

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 : DREFCC2104-0072

2. Customer

• Name : MOTREX CO., LTD.

• Address : Seoyoung Bldg., 25, Hwangsaeul-ro 258beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea

3. Use of Report : Grant of Certification

4. Product Name / Model Name : SMART DISPLAY / MS310ANQ5
(FCC ID : BP9-MS310ANQ5)

5. Test Method Used : ANSI C63.4:2014

FCC Part 15 Subpart B
(FM Broadcast receiver & digital devices)

6. Date of Test : Apr. 06. 2021 ~ Apr. 16. 2021

7 Location of Test : Permanent Testing Lab On Site Testing

(Address : Refer to the attached)

8. Testing Environment : Temperature (21 ~ 23) °C , Humidity (41 ~ 42) % R.H.

9. Test Result : Refer to the attached Test Result

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test report is not related to KOLAS accreditation.

Affirmation	Tested by Name : Hun Lee 	Reviewed by Name : HyungJun Kim 
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Apr. 26. 2021.

DT&C Co., Ltd.

KS Q ISO / IEC 17025 and KOLAS accreditation.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

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TRF-EM-150(00)190502

Pages: 1 / 56

CONTENTS

1. General Remarks	3
2. Test Laboratory	3
3. General Information of EUT	4
4. EUT Operations and Test Configurations	5
4.1 Principle of Configuration Selection.....	5
4.2 EUT Operation Mode.....	5
4.3 Test Configuration Mode	5
4.4 Supported Equipment.....	6
4.5 EUT In/Output Port	6
4.6 Test Voltage and Frequency.....	6
5. Test Summary	7
6. Test Environment.....	7
7. Test Results : Emission	8
7.1 Conducted Disturbance	8
7.2 Radiated Disturbance	10
7.3 Antenna Power Conduction.....	54
8. Revision History.....	56

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

Address of Laboratory

<input checked="" type="checkbox"/>	No.1	42, Yurim-ro 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, 17042, Korea
<input type="checkbox"/>	No.2	46, Yurim-ro 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, 17042, Korea
<input checked="" type="checkbox"/>	No.3	38, Yurim-ro 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, 17042, Korea
<input type="checkbox"/>	No.4	28, Baengnyeong-ro 20beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, 17042, Korea

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-14076, R-14180, R-4496, T-11442, G-10338, G-10754, G-10815, G-20051	Registered
Certification	Korea	KC	KR0034	Designation
	Germany	TUV	CARAT 089112 0008 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, Hwangsaeul-ro 258beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
Manufacturer	MOTREX CO., LTD. Seoyoung Bldg., 25, Hwangsaeul-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	MS310ANQ5
Add Model Name	None
Add Model Difference	None
Software Version	NQ5.GEN.0000.C01.K.P2D5.210317
Hardware Version	Rev 0.1
Maximum Internal Frequency	1 000 MHz
Rated Power	DC 12 V
FCC ID	BP9-MS310ANQ5
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	The EUT is connected to the SIGNAL GENERATOR and is receiving radio frequency(MF). The EUT is wirelessly connected to the router and continuously sends and receives data. (WIFI2.4G)
2	FM	The EUT is connected to the SIGNAL GENERATOR and is receiving radio frequency(VHF II). The EUT is wirelessly connected to the router and continuously sends and receives data. (WIFI5G) The EUT is wirelessly connected to the phone and continuously sends and receives data. (Bluetooth)
3	USB	The EUT is connected to USB memory to play BT.471-1 Moving Color bar Pattern & 1 KHz sound. The EUT is wirelessly connected to the router and continuously sends and receives data. (WIFI5.8G) The EUT is wirelessly connected to the GPS SIGNAL GENERATOR and continuously receives data. (GPS)

4.3 Test Configuration Mode

No.	Mode	Description
1	Receiving (AM,FM)	EUT is connected to DC power. EUT is connected to the SIGNAL GENERATOR. EUT is wirelessly connected to the router. The EUT is wirelessly connected to the phone.
2	USB	EUT is connected to DC power. EUT is connected to MULTI MEDIABOX. MULTI MEDIABOX is connected to USB MEMORY. EUT is wirelessly connected to the router. EUT is wirelessly connected to the GPS SIGNAL GENERATOR.

4.4 Supported Equipment

Used*	Product Type	Manufacturer	Model	Remarks
AE	Monitor	LG Display	LA123WF7 (SL)(05)	N/A
AE	Speaker	N/A	N/A	N/A
AE	USB MEMORY	Sandisk	ULTRA FLAIR 3.0	N/A
AE	ANT.	N/A	N/A	N/A
AE	MULTI MEDIABOX	N/A	N/A	N/A
AE	Phone	LG	G5	N/A
AE	ROUTER	TCN	NEXT-7004N	N/A

*Abbreviations:
AE - Auxiliary/Associated Equipment, or
SIM - Simulator

4.5 EUT In/Output Port

Name	Type*	Cable Max. >3m	Cable Shielded	Cable Back shell	Remarks
DC IN	DC	1.8	Non shield	Plastic	None
ANT.	I/O	3.0	Shield	Plastic	None
SPEAKER	I/O	1.6	Non shield	Plastic	None
MULTI MEDIABOX	I/O	2.0	Non shield	Plastic	None
Monitor	I/O	1.0	Non shield	Plastic	None

*Abbreviations:

AC = AC Power Port

DC = DC Power Port

N/E = Non-Electrical

I/O = Signal Input or Output Port

GND = Ground

PC = Patient-Coupling

TP = Telecommunication Ports

4.6 Test Voltage and Frequency

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

5. Test Summary

Test Items	Applied Standards	Results	U (k = 2)
Conducted Disturbance	ANSI C63.4 : 2014	N/A (Note 1)	Mains : 3.4 dB
Radiated Disturbance	ANSI C63.4 : 2014	C	Below 1 GHz : 4.64 dB Above 1 GHz : 6.42 dB
Antenna Power Conduction	ANSI C63.4 : 2014	C	N/A
C=Comply N/C=Not Comply N/T=Not Tested N/A=Not Applicable			

Note 1) The EUT is not a device connected to the AC mains.

The data in this test report are traceable to the national or international standards.

-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]
199.988	VER	34.27	QP	43.50	9.23

-Antenna Power Conduction

Frequency [MHz]	Result [dB μ V/m]	Detector	Limit [dB μ V/m]	Margin [dB]
867.110	33.18	RMS	51.70	18.52

6. Test Environment

Test Items	Test date (YYYY-MM-DD)	Temp. (°C)	Humidity (% R.H.)	Pressure (kPa)
Radiated Disturbance	2021-04-15 2021-04-16	21 22	41 42	-
Antenna Power Conduction	2021-04-06	23	41	100.3

7. Test Results : Emission

7.1 Conducted Disturbance

ANSI C63.4	Mains terminal disturbance voltage		Result		
Method: 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		
		Power Interface mode	N/A		
Limits – Class A					
Frequency (MHz)	Limit dB μ V				
	Quasi-Peak	Average			
0.15 to 0.50	79	66			
0.50 to 30	73	60			
Limits – Class B					
Frequency (MHz)	Limit dB μ 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
-	-	-	-	-	-

Calculation

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

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

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		
		Power Interface mode		1		
Radiated Disturbance below 1 000 MHz						
Frequency range (MHz)	Quasi-peak limit dB μ V/m					
	Class A		Class B			
	3 m distance	10 m distance	3 m distance			
30 to 88	49.1	39.1	40			
88 to 216	53.5	43.5	43.5			
216 to 960	56.4	46.4	46			
960 to 1 000	59.5	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(CISPR), Pub. 22 shown as below.						
Frequency range (MHz)	Quasi-peak limit dB μ V/m					
	Class A (10 m distance)		Class B (10 m distance)			
	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 dB μ V/m		Average limit dB μ V/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	ESU40	ROHDE & SCHWARZ	100525	2020-12-14	2021-12-14
TRILOG BROADBAND TEST-ANTENNA WITH 6DB ATT	VULB9160	SCHWARZBECK	9160-3339	2020-10-05	2022-10-05
	2708A	HP	18403	2020-10-05	2022-10-05
LOW NOISE PRE AMPLIFIER	MLA-100K01-B01-26	TSJ	1252741	2021-02-08	2022-02-08
HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1828	2020-10-21	2021-10-21
PRE AMPLIFIER	8449B	H.P	3008A00887	2020-08-31	2021-08-31
HORN ANTENNA WITH	EM-6969/	ELECTRO-METRICS/	156	2020-12-29	2021-12-29
PREAMPLIFIER	MLA-0618-B03-34	TSJ	1785642	2020-12-24	2021-12-24
HORN ANTENNA	SAS-574	A.H.SYSTEMS INC.	155	2020-06-24	2021-06-24
PREAMPLIFIER	MLA-1840-J02-45	TSJ	16966-10728	2020-06-24	2021-06-24
SIGNAL GENERATOR	SMT03	ROHDE & SCHWARZ	100416	2020-06-03	2021-06-03
REGULATED DC POWER SUPPLY	SDP 30-5D	SMTECHNO	305DPB 048	2021-02-08	2022-02-08
GPS GENERATOR	GSS7000	SPIRENT	0242	N/A	N/A

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

Calculation

Result(dBuV/m) : Reading Value(dBuV) + Cable loss(dB) - Pre amplifier gain(dB) + Ant. Factor(dB)

Margin : Limit(dBuV/m) - Result(dBuV/m)

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: 2021-04-15

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 °C 41 % R.H.
 Test Condition AM

Memo

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

Antenna Factor

1. EMC-228_VULB8160_9160-3339_with ATT_18403_2020.10.05

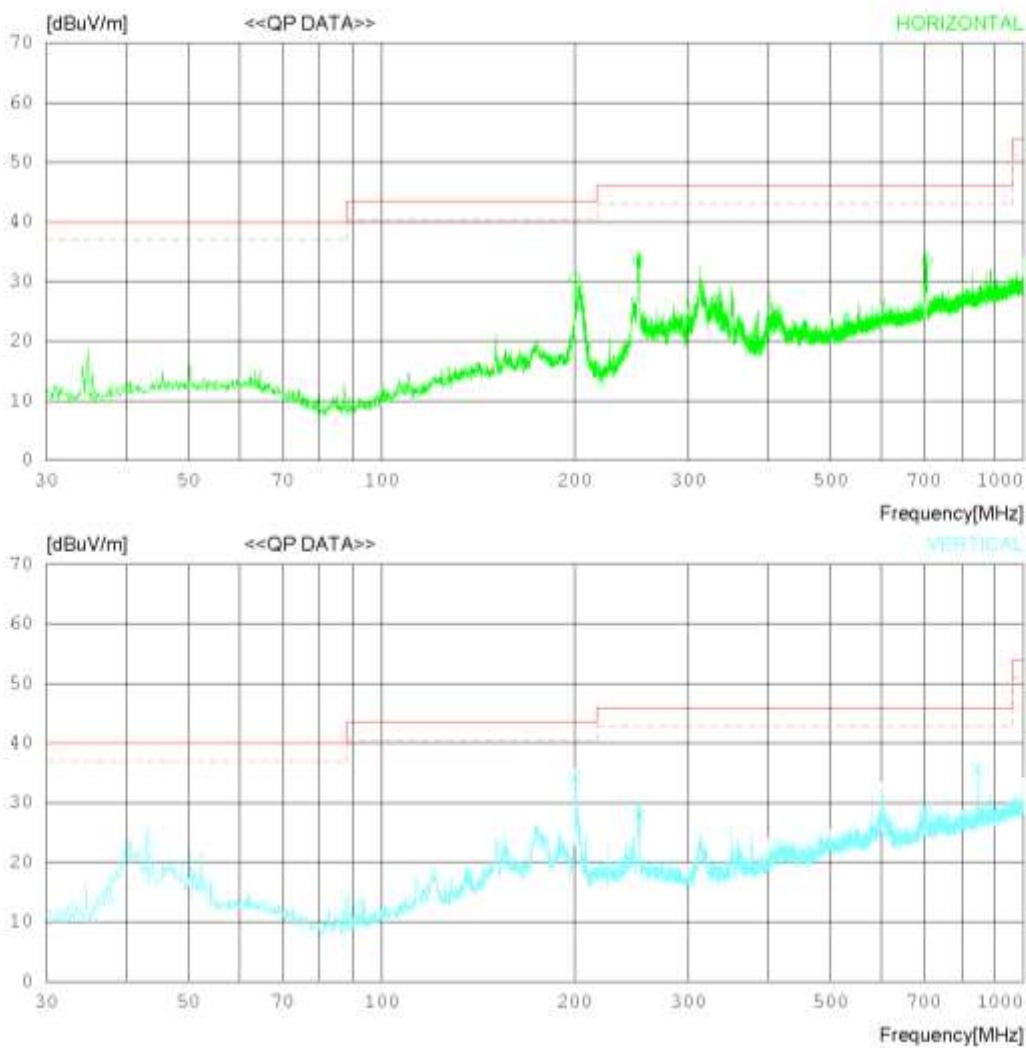
Cable Loss

1. #24_C1_ANT to BOTTOM_3m_정의_9K-1G_2021-02-19
 2. #25_C2_Amp to BOTTOM_3m_정의_9K-1G_2021-02-19

3. #28_C3_Amp to Receiver_3m_정의_9K-1G_2021-02-19

Pre Amp Gain

1. EMC-110_AMP_MLA-100K01-B01-26_1252741_2021.02.06



RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21 °C 41 % R.H.
Test Condition AM

Memo

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

Antenna Factor

1. EMC-228_VULB9160_9160-3339_with ATT_18403_2020.10.05

Cable Loss

1. #24_C1_Ant to BOTTOM_3m_충의_9K-1G_2021-02-19

2. #25_C2_Amp to BOTTOM_3m_충의_9K-1G_2021-02-19

3. #26_C3_Amp to Receiver_3m_충의_9K-1G_2021-02-19

Pre Amp Gain

1. EMC-110_AMP_MLA-100K01-B01-26_1252741_2021.02.08

No.	FREQ [MHz]	READING [dBuV]	ANT QP	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
<hr/>										
1	199.988	39.20	16.00	2.01	26.64	30.57	43.50	12.93	183	173
2	250.427	40.30	17.85	2.21	26.59	33.77	46.00	12.23	199	186
3	706.726	28.30	27.30	4.01	26.16	33.45	46.00	12.55	152	235
<hr/>										
4	199.988	42.90	16.00	2.01	26.60	34.27	43.50	9.23	115	235
5	251.246	34.30	17.86	2.21	26.59	27.78	46.00	18.22	183	187
6	846.316	28.30	29.05	4.41	26.28	35.48	46.00	10.52	231	299

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

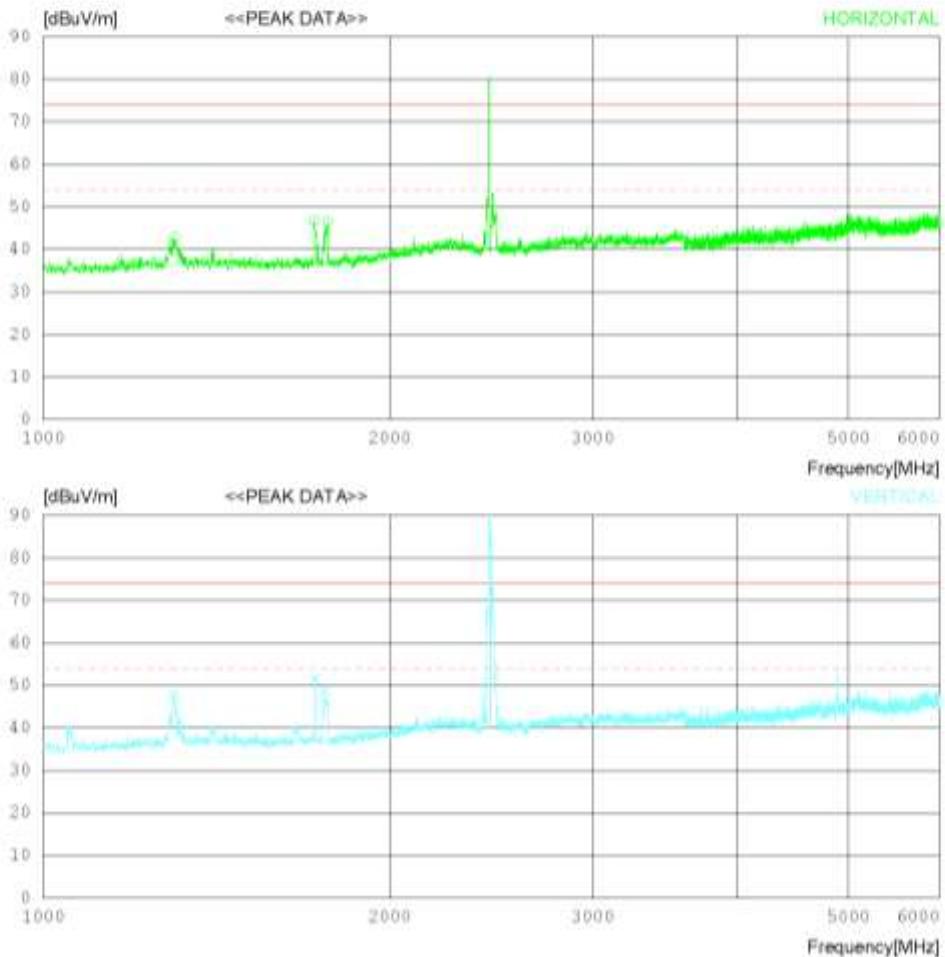
Date: 2021-04-15

Order No: DTNC2103-02326
 Power Supply: DC 12 V
 Temp/Humi: 21 °C 41 % 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)

Antenna Factor:
 1. ANT_9120D_1828_20.10.21
 Cable Loss:
 1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25
 3. #29_C3_Amp to Receiver_3m_정의_1-18G_2021.02.25
 Pre Amp Gain:
 1. AMP_8449B_3008A00887_2020.06.31



*Remark : (2,412 ~ 2,472) MHz is WIFI 2.4 G frequency.

RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21 °C 41 % 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)

Antenna Factor

1. ANT_9120D_1828_20.10.21

Cable Loss

1. #27_C1_Ant to Bottom_3m_2021.02.25
2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_2021.02.25
3. #29_C3_Amp to Receiver_3m_2021.02.25

Pre Amp Gain

1. AMP_8449B_3008A00887_2020.08.31

No.	FREQ PEAK (MHz)	READING [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dB]	MARGIN [cm]	ANTENNA TABLE [DEG]
----- HORIZONTAL -----									
1	1300.000	48.40	25.70	4.62	35.87	42.85	74.0	31.15	335 1
2	1720.000	51.70	25.06	5.47	35.41	46.82	74.0	27.18	185 1
3	1765.625	51.20	25.09	5.59	35.36	46.52	74.0	27.48	257 192
----- VERTICAL -----									
4	1299.375	53.50	25.70	4.59	35.87	47.92	74.0	26.08	236 356
5	1723.125	56.40	25.05	5.48	35.40	51.53	74.0	22.47	209 358
6	1755.000	53.70	25.03	5.57	35.37	48.93	74.0	25.07	169 358

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

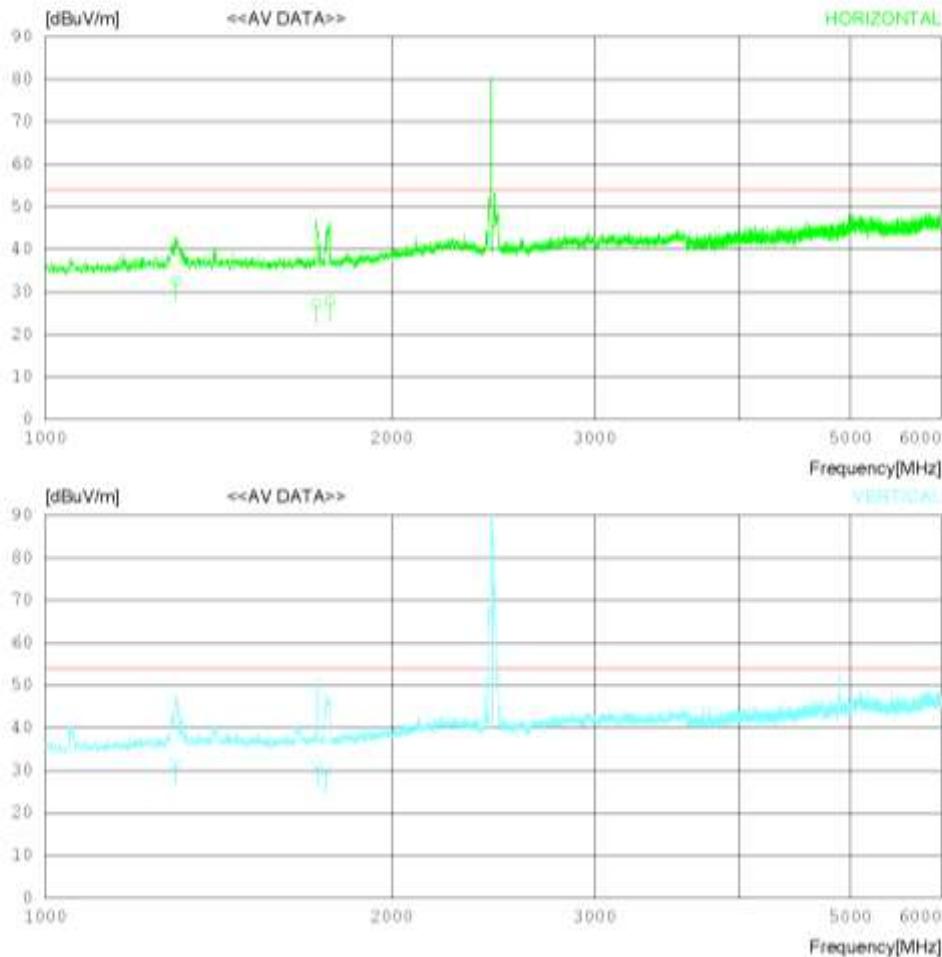
Date: 2021-04-15

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 °C 41 % 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)

Antenna Factor
 1. ANT_9120D_1828_20.10.21
 Cable Loss
 1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25
 3. #29_C3_Amp to Receiver_3m_정의_1-18G_2021.02.25
 Pre Amp Gain
 1. AMP_8449B_3008A00887_2020.06.31



*Remark : (2,412 ~ 2,472) MHz is WIFI 2.4 G frequency.

RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21 °C 41 % 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)

Antenna Factor

1. ANT_9120D_1828_20.10.21

Cable Loss

1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25
2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25
3. #29_C3_Amp to Receiver_3m_정의_1-18G_2021.02.25

Pre Amp Gain

1. AMP_8449B_3008A00887_2020.08.31

No.	REQ CAV (MHz)	READING [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
<hr/>										
1	1299.980	38.20	25.70	4.59	35.87	32.62	54.00	21.38	304	52
2	1720.124	32.10	25.06	5.47	35.41	27.22	54.00	26.78	255	33
3	1765.854	32.50	25.10	5.59	35.36	27.83	54.00	26.17	196	164
<hr/>										
4	1299.590	37.10	25.70	4.59	35.87	31.52	54.00	22.48	257	341
5	1723.536	35.50	25.05	5.48	35.40	30.63	54.00	23.37	266	305
6	1754.765	34.50	25.03	5.57	35.37	29.73	54.00	24.27	308	314

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: 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Hum 22 °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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

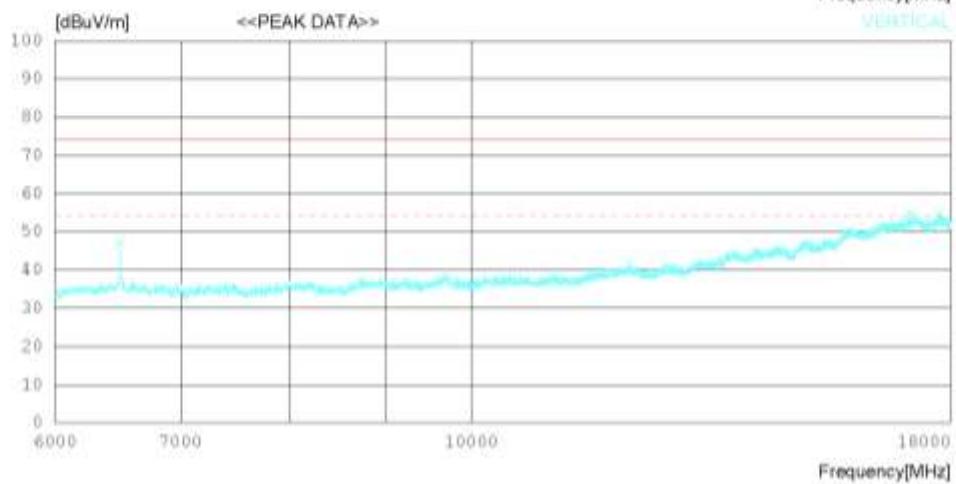
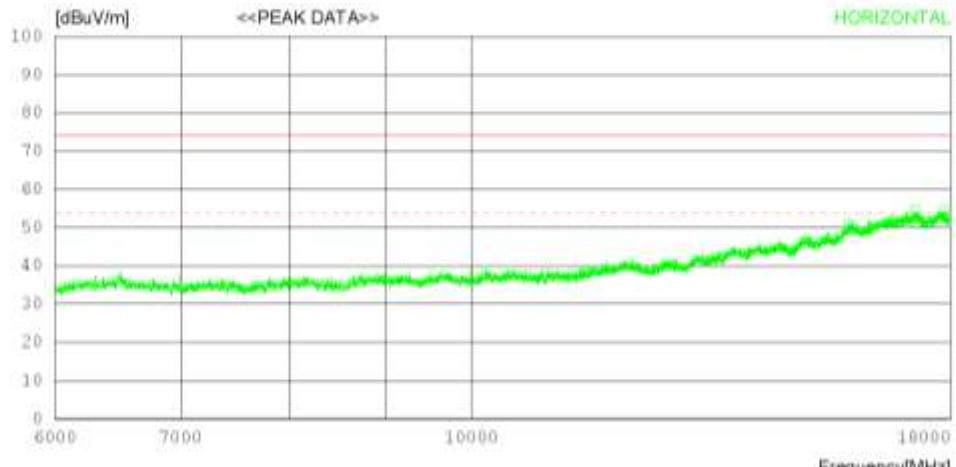
Cable Loss

1. #27_C1_Ant to Bottom_3m_평온_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter, Receiver)_3m_평온_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_항의_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_항의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24

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	15885.000	28.00	35.70	24.58	37.21	51.07	74.0	22.93	134	0
2	17229.000	28.90	36.56	26.83	37.57	54.72	74.0	19.28	244	0
3	17854.500	28.70	36.80	27.60	38.31	54.79	74.0	19.21	100	0
----- VERTICAL -----										
4	6499.500	44.00	30.90	11.76	39.52	47.14	74.0	26.86	199	0
5	17133.000	28.80	36.50	26.91	37.50	54.71	74.0	19.29	102	307
6	17754.000	28.50	36.70	27.43	38.17	54.46	74.0	19.54	250	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)	-

RADIATED EMISSION

Date: 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 22°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)

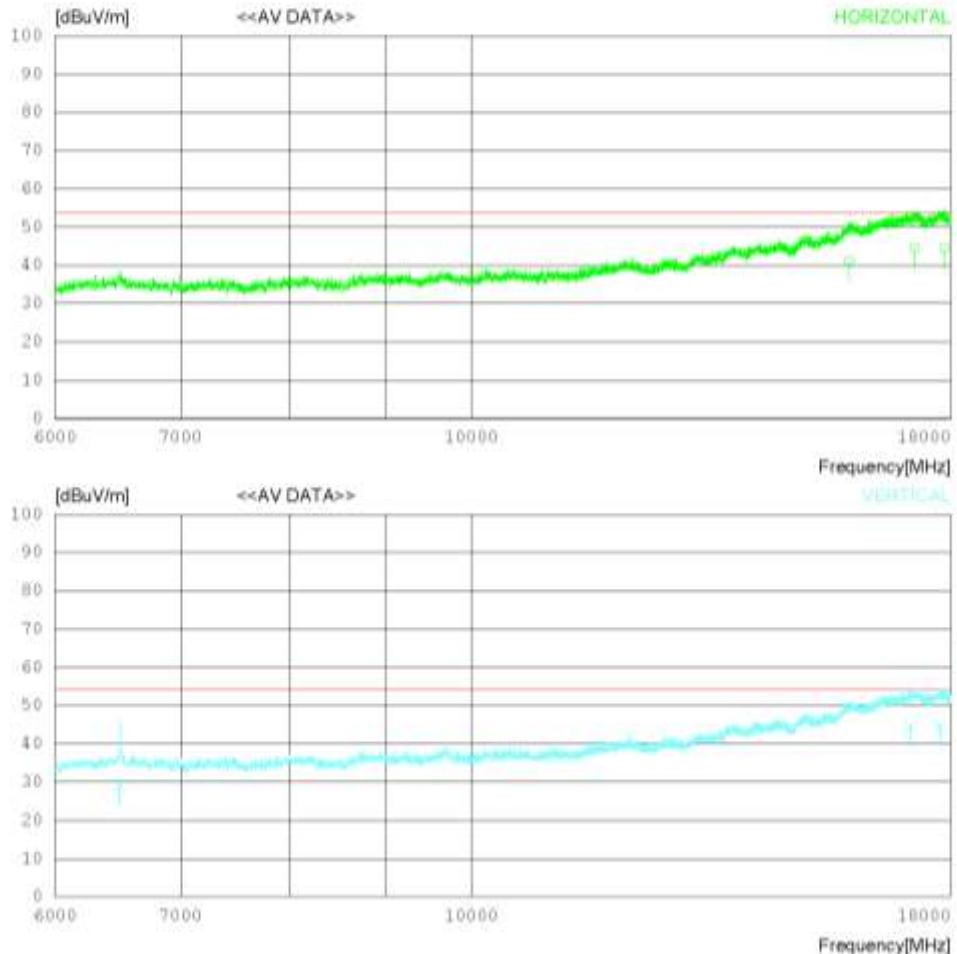
Antenna Factor
 1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_합의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_합의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_항의_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_항의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24

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	15885.630	18.10	35.70	24.58	37.21	41.17	54.00	12.83	167	35
2	17229.360	18.60	36.56	26.83	37.57	44.42	54.00	9.58	155	12
3	17854.240	18.40	36.80	27.60	38.31	44.49	54.00	9.51	207	102
----- VERTICAL -----										
4	6499.735	25.90	30.90	11.76	39.52	29.04	54.00	24.96	258	35
5	17133.250	18.60	36.50	26.91	37.50	44.51	54.00	9.49	335	341
6	17754.260	18.40	36.70	27.44	38.17	44.37	54.00	9.63	206	52

Radiated disturbance at (18 ~ 40) GHz _ Peak Measurement data			
Test configuration mode	1	EUT Operation mode	1
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

RADIATED EMISSION

Date: 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Hum 22 °C 42 % R.H.
 Test Condition AM

Memo

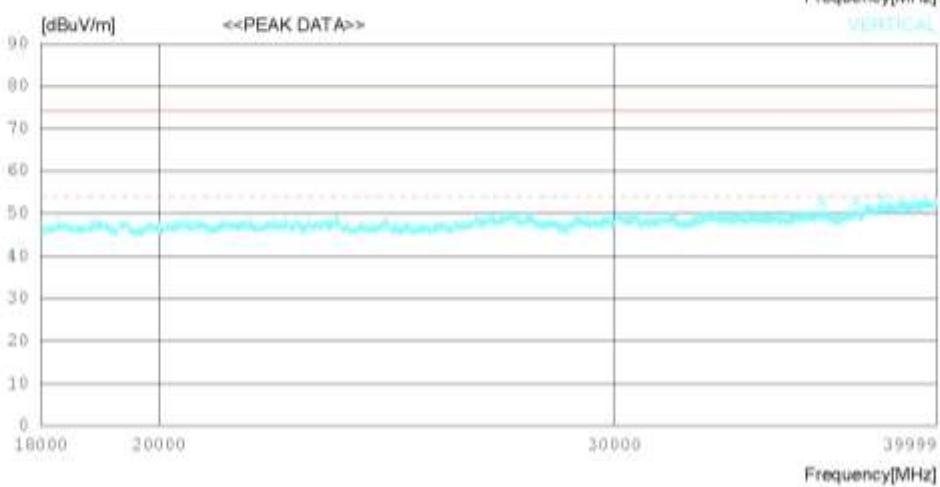
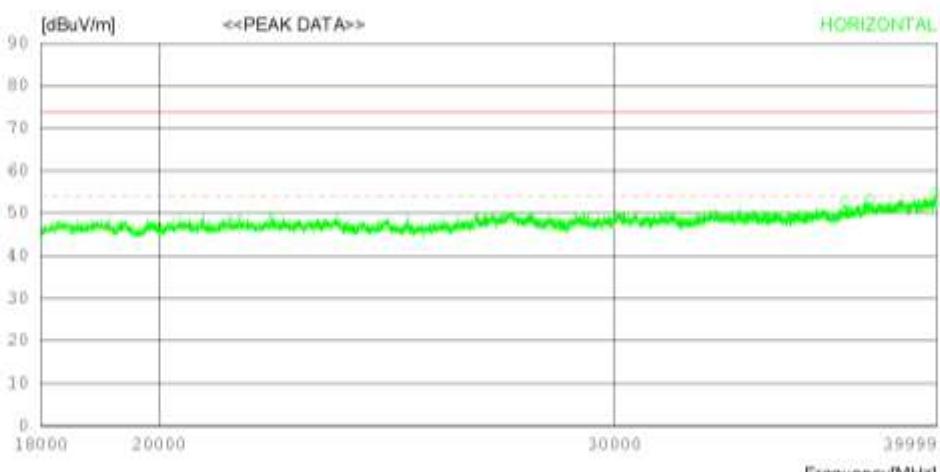
LIMIT : FCC Part15 Subpart B Class B (3m) - GHz(Peak)
 FCC Part15 Subpart B Class B (3m) - GHz(Average)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_장비_18-40G_2021.01.08 품신
 2. C2_Amp to Receiver_3m_장비_18-40G_2021.01.08 품신
 Pre Amp Gain
 1. AMP_MLA-1840-J02-45_16986-10728_2020.06.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_창의_18-40G_2021.01.08 통신

2. C2_Amp to Receiver_3m_창의_18-40G_2021.01.08 통신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24

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	36856.750	40.30	42.85	16.84	47.37	52.62	74.0	21.38	141	0
2	37673.500	40.00	43.39	17.39	47.52	53.26	74.0	20.74	305	258
3	39947.750	39.60	43.18	17.86	45.83	54.81	74.0	19.19	205	196
----- VERTICAL -----										
4	36117.000	41.20	42.65	16.74	47.72	52.87	74.0	21.13	305	288
5	37217.000	40.30	42.91	17.11	47.50	52.82	74.0	21.18	123	52
6	38116.250	39.90	43.45	17.34	46.87	53.82	74.0	20.18	185	358

Radiated disturbance at (18 ~ 40) GHz _ Average Measurement data			
Test configuration mode	1	EUT Operation mode	1
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

RADIATED EMISSION

Date: 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22 °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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

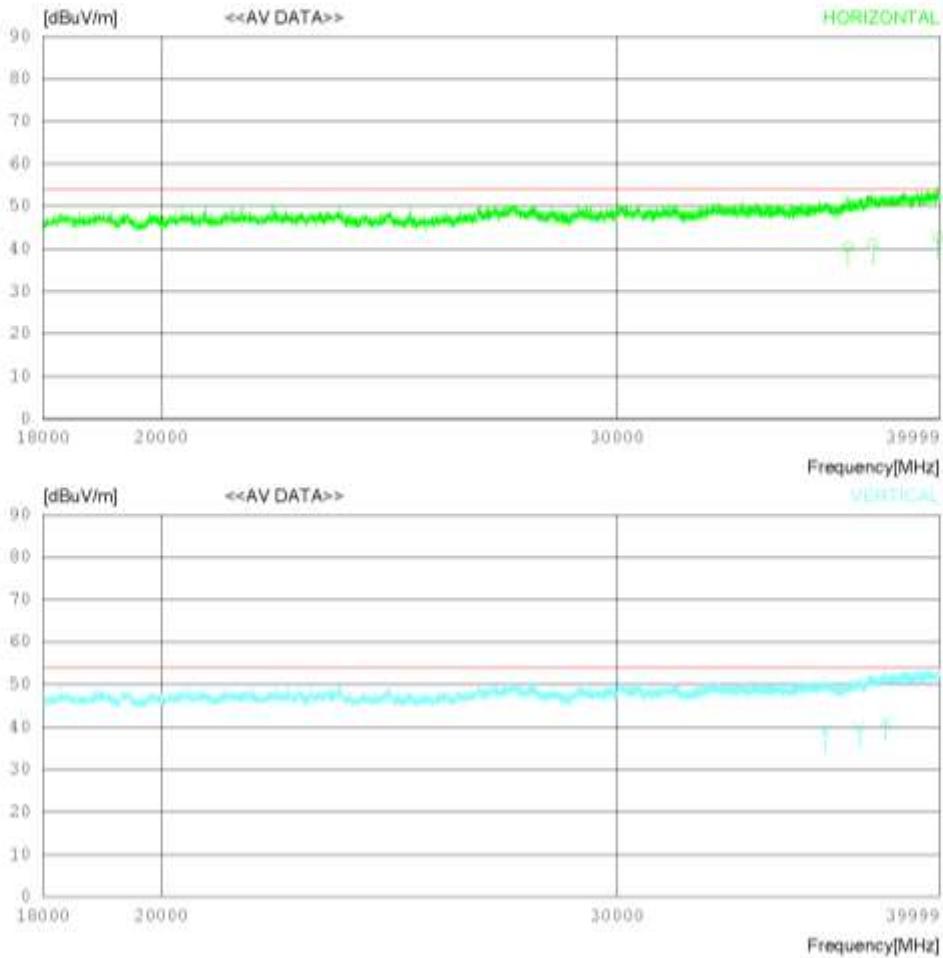
Cable Loss

1. C1_Ant to Amp_3m_필드_18-40G_2021.01.08 품신

2. C2_Amp to Receiver_3m_필드_18-40G_2021.01.08 품신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22 °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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_창의_18-40G_2021.01.08 통신

2. C2_Amp to Receiver_3m_창의_18-40G_2021.01.08 통신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24

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]
<hr/>										
1	36856.380	28.10	42.85	16.84	47.37	40.42	54.00	13.58	157	52
2	37673.550	27.80	43.39	17.39	47.52	41.06	54.00	12.94	315	274
3	39947.860	27.60	43.18	17.86	45.83	42.81	54.00	11.19	227	205
<hr/>										
4	36117.630	27.50	42.65	16.74	47.72	39.17	54.00	14.83	310	302
5	37217.810	27.40	42.92	17.11	47.50	39.93	54.00	14.07	164	67
6	38116.370	27.40	43.45	17.34	46.87	41.32	54.00	12.68	197	345

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

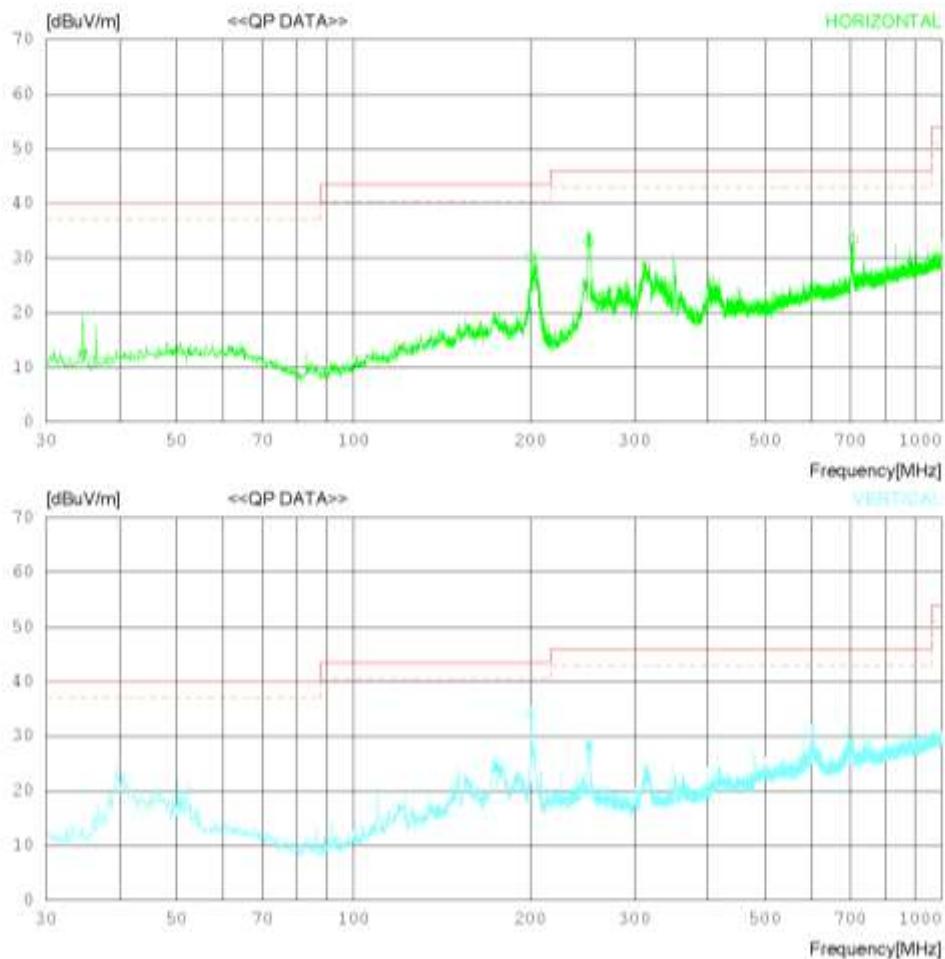
Date: 2021-04-15

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 °C 41 % R.H.
 Test Condition FM

Memo

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

Antenna Factor
 1. EMC-228_VULB9160_9160-3339_with ATT_18403_2020.10.05
 Cable Loss
 1. #24_C1_ANT to BOTTOM_3m_필드_9K-1G_2021-02-19
 2. #25_C2_Amp to BOTTOM_3m_필드_9K-1G_2021-02-19
 3. #26_C3_Amp to Receiver_3m_필드_9K-1G_2021-02-19
 Pre Amp Gain
 1. EMC-110_AMP_MLA-100K01-B01-26_1252741_2021.02.08



RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21 °C 41 % R.H.
Test Condition FM

Memo

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

Antenna Factor

1. EMC-228_VULB9160_9160-3339_with ATT_18403_2020.10.05

Cable Loss

1. #24_C1_ANT to BOTTOM_3m_충의_9K-1G_2021-02-19

2. #25_C2_Amp to BOTTOM_3m_충의_9K-1G_2021-02-19

3. #26_C3_Amp to Receiver_3m_충의_9K-1G_2021-02-19

Pre Amp Gain

1. EMC-110_AMP_MLA-100K01-B01-26_1252741_2021.02.08

No.	FREQ [MHz]	READING [dBuV]	ANT QP	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
<hr/>										
	----- HORIZONTAL -----									
1	199.988	38.80	16.00	2.01	26.64	30.17	43.50	13.33	251	139
2	250.912	39.50	17.86	2.21	26.59	32.98	46.00	13.02	189	231
3	706.605	28.20	27.30	4.01	26.16	33.35	46.00	12.65	200	115
	----- VERTICAL -----									
4	175.739	31.50	17.96	1.80	26.70	24.56	43.50	18.94	203	153
5	199.988	42.80	16.00	2.01	26.64	34.17	43.50	9.33	115	189
6	251.397	34.90	17.86	2.22	26.59	28.39	46.00	17.61	183	217

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: 2021-04-15

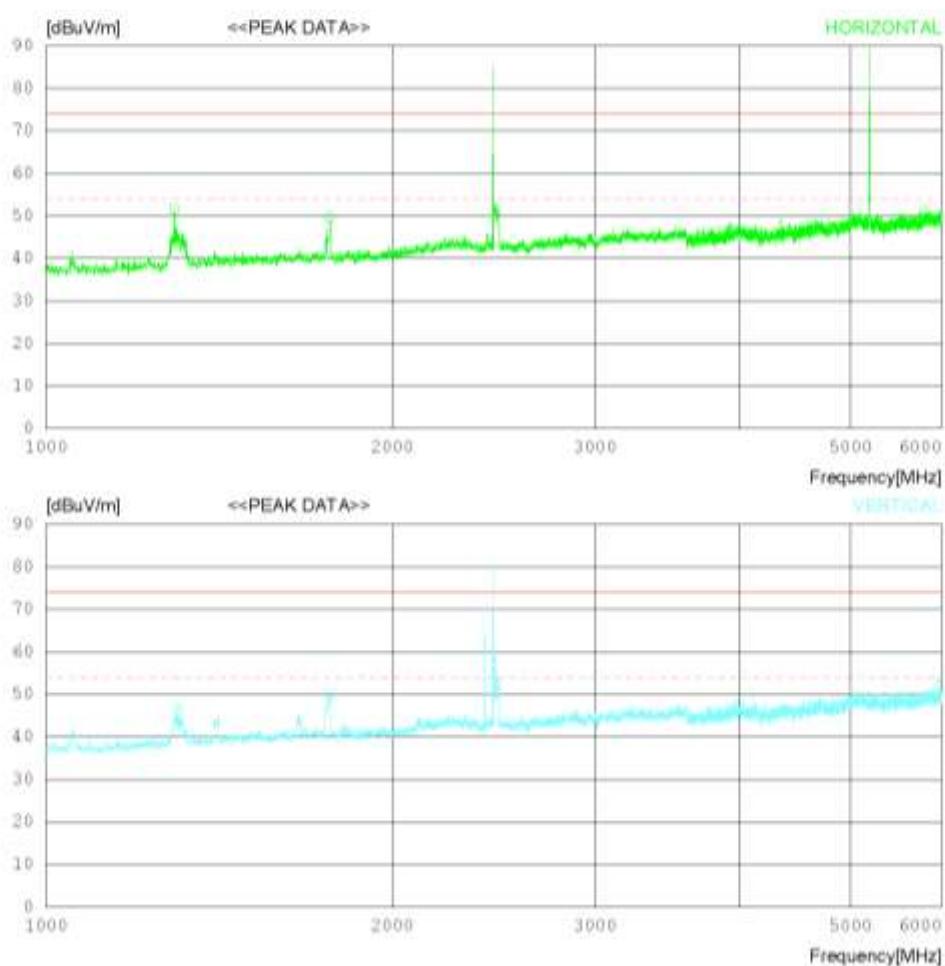
Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 °C 41 % R.H.
 Test Condition FM

Memo

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

Antenna Factor
 1. ANT_9120D_1828_20.10.21

Cable Loss
 1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25
 3. #29_C3_Amp to Receiver_3m_정의_1-18G_2021.02.25
 Pre Amp Gain
 1. AMP_8449B_3008A00887_2020.06.31



*Remark : (2,402 ~ 2,480) MHz is BT frequency.
 (5,180 ~ 5,240) MHz is WIFI 5 G frequency.

RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 °C 41 % 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)

Antenna Factor

1. ANT_9120D_1828_20.10.21

Cable Loss

1. #27_C1_Ant to Bottom_3m_한국_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_한국_1-18G_2021.02.25
 3. #29_C3_Amp to Receiver_3m_한국_1-18G_2021.02.25

Pre Amp Gain

1. AMP_8449B_3008A00887_2020.08.31

No.	FREQ PEAK (MHz)	READING [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA	TABLE
									[cm]	[DEG]
----- HORIZONTAL -----										
1	1293.750	57.18	25.69	4.58	35.88	51.57	74.0	22.43	341	143
2	1763.750	50.46	25.08	5.58	35.36	49.76	74.0	24.24	167	229
3	5805.000	42.89	32.11	11.39	35.18	51.21	74.0	22.79	234	0
----- VERTICAL -----										
4	1302.500	52.59	25.71	4.62	35.87	47.05	74.0	26.95	237	2
5	1765.625	54.75	25.09	5.59	35.36	50.07	74.0	23.93	217	5
6	5970.625	43.98	32.34	11.90	35.20	53.02	74.0	20.98	157	212

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

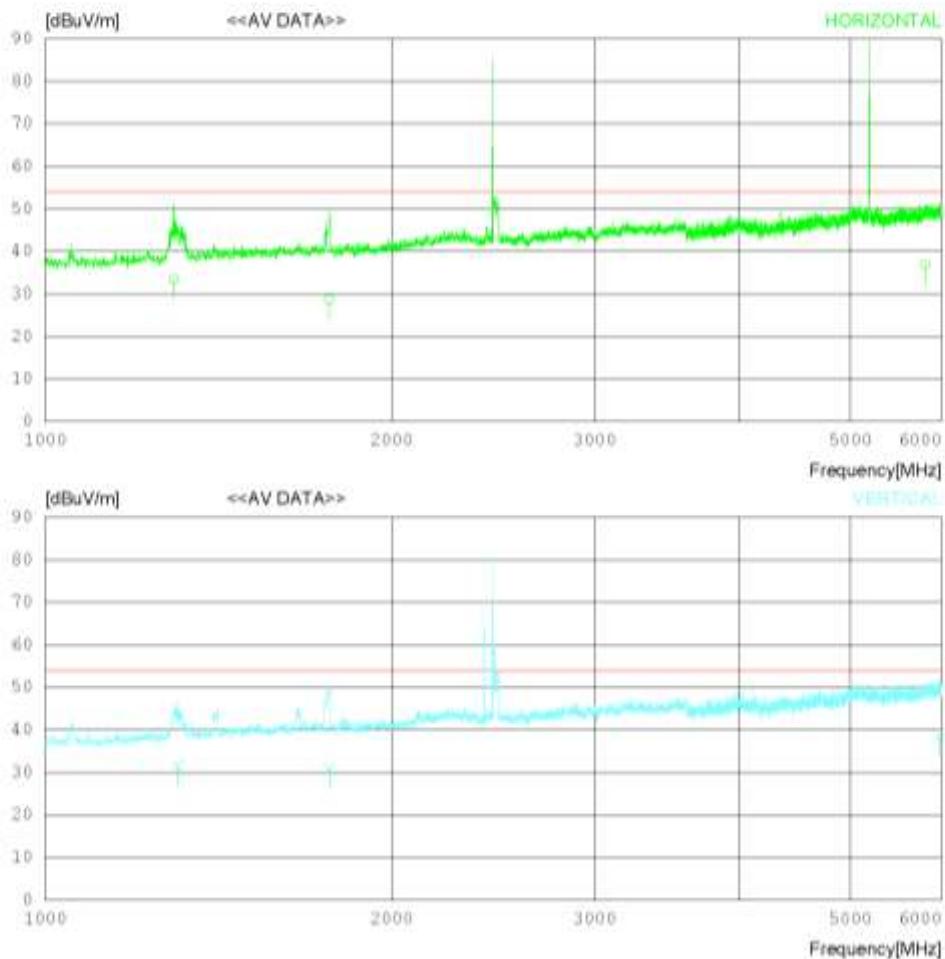
Date: 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21 °C 41 % 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)

Antenna Factor
1. ANT_9120D_1828_20.10.21
Cable Loss
1. #27_C1_Ant to Bottom_3m_2021.02.25
2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_2021.02.25
3. #29_C3_Amp to Receiver_3m_2021.02.25
Pre Amp Gain
1. AMP_8449B_3008A00887_2020.06.31



*Remark : (2,402 ~ 2,480) MHz is BT frequency.
(5,180 ~ 5,240) MHz is WIFI 5 G frequency.

RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 °C 41 % 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)

Antenna Factor

1. ANT_9120D_1828_20.10.21

Cable Loss

1. #27_C1_Ant to Bottom_3m_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_2021.02.25
 3. #29_C3_Amp to Receiver_3m_2021.02.25

Pre Amp Gain

1. AMP_8449B_3008A00887_2020.08.31

No.	REQ CAV (MHz)	READING [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- HORIZONTAL -----										
1	1293.745	39.10	25.69	4.58	35.88	33.49	54.00	20.51	302	204
2	1763.854	33.40	25.08	5.58	35.36	28.70	54.00	25.30	237	264
3	5805.364	28.70	32.11	11.39	35.18	37.02	54.00	16.98	167	91
----- VERTICAL -----										
4	1302.412	37.10	25.70	4.62	35.87	31.55	54.00	22.45	214	57
5	1765.845	35.50	25.10	5.59	35.36	30.83	54.00	23.17	277	64
6	5970.341	29.40	32.34	11.90	35.20	38.44	54.00	15.56	314	237

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: 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 22°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)

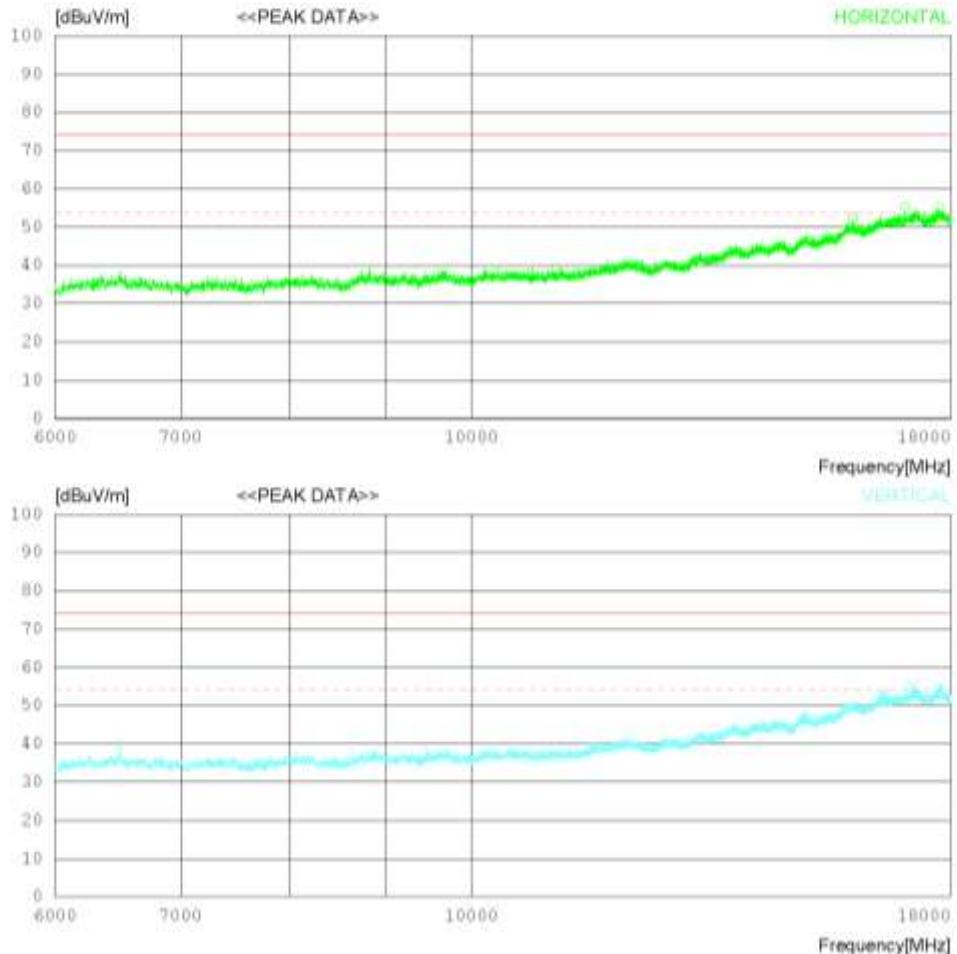
Antenna Factor
 1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_합의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_합의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_한의_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_한의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dBuV/m]	RESULT [dBuV/m]	LIMIT [dB]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
<hr/>										
1	15964.500	29.40	35.70	24.52	37.22	52.40	74.0	21.6	127	0
2	17014.500	29.30	36.40	26.76	37.40	55.06	74.0	18.94	166	226
3	17733.000	29.00	36.70	27.34	38.13	54.91	74.0	19.09	297	0
<hr/>										
4	16545.000	28.10	36.30	25.66	37.20	52.86	74.0	21.14	325	280
5	17190.000	29.00	36.50	26.99	37.54	54.95	74.0	19.05	305	356
6	17772.000	28.70	36.70	27.52	38.19	54.73	74.0	19.27	157	92

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: 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 22°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)

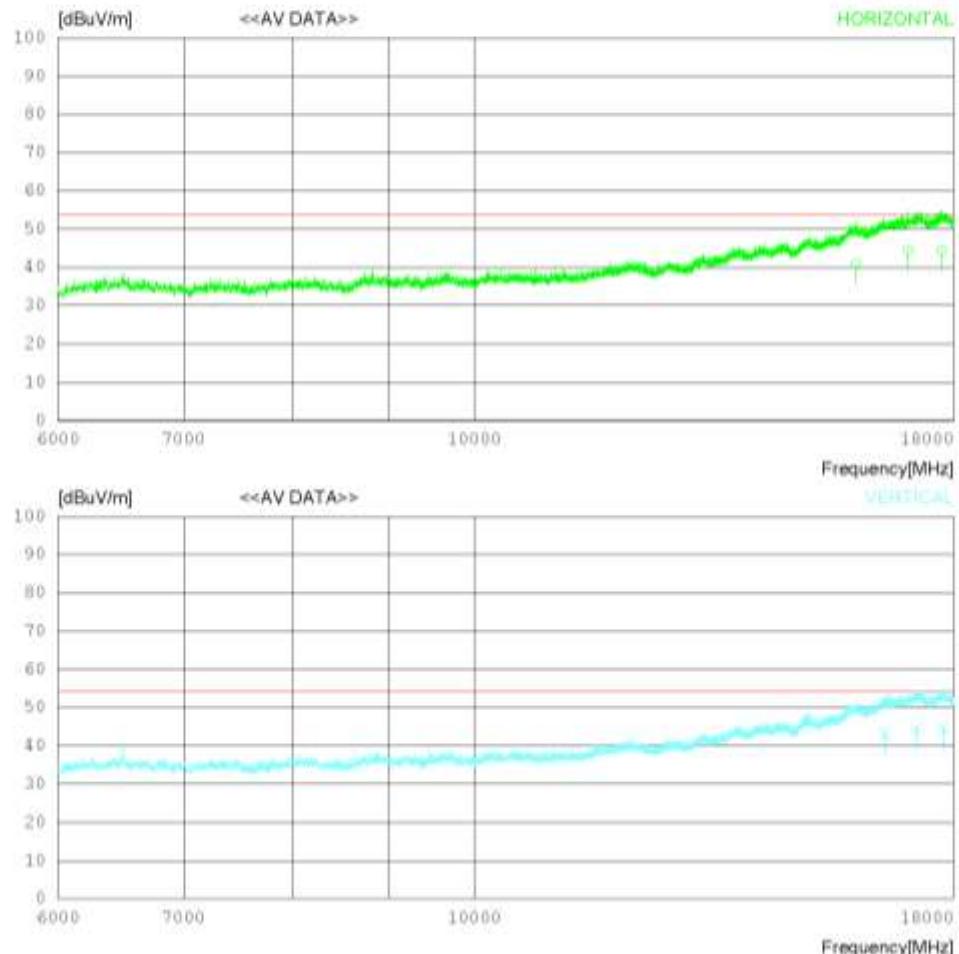
Antenna Factor
 1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_합의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_합의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22°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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_항의_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_항의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24

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	15964.340	17.90	35.70	24.52	37.22	40.90	54.00	13.10	145	52
2	17014.520	18.60	36.40	26.76	37.40	44.36	54.00	9.64	135	301
3	17733.520	18.40	36.70	27.34	38.14	44.30	54.00	9.70	244	17
----- VERTICAL -----										
4	16545.540	18.40	36.30	25.67	37.20	43.17	54.00	10.83	252	258
5	17190.350	18.50	36.50	26.99	37.50	44.45	54.00	9.55	341	341
6	17772.350	18.40	36.70	27.52	38.19	44.43	54.00	9.57	199	105

Radiated disturbance at (18 ~ 40) GHz _ Peak Measurement data			
Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

RADIATED EMISSION

Date: 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Hum 22 °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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

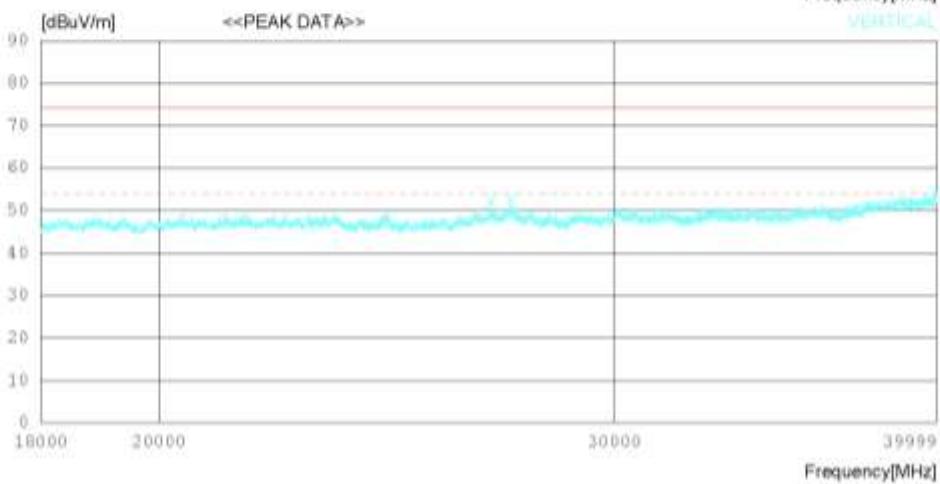
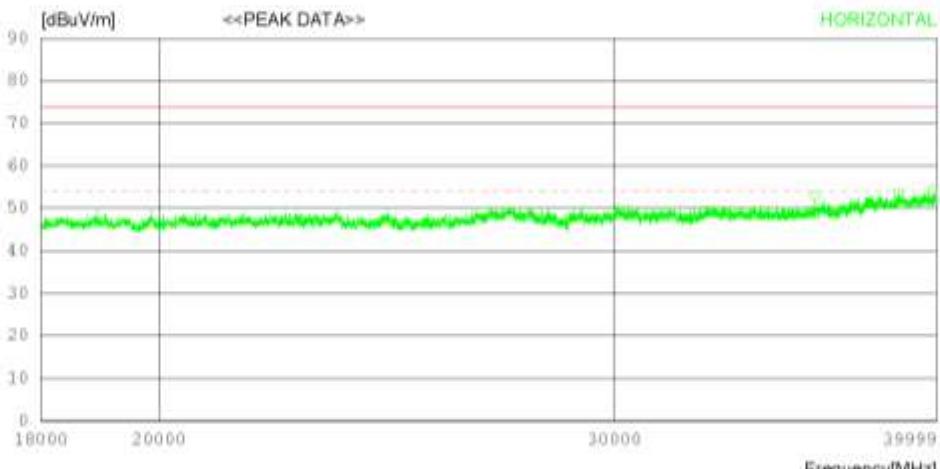
Cable Loss

1. C1_Ant to Amp_3m_장의_18-40G_2021.01.08 품신

2. C2_Amp to Receiver_3m_장의_18-40G_2021.01.08 품신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16986-10728_2020.06.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_창의_18-40G_2021.01.08 통신

2. C2_Amp to Receiver_3m_창의_18-40G_2021.01.08 통신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24

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	35872.250	41.50	42.35	16.74	47.70	52.89	74.0	21.11	235	12
2	38647.000	40.00	43.50	17.30	47.13	53.67	74.0	20.33	332	9
3	39846.000	39.00	43.17	17.93	45.89	54.21	74.0	19.79	169	196
----- VERTICAL -----										
4	26888.000	42.30	40.56	14.58	45.39	52.05	74.0	21.95	155	358
5	27355.500	42.80	40.70	14.65	45.71	52.44	74.0	21.56	308	358
6	39956.000	39.00	43.18	17.85	45.83	54.20	74.0	19.8	178	358

Radiated disturbance at (18 ~ 40) GHz _ Average Measurement data			
Test configuration mode	1	EUT Operation mode	2
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

RADIATED EMISSION

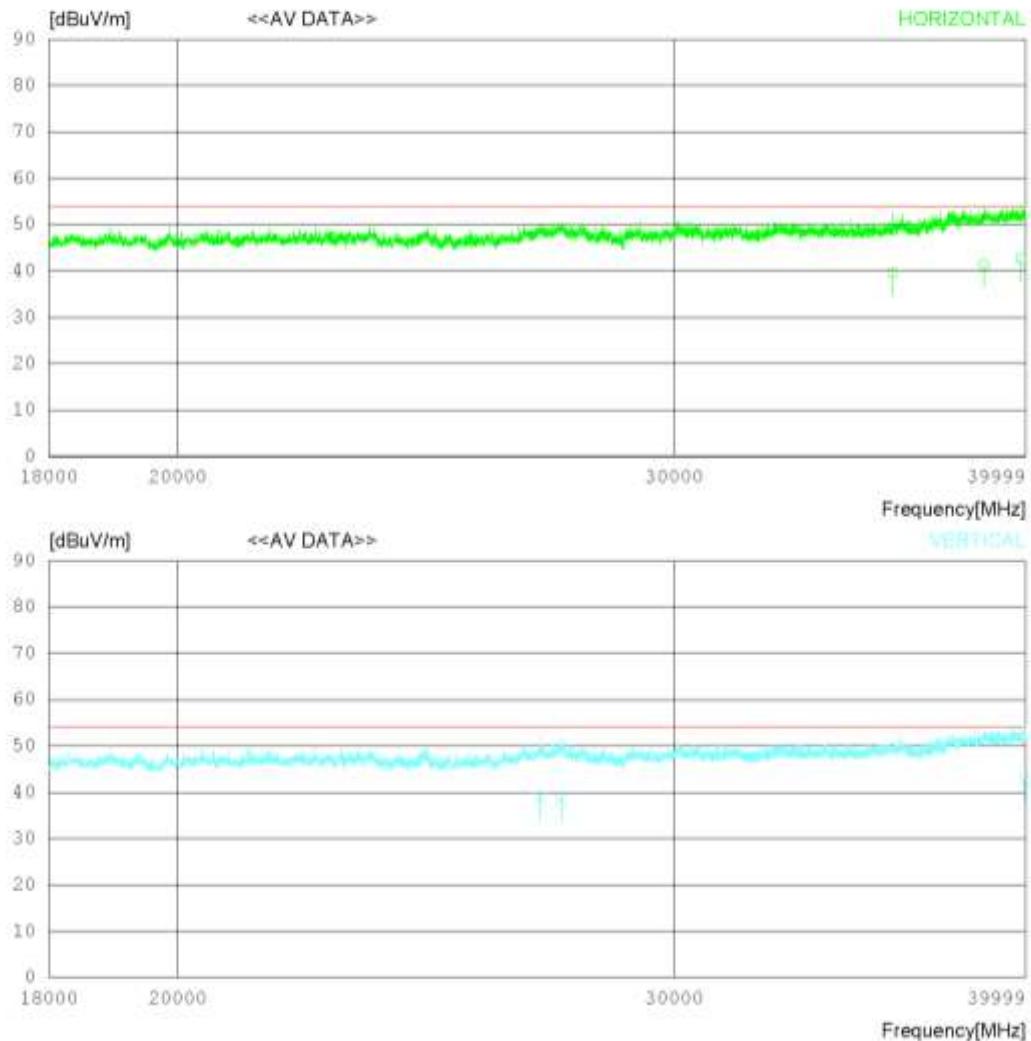
Date 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 22 '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)

Antenna Factor
 1. ANT_SAS-574_155_2020.06.24
 Cable Loss
 1. C1_Ant to Amp_3m_충의_18-40G_2021.01.08 통신
 2. C2_Amp to Receiver_3m_한의_18-40G_2021.01.08 통신
 Pre Amp Gain
 1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22 °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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_창의_18-40G_2021.01.08 통신

2. C2_Amp to Receiver_3m_창의_18-40G_2021.01.08 통신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24

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]
<hr/>										
1	35872.520	28.30	42.35	16.74	47.70	39.69	54.00	14.31	247	33
2	38647.000	27.60	43.50	17.30	47.13	41.27	54.00	12.73	352	52
3	39846.320	27.40	43.17	17.93	45.89	42.61	54.00	11.39	176	204
<hr/>										
4	26888.350	29.10	40.56	14.58	45.39	38.85	54.00	15.15	147	302
5	27355.850	28.80	40.70	14.65	45.71	38.44	54.00	15.56	315	314
6	39956.340	27.40	43.18	17.85	45.83	42.60	54.00	11.40	164	341

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: 2021-04-15

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 'C 41 % R.H.
 Test Condition USB

Memo

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

Antenna Factor

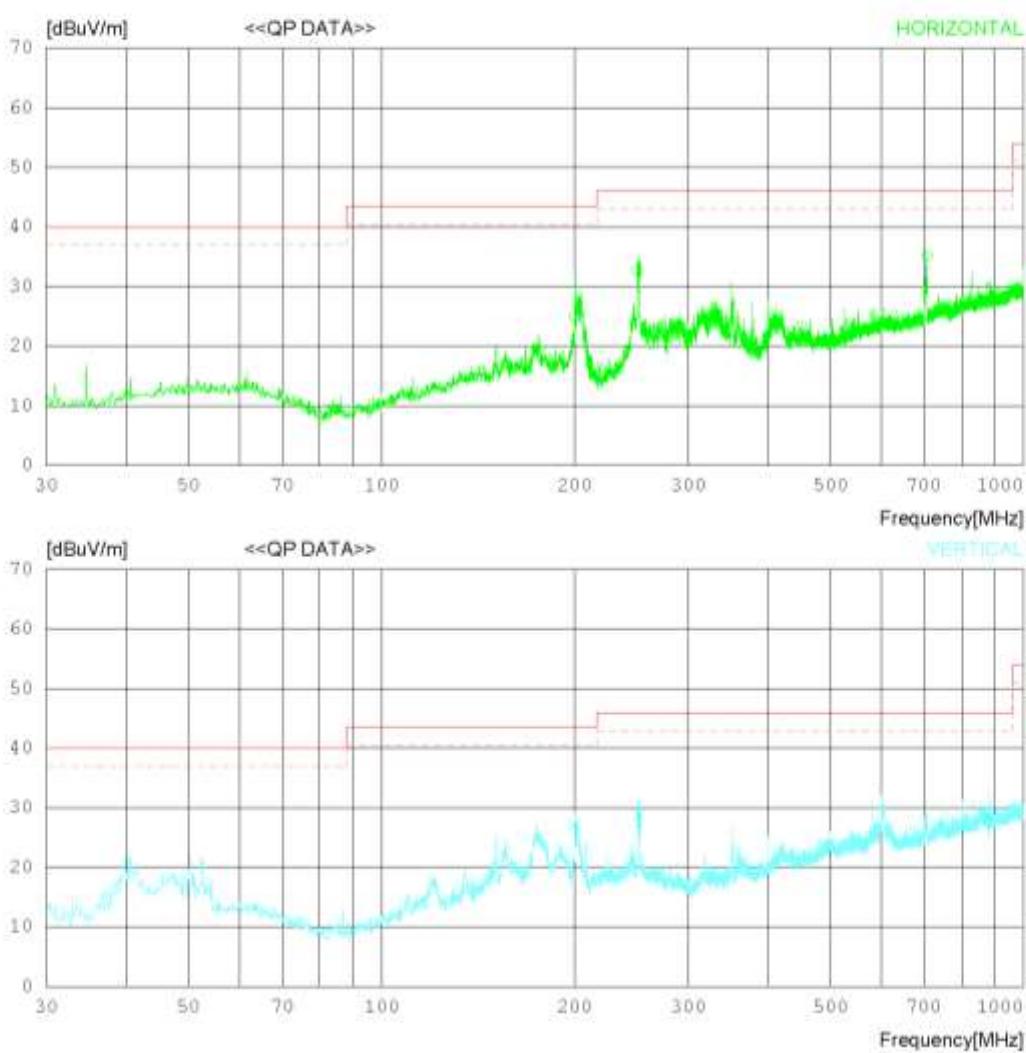
1. EMC-228_VULB8160_9160-3339_with ATT_18403_2020.10.05

Cable Loss

1. #24_C1_ANT to BOTTOM_3m_정의_9K-1G_2021-02-19
 2. #25_C2_Amp to BOTTOM_3m_정의_9K-1G_2021-02-19
 3. #28_C3_Amp to Receiver_3m_정의_9K-1G_2021-02-19

Pre Amp Gain

1. EMC-110_AMP_MLA-100K01-B01-26_1252741_2021.02.06



RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21°C 41% R.H.
Test Condition USB

Memo

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

Antenna Factor

1. EMC-228_VULB9160_9160-3339_with ATT_18403_2020.10.05

Cable Loss

1. #24_C1_Ant to BOTTOM_3m_충의_9K-1G_2021-02-19

2. #25_C2_Amp to BOTTOM_3m_충의_9K-1G_2021-02-19

3. #26_C3_Amp to Receiver_3m_충의_9K-1G_2021-02-19

Pre Amp Gain

1. EMC-110_AMP_MLA-100K01-B01-26_1252741_2021.02.08

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]
<hr/>										
1	199.835	33.50	16.02	2.01	26.64	24.89	43.50	18.61	214	345
2	250.097	39.30	17.85	2.21	26.59	32.77	46.00	13.23	208	168
3	706.507	30.00	27.30	4.01	26.16	35.15	46.00	10.85	124	189
<hr/>										
<hr/>										
4	200.077	35.80	16.00	2.01	26.60	27.17	43.50	16.33	104	325
5	252.086	35.40	17.87	2.22	26.59	28.90	46.00	17.10	120	344
6	883.297	21.10	29.30	4.53	26.46	28.47	46.00	17.53	107	34

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: 2021-04-15

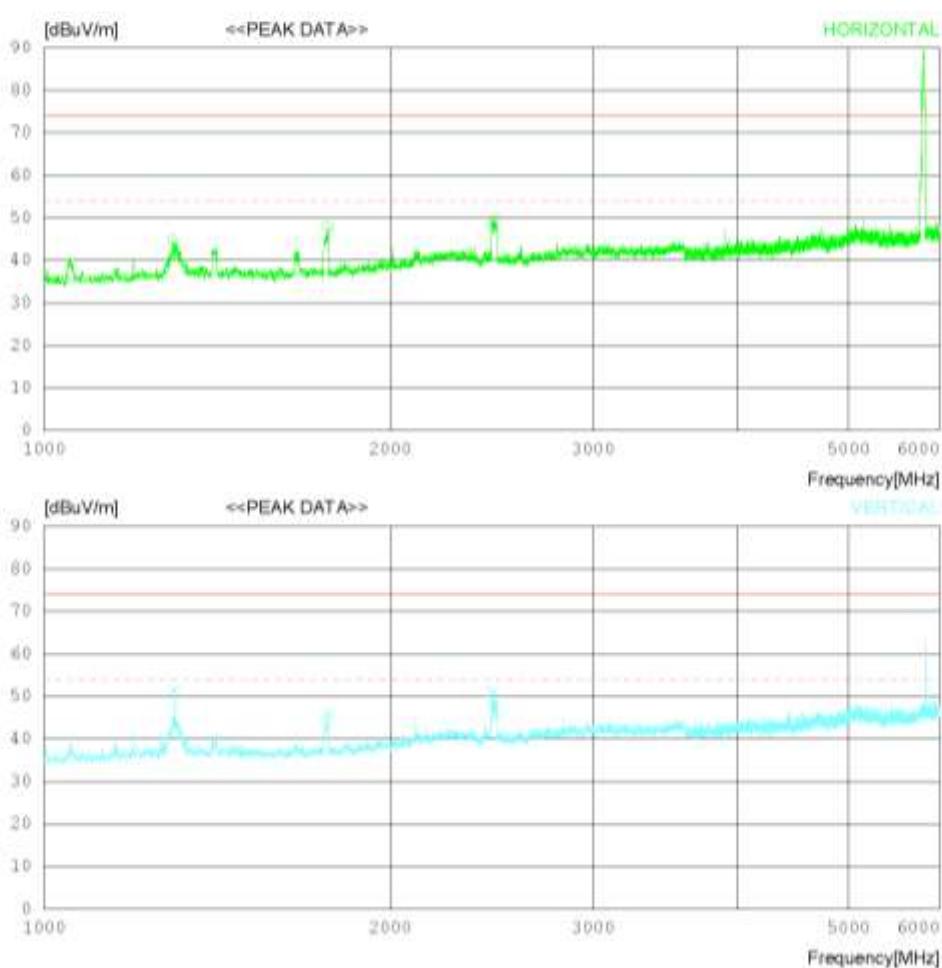
Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21 °C 41 % R.H.
 Test Condition USB

Memo

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

Antenna Factor
 1. ANT_9120D_1828_20.10.21

Cable Loss
 1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25
 3. #29_C3_Amp to Receiver_3m_정의_1-18G_2021.02.25
 Pre Amp Gain
 1. AMP_8449B_3008A00887_2020.06.31



*Remark : (5,725 ~ 5,815) MHz is WIFI 5.8 G frequency.

RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 21'C 41 % 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)

Antenna Factor

1. ANT_9120D_1828_20.10.21

Cable Loss

1. #27_C1_Ant to Bottom_3m_한의_1-18G_2021.02.25
 2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_한의_1-18G_2021.02.25
 3. #29_C3_Amp to Receiver_3m_한의_1-18G_2021.02.25

Pre Amp Gain

1. AMP_8449B_3008A00887_2020.08.31

No.	FREQ PEAK (MHz)	READING [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- HORIZONTAL -----										
1	1295.000	50.50	25.69	4.59	35.88	44.90	74.0	29.1	331	166
2	1763.750	52.70	25.08	5.58	35.36	48.00	74.0	26	197	175
3	2465.625	50.70	27.61	6.65	35.15	49.81	74.0	24.19	285	358
----- VERTICAL -----										
4	1299.375	57.10	25.70	4.59	35.87	51.52	74.0	22.48	148	356
5	1766.250	50.60	25.10	5.59	35.36	45.93	74.0	28.07	268	198
6	2455.625	52.00	27.67	6.64	35.15	51.16	74.0	22.89	136	156

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

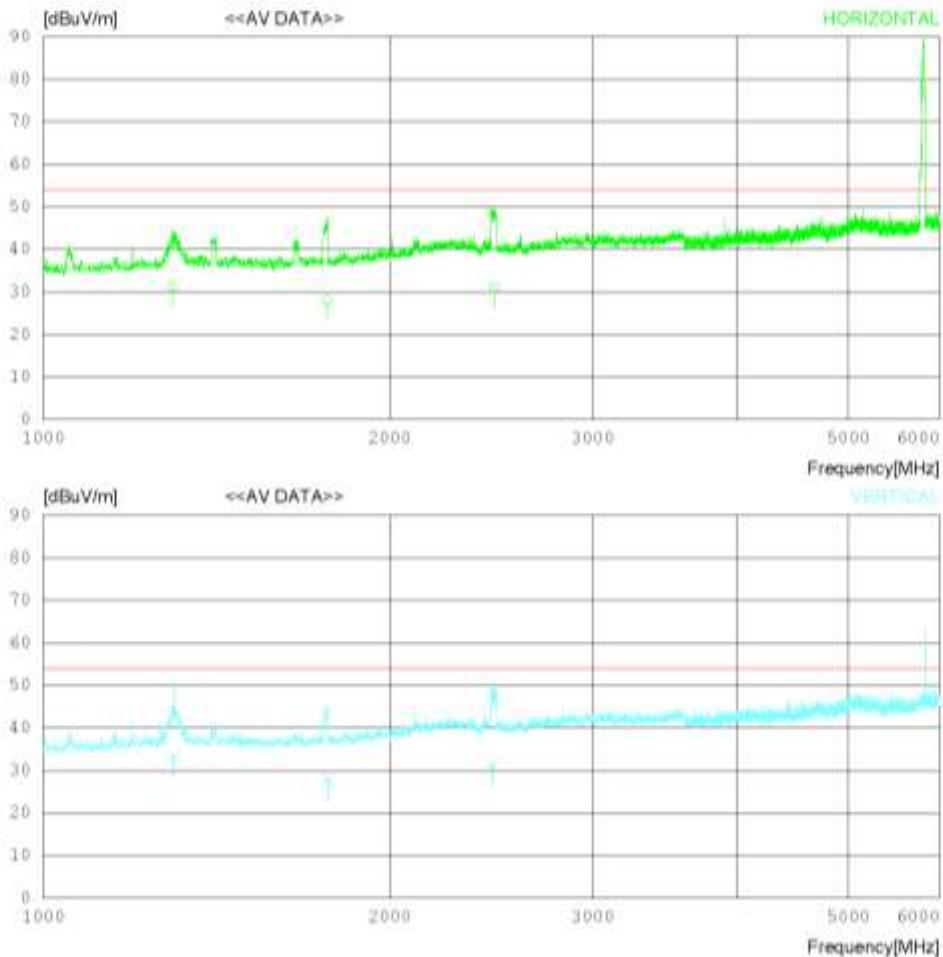
Date: 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21 °C 41 % 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)

Antenna Factor
1. ANT_9120D_1828_20.10.21
Cable Loss
1. #27_C1_Ant to Bottom_3m_장치_1-18G_2021.02.25
2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_장치_1-18G_2021.02.25
3. #29_C3_Amp to Receiver_3m_장치_1-18G_2021.02.25
Pre Amp Gain
1. AMP_8449B_3008A00887_2020.06.31



*Remark : (5,725 ~ 5,815) MHz is WIFI 5.8 G frequency.

RADIATED EMISSION

Date 2021-04-15

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 21'C 41% 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)

Antenna Factor

1. ANT_9120D_1828_20.10.21

Cable Loss

1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25
2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25
3. #29_C3_Amp to Receiver_3m_정의_1-18G_2021.02.25

Pre Amp Gain

1. AMP_8449B_3008A00887_2020.08.31

No.	REQ CAV (MHz)	READING [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
<hr/>										
1	1295.378	36.80	25.69	4.59	35.88	31.20	54.00	22.80	209	232
2	1764.072	32.80	25.08	5.58	35.36	28.10	54.00	25.90	197	174
3	2464.106	32.00	27.62	6.64	35.15	31.11	54.00	22.89	324	141
<hr/>										
4	1299.857	38.90	25.70	4.59	35.87	33.32	54.00	20.68	204	335
5	1766.609	32.60	25.10	5.59	35.36	27.93	54.00	26.07	167	204
6	2456.035	32.10	27.66	6.64	35.15	31.25	54.00	22.75	254	166

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 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

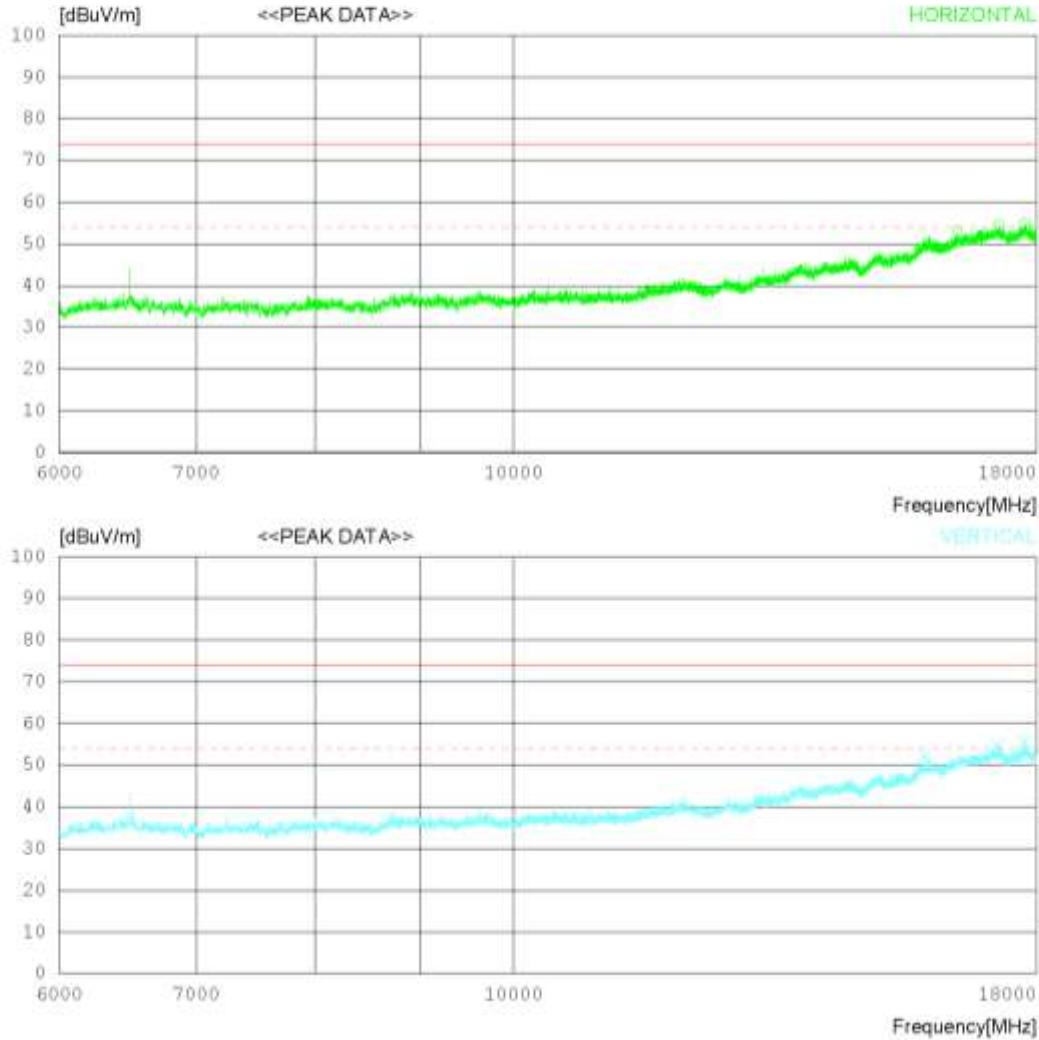
Antenna Factor
1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25
2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0818-B03-34_2020.12.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_참의_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_참의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24

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	16468.500	28.60	36.24	25.34	37.18	53.00	74.0	21	178	0
2	17251.500	28.70	36.60	26.70	37.59	54.41	74.0	19.59	197	0
3	17764.500	29.00	36.70	27.48	38.18	55.00	74.0	19	246	0
----- VERTICAL -----										
4	15859.500	29.20	35.70	24.61	37.21	52.30	74.0	21.7	285	222
5	17227.500	29.10	36.56	26.84	37.57	54.93	74.0	19.07	308	358
6	17740.500	29.70	36.70	27.37	38.15	55.62	74.0	18.38	205	358

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 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

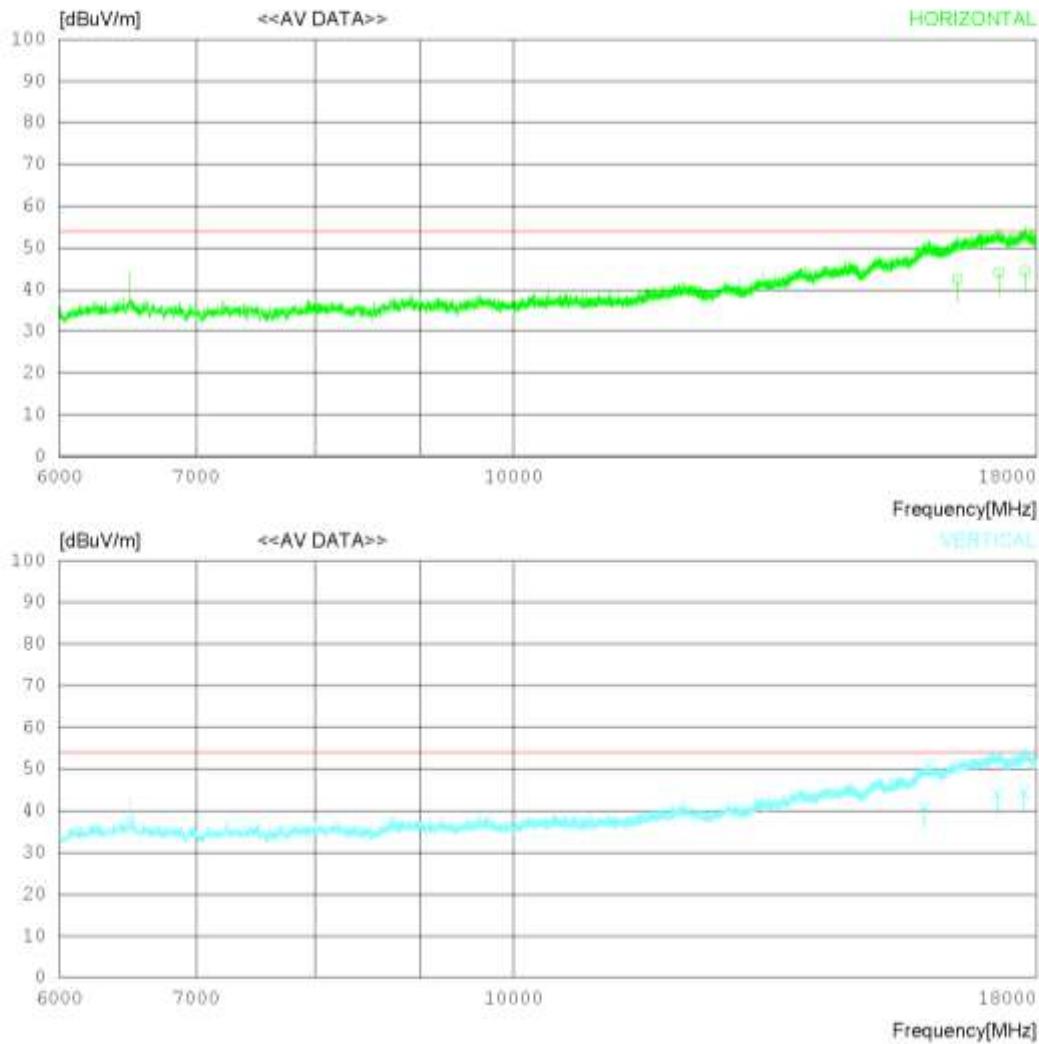
Cable Loss

1. #27_C1_Ant to Bottom_3m_정의_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_정의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0818-B03-34_2020.12.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. EMC-233-A_EM-6969_156_2020.12.29

Cable Loss

1. #27_C1_Ant to Bottom_3m_항의_1-18G_2021.02.25

2. #28_C2_Bottom to Amp(Filter,Receiver)_3m_항의_1-18G_2021.02.25

Pre Amp Gain

1. EMC-233-M_MLA-0618-B03-34_2020.12.24

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	16468.770	18.00	36.24	25.34	37.18	42.40	54.00	11.60	196	52
2	17251.450	18.40	36.60	26.70	37.59	44.11	54.00	9.89	167	14
3	17764.650	18.50	36.70	27.48	38.18	44.50	54.00	9.50	214	55
----- VERTICAL -----										
4	15859.940	17.80	35.70	24.61	37.21	40.90	54.00	13.10	244	235
5	17227.370	18.40	36.55	26.84	37.57	44.22	54.00	9.78	345	341
6	17740.290	18.50	36.70	27.37	38.15	44.42	54.00	9.58	214	332

Radiated disturbance at (18 ~ 40) GHz _ Peak Measurement data			
Test configuration mode	2	EUT Operation mode	3
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

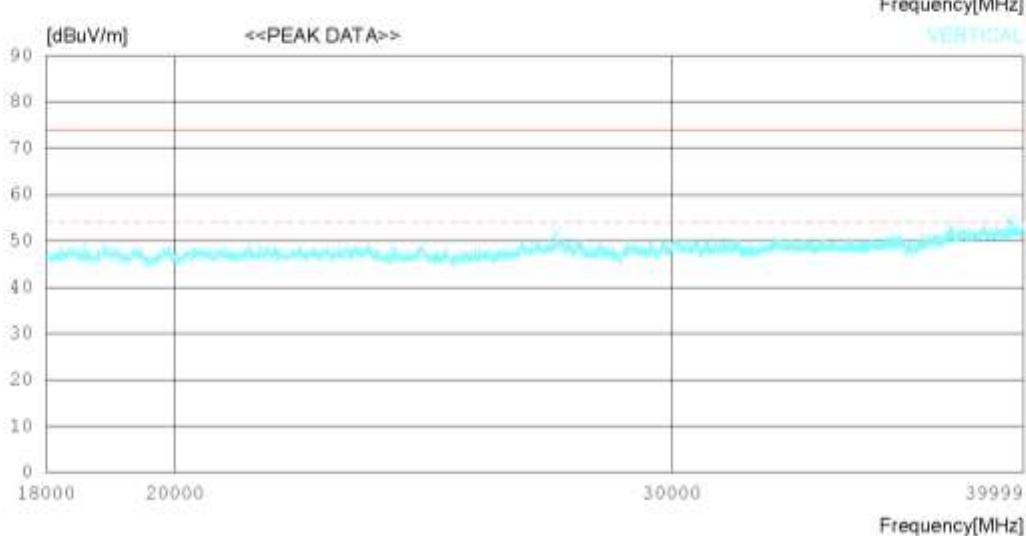
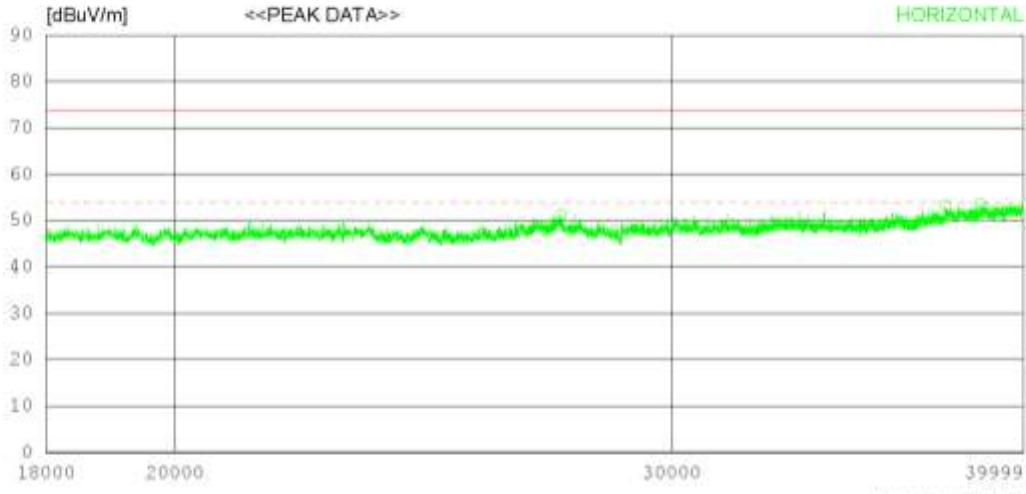
1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_충의_18-40G_2021.01.08 통신
2. C2_Amp to Receiver_3m_한의_18-40G_2021.01.08 통신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16986-10728_2020.06.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22'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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_측정_18-40G_2021.01.08 통신

2. C2_Amp to Receiver_3m_측정_18-40G_2021.01.08 통신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24

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	27416.000	41.70	40.70	14.65	45.75	51.30	74.0	22.7	247	306
2	37519.500	40.40	43.34	17.40	47.86	53.28	74.0	20.72	175	162
3	38630.500	40.00	43.50	17.29	47.13	53.66	74.0	20.34	264	258
----- VERTICAL -----										
4	27306.000	41.90	40.70	14.63	45.68	51.55	74.0	22.45	332	358
5	37651.500	39.60	43.38	17.39	47.57	52.80	74.0	21.2	305	348
6	39546.250	39.20	43.23	18.14	46.07	54.50	74.0	19.5	164	1

Radiated disturbance at (18 ~ 40) GHz _ Average Measurement data			
Test configuration mode	2	EUT Operation mode	3
Test voltage (V)	DC 12 V	Test Frequency (Hz)	-

RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
 Power Supply DC 12 V
 Temp/Humi 22 '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)

Antenna Factor

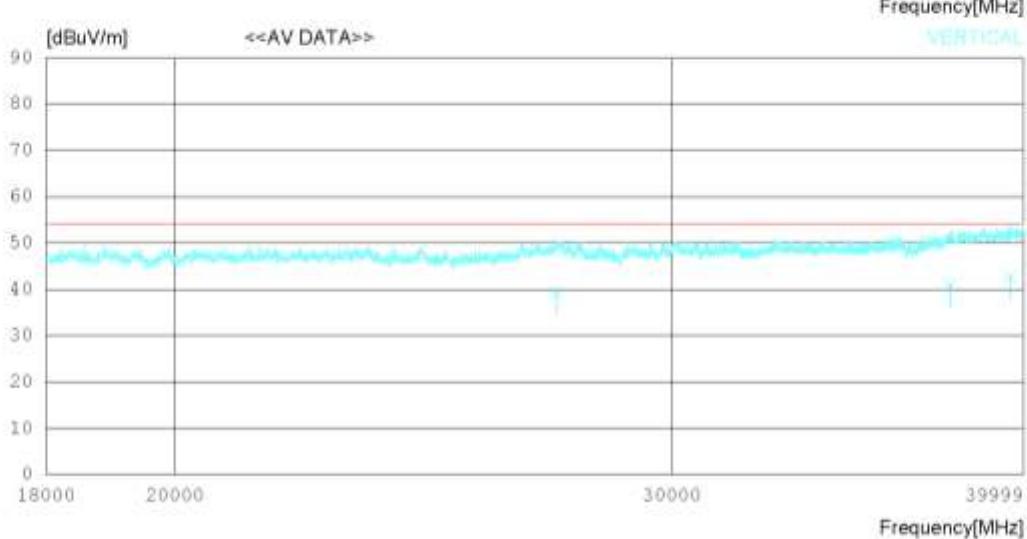
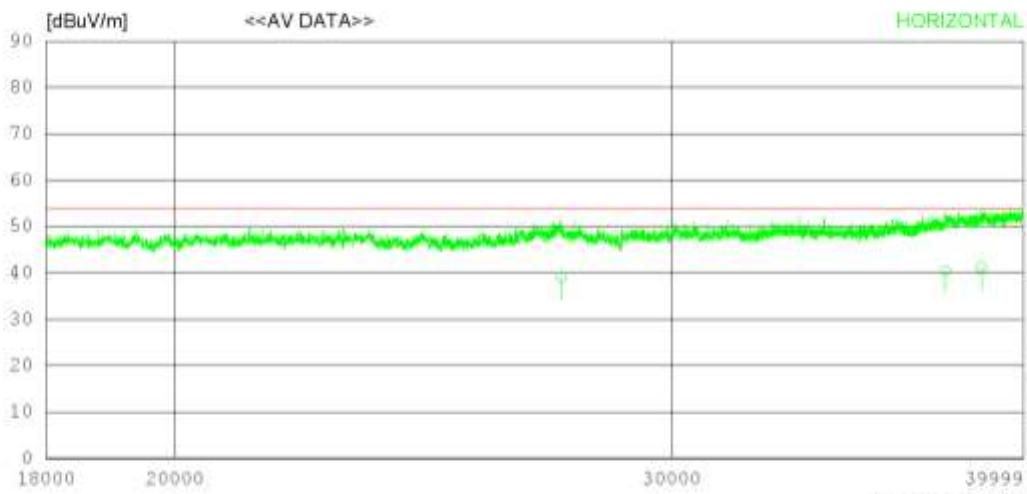
1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_창의_18-40G_2021.01.08_통신
2. C2_Amp to Receiver_3m_창의_18-40G_2021.01.08_통신

Pre Amp Gain

1. AMP_MLA-1840-J02-45_16986-10728_2020.06.24



RADIATED EMISSION

Date 2021-04-16

Order No. DTNC2103-02326
Power Supply DC 12 V
Temp/Humi 22 '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)

Antenna Factor

1. ANT_SAS-574_155_2020.06.24

Cable Loss

1. C1_Ant to Amp_3m_창의_18-40G_2021.01.08 통신

2. C2_Amp to Receiver_3m_창의_18-40G_2021.01.08 통신

Pre Amp Gain

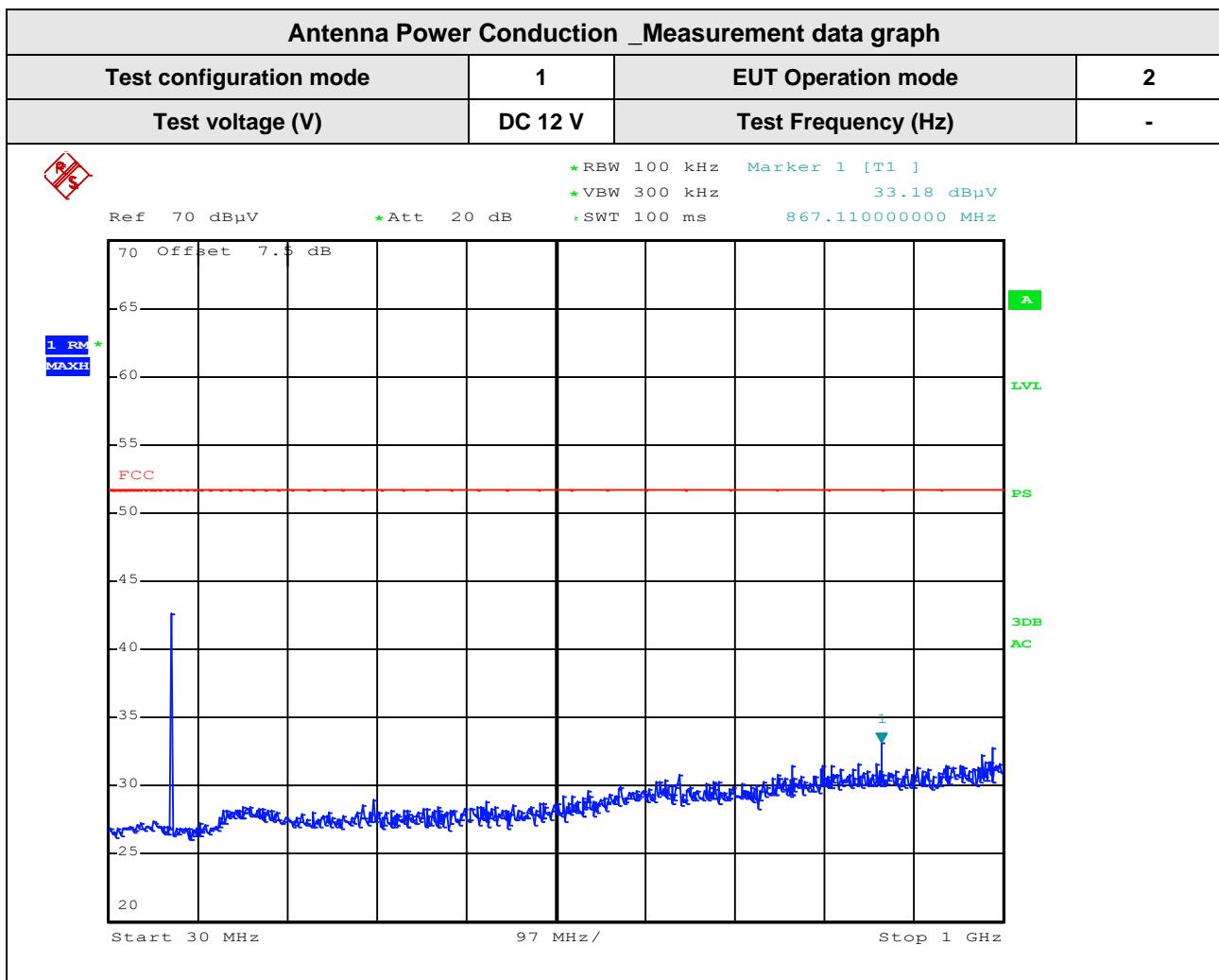
1. AMP_MLA-1840-J02-45_16966-10728_2020.06.24

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]
<hr/>										
1	27416.350	29.50	40.70	14.65	45.75	39.10	54.00	14.90	241	315
2	37519.860	27.60	43.34	17.40	47.86	40.48	54.00	13.52	167	178
3	38630.510	27.50	43.50	17.29	47.13	41.16	54.00	12.84	227	301
<hr/>										
4	27306.540	29.80	40.70	14.63	45.68	39.45	54.00	14.55	302	344
5	37651.790	27.80	43.38	17.39	47.57	41.00	54.00	13.00	331	317
6	39546.860	27.60	43.23	18.14	46.07	42.90	54.00	11.10	147	52

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 dB μ 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 2 150 MHz		2 nW (51.7 dB μ V)	
54 MHz to 300 MHz 300 MHz to 450 MHz 450 MHz to 804 MHz		-26 dBmV (34 dB μ V) -20 dBmV (40 dB μ V) -15 dBmV (45 dB μ V)	
Measurement Point		Tuner port	
EUT mode (Refer to clauses 4)		Test configuration mode	1
EUT Operation mode		2	
Power Interface mode		1	

Measurement Instrument					
Description	Model	Manufacturer	Identifier	Cal. Date	Cal. Due
EMI TEST RECEIVER	ESCI7	ROHDE&SCHWARZ	100910	2021-01-28	2022-01-28
IMPEDANCE MATCHING PAD	8AP50NM75NF	COPPER MOUNTAIN TECHNOLOGIES	16012	2020-12-09	2021-12-09
POWER SPLITTER	ZFRSC-123-S+	MINI CIRCUITS	SF139801142	2020-07-21	2021-07-21



8. Revision History

Date	Description	Revised By	Reviewed By
Apr. 26. 2021	Initial report	Hun Lee	HyungJun Kim

-End of test report-