




Approval Sheet

Bluetooth® Module

Customer MODEL	BnCOM MODEL
	BCM-SQ410

History

VERSION	DATE	DESCRIPTION
0.1	2022.04.06	Initial Release
0.2	2022.04.29	Changed information : ANT, pin assign , Audio information
0.3	2022.07.20	Add Certification label information.

CERAGEM	Prepare	Review	Approval
BnCOM	Prepare	Review	Approval
			

BCM-SQ410

Specification

Revision 0.3

2022/07/20

CONFIDENTIAL INFORMATION

BnCOM Co.,Ltd.

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1. General

1.1 Overview

This specification covers Bluetooth module which single IC Bluetooth solution; this module provides everything required to create a Bluetooth high quality audio product with RF, baseband, MCU, buffer qualified Bluetooth v5.1 stack and customer application running.

BCM-SQ410 applies Qualcomm QCC3024

All detailed specification including pin outs and electrical specification may be changed without notice

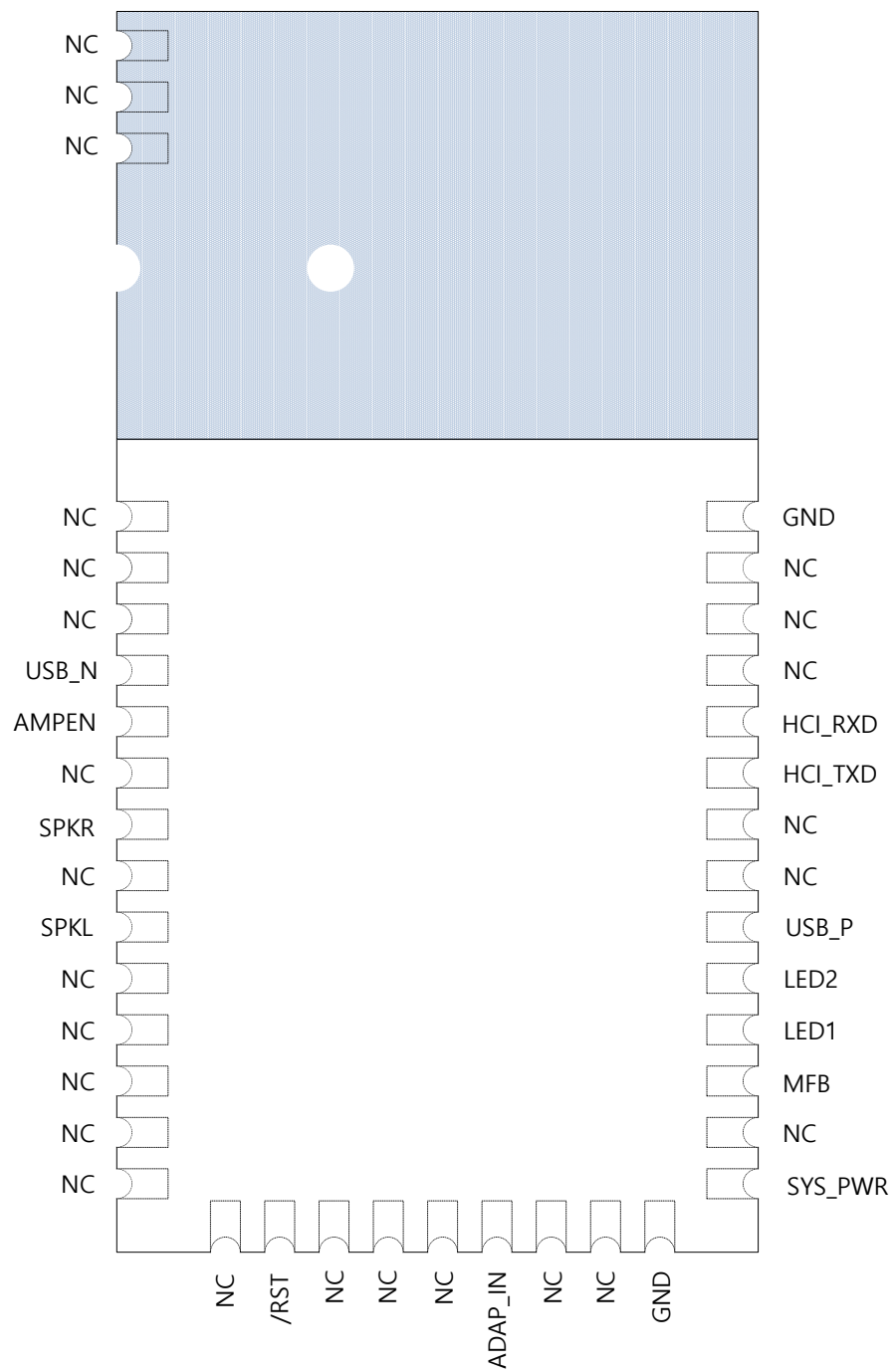
1.2 Features

- Bluetooth® v5.1 specification compliant (with Low Energy)
- Radio includes integrated balun and BPF with RF performance of 8.5dBm(TYP)
- Receiver sensitivity: -90dBm (basic rate) and -82dBm(EDR)
- 120MHz Qualcomm Kalimba audio DSP
- 32MHz Developer Processor for applications
- Stereo audio DAC
- USB 2.0 interface (full-speed)
- 1 UART interface
- 2 general purpose PIOs and unused digital interfaces are available as PIOs
- 2 LED drivers (includes RGB) with PWM flasher on sleep clock
- Include Power supply regulation
- Power-on-reset detects low supply voltage
- Audio features : SBC, AAC audio codec
- Competitive Size : 15mm x 29mm x 2.4mm : 40Pin with Shield Case.
- Operating temperature range (MAX -20°C ~ 70°C)

1.3 Application

- Mobile Phone Accessories
- Stereo Wireless Headsets
- Portable stereo speakers.

1.4 Pin Configuration



Pin Configuration (TOP VIEW)

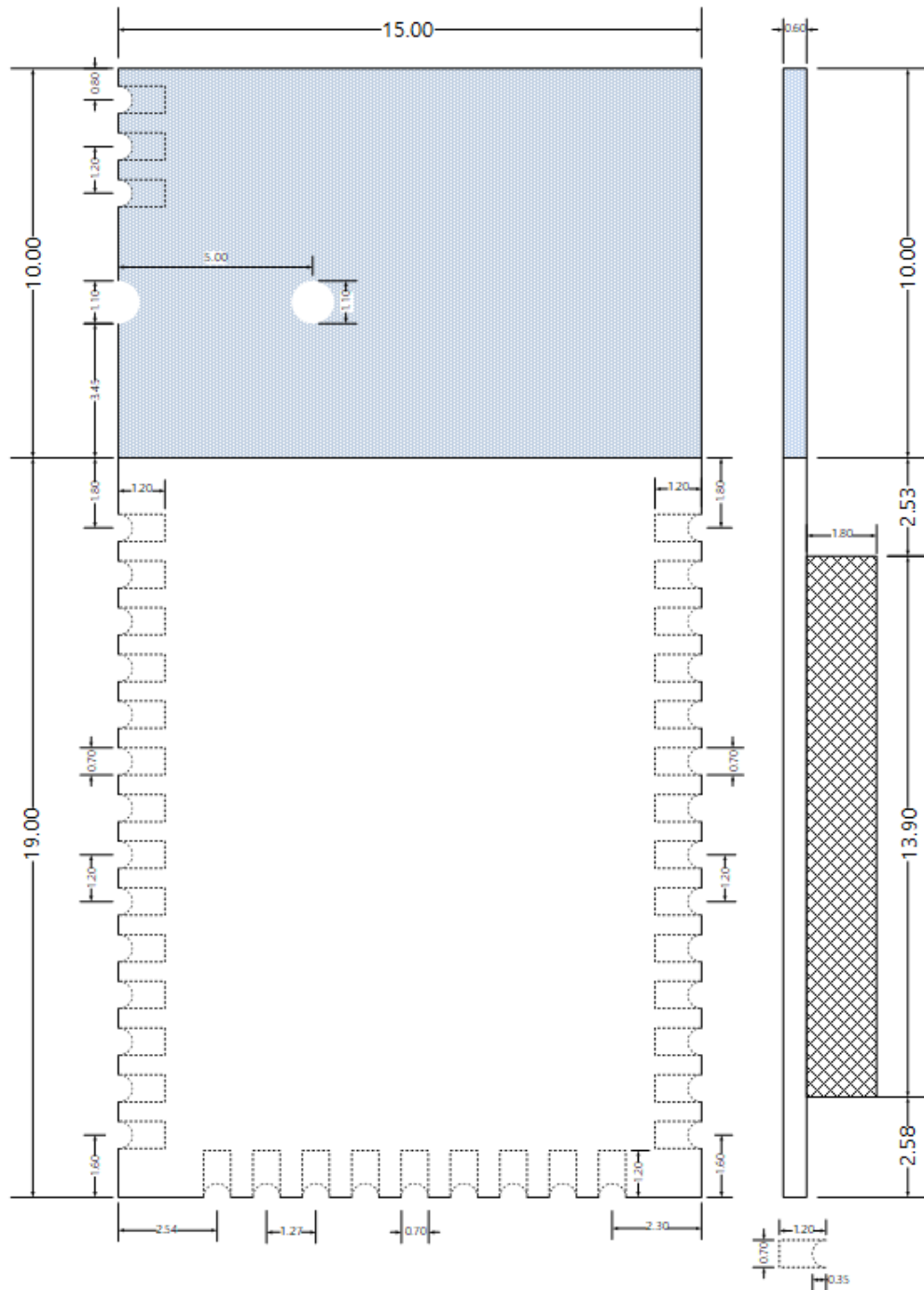
1.5 Device Terminal Functions

1.5.1 Pin Discription

Block	Function	Pin No	pad Type	Description
SPEAKER	SPKR	7	Analog out	Speaker output right
	SPKL	9	Analog out	Speaker output left
UART	HCI_TXD	32	Bidirectional with strong pull-up	UART_TX: UART data output
	HCI_RXD	33	Bidirectional with strong pull-up	UART_TX: UART data input
LED	LED1	27	Bidirectional	Open drain
	LED2	28	Bidirectional	Open drain
USB	USP_P	29	Bidirectional	USB data plus with selectable internal 1.5k pull-up resistor
	USB_N	4	Bidirectional	USB data minus
PIO	AMPEN	5	Bidirectional with strong pull-up	
	MFB	26	Bidirectional with weak pull-down	
OTHER PIN	ADAP_IN	20	Power input	Main power input 5V
	SYS_PWR	24	Power output	LED source output 5V
	GND	23,37	Ground	Ground connections
	NC	1,2,3,6,8,		Not connect
		9,10,11,12,13, 14,15,16,17,18,21 22,25,30,31,34 35,36,38,39,40		

1.6 Package Dimensions & Land Pattern

- unit = mm
- Outline Tolerances = $\pm 0.2\text{mm}$



BCM-SQ410 Package Dimensions

2. Characteristics

2.1 Electrical Characteristics

■ Absolute Maximum Ratings

Rating	Min	Max	Unit
Storage Temperature range	-40	85	°C
ADAP_IN	-0.4	6.50	V
Other terminal voltages	VSS-0.4	≤ 3.60	V

■ Recommended Operating Conditions

Operating Condition		Min	TYP	Max	Unit
Operating Temperature range		-20		70	°C
ADAP_IN		4.75	5.0	6.5	V
LEDs	LED[2:1]	1.10	3.7	4.3	V

■ USB

USB	Min	TYP	Max	Unit
VDD_IO (Internal Bypass LDO regulator output)	3.10	3.30	3.60	V
V _{IL} input logic level low	-	-	0.3 X VDD_IO	V
V _{IH} input logic level high	0.7 X VDD_IO	-	-	V
V _{OL} output logic level low	0	-	0.2	V
V _{OH} output logic level high	2.80	-	VDD_IO	V

■ Digital Terminals

Input Voltage Levels	Min	TYP	Max	Unit
V _{IL} input logic level low	-0.4	-	0.4	V
V _{IH} input logic level high	2.5	-	3.6	V
T _r /T _f	-	-	25	ns

Output Voltage Levels	Min	TYP	Max	Unit
V _{OL} output logic level low, I _{OL} = 4.0mA	-	-	0.4	V
V _{OH} output logic level high, I _{OH} = -4.0mA	2	-	-	V
T _r /T _f	-	-	5	ns

Input and Tristate Currents	Min	TYP	Max	Unit
Strong pull-up	-150	-40	-10	μA
Strong pull-down	10	40	150	μA
Weak pull-up	-5	-1.0	-0.33	μA
Weak pull-down	0.33	1.0	5.0	μA
C _i Input Capacitance	1.0	-	5.0	pF

■ LED Driver Pads

LED Driver Pads		Min	TYP	Max	Unit
Current, I _{PAD}	High impedance state	-	-	5	μA
	Current sink state	-	-	10	mA
LED pad voltage, V _{PAD}	I _{PAD} = 10mA	-	-	0.55	V
LED pad resistance	V _{PAD} < 0.5V	-	-	40	Ω

2.2 RF Characteristics

2.2.1 Transmitter

RF Characteristics		NOTE	MIN	TYP	MAX	Bluetooth Specification	UNIT
Maximum RF transmit power		a	-	8.5	10	-6 to 20	dBm
RF power variation over temperature range				±1			dB
20dB bandwidth for modulated carrier			-	925	1000	≤ 1000	kHz
ACP	F = F0 ± 2MHz	b c	-	-43	-20	≤ -20	dBm
	F = F0 ± 3MHz	b c	-	-49	-40	≤ -40	dBm
	F = F0 ± > 3MHz	b c	-	-55	-40	≤ -40	dBm
Δf1avg maximum modulation			140	165	175	140 < f1avg < 175	kHz
Δf2avg maximum modulation			115	145		≥ 115	kHz
Δ2avg/Δf1avg			0.8	0.94		≥ 0.80	
ICFT		D	-75	3	75	± 75	kHz
Drift rate			-	4	20	≤ 20	KHz/50 μs
Drift(single slot packet)			-	6	25	≤ 25	kHz
Drift(five slot packet)			-	8	40	≤ 40	kHz
2nd harmonic content		e	-	-22	-	≤ -30	dBm
3nd harmonic content		e	-	-16	-	≤ -30	dBm

a BCM-SQ-410 firmware is set to target 10 dBm. Specified Min and Max values are based on statistical variance and represent absolute limits rather than expected performance.

b Measured at F0 = 2441 MHz.

c Exceptions in up to three bands are allowed. For exceptions, there is a relaxed limit of ≤ -20 dBm.

d Carrier frequency offset is dependent upon crystal frequency accuracy

e Addition of a filter attenuates transmit harmonics. For RF specification, refer to BCM-SQ-410 *Hardware Design Guide*.

2.2.2 Receiver

RF Characteristics	Frequency (GHz)	Notes	Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity at 0.1% BER for all basic rate packet types	2.402	-	-	-96.5	-92.5	≤ -70	dBm
	2.441	-	-	-96.5	-92.5		
	2.480	-	-	-96.5	-92.5		
Maximum received signal at 0.1% BER		-	-20	> -9	-	≥ -20	dBm
Continuous power required to block Bluetooth reception (for input power of -67 dBm with 0.1% BER) measured at the output of BCM-SQ410	0.030 - 2.000	-	-10	> 4	-	-10	dBm
	2.000 - 2.400	-	-27	-4	-	-27	
	2.500 - 3.000	-	-27	-3	-	-27	
	3.000 - 12.75	-	-10	> 3	-	-10	
C/I co-channel		a b c	-	9	11	≤ 11	dB
Adjacent channel selectivity C/I	$F = F_0 + 1\text{MHz}$	a b c	-	-12	0	≤ 0	dB
	$F = F_0 - 1\text{MHz}$	a b c	-	-9	0	≤ 0	dB
	$F = F_{\text{image}}(F_0 + 2\text{MHz})$	a b c	-	-32	-9	≤ -30	dB
	$F = F_0 - 2\text{MHz}$	a b c	-	-39	-30	≤ -20	dB
	$F = F_{\text{image}} + 1\text{MHz}$	a b c	-	-43	-20	≤ -40	dB
	$F = F_0 - 3\text{MHz}$	a b c	-	-48	-40	≤ -40	dB
Maximum level of intermodulation interferers		d	-39	-26	-	≥ -39	dBm
Spurious output level		e		-155	-		dBm/Hz

- a Up to five spurious response frequencies are allowed. For these spurious response frequencies, there is a relaxed interference requirement of [BR/LE: C/I = -17 dB]/[EDR: C/I = -15 dB for $\pi/4$ DQPSK and C/I = -10 dB for 8DPSK].
- b Measured at $F_0 = 2441$ MHz.
- c $F_{\text{image}} = F_0 + 2$ MHz. However, depending on crystal frequency and channel number, the image may switch to the opposite side of the carrier. When this occurs, $F_{\text{image}} = F_0 - 2$ MHz and the offsets in the table equations associated with C/I are also reversed.
- d Measured at $f_1 - f_2 = \pm 3, 4$ and 5 MHz. Measurement is performed in accordance with Bluetooth RF test RCV/CA/05/c, i.e. wanted signal at -64 dBm.
- e Integrated in 100 kHz bandwidth and normalized to 1 Hz.

2.3 Antenna Characteristics

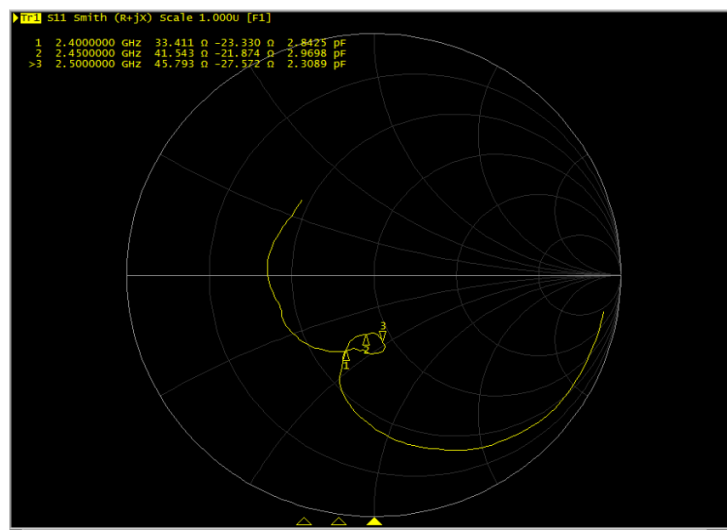
BCM-SQ410 include an fixed Antenna.

The antenna is Gradiant type of PCB antenna. The antenna impedance matching is optimized for 1 mm ~ 2 mm mother board PCB thickness. The radiation pattern is impacted by the layout of the mother board.

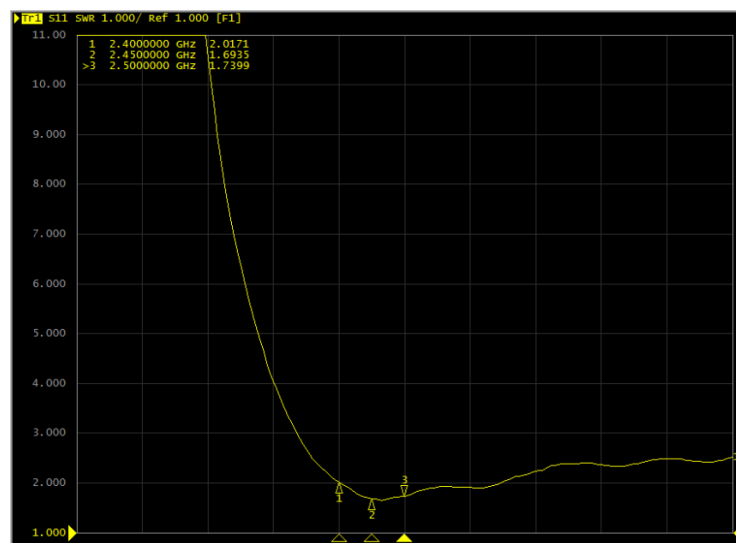
Typically the highest gain is towards GND plane and weakest gain away from the GND plane.

2.3.1 Antenna Passive Data

SMITH CHART

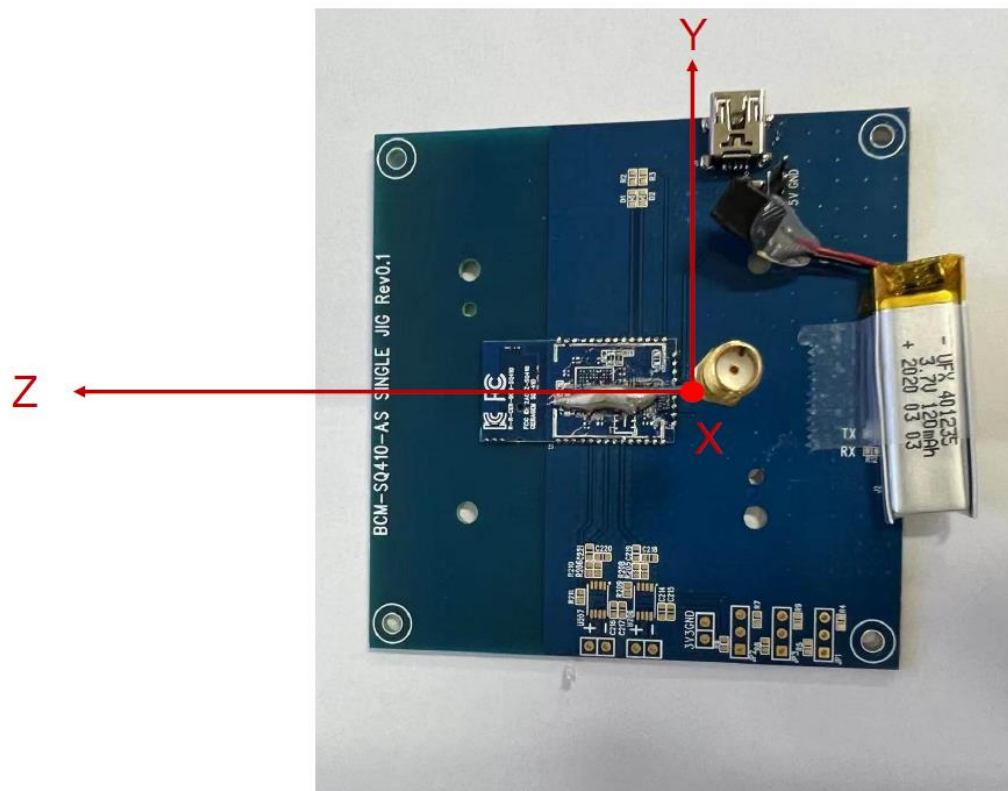


SWR

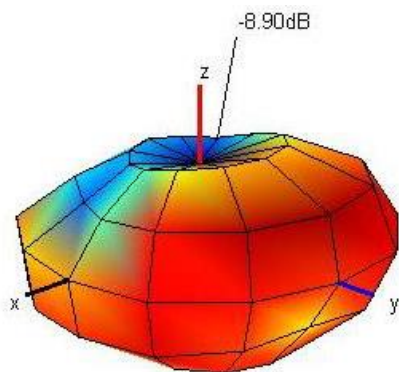


Average Efficiency	-1.41dBi	72.34%
Peak Gain	2.10dBi	

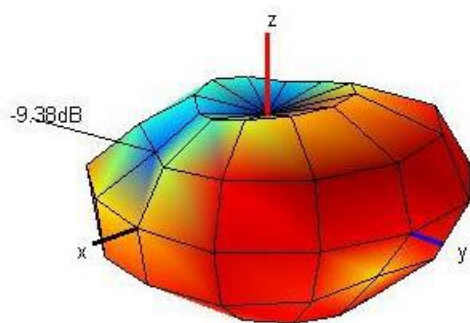
2.3.2 3D Plot



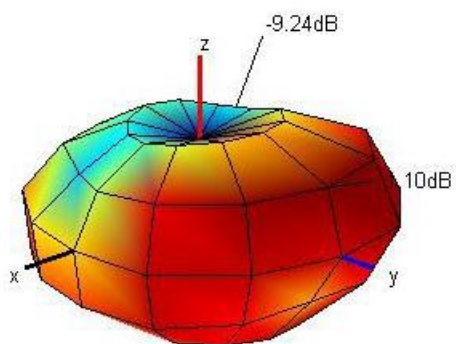
2400MHz



2445MHz



2445MHz



3. Terminal Description

3.1 UART Interface

BCM-SQ410 is a UART serial interface that provides a simple mechanism for communication with other serial devices using the RS232 protocol, including for test and debug.



When BCM-SQ410 is connected to another digital device, HCL_RXD and HCL_TXD transfer data between the 2 devices.

UART configuration parameters, such as baud rate and packet format are set using BCM-SQ410 firmware .

3.1.1 UART Setting

Parameter		Possible values
Baud rate	Minimum	1200 baud($\leq 2\%$ Error)
	Maximum	9600 baud($\leq 1\%$ Error)
		4M baud($\leq 1\%$ Error)
Flow control		None
Parity		None, Odd or Even
Number of stop bits		1 or 2
Bits per byte		8

3.2 USB Interface

BCM-SQ410 has a USB device interface :

An upstream port, for connection to a host Phone, PC

The device port is a USB2.0 Full Speed (12 Mb/s) port. Typically BCM-SQ410 enumerates as a compound device with a hub with the enabled audio source / sink / HID / mass storage device appearing behind this hub.

The DP 1.5 k pull-up is integrated in BCM-SQ410.

No series resistors are required on the USB data lines.

BCM-SQ410 contains integrated ESD protection on the data lines to IEC 61000-4-2 (device level). In normal applications, no external ESD protection is required.

Extra ESD protection is not required on ADAP_IN because BCM-SQ410 meets the USB certification requirements of a minimum of 1uF, and a maximum of 10 μ F being present on ADAP_IN.

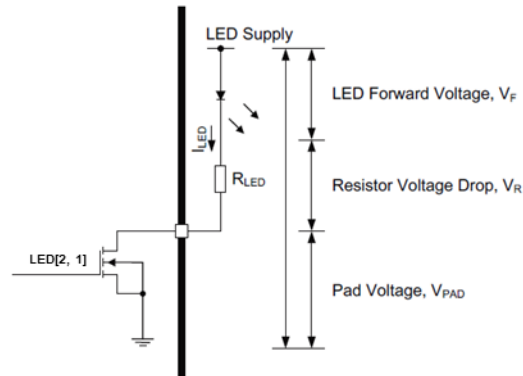
The ADAP_IN of BCM-SQ410 is tolerant of a constant 6.5 V and transients up to 7.0 V. If extra overvoltage protection is required, external clamping protection devices can be used.

NOTE. A direct USB2.0 connection from a host computer to the BCM-SQ410 can be used for most debugging and programming activities.

3.3 LED Drivers

BCM-SQ410 includes a 2-pad PWM LED driver for driving RGB LEDs for producing a wide range of colors. All LEDs are controlled by application.

The terminals are open-drain outputs, so the LED must be connected from a positive supply rail to the pad in series with a current-limiting resistor.



It is possible to derive below Equation to calculate I_{LED} . If a known value of current is required through the LED to give a specific luminous intensity, then the value of R_{LED} is calculated.

$$I_{LED} = \frac{VDD - V_F}{R_{LED} + R_{pad}}$$

4. Audio

4.1 Audio Output

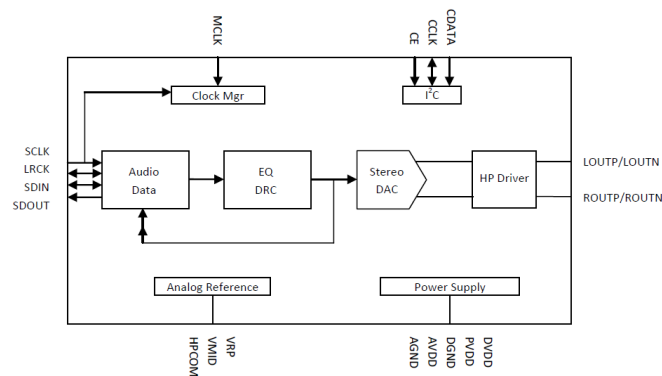
BCM-SQ410 is designed for a single-ended stereo audio output.

4.2 Audio Interface

The main features of the interface are:

- Stereo and mono analogue output for voice band and audio band

4.2.1 Audio Block Diagram



4.2.2 DAC

BCM-SQ410 includes a high quality DAC

- 110 dB signal to noise ratio, -80 dB THD+N
- Integrated headphone driver with capless option
- 7-band fully adjustable EQ
- Dynamic range compression
- Playback signal feedback
- Pop and click noise suppression

4.2.3 DAC Sample Rate Selection

Each DAC supports the following sample rates:

8kHz / 11.025kHz / 16kHz / 22.050kHz / 32kHz / 40kHz / 44.1kHz / 48kHz

4.2.4 DAC Digital Gain

The DAC outputs have two gain stages, The digital gain varies between -24dB and 21.5dB
Calls connected by VM stream automatically select the distribution of gain within DAC for best performance. Alternatively, the individual gain stages can be set.

Digital Gain Selection Value	DAC Digital Gain Setting (dB)	Digital Gain Selection Value	DAC Digital Gain Setting (dB)
0	0	8	-24
1	3.5	9	-20.5
2	6	10	-18
3	9.5	11	-14.5
4	12	12	-12
5	15.5	13	-8.5
6	18	14	-6
7	21.5	15	-2.5

4.2.5 DAC Analogue Gain

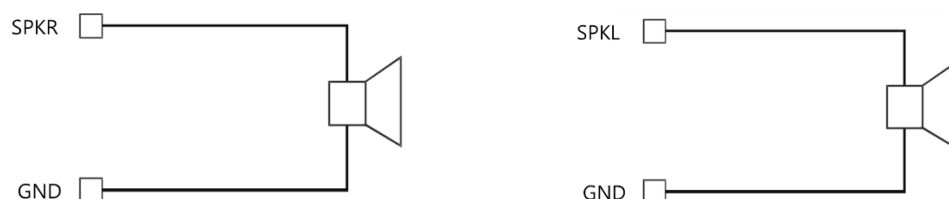
Below table shows the DAC analogue gain stage consists of 8 gain selection values that represent seven 3dB steps. The firmware controls the overall gain control of the DAC. Its setting is a combined function of the digital and analogue amplifier settings.

Analogue Gain Selection Value	DAC Analogue Gain Setting (dB)	Analogue Gain Selection Value	DAC Analogue Gain Setting (dB)
7	0	3	-12
6	-3	2	-15
5	-6	1	-18
4	-9	0	-21

4.2.6 Output Stage

The output stage digital circuitry converts the signal from 16-bit per sample, linear PCM of variable sampling frequency to bit stream, which is fed into the analogue output circuitry.

The analogue output circuit comprises a DAC, a buffer with gain-setting, a low-pass filter and a class AB output stage amplifier. Figure shows that the output is available as a signal between SPKL and GND for the left channel, and between SPKR and GND for the right channel.



5. Reset, RST#

BCM-SQ410 is reset from several sources:

- RST# pin
- Power-on reset
- UART break character
- Software configured watchdog timer

The RST# pin is an active low reset and is internally filtered using the internal low frequency clock oscillator. Qualcomm recommends applying RST# for a period >5ms.

The recommended period for BCM-SQ410 is from 10ms to 1000ms.

6. Layout Guide

6.1 Layout Guide

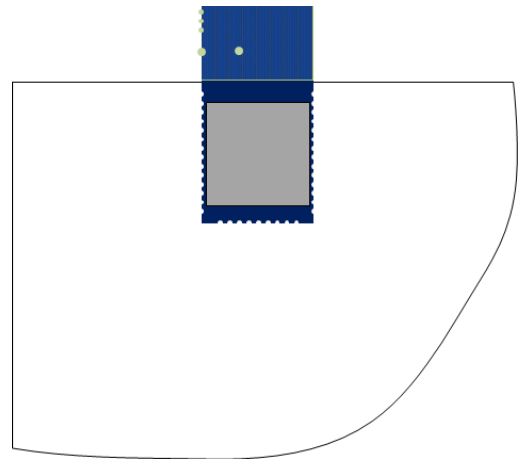
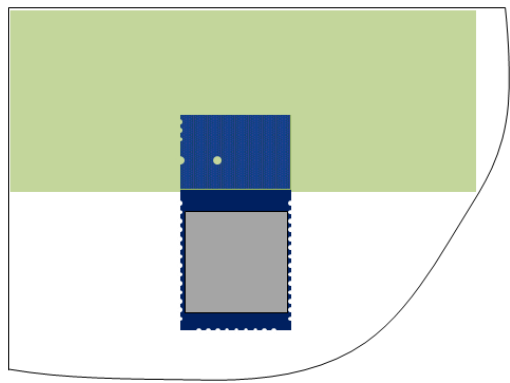
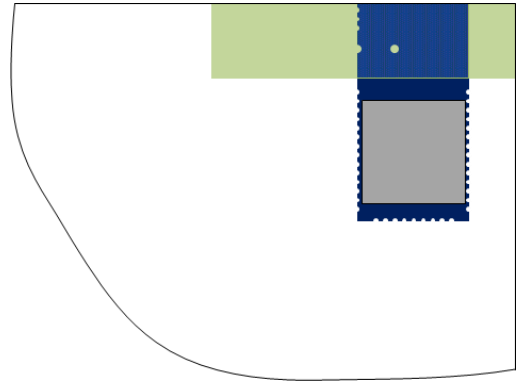
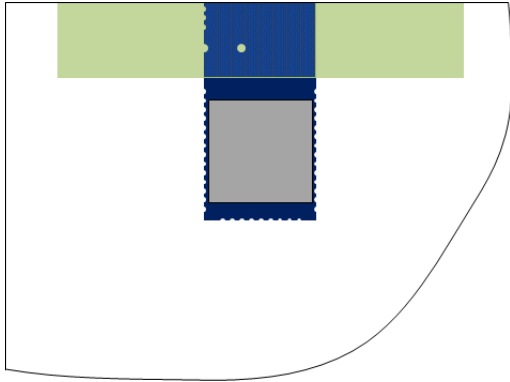
For optimal performance of the antenna place the module at the outside of the PCB

Do not place any metal (traces, components, battery etc.) within the clearance area of the antenna. Connect all the GND pins directly to a solid GND plane. Place the GND vias as close to the GND pins as possible. Use good layout practices to avoid any excessive noise coupling to signal lines or supply voltage lines. Avoid placing plastic or any other dielectric material closer than 5 mm from the antenna. Any dielectric closer than 5 mm from the antenna will detune the antenna to lower frequencies.

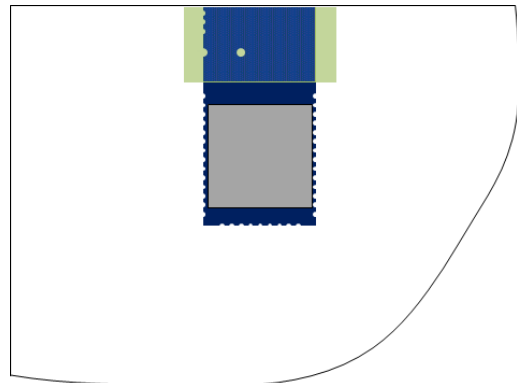
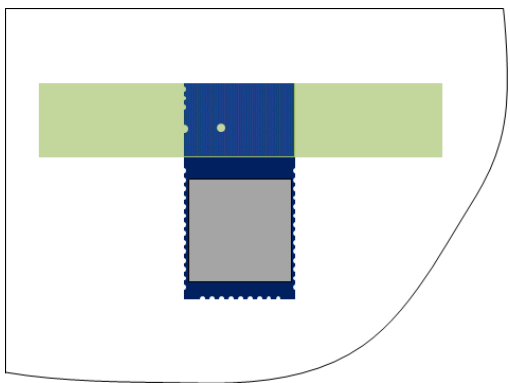


6.1.1 Module Placement example

Good Position



Bad Position



7. Reflow Temperature Profile

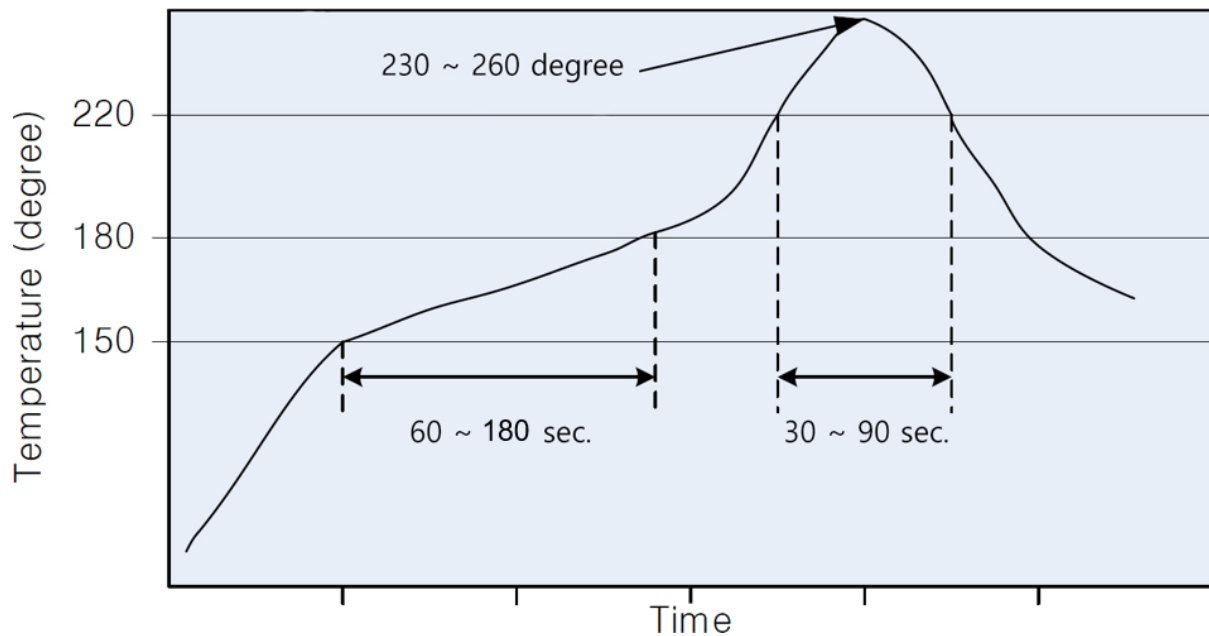
Recommended solder reflow profile are shown in below and follow the lead-free profile I accordance with JEDEC Std 20C.

Table lists the critical reflow temperatures.

Flux residue remaining from board assembly can contribute to electrochemical migration over time.

This depends on number of factors, including flux type, amount of flux residue remaining after reflow, and stress conditions during product use, such as temperature, humidity, and potential difference between pins.

Care should be taken in selecting production board/module assembly processes and materials, taking into account these factors.



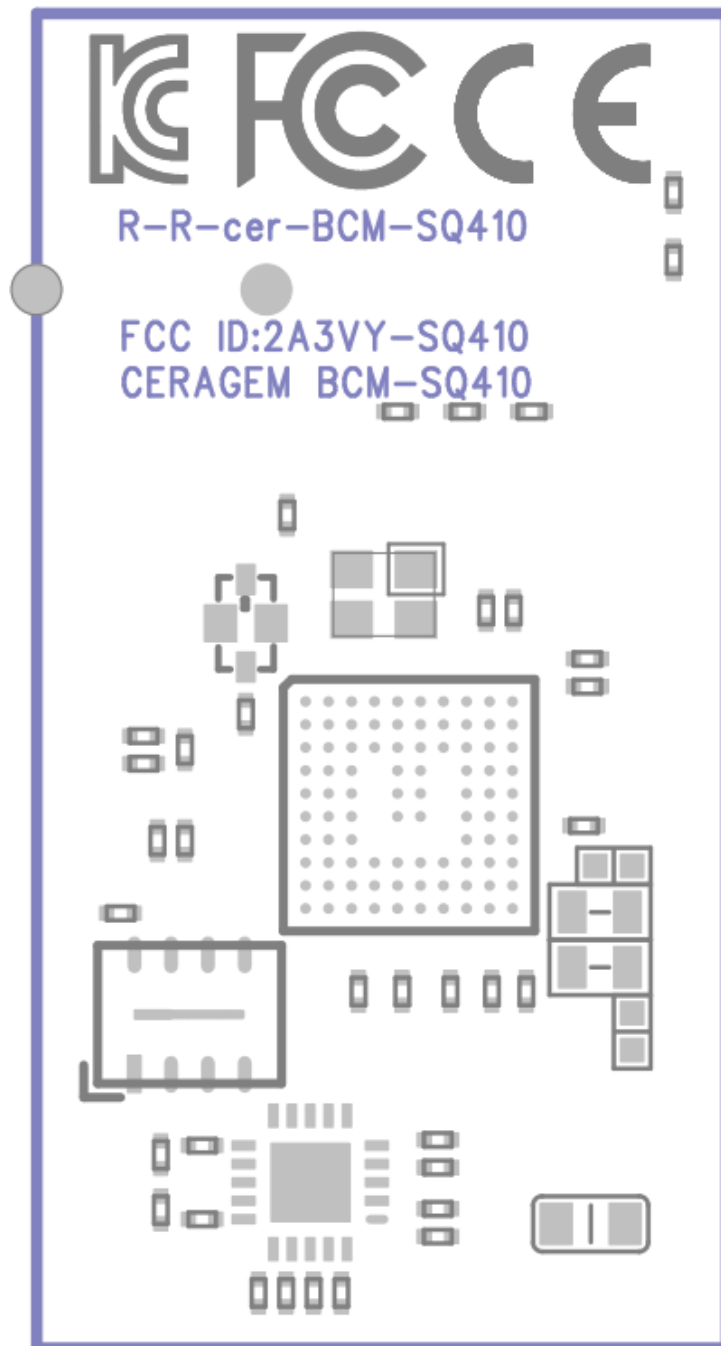
Process Step	Pb-Free Solder
Ramp rate	3°C/sec
Preheat	Max. 150°C to 180°C, 60 to 180 sec
Time above liquidus	+220°C 30 to 90 sec
Peak temperature	+255°C ±5°C
Time within 5°C of peak temperature	10 to 20 sec
Ramp-down rate	6°C/sec max

WARNING : For BCM-SQ410.

If you have reflow process multiple times in your product, you must be proceed this module in the final reflow process. If not the Shield can will drop out.

8. Certification Information

8.1. Certification Mark Location



9. Package Information

9.1. Reel Pocket Information

TBD

9.2 Reel Information

TBD

9.3 Out Box Information

TBD

FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual

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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal onboard antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator

will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2A3VY-SQ410". Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

WARNING

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

"CAUTION : Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.³

Explanation: This module meets the requirements of FCC part 15C(15.247).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has a PCB Pattern Antenna , and the antenna use a permanently attached antenna which is not replaceable.

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is

used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to

demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The Module is not a limited module.

2.5 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled

environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC

statement, FCC ID is: 2A3VY-SQ410

2.6 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type"))).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT has a PCB Pattern Antenna, and the antenna use a permanently

attached antenna

which is unique.

2.7 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the

following texts: "Contains FCC ID: 2A3VY-SQ410.

2.8 Information on test modes and additional testing requirements⁵

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or

instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: Top band can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.9 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for

the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuitry, so the module does not

require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B