- Enable API log to include a detailed log of API access.

You can enter an ip address in the "Send Log to" text box. This will send the logs to that ip at port 514. It is compatible with Syslog servers.

Example of the log can be seen below.

Figure 93 Example of security log

The first data listed in the log is the date and time that the occurrence happened. You can manually input the date and time of the radio under the Network Manager>Map Overlay tab under CoT feature. However, upon a reboot, the time will no longer be accurate.

Please disregard the lighttpd [xxxx] as this will be likely removed in updated firmware versions. The format of the details listed in the log after lighttpd [xxxx] is as follows:

"a b c d e http/https"
a = IP address of remote host
b = HTTP request-line
c = HTTP status code
d = bytes sent for the body
e = HTTP request host name

5.6   Configuration Profiles

Under the configuration profiles section you will be able to configure profile settings for the radio, and save them to a file to distribute to other radios. You will also be able to customize the multi-position switch in this section.

5.6.1   Settings profile
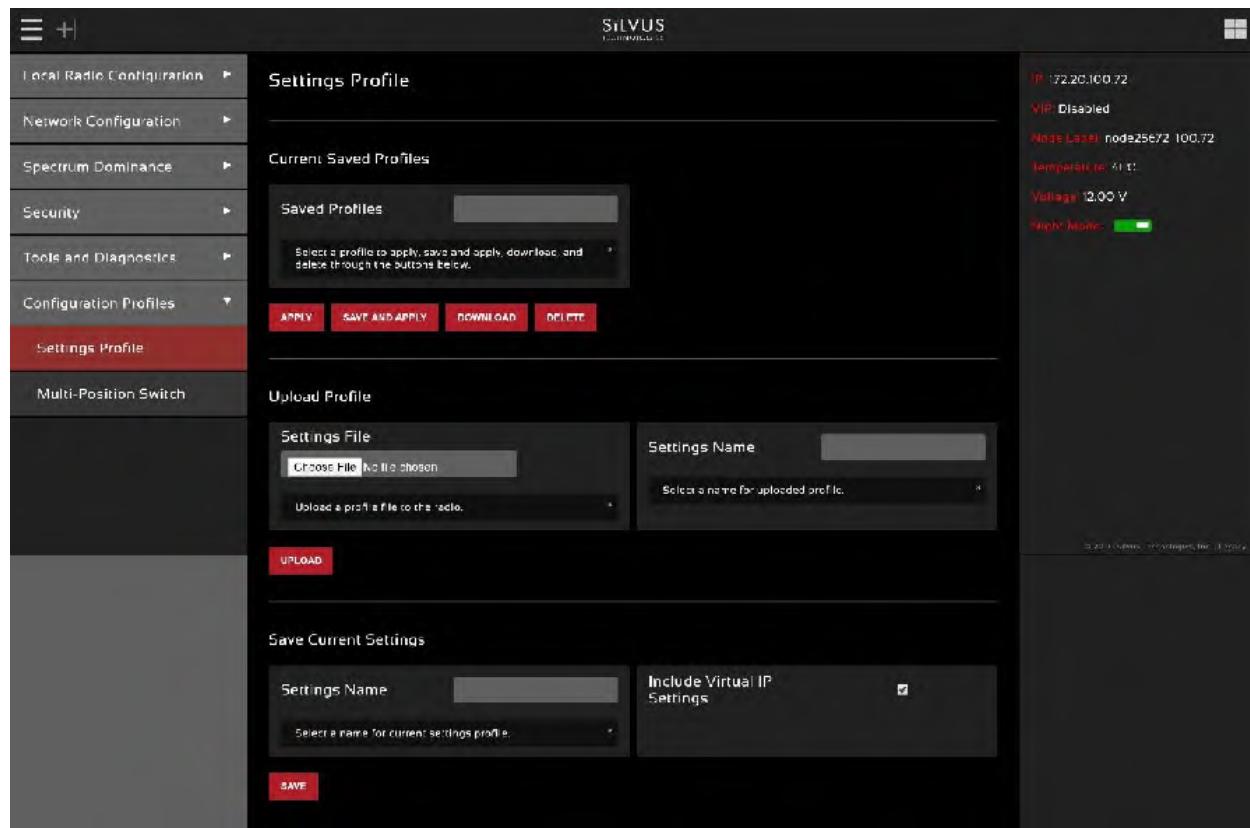
Figure 94 Configuration Profiles (Setting Profile)

- **Current Saved Profiles:** Select a saved profile and apply the settings to use the selected profile. The profile stored can be downloaded or deleted.

- **Upload Profile:** Select a downloaded profile from the computer and upload to the radio as a saved profile.

- **Save Current Settings:** Store the current settings on to the radio for future access. Note that the FIPS mode setting is not saved in the profile. You must manually enable/disable it after applying the profile.

5.6.2   MPS (Multi-Position Switch) (not available on SL4200)
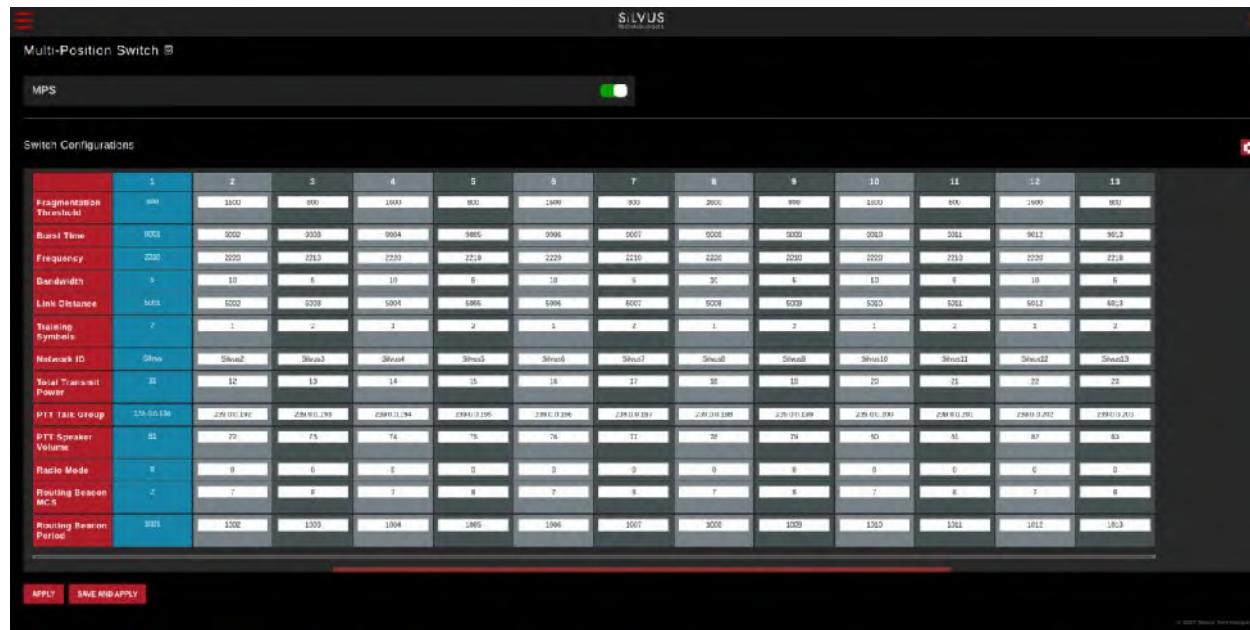
Figure 95 Multi-Position Switch

The Multi-Position Switch allows you to change various settings of the radio by using the new physical switch position, no web GUI required (This is not available on all radios).

You must first configure the settings you want to correspond with each switch position. Switch positions 1 through 13 are listed in a table with parameters listed that can be configured. To show more configuration parameters click the red boxed gear icon to the top right of the table. Configuration parameters will be shown as seen in below **Figure 96 additional configuration parameters for MPS**.
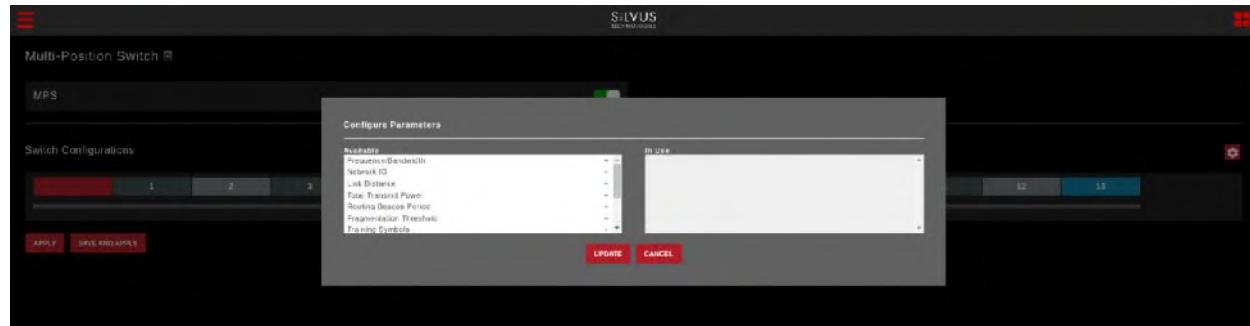
Figure 96 additional configuration parameters for MPS

Available parameters that can be configured by the MPS include link distance, total transmit power, routing beacon period, fragmentation threshold, training symbols, burst time, routing beacon MCS, radio mode, frequency, bandwidth, network ID, PTT talk group, and PTT speaker volume. Position 1 will always be associated with the parameters originally saved in the radio. Once MPS parameters have been saved into the table, click save and apply to save the settings to the radio. MPS switch parameters will be checked once every second.

When the MPS switch is turned, the LED light on the radio will quickly flash green. This means the settings are being applied for this position. When the LED stops quickly flashing, the settings have been applied.

Any time settings are updated from the GUI without using the MPS page (i.e. Basic Tab, PTT/Audio Tab), position 1 will be updated with those results. The blue highlighted column shows the current position of the physical switch.

If the radio boots up in position "Z" (second to last position on the MPS), the radio will perform a physical MPS zeroize function. This action will reset all passwords, reset all settings in the Security tab to default, and will perform a factory reset on all other settings. After zeroize has been completed, a radio reboot will be required to ensure all settings are zeroized.

6. FIPS Mode

6.1 Enable FIPS Mode

The following changes are required to make the radio FIPS 140-3 Level 2 Compliant. The additional steps when compared to FIPS in SS4 are newly added requirements to the FIPS standard.
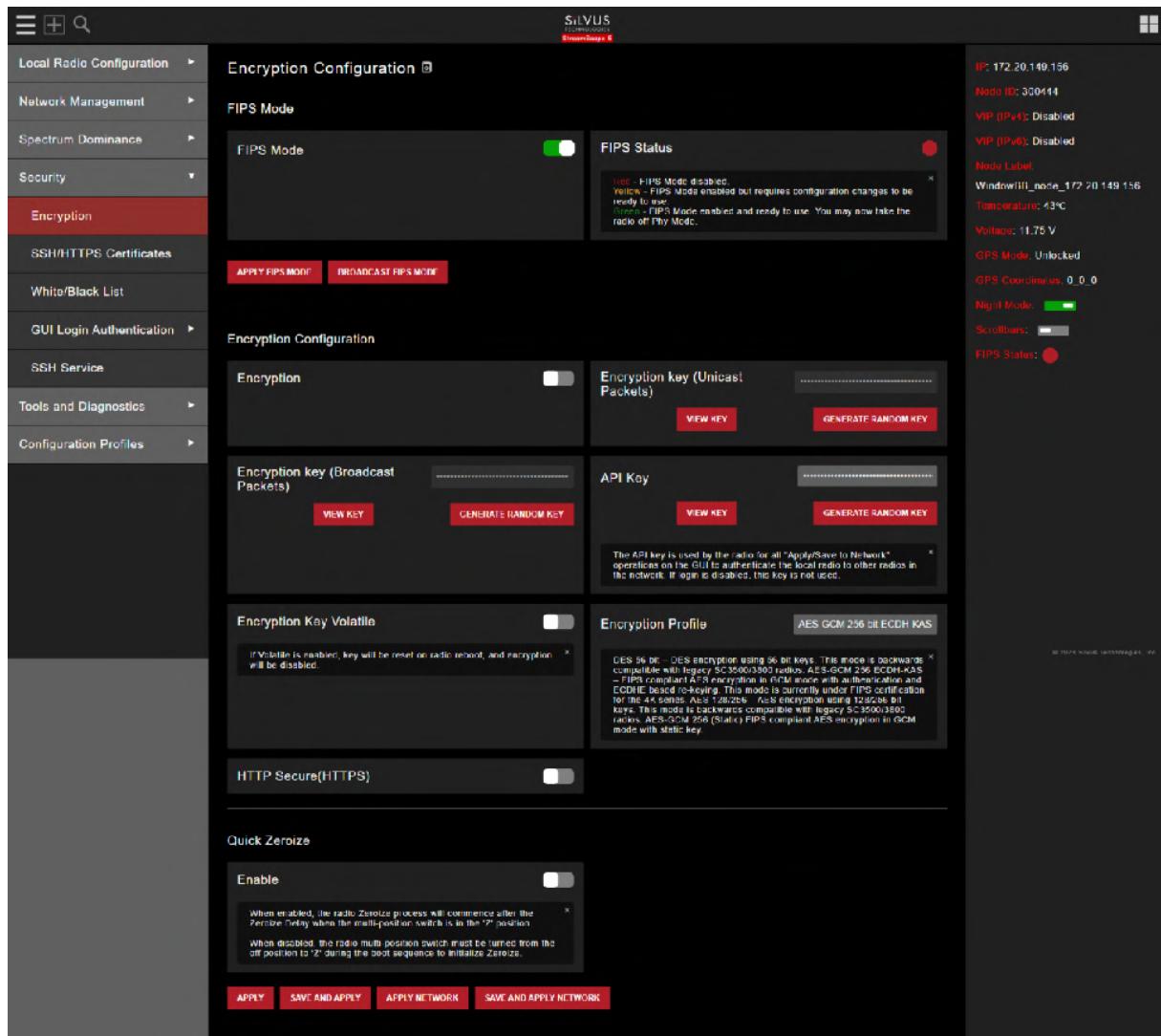
Figure 97 FIPs mode

1. Enable FIPS mode under Security -> Encryption tab. This will require a reboot and will erase all setting profiles, reset the encryption key, both SSH keys, the HTTPS certificate, and the login passwords to their factory default. It will also turn on HTTPS and Login Authentication.
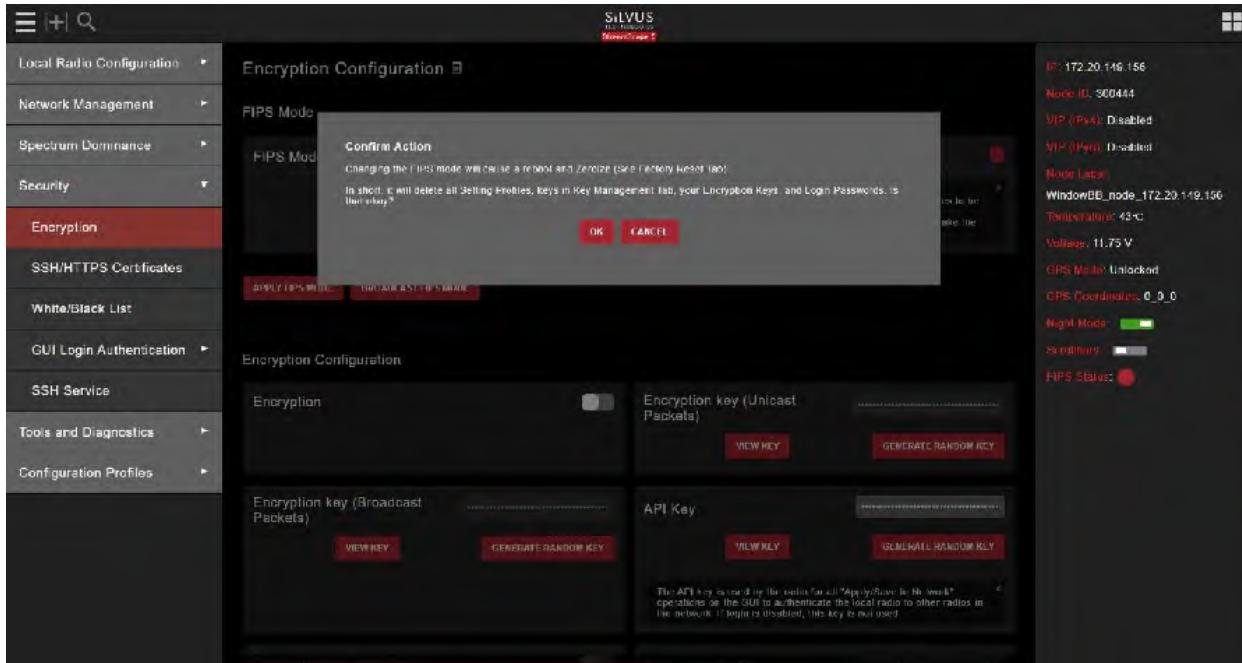
Figure 98 Confirm Action (enable FIPS)

2. After the radio comes back online, HTTPS will be enabled and if you do not have certs pre-saved on your browser you will need to tell the browser to proceed even though the security certificate is not trusted.

Figure 99 HTTPS cert warning

3. After you proceed to the radio IP address, you will need to use default login credentials to continue.
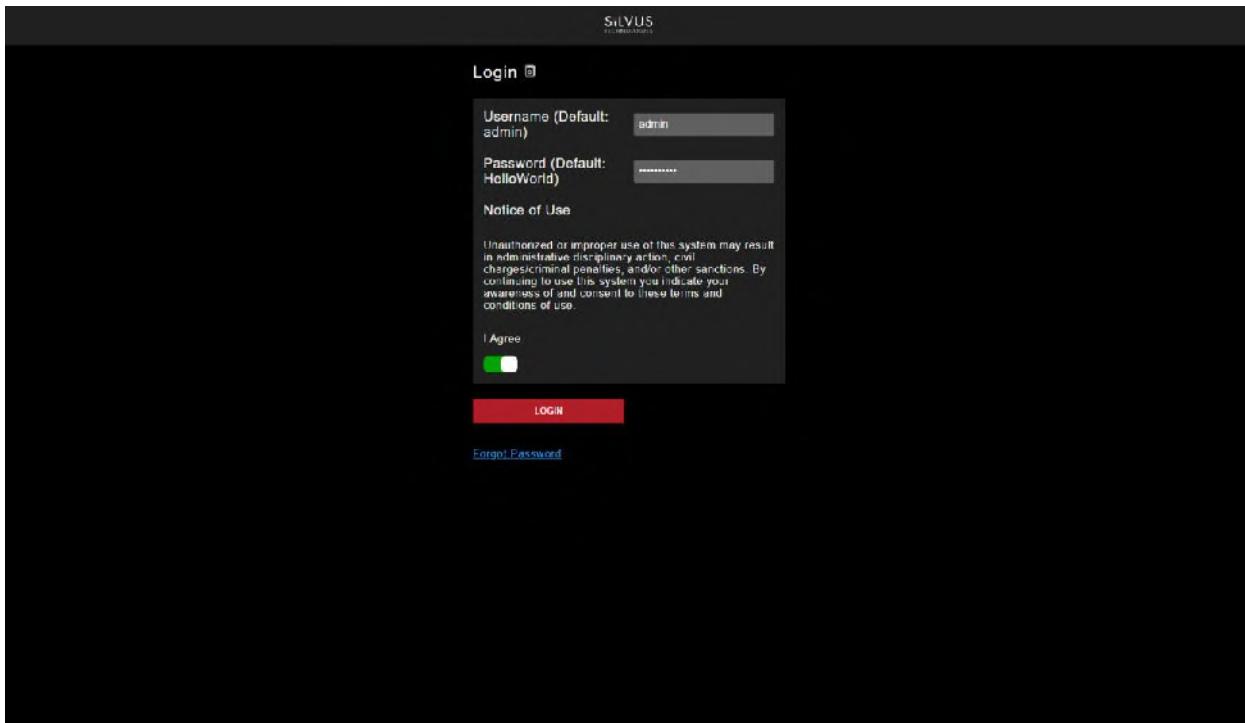
Figure 100 Default login authentication

4. After logging in to the GUI, and navigating to security/encryption section of the GUI, you will be prompted to complete additional steps to enable FIPS.
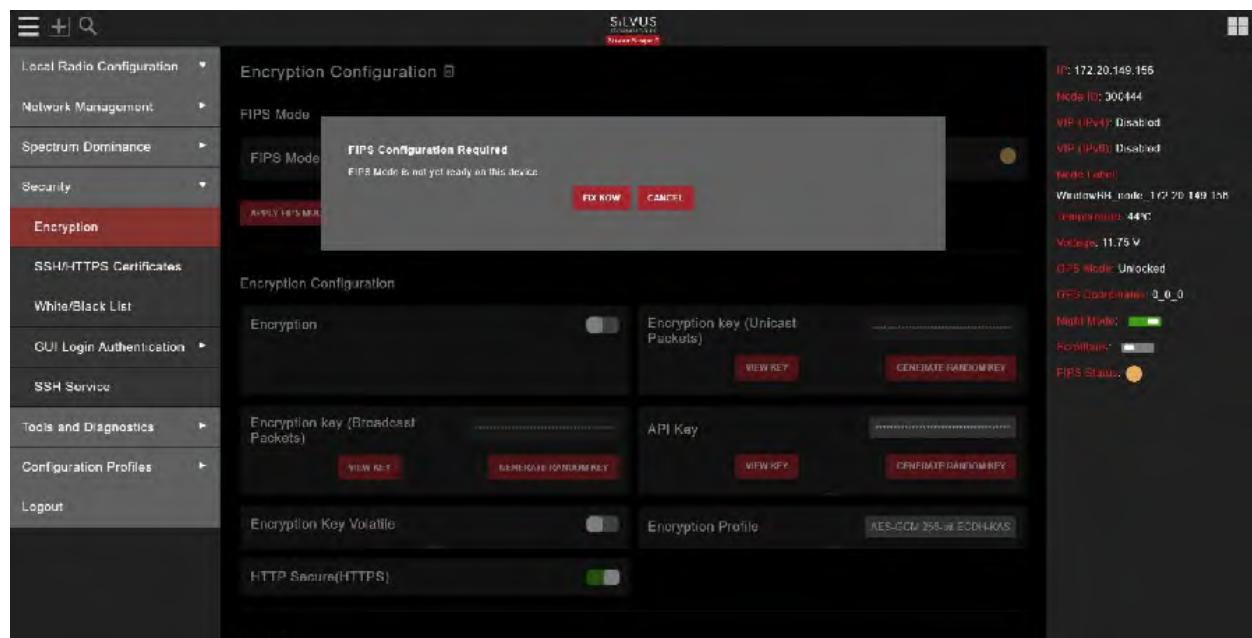
Figure 101 FIPS Configuration Required

5. A list of setting changes will need to be completed before FIPS can be considered as active. Figure 103 list all items that need to be completed. The first item is password complexity. Note that each section will be highlighted by a red dot in the top right corner which indicates the step has not yet been completed. Configuring each section and applying or saving it correctly will change the color of this indicator to green, letting the user know to move onto configuring the next section.
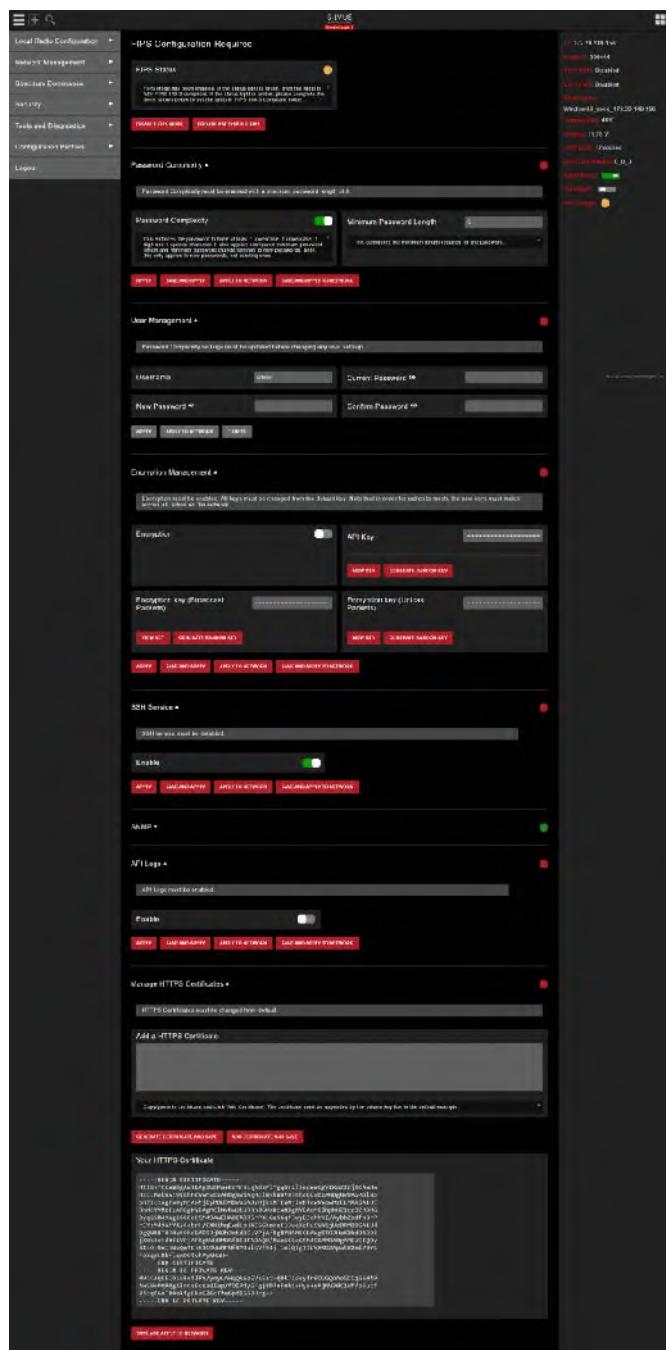
Figure 102 List of actions for FIPs

6. The next item is user management passwords need to be changed from default. All three usernames for admin, advanced, and basic will need to be changed.
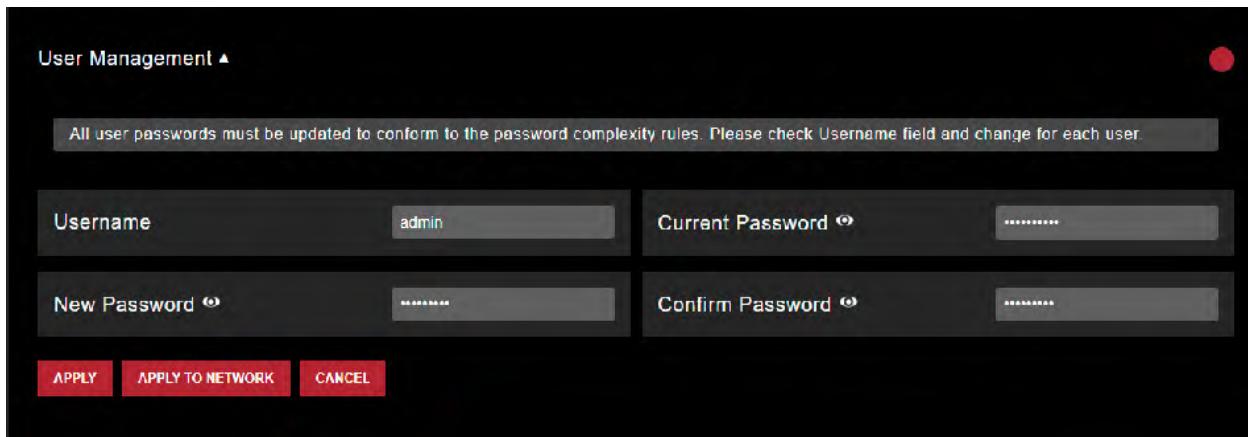
Figure 103 FIPS (user management)

7. Next section will require you to enable encryption, and change the encryption keys from the default settings.

Figure 104 FIPS (encryption management)

8. Next section will ask you to disable SSH service.
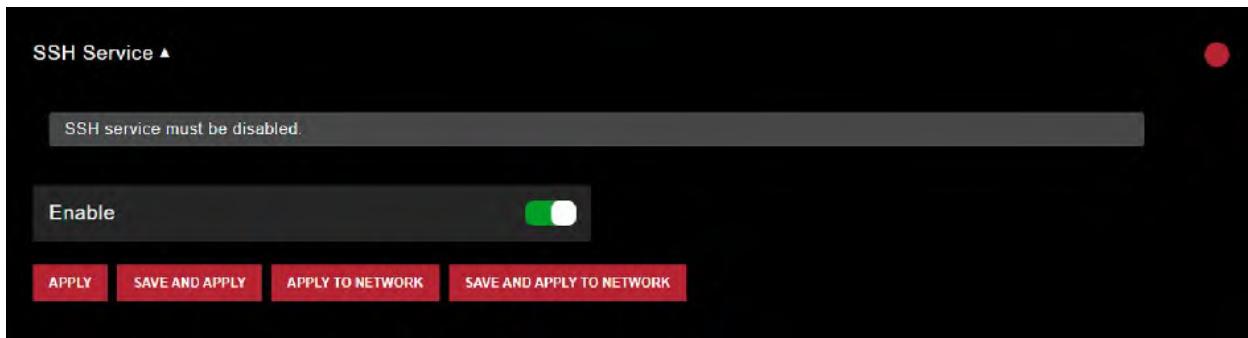
Figure 105 FIPS (SSH service)

9. The next section has SNMP disabled as default. But SNMP cannot be enabled for FIPS compliance.

10. In the next section API logs must be enabled. The API log will keep a log of all API calls made to the radio, including things done in the GUI.
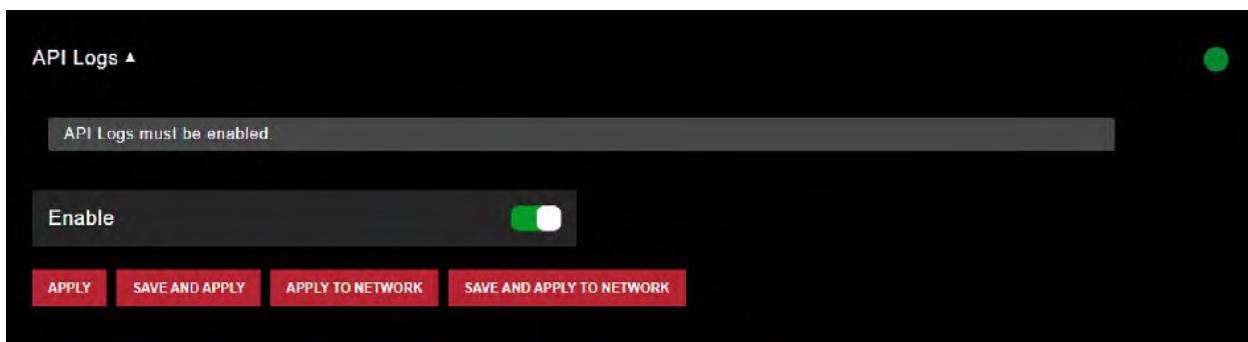
Figure 106 FIPS (API logs)

11. Next section will have you generate HTTPS certificates that are not the default.
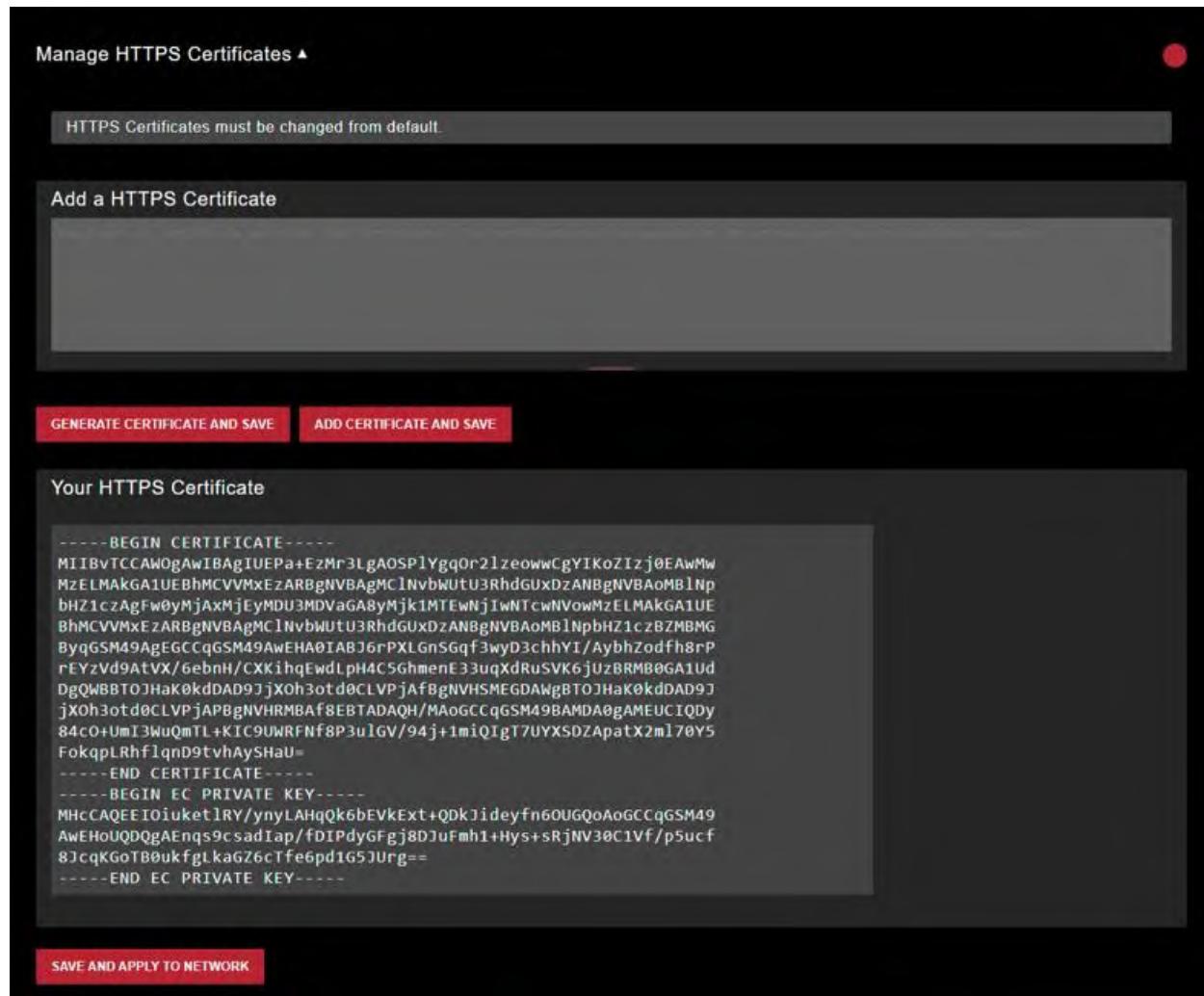
Figure 107 FIPS (HTTPS certs)

12. Once you have finished this step, you will see the FIPS configuration required steps to be complete, and the indicator changed from an orange color to a green color.
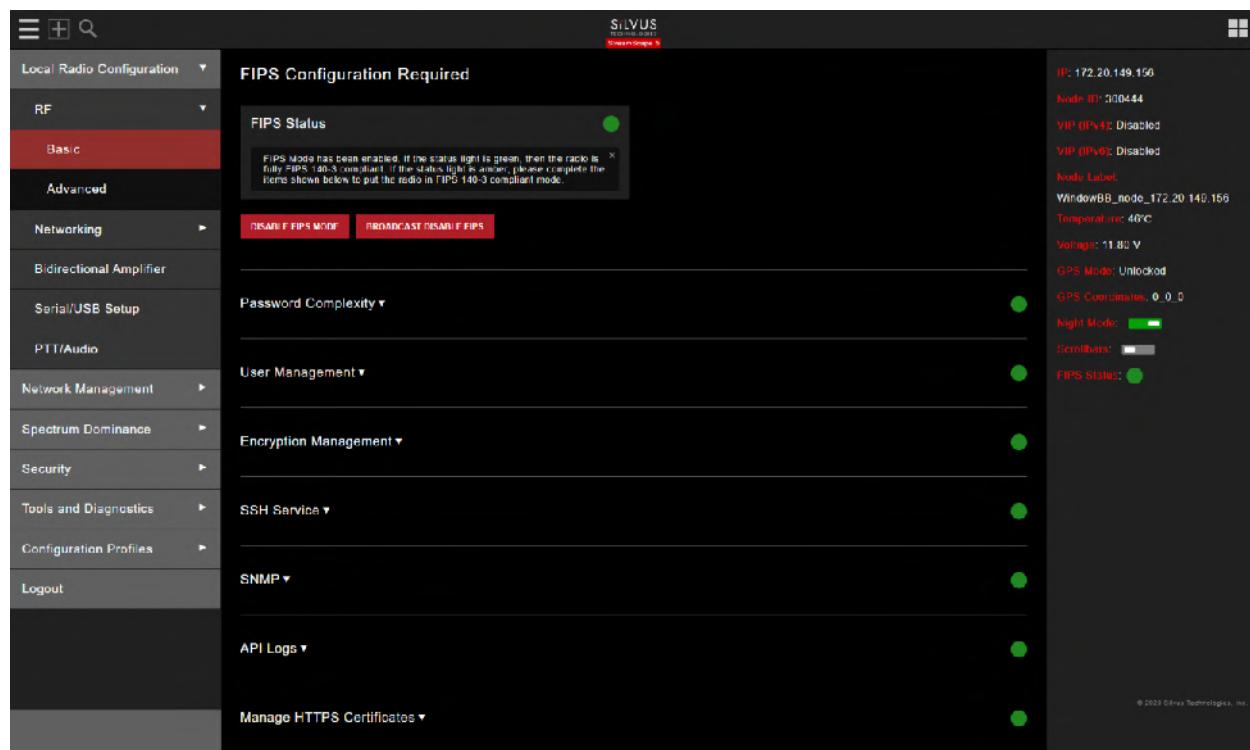
Figure 108 FIPS configuration complete

6.1.1 Potential User Errors

○ Do not use the same encryption key you were using in non FIPS mode because these may have been broadcasted in plain text. Generate new ones once in FIPS mode.

6.2 List of Security Parameters

o **Passwords (Basic, Advanced, and Admin User):** Used to login to the radio as either Basic, Advanced, or Admin user.

o **Encryption Key (also called RF-Auth-Key):** This is a 256-bit sequence, represented as 64 hex numbers. It is used to establish an encrypted connection in a network.

o **SSH Host Key:** This key is used for authenticating the radio to all machines that want to connect to it via SSH.

o **SSH Login Key(s):** These are ecdsa private/public key pairs. They are used for authorizing SSH access to the radios. These key pairs are used instead of passwords since they are more secure.

o **TLS Host Key (also called HTTPS Certificate):** This certificate is used to establish a HTTPS connection. The underlying elliptic curve keys can be either secp256r1, secp384r1, or secp521r1.

7. Wired Backbone

Wired Backbone extends the StreamCaster mesh functionality over LAN (Ethernet) and WAN (Internet) links. This feature is transparent to end-users - they do not have to re-configure their devices in any manner to use this feature.

The StreamCaster routing protocol will automatically detect and route data on wired links to preserve air bandwidth.

7.1 LAN Backbone

The LAN backbone feature allows more than one radio to be connected to a LAN.

7.1.1 Implementation

One of these radios must be configured as a "gateway" radio. This radio then begins listening promiscuously on its ethernet interface to "register" all devices on the LAN as being connected to the gateway radio. At the same time, it auto-detects other non-gateway radios connected to the LAN and establishes "wired" links to them. StreamScape Web GUI will show LAN links with the link label of "wired" and turn the link color black in order to differentiate from wireless links.

The non-gateway radios do not register any devices, they merely act as relays. The gateway radio will forward traffic originating from the LAN, destined for a device attached to a wireless radio, to the non-gateway radio that is closest to the destination. Similarly, any traffic originating from a device attached to a remote wireless radio, destined to a device on the LAN will be forwarded by non-gateway radios to the gateway radio. The gateway radio will then send it to the device.

Currently we support data rates of up to 80 Mbps on the LAN without encryption. Since all LAN traffic goes via the gateway radio, this is the upper limit of all traffic that can enter or go out of the LAN from/to devices connected to wireless radios. Of course, this limit does not affect the throughput between two devices connected directly to the LAN backbone.

7.1.2 Use Case

Consider the following scenario. A business wants to do video monitoring of its grounds. High speed LAN hookups are available only in the HQ building. They want to use the StreamCaster radios on towers to

provide complete coverage of the grounds. All video feeds are sent back and displayed at the HQ. To conserve air bandwidth and possible interference to other users, we want video data to go through the high-speed LAN backbone as much as possible. The below diagram shows the scenario.

Towers 1-3 are equipped with IP cameras attached to StreamCaster radios 1-3. Radios 4-6 are mounted on three sides of the HQ building with their Ethernet interfaces connected to the high-speed LAN. Tower 1 can only communicate wirelessly with radio 4, Tower 3 with radio 5 and Tower 2 with radio 6. Video from Tower 1 will flow wirelessly to radio 4, then via the LAN backbone to the HQ viewer which is also attached to the LAN backbone. Even though the radios 4-6 may communicate wirelessly, they will choose to do so via the LAN backbone.
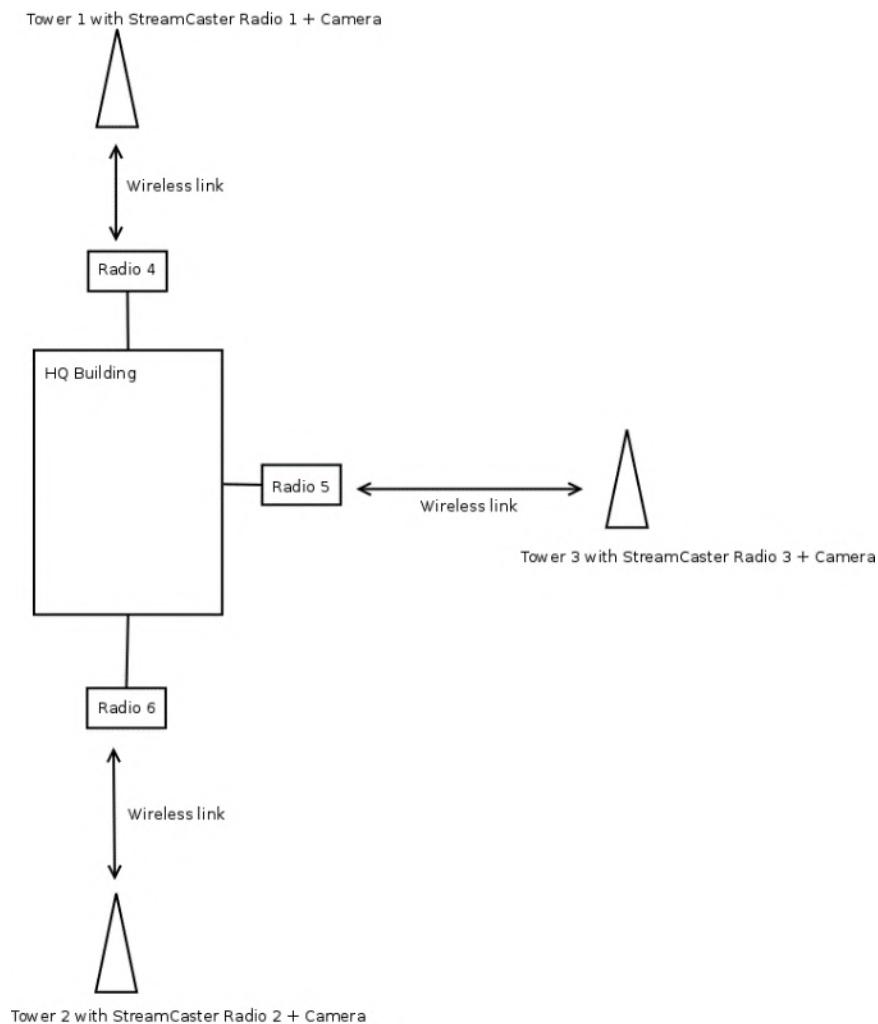
Figure 109 LAN Backbone Example

7.2   WAN Backbone with Roaming

The WAN backbone feature allows the wireless mesh network to extend over Internet links. Multiple geographically separate "sites" can be connected into one single layer 2 network as long as each site has an uplink to the Internet. The roaming feature allows mobile devices connected to StreamCaster radios to roam from one site to another without any network re-configuration.

7.2.1   Implementation

Each site wishing to become part of the wireless mesh needs to connect one StreamCaster radio to its LAN. Such a radio has to be configured to connect to a remote VPN server using the N2N protocol. Radios from multiple sites will be connected at layer 2 via the N2N VPN server creating a single broadcast domain for such nodes. By broadcasting routing packets in this domain, the nodes will auto-detect each other and establish WAN links. Such links will appear on the StreamScape GUI with a link label of "wired" and turn the link color black in order to differentiate from wireless links.

The N2N VPN server will try to establish peer-to-peer links between the radios if it can. Under some cases (e.g. symmetric NATs), this is not possible, in which case traffic between the peers is relayed by the N2N server.

The N2N server can be hosted at any server with a public IP on the Internet. As a proof-of-concept, a server has been set up on Amazon Web Services. Currently we support up to 30 Mbps unencrypted between any two sites.

7.2.2   Use Case

Consider a military scenario where a platoon of soldiers begins its mission at an HQ, then breaks up into two groups. Each group has at least one soldier with an uplink to the Internet (provided by a 4G card). The HQ also has an uplink to the Internet. Every soldier and the HQ have a StreamCaster radio attached to their devices.

The soldiers in the two groups want seamless and transparent communication between 1) other soldiers in the same group 2) soldiers in the other group 3) back to HQ. Some lone soldiers (e.g. Soldier A with a StreamCaster radio) may break up from each group and move about on their own. As they get close to group 1, 2 or the HQ, they should be able to immediately establish communication and talk to all other soldiers in the network.

The StreamCaster radios connected to the uplinks in Group 1-2 and the HQ will automatically connect and form WAN links.

Note that the WAN and LAN backbone are complementary features. E.g. at the HQ, multiple radios can be connected to a LAN backbone so that any approaching soldier or group has a direct line of sight wireless connection to the HQ.
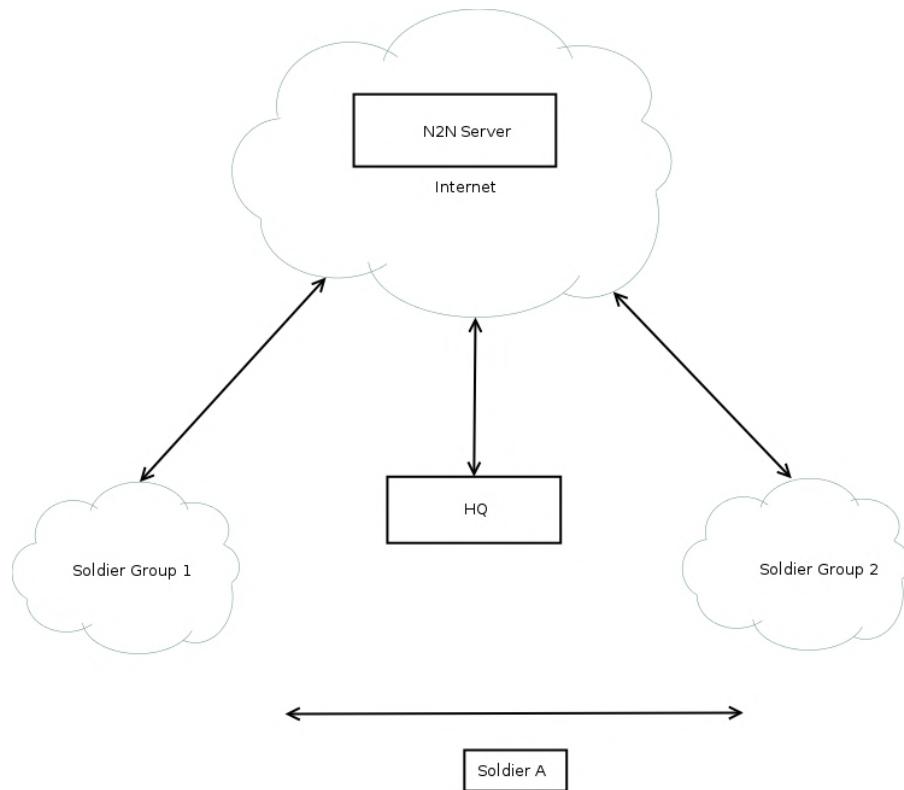
Figure 110 WAN Backbone Example

8. Custom Frequency Plan

8.1 Accessing and Installing CFP
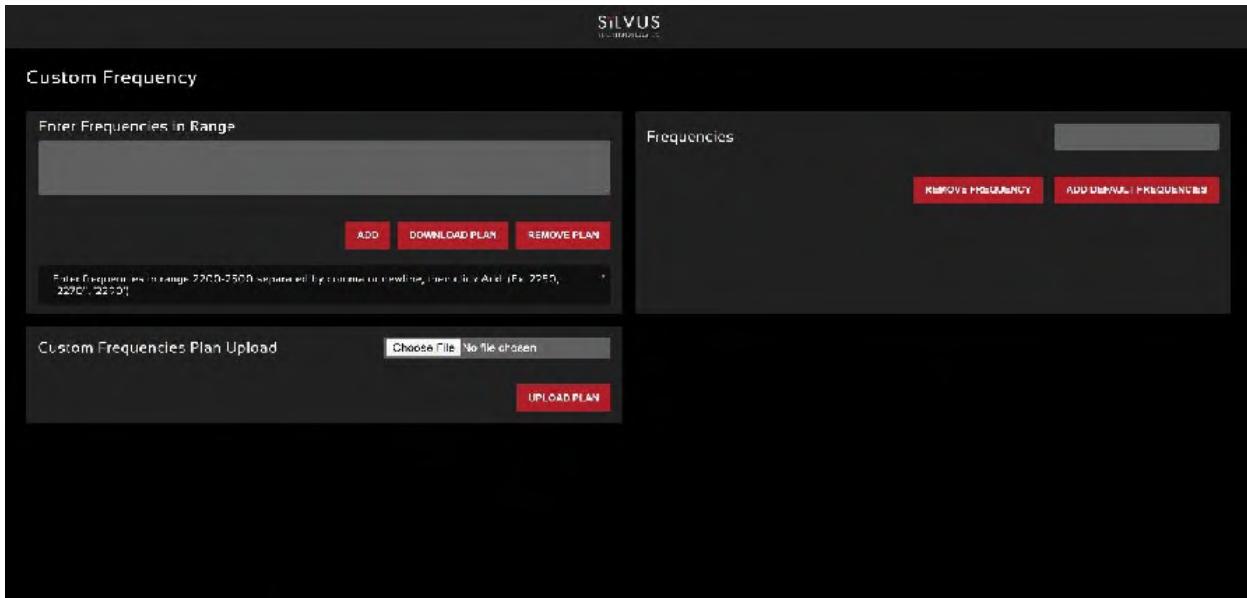
Figure 111 Custom Frequency Page

There are two ways to install the frequency plan. The first method is simpler. Users can simply click on *Create Custom Frequencies* below the frequency selection drop down to get to the custom frequency page shown in **Figure 111 Custom Frequency Page**.

- **Add:** Add the frequencies in the text box to the list

- **Download Plan:** Download the current frequency plan to a file that can be uploaded to other radios.

- **Remove Plan:** Removing the entire frequency plan. If this field is left empty, the radio will use the default frequency plan.

- **Remove Frequency:** Remove the currently selected frequency.

- **Add Default Frequencies:** The radios come with a list of default center frequencies. If you would like this list of default center frequencies in your custom list of frequencies, please select this button.

- **Custom Frequencies Plan Upload:** Upload a set of custom frequency plan from a file.

The second method requires accessing the hidden Custom Frequency Plan page. Note radios on older firmware only support this method.

The hidden Custom Frequency Plan page can be accessed via http://<radio IP>/custom_freq.sh

The interface will allow an upload of a custom frequency plan file which should be in the following format:

```
{
    "type": "custom_frequency_plan",
    "name": "cfp_example",
    "description": "CFP Example",
    "frequencies": [
      "2412",
      "2417",
      "2422",
      "2427",
      "2432",
      "2437",
      "2442",
      "2447",
      "2452",
      "2457",
      "2462",
      "2467",
      "2472",
      "5745",
      "5765",
      "5785",
      "5805",
      "5825"
    ]
}
```

(Put the above format in a Text file. Name/description can be changed)

Custom Frequency Plan Text file example:
https://drive.google.com/file/d/0ByThlCSjgHe1TDMtZ2xDXzhEblE/view?usp=sharing

The numbers can be changed to the frequencies desired. The name of the text file does not matter in order to be utilized. After uploading the file, the web interface will be populated with the Custom Frequency Plan.

Note:
Once installed, the Custom Frequency Plan will be cross-checked with hardware capability and the licensed frequency range previously installed on the radio. The Custom Frequency Plan will only change what is displayed. It will not give new frequencies that are previously out of licensed range.

9. Streaming Response

Some users may be interested in streaming specific information from the radio e.g. RSSI, noise floor, temperature, etc. After enabling the response, they need using the above commands, the radio will transmit the desired information in the form of UDP packets to a specific IP address and port. The format of each report message will be in the type-length-value format as shown below:

TYPE LENGTH VALUE TYPE LENGTH VALUE …

- TYPE and LENGTH will be 16-bit unsigned integers in network-endian format.

- TYPE indicates the kind of information being transmitted. Pre-defined types are listed later in this document.

- LENGTH indicates the length of the VALUE field in bytes, including the terminating null byte.

- VALUE will be ASCII-encoded text terminated with a null byte ('\0').

- A single report will comprise of a set of type-length-value fields beginning with a "begin" report type. It will have a type which is specific to the type of report being generated, length of 1 byte and a value of an empty string (""). Note the empty string is still null terminated.

- Each report will end with an end of report which has type 1 (type = end of report, length = 1, value = "").

- The empty string listed above has a NULL character and has length 1. Any length number in the streaming report includes the NULL character

- A UDP packet may contain more than one report.

- The UDP packets have a maximum size of 1400 bytes.

9.1　RSSI and Noise Floor Reporting

The type/length/value for RSSI and noise floor reporting are listed in the following table:

Report Type	Data Type	Information
5009	Empty string ""	Begin of RSSI report
5010	Float	Revision number for RSSI report
5011	String	172.20.xx.xx IP of radio
5012	String	Virtual IP of radio
5000	Integer	Raw signal power of first antenna, represented in full dBm steps.
5001	Integer	Raw signal power of second antenna represented in full dBm steps.
5002	Integer	Raw signal power of third antenna represented in full dBm steps.
5003	Integer	Raw signal power of fourth antenna represented in full dBm steps.
5004	Integer	Raw noise power represented in full dBm steps.
5005	32-bit integer	Sync signal power (from digital domain, see note below).
5006	32-bit integer	Sync noise power (from digital domain, see note below).
5007	16-bit integer	Node ID of the transmitter radio that triggered the receiver to send an RSSI report packet.
5008	32-bit integer	Report sequence number, increments for every report, resets after 9999.
1	Empty string ""	End of report.

Table 27 RSSI Reporting Format

Note:

The sync noise and power (types 5005, 5006) are special values obtained after packet processing in the digital domain. They cannot be directly compared to the raw signal and noise values. To obtain an SNR from these values the user needs to run the below formula on these values:

X = sync signal power;

Y = sync noise power;

Z = (Y-X)/51

SNR_mw = (X – 12 * Z)/(64 * Z)

SNR_db = 10 * log(SNR_mw)/log(10)

SNR_db is the SNR in dB and it is averaged across all antennae.

The SNR obtained above is more accurate when the real SNR goes below 10 dB. Above 10 dB, the SNR obtained from the raw signal and noise values are more accurate.

Below is an example of the RSSI report:

Report Type	Length	Information
5009	1	""
5010	4	"1.0"
5008	5	"2333"
5000	5	"-43"
5001	5	"-31"
5002	5	"-28"
5003	5	"-66"
5004	5	"-190"
5005	8	"8604568"
5006	8	"8861322"
5007	5	"1025"
1	1	""

Table 28 Sample RSSI Report

The corresponding raw UDP dump in hexadecimal format is attached below. For the purpose of easier reading, each byte is separated by a space, and each item is separated by a new line. The real streaming report is continuous without any spaces or newlines and is currently 109 bytes long.

13 ffffff91 0 1 0

13 ffffff92 0 4 31 2e 30 0

13 ffffff90 0 5 32 33 33 33 0

13 ffffff88 0 5 20 2d 34 33 0

13 ffffff89 0 5 20 2d 33 31 0

13 ffffff8a 0 5 20 2d 32 38 0

13 ffffff8b 0 5 20 2d 36 36 0

13 ffffff8c 0 5 2d 31 39 30 0

13 ffffff8d 0 a 20 20 38 36 30 34 35 36 38 0

13 ffffff8e 0 a 20 20 38 38 36 31 33 32 32 0

13 ffffff8f 0 5 31 30 32 35 0

0 1 0 1 0

9.2 Temperature Reporting

The type, length and value for temperature reporting are listed in the following table:

Report Type	Data Type	Data
8	Empty string ""	Begin of temperature report.
9	Float	Revision number for temperature report.
2	Integer	Current Temperature on the radio.
3	Integer	Maximum Temperature reached on the radio after last booting.
4	Integer	Overheat Count: number of times the radio temperature has exceeded temp_reporting_max_threshold.
1	Empty string ""	End of report

Table 29 Temperature Reporting Format

9.3   Voltage Reporting

The type, length and value for voltage reporting are listed in the following table:

Report Type	Data Type	Data
4001	START REPORT	Indicates start of voltage monitoring report
1	END REPORT	Indicates end of report
4003	REVISION_REPORT	Indicates revision of this report, currently always "1.1"
4004	CUR_VOLTAGE_REPORT	Current voltage value as a floating point string
4005	MIN_VOLTAGE_REPORT	Minimum voltage seen so far, as a floating point string
4006	MAX_VOLTAGE_REPORT	Maximum voltage seen so far, as a floating point string
4007	UNDERVOLTAGE_COUNT_REPORT	Number of times voltage dropped below min threshold, as an integer string
4008	OVERVOLTAGE_COUNT_REPORT	Number of times voltage spiked above max threshold, as an integer string.

Table 30 Voltage Reporting Format

10. Setting up an Iperf Test

10.1 Required Equipment

- Two laptops with jperf installed. It is beyond the scope of this manual to cover the installation and operation of these tools. The laptops must be on the same subnet but not necessarily the same subnet as the radios (172.20.xx.yy). It is not required for the user to set a secondary IP address on the radio to perform this test. It is recommended the iperf or jperf tests are first conducted between the laptops using an Ethernet switch or cross-over Ethernet cable between them to verify the laptops and iperf/jperf tools.

- Two or more StreamCaster radios properly configured.

10.2 Running Iperf Test

- Connect a laptop to one StreamCaster radio using the Ethernet cable.

- Connect the other laptop to another StreamCaster radio.

- Power up the radios and verify the radios are booted and connected wirelessly.

- At the receiver side type the following in a terminal

    o iperf –s –u -i 1

- At the transmitter side type the following in a terminal

    o iperf –c receiver_laptop_ip_address –u –i 1 –b 1M –t 60

11. Precautions and Recommendations

11.1 Saving the Radio Configuration

It is very important that the radio does not lose power during any configuration changes in which the user requests a "save and apply" operation. Partial saving of the configuration to the radio due to power interruption may disable the radio requiring reprogramming at the factory. Also, please wait for a "done" feedback at the web interface before proceeding to any other configuration changes.

12. Troubleshooting

12.1 Intermittent Link

- In a long range scenario if SNR is good but link drops unexpectedly check link distance parameter and make sure that the link distance is set the same on all radios and sufficiently large enough.

- Check interference levels as strong interference can result in an intermittent link.

13. FCC Notice

13.1 FCC Identifier: N2S-SC3500

Silvus Model #: SC3500-243541

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antenna: 3dB Omni (AOV3T245515575)

Bandwidth: 20MHz

Maximum Output Power across Frequency Range #1: 495.28mW from 2427MHz to 2447MHz

Maximum Output Power across Frequency Range #2: 493.62mW from 5745MHz to 5830MHz

13.2 FCC Identifier: N2S-SC3822

Silvus model #: SC3822-245580

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antenna: 3dB Omni (AOV3T245515575)

Bandwidth: 20MHz

Maximum Output Power across Frequency Range #1: 268.64mW from 2420MHz to 2450MHz

Maximum Output Power across Frequency Range #2: 329.02mW from 5760MHz to 5810MHz

13.3 FCC Identifier: N2S-SC42-245

Silvus model #: SC4210-245-BB, SC4240-245-BB

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antenna: 2.1dBi Omni Antennas (AOV2S230515)

Bandwidth: 10MHz

Maximum Output Power @ Frequency #1: 810.17mW @ 2430MHz

Maximum Output Power @ Frequency #2: 795.3mW @ 2440MHz

13.4 FCC Identifier: N2S-SC44-245

Silvus model #: SC4410-235-SBST, SC4480-235-SBST

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antenna: 2.1dBi Omni Antennas (AOV2S230515)

Bandwidth: 10MHz

Maximum Output Power @ Frequency #1: 582.1mW @ 2430MHz

Maximum Output Power @ Frequency #2: 523.6mW @ 2440MHz

13.5 FCC Identifier: N2S-SC42-520

Silvus model #: SC4210E-520-BB, SC4240E-520-BB

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antenna: 6dBi Omni Antennas (Peak Antennas CO520-6-LS)

Bandwidth: 20MHz

Maximum Output Power @ Frequency #1: 414.03mW @ 5220MHz

Maximum Output Power @ Frequency #2: 498.92mW @ 5240MHz

13.6 FCC Identifier: N2S-SC44-520

Silvus model #: SC4410E-520-SBST, SC4480E-520-SBST

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antenna: 6dBi Omni Antennas (Peak Antennas CO520-6-LS)

Bandwidth: 20MHz

Maximum Output Power @ Frequency #1: 241.48mW @ 5220MHz

Maximum Output Power @ Frequency #2: 246.52mW @ 5240MHz

13.7 FCC Identifier: N2S-SC42E-245

Silvus model #: SC4210E-245-EBEquipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antennas: 2.1dBi Omni Antennas (Silvus AOV2D230515) & 4dBi Omni Antennas (Silvus AOV4S235)

Bandwidth: 10MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #1: 789.84mW @ 2430MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #2: 790.06mW @ 2440MHz

Bandwidth: 20MHz

Maximum 20MHz Bandwidth Output Power @ Frequency #1: 123.82mW @ 2440MHz

13.8 FCC Identifier: N2S-SC42E-235470

Silvus model #: SC4240E-235470-BB

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antennas: 2.5dBi Omni Antennas (Silvus part# 1001-071)

Bandwidth: 10MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #1: 891.25mW @ 4945MHz, 4950MHz, 4955MHz, 4960MHz, 4965MHz, 4970MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #2: 955mW @ 4975MHz, 4980MHz, 4985MHz

13.9 FCC Identifier: N2S-SC44E-235470

Silvus model #: SC4480E-235470-SBST

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:

Antennas: 2.5dBi Omni Antennas (Silvus part# 1001-071)

Bandwidth: 10MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #1: 912mW @ 4945MHz, 4950MHz, 4955MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #2: 933.25mW @ 4960MHz, 4965MHz, 4970MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #3: 912mW @ 4975MHz, 4980MHz, 4985MHz

13.10   FCC ID: N2S-SL42-245

Silvus model #: SL4210-245-SB

Equipment Class: Digital Transmission System

Antennas: 2.1dBi Omni Antennas (Silvus part# 1001-071)

Bandwidth: 1.25, 2.5 or 5MHz

Maximum 5MHz Bandwidth Output Power @ Frequency #1: 950.6mW @ 2412MHz

Maximum 5MHz Bandwidth Output Power @ Frequency #2: 862.98mW @ 2440MHz

Maximum 5MHz Bandwidth Output Power @ Frequency #3: 968.28mW @ 2462MHz

Maximum output power for 5MHz @ operating frequency spectrum should not exceed 27dBm/antenna

13.11   FCC ID: N2S-SL4210-245-OEM (Modular Certification)

The product SL4210-245-O is approved for modular certification by FCC under the following ID:
FCC ID: N2S-SL4210-245-OEM

Figure 112 Silvus Radio Model SL4210-235-O

- Equipment Class: Digital Transmission System
- Frequency band: S-band, 2200-2500 MHz
- Maximum output power/antenna: 0.5W, 27dBm
- Bandwidth: 1.25, 2.5 or 5MHz
- Maximum 5MHz Bandwidth Output Power @ Frequency #1: (BACL test report)
- Maximum 5MHz Bandwidth Output Power @ Frequency #2: (BACL test report)
- Maximum 5MHz Bandwidth Output Power @ Frequency #3: (BACL test report)
- Maximum output power for 5MHz @ operating frequency spectrum should not exceed 27dBm/0.5W/antenna
- Recommended Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515G-TM) or equivalent for FCC 2.109 & 15.247 RF Exposure compliance
- DC supply: the customer provides DC power from their own DC supply source; the supply should be fused for 5-amp circuit.

Modular approval allows installation in different end-use products by an OEM with limited or no additional testing or equipment authorization for the transmitter function provided by the SL4210-245-O:

- ❖ No additional transmitter compliance testing is required if the module is operated with an approved antenna.
- ❖ No additional transmitter compliance testing is required if the module is operated with the same general type of antenna listed as approved in the SL4210-245-O documentation.
- ❖ Acceptable antennas must be of equal or less far field gain than the antenna previously authorized under the same FCC ID and must have similar in band and out of band characteristics.

The end-product must comply with all applicable FCC equipment authorizations, regulations, requirements and equipment functions not associated with the SL4210-245-O.

Compliance must be demonstrated to regulations for other transmitter components within the host product, to requirements for unintentional radiators (Part 15B), and to additional authorization requirements for the non-transmitter functions.

The OEM applying the SL4210-245-O is required to include all FCC statements and warnings detailed in the following sections to the end-product labeling and in the finished product manual.

13.11.1 Product Label

A statement must be included on the exterior of the final OEM product which communicates that the device identified by the FCC ID number is contained within the product. Include the statement:
> • Contains FCC ID: N2S-SL4210-245-OEM

Additionally, the OEM must include the following statements on the exterior of the finished product:
> • This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including any interference that may cause undesired operation.

13.11.2 User Manual (Customer end-product)

Any user documentation that accompanies the end-product must include the following information in a location that is easily read:
• To comply with FCC's RF radiation exposure requirements, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 20 cm is maintained between the reader (antenna) & user's/nearby people's body at all times and must not be collocated or operating in conjunction with another antenna or transmitter.

The finished product manual must contain the following statement:
• WARNING: The Federal Communications Commission warns that changes or modifications of the radio module within this device not expressly approved by Silvus Technologies, Inc. could void the user's authority to operate the equipment.

In the case where an OEM seeks class B (residential) limits for the host product, the finished product manual must contain the following statement:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help

In the case where an OEM seeks the lesser category of a Class A digital device for their finished product, the following statement must be included in the manual of the finished product:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

13.11.3 OEM Accessories

Accessories for the SL4200 OEM unit are detailed below:

| Silvus PN	Description
SC42E-OEM-2	RF connector, right angle SMP (f) to TNC (f); 38 mm length
SC22-OEM-6	RF connector right angle SMP (f) to SMA (f); 21 mm length
SC22-OEM-6-75mm	75 mm length
SC22-OEM-6-150mm	150 mm length
SC22-OEM-6-155mm	155 mm length
SC22-OEM-6-240mm	240 mm length
SC22-OEM-6-750mm	750 mm length
SL42-OEM-CK	Mating connector kit (6 connectors, less RF, with extra crimp pins)
SL42-OEM-L200	Status LED (200 mm wire leads; Red/Green color)
SL42-OEM-S0	2-pos On/Off rotary switch (no wires, contacts only)

Table 31 SL4200 OEM Accessories

13.11.4 Interface Connections
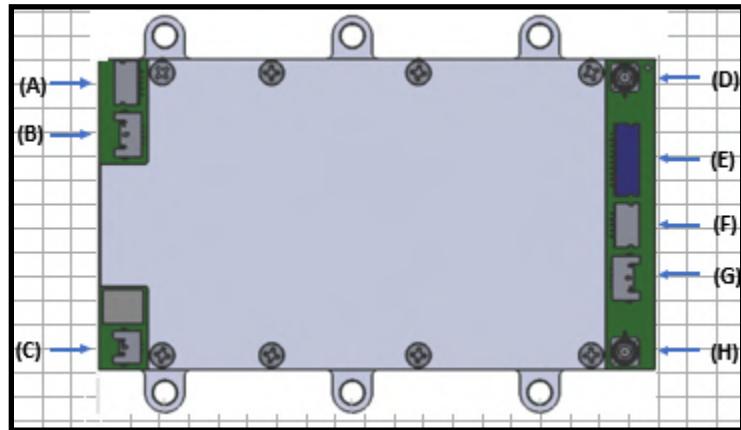
Figure 113 SL4200 OEM Connector Diagram

Fig Ref	PCB Nom	Description	Connector Type	Vendor	MPN Mating Connector
A	USB1	USB1	Header RA 5-POS (1mm)	JST Sales	SHLP-05V-S-B
B	USB PD	USB-PD (9V only)	Header RA 4-POS (1mm)	Molex	50376404013
C	VBAT	VBAT (9V - 32V)	Header RA 3-POS (1mm)	Molex	50376403013
D	1	RF-1	SMP Straight Jack (Male)	Amphenol	See accessories
E	RS232	Serial & Misc	Header RA 10-POS (1mm)	JST Sales	SHLP-10V-S-B
F	USB0	USB0	Header RA 5-POS (1mm)	JST Sales	SHLP-05V-S-B
G	ONOFF	Status LED/Power Switch	Header RA 4-POS (1mm)	Molex	50376404013
H	2	RF-2	SMP Straight Jack (Male)	Amphenol	See accessories

Table 32 SL4200 Interfaces

Connection pin-outs are detailed in StreamCaster Lite SL4200 OEM Integration.

13.11.5 DC Power Consumption & Heat Management requirements

The SL4200 OEM radio has a maximum native RF output power of 500 mW/antenna. Power consumption varies from 4.8 Watts (not transmitting) to 17 Watts depending on the transmit duty cycle, transmit power, frequency band used and if USB devices are connected. Average power consumption will be proportional to the transmit duty cycle. Peak power is 25 Watts (2.8A @ 9VDC, 2.1A @ 12 VDC) @burst transmissions for 100 micro-seconds.

When using a USB-C PD power source, the source must be rated to supply 3.0A @ 9 VDC. The external power source must be sized to meet this peak requirement. When using VBAT input the voltage range is 9.0 to 32.0 VDC. However, the radio is most power efficient when operating at 15VDC.

The recommended heat management details are in the StreamCaster Lite SL4200 OEM Integration Manual.

13.12   FCC ID: N2S-SC421-235

Silvus model #: SC4210EP-235-BB, SC4210EP-235F-BB, SC4210EP-235-EB, SC4210EP-235F-EB
Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 177.83mW @ 2440MHz
Maximum output power for 10MHz @ operating frequency spectrum should not exceed 20dBm/antenna

13.13   FCC ID: N2S-SC424-235

Silvus model #: SC4240EP-235-BB, SC4240EP-235F-BB, SC4240EP-235-EB, SC4240EP-235F-EB
Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 177.83mW @ 2440MHz
Maximum output power for 10MHz @ operating frequency spectrum should not exceed 20dBm/antenna

13.14   FCC ID: N2S-SC42A-235

Silvus model #: SC42A0EP-235-BB, SC42A0EP-235F-BB, SC42A0EP-235-EB, SC42A0EP-235F-EB
Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 190.55mW @ 2440MHz

Maximum output power for 10MHz @ operating frequency spectrum should not exceed 20dBm/antenna

13.15   FCC ID: N2S-SC421-235467

Silvus model #: SC4210EP-235467-BB, SC4210EP-235467F-BB, SC4210EP-235467-EB, SC4210EP-235467F-EB

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 186.21mW @ 2440MHz

Maximum output power for 10MHz @ operating frequency spectrum should not exceed 20dBm/antenna

13.16   FCC ID: N2S-SC424-235467

Silvus model #: SC4240EP-235467-BB, SC4240EP-235467F-BB, SC4240EP-235467-EB, SC4240EP-235467F-EB

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 165.96mW @ 2440MHz

Maximum output power for 10MHz @ operating frequency spectrum should not exceed 20dBm/antenna

13.17   FCC ID: N2S-SC42A8-235467

Silvus model #: SC42A8EP-235467-BB, SC42A8EP-235467F-BB, SC42A8EP-235467-EB, SC42A8EP-235467F-EB

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM

Bandwidth: 10MHz

Maximum 10MHz Bandwidth Output Power: 173.78mW @ 2440MHz

Maximum output power for 10MHz @ operating frequency spectrum should not exceed 20dBm/antenna

13.18   FCC ID: N2S-SC441-235

Silvus model #: SC4410E-235-SBST, SC4410E-235F-SBST

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 169.82mW @ 2440MHz

Maximum output power for 10MHz @ operating frequency spectrum should not exceed 17dBm/antenna

13.19   FCC ID: N2S-SC448-235

Silvus model #: SC4480E-235-SBST, SC4480E-235F-SBST

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Band: 2.4GHz ISM
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 190.55mW @ 2440MHz

Maximum output power for 10MHz @ operating frequency spectrum should not exceed 17dBm/antenna

13.20   FCC ID: N2S-SC44K-235

Silvus model #: SC44K0E-235-SBST, SC44K0E-235F-SBST,
            SC44K0E-235-LBST, SC44K0E-235F-LBST

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 165.96W @ 2440MHz

Maximum output power for 10MHz @ operating frequency spectrum should not exceed 17dBm/antenna

13.21   FCC ID: N2S-SC441-235467

Silvus model #: SC4410E-235467-SBST, SC4410E-235467F-SBST
Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 204.17mW @ 2440MHz
Maximum output power for 10MHz @ operating frequency spectrum should not exceed 17dBm/antenna

13.22   FCC ID: N2S-SC448-235467

Silvus model #: SC4480E-235467-SBST, SC4480E-235467F-SBST
Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 186.21mW @ 2440MHz
Maximum output power for 10MHz @ operating frequency spectrum should not exceed 17dBm/antenna

13.23   FCC ID: N2S-SC44KG-235467

Silvus model #: SC44KGE-235467-SBST, SC44KGE-235467F-SBST,
               SC44KGE-235467-LBST, SC44KGE-235467F-LBST
Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate FCC requirements:
Antennas: 2.1dBi Omni Antennas (Silvus part# AOV2D230515, vendor pn# 1001-071)
Bandwidth: 10MHz
Maximum 10MHz Bandwidth Output Power: 194.98mW @ 2440MHz
Maximum output power for 10MHz @ operating frequency spectrum should not exceed 17dBm/antenna

13.24 Common Notes

This equipment has been tested and found to comply with the limits for a class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

* Reorient or relocate the receiving antenna.

* Increase the separation between the equipment and receiver.

* Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

* Consult the dealer or an experienced radio/TV technician for help.

In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate the equipment.
To satisfy RF exposure requirements, this device and its antennas must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

14. EU-CE Markings

14.1 (-206 models)

The following Silvus Technologies models are declared to conform to CE Mark requirements:

Silvus P/N: SC4240-206-EB, SC4480-206-SBST, SC4240E-206-EB, SC4480E-206-SBST SC4240E-206-BB

Relevant standards:

ETSI EN 302 064 V2.1.1 (2016-09), Wireless Video Links, Harmonized Standard

ETSI EN 301 489-1 V2.2.0 (2017-03), EMC, Common Technical Requirements

ETSI EN 301 489-28 V1.1.1 (2004-09), EMC, Specific conditions for wireless digital video links

EN 60950-1, Information Technology Equipment, Safety

Frequency range: 2025-2110 MHz

Maximum RF power: 500 mW per channel, up to a maximum EIRP of 1.6 watts for the SC4240-206-EB, SC4240E-206-EB, SC4240E-206-BB and 3.2 watts for the SC4480-206-SBST, SC4480E-206-SBST

Antenna: 2.15dBi Omni Antennas (AOV2D230515)

Cable: Silvus cable assembly (SC22-PRICBL02-6)

External Bandpass Filter:

Microwave Filter Co. model 3813

(a filter of equivalent performance may also be used, contact Silvus Technologies customer support for more information)

AC Adapter (if used):   EDAC Power Electronics EA10523C-120 (this adapter is approved for indoor use only) (this adapter was certified by the manufacturer to IEC 60950-1)

External DC supply: If the customer provides DC power from their own source, the supply should be fused for a 5-amp circuit.

Safe Working Distance:

Maintain safe working distance of minimum 20cm. For more details, refer to TUV report no. SD72128709-0617A-0617C, "Radio Frequency Exposure Verification of the Silvus Technologies Inc. StreamCaster SC420-206 and SC4480 Tactical MIMO Radio EN 62311 January 2008" (copy of

report available upon request). The CE Mark Technical File is available upon request for inspection.

To satisfy RF exposure requirements, this device and its antennas must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with RED RF Exposure requirements.

This equipment has been constructed so that the product complies with the requirement of with Article 10(2) as it can be operated in at least one Member State as examined and the product is compliant with Article 10(10) as it has no restrictions on putting into service in all EU member states.

See restrictions mentioned in ERC Recommendation 25-10, Table 7-C2, for guidance of restrictions applicable to specific countries.

Table 33 Additional Restrictions on Band C2

EU DECLARATION OF CONFORMITY

Number: *STDOC1001*

Name and address of the Manufacturer

Silvus Technologies, Inc.,
10990 Wilshire Blvd., Suite #1500
Los Angeles, CA 90024 U.S.A

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration

Product information	StreamCaster SC4240-206-EB, SC4480-206-SBST, SC4240E-206-EB, SC4480E-206-SBST
Additional information	SW version : v3.12.6.4 for SC4240-206-EB and SC4480-206-SBST HW version : C5 for SC4240-206-EB, B1 for SC4480-206-SBST SW version : v3.17.1.1 for SC4240E-206-EB and SC4480E-SBST HW version : C7 for SC4240E-206-EB and B1 for SC4480E-SBST

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
- References to the relevant harmonised standards used or references to the technical specifications in relation to which conformity is declared

Radio Equipment Directive 2014/53/EU	RoHS Directive 2011/65/EU
EN 301 489-1 V2.1.1 EN 301 489-28 V1.1.1 EN 302 064 V2.1.1 EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013 EN62311:2008	EN 50581:2012

The notified body	Name: *TÜV SÜD American* Number:1929	**performed**	• a conformity assessment of the technical construction file
and issued the certificate	CB-19-0102		

Additional information

N/A

Signed for and on behalf of: Silvus Technologies

Authorised Representative:

Date of issue: 8 – 12 – 2019

Name and Surname / Function:

Weijun Zhu, Vice President of Engineering

1/1

EU DECLARATION OF CONFORMITY

Number: *STDOC1001*

Name and address of the Manufacturer

Silvus Technologies, Inc.,
10990 Wilshire Blvd., Suite #1500
Los Angeles, CA 90024 U.S.A

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration

Product information — StreamCaster SC4240E-206-BB

Additional information — SW version : v3.17.1.1
HW version : B7

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
- References to the relevant harmonised standards used or references to the technical specifications in relation to which conformity is declared

Radio Equipment Directive 2014/53/EU	RoHS Directive 2011/65/EU
EN 301 489-1 V2.1.1 EN 301 489-28 V1.1.1 EN 302 064 V2.1.1 EN 60950-1:2006+A11:2009+A1:2010 +A12:2011+A2:2013 EN62311:2008	EN 50581:2012

The notified body — Name: *TÜV SÜD American*
Number:1929

performed — • a conformity assessment of the technical construction file

and issued the certificate — CB-19-0102

Additional information

N/A

Signed for and on behalf of: Silvus Technologies

Authorised Representative:

Name and Surname / Function:

Weijun Zhu, Vice President of Engineering

Date of issue: *1 - 7 - 2020*

1/1

14.2 (-139 Models)

The following Silvus Technologies models are declared to conform to CE Mark requirements:

Silvus P/N: SC4240EP-139-BB, SC4240EP-139-EB, SC4480E-139-SBST

Relevant standards:

ETSI EN 302 064 V2.1.1 (2016-09), Wireless Video Links, Harmonized Standard

ETSI EN 301 489-1 V2.2.0 (2017-03), EMC, Common Technical Requirements

ETSI EN 301 489-28 V1.1.1 (2004-09), EMC, Specific conditions for wireless digital video links

EN 62368-1, Product Safety Standard

Frequency range: 1350-1440 MHz

Maximum RF power: 2W per channel, up to a maximum EIRP of 4 watts for the SC4240EP-139-BB, SC4240EP-139-EB and 8 watts for the SC4480E-139-SBST

Antenna: 2.1dBi Omni Antennas (AOV2S192)

Cable: Silvus cable assembly (SC22-PRICBL02-6)

External Bandpass Filter:

Microwave Filter Co. model 3813

(a filter of equivalent performance may also be used, contact Silvus Technologies customer support for more information)

AC Adapter (if used):   EDAC Power Electronics EA10523C-120 (this adapter is approved for indoor use only) (this adapter was certified by the manufacturer to IEC 60950-1)

External DC supply: If the customer provides DC power from their own source, the supply should be fused for a 5-amp circuit.

Safe Working Distance:

Maintain safe working distance of minimum 20cm. For more details, refer to TUV report no. 7217985B, "Radio Frequency Exposure Verification of the Silvus Technologies Inc. StreamCaster SC4240EP-139 and SC4480E-139 Tactical MIMO Radio EN 62311 January 2008" (copy of report available upon request). The CE Mark Technical File is available upon request for inspection.

To satisfy RF exposure requirements, this device and its antennas must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with RED RF Exposure requirements.

This equipment has been constructed so that the product complies with the requirement of with Article 10(2) as it can be operated in at least one Member State as examined and the product is compliant with Article 10(10) as it has no restrictions on putting into service in all EU member states.

See restrictions mentioned in ERC Recommendation 25-10, Table 7-C2, for guidance of restrictions applicable to specific countries.

Table 34 Additional Restrictions on Band C2

EU DECLARATION OF CONFORMITY

Number: 10045C000

Name and address of the Manufacturer

Silvus Technologies, Inc.,
10990 Wilshire Blvd., Suite #1500
Los Angeles, CA 90024 U.S.A

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration

Product information

StreamCaster:
SC4240EP-139-BB, SC4240EP-139-EB, SC4480E-139-SBST

Additional information

SW version : v4.0.2.7 (all models)
HW version : B1: SC4480E-139-SBST
B7: SC4240EP-139-BB
C7: SC4240EP-139-EB

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

- References to the relevant harmonised standards used or references to the technical specifications in relation to which conformity is declared

Radio Equipment Directive 2014/53/EU	RoHS Directive 2011/65/EU
EN 301 489-1 V2.1.1 EN 301 489-28 V1.1.1 EN 302 064 V2.1.1 EN 62368-1 EN62311:2008	EN 50581:2012

The notified body	Name: *TÜV SÜD America* Number: *1929*	performed	· a conformity assessment of the technical construction file
and issued the certificate	NB06 002138 0004 Rev. 00		

Additional information

N/A

Signed for and on behalf of: Silvus Technologies Inc

Authorised Representative:

Name and Sumame / Function:

Weijun Zhu, Vice President of Engineering

Date of Issue:
March 2, 2023

14.3 (-235467 Models)

The following Silvus Technologies models are declared to conform to CE Mark requirements:

Silvus P/N: SC4240EP-235467-BB, SC4240EP-235467-EB, SC4480E-235467-SBST

Relevant standards:

ETSI EN 302 064 V2.1.1 (2016-09), Wireless Video Links, Harmonized Standard

ETSI EN 301 489-1 V2.2.0 (2017-03), EMC, Common Technical Requirements

ETSI EN 301 489-28 V1.1.1 (2004-09), EMC, Specific conditions for wireless digital video links

EN 62368-1, Product Safety Standard

Frequency range: S band (2200MHz to 2500MHz)

C-1 band (4400MHz to 4940MHz)

Maximum RF power: 2W per channel, up to a maximum EIRP of 4 watts for the SC4240EP-235467-BB, SC4240EP-235467-EB and 8 Watts for the SC4480E-235467-SBST

Antenna: 1.8-1.9dBi Dual Bands Omni Antennas (AOV2D235515G)

Cable: Silvus cable assembly (SC22-PRICBL02-6)

External Bandpass Filter:

Microwave Filter Co. model 3813

(a filter of equivalent performance may also be used, contact Silvus Technologies customer support for more information)

AC Adapter (if used):   EDAC Power Electronics EA10523C-120 (this adapter is approved for indoor use only) (this adapter was certified by the manufacturer to IEC 60950-1)

External DC supply: If the customer provides DC power from their own source, the supply should be fused for a 5-amp circuit.

Safe Working Distance:

Maintain safe working distance of minimum 20cm. For more details, refer to TUV report no. 72171985D, "Radio Frequency Exposure Verification of the Silvus Technologies Inc. StreamCaster SC4240EP-235467 and SC4480E-235467 Tactical MIMO Radio EN 62311 January 2008" (copy of report available upon request). The CE Mark Technical File is available upon request for inspection.

To satisfy RF exposure requirements, this device and its antennas must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with RED RF Exposure requirements.

This equipment has been constructed so that the product complies with the requirement of with Article 10(2) as it can be operated in at least one Member State as examined and the product is compliant with Article 10(10) as it has no restrictions on putting into service in all EU member states.

See restrictions mentioned in ERC Recommendation 25-10, Table 7-C2, for guidance of restrictions applicable to specific countries.

Table 7-C2: additional information regarding the national conditions for the identified tuning ranges for video PMSE applications - Band C2

Frequency Band	Country	Implementation	Conditions/remarks
C2 2025-2110 MHz	AUT	I*	Max. 10MHz Channels, max. 20dBW erp, 2070-2090 MHz. Restricted to broadcasters only 2090-2110 MHz. Restricted to fire brigades and private users
	AZE	Y*	On a secondary basis
	BIH	I	FBS old MW link systems for PMSE. Military use in 2025-2110 MHz
	BUL	Y*	ECC Report 219. Available for Cordless Cameras, Portable video links and Mobile video links
	CZE	Y*	The band may be used in the coordination with the Ministry of Defence of the Czech Republic. https://www.ctu.cz/sites/default/files/obsah/ctu/rsup-p-06-09-2014-07-en-.pdf, new version is available only in czech https://www.ctu.cz/sites/default/files/obsah/ctu/vyzva-k-uplatneni-pripominek-k-navrhu-opatreni-obecne-povahy-casti-planu-vyuziti-radioveho-spektra-c-pv-p/6/xx-2017-yy-pro-kmitoctove-pasmo-1900-2200-mhz/obrazky/pv-p8-2017.pdf
	D	N	Deviations from the specifications in the Frequency Plan (FreqP) could be permitted for a limited time in accordance with §55 TKG. This is provided that the frequency usages indicated in the Frequency Ordinance (FreqV) and the Frequency Plan are not adversely affected (for more details see: https://www.bundesnetzagentur.de/cln_1412/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Frequenzen/Spezielle/Anwendungen/Kurzzeitzuteilungen/kurzzeitzuteilungen-node.html)
	DNK	Y*	
	L	N	Band not available
	EST	I*	2025-2110 MHz SAP/SAB. See Regulation of Ministry of Communication and Economical Affairs 21.05.2013 No. 35. Otherwise governmental use
	F	I*	Temporary licenses, e.i.r.p. max. – 10 dBW. Use of 10 MHz bandwidth centered on 2055 MHz and 2085 MHz for ground-to-ground link and 10 MHz bandwidth centered on 2065 MHz and 2105 MHz for air-to-ground link. Coordination required between assigning authorities (la Défense and Space) regarding the use of the other available bands in order to avoid harmful interference. ARCEP Decision 2016-1150
	FIN	I*	Cordless cameras, temporary use on a case-by-case basis. Standard EN 302064. Other use includes military use and space operation
	G	Y*I	Technology and application neutral but typically used for wireless cameras, typically licensed at 100 mW e.i.r.p
	GEO	L*	
	GRC	L*I	Cordless Cameras, Portable/Mobile video links, 2087.5- 2108.5 MHz : not available (exclusive use by security services)
	HNG	N	Band not available (governmental use). However the band may be used for short term PMSE use if the user demand makes it necessary at certain occasions like main events. In this case the authority handles the requests on a case-by-case basis and if the frequency use can be authorised the users receive an individual license
	HOL	L*	2070-2110 MHz for ENG-OB only

Possible implementation status   Y = the whole band is available for PMSE.   L = Limited availability.   N = the band is not available for PMSE.   * : Individual licence may be required   I : restrictions apply (e.g. geographical restrictions)

Table 35 Additional Restrictions on Band C2

EU DECLARATION OF CONFORMITY

Number: **10046C000**

Name and address of the Manufacturer

Silvus Technologies, Inc.,
10990 Wilshire Blvd., Suite #1500
Los Angeles, CA 90024 U.S.A

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration

Product information

StreamCaster:
SC4240EP-235467-BB, SC4240EP-235467-EB, SC4480E-235467-SBST

Additional information

SW version : v4.0.2.7 (all models)
HW version : B1: SC4480E-235467-SBST
B7: SC4240EP-235467-BB
C7: SC4240EP-235467-EB

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

- References to the relevant harmonised standards used or references to the technical specifications in relation to which conformity is declared

Radio Equipment Directive 2014/53/EU	RoHS Directive 2011/65/EU
EN 301 489-1 V2.1.1 EN 301 489-28 V1.1.1 EN 302 064 V2.1.1 EN 62368-1 EN62311:2008	EN 50581:2012

The notified body Name: *TÜV SÜD America*
Number: *1929*

performed • a conformity assessment of the technical construction file

and issued the certificate **NB06 002138 0005 Rev. 00**

Additional information

N/A

Signed for and on behalf of: Silvus Technologies Inc

Authorised Representative:

Name and Surname / Function:

Weijun Zhu, Vice President of Engineering

Date of Issue:

March 2, 2023

15. ISED Canada Notice

15.1 IC: 24980-SC42E245

Silvus model #: SC4210E-245-EB. Note that the SC4210E is a subset of the generic SC4200E, the "1" in the model # indicates it is a 1-watt maximum output power product or if lower the limits found by the ISED testing.

Equipment Class: Digital Transmission System

The following parameters must be used to be compliant to the appropriate ISED requirements:

Antennas: 2.1dBi Omni Antennas (Silvus AOV2D230515) & 4dBi Omni Antennas (Silvus AOV4S235)

Bandwidth: 10MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #1: 789.84mW @ 2430MHz

Maximum 10MHz Bandwidth Output Power @ Frequency #2: 790.06mW @ 2440MHz

Bandwidth: 20MHz

Maximum 20MHz Bandwidth Output Power @ Frequency #1: 123.82mW @ 2440MHz

Modulation and Coding Schemes tested: MCS0 to MCS15

15.2 Software License

A Software License is used to ensure only parameters and limits that are allowed by the ISED certificate shown in section 15.1 can be selected. These parameters include Frequency, Output Power, Modulation and Bandwidth.

15.3 Firmware Encryption

The details of our Firmware Encryption are considered proprietary and are discussed in depth in the submitted document SC4210E-245 Circuit Description v1.2 section 1.5. Also described is the method to ensure only Silvus released firmware and Software License can be loaded on the product. This will ensure

only the parameters and limits that are allowed by the Industry Canada certificate shown in section 15.1 can be selected.

15.4 IC Statement: English

This radio transmitter SC24980-SC4210E245 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

1. Omnidirectional antenna, Silvus P/N A0VD230515, maximum antenna gain 2.1 dBi, 50 ohm

2. Omnidirectional antenna, Silvus P/N A0V4S235, maximum antenna gain 4dBi, 50 ohm

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

15.5 IC Statement: French

Le présent émetteur radio [identifier le dispostif par son numéro de certification d'ISED] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenna énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cetter liste, et dont le gain est supérieur au gain maximal indiqué, pour tout type figurant sur la liste, sont strictement interdits pour l'expolitation de l'émetteur.

1. Omnidirectional d'onde, Silvus P/N A0VD230515, le gain max 2.1 dBi, 50 ohm

2. Omnidirectional d'onde, Silvus P/N A0V4S235, le gain max 4 dBi, 50 ohm

L'émettur/récepteur exempt de licence conenu dans le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) L'appareil ne doit pas produire de brouillage;

(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

15.6 Radiation Exposure Statement: English

Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 32 cm between the radiator and your body.

15.7 Radiation Exposure Statement: French

Déclaration d'exposition aux radiations

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non controlé. Cet équipement doit étre installé et utilize avec un minimum de 32 cm de distance entre la source de rayonnement et votre corps.

16. MIC Japan Notice

16.1 ID: 211-210701

Silvus model #: SC4210P-245-O. Note that the SC4210P is a subset of the generic SC4200P, the "1" in the model # indicates it is a 1-watt maximum output power product or if lower the limits found by the MIC testing.

Equipment Class: 2.4GHz Band for Unmanned Mobile Image Transfer System

The following parameters must be used to be compliant to the appropriate MIC requirements:

Antennas:

3dBi Omni Antennas (Silvus ABV3S235)

2.15dBi Omni Antennas (C-Astral OMNI2G4)

3dBi Omni Antennas (Silvus AO2D3S235F-SF)

3dBi Omni Antennas (Silvus AOM3S240F-SF)

1dBi Omni Antennas (Silvus AOV2D235515S-TM)

Bandwidth: 4.5MHz

Maximum 4.5MHz Bandwidth Output Power @ Frequency #1: 910mW @ 2486MHz

Maximum 4.5MHz Bandwidth Output Power @ Frequency #2: 870mW @ 2491MHz

Bandwidth: 9MHz

Maximum 9MHz Bandwidth Output Power @ Frequency #1: 880mW @ 2489MHz

Modulation and Coding Schemes tested: MCS0 to MCS15

16.2 ID: 011-210045

Silvus model #: SC4210P-576-O. Note that the SC4210P is a subset of the generic SC4200P, the "1" in the model # indicates it is a 1-watt maximum output power product or if lower the limits found by the MIC testing.

Equipment Class: 5.7GHz Band for Unmanned Mobile Image Transmission System

The following parameters must be used to be compliant to the appropriate MIC requirements:

Antennas:

2.3dBi Omni Antennas (Silvus AOV2D235515S-TM, also Southwest Antenna 1001-253)

2.15dBi Omni Antennas (Silvus AOV2S520G-TM, also Southwest Antenna 1001-128)

2.15dBi Omni Antennas (C-Astral OMNI5G7)

3dBi Omni Antennas (Silvus AO2D3S)

3dBi Omni Antennas (Silvus AOV3T245515575-TM, also L-Com HG2458RD-TM)

Bandwidth: 4.5MHz

Maximum 4.5MHz Bandwidth Output Power @ Frequency Low: 29.78dBm @ 5625.5MHz

Maximum 4.5MHz Bandwidth Output Power @ Frequency Mid: 29.8dBm @ 5702.5MHz

Maximum 4.5MHz Bandwidth Output Power @ Frequency High: 29.76dBm @ 5752.5MHz

Bandwidth: 9MHz

Maximum 9MHz Bandwidth Output Power @ Frequency Low: 29.72dBm @ 5655MHz

Maximum 9MHz Bandwidth Output Power @ Frequency Mid: 29.82dBm @ 5695MHz

Maximum 9MHz Bandwidth Output Power @ Frequency Low: 29.82dBm @ 5750MHz

Bandwidth: 19.7MHz

Maximum 19.7MHz Bandwidth Output Power @ Frequency Low: 29.6dBm @ 5660MHz

Maximum 19.7MHz Bandwidth Output Power @ Frequency Mid: 29.74dBm @ 5700MHz

Maximum 19.7MHz Bandwidth Output Power @ Frequency High: 29.66dBm @ 5745MHz

Modulation and Coding Schemes tested: MCS0 to MCS15

16.3 Software License

A Software License is used to ensure only parameters and limits that are allowed by the MIC certificates shown in sections 16.1 & 16.2 can be selected. These parameters include Frequency, Output Power, Modulation and Bandwidth.

16.4 Firmware Encryption

The details of our Firmware Encryption are considered proprietary and are discussed in depth in the submitted document SC4210P-576-O Circuit Description v1.3 section 1.5. Also described is the method to ensure only Silvus released firmware and Software License can be loaded on the product. This will ensure only the parameters and limits that are allowed by the MIC certificate shown in section 16.1 & 16.2 can be selected.

17. UKCA Markings

17.1 (-139 Models)

The following Silvus Technologies models are declared to conform to UKCA Mark requirements:
Silvus P/N: SC4240EP-139-BB, SC4240EP-139-EB, SC4480E-139-SBST

Relevant standards:
- EN 302 064 V2.1.1, Wireless Video Links, Harmonized Standard
- EN 301 489-1 V2.2.0, EMC, Common Technical Requirements
- EN 301 489-28 V1.1.1, EMC, Specific conditions for wireless digital video links
- EN 62368-1, Product Safety Standard

Frequency range: 1350-1440 MHz

Maximum RF power: 2W per channel, up to a maximum EIRP of 4 watts for the SC4240EP-139-BB, SC4240EP-139-EB and 8 watts for the SC4480E-139-SBST

Antenna: 2.1dBi Omni Antennas (AOV2S192)

Cable: Silvus cable assembly (SC22-PRICBL02-6)

External Bandpass Filter: Microwave Filter Co. model 3813 (a filter of equivalent performance may also be used, contact Silvus Technologies customer support for more information)

AC Adapter (if used): EDAC Power Electronics EA10523C-120 (this adapter is approved for indoor use only) (this adapter was certified by the manufacturer to IEC 60950-1)

External DC supply: If the customer provides DC power from their own source, the supply should be fused for a 5-amp circuit.

Safe Working Distance:

Maintain safe working distance of minimum 20cm. For more details, refer to TUV report no.

7217985B, "Radio Frequency Exposure Verification of the Silvus Technologies Inc. StreamCaster

SC4240EP-139 and SC4480E-139 Tactical MIMO Radio EN 62311 January 2008" (copy of report available upon request). The UKCA Mark Technical File is available upon request for inspection.

To satisfy RF exposure requirements, this device and its antennas must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with RF Exposure requirements.

See restrictions mentioned in ERC Recommendation 25-10, Table 7-C2, for guidance of restrictions applicable to specific countries.

Table 32 Additional Restrictions on Band C2

Annex A   UK DECLARATION OF CONFORMITY

NOTE – THIS IS NOT A TEMPLATE. It is the responsibility of the manufacturer and / or the authorised representative to produce the Declaration of Conformity with suitable content. This is purely for consideration of what should be included and should not be used as a template. Other UK regulations if applicable may be additionally required on the Declaration of Conformity or Declaration of Conformity dossier.

We,   **Silvus Technologies Inc.**

(Manufacturer's name)

Of

10990 Wilshire Blvd, Los Angeles, CA 90024

(Address)

Declare under our sole responsibility that the product:

StreamCaster:
SC4240EP-139-BB, SC4240EP-139-EB, SC4480E-139-SBST

(Detailed description of product including batch or serial number, name, type, model, and, where necessary, a colour image; where applicable a description of accessories and components, and software, which allow the radio equipment to operate as intended and covered by the declaration of conformity)

to which this declaration relates, is in conformity with the following designated standards and/or technical specifications
(References to standards/specifications must be listed with their identification number and version and, where applicable, date of issue)

Regulation 6(1)(a) [Health & Safety]:	EN 62368-1:2014, EN 62311:2008
Regulation 6(1)(b) [EMC]:	EN 301 489-1 V2.2.0 , EN 301 489 -28 V1.1.1
Regulation 6(2) [Spectrum Usage]:	EN 302 064 V2.1.1
Regulation 6A [Additional essential requirements]:	

We hereby declare that the above-named product is in conformity to the requirements of the Radio Equipment Regulations 2017 with the involvement of the following UK Market Conformity Assessment Body under Schedule 3 Module B of the Regulation.(Where the Certification Body Type Examination Certificate / involvement is only for limited Regulations, i.e. Regulation 6(2) only this should be explicitly stated here).

TUV SUD America Inc, 401 Edgewater Place #500, Wakefield, MA, 01880, USA

Approved Body:	**1929**	Type Examination Certificate No:	**UKCB2 002138 0006 Rev. 00**

The technical documentation relevant to the above equipment will be held at:
Silvus Technologies Inc. 10990 Wilshire Blvd, Los Angeles, CA 90024

(Name and address of the UK Authorised Representative, if applicable and formally appointed by the manufacturer)

11/17/2023

(Signature of authorised person)   (Date)
Grant Denoon   San Diego, CA, USA

(Name of authorised person)   (Place of issue: e.g. City/town, and Country)
Director of RF Engineering

(Job title)

17.2 (-235467 Models)

The following Silvus Technologies models are declared to conform to UKCA Mark requirements:

Silvus P/N: SC4240EP-235467-BB, SC4240EP-235467-EB, SC4480E-235467-SBST

Relevant standards:

- EN 302 064 V2.1.1, Wireless Video Links, Harmonized Standard
- EN 301 489-1 V2.2.0, EMC, Common Technical Requirements
- EN 301 489-28 V1.1.1, EMC, Specific conditions for wireless digital video links
- EN 62368-1, Product Safety Standard

Frequency range: S band (2200MHz to 2500MHz)
C-1 band (4400MHz to 4940MHz)

Maximum RF power: 2W per channel, up to a maximum EIRP of 4 watts for the SC4240EP-235467-BB, SC4240EP-235467-EB and 8 Watts for the SC4480E-235467-SBST

Antenna: 1.8-1.9dBi Dual Bands Omni Antennas (AOV2D235515G) Cable: Silvus   cable   assembly (SC22-PRICBL02-6)

External Bandpass Filter: Microwave Filter Co. model 3813 (a filter of equivalent performance may also be used, contact Silvus Technologies customer support for more information)

AC Adapter (if used):   EDAC Power Electronics EA10523C-120 (this adapter is approved for indoor use only) (this adapter was certified by the manufacturer to IEC 60950-1)

External DC supply: If the customer provides DC power from their own source, the supply should be fused for a 5-amp circuit.

Safe Working Distance:

Maintain safe working distance of minimum 20cm. For more details, refer to TUV report no. 72171985D, "Radio Frequency Exposure Verification of the Silvus Technologies Inc. StreamCaster SC4240EP-235467 and SC4480E-235467 Tactical MIMO Radio EN 62311 January 2008" (copy of report available upon request). The UKCA Mark Technical File is available upon request for inspection.

To satisfy RF exposure requirements, this device and its antennas must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with RF Exposure requirements.

See restrictions mentioned in ERC Recommendation 25-10, Table 7-C2, for guidance of restrictions applicable to specific countries.

Table 33 Additional Restrictions on Band C2

Annex A   UK DECLARATION OF CONFORMITY

NOTE – THIS IS NOT A TEMPLATE. It is the responsibility of the manufacturer and / or the authorised representative to produce the Declaration of Conformity with suitable content. This is purely for consideration of what should be included and should not be used as a template. Other UK regulations if applicable may be additionally required on the Declaration of Conformity or Declaration of Conformity dossier.

We,   **Silvus Technologies Inc.**

_____
(Manufacturer's name)

Of

_____
10990 Wilshire Blvd, Los Angeles, CA 90024
_____
(Address)

Declare under our sole responsibility that the product:

StreamCaster:
SC4240EP-235467-BB, SC4240EP-235467-EB, SC4480E-235467-SBST

_____

(Detailed description of product including batch or serial number, name, type, model, and, where necessary, a colour image; where applicable a description of accessories and components, and software, which allow the radio equipment to operate as intended and covered by the declaration of conformity)

to which this declaration relates, is in conformity with the following designated standards and/or technical specifications
(References to standards/specifications must be listed with their identification number and version and, where applicable, date of issue)

Regulation 6(1)(a) [Health & Safety]:	EN 62368-1:2014, EN 62311:2008
Regulation 6(1)(b) [EMC]:	EN 301 489-1 V2.2.0, EN 301 489 -28 V1.1.1
Regulation 6(2) [Spectrum Usage]:	EN 302 064 V2.1.1
Regulation 6A [Additional essential requirements]:	

We hereby declare that the above-named product is in conformity to the requirements of the Radio Equipment Regulations 2017 with the involvement of the following UK Market Conformity Assessment Body under Schedule 3 Module B of the Regulation.(Where the Certification Body Type Examination Certificate / involvement is only for limited Regulations, i.e. Regulation 6(2) only this should be explicitly stated here).

TUV SUD America Inc, 401 Edgewater Place #500, Wakefield, MA, 01880, USA

Approved Body:	**1929**	Type Examination Certificate No:	**UKCB2 002138 0007 Rev. 00**

The technical documentation relevant to the above equipment will be held at:
Silvus Technologies Inc. 10990 Wilshire Blvd, Los Angeles, CA 90024

_____

_____
(Name and address of the UK Authorised Representative, if applicable and formally appointed by the manufacturer)

11/17/2023

_____   _____
(Signature of authorised person)   (Date)
Grant Denoon   San Diego, CA. USA

_____   _____
(Name of authorised person)   (Place of issue; e.g. City/town, and Country)
Director of RF Engineering

_____
(Job title)