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# TEST REPORT

**Report Number: 18020686HKG-001**

Application for Original Grant of 47 CFR Part 15 Certification

Single New of RSS-247 Issue 2 Equipment

**FCC ID: RNL-KONOZ**

**IC: 4970A-KONOZ**

| PREPARED AND CHECKED BY: | APPROVED BY: |
|---|---|
| Signed On File<br>Wong Cheuk Ho, Herbert<br>Lead Engineer | Digitally signed by Kenneth Wong<br>Location: Intertek Testing Services Hong Kong Ltd.<br>Wong Kwok Yeung , Kenneth<br>Senior Lead Engineer<br>Date: March 14, 2018 |

# TEST REPORT

## GENERAL INFORMATION

| | |
|---|---|
| **Applicant Name:** | LUX Products Corporation |
| **Applicant Address:** | 4747 South Broad Street Building 101, Suite 330, Philadelphia, PA 19112 United States Of America |
| **FCC Specification Standard:** | FCC Part 15, October 1, 2016 Edition |
| **FCC ID:** | RNL-KONOZ |
| **FCC Model(s):** | KN-Z-WH1-B04 |
| **IC Specification Standard:** | RSS-247 Issue 2, February 2017<br>RSS-Gen Issue 4, November 2014 |
| **IC:** | 4970A-KONOZ |
| **PMN:** | KONOz Smart Hub Thermostat |
| **HVIN:** | KN-Z-WH1-B04 |
| **Type of EUT:** | Spread Spectrum Transmitter |
| **Description of EUT:** | Programmable ZigBee Thermostat |
| **Serial Number:** | N/A |
| **Sample Receipt Date:** | February 15, 2018 |
| **Date of Test:** | February 15, 2018 to February 28, 2018 |
| **Report Date:** | March 14, 2018 |
| **Environmental Conditions:** | Temperature: +10 to 40°C<br>Humidity: 10 to 90% |

# TEST REPORT

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# TEST REPORT

# 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, 2016 Edition
RSS-247 Issue 2, February 2017
RSS-Gen Issue 4, November 2014

# TEST REPORT

# EXHIBIT 2 GENERAL DESCRIPTION

## 2.0 GENERAL DESCRIPTION

### 2.1 Product Description

The Equipment Under Test (EUT) is a Programmable ZigBee 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 v04 (05-April-2017) All other measurements were made in accordance with the procedures in 47 CFR Part 2 and RSS-Gen Issue 4 (2014).

## 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.: 2042V-1.

## 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 method 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 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

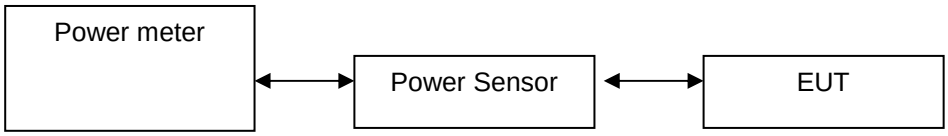
# EXHIBIT 4 TEST RESULTS

## 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 | 20.0 | 100.0 |
| Middle Channel: 2440 | 18.8 | 75.9 |
| High Channel: 2480 | -4.0 | 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 = 20.0 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 | 1.64 |
| Middle Channel: 2440 | 1.62 |
| High Channel: 2480 | 1.62 |

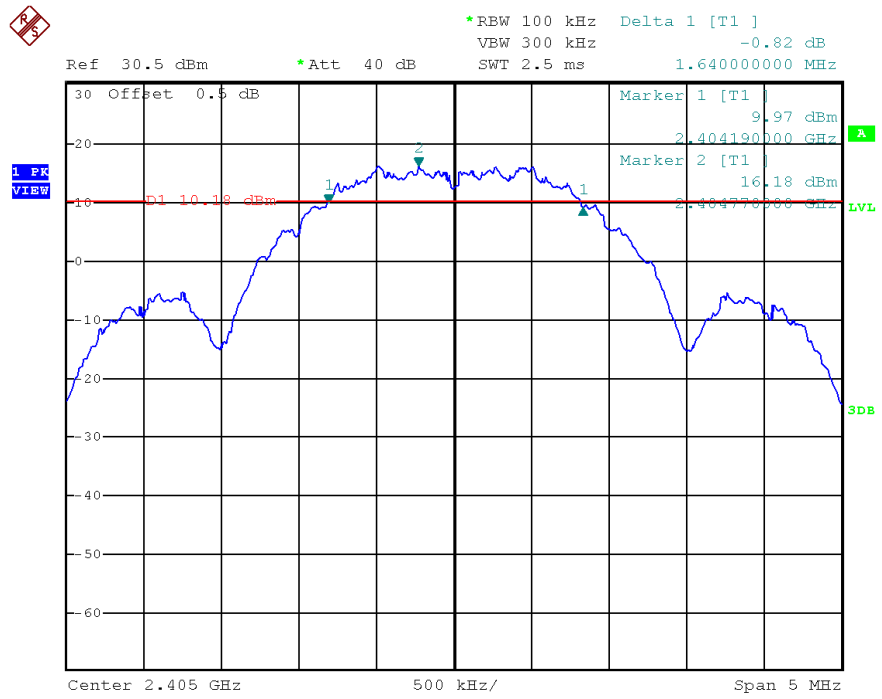
Limits
6 dB bandwidth shall be at least 500kHz

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

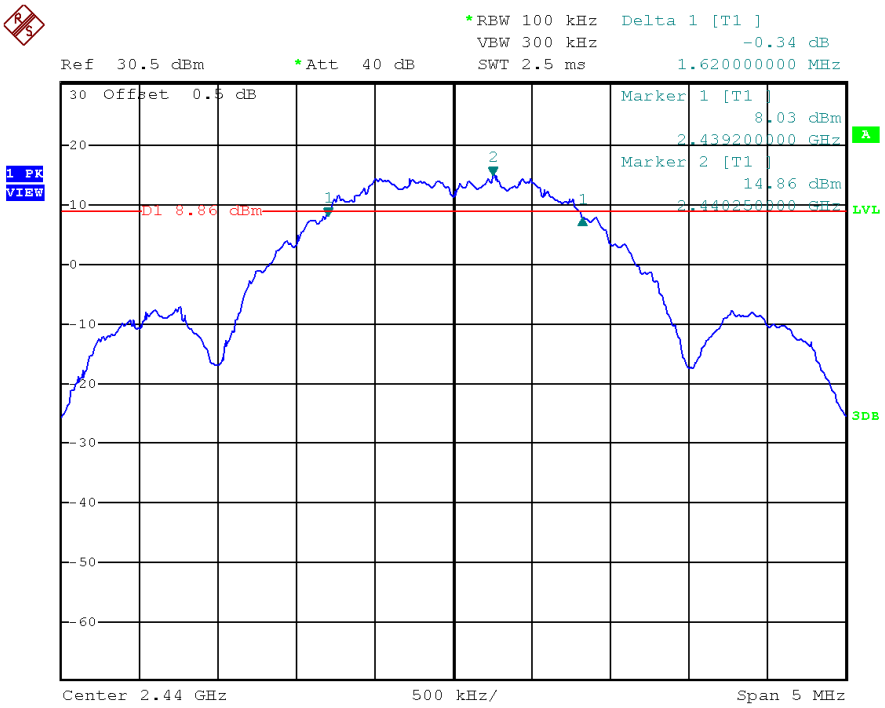
# TEST REPORT

## PLOTS OF 6dB RF BANDWIDTH

Lowest Channel



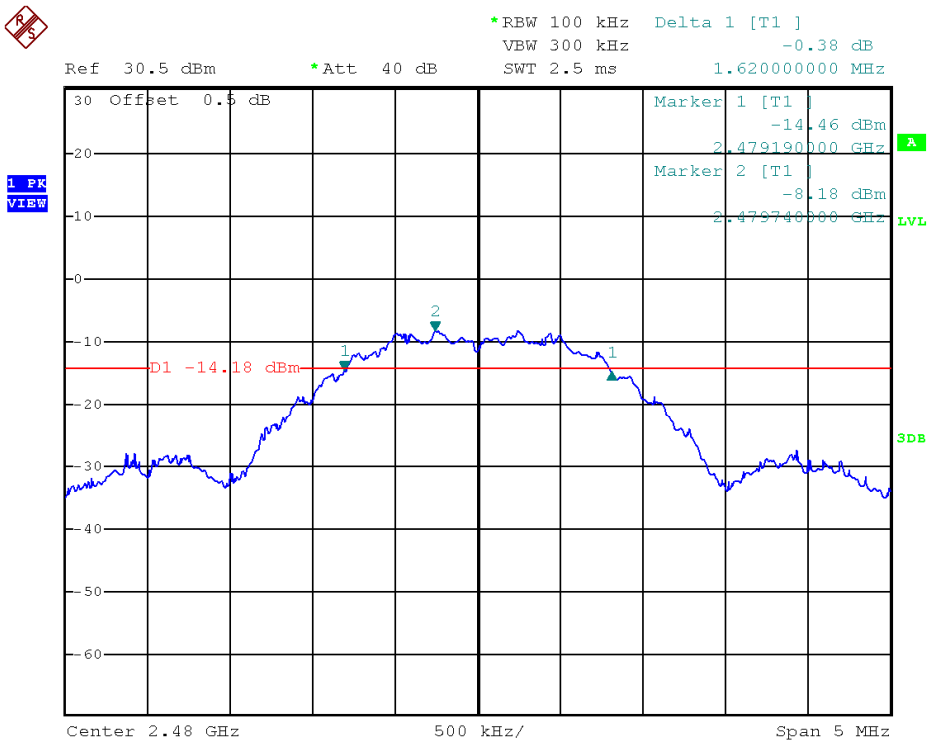

Middle Channel



# TEST REPORT

## PLOTS OF 6dB RF BANDWIDTH

Highest Channel



## 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 | 16.45 | 4.46 |
| Middle Channel: | 2440 | 14.90 | 2.35 |
| High Channel: | 2480 | -8.38 | -20.30 |

Cable Loss: 0.5 dB

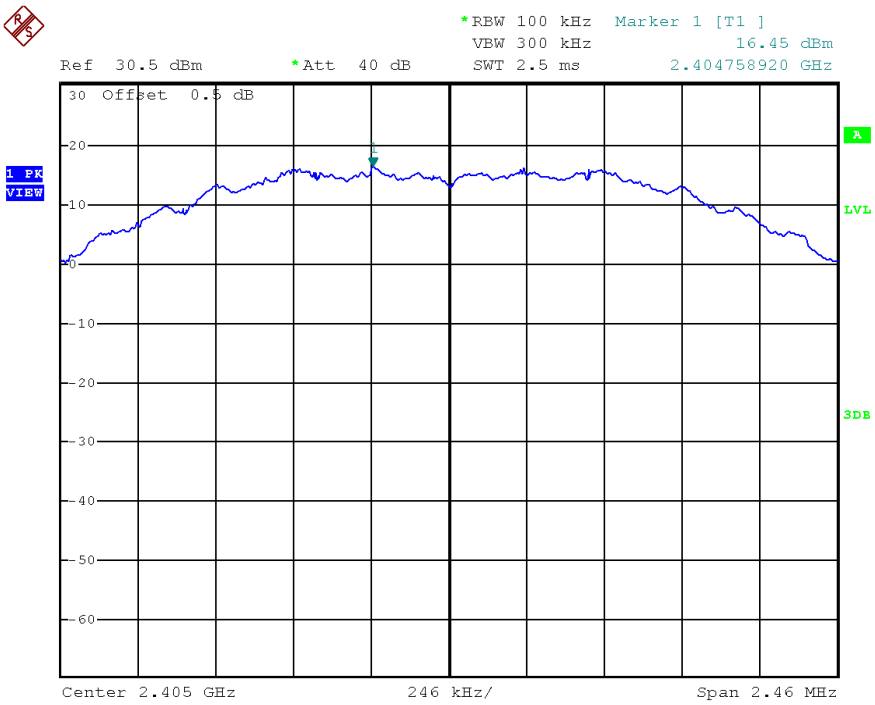
Limit:
8dBm

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

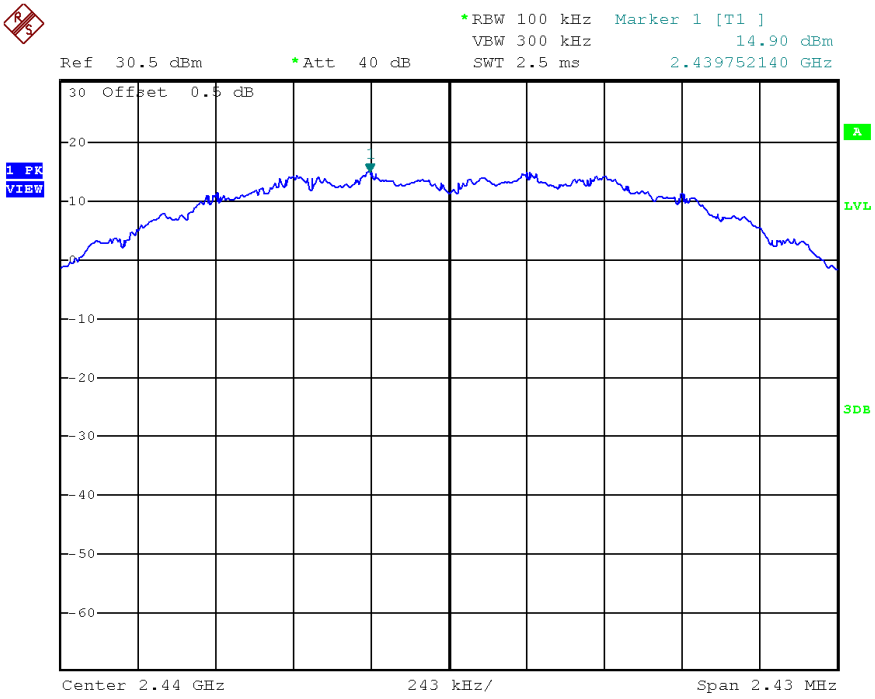
# TEST REPORT

## PLOTS OF POWER SPECTRAL DENSITY (100kHz RBW)

Lowest channel



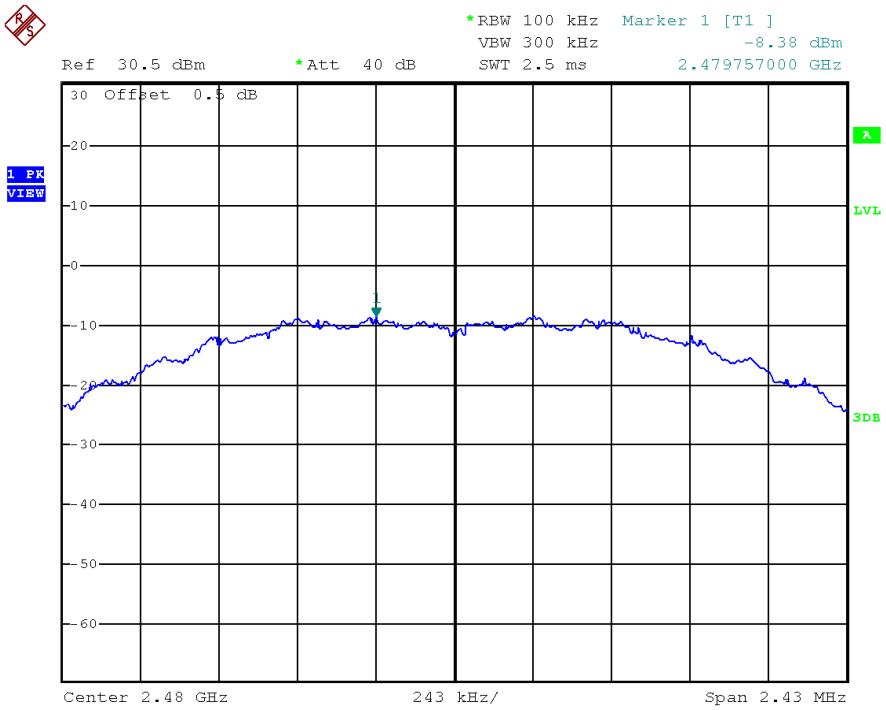

Middle channel



# TEST REPORT

## PLOTS OF POWER SPECTRAL DENSITY (100kHz RBW)

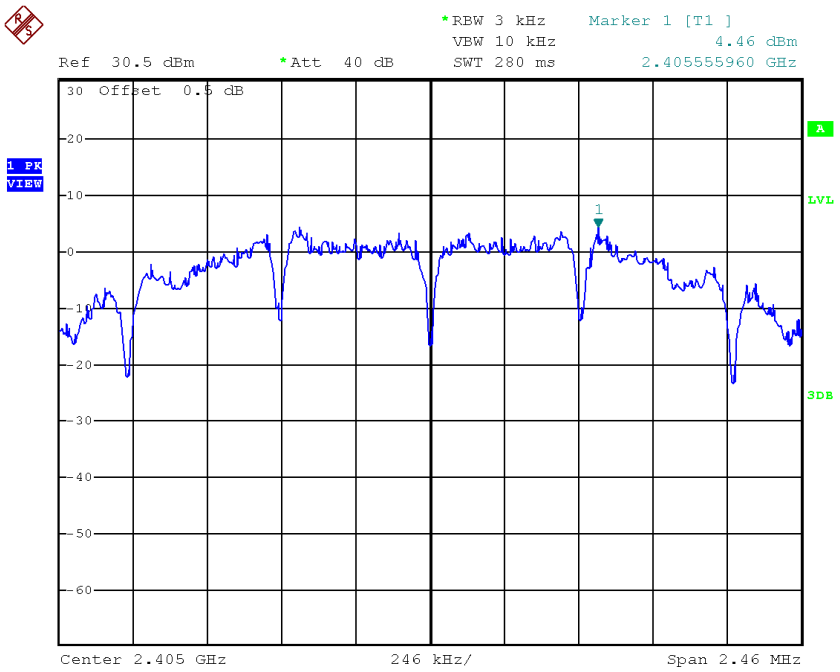
Highest channel



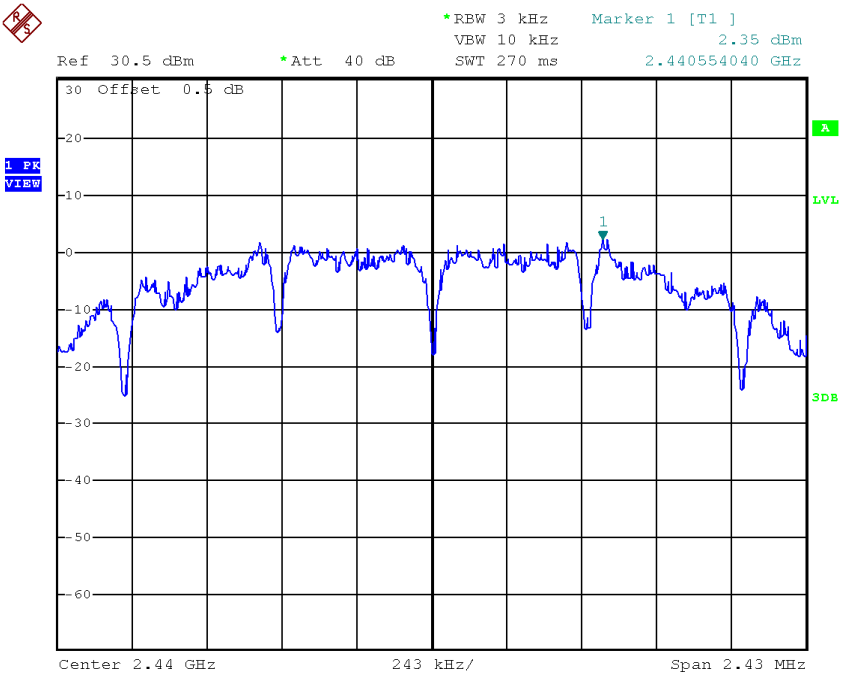
# TEST REPORT

## PLOTS OF POWER SPECTRAL DENSITY (3kHz RBW)

Lowest channel



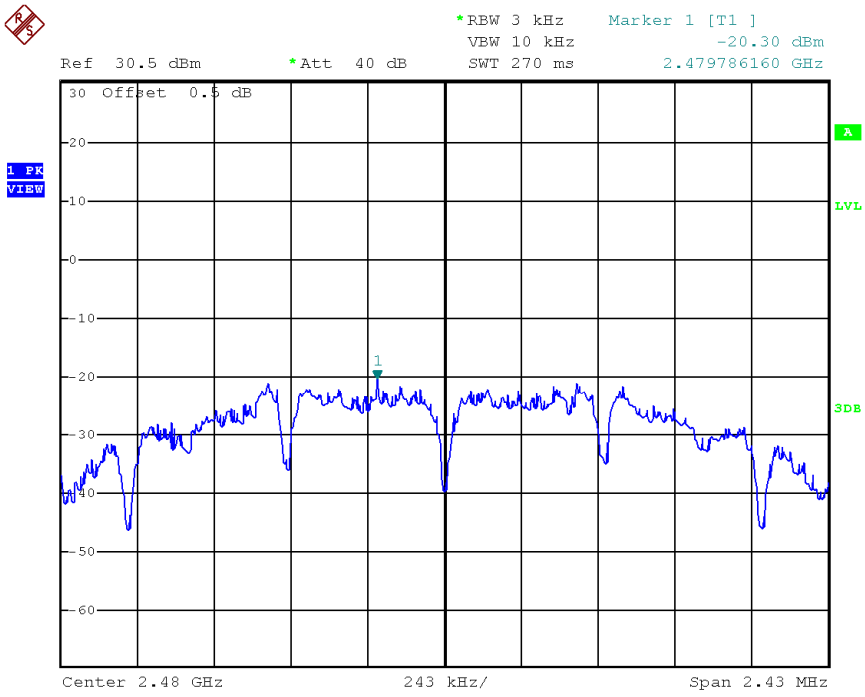

Middle channel



# 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 KDB558074 D01 v04 (05-April-2017) were used.

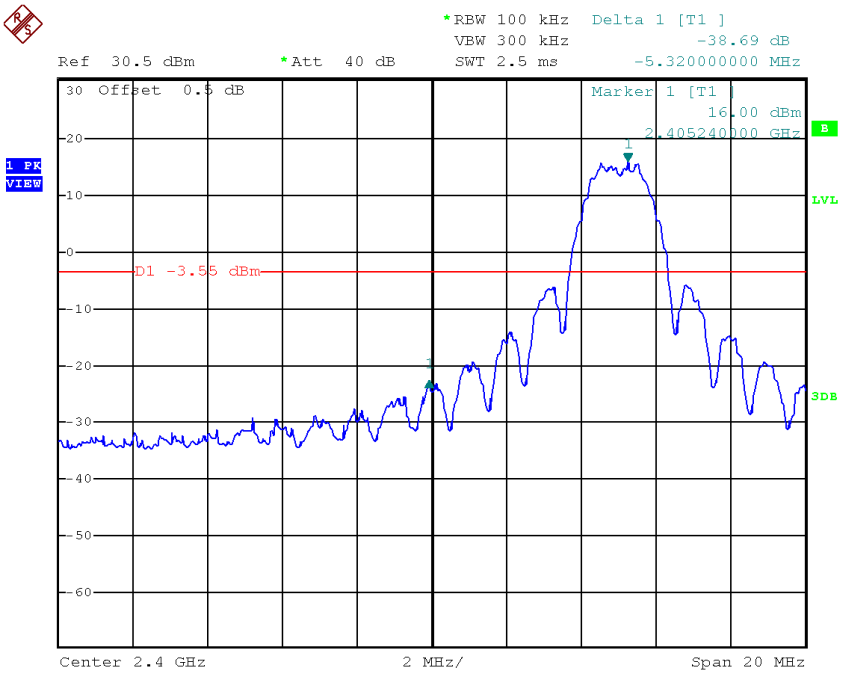
Furthermore, delta measurement technique for measuring bandedge emissions was incorporated in the test of the edge at 2483.5MHz.

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.

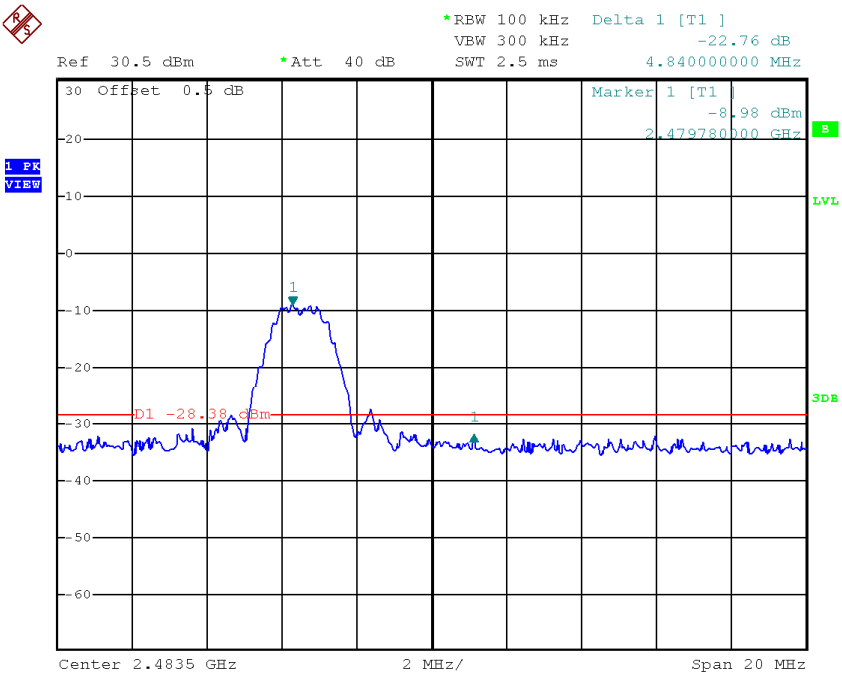
# TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Bandedge



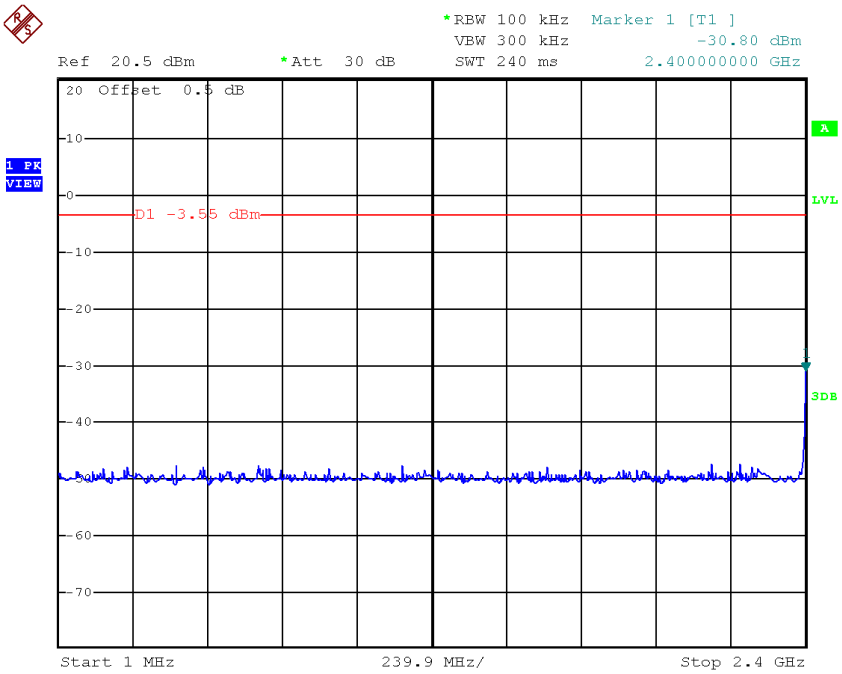

Highest Channel, Bandedge



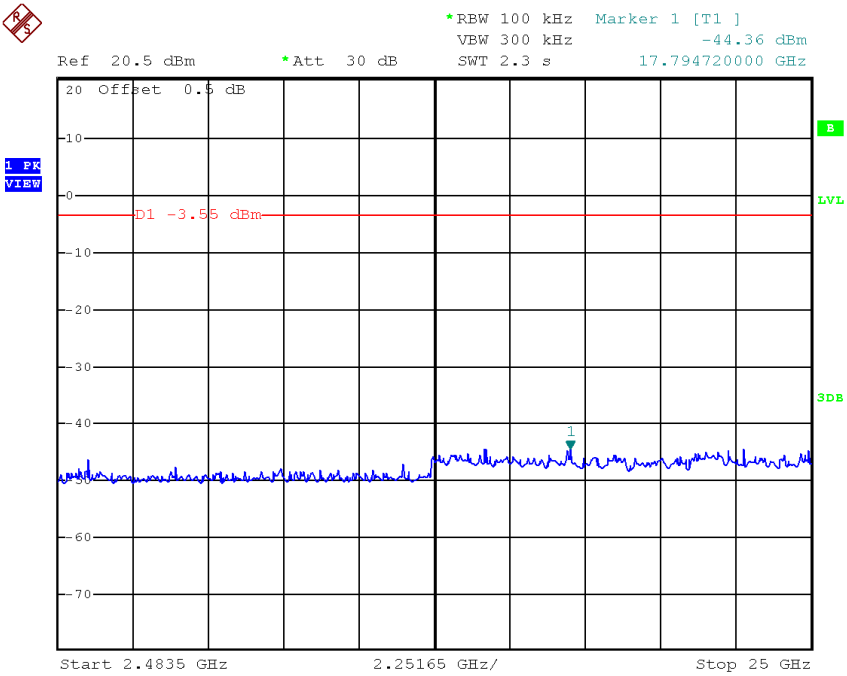
# TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Plot A



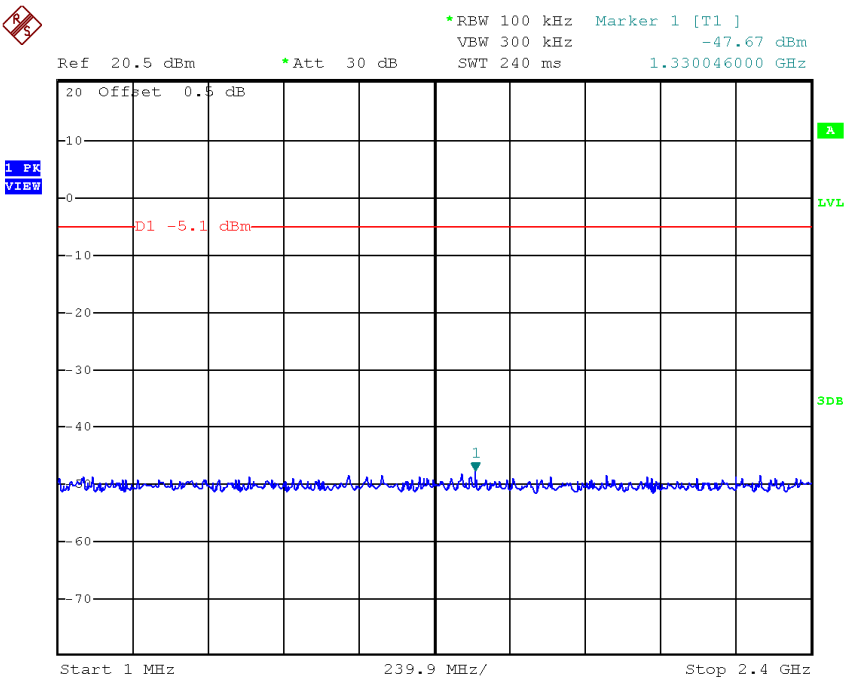

Lowest Channel, Plot B



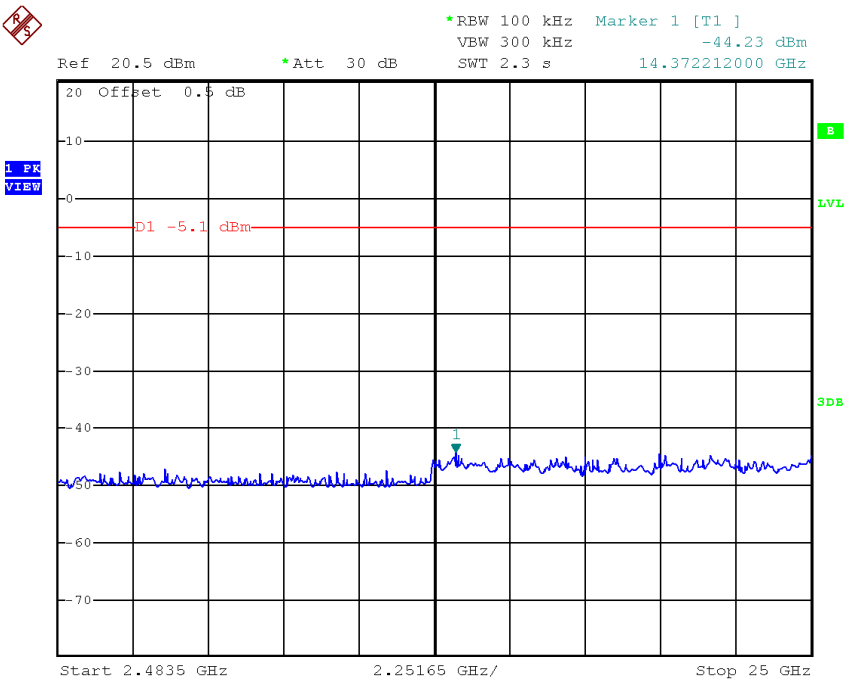
# TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, Plot A



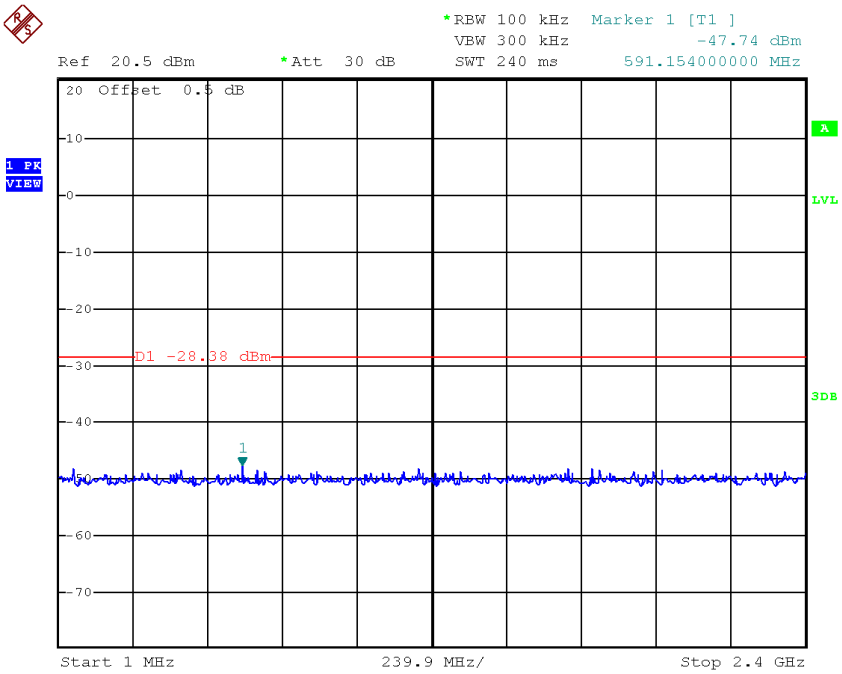

Middle Channel, Plot B



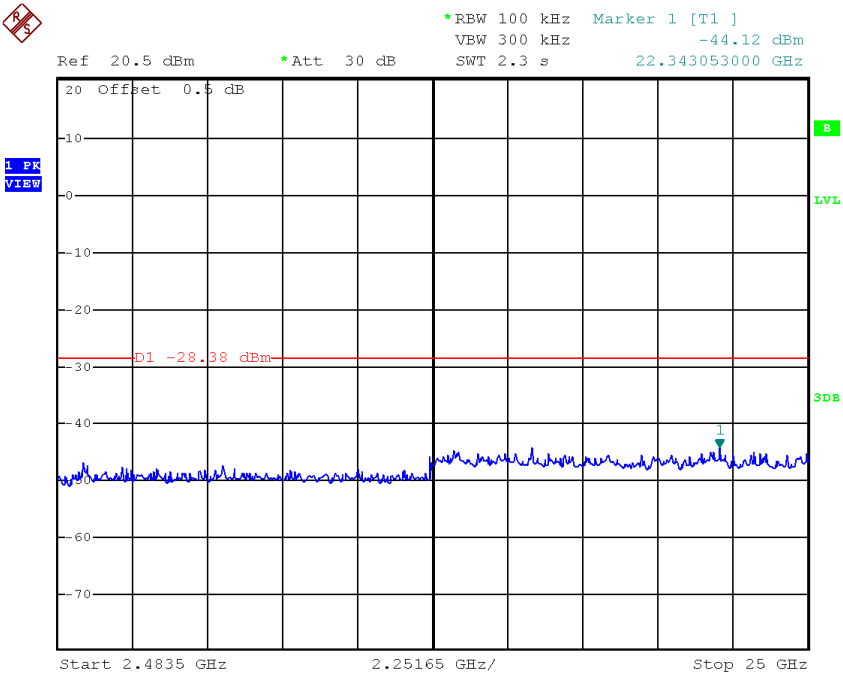
# TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, Plot A




Highest Channel, Plot B



## TEST REPORT

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

## TEST REPORT

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

2390.000 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 1.2 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 (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***2390.000*** | ***56.4*** | ***33*** | ***29.4*** | ***52.8*** | ***54.0*** | ***-1.2*** |
| ***H*** | ***4810.000*** | ***44.7*** | ***33*** | ***34.9*** | ***46.6*** | ***54.0*** | ***-7.4*** |
| ***H*** | ***12025.000*** | ***34.9*** | ***33*** | ***40.5*** | ***42.4*** | ***54.0*** | ***-11.6*** |

| 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*** | ***69.0*** | ***33*** | ***29.4*** | ***65.4*** | ***74.0*** | ***-8.6*** |
| ***H*** | ***4810.000*** | ***56.9*** | ***33*** | ***34.9*** | ***58.8*** | ***74.0*** | ***-15.2*** |
| ***H*** | ***12025.000*** | ***45.9*** | ***33*** | ***40.5*** | ***53.4*** | ***74.0*** | ***-20.6*** |

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 2440MHz

Table 2

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***4880.000*** | ***44.6*** | ***33*** | ***34.9*** | ***46.5*** | ***54.0*** | ***-7.5*** |
| ***H*** | ***7320.000*** | ***42.5*** | ***33*** | ***37.9*** | ***47.4*** | ***54.0*** | ***-6.6*** |
| ***H*** | ***12200.000*** | ***34.7*** | ***33*** | ***40.5*** | ***42.2*** | ***54.0*** | ***-11.8*** |

| 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*** | ***57.6*** | ***33*** | ***34.9*** | ***59.5*** | ***74.0*** | ***-14.5*** |
| ***H*** | ***7320.000*** | ***57.8*** | ***33*** | ***37.9*** | ***62.7*** | ***74.0*** | ***-11.3*** |
| ***H*** | ***12200.000*** | ***46.5*** | ***33*** | ***40.5*** | ***54.0*** | ***74.0*** | ***-20.0*** |

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 (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***2483.500*** | ***50.4*** | ***33*** | ***29.4*** | ***46.8*** | ***54.0*** | ***-7.2*** |
| ***H*** | ***4960.000*** | ***36.9*** | ***33*** | ***34.9*** | ***38.8*** | ***54.0*** | ***-15.2*** |
| ***H*** | ***7440.000*** | ***35.9*** | ***33*** | ***37.9*** | ***40.8*** | ***54.0*** | ***-13.2*** |
| ***H*** | ***12400.000*** | ***35.3*** | ***33*** | ***40.5*** | ***42.8*** | ***54.0*** | ***-11.2*** |

| 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*** | ***65.2*** | ***33*** | ***29.4*** | ***61.6*** | ***74.0*** | ***-12.4*** |
| ***H*** | ***4960.000*** | ***41.7*** | ***33*** | ***34.9*** | ***43.6*** | ***74.0*** | ***-30.4*** |
| ***H*** | ***7440.000*** | ***42.5*** | ***33*** | ***37.9*** | ***47.4*** | ***74.0*** | ***-26.6*** |
| ***H*** | ***12400.000*** | ***45.6*** | ***33*** | ***40.5*** | ***53.1*** | ***74.0*** | ***-20.9*** |

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 | 99.008 | 45.5 | 16 | 12.0 | 41.5 | 43.5 | -2.0 |
| V | 100.880 | 44.2 | 16 | 12.0 | 40.2 | 43.5 | -3.3 |
| V | 101.572 | 45.0 | 16 | 13.0 | 42.0 | 43.5 | -1.5 |
| H | 214.508 | 32.5 | 16 | 17.0 | 33.5 | 43.5 | -10.0 |
| H | 233.770 | 31.0 | 16 | 19.0 | 34.0 | 46.0 | -12.0 |
| H | 234.948 | 27.6 | 16 | 19.0 | 30.6 | 46.0 | -15.4 |

NOTES:
1. Quasi-Peak detector is used for the emission measurement.

2. 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.

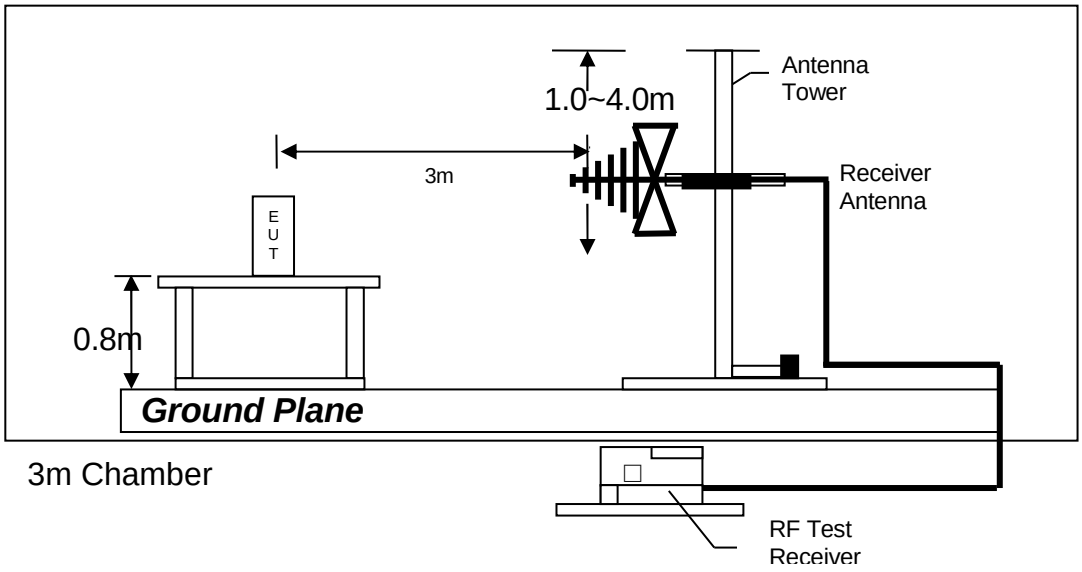
3. Negative value in the margin column shows emission below limit.

4. 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.

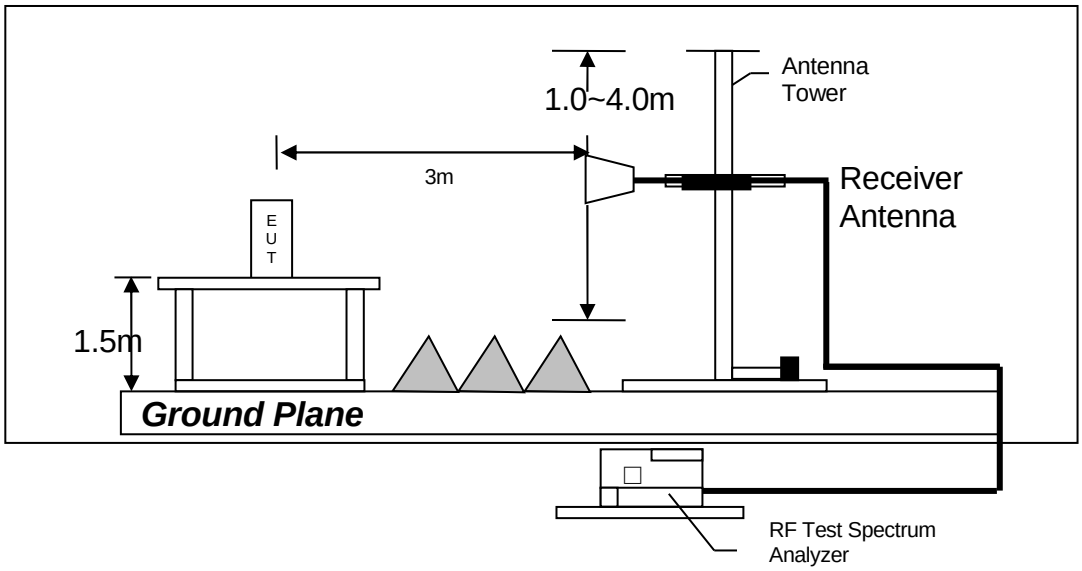
## TEST REPORT

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

1.271 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

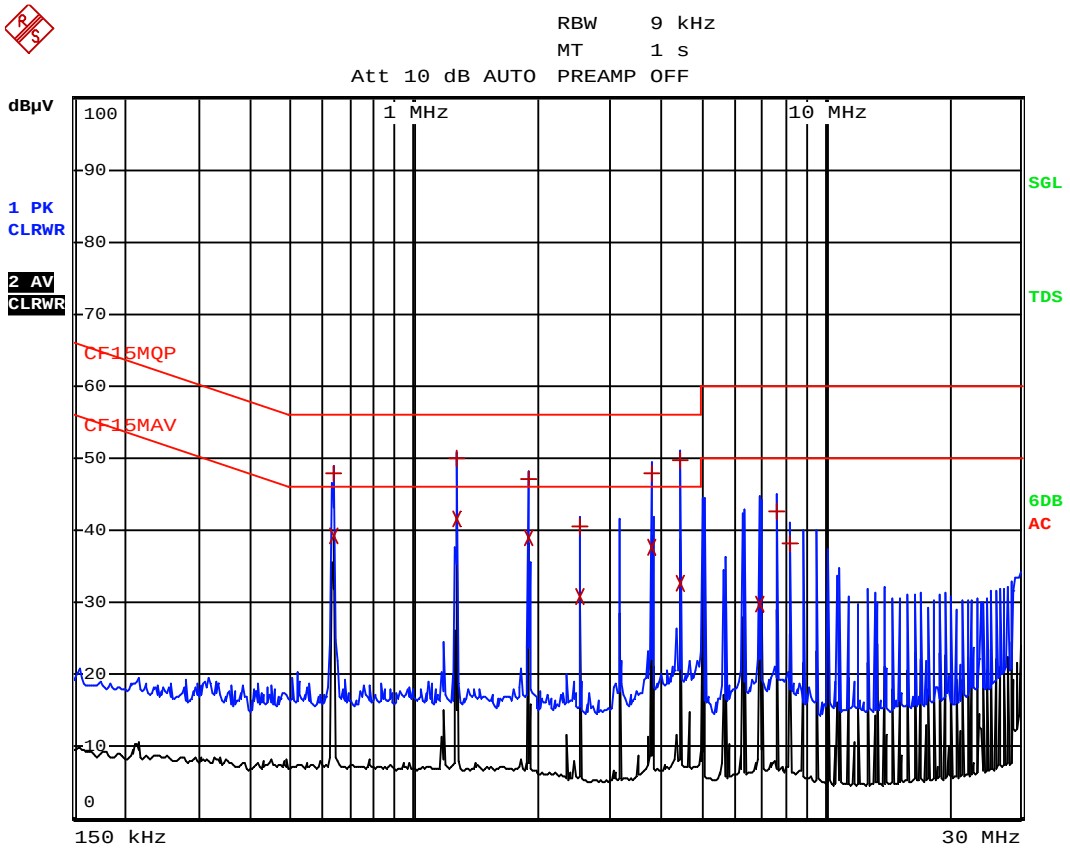
The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 4.5 dB margin compare with CISPR Average limit

# TEST REPORT

## AC POWER LINE CONDUCTED EMISSION

Worst Case: ZigBee Operating




Date: 23.FEB.2018 05:16:53

# TEST REPORT

Worst Case: ZigBee Operating

EDIT PEAK LIST (Final Measurement Results)

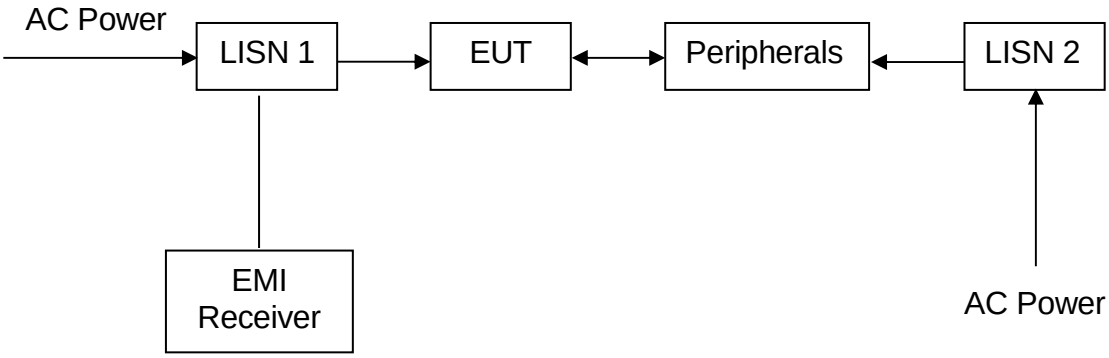
Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

| | TRACE | FREQUENCY | LEVEL dBµV | | DELTA LIMIT dB |
|---|---|---|---|---|---|
| 1 | Quasi Peak | 636 kHz | 47.83 | N | -8.16 |
| 2 | CISPR Average | 636 kHz | 39.19 | L1 | -6.80 |
| 1 | Quasi Peak | 1.2705 MHz | 49.93 | N | -6.06 |
| 2 | CISPR Average | 1.2705 MHz | 41.49 | L1 | -4.50 |
| 1 | Quasi Peak | 1.905 MHz | 47.20 | N | -8.80 |
| 2 | CISPR Average | 1.905 MHz | 38.93 | L1 | -7.06 |
| 1 | Quasi Peak | 2.5395 MHz | 40.62 | N | -15.37 |
| 2 | CISPR Average | 2.5395 MHz | 30.93 | N | -15.06 |
| 1 | Quasi Peak | 3.8085 MHz | 47.81 | L1 | -8.18 |
| 2 | CISPR Average | 3.8085 MHz | 37.59 | L1 | -8.40 |
| 2 | CISPR Average | 4.4385 MHz | 32.71 | L1 | -13.28 |
| 1 | Quasi Peak | 4.443 MHz | 49.78 | N | -6.21 |
| 2 | CISPR Average | 6.981 MHz | 29.81 | L1 | -20.19 |
| 1 | Quasi Peak | 7.6155 MHz | 42.68 | L1 | -17.31 |
| 1 | Quasi Peak | 8.2545 MHz | 38.05 | L1 | -21.94 |

Date: 23.FEB.2018 05:16:32

## TEST REPORT

4.7.3 Conducted Emission Test Setup

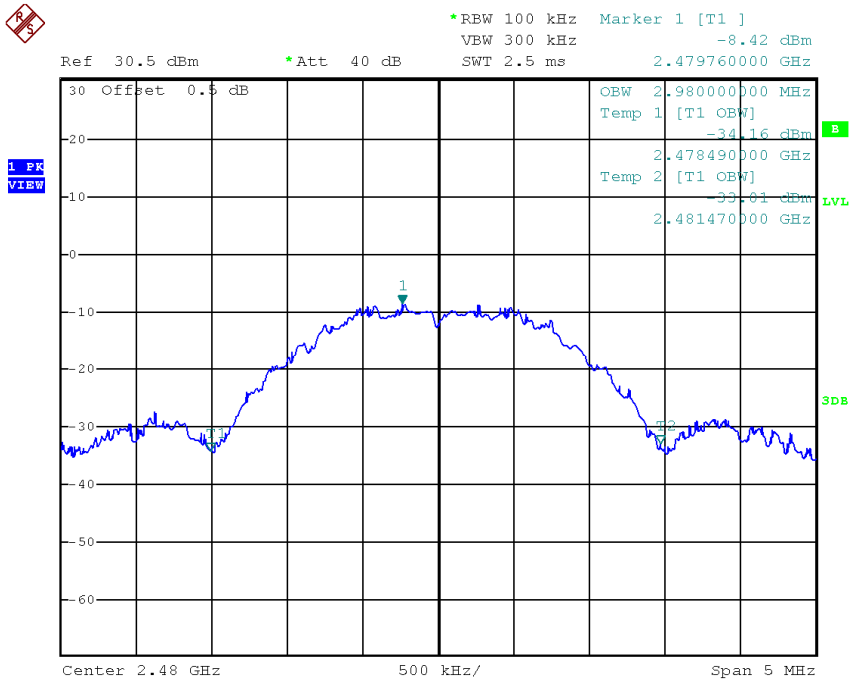


# TEST REPORT

Occupied Bandwidth Results: (ZigBee)

| (ZigBee) | Occupied Bandwidth (MHz) |
|---|---|
| Low Channel: 2405MHz | 2.46 |
| Middle Channel: 2440MHz | 2.42 |
| High Channel: 2480MHz | 2.98 |

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 | BICONICAL ANTENNA | LOG PERIODIC ANTENNA |
|---|---|---|---|
| Registration No. | EW-2500 | EW-2512 | EW-1042 |
| Manufacturer | ROHDESCHWARZ | EMCO | EMCO |
| Model No. | ESCI | 3104C | 3148 |
| Calibration Date | Oct. 13, 2017 | Nov. 16, 2016 | Jun. 19, 2017 |
| Calibration Due Date | Oct. 13, 2018 | May. 16, 2018 | Dec. 19, 2018 |

| EQUIPMENT | SPECTRUM ANALYZER | Pyramidal Horn Antenna | DOUBLE RIDGED GUIDE ANTENNA |
|---|---|---|---|
| Registration No. | EW-2253 | EW-0905 | EW-1015 |
| Manufacturer | ROHDESCHWARZ | EMCO | EMCO |
| Model No. | FSP40 | 3160-09 | 3115 |
| Calibration Date | Jul. 24, 2017 | Aug. 18, 2017 | Nov. 17, 2017 |
| Calibration Due Date | Jul. 24, 2018 | Feb. 18, 2019 | May. 17, 2019 |

| Equipment | Active Loop H-field (9kHz to 30MHz) | RF Cable 9kHz to 1000MHz | RF Cable 14m (1GHz to 26.5GHz) |
|---|---|---|---|
| Registration No. | EW-3326 | EW-3170 | EW-2781 |
| Manufacturer | EMCO | N/A | GREATBILLION |
| Model No. | 6502 | 9kHz to 1000MHz | SMA m/SHF5MPU /SMA m ra14m,26G |
| Calibration Date | Sep. 27, 2017 | Mar. 20, 2017 | Sep. 25, 2017 |
| Calibration Due Date | Mar. 27, 2019 | Mar. 20, 2018 | Sep. 25, 2018 |

| Equipment | RF PRE-AMPLIFIER 3 PCS (9KHZ TO 40GHZ) | Notch Filter (cutoff frequency 2.4GHz to 2.5GHz) |
|---|---|---|
| Registration No. | EW-3006 | EW-2213 |
| Manufacturer | SCHWARZBECK | MICROTRONICS |
| Model No. | BBV 9718 | BRM50701-02 |
| Calibration Date | Mar. 23, 2017 | May. 26, 2017 |
| Calibration Due Date | Mar. 23, 2018 | May. 26, 2018 |

## TEST REPORT

2) Conducted Emissions Test

| Equipment | RF Power Meter with Power Sensor (N1921A) | RF Cable (up to 40GHz) 1.5m length | SPECTRUM ANALYZER |
|---|---|---|---|
| Registration No. | EW-2270 | EW-3104 | EW-2253 |
| Manufacturer | AGILENTTECH | N/A | ROHDESCHWARZ |
| Model No. | N1911A | SMA-M to SMA-M | FSP40 |
| Calibration Date | Jan. 15, 2018 | Feb. 28, 2017 | Jul. 24, 2017 |
| Calibration Due Date | Jan. 15, 2019 | Feb. 28, 2018 | Jul. 24, 2018 |

3) Bandedge/Bandwidth Measurement

| EQUIPMENT | RF Cable (up to 40GHz) 1.5m length | SPECTRUM ANALYZER |
|---|---|---|
| Registration No. | EW-3104 | EW-2253 |
| Manufacturer | N/A | ROHDESCHWARZ |
| Model No. | SMA-M to SMA-M | FSP40 |
| Calibration Date | Feb. 28, 2017 | Jul. 24, 2017 |
| Calibration Due Date | Feb. 28, 2018 | Jul. 24, 2018 |

## TEST REPORT

4) Conducted Emissions Test

| Equipment | EMI Test Receiver | RF Cable 9kHz to 1000MHz | Artificial Mains Network |
|---|---|---|---|
| Registration No. | EW-2500 | EW-3170 | EW-0192 |
| Manufacturer | ROHDESCHWARZ | N/A | ROHDESCHWARZ |
| Model No. | ESCI | 9kHz to 1000MHz | ESH3-Z5 |
| Calibration Date | Oct. 13, 2017 | Mar. 20, 2017 | Oct. 27, 2017 |
| Calibration Due Date | Oct. 13, 2018 | Mar. 20, 2018 | Aug. 25, 2018 |

- End of Report -