

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : A battery discharge prevention device
MODEL/TYPE NO : PMEZ(POWER MAGIC EZ) / NONE
FCC ID : YCK-PMEZ
MULTIPLE MODEL : -
BRAND NAME : **BLACKVUE™**
APPLICANT : Pittasoft Co., Ltd.
7F, BYC HIGHCITY Building A 131, Gasan Digital-ro,
Geumcheon-gu, Seoul, 08506 Republic of Korea
Attn.: Minho Shin / Senior Research Engineer
MANUFACTURER : Pittasoft Co., Ltd.
7F, BYC HIGHCITY Building A 131, Gasan Digital-ro,
Geumcheon-gu, Seoul, 08506 Republic of Korea
EQUIPMENT CLASS : JAV - Other non-digital SDoC Devices
TYPE OF DEVICE : All Other Devices
RULE PART(S) : FCC Part 15 Subpart B
TEST PROCEDURE : ANSI C63.4-2014
TEST REPORT No. : ETLE181030.1061
DATES OF TEST : November 02, 2018
REPORT ISSUE DATE : February 13, 2019
TEST LABORATORY : ETL Inc. (FCC Designation Number: KR0022)

This A battery discharge prevention device, Model PMEZ(POWER MAGIC EZ) has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B:

I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared by:

Sang Yeol, Yun (Test Engineer)

February 13, 2019

Reviewed by:

Hyung Min, Choi (Chief Engineer)

February 13, 2019

ETL Inc.

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The test report merely corresponds to the test sample(s).

This report shall not be reproduced, in whole or in part without the written approval of ETL Inc.

This test report is not the accredited test result by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

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FCC MEASUREMENT REPORT

Scope – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

General Information

Applicant Name : Pittasoft Co., Ltd.

Address : 7F, BYC HIGHCITY Building A 131, Gasan Digital-ro,
Geumcheon-gu, Seoul, 08506 Republic of Korea

Attention : Minho Shin / Senior Research Engineer

- **EUT Type** : A battery discharge prevention device
- **Model Number** : PMEZ(POWER MAGIC EZ)
- **S/N** : NONE
- **Rule Part(s)** : FCC Part 15 Subpart B
- **Test Procedure** : ANSI C63.4-2014
- **Equipment Class** : JAV - Other non-digital SDoC Devices
- **Type of Device** : All Other Devices
- **Dates of Tests** : November 02, 2018
- **Environmental of Tests** : Temperature: (20.6 ± 0.9) °C
Humidity: (41 ± 2) % R.H.
Atmospheric Pressure: (102.6 ± 0.2) kPa
- **Place of Tests** : ETL Inc. Testing Lab. (FCC Designation Number : KR0022)

Radiated Emission test 1;
#499-1, Sagot-ri, Seosin-myeon, Hwaseong-si,
Gyeonggi-do, 445-882, Korea

Radiated Emission test 2 and Conducted Emission test;
#371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No.** : ETLE181030.1061

1. INTRODUCTION

The measurement tests for radiated and conducted emission test were conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2014 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 m and 10 m site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2014 and registered to the Federal Communications Commission (FCC Designation Number : KR0022).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014) was used in determining radiated and conducted emissions from the Pittasoft Co., Ltd., Model: PMEZ(POWER MAGIC EZ).

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the A battery discharge prevention device (model: PMEZ(POWER MAGIC EZ)).

The model PMEZ(POWER MAGIC EZ) is basic model that was tested.

2.2 General Specification

Item	Specification
Power	Input: DC 12 V, DC 24 V
	Output: DC 12 V, DC 24 V
Basic Size	48.9 mm x 31.5 mm x 17 mm
High Internal Frequency	X-tal → 8 MHz

3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2014. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω /50 μ H LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1 m x 1.5 m x 0.8 m wooden table which is placed 40 cm away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. Non-inductive bundling to a 1 m length shortened all interconnecting cables more than 1 m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the EMI Test Receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the spectrum analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup in Appendix B.

3.2 Radiated Emission Measurement

Radiated emission measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2014. The measurements were performed over the frequency range of 30 MHz to 40 GHz (or 5th harmonic of the highest frequency) in using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements below 1 GHz were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz. The measurements above 1 GHz were made with the detector set for "Peak and Average" within a bandwidth of 1 MHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1 000 MHz using Log-Bicon antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site or SVSWR chamber at 10 m or 3 m. The test equipment was placed on a styrofoam table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1 m x 1.5 m table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 m to 4 m and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

4.2 EUT operation

The equipment under test was operated during the measurement under following conditions:

- Normal operating mode (DC 12 V)
- Normal operating mode (DC 24 V)

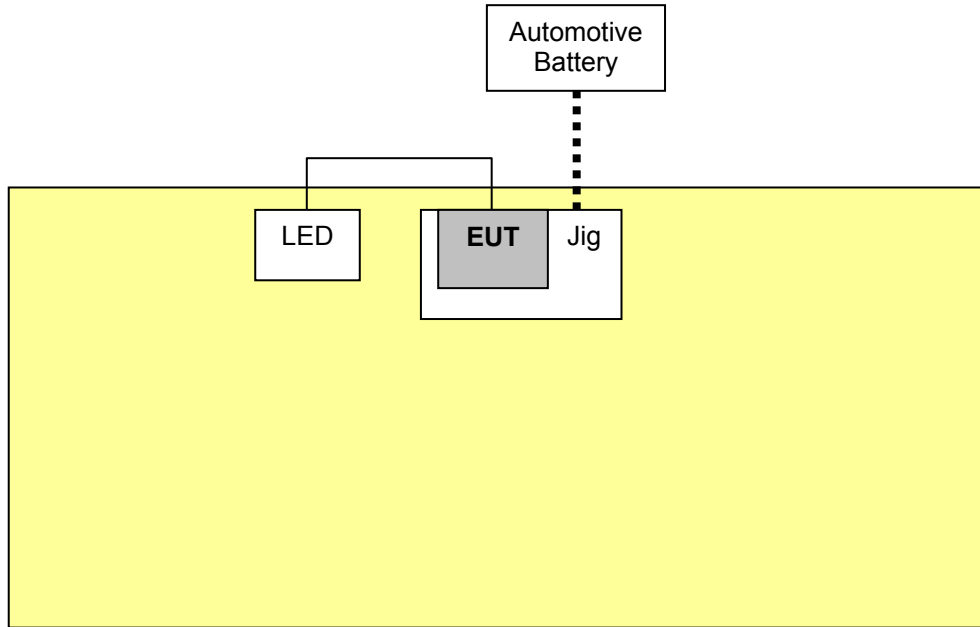
4.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer	FCC
Jig (for Test)	NONE	NONE	NONE	-
LED	NONE	NONE	NONE	-
Automotive Battery (2 EA)	NONE	NONE	NONE	-

4.4 Type of Cables Used

Device from	Device to	Type of I/O port	Length [m]	Type of shield	Used ferrite core
EUT	Jig	DC Input	-	-	-
EUT	LED	DC Output	> 3.0	Shielded	X
Jig	Automotive Battery	DC Input	2.0	Unshielded	X

4.5 The setup drawing(s)



- : Signal line
- : AC Power line
- : DC Power line
- : Adapter

5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule	Measurement Required	Result
15.107(b)	Conducted Emission Measurement	N/A *
15.109(b)	Radiated Emission Measurement (Below 1 GHz)	Passed by 8.74 dB
15.109(b)	Radiated Emission Measurement (Above 1 GHz)	N/A **

* This test was not applied. Because, EUT is powered by DC 12 V – DC 24 V on the automotive battery.

** This test was not applied. Because, the highest frequency of the internal sources of the EUT is less than 108 MHz. This test was measurement made up to 1 GHz according to the conditional testing procedure.

The data collected shows that the **Pittasoft Co., Ltd. / A battery discharge prevention device / PMEZ(POWER MAGIC EZ)** complied with technical requirements of above rules part 15.109(b) Class A Limits.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

5.2 Radiated Emissions Measurement

5.2.1 Radiated Emissions Data

- Below 1 GHz

EUT	A battery discharge prevention device / PMEZ(POWER MAGIC EZ) (S/N: N/A)
Limit apply to	FCC Part 15.109(b) Class A
Test Date	November 02, 2018
Environmental of Test	(20.3 ± 0.6) °C, (41 ± 2) % R.H., (102.6 ± 0.1) kPa
Operating Condition	Normal operating mode
Power Supply mode	DC 12 V
Result	Passed by 13.80 dB

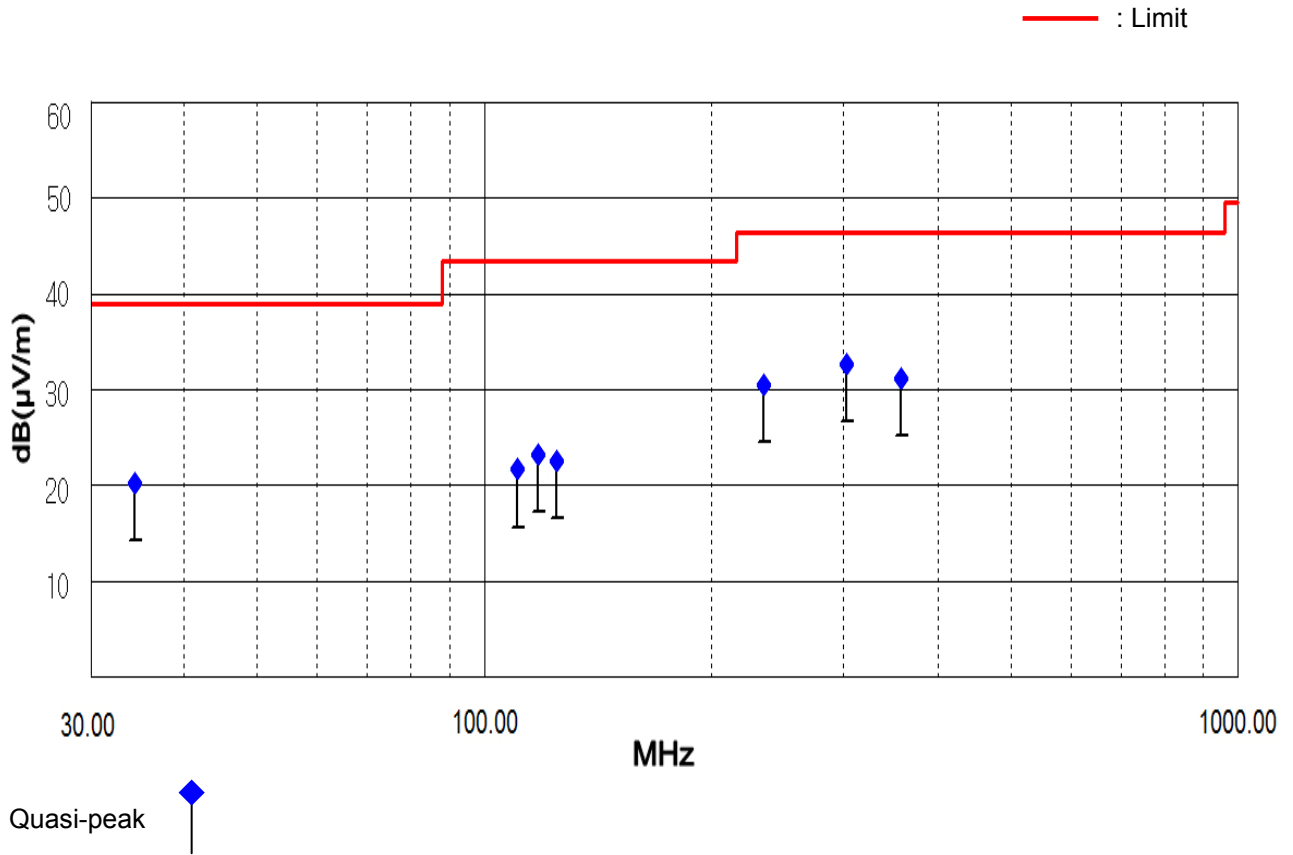
Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB(μV)]	Height [cm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
34.38	42.12	V	10.32	-32.17	100	20.27	39.00	18.73
110.57	42.62	V	10.64	-31.62	124	21.64	43.50	21.86
118.03	45.20	V	9.56	-31.55	115	23.21	43.50	20.29
124.61	45.14	V	8.91	-31.49	128	22.56	43.50	20.94
234.78	49.04	V	12.55	-31.12	134	30.47	46.44	15.97
302.35	49.92	H	13.74	-31.02	315	32.64	46.44	13.80
357.48	46.93	H	15.02	-30.77	148	31.18	46.44	15.26

NOTES:

- * H : Horizontal polarization , ** V : Vertical polarization
- The cable loss value was included the Amp. Gain.
- Result = Reading + Antenna factor + Cable loss
- Margin value = Limit – Result
- Emission level [dB(μV/m)] = 20 log Emission level (μV/m)
- The measurement was performed for the frequency range 30 MHz ~ 1 000 MHz according to the FCC Part 15.109(b) Class A.
- Test measurement distance of 10 m.
- The highest frequency of the internal sources of the EUT is less than 108 MHz. This test was measurement made up to 1 GHz according to the conditional testing procedure.



- Below 1 GHz

EUT	A battery discharge prevention device / PMEZ(POWER MAGIC EZ) (S/N: N/A)
Limit apply to	FCC Part 15.109(b) Class A
Test Date	November 02, 2018
Environmental of Test	(20.8 ± 0.7) °C, (42 ± 1) % R.H., (102.5 ± 0.1) kPa
Operating Condition	Normal operating mode
Power Supply mode	DC 24 V
Result	Passed by 8.74 dB

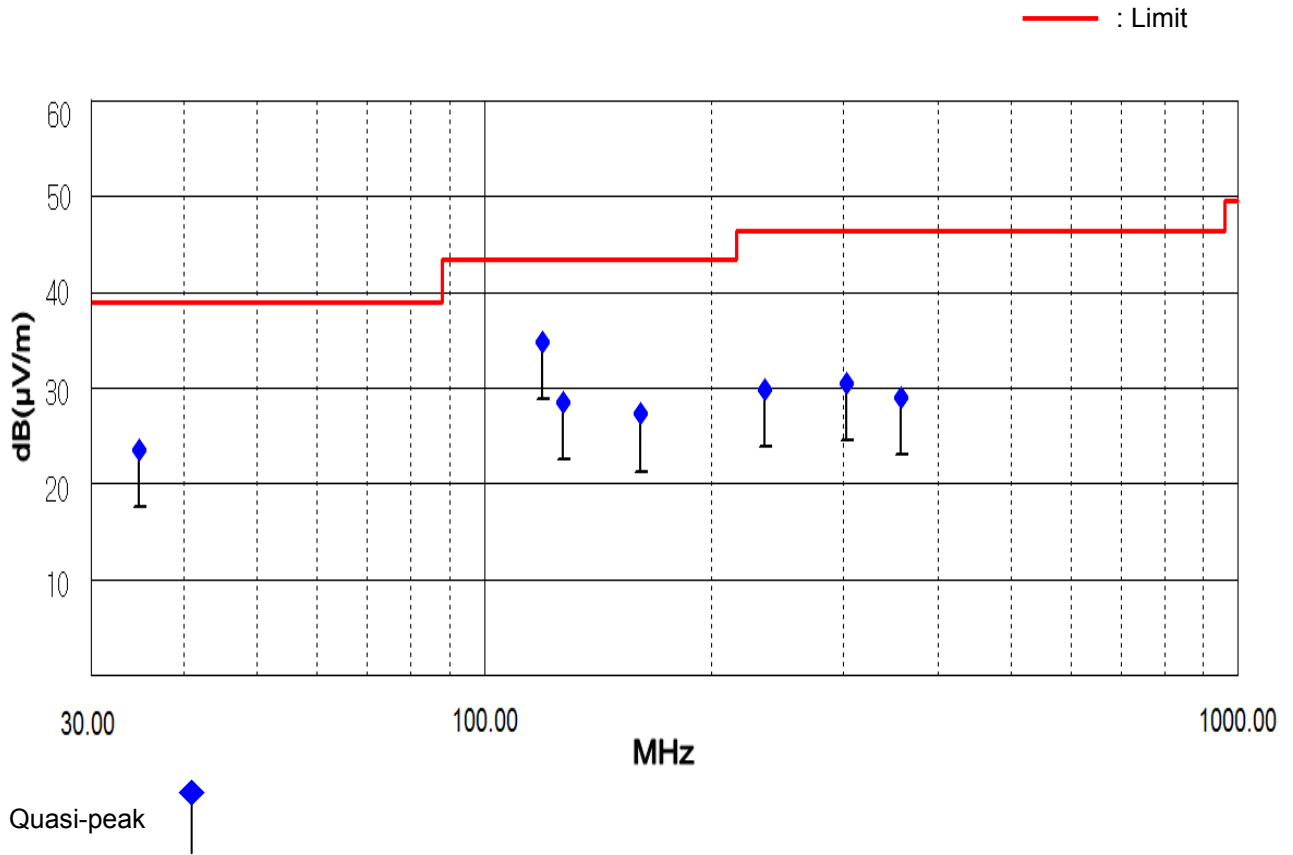
Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB(μV)]	Height [cm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
34.91	45.36	V	10.34	-32.19	100	23.51	39.00	15.49
119.43	56.94	V	9.36	-31.54	121	34.76	43.50	8.74
127.18	51.28	V	8.71	-31.46	128	28.53	43.50	14.97
161.35	50.43	V	8.37	-31.51	136	27.29	43.50	16.21
235.73	48.39	V	12.57	-31.12	132	29.84	46.44	16.60
302.15	47.80	H	13.74	-31.02	325	30.52	46.44	15.92
357.48	44.71	H	15.02	-30.77	148	28.96	46.44	17.48

NOTES:

- * H : Horizontal polarization , ** V : Vertical polarization
- The cable loss value was included the Amp. Gain.
- Result = Reading + Antenna factor + Cable loss
- Margin value = Limit – Result
- Emission level [dB(μV/m)] = 20 log Emission level (μV/m)
- The measurement was performed for the frequency range 30 MHz ~ 1 000 MHz according to the FCC Part 15.109(b) Class A.
- Test measurement distance of 10 m.
- The highest frequency of the internal sources of the EUT is less than 108 MHz. This test was measurement made up to 1 GHz according to the conditional testing procedure.



6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor - Preamplifier Factor

$$dB(\mu V) = 20 \log_{10} (\mu V) : \text{Equation}$$

$$dB(\mu V) = dBm + 107$$

Example : @ 119.43 MHz

Class A Limit	=	43.50 dB(μ V/m)
Reading	=	56.94 dB(μ V)
Antenna Factor + (Cable Loss - Amp. Gain)	=	9.36 + (-31.54) = -22.18 dB(μ V/m)
Total	=	34.76 dB(μ V/m)
Margin	=	43.50 - 34.76 = 8.74 dB
	=	8.74 dB below Limit

7. List of test equipments used for measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
<input checked="" type="checkbox"/>	EMI Test Receiver	ESPI3	R&S	100478	18.08.30	19.08.30
<input checked="" type="checkbox"/>	Amplifier	BLWA 0310-1	BONN Elektronik	045672	18.08.31	19.08.31
<input checked="" type="checkbox"/>	Bi-Log Antenna	VULB9163	Schwarzbeck	01069	17.02.17	19.02.17
<input checked="" type="checkbox"/>	Turn-Table	TT 1.35 SI	SES	-	N/A	N/A
<input checked="" type="checkbox"/>	Antenna Master	AM 4.5	SES	-	N/A	N/A