CERTIFICATION TEST REPORT

FCC CFR47 PART 15 SUBPART C

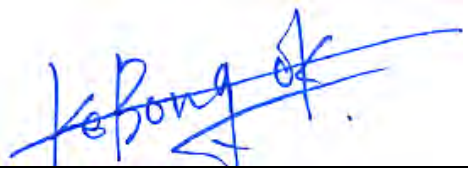
Test Report File No.	14-IST-0150	■ Basic	☐ Alternate
Date of Receipt	Feburary 24, 2014	**Begin of test date**	March 12, 2014
Date of Issue	March 26, 2014	**End of test date**	March 18, 2014

Kind of Product	FOB
Basic Model(s)	S-10F
FCC ID	2AB26S-10F

Applicant	PLATO CO., LTD.
Address	5F Pyungchon IT Venture Center, 1113-1, Bisan-Dong,
	Dongan-Gu,Anyang-City, Gyeonggi-Do, Korea
Manufacturer	PLATO CO., LTD.
Address	5F Pyungchon IT Venture Center, 1113-1, Bisan-Dong,
	Dongan-Gu,Anyang-City, Gyeonggi-Do, Korea

Test Result ■ **Positive** ☐ **Negative**

Tested By



B.O.KO

Reviewed By

S.J.CHO

Comment(s)

- Investigations requested : Measurement to the relevant clauses of FCC rules and regulations Part 15 Subpart C.
- The test report is consists of 17 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST Co., Ltd.
- This equipment as for has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4 I assume full responsibility for accuracy and completeness of these data.

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INFORMATION OF TEST LABORATORY

EMC LABORATORY of IST Co., Ltd.
52-20, Sinjeong-ro 41beon-gil, Giheung-gu
Yongin-si, Gyeonggi-do, Korea.

TEL : +82 31 326 6700 FAX : +82 31 326 6797

KOLAS Testing No. : KT118
RRA Designation No. : KR0018
FCC Registration No. : 400603
VCCI Member No. : 1739

Measurement Uncertainty

Conducted Emissions	U = 2.98 [dB] (Confidence level approximately 95 %, k = 2)
Radiated Emissions (Antenna - Horizontal)	U = 3.83 [dB] (Confidence level approximately 95 %, k = 2)
Radiated Emissions (Antenna - Verical)	U = 4.50 [dB] (Confidence level approximately 95 %, k = 2)

PRODUCT INFORMATION

Specification(FOB)

Power	DC 3V (Battery_CR2032)
Dark Current	Max. 6uA
LF Frequency	134.2KHz(Rx)
LF Range	1m
RF Frequency	433.9 MHz(Tx)
Modulation	FSK
RF Range	Max 30m
Dimension	45 x 50 x 16 mm
Operating Temp	-10 ~ 60°C
Weight	20g
Battery Life Time	Min. 2 years

Note: All the testing were performed according to the procedures in FCC CFR47 PART 15 SUBPART C

SUMMARY

Applied Standard : FCC CRF Part 15 Subpart C

Standard Section	Description	result	remark
15.209(a) 15.231(b)	Radiated emission, Spurious Emission and Field Strength of Fundamental	Pass	Meet the requirements
15.231(C)	Bandwidth of Operation Frequency	Pass	Meet the requirements
15.231(a)	Transmission Time	Pass	Meet the requirements
15.203	Antenna requirement	-	Meet the requirements

Equipment Under Test

EUT Type :

☐ Table-Top. ☐ Floor-Standing.

☐ Table-Top and Floor-Standing(Combination).

■ Hand held

Operation – mode of the E.U.T. :

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

☐ Standby Mode

■ Operational Condition : ■ continue Transmit

Configuration of the equipment under test :

Following peripheral devices and interface cables were connected during the measurement :

Equipment	Type	Brand	Serial No.
-	-	-	-

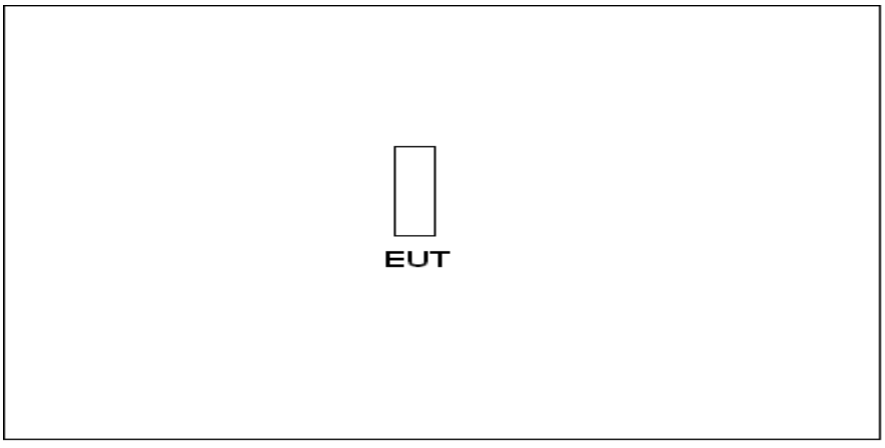
EUT exercise Software

To get a maximum radiated emission from the EUT, the touch screen o the EUT was pushed to transmit RF signal continuously.

To activate continuous transmission, software was changed as above for testing only.

To get a maximum emission levels from the EUT, the EUT was moved throughout the X, Y, and Z planes.

Test Set-Up



Radiated Emissions

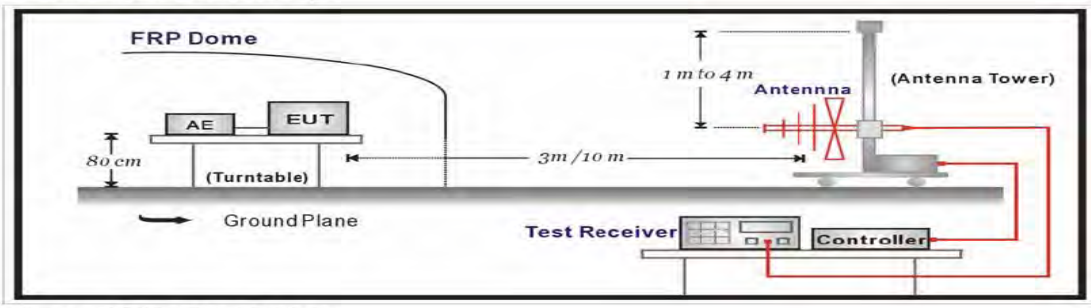
Radiated Emissions:

The measurement was performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120kHz.

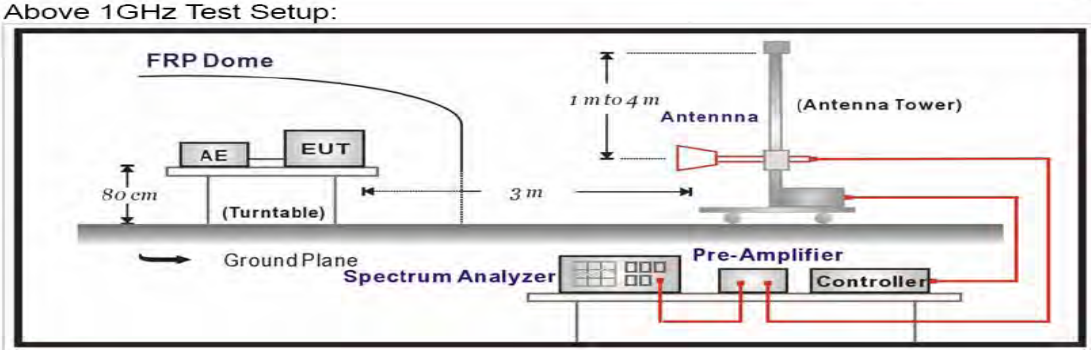
Procedure of Test

Preliminary measurements were made at 3 meter using bi-log antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 1000MHz using bi-log antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3-meters test distance using bi-log antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuation. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral 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 120kHz or 1MHz depending on the frequency of type of signal. The EUT, peripheral 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-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral 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 to 4 meters 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 peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.(The bandwidth below 1GHz setting on the field strength meter is 120KHz and above 1GHz is 1MHz.)

Under 1GHz Test Setup:



Above 1GHz Test Setup:



Limits

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 :

FCC Part 15 Subpart C Section 15.209 Limits		
Frequency(MHz)	μV/meter	dBμV/meter(3m)
0.009-0.490	2400/F(KHz) at 300 m	20log 2400/F(KHz)+80
0.490-1.705	24000/F(KHz)at 30m	20log 24000/F(KHz)+40
1.705-30	30 at 30 m	49.5
30-88	100**	40
88-216	150**	43.5
216-960	200**	46
Above 960	500	54

Remarks : Except as provided in paragraph(g), fundamental emissions from an intentional radiators operating under this section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section 15.231 and 15.241.

FCC PART 15 subpart C section 15.231:

Fundamental Frequency (MHz)	Field Strength of Fundamental (μV/meter)	Field Strength of Spurious Emissions (μV/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,250**	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)-6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F)-7083.3333. The maximum permitted unwanted emission level is 20dB below the maximum permitted

Fundamental level.]

In the above emission table, the tighter limit applies at the band edges.

Fundamental Frequency (MHz)	Field Strength				Measurement Distance (meter)
	Fundamental		Spurious Emissions		
	PK(dBuV/m)	AV(dBuV/m)	PK(dBuV/m)	AV(dBuV/m)	
433.92	100.82	80.82	80.82	60.82	3

Radiated Emissions Results

[Applicable]

◆ Test Equipment Used

Name	Type	Manufacturer	Due for Cal	Serial Number
EMI Receiver	ESCS30	Rohde & Schwarz	May 10, 2014	100171
EMI Receiver	ESCI7	Rohde & Schwarz	Jul. 16, 2014	100872
SPECTRUM ANALYZER	R3273	ADVANTEST	Oct. 07, 2014	95090431
Loop Antenna	HFH2-Z2	Rohde & Schwarz	Oct. 26, 2014	8620771017
Log-bicon Antenna	VULB9160	Schwarz beck	Jun. 03, 2015	3071
HORN-Antenna	3115	EMCO	Dec. 04, 2015	9012-3602
HORN-Antenna	HF906	Rohde & Schwarz	Oct. 25, 2015	100530
PRE AMPLIFIER	8449B OPT H02	HP	Oct. 08, 2014	3008A0530

Note : 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

◆ Test Conditions

Temperature (22.5 ± 0.2) ℃
Humidity (37.8 ± 0.2) % R.H.
Atmosphere (1010) mbar

◆ Test Area Full-Anechoic Room (3m)

◆ Test Date March 14, 2014

Note :

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

Where Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

Radiated Emissions Test, 9 kHz to 30 MHz(Magnetic Field Test)

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions at a distance of 3 meters according to Section 15.31(f)(2).
2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table.
3. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions if applicable.
4. To obtain the final measurement data, each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector with specified bandwidth.
5. The result was 20dB lower than the limit line 15.31(o) was not reported.

Radiated Emission Result

Frequency MHz	Reading dBuV	P (H, V)	Ant. Factor dB	Cable Loss dB	Limit dBuV	Total dBuV	Margin dB

Not detected (In the noise floor)

Note : The result was 20dB lower than the limit line 15.31(o) was not reported.

Field strength of fundamental

Spurious Emissions Test (Below 1GHz) :

☒ Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, packet types and antenna ports(if EUT with antenna diversity architecture), and X,Y,Z Axis.

EUT	S-10F	PROBE	Below 1 GHz(Y Plane)H/V
POWER	New Battery	NOTE	433.92MHz

Frequency MHz	Reading [dBuV]	Detector Mode	P (H,V)	Ant. Factor [dB/m]	Cable Loss dB	Total [dBuV/m]	Averaging Limit [dBuV/m]	Margin dB
433.92	53.20	PK	H	16.33	3.48	73.01	80.82	7.81
433.92	57.60	PK	V	16.33	3.48	77.41	80.82	3.41

Note :

1. *EUT was in continuous transmission mode and peak field strength meets AV limit.*
   Therefore averaging correction factor using the duty cycle is not required.
2. *Total = reading level + Ant Factor + Cable Loss*

Field strength of spurious emissions

EUT	S-10F	PROBE	Above 1 GHz(Y Plane)H/V
POWER	New Battery	NOTE	433.92MHz

Frequency MHz	Reading [dBuV]	Detector Mode	P (H,V)	Correction factors [dB/m]	Total [dBuV/m]	Averaging Limit [dBuV/m]	Margin dB
*1301.8	53.2	PK	V	-3.7	49.50	54.00	4.50
2170.3	51.9	PK	H	1.1	53.00	60.82	7.82
2603.7	50.4	PK	H	2.3	52.70	60.82	8.12
3038.2	46.5	PK	H	4.8	51.30	60.82	9.52

Note :

1. *EUT was in continuous transmission mode and peak field strength meets AV limit.*
2. *"*"means the restricted band.*
3. *No other spurious and harmonic emissions were reported greater than listed emissions above table.*
4. *Correction factor = Ant Factor + Cable Loss – Amplifier Gain*

FCC PART 15.231 REQUIREMENTS

TEST Equipment

The following test equipment are used during the test:

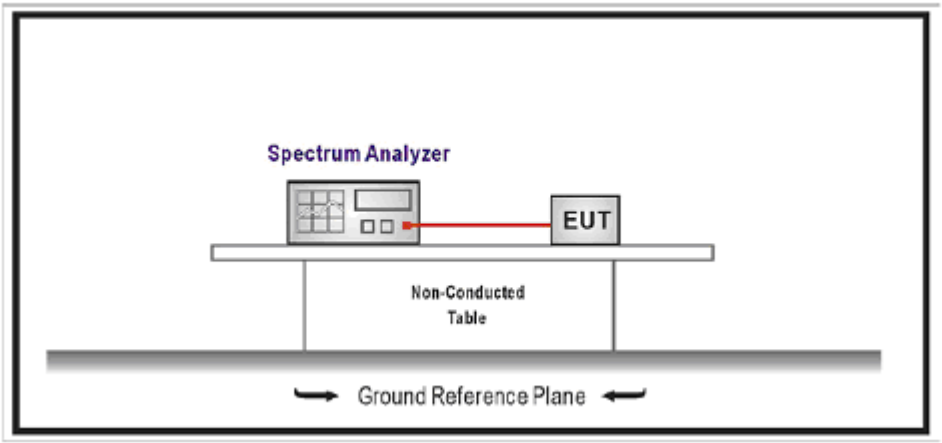
Name	Type	Manufacturer	Calibration. Date	Serial Number
SPECTRUM ANALYZER	R3273	ADVANTEST	Oct. 07, 2014	95090431

Note : *1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.*

2. The calibration interval of horn ant. and loop ant. is 24 months

Test setup

RF Conducted Measurement:



APPLICABLE STANDARD

(c) 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.

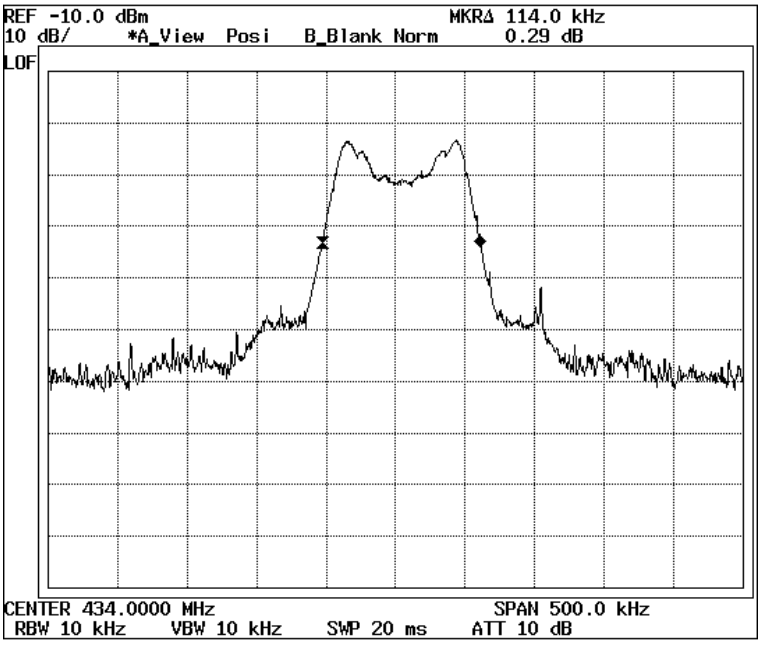
Carrier Frequency (MHz)	Limit		Remark
433.92	F(MHz)*0.25%	1,084,800 Hz	The points 20 dB down from the modulated carrier

Test specification

According to FCC Part 15 Subpart C paragraph 15.231

The bandwidth of the Result

Carrier Frequency (MHz)	Bandwidth of the emission	Limit	Remark
433.92	114KHz	1,084,800 Hz	The points 20 dB down from the modulated carrier



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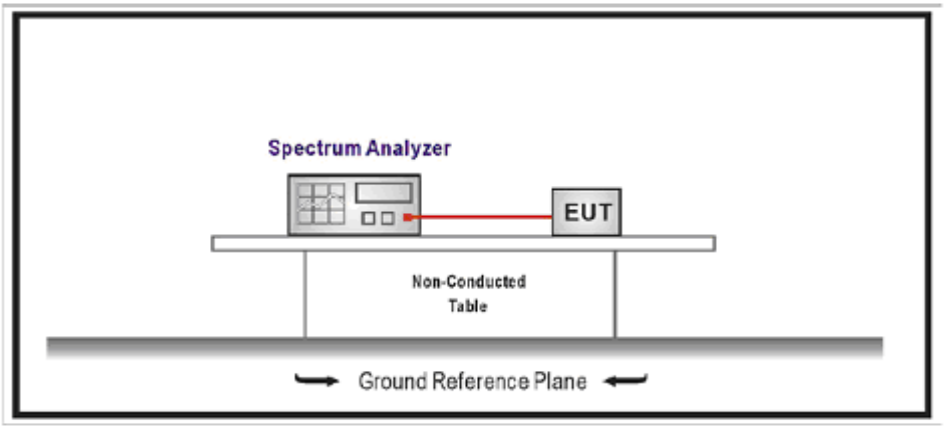
Test setup

RF Conducted Measurement:



APPLICABLE STANDARD

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

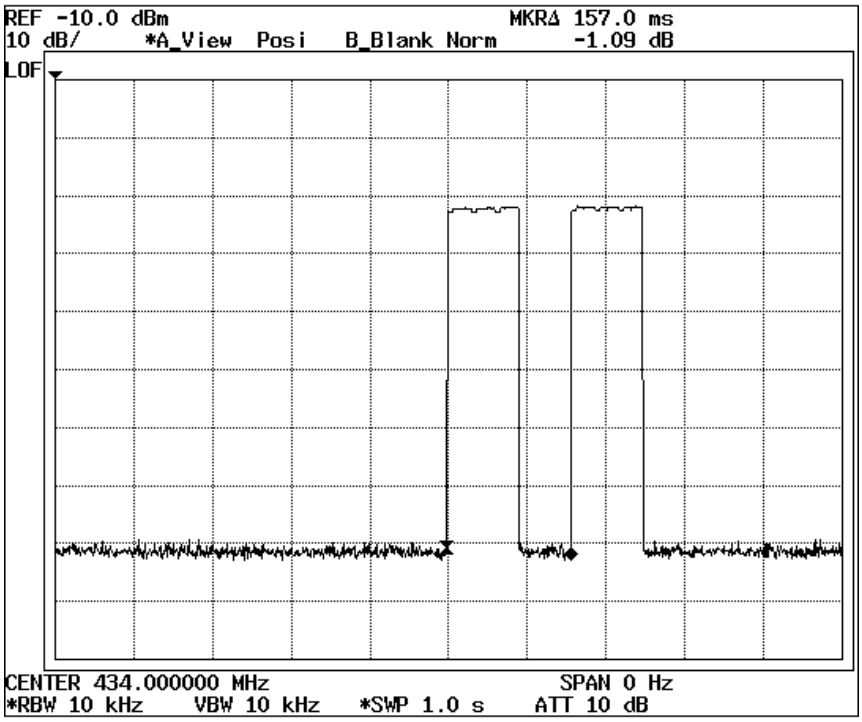
(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds. after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

Test specification

According to FCC Part 15 Subpart C paragraph 15.231

The Transmission time of the Result

According to 15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released



[433.92MHz]

Note: This EUT operated manually. It is deactivated within less than 5 seconds of being released.

Appendix A. The Photos of Test Setup

Radiated Emissions Below 1000MHz - Y View

Radiated Emissions Above 1GHz - Y View

Appendix A. The Photos of Test Setup

Antenna requirements

According to FCC 47 CFR 15.203

"an intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached or an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section"

* The antenna is permanently mounted on PCB, no consideration of replacement
* The EUT complies with the requirement of 15.203