SPECIFICATION

20800D8-04V1.0&1ANT

IEEE 802. 11 Wi-Fi Integrated

Approved by Company		
Checked by	Rechecked by	Approved by

Please send the original back to us after you have approved and signed.

Approved by customer		
Comments	Approved by	Company's seal
Customer's Name:		

REVISION HISTORY

VERSION	DATE	BOARD ID	PAGE	DESCRIPTION	AUTHOR
V1.0	2023.05.27	AIC8800D40			

1. Introduction

20800D8-04 module is based on AIC8800D40 solution. 20800D8-04 is a combo low-power, high-performance and high-integrated dual band wireless communication module which is designed for meeting the customers ' needs of small size and low cost. This module supports both WLAN and functions. Its WLAN/function supports the USB2.0/SDIO3.0 interface, and its BT function supports the UART interface, and the module meets the requirements of standard protocol IEEE 802.11 . Such units as power management, power amplifier and low- noise amplifier are integrated in the main chip of the module. Its WLAN PHY rate is up to 2 8 6 . 8 Mbps@TX. The module can be applied in smart sound boxes, set-

top boxes,game machines, printers, IP cameras, tachographs, and other smart equipment. This documentation describes the engineering requirements specification.

20800D8-04 模块基于 AIC8800D40 方案。20800D8-04是一款 组合的低功耗、高性能、高集成度双频无线通信模块，专为满足客户小尺寸、低成本的需求而设计。 该模块支持WLAN 功能。WLAN/BT 功能支持USB2.0 / SDIO3.0 接口，功能支持UART接口，满 足 IEEE 802.11 标准协议要求。本文档描述了工程要求规范。

2. Features

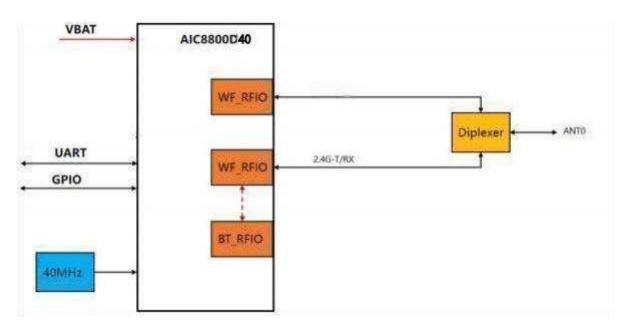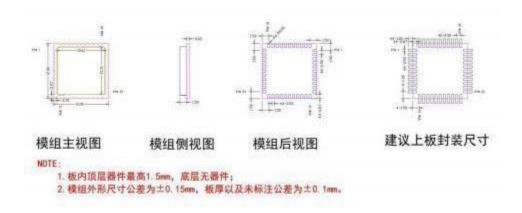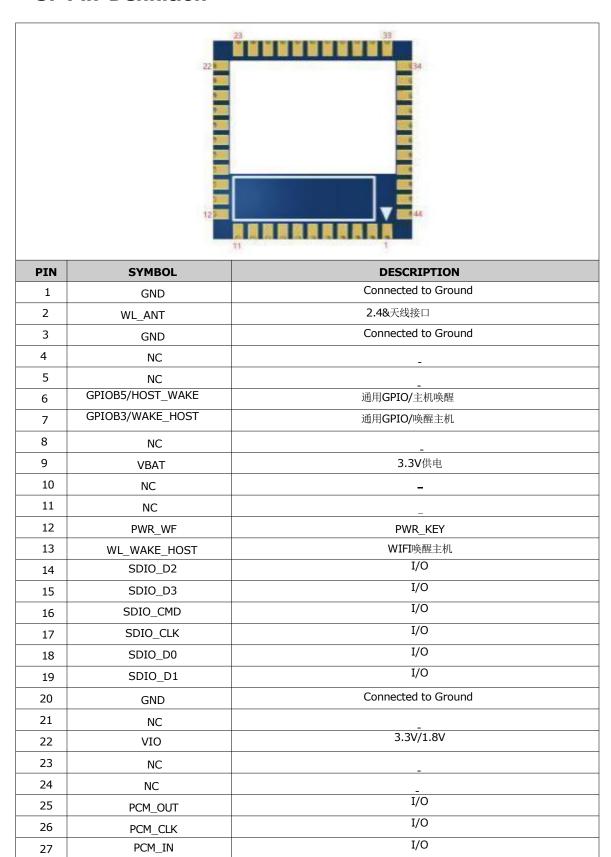| Reserving System	
	IEEE Std. 802.11b
	IEEE Std. 802.11g
	IEEE Std. 802.11n
	IEEE Std. 802.11ax
Chip Solution	AIC8800D40
Band	2.4GHz
Dimensions	12mm×12mm×1.85mm
Antenna	Stamp Hole
Installation Mode	SMD
Remark	

3. Block Diagram

Figure 1 20800D8-04 Block Diagram
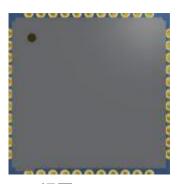
4. Package Outline and Mounting

模组主视图　　　模组侧视图　　　模组后视图　　　建议上板封装尺寸

NOTE:
1. 板内顶层器件最高1.5mm，底层无器件；
2. 模组外形尺寸公差为±0.15mm，板厚以及未标注公差为±0.1mm。

5. Pin Definition

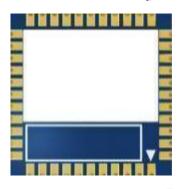| PIN	SYMBOL	DESCRIPTION
1	GND	Connected to Ground
2	WL_ANT	2.4&天线接口
3	GND	Connected to Ground
4	NC	-
5	NC	-
6	GPIOB5/HOST_WAKE	通用GPIO/主机唤醒
7	GPIOB3/WAKE_HOST	通用GPIO/唤醒主机
8	NC	-
9	VBAT	3.3V供电
10	NC	-
11	NC	-
12	PWR_WF	PWR_KEY
13	WL_WAKE_HOST	WIFI唤醒主机
14	SDIO_D2	I/O
15	SDIO_D3	I/O
16	SDIO_CMD	I/O
17	SDIO_CLK	I/O
18	SDIO_D0	I/O
19	SDIO_D1	I/O
20	GND	Connected to Ground
21	NC	-
22	VIO	3.3V/1.8V
23	NC	-
24	NC	-
25	PCM_OUT	I/O
26	PCM_CLK	I/O
27	PCM_IN	I/O

28	PCM_SYNC	I/O
29	UART0_TX	I/O
30	UART0_RX	I/O
31	GND	Connected to Ground
32	NC	-
33	GND	Connected to Ground
34	PWR_	通用GPIO/_DIS 使能
35	NC	通用GPIO
36	GND	Connected to Ground
37	NC	-
38	NC	-
39	NC	-
40	NC	-
41	UART1_RTS	I/O
42	UART1_TX	I/O
43	UART1_RX	I/O
44	UART1_CTS	I/O

6. Product Pictures

正视图（**Top view**）

背视图（**Bottom view**）

7. Key Materials

序号	关键件名称	型号	规格/材料	备注
1	集成电路	AIC8800D40	QFN48	AIC
2	PCB			
3	晶体振荡器			
4	双工器			

8. General Requirements

No.	Feature	Description
8-1	Operation Voltage 工作电压范围	3.3V±0.3
8-2	Current Consumption 最大电流	580mA
8-3	Ripple 纹波	≤120mV
8-4	Operation Temperature 工作温度范围	-20℃ to +40℃
8-5	Antenna Type 天线类型	External antenna
8-6	Interface	SDIO3.0/USB2.0/PCM/UART
8-7	Storage Temperature 存储温度	-40℃ to +85℃

9. Electrical Characteristics

除非另有说明，电气规范试验都在下列条件下进行：

环境条件温度：25℃±5℃ ；

电源电压：模块输上入电压 3.3V(±10%）；

The Test for electrical specification was performed under the following condition unless otherwise specified.

Ambient condition Temperature :25℃ ± 5℃;

Power supply voltages：3.3V (±10%) input power at the Module;

9.1 IEEE 802.11b Section (2.4GHz)

Items	Contents				
Specification	IEEE802.11b				
Mode	CCK				
Channel	CH1 to CH13				
Data rate	1, 2, 5.5, 11Mbps				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels at each rate					

(1Mbps~11Mbps)					
2. Spectrum Mask @ target power					
1) fc ± 11MHz to ±22MHz	-	-	-30	dBr	
2) fc > ±22MHz	-	-	-50	dBr	
3. Constellation Error(EVM)@ target power					
1) 1Mbps	-	-	-9.11	dB	
2) 2Mbps	-	-	-9.11	dB	
3) 5.5Mbps	-	-	-9.11	dB	
4) 11Mbps	-	-	-9.11	dB	
4. Frequency Error	-20	-	20	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity					
1) 1Mbps (FER ≦8%)	-	-	-83	dBm	
2) 2Mbps (FER ≦8%)	-	-	-80	dBm	
3) 5.5Mbps (FER ≦8%)	-	-	-79	dBm	
4) 11Mbps (FER ≦8%)	-	-	-76	dBm	
6. Maximum Input Level (FER ≦8%)	-10	-	-	dBm	

9.2 IEEE 802.11g Section (2.4GHz)

Items	Contents				
Specification	IEEE802.11g				
Mode	OFDM				
Channel	CH1 to CH13				
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) For antenna port（54M）					
2. Spectrum Mask @ target power					
1) at fc +/-11MHz	-	-	-20	dBr	
2) at fc +/-20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz	-	-	-40	dBr	
3 Constellation Error(EVM)@ target power					
1) 6Mbps	-	-	-5	dB	
2) 9Mbps	-	-	-8	dB	
3) 12Mbps	-	-	-10	dB	
4) 18Mbps	-	-	-13	dB	
5) 24Mbps	-	-	-16	dB	
6) 36Mbps	-	-	-19	dB	
7) 48Mbps	-	-	-22	dB	
8) 54Mbps	-	-	-25	dB	
4 Frequency Error	-20	-	20	ppm	

RX Characteristics	Min.	Typ.	Max.	Unit	
5 Minimum Input Level Sensitivity					
1) 6Mbps (PER ≤ 10%)	-	-	-85	dBm	
2) 9Mbps (PER ≤ 10%)	-	-	-84	dBm	
3) 12Mbps (PER ≤ 10%)	-	-	-82	dBm	
4) 18Mbps (PER ≤ 10%)	-	-	-80	dBm	
5) 24Mbps (PER ≤ 10%)	-	-	-77	dBm	
6) 36Mbps (PER ≤ 10%)	-	-	-73	dBm	
7) 48Mbps (PER ≤ 10%)	-	-	-69	dBm	
8) 54Mbps (PER ≤ 10%)	-	-	-65	dBm	

9.3 IEEE 802.11n HT20/40 Section(2.4GHz)

Items	Contents				
Specification	IEEE802.11n HT20/40@2.4GHz				
Mode	OFDM				
Channel	HT20:CH1 to CH13 HT40:CH3 to CH11				
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7				
TX Characteristics	Min.	Typ.	Max.		Unit	
1. Power Levels (Calibrated)					
1) For antenna port（MCS7）					
2. Spectrum Mask @target power					
1) fc +/-22MHz	-	-	-20	dBr	
2) fc +/-40MHz	-	-	-28	dBr	
3) fc > +/-60MHz	-	-	-45	dBr	
3. Constellation Error(EVM)@ target power					
1) MCS0	-	-	-5	dB	
2) MCS1	-	-	-10	dB	
3) MCS2	-	-	-13	dB	
4) MCS3	-	-	-16	dB	
5) MCS4	-	-	-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-	-28	dB	
4. Frequency Error	-20	-	20	ppm	
RX Characteristics	Min.	Typ.	Max.		Unit	
5. Minimum Input Level Sensitivity			HT20	HT40	
1) MCS0 (PER ≤ 10%)	-	-	-82	-79	dBm
2) MCS1 (PER ≤ 10%)	-	-	-79	-76	dBm
3) MCS2 (PER ≤ 10%)	-	-	-77	-74	dBm
4) MCS3 (PER ≤ 10%)	-	-	-74	-71	dBm

Items					Unit	
5) MCS4 (PER ≤ 10%)	-	-	-70	-67	Bm	
6) MCS5 (PER ≤ 10%)	-	-	-66	-63	dBm	
7) MCS6 (PER ≤ 10%)	-	-	-65	-62	dBm	
8) MCS7 (PER ≤ 10%)	-	-	-64	-61	dBm	
6. Maximum Input Level (PER ≤ 10%)	-20	-		-	dBm	

9.4 IEEE 802.11ax HE20/40 Section (2.4GHz)

Items	Contents			
Specification	IEEE802.11ax HE20/40@2.4GHz			
Mode	OFDMA			
Channel	HE20:CH1 to CH13 HE40:CH3 to CH11			
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8/9			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels (Calibrated)				
1) For antenna port（MCS11）				
2. Spectrum Mask @VHT20/VHT40 target power				
1) fc +/- 11MHz/21MHz/41MHz	-	-	-20	dBr
2) fc +/-20MHz/40MHz	-	-	-28	dBr
3) fc +/-30MHz/60MHz	-	-	-40	dBr
3. Constellation Error(EVM)@ target power				
1) MCS0	-	-	-5	dB
2) MCS1	-	-	-10	dB
3) MCS2	-	-	-13	dB
4) MCS3	-	-	-16	dB
5) MCS4	-	-	-19	dB
6) MCS5	-	-	-22	dB
7) MCS6	-	-	-25	dB
8) MCS7	-	-	-27	dB
9) MCS8	-	-	-30	dB
10) MCS9	-	-	-32	dB
11) MCS10	-	-	-34	dB
12) MCS11	-	-	-35	dB
4. Frequency Error	-20	-	20	ppm
RX Characteristics	Min.	Typ.	Max.		Unit
5.Minimum Input Level Sensitivity			HE20	HE40	
1) MCS0 (PER ≤ 10%)	-	-	-82	-79	dBm
2) MCS1 (PER ≤ 10%)	-	-	-79	-76	dBm
3) MCS2 (PER ≤ 10%)	-	-	-77	-74	dBm
4) MCS3 (PER ≤ 10%)	-	-	-74	-71	dBm

5) MCS4 (PER ≤10%)	-	-	-70	-67	dBm	
6) MCS5 (PER ≤10%)	-	-	-66	-63	dBm	
7) MCS6 (PER ≤10%)	-	-	-65	-62	dBm	
8) MCS7 (PER ≤10%)	-	-	-64	-61	dBm	
9) MCS8(PER ≤10%)	-	-	-59	-56	dBm	
10) MCS9(PER ≤10%)	-	-	-57	-54	dBm	
11) MCS10(PER ≤10%)	-	-	-54	-51	dBm	
12) MCS11(PER ≤10%)	-	-	-51	-49	dBm	
6. Maximum Input Level (PER ≤10%)	-30	-	-		dBm	

10.　Reference　Design

10.1　DC　Electrical Characteristics

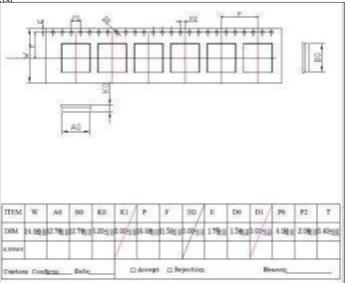| Symbol	Description	conditions	Min.	Typ.	Max.	Unit
VDD33	Power supplies	-	3.0	3.3	3.6	V
VDDIO	I/O input power supplies	-	3.0	3.3	3.6	V
			1.7	1.8	1.9	
I$_{VDD}$33	Power supply current	-	-	-	800	mA
I$_{VDDIO}$	I/O supply current	-	-	-	50	mA
V$_{IH}$	High-level input voltage	VDDIO=3.3V	VDDIO*0.625	-	VDDIO+0.3	V
		VDDIO=1.8V	VDDIO*0.65			
V$_{IL}$	Low-level input voltage	VDDIO=3.3V	-0.3	-	VDDIO*0.25	V
		VDDIO=1.8V		-	VDDIO*0.35	
V$_{OH}$	High-level output voltage	VDDIO=3.3V	VDDIO-0.4	-	VDDIO+0.3	V
		VDDIO=1.8V	VDDIO-0.2			
V$_{OL}$	Low-level output voltage	VDDIO=3.3V	-0.3	-	0.4	V
		VDDIO=1.8V		-	0.2	
R$_{PU}$	Internal pull-up resistor	VDDIO=3.3V	40	75	190	kΩ
		VDDIO=1.8V	10	50	100	
R$_{PD}$	Internal pull-down resistor	VDDIO=3.3V	40	75	190	kΩ
		VDDIO=1.8V	10	50	100	

11. Mechanical,Environmental and Reliability Tests

Test Items		Test Conditions	Qty	Criteria Condition
11-1	**Drop test**	The packed samples within 100Kg can be tested Drop height: Face Side: 800/600/450mm Edge line: 600/450/350mm Drop time: 1 each Face and edge.	1xBox	After drop test, the outer box and inner box will not been broken by appearance visual inspection.
11-2	**Vibration test**	X-Y-Z direction, first Frequency changing from 10Hz to 30Hz to 10Hz,amplitude 0.75mm, 5 times vibrations, then frequency Changing from 30Hz to 55 Hz to 30 Hz, amplitude 0.15mm, 5 time vibration.	3	After test, the Appearance, Power EVM and Frequency error shall be satisfied with the specification.
11-3	**Impact test**	Impact acceleration: 50m/sec2; Impact duration: 16ms； Impact times: 1000.	3	After test, the Appearance, Power EVM and Frequency error shall be satisfied with the specification.
11-4	**Soldering ability test**	Soldering temperature: 235±5℃ Soldering duration: 2±0.5S	3	1.After soldering, the soldered area must be covered by a smooth bright solder layer, some deficiencies such as a small amount of the pinhole, not wetting are allowed, but the deficiencies can not be in the same place； 2.At least 90% of soldered area shall be covered continuously by the soldering material.
11-5	**Humidity test**	Leave samples in 40±3℃, 93% RH @ 96 hours	3	Leave samples in standard test condition for 2 hours then test, the Appearance, Power, EVM and Frequency error functional parameter shall be satisfied with the test specification.

11-6	**High temperature load life test**	Thermostat cabinet temperature: 55±5℃ Applied voltage: 110% rated voltage Working duration: 200 hour (Supply Voltage Cycle 23h power on,	60	After test, leave samples in standard condition for 1 hour and test, Power, EVM and Frequency error shall be satisfied with the test specification.
		1h power off)		
11-7	**High temperature load test**	Temperature: 55±5℃ Samples work for 16 hours	3	After test, the Appearance, Power, EVM and Frequency error shall be Satisfied with the test specification.
11-8	**Low temperature storage test**	Leave the samples in -25±3℃@24 hours	3	Leave samples in standard test condition for 2 hours then test, the Appearance, Power, EVM and Frequency error shall be satisfied with the test specification.
11-9	**Low temperature load test**	Leave samples in -15±3℃@ 2 hours, samples' function shall be normal, the let samples work for 1 hour	3	After test, leave the samples in standard condition and tested the Appearance, Power, EVM and Frequency error shall be satisfied with the test specification.
11-10	**Temperature circle test**	One cycle duration -10±3℃@3H 40±3℃ @3H Total cycle: 10x	3	After test, leave the samples in standard condition and tested Power EVM and Frequency error shall be qualified and all the characters shall be satisfied with the test specification.
11-11	**Continuous TP test**	Twice cycle duration -10±3℃@4H +60±3℃@4H, +25@2H@2H	3	During test, There will not been appeared signal disconnection or interruption between DUT and AP.
11-12	**ESD**	Discharge voltage: 1kV C: 150pF Discharge resistance: 330Ω Positive10 times 1 time for each second	3	The products can recoverable smoothly after ESD test.

12. Package (包装)

（1） 编带包装示意图

ITEM	W	A0	B0	K0	K1	P	F	S0	E	D0	D1	P0	P2	T
DIM	24.0	12.7	12.7	3.20	0.00	16.0	11.50	0.00	1.75	1.5	0.00	4.0	2.0	0.40
ALTERNATE														
Custom Confirm: Date:				□ Accept □ Rejection					Reason:					

FCC Statement

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 interference that may cause undesired operation.

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 important announcement

Important Note:

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 and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

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

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing 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.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID 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.

End Product Labeling

The final end product must be labeled in a visible area with the following"

Contains FCC ID: **2BL2Z-20800D8-04** "

Manual Information to the End User

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.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

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.

2.7 Antennas

This radio transmitter **FCC ID: 2BL2Z-20800D8-04** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
2.4G Wi-Fi	/	FPC Antenna	1.82	2400-2500MHz

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID: 2BL2Z-20800D8-04**".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.