

FCC - TEST REPORT

Report Number : **68.710.19.0471.01** Date of Issue: March 16, 2020

Model : **DT2019209**

Product Type : Remote control

Applicant : HangzhouTianyuan Pet Products Co.,Ltd

Address : No.10-1 Xingling Rd., XingQiao Town, Linping, Yuhang,
311100 Hangzhou, PEOPLE'S REPUBLIC OF CHINA

Production Facility : HangzhouTianyuan Pet Products Co.,Ltd

Address : No.10-1 Xingling Rd., XingQiao Town, Linping, Yuhang,
311100 Hangzhou, PEOPLE'S REPUBLIC OF CHINA

Test Result : **n Positive** **o Negative**

Total pages including Appendices : 24

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
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P. R. China

FCC Registration
Number: 514049

ISED#: 10320A

CAB identifier: CN0077

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

3 Description of the Equipment under Test

Product/PMN:	Remote control
Model no./HVIN:	DT2019209
FCC ID:	2AL5X-DT2019209
Ratings:	3.0VDC (2 x AAA battery), 36mW
RF Transmission Frequency:	2407.127MHz-2475.127MHz
No. of Operated Channel:	27
Modulation:	O/QPSK
Antenna Type:	Integrated Antenna
Antenna Gain:	-2dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Remote control supports 2.4GHz wireless technology. The TX range is 2407.127MHz-2475.127MHz

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2018 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to ANSI C63.10-2013.

5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C 15.249					
Test Condition	Pages	Test Site	Test Result		
			Pass	Fail	N/A
15.207, Conducted emission AC power port*	---	---	☐	☐	☒
§15.205(a), §15.209(a), §15.249(a), §15.249(c) and §15.249(d), Field strength of emissions and Out of band emissions	9	Site 1	☒	☐	☐
§15.249(d), bandedge	14	Site 1	☒	☐	☐
FCC §15.215(c), 20dB bandwidth	19	Site 1	☒	☐	☐
§15.203, Antenna requirement	See note 2		☒	☐	☐

*: The appliance is powered by battery, therefore the requirements of conducted emission are not applicable.

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an integrated antenna, which gain is -2dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AL5X-DT2019209 complies with Section 15.207, 15.205, 15.209 and 15.249 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment under Test

n - **Fulfills** the general approval requirements.

o - **Does not** fulfill the general approval requirements.

Sample Received Date: November 14, 2019

Testing Start Date: November 19, 2019

Testing End Date: November 27, 2019

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch –

Reviewed by:



Jessie He
EMC Project Manager

Prepared by:



Myron Yu
EMC Project Engineer

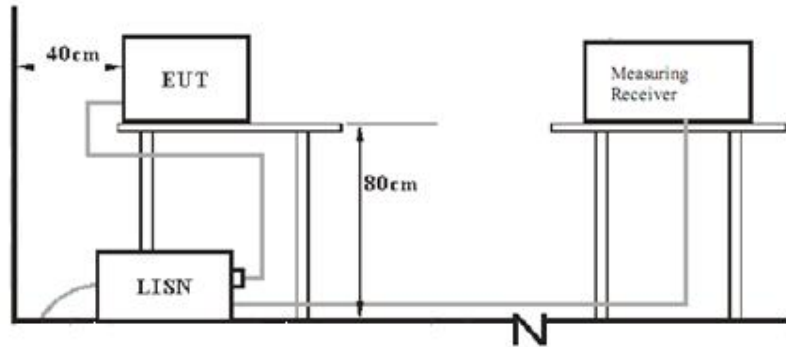
Tested by:



Louise Liu
EMC Test Engineer

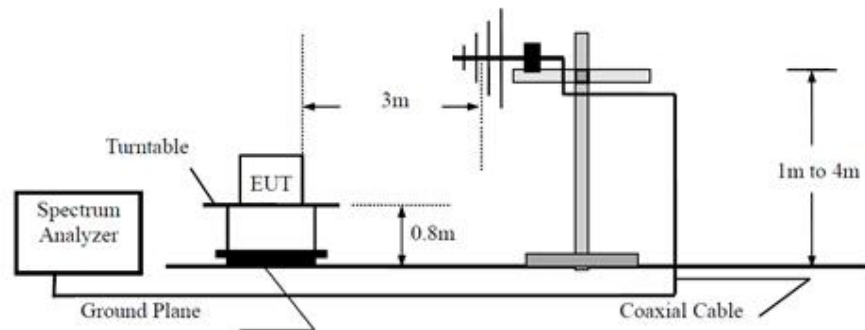
7 Test Setups

7.3 AC Power Line Conducted Emission test setups

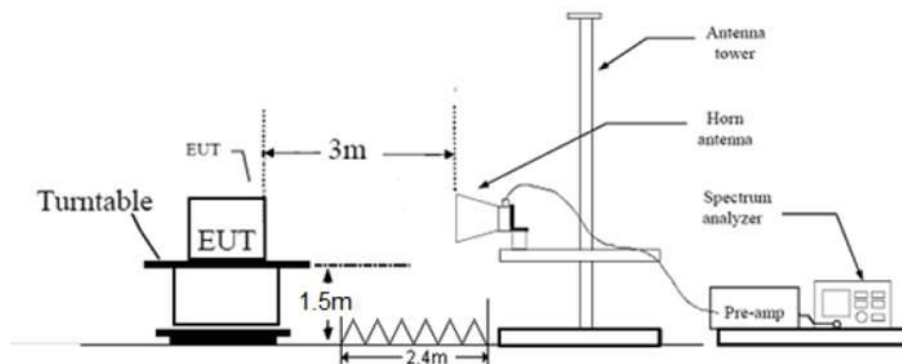


7.1 Radiated test setups

Below 1GHz



Above 1GHz



8 Technical Requirement

8.1 Field strength of emissions and Out of band emissions

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: 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.
- 4: 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.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW ≥ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (duty cycle ≥ 98%) for peak detection at frequency above 1GHz.
- 4: If the emission is pulsed (duty cycle < 98%), modify the unit for continuous operation: use the settings shown above, then correct the reading by subcontracting the peak to average duty cycle correction factor $20 \log(\text{duty cycle})$, derived from the appropriate duty cycle calculation.

Field strength of emissions and Out of band emissions

Limits

According to §15.249 (a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

According to §15.249 (c), Field strength limits are specified at a distance of 3 meters.

According to §15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

According to §15.205, unwanted emissions falling into restricted bands in §15.205 (a) shall comply with the limits specified in §15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBμV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Field strength of emissions and Out of band emissions

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

EUT: Remote control

M/N: DT2019209

Operating Condition: Tx: 2407.127 MHz

For Peak Value

Radiated Emission							
Value	Emissions Frequency MHz	E-Field Polarity	Correction Factor dB	PK Emission dBμV/m	Limit dBμV/m	Margin dBm	Emission Type
PK	943.201111	H	-14.6	36.01	46.00	9.99	Spurious
PK	943.308889	V	-14.6	33.04	46.00	12.96	Spurious
PK	2407.127000	H	-4.7	88.05	114.00	25.95	Fundamental
PK	2407.127000	V	-4.7	88.47	114.00	25.53	Fundamental
PK	7222.000000	H	6.2	57.38	74.00	16.62	Spurious
PK	7223.000000	V	6.2	70.26	74.00	3.74	Spurious
PK	4815.000000	V	2.6	57.25	74.00	16.75	Spurious

For AV Value

Radiated Emission								
Value	Emissions Frequency MHz	E-Field Polarity	PK Emission dBμV/m	Average Factor dB	AV Emission dBμV/m	Limit dBμV/m	Margin dBm	Emission Type
AV	2407.127000	H	88.05	-21.33	66.72	94.00	27.28	Fundamental
AV	2407.127000	V	88.47	-21.33	67.14	94.00	26.86	Fundamental
AV	7222.000000	H	57.38	-21.33	36.05	54.00	17.95	Spurious
AV	7223.000000	V	70.26	-21.33	48.93	54.00	5.07	Spurious
AV	4815.000000	V	57.25	-21.33	35.92	54.00	18.08	Spurious
Peak to average duty cycle correction factor =20log(duty cycle), duty cycle=8.58%;								
Correction factor=20log(8.58%)=-21.33dB								

Remark:

- 1: Data of measurement within this frequency range shown "I" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
 - 2: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
 - 3: AV Emission Level= Peak emission Level+20log(dutycycle) (for duty cycle<98%)
 - 4: PK Emission = Reading Level + Correction Factor
- AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)
 Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
 Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
 (The Reading Level is recorded by software which is not shown in the sheet)

Field strength of emissions and Out of band emissions

EUT: Remote control

M/N: DT2019209

Operating Condition: Tx: 2445.127 MHz

For Peak Value

Radiated Emission							
Value	Emissions Frequency MHz	E-Field Polarity	Correction Factor dB	PK Emission dBμV/m	Limit dBμV/m	Margin dBm	Emission Type
PK	2445.127000	H	-6.5	85.17	114.00	28.83	Fundamental
PK	2445.127000	V	-6.5	76.80	114.00	37.20	Fundamental
PK	7335.398438	H	3.7	54.28	74.00	19.72	Spurious
PK	7337.226563	V	3.6	52.25	74.00	21.75	Spurious

For AV Value

Radiated Emission								
Value	Emissions Frequency MHz	E-Field Polarity	PK Emission dBμV/m	Average Factor dB	AV Emission dBμV/m	Limit dBμV/m	Margin dBm	Emission Type
AV	2445.127000	H	85.17	-21.33	63.84	94.00	30.16	Fundamental
AV	2445.127000	V	76.80	-21.33	55.47	94.00	38.53	Fundamental
AV	7335.398438	H	54.28	-21.33	32.95	54.00	21.05	Spurious
AV	7337.226563	V	52.25	-21.33	30.92	54.00	23.08	Spurious
Peak to average duty cycle correction factor = $20\log(\text{duty cycle})$, duty cycle=8.58%; Correction factor= $20\log(8.58\%)=-21.33\text{dB}$								

Remark:

- 1: Data of measurement within this frequency range shown "f" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 2: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- 3: AV Emission Level= Peak emission Level+ $20\log(\text{duty cycle})$ (for duty cycle<98%)
- 4: PK Emission = Reading Level + Correction Factor
AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)
Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)

Field strength of emissions and Out of band emissions

EUT: Remote control

M/N: DT2019209

Operating Condition: Tx: 2475.127 MHz

For Peak Value

Radiated Emission							
Value	Emissions Frequency MHz	E-Field Polarity	Correction Factor dB	PK Emission dBμV/m	Limit dBμV/m	Margin dBm	Emission Type
PK	2475.127000	H	-6.4	83.86	114.00	30.14	Fundamental
PK	2475.127000	V	-6.4	75.60	114.00	38.40	Fundamental
PK	4951.218750	H	1.7	52.64	74.00	21.36	Spurious
PK	4951.523438	V	1.7	52.01	74.00	21.99	Spurious

For AV Value

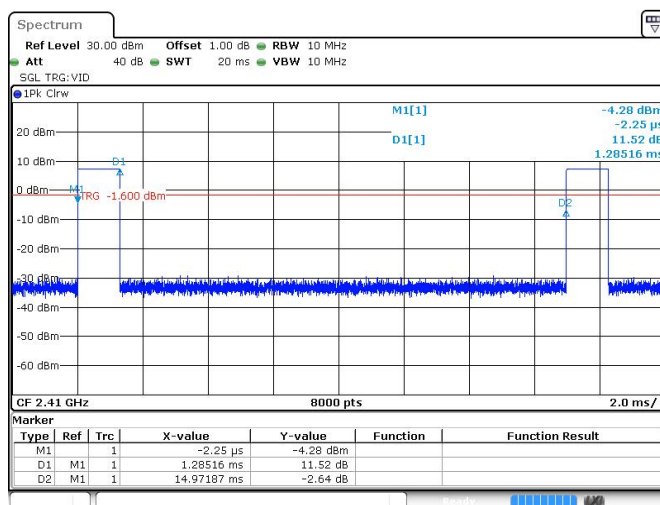
Radiated Emission								
Value	Emissions Frequency MHz	E-Field Polarity	PK Emission dBμV/m	Average Factor dB	AV Emission dBμV/m	Limit dBμV/m	Margin dBm	Emission Type
AV	2475.127000	H	83.86	-21.33	62.53	94.00	31.47	Fundamental
AV	2475.127000	V	75.60	-21.33	54.27	94.00	39.73	Fundamental
AV	7335.398438	H	52.64	-21.33	31.31	54.00	22.69	Spurious
AV	7337.226563	V	52.01	-21.33	30.68	54.00	23.32	Spurious

Peak to average duty cycle correction factor = $20\log(\text{duty cycle})$, duty cycle=8.58%;
Correction factor= $20\log(8.58\%)$ =-21.33dB

Remark:

- 1: Data of measurement within this frequency range shown "I" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
 - 2: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
 - 3: AV Emission Level= Peak emission Level+20log(duty cycle) (for duty cycle<98%)
 - 4: PK Emission = Reading Level + Correction Factor
- AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)
Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)

Duty cycle:



Date: 19 NOV 2019 09:51:51

8.2 Bandedge

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW $\geq$ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

Limits

According to §15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

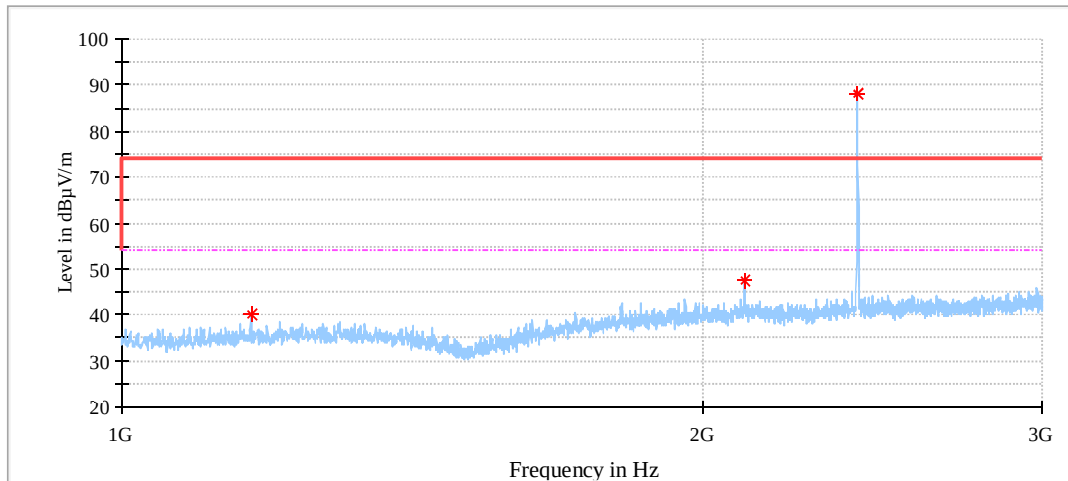
Bandedge

EUT: Remote control

M/N: DT2019209

Operating Condition: Tx: 2407.127 MHz

Polarization: Horizontal



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1166.500000	39.90	74.00	34.10	150.0	H	313.0	-10.2
2104.000000	47.30	74.00	26.70	150.0	H	180.0	-5.6
2408.000000	88.05	74.00	-14.05	150.0	H	301.0	-4.7

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier

(The Reading Level is recorded by software which is not shown in the sheet)

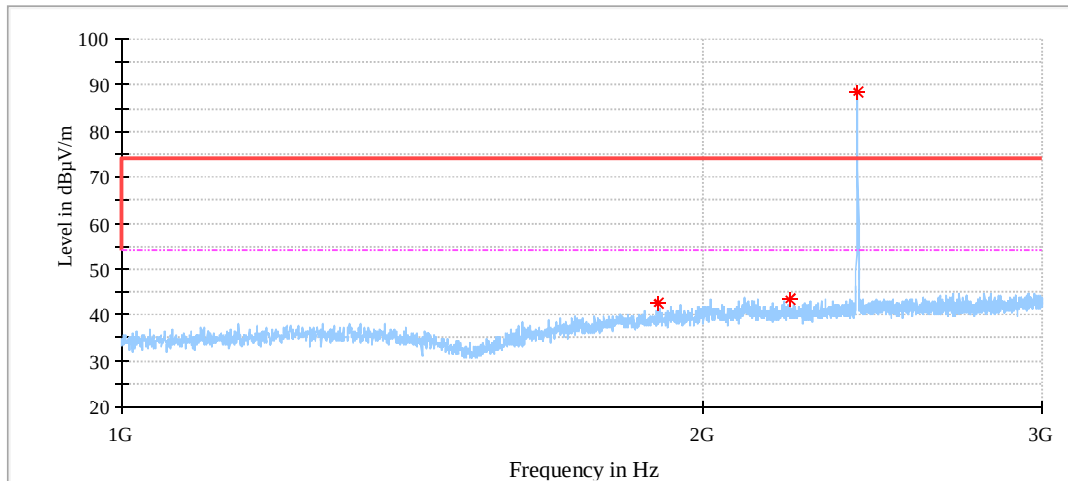
Bandedge

EUT: Remote control

M/N: DT2019209

Operating Condition: Tx: 2407.127 MHz

Polarization: Vertical



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1898.000000	42.73	74.00	31.27	150.0	V	19.0	-6.3
2221.000000	43.38	74.00	30.62	150.0	V	82.0	-5.6
2408.000000	88.47	74.00	-14.47	150.0	V	214.0	-4.7

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier

(The Reading Level is recorded by software which is not shown in the sheet)

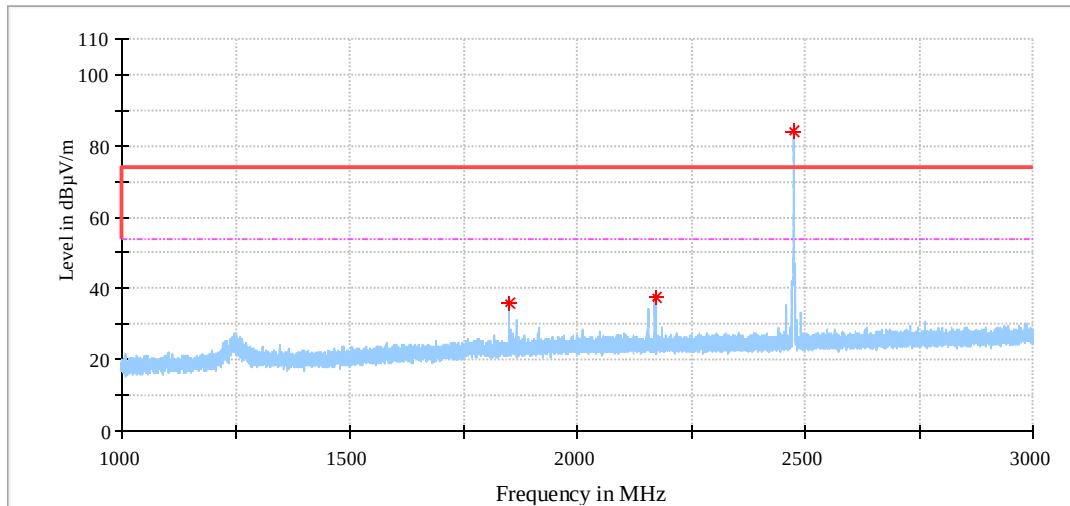
Bandedge

EUT: Remote control

M/N: DT2019209

Operating Condition: Tx: 2475.127 MHz

Polarization: Horizontal



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1851.562500	35.81	74.00	38.19	---	---	154.0	H	227.0	-8.9
2171.562500	37.71	74.00	36.29	---	---	154.0	H	4.0	-7.3
2475.625000	83.86	74.00	-9.86	---	---	154.0	H	254.0	-6.4

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier

(The Reading Level is recorded by software which is not shown in the sheet)

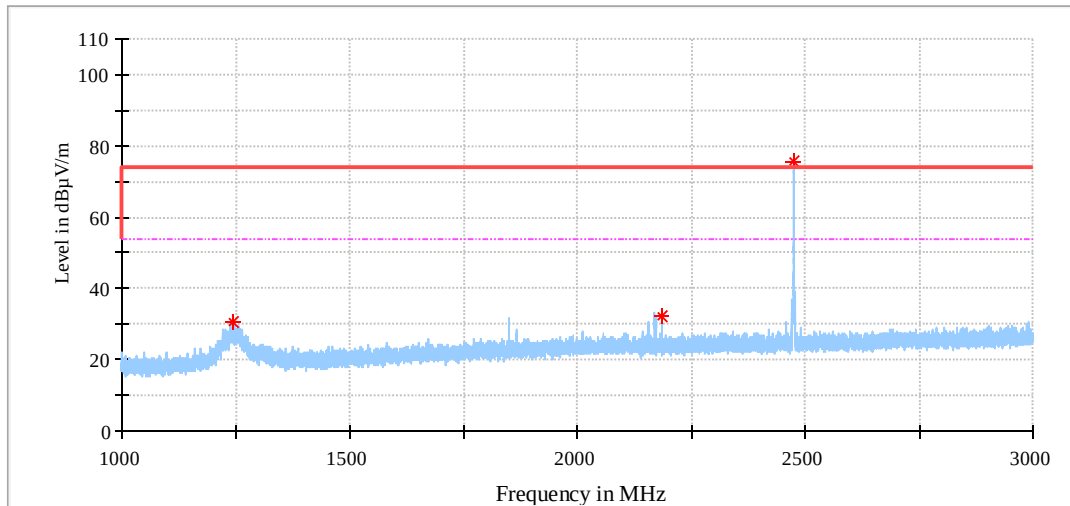
Bandedge

EUT: Remote control

M/N: DT2019209

Operating Condition: Tx: 2475.127 MHz

Polarization: Vertical



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1244.187500	30.66	74.00	43.34	---	---	154.0	V	335.0	-13.1
2187.625000	32.26	74.00	41.74	---	---	154.0	V	200.0	-7.3
2475.562500	75.60	74.00	-1.60	---	---	154.0	V	263.0	-6.4

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier

(The Reading Level is recorded by software which is not shown in the sheet)

8.3 20dB Bandwidth & 99% Occupied Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to spectrum analyser. 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.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

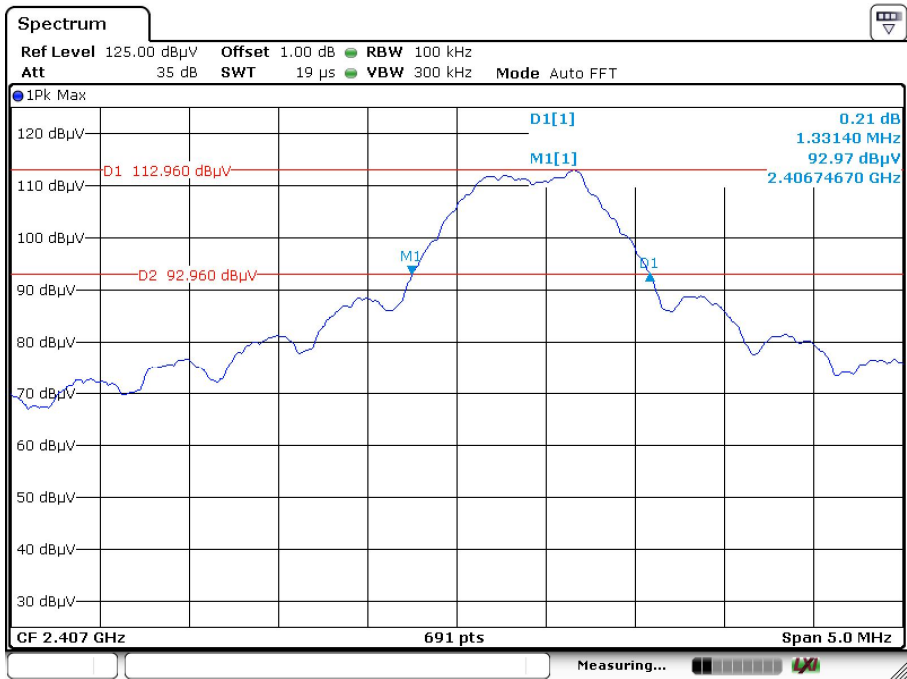
Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.



20dB Bandwidth & 99% Occupied Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2407.127	1.3314	--



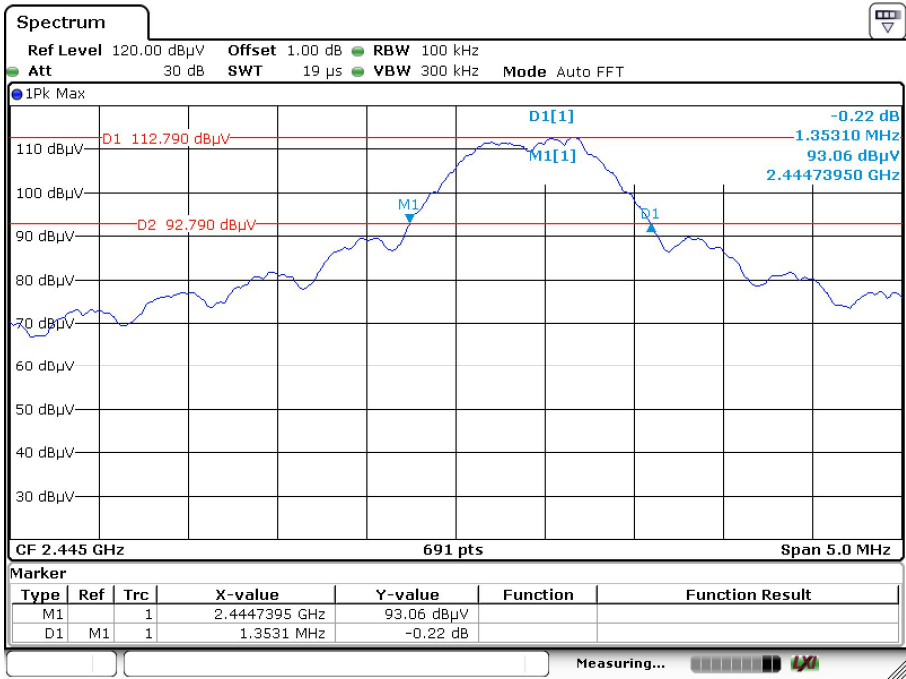
Date: 2.APR.2020 16:56:38

2407.127 MHz



20dB Bandwidth & 99% Occupied Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2445.127	1.3531	--



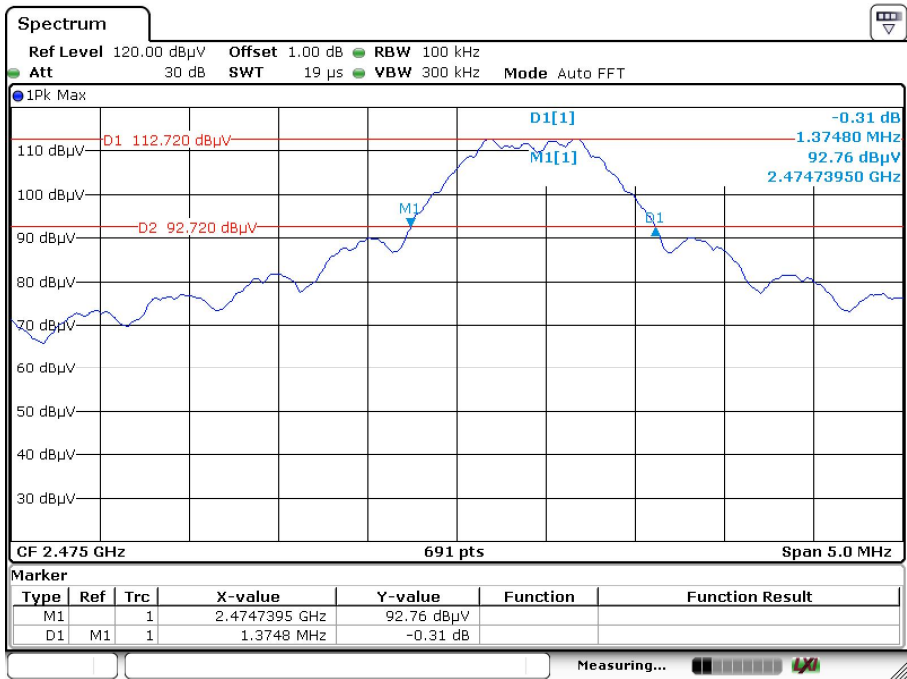
Date: 27.FEB.2020 10:47:08

2445.127 MHz



20dB Bandwidth & 99% Occupied Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2475.127	1.3748	--



Date: 27.FEB.2020 10:48:29

2475.127 MHz

9 Test Equipment List

Site 1:

Radiated Spurious Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-003	101031	2020-6-28
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	68-4-80-14-003	708	2020-7-5
Horn Antenna	Rohde & Schwarz	HF907	68-4-80-14-004	102295	2020-7-5
Wideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	2020-7-5
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	2020-6-28
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	2020-7-16
Fully Anechoic Chamber	TDK	8X4X4	68-4-90-14-002	--	2020-7-7
Test software	Rohde & Schwarz	EMC32	68-4-90-14-002-A10	Version 9.15.00	N/A

10 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Site 1:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Spurious Emission 30MHz-1000MHz	Horizontal: 5.12dB; Vertical: 5.10dB;
Uncertainty for Radiated Spurious Emission 1000MHz-18000MHz	Horizontal: 5.01dB; Vertical: 5.00dB