

TEST REPORT

Report No.: 18070906HKG-001

Dartslive International Ltd.

Application For Certification
(Original Grant)

FCC ID: 2ARUU-DL20000

Transceiver

Prepared and Checked by:

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Date: August 20, 2018

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TEST REPORT

GENERAL INFORMATION

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Manufacturer:	Grand Interactive Technology Corporation
Manufacturer Address:	No.632, Sec.3, Kangzhuang Rd., Daxi Township, Taoyuan County 33558, Taiwan (R.O.C)
Brand Name:	DARTSLIVE
Model:	DL2-0000
Type of EUT:	Transceiver
Description of EUT:	Dartslive2 EX
Serial Number:	N/A
FCC ID:	2ARUU-DL20000
Date of Sample Submitted:	July 16, 2018
Date of Test:	July 16, 2018 to August 08, 2018
Report No.:	18070906HKG-001
Report Date:	August 20, 2018
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

TEST REPORT

SUMMARY OF TEST RESULT

Test Specification	Reference	Results
Transmitter Field Strength Frequency Stability	15.225	Pass
Radiated Emission Radiated Emission on the Bandedge	15.209	Pass
Radiated Emission in Restricted Bands	15.205	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2017 Edition

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

TEST REPORT

TABLE OF CONTENTS

1.0	GENERAL DESCRIPTION	5
1.1	Product Description	5
1.2	Related Submittal(s) Grants	5
1.3	Test Methodology	5
1.4	Test Facility	5
2.0	SYSTEM TEST CONFIGURATION.....	6
2.1	Justification.....	6
2.2	EUT Exercising Software.....	6
2.3	Special Accessories	6
2.4	Measurement Uncertainty.....	6
2.5	Support Equipment List and Description.....	6
3.0	EMISSION RESULTS.....	7
3.1	Field Strength Calculation	7
3.2	Radiated Emission Configuration Photograph.....	8
3.3	Radiated Emission Data	8
3.4	Conducted Emission Configuration Photograph	8
3.5	Conducted Emission Data	8
3.6	Frequency Stability	14
4.0	EQUIPMENT PHOTOGRAPHS	16
5.0	PRODUCT LABELLING.....	16
6.0	TECHNICAL SPECIFICATIONS	16
7.0	INSTRUCTION MANUAL.....	16
8.0	MISCELLANEOUS INFORMATION	17
8.1	Measured Bandwidth	17
8.2	Discussion of Pulse Desensitization.....	19
8.3	Calculation of Average Factor	19
8.4	Emissions Test Procedures.....	20
9.0	CONFIDENTIALITY REQUEST	24
10.0	EQUIPMENT LIST.....	24

TEST REPORT

1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment-Under-Test (EUT) Dartslive2 EX is a dart game tower. The EUT contains two 13.56MHz modules which are CardRW and Live Credit (RFID reader). The CardRW module is for the gamer ID recognition and the Live Credit is for the credit adding. The EUT can operate in offline and online mode. The EUT is powered by 120VAC.

Applicant had provided two versions of Live Credit module.

1. JSC530 V3.1 (with LED display)
2. JSC530 V5.1 (without LED display)

Both modules are using the same RF portion and power setting. The only difference is JSC530 V3.1 contains LED display while JSC530 V5.1 without LED display.

Both modules were tested and the worse-case data (JSC530 V5.1) is shown in report only.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber. Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “**Justification Section**” of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

TEST REPORT

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by 120VAC.

Applicant had provided two versions of Live Credit module.

1. JSC530 V3.1 (with LED display)
2. JSC530 V5.1 (without LED display)

Both modules are using the same RF portion and power setting. The only difference is JSC530 V3.1 contains LED display while JSC530 V5.1 without LED display.

Both modules were tested and the worse-case data (JSC530 V5.1) is shown in report only.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emission at and above 30 MHz, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data report in Exhibit 3.0.

For this floor-stand equipment, the unit was operated standalone and placed on insulating material to prevent direct metallic contact of the EUT and reference ground plane.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on the centre of turning platform, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

For simultaneous transmission, both CardRW and Live Credit portions are also switched on when taking radiated emission for determining worst-case spurious emission.

2.2 EUT Exercising Software

The EUT exercise program (if any) used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

2.5 Support Equipment List and Description

N/A

TEST REPORT

3.0 EMISSION RESULTS

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG - AV$$

where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in dB μ V/m

RR = RA - AG - AV in dB μ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V/m}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$LF = 9.0 \text{ dB}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$

TEST REPORT

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 167.705 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 1.8 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 13.562 MHz

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 1.7 dB

TEST REPORT

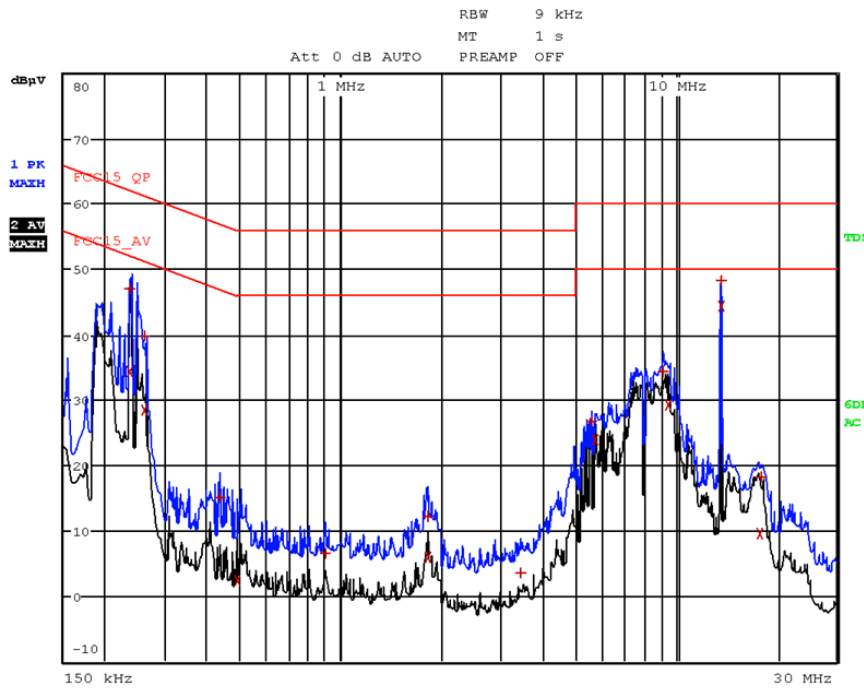
CONDUCTED EMISSION

Model: DL2-0000

Date of Test: August 08, 2018

Worst-Case Operating Mode: CardRW and Live Credit (JSC530 V5.1) Transmitting

Polarity: Live



Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
1	238.000000000 kHz	46.92	Quasi Peak	-5.24
2	238.000000000 kHz	34.41	Average	-27.75
1	262.000000000 kHz	39.75	Quasi Peak	-11.61
2	262.000000000 kHz	28.46	Average	-32.91
1	434.000000000 kHz	15.12	Quasi Peak	-32.06
2	490.000000000 kHz	2.41	Average	-53.76
1	898.000000000 kHz	6.46	Quasi Peak	-39.54
2	1.814000000 MHz	5.98	Average	-50.02
1	1.818000000 MHz	12.26	Quasi Peak	-33.74
1	3.434000000 MHz	3.59	Quasi Peak	-42.41
1	5.598000000 MHz	26.81	Quasi Peak	-23.19
2	5.722000000 MHz	23.86	Average	-36.14
1	9.142000000 MHz	34.38	Quasi Peak	-15.62
2	9.454000000 MHz	29.16	Average	-30.84
1	13.562000000 MHz	48.35	Quasi Peak	-1.65
2	13.562000000 MHz	44.30	Average	-15.70
2	17.790000000 MHz	9.64	Average	-50.36
1	17.910000000 MHz	18.27	Quasi Peak	-31.73

Note: Measurement Uncertainty is ± 4.2 dB at a level of confidence of 95%.

TEST REPORT

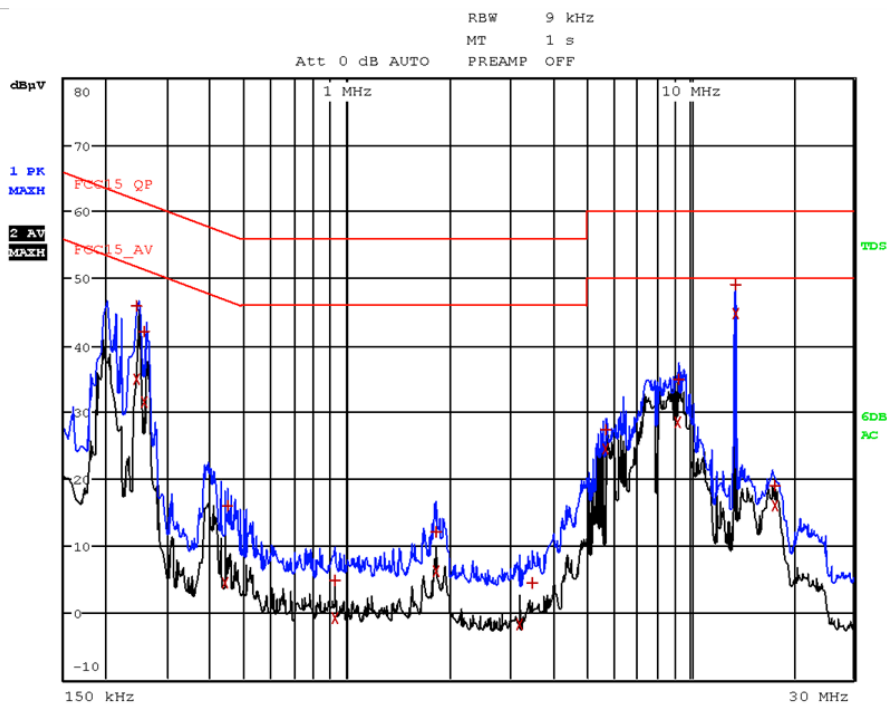
CONDUCTED EMISSION

Model: DL2-0000

Date of Test: August 08, 2018

Worst-Case Operating Mode: CardRW and Live Credit (JSC530 V5.1) Transmitting

Polarity: Neutral



Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
1	246.00000000 kHz	45.79	Quasi Peak	-16.10
2	246.00000000 kHz	34.96	Average	-16.93
1	258.00000000 kHz	42.02	Quasi Peak	-19.48
2	258.00000000 kHz	31.58	Average	-19.92
2	438.00000000 kHz	4.41	Average	-42.69
1	446.00000000 kHz	15.92	Quasi Peak	-41.03
1	918.00000000 kHz	4.81	Quasi Peak	-51.19
2	918.00000000 kHz	-0.79	Average	-46.79
1	1.81000000 MHz	12.02	Quasi Peak	-43.98
2	1.81000000 MHz	6.25	Average	-39.75
2	3.17800000 MHz	-1.82	Average	-47.82
1	3.47000000 MHz	4.51	Quasi Peak	-51.49
1	5.65800000 MHz	27.30	Quasi Peak	-32.70
2	5.65800000 MHz	24.54	Average	-25.46
2	9.20600000 MHz	28.51	Average	-21.49
1	9.26200000 MHz	34.82	Quasi Peak	-25.18
1	13.56200000 MHz	49.02	Quasi Peak	-10.98
2	13.56200000 MHz	44.69	Average	-5.31
2	17.72200000 MHz	16.02	Average	-33.98
1	17.72600000 MHz	18.93	Quasi Peak	-41.07

Note: Measurement Uncertainty is ± 4.2 dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSIONS

Model: DL2-0000

Date of Test: August 08, 2018

Worst-Case Operating Mode: Card RW Transmitting

Table 1
Pursuant to FCC Part 15 Section 15.225 Requirement

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Distance Factor (-dB)	Calculated at 30m (dBμV/m)	Limit at 30m (dBμV/m)	Margin (dB)
O	13.559	30.6	0	10.8	41.4	40.0	1.4	84.0	-82.6
O	27.118	9.3	0	9.5	18.8	40.0	-21.2	29.5	-50.7

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	40.677	28.8	16	10.0	22.8	40.0	-17.2
V	54.236	27.6	16	11.0	22.6	40.0	-17.4
V	67.795	28.6	16	8.0	20.6	40.0	-19.4
V	81.354	31.8	16	7.0	22.8	40.0	-17.2
V	94.913	29.5	16	11.0	24.5	43.5	-19.0
V	108.472	25.5	16	14.0	23.5	43.5	-20.0
V	122.031	23.4	16	14.0	21.4	43.5	-22.1
V	135.590	24.8	16	14.0	22.8	43.5	-20.7
V	139.010	38.8	16	14.0	36.8	43.5	-6.7
H	175.215	38.6	16	19.0	41.6	43.5	-1.9
V	204.367	40.6	16	16.0	40.6	43.5	-2.9
V	225.497	38.8	16	18.0	40.8	46.0	-5.2
H	325.495	29.5	16	24.0	37.5	46.0	-8.5
V	375.837	32.4	16	24.0	40.4	46.0	-5.6
H	448.897	25.4	16	26.0	35.4	46.0	-10.6
H	799.345	18.3	16	31.0	33.3	46.0	-12.7

- NOTES: 1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative sign in the column shows value below limit.
4. Loop antenna is used for the emissions below 30MHz.
5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

TEST REPORT

Model: DL2-0000

Date of Test: August 08, 2018

Worst-Case Operating Mode: Live Credit (JSC530 V5.1) Transmitting

Table 2
Pursuant to FCC Part 15 Section 15.225 Requirement

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Distance Factor (-dB)	Calculated at 30m (dBμV/m)	Limit at 30m (dBμV/m)	Margin (dB)
O	13.560	40.0	0	10.8	50.8	40.0	10.8	84.0	-73.2
O	27.120	9.3	0	9.5	18.8	40.0	-21.2	29.5	-50.7

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	40.680	26.8	16	10.0	20.8	40.0	-19.2
V	54.240	25.6	16	11.0	20.6	40.0	-19.4
V	67.800	30.8	16	8.0	22.8	40.0	-17.2
V	81.360	29.4	16	7.0	20.4	40.0	-19.6
V	94.920	27.2	16	11.0	22.2	43.5	-21.3
V	108.480	23.8	16	14.0	21.8	43.5	-21.7
V	122.040	26.8	16	14.0	24.8	43.5	-18.7
V	135.600	24.4	16	14.0	22.4	43.5	-21.1
V	139.010	36.6	16	14.0	34.6	43.5	-8.9
H	175.215	37.2	16	19.0	40.2	43.5	-3.3
V	204.367	40.8	16	16.0	40.8	43.5	-2.7
V	325.495	30.2	16	24.0	38.2	46.0	-7.8
H	432.030	27.8	16	25.0	36.8	46.0	-9.2
H	799.345	19.8	16	31.0	34.8	46.0	-11.2

- NOTES:
1. Peak Detector Data unless otherwise stated.
 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative sign in the column shows value below limit.
 4. Loop antenna is used for the emissions below 30MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

TEST REPORT

Model: DL2-0000

Date of Test: August 08, 2018

Worst-Case Operating Mode: CardRW and Live Credit (JSC530 V5.1) Transmitting

Table 3
Pursuant to FCC Part 15 Section 15.209 Requirement

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	38.904	36.0	16	10.0	30.0	40.0	-10.0
V	73.304	38.2	16	6.0	28.2	40.0	-11.8
V	108.015	34.5	16	14.0	32.5	43.5	-11.0
V	145.084	43.0	16	14.0	41.0	43.5	-2.5
V	146.018	43.0	16	14.0	41.0	43.5	-2.5
H	167.705	39.7	16	18.0	41.7	43.5	-1.8
H	191.990	40.4	16	16.0	40.4	43.5	-3.1
V	225.490	41.8	16	18.0	43.8	46.0	-2.2
V	226.564	40.8	16	18.0	42.8	46.0	-3.2
V	229.265	39.5	16	18.0	41.5	46.0	-4.5
H	336.000	25.2	16	24.0	33.2	46.0	-12.8
V	396.036	25.0	16	25.0	34.0	46.0	-12.0
V	601.815	21.2	16	29.0	34.2	46.0	-11.8
V	720.016	20.6	16	30.0	34.6	46.0	-11.4
H	935.702	21.6	16	33.0	38.6	46.0	-7.4

- NOTES:
1. Quasi-Peak Detector Data unless otherwise stated.
 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

TEST REPORT

3.6 Frequency Stability

FCC Part 15 Section 15.225

Data Table Frequency Deviation with Voltage Variation

For Card RW

Operating frequency		13.560MHz		
Test Voltage (V)	Temperature (°C)	Measured frequency (MHz)	Frequency error (%)	Limit (%)
120	+ 50	13.560375	+0.0028	±0.01
120	+ 40	13.560336	+0.0025	±0.01
120	+ 30	13.560321	+0.0024	±0.01
120	+ 20	13.560092	+0.0007	±0.01
120	+ 10	13.560126	+0.0009	±0.01
120	0	13.560205	+0.0015	±0.01
120	- 10	13.560159	-0.0012	±0.01
120	- 20	13.560227	-0.0017	±0.01

Nominal frequency Temperature (°C) Humidity (%)	13.560MHz Voltage	Frequency (MHz)	Frequency error (ppm)	Limit (ppm)	Result
20°C 50%	102	13.560028	2.07	100	Pass
20°C 50%	120	13.560092	6.79	100	Pass
20°C 50%	132	13.560126	9.29	100	Pass
Min -30C 0%	102	13.560242	17.85	100	Pass
Min -30C 0%	120	13.560188	13.86	100	Pass
Min -30C 0%	132	13.560254	18.73	100	Pass
Max 50C 50%	102	13.560294	21.68	100	Pass
Max 50C 50%	120	13.560363	26.77	100	Pass
Max 50C 50%	132	13.560341	25.15	100	Pass

The device is deemed to comply with requirement of FCC15.225(e).

TEST REPORT

For Live Credit (JSC530 V5.1)

Operating frequency		13.560MHz		
Test Voltage (V)	Temperature (°C)	Measured frequency (MHz)	Frequency error (%)	Limit (%)
120	+ 50	13.560684	+0.0050	±0.01
120	+ 40	13.560696	+0.0051	±0.01
120	+ 30	13.560728	+0.0054	±0.01
120	+ 20	13.560748	+0.0055	±0.01
120	+ 10	13.560752	+0.0056	±0.01
120	0	13.560768	+0.0057	±0.01
120	- 10	13.560808	+0.0060	±0.01
120	- 20	13.560842	+0.0062	±0.01

Nominal frequency	13.560MHz				
Temperature (°C) Humidity (%)	Voltage	Frequency (MHz)	Frequency error (ppm)	Limit (ppm)	Result
25°C 50%	102	13.560744	54.87	100	Pass
25°C 50%	120	13.560746	55.01	100	Pass
25°C 50%	132	13.560748	55.16	100	Pass
Min -30C 0%	102	13.560840	61.95	100	Pass
Min -30C 0%	120	13.560842	62.09	100	Pass
Min -30C 0%	132	13.560844	62.24	100	Pass
Max 50C 50%	102	13.560682	50.29	100	Pass
Max 50C 50%	120	13.560684	50.44	100	Pass
Max 50C 50%	132	13.560685	50.52	100	Pass

The device is deemed to comply with requirement of FCC15.225(e).

TEST REPORT

4.0 EQUIPMENT PHOTOGRAPHS

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 PRODUCT LABELLING

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 TECHNICAL SPECIFICATIONS

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 INSTRUCTION MANUAL

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

TEST REPORT

8.0 MISCELLANEOUS INFORMATION

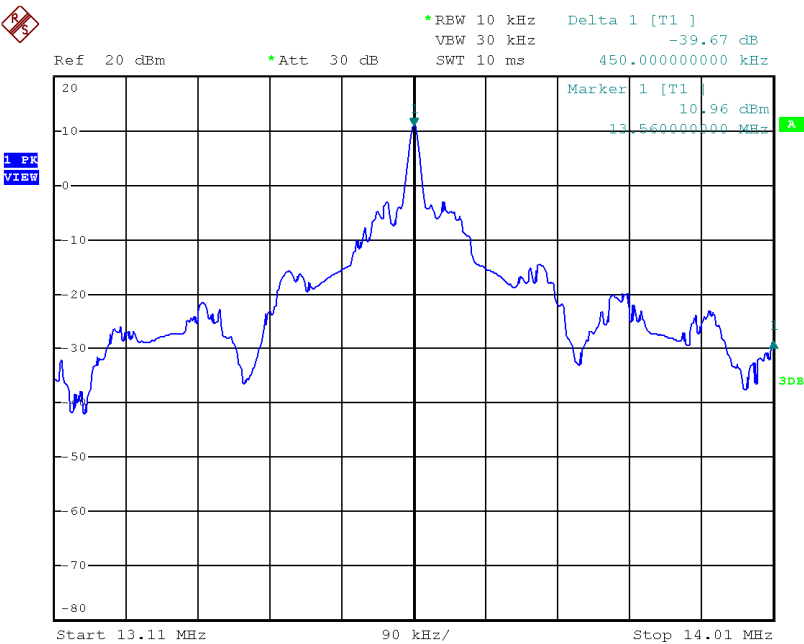
The miscellaneous information includes details of the test procedure.

8.1 Measured Bandwidth

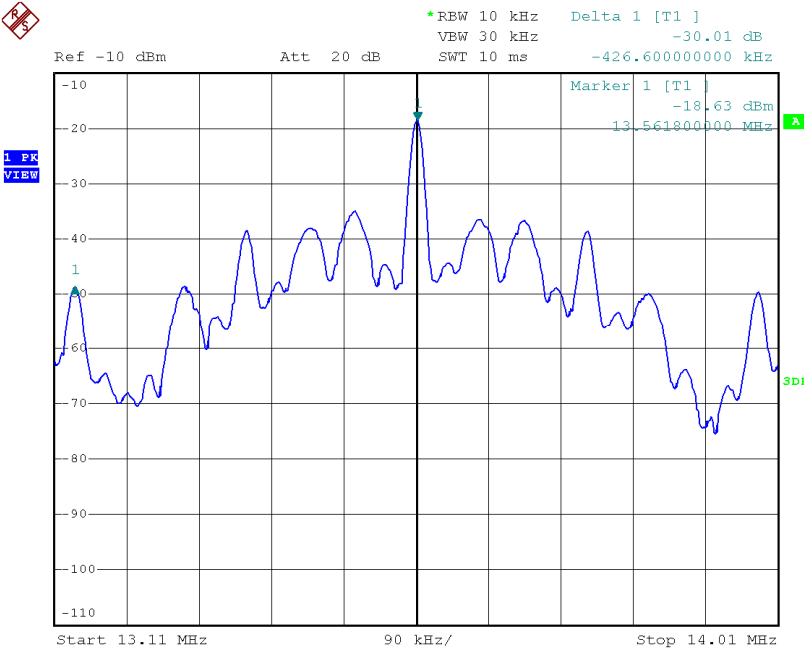
The plot saved in bw.pdf which shows the fundamental emission is confined in the specified band. The emission of the fundamental is 1.4 & 10.8 dB μ V/m and it is below the limit of 50.5 dB μ V/m in the range of (13.410-13.553MHz) and (13.710-14.010MHz) and the limit of 40.5 dB μ V/m in the frequency range of (13.110-14.410MHz) and (13.710-14.010MHz). In the frequency range from 13.110-14.010MHz, we can not find any emission higher than the fundamental emission. Therefore they meet the requirement of Section 15.225(a), (b), (c), & (d).

TEST REPORT

For Card RW



For Live Credit (JSC530 V5.1)



TEST REPORT

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

TEST REPORT

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

TEST REPORT

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.10 (2013).

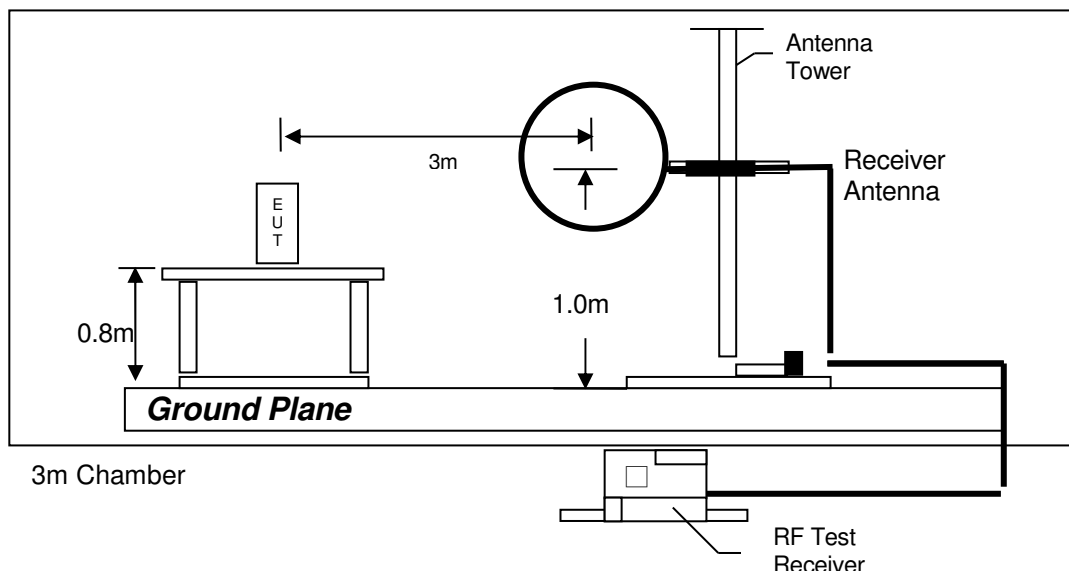
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 3 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

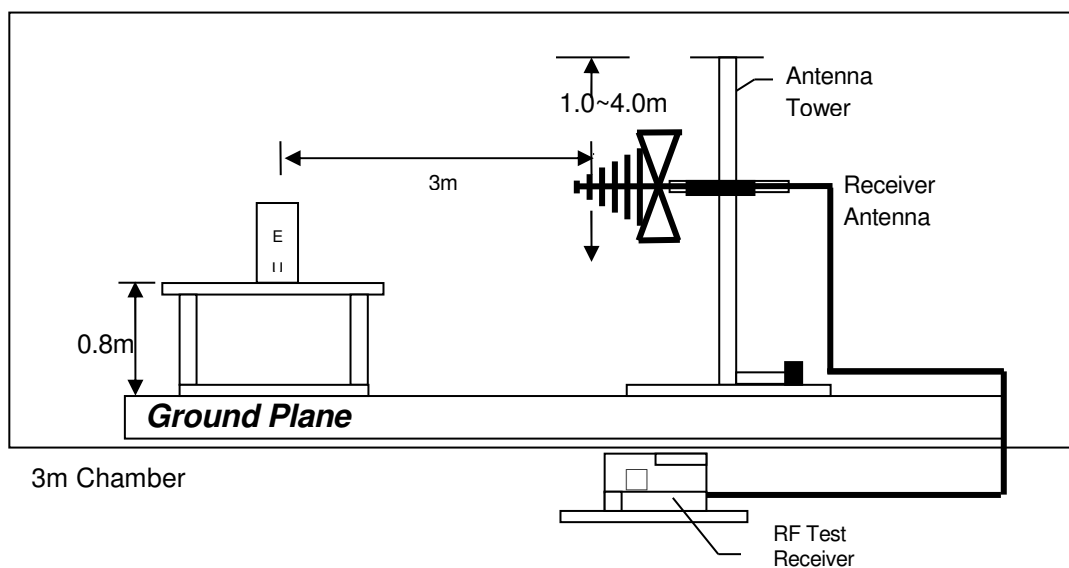
TEST REPORT

8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 30MHz



Test setup of radiated emissions above 1GHz

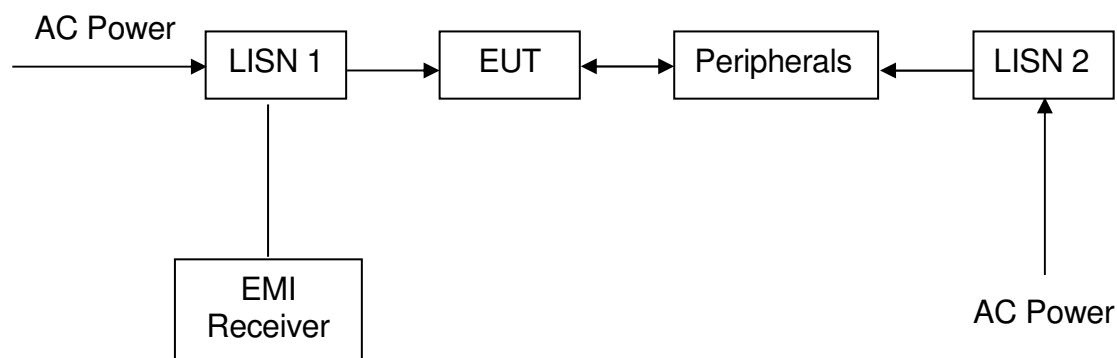
TEST REPORT

8.4.2 Conducted Emission Test Procedures

For tabletop equipment, the EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table. For floor-standing equipment, the EUT and all cables were insulated, if required, from the ground plane by up to 12 mm of insulating material. The EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4.3 Conducted Emission Test Setup



TEST REPORT

9.0 CONFIDENTIALITY REQUEST

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

10.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-3156	EW-0954	EW-0447
Manufacturer	ROHDESCHWARZ	EMCO	EMCO
Model No.	ESR26	3104C	3146
Calibration Date	November 10, 2017	February 27, 2018	January 17, 2018
Calibration Due Date	November 10, 2018	August 27, 2019	July 17, 2019

Equipment	Active Loop H-field (9kHz to 30MHz)	12m Double Shield RF Cable (20MHz to 6GHz)	RF Cable (up to 40GHz)
Registration No.	EW-2313	EW-1852	EW-3155
Manufacturer	ELECTROMETRI	RADIALL	N/A
Model No.	EM-6876	N(m)-RG142 - N(m)	1-40 GHz
Calibration Date	March 08, 2018	January 19, 2018	January 29, 2018
Calibration Due Date	September 08, 2019	January 19, 2019	January 29, 2019

Equipment	Double Ridged Guide Antenna	Pyramidal Horn Antenna	Spectrum Analyzer
Registration No.	EW-1015	EW-0905	EW-3110
Manufacturer	EMCO	EMCO	R&S
Model No.	3115	3160-09	FSP30
Calibration Date	November 17, 2017	August 18, 2017	March 05, 2018
Calibration Due Date	May 17, 2019	February 18, 2019	March 05, 2019

Equipment	RF Pre-amplifier (9kHz to 40GHz)
Registration No.	EW-3006
Manufacturer	SCHWARZBECK
Model No.	BBV 9744
Calibration Date	April 26, 2018
Calibration Due Date	April 26, 2019

TEST REPORT

2) Conducted Emissions Test

Equipment	Artificial Mains Network	RF Cable 120cm (RG142) (9kHz to 30MHz)	EMI Test Receiver
Registration No.	EW-2501	EW-2453	EW-2500
Manufacturer	ROHDESCHWARZ	RADIALL	ROHDESCHWARZ
Model No.	ENV-216	bnc m st / 142 / bnc m st	ESCI
Calibration Date	February 14, 2018	September 15, 2017	October 13, 2017
Calibration Due Date	February 14, 2019	September 15, 2018	October 13, 2018

3) Bandedge Measurement

Equipment	Spectrum Analyzer	RF Cable 120cm (RG142) (9kHz to 30MHz)
Registration No.	EW-2329	EW-2453
Manufacturer	R&S	RADIALL
Model No.	FSP3	bnc m st / 142 / bnc m st
Calibration Date	September 28, 2017	September 15, 2017
Calibration Due Date	September 28, 2018	September 15, 2018

4) Frequency Deviation Measurement

Equipment	Frequency Counter (up to 3GHz)	RF Cable 120cm (RG142) (9kHz to 30MHz)	Temperature & Humidity Chamber (2 chambers inside) (Top + Bottom)
Registration No.	EW-2288	EW-2453	EW-2395
Manufacturer	AGILENTTECH	RADIALL	GIANT FORCE
Model No.	53181A	bnc m st / 142 / bnc m st	GTH-210-40-SP-AR
Calibration Date	August 01, 2017	September 15, 2017	August 29, 2017
Calibration Due Date	February 01, 2019	September 15, 2018	September 04, 2018

Equipment	Spectrum Analyzer
Registration No.	EW-2329
Manufacturer	R&S
Model No.	FSP3
Calibration Date	September 28, 2017
Calibration Due Date	September 28, 2018

END OF TEST REPORT