the USB stick has no other data stored on it to ensure stored data is not corrupted. No responsibility will be accepted by the manufacturer for any technical problems/damage/loss of data caused by the connection/transfer of data from the HSA-Q1 to any computer/storage device. Please note ONLY USB Sticks should be connected. Damage may result if other USB cables or devices are connected to the 'USB STICK' socket.

BACKGROUND SCAN

The HSA-Q1 can perform a 'Background' scan where it will learn and store the current RF environment. This can be stored to a USB memory stick and recalled at any time in the future for comparison to see if any new suspect signals have appeared in the RF environment since last checked. New signals will be highlighted on the display for closer inspection.

To enter Background Mode press the BACKGROUND button. The Background Setting screen will be displayed. To start a new background scan use the circular   buttons to select 'Start a New Background Scan' and then press OK to confirm.



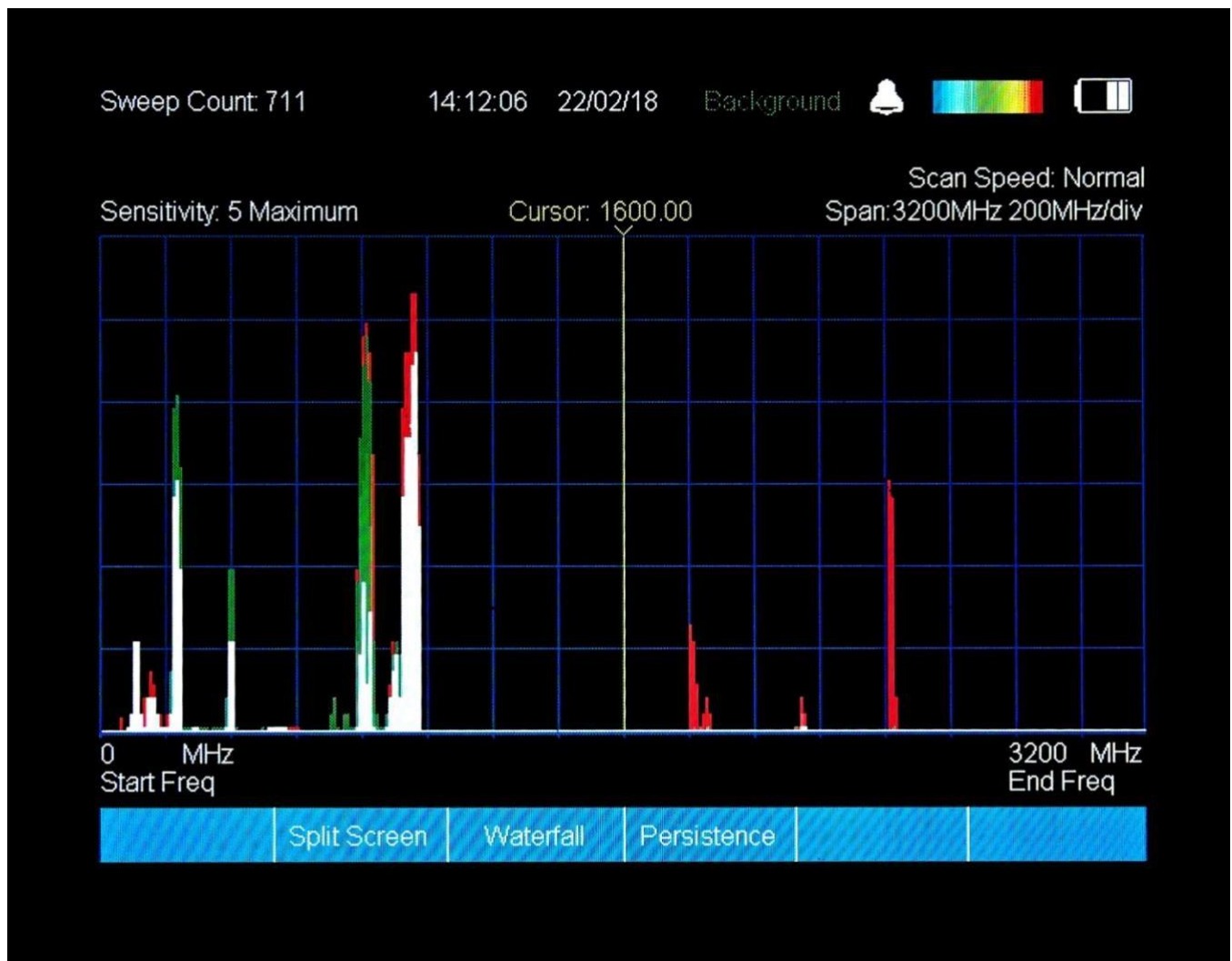
Background Mode selected and scan of the current RF environment being recorded for later comparison

The Background scan will now commence and progress will be shown on screen. The blue bar running from left to right will show each scan progress and the number of Scan Passes with the number shown numerically in red.

Each Scan pass represents one sweep of every possible Sweep Frequency Span, from Maximum 13.44 GHz right down to 25 Mhz so that when recalled the user has the maximum amount of data stored for comparison. At least one Scan Pass will be required to provide sufficient data for comparison at all Frequency Spans.

The more Scan Passes that are completed during a background scan the more detected background data will be recorded giving a better indication of the real background RF environment under investigation.

Once you have completed your background scan press the BACKGROUND button to leave the background scan mode and return to the main screen. If the USB stick is connected the message 'BACKGROUND TO USB PLEASE WAIT' will be seen and the data stored to the USB stick. The background scan will be stored in Date & Time format for reference.



Main Screen in Background Mode - Live signals (white), Historical signals (red) and Background recorded signals (green).

The main screen will now show the text BACKGROUND in green at the top of the display. Any signals that were recorded within the background scan will now be shown in GREEN as well as the usual White live signals and Red historical signals. This enables the user to see if there have been any new signals or even signals that are no longer present since the background scan was recorded.

To recall a stored Background Scan go to the Background settings menu and select 'Get Background from USB'.

To enable the user to perform a sweep ignoring all signals from a stored background select 'Subtract Background from Live'. This will literally subtract any stored background traces from the current detected live traces and show the difference. This will represent new signals since the background scan or signals that may be stronger now than they were at the time of the scan.

To leave Background mode and return to normal live scanning select 'Hide Background Scan' from the Background Settings screen.

SETTINGS

To adjust the settings of the HSA-Q1 press the SETTINGS button. Use the circular▲ ▼ buttons to select the required setting and then press OK confirm.

1. Time & Date adjustment - refer above to 'SETTING TIME & DATE'.
2. Keyboard 'Beep' tone on or off - Select 'Beep On' or 'Beep Off'. The bell icon will be displayed at the top of the screen to indicate the Beep tone is on.
3. Outline Graph - Depending on visual preference the Main screen live detected signals that are shown in white can be displayed in two ways. Either as a thin white outline (with red inner fill) or as a completely white filled line. Select either Fill Graph or Outline graph.

To leave the Setting Menu press the custom key 'Exit'

MASTER RESET

In the unlikely event of a firmware failure the HSA-Q1 can be reset by pressing the following three buttons simultaneously:

'ZOOM', 'OK' and 'Power Symbol' Button

This will force the HSA-Q1 to shut down so it can then be restarted as usual.

FIRMWARE UPDATES

If required the HSA-Q1 can have its firmware updated via the USB stick.

IMPORTANT: Before any firmware updates are carried out the HSA-Q1 must have a FULLY CHARGED battery. Failure to update the unit without a full battery charge may result in a complete system failure which will mean the unit can no longer be operated and will need to

be returned to the manufacturer for servicing. This will not be covered by manufacturer warranty.

1. To update the HSA-Q1 obtain the latest firmware file from your dealer.
2. The file must be saved to an EMPTY USB stick with no other files saved to it.
3. Switch the HSA-Q1 power OFF.
4. Connect the USB Stick with the latest firmware to the USB Stick socket
5. Switch the Power on.
6. The display will show a white screen and a constant Beep tone will be heard whilst the update is taking place.
7. Once complete the unit will start up as usual.
8. Remove the USB stick - IMPORTANT - Now remove this file from the USB stick otherwise the unit will try to update again every time you use it.



Supplied in Package:

- HSA-Q1 Handheld Spectrum Analyser
- Multi-Element Concentric Antenna (23 cm)
- Telescopic Whip Antenna
- Charger - 110V to 240V AC input (Auto Switching) with International Adaptors – Output 5V DC
- Earphones
- High Protection Military Standard Carry Case

TECHNICAL SPECIFICATIONS Typical Performance Characteristics - at 20 degrees C

Detected Frequency Range:	1 MHz to 13.44 GHz
Sweep time:	500 ms (Full Range) down to 200ms (Lower Range)
Waterfall Function:	Real Time Colour Spectrogram
Tune & Listen Function :	Direct Tune to any frequency (1 KHz Resolution) AM/WFM/NFM Demodulation via Speaker or Earphones
Background Memory Function:	Record RF environment and store for later comparison
RF Sensitivity in Sweep Mode:	-80 dBm Max
RF Sensitivity in Tune & Listen Mode:	-100 dBm Max
Maximum Relative Bandwidth:	100 KHz
Display:	6" TFT Display Screen - Outdoor Readable
Data Logging interface:	to USB Stick – Time and Date Stamped
Audio Output:	Internal Speaker or 3.5mm Headphone Socket
RF Connector:	TNC Jack
Antenna 1:	Multi-Element 13.44GHz - Length 220mm x Dia. 17mm
Antenna 2:	Telescopic Whip Antenna (Low Frequency use)
Power:	Internal Lithium Polymer Battery – up to 4 Hours Battery Life
DC Charge:	Micro USB
Charger:	110/220V Auto-switching with International Adaptors
Operating Temperature:	0 to 40 deg C
Enclosure	Machined Aluminium Enclosure
Weight:	1.3Kg (Main unit)
Dimensions:	Height 223mm x Width 158 mm x Depth 45mm
Carry Case:	Military Standard L363mm x W282mm x H120mm