RF TEST REPORT

Report No.: DDT-B25052217-5E01

Applicant	:	DORAN MFG, LLC
Applicant Address	:	4362 Glendale Milford Rd, Cincinnati OH 45242 United States
Equipment Under Test	:	Doran TPMS Sensor for OTR
Model No.	:	3607, 3607AG
Series Model No.	:	N/A
Trade Mark	:	DORAN
FCC ID	:	VZ43607N3
IC	:	12007A-3607N3
Manufacturer	:	DORAN MFG, LLC
Manufacturer Address	:	4362 Glendale Milford Rd, Cincinnati OH 45242 United States
Issued By	:	Suzhou Dongdian Testing Service Co., Ltd.
Address	:	Phase II, No.16 Runsheng Road, Suzhou Industrial Park, Suzhou, People's Republic of China Tel: +86-0512-62531270, E-mail: rui.zhang@dgddt.com, http://www.ddttest.com

REPORT

Table of Contents

1. Summary of Test Results 7
1.1. Summary of test result 7
2. General Test Information 8
2.1. Description of EUT 8
2.2. Accessories of EUT 8
2.3. Assistant equipment used for test 8
2.4. Block diagram of EUT configuration for test 8
2.5. Test environment conditions 9
2.6. Test laboratory 9
3. Test Configuration 10
3.1. Test Mode 10
4. Equipment Used During Test 11
5. Measurement uncertainty 12
6. Antenna requirement 13
6.1. Regulation 13
6.2. Result 13
7. Restricted bands of Operation 14
7.1. Regulation 14
7.2. Result 16
8. Radiated Spurious Emission 17
8.1. Regulation limit 17
8.2. Block diagram of test setup 19
8.3. Test procedure 21
8.4. Test result 23
9. Periodic operation characteristics 28
9.1. Regulation 28
9.2. Result 28
10. Fundamental frequencies/Field strength 30
10.1. Regulation limit 30
10.2. Block diagram of test setup 30
10.3. Test procedure 30
10.4. Test result 33
11. Bandwidth(20dB) 35
11.1. Regulation 35
11.2. Calculation of the 20dB bandwidth limit 35
11.3. Test Procedure 35

11.4. Test result 36
12. Bandwidth(99%) 38
12.1. Regulation 38
12.2. Calculation of the 99% bandwidth limit 38
12.3. Test Procedure 38
12.4. Test result 39
13. Photos of the EUT 40
14. Photos of the Setup 40

Test Report Declare

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Address	:	4362 Glendale Milford Rd, Cincinnati OH 45242 United States

Test Standard Used:
47 CFR FCC Part 15C(Part 15.231); RSS-210 Issue 11; RSS-GEN Issue 5+ Amendment 1-2019+ Amendment 2-2021
Test Procedure Used:
ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 + Errata to C63.10a-2024

We Declare:
The equipment described above is tested by Suzhou Dongdian Testing Service Co.,Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Suzhou Dongdian Testing Service Co.,Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above standards.

Report No:	DDT-B25052217-5E01		
Sample No:	Y25052217-06		
Date of Receipt:	Jun. 03, 2025	**Date of Test:**	Jun. 04, 2025 ~ Jun. 10, 2025

Prepared By:	Reviewed By:	Authorized By:
Bacon Dong	Vane Xia	leon Wu
Bacon Dong/Engineer	Vane Xia/Director	Leon Wu/Director

Note:
This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Suzhou Dongdian Testing Service Co., Ltd. The results reported herein have been performed in accordance with the laboratory's terms of accreditation.

This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Aug. 04, 2025	

1. Summary of Test Results

1.1. Summary of test result

Test Item	Standard	Result
Antenna requirement	FCC §15.203 RSS-GEN Clause 6.8	Pass
Restricted bands of operation	FCC §15.205，FCC §15.209 RSS-GEN Clause 8.10	Pass
Radiated emission limits, general requirements	FCC §15.209 FCC §15.231(e) RSS-210 Annex A，A.1.5	Pass
Periodic operation characteristics	FCC §15.231(e) RSS-210 Annex A，A.1.5	Pass
Fundamental frequencies /Field strength limits	FCC §15.231(e) RSS-210 Annex A，A.1.5	Pass
Bandwidth (20dB)	FCC §15.231(c)	Pass
99% Occupied Bandwidth	RSS-210 Annex A，A.1.4 RSS-GEN Clause 6.7	Pass

2. General Test Information

2.1. Description of EUT

EUT Description	:	Doran TPMS Sensor for OTR
Model Number	:	3607, 3607AG
HVIN	:	3607N3, 3607AGN3
Series Model Number	:	N/A
Models difference	:	Model 3607AG is the same as 3607 except different marking, model number, which does not affect radio parameters.
Trade Mark	:	DORAN
Serial Number	:	N/A
Hardware Version	:	V1.0
Software Version	:	N/A
Sample Type	:	Vehicle Device
Frequency Band	:	434.1MHz
Number of Channel	:	1 Channel
Modulation	:	FSK
Antenna Type	:	PCB antenna
Power Supply	:	3Vdc (internal CR2450HR)

Note:
1. EUT is the abbreviation of equipment under test.
2. This EUT only support transmit function

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Remark
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
N/A	N/A	N/A	N/A	N/A

2.4. Block diagram of EUT configuration for test

EUT

2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Condition	Normal Condition	Extreme Condition
Pressure range	86-106KPa	N/A
Relative Humidity	30-75%	N/A
Temperature(℃)	NT: 25℃	N/A
Voltage(V)	NV: 3V	N/A
Note: N/A: Not Applicable NV: Normal Voltage LV: Low Extreme Test Voltage HV: High Extreme Test Voltage NT: Normal Temperature LT: Low Extreme Test Temperature HT: High Extreme Test Temperature		

2.6. Test laboratory

Lab Information	Company Name: Suzhou Dongdian Testing Service Co.,Ltd. Address: Phase II, No.16 Runsheng Road, Suzhou Industrial Park, Suzhou, People's Republic of China. Tel: +86-0512-62531270, E-mail: rui.zhang@dgddt.com, http://www.ddttest.com
Accreditation Certificate	A2LA (Certificate No.: 7346.01) Suzhou Dongdian Testing Service Co.,Ltd. has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1397) Suzhou Dongdian Testing Service Co.,Ltd. has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. IC (IC Designation No.: 32952; CAB No.:CN0182) Suzhou Dongdian Testing Service Co.,Ltd. has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.
Note 1: All tests measurement facilities use to collect the measurement data are located at Phase II, No.16 Runsheng Road, Suzhou Industrial Park, Suzhou, China. Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS. Note 3: The test anechoic chamber in Suzhou Dongdian Testing Service Co.,Ltd had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.	

3. Test Configuration

3.1. Test Mode

During testing, the interface cables and equipment positions were arranged according to standard ANSI C63.10.

All modes were tested in the laboratory, only worst cases shown in below table and recorded in this report.

Mode	Channel	Frequency	Condition
1	N/A	434.1 MHz	TX mode

4. Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Conducted Test					
MXG Vector Signal Generator(100kHz-6GHz)	Agilent	N5182A	MY50144775	2025/01/23	1 Year
Spectrum Analyzer(9kHz-40GHz)	R&S	FSV40-N	101642	2025/01/23	1 Year
Vector Signal Generator(4kHz-7.125GHz)	R&S	SMCV100B	103781	2025/01/23	1 Year
WIDBAND RADIO COMMUNICATION TESTER	R&S	CMW 500	167141	2025/01/23	1 Year
Signal Analyzer(10Hz-26.5GHz)	Keysight	N9020B	MY56080159	2025/01/23	1 Year
RF Control Unit	Tonscend	JS0806-3	24A80620795	2025/01/23	1 Year
Signal Generator	R&S	SMF 100A	101396	2025/01/23	1 Year
Temperature, humidity and pressure recorder	Huahanwei	TH10R	c00286000Ebc	2025/02/05	1 Year
Test Software	TONSCEND	JS1120-3	3.5.39	N/A	N/A
Radiated Spurious Emission 3m EMI Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Interval**
EMI Test Receiver	R&S	ESCI7	101138	2025/01/23	1 Year
Signal Analyzer	R&S	FSV40	101730	2025/01/23	1 Year
Hybrid antenna	TESEQ	CBL6141B	27421	2024/01/10	3 Year
Horn Antenna	ETS	ETS 3117	157735	2024/01/19	3 Year
Pre-Amplifier_HF	COM-MW	DPA8-1000-18000-1012	9BH231242575	2025/01/23	1 Year
Low Noise Amplifier	Tonscend	TAP10M1G40N	806JSAP039904251006	2025/04/09	1 Year
Temperature, humidity and pressure recorder	Huahanwei	TH10R	c0222020002F	2025/02/05	1 Year
3m Anechoic Chamber	CeRuiTong	3m-SAC	N/A	2024/05/10	3 Year
Test software	TONSCEND	JS35-RSE	5.0.1	N/A	N/A

5. Measurement uncertainty

No.	Test Item	Uncertainty
1	RF frequency	±2.8 %
2	Radiated RF power	±1.5 dB
5	Bandwidth	±1.9 %
6	Radiated Emissions	30MHz-1GHz: ±1.5 dB
		1GHz-12.75GHz: ±1.9dB
		12.75GHz-26.5GHz: ±2.1dB
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

6. Antenna requirement

6.1. Regulation

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

6.2. Result

Test Item	Verdict
The equipment meets the requirements	Yes

7. Restricted bands of Operation

7.1. Regulation

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

FCC Part 15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41	--	--	--

RSS-GEN Clause 8.10 Table 7 – Restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	13.36–13.41	608–614	8.025–8.5
0.495–0.505	16.42–16.423	960–1427	9.0–9.2
2.1735–2.1905	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677–5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4

MHz	MHz	MHz	GHz
6.26775–6.26825	108–138	2483.5–2500	22.01–23.12
6.31175–6.31225	149.9–150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125–167.17	3345.8–3358	*Above 38.6
8.41425–8.41475	167.72–173.2	3500–4400	--
12.29–12.293	240–285	4500–5150	--
12.51975–12.52025	322–335.4	5350–5460	--
12.57675–12.57725	399.9–410	7250–7750	--

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

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

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

(1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

(2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

(3) Cable locating equipment operated pursuant to § 15.213.

(4) Any equipment operated under the provisions of §§ 15.255 and 15.256 in the frequency band 75–85 GHz, § 15.257 in the 92–95 GHz band or § 15.258.

(5) Biomedical telemetry devices operating under the provisions of § 15.242 of this part are not subject to the restricted band 608–614 MHz but are subject to compliance within the other

restricted bands.

(6) Transmitters operating under the provisions of subparts D or F of this part.

(7) Devices operated pursuant to § 15.225 are exempt from complying with this section for the 13.36–13.41 MHz band only.

(8) Devices operated in the 24.075–24.175 GHz band under § 15.245 are exempt from complying with the requirements of this section for the 48.15–48.35 GHz and 72.225–72.525 GHz bands only, and shall not exceed the limits specified in § 15.245(b).

(9) Devices operated in the 24.0–24.25 GHz band under § 15.249 are exempt from complying with the requirements of this section for the 48.0–48.5 GHz and 72.0–72.75 GHz bands only, and shall not exceed the limits specified in § 15.249(a).

(10) White space devices operating under subpart H of this part are exempt from complying with the requirements of this section for the 608–614 MHz band.

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of § 15.245 shall not exceed the limits specified in § 15.245(b).

7.2. Result

Test Item	Verdict
The equipment meets the requirements	Yes

8. Radiated Spurious Emission

8.1. Regulation limit

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

FCC Part 15.209

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
Above 960	500	3

FCC Part 15.231(e)

Fundamental Frequency (MHz)	Field strength of Fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

RSS-210 Annex A · A.1.5 Table A2: Reduced field strength limits for momentarily operated devices

Fundamental frequency (MHz), excluding restricted frequency bands specified in RSS-Gen	Field strength of the fundamental emissions (μV/m at 3 m)	Field strength of spurious emission (μV/m at 3 m)
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

For the 30MHz-960MHz band, the emission limit of 15.231(e) is higher than the limit of 15.209, so the test results meet the limit requirements of 15.209 and can be considered to meet the emission spurious requirements of 15.231(e).

For the 960MHz -1GHz,1GHz-6GHz band 15.209, the emission limit is higher than the 15.231(e) limit, so the test results that meet the 15.231(e) limit requirements can be considered to meet the 15.209 radiation spurious emission requirements.

For 130-174 MHz: Field strength of spurious emission (μ V/m) = ((22.73 x f)-2454.55)/10
For 260-470 MHz: Field strength of spurious emission (μ V/m) = ((16.67 x f)-2833.33)/10
For 434.1 MHz: Field strength of spurious emission (μ V/m) = ((16.67 x f)-2833.33)/10=440.31 μ V/m=52.9dB μ V/m

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all

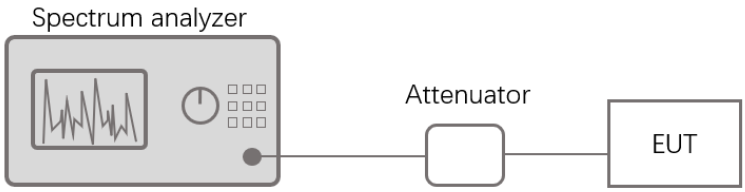
devices operated under this part.

(f) In accordance with § 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in § 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in § 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in § 15.109 that are applicable to the incorporated digital device.

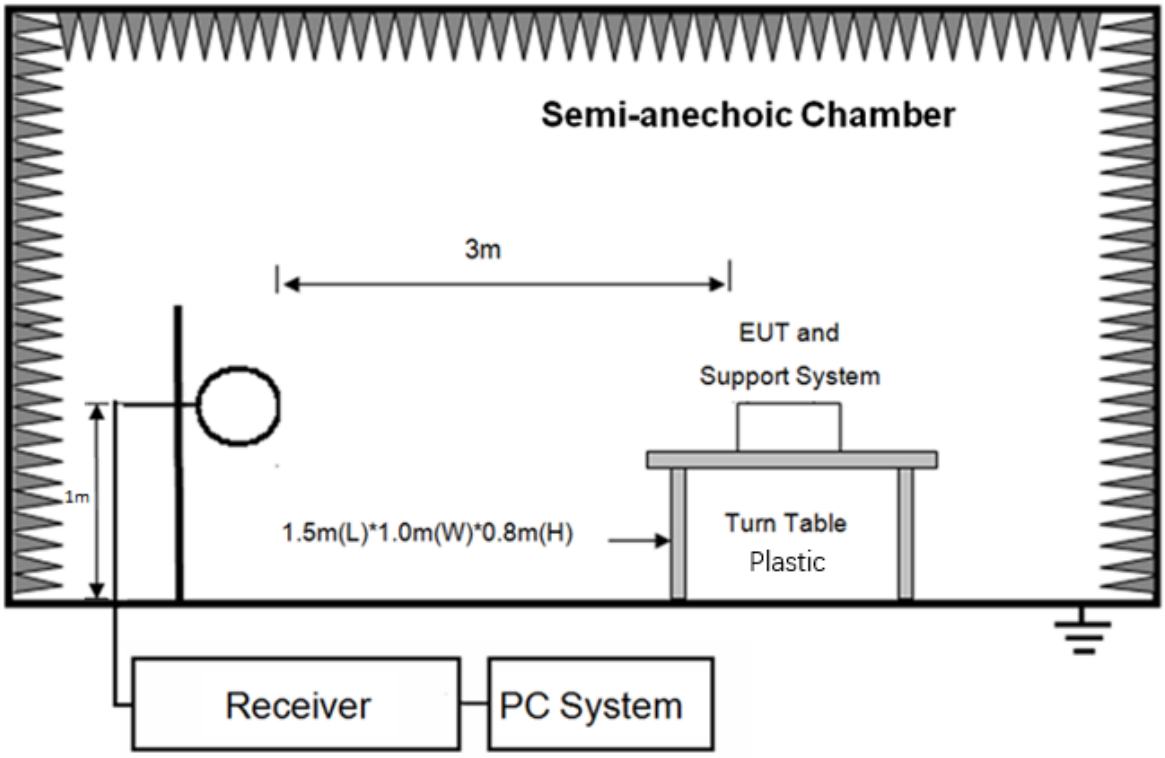
(g) Perimeter protection systems may operate in the 54–72 MHz and 76–88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

8.2. Block diagram of test setup

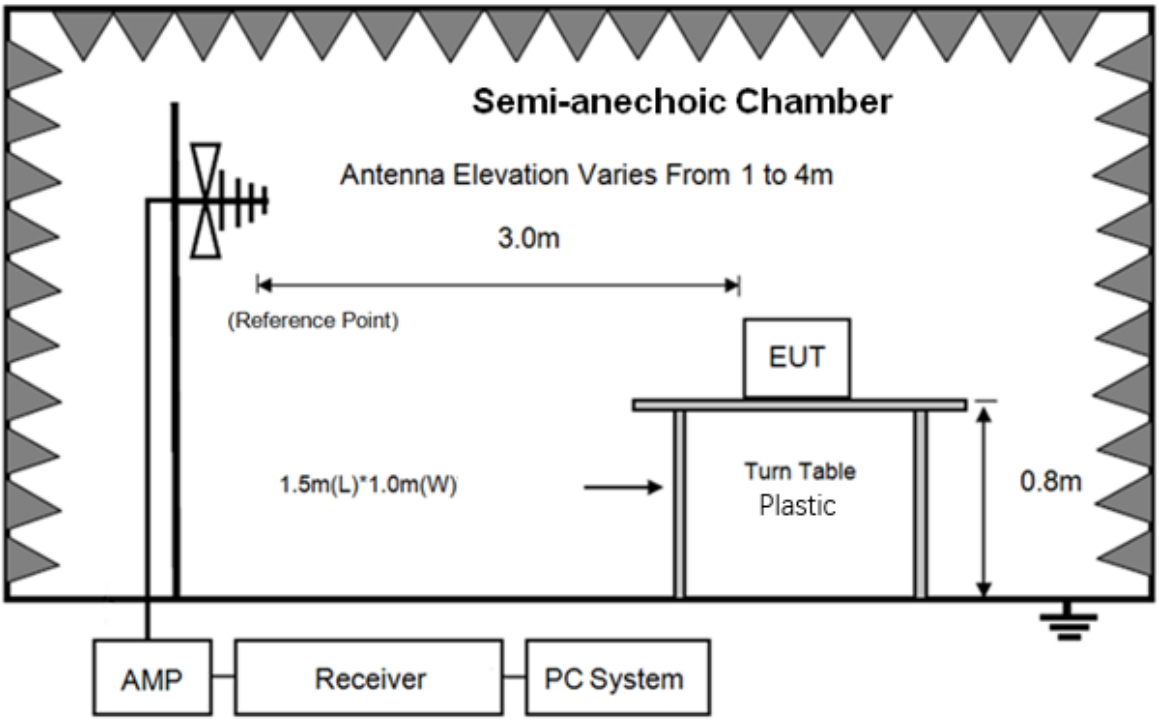
Conducted Measurement Test setup:



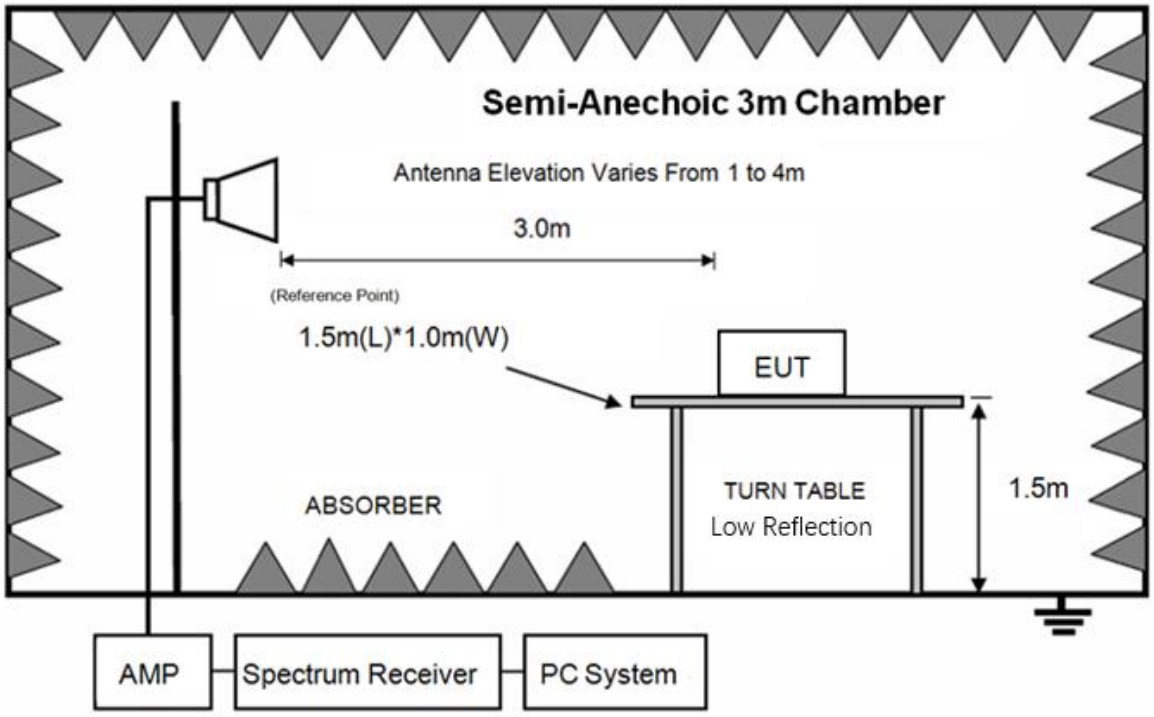
Radiated Measurement Test setup:
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz – 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



8.3. Test procedure

The EUT and this peripheral (when additional equipment exists) are placed on a tur table which is 0.8m above the ground. The turn table would be allowed to rotate 360 degrees to determine the position of the maximum emission level. The test distance between the EUT and the receiving antenna are 3m. To find the maximum emission. the polarization of the receiving antenna 1s changed in horizontal and vertical polarization: the position of the EUT was changed indifferent orthogonal determinations.

In the frequency range of 9kHz to 30MHz, magnetic field measurements may be performed. This method is applicable for radiated radio noise from all units, cables, power cords, and interconnect cabling or wiring. A calibrated loop antenna shall be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna may also need to be positioned horizontally at the specified distance from the EUT. The center of the loop shall be 1 m above the ground.

Measurement procedures for electric field radiated emissions above 1 GHz are covered in ANSI C63.10. The ANSI C63.10 measurement procedure consists of both an exploratory test and a final measurement. The exploratory test is critical to determine the frequency of all significant emissions. For each mode of operation required to be tested, the frequency spectrum is monitored. Variations in antenna height, antenna orientation. antenna polarization,

EUT azimuth, and cable or wire placement is explored to produce the emission that has the highest amplitude relative to the limit.

The final measurements are made based on the findings in the exploratory testing. When making exploratory and final measurements it is necessary to maximize the measured radiated emission. The measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." We consider the "cone of radiation" to be the 3 dB beamwidth of the measurement antenna.

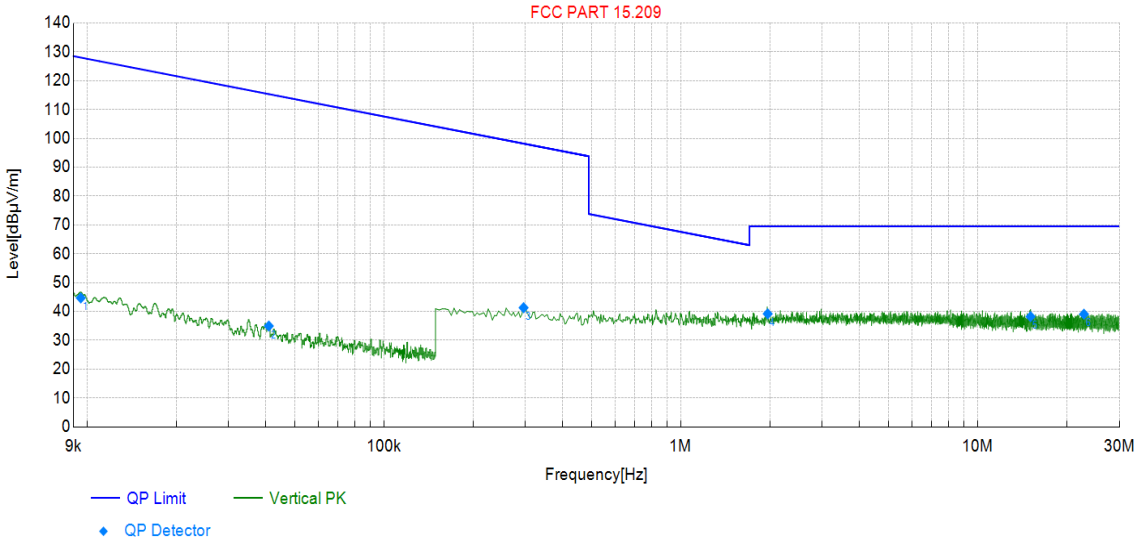
While the "bore-sighting" technique is not explicitly mentioned in ANSI C63.10. it is a useful technique for measurements using a directional antenna, such as a double-ridged waveguide antenna. Several precautions must be observed, including. knowledge of the beamwidth of the antenna and the result illumination area relative to the size of the EUT, estimation for source of the emission and general location within larger EUTS, measuring system sensitivity. Etc.

ANSI C63.10 requires that the measurement antenna 1s kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. That means that if the directional radiation pattern of the EUT results in a maximum emission at an upwards angle from the EUT. when a directional antenna is used to make the measurements it will be necessary for it to be pointed towards the source of the emission within the EUT. This can be done by either pointing the antenna at an angle towards the source of the emission, or by rotating the EUT, in both height and polarization, to maximize the measured emission. The emission must be kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission f om the EUT is measured

Radiated emissions test characteristics	
Frequency range	30 MHz-4000 MHz
Test distance	3m
Test instrumentation resolution bandwidth	120 KHz (30 MHz-1000 MHz)
	1 MHz (1000 MHz-4000 MHz)
Receive antenna scan height	1m-4m
Receive antenna polarization	Vertical / Horizontal

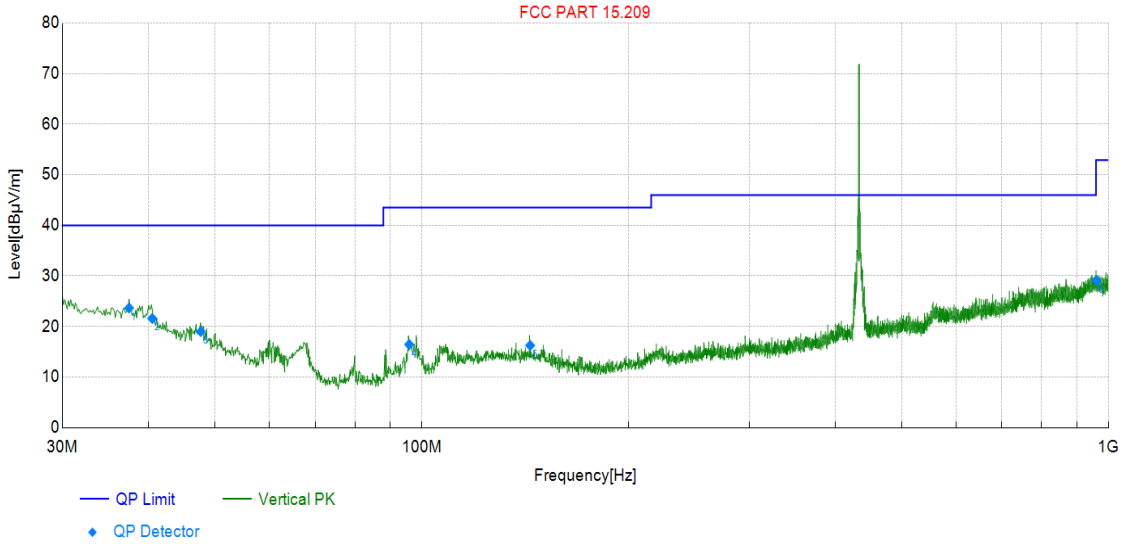
8.4. Test result

Radiated Emission test (9KHz-30MHz)

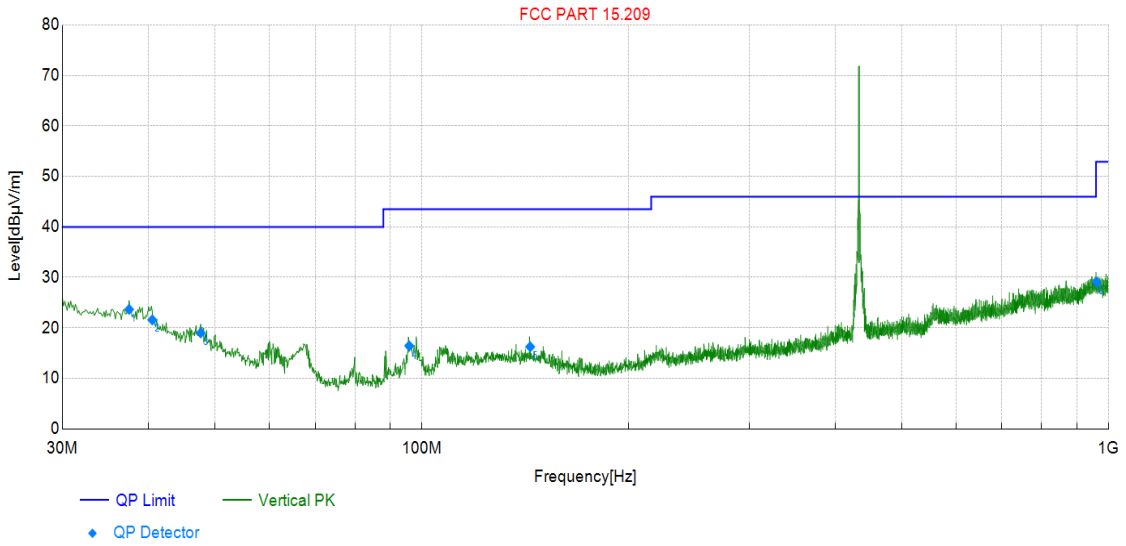


Final Data List										
NO.	Frequency [MHz]	Factor [dB/m]	QP Reading [dBµV]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pol	Verdict
1	0.01	21.47	23.21	44.68	128.02	83.34	100	292	V	PASS
2	0.04	20.41	14.54	34.95	115.35	80.40	100	175	V	PASS
3	0.30	20.44	20.86	41.30	98.19	56.89	100	95	V	PASS
4	1.96	20.07	19.11	39.18	69.54	30.36	100	37	V	PASS
5	15.08	20.06	18.14	38.20	69.54	31.34	100	252	V	PASS
6	22.82	20.18	18.87	39.05	69.54	30.49	100	342	V	PASS

Radiated Emission test (30MHz-1 GHz)

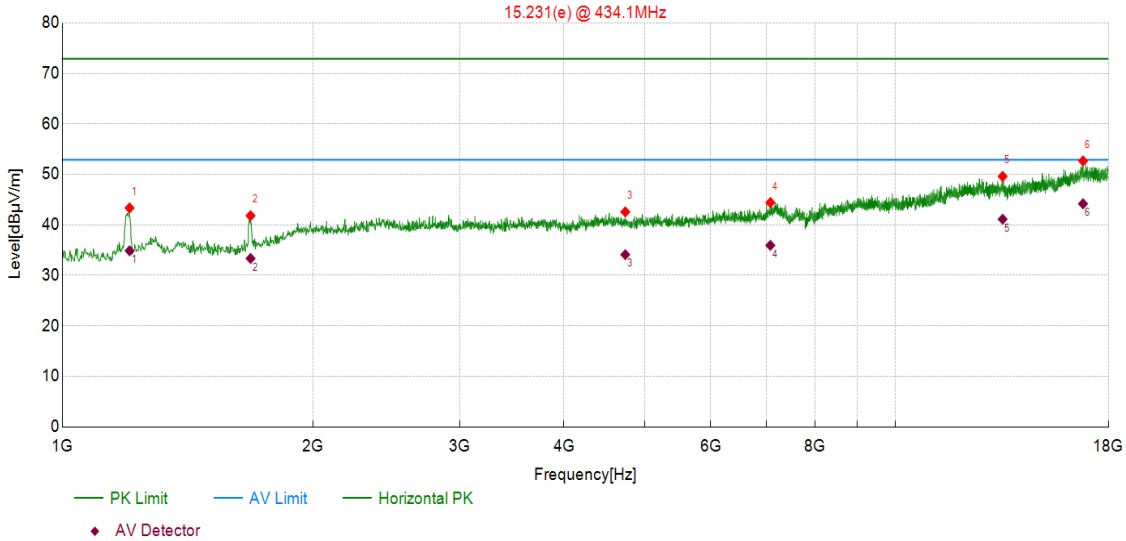


Suspected Data List											
NO.	Frequency [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Det	Pol	Verdict
1	30.61	-14.26	37.83	23.57	40.00	16.43	100	90	PK	H	PASS
2	34.85	-16.02	39.27	23.25	40.00	16.75	100	209	PK	H	PASS
3	41.28	-18.94	40.69	21.75	40.00	18.25	100	90	PK	H	PASS
4	47.70	-22.00	40.19	18.19	40.00	21.81	100	345	PK	H	PASS
5	745.86	-11.05	36.87	25.82	46.00	20.18	100	41	PK	H	PASS
6	941.19	-8.10	37.32	29.22	46.00	16.78	100	199	PK	H	PASS



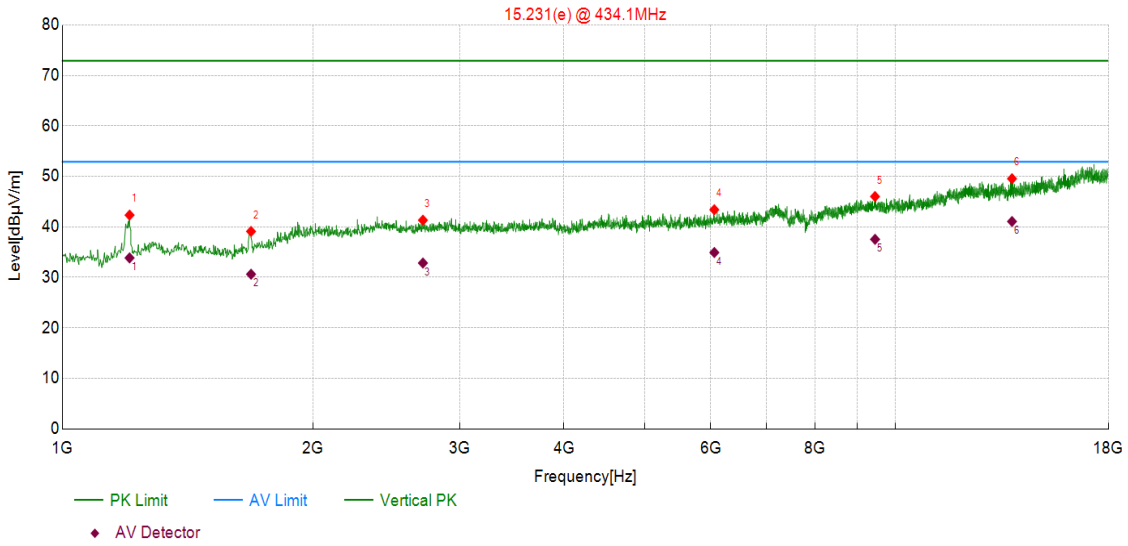
Suspected Data List											
NO.	Frequency [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Det	Pol	Verdict
1	37.52	-17.16	40.81	23.65	40.00	16.35	100	308	PK	V	PASS
2	40.55	-18.65	40.23	21.58	40.00	18.42	100	123	PK	V	PASS
3	47.70	-22.00	40.99	18.99	40.00	21.01	100	64	PK	V	PASS
4	95.96	-27.10	43.53	16.43	43.50	27.07	100	260	PK	V	PASS
5	143.98	-23.76	40.01	16.25	43.50	27.25	100	133	PK	V	PASS
6	961.69	-7.62	36.7	29.08	52.90	23.82	100	0	PK	V	PASS

Above 1G



Suspected Data List											
NO.	Frequency [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Det	Pol	Verdict
1	1204.00	63.16	43.36	-19.80	72.90	29.54	200	36	PK	H	PASS
2	1682.13	60.63	41.83	-18.80	72.90	31.07	100	318	PK	H	PASS
3	4737.88	51.71	42.59	-9.12	72.90	30.31	200	328	PK	H	PASS
4	7075.38	48.69	44.43	-4.26	72.90	28.47	100	179	PK	H	PASS
5	13444.00	45.91	49.61	3.70	72.90	23.29	100	360	PK	H	PASS
6	16788.75	43.17	52.67	9.50	72.90	20.23	200	247	PK	H	PASS

Final Data List										
NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBµV]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Pol	Verdict
1	1204.00	-19.80	54.68	34.88	52.90	18.02	200	36	H	PASS
2	1682.13	-18.80	52.15	33.35	52.90	19.55	100	318	H	PASS
3	4737.88	-9.12	43.23	34.11	52.90	18.79	200	328	H	PASS
4	7075.38	-4.26	40.21	35.95	52.90	16.95	100	179	H	PASS
5	13444.00	3.70	37.43	41.13	52.90	11.77	100	360	H	PASS
6	16788.75	9.50	34.69	44.19	52.90	8.71	200	247	H	PASS



Suspected Data List											
NO.	Frequency [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Det	Pol	Verdict
1	1204.00	62.14	42.34	-19.80	72.90	30.56	100	44	PK	V	PASS
2	1684.25	57.89	39.11	-18.78	72.90	33.79	100	7	PK	V	PASS
3	2708.50	54.88	41.33	-13.55	72.90	31.57	100	197	PK	V	PASS
4	6059.63	49.89	43.41	-6.48	72.90	29.49	200	185	PK	V	PASS
5	9449.00	48.01	46.02	-1.99	72.90	26.88	200	94	PK	V	PASS
6	13796.75	45.60	49.56	3.96	72.90	23.34	200	226	PK	V	PASS

Final Data List										
NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBµV]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Pol	Verdict
1	1204.00	-19.80	53.66	33.86	52.90	19.04	100	44	V	PASS
2	1684.25	-18.78	49.41	30.63	52.90	22.27	100	7	V	PASS
3	2708.50	-13.55	46.4	32.85	52.90	20.05	100	197	V	PASS
4	6059.63	-6.48	41.41	34.93	52.90	17.97	200	185	V	PASS
5	9449.00	-1.99	39.53	37.54	52.90	15.36	200	94	V	PASS
6	13796.75	3.96	37.12	41.08	52.90	11.82	200	226	V	PASS

9. Periodic operation characteristics

9.1. Regulation

Devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

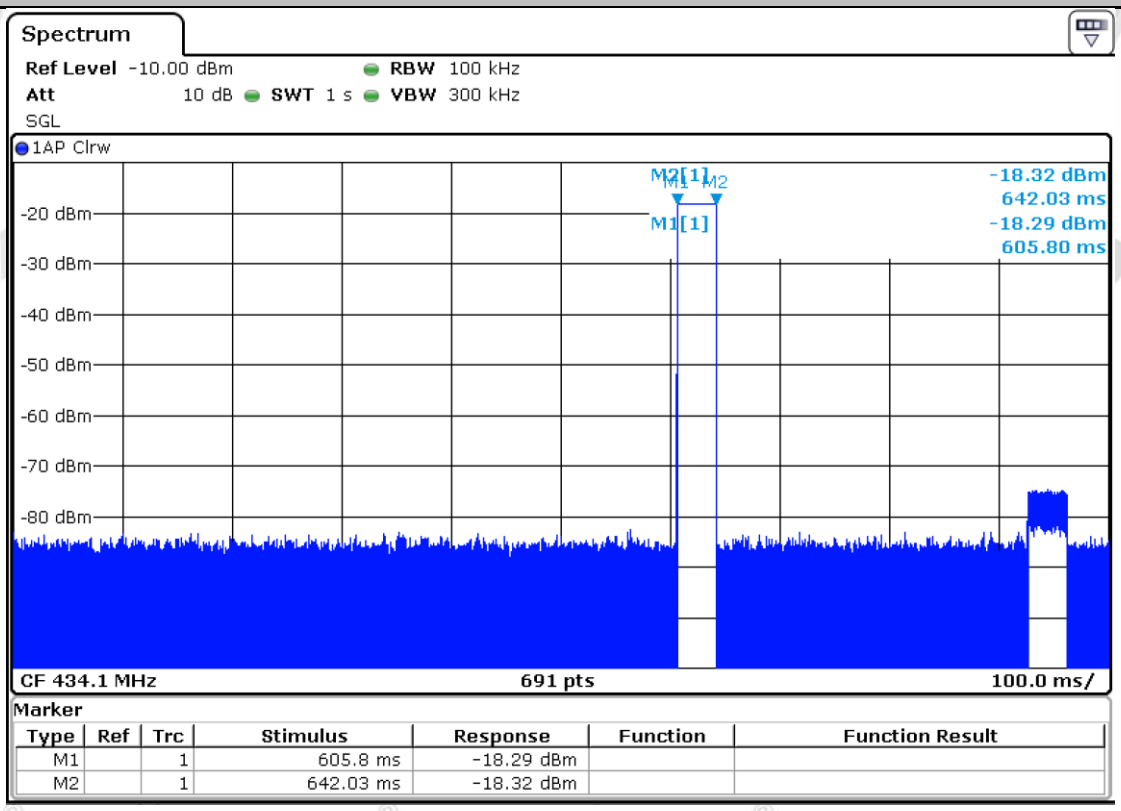
9.2. Result

The intentional radiator complies with the provisions of paragraph (e) of FCC CFR § 15.231.

Modulation	Transmission Time Result (s)	Silent period Result (s)	Transmission Time Limit (s)	Silent period Limit (s)	Result
FSK	0.03623	11.4522	1	10	Pass

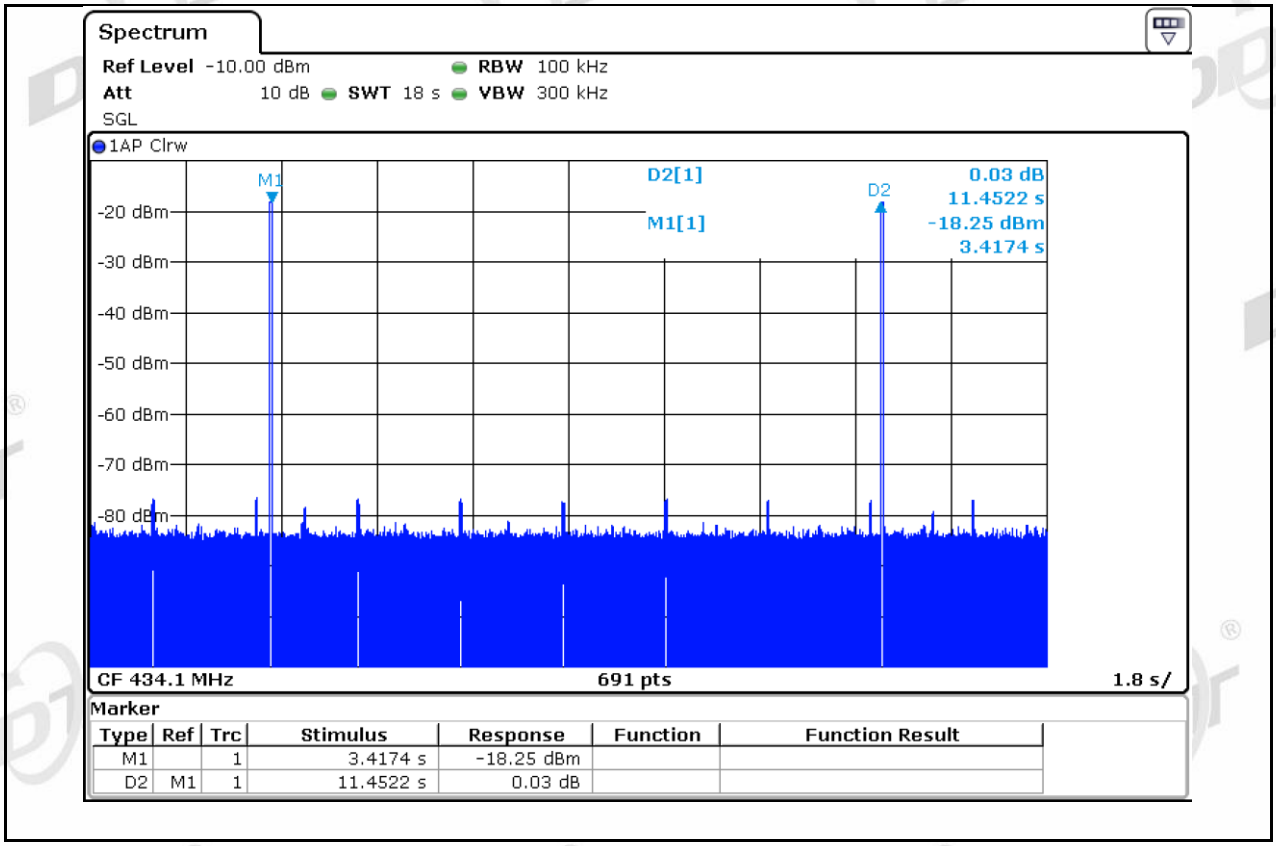
Note: Transmission time= T1 =36.23ms

Transmission time



T1

Silent period


Spectrum
Ref Level -10.00 dBm
RBW 100 kHz
Att 10 dB
SWT 18 s
VBW 300 kHz
SGL
1AP Clrw
M1
D2[1]
M1[1]
D2
0.03 dB
11.4522 s
-18.25 dBm
3.4174 s
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 434.1 MHz
691 pts
1.8 s/
Marker
Type Ref Trc Stimulus Response Function Function Result
M1 1 3.4174 s -18.25 dBm
D2 M1 1 11.4522 s 0.03 dB

10. Fundamental frequencies/Field strength

10.1. Regulation limit

Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental Frequency (MHz)	Field strength of Fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

#Linear interpolation with frequency, f, in MHz:

For 130-174 MHz: Field Strength (μ V/m) = (22.73 x f)-2454.55
For 260-470 MHz: Field Strength (μ V/m) = (16.67 x f)-2833.33

10.2. Block diagram of test setup

Refer to 8.2.

10.3. Test procedure

The EUT and this peripheral (when additional equipment exists) are placed on a tum table which is 0.8m above the ground. The turn table would be allowed to rotate 360 degrees to determine the position of the maximum emission level. The test distance between the EUT and the receiving antenna are 3m. To find the maximum emission, the polarization of the receiving antenna are changed in horizontal and vertical polarization. the position of the EUT was changed indifferent orthogonal determinations.

Measurement procedures for electric field radiated emissions above 30MHz below 1 GHz are covered in ANSI C63.10. The ANSI C63.10 measurement procedure consists of both an exploratory test and a final measurement. The exploratory test is critical to determine the frequency of all significant emissions. For each mode of operation required to be tested, the frequency spectrum is monitored. Variations in antenna height, antenna orientation. antenna polarization, EUT azimuth, and cable or wire placement is explored to produce the emission that

has the highest amplitude relative to the limit.

The final measurements are made based on the findings in the exploratory testing. When making exploratory and final measurements it 1s necessary to maximize the measured radiated emission. ANSI C63.10 states that the measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." We consider the “*cone of radiation” to be the 3 dB beamwidth of the measurement antenna.

While the "bore-sighting" technique is not explicitly mentioned in ANSI C63.10, it is a useful technique for measurements using a directional antenna, such as a double-ridged waveguide antenna. Several precautions must be observed. including: knowledge of the beamwidth of the antenna and the resulting illumination area relative to the size of the EUT, estimation for source of the emission and general location within larger EUTS, measuring system sensitivity. etc.

ANSI C63.10 requires that the measurement antenna is kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. That means that if the directional radiation pattern of the EUT results in a maximum emission at an upwards angle from the EUT, when a directional antenna 1s used to make the measurement it will be necessary for it to be pointed towards the source of the emission within the EUT. This can be done by either pointing the antenna at an angle towards the source of the emission. or by rotating the EUT. in both height and polarization. to maximize the measured emission The emission must be kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission from the EUT is measured

when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval. The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in Equation:

$$\delta(\mathrm{dB}) = 20\log(\Delta)$$

where

δ is the duty cycle correction factor (dB)
Δ is the duty cycle (dimensionless)

This correction factor may then be subtracted from the peak pulse amplitude (in dB) to find the

average emission. This correction may be applied to all emissions that demonstrate the same pulse timing characteristics as the fundamental emission (e.g., the fundamental and harmonic emissions). In cases where the pulse train is truly random or pseudo random, some regulatory agencies might accept a declaration by the manufacturer of the worst-case value of t_{ON}. The duty cycle correction is determined as follows:

a) Adjust and configure any EUT switches, controls, or input data streams to ensure that the EUT is transmitting or encoded to obtain the “worst-case” pulse ON time.

b) Couple the final radio frequency output signal to the input of a spectrum analyzer. This may be performed by a radiated, direct connection (i.e., conducted) or by a “near-field” coupling method. The signal received shall be of sufficient level to trigger adequately the spectrum analyzer sweep display.

NOTE—If the bandwidth of the pulse is greater than the RBW of the spectrum analyzer, then a similar measurement may be performed using a wideband digital storage oscilloscope (DSO).

c) Adjust the center frequency of the spectrum analyzer to the center of the RF signal.

d) Set the spectrum analyzer for ZERO SPAN.

e) Adjust the SWEEP TIME to obtain at least a 100 ms period of time on the horizontal display axis of the spectrum analyzer.

f) If the pulse train is periodic (i.e., consists of a series of pulses that repeat in a characteristic pattern over a constant time period), and the period (T) is less than or equal to 100 ms, then:

1) Set the TRIGGER on the spectrum analyzer to capture at least one period of the pulse train, including any blanking intervals.

2) Determine the total maximum pulse “ON time” (t_{ON}) over one period of the pulse train. If the pulse train contains pulses of different widths, then t_{ON} is determined by summing the duration of all of the pulses within the pulse train [i.e., $t_{ON} = \Sigma(t1 + t2 + \ldots tn)$].

3) The duty cycle is then determined by dividing the total maximum “ON time” by the period of the pulse train (t_{ON}/T).

g) If the pulse train is nonperiodic or is periodic with a period that exceeds 100 ms, or as an alternative to step f), then:

1) Set the TRIGGER on the spectrum analyzer to capture the greatest amount of pulse “ON time” over 100 ms.

2) Find the 100 ms period that contains the maximum “on time”; this could require summing the duration of multiple pulses as described in step f2).

3) Determine the duty cycle by dividing the total maximum “ON time” by 100 ms (t_{ON}/100 ms).

$$\delta(\mathrm{dB}) = 20\log\left[\sum\left(nt_1 + mt_2 + \ldots + \xi t_x\right)/T\right]$$

n is the number of pulses of duration t1

m is the number of pulses of duration t2

ξ is the number of pulses of duration tx

T is the period of the pulse train, or 100 ms if the pulse train length is greater than 100 ms

10.4. Test result

Item (Mark)	Freq. (MHz)	Result Level (PK) (dBµV/m)	Result Level (AV) (dBµV/m)	Limit Line (PK) (dBµV/m)	Limit Line (AV) (dBµV/m)	Margin (dB)	Detector	Polarization
1	434.1	65.45	56.63	92.9	72.9	16.27	PK	H
2	434.1	73.35	64.53	92.9	72.9	8.37	PK	V

Note:

Calculate Average value based on Duty Cycle correction factor:

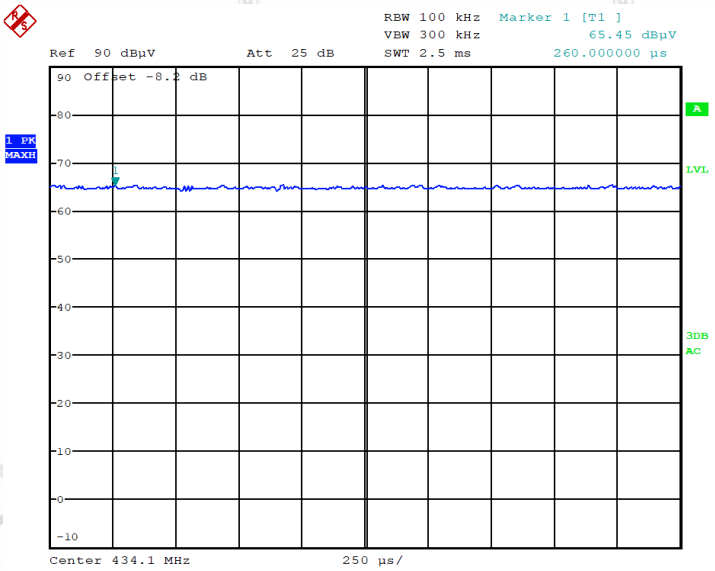
Ton = T1=ms=36.23ms

Tp=100ms

duty cycle factor=20*log(Ton/Tp)= 20*log(36.23ms/100ms)=-8.82 dB

Test Result

H



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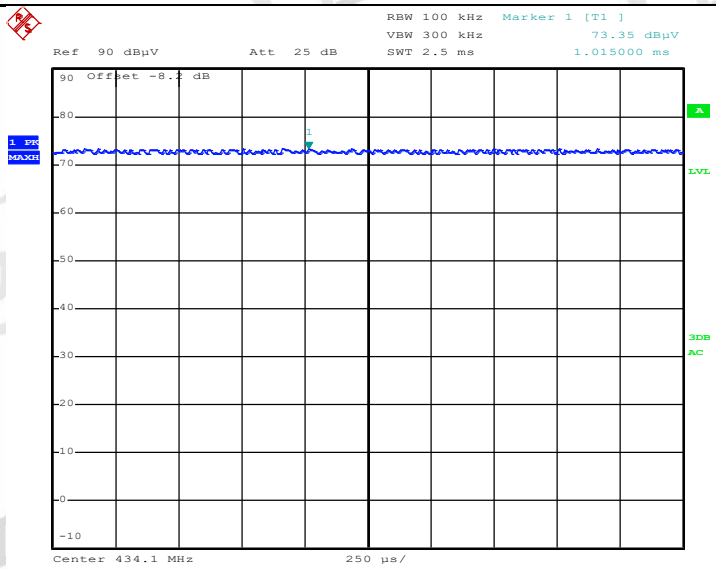
V



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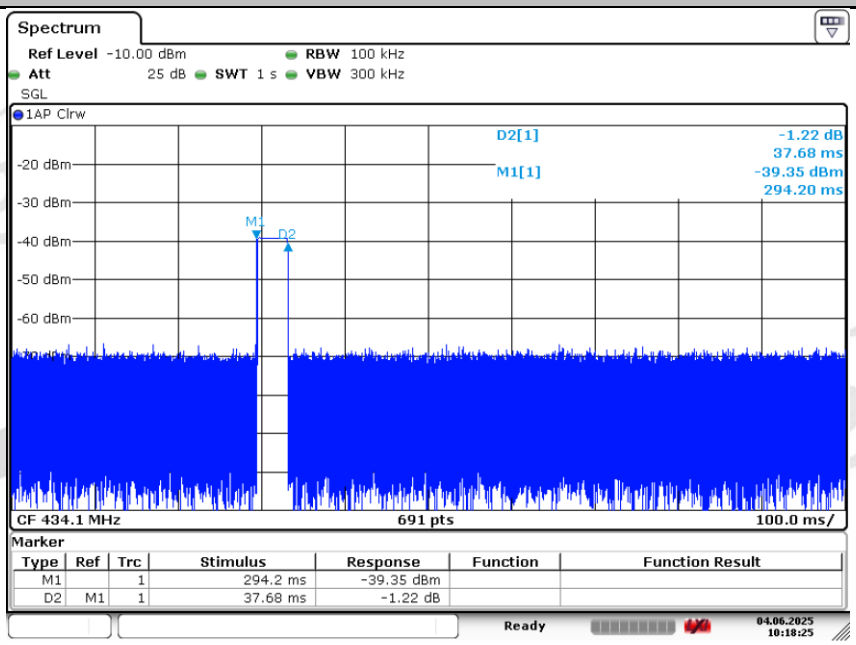
Duty Cycle



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11. Bandwidth(20dB)

11.1. Regulation

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz, For devices operating above 900 MHz. the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

11.2. Calculation of the 20dB bandwidth limit

The 20 dB bandwidth limit = 0.0025 * 434.1 MHz = 1.08525 MHz = 1085.25kHz

11.3. Test Procedure

A dBc bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). Typical ratios, expressed in dB, are −6 dB, −20 dB, and −26 dB, corresponding to 6 dB BW, 20 dB BW, and 26 dB BW, respectively. In this subclause, the ratio is designated by "−xx dB." The reference value is either the level of the unmodulated carrier or the highest level of the spectral envelope of the modulated signal, as stated by the applicable requirement. Some requirements might specify a specific maximum or minimum value for the "−xx dB" bandwidth; other requirements might specify that the "−xx dB" bandwidth be entirely contained within the authorized or designated frequency band

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be at least three times RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.

d) Steps a) through c) might require iteration to adjust within the specified tolerances.

e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.

f) Set detection mode to peak and trace mode to max-hold.

g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

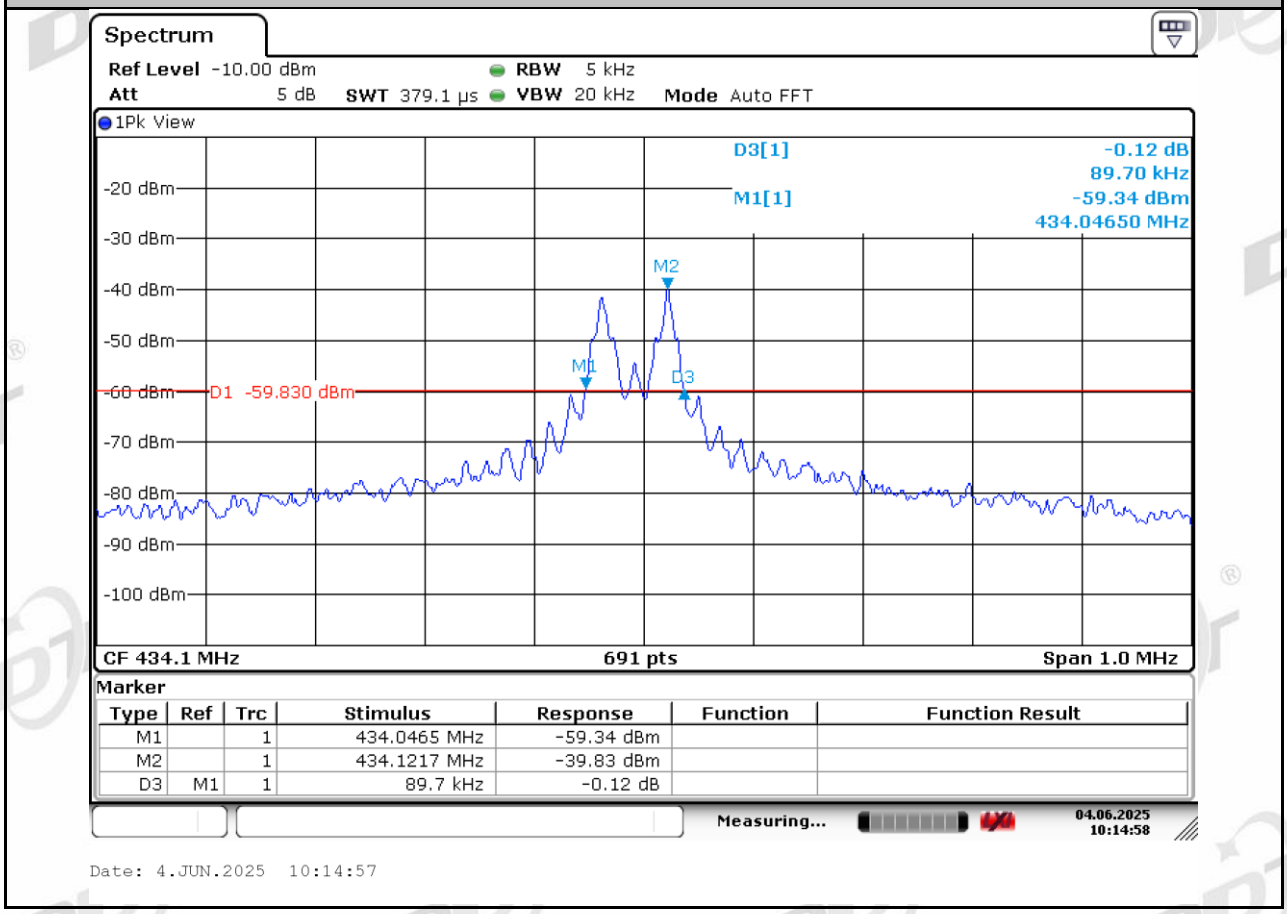
h) Determine the “−xx dB down amplitude” using [(reference value) - xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.
i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).
j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “−xx dB down amplitude” determined in step h). If a marker is below this “−xx dB down amplitude” value, then it shall be as close as possible to this value. The dBc bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “−xx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.
k) The dBc bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

11.4. Test result

Modulation	F_L Result (MHz)	F_H Result (MHz)	Limit Low (MHz)	Limit high (MHz)	Bandwidth Result (kHz)	Bandwidth Limit (kHz)	Result
FSK	434.0465	434.1362	433.5574	434.6426	89.7	1085.25	PASS

Note: The EUT is not capable of producing an unmodulated carrier.

20dB Bandwidth



12. Bandwidth(99%)

12.1. Regulation

The occupied bandwidth of momentarily operated devices shall be less than or equal to 0.25% of the center frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the occupied bandwidth shall be less than or equal to 0.5% of the center frequency.

12.2. Calculation of the 99% bandwidth limit

The 99% bandwidth limit = 0.0025 * 434.1 MHz = 1.08525 MHz = 1085.25kHz

12.3. Test Procedure

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be at least three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max-hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

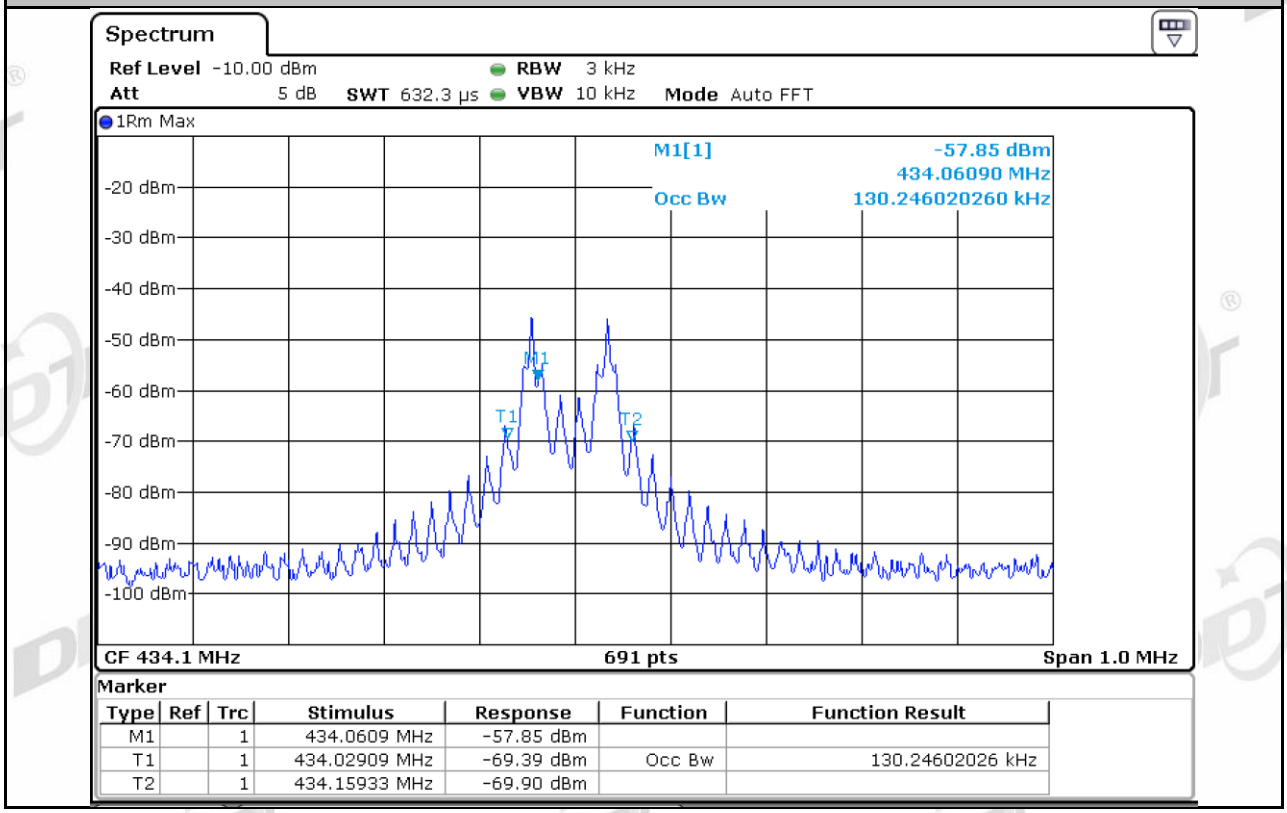
h) The occupied bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

12.4. Test result

Modulation	F_L Result (MHz)	F_H Result (MHz)	Limit Low (MHz)	Limit high (MHz)	Bandwidth Result (kHz)	Bandwidth Limit (kHz)	Result
FSK	434.02909	434.15933	433.5574	434.6426	130.246	1085.25	Pass

Note: The EUT is not capable of producing an unmodulated carrier.

99% Occupied _ Bandwidth



13. Photos of the EUT

Please refer to the appendix A.

14. Photos of the Setup

Please refer to the appendix B.

END REPORT