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TEST REPORT

Report Number: 17081484HKG-002

Application for Original Grant of 47 CFR Part 15 Certification

Single New of RSS-247 Issue 2 Equipment

FCC ID: 2ARFW-OCLU

IC: 24408-C01010

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: November 04, 2018

TEST REPORT

GENERAL INFORMATION

Applicant Name:	OCLU Limited
Applicant Address:	4th Floor, 18 St. Cross Street, London, EC1N 8UN, United Kingdom
FCC Specification Standard:	FCC Part 15, October 1, 2017 Edition
FCC ID:	2ARFW-OCLU
FCC Model(s):	OCLU Camera C01010
IC Specification Standard:	RSS-247 Issue 2, February 2017 RSS-Gen Issue 5, April 2018
IC:	24408-C01010
PMN:	OCLU Camera C01010
HVIN:	OCLU Camera C01010
Type of EUT:	Spread Spectrum Transmitter
Description of EUT:	Digital Sports Camera
Serial Number:	N/A
Sample Receipt Date:	August 25, 2018
Date of Test:	August 25, 2018 to November 04, 2018
Report Date:	November 04, 2018
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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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	6.8#	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	7.2#	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, 2017 Edition
RSS-247 Issue 2, February 2017
RSS-Gen Issue 5, April 2018

TEST REPORT

EXHIBIT 2 GENERAL DESCRIPTION

2.0 GENERAL DESCRIPTION

2.1 Product Description

The OCLU Camera C01010 is a Digital Sports camera which contains a WiFi module. The USB port is charging purpose only. The EUT is powered by internal 3.7V rechargeable battery and/or USB port (5VDC).

The Equipment Under Test (EUT) operates at frequency range of 2412MHz to 2462MHz with 11 channels.

For 802.11b mode, it operates at frequency range of 2412MHz to 2462MHz with 11 channels. It transmits via Direct-sequence spread spectrum (DSSS) modulation. Maximum bit rate can be up to 11Mbps.

For 802.11g mode, it operates at frequency range of 2412MHz to 2462MHz with 11 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation. Maximum bit rate can be up to 54Mbps.

For 802.11n (with 20MHz bandwidth) mode, it operates at frequency range of 2412MHz to 2462MHz with 11 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation. Maximum bit rate can support up to 65Mbps.

The antenna(s) used in the EUT is internal, integral.

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

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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 5 (2018).

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 (WiFi 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 3.7VDC (fully charged 3.7V rechargeable battery) and/or powered by USB Port of 5VDC. Both powering method were tested. Only the worse-case data is shown in this report (powered by USB Port of 5VDC).

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.

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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.

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3.3 Details of EUT and Description of Accessories

Details of EUT:

The EUT was powered by 3.7VDC (fully charged 3.7V rechargeable battery) and/or powered by USB Port of 5VDC. Both powering method were tested. Only the worse-case data is shown in this report (powered by USB Port of 5VDC).

(1) 1 x 3.7V 1000mAh Li-ion battery (Provided by Applicant)

Description of Accessories:

(1) 32GB SanDisk Micro SD
(2) HP Elitebook (Model: 2540p; S/N: CND051042C)
(3) 1 x LAN cable with length of 2m with termination (Provided by Intertek)
(4) 1 x USB cable with length of 0.4m with two ferrites (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.

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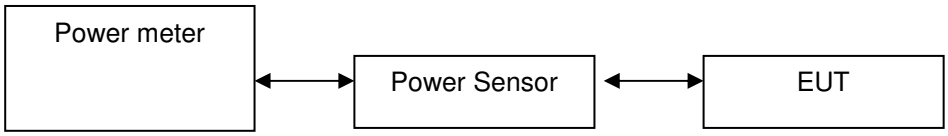
EXHIBIT 4 TEST RESULTS

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.

B mode Antenna Gain = 2 dBi

Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	3.48	2.23
Middle Channel: 2437	3.04	2.01
High Channel: 2462	2.24	1.67

G mode Antenna Gain = 2 dBi

Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	1.77	1.50
Middle Channel: 2437	1.68	1.47
High Channel: 2462	1.57	1.44

N20 mode Antenna Gain = 2 dBi

Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	1.66	1.47
Middle Channel: 2437	1.47	1.40
High Channel: 2462	1.37	1.37

TEST REPORT

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

Cable loss: 1 dB External Attenuation: 0 dB

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

max. conducted (peak) output level = 3.68 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.

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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.

B mode

Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel: 2412	8.88
Middle Channel: 2437	8.08
High Channel: 2462	9.44

G mode

Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel: 2412	16.48
Middle Channel: 2437	16.56
High Channel: 2462	16.64

N20 mode

Frequency (MHz)	6dB Bandwidth (MHz)
Low Channel: 2412	17.84
Middle Channel: 2437	17.84
High Channel: 2462	17.84

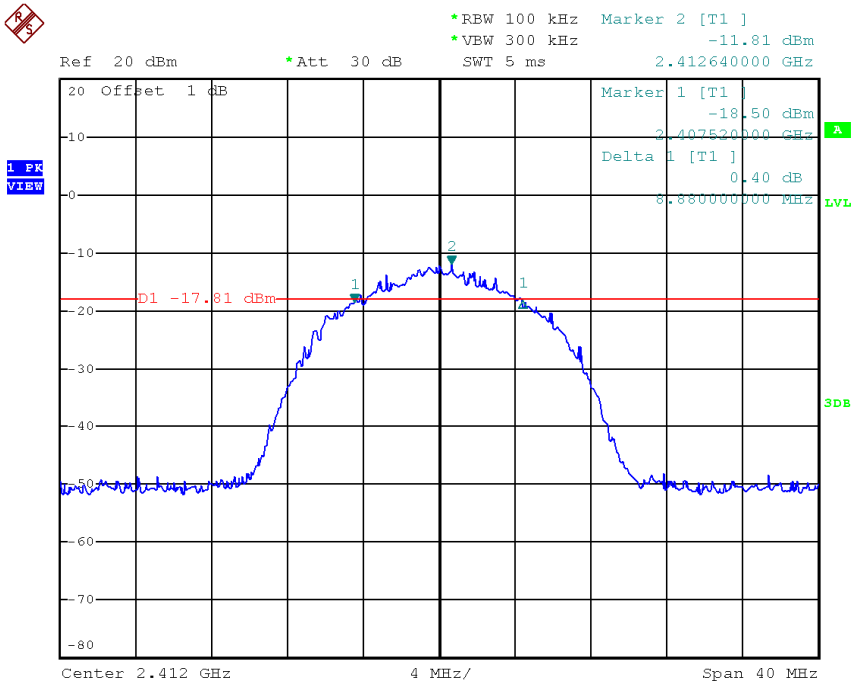
Limits
6 dB bandwidth shall be at least 500kHz

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

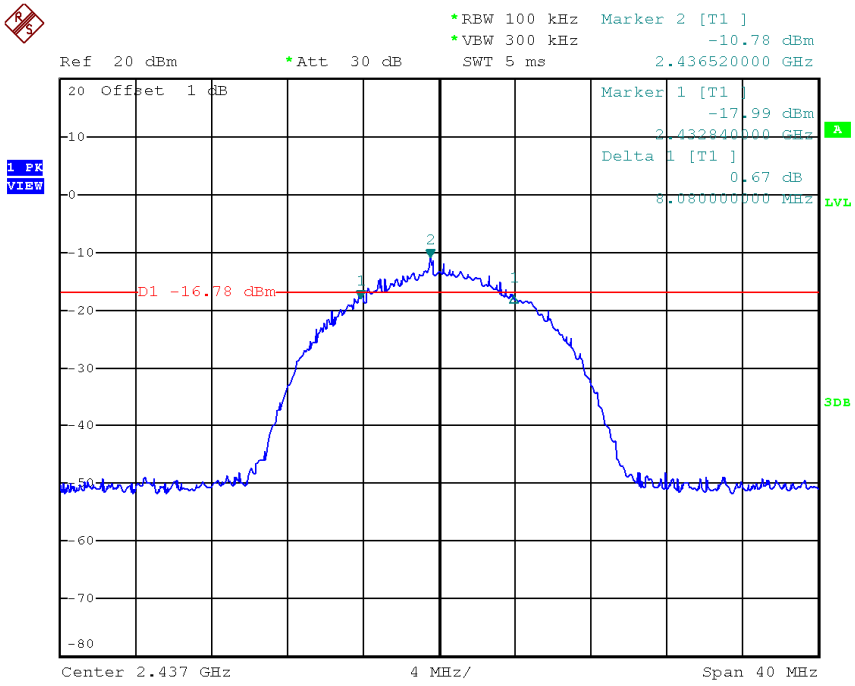
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

Lowest Channel, B mode



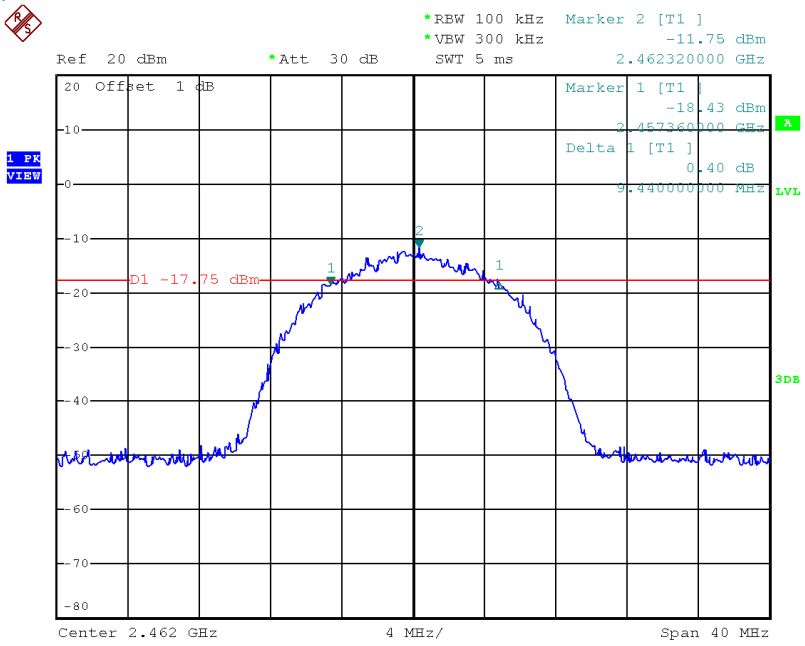
Middle Channel, B mode



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

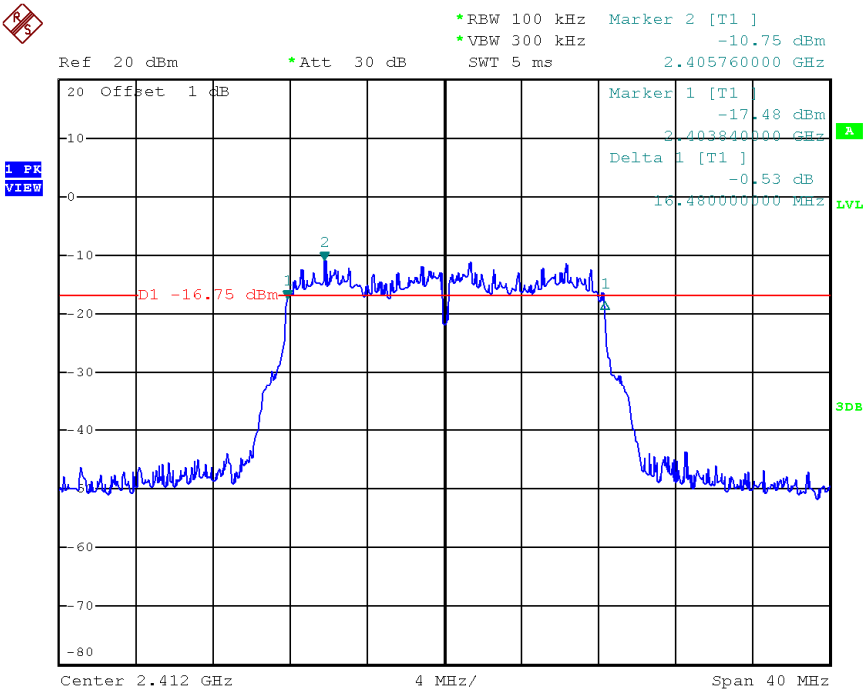
Highest Channel, B mode



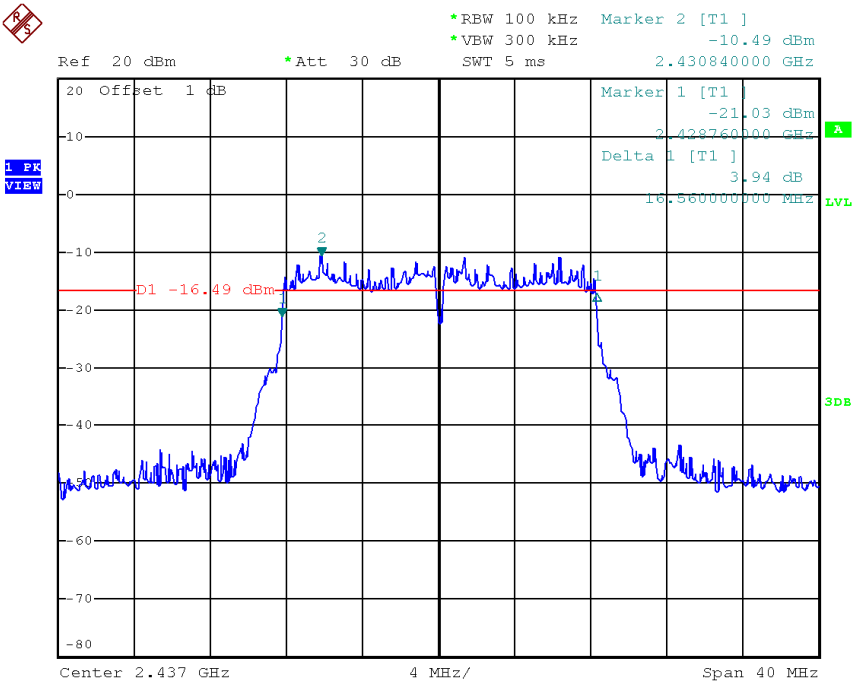
TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

Lowest Channel, G mode



Middle Channel, G mode



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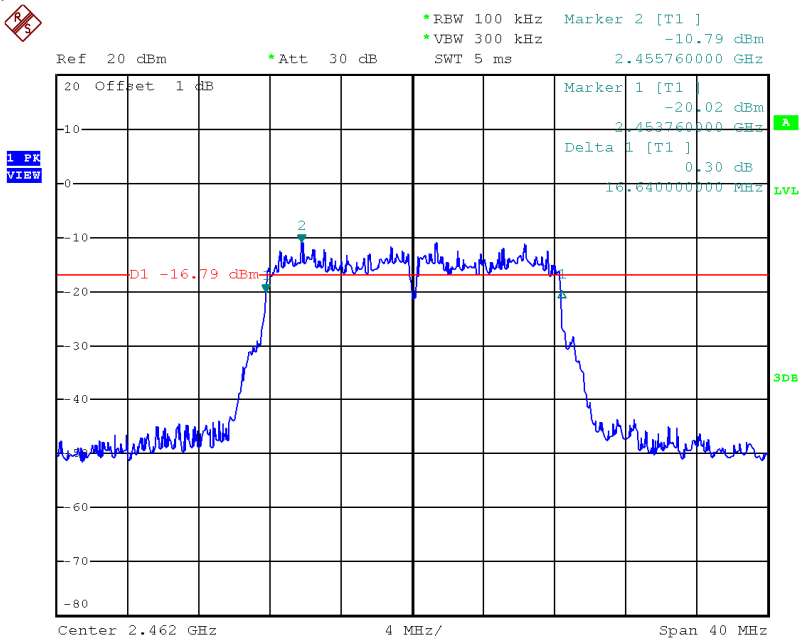
PLOTS OF 6dB RF BANDWIDTH

Highest Channel, G mode



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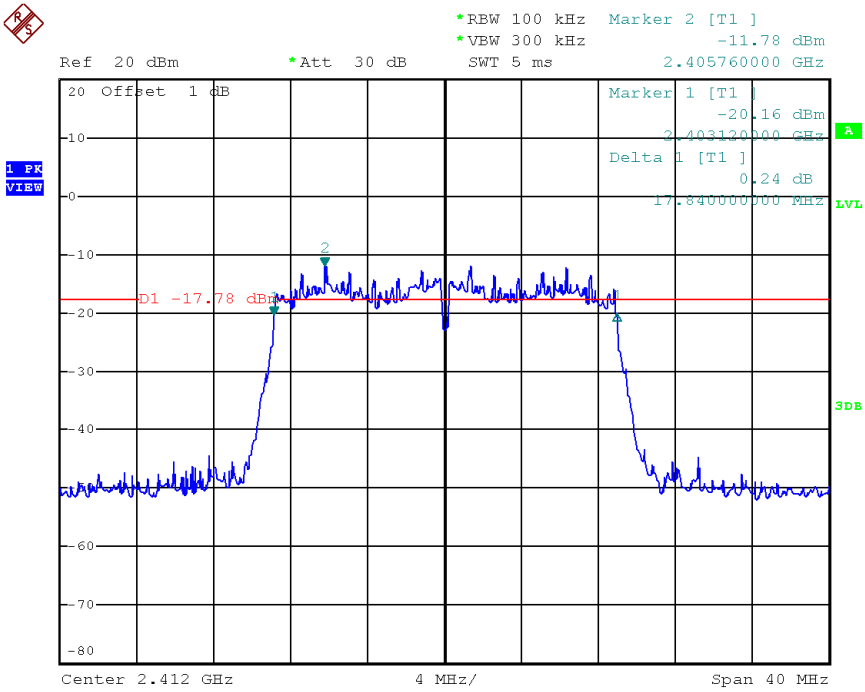
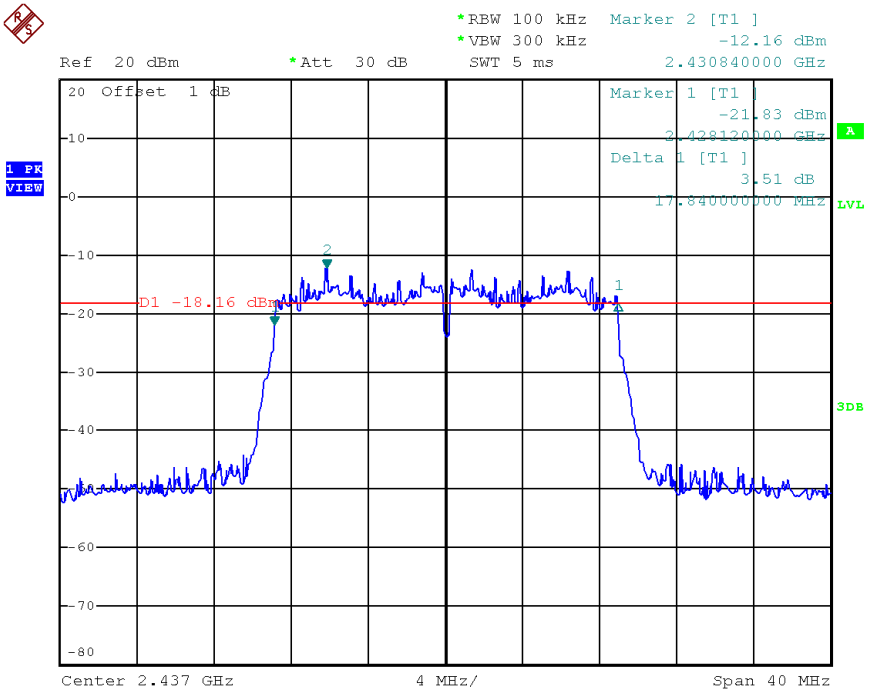
PLOTS OF 6dB RF BANDWIDTH

Lowest Channel, N20 mode



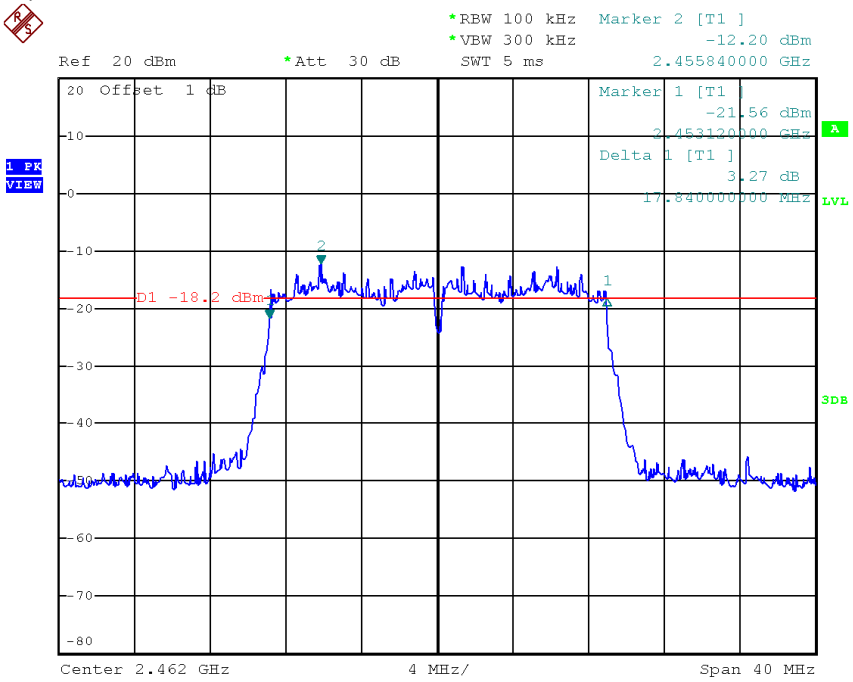
Middle Channel, N20 mode



TEST REPORT

PLOTS OF 6dB RF BANDWIDTH

Highest Channel, N20 mode



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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)
Low Channel:	2412	-12.22
Middle Channel:	2437	-11.76
High Channel:	2462	-10.19

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	-10.87
Middle Channel:	2437	-10.13
High Channel:	2462	-10.80

Frequency (MHz)		PSD in 100kHz (dBm)
Low Channel:	2412	-11.71
Middle Channel:	2437	-11.83
High Channel:	2462	-11.85

Cable Loss: 1 dB

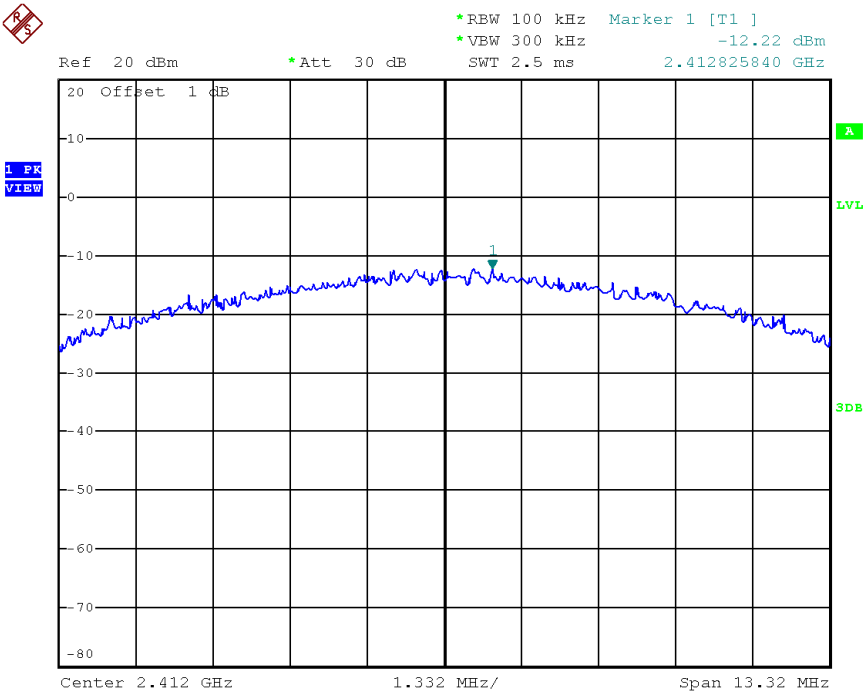
Limit:
8dBm

The plots of power spectral density are as below.

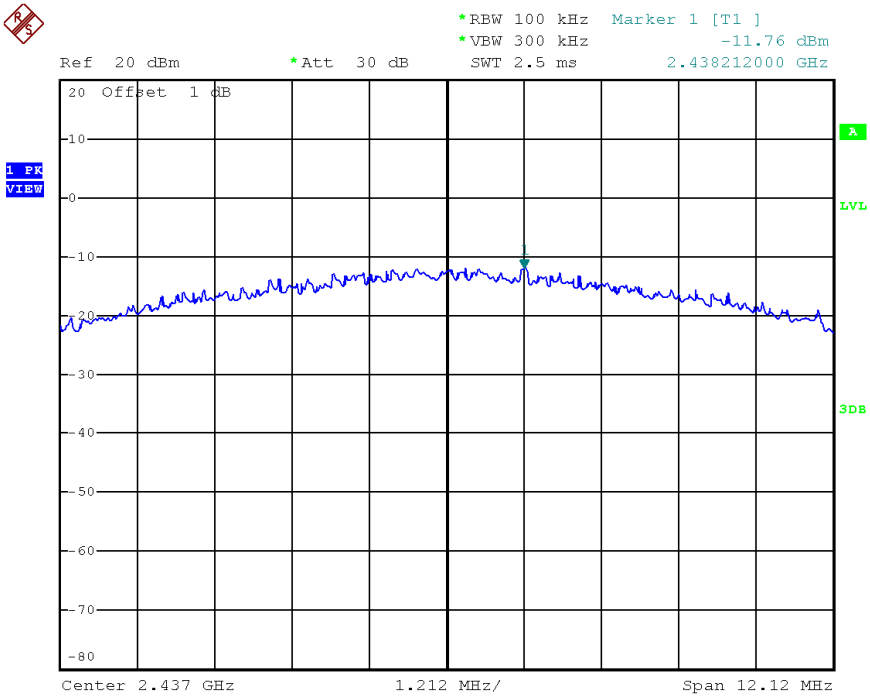
TEST REPORT

PLOTS OF POWER SPECTRAL DENSITY

Lowest channel, B mode



Middle channel, B mode



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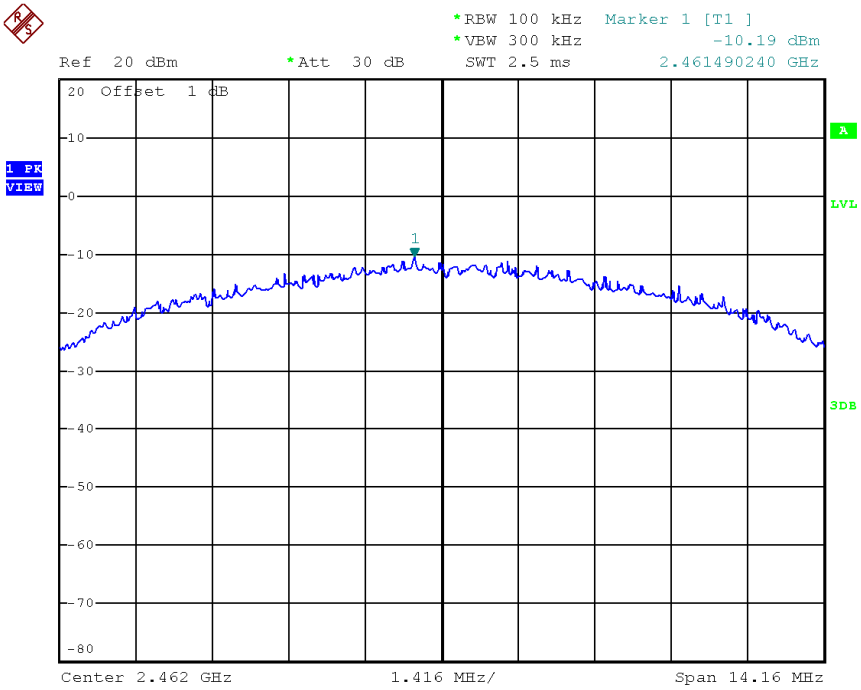
PLOTS OF POWER SPECTRAL DENSITY

Highest channel, B mode



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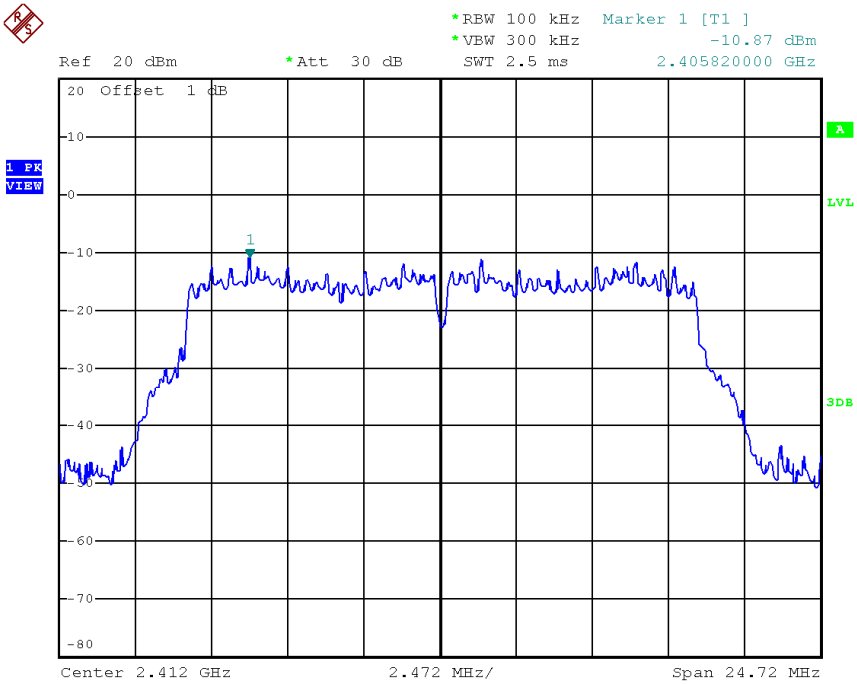
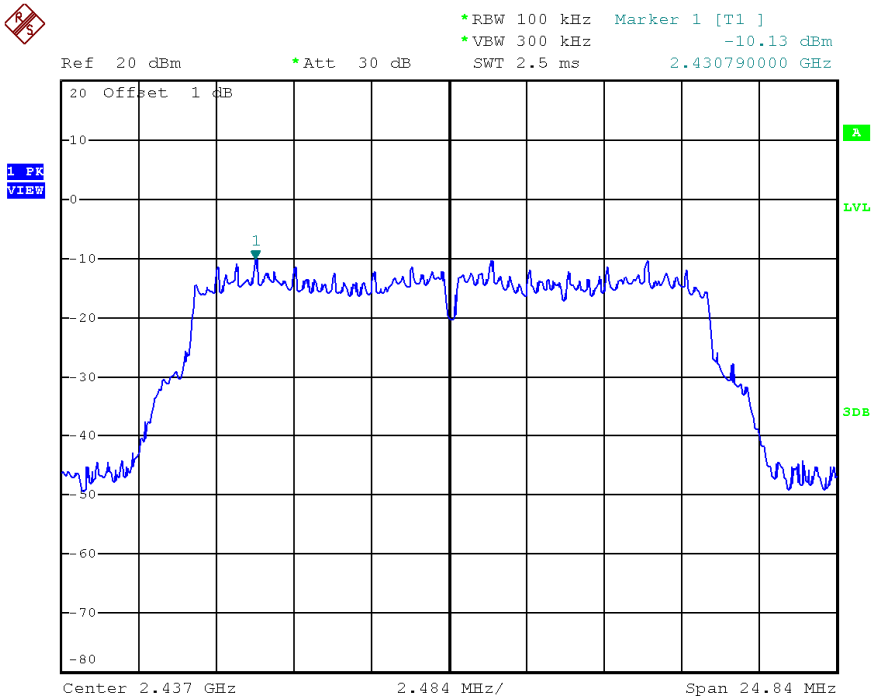
PLOTS OF POWER SPECTRAL DENSITY

Lowest channel, G mode



Middle channel, G mode



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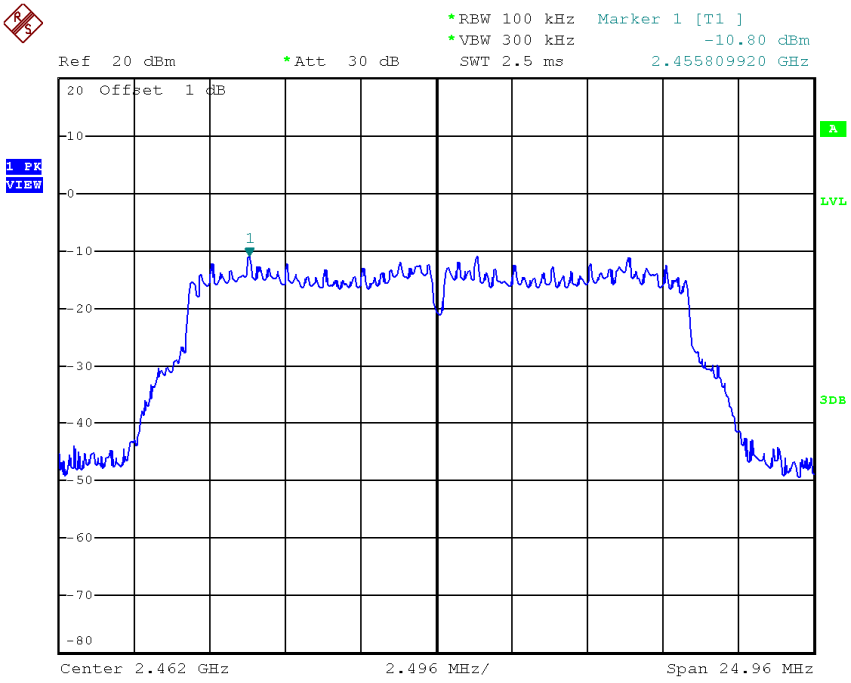
PLOTS OF POWER SPECTRAL DENSITY

Highest channel, G mode



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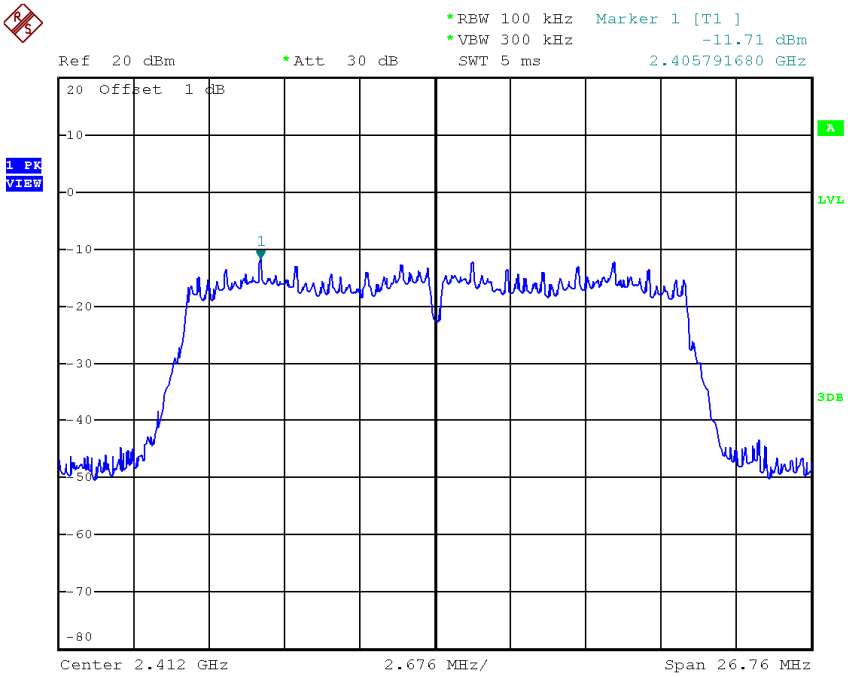
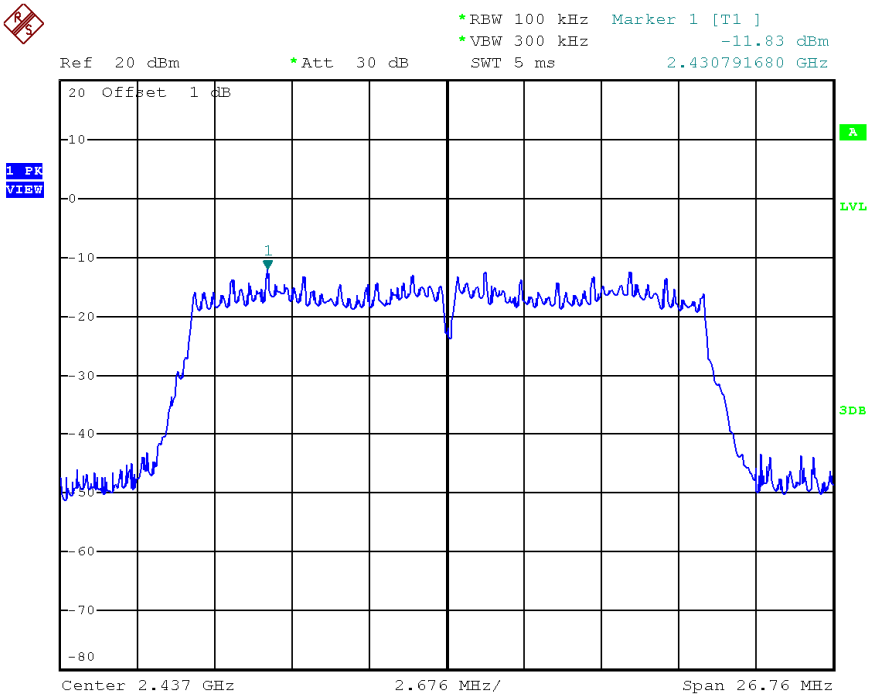
PLOTS OF POWER SPECTRAL DENSITY

Lowest channel, N20 mode



Middle channel, N20 mode



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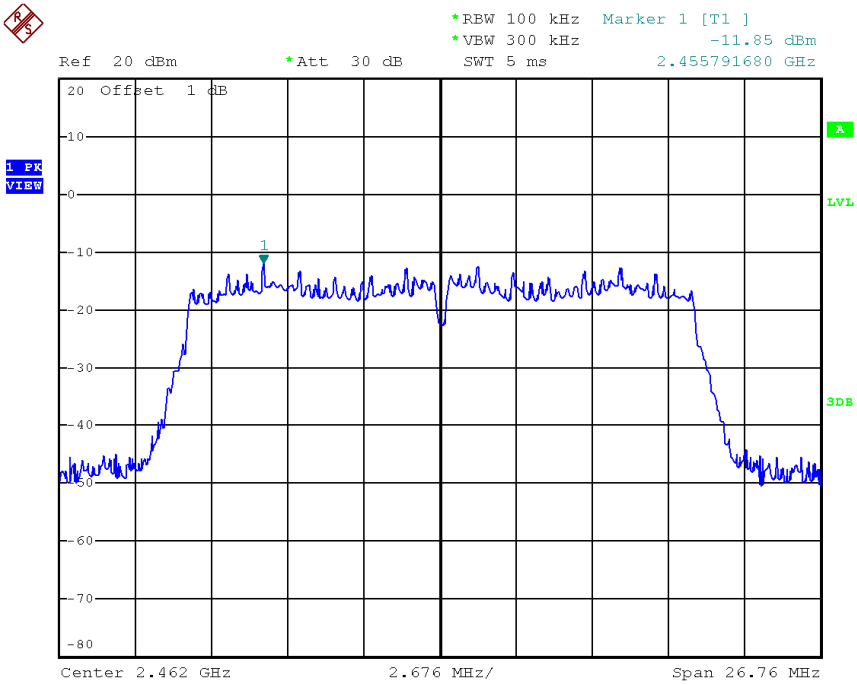
PLOTS OF POWER SPECTRAL DENSITY

Highest channel, N20 mode



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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.

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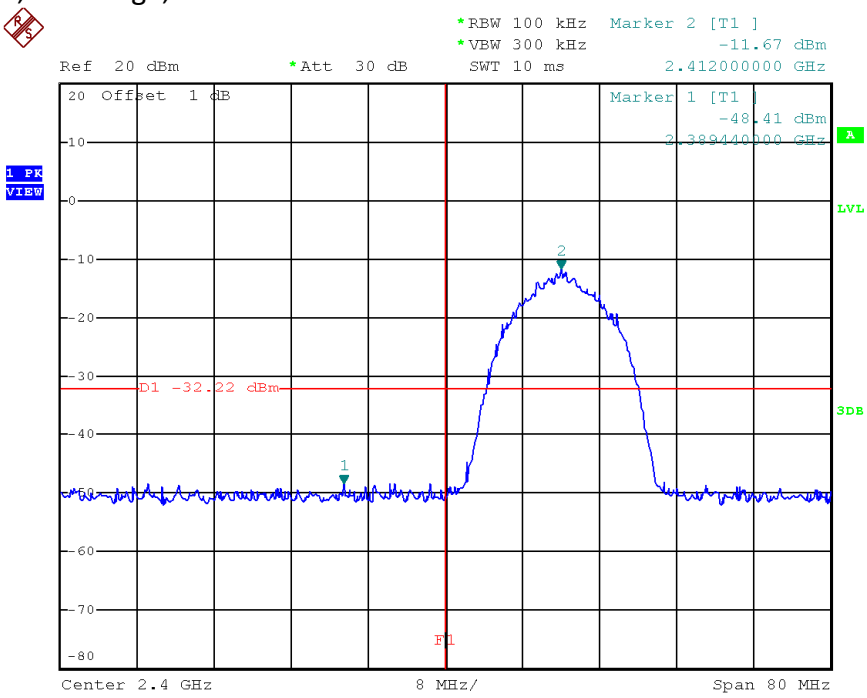
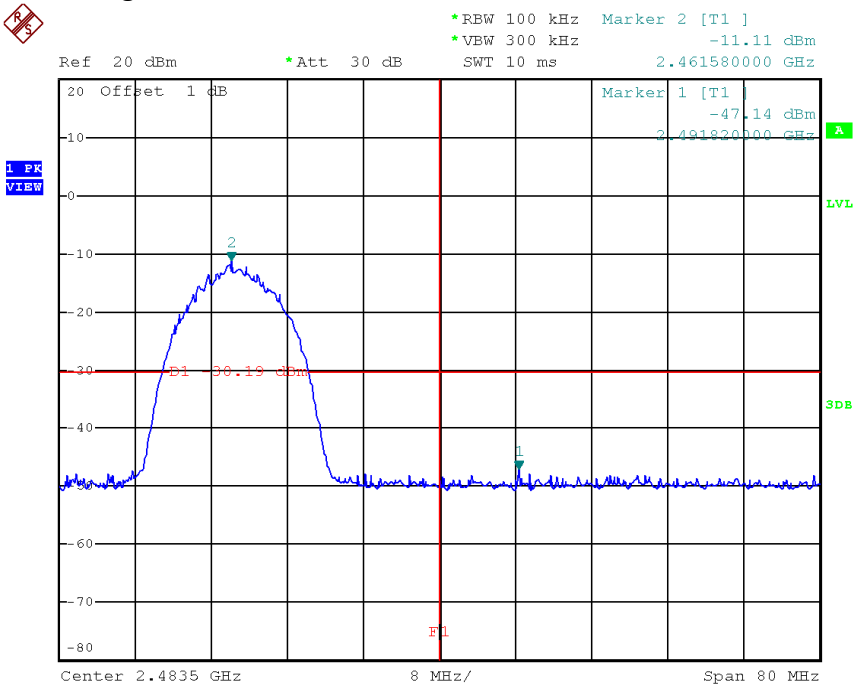
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Bandedge, B mode



Highest Channel, Bandegde, B mode



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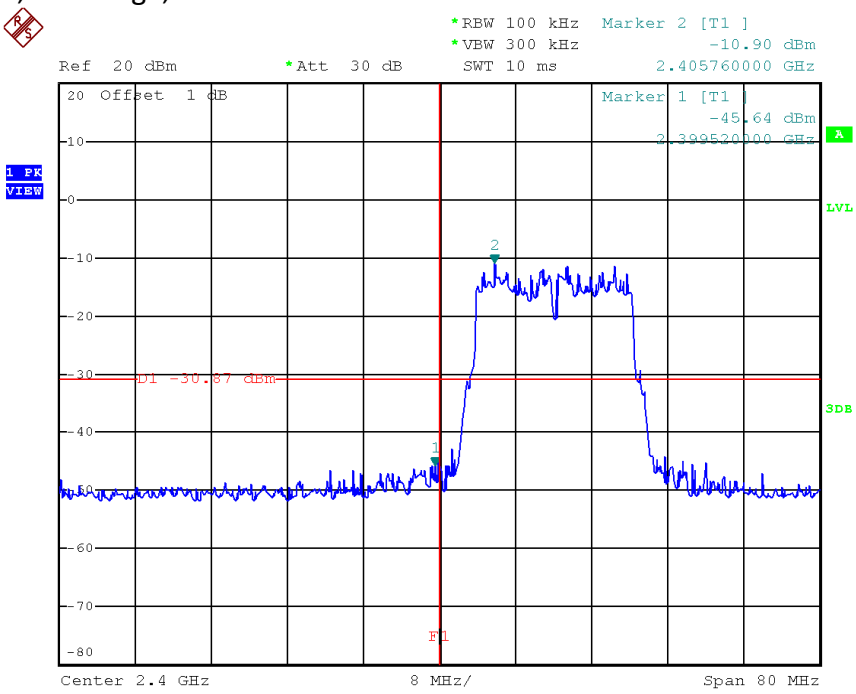
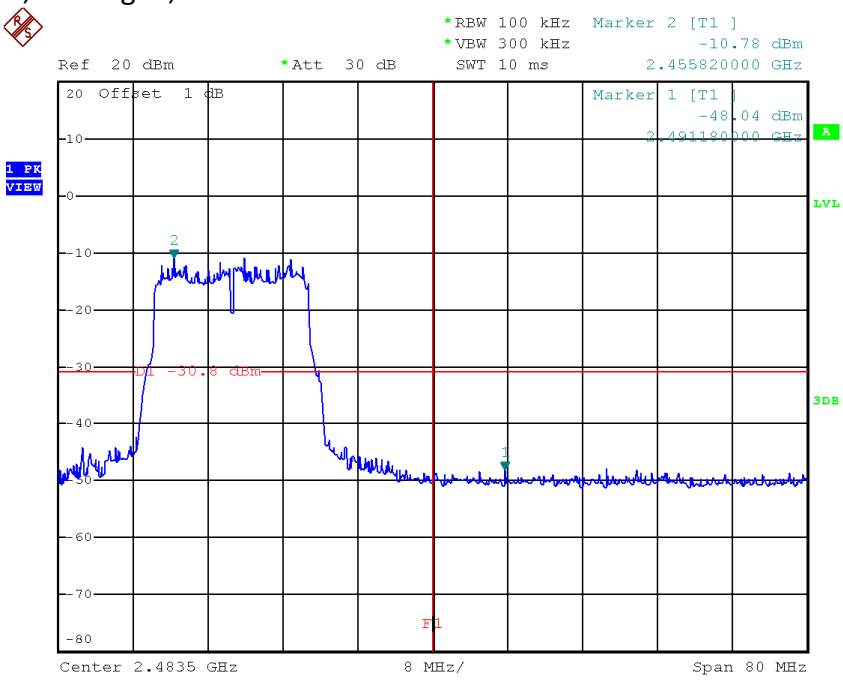
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Bandedge, G mode



Highest Channel, Bandegde, G mode



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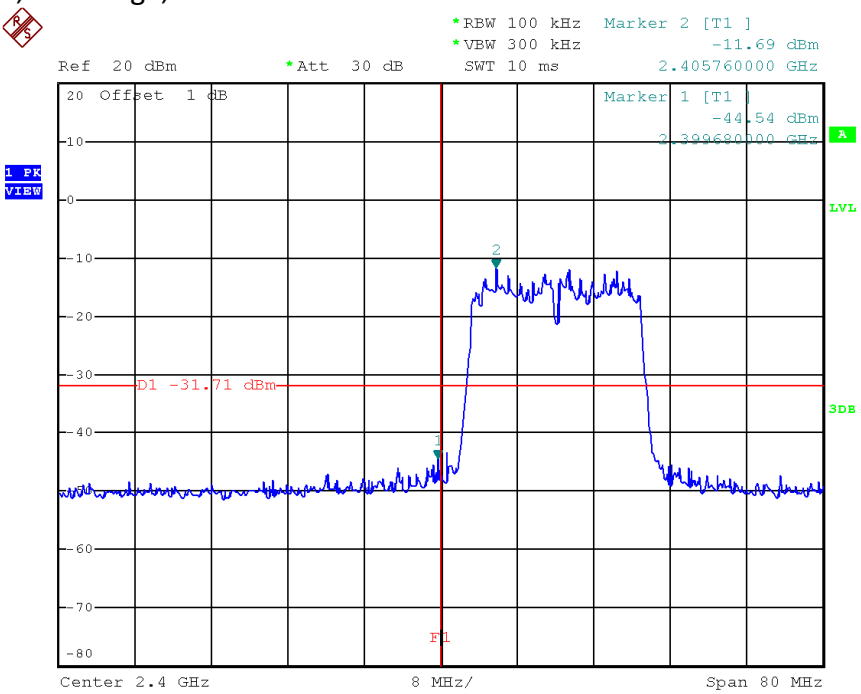
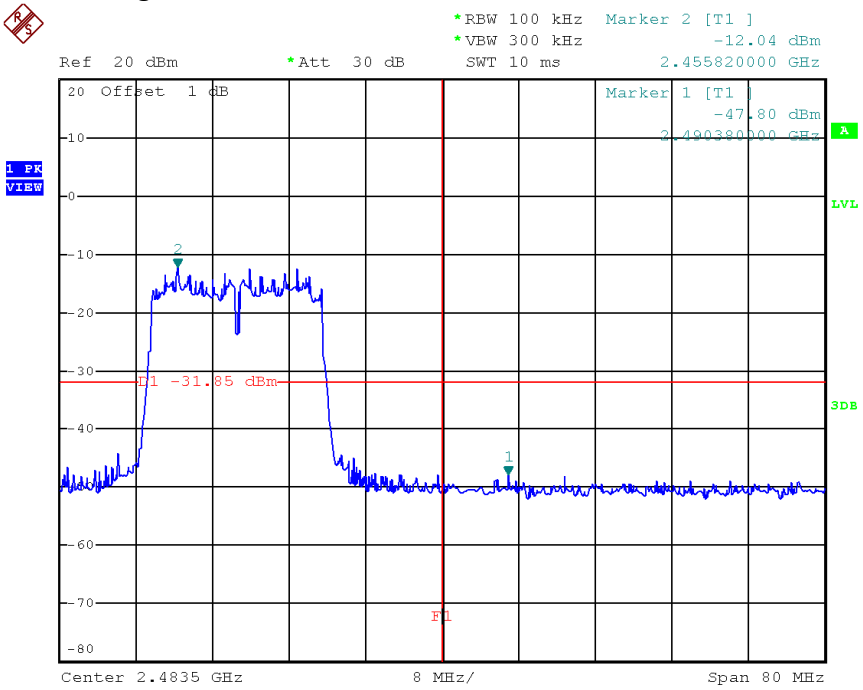
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Bandedge, N20 mode



Highest Channel, Bandegde, N20 mode



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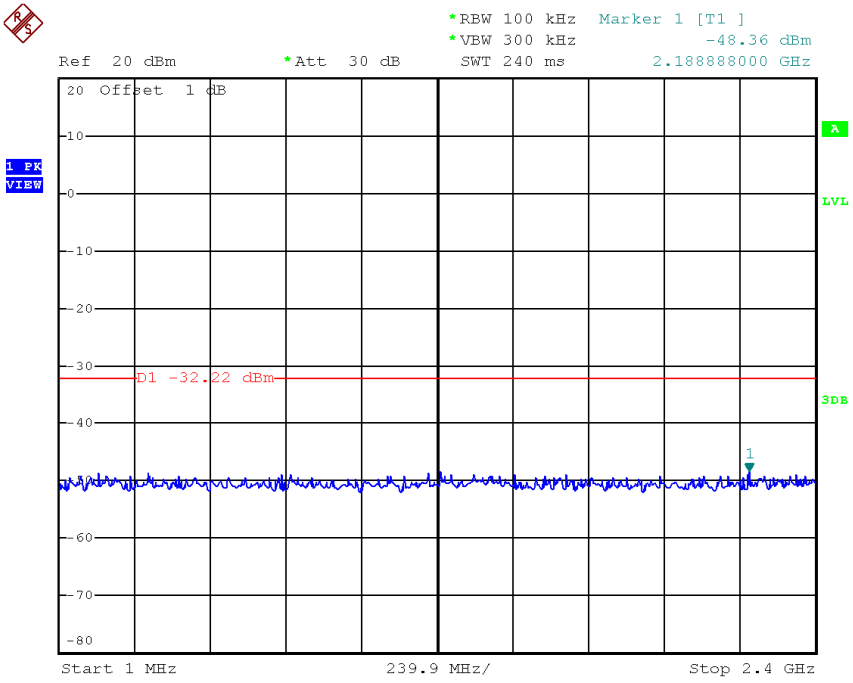
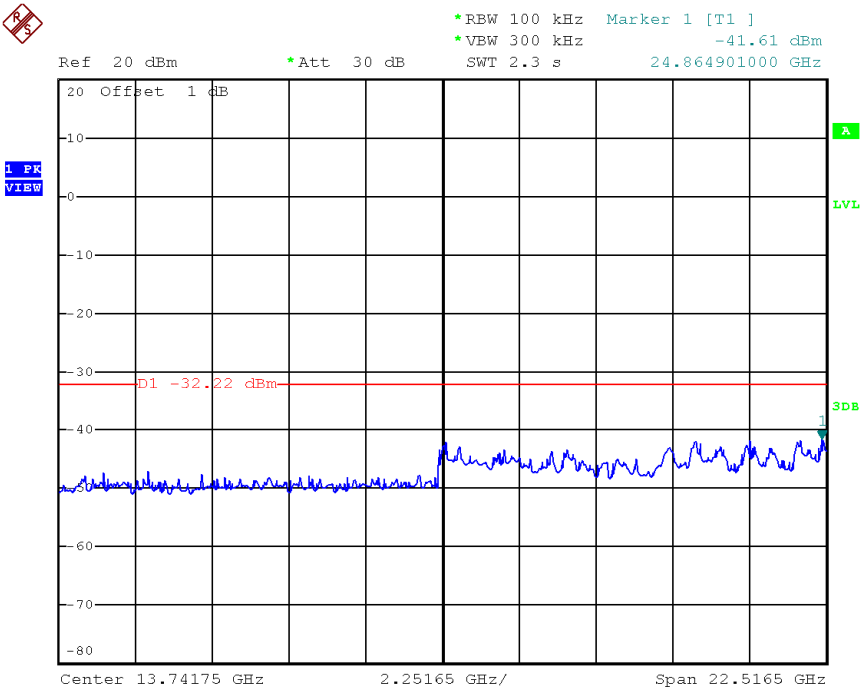
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, B mode, Plot A



Lowest Channel, B mode, Plot B



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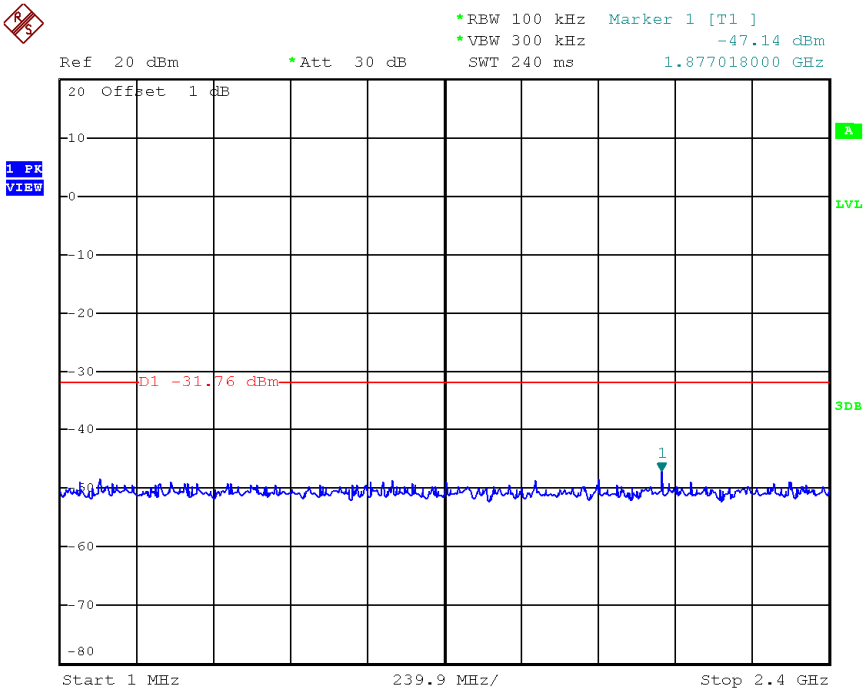
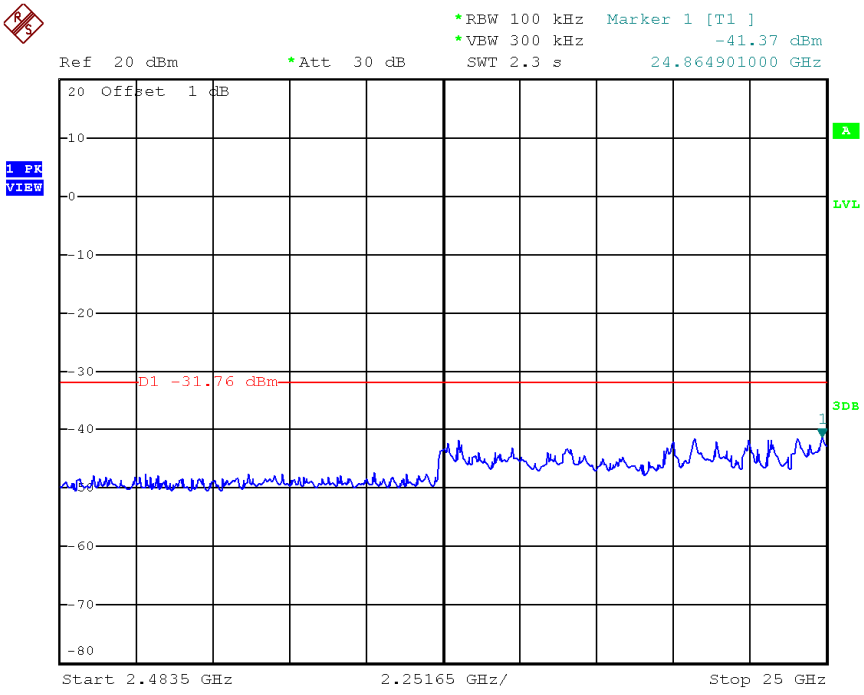
PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, B mode, Plot A



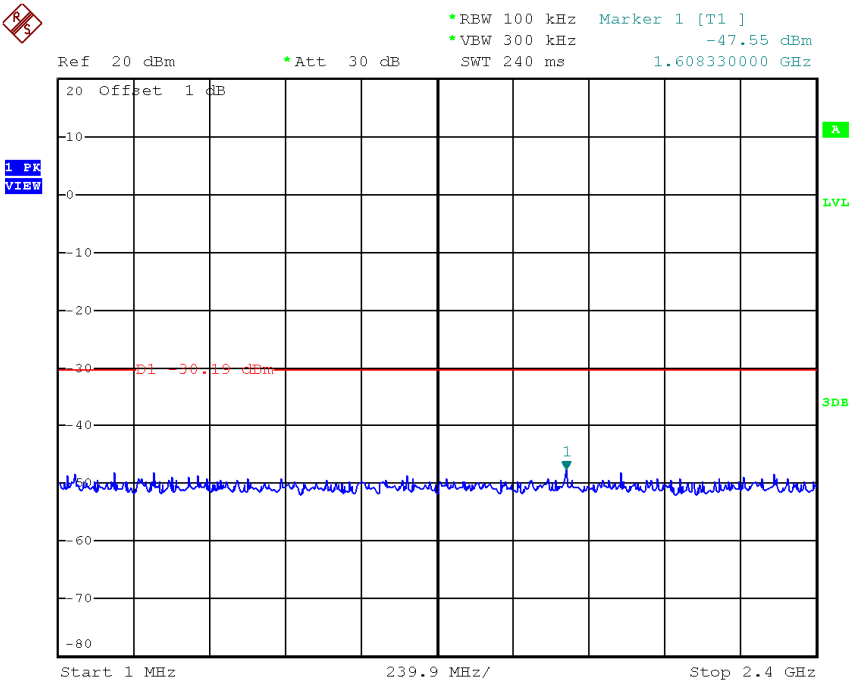
Middle Channel, B mode, Plot B



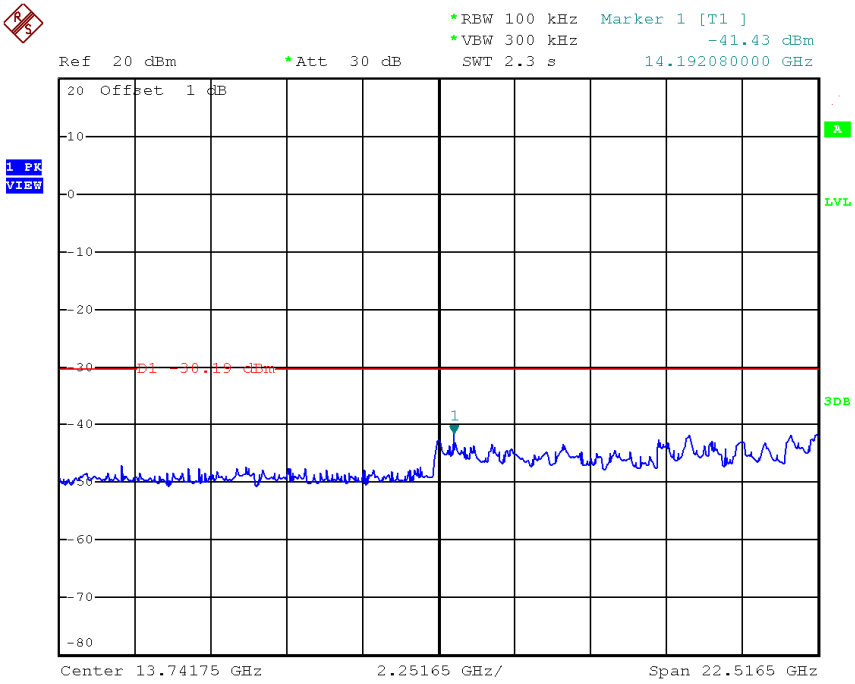
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, B mode, Plot A



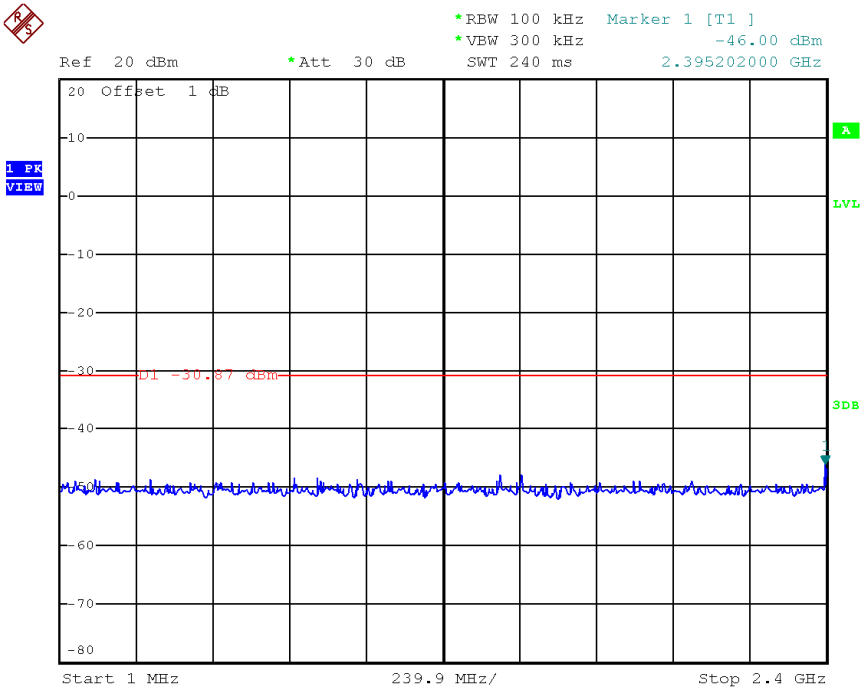
Highest Channel, B mode, Plot B



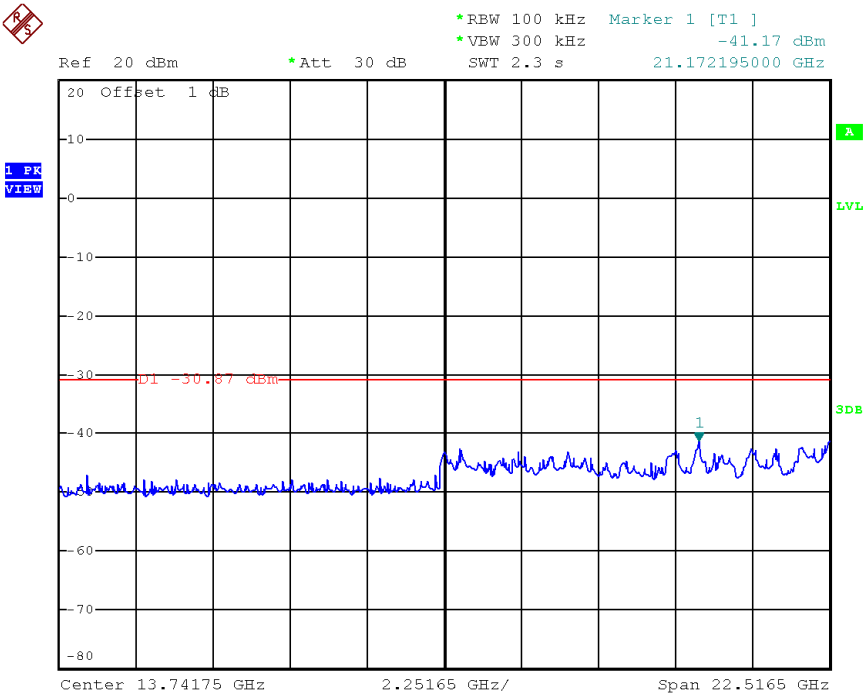
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, G mode, Plot A



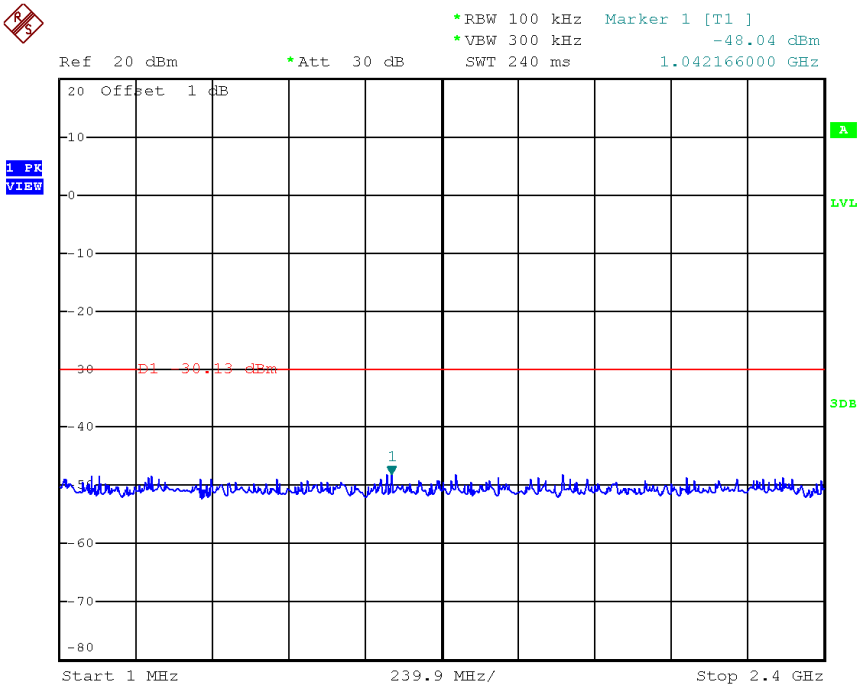
Lowest Channel, G mode, Plot B



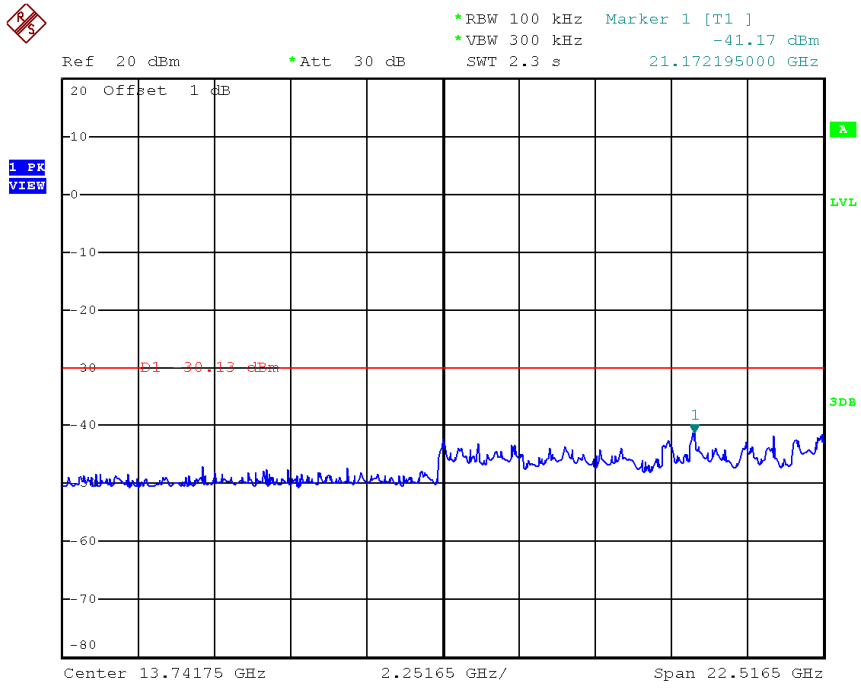
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, G mode, Plot A



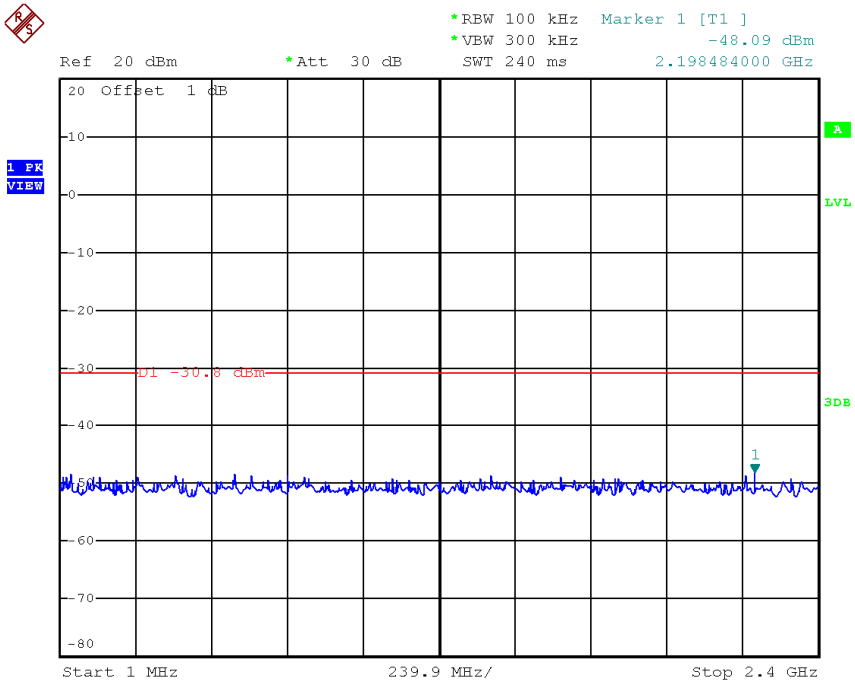
Middle Channel, G mode, Plot B



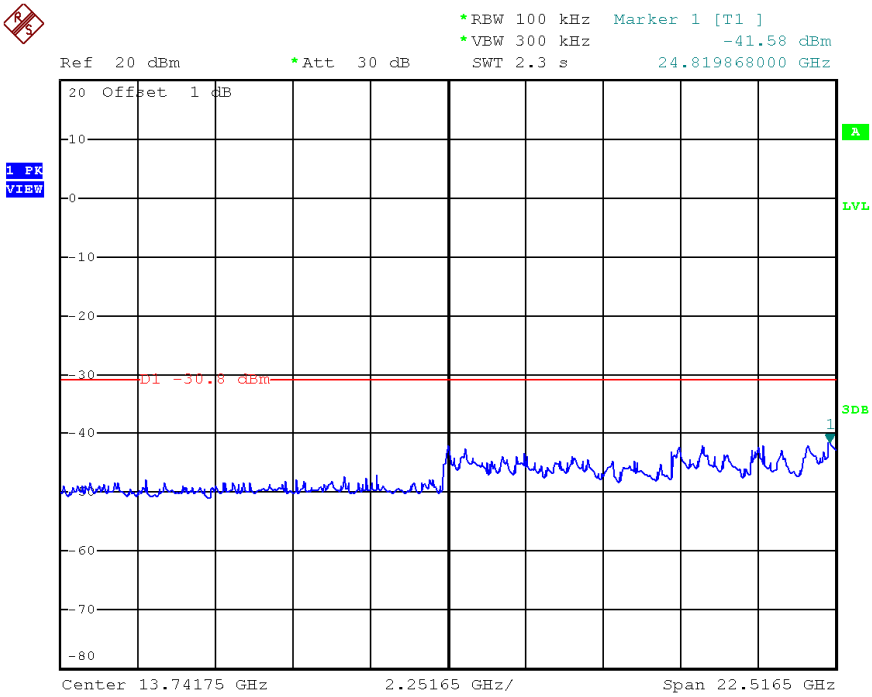
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, G mode, Plot A



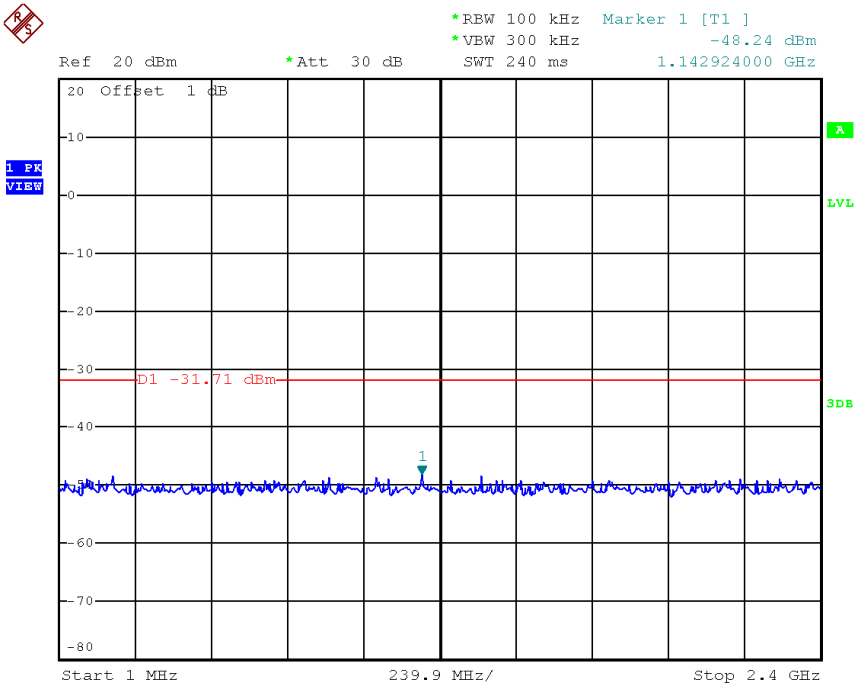
Highest Channel, G mode, Plot B



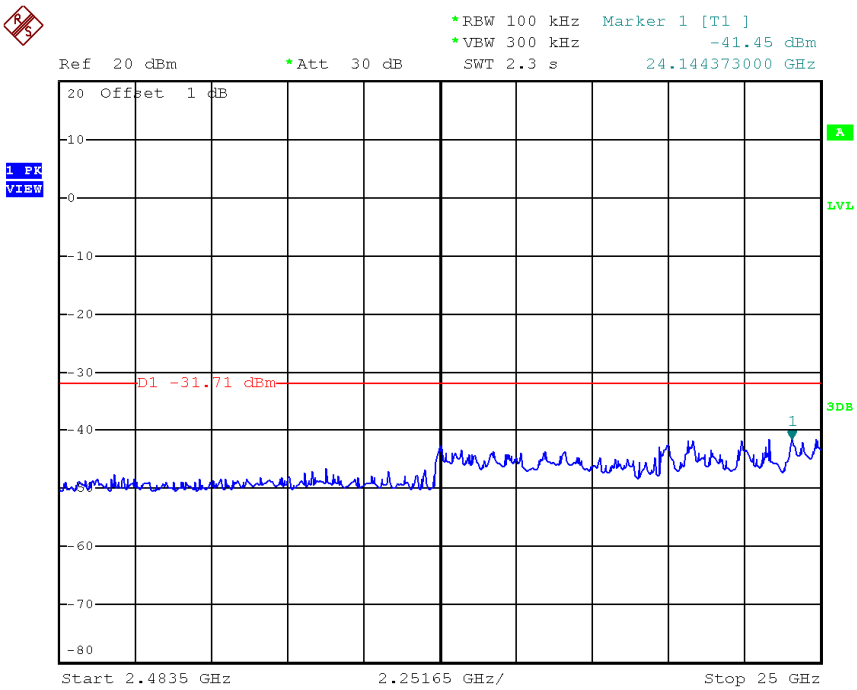
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, N20 mode, Plot A



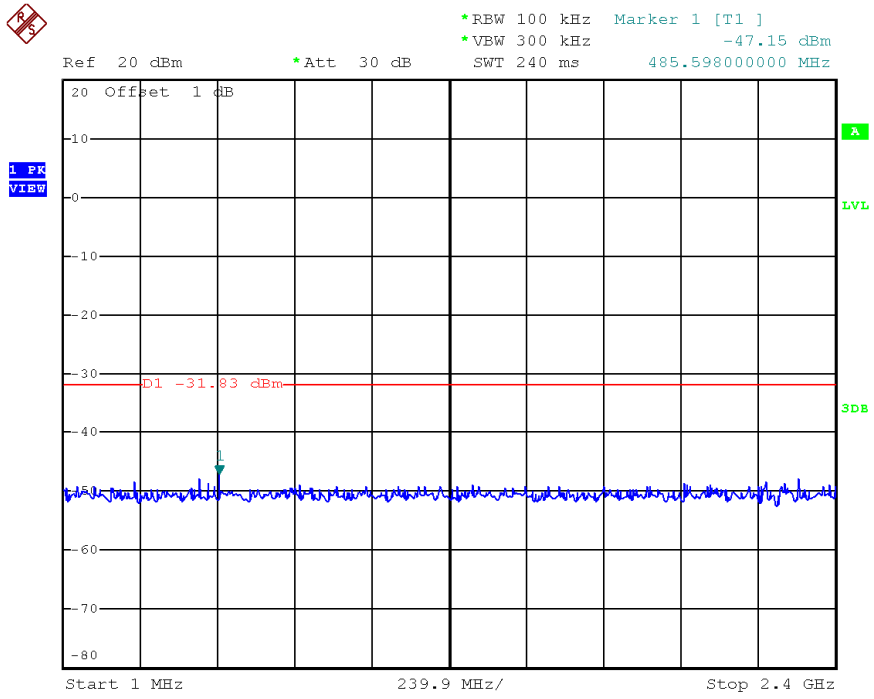
Lowest Channel, N20 mode, Plot B



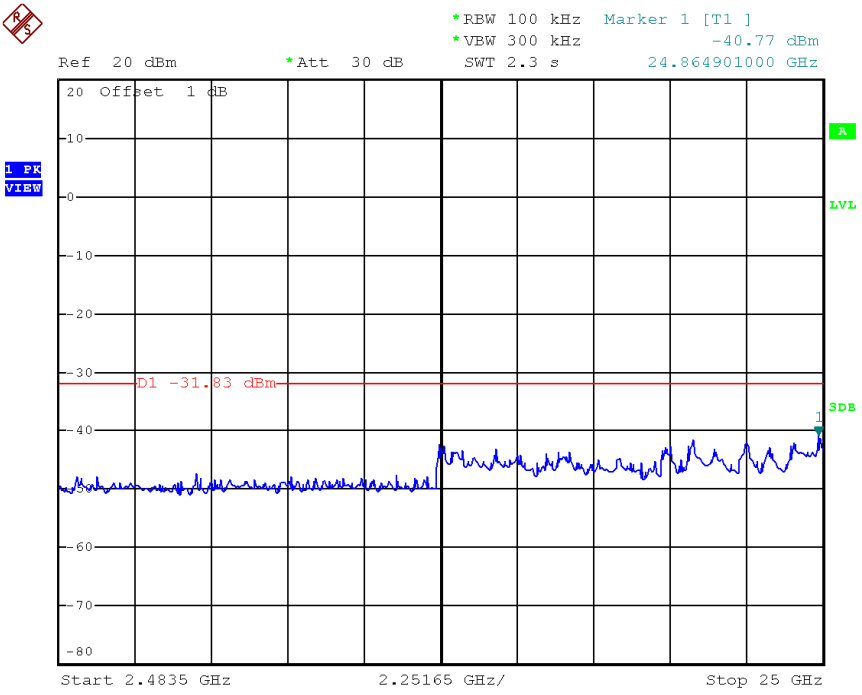
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, N20 mode, Plot A



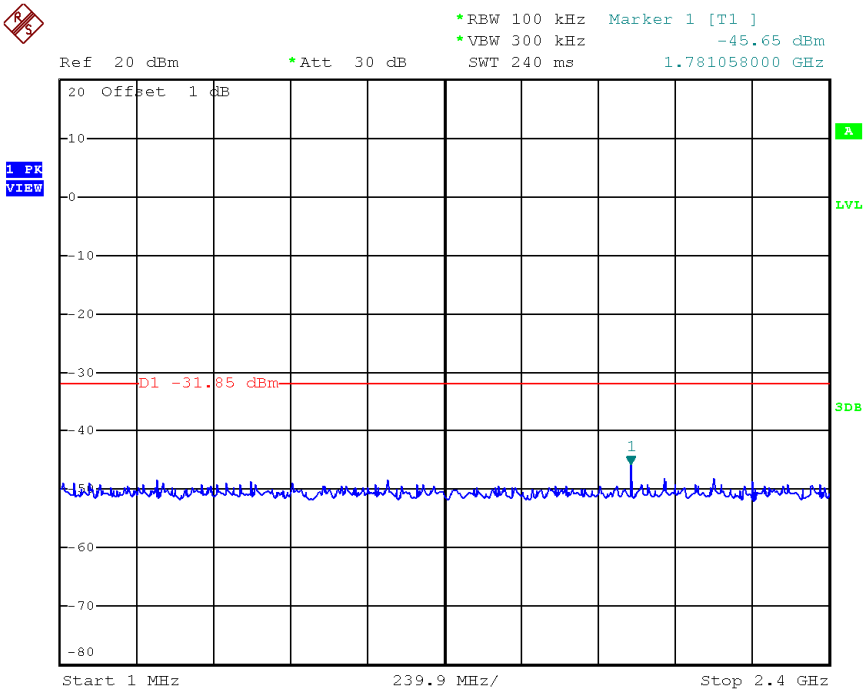
Middle Channel, N20 mode, Plot B



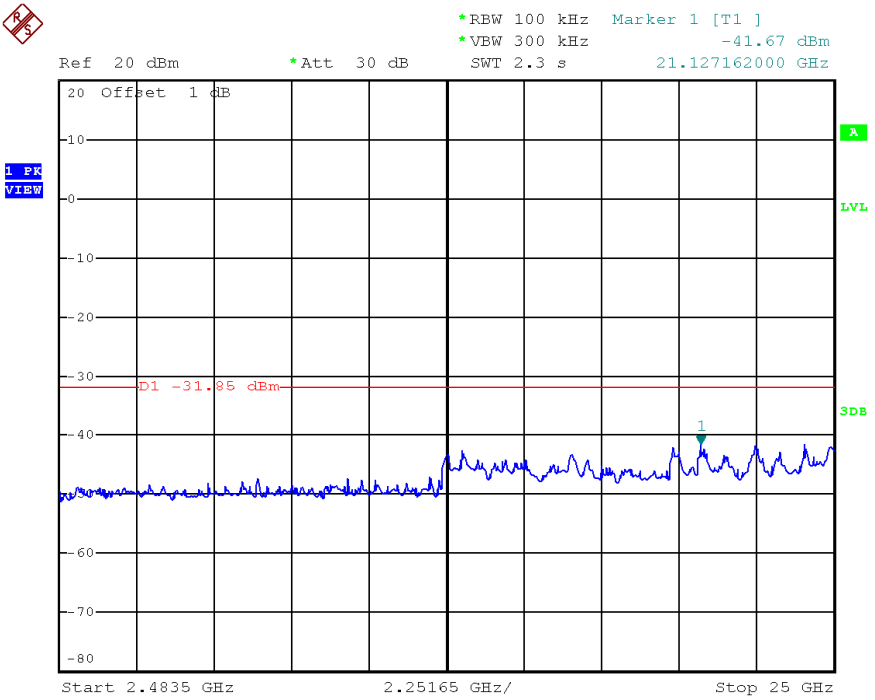
TEST REPORT

PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, N20 mode, Plot A



Highest Channel, N20 mode, 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

648.011 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 1.0 dB margin

TEST REPORT

RADIATED EMISSION DATA

B Mode: TX-Channel 2412MHz

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***	***33.2***	***33***	***46.3***	***46.5***	***54.0***	***-7.5***
H	***4824.000***	***34.8***	***33***	***34.9***	***36.7***	***54.0***	***-17.3***
H	***9648.000***	***30.9***	***33***	***40.4***	***38.3***	***54.0***	***-15.7***
H	***12060.000***	***31.2***	***33***	***43.0***	***41.2***	***54.0***	***-12.8***

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	***2390.000***	***59.4***	***33***	***29.4***	***55.8***	***74.0***	***-18.2***
H	***4824.000***	***50.7***	***33***	***34.9***	***52.6***	***74.0***	***-21.4***
H	***9648.000***	***42.8***	***33***	***40.4***	***50.2***	***74.0***	***-23.8***
H	***12060.000***	***45.0***	***33***	***40.5***	***52.5***	***74.0***	***-21.5***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

B Mode: TX-Channel 2437MHz

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	***4874.000***	***34.6***	***33***	***34.9***	***36.5***	***54.0***	***-17.5***
H	***7311.000***	***31.6***	***33***	***37.9***	***36.5***	***54.0***	***-17.5***
H	***12185.000***	***35.0***	***33***	***40.5***	***42.5***	***54.0***	***-11.5***

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	***4874.000***	***50.3***	***33***	***34.9***	***52.2***	***74.0***	***-21.8***
H	***7311.000***	***44.3***	***33***	***37.9***	***49.2***	***74.0***	***-24.8***
H	***12185.000***	***46.1***	***33***	***40.5***	***53.6***	***74.0***	***-20.4***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

B Mode: TX-Channel 2462MHz

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***	***50.8***	***33***	***29.4***	***47.2***	***54.0***	***-6.8***
H	***4924.000***	***34.2***	***33***	***34.9***	***36.1***	***54.0***	***-17.9***
H	***7386.000***	***33.2***	***33***	***37.9***	***38.1***	***54.0***	***-15.9***
H	***12310.000***	***35.0***	***33***	***40.5***	***42.5***	***54.0***	***-11.5***

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***	***60.5***	***33***	***29.4***	***56.9***	***74.0***	***-17.1***
H	***4924.000***	***50.3***	***33***	***34.9***	***52.2***	***74.0***	***-21.8***
H	***7386.000***	***43.4***	***33***	***37.9***	***48.3***	***74.0***	***-25.7***
H	***12310.000***	***47.7***	***33***	***40.5***	***55.2***	***74.0***	***-18.8***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

G Mode: TX-Channel 2412MHz

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***	***34.6***	***33***	***46.3***	***47.9***	***54.0***	***-6.1***
H	***4824.000***	***33.8***	***33***	***34.9***	***35.7***	***54.0***	***-18.3***
H	***9648.000***	***29.8***	***33***	***40.4***	***37.2***	***54.0***	***-16.8***
H	***12060.000***	***30.4***	***33***	***43.0***	***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***	***74.9***	***33***	***29.4***	***71.3***	***74.0***	***-2.7***
H	***4824.000***	***49.8***	***33***	***34.9***	***51.7***	***74.0***	***-22.3***
H	***9648.000***	***41.4***	***33***	***40.4***	***48.8***	***74.0***	***-25.2***
H	***12060.000***	***44.8***	***33***	***40.5***	***52.3***	***74.0***	***-21.7***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

G Mode: TX-Channel 2437MHz

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	***4874.000***	***33.3***	***33***	***34.9***	***35.2***	***54.0***	***-18.8***
H	***7311.000***	***30.2***	***33***	***37.9***	***35.1***	***54.0***	***-18.9***
H	***12185.000***	***32.8***	***33***	***40.5***	***40.3***	***54.0***	***-13.7***

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	***4874.000***	***48.5***	***33***	***34.9***	***50.4***	***74.0***	***-23.6***
H	***7311.000***	***43.0***	***33***	***37.9***	***47.9***	***74.0***	***-26.1***
H	***12185.000***	***44.3***	***33***	***40.5***	***51.8***	***74.0***	***-22.2***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

G Mode: TX-Channel 2462MHz

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***	***52.0***	***33***	***29.4***	***48.4***	***54.0***	***-5.6***
H	***4924.000***	***32.6***	***33***	***34.9***	***34.5***	***54.0***	***-19.5***
H	***7386.000***	***30.3***	***33***	***37.9***	***35.2***	***54.0***	***-18.8***
H	***12310.000***	***33.2***	***33***	***40.5***	***40.7***	***54.0***	***-13.3***

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***	***75.8***	***33***	***29.4***	***72.2***	***74.0***	***-1.8***
H	***4924.000***	***47.4***	***33***	***34.9***	***49.3***	***74.0***	***-24.7***
H	***7386.000***	***41.9***	***33***	***37.9***	***46.8***	***74.0***	***-27.2***
H	***12310.000***	***44.9***	***33***	***40.5***	***52.4***	***74.0***	***-21.6***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

N20 Mode: TX-Channel 2412MHz

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***	***34.1***	***33***	***46.3***	***47.4***	***54.0***	***-6.6***
H	***4824.000***	***33.6***	***33***	***34.9***	***35.5***	***54.0***	***-18.5***
H	***12060.000***	***30.1***	***33***	***43.0***	***40.1***	***54.0***	***-13.9***
H	***14472.000***	***35.5***	***33***	***40.0***	***42.5***	***54.0***	***-11.5***

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***	***73.9***	***33***	***29.4***	***70.3***	***74.0***	***-3.7***
H	***4824.000***	***48.7***	***33***	***34.9***	***50.6***	***74.0***	***-23.4***
H	***12060.000***	***44.4***	***33***	***40.5***	***51.9***	***74.0***	***-22.1***
H	***14472.000***	***46.4***	***33***	***40.0***	***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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

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N20 Mode: TX-Channel 2437MHz

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	***4874.000***	***32.5***	***33***	***34.9***	***34.4***	***54.0***	***-19.6***
H	***7311.000***	***31.4***	***33***	***37.9***	***36.3***	***54.0***	***-17.7***
H	***12185.000***	***33.6***	***33***	***40.5***	***41.1***	***54.0***	***-12.9***

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	***4874.000***	***47.4***	***33***	***34.9***	***49.3***	***74.0***	***-24.7***
H	***7311.000***	***42.6***	***33***	***37.9***	***47.5***	***74.0***	***-26.5***
H	***12185.000***	***44.6***	***33***	***40.5***	***52.1***	***74.0***	***-21.9***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

N20 Mode: TX-Channel 2462MHz

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***	***51.3***	***33***	***29.4***	***47.7***	***54.0***	***-6.3***
H	***4924.000***	***33.1***	***33***	***34.9***	***35.0***	***54.0***	***-19.0***
H	***7386.000***	***30.9***	***33***	***37.9***	***35.8***	***54.0***	***-18.2***
H	***12310.000***	***33.4***	***33***	***40.5***	***40.9***	***54.0***	***-13.1***

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***	***74.6***	***33***	***29.4***	***71.0***	***74.0***	***-3.0***
H	***4924.000***	***47.6***	***33***	***34.9***	***49.5***	***74.0***	***-24.5***
H	***7386.000***	***42.0***	***33***	***37.9***	***46.9***	***74.0***	***-27.1***
H	***12310.000***	***45.0***	***33***	***40.5***	***52.5***	***74.0***	***-21.5***

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.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.

TEST REPORT

Mode: WiFi Operating + Charging

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	32.425	38.4	16	10.0	32.4	40.0	-7.6
V	***112.844***	***40.2***	***16***	***14.0***	***38.2***	***43.5***	***-5.3***
V	***119.270***	***40.6***	***16***	***14.0***	***38.6***	***43.5***	***-4.9***
H	***131.819***	***38.6***	***16***	***14.0***	***36.6***	***43.5***	***-6.9***
H	152.735	39.4	16	15.0	38.4	43.5	-5.1
H	***172.438***	***36.5***	***16***	***18.0***	***38.5***	***43.5***	***-5.0***
H	215.997	37.8	16	17.0	38.8	43.5	-4.7
H	228.365	35.8	16	18.0	37.8	46.0	-8.2
H	304.449	34.2	16	22.0	40.2	46.0	-5.8
H	343.522	34.2	16	24.0	42.2	46.0	-3.8
H	381.079	34.6	16	24.0	42.6	46.0	-3.4
H	432.004	32.4	16	25.0	41.4	46.0	-4.6
H	485.293	32.2	16	26.0	42.2	46.0	-3.8
H	536.340	29.8	16	28.0	41.8	46.0	-4.2
H	576.049	28.4	16	28.0	40.4	46.0	-5.6
H	648.011	32.0	16	29.0	45.0	46.0	-1.0
H	720.033	26.6	16	30.0	40.6	46.0	-5.4
H	791.753	25.4	16	31.0	40.4	46.0	-5.6
H	***996.453***	***23.2***	***16***	***33.0***	***40.2***	***54.0***	***-13.8***

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.

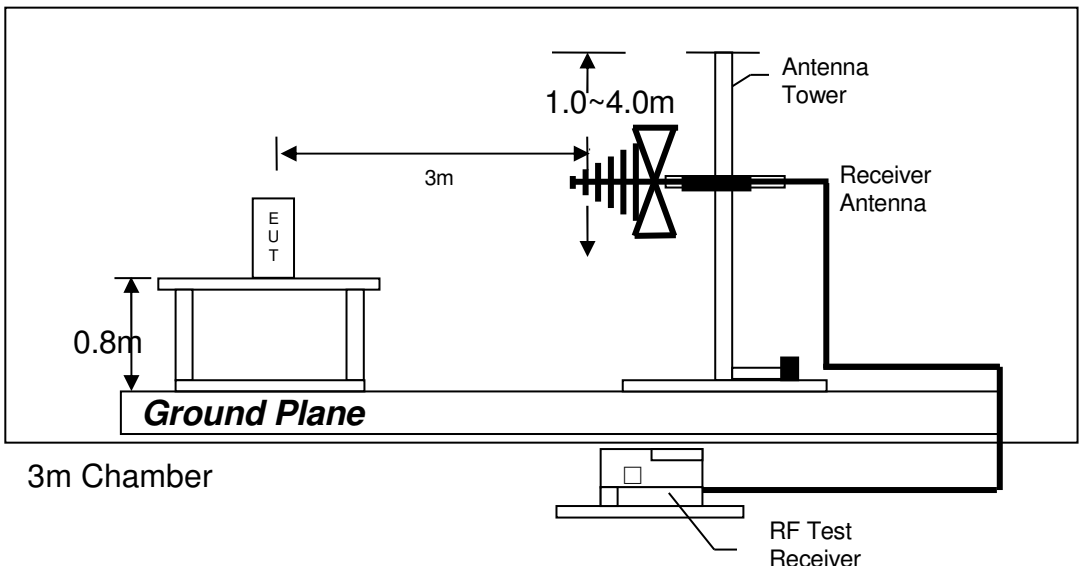
3. Negative value in the margin column shows emission below limit.

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.

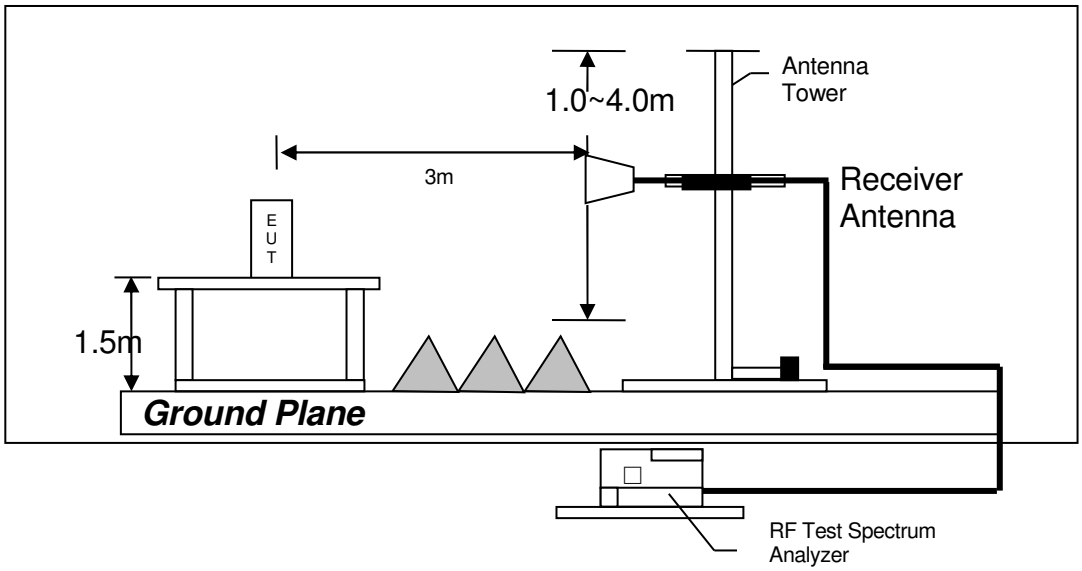
TEST REPORT

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

0.150 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 14.0 dB margin

TEST REPORT

AC POWER LINE CONDUCTED EMISSION

Worst Case: WiFi Operating + Charging

EDIT PEAK LIST (Final Measurement Results)

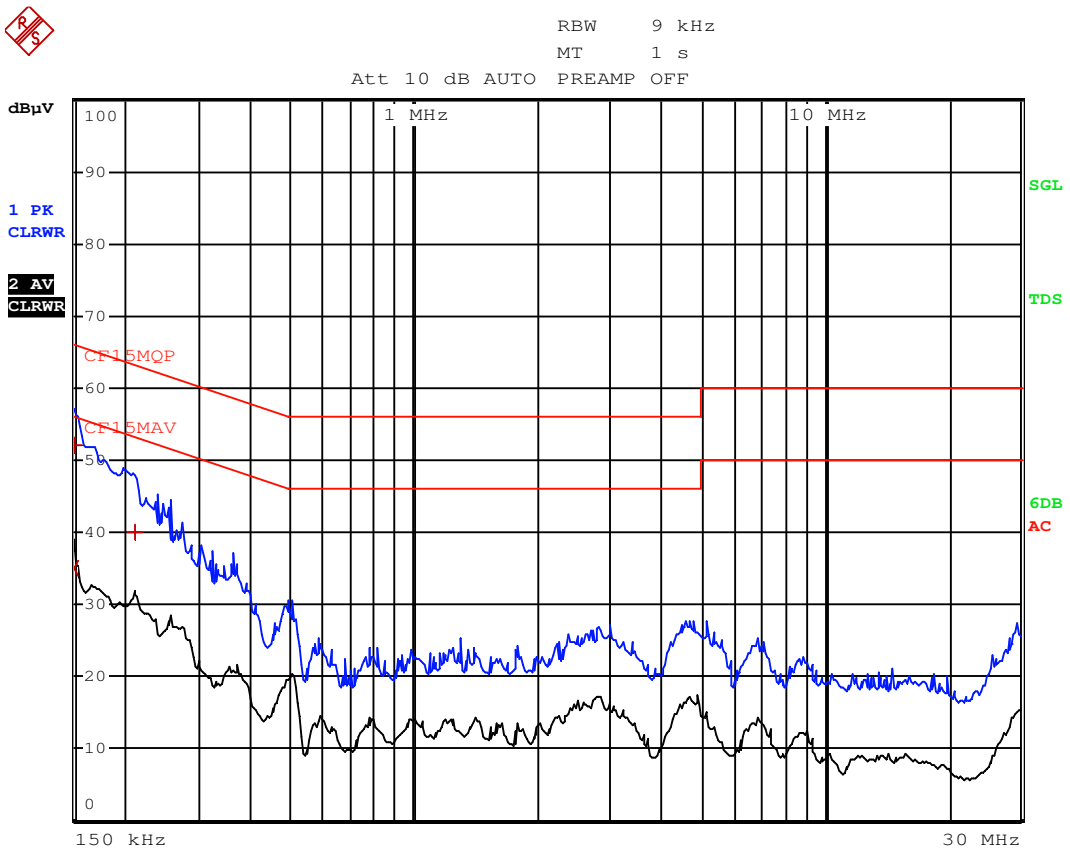
Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	150 kHz	52.05	N	-13.95
2	CISPR Average	150 kHz	34.93	N	-21.06
1	Quasi Peak	213 kHz	39.91	L1	-23.17

Date: 2.OCT.2018 09:40:17

TEST REPORT

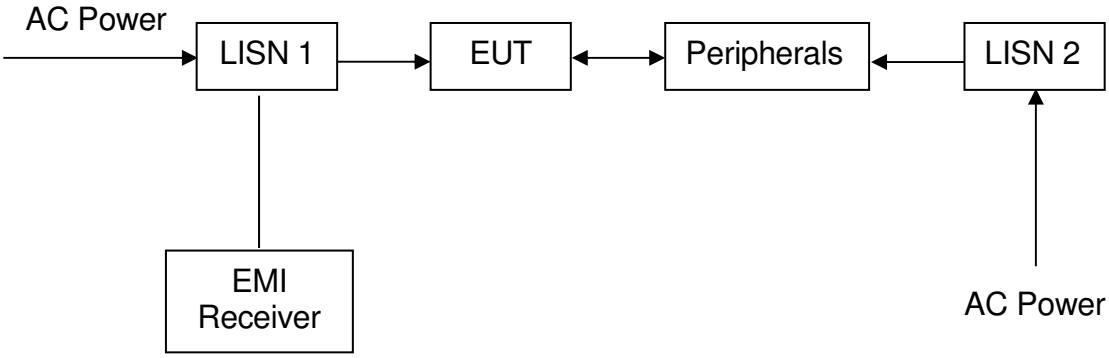
Worst Case: WiFi Operating + Charging



Date: 2.OCT.2018 09:40:36

TEST REPORT

4.7.3 Conducted Emission Test Setup

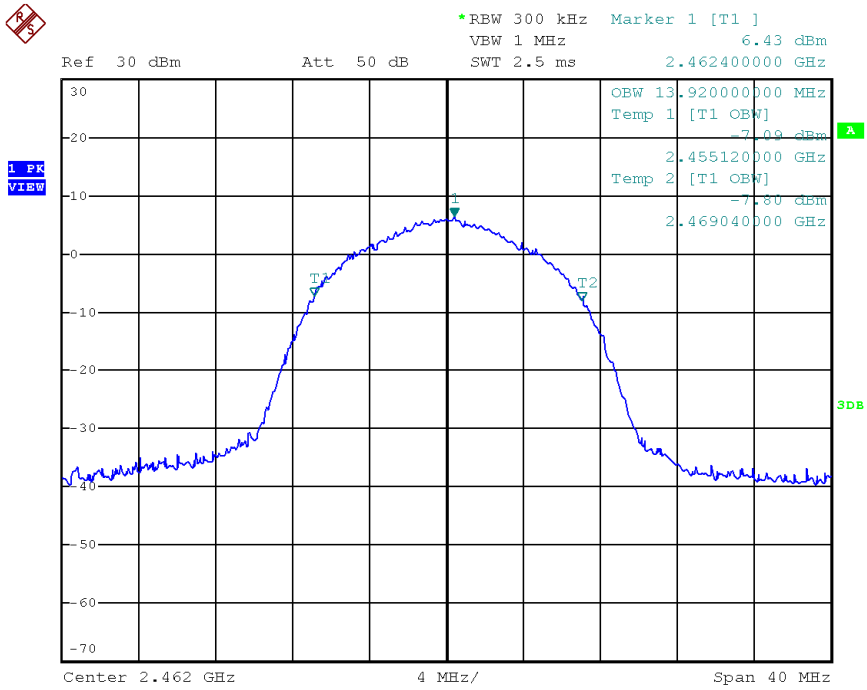


TEST REPORT

Occupied Bandwidth Results:

B mode	Occupied Bandwidth (MHz)
Low Channel: 2412MHz	13.84
Middle Channel: 2437MHz	13.84
High Channel: 2462MHz	13.92

The worst case is shown as below

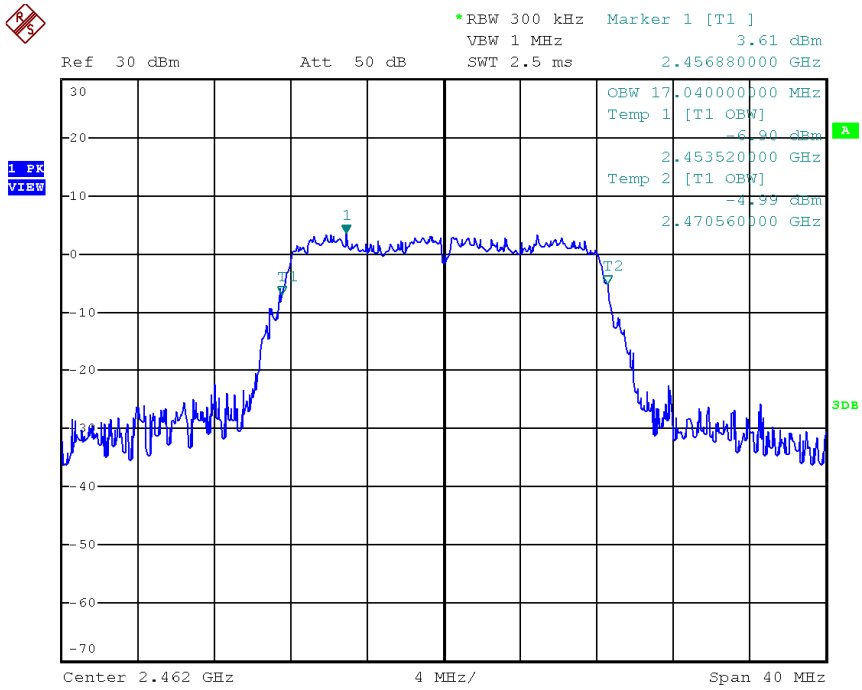


TEST REPORT

Occupied Bandwidth Results:

G mode	Occupied Bandwidth (MHz)
Low Channel: 2412MHz	16.80
Middle Channel: 2437MHz	16.80
High Channel: 2462MHz	17.04

The worst case is shown as below

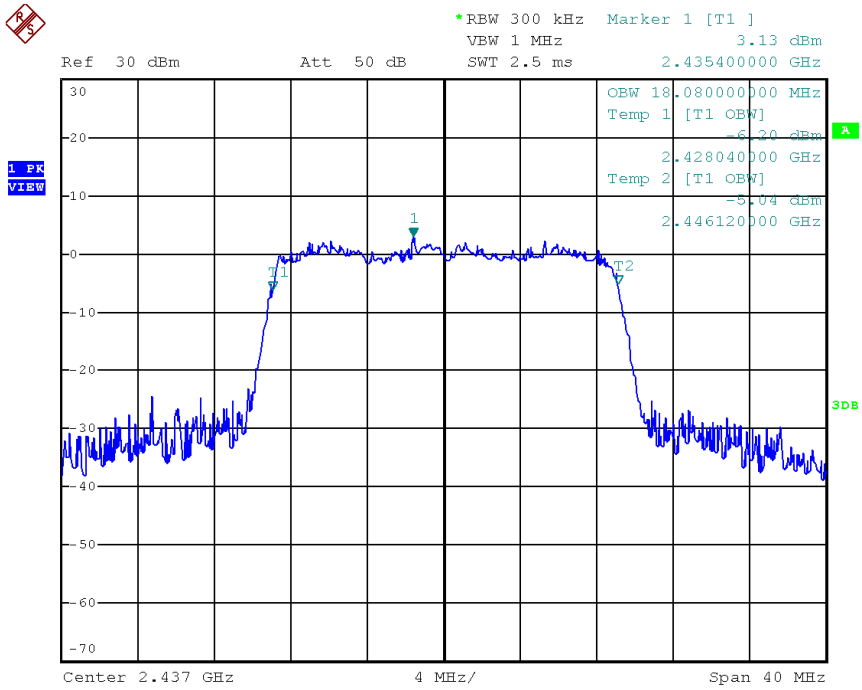


TEST REPORT

Occupied Bandwidth Results:

N20 mode	Occupied Bandwidth (MHz)
Low Channel: 2412MHz	18.08
Middle Channel: 2437MHz	18.08
High Channel: 2462MHz	18.00

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-3156	EW-0954	EW-0447
Manufacturer	ROHDESCHWARZ	EMCO	EMCO
Model No.	ESR26	3104C	3146
Calibration Date	November 10, 2017	February 27, 2018	January 17, 2018
Calibration Due Date	November 10, 2018	August 27, 2019	July 17, 2019

Equipment	Active Loop H-field (9kHz to 30MHz)	12m Double Shield RF Cable (20MHz to 6GHz)	RF Cable (up to 40GHz)
Registration No.	EW-2313	EW-1852	EW-3155
Manufacturer	ELECTROMETRI	RADIALL	N/A
Model No.	EM-6876	N(m)-RG142 - N(m)	1-40 GHz
Calibration Date	March 08, 2018	January 19, 2018	January 29, 2018
Calibration Due Date	September 08, 2019	January 19, 2019	January 29, 2019

Equipment	Double Ridged Guide Antenna	Pyramidal Horn Antenna	Spectrum Analyzer
Registration No.	EW-1015	EW-0905	EW-3110
Manufacturer	EMCO	EMCO	R&S
Model No.	3115	3160-09	FSP30
Calibration Date	November 17, 2017	August 18, 2017	March 05, 2018
Calibration Due Date	May 17, 2019	February 18, 2019	March 05, 2019

Equipment	Notch Filter (cutoff frequency 2.4GHz to 2.5GHz)	Solid State Low Noise Preamplifier Assembly (1 - 18)GHz	RF Pre-amplifier (9kHz to 40GHz)
Registration No.	EW-2213	EW-3229	EW-3006
Manufacturer	MICROTRONICS	BONN ELEKTRO	SCHWARZBECK
Model No.	BRM50701-02	BLMA 0118-5G	BBV 9744
Calibration Date	May. 24, 2018	January 30, 2018	April 26, 2018
Calibration Due Date	May. 24, 2019	January 30, 2019	April 26, 2019

TEST REPORT

2) Conductive Measurement 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-3110
Manufacturer	AGILENTTECH	N/A	R&S
Model No.	N1911A	SMA-M to SMA-M	FSP30
Calibration Date	Jan. 15, 2018	July 03, 2018	March 05, 2018
Calibration Due Date	Jan. 15, 2019	July 03, 2019	March 05, 2019

TEST REPORT

3) Conducted Emissions Test

Equipment	Artificial Mains Network	RF Cable 240cm (RG142) (9kHz to 30MHz)	EMI Test Receiver
Registration No.	EW-2501	EW-2454	EW-3156
Manufacturer	ROHDESCHWARZ	RADIALL	ROHDESCHWARZ
Model No.	ENV-216	bnc m st / 142 / bnc m st	ESR26
Calibration Date	February 14, 2018	March 27, 2018	November 10, 2017
Calibration Due Date	February 14, 2019	March 27, 2019	November 10, 2018

4) Bandedge/Bandwidth Measurement

Equipment	RF Cable (up to 40GHz) 1.5m length	Spectrum Analyzer
Registration No.	EW-3104	EW-3110
Manufacturer	N/A	R&S
Model No.	SMA-M to SMA-M	FSP30
Calibration Date	July 03, 2018	March 05, 2018
Calibration Due Date	July 03, 2019	March 05, 2019

- End of Report -