

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. : DREFCC1905-0162

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 / MTXNC10AB / BP9-MTXNC10AB

5. Test Standard : ANSI C 63.4 : 2014
FCC Part 15 Subpart B
(FM Broadcast receiver)

6. Date of Test : Apr. 18. 2019 ~ Apr. 23. 2019

7. Testing Environment : Temperature (19 ~ 20) °C , Humidity (35 ~ 42) % R.H.

8. Test Result : Refer to the attached Test Result

Affirmation	Tested by	Reviewed by
	Name : GiHyun Kim (Signature)	Name : HyungJun Kim (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.

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May. 15. 2019

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to 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.dtnet.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	MTXNC10AB
Add Model Name	None
FCC ID	BP9-MTXNC10AB
Maximum Internal Frequency	1 GHz
Software Version	ABPV30_190318_181019_M03
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.
2	USB	The EUT is connected to USB memory to play the music. (1 kHz tone).

4.4 Supported Equipment

Used*	Product Type	Manufacturer	Model	Remarks
AE	DC Power Supply	Smtechno	SDP 30-5D	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 m	Non-Shield	Plastic	None
Antenna	I/O	3.0 m	Shield	Plastic	None
Speaker	I/O	1.5 m	Non-Shield	Plastic	None
Multimedia box	I/O	1.5 m	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 μ V]	Detector	Limit [dB μ V]	Margin [dB]
-	-	-	-	-	-

-Radiated Disturbance

Frequency [MHz]	Pol.	Result [dB μ V/m]	Detector	Limit [dB μ V/m]	Margin [dB]
494.981	H	42.53	Quasi-Peak	46.00	3.47

6. Test Environment

Test Items	Test date (YYYY-MM-DD)	Temp. (°C)	Humidity (% R.H.)	Pressure (kPa)
Radiated Disturbance	2019-04-18 2019-04-22	20 19	35 42	-
Antenna Power Conduction	2019-04-23	20	37	

7. Test Results : Emission

7.1 Conducted Disturbance

ANSI C63.4	Mains terminal disturbance voltage		Result		
<u>Method:</u> 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.			Not Applicable		
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 dBµV				
	Quasi-Peak	Average			
0.15 to 0.50	79	66			
0.50 to 30	73	60			
Limits – Class B					
Frequency (MHz)	Limit dBµV				
	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(dBμV) : Reading Value(dBμV) + C.FACTOR(dB)
Margin(dB) : Limit(dBμV) - Result(dBμV)

7.2 Radiated Disturbance

ANSI C63.4	Radiated disturbance 30 MHz – 40 GHz			Result
<u>Method:</u> 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	
Radiated Disturbance below 1 000 MHz				
Frequency range (MHz)	Quasi-peak limit dBµV/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 dBµV/m			
	Class A (10 m distance)		Class B (10 m distance)	
30 to 230	40		30	
230 to 1 000	47		37	
Radiated Disturbance for above 1 000 MHz at a measurement distance of 3 m				
Frequency range (GHz)	Peak limit dBµV/m		Average limit dBµV/m	
	Class A	Class B	Class A	Class B
1 to 40	80	74	60	54
The test frequency range of Radiated Disturbance measurements are listed below.				
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 th 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	ESU	ROHDE&SCHWARZ	100469	2018.06.28	2019.06.28
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
PRE AMPLIFIER	8449B	H.P	3008A00887	2018.08.31	2019.08.31
HORN ANTENNA	3117	ETS-LINDGREN	00152093	2018.03.26	2020.03.26
(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)	-

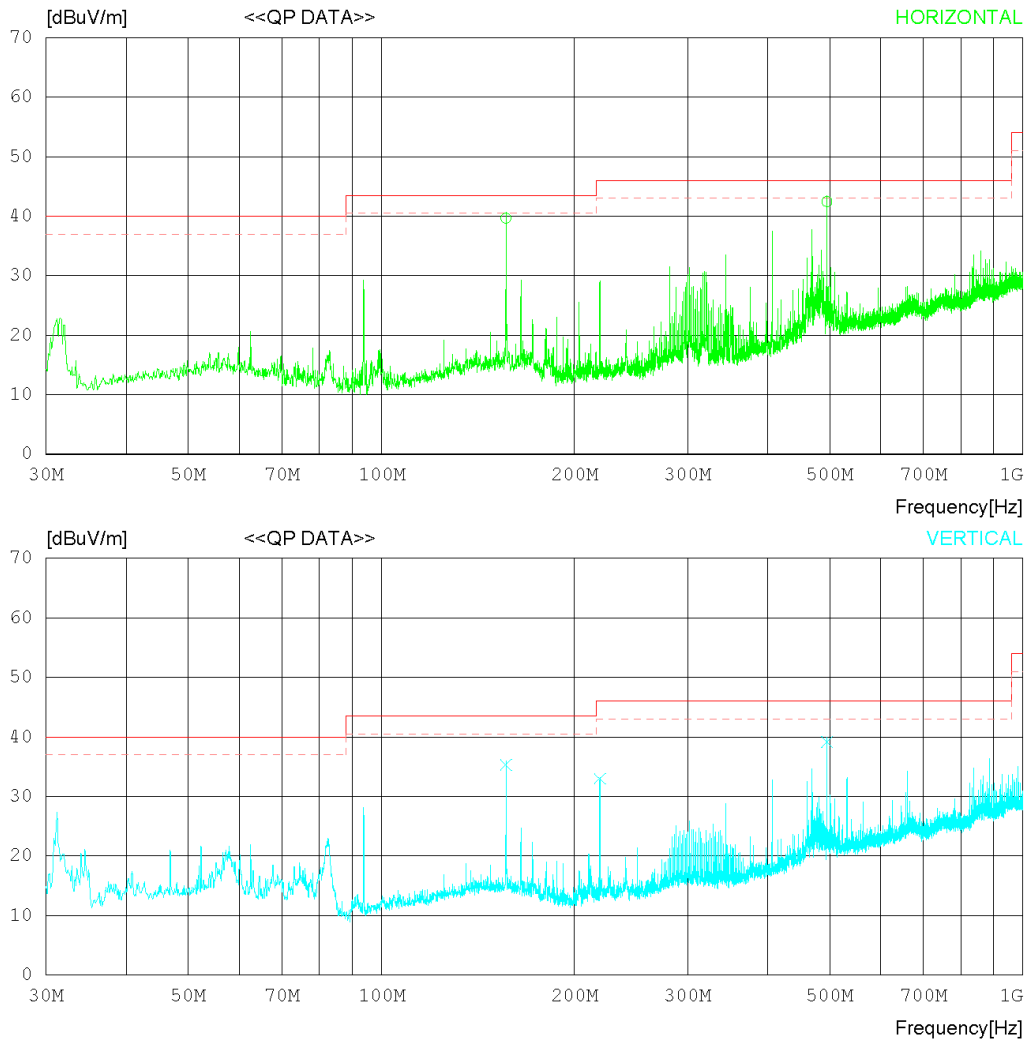
RADIATED EMISSION

Date 2019-04-18

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 20 'C 35 % R.H.
Test Condition AM

Memo

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



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Date 2019-04-18

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 20°C 35 % 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	156.340	44.63	18.90	1.77	25.66	39.64	43.50	3.86	184	358
2	494.981	41.47	23.70	2.84	25.57	42.44	46.00	3.56	233	247
----- Vertical -----										
3	156.340	40.30	18.90	1.77	25.66	35.31	43.50	8.19	202	120
4	218.903	39.80	16.86	1.99	25.65	33.00	46.00	13.00	145	1
5	494.981	38.21	23.70	2.84	25.57	39.18	46.00	6.82	130	1

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)	-

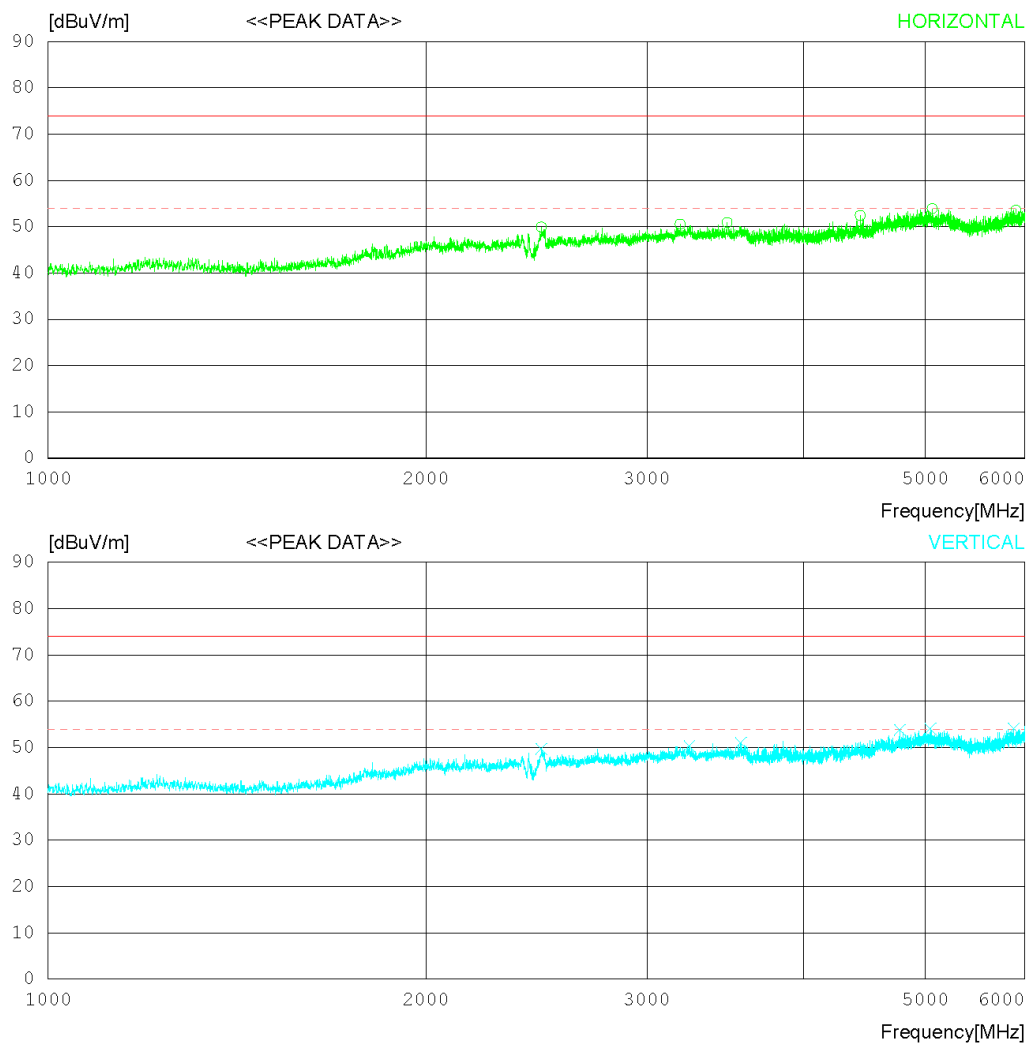
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % 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 2019-04-22

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Power Supply DC 12 V
Temp/Humi 19°C 42 % 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	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	PEAK [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	2471.250	45.30	32.19	7.26	34.83	49.92	74.0	24.08	352	324
2	3187.500	43.80	33.15	8.34	34.75	50.54	74.0	23.46	354	0
3	3474.375	44.10	32.80	8.63	34.60	50.93	74.0	23.07	362	352
4	4436.250	42.60	33.87	10.44	34.47	52.44	74.0	21.56	347	0
5	5061.250	43.00	34.18	11.34	34.65	53.87	74.0	20.13	323	248
6	5900.625	41.50	35.00	11.81	34.75	53.56	74.0	20.44	123	358
----- Vertical -----										
7	2471.250	45.10	32.19	7.26	34.83	49.72	74.0	24.28	147	289
8	3242.500	43.70	33.03	8.40	34.72	50.41	74.0	23.59	384	338
9	3563.750	43.80	33.07	8.72	34.56	51.03	74.0	22.97	149	307
10	4771.250	43.40	34.00	11.01	34.57	53.84	74.0	20.16	122	199
11	5046.250	43.20	34.19	11.35	34.65	54.09	74.0	19.91	318	358
12	5878.125	42.10	34.96	11.81	34.75	54.12	74.0	19.88	340	0

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)	-

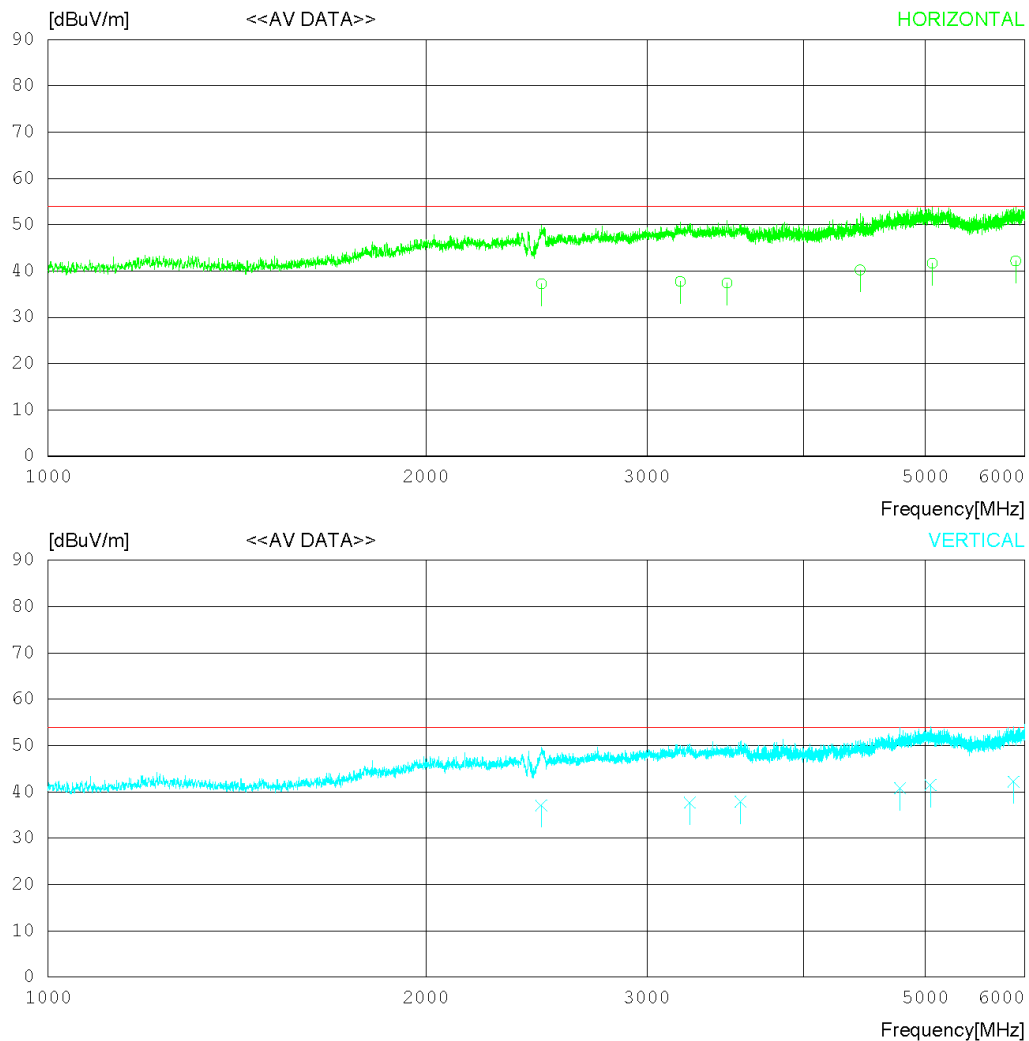
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Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % R.H.
Test Condition AM

Memo

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



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Test Condition AM

Memo

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

No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	CAV [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	2472.209	32.60	32.19	7.26	34.83	37.22	54.00	16.78	354	175
2	3188.601	31.00	33.15	8.34	34.75	37.74	54.00	16.26	364	352
3	3473.910	30.60	32.80	8.63	34.60	37.43	54.00	16.57	372	330
4	4434.106	30.40	33.87	10.44	34.47	40.24	54.00	13.76	366	145
5	5062.296	30.80	34.18	11.35	34.65	41.68	54.00	12.32	357	96
6	5899.612	30.10	35.00	11.81	34.75	42.16	54.00	11.84	134	24
----- Vertical -----										
7	2470.419	32.50	32.18	7.26	34.83	37.11	54.00	16.89	120	165
8	3244.341	31.00	33.02	8.41	34.72	37.71	54.00	16.29	384	177
9	3562.052	30.70	33.04	8.72	34.56	37.90	54.00	16.10	134	263
10	4773.332	30.30	34.00	11.01	34.57	40.74	54.00	13.26	158	289
11	5045.406	30.60	34.19	11.34	34.65	41.48	54.00	12.52	371	63
12	5878.520	30.20	34.96	11.81	34.75	42.22	54.00	11.78	361	1

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)	-

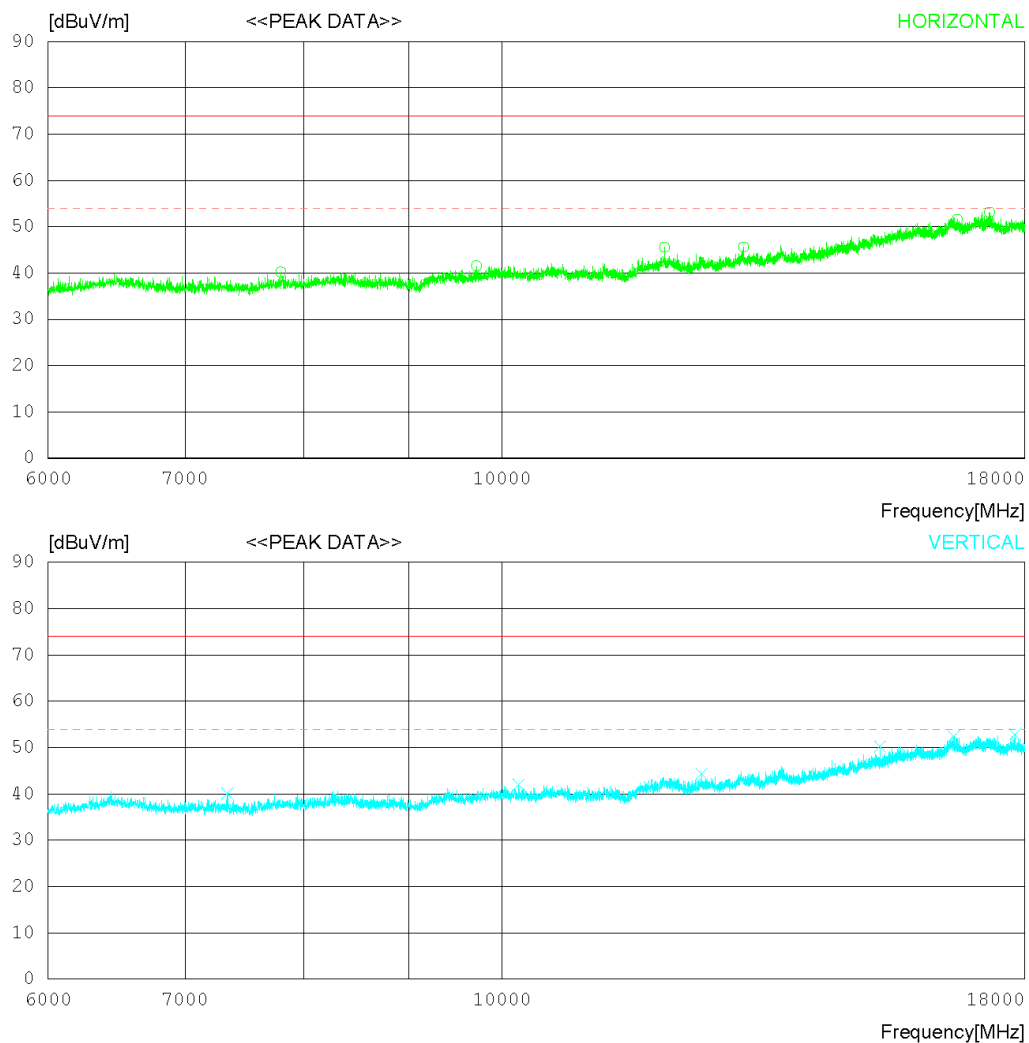
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Test Condition AM

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 2019-04-22

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Power Supply DC 12 V
Temp/Humi 19'C 42 % 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	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	PEAK [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	7794.000	34.40	31.33	12.60	38.12	40.21	74.0	33.79	320	0
2	9714.000	33.60	32.42	14.21	38.67	41.56	74.0	32.44	289	110
3	12000.000	34.10	33.46	15.68	37.66	45.58	74.0	28.42	133	358
4	13116.000	33.60	33.59	16.57	38.13	45.63	74.0	28.37	274	358
5	16680.000	31.80	37.19	19.57	36.97	51.59	74.0	22.41	126	293
6	17296.500	33.40	37.78	19.46	37.51	53.13	74.0	20.87	130	289
----- Vertical -----										
7	7341.000	35.60	31.40	11.68	38.51	40.17	74.0	33.83	126	198
8	10185.000	33.00	32.52	14.45	37.99	41.98	74.0	32.02	309	0
9	12514.500	33.40	33.51	15.98	38.54	44.35	74.0	29.65	347	0
10	15294.000	33.20	35.74	18.26	37.00	50.20	74.0	23.8	330	0
11	16618.500	32.20	37.12	19.98	36.92	52.38	74.0	21.62	250	11
12	17805.000	33.10	38.17	19.71	38.10	52.88	74.0	21.12	309	0

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)	-

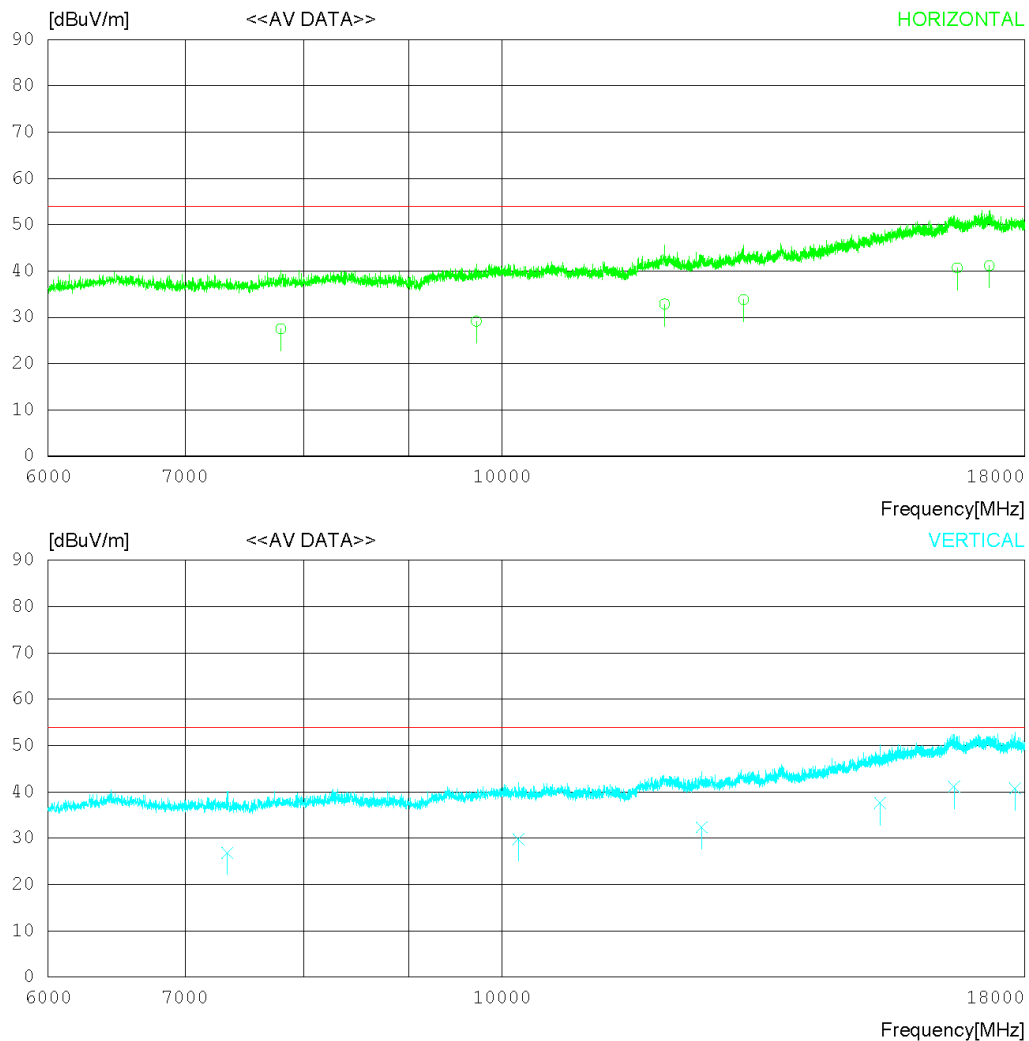
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Test Condition AM

Memo

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

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Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % R.H.
Test Condition AM

Memo

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

No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	CAV [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	7794.906	21.70	31.33	12.60	38.12	27.51	54.00	26.49	325	36
2	9712.136	21.20	32.42	14.21	38.67	29.16	54.00	24.84	284	110
3	12001.730	21.40	33.46	15.68	37.66	32.88	54.00	21.12	130	315
4	13116.780	21.80	33.59	16.57	38.13	33.83	54.00	20.17	284	14
5	16680.130	20.90	37.19	19.57	36.97	40.69	54.00	13.31	174	154
6	17294.820	21.40	37.78	19.46	37.51	41.13	54.00	12.87	152	287
----- Vertical -----										
7	7341.159	22.30	31.40	11.68	38.51	26.87	54.00	27.13	144	15
8	10184.880	20.80	32.52	14.45	37.99	29.78	54.00	24.22	331	137
9	12514.870	21.40	33.51	15.98	38.54	32.35	54.00	21.65	329	96
10	15293.670	20.60	35.73	18.26	37.00	37.59	54.00	16.41	354	274
11	16617.990	20.90	37.12	19.98	36.92	41.08	54.00	12.92	212	1
12	17804.490	21.00	38.17	19.70	38.10	40.77	54.00	13.23	322	105

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)	-

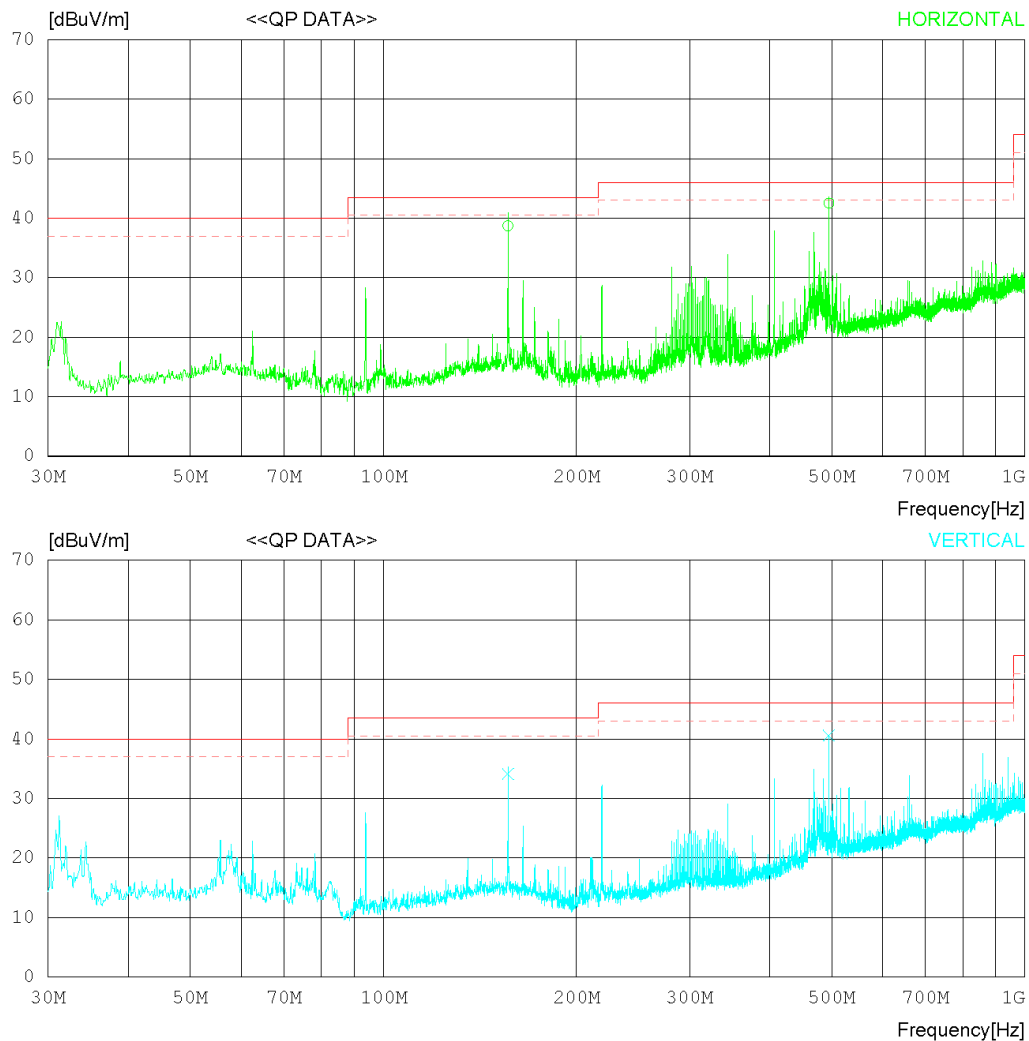
RADIATED EMISSION

Date 2019-04-18

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 20 'C 35 % R.H.
Test Condition FM

Memo

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



RADIATED EMISSION

Date 2019-04-18

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 20°C 35 % 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	156.340	43.70	18.90	1.77	25.66	38.71	43.50	4.79	251	45
2	494.981	41.56	23.70	2.84	25.57	42.53	46.00	3.47	233	252
----- Vertical -----										
3	156.340	39.10	18.90	1.77	25.66	34.11	43.50	9.39	206	358
4	494.981	39.60	23.70	2.84	25.57	40.57	46.00	5.43	145	1

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)	-

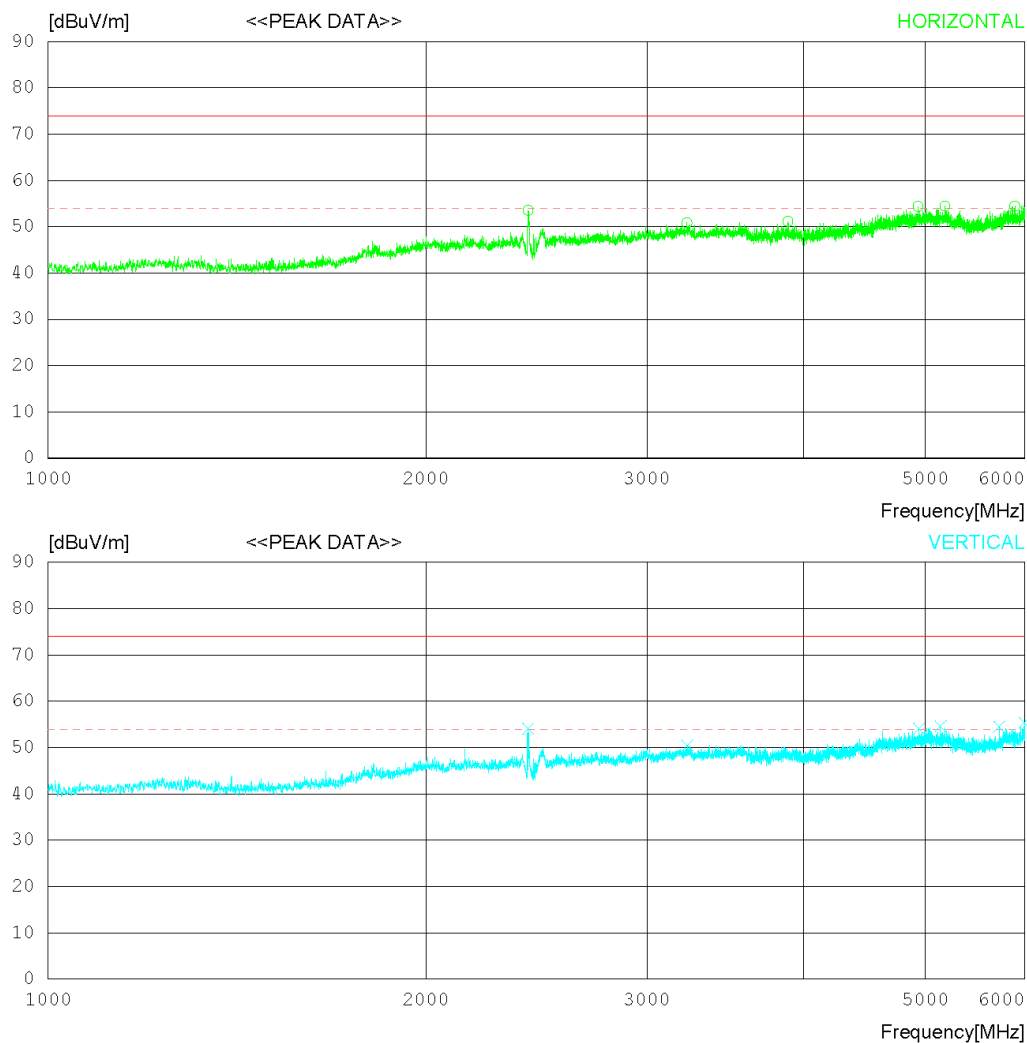
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % 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 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19°C 42 % 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	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	PEAK [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	2412.500	49.30	31.88	7.21	34.83	53.56	74.0	20.44	120	0
2	3227.500	44.10	33.09	8.38	34.73	50.84	74.0	23.16	375	0
3	3885.000	42.70	33.44	9.41	34.40	51.15	74.0	22.85	152	0
4	4931.250	43.60	34.16	11.27	34.62	54.41	74.0	19.59	145	1
5	5180.000	43.60	34.20	11.30	34.66	54.44	74.0	19.56	344	34
6	5888.750	42.40	34.98	11.81	34.75	54.44	74.0	19.56	206	344
----- Vertical -----										
7	2412.500	49.80	31.88	7.21	34.83	54.06	74.0	19.94	122	74
8	3231.250	43.70	33.08	8.39	34.72	50.45	74.0	23.55	175	0
9	4940.625	43.30	34.18	11.28	34.62	54.14	74.0	19.86	186	355
10	5139.375	43.80	34.18	11.33	34.66	54.65	74.0	19.35	121	358
11	5726.250	42.90	34.65	11.65	34.73	54.47	74.0	19.53	368	359
12	5995.625	43.20	35.10	11.82	34.76	55.36	74.0	18.64	374	19

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)	-

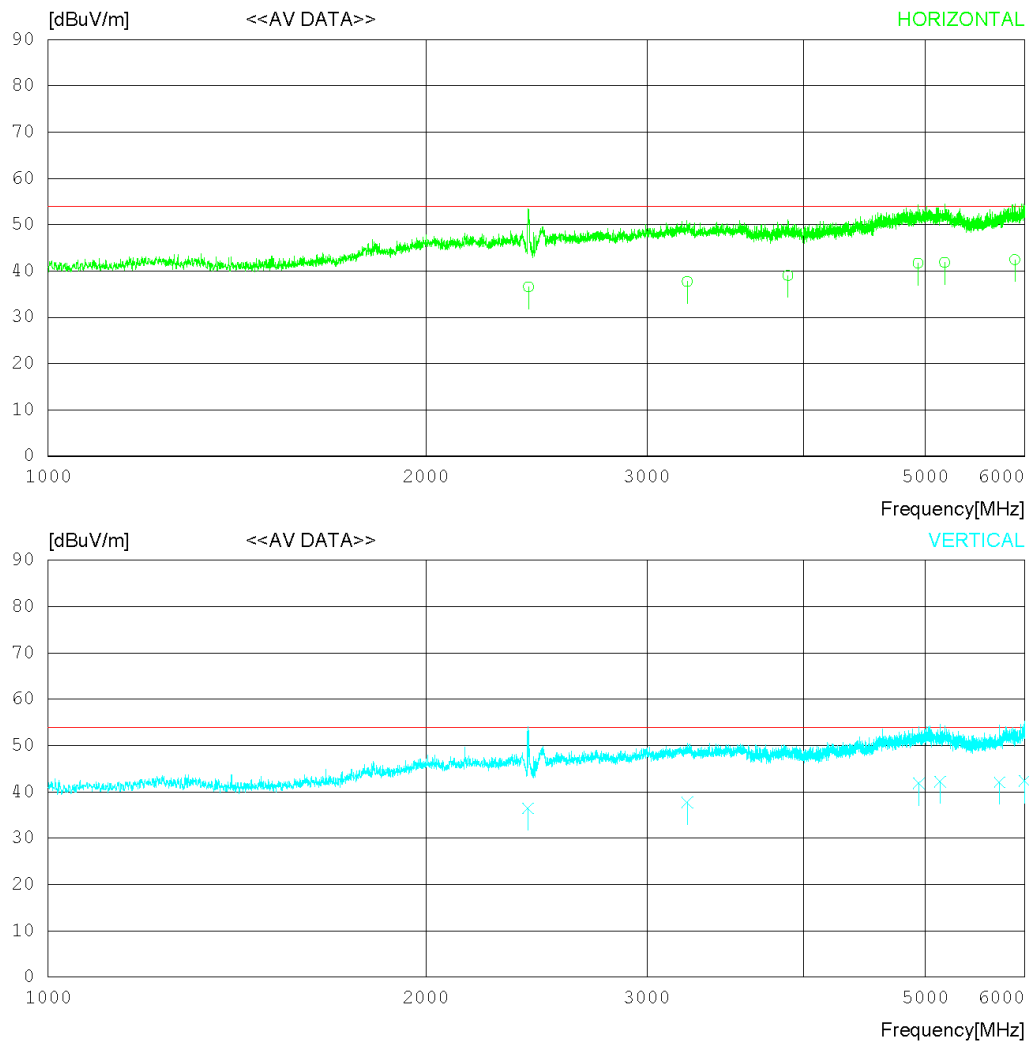
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % R.H.
Test Condition FM

Memo

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



RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19°C 42 % R.H.
Test Condition FM

Memo

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

No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	CAV [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	2413.673	32.30	31.88	7.21	34.83	36.56	54.00	17.44	145	350
2	3229.471	31.00	33.08	8.38	34.73	37.73	54.00	16.27	374	174
3	3884.652	30.60	33.44	9.41	34.40	39.05	54.00	14.95	133	358
4	4930.957	30.90	34.16	11.26	34.62	41.70	54.00	12.30	141	124
5	5177.875	31.00	34.20	11.31	34.66	41.85	54.00	12.15	326	119
6	5888.434	30.40	34.98	11.81	34.75	42.44	54.00	11.56	219	8
----- Vertical -----										
7	2412.807	32.20	31.88	7.21	34.83	36.46	54.00	17.54	137	174
8	3230.890	31.00	33.08	8.38	34.72	37.74	54.00	16.26	184	26
9	4940.110	31.00	34.18	11.28	34.62	41.84	54.00	12.16	167	95
10	5137.246	31.40	34.17	11.32	34.66	42.23	54.00	11.77	130	356
11	5728.278	30.50	34.66	11.65	34.73	42.08	54.00	11.92	371	1
12	5996.016	30.20	35.10	11.83	34.76	42.37	54.00	11.63	383	78

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)	-

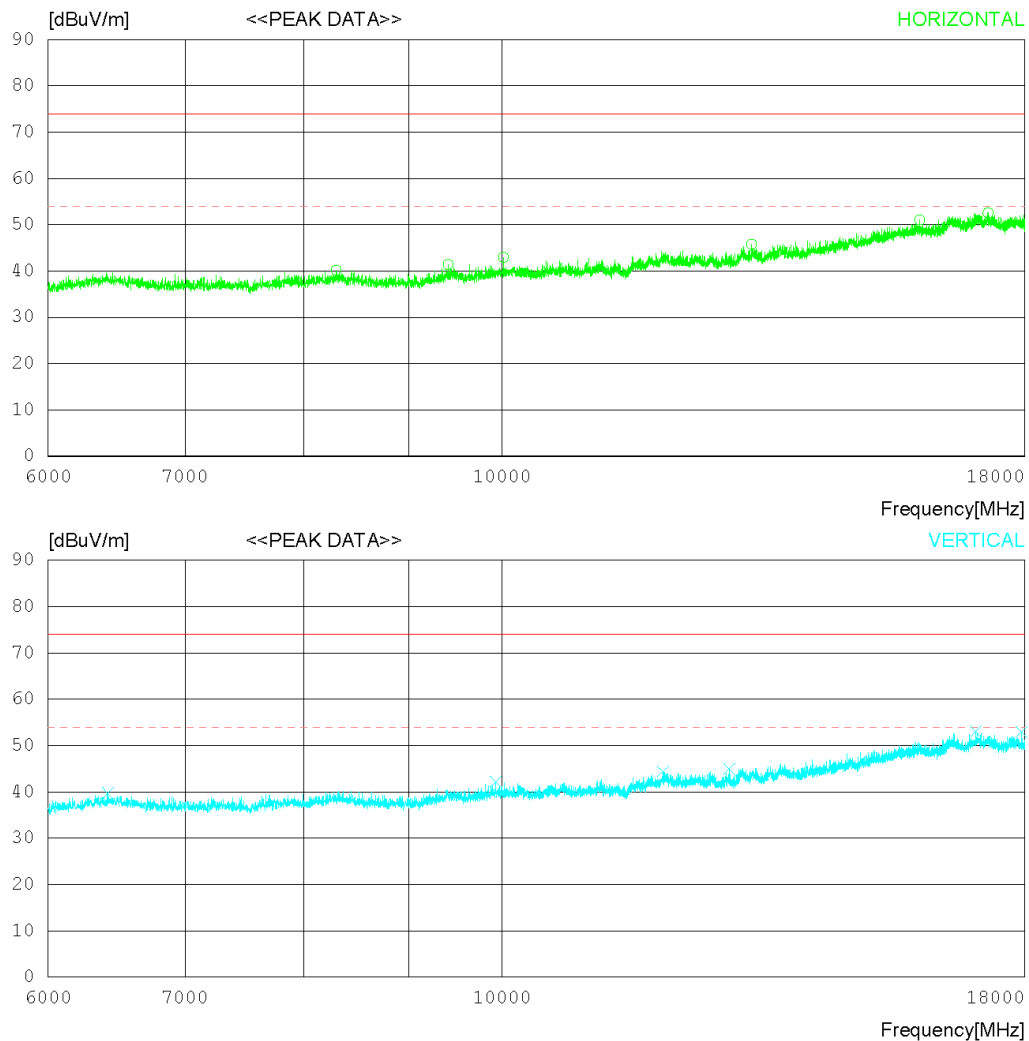
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 °C 42 % 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 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19'C 42 % 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	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	PEAK [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	8296.500	33.50	31.54	12.84	37.71	40.17	74.0	33.83	133	250
2	9409.500	34.10	32.28	14.21	39.18	41.41	74.0	32.59	360	0
3	10014.000	33.90	32.55	14.40	37.92	42.93	74.0	31.07	354	293
4	13237.500	33.40	33.64	16.77	38.02	45.79	74.0	28.21	181	0
5	15990.000	32.40	36.41	19.03	36.79	51.05	74.0	22.95	129	189
6	17269.500	32.90	37.76	19.38	37.49	52.55	74.0	21.45	273	358
----- Vertical -----										
7	6417.000	35.60	31.61	11.18	38.62	39.77	74.0	34.23	333	0
8	9927.000	33.50	32.52	14.28	38.10	42.20	74.0	31.8	121	0
9	11980.500	33.00	33.44	15.64	37.69	44.39	74.0	29.61	365	349
10	12912.000	33.30	33.54	16.41	38.29	44.96	74.0	29.04	237	358
11	17037.000	32.70	37.58	20.02	37.29	53.01	74.0	20.99	325	0
12	17934.000	33.00	38.27	19.95	38.28	52.94	74.0	21.06	360	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)	-

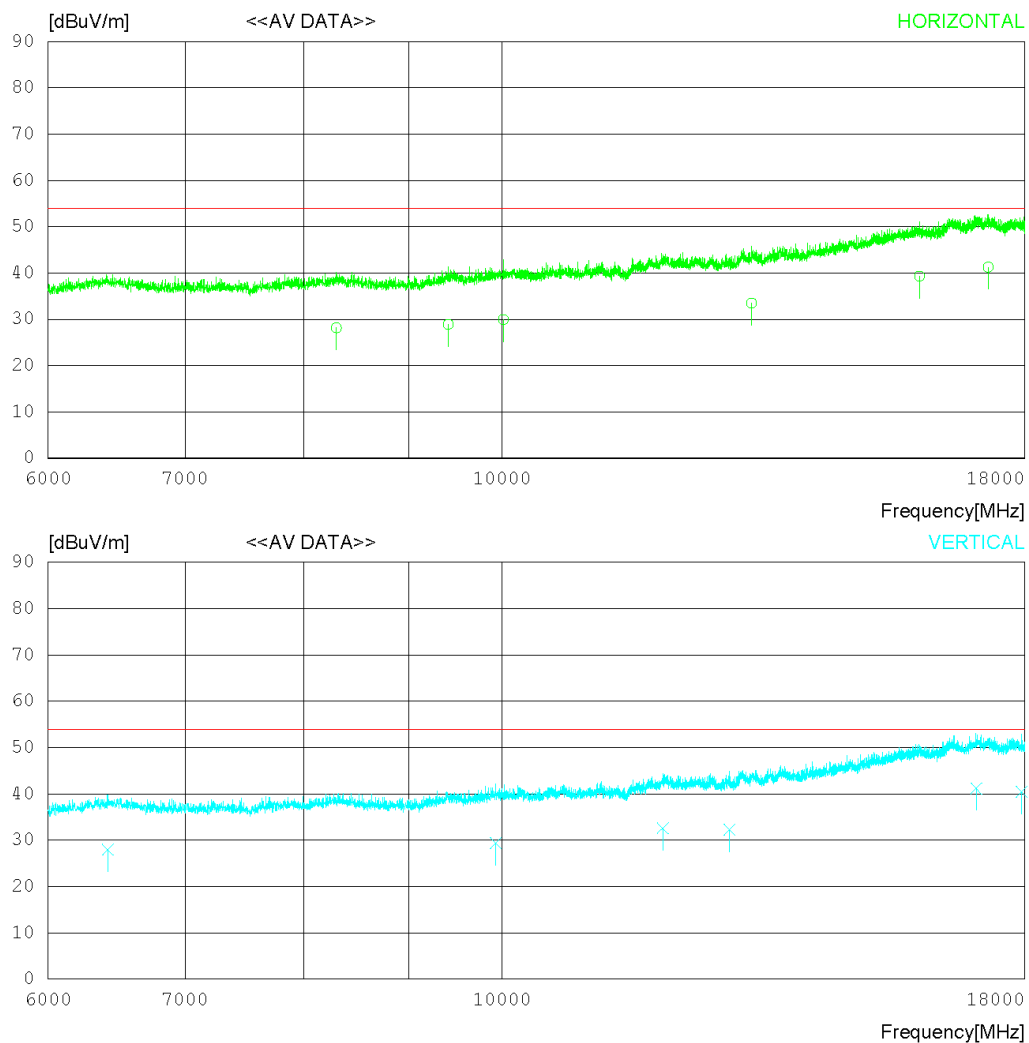
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 °C 42 % R.H.
Test Condition FM

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)
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 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % R.H.
Test Condition FM

Memo

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

No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	CAV [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	8298.236	21.50	31.54	12.84	37.71	28.17	54.00	25.83	133	242
2	9410.427	21.60	32.28	14.21	39.18	28.91	54.00	25.09	384	106
3	10013.620	20.90	32.55	14.40	37.92	29.93	54.00	24.07	365	275
4	13237.100	21.10	33.64	16.77	38.02	33.49	54.00	20.51	199	45
5	15989.670	20.70	36.41	19.03	36.79	39.35	54.00	14.65	137	264
6	17271.350	21.60	37.76	19.39	37.49	41.26	54.00	12.74	277	19
----- Vertical -----										
7	6417.650	23.80	31.61	11.18	38.62	27.97	54.00	26.03	323	317
8	9927.533	20.70	32.52	14.28	38.10	29.40	54.00	24.60	129	89
9	11980.040	21.20	33.44	15.64	37.69	32.59	54.00	21.41	370	180
10	12912.000	20.60	33.54	16.41	38.29	32.26	54.00	21.74	231	142
11	17038.730	20.90	37.58	20.01	37.29	41.20	54.00	12.80	341	9
12	17934.880	20.50	38.27	19.95	38.28	40.44	54.00	13.56	363	340

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)	-

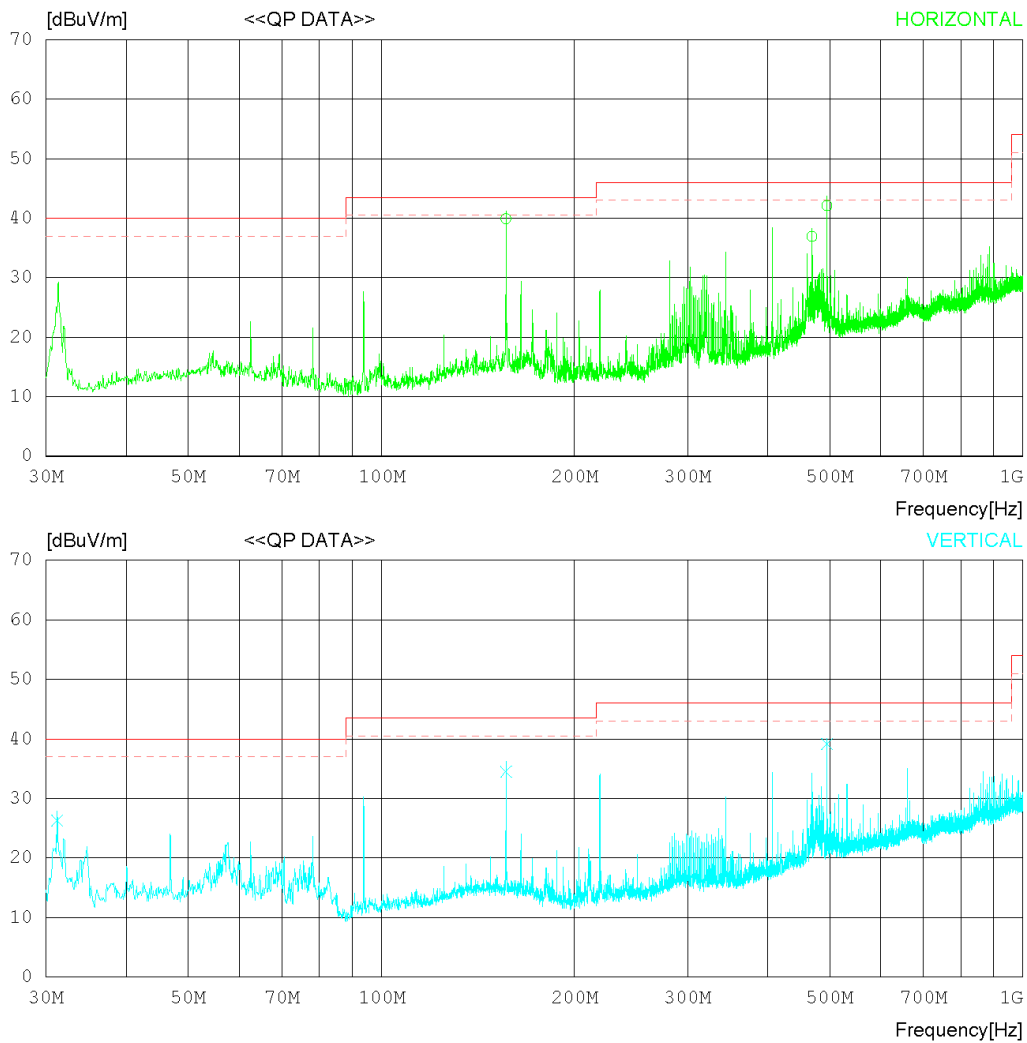
RADIATED EMISSION

Date 2019-04-18

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 20 'C 35 % R.H.
Test Condition USB

Memo

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



RADIATED EMISSION

Date 2019-04-18

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 20'C 35 % 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	156.340	44.89	18.90	1.77	25.66	39.90	43.50	3.60	233	35
2	469.155	36.33	23.47	2.72	25.60	36.92	46.00	9.08	245	246
3	494.981	41.12	23.70	2.84	25.57	42.09	46.00	3.91	232	0
----- Vertical -----										
4	31.213	35.64	15.40	1.10	25.82	26.32	40.00	13.68	132	11
5	156.340	39.48	18.90	1.77	25.66	34.49	43.50	9.01	222	117
6	494.981	38.22	23.70	2.84	25.57	39.19	46.00	6.81	154	2

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)	-

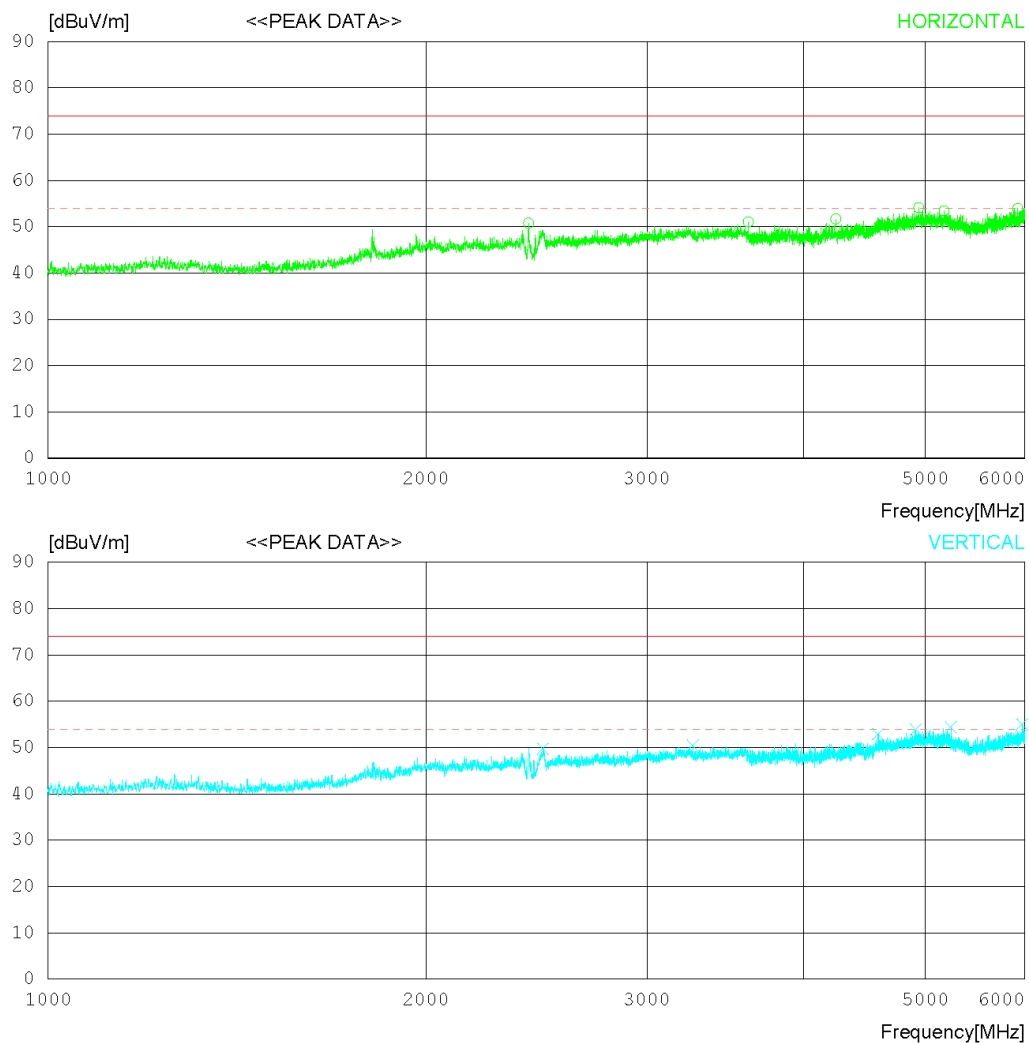
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % 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 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 °C 42 % 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	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	PEAK [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	2414.375	46.50	31.89	7.21	34.83	50.77	74.0	23.23	131	171
2	3613.125	43.40	33.37	8.80	34.53	51.04	74.0	22.96	123	0
3	4240.625	42.60	33.46	10.01	34.41	51.66	74.0	22.34	216	358
4	4937.500	43.30	34.18	11.28	34.62	54.14	74.0	19.86	247	343
5	5172.500	42.60	34.20	11.31	34.66	53.45	74.0	20.55	153	35
6	5921.875	41.80	35.04	11.81	34.75	53.90	74.0	20.1	206	358
----- Vertical -----										
7	2477.500	45.10	32.21	7.25	34.83	49.73	74.0	24.27	110	172
8	3263.750	43.80	32.97	8.40	34.71	50.46	74.0	23.54	390	0
9	4583.750	42.80	33.97	10.74	34.52	52.99	74.0	21.01	106	11
10	4911.875	43.20	34.12	11.23	34.61	53.94	74.0	20.06	222	359
11	5238.750	43.50	34.28	11.31	34.67	54.42	74.0	19.58	362	339
12	5970.000	42.80	35.10	11.83	34.76	54.97	74.0	19.03	376	178

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)	-

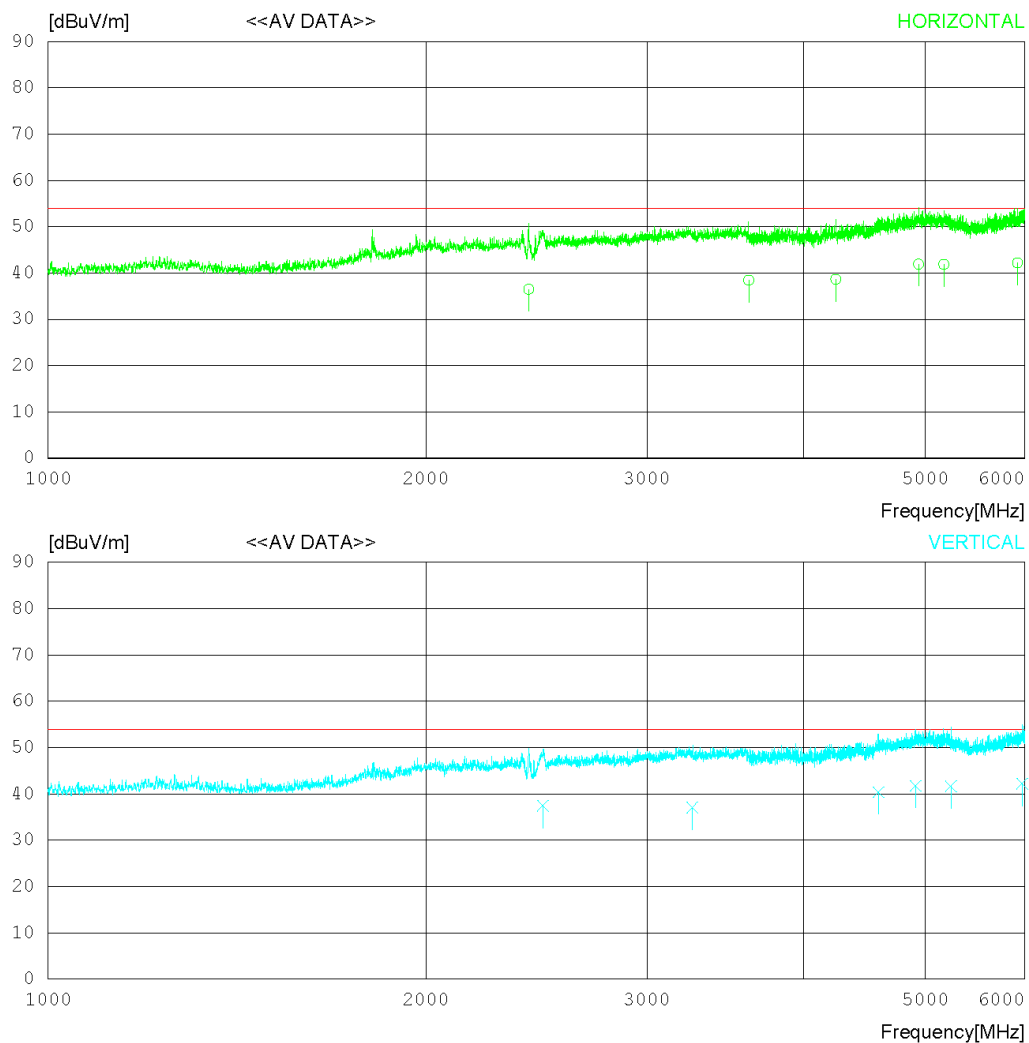
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 'C 42 % R.H.
Test Condition USB

Memo

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



RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 °C 42 % R.H.
Test Condition USB

Memo

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

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	2414.603	32.20	31.89	7.21	34.83	36.47	54.00	17.53	144	54
2	3614.847	30.80	33.35	8.81	34.53	38.43	54.00	15.57	137	20
3	4240.551	29.60	33.46	10.01	34.41	38.66	54.00	15.34	210	196
4	4936.185	31.10	34.17	11.28	34.62	41.93	54.00	12.07	223	255
5	5170.580	31.00	34.20	11.32	34.66	41.86	54.00	12.14	137	278
6	5918.858	30.10	35.04	11.82	34.75	42.21	54.00	11.79	216	350
----- Vertical -----										
7	2478.196	32.80	32.21	7.25	34.83	37.43	54.00	16.57	131	25
8	3260.581	30.40	32.98	8.41	34.71	37.08	54.00	16.92	371	263
9	4585.004	30.20	33.97	10.74	34.52	40.39	54.00	13.61	134	351
10	4911.249	31.00	34.12	11.23	34.61	41.74	54.00	12.26	238	71
11	5237.790	30.70	34.28	11.31	34.67	41.62	54.00	12.38	390	142
12	5970.977	30.00	35.10	11.83	34.76	42.17	54.00	11.83	387	274

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)	-

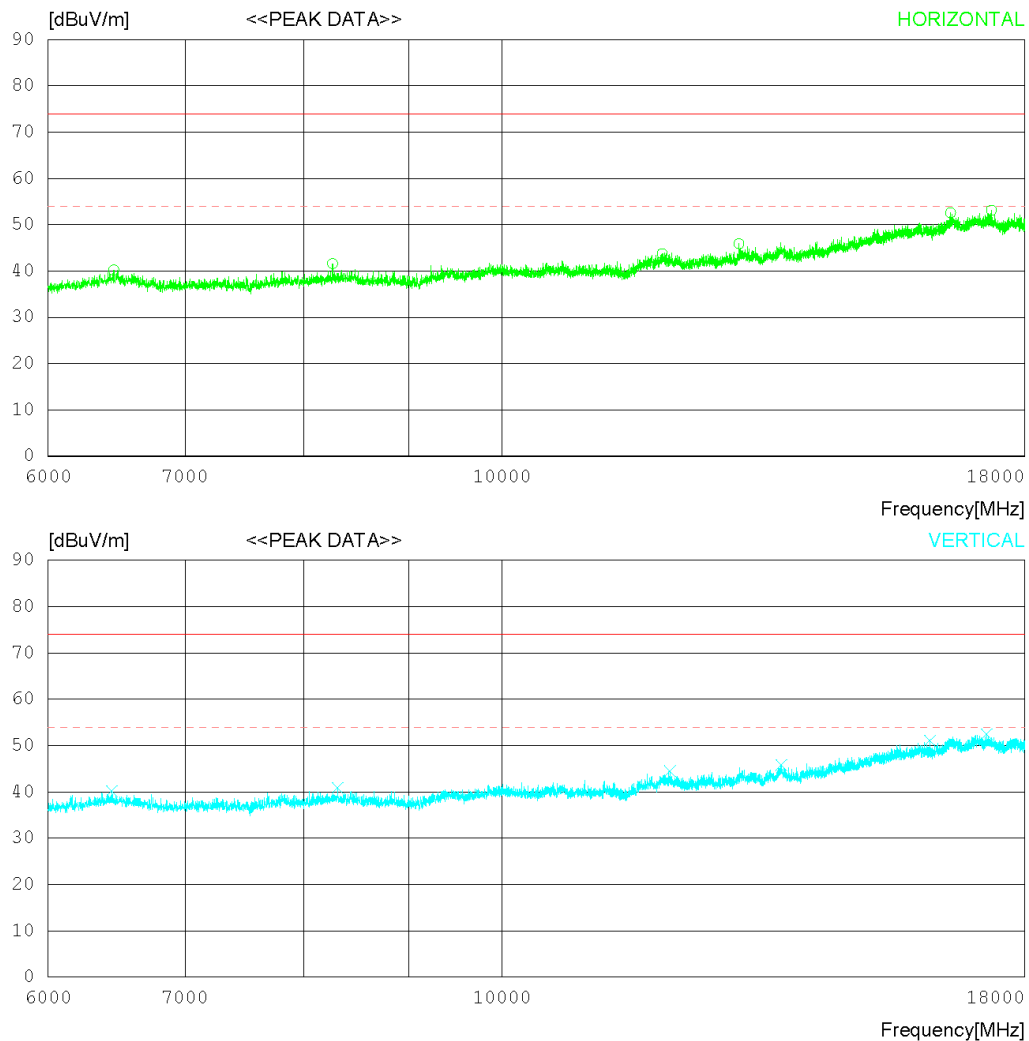
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 °C 42 % 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 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19'C 42 % 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	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	PEAK [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	6460.500	36.00	31.60	11.20	38.58	40.22	74.0	33.78	370	0
2	8262.000	35.00	31.51	12.80	37.73	41.58	74.0	32.42	385	37
3	11970.000	32.40	33.43	15.62	37.71	43.74	74.0	30.26	283	166
4	13050.000	34.10	33.57	16.42	38.19	45.90	74.0	28.1	260	249
5	16557.000	32.50	37.05	19.89	36.86	52.58	74.0	21.42	376	0
6	17334.000	33.30	37.81	19.56	37.54	53.13	74.0	20.87	299	358
----- Vertical -----										
7	6448.500	36.00	31.60	11.19	38.59	40.20	74.0	33.8	230	212
8	8310.000	34.20	31.55	12.85	37.71	40.89	74.0	33.11	105	0
9	12076.500	33.20	33.47	15.63	37.80	44.50	74.0	29.5	130	246
10	13686.000	32.50	33.80	17.25	37.74	45.81	74.0	28.19	323	13
11	16179.000	32.50	36.62	18.76	36.80	51.08	74.0	22.92	351	344
12	17242.500	32.90	37.74	19.31	37.46	52.49	74.0	21.51	240	90

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)	-

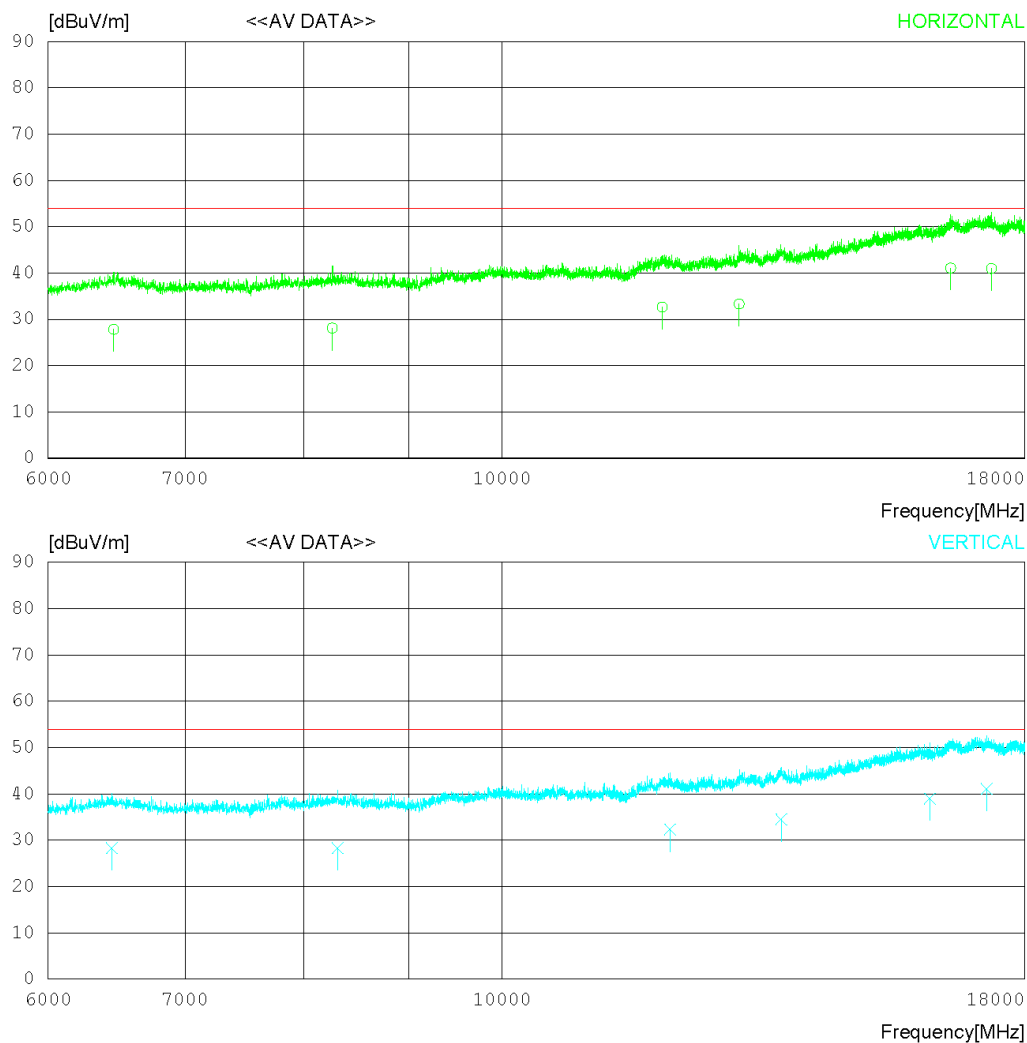
RADIATED EMISSION

Date 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19 °C 42 % R.H.
Test Condition USB

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)
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 2019-04-22

Order No. DTNC1904-02656
Power Supply DC 12 V
Temp/Humi 19'C 42 % R.H.
Test Condition USB

Memo

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

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	6459.450	23.60	31.60	11.20	38.58	27.82	54.00	26.18	324	92
2	8260.153	21.50	31.51	12.80	37.73	28.08	54.00	25.92	374	190
3	11970.450	21.30	33.43	15.62	37.71	32.64	54.00	21.36	261	263
4	13051.470	21.50	33.57	16.42	38.19	33.30	54.00	20.70	283	311
5	16557.190	21.00	37.05	19.89	36.86	41.08	54.00	12.92	376	239
6	17334.990	21.10	37.81	19.57	37.54	40.94	54.00	13.06	261	52
----- Vertical -----										
7	6447.021	24.10	31.60	11.19	38.59	28.30	54.00	25.70	249	248
8	8311.640	21.60	31.55	12.86	37.71	28.30	54.00	25.70	133	30
9	12076.830	21.00	33.47	15.63	37.80	32.30	54.00	21.70	151	93
10	13685.980	21.20	33.80	17.25	37.74	34.51	54.00	19.49	322	106
11	16178.570	20.40	36.62	18.76	36.80	38.98	54.00	15.02	319	156
12	17240.010	21.50	37.73	19.30	37.46	41.07	54.00	12.93	208	18

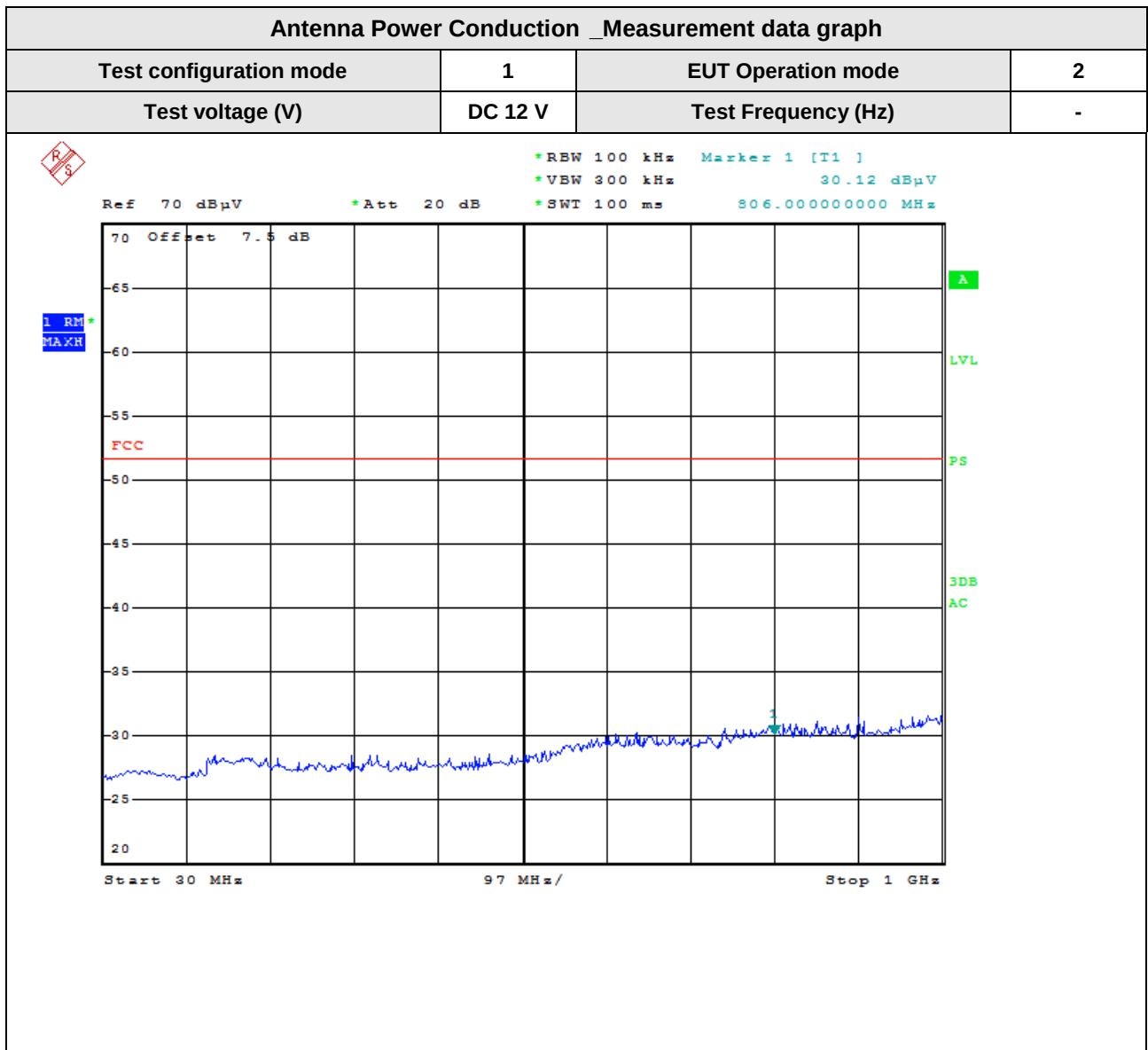
Calculation

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
<u>Method:</u> 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 dBμV. 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 2 150 MHz	2 nW (51.7 dBμV)	
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	ESC17	ROHDE & SCHWARZ	100910	2019.01.30	2020.01.30
SPLITTER	ZFRSC-123-S+	MINI CIRCUITS	SF139801142	2018.07.09	2019.07.09



8. Revision History

Date	Description	Revised By	Reviewed By
May. 15. 2019	Initial report	GiHyun Kim	HyungJun Kim

-End of test report-