

FCC Test Report

Product Name	RFID reader
Model No.	RA-XXXX & RZ-XXXX(X=0~9 A~Z)
FCC ID.	NBF-RA7120

Applicant	Argox Information Co., Ltd.
Address	7F, No.126, Lane 235, Baoqiao Rd., Xindian Dist., New Taipei City, Taiwan, R.O.C.

Date of Receipt	Apr. 08, 2020
Issued Date	Oct. 26, 2020
Report No.	2040152R-E3032110108
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

Issued Date: Oct. 26, 2020

Report No.: 2040152R-E3032110108



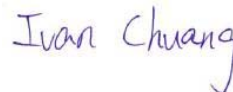
Product Name	RFID reader
Applicant	Argox Information Co., Ltd.
Address	7F, No.126, Lane 235, Baoqiao Rd., Xindian Dist., New Taipei City, Taiwan, R.O.C.
Manufacturer	Argox Information Co., Ltd.
Model No.	RA-XXXX & RZ-XXXX(X=0~9 A~Z)
FCC ID.	NBF-RA7120
EUT Rated Voltage	DC 3.6V (Power by battery) or DC 5V (Power by USB)
EUT Test Voltage	DC 5V (Power by USB)
Trade Name	ARGOX
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Joanne Lin)

Tested By :



(Senior Engineer / Ivan Chuang)

Approved By :



(Director / Vincent Lin)

Revision History

Report No.	Version	Description	Issued Date
2040152R-E3032110108	V1.0	Initial issue of report.	2020-10-26

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	RFID reader
Trade Name	ARGOX
Model No.	RA-XXXX & RZ-XXXX(X=0~9 A~Z)
FCC ID.	NBF-RA7120
Frequency Range	903.24-926.76MHz
Channel Number	50
Type of Modulation	ASK
Antenna Type	PCB Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
USB Cable	Non-shielded, 1.5m

Antenna List

No.	Manufacturer	Product No.	Antenna Type	Peak Gain
1	FAVEPC	FI-A307V	PCB antenna	2.5dBi

Note: The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	903.24	26	915.24
2	903.72	27	915.72
3	904.20	28	916.20
4	904.68	29	916.68
5	905.16	30	917.16
6	905.64	31	917.64
7	906.12	32	918.12
8	906.60	33	918.60
9	907.08	34	919.08
10	907.56	35	919.56
11	908.04	36	920.04
12	908.52	37	920.52
13	909.00	38	921.00
14	909.48	39	921.48
15	909.96	40	921.96
16	910.44	41	922.44
17	910.92	42	922.92
18	911.40	43	923.40
19	911.88	44	923.88
20	912.36	45	924.36
21	912.84	46	924.84
22	913.32	47	925.32
23	913.80	48	925.80
24	914.28	49	926.28
25	914.76	50	926.76

Note:

1. The EUT is an RFID reader with built-in RFID (903.24-926.76MHz) and Bluetooth transceiver, this report for RFID (903.24-926.76MHz).
2. The EUT is an RFID reader contain Bluetooth module, FCC ID: RFRMSR.
3. It's declared by manufacture about all models are electrically identical, different model names for marketing purpose. The identification of test sample is RA-7120.
4. These tests were conducted on a sample for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
5. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.

Test Mode	Mode 1: Transmit
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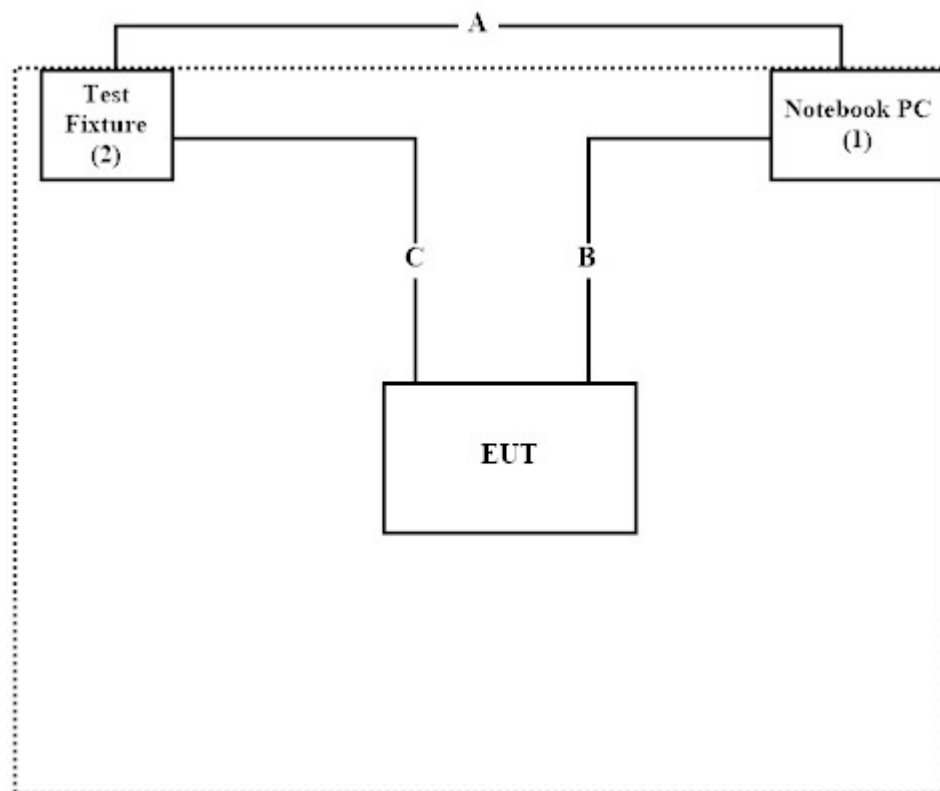
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	P62G	CY9FJC2	N/A
2	Test Fixture	ARGOX	N/A	N/A	N/A

Signal Cable Type		Signal Cable Description
A	USB Cable	Shielded, 1.1m
B	USB Cable	Non-shielded, 1.5m
C	Signal Cable	Non-shielded, 2.2m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software “Docklight V1.9” on the Notebook PC.
3. Configure the test mode, the test channel.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 °C	22.4°C
	Humidity (%RH)	10~90 %	61.7%
Radiated Emission	Temperature (°C)	10~40 °C	21.2°C
	Humidity (%RH)	10~90 %	61.2%
Conductive	Temperature (°C)	10~40 °C	22°C
	Humidity (%RH)	10~90 %	55%

USA : FCC Registration Number: TW0023

Canada : IC Registration Number: 25880

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan, R.O.C.
Phone number : 886-2-2602-7968
Fax number : 866-2-2602-3286
Email address : info.tw@dekra.com
Website : <http://www.dekra.com.tw>

1.7. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101602	2019.12.16	2020.12.15
X	Two-Line V-Network	R&S	ENV216	101306	2020.03.25	2021.03.24
X	Two-Line V-Network	R&S	ENV216	101307	2020.04.17	2021.04.16
X	Coaxial Cable	DEKRA	RG400_BNC	RF001	2019.05.24	2020.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Testing System V1.2.

For Conducted measurements /ASR2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2020.02.11	2021.02.10
X	Power Meter	Anritsu	ML2496A	1548003	2019.12.17	2020.12.16
X	Power Sensor	Anritsu	MA2411B	1531024	2019.12.17	2020.12.16
X	Power Sensor	Anritsu	MA2411B	1531025	2019.12.17	2020.12.16
	Bluetooth Tester	R&S	CBT	101238	2020.02.10	2021.02.11

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Conduction Test System V9.0.5.

For Radiated measurements /ACB1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2020.03.16	2021.03.15
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-953	2020.01.03	2021.01.02
X	Horn Antenna	ETS-Lindgren	3117	00203800	2019.12.12	2020.12.11
X	Horn Antenna	ETS-Lindgren	3117	00203761	2019.10.31	2020.10.30
X	Horn Antenna	Com-Power	AH-840	101087	2020.06.08	2021.06.07
X	Pre-Amplifier	EMCI	EMC001330	980316	2019.06.14	2020.06.13
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2019.06.13	2020.06.12
X	Pre-Amplifier	EMCI	EMC051835SE	980312	2020.06.10	2021.06.09
	Pre-Amplifier	EMCI	EMC05820SE	980310	2019.06.24	2020.06.23
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2020.06.10	2021.06.09
X	Filter	MICRO TRONICS	BRM50702	G251	2020.09.17	2021.09.16
	Filter	MICRO TRONICS	BRM50716	G188	2020.09.17	2021.09.16
X	EMI Test Receiver	R&S	ESR7	101602	2019.12.16	2020.12.15
X	Spectrum Analyzer	R&S	FSV40	101148	2020.03.16	2021.03.15
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2020.07.03	2021.07.02
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2020.06.10	2021.06.09

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Testing System V1.2.

1.8. Uncertainty

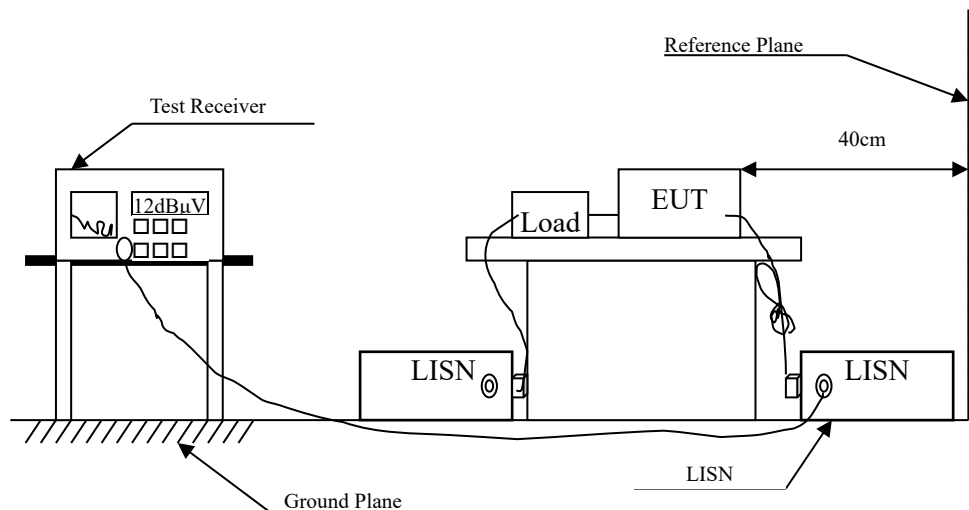
Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB μ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

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

2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer 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 the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

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

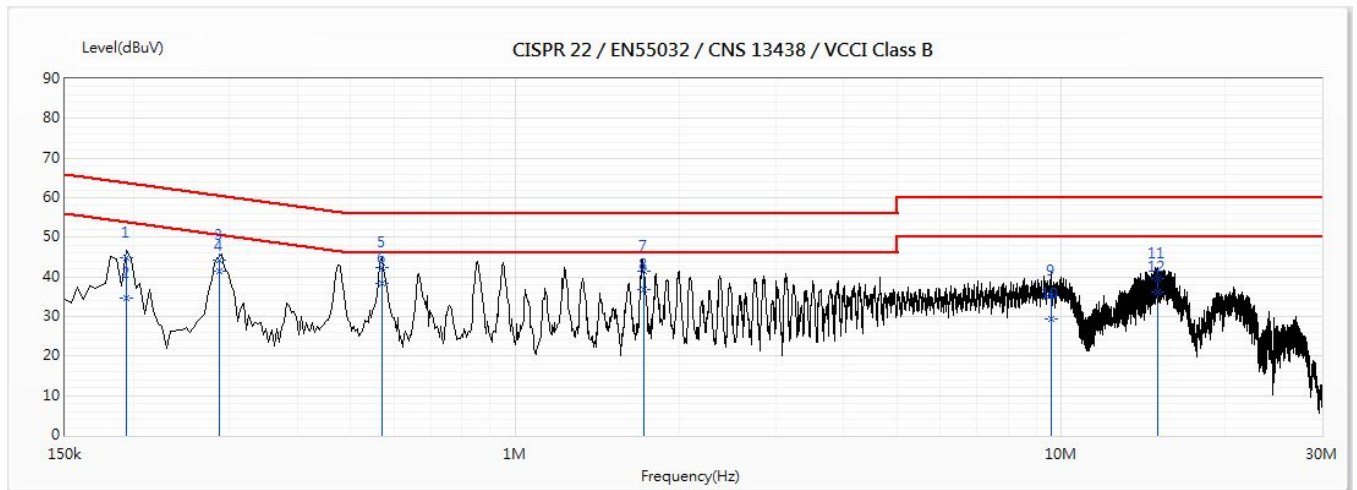
The EUT setup and the test procedure are according to ANSI C63.4, 2014 to comply with the requirements of FCC 47CFR Subpart C.

2.4. Uncertainty

$\pm 2.35\text{dB}$

2.5. Test Result of Conducted Emission

Product : RFID reader
 Test Item : Conducted Emission Test
 Power Line : L 1
 Test Mode : Mode 1: Transmit (903.24MHz)
 Test Date : 2020/05/18

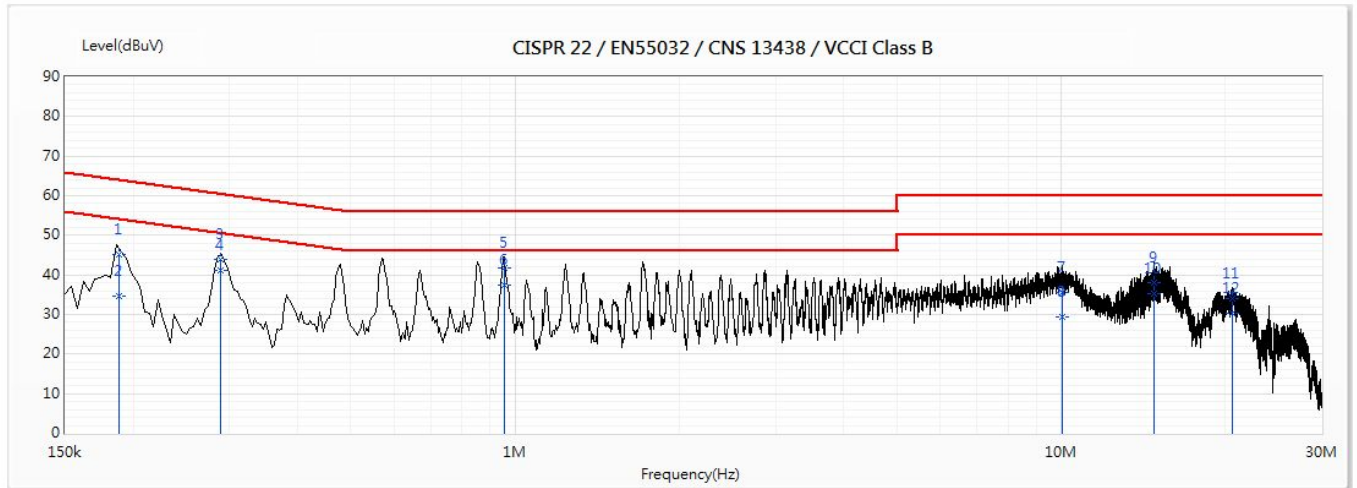


No	Frequency (MHz)	Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB)	Detector Type
1	0.194	44.82	63.87	-19.06	35.18	9.63	QP
2	0.194	34.58	53.87	-19.29	24.94	9.63	AV
3	0.288	44.17	60.59	-16.41	34.53	9.64	QP
4	0.288	41.33	50.59	-9.25	31.70	9.64	AV
5	0.572	42.22	56.00	-13.78	32.57	9.65	QP
*6	0.572	38.38	46.00	-7.62	28.73	9.65	AV
7	1.717	41.46	56.00	-14.54	31.76	9.70	QP
8	1.717	36.90	46.00	-9.10	27.21	9.70	AV
9	9.587	35.23	60.00	-24.77	25.36	9.88	QP
10	9.587	29.53	50.00	-20.47	19.65	9.88	AV
11	15.032	39.53	60.00	-20.47	29.59	9.93	QP
12	15.032	36.29	50.00	-13.71	26.36	9.93	AV

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ * “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : RFID reader
 Test Item : Conducted Emission Test
 Power Line : N
 Test Mode : Mode 1: Transmit (903.24MHz)
 Test Date : 2020/05/18



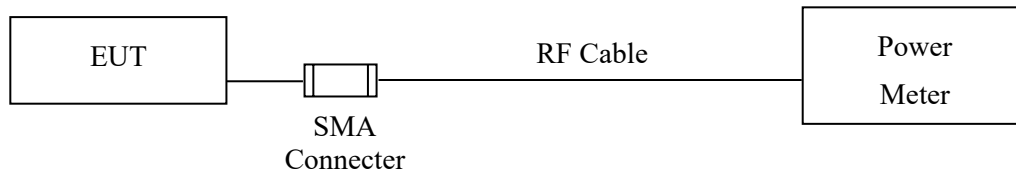
No	Frequency (MHz)	Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB)	Detector Type
1	0.188	45.28	64.11	-18.83	35.62	9.65	QP
2	0.188	34.73	54.11	-19.38	25.08	9.65	AV
3	0.289	43.88	60.54	-16.66	34.23	9.66	QP
4	0.289	41.26	50.54	-9.29	31.60	9.66	AV
5	0.954	41.74	56.00	-14.26	32.07	9.67	QP
*6	0.954	37.50	46.00	-8.50	27.83	9.67	AV
7	10.051	35.55	60.00	-24.45	25.65	9.90	QP
8	10.051	29.41	50.00	-20.59	19.50	9.90	AV
9	14.795	38.18	60.00	-21.82	28.20	9.98	QP
10	14.795	35.39	50.00	-14.61	25.41	9.98	AV
11	20.615	34.12	60.00	-25.88	24.07	10.05	QP
12	20.615	30.41	50.00	-19.59	20.35	10.05	AV

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ * “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup



3.2. Limit

According to FCC Section 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.

3.3. Test Procedure

Tested according to FHSS test procedure of KDB 558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

3.4. Uncertainty

± 0.86 dB

3.5. Test Result of Peak Power Output

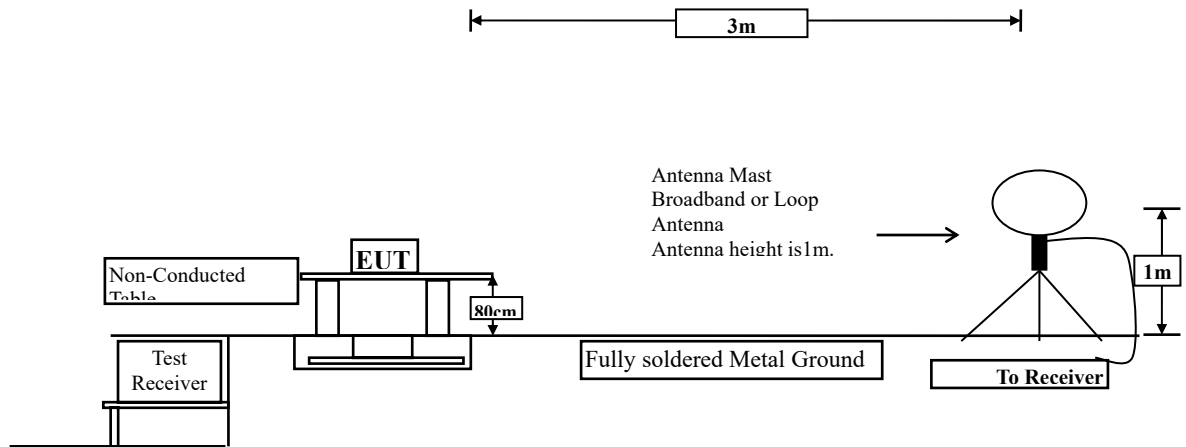
Product : RFID reader
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit
Test Date : 2020/05/19

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 1	903.24	29.39	1 Watt= 30 dBm	Pass
Channel 26	915.24	29.53	1 Watt= 30 dBm	Pass
Channel 50	926.76	29.63	1 Watt= 30 dBm	Pass

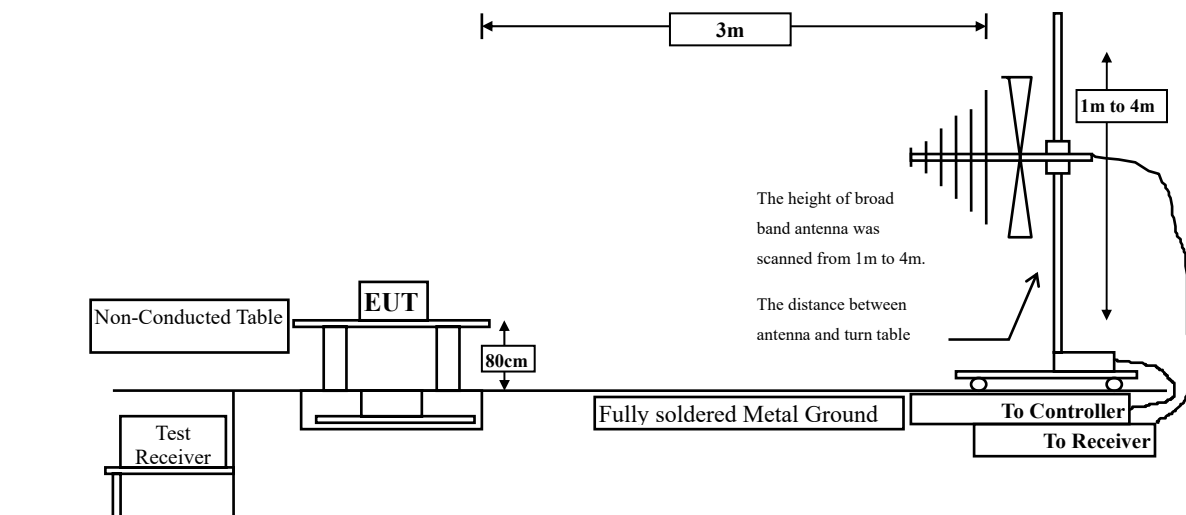
4. Radiated Emission

4.1. Test Setup

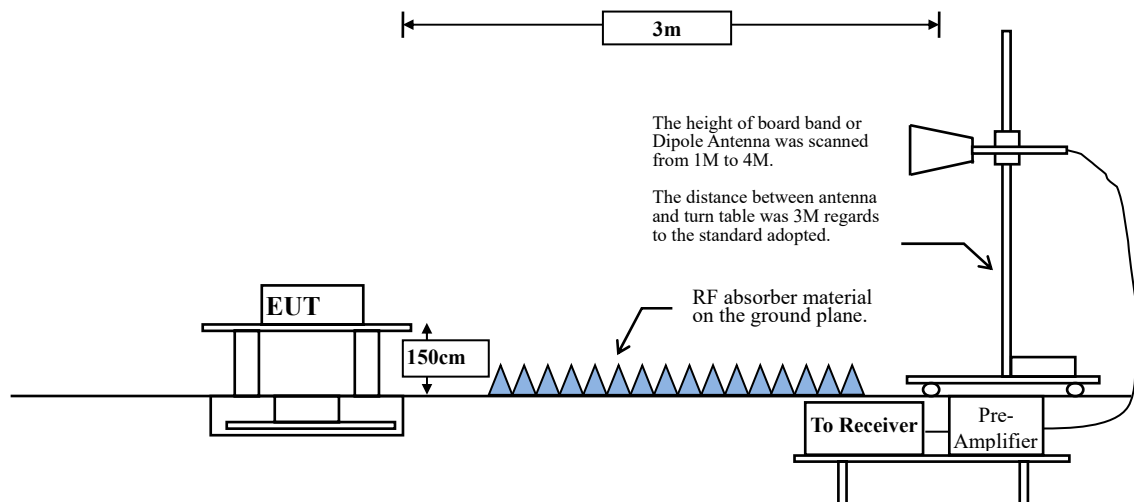
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. Limits

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
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 closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna. The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

4.4. Uncertainty

Horizontal polarization :

30-300MHz: $\pm 4.08\text{dB}$; 300M-1GHz: $\pm 3.86\text{dB}$; 1-18GHz: $\pm 3.77\text{dB}$; 18-40GHz: $\pm 3.98\text{dB}$

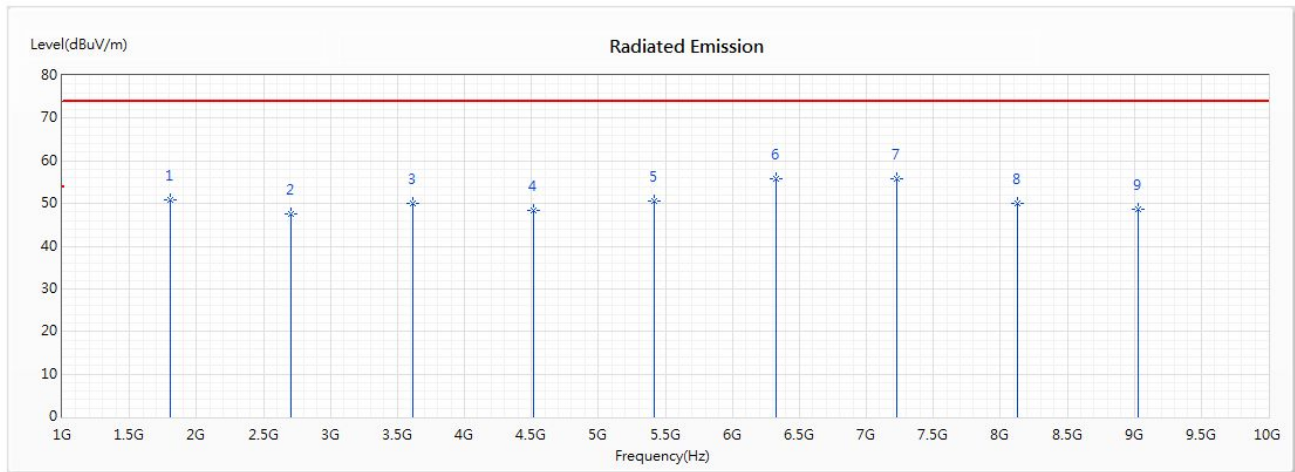
Vertical polarization :

30-300MHz: $\pm 4.81\text{dB}$; 300M-1GHz: $\pm 3.87\text{dB}$; 1-18GHz : $\pm 3.83\text{dB}$; 18-40GHz: $\pm 3.98\text{dB}$

4.5. Test Result of Radiated Emission

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (903.24MHz)
 Test Date : 2020/05/11

Horizontal



No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	1806.48	50.98	74.00	-23.02	59.20	-8.22	PK
2	2709.72	47.43	74.00	-26.57	52.87	-5.44	PK
3	3612.96	50.10	74.00	-23.90	54.56	-4.46	PK
4	4516.2	48.31	74.00	-25.69	51.72	-3.41	PK
5	5419.44	50.57	74.00	-23.43	53.14	-2.57	PK
* 6	6322.68	55.75	74.00	-18.25	56.58	-0.83	PK
7	7225.92	55.69	74.00	-18.31	55.81	-0.12	PK
8	8129.16	50.04	74.00	-23.96	49.70	0.34	PK
9	9032.4	48.66	74.00	-25.34	47.40	1.26	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

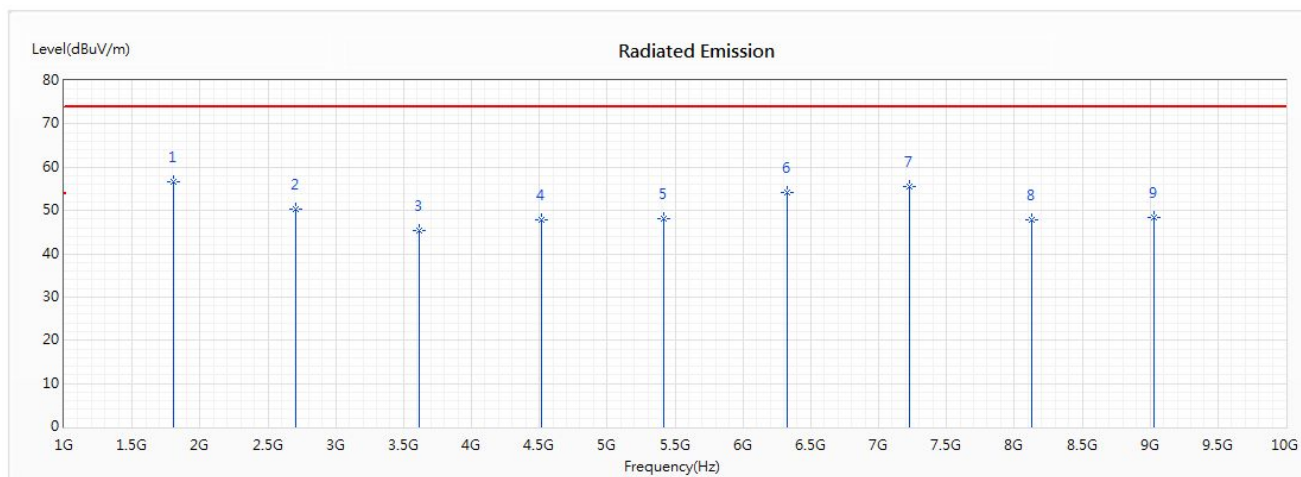
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
6322.68	55.75	-11.341	44.409	-9.591	74.000	54.000
7225.92	55.69	-11.341	44.349	-9.651	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (903.24MHz)
 Test Date : 2020/05/11

Vertical



No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
* 1	1806.48	56.62	74.00	-17.38	64.84	-8.22	PK
2	2709.72	50.40	74.00	-23.60	55.84	-5.44	PK
3	3612.96	45.41	74.00	-28.59	49.87	-4.46	PK
4	4516.2	47.97	74.00	-26.03	51.38	-3.41	PK
5	5419.44	48.07	74.00	-25.93	50.64	-2.57	PK
6	6322.68	54.29	74.00	-19.71	55.12	-0.83	PK
7	7225.92	55.50	74.00	-18.50	55.62	-0.12	PK
8	8129.16	47.89	74.00	-26.11	47.55	0.34	PK
9	9032.4	48.37	74.00	-25.63	47.11	1.26	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

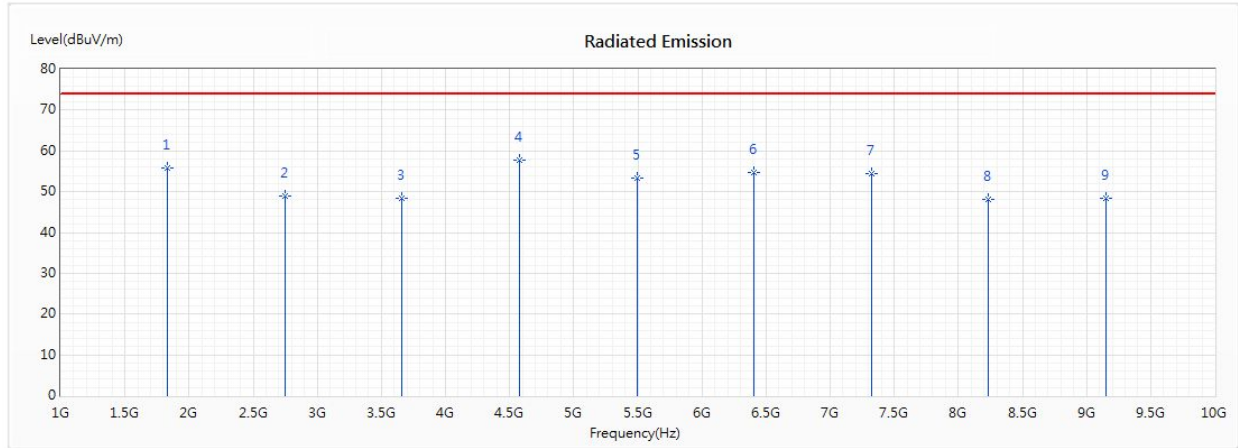
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
1806.48	56.62	-11.341	45.279	-8.721	74.000	54.000
6322.68	54.29	-11.341	42.949	-11.051	74.000	54.000
7225.92	55.5	-11.341	44.159	-9.841	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (915.24MHz)
 Test Date : 2020/05/11

Horizontal



No	Frequency (MHz)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Reading Level (dB μ V)	Correct Factor (dB/m)	Detector Type
1	1830.48	55.79	74.00	-18.21	63.67	-7.88	PK
2	2745.72	48.86	74.00	-25.14	54.34	-5.48	PK
3	3660.96	48.47	74.00	-25.53	52.98	-4.51	PK
* 4	4576.2	57.72	74.00	-16.28	61.00	-3.28	PK
5	5491.44	53.40	74.00	-20.60	55.84	-2.44	PK
6	6406.68	54.59	74.00	-19.41	55.26	-0.67	PK
7	7321.92	54.55	74.00	-19.45	54.65	-0.10	PK
8	8237.16	48.21	74.00	-25.79	47.62	0.59	PK
9	9152.4	48.46	74.00	-25.54	47.19	1.27	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

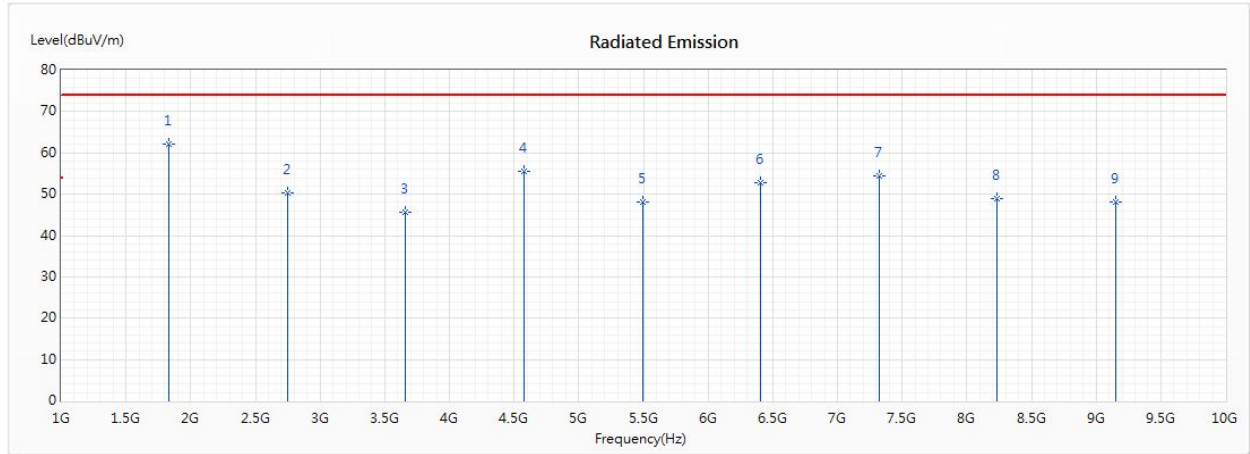
Frequency MHz	Peak Measurement dB μ V/m	Duty Cycle Factor dB	Average Measurement dB μ V/m	Margin dB	Peak Limit dB μ V/m	Average Limit dB μ V/m
Average Detector:						
1830.48	55.79	-11.182	44.608	-9.392	74.000	54.000
4576.2	57.72	-11.182	46.538	-7.462	74.000	54.000
6406.68	54.59	-11.182	43.408	-10.592	74.000	54.000
7321.92	54.55	-11.182	43.368	-10.632	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (915.24MHz)
 Test Date : 2020/05/11

Vertical



No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
* 1	1830.48	62.21	74.00	-11.79	70.09	-7.88	PK
2	2745.72	50.32	74.00	-23.68	55.80	-5.48	PK
3	3660.96	45.73	74.00	-28.27	50.24	-4.51	PK
4	4576.2	55.61	74.00	-18.39	58.89	-3.28	PK
5	5491.44	48.04	74.00	-25.96	50.48	-2.44	PK
6	6406.68	52.91	74.00	-21.09	53.58	-0.67	PK
7	7321.92	54.35	74.00	-19.65	54.45	-0.10	PK
8	8237.16	48.85	74.00	-25.15	48.26	0.59	PK
9	9152.4	48.15	74.00	-25.85	46.88	1.27	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

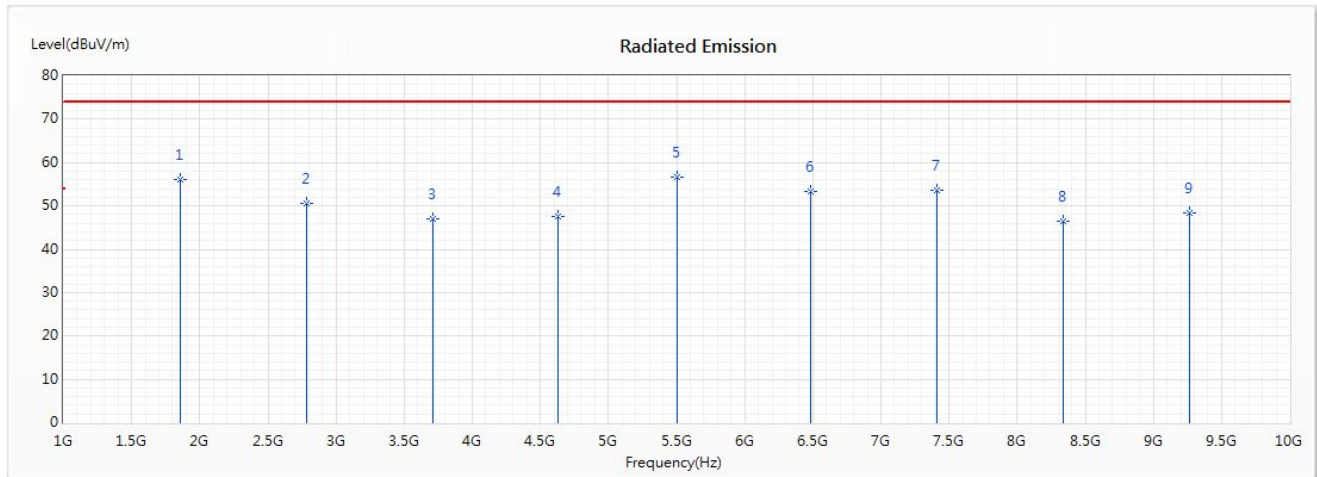
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
1830.48	62.21	-11.182	51.028	-2.972	74.000	54.000
4576.2	55.61	-11.182	44.428	-9.572	74.000	54.000
7321.92	54.35	-11.182	43.168	-10.832	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (926.76MHz)
 Test Date : 2020/05/11

Horizontal



No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	1853.52	56.20	74.00	-17.80	63.76	-7.56	PK
2	2780.28	50.64	74.00	-23.36	56.23	-5.59	PK
3	3707.04	46.91	74.00	-27.09	51.33	-4.42	PK
4	4633.8	47.46	74.00	-26.54	50.84	-3.38	PK
* 5	5505.6	56.68	74.00	-17.32	59.00	-2.32	PK
6	6487.32	53.41	74.00	-20.59	54.04	-0.63	PK
7	7414.08	53.72	74.00	-20.28	53.85	-0.13	PK
8	8340.84	46.36	74.00	-27.64	45.81	0.55	PK
9	9267.6	48.46	74.00	-25.54	47.10	1.36	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

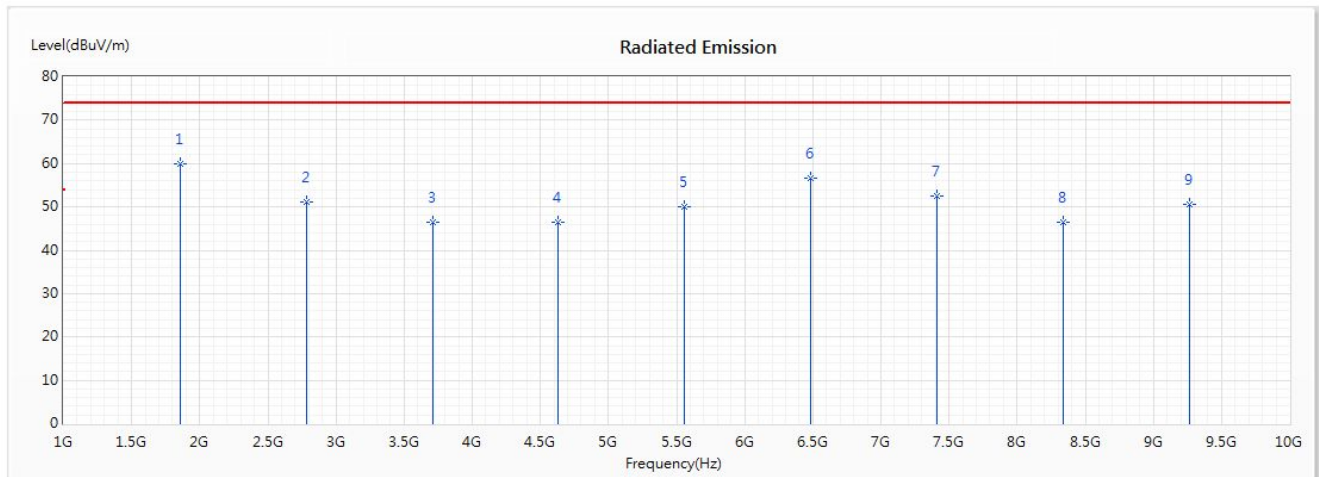
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
1853.52	56.2	-11.341	44.859	-9.141	74.000	54.000
5505.6	56.68	-11.341	45.339	-8.661	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (926.76MHz)
 Test Date : 2020/05/11

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	1853.52	59.98	74.00	-14.02	67.54	-7.56	PK
2	2780.28	51.19	74.00	-22.81	56.78	-5.59	PK
3	3707.04	46.53	74.00	-27.47	50.95	-4.42	PK
4	4633.8	46.46	74.00	-27.54	49.84	-3.38	PK
5	5560.56	49.98	74.00	-24.02	52.30	-2.32	PK
6	6487.32	56.70	74.00	-17.30	57.33	-0.63	PK
7	7414.08	52.54	74.00	-21.46	52.67	-0.13	PK
8	8340.84	46.58	74.00	-27.42	46.03	0.55	PK
9	9267.6	50.68	74.00	-23.32	49.32	1.36	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

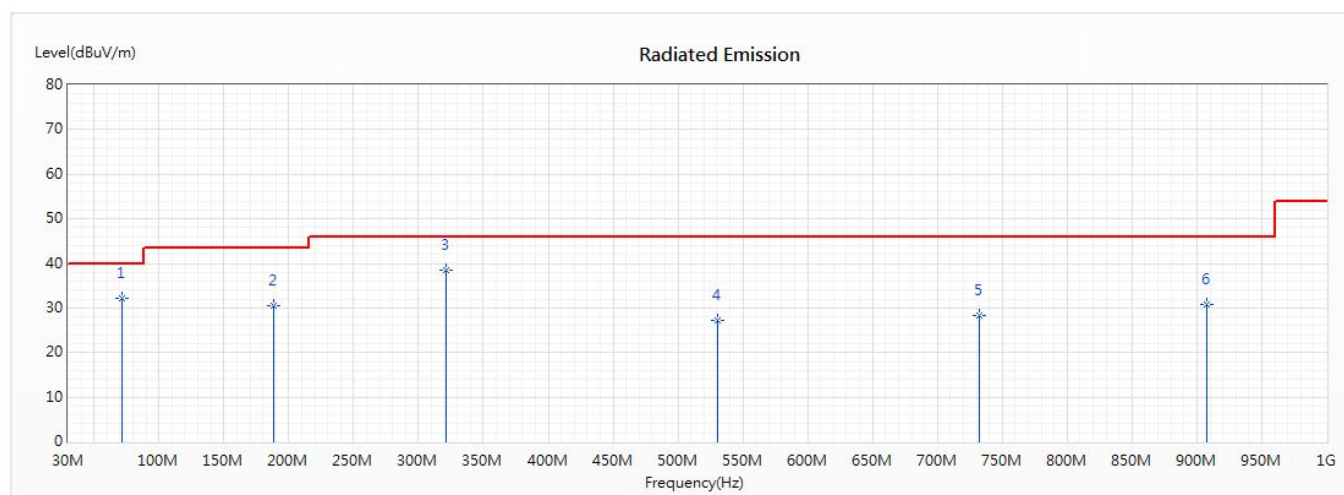
Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Average Measurement dBuV/m	Margin dB	Peak Limit dBuV/m	Average Limit dBuV/m
1853.52	59.98	-11.341	48.639	-5.361	74.000	54.000
6487.32	56.7	-11.341	45.359	-8.641	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product : RFID reader
 Test Item : General Radiated Emission
 Test Mode : Mode 1: Transmit (903.24MHz)
 Test Date : 2020/05/13

Horizontal



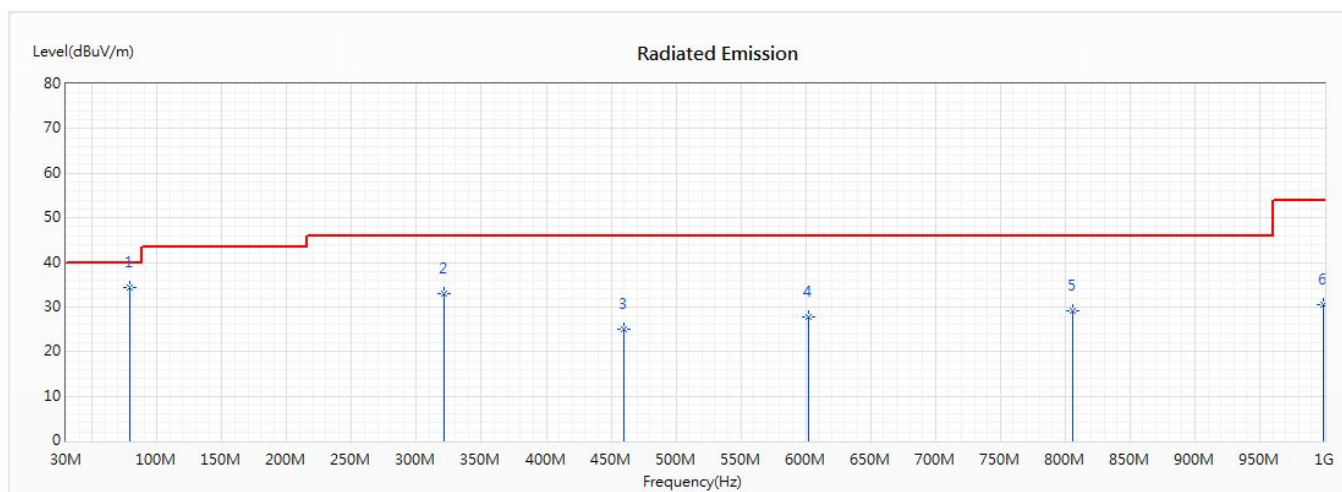
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	71.71	32.12	40.00	-7.88	45.42	-13.30	QP
2	188.11	30.51	43.50	-12.99	42.84	-12.33	QP
* 3	321	38.48	46.00	-7.52	47.39	-8.91	QP
4	530.52	27.14	46.00	-18.86	31.69	-4.55	QP
5	732.28	28.45	46.00	-17.55	29.61	-1.16	QP
6	907.85	30.91	46.00	-15.09	29.89	1.02	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : RFID reader
 Test Item : General Radiated Emission
 Test Mode : Mode 1: Transmit (903.24MHz)
 Test Date : 2020/05/13

Vertical

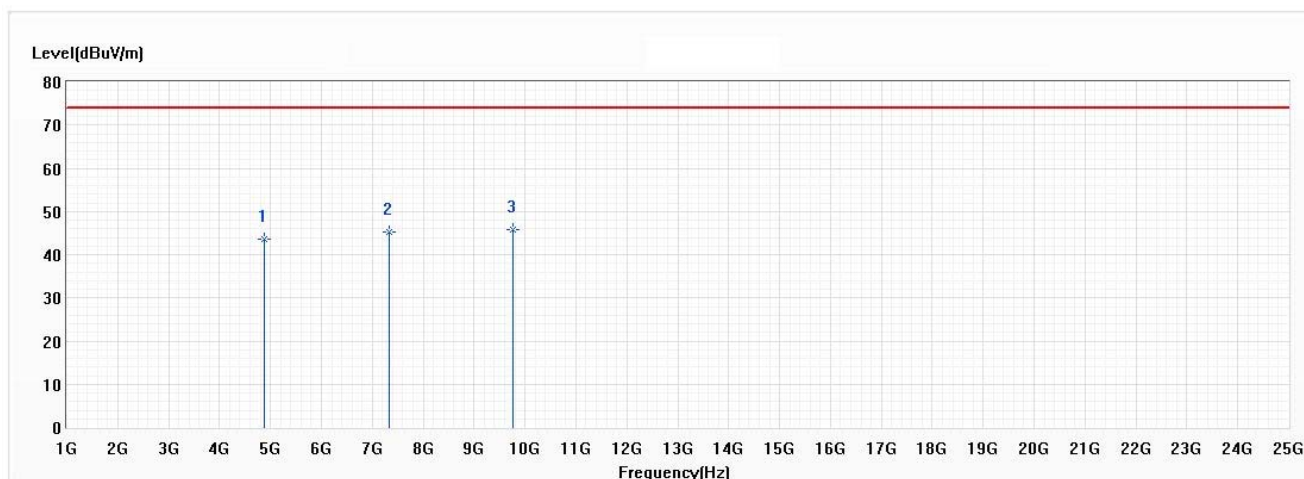


Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (Bluetooth 1Mbps 2441MHz+RFID 926.76MHz)
 Test Date : 2020/10/26

Horizontal



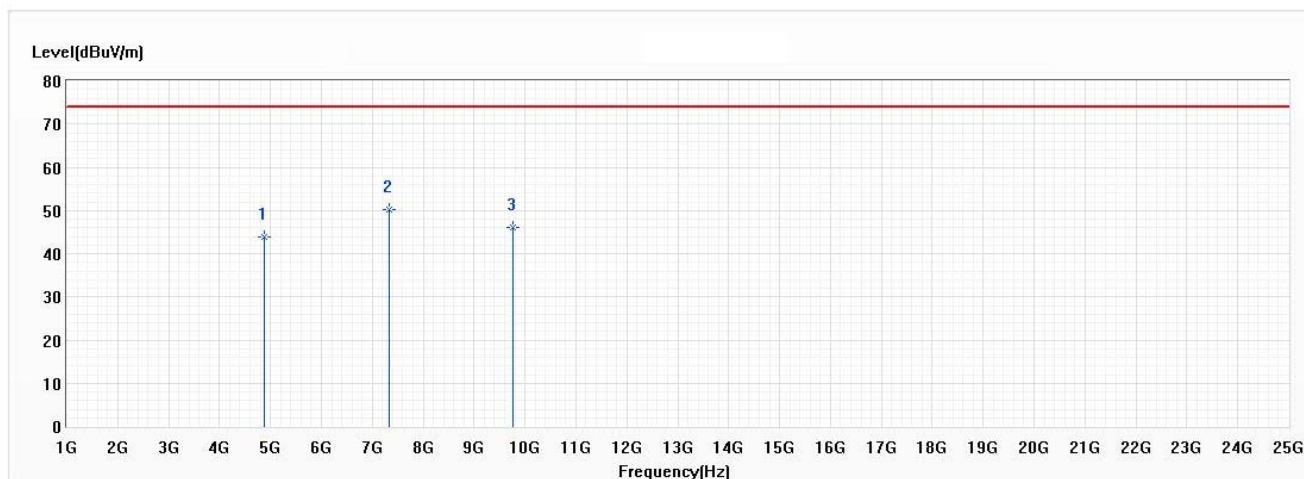
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	4882.000	43.65	74.00	-30.35	47.98	-4.33	PK
2	7323.000	45.19	74.00	-28.81	45.89	-0.70	PK
* 3	9764.000	45.78	74.00	-28.22	43.76	2.02	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (Bluetooth 1Mbps 2441MHz+RFID 926.76MHz)
 Test Date : 2020/10/26

Vertical



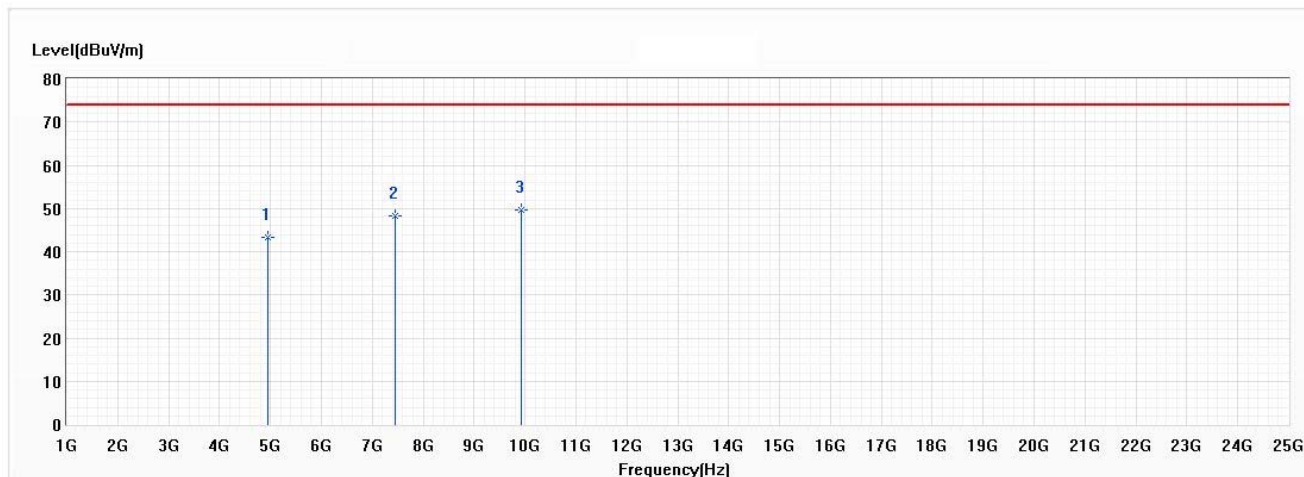
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	4882.000	43.89	74.00	-30.11	48.22	-4.33	PK
* 2	7323.000	50.31	74.00	-23.69	51.01	-0.70	PK
3	9764.000	46.12	74.00	-27.88	44.10	2.02	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (BLE 1Mbps 2480MHz+RFID 926.76MHz)
 Test Date : 2020/10/26

Horizontal



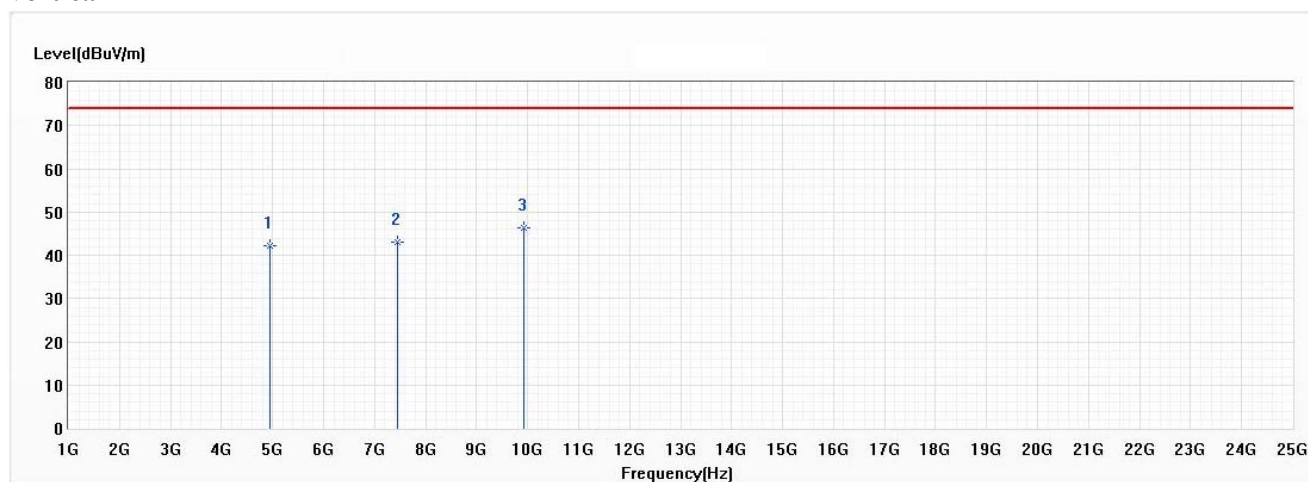
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	4960.000	43.39	74.00	-30.61	47.46	-4.07	PK
2	7440.000	48.30	74.00	-25.70	48.99	-0.69	PK
* 3	9920.000	49.53	74.00	-24.47	47.27	2.26	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : RFID reader
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (BLE 1Mbps 2480MHz+RFID 926.76MHz)
 Test Date : 2020/10/26

Vertical



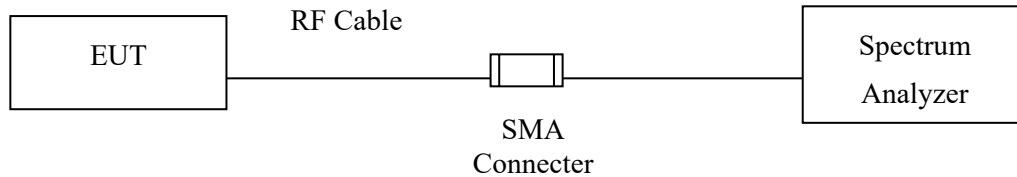
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB)	Detector Type
1	4960.000	42.13	74.00	-31.87	46.20	-4.07	PK
2	7440.000	42.98	74.00	-31.02	43.67	-0.69	PK
* 3	9920.000	46.28	74.00	-27.72	44.02	2.26	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

Tested according to FHSS test procedure of KDB558074 section 9 b) for compliance to FCC 47CFR 15.247 requirements.

5.4. Uncertainty

$\pm 1.23\text{dB}$

5.5. Test Result of RF Antenna Conducted Test

Product : RFID reader
Test Item : RF Antenna Conducted Test
Test Mode : Mode 1: Transmit
Test Date : 2020/05/18

Figure Channel 1:

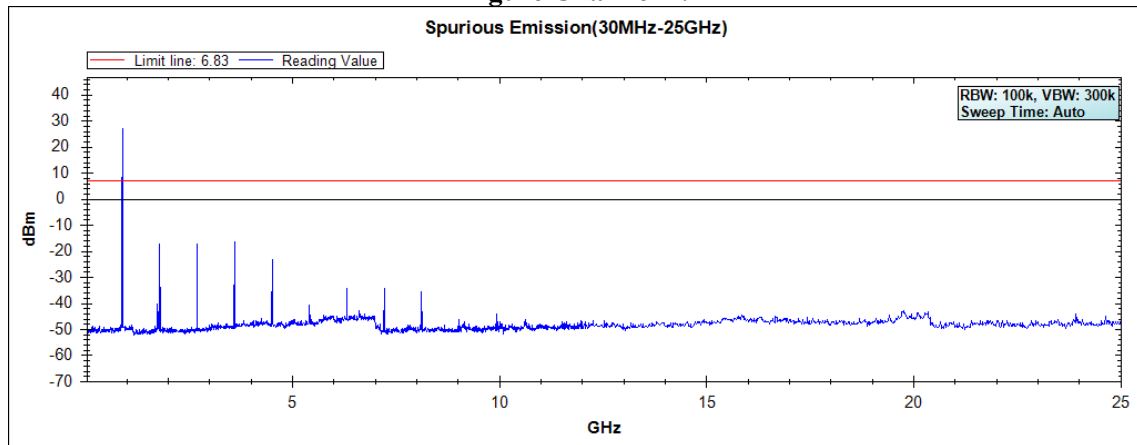


Figure Channel 26:

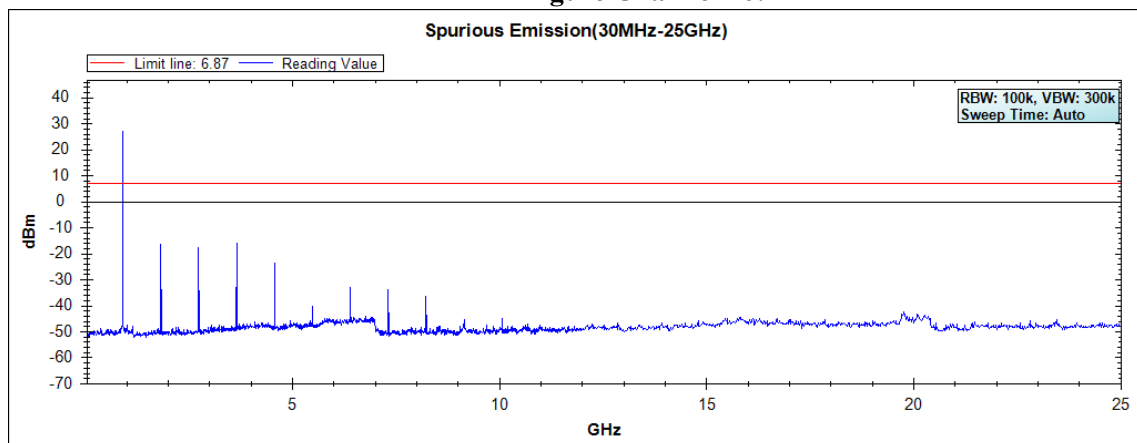
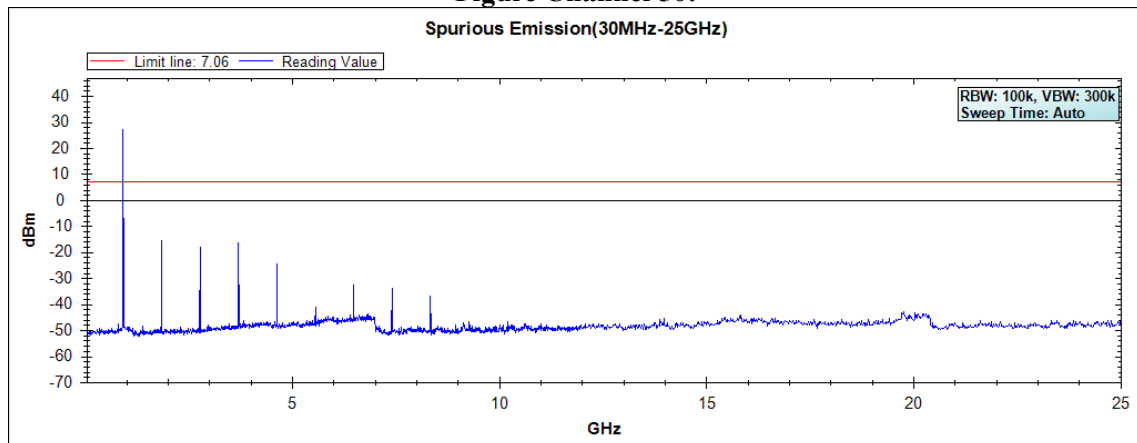


Figure Channel 50:

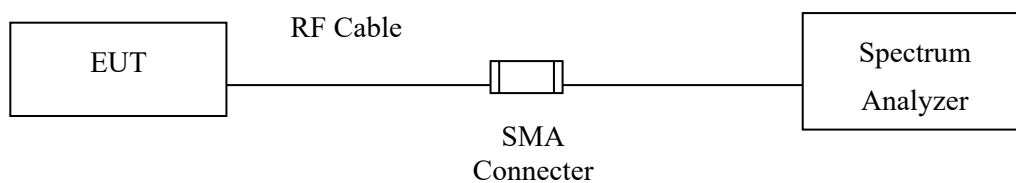


Note: The above test pattern is synthesized by multiple of the frequency range.

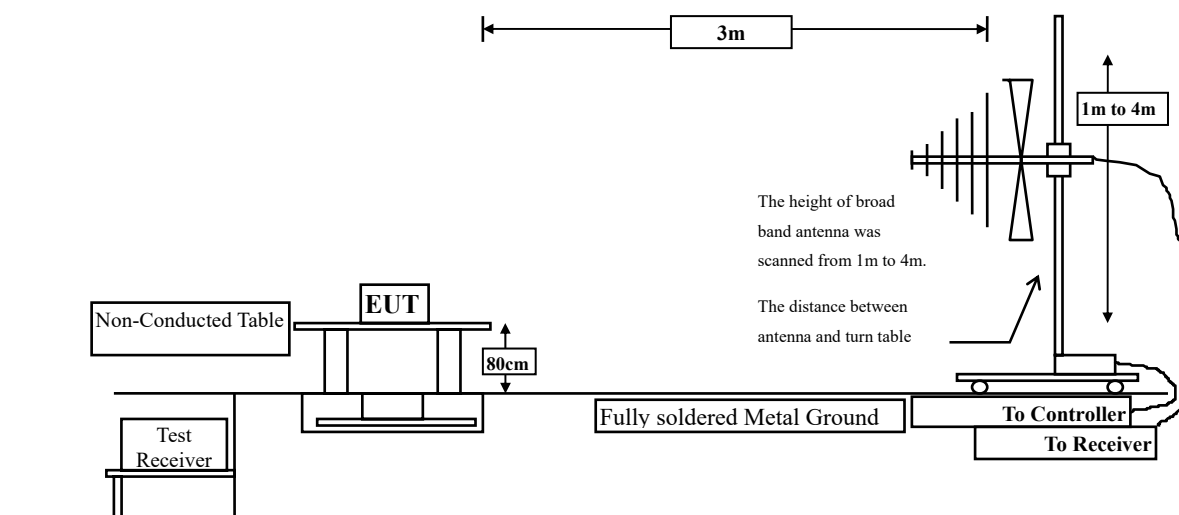
6. Band Edge

6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



6.2. Limit

According to FCC Section 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 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, 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 emissions 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)).

6.3. Test Procedure

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

6.4. Uncertainty

Conducted: $\pm 1.23\text{dB}$

Radiated:

Horizontal polarization : 30-300MHz: $\pm 4.08\text{dB}$; 300M-1GHz: $\pm 3.86\text{dB}$

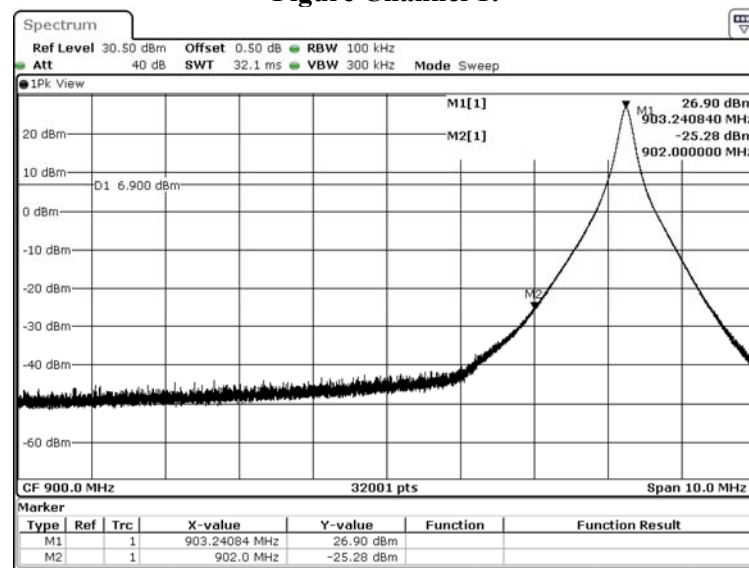
Vertical polarization : 30-300MHz: $\pm 4.81\text{dB}$; 300M-1GHz: $\pm 3.87\text{dB}$

6.5. Test Result of Band Edge

Product : RFID reader
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit (Hopping off)
 Test Date : 2020/05/18

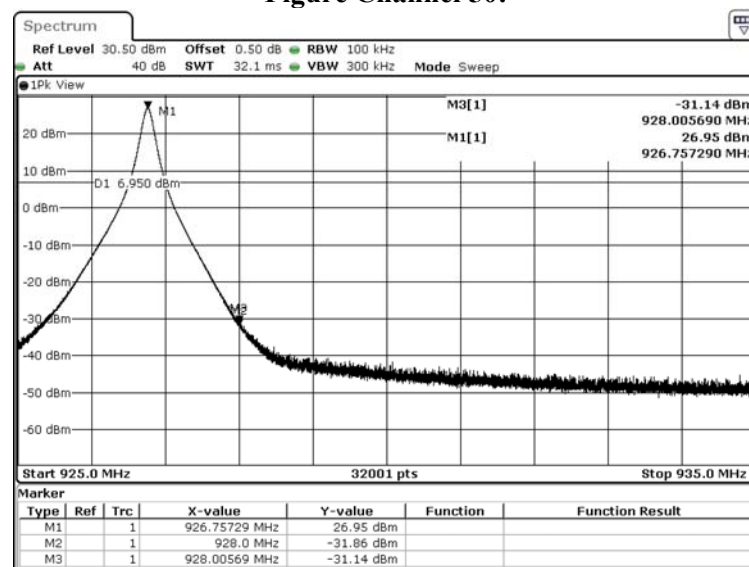
Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel 1:



Date: 18.MAY.2020 16:36:59

Figure Channel 50:

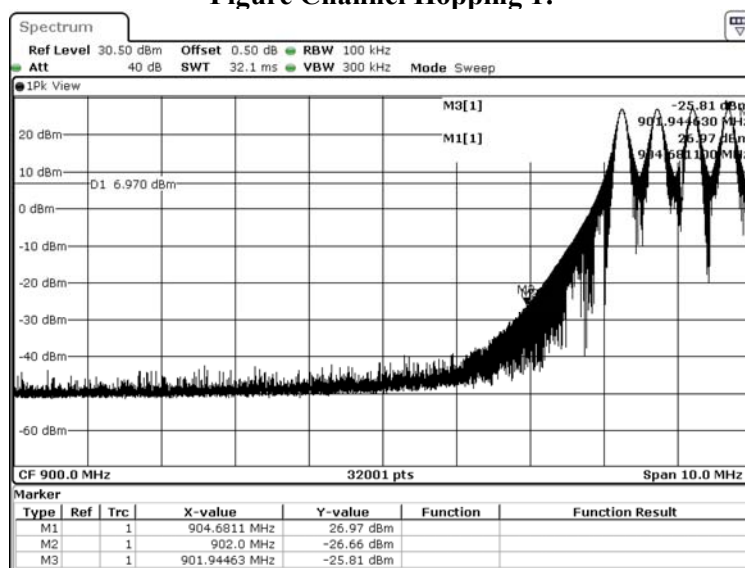


Date: 18.MAY.2020 16:39:49

Product : RFID reader
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit (Hopping on)
 Test Date : 2020/05/18

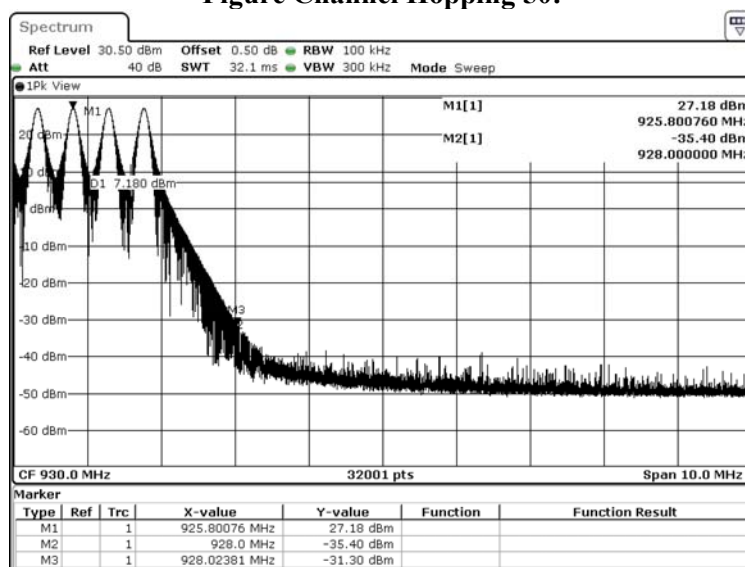
Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel Hopping 1:



Date: 18.MAY.2020 16:35:23

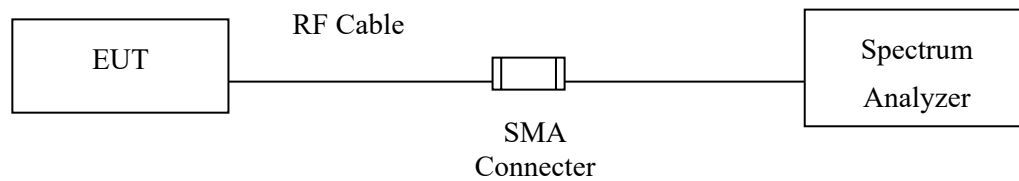
Figure Channel Hopping 50:



Date: 18.MAY.2020 16:46:26

7. Channel Number

7.1. Test Setup



7.2. Limit

According to FCC Section 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 less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

7.3. Test Procedure

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

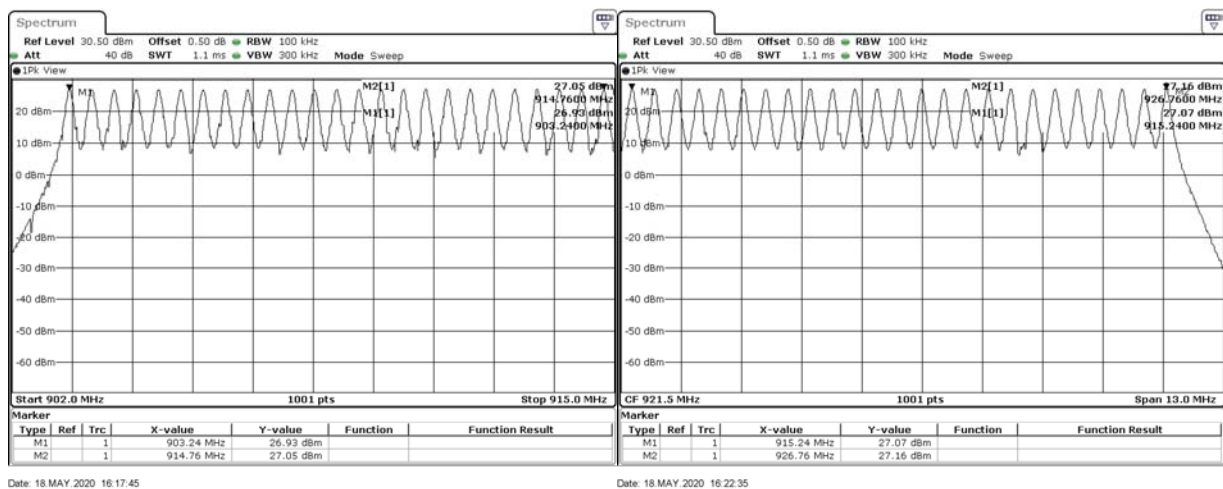
7.4. Uncertainty

N/A

7.5. Test Result of Channel Number

Product : RFID reader
 Test Item : Channel Number
 Test Mode : Mode 1: Transmit
 Test Date : 2020/05/18

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
903.24 ~ 926.76	50	≥ 50	Pass

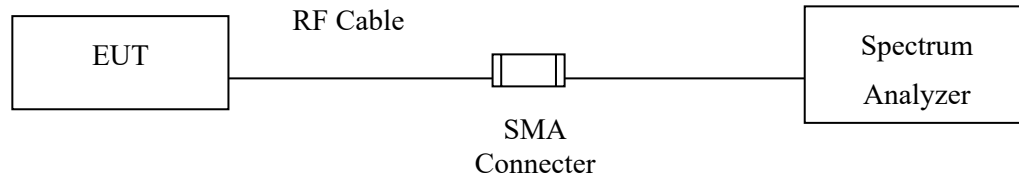


Date: 18 MAY 2020 16:17:45

Date: 18 MAY 2020 16:22:35

8. Channel Separation

8.1. Test Setup



8.2. Limit

According to FCC Section 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.

8.3. Test Procedure

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

8.4. Uncertainty

$\pm 279.2\text{Hz}$

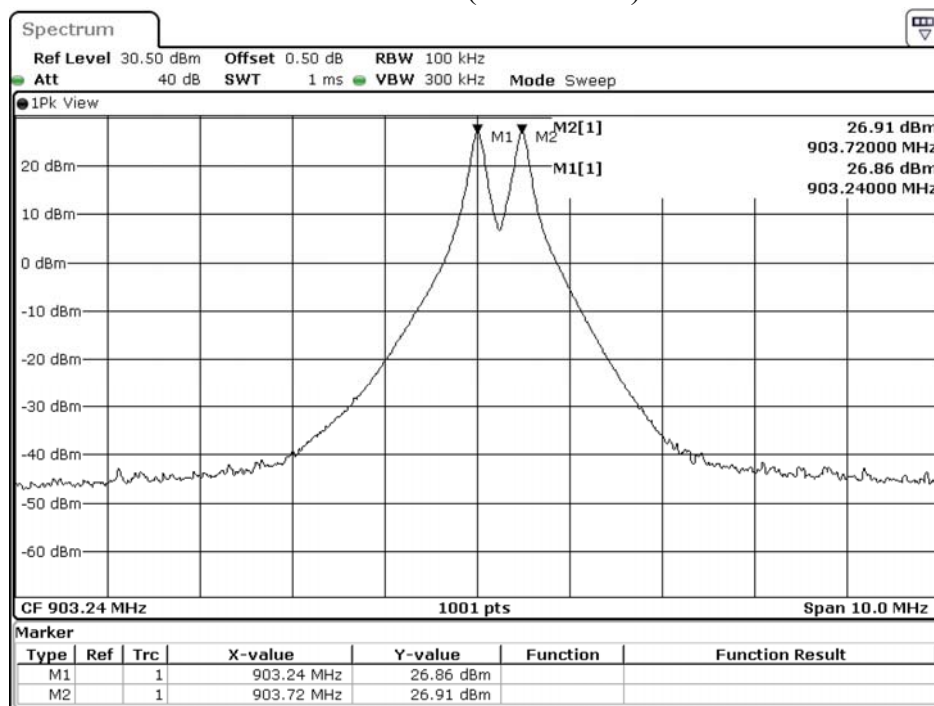
8.5. Test Result of Channel Separation

Product : RFID reader
 Test Item : Channel Separation
 Test Mode : Mode 1: Transmit
 Test Date : 2020/05/18

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of 20dB Bandwidth (kHz)	Result
1	903.24	480	>25 kHz	74.0	Pass
26	915.24	480	>25 kHz	76.0	Pass
50	926.76	480	>25 kHz	76.0	Pass

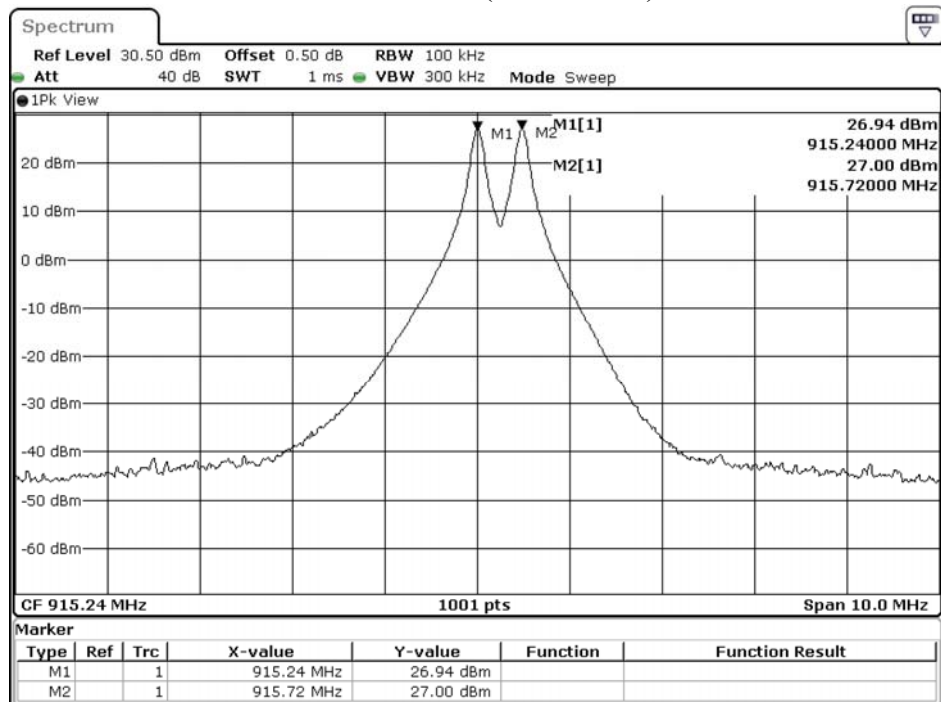
NOTE: The 20dB Bandwidth is refer to section 10.

Channel 1 (903.24MHz)



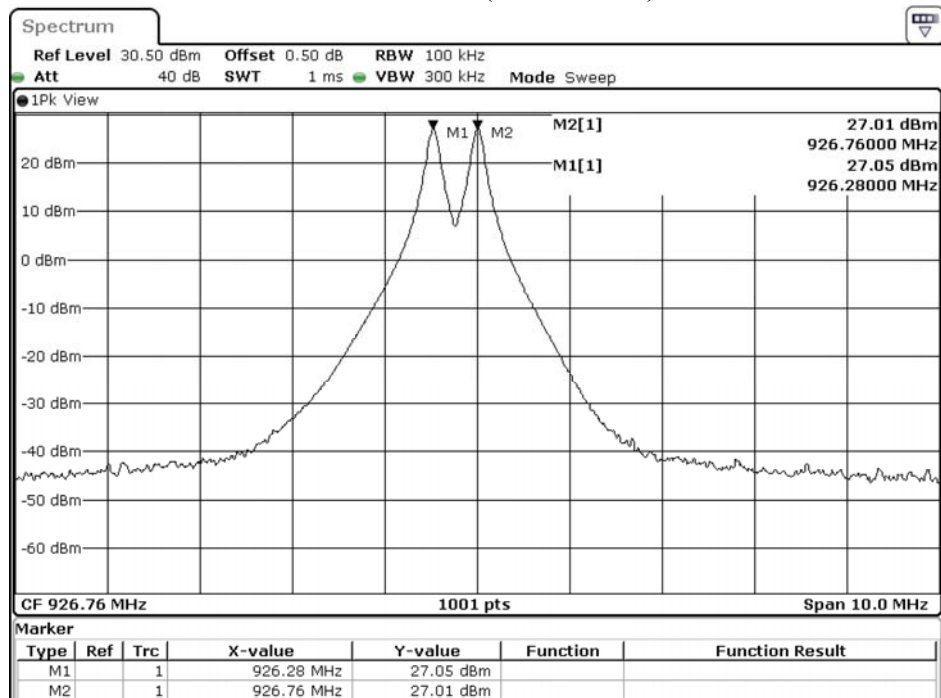
Date: 18.MAY.2020 15:48:58

Channel 26 (915.24MHz)



Date: 18.MAY.2020 15:52:11

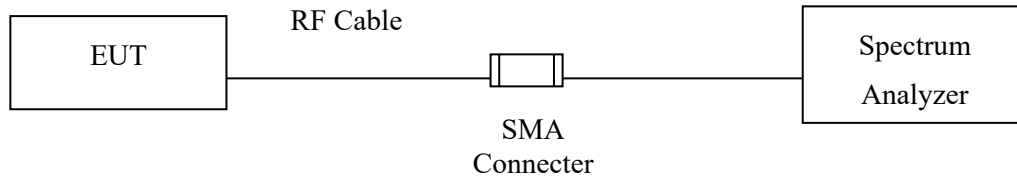
Channel 50 (926.76MHz)



Date: 18.MAY.2020 15:56:58

9. Dwell Time

9.1. Test Setup



9.2. Limit

According to FCC Section 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 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.

9.3. Test Procedure

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements).

9.4. Uncertainty

$\pm 2.31\text{msec}$

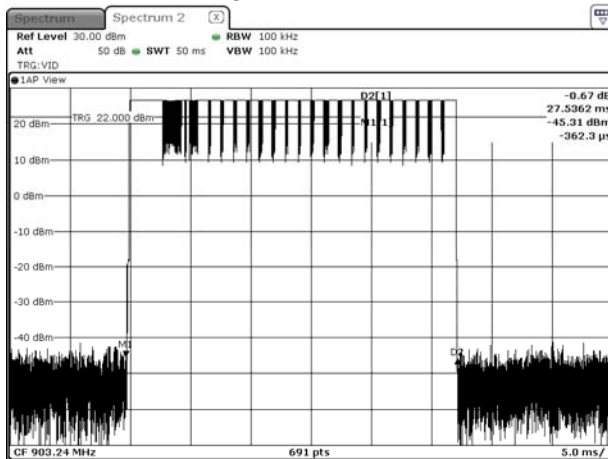
9.5. Test Result of Dwell Time

Product : RFID reader
 Test Item : Dwell Time
 Test Mode : Mode 1: Transmit
 Test Date : 2020/05/18

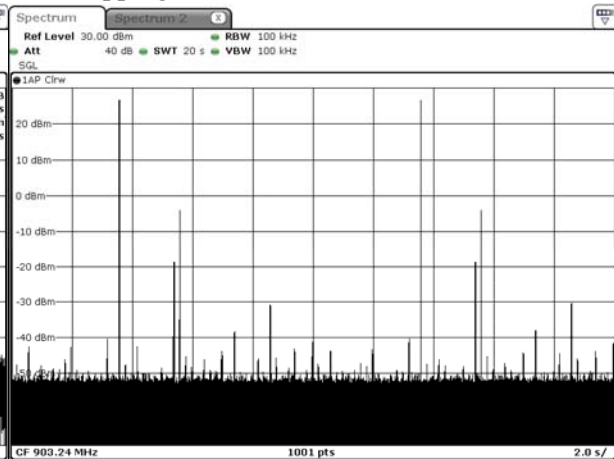
Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
903.24	27.536	2	20000	55.072	400	Pass
915.24	27.536	2	20000	55.072	400	Pass
926.76	27.536	2	20000	55.072	400	Pass

Dwell time = Time slot length(ms)*Hopping of Number

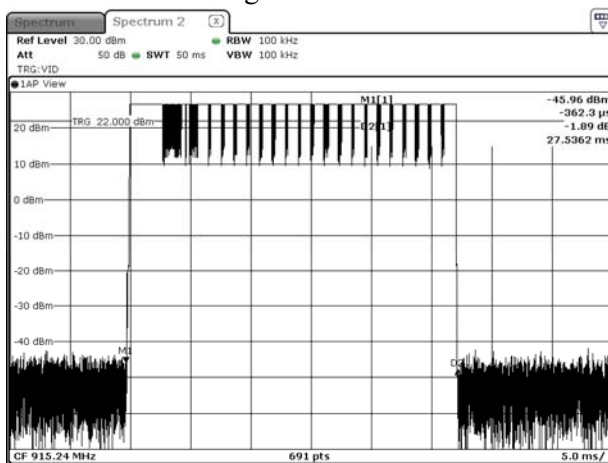
CH 1 Time slot length



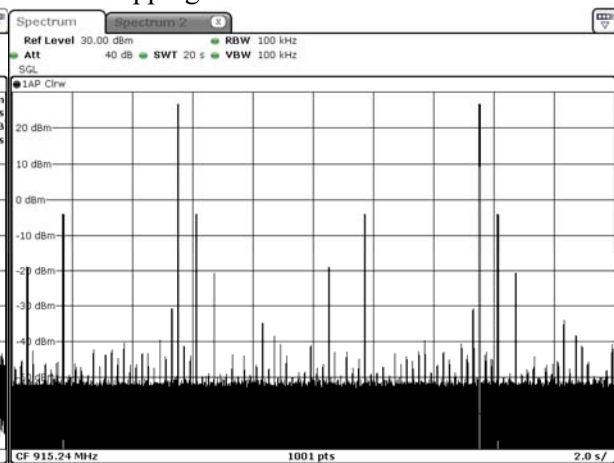
CH 1 Hopping of Number



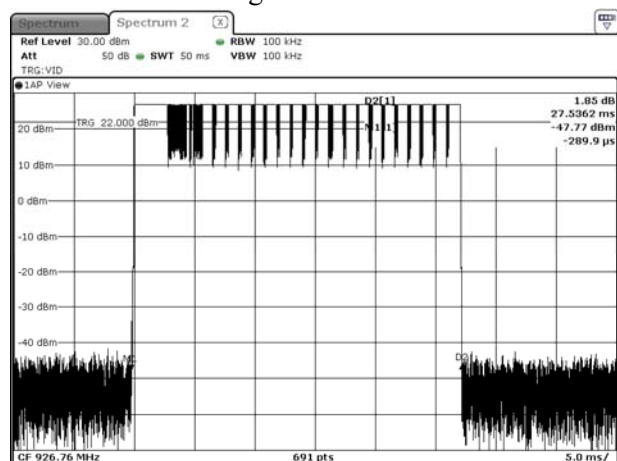
CH 26 Time slot length



CH 26 Hopping of Number

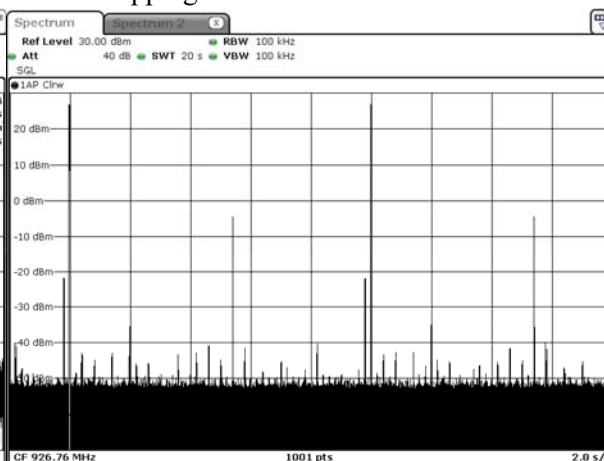


CH 50 Time slot length



Date: 19 MAY 2020 10:41:20

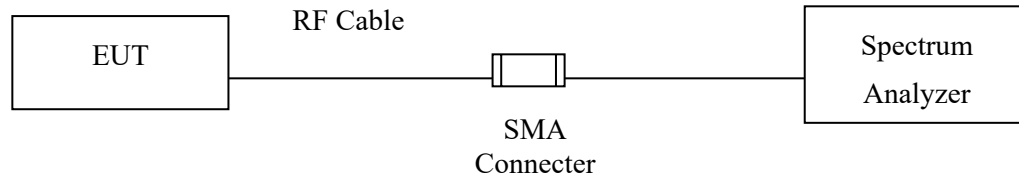
CH 50 Hopping of Number



Date: 19 MAY 2020 10:48:15

10. Occupied Bandwidth

10.1. Test Setup



10.2. Limits

According to FCC Section 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 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

10.3. Test Procedure

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

10.4. Uncertainty

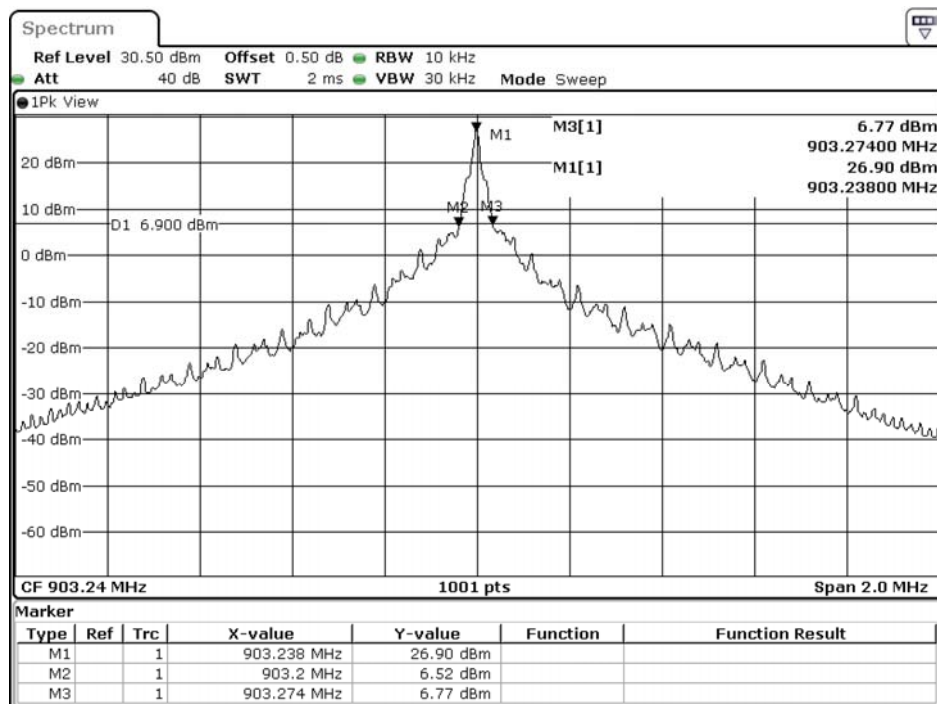
$\pm 279.2\text{Hz}$

10.5. Test Result of Occupied Bandwidth

Product : RFID reader
 Test Item : Occupied Bandwidth Data
 Test Mode : Mode 1: Transmit
 Test Date : 2019/06/07

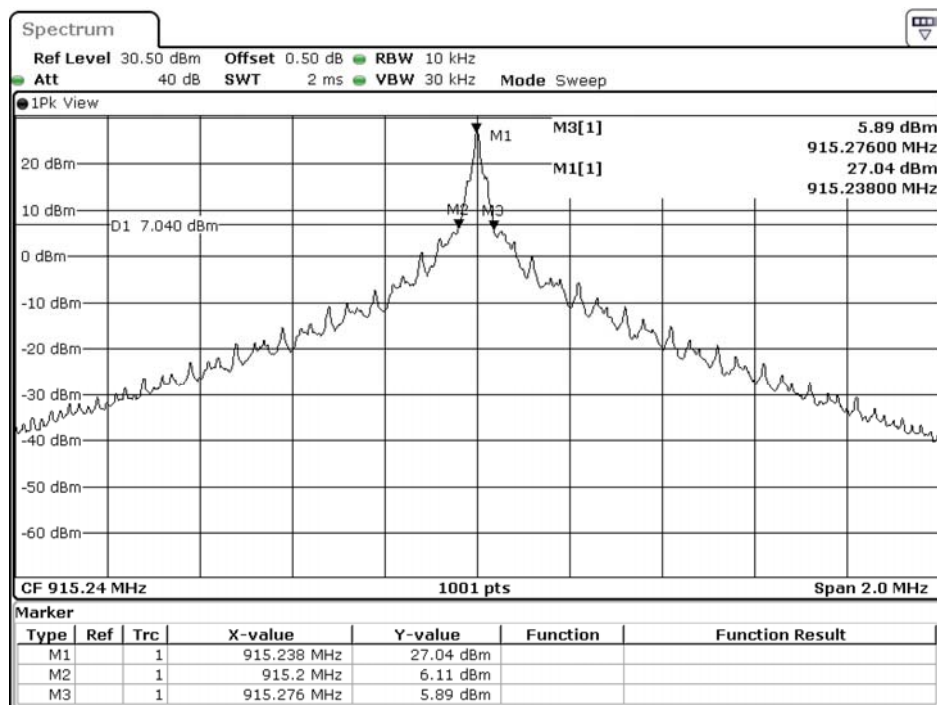
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	903.24	74	< 250kHz	Pass
26	915.24	76	< 250kHz	Pass
50	926.76	76	< 250kHz	Pass

Figure Channel 1:



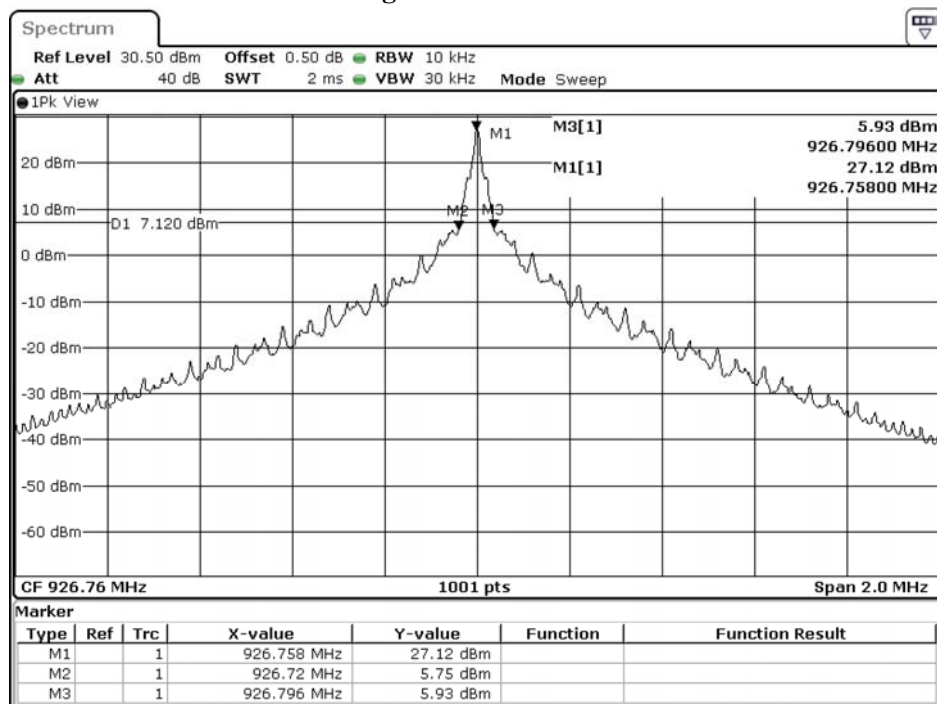
Date: 18.MAY.2020 16:01:21

Figure Channel 26:



Date: 18.MAY.2020 16:03:22

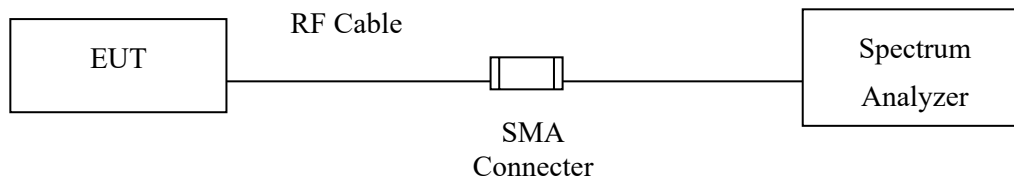
Figure Channel 50:



Date: 18.MAY.2020 16:05:24

11. Duty Cycle

11.1. Test Setup

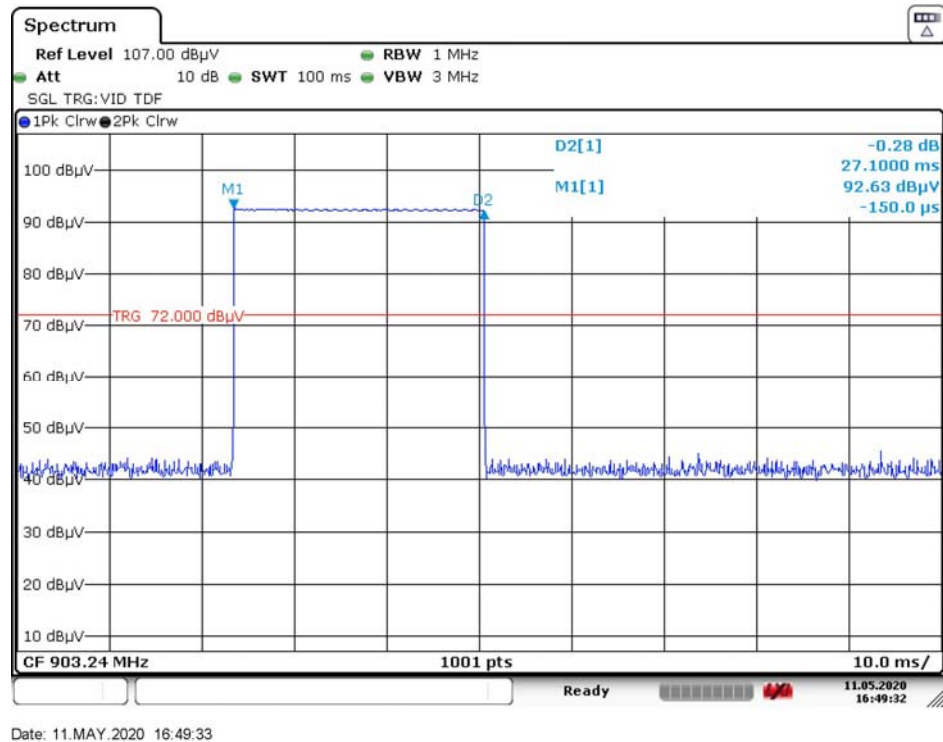


11.2. Uncertainty

$\pm 2.31\text{ms}$

11.3. Test Result of Duty Cycle

Product : RFID reader
 Test Item : Duty Cycle Data
 Test Mode : Mode 1: Transmit



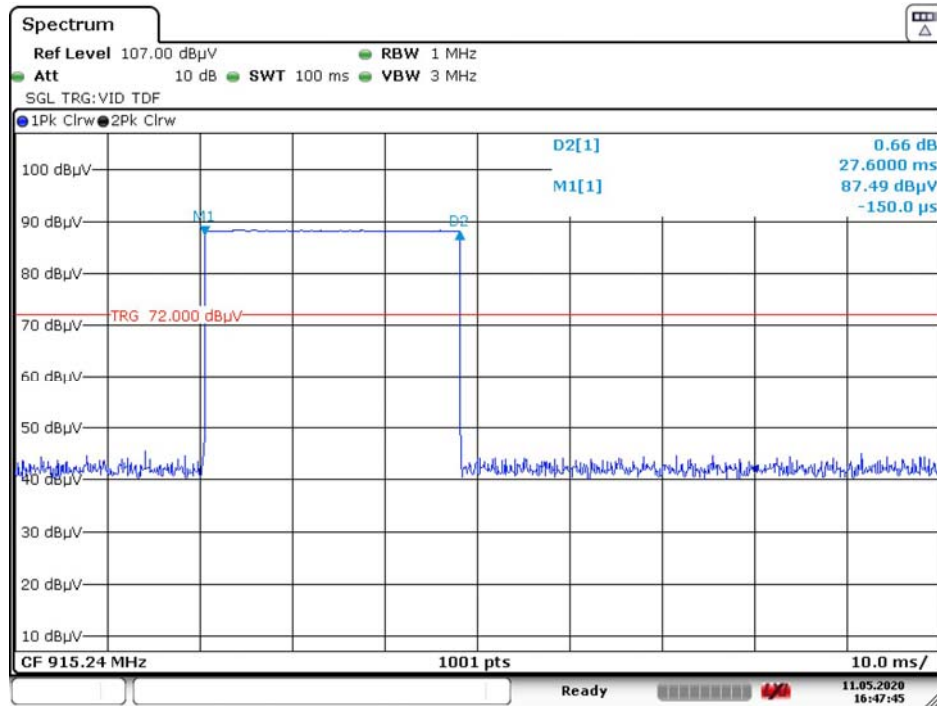
Time on of 100ms= 27.1ms

Duty Cycle= $\frac{27.1\text{ms}}{100\text{ms}} = 0.271$

Duty Cycle correction factor= $20 \text{ LOG } 0.271 = -11.341 \text{ dB}$

Duty Cycle correction factor	-11.341	dB
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Product : RFID reader
 Test Item : Duty Cycle Data
 Test Mode : Mode 1: Transmit



Date: 11.MAY.2020 16:47:45

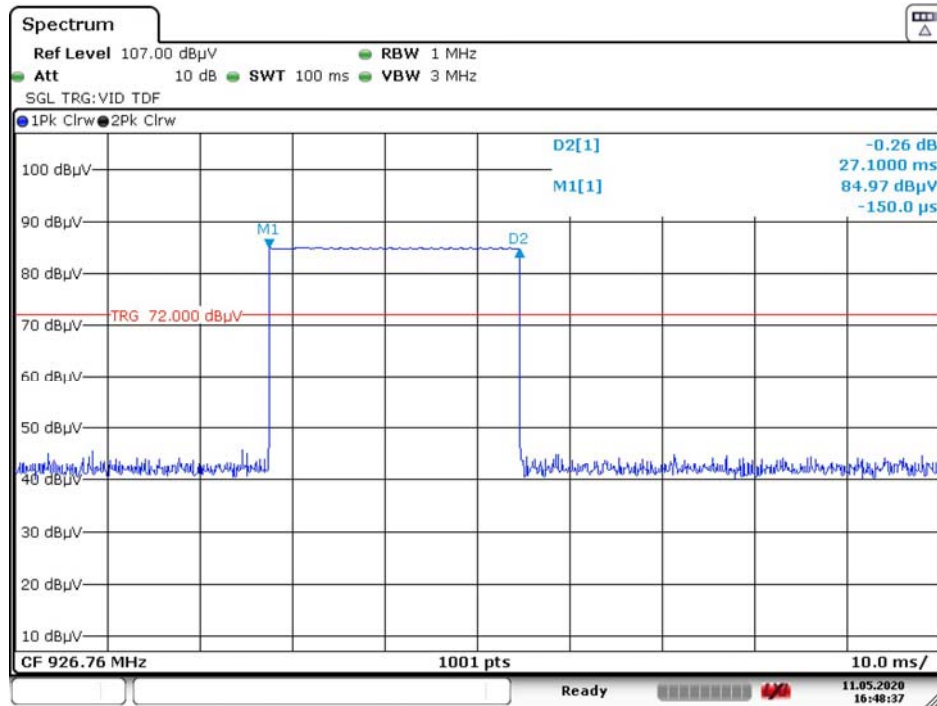
Time on of 100ms= 27.6ms

Duty Cycle=27.6ms / 100ms= 0.276

Duty Cycle correction factor= 20 LOG 0.276= -11.182 dB

Duty Cycle correction factor	-11.182	dB
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Product : RFID reader
 Test Item : Duty Cycle Data
 Test Mode : Mode 1: Transmit



Date: 11.MAY.2020 16:48:37

Time on of 100ms= 27.1ms

Duty Cycle=27.1ms / 100ms= 0.271

Duty Cycle correction factor= 20 LOG 0.271= -11.341 dB

Duty Cycle correction factor	-11.341	dB
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12. EMI Reduction Method During Compliance Testing

No modification was made during testing.