TEST REPORT

Test Report Number:	N2203R-0997-1
Project Number:	A2022-03330
Applicant:	ATID CO., Ltd
Address of Applicant:	#1402, 83, Gasan Digital 1-Ro, Geumcheon-Gu, Seoul, South Korea 08589
Manufacturer and Country	ATID CO., Ltd
Address of Manufacturer/Factory:	#1402, 83, Gasan Digital 1-Ro, Geumcheon-Gu, Seoul, South Korea 08589

Equipment Under Test (EUT)

Product Name:	UHF RFID Reader
Model No.:	ATS200

■ **FCC ID** : VUJ-ATS200 □ **IC**

Applicable standards:	FCC CFR Title 47 Part 15 Subpart C (15.247) ANSI C63.10-2020 KDB 558074 D01
Date of Test:	Mar. 7, 2022 to Mar. 28, 2022
Date of report issued:	Mar. 29, 2022
Test Result:	Compliance *

Prepared By: ***Date:*** Mar. 29. 2022

Project Engineer

Check By: ***Date:*** Mar. 29. 2022

Reviewer

REPORT REVISION HISTORY

Date	Revision	Page No
Mar. 28. 2022	Originally Issued	-
Mar. 29. 2022	Correction of the applicant's address	1

Contents

1. General Information

1.1 General Description of EUT

Product Name	UHF RFID Reader
Model Name	ATS200
Variant Model Name	RP200
FCC ID	VUJ-ATS200
Operation Frequency	UHF RFID : 902.75 MHz ~ 927.25 MHz Bluetooth(BDR/EDR/Low Energy) : 2402 MHz ~ 2480 MHz
Number of Channel	UHF RFID : 50 Bluetooth(BDR/EDR) : 79 Bluetooth(Low Energy) : 40
Antenna Specification	UHF RFID : Circularly Polarized Antenna Bluetooth(BDR/EDR/Low Energy) : Multilayer Chip Antenna
Antenna Gain	UHF RFID : 1.82 dBi Bluetooth(BDR/EDR/Low Energy) : 0.5 dBi
Power supply	3.7 V (Internal chargeable Li-ion Battery)

1.2 EUT Test Frequency

The EUT was operated in the engineering mode to fix Tx frequency that was for the purpose of the test measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level.

The test was performed at low, middle and high channel and the selected channel as shown in the chart below:

RFID

Channel	Frequency [MHz]
Lowest channel	902.75
Middle channel	914.75
Highest channel	927.25

Bluetooth(BDR/EDR)

Channel	Frequency [MHz]
Lowest channel	2 402
Middle channel	2 441
Highest channel	2 480

Bluetooth(Low Energy)

Channel	Frequency [MHz]
Lowest channel	2 402
Middle channel	2 442
Highest channel	2 480

1.3 Test Condition

	Normal voltage
DC Power	3.7

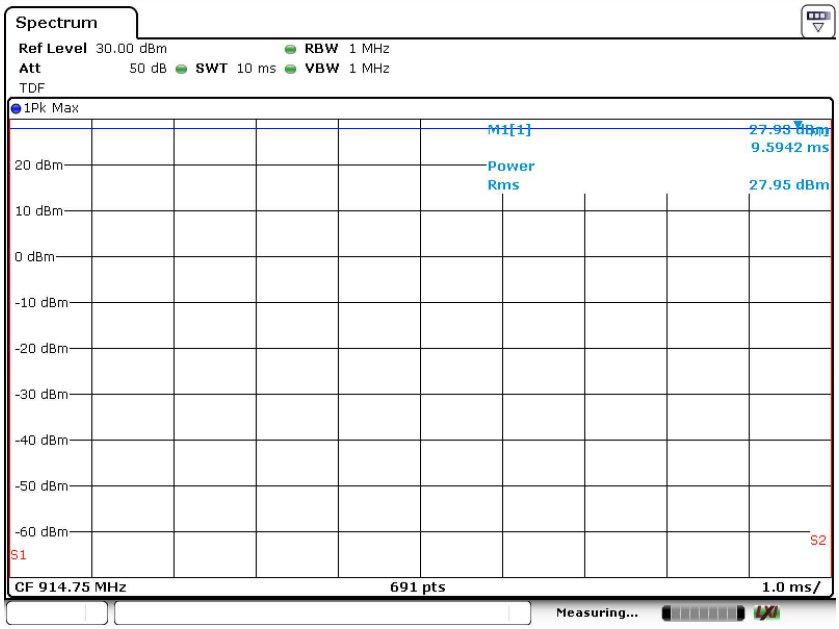
1.4 Duty Cycle

Mode	Ton (ms)	Ton+off (ms)	Duty Cycle[1] (%)	Duty Factor[2] (dB)
RFID	-	-	100	0

Note[1] : Duty Cycle = (Ton/Ton+off)*100
Note[2] : Duty Factor = 10*log(1/Duty cycle)

Test plots

RFID	Test channel:	Middle(914.75 MHz)



1.5 Test Perfomed

RRA Designation No.: KR0157

KOLAS Accreditation No. : KT511

Laboratory		NTREE Co., Ltd.
1st laboratory Address	:	228-60, Saneop-ro 155beon-gil, Gwonseon-gu, Suwon-si, Gyeionggi-do, 16648, KOREA
Telephone	:	+82-31-893-0999
Facsimile	:	+82-31-297-0444
2nd laboratory Address	:	30, Pajangcheon-ro 44beon-gil, Jangan-gu, Suwon-si, Gyeonggi-do, 16204, KOREA
Telephone	:	+82-31-893-1000
Facsimile	:	+82-31-893-0111

SITE MAP

1st laboratory

2nd laboratory

* The test was performed at 1st laboratory.

1.6 Test Instruments List

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Due date (mm-dd-yy)
1	Signal Analyzer	ROHDE & SCHWARZ	FSVA40	101501	11-01-22
2	DC Power Supply	AGILENT	6632B	MY43004016	03-10-23
3	DC Power Supply	TOYOTECH	DP30-05CF	17050049	07-15-22
4	Signal Generator	ROHDE & SCHWARZ	SMB100A	177568	03-10-23
5	Vector Signal Generator	ROHDE & SCHWARZ	SMBV100A	260354	03-10-23
6	Power Sensor	ROHDE & SCHWARZ	NRP-Z85	101554	11-02-22
7	Tri-Log Antenna	ROHDE & SCHWARZ	VULB9168	9168-578	10-05-22
8	LOOP ANTENNA	ROHDE & SCHWARZ	FMZB1519	1519-046	05-18-22
9	EMI Test Receiver	ROHDE & SCHWARZ	ESR7	101302	10-03-23
10	Attenuator	AEROFLEX	40AH2W-10	203130	03-11-23
11	Attenuator	WEINSCHEL	89-30-12	715	03-11-23
12	Horn Antenna	Schwarzbeck	BBHA 9120D	02083	10-18-22
13	Horn Antenna	Schwarzbeck	BBHA 9170	573	03-22-23
14	Amplifier	TESTEK	TK-PA1840H	140003	03-11-23
15	Amplifier	TESTEK	TK-PA18H	160006-L	03-11-23
16	Amplifier	TESTEK	TK-PA6S	120018	11-02-22
17	Band Reject Filter	CHENGDU MICROWAVE	WT-A1696-HS	WT160105002	03-11-23
18	Two-Line V-Network(MAIN)	ROHDE & SCHWARZ	ENV216	102177	03-10-23

1.7 Summary of tests

FCC Rules	Description of Test Item	Test Result
§15.247(b)(2)	RF Output Power	Pass
§15.247(a)(1)(i)	Number of Hopping Frequency	Pass
§15.247(a)(1)	Carrier Frequency Separation	Pass
§15.247(a)(1)(i)	Time of Occupancy (Dwell time)	Pass
§15.247(a)	20dB Bandwidth	Pass
§2.1051, §15.247(d)	Conducted Spurious Emissions and Band Edge	Pass
§15.247(d), §15.205, §15.209	Radiated Spurious Emissions and Restricted Bands	Pass
§15.207(a)	AC Power Line Conducted Emission	Pass
§15.203	Antenna Requirement	Pass

1.8 Measurement uncertainty

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR100028-1 [2] and shall correspond to an expansion factor (coverage factor) *k*=1.96 or *k*=2 (which provide confidence levels of respectively 95% and 95.5% in the case where the distributions characterizing the actual measurement uncertainties are normal.

Parameter	Uncertainty
Transmitter output power (Conducted)	± 1.3 dB
AC Conducted emission	± 2.0 dB
Radiated spurious emission (Below 1 GHz)	± 4.8 dB
Radiated spurious emission (Above 1 GHz)	± 5.0 dB

1.9 Information of Variant Model

Model Name	Information
ATS200	- Basic Model
RP200	- Same to Basic Model - Only Color is different(Case Black)

2. Test results

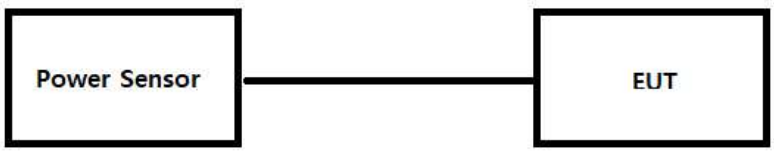
2.1 Maximum Peak Output Power

2.1.1 Limit

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(2), 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
2. According to §15.247(b)(4), the 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, is 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

2.1.2 Test configuration



2.1.3 Test procedure

1. PKPM1 Peak power meter method of KDB558074 D01v05r02
   The maximum conducted output powers were measured using a broadband peak RF power meter which has greater video bandwidth than DUT's DTS bandwidth and utilize a fast-responding diode detector.
2. Method AVGPM-G (Measurement using a gated RF average power meter) of KDB558074 D01v05r02 The average conducted output powers were measured using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

Note: The measure-and-sum technique is used for test mode with multiple transmitting.

2.1.4 Test Result

Measurement Data

Test mode	Channel	Conducted output power (dBm)	
		Average	Peak
RFID	Lowest(902.75 MHz)	28.30	28.40
	Middle(914.75MHz)	28.75	28.85
	Highest(927.25MHz)	28.67	28.77
Limit (dBm)		30	
Limit (W)		1	
Result		Pass	

Note 1: Conducted output power (dBm) = Attenuator loss + Cable loss + Duty cycle factor

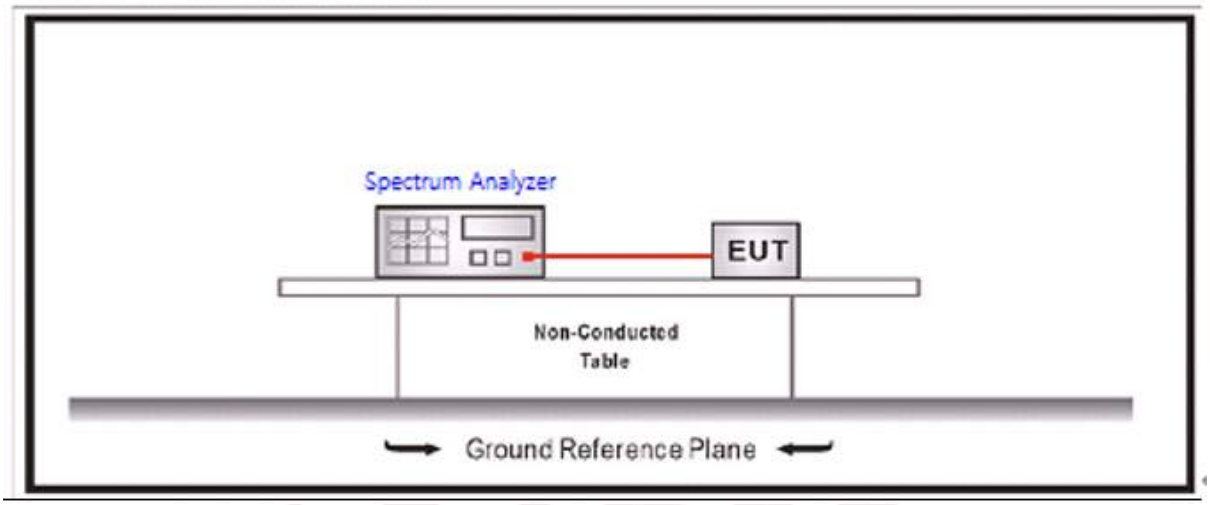
2.2 20 dB Bandwidth

2.2.1 Limit

Not Applicable (Occupied Bandwidth-relative measurement procedure)

2.2.2 Test Configuration

RF Conducted Measurement:



2.2.3 Test Procedure

According to ANSI 63.10-2020 Section 6.9.2 and 6.9.3

1. Span = The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 2.0 times and 5.0 times the OBW.
2. RBW = The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW.
3. VBW = Shall be approximately three times the RBW.
4. Sweep = auto
5. Detector function = peak
6. Trace mode = max hold

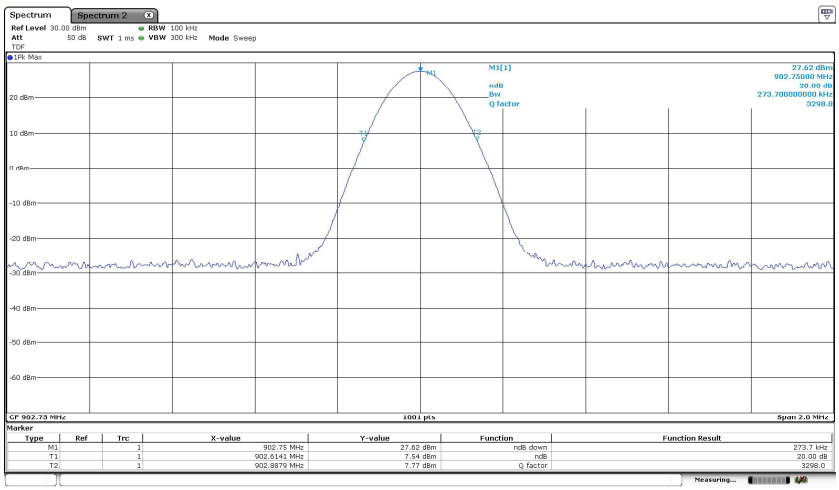
2.2.4 Test Result

Measurement Data

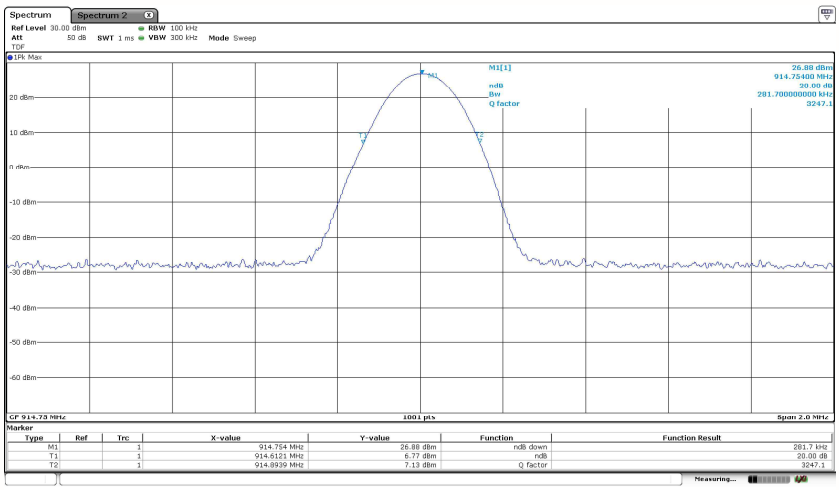
Test mode	Channel	20 dB bandwidth (MHz)	Limit (kHz)
RFID	Lowest	0.274	N/A
	Middle	0.282	
	Highest	0.280	

20 dB bandwidth test plot as follows:

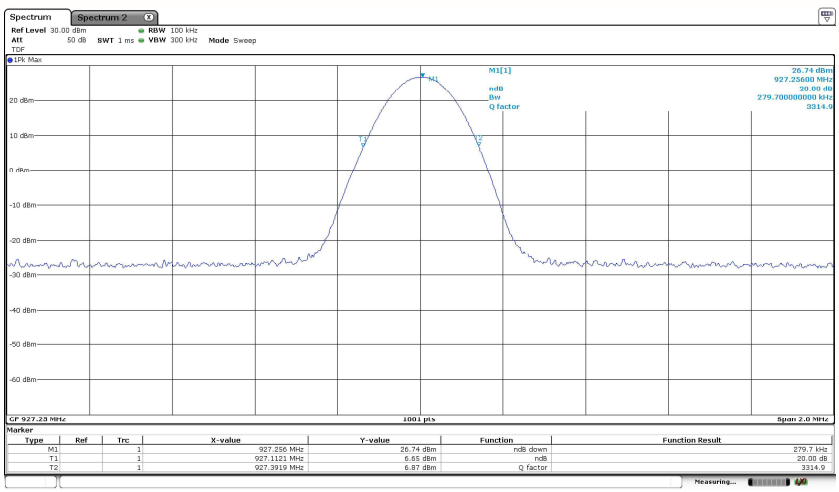
RFID	Test channel:	Lowest



RFID	Test channel:	Middle



RFID	Test channel:	Highest



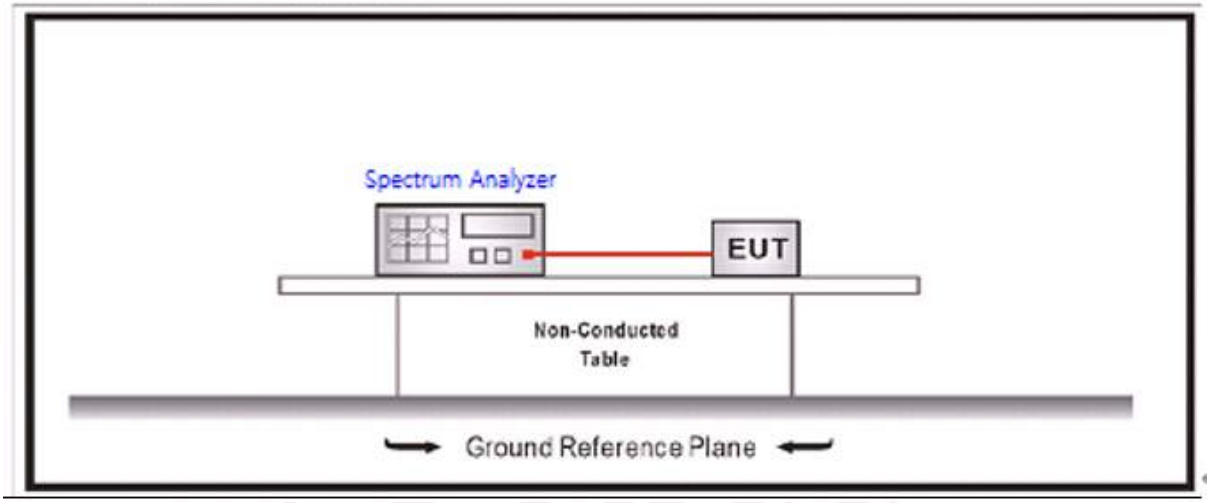
2.3 Carrier Frequency Separation

2.3.1 Limit

According to 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

2.3.2 Test Configuration

RF Conducted Measurement:



2.3.3 Test Procedure

According to ANSI 63.10-2020 Section 7.8.2

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
a) Span: Wide enough to capture the peaks of two adjacent channels.
b) 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.
c) Video (or average) bandwidth VBW ≥ RBW .
d) Sweep: No faster than coupled (auto) time.
e) Detector function: Peak.
f) Trace: max-hold.
g) Allow the trace to stabilize.

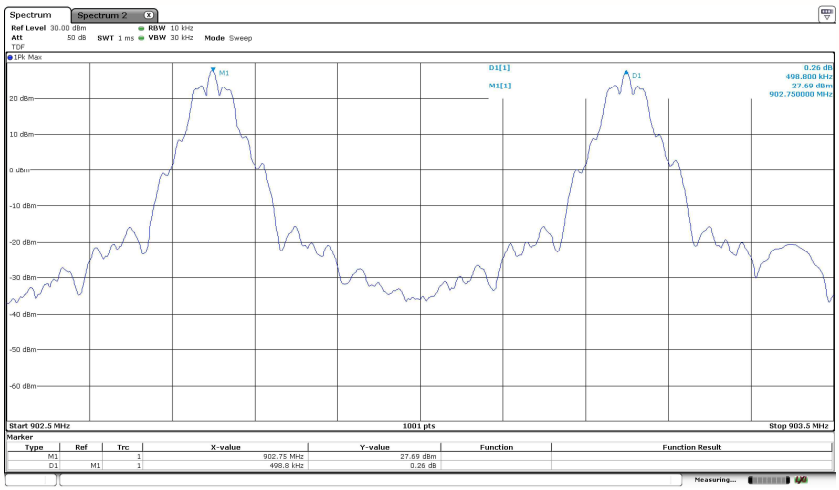
2.3.4 Test Result

Measurement Data

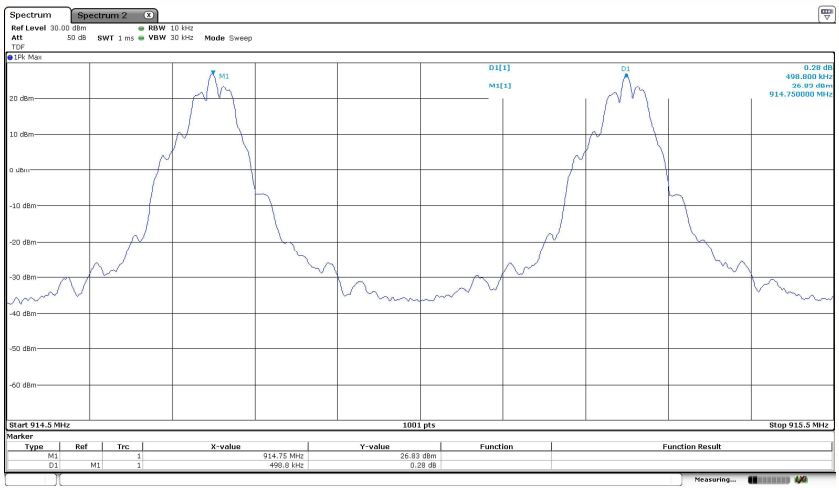
Test mode	Channel No.	Channel Separation (kHz)	Limit (kHz)
RFID	Lowest	498.8	273.7
	Middle	498.8	281.7
	Highest	499.8	279.7
Test Result	**Pass**		

Channel Separation test plot as follows:

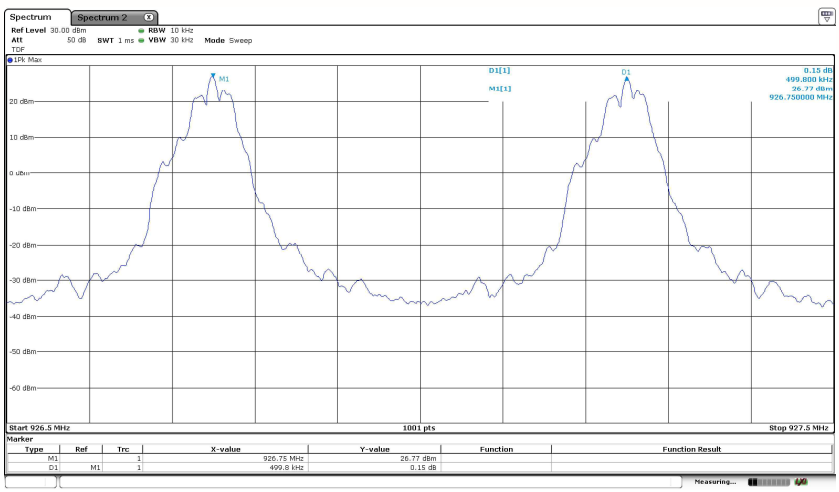
RFID	Test channel:	Lowest



RFID	Test channel:	Middle



RFID	Test channel:	Highest



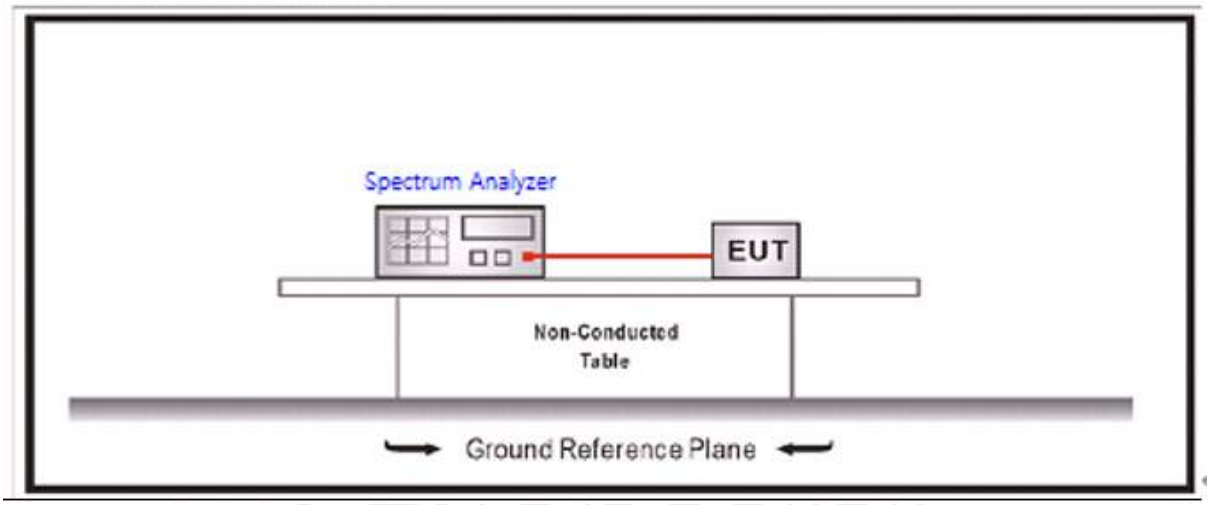
2.4 Number of Hopping Frequency

2.4.1 Limit

According to 15.247(a)(1)(i),For frequency hopping systems operating in the 902-928 MHz band; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies

2.4.2 Test Configuration

RF Conducted Measurement:



2.4.3 Test Procedure

According to ANSI 63.10-2020 Section 7.8.3
The EUT shall have its hopping function enabled.
Use the following spectrum analyzer settings:

a) Span: The frequency band of operation. Depending on the number of channels the device supports, it could be necessary to divide the frequency range of operation across Multiple spans, to allow the individual channels to be clearly seen.
b) 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.
c) VBW ≥ RBW
d) Sweep: No faster than coupled (auto) time.
e) Detector function: Peak.
f) Trace: max-hold.
g) Allow the trace to stabilize.

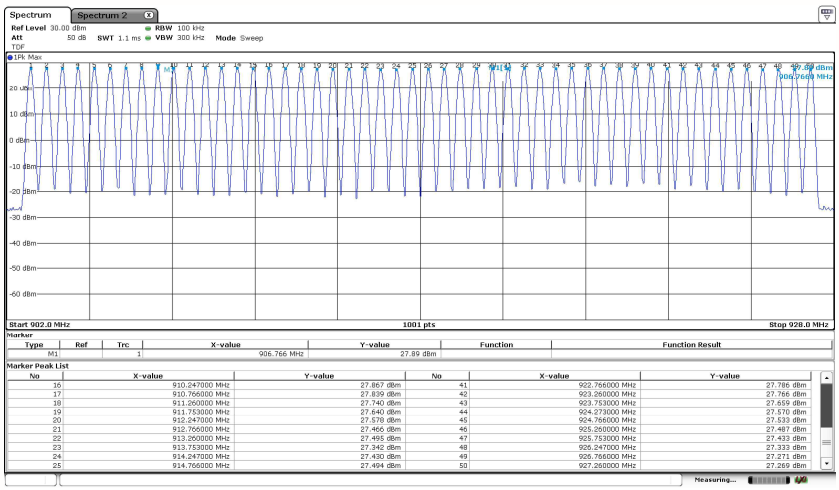
2.4.4 Test Result

Measurement Data

Test mode	Number of Hopping Frequency	Limit
RFID	50	25
Test Result	**Pass**	

Number of Hopping Frequency test plot as follows:

RFID	Test Mode:	Hopping



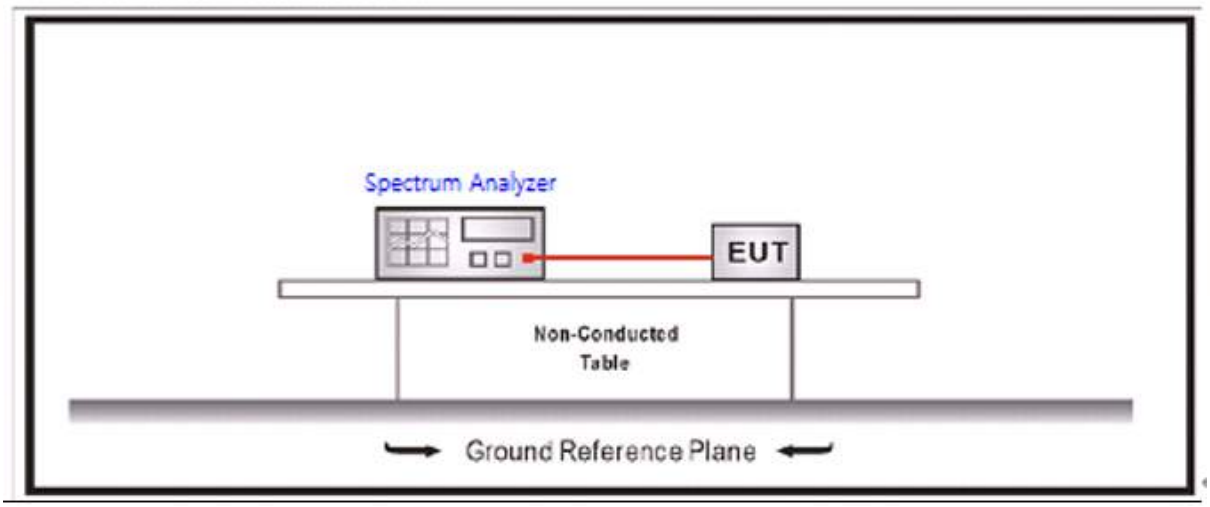
2.5 Time of Occupancy

2.5.1 Limit

According to 15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz Band; 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.

2.5.2 Test Configuration

RF Conducted Measurement:



2.5.3 Test Procedure

According to ANSI 63.10-2020 Section 7.8.4

a) Span: Zero span, centered on a hopping channel.
b) RBW shall be ≤ channel spacing and where possible RBW should be set >> I / T, where T is the expected transmission time per hop.
c) Sweep time: Set so that the start of the first transmission and end of the last transmission for the hop are clearly captured. Setting the sweep time to be slightly longer than the hopping period per channel (hopping period = I/hopping rate) should achieve this.
d) use a video trigger, where possible with a trigger delay, so that the start of the transmission is clearly observed. The trigger level might need adjustment to reduce the chance of triggering when the system hops on an adjacent channel.
e) Detector function: Peak.
t) Trace: Clear-write, single sweep.
g) Place markers at the start of the first transmission on the channel and at the end of the last transmission. The dwell time per hop is the time between these two markers.

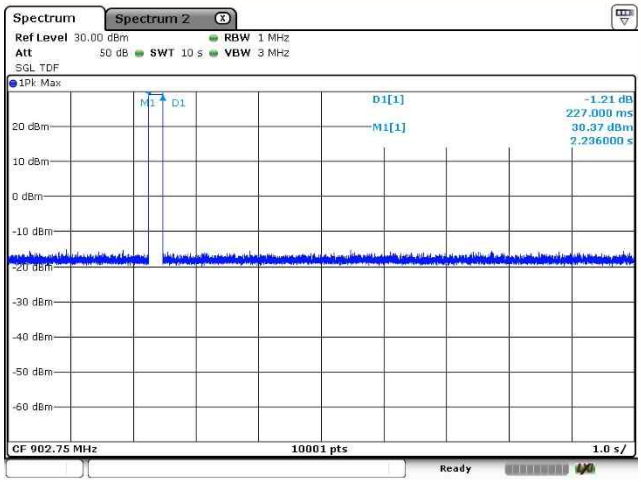
2.5.4 Test Result

Measurement Data

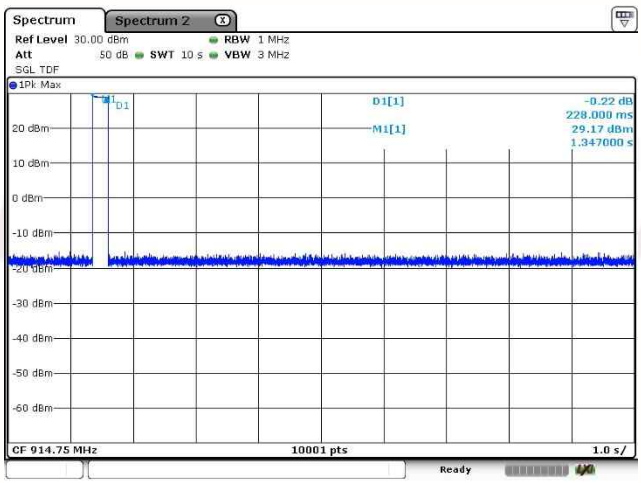
Test mode	Channel	Number of Transmission in 10s	Total Dwell Time in 10s (ms)	Limit (ms)
RFID	Lowest	1	227	400
	Middle	1	228	
	Highest	1	227	
Test Result	**Pass**			

Time of Occupancy test plot as follows:

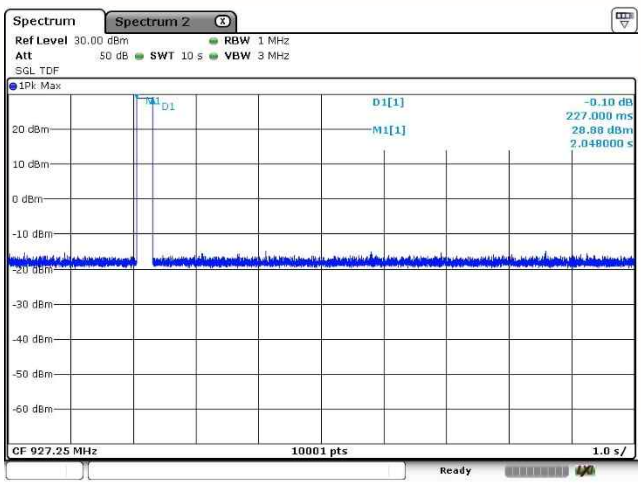
RFID	Test Channel:	Lowest



RFID	Test Channel:	Middle



RFID	Test Channel:	Highest

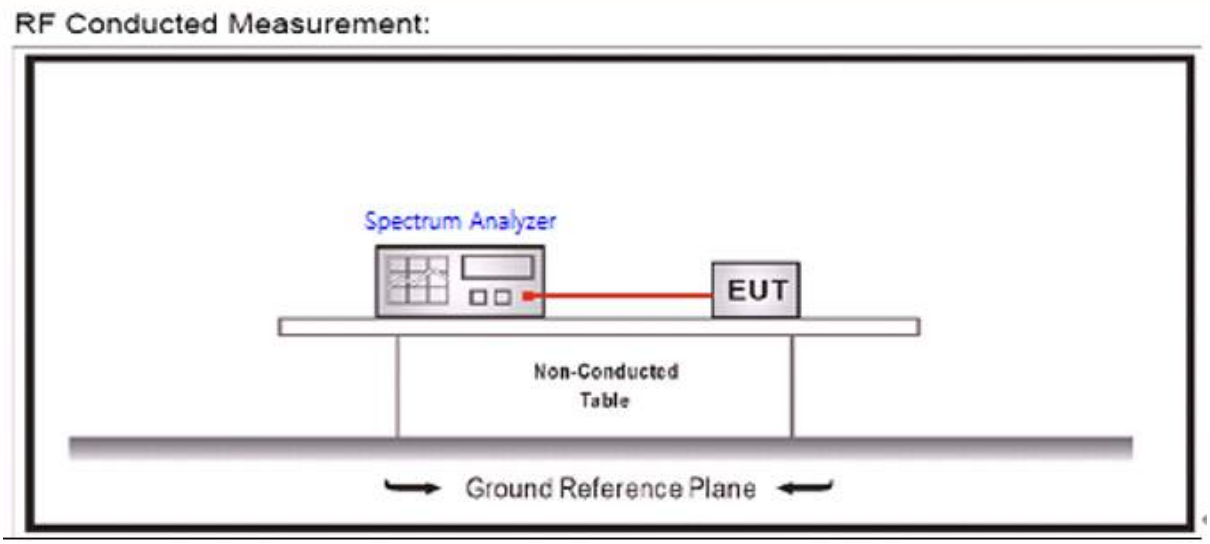


2.6 Conducted Emissions and Band Edge

2.6.1 Requirement

According to 15.247(d) and RSS-247 5.5, 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 base on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of thes section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in 15.209(a) is not required.

2.6.2 Test configuration



2.6.3 Test Procedure

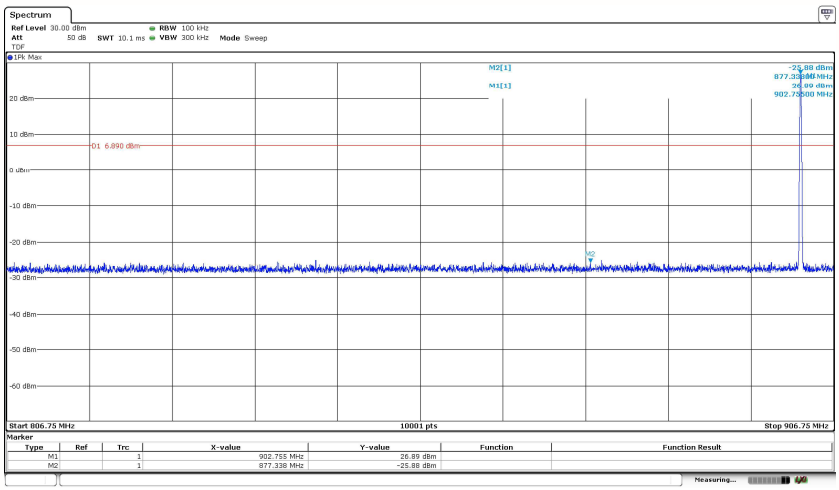
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

2.6.4 Test Result

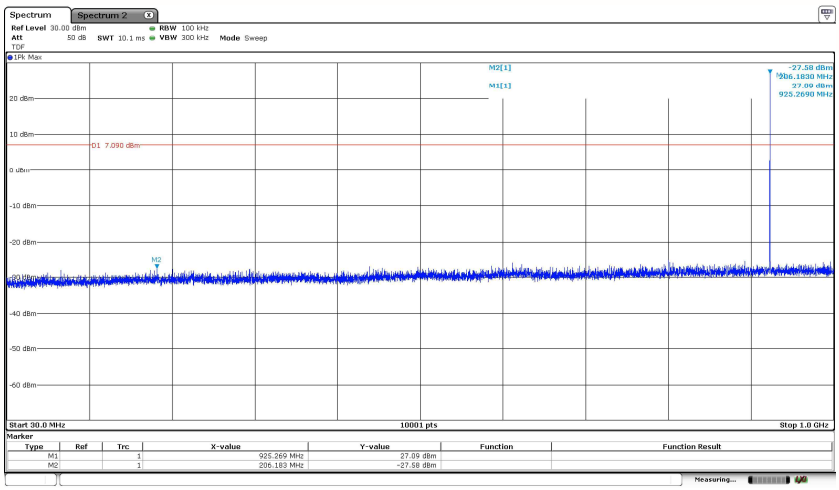
Test mode	Channel	Max. Out of band Emission	Carrier level	Calculated -20dBc limit
RFID	Lowest	-17.12	26.89	6.89
	Middle	-16.70	26.98	6.98
	Highest	-16.29	27.44	7.44
Hopping	-	-25.71	27.64	7.64

test plot as follows:

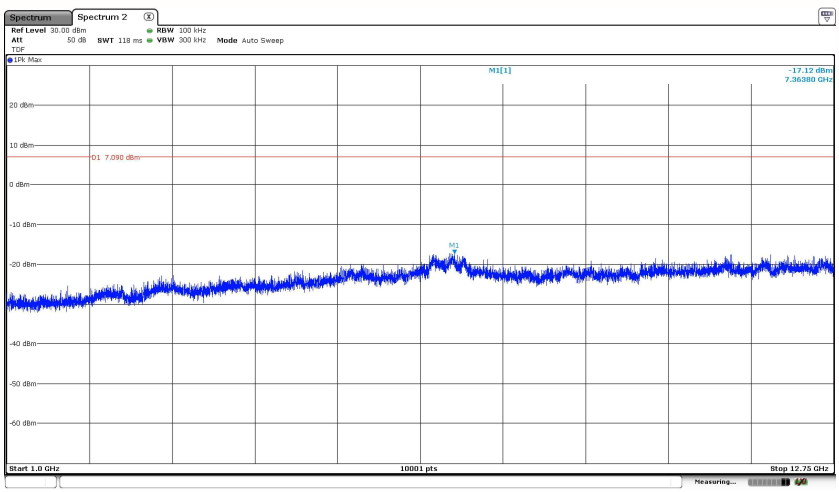
RFID	Test Channel:	Lowest



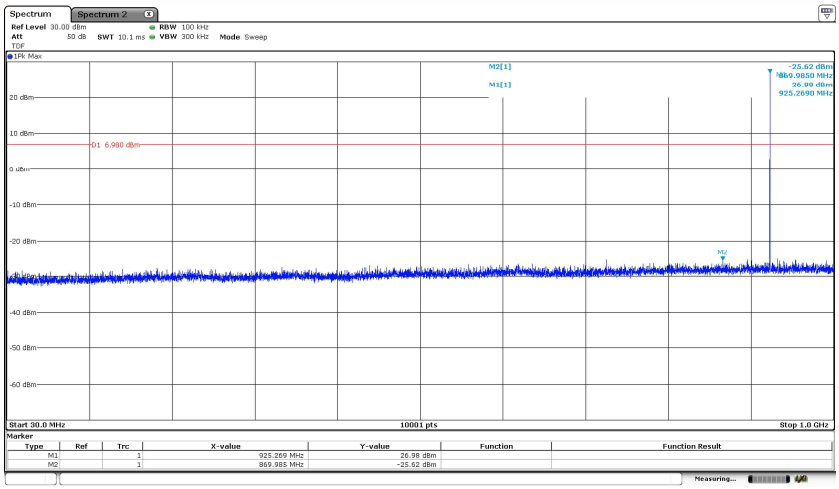
RFID	Test Channel:	Lowest



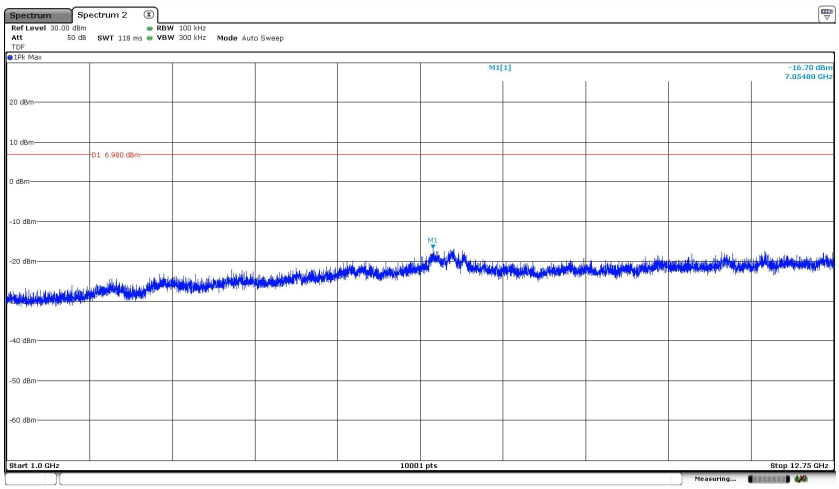
RFID	Test Channel:	Lowest



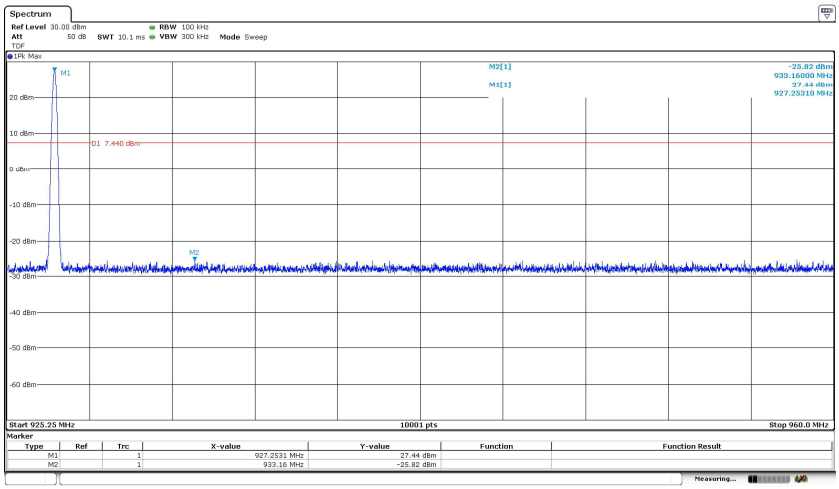
RFID	Test Channel:	Middle



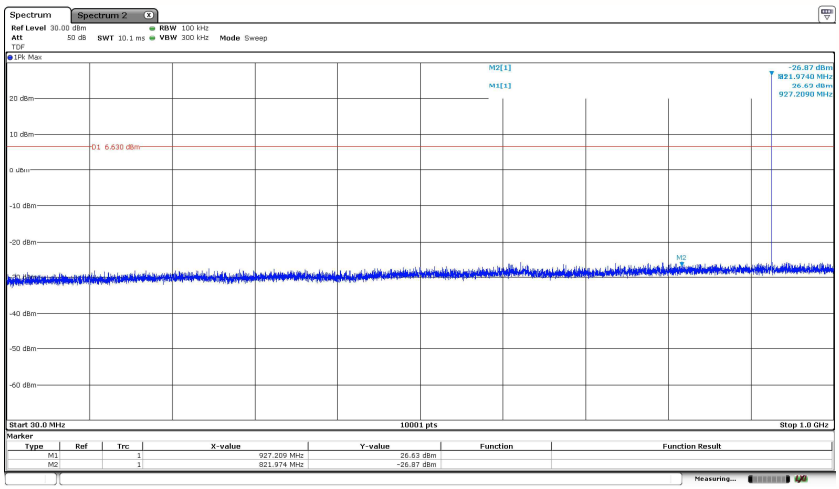
RFID	Test Channel:	Middle



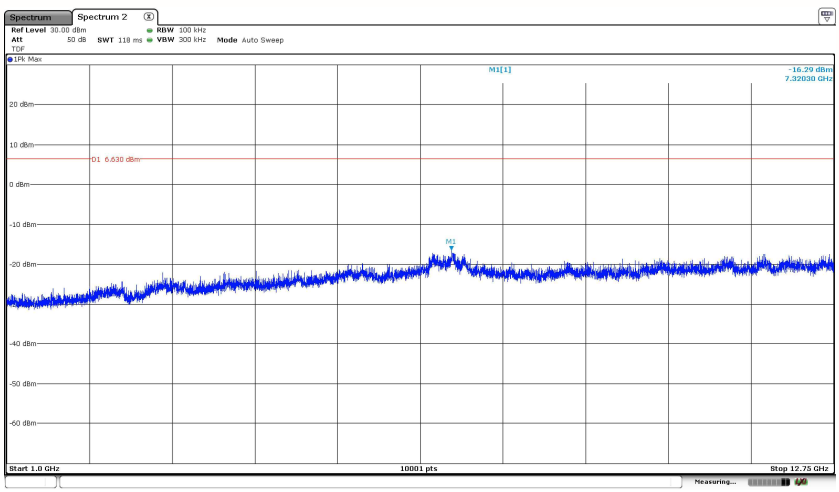
RFID	Test Channel:	Highest



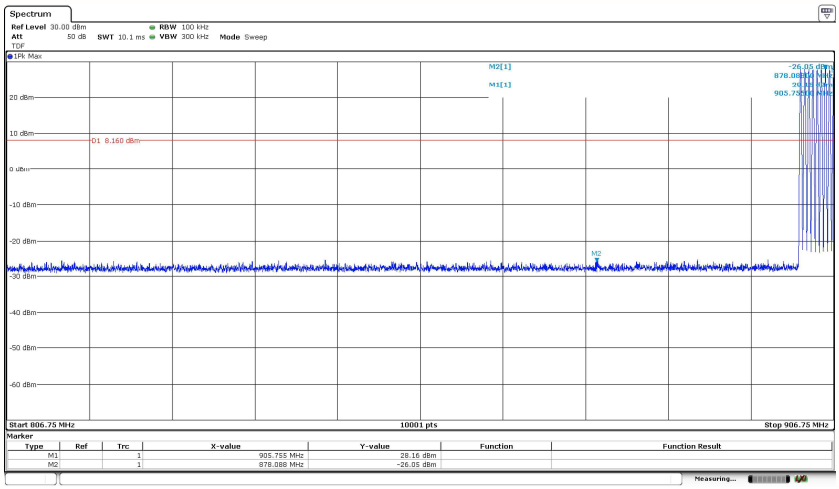
RFID	Test Channel:	Highest



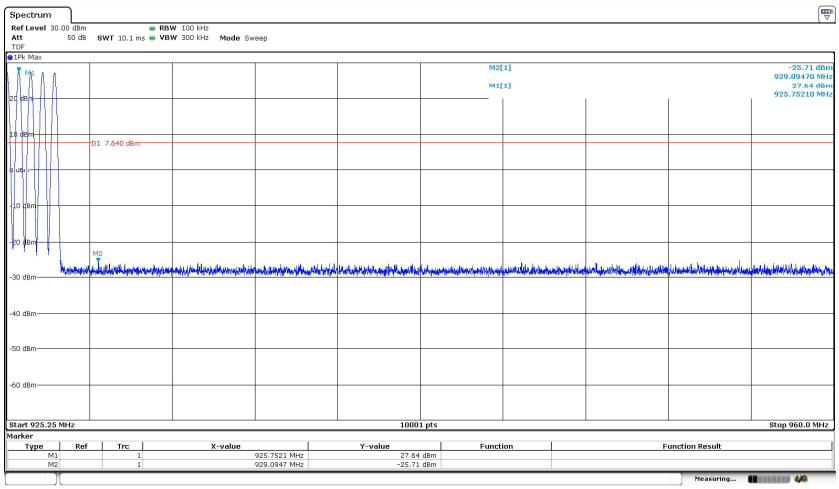
RFID	Test Channel:	Highest



RFID	Test Mode:	Hopping



RFID	Test Mode:	Hopping



2.7 Radiated Spurious Emission and Restricted Band Edge

The measurement was performed over the frequency range of 30 MHz to 1 GHz 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 120 kHz.
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 Semi-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 30 MHz to 1000 MHz using bi-log antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.
Final measurements were made with 3-meters test distance using bi-log antenna or horn antenna. The 3 m Full Chamber have been verified in regular for its normalized site attenuation. The test equipment was placed on a 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 120 kHz or 1 MHz 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 m 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 1 GHz setting on the field strength meter is 120 kHz and above 1 GHz is 1 MHz)

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 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 m 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.

2.7.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (see Section 15.205(c))
All emission from a digital device, including any network of conductors and apparatus connected thereto shall not exceed the level of field strength specified below:

FCC Part 15 Subpart C paragraph 15.247(a) Limit

Fundamental Frequency (MHz)	Field Strength of Harmonics (3 m)		
	(mV/m)	(dBuV/m)	
902.75-927.25	500	54 (Avg.)	74 (Peak)

Note : 1. RF Field Strength (dBuV) = 20log RF Voltage(uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector

Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dBuV/m)
0.009-0.490	300	20log 2400/F (kHz) + 80
0.490-1.705	30	20log 24000/F (kHz) + 40
1.705-30	30	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note : 1. RF voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
4. This device used to install a within vehicular. The location of EUT measurements has the Y-plane(Stand).
5. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30 – 1000 MHz. As to 1 – 26.5 GHz, the final emission level got using PK and AV detector.
6. If measurement is made at 3m distance.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor Cable loss 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:

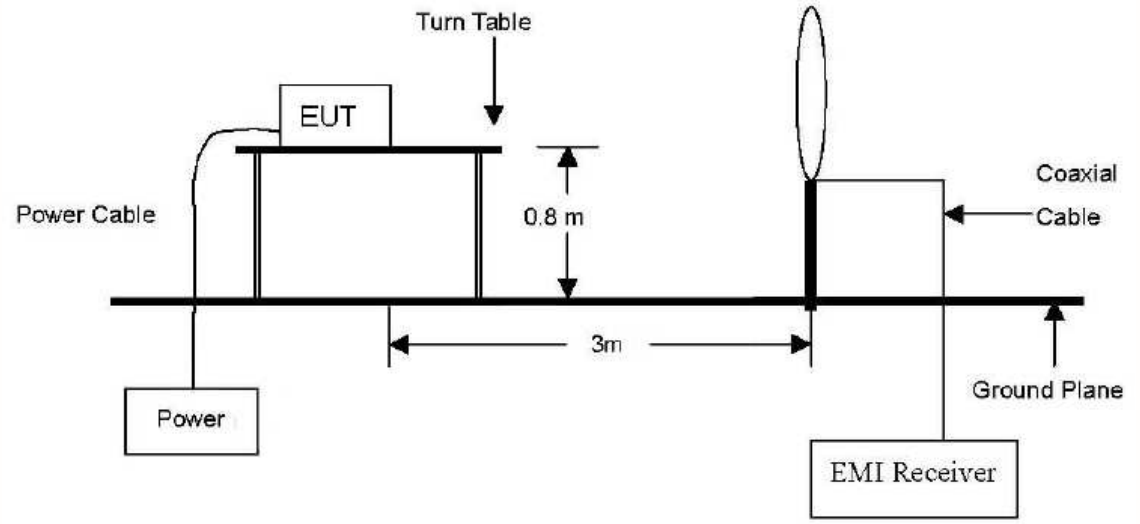
Peak = Reading + Corrected Factor

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

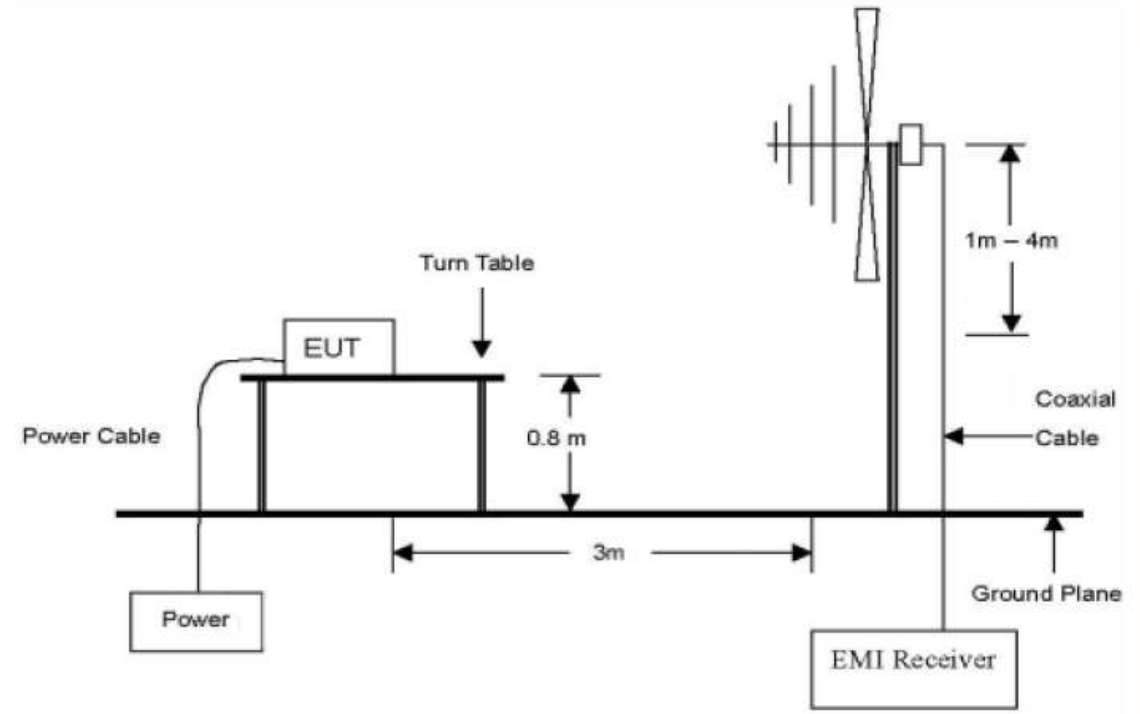
Note: Example of Field strength = 20log 2400/F + 80 = 129

2.7.2 Test Configuration

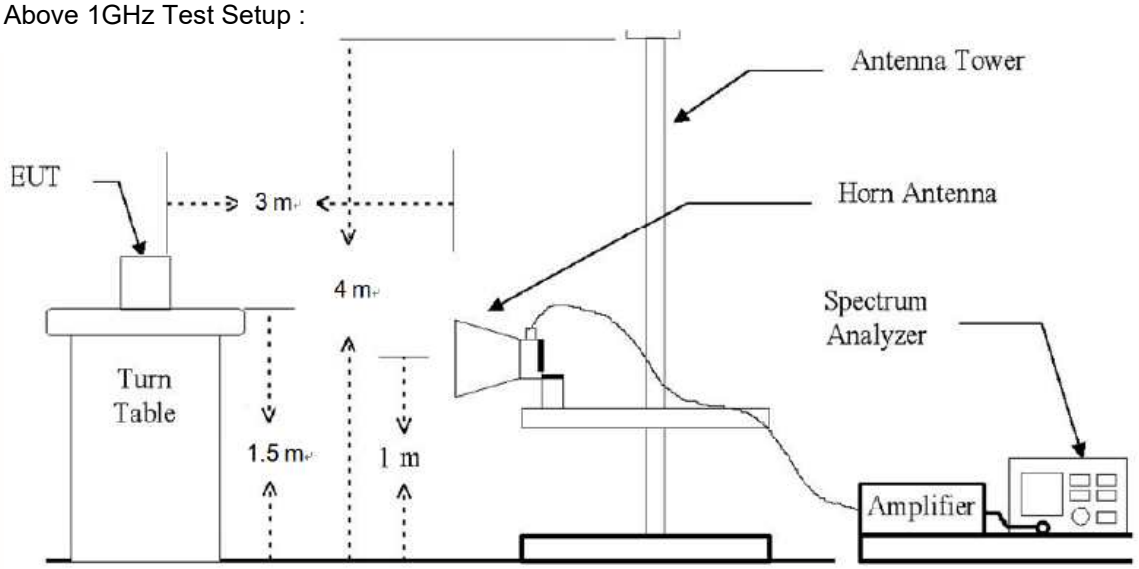
Below 30 MHz



Below 1 GHz test setup:



Above 1GHz Test Setup :



2.7.3 Test Procedure

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. (Restriced bandedge, Final detection of spurious harmonic emissions)
Duty cycle factor = 10 log (1/x). For this sample: DCF = 10log(1/1)=0 dB(Spectrum Analyzer round it up to 0 dB).
1/T minimum VBW = 1/Duty cycle. For this sample: minimum VBW = 1/1 = 1 kHz
Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.
The spectrum from 1 GHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 900 MHz band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth.
The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission.
Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

2.7.4 Test Result (Restricted Band Edge Above 1 GHz)

The frequency spectrum above 1000 MHz was investigated. All reading values are peak and average values.

RFID

Lowest Channel(902.75 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
1 805.52	49.40	P	V	25.52	-42.84	32.08	74.00	41.92
1 805.52	41.02	A	V	25.52	-42.84	23.70	54.00	30.30

Middle Channel(914.75 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
1 829.37	48.98	P	V	25.62	-42.79	31.81	74.00	42.19
1 829.37	40.98	A	V	25.62	-42.79	23.81	54.00	30.19

Highest Channel(927.25 MHz)

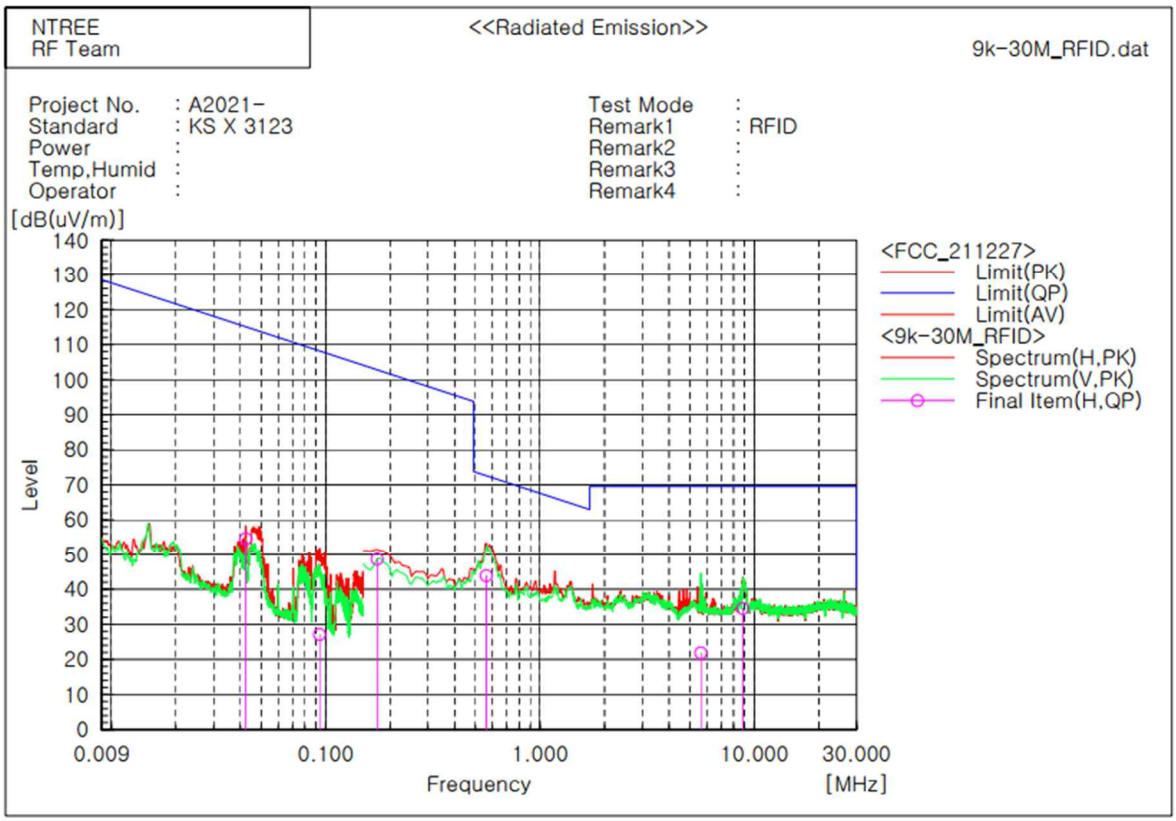
Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuv/m)	Limit (dBuv/m)	Margin (dB)
1 854.51	45.68	P	V	25.71	-42.74	28.65	74.00	45.35
1 854.51	37.12	A	V	25.71	-42.74	20.09	54.00	33.91

Note)

1. P = Peak
2. A = Average
3. AF = Antenna Factor
4. CL = Cable Loss
5. DCF = Duty Cycle Factor
6. “*” means the restricted band.
7. Measuring frequencies from 1GHz to the 10^{th} Harmonic of highest fundamental frequency.
8. According to §15.31(o), emissions level are not be reported lower than the limit by over 20dB.

2.7.5 Test Result (Spurious Emissions Above 9 kHz to Below 30 MHz)

RFID



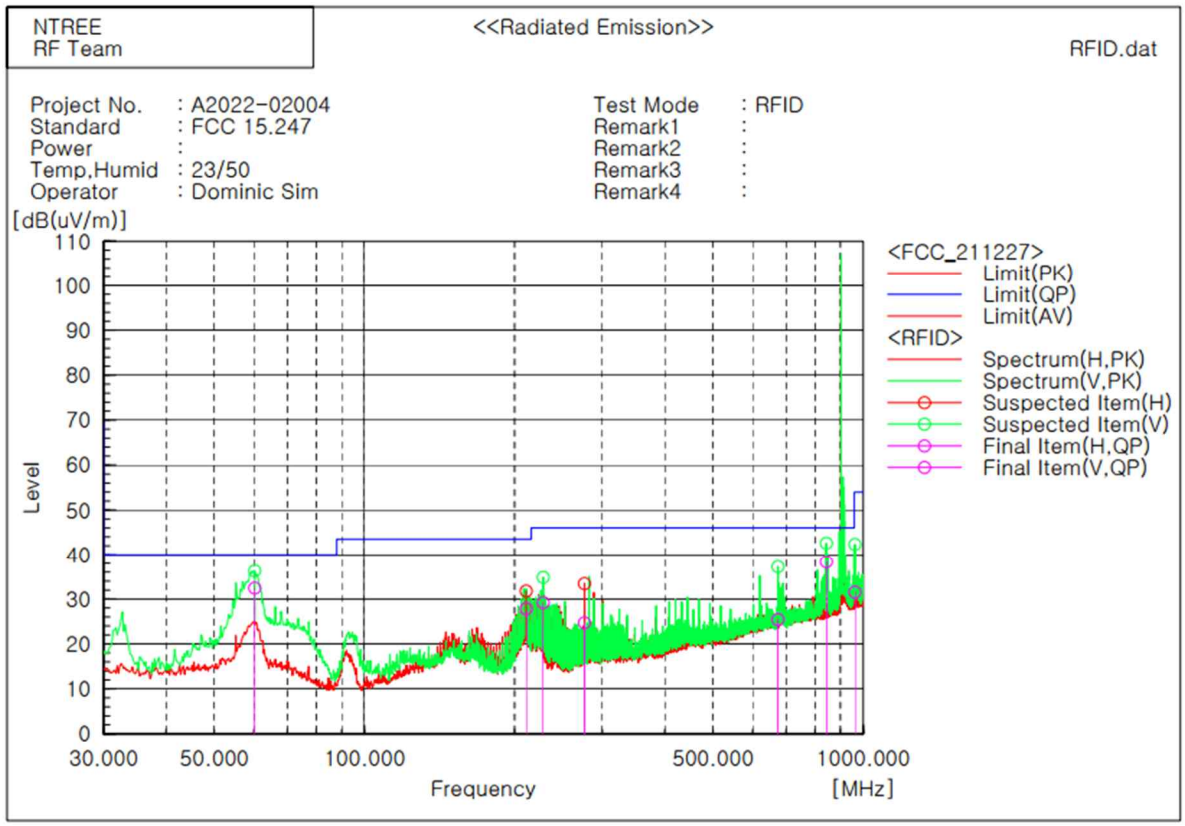
Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	5.630	H	1.9	19.9	21.8	69.5	47.7	100.0	240.0	
2	8.830	H	14.4	20.1	34.5	69.5	35.0	100.0	345.0	
3	0.042	H	35.9	18.7	54.6	115.1	60.5	100.0	102.0	
4	0.094	H	8.5	18.6	27.1	108.2	81.1	100.0	45.0	
5	0.174	H	30.0	18.6	48.6	102.8	54.2	100.0	40.0	
6	0.562	H	25.2	18.7	43.9	72.6	28.7	100.0	161.0	

Note: Worst case (Middle Channel (914.75 MHz))

2.7.6 Test Result (Spurious Emissions Above 30 MHz to Below 1 GHz)

RFID



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	60.264	V	62.3	-29.9	32.4	40.0	7.6	100.0	114.0	
2	211.002	H	59.6	-31.8	27.8	43.5	15.7	200.0	308.0	
3	228.268	V	60.5	-31.3	29.2	46.0	16.8	100.0	279.0	
4	276.186	H	52.9	-28.2	24.7	46.0	21.3	100.0	22.0	
5	674.662	V	43.5	-18.1	25.4	46.0	20.6	100.0	193.0	
6	843.636	V	53.7	-15.4	38.3	46.0	7.7	100.0	179.0	
7	962.364	V	44.4	-12.9	31.5	54.0	22.5	100.0	193.0	

Note: Worst case (Middle Channel (914.75 MHz))

2.8 AC Power Line Conducted Emission

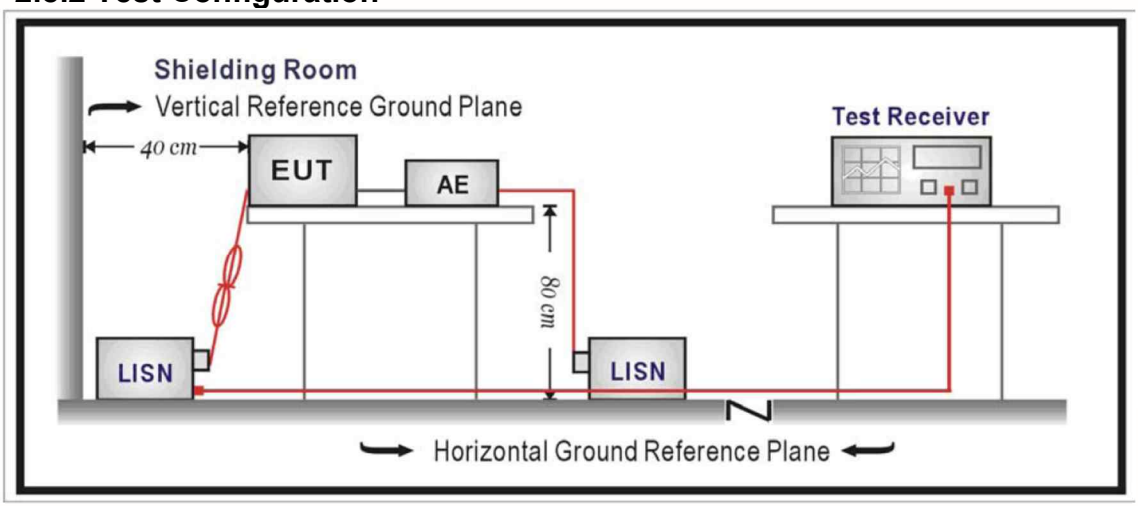
2.8.1 Limit

Test Specification: According to FCC CFR Title 47 Part 15 Subpart C Section 15.207

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

Note : * Decrease with the logarithm of the frequency

2.8.2 Test Configuration



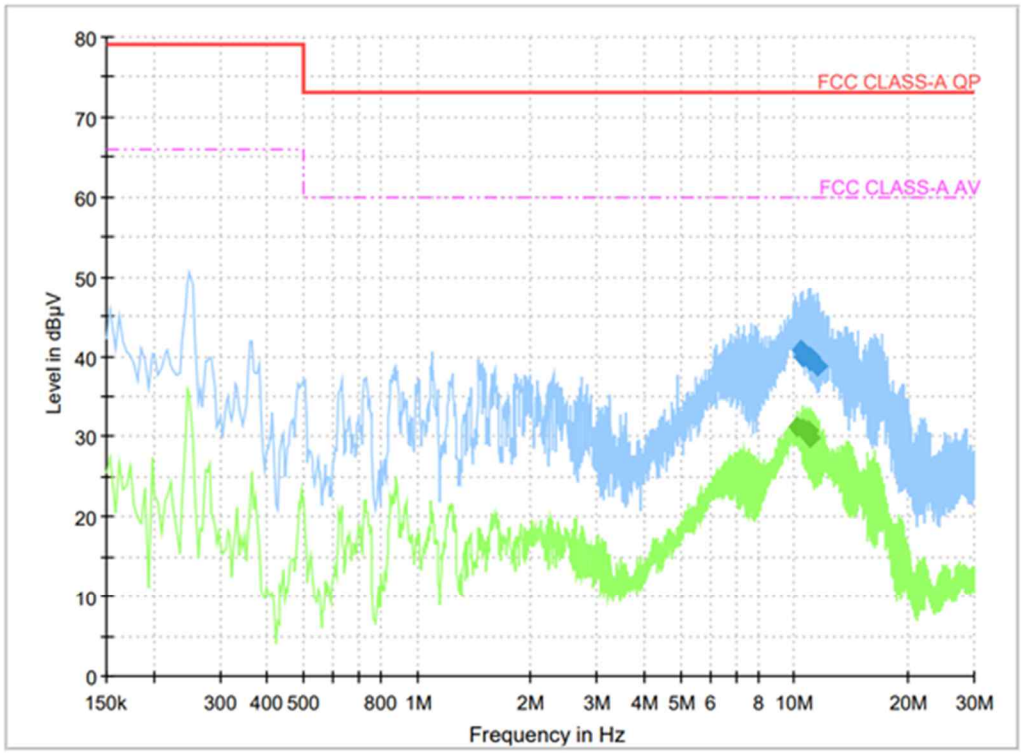
2.8.3 Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/50 uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9kHz.

2.8.4 Test Result

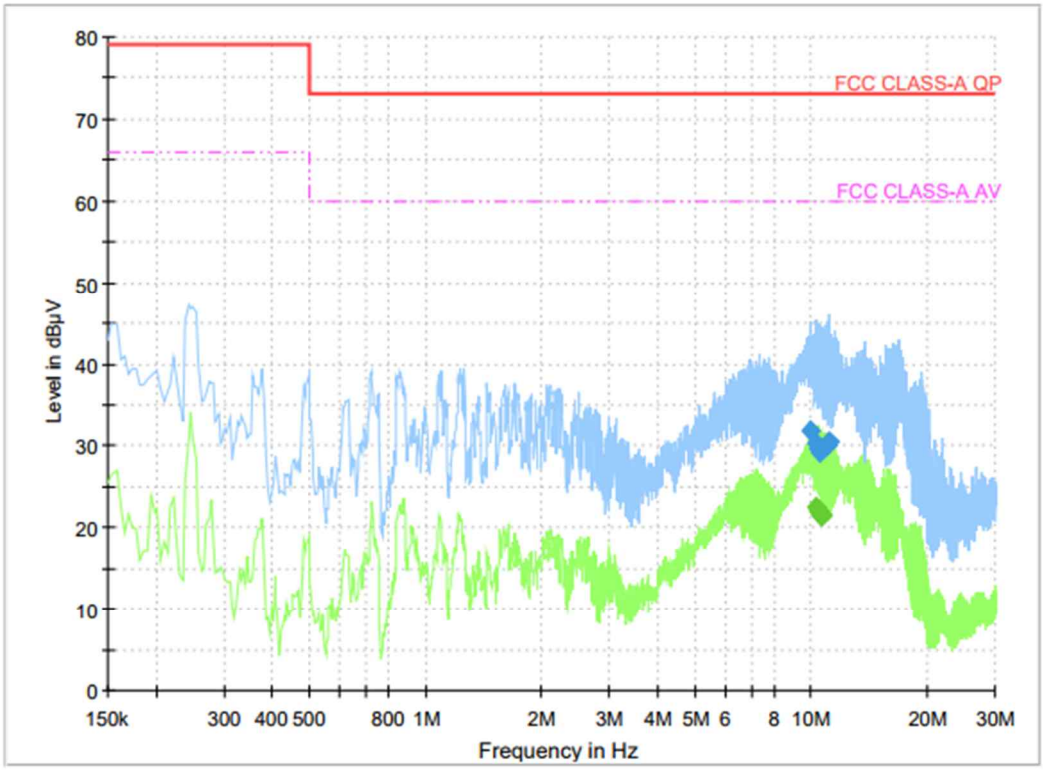
Line : Hot



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
10.180000	---	31.16	60.00	28.84	1000.0	9.000	L1	9.9
10.428000	40.74	---	73.00	32.26	1000.0	9.000	L1	9.9
10.508000	39.86	---	73.00	33.14	1000.0	9.000	L1	9.9
10.556000	---	31.06	60.00	28.94	1000.0	9.000	L1	9.9
10.692000	---	30.83	60.00	29.17	1000.0	9.000	L1	9.9
10.744000	---	30.43	60.00	29.57	1000.0	9.000	L1	9.9
10.880000	39.99	---	73.00	33.01	1000.0	9.000	L1	9.9
10.924000	---	30.71	60.00	29.29	1000.0	9.000	L1	9.9
10.972000	39.95	---	73.00	33.05	1000.0	9.000	L1	9.9
11.068000	---	29.86	60.00	30.14	1000.0	9.000	L1	9.9
11.080000	39.43	---	73.00	33.57	1000.0	9.000	L1	9.9
11.500000	38.86	---	73.00	34.14	1000.0	9.000	L1	9.9

Line : Neutral



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
9.994000	31.91	---	73.00	41.09	1000.0	9.000	N	9.9
10.276000	30.25	---	73.00	42.75	1000.0	9.000	N	9.9
10.312000	---	22.61	60.00	37.39	1000.0	9.000	N	9.9
10.400000	29.65	---	73.00	43.35	1000.0	9.000	N	9.9
10.404000	---	22.06	60.00	37.94	1000.0	9.000	N	9.9
10.448000	---	21.95	60.00	38.05	1000.0	9.000	N	9.9
10.500000	29.28	---	73.00	43.72	1000.0	9.000	N	9.9
10.592000	---	21.53	60.00	38.47	1000.0	9.000	N	9.9
10.632000	---	21.56	60.00	38.44	1000.0	9.000	N	9.9
10.700000	---	21.34	60.00	38.66	1000.0	9.000	N	9.9
11.020000	30.08	---	73.00	42.92	1000.0	9.000	N	9.9
11.120000	30.51	---	73.00	42.49	1000.0	9.000	N	9.9

2.9 Antenna Requirement

2.9.1 Applicable Standard

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.

2.9.2 Applicable Construction

2.9.3 Test Result

Pass