保密等级：机密

SPECIFICATION

产品规格书

SKI.WB921AU.1

IEEE 802.11b/g/n/a/ac/ax 2T2R USB WiFi Module

Integrated BT 2.1+EDR/4.2/5.2

Approved by Shikun		
Checked by 审核	Rechecked by 复审	Approved by 批准
周钊		

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Approved by customer		
Comments 确认意见	Approved by 批准签字	Company's seal 盖章
Customer's Name:		

REVISION HISTORY.

VERSION	DATE	BOARD ID	PAGE	DESCRIPTION	AUTHOR
V0	2020.07.06	SKI.WB921AU.1 A20273	All	First Issued	San
V1.0	2020.09.06	SKI.WB921AU.1 B20415	All	Change PCB's structure	San
V1.1	2020.10.06	SKI.WB921AU.1 C20523	All	Black PCB turn to Green	San
V1.2	2021.03.06	SKI.WB921AU.1 C20523	All	Adjust transmit power	San
V1.3	2021.07.13	SKI.WB921AU.1 C20523	All	Add package information	San
V1.4	2021.07.14	SKI.WB921AU.1 C20523	All	Add BT ANT describe	San
V1.5	2021.07.21	SKI.WB921AU.1 C20523	All	Add RoHS certificate	San
V1.6	2021.11.05	SKI.WB921AU.1 C20523	All	Update operating temperature,add WiFi6E RF parameters,modify BT power	San
V1.7	2021.12.02	SKI.WB921AU.1 C20523	All	Update WiFi TX power	San
V1.8	2021.12.10	SKI.WB921AU.1 C20523	All	Update power table	Zhouz
V1.9	2021.12.13	SKI.WB921AU.1 C20523	All	Update General Requirements	Zhouz
V2.0	2022.06.10	SKI.WB921AU.1 C20523	All	Update Antenna Configuration	Zhouz
V2.1	2022.08.04	SKI.WB921AU.1 C20523	All	Added requirements for module coplanarity	Zhouz
V2.2	2023.01.08	SKI.WB921AU.1 C20523	All	Adding BOM configuration	Zhouz
V2.3	2023.02.06	SKI.WB921AU.1 C20523	All	Update package quantity	Zhouz
V2.4	2023.04.24	SKI.WB921AU.1 D23073	All	New configuration	Zhouz
V2.5	2023.09.04	SKI.WB921AU.1 D23073	All	Modify the configuration 5 label	Zhouz
V2.6	2024.06.24	SKI.WB921AU.1 D23073	All	Add MIC information	Zhouz

Content

1. Introduction（简介）

SKI.WB921AU.1 module is based on MediaTek MT7921AU solution.

MT7921A is a highly integrated single chip which features a low power 2x2 11a/b/g/n/ac/ax dual-band Wi-Fi subsystem and a Bluetooth v5.2 subsystem, offering feature-rich wireless connectivity at high standards,and delivering reliable,cost-effective throughput from an extended distance.

MT7921AUN data rate up to 800Mbps with USB3.0.Optimized RF architecture and baseband algorithms provide superb performance and low power consumption. Intelligent MAC design deploys a high efficient offload engine,and hardware data processing accelerators which fully offloads Wi-Fi task of the host processor, MT7921A is designed to support standard based features in the areas of security, quality of service and international regulations, giving end users the greatest performance any time and in any circumstance.This documentation describes the engineering requirements specification.

SKI.WB921AU.1 模块基于联发科 MT7921AU 方案。MT7921A 是一款高度集成的单芯片，符合 2x2 11a/b/g/n/ac/ax 标准，支持低功耗的双频 Wi-Fi 和蓝牙 v5.2 子系统，提供功能丰富的无线标准接口，以及可靠、高效的远距离吞吐量。

MT7921AUN 使用 USB3.0 高速接口，数据速率高达 800Mbps，优化后的射频架构和基带算法提供了卓越的性能，并且功耗很低。MAC 部署了一个高效的卸载引擎和硬件数据处理加速器，可完全卸载主机处理器的 Wi-Fi 任务。MT7921A 安全、优异的性能，并且符合国际法律法规标准，无论何时何地都为用户提供最好的应用体验。本文档描述了工程要求规范。

2. Features（特性）

Reserving System **接收制式**	IEEE Std. 802.11a
	IEEE Std. 802.11b
	IEEE Std. 802.11g
	IEEE Std. 802.11n
	IEEE Std. 802.11ac
	IEEE Std. 802.11ax(5GHz)
	IEEE Std. 802.11ax(6GHz)
	BT 2.1+EDR
	BT 4.2

	BT 5.2 with BLE (BT low energy)
Chip Solution 芯片方案	MT7921AU
Band & occupied bandwidth 波段与占用带宽	BT: 2400-2483.5MHz@≤3MHz WiFi:2400-2483.5MHz@≤40MHz 5150-5350MHz@≤80MHz 5725-5850MHz@≤80MHz
Modulation system 调制方式	WiFi:DBPSK/DQPSK/CCK/BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM BT:GFSK, π/4-DQPSK, 8-DPSK
Dimensions 尺寸	30mm×23mm×2.6mm

Model 型号	**Installation Mode 安装方式**	**Protocol 支持标准**	**Frequency 频段**	**Antenna 天线**	**Remark 备注**
SKI.WB921AU.1	SMD	IEEE 802.11a/b/g/n/ac/ax BT 2.1+EDR/4.2/5.2	2.4GHz/5GHz /6GHz	WiFi&BT： 一代 Ipex	30mm×23mm ×2.6mm

3. Block Diagram（结构框图）

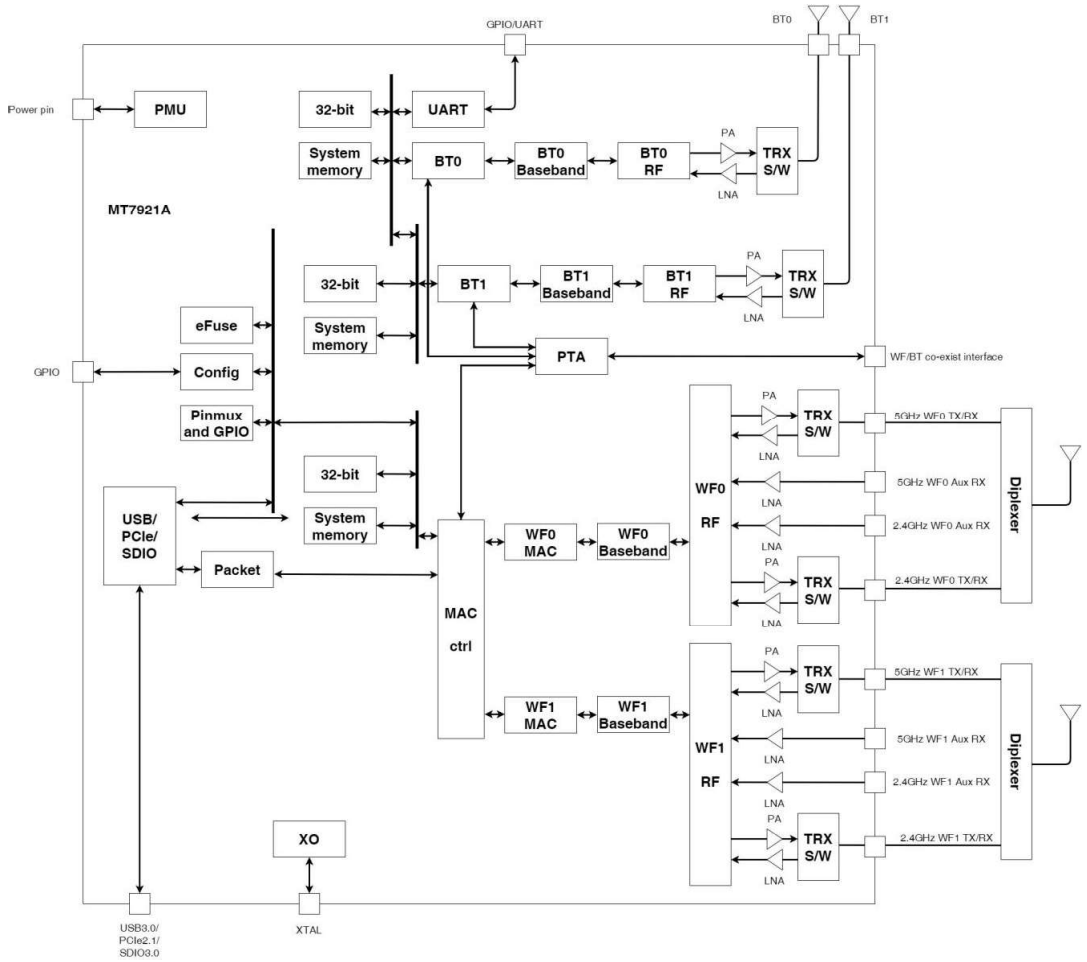
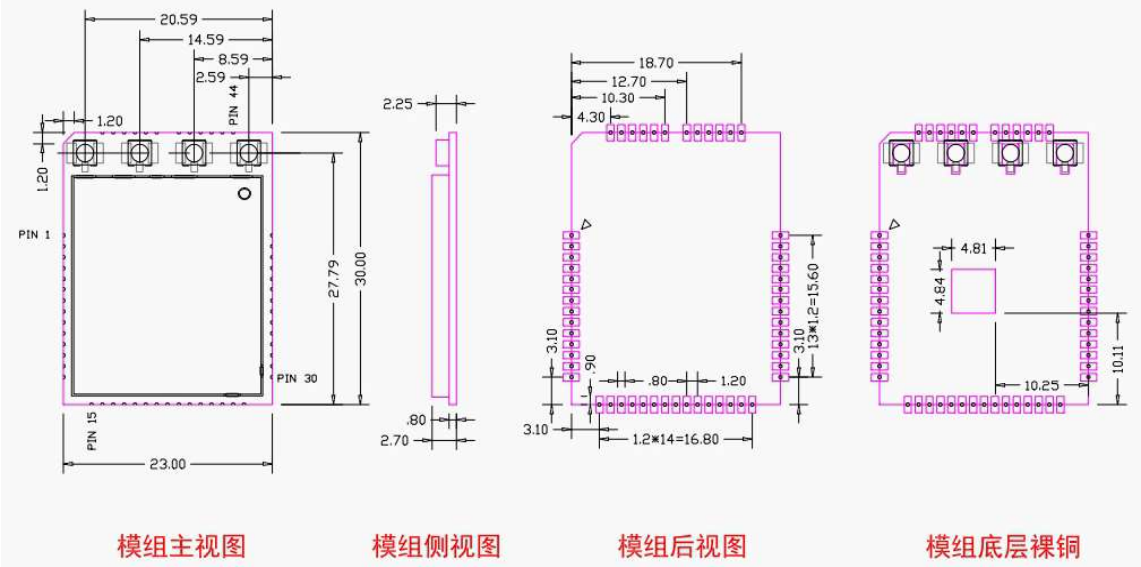


Figure 1 SKI.WB921AU.1 Block Diagram

4. Package Outline and Mounting（外形及安装尺寸）

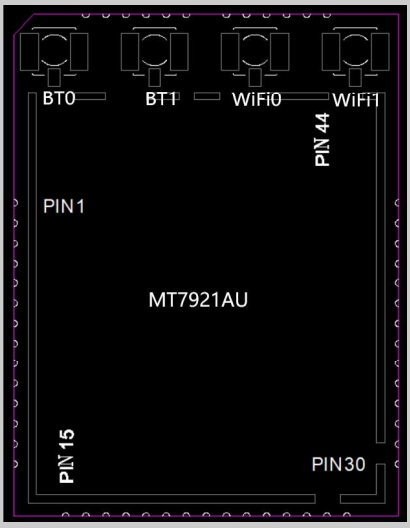


注意：1. 单位为 mm。

2.模组外形尺寸公差为±0.2mm，板厚及未标注公差为±0.1mm。

3.平面度要求：＜0.15mm。

Pin Definition（引脚定义）



模组正视图

PIN	SYMBOL	DESCRIPTION
1	GND	GND
2	NC	Not connect
3	NC	Not connect
4	GND	GND

5	RESET	PMU RESET，内部 10K 上拉，低电平有效
6	GND	GND
7	GND	GND
8	3.3V	3.3V (DCDC 单独供电，预留 2A，纹波小于 120mV)
9	3.3V	3.3V (DCDC 单独供电，预留 2A，纹波小于 120mV)
10	GND	GND
11	NC	Not connect
12	NC	Not connect
13	GPIO13	DEBUG,WL FW LOG
14	GPIO4	DEBUG,BT FW LOG
15	GND	GND
16	WIFI_WAKE	WIFI 唤醒，内部 10K 上拉，低电平有效
17	GPIO12	ICE DEBUG
18	GPIO1I	ICE DEBUG
19	NC	Not connect
20	GND	GND
21	U3-TXN	USB3.0 TXN，连接主平台 RXN
22	U3-TXP	USB3.0 TXP，连接主平台 RXP
23	GND	GND
24	NC	Not connect
25	NC	Not connect
26	GND	GND
27	U3-RXN	USB3.0 RXN，连接主平台 TXN
28	U3-RXP	USB3.0 RXP，连接主平台 TXP
29	GND	GND
30	U2-DP	USB2.0 DP，连接主平台 DP
31	U2-DM	USB2.0 DM，连接主平台 DM
32	GND	GND
33	NC	Not conneet
34	BT_WAKE	BT 唤醒，内部 10K 上拉，低电平有效
35	NC/BT_Stereo	Not conneet/BT_Stereo
36	NC	Not connect
37	GND	GND
38	NC	Not connect
39	NC	Not connect
40	NC	Not connect
41	NC	Not conneet
42	GND	GND

43	GND	GND
44	GND	GND
45	WiFi1	Not connect(默认使用板载 ipex)
46	GND	GND
47	GND	GND
48	WiFi0	Not connect(默认使用板载 ipex)
49	GND	GND
50	GND	GND
51	BT1	Not connect(默认使用板载 ipex)
52	GND	GND
53	GND	GND
54	BT0	Not connect(默认使用板载 ipex)
55	GND	GND

5. Product Pictures（实物图片）

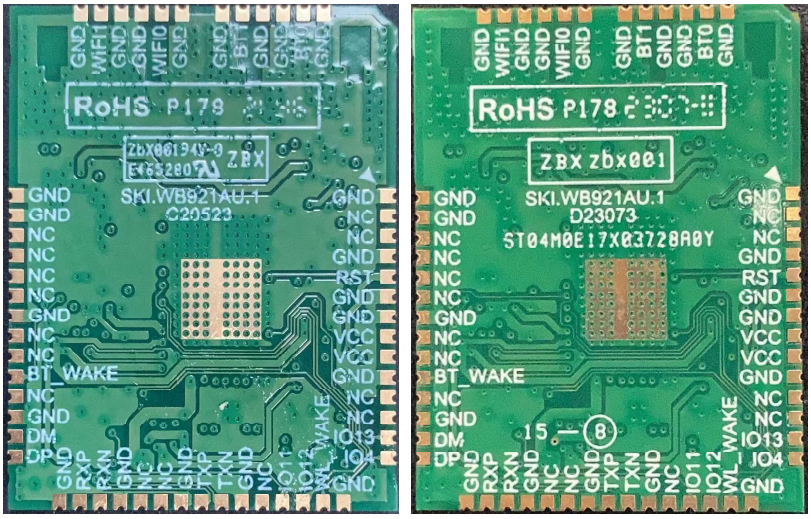
配置 1　　配置 2　　配置 3　　配置 4　　配置 5

正视图（top view）

配置说明：

CVTE 提供五种模块配置，如下图

机型	CVTE 料号	说明
SKI.WB921AU.1	配置 1：002.029.0000435	IPEX 输出：4 天线，2 WiFi+2 BT 配置，USB3.0-5G
	配置 2：002.029.0000436	IPEX 输出：3 天线，2WiFi+1BT（默认 BT0，主 BT），USB3.0-5G
	配置 3：002.029.0000874	邮票孔输出：4 天线，2 WiFi+2 BT 配置，USB3.0-5G
	配置 4：002.029.0000969	IPEX 输出：4 天线，2 WiFi+2 BT 配置，USB3.0-2.5G
	配置 5：002.029.0000995	IPEX 输出：4 天线，2 WiFi+2 BT 配置，USB3.0-5G（支持 BT_Stereo）



配置 1~4　　配置 5

背视图（bottom view）

标签信息（information view）

6. Key Materials（关键物料）

序号	关键件名称	型号	规格/材料	备注
1	集成电路	MT7921AU	109-DRQFN	
2	PCB	SKI.WB921AU.1	FR-4,4LAY	
3	晶体振荡器	CF4040M00006T2115218	40MHz	

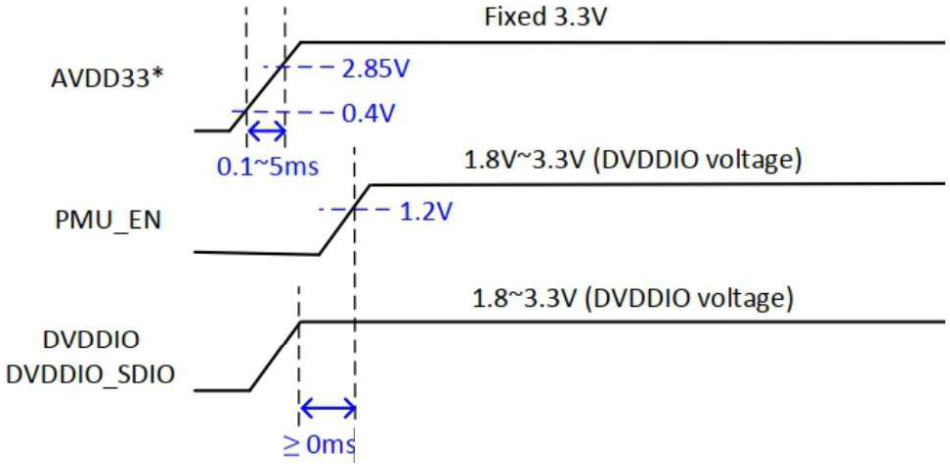
R 210-192431

The device is restricted to indoor use when operating in 5150-5350MHz frequency range.

7. General Requirements（一般要求）

No.	Feature	Description
7-1	Operation Voltage 工作电压范围	3.3V+/-0.3
7-2	Current Consumption 最大电流	900mA（预留 2A）
7-3	Ripple 纹波	≤120mV
7-4	Operation Temperature 工作温度范围	-10°C to +70°C
7-5	Antenna Type 天线类型	External antenna
7-6	USB	High Speed USB 3.0 Interface （兼容 High Speed USB 2.0 Interface）
7-7	Storage Temperature 存储温度	-40°C to +125°C

8. Interface Timing Specification



Ps：1、After 3.3V power supply is stabilized, PMU_EN can be pulled up again (Delta T>0)；

2、It is recommended that the main chip be pulled down again PMU_EN after the WIFI power is stabilized.

9. Electrical Characteristics（电气特性）

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+/-0.3；

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

Ambient condition Temperature :25℃ ± 5℃;

Power supply voltages：3.3V+/-0.3 input power at the Module;

9.1 IEEE 802.11b Section(2.4GHz)

Items	Contents				
Specification	IEEE802.11b				
Mode	CCK				
Channel	CH1 to CH13				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels(Calibrated)					
1) For antenna port（CCK 11M）	15	17	19	dBm	
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	-	-	-10	dB	
2) 2Mbps	-	-	-10	dB	
3) 5.5Mbps	-	-	-10	dB	
4) 11Mbps	-	-	-10	dB	
4. Frequency Error	-20	-	20	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5 Minimum Input Level Sensitivity (each chain)					
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				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) For antenna port（54M）	14	16	18	dBm	
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 (each chain)					
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	
6 Maximum Input Level (PER ≦10%)	-20	-	-	dBm	

8.3 IEEE 802.11n HT20 Section(2.4GHz)

Items	Contents				
Specification	IEEE802.11n HT20 @ 2.4GHz				
Mode	OFDM				
Channel	CH1 to CH13				
TX Characteristics	Min.	Typ.	Max.	Unit	
1. Power Levels					
1) For antenna port（MCS7）	13	15	17	dBm	
2. Spectrum Mask @ target power					
1) at fc +/-11MHz	-	-	-20	dBr	
2) at fc +/-20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz	-	-	-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 (each chain)					
1) MCS0 (PER ≦10%)	-	-	-82	dBm	
2) MCS1 (PER ≦10%)	-	-	-79	dBm	
3) MCS2 (PER ≦10%)	-	-	-77	dBm	
4) MCS3 (PER ≦10%)	-	-	-74	dBm	
5) MCS4 (PER ≦10%)	-	-	-70	dBm	
6) MCS5 (PER ≦10%)	-	-	-66	dBm	
7) MCS6 (PER ≦10%)	-	-	-65	dBm	
8) MCS7 (PER ≦10%)	-	-	-64	dBm	
7. Maximum Input Level (PER ≦10%)	-20	-	-	dBm	

8.4 IEEE 802.11n HT40 Section(2.4GHZ)

Items	Contents				
Specification	IEEE802.11n HT40 @ 2.4GHz				
Mode	OFDM				
Channel	CH3 to CH11				
TX Characteristics	Min.	Typ.	Max.	Unit	
1. Power Levels (Calibrated)					
1) For antenna port（MCS7）	13	15	17	dBm	
2. Spectrum Mask @target power					
1) at fc +/-22MHz	-	-	-20	dBr	
2) at fc +/-40MHz	-	-	-28	dBr	
3) at 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 (each chain)					
1) MCS0 (PER ≦10%)	-	-	-79	dBm	
2) MCS1 (PER ≦10%)	-	-	-76	dBm	
3) MCS2 (PER ≦10%)	-	-	-74	dBm	

4) MCS3 (PER ≦10%)	-	-	-71	dBm	
5) MCS4 (PER ≦10%)	-	-	-67	dBm	
6) MCS5 (PER ≦10%)	-	-	-63	dBm	
7) MCS6 (PER ≦10%)	-	-	-62	dBm	
8) MCS7 (PER ≦10%)	-	-	-61	dBm	
6. Maximum Input Level (PER ≦10%)	-20	-	-	dBm	

8.5 IEEE 802.11ax Section(2.4GHz)

Items	Contents				
Specification	IEEE802.11ax				
Mode	BPSK, QPSK, 16QAM, 64QAM,256QAM, 1024QAM and OFDMA				
Channel	HE20：CH1 to CH13 HE40：CH3 to CH11				
TX Characteristics	Min.	Typ.	Max.	Unit	
1. Power Levels (Calibrated)					
1) For antenna port（MCS11）	11	13	15	dBm	
2. Spectrum Mask @VHT20/VHT40/VHT80 target power					
1) at fc +/-11MHz/21MHz/41MHz	-	-	-20	dBr	
2) at fc +/-20MHz/40MHz/80MHz	-	-	-28	dBr	
3) at fc +/-30MHz/60MHz/120MHz	-	-	-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 (each chain)			HE 20 / HE 40		
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%)	-	-	-52	-49		dBm	
6. Maximum Input Level (PER ≦10%)	-30	-	-			dBm	

8.6 IEEE 802.11a Section(5GHz)

Items	Contents				
Specification	IEEE802.11a				
Mode	OFDM				
Channel	CH36 to CH165				
TX Characteristics	Min.	Typ.	Max.	Unit	
1. Power Levels (Calibrated)					
1) For antenna port（54M）	14	16	18	dBm	
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 (each chain)					
1) 6Mbps (PER ≦10%)	-	-	-82	dBm	
2) 9Mbps (PER ≦10%)	-	-	-81	dBm	
3) 12Mbps (PER ≦10%)	-	-	-79	dBm	
4) 18Mbps (PER ≦10%)	-	-	-77	dBm	