



Part 15C

TEST REPORT

Product Name	FS Reader
Model	FS Reader
FCC ID	2AEN9FS3771470
Applicant	DARE!! Measurements
Manufacturer	EasyLogic RFID distribution b.v.
Date of issue	September 15, 2015

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GENERAL SUMMARY

Reference Standard(s)	FCC CFR47 Part 15C Radio Frequency Devices 15.203 Antenna requirement 15.205 Restricted bands of operation; 15.207 Conducted limits; 15.209 Radiated emission limits; general requirements; ANSI C63.4 Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40GHz. (2014)
Conclusion	This equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 2 of this test report are below limits specified in the relevant standards. General Judgment: Pass
Comment	The test result only responds to the measured sample.

Approved by Kai Xu
Kai Xu
Director

Revised by Lingling Kang
Lingling Kang
RF Manager

Performed by Changxu Wan
Changxu Wan
RF Engineer

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1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L2264.

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 428261.

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 8510A.

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of **TA Technology (Shanghai) Co., Ltd.**

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1.2. Testing laboratory

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com

1.3. Applicant Information

Company: DARE!! Measurements
Address: Vijzelmolenlaan 7, Woerden, The Netherlands NL-3447 GX

1.4. Manufacturer Information

Company: EasyLogic RFID distribution b.v.
Address: Westbaan 288, Moordrecht, The Netherlands NL-2841 MC

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1.5. Information of EUT

General information

Name of EUT:	FS Reader
SN:	002136
Hardware Version:	V4.0
Software Version:	V1.0.35 EMD
Antenna Type:	Internal Antenna
Device Operating Configurations:	
Modulation Type:	ASK
Power Supply:	Battery or Adapter
Operating Frequency Range(s)	125K

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Auxiliary equipment details

AE2: Charger

Model: FS Cradle

Manufacturer: /

S/N: 001124

1.6. Test Date

The test is performed from January 28, 2015 to March 29, 2015

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2. Test Information

2.1. Test Mode

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

EUT is stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded. Then this mode was measured in the following mode: EUT with cradle and EUT without cradle. The worst emission was found in EUT with cradle mode and the worst case was recorded.

Test Modes		
Band	Radiated Test Cases	Conducted Test Cases
RFID(125kHz)	ASK(125kHz)	ASK(125kHz)

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2.2. Summary of test results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	-26dB Bandwidth	ANSI C63.4	PASS
2	Spurious RF Conducted Emissions	15.207	NA
3	Radiates Emission	15.209	PASS
4	Conducted Emission	15.209	PASS

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2.3. -26dB Bandwidth

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer via an omni antenna. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 1kHz; VBW is set to 3kHz. 99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

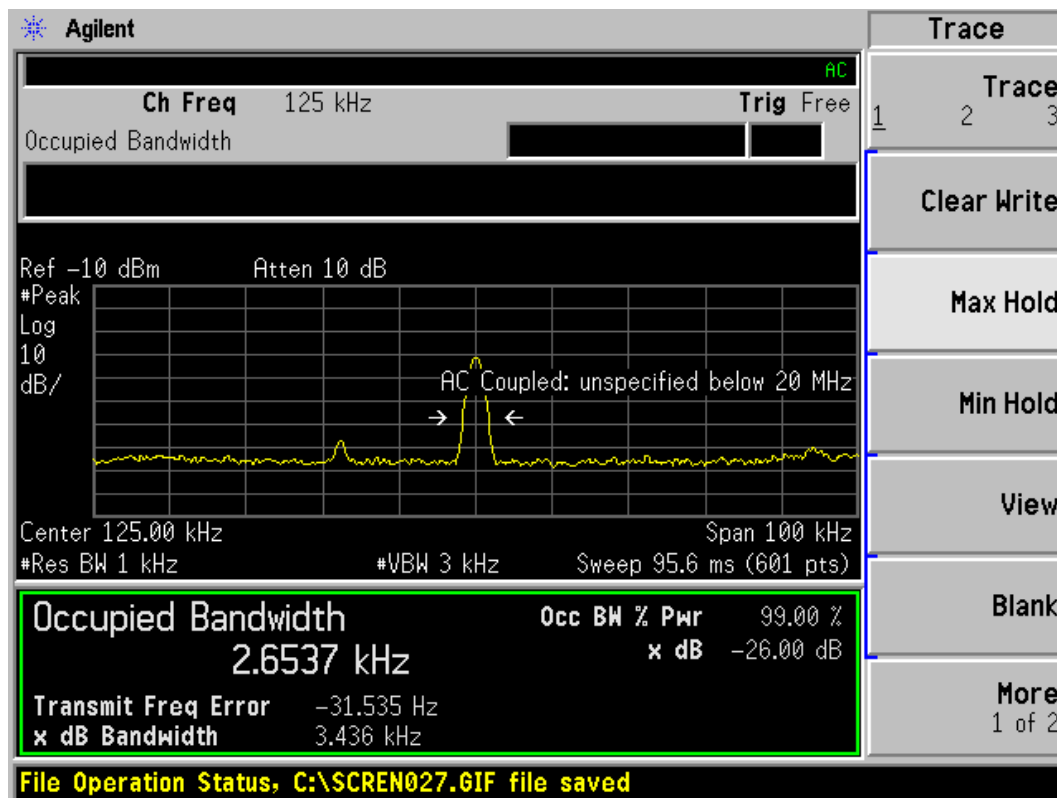
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Test Results

Frequency (kHz)	99% Power Bandwidth (kHz)	-26dBc Bandwidth(kHz)
125	2.6537	3.436



Carrier frequency (MHz): 125kHz

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2.4. Spurious RF Conducted Emissions

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. RBW and VBW are set to 100 kHz, Sweep is set to ATUO.

The test is in transmitting mode.

Test setup



Limits

Rule Part 15.247(d) specifies that "In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power."

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

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Test Results:

These requirements do not apply for the equipment.

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2.5. Radiates Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.4-2014. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz (detector: Peak and Quasi-Peak)

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz(detector: Peak):

(a) PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded. Then this mode was measured in the following mode: EUT with cradle and EUT without cradle. The worst emission was found in EUT with cradle mode and the worst case was recorded.

The test is in transmitting mode.

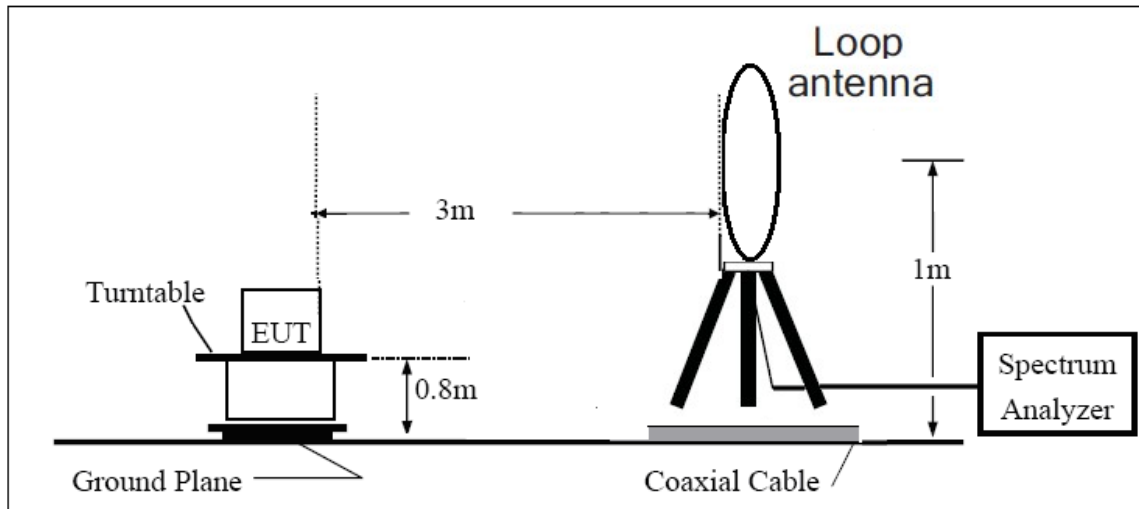
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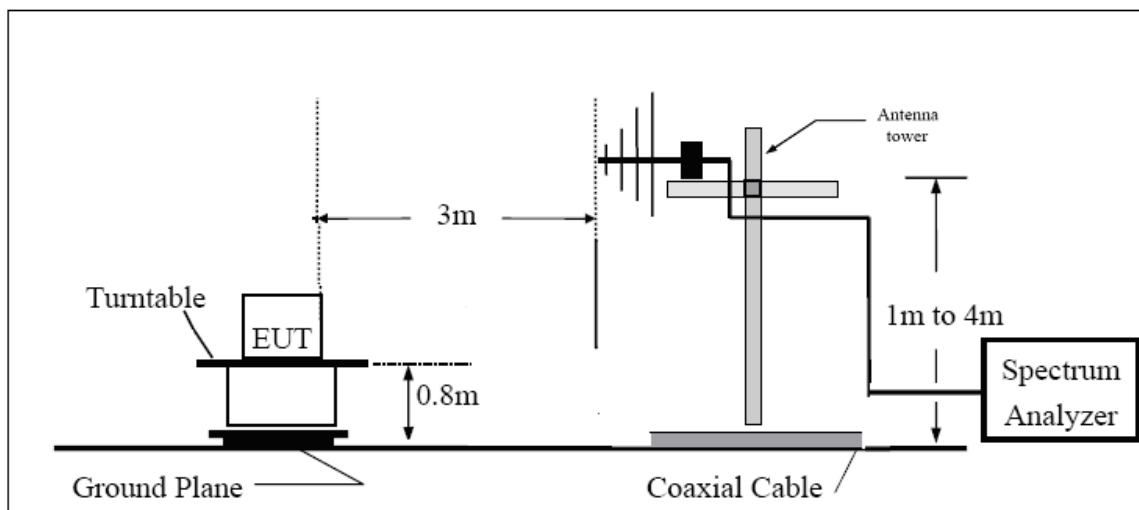
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Test setup

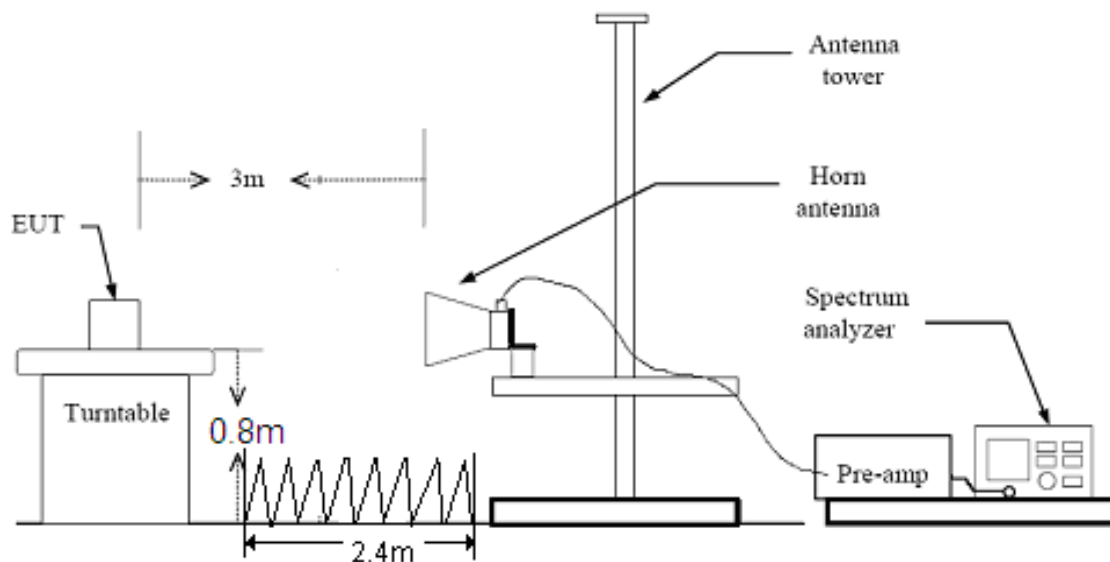
9KHz~~~ 30MHz



30MHz~~~ 1GHz



Above 1GHz



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Limits

Rule Part 15.247(d) specifies that “In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).”

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009–0.490	2400/F(kHz)	107.6-20logF
0.490–1.705	24000/F(kHz)	107.6-20logF
1.705–30.0	30	50
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB

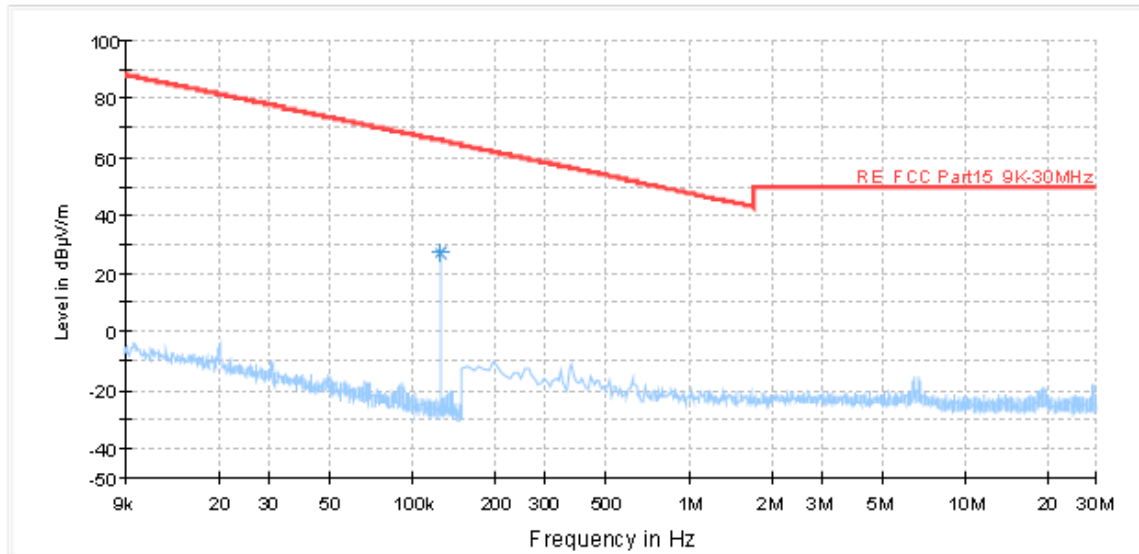
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Test result

RE 9K-30MHz



RE FCC Part15 9K-30MHz [..V]
Preview Result 1-PK+ [Preview Result 1.Result:1]
* Data Reduction Result 1 [1]-PK+ [Data Reduction Result 1 [1].Result:1]

Radiates Emission from 9KHz to 30MHz

Note: This graph displays the maximum values of horizontal and vertical by software

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polari zation	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
0.125043	27.3	100.0	V	0.0	59.9	-32.6	38.4	65.7

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

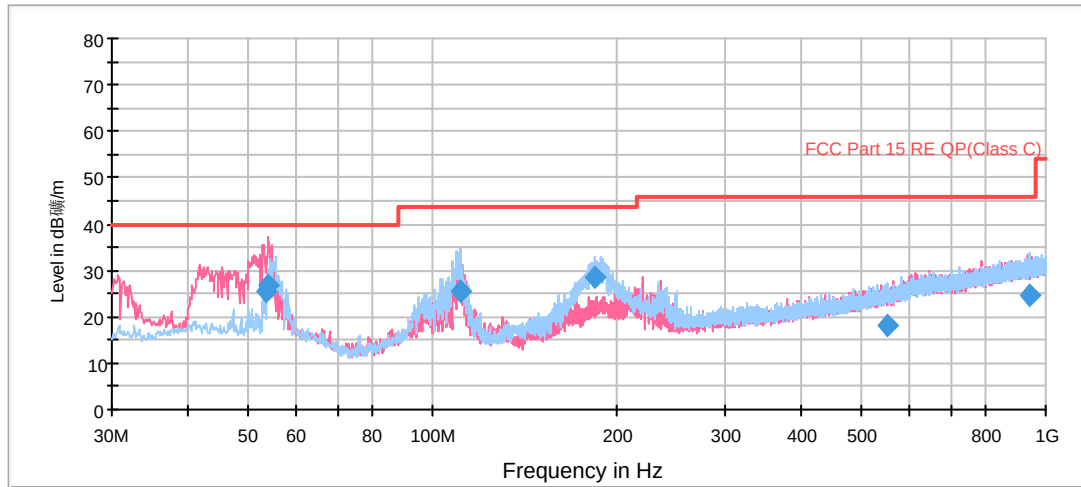
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RE 0.03-1GHz QP Class B



— FCC Part 15 RE QP(Class C) [...] — Preview Result 1V-PK+ [Preview Result 1V.Result:1]
 — Preview Result 1H-PK+ [Preview Result 1H.Result:1] ◆ Final Result 1-QPK [Final Result 1.Result:1]

Radiates Emission from 30MHz to 1GHz

Note: The signal beyond the limit is carrier.

Note: This graph displays the maximum values of horizontal and vertical by software

Note: The signal beyond the limit is carrier. a font (Level in dBμV/m) in the test plot =(level in dBuV/m)

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
53.516250	25.7	100.0	V	225.0	38.5	12.8	14.3	40.0
54.127500	26.8	100.0	V	288.0	39.6	12.8	13.2	40.0
111.316250	25.4	125.0	H	0.0	37.5	12.1	18.1	43.5
184.511250	28.3	114.0	H	0.0	39.4	11.1	15.2	43.5
552.018750	18.2	125.0	H	332.0	39.3	21.1	27.8	46.0
944.631250	24.8	100.0	H	167.0	50.8	26.0	21.2	46.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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2.6. Conducted Emission

Ambient condition

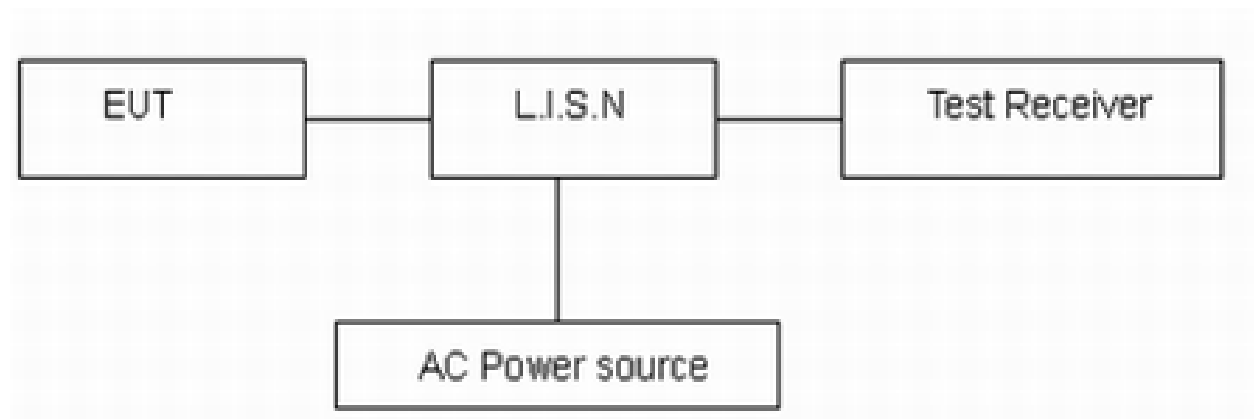
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

The test is in transmitting mode.

Test Setup



Note: AC Power source is used to change the voltage from 220V/50Hz to 110V/60Hz.

Limits

Frequency (MHz)	Conducted Limits(dB μ V)	
	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.		

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 2.69$ dB.

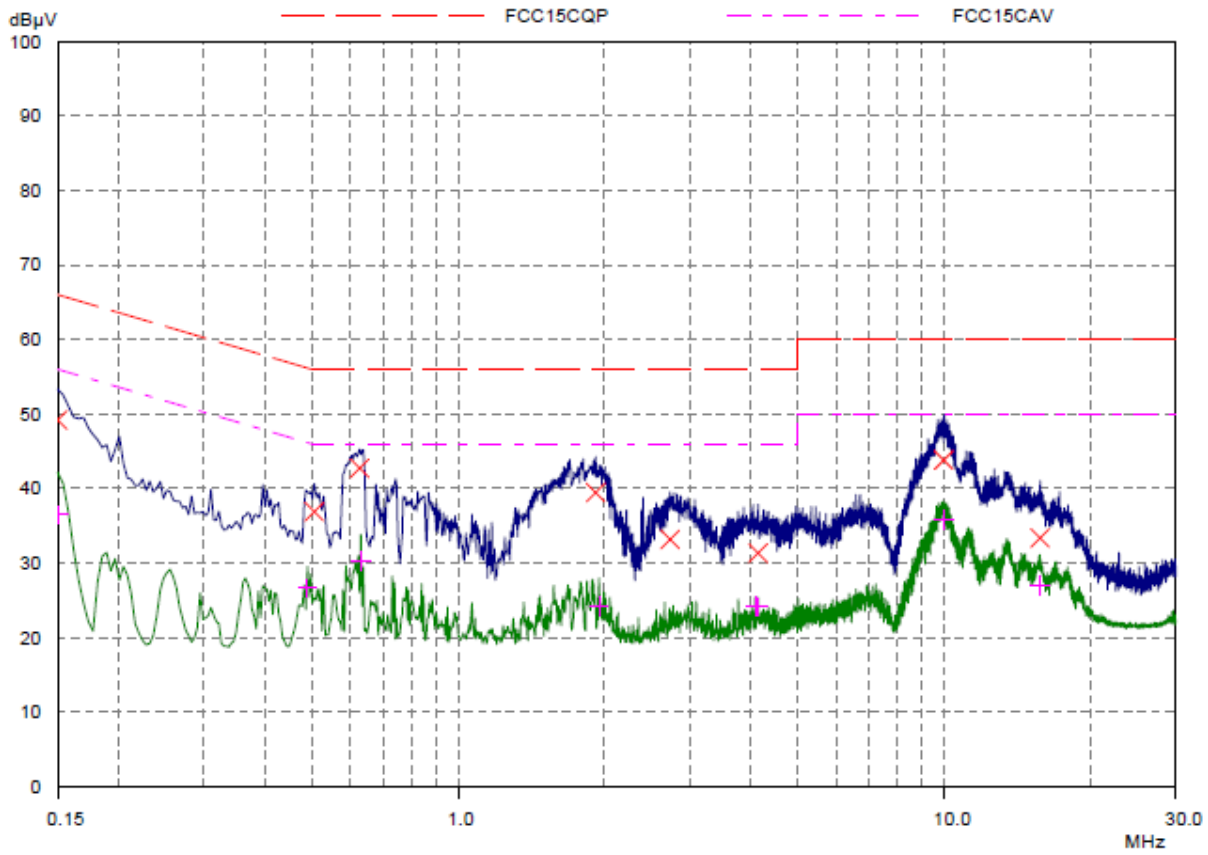
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Test Results:



Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.15	49.22	66.00	16.78	L1	gnd
0.50546	36.91	56.00	19.09	L1	gnd
0.62656	42.74	56.00	13.26	L1	gnd
1.91953	39.47	56.00	16.53	L1	gnd
2.72812	33.19	56.00	22.81	L1	gnd
4.14217	31.38	56.00	24.62	L1	gnd
9.98593	43.83	60.00	16.17	L1	gnd
15.76328	33.39	60.00	26.61	L1	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.15	36.48	56.00	19.52	L1	gnd
0.48984	26.67	46.17	19.50	L1	gnd
0.63046	30.26	46.00	15.74	L1	gnd
1.95078	24.28	46.00	21.72	L1	gnd
4.08359	24.15	46.00	21.85	L1	gnd
4.14217	24.11	46.00	21.89	L1	gnd
9.97031	35.91	50.00	14.09	L1	gnd
15.73203	26.94	50.00	23.06	L1	gnd

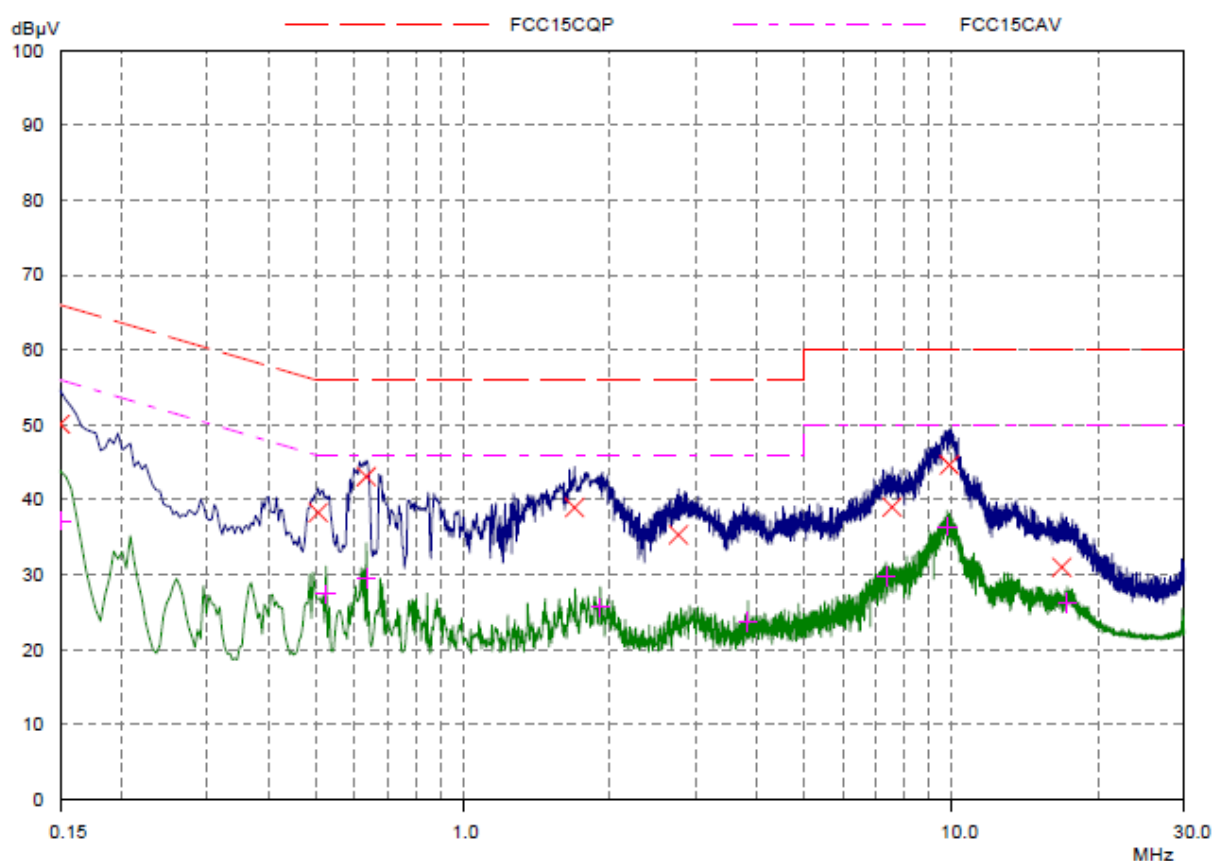
L Line

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Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.15	50.12	66.00	15.88	N	gnd
0.50546	38.29	56.00	17.71	N	gnd
0.63437	43.10	56.00	12.90	N	gnd
1.69296	38.97	56.00	17.03	N	gnd
2.76328	35.33	56.00	20.67	N	gnd
7.56796	39.04	60.00	20.96	N	gnd
9.91562	44.64	60.00	15.36	N	gnd
16.8414	31.01	60.00	28.99	N	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.15	37.20	56.00	18.80	N	gnd
0.525	27.41	46.00	18.59	N	gnd
0.63437	29.59	46.00	16.41	N	gnd
1.91171	25.64	46.00	20.36	N	gnd
3.83359	23.80	46.00	22.20	N	gnd
7.34921	29.70	50.00	20.30	N	gnd
9.79062	36.44	50.00	13.56	N	gnd
17.27109	26.19	50.00	23.81	N	gnd

N Line

Conducted Emission from 150 KHz to 30 MHz

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3. Main Test Instruments

No.	Name	Type	Manufacturer	Serial Number	Calibration Date	Expiration Time	Valid Period
01	Loop Antenna	FMZB1516	SCHWARZBECK	237	2014-06-29	2016-06-28	2 years
02	EMI Test Receiver	ESCS30	R&S	100138	2014-12-17	2015-12-16	1 year
03	LISN	ENV216	R&S	101171	2014-12-17	2015-12-16	1 year
04	EMI Test Receiver	ESCI	R&S	100948	2014-05-26	2015-05-25	1 year
05	TRILOG Broadband Antenna	VULB 9163	Schwarzbeck	9163-201	2013-11-25	2016-11-24	3 years
06	Double Ridged Waveguide Horn Antenna	HF907	R&S	100126	2012-07-02	2015-07-01	3 years
07	Spectrum Analyzer	E4445A	Agilent	MY46181146	2014-05-26	2015-05-25	1 year
08	Spectrum Analyzer	FSV30	R&S	100815	2014-12-17	2015-12-16	1 year
09	Standard Gain Horn	3160-09	ETS-Lindgren	00102644	2012-05-20	2015-05-19	3 years

*****END OF REPORT *****

ANNEX A: EUT photograph



Picture 1-1 Front Side



Picture 1-2 Back Side

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Picture 1-3 Charger

Picture 1 Constituents of EUT

ANNEX B: EUT Appearance and Test Setup

Test Setup



9kHz-30MHz



30M Hz-1GHz

Picture 2 Radiated Emission Test Setup

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Picture 3 Conducted Emission Test Setup