Shenzhen Huaxia Testing Technology Co., Ltd.

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Report Template Version: V05
Report Template Revision Date: 2021-11-03

TEST REPORT

Report No.:	CQASZ20221101941E -01
Applicant:	Shenzhen DO Intelligent Technology Co., Ltd
Address of Applicant:	11th Floor, 3# Building, Guole Tech Park, Lirong Road, Dalang, Longhua District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	Smart Watch
Model No.:	IDW15, IDW15 Plus, IDW15 Plus BT
Test Model No.:	IDW15
Brand Name:	IDO
FCC ID:	2AHFT499
Standards:	47 CFR Part 15.247
Date of Receipt:	2022-11-16
Date of Test:	2022-11-21 to 2022-11-24
Date of Issue:	2022-12-30
Test Result:	Pass*

* In the configuration tested, the EUT compiled with the standards with above.

Tested By: Lewis Zhou
(Lewis Zhou)

Reviewed By: Timo Lei
(Timo Lei)

Approved By: [signature]
(Jack Ai)

SHENZHEN HUAXIA TESTING TECHNOLOGY CO., LTD
CQA 华夏准测
★ APPROVED ★

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History of Report

Report No.	Version	Description	Issue Date
CQASZ20221101941E -01	Rev. 01	Initial report	2022-12-30

2 Test Summary

Test Item	Standard	Test Method	Class / Severity	Result
Antenna requirement	47 CFR Part 15.247		Part 15.203	Pass
Occupied Bandwidth	47 CFR Part 15.247	ANSI C63.10-2013, section 6.9.2	47 CFR 15.215(c)	Pass
Maximum Conducted Output Power	47 CFR Part 15.247	ANSI C63.10-2013, section 7.8.5	47 CFR 15.247(b)(1)	Pass
Channel Separation	47 CFR Part 15.247	ANSI C63.10-2013, section 7.8.2	47 CFR 15.247(a)(1)	Pass
Number of Hopping Frequencies	47 CFR Part 15.247	ANSI C63.10-2013, section 7.8.3	47 CFR 15.247(a)(1)(iii)	Pass
Dwell Time	47 CFR Part 15.247	ANSI C63.10-2013, section 7.8.4	47 CFR 15.247(a)(1)(iii)	Pass
Emissions in non-restricted frequency bands	47 CFR Part 15.247	7.8.8	47 CFR 15.247(d)	Pass
Emissions around the fundamental	47 CFR Part 15.247	ANSI C63.10-2013 section 6.6.4	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (below 1GHz)	47 CFR Part 15.247	ANSI C63.10-2013 section 6.6.4	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (above 1GHz)	47 CFR Part 15.247	ANSI C63.10-2013 section 6.6.4	47 CFR 15.247(d)	Pass

3 Contents

4 General Information

4.1 Client Information

Applicant:	Shenzhen DO Intelligent Technology Co., Ltd
Address of Applicant:	11th Floor, 3# Building, Guole Tech Park, Lirong Road, Dalang, Longhua District, Shenzhen, China
Manufacturer:	Shenzhen DO Intelligent Technology Co., Ltd
Address of Manufacturer:	11th Floor, 3# Building, Guole Tech Park, Lirong Road, Dalang, Longhua District, Shenzhen, China
Factory:	Shenzhen DO Intelligent Technology Co., Ltd
Address of Factory:	11th Floor, 3# Building, Guole Tech Park, Lirong Road, Dalang, Longhua District, Shenzhen, China

4.2 General Description of EUT

Product Name:	Smart Watch
Model No.:	IDW15, IDW15 Plus, IDW15 Plus BT
Test Model No.:	IDW15
Trade Mark:	IDO
Power Supply:	Li-ion battery DC 3.8V 300mAh, Charge by DC 5V for adapter
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	79
Software Version:	IDW15_V1.0.1
Hardware Version:	V1.1
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Antenna Type:	FPC
Antenna Gain:	-0.18dBi
Bluetooth Version:	V5.3

4.3 Description of Support Units

The EUT was tested as an independent device.

4.4 Test Mode

No	Title	Description
TM1	TX-GFSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM2	TX-Pi/4DQPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with Pi/4DQPSK modulation.
TM3	TX-8DPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with 8DPSK modulation.
TM4	TX-GFSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,.
TM5	TX-Pi/4DQPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with Pi/4DQPSK modulation.

TM6	TX-8DPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with 8DPSK modulation.
TM7	Test of difference 1#	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM8	Test of difference 2#	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM9	Test of difference 3#	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM10	Test of difference 4#	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM11	Test of difference 5#	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM12	Test of difference 6#	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM13	Test of difference 7#	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.

Note:
TM1-9 and TM10-13 flash are different, the former is 64Mb and the latter 128Mb
EUT Flash comes in two sizes, 128Mb and 64Mb, and there are four screen vendors
these changes does not affect the radio performance

4.5 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd.
1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• IC Registration No.: 22984-1

The 3m Semi-anechoic chamber of Shenzhen Huaxia Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

• CNAS (No. CNAS L5785)

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 4742.01)

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• FCC Registration No.: 522263

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Condition

None

4.9 Other Information Requested by the Customer

None.

4.10 Measurement Uncertainty (95% confidence levels, k=2)

Test Item	Measurement Uncertainty
Occupied Bandwidth	1.1%
RF Conducted Power	0.86dB
Duty Cycle	0.6 %
Conducted Spurious Emissions	0.86dB

5 Equipment List

Occupied Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC power	KEYSIGHT	E3631A	CQA-028	2022-09-09	2023-09-08
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2022-09-09	2023-09-08
Signal generator	R&S	SME06	CQA-024	2022-09-09	2023-09-08
Vector signal generator	R&S	SMBV100A	CQA-039	2022-09-09	2023-09-08
Antenna Connector	CQA	RFC-01	CQA-080	2022-09-09	2023-09-08
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2022-09-09	2023-09-08
RF Control Unit	Tonsced	JS0806-2	CQA-057	2022-09-09	2023-09-08
RF Cable (9KHz~40GHz)	CQA	N/A	C005	2022-09-09	2023-09-08
high-low temperature chamber	Auchno	OJN-9606	CQA-S003	2022-09-09	2023-09-08

Maximum Conducted Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC power	KEYSIGHT	E3631A	CQA-028	2022-09-09	2023-09-08
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2022-09-09	2023-09-08
Signal generator	R&S	SME06	CQA-024	2022-09-09	2023-09-08
Vector signal generator	R&S	SMBV100A	CQA-039	2022-09-09	2023-09-08
Antenna Connector	CQA	RFC-01	CQA-080	2022-09-09	2023-09-08
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2022-09-09	2023-09-08
RF Control Unit	Tonsced	JS0806-2	CQA-057	2022-09-09	2023-09-08
RF Cable (9KHz~40GHz)	CQA	N/A	C005	2022-09-09	2023-09-08
high-low temperature chamber	Auchno	OJN-9606	CQA-S003	2022-09-09	2023-09-08

Channel Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC power	KEYSIGHT	E3631A	CQA-028	2022-09-09	2023-09-08
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2022-09-09	2023-09-08
Signal generator	R&S	SME06	CQA-024	2022-09-09	2023-09-08

Vector signal generator	R&S	SMBV100A	CQA-039	2022-09-09	2023-09-08
Antenna Connector	CQA	RFC-01	CQA-080	2022-09-09	2023-09-08
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2022-09-09	2023-09-08
RF Control Unit	Tonsced	JS0806-2	CQA-057	2022-09-09	2023-09-08
RF Cable (9KHz~40GHz)	CQA	N/A	C005	2022-09-09	2023-09-08
high-low temperature chamber	Auchno	OJN-9606	CQA-S003	2022-09-09	2023-09-08

Number of Hopping Frequencies					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC power	KEYSIGHT	E3631A	CQA-028	2022-09-09	2023-09-08
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2022-09-09	2023-09-08
Signal generator	R&S	SME06	CQA-024	2022-09-09	2023-09-08
Vector signal generator	R&S	SMBV100A	CQA-039	2022-09-09	2023-09-08
Antenna Connector	CQA	RFC-01	CQA-080	2022-09-09	2023-09-08
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2022-09-09	2023-09-08
RF Control Unit	Tonsced	JS0806-2	CQA-057	2022-09-09	2023-09-08
RF Cable (9KHz~40GHz)	CQA	N/A	C005	2022-09-09	2023-09-08
high-low temperature chamber	Auchno	OJN-9606	CQA-S003	2022-09-09	2023-09-08

Dwell Time					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC power	KEYSIGHT	E3631A	CQA-028	2022-09-09	2023-09-08
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2022-09-09	2023-09-08
Signal generator	R&S	SME06	CQA-024	2022-09-09	2023-09-08
Vector signal generator	R&S	SMBV100A	CQA-039	2022-09-09	2023-09-08
Antenna Connector	CQA	RFC-01	CQA-080	2022-09-09	2023-09-08
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2022-09-09	2023-09-08
RF Control Unit	Tonsced	JS0806-2	CQA-057	2022-09-09	2023-09-08
RF Cable (9KHz~40GHz)	CQA	N/A	C005	2022-09-09	2023-09-08

high-low temperature chamber	Auchno	OJN-9606	CQA-S003	2022-09-09	2023-09-08

Emissions in non-restricted frequency bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC power	KEYSIGHT	E3631A	CQA-028	2022-09-09	2023-09-08
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2022-09-09	2023-09-08
Signal generator	R&S	SME06	CQA-024	2022-09-09	2023-09-08
Vector signal generator	R&S	SMBV100A	CQA-039	2022-09-09	2023-09-08
Antenna Connector	CQA	RFC-01	CQA-080	2022-09-09	2023-09-08
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2022-09-09	2023-09-08
RF Control Unit	Tonsced	JS0806-2	CQA-057	2022-09-09	2023-09-08
RF Cable (9KHz~40GHz)	CQA	N/A	C005	2022-09-09	2023-09-08
high-low temperature chamber	Auchno	OJN-9606	CQA-S003	2022-09-09	2023-09-08

Emissions around the fundamental					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Loop antenna	SCHWARZBECK	FMZB 1516	CQA-060	2021-09-16	2024-09-15
Horn Antenna	R&S	BBHA 9170	CQA-088	2021-09-16	2024-09-15
Horn Antenna	R&S	HF906	CQA-012	2021-09-16	2024-09-15
Bilog Antenna	R&S	HL562	CQA-011	2021-09-16	2024-09-15
EMI Test Receiver	R&S	ESR7	CQA-005	2022-09-09	2023-09-08
Spectrum analyzer	R&S	FSU26	CQA-038	2022-09-09	2023-09-08
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2022-09-09	2023-09-08
Coaxial cable (1GHz~40GHz)	CQA	N/A	C007	2022-09-09	2023-09-08
Coaxial cable (9KHz~1GHz)	CQA	N/A	C013	2022-09-09	2023-09-08
Full anechoic chamber	CQA	966	CQA-009	2022-09-09	2023-09-08

Emissions in restricted frequency bands (below 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Loop antenna	SCHWARZBECK	FMZB 1516	CQA-060	2021-09-16	2024-09-15
Horn Antenna	R&S	BBHA 9170	CQA-088	2021-09-16	2024-09-15

Horn Antenna	R&S	HF906	CQA-012	2021-09-16	2024-09-15
Bilog Antenna	R&S	HL562	CQA-011	2021-09-16	2024-09-15
EMI Test Receiver	R&S	ESR7	CQA-005	2022-09-09	2023-09-08
Spectrum analyzer	R&S	FSU26	CQA-038	2022-09-09	2023-09-08
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2022-09-09	2023-09-08
Coaxial cable (1GHz~40GHz)	CQA	N/A	C007	2022-09-09	2023-09-08
Coaxial cable (9KHz~1GHz)	CQA	N/A	C013	2022-09-09	2023-09-08
Full anechoic chamber	CQA	966	CQA-009	2022-09-09	2023-09-08

Emissions in restricted frequency bands (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Loop antenna	SCHWARZBECK	FMZB 1516	CQA-060	2021-09-16	2024-09-15
Horn Antenna	R&S	BBHA 9170	CQA-088	2021-09-16	2024-09-15
Horn Antenna	R&S	HF906	CQA-012	2021-09-16	2024-09-15
Bilog Antenna	R&S	HL562	CQA-011	2021-09-16	2024-09-15
EMI Test Receiver	R&S	ESR7	CQA-005	2022-09-09	2023-09-08
Spectrum analyzer	R&S	FSU26	CQA-038	2022-09-09	2023-09-08
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2022-09-09	2023-09-08
Coaxial cable (1GHz~40GHz)	CQA	N/A	C007	2022-09-09	2023-09-08
Coaxial cable (9KHz~1GHz)	CQA	N/A	C013	2022-09-09	2023-09-08
Full anechoic chamber	CQA	966	CQA-009	2022-09-09	2023-09-08

6 Evaluation Results (Evaluation)

6.1 Antenna requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: 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, 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. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is FPC antenna. The best case gain of the antenna is -0.18dBi.	

7 Radio Spectrum Matter Test Results (RF)

7.1 Occupied Bandwidth

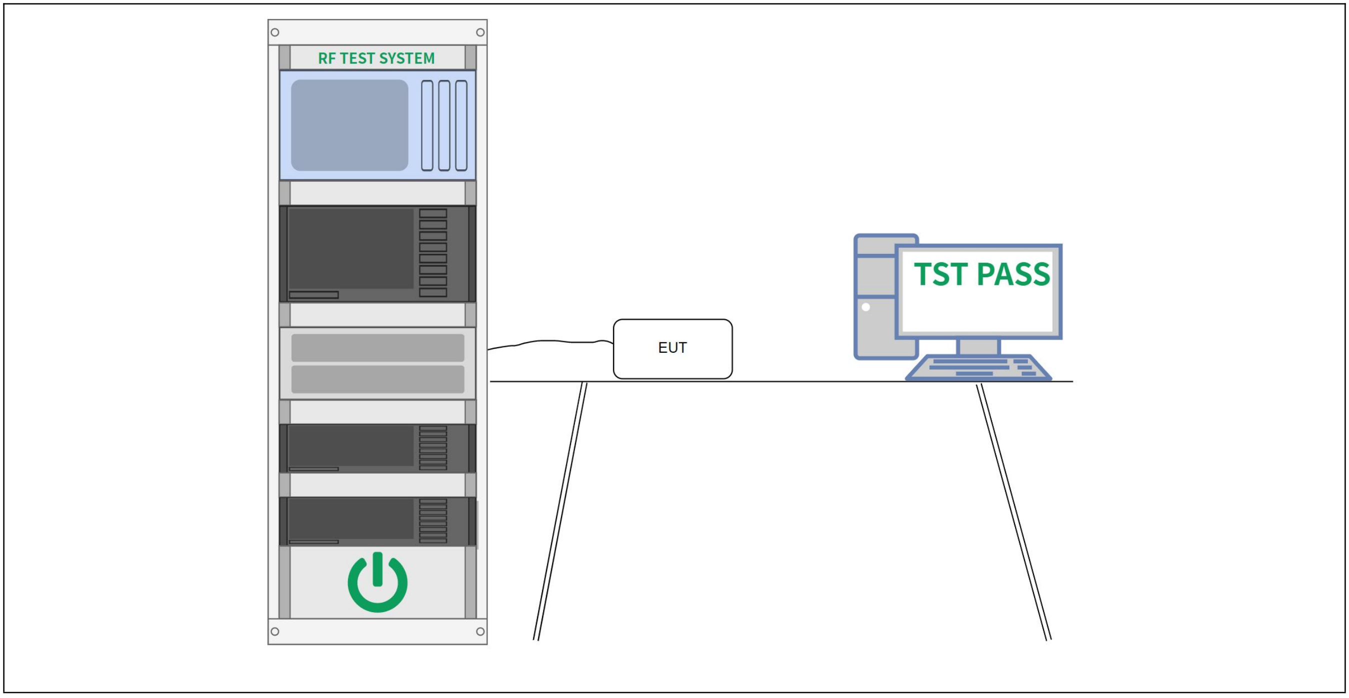
Test Requirement:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Method:	Occupied bandwidth—relative measurement procedure
Test Limit:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Procedure:	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 approximately 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. Specific guidance is given in 4.1.5.2. 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 occupied 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 occupied bandwidth shall be reported by providing 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).

7.1.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.6 °C
Humidity:	42.7 %
Atmospheric Pressure:	101 kPa
Pre test mode:	TM1, TM2, TM3
Final test mode:	TM1, TM2, TM3

7.1.2 Test Setup Diagram:



7.1.3 Test Data:

Please Refer to Appendix for Details.

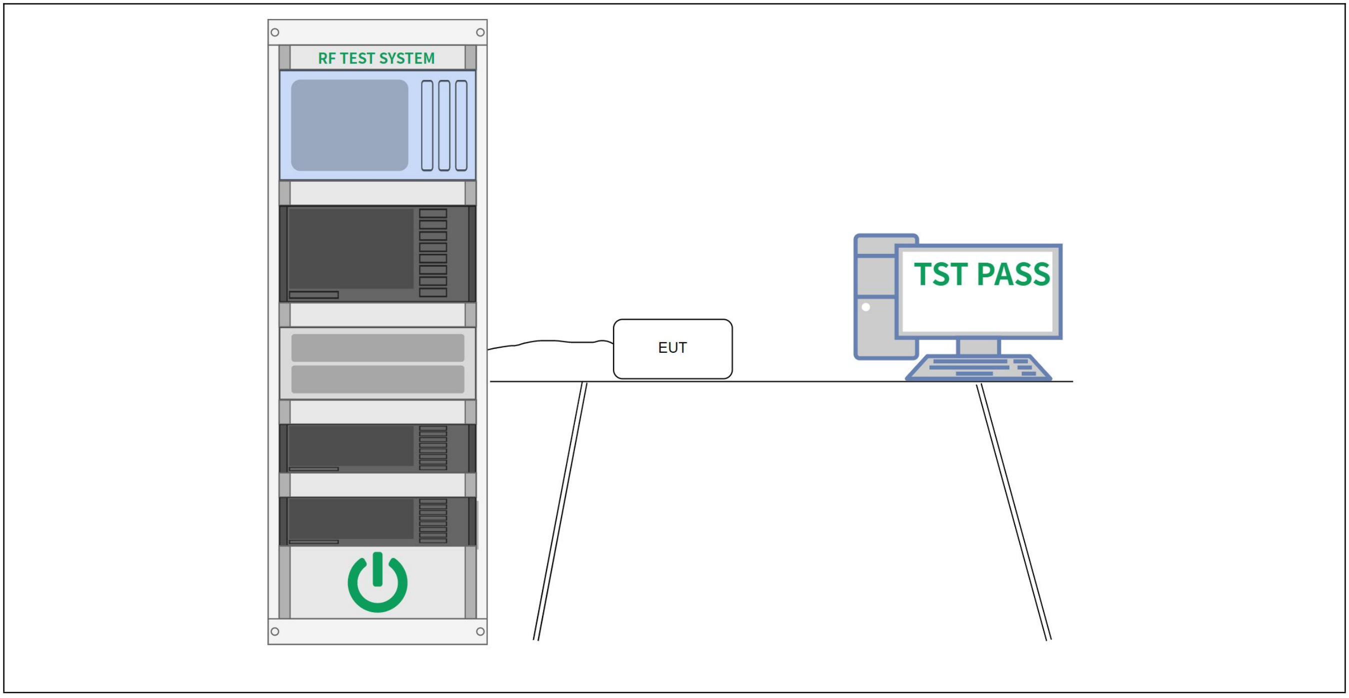
7.2 Maximum Conducted Output Power

Test Requirement:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Method:	Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices
Test Limit:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Procedure:	This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test: a) Use the following spectrum analyzer settings: 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel. 2) RBW > 20 dB bandwidth of the emission being measured. 3) VBW >= RBW. 4) Sweep: Auto. 5) Detector function: Peak. 6) Trace: Max hold. b) Allow trace to stabilize. c) Use the marker-to-peak function to set the marker to the peak of the emission. d) The indicated level is the peak output power, after any corrections for external attenuators and cables. e) A plot of the test results and setup description shall be included in the test report. NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

7.2.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.6 °C
Humidity:	42.7 %
Atmospheric Pressure:	101 kPa
Pre test mode:	TM1, TM2, TM3
Final test mode:	TM1, TM2, TM3

7.2.2 Test Setup Diagram:



7.2.3 Test Data:

Please Refer to Appendix for Details.

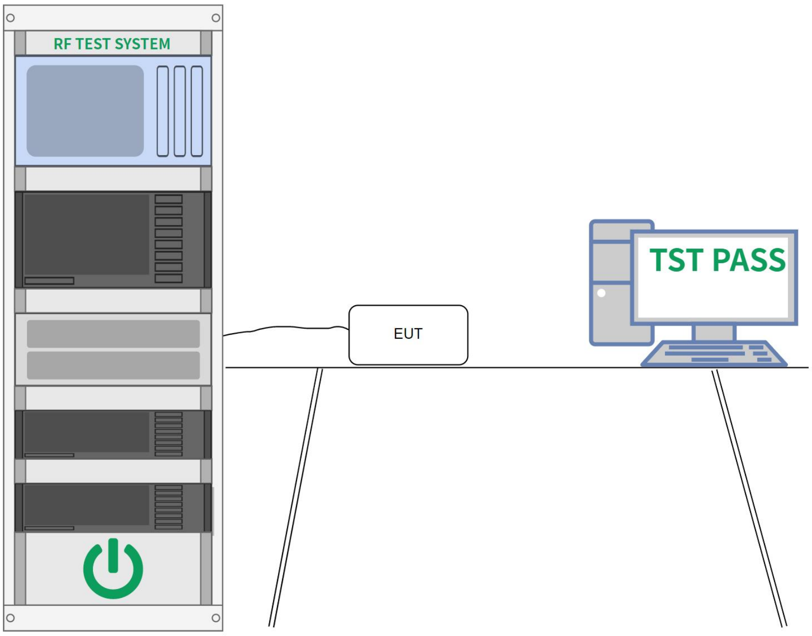
7.3 Channel Separation

Test Requirement:	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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Method:	Carrier frequency separation
Test 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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Wide enough to capture the peaks of two adjacent channels. b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. c) Video (or average) bandwidth (VBW) ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

7.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.6 °C
Humidity:	42.7 %
Atmospheric Pressure:	101 kPa
Pre test mode:	TM4, TM5, TM6
Final test mode:	TM4, TM5, TM6

7.3.2 Test Setup Diagram:



7.3.3 Test Data:

Please Refer to Appendix for Details.

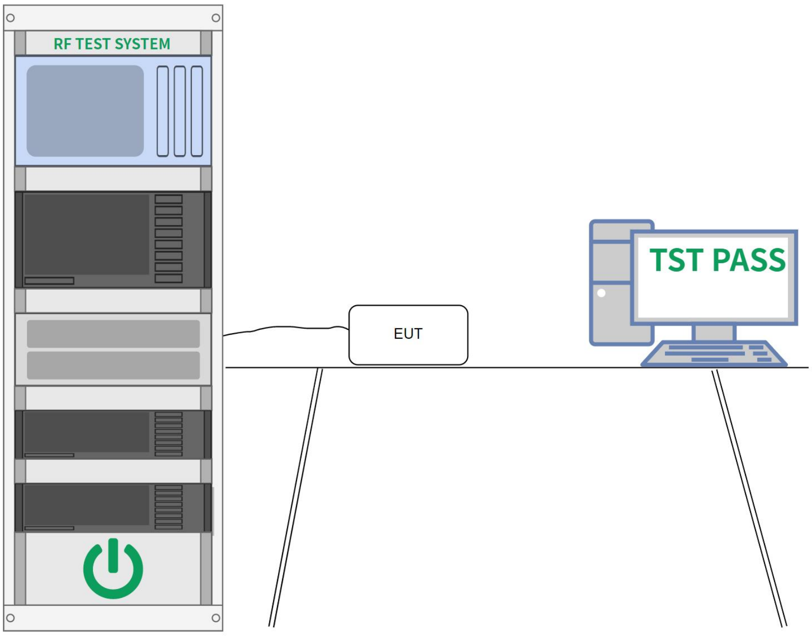
7.4 Number of Hopping Frequencies

Test Requirement:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	Number of hopping frequencies
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen. b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. c) VBW ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

7.4.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.6 °C
Humidity:	42.7 %
Atmospheric Pressure:	101 kPa
Pre test mode:	TM4, TM5, TM6
Final test mode:	TM4, TM5, TM6

7.4.2 Test Setup Diagram:



7.4.3 Test Data:

Please Refer to Appendix for Details.

7.5 Dwell Time

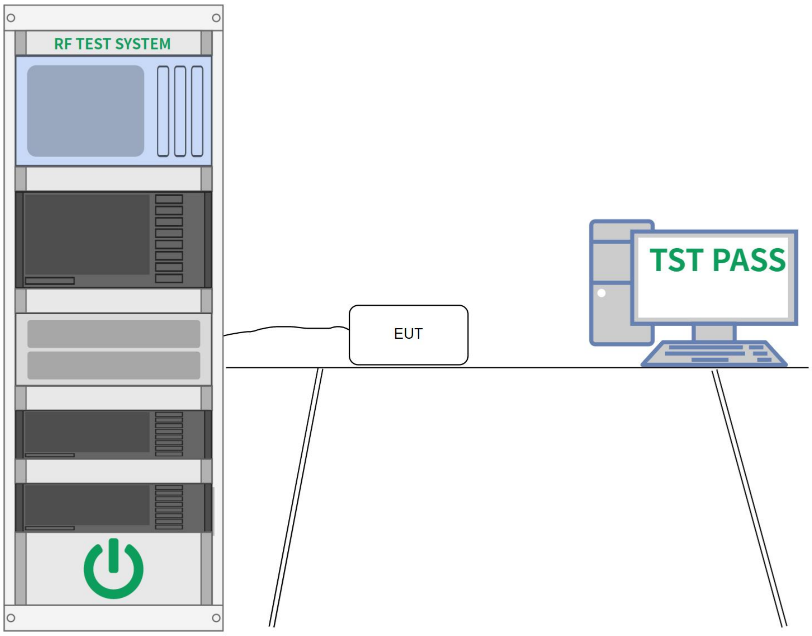
Test Requirement:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	Time of occupancy (dwell time)
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Zero span, centered on a hopping channel. b) RBW shall be <= channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel. c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel. d) Detector function: Peak. e) Trace: Max hold. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation: (Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time) The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation. The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

7.5.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.6 °C
Humidity:	42.7 %
Atmospheric Pressure:	101 kPa

Pre test mode:	TM4, TM5, TM6
Final test mode:	TM4, TM5, TM6

7.5.2 Test Setup Diagram:



7.5.3 Test Data:

Please Refer to Appendix for Details.

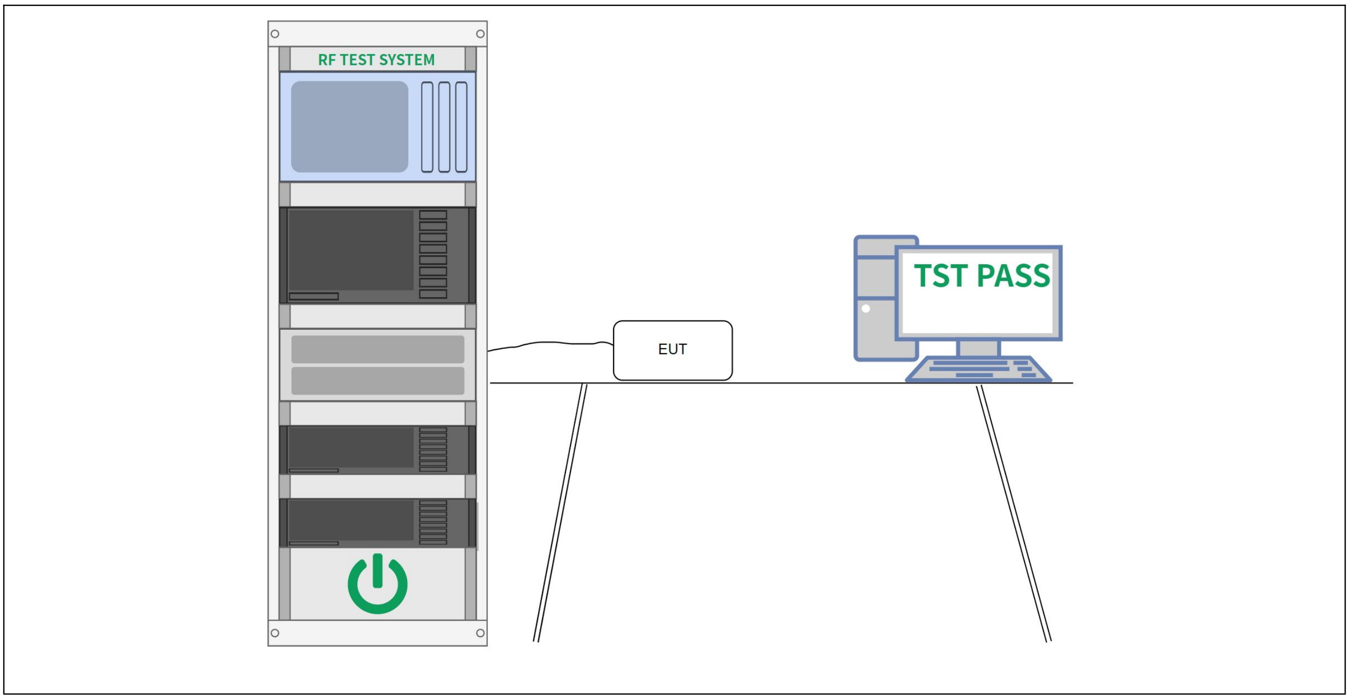
7.6 Emissions in non-restricted frequency bands

Test Requirement:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method:	Conducted spurious emissions test methodology
Test Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Procedure:	Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers. Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

7.6.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.6 °C
Humidity:	42.7 %
Atmospheric Pressure:	101 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6

7.6.2 Test Setup Diagram:



7.6.3 Test Data:

Please Refer to Appendix for Details.

7.7 Emissions around the fundamental

<table>
<tr><td>Test Requirement:</td><td>In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`</td></tr>
<tr><td>Test Method:</td><td>Radiated emissions tests</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g.,
§§ 15.231 and 15.241.
</td></tr>
<tr><td>Procedure:</td><td>ANSI C63.10-2013 section 6.6.4</td></tr>
</table>

7.7.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.5 °C
Humidity:	53 %
Atmospheric Pressure:	100.9 kPa
Pre test mode:	TM1, TM2, TM3
Final test mode:	TM1

7.7.2 Test Data:

Please Refer to 7.9 for Details.

7.8 Emissions in restricted frequency bands (below 1GHz)

Test Requirement:	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`
Test Method:	Radiated emissions tests
Test Limit:	See table below
Procedure:	ANSI C63.10-2013 section 6.6.4

Test Limit:

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

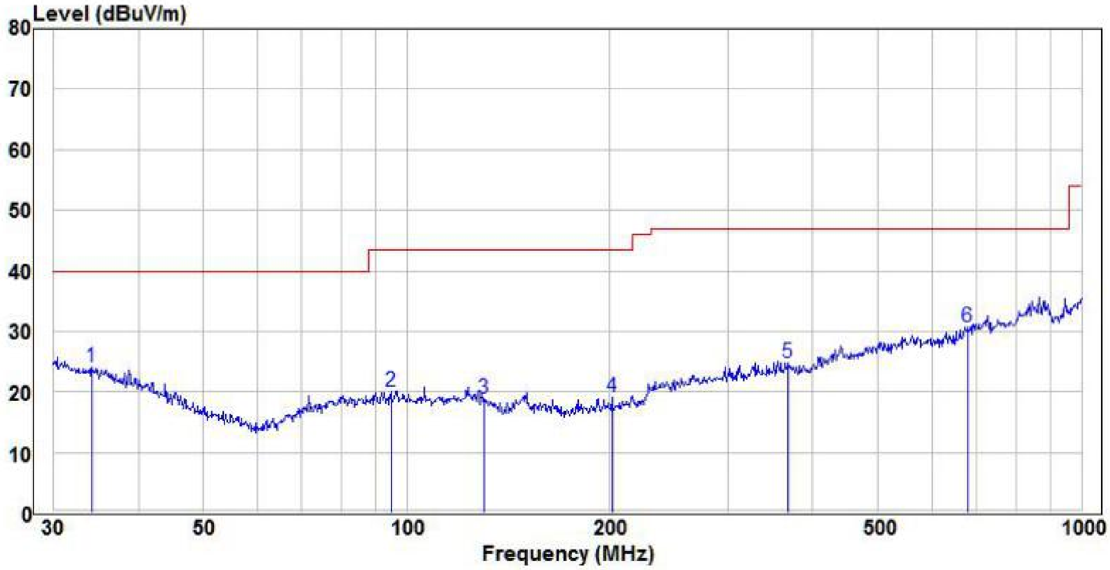
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g.,
§§ 15.231 and 15.241.

7.8.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.5 °C
Humidity:	53 %
Atmospheric Pressure:	100.9 kPa
Pre test mode:	TM1, TM7, TM8, TM9, TM10, TM11, TM12, TM13
Final test mode:	TM1, TM7, TM8, TM9, TM10, TM11, TM12, TM13

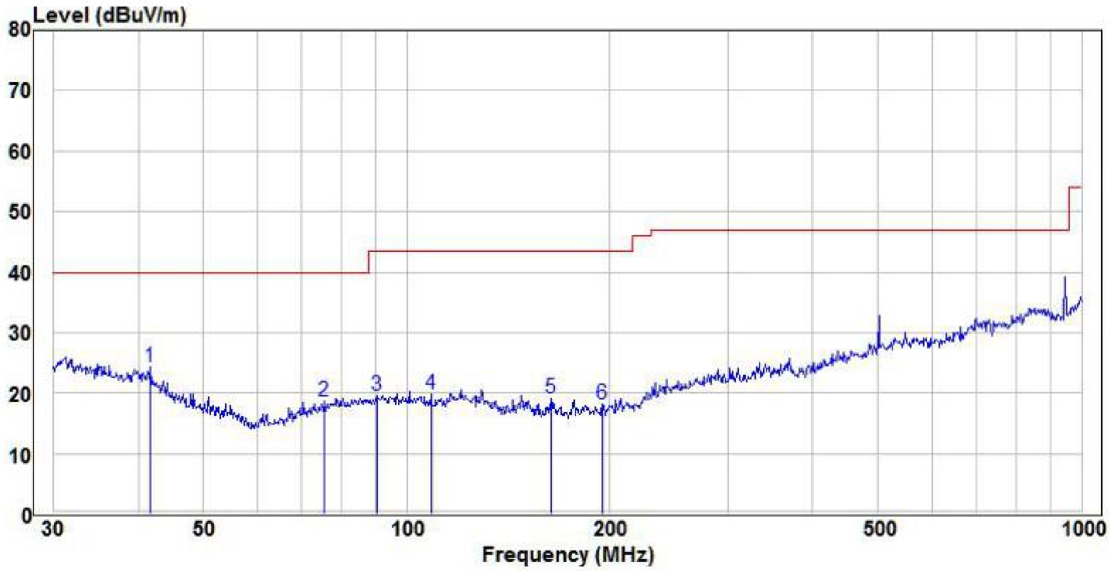
7.8.2 Test Data:

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



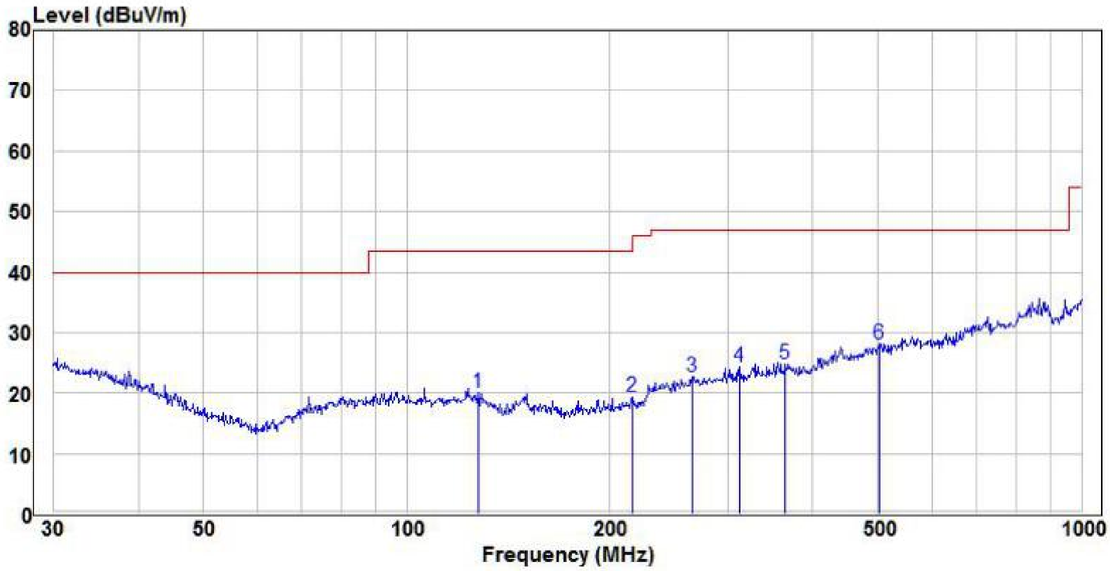
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
	dBuV	dBuV	dBuV	dBuV	dBuV	dBuV				
1	34.16	9.26	16.60	24.09	40.00	-15.91	Peak	HORIZONTAL	---	---
2	94.76	9.81	9.89	20.13	43.50	-23.37	Peak	HORIZONTAL	---	---
3	130.38	8.74	9.71	18.97	43.50	-24.53	Peak	HORIZONTAL	---	---
4	201.39	10.55	7.84	19.08	43.50	-24.42	Peak	HORIZONTAL	---	---
5	368.11	9.29	12.47	24.68	47.00	-22.32	Peak	HORIZONTAL	---	---
6	679.96	10.48	18.36	30.71	47.00	-16.29	Peak	HORIZONTAL	---	---

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



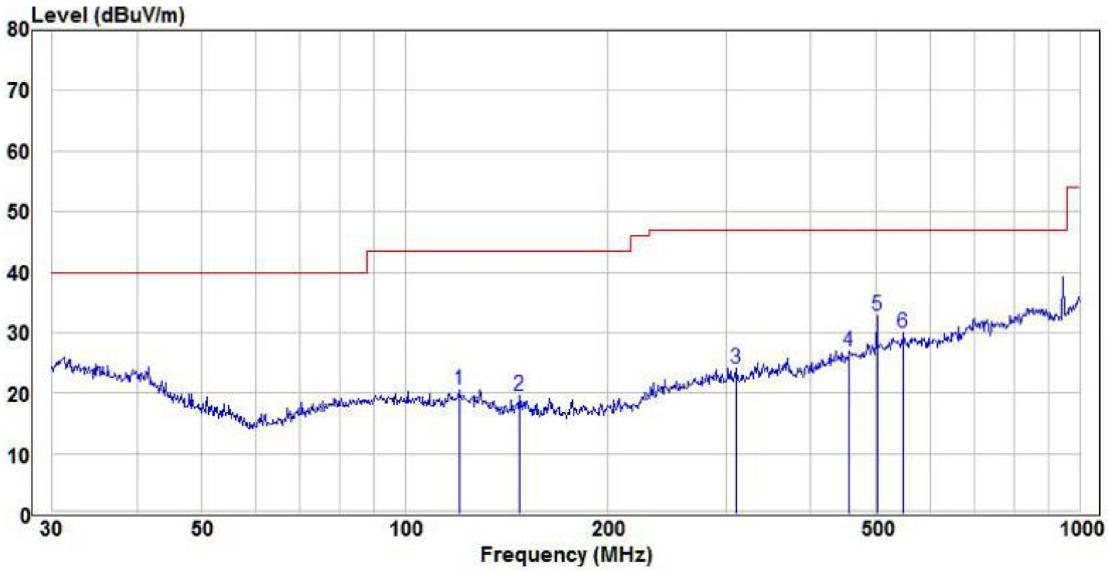
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
	dBuV	dBuV	dBuV	dBuV	dBuV	dBuV				
1	41.71	12.28	13.52	24.27	40.00	-15.73	Peak	VERTICAL	---	---
2	75.45	9.57	8.67	18.61	40.00	-21.39	Peak	VERTICAL	---	---
3	90.22	9.52	9.61	19.55	43.50	-23.95	Peak	VERTICAL	---	---
4	108.65	9.63	9.77	19.87	43.50	-23.63	Peak	VERTICAL	---	---
5	163.76	11.39	7.12	19.11	43.50	-24.39	Peak	VERTICAL	---	---
6	195.14	9.88	7.56	18.12	43.50	-25.38	Peak	VERTICAL	---	---

TM7 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



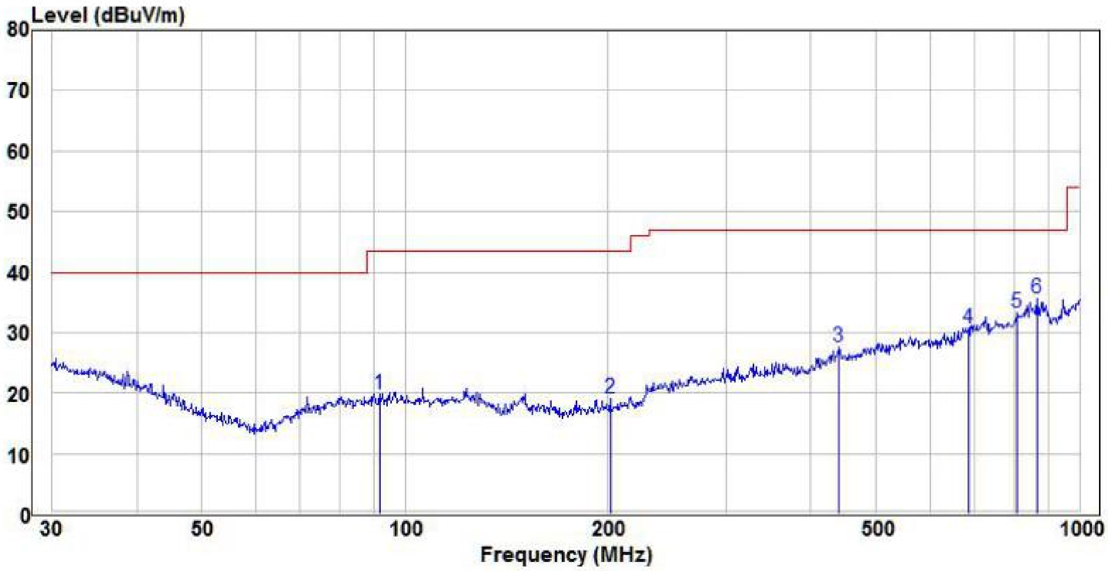
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
	dBuV	dBuV	dBuV	dBuV	dBuV	dBuV				
1	127.66	9.73	9.89	20.14	43.50	-23.36	Peak	HORIZONTAL	---	---
2	216.02	10.28	8.30	19.28	46.00	-26.72	Peak	HORIZONTAL	---	---
3	264.75	10.08	9.81	22.65	47.00	-24.35	Peak	HORIZONTAL	---	---
4	311.09	10.29	11.15	24.29	47.00	-22.71	Peak	HORIZONTAL	---	---
5	364.26	9.49	12.38	24.78	47.00	-22.22	Peak	HORIZONTAL	---	---
6	501.18	9.92	16.11	28.21	47.00	-18.79	Peak	HORIZONTAL	---	---

TM7 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



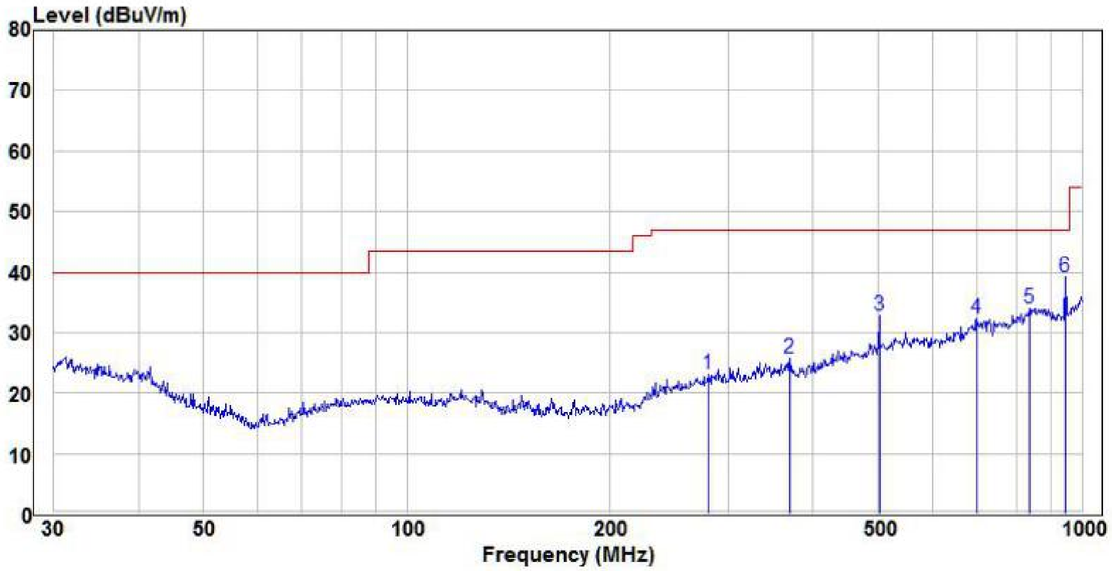
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
		dBuV	dBuV	dBuV	dBuV	dBuV				
1	120.28	9.85	10.19	20.54	43.50	-22.96	Peak	VERTICAL	---	---
2	147.92	11.10	7.82	19.49	43.50	-24.01	Peak	VERTICAL	---	---
3	310.00	10.17	11.13	24.14	47.00	-22.86	Peak	VERTICAL	---	---
4	455.91	9.92	14.82	26.83	47.00	-20.17	Peak	VERTICAL	---	---
5	501.18	14.45	16.11	32.74	47.00	-14.26	Peak	VERTICAL	---	---
6	549.02	11.27	16.54	30.06	47.00	-16.94	Peak	VERTICAL	---	---

TM8 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



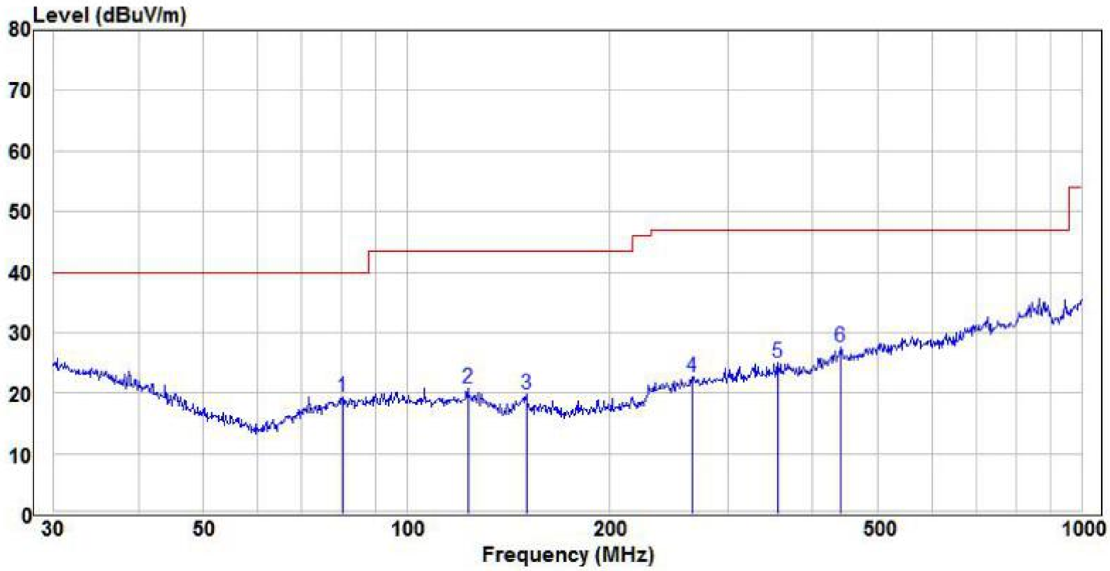
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
	dBuV	dBuV	dBuV	dBuV	dBuV	dBuV				
1	91.82	9.78	9.71	19.91	43.50	-23.59	Peak	HORIZONTAL	---	---
2	201.39	10.55	7.84	19.08	43.50	-24.42	Peak	HORIZONTAL	---	---
3	440.20	11.18	14.37	27.60	47.00	-19.40	Peak	HORIZONTAL	---	---
4	684.75	10.44	18.44	30.75	47.00	-16.25	Peak	HORIZONTAL	---	---
5	810.27	9.99	19.24	33.26	47.00	-13.74	Peak	HORIZONTAL	---	---
6	866.09	11.56	18.90	35.54	47.00	-11.46	Peak	HORIZONTAL	---	---

TM8 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



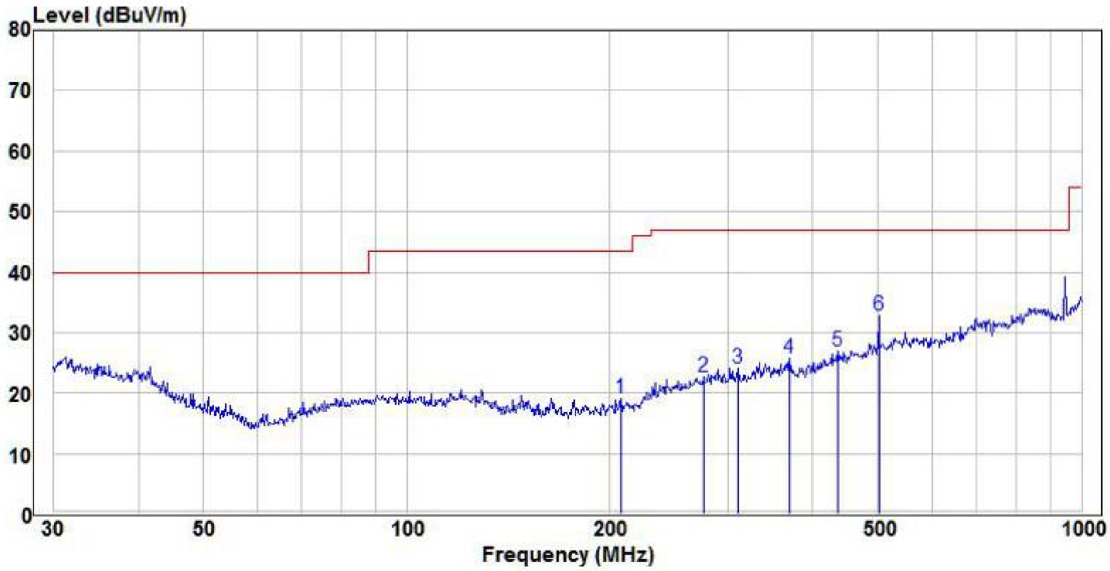
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
	dBuV	dBuV	dBuV	dBuV	dBuV	dBuV				
1	280.02	10.01	10.28	23.08	47.00	-23.92	Peak	VERTICAL	---	---
2	369.40	10.34	12.50	25.76	47.00	-21.24	Peak	VERTICAL	---	---
3	501.18	14.45	16.11	32.74	47.00	-14.26	Peak	VERTICAL	---	---
4	699.30	11.14	18.69	32.22	47.00	-14.78	Peak	VERTICAL	---	---
5	836.24	9.86	19.08	33.98	47.00	-13.02	Peak	VERTICAL	---	---
6	945.44	15.64	19.93	39.26	47.00	-7.74	Peak	VERTICAL	---	---

TM9 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



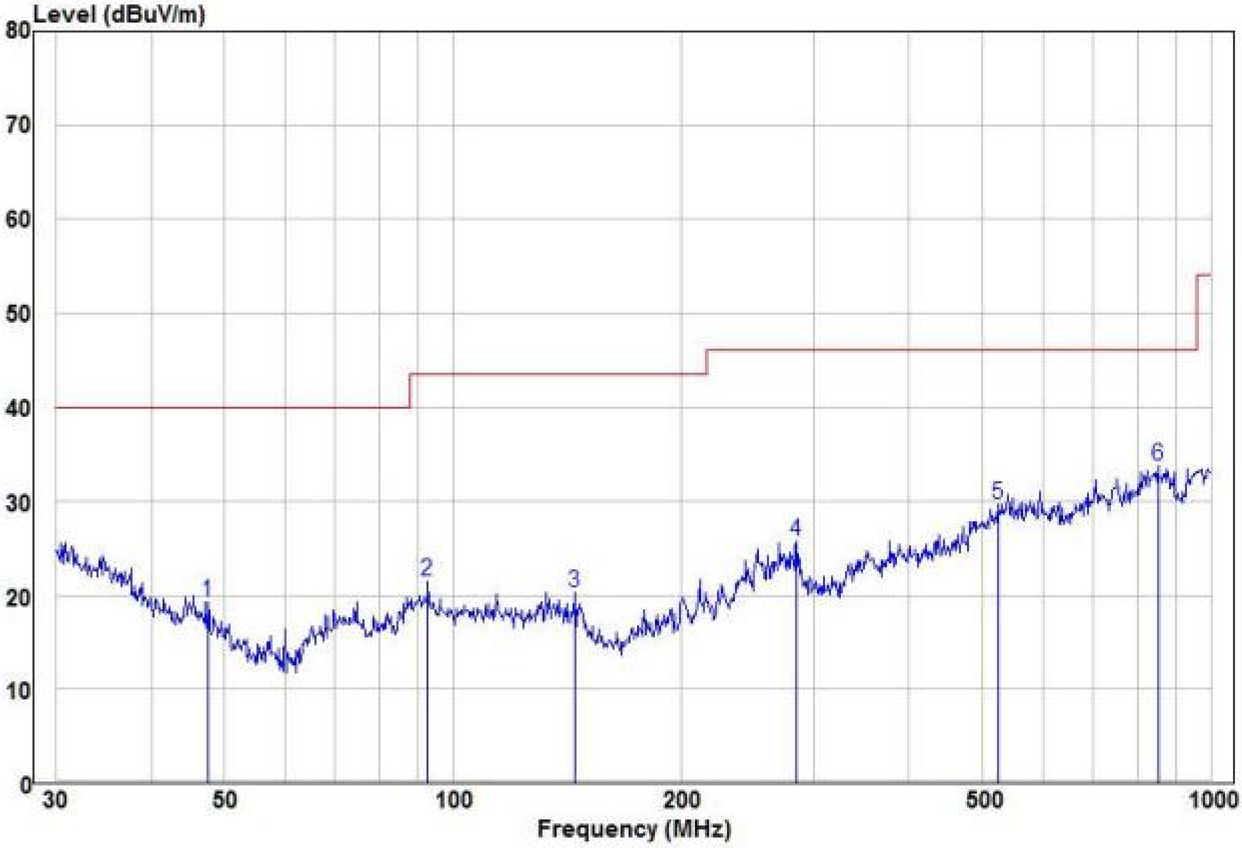
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
	dBuV	dBuV	dBuV	dBuV	dBuV	dBuV				
1	80.36	9.64	9.41	19.44	40.00	-20.56	Peak	HORIZONTAL	---	---
2	123.27	10.29	10.07	20.87	43.50	-22.63	Peak	HORIZONTAL	---	---
3	150.54	11.49	7.86	19.92	43.50	-23.58	Peak	HORIZONTAL	---	---
4	264.75	10.08	9.81	22.65	47.00	-24.35	Peak	HORIZONTAL	---	---
5	355.43	9.97	12.17	25.05	47.00	-21.95	Peak	HORIZONTAL	---	---
6	440.20	11.18	14.37	27.60	47.00	-19.40	Peak	HORIZONTAL	---	---

TM9 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



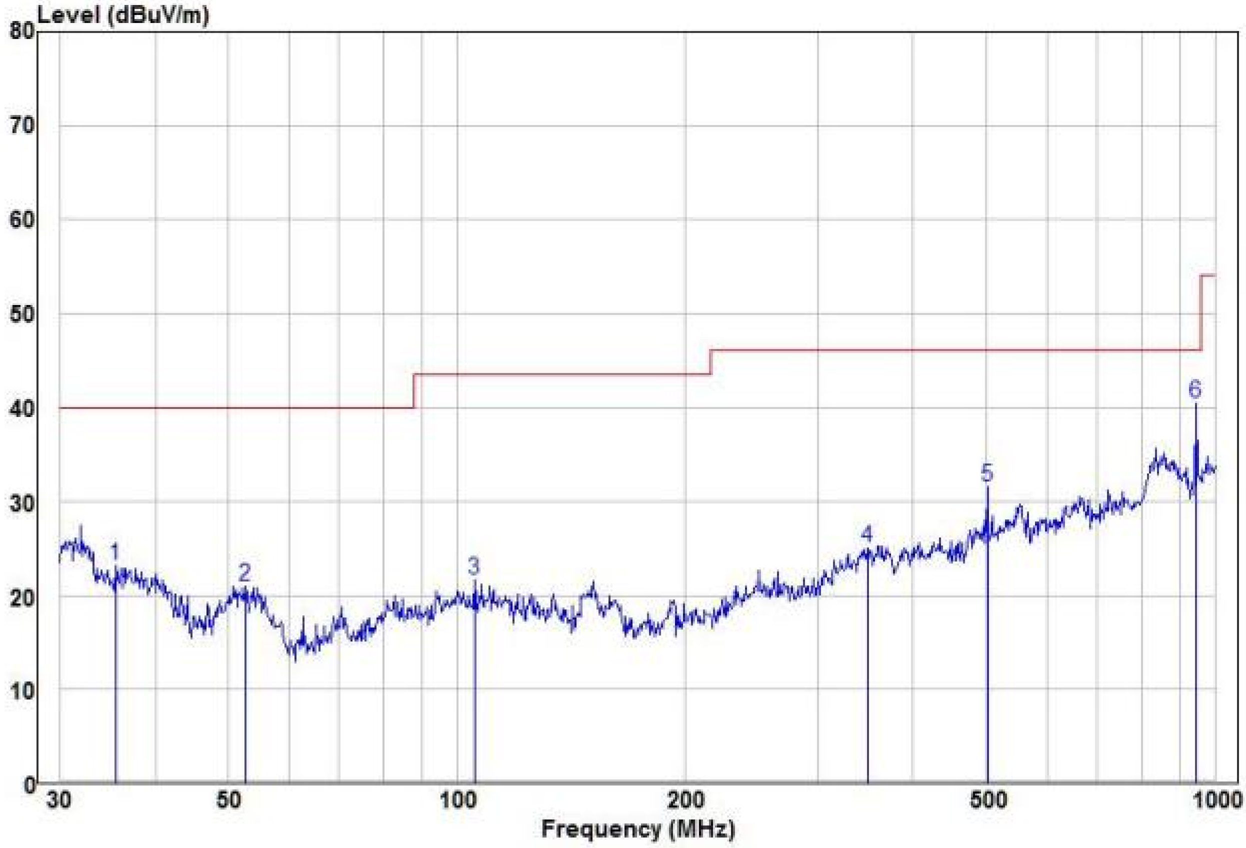
	Freq.	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	APos	TPos
	dBuV	dBuV	dBuV	dBuV	dBuV	dBuV				
1	207.85	10.33	8.04	19.07	43.50	-24.43	Peak	VERTICAL	---	---
2	275.16	9.75	10.13	22.66	47.00	-24.34	Peak	VERTICAL	---	---
3	310.00	10.17	11.13	24.14	47.00	-22.86	Peak	VERTICAL	---	---
4	369.40	10.34	12.50	25.76	47.00	-21.24	Peak	VERTICAL	---	---
5	435.59	10.56	14.23	26.83	47.00	-20.17	Peak	VERTICAL	---	---
6	501.18	14.45	16.11	32.74	47.00	-14.26	Peak	VERTICAL	---	---

TM10 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



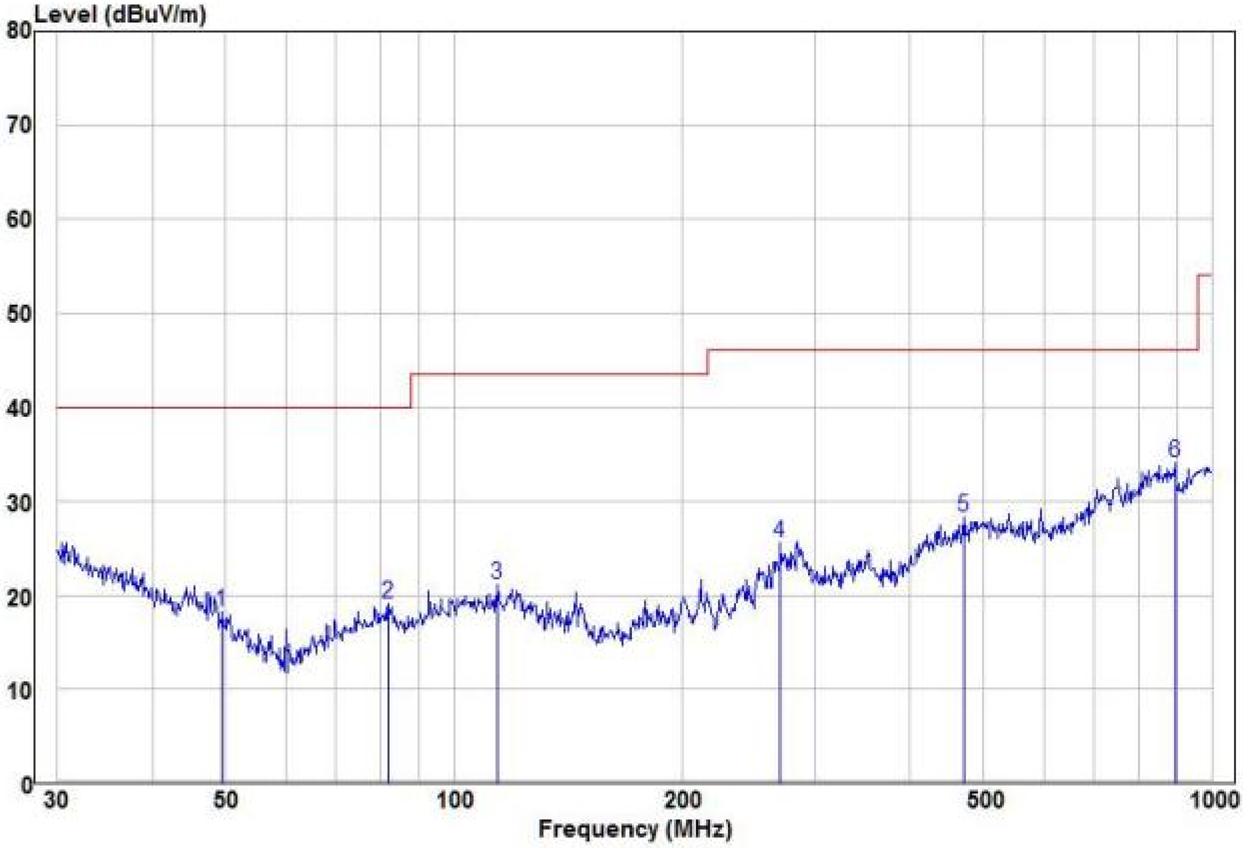
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	47.49	10.02	9.27	19.29	40.00	-20.71	Peak	HORIZONTAL
2	92.79	11.29	10.20	21.49	43.50	-22.01	Peak	HORIZONTAL
3	144.84	12.09	8.25	20.34	43.50	-23.16	Peak	HORIZONTAL
4	283.98	12.63	13.20	25.83	46.00	-20.17	Peak	HORIZONTAL
5	524.55	11.13	18.53	29.66	46.00	-16.34	Peak	HORIZONTAL
6 pp	851.04	9.67	24.04	33.71	46.00	-12.29	Peak	HORIZONTAL

TM10 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



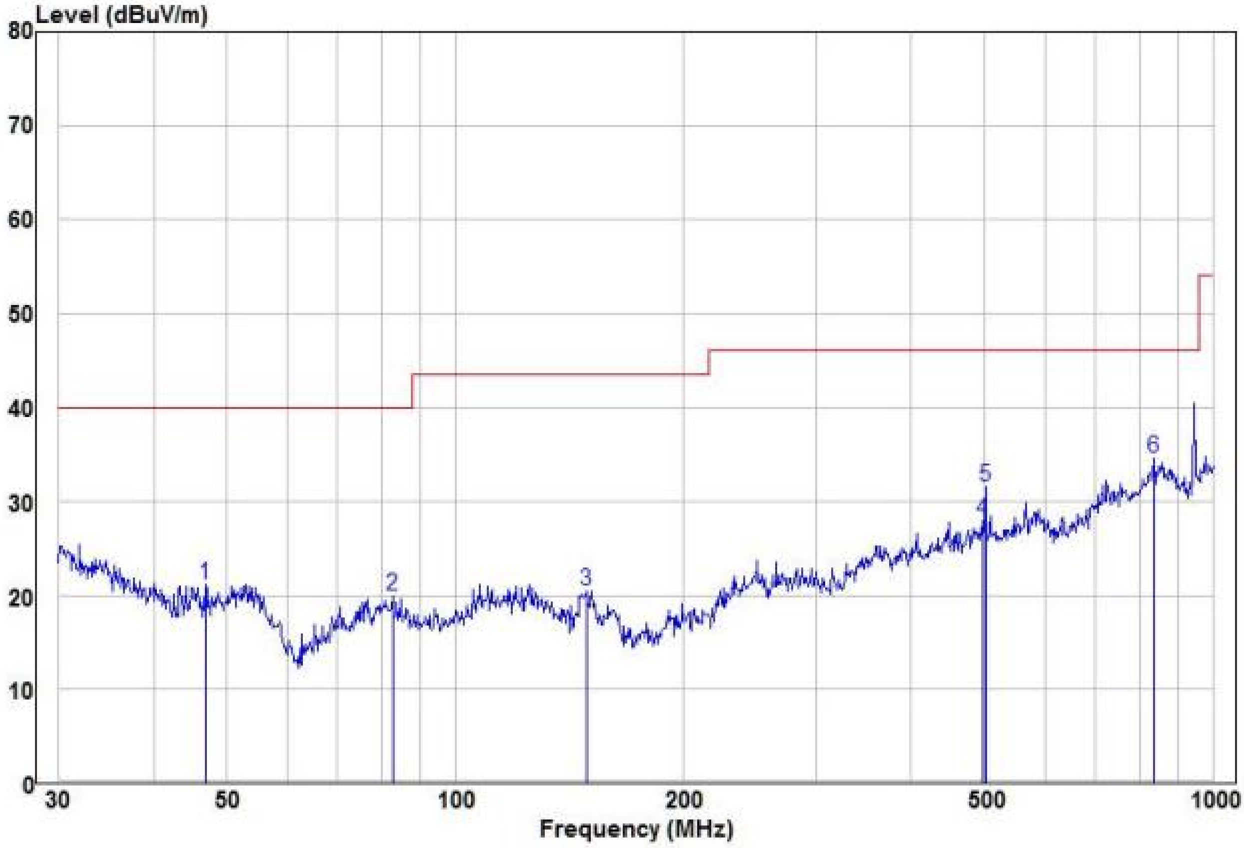
		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1		35.50	8.75	14.42	23.17	40.00	-16.83	Peak	VERTICAL
2		52.76	13.45	7.52	20.97	40.00	-19.03	Peak	VERTICAL
3		105.64	11.24	10.38	21.62	43.50	-21.88	Peak	VERTICAL
4		348.03	10.17	14.90	25.07	46.00	-20.93	Peak	VERTICAL
5		501.18	13.27	18.29	31.56	46.00	-14.44	Peak	VERTICAL
6	pp	945.44	16.74	23.62	40.36	46.00	-5.64	Peak	VERTICAL

TM11 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



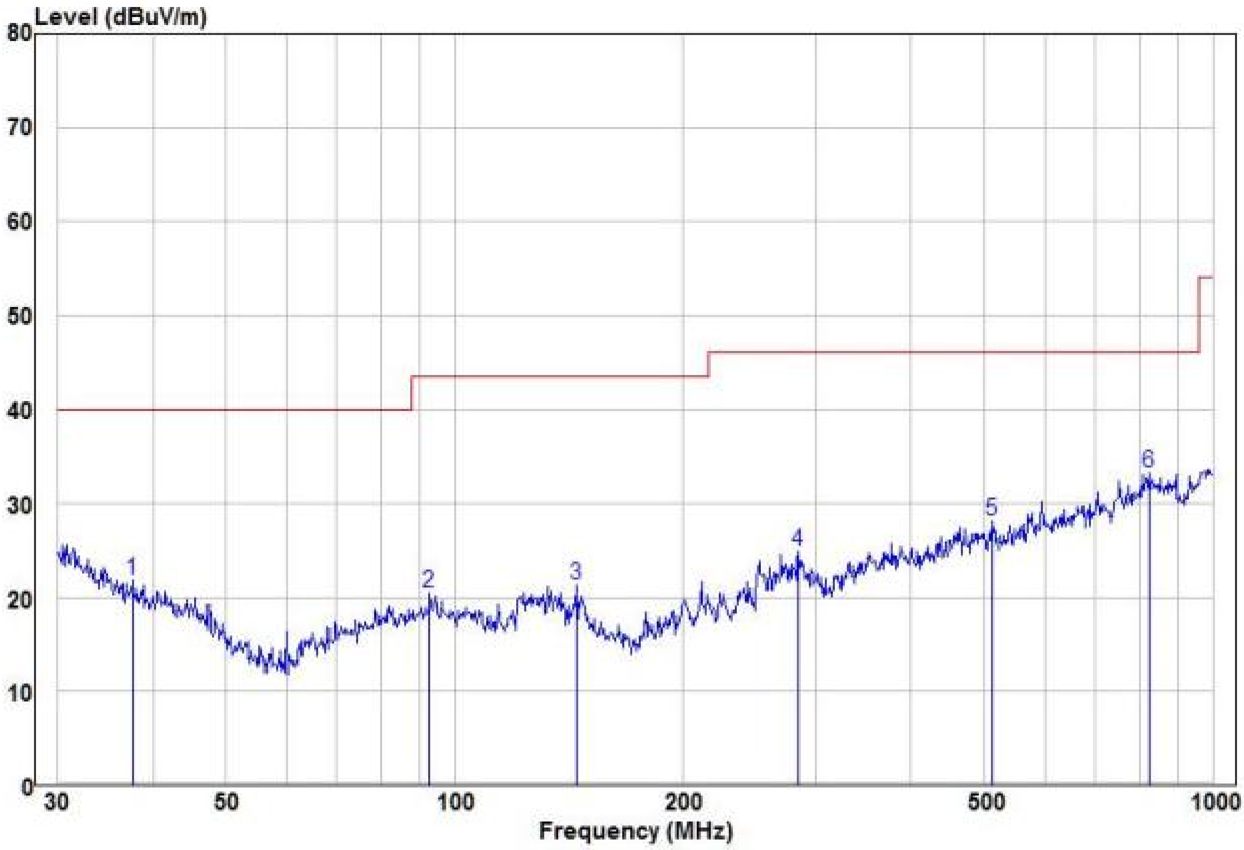
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	49.53	9.91	8.31	18.22	40.00	-21.78	Peak	HORIZONTAL
2	82.07	9.31	9.83	19.14	40.00	-20.86	Peak	HORIZONTAL
3	114.11	10.81	10.39	21.20	43.50	-22.30	Peak	HORIZONTAL
4	269.43	12.93	12.72	25.65	46.00	-20.35	Peak	HORIZONTAL
5	470.52	11.01	17.37	28.38	46.00	-17.62	Peak	HORIZONTAL
6 pp	893.86	10.17	23.87	34.04	46.00	-11.96	Peak	HORIZONTAL

TM11 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



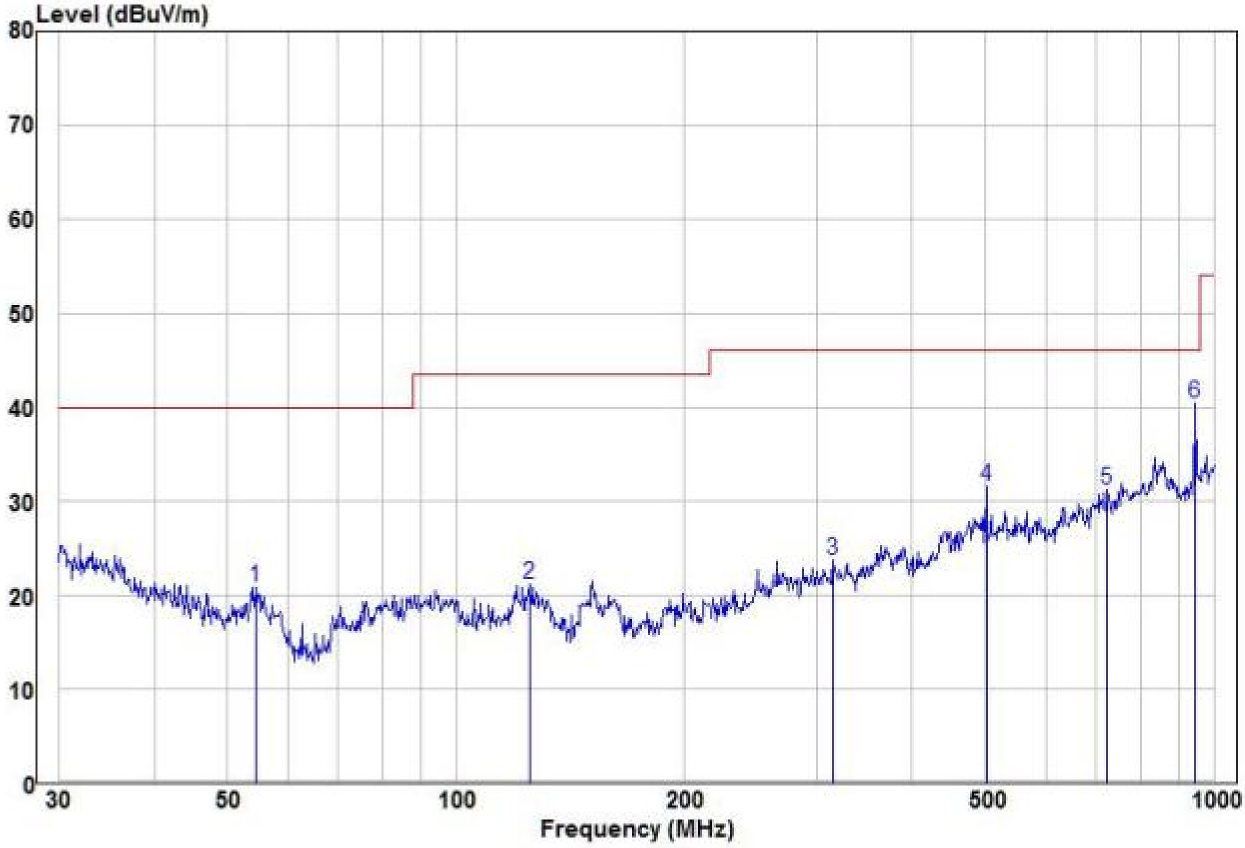
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	46.83	11.57	9.58	21.15	40.00	-18.85	Peak	VERTICAL
2	82.65	10.20	9.84	20.04	40.00	-19.96	Peak	VERTICAL
3	148.96	12.08	8.43	20.51	43.50	-22.99	Peak	VERTICAL
4	497.68	9.77	18.21	27.98	46.00	-18.02	Peak	VERTICAL
5	501.18	13.27	18.29	31.56	46.00	-14.44	Peak	VERTICAL
6 pp	836.24	10.56	24.12	34.68	46.00	-11.32	Peak	VERTICAL

TM12 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



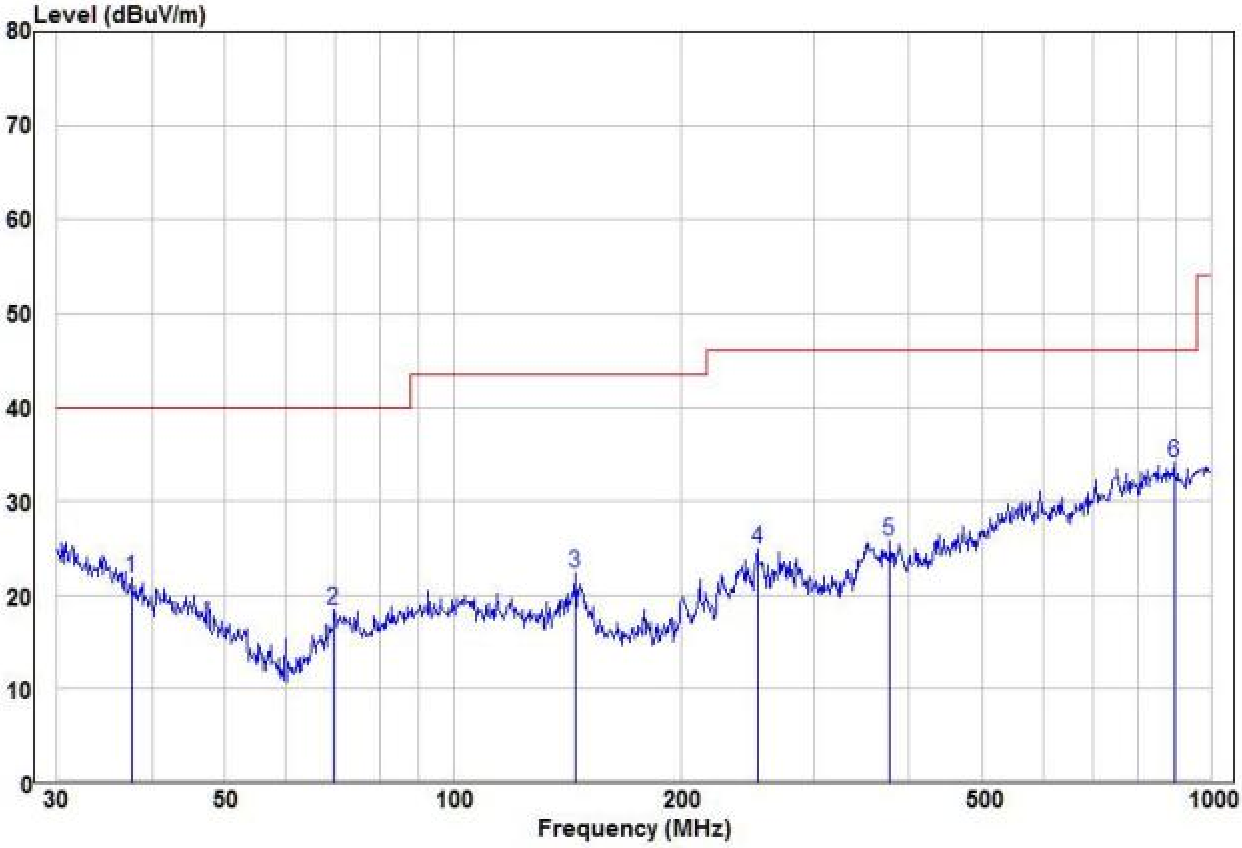
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	37.55	8.18	13.68	21.86	40.00	-18.14	Peak	HORIZONTAL
2	92.79	10.29	10.20	20.49	43.50	-23.01	Peak	HORIZONTAL
3	144.84	13.09	8.25	21.34	43.50	-22.16	Peak	HORIZONTAL
4	283.98	11.63	13.20	24.83	46.00	-21.17	Peak	HORIZONTAL
5	511.84	9.68	18.41	28.09	46.00	-17.91	Peak	HORIZONTAL
6 pp	824.60	9.57	23.64	33.21	46.00	-12.79	Peak	HORIZONTAL

TM12 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



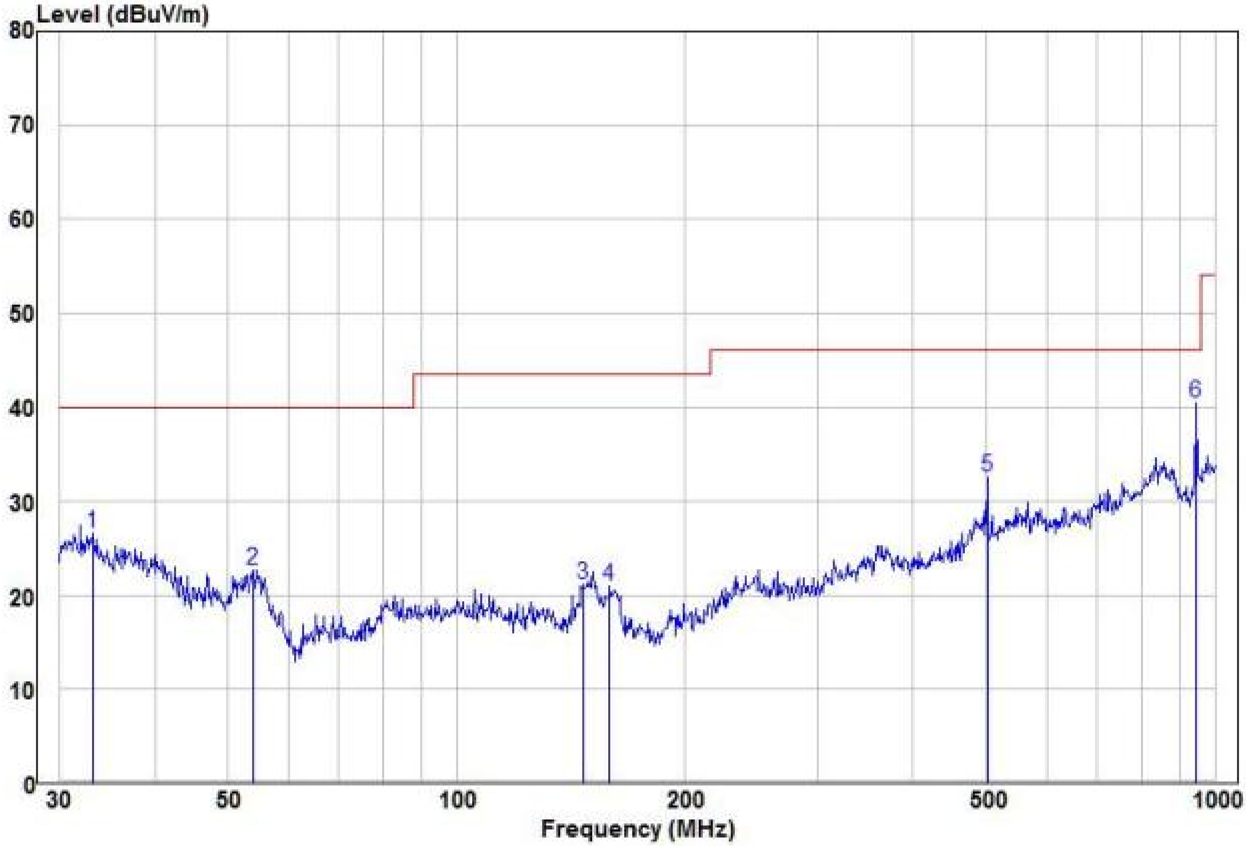
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	54.45	13.57	7.16	20.73	40.00	-19.27	Peak	VERTICAL
2	125.45	10.72	10.49	21.21	43.50	-22.29	Peak	VERTICAL
3	314.38	9.70	14.08	23.78	46.00	-22.22	Peak	VERTICAL
4	501.18	13.27	18.29	31.56	46.00	-14.44	Peak	VERTICAL
5	724.26	9.96	21.25	31.21	46.00	-14.79	Peak	VERTICAL
6 pp	945.44	16.74	23.62	40.36	46.00	-5.64	Peak	VERTICAL

TM13 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	37.55	8.18	13.68	21.86	40.00	-18.14	Peak	HORIZONTAL
2	69.60	10.44	8.03	18.47	40.00	-21.53	Peak	HORIZONTAL
3	144.84	14.09	8.25	22.34	43.50	-21.16	Peak	HORIZONTAL
4	252.06	12.76	12.14	24.90	46.00	-21.10	Peak	HORIZONTAL
5	377.26	11.09	14.61	25.70	46.00	-20.30	Peak	HORIZONTAL
6 pp	893.86	10.17	23.87	34.04	46.00	-11.96	Peak	HORIZONTAL

TM13 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	33.09	11.50	15.11	26.61	40.00	-13.39	Peak	VERTICAL
2	53.88	15.45	7.29	22.74	40.00	-17.26	Peak	VERTICAL
3	147.40	12.74	8.36	21.10	43.50	-22.40	Peak	VERTICAL
4	159.23	13.07	7.84	20.91	43.50	-22.59	Peak	VERTICAL
5	501.18	14.27	18.29	32.56	46.00	-13.44	Peak	VERTICAL
6 pp	945.44	16.74	23.62	40.36	46.00	-5.64	Peak	VERTICAL

7.9 Emissions in restricted frequency bands (above 1GHz)

Test Requirement:	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`
Test Method:	Radiated emissions tests
Test Limit:	(see table below)

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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g.,

§§ 15.231 and 15.241.

Procedure:

a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. Note: For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

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

a. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

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

c. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be

	re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. d. Test the EUT in the lowest channel (2402MHz),the middle channel (2441MHz),the Highest channel (2480MHz) e. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. Repeat above procedures until all frequencies measured was complete. Remark: The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Factor= Antenna Factor + Cable Factor – Preamplifier Factor, Level = Read Level + Factor, Over Limit=Level-Limit Line. 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

7.9.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.5 °C
Humidity:	53 %
Atmospheric Pressure:	100.9 kPa
Pre test mode:	TM1, TM2, TM3
Final test mode:	TM1

7.9.2 Test Data:

Worse case mode:		GFSK(DH5)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
2390	**55.57**	**-9.2**	**46.37**	**74**	**-27.63**	**Peak**	**H**
2400	56.53	-9.39	47.14	74	-26.86	Peak	H
4804	51.29	-4.33	46.96	74	-27.04	Peak	H
7206	48.94	1.01	49.95	74	-24.05	Peak	H
2390	**53.93**	**-9.2**	**44.73**	**74**	**-29.27**	**Peak**	**V**
2400	56.99	-9.39	47.60	74	-26.40	Peak	V
4804	55.10	-4.33	50.77	74	-23.23	Peak	V
7206	49.10	1.01	50.11	74	-23.89	Peak	V

Worse case mode:		GFSK(DH5)		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
4882	51.12	-4.11	47.01	74	-26.99	peak	H
7323	49.27	1.51	50.78	74	-23.22	peak	H
4882	52.26	-4.11	48.15	74	-25.85	peak	V
7323	51.00	1.51	52.51	74	-21.49	peak	V

Worse case mode:		GFSK(DH5)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
2483.5	**55.47**	**-9.29**	**46.18**	**74**	**-27.82**	**Peak**	**H**
4960	51.48	-4.04	47.44	74	-26.56	Peak	H
7440	50.94	1.57	52.51	74	-21.49	Peak	H
2483.5	**54.74**	**-9.29**	**45.45**	**74**	**-28.55**	**Peak**	**V**
4960	49.35	-4.04	45.31	74	-28.69	Peak	V
7440	48.96	1.57	50.53	74	-23.47	Peak	V

Worse case mode:		π/4DQPSK (2DH5)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390	**53.68**	**-9.2**	**44.48**	**74**	**-29.52**	**Peak**	**H**
2400	56.20	-9.39	46.81	74	-27.19	Peak	H
4804	52.34	-4.33	48.01	74	-25.99	Peak	H
7206	50.93	1.01	51.94	74	-22.06	Peak	H
2390	**55.23**	**-9.2**	**46.03**	**74**	**-27.97**	**Peak**	**V**
2400	57.23	-9.39	47.84	74	-26.16	Peak	V
4804	52.73	-4.33	48.40	74	-25.60	Peak	V
7206	50.82	1.01	51.83	74	-22.17	Peak	V

Worse case mode:		π/4DQPSK (2DH5)		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4882	50.30	-4.11	46.19	74	-27.81	peak	H
7323	48.90	1.51	50.41	74	-23.59	peak	H
4882	52.94	-4.11	48.83	74	-25.17	peak	V
7323	49.22	1.51	50.73	74	-23.27	peak	V

Worse case mode:		π/4DQPSK (2DH5)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.5	**54.33**	**-9.29**	**45.04**	**74**	**-28.96**	**Peak**	**H**
4960	51.45	-4.04	47.41	74	-26.59	Peak	H
7440	50.45	1.57	52.02	74	-21.98	Peak	H
2483.5	**55.94**	**-9.29**	**46.65**	**74**	**-27.35**	**Peak**	**V**
4960	48.94	-4.04	44.90	74	-29.10	Peak	V
7440	49.88	1.57	51.45	74	-22.55	Peak	V

Worse case mode:		8DPSK (3DH5)		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390	**55.04**	**-9.2**	**45.84**	**74**	**-28.16**	**Peak**	**H**
2400	55.97	-9.39	46.58	74	-27.42	Peak	H
4804	51.62	-4.33	47.29	74	-26.71	Peak	H
7206	49.13	1.01	50.14	74	-23.86	Peak	H
2390	**54.53**	**-9.2**	**45.33**	**74**	**-28.67**	**Peak**	**V**
2400	54.59	-9.39	45.20	74	-28.80	Peak	V
4804	53.48	-4.33	49.15	74	-24.85	Peak	V
7206	49.27	1.01	50.28	74	-23.72	Peak	V

Worse case mode:		8DPSK (3DH5)		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4882	51.97	-4.11	47.86	74	-26.14	peak	H
7323	50.69	1.51	52.20	74	-21.80	peak	H
4882	53.77	-4.11	49.66	74	-24.34	peak	V
7323	48.41	1.51	49.92	74	-24.08	peak	V

Worse case mode:		8DPSK (3DH5)		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.5	**54.94**	**-9.29**	**45.65**	**74**	**-28.35**	**Peak**	**H**
4960	52.61	-4.04	48.57	74	-25.43	Peak	H
7440	48.64	1.57	50.21	74	-23.79	Peak	H
2483.5	**54.81**	**-9.29**	**45.52**	**74**	**-28.48**	**Peak**	**V**
4960	49.37	-4.04	45.33	74	-28.67	Peak	V
7440	50.17	1.57	51.74	74	-22.26	Peak	V

Remark:

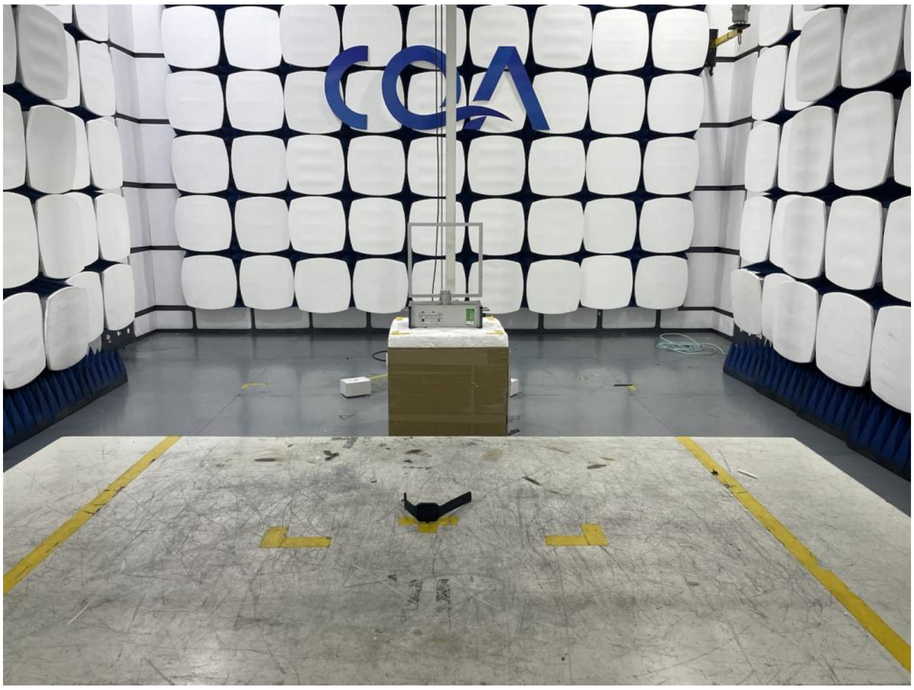
1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

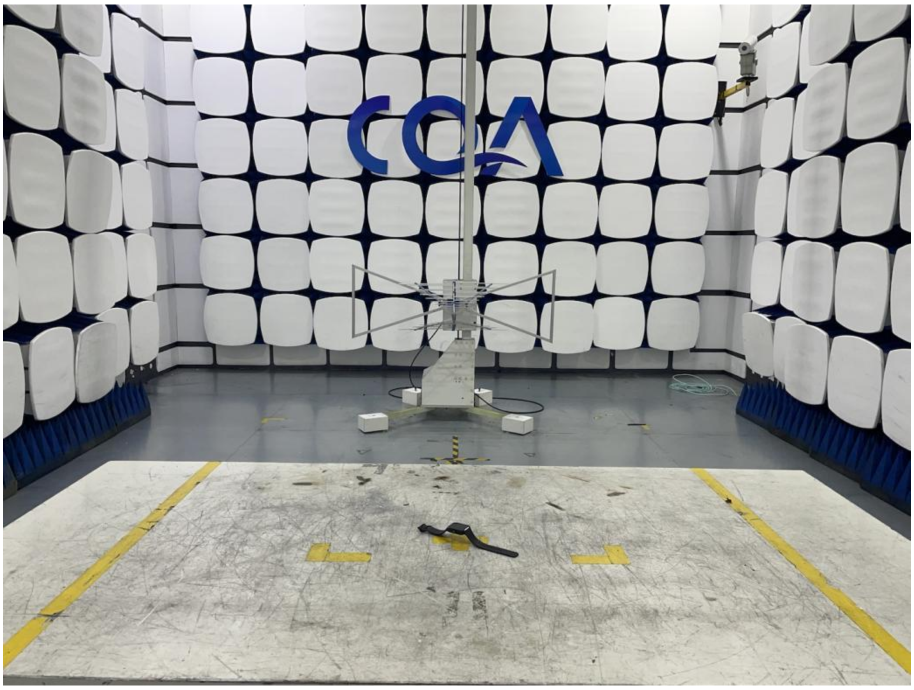
2) Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

8 Test Setup Photos

Emissions around the fundamental



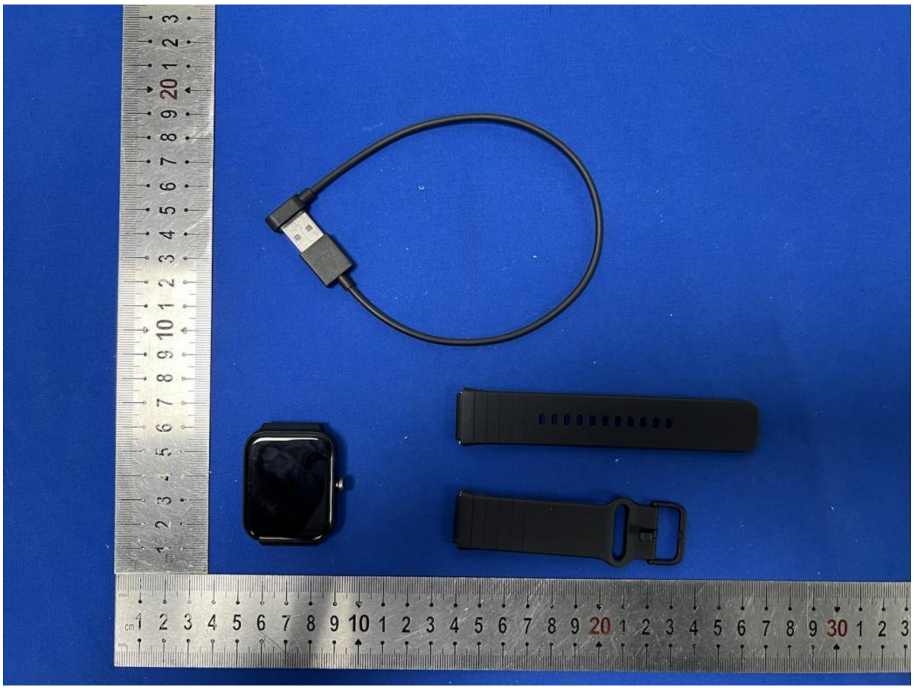
Emissions in restricted frequency bands (below 1GHz)

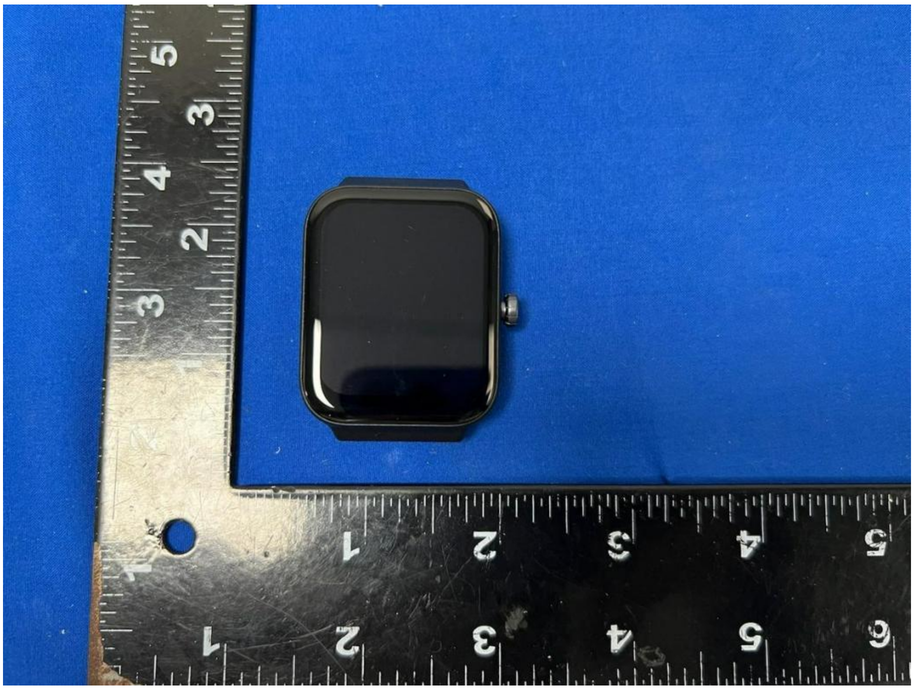


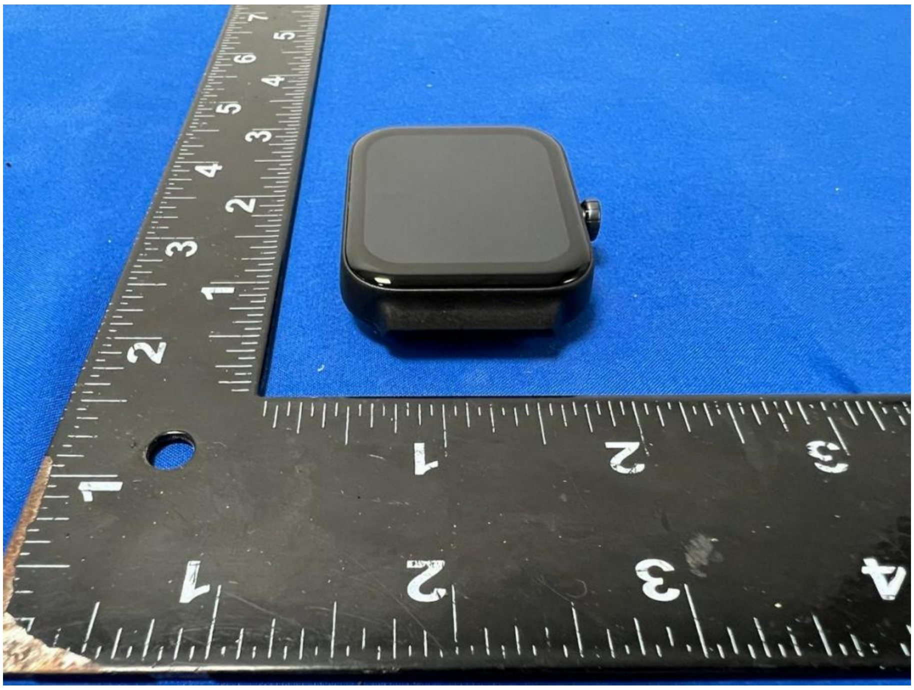
Emissions in restricted frequency bands (above 1GHz)

9 Photographs of EUT

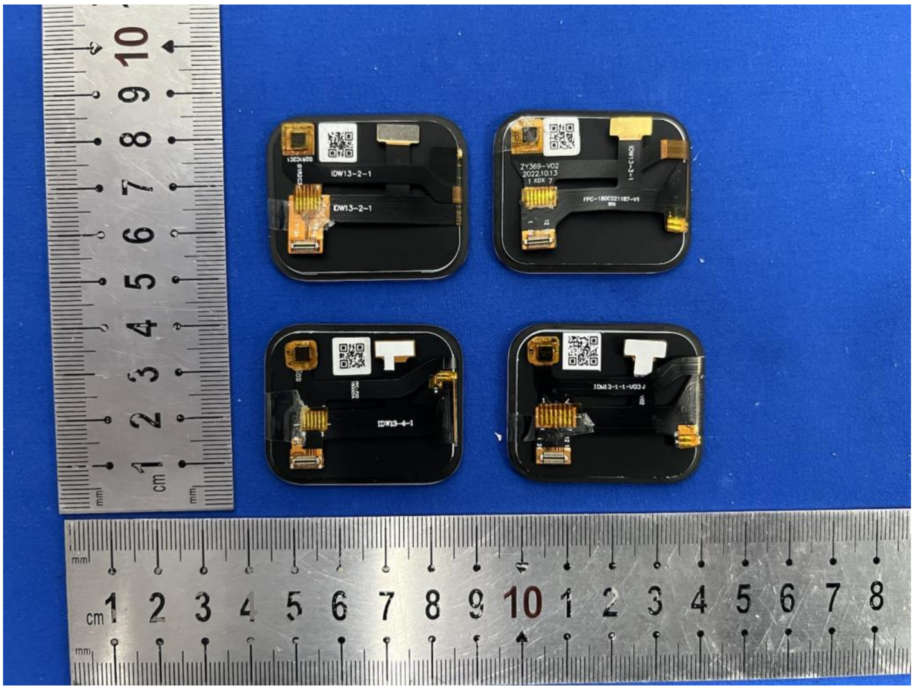
External

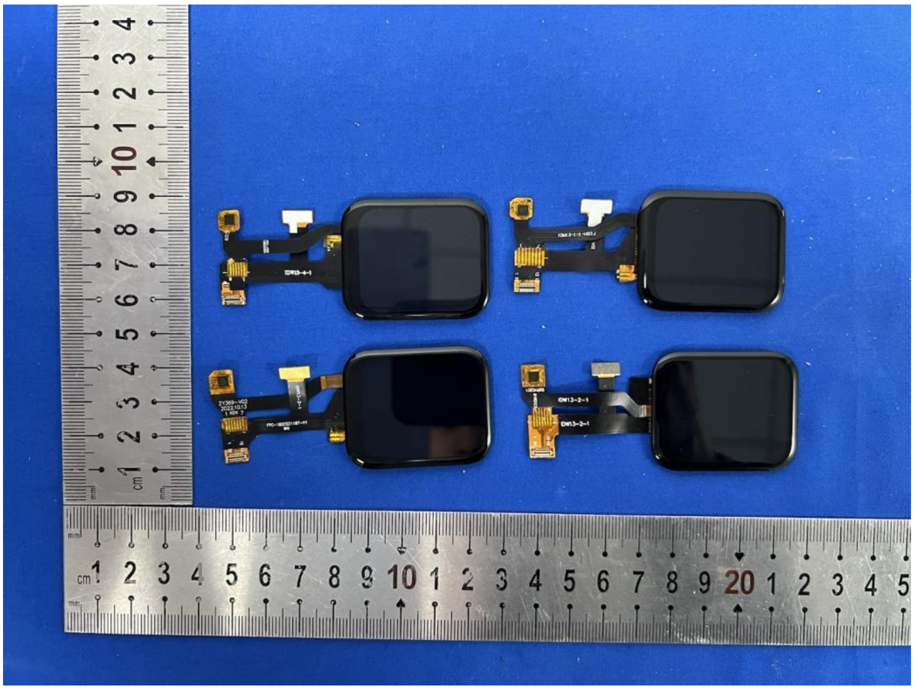


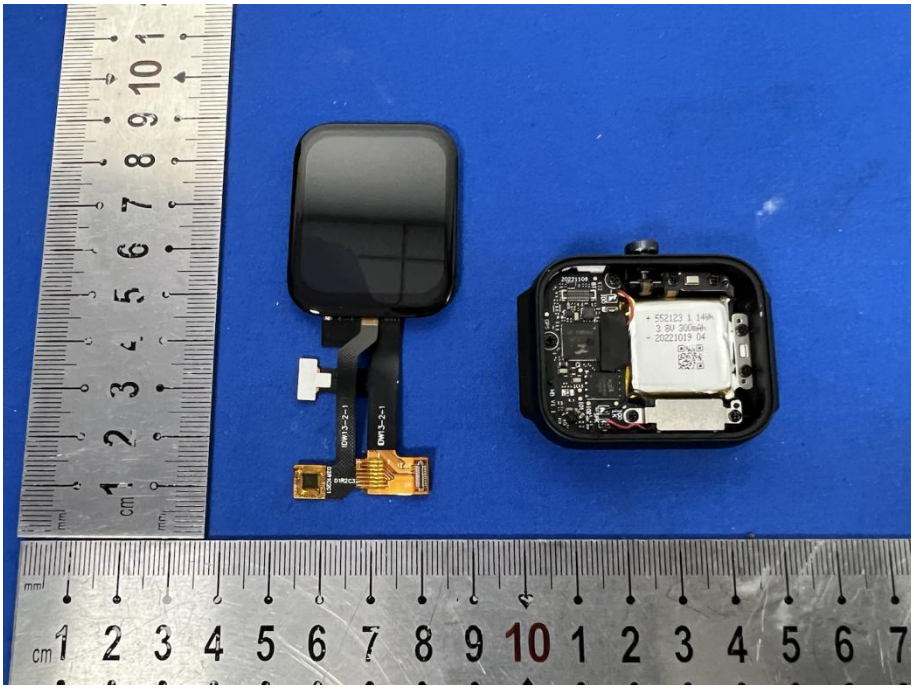


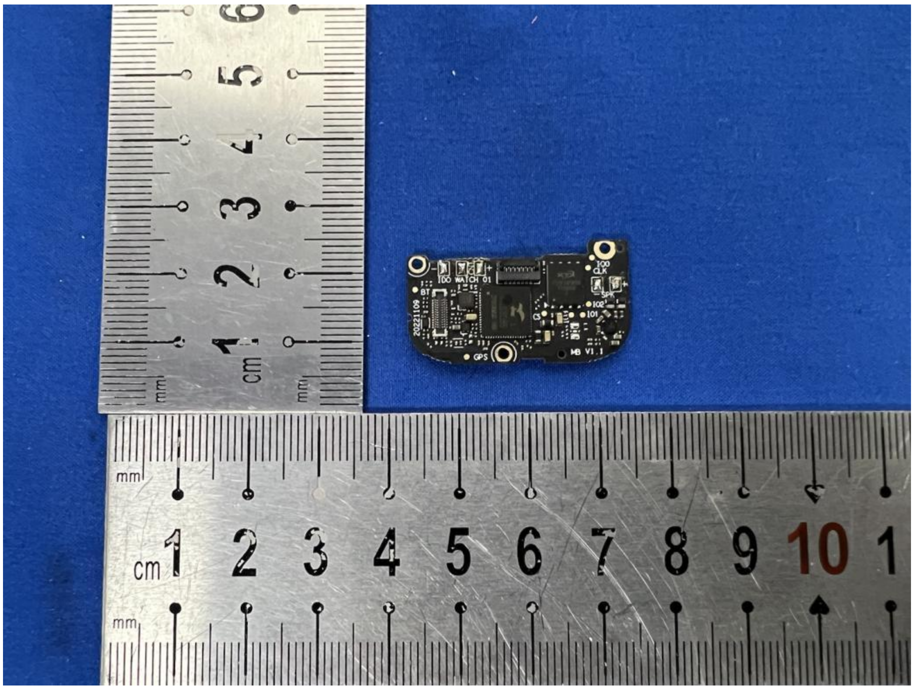


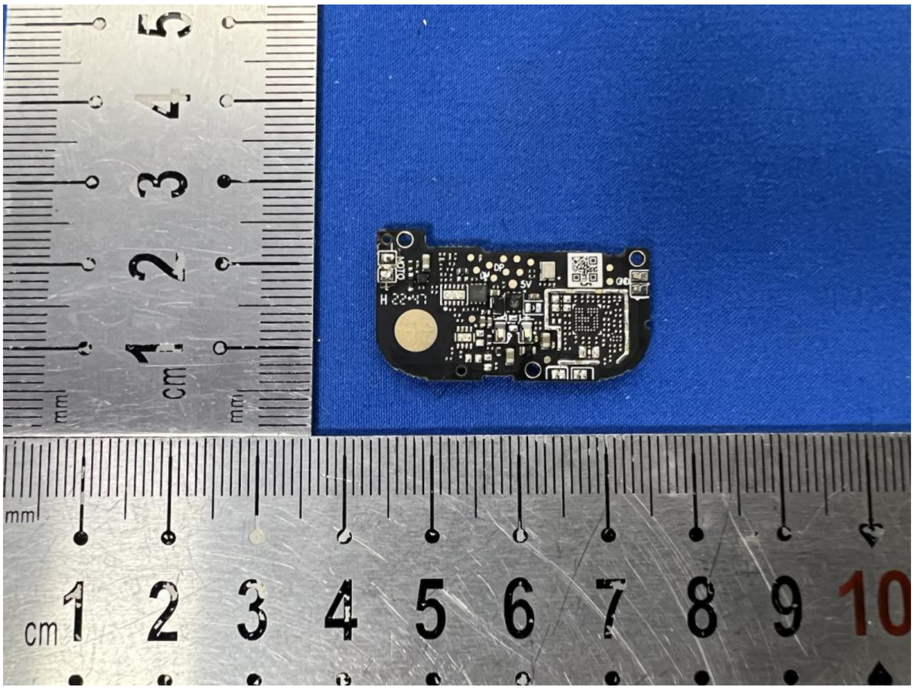
Internal

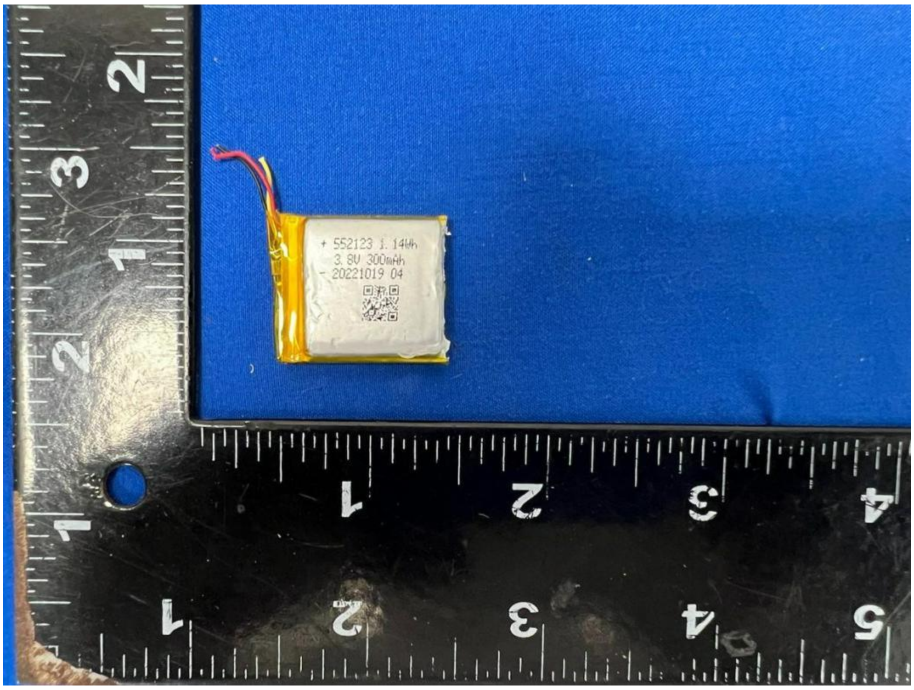




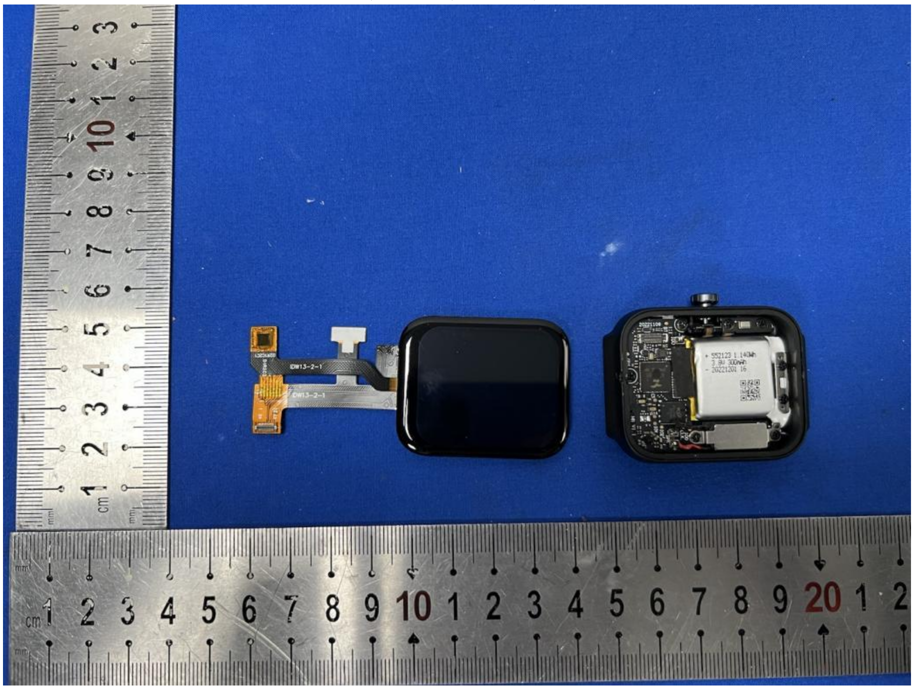


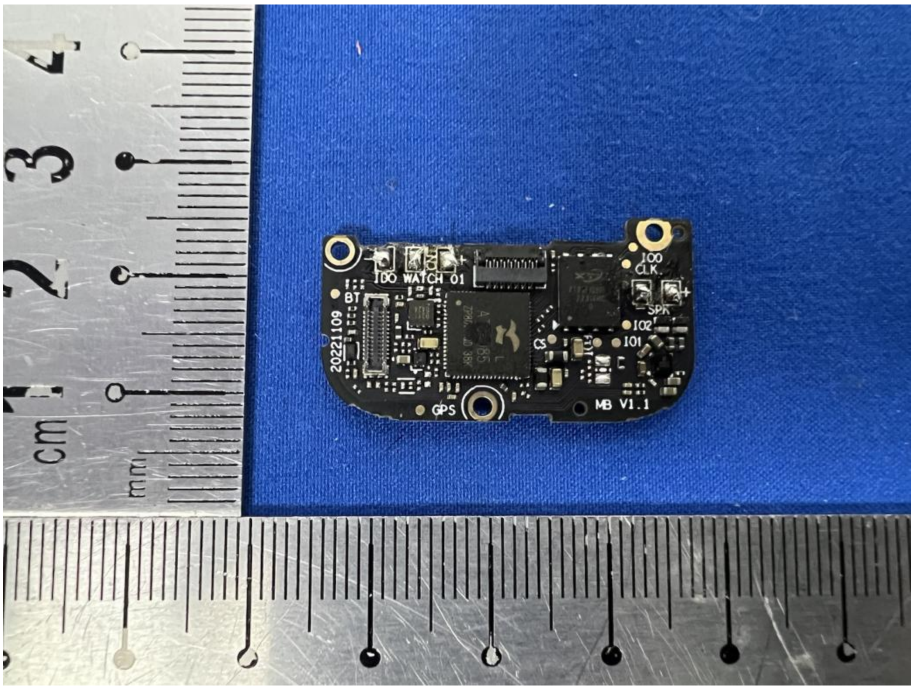


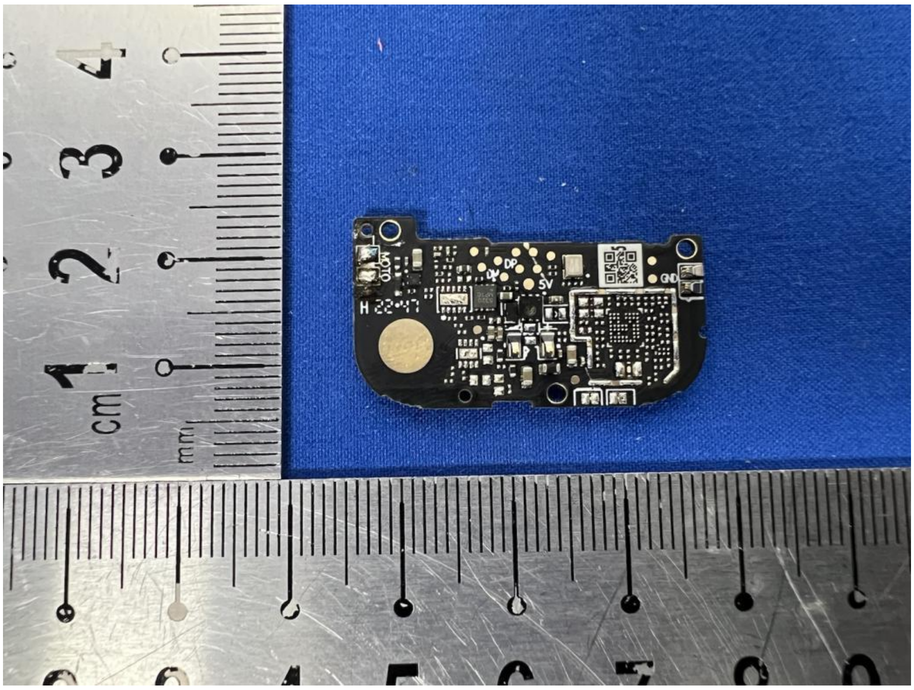


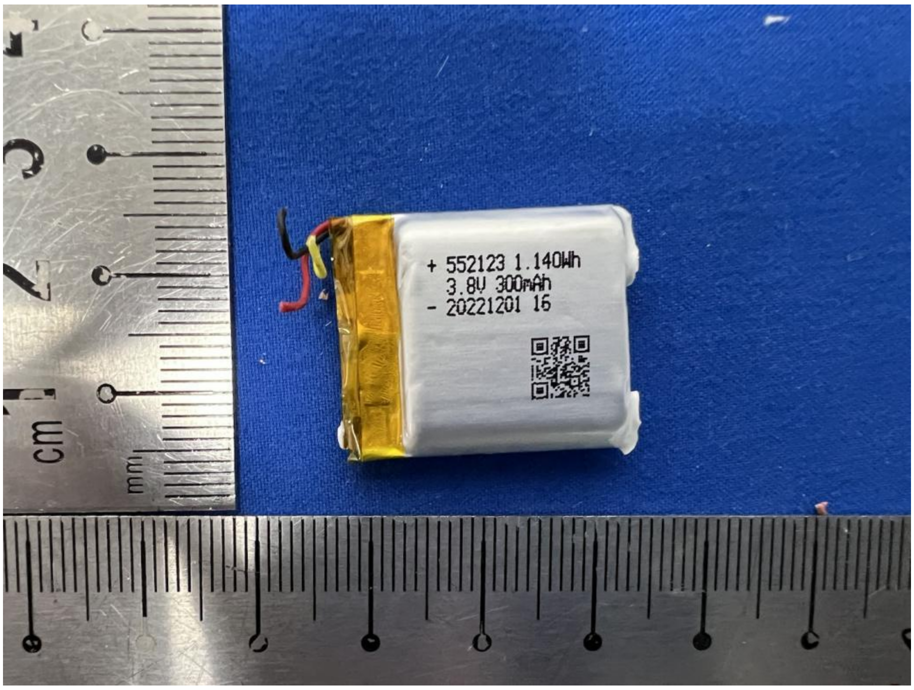


TM10, TM11, TM12, TM13




IDO WATCH 01
20221109
GPS
MB V1.1
SPK




+ 552123 1.140Wh
3.8V 300mAh
- 20221201 16

Appendix

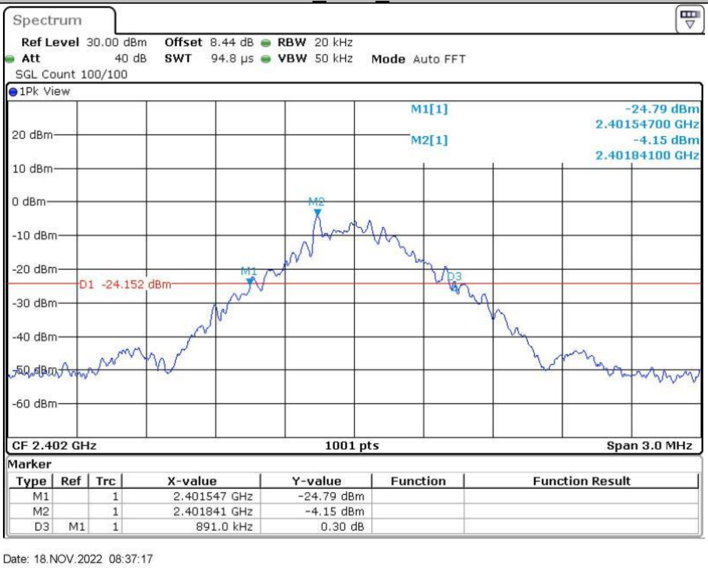
9.1 Appendix A: 20dB Emission Bandwidth

9.1.1 Test Result

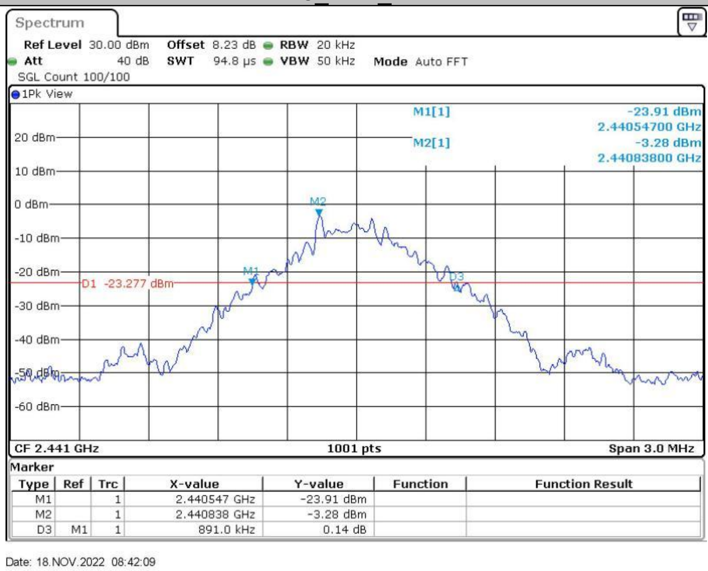
TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.891	2401.547	2402.438	---	PASS
		2441	0.891	2440.547	2441.438	---	PASS
		2480	0.948	2479.544	2480.492	---	PASS
2DH5	Ant1	2402	1.218	2401.400	2402.618	---	PASS
		2441	1.185	2440.409	2441.594	---	PASS
		2480	1.251	2479.379	2480.630	---	PASS
3DH5	Ant1	2402	1.242	2401.379	2402.621	---	PASS
		2441	1.248	2440.373	2441.621	---	PASS
		2480	1.239	2479.379	2480.618	---	PASS

9.1.2 Test Graphs

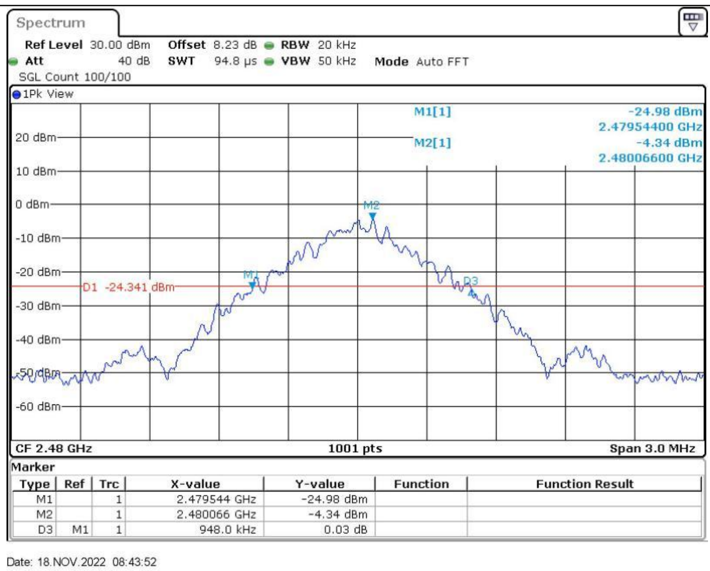
DH5_Ant1_2402



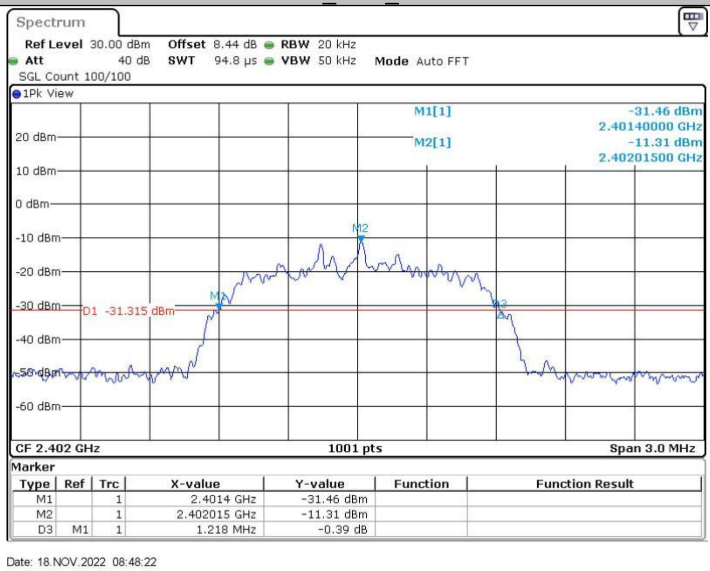
DH5_Ant1_2441



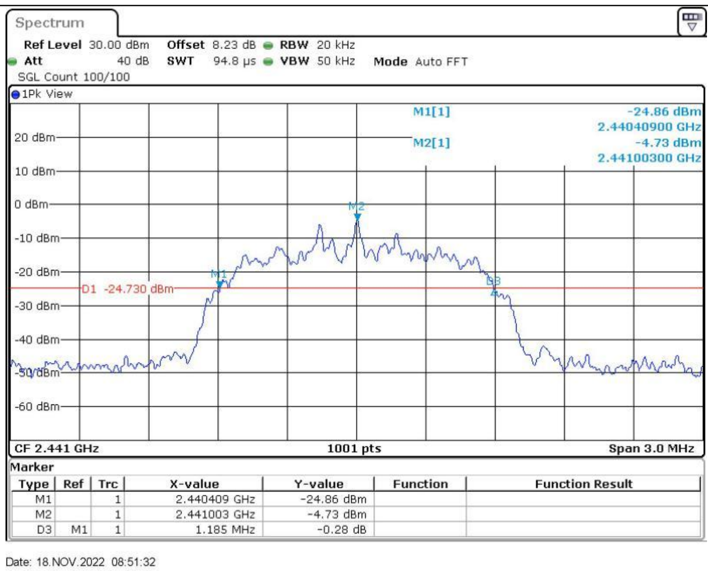
DH5_Ant1_2480



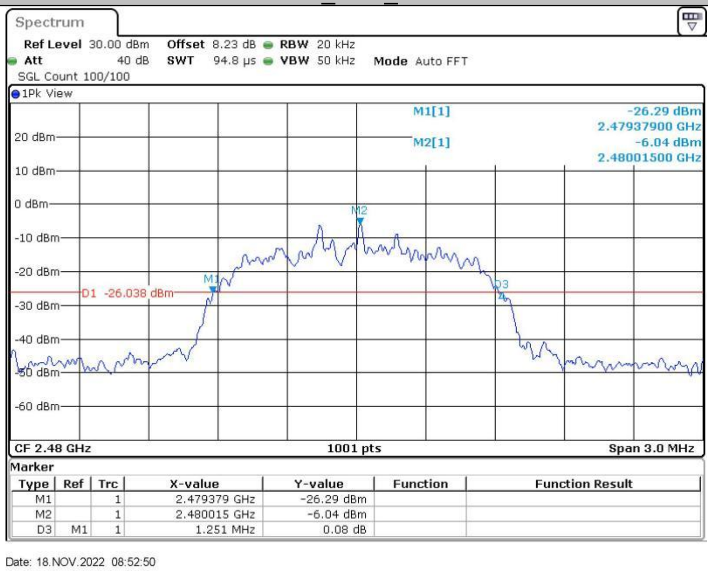
2DH5_Ant1_2402



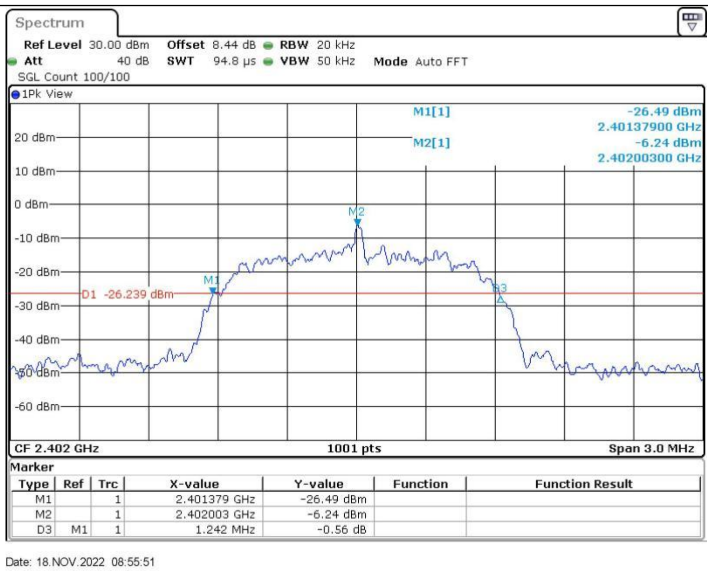
2DH5_Ant1_2441



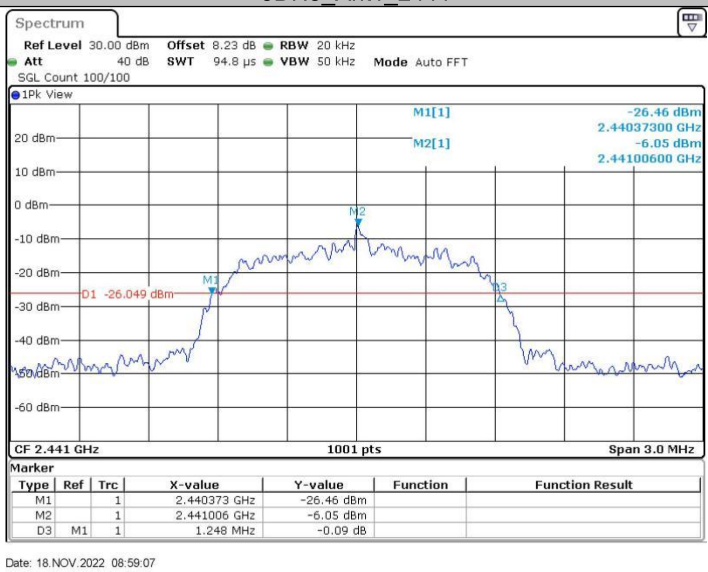
2DH5_Ant1_2480



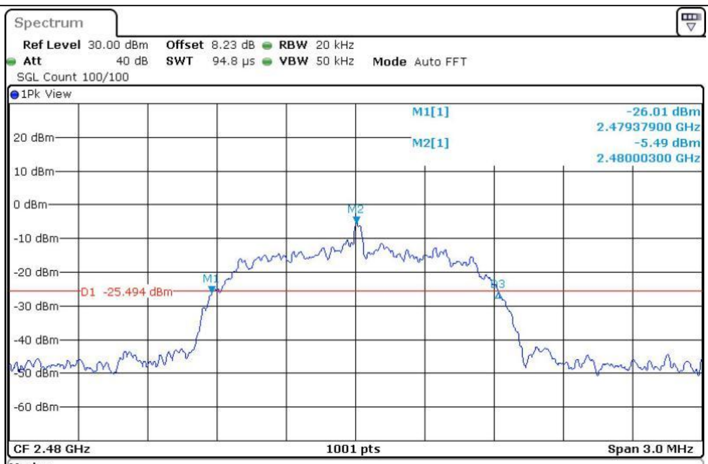
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479379 GHz	-26.01 dBm		
M2		1	2.480003 GHz	-5.49 dBm		
D3	M1	1	1.239 MHz	0.28 dB		

Date: 18.NOV.2022 09:00:36

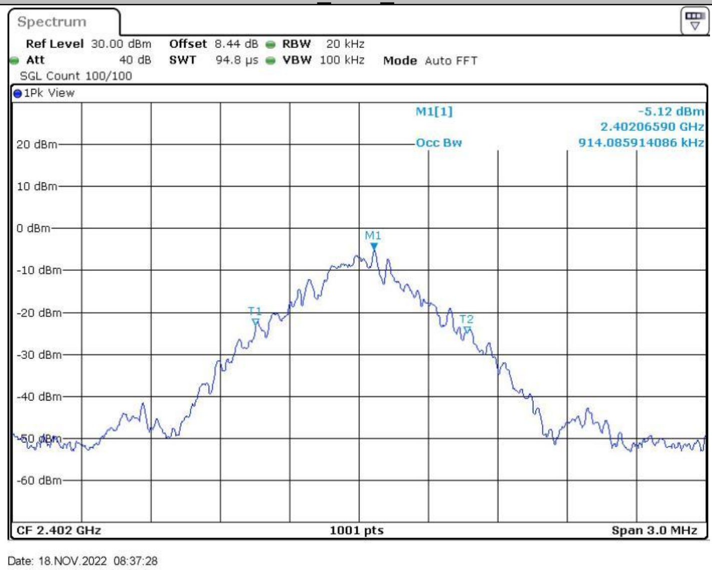
9.2 Appendix B: Occupied Channel Bandwidth

9.2.1 Test Result

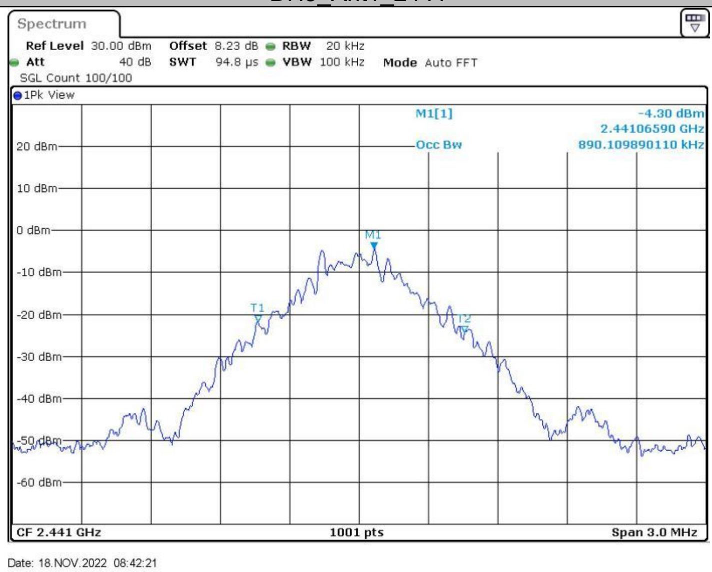
TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.914	2401.553	2402.468	---	PASS
		2441	0.89	2440.565	2441.456	---	PASS
		2480	0.89	2479.565	2480.456	---	PASS
2DH5	Ant1	2402	1.154	2401.428	2402.581	---	PASS
		2441	1.157	2440.428	2441.584	---	PASS
		2480	1.16	2479.422	2480.581	---	PASS
3DH5	Ant1	2402	1.163	2401.425	2402.587	---	PASS
		2441	1.145	2440.437	2441.581	---	PASS
		2480	1.154	2479.431	2480.584	---	PASS

9.2.2 Test Graphs

DH5_Ant1_2402



DH5_Ant1_2441



DH5_Ant1_2480