

## FCC Test Report

**Report No.:** RFACXM-WTW-P22040515-7

**FCC ID:** 2AEUPBHASG001

**Test Model:** 5F48E9

**Received Date:** 2022/4/14

**Test Date:** 2022/7/7 ~ 2022/8/12

**Issued Date:** 2022/9/13

**Applicant:** Ring LLC

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
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**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
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**FCC Registration /** 723255 / TW2022

**Designation Number:**



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### Release Control Record

Issue No.	Description	Date Issued
RFACXM-WTW-P22040515-7	Original release.	2022/9/13

## 1 Certificate of Conformity

**Product:** Amazon Sidewalk Bridge Pro by Ring

**Brand:** Ring

**Test Model:** 5F48E9

**Sample Status:** Engineering sample

**Applicant:** Ring LLC

**Test Date:** 2022/7/7 ~ 2022/8/12

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** Vivian Huang , **Date:** 2022/9/13  
Vivian Huang / Specialist

**Approved by :** May Chen , **Date:** 2022/9/13  
May Chen / Manager

## 2 Summary of Test Results

### ➤ Hybrid Mode

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -5.52 dB at 0.40000 MHz.
15.247(a)(1)(i)	Number of Hopping Frequency Used	NA	Refer to Note
15.247(a)(1)(i)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.
15.247(a)(1)(i)	Hopping Channel Separation	Pass	Meet the requirement of limit.
15.247(b)(2)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -8.4 dB at 31.41 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is R-N type(F) and R-N type(M). (The device is professionally installed)

#### Note:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. There is no requirement for this type of hybrid system to comply with the 500 kHz minimum bandwidth normally associated with a DTS transmission; and, there is no minimum number of hopping channels associated with this type of hybrid system.

➤ **DTS Mode**

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -5.22 dB at 0.40000 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -6.6 dB at 928.00 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is R-N type(F) and R-N type(M). (The device is professionally installed)

Note:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

**2.1 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	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.1 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB

**2.2 Modification Record**

There were no modifications required for compliance.



### 3 General Information

#### 3.1 General Description of EUT

Product	Amazon Sidewalk Bridge Pro by Ring
Brand	Ring
Test Model	5F48E9
DSN No.	For Conducted & Radiated Emissions test items: GBA1VV012212000F For other test items: GBA1VV012212000H
Status of EUT	Engineering sample
Power Supply Rating	DC 6V from battery or DC 53V from POE
Modulation Type	FSK
Modulation Technology	<b>Hybrid Mode:</b> CSS <b>DTS Mode:</b> DTS
Transfer Rate	Refer to Note
Operating Frequency	<b>Hybrid Mode:</b> 923.1 ~ 927.7 MHz <b>DTS Mode:</b> <b>Channel Spacing 600 kHz:</b> 923.3 ~ 927.5 MHz <b>Channel Spacing 800 kHz:</b> 902.5 ~ 926.5 MHz
Number of Channel	Refer to Note
Output Power	<b>Hybrid Mode:</b> 136.458 mW <b>DTS Mode:</b> <b>Channel Spacing 600 kHz:</b> 626.614 mW <b>Channel Spacing 800 kHz:</b> 609.537 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The EUT has three Configurations, please refer to the following table:

Configuration	Function	Semtech transceiver	Modulation	Mode
1	BP OFF	LR1110	FSK	FHSS
			Lora	FHSS DTS_800kHz
2	BP OFF	LR1110	FSK	FHSS
			SX1303	Lora
		SX1303		Lora
			Hybrid	
3	BP ON	LR1110	FSK	FHSS
		SX1303	Lora	DTS_800kHz
				DTS_600kHz
Hybrid				

2. The LoRa technology information as below table.

Mode	Channel Spacing	Data Rate	Number of Channel	Spec.
Hybrid (Hopping + DTS)	200 kHz	DR1 (SF9): 1.76 kbps DR3 (SF7): 5.47 kbps	24	1. DR1 (SF9), DR3 (SF7) / BW: 125kHz 2. Group 1: 923.1~924.5 MHz 3. Group 2: 924.7~926.1 MHz 4. Group 3: 926.3~927.7 MHz

Note: From the above Data Rate, the worst radiated emissions was found in **DR3 (SF7)**. Therefore only the test data of the Data Rate were recorded in this report.

**Configuration 1 (LR1110)**

Mode	Channel Spacing	Data Rate	Number of Channel	Spec.
DTS	800 kHz	DR11 (SF9): 7 kbps, DR9 (SF11): 1.76 kbps	31	BW: 500kHz ; 902.5~926.5MHz

**Configuration 2 (SX1303)**

Mode	Channel Spacing	Data Rate	Number of Channel	Spec.
DTS	600 kHz	DR11 (SF9): 7 kbps, DR9 (SF11): 1.76 kbps	8	BW: 500kHz ; 923.3~927.5MHz
	800 kHz		31	BW: 500kHz ; 902.5~926.5MHz

Note: From the above Data Rate, the worst radiated emissions was found in **DR9 (SF11)**. Therefore only the test data of the Data Rate were recorded in this report.

3. For Radiated Emission test, the EUT was pre-tested under the following modes:

Pre-test Mode	Description
<b>Mode A</b>	<b>Power from POE</b>
Mode B	Power from Battery

From the above modes, the worst case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.

4. The EUT contains certified WWAN (LTE) modular which FCC ID: ZMONL668AM00.

5. The EUT has below radios as following table:

Radio 1	Radio 2	Radio 3	Radio 4
WLAN 2.4GHz+ WLAN 5GHz+ Bluetooth	WWAN (LTE)	GPS	LoRa + FSK

6. Simultaneously transmission condition.

Condition	Technology			
1	WLAN (2.4GHz)	LoRa	Bluetooth	-
2	WLAN (5GHz)	LoRa	Bluetooth	-
3	WLAN (2.4GHz)	FSK	Bluetooth	-
4	WLAN (5GHz)	FSK	Bluetooth	-
5	LTE	LoRa	Bluetooth	-
6	LTE	FSK	Bluetooth	-
7	WLAN (2.4GHz)	LoRa	FSK	Bluetooth
8	WLAN (5GHz)	LoRa	FSK	Bluetooth
9	LTE	LoRa	FSK	Bluetooth

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

7. The EUT must be supplied with a battery and following below table:

Brand	Model No.	Spec.
WELLTECH ENERGY INC.	5F48E9	6 Vdc, 3100 mAh

8. The antennas provided to the EUT, please refer to the following table:

RF Chain No	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type	Cable Length (mm)
LoRa/FSK (Outdoor)	Inpaq	RFDPA563600AF RBX01	5.5	902~928 MHz	Dipole	R-N type(F)	1000
			5	902~928 MHz	Dipole	R-N type(F)	3000
LoRa/FSK (Indoor)	Inpaq	FDPA161500AMU B801	2.8	902~928 MHz	Dipole	R-N type(M)	NA

Note: For Radiated Emission test item the max. gain was selected for the final test .

9. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

10. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

### 3.2 Description of Test Modes

#### Hybrid Mode:

#### Configuration 2 (SX1303 Chip) and Configuration 3 (SX1303 Chip)

24 channels are provided for Hybrid mode:

Group	Channel	Freq. (MHz)	Group	Channel	Freq. (MHz)	Group	Channel	Freq. (MHz)
Group 1	0	923.1	Group 2	8	924.7	Group 3	16	926.3
	1	923.3		9	924.9		17	926.5
	2	923.5		10	925.1		18	926.7
	3	923.7		11	925.3		19	926.9
	4	923.9		12	925.5		20	927.1
	5	924.1		13	925.7		21	927.3
	6	924.3		14	925.9		22	927.5
	7	924.5		15	926.1		23	927.7

#### DTS Mode:

#### Configuration 1 (LR1110 Chip)

31 channels are provided for DTS mode (Channel Spacing: 800 kHz):

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	902.5	13	912.9	26	923.3
1	903.3	14	913.7	27	924.1
2	904.1	15	914.5	28	924.9
3	904.9	16	915.3	29	925.7
4	905.7	17	916.1	30	926.5
5	906.5	18	916.9		
6	907.3	19	917.7		
7	908.1	20	918.5		
8	908.9	21	919.3		
9	909.7	22	920.1		
10	910.5	23	920.9		
11	911.3	24	921.7		
12	912.1	25	922.5		

### Configuration 2 (SX1303 Chip)

31 channels are provided for DTS mode (Channel Spacing: 800 kHz):

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	902.5	13	912.9	26	923.3
1	903.3	14	913.7	27	924.1
2	904.1	15	914.5	28	924.9
3	904.9	16	915.3	29	925.7
4	905.7	17	916.1	30	926.5
5	906.5	18	916.9		
6	907.3	19	917.7		
7	908.1	20	918.5		
8	908.9	21	919.3		
9	909.7	22	920.1		
10	910.5	23	920.9		
11	911.3	24	921.7		
12	912.1	25	922.5		

### Configuration 3 (SX1303 Chip)

8 channels are provided for DTS mode (Channel Spacing: 600 kHz):

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	923.3	3	925.1	6	926.9
1	923.9	4	925.7	7	927.5
2	924.5	5	926.3		

5 channels are provided for DTS mode (Channel Spacing: 800 kHz):

Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	923.3	3	925.7
1	924.1	4	926.5
2	924.9		

### 3.2.1 Test Mode Applicability and Tested Channel Detail (Hybrid Mode)

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	APCM	
1	√	√	√	√	Configuration 2: Channel Spacing: 200 kHz
2	√	√	√	√	Configuration 3: Channel Spacing: 200 kHz

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz      **RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission      **APCM**: Antenna Port Conducted Measurement

#### **Radiated Emission Test (Above 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 23	0, 23	FSK	1.76

#### **Radiated Emission Test (Below 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 23	23	FSK	1.76

#### **Power Line Conducted Emission Test:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 23	23	FSK	1.76

#### **Antenna Port Conducted Measurement:**

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 23	0, 23	FSK	1.76

**Test Condition:**

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE $\geq$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Carter Lin
RE $<$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Carter Lin
PLC	26deg. C, 75%RH	120Vac, 60Hz	Ryan Du
APCM	25deg. C, 66%RH	120Vac, 60Hz	Eric Peng

### 3.2.2 Test Mode Applicability and Tested Channel Detail (DTS Mode)

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	APCM	
1	√	√	√	√	Configuration 1: Channel Spacing: 800 kHz (LR1110)
2	√	√	√	√	Configuration 2: Channel Spacing: 800 kHz (SX1303)
3	√	√	√	√	Configuration 2: Channel Spacing: 600 kHz (SX1303)
4	√	√	√	√	Configuration 3: Channel Spacing: 800 kHz (SX1303)
5	√	√	√	√	Configuration 3: Channel Spacing: 600 kHz (SX1303)

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz      **RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission      **APCM**: Antenna Port Conducted Measurement

#### **Radiated Emission Test (Above 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 30	0, 15, 30	FSK	21.9
3	0 to 7	0, 7	FSK	21.9
4	0 to 4	0, 4	FSK	21.9
5	0 to 7	0, 7	FSK	21.9

#### **Radiated Emission Test (Below 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 30	30	FSK	21.9
3	0 to 7	7	FSK	21.9
4	0 to 4	0	FSK	21.9
5	0 to 7	7	FSK	21.9

#### **Power Line Conducted Emission Test:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 30	30	FSK	21.9
3	0 to 7	7	FSK	21.9
4	0 to 4	0	FSK	21.9
5	0 to 7	7	FSK	21.9



### Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
1, 2	0 to 30	0, 15, 30	FSK	21.9
3	0 to 7	0, 7	FSK	21.9
4	0 to 4	0, 4	FSK	21.9
5	0 to 7	0, 7	FSK	21.9

### Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE $\geq$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Carter Lin
RE $<$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Carter Lin
PLC	26deg. C, 75%RH	120Vac, 60Hz	Ryan Du
APCM	25deg. C, 66%RH	120Vac, 60Hz	Eric Peng

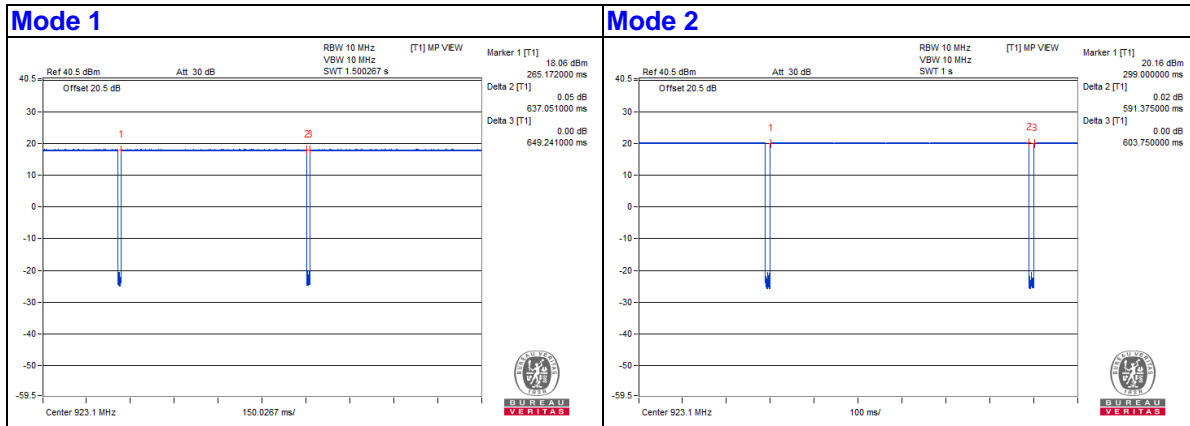
### 3.3 Duty Cycle of Test Signal

If duty cycle of test signal is  $\geq 98\%$ , duty factor is not required.  
 If duty cycle of test signal is  $< 98\%$ , duty factor shall be considered.

#### Hybrid Mode:

**Mode 1:** Duty cycle =  $637.051 \text{ ms} / 649.241 \text{ ms} = 0.981$

**Mode 2:** Duty cycle =  $591.375 \text{ ms} / 603.75 \text{ ms} = 0.98$



**DTS Mode:**

**Mode 1:** Duty cycle = 474.75 ms/478.875 ms = 0.991

**Mode 2:** Duty cycle = 461.5 ms/470.25 ms = 0.981

**Mode 3:** Duty cycle = 461.75 ms/470.25 ms = 0.982

**Mode 4:** Duty cycle = 525.5 ms/533.75 ms = 0.985

**Mode 5:** Duty cycle = 525.125 ms/534.125 ms = 0.983



### 3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

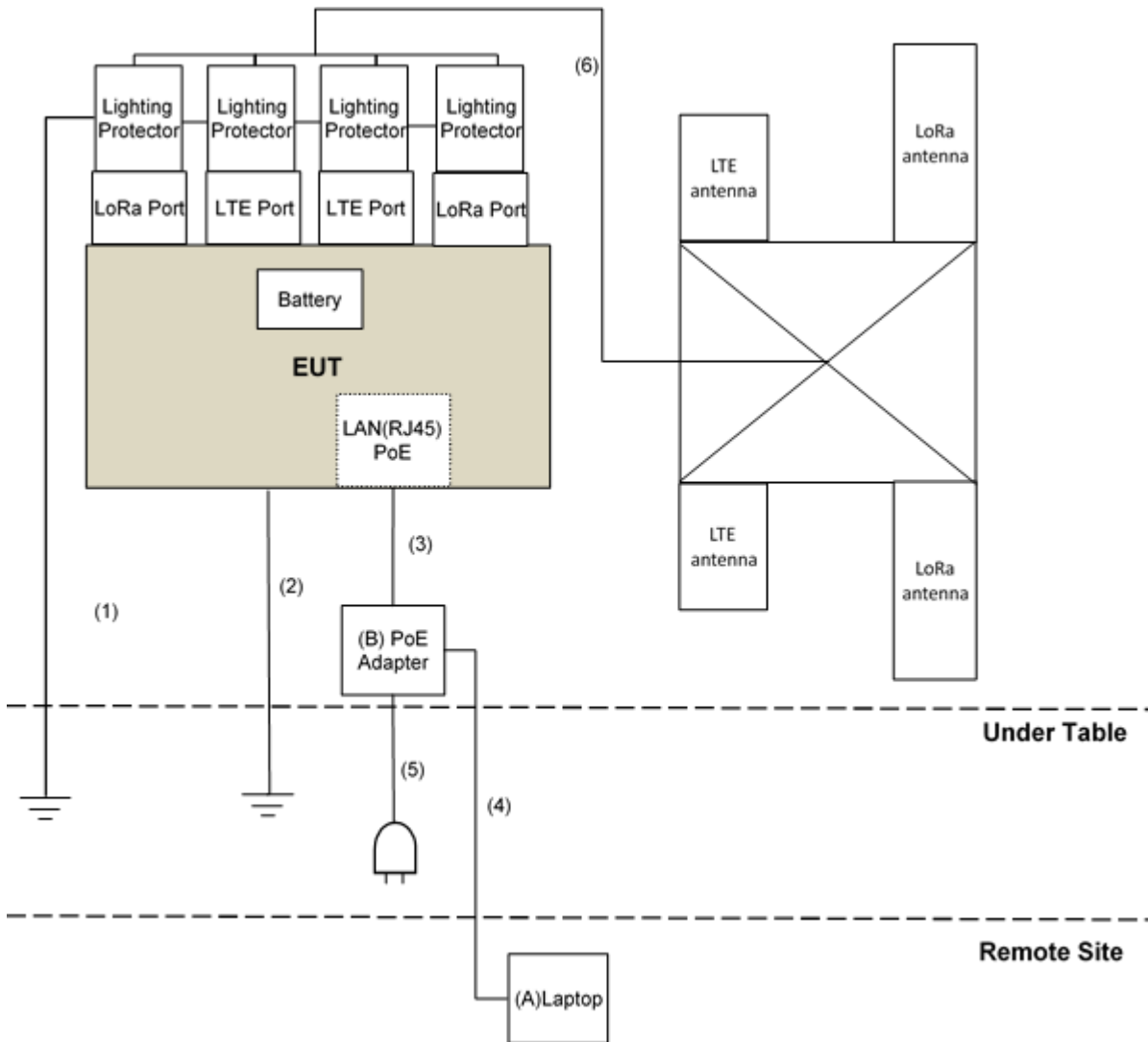
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Lenovo	20U5S01X00 L14	PF-1ANPYA	NA	Provided by Lab
B.	PoE Adapter	Gospower	G0545-530-060-P SE1000	NA	NA	Supplied by applicant

Note: 1. All power cords of the above support units are non-shielded (1.8m).

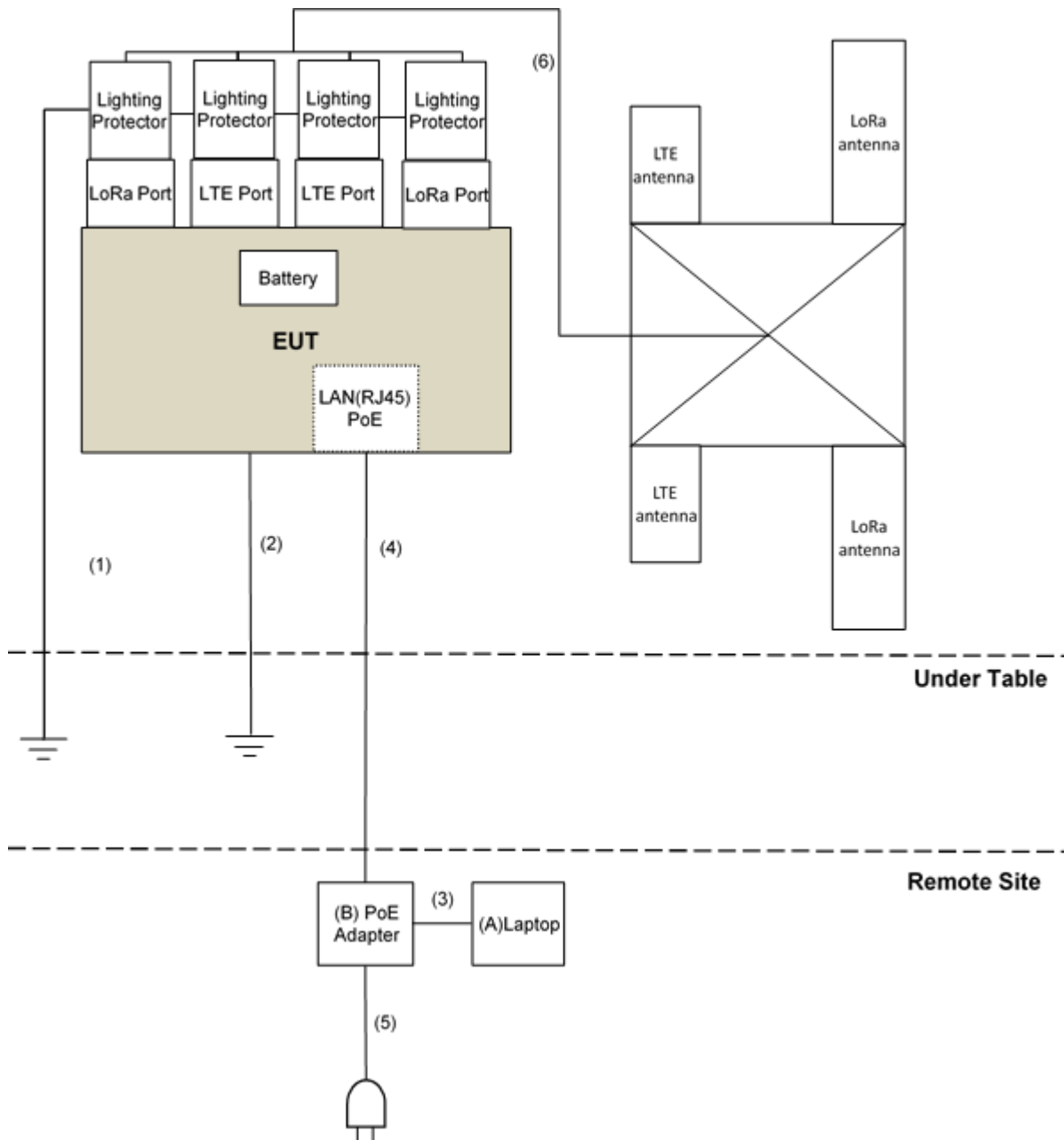
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	GND Cable	1	3	No	0	Provided by Lab
2.	GND Cable	1	3	No	0	Provided by Lab
3.	RJ-45 Cable	1	1.5	No	0	Provided by Lab
4.	RJ-45 Cable	1	10	No	0	Provided by Lab
5.	AC Cable	1	1	No	0	Supplied by applicant
6.	Antenna Cable	4	1	Yes	0	Supplied by applicant

### 3.4.1 Configuration of System under Test

For AC Power Conducted Emission test



For Radiated Emission test



### 3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

**Test standard:**

**FCC Part 15, Subpart C (15.247)**

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

**References Test Guidance:**

**KDB 558074 D01 15.247 Meas Guidance v05r02**

All test items have been performed as a reference to the above KDB test guidance.

## 4 Test Types and Results (Hybrid Mode)

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**Note:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



## 4.1.2 Test Instruments

**For Radiated Emission test:**

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer Keysight	N9020B	MY60112410	2022/3/13	2023/3/12
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Test Receiver KEYSIGHT	N9038A	MY59050100	2022/6/20	2023/6/19
Pre_Amplifier EMCI	EMC001340	980142	2022/6/2	2023/6/1
LOOP ANTENNA Electro-Metrics	EM-6879	264	2022/3/18	2023/3/17
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2022/1/6	2023/1/5
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2022/1/6	2023/1/5
Pre_Amplifier(20M-3G) EMCI	EMC330N	980852	2022/3/28	2023/3/27
Bilog Antenna Schwarzbeck	VULB 9168	9168-0942	2021/10/26	2022/10/25
RF Coaxial Cable COMMATE/PEWC	8D	966-6-1	2022/4/25	2023/4/24
RF Coaxial Cable COMMATE/PEWC	8D	966-6-2	2022/4/25	2023/4/24
RF Coaxial Cable COMMATE/PEWC	8D	966-6-3	2022/4/25	2023/4/24
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-01	2022/1/10	2023/1/9
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-2035	2021/11/14	2022/11/13
Pre_Amplifier EMCI	EMC12630SE	980385	2021/8/25	2022/8/24
RF Coaxial Cable EMCI	EMC101G-KM-KM-10000	210708	2021/11/9	2022/11/8
RF Cable EMCI	EMC104-SM-SM-1300	210205	2022/5/10	2023/5/9
Pre_Amplifier EMCI	EMC184045SE	980387	2022/1/10	2023/1/9
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170519	2021/11/14	2022/11/13
RF Cable-Frequency range: 1-40GHz EMCI	EMC102-KM-KM-1200	160924	2022/1/10	2023/1/9
RF Coaxial Cable EMCI	EMC-KM-KM-4000	200214	2022/3/8	2023/3/7

Note: 1. The test was performed in 966 Chamber No. 6.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

3. Tested Date: 2022/7/31 ~ 2022/8/2

**For other test items:**

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101516	2022/3/7	2023/3/6
Power Meter Anritsu	ML2495A	1529002	2022/6/22	2023/6/21
Pulse Power Sensor Anritsu	MA2411B	1339443	2022/6/22	2023/6/21
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2022/4/5	2023/4/4
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

- Note: 1. The test was performed in Oven room 2.  
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 3. Tested Date: 2022/7/7 ~ 2022/8/12

#### 4.1.3 Test Procedures

##### **For Radiated emission below 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

##### **For Radiated emission above 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

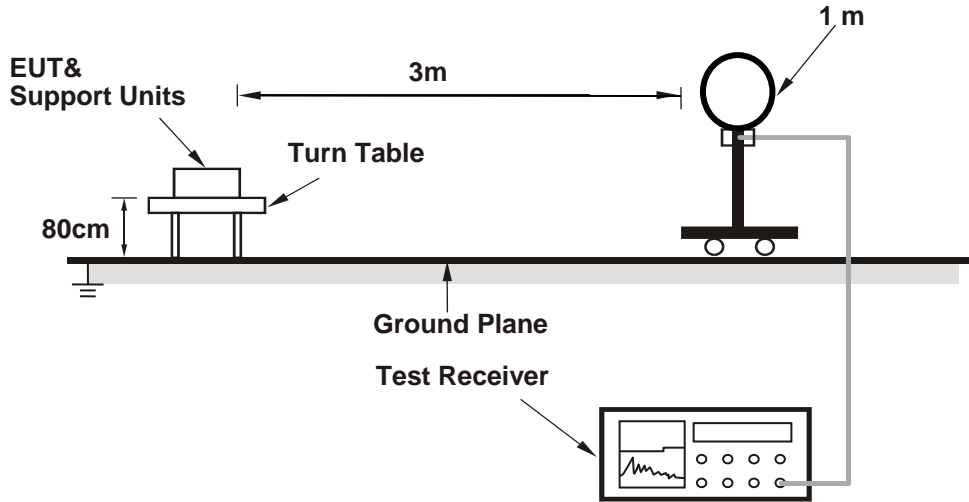
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

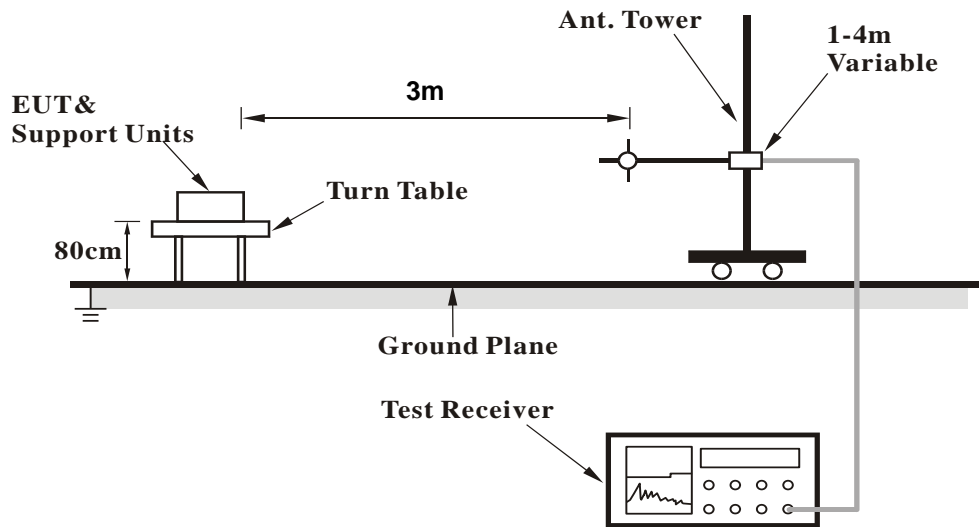
No deviation.

4.1.5 Test Setup

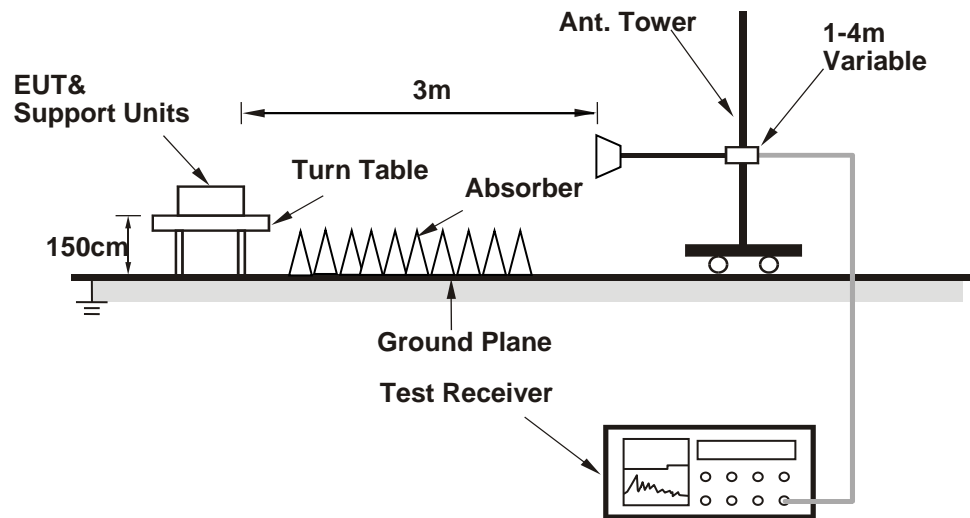
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



### For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Controlling software (Run Putty.exe paste Lora and Fsk.txt command) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results (Mode 1)

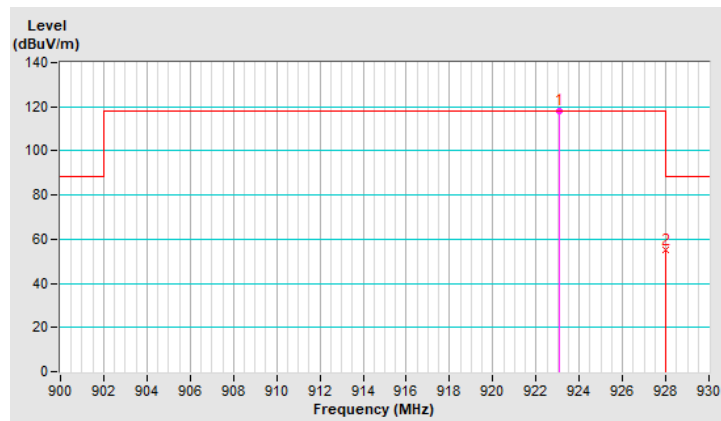
##### Bandedge Data:

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 0 : 923.1 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.10	118.3 QP			1.00 H	336	87.4	30.9
2	928.00	54.9 QP	88.3	-33.4	1.00 H	336	24.0	30.9

##### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.

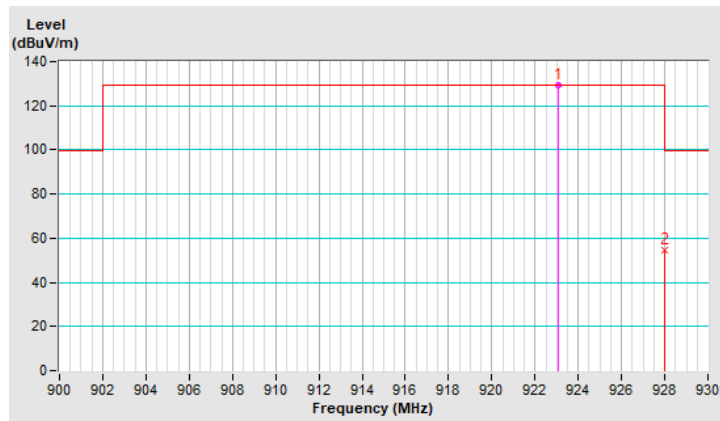


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 0 : 923.1 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.10	129.5 QP			2.23 V	161	98.6	30.9
2	928.00	54.8 QP	99.5	-44.7	2.23 V	161	23.9	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.



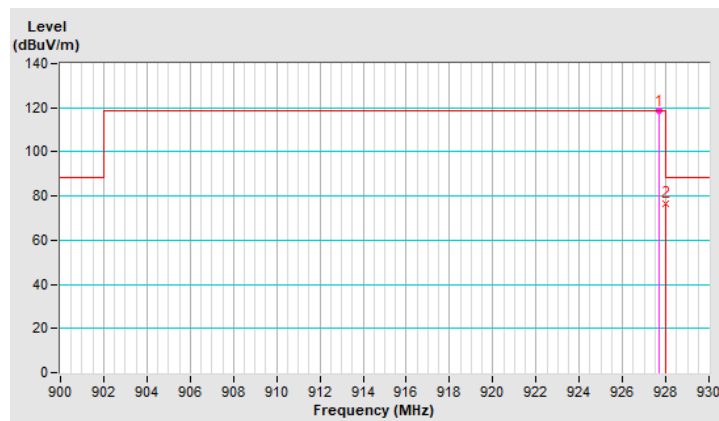
<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.70	118.5 QP			1.21 H	220	87.6	30.9
2	928.00	76.8 QP	88.5	-11.7	1.21 H	220	45.9	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.



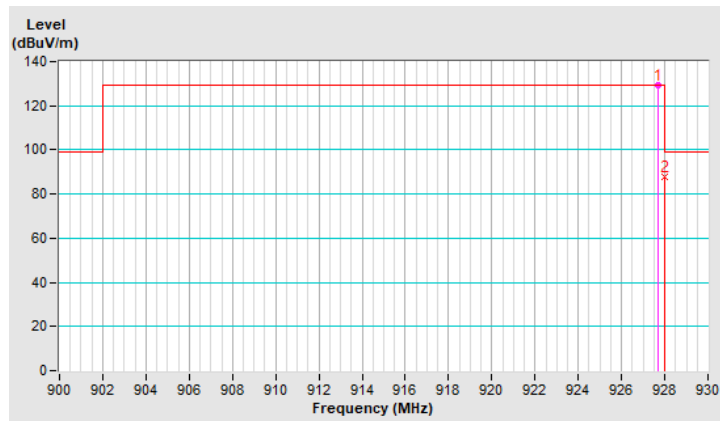


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.70	129.3 QP			2.21 V	154	98.4	30.9
2	928.00	87.5 QP	99.3	-11.8	2.21 V	154	56.6	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.



**Above 1GHz Data:**

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 0 : 923.1 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.30	35.2 PK	74.0	-38.8	1.46 H	220	38.0	-2.8
2	2769.30	24.5 AV	54.0	-29.5	1.46 H	220	27.3	-2.8
3	3692.40	34.9 PK	74.0	-39.1	1.08 H	120	36.0	-1.1
4	3692.40	23.8 AV	54.0	-30.2	1.08 H	120	24.9	-1.1
5	4615.50	35.3 PK	74.0	-38.7	1.46 H	162	34.7	0.6
6	4615.50	23.9 AV	54.0	-30.1	1.46 H	162	23.3	0.6
7	7384.80	42.2 PK	74.0	-31.8	1.54 H	194	35.0	7.2
8	7384.80	30.5 AV	54.0	-23.5	1.54 H	194	23.3	7.2
9	8307.90	43.4 PK	74.0	-30.6	1.55 H	176	36.0	7.4
10	8307.90	31.1 AV	54.0	-22.9	1.55 H	176	23.7	7.4

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.30	35.3 PK	74.0	-38.7	1.01 V	195	38.1	-2.8
2	2769.30	26.9 AV	54.0	-27.1	1.01 V	195	29.7	-2.8
3	3692.40	34.7 PK	74.0	-39.3	1.03 V	105	35.8	-1.1
4	3692.40	23.5 AV	54.0	-30.5	1.03 V	105	24.6	-1.1
5	4615.50	35.0 PK	74.0	-39.0	1.43 V	157	34.4	0.6
6	4615.50	23.6 AV	54.0	-30.4	1.43 V	157	23.0	0.6
7	7384.80	45.4 PK	74.0	-28.6	1.67 V	214	38.2	7.2
8	7384.80	38.7 AV	54.0	-15.3	1.67 V	214	31.5	7.2
9	8307.90	43.2 PK	74.0	-30.8	1.49 V	165	35.8	7.4
10	8307.90	30.8 AV	54.0	-23.2	1.49 V	165	23.4	7.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2783.10	35.5 PK	74.0	-38.5	1.75 H	229	38.2	-2.7
2	2783.10	24.3 AV	54.0	-29.7	1.75 H	229	27.0	-2.7
3	3710.80	34.9 PK	74.0	-39.1	1.06 H	136	35.9	-1.0
4	3710.80	24.0 AV	54.0	-30.0	1.06 H	136	25.0	-1.0
5	4638.50	35.6 PK	74.0	-38.4	1.41 H	183	35.0	0.6
6	4638.50	24.0 AV	54.0	-30.0	1.41 H	183	23.4	0.6
7	7421.60	42.3 PK	74.0	-31.7	1.54 H	190	35.1	7.2
8	7421.60	30.4 AV	54.0	-23.6	1.54 H	190	23.2	7.2
9	8349.30	43.4 PK	74.0	-30.6	1.66 H	187	36.2	7.2
10	8349.30	31.3 AV	54.0	-22.7	1.66 H	187	24.1	7.2

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2783.10	34.2 PK	74.0	-39.8	1.51 V	243	36.9	-2.7
2	2783.10	24.9 AV	54.0	-29.1	1.51 V	243	27.6	-2.7
3	3710.80	35.2 PK	74.0	-38.8	1.02 V	129	36.2	-1.0
4	3710.80	24.2 AV	54.0	-29.8	1.02 V	129	25.2	-1.0
5	4638.50	35.4 PK	74.0	-38.6	1.40 V	175	34.8	0.6
6	4638.50	24.2 AV	54.0	-29.8	1.40 V	175	23.6	0.6
7	7421.60	46.2 PK	74.0	-27.8	1.36 V	215	39.0	7.2
8	7421.60	40.2 AV	54.0	-13.8	1.36 V	215	33.0	7.2
9	8349.30	43.9 PK	74.0	-30.1	1.59 V	166	36.7	7.2
10	8349.30	31.5 AV	54.0	-22.5	1.59 V	166	24.3	7.2

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

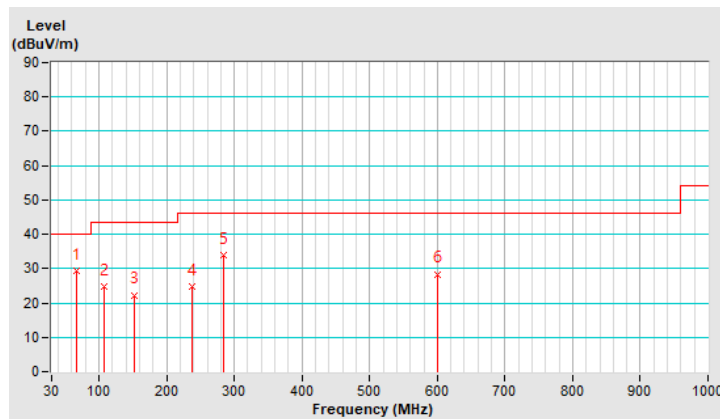
**Below 1GHz Data:**

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	67.67	29.3 QP	40.0	-10.7	2.50 H	57	43.4	-14.1
2	106.65	24.8 QP	43.5	-18.7	1.50 H	250	40.9	-16.1
3	152.51	22.3 QP	43.5	-21.2	1.50 H	360	34.6	-12.3
4	238.52	24.9 QP	46.0	-21.1	2.00 H	125	39.2	-14.3
5	283.62	33.9 QP	46.0	-12.1	1.50 H	99	46.2	-12.3
6	601.20	28.4 QP	46.0	-17.6	1.50 H	191	33.0	-4.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

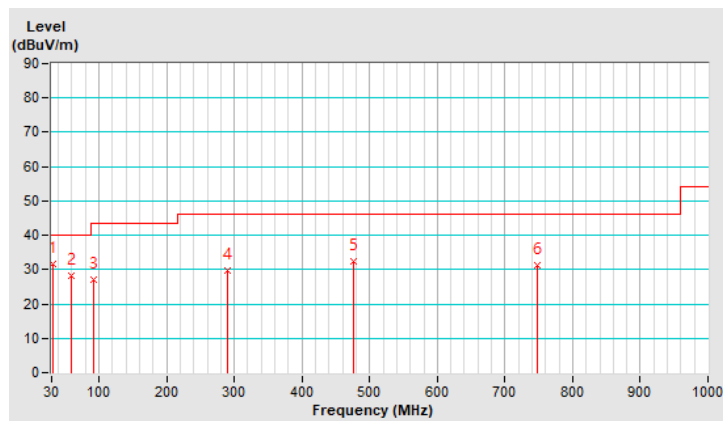


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.41	31.6 QP	40.0	-8.4	1.00 V	195	45.4	-13.8
2	59.95	28.1 QP	40.0	-11.9	1.50 V	9	41.1	-13.0
3	92.77	27.0 QP	43.5	-16.5	2.00 V	99	45.1	-18.1
4	289.05	29.6 QP	46.0	-16.4	1.00 V	70	41.9	-12.3
5	476.69	32.5 QP	46.0	-13.5	1.50 V	208	40.2	-7.7
6	748.01	31.2 QP	46.0	-14.8	1.00 V	200	33.8	-2.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



#### 4.1.8 Test Results (Mode 2)

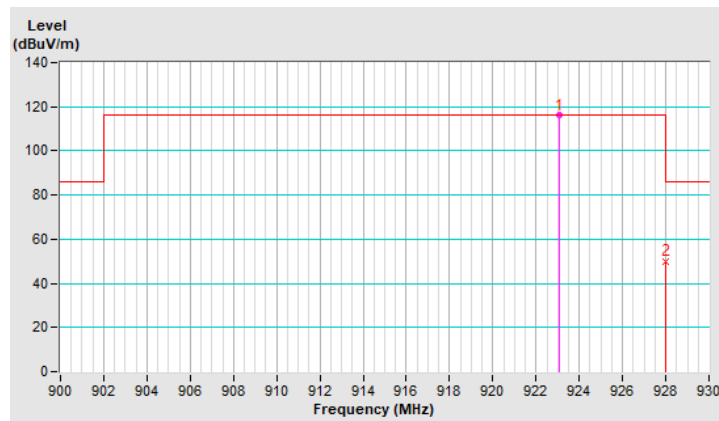
##### Bandedge Data:

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 0 : 923.1 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.10	116.2 QP			1.05 H	345	85.3	30.9
2	928.00	50.0 QP	86.2	-36.2	1.05 H	345	19.1	30.9

##### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.

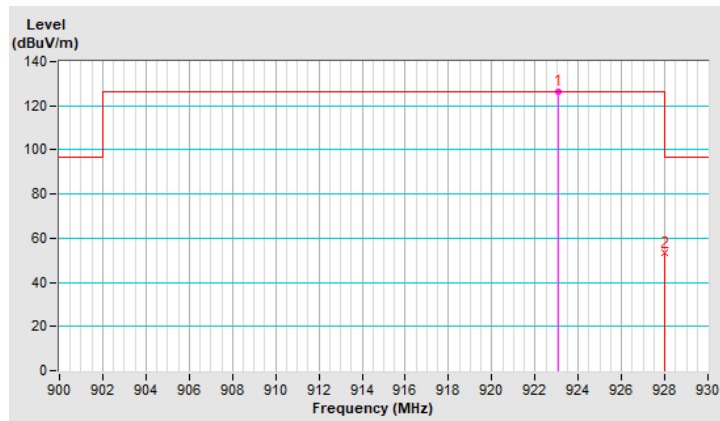


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 0 : 923.1 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.10	126.6 QP			2.22 V	158	95.7	30.9
2	928.00	53.4 QP	96.6	-43.2	2.22 V	158	22.5	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.



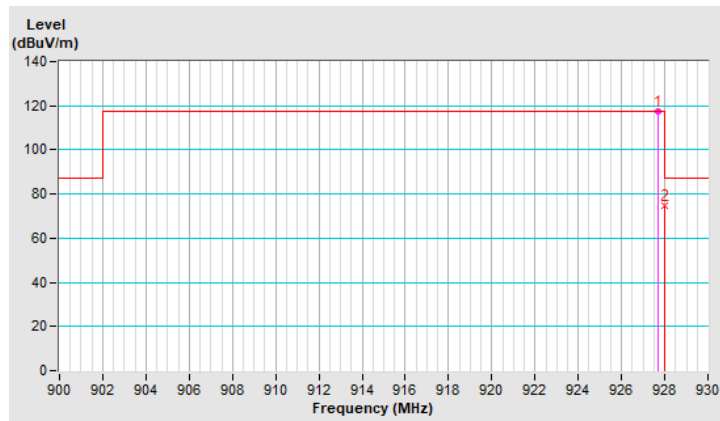
<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.70	117.4 QP			2.20 H	150	86.5	30.9
2	928.00	74.6 QP	87.4	-12.8	2.20 H	150	43.7	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.



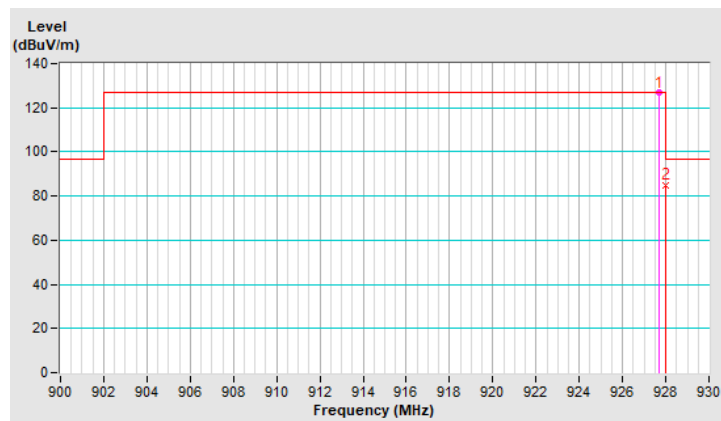


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.70	126.9 QP			2.22 V	158	96.0	30.9
2	928.00	85.1 QP	96.9	-11.8	2.22 V	158	54.2	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. " \* ": Fundamental frequency.



**Above 1GHz Data:**

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 0 : 923.1 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.30	35.3 PK	74.0	-38.7	1.61 H	239	38.1	-2.8
2	2769.30	24.2 AV	54.0	-29.8	1.61 H	239	27.0	-2.8
3	3692.40	35.0 PK	74.0	-39.0	1.22 H	127	36.1	-1.1
4	3692.40	24.2 AV	54.0	-29.8	1.22 H	127	25.3	-1.1
5	4615.50	35.5 PK	74.0	-38.5	1.49 H	158	34.9	0.6
6	4615.50	23.9 AV	54.0	-30.1	1.49 H	158	23.3	0.6
7	7384.80	42.0 PK	74.0	-32.0	1.68 H	177	34.8	7.2
8	7384.80	30.6 AV	54.0	-23.4	1.68 H	177	23.4	7.2
9	8307.90	43.2 PK	74.0	-30.8	1.43 H	157	35.8	7.4
10	8307.90	30.8 AV	54.0	-23.2	1.43 H	157	23.4	7.4

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.30	33.7 PK	74.0	-40.3	1.00 V	197	36.5	-2.8
2	2769.30	25.3 AV	54.0	-28.7	1.00 V	197	28.1	-2.8
3	3692.40	35.2 PK	74.0	-38.8	1.26 V	131	36.3	-1.1
4	3692.40	24.2 AV	54.0	-29.8	1.26 V	131	25.3	-1.1
5	4615.50	35.1 PK	74.0	-38.9	1.52 V	160	34.5	0.6
6	4615.50	23.6 AV	54.0	-30.4	1.52 V	160	23.0	0.6
7	7384.80	44.2 PK	74.0	-29.8	3.98 V	213	37.0	7.2
8	7384.80	37.5 AV	54.0	-16.5	3.98 V	213	30.3	7.2
9	8307.90	43.3 PK	74.0	-30.7	1.72 V	228	35.9	7.4
10	8307.90	32.5 AV	54.0	-21.5	1.72 V	228	25.1	7.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2783.10	35.1 PK	74.0	-38.9	1.80 H	211	37.8	-2.7
2	2783.10	24.5 AV	54.0	-29.5	1.80 H	211	27.2	-2.7
3	3710.80	35.2 PK	74.0	-38.8	1.15 H	118	36.2	-1.0
4	3710.80	24.4 AV	54.0	-29.6	1.15 H	118	25.4	-1.0
5	4638.50	35.4 PK	74.0	-38.6	1.52 H	183	34.8	0.6
6	4638.50	24.1 AV	54.0	-29.9	1.52 H	183	23.5	0.6
7	7421.60	41.9 PK	74.0	-32.1	1.42 H	192	34.7	7.2
8	7421.60	30.6 AV	54.0	-23.4	1.42 H	192	23.4	7.2
9	8349.30	43.8 PK	74.0	-30.2	1.43 H	177	36.6	7.2
10	8349.30	30.9 AV	54.0	-23.1	1.43 H	177	23.7	7.2

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2783.10	33.6 PK	74.0	-40.4	1.02 V	191	36.3	-2.7
2	2783.10	24.9 AV	54.0	-29.1	1.02 V	191	27.6	-2.7
3	3710.80	35.0 PK	74.0	-39.0	1.22 V	143	36.0	-1.0
4	3710.80	24.3 AV	54.0	-29.7	1.22 V	143	25.3	-1.0
5	4638.50	35.6 PK	74.0	-38.4	1.52 V	168	35.0	0.6
6	4638.50	24.2 AV	54.0	-29.8	1.52 V	168	23.6	0.6
7	7421.60	45.4 PK	74.0	-28.6	3.92 V	214	38.2	7.2
8	7421.60	39.3 AV	54.0	-14.7	3.92 V	214	32.1	7.2
9	8349.30	45.8 PK	74.0	-28.2	2.78 V	150	38.6	7.2
10	8349.30	36.6 AV	54.0	-17.4	2.78 V	150	29.4	7.2

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

### Below 1GHz Data:

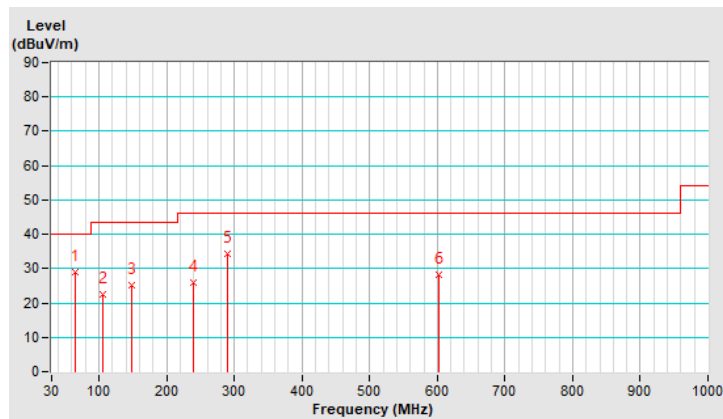
<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

#### Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	65.50	29.1 QP	40.0	-10.9	1.00 H	58	42.9	-13.8
2	105.02	22.6 QP	43.5	-20.9	1.50 H	260	38.8	-16.2
3	149.29	25.0 QP	43.5	-18.5	1.50 H	359	37.3	-12.3
4	238.79	26.0 QP	46.0	-20.0	2.00 H	131	40.3	-14.3
5	290.48	34.1 QP	46.0	-11.9	1.50 H	106	46.4	-12.3
6	601.39	28.2 QP	46.0	-17.8	1.50 H	175	32.8	-4.6

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

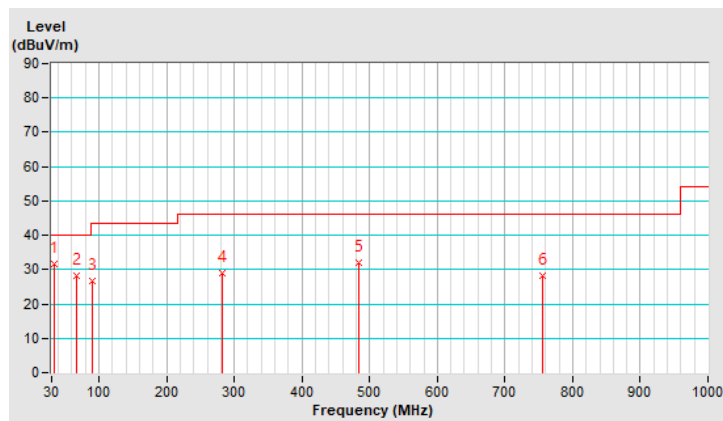


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	33.99	31.5 QP	40.0	-8.5	1.50 V	194	45.0	-13.5
2	66.34	28.1 QP	40.0	-11.9	1.50 V	11	42.0	-13.9
3	90.81	26.7 QP	43.5	-16.8	2.00 V	93	45.0	-18.3
4	281.93	29.1 QP	46.0	-16.9	1.00 V	59	41.5	-12.4
5	483.85	32.1 QP	46.0	-13.9	1.50 V	201	39.8	-7.7
6	754.61	28.1 QP	46.0	-17.9	1.00 V	203	30.6	-2.5

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
TEST RECEIVER R&S	ESCS 30	847124/029	2021/10/13	2022/10/12
LISN R&S	ESH3-Z5	848773/004	2021/10/29	2022/10/28
50 ohms Terminator NA	50	3	2021/10/27	2022/10/26
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2021/9/25	2022/9/24
Fixed attenuator STI	STI02-2200-10	005	2021/8/27	2022/8/26
Software BVADT	BVADT_Cond_V7.3.7.4	NA	NA	NA

Note: 1. The test was performed in Conduction 1.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

3. Tested Date: 2022/8/6

#### 4.2.3 Test Procedures

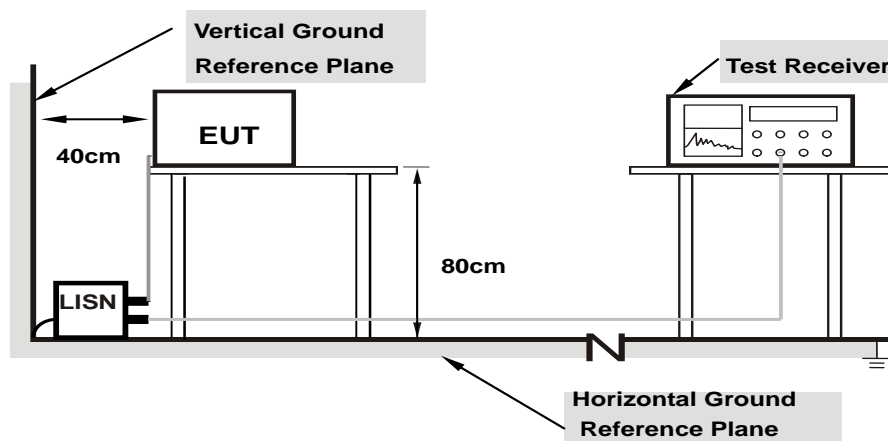
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**Note:** The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note:** 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT Operating Condition

Same as 4.1.6.

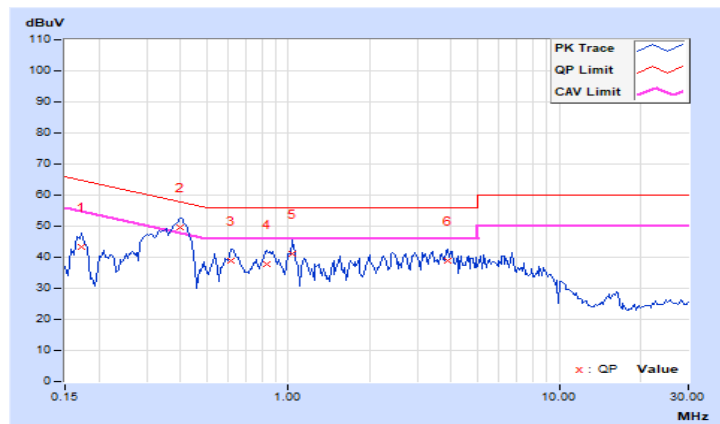
4.2.7 Test Results (Mode 1)

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17344	10.05	33.39	23.17	43.44	33.22	64.79	54.79	-21.35	-21.57
<b>2</b>	<b>0.40000</b>	<b>10.07</b>	<b>39.66</b>	<b>32.26</b>	<b>49.73</b>	<b>42.33</b>	<b>57.85</b>	<b>47.85</b>	<b>-8.12</b>	<b>-5.52</b>
3	0.61484	10.08	28.88	22.72	38.96	32.80	56.00	46.00	-17.04	-13.20
4	0.82969	10.10	27.71	22.23	37.81	32.33	56.00	46.00	-18.19	-13.67
5	1.03516	10.11	30.97	25.73	41.08	35.84	56.00	46.00	-14.92	-10.16
6	3.85938	10.25	28.77	22.17	39.02	32.42	56.00	46.00	-16.98	-13.58

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



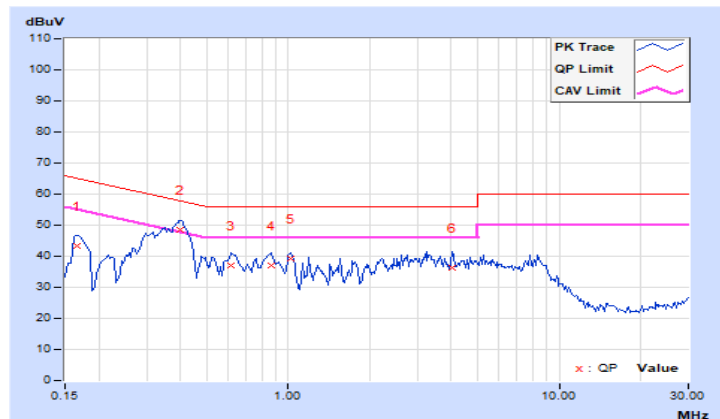


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	10.02	33.13	22.31	43.15	32.33	65.18	55.18	-22.03	-22.85
2	0.40000	10.04	38.58	31.22	48.62	41.26	57.85	47.85	-9.23	-6.59
3	0.61094	10.05	26.99	20.85	37.04	30.90	56.00	46.00	-18.96	-15.10
4	0.86094	10.07	26.82	21.48	36.89	31.55	56.00	46.00	-19.11	-14.45
5	1.01953	10.08	29.09	23.91	39.17	33.99	56.00	46.00	-16.83	-12.01
6	4.00781	10.21	26.03	19.67	36.24	29.88	56.00	46.00	-19.76	-16.12

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



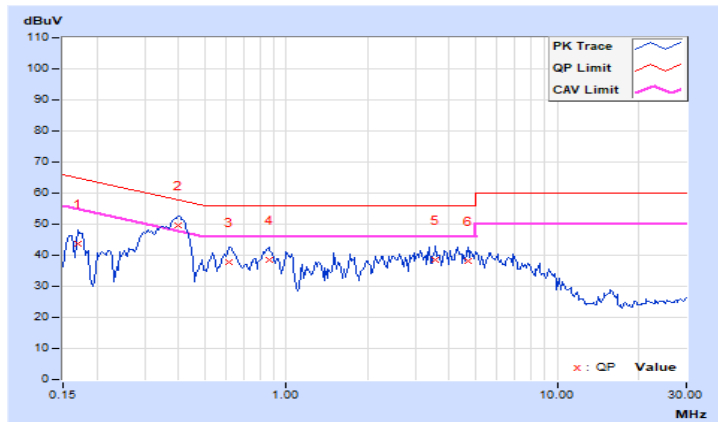
4.2.8 Test Results (Mode 2)

<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	10.05	33.69	23.95	43.74	34.00	64.98	54.98	-21.24	-20.98
2	0.40000	10.07	39.55	32.16	49.62	42.23	57.85	47.85	-8.23	-5.62
3	0.61094	10.08	27.85	21.73	37.93	31.81	56.00	46.00	-18.07	-14.19
4	0.86094	10.10	28.43	22.91	38.53	33.01	56.00	46.00	-17.47	-12.99
5	3.55859	10.24	28.31	21.63	38.55	31.87	56.00	46.00	-17.45	-14.13
6	4.69141	10.30	27.75	18.84	38.05	29.14	56.00	46.00	-17.95	-16.86

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

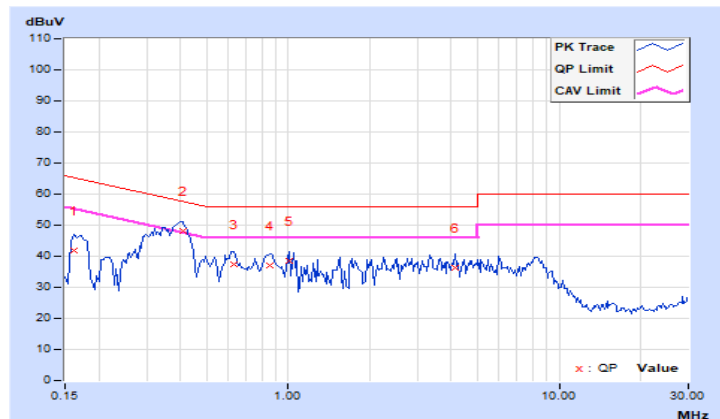


<b>RF Mode</b>	TX LoRa_Hybrid	<b>Channel</b>	CH 23 : 927.7 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	10.02	31.72	18.36	41.74	28.38	65.38	55.38	-23.64	-27.00
2	0.40781	10.04	37.95	30.63	47.99	40.67	57.69	47.69	-9.70	-7.02
3	0.63438	10.05	27.52	21.12	37.57	31.17	56.00	46.00	-18.43	-14.83
4	0.85703	10.07	27.01	21.57	37.08	31.64	56.00	46.00	-18.92	-14.36
5	1.01172	10.08	28.42	22.82	38.50	32.90	56.00	46.00	-17.50	-13.10
6	4.12500	10.22	26.16	19.85	36.38	30.07	56.00	46.00	-19.62	-15.93

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

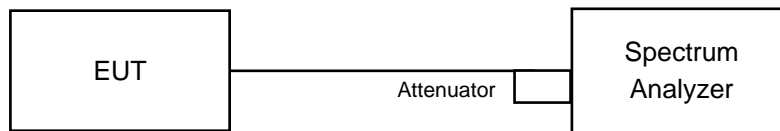


### 4.3 Number of Hopping Frequency Used

#### 4.3.1 Limits of Hopping Frequency Used Measurement

There is no minimum number of hopping channels associated with this type of hybrid system.

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

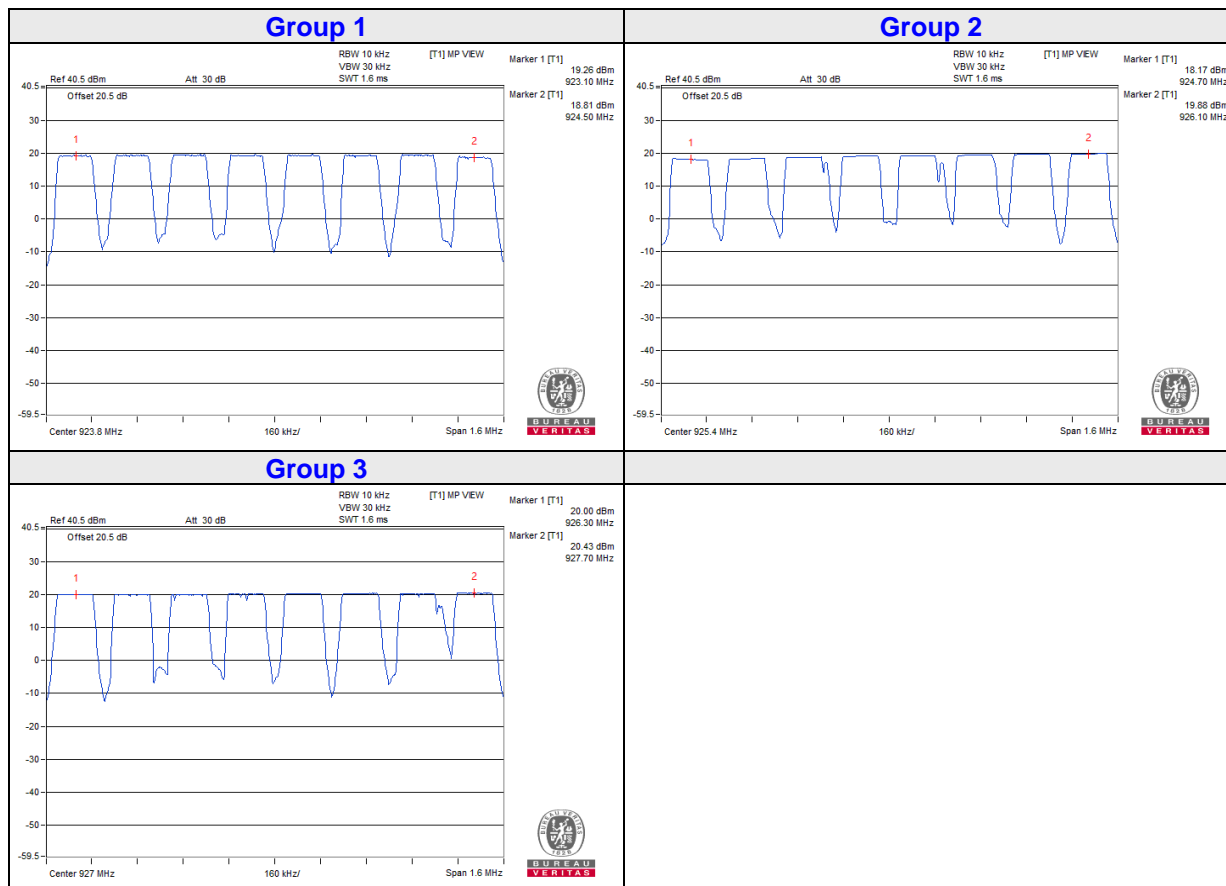
- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- d. Set the SA on View mode and then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were complete.

#### 4.3.5 Deviation from Test Standard

No deviation.

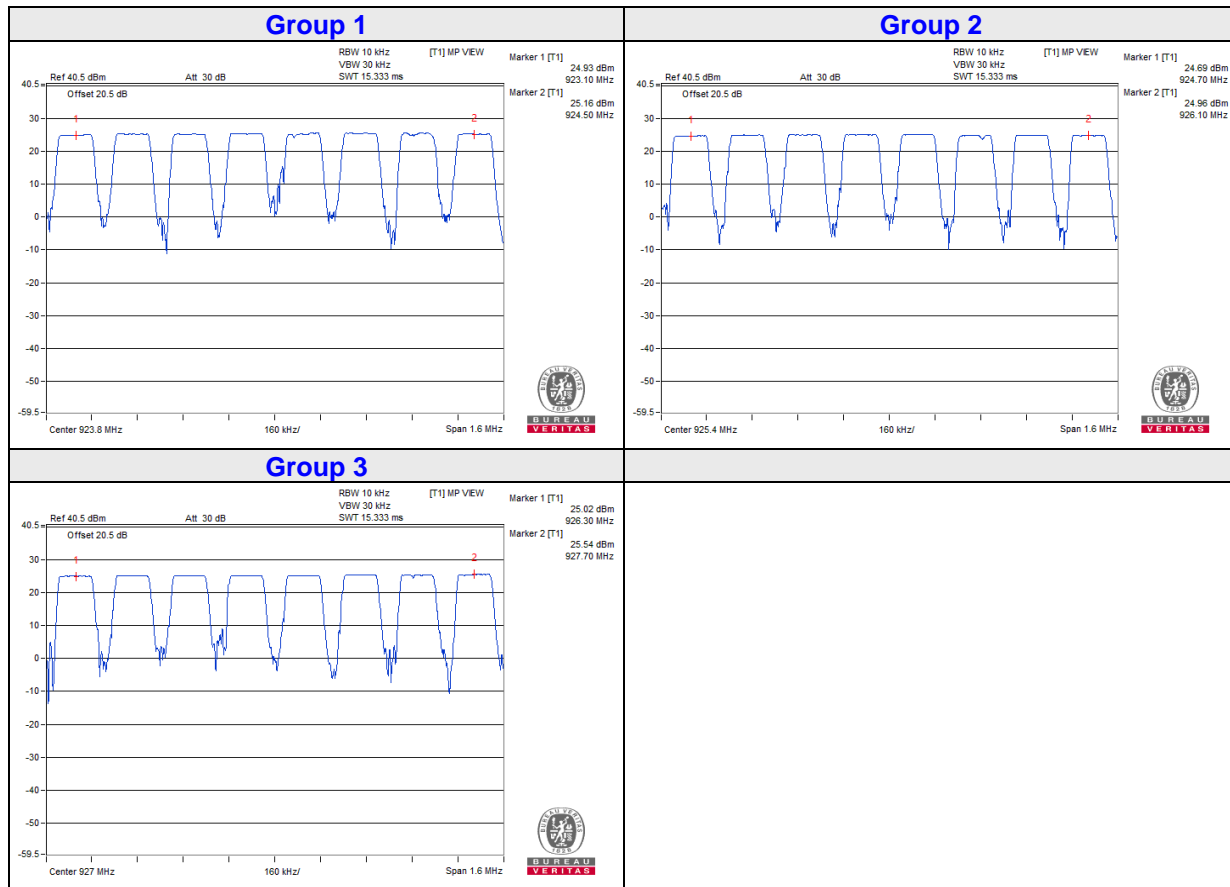
### 4.3.6 Test Results (Mode 1)

There are 8 hopping frequencies in the hybrid mode of each group.



### 4.3.7 Test Results (Mode 2)

There are 8 hopping frequencies in the hybrid mode of each group.

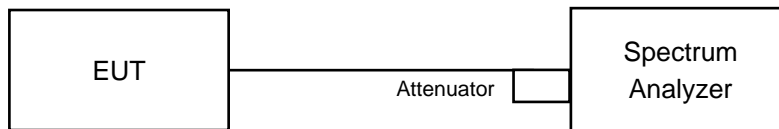


## 4.4 Dwell Time on Each Channel

### 4.4.1 Limits of Dwell Time on Each Channel Measurement

A hybrid system must comply with a 0.4 second/channel maximum dwell time when the hopping function is turned on.

### 4.4.2 Test Setup



### 4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.4.4 Test Procedures

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

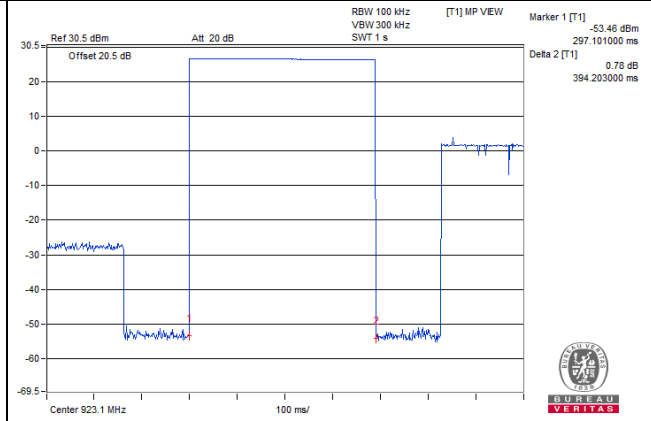
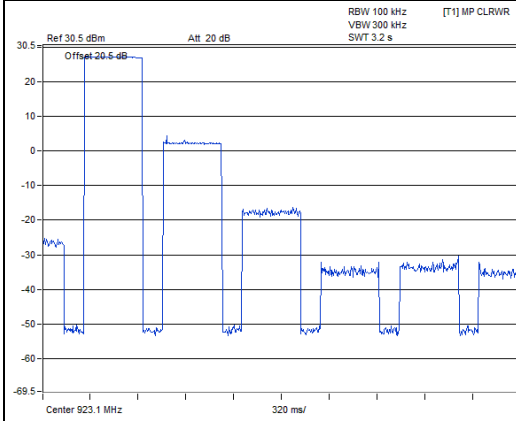
### 4.4.5 Deviation from Test Standard

No deviation.

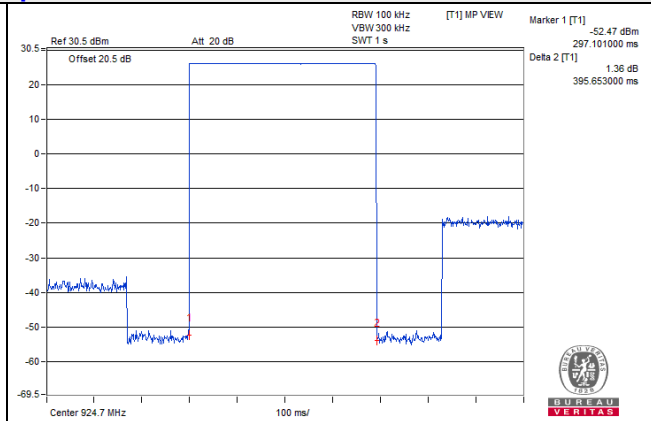
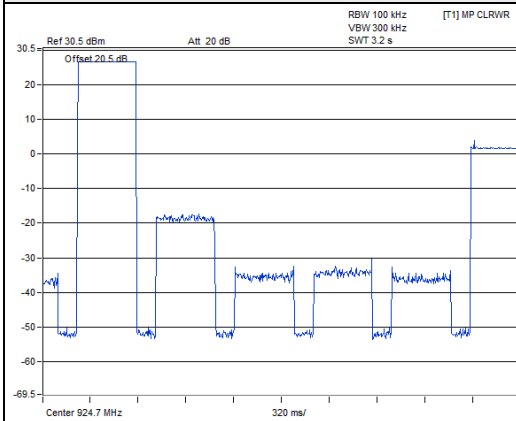
#### 4.4.6 Test Results (Mode 1)

Group	Number of transmission in 3.2 sec (8Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)	Test Result
1	1 times	394.203	394.203	400	Pass
2	1 times	395.653	395.653	400	Pass
3	1 times	397.101	397.101	400	Pass

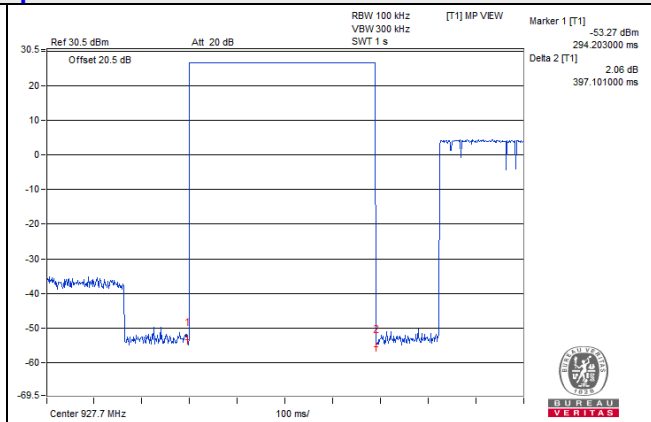
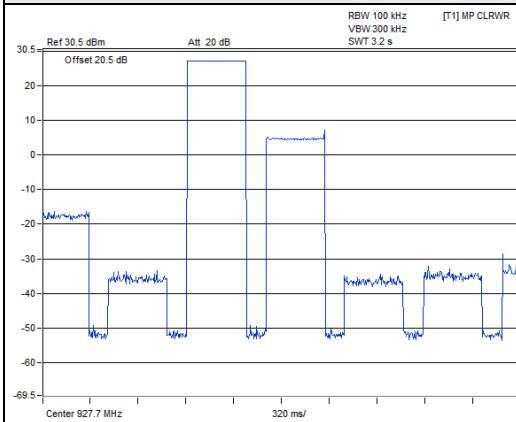
#### Group 1



#### Group 2



#### Group 3

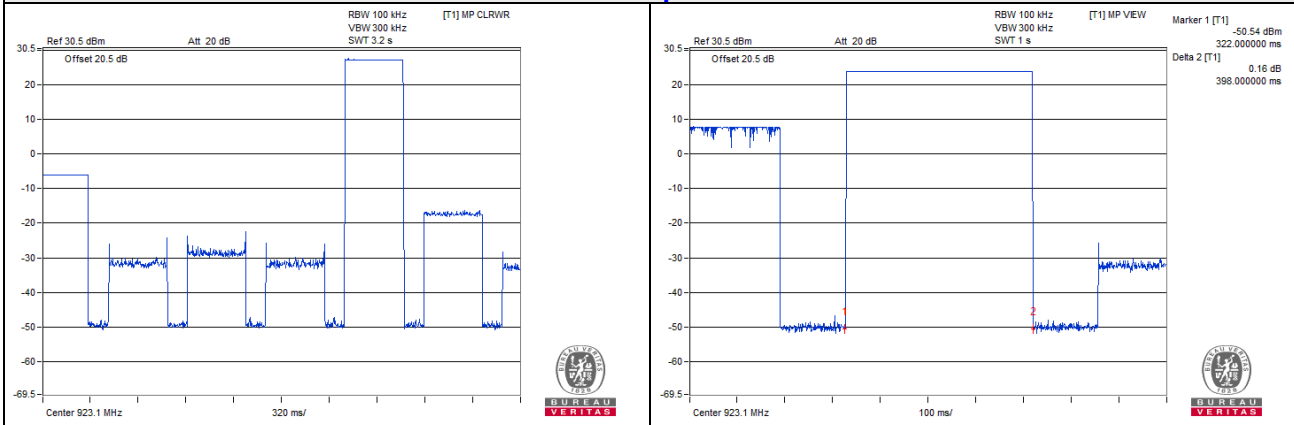




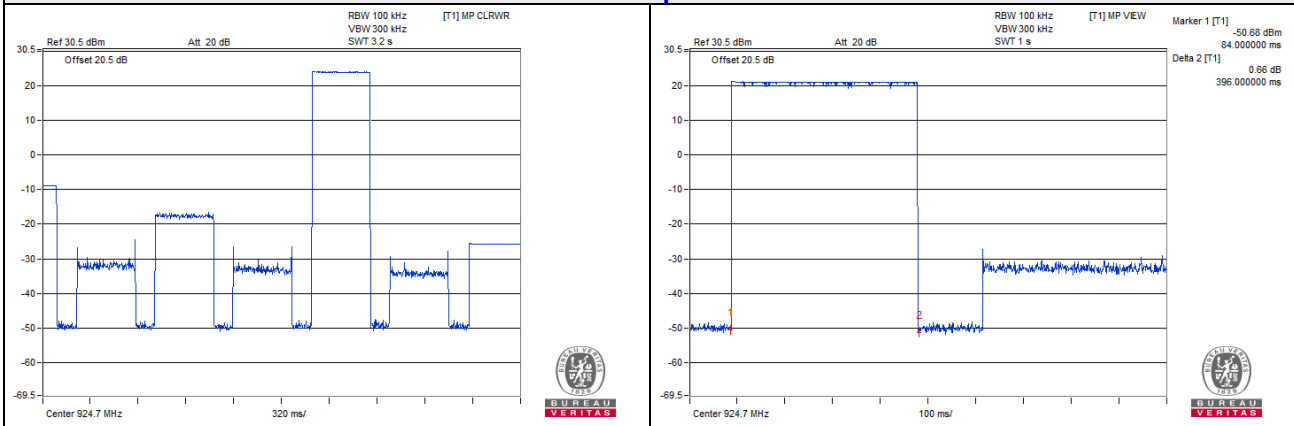
#### 4.4.7 Test Results (Mode 2)

Group	Number of transmission in 3.2 sec (8Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)	Test Result
1	1 times	398	398	400	Pass
2	1 times	396	396	400	Pass
3	1 times	398.8	398.8	400	Pass

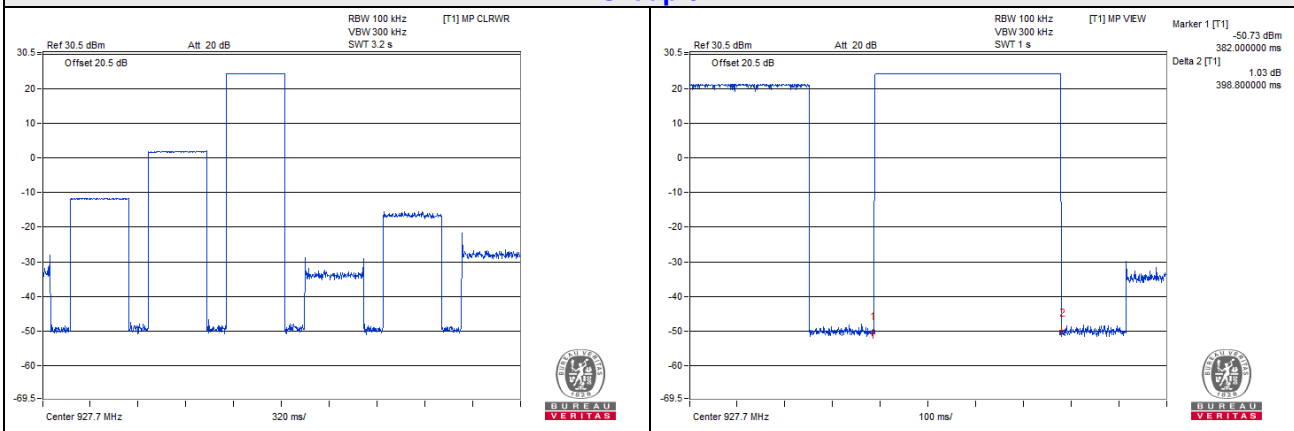
#### Group 1



#### Group 2



#### Group 3

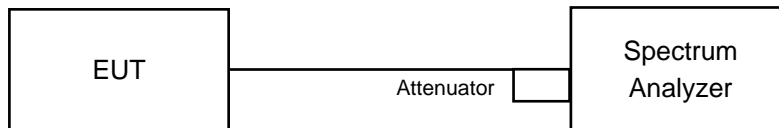


## 4.5 Channel Bandwidth

### 4.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 902-928MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz.

### 4.5.2 Test Setup



### 4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

### 4.5.5 Deviation from Test Standard

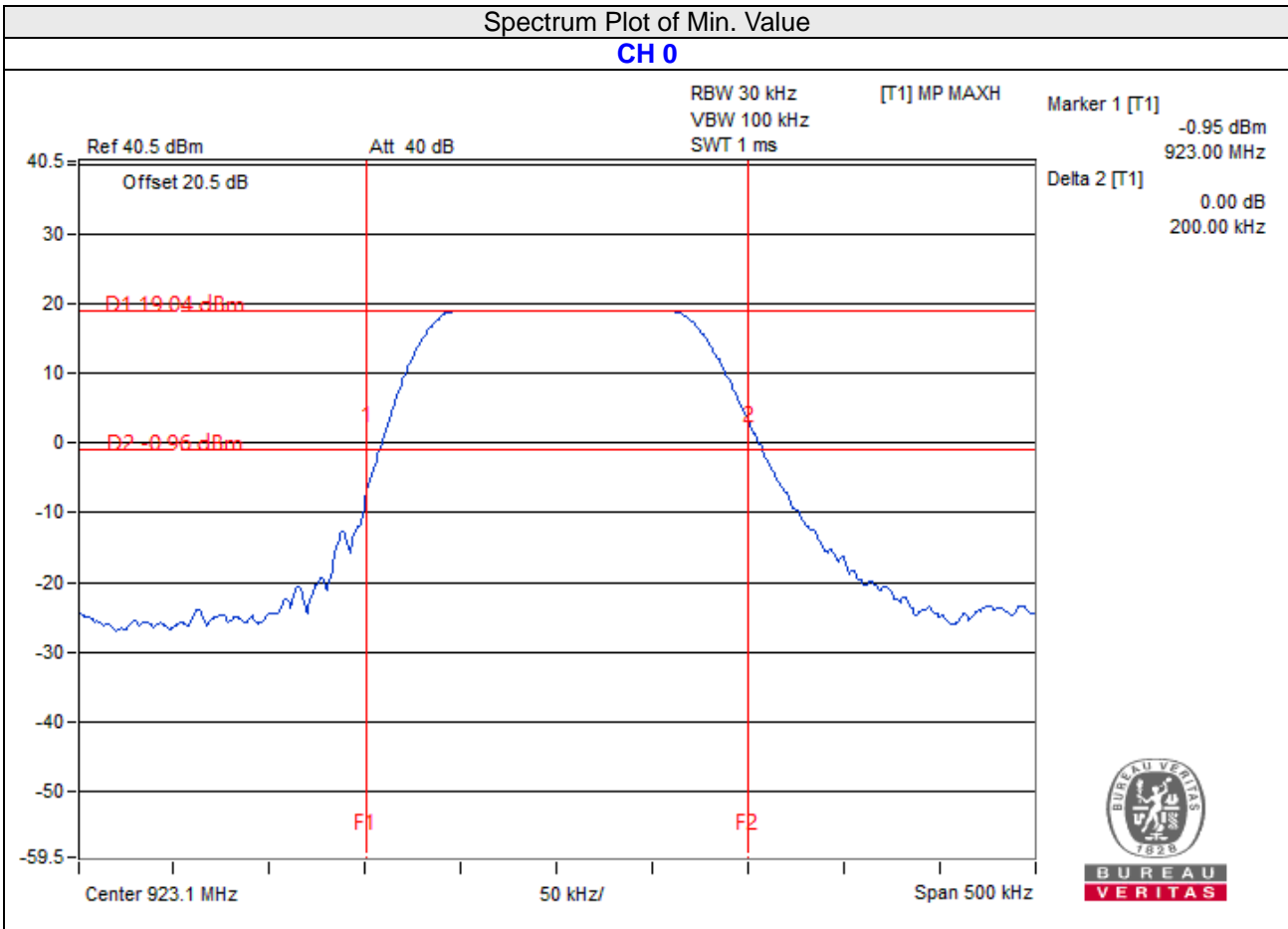
No deviation.

### 4.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest and highest channel frequencies individually.

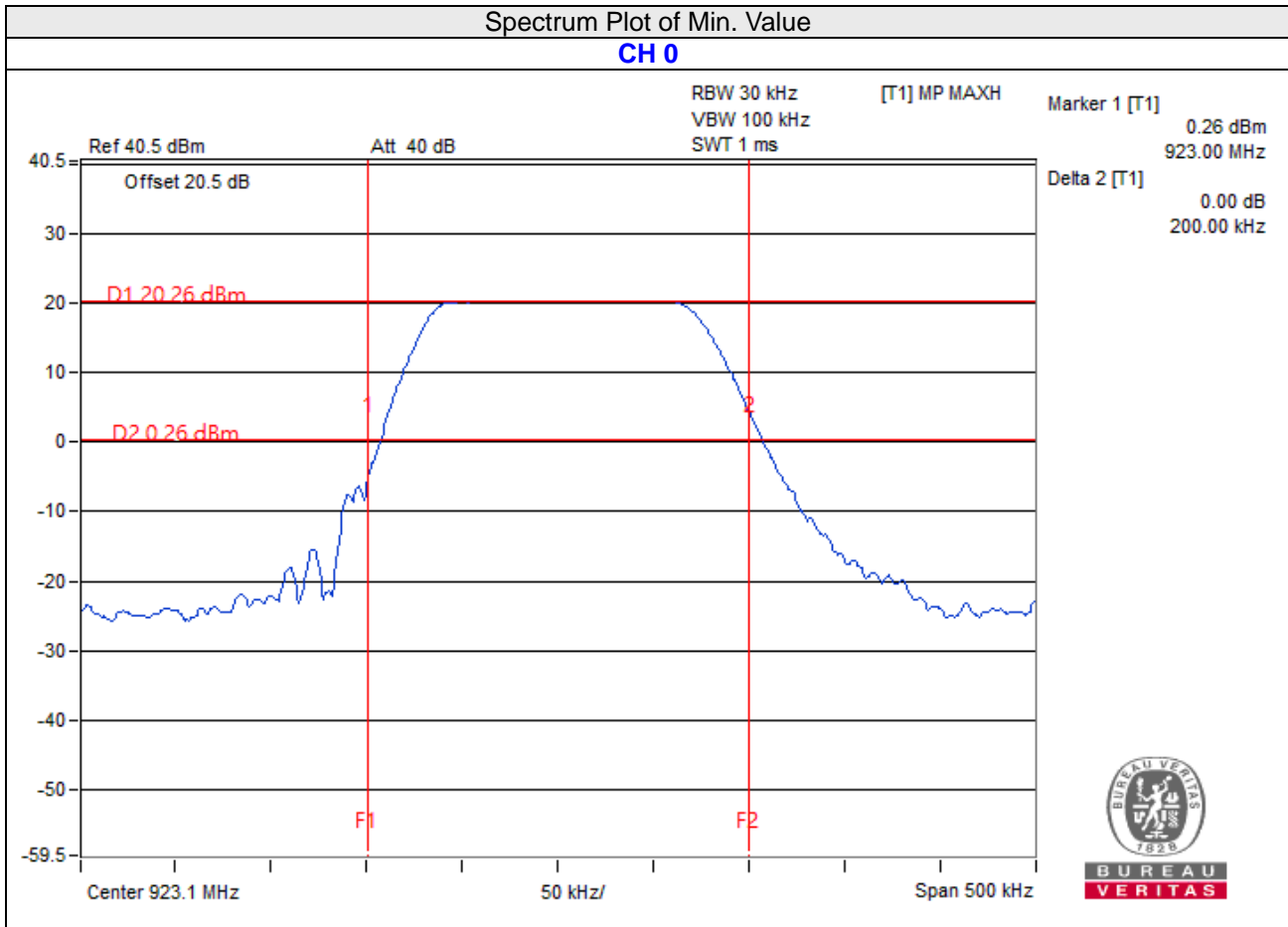
#### 4.5.7 Test Results (Mode 1)

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	>= 25kHz
0	923.1	0.2	Yes
23	927.7	0.2	Yes



#### 4.5.8 Test Results (Mode 2)

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	>= 25kHz
0	923.1	0.2	Yes
23	927.7	0.2	Yes

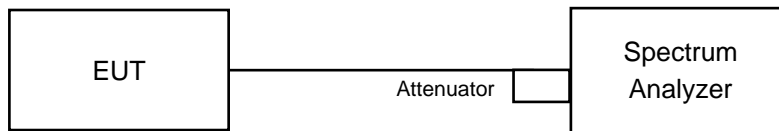


## 4.6 Hopping Channel Separation

### 4.6.1 Limits of Hopping Channel Separation Measurement

At least 25kHz or 20dB hopping channel bandwidth (whichever is greater).

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

Measurement Procedure REF

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

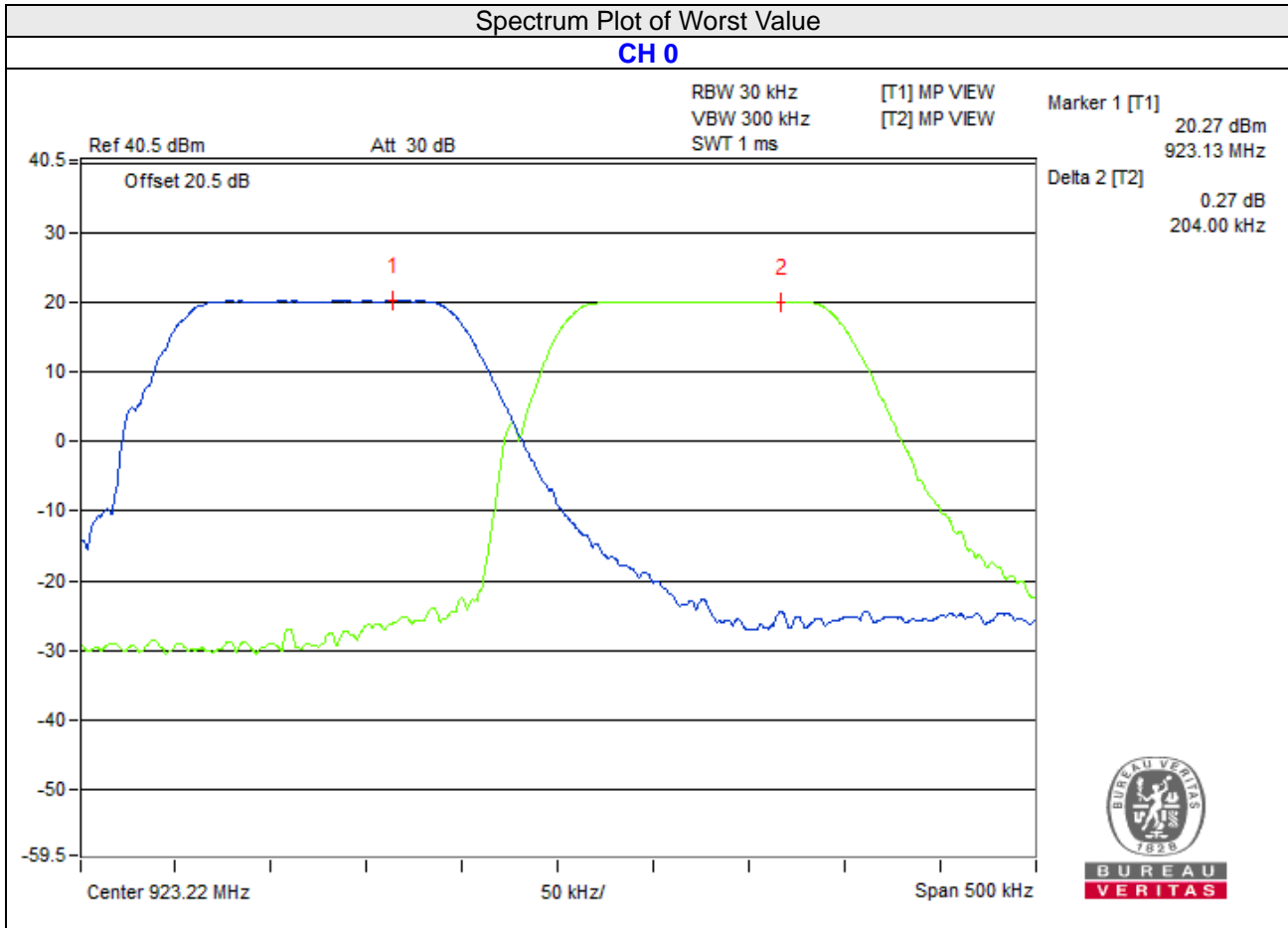
### 4.6.5 Deviation from Test Standard

No deviation.

#### 4.6.6 Test Results (Mode 1)

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	923.1	0.204	0.2	0.2	Pass
23	927.7	0.203	0.2	0.2	Pass

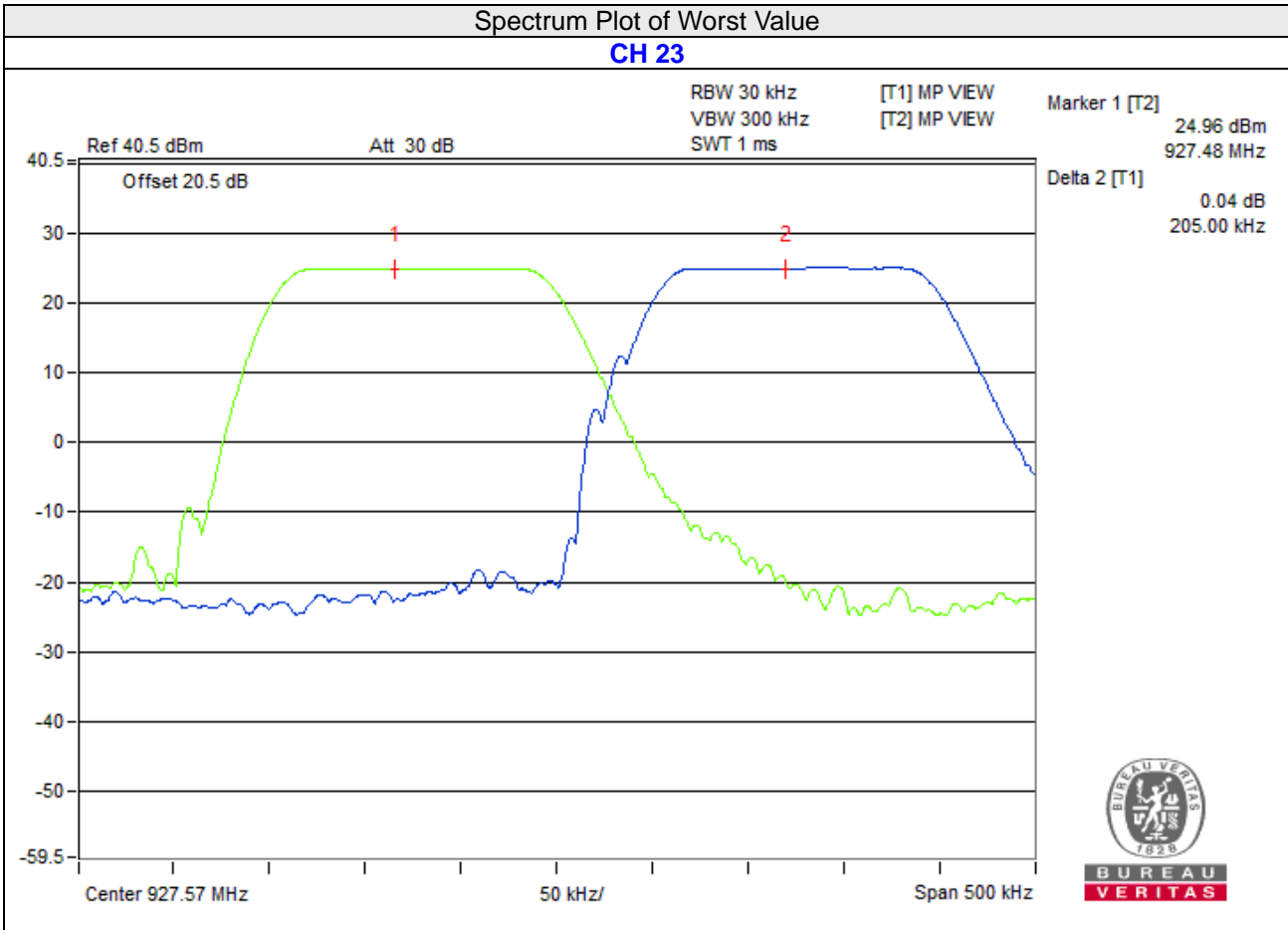
**Note:** The minimum limit is 20dB bandwidth.



#### 4.6.7 Test Results (Mode 2)

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	923.1	0.204	0.2	0.2	Pass
23	927.7	0.205	0.2	0.2	Pass

**Note:** The minimum limit is 20dB bandwidth.

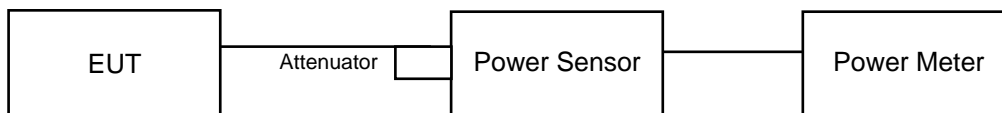


## 4.7 Maximum Output Power

### 4.7.1 Limits of Maximum Output Power Measurement

For hybrid system using in the 902-928 MHz bands: 1 Watt (30dBm)

### 4.7.2 Test Setup



### 4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.7.4 Test Procedure

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

### 4.7.5 Deviation from Test Standard

No deviation.

### 4.7.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest and highest channel frequencies individually.

### 4.7.7 Test Results (Mode 1)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
0	923.1	96.383	19.84	30	Pass
23	927.7	119.399	20.77	30	Pass

### 4.7.8 Test Results (Mode 2)

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
0	923.1	136.458	21.35	30	Pass
23	927.7	130.317	21.15	30	Pass



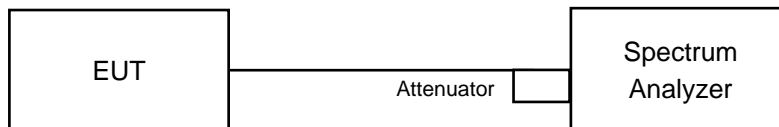
## 4.8 Power Spectral Density Measurement

### 4.8.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

A hybrid system must comply with the power density standard of 8 dBm in any 3 kHz band when the frequency hopping function is turned off

### 4.8.2 Test Setup



### 4.8.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.8.4 Test Procedure

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the DTS bandwidth.
- c. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set the VBW  $\geq 3 \times \text{RBW}$ .
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. Use the peak marker function to determine the maximum amplitude level within the RBW.

### 4.8.5 Deviation from Test Standard

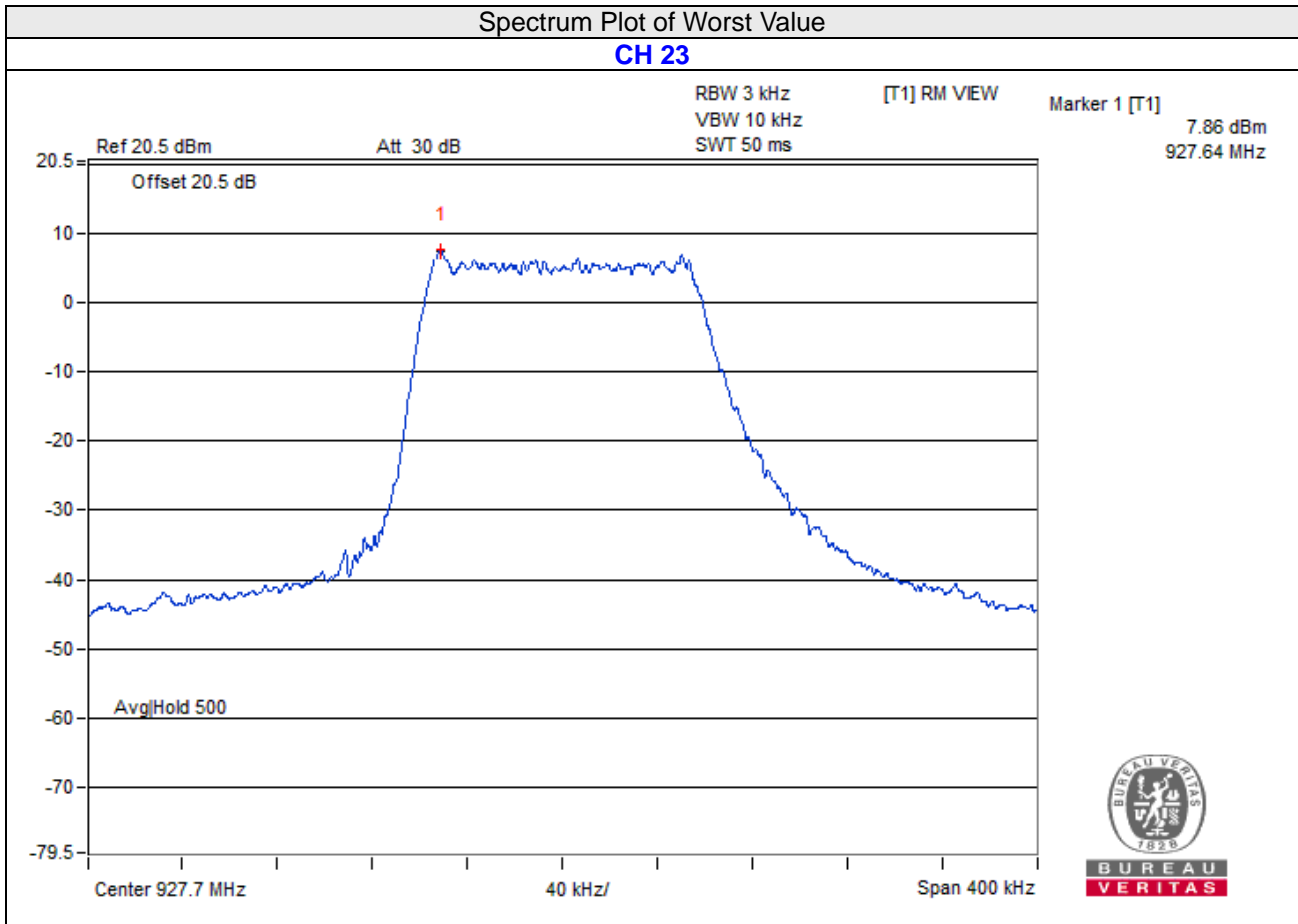
No deviation.

### 4.8.6 EUT Operating Condition

Same as Item 4.7.6.

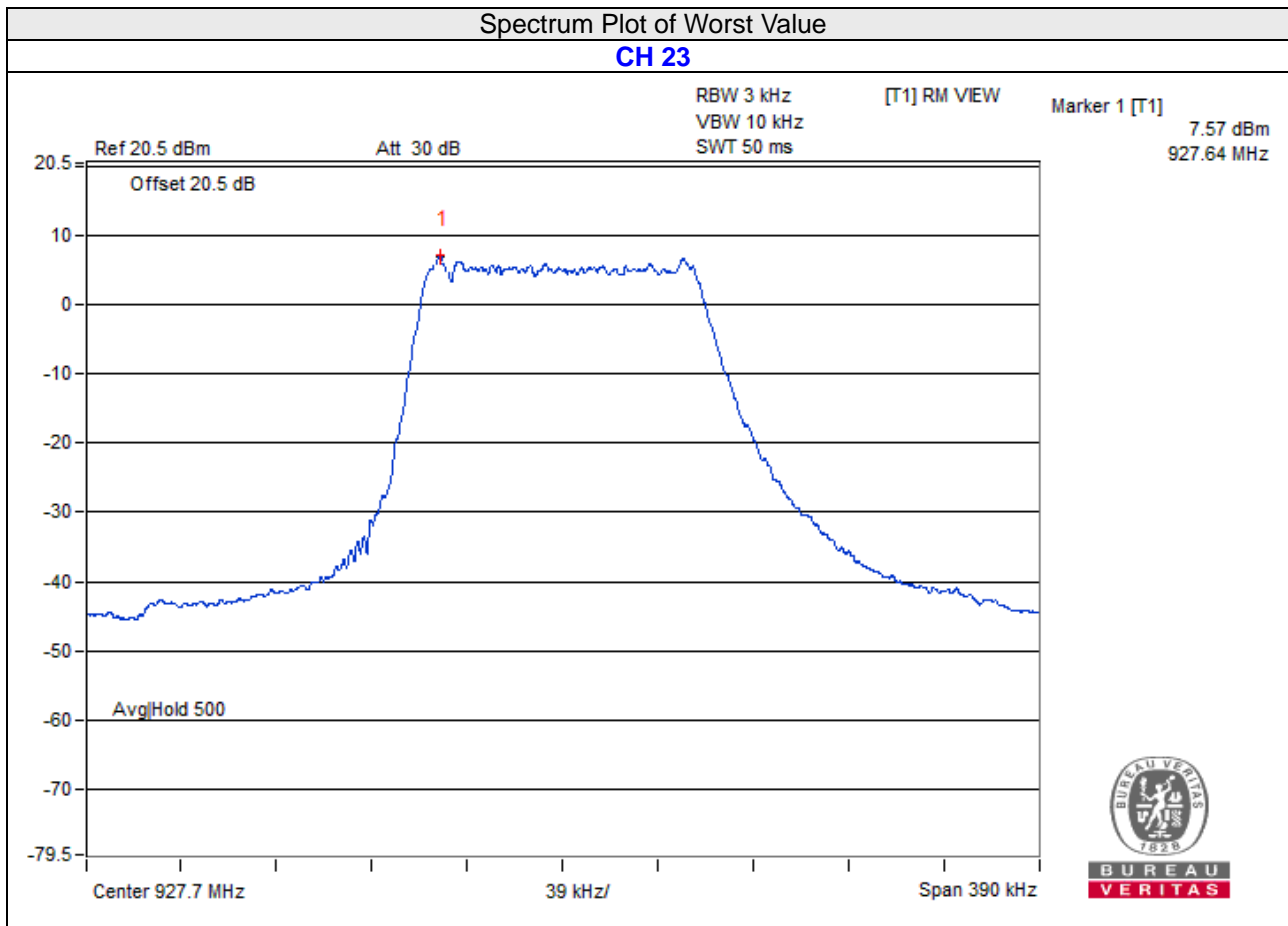
#### 4.8.7 Test Results (Mode 1)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	923.1	7.47	8.00	Pass
23	927.7	7.86	8.00	Pass



4.8.8 Test Results (Mode 2)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	923.1	6.58	8.00	Pass
23	927.7	7.57	8.00	Pass



## 4.9 Conducted Out of Band Emission Measurement

### 4.9.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.9.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.9.3 Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

### 4.9.4 Deviation from Test Standard

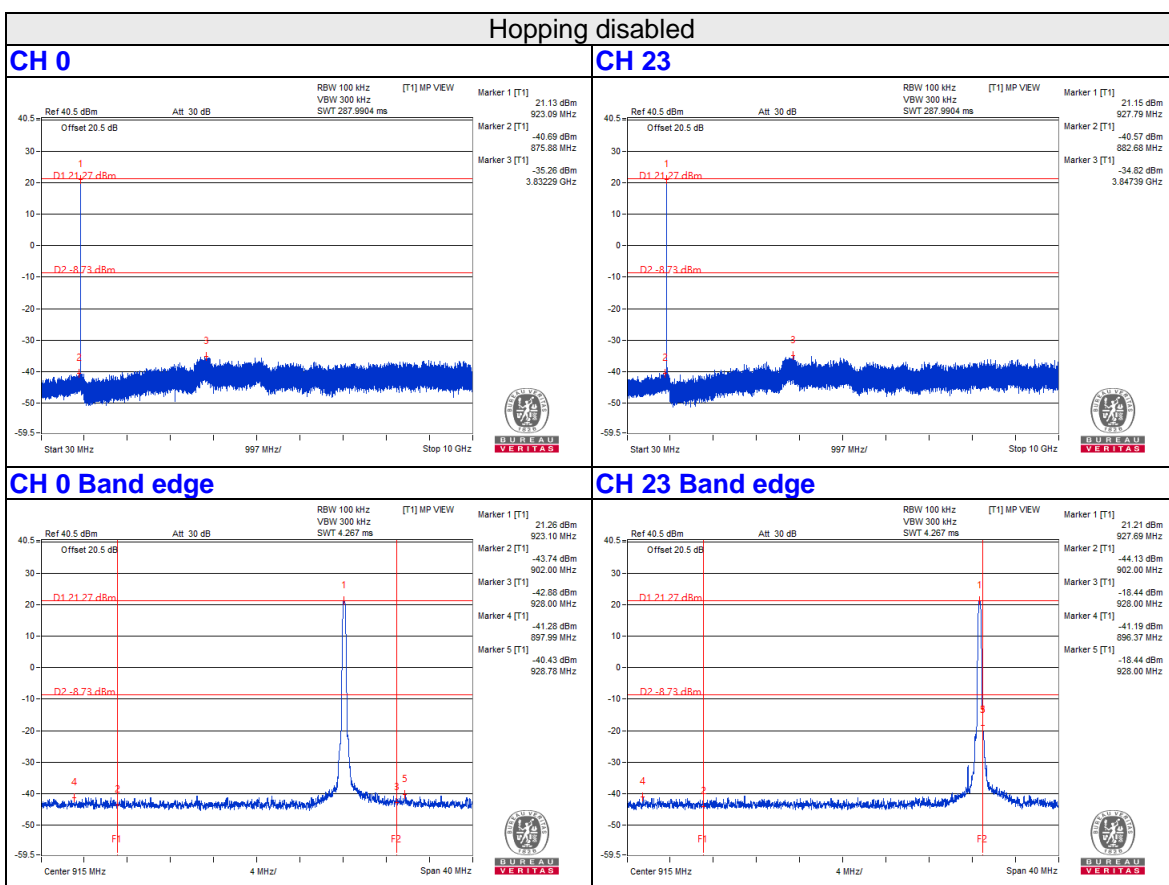
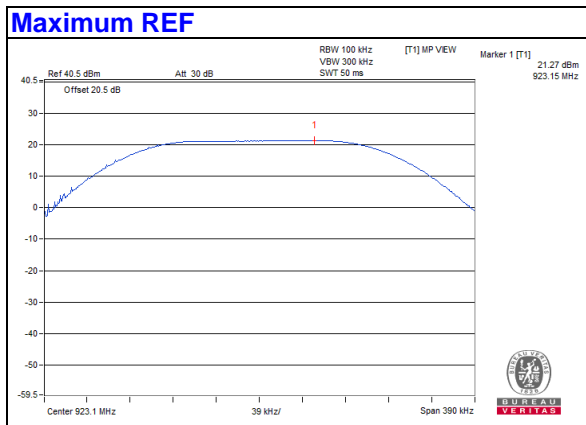
No deviation.

### 4.9.5 EUT Operating Condition

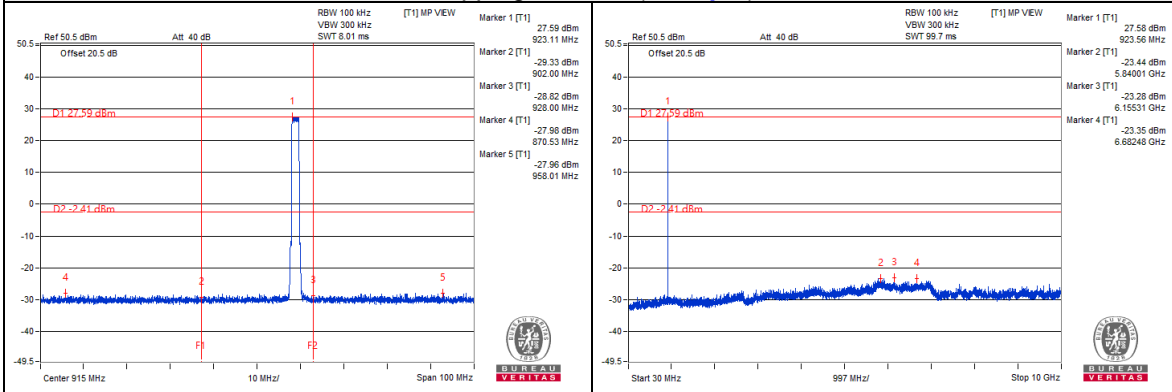
The software provided by client enabled the EUT to transmit and receive data at lowest and highest channel frequencies individually.

### 4.9.6 Test Results (Mode 1)

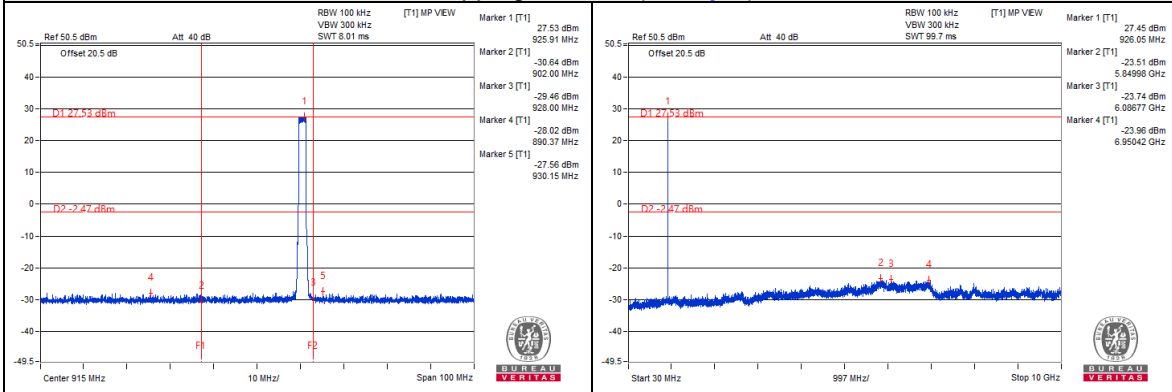
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.



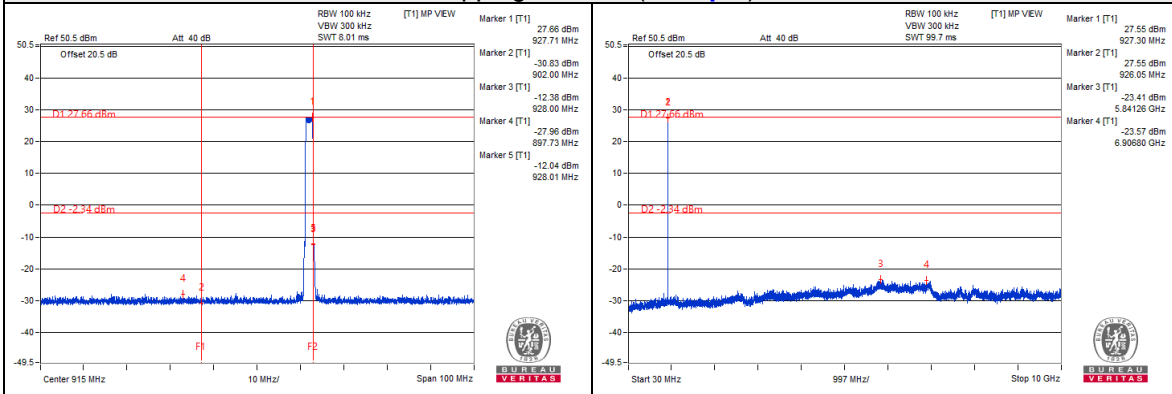
### Hopping enabled (Group 1)



### Hopping enabled (Group 2)

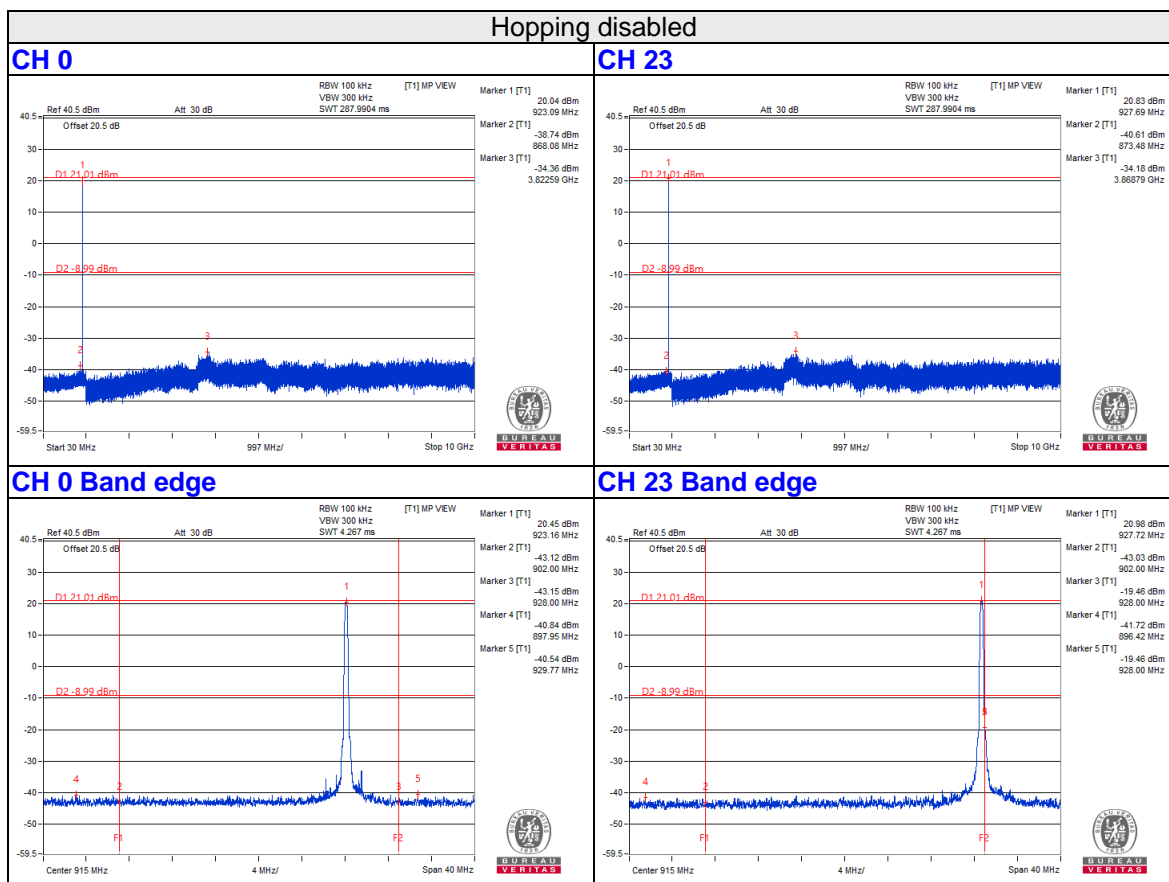
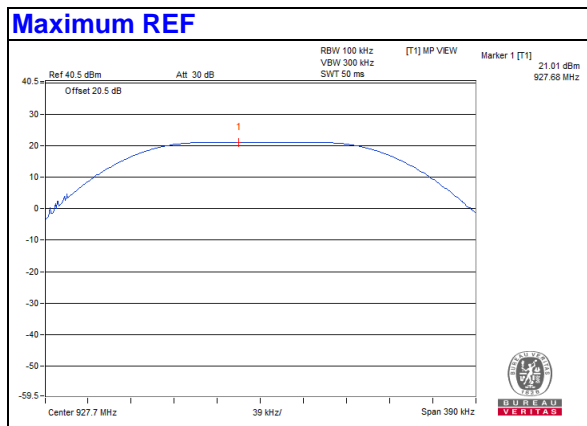


### Hopping enabled (Group 3)

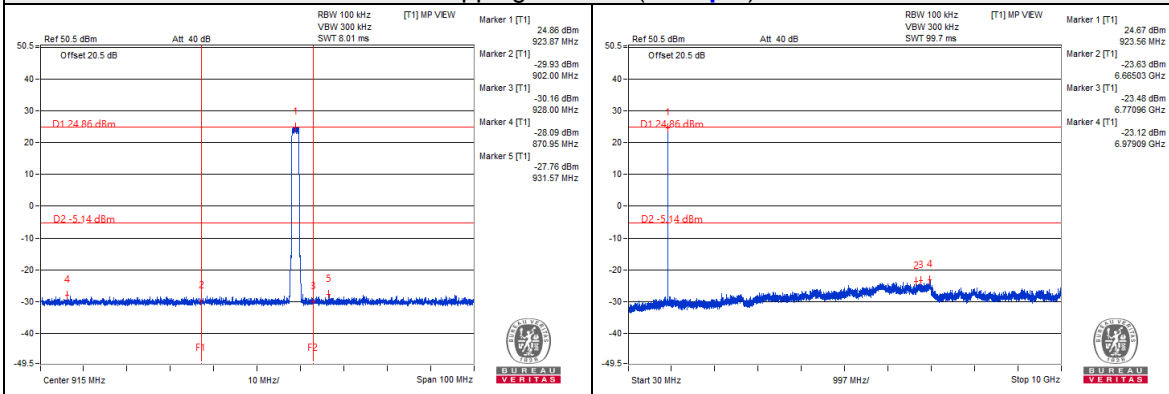


### 4.9.7 Test Results (Mode 2)

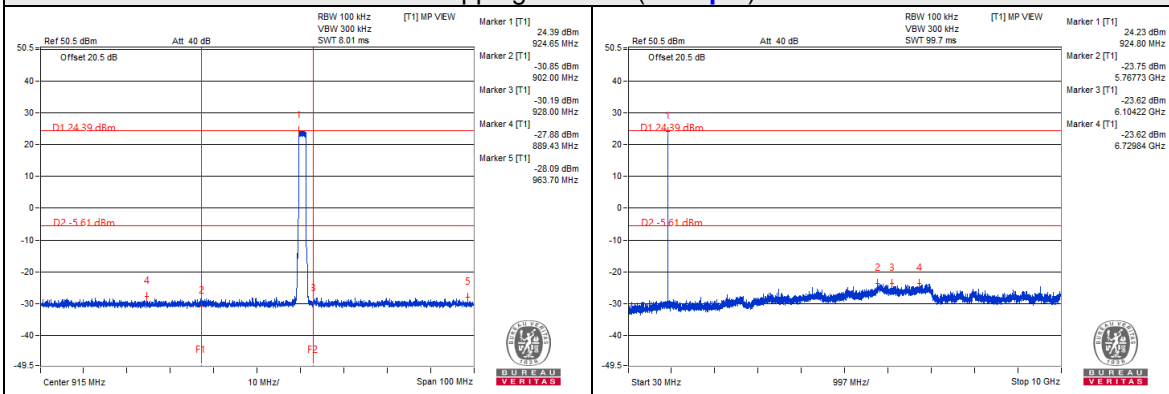
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.



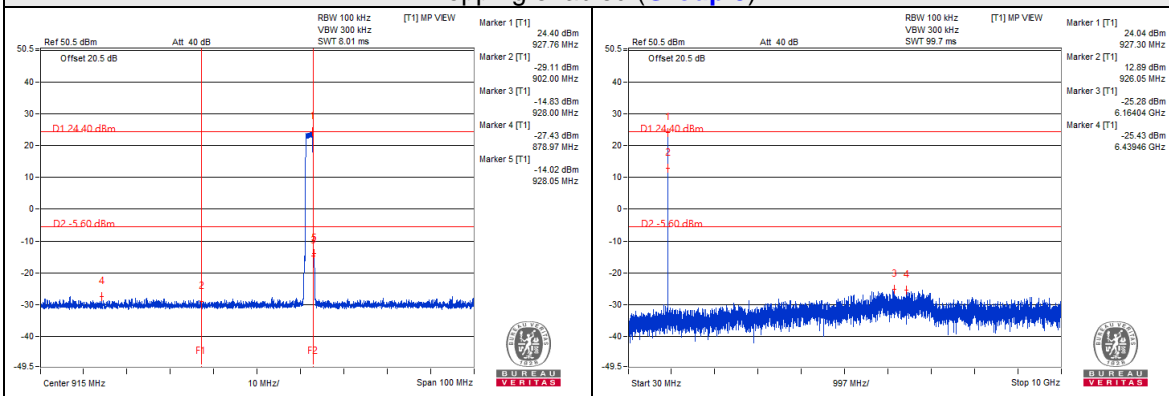
### Hopping enabled (Group 1)



### Hopping enabled (Group 2)



### Hopping enabled (Group 3)





## 5 Test Types and Results (DTS Mode)

### 5.1 Radiated Emission and Bandedge Measurement

#### 5.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**Note:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 5.1.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 5.1.3 Test Procedures

#### **For Radiated emission below 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

#### **For Radiated emission above 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

#### **Note:**

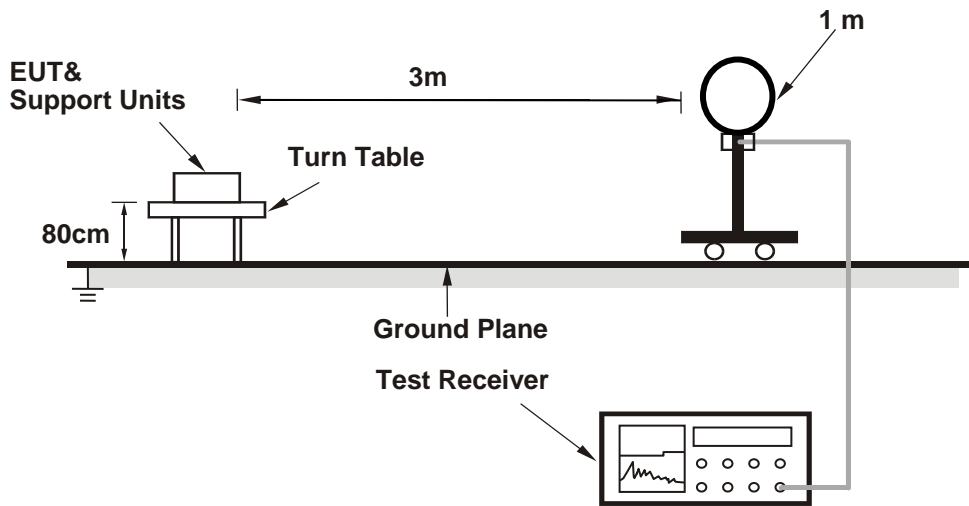
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

5.1.4 Deviation from Test Standard

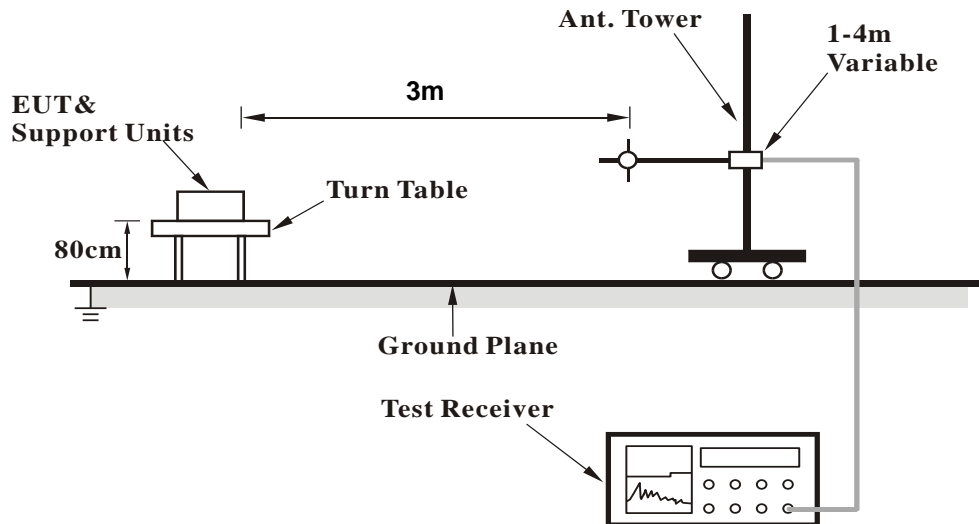
No deviation.

5.1.5 Test Setup

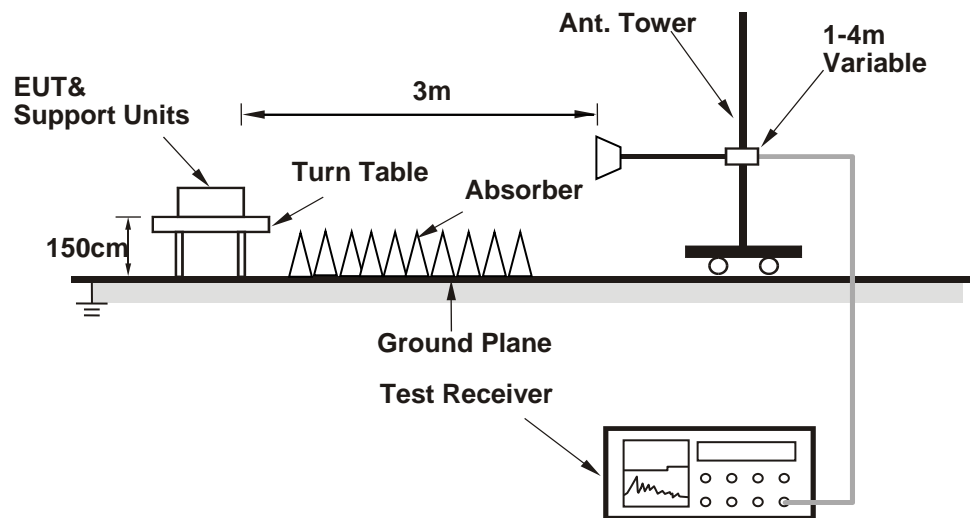
**For Radiated emission below 30MHz**



**For Radiated emission 30MHz to 1GHz**



### For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 5.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Controlling software (Run Putty.exe paste Lora and Fsk.txt command) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

5.1.7 Test Results (Mode 1)

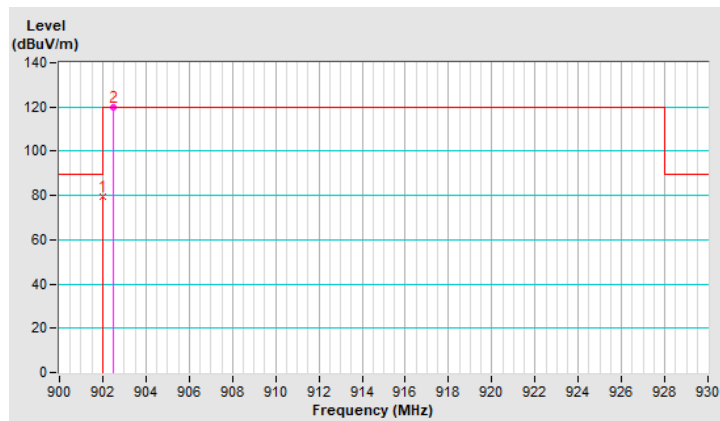
**Bandedge Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 902.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	79.2 QP	89.6	-10.4	1.40 H	134	48.9	30.3
2	*902.50	119.6 QP			1.40 H	134	89.3	30.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

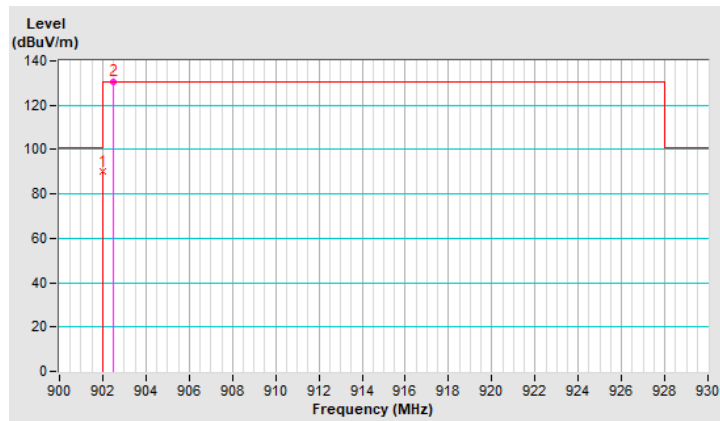


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 902.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	90.2 QP	100.7	-10.5	1.00 V	146	59.9	30.3
2	*902.50	130.7 QP			1.00 V	146	100.4	30.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

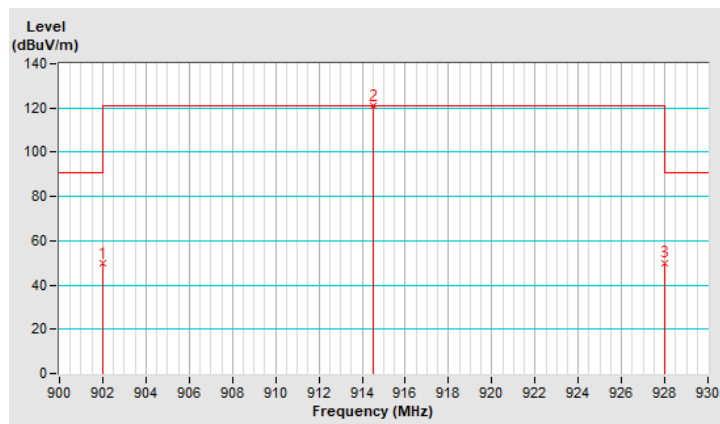


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 15 : 914.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	49.7 QP	90.8	-41.1	1.40 H	135	19.4	30.3
2	*914.50	120.8 QP			1.40 H	135	90.1	30.7
3	928.00	49.9 QP	90.8	-40.9	1.40 H	135	19.0	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

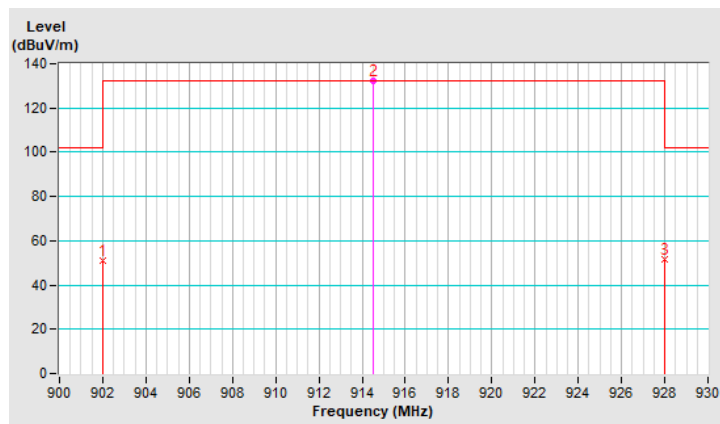


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 15 : 914.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	50.9 QP	102.1	-51.2	1.00 V	148	20.6	30.3
2	*914.50	132.1 QP			1.00 V	148	101.4	30.7
3	928.00	51.5 QP	102.1	-50.6	1.00 V	148	20.6	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



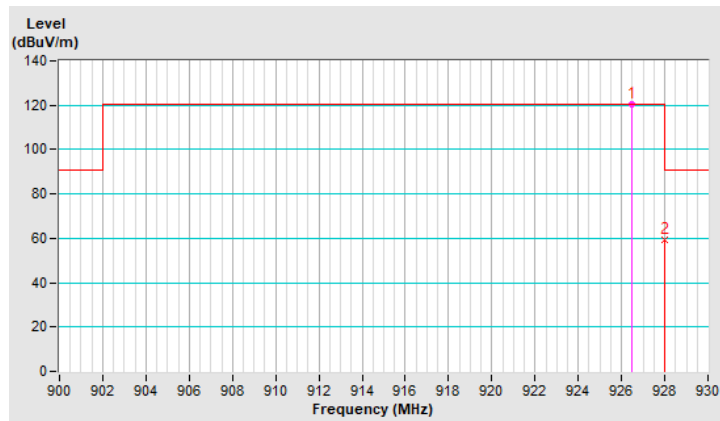


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*926.50	120.6 QP			1.30 H	131	89.7	30.9
2	928.00	59.4 QP	90.6	-31.2	1.30 H	131	28.5	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

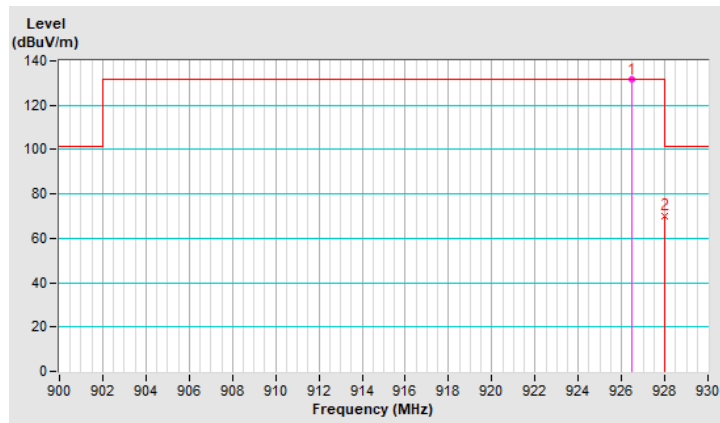


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*926.50	131.6 QP			1.00 V	150	100.7	30.9
2	928.00	70.2 QP	101.6	-31.4	1.00 V	150	39.3	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



**Above 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 902.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.50	36.0 QP	74.0	-38.0	1.54 H	249	38.9	-2.9
2	2707.50	25.3 QP	54.0	-28.7	1.54 H	249	28.2	-2.9
3	3610.00	36.1 QP	74.0	-37.9	1.21 H	151	37.4	-1.3
4	3610.00	24.9 QP	54.0	-29.1	1.21 H	151	26.2	-1.3
5	4512.50	36.3 QP	74.0	-37.7	1.53 H	181	35.9	0.4
6	4512.50	25.1 QP	54.0	-28.9	1.53 H	181	24.7	0.4
7	5415.00	38.7 QP	74.0	-35.3	1.72 H	176	37.1	1.6
8	5415.00	27.0 QP	54.0	-27.0	1.72 H	176	25.4	1.6
9	8122.50	44.5 QP	74.0	-29.5	1.40 H	166	36.4	8.1
10	8122.50	31.8 QP	54.0	-22.2	1.40 H	166	23.7	8.1
11	9025.00	45.0 QP	74.0	-29.0	1.69 H	163	36.5	8.5
12	9025.00	34.0 QP	54.0	-20.0	1.69 H	163	25.5	8.5

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.50	36.6 QP	74.0	-37.4	1.29 V	155	39.5	-2.9
2	2707.50	28.5 QP	54.0	-25.5	1.29 V	155	31.4	-2.9
3	3610.00	38.4 QP	74.0	-35.6	1.91 V	194	39.7	-1.3
4	3610.00	28.0 QP	54.0	-26.0	1.91 V	194	29.3	-1.3
5	4512.50	36.8 QP	74.0	-37.2	1.73 V	146	36.4	0.4
6	4512.50	25.3 QP	54.0	-28.7	1.73 V	146	24.9	0.4
7	5415.00	38.1 QP	74.0	-35.9	1.54 V	140	36.5	1.6
8	5415.00	26.6 QP	54.0	-27.4	1.54 V	140	25.0	1.6
9	8122.50	44.3 QP	74.0	-29.7	1.61 V	147	36.2	8.1
10	8122.50	31.9 QP	54.0	-22.1	1.61 V	147	23.8	8.1
11	9025.00	44.5 QP	74.0	-29.5	1.55 V	160	36.0	8.5
12	9025.00	33.4 QP	54.0	-20.6	1.55 V	160	24.9	8.5

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 15 : 914.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2743.50	37.6 QP	74.0	-36.4	1.46 H	242	40.4	-2.8
2	2743.50	29.2 QP	54.0	-24.8	1.46 H	242	32.0	-2.8
3	3658.00	36.3 QP	74.0	-37.7	1.19 H	113	37.4	-1.1
4	3658.00	27.6 QP	54.0	-26.4	1.19 H	113	28.7	-1.1
5	4572.50	35.9 QP	74.0	-38.1	1.51 H	169	35.4	0.5
6	4572.50	24.7 QP	54.0	-29.3	1.51 H	169	24.2	0.5
7	7316.00	42.9 QP	74.0	-31.1	1.77 H	183	36.2	6.7
8	7316.00	31.8 QP	54.0	-22.2	1.77 H	183	25.1	6.7
9	8230.50	43.8 QP	74.0	-30.2	1.45 H	160	36.0	7.8
10	8230.50	31.9 QP	54.0	-22.1	1.45 H	160	24.1	7.8
11	9145.00	45.0 QP	74.0	-29.0	1.47 H	191	36.0	9.0
12	9145.00	33.8 QP	54.0	-20.2	1.47 H	191	24.8	9.0

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2743.50	37.8 QP	74.0	-36.2	1.02 V	173	40.6	-2.8
2	2743.50	28.7 QP	54.0	-25.3	1.02 V	173	31.5	-2.8
3	3658.00	37.2 QP	74.0	-36.8	2.33 V	176	38.3	-1.1
4	3658.00	27.6 QP	54.0	-26.4	2.33 V	176	28.7	-1.1
5	4572.50	36.6 QP	74.0	-37.4	1.81 V	154	36.1	0.5
6	4572.50	25.2 QP	54.0	-28.8	1.81 V	154	24.7	0.5
7	7316.00	42.5 QP	74.0	-31.5	1.86 V	157	35.8	6.7
8	7316.00	31.3 QP	54.0	-22.7	1.86 V	157	24.6	6.7
9	8230.50	44.0 QP	74.0	-30.0	1.57 V	134	36.2	7.8
10	8230.50	31.6 QP	54.0	-22.4	1.57 V	134	23.8	7.8
11	9145.00	44.9 QP	74.0	-29.1	1.47 V	140	35.9	9.0
12	9145.00	33.8 QP	54.0	-20.2	1.47 V	140	24.8	9.0

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2779.50	38.2 QP	74.0	-35.8	1.65 H	209	40.9	-2.7
2	2779.50	29.5 QP	54.0	-24.5	1.65 H	209	32.2	-2.7
3	3706.00	36.8 QP	74.0	-37.2	1.00 H	148	37.8	-1.0
4	3706.00	28.2 QP	54.0	-25.8	1.00 H	148	29.2	-1.0
5	4632.50	36.2 QP	74.0	-37.8	1.52 H	153	35.7	0.5
6	4632.50	24.8 QP	54.0	-29.2	1.52 H	153	24.3	0.5
7	7412.00	42.8 QP	74.0	-31.2	1.60 H	189	35.5	7.3
8	7412.00	31.4 QP	54.0	-22.6	1.60 H	189	24.1	7.3
9	8338.50	43.9 QP	74.0	-30.1	1.75 H	147	36.6	7.3
10	8338.50	31.2 QP	54.0	-22.8	1.75 H	147	23.9	7.3

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2779.50	37.2 QP	74.0	-36.8	2.50 V	126	39.9	-2.7
2	2779.50	28.0 QP	54.0	-26.0	2.50 V	126	30.7	-2.7
3	3706.00	37.0 QP	74.0	-37.0	1.15 V	161	38.0	-1.0
4	3706.00	27.6 QP	54.0	-26.4	1.15 V	161	28.6	-1.0
5	4632.50	36.7 QP	74.0	-37.3	1.64 V	121	36.2	0.5
6	4632.50	25.5 QP	54.0	-28.5	1.64 V	121	25.0	0.5
7	7412.00	42.9 QP	74.0	-31.1	1.55 V	145	35.6	7.3
8	7412.00	31.4 QP	54.0	-22.6	1.55 V	145	24.1	7.3
9	8338.50	44.1 QP	74.0	-29.9	1.89 V	115	36.8	7.3
10	8338.50	32.2 QP	54.0	-21.8	1.89 V	115	24.9	7.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

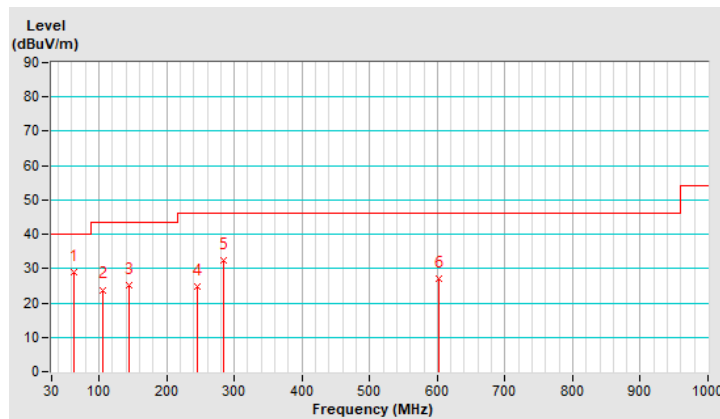
**Below 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	62.62	29.0 QP	40.0	-11.0	1.00 H	46	42.3	-13.3
2	106.00	23.8 QP	43.5	-19.7	1.50 H	266	40.0	-16.2
3	144.35	25.0 QP	43.5	-18.5	2.00 H	360	37.4	-12.4
4	244.91	24.6 QP	46.0	-21.4	2.00 H	139	38.6	-14.0
5	283.54	32.3 QP	46.0	-13.7	2.50 H	120	44.6	-12.3
6	601.97	26.9 QP	46.0	-19.1	1.50 H	175	31.5	-4.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

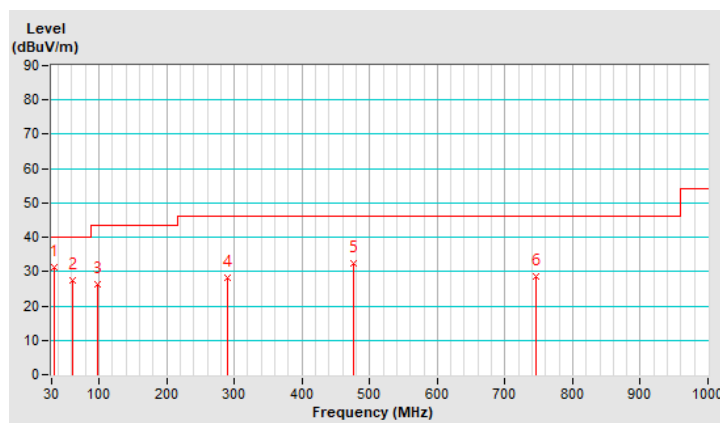


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	33.17	31.4 QP	40.0	-8.6	1.00 V	174	45.0	-13.6
2	61.26	27.4 QP	40.0	-12.6	1.50 V	16	40.4	-13.0
3	98.30	26.2 QP	43.5	-17.3	2.50 V	91	43.6	-17.4
4	290.21	28.2 QP	46.0	-17.8	1.00 V	63	40.5	-12.3
5	476.06	32.3 QP	46.0	-13.7	1.00 V	193	40.0	-7.7
6	745.06	28.4 QP	46.0	-17.6	1.00 V	215	31.0	-2.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



5.1.8 Test Results (Mode 2)

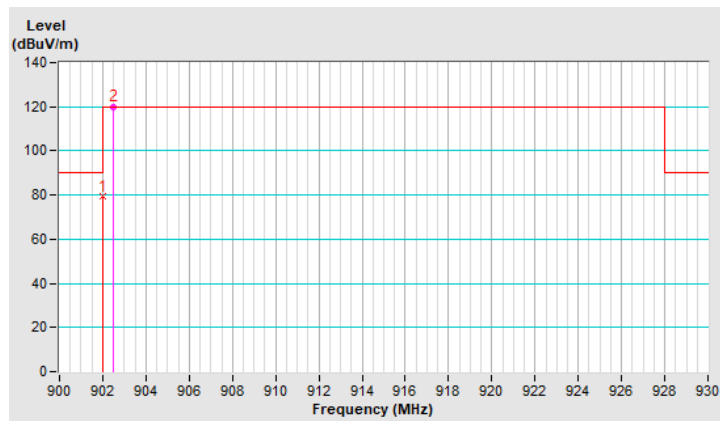
**Bandedge Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 902.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	79.2 QP	90.1	-10.9	1.00 H	340	48.9	30.3
2	*902.50	120.1 QP			1.00 H	340	89.8	30.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



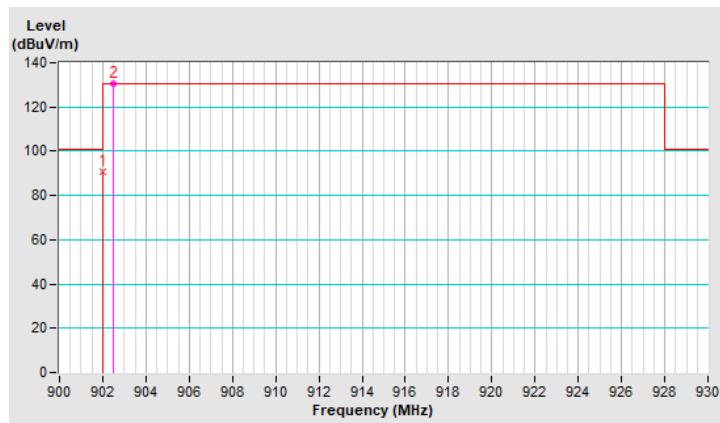


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 902.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	91.0 QP	100.7	-9.7	2.25 V	250	60.7	30.3
2	*902.50	130.7 QP			2.25 V	250	100.4	30.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



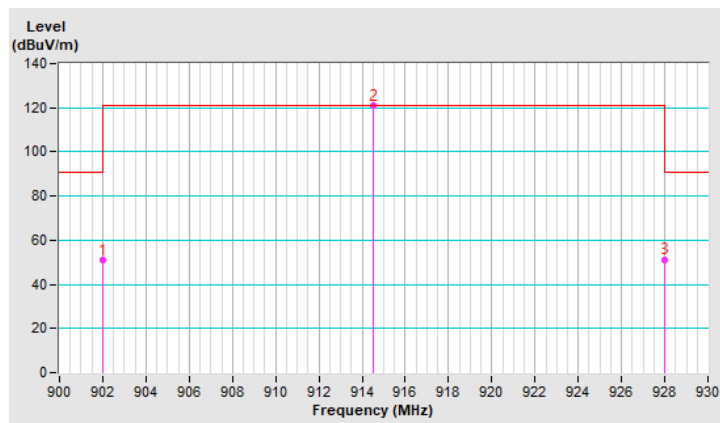
<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 15 : 914.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	51.0 QP	90.8	-39.8	1.40 H	131	20.7	30.3
2	*914.50	120.8 QP			1.40 H	131	90.1	30.7
3	928.00	51.1 QP	90.8	-39.7	1.40 H	131	20.2	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

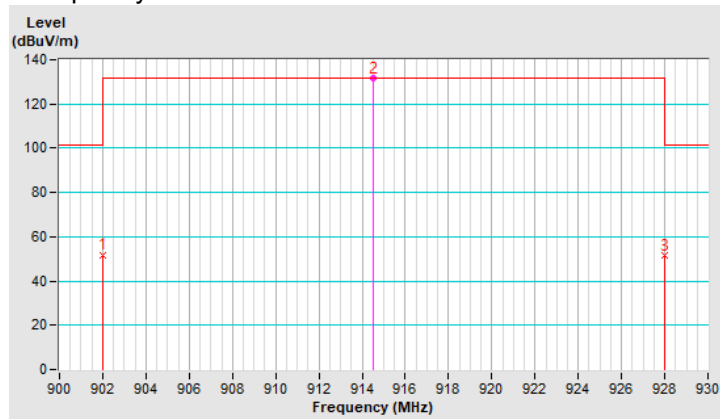


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 15 : 914.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	51.8 QP	101.6	-49.8	2.25 V	240	21.5	30.3
2	*914.50	131.6 QP			2.25 V	240	100.9	30.7
3	928.00	51.4 QP	101.6	-50.2	2.25 V	240	20.5	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



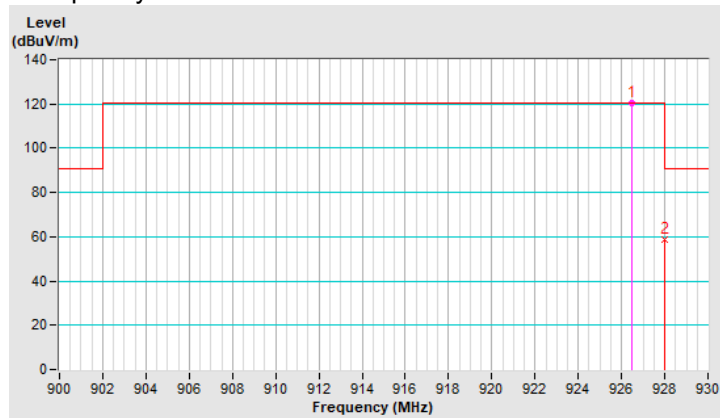
<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*926.50	120.7 QP			1.11 H	120	89.8	30.9
2	928.00	58.9 QP	90.7	-31.8	1.11 H	120	28.0	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

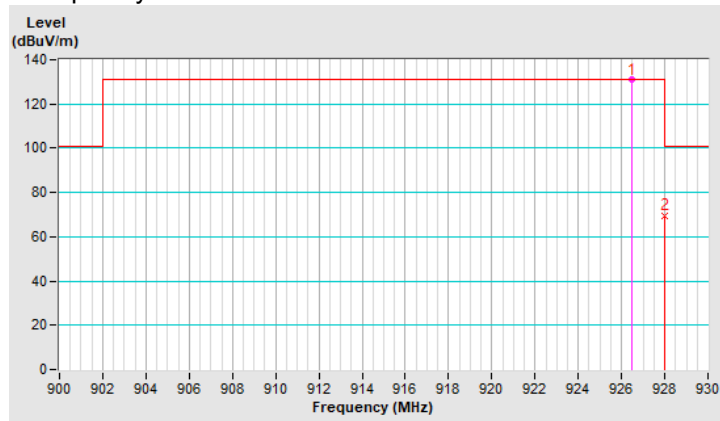


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*926.50	131.0 QP			2.20 V	155	100.1	30.9
2	928.00	69.5 QP	101.0	-31.5	2.20 V	155	38.6	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



**Above 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 902.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.50	36.7 PK	74.0	-37.3	1.65 H	236	39.6	-2.9
2	2707.50	25.0 AV	54.0	-29.0	1.65 H	236	27.9	-2.9
3	3610.00	35.9 PK	74.0	-38.1	1.19 H	162	37.2	-1.3
4	3610.00	25.0 AV	54.0	-29.0	1.19 H	162	26.3	-1.3
5	4512.50	36.0 PK	74.0	-38.0	1.47 H	188	35.6	0.4
6	4512.50	25.3 AV	54.0	-28.7	1.47 H	188	24.9	0.4
7	5415.00	38.9 PK	74.0	-35.1	1.54 H	197	37.3	1.6
8	5415.00	26.8 AV	54.0	-27.2	1.54 H	197	25.2	1.6
9	8122.50	44.4 PK	74.0	-29.6	1.59 H	160	36.3	8.1
10	8122.50	32.1 AV	54.0	-21.9	1.59 H	160	24.0	8.1
11	9025.00	45.1 PK	74.0	-28.9	1.72 H	174	36.6	8.5
12	9025.00	33.5 AV	54.0	-20.5	1.72 H	174	25.0	8.5

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2707.50	37.0 PK	74.0	-37.0	3.18 V	239	39.9	-2.9
2	2707.50	28.2 AV	54.0	-25.8	3.18 V	239	31.1	-2.9
3	3610.00	36.4 PK	74.0	-37.6	1.00 V	111	37.7	-1.3
4	3610.00	25.4 AV	54.0	-28.6	1.00 V	111	26.7	-1.3
5	4512.50	36.2 PK	74.0	-37.8	1.51 V	171	35.8	0.4
6	4512.50	25.6 AV	54.0	-28.4	1.51 V	171	25.2	0.4
7	5415.00	38.7 PK	74.0	-35.3	1.63 V	154	37.1	1.6
8	5415.00	26.7 AV	54.0	-27.3	1.63 V	154	25.1	1.6
9	8122.50	44.2 PK	74.0	-29.8	1.90 V	158	36.1	8.1
10	8122.50	31.2 AV	54.0	-22.8	1.90 V	158	23.1	8.1
11	9025.00	45.0 PK	74.0	-29.0	1.75 V	155	36.5	8.5
12	9025.00	33.1 AV	54.0	-20.9	1.75 V	155	24.6	8.5

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 15 : 914.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2743.50	36.3 PK	74.0	-37.7	1.63 H	257	39.1	-2.8
2	2743.50	25.2 AV	54.0	-28.8	1.63 H	257	28.0	-2.8
3	3658.00	35.6 PK	74.0	-38.4	1.24 H	157	36.7	-1.1
4	3658.00	25.3 AV	54.0	-28.7	1.24 H	157	26.4	-1.1
5	4572.50	36.1 PK	74.0	-37.9	1.54 H	200	35.6	0.5
6	4572.50	24.6 AV	54.0	-29.4	1.54 H	200	24.1	0.5
7	7316.00	43.0 PK	74.0	-31.0	1.47 H	179	36.3	6.7
8	7316.00	31.6 AV	54.0	-22.4	1.47 H	179	24.9	6.7
9	8230.50	44.1 PK	74.0	-29.9	1.77 H	141	36.3	7.8
10	8230.50	31.9 AV	54.0	-22.1	1.77 H	141	24.1	7.8
11	9145.00	45.1 PK	74.0	-28.9	1.59 H	162	36.1	9.0
12	9145.00	34.0 AV	54.0	-20.0	1.59 H	162	25.0	9.0

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2743.50	37.9 PK	74.0	-36.1	1.48 V	131	40.7	-2.8
2	2743.50	29.0 AV	54.0	-25.0	1.48 V	131	31.8	-2.8
3	3658.00	35.3 PK	74.0	-38.7	1.05 V	167	36.4	-1.1
4	3658.00	25.0 AV	54.0	-29.0	1.05 V	167	26.1	-1.1
5	4572.50	35.3 PK	74.0	-38.7	1.30 V	170	34.8	0.5
6	4572.50	24.6 AV	54.0	-29.4	1.30 V	170	24.1	0.5
7	7316.00	45.7 PK	74.0	-28.3	2.24 V	177	39.0	6.7
8	7316.00	34.3 AV	54.0	-19.7	2.24 V	177	27.6	6.7
9	8230.50	44.3 PK	74.0	-29.7	1.96 V	159	36.5	7.8
10	8230.50	31.8 AV	54.0	-22.2	1.96 V	159	24.0	7.8
11	9145.00	44.8 PK	74.0	-29.2	1.69 V	168	35.8	9.0
12	9145.00	34.5 AV	54.0	-19.5	1.69 V	168	25.5	9.0

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2779.50	36.0 PK	74.0	-38.0	1.77 H	206	38.7	-2.7
2	2779.50	25.4 AV	54.0	-28.6	1.77 H	206	28.1	-2.7
3	3706.00	35.4 PK	74.0	-38.6	1.24 H	147	36.4	-1.0
4	3706.00	24.5 AV	54.0	-29.5	1.24 H	147	25.5	-1.0
5	4632.50	36.1 PK	74.0	-37.9	1.44 H	176	35.6	0.5
6	4632.50	25.0 AV	54.0	-29.0	1.44 H	176	24.5	0.5
7	7412.00	43.5 PK	74.0	-30.5	1.28 H	187	36.2	7.3
8	7412.00	31.1 AV	54.0	-22.9	1.28 H	187	23.8	7.3
9	8338.50	44.8 PK	74.0	-29.2	1.40 H	189	37.5	7.3
10	8338.50	32.0 AV	54.0	-22.0	1.40 H	189	24.7	7.3

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2779.50	37.0 PK	74.0	-37.0	1.42 V	228	39.7	-2.7
2	2779.50	28.3 AV	54.0	-25.7	1.42 V	228	31.0	-2.7
3	3706.00	35.9 PK	74.0	-38.1	1.03 V	157	36.9	-1.0
4	3706.00	25.0 AV	54.0	-29.0	1.03 V	157	26.0	-1.0
5	4632.50	35.7 PK	74.0	-38.3	1.54 V	141	35.2	0.5
6	4632.50	24.6 AV	54.0	-29.4	1.54 V	141	24.1	0.5
7	7412.00	48.1 PK	74.0	-25.9	1.13 V	233	40.8	7.3
8	7412.00	37.4 AV	54.0	-16.6	1.13 V	233	30.1	7.3
9	8338.50	44.6 PK	74.0	-29.4	1.54 V	179	37.3	7.3
10	8338.50	32.2 AV	54.0	-21.8	1.54 V	179	24.9	7.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



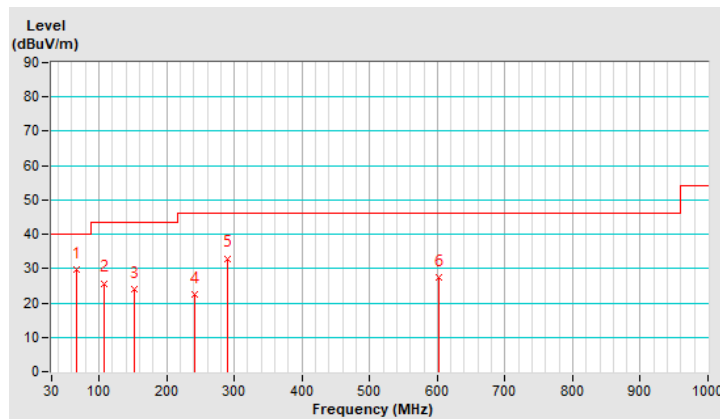
**Below 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.24	29.6 QP	40.0	-10.4	1.50 H	67	43.5	-13.9
2	107.60	25.7 QP	43.5	-17.8	1.50 H	259	41.6	-15.9
3	152.30	23.9 QP	43.5	-19.6	1.50 H	360	36.2	-12.3
4	242.07	22.4 QP	46.0	-23.6	2.00 H	149	36.5	-14.1
5	290.79	33.0 QP	46.0	-13.0	1.50 H	112	45.3	-12.3
6	602.42	27.6 QP	46.0	-18.4	2.50 H	165	32.2	-4.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

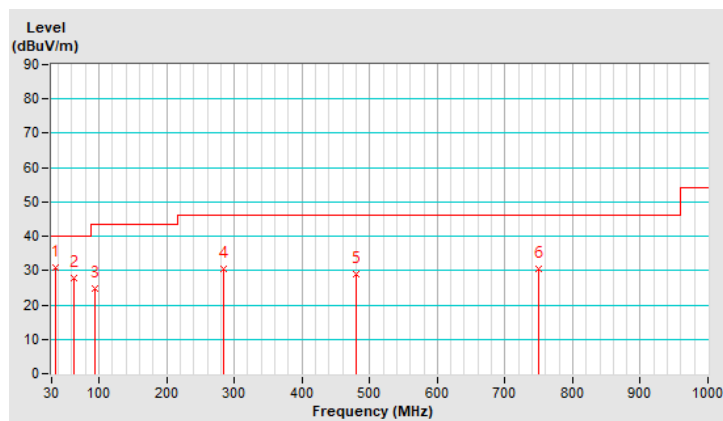


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	36.04	30.9 QP	40.0	-9.1	1.00 V	175	44.4	-13.5
2	62.76	27.8 QP	40.0	-12.2	1.50 V	15	41.1	-13.3
3	93.51	24.9 QP	43.5	-18.6	1.00 V	78	42.9	-18.0
4	284.71	30.5 QP	46.0	-15.5	1.00 V	76	42.8	-12.3
5	480.52	29.0 QP	46.0	-17.0	1.50 V	197	36.7	-7.7
6	748.94	30.6 QP	46.0	-15.4	1.00 V	215	33.2	-2.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



5.1.9 Test Results (Mode 3)

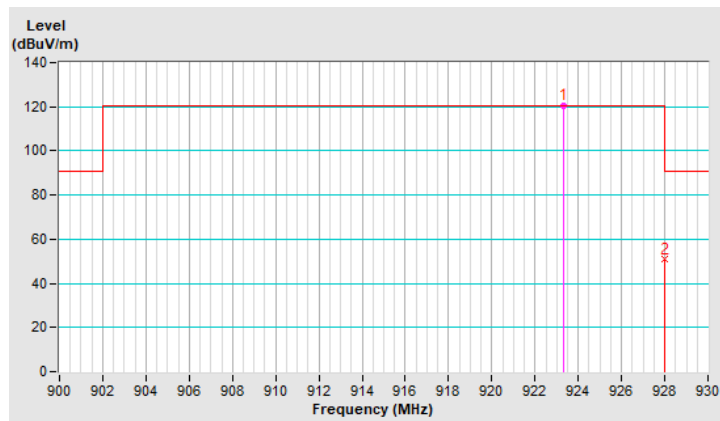
**Bandedge Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.30	120.7 QP			2.20 H	150	89.8	30.9
2	928.00	51.0 QP	90.7	-39.7	2.20 H	150	20.1	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

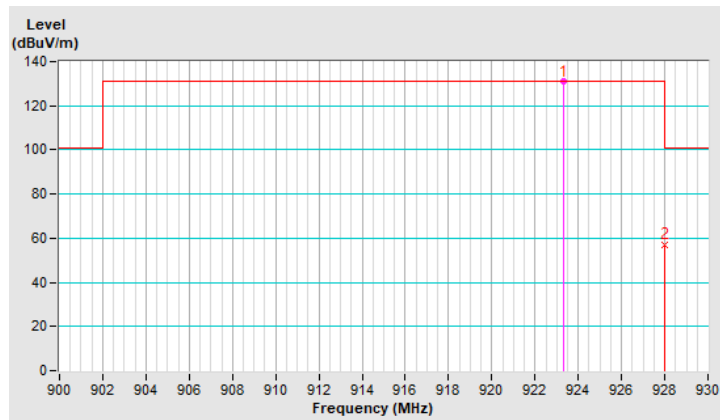


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.30	130.9 QP			2.20 V	145	100.0	30.9
2	928.00	57.0 QP	100.9	-43.9	2.20 V	145	26.1	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

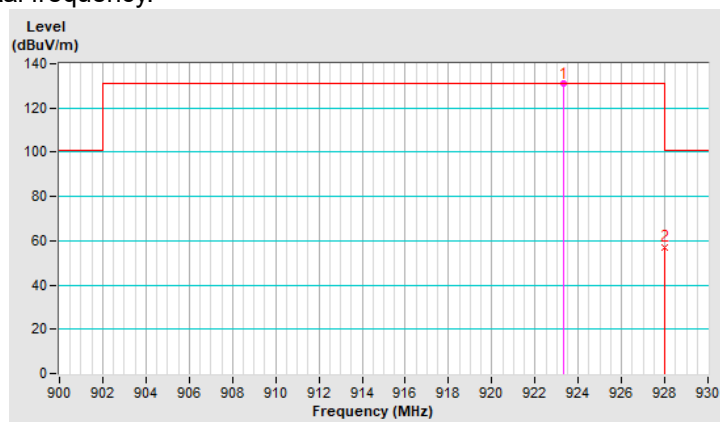


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.50	120.4 QP			1.20 H	110	89.5	30.9
2	928.00	83.8 QP	90.4	-6.6	1.20 H	110	52.9	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

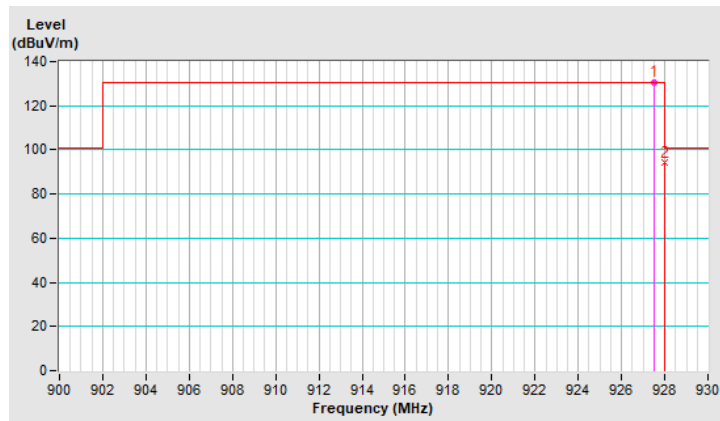


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.50	130.7 QP			2.20 V	150	99.8	30.9
2	928.00	94.1 QP	100.7	-6.6	2.20 V	150	63.2	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



**Above 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.90	36.1 PK	74.0	-37.9	1.39 H	246	38.9	-2.8
2	2769.90	25.5 AV	54.0	-28.5	1.39 H	246	28.3	-2.8
3	3693.20	35.8 PK	74.0	-38.2	1.00 H	143	36.9	-1.1
4	3693.20	25.0 AV	54.0	-29.0	1.00 H	143	26.1	-1.1
5	4616.50	36.6 PK	74.0	-37.4	1.54 H	193	36.0	0.6
6	4616.50	24.9 AV	54.0	-29.1	1.54 H	193	24.3	0.6
7	7386.40	42.5 PK	74.0	-31.5	1.60 H	159	35.2	7.3
8	7386.40	31.2 AV	54.0	-22.8	1.60 H	159	23.9	7.3
9	8309.70	44.2 PK	74.0	-29.8	1.78 H	186	36.8	7.4
10	8309.70	31.8 AV	54.0	-22.2	1.78 H	186	24.4	7.4

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.90	37.5 PK	74.0	-36.5	1.11 V	194	40.3	-2.8
2	2769.90	29.0 AV	54.0	-25.0	1.11 V	194	31.8	-2.8
3	3693.20	36.3 PK	74.0	-37.7	1.00 V	141	37.4	-1.1
4	3693.20	25.1 AV	54.0	-28.9	1.00 V	141	26.2	-1.1
5	4616.50	36.5 PK	74.0	-37.5	1.55 V	179	35.9	0.6
6	4616.50	24.9 AV	54.0	-29.1	1.55 V	179	24.3	0.6
7	7386.40	47.9 PK	74.0	-26.1	1.68 V	165	40.6	7.3
8	7386.40	36.7 AV	54.0	-17.3	1.68 V	165	29.4	7.3
9	8309.70	43.8 PK	74.0	-30.2	1.48 V	169	36.4	7.4
10	8309.70	31.5 AV	54.0	-22.5	1.48 V	169	24.1	7.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.50	35.0 PK	74.0	-39.0	1.78 H	215	37.7	-2.7
2	2782.50	25.0 AV	54.0	-29.0	1.78 H	215	27.7	-2.7
3	3710.00	36.1 PK	74.0	-37.9	1.00 H	146	37.1	-1.0
4	3710.00	25.7 AV	54.0	-28.3	1.00 H	146	26.7	-1.0
5	4637.50	36.3 PK	74.0	-37.7	1.37 H	171	35.7	0.6
6	4637.50	24.4 AV	54.0	-29.6	1.37 H	171	23.8	0.6
7	7420.00	49.4 PK	74.0	-24.6	1.19 H	228	42.2	7.2
8	7420.00	38.8 AV	54.0	-15.2	1.19 H	228	31.6	7.2
9	8347.50	44.7 PK	74.0	-29.3	1.29 H	246	37.4	7.3
10	8347.50	32.5 AV	54.0	-21.5	1.29 H	246	25.2	7.3

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.50	36.6 PK	74.0	-37.4	1.37 V	262	39.3	-2.7
2	2782.50	27.9 AV	54.0	-26.1	1.37 V	262	30.6	-2.7
3	3710.00	36.2 PK	74.0	-37.8	1.00 V	115	37.2	-1.0
4	3710.00	25.8 AV	54.0	-28.2	1.00 V	115	26.8	-1.0
5	4637.50	36.7 PK	74.0	-37.3	1.46 V	204	36.1	0.6
6	4637.50	25.2 AV	54.0	-28.8	1.46 V	204	24.6	0.6
7	7420.00	48.0 PK	74.0	-26.0	3.88 V	202	40.8	7.2
8	7420.00	37.2 AV	54.0	-16.8	3.88 V	202	30.0	7.2
9	8347.50	43.8 PK	74.0	-30.2	1.02 V	184	36.5	7.3
10	8347.50	32.5 AV	54.0	-21.5	1.02 V	184	25.2	7.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



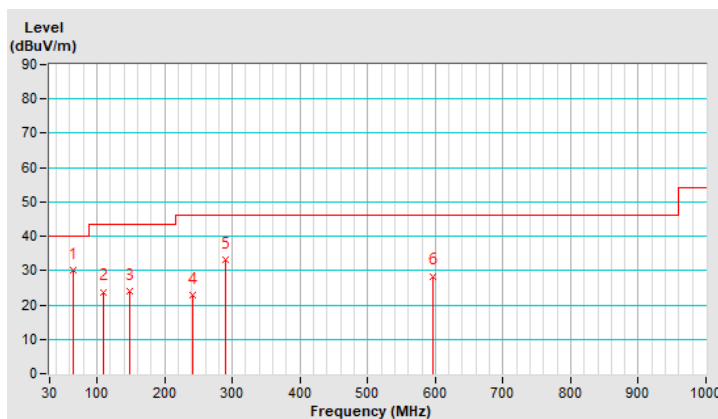
**Below 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	64.80	30.2 QP	40.0	-9.8	1.00 H	49	43.9	-13.7
2	110.22	23.8 QP	43.5	-19.7	2.00 H	255	39.4	-15.6
3	148.93	23.9 QP	43.5	-19.6	1.50 H	360	36.2	-12.3
4	242.16	22.9 QP	46.0	-23.1	2.00 H	144	37.0	-14.1
5	289.96	33.3 QP	46.0	-12.7	1.50 H	98	45.6	-12.3
6	597.07	28.4 QP	46.0	-17.6	1.50 H	167	33.2	-4.8

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

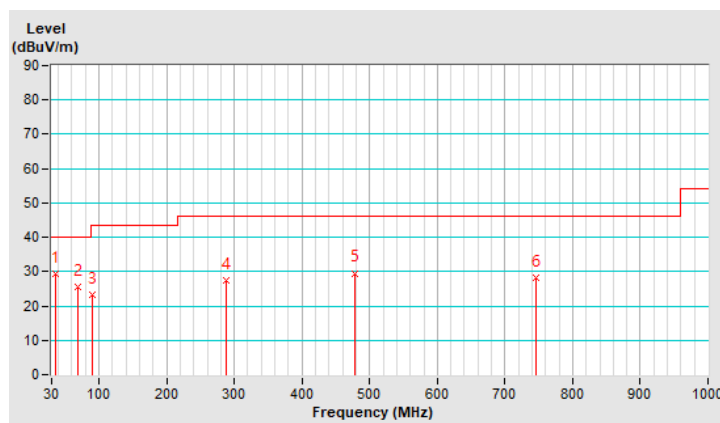


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	35.51	29.4 QP	40.0	-10.6	1.00 V	179	42.8	-13.4
2	69.60	25.4 QP	40.0	-14.6	1.50 V	1	39.9	-14.5
3	90.00	23.4 QP	43.5	-20.1	2.00 V	83	41.8	-18.4
4	288.05	27.5 QP	46.0	-18.5	2.50 V	87	39.8	-12.3
5	478.05	29.6 QP	46.0	-16.4	1.50 V	218	37.3	-7.7
6	745.47	28.2 QP	46.0	-17.8	1.00 V	207	30.8	-2.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



## 5.1.10 Test Results (Mode 4)

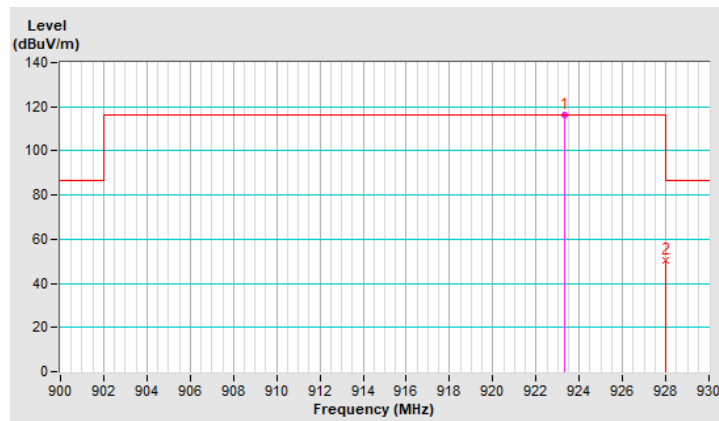
**Bandedge Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.30	116.5 QP			1.00 H	310	85.6	30.9
2	928.00	50.7 QP	86.5	-35.8	1.00 H	310	19.8	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

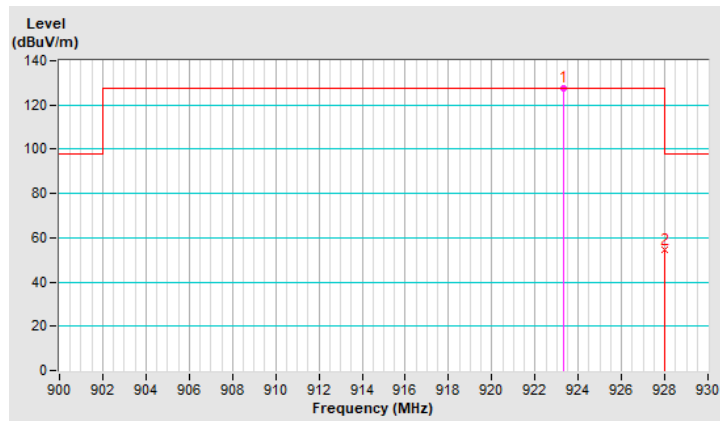


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.30	127.7 QP			2.20 V	140	96.8	30.9
2	928.00	54.6 QP	97.7	-43.1	2.20 V	140	23.7	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

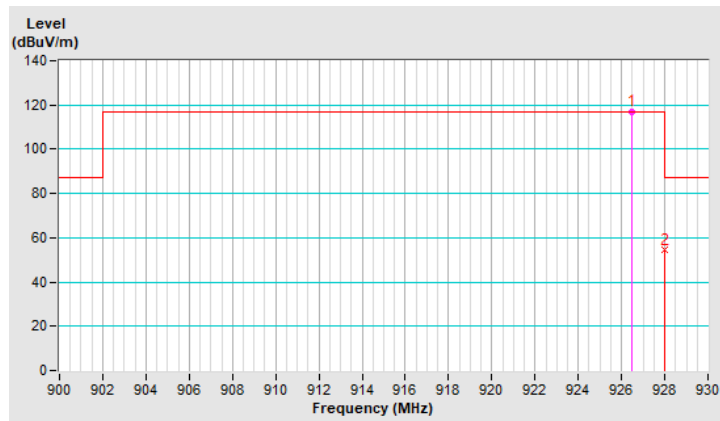


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 4 : 926.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*926.50	117.1 QP			1.25 H	132	86.2	30.9
2	928.00	54.5 QP	87.1	-32.6	1.25 H	132	23.6	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

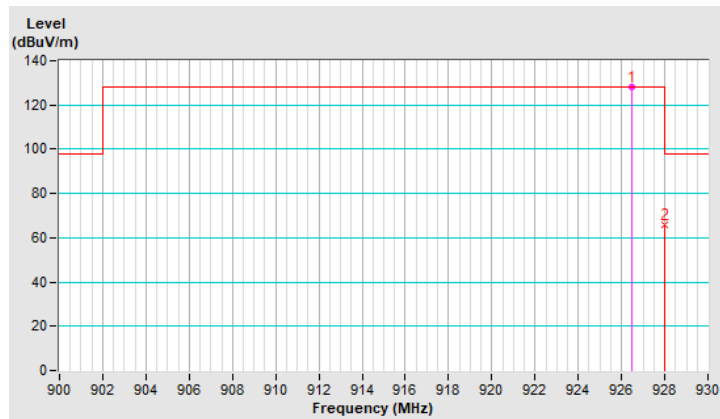


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 4 : 926.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*926.50	127.9 QP			2.26 V	160	97.0	30.9
2	928.00	65.7 QP	97.9	-32.2	2.26 V	160	34.8	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



**Above 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.90	36.4 PK	74.0	-37.6	1.30 H	253	39.2	-2.8
2	2769.90	25.0 AV	54.0	-29.0	1.30 H	253	27.8	-2.8
3	3693.20	36.2 PK	74.0	-37.8	1.24 H	148	37.3	-1.1
4	3693.20	24.9 AV	54.0	-29.1	1.24 H	148	26.0	-1.1
5	4616.50	36.5 PK	74.0	-37.5	1.64 H	181	35.9	0.6
6	4616.50	24.7 AV	54.0	-29.3	1.64 H	181	24.1	0.6
7	7386.40	43.2 PK	74.0	-30.8	1.45 H	197	35.9	7.3
8	7386.40	31.7 AV	54.0	-22.3	1.45 H	197	24.4	7.3
9	8309.70	44.2 PK	74.0	-29.8	1.30 H	207	36.8	7.4
10	8309.70	32.1 AV	54.0	-21.9	1.30 H	207	24.7	7.4

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.90	35.4 PK	74.0	-38.6	1.12 V	211	38.2	-2.8
2	2769.90	25.3 AV	54.0	-28.7	1.12 V	211	28.1	-2.8
3	3693.20	36.1 PK	74.0	-37.9	1.00 V	164	37.2	-1.1
4	3693.20	25.3 AV	54.0	-28.7	1.00 V	164	26.4	-1.1
5	4616.50	36.3 PK	74.0	-37.7	1.93 V	167	35.7	0.6
6	4616.50	25.1 AV	54.0	-28.9	1.93 V	167	24.5	0.6
7	7386.40	46.3 PK	74.0	-27.7	1.99 V	224	39.0	7.3
8	7386.40	35.6 AV	54.0	-18.4	1.99 V	224	28.3	7.3
9	8309.70	44.6 PK	74.0	-29.4	1.51 V	181	37.2	7.4
10	8309.70	32.4 AV	54.0	-21.6	1.51 V	181	25.0	7.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 4 : 926.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2779.50	36.8 PK	74.0	-37.2	1.58 H	206	39.5	-2.7
2	2779.50	25.3 AV	54.0	-28.7	1.58 H	206	28.0	-2.7
3	3706.00	35.9 PK	74.0	-38.1	1.00 H	119	36.9	-1.0
4	3706.00	24.9 AV	54.0	-29.1	1.00 H	119	25.9	-1.0
5	4632.50	36.3 PK	74.0	-37.7	1.66 H	174	35.8	0.5
6	4632.50	25.1 AV	54.0	-28.9	1.66 H	174	24.6	0.5
7	7412.00	43.0 PK	74.0	-31.0	1.62 H	201	35.7	7.3
8	7412.00	31.8 AV	54.0	-22.2	1.62 H	201	24.5	7.3
9	8338.50	44.1 PK	74.0	-29.9	1.91 H	199	36.8	7.3
10	8338.50	32.0 AV	54.0	-22.0	1.91 H	199	24.7	7.3

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2779.50	35.7 PK	74.0	-38.3	1.28 V	208	38.4	-2.7
2	2779.50	25.6 AV	54.0	-28.4	1.28 V	208	28.3	-2.7
3	3706.00	35.9 PK	74.0	-38.1	1.09 V	151	36.9	-1.0
4	3706.00	24.6 AV	54.0	-29.4	1.09 V	151	25.6	-1.0
5	4632.50	36.8 PK	74.0	-37.2	1.75 V	165	36.3	0.5
6	4632.50	25.2 AV	54.0	-28.8	1.75 V	165	24.7	0.5
7	7412.00	47.2 PK	74.0	-26.8	2.03 V	220	39.9	7.3
8	7412.00	36.3 AV	54.0	-17.7	2.03 V	220	29.0	7.3
9	8338.50	43.8 PK	74.0	-30.2	1.72 V	188	36.5	7.3
10	8338.50	31.7 AV	54.0	-22.3	1.72 V	188	24.4	7.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



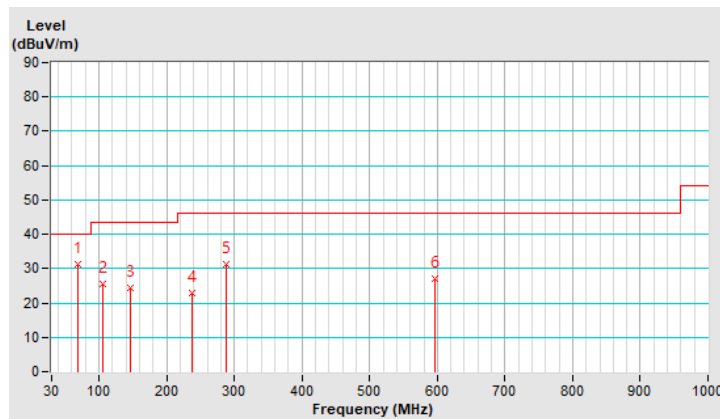
**Below 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	68.20	31.3 QP	40.0	-8.7	1.00 H	73	45.6	-14.3
2	105.47	25.6 QP	43.5	-17.9	1.50 H	263	41.8	-16.2
3	146.28	24.3 QP	43.5	-19.2	2.50 H	360	36.7	-12.4
4	237.43	22.9 QP	46.0	-23.1	2.00 H	137	37.2	-14.3
5	288.40	31.4 QP	46.0	-14.6	1.50 H	113	43.7	-12.3
6	597.31	27.0 QP	46.0	-19.0	2.00 H	180	31.8	-4.8

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

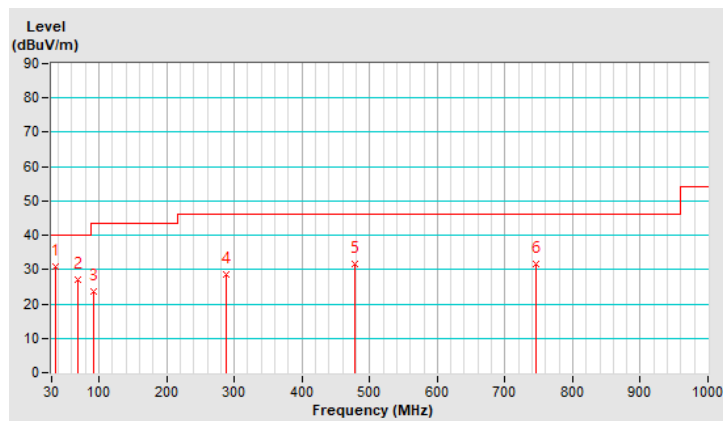


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	34.99	30.8 QP	40.0	-9.2	1.00 V	167	44.1	-13.3
2	68.11	27.2 QP	40.0	-12.8	1.50 V	11	41.5	-14.3
3	92.47	23.6 QP	43.5	-19.9	2.00 V	88	41.7	-18.1
4	287.48	28.6 QP	46.0	-17.4	1.00 V	87	40.9	-12.3
5	477.91	31.7 QP	46.0	-14.3	1.50 V	189	39.4	-7.7
6	745.57	31.6 QP	46.0	-14.4	1.00 V	228	34.2	-2.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



5.1.11 Test Results (Mode 5)

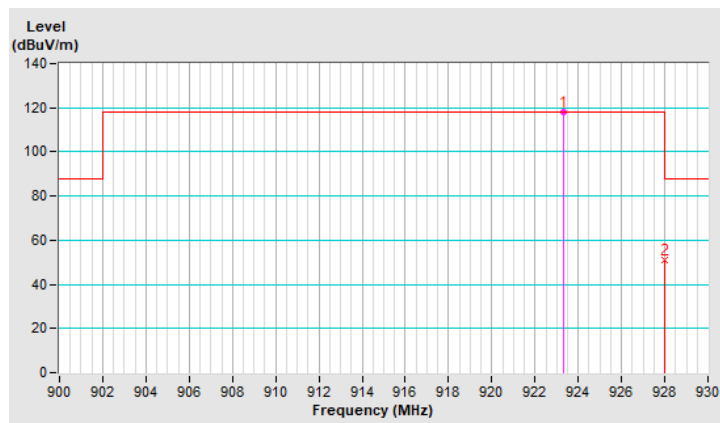
**Bandedge Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.30	118.0 QP			1.20 H	130	87.1	30.9
2	928.00	50.9 QP	88.0	-37.1	1.20 H	130	20.0	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

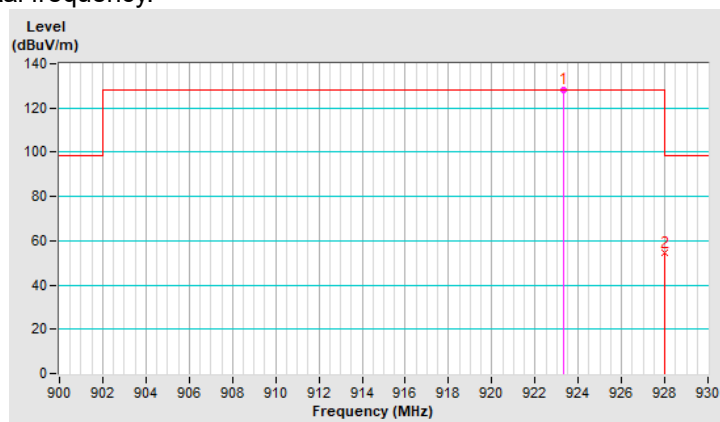


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*923.30	128.2 QP			2.00 V	160	97.3	30.9
2	928.00	54.5 QP	98.2	-43.7	2.00 V	160	23.6	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



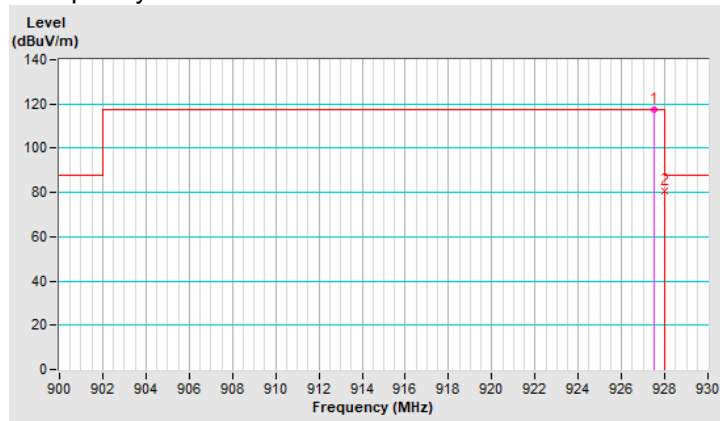
<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.50	117.7 QP			1.30 H	130	86.8	30.9
2	928.00	80.9 QP	87.7	-6.8	1.30 H	130	50.0	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.

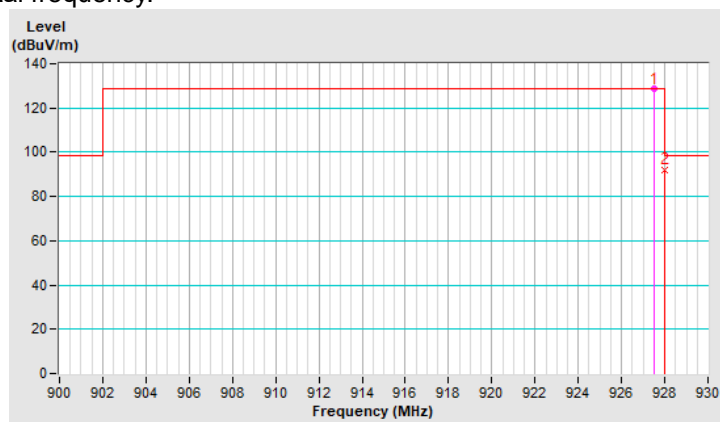


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	900MHz ~ 930MHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*927.50	128.6 QP			2.15 V	161	97.7	30.9
2	928.00	92.0 QP	98.6	-6.6	2.15 V	161	61.1	30.9

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. “ \* “: Fundamental frequency.



**Above 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.90	36.4 PK	74.0	-37.6	1.39 H	228	39.2	-2.8
2	2769.90	25.0 AV	54.0	-29.0	1.39 H	228	27.8	-2.8
3	3693.20	36.0 PK	74.0	-38.0	1.06 H	131	37.1	-1.1
4	3693.20	24.5 AV	54.0	-29.5	1.06 H	131	25.6	-1.1
5	4616.50	36.4 PK	74.0	-37.6	1.66 H	168	35.8	0.6
6	4616.50	24.7 AV	54.0	-29.3	1.66 H	168	24.1	0.6
7	7386.40	43.1 PK	74.0	-30.9	1.22 H	156	35.8	7.3
8	7386.40	31.3 AV	54.0	-22.7	1.22 H	156	24.0	7.3
9	8309.70	44.6 PK	74.0	-29.4	1.51 H	192	37.2	7.4
10	8309.70	31.7 AV	54.0	-22.3	1.51 H	192	24.3	7.4

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2769.90	35.8 PK	74.0	-38.2	1.27 V	209	38.6	-2.8
2	2769.90	25.1 AV	54.0	-28.9	1.27 V	209	27.9	-2.8
3	3693.20	35.8 PK	74.0	-38.2	1.23 V	174	36.9	-1.1
4	3693.20	24.4 AV	54.0	-29.6	1.23 V	174	25.5	-1.1
5	4616.50	36.5 PK	74.0	-37.5	1.81 V	167	35.9	0.6
6	4616.50	25.1 AV	54.0	-28.9	1.81 V	167	24.5	0.6
7	7386.40	46.5 PK	74.0	-27.5	1.95 V	239	39.2	7.3
8	7386.40	35.9 AV	54.0	-18.1	1.95 V	239	28.6	7.3
9	8309.70	44.5 PK	74.0	-29.5	1.56 V	187	37.1	7.4
10	8309.70	32.1 AV	54.0	-21.9	1.56 V	187	24.7	7.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	1GHz ~ 10GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.50	36.3 PK	74.0	-37.7	1.59 H	220	39.0	-2.7
2	2782.50	25.5 AV	54.0	-28.5	1.59 H	220	28.2	-2.7
3	3710.00	35.5 PK	74.0	-38.5	1.18 H	131	36.5	-1.0
4	3710.00	24.9 AV	54.0	-29.1	1.18 H	131	25.9	-1.0
5	4637.50	36.2 PK	74.0	-37.8	1.57 H	188	35.6	0.6
6	4637.50	25.2 AV	54.0	-28.8	1.57 H	188	24.6	0.6
7	7420.00	42.9 PK	74.0	-31.1	1.62 H	181	35.7	7.2
8	7420.00	31.8 AV	54.0	-22.2	1.62 H	181	24.6	7.2
9	8347.50	43.9 PK	74.0	-30.1	1.39 H	192	36.6	7.3
10	8347.50	31.9 AV	54.0	-22.1	1.39 H	192	24.6	7.3

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2782.50	36.1 PK	74.0	-37.9	1.09 V	210	38.8	-2.7
2	2782.50	25.7 AV	54.0	-28.3	1.09 V	210	28.4	-2.7
3	3710.00	36.2 PK	74.0	-37.8	1.07 V	122	37.2	-1.0
4	3710.00	24.9 AV	54.0	-29.1	1.07 V	122	25.9	-1.0
5	4637.50	36.5 PK	74.0	-37.5	1.64 V	194	35.9	0.6
6	4637.50	25.0 AV	54.0	-29.0	1.64 V	194	24.4	0.6
7	7420.00	46.7 PK	74.0	-27.3	1.96 V	215	39.5	7.2
8	7420.00	35.8 AV	54.0	-18.2	1.96 V	215	28.6	7.2
9	8347.50	43.9 PK	74.0	-30.1	1.31 V	189	36.6	7.3
10	8347.50	32.0 AV	54.0	-22.0	1.31 V	189	24.7	7.3

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



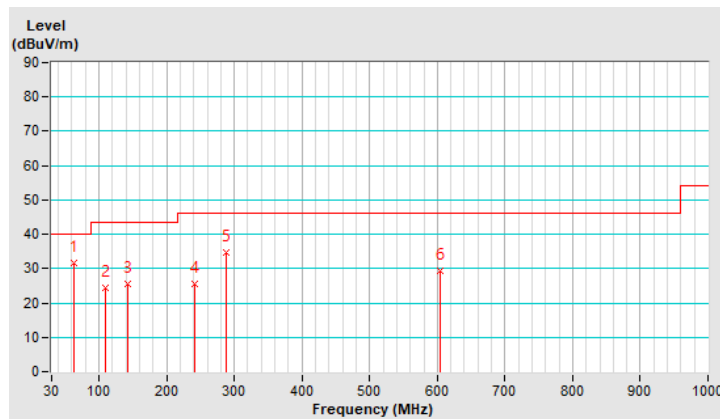
**Below 1GHz Data:**

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	62.22	31.7 QP	40.0	-8.3	1.00 H	69	44.9	-13.2
2	109.07	24.5 QP	43.5	-19.0	1.50 H	241	40.1	-15.6
3	143.43	25.4 QP	43.5	-18.1	1.00 H	360	37.9	-12.5
4	241.25	25.4 QP	46.0	-20.6	2.00 H	154	39.5	-14.1
5	288.91	34.7 QP	46.0	-11.3	1.50 H	118	47.0	-12.3
6	604.28	29.3 QP	46.0	-16.7	1.50 H	172	33.8	-4.5

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

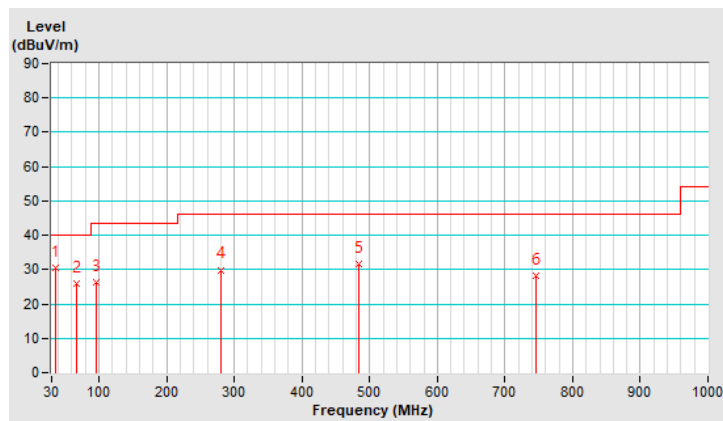


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	36.37	30.4 QP	40.0	-9.6	1.00 V	172	43.8	-13.4
2	66.56	25.9 QP	40.0	-14.1	1.00 V	7	39.8	-13.9
3	95.20	26.1 QP	43.5	-17.4	2.00 V	97	43.9	-17.8
4	280.81	29.9 QP	46.0	-16.1	1.00 V	65	42.3	-12.4
5	483.62	31.6 QP	46.0	-14.4	1.50 V	195	39.3	-7.7
6	745.11	28.2 QP	46.0	-17.8	1.00 V	221	30.8	-2.6

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



## 5.2 Conducted Emission Measurement

### 5.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 5.2.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 5.2.3 Test Procedures

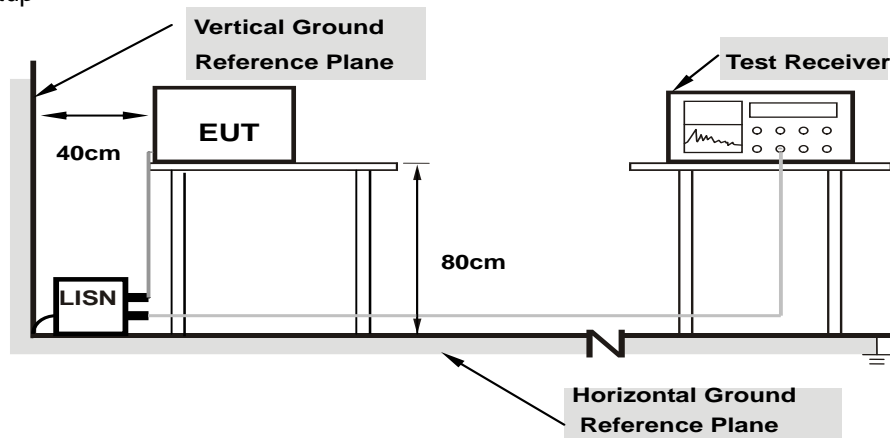
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**Note:** The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

### 5.2.4 Deviation from Test Standard

No deviation.

### 5.2.5 Test Setup



**Note: 1.Support units were connected to second LISN.**

For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 5.2.6 EUT Operating Conditions

Same as 4.1.6.

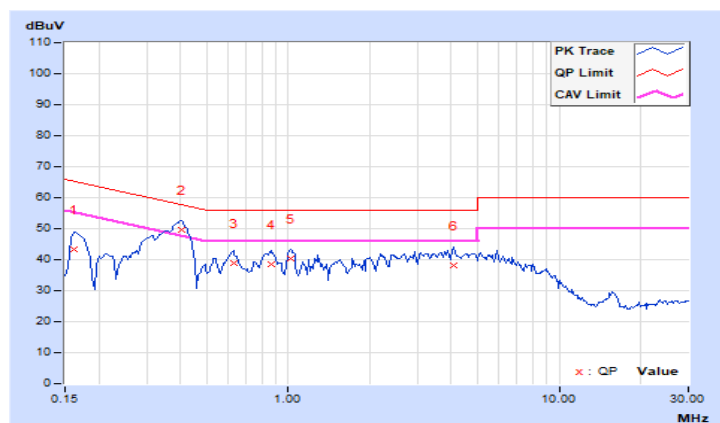
5.2.7 Test Results (Mode 1)

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	10.05	33.45	19.53	43.50	29.58	65.38	55.38	-21.88	-25.80
2	0.40391	10.07	39.52	32.24	49.59	42.31	57.77	47.77	-8.18	-5.46
3	0.62656	10.08	28.91	23.23	38.99	33.31	56.00	46.00	-17.01	-12.69
4	0.86094	10.10	28.48	23.14	38.58	33.24	56.00	46.00	-17.42	-12.76
5	1.01953	10.11	30.22	25.03	40.33	35.14	56.00	46.00	-15.67	-10.86
6	4.06250	10.26	27.91	21.77	38.17	32.03	56.00	46.00	-17.83	-13.97

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

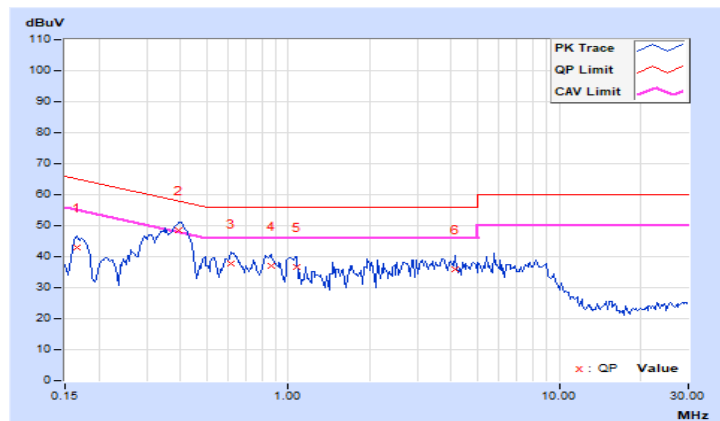


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	10.02	33.06	22.25	43.08	32.27	65.18	55.18	-22.10	-22.91
2	0.39609	10.04	38.40	31.14	48.44	41.18	57.93	47.93	-9.49	-6.75
3	0.61484	10.05	27.55	21.39	37.60	31.44	56.00	46.00	-18.40	-14.56
4	0.86094	10.07	26.80	21.52	36.87	31.59	56.00	46.00	-19.13	-14.41
5	1.07031	10.08	26.73	20.41	36.81	30.49	56.00	46.00	-19.19	-15.51
6	4.15234	10.22	25.76	19.44	35.98	29.66	56.00	46.00	-20.02	-16.34

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



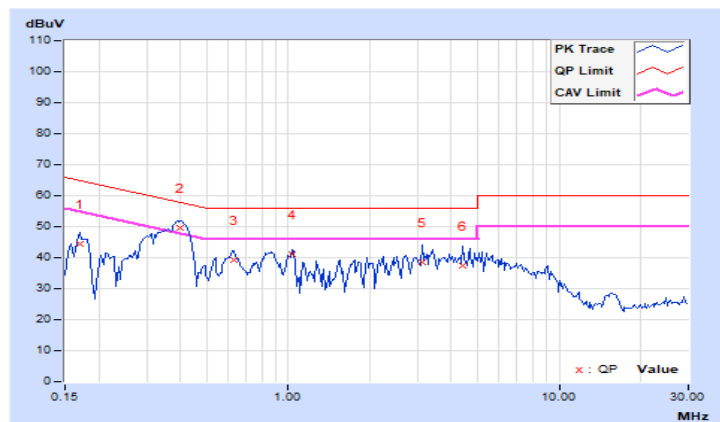
5.2.8 Test Results (Mode 2)

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	10.05	34.37	24.53	44.42	34.58	64.98	54.98	-20.56	-20.40
2	0.40000	10.07	39.74	32.16	49.81	42.23	57.85	47.85	-8.04	-5.62
3	0.63047	10.08	29.06	22.86	39.14	32.94	56.00	46.00	-16.86	-13.06
4	1.03125	10.11	31.05	25.65	41.16	35.76	56.00	46.00	-14.84	-10.24
5	3.12109	10.22	28.21	21.53	38.43	31.75	56.00	46.00	-17.57	-14.25
6	4.42188	10.28	26.96	20.18	37.24	30.46	56.00	46.00	-18.76	-15.54

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

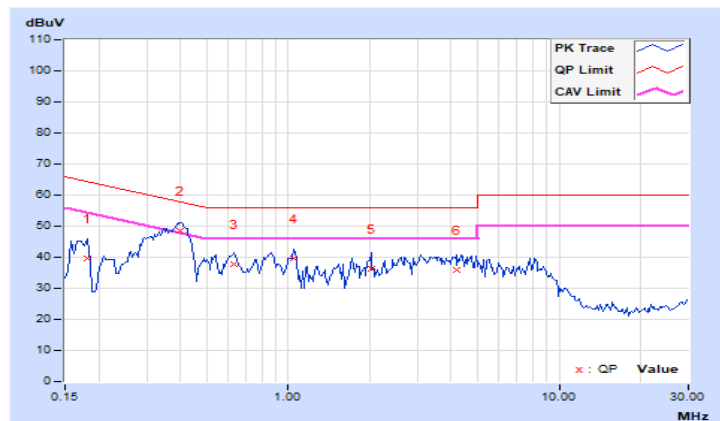


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 30 : 926.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18125	10.03	29.53	16.27	39.56	26.30	64.43	54.43	-24.87	-28.13
2	0.40000	10.04	38.62	31.26	48.66	41.30	57.85	47.85	-9.19	-6.55
3	0.63047	10.05	27.65	21.69	37.70	31.74	56.00	46.00	-18.30	-14.26
4	1.04688	10.08	29.37	24.23	39.45	34.31	56.00	46.00	-16.55	-11.69
5	2.01953	10.13	26.09	20.77	36.22	30.90	56.00	46.00	-19.78	-15.10
6	4.16406	10.22	25.70	19.46	35.92	29.68	56.00	46.00	-20.08	-16.32

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value





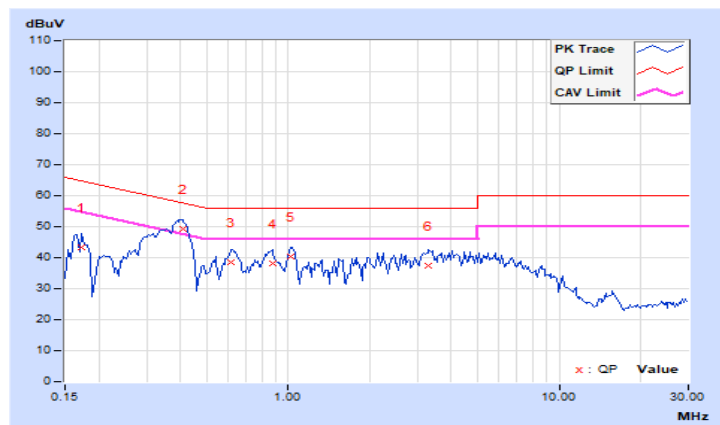
5.2.9 Test Results (Mode 3)

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17344	10.05	33.37	23.19	43.42	33.24	64.79	54.79	-21.37	-21.55
2	0.40781	10.07	39.18	31.96	49.25	42.03	57.69	47.69	-8.44	-5.66
3	0.61094	10.08	28.36	22.10	38.44	32.18	56.00	46.00	-17.56	-13.82
4	0.87266	10.10	28.21	22.71	38.31	32.81	56.00	46.00	-17.69	-13.19
5	1.01563	10.11	30.15	24.55	40.26	34.66	56.00	46.00	-15.74	-11.34
6	3.30469	10.23	27.31	20.61	37.54	30.84	56.00	46.00	-18.46	-15.16

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

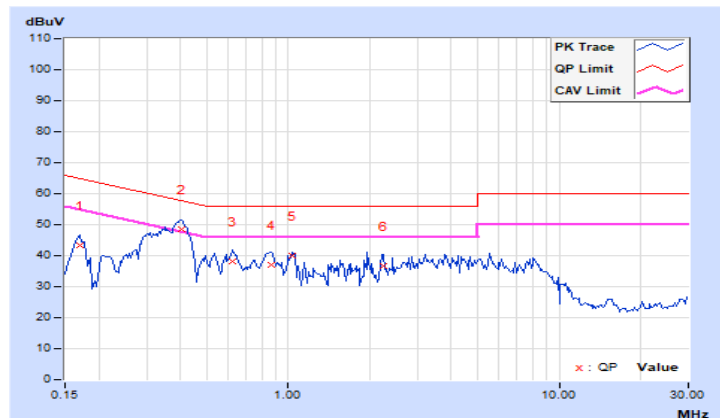


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	10.02	33.13	23.45	43.15	33.47	64.98	54.98	-21.83	-21.51
2	0.40391	10.04	38.58	31.28	48.62	41.32	57.77	47.77	-9.15	-6.45
3	0.62266	10.05	28.04	22.04	38.09	32.09	56.00	46.00	-17.91	-13.91
4	0.86094	10.07	26.93	21.45	37.00	31.52	56.00	46.00	-19.00	-14.48
5	1.03516	10.08	29.93	24.65	40.01	34.73	56.00	46.00	-15.99	-11.27
6	2.25000	10.14	26.62	21.06	36.76	31.20	56.00	46.00	-19.24	-14.80

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



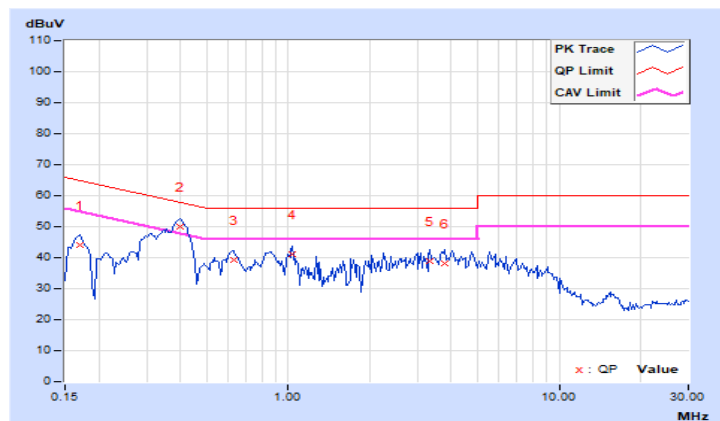
5.2.10 Test Results (Mode 4)

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	10.05	34.19	24.05	44.24	34.10	64.98	54.98	-20.74	-20.88
<b>2</b>	<b>0.40000</b>	<b>10.07</b>	<b>39.85</b>	<b>32.56</b>	<b>49.92</b>	<b>42.63</b>	<b>57.85</b>	<b>47.85</b>	<b>-7.93</b>	<b>-5.22</b>
3	0.62656	10.08	29.04	23.09	39.12	33.17	56.00	46.00	-16.88	-12.83
4	1.03906	10.11	31.03	25.79	41.14	35.90	56.00	46.00	-14.86	-10.10
5	3.33594	10.23	28.50	21.78	38.73	32.01	56.00	46.00	-17.27	-13.99
6	3.76563	10.25	27.90	21.38	38.15	31.63	56.00	46.00	-17.85	-14.37

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

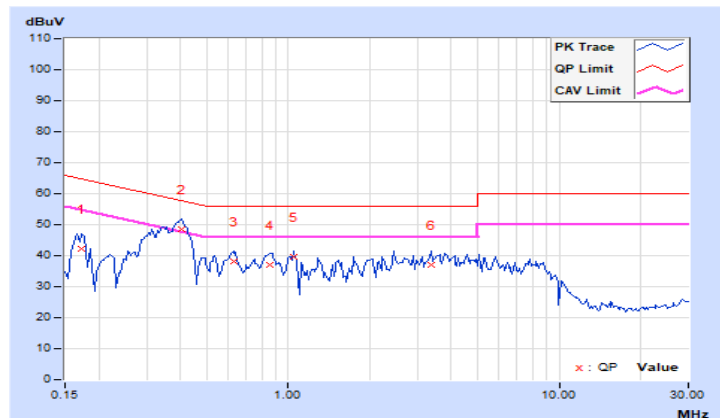


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 0 : 923.3 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17344	10.02	32.33	22.70	42.35	32.72	64.79	54.79	-22.44	-22.07
2	0.40391	10.04	38.62	31.22	48.66	41.26	57.77	47.77	-9.11	-6.51
3	0.62656	10.05	27.96	22.06	38.01	32.11	56.00	46.00	-17.99	-13.89
4	0.85703	10.07	26.97	21.47	37.04	31.54	56.00	46.00	-18.96	-14.46
5	1.04688	10.08	29.44	24.23	39.52	34.31	56.00	46.00	-16.48	-11.69
6	3.35547	10.18	26.88	20.54	37.06	30.72	56.00	46.00	-18.94	-15.28

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



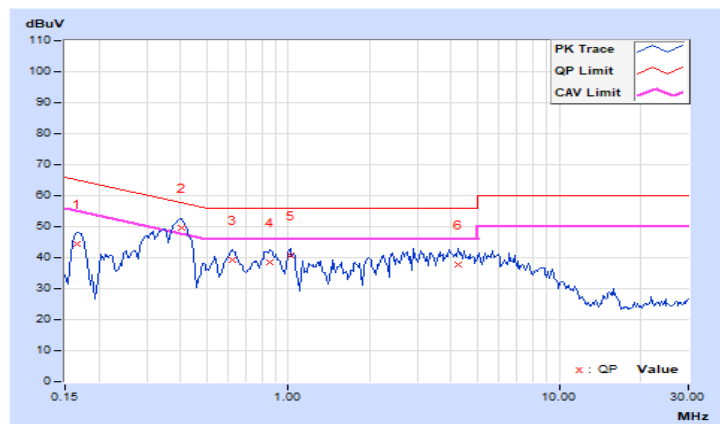
5.2.11 Test Results (Mode 5)

<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	10.05	34.57	22.66	44.62	32.71	65.18	55.18	-20.56	-22.47
2	0.40391	10.07	39.68	32.36	49.75	42.43	57.77	47.77	-8.02	-5.34
3	0.62266	10.08	29.02	23.13	39.10	33.21	56.00	46.00	-16.90	-12.79
4	0.85313	10.10	28.51	23.06	38.61	33.16	56.00	46.00	-17.39	-12.84
5	1.01953	10.11	30.63	25.17	40.74	35.28	56.00	46.00	-15.26	-10.72
6	4.25000	10.27	27.36	20.78	37.63	31.05	56.00	46.00	-18.37	-14.95

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

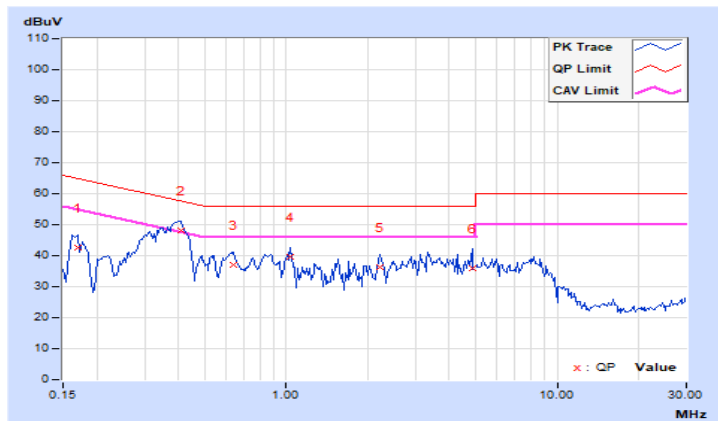


<b>RF Mode</b>	TX LoRa_DTS	<b>Channel</b>	CH 7 : 927.5 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	10.02	32.64	23.47	42.66	33.49	64.98	54.98	-22.32	-21.49
2	0.40781	10.04	37.97	30.59	48.01	40.63	57.69	47.69	-9.68	-7.06
3	0.63828	10.05	26.87	20.41	36.92	30.46	56.00	46.00	-19.08	-15.54
4	1.03906	10.08	29.55	24.59	39.63	34.67	56.00	46.00	-16.37	-11.33
5	2.21094	10.14	26.20	20.48	36.34	30.62	56.00	46.00	-19.66	-15.38
6	4.85156	10.25	25.61	18.61	35.86	28.86	56.00	46.00	-20.14	-17.14

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

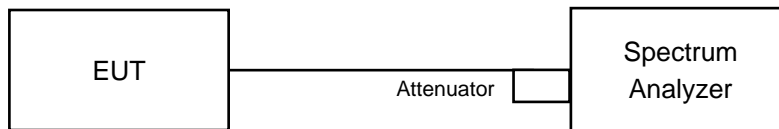


### 5.3 6dB Bandwidth Measurement

#### 5.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

#### 5.3.2 Test Setup



#### 5.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 5.3.4 Test Procedure

- a. Set resolution bandwidth (RBW) = 100kHz
- b. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

#### 5.3.5 Deviation from Test Standard

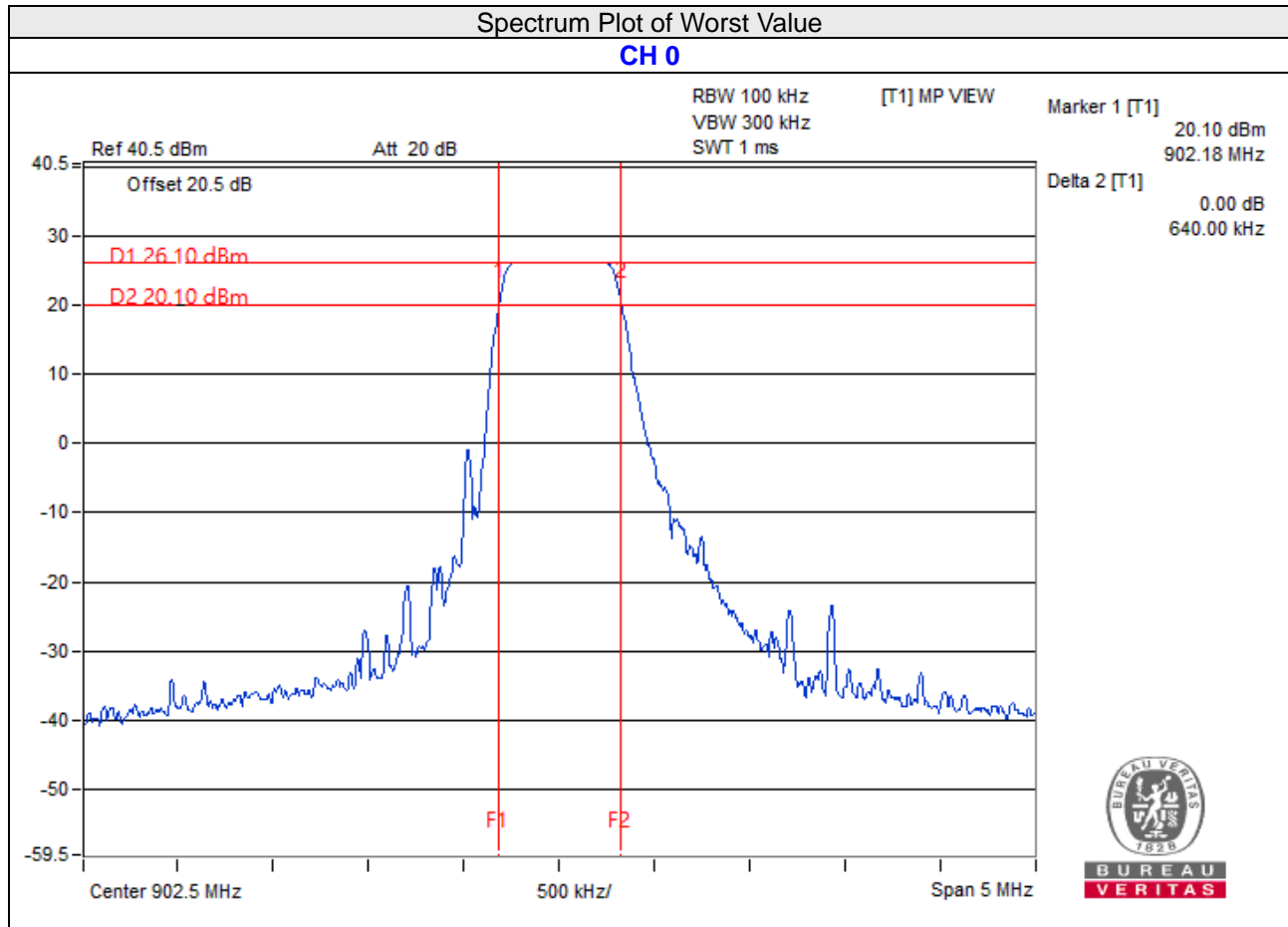
No deviation.

#### 5.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 5.3.7 Test Results (Mode 1)

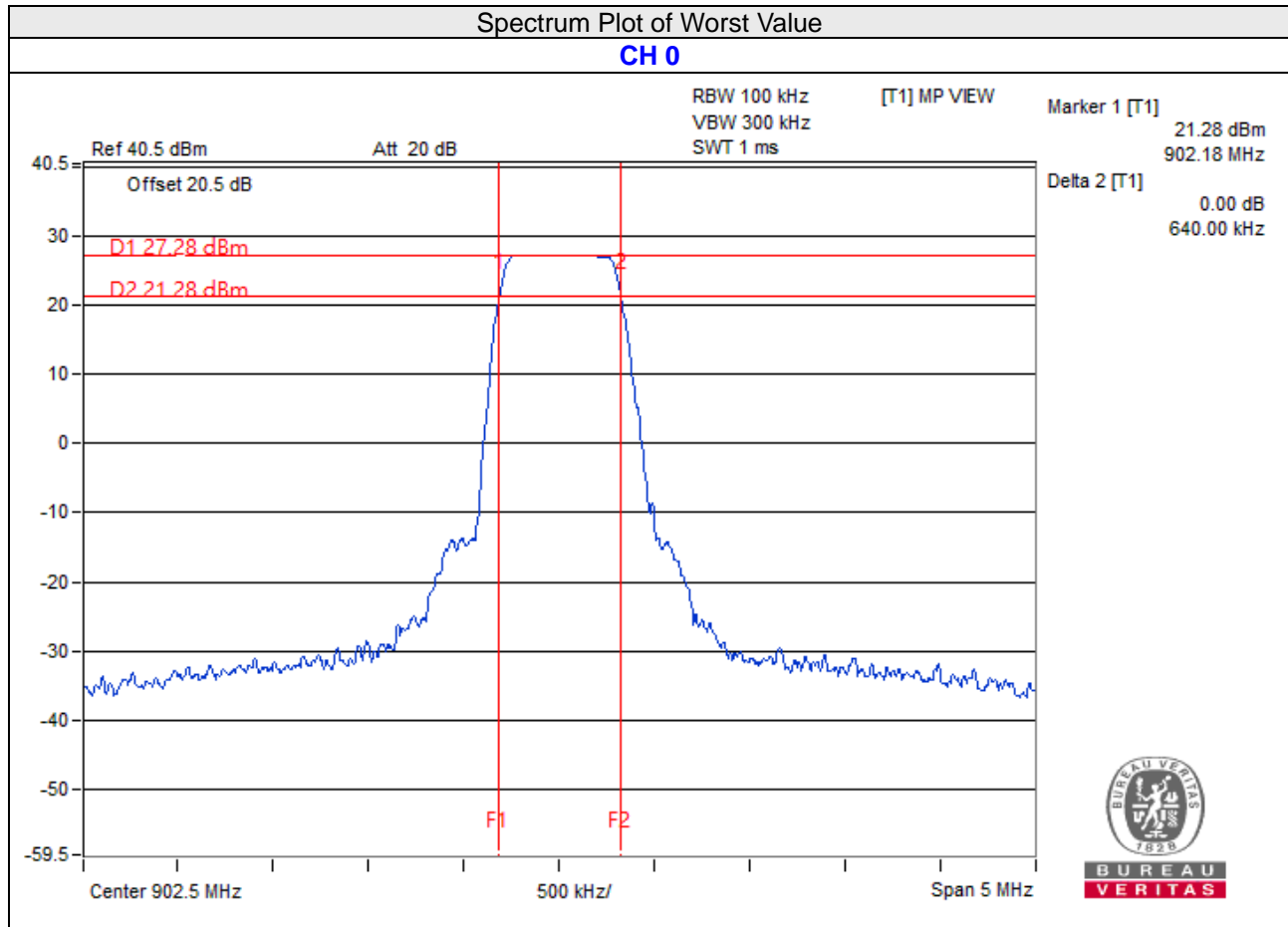
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	902.5	0.64	0.5	Pass
15	914.5	0.65	0.5	Pass
30	926.5	0.65	0.5	Pass





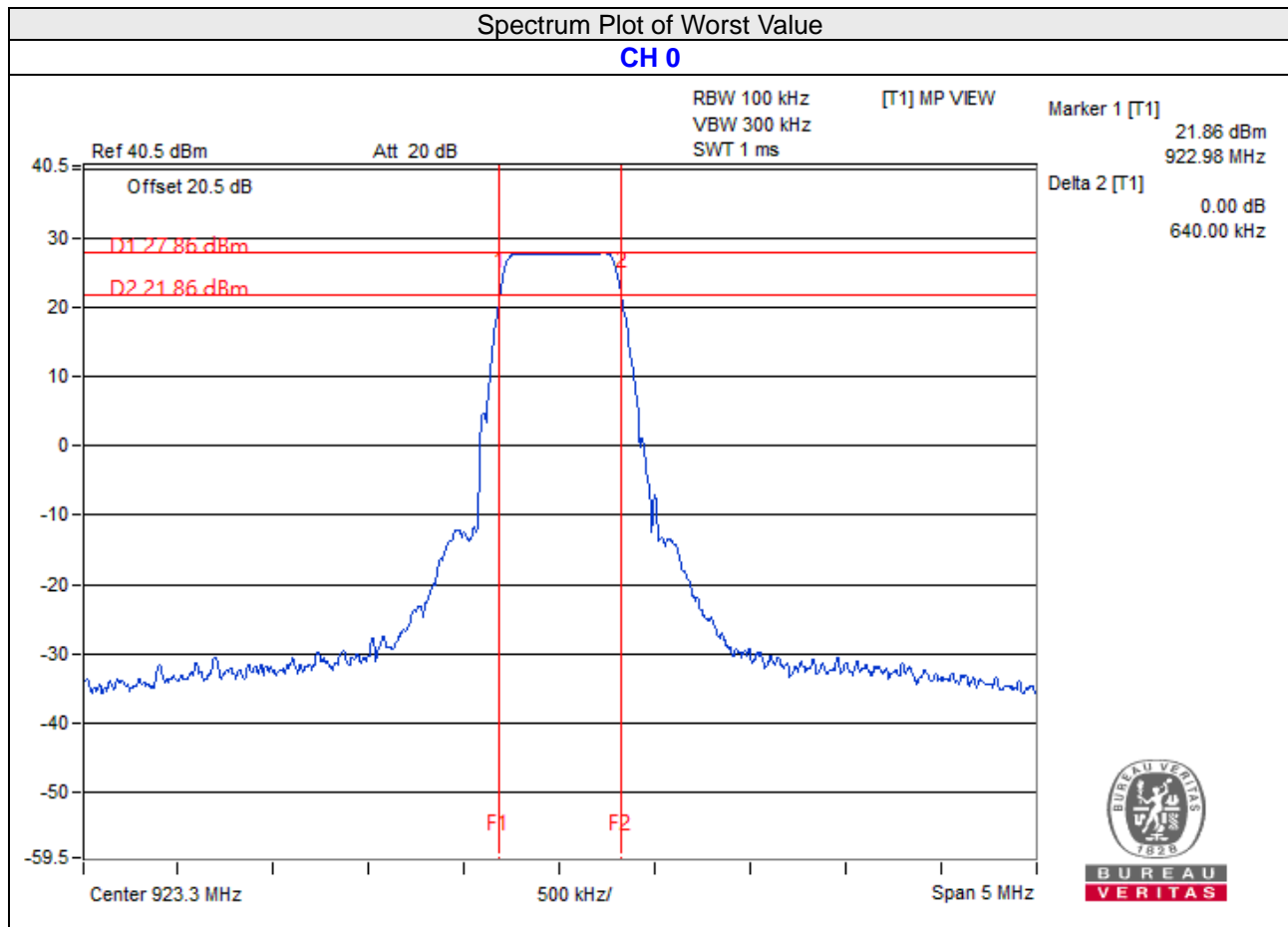
### 5.3.8 Test Results (Mode 2)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	902.5	0.64	0.5	Pass
15	914.5	0.64	0.5	Pass
30	926.5	0.64	0.5	Pass



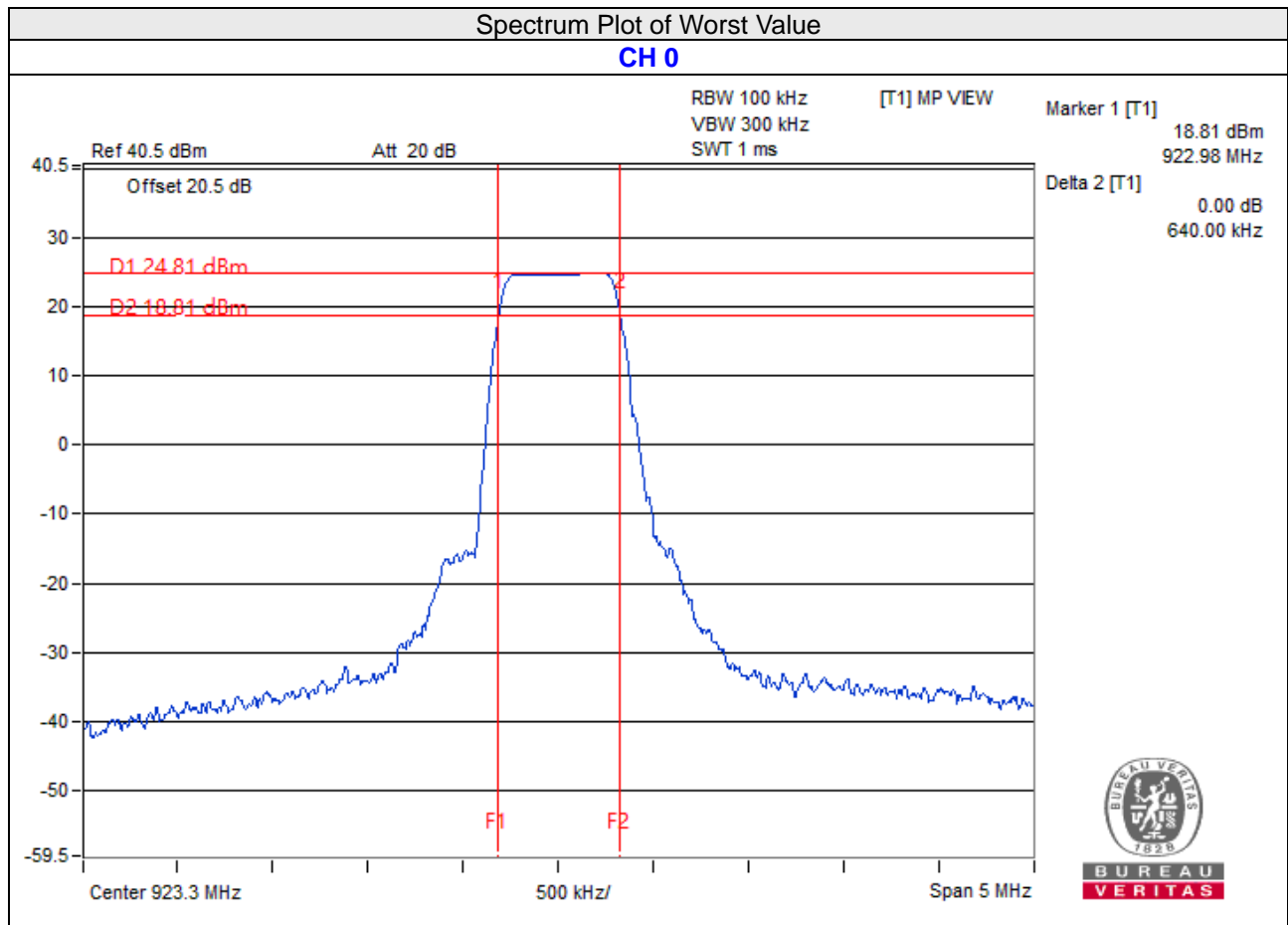
### 5.3.9 Test Results (Mode 3)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	923.3	0.64	0.5	Pass
7	927.5	0.64	0.5	Pass



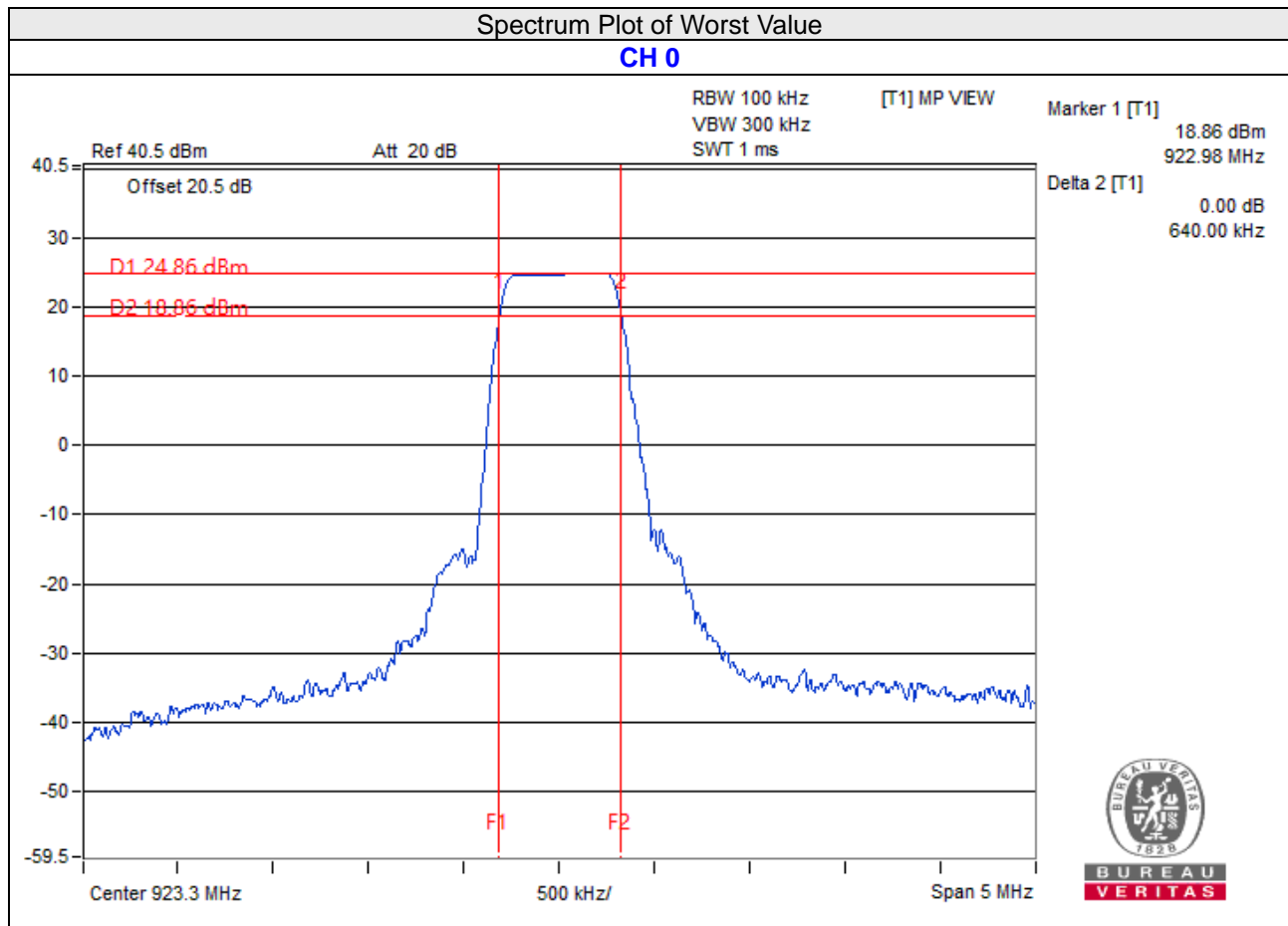
5.3.10 Test Results (Mode 4)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	923.3	0.64	0.5	Pass
4	926.5	0.64	0.5	Pass



5.3.11 Test Results (Mode 5)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	923.3	0.64	0.5	Pass
7	927.5	0.64	0.5	Pass

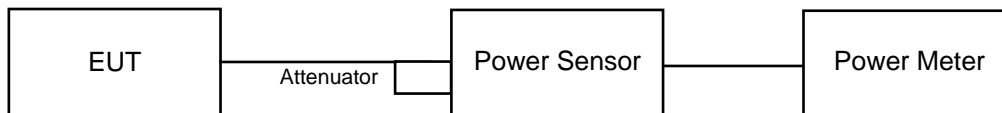


## 5.4 Conducted Output Power Measurement

### 5.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 902-928 MHz bands: 1 Watt (30dBm)

### 5.4.2 Test Setup



### 5.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 5.4.4 Test Procedures

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

### 5.4.5 Deviation from Test Standard

No deviation.

### 5.4.6 EUT Operating Conditions

Same as Item 5.3.6.

#### 5.4.7 Test Results (Mode 1)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass/Fail
0	902.5	382.825	25.83	30	Pass
15	914.5	454.988	26.58	30	Pass
30	926.5	481.948	26.83	30	Pass

#### 5.4.8 Test Results (Mode 2)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass/Fail
0	902.5	518.8	27.15	30	Pass
15	914.5	606.736	27.83	30	Pass
30	926.5	609.537	27.85	30	Pass

#### 5.4.9 Test Results (Mode 3)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass/Fail
0	923.3	615.177	27.89	30	Pass
7	927.5	626.614	27.97	30	Pass

#### 5.4.10 Test Results (Mode 4)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass/Fail
0	923.3	298.538	24.75	30	Pass
4	926.5	297.852	24.74	30	Pass

#### 5.4.11 Test Results (Mode 5)

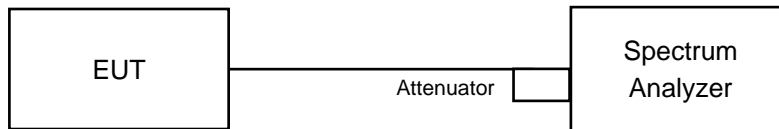
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass/Fail
0	923.3	297.852	24.74	30	Pass
7	927.5	321.366	25.07	30	Pass

## 5.5 Power Spectral Density Measurement

### 5.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

### 5.5.2 Test Setup



### 5.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 5.5.4 Test Procedure

#### DTS Mode (Channel Spacing: 600 kHz):

- a. Set instrument center frequency to DTS channel center frequency.
- b. Set span to at least 1.5 times the OBW.
- c. Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set VBW  $\geq 3 \times \text{RBW}$ .
- e. Detector = power averaging (RMS) or sample detector (when RMS not available).
- f. Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$ .
- g. Sweep time = auto couple.
- h. Employ trace averaging (RMS) mode over a minimum of 100 traces.
- i. Use the peak marker function to determine the maximum amplitude level.

#### DTS Mode (Channel Spacing: 800 kHz):

- a. Measure the duty cycle (x).
- b. Set instrument center frequency to DTS channel center frequency.
- c. Set span to at least 1.5 times the OBW.
- d. Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- e. Set VBW  $\geq 3 \times \text{RBW}$ .
- f. Detector = power averaging (RMS) or sample detector (when RMS not available).
- g. Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$ .
- h. Sweep time = auto couple.
- i. Do not use sweep triggering. Allow sweep to "free run".
- j. Employ trace averaging (RMS) mode over a minimum of 100 traces.
- k. Use the peak marker function to determine the maximum amplitude level.
- l. Add  $10 \log (1/x)$ , where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.

### 5.5.5 Deviation from Test Standard

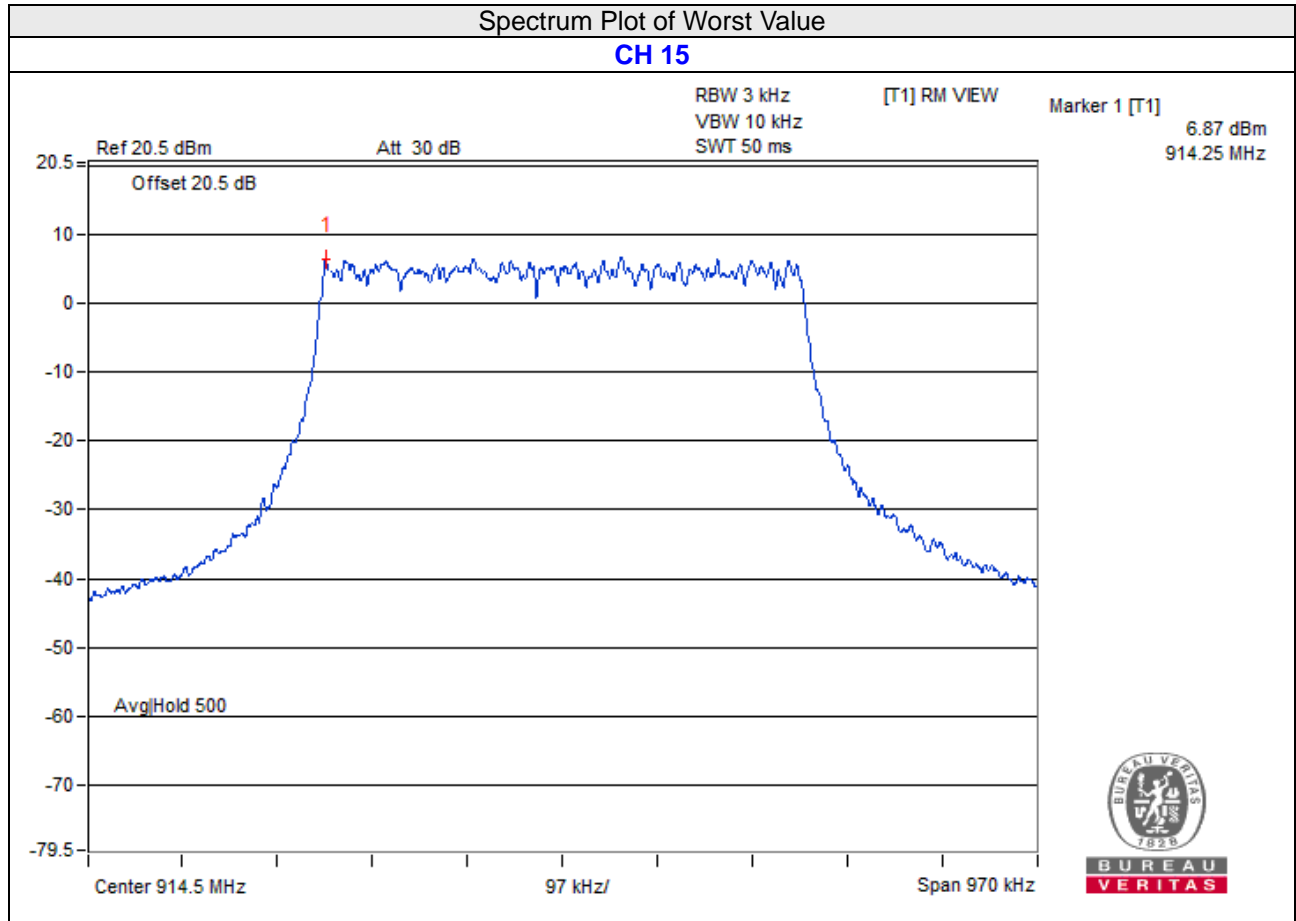
No deviation.

### 5.5.6 EUT Operating Condition

Same as Item 5.3.6.

### 5.5.7 Test Results (Mode 1)

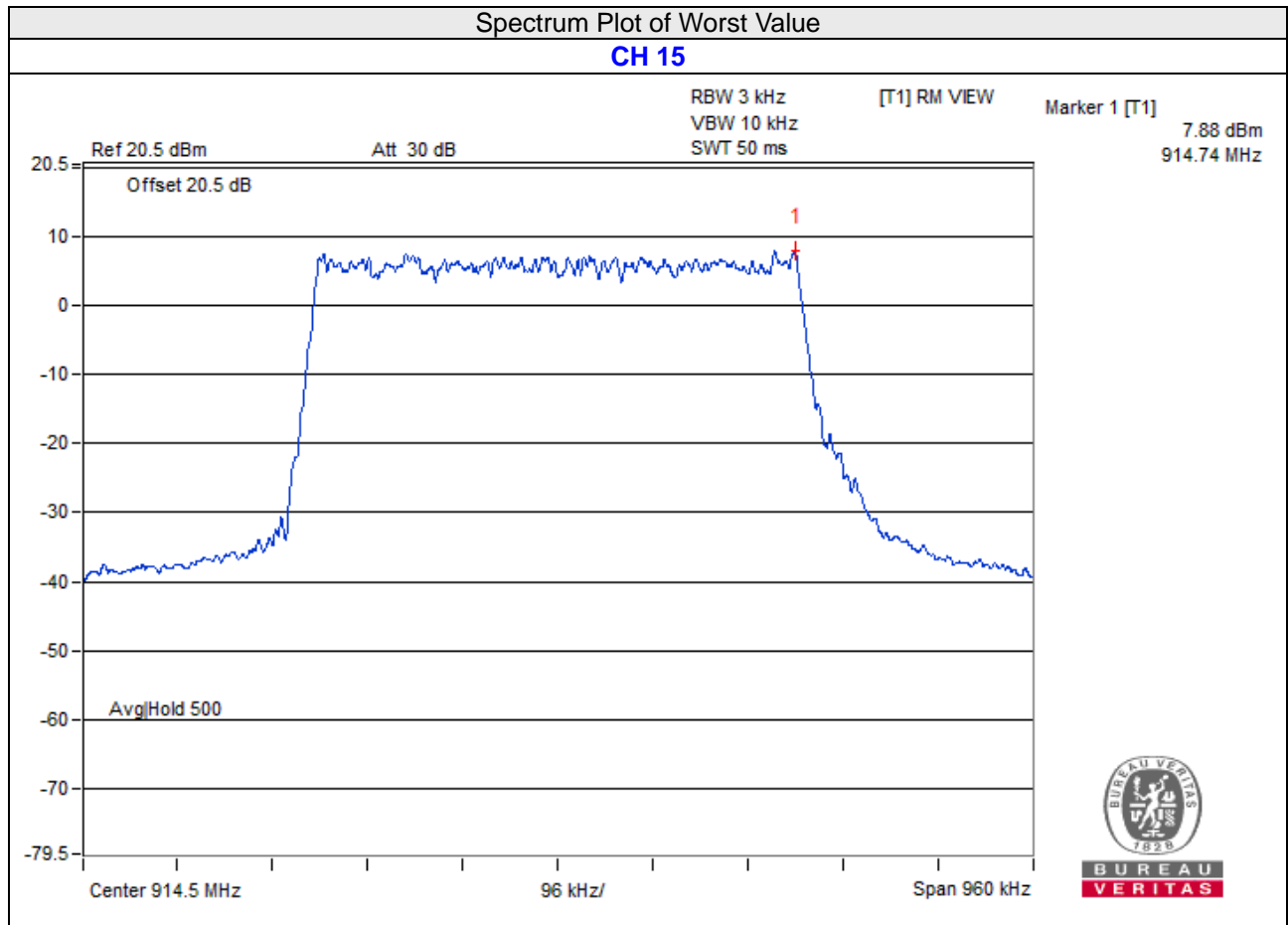
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	902.5	6.48	8.00	Pass
15	914.5	6.87	8.00	Pass
30	926.5	6.48	8.00	Pass





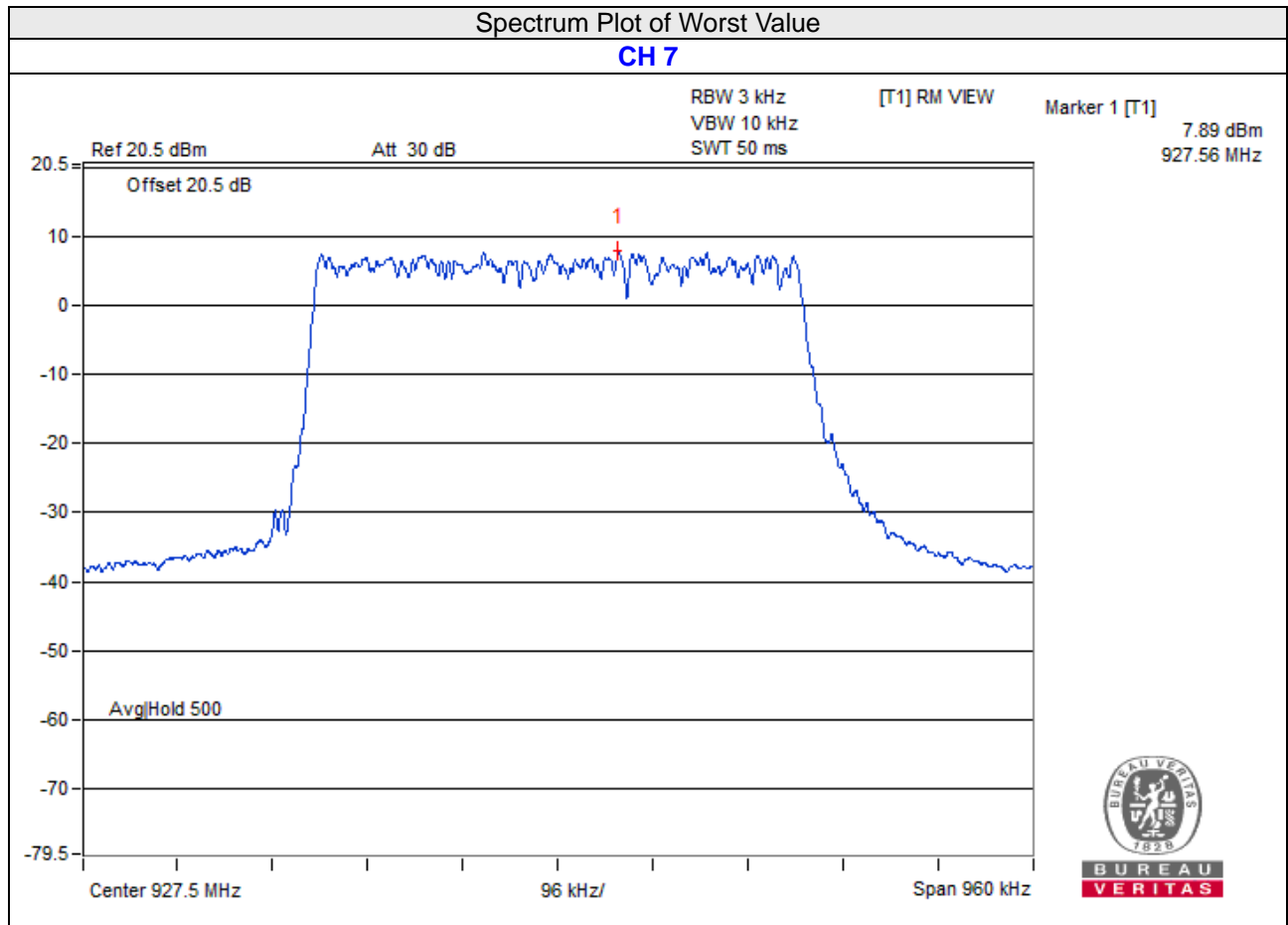
### 5.5.8 Test Results (Mode 2)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	902.5	7.09	8.00	Pass
15	914.5	7.88	8.00	Pass
30	926.5	7.86	8.00	Pass



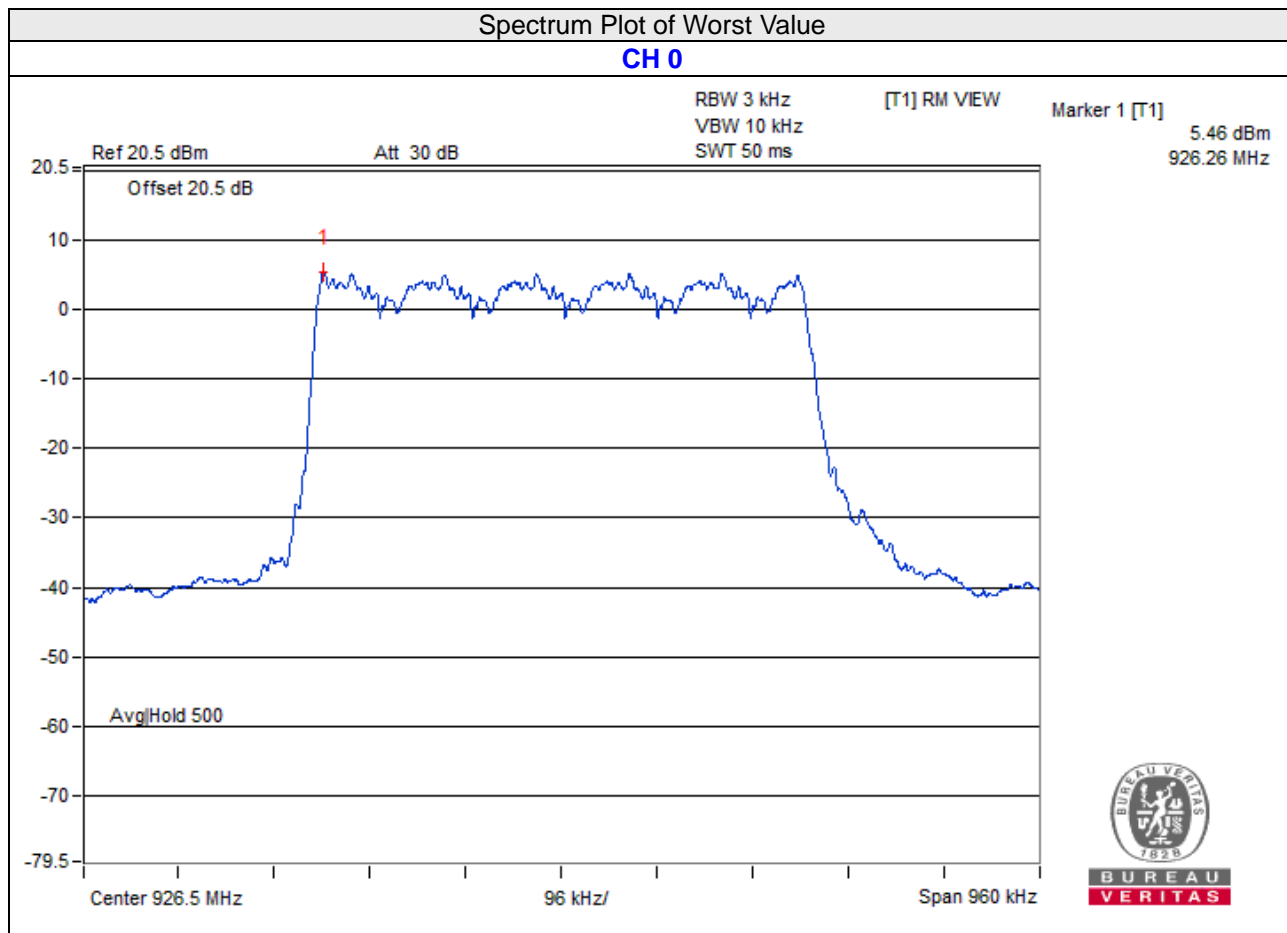
5.5.9 Test Results (Mode 3)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	923.3	7.84	8.00	Pass
7	927.5	7.89	8.00	PassT



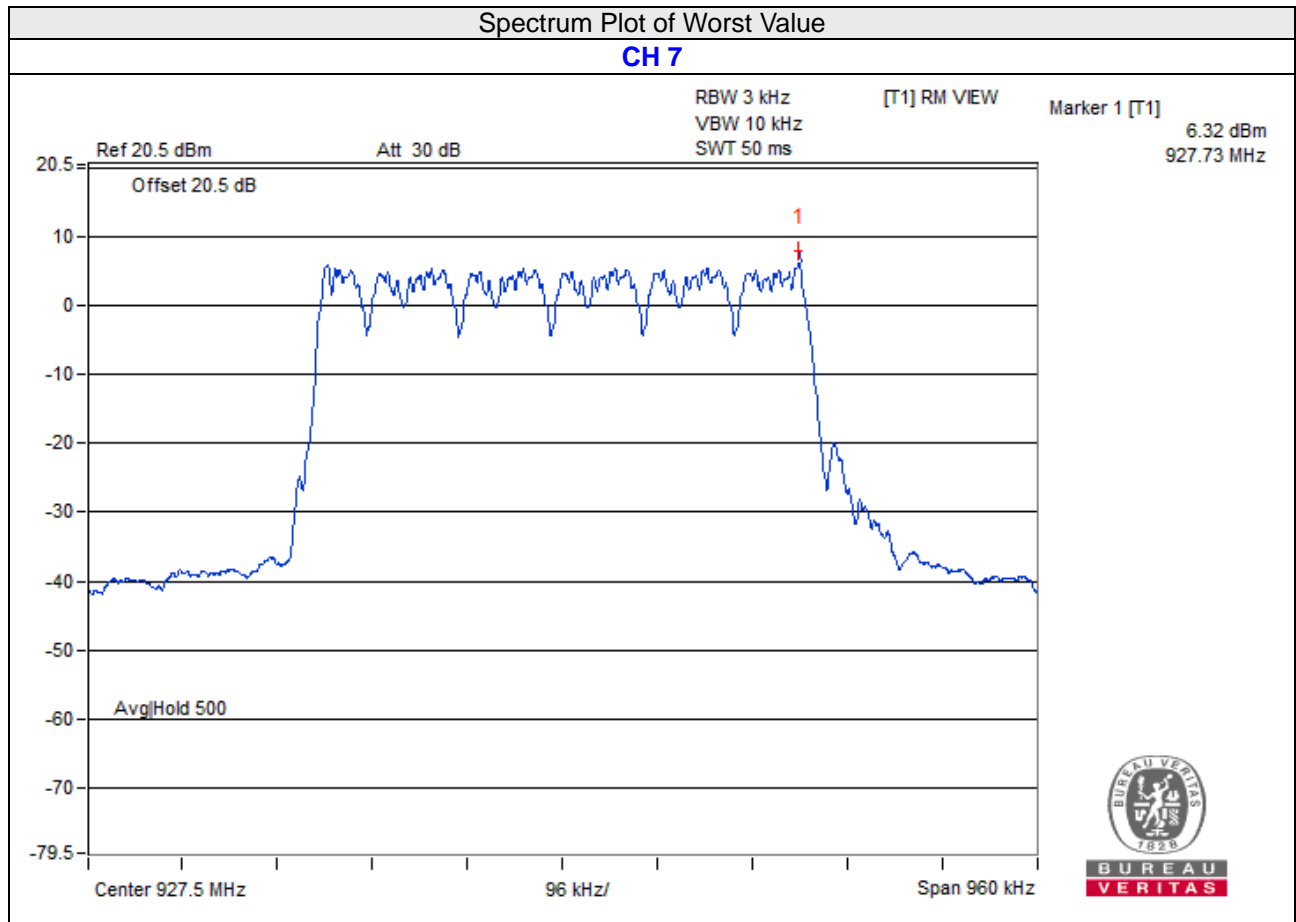
5.5.10 Test Results (Mode 4)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	923.3	5.12	8.00	Pass
4	926.5	5.46	8.00	PassT



5.5.11 Test Results (Mode 5)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Test Result
0	923.3	4.41	8.00	Pass
7	927.5	6.32	8.00	PassT

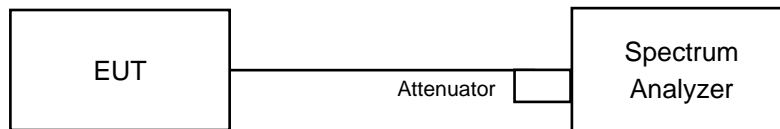


## 5.6 Conducted Out of Band Emission Measurement

### 5.6.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 5.6.2 Test Setup



### 5.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 5.6.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

### 5.6.5 Deviation from Test Standard

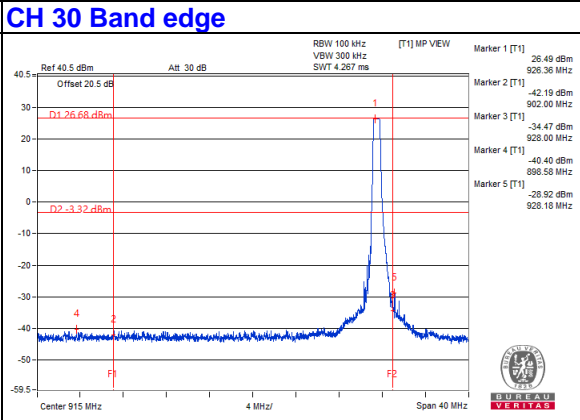
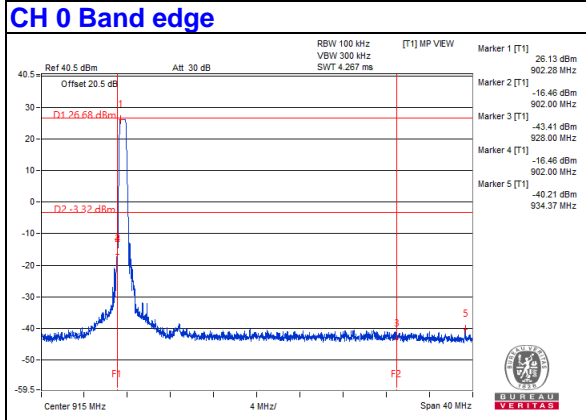
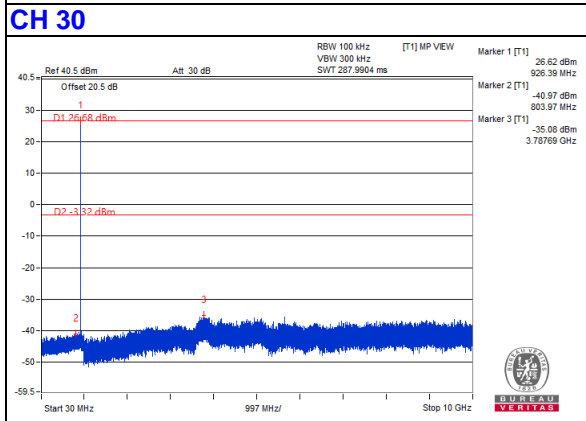
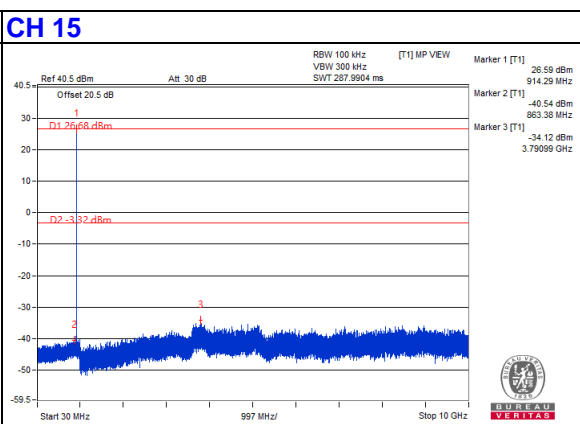
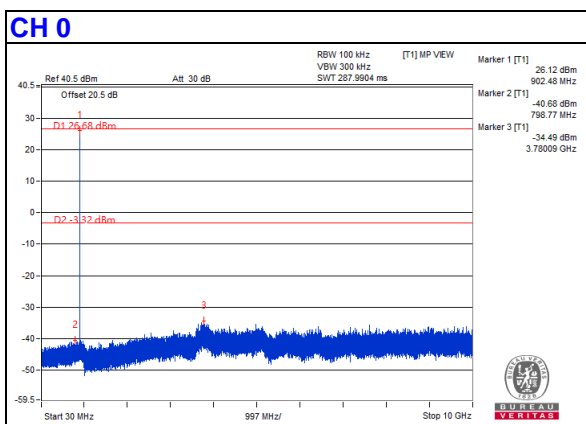
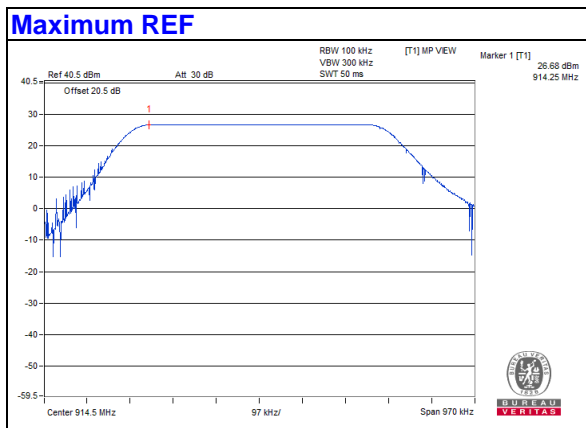
No deviation.

### 5.6.6 EUT Operating Condition

Same as Item 5.3.6.

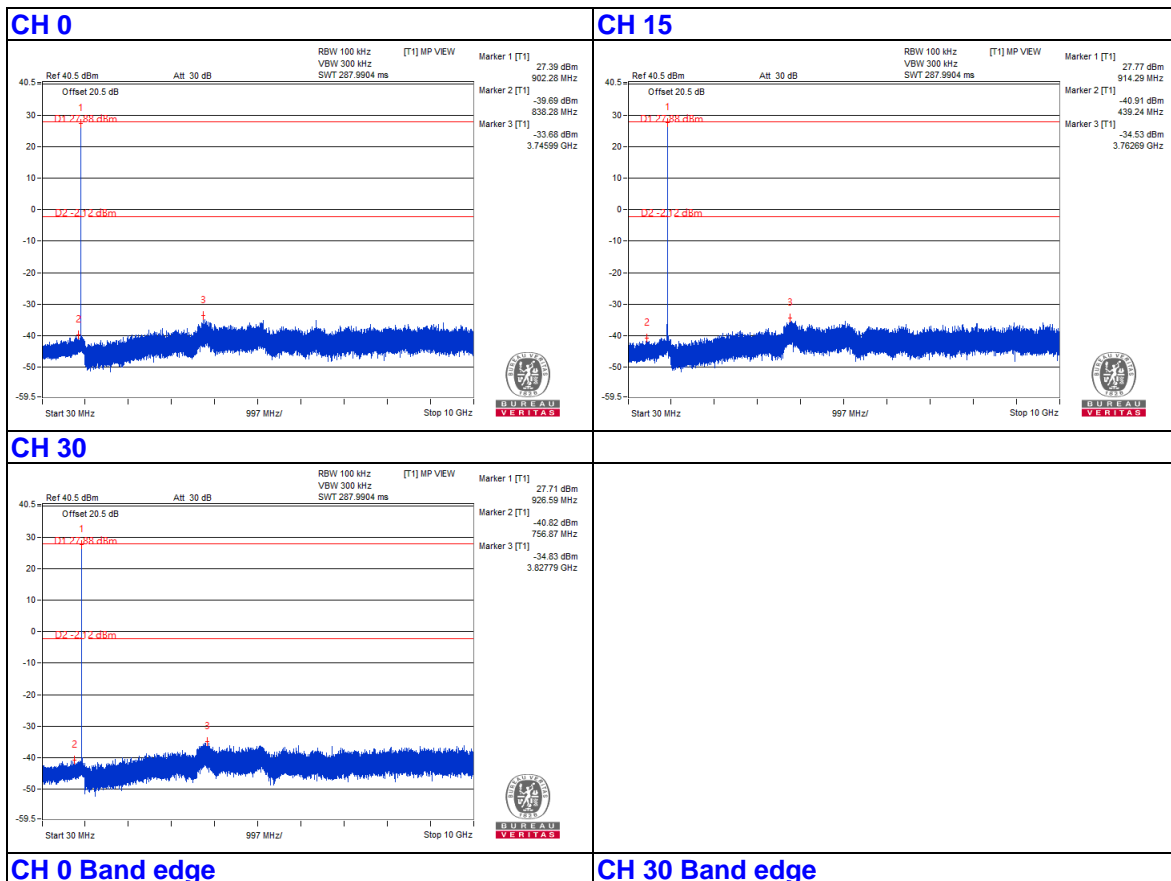
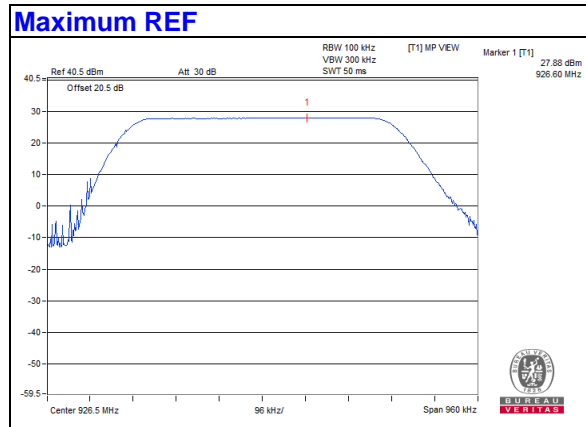
### 5.6.7 Test Results (Mode 1)

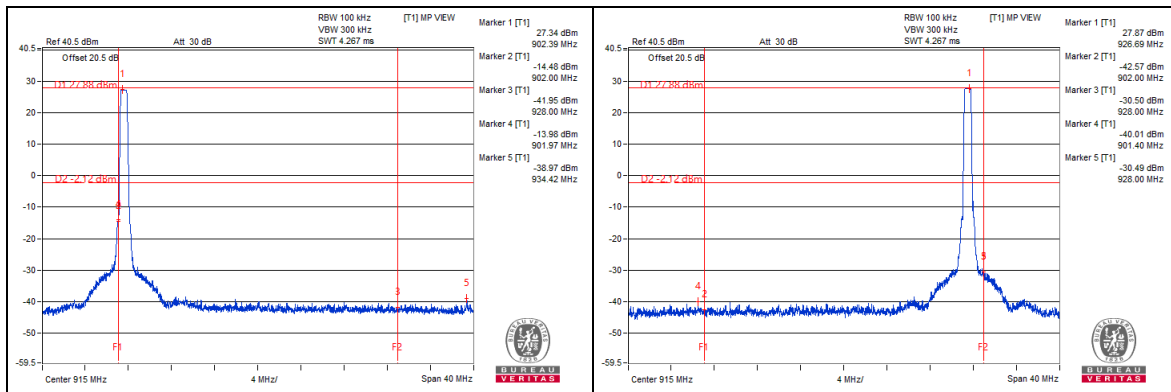
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.



### 5.6.8 Test Results (Mode 2)

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

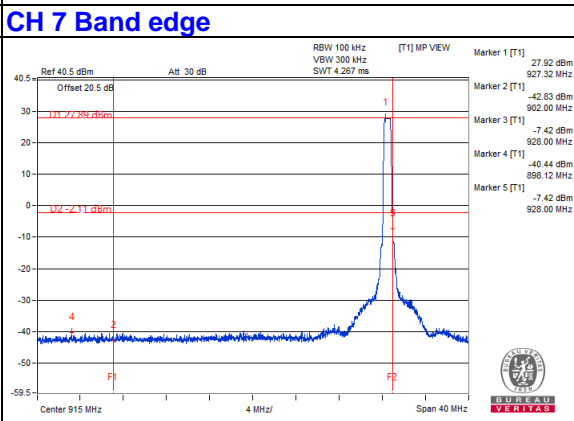
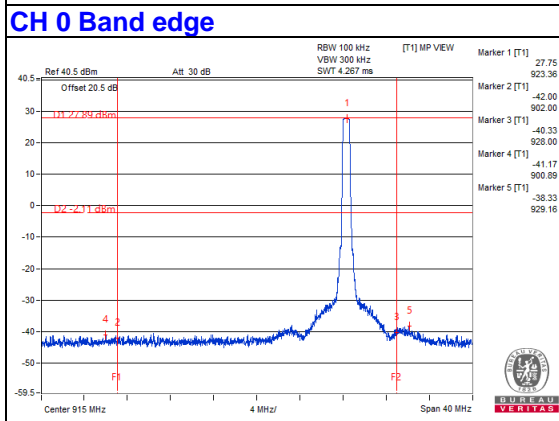
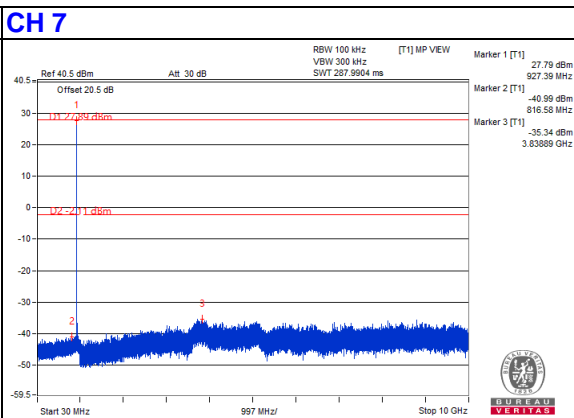
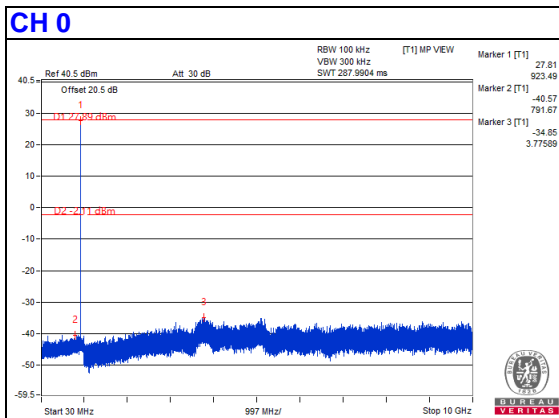
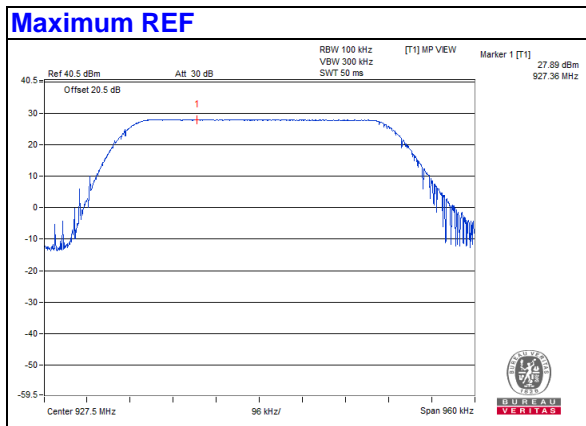






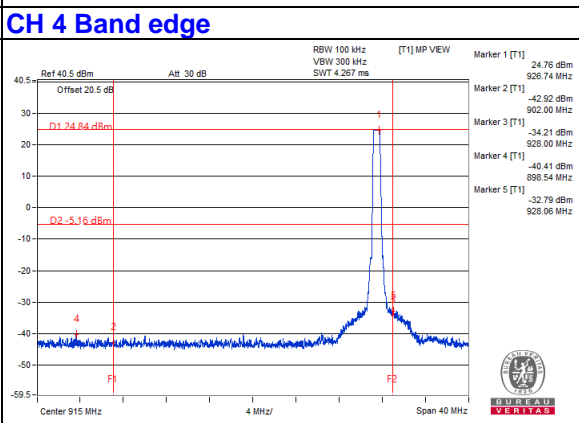
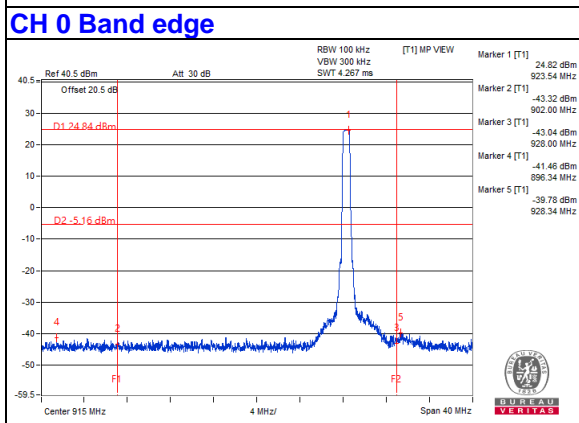
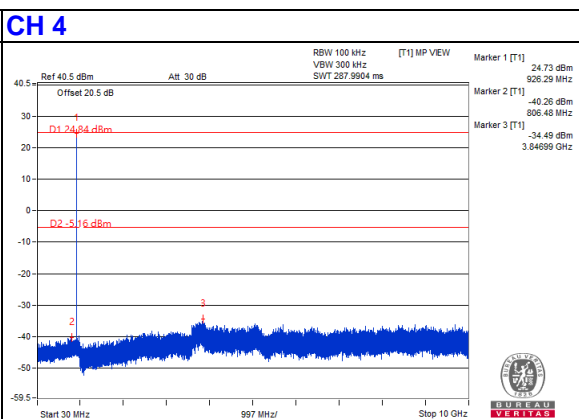
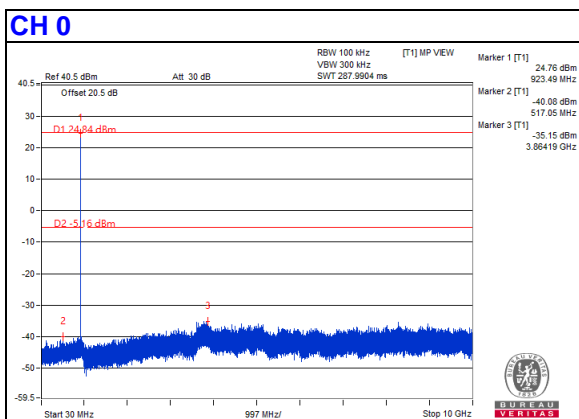
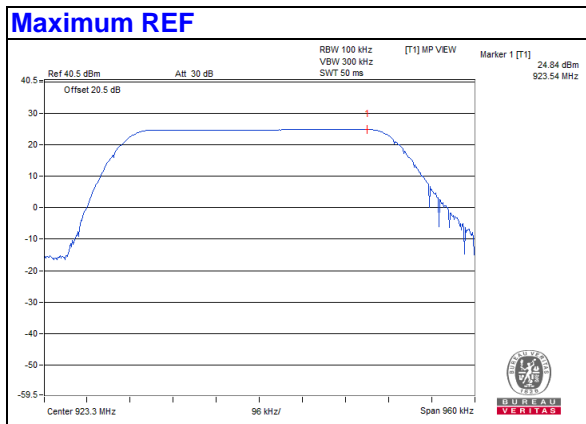
### 5.6.9 Test Results (Mode 3)

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.



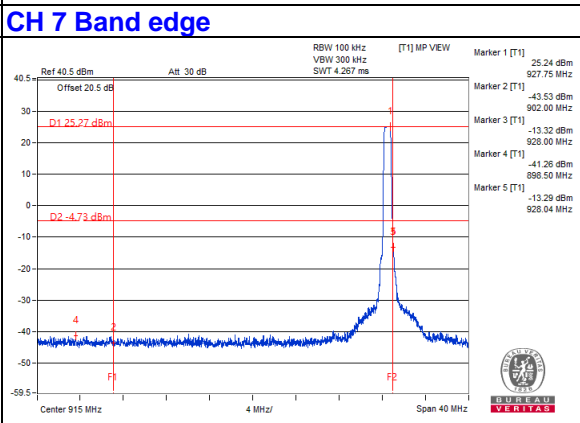
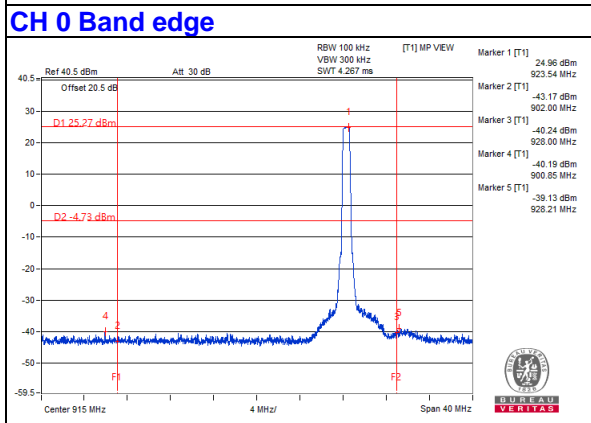
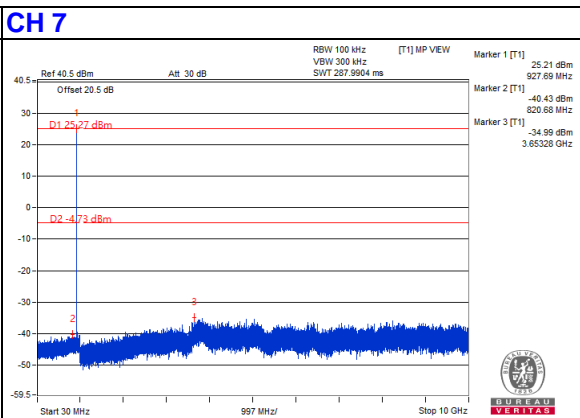
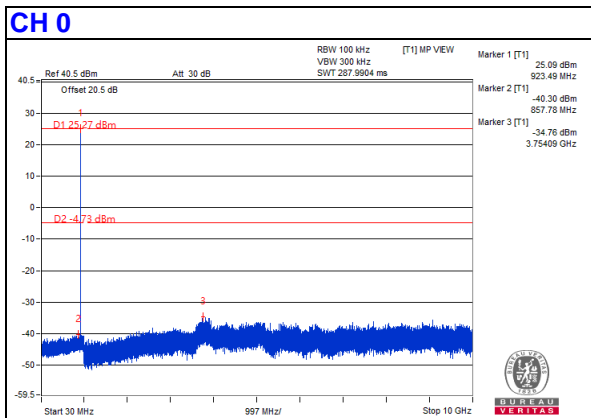
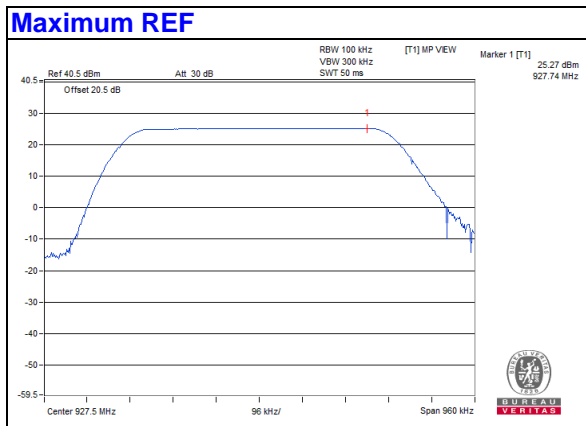
### 5.6.10 Test Results (Mode 4)

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.



### 5.6.11 Test Results (Mode 5)

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.



## 6 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

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