

# Test Report

Verified code: 278227

Report No.: E20211217696105-3

Customer: BYD Auto Industry Company Limited

Address: No. 3001, 3007, Hengping Road, Pingshan, Shenzhen, P. R. China

Sample Name: DiLink

Sample Model: DiLink 3.0F

Receive Sample Date: Feb.10,2022

Test Date: Apr.03,2022 ~ Apr.24,2022

Reference Document: CFR 47, FCC Part 15 Subpart C  
RADIO FREQUENCY DEVICES:Subpart C—Intentional Radiators

Test Result: Pass

Prepared by: Yang Zhaoyun

Reviewed by: Zhao Zetian

Approved by: Xiao Liang

GUANGZHOU GRG METROLOGY & TEST CO., LTD

Issued Date: 2022-06-07

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## Table of Contents

1.	TEST RESULT SUMMARY .....	6
2.	GENERAL DESCRIPTION OF EUT.....	7
2.1	APPLICANT .....	7
2.2	MANUFACTURER .....	7
2.3	FACTORY .....	7
2.4	BASIC DESCRIPTION OF EQUIPMENT UNDER TEST .....	7
2.5	CHANNELLIST .....	8
2.6	TEST OPERATION MODE .....	8
2.7	LOCAL SUPPORTIVE .....	8
2.8	CONFIGURATION OF SYSTEM UNDER TEST .....	9
2.9	DUTY CYCLE.....	10
3.	LABORATORY AND ACCREDITATIONS AND MEASUREMENT UNCERTAINTY .....	12
3.1	LABORATORY .....	12
3.2	ACCREDITATIONS .....	12
3.3	MEASUREMENT UNCERTAINTY .....	13
4.	LIST OF USED TEST EQUIPMENT AT GRGT .....	14
5.	RADIATED SPURIOUS EMISSIONS .....	15
5.1	LIMITS.....	15
5.2	TEST PROCEDURES .....	15
5.3	TEST SETUP .....	18
5.4	DATA SAMPLE .....	19
5.5	TEST RESULTS .....	20
6.	6dB BANDWIDTH.....	35
6.1	LIMITS.....	35
6.2	TEST PROCEDURES .....	35
6.3	TEST SETUP .....	35
6.4	TEST RESULTS.....	35
7.	MAXIMUM PEAK OUTPUT POWER .....	40
7.1	LIMITS.....	40
7.2	TEST PROCEDURES .....	40
7.3	TEST SETUP .....	40
7.4	TEST RESULTS .....	40
8.	POWER SPECTRAL DENSITY .....	41
8.1	LIMITS.....	41
8.2	TEST PROCEDURES .....	41
8.3	TEST SETUP .....	41
8.4	TEST RESULTS .....	41
9.	CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS .....	46
9.1	LIMITS.....	46
9.2	TEST PROCEDURES .....	46
9.3	TEST SETUP .....	46

9.4 TEST RESULTS ..... 47

10. RESTRICTED BANDS OF OPERATION ..... 60

10.1 LIMITS ..... 60

10.2 TEST PROCEDURES ..... 61

10.3 TEST SETUP ..... 61

10.4 TEST RESULTS ..... 62

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM ..... 70

APPENDIX B. PHOTOGRAPH OF THE EUT ..... 70

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20211217696105-3	Original Issue	2022-04-26

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**1. TEST RESULT SUMMARY**

<b>Technical Requirements</b>		
FCC 47 CFR Part 15 Subpart C 15.247 ANSI C63.10-2013 KDB 558074 D01 15.247 measurement guidance v05r02		
<b>Limit / Severity</b>	<b>Item</b>	<b>Result</b>
§15.203	Antenna Requirement	Pass
§15.207(a)	Conducted Emission	Not Applicable
§15.247(d) & 15.205 & 15.209	Radiated Spurious Emission	Pass
§15.247(b)(3)	Maximum Peak Output Power	Pass
§15.247(e)	Power Spectral Density	Pass
§15.247(a)(2)	6dB bandwidth	Pass
§15.247(d)	Conducted band edges and Spurious Emission	Pass
§15.247(d) & 15.205 & 15.209	Restricted bands of operation	Pass

Note: 1) Not Applicable, the EUT is powered by DC 12V.

2) The antenna is External antenna. The max gain of antenna is -1.77dBi, which accordance 15.203 is considered sufficient to comply with the provisions of this section.

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## 2. GENERAL DESCRIPTION OF EUT

### 2.1 APPLICANT

Name: BYD Auto Industry Company Limited  
Address: No. 3001, 3007, Hengping Road, Pingshan, Shenzhen, P. R. China

### 2.2 MANUFACTURER

Name: BYD Auto Industry Company Limited  
Address: No. 3001, 3007, Hengping Road, Pingshan, Shenzhen, P. R. China

### 2.3 FACTORY

Name: Huizhou BYD Electronics Co., Ltd.  
Address: Xiangshui River, Economic Development Zone, Daya Bay, Huizhou, Guangdong, P. R. China

### 2.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: DiLink  
Model No.: DiLink 3.0F  
Adding Model: /  
Models discrepancy: /  
Trade Name: BYD  
FCC ID: SD4-DILINK6125F  
Power supply: DC 12V  
Frequency Band: 2402-2480MHz  
Transmit Power: BLE\_1M:4.79dBm  
BLE\_2M:5.08dBm  
Modulation type: GFSK  
Channel space: 2MHz  
Antenna Specification: External antenna -1.77dBi gain (Max.)  
Temperature Range: -30°C~70°C  
Hardware Version: DiLink HW 6125F  
Software Version: DiLink SW 4.0F  
Sample No: E20211217696105 -0001  
Note: /

## 2.5 CHANNELIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	10	2422	20	2442	30	2462
01	2404	11	2424	21	2444	31	2464
02	2406	12	2426	22	2446	32	2466
03	2408	13	2428	23	2448	33	2468
04	2410	14	2430	24	2450	34	2470
05	2412	15	2432	25	2452	35	2472
06	2414	16	2434	26	2454	36	2474
07	2416	17	2436	27	2456	37	2476
08	2418	18	2438	28	2458	38	2478
09	2420	19	2440	29	2460	39	2480

## 2.6 TEST OPERATION MODE

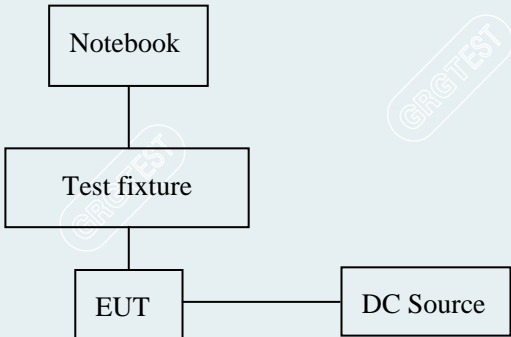
Mode No.	Description of the modes
1	Bluetooth BLE fixed frequency transmitting

## 2.7 LOCAL SUPPORTIVE

Name of equipment	Manufacturer	Model	Serial number	Note
Notebook	LENOVO	TianYi 310-14ISK	MP18DLC6	/
Adapter(Notebook)	LENOVO	ADLX65NVV3A	SA10M42747	Unshielded, 1m (AC Cable) Shielded, 1.8m (DC Cable)
DC Source	LW	PS-305DM	/	/
Test fixture	/	/	/	/
Cable				
Test fixture cable	/	/	/	Unshielded 0.15m
USB cable	/	/	/	Unshielded 1.0m
DC cable	/	/	/	Unshielded 0.8m



2.8 CONFIGURATION OF SYSTEM UNDER TEST



Test software:

Software version	Test level
QRCT	/

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## 2.9 DUTY CYCLE

Environment: 23.6°C/53%RH

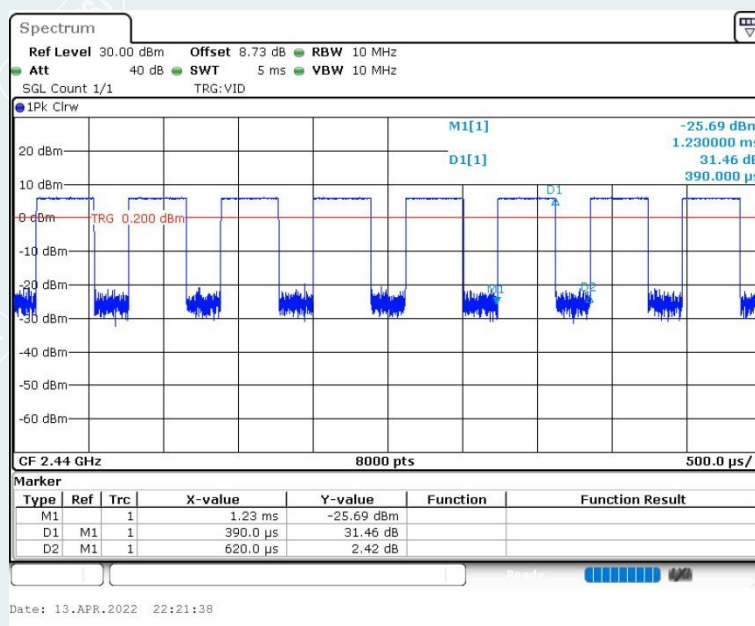
Tested By: Lu Wei

Voltage: DC 12V

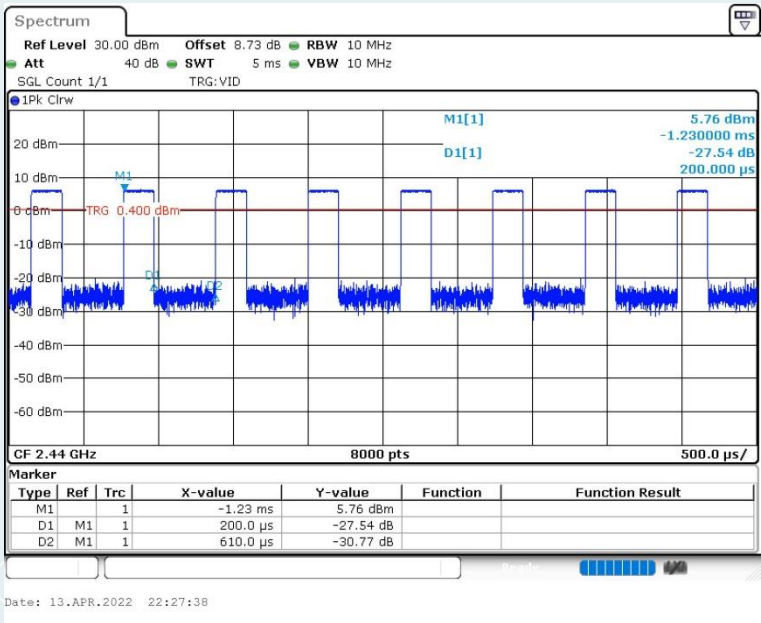
Date: 2022-04-13

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	DC [%]	T [s]
BLE_1M	Ant1	2440	0.39	0.62	62.90	0.00038
BLE_2M	Ant1	2440	0.20	0.61	32.79	0.00020

BLE\_1M\_2440 MHz



BLE\_2M\_2440 MHz



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### 3. LABORATORY AND ACCREDITATIONS AND MEASUREMENT UNCERTAINTY

#### 3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

Add.: No.1301 Guangang Road Xinlan Community, Guanlan Street, Longhua District  
Shenzhen, 518110, People's Republic of China

P.C.: 518110

Tel : 0755-61180008

Fax: 0755-61180008

#### 3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	A2LA(Certificate #2861.01)
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The measuring facility of laboratories has been authorized or registered by the following approval agencies.

<b>Canada</b>	ISED (Company Number: 24897, CAB identifier:CN0069)
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### 3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Radiated Emission	Horizontal	9kHz~30MHz	4.5dB
		30MHz~1000MHz	4.3dB
		1GHz~18GHz	5.6dB
		18GHz~26.5GHz	3.7dB
	Vertical	9kHz~30MHz	4.4dB
		30MHz~1000MHz	4.3dB
		1GHz~18GHz	5.6dB
		18GHz~26.5GHz	3.7dB

Measurement	Uncertainty
RF frequency	$6.0 \times 10^{-6}$
RF power conducted	0.8dB
Occupied channel bandwidth	0.4dB
Unwanted emission, conducted	0.7dB
Humidity	6%
Temperature	2°C

This uncertainty represents an expanded uncertainty factor of  $k=2$ .

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**4. LIST OF USED TEST EQUIPMENT AT GRGT**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
<b>Radiated Spurious Emission &amp; Restricted bands of operation</b>				
Test S/W	EZ	CCS-03A1		
Test Receiver	R&S	ESR7	102444	2022-09-21
Preamplifier	EMEC	EM330	I00426	2023-03-05
Loop Antenna	TESEQ	HLA6121	52599	2023-04-02
Bi-log Antenna	Schwarzbeck	VULB9160	VULB9160-3401	2022-10-27
Spectrum Analyzer	Agilent	N9020B	MY57120179	2022-08-08
Horn Antenna	Schwarzbeck	BBHA9120D (1201)	02143	2022-10-22
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-497	2022-10-16
Amplifier	Tonscend	TAP01018048	AP20E8060075	2022-05-09
Amplifier	Tonscend	TAP184050	AP20E806071	2022-05-17
Test S/W	Tonscend	JS36-RE/2.5.1.5		
<b>6dB Bandwidth &amp; Conducted band edges and Spurious Emission &amp; Power Spectral Density</b>				
Spectrum Analyzer	R&S	FSV30	104381	2022-12-10
Simultaneous sampling DAQ	Tonscend	JS0806-2	186060020	2022-09-04
BT/WIFI System	Tonscend	JS1120-3		
<b>Maximum Peak Output Power</b>				
Pulse power sensor	Anritsu	MA2411B	1126150	2023-03-01
Power meter	Anritsu	ML2495A	1204003	2023-02-28

Note: The calibration interval of the above test instruments is 12 months.



## 5. RADIATED SPURIOUS EMISSIONS

### 5.1 LIMITS

In any 100kHz 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 20dB below that in the 100kHz 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 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required.

Frequency (MHz)	Quasi-peak( $\mu\text{V/m}$ )	Measurement distance(m)	Quasi-peak(dB $\mu\text{V/m}$ )@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

**NOTE:**

- (1) The emission limits for the ranges 9-90kHz and 110-490kHz are based on measurements employing a linear average detector.
- (2) The lower limit shall apply at the transition frequencies.
- (3) Above 18GHz test distance is 1m, so the Peak Limit=74+20\*log(3/1)=83.54 (dB $\mu\text{V/m}$ ).  
The Avg Limit=54+20\*log(3/1)=63.54 (dB $\mu\text{V/m}$ ).

### 5.2 TEST PROCEDURES

#### 1) Sequence of testing 9kHz to 30MHz

**Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3meter.
- The EUT was set into operation.

**Pre measurement:**

- The turntable rotates from 0 ° to 360 °.
- The antenna height is 1.0 meter.
- The antenna is polarized X,Y and Z.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**

- Identified emissions during the pre measurement the software maximizes by rotating the turntable

position (0 ° to 360 °) and by rotating the elevation axes (0 ° to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

## 2) Sequence of testing 30MHz to 1GHz

### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

### Pre measurement:

--- The turntable rotates from 0 ° to 360 °.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

## 3) Sequence of testing 1GHz to 18GHz

### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Pre measurement:**

- The turntable rotates from 0 ° to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

**Final measurement:**

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

**4) Sequence of testing above 18GHz****Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

**Pre measurement:**

- The antenna is moved spherical over the EUT in different polarisations of the antenna.

**Final measurement:**

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the pre measurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

**NOTE:**

- (a). The frequency from 9kHz to 150kHz, Set RBW=300Hz (for Peak & AVG), VBW=300Hz (for Peak & AVG). The frequency from 150kHz to 30MHz, Set RBW=9kHz, VBW=9kHz, (for QP Detector).
- (b). The frequency from 30MHz to 1GHz, Set RBW=120kHz, VBW=300kHz, (for QP Detector).
- (c). The frequency above 1GHz, for Peak detector: Set RBW=1MHz, VBW=3MHz.
- (d). The frequency above 1GHz, for Avg detector: Set RBW=1MHz, if the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set  $VBW \leq RBW/100$  (i.e., 10kHz) but not less than 10 Hz. If the EUT duty cycle is  $< 98\%$ , set  $VBW \geq 1/T$ , Where T is defined in section 2.9.

### 5.3 TEST SETUP

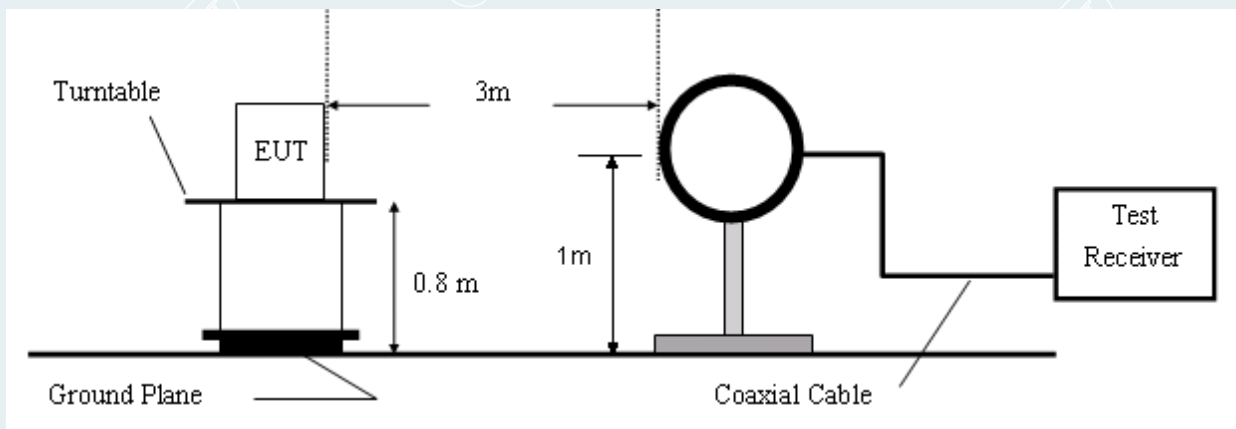


Figure 1. 9kHz to 30MHz radiated emissions test configuration

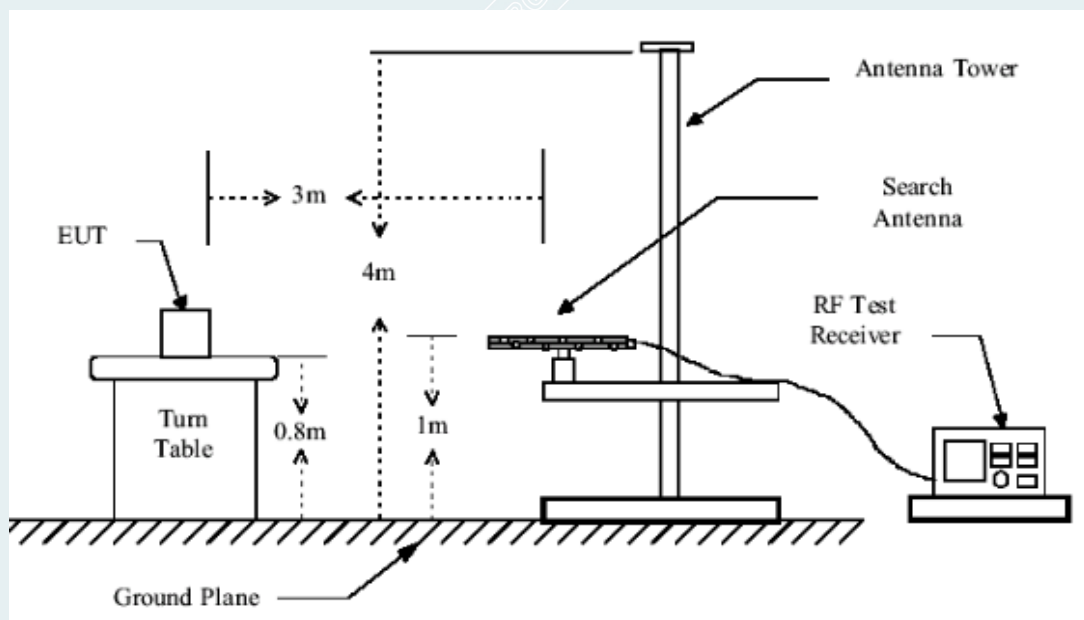


Figure 2. 30MHz to 1GHz radiated emissions test configuration

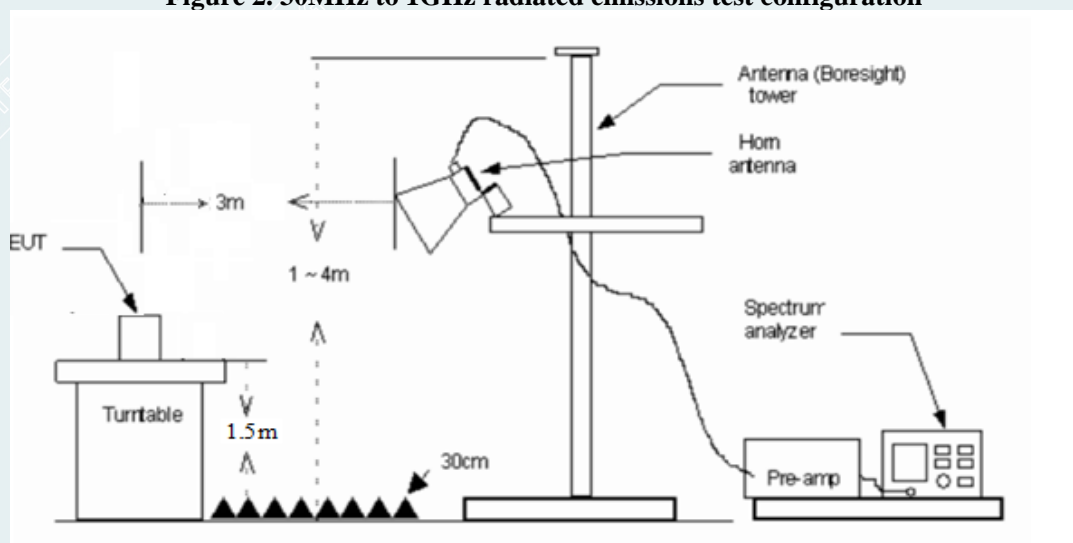


Figure 3. 1GHz to 18GHz radiated emissions test configuration



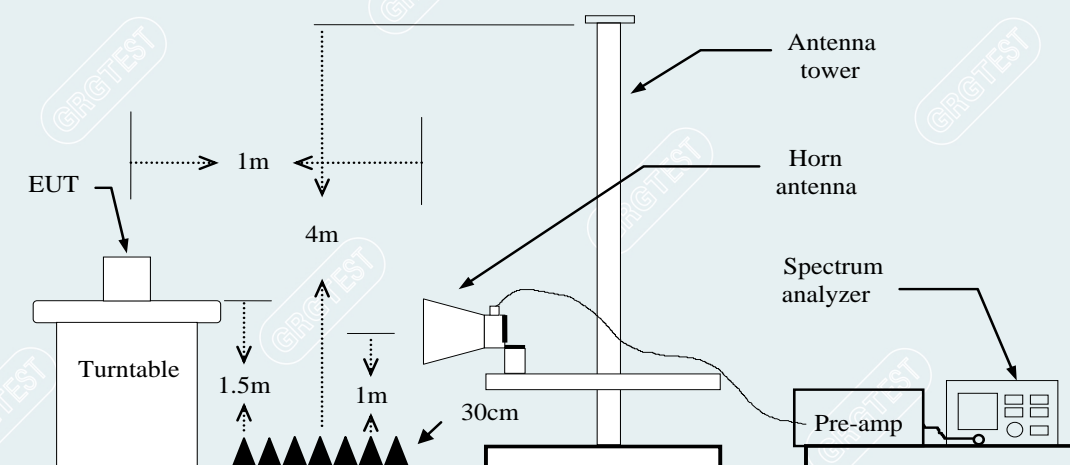


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

#### 5.4 DATA SAMPLE

##### 30MHz to 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	37.06	-15.48	21.58	40.00	-18.42	QP	Vertical

##### 1GHz to 18GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	65.45	-11.12	54.33	74.00	-19.67	Peak	Vertical
xxx	xxx	63.00	-11.12	51.88	54.00	-2.12	AVG	Vertical

##### Above 18GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	68.86	57.66	-11.20	83.54	25.88	peak	Vertical
xxx	xxx	68.89	-11.20	57.69	63.54	5.85	AVG	Vertical

Frequency (MHz) = Emission frequency in MHz

Ant.Pol. (H/V) = Antenna polarization

Reading (dBuV) = Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)

Limit (dBuV/m) = Limit stated in standard

Margin (dB) = Remark Result (dBuV/m) – Limit (dBuV/m)

Peak = Peak Reading

QP = Quasi-peak Reading

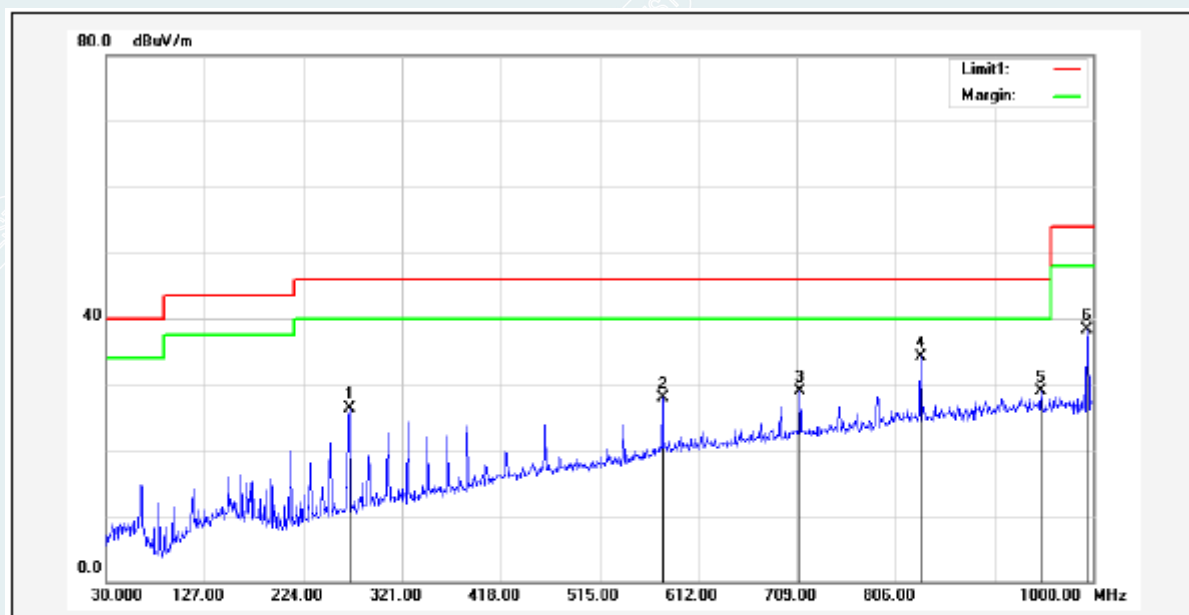
AVG = Average Reading

## 5.5 TEST RESULTS

### Below 1GHz

All models were pretested and only the worst modes and channels were recorded in this report. (BLE\_2M)

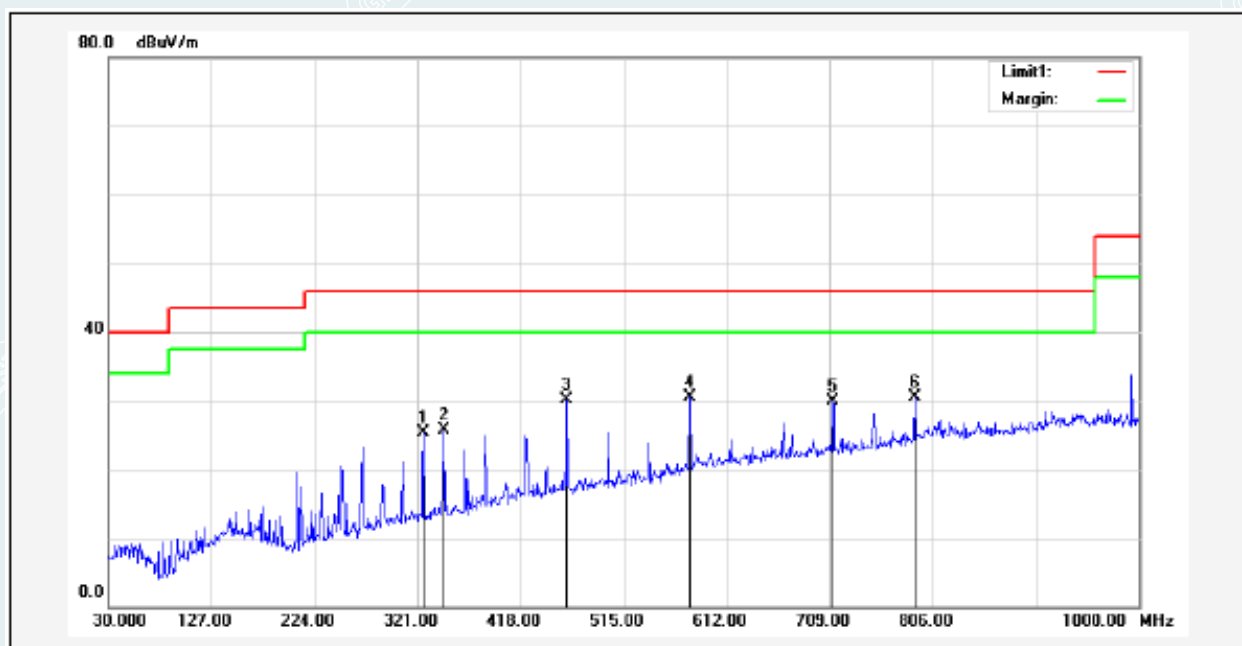
<b>EUT Name</b>	DiLink	<b>Model</b>	DiLink 3.0F
<b>Environmental Conditions</b>	24.0 °C / 46 %RH	<b>Test Voltage</b>	DC 12V
<b>Test Mode</b>	TX/ BLE_2M (2402MHz)	<b>Polarity</b>	Vertical
<b>Tested By</b>	Zeng Xianglong	<b>Tested Date</b>	2022-04-04



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over (dB)	Degree (deg.)	Height (cm)	Remark
1	269.5900	50.86	-24.65	26.21	46.00	-19.79	360	113	QP
2	577.0800	43.66	-15.77	27.89	46.00	-18.11	223	100	QP
3	711.9100	41.98	-13.07	28.91	46.00	-17.09	306	100	QP
4*	831.2200	45.35	-11.15	34.20	46.00	-11.80	3	200	QP
5	948.5900	38.41	-9.42	28.99	46.00	-17.01	360	101	QP
6	994.1800	47.23	-8.89	38.34	54.00	-15.66	97	100	QP

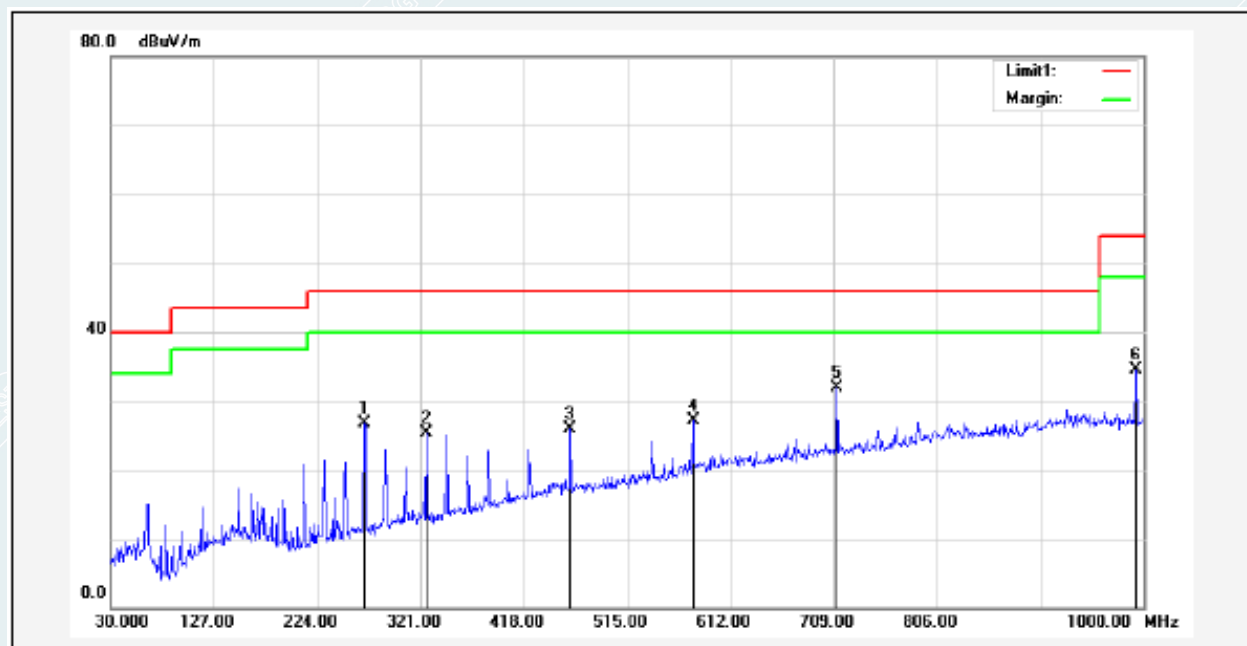


<b>EUT Name</b>	DiLink	<b>Model</b>	DiLink 3.0F
<b>Environmental Conditions</b>	24.0 °C / 46 %RH	<b>Test Voltage</b>	DC 12V
<b>Test Mode</b>	TX/ BLE_2M (2402MHz)	<b>Polarity</b>	Horizontal
<b>Tested By</b>	Zeng Xianglong	<b>Tested Date</b>	2022-04-04



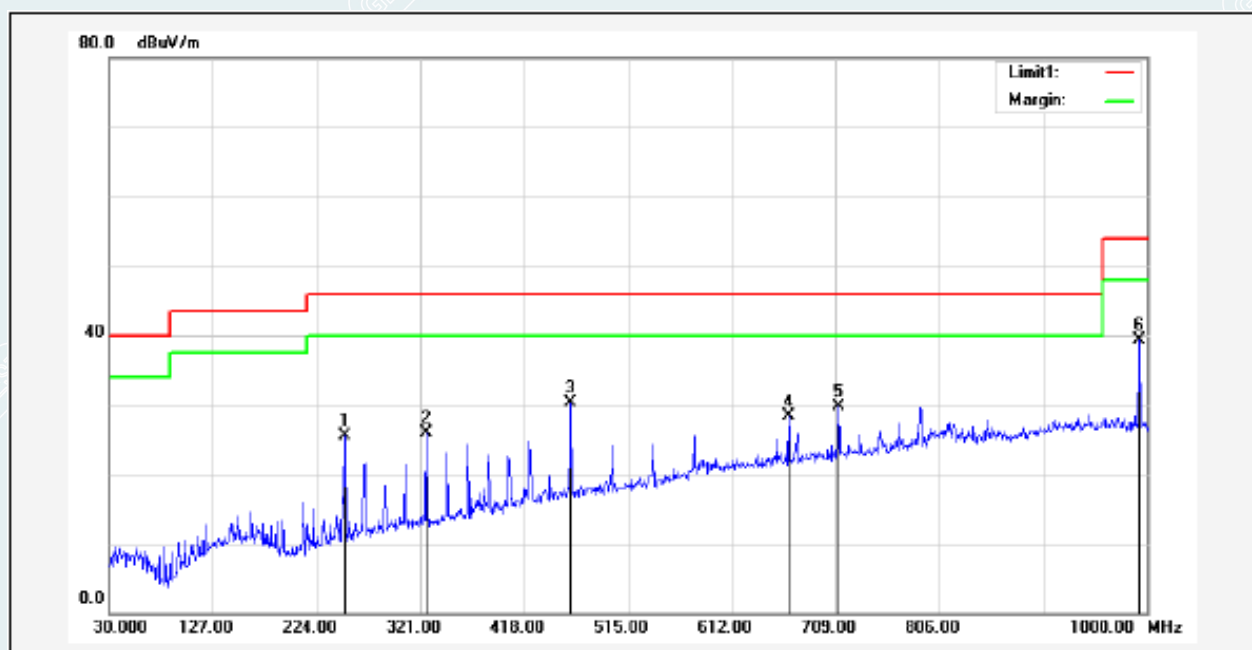
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over (dB)	Degree (deg.)	Height (cm)	Remark
1	326.8200	48.14	-22.91	25.23	46.00	-20.77	205	300	QP
2	346.2200	48.23	-22.44	25.79	46.00	-20.21	214	199	QP
3	461.6500	48.59	-18.55	30.04	46.00	-15.96	232	199	QP
4*	578.0500	46.19	-15.74	30.45	46.00	-15.55	359	159	QP
5	711.9100	42.94	-13.07	29.87	46.00	-16.13	257	199	QP
6	789.5100	42.08	-11.67	30.41	46.00	-15.59	306	100	QP

<b>EUT Name</b>	DiLink	<b>Model</b>	DiLink 3.0F
<b>Environmental Conditions</b>	24.0 °C / 46 %RH	<b>Test Voltage</b>	DC 12V
<b>Test Mode</b>	TX/ BLE_2M (2440MHz)	<b>Polarity</b>	Vertical
<b>Tested By</b>	Zeng Xianglong	<b>Tested Date</b>	2022-04-04



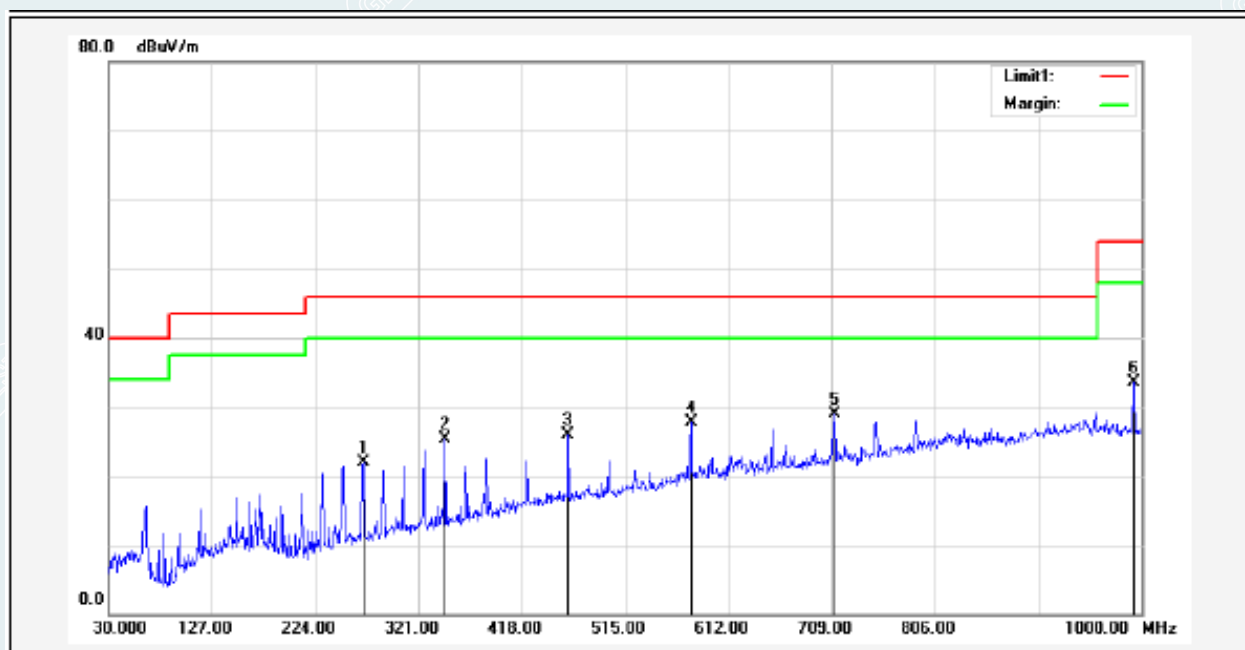
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over (dB)	Degree (deg.)	Height (cm)	Remark
1	268.6200	51.44	-24.69	26.75	46.00	-19.25	340	100	QP
2	326.8200	48.26	-22.91	25.35	46.00	-20.65	166	100	QP
3	461.6500	44.46	-18.55	25.91	46.00	-20.09	344	100	QP
4	577.0800	42.80	-15.77	27.03	46.00	-18.97	240	100	QP
5*	711.9100	44.88	-13.07	31.81	46.00	-14.19	214	100	QP
6	993.2100	43.38	-8.89	34.49	54.00	-19.51	98	200	QP

<b>EUT Name</b>	DiLink	<b>Model</b>	DiLink 3.0F
<b>Environmental Conditions</b>	24.0 °C / 46 %RH	<b>Test Voltage</b>	DC 12V
<b>Test Mode</b>	TX/ BLE_2M (2440MHz)	<b>Polarity</b>	Horizontal
<b>Tested By</b>	Zeng Xianglong	<b>Tested Date</b>	2022-04-04



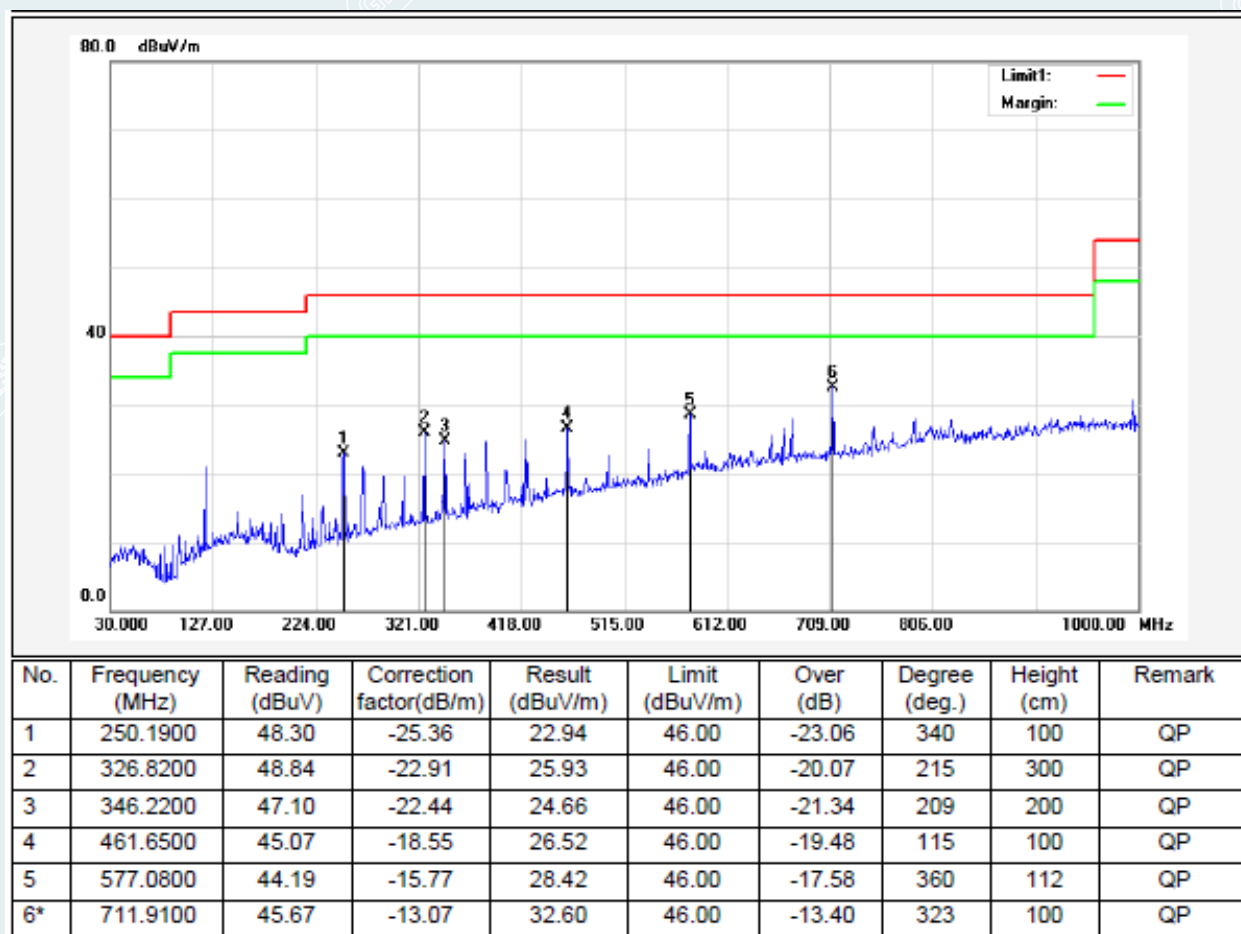
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over (dB)	Degree (deg.)	Height (cm)	Remark
1	250.1900	50.91	-25.36	25.55	46.00	-20.45	297	100	QP
2	326.8200	48.90	-22.91	25.99	46.00	-20.01	231	300	QP
3	461.6500	48.90	-18.55	30.35	46.00	-15.65	219	200	QP
4	665.3500	42.30	-13.99	28.31	46.00	-17.69	360	151	QP
5	711.9100	42.71	-13.07	29.64	46.00	-16.36	150	100	QP
6*	993.2100	48.27	-8.89	39.38	54.00	-14.62	231	200	QP

<b>EUT Name</b>	DiLink	<b>Model</b>	DiLink 3.0F
<b>Environmental Conditions</b>	24.0 °C / 46 %RH	<b>Test Voltage</b>	DC 12V
<b>Test Mode</b>	TX/ BLE_2M (2480MHz)	<b>Polarity</b>	Vertical
<b>Tested By</b>	Zeng Xianglong	<b>Tested Date</b>	2022-04-04



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over (dB)	Degree (deg.)	Height (cm)	Remark
1	269.5900	46.46	-24.65	21.81	46.00	-24.19	359	192	QP
2	346.2200	47.68	-22.44	25.24	46.00	-20.76	132	100	QP
3	461.6500	44.48	-18.55	25.93	46.00	-20.07	1	100	QP
4	577.0800	43.38	-15.77	27.61	46.00	-18.39	359	198	QP
5*	711.9100	41.98	-13.07	28.91	46.00	-17.09	340	100	QP
6	992.2400	42.42	-8.90	33.52	54.00	-20.48	84	100	QP

<b>EUT Name</b>	DiLink	<b>Model</b>	DiLink 3.0F
<b>Environmental Conditions</b>	24.0 °C / 46 %RH	<b>Test Voltage</b>	DC 12V
<b>Test Mode</b>	TX/ BLE_2M (2480MHz)	<b>Polarity</b>	Horizontal
<b>Tested By</b>	Zeng Xianglong	<b>Tested Date</b>	2022-04-04

**Remark:**

- 1 No emission found between lowest internal used/generated frequency to 30MHz.
- 2 Radiated emissions measured in frequency range from 9 kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
- 3 The IF bandwidth of Receiver between 30MHz to 1GHz was 120kHz.

**Above 1GHz:**

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Mode: TX/ BLE\_1M

Lowest Frequency (2402MHz)

Environment: 25°C/60%RH

Tested By: Lu Qiang

Date: 2022-04-06

Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1237.2797	63.35	40.97	-22.38	74.00	33.03	200	11	Horizontal
2	1598.8249	62.85	40.51	-22.34	74.00	33.49	100	138	Horizontal
3	2314.6643	67.33	48.00	-19.33	74.00	26.00	200	11	Horizontal
4	3198.7748	61.58	44.80	-16.78	74.00	29.20	100	257	Horizontal
5	3489.4362	59.03	42.84	-16.19	74.00	31.16	100	304	Horizontal
6	6401.6752	53.05	43.59	-9.46	74.00	30.41	100	337	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1112.5141	69.17	46.99	-22.18	74.00	27.01	100	1	Vertical
2	1268.7836	69.97	45.67	-24.30	74.00	28.33	100	3	Vertical
3	1864.8581	68.31	45.49	-22.82	74.00	28.51	100	255	Vertical
4	3198.7748	66.95	49.46	-17.49	74.00	24.54	100	267	Vertical
5	3997.6247	62.65	47.06	-15.59	74.00	26.94	100	257	Vertical
6	6354.7943	57.83	47.45	-10.38	74.00	26.55	100	55	Vertical

----- The following blanks -----



Mode: TX/ BLE\_1M  
Middle Frequency (2440MHz)  
Environment: 25°C/60%RH  
Tested By: Lu Qiang

Date: 2022-04-06  
Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1265.2832	62.90	40.85	-22.05	74.00	33.15	100	23	Horizontal
2	1592.8241	63.34	41.01	-22.33	74.00	32.99	100	153	Horizontal
3	2309.9137	69.93	50.62	-19.31	74.00	23.38	200	315	Horizontal
4	3189.3987	64.02	47.36	-16.66	74.00	26.64	100	341	Horizontal
5	3489.4362	61.45	45.26	-16.19	74.00	28.74	100	57	Horizontal
6	6189.7737	53.14	43.16	-9.98	74.00	30.84	100	266	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1116.0145	69.13	46.82	-22.31	74.00	27.18	100	360	Vertical
2	1994.1243	71.89	51.48	-20.41	74.00	22.52	100	285	Vertical
3	2788.4736	63.68	45.73	-17.95	74.00	28.27	100	330	Vertical
4	3200.6501	66.26	48.77	-17.49	74.00	25.23	100	300	Vertical
5	3982.6228	63.52	47.90	-15.62	74.00	26.10	100	261	Vertical
6	6371.6715	61.55	51.47	-10.08	74.00	22.53	100	291	Vertical

----- The following blanks -----

Mode: TX/ BLE\_1M  
Highest Frequency (2480MHz)  
Environment: 25°C/60%RH  
Tested By: Lu Qiang

Date: 2022-04-06  
Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1261.5327	63.09	41.06	-22.03	74.00	32.94	200	3	Horizontal
2	1651.5814	66.16	43.18	-22.98	74.00	30.82	100	220	Horizontal
3	2314.9144	66.29	46.96	-19.33	74.00	27.04	200	33	Horizontal
4	2798.2248	60.16	42.85	-17.31	74.00	31.15	100	331	Horizontal
5	3193.1491	61.16	44.45	-16.71	74.00	29.55	100	321	Horizontal
6	6392.2990	51.99	42.36	-9.63	74.00	31.64	100	336	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1313.2892	68.98	46.35	-22.63	74.00	27.65	100	360	Vertical
2	1992.8741	69.44	49.00	-20.44	74.00	25.00	100	283	Vertical
3	2389.6737	67.29	50.25	-17.04	74.00	23.75	100	279	Vertical
4	3198.7748	64.46	46.97	-17.49	74.00	27.03	100	303	Vertical
5	3990.1238	61.18	45.57	-15.61	74.00	28.43	100	261	Vertical
6	6354.7943	59.11	48.73	-10.38	74.00	25.27	100	52	Vertical

----- The following blanks -----

Mode: TX/ BLE\_2M  
Lowest Frequency (2402MHz)  
Environment: 25°C/60%RH  
Tested By: Lu Qiang

Date: 2022-04-06  
Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1114.5143	64.73	39.85	-24.88	74.00	34.15	100	195	Horizontal
2	1994.1243	64.91	43.97	-20.94	74.00	30.03	100	308	Horizontal
3	2529.6912	61.85	45.55	-16.30	74.00	28.45	100	237	Horizontal
4	3191.2739	62.71	46.02	-16.69	74.00	27.98	100	315	Horizontal
5	3487.5609	63.45	47.26	-16.19	74.00	26.74	100	27	Horizontal
6	6381.0476	52.80	42.95	-9.85	74.00	31.05	100	7	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1065.2582	69.44	46.87	-22.57	74.00	27.13	100	1	Vertical
2	1352.7941	66.97	45.41	-21.56	74.00	28.59	100	7	Vertical
3	1992.8741	66.84	46.40	-20.44	74.00	27.60	100	319	Vertical
4	3195.0244	67.24	49.79	-17.45	74.00	24.21	100	270	Vertical
5	3990.1238	63.28	47.67	-15.61	74.00	26.33	100	259	Vertical
6	6396.0495	60.30	50.65	-9.65	74.00	23.35	100	270	Vertical

----- The following blanks -----

Mode: TX/ BLE\_2M  
Middle Frequency (2440MHz)  
Environment: 25°C/60%RH  
Tested By: Lu Qiang

Date: 2022-04-06  
Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1246.5308	64.42	42.33	-22.09	74.00	31.67	200	79	Horizontal
2	1991.6240	65.56	44.64	-20.92	74.00	29.36	100	354	Horizontal
3	2305.9132	66.53	47.24	-19.29	74.00	26.76	100	247	Horizontal
4	3198.7748	60.68	43.90	-16.78	74.00	30.10	100	318	Horizontal
5	4385.7982	54.23	40.64	-13.59	74.00	33.36	100	293	Horizontal
6	6373.5467	54.50	44.50	-10.00	74.00	29.50	100	9	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1114.5143	69.03	46.78	-22.25	74.00	27.22	100	20	Vertical
2	2388.6736	67.26	50.20	-17.06	74.00	23.80	100	287	Vertical
3	2522.4403	65.71	49.13	-16.58	74.00	24.87	100	256	Vertical
4	3191.2739	65.28	47.88	-17.40	74.00	26.12	100	278	Vertical
5	3997.6247	62.04	46.45	-15.59	74.00	27.55	100	71	Vertical
6	6369.7962	59.46	49.35	-10.11	74.00	24.65	100	53	Vertical

----- The following blanks -----

Mode: TX/ BLE\_2M  
 Highest Frequency (2480MHz)  
 Environment: 25°C/60%RH  
 Tested By: Lu Qiang

Date: 2022-04-06  
 Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1254.7818	62.62	40.62	-22.00	74.00	33.38	200	1	Horizontal
2	1599.8250	63.52	41.18	-22.34	74.00	32.82	100	143	Horizontal
3	2309.1636	65.01	45.71	-19.30	74.00	28.29	100	332	Horizontal
4	2642.2053	67.29	48.68	-18.61	74.00	25.32	200	315	Horizontal
5	3191.2739	62.04	45.35	-16.69	74.00	28.65	100	323	Horizontal
6	6364.1705	54.46	44.28	-10.18	74.00	29.72	100	336	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1063.2579	70.24	47.62	-22.62	74.00	26.38	100	353	Vertical
2	1992.1240	67.41	46.95	-20.46	74.00	27.05	200	266	Vertical
3	2389.1736	67.06	50.01	-17.05	74.00	23.99	100	285	Vertical
4	3198.7748	65.58	48.09	-17.49	74.00	25.91	100	264	Vertical
5	3982.6228	59.49	43.87	-15.62	74.00	30.13	100	291	Vertical
6	6386.6733	56.94	47.13	-9.81	74.00	26.87	100	52	Vertical

**Remark:**

- 1 Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2 Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3 Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4 Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



**18MHz to 40GHz**

All models were pretested and only the worst modes and channels were recorded in this report. (BLE\_2M)

Mode: TX/ BLE\_2M

Lowest Frequency (2402MHz)

Environment: 25°C/60%RH

Tested By: Lu Qiang

Date: 2022-04-12

Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18465.3750	57.43	45.09	-12.34	83.54	38.45	150	295	Horizontal
2	19234.6250	56.92	45.19	-11.73	83.54	38.35	150	192	Horizontal
3	20655.8250	55.85	45.48	-10.37	83.54	38.06	150	250	Horizontal
4	21213.4250	55.78	45.55	-10.23	83.54	37.99	150	250	Horizontal
5	22816.5250	54.71	45.79	-8.92	83.54	37.75	150	50	Horizontal
6	23857.3500	54.44	45.73	-8.71	83.54	37.81	150	244	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18877.6250	56.93	44.85	-12.08	83.54	38.69	150	59	Vertical
2	19833.8750	55.95	44.69	-11.26	83.54	38.85	150	359	Vertical
3	22056.2000	54.86	45.05	-9.81	83.54	38.49	150	288	Vertical
4	22632.9250	55.17	46.06	-9.11	83.54	37.48	150	100	Vertical
5	24394.9750	54.50	46.29	-8.21	83.54	37.25	150	152	Vertical
6	25345.2750	54.34	46.87	-7.47	83.54	36.67	150	145	Vertical

----- The following blanks -----



Mode: TX/ BLE\_2M  
Middle Frequency (2440MHz)  
Environment: 25°C/60%RH  
Tested By: Lu Qiang

Date: 2022-04-12  
Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18939.2500	56.98	44.94	-12.04	83.54	38.60	150	113	Horizontal
2	20326.4500	56.02	45.31	-10.71	83.54	38.23	150	325	Horizontal
3	21112.2750	54.91	44.69	-10.22	83.54	38.85	150	34	Horizontal
4	23547.5250	54.83	45.92	-8.91	83.54	37.62	150	228	Horizontal
5	24446.8250	54.12	45.99	-8.13	83.54	37.55	150	28	Horizontal
6	25695.9000	54.92	46.95	-7.97	83.54	36.59	150	113	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18436.4750	57.66	45.27	-12.39	83.54	38.27	150	320	Vertical
2	19483.6750	57.07	45.53	-11.54	83.54	38.01	150	113	Vertical
3	20847.0750	55.83	45.59	-10.24	83.54	37.95	150	243	Vertical
4	21808.8500	55.37	45.58	-9.79	83.54	37.96	150	307	Vertical
5	23859.9000	54.48	45.83	-8.65	83.54	37.71	150	24	Vertical
6	24975.9500	53.97	46.45	-7.52	83.54	37.09	150	152	Vertical

----- The following blanks -----

Mode: TX/ BLE\_2M  
Highest Frequency (2480MHz)  
Environment: 25°C/60%RH  
Tested By: Lu Qiang

Date: 2022-04-12  
Voltage: DC 12V

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18500.2250	57.38	45.06	-12.32	83.54	38.48	150	282	Horizontal
2	19509.6000	56.37	44.86	-11.51	83.54	38.68	150	274	Horizontal
3	20687.2750	55.11	44.77	-10.34	83.54	38.77	150	126	Horizontal
4	21430.6000	55.29	45.33	-9.96	83.54	38.21	150	2	Horizontal
5	22649.9250	54.41	45.24	-9.17	83.54	38.30	150	0	Horizontal
6	24165.9000	54.17	45.80	-8.37	83.54	37.74	150	145	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18455.6000	57.58	45.21	-12.37	83.54	38.33	150	285	Vertical
2	19123.2750	56.73	44.82	-11.91	83.54	38.72	150	234	Vertical
3	21232.5500	56.61	46.48	-10.13	83.54	37.06	150	220	Vertical
4	22939.3500	54.25	45.39	-8.86	83.54	38.15	150	155	Vertical
5	23874.7750	54.41	45.77	-8.64	83.54	37.77	150	355	Vertical
6	24390.3000	54.51	46.30	-8.21	83.54	37.24	150	110	Vertical

----- The following blanks -----

## 6. 6dB BANDWIDTH

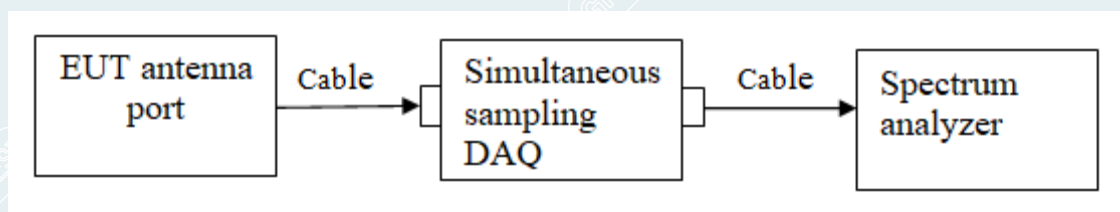
### 6.1 LIMITS

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.

### 6.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- 2) Set resolution bandwidth (RBW) = 100kHz. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize, record 6dB bandwidth value.
- 3) Repeat above procedures until all frequencies measured were complete.

### 6.3 TEST SETUP



### 6.4 TEST RESULTS

Environment: 23.6°C/53%RH

Tested By: Lu Wei

Voltage: DC 12V

Date: 2022-04-13

#### BLE\_1M

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	668	$\geq 500$	PASS
Middle	2440	668		PASS
Highest	2480	660		PASS

#### BLE\_2M

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	1132	$\geq 500$	PASS
Middle	2440	1136		PASS
Highest	2480	1136		PASS