

TEST REPORT

Report Number : A-003-16-C

Date of Issue: 6 July 2016

FCC Rules and Regulations Part 15 Subpart C Intentional Radiators.

This test report is to certify that the device was tested according to the requirements of the above.
The results of this report should not be construed to imply compliance of devices other than the sample tested.
Without the laboratory approval by the documents, this report should not be copied in part.

1. Applicant

Company Name : Panasonic Corporation
Mailing Address : 1-15, Matsuo-cho, Kadoma-shi, Osaka, Japan

2. Identification of Tested Device

Type of Device : Transmitter
FCC ID : ACJ-LB-DF71
Device Name : Data Archiver
Model Number : LB-DF71
Serial Number : Sample1
Trade Name : Panasonic
Type of Test : ☐ Production ☐ Pre-production ☒ Prototype

3. Test Items

AC Power Line Conducted Emission Measurement	☒ Pass	☐ Fail	☐ N/A
Radiated Emission (The Frequency Range of 9kHz to 30MHz)	☒ Pass	☐ Fail	☐ N/A
Radiated Emission (The Frequency Range of above 30MHz)	☒ Pass	☐ Fail	☐ N/A
20dB Bandwidth Measurement	☒ Pass	☐ Fail	☐ N/A
Frequency Tolerance of Carrier Signal	☒ Pass	☐ Fail	☐ N/A

Refer the below reason(s) with respect to the decision and justification not to test.

(*1) EUT Specifications (*2) Request of Applicant (*3) According to Test Plan

KEC Electronic Industry Development Center Testing Division
3-2-2, Hikari-dai, Seika-cho, Soraku-gun, Kyoto 619-0237 Japan

Test Engineer(s)



Naoki Norimoto



Approved by



Ikuya Minematsu / Group Manager

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1. REVISION HISTORY

Report Version	Page	Description	Date of Issue	Status
A	-	Initial issue of report	6 July 2016	Original

2. LABORATORY INFORMATION

2.1. Laboratory Accreditation

The KEC has been accredited by the following organizations based on their criteria for testing laboratory (ISO/IEC 17025).

- | | |
|---|----------------------------------|
| (1) Japan Accreditation Board for Conformity Assessment (JAB) | : Accreditation Number: RTL02810 |
| (2) Voluntary EMC Laboratory Accreditation Center Inc. (VLAC) | : Accreditation Number: VLAC-005 |

2.2. Test Facility

All tests described in this report were performed by:

Name: KEC Electronic Industry Development Center
Testing Division

Address: 3-2-2, Hikari-dai, Seika-cho, Soraku-gun, Kyoto 619-0237 Japan

Anechoic Chamber	:	☒ No.1	☐ No.2	☐ No.3	☐ No.6	☐ No.7
		☐ No.8	☐ No.9	☐ No.10	☐ No.11	☐ No.12
Shielded Room	:	☐ No.1	☐ No.7	☐ No.8	☒ No.9	☐ No.10
Harmonic Current Meas. Room	:	☐				

2.3. Measurement Uncertainty

The result of a measurement is only an approximation or estimate of the value of a specific quantity. And thus the measurand is complete only when a statement of uncertainty is given. KEC quotes Measurement Uncertainty (U) as follows.

Conducted Disturbance at Mains Port (150kHz-30MHz)	+2.5 / -2.8 dB
Conducted Disturbance at Mains Port (9kHz-30MHz)	+2.9 / -3.5 dB
Conducted Disturbance at Telecommunication Ports ISN method (None-Shield type)	+2.5 / -2.7 dB
Conducted Disturbance at Telecommunication Ports ISN method (Shield type)	+2.5 / -2.7 dB
Conducted Disturbance at Telecommunication Ports Current Probe method	+2.3 / -2.8 dB
Conducted Disturbance at Telecommunication Ports 150Ω Load voltage method	+2.0 / -2.6 dB
Conducted Disturbance at Telecommunication Ports None Invasive method	+2.9 / -3.9 dB
Conducted Disturbance at Lead Terminals and Additional Terminals	+1.8 / -2.1 dB
Disturbance Power (30MHz -300MHz)	+3.3 / -3.4 dB
Radiated Disturbance at Frequency Range from 9kHz up to 30MHz 60cm Loop Antenna method	+3.7 / -4.4 dB
Radiated Disturbance at Frequency Range from 9kHz up to 30MHz LLA method	+1.4 / -1.5 dB
Radiated Disturbance at Frequency Range from 30MHz up to 300MHz 3m method	+3.4 / -3.9 dB
Radiated Disturbance at Frequency Range from 300MHz up to 1GHz 3m method	+3.5 / -3.9 dB
Radiated Disturbance at Frequency Range from 30MHz up to 300MHz 10m method	+3.2 / -3.9 dB
Radiated Disturbance at Frequency Range from 300MHz up to 1GHz 10m method	+3.6 / -4.5 dB
Radiated Disturbance at Frequency Range from 30MHz up to 1GHz 10m method (Hybrid Antenna used measurement)	+4.1 / -4.6 dB
Radiated Disturbance at Frequency Range from 1GHz up to 6GHz 3m method	+4.7 / -6.0 dB
Radiated Disturbance at Frequency Range from 6GHz up to 26.5GHz 3m method	+4.5 / -5.1 dB
Harmonics Currents Emissions	+/- 5.7 %
Voltage Change, Voltage Fluctuations and Flicker	+/- 5.3 %

Expiration Date : 2016/9/30

The above values are calculated as Expanded Uncertainty (k=2 [95%]).

[Note]

If the measured result is below the specification limit and a margin is less than the above measurement uncertainty, it is impossible to determine compliance at a level of confidence of 95%. However, the measured result indicates high probability that the tested device complies with the specification limit.



3. GENERAL INFORMATION

3.1. Product Description

(1) Technical Specifications

- Maximum data size : 1641.6TB
- Maximum transfer rate : 432MB/s (RAID0)
- Number of Installed Drive : 3 drive units
- Medium : 3.6 TB recordable magazine
- Number of magazine drawers : 10 drawers(Left and right)
- Maximum number of magazines : Up to 76

(2) Maximum Oscillators Frequency

- OPTICAL PICK UP HFM : 370±20MHz

(3) Radio Specifications

- Tx Operating Frequency : 13.56MHz

(4) Software Version

- ASPI : 1.29
- TERATERM : 4.77

(5) Firmware Version

: 0.9.72

(6) Interface and Provide Terminal

- CONTROL PORT : Changer control/Magazine drawer monitoring
- SAS PORT : Host interface

(7) Rated Power Supply

: AC100-277V 50-60Hz
(Test for AC277V 60Hz by the applicant's request)

4. TESTED SYSTEM

4.1. Reference Rule and Specification

(1) Reference Rule and Regulation	: FCC Rule Part 15 Subpart C, Section 15.225 Operation within the band 13.110-14.010 MHz ☒ Section 15.205 ☒ Section 15.207 ☒ Section 15.209 ☒ Section 15.215 ☒ Section 15.225
(2) Test Procedure	: ANSI C63.10-2013

4.2. Date of Test

Receipt of Test Sample : 27 June 2016
 Condition of Test Sample : ☒ Damage is not found on the set.
 ☐ Damage is found on the set. (Details are described in this report)

 Test Completed on : 4 July 2016
 Condition of Test Sample : ☒ Damage is not found on the set.
 ☐ Damage is found on the set. (Details are described in this report)

4.3. Deviation of Standard

☒ without deviation, ☐ with deviation (details are found inside of this report)

4.4. Test Mode

Test items	Test mode	Test frequency
AC Power Line Conducted Emission	Continuous transmission	13.56MHz
Radiated Emission (9kHz to 30MHz)		
Radiated Emission (above 30MHz)		
20dB Emission Bandwidth		
Frequency Tolerance of Carrier Signal		

[Note]

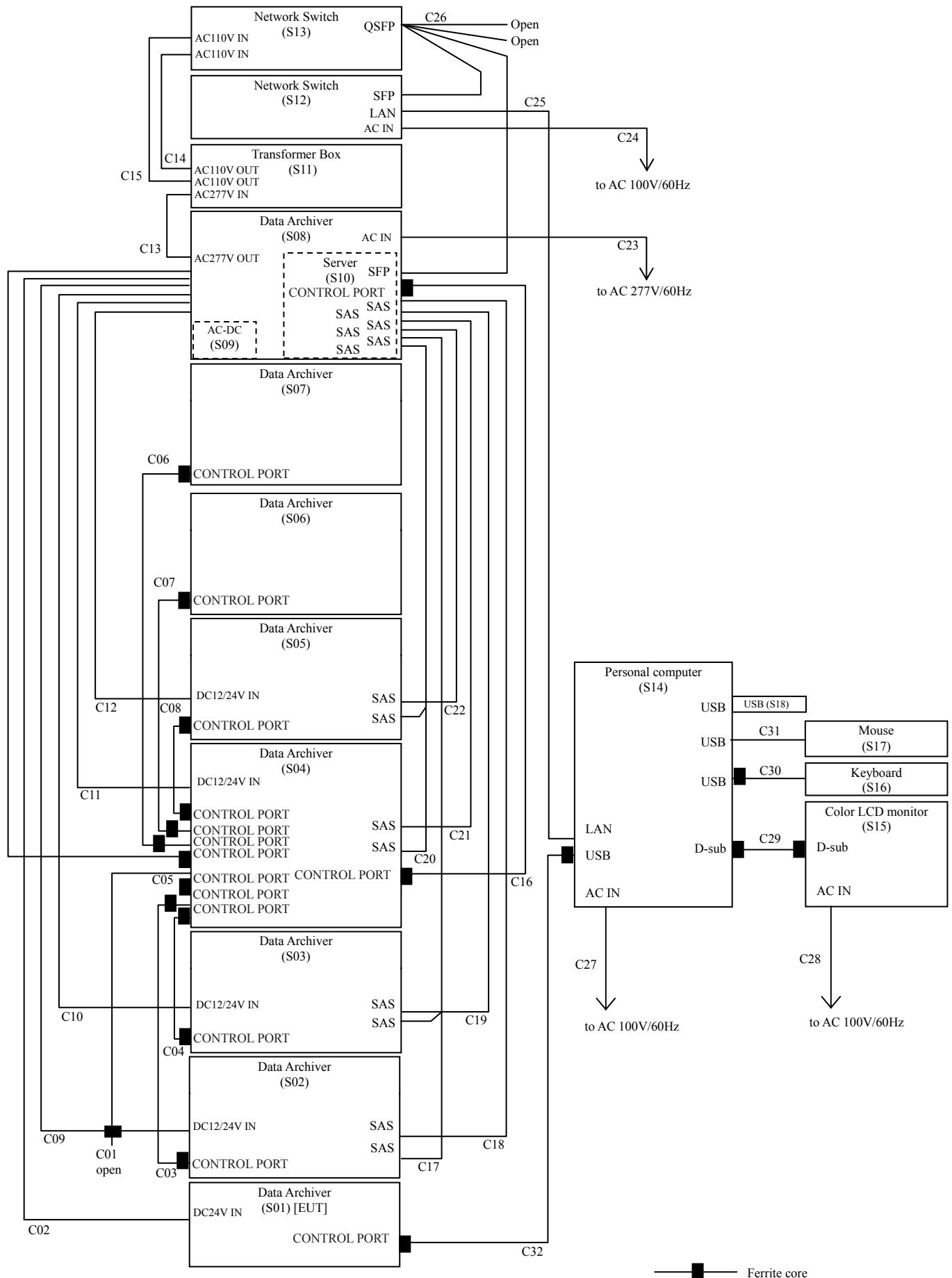
- (1) The test program was prepared by applicant.
- (2) The test modes were confirmed with and without tag, and the test was made without tag that was worst condition.

Extreme test condition	
Temperature	-20 deg C to 50 deg C
Voltage	AC 235.45V to 300V

[Note]

- The upper limit of the product specification is 300V and this product doesn't work with above AC 300 V. Therefore, the Limit of the Extreme test condition was set at + 8% (300V).
- Temperature extreme test was measured only in the radio part for the device is large.

4.5. Block Diagram of Test System



4.6. List of Test System

No.	Device Name	Model No.	Serial No.	Trade Name	Note
S01	Data Archiver	LB-DF71	Sample1	Panasonic	EUT (Bottom Module)
S02	Data Archiver	LB-DF72C	Sample1	Panasonic	(Extension Module/Writer)
S03	Data Archiver	LB-DF72C	Sample2	Panasonic	(Extension Module/Writer)
S04	Data Archiver	LB-DF70	Sample1	Panasonic	(Base Module)
S05	Data Archiver	LB-DF72C	Sample3	Panasonic	(Extension Module/Writer)
S06	Data Archiver	LB-DF72Z	Sample1	Panasonic	(Extension Module/Control)
S07	Data Archiver	LB-DF72Z	Sample2	Panasonic	(Extension Module/Control)
S08	Data Archiver	LB-DF73	Sample1	Panasonic	(Server Bay)
S09	AC-DC CONVERTER	PFE3000-12-069RA	0003	Bel Power Solutions	
S10	Server	Leopard ORV2	2634905	QUANTA COMPUTER INC.	
S11	Transformer Box	DPST-900CBA	62006	DELTA ELECTRONICS, INC.	
S12	Network Switch	XS708E	3GW43C72801DD	NETGEAR	
S13	Network Switch	Wedge-AC-F	FP2FB6632000A	FACEBOOK	
S14	Personal computer	1622A052200569	702571-24200	Diginnos	
S15	Color LCD monitor	RDT17 II VM	56005923NJ	MITSUBISHI	
S16	Keyboard	L100	U01J	DELL	
S17	Mouse	AM-1510-U	0099453	-	
S18	USB	UHYBS-008GH	-	TOSHIBA	

[Note]

(1) : Accessory of EUT

4.7. List of Cables

No.	Cable Name	Shielded (Y/N)	Length (m)	Note	Remark
C01	Control Cable	Y	3.0	With two ferrite cores (1-turn)	(2)
C02	DC24V Power Cord	Y	2.0		(1)
C03	Control Cable	Y	3.0	With two ferrite cores (1-turn)	(2)
C04	Control Cable	Y	3.0	With two ferrite cores (1-turn)	(2)
C05	Control Cable	Y	1.8	With one ferrite cores (1-turn)	(1)
C06	Control Cable	Y	3.0	With two ferrite cores (1-turn)	(2)
C07	Control Cable	Y	3.0	With two ferrite cores (1-turn)	(2)
C08	Control Cable	Y	3.0	With two ferrite cores (1-turn)	(2)
C09	DC24/12V Power Cord	Y	2.0		(1)
C10	DC24/12V Power Cord	Y	2.0		(1)
C11	DC24/12V Power Cord	Y	2.0		(1)
C12	DC24/12V Power Cord	Y	2.0		(1)
C13	AC277V Power Cord	N	0.6		(3)
C14	AC110V Power Cord	N	0.9		(3)
C15	AC110V Power Cord	N	0.9		(3)
C16	Control Cable	Y	3.0	With two ferrite cores (1-turn)	(2)
C17	MiniSASHD Cable	Y	2.5		
C18	MiniSASHD Cable	Y	2.5		
C19	MiniSASHD Cable	Y	2.5		
C20	MiniSASHD Cable	Y	2.0		
C21	MiniSASHD Cable	Y	2.0		
C22	MiniSASHD Cable	Y	2.0		
C23	AC Power Cord	Y	2.7		(2),(3)
C24	AC Power Cord	N	2.5		(3)
C25	LAN Cable	Y	5.0		
C26	QSFP+x1/SFP+x4 Network Cable	Y	1.0		
C27	AC Power Cord	N	1.8		(3)
C28	AC Power Cord	N	1.9		(3)
C29	D-sub Cable	Y	1.8	With two ferrite core (1-turn)	
C30	USB Cable	Y	2.1	With one ferrite cores (1-turn)	(1)
C31	USB Cable	Y	1.3		(1)
C32	Control Cable	Y	3.0	With two ferrite cores (1-turn)	

[Note]

- (1) : Undetachable cable type
- (2) : Accessories cable of EUT
- (3) : 3-wires type,earth plug is grounded
- (4) : 2-wires type

5. AC POWER LINE CONDUCTED EMISSION MEASUREMENT

5.1. Test Procedure

- (1) Configure the EUT System in accordance with ANSI C63.10.
See also the block diagram and the photographs of EUT System configuration in this report.
- (2) Connect the EUT's AC power cord to one Line Impedance Stabilization Network (LISN).
- (3) Any other power cord of other equipment is connected to a LISN different from the LISN used for the EUT.
- (4) Warm up the EUT System.
- (5) Activate the EUT System and run the software prepared for the test, if necessary.
- (6) Connect the spectrum analyzer (*1) to the measuring port of the LISN for the EUT, using a calibrated coaxial cable.
- (7) To find out an EUT System condition, which produces the maximum emission, the configuration of EUT System, the position of the cables, and the operation mode, are changed under normal usage of the EUT.
- (8) The spectrums are scanned from 150kHz to 30MHz and collect the six highest emissions minimum on the spectrum analyzer relative to the limits in the whole range.
- (9) The test receiver (*2) is connected to the LISN for the EUT, and the six highest emissions minimum recorded above are measured.

[Note]

(*1) Spectrum Analyzer Set Up Conditions

Frequency range : 150kHz – 30MHz
Resolution bandwidth : 10kHz (6dB Bandwidth)
Video bandwidth : 1MHz
Detector function : Peak mode

(*2) Test Receiver Set Up Conditions

Detector function : Quasi – Peak / Average (if necessary)
IF bandwidth : 10kHz (6dB Bandwidth)

5.2. Test Software List

KEC No.	Software Name	Version	Manufacture
TF-088	TEPTO Conducted emission automatic measurement	2.3.0320	TSJ
TF-110	Junction sheet	1.6H	KEC

5.3. Test Results

Measured Frequency (MHz)	LISN Factor (dB)	Meter Reading				Maximum RF Voltage		Limit		Margin for Limit	
		Q-Peak		Average		Q-Peak (dBμV)	Average (dBμV)	Q-Peak (dBμV)	Average (dBμV)	Q-Peak (dB)	Average (dB)
		Va (dBμV)	Vb (dBμV)	Va (dBμV)	Vb (dBμV)						
13.560	10.9	39.3	44.1	32.7	34.4	55.0	45.3	60.0	50.0	5.0	4.7
27.120	11.5	13.9	15.6	4.3	5.3	27.1	16.8	60.0	50.0	32.9	33.2

- The emissions from the IT Device (Other than the emissions from the LB-DF71)

Measured Frequency (MHz)	LISN Factor (dB)	Meter Reading				Maximum RF Voltage		Limit		Margin for Limit	
		Q-Peak		Average		Q-Peak (dBμV)	Average (dBμV)	Q-Peak (dBμV)	Average (dBμV)	Q-Peak (dB)	Average (dB)
		Va (dBμV)	Vb (dBμV)	Va (dBμV)	Vb (dBμV)						
0.150	10.5	51.6	49.1	50.9	47.0	62.1	61.4	79.0	66.0	16.9	4.6
0.195	10.4	31.1	30.8	24.9	24.5	41.5	35.3	79.0	66.0	37.5	30.7
0.446	10.3	48.0	48.9	46.8	47.7	59.2	58.0	79.0	66.0	19.8	8.0
0.748	10.3	48.3	48.3	46.4	46.4	58.6	56.7	73.0	60.0	14.4	3.3
1.046	10.3	47.8	47.2	44.5	43.7	58.1	54.8	73.0	60.0	14.9	5.2
1.340	10.3	47.7	42.1	42.1	40.8	58.0	52.4	73.0	60.0	15.0	7.6
1.641	10.3	44.1	43.4	37.3	36.5	54.4	47.6	73.0	60.0	18.6	12.4
13.353	10.8	42.1	48.8	30.6	37.8	59.6	48.6	73.0	60.0	13.4	11.4

[Note]

- (1) LISN Factor includes the cable loss and attenuator loss.
- (2) Test Condition : Continuous transmission (non- terminated)

[Calculation method]

Maximum RF Voltage (dBμV)
= Meter Reading (at maximum level of Va or Vb) (dBμV) + LISN Factor (dB)

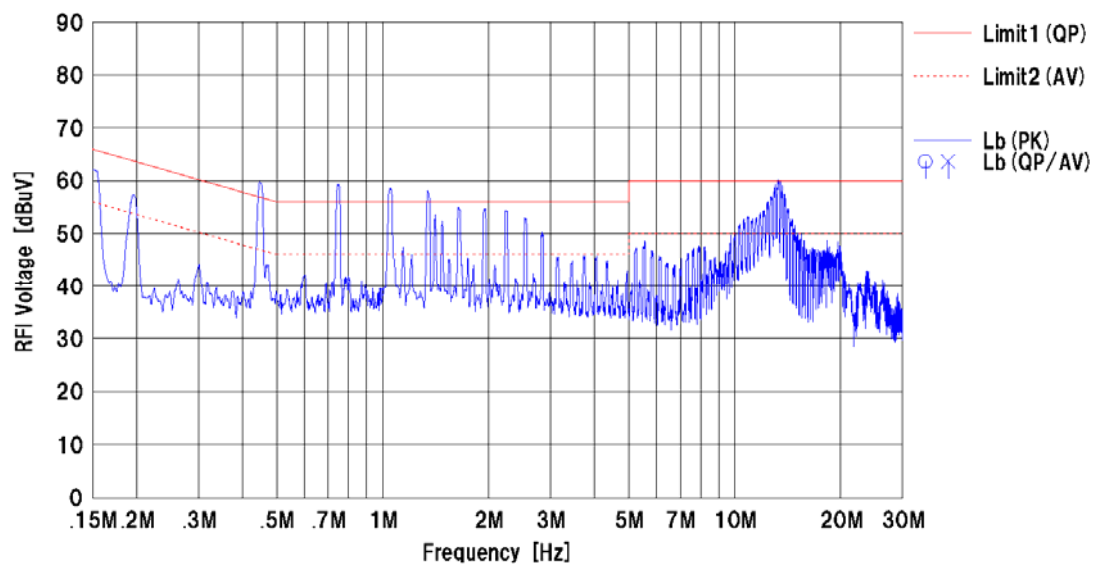
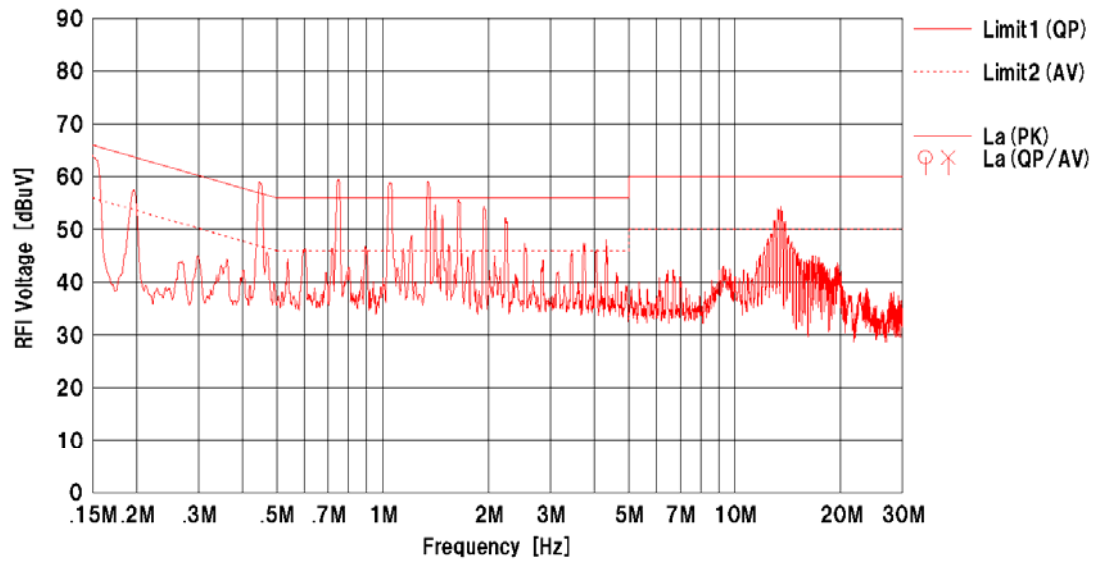
At the next page, the result of exploratory conducted emission measurement by using the spectrum analyzer is shown by the spectrum chart.

Tested Date	Environment	
	Temperature	Humidity
30 June 2016	22°C	59%



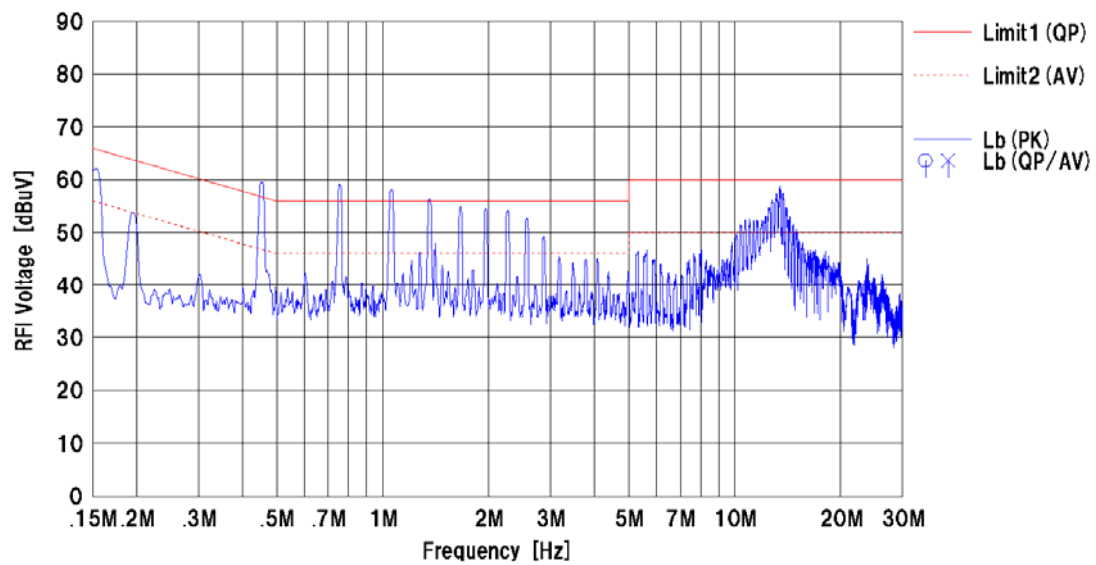
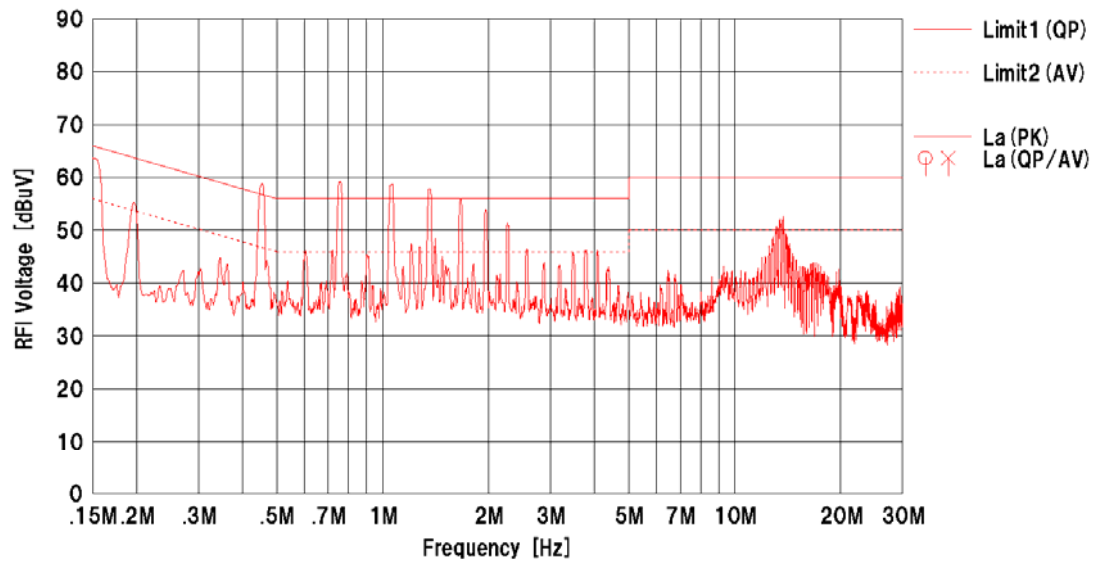
Test Results in Graph

Transmission of RFID : ON





LB-DF71 only P-OFF (other equipments are in a P-ON)



6. RADIATED EMISSION (The Frequency Range of 9kHz to 30MHz)

6.1. Test Procedure

- (1) The EUT is placed in accordance with ANSI C63.10.
- (2) The EUT is activated as to simulate an actual operation.
- (3) To find out the maximum emission of the configuration of the EUT System, the operation mode and the position of the cables are changed, then preliminary radiated measurement are performed using the spectrum analyzer (*1) and the loop antenna.
- (4) The emissions recorded are measured at the specified distance using the loop antenna and the test receiver (*2).
- (5) If the emission level is low and not detected at the specified distance, compliance test is performed at a closer distance and judged from calculating field strength at specified distance by using the measured data at a closer distance.

[Note]

- (*1) Spectrum Analyzer Set Up Conditions
 - Frequency range : 9kHz – 150kHz / 150kHz – 30MHz
 - Resolution bandwidth : 300Hz / 10kHz (6dB Bandwidth)
 - Detector function : Peak mode
- (*2) Test Receiver Set Up Conditions
 - Detector function : Quasi – Peak
 - IF bandwidth : 200Hz (9kHz – 150kHz) (6dB Bandwidth)
 - : 10kHz (150kHz – 30MHz) (6dB Bandwidth)



6.2. Test Results

1) Field Strength at 300m

Measured Frequency (MHz)	Correction Factor (dB)	Meter Reading including 20dB Constant Antenna Factor (dB μ V/m)	Maximum Field Strength at 3m (dB μ V/m)	Conversion Factor 3m to 300m (dB)	Maximum Field Strength at 300m (dB μ V/m)	Limit at 300m (dB μ V/m)	Margin for Limit (dB)
Peak measurement							
* 0.03891	0.1	51.5	51.6	-80.0	-28.4	35.8	64.2
* 0.04972	-0.2	79.0	78.8	-80.0	-1.2	33.7	34.9
* 0.06509	-0.3	59.0	58.7	-80.0	-21.3	31.3	52.6
* 0.06896	-0.3	47.1	46.8	-80.0	-33.2	30.8	64.0
* 0.07790	-0.4	44.0	43.6	-80.0	-36.4	29.8	66.2
* 0.15000	-0.5	48.9	48.4	-80.0	-31.6	24.1	55.7

2) Field Strength at 30m

Measured Frequency (MHz)	Correction Factor (dB)	Meter Reading including 20dB Constant Antenna Factor (dB μ V/m)	Maximum Field Strength at 3m (dB μ V/m)	Conversion Factor 3m to 30m (dB)	Maximum Field Strength at 30m (dB μ V/m)	Limit at 30m (dB μ V/m)	Margin for Limit (dB)
* 0.59500	-0.5	48.2	47.7	-40.0	7.7	32.1	24.4
13.11000	1.0	24.9	25.9	-40.0	-14.1	29.5	43.6
13.41000	1.0	24.7	25.7	-40.0	-14.3	40.5	54.8
13.55300	1.1	30.1	31.2	-40.0	-8.8	50.4	59.2
13.56000	1.1	45.0	46.1	-40.0	6.1	83.9	77.8
13.56700	1.1	29.5	30.6	-40.0	-9.4	50.4	59.8
13.71000	1.1	24.6	25.7	-40.0	-14.3	40.5	54.8
14.01000	1.1	24.6	25.7	-40.0	-14.3	29.5	43.8
27.12000	3.2	22.6	25.8	-40.0	-14.2	29.5	43.7

The following are data that operates only LB-DF71. (Other equipments are in a P-OFF.) Therefore, the frequencies of * mark are noise other than LB-DF71, and those results are comply with FCC Part 15 Section 15.209 (c).

1) Field Strength at 300m

Measured Frequency (MHz)	Correction Factor (dB)	Meter Reading including 20dB Constant Antenna Factor (dB μ V/m)	Maximum Field Strength at 3m (dB μ V/m)	Conversion Factor 3m to 300m (dB)	Maximum Field Strength at 300m (dB μ V/m)	Limit at 300m (dB μ V/m)	Margin for Limit (dB)
Peak measurement							
0.03891	0.1	<30.0	<30.1	-80.0	<-49.9	35.8	>85.7
0.04972	-0.2	<30.0	<29.8	-80.0	<-50.2	33.7	>83.9
0.06509	-0.3	<30.0	<29.7	-80.0	<-50.3	31.3	>81.6
0.06896	-0.3	<30.0	<29.7	-80.0	<-50.3	30.8	>81.1
0.07790	-0.4	<30.0	<29.6	-80.0	<-50.4	29.8	>80.2
0.15000	-0.5	40.0	39.5	-80.0	-40.5	24.1	64.6

2) Field Strength at 30m

Measured Frequency (MHz)	Correction Factor (dB)	Meter Reading including 20dB Constant Antenna Factor (dB μ V/m)	Maximum Field Strength at 3m (dB μ V/m)	Conversion Factor 3m to 30m (dB)	Maximum Field Strength at 30m (dB μ V/m)	Limit at 30m (dB μ V/m)	Margin for Limit (dB)
0.59500	-0.5	<30.0	<29.5	-40.0	<-10.5	32.1	>42.6



[Note]

- (1) Correction Factor includes the Antenna factor and cable loss.
- (2) Measurement Distance : 3m
- (3) Conversion Factor : FCC Part 15 Subpart A Section 15.31(f) (2) is applied.
- (4) Although these tests were performed other than open field area test site, adequate comparison measurements were confirmed against 30 m open field are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

[Calculation method]

Maximum Field Strength (dB μ V/m) = Meter Reading (dB μ V/m) + Correction Factor (dB) + Conversion Factor (dB)

Tested Date	Environment	
	Temperature	Humidity
28 June 2016	24 °C	53%

7. RADIATED EMISSION (The Frequency Range of above 30MHz)

7.1. Test Procedure

- (1) The EUT is placed in accordance with ANSI C63.10.
- (2) The EUT is activated as to simulate an actual operation.
- (3) To find out the maximum emission of the configuration of the EUT System, the operation mode and the position of the cables are changed, then preliminary radiated measurement are performed using the spectrum analyzer (*1) and the broad band antenna.
- (4) The spectrums are scanned from 30MHz to 1GHz, and collect the highest emissions on the spectrum analyzer relative to the limits in the whole range.
In the frequency above 1GHz, it is performed using the spectrum analyzer (*2) and the horn antenna.
- (5) The highest emissions are measured at the specified distance using the test receiver (*3) and the broad band antenna or the tuned dipole. In the frequency above 1GHz, the measurements are performed by Bore-sight method using the spectrum analyzer (*4) and the horn antenna (*5).
If the 3dB beam width does not cover the EUT volume, confirms move the horn antenna.

[Note]

- (*1) Spectrum Analyzer Set Up Conditions
 - Frequency range : 30MHz – 1GHz
 - Resolution bandwidth : 100kHz (6dB Bandwidth)
 - Detector function : Peak mode
- (*2) Spectrum Analyzer Set Up Conditions (Pre-measurement)
 - Frequency range : 1GHz – Upper frequency of measurement range
 - Resolution bandwidth : 1MHz (Impulse Bandwidth)
- (*3) Test Receiver Set Up Conditions
 - Detector function : Quasi – Peak
 - IF bandwidth : 120kHz (6dB Bandwidth)
- (*4) Spectrum Analyzer Set Up Conditions
 - Center Frequency : Measurement Frequency
 - Resolution bandwidth : 1MHz (Impulse Bandwidth)
 - Video bandwidth : 1MHz (Peak measurement)
10Hz or 30Hz (Average measurement)
 - Y axis : Linear (Average measurement)
- (*5) Cover Area of Horn Antenna (3dB Beamwidth)

Frequency [GHz]	RGA-180 Cover Area [m] at distance 3m	3117 Cover Area [m] at distance 3m
1.0	4.39	5.3
2.0	2.87	3.46
3.0	2.18	4.6
4.0	2.35	3.19
5.0	2.42	3.05
6.0	2.23	2.79
8.0	-	1.94
10.0	-	2.06

Frequency [GHz]	Standard Gain Horn Cover Area [m] at distance 3m	Standard Gain Horn Cover Area [m] at distance 1m
5.8-8.2	0.631	0.21
8.2-12.4	0.631	0.21
12.4-18.0	0.472	0.157
18.0-26.5	0.472	0.157
26.5-40.0	0.472	0.157



7.2. Test Software List

KEC No.	Software Name	Version	Manufacture
TF-059	TEPTO Radiated emission automatic measurement	2.3.0321	TSJ
TF-110	Junction sheet	1.6H	KEC

7.3. Test Results

Measured Frequency (MHz)	Correction Factor (dB)	Meter Reading		Maximum Field Strength (dBμV/m)	Limit (dBμV/m)	Margin for Limit (dB)
		Horizontal Polarization (dBμV)	Vertical Polarization (dBμV)			
40.68	-4.2	<25.0	30.9	26.7	40.0	13.3
54.24	-8.9	25.1	29.1	20.2	40.0	19.8
122.04	-4.2	34.1	27.5	29.9	43.5	13.6
189.84	-0.2	35.6	32.7	35.4	43.5	8.1
515.28	-0.9	34.3	25.3	33.4	46.0	12.6
542.40	-0.2	40.1	26.8	39.9	46.0	6.1
569.62	0.8	40.5	31.1	41.3	46.0	4.7
596.64	1.8	40.1	29.0	41.9	46.0	4.1
623.76	2.4	39.5	30.0	41.9	46.0	4.1
650.88	2.8	33.0	29.0	35.8	46.0	10.2
678.00	3.6	28.4	29.4	33.0	46.0	13.0
705.12	4.1	34.0	30.6	38.1	46.0	7.9
732.24	3.7	34.3	34.3	38.0	46.0	8.0
759.36	3.9	32.2	31.0	36.1	46.0	9.9

[Note]

- (1) ☒ Correction Factor includes the Antenna Factor, cable loss, attenuator loss and pre-amplifier gain.
☐ Correction includes the Antenna Factor, cable loss and attenuator loss.
Above 1000MHz, the antenna factor includes the cable loss and pre-amplifier gain.
- (2) * mark in Measured Frequency : Measured with the tuned dipole antenna.
no mark in Measured Frequency : Measured with the broadband antenna.
- (3) Upper Frequency : ☒ Transmitter Frequency (TX): TX < 10GHz
☐ 1GHz ☒ 10th harmonic of the highest frequency / ☐ Up to 40GHz
☐ Transmitter Frequency (TX): 10GHz ≤ TX < 30GHz
☐ 10th harmonic of the highest frequency / ☐ Up to 100GHz
☐ Transmitter Frequency (TX): 30GHz ≤ TX
☐ 10th harmonic of the highest frequency / ☐ Up to 200GHz
- (4) Measurement Distance : <below 1GHz> ☒ 3m ☐ 10m
<above 1GHz> ☐ 3m ☐ 10m
- (5) The other emissions were the noise from the IT devices, and it conforms to the FCC Part 15 Subpart B - Unintentional Radiators class A limit. (Test Report No.A-005-16-A)
See next page, the radio device power off spectrum chart.

[Calculation method]

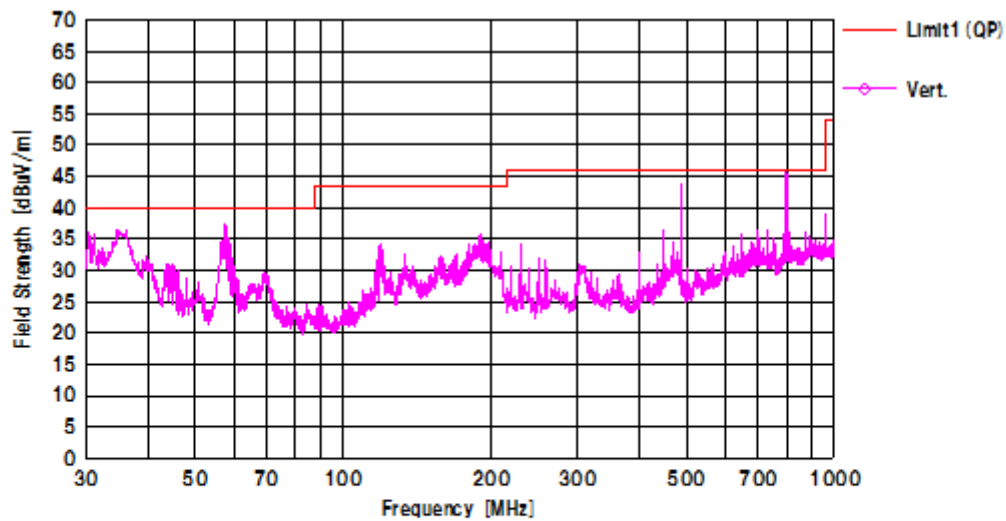
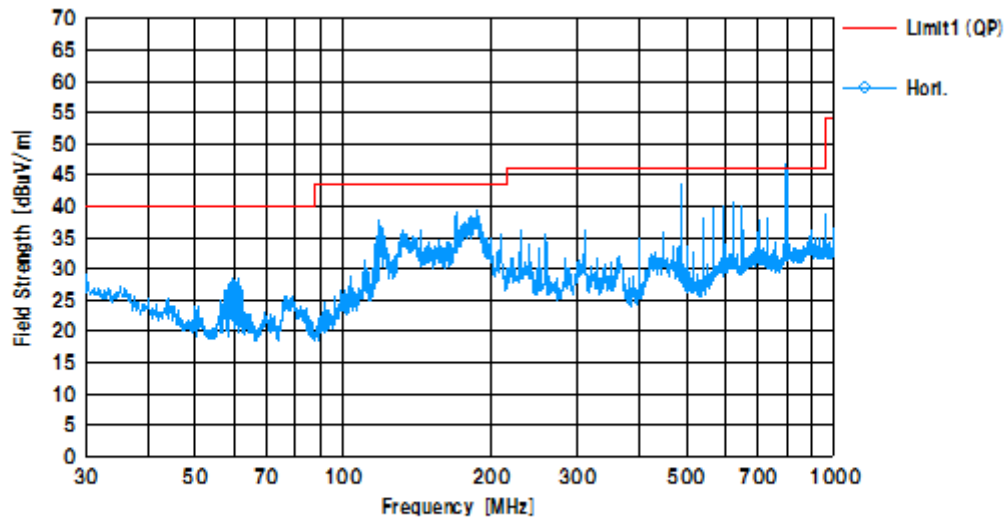
Maximum Field Strength (dBμV/m)
= Meter Reading (at maximum level of Horizontal or Vertical) (dBμV) + Correction Factor (dB/m)

Tested Date	Environment	
	Temperature	Humidity
28 June 2016	24 °C	53 %



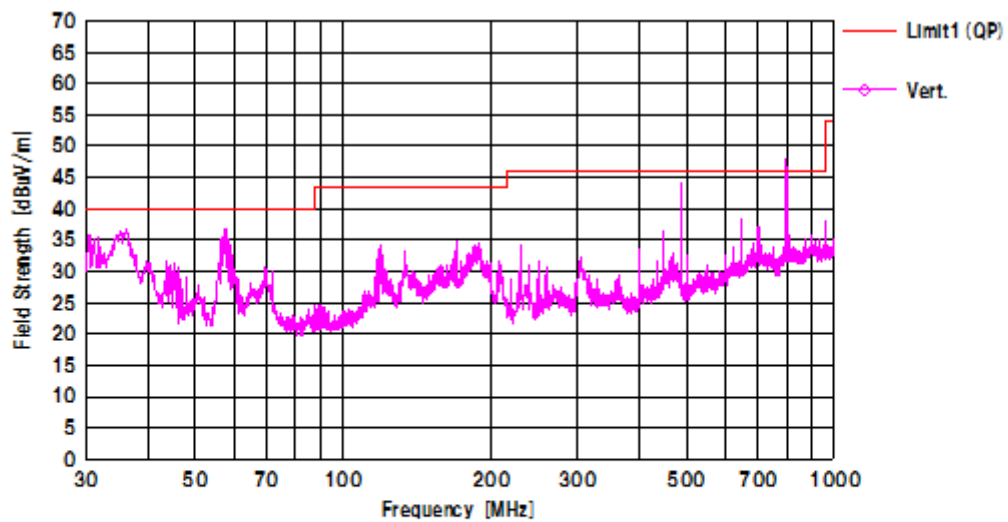
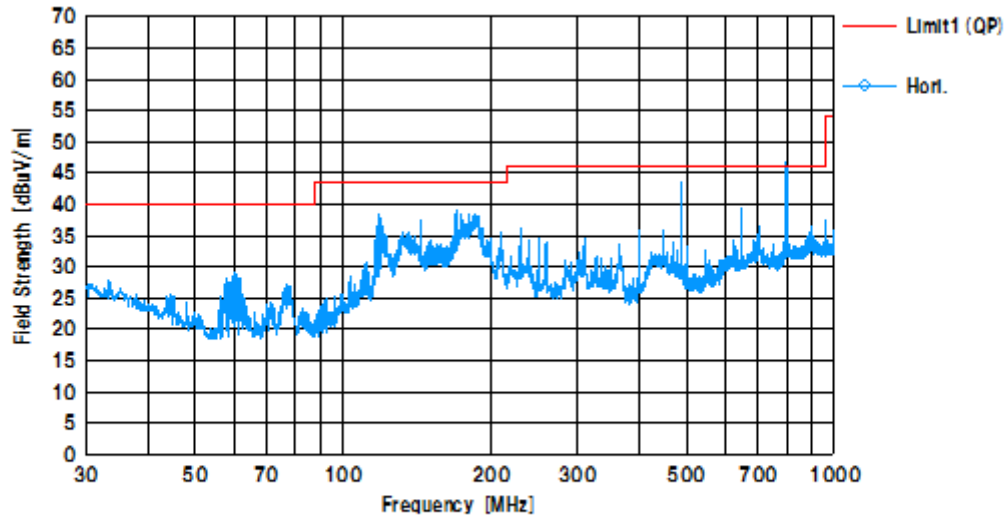
Test Results in Graph

Transmission of RFID : ON





LB-DF71 only P-OFF (other equipments are in a P-ON)



8. 20dB BANDWIDTH MEASUREMENT

8.1. Test Procedure

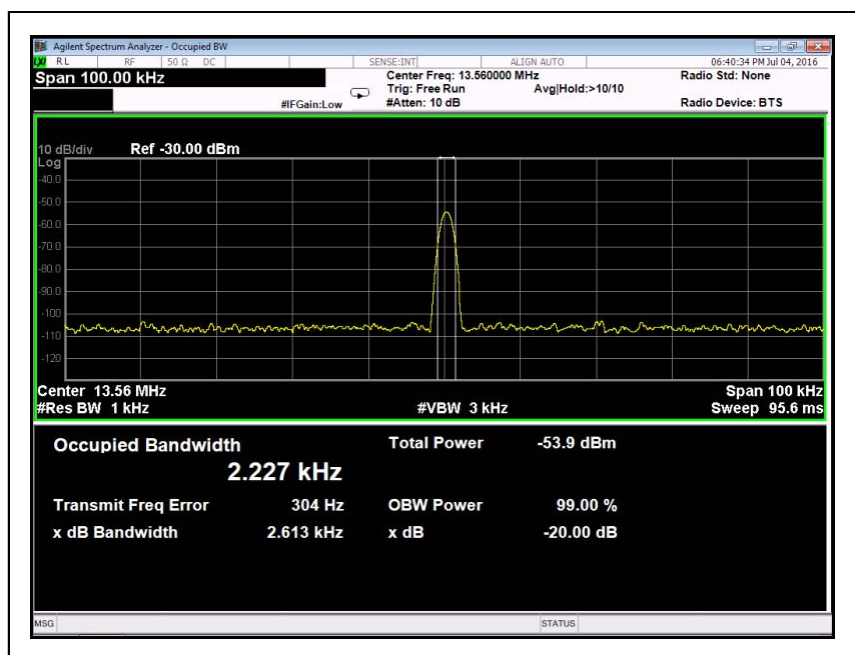
- (1) Connect the EUT RF output port to spectrum analyzer (*1) via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and execute the software prepared for test, if necessary.
- (3) To find out the maximum emission condition, the transmitting data rate of EUT is set to maximum data rate.
- (4) 20dB Bandwidth is measured using the function of spectrum analyzer.

[Note]

(*1) Spectrum Analyzer Set Up Conditions

Frequency Span : 100kHz
Resolution bandwidth : 1kHz
Video bandwidth : 3kHz
Detector function : Peak
x dB : -20dB

8.2. Test Results



Test Items	Result(kHz)
20dB Bandwidth	2.613

Tested Date	Environment	
	Temperature	Humidity
4 July 2016	20 °C	40 %

9. FREQUENCY TOLERANCE OF CARRIER SIGNAL

9.1. Test Procedure

- (1) Connect the EUT RF output port to spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and execute the software prepared for test, if necessary.
- (3) To find out the maximum emission condition, the transmitting data rate of EUT is set to maximum data rate.
- (4) The operating frequency measured by using frequency counter function of spectrum analyzer (*1) .
- (5) Frequency stability measurement was carried out from the high temperature to low temperature in order.

[Note]

(*1) Spectrum Analyzer Set Up Conditions

Center Frequency	: Equal to operating frequency of EUT
Resolution bandwidth	: 3 kHz
Video bandwidth	: 100 Hz
Sweep	: Auto
Function	: Frequency counter

9.2. Test Results

[Temperature : 50deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560266	0.266	0.0020	± 0.01
after 2minutes	13.56	13.560264	0.264	0.0019	± 0.01
after 5minutes	13.56	13.560264	0.264	0.0019	± 0.01
after 10minutes	13.56	13.560264	0.264	0.0019	± 0.01

[Temperature : 40deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560279	0.279	0.0021	± 0.01
after 2minutes	13.56	13.560275	0.275	0.0020	± 0.01
after 5minutes	13.56	13.560275	0.275	0.0020	± 0.01
after 10minutes	13.56	13.560275	0.275	0.0020	± 0.01

[Temperature : 30deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560305	0.305	0.0022	± 0.01
after 2minutes	13.56	13.560299	0.299	0.0022	± 0.01
after 5minutes	13.56	13.560299	0.299	0.0022	± 0.01
after 10minutes	13.56	13.560299	0.299	0.0022	± 0.01

[Temperature : 20deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560335	0.335	0.0025	± 0.01
after 2minutes	13.56	13.560329	0.329	0.0024	± 0.01
after 5minutes	13.56	13.560328	0.328	0.0024	± 0.01
after 10minutes	13.56	13.560328	0.328	0.0024	± 0.01

[Temperature : 10deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560359	0.359	0.0026	± 0.01
after 2minutes	13.56	13.560355	0.355	0.0026	± 0.01
after 5minutes	13.56	13.560354	0.354	0.0026	± 0.01
after 10minutes	13.56	13.560354	0.354	0.0026	± 0.01

[Temperature : 0deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560370	0.370	0.0027	± 0.01
after 2minutes	13.56	13.560369	0.369	0.0027	± 0.01
after 5minutes	13.56	13.560369	0.369	0.0027	± 0.01
after 10minutes	13.56	13.560369	0.369	0.0027	± 0.01

[Temperature : -10deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560359	0.359	0.0026	± 0.01
after 2minutes	13.56	13.560363	0.363	0.0027	± 0.01
after 5minutes	13.56	13.560363	0.363	0.0027	± 0.01
after 10minutes	13.56	13.560363	0.363	0.0027	± 0.01

[Temperature : -20deg.C]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560321	0.321	0.0024	± 0.01
after 2minutes	13.56	13.560332	0.332	0.0024	± 0.01
after 5minutes	13.56	13.560333	0.333	0.0025	± 0.01
after 10minutes	13.56	13.560333	0.333	0.0025	± 0.01

[Temperature : 20deg.C, Voltage : AC235.45V(85%)]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560334	0.334	0.0025	± 0.01
after 2minutes	13.56	13.560329	0.329	0.0024	± 0.01
after 5minutes	13.56	13.560328	0.328	0.0024	± 0.01
after 10minutes	13.56	13.560328	0.328	0.0024	± 0.01

[Temperature : 20deg.C, Voltage : AC300V(108%)]

Test Condition	Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (%)	Limit (%)
startup	13.56	13.560334	0.334	0.0025	± 0.01
after 2minutes	13.56	13.560329	0.329	0.0024	± 0.01
after 5minutes	13.56	13.560328	0.328	0.0024	± 0.01
after 10minutes	13.56	13.560328	0.328	0.0024	± 0.01

[Calculation method]

Tolerance (kHz) = Result – Channel Frequency

Tolerance (%) = (Tolerance (kHz) / Channel Frequency (kHz)) × 10²

Tested Date	Environment	
	Temperature	Humidity
4 July 2016	20°C	40%



10. TEST EQUIPMENT

• AC Power Line Conducted Emission Measurement

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AT-119	Fixed Attenuator	JFW	50HF-010N	2016/06	2017/06
FL-108	LISN	KYORITSU	KNW-242	2016/06	2017/06
FL-106	LISN	KYORITSU	KNW-407	2016/06	2017/06
FL-108-1	50Ω Terminator	STACK	T1302	2016/06	2017/06
FS-088	Test Receiver	ROHDE & SCHWARZ	ESHS10	2016/02	2017/02
FS-103	Test Receiver	Schwarzbeck	FCKL1528	2015/12	2016/12
AX-060	GP-IB Selector Unit	A. B. O	TM-220	2016/06	2017/06
SA-054	Spectrum Analyzer	Agilent	E4403B	2016/03	2017/03

• Radiated Emission (9kHz to 30MHz)

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AN-074	Loop Antenna	ROHDE & SCHWARZ	HFH2-Z2	2015/04	2017/04
FS-088	Test Receiver	ROHDE & SCHWARZ	ESHS10	2016/02	2017/02
SA-062	Test Receiver	Agilent	N9038A	2016/04	2017/04

• Radiated Emission (above 30MHz)

KEC No.	Equipment	Manufacture	Model No.	Last Cal.	Next Cal.
AM-105	Pre-Amplifier	SONOMA	310N	2016/04	2017/04
AN-219	Biconical Antenna	Schwarzbeck	VHA9103/BBA9106	2016/04	2017/04
AN-332	Log Periodic Dipole Array Antenna	ETS LINDGREN	3148B	2016/04	2017/04
AT-156	Fixed Attenuator	Anritsu	MP721B	2016/04	2017/04
AX-064	RF Relay Matrix Unit	TSJ	RFM-E21	2016/04	2017/04
FS-079	Test Receiver	ROHDE & SCHWARZ	ESVD	2015/12	2016/11
SA-062	Test Receiver	Agilent	N9038A	2016/04	2017/04

• 20dB Bandwidth Measurement

• Frequency Tolerance of Carrier Signal

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AT-148	Fixed Attenuator	Anritsu	41KC-10	2016/05	2017/04
SA-065	Spectrum Analyzer	Agilent	N9030A	2015/10	2016/11
SF-093	Temperature Chamber	ESPEC CORP.	SH-641	2015/07	2017/07

Note : (*1) KEC checked the performance, before using this device.

The overall program of calibration and verification of equipment is designed and operated so as to ensure that measurements made by KEC are traceable to the national standards of measurement or equivalent abroad.