



Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

Test Mode: CH00 2402MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2390.00	52.74	27.39	2.77	34.01	48.89	74.00	-25.11	H	Peak
2400.00	62.12	27.42	2.78	34.01	58.31	74.00	-15.69	H	
2390.00	54.50	27.39	2.77	34.01	50.65	74.00	-23.35	V	
2400.00	64.22	27.42	2.78	34.01	60.41	74.00	-13.59	V	
2390.00	39.19	27.39	2.77	34.01	35.34	54.00	-18.66	H	
2400.00	47.60	27.42	2.78	34.01	43.79	54.00	-10.21	H	Average
2390.00	41.10	27.39	2.77	34.01	37.25	54.00	-16.75	V	
2400.00	48.81	27.42	2.78	34.01	45.00	54.00	-9.00	V	

Test Mode: CH39 2480MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2483.50	53.87	27.70	2.84	34.03	50.38	74.00	-23.62	H	Peak
2500.00	49.35	27.75	2.86	34.03	45.93	74.00	-28.07	H	
2483.50	56.35	27.70	2.84	34.03	52.86	74.00	-21.14	V	
2500.00	52.06	27.75	2.86	34.03	48.64	74.00	-25.36	V	
2483.50	39.72	27.70	2.84	34.03	36.23	54.00	-17.77	H	
2500.00	35.61	27.75	2.86	34.03	32.19	54.00	-21.81	H	Average
2483.50	41.77	27.70	2.84	34.03	38.28	54.00	-15.72	V	
2500.00	37.54	27.75	2.86	34.03	34.12	54.00	-19.88	V	



7 Band Edge Measurement

Test Requirement : Section 15.247(d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Test Method : ANSI C63.10:2013

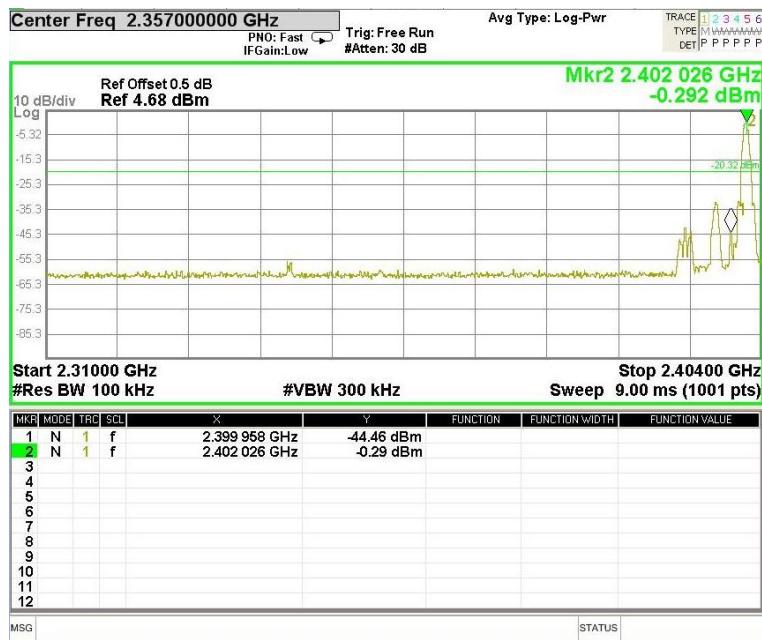
Test Limit : Regulation 15.247 (d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

7.2 Test Result

Band Edges Test Data CH0



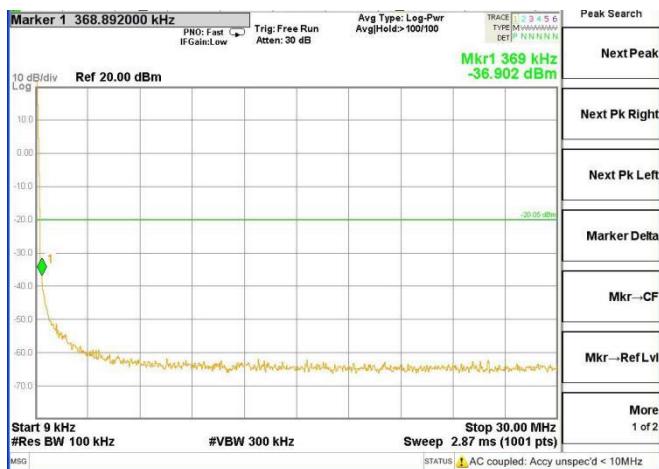
Band Edges Test Data CH39

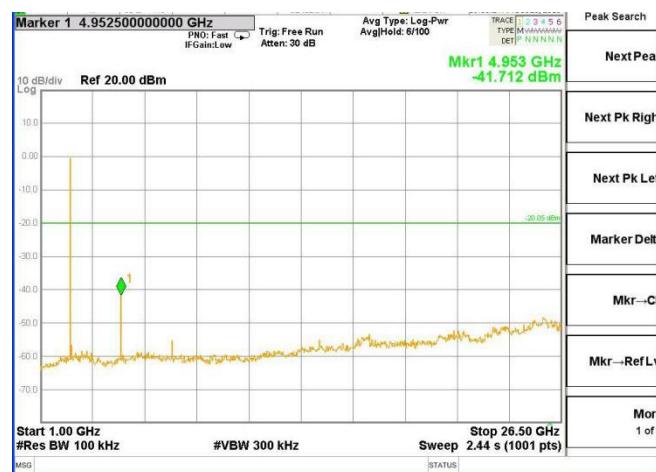
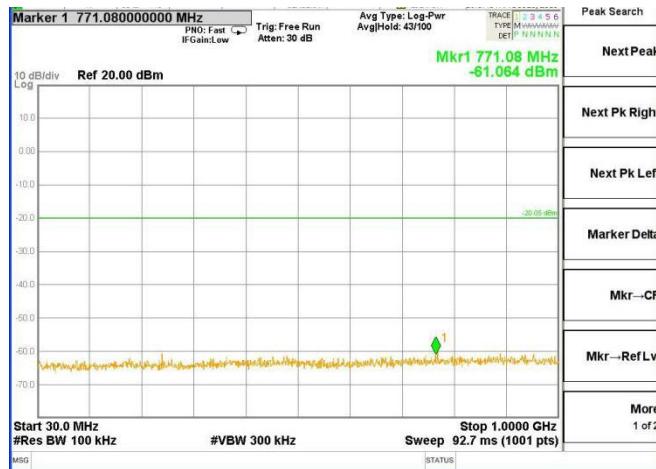




Conducted Spurious Emission Measurement Result

The worst mode is GFSK CH39 mode, and the report only show the worst mode data.







8 6dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

Test Limit Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

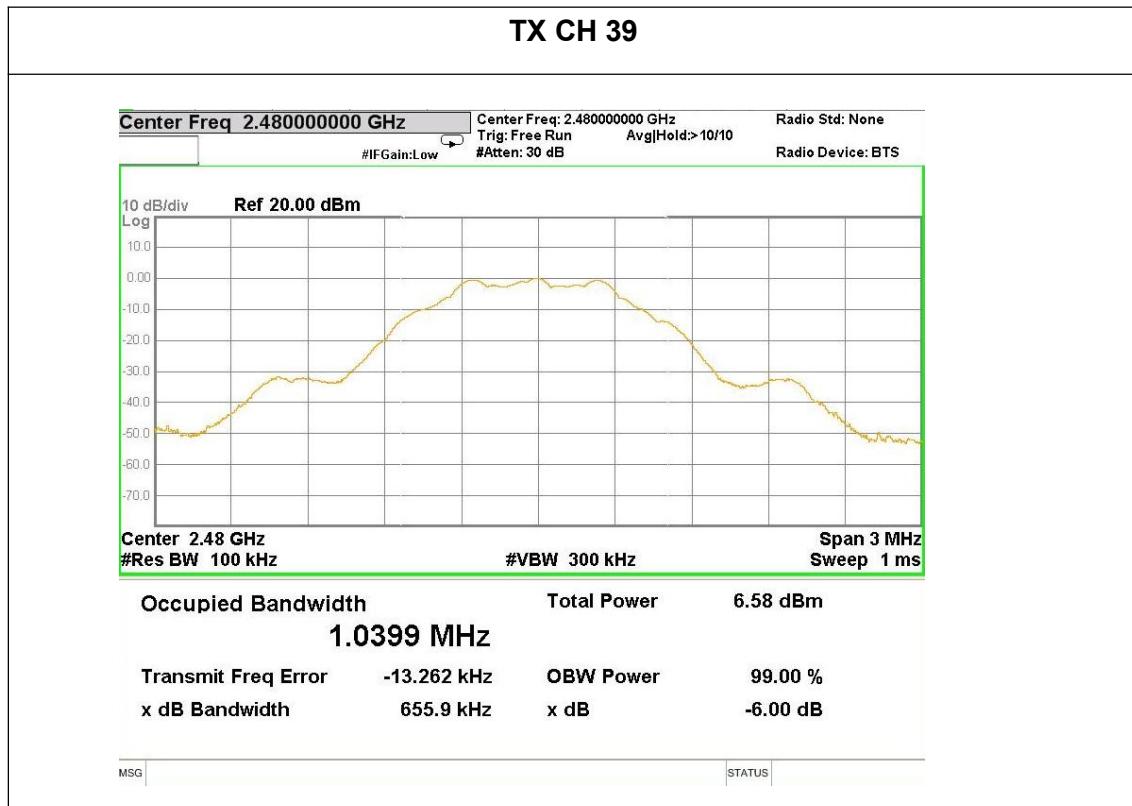
8.1 Test Procedure

1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100KHz, Set the Video Bandwidth(VBW)= 300KHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500KHz.
4. Measure and record the results in the test report.

8.2 Test Result

Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)	Result
2402	637.8	>500	Pass
2440	655.8	>500	Pass
2480	655.9	>500	Pass

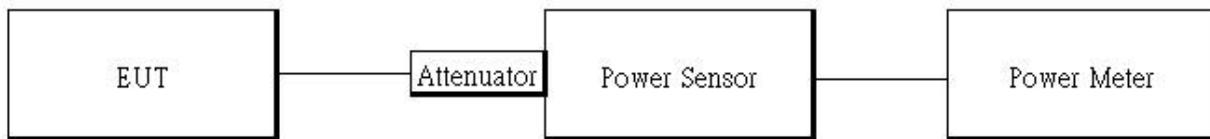




9 Maximum Peak Output Power

Test Requirement : FCC CFR47 Part 15 Section 15.247
 Test Method : ANSI C63.10:2013
 Test Limit : Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

9.1 Test Setup



9.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 15.247 Meas Guidance v05r02.
3. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the power meter.
4. Record the max. Reading as observed from Power Meter.
5. Repeat above procedures until all test default channel measured was complete.

9.3 Test Result

BLE Mode:

Frequency (MHz)	Peak Power Output (dBm)	Limit(dBm)
2402	0.170	30
2440	0.171	30
2480	1.022	30



10 Power Spectral density

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.1 Test Procedure

1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW0 = 3KHz, Video Bandwidth (VBW) = 10KHz, in order to make an accurate measurement, set the span to 1.5 times DTS channel bandwidth.
4. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
5. Measure and record the result in the test report.

10.2 Test Result

Channel frequency (MHz)	Measurement level (dBm)	Required Limit (dBm/3kHz)	Pass/Fail
	PSD/3kHz		
2402	-15.467	8	PASS
2440	-15.148	8	PASS
2480	-14.385	8	PASS

TX CH00



TX CH19





TX CH39





11 Antenna Application

11.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2 Result

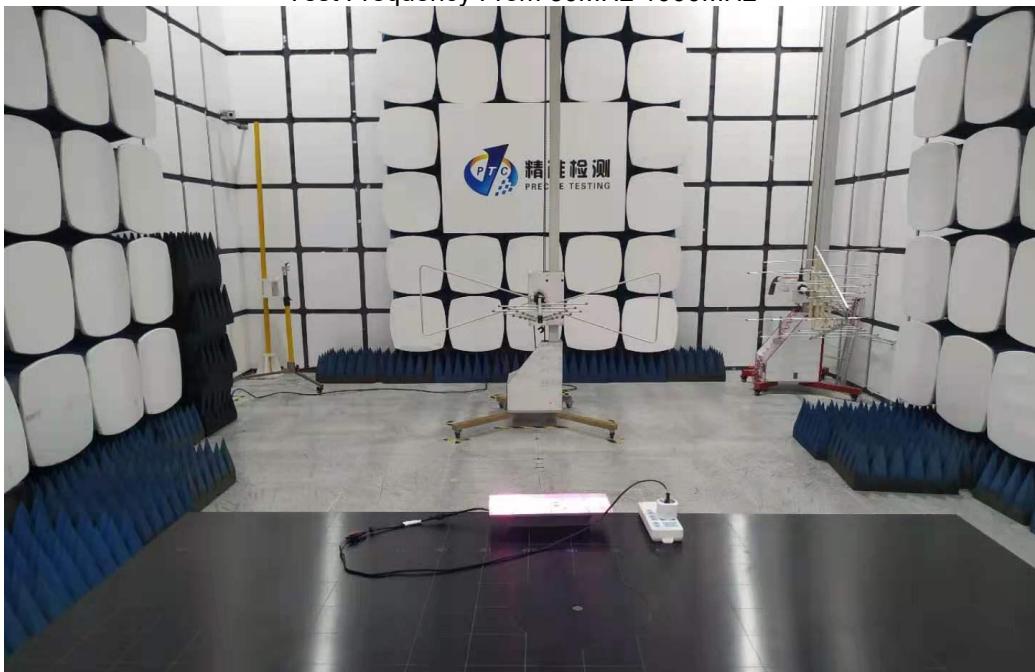
The EUT'S antenna, permanent attached antenna, is internal antenna. The antenna's gain is 2dBi and meets the requirement.

12 Test Setup

Conducted Emission



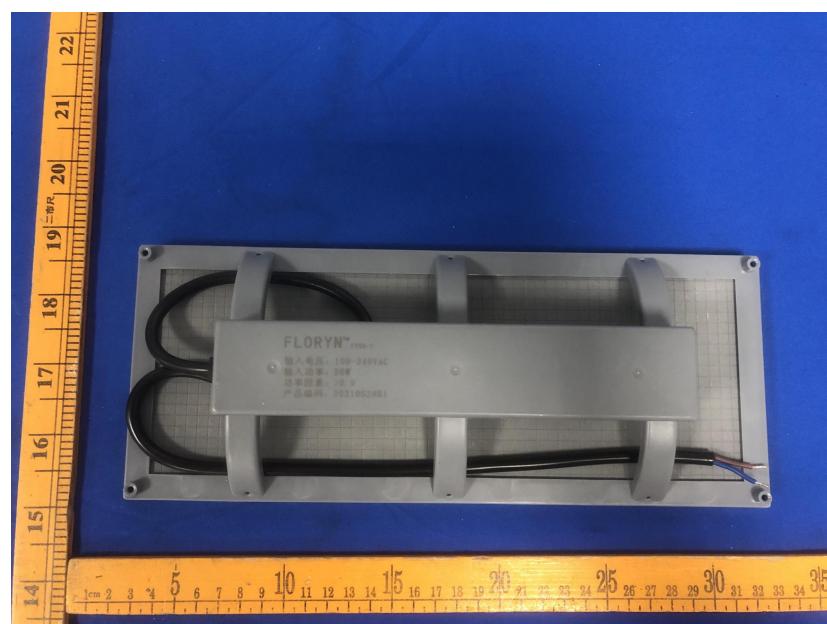
Radiated Spurious Emissions
Test Frequency From 30MHz-1000MHz

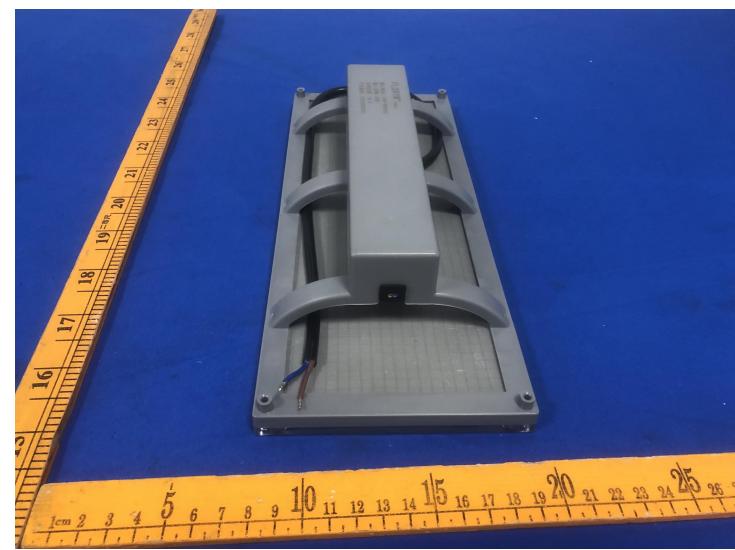


Test frequency from 1GHz-18GHz

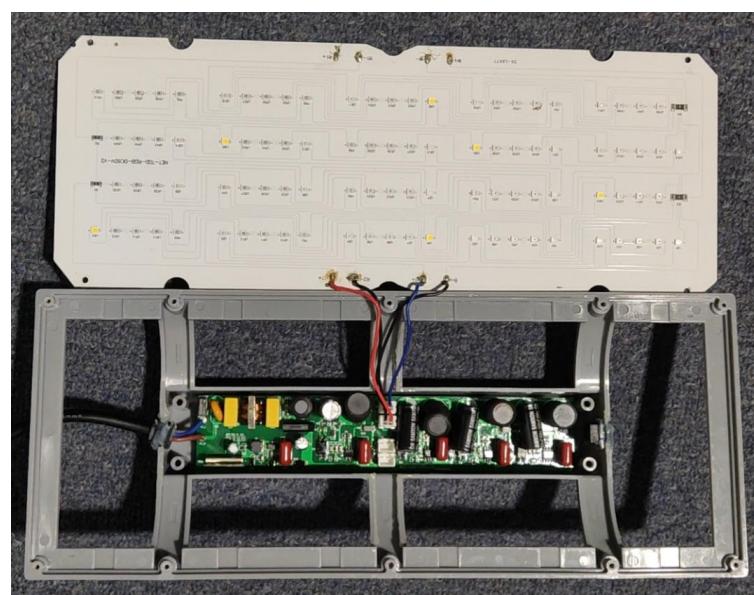


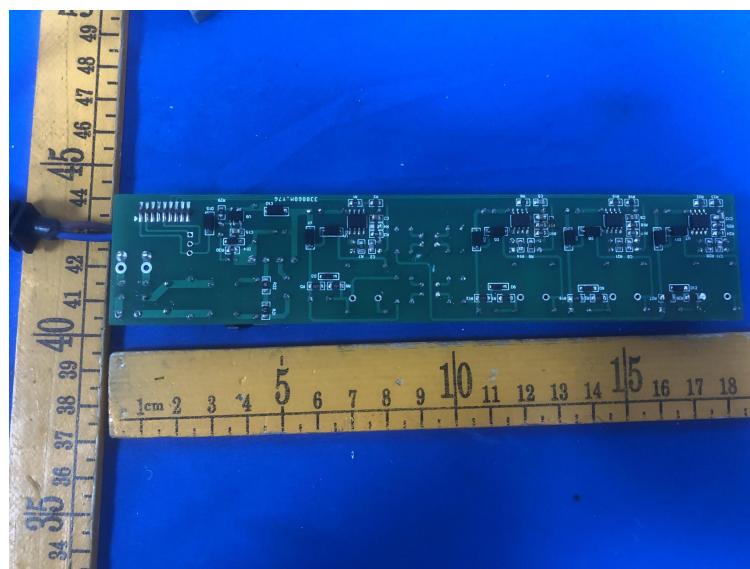
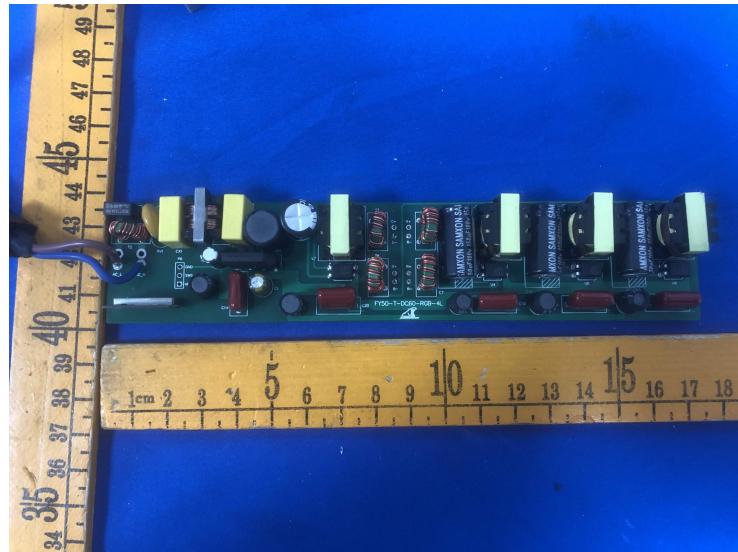
13 EUT Photos

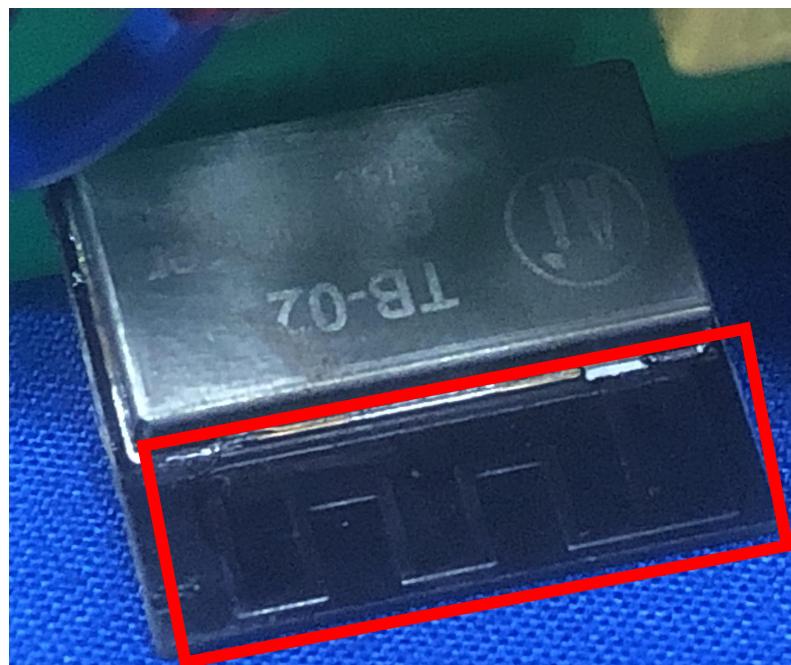
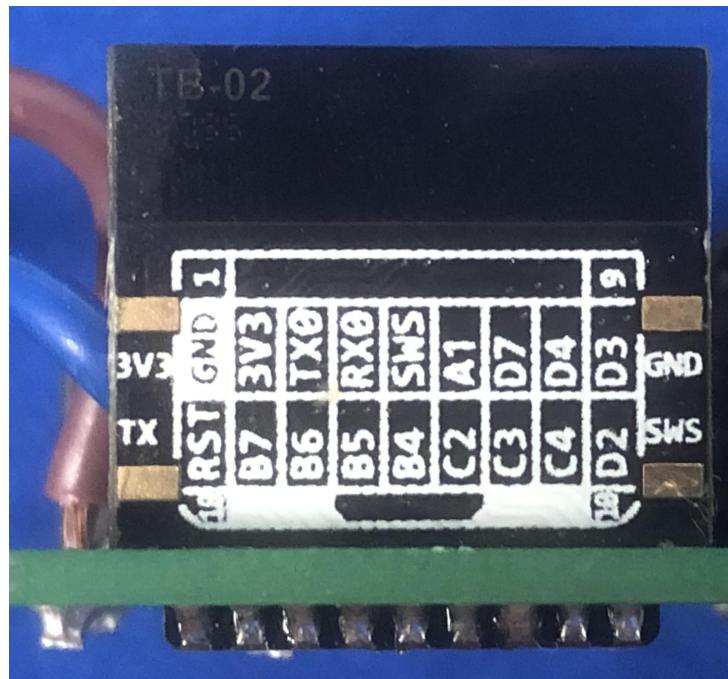




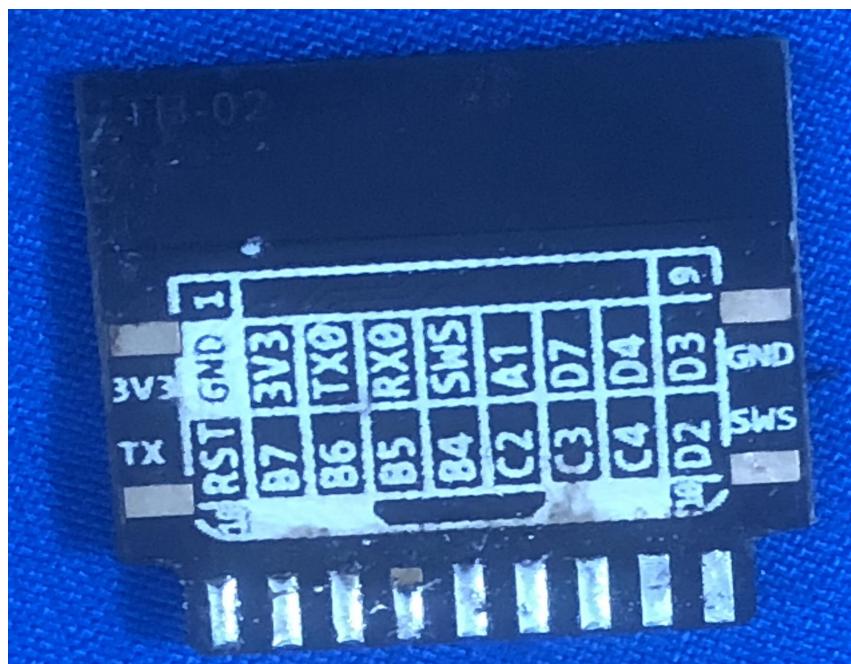
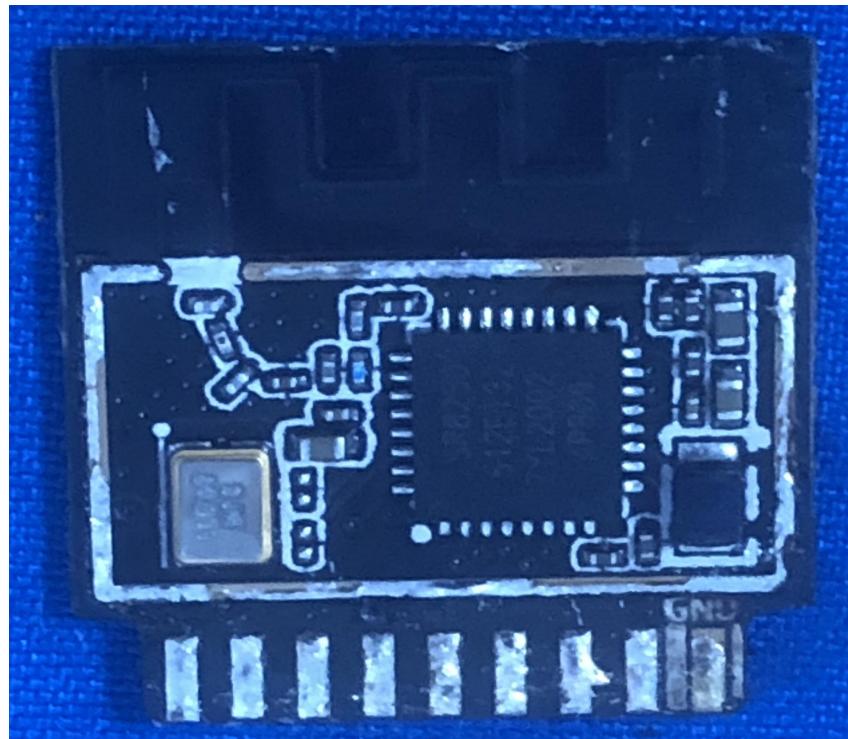








Antenna



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