

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : Radar detector TPX main console
MODEL/TYPE NO : A-01-01
FCC ID : VWV-A-01-01
APPLICANT : Adaptiv Technologies, LLC
459 Columbus Avenue, #709 New York, NY 10024
Attn.: Mr. Adam Gold / Director
MANUFACTURER : Willtronics Co., Ltd
301 Kwanlidong, KwangMyung Industrial Complex, 201 Haan-3-Dong,
KwangMyung, Kyungki, Korea, 423-063
FCC CLASSIFICATION : DSC : Part 15 Security/Remote Control Transmitter
FCC RULE PART(S) : FCC Title 47, Part 15 Subpart B & C
FCC PROCEDURE : ANSI C63.4-2003
TEST REPORT No. : ETLE071211.900
DATES OF TEST : December 14, 2007 – December 18, 2007
REPORT ISSUE DATE : January 02, 2008
TEST LABORATORY : ETL Inc. (FCC Registration Number : 95422)

This is Radar detector TPX main console, Model A-01-01 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 at the ETL Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C section 15.231 & Subpart B section 15.109.

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.



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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	: Adaptiv Technologies, LLC
Address	: 459 Columbus Avenue, #709 New York, NY 10024
Attention	: Mr. Adam Gold / Director

- **EUT Type :** Radar detector TPX main console
- **Model Number :** A-01-01
- **FCC ID :** VWV-A-01-01
- **S/N :** Proto-type
- **Freq. Range :** 418 MHz
- **FCC Rule Part(s) :** FCC Part 15 Subpart C section 15.231 & Subpart B Section 15.109
- **Test Procedure :** ANSI C63.4-2003
- **FCC Classification :** DSC: Part 15 Security/Remote Control Transmitter
- **Dates of Tests :** December 14, 2007 – December 18, 2007
- **Place of Tests :** ETL Inc. Testing Lab. (FCC Registration Number : 95422)
 - Radiated Emission test;
#584, Sangwhal-ri, Ganam-myeon, Yaju-gun,
Gyeonggi-do, 469-885, Korea
 - Conducted Emission test;
ETL Inc. Testing Lab. (FCC Registration Number : 95422)
371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No. :** ETLE071211.900



1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the open area test site of ETL Inc. facility located at #584, Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyeonggi-do, 469-885, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 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 C63.4-2003 and registered to the Federal Communications Commission (Registration Number : 95422).

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 C63.4-2003) was used in determining radiated and conducted emissions from the Adaptiv Technologies, LLC, Model: A-01-01

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Adaptiv Technologies, LLC, Model: A-01-01

2.2 General Specification

Dimensions:	65mm(W) x 118mm(L) x 42mm(H)
Weight:	185 g
Power Requirement:	12V DC
Temperature Range:	Operating -20°C to +80°C Storage -40°C to +100°C

• Laser Detector

Receiver Type	Pulse Laser Signal Receiver
Sensor Front End	Convex Condenser Lens
Detector Type	Pulse Width Discriminator
Receiver Bandwidth	30 MHz
Spectral Response	800- 1100 nm

• Radar Detector

Receiver Type	Double Conversion Superheterodyne
Detector Type	Scanning Frequency Discriminator
Antenna Type	Linear Polarization
Frequency of	10.525 GHz ± 50 MHz (X Band)
Operation	24.150 GHz ± 100 MHz (K Band)
	34.700 GHz ± 1300 MHz (Ka Band)

• Transmitter Frequency(Tx)

Transmitter	418.00 MHz
Moudulation	ASK(Amplitude shift keying)
Transmitter used in device	SAW(surface acoustic wave) RESONATOR NDR4047
Tolerance of transmission frequency	± 20 ppm
Modulation contents	Digital data

3. DESCRIPTION OF TESTS

3.1 Radiated Emission Measurement

Radiated emission measurements were in accordance with § 13 in ANSI C63.4-2003 "Measurement of Intentional radiators" and § 11 in ANSI C63.4-2003 "Measurement of Information Technology Equipment". The measurements were performed over the frequency ranges of 30 MHz to 4,2 GHz and 11,7 GHz to 12,2 GHz using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements were made with the detector set for "Quasi-peak or Peak" within a bandwidth of 120 kHz or 1 MHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determine the frequency producing the max 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 broad-band horn antennas were used. Final measurements were made open site at 3 m. The test equipment was placed on a wooden turn-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 detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the max. 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 max 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.

3.2 FCC Part 15.205 Restricted Bands of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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 and which tends to maximize its emission level in a typical application.

4.2 EUT operation

The EUT was connected as user's guide. And during the test executed EUT is operating on the following

- Function of transmitter

The EUT (model: A-01-01) has been tested under operating condition.
Fixed Channel (418 MHz) was chosen for testing.

- Function of Radar detector

Bands: 10,525 GHz \pm 50 MHz (X-Band), 24,150 GHz \pm 100 MHz (K-Band),
34,700 GHz \pm 1 300 MHz (Ka-Band(super-wide))

Operating Mode
Stand-by mode
10,525 GHz \pm 50 MHz (X-Band),
24,150 GHz \pm 100 MHz (K-Band)
34,700 GHz \pm 1 300 MHz (Ka-Band(super-wide))

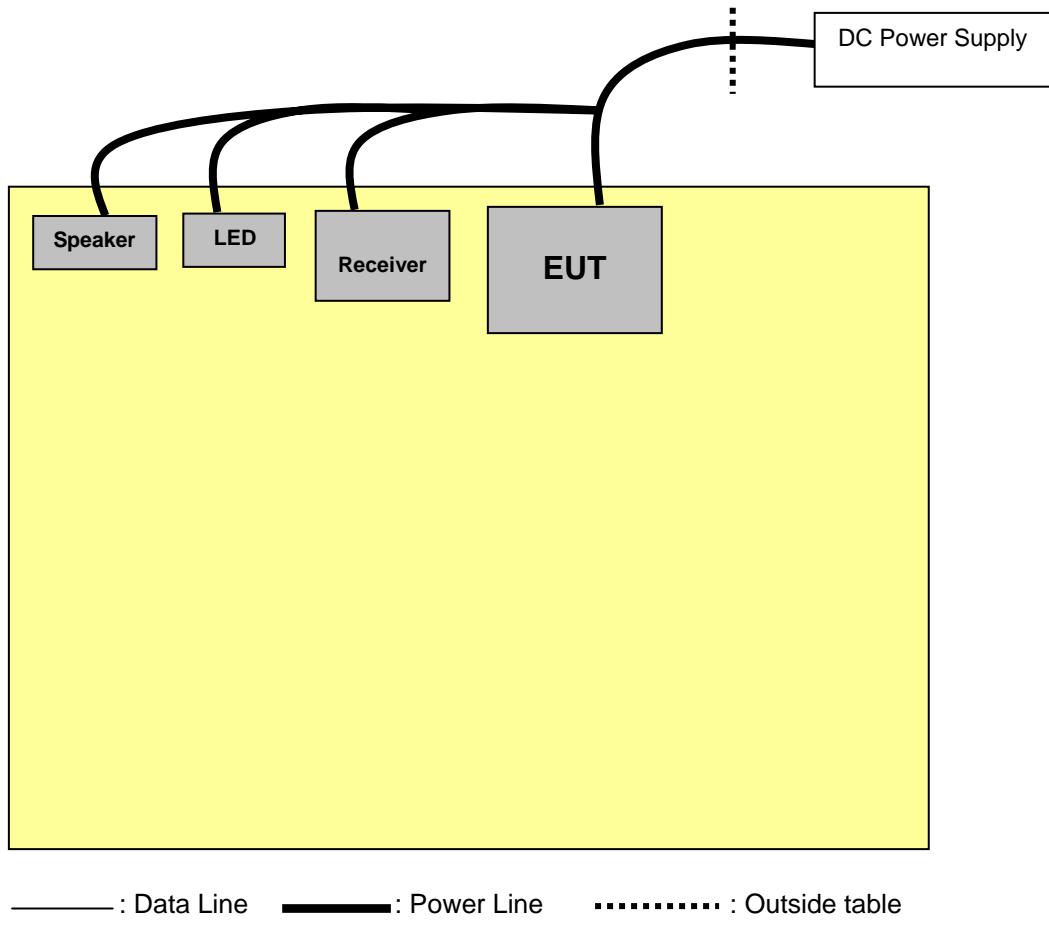
4.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer	FCC ID
Receiver	NONE	NONE	NONE	-
LED	NONE	NONE	NONE	-
Speaker	NONE	NONE	NONE	-

4.4 Type of Cables Used

Device from	Device to	Type of Cable	Length(m)	Type of shield
EUT	DC Power Supply	DC Input	0,8	Shielded
	Receiver	DC Input	2,0	Shielded
	Speaker	DC Input	0,8	Shielded
	LED	DC Input	1,5	Shielded

4.5 The setup drawing(s)



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.

Applied Standard : 47 CFR Part 15, Subpart C & Subpart B			
FCC Rule	Measurement Required	Result	Remarks
15.109(h)	Radiated Emissions within Restricted Bands	Pass	
15.207(a)	Power line Conducted Emissions	N/A	1)
15.231(a)(1)	Manually operated transmitter	Pass	
15.231(a)(2)	Automatically activated transmitter	Pass	
15.231(a)(3)	Periodic transmissions at regular predetermined intervals	Pass	
15.231(a)(4)	Radiators used in cases of emergency	Pass	
15.231(a)(5)	Set-up information for security systems	Pass	
15.231(b)	Radiated Emissions	Pass	
15.231(c)	20 dB Bandwidth	Pass	
15.231(d)	Devices operating within the frequency band 40,66-40,70 MHz	N/A	2)
15.231(e)	Radiated emissions for Periodic radiators	N/A	
15.209(a)	Radiated Emissions within Restricted Bands	Pass	

Notes:

- 1) The EUT is powered by DC power supply that uses battery only.
- 2) The frequency range of EUT is 418 MHz fixed.

The data collected shows that the **Adaptiv Technologies, LLC / Radar detector TPX main console / A-01-01** complied with technical requirements of above rules part 15.109, 15.209 and 15.231 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

EUT	Radar detector TPX main console / A-01-01
Limit apply to	FCC Part 15. 109(h)
Test Date	December 14, 2007
Operating Condition	Operating on the following Bands (X, K, Ka bands)
Result	Passed

Limit

Radar detectors shall comply with the emission limits in paragraph (a) of this section over the frequency range of 11.7-12.2 GHz.

Test Data

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

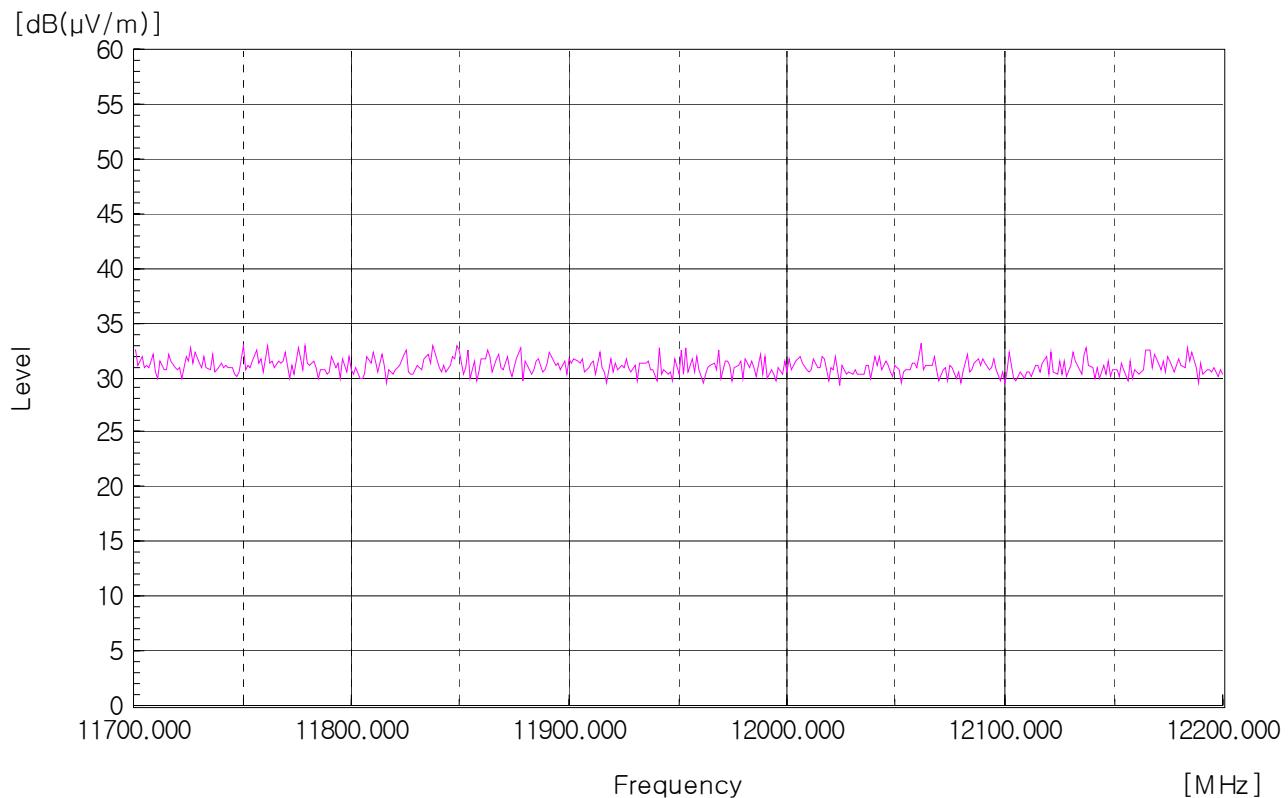
Detector mode: Peak mode (Bandwidth: 1 MHz)

NOTES :* H : Horizontal polarization , ** V : Vertical polarization

- 1. Result = Reading + Antenna factor + Cable loss
- 2. Margin value = Limit - Result level
- 3. The measurement was performed for the frequency range 11,7 GHz – 12,2 GHz according to the FCC Part 15.109(h)
- 4. No signal detected of 11.7 GHz – 12.2 GHz. Refer to plot data



Test Engineer: Kug Kyoung, Yoon

Plot data (Radiated Emissions Measurement of 11,7 GHz ~ 12,2 GHz)

5.3 20 dB Bandwidth

EUT	Radar detector TPX main console / A-01-01
Limit apply to	FCC Part 15. 231(c)
Test Date	December 15, 2007
Operating Condition	Continues transmitter(418 MHz)
Result	Passed

Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Data

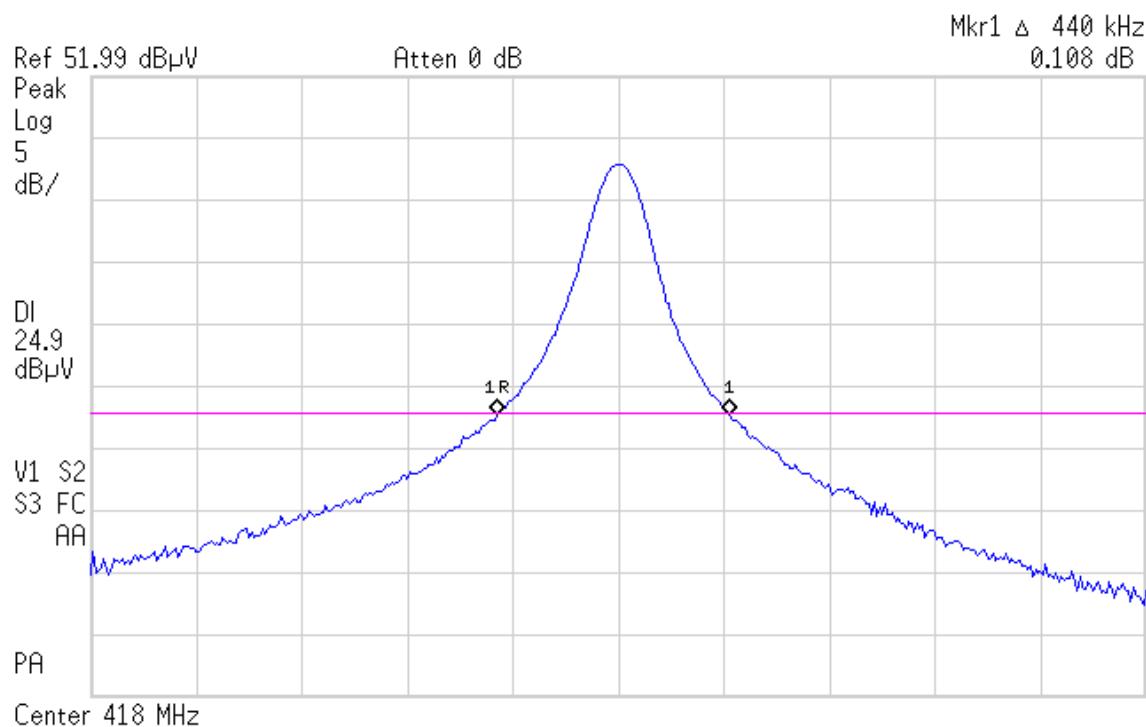
Center Frequency [MHz]	Measured occupied bandwidth [MHz]	Limit [MHz]	Rusult
418,00	0,440	1,045 (0.25%)	Pass

NOTES :

1. Please see the measured bandwidth plot in next page.
2. The bandwidth is determined at the points 20 dB down from the modulated carrier.



Test Engineer: Kug Kyoung, Yoon

20 dB Bandwidth

5.4 Radiated Emissions for Periodic radiators

EUT	Radar detector TPX main console / A-01-01
Limit apply to	FCC Part 15. 209(a) & 15.231(b)
Test Date	December 18, 2007
Operating Condition	Continues transmitter(418 MHz)
Result	Passed

Part 15.209(a) except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequencies (MHz)	15.209 Radiated Limits (dBuV/m@3 m)
30 – 88	40
88 – 216	43.5
216 – 960	46
Above 960	54

Part 15.231(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emission (microvolts/meter)
40,66-40,70	2 250	225
70-130	1 250	125
130-174	1 250 to 3 750**	125 to 375**
174-260	3 750	375
260-470	3 750 to 12 500**	375 to 1 250**
Above 470	12 500	1 250

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = $56,81818(F) - 6,136,3636$; for the band 260-470 MHz, uV/m at 3 meters = $41,6667(F) - 7,083,3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

$$\begin{aligned}\text{Fundamental: uV/m at 3 meters} &= 41,6667(418) - 7,083,3333 = 10,333,3473 = 20\log*10,333,3473 \\ &= 80,28 \text{ dB}_{\mu\text{V/m}}\end{aligned}$$

$$\begin{aligned}\text{Spurious emissions: uV/m at 3 meters} &= 20 \text{ dB below of fundamental level} \\ &= 60,28 \text{ dB}_{\mu\text{V/m}}\end{aligned}$$

Test Results

- Refer to see the measured plot in next page.

5.4.1 Radiated Emissions Data

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

Detector mode: Quasi-Peak mode (RBW: 120 kHz) below 1 GHz
Peak – AV mode (RBW: 1 MHz) above 1 GHz

Frequency [MHz]	Reading [dB μ V]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB μ V]	Emission Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
36,08	17,83	V	9,01	1,56	28,40	40,00	11,60
40,12	15,27	V	9,33	1,80	26,40	40,00	13,60
45,52	17,00	V	9,59	2,01	28,60	40,00	11,40
53,62	11,53	H	9,27	2,10	22,90	40,00	17,10
55,65	17,35	H	9,05	2,10	28,50	40,00	11,50
120,45	18,81	H	10,48	3,11	32,40	43,50	11,10
133,95	17,16	H	11,09	3,31	31,56	43,50	11,94
184,58	15,72	H	10,01	3,92	29,65	43,50	13,85
228,45	19,35	H	10,65	4,58	34,58	46,00	11,42
252,75	14,41	H	11,35	4,89	30,65	46,00	15,35
Other frequencies	-	-	-	-	-	-	-

NOTES : 1. * H : Horizontal polarization , ** V : Vertical polarization
2. Result = Reading + Antenna factor + Cable loss
3. Margin value = Limit – Result
4. Results found to be 20dB or greater under the limit have not been included.
5. The measurement was performed for the frequency range 30 MHz – 4,2 GHz according to the FCC Part 15.209(a)
6. below 1 GHz = Ant factor + cable loss, above 1 GHz = Ant factor + cable loss + AMP gain



Test Engineer: Kug Kyoung, Yoon

5.4.2 Field Strength of Fundamental and Spurious Emissions Data

Peak Mode Test Data

Frequency [MHz]	Reading [dB μ V]	Polarization (*H/**V)	AMP gain [dB/m]	Ant. Factor [dB/m]	Cable Loss [dB μ V]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
418,00	46,12	H	0	14,86	6,82	67,80	100,28	32,48
836,00	23,08	H	0	22,12	11,30	56,50	80,28	23,78
1 254,00	37,70	H	-29,00	24,90	12,60	46,20	80,28	34,08
1 672,00	37,20	H	-33,00	26,50	12,80	43,50	74,00	30,50
2 090,00	26,40	H	-25,00	27,60	13,10	42,10	80,28	38,18
Other frequencies	-	-		-	-	-	-	-

Average Mode Test Data

Frequency [MHz]	Reading [dB μ V]	Polarization (*H/**V)	AMP gain [dB/m]	Ant. Factor [dB/m]	Cable Loss [dB μ V]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
418,00	35,10	H	0	14,86	6,82	56,78	80,28	23,50
836,00	3,45	H	0	22,12	11,30	36,87	60,28	23,41
1 254,00	28,50	H	-29,00	24,90	12,60	37,00	60,28	23,28
1 672,00	19,68	H	-33,00	26,50	12,80	25,98	54,00	28,02
Other frequencies	-	-		-	-	-	-	-

NOTES:

1. The test was searched from 30 MHz to the 10th Harmonic.(30MHz – 4.2GHz)
2. Results found to be 40dB or greater under the limit have not been included.
3. Below 1 GHz = Ant factor + cable loss, above 1 GHz = Ant factor + cable loss + AMP gain



Test Engineer : Kug Kyoung, Yoon

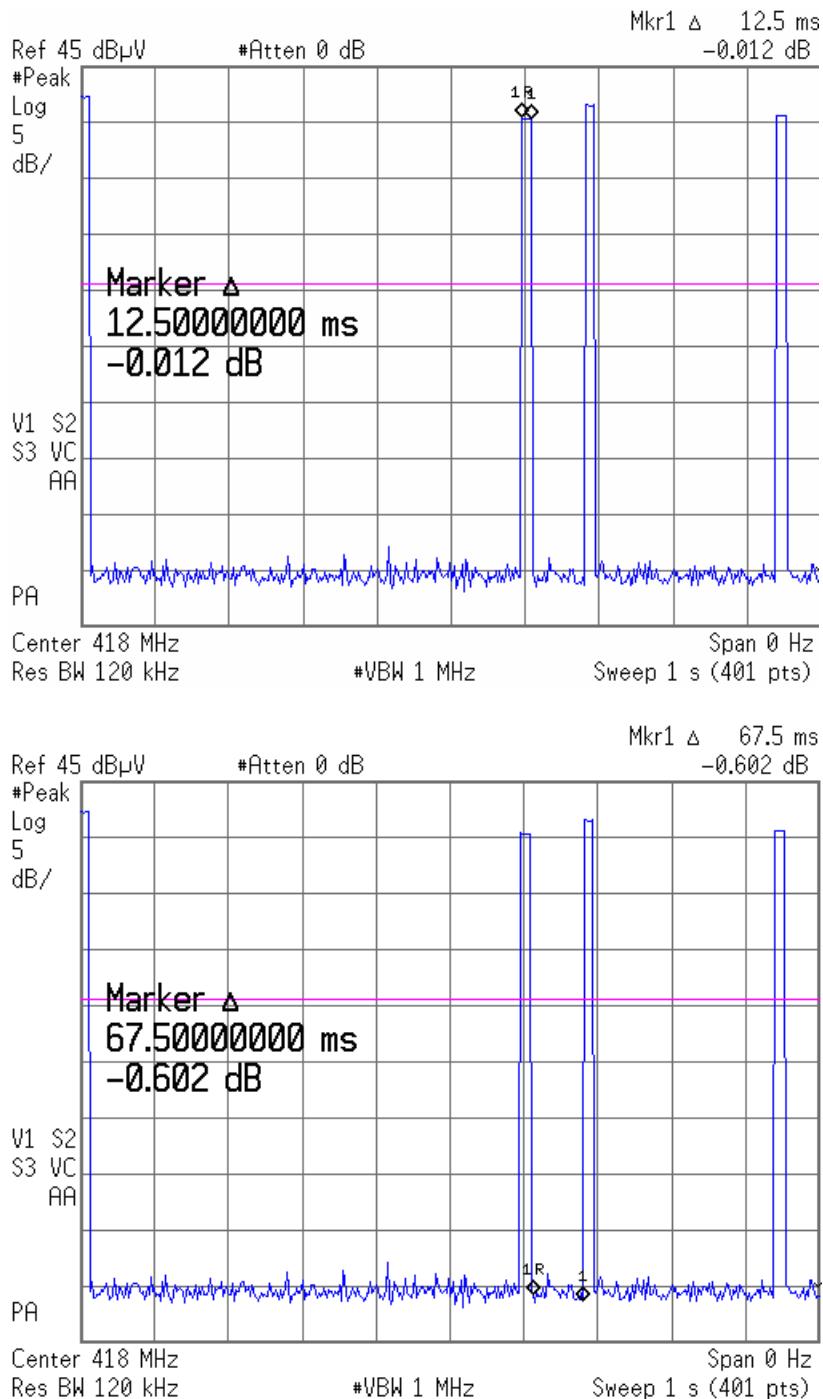
5.5 Periodic Operation Measurement Plot

Refer to the duty cycle plot (as below)

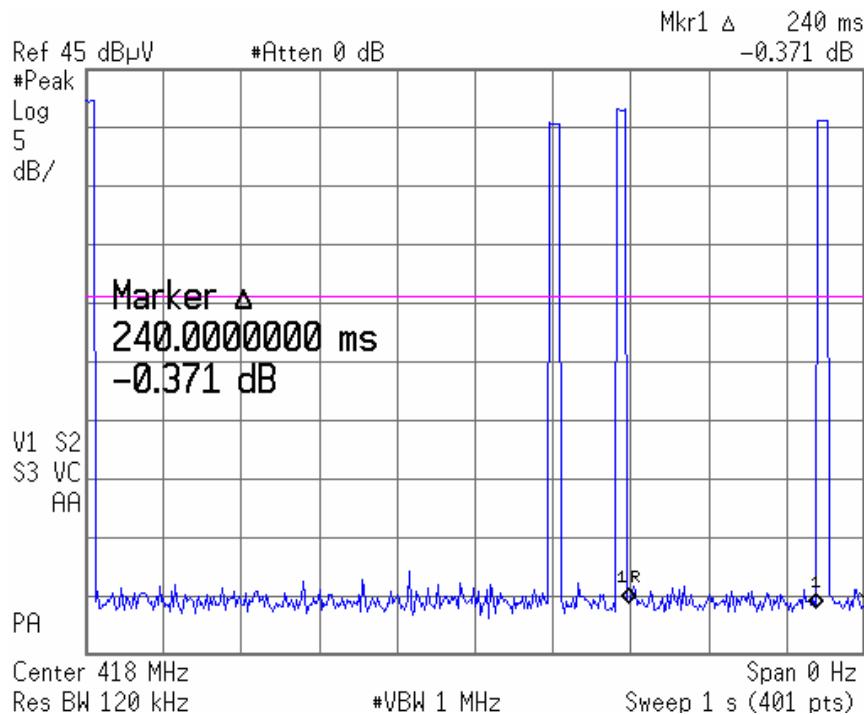
We find each the duration transmission for the device is about 12,5 ms and silent period between transmissions is about 240 ms.

This device does meet the FCC 15.231(a) requirement.

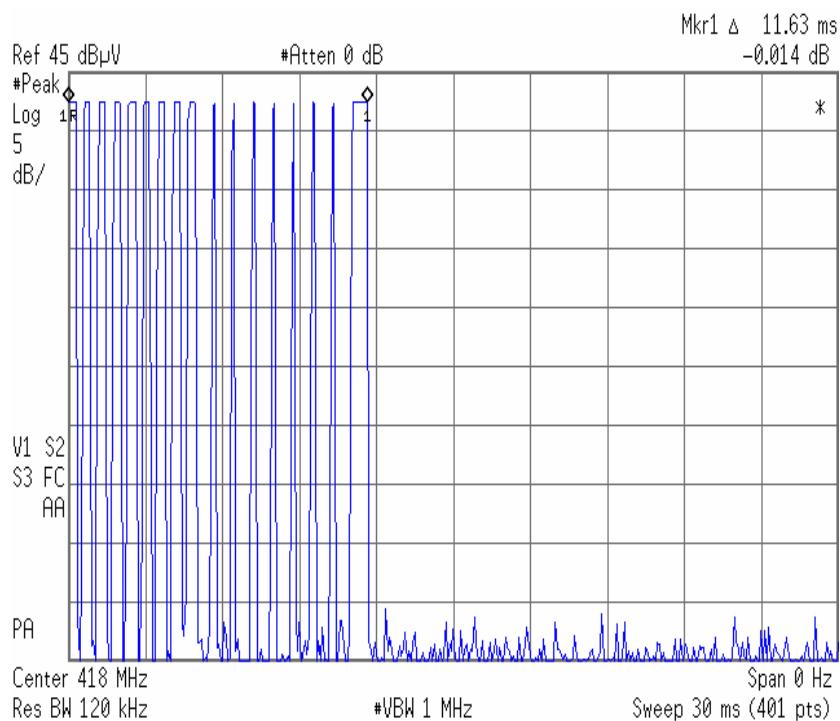
Auto activation time



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Manual activation time



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

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

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

Example : @ 120,45 MHz

$$\text{Class B Limit} = 43,50 \text{ dB } \mu V/m$$

$$\text{Reading} = 18,81 \text{ dB } \mu V$$

$$\text{Antenna Factor + Cable Loss} = 10,48 + 3,11 = 13,59 \text{ dB/m}$$

$$\text{Total} = 32,40 \text{ dB } \mu V/m$$

$$\text{Margin} = 43,50 - 32,40 = 11,10 \text{ dB}$$

$$= 11,10 \text{ dB below Limit}$$

7. List of test equipments used for measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Due Date
<input checked="" type="checkbox"/>	SPECTRUM ANALYZER	E7405A	H.P	US41160290	08.10.17
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESVS 10	R&S	835165/001	08.05.03
<input checked="" type="checkbox"/>	Broad band Horn antenna	BBHA 9120D	Schwarzbeck	227	08-03-15
<input checked="" type="checkbox"/>	Turn-Table	DETT-03	Daeil EMC	-	N/A
<input checked="" type="checkbox"/>	Antenna Master	DEAM-03	Daeil EMC	-	N/A
<input checked="" type="checkbox"/>	LogBicon Antenna	VULB9165	Schwarz Beck	2023	08-07-23
<input checked="" type="checkbox"/>	Preamplifier	8447D	H.P	3307A02865	08-10-05

End of Test Report