Test Report

1. Client

- Name : Apulse Technology Co.,Ltd
- Address : A-1403, 60, Haan-ro, Gwangmyeong-si, Gyeonggi-do, Republic of Korea.

2. Use of Report : FCC Approval

3. Sample Description

- Product Name : RFID Fixed Reader
- Model Name : a313

4. Date of Receipt : 2022-10-05

5. Date of Test : 2022-10-11 ~ 2022-10-24

6. Test Method : FCC Part 15 Subpart C 15.247

7. Test Results : Refer to the test results

This test report must not be reproduced or reproduced in any way.
The results shown in this test report are the results of testing the samples provided.
This test report is prepared according to the requirements of ISO / IEC 17025.

Affirmation	Tested by Dae-Seong, Choi (signature)	Technical Manager Yong-Min, Won (signature)

Oct 31, 2022

EMC Labs Co., Ltd. (seal)

Contents

Version

TEST REPORT NO.	DATE	DESCRIPTION
KR0140-RF2210-006	Oct 31, 2022	Initial Issue

1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant Information

Applicant	Apulse Technology Co.,Ltd
Applicant Address	A-1403, 60, Haan-ro, Gwangmyeong-si, Gyeonggi-do, Republic of Korea.
Contact Person	Robin, Jang
Telephone No.	+82-10-5526-0605
Fax No.	+82-70-4222-5686
E-mail	robinjang@apulsetech.com

1.2. Manufacturer Information

Manufacturer	Apulse Technology Co.,Ltd
Manufacturer Address	A-1403, 60, Haan-ro, Gwangmyeong-si, Gyeonggi-do, Republic of Korea.

1.3 Test Laboratory Information

Laboratory	EMC Labs Co., Ltd.
Laboratory Address	100, Jangjateo-ro, Hobeop-myeon, Icheon-si, Gyeonggi-do, Republic of Korea
Contact Person	Yongmin Won
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Fax No.	+82-2-538-3668
FCC Designation No.	KR0140
FCC Registration No.	58000
IC Site Registration No.	28751

2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	RFID Fixed Reader
Model Name	a313
FCC ID	2AWMDA313
Power Supply	DC 12.0 V

2.2 Additional Information

Operating Frequency	902.75 MHz ~ 927.25 MHz
Number of channel	50
Modulation Type	A1D
Antenna Type	Patch Antenna
Antenna Gain	5.34dBi
Firmware Version	1.0
Hardware Version	1.0
Test software	Certihost/v1.0.2

2.3 Test Frequency

Test mode	Test Frequency (MHz)		
	Low Frequency	Middle Frequency	High Frequency
RFID (900 MHz FHSS)	902.75	915.75	927.25

2.4 Used Test Software Setting Value

Test Mode	Setting Item
	Power
RFID (900 MHz FHSS)	27

2.7 Mode of operation during the test

- The EUT continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

2.8 Modifications of EUT

- None

3. Test Summary

Applied	FCC Rule	IC Rule	Test Items	Test Condition	Result
☒	15.203	-	Antenna Requirement	Conducted	C
☒	15.247(a)	-	20 dB Bandwidth		C
☒	-	RSS GEN (6.7)	Occupied Bandwidth (99%)		C
☒	15.247(a)	RSS-247 (5.1)	Number of Hopping Frequencies		C
☒	15.247(a)	RSS-247 (5.1)	Time of Occupancy (Dwell Time)		C
☒	15.247(a)	RSS-247 (5.1)	Carrier Frequencies Separation		C
☒	15.247(b)	RSS-247 (5.4)	Peak Output Power		C
☒	15.247(d)	RSS-247 (5.5)	Conducted Spurious Emission		C
☒	15.247(d) 15.205 & 15.209	RSS-247 (5.5) RSS-GEN (8.9 & 8.10)	Radiated Spurious Emission	Radiated	C
☒	15.207	RSS-GEN (8.8)	Conducted Emissions	AC Line Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

The sample was tested according to the following specification: ANSI C63.10:2013.
Compliance was determined by specification limits of the applicable standard according to customer requirements.

4. Used equipment on test

	Description	Manufacturer	Model Name	Serial Name	Next Cal.
■	TEMP & HUMID CHAMBER	JFM	JFMA-001	20200929-01	2022.12.17
■	CONTROLLER	AMWON TECHNOLOGY	TEMI2500	S7800VK191 0707	2022.12.17
■	PSA SERIES SPECTRUM ANALYZER	AGILENT	E4440A	MY45304057	2022.12.15
■	MXG ANALOG SIGNAL GENERATOR	AGILENT	N5183A	MY50141890	2022.12.15
■	SYSTEM DC POWER SUPPLY	AGILENT	6674A	MY53000118	2022.12.15
□	VECTOR SIGNAL GENERATOR	ROHDE & SCHWARZ	SMBV100A	257524	2022.12.15
□	BLUETOOTH TESTER	TESCOM	TC-3000A	3000A480088	2022.12.15
□	DIRECTIONAL COUPLER	AGILENT	773D	2839A01855	2022.12.15
□	ATTENUATOR	AGILENT	8493C	73193	2022.12.15
■	ATTENUATOR	ACE RF COMM	ATT SMA 20W 20dB 8 ㎓	A-0820.SM20.2	2023.04.11
□	TERMINATIOM	HEWLETT PACKARD	909D	07492	2022.12.15
□	POWER DIVIDER	HEWLETT PACKARD	11636A	06916	2022.12.15
□	SLIDE-AC	DAEKWANG TECH	SV-1023	-	-
□	DIGITAL MULTIMETER	HUMANTECHSTORE	15B+	50561541WS	2022.12.15
■	ACTIVE LOOP ANTENNA	TESEQ	HLA 6121	55685	2022.12.30
■	Biconilog ANT	Schwarzbeck	VULB 9160	3260	2023.02.03
□	Biconilog ANT	Schwarzbeck	VULB9168	902	2023.01.14
■	Horn Ant.	Schwarzbeck	BBHA9120D	974	2023.01.08
□	Horn Ant.	S/B	BBHA9120D	1497	2023.01.25
■	Amplifier	TESTEK	TK-PA18H	200104-L	2023.03.17
■	EMI TEST RECEIVER	ROHDE& SCHWARZ	ESW44	101952	2023.04.07
□	PROGRAMMABLE DC POWER SUPPLY	ODA	OPE-305Q	oda-01-09-23-1831	2023.01.10
□	DC POWER SUPPLY	AGILENT	E3634A	MY40012120	2023.02.03
■	POWER SENSOR	AGILENT	U2001H	MY51140028	2023.02.19
■	Test Receiver	ROHDE & SCHWARZ	ESR7	101616	2023.06.28
■	LISN	ROHDE & SCHWARZ	ENV216	100409	2023.01.10
■	PULSE LIMITER	lignex1	EPL-30	NONE	2023.01.24

5. Antenna Requirement

According to §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. 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.

According to §15.247(b)(4) e conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1 Result

Complies
(The transmitter has a Patch Antenna. The directional peak gain of the antenna is 5.34 dBi.)

6. 20 dB Bandwidth & Occupied Bandwidth (99%)

6.1 Test Setup

Refer to the APPENDIX I.

6.2 Limit

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

6.3 Test Procedure

1. The 20 dB bandwidth & Occupied bandwidth were measured with a spectrum analyzer connected to RF antenna Connector (conducted measurement) while EUT was operating in transmit mode. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer.

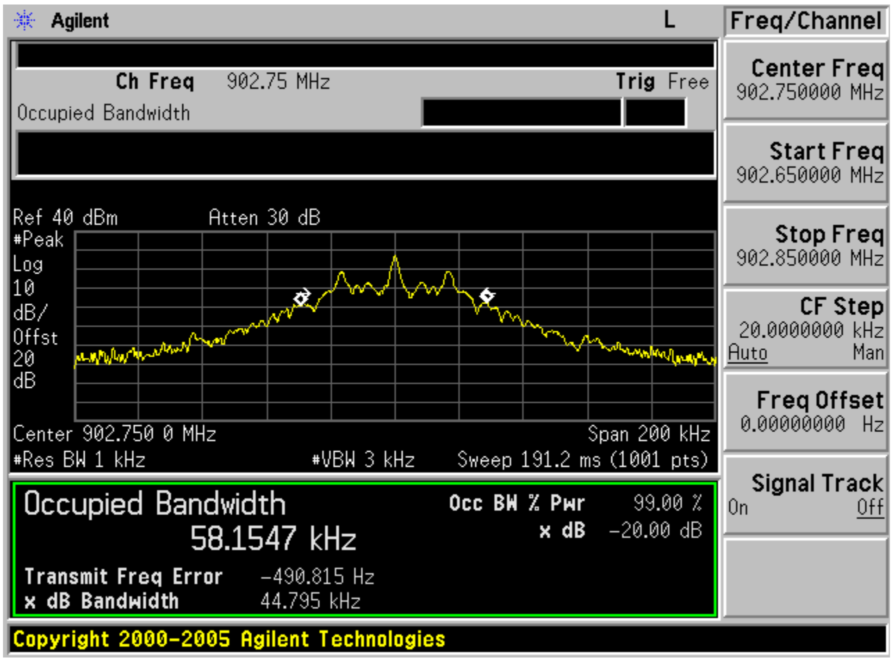
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using below setting:
   RBW = 1% to 5% of the 20 dB Bandwidth & Occupied Bandwidth
   VBW ≥ 3 × RBW
   Span = between two times and five times the 20 dB Bandwidth & Occupied Bandwidth
   Sweep = Auto
   Detector function = Peak
   Trace = Max Hold

6.4 Test Result

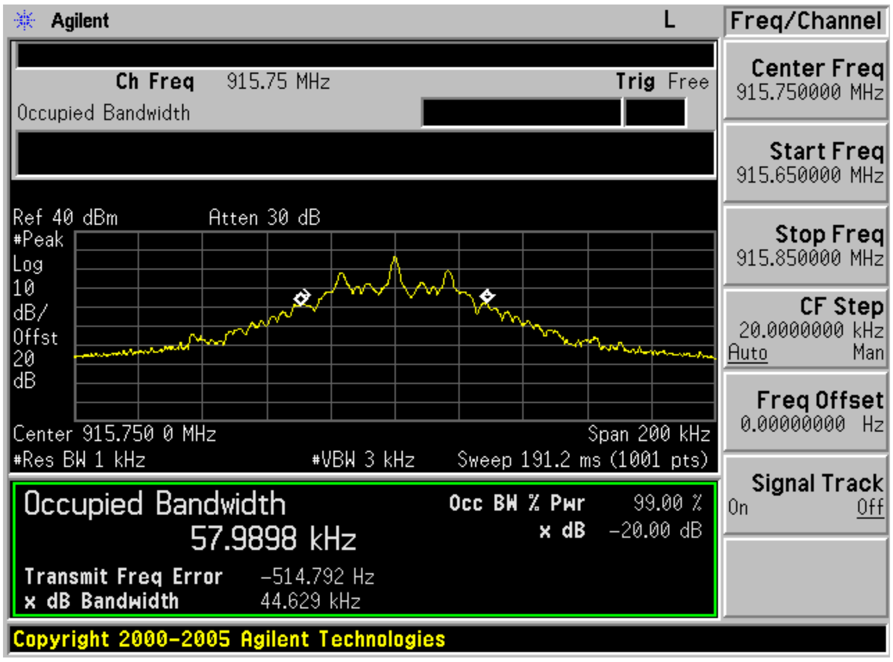
Test Mode	Test Frequency	20 dB Bandwidth (kHz)	Occupied Bandwidth (kHz)
RFID	Low	44.795	58.155
	Middle	44.629	57.990
	High	44.918	58.318

6.5 Test Plot

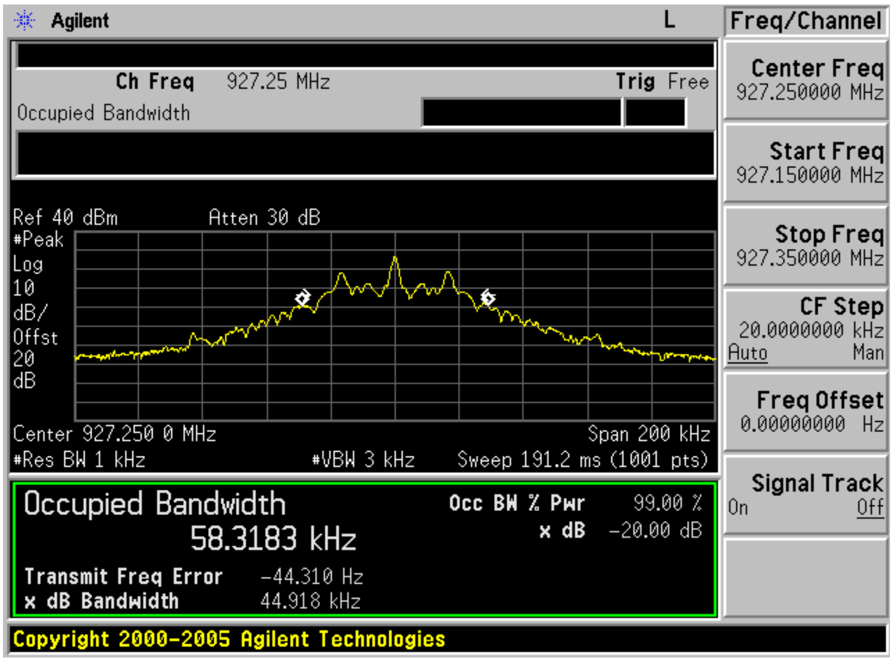
RFID _ Low frequency	20 dB Bandwidth & Occupied Bandwidth



RFID _ Middle frequency	20 dB Bandwidth & Occupied Bandwidth



RFID _ High frequency	20 dB Bandwidth & Occupied Bandwidth



7. Number of Hopping Frequencies

7.1 Test Setup

Refer to the APPENDIX I.

7.2 Limit

Limit : >= 50 hops

7.3 Test Procedure

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.
To get higher resolution, two frequency ranges for FH mode within the 902 ~ 928 MHz were examined.

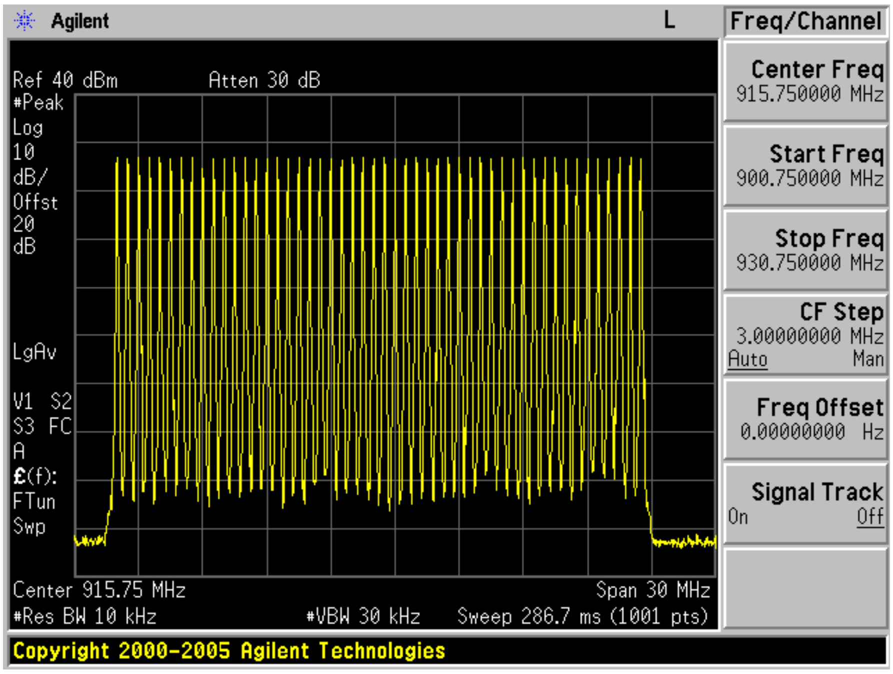
The spectrum analyzer is set to:
Span = 30 MHz
RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW ≥ RBW
Sweep = Auto
Detector = Peak
Trace = Max hold

7.4 Test Result

Test Mode	Number of Hopping Channels
RFID	50

7.5 Test Plot

RFID _ Hopping Mode	Number of Hopping Frequencies



8. Time of Occupancy (Dwell Time)

8.1 Test Setup

Refer to the APPENDIX I.

8.2 Limit

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

8.3 Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

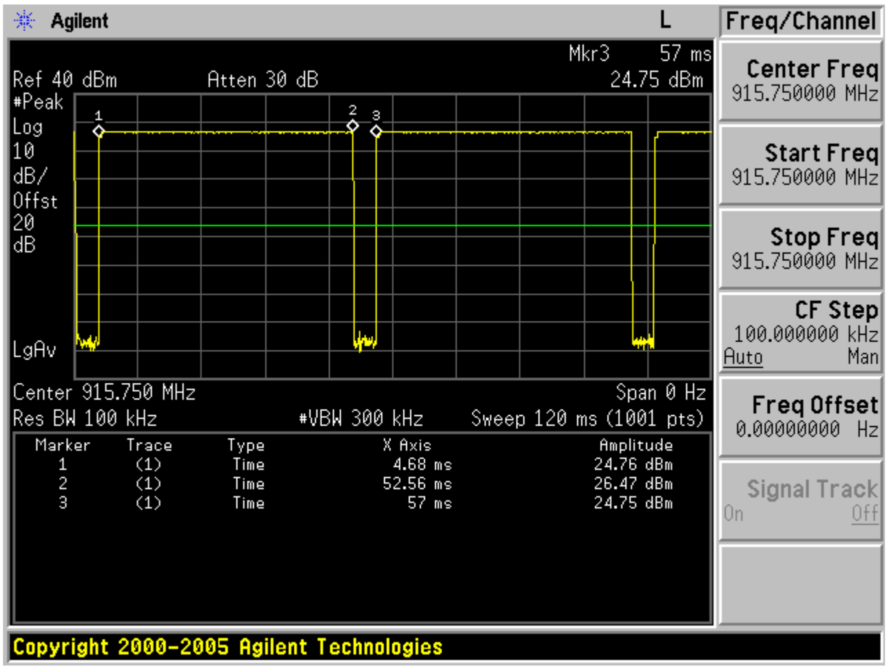
The spectrum analyzer is set to:
Center frequency = 921.9 MHz   Span = Zero
RBW = 100 kHz (RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel)
VBW ≥ RBW   Detector = Peak
Trace = Max hold

8.4 Test Result

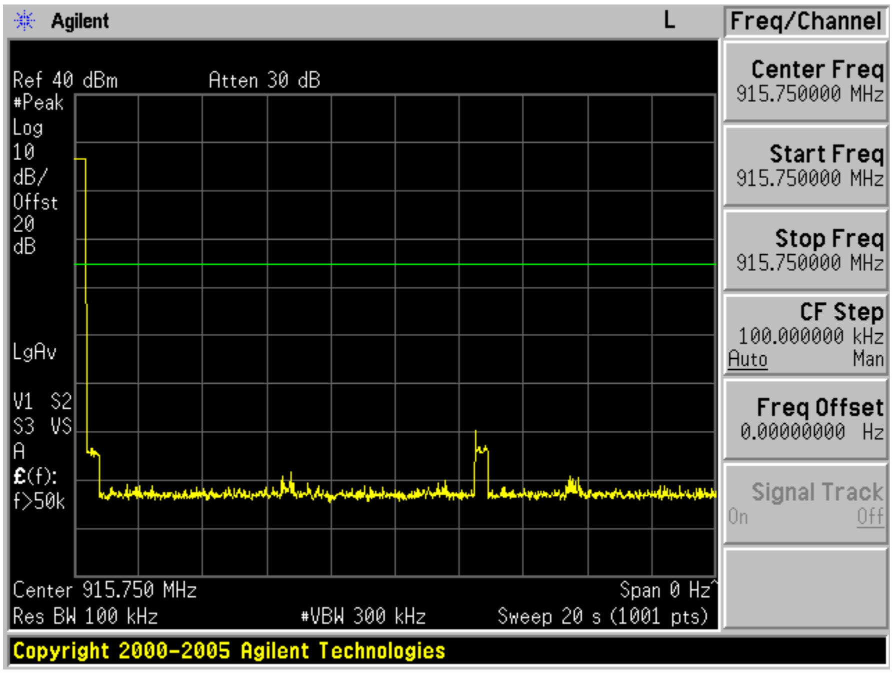
Test Frequency (MHz)	Length (ms)	Number	Dwell Time (ms)
915.75	47.88	1	47.88

8.5 Test Plot

RFID	Length



RFID	Number



9. Carrier Frequencies Separation

9.1 Test Setup

Refer to the APPENDIX I.

9.2 Limit

Limit : ≥ 25 kHz or ≥ 20 dB Bandwidth whichever is greater.

9.3 Test Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.
After the trace being stable, the reading value between the peaks of the adjacent channels using the marker delta function was recorded as the measurement results.

The spectrum analyzer is set to:
Span = wide enough to capture the peaks of two adjacent channels
RBW = Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW ≥ RBW　　Sweep = Auto
Detector = Peak　　Trace = Max hold

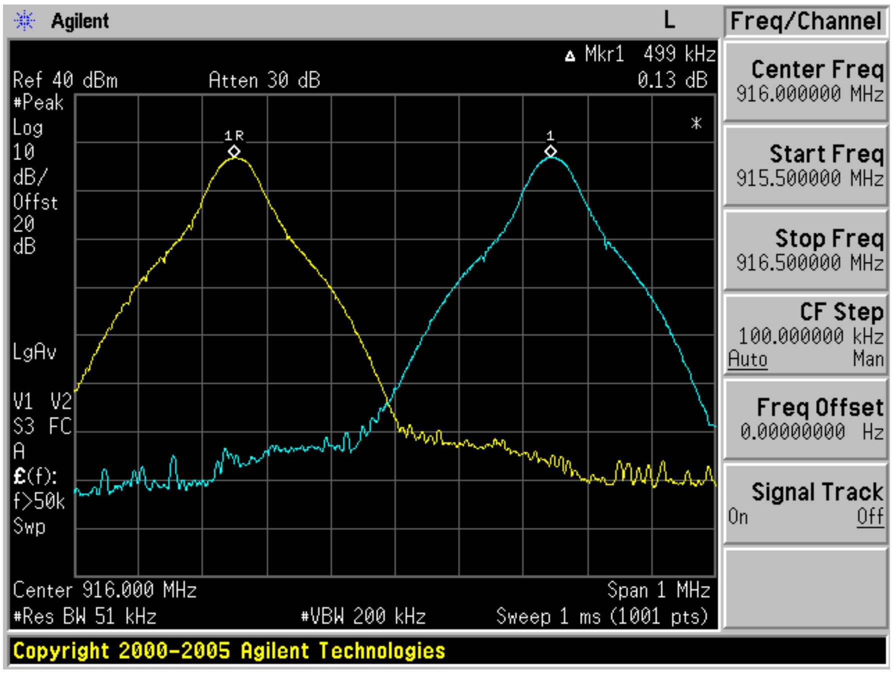
9.4 Test Result

Test Mode	Carrier Frequencies Separation (kHz)	Min. Limit (kHz)
RFID	499.00	57.99

Note: Limit (kHz) = Test Result of 20 dB BW

9.5 Test Plot

RFID	Carrier Frequency Separation



10. Peak Output Power

10.1 Test Setup

Refer to the APPENDIX I.

10.2 Limit

The maximum peak output power of the intentional radiator shall not exceed the following:
§15.247(b)(2) and RSS-247(5.4) (a), For frequency hopping systems operating in the 902-928 MHz band:
1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) and 5.4(a) of this section.

10.3 Test Procedure

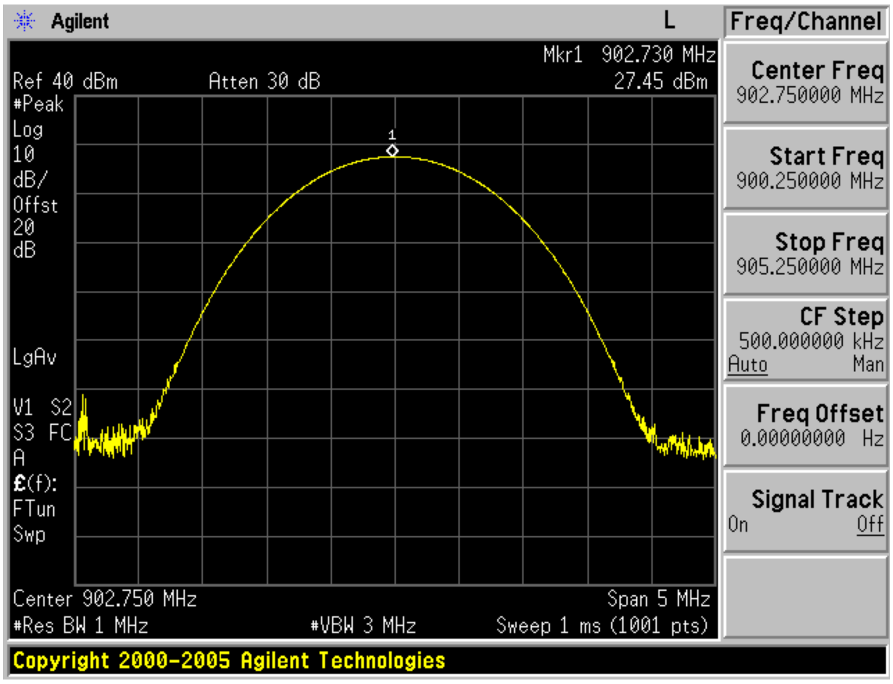
1. The RF output power was measured with a spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, a spectrum analyzer was used to record the shape of the transmit signal.
2. The peak output power of the fundamental frequency was measured with the spectrum analyzer using;
   Span = approximately 5 times of the 20 dB bandwidth, centered on a hopping channel
   RBW ≥ 20 dB Bandwidth
   VBW ≥ RBW
   Sweep = Auto
   Detector function = Peak
   Trace = Max Hold

10.4 Test Result

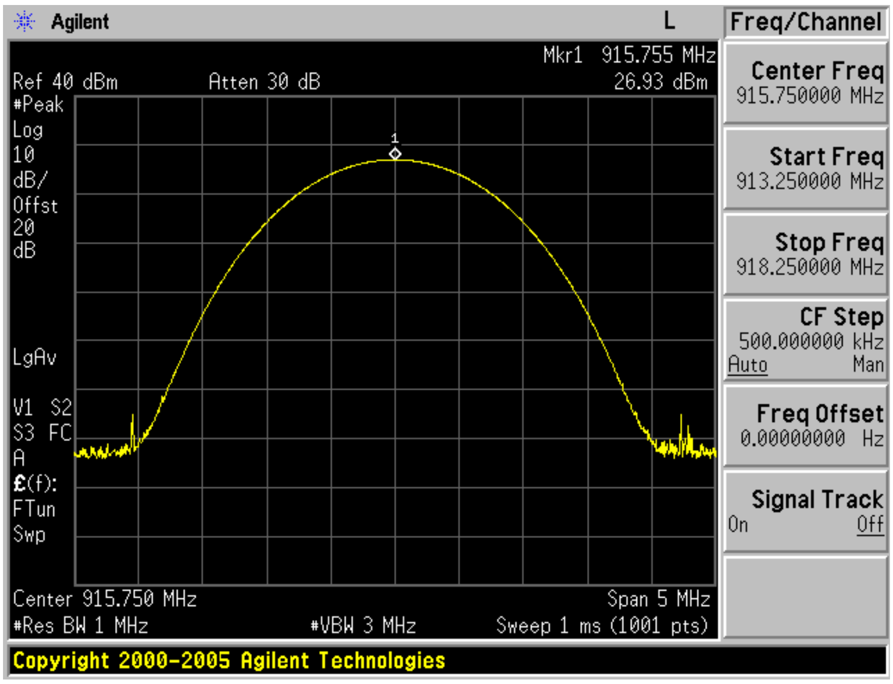
Test Mode	Test Frequency	Peak Output Power	
		dBm	mW
RFID	Low	27.45	555.90
	Middle	26.93	493.17
	High	26.90	489.78

10.5 Test Plot

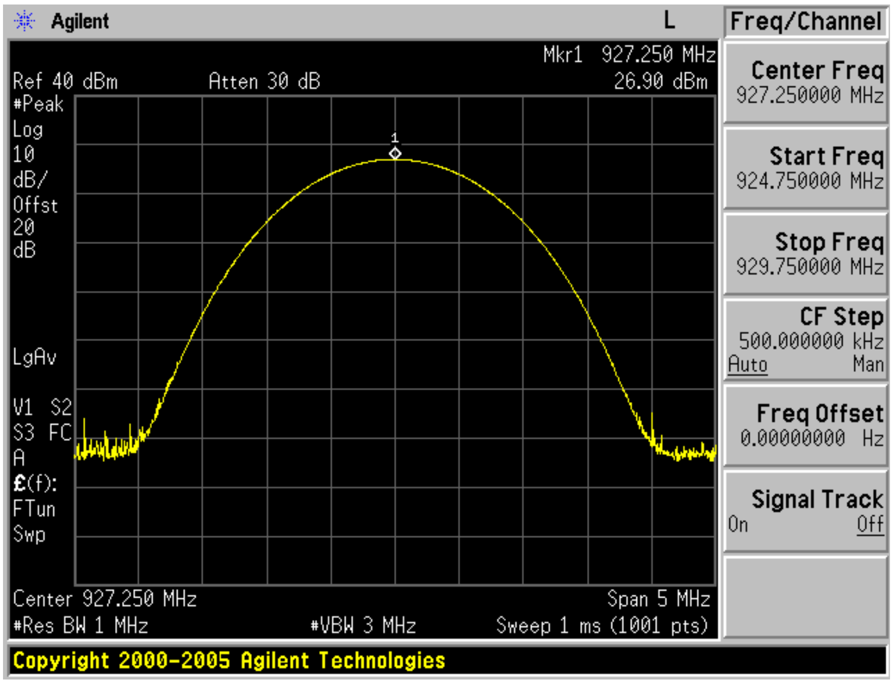
RFID _ Low frequency	Peak Output Power



RFID _ Middle frequency	Peak Output Power



RFID _ High frequency	Peak Output Power



11. TX Radiated Spurious Emission and Conducted Spurious Emission

11.1 Test Setup

Refer to the APPENDIX I.

11.2 Limit

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 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

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1705	24000/F (kHz)	30
1705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(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. 15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of
The frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 ~ 0.110	16.42 ~ 16.423	399.90 ~ 410	4.5 ~ 5.15
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.	1435 ~ 1626.5	9.0 ~ 9.2
4.20725 ~ 4.20775	25 73 ~ 74.6	1645.5 ~ 1646.5	9.3 ~ 9.5
4.17725 ~ 4.17775	74.8 ~ 75.2	1660 ~ 1710	10.6 ~ 12.7
6.215 ~ 6.218	108 ~ 121.94	1718.8 ~ 1722.2	13.25 ~ 13.4
6.26775 ~ 6.26825	149.9 ~ 150.05	2200 ~ 2300	14.47 ~ 14.5
6.31175 ~ 6.31225	156.52475 ~ 156.52525	2310 ~ 2390	15.35 ~ 16.2
8.291 ~ 8.294	156.7 ~ 156.9	2483.5 ~ 2500	17.7 ~ 21.4
8.362 ~ 8.366	162.0125 ~ 167.17	2690 ~ 2900	22.01 ~ 23.12
8.37625 ~ 8.38675	3345.8 ~ 3358	3260 ~ 3267	23.6 ~ 24.0
8.41425 ~ 8.41475	3600 ~ 4400	3332 ~ 3339	31.2 ~ 31.8
12.51975 ~ 12.52025	3345.8 ~ 3358	240 ~ 285	36.43 ~ 36.5
12.57675 ~ 12.57725	3600 ~ 4400	322 ~ 335.4	Above 38.6
13.36 ~ 13.41			

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

11.3 Test Procedure for Radiated Spurious Emission

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 ㎓, the table height is 80 cm. For emission measurements above 1 ㎓, the table height is 1.5 m. The table was rotated 360 degrees to determine the position of the highest radiation.

2. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3.75 meter away from the interference-receiving antenna.

3. For measurements above 1 ㎓ absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 ㎓, the absorbers are removed.

4. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

5. For each suspected emission, the EUT was arranged to its worst case and then The antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
   (The EUT was pre-tested with three axes (X, Y, Z) and the final test was performed at the worst case.)

6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

7. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Measurement Instrument Setting

1. Frequency Range: Below 1 ㎓
   RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak

2. Frequency Range: Above 1 ㎓
   Peak Measurement
   RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto,
   Trace mode = Max Hold until the trace stabilizes

   Average Measurement
   RBW = 1MHz, VBW ≥ 1/T, Detector = Peak, Sweep Time = Auto,
   Trace Mode = Max Hold until the trace stabilizes

11.4 Test Procedure for Conducted Spurious Emission

1. The transmitter output was connected to the spectrum analyzer.

2. The reference level of the fundamental frequency was measured with the spectrumanalyzer using
   RBW = 100 kHz, VBW = 300 kHz.

3. The conducted spurious emission was tested each ranges were set as below.
   Frequency range: 30 MHz ~ 26.5 ㎓
   RBW = 100 kHz, VBW = 300 kHz, Sweep Time = Auto, Detector = Peak,
   Trace = Max Hold

   LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

11.5 Test Result

9 kHz ~ 10 ㎓ Data

- Low frequency

Frequency	Reading (dBuV/m)		Pol.	T.F (dB)	DCCF (dB)	Limits (dBuV/m)		Result (dBuV/m)		Margin (dB)	
(MHz)	AV / Peak					AV / Peak		AV / Peak		AV / Peak	
1 805.48	44.09	50.60	V	-11.56	N/A	54.0	74.0	32.5	39.0	21.5	35.0
2 708.33	55.59	60.47	V	-6.89	N/A	54.0	74.0	48.7	53.6	5.3	20.4

- Middle frequency

Frequency	Reading (dBuV/m)		Pol.	T.F (dB)	DCCF (dB)	Limits (dBuV/m)		Result (dBuV/m)		Margin (dB)	
(MHz)	AV / Peak					AV / Peak		AV / Peak		AV / Peak	
1 831.37	45.45	52.10	V	-11.56	N/A	54.0	74.0	33.9	40.5	20.1	33.5
2 747.28	49.94	55.84	V	-6.89	N/A	54.0	74.0	43.1	49.0	11.0	25.1

- High frequency

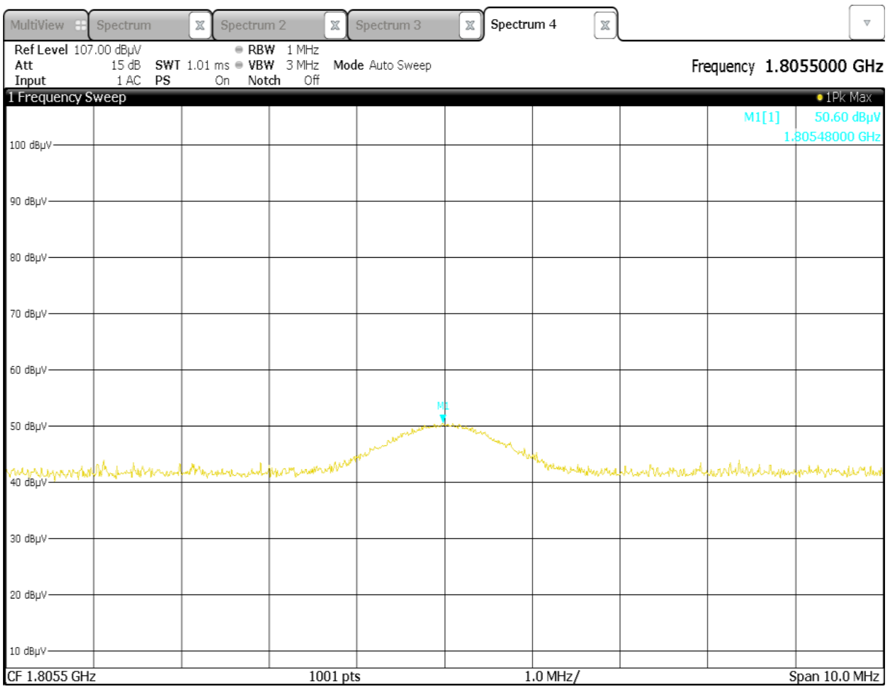
Frequency	Reading (dBuV/m)		Pol.	T.F (dB)	DCCF (dB)	Limits (dBuV/m)		Result (dBuV/m)		Margin (dB)	
(MHz)	AV / Peak					AV / Peak		AV / Peak		AV / Peak	
1 854.51	48.39	54.05	V	-11.46	N/A	54.0	74.0	36.9	42.6	17.1	31.4
2 781.75	58.34	63.76	V	-6.59	N/A	54.0	74.0	51.8	57.2	2.2	16.8

Note 1: The radiated emissions were inverstigated 9 kHz to 10 ㎓. And no other spurious and harmonic emissions were found above listed frequencies.
Note 2: DCCF(Duty Cycle Correction Factor)
Note 3: Sample Calculation.
Margin = Limit – Result / Peak Result = Peak Reading + TF / Average Result = Average Reading + TF
TF = Ant factor + Cable Loss + Filter Loss – Amp Gain + Distance Factor
Distance Factor = 20log(applied distance/required distance) = 20log(3.75m/3m) = 1.94

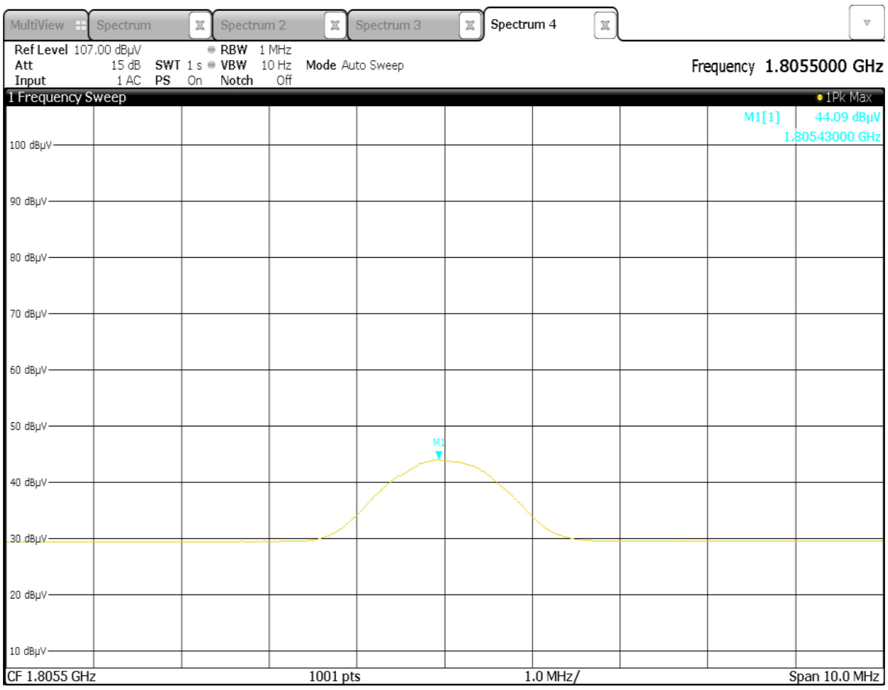
11.6 Test Plot for Radiated Spurious Emission

- RFID _ Low frequency

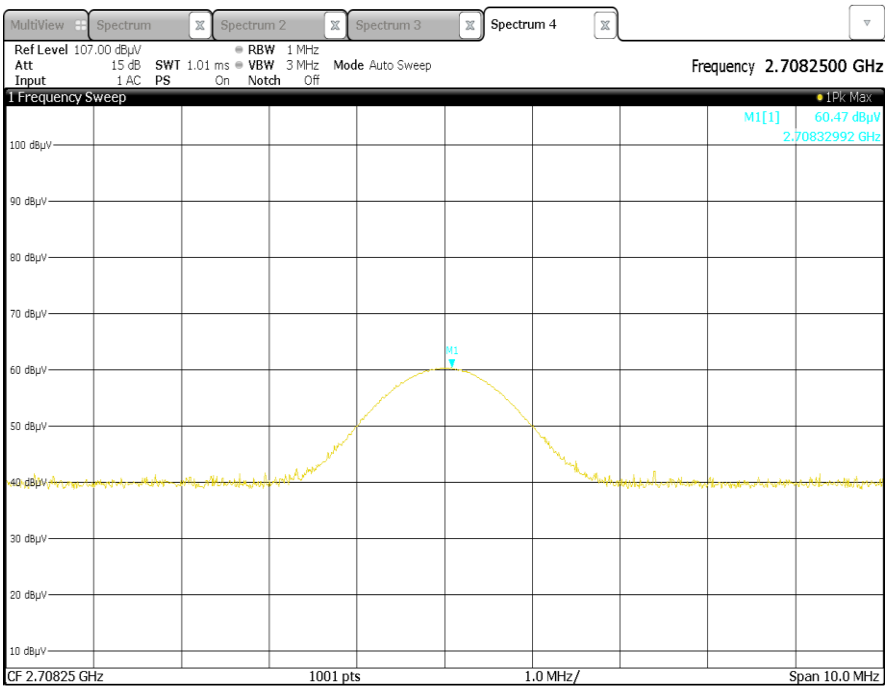
	Spurious – Peak



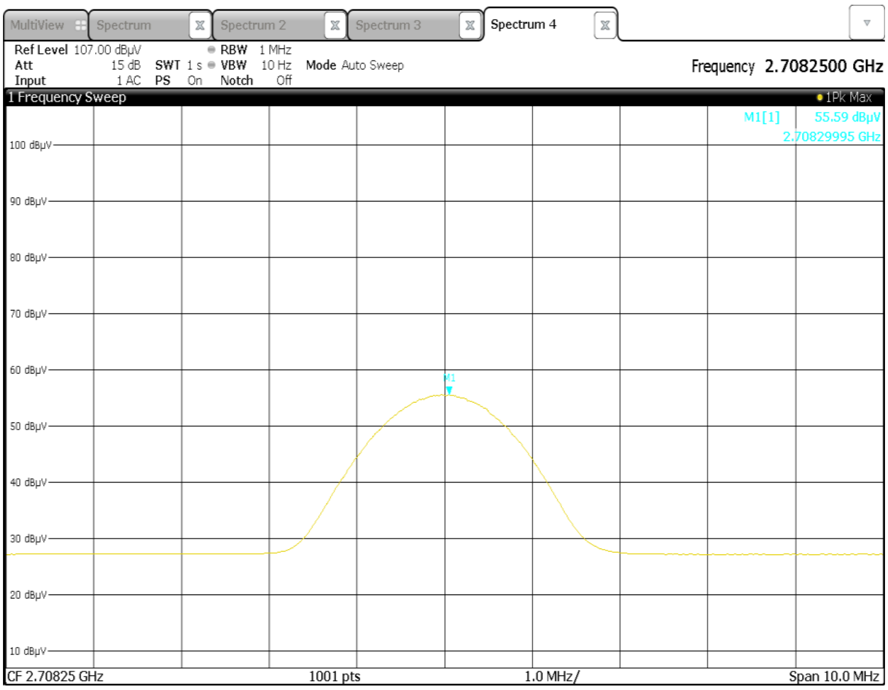
	Spurious – Average



	Spurious – Peak

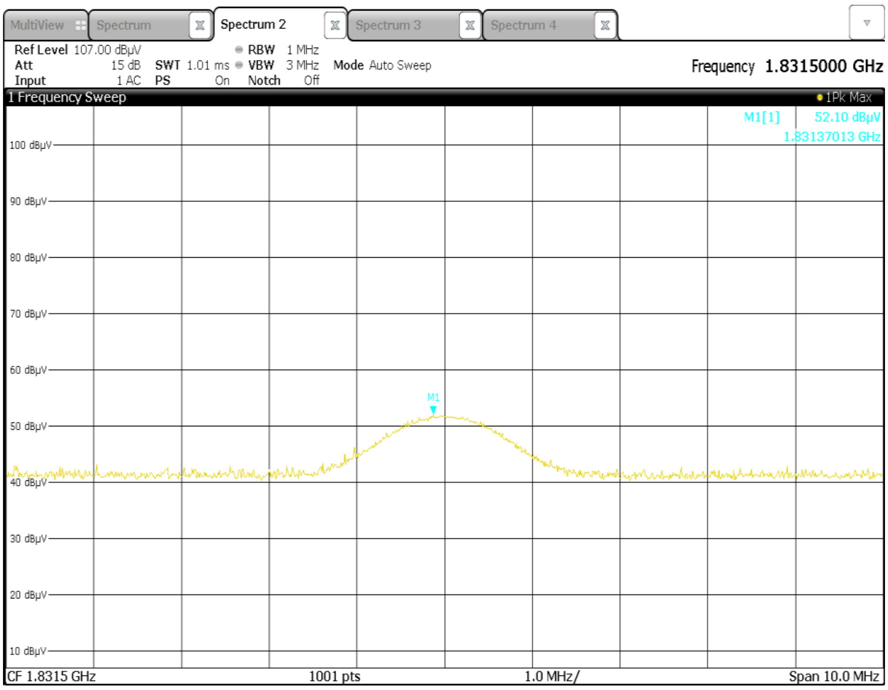


	Spurious – Average

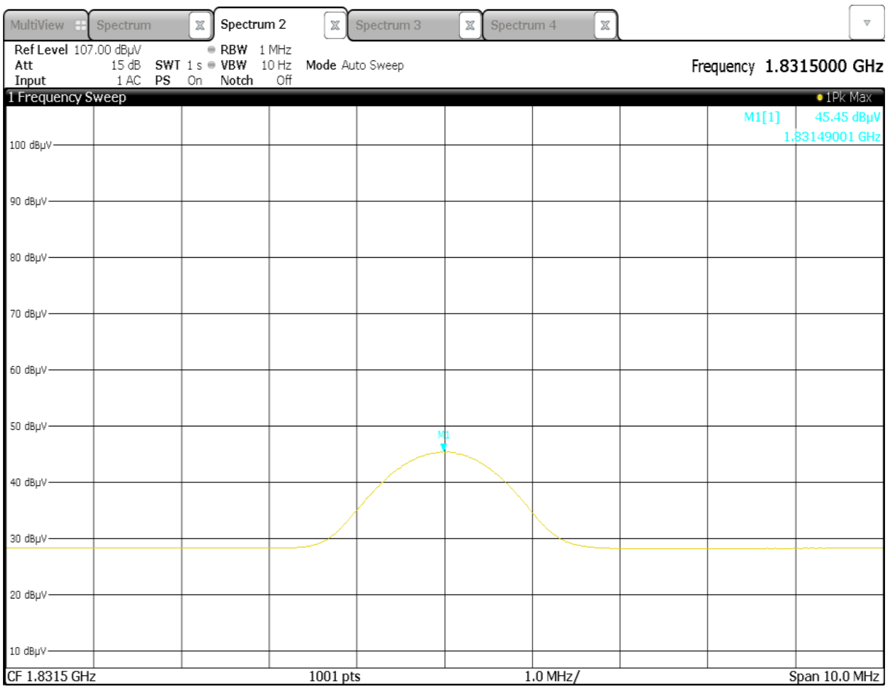


- RFID _ Middle frequency

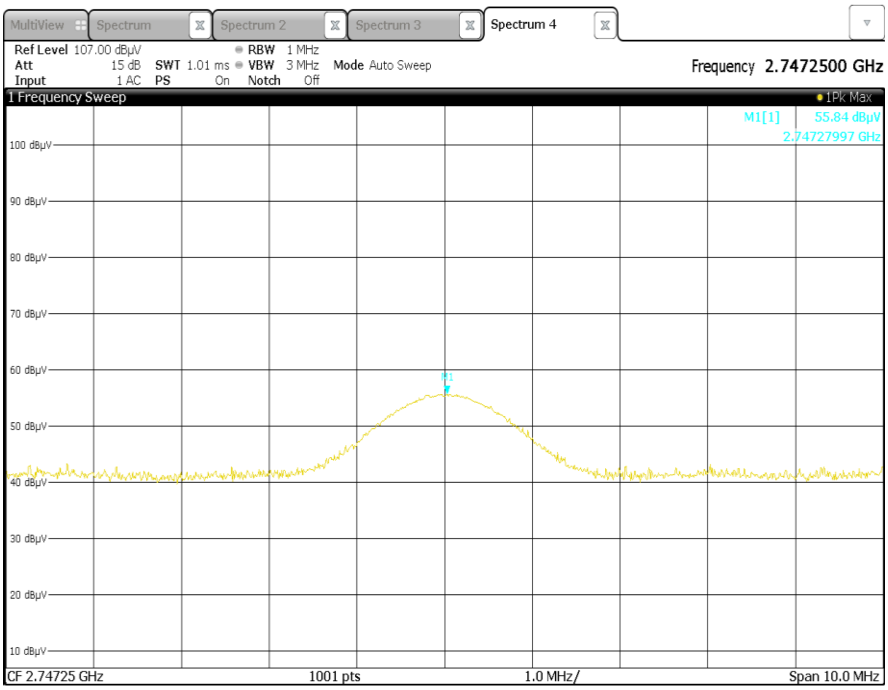
	Spurious – Peak



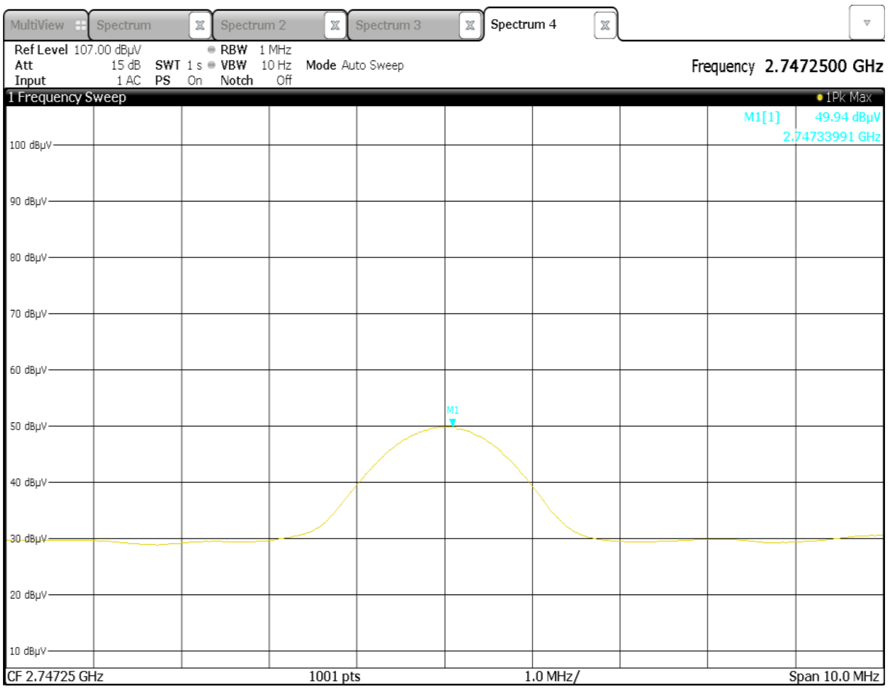
	Spurious – Average



	Spurious – Peak

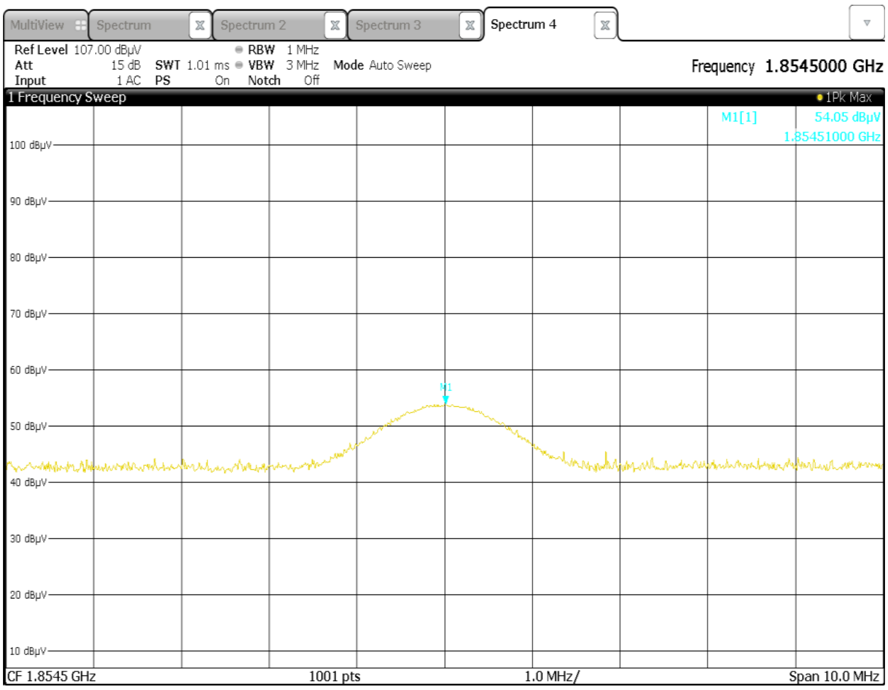


	Spurious – Average

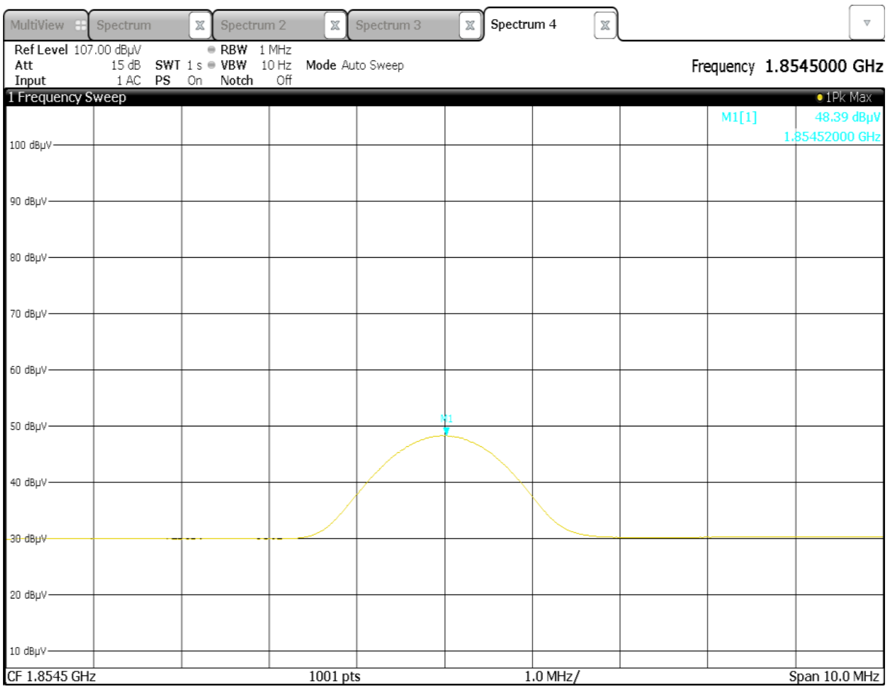


- RFID _ High frequency

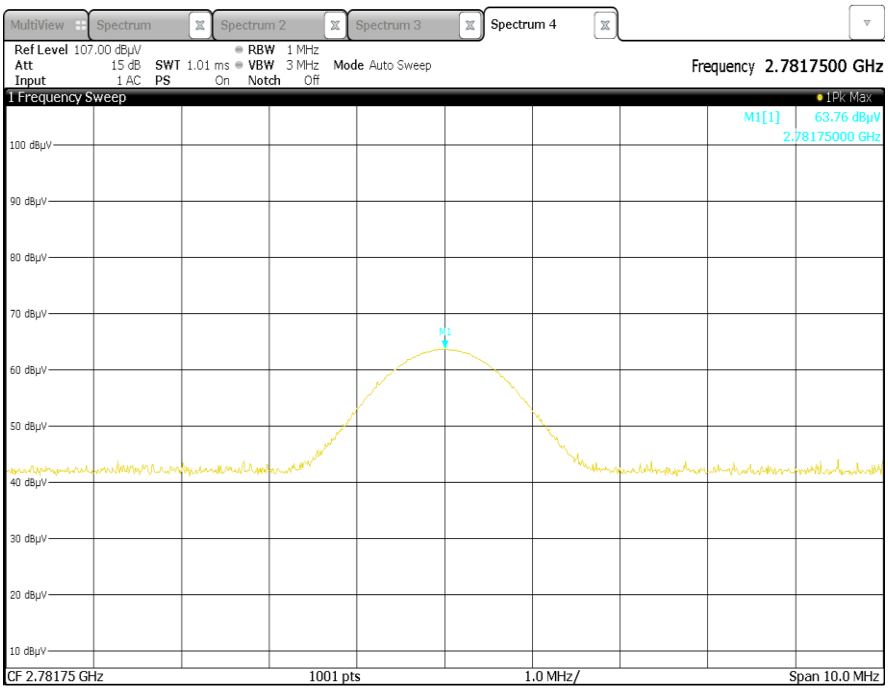
	Spurious – Peak



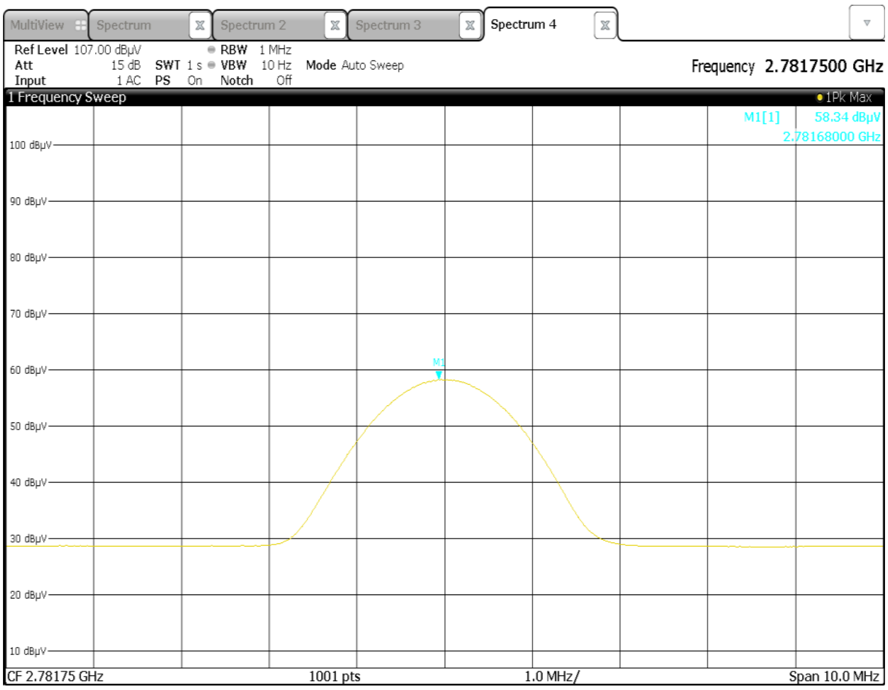
	Spurious – Average



	Spurious – Peak



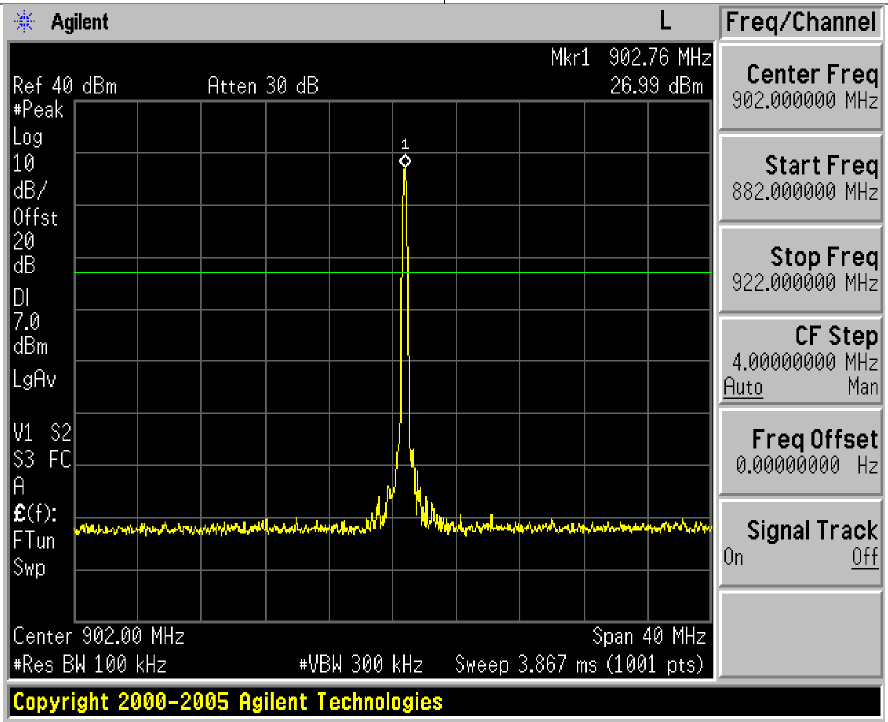
	Spurious – Average



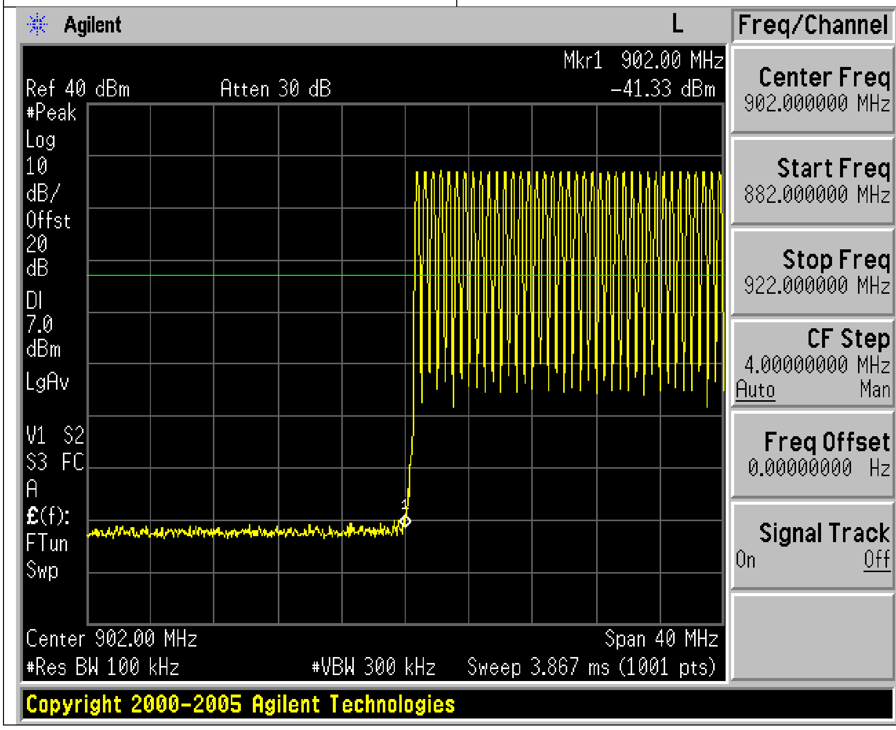
11.7 Test Plot for Conducted Spurious Emission

- RFID _ Low frequency

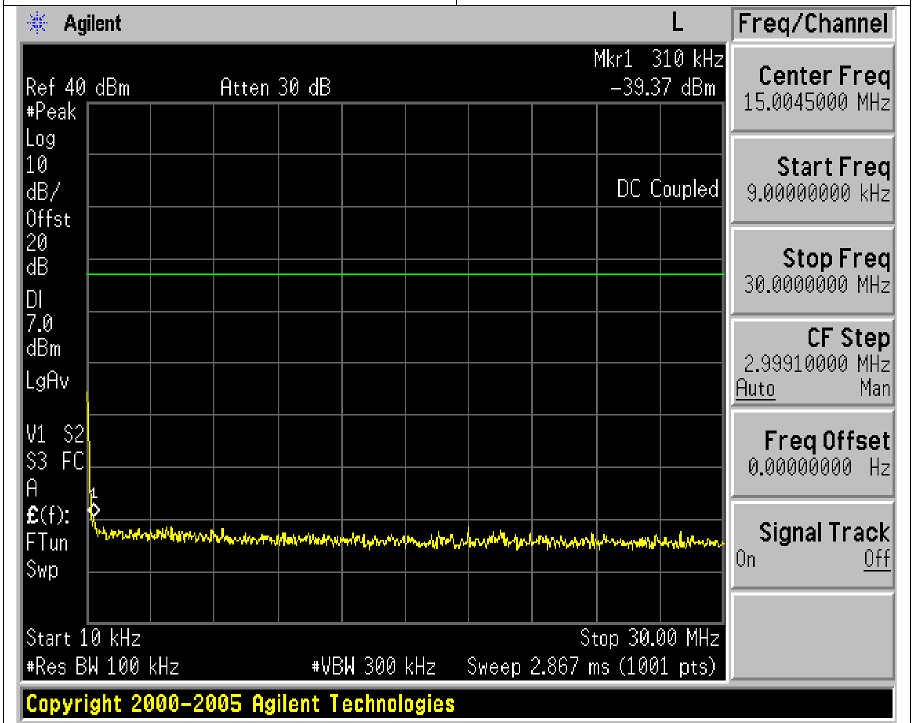
Reference & Bandedge _ Single



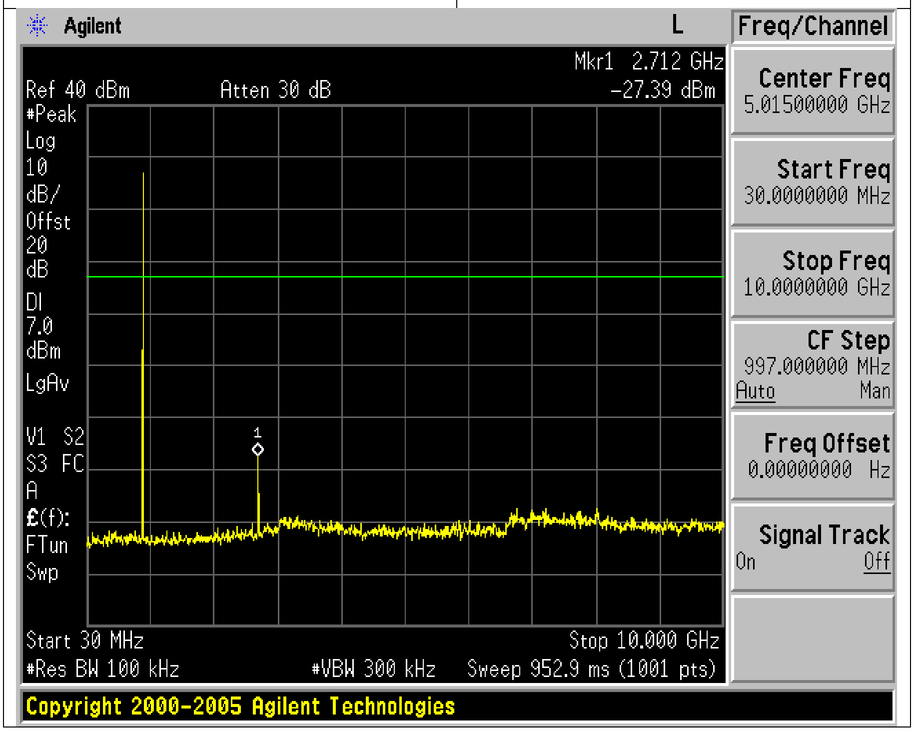
Bandedge _ Hopping



	Spurious

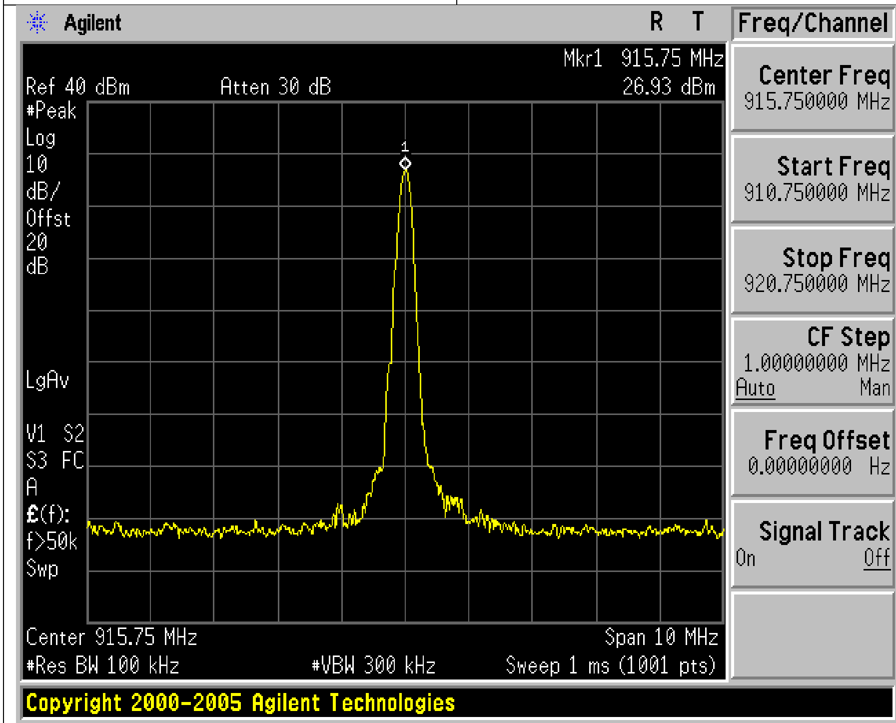


	Spurious

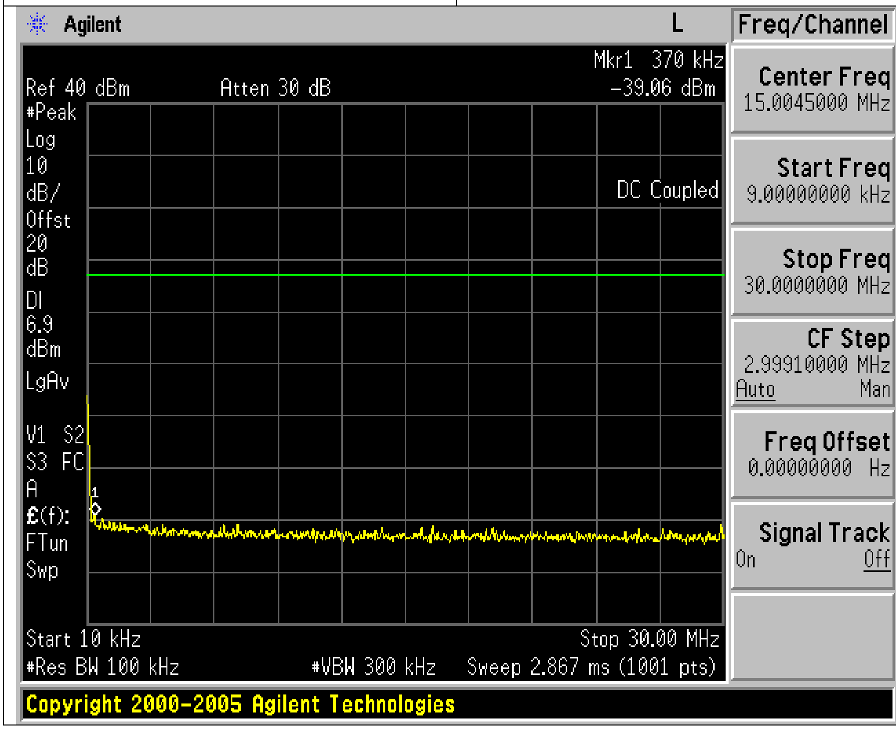


- RFID _ Middle frequency

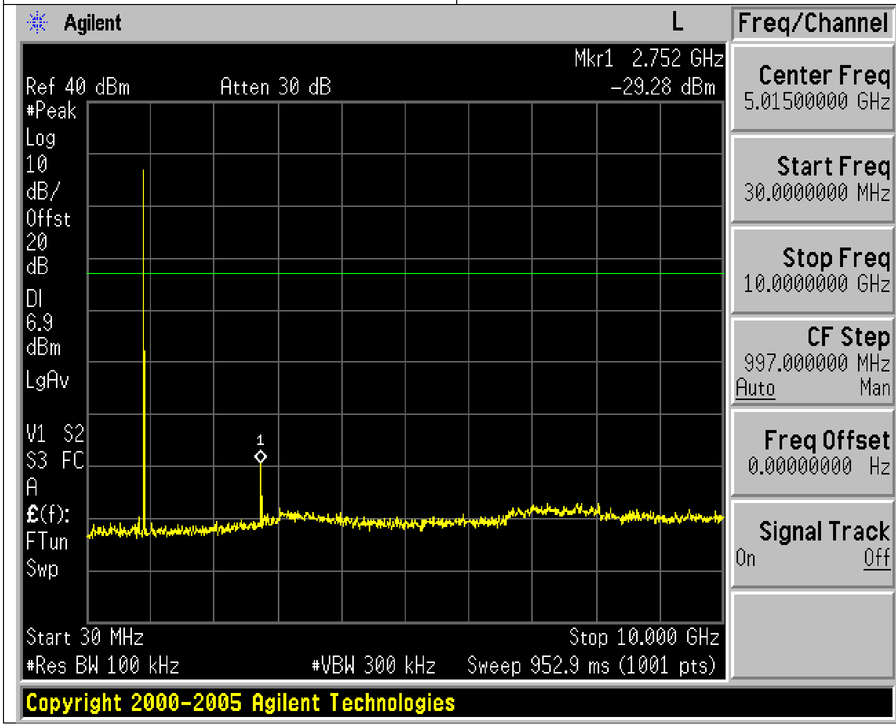
	Reference



	Spurious

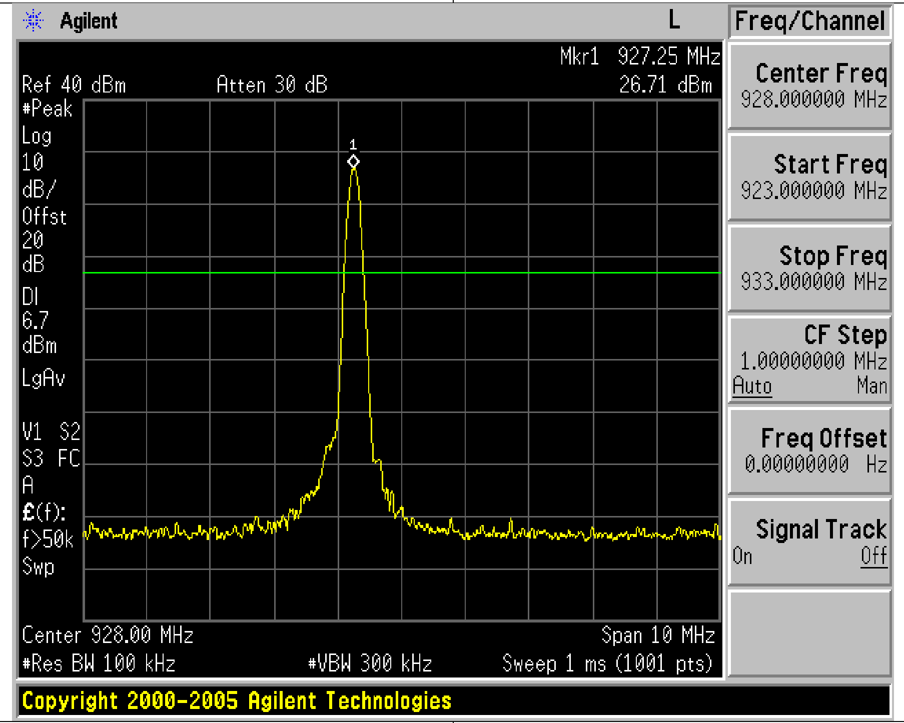


	Spurious

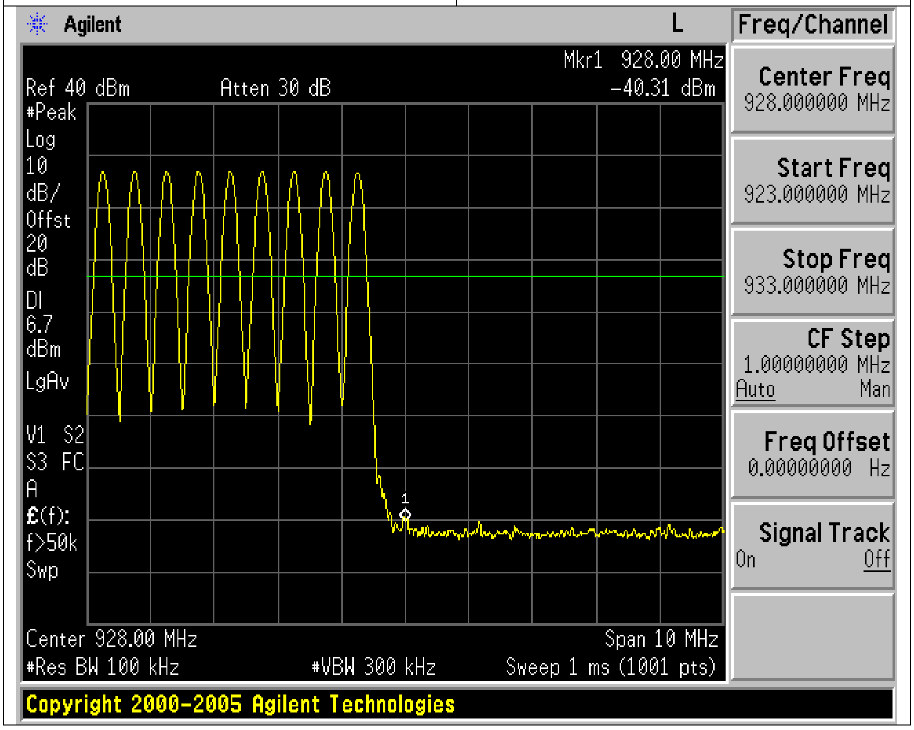

Agilent
L
Freq/Channel
Mkr1 2.752 GHz
Ref 40 dBm
Atten 30 dB
-29.28 dBm
#Peak
Log
10
dB/
Offst
20
dB
Dl
6.9
dBm
LgAv
V1 S2
S3 FC
A
£(f):
FTun
Swp
1
Start 30 MHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 952.9 ms (1001 pts)
Center Freq
5.01500000 GHz
Start Freq
30.0000000 MHz
Stop Freq
10.0000000 GHz
CF Step
997.000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2005 Agilent Technologies

- RFID _ High frequency

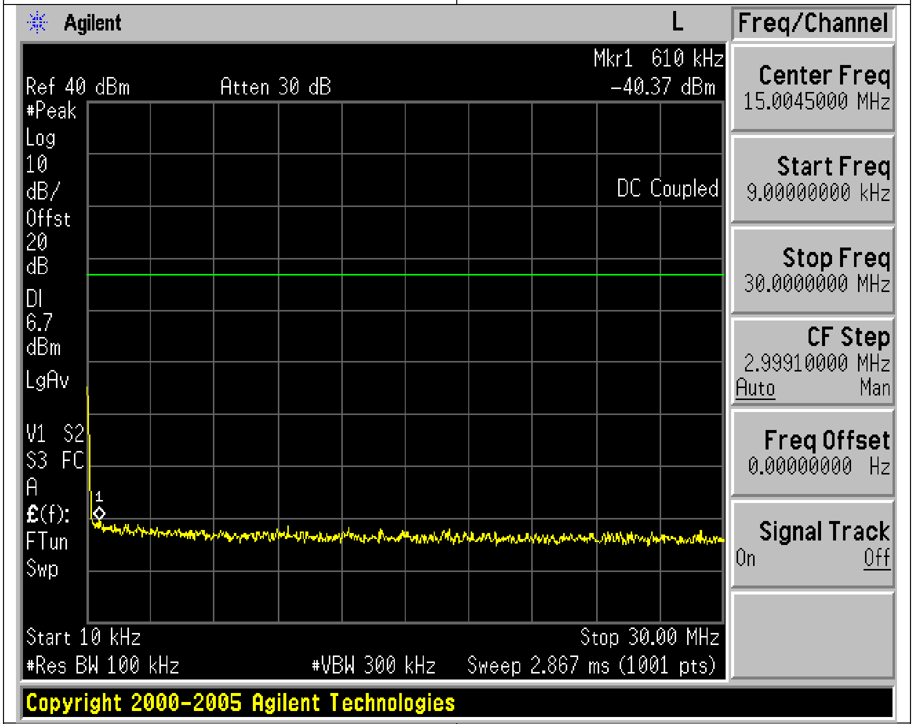
	Reference & Bandedge _ Single



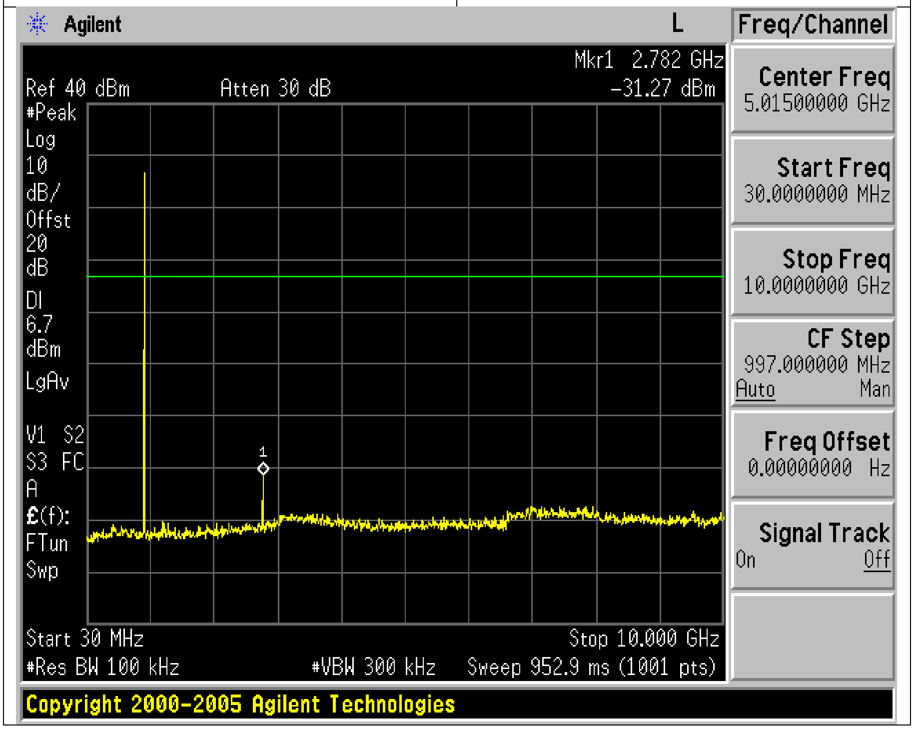
	Bandedge _ Hopping



	Spurious



	Spurious



12. Conducted Emission

12.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

12.2 Limit

According to §15.207(a) 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 uH/50 ohm line impedance stabilization network (LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

12.3 Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

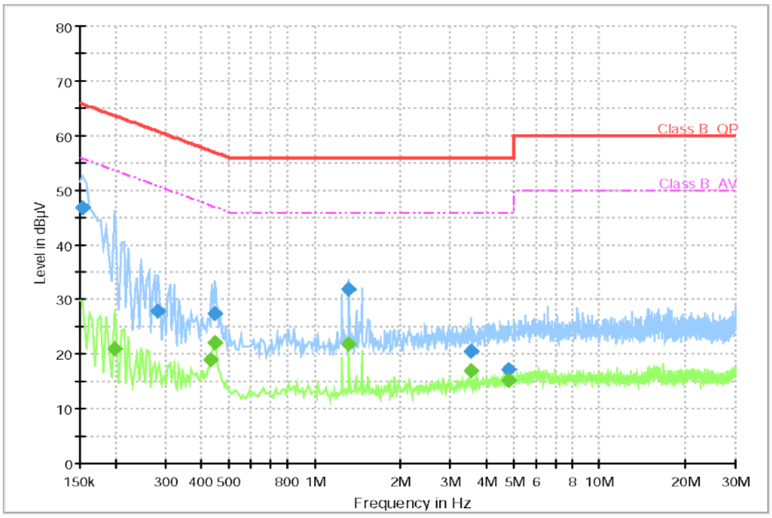
1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

12.4 Test Result

- AC Line Conducted Emission (Graph)

a313_RFID_L1

Conducted Emission

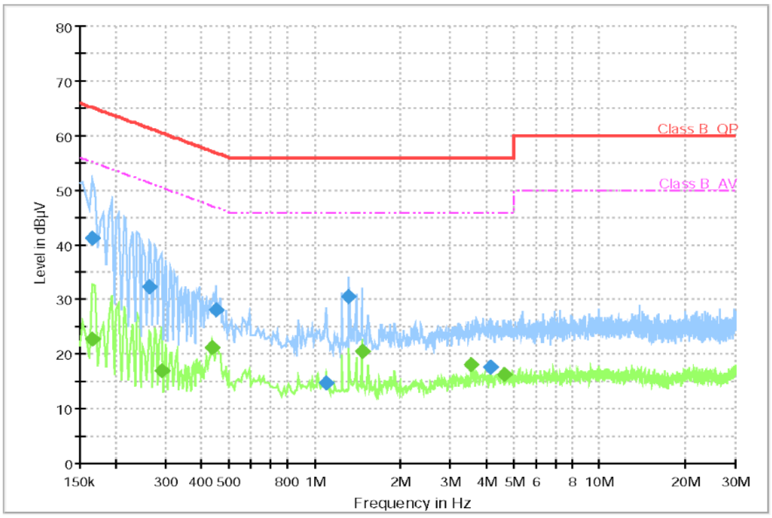


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.154	46.88	---	65.78	18.90	9	L1	19.3
0.198	---	21.00	53.69	32.69	9	L1	19.4
0.282	27.86	---	60.76	32.90	9	L1	19.4
0.430	---	19.04	47.25	28.21	9	L1	19.8
0.446	---	21.99	46.95	24.96	9	L1	19.8
0.446	27.41	---	56.95	29.54	9	L1	19.8
1.320	31.76	---	56.00	24.24	9	L1	19.7
1.320	---	21.93	46.00	24.07	9	L1	19.7
3.530	20.54	---	56.00	35.46	9	L1	19.8
3.530	---	17.03	46.00	28.97	9	L1	19.8
4.770	---	15.26	46.00	30.74	9	L1	19.8
4.770	17.07	---	56.00	38.93	9	L1	19.8

a313_RFID_N

Conducted Emission



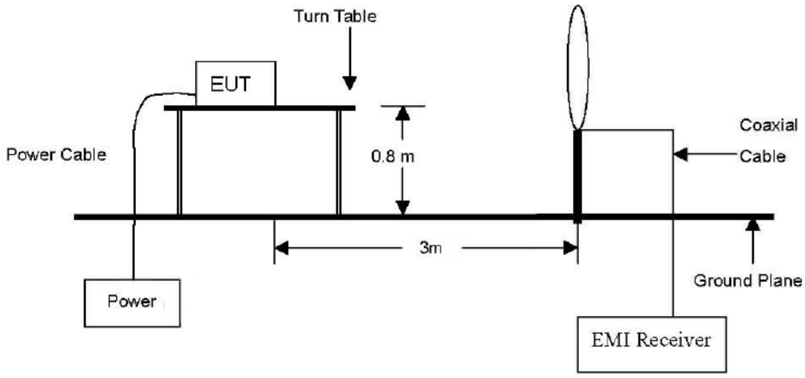
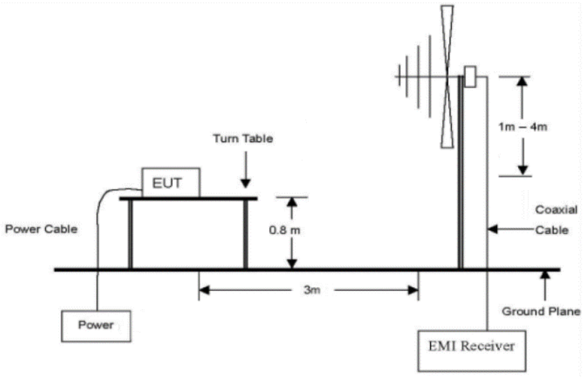
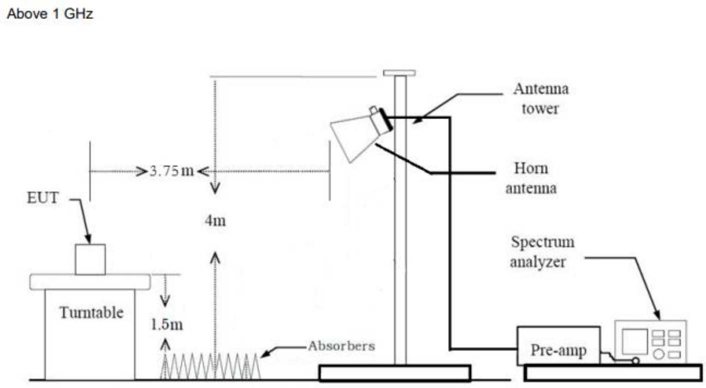
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.166	---	22.77	55.16	32.39	9	N	19.5
0.166	41.13	---	65.16	24.02	9	N	19.5
0.262	32.40	---	61.37	28.97	9	N	19.3
0.290	---	16.98	50.52	33.54	9	N	19.4
0.438	---	21.28	47.10	25.82	9	N	19.8
0.450	28.16	---	56.88	28.72	9	N	19.8
1.100	14.79	---	56.00	41.21	9	N	19.7
1.320	30.44	---	56.00	25.56	9	N	19.7
1.470	---	20.56	46.00	25.44	9	N	19.7
3.530	---	17.98	46.00	28.02	9	N	19.8
4.120	17.54	---	56.00	38.46	9	N	19.8
4.630	---	16.25	46.00	29.75	9	N	19.8

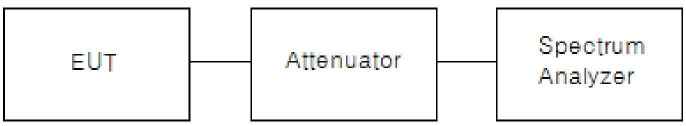
APPENDIX I

TEST SETUP

- Radiated Measurement

below 30 MHz	
below 1 ㎓	
above 1 ㎓	

- Conducted Measurement

Conducted	

APPENDIX II

UNCERTAINTY

Measurement Item	Expanded Uncertainty U = kUc (k=2)
Conducted RF power	0.32 dB
Conducted Spurious Emissions	0.32 dB
Radiated Spurious Emissions	6.34 dB
Conducted Emissions	1.74 dB