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 : DRTFCC1810-0248(1)
2. Customer
   - Name : LINE Friends Corporation
   - Address : 200, Itaewon-ro, Yongsan-gu, Seoul, South Korea
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : WIRELESS CHARGER / LFBT21-WCP-2018-1
   FCC ID : 2AQTS-LFBT21-WCP
5. Test Method Used : ANSI C63.10 - 2013
   Test Specification : FCC Part 15 Subpart C
6. Date of Test : 2018.09.19 ~ 2018.09.21
7. Testing Environment : See appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name : SunGeun Lee (Signature)	Reviewed by Name : Geunki Son (Signature)

2018 . 11 . 05 .

DT&C Co., Ltd.

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

Test Report Version

Test Report No.	Date	Description
DRTFCC1810-0248	Oct. 12, 2018	Initial issue
DRTFCC1810-0248(1)	Nov. 05, 2018	Update of Equipment information

CONTENTS

1. General Information

1.1. Testing Laboratory

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014. **- FCC MRA Accredited Test Firm No. : KR0034**		
www.dtnc.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.2. Testing Environment

Ambient Condition	
▪ Temperature	23 ℃ ~ 25 ℃
▪ Relative Humidity	45 % ~ 52 %

1.3. Measurement Uncertainty

Test items	Measurement uncertainty
AC conducted emission	2.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)

1.4. Details of Applicant

Applicant	:	LINE Friends Corporation
Address	:	200, Itaewon-ro, Yongsan-gu, Seoul, South Korea
Contact person	:	JaeHong Noh

1.5. Description of EUT

FCC Equipment Class	Part 15 Low Power Transmitter Below 1705 kHz (DCD)
Equipment type	WIRELESS CHARGER
Equipment model name	LFBT21-WCP-2018-1
Equipment add model name	LFBT21-WCP-2018-2, LFBT21-WCP-2018-3, LFBT21-WCP-2018-4, LFBT21-WCP-2018-5, LFBT21-WCP-2018-6, LFBT21-WCP-2018-7, LFBT21-WCP-2018-8
Equipment serial no.	Identical prototype
Hardware Version	N10TX_V2
Software Version	N10_V1.0
Frequency	111 kHz ~ 205 kHz
Output power	Max : 5 W, 10 W
Power Supply	DC 5 V, 9 V
Antenna type	Coil Antenna

2. Information about test items

2.1 Test mode

This device has been tested with the below test modes and charging current conditions:

Test Mode	Output Power	Charging current	Support Equipment
TM1	5 W	1 A	Client device(Passive Coil)
TM2	10 W	1.1 A	Client device(Passive Coil)

2.2 Support equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Passive Coil	NA	NA	LINE Friends Corporation	5V, 1A
Passive Coil	NA	NA	LINE Friends Corporation	9V, 1.1A

Note: The above equipment was supported by manufacturer.

2.3 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Antenna requirements

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

The antenna is permanently attached.

Please refer to the internal photo. Therefore this E.U.T Complies with the requirement of §15.203

4. Test Report

4.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
2.1049	20 dB Bandwidth	N/A	Radiated	C
15.209	Radiated Emission	FCC 15.209 limits		C
15.207	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

:

4.2 Transmitter requirements

4.2.1 20 dB Bandwidth

- Procedure:

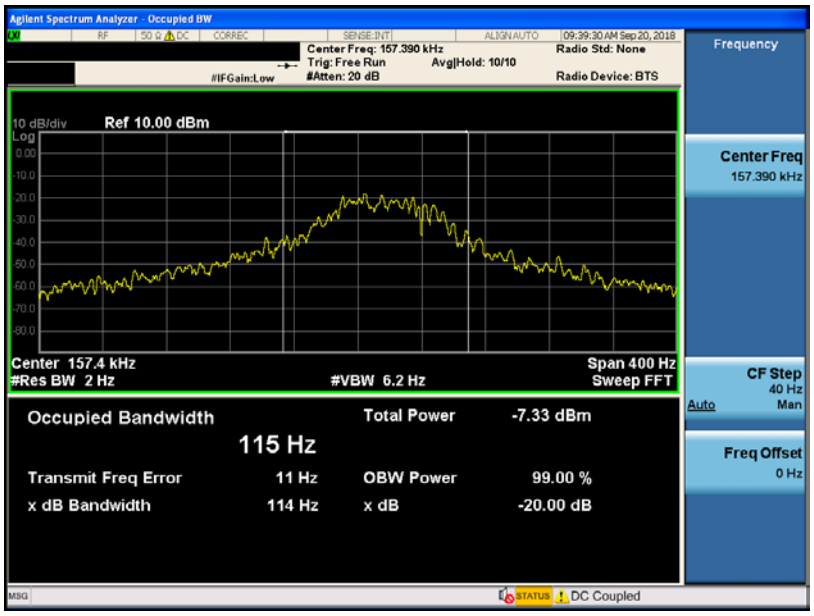
The 20 dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.
And spectrum analyzer setting use following test procedure of **ANCSI C63.10-2013 – Section 6.9.2.**

1. Center frequency = EUT channel center frequency
2. Span = 2 ~ 5 times the OBW
3. RBW = 1 % ~ 5 % OBW
4. VBW ≥ 3 x RBW
5. Detector = Peak
6. Trace = Max hold
7. The trace was allowed to stabilize
8. Determine the reference value = Set the spectrum analyzer marker to the highest level of the displayed trace
9. Using the marker-delta function of the instrument, determine the "−xx dB down amplitude" using [(reference value) − xx].
10. Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

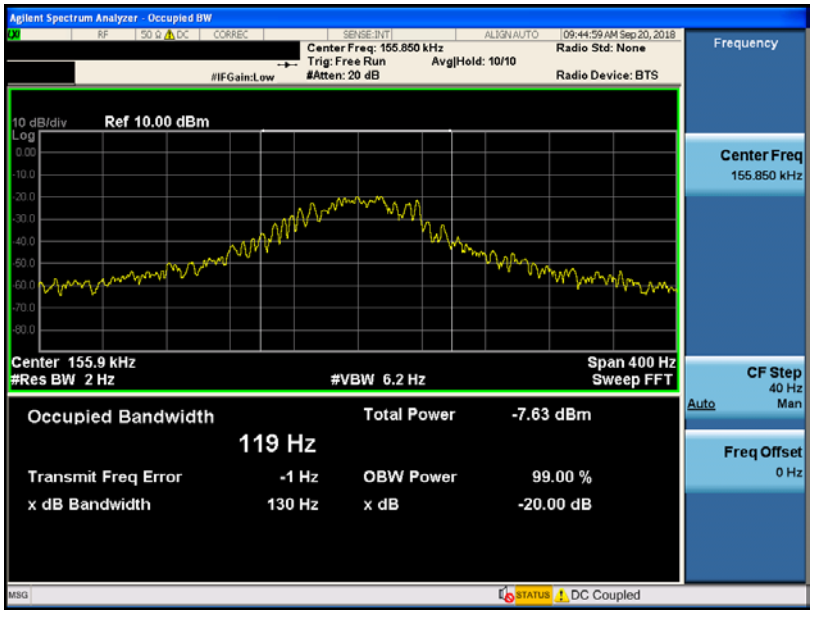
- Measurement Data: Comply

Test mode	Tested Frequency(kHz)	20dB Bandwidth(kHz)
TM 1	157.400	**0.114**
TM 2	155.900	**0.130**

-TM 1



-TM 2



- **Minimum Standard: NA**

4.2.2 Radiated Emissions

- Limit: FCC Part 15.209(a)

Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

- Procedure:

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- Measurement Data: Comply (refer to the next page)

- Measurement Data:

Measurement Distance : **3 Meters**

Tested Mode	Emissions (Note 1)	Freq. [MHz]	Worst case ANT pol (Note 2)	Reading [dBuV]	T.F [dB/m]	D.C.F.	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
TM 1	F	0.155	P	65.60	18.63	80	4.23	23.80	19.57
	S	0.625	P	23.20	18.68	40	1.88	31.69	29.81
	S	0.785	P	28.80	18.70	40	7.50	29.71	22.21
	S	1.110	P	23.10	18.75	40	1.85	26.70	24.85
	S	1.430	P	22.30	18.82	40	1.12	24.50	23.38
	S	1.746	P	21.90	18.90	40	0.80	29.54	28.74
	S	41.398	V	42.00	-9.89	NA	32.11	40.00	7.89
	S	96.323	H	47.60	-12.70	NA	34.90	43.50	8.60
	S	170.889	H	39.40	-8.12	NA	31.28	43.50	12.22
	S	244.480	H	35.90	-9.12	NA	26.78	46.00	19.22
TM 2	F	0.155	P	62.60	18.63	80	1.23	23.80	22.57
	S	0.785	P	30.00	18.70	40	8.70	29.71	21.01
	S	1.101	P	23.20	18.75	40	1.95	26.77	24.82
	S	1.416	P	17.50	18.82	40	-3.68	24.58	28.26
	S	35.820	V	40.20	-10.58	NA	29.62	40.00	10.38
	S	96.323	H	32.50	-12.70	NA	19.80	43.50	23.70
	S	350.091	H	27.80	-5.04	NA	22.76	46.00	23.24

Note 1. "F" = Fundamental emission **/** "S" = Spurious emission **/** "*" = Noise Floor

Note 2. Loop antenna orientation (30 MHz Below)
"P"= Parallel, "V"= perpendicular, "G"= ground-parallel
Bilog antenna polarization (30 MHz above)
"H"= Horizontal, "V"= Vertical

Note 3. All data were recorded using a spectrum analyzer employing a peak detector.
If PK results were meet Quasi-peak limit, Quasi-peak measurements were omitted.

Note 4. No other spurious and harmonic emissions were reported greater than listed emissions above table.

Note 5. Sample calculation
Margin = Limit – Field Strength
Field Strength = Reading + T.F – Distance factor
T.F = AF + CL – AG
Distance factor = 20log(Measurement distance / The measured distance)^2
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

4.2.3 AC Line Conducted Emissions

- Test Requirements and limit

For an intentional radiator that is designed to be connected to the public utility (AC)power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration:

See test photographs for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

Measurement Data: **Comply** (refer to the next page)

Measurement Data (5W)

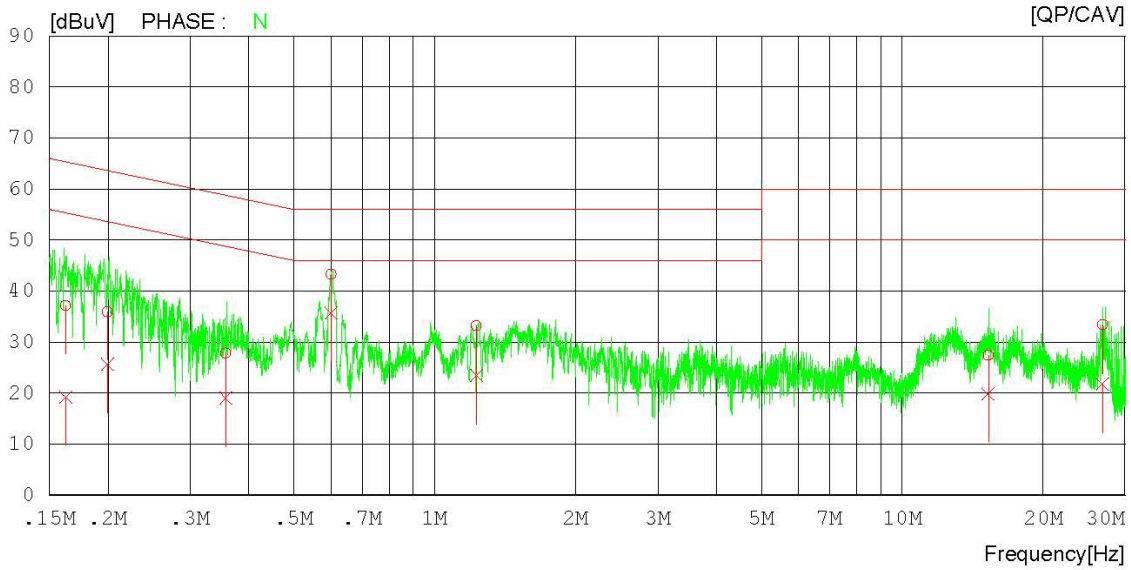
Results of Conducted Emission

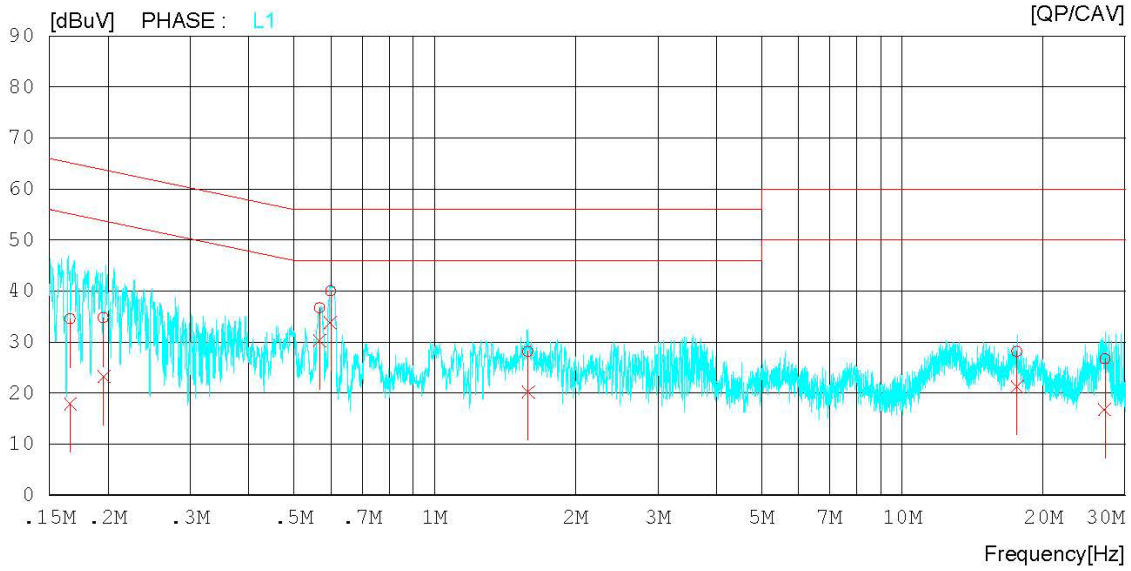
DTNC Date 2018-09-21

Order No.		Referrence No.	
Model No.	LFBT21-WCP-2018-1	Power Supply	120 V / 60Hz
Serial No.		Temp/Humi.	25 'C / 45 %
Test Condition	5W	Operator	S.G.LEE

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV





Measurement Data (5W)

Results of Conducted Emission

DTNC Date 2018-09-21

Order No.		Referrence No.	
Model No.	LFBT21-WCP-2018-1	Power Supply	120 V / 60Hz
Serial No.		Temp/Humi.	25 'C / 45 %
Test Condition	5W	Operator	S.G.LEE

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.16251	27.00	8.99	10.21	37.21	19.20	65.33	55.33	28.12	36.13	N
2	0.19961	25.92	15.64	9.99	35.91	25.63	63.63	53.63	27.72	28.00	N
3	0.35742	17.80	8.97	10.02	27.82	18.99	58.79	48.79	30.97	29.80	N
4	0.60073	33.23	25.69	10.03	43.26	35.72	56.00	46.00	12.74	10.28	N
5	1.22920	23.11	13.43	10.06	33.17	23.49	56.00	46.00	22.83	22.51	N
6	15.26440	16.91	9.39	10.48	27.39	19.87	60.00	50.00	32.61	30.13	N
7	26.81880	22.74	11.10	10.65	33.39	21.75	60.00	50.00	26.61	28.25	N
8	0.16628	24.32	7.64	10.16	34.48	17.80	65.14	55.14	30.66	37.34	L1
9	0.19567	24.70	13.18	9.99	34.69	23.17	63.79	53.79	29.10	30.62	L1
10	0.56715	26.72	20.21	10.00	36.72	30.21	56.00	46.00	19.28	15.79	L1
11	0.59892	29.98	23.73	10.00	39.98	33.73	56.00	46.00	16.02	12.27	L1
12	1.58400	18.06	10.13	10.05	28.11	20.18	56.00	46.00	27.89	25.82	L1
13	17.60240	17.67	10.74	10.48	28.15	21.22	60.00	50.00	31.85	28.78	L1
14	27.11760	16.07	6.14	10.60	26.67	16.74	60.00	50.00	33.33	33.26	L1

Measurement Data (10W)

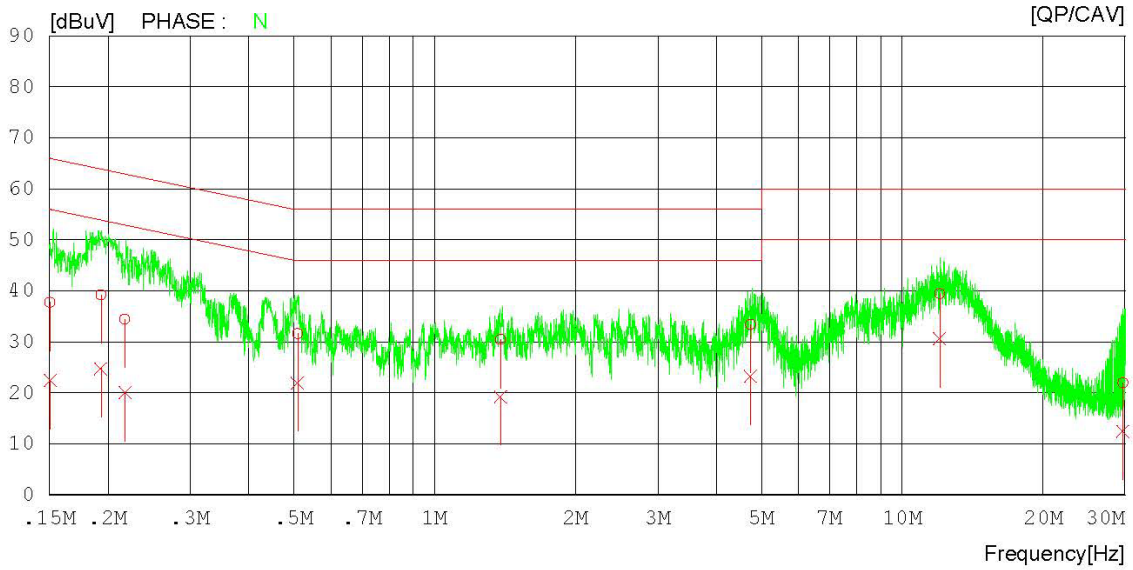
Results of Conducted Emission

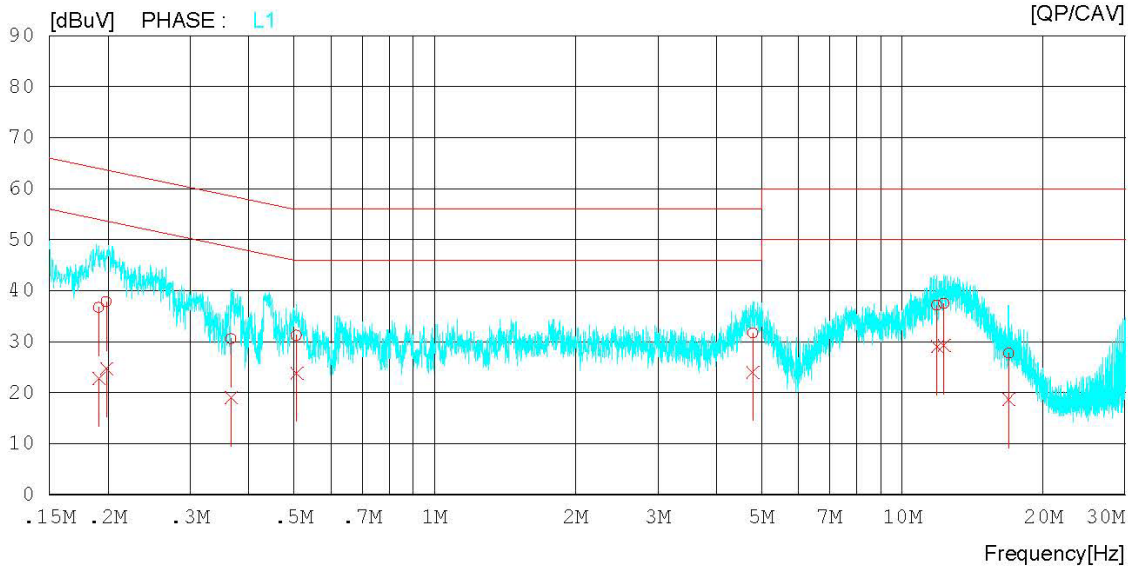
DTNC Date 2018-09-21

Order No.		Referrence No.	
Model No.	LFBT21-WCP-2018-1	Power Supply	120 V / 60Hz
Serial No.		Temp/Humi.	25 'C / 45 %
Test Condition	10W	Operator	S.G.LEE

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV





Measurement Data (5W)

Results of Conducted Emission

DTNC Date 2018-09-21

Order No.		Referrence No.	
Model No.	LFBT21-WCP-2018-1	Power Supply	120 V / 60Hz
Serial No.		Temp/Humi.	25 'C / 45 %
Test Condition	10W	Operator	S.G.LEE

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15061	27.44	12.11	10.28	37.72	22.39	65.97	55.97	28.25	33.58	N
2	0.19325	29.22	14.69	10.03	39.25	24.72	63.90	53.90	24.65	29.18	N
3	0.21755	24.46	10.04	9.99	34.45	20.03	62.91	52.91	28.46	32.88	N
4	0.50906	21.55	11.91	10.01	31.56	21.92	56.00	46.00	24.44	24.08	N
5	1.38320	20.38	9.17	10.07	30.45	19.24	56.00	46.00	25.55	26.76	N
6	4.73400	23.27	13.05	10.19	33.46	23.24	56.00	46.00	22.54	22.76	N
7	12.02140	29.03	20.25	10.39	39.42	30.64	60.00	50.00	20.58	19.36	N
8	29.65340	11.25	1.68	10.72	21.97	12.40	60.00	50.00	38.03	37.60	N
9	0.19150	26.64	12.77	10.02	36.66	22.79	63.97	53.97	27.31	31.18	L1
10	0.19855	27.79	14.65	9.98	37.77	24.63	63.67	53.67	25.90	29.04	L1
11	0.36682	20.54	9.03	9.98	30.52	19.01	58.57	48.57	28.05	29.56	L1
12	0.50699	21.25	13.81	9.99	31.24	23.80	56.00	46.00	24.76	22.20	L1
13	4.79040	21.49	13.86	10.16	31.65	24.02	56.00	46.00	24.35	21.98	L1
14	11.86660	26.77	18.68	10.34	37.11	29.02	60.00	50.00	22.89	20.98	L1
15	12.27700	27.13	18.90	10.35	37.48	29.25	60.00	50.00	22.52	20.75	L1
16	16.89420	17.20	8.16	10.47	27.67	18.63	60.00	50.00	32.33	31.37	L1

APPENDIX I

TEST EQUIPMENT FOR TESTS

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	17/12/28	18/12/28	MY49060056
Multimeter	FLUKE	17B	17/12/26	18/12/26	26030065WS
IN/OUT Thermohygrometer	SATO	PC-5000TRH-II	18/07/18	19/07/18	N/A
Thermohygrometer	BODYCOM	BJ5478	18/01/03	19/01/03	120612-1
HYGROMETER	TESTO	608-H1	18/02/10	19/02/10	34862883
Signal Generator	Rohde Schwarz	SMBV100A	17/12/27	18/12/27	255571
Loop Antenna	Schwarzbeck	FMZB1513	18/01/30	20/01/30	1513-128
Biglog Antenna	Schwarzbeck	VULB 9160	18/07/13	20/07/13	3359
PreAmplifier	TSJ	MLA-010K01-B01-27	18/01/11	19/01/11	2005354
EMI TEST RECEIVER	Rohde Schwarz	ESCI7	18/02/12	19/02/12	100910
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	17/09/29	18/09/29	101333
LISN	SCHWARZBECK	NNLK 8121	18/03/20	19/03/20	06183
EMI Test Receiver	Rohde Schwarz	ESW44	18/08/06	19/08/06	101645
Cable	DT&C	CABLE	18/07/05	19/07/05	RF-82
Cable	HUBER+SUNNER	SUCOFLEX	17/12/22	18/12/22	C-1
Cable	HUBER+SUNNER	SUCOFLEX	17/12/22	18/12/22	C-2
Cable	HUBER+SUNNER	SUCOFLEX	17/12/22	18/12/22	C-3
Cable	HUBER+SUNNER	SUCOFLEX	17/12/22	18/12/22	C-4