

# TEST REPORT



**DT&C Co., Ltd.**

42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042  
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No. : DREFCC1909-0262
2. Client / Applicant
  - Name : MOTREX CO., LTD.
  - Address : Seoyoung Bldg., 25, Hwangsaoul-ro 258beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
3. Use of Report : Grant of Certification
4. Product Name / Model Name / FCC ID : SMART DISPLAY / MS300ASP2I / BP9-MS300ASP2I
5. Test Standard : ANSI C 63.4 : 2014  
FCC Part 15 Subpart B  
(FM Broadcast receiver)
6. Date of Test : Jul. 29. 2019 ~ Aug. 02. 2019
7. Testing Environment : Temperature 25 °C , Humidity (46 ~ 51) % R.H.
8. Test Result : Refer to the attached Test Result

Affirmation	Tested by	Reviewed by
	Name : MinWoo Park (Signature)	Name : DaeHwa Eun (Signature)

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose.

This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

**Sep. 26. 2019**

**DT&C Co., Ltd.**

If this report is required to confirmation of authenticity, please contact to [report@dtnc.net](mailto:report@dtnc.net)

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## 1. General Remarks

This report contains the result of tests performed by :

### DT&C Co., Ltd.

42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042

<http://www.dtnc.net>

Tel: +82-31-321-2664 Fax: +82-31-321-1664

## 2. Test Laboratory

DT&C Co., Ltd. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Remark
Accreditation	Korea	KOLAS	393	ISO/IEC 17025
	South Africa	SABS	0006	ISO/IEC 17025
	Ghana	NCA	NCA agreement 23rd,Oct,2018	-
Site Filing	USA	FCC	KR0034 101842 678747, 596748, 804488, 165783	Accredited 2.948 Listed
	Canada	IC	5740A-3 5740A-4	Registered
	Japan	VCCI	C-1427 R-3385, R-4076, R-4180, R-4496, T-1442, G-10338, G-754, G-10815, G-20051	Registered
Certification	Korea	KC	KR0034	Designation
	Germany	TUV	CARAT 089112 0006 Rev.00	ISO/IEC 17025
	Russia	RMRS	17.10189.296	ISO/IEC 17025

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competent of calibration and testing laboratory".

### 3. General Information of EUT

Applicant	MOTREX CO., LTD. Seoyoung Bldg., 25, Hwangsaoul-ro 258beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
Manufacturer	MOTREX CO., LTD. Seoyoung Bldg., 25, Hwangsaoul-ro 258beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
Factory	MOTREX CO., LTD. 62-7, Pungsesandan 4-ro, Pungse-myeon, Dongnam-gu, Cheonan-si, Chungcheongnam-do, Korea
Product Name	SMART DISPLAY
Model Name	MS300ASP2I
Add Model Name	None
FCC ID	BP9-MS300ASP2I
Maximum Internal Frequency	1 GHz
Software Version	SP2.MEX.0000.013.190710
Hardware Version	Rev0.1
Rated Power	DC 12 V
Remarks	

**Related Submittal(s) / Grant(s)**  
**Original submittal only**

## 4. EUT Operations and Test Configurations

### 4.1 Principle of Configuration Selection

#### Emission :

The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use. For each testing mode different configurations were used, Refer to the individual tests.

### 4.2 EUT Operation Mode

No.	Mode	Description
1	AM	AM receiving mode(MF)
2	FM	FM receiving mode (VHF)
3	USB	USB play mode(1 kHz tone)

### 4.3 Test Configuration Mode

No.	Mode	Description
1	Receiving	The EUT is connected to the SIGNAL GENERATOR and is receiving radio frequency. And continuously output audio signal. EMS testing we checked the SNR by audio analyzer.
2	USB	The EUT is connected to USB memory to play the music. (1 kHz tone). EMS testing we checked the SNR by audio analyzer.

#### 4.4 Supported Equipment

Used*	Product Type	Manufacturer	Model	Remarks
AE	DC Power supply	SMtechno	SPD30-5D	305DPL226
AE	SPEAKER	N/A	N/A	None
AE	USB	Sandisk	ULTRA FLAIR 3.0	None
SIM	SIGNAL GENERATOR	Rohde & Schwarz	SMT03	100417
*Abbreviations: AE - Auxiliary/Associated Equipment, or SIM - Simulator				

#### 4.5 EUT In/Output Port

Name	Type*	Cable Max. >3 m	Cable Shielded	Cable Back shell	Remarks
DC IN	DC	1.8	Non shield	Plastic	None
Antenna	I/O	3.0	Shield	Plastic	None
Speaker	I/O	1.6	Non shield	Plastic	None
Multimedia box	I/O	1.8	Non shield	Plastic	None
*Abbreviations: AC = AC Power Port                      DC = DC Power Port                      N/E = Non-Electrical I/O = Signal Input or Output Port TP = Telecommunication Ports					

#### 4.6 Test Voltage and Frequency

Case	Voltage (V)	Frequency (Hz)	Phases	Remarks
1	12 V DC	-	-	None

## 5. Test Summary

Test Items	Applied Standards	Results
Conducted Disturbance	ANSI C63.4 : 2014	N/A (Note 1)
Radiated Disturbance	ANSI C63.4 : 2014	C
Antenna Power Conduction	ANSI C63.4 : 2014	C
Note 1) The EUT is not a device connected to the AC mains.		
C=Comply    N/C=Not Comply    N/T=Not Tested    N/A=Not Applicable		

### -Conducted Disturbance

Frequency [MHz]	Phase	Result [dB $\mu$ V]	Detector	Limit [dB $\mu$ V]	Margin [dB]
-	-	-	-	-	-

### -Radiated Disturbance

Frequency [MHz]	Pol.	Result [dB $\mu$ V/m]	Detector	Limit [dB $\mu$ V/m]	Margin [dB]
831.998	H	35.27	Quasi-Peak	46.00	10.73

## 6. Test Environment

Test Items	Test date (YYYY-MM-DD)	Temp. (°C)	Humidity (% R.H.)	Pressure (kPa)
Radiated Disturbance	2019-07-29	25	46	-
	2019-07-30	25	46	
Antenna Power Conduction	2019-08-02	25	51	

## 7. Test Results : Emission

### 7.1 Conducted Disturbance

ANSI C63.4	Mains terminal disturbance voltage		Result		
<b>Method:</b> The AMN placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment were at least 0,8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN. The measuring port of the LISN for EUT was connected to spectrum analyzer. Using conducted emission test software, the emissions were scanned with peak detector mode. After scanning over the frequency range, suspected emissions were selected to perform final measurement. When performing final measurement, the receiver was used which has Quasi-Peak detector and CISPR Average detector. For (0.15 ~ 30) MHz frequency range, Quasi-Peak detector with 10 kHz RBW and 30 kHz VBW was used. By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission.		<b>Not Applicable</b>			
Fully configured sample scanned over the following frequency range	Frequency range on each side of line		Measurement Point		
	150 kHz to 30 MHz		Mains		
EUT mode (Refer to clauses 4)	Test configuration mode		N/A		
	EUT Operation mode		N/A		
Limits – Class A					
Frequency (MHz)	Limit dB $\mu$ V				
	Quasi-Peak		Average		
0.15 to 0.50	79		66		
0.50 to 30	73		60		
Limits – Class B					
Frequency (MHz)	Limit dB $\mu$ V				
	Quasi-Peak		Average		
0.15 to 0.50	66 to 56		56 to 46		
0.50 to 5	56		46		
5 to 30	60		50		
Measurement Instrument					
Description	Model	Manufacturer	Identifier	Cal. Date	Cal. Due
-	-	-	-	-	-



Mains terminal disturbance voltage _ Measurement data			
Test configuration mode	N/A	EUT Operation mode	N/A
Test voltage (V)	N/A	Test Frequency (Hz)	N/A

**Calculation**

N : Neutral phase, L1 : Live phase
C.FACTOR(dB) : Pulse Limiter(dB) + Cable loss(dB) + Insertion loss of LISN(dB)
Result(dB $\mu$ V) : Reading Value(dB $\mu$ V) + C.FACTOR(dB)
Margin(dB) : Limit(dB $\mu$ V) - Result(dB $\mu$ V)

## 7.2 Radiated Disturbance

ANSI C63.4	Radiated disturbance 30 MHz – 40 GHz			Result
Method: Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 or 3 meter below 1GHz and 3 meter above 1GHz. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable. For final measurement below 1 GHz frequency range, Quasi-Peak detector with (RBW = 120 kHz Bandwidth) was used. For final measurement above 1 GHz frequency range, Peak detector with (RBW = 1 MHz Bandwidth) and CISPR Average detector with (RBW = 1 MHz Bandwidth) were used.				Comply
EUT mode (Refer to clauses 4)	Test configuration mode		1, 2	
	EUT Operation mode		1, 2, 3	
<b>Radiated Disturbance below 1 000 MHz</b>				
Frequency range (MHz)	Quasi-peak limit dB $\mu$ V/m			
	Class A (10 m distance)		Class B (3 m distance)	
30 to 88	39.1		40	
88 to 216	43.5		43.5	
216 to 960	46.4		46	
960 to 1 000	49.5		54	
According to 15.109(g), as an alternative to the radiated emission limit shown above, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22 shown.				
Frequency range (MHz)	Quasi-peak limit dB $\mu$ V/m			
	Class A (10 m distance)		Class B (10 m distance)	
30 to 230	40		30	
230 to 1 000	47		37	
<b>Radiated Disturbance for above 1 000 MHz at a measurement distance of 3 m</b>				
Frequency range (GHz)	Peak limit dB $\mu$ V/m		Average limit dB $\mu$ V/m	
	Class A	Class B	Class A	Class B
1 to 40	80	74	60	54
<b>The test frequency range of Radiated Disturbance measurements are listed below.</b>				
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)			Upper frequency of measurement range (MHz)	
Below 108			1 000	
108 – 500			2 000	
500 – 1 000			5 000	
Above 1 000			5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower	

Measurement Instrument					
Description	Model	Manufacturer	Identifier	Cal. Date	Cal. Due
MEASUREMENT SOFTWARE	EMI-R VER. 2.00.0177	TSJ	N/A	N/A	N/A
EMI TEST RECEIVER	ESU40	ROHDE&SCHWARZ	100525	2018.12.18	2019.12.18
TRILOG BROADBAND TEST-ANTENNA WITH 6DB ATT	VULB9160	SCHWARZBECK	9160-3339	2018.10.22	2020.10.22
	8491B	H.P	18403	2018.10.22	2020.10.22
LOW NOISE PRE AMPLIFIER	MLA-100K01-B01-26	TSJ	1252741	2019.02.18	2020.02.18
HORN ANTENNA	3117	ETS-LINDGREN	152093	2018.03.26	2020.03.26
PRE AMPLIFIER	8449B	H.P	3008A00887	2018.08.31	2019.08.31
HORN ANTENNA WITH	EM-6969	ELECTRO-METRICS	156	2019.02.13	2021.02.13
PREAMPLIFIER	MLA-0618-B03-34	TSJ	1785642	2018.12.27	2019.12.27

(NOTE : THE MEASUREMENT ANTENNAS WERE CALIBRATED IN ACCORDANCE TO THE REQUIREMENTS OF C63.5-2017.)

Radiated disturbance at (30 ~ 1000) MHz _ Measurement data			
Test configuration mode	1	EUT Operation mode	1
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

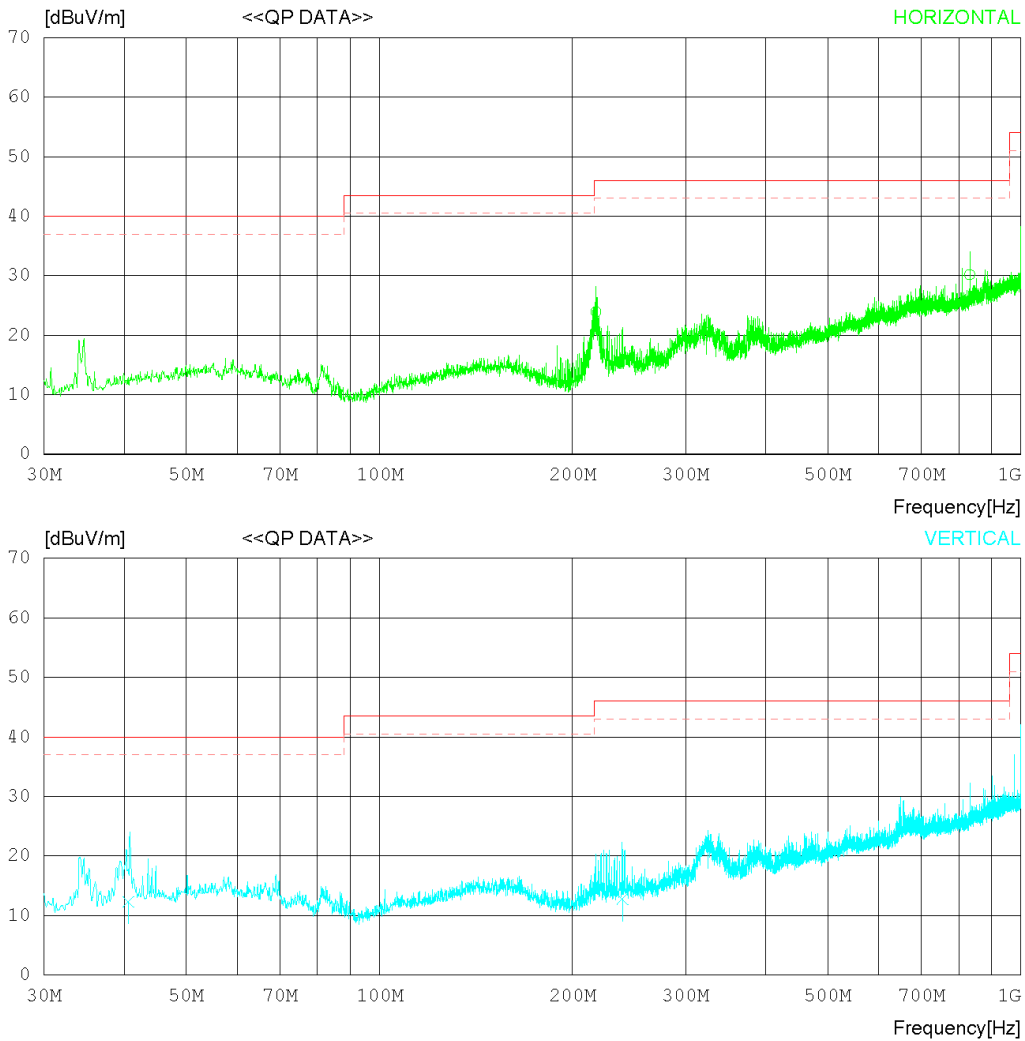
## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m)  
 MARGIN: 3 dB



## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m)  
 MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	217.453	30.80	16.80	1.98	25.65	23.93	46.00	22.07	110	109
2	323.215	24.30	19.66	2.34	25.87	20.43	46.00	25.57	105	8
3	831.952	23.60	28.78	3.54	25.75	30.17	46.00	15.83	214	56
----- Vertical -----										
4	40.649	19.80	17.12	1.20	25.81	12.31	40.00	27.69	221	347
5	239.087	18.40	18.04	2.07	25.71	12.80	46.00	33.20	135	173
6	324.909	25.40	19.70	2.34	25.87	21.57	46.00	24.43	198	40

Radiated disturbance at (1 ~ 6) GHz _ Peak measurement data			
Test configuration mode	1	EUT Operation mode	1
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

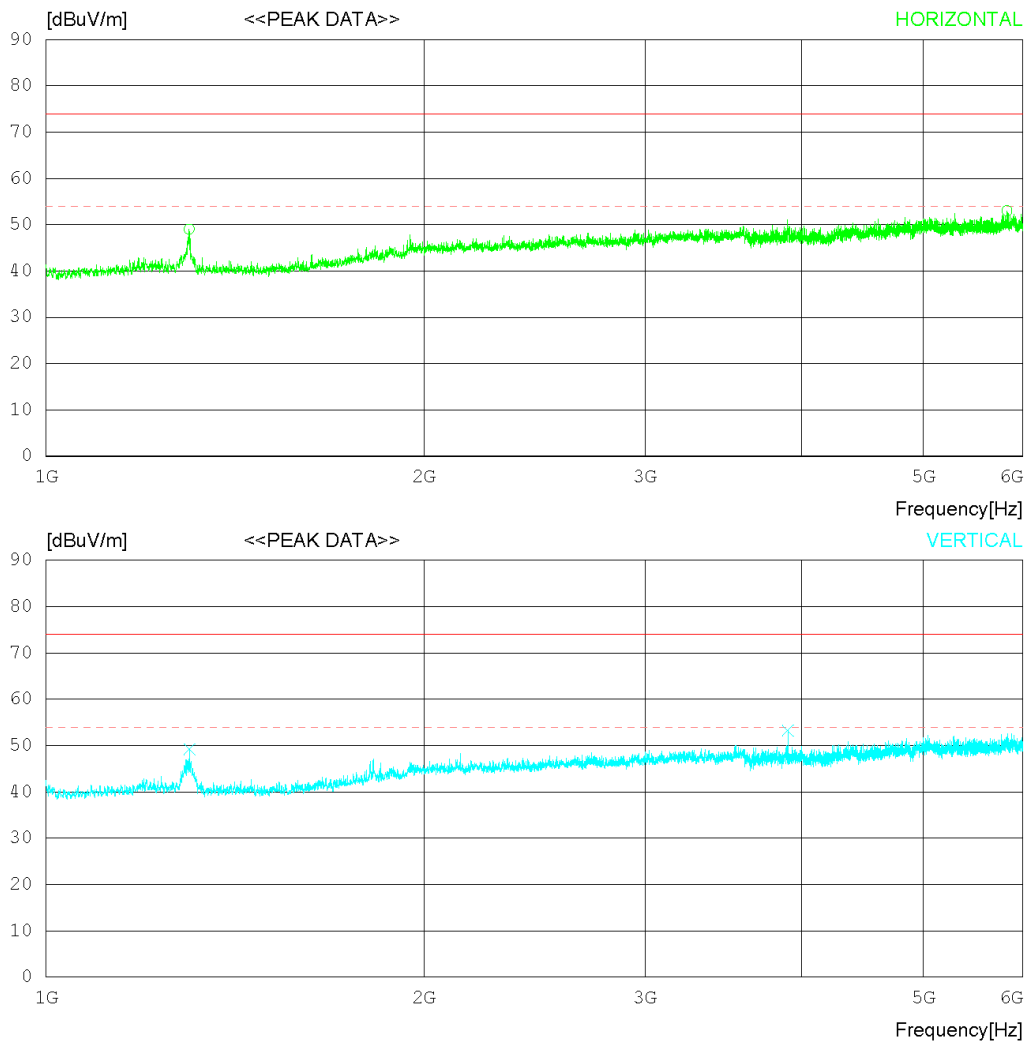
## RADIATED EMISSION

Date 2019-07-29

Order No.	DTNC1907-05874
Power Supply	DC 12 V
Temp/Humi	25 °C 46 % R.H.
Test Condition	AM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)



## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1300.000	50.90	28.80	4.88	35.54	49.04	74.0	24.96	225	0
2	5827.500	41.70	34.81	11.26	34.74	53.03	74.0	20.97	103	359
----- Vertical -----										
3	1301.250	51.10	28.78	4.88	35.54	49.22	74.0	24.78	147	0
4	3898.750	45.20	33.50	8.92	34.39	53.23	74.0	20.77	100	7

Radiated disturbance at (1 ~ 6) GHz _Average measurement data			
Test configuration mode	1	EUT Operation mode	1
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

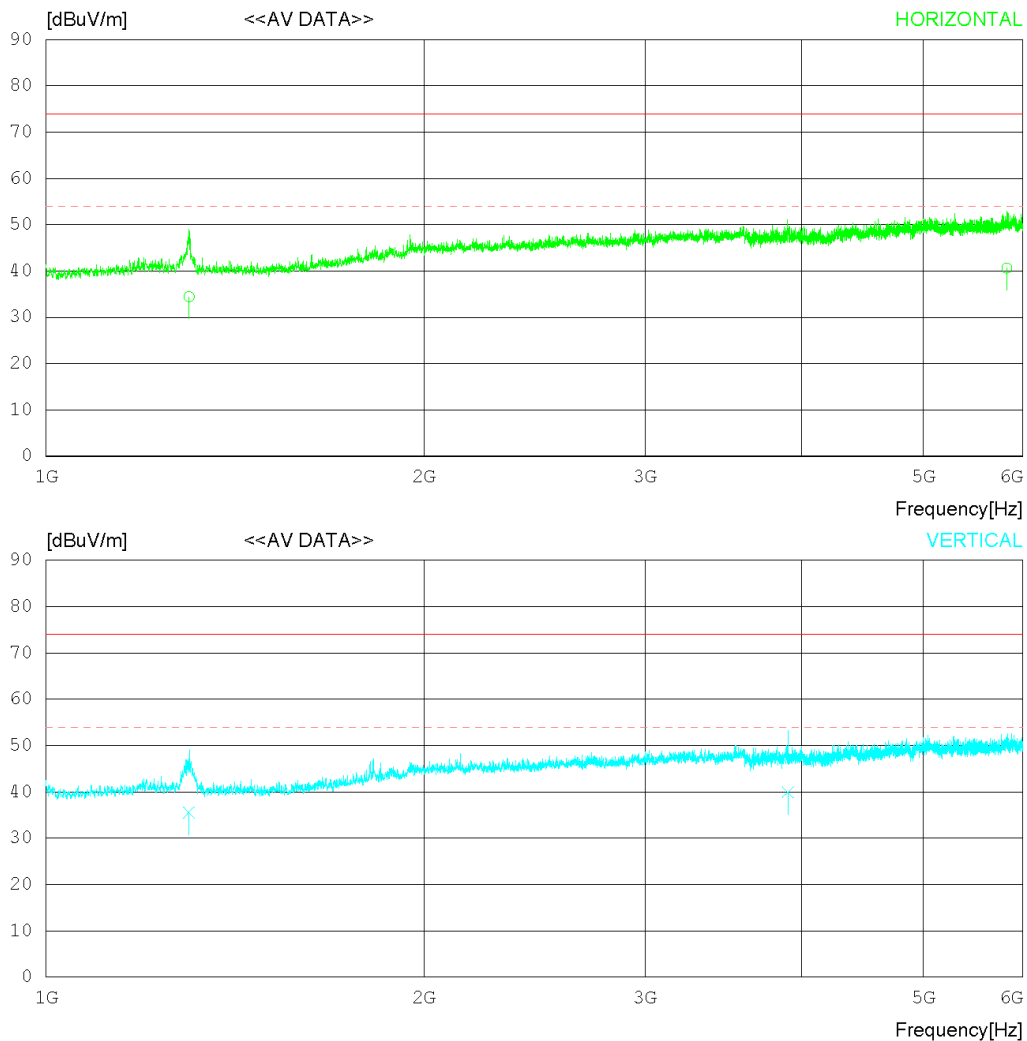
## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)





## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1300.128	36.30	28.80	4.88	35.54	34.44	54.00	19.56	236	7
2	5826.625	29.30	34.81	11.26	34.74	40.63	54.00	13.37	104	222
----- Vertical -----										
3	1299.226	37.40	28.80	4.86	35.54	35.52	54.00	18.48	126	137
4	3899.683	31.90	33.50	8.92	34.39	39.93	54.00	14.07	105	94

Radiated disturbance at (6 ~ 18) GHz _Peak measurement data			
Test configuration mode	1	EUT Operation mode	1
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

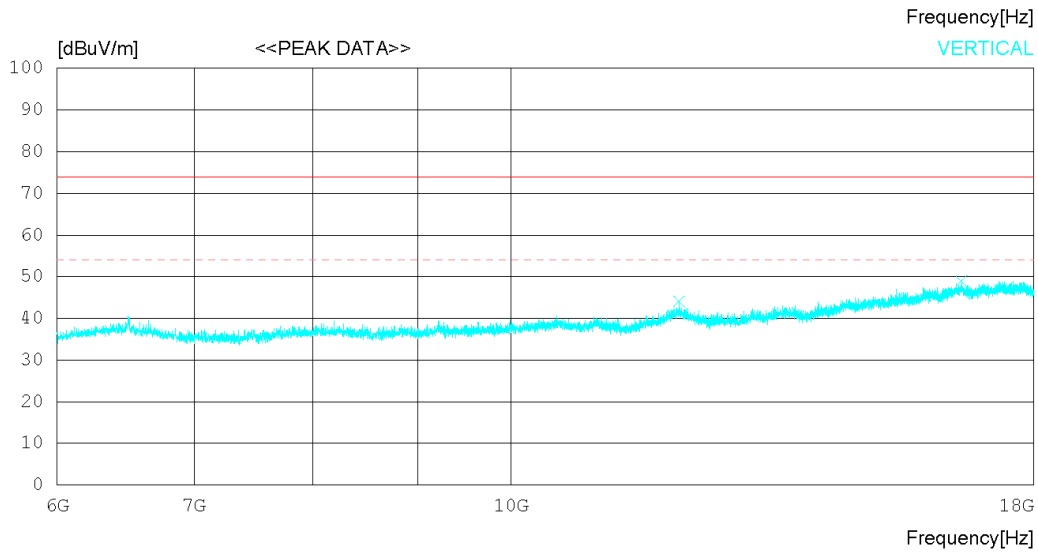
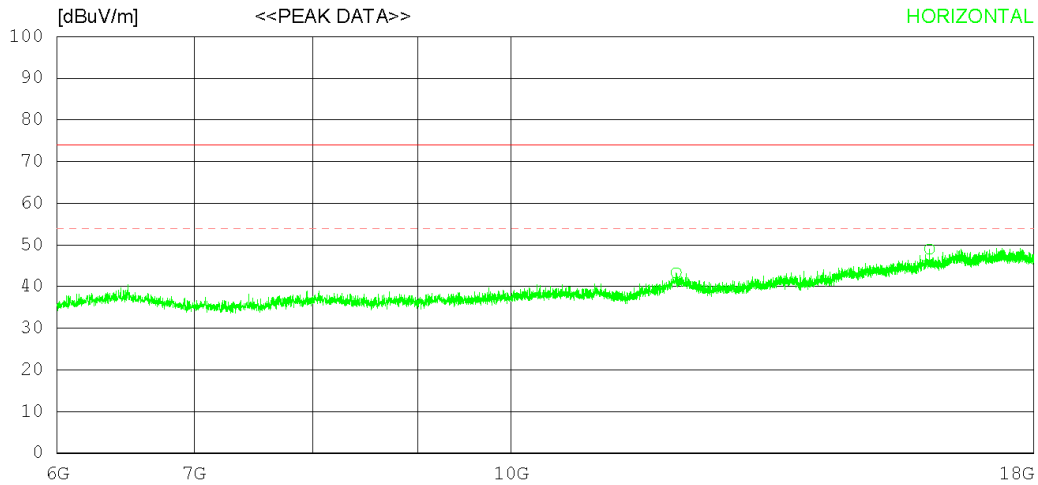
## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)



\* The measurement is performed above 18 GHz up to 40 GHz and not found emissions above 18 GHz.

## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	12039.000	31.90	33.46	15.65	37.73	43.28	74.0	30.72	223	358
2	16008.000	30.30	36.43	19.04	36.79	48.98	74.0	25.02	107	358
----- Vertical -----										
3	12076.500	32.80	33.47	15.63	37.80	44.10	74.0	29.9	185	277
4	16593.000	28.70	37.09	20.06	36.89	48.96	74.0	25.04	100	358

Radiated disturbance at (6 ~ 18) GHz _ Average measurement data			
Test configuration mode	1	EUT Operation mode	1
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

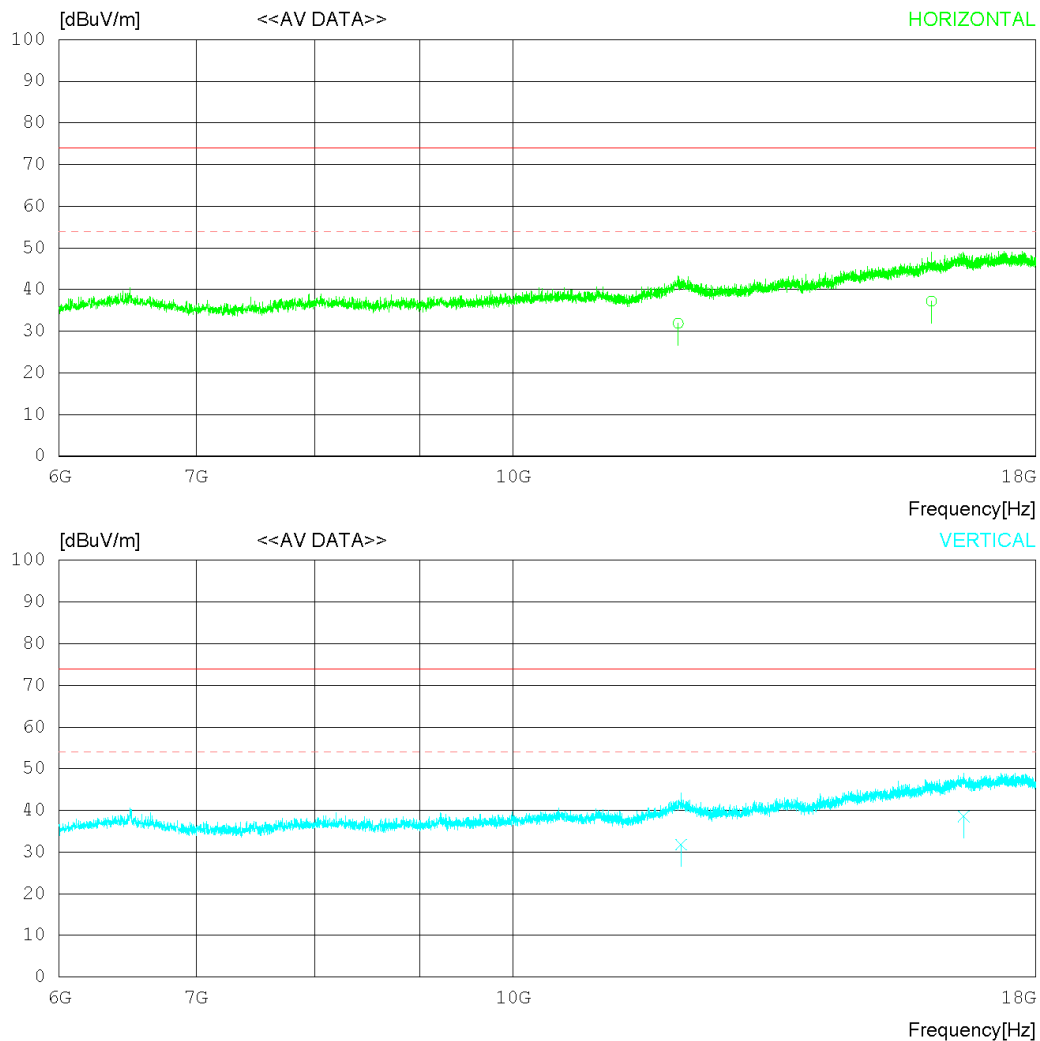
## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)



\* The measurement is performed above 18 GHz up to 40 GHz and not found emissions above 18 GHz.

## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition AM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	12037.400	20.50	33.46	15.66	37.73	31.89	54.00	22.11	189	355
2	16005.840	18.50	36.43	19.04	36.79	37.18	54.00	16.82	113	251
----- Vertical -----										
3	12074.150	20.50	33.47	15.62	37.79	31.80	54.00	22.20	235	314
4	16594.260	18.30	37.09	20.07	36.89	38.57	54.00	15.43	136	289

Radiated disturbance at (30 ~ 1000) MHz _ Measurement data			
Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

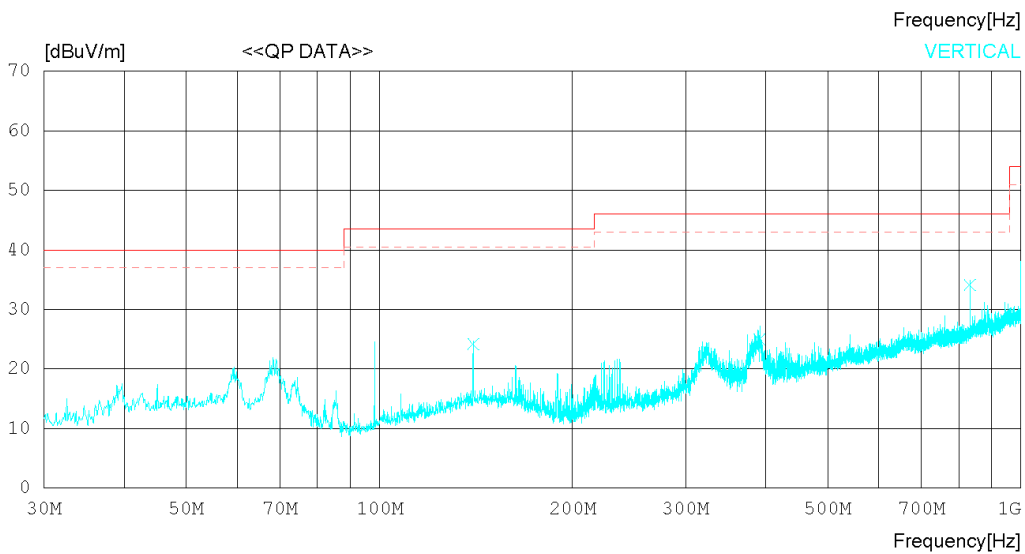
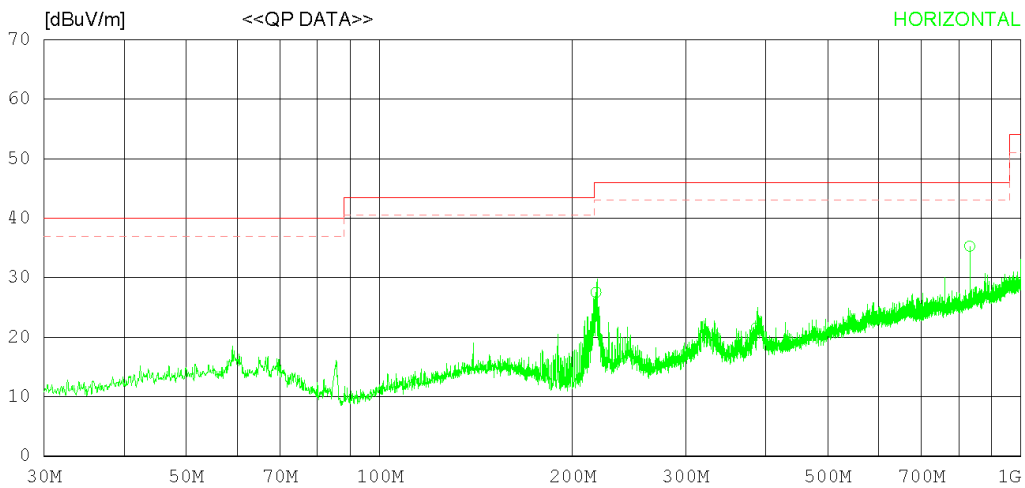
## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m)  
 MARGIN: 3 dB



## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m)  
 MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	217.663	34.40	16.81	1.98	25.65	27.54	46.00	18.46	104	57
2	386.689	23.70	21.20	2.50	25.86	21.54	46.00	24.46	126	314
3	831.998	28.70	28.78	3.54	25.75	35.27	46.00	10.73	200	359
----- Vertical -----										
4	139.996	29.50	18.70	1.68	25.68	24.20	43.50	19.30	113	96
5	391.128	27.00	21.32	2.51	25.85	24.98	46.00	21.02	100	145
6	832.009	27.60	28.78	3.54	25.75	34.17	46.00	11.83	120	228

Radiated disturbance at (1 ~ 6) GHz _ Peak measurement data			
Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

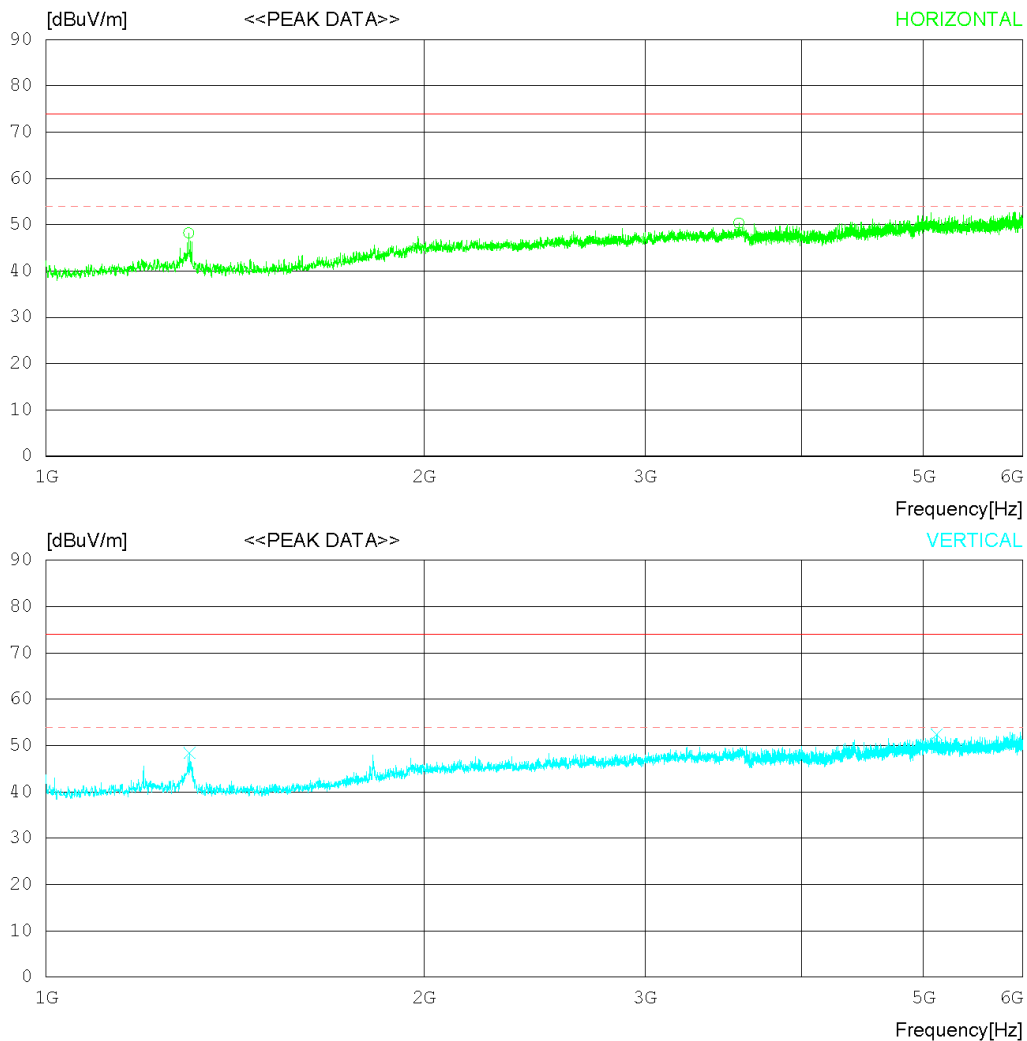
## RADIATED EMISSION

Date 2019-07-29

Order No.	DTNC1907-05874
Power Supply	DC 12 V
Temp/Humi	25 °C 46 % R.H.
Test Condition	FM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)





## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1298.750	50.10	28.80	4.86	35.54	48.22	74.0	25.78	328	197
2	3563.125	43.60	33.06	8.25	34.56	50.35	74.0	23.65	119	218
----- Vertical -----										
3	1301.250	50.30	28.78	4.88	35.54	48.42	74.0	25.58	124	187
4	5124.375	42.20	34.15	10.70	34.65	52.40	74.0	21.6	300	0

Radiated disturbance at (1 ~ 6) GHz _Average measurement data			
Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

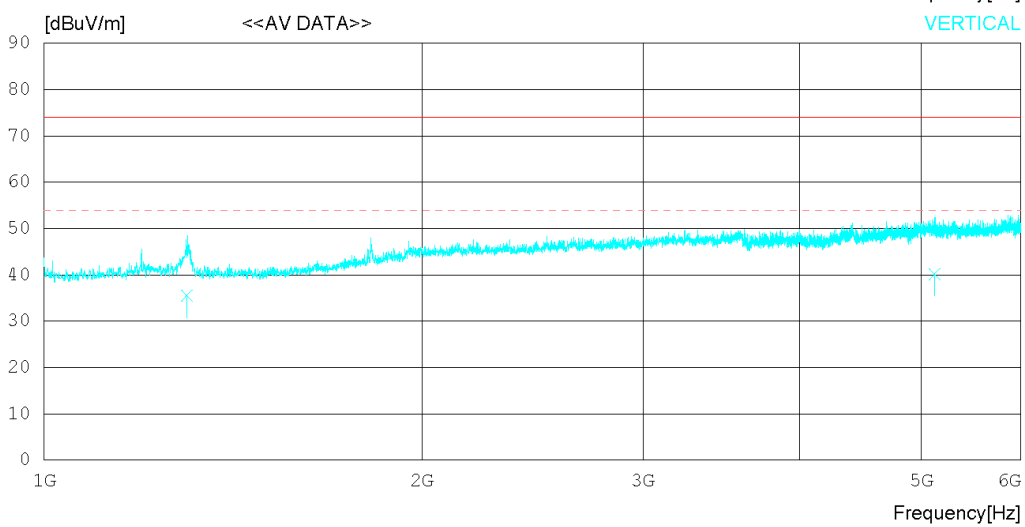
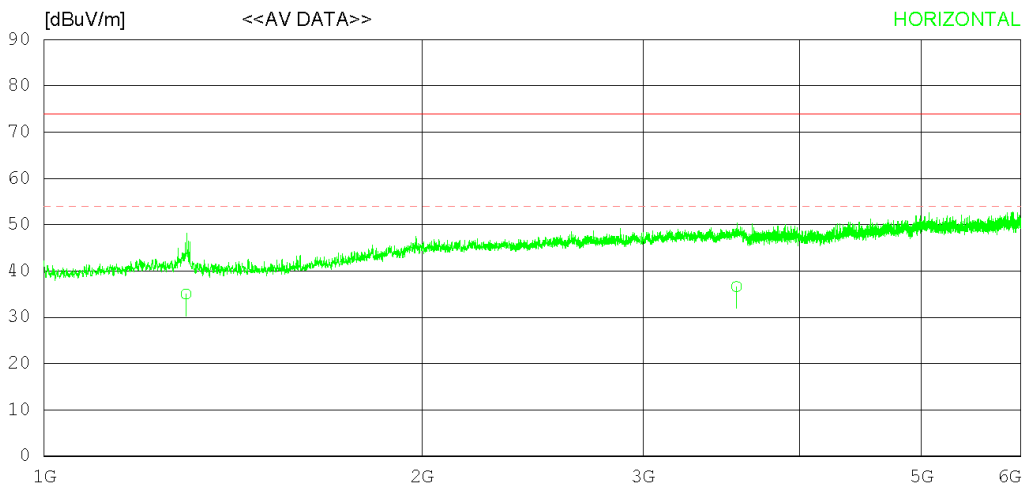
## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)



## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1297.282	36.90	28.79	4.86	35.54	35.01	54.00	18.99	317	215
2	3561.323	29.90	33.04	8.25	34.56	36.63	54.00	17.37	110	276
----- Vertical -----										
3	1299.245	37.40	28.80	4.86	35.54	35.52	54.00	18.48	124	256
4	5124.603	30.00	34.15	10.70	34.65	40.20	54.00	13.80	308	9

Radiated disturbance at (6 ~ 18) GHz _Peak measurement data			
Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

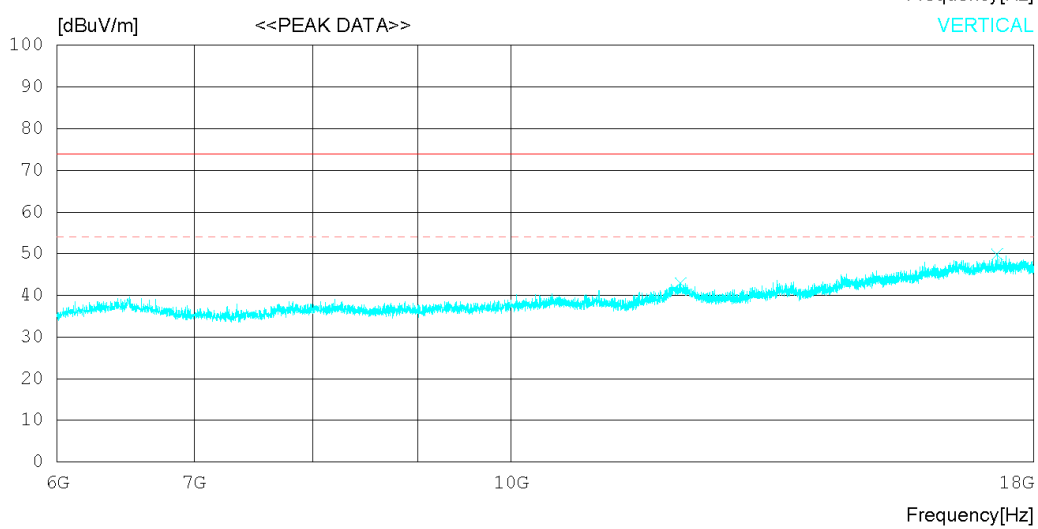
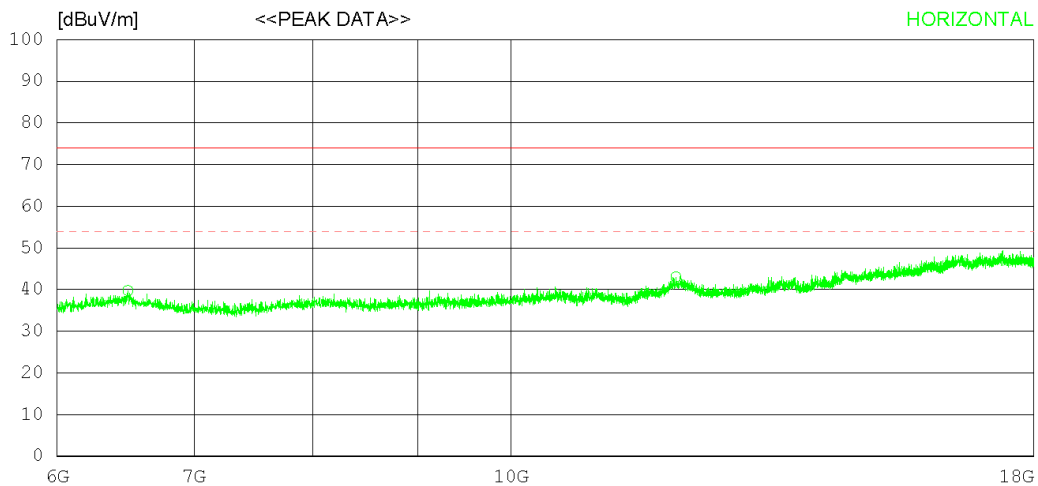
## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)



\* The measurement is performed above 18 GHz up to 40 GHz and not found emissions above 18 GHz.

## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	6498.000	35.50	31.59	11.20	38.54	39.75	74.0	34.25	114	358
2	12033.000	31.60	33.46	15.66	37.72	43.00	74.0	31	252	0
----- Vertical -----										
3	12099.000	31.70	33.47	15.61	37.84	42.94	74.0	31.06	200	3
4	17272.500	30.20	37.76	19.40	37.49	49.87	74.0	24.13	105	358

Radiated disturbance at (6 ~ 18) GHz _ Average measurement data			
Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

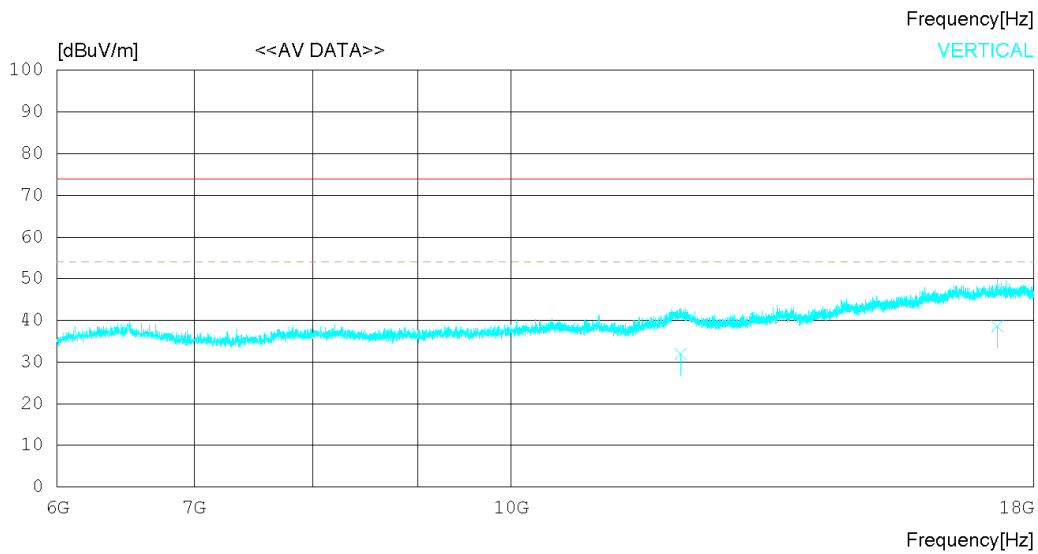
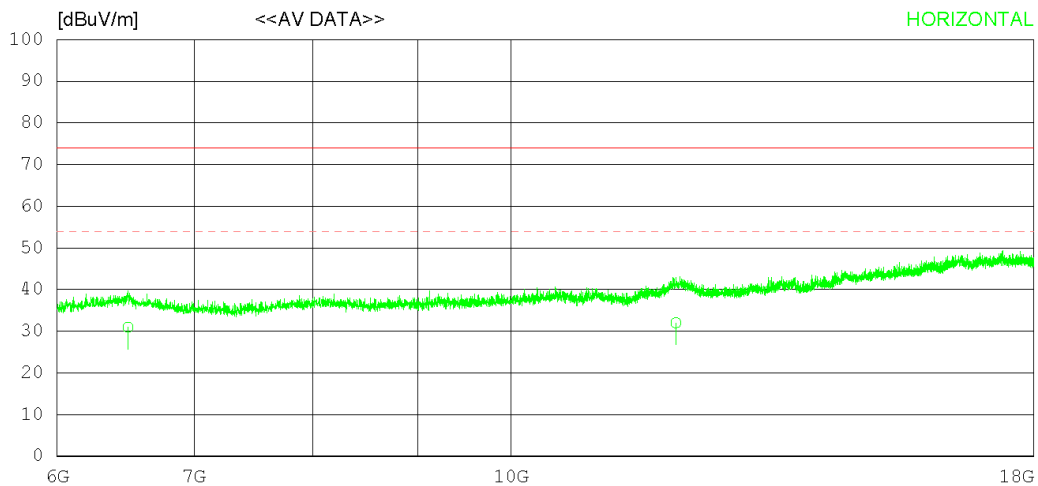
## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)



\* The measurement is performed above 18 GHz up to 40 GHz and not found emissions above 18 GHz.

## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition FM

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	6497.872	26.70	31.59	11.20	38.54	30.95	54.00	23.05	138	7
2	12033.700	20.60	33.46	15.66	37.72	32.00	54.00	22.00	221	143
----- Vertical -----										
3	12097.200	20.70	33.47	15.61	37.83	31.95	54.00	22.05	246	108
4	17272.180	19.00	37.76	19.39	37.49	38.66	54.00	15.34	115	35

Radiated disturbance at (30 ~ 1000) MHz _ Measurement data			
Test configuration mode	2	EUT Operation mode	3
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

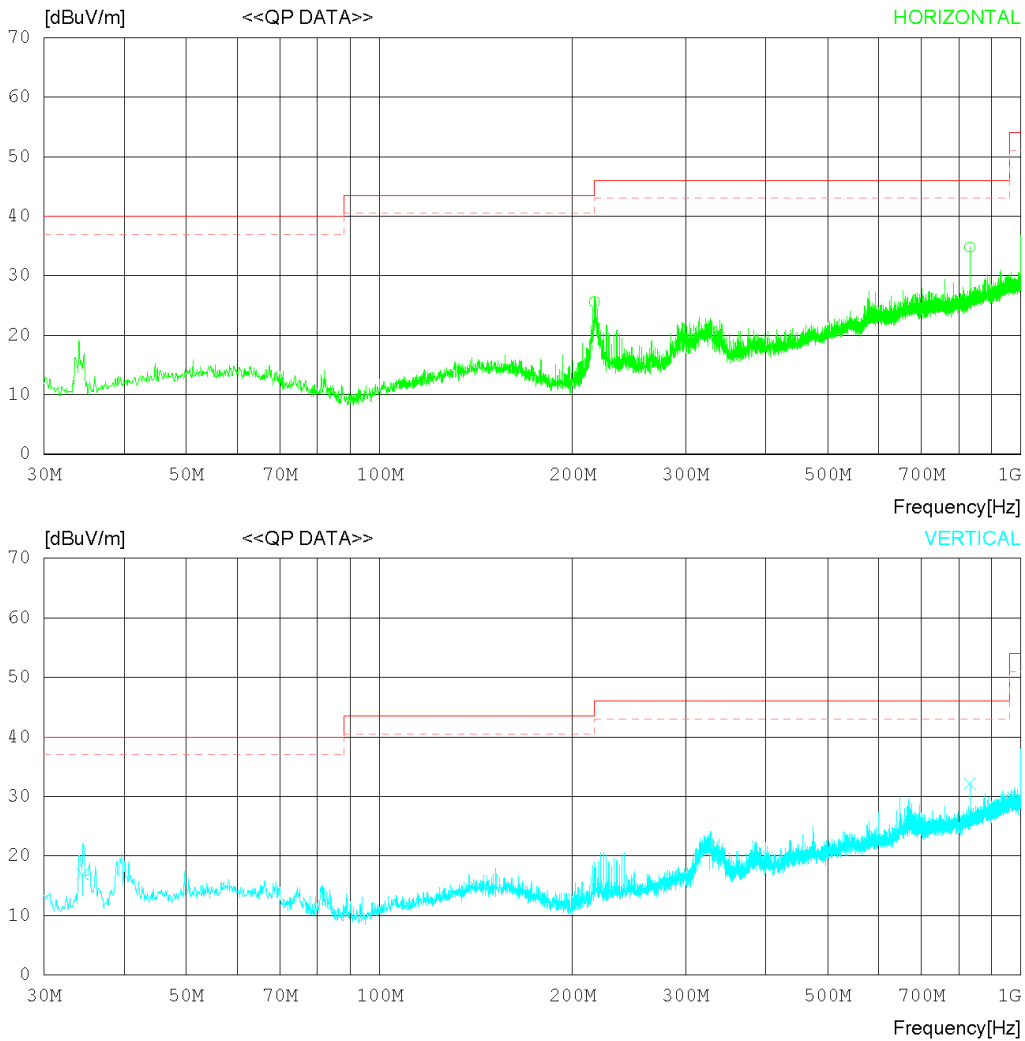
## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m)  
 MARGIN: 3 dB





## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m)  
 MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	216.378	32.50	16.76	1.98	25.65	25.59	46.00	20.41	104	5
2	831.981	28.20	28.78	3.54	25.75	34.77	46.00	11.23	115	302
----- Vertical -----										
3	34.463	25.90	15.75	1.14	25.82	16.97	40.00	23.03	129	50
4	327.244	25.20	19.74	2.34	25.87	21.41	46.00	24.59	220	320
5	831.967	25.60	28.78	3.54	25.75	32.17	46.00	13.83	106	351

Radiated disturbance at (1 ~ 6) GHz _ Peak measurement data			
Test configuration mode	2	EUT Operation mode	3
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

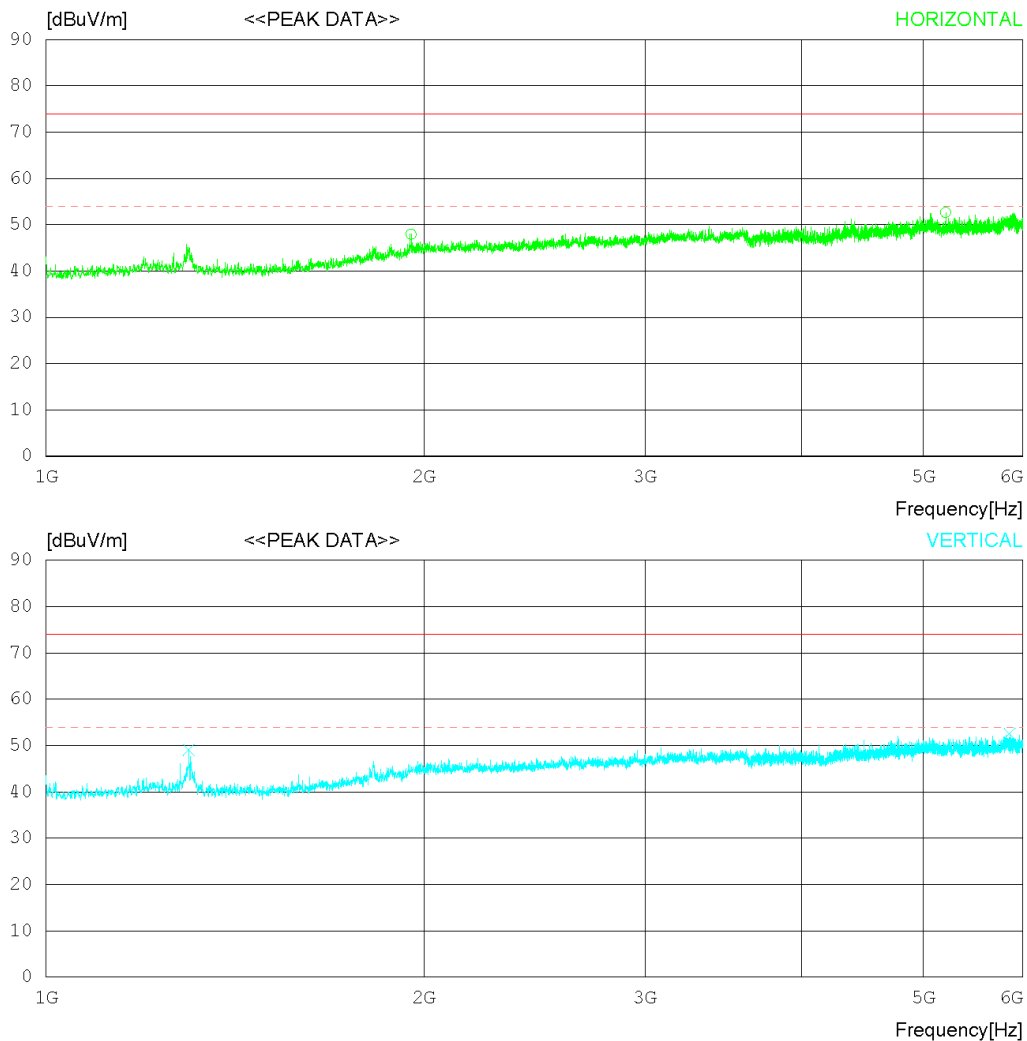
## RADIATED EMISSION

Date 2019-07-29

Order No.	DTNC1907-05874
Power Supply	DC 12 V
Temp/Humi	25 °C 46 % R.H.
Test Condition	USB

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)



## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1953.750	45.30	31.51	6.00	34.87	47.94	74.0	26.06	183	0
2	5207.500	42.40	34.22	10.70	34.66	52.66	74.0	21.34	310	356
----- Vertical -----										
3	1299.375	50.90	28.80	4.86	35.54	49.02	74.0	24.98	169	358
4	5856.875	41.10	34.91	11.28	34.74	52.55	74.0	21.45	307	0

Radiated disturbance at (1 ~ 6) GHz _Average measurement data			
Test configuration mode	2	EUT Operation mode	3
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

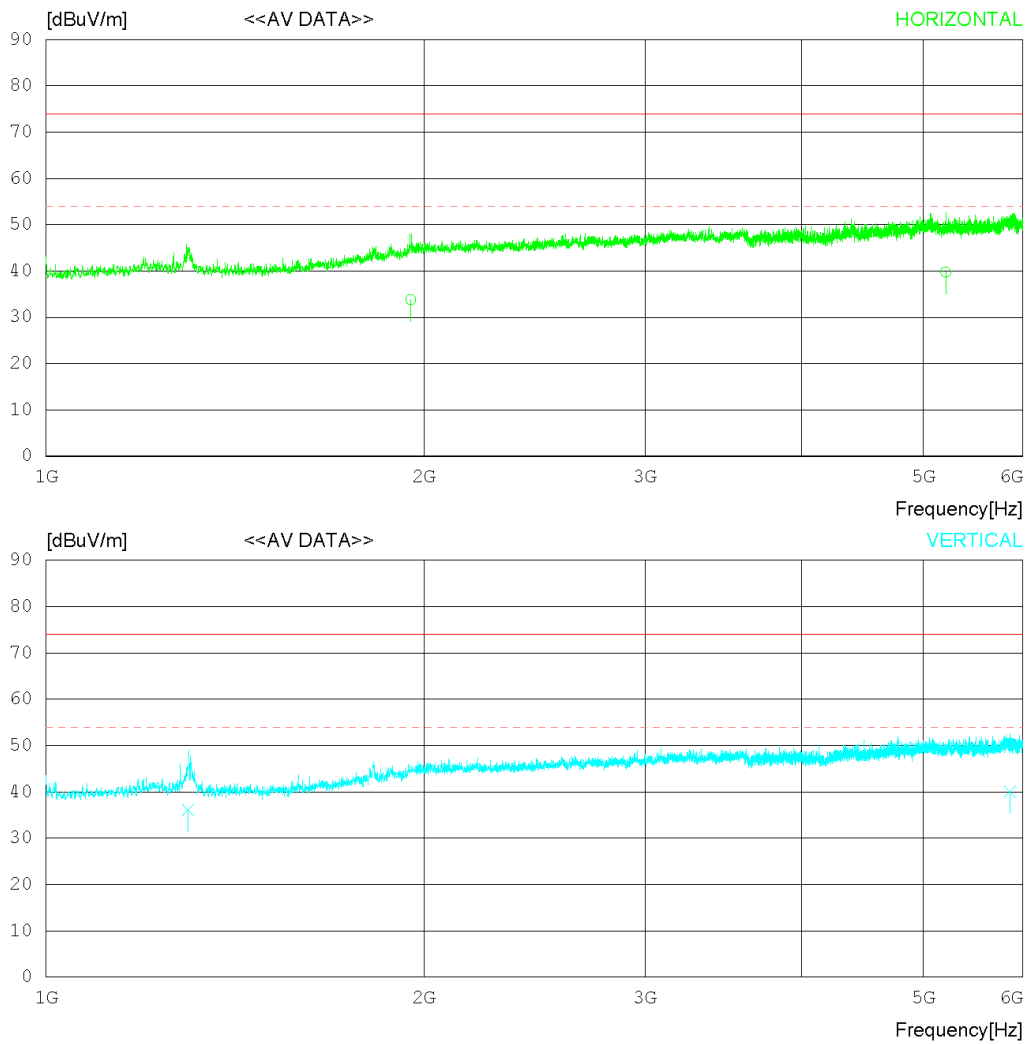
## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)



## RADIATED EMISSION

Date 2019-07-29

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1951.495	31.20	31.50	6.00	34.87	33.83	54.00	20.17	197	1
2	5206.390	29.50	34.21	10.69	34.66	39.74	54.00	14.26	278	344
----- Vertical -----										
3	1297.826	38.00	28.80	4.86	35.54	36.12	54.00	17.88	194	315
4	5857.306	28.60	34.91	11.28	34.74	40.05	54.00	13.95	317	2

Radiated disturbance at (6 ~ 18) GHz _Peak measurement data			
Test configuration mode	2	EUT Operation mode	3
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

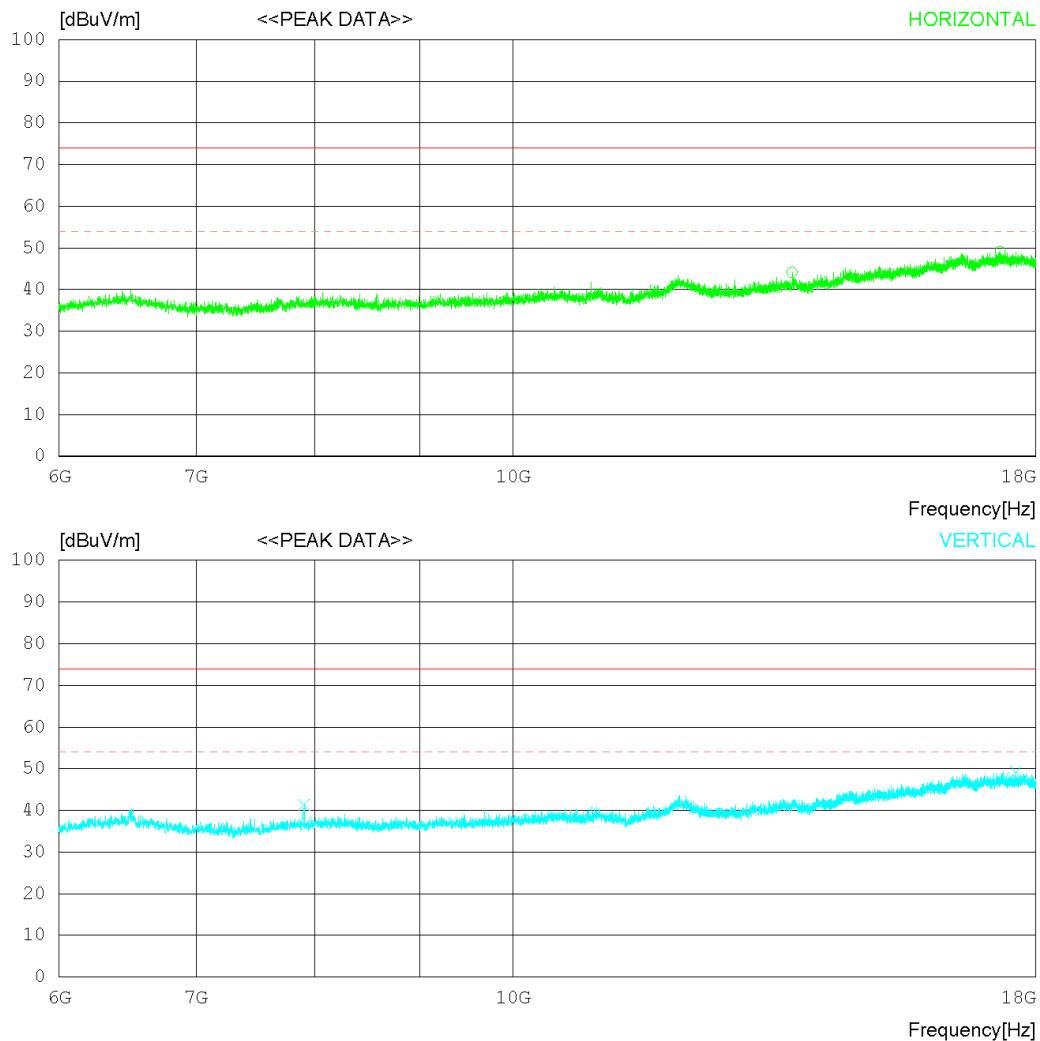
## RADIATED EMISSION

Date 2019-07-30

Order No.	DTNC1907-05874
Power Supply	DC 12 V
Temp/Humi	25 °C 46 % R.H.
Test Condition	USB

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)



\* The measurement is performed above 18 GHz up to 40 GHz and not found emissions above 18 GHz.

## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	13683.000	30.80	33.80	17.25	37.74	44.11	74.0	29.89	137	358
2	17287.500	29.40	37.77	19.44	37.50	49.11	74.0	24.89	211	250
----- Vertical -----										
3	7903.500	35.60	31.31	12.42	38.00	41.33	74.0	32.67	256	30
4	17602.500	29.30	38.01	19.76	37.82	49.25	74.0	24.75	100	359

Radiated disturbance at (6 ~ 18) GHz _ Average measurement data			
Test configuration mode	2	EUT Operation mode	3
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

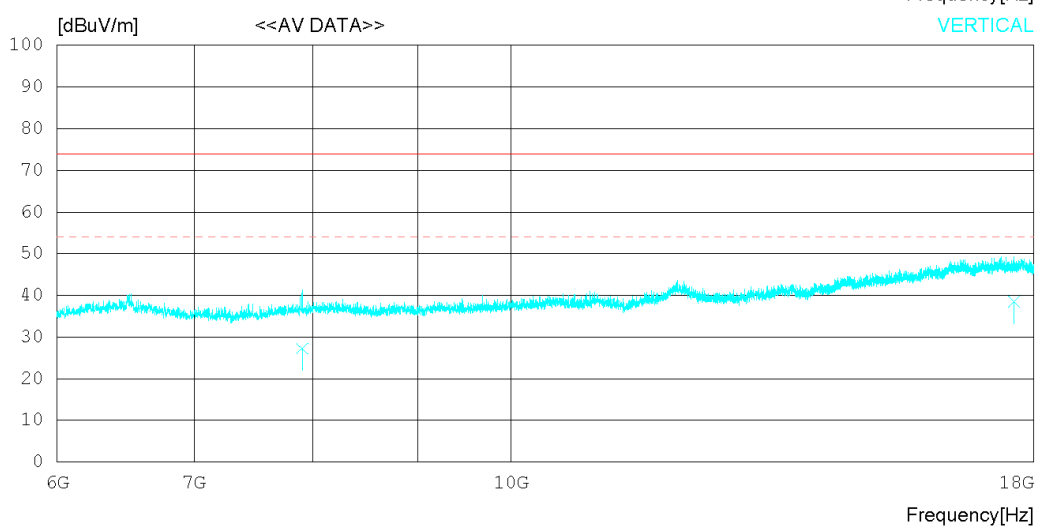
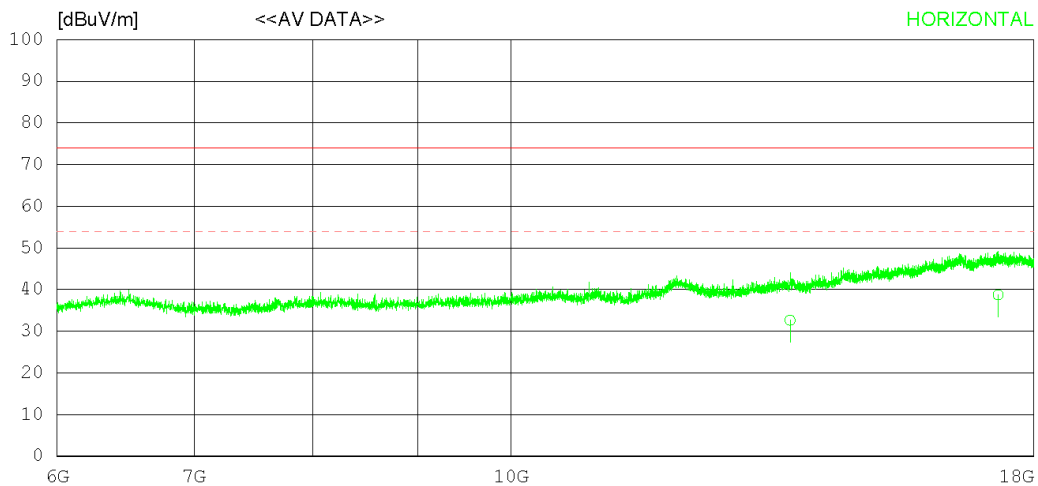
## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)



\* The measurement is performed above 18 GHz up to 40 GHz and not found emissions above 18 GHz.



## RADIATED EMISSION

Date 2019-07-30

Order No. DTNC1907-05874  
 Power Supply DC 12 V  
 Temp/Humi 25 °C 46 % R.H.  
 Test Condition USB

**Memo**

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)  
 FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	13684.490	19.30	33.80	17.25	37.74	32.61	54.00	21.39	102	110
2	17288.940	19.00	37.77	19.44	37.50	38.71	54.00	15.29	252	59
----- Vertical -----										
3	7903.000	21.50	31.31	12.42	38.00	27.23	54.00	26.77	236	58
4	17602.380	18.60	38.01	19.76	37.82	38.55	54.00	15.45	129	340

**Calculation**

N : Neutral phase, L1 : Live phase
C.FACTOR(dB) : Pulse Limiter(dB) + Cable loss(dB) + Insertion loss of LISN(dB)
Result(dBμV) : Reading Value(dBμV) + C.FACTOR(dB)
Margin(dB) : Limit(dBμV) - Result(dBμV)

### 7.3 Antenna Power Conduction

ANSI C63.4	Antenna power conduction		Result
Method: Power on the receive antenna terminals was to be determined by measurement of the voltage present at these terminals. Antenna conducted power measurements was performed with the EUT antenna terminals connected directly to measuring instrument using a impedance-Matching network to connect the measurement Instrument to the antenna terminals of the EUT. The losses in decibels in impedance-matching network and cables was added to the measured values in dB $\mu$ V. The measurements were repeated with the receiver tuned to a frequency until all of frequencies had been successively measured. Power in the receive antenna terminals in the ratio of $V^2/R$ , where V is the loss-corrected voltage measured at the antenna terminals, and R is the impedance of the measuring instrument			Comply
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Limit	
	30 MHz to 1 GHz	2 nW (51.7 dB $\mu$ V)	
Measurement Point	Tuner port		
EUT mode (Refer to clauses 4)	Test configuration mode	1	
	EUT Operation mode	2	

Measurement Instrument					
Description	Model	Manufacturer	Identifier	Cal. Date	Cal. Due
EMI TEST RECEIVER	ESU	ROHDE & SCHWARZ	100538	2019.01.23	2020.01.23
SPLITTER	ZFRSC-123-S+	MINI CIRCUITS	SF139801142	2019.07.15	2020.07.15

Antenna Power Conduction \_ Measurement data graph

Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-



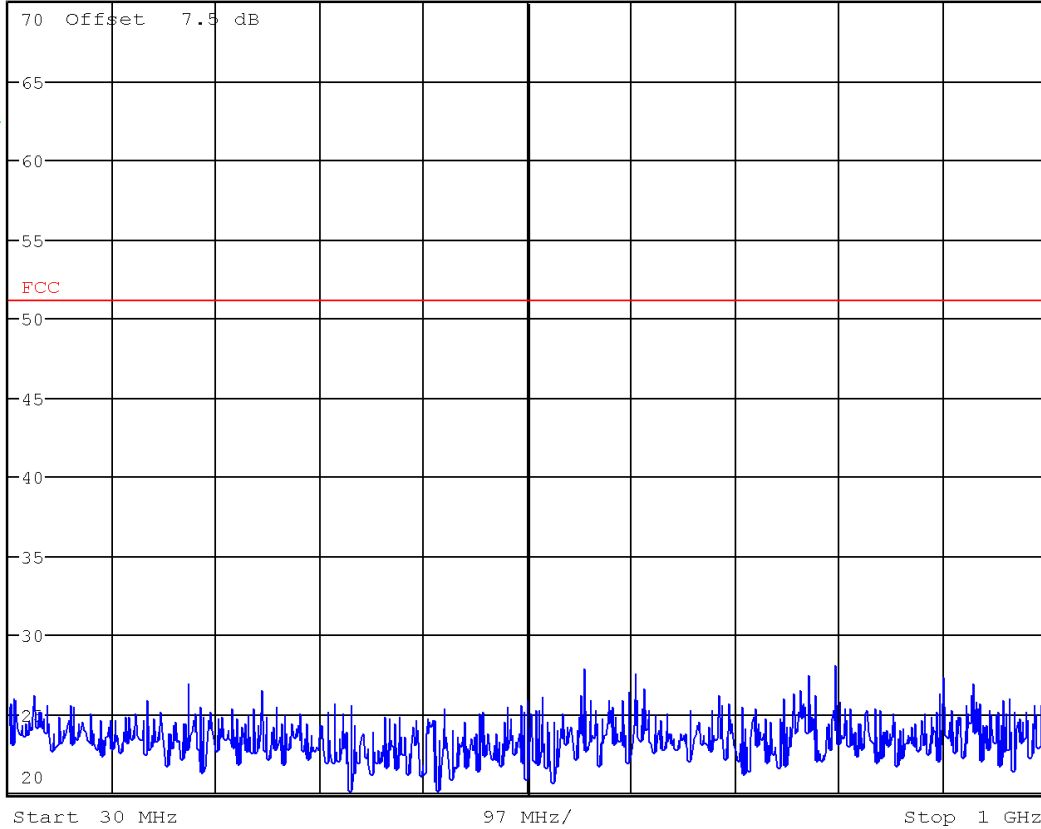
\* RBW 100 kHz  
 \* VBW 300 kHz  
 \* SWT 100 ms

Ref 70 dBμV

\* Att 10 dB

70 Offset 7.5 dB

1 RM\*  
 VIEW



## 8. Revision History

Date	Description	Revised By	Reviewed By
Sep. 26. 2019	Initial report	MinWoo Park	DaeHwa Eun

-End of test report-