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TEST REPORT

Report Number: 19060256HKG-001

Application for Original Grant of 47 CFR Part 15 Certification

Single New of RSS-247 Issue 2 Equipment

Modular Approval

Transceiver

FCC ID: 2ATBKDSMPSDR

IC: 25067-DSMPSDR

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 Ltd. Wong Kwok Yeung, Kenneth Senior Lead Engineer Date: June 11, 2019

TEST REPORT

GENERAL INFORMATION

Applicant Name:	Xenon Electronics Limited
Applicant Address:	719 Woldwide Ind. Centre, 43-47 Shan Mei St., Fotan, Hong Kong.
FCC Specification Standard:	FCC Part 15, October 1, 2017 Edition
FCC ID:	2ATBKDSMPSDR
FCC Model(s):	DSMPSDRH001
IC Specification Standard:	RSS-247 Issue 2, February 2017 RSS-Gen Issue 5 Amendment 1, March 2019
IC:	25067-DSMPSDR
HVIN:	DSMPSDRH001
PMN:	DSMPSDR
Type of EUT:	Transceiver
Description of EUT:	2.4GHz Frequency Hopping GFSK Module
Serial Number:	N/A
Sample Receipt Date:	June 06, 2019
Date of Test:	June 06, 2019 to June 11, 2019
Report Date:	June 11, 2019
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.

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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	7.1.2#	Pass	2.1
Max. Conducted Output Power	15.247(b)(1) & (4)	5.4(2)	Pass	4.1
Max. 20dB RF Bandwidth	15.247(a)(1)(iii)	5.1(1)	N/A	4.2
Min. No. of Hopping Frequencies	15.247(a)(1)(iii)	5.1(4)	Pass	4.3
Min. Hopping Channel Carrier Frequency Separation	15.247(a)(1)	5.1(2)	Pass	4.4
Average Time of Occupancy	15.247(a)(1)(iii)	5.1(4)	Pass	4.5
Out of Band Antenna Conducted Emission	15.247(d)	5.5	Pass	4.6
Radiated Emission in Restricted Bands and Spurious Emissions	15.247(d), 15.209 & 15.109	5.5	Pass	4.8
AC Power Line Conducted Emission	15.207 & 15.107	7.2.4#	Pass	4.9

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 standards:

FCC Part 15, October 1, 2017 Edition
RSS-247 Issue 2, February 2017
RSS-Gen Issue 5 Amendment 1, March 2019

TEST REPORT

2.0 GENERAL DESCRIPTION

2.1 Product Description

The Equipment Under Test (EUT) is a 2.4GHz Frequency Hopping GFSK Module Transceiver. It operates in frequency range of 2402MHz to 2478MHz with 2MHz channel spacing. There are total 23 hopping channels in normal operation. It is intended to be used as short-range radio communication for embedded application inside a host. The EUT is powered by the host (3.3VDC).

The antenna used in the EUT is integral Monopole Antenna (1.5dBi), and the test sample is a prototype.

The circuit description and frequency hopping algorithm are attached in the Appendix and saved with filename: descri.pdf.

2.2 Test Methodology

Both AC power line-conducted and radiated emission measurements was performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in Open Area 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 FCC Public Notice DA 00-705 (30-Mar-2000). All other measurements were made in accordance with the procedures in 47 CFR Part 2.

2.3 Test Facility

The radiated emission test site, AC power line conducted measurement facility and antenna port conducted measurement facility used to collect the radiated data, AC Power Line conducted data, and conductive data are at Intertek Testing Services Hong Kong Ltd., which is located 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 FCC and Industry Canada No. 2042H.

TEST REPORT

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 DC 3.3V and tested on the test-jig provided by the applicant

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable at 0.8m height from the ground plane for emission testing at or below 1GHz and 1.5m for emission measurements above 1GHz. If the base unit attached to peripherals, they were connected and operational (as typical as possible). The parent unit was remotely located as far from the antenna and the base as possible to ensure full power transmission from the parent unit. Else, the base was wired to transmit full power with modulation.

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.

For transmitter radiated measurement, the spectrum analyzer resolution bandwidth was 100 kHz for frequencies below 1000 MHz. The resolution bandwidth was 1 MHz for frequencies above 1000 MHz.

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. Receiver was performed from 30MHz to the fifth harmonic of the highest frequency or 40GHz, whichever is lower.

TEST REPORT

3.1 Justification - Cont'd

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. Digital circuitry used to control additional functions other than the operation of the transmitter is subject to FCC Part Section 15.109 Limits.

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 4.3.4.

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 4.3.4. With the resolution bandwidth 1MHz 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.

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 used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

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3.3 Details of EUT and Description of Accessories

Details of EUT:

(1) The EUT is powered by DC 3.3V

Description of Accessories:

(1) 1 x test jig (Provided by Applicant)

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.

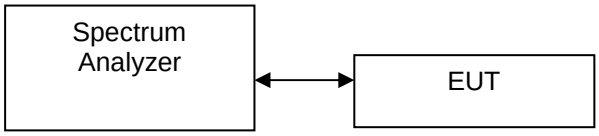
Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

TEST REPORT

4.0 TEST RESULTS

RF Conducted measurement Test Setup by a Spectrum Analyzer.

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



4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

☐ 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 obtain power at the EUT antenna terminals.

☒ The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for RBW>20dB bandwidth and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

Antenna Gain = 1.5 dBi

Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2402	10.35	10.84
Middle Channel: 2440	10.66	11.64
High Channel: 2478	8.28	6.73

Cable loss : 0.5 dB External Attenuation : 0 dB

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

dBm max. output level = 10.66 dBm

Limits:
☒ 0.125W (21dBm) for antennas with gains of 6dBi or less

☐ 0.25W (24dBm) for antennas with gains of 6dBi or less

☐ 1W (30dBm) for antennas with gains of 6dBi or less

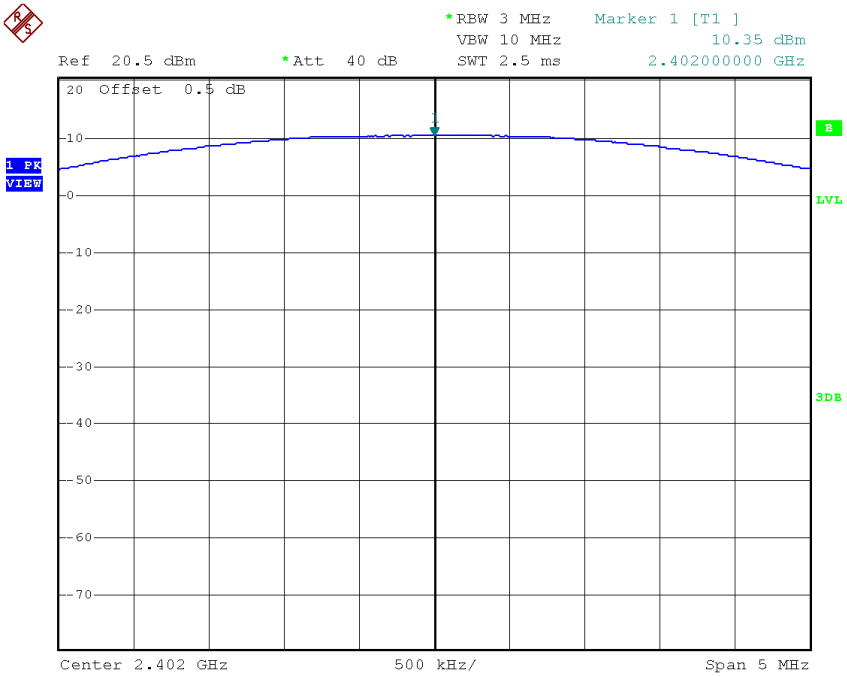
☐ ___W (___dBm) for antennas with gains more than 6dBi

The plots of conducted output power are saved as below.

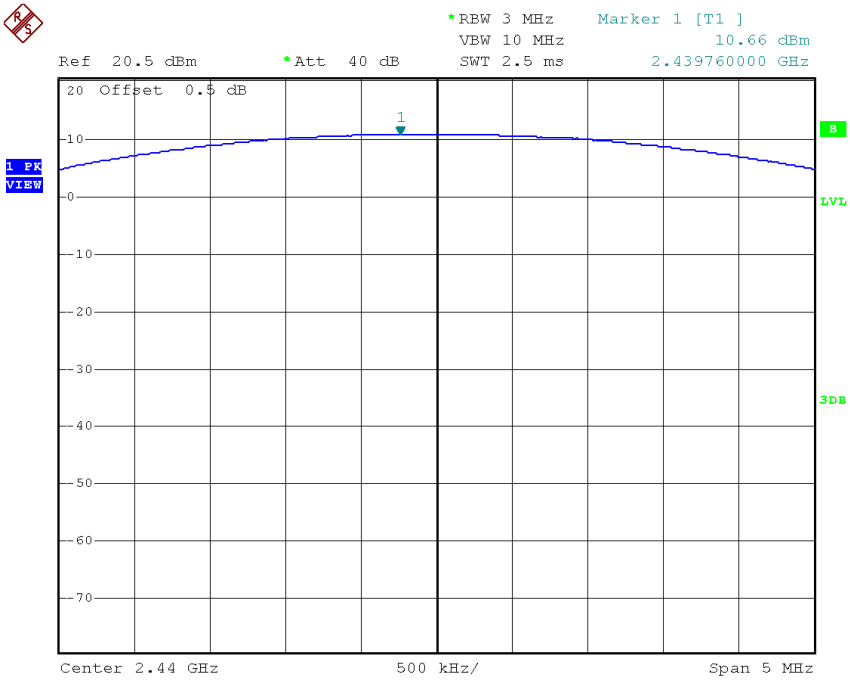
TEST REPORT

PLOTS OF CONDUCTED OUTPUT POWER

Lowest Channel



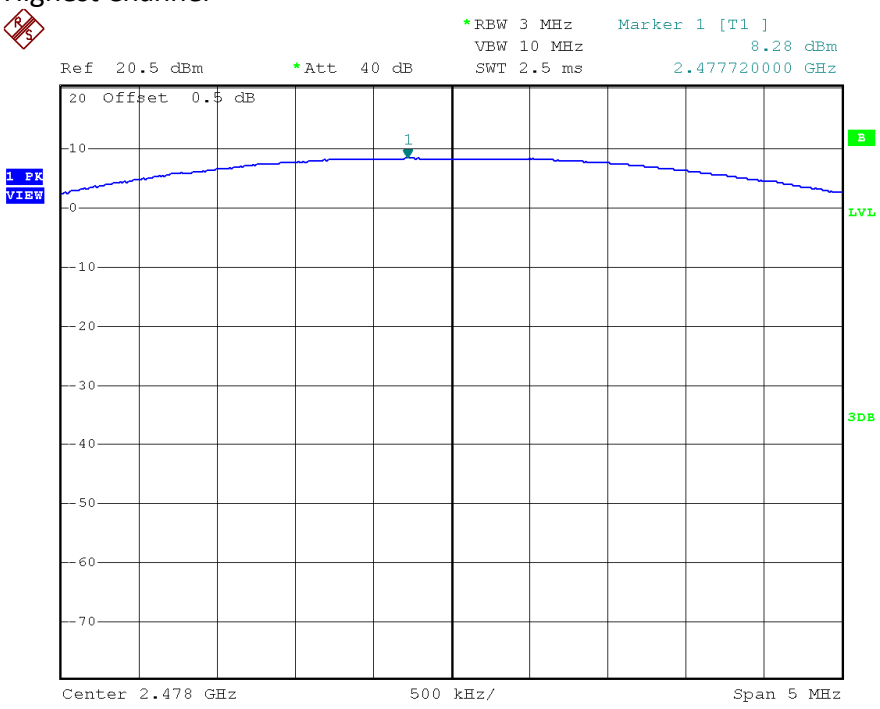
Middle Channel



TEST REPORT

PLOTS OF CONDUCTED OUTPUT POWER

Highest Channel



TEST REPORT

4.2 Maximum 20 dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was chosen so that the display was a result of the hopping channel modulation. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level. The 20 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	20 dB Bandwidth (kHz)
Low Channel: 2402	1128
Middle Channel: 2440	1128
High Channel: 2478	1128

Limits

☐ ≤500kHz for 902-928MHz

☒ N/A for 2400-2483.5MHz

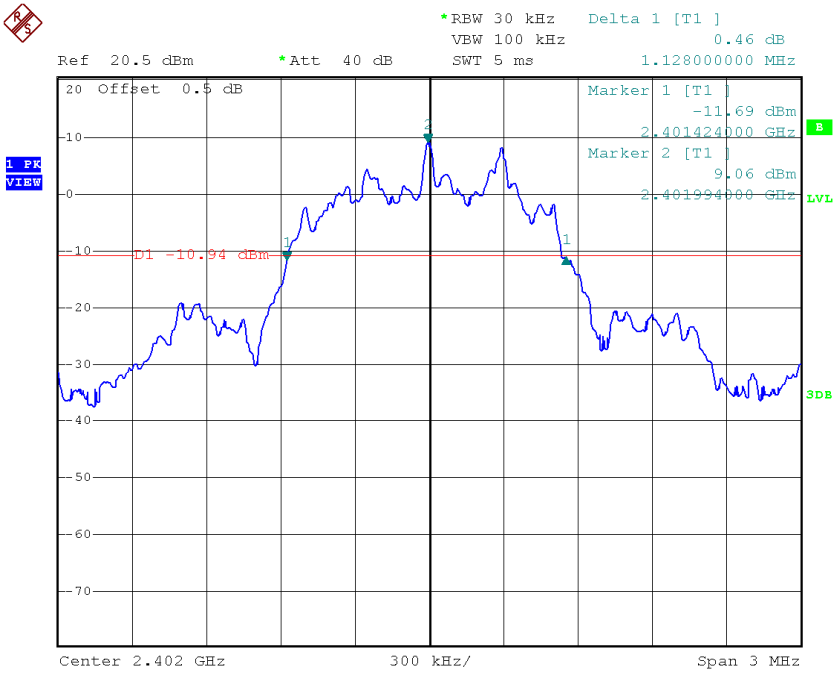
☐ ≤1MHz for 5725-5850MHz

The plots of 20dB RF bandwidth are saved as below.

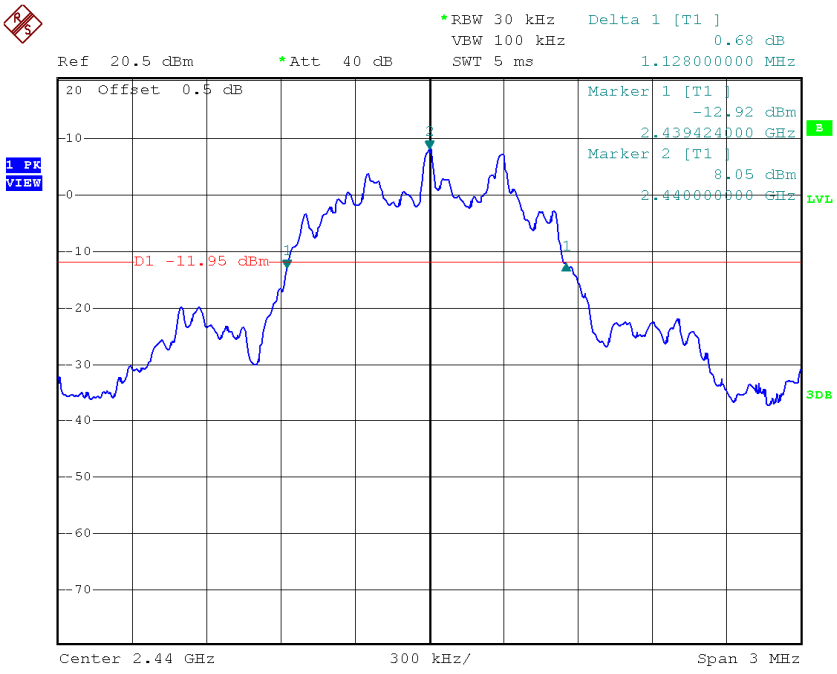
TEST REPORT

PLOTS OF 20dB RF BANDWIDTH

Lowest Channel



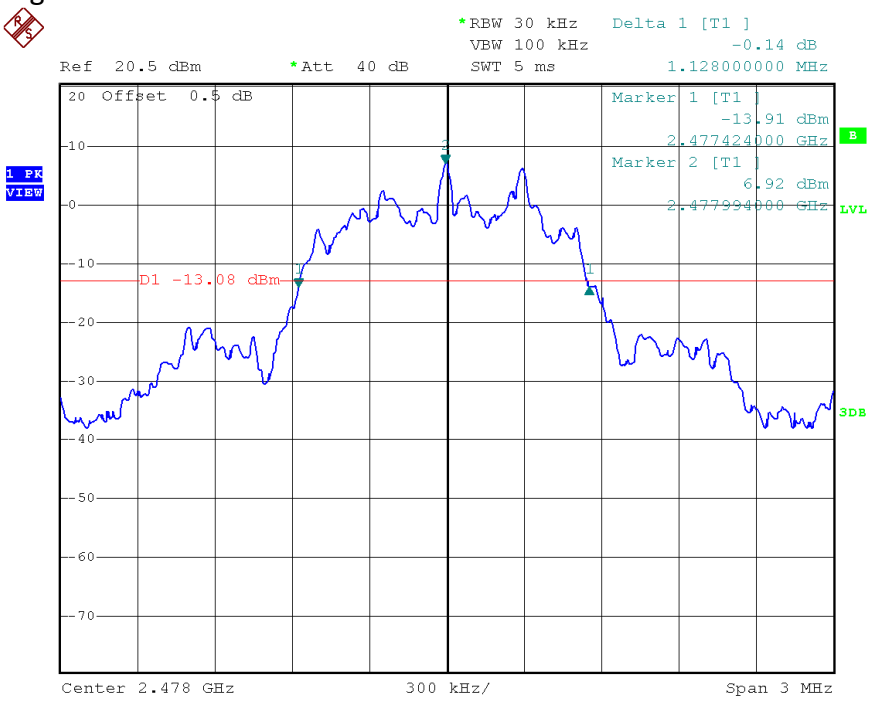
Middle Channel



TEST REPORT

PLOTS OF 20dB RF BANDWIDTH

Highest Channel



TEST REPORT

4.3 Minimum Number of Hopping Frequencies

With the analyzer set to MAX HOLD readings were taken for 2-3 minutes in each band. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

No. of Hopping Channels	23

Minimum Requirements:

☐ at least 50 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel < 250kHz)

☐ at least 25 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel ≥ 250kHz)

☒ at least 15 hopping channels for 2400MHz-2483.5MHz.

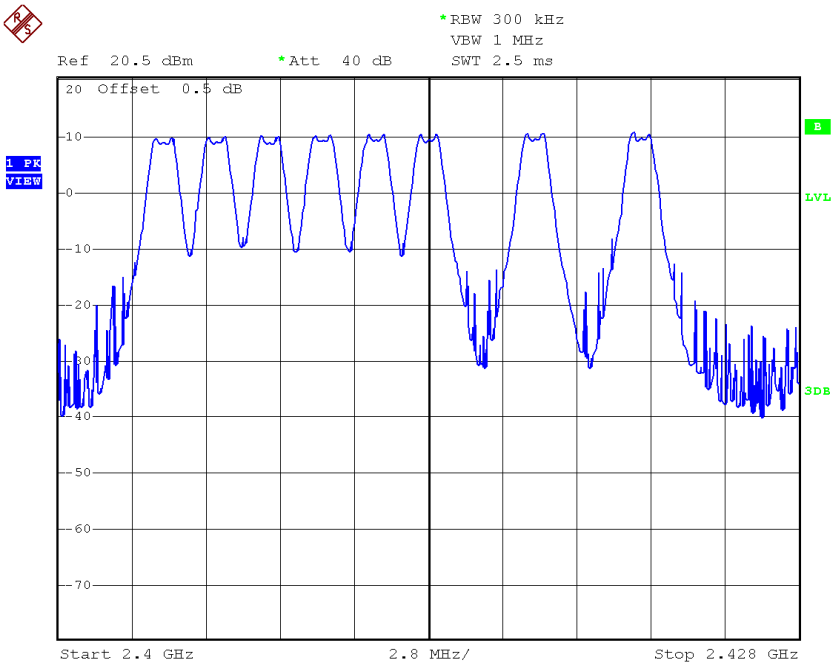
☐ at least 75 hopping channels for 5725MHz-5850MHz.

The plots of number of hopping frequencies are saved as below.

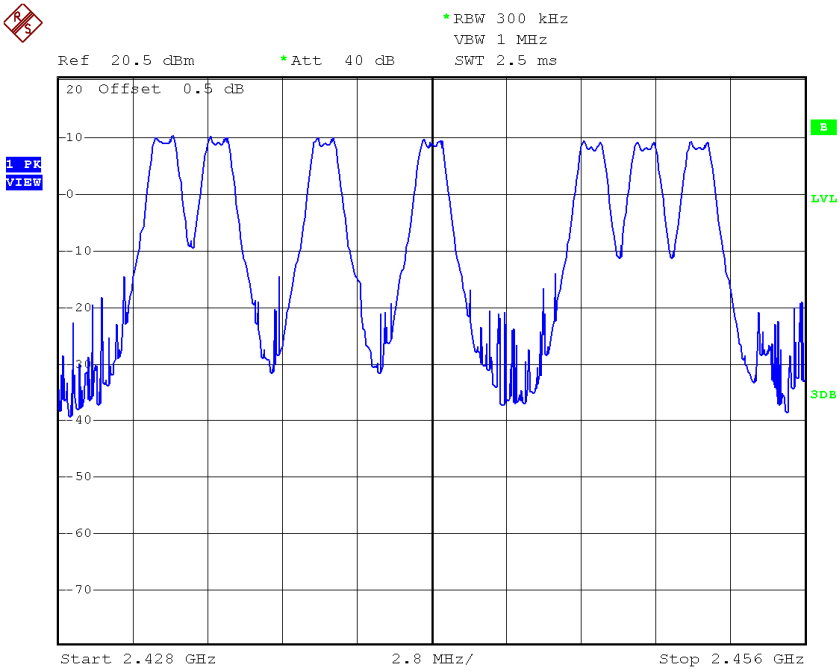
TEST REPORT

PLOTS OF NUMBER OF HOPPING FREQUENCIES

Lowest Channel



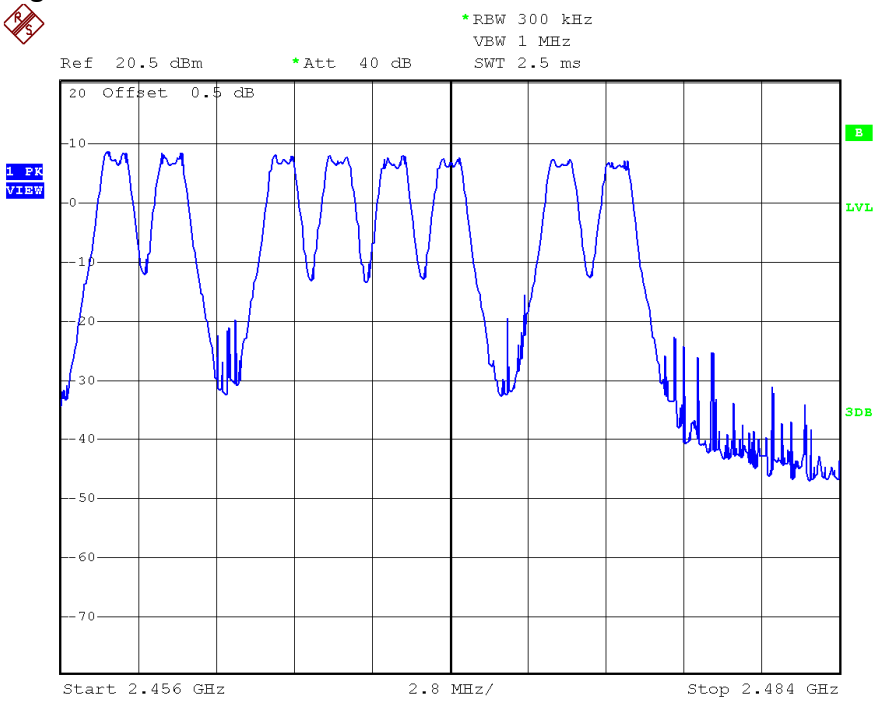
Middle Channel



TEST REPORT

PLOTS OF NUMBER OF HOPPING FREQUENCIES

Highest Channel



TEST REPORT

4.4 Minimum Hopping Channel Carrier Frequency Separation

Using the DELTA MARKER function of the analyzer, the frequency separation between two adjacent channels was measured and met the requirement.

Channel Separation (Channel 1 and Channel 2)	2000kHz

Limits:
The channel separation must be larger than:

☐ 25 kHz

☐ 20 dB bandwidth of hopping channel: ___Hz

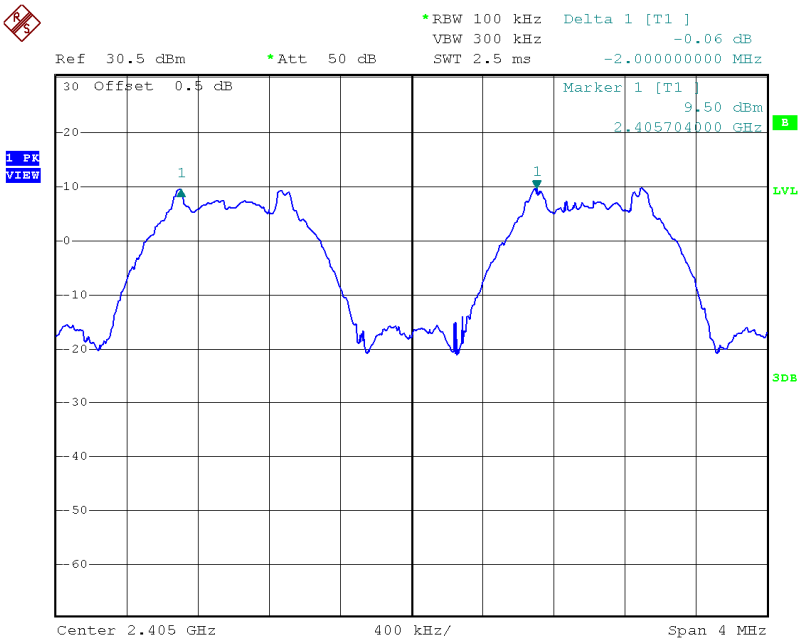
☒ 2/3 of 20dB bandwidth of hopping channel: 752 kHz

The plot(s) of hopping channel carrier frequency separation is saved as below.

TEST REPORT

PLOTS OF HOPPING CHANNEL CARRIER FREQUENCY SEPARATION

Between Channel 1 and Channel 2



TEST REPORT

4.5 Average Channel Occupancy Time

The spectrum analyzer center frequency was set to one of the known hopping channels. The SWEEP was set to 1ms, the SPAN was set to ZERO SPAN, and the TRIGGER was set to VIDEO. The time duration of the transmission so captured was measured with the MARKER DELTA function.

The SWEEP was then set to the time required by the regulation (20 seconds for 902-928 MHz devices, if the 20dB bandwidth is less than 250kHz, 10 seconds for 902-928 MHz if the 20dB bandwidth is or greater than 250kHz, "0.4 seconds x Number of hopping channels employed" seconds for 2400-2483.5 MHz, 30 seconds for 5725-5850 MHz). The analyzer was set to SINGLE SWEEP, the total ON time was added and compared against the limit (0.4 seconds).

Average Occupancy Time	
Number of hops in 9.2s = 73 Single pulse width = 1.5 ms Average Occupancy Time = 1.5 ms X 73	0.1095 s

Limits:
Average 0.4 seconds maximum occupancy in:

☒ 9.2 seconds (0.4 sec. x 23) for 2400MHz-2483.5MHz
(Traffic – in a clear RF environment)

☐ 20 seconds for 902MHz-928MHz ≥ 50 hopping channels

☐ 10 seconds for 902MHz-928MHz ≥ 25 hopping channels

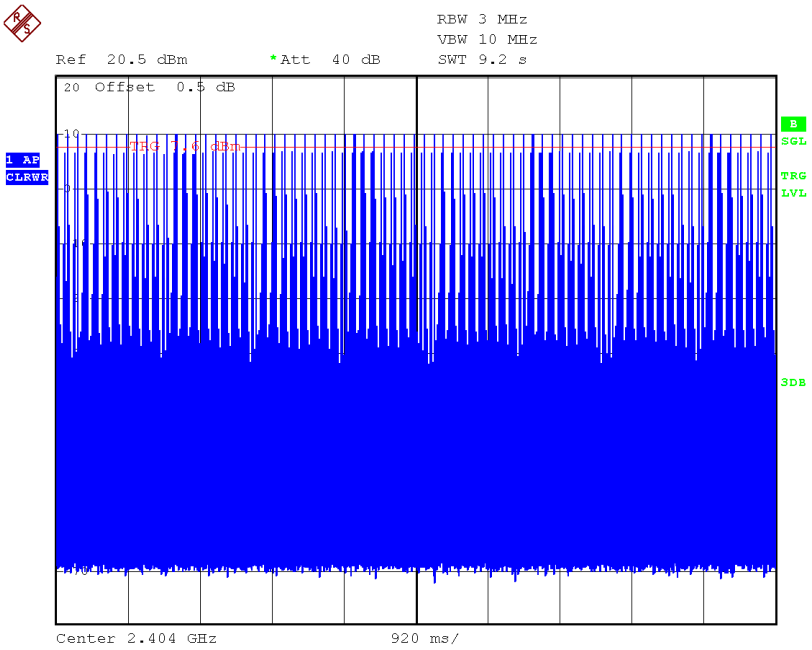
☐ 30 seconds for 5725-5850MHz

The plots of average channel occupancy time are saved as below.

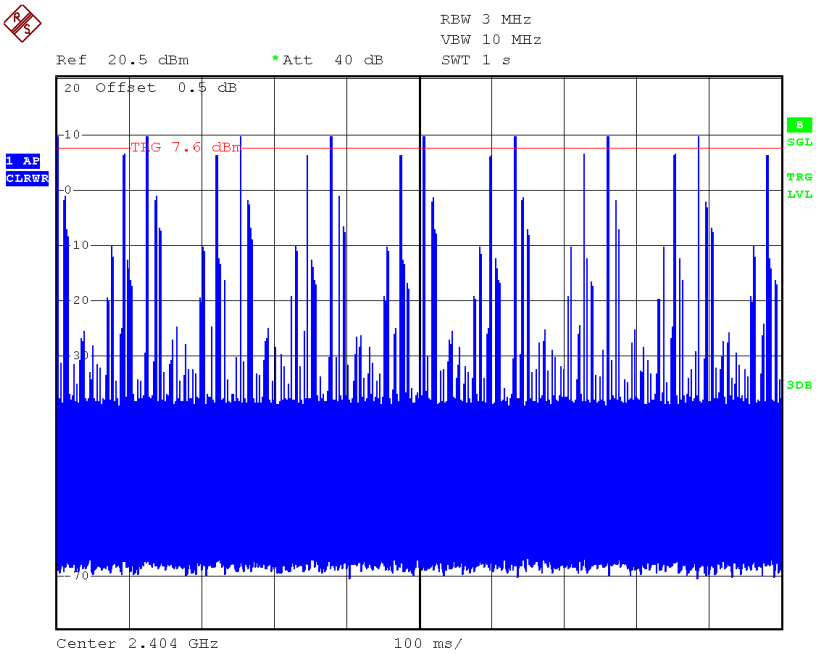
TEST REPORT

PLOTS AVERAGE CHANNEL OCCUPANCY TIME

Plot A



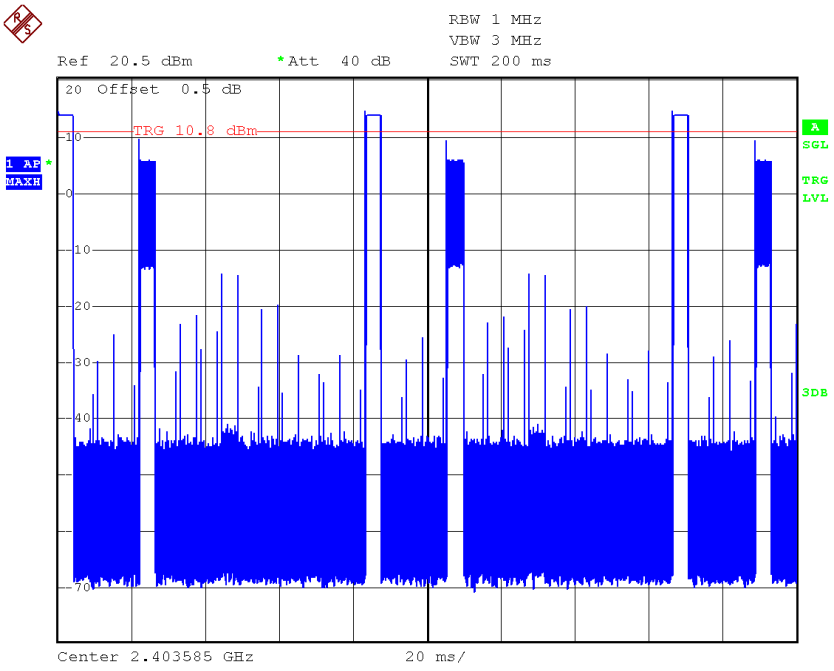
Plot B



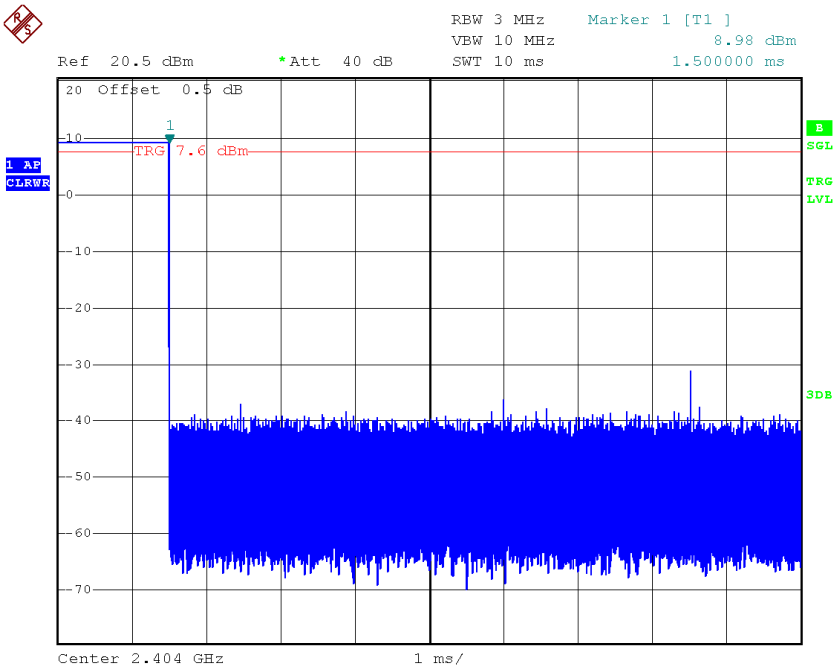
TEST REPORT

PLOTS AVERAGE CHANNEL OCCUPANCY TIME

Plot C



Plot D



TEST REPORT

4.6 Out of Band Conducted Emissions

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

The plot(s) of bandedge compliance is shown the worst-case which has been already considered between enable and disable the hopping function of the EUT.

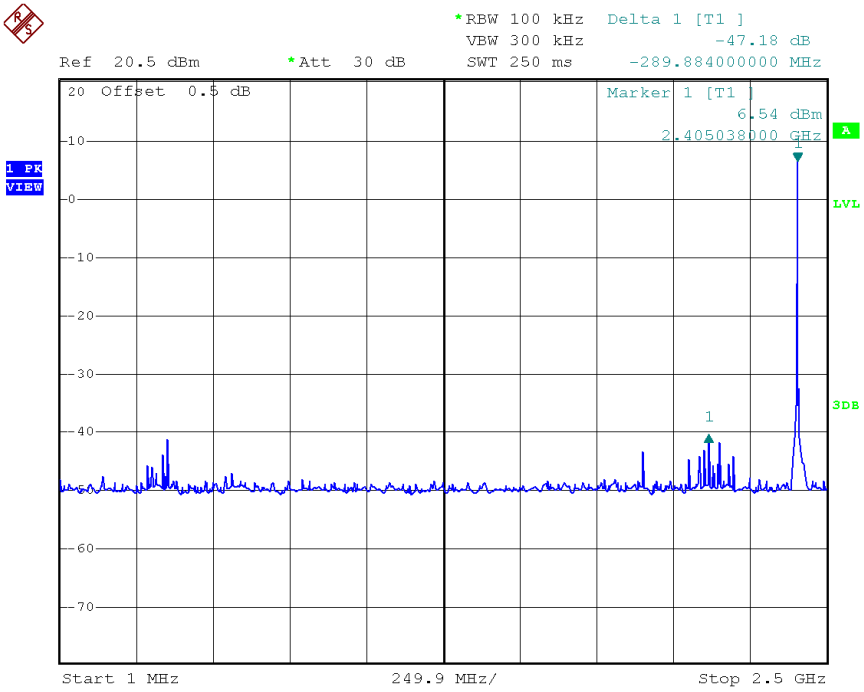
Limits:
All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The plots of out of band conducted emissions are saved as below.

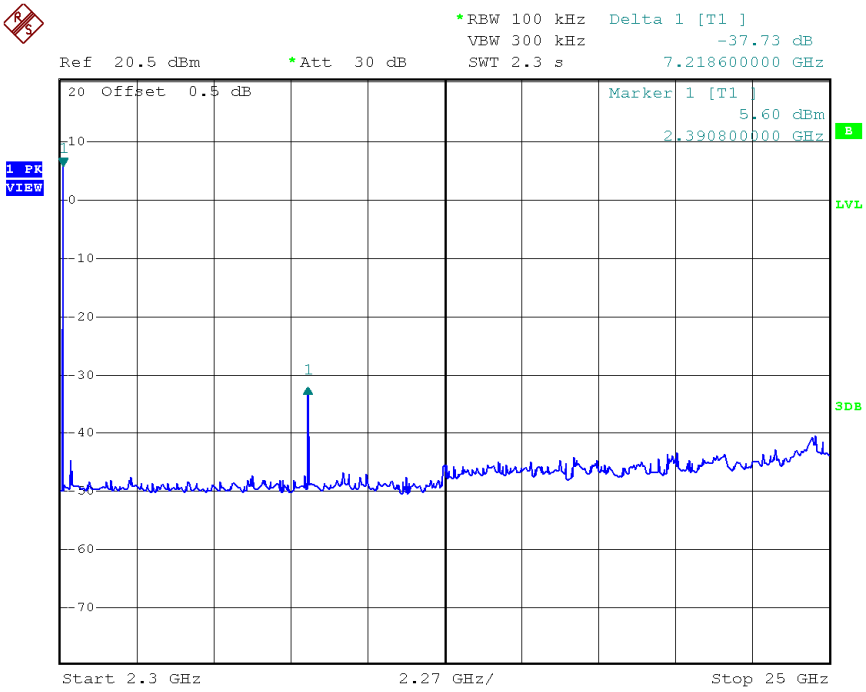
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Plot 1



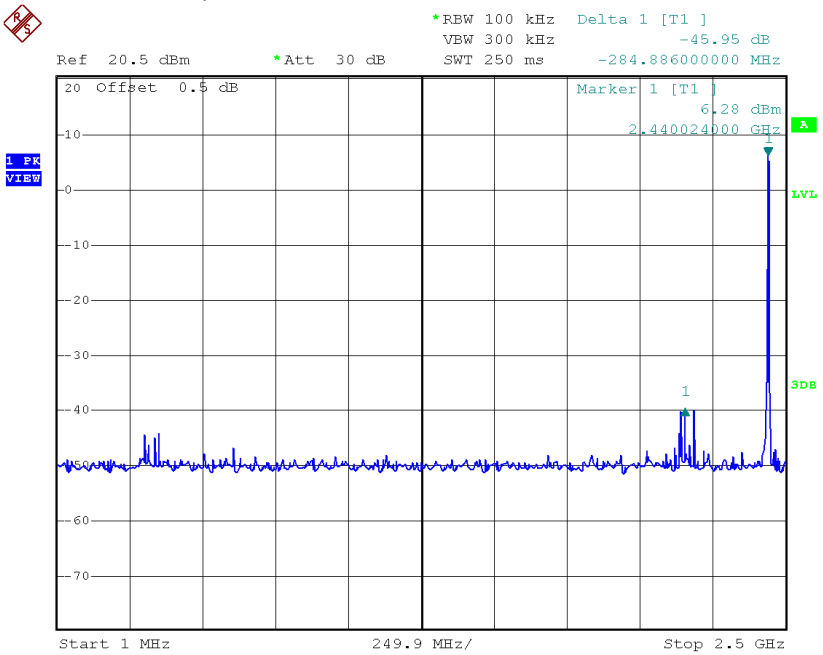
Lowest Channel, Plot 2



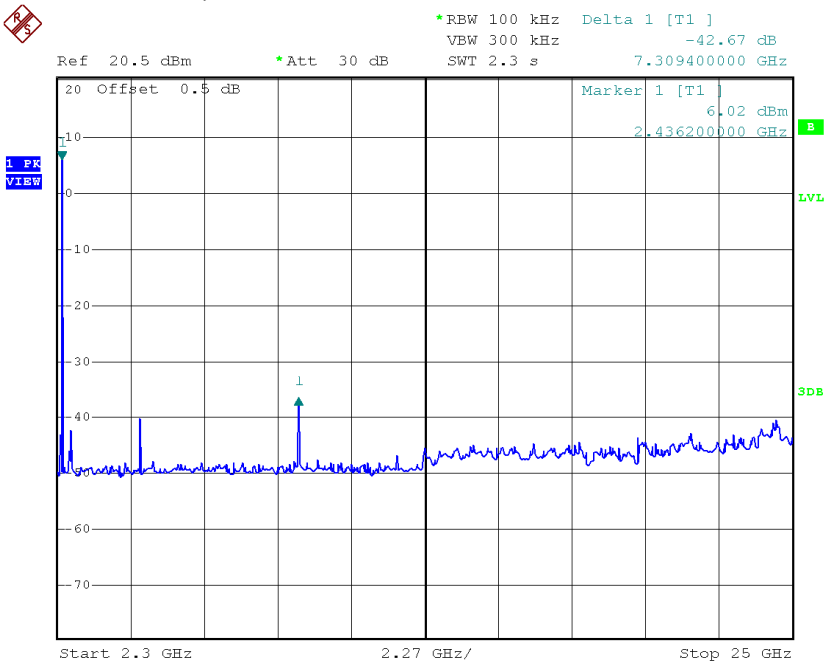
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, Plot 1



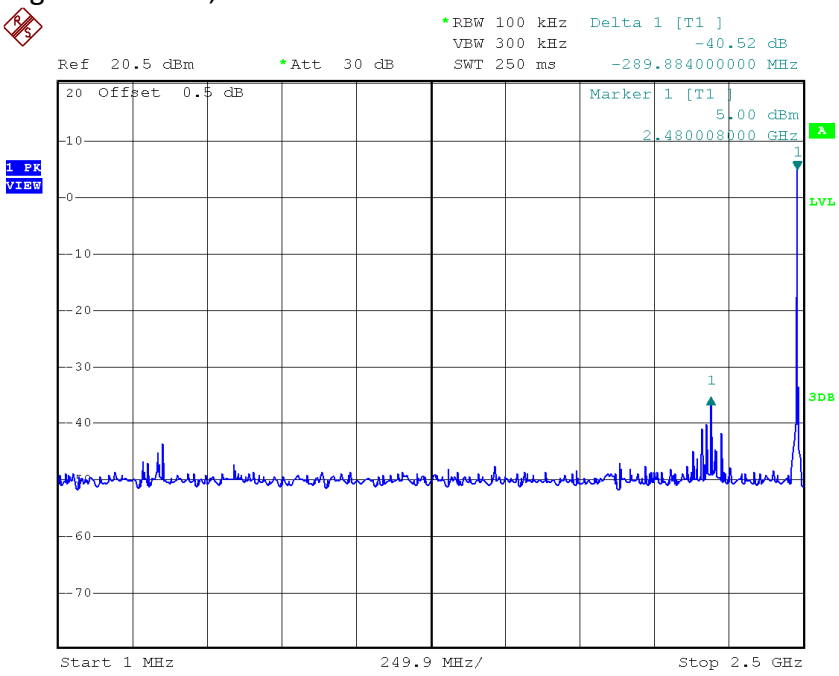
Middle Channel, Plot 2



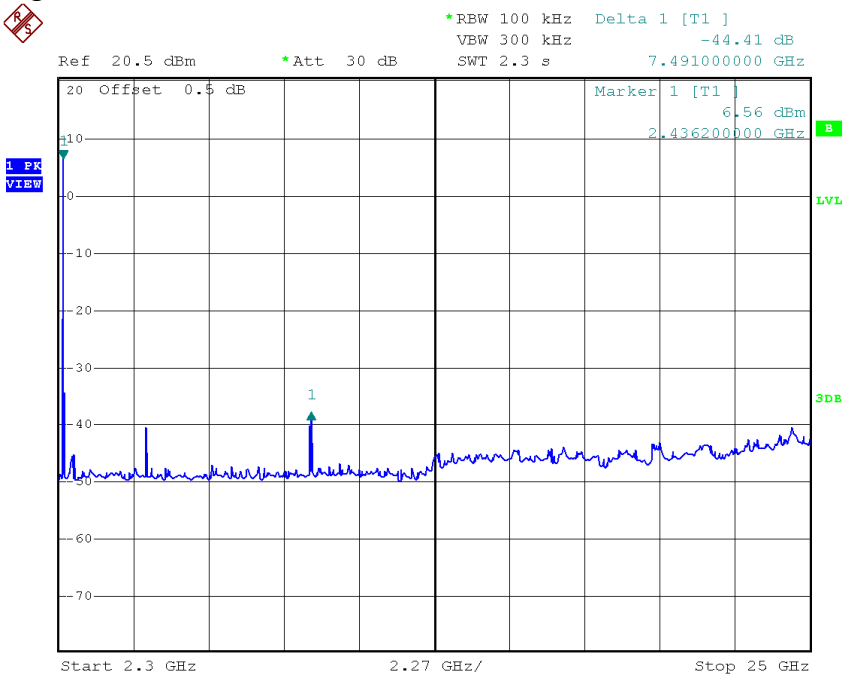
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, Plot 1



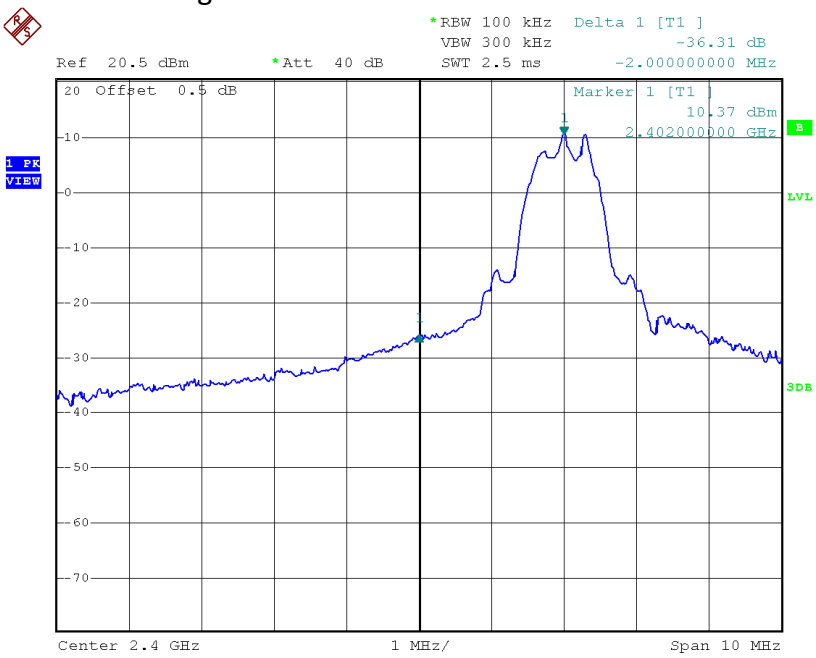
Highest Channel, Plot 2



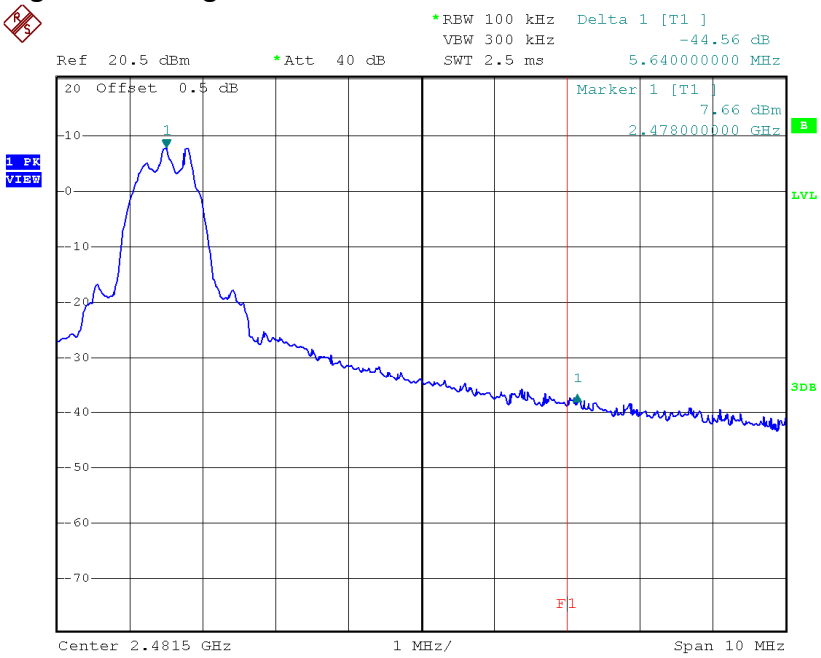
TEST REPORT

PLOTS OF BANDEDGE

Lowest Bandedge



Highest Bandedge



TEST REPORT

4.7 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 reflects 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 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29 dB
PD = 0 dB
AV = -10 dB
FS = 62 + 7.4 +1.6 -29 +0 + (-10) = 32 dBµV/m

Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

TEST REPORT

4.8 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.

TEST REPORT

4.8.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission
at

2390 MHz

The worst case radiated emission configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.8.2 Radiated Emission Data

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

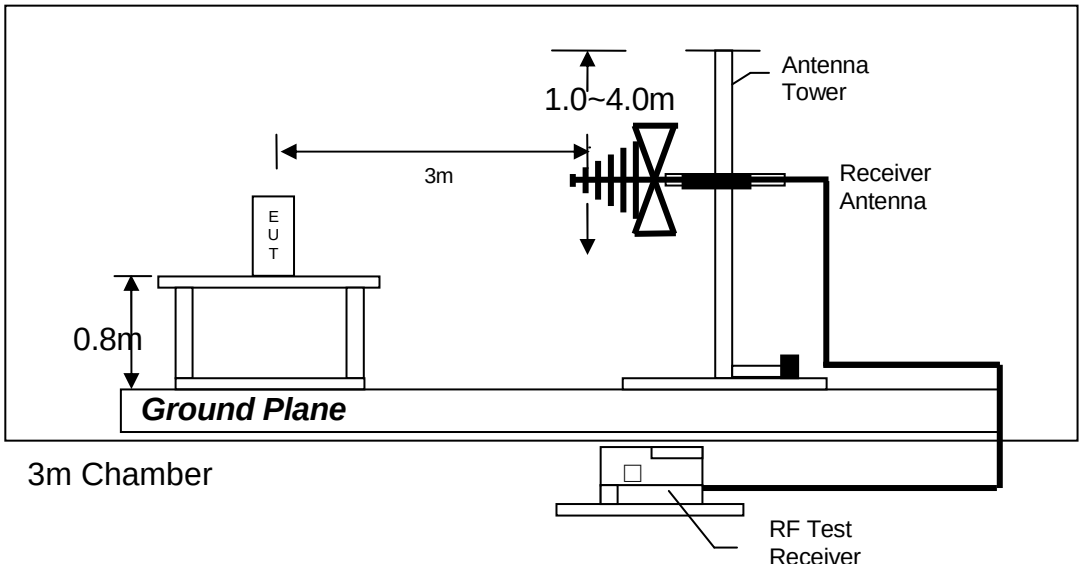
Judgement

Passed by 1.5 dB margin

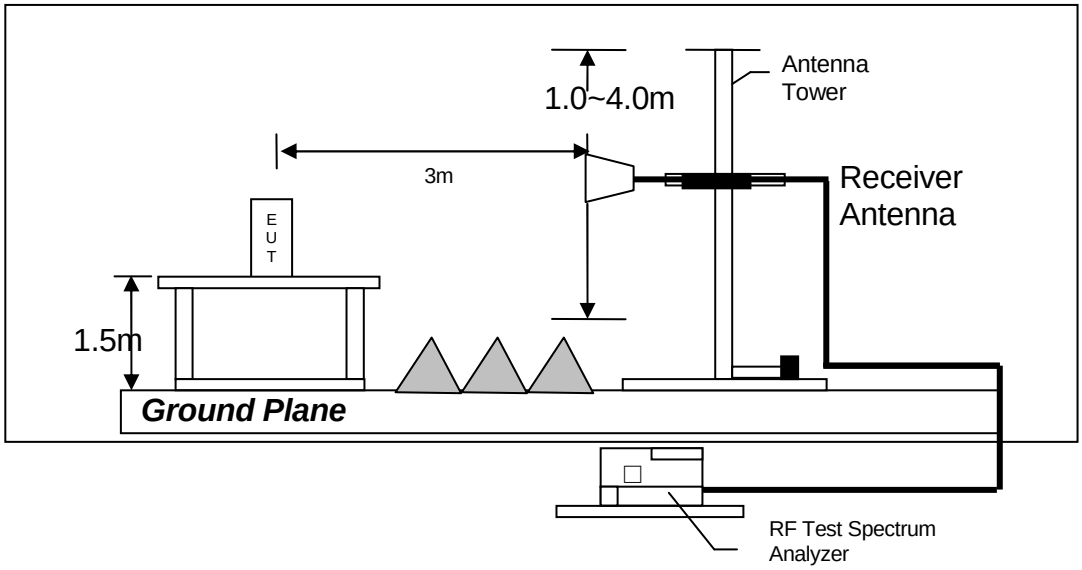
TEST REPORT

4.8.3 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

RADIATED EMISSION DATA

Mode: TX-Channel (2402MHz)

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)
V	***2390.000***	***56.1***	***33***	***29.4***	***52.5***	***54.0***	***-1.5***
V	***4804.000***	***27.3***	***33***	***34.9***	***29.2***	***54.0***	***-24.8***
V	***12010.000***	***29.3***	***33***	***40.5***	***36.8***	***54.0***	***-17.2***

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)
V	***2390.000***	***76.0***	***33***	***29.4***	***72.4***	***74.0***	***-1.6***
V	***4804.000***	***56.6***	***33***	***34.9***	***58.5***	***74.0***	***-15.5***
V	***12010.000***	***44.5***	***33***	***40.5***	***52.0***	***74.0***	***-22.0***

NOTES:

1. Peak detector is used for the emission measurement.
   Average measurement is according to ANSI C63.10.

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. Horn antenna is used for the emission over 1000MHz.

5. 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 - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	***4880.000***	***26.9***	***33***	***34.9***	***28.8***	***54.0***	***-25.2***
V	***7320.000***	***26.5***	***33***	***37.9***	***31.4***	***54.0***	***-22.6***
V	***12200.000***	***29.9***	***33***	***40.5***	***37.4***	***54.0***	***-16.6***

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)
V	***4880.000***	***55.9***	***33***	***34.9***	***57.8***	***74.0***	***-16.2***
V	***7320.000***	***44.9***	***33***	***37.9***	***49.8***	***74.0***	***-24.2***
V	***12200.000***	***44.7***	***33***	***40.5***	***52.2***	***74.0***	***-21.8***

NOTES:

1. Peak detector is used for the emission measurement.
   Average measurement is according to ANSI C63.10.

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. Horn antenna is used for the emission over 1000MHz.

5. 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 (2478MHz)

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)
V	***2483.500***	***52.4***	***33***	***29.4***	***48.8***	***54.0***	***-5.2***
V	***4956.000***	***27.6***	***33***	***34.9***	***29.5***	***54.0***	***-24.5***
V	***7434.000***	***26.1***	***33***	***37.9***	***31.0***	***54.0***	***-23.0***
V	***12390.000***	***29.3***	***33***	***40.5***	***36.8***	***54.0***	***-17.2***

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)
V	***2483.500***	***74.6***	***33***	***29.4***	***71.0***	***74.0***	***-3.0***
V	***4956.000***	***56.9***	***33***	***34.9***	***58.8***	***74.0***	***-15.2***
V	***7434.000***	***44.5***	***33***	***37.9***	***49.4***	***74.0***	***-24.6***
V	***12390.000***	***44.3***	***33***	***40.5***	***51.8***	***74.0***	***-22.2***

NOTES:

1. Peak detector is used for the emission measurement.
   Average measurement is according to ANSI C63.10.

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. Horn antenna is used for the emission over 1000MHz.

5. 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 Hopping

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	56.124	37.4	16	11.0	32.4	40.0	-7.6
V	62.110	38.8	16	10.0	32.8	40.0	-7.2
V	***118.174***	***43.5***	***16***	***14.0***	***41.5***	***43.5***	***-2.0***
V	***244.476***	***30.0***	***16***	***20.0***	***34.0***	***46.0***	***-12.0***
V	***324.924***	***33.0***	***16***	***24.0***	***41.0***	***46.0***	***-5.0***
V	494.986	28.8	16	26.0	38.8	46.0	-7.2
H	699.960	29.8	16	30.0	43.8	46.0	-2.2

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

4.8.4 Transmitter Duty Cycle Calculation

N/A

4.9 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.

4.9.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration
at

15.999 MHz

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

4.9.2 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.

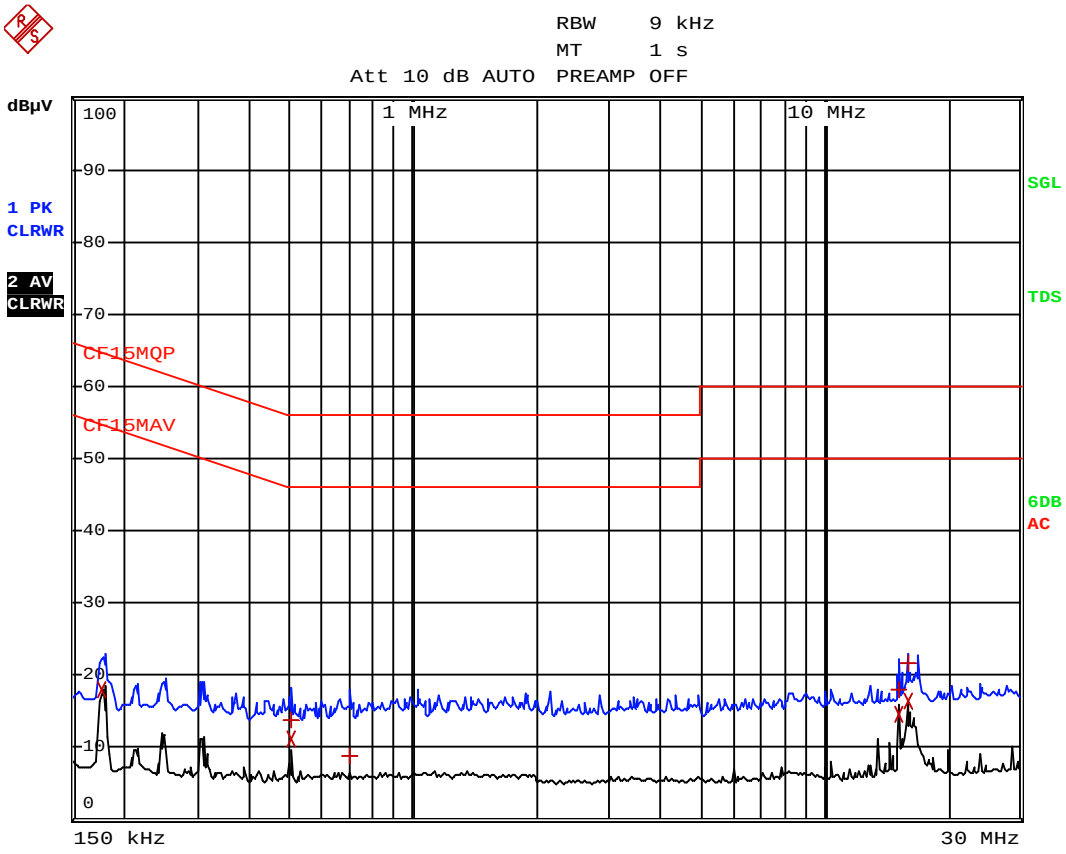
Judgement

Passed by 33.6 dB margin

TEST REPORT

AC POWER LINE CONDUCTED EMISSION

Worst Case: Tx Hopping



TEST REPORT

Worst Case: Tx Hopping

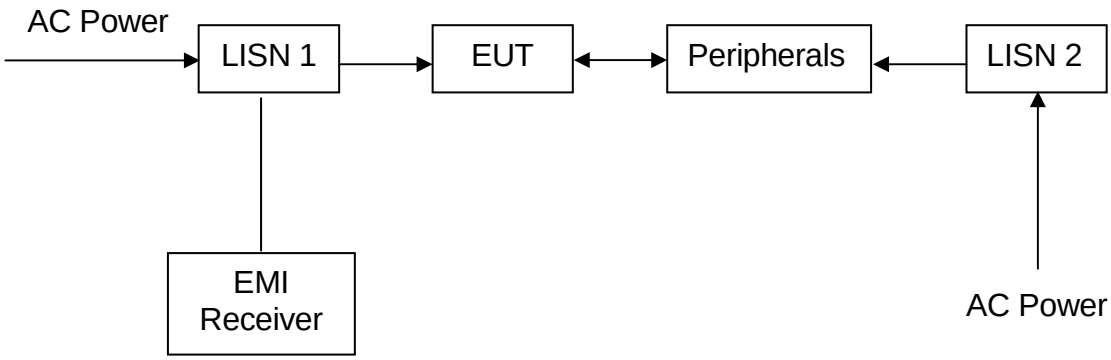
EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	177 kHz	17.87	N	-36.74
1	Quasi Peak	501 kHz	13.71	L1	-42.28
2	CISPR Average	501 kHz	11.15	L1	-34.84
1	Quasi Peak	699 kHz	8.79	N	-47.20
1	Quasi Peak	15.2025 MHz	18.05	L1	-41.94
2	CISPR Average	15.2025 MHz	14.66	N	-35.33
1	Quasi Peak	15.999 MHz	21.77	L1	-38.22
2	CISPR Average	15.999 MHz	16.37	N	-33.62

TEST REPORT

4.9.3 AC Line Conducted Emission Test Setup



The EUT along with its peripherals were placed on a 1.0m(W)×1.5m(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 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

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

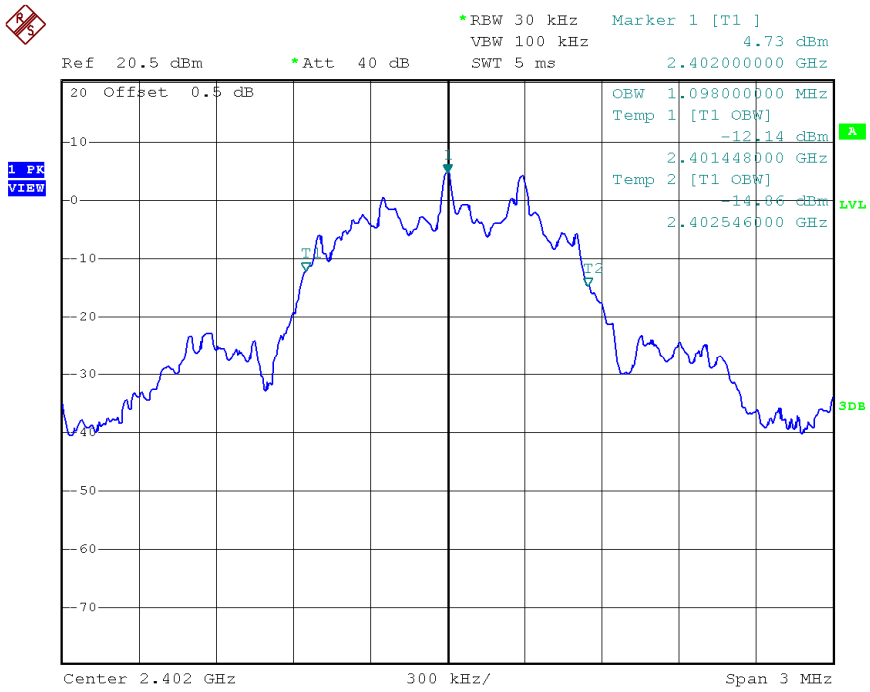
TEST REPORT

4.10 Occupied Bandwidth

Occupied Bandwidth Results:

	Occupied Bandwidth (kHz)
Low Channel: 2402	1098
Middle Channel: 2440	1080
High Channel: 2478	1074

The worst case is shown as below



TEST REPORT

5.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-3156	EW-2253	EW-0571
Manufacturer	R&S	R&S	EMCO
Model No.	ESR26	FSP40	3104C
Calibration Date	November 19, 2018	November 27, 2018	February 27, 2018
Calibration Due Date	November 19, 2019	November 27, 2019	August 27, 2019

Equipment	Log Periodic Antenna	Active Loop H-field (9kHz to 30MHz)	Double Ridged Guide Antenna
Registration No.	EW-0447	EW-2313	EW-0194
Manufacturer	EMCO	ELECTROMETRI	EMCO
Model No.	3146	EM-6876	3115
Calibration Date	January 17, 2018	March 08, 2018	March 14, 2018
Calibration Due Date	July 17, 2019	September 08, 2019	September 14, 2019

Equipment	RF Cable 14m (1GHz to 26.5GHz)	RF Pre-amplifier 3 pcs (9kHz to 40GHz)	14m Double Shield RF Cable (20MHz to 6GHz)
Registration No.	EW-2781	EW-3006b	EW-2505
Manufacturer	GREATBILLION	SCHWARZBECK	RADIALL
Model No.	SMA m/SHF5MPU /SMA m ra14m,26G	BBV 9718	nm / br5d / sma 14m
Calibration Date	October 27, 2018	May 15, 2019	October 27, 2018
Calibration Due Date	October 27, 2019	May 15, 2020	October 27, 2019

2) Conducted Emissions Test

Equipment	EMI Test Receiver	Artificial Mains Network	RF Cable 80cm (RG142) (9kHz to 30MHz)
Registration No.	EW-2500	EW-0192	EW-2451
Manufacturer	R&S	R&S	RADIALL
Model No.	ESCI	ESH3-Z5	bnc m st / 142 / bnc m st 80cm
Calibration Date	November 28, 2018	March 11, 2019	November 03, 2018
Calibration Due Date	November 28, 2019	March 11, 2020	November 03, 2019

TEST REPORT

3) Conductive Measurement Test

Equipment	RF Power Meter with Power Sensor	RF Cable (up to 40GHz) 1.5m length
Registration No.	EW-2270	EW-3104
Manufacturer	AGILENTTECH	N/A
Model No.	N1911A	SMA-M to SMA-M
Calibration Date	March 09, 2019	July 03, 2018
Calibration Due Date	March 09, 2020	July 03, 2019

4) Bandwith/Bandedge Measurement Test

Equipment	Spectrum Analyzer	RF Cable (up to 40GHz) 1.5m length
Registration No.	EW-2466	EW-3104
Manufacturer	R&S	N/A
Model No.	FSP30	SMA-M to SMA-M
Calibration Date	January 06, 2019	July 03, 2018
Calibration Due Date	January 06, 2020	July 03, 2019

END OF TEST REPORT