FCC Radio Test Report

FCC ID: VTV-M7EDEKA

Report No.	:	BTL-FCCP-1-2312T070
Equipment	:	UHD RFID Module
Model Name	:	M7E-DEKA, M7E-PICO
Brand Name	:	TSC
Applicant	:	TSC Auto ID Technology Co., Ltd.
Address	:	9F., No. 95, Minquan Rd. Xindian Dist. New Taipei
Radio Function	:	RFID UHF (920 - 928 MHz)
FCC Rule Part(s)	:	FCC CFR Title 47, Part 15, Subpart C (15.247)
Measurement Procedure(s)	:	ANSI C63.10-2013
Date of Receipt	:	2023/12/18
Date of Test	:	2024/1/16 ~ 2024/2/2
Issued Date	:	2024/3/14

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

Prepared by : Eddie Lee, Engineer

Approved by : Jerry Chuang, Supervisor

Testing Laboratory 0659

BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

CONTENTS

REVISON HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-1-2312T070	R00	Original Report.	2024/3/14	Valid

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

Standard(s) Section	Description	Test Result	Judgement	Remark
15.207	AC Power Line Conducted Emissions	APPENDIX A	Pass	------
15.205 15.209 15.247(d)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	Pass	------
15.247(a)(1)(i)	Number of Hopping Channel	APPENDIX E	Pass	------
15.247(f)	Average Time of Occupancy (Dwell Time)	APPENDIX F	Pass	------
15.247(a)(1)	Hopping Channel Separation	APPENDIX G	Pass	------
15.247(a)(1)(i)	20dB Bandwidth	APPENDIX H	Pass	------
15.247(b)(2)	Output Power	APPENDIX I	Pass	------
15.247(d)	Antenna conducted Spurious Emission	APPENDIX J	Pass	------
15.203	Antenna Requirement	------	Pass	------

NOTE:
(1) ”N/A” denotes test is not applicable in this Test Report.
(2) The report format version is TP.1.1.1.

1.1 TEST FACILITY

The test locations stated below are under the TAF Accreditation Number 0659.
The test location(s) used to collect the test data in this report are:
No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)
☐ C05 ☐ CB08 ☐ CB11 ☐ SR10 ☒ SR11
No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)
☒ SR05 ☐ CB12
No. 72, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)
☒ C06 ☒ CB21 ☐ CB22

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expanded uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k = 2**, providing a level of confidence of approximately **95 %**. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U (dB)
SR05	CISPR	150 kHz ~ 30 MHz	3.44

B. Radiated emissions test :

C. Test Site	Method	Measurement Frequency Range	U (dB)
CB21	CISPR	9 kHz ~ 150 kHz	2.82
		150 kHz ~ 30 MHz	2.58

Test Site	Measurement Frequency Range	U (dB)
CB21	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

D. Conducted test :

Test Item	U,(dB)
Number of Hopping Channel	0.00
Average Time of Occupancy (Dwell Time)	1.20
Hopping Channel Separation	1.20
20dB Bandwidth	1.13
Output Power	1.06
Antenna conducted Spurious Emission	1.14
Conducted Band edges	1.13

NOTE:
Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

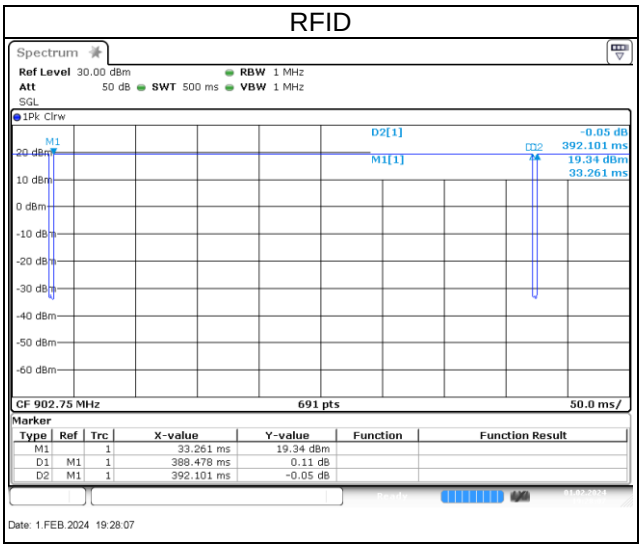
Test Item	Environment Condition	Test Voltage	Tested by
AC Power Line Conducted Emissions	23 °C, 55 %	DC 5.5V	Ken Lan
Radiated emissions below 1 GHz	22 °C, 59 %	DC 5.5V	Kevin Zhen
Radiated emissions above 1 GHz	22 °C, 59 %	DC 5.5V	Kevin Zhen
Number of Hopping Frequency	20 °C, 48 %	DC 5.5V	Easton Tsai
Average Time of Occupancy(Dwell Time)	20 °C, 48 %	DC 5.5V	Easton Tsai
Hopping Channel Separation	20 °C, 48 %	DC 5.5V	Easton Tsai
20dB Bandwidth	20 °C, 48 %	DC 5.5V	Easton Tsai
Output Power	20 °C, 48 %	DC 5.5V	Easton Tsai
Antenna conducted Spurious Emission	20 °C, 48 %	DC 5.5V	Easton Tsai

1.4 DUTY CYCLE

If duty cycle is ≥ 98 %, duty factor is not required.
If duty cycle is < 98 %, duty factor shall be considered.

Mode	ON (ms)	Numbers (ON)	On Time (B) (ms)	Period (ON+OFF) (ms)	Duty Cycle (%)	Duty Factor (dB)
RFID	388.478	1	388.478	392.101	99.08%	Not Considered

RFID



2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	UHD RFID Module
Model Name	M7E-DEKA, M7E-PICO
Brand Name	TSC
Model Difference	Different model distribute to different area.
Power Source	Supplied from host.
Power Rating	DC 3.3~5.5V
Products Covered	3 * Antenna: (1) TSC / RFID PCB antenna 1 (2) TSC / RFID PCB antenna 2 (3) TSC / RFID PCB antenna 3
Operation Frequency	902 MHz ~ 928 MHz
Modulation Type	FSK
Modulation Technology	FHSS
Output Power Max.	10.68 dBm (0.0117 W)
Test Model	M7E-DEKA
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:
(1) The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

(2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
902750	902.75	911250	911.25	919750	919.75
903250	903.25	911750	911.75	920250	920.25
903750	903.75	912250	912.25	920750	920.75
904250	904.25	912750	912.75	921250	921.25
904750	904.75	913250	913.25	921750	921.75
905250	905.25	913750	913.75	922250	922.25
905750	905.75	914250	914.25	922750	922.75
906250	906.25	914750	914.75	923250	923.25
906750	906.75	915250	915.25	923750	923.75
907250	907.25	915750	915.75	924250	924.25
907750	907.75	916250	916.25	924750	924.75
908250	908.25	916750	916.75	925250	925.25
908750	908.75	917250	917.25	925750	925.75
909250	909.25	917750	917.75	926250	926.25
909750	909.75	918250	918.25	926750	926.75
910250	910.25	918750	918.75	927250	927.25
910750	910.75	919250	919.25		

(3) Table for Filed Antenna:

Ant.	Manufacture	Model	Type	Connector	Frequency Range (MHz)	Gain (dBi)
Ant 1	TSC	RFID PCB antenna 1	PCB	MHF Connector	902-928	1.68
Ant 2	TSC	RFID PCB antenna 2	PCB	MHF Connector	902-928	-5.48
Ant 3	TSC	RFID PCB antenna 3	PCB	MHF Connector	902-928	0.2

(4) The above Antenna information are derived from the antenna data sheet provided by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.2 TEST MODES

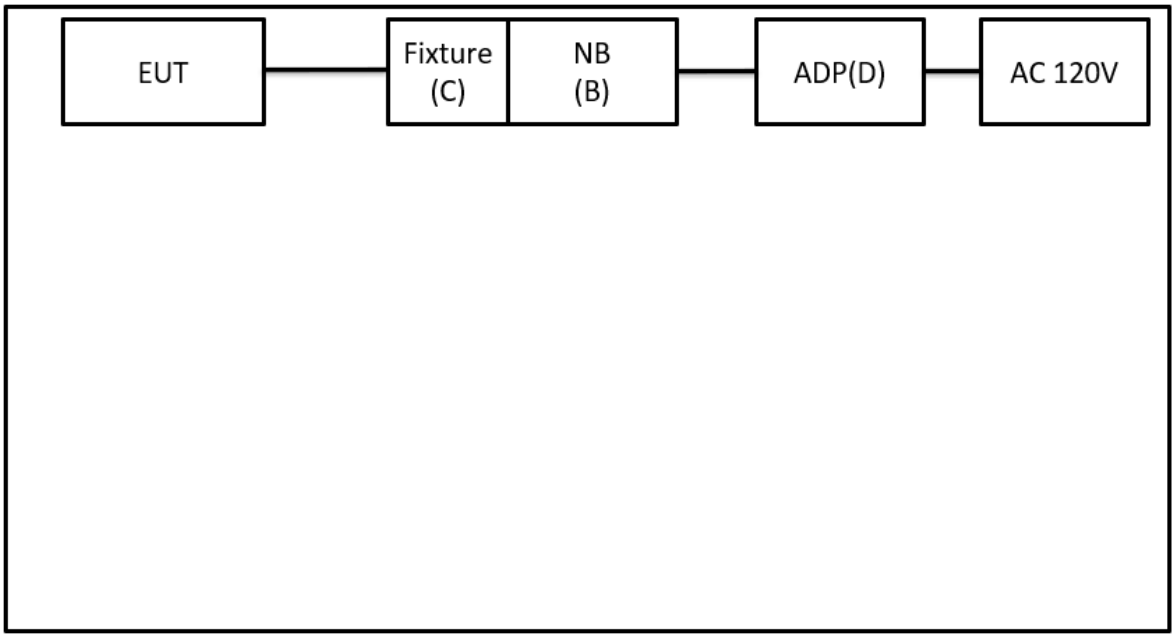
Test Items	Test mode	Channel	Note
AC power line conducted emissions	Normal/Idle	-	-
Transmitter Radiated Emissions (below 30MHz)	RFID	927250	-
Transmitter Radiated Emissions (30MHz TO 1GHz)	RFID	915250	-
Transmitter Radiated Emissions (above 1GHz)	RFID	902750/915250 /927250	Harmonic
Number of Hopping Frequency	RFID	Hopping	-
Average Time of Occupancy(Dwell Time)	RFID	902750/915250 /927250	-
Hopping Channel Separation	RFID	902750/915250 /927250	-
20dB Bandwidth	RFID	902750/915250 /927250	-
Output Power	RFID	902750/915250 /927250	-
Antenna conducted Spurious Emission	RFID	902750/915250 /927250	-

NOTE:
(1) All X, Y and Z axes are evaluated, but only the worst case (X axis) is recorded.

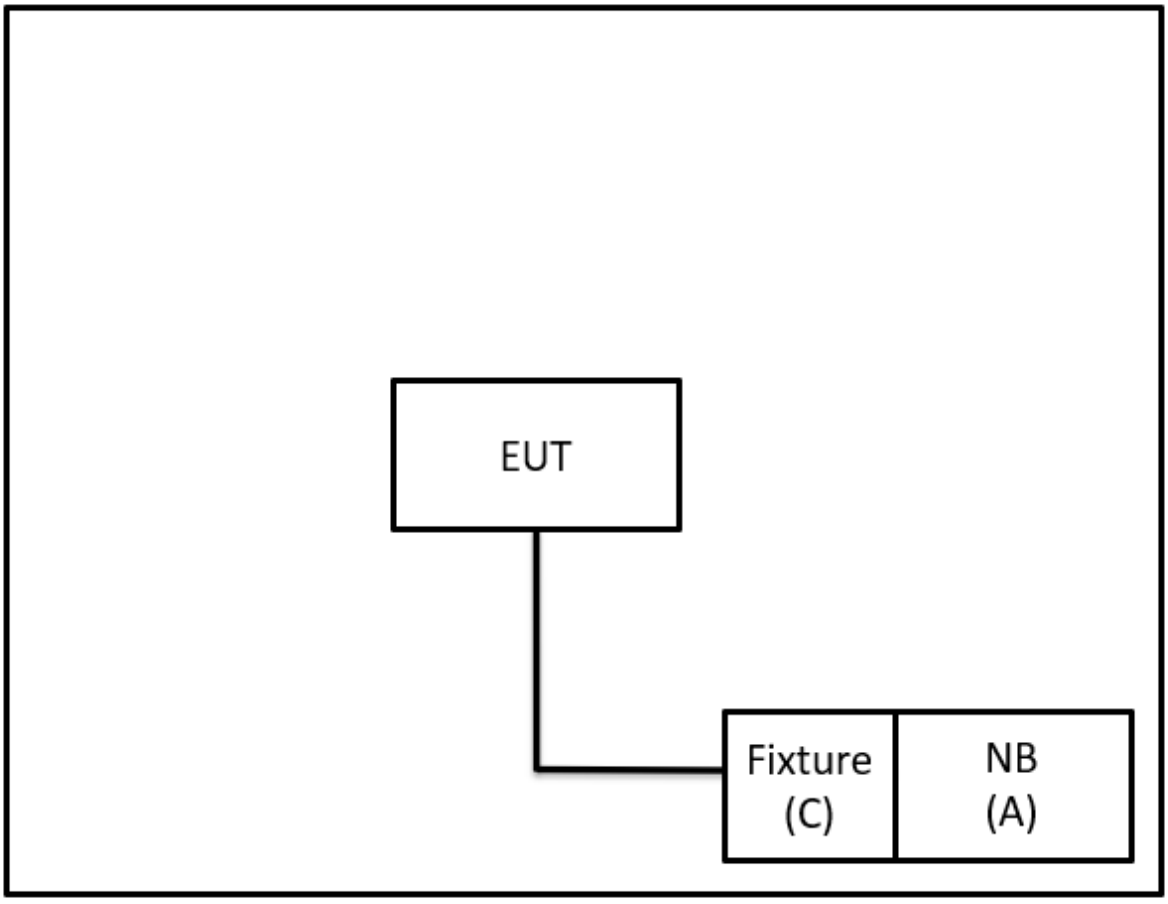
2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.

AC power line conducted emissions



Radiated Emissions



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
A	NB	Dynabook	TPN-C125	N/A	Furnished by test lab.
B	NB	Lenovo	E14	N/A	Furnished by test lab.
C	Fixture	N/A	CP2102	N/A	Furnished by test lab.
D	ADP	Lenovo	ADLX45YCC2D	N/A	Furnished by test lab.

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
-	-	-	-	-	-

3 AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	56 - 46 *
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:
(1) The tighter limit applies at the band edges.
(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
(3) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor (if use)
Margin Level = Measurement Value – Limit Value
Calculation example:

Reading Level (dBuV)		Correct Factor (dB)		Measurement Value (dBuV)
38.22	+	3.45	=	41.67

Measurement Value (dBuV)		Limit Value (dBuV)		Margin Level (dB)
41.67	-	60	=	-18.33

The following table is the setting of the receiver.

Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

3.2 TEST PROCEDURE

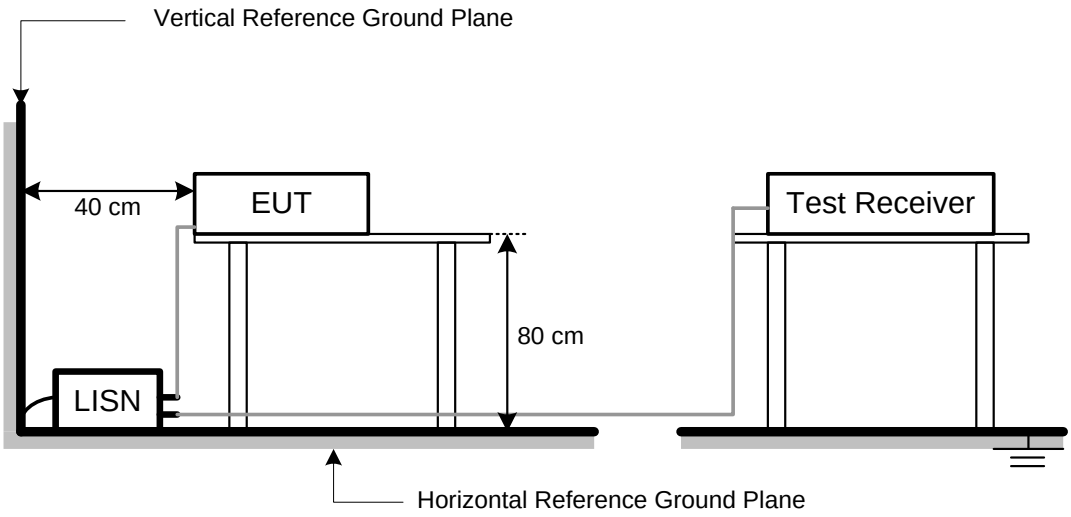
a. The EUT was placed 0.8 m above the horizontal ground plane with the EUT being connected to the power mains through a line impedance stabilization network (LISN).
All other support equipment were powered from an additional LISN(s).
The LISN provides 50 Ohm/50uH of impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle to keep the cable above 40 cm.
c. Excess I/O cables that are not connected to a peripheral shall be bundled in the center.
The end of the cable will be terminated, using the correct terminating impedance.
The overall length shall not exceed 1 m.
d. The LISN is spaced at least 80 cm from the nearest part of the EUT chassis.
e. For the actual test configuration, please refer to the related Item - EUT TEST PHOTO.

NOTE:
(1) In the results, each reading is marked as Peak, QP or AVG per the detector used.
BW=9 kHz (6 dB Bandwidth)
(2) All readings are Peak unless otherwise stated QP or AVG in column of Note. Both the QP and the AVG readings must be less than the limit for compliance.

3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4 TEST SETUP



3.5 TEST RESULT

Please refer to the APPENDIX A.

4 RADIATED EMISSIONS TEST

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205, then the 15.209 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF RADIATED EMISSIONS MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	Radiated Emissions (dBuV/m)		Measurement Distance (meters)
	Peak	Average	
Above 1000	74	54	3

NOTE:
(1) The limit for radiated test was performed according to FCC Part 15, Subpart C.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).
(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value
Calculation example:

Reading Level (dBuV)		Correct Factor (dB)		Measurement Value (dBuV/m)
35.45	+	-11.37	=	24.08

Measurement Value (dBuV/m)		Limit Value (dBuV/m)		Margin Level (dB)
24.08	-	40	=	-15.92

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

4.2 TEST PROCEDURE

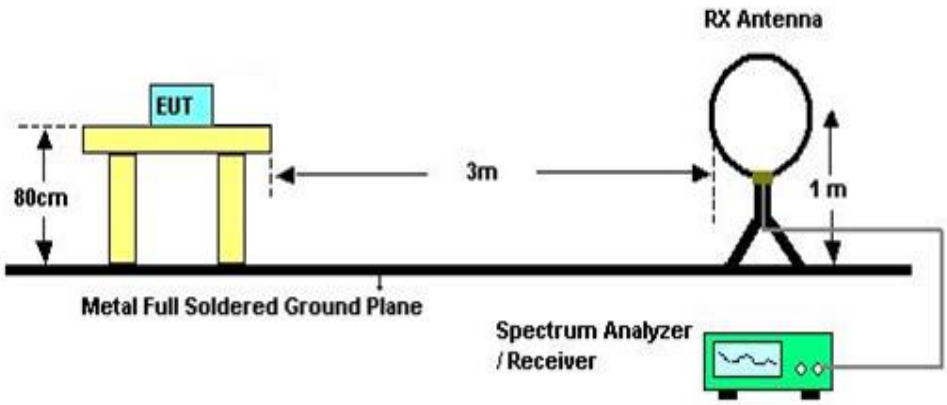
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1GHz)
i. For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

4.3 DEVIATION FROM TEST STANDARD

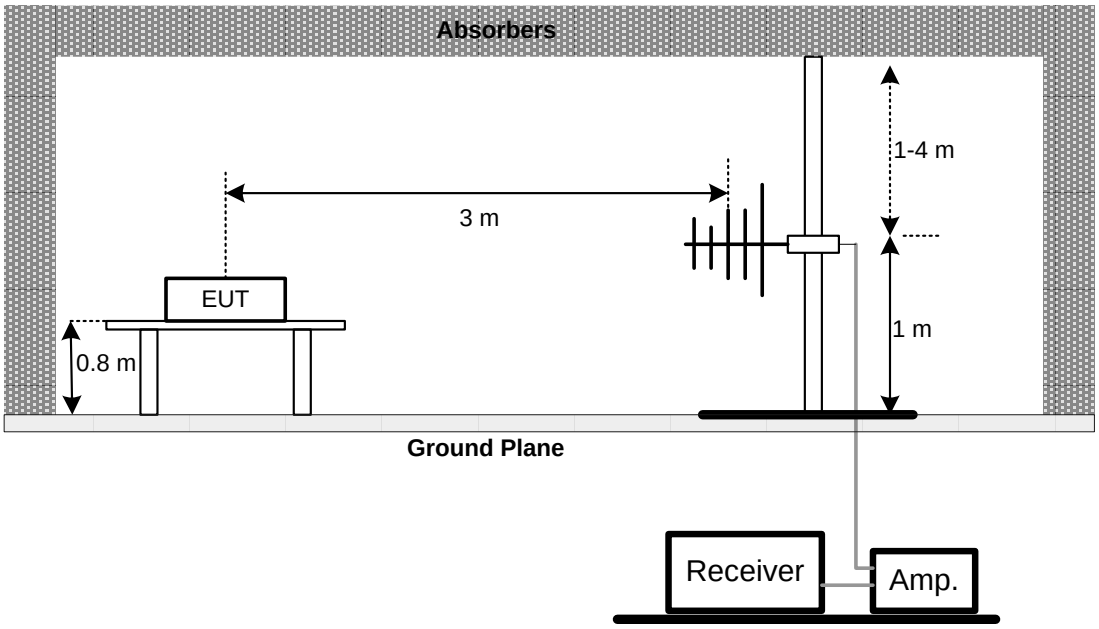
No deviation.

4.4 TEST SETUP

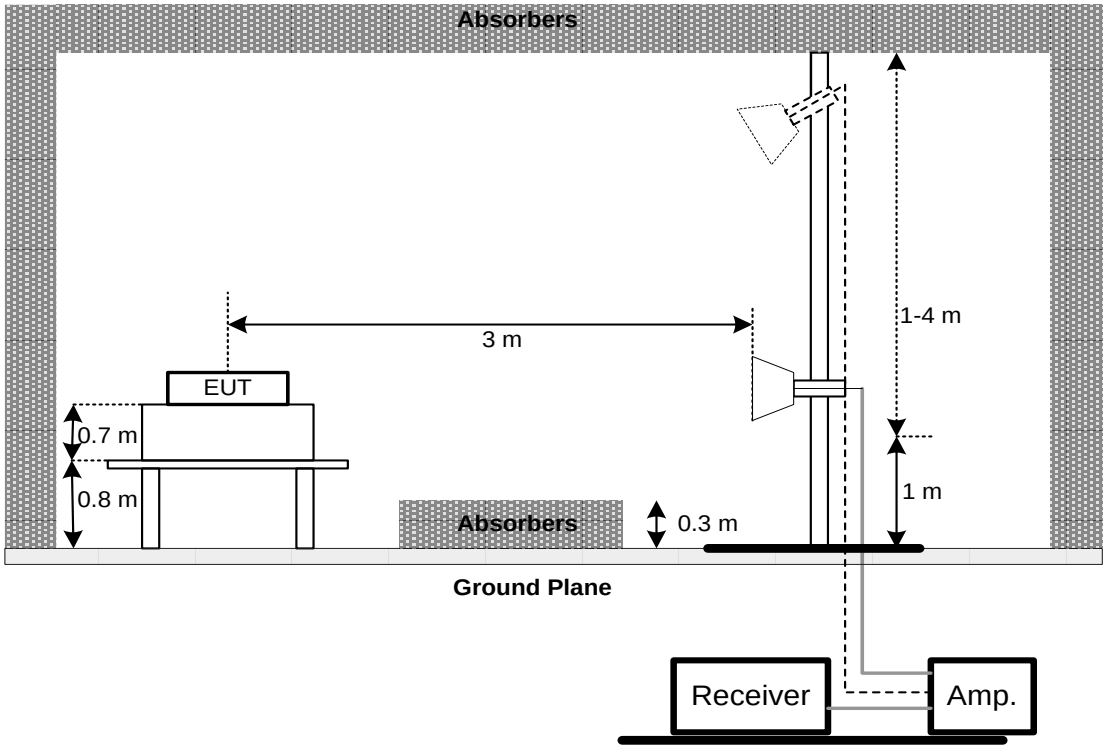
9 kHz to 30 MHz



30 MHz to 1 GHz



Above 1 GHz



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT – BELOW 30 MHZ

Please refer to the APPENDIX B.

4.7 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX C.

4.8 TEST RESULT – ABOVE 1 GHZ

Please refer to the APPENDIX D.

NOTE:

(1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5 NUMBER OF HOPPING CHANNEL

5.1 LIMIT

☒ N ≥ 50, 20 dB bandwidth of the hopping channel is less than 250 kHz
☐ N ≥ 25, 20 dB bandwidth of the hopping channel is 250 kHz or greater
☐ Hybrid mode, No minimum number of hopping channels associated with hybrid system.
N: Number of Hopping Frequencies

5.2 TEST PROCEDURE

a. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Pf eak Trace max hold.
b. Allow trace to stabilize.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP

5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Please refer to the APPENDIX E.

6 AVERAGE TIME OF OCCUPANCY (DWELL TIME)

6.1 LIMIT

☒ ≤ 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz
☐ ≤ 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater
☐ Hybrid mode ,an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

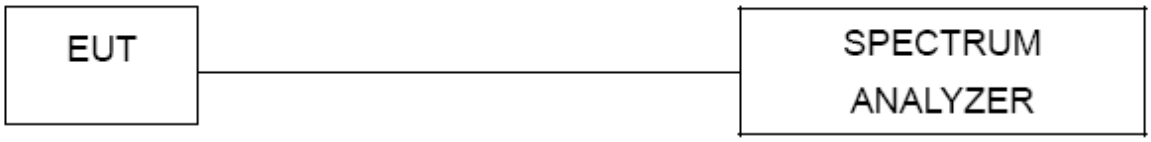
6.2 TEST PROCEDURE

a. Set RBW=100kHz, VBW=300kHz, Sweep time=6.4s / 500ms, Detector=Peak, Span=0Hz, Trace max hold.
b. Measure and record the burst on time.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

Please refer to the APPENDIX F.

7 HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 LIMIT

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.

7.2 LIMIT

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.

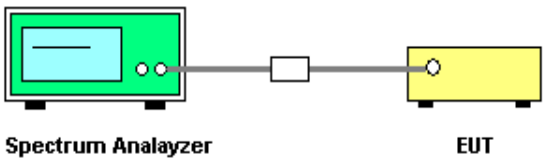
7.3 TEST PROCEDURE

The test procedures are followed to clause 7.8.2 of ANSI C63.10.

7.4 DEVIATION FROM STANDARD

No deviation.

7.5 TEST SETUP



7.6 TEST RESULTS

Please refer to the APPENDIX G.

8 20 dB BANDWIDTH TEST

8.1 LIMIT

The maximum allowed 20 dB bandwidth of the hopping channel is 250 kHz.

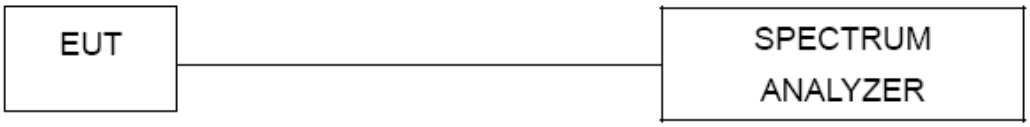
8.2 TEST PROCEDURE

a. Set RBW=3kHz, VBW=10kHz, Sweep time=Auto, Detector=Peak Trace max hold.
b. Allow trace to stabilize.
c. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

8.6 TEST RESULTS

Please refer to the APPENDIX H.

9 OUTPUT POWER TEST

9.1 LIMIT

☐ 1 Watt, systems using digital modulation
☒ 1 Watt, frequency hopping systems employing at least 50 hopping channels
☐ 0.25 Watt, frequency hopping systems employing less than 50 hopping channels, but at least 25 hopping channels

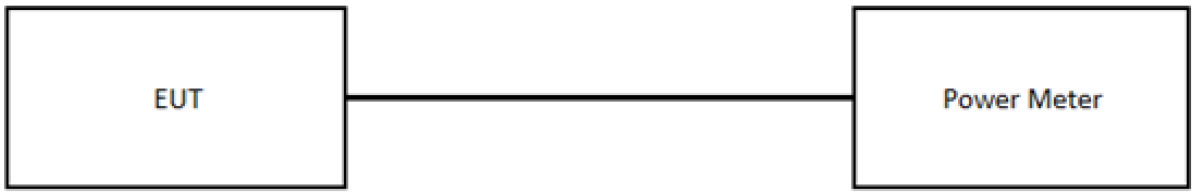
9.2 TEST PROCEDURE

a. A wideband power meter is used for power measurement. Bandwidth of power senor and meter is 50MHz
b. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power

9.3 DEVIATION FROM STANDARD

No deviation.

9.4 TEST SETUP



9.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

9.6 TEST RESULTS

Please refer to the APPENDIX I.

10 ANTENNA CONDUCTED SPURIOUS EMISSION

10.1 LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits.

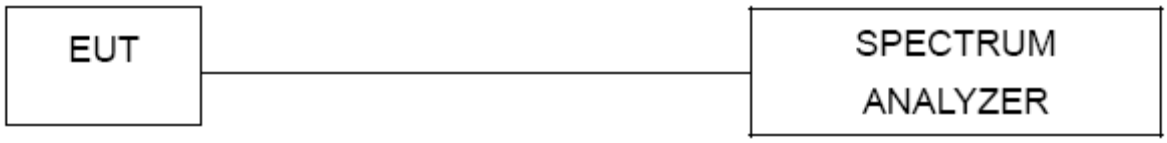
10.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW= 100KHz, VBW=100KHz, Sweep time = Auto.
c. Offset=antenna gain+cable loss

10.3 DEVIATION FROM STANDARD

No deviation.

10.4 TEST SETUP



10.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

10.6 TEST RESULTS

Please refer to the APPENDIX J.

11 LIST OF MEASURING EQUIPMENTS

AC Power Line Conducted Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	TWO-LINE V-NETWORK	R&S	ENV216	101497	2023/5/18	2024/5/17
2	Test Cable	EMCI	EMC400-BM-BM-5000	170501	2023/8/1	2024/7/31
3	EMI Test Receiver	R&S	ESR3	102950	2023/4/12	2024/4/11
4	Measurement Software	EZ	EZ_EMC (Version NB-03A1-01)	N/A	N/A	N/A

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC330N	980850	2023/9/6	2024/9/5
2	Preamplifier	EMCI	EMC118A45SE	980819	2023/3/7	2024/3/5
3	Preamplifier	EMCI	EMC001340	980579	2023/9/6	2024/9/5
4	Test Cable	EMCI	EMC104-SM-1000	180809	2023/7/10	2024/7/9
5	Test Cable	EMCI	EMC104-SM-SM-3000	220322	2023/3/14	2024/3/13
6	Test Cable	EMCI	EMC104-SM-SM-7000	220324	2023/3/14	2024/3/13
7	EXA Signal Analyzer	keysight	N9020B	MY57120120	2023/2/24	2024/2/23
8	Loop Ant	Electro-Metrics	EMCI-LPA600	291	2023/9/12	2024/9/11
9	Horn Antenna	RFSPIN	DRH18-E	211202A18EN	2023/5/12	2024/5/11
10	Log-bicon Antenna	Schwarzbeck	VULB9168	1369	2023/5/9	2024/5/8
11	6dB Attenuator	EMCI	EMCI-N-6-06	AT-06001	2023/5/9	2024/5/8
12	Measurement Software	EZ	EZ_EMC (Version NB-03A1-01)	N/A	N/A	N/A

Number of Hopping Frequency						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

Average Time of Occupancy(Dwell Time)						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

Hopping Channel Separation						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

20dB Bandwidth						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

Output Power						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Power Meter	Anritsu	ML2495A	1128008	2020/6/11	2021/6/10
2	Power Sensor	Anritsu	MA2411B	1126001	2020/6/11	2021/6/10

Antenna conducted Spurious Emission						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

Remark: “N/A” denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

12 EUT TEST PHOTO

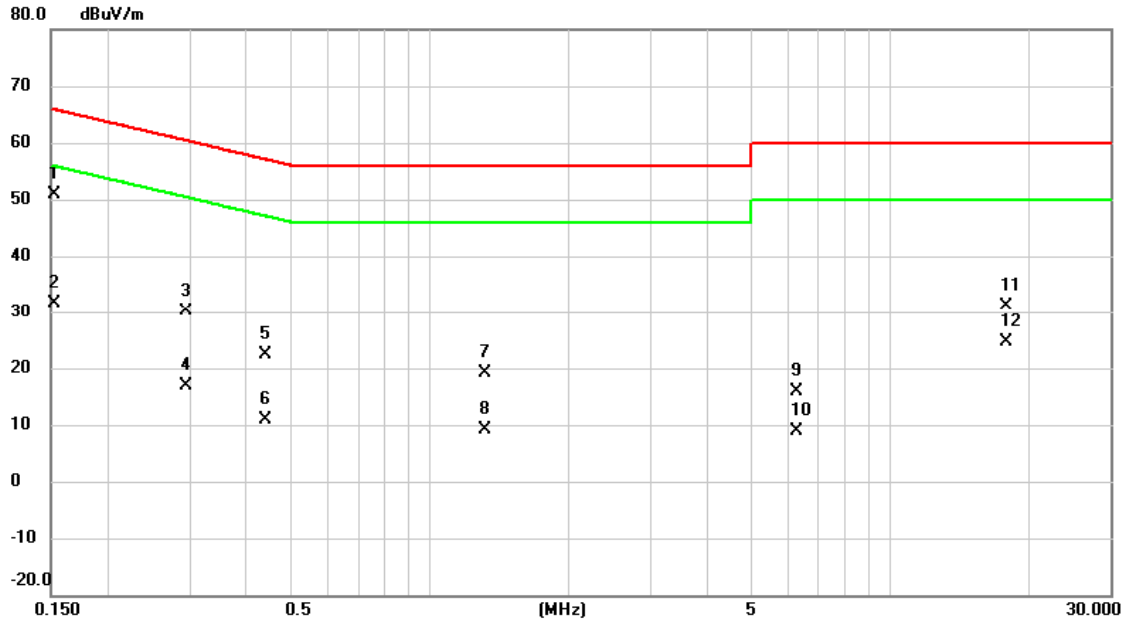
Please refer to document Appendix No.: TP-2312T070-FCCP-1 (APPENDIX-TEST PHOTOS).

13 EUT PHOTOS

Please refer to document Appendix No.: EP-2312T070-1 (APPENDIX-EUT PHOTOS).

APPENDIX A AC POWER LINE CONDUCTED EMISSIONS

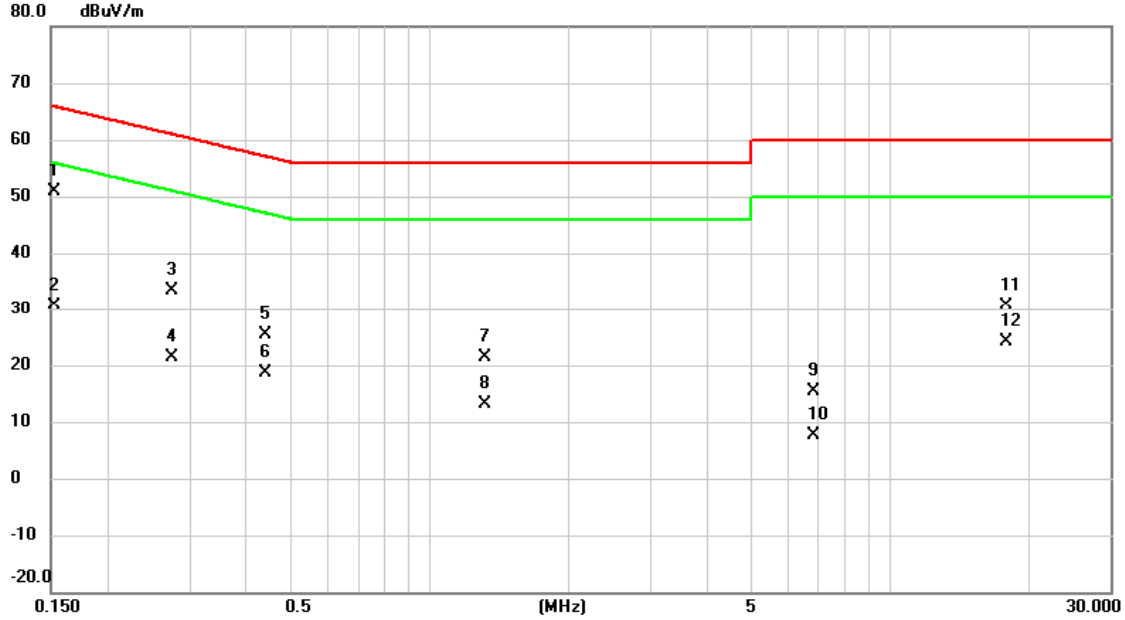
Test Mode	Normal	Tested Date	2024/1/16
Test Frequency	-	Phase	Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.1532	41.09	9.80	50.89	65.82	-14.93	QP	
2		0.1532	21.95	9.80	31.75	55.82	-24.07	AVG	
3		0.2940	20.40	9.77	30.17	60.41	-30.24	QP	
4		0.2940	7.07	9.77	16.84	50.41	-33.57	AVG	
5		0.4402	12.62	9.76	22.38	57.06	-34.68	QP	
6		0.4402	1.07	9.76	10.83	47.06	-36.23	AVG	
7		1.3200	9.43	9.78	19.21	56.00	-36.79	QP	
8		1.3200	-0.62	9.78	9.16	46.00	-36.84	AVG	
9		6.2768	6.11	9.79	15.90	60.00	-44.10	QP	
10		6.2768	-0.96	9.79	8.83	50.00	-41.17	AVG	
11		17.8868	21.09	10.13	31.22	60.00	-28.78	QP	
12		17.8868	14.61	10.13	24.74	50.00	-25.26	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

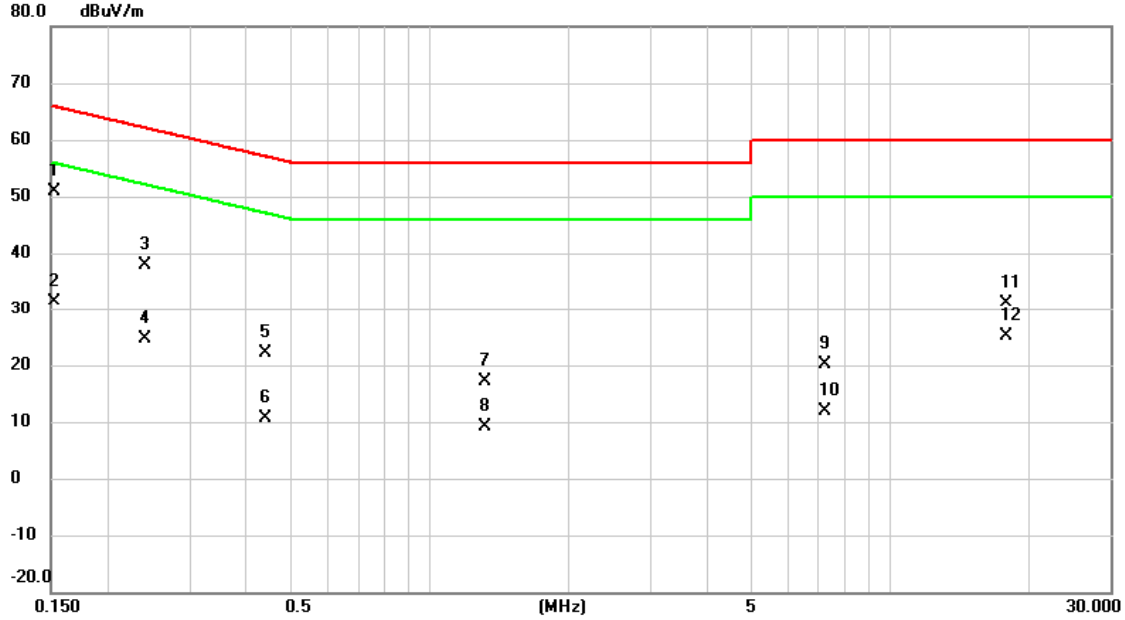
Test Mode	Normal	Tested Date	2024/1/16
Test Frequency	-	Phase	Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.1522	41.03	9.77	50.80	65.88	-15.08	QP	
2		0.1522	20.84	9.77	30.61	55.88	-25.27	AVG	
3		0.2737	23.62	9.76	33.38	61.00	-27.62	QP	
4		0.2737	11.74	9.76	21.50	51.00	-29.50	AVG	
5		0.4402	15.69	9.75	25.44	57.06	-31.62	QP	
6		0.4402	8.94	9.75	18.69	47.06	-28.37	AVG	
7		1.3200	11.70	9.78	21.48	56.00	-34.52	QP	
8		1.3200	3.44	9.78	13.22	46.00	-32.78	AVG	
9		6.8280	5.55	9.79	15.34	60.00	-44.66	QP	
10		6.8280	-2.25	9.79	7.54	50.00	-42.46	AVG	
11		17.8868	20.34	10.25	30.59	60.00	-29.41	QP	
12		17.8868	13.90	10.25	24.15	50.00	-25.85	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

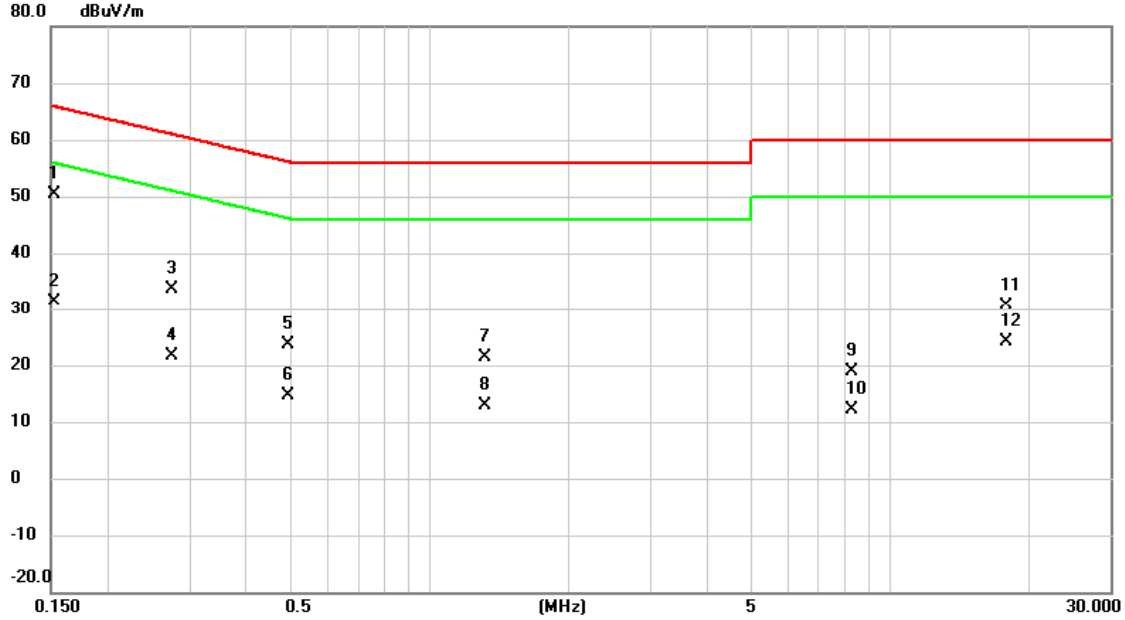
Test Mode	Idle	Tested Date	2024/1/16
Test Frequency	-	Phase	Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.1522	41.07	9.80	50.87	65.88	-15.01	QP	
2		0.1522	21.50	9.80	31.30	55.88	-24.58	AVG	
3		0.2400	28.09	9.78	37.87	62.10	-24.23	QP	
4		0.2400	14.85	9.78	24.63	52.10	-27.47	AVG	
5		0.4402	12.32	9.76	22.08	57.06	-34.98	QP	
6		0.4402	0.75	9.76	10.51	47.06	-36.55	AVG	
7		1.3200	7.27	9.78	17.05	56.00	-38.95	QP	
8		1.3200	-0.58	9.78	9.20	46.00	-36.80	AVG	
9		7.2128	10.27	9.78	20.05	60.00	-39.95	QP	
10		7.2128	2.15	9.78	11.93	50.00	-38.07	AVG	
11		17.8868	20.96	10.13	31.09	60.00	-28.91	QP	
12		17.8868	15.02	10.13	25.15	50.00	-24.85	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	Idle	Tested Date	2024/1/16
Test Frequency	-	Phase	Neutral

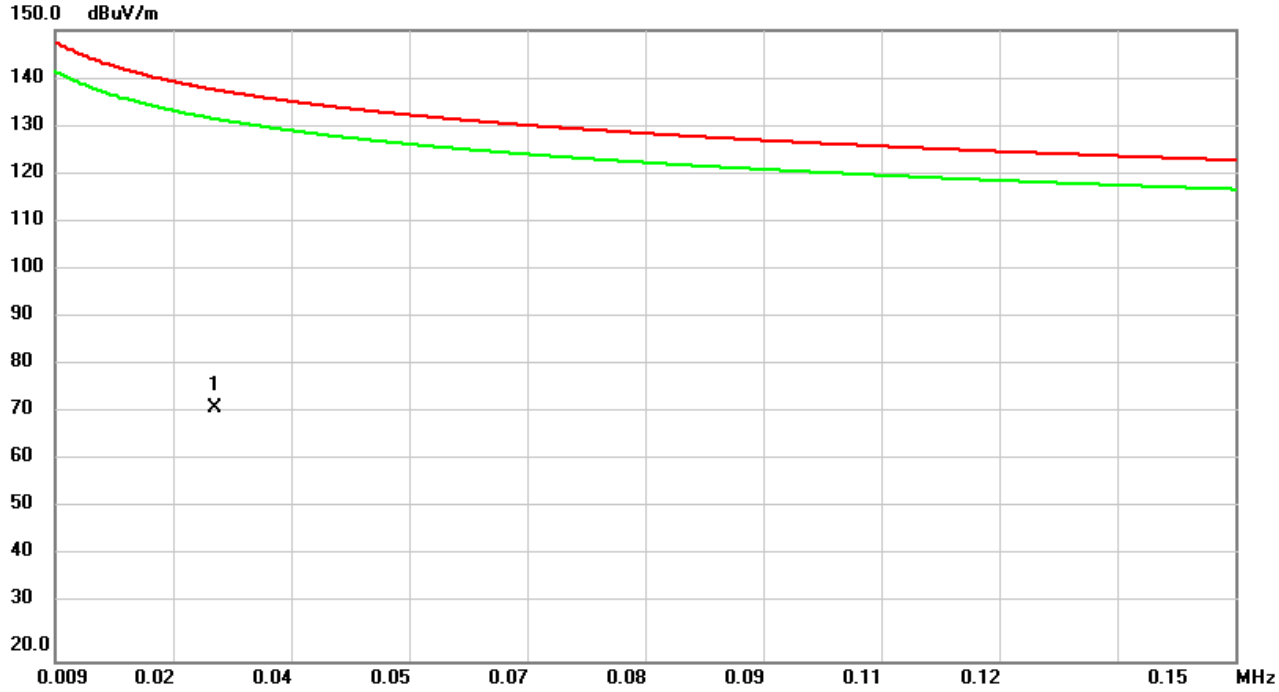


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.1522	40.63	9.77	50.40	65.88	-15.48	QP	
2		0.1522	21.57	9.77	31.34	55.88	-24.54	AVG	
3		0.2737	23.84	9.76	33.60	61.00	-27.40	QP	
4		0.2737	11.77	9.76	21.53	51.00	-29.47	AVG	
5		0.4920	13.77	9.75	23.52	56.13	-32.61	QP	
6		0.4920	4.78	9.75	14.53	46.13	-31.60	AVG	
7		1.3200	11.50	9.78	21.28	56.00	-34.72	QP	
8		1.3200	2.99	9.78	12.77	46.00	-33.23	AVG	
9		8.2567	9.01	9.79	18.80	60.00	-41.20	QP	
10		8.2567	2.24	9.79	12.03	50.00	-37.97	AVG	
11		17.8868	20.26	10.25	30.51	60.00	-29.49	QP	
12		17.8868	14.00	10.25	24.25	50.00	-25.75	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX B RADIATED EMISSIONS - 9 KHZ TO 30 MHZ

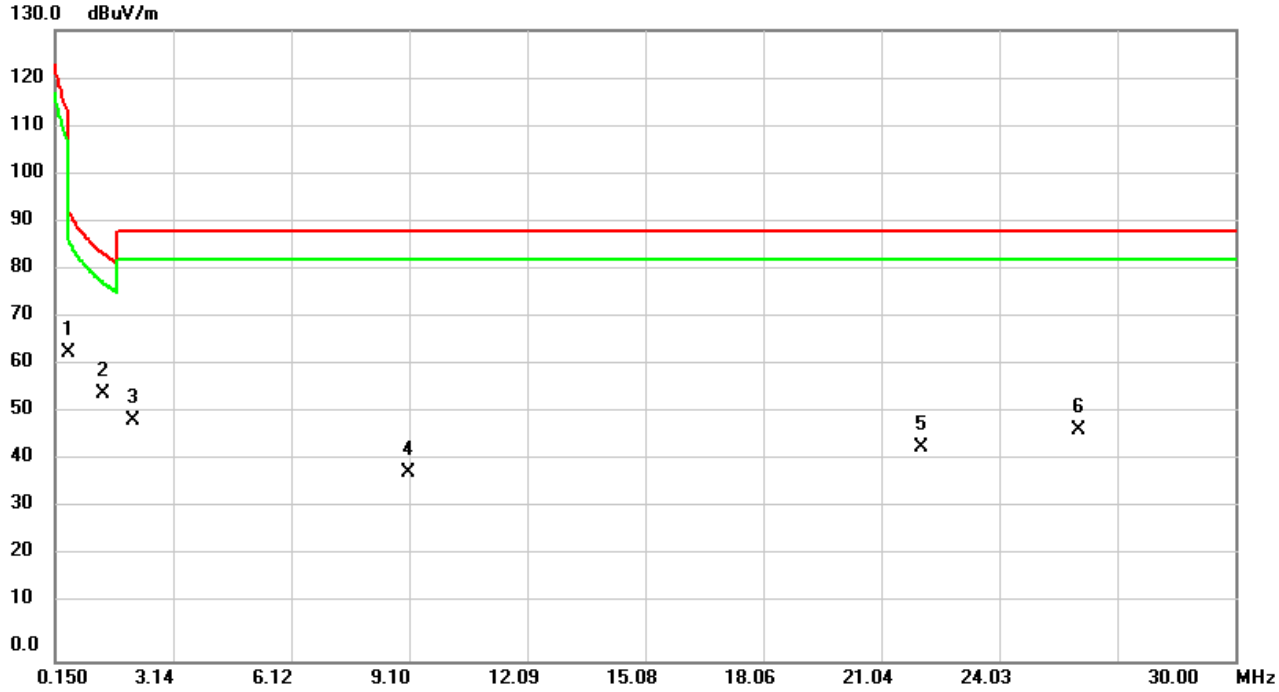
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	927.25MHz	Polarization	Vertical
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0281	43.11	28.95	72.06	137.71	-65.65	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

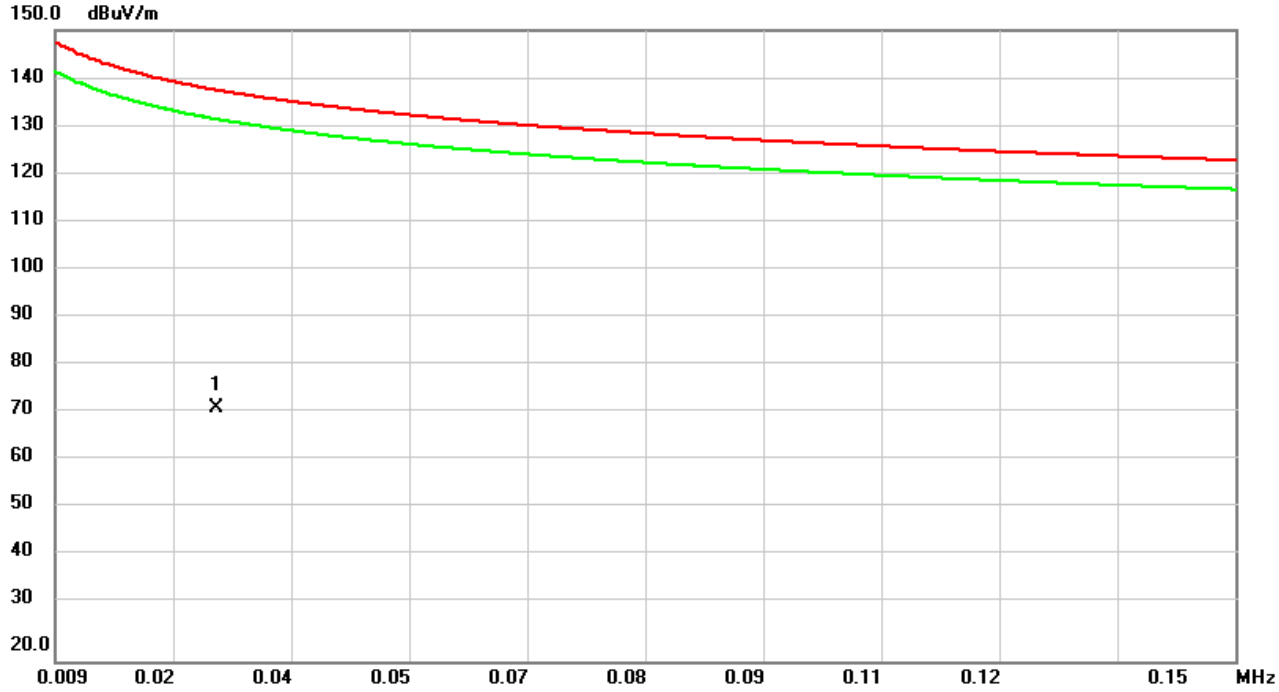
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	927.25MHz	Polarization	Vertical
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.4734	58.11	5.56	63.67	113.18	-49.51	QP	
2	*	1.3538	55.19	-0.10	55.09	84.05	-28.96	QP	
3		2.1330	51.59	-2.06	49.53	88.62	-39.09	QP	
4		9.0771	42.22	-3.43	38.79	88.62	-49.83	QP	
5		22.0748	47.02	-3.12	43.90	88.62	-44.72	QP	
6		26.0380	48.92	-1.24	47.68	88.62	-40.94	QP	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

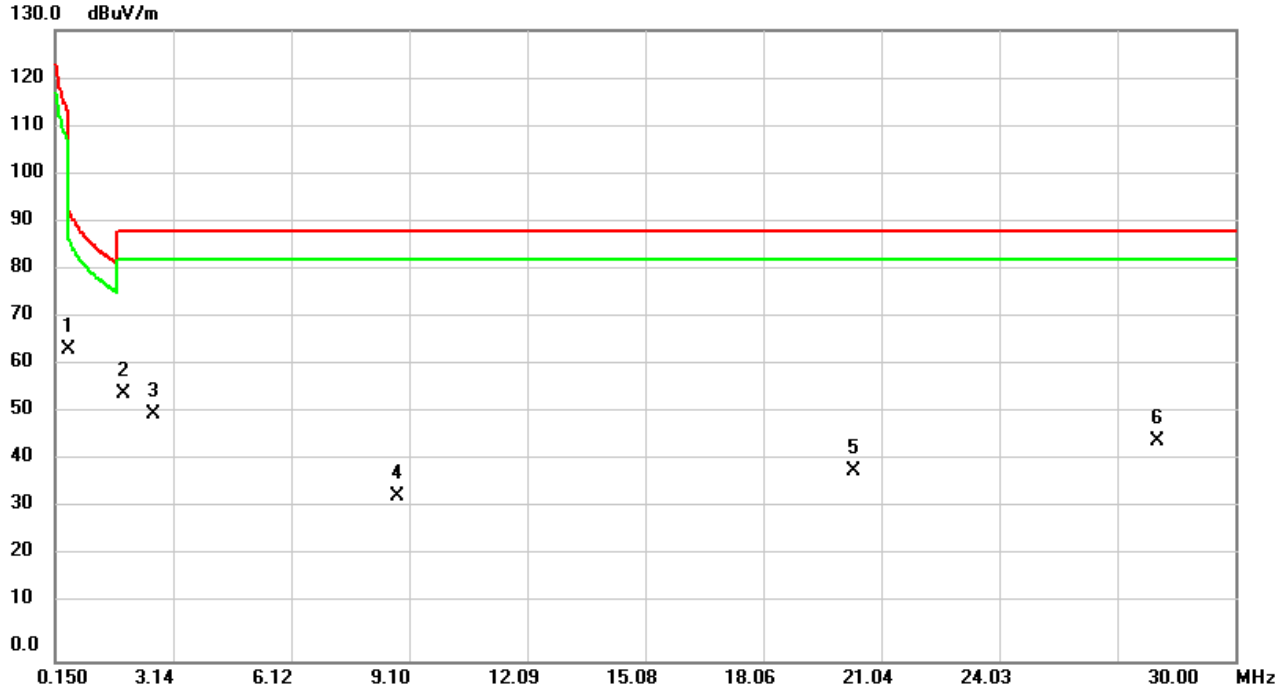
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	927.25MHz	Polarization	Horizontal
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0282	43.23	28.91	72.14	137.68	-65.54	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	RFID	Test Date	2024/1/16
Test Frequency	927.25MHz	Polarization	Horizontal
Temp	22°C	Hum.	59%

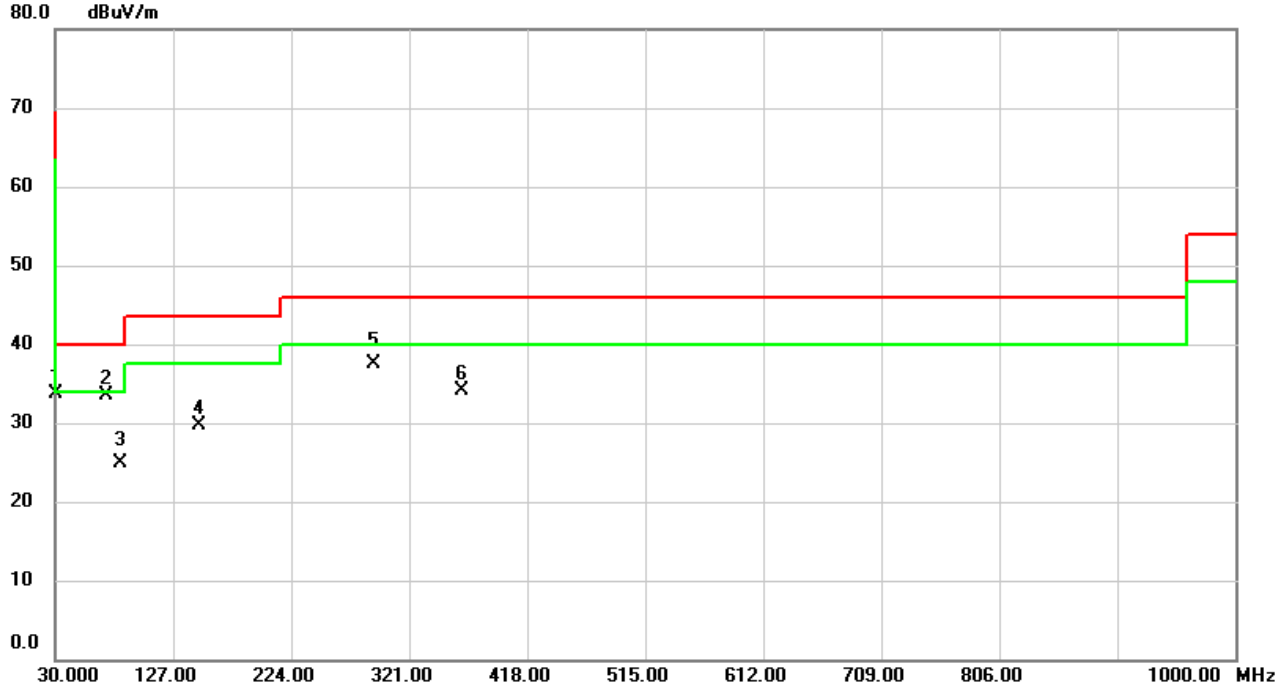


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.4754	58.71	5.53	64.24	113.14	-48.90	QP	
2	*	1.8704	56.48	-1.45	55.03	88.62	-33.59	QP	
3		2.6395	53.86	-3.08	50.78	88.62	-37.84	QP	
4		8.8075	37.47	-3.49	33.98	88.62	-54.64	QP	
5		20.3306	43.25	-3.96	39.29	88.62	-49.33	QP	
6		28.0438	45.58	-0.29	45.29	88.62	-43.33	QP	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX C RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

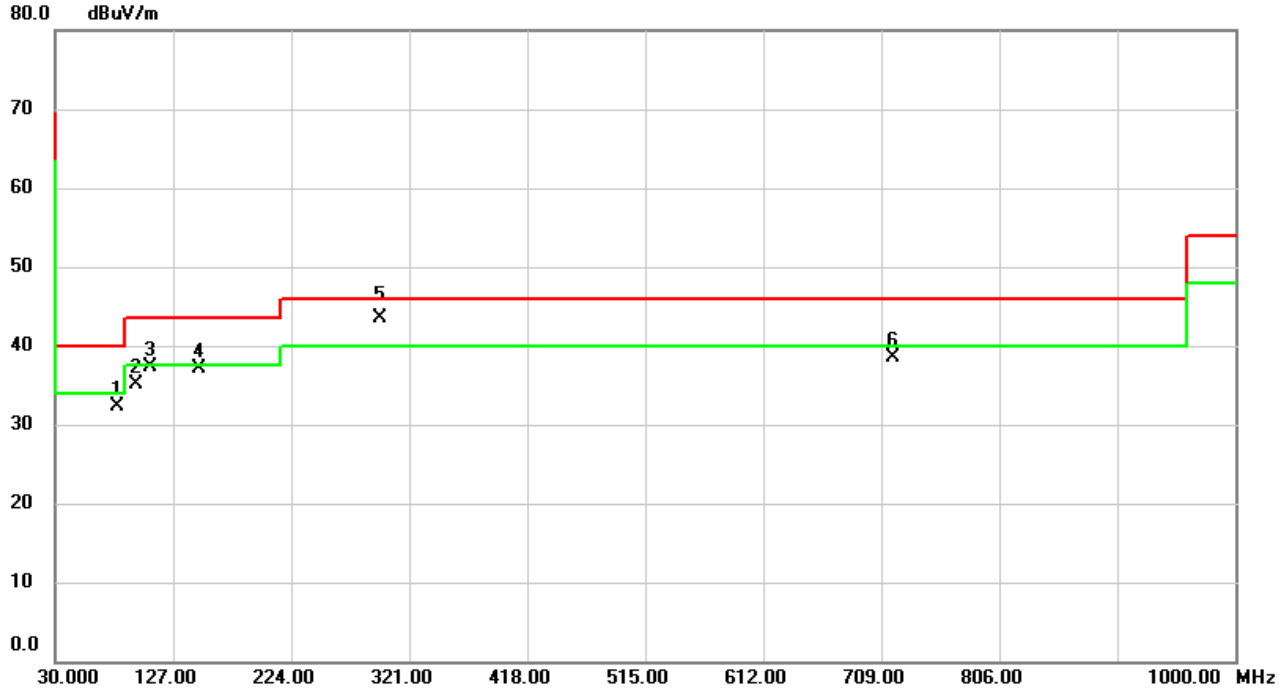
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	915.25MHz	Polarization	Vertical
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	30.0000	47.06	-13.32	33.74	40.00	-6.26	peak	
2		72.0333	47.98	-14.52	33.46	40.00	-6.54	peak	
3		84.1583	41.89	-17.02	24.87	40.00	-15.13	QP	
4		148.4370	41.58	-11.89	29.69	43.50	-13.81	peak	
5		291.5443	48.96	-11.41	37.55	46.00	-8.45	QP	
6		364.8763	43.77	-9.72	34.05	46.00	-11.95	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	RFID	Test Date	2024/1/16
Test Frequency	915.25MHz	Polarization	Horizontal
Temp	22°C	Hum.	59%

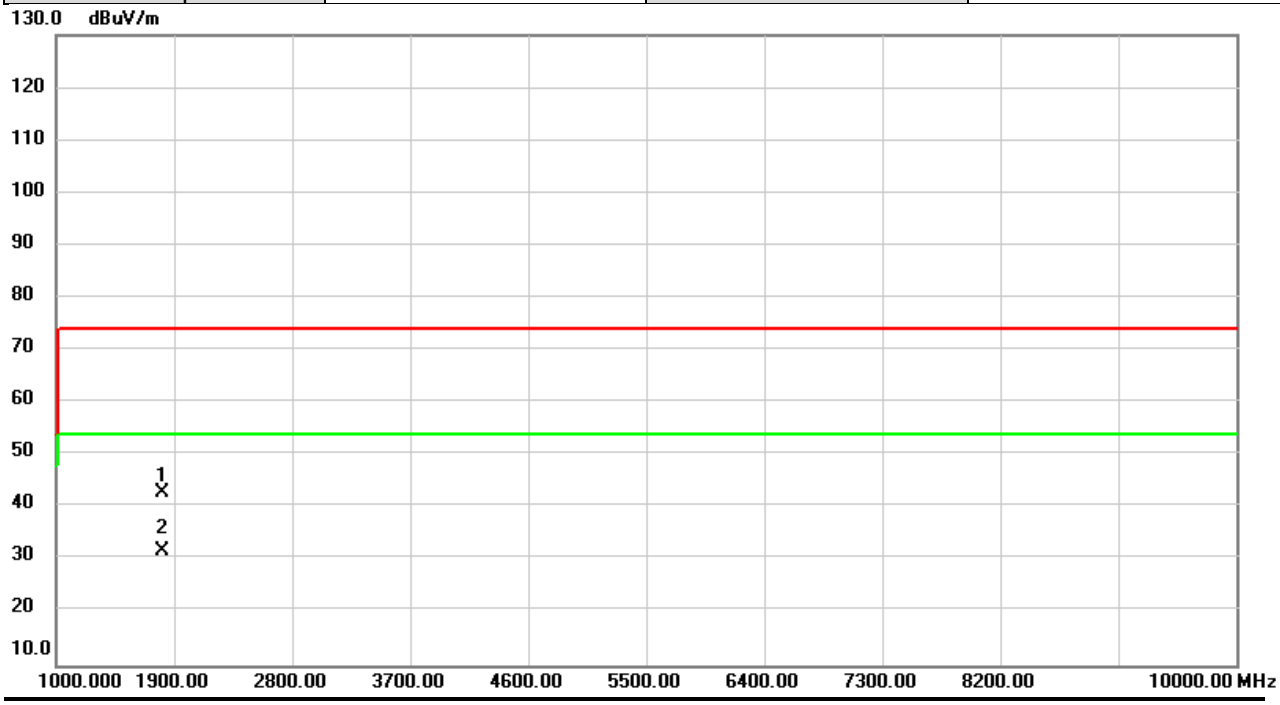


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		81.3130	48.87	-16.62	32.25	40.00	-7.75	peak	
2		95.9923	52.17	-17.10	35.07	43.50	-8.43	peak	
3		108.0850	52.60	-15.35	37.25	43.50	-6.25	peak	
4		148.4047	49.08	-11.89	37.19	43.50	-6.31	peak	
5	*	297.2997	54.91	-11.32	43.59	46.00	-2.41	QP	
6		718.9263	40.77	-2.18	38.59	46.00	-7.41	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX D RADIATED EMISSIONS - ABOVE 1 GHZ

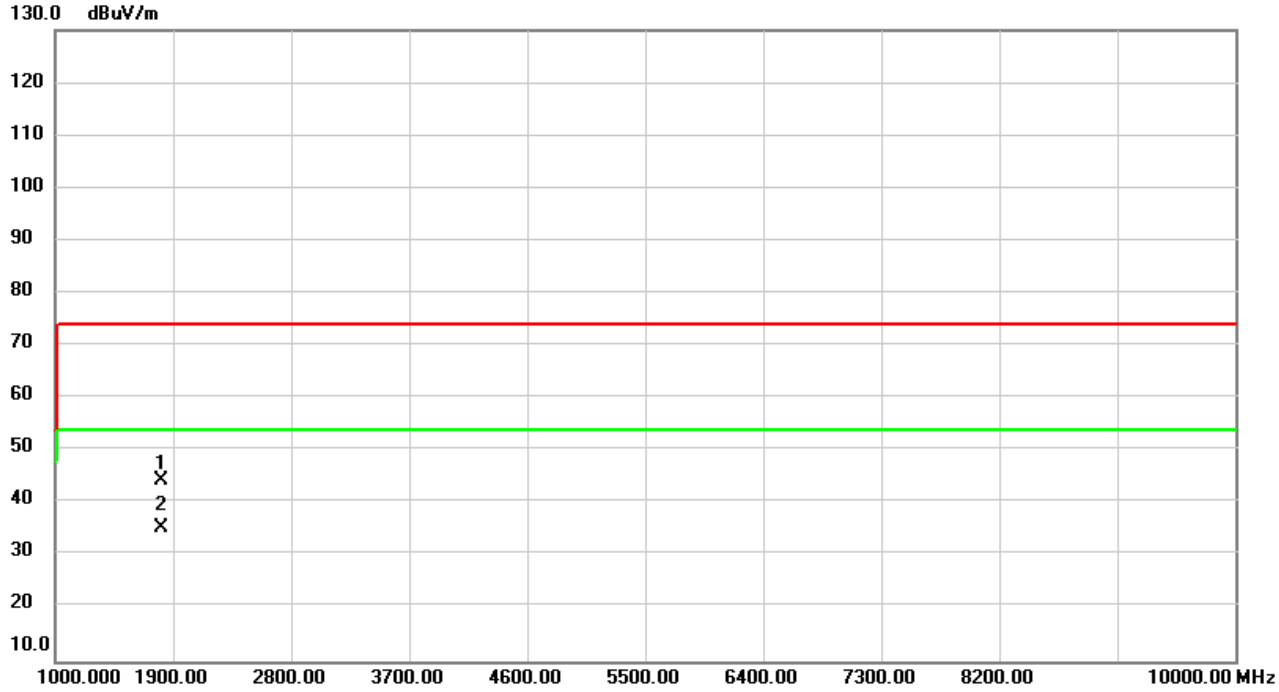
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	902.75MHz	Polarization	Vertical
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1806.000	49.55	-6.78	42.77	74.00	-31.23	peak	
2	*	1806.000	38.66	-6.78	31.88	54.00	-22.12	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

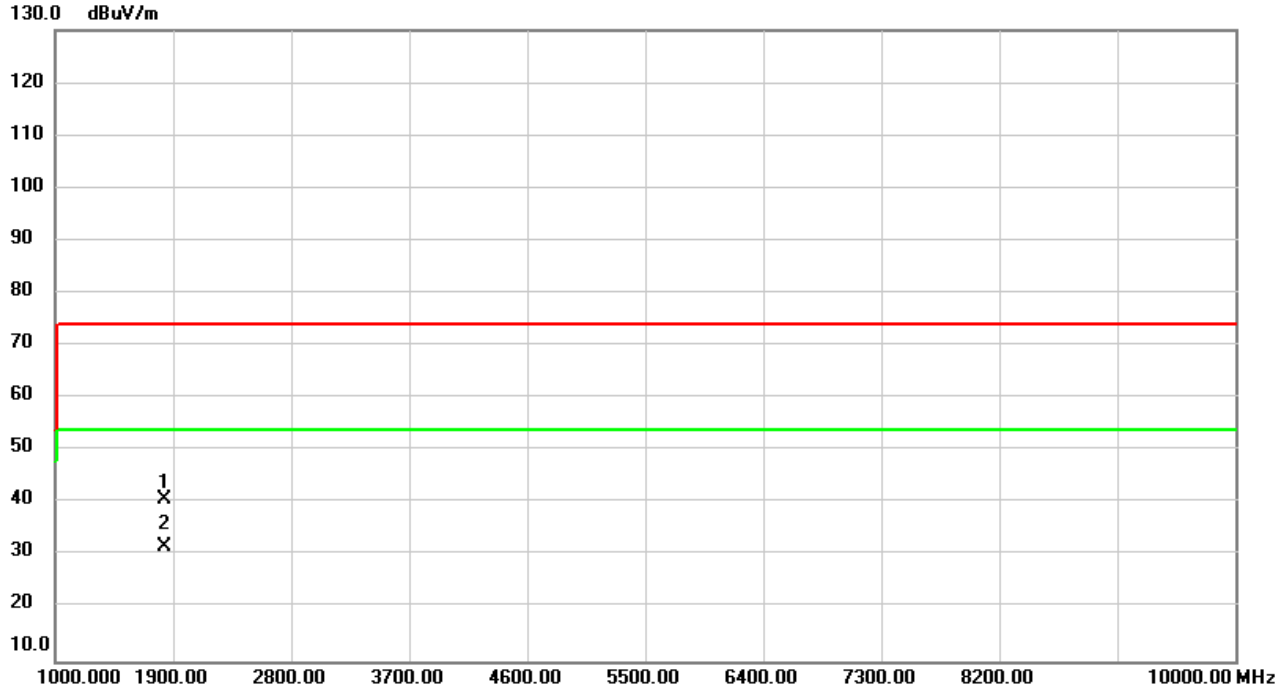
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	902.75MHz	Polarization	Horizontal
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1806.000	51.13	-6.78	44.35	74.00	-29.65	peak	
2	*	1806.000	42.23	-6.78	35.45	54.00	-18.55	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

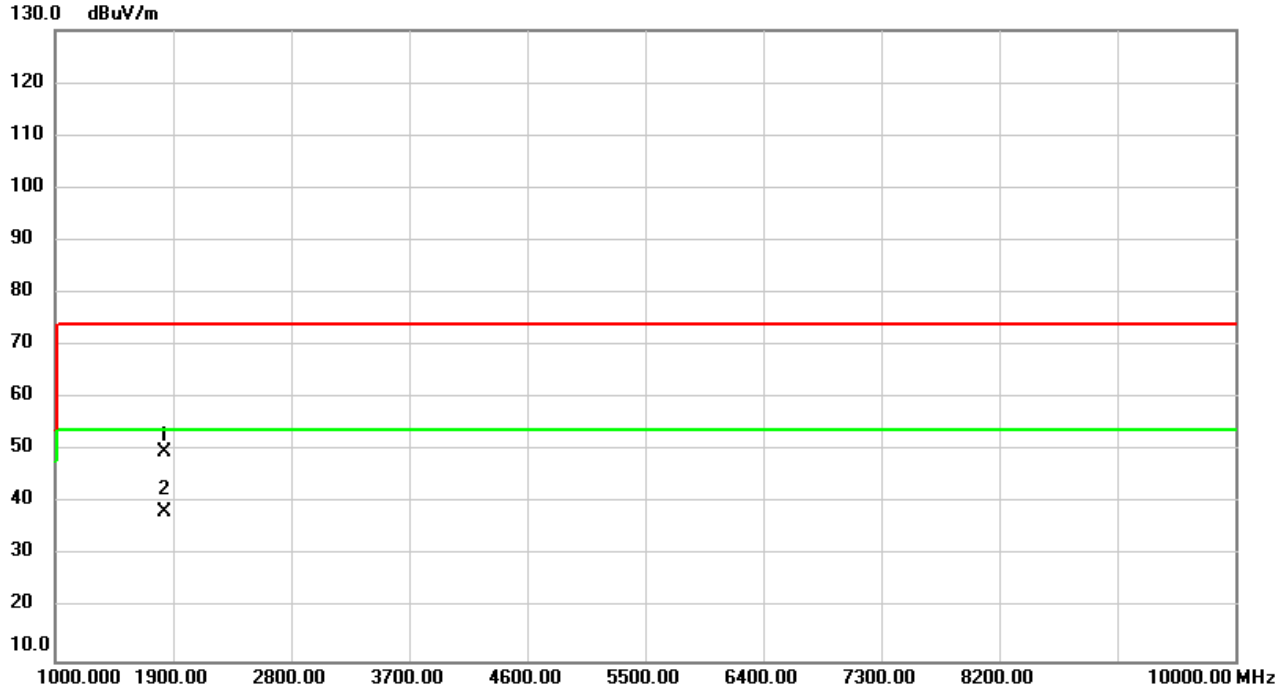
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	915.25MHz	Polarization	Vertical
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1831.000	47.32	-6.71	40.61	74.00	-33.39	peak	
2	*	1831.000	38.39	-6.71	31.68	54.00	-22.32	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

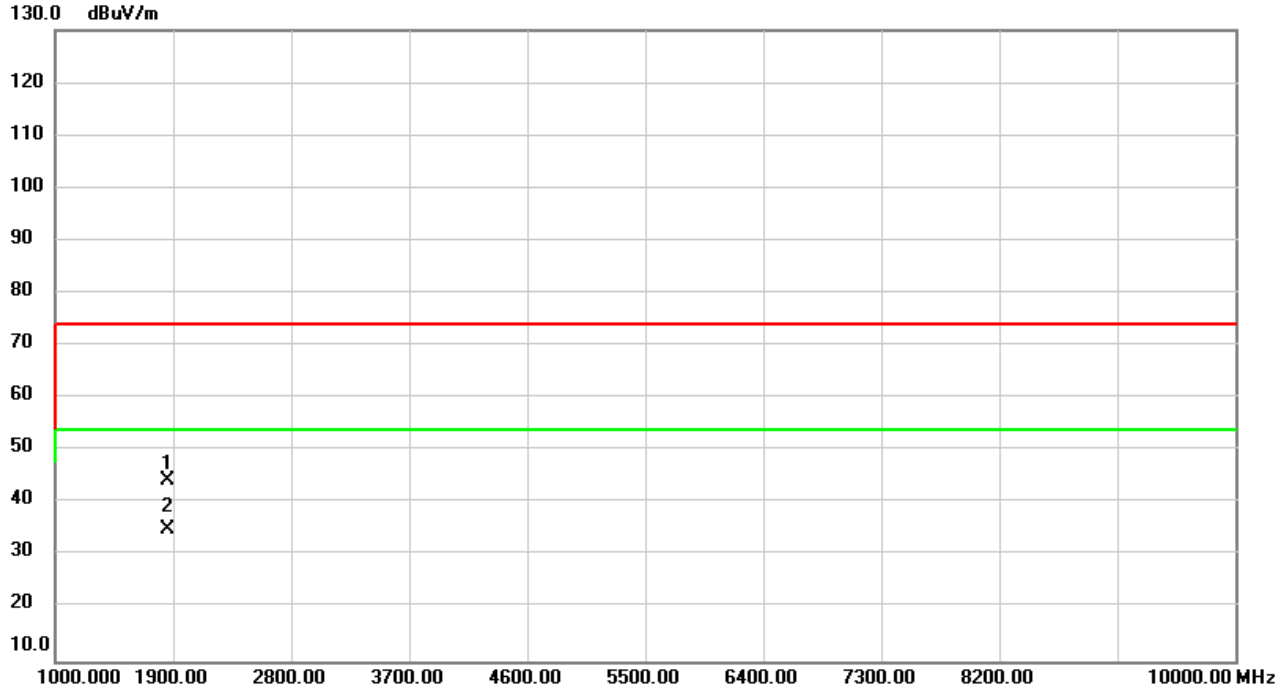
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	915.25MHz	Polarization	Horizontal
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1831.000	56.40	-6.71	49.69	74.00	-24.31	peak	
2	*	1831.000	45.06	-6.71	38.35	54.00	-15.65	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

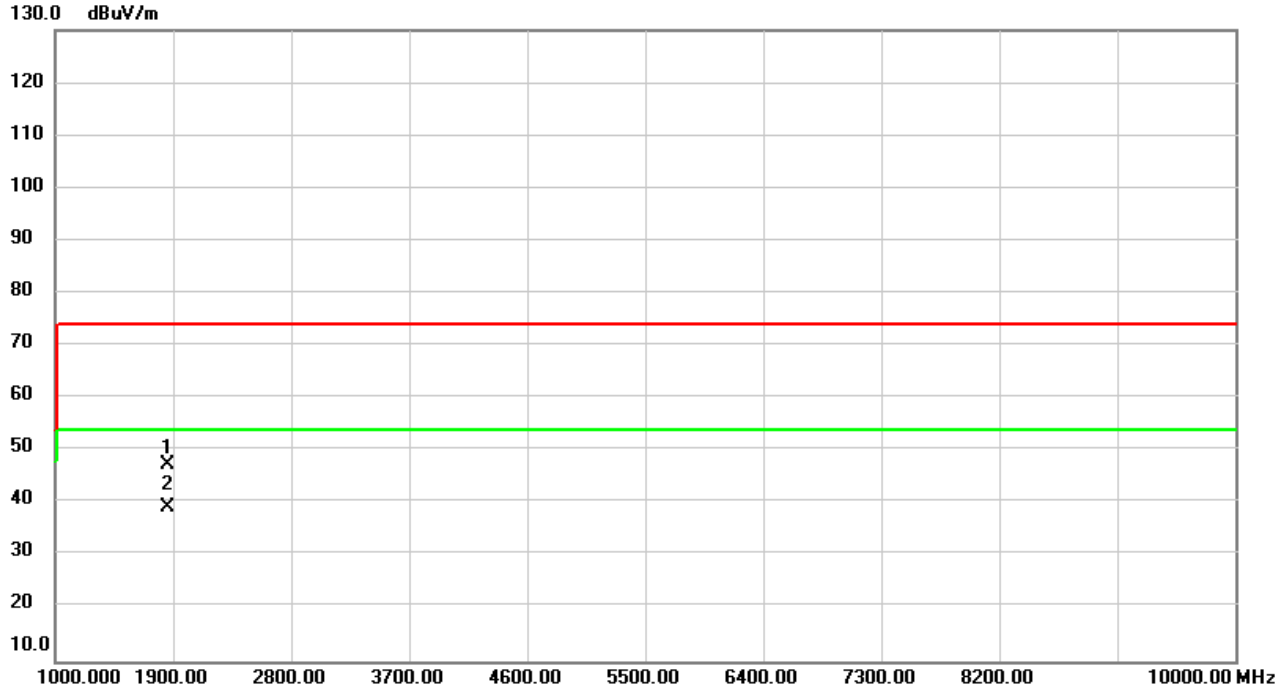
Test Mode	RFID	Test Date	2024/1/16
Test Frequency	927.25MHz	Polarization	Vertical
Temp	22°C	Hum.	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1855.000	51.02	-6.65	44.37	74.00	-29.63	peak	
2	*	1855.000	41.58	-6.65	34.93	54.00	-19.07	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	RFID	Test Date	2024/1/16
Test Frequency	927.25MHz	Polarization	Horizontal
Temp	22°C	Hum.	59%



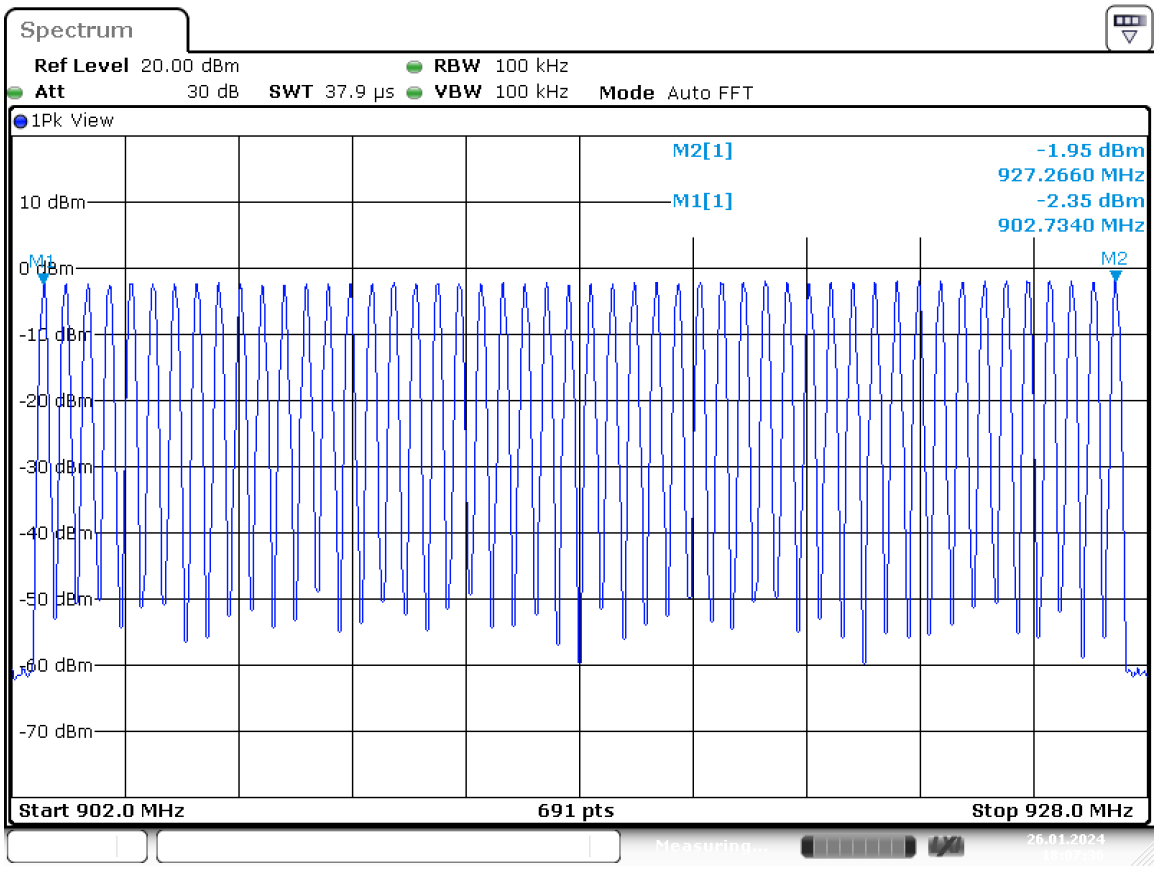
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1855.000	54.11	-6.65	47.46	74.00	-26.54	peak	
2	*	1855.000	45.93	-6.65	39.28	54.00	-14.72	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX E NUMBER OF HOPPING CHANNEL

Test Mode	RFID

RFID

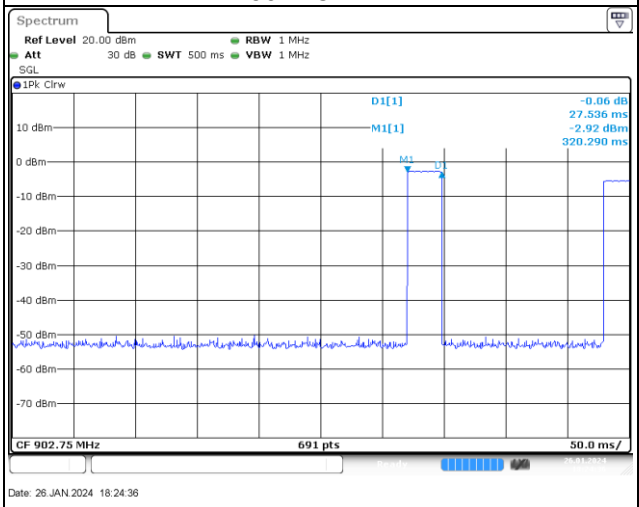
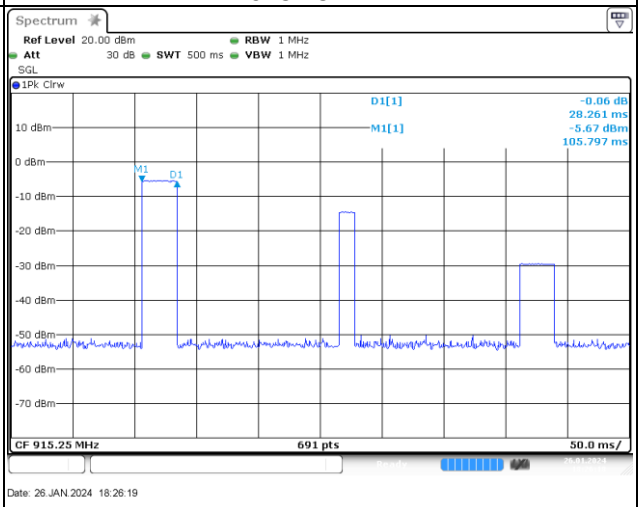
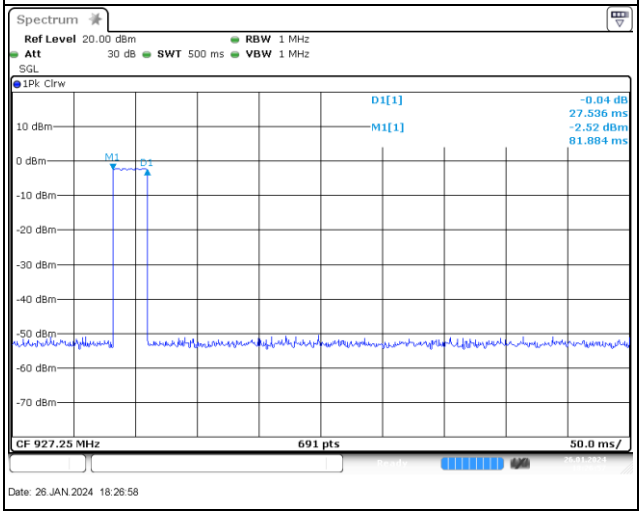


Date: 26.JAN.2024 18:07:36

APPENDIX F AVERAGE TIME OF OCCUPANCY (DWELL TIME)

Test Mode :	RFID

Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
902.75	27.5360	0.2460	0.4000	Pass
915.25	28.2610	0.2460	0.4000	Pass
927.25	27.5360	0.2460	0.4000	Pass

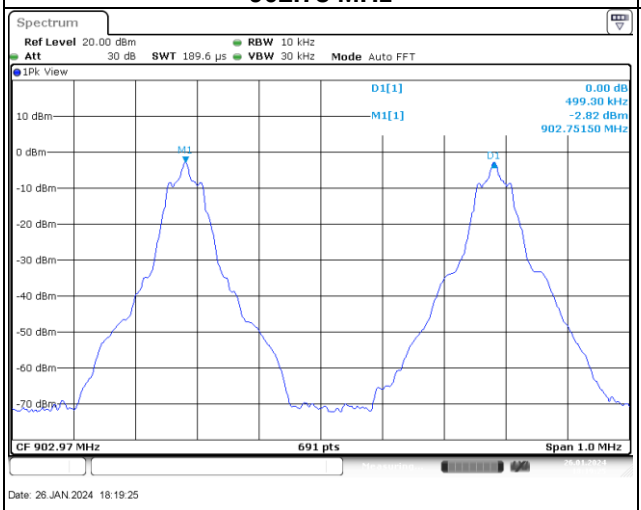
902.75 MHz	915.25 MHz
	
927.25 MHz	**-**
	-

APPENDIX G HOPPING CHANNEL SEPARATION MEASUREMENT

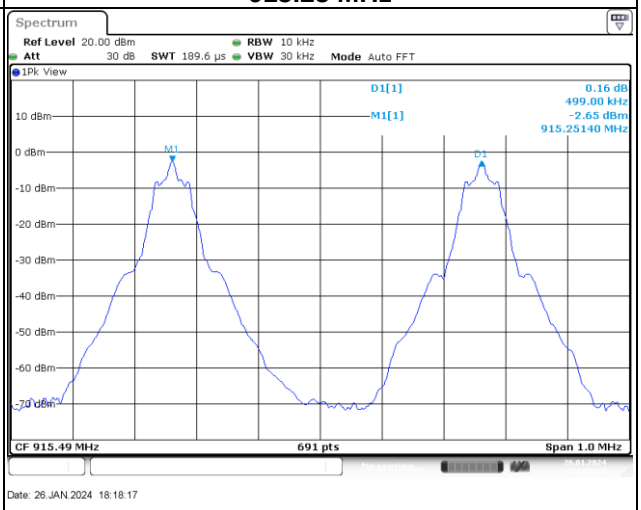
Test Mode :	RFID

Frequency (MHz)	Channel Separation (KHz)	Min. Limit (KHz)	Test Result
902.75	499.300	89.700	Pass
915.25	499.000	82.500	Pass
927.25	500.70	88.300	Pass

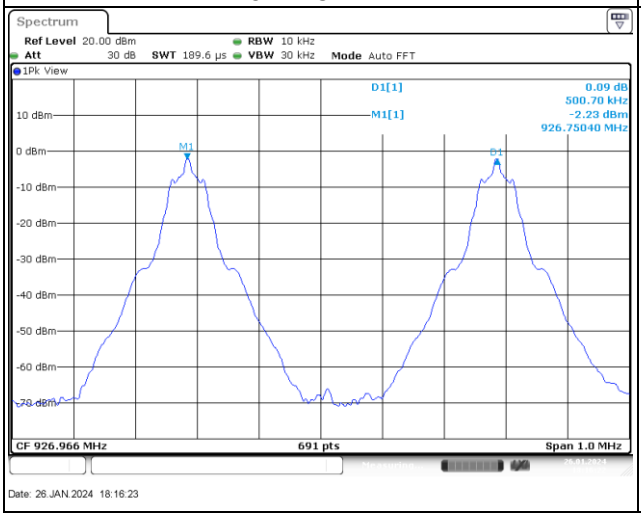
902.75 MHz



915.25 MHz



927.25 MHz



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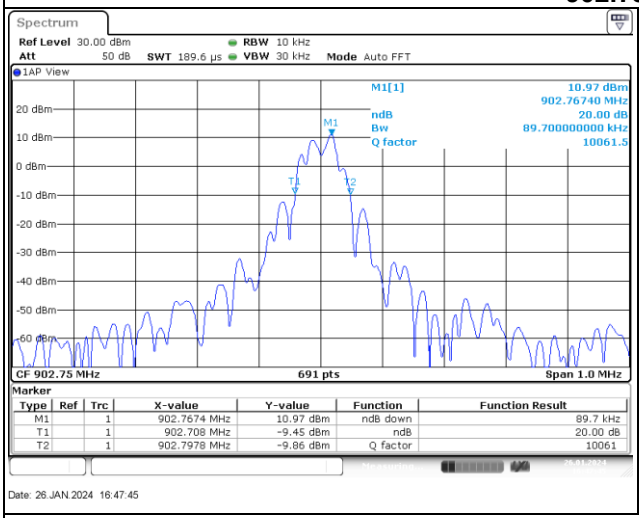
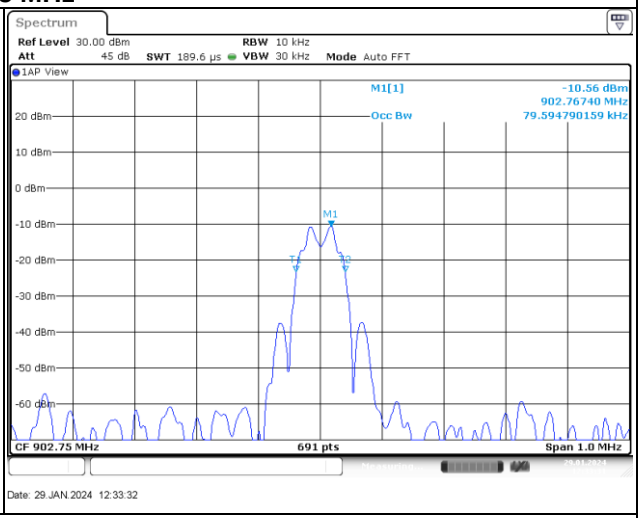
APPENDIX H 20dB BANDWIDTH

Test Mode :	RFID

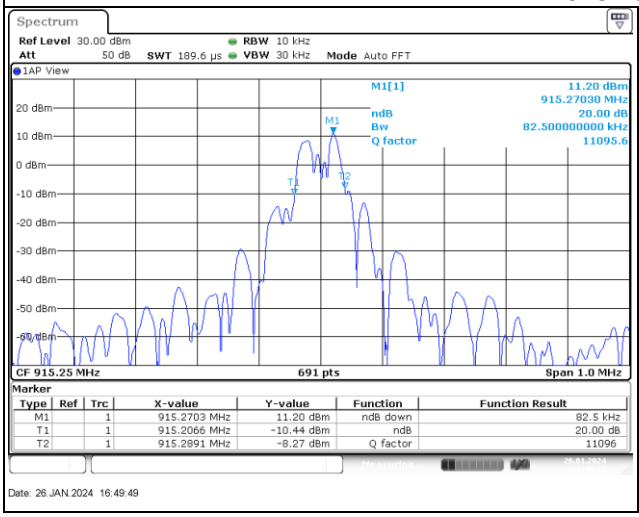
Frequency (MHz)	20dB Bandwidth (KHz)	99% Occupied BW	Max. Limit (kHz)	Test Result
902.75	89.700	75.590	250	Pass
915.25	82.500	78.147	250	Pass
927.25	88.300	76.700	250	Pass

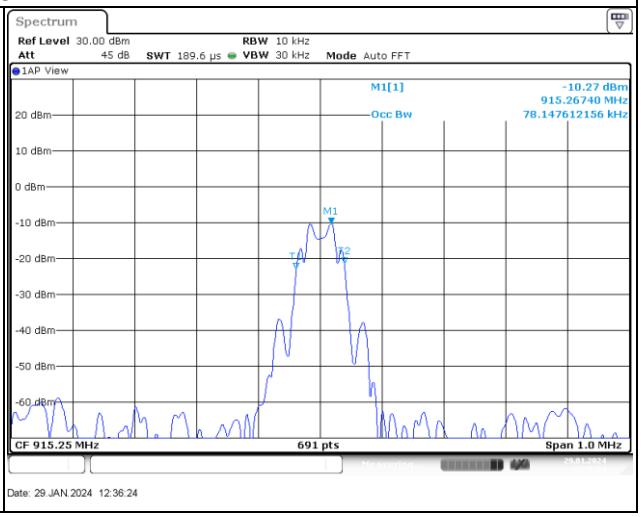
902.75 MHz



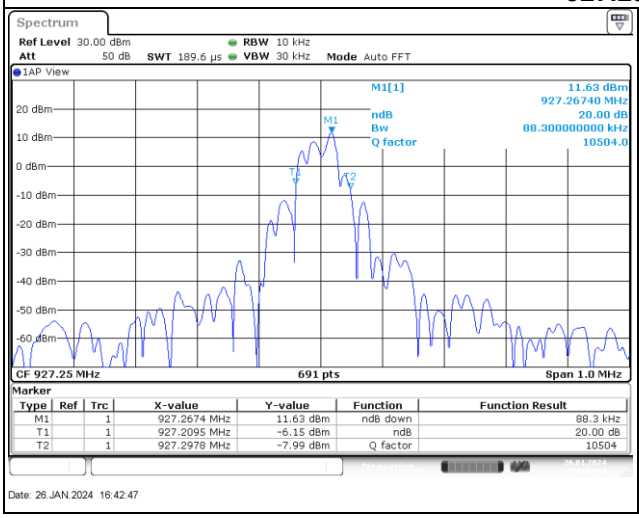


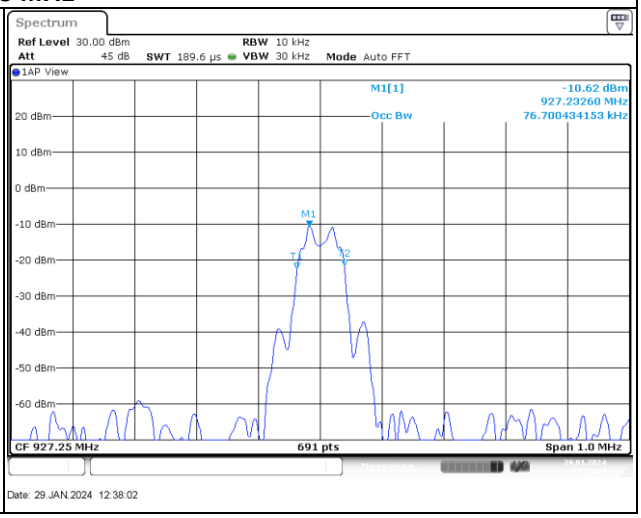
915.25 MHz





927.25 MHz


Spectrum
Ref Level 30.00 dBm
RBW 10 kHz
Att 50 dB
SWT 189.6 µs
VBW 30 kHz
Mode Auto FFT
1AP View
M1[1]
11.63 dBm
927.26740 MHz
ndB 20.00 dB
Bw 88.300000000 kHz
Q factor 10504.0
CF 927.25 MHz
691 pts
Span 1.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 927.2674 MHz 11.63 dBm ndB down 88.3 kHz
T1 1 927.2095 MHz -6.15 dBm ndB 20.00 dB
T2 1 927.2978 MHz -7.99 dBm Q factor 10504
Date: 26.JAN.2024 16:42:47


Spectrum
Ref Level 30.00 dBm
RBW 10 kHz
Att 45 dB
SWT 189.6 µs
VBW 30 kHz
Mode Auto FFT
1AP View
M1[1]
-10.62 dBm
927.23260 MHz
Occ Bw 76.700434153 kHz
CF 927.25 MHz
691 pts
Span 1.0 MHz
Date: 29.JAN.2024 12:38:02

APPENDIX I OUTPUT POWER

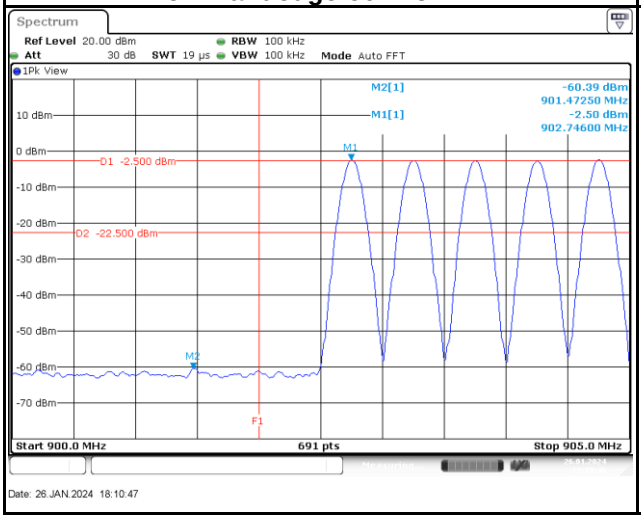
Test Mode :	RFID	Tested Date	2024/1/29

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
902.75	10.63	0.0116	30.00	1.0000	Pass
915.25	10.68	0.0117	30.00	1.0000	Pass
927.25	10.59	0.0115	30.00	1.0000	Pass

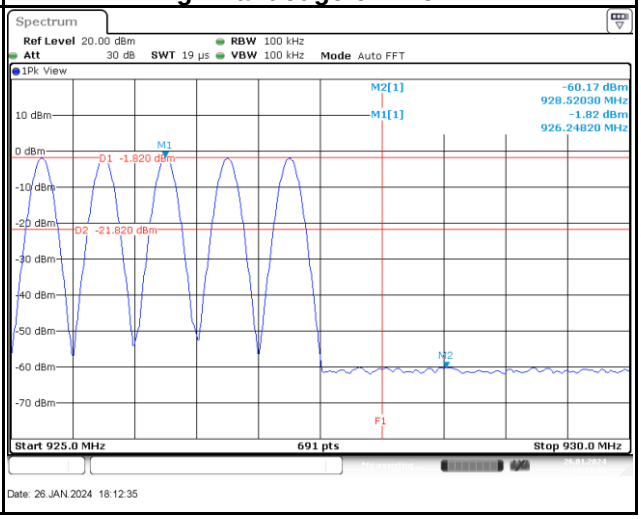
APPENDIX J ANTENNA CONDUCTED SPURIOUS EMISSION

Test Mode	RFID

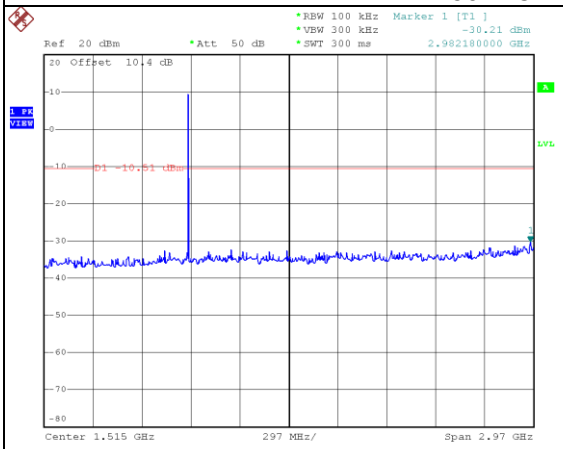
Low Bandedge-902.75 MHz

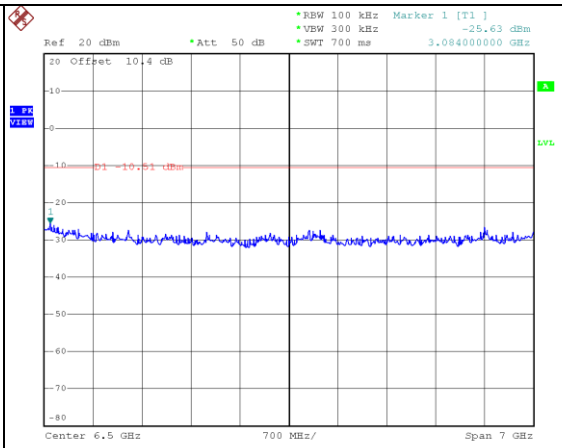


High Bandedge-927.25MHz

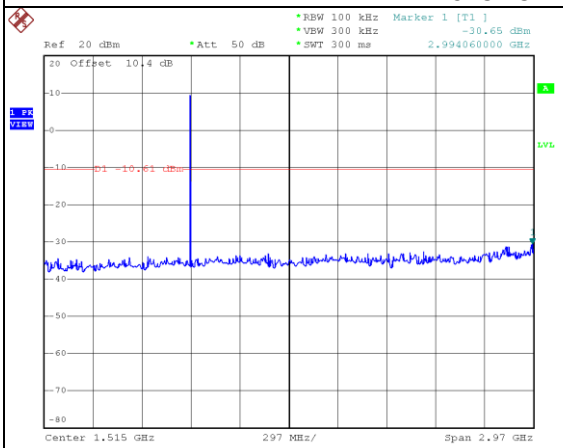


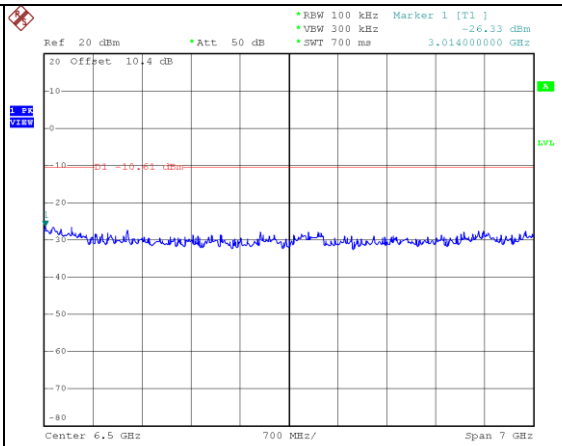
902.75 MHz – 10th Harmonics



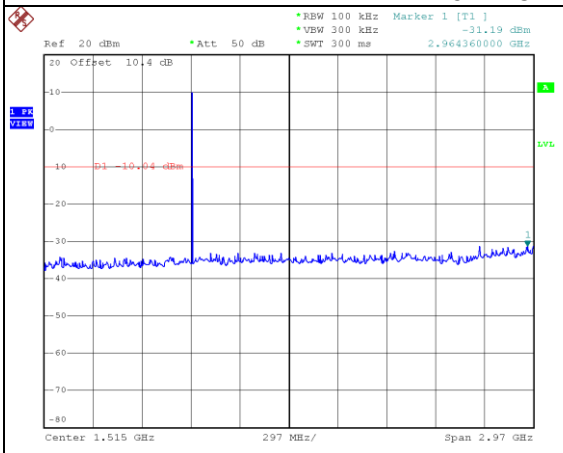


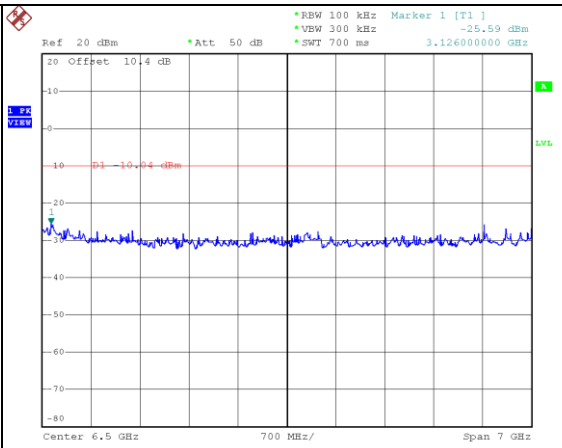
915.25 MHz – 10th Harmonics





927.25 MHz – 10th Harmonics





End of Test Report