REPORT No.: SZ18050201W10

TEST REPORT

MANUFACTURER	:	Shenzhen Chainway Information Technology Co.,Ltd.
PRODUCT NAME	:	Mobile Data Terminal
MODEL NAME	:	C75
BRAND NAME	:	CHAINWAY
STANDARD(S)	:	ETSI EN 300 330 V2.1.1 (2017-02)
TEST DATE	:	2018-11-08
ISSUE DATE	:	2018-11-13

Tested by: Peng Xuewei

Peng Xuewei (Test Engineer)

Approved by:

Peng Huarui (Supervisor)

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DIRECTORY

Change History		
Issue	**Date**	**Reason for change**
1.0	2018-11-13	First edition

1. Technical Information

Note: Provide by manufacturer.

1.1. Manufacturer and Factory Information

Manufacturer:	Shenzhen Chainway Information Technology Co.,Ltd.
Manufacturer Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Factory:	Shenzhen Chainway Information Technology Co.,Ltd.
Factory Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen

1.2. Equipment Under Test (EUT) Description

Product Name:	Mobile Data Terminal	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	C70_MB_V11	
Software Version:	C75E_MT6737_V1.2_EU_GITe4dc346_201805171136	
Frequency:	13.56MHz	
Modulation Type:	CPFSK	
Product Class:	1(see clause 1.5)	
Operating voltage:	Normal(NV):	3.8 V
Operating temperature:	Normal(NT):	25°C
	Lowest(LT):	-20°C
	Highest(HT):	50°C

Note 1: The EUT supports NFC function.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Test Standards and Results

The EUT has been tested according to ETSI EN 300 330 V2.1.1 (2017-02):

No.	Identity	Document Title
1	ETSI EN 300 330 V2.1.1 (2017-02)	Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Test items and the results are as bellow:

No.	Sub clause in EN 300330	Test Item	Test Engineer	Result
1	4.3.1	Permitted range of operating frequencies	Peng Xuewei	PASS
2	4.3.2	Operating frequency ranges	Peng Xuewei	PASS
3	4.3.3	Modulation bandwidth	Peng Xuewei	PASS
4	4.3.4	Transmitter H-field requirements	Peng Xuewei	PASS
5	4.3.8	Transmitter radiated spurious domain emission limits < 30 MHz	Peng Xuewei	PASS
6	4.3.9	Transmitter radiated spurious domain emission limits > 30 MHz	Peng Xuewei	PASS
7	4.4.2	Receiver spurious emissions	Peng Xuewei	PASS

1.4. EUT Setup and Operating Conditions

The 13.56MHz RF Module was activated and controlled by reading the card. The EUT is powered by a battery.

1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	20 - 75
Atmospheric Pressure (kPa):	86 - 106

2. Transmitter Parameters

2.1. EN 300 330§4.3.1 - Permitted range of operating frequencies

The permitted range of operating frequencies is the frequency range over which the equipment is authorized to operate.

2.1.1. Test Description

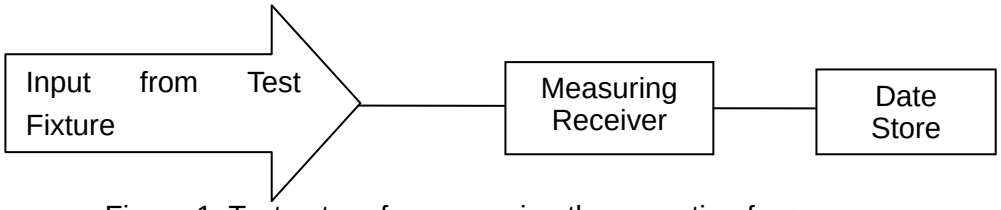


Figure 1: Test set-up for measuring the operating frequency range

The test shall be measured using the method shown in figure 1.
The measurement antenna shall be placed at one point of the setup up.
A spectrum analyser with the following settings is used as measuring receiver in the test set-up:

- Start frequency: lower than the lower edge of the permitted frequency range.
- Stop frequency: higher than the upper edge of the permitted frequency range.
- Resolution Bandwidth: see table 11 in ETSI EN 300 330 V2.1.1.
- Video Bandwidth: ≥ Resolution Bandwidth.
- Detector mode: RMS.
- Display mode: Maxhold.

The 99 % OBW function shall be used to determine the operating frequency range:

- fH is determined. fH is the frequency of the upper marker resulting from the OFR.
- fL is determined. fL is the frequency of the lower marker resulting from the OFR.
- fc is the centre frequency.

Alternatively, the recorded results from the H-field measurement described in ETSI EN 300 330 V2.1.1 clause 6.2.4 may be used.

2.1.2. Test Limit

The permitted range of operating frequencies for intentional emissions shall be entirely within the frequency bands in ETSI EN 300 330 V2.1.1 table 1.

2.1.3. Test Result

Test Method	Modulation	Test Conditions		Operating Frequency(MHz)	Limit
☒ Radiated ☐Conducted	☒ ON ☐ OFF	NT	NV	13.5589 to 13.5608	13.553MHz to 13.567MHz
Test Result				PASS	

2.2. EN 300 330§4.3.2 - Operating frequency ranges

The operating frequency range (OFR) is the frequency range over which the EUT is transmitting.
The operating frequency range of the EUT is determined by the lowest (f_L) and highest frequency (f_H) as occupied by the power envelope.
With the centre frequency of the OFR as: $f_C = (f_H + f_L)/2$.
An EUT could have more than one operating frequency range.

2.2.1. Test Description

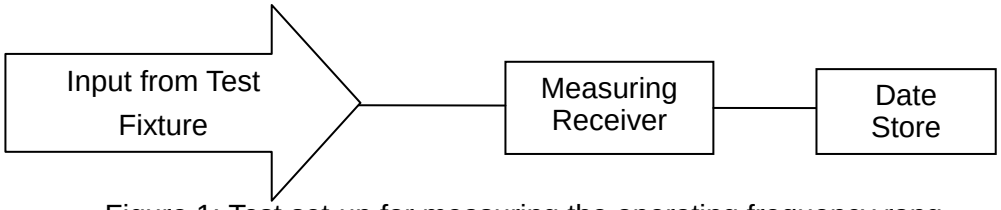


Figure 1: Test set-up for measuring the operating frequency range

2.2.1.1 OFR measurement with spectrum analyser

The measurement antenna shall be placed at one point of the setup up. Alternatively, a current probe could be used.A spectrum analyser with the following settings is used as measuring receiver in the test set-up:
Start frequency: lower than the lower edge of the permitted frequency range.
Stop frequency: higher than the upper edge of the permitted frequency range.
Resolution Bandwidth: see table 11 in ETSI EN 300 330 V2.1.1.
Video Bandwidth: ≥ Resolution Bandwidth.
Detector mode: RMS
Display mode: Maxhold.
The 99 % OBW function shall be used to determine the operating frequency range:
f_H is determined. f_H is the frequency of the upper marker resulting from the OFR.
f_L is determined. f_L is the frequency of the lower marker resulting from the OFR.
f_C is the centre frequency. $f_C = (f_H + f_L)/2$

2.2.2. Test Limit

The permitted range of operating frequencies for intentional emissions shall be entirely within the frequency bands in ETSI EN 300 330 V2.1.1 table 1.

2.2.3. Test Result

Test Method	Modulation	Test Conditions		Operating Frequency(MHz)	Limit
☒ Radiated ☐Conducted	☒ ON ☐ OFF	NT	NV	13.560	13.553MHz to 13.567MHz
Test Result				PASS	

2.3. EN 300 330§4.3.3 - Modulation bandwidth

The modulation bandwidth contains all associated side bands above the following level:

a) For carrier frequencies below 135kHz:
23dB below the carrier, for RFID within the transmitter emission boundary of figure I.1, and for RFID and EAS systems within the transmitter mask of figures I.2,I.3 and I.4, see CISPR 16-1-4 [2] or theappropriate spurious limit as defined in clauses 4.3.7, 4.3.8, 4.3.9 in ETSI EN 300 330 V2.1.1.

b) For carrier frequencies in the range 135kHz to 30MHz:
15 dB below the carrier or the appropriate spurious limit as defined in clauses 4.3.7, 4.3.8, 4.3.9 of ETSI EN 300 330 V2.1.1.

2.3.1. Test Description

1. The transmitter shall be connected to an artificial antenna or if the transmitter has an integral antenna, a test fixture shall be used (see clause 5.10 of ETSI EN 300 330 V2.1.1). The RF output of the equipment shall be connected to a spectrum analyser via a 50 Ω variable attenuator.
2. The transmitter shall be operated at the nominal carrier power or field strength measured under normal test conditions in clause 4.3.4 of ETSI EN 300 330 V2.1.1. The attenuator shall be adjusted to an appropriate level displayed at the spectrum analyser screen.
3. The transmitter shall be modulated with standard test modulation. If the equipment cannot be modulated externally, the internal modulation shall be used.
4. For transmitters using a continuous wideband swept carrier the measurement shall be made with the sweep on.
5. The output of the transmitter, with or without test fixture, shall be measured by using a spectrum analyser with a resolution bandwidth appropriate to accept all major side bands. The power level calibration of the spectrum analyser shall then be related to the power level or field strength measured in clause 4.3.3 of ETSI EN 300 330 V2.1.1. The calculation will be used to calculate the absolute level of the sideband power.
6. The test laboratory shall ensure that the spectrum analyser's span is sufficiently wide enough to ensure that the carrier and all its major side bands are captured.

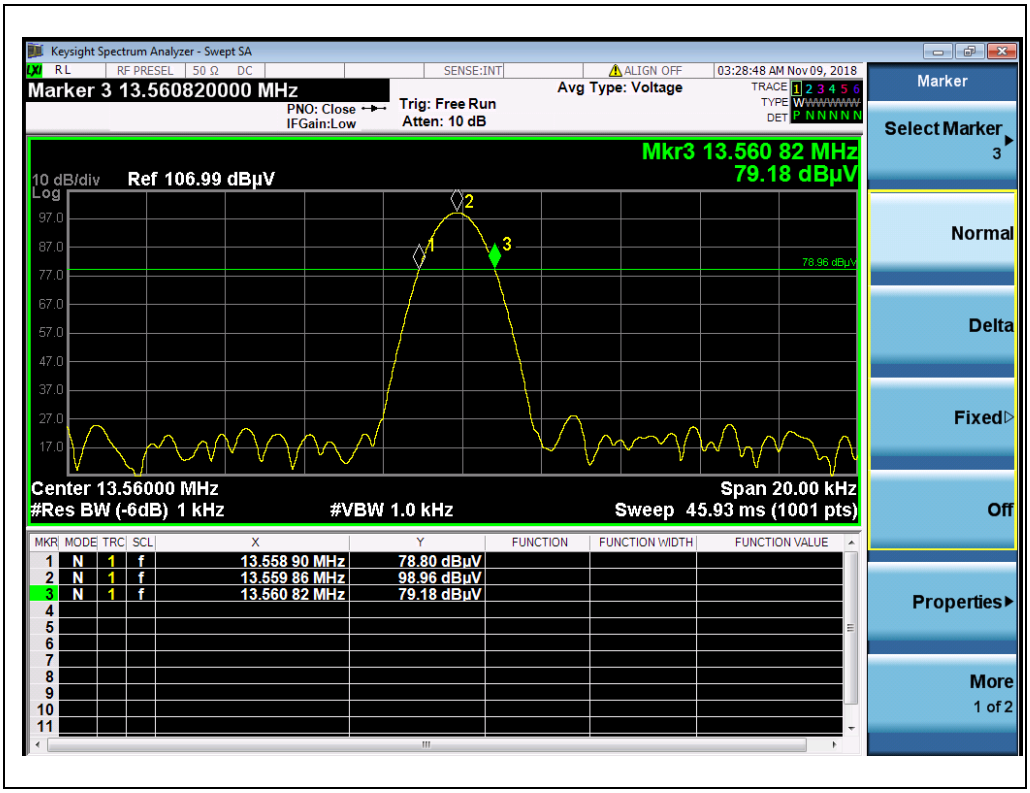
2.3.2. Test Limit

The modulation bandwidth shall be within the assigned frequency band see table 1 or ±7,5 % of the carrier frequency whichever is the smallest. For RFID and EAS Systems, the modulation bandwidth shall be within the transmitter emission boundary of figures I.1, I.2, I.3 and I.4 in ETSI EN 300 330 V2.1.1.

2.3.3. Test Result

Test Method	Modulation	Test Conditions		Frequency band	
				Measured Frequency	limit
☒ Radiated ☐ Conducted	☒ ON ☐ OFF	NT	NV	13.559MHz to 13.561MHz	13.553MHz to 13.567MHz
Test Result		PASS			

2.3.4. Test Plot

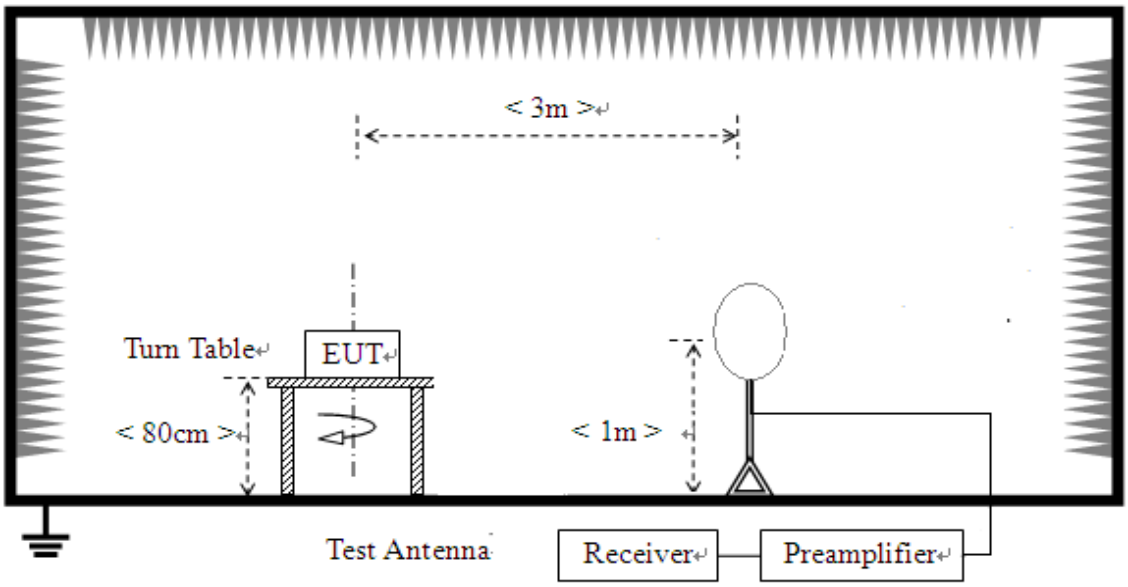


2.4. EN 300 330 §4.3.4 - Transmitter H-field requirements

In the case of a transmitter with an integral or dedicated antenna, the radiated H-field is defined in the direction of maximum field strength under specified conditions of measurement.

2.4.1. Test Description

A. Test setup



B. Test procedure

1. The measurements of the transmitter radiated H-field shall be made on an open field test site. Any measured values shall be at least 6 dB above the ambient noise level.

2. The H-field produced by the equipment shall be measured at standard distance of 10 m. Where this is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m according to annex H and these calculations shall be stated in the test report.

3. The H-field was measured with a shielded loop antenna connected to a measurement receiver. The measuring bandwidth and detector type of the measurement receiver was in accordance with below table.

Frequency	Detector type	Measurement receiver bandwidth	Spectrum analyzer bandwidth
9KHz≤f<150KHz	Quasi Peak	200Hz	300Hz
150KHz≤f<30MHz	Quasi Peak	9KHz	10KHz
30MHz≤f<1GHz	Quasi Peak	120KHz	100KHz
Note: For the measurement of the ranges 6,765 MHz ≤ f < 6,795 MHz and 13,553 MHz ≤ f <13,567 MHz, the measurement bandwidth has to be 200 Hz respectively 300 Hz.			

4. The equipment under test operated with normal modulation.

5. For measuring equipment calibrated in dBμV/m, the reading should be reduced by 51.5 dB to be converted to dBμA/m.

2.4.2. Test Limits

A. Limits for measurements at 10 m distance:

Frequency Range	H-field strength limit (Hf) dBμA/m at 10 m
13.553 ≤ f ≤ 13.567	60

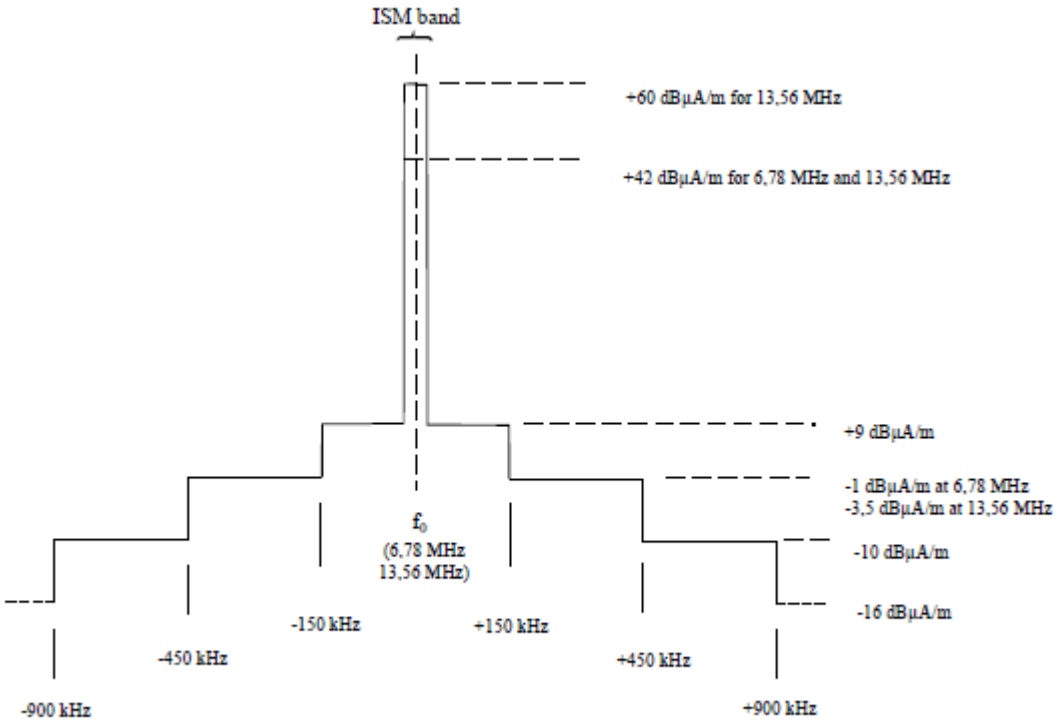


Figure I.2: Spectrum mask limit for RFIDs and EAS in the 6,78 MHz and 13,56 MHz range

B. Limits for measurements at 3 m distance:

Radiated field strength					
Transmitter Mode					
Start Frequency	Limit		Stop Frequency	Limit	
(MHz)	(dBμV/m)	(dBμA/m)	(MHz)	(dBμV/m)	(dBμA/m)
12.160	58.5	7	12.653	58.5	7
12.653	64.5	13	13.103	64.5	13
13.103	71	19.5	13.403	71	19.5
13.403	83.5	32	13.553	83.5	32
13.553	134.5	83	13.567	134.5	83
13.567	83.5	32	13.717	83.5	32
13.717	71	19.5	14.017	71	19.5
14.017	64.5	13	14.467	64.5	13
14.467	58.5	7	14.960	58.5	7

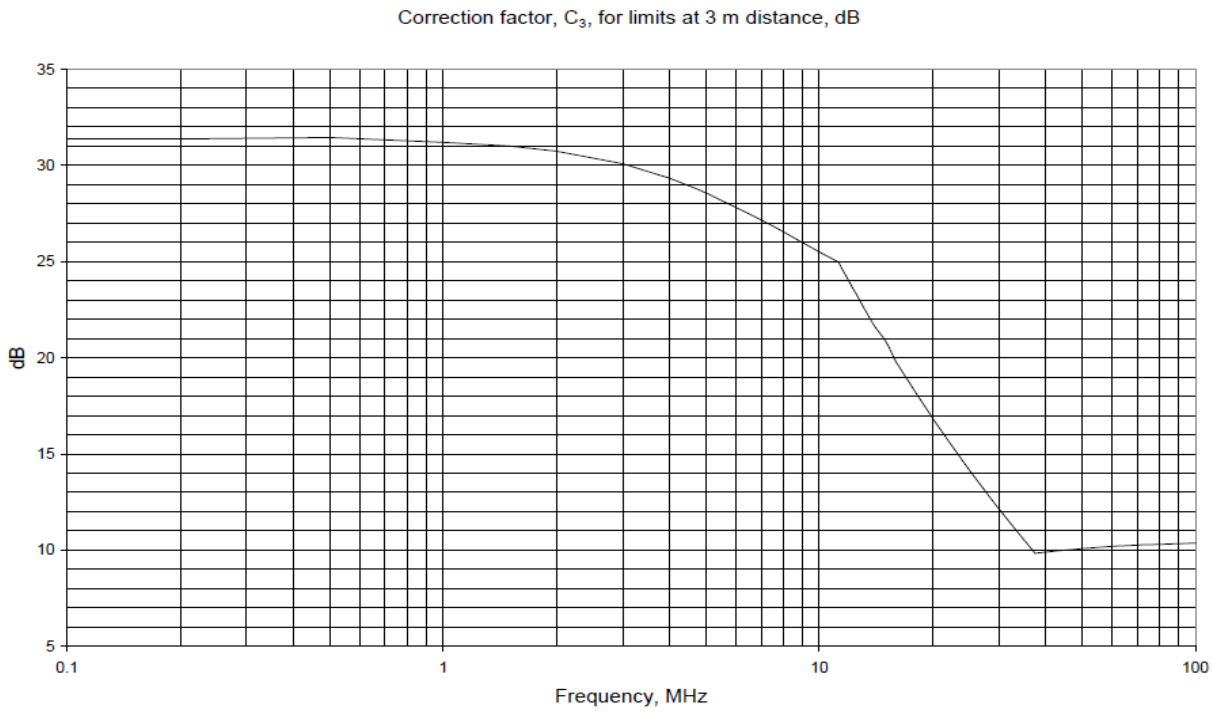
Note: The The H-field limit in dBμA/m at 3 m, H3m, is determined by the following equation:

$H3m = H10m + C3$

where:

H10m is the H-field limit in dBμA/m at 10 m distance according to the present document; and

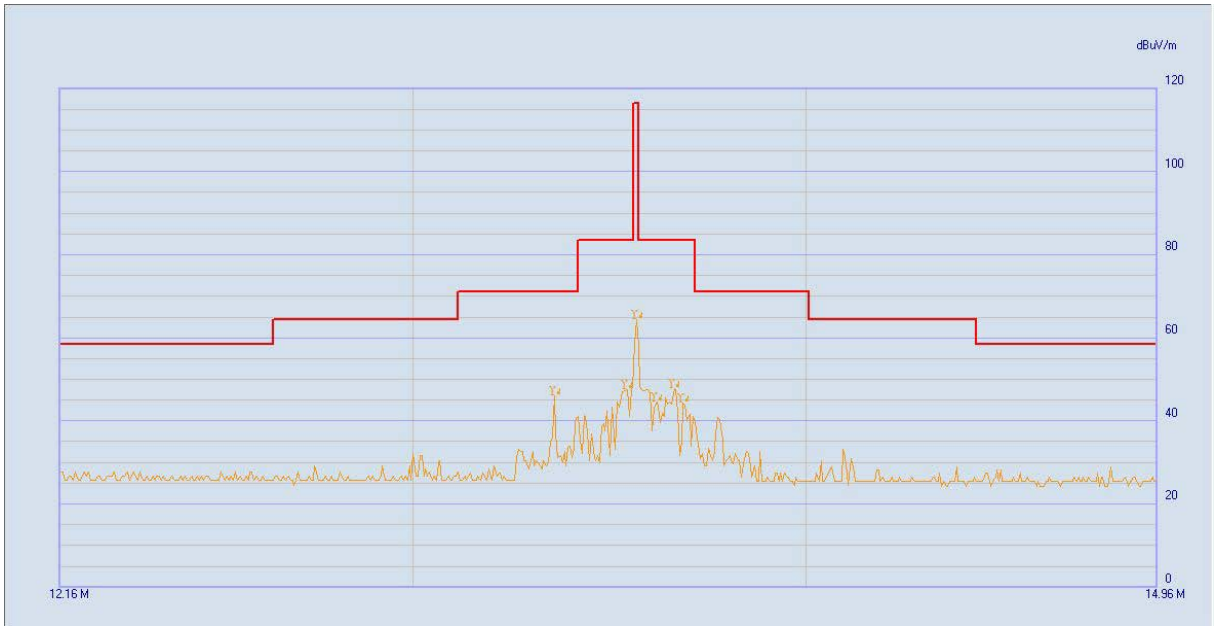
C3 is a conversion factor in dB determined from ETSI EN 300 330 V2.1.1, Annex I, Figure.2.



2.4.3. Test Result

Test Method	Modulation	Test Conditions		H-field strength	Frequency
☒ Radiated ☐Conducted	☒ ON ☐ OFF	NT	NV	Below limit	12.16MHz to 14.96 MHz
Test Result				PASS	

2.4.4. Test Plots



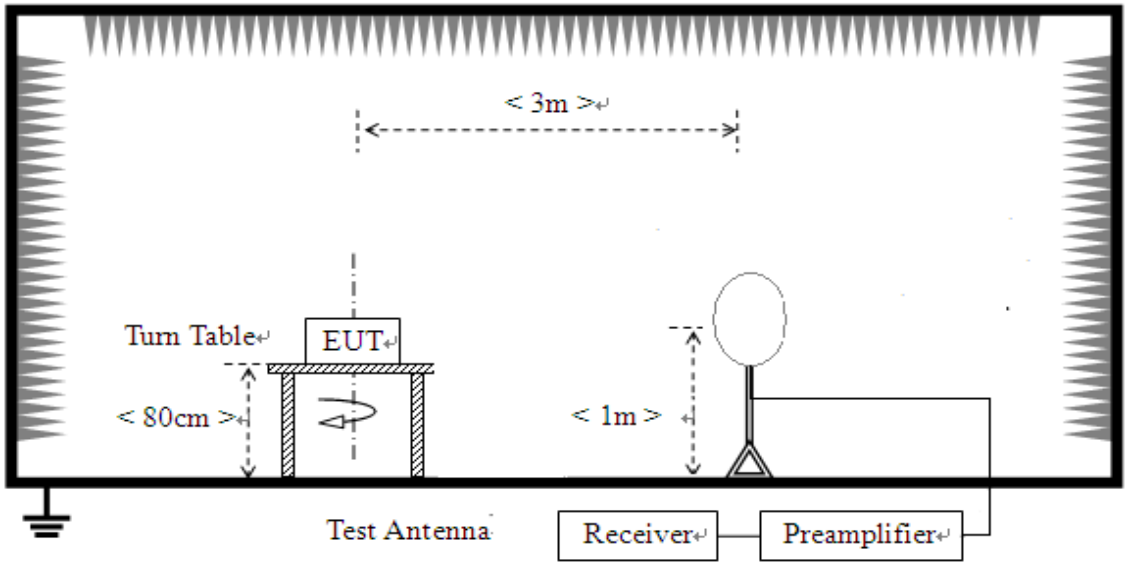
Frequency (MHz)	Measurement Bandwidth (kHz)	Detector Type	Level at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Level at 10m (dBμA/m)	Limit at 10m (dBμA/m)
13.56	9	Quasi Peak	64.31	134.5	-10.69	60

2.5. EN 300 330§4.3.8 - Transmitter radiated spurious domain emission limits < 30 MHz

Spurious domain emission limits are limits on emissions at frequencies other than those of the carrier and sidebands associated with normal test modulation.

2.5.1. Test Description

A. Test setup



B. Test procedure

1. The field strength was measured for frequencies below 30 MHz. The equipment under test was measured at a distance of 3 m on a semi-anechoic. The test antenna was a calibrated shielded magnetic field antenna.
2. The equipment under test was switched on with normal modulation. The characteristics of the modulation signal used was stated on the test report. The measuring receiver was tuned over the frequency range 9 kHz to 30 MHz, except for the frequency band on which the transmitter was intended to operate.
3. At each frequency at which a relevant spurious signal was detected the equipment under test and the test antenna was rotated until maximum field strength was indicated on the measuring receiver. This level was noted.
4. The measurements were repeated in the standby mode.
5. For measuring equipment calibrated in dBμV/m, the reading should was reduced by 51.5 dB to be converted to dBμA/m.

2.5.2. Test Limit

A. Limits for measurements at 10 m distance:

State	Frequency 9 KHz≤ f <10MHz	Frequency 10 MHz≤ f <30MHz
Operating	27 dBμA/m at 9 kHz descending 3 dB/oct	-3.5 dBμA/m
Standby	5.5 dBμA/m at 9 kHz descending 3 dB/oct	-25 dBμA/m

B. H-field strength limit (Hf) dBμV/m at 3 m:

Radiated field strength					
Operating Mode					
Start Frequency	Limit		Stop Frequency	Limit	
(MHz)	(dBμV/m)	(dBμA/m)	(MHz)	(dBμV/m)	(dBμA/m)
0.009	109.9	58.4	0.018	106.9	55.4
0.018	106.9	55.4	0.036	103.9	52.4
0.0036	103.9	52.4	0.072	100.9	49.4
0.072	100.9	49.4	0.1	99.6	48.1
0.1	99.6	48.1	0.144	97.9	46.4
0.144	97.9	46.4	0.2	96.7	45.2
0.2	96.7	45.2	0.288	94.9	43.4
0.288	94.9	43.4	0.3	94.4	42.9
0.3	94.4	42.9	0.5	92.8	41.3
0.5	92.8	41.3	0.576	92	40.5
0.576	92	40.5	0.6	91.8	40.3
0.6	91.8	40.3	0.7	91.2	39.7
0.7	91.2	39.7	0.8	90.5	39.0
0.8	90.5	39.0	0.9	89.95	38.45
0.9	89.95	38.45	1	89.3	37.8
1	89.3	37.8	1.152	88.6	37.1
1.152	88.6	37.1	1.5	87.6	36.1
1.5	87.6	36.1	2	86	34.5
2	86	34.5	2.304	85	33.5
2.304	85	33.5	3	83.7	32.2
3	83.7	32.2	4	81.7	30.2
4	81.7	30.2	4.608	80.4	28.9
4.608	80.4	28.9	5	79.8	28.3
5	79.8	28.3	6	78.4	26.9
6	78.4	26.9	7	77.1	25.6

7	77.1	25.6	8	75.9	24.4
8	75.9	24.4	9	74.6	23.1
9	74.6	23.1	9.216	74.4	22.9
9.216	74.4	22.9	10	73.5	22.0
10	73.5	22.0	12	73	21.5
12	73	21.5	20	64.9	13.4
20	64.9	13.4	30	60.1	8.6
Standby Mode					
Start Frequency	**Limit**		**Stop Frequency**	**Limit**	
(MHz)	**(dBμV/m)**	**(dBμA/m)**	**(MHz)**	**(dBμV/m)**	**(dBμA/m)**
0.009	88.4	36.9	0.018	85.4	33.9
0.018	85.4	33.9	0.036	82.4	30.9
0.036	82.4	30.9	0.072	79.4	27.9
0.072	79.4	27.9	0.1	78.1	26.6
0.1	78.1	26.6	0.144	76.4	24.9
0.144	76.4	24.9	0.2	75.2	23.7
0.2	75.2	23.7	0.288	73.4	21.9
0.288	73.4	21.9	0.3	72.9	21.4
0.3	72.9	21.4	0.5	71.3	19.8
0.5	71.3	19.8	0.576	70.5	19.0
0.576	70.5	19.0	0.6	70.3	18.8
0.6	70.3	18.8	0.7	69.7	18.2
0.7	69.7	18.2	0.8	69	17.5
0.8	69	17.5	0.9	68.45	16.95
0.9	68.45	16.95	1	67.8	16.3
1	67.8	16.3	1.152	67.1	15.6
1.152	67.1	15.6	1.5	66.1	14.6
1.5	66.1	14.6	2	64.5	13.0
2	64.5	13.0	2.304	63.5	12.0
2.304	63.5	12.0	3	62.2	10.7
3	62.2	10.7	4	60.2	8.7
4	60.2	8.7	4.608	58.9	7.4
4.608	58.9	7.4	5	58.3	6.8
5	58.3	6.8	6	56.9	5.4
6	56.9	5.4	7	55.6	4.1
7	55.6	4.1	8	54.4	2.9
8	54.4	2.9	9	53.1	1.6
9	53.1	1.6	9.216	52.9	1.4

9.216	52.9	1.4	10	52	0.5
10	52	0.5	12	51.5	0.0
12	51.5	0.0	20	43.4	-8.1
20	43.4	-8.1	30	38.6	-12.9

2.5.3. Test Result

A. Transmitter Operating Mode

No.	Frequency (MHz)	Measurement Bandwidth (kHz)	Detector Type	Level at 3m(dBμV/m)	Limit at 3m(dBμV/m)	Result
1	0.009	0.2	Quasi Peak	64.12	109.9	PASS
2	1.649	9	Quasi Peak	37.04	87.6	PASS
3	1.714	9	Quasi Peak	36.46	87.6	PASS
4	1.779	9	Quasi Peak	36.16	87.6	PASS
5	2.769	9	Quasi Peak	35.65	85.0	PASS
6	13.554	9	Quasi Peak	58.83	73.0	PASS

B. Transmitter Standby Mode

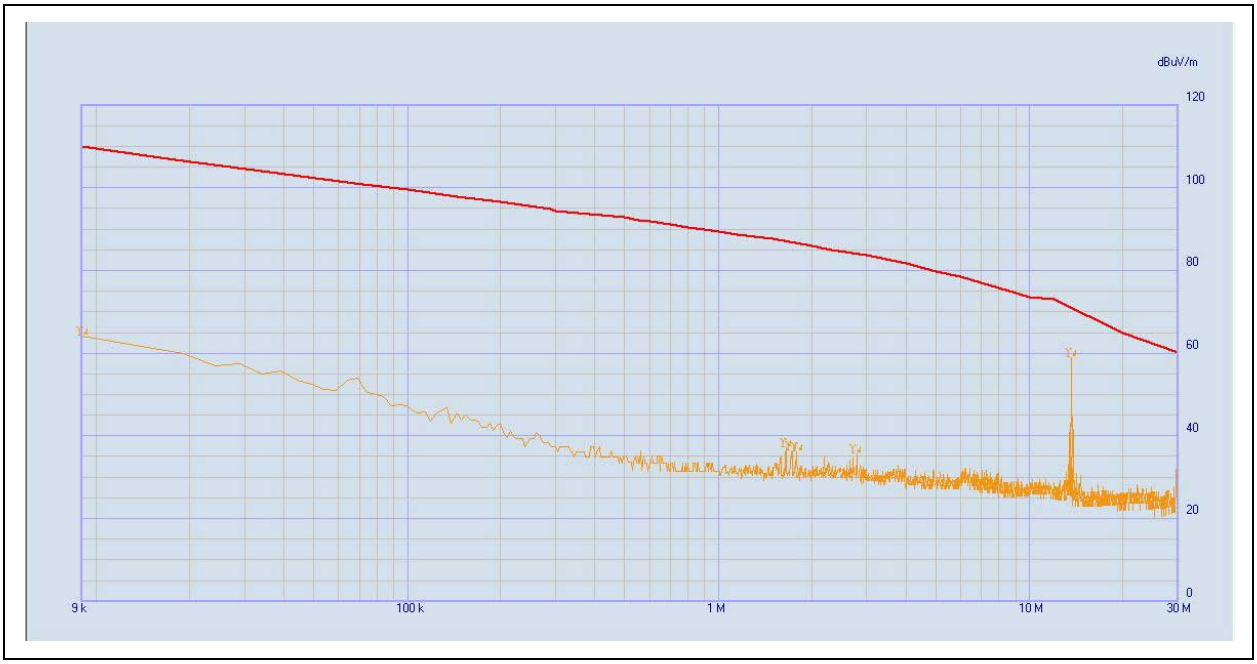
No.	Frequency (MHz)	Measurement Bandwidth (kHz)	Detector Type	Level at 3m(dBμV/m)	Limit at 3m(dBμV/m)	Result
1	0.009	0.2	Quasi Peak	65.21	88.4	PASS
2	1.584	9	Quasi Peak	35.80	66.1	PASS
3	1.644	9	Quasi Peak	37.04	66.1	PASS
4	1.715	9	Quasi Peak	37.06	66.1	PASS
5	1.779	9	Quasi Peak	36.78	66.1	PASS
	2.699	9	Quasi Peak	35.63	63.5	PASS

a) Only radiated measurement method was used. For the radiated method, the antenna polarization was set to vertical and horizontal respectively.

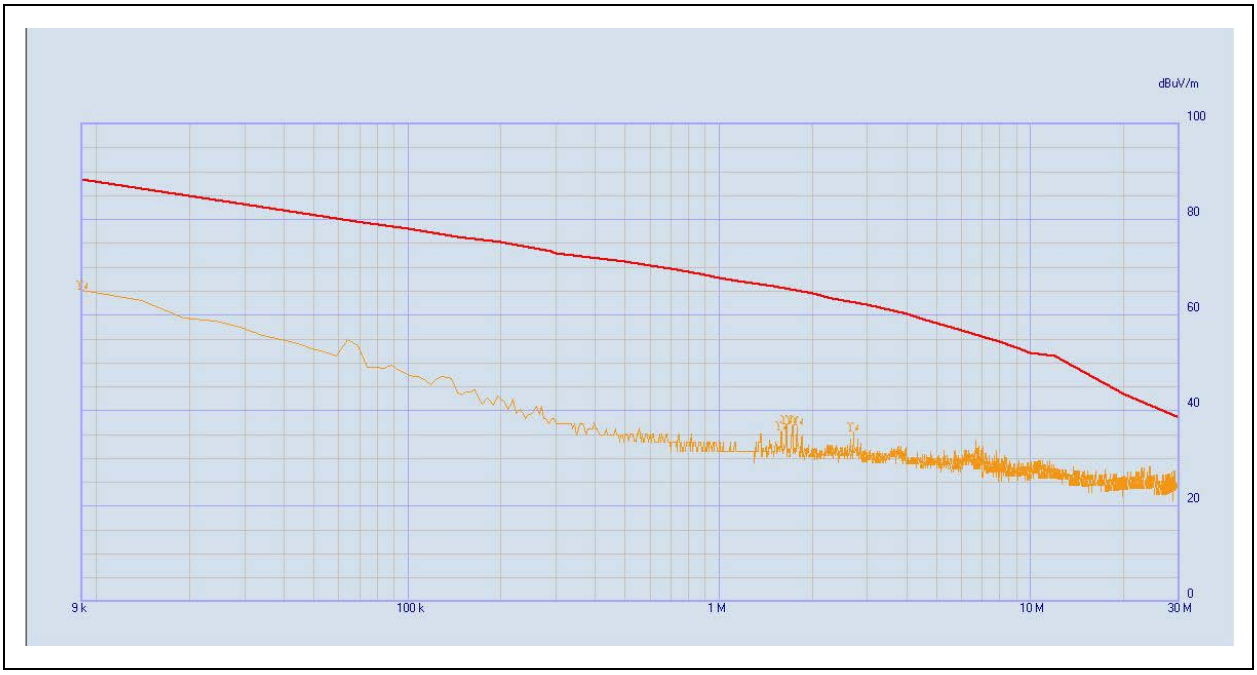
b) The measurement was performed at the operating frequency.

2.5.4. Test Plots

A. Operating Mode



B. Standby Mode

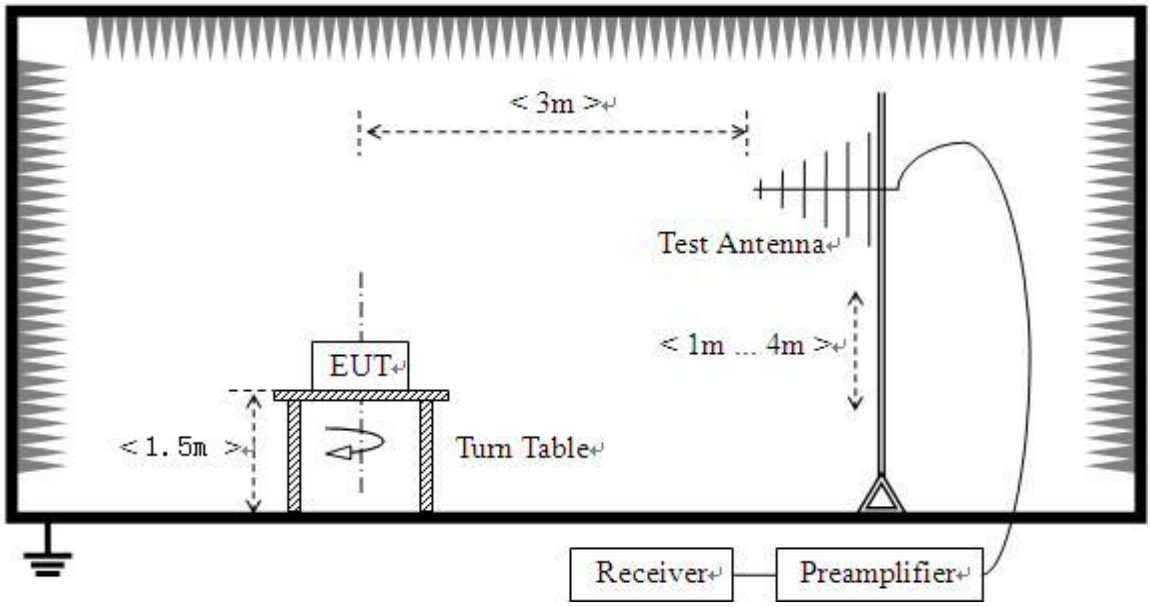


2.6. EN 300 330§4.3.8 - Transmitter radiated spurious domain emission limits > 30 MHz

Spurious domain emission limits are limits on emissions at frequencies other than those of the carrier and sidebands associated with normal test modulation.

2.6.1. Test Description

A. Test Setup:



B. Test Procedure:

1. For classes 1, 2 and 4 an appropriate test site selected from annex C in in ETSI EN 300 330 shall be used. The equipment shall be placed at the specified height on a non-conducting support and in the position closest to normal use as declared by the manufacturer.

2. The test antenna shall be oriented for vertical polarization. The output of the test antenna shall be connected to a measuring receiver.

3. The transmitter shall be switched on with normal modulation, and the measuring receiver shall be tuned over the frequency range 30 MHz to 1 000 MHz.

4. At each frequency at which a relevant spurious component is detected, the test antenna shall be raised and lowered through the specified range of heights until a maximum signal level is detected on the measuring receiver.

5. The transmitter shall then be rotated through 360° in the horizontal plane, until the

maximum signal level is detected by the measuring receiver.

6. The maximum signal level detected by the measuring receiver shall be noted.
7. The substitution antenna shall be oriented for vertical polarization and calibrated for the frequency of the spurious component detected.
8. The frequency of the calibrated signal generator shall be set to the frequency of the spurious component detected. The input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver, if necessary.
9. The test antenna shall be raised and lowered through the specified range of heights to ensure that the maximum signal is received.
10. When a test site according to clause C.1.1 in in ETSI EN 300 330 is used, there is no need to vary the height of the antenna.
11. The input signal to the substitution antenna shall be adjusted until an equal or a known related level to that detected from the transmitter is obtained on the measuring receiver.
12. The input signal to the substitution antenna shall be recorded as a power level and corrected for any change of input attenuator setting of the measuring receiver.
13. The measure of the effective radiated power of the spurious components is the larger of the two power levels recorded for each spurious component at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.
14. If an unmodulated carrier cannot be obtained then the measurements shall be made with the transmitter modulated by the normal test signal (see clause 5.8.2 in ETSI EN 300 330) in which case this fact shall be recorded in the test report.
15. If standby mode is available, the measurements shall be repeated in that mode.

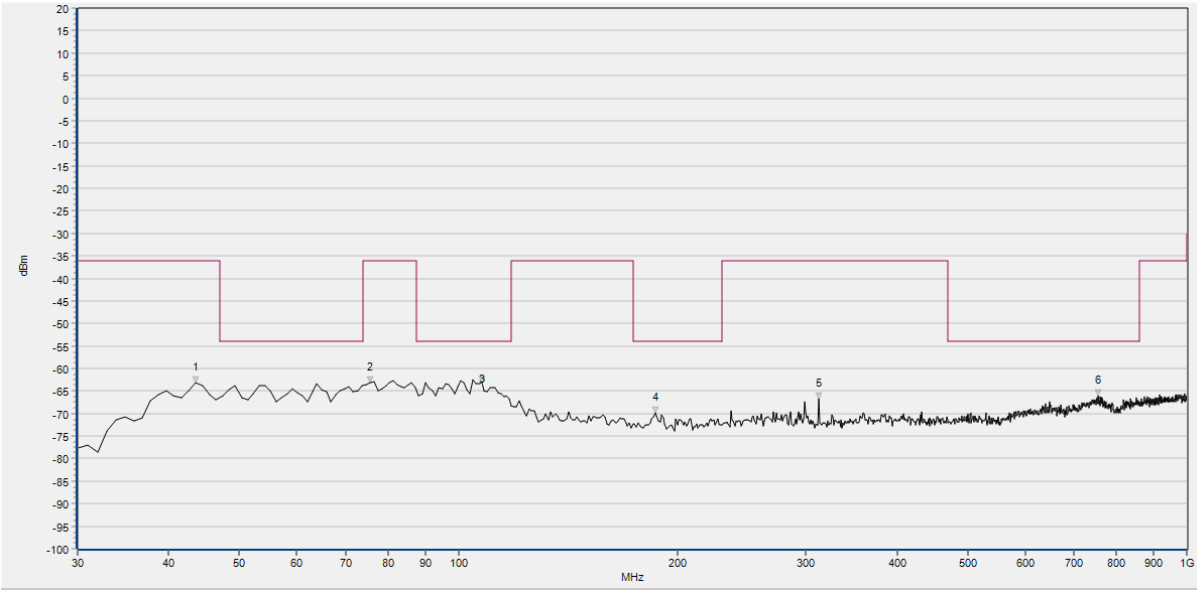
2.6.2. Test Limits

The power of any radiated emission shall not exceed the values given in flowing table.

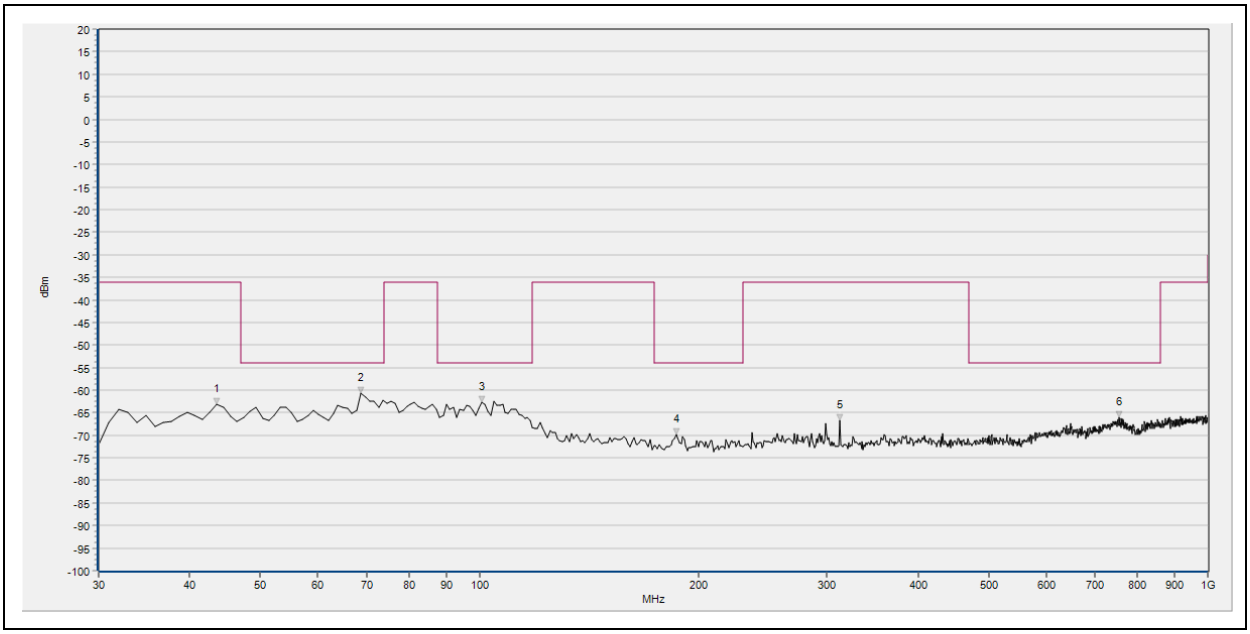
State	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies between 30 MHz to 1 000 MHz
Operating	4nW	250nW
Standby	2nW	2nW

2.6.3. Test Result:

A. Operating mode

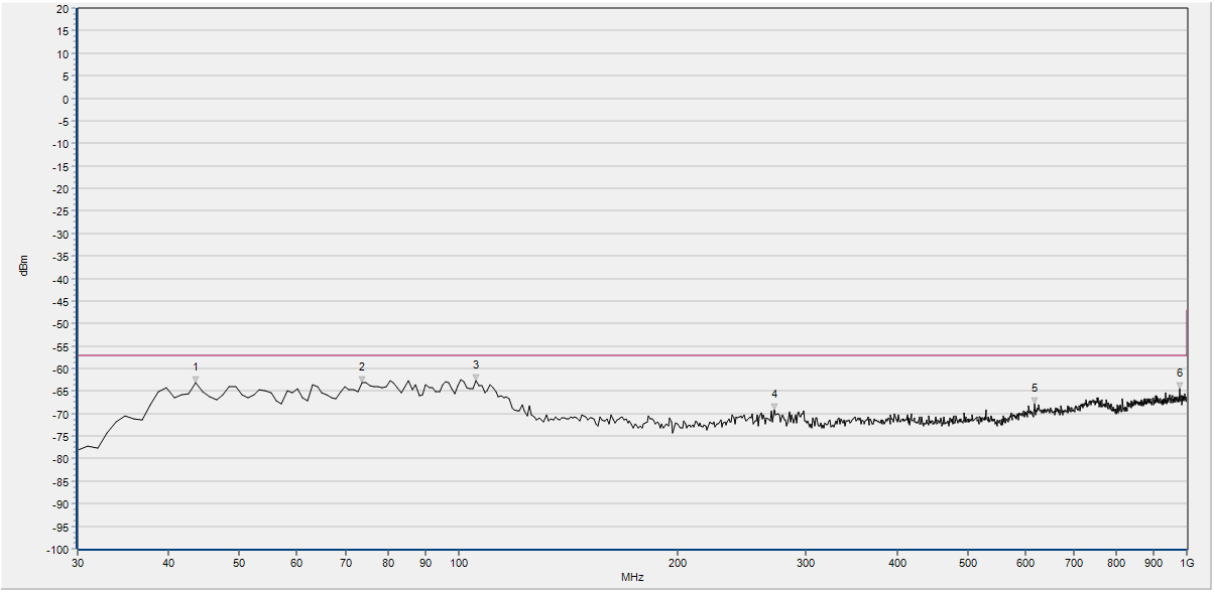


NO.	Fre.(MHz)	Peak (dBm)	Limit (dBm)	Antenna	Verdict
1	43.580	-63.22	-36.00	Horizontal	PASS
2	75.590	-63.12	-36.00	Horizontal	PASS
3	107.600	-63.18	-54.00	Horizontal	PASS
4	186.170	-69.90	-54.00	Horizontal	PASS
5	312.270	-66.76	-36.00	Horizontal	PASS
6	756.530	-66.00	-54.00	Horizontal	PASS

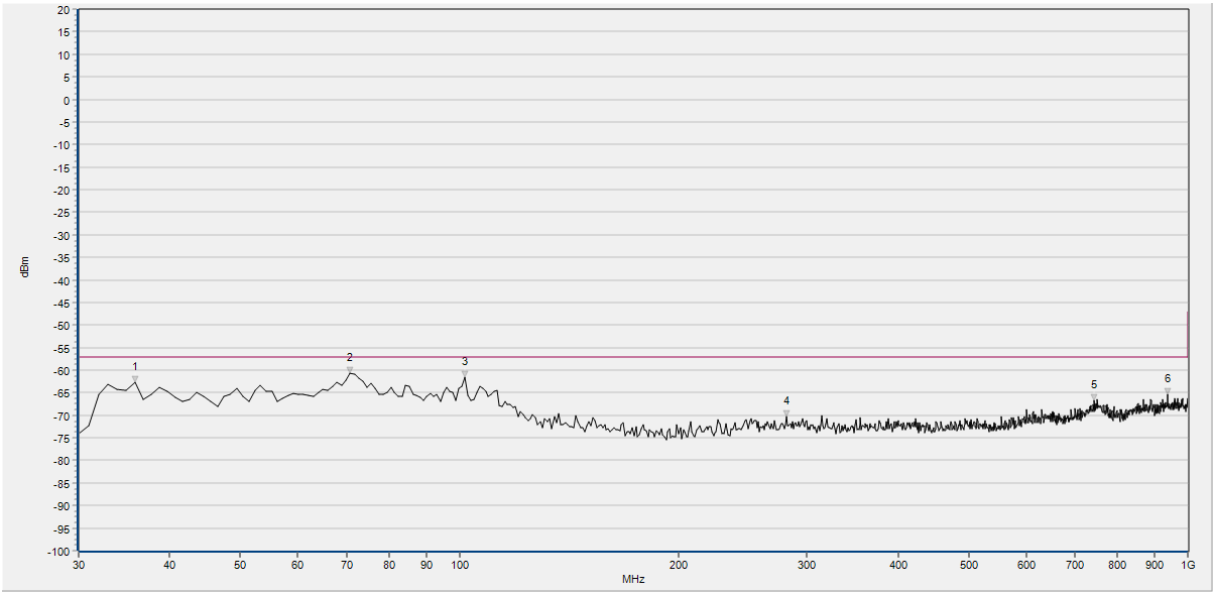


NO.	Fre.(MHz)	Peak (dBm)	Limit (dBm)	Antenna	Verdict
1	43.580	-63.22	-36.00	Vertical	PASS
2	68.800	-60.62	-54.00	Vertical	PASS
3	100.810	-62.73	-54.00	Vertical	PASS
4	186.170	-69.90	-54.00	Vertical	PASS
5	312.270	-66.76	-36.00	Vertical	PASS
6	756.530	-66.00	-54.00	Vertical	PASS

B. Standby Mode



NO.	Fre.(MHz)	Peak (dBm)	Limit (dBm)	Antenna	Verdict
1	43.594	-63.21	-57.00	Horizontal	PASS
2	73.694	-63.14	-57.00	Horizontal	PASS
3	105.736	-62.72	-57.00	Horizontal	PASS
4	271.772	-69.25	-57.00	Horizontal	PASS
5	618.408	-67.80	-57.00	Horizontal	PASS
6	977.668	-64.53	-57.00	Horizontal	PASS



NO.	Fre.(MHz)	Peak (dBm)	Limit (dBm)	Antenna	Verdict
1	35.826	-62.76	-57.00	Vertical	PASS
2	70.781	-60.73	-57.00	Vertical	PASS
3	101.852	-61.57	-57.00	Vertical	PASS
4	281.481	-70.25	-57.00	Vertical	PASS
5	743.664	-66.79	-57.00	Vertical	PASS
6	937.858	-65.43	-57.00	Vertical	PASS

3. Receiver Parameters

3.1. EN 300 330-2§5.2.2.3 - Receiver spurious emissions

Spurious radiation from receivers are emissions radiated from the antenna, the chassis and case of the receiver. It is specified as the radiated power of a discrete signal.

3.1.1. Test Description

For radiation below 30 MHz, the methods of measurements should be in accordance with clause 6.2.8 in ETSI EN 300 330.
For radiation at or above 30 MHz, the methods of measurements should be in accordance with clause 6.2.9 in ETSI EN 300 330. Convert reading by 51.5 dB for measuring equipment calibrated in dBµV or dBµV/m..

3.1.2. Test Limits

Radiated emissions below 30 MHz:

Limits for measurements at 10 m distance:					
Frequency range			Limit		
9 kHz ≤ f < 10 MHz			5.5 dBµA/m at 9 kHz descending 3 dB/oct		
10 MHz ≤ f < 30 MHz			-25 dBµA/m		
Limits for measurements at 3 m distance:					
Start Frequency	**Limit**		**Stop Frequency**	**Limit**	
(MHz)	**(dBµV/m)**	**(dBµA/m)**	**(MHz)**	**(dBµV/m)**	**(dBµA/m)**
0.009	88.4	36.9	0.018	85.4	33.9
0.018	85.4	33.9	0.036	82.4	30.9
0.036	82.4	30.9	0.072	79.4	27.9
0.072	79.4	27.9	0.1	78.1	26.6
0.1	78.1	26.6	0.144	76.4	24.9
0.144	76.4	24.9	0.2	75.2	23.7
0.2	75.2	23.7	0.288	73.4	21.9
0.288	73.4	21.9	0.3	72.9	21.4
0.3	72.9	21.4	0.5	71.3	19.8
0.5	71.3	19.8	0.576	70.5	19.0
0.576	70.5	19.0	0.6	70.3	18.8
0.6	70.3	18.8	0.7	69.7	18.2

0.7	69.7	18.2	0.8	69.0	17.5
0.8	69.0	17.5	0.9	68.45	16.95
0.9	68.45	16.95	1	67.8	16.3
1	67.8	16.3	1.152	67.1	15.6
1.152	67.1	15.6	1.5	66.1	14.6
1.5	66.1	14.6	2	64.5	13.0
2	64.5	13.0	2.304	63.5	12.0
2.304	63.5	12.0	3	62.2	10.7
3	62.2	10.7	4	60.2	8.7
4	60.2	8.7	4.608	58.9	7.4
4.608	58.9	7.4	5	58.3	6.8
5	58.3	6.8	6	56.9	5.4
6	56.9	5.4	7	55.6	4.1
7	55.6	4.1	8	54.4	2.9
8	54.4	2.9	9	53.1	1.6
9	53.1	1.6	9.216	52.9	1.4
9.216	52.9	1.4	10	52	0.5
10	52	0.5	12	51.5	0.0
12	51.5	0.0	20	43.4	-8.1
20	43.4	-8.1	30	38.6	-12.9

Radiated emissions above 30 MHz:

Frequency range	**Limit**
30 MHz ≤ f < 1000 MHz	2nW/-57dBm

3.1.3. Test Results

A. Radiated emissions below 30 MHz

No.	Frequency (MHz)	Measurement Bandwidth (kHz)	Detector Type	Level at 3m(dBμV/m)	Limit at 3m(dBμV/m)	Result
1	0.009	0.2	Quasi Peak	63.79	88.4	PASS
2	1.579	9	Quasi Peak	36.75	66.1	PASS
3	1.649	9	Quasi Peak	36.75	66.1	PASS
4	1.709	9	Quasi Peak	36.76	66.1	PASS
5	6.899	9	Quasi Peak	32.15	56.9	PASS
6	7.399	9	Quasi Peak	29.36	55.6	PASS

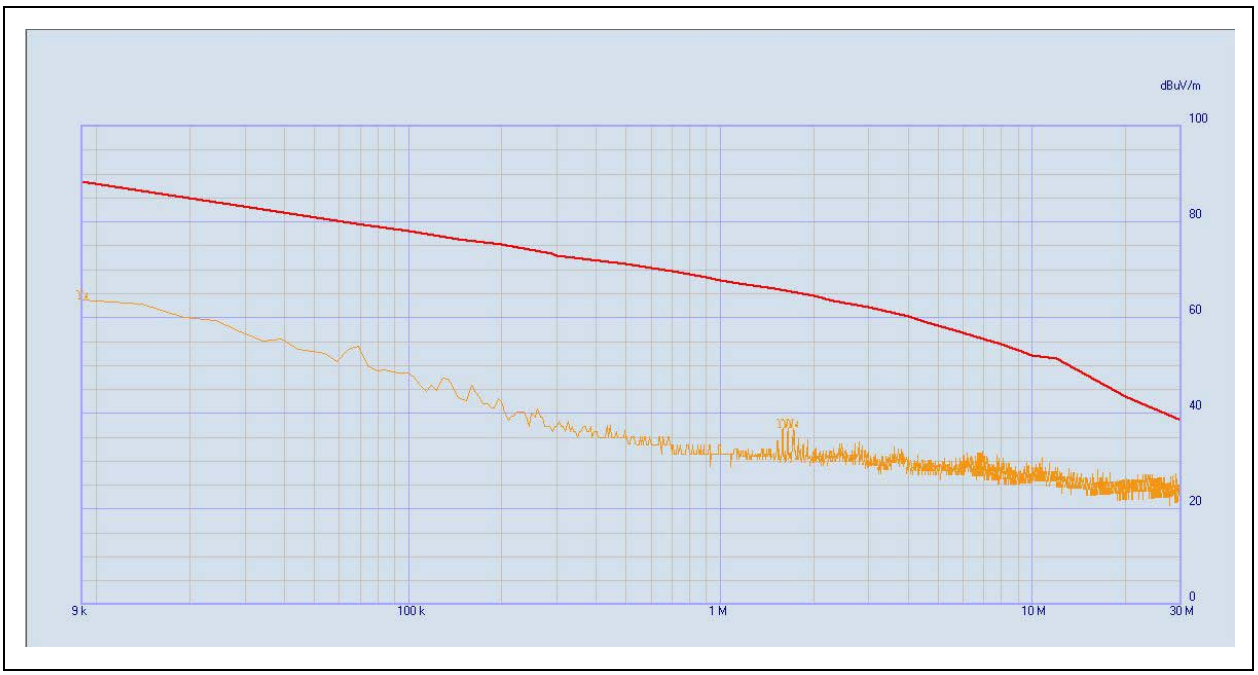
B. Radiated emissions above 30 MHz

Antenna	Frequency (MHz)	Measurement Bandwidth (kHz)	Level (dBm)	Limit (dBm)	Result
Horizontal	30-1000	120	See the test plot	-57	PASS
Vertical	30-1000	120	See the test plot	-57	PASS

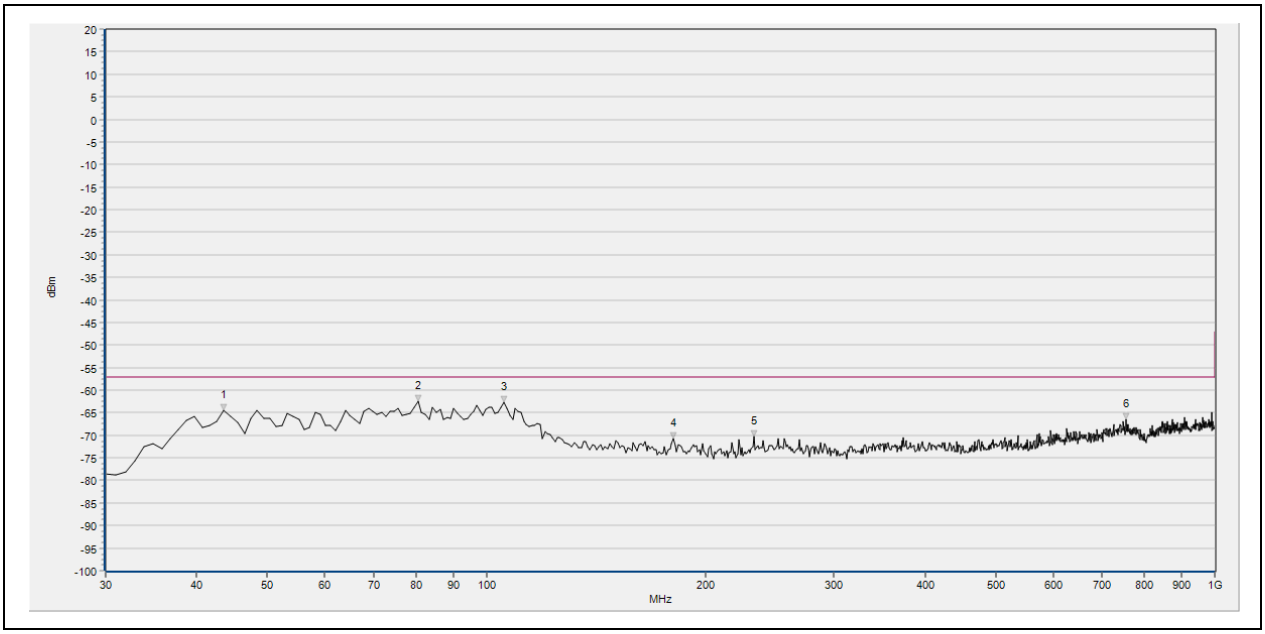
a) Only radiated measurement method and conducted measurement method were used. For the radiated method, the antenna polarization was set to vertical and horizontal respectively.

b) The measurement was performed at the operating frequency.

3.1.4. Test Plots

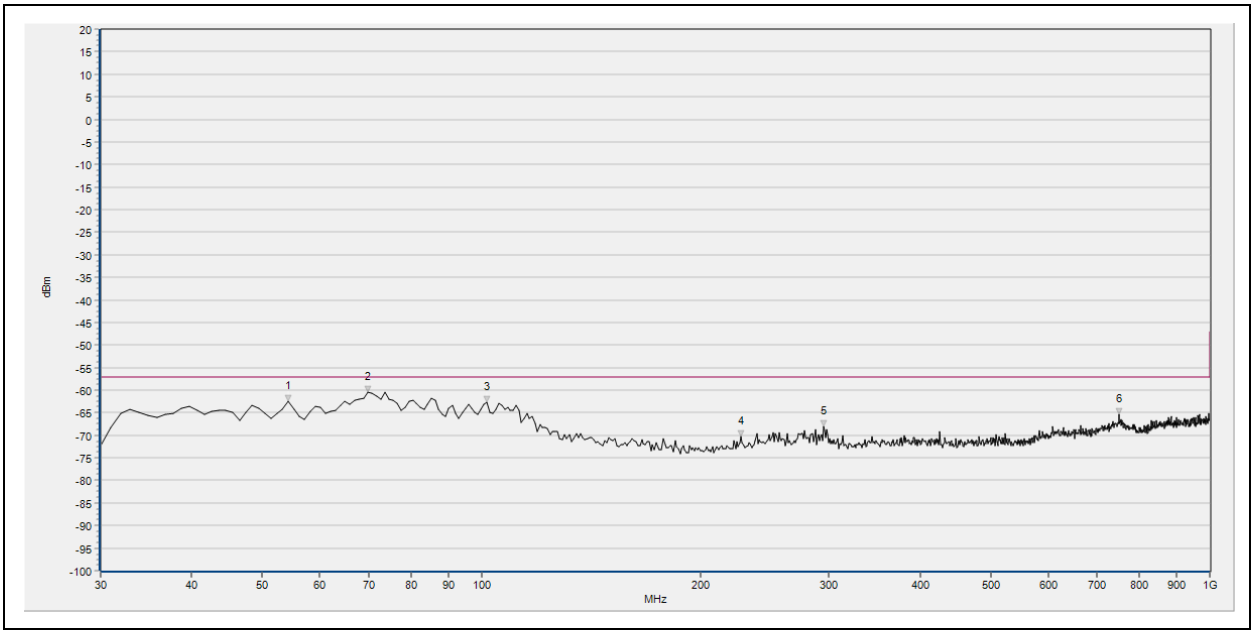


(Radiated emissions below 30 MHz)



(Horizontal Antenna, Radiated emissions above 30 MHz)

NO.	Fre.(MHz)	Peak (dBm)	Limit (dBm)	Antenna	Verdict
1	43.594	-64.50	-57.00	Horizontal	PASS
2	80.490	-62.41	-57.00	Horizontal	PASS
3	105.736	-62.72	-57.00	Horizontal	PASS
4	180.501	-70.66	-57.00	Horizontal	PASS
5	232.933	-70.32	-57.00	Horizontal	PASS
6	755.315	-66.38	-57.00	Horizontal	PASS

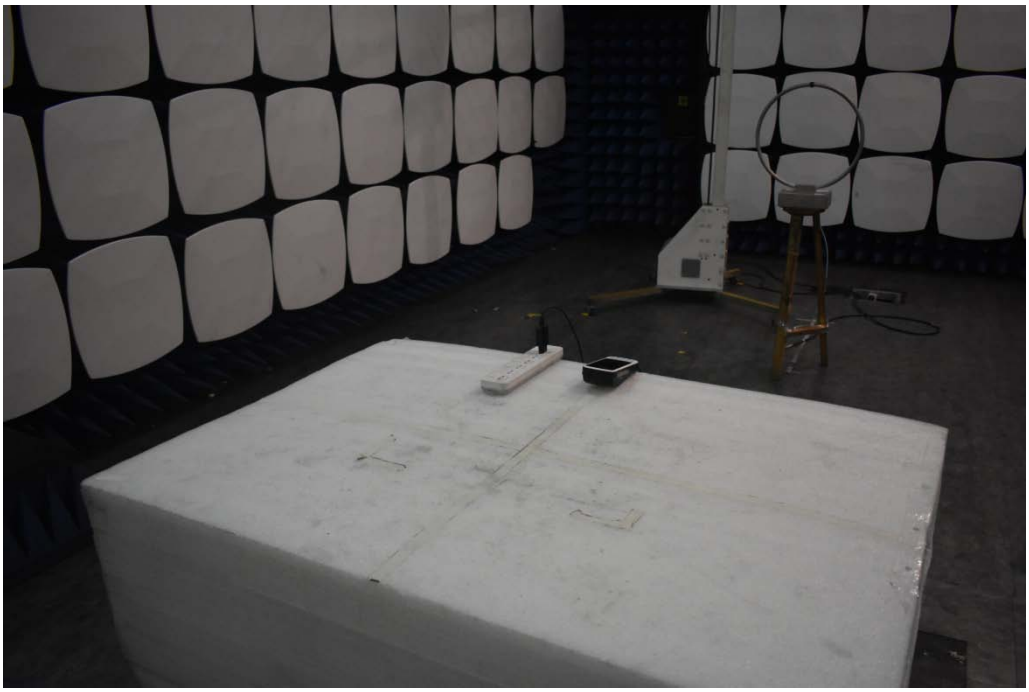


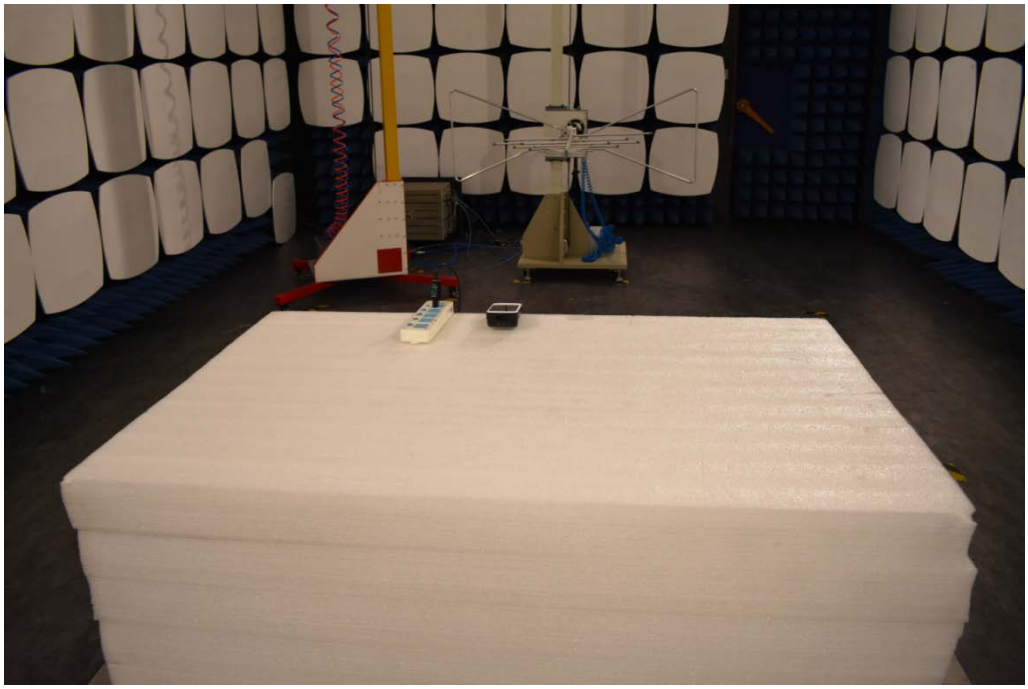
(Vertical Antenna, Radiated emissions above 30 MHz)

NO.	Fre.(MHz)	Peak (dBm)	Limit (dBm)	Antenna	Verdict
1	54.274	-62.53	-57.00	Vertical	PASS
2	69.810	-60.40	-57.00	Vertical	PASS
3	101.852	-62.61	-57.00	Vertical	PASS
4	227.107	-70.21	-57.00	Vertical	PASS
5	295.075	-68.14	-57.00	Vertical	PASS
6	750.460	-65.33	-57.00	Vertical	PASS

Annex A Photographs of Test Setup

Radiated Measurement Setup





Annex B Test Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Bandwidth	±25Hz
Uncertainty of Radiated Emission:	±3.9dB

Annex C Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Test Equipments Utilized

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
MXE EMI Receiver	MY54130016	N9038A	Agilent	2018.08.04	2019.08.03
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.18	2019.05.17
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2018.08.06	2019.08.05
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

END OF REPORT