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TEST REPORT

Report Number: 21100814HKG-001

Application for Original Grant of 47 CFR Part 15 Certification

Single New of RSS-247 Issue 2 Equipment

FCC ID: RNL-KONOZH2O

IC: 279A-KONOZH2O

PREPARED AND CHECKED BY:	APPROVED BY:
Signed On File Wong Cheuk Ho, Herbert Lead Engineer	Digitally signed by Kenneth Wong Location: Intertek Testing Services Hong Kong Limited Wong Kwok Yeung, Kenneth Assistant Supervisor Date: May 05, 2022

TEST REPORT

GENERAL INFORMATION

Applicant Name:	Johnson Controls, Inc.
Applicant Address:	507 E Michigan St Milwaukee Wisconsin 53202 United States
FCC Specification Standard:	FCC Part 15, October 1, 2020 Edition
FCC ID:	RNL-KONOZH2O
FCC Model(s):	KN-Z-H2O
IC Specification Standard:	RSS-247 Issue 2, February 2017 RSS-Gen Issue 5 Amendment 2, February 2021
IC:	279A-KONOZH2O
PMN:	T-1000
HVIN:	KN-Z-H2O
Type of EUT:	Spread Spectrum Transmitter
Description of EUT:	KONOz Programmable Thermostat
Serial Number:	110122A
Sample Receipt Date:	February 15, 2022
Date of Test:	March 25, 2022 to March 30, 2022
Report Date:	May 05, 2022
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 / RSS-247 Issue 2 Certification.

TEST REPORT

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EXHIBIT 1 TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE

1.0 TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE

1.1 Summary of Test Results

TEST ITEMS	FCC PART 15 SECTION	RSS-247/ RSS-GEN# SECTION	RESULTS	DETAILS SEE SECTION
Antenna Requirement	15.203	8.3#	Pass	2.1
Max. Conducted Output Power (Peak)	15.247(b)(3)&(4)	5.4(d)	Pass	4.1
Min. 6dB RF Bandwidth	15.247(a)(2)	5.2(a)	Pass	4.2
Max. Power Density (average)	15.247(e)	5.2(b)	Pass	4.3
Out of Band Antenna Conducted Emission	15.247(d)	5.5	Pass	4.4
Radiated Emission in Restricted Bands and Spurious Emissions	15.247(d), 15.209 & 15.109	5.5 8.10#	Pass	4.6
AC Power Line Conducted Emission	15.207 & 15.107	8.8#	Pass	4.7

Note: Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

1.2 Statement of Compliance

The equipment under test is found to be complying with the following standard:

FCC Part 15, October 1, 2020 Edition
RSS-247 Issue 2, February 2017
RSS-Gen Issue 5 Amendment 2, February 2021

TEST REPORT

EXHIBIT 2 GENERAL DESCRIPTION

2.0 GENERAL DESCRIPTION

2.1 Product Description

The Equipment Under Test (EUT) is a KONOz Programmable Thermostat, equipped with a ZigBee module. After connecting the EUT to the ZigBee home control system, user can control the home heater/cooler system. The EUT is powered by 4X size “AA” batteries or 24VAC.

The antenna(s) used in the EUT is integral, and the test sample is a prototype.

The circuit description is saved with filename: descri.pdf.

TEST REPORT

2.2 Test Methodology

Both AC power line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in radiated emission test sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. Antenna port conducted measurements were performed according to ANSI C63.10 (2013) and KDB Publication No.558074 D01 v05r02 (02-April-2019). All other measurements were made in accordance with the procedures in 47 CFR Part 2 and RSS-Gen Issue 5 Amendment 2, February 2021.

2.3 Test Facility

The radiated emission test site and antenna port conducted measurement facility used to collect the radiated data and conductive data are at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada No.: 2042H, CABID is “HKAP01”.

2.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver (ZigBee portion)

TEST REPORT

EXHIBIT 3 SYSTEM TEST CONFIGURATION

3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

For radiated emissions testing, the equipment under test (EUT) was setup to transmit / receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions.

The EUT was powered by a 4X size “AA” batteries or 24VAC. Both powering methods were tested. Only the worse-case data is shown in this report (powered by 24VAC).

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable. If the base unit attached to peripherals, they were connected and operational (as typical as possible).

The signal was maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization were varied during the search for maximum signal level. The antenna height was varied from 1 to 4 meters. Radiated emissions were taken at three meters unless the signal level was too low for measurement at that distance. If necessary, a pre-amplifier was used and/or the test was conducted at a closer distance.

For any intentional radiator powered by AC power line, measurements of the radiated signal level of the fundamental frequency component of the emission was performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Radiated emission measurement for transmitter were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Emission that are directly caused by digital circuits in the transmit path and transmitter portion were measured, and the limit are according to FCC Part 15 Section 15.209 / RSS-247 2.5. Digital circuitries used to control additional functions other than the operation of the transmitter are subject to FCC Part 15 Section 15.109 / RSS-247 Section 5.5 Limits.

TEST REPORT

3.1 Justification – Cont'd

Detector function for radiated emissions was in peak mode. Average readings, when required, were taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.8.3.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF.* The effective period (Teff) was referred to Exhibit 4.8.3. With the resolution bandwidth 3MHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

For AC line conducted emission test, the EUT along with its peripherals were placed on a 1.0m(W)x1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50ohm coupling impedance for measuring instrument. The LISN housing, measuring instrument case, reference ground plane, and vertical ground plane were bounded together. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were manipulated to find the maximum emission.

Different data rates have been tested. Worst case is reported only.

All relevant operation modes have been tested, and the worst-case data is included in this report.

3.2 EUT Exercising Software

The EUT exercise program (if any) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

TEST REPORT

3.3 Details of EUT and Description of Accessories

Details of EUT:

An AC transformer was used to power the device. Their description(s) are listed below.

(1) 24V AC transformer (Input: 120V, Output: 24V) (Provided by Intertek)

Description of Accessories:

(1) N/A

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test at a level of confidence of 95% has been considered. The values of the Measurement uncertainty for radiated emission test and RF conducted measurement test are ± 5.3dB and ±0.99dB respectively. The value of the Measurement uncertainty for conducted emission test is ±4.2dB.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

TEST REPORT

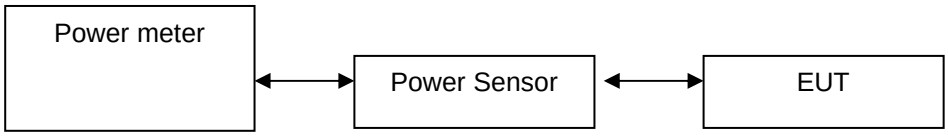
EXHIBIT 4 TEST RESULTS

4.0 TEST RESULTS

4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

RF Conduct Measurement Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



The antenna port of the EUT was connected to the input of a spectrum analyzer.

☒ The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to the obtain power at the EUT antenna terminals. The measurement procedure 9.1.3 was used.

☐ The EUT should be configured to transmit continuously (at a minimum duty cycle of 98%) at full power over the measurement duration. The measurement procedure AVG1 was used.

Antenna Gain = -3.2 dBi

Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2405	20.8	120.2
Middle Channel: 2440	20.0	100.0
High Channel: 2480	-4.2	0.4

TEST REPORT

4.1 Maximum Conducted Output Power at Antenna Terminals – Cont'd

Cable loss: 0.5 dB External Attenuation: 0 dB

Cable loss, external attenuation: ☒ included in OFFSET function
☐ added to SA raw reading

max. conducted (peak) output level = 20.8 dBm

Limits:
☒ 1W (30dBm) for antennas with gains of 6dBi or less

☐ ___W (___dBm) for antennas with gains more than 6dBi

The plots of conducted output power are saved as below.

TEST REPORT

4.2 Minimum 6dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. The EBW measurement procedure was used. A PEAK output reading was taken, a DISPLAY line was drawn 6dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel: 2405	1.62
Middle Channel: 2440	1.62
High Channel: 2480	1.62

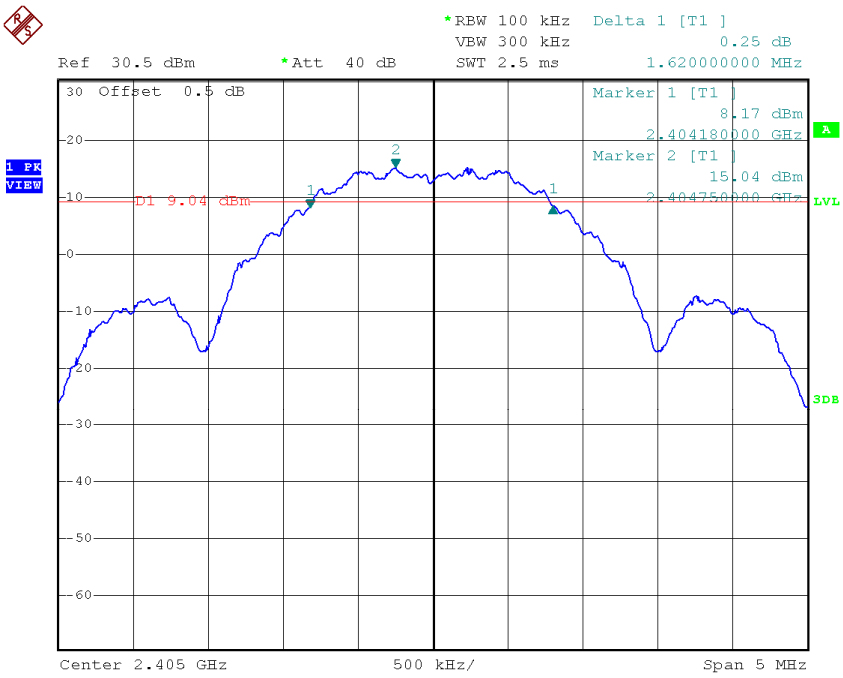
Limits
6 dB bandwidth shall be at least 500kHz

The plots of 6dB RF bandwidth are saved as below.

TEST REPORT

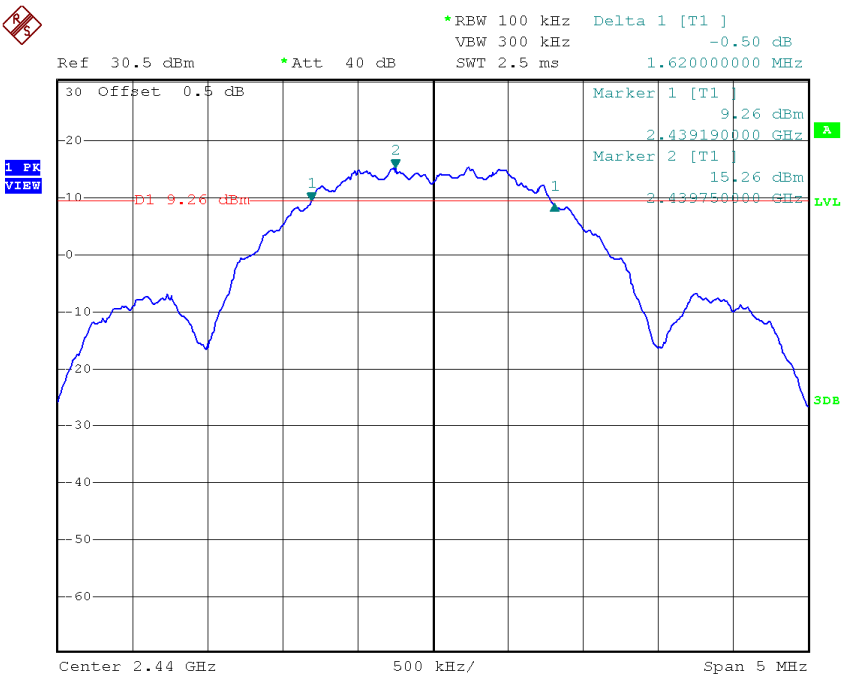
PLOTS OF 6dB RF BANDWIDTH

Lowest Channel



Date: 25.MAR.2022 16:43:46

Middle Channel

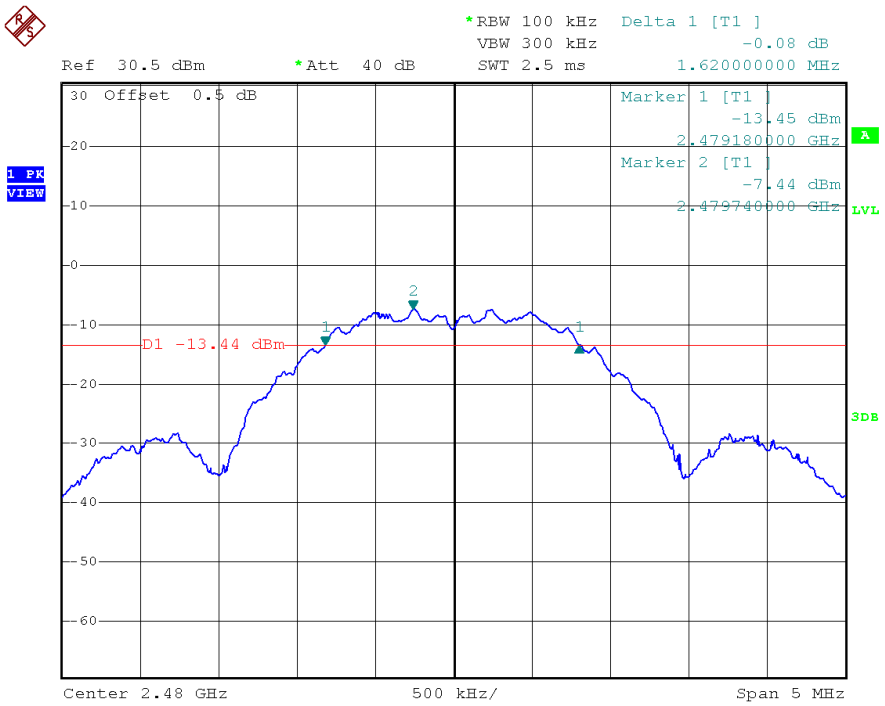


Date: 25.MAR.2022 16:54:22

TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

Highest Channel



Date: 25.MAR.2022 16:41:17

TEST REPORT

4.3 Maximum Power Spectral Density

Antenna output of the EUT was coupled directly to spectrum analyzer. The measurement procedure 10.2 PKPSD was used. If an external attenuator and/or cable was used, these losses are compensated for using the OFFSET function of the analyser.

Frequency (MHz)		PSD in 100kHz (dBm)	PSD in 3kHz (dBm)
Low Channel:	2405	14.94	2.25
Middle Channel:	2440	15.30	3.35
High Channel:	2480	-7.56	-19.32

Cable Loss: 0.5 dB

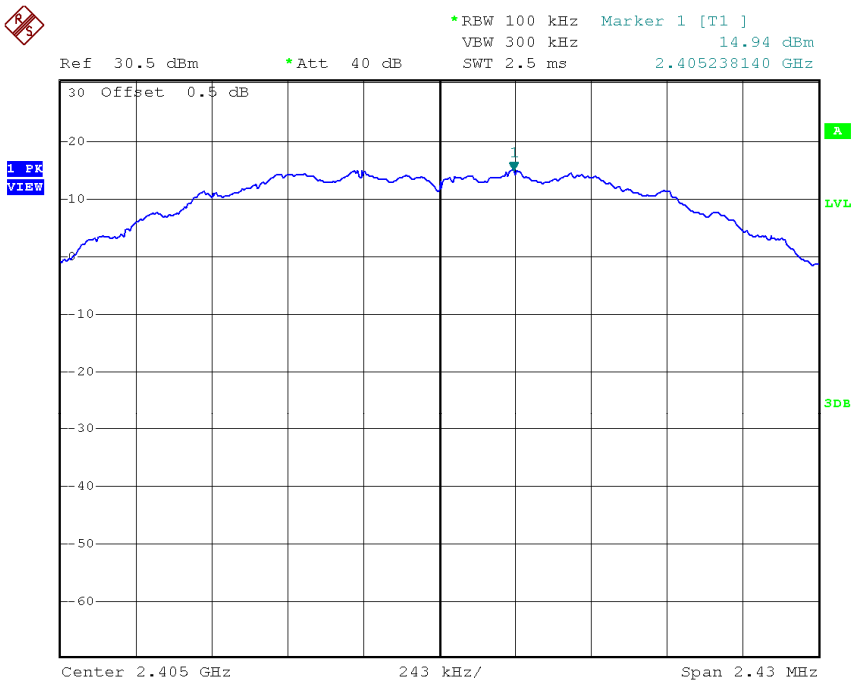
Limit:
8dBm

The plots of power spectral density are as below.
4.3 Maximum Power Spectral Density

TEST REPORT

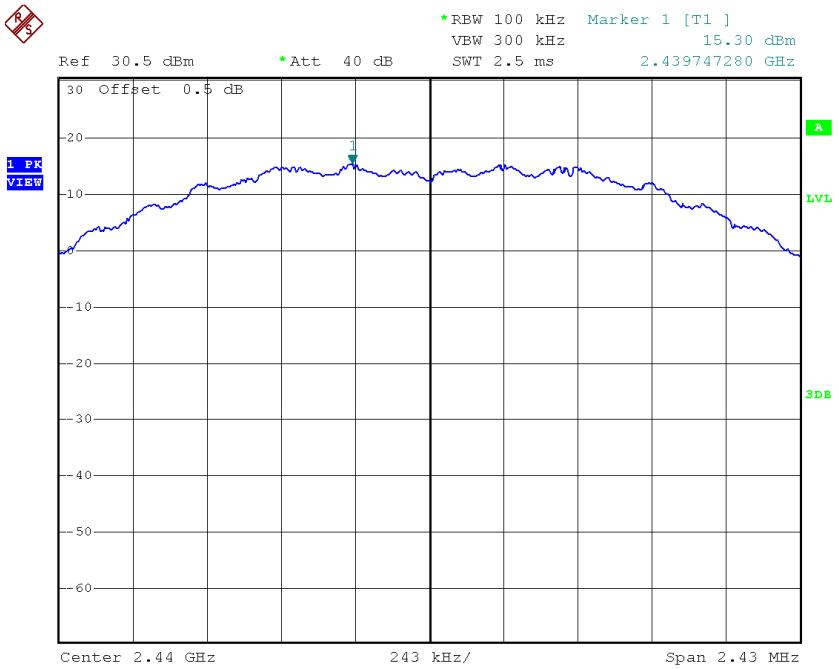
PLOTS OF POWER SPECTRAL DENSITY (100kHz RBW)

Lowest channel



Date: 25.MAR.2022 17:00:33

Middle channel

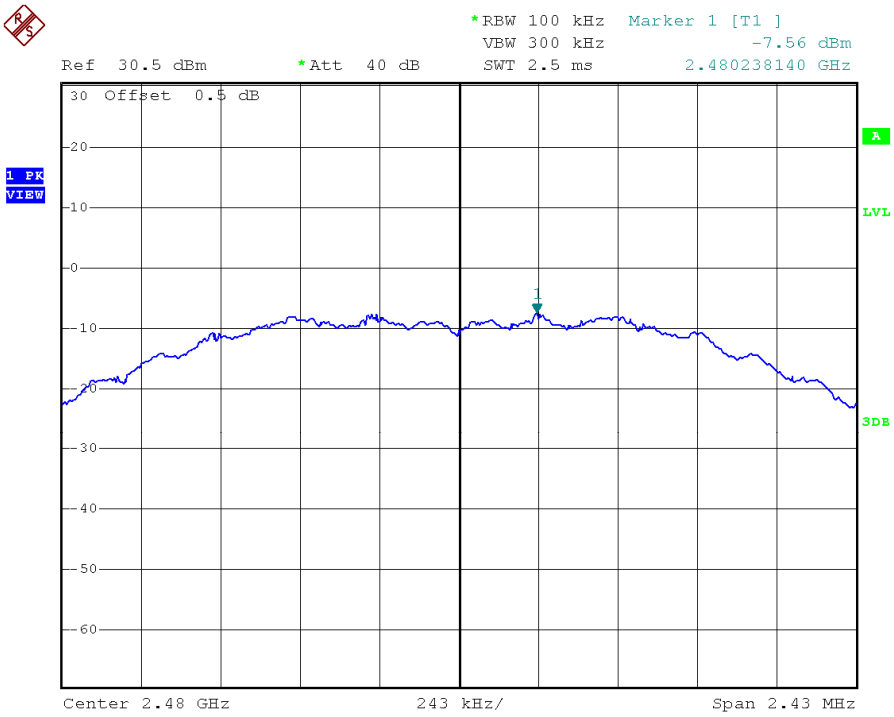


Date: 25.MAR.2022 17:04:50

TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY (100kHz RBW)

Highest channel

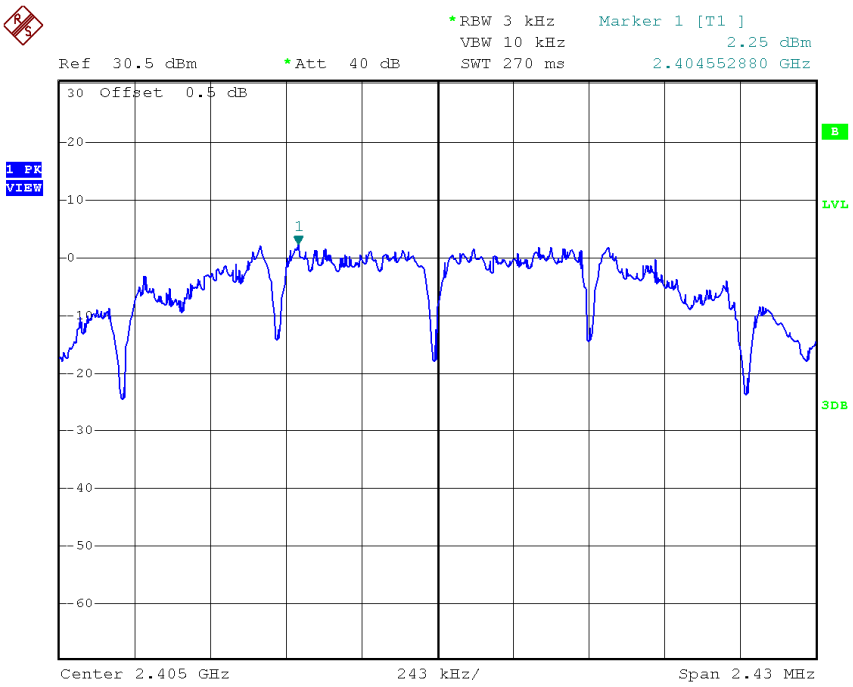


Date: 25.MAR.2022 17:06:00

TEST REPORT

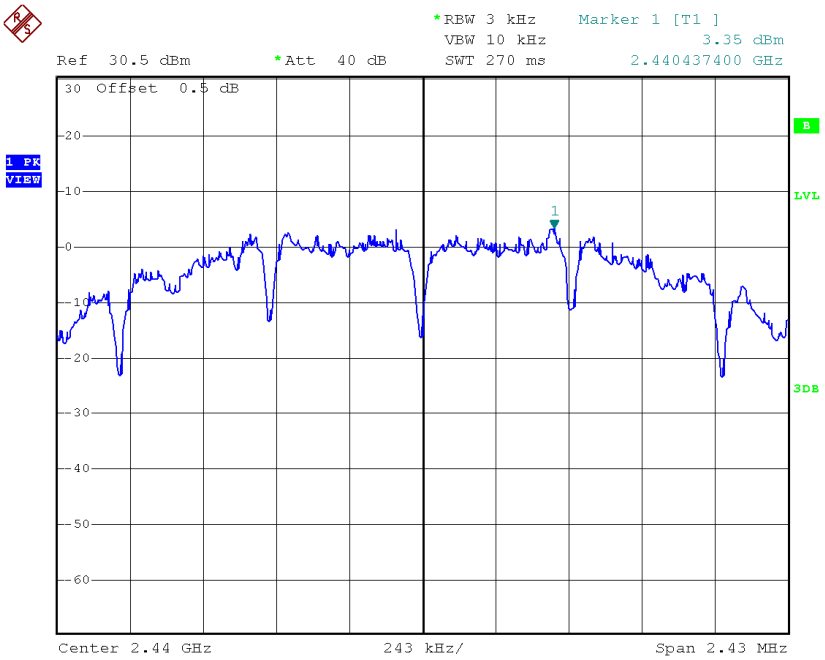
PLOTS OF POWER SPECTRAL DENSITY (3kHz RBW)

Lowest channel



Date: 25.MAR.2022 17:02:35

Middle channel

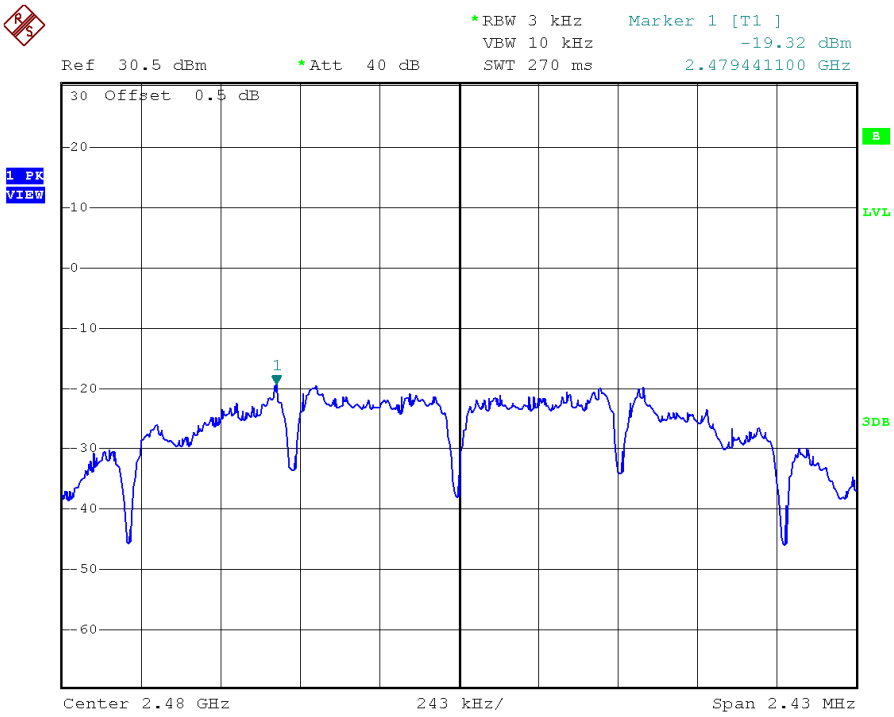


Date: 25.MAR.2022 17:03:41

TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY (3kHz RBW)

Highest channel



TEST REPORT

4.4 Out of Band Conducted Emissions

The maximum conducted (peak) output power was used to demonstrate compliance as described in 9.1. Then the display line (in red) shown in the following plots denotes the limit at 20dB below maximum measured in-band peak PSD level in 100 KHz bandwidth.

The measurement procedures under sections 11 of KDB No.558074 D01 v05r02 (02-April-2019) were used.

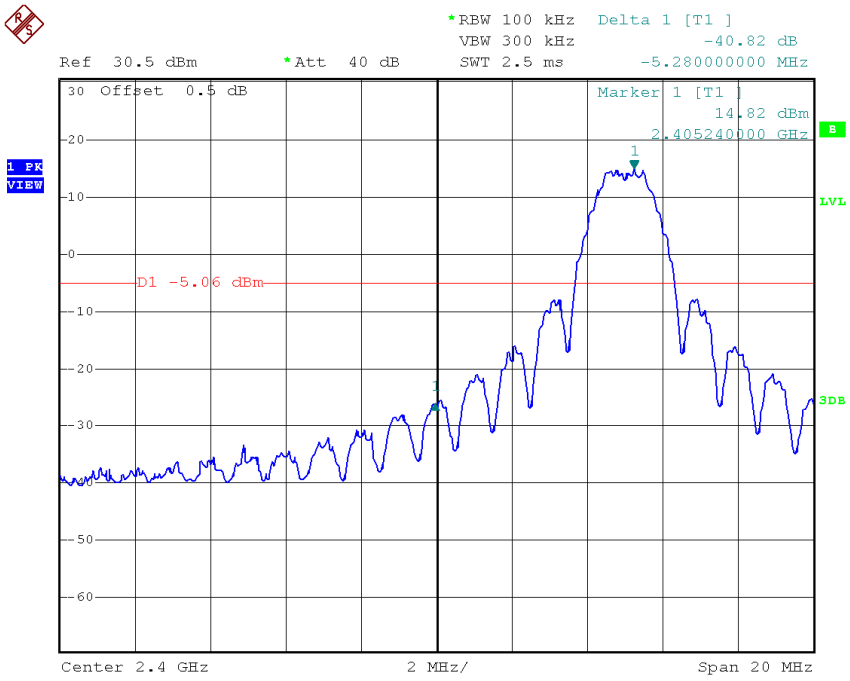
Furthermore, delta measurement technique for measuring bandedge emissions was incorporated in the test of the edge at 2483.5MHz.

Limits:
All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20dB below the maximum measured in-band peak PSD level.

TEST REPORT

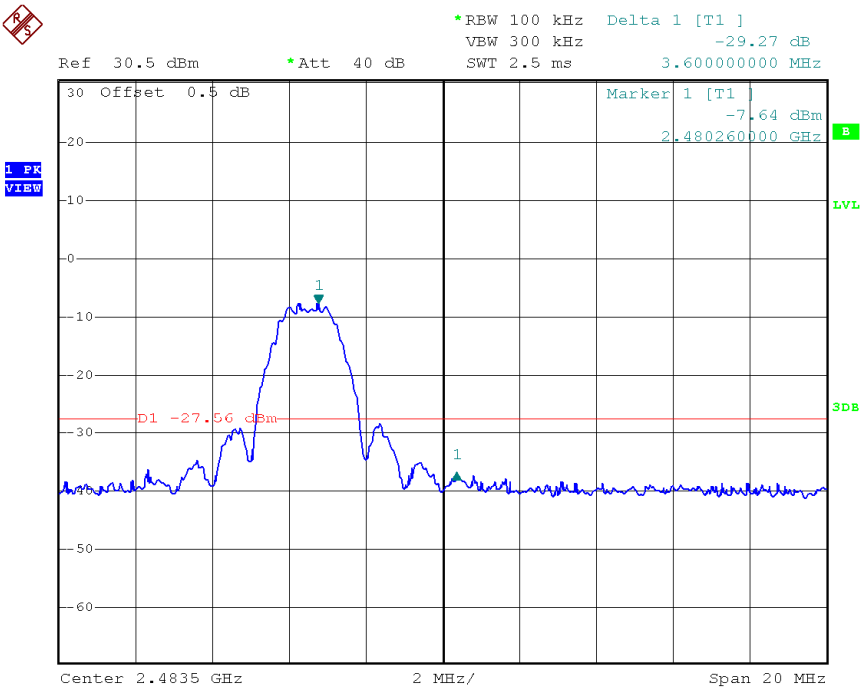
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Bandedge



Date: 25.MAR.2022 17:24:52

Highest Channel, Bandedge



Date: 25.MAR.2022 17:26:18

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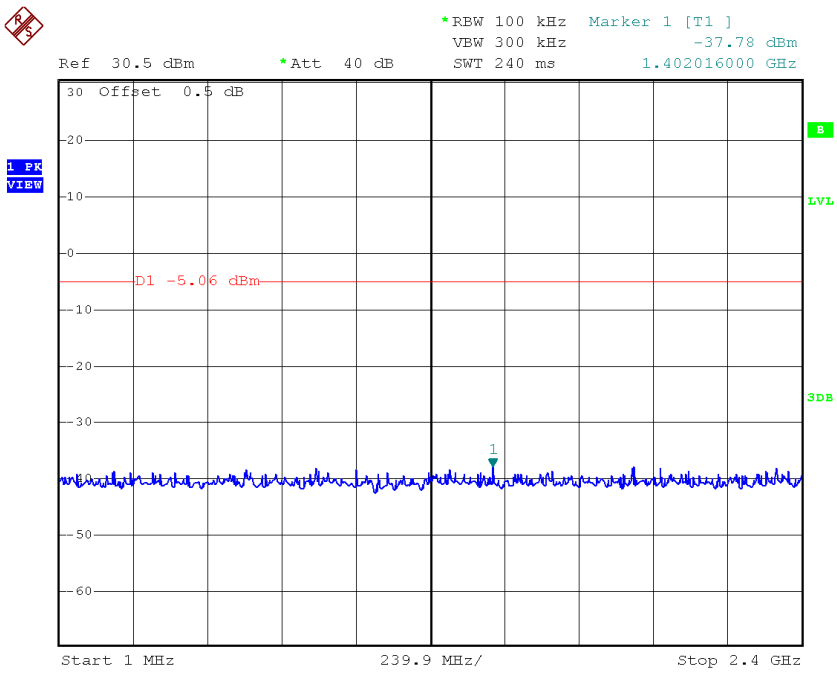
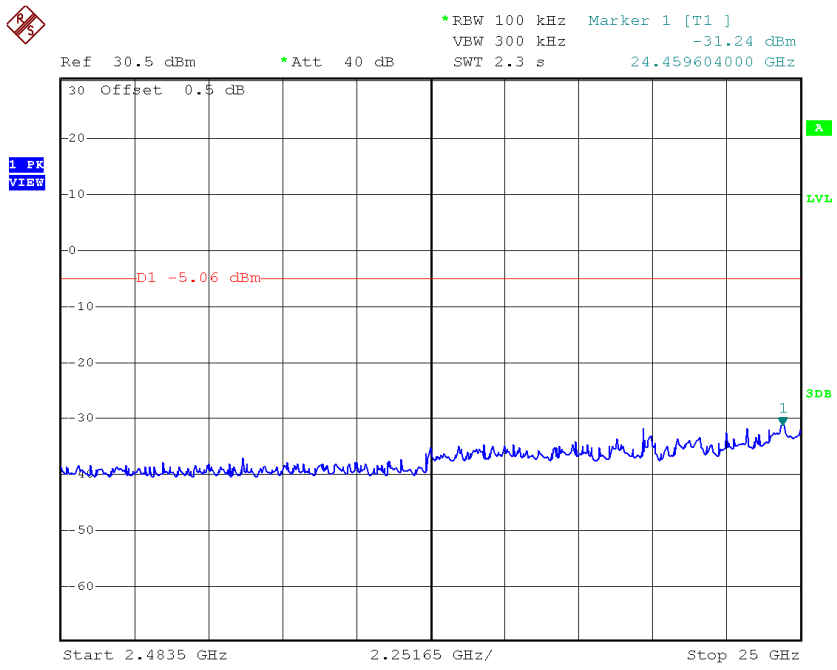
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Plot A



Date: 25.MAR.2022 17:22:20

Lowest Channel, Plot B



Date: 25.MAR.2022 17:21:36

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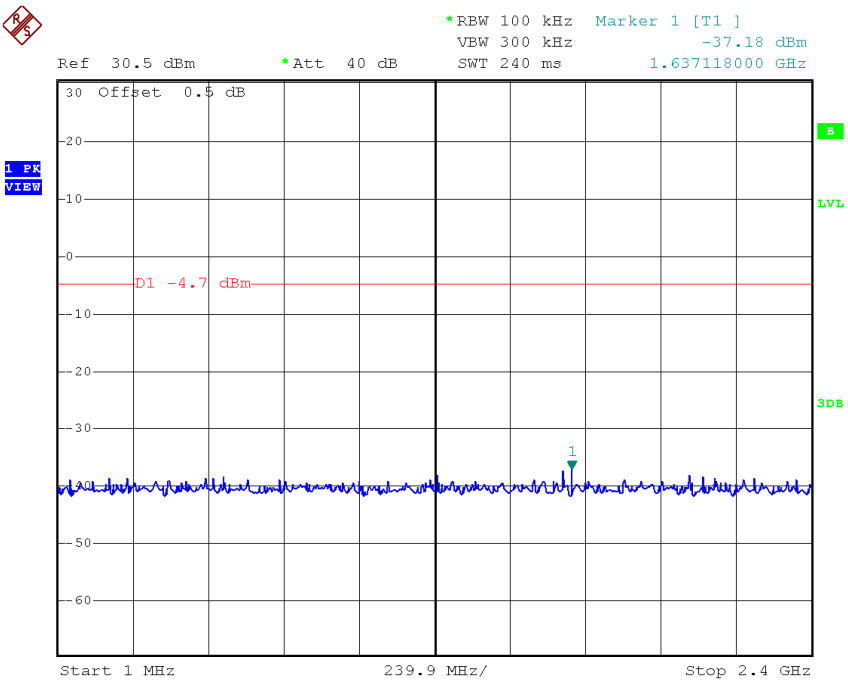
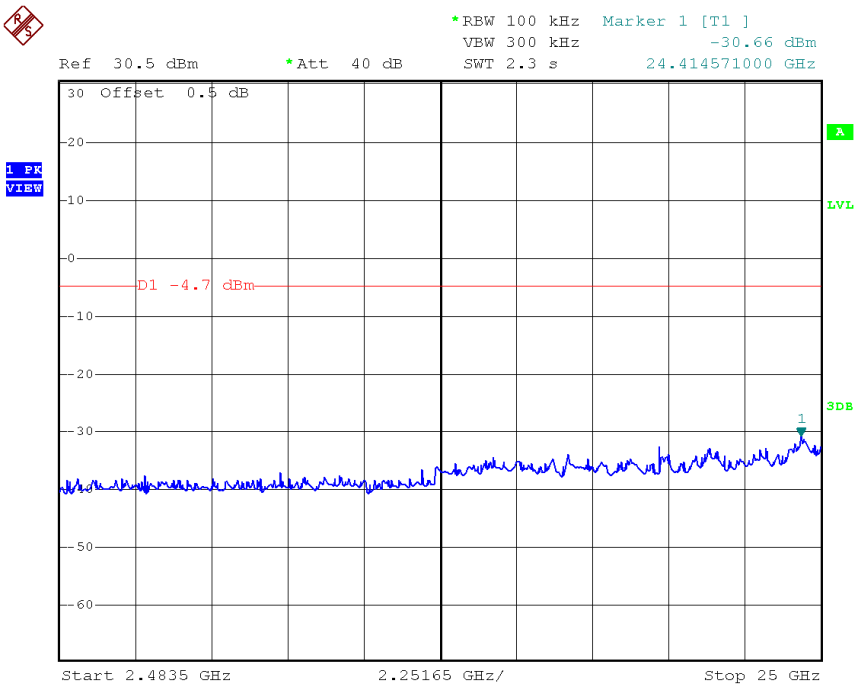
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, Plot A



Date: 25.MAR.2022 17:19:10

Middle Channel, Plot B

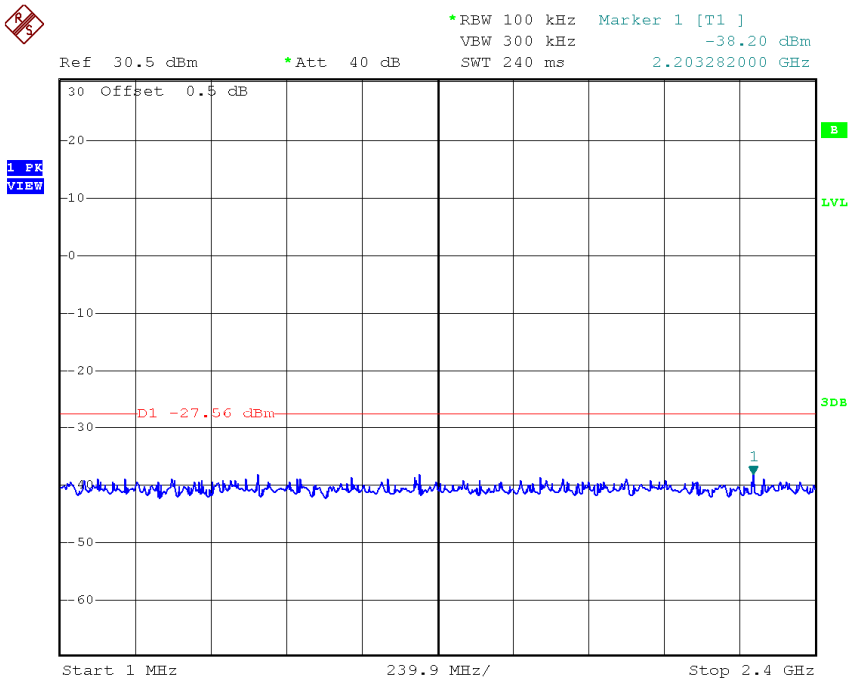


Date: 25.MAR.2022 17:19:40

TEST REPORT

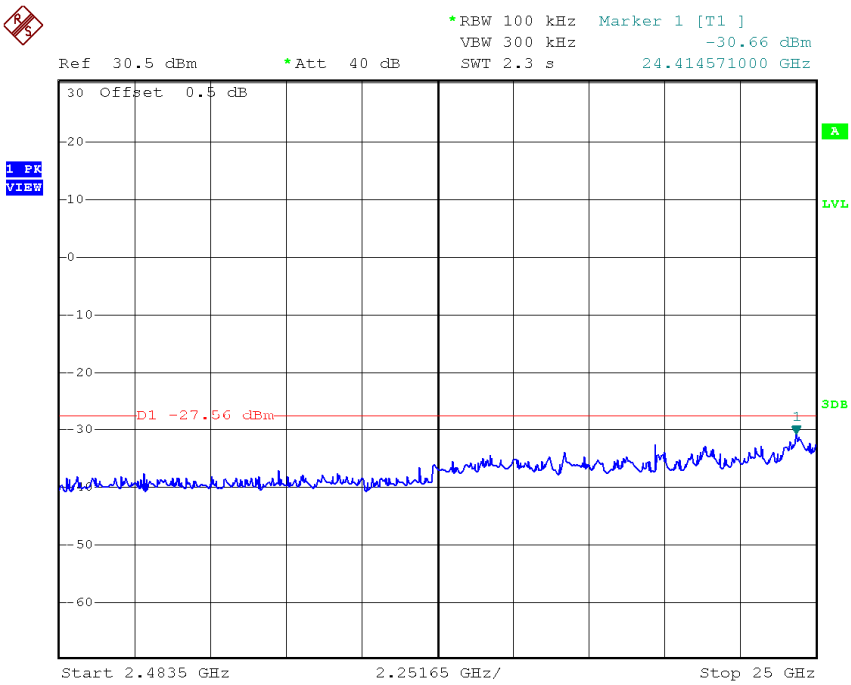
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, Plot A



Date: 25.MAR.2022 17:17:50

Highest Channel, Plot B



Date: 25.MAR.2022 17:11:37

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4.5 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

Where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Example
Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29.0 dB is subtracted. The pulse desensitization factor of the spectrum analyzer is 0.0 dB, and the resultant average factor is -10.0 dB. The net field strength for comparison to the appropriate emission limit is 32.0 dBµV/m. This value in dBµV/m is converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0.0 dB
AV = -10 dB

FS = 62.0 + 7.4 + 1.6 – 29.0 + 0.0 + (-10.0) = 32.0 dBµV/m

Level in µV/m = Common Antilogarithm [(32.0 dBµV/m)/20] = 39.8 µV/m

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4.6 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

4.6.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission
at

87.758 MHz

The worst case radiated emission configuration photographs are saved with filename: config photos.pdf

4.6.2 Radiated Emission Data

The data in tables 1-4 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 3.2 dB margin

TEST REPORT

RADIATED EMISSION DATA

Mode: TX-Channel 2405MHz

Table 1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (Average) (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***2390.000***	***47.1***	***33***	***29.4***	***43.5***	***54.0***	***-10.5***
H	***4810.000***	***48.3***	***33***	***34.9***	***50.2***	***54.0***	***-3.8***
H	***12025.000***	***32.9***	***33***	***40.5***	***40.4***	***54.0***	***-13.6***

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	***2390.000***	***59.6***	***33***	***29.4***	***56.0***	***74.0***	***-18.0***
H	***4810.000***	***55.1***	***33***	***34.9***	***57.0***	***74.0***	***-17.0***
H	***12025.000***	***39.8***	***33***	***40.5***	***47.3***	***74.0***	***-26.7***

NOTES:

1. Peak detector is used for the emission measurement.
2. Average measurement method is according to ANSI C63.10.
3. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

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Mode: TX-Channel 2440MHz

Table 2

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (Average)(dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***4880.000***	***48.1***	***33***	***34.9***	***50.0***	***54.0***	***-4.0***
H	***7320.000***	***44.4***	***33***	***37.9***	***49.3***	***54.0***	***-4.7***
H	***12200.000***	***32.6***	***33***	***40.5***	***40.1***	***54.0***	***-13.9***

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	***4880.000***	***55.4***	***33***	***34.9***	***57.3***	***74.0***	***-16.7***
H	***7320.000***	***51.9***	***33***	***37.9***	***56.8***	***74.0***	***-17.2***
H	***12200.000***	***38.9***	***33***	***40.5***	***46.4***	***74.0***	***-27.6***

NOTES:

1. Peak detector is used for the emission measurement.
2. Average measurement method is according to ANSI C63.10.
3. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: TX-Channel 2480MHz

Table 3

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (Average) (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	***2483.500***	***51.8***	***33***	***29.4***	***48.2***	***54.0***	***-5.8***
H	***4960.000***	***29.5***	***33***	***34.9***	***31.4***	***54.0***	***-22.6***
H	***7440.000***	***30.8***	***33***	***37.9***	***35.7***	***54.0***	***-18.3***
H	***12400.000***	***31.5***	***33***	***40.5***	***39.0***	***54.0***	***-15.0***

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	***2483.500***	***64.0***	***33***	***29.4***	***60.4***	***74.0***	***-13.6***
H	***4960.000***	***38.8***	***33***	***34.9***	***40.7***	***74.0***	***-33.3***
H	***7440.000***	***38.5***	***33***	***37.9***	***43.4***	***74.0***	***-30.6***
H	***12400.000***	***39.1***	***33***	***40.5***	***46.6***	***74.0***	***-27.4***

NOTES:

1. Peak detector is used for the emission measurement.
2. Average measurement method is according to ANSI C63.10.
3. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

TEST REPORT

Mode: ZigBee Operating

Table 4

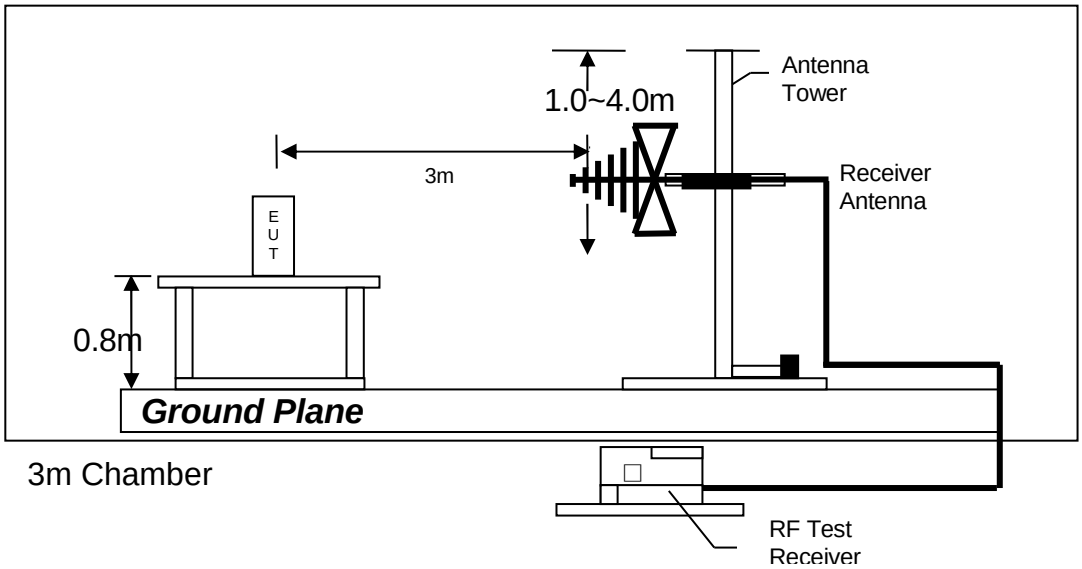
Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	31.978	42.2	16	10.0	36.2	40.0	-3.8
V	57.784	34.5	16	11.0	29.5	40.0	-10.5
V	87.758	43.8	16	9.0	36.8	40.0	-3.2
H	191.968	34.5	16	16.0	34.5	43.5	-9.0
H	263.508	34.8	16	21.0	39.8	46.0	-6.2
H	375.025	28.5	16	24.0	36.5	46.0	-9.5

NOTES:
1. Quasi-Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Emission within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

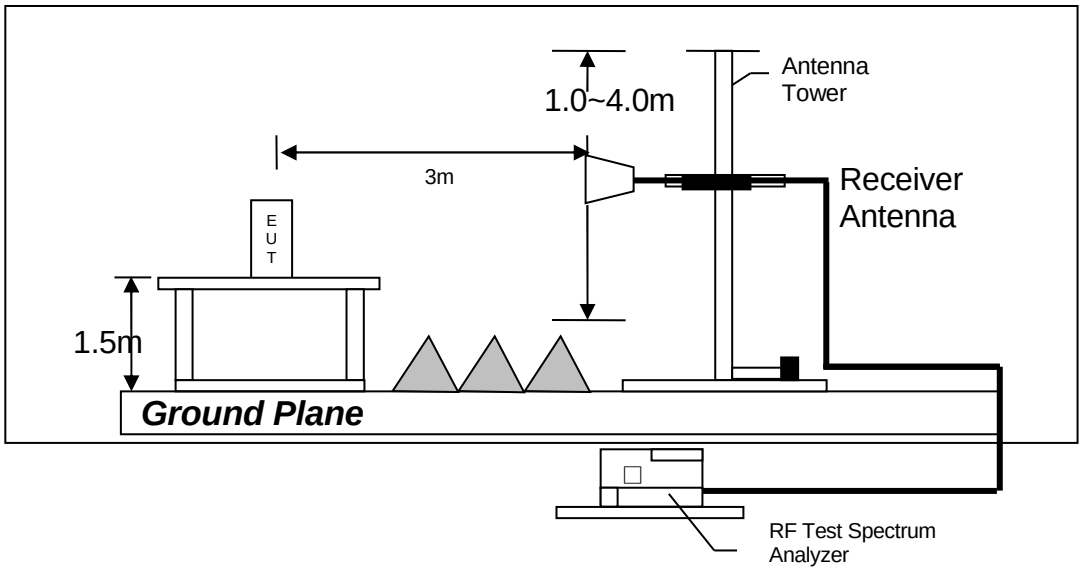
TEST REPORT

4.6.3 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

TEST REPORT

4.6.4 Transmitter Duty Cycle Calculation

Not applicable – No average factor is required.

TEST REPORT

4.7 AC Power Line Conducted Emission

☐ Not applicable – EUT is only powered by battery for operation.

☒ EUT connects to AC power line. Emission Data is listed in following pages.

☐ Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

4.7.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration
at

1.923 MHz

The worst-case line conducted configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.7.2 AC Power Line Conducted Emission Data

The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 10.1 dB margin

TEST REPORT

AC POWER LINE CONDUCTED EMISSION

Worst Case: ZigBee Operating

EDIT PEAK LIST (Final Measurement Results)

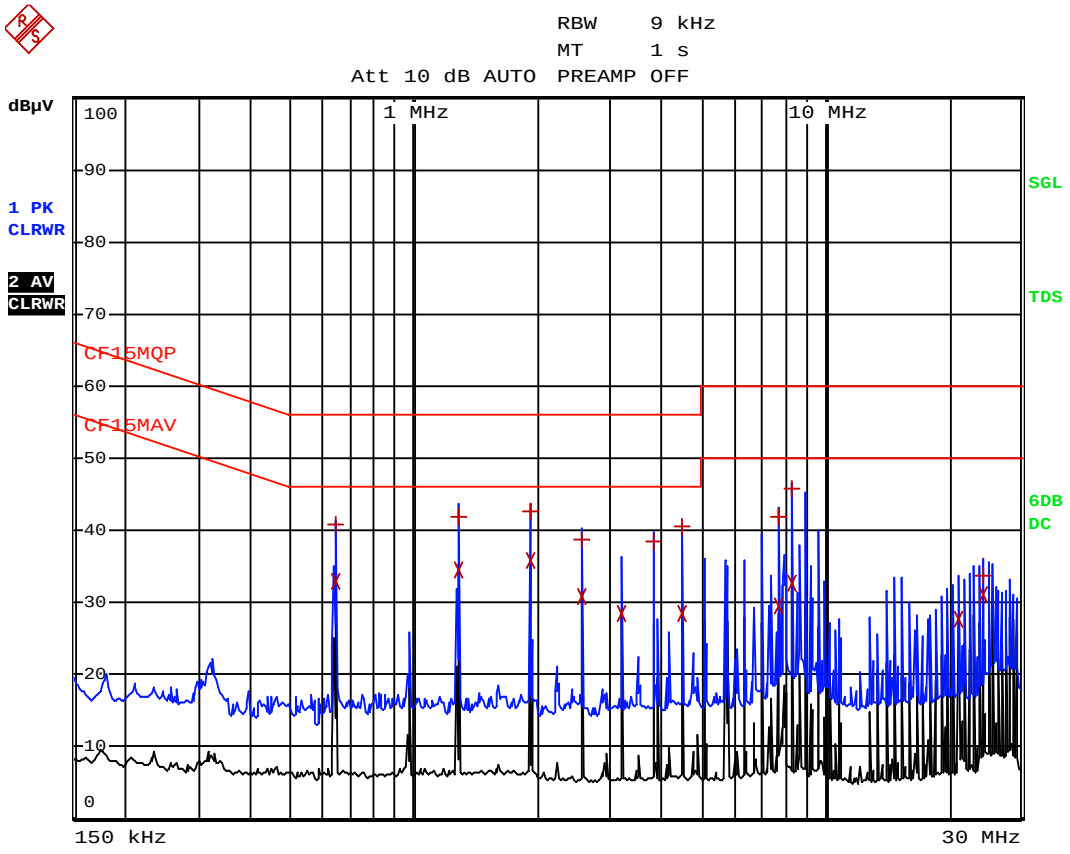
Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	640.5 kHz	40.75	L1	-15.25
2	CISPR Average	640.5 kHz	32.83	L1	-13.16
1	Quasi Peak	1.284 MHz	41.75	L1	-14.24
2	CISPR Average	1.284 MHz	34.64	L1	-11.35
1	Quasi Peak	1.923 MHz	42.70	N	-13.30
2	CISPR Average	1.923 MHz	35.85	L1	-10.14
1	Quasi Peak	2.562 MHz	38.82	N	-17.17
2	CISPR Average	2.562 MHz	30.91	L1	-15.08
2	CISPR Average	3.2055 MHz	28.37	L1	-17.62
1	Quasi Peak	3.8445 MHz	38.40	L1	-17.59
1	Quasi Peak	4.4835 MHz	40.55	N	-15.44
2	CISPR Average	4.488 MHz	28.60	L1	-17.39
1	Quasi Peak	7.6875 MHz	41.93	N	-18.06
2	CISPR Average	7.692 MHz	29.63	N	-20.36
1	Quasi Peak	8.331 MHz	45.87	N	-14.12
2	CISPR Average	8.331 MHz	32.59	N	-17.41
2	CISPR Average	21.156 MHz	27.60	L1	-22.39
1	Quasi Peak	24.3465 MHz	33.62	N	-26.37
2	CISPR Average	24.36 MHz	31.07	L1	-18.92

Date: 30.MAR.2022 11:05:46

TEST REPORT

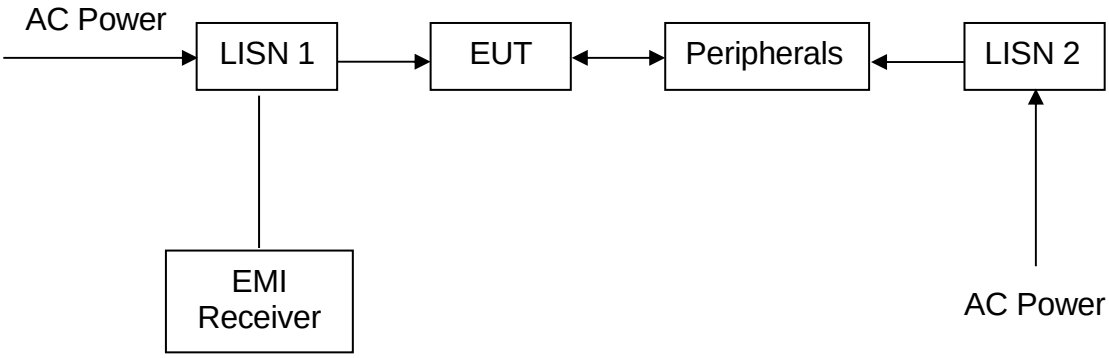
Worst Case: ZigBee Operating



Date: 30.MAR.2022 11:06:14

TEST REPORT

4.7.3 Conducted Emission Test Setup

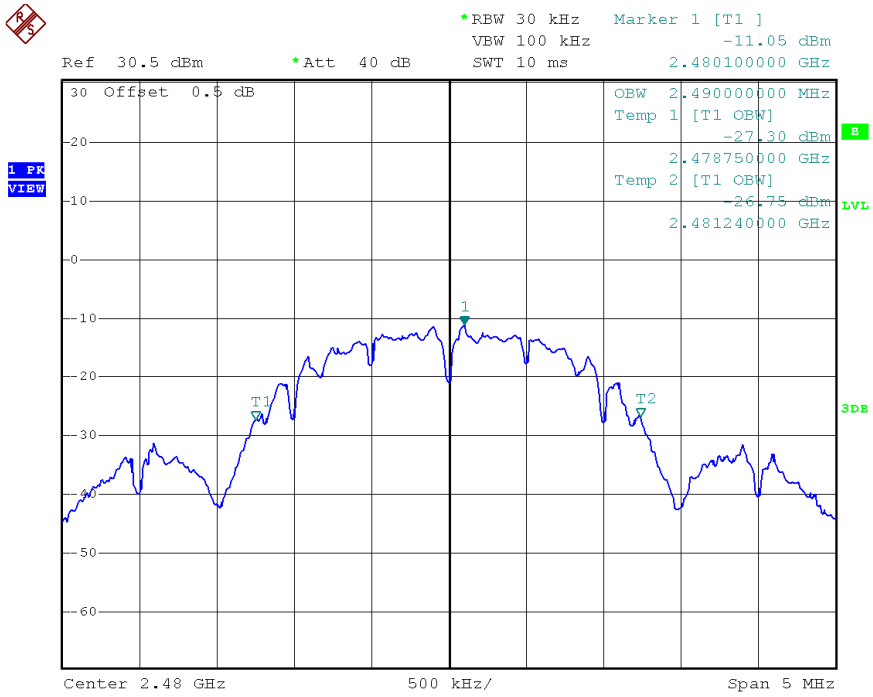


TEST REPORT

Occupied Bandwidth Results: (ZigBee)

(ZigBee)	Occupied Bandwidth (MHz)
Low Channel: 2405MHz	2.38
Middle Channel: 2440MHz	2.41
High Channel: 2480MHz	2.49

The worst case is shown as below



TEST REPORT

EXHIBIT 5 EQUIPMENT LIST

5.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna (20MHz to 200MHz)
Registration No.	EW-3481	EW-2466	EW-3061
Manufacturer	ROHDESCHWARZ	ROHDESCHWARZ	EMCO
Model No.	ESR7	FSP30	3142E
Calibration Date	December 21, 2021	November 18, 2019	February 02, 2021
Calibration Due Date	December 21, 2022	August 18, 2022	August 02, 2022

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna	Active Loop H-field (9kHz to 30MHz)
Registration No.	EW-3243	EW-1133	EW-3302
Manufacturer	EMCO	EMCO	EMCO
Model No.	3148B	3115	6502
Calibration Date	June 30, 2021	June 03, 2021	December 13, 2021
Calibration Due Date	December 30, 2022	June 03, 2022	June 13, 2023

Equipment	RF Preamplifier (9kHz to 6000MHz)	2.4GHz Notch Filter	14m Double Shield RF Cable (20MHz to 6GHz)
Registration No.	EW-3006b	EW-3435	EW-2074
Manufacturer	SCHWARZBECK	MICROWAVE	RADIALL
Model No.	BBV9718	N0324413	N(m)-RG142-BNC(m) L=14M
Calibration Date	November 25, 2019	November 16, 2019	November 14, 2019
Calibration Due Date	June 25, 2022	June 16, 2022	August 14, 2022

Equipment	Double Ridged Guide Antenna	Pyramidal Horn Antenna
Registration No.	EW-1133	EW-0905
Manufacturer	EMCO	EMCO
Model No.	3115	3160-09
Calibration Date	June 03, 2021	July 23, 2019
Calibration Due Date	June 03, 2022	June 23, 2022

TEST REPORT

2) Conductive Measurement Test

Equipment	5m RF Cable (40GHz)	Wideband power sensor 2 pcs 50MHz to 18GHz	Spectrum Analyzer
Registration No.	EW-2701	EW-3309	EW-2466
Manufacturer	RADIALL	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	Sma m-m 5m 40G	NRP-Z81	FSP30
Calibration Date	November 24, 2020	December 01, 2021	November 18, 2019
Calibration Due Date	November 24, 2022	December 01, 2022	August 18, 2022

3) Bandedge/Bandwidth Measurement

EQUIPMENT	5m RF Cable (40GHz)	Spectrum Analyzer
Registration No.	EW-2701	EW-2466
Manufacturer	RADIALL	ROHDESCHWARZ
Model No.	Sma m-m 5m 40G	FSP30
Calibration Date	November 24, 2020	November 18, 2019
Calibration Due Date	November 24, 2022	August 18, 2022

TEST REPORT

4) Conducted Emissions Test

Equipment	RF Cable 240cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver
Registration No.	EW-2454	EW-2501	EW-3481
Manufacturer	RADIALL	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	Bnc m st / 142 / bnc mra 240cm	ENV-216	ESR7
Calibration Date	November 10, 2020	September 11, 2021	December 21, 2021
Calibration Due Date	May 10, 2022	September 11, 2022	December 21, 2022

5) Control Software for Radiated Emission

Software Information	
Software Name	EMC32
Manufacturer	ROHDESCHWARZ
Software version	10.50.40 & 10.40.10

- End of Report -