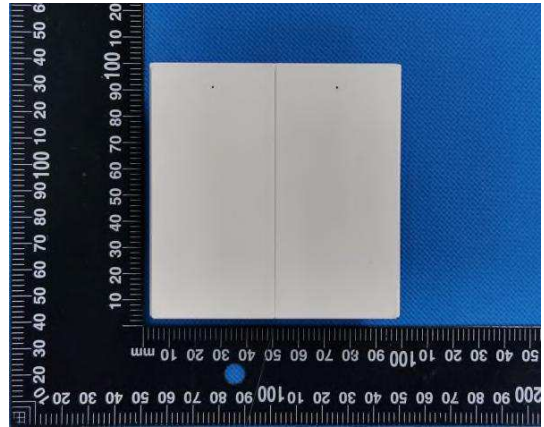


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Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date.:</i>	2020.12.29	
Auftraggeber: <i>Client:</i>	Lumi United Technology Co., Ltd. 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen, Guangdong, P.R. China			
Prüfgegenstand: <i>Test item:</i>	Smart Wall Switch			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	WS-EUK01, WS-EUK02			
Auftrags-Inhalt: <i>Order content:</i>	TÜV Rheinland RED service			
Prüfgrundlage: <i>Test specification:</i>	EN 300328 V2.2.2:2019 EN 301 489-1 V2.2.3:2019 EN IEC 61000-3-2:2019 EN 60669-1:1999+A1+A2	EN IEC 62311:2020 EN 301 489-17 V3.2.4:2020 EN 61000-3-3:2013+A1 EN 60669-2-1:2004+A1+A12		
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020.12.31			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A002979252 006			
Prüfzeitraum: <i>Testing period:</i>	Refer to test report			
Ort der Prüfung: <i>Place of testing:</i>	Refer to section 2.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Guangdong) Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
überprüft von: <i>reviewed by:</i>	<p><i>Amy Wang</i></p>		genehmigt von: <i>authorized by:</i>	<p><i>Storm Shu</i></p>
Datum: 2021.03.12 <i>Date:</i>			Datum: 2021.03.22 <i>Date:</i>	
Stellung/Position:	Amy Wang/Project Manager		Stellung/Position:	Storm Shu/TC
Sonstiges / Other:	<p>They are for compliance with all provisions in the Article 3 of Council Directive 2014/53/EU referred to as the RED. This report is for Article 3.2 Radio Spectrum, Article 3.1a Health requirements and Article 3.1b EMC only. Please refer to the related test report about essential requirements for details as below, TUV Rheinland report: CN21ZYD3 001 (Article 3.1b EMC) TUV Rheinland report: CN21BLMK 001 (Article 3.1a electrical safety).</p>			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	1 = sehr gut 2 = gut P(ass) = entspricht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
Legend:	1 = very good 2 = good P(ass) = passed a.m. test specifications(s)	3 = satisfactory F(ail) = failed a.m. test specifications(s)	4 = sufficient N/A = not applicable	5 = poor N/T = not tested
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

Test Summary

5.1.1 RF OUTPUT POWER

RESULT: Pass

5.1.2 POWER SPECTRAL DENSITY

RESULT: Pass

5.1.3 DUTY CYCLE, TX-SEQUENCE, TX-GAP

RESULT: Pass

5.1.4 MEDIUM UTILISATION (MU) FACTOR

RESULT: Pass

5.1.5 ADAPTIVITY

RESULT: Not applicable

5.1.6 OCCUPIED CHANNEL BANDWIDTH

RESULT: Pass

5.1.7 TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

RESULT: Pass

5.1.8 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

RESULT: Pass

5.2.1 RECEIVER SPURIOUS EMISSIONS

RESULT: Pass

5.2.2 RECEIVER BLOCKING

RESULT: Pass

5.2.3 GEO-LOCATION CAPABILITY

RESULT: Not applicable

6.1.1 HARMONIC CURRENT EMISSIONS ON AC MAINS

RESULT: Pass

6.1.2 VOLTAGE FLUCTUATIONS AND FLICKER ON AC MAINS

RESULT: Pass

6.1.3 CONDUCTED EMISSION ON AC MAINS

RESULT: Pass

6.1.4 CONDUCTED EMISSION ON DC POWER INPUT/OUTPUT PORT

RESULT: Not applicable

6.1.5 CONDUCTED EMISSION ON WIRED NETWORK PORT

RESULT: Not applicable

6.1.6 RADIATED EMISSION

RESULT: Pass

6.2.1 RADIO FREQUENCY ELECTROMAGNETIC FIELDS (RS)

RESULT: Pass

6.2.2 RADIO FREQUENCY CONTINUOUS CONDUCTED (CS)

RESULT: Pass

6.2.3 ELECTROSTATIC DISCHARGE (ESD)

RESULT: Pass

6.2.4 ELECTRICAL FAST TRANSIENTS (EFT)

RESULT: Pass

6.2.5 SURGE

RESULT: Pass

6.2.6 VOLTAGE DIPS AND INTERRUPTIONS

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RESULT: Pass

7.1.1 ELECTROMAGNETIC FIELDS

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix 1: Test Results of Article 3.2 Radio Spectrum Requirements and Article 3.1b EMC Requirements.
Appendix 1: List of Test and Measurement Equipment.

2 Test Site

2.1 Test Facilities

Waltek Testing Group (Shenzhen) Co., Ltd.

1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Refer to attached Appendix 1.

2.3 Uncertainty of Measurement

Table 2: Measurement Uncertainty

Parameter	Uncertainty
Output Power	±0.42dB
Occupied Channel Bandwidth	±1.5%
Power Spectral Density	±0.70 dB
Conducted Spurious Emission	±2.17 dB
Conducted Emission	9KHz-150KHz ±3.74dB 150 KHz ~ 30MHz ±3.34dB
Radiated Emissions	30-200MHz ±4.52dB 0.2-1GHz ±5.56dB 1-6GHz ±3.84dB 6-18GHz ±3.92dB
Temperature	±0.88°C
Time	±0.58 %
Supply voltages	±0.3 %
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3 General Product Information

The submitted samples WS-EUK01 and WS-EUK02 are Smart Wall Switch with ZigBee wireless control for household used.

Model WS-EUK01 and WS-EUK02 have the same electronic designed and wireless module except for the structure. WS-EUK02 has two control loops, WS-EUK01 has one control loop.

Based on above information, full RF tests were performed on model WS-EUK02.

For details, refer to the User Manual, Technical Description and Circuit Diagram.

3.1 Product Function and Intended Use

Refer to the Technical Documentation and user manual.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Smart Wall Switch
Type Designation	WS-EUK01, WS-EUK02
Type of Device	DSSS with non-adaptive
Classification of Receiver	Category 2
Operating Temperature Range	-10 °C ~ +40 °C
Operating Voltage	AC 100-250V, 50/60Hz, Max. 8A (Resistive Load), 50/60Hz
Testing Voltage	AC 230V, 50Hz
Technical Specification of Wi-Fi Wireless	
Operating Frequency	2405 - 2480 MHz
Type of Modulation	O-QPSK
Channel Number	16
Channel Spacing	5MHz
Antenna Type	PIFA Antenna
Antenna Gain	1.0dBi

Table 4: RF Channel and Frequency of General 2.4GHz Wireless

RF Channel	ZigBee
	Frequency (MHz)
11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
26	2480

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, wireless
 - 1. Transmitting mode
 - a. Low channel
 - b. Middle channel
 - c. High channel
 - 2. Receiving mode
 - a. Low channel
 - b. High channel
- B. On, Operating on normal mode (communication data through wireless link)
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

For details refer to the Circuit Diagram.

3.5 Submitted Documents

- PCB Layout
- Schematics
- User Manual
- Parts List
- Rating Label
- Model Difference Letter

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Immunity: The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Software used for testing: pca10028v20191217

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate, the connection laptop was removed when performing the testing.

Test operation refers to test setup in chapter 5 and chapter 6.

4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Notebook	Lenovo	E445	EB12648265	N/A
Mobile phone	HUAWEI	VOG-AL00	N/A	N/A
Hub M1S	Lumi	HM1S-G01	N/A	N/A

4.4 Countermeasures to Achieve EMC Compliance

No additional measures were employed to achieve compliance.

5 Test Results ERM

5.1 Transmitter Requirement & Test Suites

5.1.1 RF Output Power

RESULT: **Pass**

Test Specification

Test standard : EN 300 328 V2.2.2
 Test requirement : EN 300 328 V2.2.2, Clause 4.3.2.2
 Limit : EN 300 328 V2.2.2, Clause 4.3.2.2.2.3
 Test suites : EN 300 328 V2.2.2, Clause 5.4.2

Test Setup

Date of testing : 2021.01.29
 Test voltage : AC230V
 Test environment : Normal and extreme temperature
 Operation mode : A.1
 Ambient temperature : 20 °C
 Relative humidity : 46 %
 Atmospheric pressure : 101 kPa

Table 6: Test Result of RF Output Power

TEST CONDITIONS	Total e.i.r.p (dBm)		
	Low	Middle	High
25°C	10.70	10.93	10.73
-10°C	10.69	10.91	10.70
40°C	10.69	10.93	10.72
Max e.i.r.p Power	10.93		
Limits	20dBm		
Result	Complies		

NOTE:

- The cable loss is taken into account in results.
- The RF Output Power (P) should be calculated using the formula below:
 The $P = A_{(RMS\ power)} + G + Y$
 Antenna gain(G): 1.0 dBi

5.1.2 Power Spectral Density

RESULT:

Pass

Test Specification

Test standard : EN 300 328 V2.2.2
 Test requirement : EN 300 328 V2.2.2, Clause 4.3.2.3
 Limit : EN 300 328 V2.2.2, Clause 4.3.2.3.3
 Test suites : EN 300 328 V2.2.2, Clause 5.4.3

Test Setup

Date of testing : 2021.01.29
 Test voltage : AC230V
 Test environment : Normal temperature
 Operation mode : A.1
 Ambient temperature : 24 °C
 Relative humidity : 53 %
 Atmospheric pressure : 101 kPa

Table 7: Test Result of Power Spectral Density

Modulation	Frequency (MHz)	RF Output Power (dBm)	Limit(s) (dBm)	Result
ZigBee	L(2405)	9.35	≤ 10dBm/MHz	Pass
	M(2440)	9.72		Pass
	H(2480)	9.39		Pass
Maximum Measured Value		9.72		Pass

NOTE:

- The cable loss is taken into account in results.
- The Power Spectral Density (PSD) should be calculated using the formula below:
 The PSD=D+ G+ Y+10xlog(1/DC)(dBm/MHz)
 Antenna gain(G): 1.0 dBi

For the measurement records, refer to the appendix 1.

5.1.3 Duty Cycle, TX-sequence, TX-gap

RESULT:

Pass

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.4
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.4.3
Test suites	: EN 300 328 V2.2.2, Clause 5.4.2

Test Setup

Date of testing	: 2021.01.29
Test voltage	: AC230V
Test environment	: Normal temperature
Operation mode	: B
Ambient temperature	: 20 °C
Relative humidity	: 46%
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix 1.

5.1.4 Medium Utilisation (MU) Factor

RESULT:

Pass

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.5
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.5.3
Test suites	: EN 300 328 V2.2.2, Clause 5.4.2

Test Setup

Date of testing	: 2021.01.29
Test voltage	: AC230V
Test environment	: Normal temperature
Operation mode	: B
Ambient temperature	: 20 °C
Relative humidity	: 46%
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix 1.

5.1.5 Adaptivity

RESULT:

Not applicable

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.6
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.6.2.2
Test suites	: EN 300 328 V2.2.2, Clause 5.4.6

Exemption Conditions:

These requirements apply to non-adaptive equipment or to adaptive equipment when operating in non-adaptive mode. The equipment is using wide band modulations other than FHSS.

Conclusion

The EUT is non-adaptive equipment, hence this requirement is not applicable.

5.1.6 Occupied Channel Bandwidth

RESULT:

Pass

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.7
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.7.3
Test suites	: EN 300 328 V2.2.2, Clause 5.4.7

Test Setup

Date of testing	: 2021.01.29
Test voltage	: AC230V
Test environment	: Normal temperature
Operation mode	: A.1
Ambient temperature	: 21 °C
Relative humidity	: 60 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix 1.

5.1.7 Transmitter Unwanted Emissions in the Out-of-band Domain

RESULT:

Pass

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.8
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.8.3
Test suites	: EN 300 328 V2.2.2, Clause 5.4.7

Test Setup

Date of testing	: Refer to the appendix 1
Test voltage	: AC230V
Test environment	: Normal temperature
Operation mode	: A.1
Ambient temperature	: Refer to the appendix 1
Relative humidity	: Refer to the appendix 1
Atmospheric pressure	: Refer to the appendix 1

For the measurement records, refer to the appendix 1.

5.1.8 Transmitter Unwanted Emissions in the Spurious Domain

RESULT:

Pass

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.9
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.9.3
Test suites	: EN 300 328 V2.2.2, Clause 5.4.9

Test Setup

Date of testing	: Refer to the appendix 1
Test voltage	: AC230V
Test environment	: Normal temperature
Operation mode	: A.1
Ambient temperature	: Refer to the appendix 1
Relative humidity	: Refer to the appendix 1
Atmospheric pressure	: Refer to the appendix 1

For the measurement records, refer to the appendix 1.

5.2 Receiver Requirement & Test Suites

5.2.1 Receiver Spurious Emissions

RESULT:

Pass

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.10
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.10.3
Test suites	: EN 300 328 V2.2.2, Clause 5.4.10

Test Setup

Date of testing	: Refer to the appendix 1
Test voltage	: AC230V
Test environment	: Normal temperature
Operation mode	: A.2
Ambient temperature	: Refer to the appendix 1
Relative humidity	: Refer to the appendix 1
Atmospheric pressure	: Refer to the appendix 1

For the measurement records, refer to the appendix 1.

5.2.2 Receiver Blocking

RESULT:

Pass

Test Specification

Test standard	: EN 300 328 V2.2.2
Test requirement	: EN 300 328 V2.2.2, Clause 4.3.2.11
Limit	: EN 300 328 V2.2.2, Clause 4.3.2.11.4
Test suites	: EN 300 328 V2.2.2, Clause 5.4.11

Test Setup

Date of testing	: 2021.01.29
Test voltage	: AC230V
Test environment	: Normal temperature
Operation mode	: B
Ambient temperature	: 21 °C
Relative humidity	: 60 %
Atmospheric pressure	: 101 kPa

The EUT belongs to receiver category 1 equipment.

For the measurement records, refer to the appendix 1

5.2.3 Geo-location Capability

RESULT:

Not applicable

Test Specification

Test standard : EN 300 328 V2.2.2
Test requirement : EN 300 328 V2.2.2, Clause 4.3.2.12

Exemption Conditions:

This requirement only applies to equipment with geo-location capability as defined in clause 4.3.2.12.1.

Conclusion:

The EUT is adaptive equipment and does not support geo-location capability, hence this requirement is not applicable.

6 Test Results of EMC Requirement

6.1 Test Results of EMISSION

6.1.1 Harmonic Current Emissions on AC Mains

RESULT:

Pass

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020 EN IEC 61000-3-2:2019
Basic standard	:	EN 301 489-1 V2.2.3:2019, Clause 8.5
Measured harmonics	:	2 - 40
Classification	:	Class A
Limit	:	EN IEC 61000-3-2:2019, Clause 7.1 Table 1

Test Setup

Date of testing	:	Refer to appendix 1
Test voltage	:	AC 230V, 50Hz
Operation mode	:	B
Test Ports	:	AC Mains
Ambient temperature	:	Refer to appendix 1
Relative humidity	:	Refer to appendix 1
Atmospheric pressure	:	Refer to appendix 1

For the measurement records, refer to the appendix 1.

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6.1.2 Voltage Fluctuations and Flicker on AC Mains

RESULT:

Pass

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020 EN 61000-3-3:2013+A1
Basic standard	: EN 301 489-1 V2.2.3:2019, Clause 8.6
Frequency range	: 0 – 2 kHz
Limit	: EN 61000-3-3:2013+A1, Clause 5

Test Setup

Date of testing	: Refer to appendix 1
Test voltage	: AC 230V, 50Hz
Operation mode	: B
Test Ports	: AC Mains
Ambient temperature	: Refer to appendix 1
Relative humidity	: Refer to appendix 1
Atmospheric pressure	: Refer to appendix 1

For the measurement records, refer to the appendix 1.

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6.1.3 Conducted Emission on AC Mains

RESULT:

Pass

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 8.4
Frequency range	: 150 KHz – 30 MHz
Kind of test site	: Shielded Room
Limit	: EN 301 489-1 V2.2.3:2019, Clause 8.4.3.2

Test Setup

Date of testing	: Refer to appendix 1
Test voltage	: AC 230V/50Hz, AC 100V/60Hz
Operation mode	: B
Test Ports	: AC Mains
Ambient temperature	: Refer to appendix 1
Relative humidity	: Refer to appendix 1
Atmospheric pressure	: Refer to appendix 1

For the measurement records, refer to the appendix 1.

6.1.4 Conducted Emission on DC power input/output port

RESULT:

Not applicable

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 8.3
Frequency range	: 150 KHz – 30 MHz
Kind of test site	: Shielded Room
Limit	: EN 301 489-1 V2.2.3:2019, Clause 8.3.3

Exemption Conditions:

According to the electrical construction of the EUT, there is no DC terminal incorporated. Therefore this test is not applicable for this EUT.

6.1.5 Conducted Emission on Wired network port

RESULT:

Not applicable

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 8.7
Frequency range	: 150 KHz – 30 MHz
Kind of test site	: Shielded Room
Limit	: EN 301 489-1 V2.2.3:2019, Clause 8.7.3

Exemption Conditions:

According to the electrical construction of the EUT, there is no wired network terminal incorporated. Therefore this test is not applicable for this EUT.

6.1.6 Radiated Emission

RESULT:

Pass

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 8.2
Classification	: Class B
Frequency range	: 30 MHz – 6 GHz*
Kind of test site	: 3m Semi-anechoic Chamber
Limit	: EN 301 489-1 V2.2.3:2019, Clause 8.2.3

Test Setup

Date of testing	: Refer to appendix 1
Test voltage	: AC 230V/50Hz, AC 100V/60Hz
Operation mode	: B
Test Ports	: Enclosure
Earthing	: Not connected
Ambient temperature	: Refer to appendix 1
Relative humidity	: Refer to appendix 1
Atmospheric pressure	: Refer to appendix 1

*) Since the highest frequency of the internal sources of the EUT is above 1GHz, According to 55032:2015, the measurement shall only be made up to 6 GHz.

For the measurement records, refer to the appendix 1.

6.2 Test Results of IMMUNITY

6.2.1 Radio Frequency Electromagnetic Fields (RS)

RESULT:

Pass

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019 EN 61000-4-3
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 9.2
Frequency range	: 80 MHz to 6000 MHz
Test level	: 3 V/m, (unmodulated, r.m.s)
Modulation	: 80% AM by a sinusoidal signal of 1kHz
Kind of test site	: 3m Full-anechoic Chamber
Performance criteria	: A (Transmitters: CT & Receivers: CR)

Test Setup

Date of testing	: 2021.01.27
Test voltage	: AC 230V,50Hz
Operation mode	: B
Test Ports	: Enclosure
Ambient temperature	: 22 °C
Relative humidity	: 55 %
Atmospheric pressure	: 101 kPa

Table 8: Test Result of Radio Frequency Electromagnetic Fields (RS)

Test Frequency Band	Test port	Polarity	Location	Actual Performance
80MHz – 1000MHz	Enclosure	Vertical / Horizontal	Front	A*
			Rear	A*
			Left	A*
			Right	A*
1000MHz – 6000MHz	Enclosure	Vertical / Horizontal	Front	A*
			Rear	A*
			Left	A*
			Right	A*

*Remark: No degradation was observed during and after the tests.

6.2.2 Radio Frequency Continuous Conducted (CS)

RESULT:

Pass

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019 EN 61000-4-6
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 9.5
Frequency range	: 0.15 - 80 MHz
Source impedance	: 150 Ω
Test level	: 3V ms (unmodulated, r.m.s.)
Modulation	: AM 80%, 1 kHz sine-wave
Sweep mode	: Automatic
Sweep rate	: < 1.5×10 ⁻³ decade / sec.
Performance criteria	: A (Transmitters: CT & Receivers: CR)

Test Setup

Date of testing	: 2021.01.27
Input voltage	: AC 230V,50Hz
Operation mode	: B
Test Ports	: AC mains power port**
Earthing	: Not connected
Ambient temperature	: 21 °C
Relative humidity	: 45 %
Atmospheric pressure	: 100 kPa

Table 9: Test Result of Radio Frequency Continuous Conducted (CS)

Coupling point	Application	Level (V(r.m.s))	Remark
Power ports			
AC power port	CDN-M2	3	Applied, *)
DC power port	EM clamp	3	N/A
Signal lines			
Control port	Current Clamp	3	N/A
	EM clamp	3	N/A
Control lines	Current Clamp	3	N/A
	EM clamp	3	N/A

*Remark: No degradation was observed during and after the tests.

** Remark: The cable was less than 3m connected to control ports.

6.2.3 Electrostatic Discharge (ESD)

RESULT:

Pass

Test Specification

Test standard : EN 301 489-17 V3.2.4:2020
 Basic standard : EN 301 489-1 V2.2.3:2019
 EN 61000-4-2
 Test requirement : EN 301 489-1 V2.2.3:2019, Clause 9.3
 Discharge impedance : 330 Ω / 150 pF
 Test level : Air discharge: ± 2 kV, ± 4 kV, ± 8 kV
 Contact discharge: ± 4 kV
 HCP & VCP: ± 4 kV
 Position : All exposed surfaces
 Performance criteria : B (Transmitters: TT & Receivers: TR)

Test Setup

Date of testing : 2021.01.27
 Input voltage : AC 230V,50Hz
 Operation mode : B
 Test Ports : Enclosure
 Earthing : Not connected
 Ambient temperature : 21 °C
 Relative humidity : 46 %
 Atmospheric pressure : 101.7 kPa

Table 10: Test Result of Electrostatic Discharge (ESD)

Test Level	Location	Actual Performance
± 4 kV / Contact	HCP	A*
	VCP	A*
	Conducted Enclosure	A*
± 2.0kV, ± 4.0kV, ± 8.0kV / Air	Non-conducted Enclosure	A*
	Button	A*
	Slot	A*

*Remark: No degradation was observed during and after the tests.

6.2.4 Electrical Fast Transients (EFT)

RESULT:

Pass

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019 EN 61000-4-4
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 9.4
Test level	: ± 1.0 kV on AC
Test duration	: 2 minute per level & polarity
Rise time	: 5/50ns
Repetition frequency	: 5 KHz
Performance criteria	: B (Transmitters: TT & Receivers: TR)

Test Setup

Date of testing	: 2021.01.27
Input voltage	: AC 230V,50Hz
Operation mode	: B
Test Ports	: AC mains power input ports**
Earthing	: Not connected
Ambient temperature	: 21 °C
Relative humidity	: 46 %
Atmospheric pressure	: 100kPa

Table 11: Test Result of Electrical Fast Transients (EFT)

Coupling point	Application	Level(kV)	Polarity	Remark
Power ports				
AC power port	Coupling/Decoupling network	1	+	Applied, *)
		1	-	Applied, *)
DC power port	Capacitive Coupling Clamp	0.5	+	N/A
		0.5	-	N/A
Signal lines				
Control port	Capacitive Coupling Clamp	0.5	+	N/A
		0.5	-	N/A
Control lines				
N/A	Capacitive Coupling Clamp	0.5	+	N/A
		0.5	-	N/A

*Remark: No degradation was observed during and after the tests.

** Remark: The cable was less than 3m connected to control ports.

6.2.5 Surge

RESULT:

Pass

Test Specification

Test standard : EN 301 489-17 V3.2.4:2020
 Basic standard : EN 301 489-1 V2.2.3:2019
 EN 61000-4-5
 Test requirement : EN 301 489-1 V2.2.3:2019, Clause 9.8
 Test level : ± 1.0 kV line to line
 Repetition rate : Max. 1/min
 Performance criteria : B (Transmitters: TT & Receivers: TR)

Test Setup

Date of testing : 2021.01.27
 Input voltage : AC 230V,50Hz
 Operation mode : B
 Test Ports : ± 1.0 kV line to line on AC
 T_r / T_h : 1,2 / 50 μs
 Earthing : Not connected
 Ambient temperature : 21 °C
 Relative humidity : 46 %
 Atmospheric pressure : 100 kPa

Table 12: Test Result of Surge

Coupling Port	Test Level (±kV)	Coupling Phase	Actual Performance
AC mains power port	± 1.0 kV line to line	0	B
		$\pi/2$	B
		π	B
		$3\pi/2$	B

*Remark: No degradation was observed during and after the tests.

6.2.6 Voltage Dips and Interruptions

RESULT:

Pass

Test Specification

Test standard	: EN 301 489-17 V3.2.4:2020
Basic standard	: EN 301 489-1 V2.2.3:2019 EN 61000-4-11
Test requirement	: EN 301 489-1 V2.2.3:2019, Clause 9.7
Test level	: Voltage dips: <input checked="" type="checkbox"/> 0 % residual voltage for 0,5 cycle <input checked="" type="checkbox"/> 0 % residual voltage for 1 cycle <input checked="" type="checkbox"/> 70 % residual voltage for 25 cycles (at 50 Hz) Voltage interruptions: <input checked="" type="checkbox"/> 0 % residual voltage for 250 cycles (at 50 Hz).
Performance criteria	: B (Transmitters: TT & Receivers: TR) C (Transmitters: TT & Receivers: TR) for 250 cycles

Test Setup

Date of testing	: 2021.01.27
Input voltage	: AC 230V,50Hz
Operation mode	: B
Test Ports	: AC mains power port
Earthing	: Not connected
Ambient temperature	: 21 °C
Relative humidity	: 46 %
Atmospheric pressure	: 100 kPa

Table 13: Test Result of Voltage Dips and Interruptions

Coupling Port	Voltage Reduction (%)	Reduction Duration (in Period)	Actual Performance
AC mains power port	100%	0.5	A*
	100%	1	A*
	30%	25	A*
	100%	250	B*

*Remark: No degradation was observed during and after the tests.

7 Safety Human Exposure

7.1 Human Exposure to Electromagnetic Fields 10MHz-300GHz

7.1.1 Electromagnetic Fields

RESULT:

Pass

Test Specification

Test standard : EN IEC 62311: 2020

Limit : 61 V/m

Assumed used distance from EUT to Human, 20 cm separation distance warning is required. In this section, the power density at 20 cm location is calculated to examine if it is lower than the limit.

a), Stand-alone

The electric field strength:

$$E = \sqrt{30PG_{(\theta,\phi)}} / r$$

Antenna gain (G): 1.0dBi

Reference electromagnetic field strength (E): 61 V/m

Distance from EUT to Human (r): 0.20 m

Input power to antenna (P): refer to below table

Table 14: Test Result of Maximum Measured E Field Strength

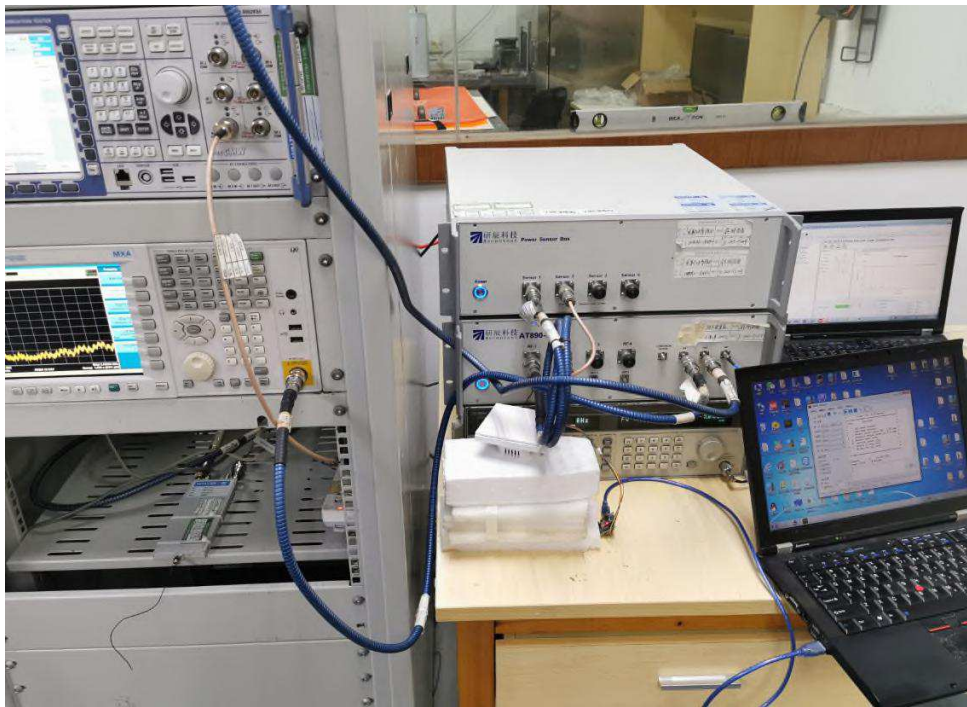
Test Condition (Temperature)	Antenna Gain (Numeric)	Maximum Output Power (dBm)	Maximum Output Power (mW)	E Field Strength (V/m)	E Field Strength Limit (V/m)	Result
Normal	!Syntax Error, !	10.93	12.39	0.00	61	Pass
Low	!Syntax Error, !	10.91	12.33	0.00	61	Pass
High	!Syntax Error, !	10.93	12.39	0.00	61	Pass
Maximum Measured Value		10.93	12.39	0.00	61	Pass

Conclusion:

The device complies with the EMF directive 1999/519/EC exposure requirements since the maximum Electric Field is less than the limit 61V/m.

8 Photographs of the Test Set-Up

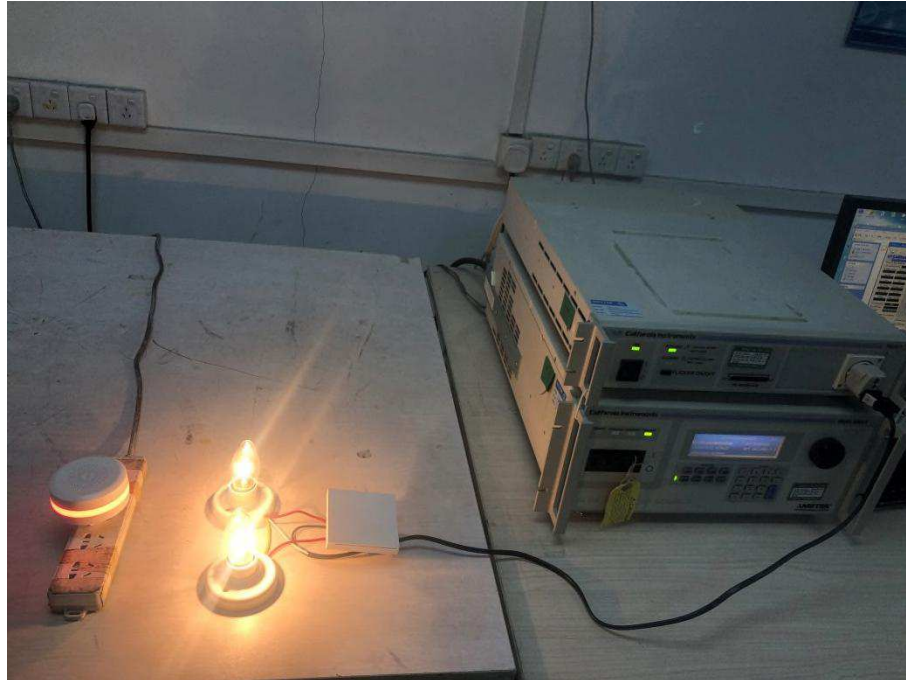
Photograph 1: Set-up for Radio Spectrum Testing



Photograph 2: Set-up for Transmitter & Receiver Spurious Emissions



Photograph 3: Set-up for Harmonic and Flicker



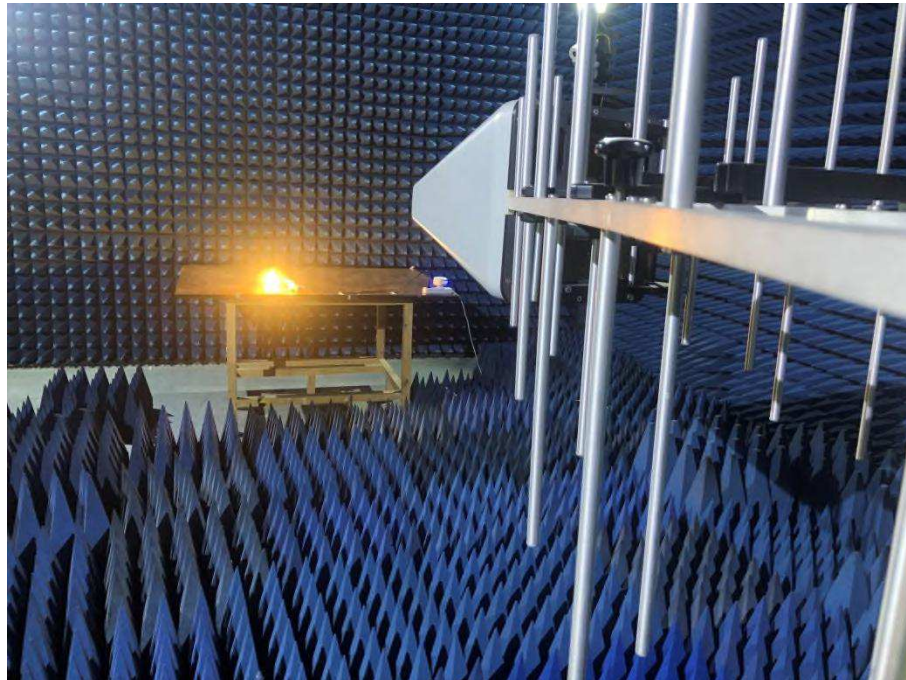
Photograph 4: Set-up for Conducted Emission



Photograph 5: Set-up for Radiated Emission



Photograph 6: Set-up for Radio-frequency Electromagnetic Field Susceptibility



Photograph 7: Set-up for Electrostatic Discharge

⚡ Contact Discharge $\pm 4\text{kV}$

⚡ Air Discharge $\pm 2, 4, 8\text{kV}$



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Photograph 8: Set-up for Conducted Susceptibility (CS)



Photograph 9: Set-up for EFT



Photograph 10: Set-up for Surge



Photograph 11: Set-up for Voltage dips



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Waltek Testing Group (Shenzhen) Co., Ltd.

Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
Radiated Test equipment				
Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2021-04-28
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2021-04-28
Amplifier	Agilent	8447F	3113A06717	2021-04-28
Amplifier	C&D	PAP-1G18	2002	2021-04-28
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2021-05-05
Horn Antenna	ETS	3117	00086197	2021-05-05
Conducted Test equipment				
Spectrum Analyzer	Agilent	N9020A	US47140102	2021-04-28
Signal Generator	Agilent	83752A	3610A01453	2021-04-28
Vector Signal Generator	Agilent	N5182A	MY47070202	2021-04-28
Power Sensor	Agilent	U2021XA	MY54250019	2021-04-28
Power Sensor	Agilent	U2021XA	MY54250021	2021-04-28
Simultaneous Sampling	Agilent	U2531A	TW54243509	2021-04-28
temperature and humidity testing machine	KEWEN	GDJS-1000-40	/	2021-10-19
Radiated Emission				
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2021-04-28
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2021-04-28
Amplifier	Agilent	8447F	3113A06717	2021-04-28
Amplifier	C&D	PAP-1G18	2002	2021-04-28
Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-05-05
Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2021-05-05
Horn Antenna	ETS	3117	00086197	2021-05-05
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	N/A	N/A
Conducted Emission				
EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2021-04-28
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2021-04-28
AC LISN	Schwarz beck	NSLK8126	8126-224	2021-04-28
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	N/A	N/A

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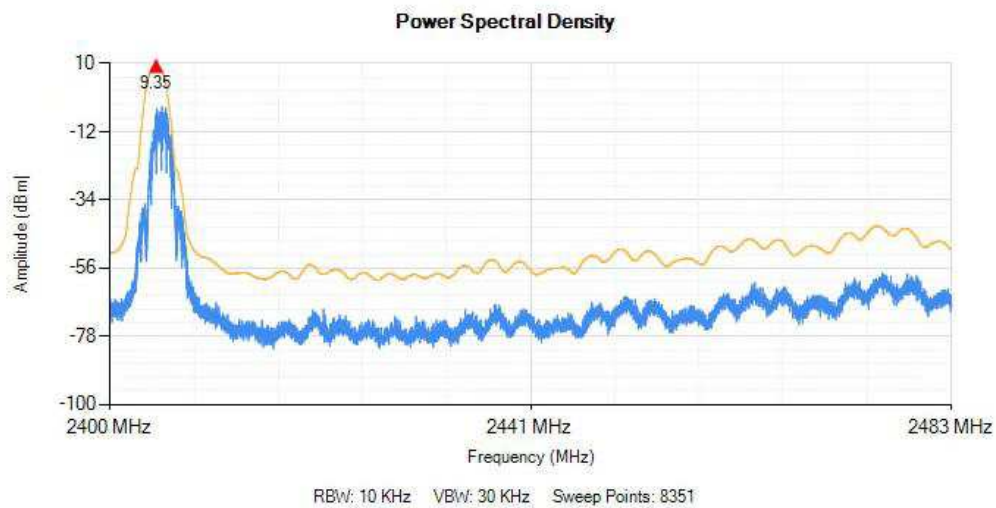
Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
Harmonics & Flicker				
Digital Power Analyzer	California Instrument	PACS-1	72831	2021-04-28
Power Source	California Instrument	5001iX	25965	2021-04-28
Electrostatic Discharge(ESD)				
ESD Generator	LIOGCEL	ESD-203B	0170901	2021-04-28
Electrical Fast Transient(EFT)				
Transient 2000	EMC PARTNER	TRA2000	863	2021-04-28
Surge				
Transient 2000	EMC PARTNER	TRA2000	863	2021-04-28
Conducted Susceptibility (150kHz-80MHz)				
CONDUCTED IMMUNITY TEST SYSTEM	FRANKONIA	CIT-10/75	126B1247/2013	2022-01-08
Attenuator	EMTEST	MA-5100/6BF2	1009	2021-04-28
CDN	Luthi	L-801M2/M3	2665	2021-04-28
Voltage Dips and Interruptions				
Transient 2000	EMC PARTNER	TRA2000	863	2021-04-28
Radiated Susceptibility				
Anechoic chamber	Albatross Projects	MCDC	----	2021-04-28
Signal Generator	HP	8688B	3438A00604	2021-04-28
Power Meter	KEITHLEY	3500	1162591	2021-04-28
Power Meter	KEITHLEY	3500	1121428	2021-04-28
RF Power Amplifier	MicoTop	MPA-80-1000-250	MPA1906239	2021-04-28
RF Power Amplifier	MicoTop	MPA-80-1000-100	MPA1906238	2021-04-28
Antenna	SCHWARZBECK	STLP 9129	9129 114	N/A

1 RF Test Result

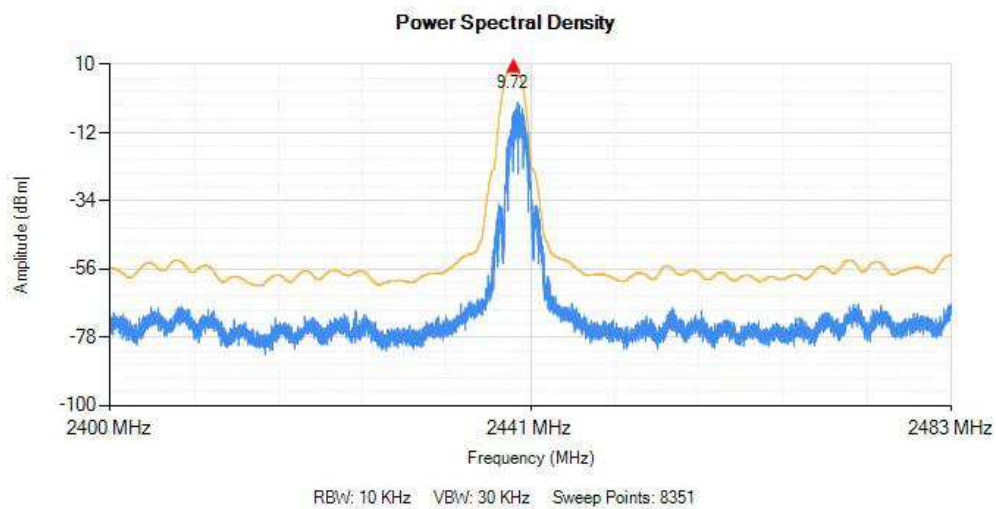
Power Spectral Density

Condition	Mode	Frequency (MHz)	Max PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
NVNT	ZigBee	2405	9.35	10	Pass
NVNT	ZigBee	2440	9.72	10	Pass
NVNT	ZigBee	2480	9.39	10	Pass

PSD NVNT ZigBee 2405MHz

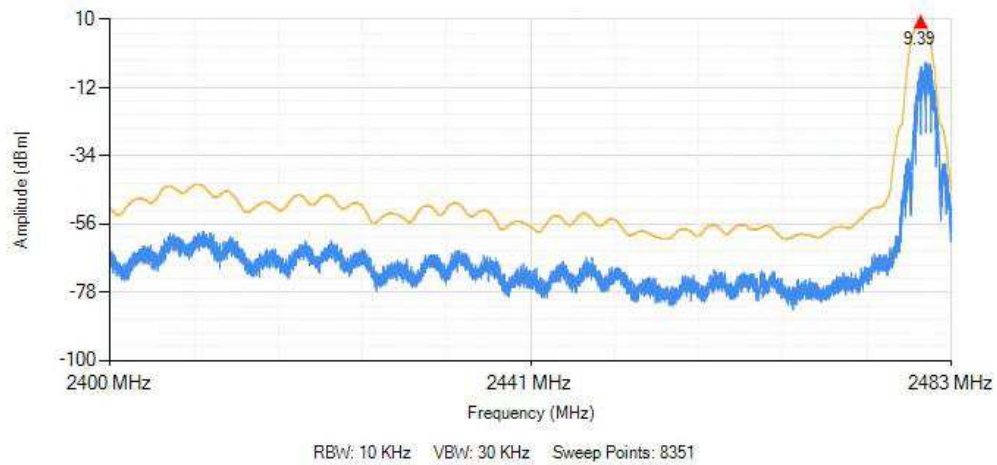


PSD NVNT ZigBee 2440MHz



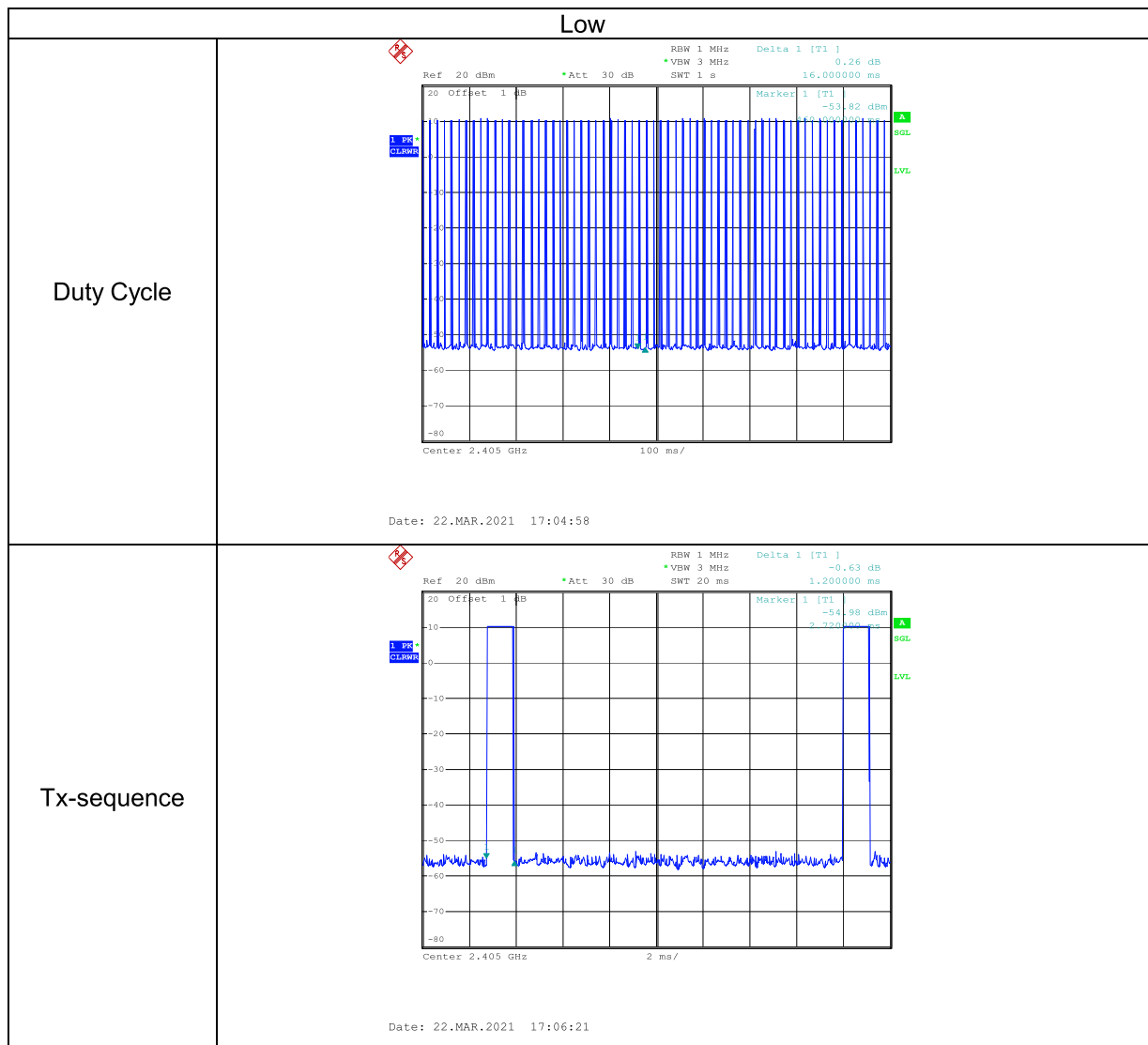
PSD NVNT ZigBee 2480MHz

Power Spectral Density

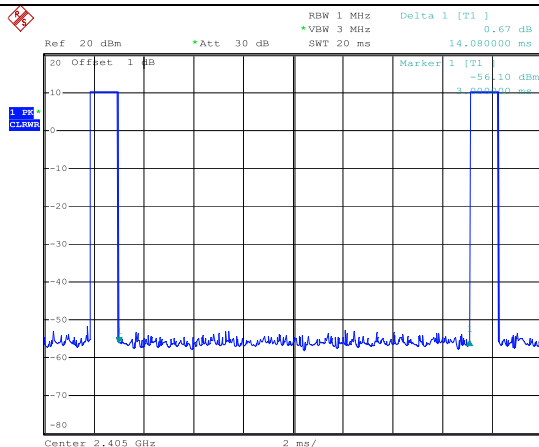


Duty Cycle, TX-sequence, TX-gap, Medium Utilisation

DUT Frequency (MHz)	Duty Cycle (%)	Tx-sequence (ms)	Tx Gap (ms)	Medium Utilisation (%)
2405	7.8	1.2	14.08	0.91
2440	7.8	1.2	16.02	0.97
2480	8.06	1.24	14.04	0.95
Limit	≤Maximum value declared by the Manufacturer	≤10	≥3.5	< 10



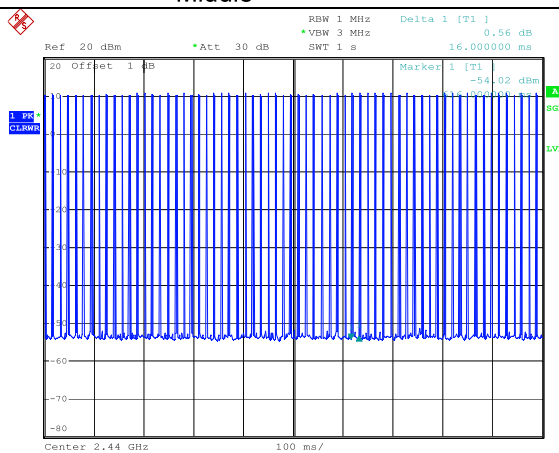
Tx Gap



Date: 22.MAR.2021 17:06:43

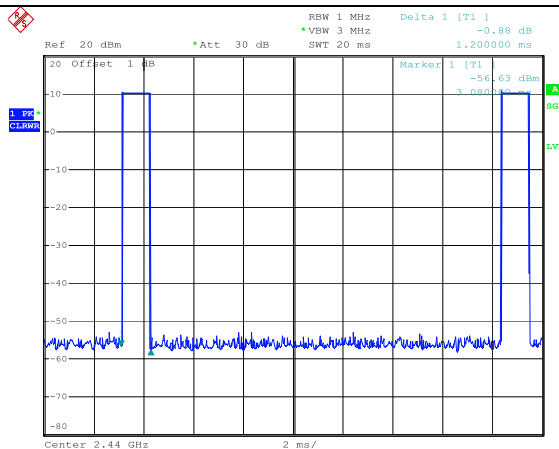
Middle

Duty Cycle



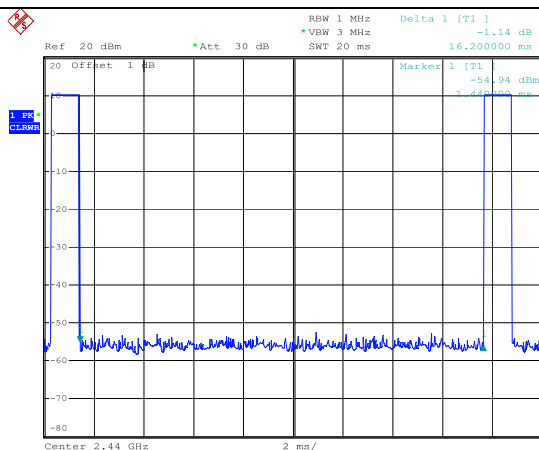
Date: 22.MAR.2021 17:07:38

Tx-sequence



Date: 22.MAR.2021 17:09:53

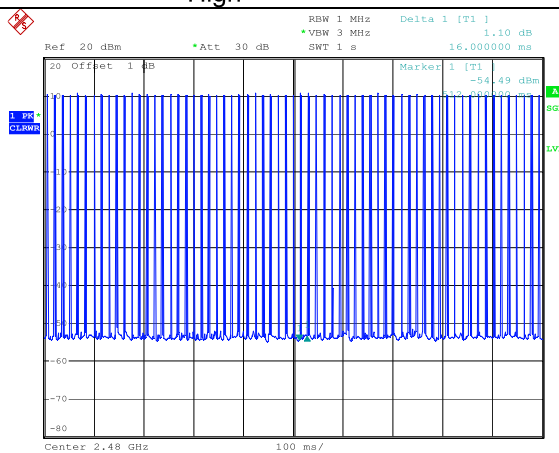
Tx Gap



Date: 22.MAR.2021 17:10:35

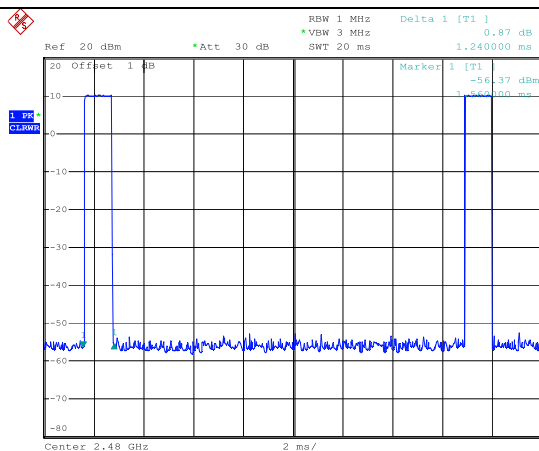
High

Duty Cycle



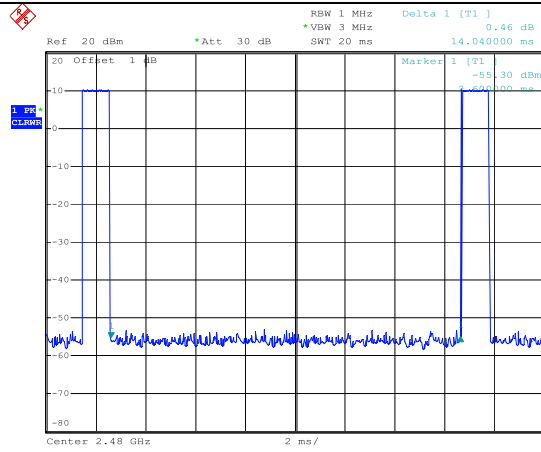
Date: 22.MAR.2021 17:11:42

Tx-sequence



Date: 22.MAR.2021 17:13:39

Tx Gap



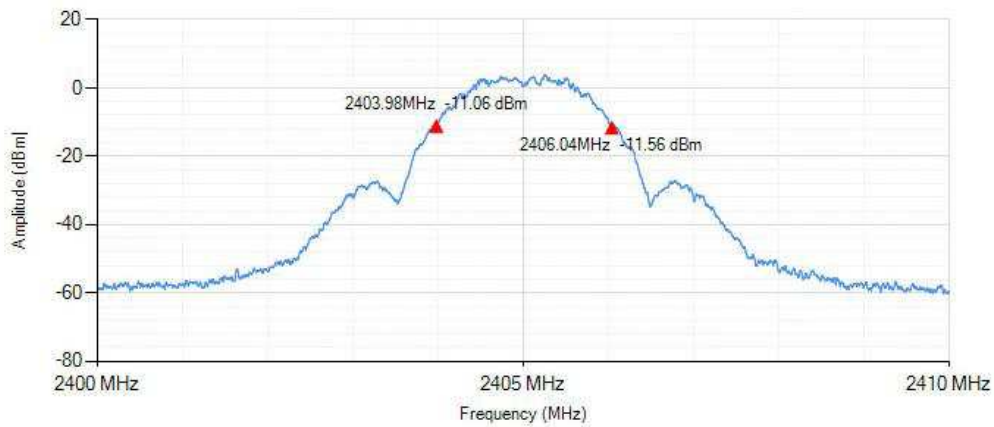
Date: 22.MAR.2021 17:14:00

Occupied Channel Bandwidth

Condition	Mode	Frequency (MHz)	Center Frequency (MHz)	OBW (MHz)	Lower Edge (MHz)	Upper Edge (MHz)	Limit OBW (MHz)	Verdict
NVNT	ZigBee	2405	2405.01	2.06	2403.98	2406.04	2400.00~2483.50	Pass
NVNT	ZigBee	2480	2480.01	2.06	2478.98	2481.04	2400.00~2483.50	Pass

OBW NVNT ZigBee 2405MHz

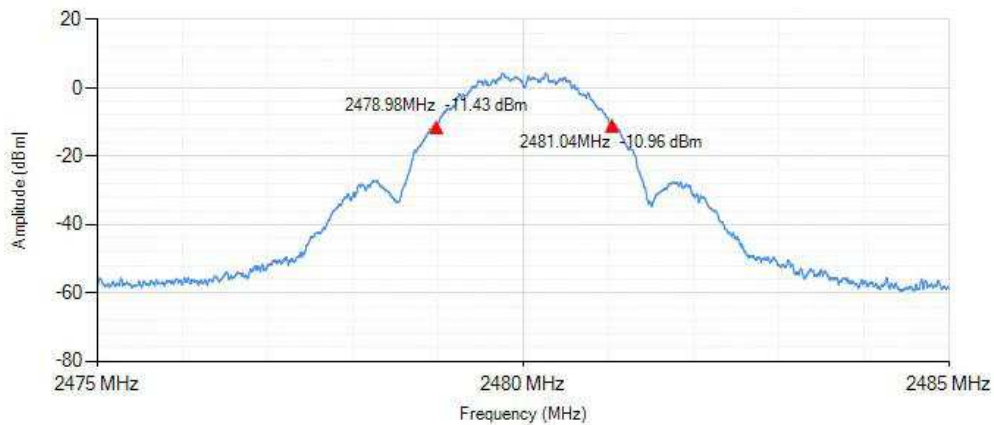
Occupied Channel Bandwidth



RBW: 100 KHz VBW: 300 KHz Sweep Points: 5001

OBW NVNT ZigBee 2480MHz

Occupied Channel Bandwidth



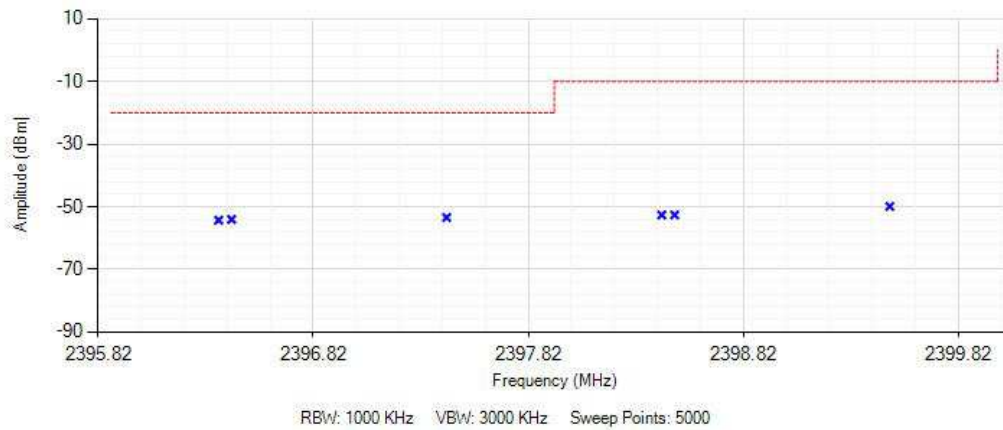
RBW: 100 KHz VBW: 300 KHz Sweep Points: 5001

Transmitter unwanted emissions in the out-of-band domain

Condition	Mode	Frequency (MHz)	OOB Frequency (MHz)	Level (dBm/MHz)	Limit (dBm/MHz)	Verdict
NVNT	ZigBee	2405	2399.5	-49.891	-10	Pass
NVNT	ZigBee	2405	2398.5	-52.601	-10	Pass
NVNT	ZigBee	2405	2398.44	-52.621	-10	Pass
NVNT	ZigBee	2405	2397.44	-53.441	-20	Pass
NVNT	ZigBee	2405	2396.44	-54.031	-20	Pass
NVNT	ZigBee	2405	2396.38	-54.281	-20	Pass
NVNT	ZigBee	2480	2484	-46.829	-10	Pass
NVNT	ZigBee	2480	2485	-48.679	-10	Pass
NVNT	ZigBee	2480	2485.06	-48.689	-10	Pass
NVNT	ZigBee	2480	2486.06	-50.709	-20	Pass
NVNT	ZigBee	2480	2487.06	-53.519	-20	Pass
NVNT	ZigBee	2480	2487.12	-53.669	-20	Pass

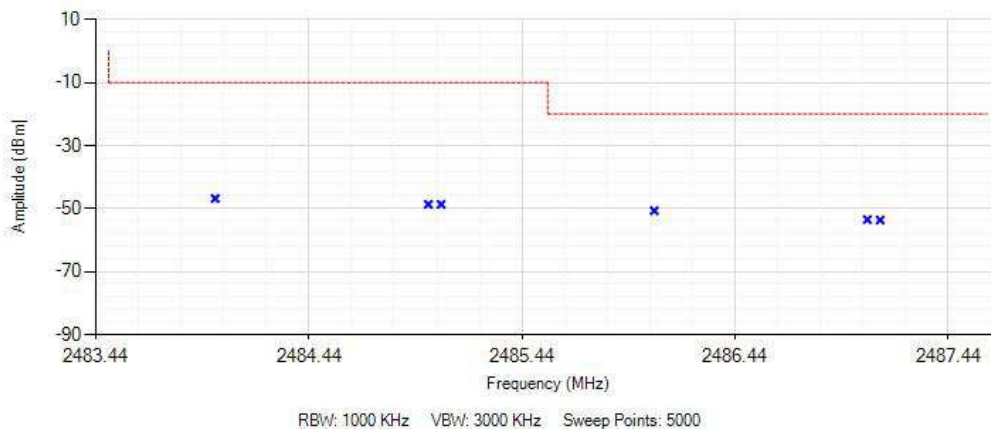
Tx. Emissions OOB NVNT ZigBee 2405MHz

Transmitter unwanted emissions in the out-of-band domain



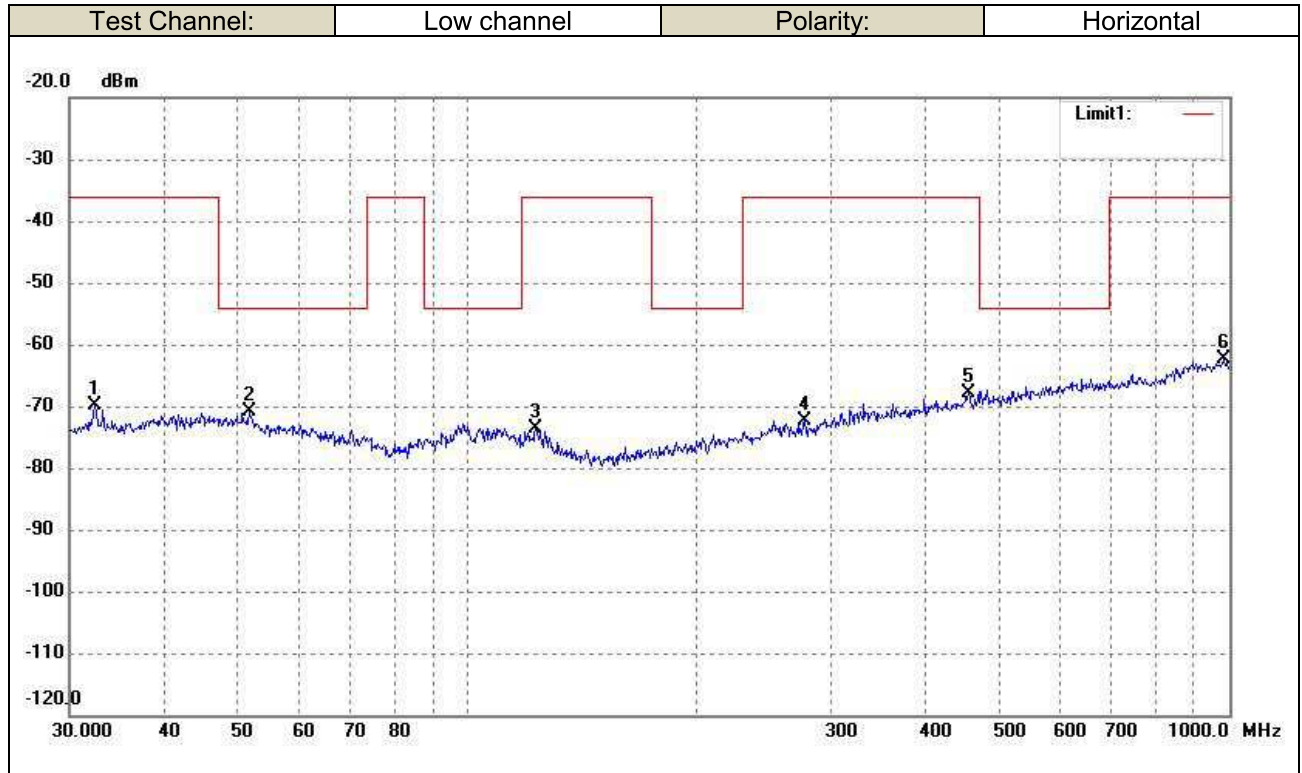
Tx. Emissions OOB NVNT ZigBee 2480MHz

Transmitter unwanted emissions in the out-of-band domain

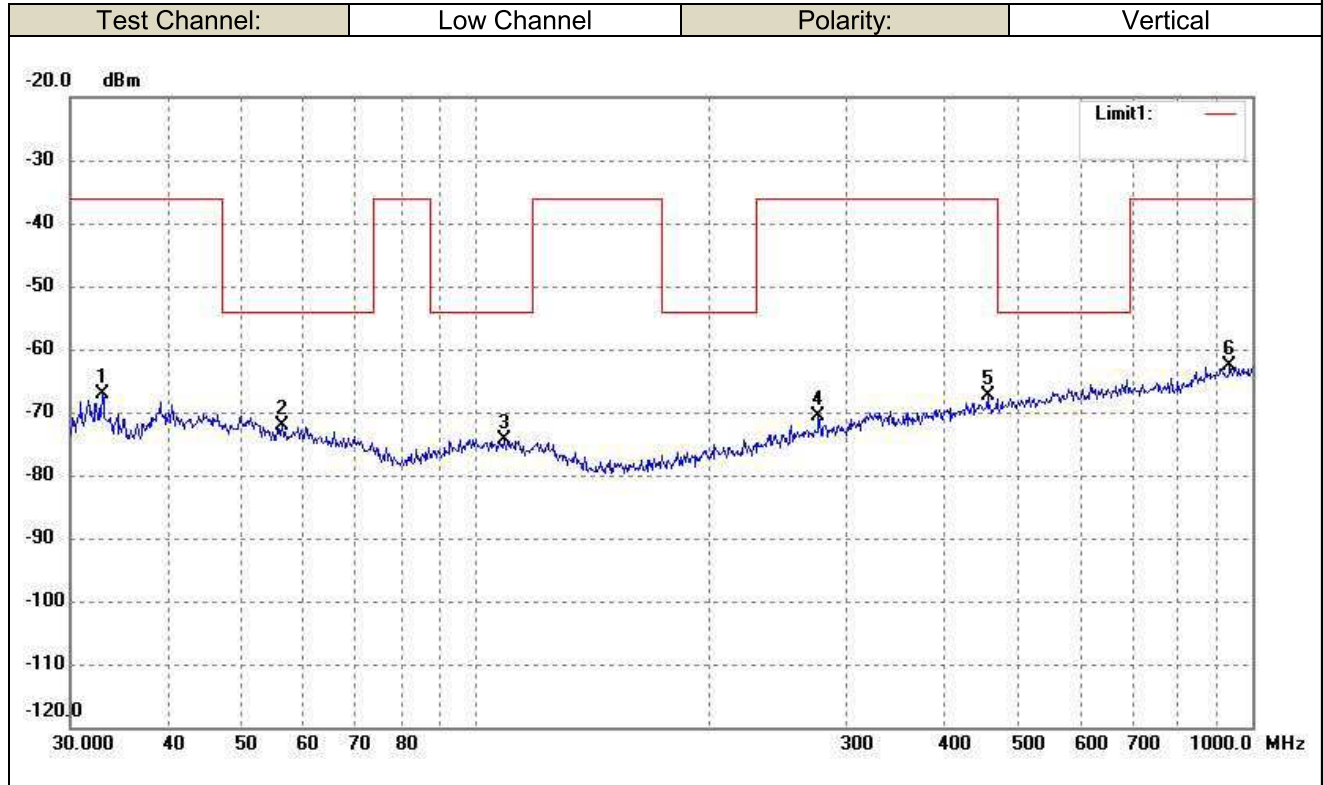


Transmitter Unwanted Emissions in the Spurious Domain

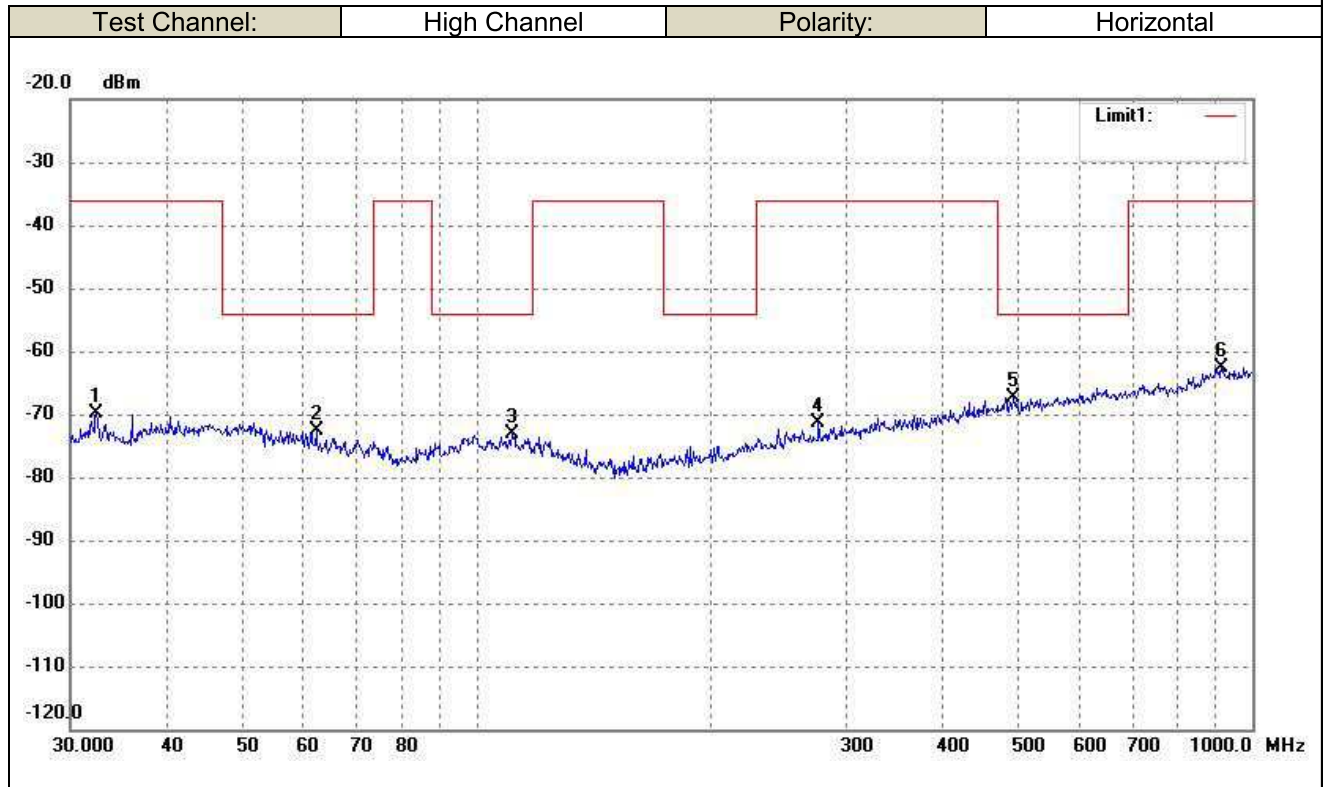
➤ Below 1GHz



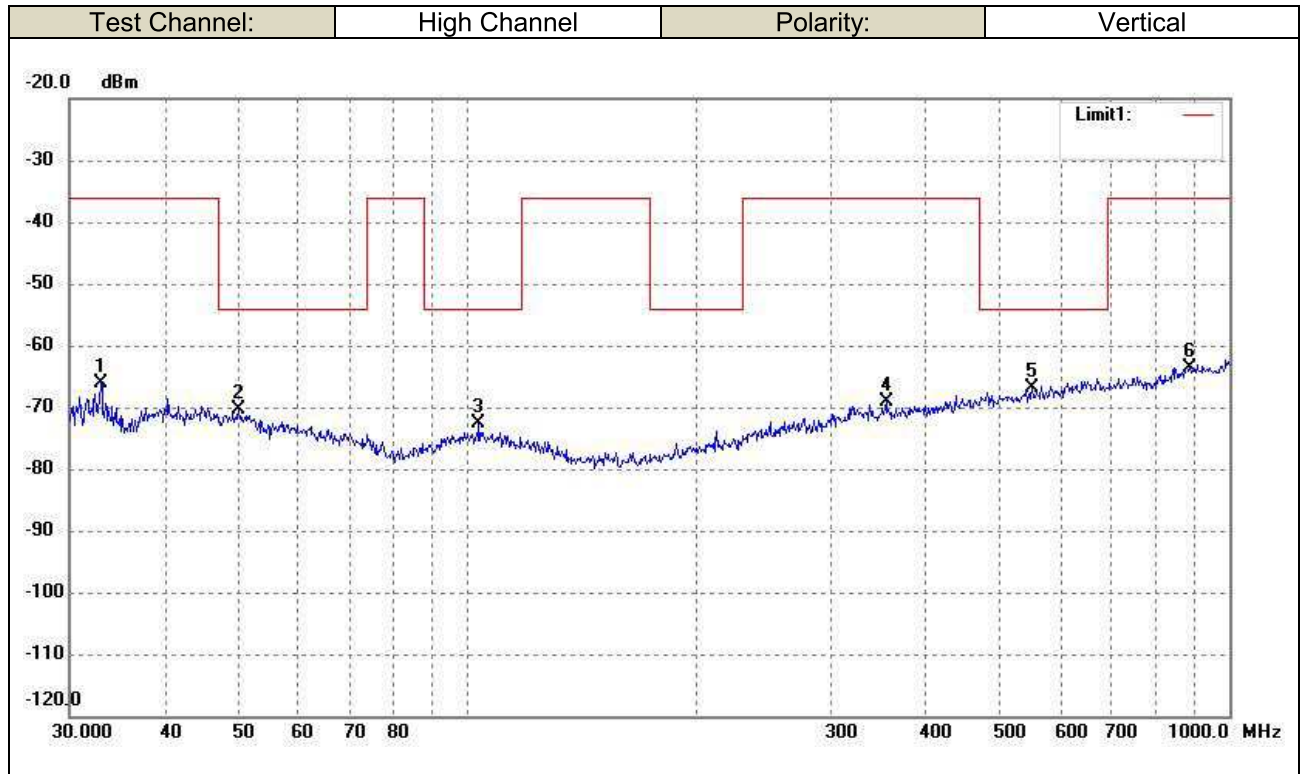
No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	32.4059	-67.60	-2.22	-69.82	-36.00	-33.82	ERP
2	51.6616	-70.65	-0.20	-70.85	-54.00	-16.85	ERP
3	122.8340	-70.45	-3.25	-73.70	-36.00	-37.70	ERP
4	277.0935	-73.47	1.19	-72.28	-36.00	-36.28	ERP
5	454.3100	-74.19	6.34	-67.85	-36.00	-31.85	ERP
6	982.6200	-75.83	13.40	-62.43	-36.00	-26.43	ERP



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	32.9791	-65.00	-2.19	-67.19	-36.00	-31.19	ERP
2	56.1974	-71.09	-1.15	-72.24	-54.00	-18.24	ERP
3	108.6470	-72.76	-1.51	-74.27	-54.00	-20.27	ERP
4	276.1235	-71.65	1.12	-70.53	-36.00	-34.53	ERP
5	455.9058	-73.86	6.39	-67.47	-36.00	-31.47	ERP
6	935.5463	-76.02	13.45	-62.57	-36.00	-26.57	ERP

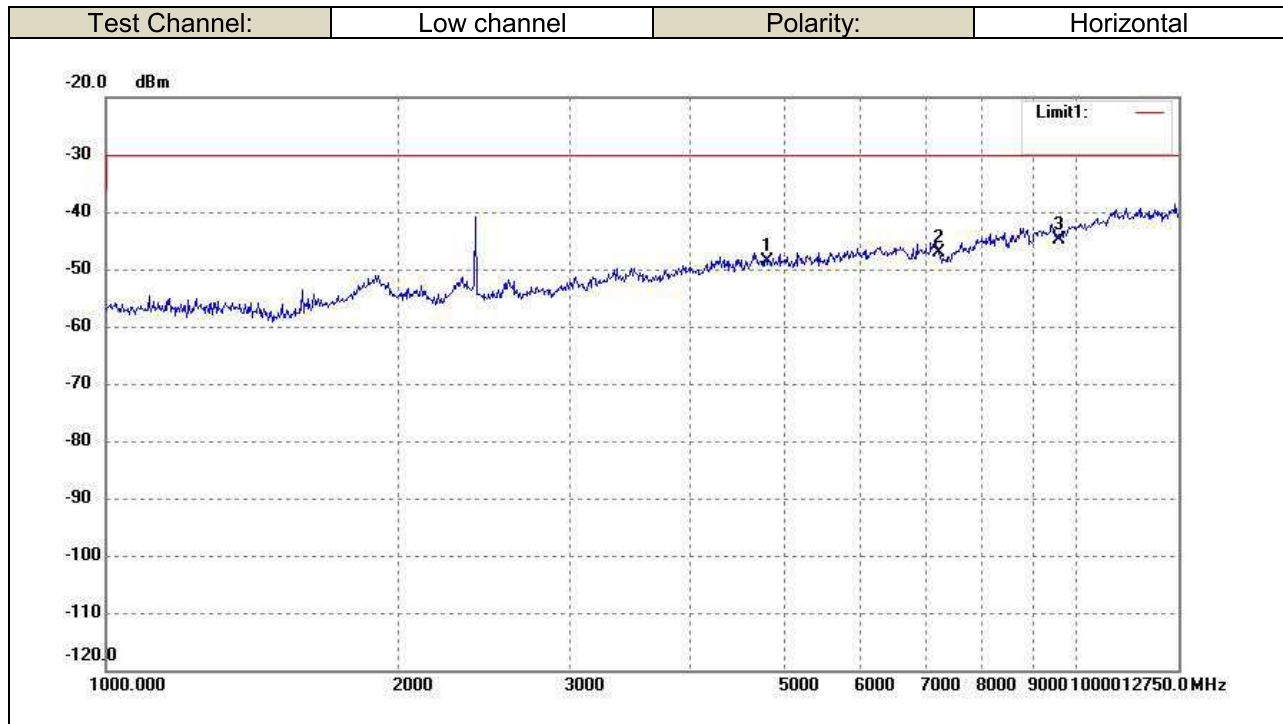


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	32.4059	-67.77	-2.22	-69.99	-36.00	-33.99	ERP
2	62.2128	-70.97	-1.60	-72.57	-54.00	-18.57	ERP
3	111.3468	-71.49	-1.65	-73.14	-54.00	-19.14	ERP
4	276.1236	-72.50	1.12	-71.38	-36.00	-35.38	ERP
5	492.4685	-74.82	7.51	-67.31	-54.00	-13.31	ERP
6	912.8620	-76.18	13.51	-62.67	-36.00	-26.67	ERP

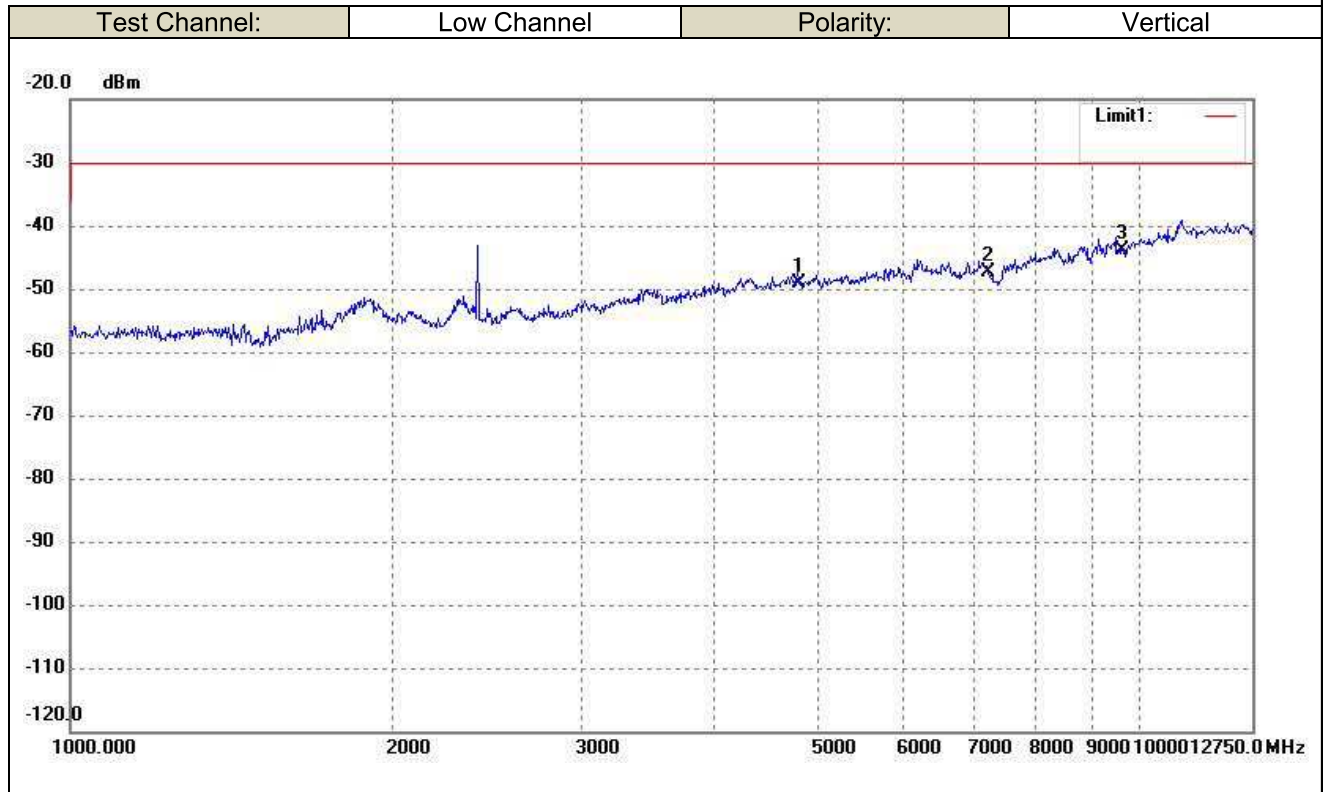


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	32.9791	-64.04	-2.19	-66.23	-36.00	-30.23	ERP
2	50.0566	-70.52	0.25	-70.27	-54.00	-16.27	ERP
3	103.4421	-71.15	-1.51	-72.66	-54.00	-18.66	ERP
4	354.1831	-73.60	4.41	-69.19	-36.00	-33.19	ERP
5	550.9480	-74.81	8.05	-66.76	-54.00	-12.76	ERP
6	887.6099	-76.42	12.85	-63.57	-36.00	-27.57	ERP

➤ Above 1GHz



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4810.000	-55.86	7.29	-48.57	-30.00	-18.57	ERP
2	7215.000	-56.84	9.60	-47.24	-30.00	-17.24	ERP
3	9620.000	-58.39	13.55	-44.84	-30.00	-14.84	ERP

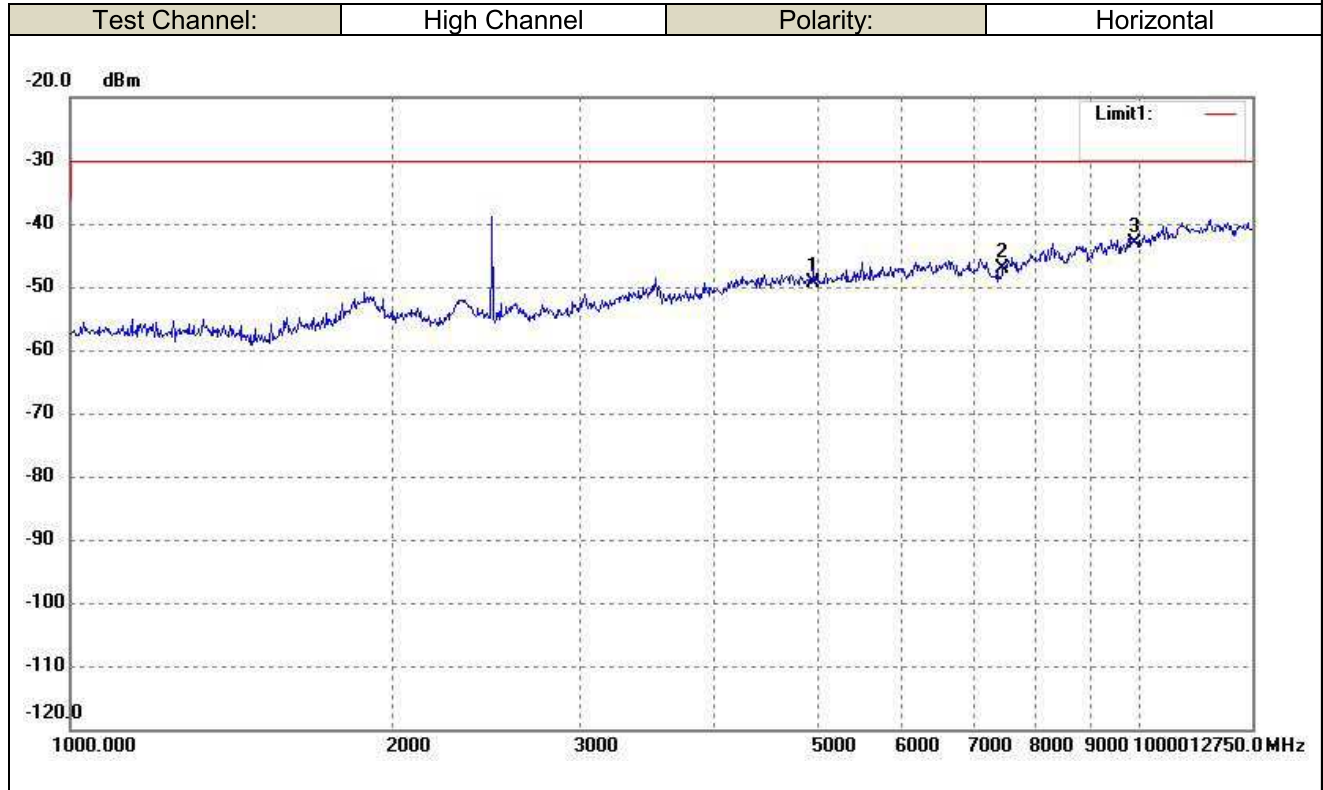


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4810.000	-56.53	7.29	-49.24	-30.00	-19.24	ERP
2	7215.000	-56.88	9.60	-47.28	-30.00	-17.28	ERP
3	9620.000	-57.32	13.55	-43.77	-30.00	-13.77	ERP

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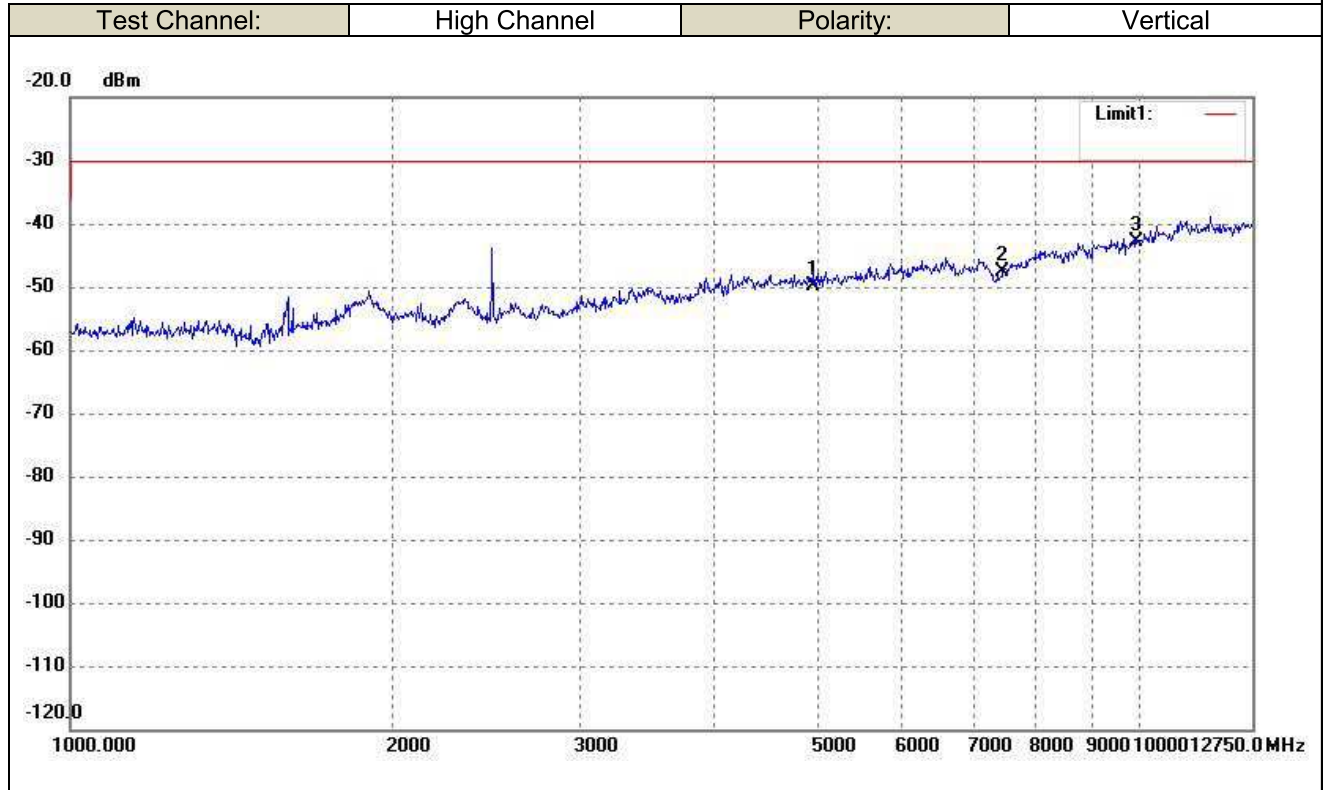


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4960.000	-56.64	7.39	-49.25	-30.00	-19.25	ERP
2	7440.000	-56.68	9.66	-47.02	-30.00	-17.02	ERP
3	9920.000	-57.14	13.99	-43.15	-30.00	-13.15	ERP

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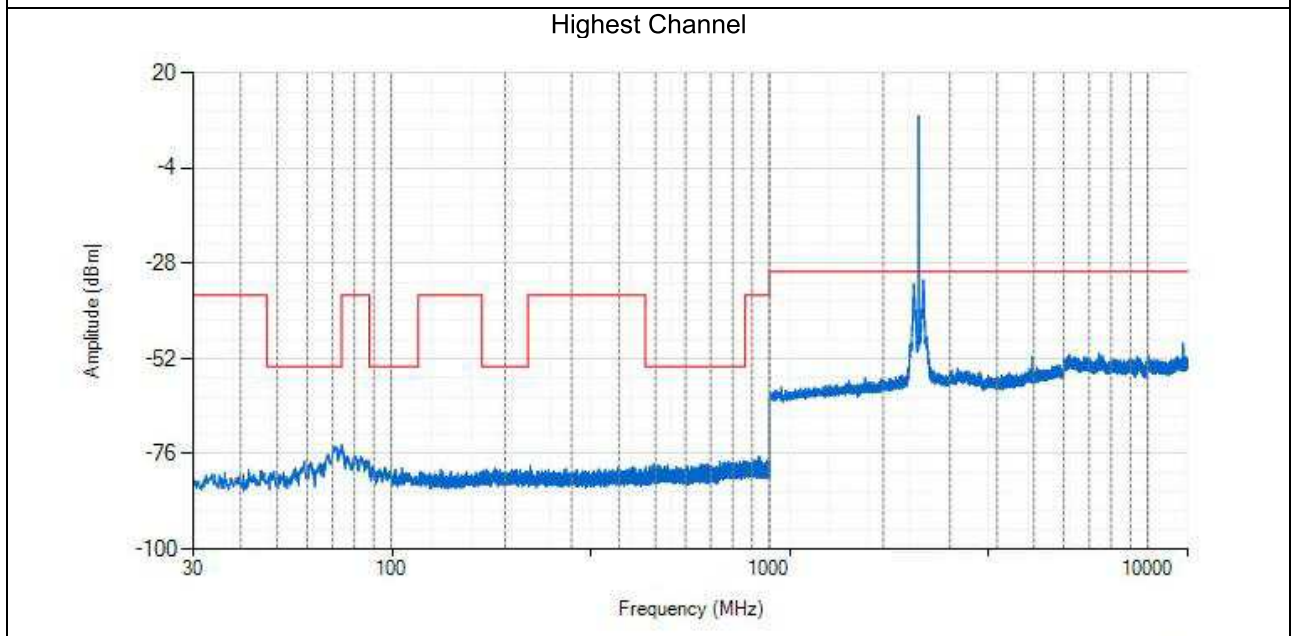
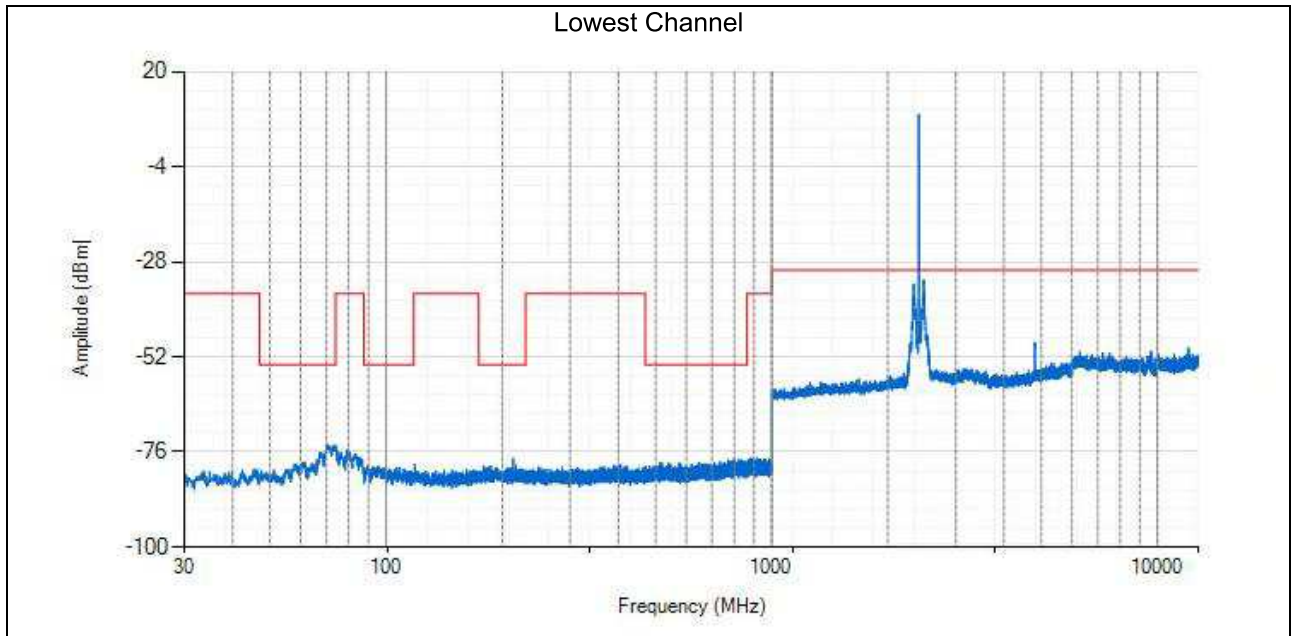
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No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4960.000	-57.18	7.39	-49.79	-30.00	-19.79	ERP
2	7440.000	-57.34	9.66	-47.68	-30.00	-17.68	ERP
3	9920.000	-56.88	13.99	-42.89	-30.00	-12.89	ERP

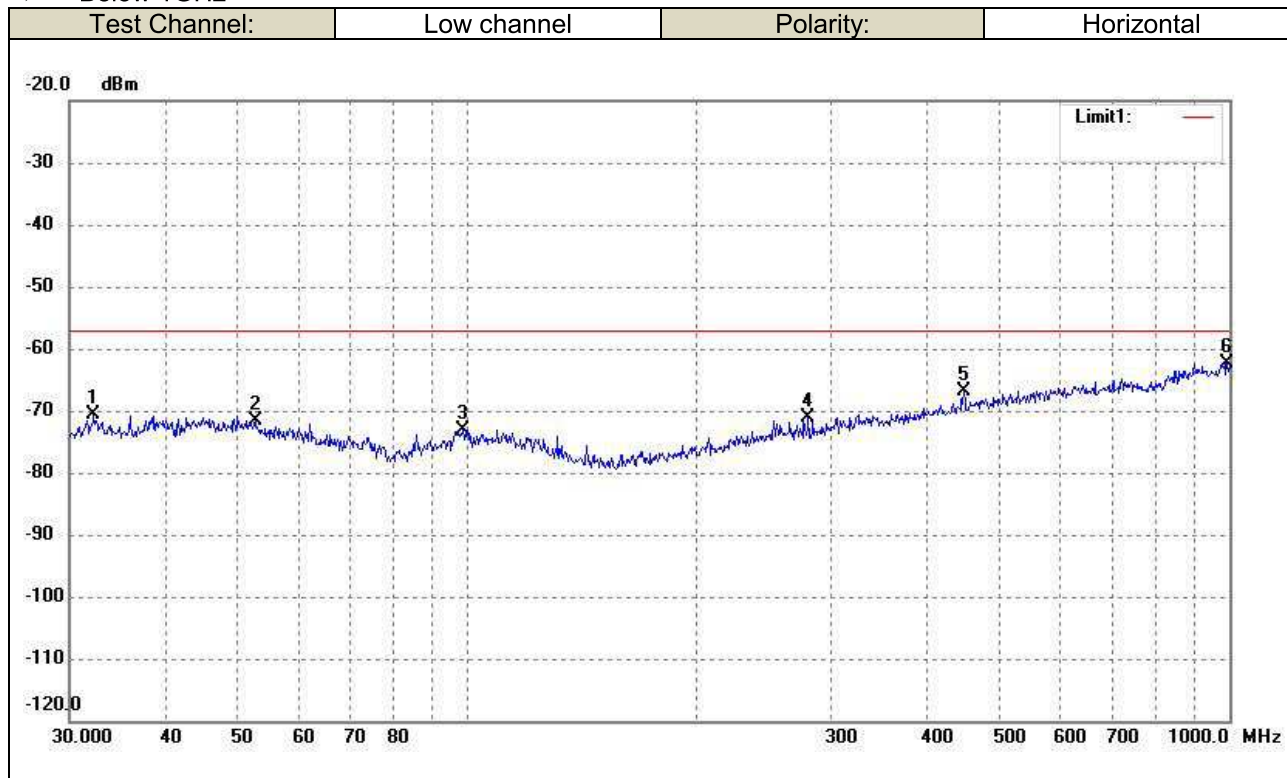
➤ **Conducted Transmitter Spurious Emission:**



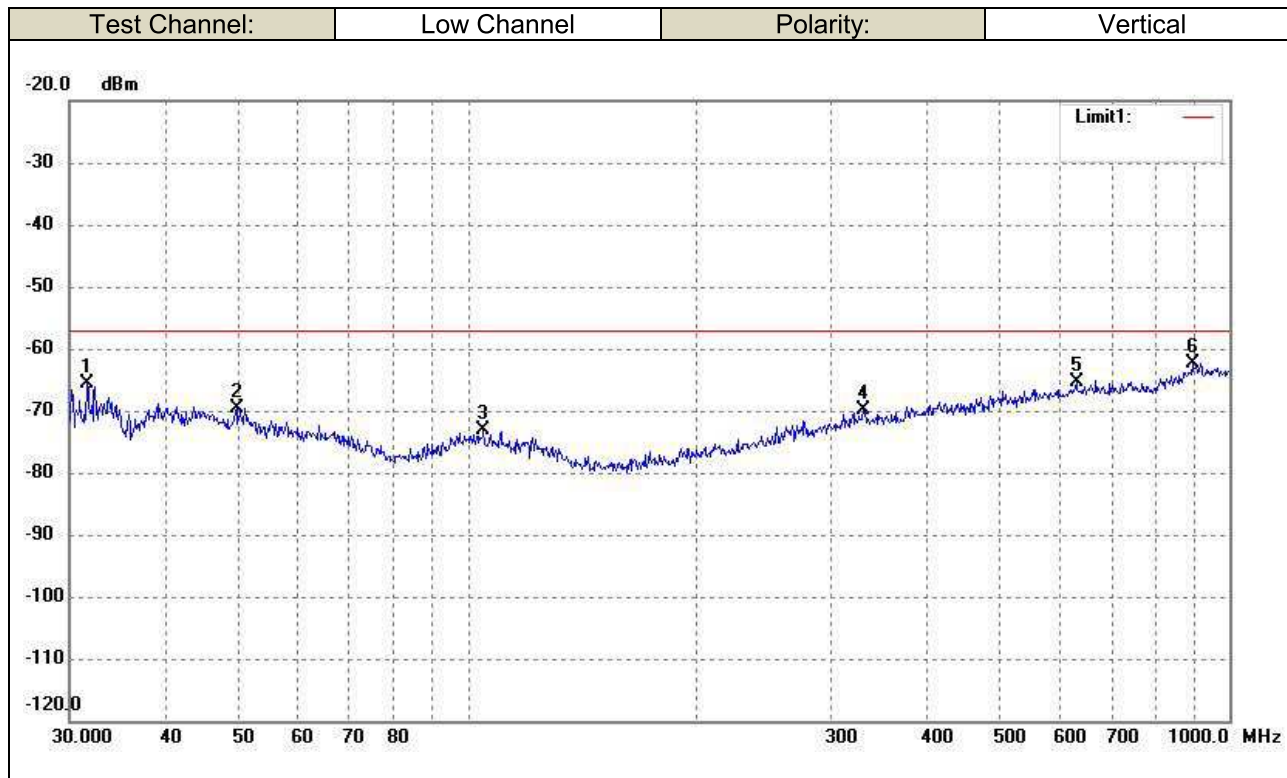
Note 1: Testing is carried out with frequency rang 30MHz to 12.75GHz, which emissions are too small are not list above.

Receiver Spurious Emissions

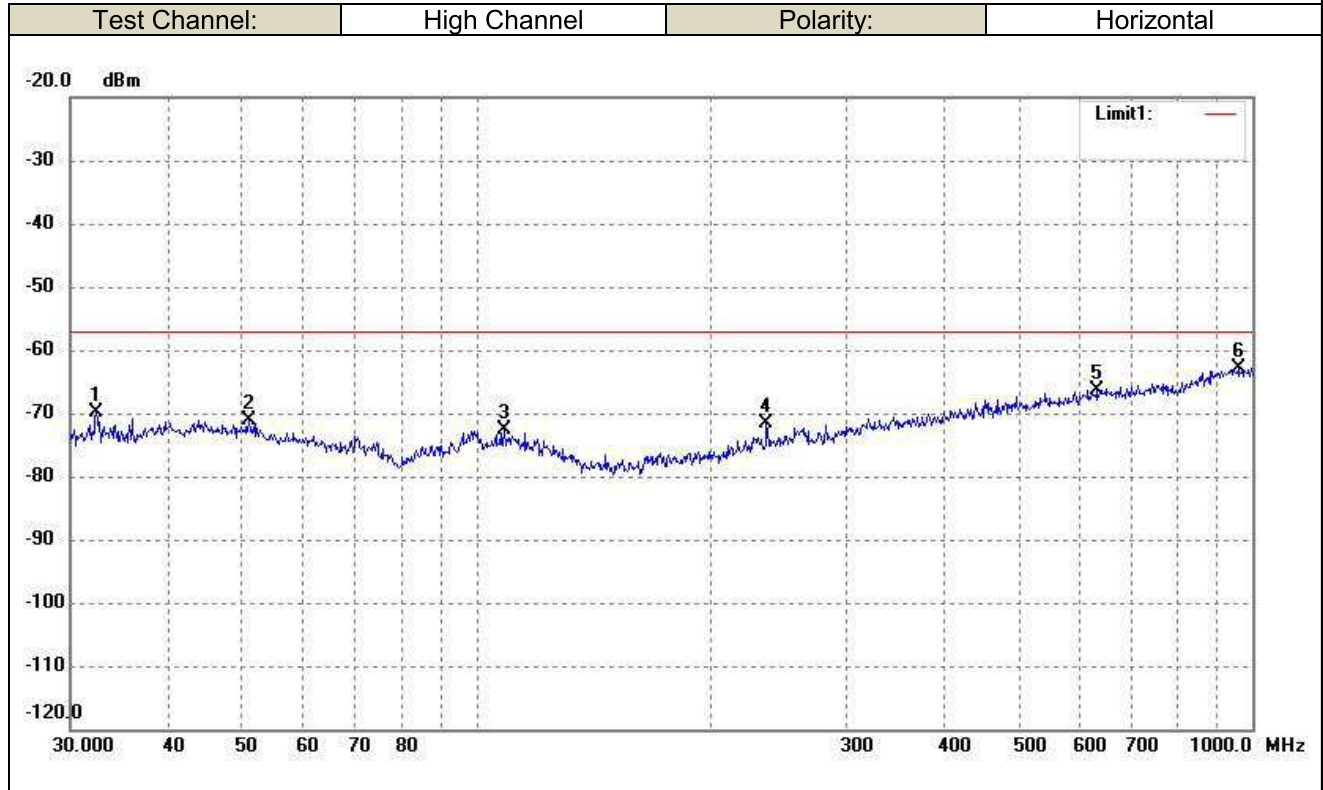
➤ Below 1GHz



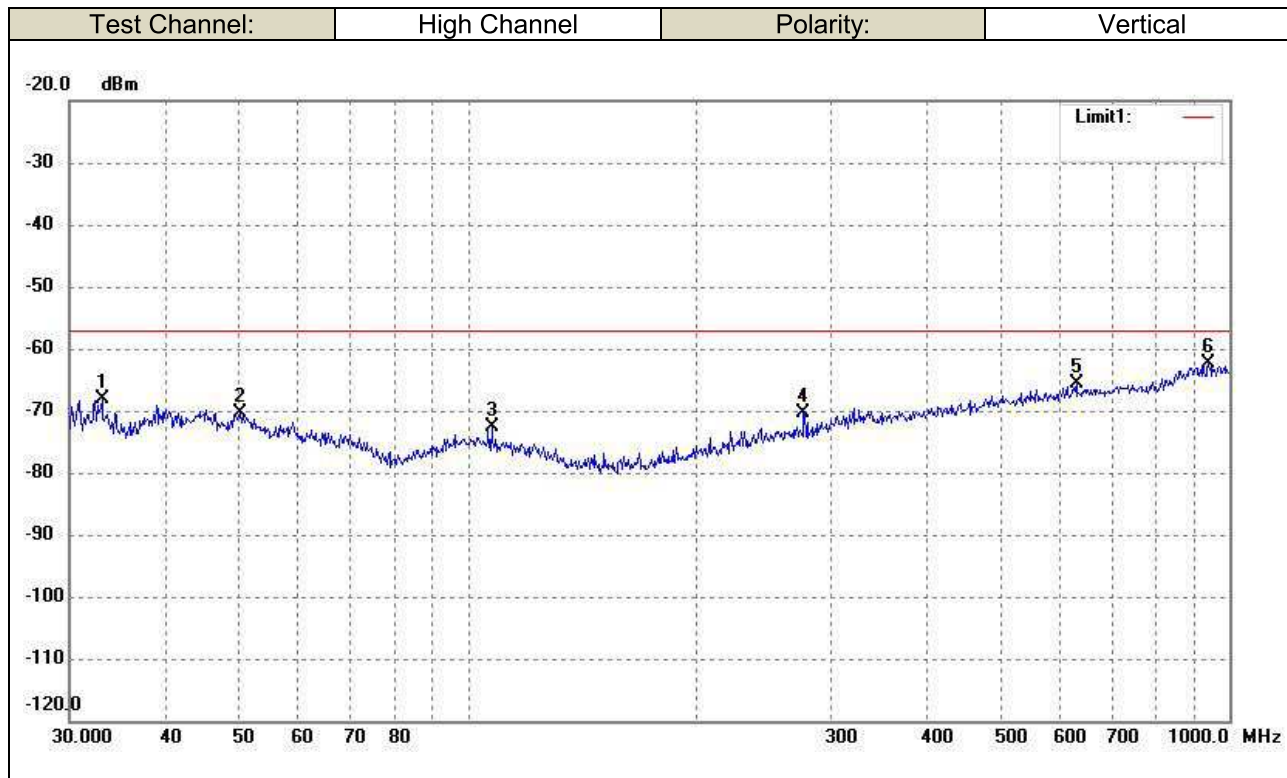
No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	32.2925	-68.37	-2.23	-70.60	-57.00	-13.60	ERP
2	52.5753	-71.23	-0.45	-71.68	-57.00	-14.68	ERP
3	98.4866	-71.25	-1.77	-73.02	-57.00	-16.02	ERP
4	280.0238	-72.65	1.41	-71.24	-57.00	-14.24	ERP
5	447.9822	-72.94	6.19	-66.75	-57.00	-9.75	ERP
6	993.0114	-75.91	13.58	-62.33	-57.00	-5.33	ERP



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	31.6202	-63.43	-2.26	-65.69	-57.00	-8.69	ERP
2	49.7068	-69.88	0.25	-69.63	-57.00	-12.63	ERP
3	104.9033	-71.49	-1.52	-73.01	-57.00	-16.01	ERP
4	330.1949	-73.09	3.16	-69.93	-57.00	-12.93	ERP
5	629.4772	-75.09	9.61	-65.48	-57.00	-8.48	ERP
6	893.8567	-75.57	13.10	-62.47	-57.00	-5.47	ERP

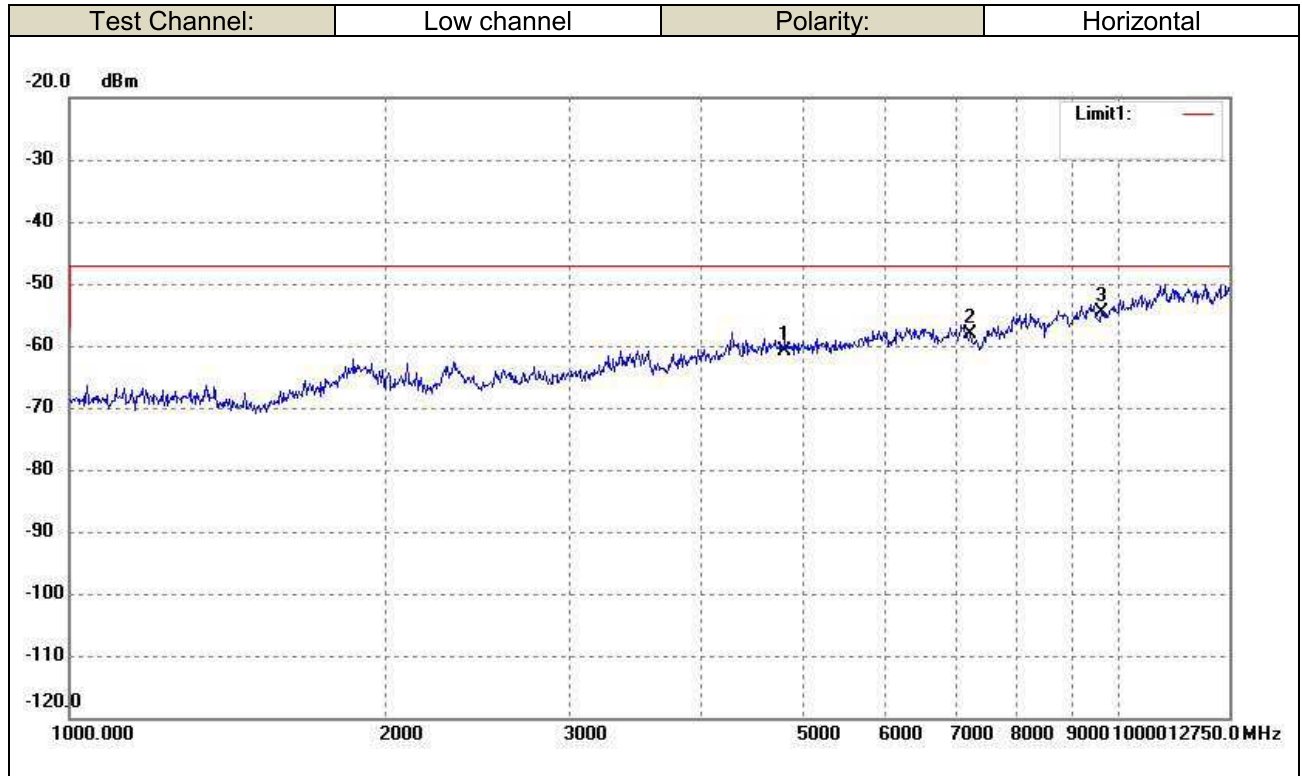


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	32.4059	-67.55	-2.22	-69.77	-57.00	-12.77	ERP
2	50.9420	-71.19	0.00	-71.19	-57.00	-14.19	ERP
3	108.6470	-71.09	-1.51	-72.60	-57.00	-15.60	ERP
4	236.6447	-71.82	0.22	-71.60	-57.00	-14.60	ERP
5	631.6884	-76.05	9.59	-66.46	-57.00	-9.46	ERP
6	958.7943	-75.98	13.20	-62.78	-57.00	-5.78	ERP

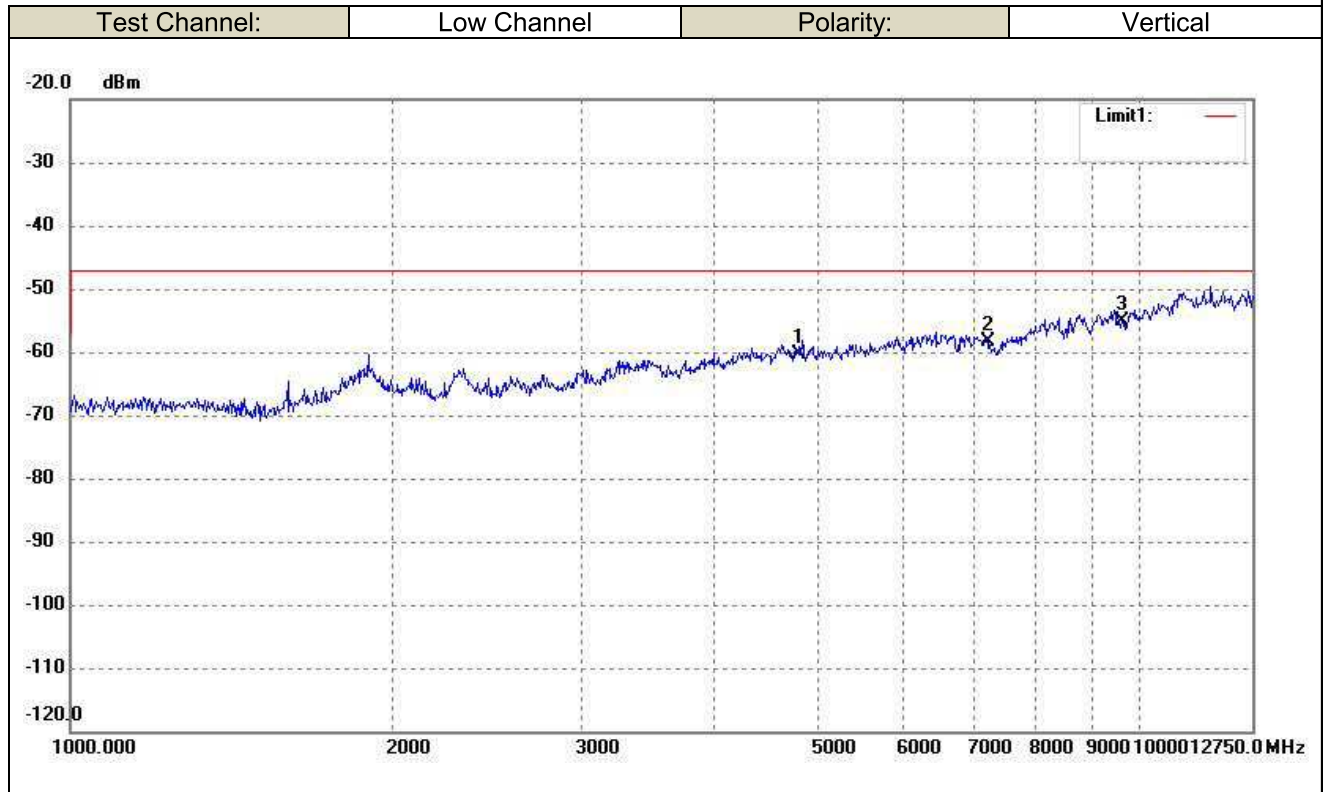


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	33.0950	-66.01	-2.18	-68.19	-57.00	-11.19	ERP
2	50.2324	-70.61	0.20	-70.41	-57.00	-13.41	ERP
3	107.5101	-71.11	-1.52	-72.63	-57.00	-15.63	ERP
4	276.1235	-71.40	1.12	-70.28	-57.00	-13.28	ERP
5	629.4772	-75.11	9.61	-65.50	-57.00	-8.50	ERP
6	938.8326	-75.71	13.39	-62.32	-57.00	-5.32	ERP

➤ Above 1GHz



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4810.000	-68.13	7.29	-60.84	-47.00	-13.84	ERP
2	7215.000	-67.83	9.60	-58.23	-47.00	-11.23	ERP
3	9620.000	-68.24	13.55	-54.69	-47.00	-7.69	ERP

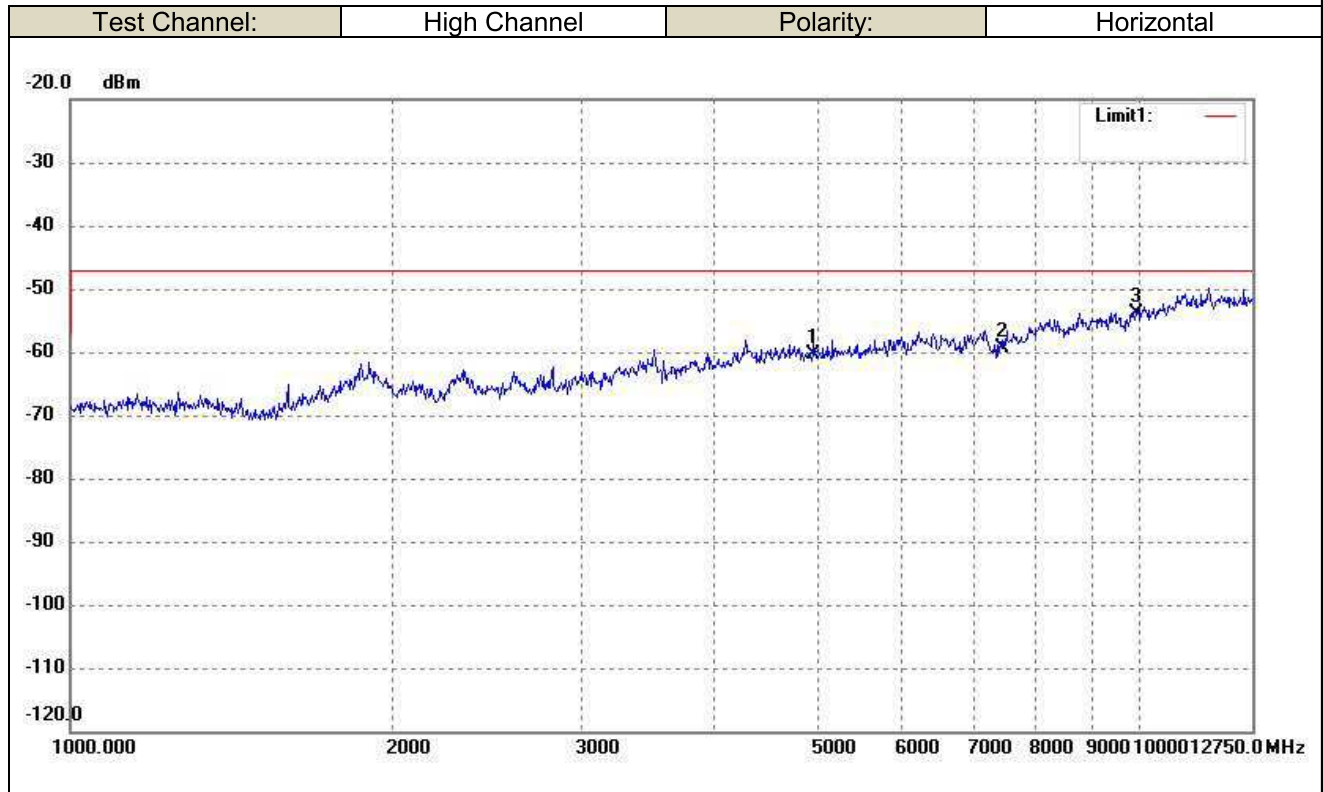


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4810.000	-67.69	7.29	-60.40	-47.00	-13.40	ERP
2	7215.000	-68.07	9.60	-58.47	-47.00	-11.47	ERP
3	9620.000	-68.66	13.55	-55.11	-47.00	-8.11	ERP

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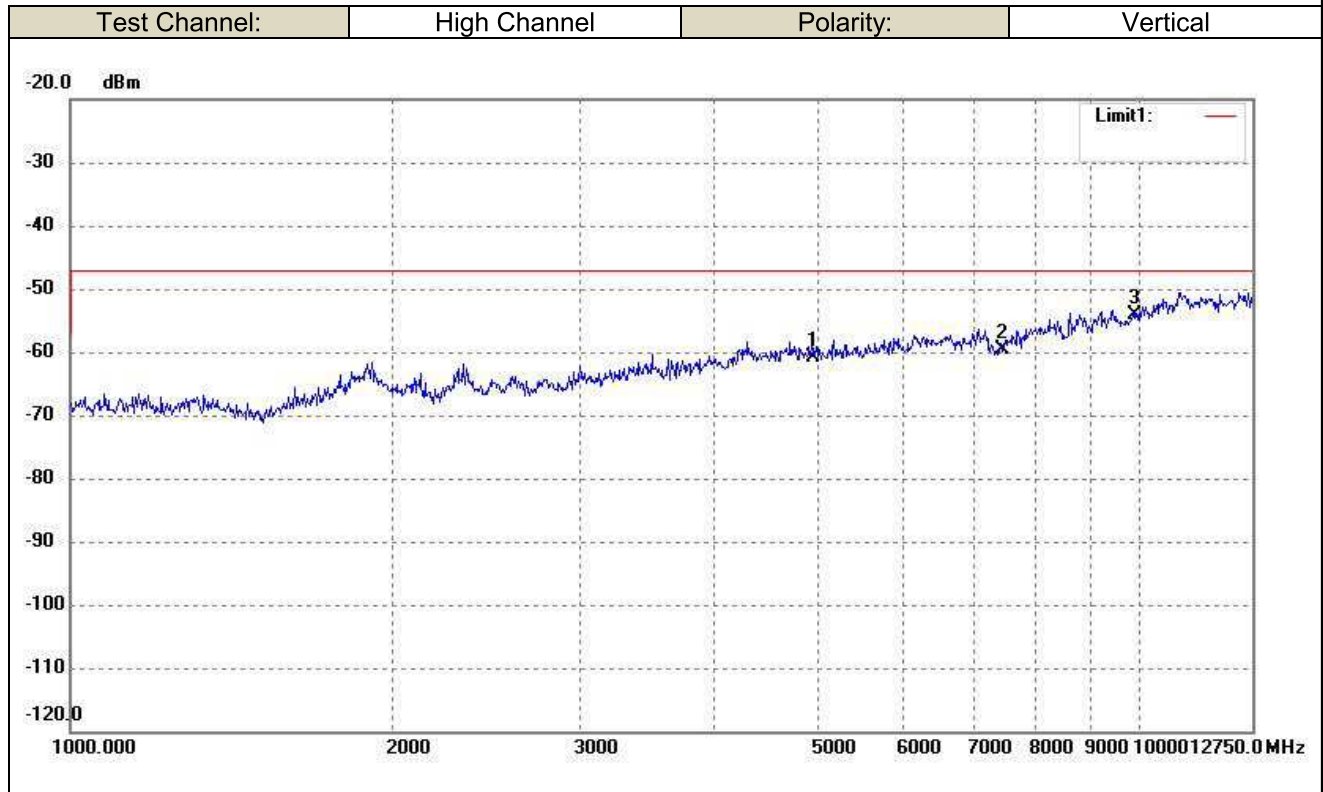


No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4960.000	-67.66	7.39	-60.27	-47.00	-13.27	ERP
2	7440.000	-68.95	9.66	-59.29	-47.00	-12.29	ERP
3	9920.000	-67.82	13.99	-53.83	-47.00	-6.83	ERP

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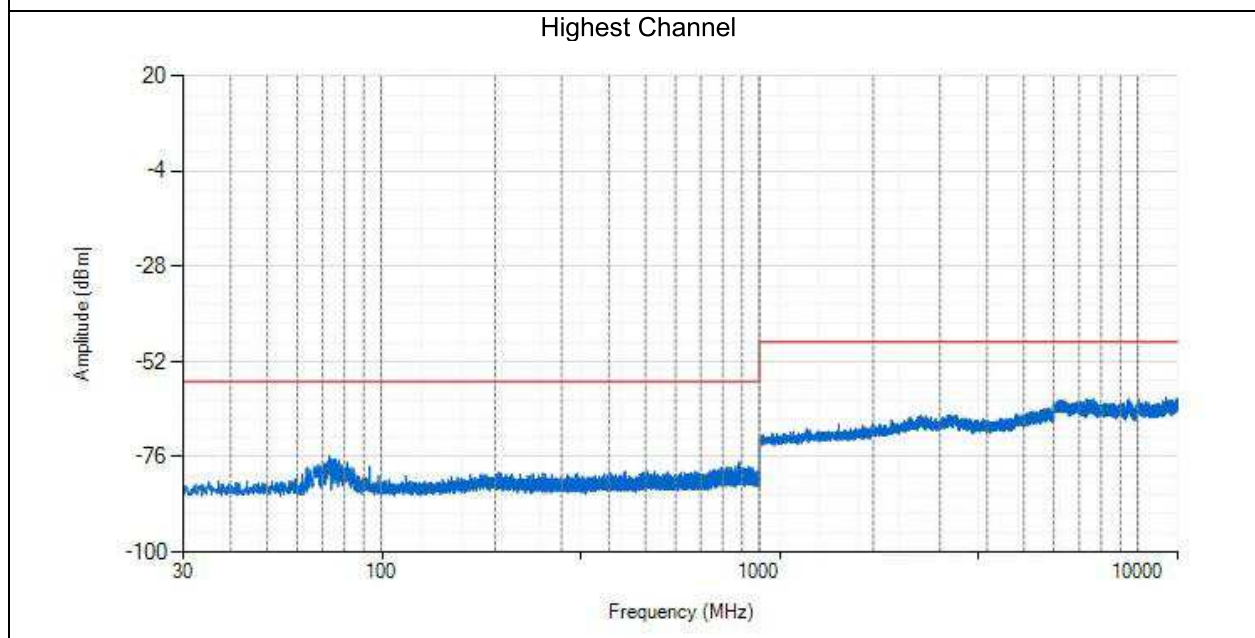
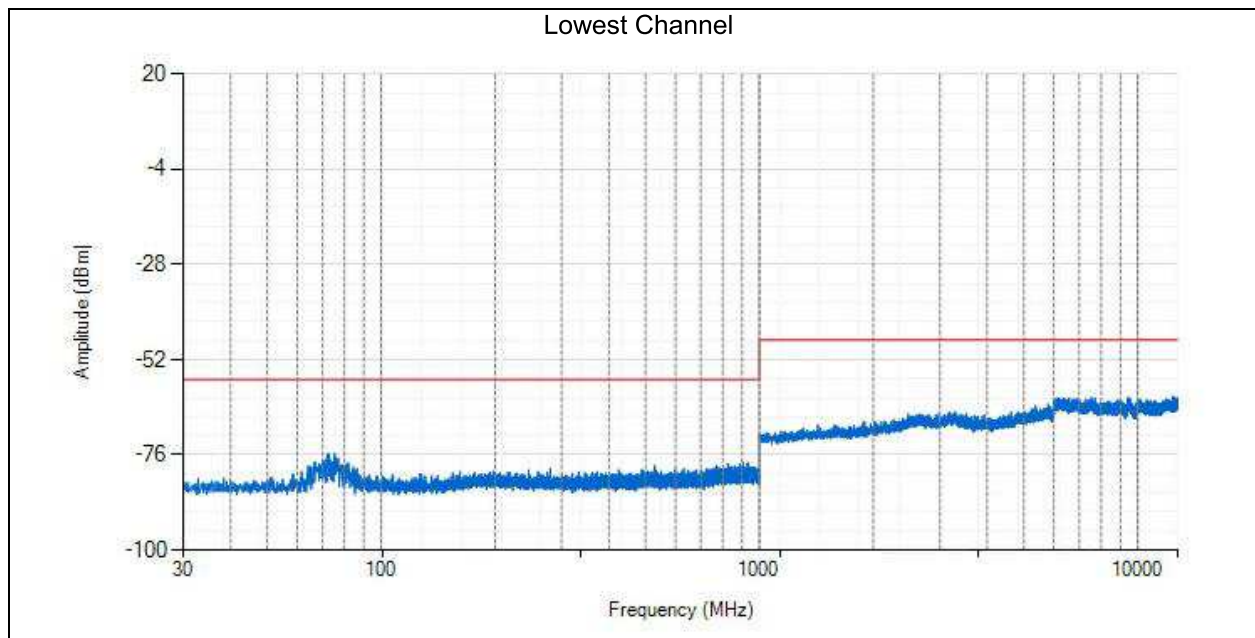
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No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	4960.000	-68.15	7.39	-60.76	-47.00	-13.76	ERP
2	7440.000	-69.32	9.66	-59.66	-47.00	-12.66	ERP
3	9920.000	-68.12	13.99	-54.13	-47.00	-7.13	ERP

Conducted Receiver Spurious Emission:



Note 1: Testing is carried out with frequency rang 30MHz to 12.75GHz, which emissions are too small are not list above.

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Receiver Blocking

The product is receiver category 2

Mode/ Channel	Wanted signal power (dBm)	Blocking signal Frequency (MHz)	Blocking signal power (dBm)	Test PER(%)	Limit(%)	Result
ZigBee- Low channel	-66	2380	-34	1.34	<10	Pass
		2300				
ZigBee- High channel	-66	2504	-34	1.40	<10	Pass
		2584				

OBW=2.06MHz

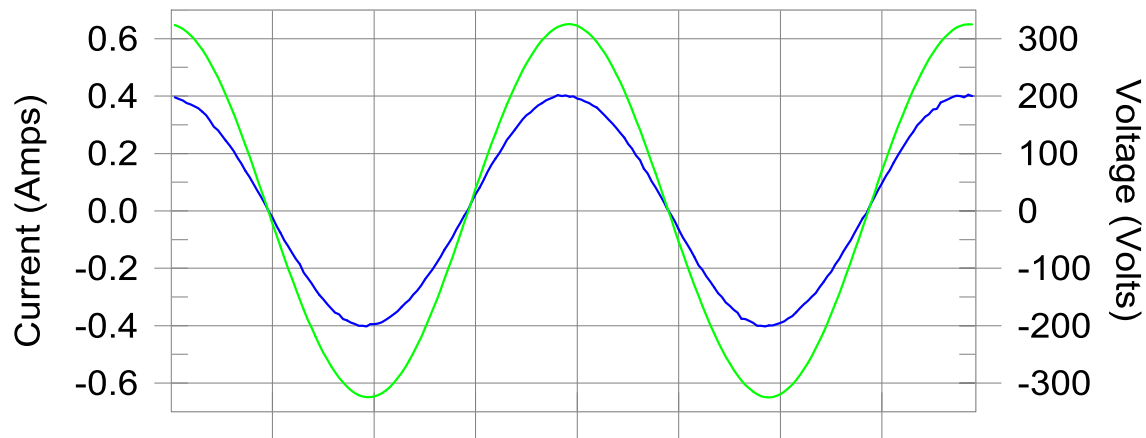
2 EMC test result

Harmonics – Class-A per Ed. Ed. 5.0 (2018)(Run time)

Test category: Class-A per Ed. 5.0 (2018) (European limits) Test Margin: 100
Test date: 2021-1-18 Start time: pm 05:58:07 End time: pm 06:00:48
Test duration (min): 2.5 Data file name: H-000565.cts_data
Comment:
Customer:

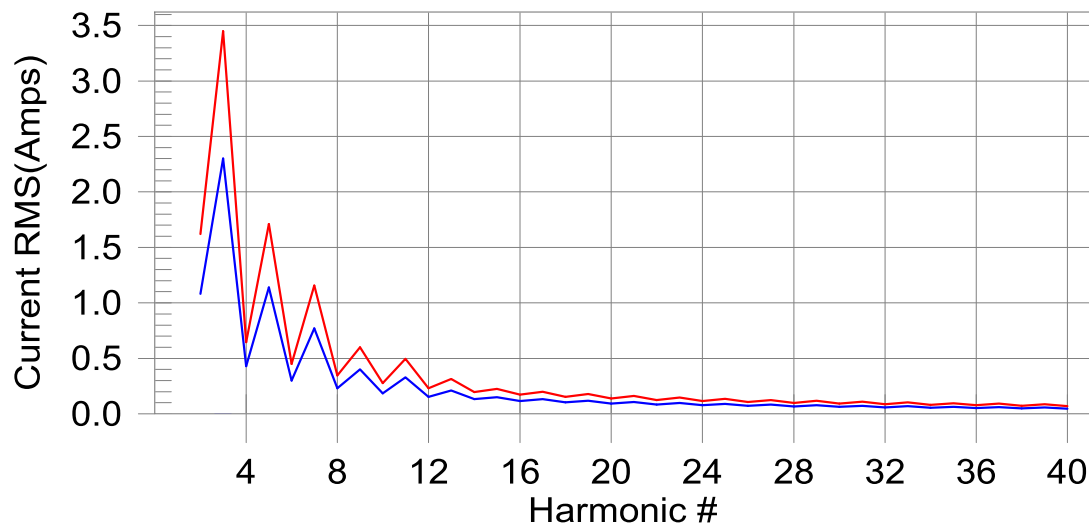
Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Test result: Pass Worst harmonics H0-0.0% of 150% limit, H0-0% of 100% limit

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Current Test Result Summary (Run time)

Test category: Class-A per Ed. 5.0 (2018) (European limits) Test Margin: 100
 Test date: 2021-1-18 Start time: pm 05:58:07 End time: pm 06:00:48
 Test duration (min): 2.5 Data file name: H-000565.cts_data
 Comment:
 Customer:

Test Result: Pass Source qualification: Normal
 THC(A): 0.004 I-THD(%): 1.3 POHC(A): 0.000 POHC Limit(A): 0.251

Highest parameter values during test:

V_RMS (Volts): 229.96 Frequency(Hz): 50.00
 I_Peak (Amps): 0.421 I_RMS (Amps): 0.285
 I_Fund (Amps): 0.285 Crest Factor: 1.485
 Power (Watts): 65.5 Power Factor: 1.000

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.001	1.620	N/A	Pass
3	0.004	2.300	N/A	0.004	3.450	N/A	Pass
4	0.000	0.430	N/A	0.001	0.645	N/A	Pass
5	0.000	1.140	N/A	0.000	1.710	N/A	Pass
6	0.000	0.300	N/A	0.000	0.450	N/A	Pass
7	0.000	0.770	N/A	0.000	1.155	N/A	Pass
8	0.000	0.230	N/A	0.000	0.345	N/A	Pass
9	0.000	0.400	N/A	0.000	0.600	N/A	Pass
10	0.000	0.184	N/A	0.000	0.276	N/A	Pass
11	0.000	0.330	N/A	0.000	0.495	N/A	Pass
12	0.000	0.153	N/A	0.000	0.230	N/A	Pass
13	0.000	0.210	N/A	0.000	0.315	N/A	Pass
14	0.000	0.131	N/A	0.000	0.197	N/A	Pass
15	0.000	0.150	N/A	0.000	0.225	N/A	Pass
16	0.000	0.115	N/A	0.000	0.173	N/A	Pass
17	0.000	0.132	N/A	0.000	0.198	N/A	Pass
18	0.000	0.102	N/A	0.000	0.153	N/A	Pass
19	0.000	0.118	N/A	0.000	0.178	N/A	Pass
20	0.000	0.092	N/A	0.000	0.138	N/A	Pass
21	0.000	0.107	N/A	0.000	0.161	N/A	Pass
22	0.000	0.084	N/A	0.000	0.125	N/A	Pass
23	0.000	0.098	N/A	0.000	0.147	N/A	Pass
24	0.000	0.077	N/A	0.000	0.115	N/A	Pass
25	0.000	0.090	N/A	0.000	0.135	N/A	Pass
26	0.000	0.071	N/A	0.000	0.107	N/A	Pass
27	0.000	0.083	N/A	0.000	0.125	N/A	Pass
28	0.000	0.066	N/A	0.000	0.099	N/A	Pass
29	0.000	0.078	N/A	0.000	0.116	N/A	Pass
30	0.000	0.061	N/A	0.000	0.092	N/A	Pass
31	0.000	0.073	N/A	0.000	0.109	N/A	Pass
32	0.000	0.058	N/A	0.000	0.086	N/A	Pass
33	0.000	0.068	N/A	0.000	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.000	0.064	N/A	0.000	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.000	0.061	N/A	0.000	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.000	0.058	N/A	0.000	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass

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Voltage Source Verification Data (Run time)

Test category: Class-A per Ed. 5.0 (2018) (European limits) Test Margin: 100
 Test date: 2021-1-18 Start time: pm 05:58:07 End time: pm 06:00:48
 Test duration (min): 2.5 Data file name: H-000565.cts_data
 Comment:
 Customer:

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 229.96 Frequency(Hz): 50.00
 I_Peak (Amps): 0.421 I_RMS (Amps): 0.285
 I_Fund (Amps): 0.285 Crest Factor: 1.485
 Power (Watts): 65.5 Power Factor: 1.000

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.061	0.460	13.25	OK
3	0.505	2.069	24.43	OK
4	0.055	0.460	11.88	OK
5	0.062	0.920	6.78	OK
6	0.032	0.460	6.98	OK
7	0.021	0.690	3.10	OK
8	0.016	0.460	3.40	OK
9	0.011	0.460	2.33	OK
10	0.010	0.460	2.23	OK
11	0.013	0.230	5.82	OK
12	0.010	0.230	4.25	OK
13	0.012	0.230	5.06	OK
14	0.005	0.230	2.38	OK
15	0.010	0.230	4.50	OK
16	0.008	0.230	3.66	OK
17	0.012	0.230	5.02	OK
18	0.012	0.230	5.08	OK
19	0.012	0.230	5.07	OK
20	0.015	0.230	6.72	OK
21	0.009	0.230	3.87	OK
22	0.004	0.230	1.93	OK
23	0.005	0.230	2.08	OK
24	0.003	0.230	1.41	OK
25	0.006	0.230	2.53	OK
26	0.004	0.230	1.74	OK
27	0.008	0.230	3.38	OK
28	0.005	0.230	2.02	OK
29	0.007	0.230	2.96	OK
30	0.004	0.230	1.73	OK
31	0.005	0.230	2.04	OK
32	0.004	0.230	1.72	OK
33	0.004	0.230	1.88	OK
34	0.003	0.230	1.23	OK
35	0.004	0.230	1.88	OK
36	0.003	0.230	1.27	OK
37	0.006	0.230	2.41	OK
38	0.003	0.230	1.17	OK
39	0.006	0.230	2.47	OK
40	0.008	0.230	3.66	OK

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Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

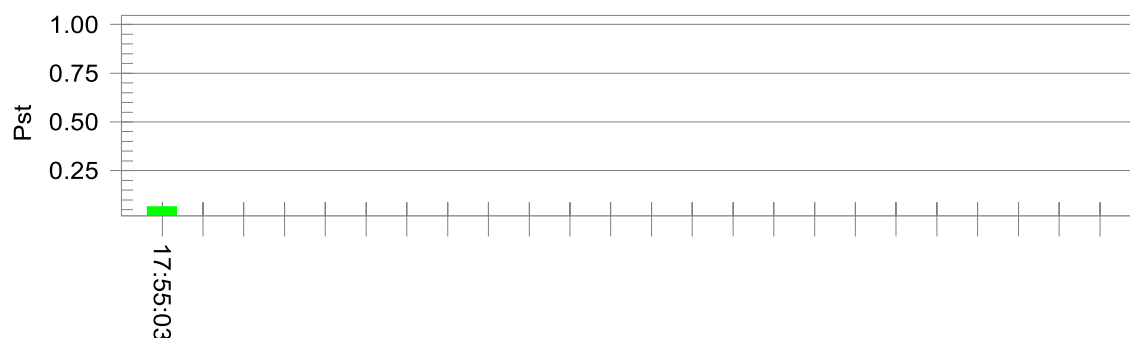
Test category: All parameters (European limits) Test Margin: 100
 Test date: 2021-1-18 Start time: pm 05:44:43 End time: pm 05:55:10
 Test duration (min): 10 Data file name: F-000564.cts_data
 Comment:
 Customer:

Test Result: Pass

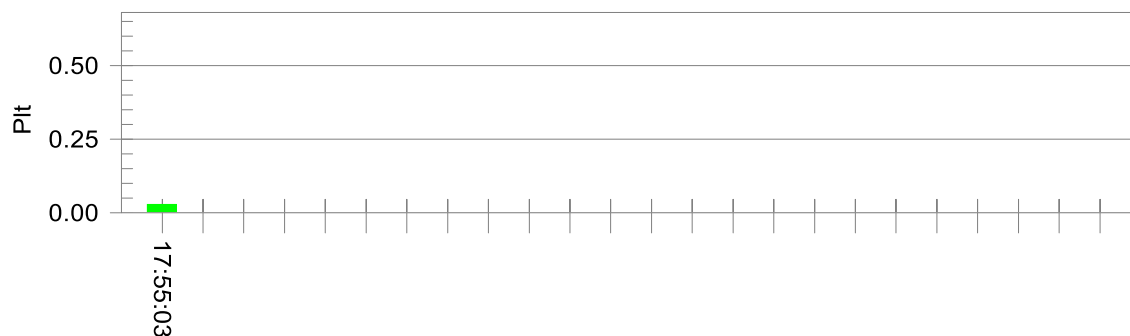
Status: Test Completed

Pst_i and limit line

European Limits



Plt and limit line

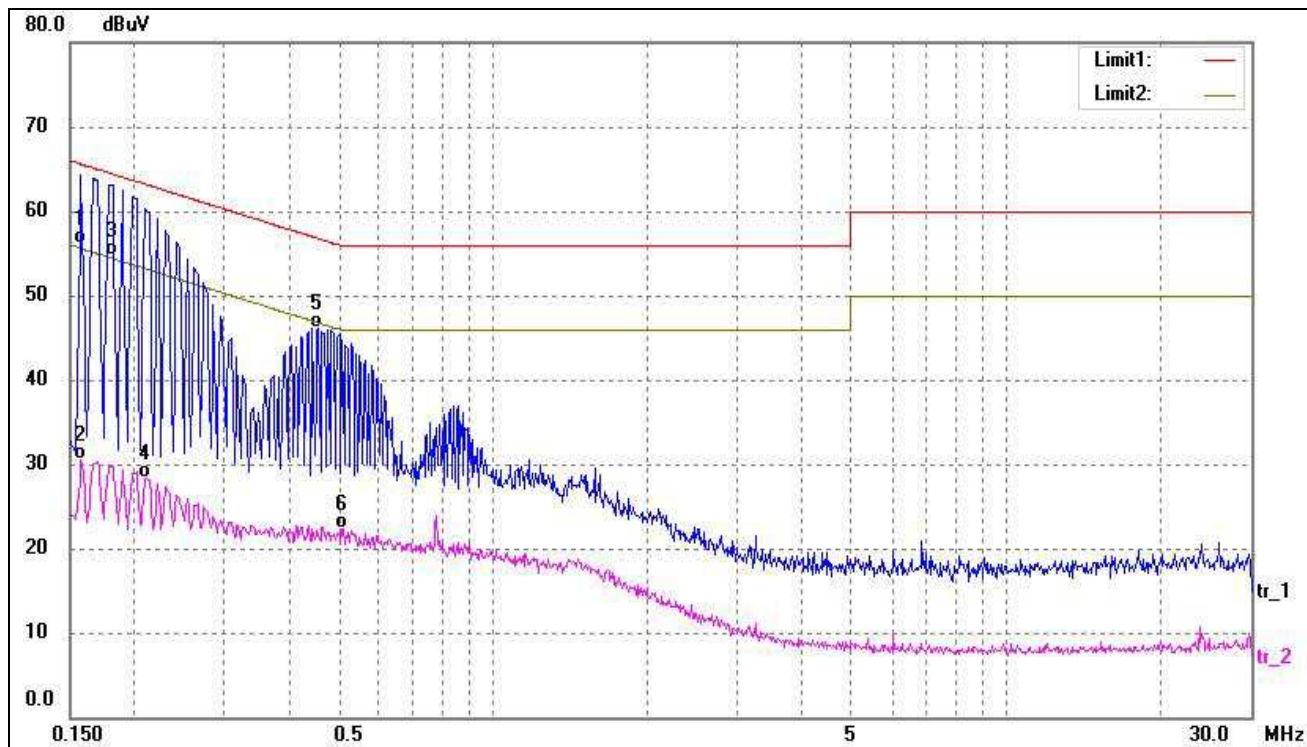


Parameter values recorded during the test:

Vrms at the end of test (Volt):	229.74		
T-max (mS):	0	Test limit (mS):	500.0 Pass
Highest dc (%):	0.00	Test limit (%):	3.30 Pass
Highest dmax (%):	0.00	Test limit (%):	4.00 Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000 Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650 Pass

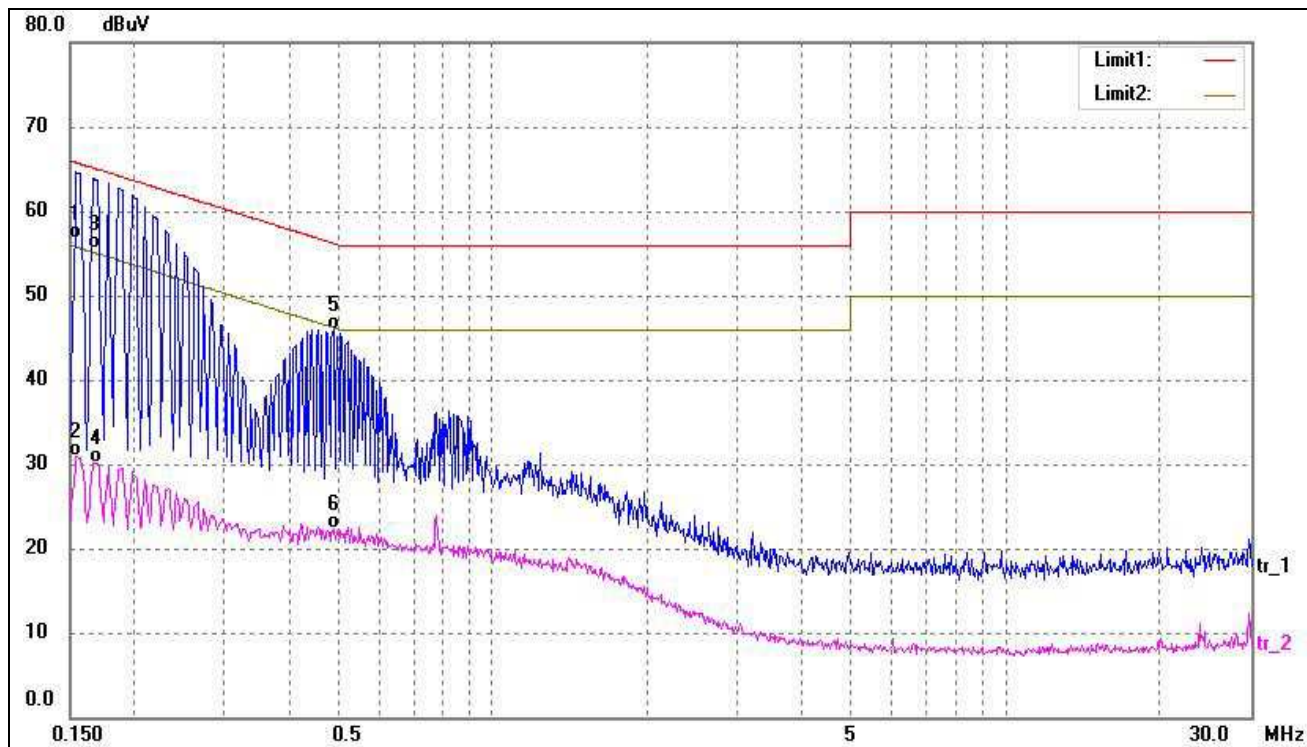
AC100V 60Hz

Test mode:	TM1	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1580	45.79	10.25	56.04	65.56	-9.52	QP
2	0.1580	20.21	10.25	30.46	55.56	-25.10	AVG
3	0.1806	44.51	10.26	54.77	64.45	-9.68	QP
4	0.2100	18.03	10.27	28.30	53.20	-24.90	AVG
5	0.4580	35.92	10.22	46.14	56.73	-10.59	QP
6	0.5100	12.17	10.22	22.39	46.00	-23.61	AVG

Test mode:	TM1	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1539	46.38	10.25	56.63	65.78	-9.15	QP
2	0.1539	20.68	10.25	30.93	55.78	-24.85	AVG
3	0.1660	45.25	10.26	55.51	65.15	-9.64	QP
4	0.1700	19.94	10.25	30.19	54.96	-24.77	AVG
5	0.4900	35.76	10.22	45.98	56.17	-10.19	QP
6	0.4900	12.02	10.22	22.24	46.17	-23.93	AVG

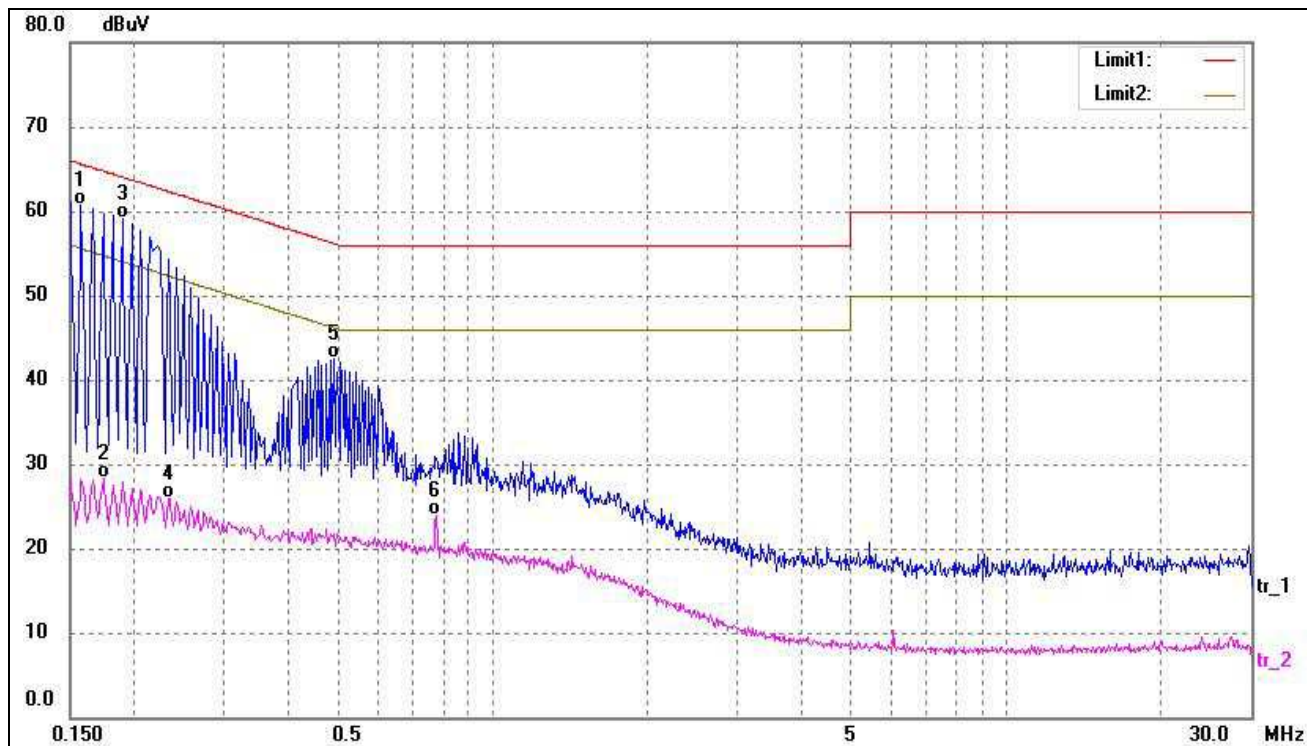
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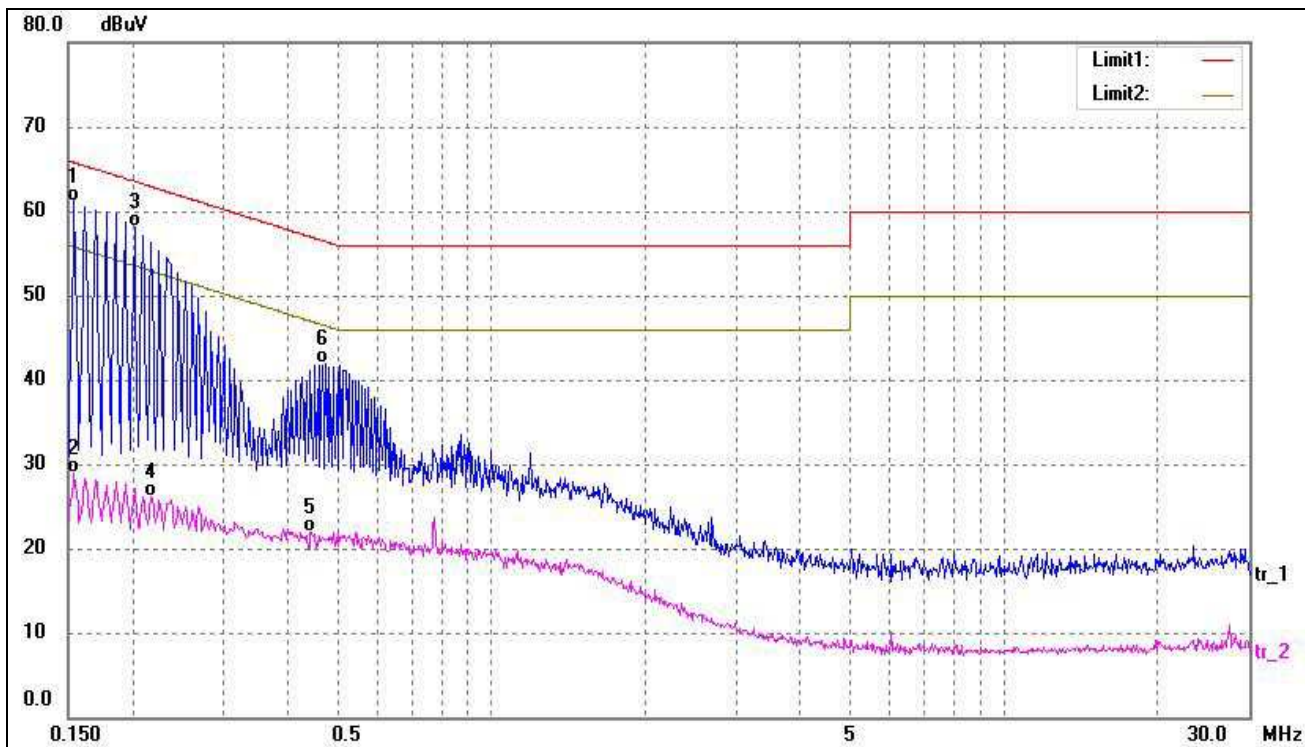
AC 230V, 50Hz

Test mode:	TM2	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1580	50.48	10.25	60.73	65.56	-4.83	QP
2	0.1740	18.14	10.25	28.39	54.76	-26.37	AVG
3	0.1900	48.84	10.26	59.10	64.03	-4.93	QP
4	0.2340	15.63	10.26	25.89	52.30	-26.41	AVG
5	0.4900	32.22	10.22	42.44	56.17	-13.73	QP
6	0.7780	13.71	10.18	23.89	46.00	-22.11	AVG

Test mode:	TM2	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1539	50.95	10.25	61.20	65.78	-4.58	QP
2	0.1539	18.61	10.25	28.86	55.78	-26.92	AVG
3	0.2020	47.78	10.27	58.05	63.52	-5.47	QP
4	0.2180	15.94	10.26	26.20	52.89	-26.69	AVG
5	0.4460	11.68	10.22	21.90	46.95	-25.05	AVG
6	0.4780	31.69	10.22	41.91	56.37	-14.46	QP

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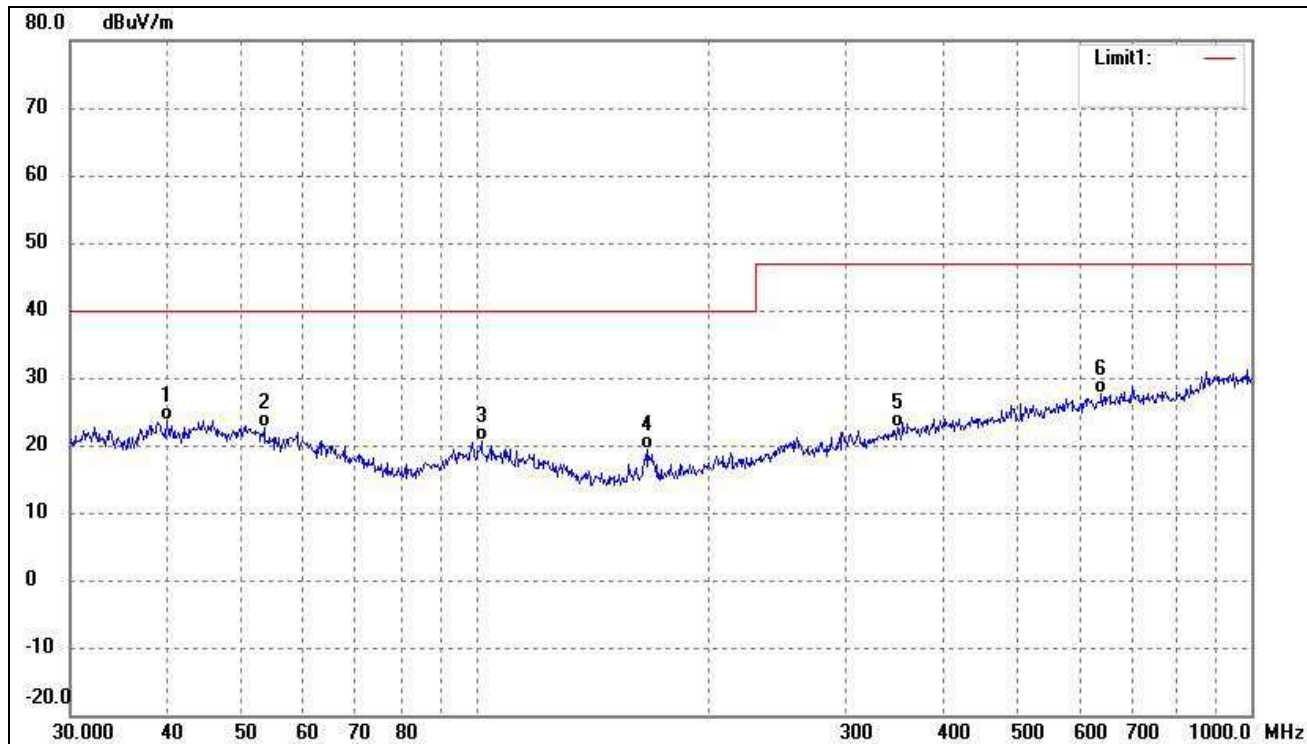
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➤ 30MHz to 1GHz
AC100V 60Hz

Test mode:	TM1	Polarity:	Horizontal
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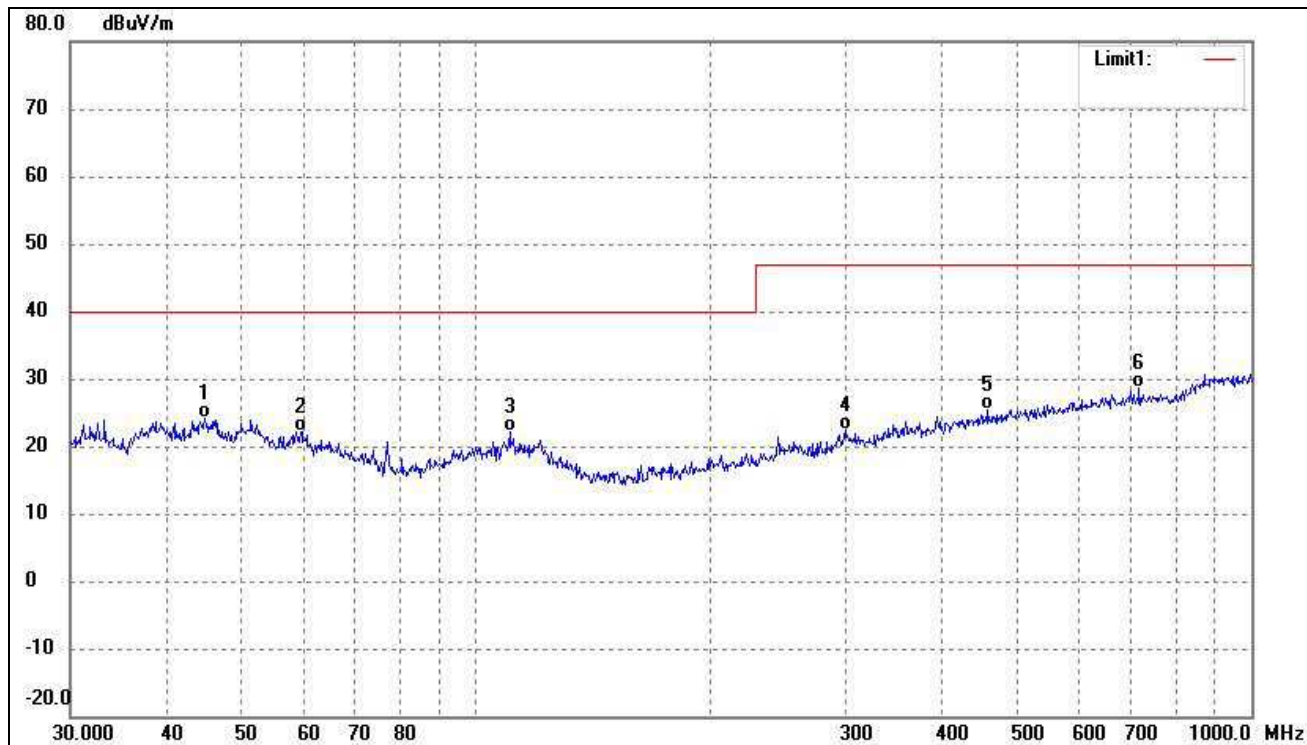
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	39.9942	35.58	-11.98	23.60	40.00	-16.40	QP
2	53.3179	35.18	-12.47	22.71	40.00	-17.29	QP
3	101.6443	33.86	-13.32	20.54	40.00	-19.46	QP
4	166.6514	34.66	-15.20	19.46	40.00	-20.54	QP
5	349.2500	30.16	-7.47	22.69	47.00	-24.31	QP
6	640.6110	29.81	-2.29	27.52	47.00	-19.48	QP

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Test mode:	TM1	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	44.7433	35.86	-11.81	24.05	40.00	-15.95	QP
2	59.4405	35.15	-12.98	22.17	40.00	-17.83	QP
3	110.5687	35.51	-13.36	22.15	40.00	-17.85	QP
4	299.3158	31.36	-8.96	22.40	47.00	-24.60	QP
5	457.5073	30.66	-5.36	25.30	47.00	-21.70	QP
6	716.6820	29.85	-1.28	28.57	47.00	-18.43	QP

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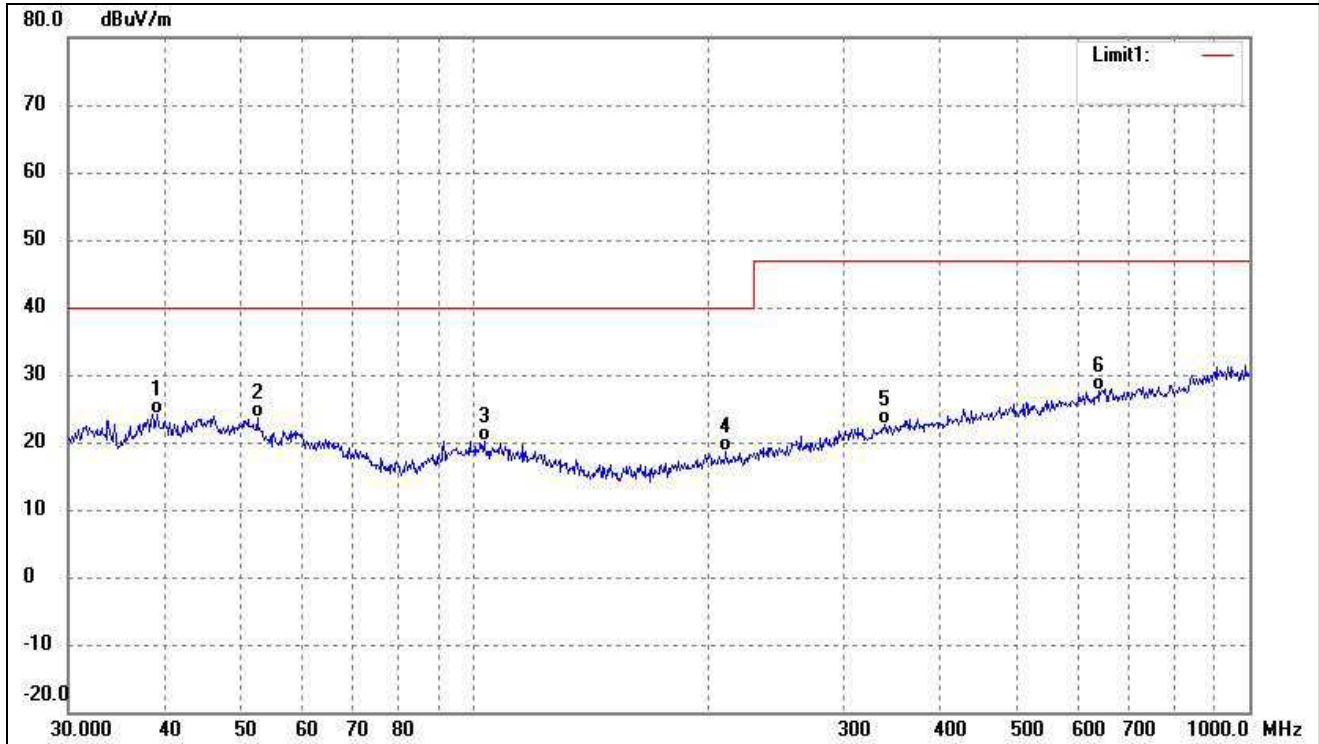
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AC 230V, 50Hz

Test mode:	TM2	Polarity:	Horizontal
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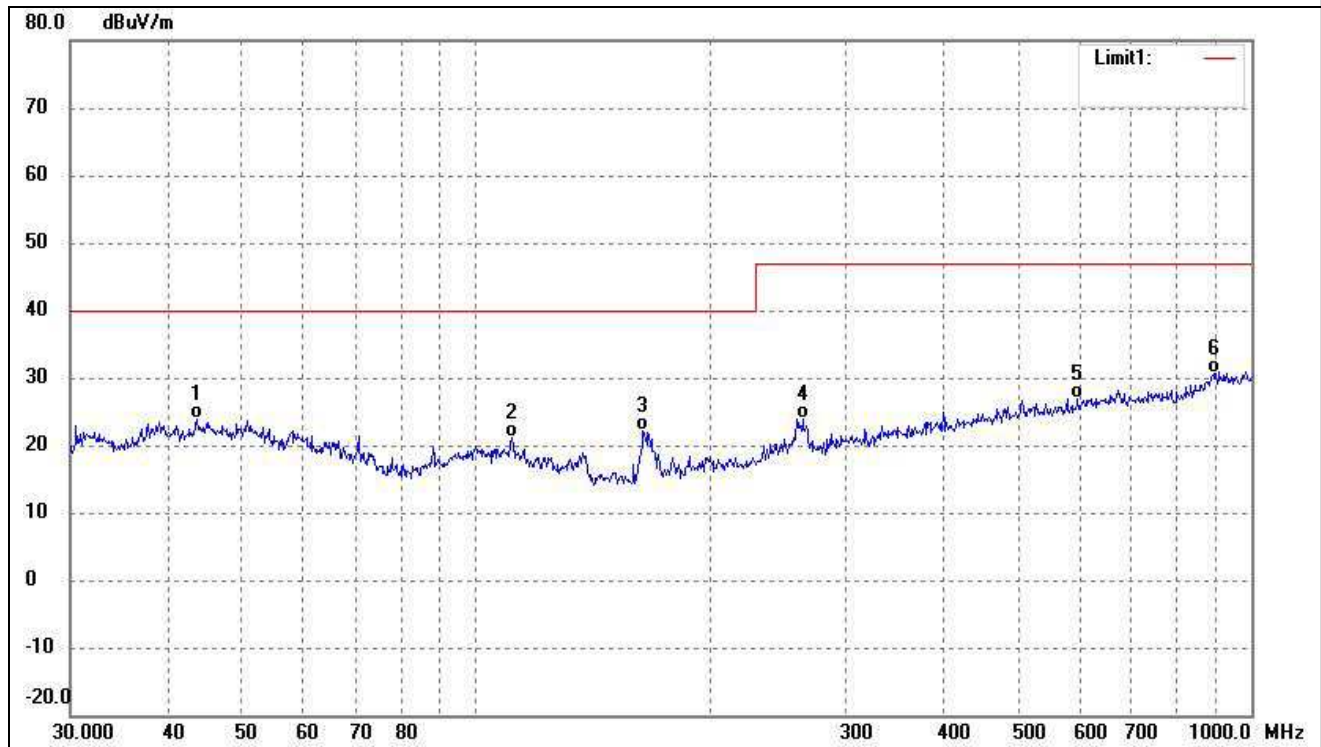
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	39.0245	36.57	-12.35	24.22	40.00	-15.78	QP
2	52.5752	35.77	-12.25	23.52	40.00	-16.48	QP
3	103.0799	33.39	-13.32	20.07	40.00	-19.93	QP
4	211.5264	30.83	-12.29	18.54	40.00	-21.46	QP
5	338.4001	30.87	-8.14	22.73	47.00	-24.27	QP
6	640.6109	29.93	-2.29	27.64	47.00	-19.36	QP

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Test mode:	TM2	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	43.6584	35.83	-11.84	23.99	40.00	-16.01	QP
2	111.3468	34.52	-13.45	21.07	40.00	-18.93	QP
3	164.3301	37.51	-15.32	22.19	40.00	-17.81	QP
4	263.8190	34.65	-10.83	23.82	47.00	-23.18	QP
5	597.2234	28.90	-2.01	26.89	47.00	-20.11	QP
6	893.8567	29.45	1.30	30.75	47.00	-16.25	QP

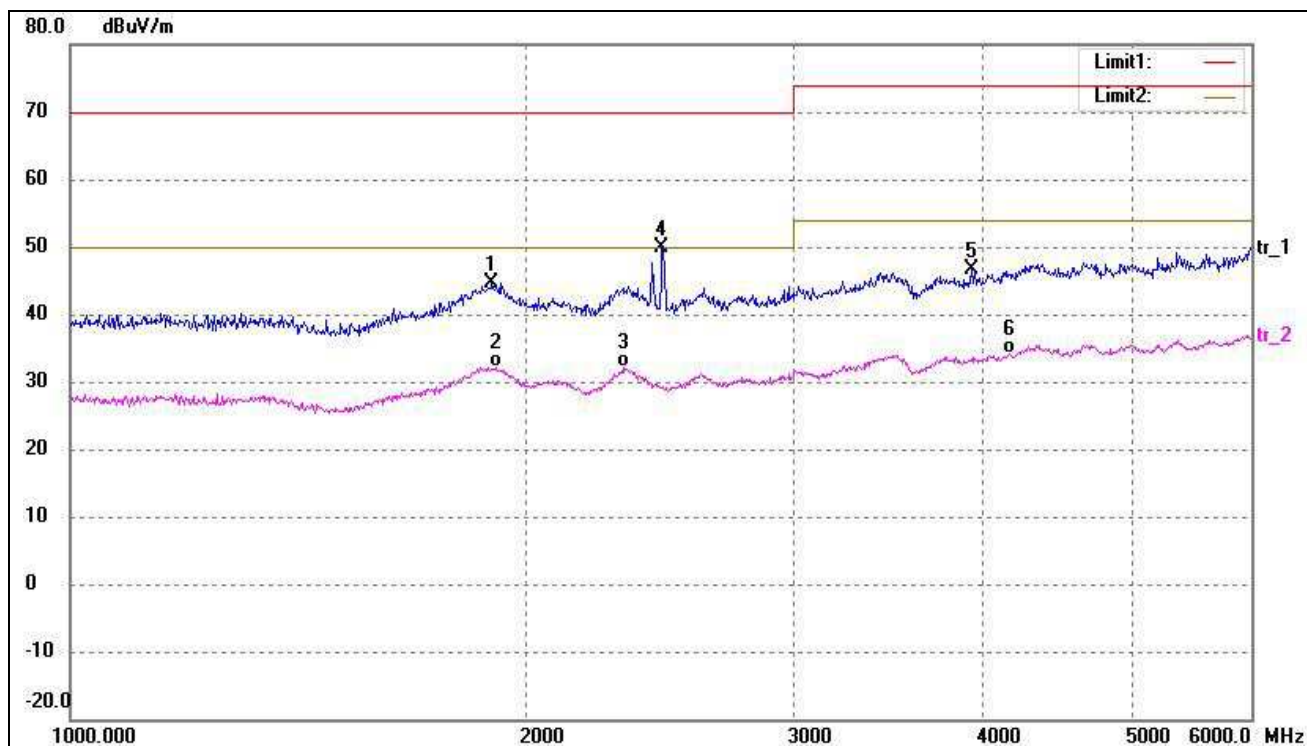
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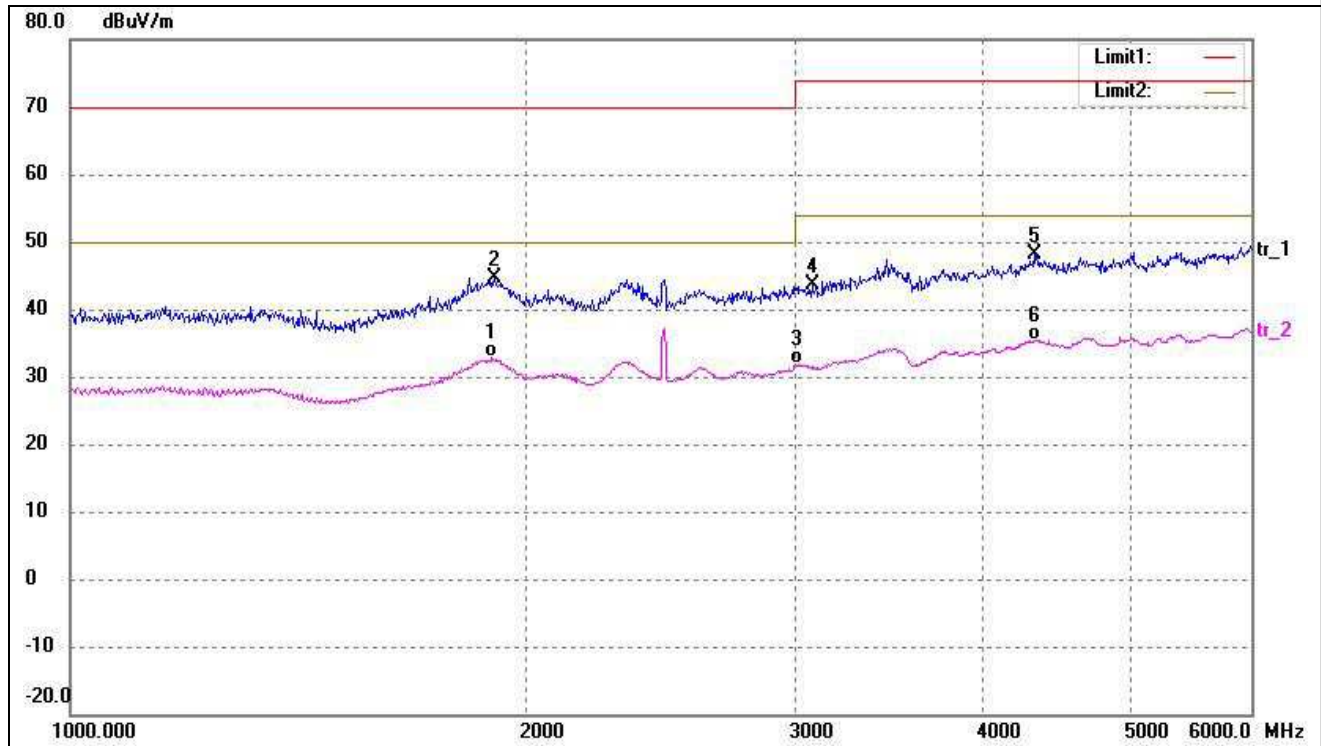
➤ Above 1GHz
AC100V 60Hz

Test mode:	TM1	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1895.833	53.20	-8.60	44.60	70.00	-25.40	peak
2	1909.469	40.92	-8.72	32.20	50.00	-17.80	AVG
3	2312.995	41.84	-9.67	32.17	50.00	-17.83	AVG
4	2453.883	59.35	-9.37	49.98	70.00	-20.02	peak
5	3924.004	53.55	-6.81	46.74	74.00	-27.26	peak
6	4155.567	40.31	-6.12	34.19	54.00	-19.81	AVG

Test mode:	TM1	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1895.833	41.51	-8.60	32.91	50.00	-17.09	AVG
2	1902.639	53.21	-8.59	44.62	70.00	-25.38	peak
3	3004.588	40.47	-8.63	31.84	54.00	-22.16	AVG
4	3080.910	51.95	-8.40	43.55	74.00	-30.45	peak
5	4314.907	53.53	-5.46	48.07	74.00	-25.93	peak
6	4322.645	40.84	-5.44	35.40	54.00	-18.60	AVG

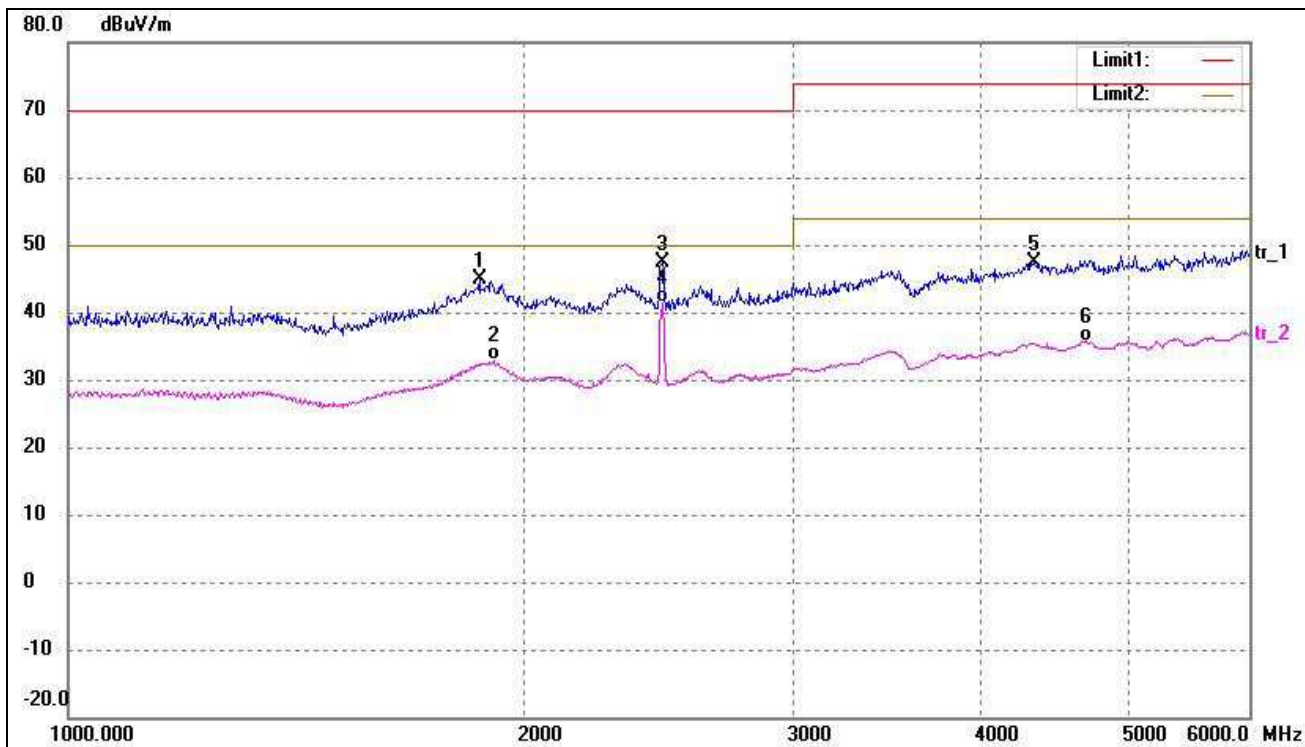
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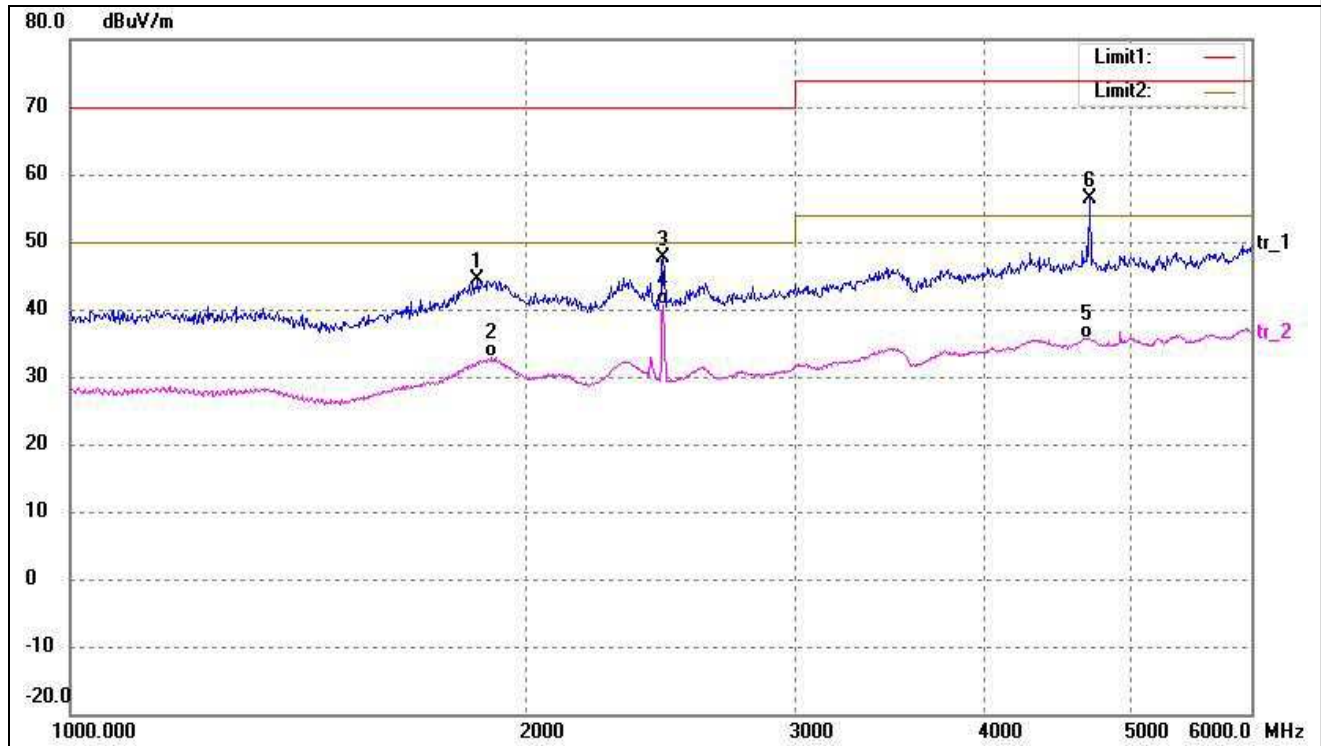
AC 230V, 50Hz

Test mode:	TM2	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1865.506	53.74	-8.86	44.88	70.00	-25.12	peak
2	1906.051	41.47	-8.65	32.82	50.00	-17.18	AVG
3	2462.692	56.81	-9.36	47.45	70.00	-22.55	peak
4	2462.692	50.73	-9.36	41.37	50.00	-8.63	AVG
5	4330.397	52.66	-5.40	47.26	74.00	-26.74	peak
6	4660.494	40.28	-4.60	35.68	54.00	-18.32	AVG

Test mode:	TM2	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1855.505	53.22	-8.95	44.27	70.00	-25.73	peak
2	1895.833	41.40	-8.60	32.80	50.00	-17.20	AVG
3	2458.283	57.02	-9.36	47.66	70.00	-22.34	peak
4	2458.283	50.10	-9.36	40.74	50.00	-9.26	AVG
5	4660.494	40.34	-4.60	35.74	54.00	-18.26	AVG
6	4694.016	61.07	-4.58	56.49	74.00	-17.51	peak