RF PERFORMANCE TEST REPORT

Test Report No.	**: OT-20O-RWD-030**
Reception No.	**: 2010003957**
Applicant	**: Asterisk, Inc.**
Address	**: Shin-Osaka Dainichi Bldg. 201, 5-6-16, Nishinakajima, Yodogawa-ku, Osaka, Japan**
Manufacturer	**: Asterisk, Inc.**
Address	**: Shin-Osaka Dainichi Bldg. 201, 5-6-16, Nishinakajima, Yodogawa-ku, Osaka, Japan**
Type of Equipment	**: AsLock RFID**
FCC ID.	**: 2AJXE-ASR-L70D**
Model Name	**: ASR-L70D**
Multiple Model Name	**: ASR-L71D, ASR-L30D, ASR-L31D**
Serial number	**: N/A**
Total page of Report	**: 19 pages (including this page)**
Date of Incoming	**: October 15, 2020**
Date of issue	**: October 23, 2020**

SUMMARY

The equipment complies with the regulation; **FCC CFR47 Part 15 Subpart C Section 15.207 and 15.209**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Tested by	Reviewed by	Approved by
/ Youngyong Kim/ Assistant Manager	/ Ha-Ram Lee / Manager	/ Ki-Hong, Nam / General Manager
ONETECH Corp.	ONETECH Corp.	ONETECH Corp.

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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Revision History

Issue Report No.	Issued Date	Revisions	Effect Section
OT-20O-RWD-030	October 23, 2020	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

APPLICANT	: Asterisk, Inc.
ADDRESS	: Shin-Osaka Dainichi Bldg. 201, 5-6-16, Nishinakajima, Yodogawa-ku, Osaka, Japan
CONTACT PERSON	: Naoki Kumamoto / Chief Technical Officer
TELEPHONE NO	: +81-50-5536-1185
FCC ID	: 2AJXE-ASR-L70D
MODEL NAME	: ASR-L70D
BRAND NAME	: AsReader
SERIAL NUMBER	: N/A
DATE	: October 23, 2020

EQUIPMENT CLASS	**DCD – Part 15 Low Power Transmitter Below 1 705 kHz**
KIND OF EQUIPMENT	AsLock RFID
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC&IC RULES PART(S)	FCC CFR47 Part 15 Subpart C Section 15.207 and 15.209
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. The equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

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2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.209, 15.209(a)	Radiated emission, Spurious Emission and Field Strength of Fundamental	Met the Limit / PASS
15.215	20 dB Bandwidth	Met the Limit / PASS
15.207	Transmitter AC Power Line Conducted Emission	Met the Limit / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC CFR47 Part 15 Subpart C Section 15.207 and 15.209, 15.215

2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.10: 2013 at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The ONETECH Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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3. GENERAL INFORMATION

3.1 Product Description

The Asterisk, Inc., Model: ASR-L70D (referred to as the EUT in this report) is a AsLock RFID. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	AsLock RFID
OPERATING FREQUENCY	134.20 kHz
RATED RF OUTPUT POWER	72.9 dBμV/m
ANTENNA TYPE	Coil Antenna
MODULATION	ASK
RATED SUPPLY VOLTAGE	DC 5.0 V

3.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
ASR-L70D	Basic Model	☑
ASR-L71D	This model is identical to the basic model except for the end customer and color of product.	☐
ASR-L30D		☐
ASR-L31D		☐

Note: 1. Applicant consigns only basic model to test. Therefore, this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

4. EUT MODIFICATIONS

-. None

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5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	N/A	N/A
Module	N/A	N/A	N/A

5.2 Peripheral equipment

Model	Manufacturer	Description	Connected to
RFID Reader	N/A	N/A	N/A
RFID Tag	N/A	N/A	N/A
Charging Cable	N/A	N/A	N/A

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 134.20 kHz for 5V.

To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

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5.4 Configuration of Test System

Line Conducted Test **:** The EUT was tested in a charging mode. The EUT was connected to USB and the power of USB was connected to Adapter. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4: 2009 7.3.3 to determine the worse operating conditions.

Radiated Emission Test **:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

According to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The antenna of the EUT is a Coil Antenna on the main board in the EUT, so no consideration of replacement by the user.

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6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Charging Mode	X

6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

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7. 20 dB BANDWIDTH

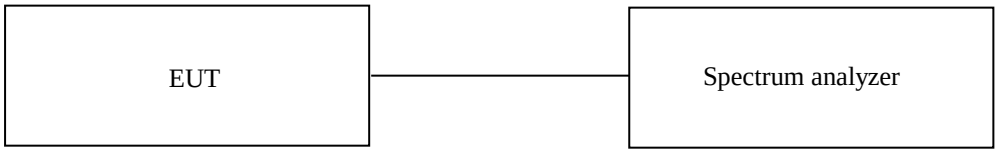
7.1 Operating environment

Temperature	:	23 °C
Relative humidity	:	53 % R.H.

7.2 Test set-up

a. Span = approximately 2 to 3 times the 20 dB bandwidth, RBW = greater than 1 % of the 20 dB bandwidth, VBW = RBW, Sweep = auto, Detector = peak, Trace = max hold.

b. The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level.
The marker-delta reading at this point is 20 dB bandwidth of the emission.



7.3 Test date

October 19, 2020

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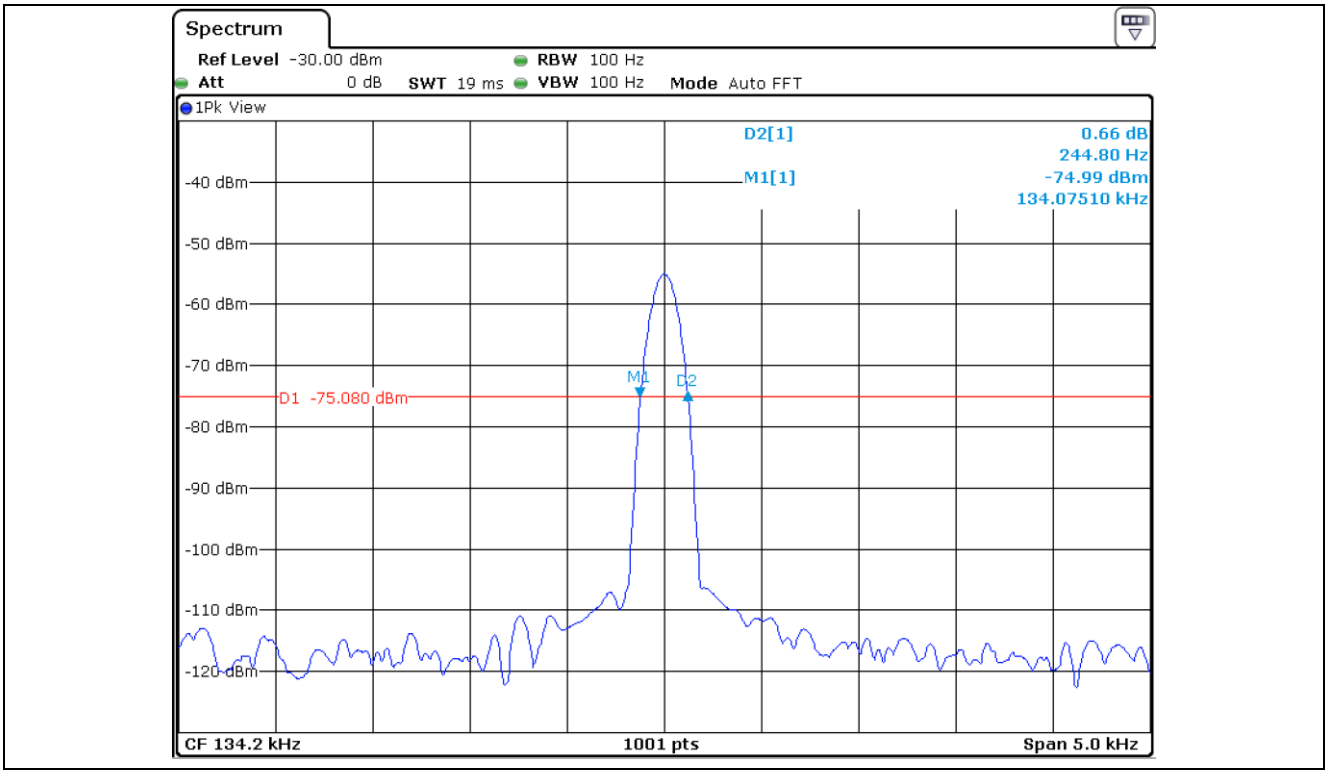
7.4 Test data

Frequency : 134.20 KHz

20 dB Bandwidth : 244.80 Hz



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8. Spurious Emission Test

8.1 Regulation

According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency [MHz]	Field strength [μ V/m]	Field strength [dBμ V/m]	Measurement distance [m]
0.009 ~ 0.490	2 400 / F (kHz)	48.52 ~ 13.80	300
0.490 ~ 1.705	24 000 / F (kHz)	33.8 ~ 22.97	30
1.705 ~ 30	30	29.50	30
30 ~ 88	*100	40.00	3
88 ~ 216	*150	43.52	3
216 ~ 960	*200	46.02	3
Above 960	500	53.98	3

*Except as provided in paragraph (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., Sections 15.231 and 15.241.

8.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 kHz to 1 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 ms in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

8.3 Test data

8.3.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 53 % R.H. Temperature: 23 ºC

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Frequency Range : 9 kHz ~ 30 MHz

Result : PASSED

EUT : AsLock RFID

Operating Condition : Transmitting Mode

Frequency (MHz)	Detector	Ant. Pol. (H/V)	Reading (dBμV)	Ant. Factor (dB/m)	Cable Loss	Emission Level at 3m (dBμV/m)	Emission Level at 300m (dBμV/m)	Limit at 300m (dBμV/m)	Margin (dB)
0.015	QP	H	37.7	20.3	0.0	58.0	-22.0	44.1	66.1
0.031	QP	H	41.2	18.6	0.0	59.8	-20.2	37.8	58.0
*0.134	QP	H	53.4	19.3	0.2	72.9	-7.1	25.1	32.2
*0.134	QP	V	36.6	19.3	0.2	56.1	-23.9	25.1	49.0

Frequency (MHz)	Detector	Ant. Pol. (H/V)	Reading (dBμV)	Ant. Factor (dB/m)	Cable Loss	Emission Level at 3m (dBμV/m)	Emission Level at 30m (dBμV/m)	Limit at 30m (dBμV/m)	Margin (dB)
18.597	AV	V	34.0	19.3	0.2	53.5	13.5	30.0	16.5

-. Remark: “H” Horizontal, “V” Vertical

-. “*” Means Fundamental frequency

-. Emission Level at 3m [dB μ V/m] = Reading [dBμV] + Ant. Factor [dB/m] + Cable Loss [dB]

-. Margin [dB] = Emission Level at 300m [dBμV/m] – Limit at 300m [dBμV/m]

= Emission Level at 300m [dBμV/m] – Limit at 30m [dBμV/m]

-. Emission Level at 300m [dBμV/m] = Emission Level at 3m [dBμV/m] - 40log (300/3), 80 dB for up to 0.49 MHz

-. Emission Level at 30m [dBμV/m] = Emission Level at 3m [dBμV/m] - 40log (30/3), 40 dB for above 0.49 MHz, Below 30 MHz

8.3.2 Spurious Radiated Emission below 1 GHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 53 % R.H. Temperature: 23 ºC

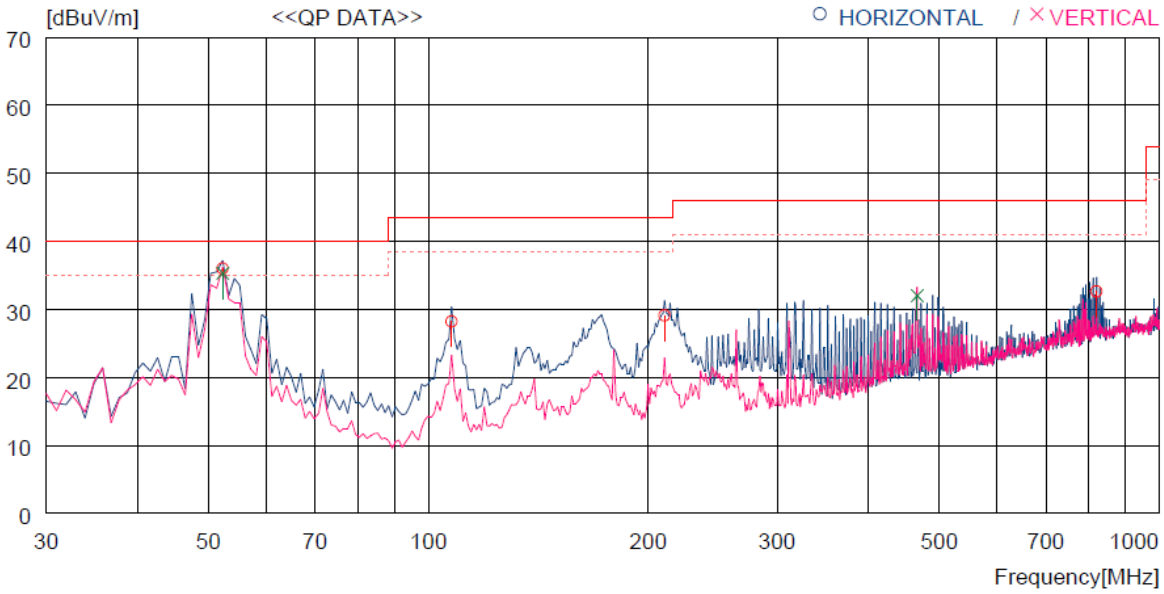
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Frequency range : 30 MHz ~ 1 000 MHz

Result : PASSED

EUT : AsLock RFID

Operating Condition : Transmitting Mode



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	52.310	48.5	19.6	1.1	33.2	36.0	40.0	4.0	300	189
2	107.600	44.1	15.5	1.7	33.1	28.2	43.5	15.3	300	0
3	210.420	43.9	15.7	2.5	33.0	29.1	43.5	14.4	100	0
4	820.541	32.5	28.4	5.0	33.3	32.6	46.0	13.4	100	0
----- Vertical ------										
5	52.310	47.8	19.6	1.1	33.2	35.3	40.0	4.7	100	113
6	466.501	38.1	23.2	3.7	33.0	32.0	46.0	14.0	100	164

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9. CONDUCTED EMISSION TEST

9.1 Operating environment

Temperature : 23 °C

Relative humidity : 53 % R.H

9.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μH + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

9.3 Test equipment used

All test equipment used is calibrated on a regular basis.

9.4 Test date

October 19, 2020

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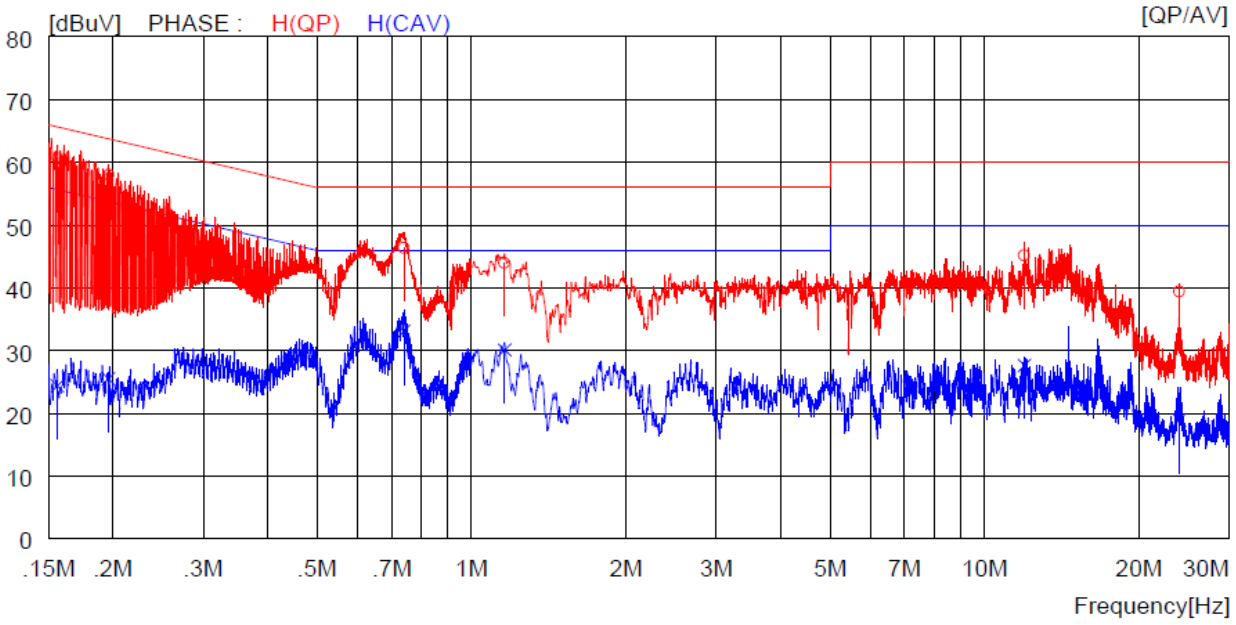
9.4 Test data

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15600	50.6	----	10.0	60.6	----	65.7	----	5.1	----	H(QP)
2	0.19600	48.0	----	10.0	58.0	----	63.8	----	5.8	----	H(QP)
3	0.73800	36.4	----	10.0	46.4	----	56.0	----	9.6	----	H(QP)
4	1.16000	33.9	----	10.1	44.0	----	56.0	----	12.0	----	H(QP)
5	11.96000	35.0	----	10.2	45.2	----	60.0	----	14.8	----	H(QP)
6	23.98000	28.9	----	10.5	39.4	----	60.0	----	20.6	----	H(QP)
7	0.15600	----	14.4	10.0	----	24.4	----	55.7	----	31.3	H(CAV)
8	0.19600	----	15.5	10.0	----	25.5	----	53.8	----	28.3	H(CAV)
9	0.73800	----	23.1	10.0	----	33.1	----	46.0	----	12.9	H(CAV)
10	1.16000	----	20.0	10.1	----	30.1	----	46.0	----	15.9	H(CAV)
11	11.96000	----	17.4	10.2	----	27.6	----	50.0	----	22.4	H(CAV)
12	23.98000	----	8.4	10.5	----	18.9	----	50.0	----	31.1	H(CAV)

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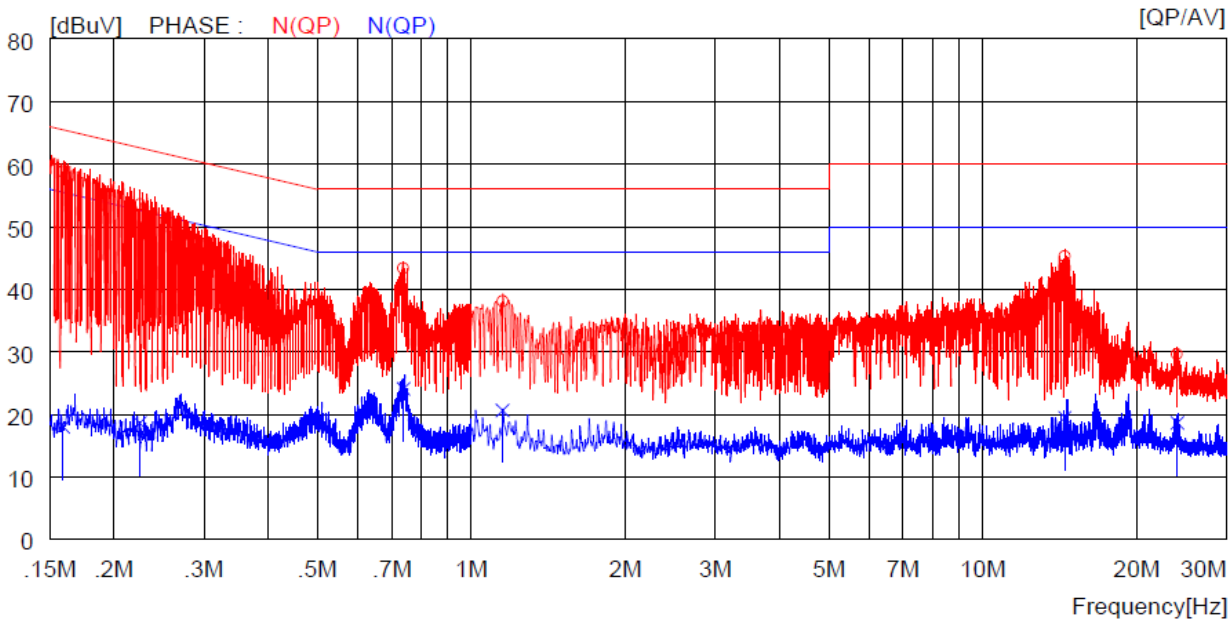
-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15900	48.8	----	10.0	58.8	----	65.5	----	6.7	----	N(QP)
2	0.22500	43.7	----	9.9	53.6	----	62.6	----	9.0	----	N(QP)
3	0.73700	33.3	----	10.0	43.3	----	56.0	----	12.7	----	N(QP)
4	1.15200	28.0	----	10.1	38.1	----	56.0	----	17.9	----	N(QP)
5	14.48000	35.1	----	10.2	45.3	----	60.0	----	14.7	----	N(QP)
6	24.03000	19.1	----	10.5	29.6	----	60.0	----	30.4	----	N(QP)
7	0.15900	----	8.0	10.0	----	18.0	----	55.5	----	37.5	N(CAV)
8	0.22500	----	8.7	9.9	----	18.6	----	52.6	----	34.0	N(CAV)
9	0.73700	----	14.1	10.0	----	24.1	----	46.0	----	21.9	N(CAV)
10	1.15200	----	10.6	10.1	----	20.7	----	46.0	----	25.3	N(CAV)
11	14.48000	----	9.3	10.2	----	19.5	----	50.0	----	30.5	N(CAV)
12	24.03000	----	8.1	10.5	----	18.6	----	50.0	----	31.4	N(CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

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10. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
FSV30	R/S	Spectrum analyzer	101199	Feb. 20, 2020 (1Y)
ESR	R/S	Test receiver	101470	Oct. 20, 2021 (1Y)
VULB9168	Schwarzbeck	TRILOG Broadband Antenna	01088	Dec. 09, 2020 (1Y)
310N	Sonoma Instrument	Amplifier	312544	Mar. 16, 2020 (1Y)
CO3000	Innco Systems GmbH	Controller	N/A	N/A
DT5000	Innco Systems GmbH	Turn Table	N/A	N/A
MA-4640-XPET	Innco Systems GmbH	Antenna Master	MA4640/652/43100318/P	N/A
ESCI	R/S	Test Receiver	101012	Oct. 19, 2020 (1Y)
ESH3-Z2	R/S	PULSE LIMITER	100655	Mar. 16, 2020 (1Y)
NSLK8128	Schwarzbeck	LISN	8128-216	Mar. 16, 2020 (1Y)
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar 24, 2020 (2Y)
PSL-2KP	ESPEC	Environmental Test Chamber	14009407	Feb 21, 2020 (1Y)

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