CONFORMANCE TEST REPORT

FOR

Subpart C Part 15.231

Report No. : JNDL-NU-16R-0002

Client:	**Getron System Co., Inc**
Product:	***Wireless Control System***
Model:	**RF-60MP**
Manufacture/supplier:	**Getron System Co., Inc**
Date test item received:	**2016/02/24**
Date test campaign completed:	**2016/03/30**
Date of issue:	**2016/04/04**

ATTESTATION STAEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards.

All **JNDL Laboratory. CO., LTD** instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements**.**

Total number of pages of this test report : 26 pages

Test engineer	Report reviewed by
	
Seok-Hee Han	**Byoung-Su Shim**

REPORT SUMMARY

Purpose of Test :	To demonstrate the EUT in compliance with Part 15.231 Subpart C of the FCC's
Disclaimer :	The test results relate only to the items tested.
Applicable Standards :	Pt 15.231, Pt 15.209, ANSI 63.4:2009

TEST ENVIRONMENT AND TEST SETUP

Test Facilities :	Test Firm Registration # : 748649 3m & 10m Open Site : 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 3m semi-Anechoic chamber : B 114~115, 810 Kwanyang-Dong, dongan-Gu, Anyang-Si, Kyunggi-Do, 431-060, Korea
Laboratory Test Conditions :	Open Site : Temperature 12 ºC, Humidity : 40 % 3m anechoic chamber : Temperature 25 ºC, Humidity : 51 %
Test Exercise :	The EUT was set in continuous transmit mode of operation unless stated otherwise.
Modification to the EUT :	No moidification was made.
Supporting Accessories :	None

REVISION HISTORY

Revison	Date	Desriptions
0	2016. 04. 04	Original release

Table of Contents

1. General Remarks

The test results in this report apply to the particular Equipment Under Test (EUT) as declared in this report.
The test results presented in this report relate only to the item tested.

2. Test Site

2.1 Location

JNDL Laboratory. CO., LTD. .(Test Firm Registration # : 748649)
3m anechoic chamber : B 114~115, 810 Kwanyang-Dong, dongan-Gu, Anyang-Si, Kyunggi-Do, Korea
3m & 10m Open site : 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea

2.2 List of Test equipment used for tests

No.	Instrument	Model No.	Due to Calibration	Manufactor	Serial No.
☒	PSA SPECTRUM ANALYZER (3 Hz ~ 26.5 GHz)	E4440A	2017-01-02	Agilent Technologies	MY46185375
☒	SIGNAL GENERATOR (10 MHz ~ 40 GHz)	MG3694B	2016-09-08	Anritsu Corp	062513
☒	POWER METER (DC ~ 67 GHz)	NRP2	2016-09-02	Rohde & Schwarz	100973
☒	POWER SENSOR (50 MHz ~ 40 GHz)	NRP-Z85	2016-09-02	Rohde & Schwarz	101121
☒	POWER SENSOR (9 KHz ~ 6 GHz)	NRP-Z92	2016-09-02	Rohde & Schwarz	100093
☒	EMI TEST RECEIVER (9 KHz ~ 7 GHz)	ESCI7	2016-09-01	Rohde & Schwarz	100933
☒	EMI TEST RECEIVER (20 MHz ~ 1000 MHz)	ESVS30	2016-09-01	Rohde & Schwarz	828525/005
☒	EMI TEST RECEIVER (9 KHz ~ 2700 MHz)	PMM 9010	2016-09-14	Narda S.T.S/PMM	697WW40306
☒	2-LINE V-NETWORK	ENV216	2016-09-02	Rohde & Schwarz	101456
☒	2-LINE V-NETWORK	ENV216	2016-09-02	Rohde & Schwarz	101457
☒	BILOG ANTENNA (30 MHz ~ 1000 MHz)	VULB 9168	2016-10-23	Schwarzbeck	9168-506
☒	HORN ANTENNA (1 GHz ~ 18 GHz)	BBHA 9120D	2018-03-11	Schwarzbeck	568
☒	Low Noise Amplifier (1 GHz ~ 6 GHz)	TK-PA6S	2016-09-02	TESTEK	140001

➔ All equipment is calibrated with traceable calibrations.
Each calibration is traceable to the national or international standards.

2.3 Test Date

Date of Application: 2016 - 03 - 10
Date of Test: 2016 - 03 - 12 ~ 2016 - 03 - 30

3. Description of the Equipment Under Test

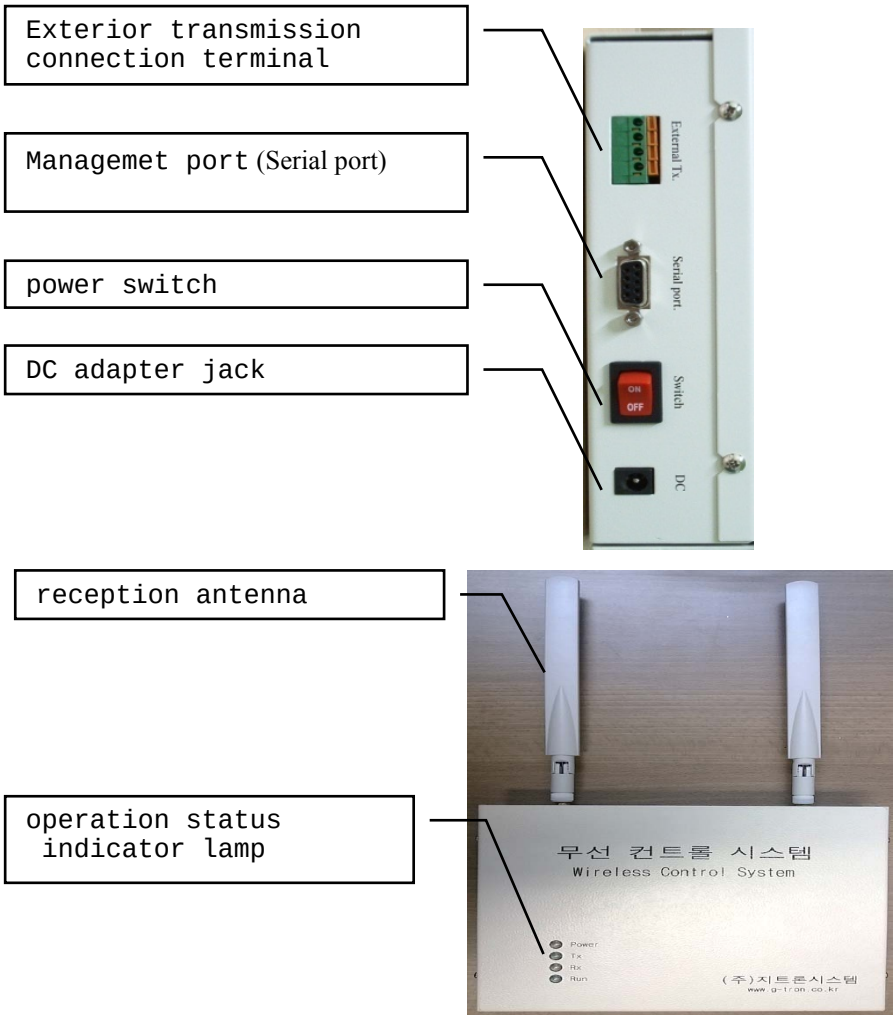
3.1 Manufacturers declarations

Manufacturer :	**Getron System Co., Inc**
Product Description :	Remote control system offered in wireless form is easy to install, is a convenient system that can immediately send the transmission signal and sensor error signal to the person in charge, for groundbreaking improvement of work efficiency. The wireless control system can immediately deliver the signal to the person in charge. Also, the FSK type wireless signal accurately processes the wireless signal transmitted from long distance, with a software structure that can process data without error. In areas where staff cannot be stationed, automatic paging with point of contact signal, and it can also be linked to wireless sensor device by receiving different types of sensor signals from equipment sensor devices.
FCC ID :	W8PRF-60MP
Model Name :	RF-60MP
Multiple Model Name :	None
Operationg Frequency :	434.0400 MHz ~ 434.7900 MHzz
Occupied Bandwidth :	≤ 8.5 KHz (at 99%)
Operation Channel :	32
Modulation :	FSK
EUT Power Source :	Primary power – 12 Vdc (Via AC Mains Powered DC supply)
	Secondary Power – N/A
Test Item :	Protype
Type of Equipment :	Fixed wall
Antennas :	Dipole Antenna
Antenna Connector :	Reverse polarity SMA connector

➔All the testing were performed according to the procedures in FCC Parts 15.231
The EUT was operation in special test mode.

3.2 Information about EUT

- Remote control system offered in wireless form is easy to install, is a convenient system that can immediately send the transmission signal and sensor error signal to the person in charge, for groundbreaking improvement of work efficiency.
- The wireless control system can immediately deliver the signal to the person in charge.
- Also, the FSK type wireless signal accurately processes the wireless signal transmitted from long distance, with a software structure that can process data without error. In areas where staff cannot be stationed, automatic paging with point of contact signal, and it can also be linked to wireless sensor device by receiving different types of sensor signals from equipment sensor devices.



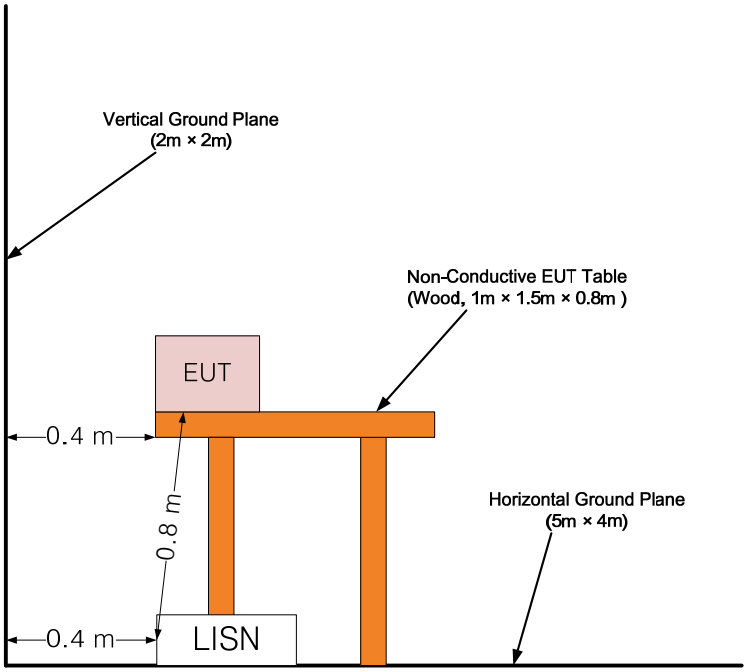
4. List of Measurements

Guide Lines	FCC Rules Part 15	Result
Power Line Conducted Emissions	15.207	PASS
Antenna Requirement	15.203	PASS
Periodic Operation	15.231(a)	PASS
Occupied Bandwidth	15.231(c)	PASS
Spurious Radiated Emissions	15.231(b)	PASS
Duty Cycle Correction Factor	15.231(b)	-

5. Transmitter radiated emissions setup

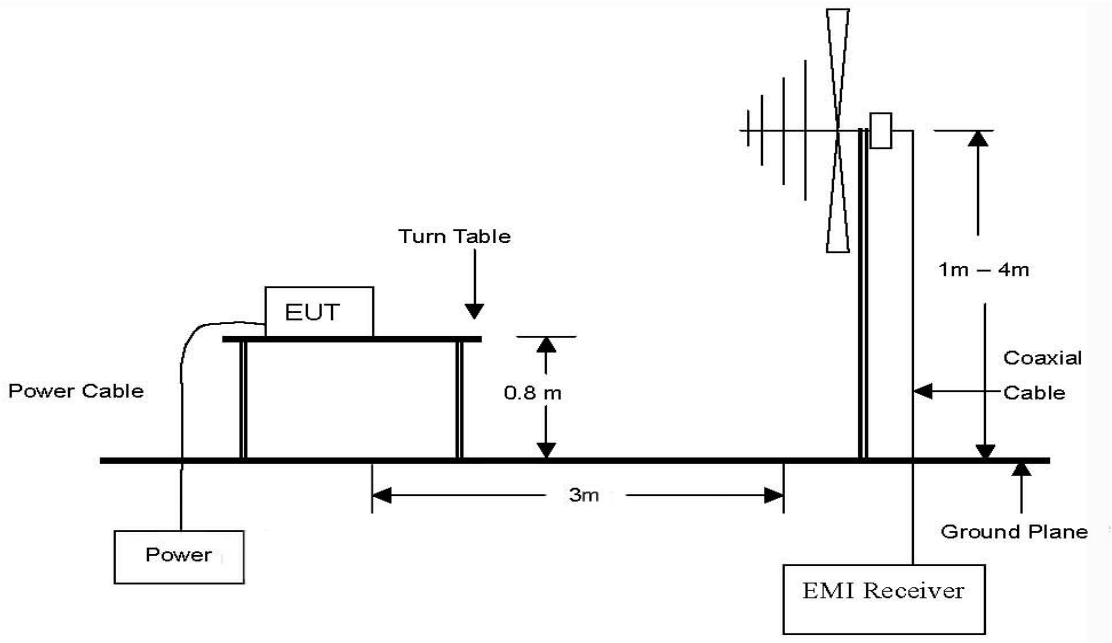
5.1 Test setup for 9 KHz ~ 30 MHz

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 KHz to 30 MHz Conducted emissions



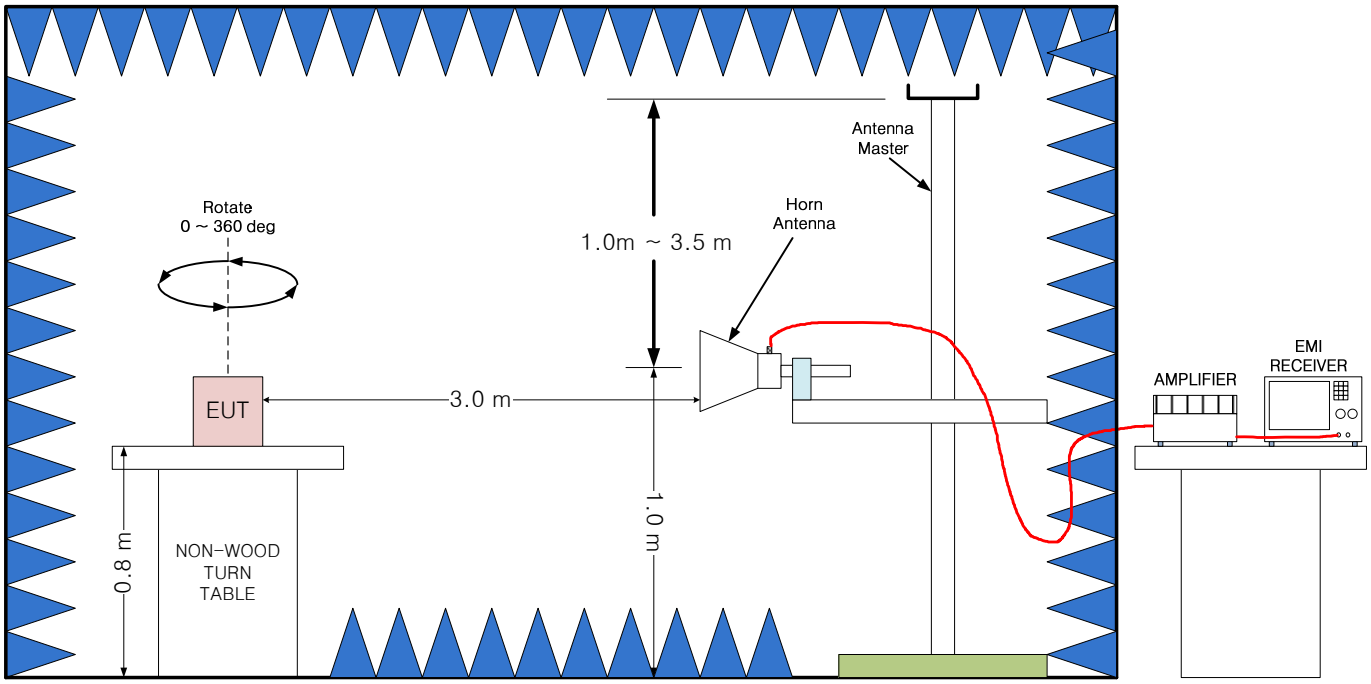
5.2 Test setup for 30 MHz ~ 1 GHz

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions



5.3 Test setup for 1 GHz ~ 4.5 GHz

The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 4.5 GHz emissions. As required by subpart 15.33 emissions were measured to 4.5 GHz.(10th carrier frequency)



6. Power Line Conducted Emissions

6.1 Definition

The EUT was evaluated to determine compliance with FCC section 15.207

6.2 Test Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the EMI Receiver (ESCS30) set to 9kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = EMI Receiver Reading + LISN Factor + Cable Loss
Margin = Corrected Reading - Applicable Limit

6.3 Test Criteria

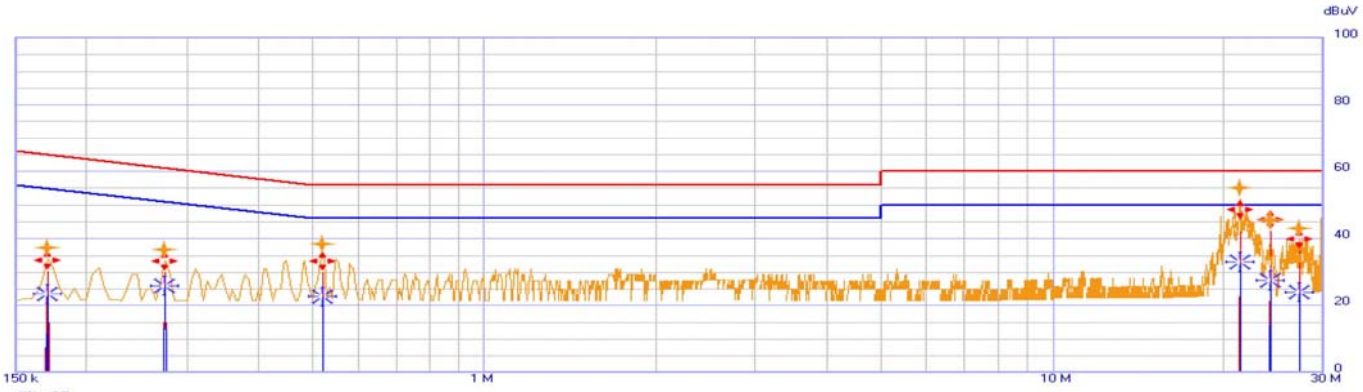
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges

Frequency in emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5.0	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

6.4 Test Results

6.4.1 F1(434.040 MHz) conducted Emissions Line 1 & Line 2



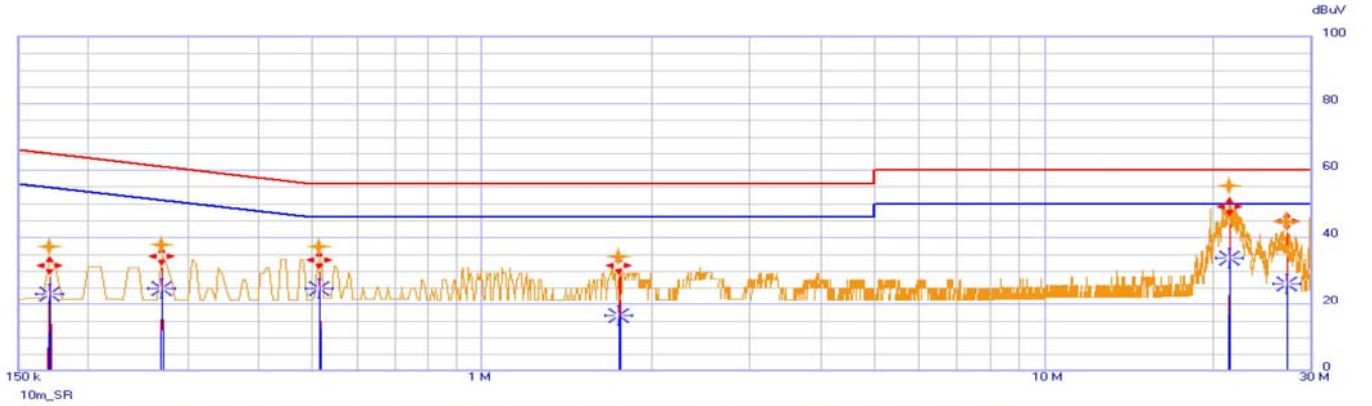
	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q C Class B_QP Class B_CAV	1500 ms	9 kHz	10	ON	ON	...	...

Pulse Limiter ON
Ancillary = General
Limits:
Class B_QP
Class B_CAV

Factors:
LISN_L
Loop_Cable loss_20151106

Peak
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit Class B_QP [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit Class B_CAV [dBuV]	Delta [dB]	Factor LISN_L [dB]	Factor Loop_Cabl.. [dB]
1	0.17	30.35	64.96	-34.61	23.14	54.96	-31.82	9.58	0.03
2	0.275	29.92	60.97	-31.05	25.82	50.97	-25.15	9.58	0.03
3	0.52	30.04	56.00	-25.96	22.46	46.00	-23.54	9.58	0.03
4	21.265	45.31	60.00	-14.69	32.78	50.00	-17.22	9.78	0.10
5	24	42.35	60.00	-17.65	27.39	50.00	-22.61	9.78	0.11
6	27.195	36.40	60.00	-23.60	23.86	50.00	-26.14	9.78	0.13



	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q C Class B_QP Class B_CAV	1500 ms	9 kHz	10	ON	ON	...	...

Pulse Limiter ON
Ancillary = General
Limits:
Class B_QP
Class B_CAV

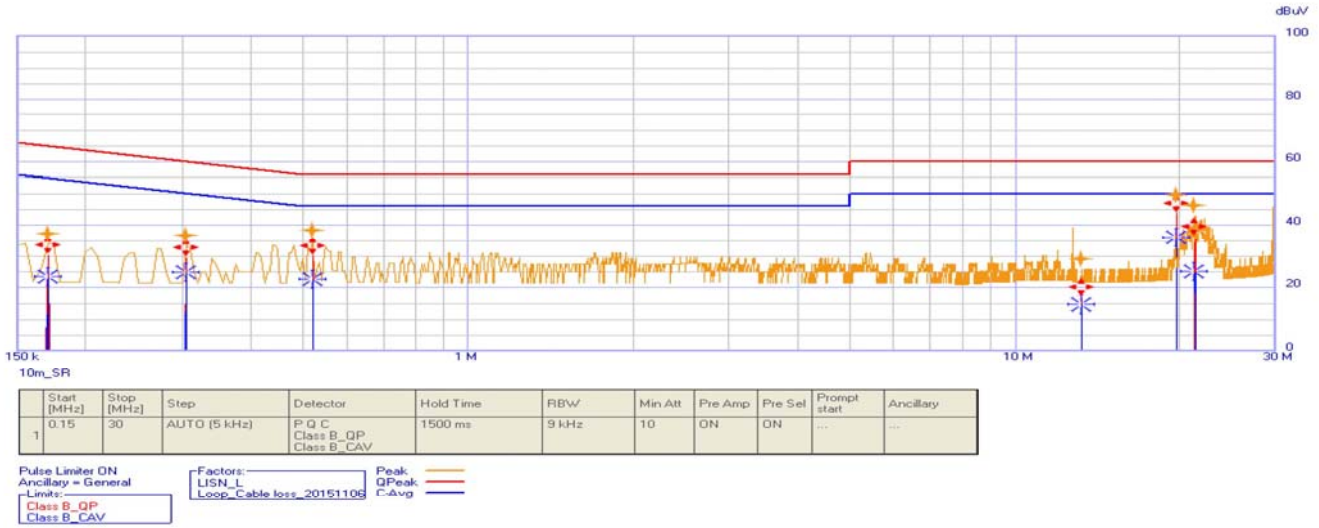
Factors:
LISN_N
Loop_Cable loss_20151106

Peak
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit Class B_QP [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit Class B_CAV [dBuV]	Delta [dB]	Factor LISN_N [dB]	Factor Loop_Cabl.. [dB]
1	0.17	28.22	64.96	-36.74	23.05	54.96	-31.91	9.57	0.03
2	0.27	31.01	61.12	-30.11	24.50	51.12	-26.62	9.58	0.03
3	0.515	30.08	56.00	-25.92	24.65	46.00	-21.35	9.58	0.03
4	1.755	28.38	56.00	-27.62	16.45	46.00	-29.55	9.60	0.05
5	21.245	45.94	60.00	-14.06	33.71	50.00	-16.29	9.76	0.10
6	26.935	41.44	60.00	-18.56	26.07	50.00	-23.93	9.79	0.13

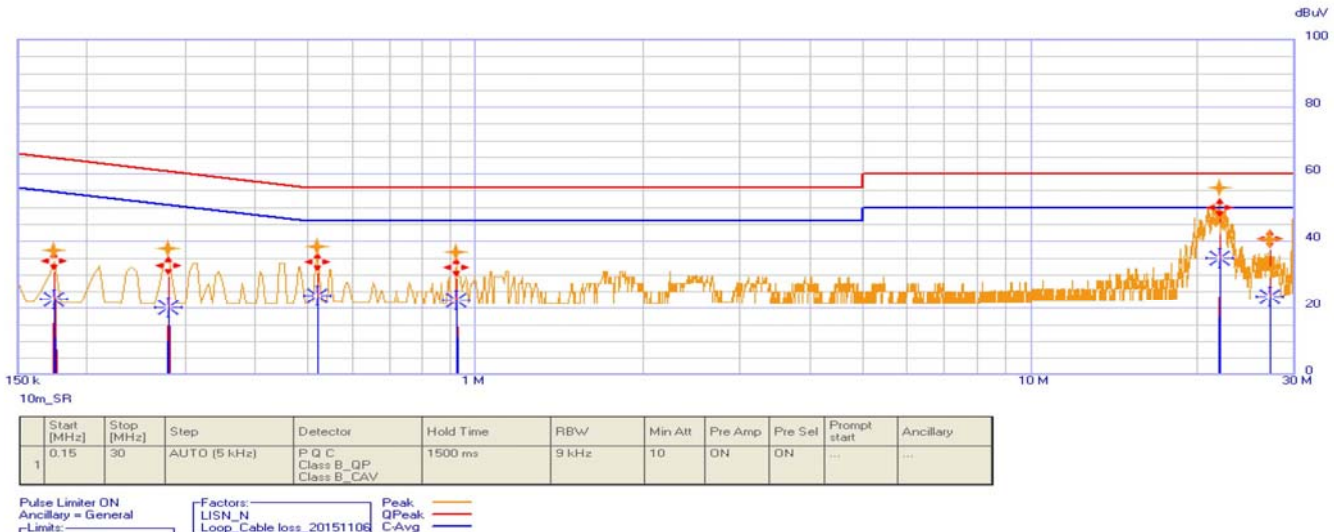
* Phase : L : Hot Line, N : Neutral Line

6.4.2 F2(434.440 MHz) conducted Emissions Line 1 & Line 2



	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q C Class B_QP Class B_CAV	1500 ms	9 kHz	10	ON	ON	...	...

	Frequency [MHz]	QPeak [dBuV]	Limit Class B_QP [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit Class B_CAV [dBuV]	Delta [dB]	Factor LISN_L [dB]	Factor Loop_Cabl.. [dB]
1	0.17	30.33	64.96	-34.63	23.24	54.96	-31.72	9.58	0.03
2	0.305	29.45	60.11	-30.66	24.50	50.11	-25.61	9.58	0.03
3	0.52	29.83	56.00	-26.17	22.55	46.00	-23.45	9.58	0.03
4	13.235	16.94	60.00	-43.06	14.52	50.00	-35.48	9.70	0.07
5	19.66	43.60	60.00	-16.40	35.89	50.00	-14.11	9.78	0.09
6	21.21	36.36	60.00	-23.64	24.89	50.00	-25.11	9.78	0.10

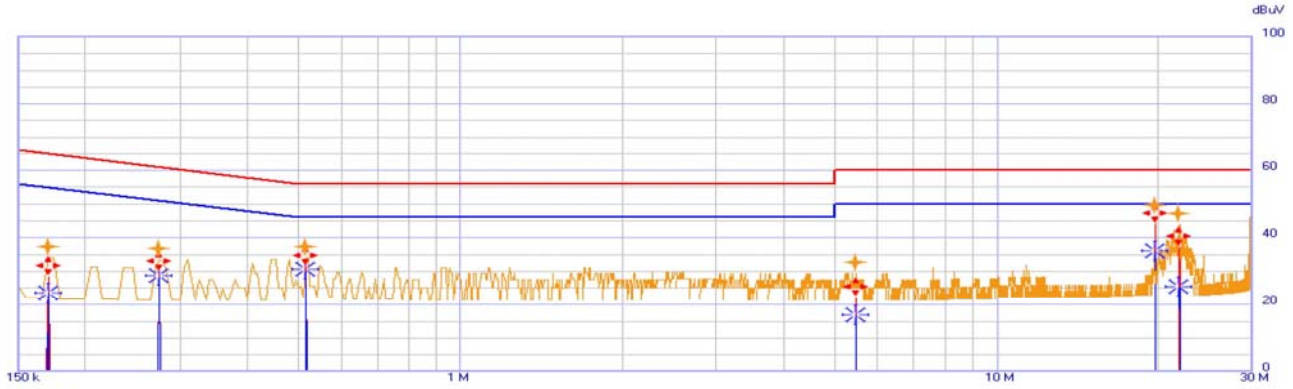


	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q C Class B_QP Class B_CAV	1500 ms	9 kHz	10	ON	ON	...	...

	Frequency [MHz]	QPeak [dBuV]	Limit Class B_QP [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit Class B_CAV [dBuV]	Delta [dB]	Factor LISN_N [dB]	Factor Loop_Cabl.. [dB]
1	0.175	30.71	64.72	-34.01	22.50	54.72	-32.22	9.57	0.03
2	0.28	29.51	60.82	-31.31	20.08	50.82	-30.74	9.58	0.03
3	0.52	30.56	56.00	-25.44	23.48	46.00	-22.52	9.58	0.03
4	0.93	28.92	56.00	-27.08	22.17	46.00	-23.83	9.59	0.04
5	21.82	46.56	60.00	-13.44	34.84	50.00	-15.16	9.76	0.10
6	26.965	37.37	60.00	-22.63	23.34	50.00	-26.66	9.79	0.13

* Phase : L : Hot Line, N : Neutral Line

6.4.3 F3(434.790 MHz) conducted Emissions Line 1 & Line 2



	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q C Class B_QP Class B_CAV	1500 ms	9 kHz	10	ON	ON	...	...

Pulse Limiter ON
Ancillary = General
Limits:
Class B_QP
Class B_CAV

Factors:
LISN_L
Loop_Cable loss_20151106

Peak
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit Class B_QP [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit Class B_CAV [dBuV]	Delta [dB]	Factor LISN_L [dB]	Factor Loop_Cabl.. [dB]
1	0.17	28.22	64.96	-36.74	23.35	54.96	-31.61	9.58	0.03
2	0.275	29.68	60.97	-31.29	28.44	50.97	-22.53	9.58	0.03
3	0.515	31.38	56.00	-24.62	30.32	46.00	-15.68	9.58	0.03
4	5.445	22.10	60.00	-37.90	16.70	50.00	-33.30	9.64	0.06
5	19.66	43.79	60.00	-16.21	35.91	50.00	-14.09	9.78	0.09
6	21.78	37.10	60.00	-22.90	25.29	50.00	-24.71	9.78	0.10

	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q C Class B_QP Class B_CAV	1500 ms	9 kHz	10	ON	ON	...	...

Pulse Limiter ON
Ancillary = General
Limits:
Class B_QP
Class B_CAV

Factors:
LISN_N
Loop_Cable loss_20151106

Peak
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit Class B_QP [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit Class B_CAV [dBuV]	Delta [dB]	Factor LISN_N [dB]	Factor Loop_Cabl.. [dB]
1	0.17	28.22	64.96	-36.74	23.08	54.96	-31.88	9.57	0.03
2	0.27	30.96	61.12	-30.16	23.35	51.12	-27.77	9.58	0.03
3	0.31	31.48	59.97	-28.49	26.07	49.97	-23.90	9.58	0.03
4	16.085	23.36	60.00	-36.64	19.35	50.00	-30.65	9.73	0.08
5	19.66	44.05	60.00	-15.95	36.73	50.00	-13.27	9.75	0.09
6	21.23	36.38	60.00	-23.62	25.32	50.00	-24.68	9.76	0.10

* Phase : L : Hot Line, N : Neutral Line

7. Antenna Requirment

7.1 Definition

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.

7.2 Test Criteria

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

7.3 Test Result

The antenna used a Reverse Polarity SMA Dipole antenna. It's gain is -2.0 dBi below

8. Periodic Operation

8.1 Definition

The intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation.

8.2 Test Procedure

The EUT Output is connected to the spectrum analyzer.
It measured with the spectrum analyzer set to RBW=1 MHz, VBW=3(1) MHz, Span= 0 Hz, Sweep time = 15 seconds (or 30 seconds).

8.3 Test Criteria

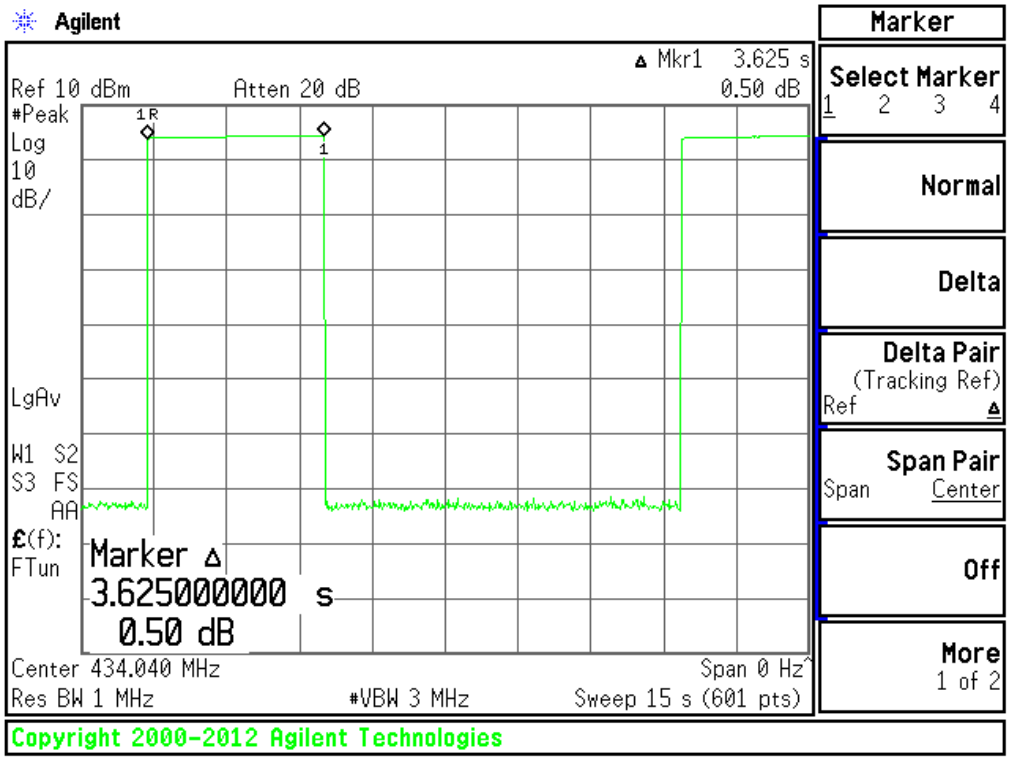
(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

8.4 Test Result

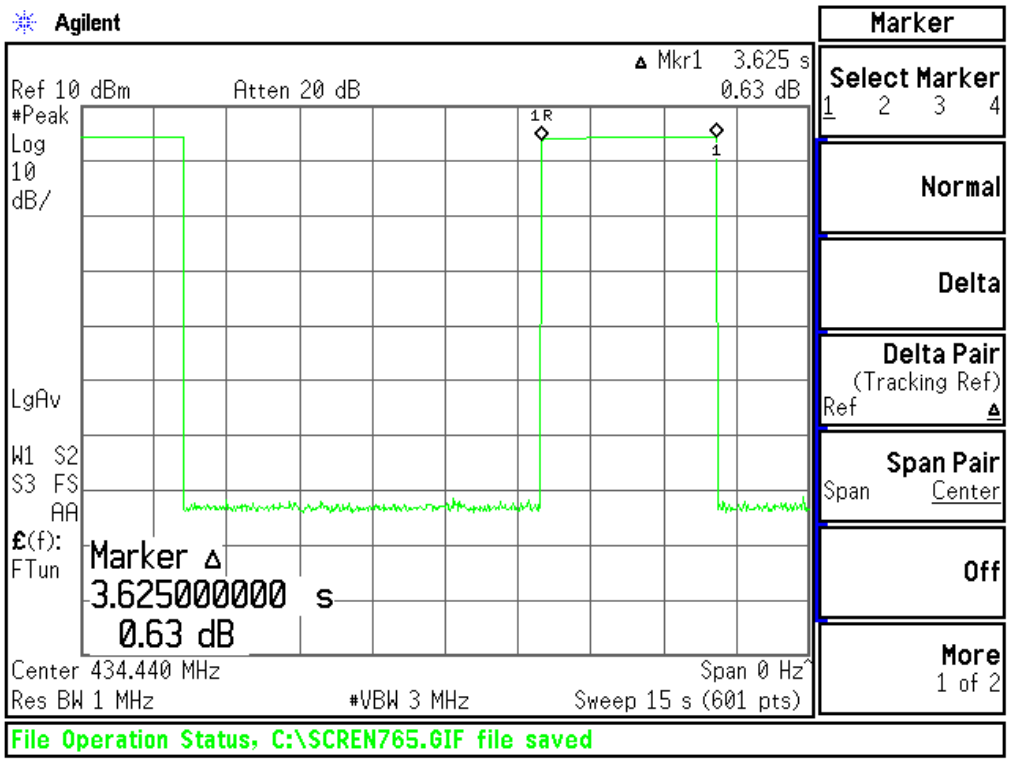
(1) Transmission Time

Carrier Frequency [MHz]	Plot #	Transmission Time (sec)	Limit (sec)	Remark
434.040	1	3.625	≤ 5	PASS
434.440	2	3.625	≤ 5	PASS
434.790	3	3.600	≤ 5	PASS

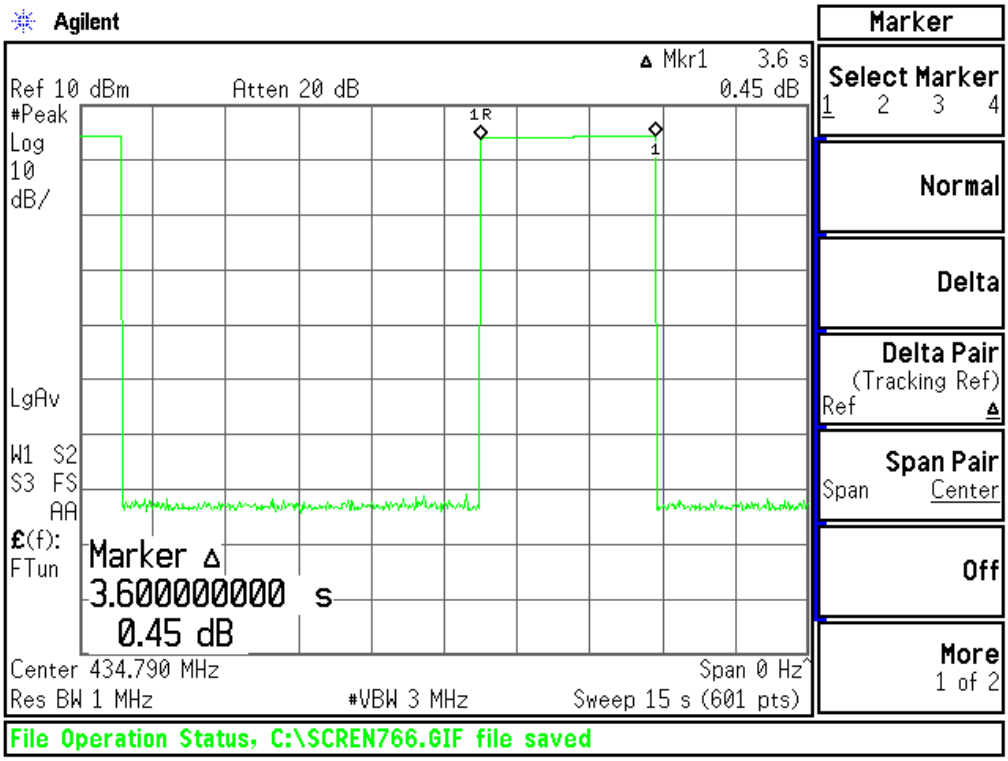
Plot #1



Plot #2


Agilent
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Mkr1 3.625 s
0.63 dB
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Marker Δ
3.625000000 s
0.63 dB
Center 434.440 MHz
Span 0 Hz
Res BW 1 MHz
#VBW 3 MHz
Sweep 15 s (601 pts)
File Operation Status, C:\SCREN765.GIF file saved

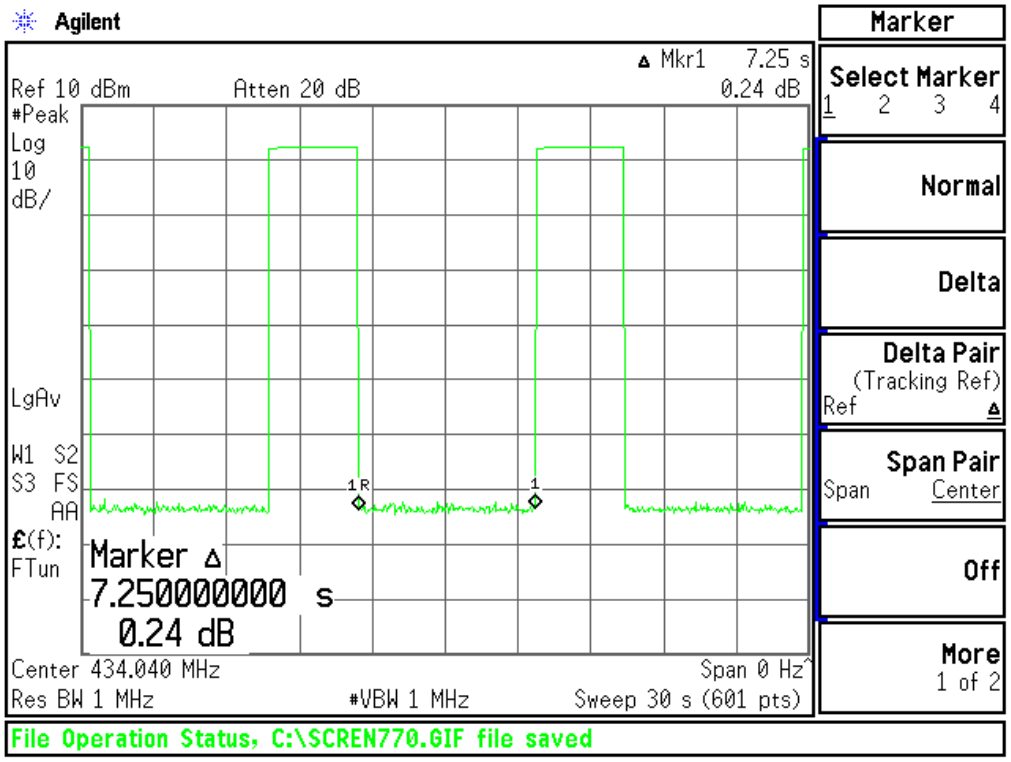
Plot #3


Agilent
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Mkr1 3.6 s
0.45 dB
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Marker Δ
3.600000000 s
0.45 dB
Center 434.790 MHz
Span 0 Hz
Res BW 1 MHz
#VBW 3 MHz
Sweep 15 s (601 pts)
File Operation Status, C:\SCREN766.GIF file saved

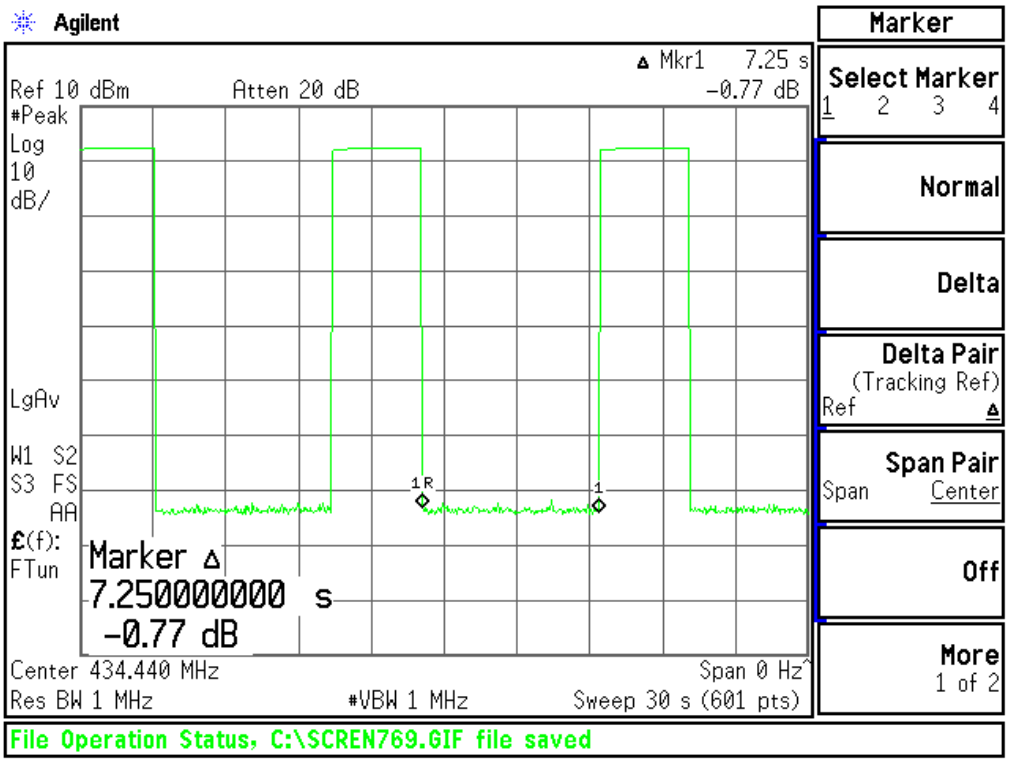
(2) Release Time

Carrier Frequency [MHz]	Plot #	Mark	Release Time (sec)	Limit (sec)	Remark
434.040	4	◇1R to ◇1	7.250	≥ 5	PASS
434.440	5	◇1R to ◇1	7.250	≥ 5	PASS
434.790	6	◇1R to ◇1	7.250	≥ 5	PASS

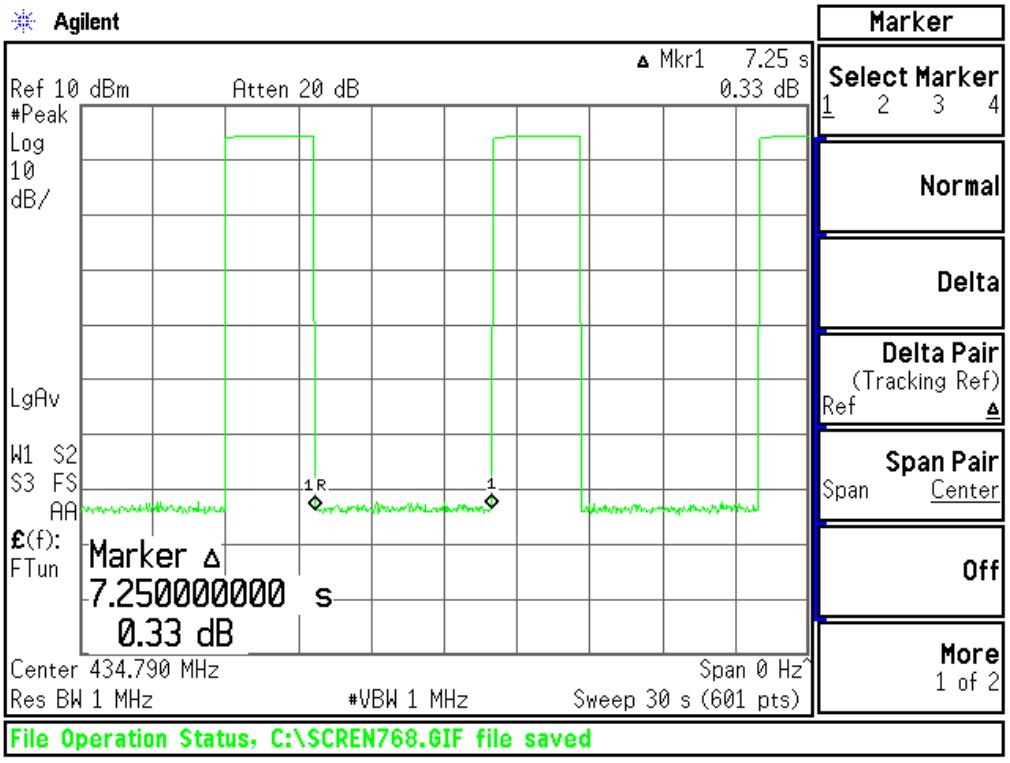
Plot #4



Plot #5


Agilent
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Mkr1 7.25 s
-0.77 dB
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Marker Δ
7.250000000 s
-0.77 dB
Center 434.440 MHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 30 s (601 pts)
File Operation Status, C:\SCREN769.GIF file saved

Plot #6


Agilent
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Mkr1 7.25 s
0.33 dB
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Marker Δ
7.250000000 s
0.33 dB
Center 434.790 MHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 30 s (601 pts)
File Operation Status, C:\SCREN768.GIF file saved

9. Occupied Bandwidth

9.1 Definition

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.

9.2 Test Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer display was set between two times and five times the occupied bandwidth (OBW) of the emission. The RBW of the spectrum analyzer was set to approximately 1 % to 5 % of the OBW. The trace was set to max hold with a peak detector active. The Occupied Bandwidth function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.
It measured with the spectrum analyzer set to RBW=1 KHz, VBW=3 KHz, Span= 150 KHz, Sweep time = auto

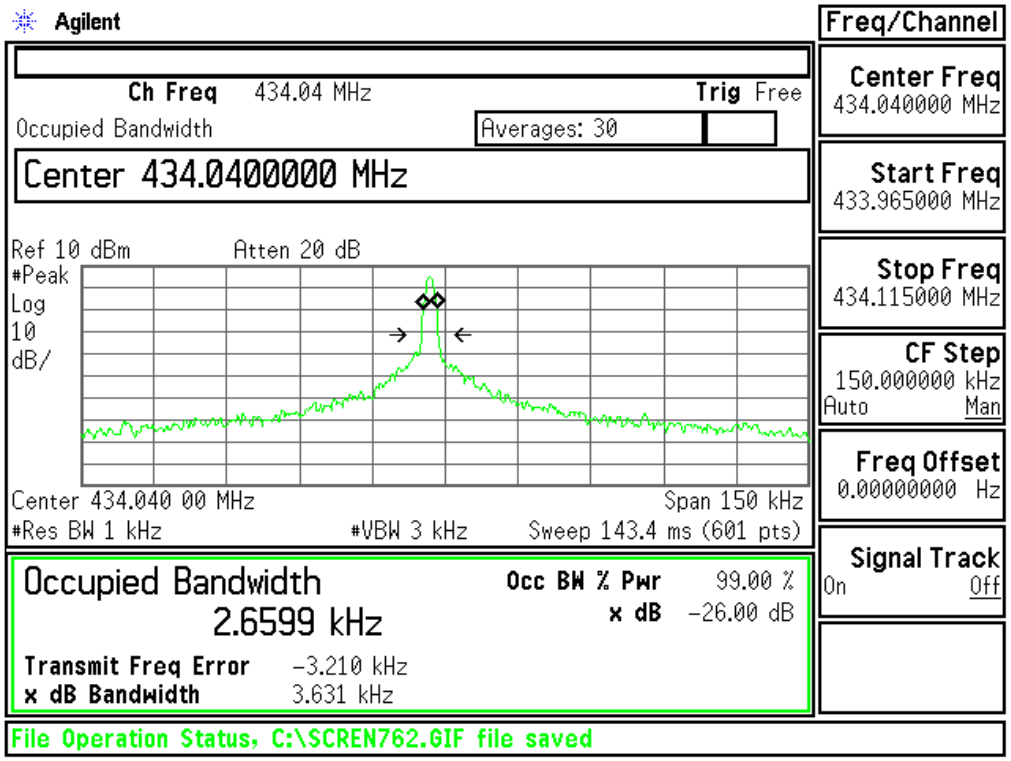
9.3 Test Criteria

(1) The bandwidth of the emission shall be no wider than 0.25% of the center frequency.
(2) Bandwidth is determined at the points 20 dB down from the modulated carrier.

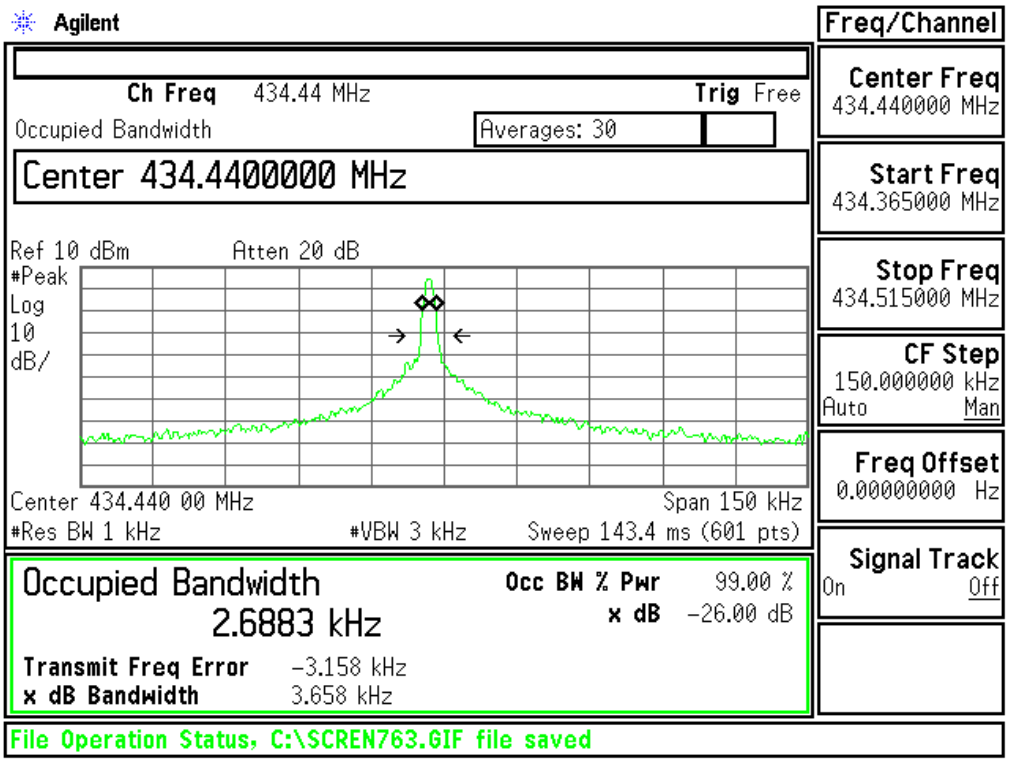
9.4 Test Result

Carrier Frequency [MHz]	Plot #	-20 dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (KHz)	Remark
434.040	7	3.631	2.6599	1 085.10	PASS
434.440	8	3.658	2.6883	1 086.10	PASS
434.790	9	9.597	6.8789	1 086.98	PASS

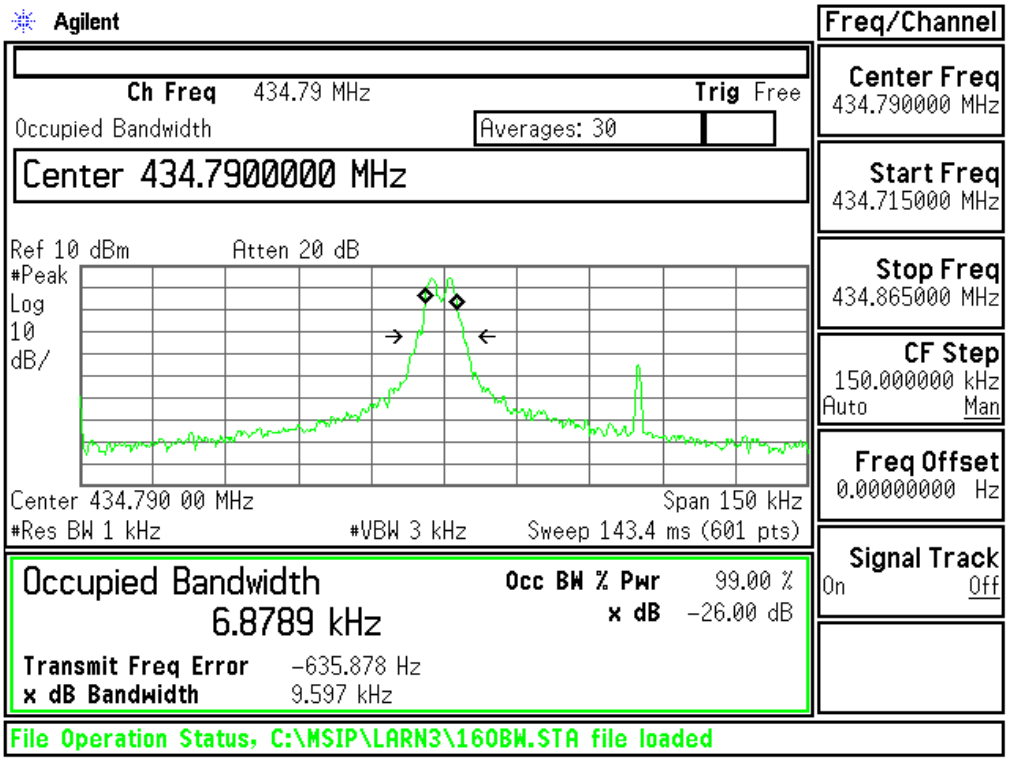
Plot #7



Plot #8


Agilent
Freq/Channel
Ch Freq 434.44 MHz
Trig Free
Occupied Bandwidth
Averages: 30
Center 434.4400000 MHz
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Center 434.440 00 MHz
Span 150 kHz
#Res BW 1 kHz
#VBW 3 kHz
Sweep 143.4 ms (601 pts)
Occupied Bandwidth
2.6883 kHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -3.158 kHz
x dB Bandwidth 3.658 kHz
Center Freq
434.440000 MHz
Start Freq
434.365000 MHz
Stop Freq
434.515000 MHz
CF Step
150.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
File Operation Status, C:\SCREN763.GIF file saved

Plot #9


Agilent
Freq/Channel
Ch Freq 434.79 MHz
Trig Free
Occupied Bandwidth
Averages: 30
Center 434.7900000 MHz
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Center 434.790 00 MHz
Span 150 kHz
#Res BW 1 kHz
#VBW 3 kHz
Sweep 143.4 ms (601 pts)
Occupied Bandwidth
6.8789 kHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -635.878 Hz
x dB Bandwidth 9.597 kHz
Center Freq
434.790000 MHz
Start Freq
434.715000 MHz
Stop Freq
434.865000 MHz
CF Step
150.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
File Operation Status, C:\MSIP\LARN3\160BW.STA file loaded

10. Spurious Radiated Emissions

10.1 Definition

In addition to the provisions of §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 emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

10.2 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 3 meters from the measurement antenna.

For spurious emissions below 1 GHz quasi-peak detection is used with a resolution bandwidth of 120 kHz. The emissions were maximized by rotating the EUT and raising and lowering the measurement antenna from 1~4 meters(above 1 GHz, measure antenna from 1 ~ 3.5 meters)

Spurious/harmonic emissions above 1 GHz peak are measured with average and peak detection with a resolution bandwidth of 1 MHz and measured at a distance of 3 meter.

Average detection is used to determine compliance of the EUT if the peak does not meet the average limit. Non-harmonic emissions must satisfy the average limit and the peak limit (20 dB above average).

Further, compliance with the provisions of 15.205 was demonstrated using the measurement instrumentation specified in that section where applicable.

Radiated emissions from the EUT were measured by EMI Receiver according to the dictates of ANSI C63.4:2009

Correction factor is a combination of cable loss (CL), microwave amplifier gain (G amp), antenna factor (AF)
Example correction factor calculation: F/S(Field Strength) = Measuring Value +AF-(G amp-CL)

Both vertical and horizontal polarities were tested and the worst case presented. In all cases the vertical polarization resulted in the greatest signal.

10.3 Test Criteria

10.3.1 Radiated emission limits; general requirements.

Frequency in MHz	Field strength
0.009-0.490	2400/F(kHz) μV/m @ 300 meters
0.490-1.705	24000/F(kHz) μV/m @ 30 meters
1.705-30.0	29.54 dBμV/m @ 30 meters
30 – 88	40.0 dBμV/m @ 3 meters
88 – 216	43.5 dBμV/m @ 3 meters
216 – 960	46.0 dBμV/m @ 3 meters
Above 960	54.0 dBμV/m @ 3 meters

10.3.2 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

Fundamental frequency (MHz)	**Field strength of fundamental (microvolts/meter)**	**Field strength of spurious emissions (microvolts/meter)**
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]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 260 – 470 MHz, μV/m at 3 meters = 41.6667(F)-7083.333.
Also, field strength of spurious emissions is μV/m at 3 meters = 4.16667(F)-708.3333 (= fundamental field – 20 dB)

10.4 Test Results

10.4.1 F1(434.040 MHz)

XY SCAN

** F is Fund Freq

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.04	58.79	58.69	XY	H	192	100	16.28		1.84	76.91	76.81	100.83	80.83	-23.92	-4.02
434.04	62.20	62.14	XY	V	360	100	16.28		1.84	80.32	80.26	100.83	80.83	-20.51	-0.57
Spurious Emissions															
137.40	19.53	15.58	XY	H	57	220	11.81		1.00	32.34	28.39	46.02	46.02	-13.68	-17.63
2414.00	47.49	32.99	XY	H	342	100	26.97	-43.08	5.79	37.17	22.67	80.83	60.83 **	-43.66	-38.16
3884.00	45.88	32.20	XY	V	257	100	28.98	-34.62	5.79	46.03	32.35	80.83	60.83 **	-34.80	-28.48

YZ SCAN

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.04	54.69	54.61	YZ	H	121	100	16.28		1.84	72.81	72.73	100.83	80.83	-28.02	-8.10
434.04	54.32	54.23	YZ	V	126	100	16.28		1.84	72.44	72.35	100.83	80.83	-28.39	-8.48
Spurious Emissions															
88.46	30.04	27.94	YZ	H	171	100	7.94		0.85	38.83	36.73	40.00	40.00	-1.17	-3.27
2169.00	46.73	32.75	YZ	V	148	100	26.47	-43.34	5.44	35.30	21.32	80.83	60.83 **	-45.53	-39.51
2414.00	47.80	32.97	YZ	H	54	100	26.97	-43.08	5.79	37.48	22.65	80.83	60.83 **	-43.35	-38.18

ZX SCAN

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.04	58.14	58.05	ZX	H	230	100	16.28		1.84	76.26	76.17	100.83	80.83	-24.57	-4.66
434.04	62.33	62.26	ZX	V	337	100	16.28		1.84	80.45	80.38	100.83	80.83	-20.38	-0.45
Spurious Emissions															
404.50	23.13	22.52	ZX	H	348	100	15.60		1.73	40.46	39.85	46.02	46.02 **	-5.56	-6.17
1301.00	43.62	30.22	ZX	H	302	100	24.75	-43.12	4.17	29.42	16.02	80.83	60.83 **	-51.41	-44.81
2162.00	47.16	33.09	ZX	V	80	100	26.47	-43.34	5.44	35.73	21.66	80.83	60.83 **	-45.10	-39.17

10.4.2 F2(434.440 MHz)

XY SCAN

** F is Fund Freq

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.44	60.69	60.61	XY	H	181	100	16.28		1.84	78.81	78.73	100.84	80.84	-22.03	-2.11
434.44	62.31	61.02	XY	V	0	100	16.28		1.84	80.43	79.14	100.84	80.84	-20.41	-1.70
Spurious Emissions															
88.48	30.21	29.09	XY	V	119	100	7.94		0.85	39.00	37.88	40.00	40.00 **	-1.00	-2.12
2120.00	46.61	32.42	XY	H	11	100	26.24	-43.31	5.35	34.89	20.70	80.84	60.84 **	-45.95	-40.14
2414.00	47.74	32.96	XY	V	57	100	26.97	-43.08	5.79	37.42	22.64	80.84	60.84 **	-43.42	-38.20

YZ SCAN

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.44	52.84	52.67	YZ	H	219	100	16.28		1.84	70.96	70.79	100.84	80.84	-29.88	-10.05
434.44	54.16	54.08	YZ	V	118	220	16.28		1.84	72.28	72.20	100.84	80.84	-28.56	-8.64
Spurious Emissions															
404.90	15.48	14.35	YZ	H	255	100	15.62		1.73	32.83	31.70	40.00	40.00	-7.17	-8.30
2162.00	46.91	32.88	YZ	V	162	100	26.47	-43.34	5.44	35.48	21.45	80.84	60.84 **	-45.36	-39.39
2414.00	50.70	33.02	YZ	H	354	100	26.97	-43.08	5.79	40.38	22.70	80.84	60.84 **	-40.46	-38.14

ZX SCAN

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.44	57.54	57.47	ZX	H	228	100	16.28		1.84	75.66	75.59	100.84	80.84	-25.18	-5.25
434.44	62.54	62.49	ZX	V	341	100	16.28		1.84	80.66	80.61	100.84	80.84	-20.18	-0.23
Spurious Emissions															
404.90	22.27	21.68	ZX	H	343	100	15.62		1.73	39.62	39.03	40.00	40.00 **	-0.38	-0.97
2169.00	46.82	32.88	ZX	V	51	100	26.47	-43.34	5.44	35.39	21.45	80.84	60.84 **	-45.45	-39.39
2652.00	46.03	32.87	ZX	H	218	100	27.36	-42.91	6.10	36.58	23.42	80.84	60.84 **	-44.26	-37.42

10.4.3 F3(434.790 MHz)

XY SCAN ** F is Fund Freq

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.79	60.55	60.46	XY	H	198	100	16.28		1.84	78.67	78.58	100.85	80.85	-22.18	-2.27
434.79	61.32	61.25	XY	V	5	100	16.28		1.84	79.44	79.37	100.85	80.85	-21.41	-1.48
Spurious Emissions															
405.30	13.06	11.83	XY	V	95	100	15.62		1.73	30.41	29.18	40.00	40.00	-9.59	-10.82
2162.00	49.23	33.00	XY	H	103	100	26.47	-43.34	5.44	37.80	21.57	80.85	60.85 **	-43.05	-39.28
2414.00	48.07	33.07	XY	H	103	100	26.97	-43.08	5.79	37.75	22.75	80.85	60.85 **	-43.10	-38.10

YZ SCAN

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.79	62.62	62.54	YZ	H	48	100	16.28		1.84	80.74	80.66	100.85	80.85	-20.11	-0.19
434.79	62.94	62.59	YZ	V	201	100	16.28		1.84	81.06	80.71	100.85	80.85	-19.79	-0.14
Spurious Emissions															
405.30	12.51	10.91	YZ	H	248	100	15.62		1.73	29.86	28.26	40.00	40.00	-10.14	-11.74
2162.00	46.91	32.81	YZ	H	105	100	26.47	-43.34	5.44	35.48	21.38	80.85	60.85 **	-45.37	-39.47
2414.00	46.30	32.93	YZ	V	105	100	26.97	-43.08	5.79	35.98	22.61	80.85	60.85 **	-44.87	-38.24

ZX SCAN

Frequency	Level		EUT	Antenna	table	Mast	Correction Factors			Corrected Level		Limit		Margin	
	pk	Qpk/Avg	SCAN	Polarity	angle	Height	AF	Amp	Cable	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
(MHz)	(dBμV)	(dBμV)		(H/V)	degree	(cm)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
Fundmanteal Emissions															
434.79	62.59	62.53	ZX	H	330	100	16.28		1.84	80.71	80.65	100.85	80.85	-20.14	-0.20
434.79	54.91	54.85	ZX	V	276	100	16.28		1.84	73.03	72.97	100.85	80.85	-27.82	-7.88
Spurious Emissions															
405.30	19.66	18.97	ZX	H	344	100	15.62		1.73	37.01	36.32	80.85	60.85 **	-43.84	-24.53
1301.00	43.74	30.21	ZX	H	292	100	24.75	-43.12	4.17	29.54	16.01	80.85	60.85 **	-51.31	-44.84
2421.00	48.01	32.56	ZX	V	117	100	26.97	-43.08	5.79	37.69	22.24	80.85	60.85 **	-43.16	-38.61

➔ Emissions not reported below the noise floor of the measurement system.

11. Duty Cycle Correction Factor

11.1 Definition

For average radiated measurements, the measured level was reduced by a factor X dB to account for the duty cycle of the EUT.

11.2 Test Procedure

Remove the antenna from the EUT and then connect a phase stable low loss RF cable from the antenna port to the spectrum analyzer.

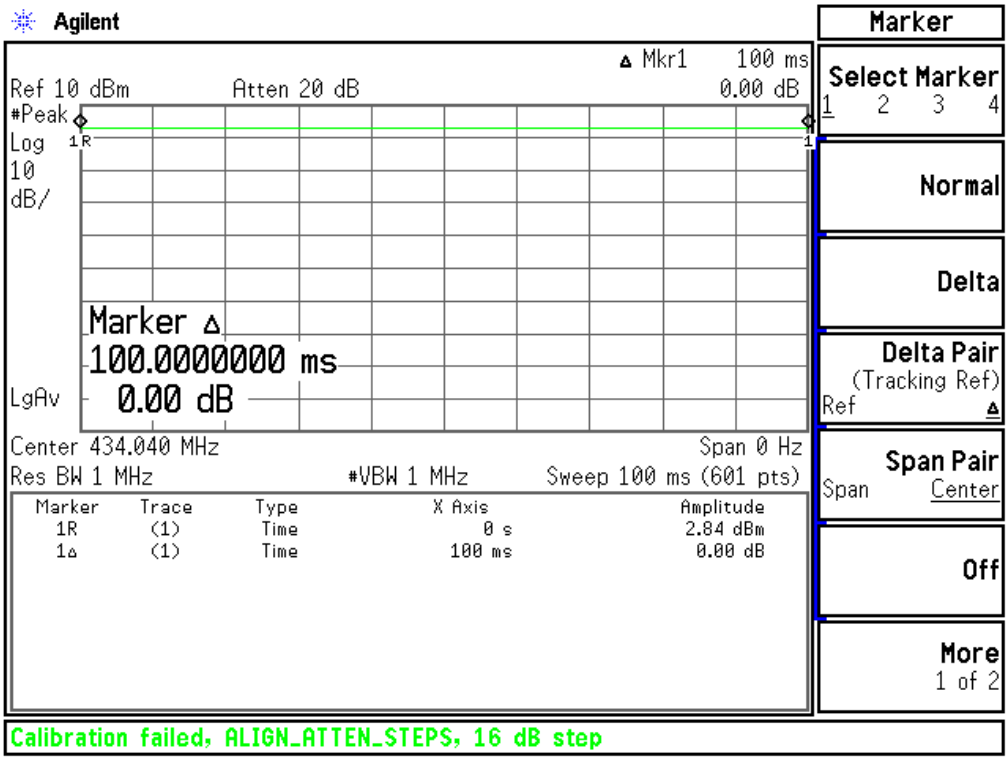
Set center frequency of spectrum analyzer = operation frequency
Set the spectrum analyzer as RBW=1 MHz, VBW=1 MHz, Span=0 Hz, Sweep Time=100 ms
Repeat above procedure all frequency measured were completed.

The worst case duty cycle was determined to be 100%.
The duty cycle correction factor is determined using the formula: 20log (100/100) = 0 dB.
Determination of the duty cycle correction is included in the plots and justification below.

11.3 Test Results

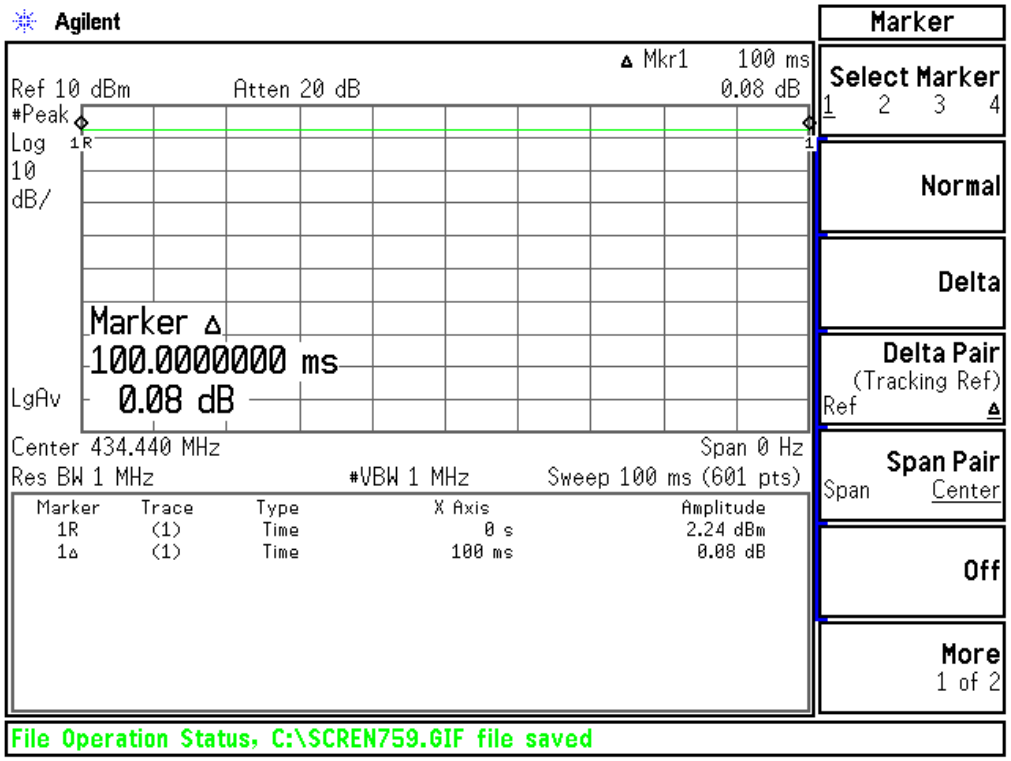
11.3.1 F1(434.040 MHz)

Duty cycle correction factor = 0 dB



11.3.2 F2(434.440 MHz)

Duty cycle correction factor = 0 dB



11.3.3 F3(434.790 MHz)

Duty cycle correction factor = 0 dB