

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 : DREFCC1709-0267
2. Customer
 - Name : SENA TECHNOLOGIES.Inc
 - Address : 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul
3. Product Name / Model Name : Momentum CAM / SP45
4. Test Method Used : ANSI C 63.4:2014
FCC Part 15 Subpart B (All other devices)
ICES-003:2016
CAN/CSA-CISPR 22-10
5. Date of Test : 2017-09-25 ~ 2017-09-28
6. Testing Environment : Temperature (23 ~ 24) °C , Humidity (43 ~ 48) % R.H.
7. Test Result : Refer to the attached Test Result

Affirmation	Tested by	Technical Manager
	Name : MinChul Kim (Signature)	Name : HyunSuk Ko (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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2017. 09. 29.

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.

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

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2. Test Laboratory

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

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	393	ISO/IEC 17025
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-1364, R-3385, R-4076, R-4180, T-1442, G-10338, G-754, G-815	Registered
Certification	Korea	KC	KR0034	Designation
	Germany	TUV	CARAT 17 01 89112 004	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

Kind of Equipment	Momentum CAM
Model Name	SP45
Add Model Name	None
Serial No.	None
Type of Sample Tested	Pre-Production
Supplied Power for Test	AC 120 V, 60 Hz
Rating Power	DC 3.7 V
FCC ID	S7A-SP45
IC	8154A-SP45
RF Frequency	2412 ~ 2472 MHz
Clock Frequency	108 MHz
Applicant	SENA TECHNOLOGIES.Inc 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul
Manufacturer	SENA TECHNOLOGIES.Inc 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul
Factory	SENA TECHNOLOGIES.Inc 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul

Related Submittal(s) / Grant(s)

Original submittal only.

4. Test Summary

4.1 Applied standards and test results

Test Items	Applied Standards	Results
Conducted Disturbance	ANSI C 63.4:2014 CAN/CSA-CISPR 22-10	C
Radiated Disturbance	ANSI C 63.4:2014 CAN/CSA-CISPR 22-10	C
C=Comply N/C=Not Comply N/T=Not Tested N/A=Not Applicable		

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

4.2 Test environment and conditions

Test Items	Test date (YYYY-MM-DD)	Temp (°C)	Humidity (% R.H.)
Conducted Disturbance	2017-09-25	24	43
Radiated Disturbance	2017-09-26	23	44
	2017-09-27	23	48
	2017-09-28	23	44

5. Test Set-up and operation mode

5.1 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.

5.2 Test Operation Mode

- The EUT is in the operating state while the camera is charging and stores the captured images on the SD card.

5.3 Support Equipment Used

Unit	Model No.	Serial No.	Manufacturer	CABLE			Backshell	FCC ID
				Connect type	Length (m)	Shield		
ZIG	N/A	N/A	SENA TECHNOLOGIES,Inc	AC IN DC OUT	1.4 1.0	Non-Shield Non-Shield	Plastic Plastic	DOC DOC

NOTE

- See “APPENDIX 2 Photographs” for actual system test setup

6. Test Results : Emission

6.1 Conducted Disturbance

6.1.1 Measurement Procedure

In the range of 0.15 MHz to 30 MHz, the conducted disturbance was measured and set-up was made accordance with **ANSI C 63.4** and **CAN/CSA-CISPR 22**.

If the EUT is table top equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 0.4 m from the conducting wall of the shielded room. Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15m above the reference ground plane. Connect the EUT's power source lines to the appropriate power mains / peripherals through the LISN. All the other peripherals are connected to the 2nd LISN, if any. Unused measuring port of the LISN was resistively terminated by 50 ohm terminator.

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 Average detector. By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission. For further description of the configuration refer to the picture of the test set-up.

6.1.2 Limit for Conducted Disturbance

(1) Conducted disturbance at mains ports.

Frequency range (MHz)	Limits dB(μV)			
	Quasi-peak		Average	
	Class A	Class B	Class A	Class B
0.15 to 0.50	79	66 to 56	66	56 to 46
0.50 to 5	73	56	60	46
5 to 30		60		50
Note 1 The lower limit shall apply at the transition frequencies.				
Note 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Note) 1. Emission Level = Reading Value + Correction Factor.

2. Correction Factor = Cable Loss + Insertion Loss of LISN + Pulse Limiter

3. Margin = Limit - Emission level

Test Result

< Main ports >

Results of Conducted Emission

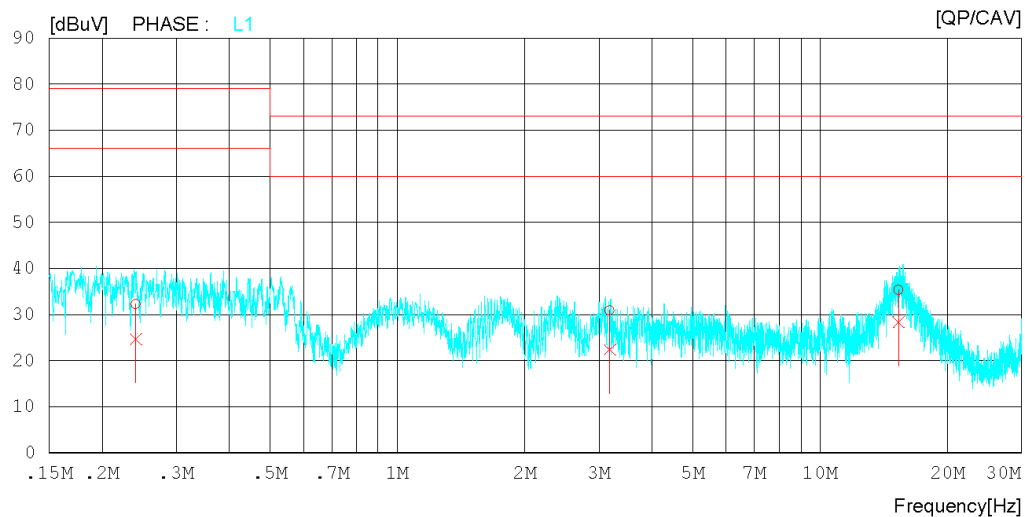
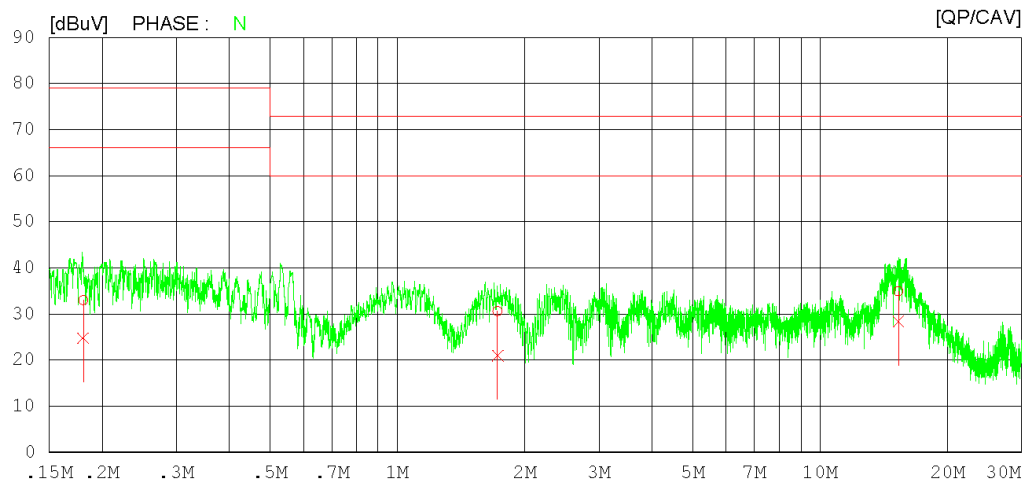
DTNC

Date 2017-09-28

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 24 'C 43 % R.H.
Atm.

Memo

LIMIT : CISPR32_A QP
CISPR32_A AV



Results of Conducted Emission

DTNC

Date 2017-09-28

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 24 'C 43 % R.H.
Atm.

Memo

LIMIT : CISPR32_A QP
CISPR32_A AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	CAV [dBuV]		QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]	
1	0.18046	22.95	14.76	10.01	32.96	24.77	79.00	66.00	46.04	41.23	N
2	1.72640	20.48	10.87	10.09	30.57	20.96	73.00	60.00	42.43	39.04	N
3	15.33380	24.31	17.79	10.58	34.89	28.37	73.00	60.00	38.11	31.63	N
4	0.24044	22.23	14.63	10.00	32.23	24.63	79.00	66.00	46.77	41.37	L1
5	3.18000	20.74	12.19	10.15	30.89	22.34	73.00	60.00	42.11	37.66	L1
6	15.35500	24.73	17.75	10.56	35.29	28.31	73.00	60.00	37.71	31.69	L1

6.2 Radiated Disturbance

6.2.1 Measurement Procedure

The radiated disturbance was measured and set-up was made accordance with **ANSI C 63.4 and CAN/CSA-CISPR 22**.

If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 3 m or 10 m away from the interference receiving antenna in the **3m semi-anechoic chamber**. Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m above the reference ground plane. Rotate the EUT from (0 - 360)° and position the receiving antenna at heights from (1 - 4) m above the reference ground plane continuously to determine associated with higher emission levels and record them. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report. For below 1 GHz frequency range, Quasi-Peak detector with 120 kHz RBW was used. Also Peak and Average detector with 1 MHz RBW were used for above 1 GHz frequency range. For further description of the configuration refer to the picture of the test set-up.

6.2.2 Limit for Radiated Disturbance

- 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

(1) Limit for Radiated Emission below 1 000MHz

Frequency range (MHz)	Class A Equipment (10 m distance)	Class B Equipment (3 m distance)
	Quasi-peak (dBμV/m)	Quasi-peak (dBμV/m)
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
Note 1 The lower limit shall apply at the transition frequency. Note 2 Additional provisions may be required for cases where interference occurs. Note 3 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)	Class A Equipment (10 m distance)	Class B Equipment (10 m distance)
	Quasi-peak (dBμV/m)	Quasi-peak (dBμV/m)
30 to 230	40	30
230 to 1 000	47	37

(2) Limits for Radiated Emission above 1 000MHz at a measuring distance of 3 m

Frequency (GHz)	Class A Equipment		Class B Equipment	
	Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)
1 to 40	80	60	74	54

Note) 1. Emission Level = Reading Value + loss - gain + Ant Factor

2. Margin = Limit - Emission level

3. loss = Cable loss, gain = Amp gain, Ant Factor = Antenna Factor

Test Result

< 30 MHz ~ 1 GHz >

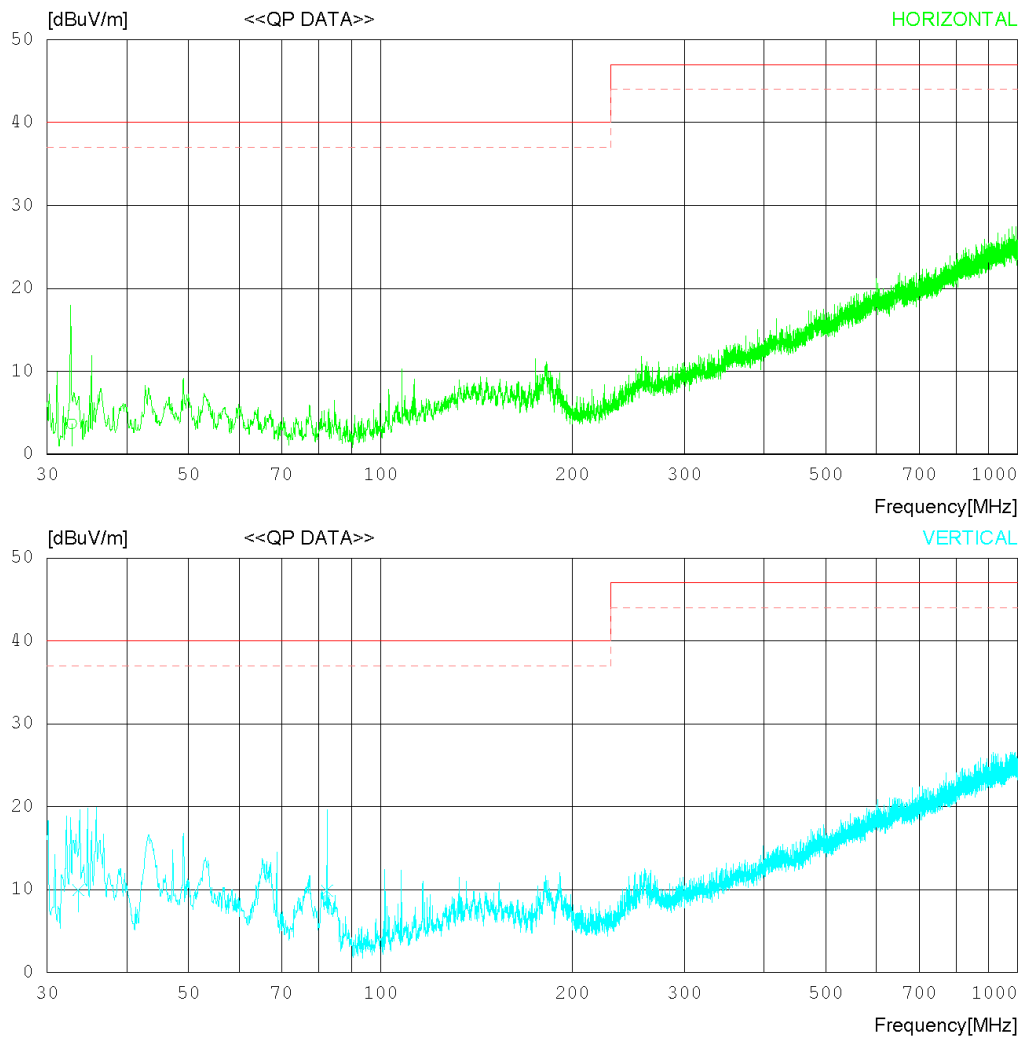
RADIATED EMISSION

Date 2017-09-27

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 48 % R.H.
Test Condition

Memo

LIMIT : CISPR Pub.32 Class A (10m)
MARGIN: 3 dB



RADIATED EMISSION

Date 2017-09-27

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 48 % R.H.
Test Condition

Memo

LIMIT : CISPR Pub.32 Class A (10m)
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	32.791	22.20	10.67	1.30	30.52	3.65	40.00	36.35	355	231
----- Vertical -----										
2	33.605	28.41	10.74	1.31	30.51	9.95	40.00	30.05	196	150
3	82.501	30.09	8.10	2.07	30.38	9.88	40.00	30.12	100	0

< (1 ~ 6) GHz _ Peak >

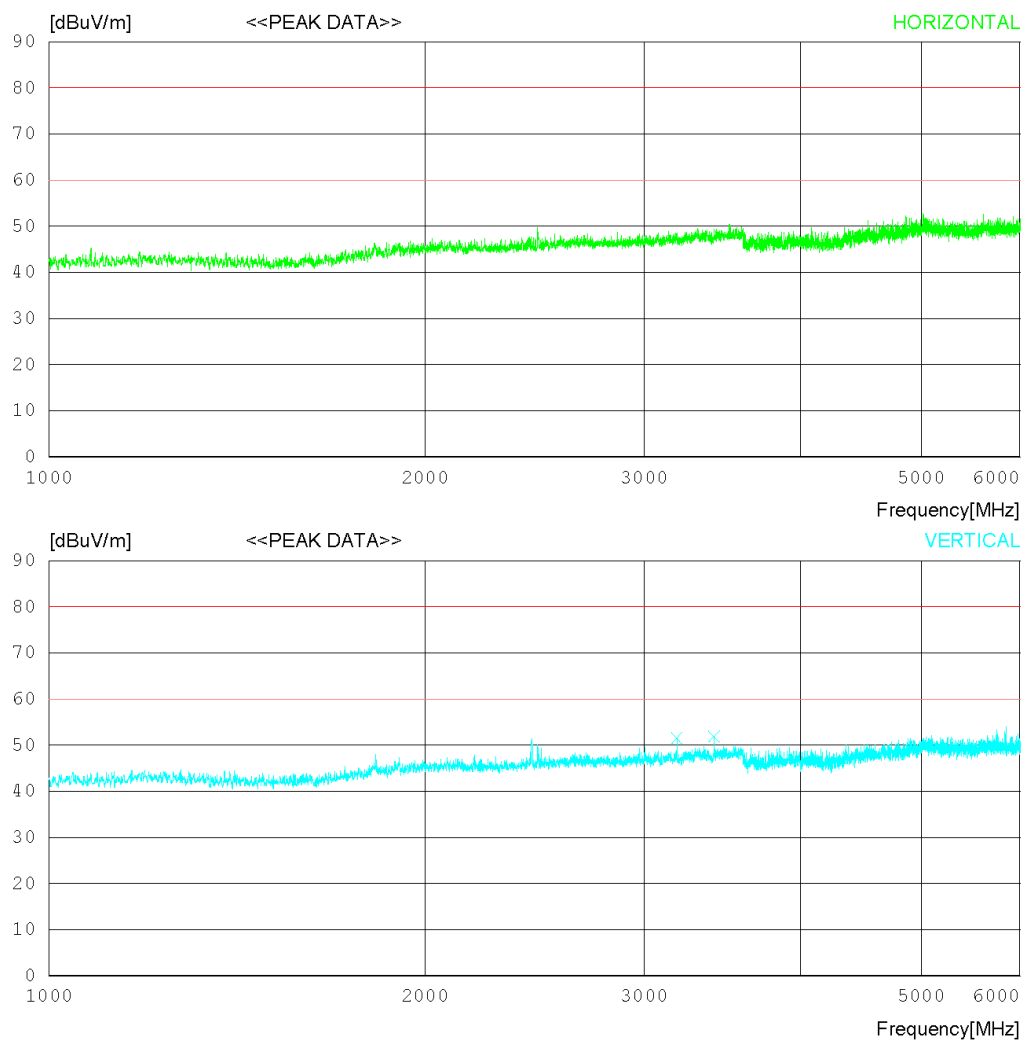
RADIATED EMISSION

Date 2017-09-26

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H.
Test Condition

Memo

LIMIT : FCC_CLASS A _PK_1-18G
FCC_CLASS A_AV_1-18G



RADIATED EMISSION

Date 2017-09-26

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H.
Test Condition

Memo

LIMIT : FCC_CLASS A__PK_1-18G
FCC_CLASS A_AV_1-18G

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]
----- Vertical -----										
1	3183.693	45.30	32.68	6.16	32.60	51.54	80.0	28.46	100	358
2	3410.000	45.00	32.80	6.63	32.62	51.81	80.0	28.19	100	358

< (1 ~ 6) GHz _ Average >

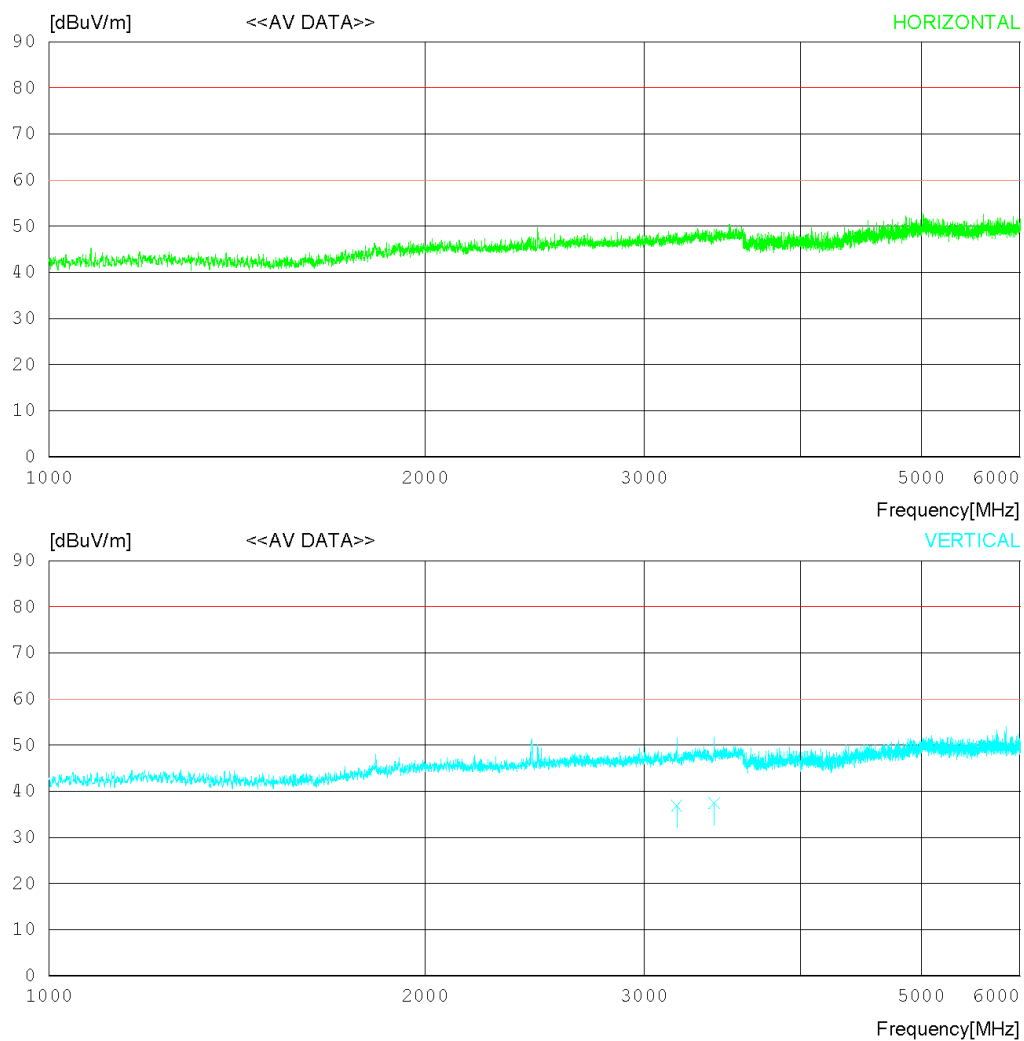
RADIATED EMISSION

Date 2017-09-26

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H.
Test Condition

Memo

LIMIT : FCC_CLASS A_AV_1-18G
FCC_CLASS A_PK_1-18G



RADIATED EMISSION

Date 2017-09-26

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H.
Test Condition

Memo

LIMIT : FCC_CLASS A_AV_1-18G
FCC_CLASS A_PK_1-18G

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]
----- Vertical -----										
1	3183.600	30.60	32.68	6.16	32.60	36.84	60.00	23.16	100	358
2	3411.200	30.60	32.80	6.63	32.62	37.41	60.00	22.59	100	358

< (6 ~ 18) GHz _ Peak >

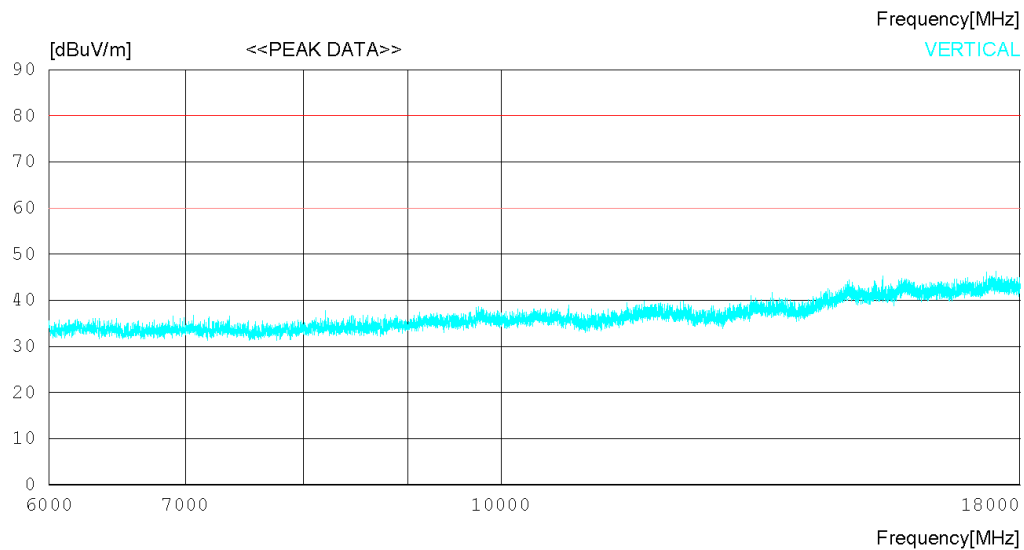
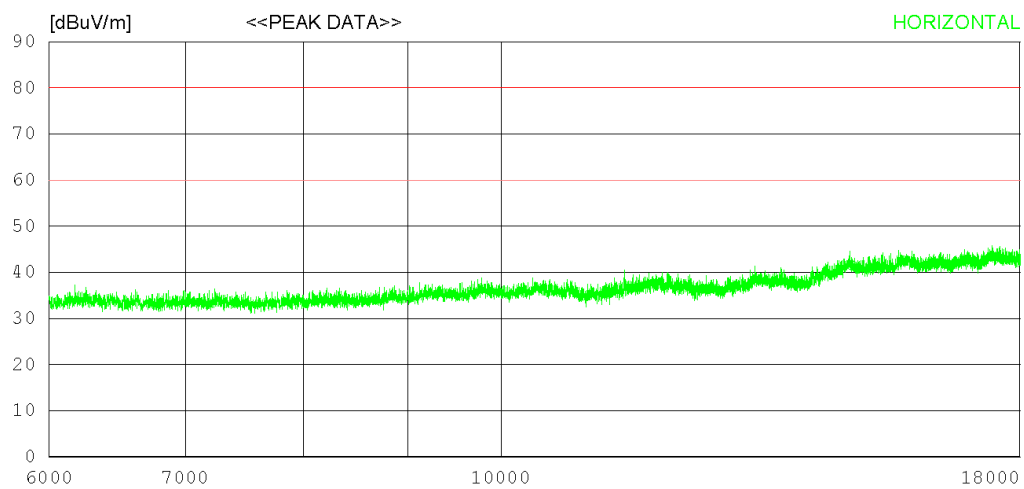
RADIATED EMISSION

Date 2017-09-28

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H.
Test Condition

Memo

LIMIT : FCC_CLASS A _PK_1-18G
FCC_CLASS A_AV_1-18G



RADIATED EMISSION

Date 2017-09-28

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H..
Test Condition

Memo

LIMIT : FCC_CLASS A__PK_1-18G
FCC_CLASS A_AV_1-18G

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	14883.750	8.10	-2.21	15.60	0.00	41.49	80.0	38.51	100	147
----- Vertical -----										
2	14883.750	7.70	-2.21	15.60	0.00	41.09	80.0	38.91	100	358

< (6 ~ 18) GHz _ Average >

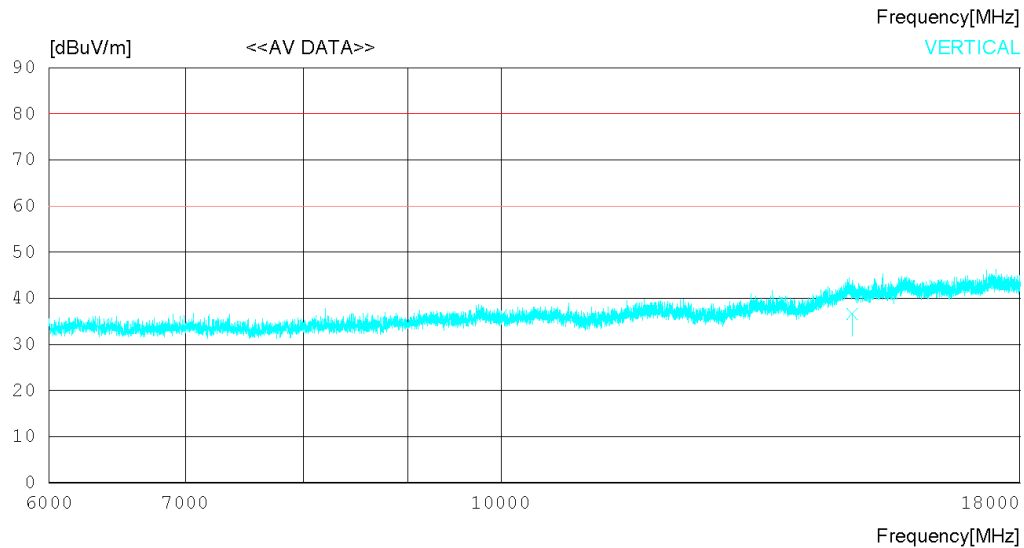
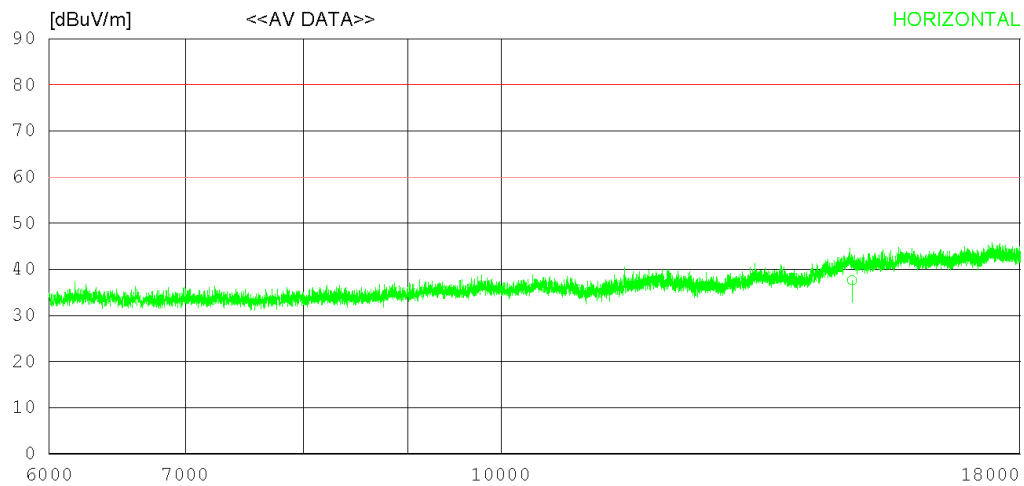
RADIATED EMISSION

Date 2017-09-28

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H..
Test Condition

Memo

LIMIT : FCC_CLASS A_AV_1-18G
FCC_CLASS A_PK_1-18G



RADIATED EMISSION

Date 2017-09-28

Order No. DTNC1709-07003,DTNC1709-07004
Power Supply 120 V 60 Hz
Temp/Humi 23 'C 44 % R.H.
Test Condition

Memo

LIMIT : FCC_CLASS A_AV_1-18G
FCC_CLASS A_PK_1-18G

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	14883.750	4.23	-2.21	15.60	0.00	37.62	60.00	22.38	100	147
----- Vertical -----										
2	14883.750	3.19	-2.21	15.60	0.00	36.58	60.00	23.42	100	358

Appendix 1

List of Test and Measurement Instruments

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment is identified by the Test Laboratory.

1. Conducted Disturbance

Name of Instrument	Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒ MEASUREMENT SOFTWARE	EMI-C VER. 2.00.0143	TSJ	N/A	N/A	N/A
☒ EMI TEST RECEIVER	ESC17	ROHDE & SCHWARZ	100910	2017.02.16	2018.02.16
☒ LISN	NNLK 8121	SCHWARZBECK	06183	2017.04.03	2018.04.03
☒ PULSE LIMITER	ESH3-Z2	ROHDE & SCHWARZ	101334	2017.01.03	2018.01.03
☐ 50 OHM TERMINATOR	CT-01	TME	N/A	2017.01.03	2018.01.03

2. Radiated Disturbance

Name of Instrument	Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒ MEASUREMENT SOFTWARE	EMI-R VER. 2.00.0121	TSJ	N/A	N/A	N/A
☒ EMI TEST RECEIVER	ESU	ROHDE & SCHWARZ	100014	2016.12.23	2017.12.23
☒ TRILOG BROADBAND TEST-ANTENNA	VULB9160	SCHWARZBECK	9160-3363	2016.08.05	2018.08.05
☐ HORN ANTENNA	BBHA9120A	SCHWARZBECK	322	2016.05.13	2018.05.13
☒ AMPLIFIER	MLA-10K01-B01-27	TSJ	1760253	2017.05.12	2018.05.12
☒ PRE AMPLIFIER	8449B	AGILENT	3008A01590	2017.02.20	2018.02.20
☒ EMI TEST RECEIVER	ESR7	ROHDE&SCHWARZ	101061	2017.02.16	2018.02.16
☒ HORN ANTENNA	3117	ETS-LINDGREN	00152093	2016.02.26	2018.02.26
☒ HORN ANTENNA	EM-6969	ELECTRO-METRICS	156	2017.02.10	2019.02.10
☒ PREAMPLIFIER	MLA-0618-B03-34	TSJ	1785642	2017.01.19	2018.01.19

NOTE : The measurement antennas were calibrated in accordance to the requirements of C63.5-2006.

Appendix 2

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None	Original	N/A	N/A