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FCC / IC BT LE REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Date of Issue:
March 05, 2019

Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-1903-FI005

FCC ID:	**A3LSMT510**
IC:	**649E-SMT510**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : A3LSMT515 report.

Model:	SM-T510
EUT Type:	Tablet
Average Output Power:	4.88 dBm (3.076 mW)
Frequency Range:	2402 MHz -2480 MHz
Modulation type	GFSK
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s):	Part 15.247
ISED Rule Part(s):	RSS-247 Issue 2 (February 2017), RSS-Gen Issue 5(April 2018)

Engineering Statement:

Engineering Statement:
The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC / IC Rules under normal use and maintenance.

Report prepared by : Kwon Jeong
Engineer of Telecommunication testing center

Approved by : Jong Seok Lee
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1903-FI005	March 05, 2019	- First Approval Report

Table of Contents

1. EUT DESCRIPTION

Model	SM-T510	
EUT Type	Tablet	
Power Supply	DC 3.85 V	
Battery Information	Model: EB-0BT515ABU Type: Li-ion battery	
Travel Adapter Information	Model : EP-TA50EWE Manufacture: DONGYANG	
Frequency Range	2402 MHz - 2480 MHz	
Max. RF Output Power	Peak (For information only)	1M Bit/s : 5.103 dBm (3.238 mW) 2M Bit/s : 5.455 dBm (3.512 mW)
	Average	1M Bit/s : 4.88 dBm (3.076 mW) 2M Bit/s : 4.81 dBm (3.027 mW)
Modulation Type	GFSK	
Bluetooth Version	5.0	
Number of Channels	40 Channels	
Antenna Specification	Antenna type: LDS Peak Gain : 0.02 dBi	
Date(s) of Tests	January 17, 2019 ~ February 21, 2019 February 27, 2019 (Only OBW For IC)	
PMN (Product Marketing Number)	SM-T510	
HVIN (Hardware Version Identification Number)	SM-T510	
FVIN (Firmware Version Identification Number)	T510.001	
HMN (Host Marketing Name)	N/A	

2. TEST METHODOLOGY

FCC KDB 558074 D01 15.247 Meas Guidance v05r01 dated February 11, 2019 entitled “guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices and the measurement procedure described in ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpse of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C. / RSS-Gen issue 5, RSS-247 issue 2.

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

See Section from 8.3.(KDB 558074 v05r01)

DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,

Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

For ISED, test facility was accepted dated February 14, 2019 (CAB identifier: KR0032).

EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203 / RSS-Gen(Issue 5) Section 8:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

* The antennas of this E.U.T are permanently attached.
* The E.U.T Complies with the requirement of §15.203

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence.

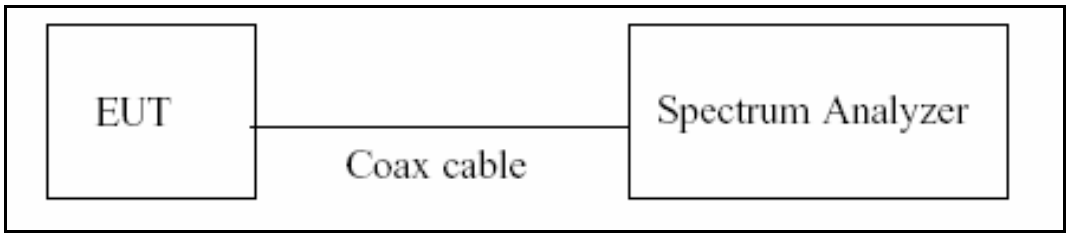
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.71

7. DESCRIPTION OF TESTS

7.1. Duty Cycle

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method, 6.0)b) in KDB 558074 v05r01.

The largest availble value of RBW is 8 MHz and VBW is 50 MHz.

The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/*T*.

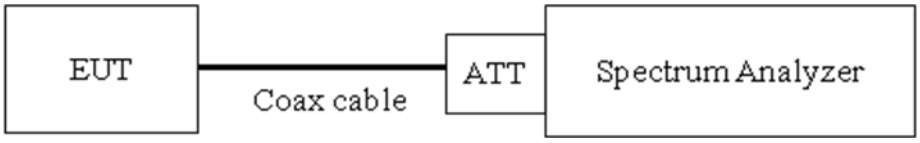
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10*log(1/Duty Cycle)

7.2. 6dB Bandwidth & 99 % Bandwidth

Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 8.2 in KDB 558074 v05r01,
Procedure 11.8.1 in ANSI 63.10-2013)

1) RBW = 100 kHz
2) VBW ≥ 3 x RBW
3) Detector = Peak
4) Trace mode = max hold
5) Sweep = auto couple
6) Allow the trace to stabilize
7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

Test Procedure (99 % Bandwidth for IC)

The transmitter output is connected to the spectrum analyzer.

RBW = 1% ~ 5% of the occupied bandwidth
VBW ≒ 3 x RBW
Detector = Peak
Trace mode = max hold
Sweep = auto couple
Allow the trace to stabilize

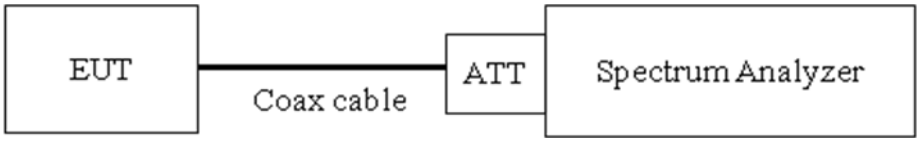
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

7.3. Output Power

Limit

The maximum permissible conducted output power is 1 Watt.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

This EUT TX condition is actual operating mode by BT LE mode test program.

The Spectrum Analyzer is set to

- Peak Power (Procedure 8.3.1.1 in KDB 558074 v05r01, Procedure 11.9.1.1 in ANSI 63.10-2013)
  1) RBW ≥ DTS Bandwidth
  2) VBW ≥ 3 x RBW
  3) SPAN ≥ 3 x RBW
  4) Detector Mode = Peak
  5) Sweep = auto couple
  6) race Mode = max hold
  7) Allow trace to fully stabilize.
  8) Use peak marker function to determine the peak amplitude level

▪ Average Power (Procedure 8.3.2.2 in KDB 558074 v05r01, Procedure 11.9.2.2 in ANSI 63.10-2013)

1) We use the spectrum analyzer's integrated band power measurement function.
2) Measure the duty cycle
3) Set span to at least 1.5 times the OBW
4) RBW = 1-5 % of the OBW, not to exceed 1 MHz.
5) VBW ≥ 3 x RBW.
6) Number of points in sweep ≥ 2 x span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
7) Sweep time = auto.
8) Detector = RMS(i.e., power averaging)
9) Do not use sweep triggering. Allow the sweep to "free run".
10) Trace average at least 100 traces in power averaging(RMS) mode.
11) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
12) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Sample Calculation

▪ Conducted Output Power(Peak) = Reading Value + ATT loss + Cable loss

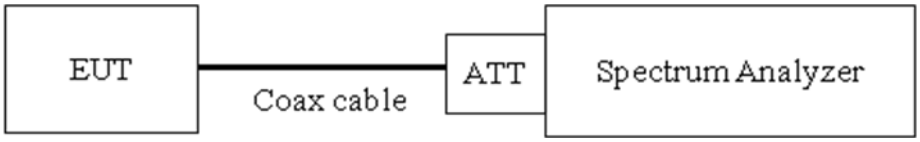
▪ Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

7.4. Power Spectral Density

Limit

The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 8.4 in KDB 558074 v05r01, Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

1) Set analyzer center frequency to DTS channel center frequency.
2) Set span to at least 1.5 times the OBW.
3) RBW = 3 kHz ≤ RBW ≤ 100 kHz.
4) VBW ≥ 3 x RBW.
5) Sweep = auto couple
6) Detector = power averaging (rms) or sample detector (when rms not available).
7) Ensure that the number of measurement points in the sweep ≥[2 ×span / RBW].
8) Employ trace averaging (rms) modeover a minimum of 100 traces
9) Use the peak marker function to determine the maximum amplitude level.
10) Use the peak marker function to determine the maximum amplitude level within the RBW.
    If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Sample Calculation

▪ Power Spectral Density = Reading Value + ATT loss + Cable loss

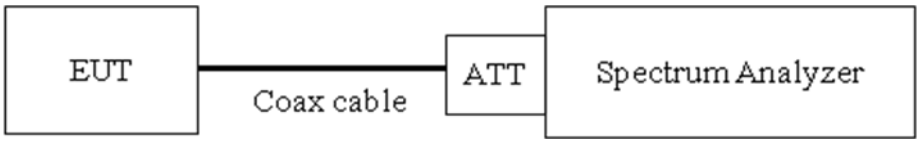
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

Limit

The maximum conducted (average) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

[Conducted > 30 dBc]

Test Configuration



Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 8.5 in KDB 558074 v05r01, Procedure 11.11 in ANSI 63.10-2013)

1) RBW = 100 kHz
2) VBW ≥ 3 x RBW
3) Set span to encompass the spectrum to be examined
4) Detector = Peak
5) Trace Mode = max hold
6) Sweep time = auto couple
7) Ensure that the number of measurement points ≥ 2*Span/RBW
8) Allow trace to fully stabilize.
9) Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

Factors for frequency

Freq(MHz)	Factor(dB)
30	21.88
100	20.41
200	20.77
300	20.71
400	20.81
500	20.83
600	20.90
700	20.93
800	20.93
900	20.92
1000	20.97
2000	21.22
2400*	21.21
2500*	21.23
3000	21.26
4000	21.47
5000	21.41
6000	21.44
7000	21.93
8000	21.90
9000	22.06
10000	22.14
11000	22.14
12000	22.26
13000	22.41
14000	22.48
15000	22.56
16000	22.62
17000	22.60
18000	22.66
19000	22.65
20000	22.72
21000	22.75
22000	22.89
23000	23.18
24000	22.92
25000	23.11
26000	22.60

Note : 1. '*' is fundamental frequency range.
2. Factor = Attenuator loss + Cable loss

7.6. Radiated Test

Limit

FCC

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30

IC

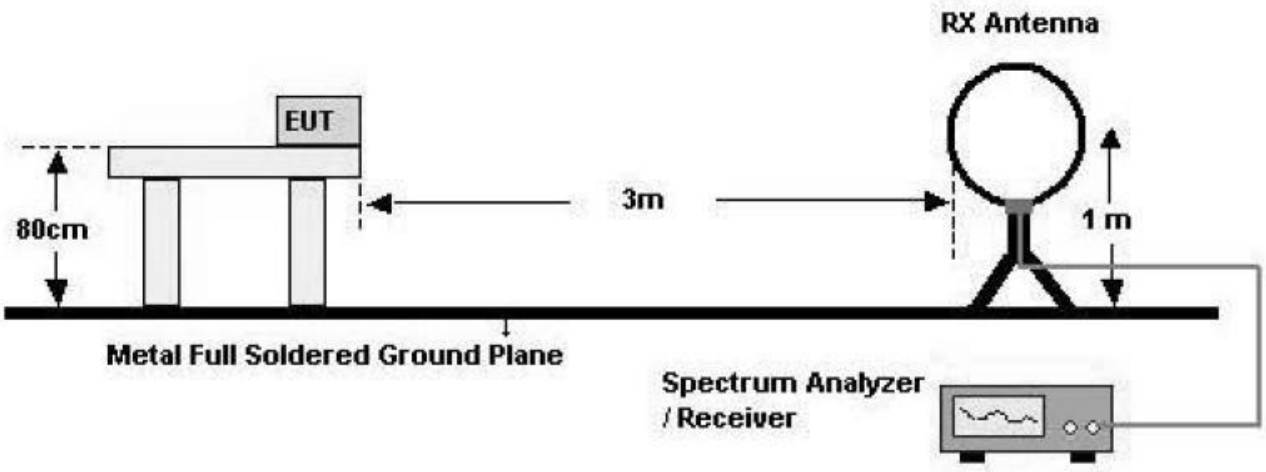
Frequency (MHz)	Field Strength (uA/m)	Measurement Distance (m)
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

FCC&IC

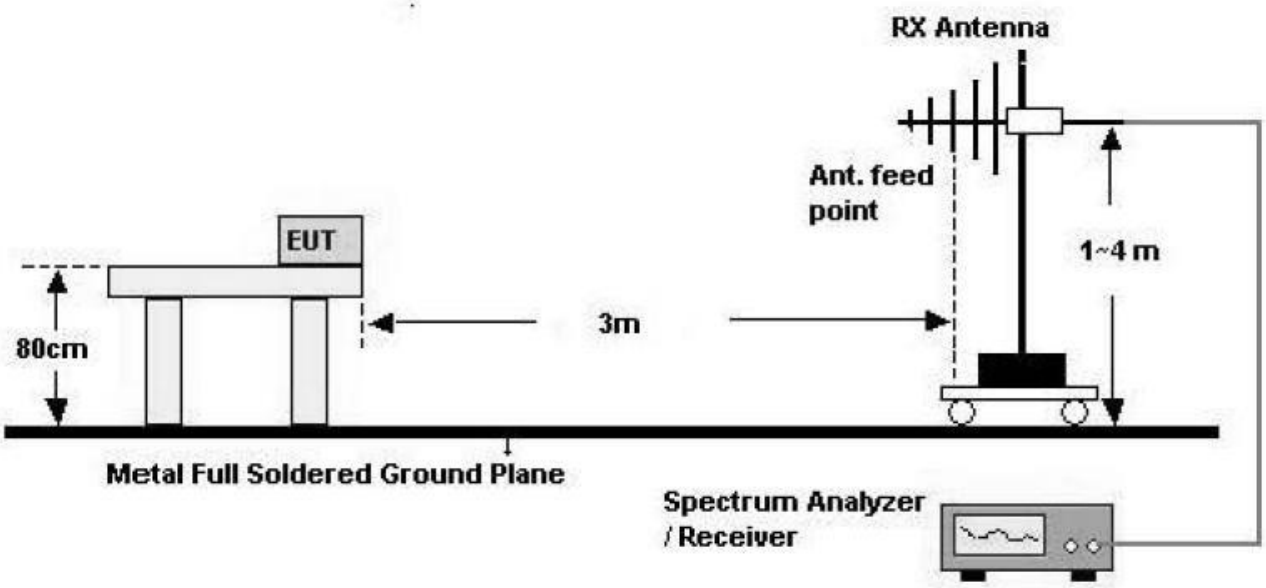
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

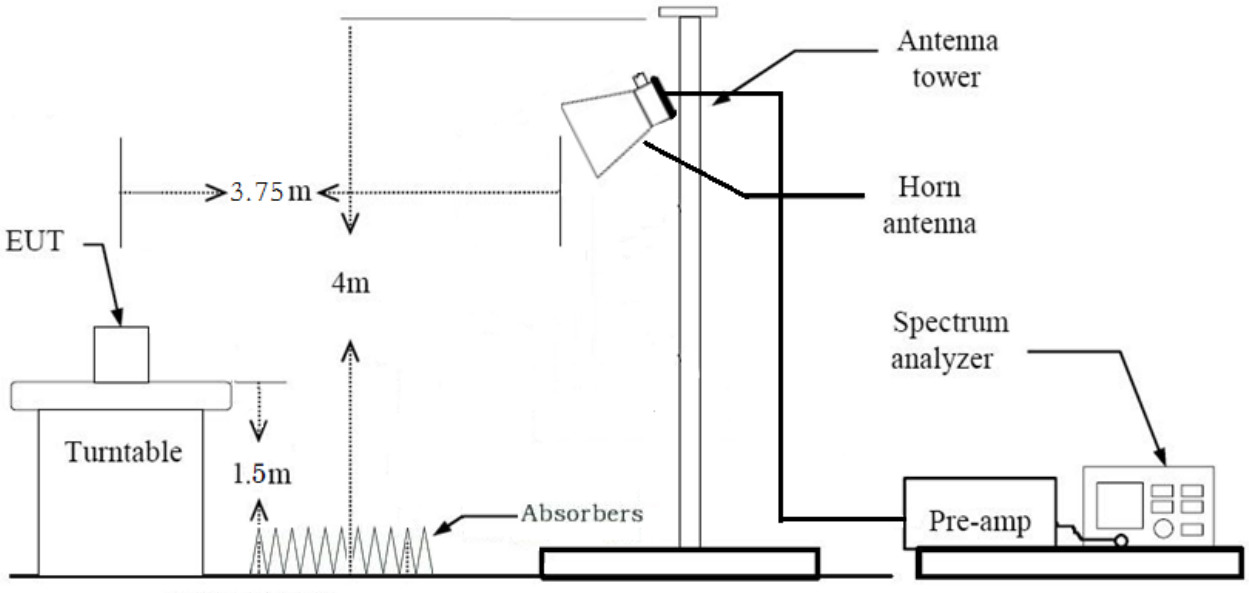
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = 40*log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40*log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3*RBW
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. The test results for below 30 MHz is correlated to an open site.
    The result on OFS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

Test Procedure of Radiated spurious emissions(Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3*RBW
   (2) Measurement Type(Quasi-peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Quasi-Peak
      - RBW = 120 kHz
   *In general, (1) is used mainly
6. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
   *Distance extrapolation factor = 20*log (test distance / specific distance) (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting (Method 8.6 in KDB 558074 v05r01, Procedure 11.12 in ANSI 63.10-2013)
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3*RBW

(2) Measurement Type(Average):

- Duty cycle < 98%, duty cycle variations are less than ±2%
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW ≥ 3*RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
11. Total(Measurement Type : Peak)
= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

Total(Measurement Type : Average)
= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)
+ Duty Cycle Factor

Test Procedure of Radiated Restricted Band Edge

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
*Distance extrapolation factor = 20*log (test distance / specific distance) (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting

(1) Measurement Type(Peak):

- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz

- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW ≥ 3*RBW

(2) Measurement Type(Average):

- Duty cycle < 98%, duty cycle variations are less than ±2%
- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW ≥ 3*RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

11. Total(Measurement Type : Peak)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

Total(Measurement Type : Average)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty Cycle Factor

7.7. AC Power line Conducted Emissions

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.

Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

7.8. Receiver Spurious Emissions

Limit

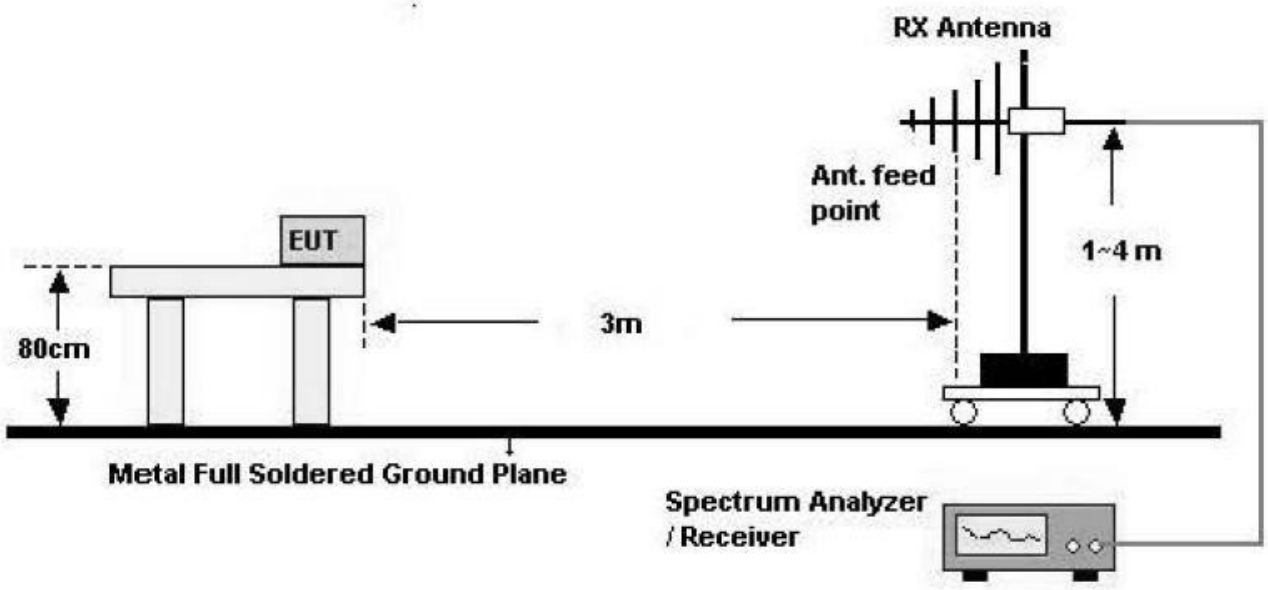
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

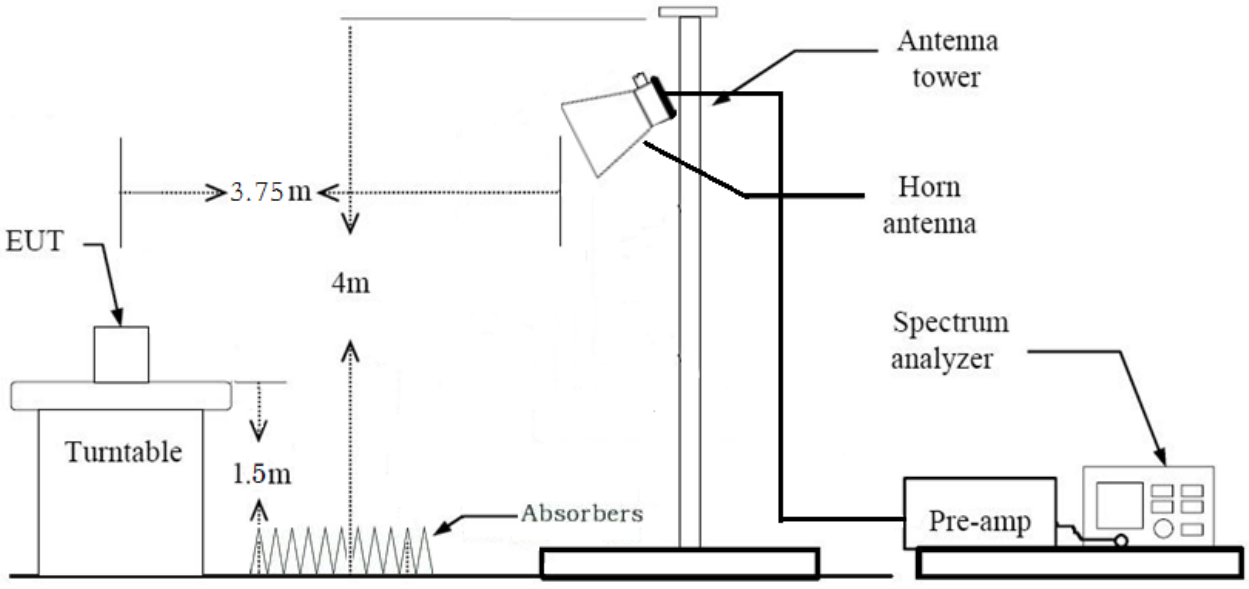
Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

Test Configuration

30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
   *Distance extrapolation factor = 20*log (test distance / specific distance) (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3*RBW
   (2) Measurement Type(Average):
      - We performed using a reduced video BW method was done with the analyzer in linear mode
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 1/τ Hz, where τ = pulse width in seconds
        The actual setting value of VBW = 1 kHz
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

7.9. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
2. EUT Axis
   - Radiated Spurious Emissions : X
   - Radiated Restricted Band Edge : X
3. All packet length of operation were investigated and the test results are worst case in lowest packet length.

*Worst case :
- LE 5.0(1M Bit/s) : 255 Byte
- LE 5.0(2M Bit/s) : 37 Byte

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.

Conducted test

The EUT was configured with packet length of highest power.

* Packet length of highest power :
- LE 5.0(1M Bit/s) : 255 Byte
- LE 5.0(2M Bit/s) : 37 Byte

8. SUMMARY TEST OF RESULTS

FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	Conducted	PASS
Conducted Maximum Peak Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	§15.247(d)	Conducted > 30 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 7.7		PASS
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 7.6		PASS

IC Part

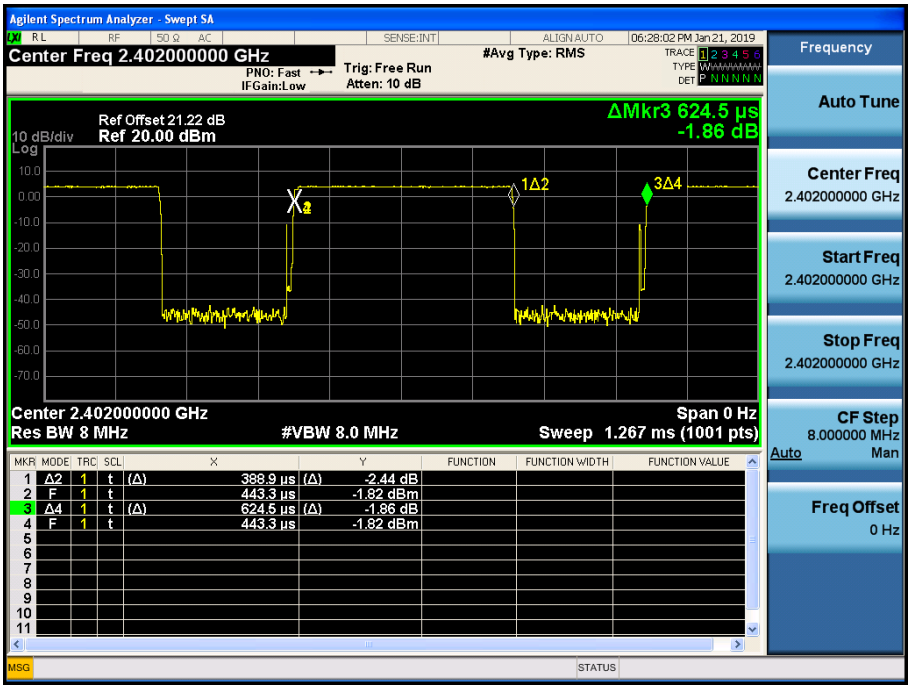
Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-247, 5.2	> 500 kHz	Conducted	PASS
99% Bandwidth	RSS-GEN, 6.7	NA		PASS
Conducted Maximum Peak Output Power And e.i.r.p.	RSS-247, 5.4.4	< 1 Watt <4 Watt(e.i.r.p.)		PASS
Power Spectral Density	RSS-247, 5.2	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	RSS-247, 5.5	Conducted > 30 dBc		PASS
AC Power line Conducted Emissions	RSS-GEN, 8.8	cf. Section 7.7		PASS
Radiated Spurious Emissions	RSS-GEN, 8.9	cf. Section 7.6	Radiated	PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.3	cf. Section 7.8		PASS
Radiated Restricted Band Edge	RSS-GEN, 8.10	cf. Section 7.6		PASS

9. TEST RESULT

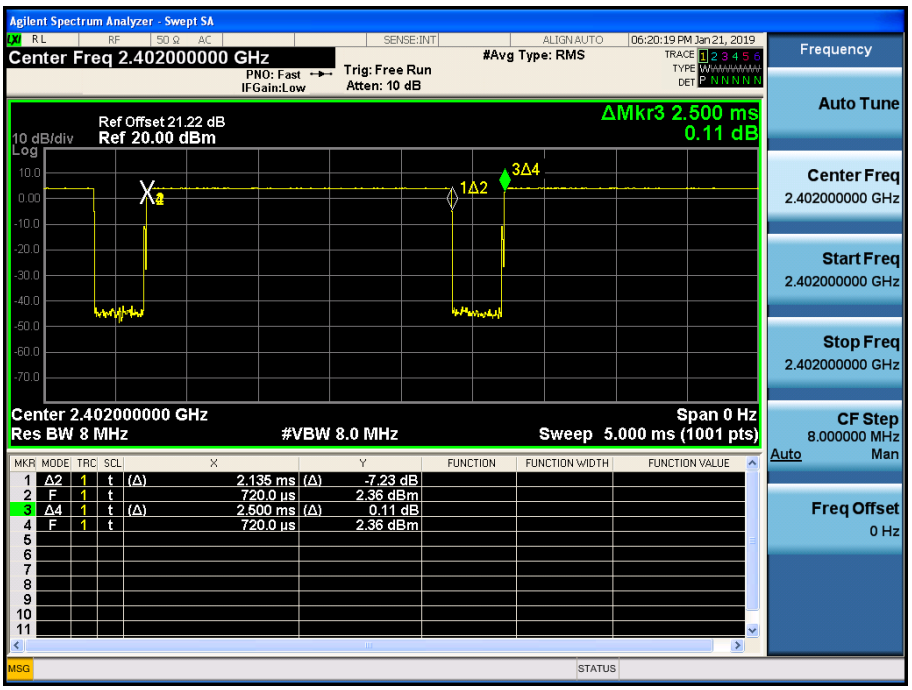
9.1 DUTY CYCLE

Data rate (Bit/s)	Packet length (Byte)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
1M	37	0.3889	0.6245	0.6227	2.06
	255	2.1350	2.5000	0.8540	0.69
2M	37	0.2027	0.6245	0.3246	4.89
	255	1.0750	1.8750	0.5733	2.42

▣ 1M Bit/s (37 Byte) Test Plots

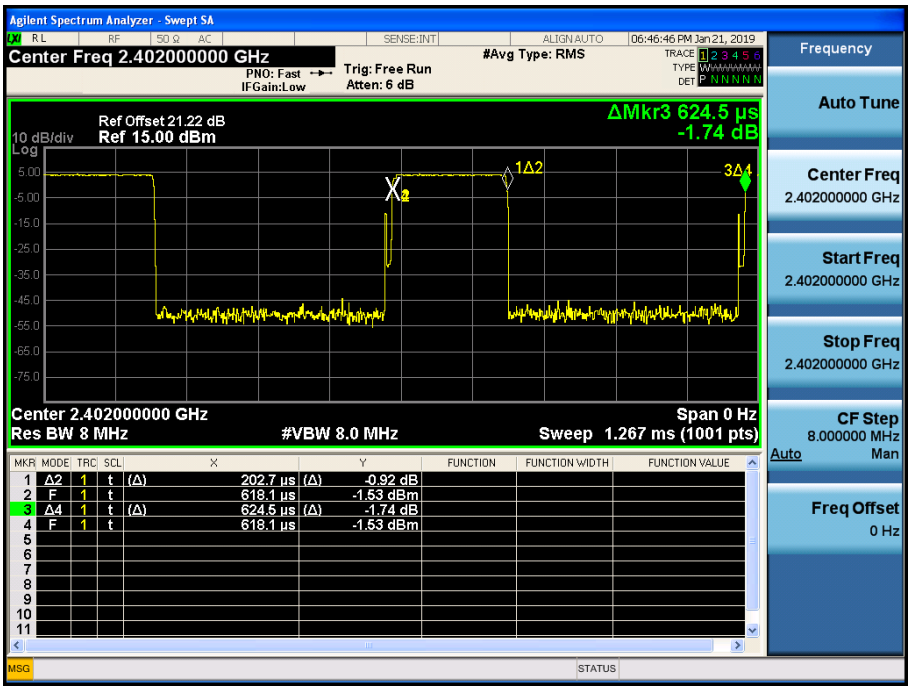


▣ 1M Bit/s (255 Byte) Test Plots

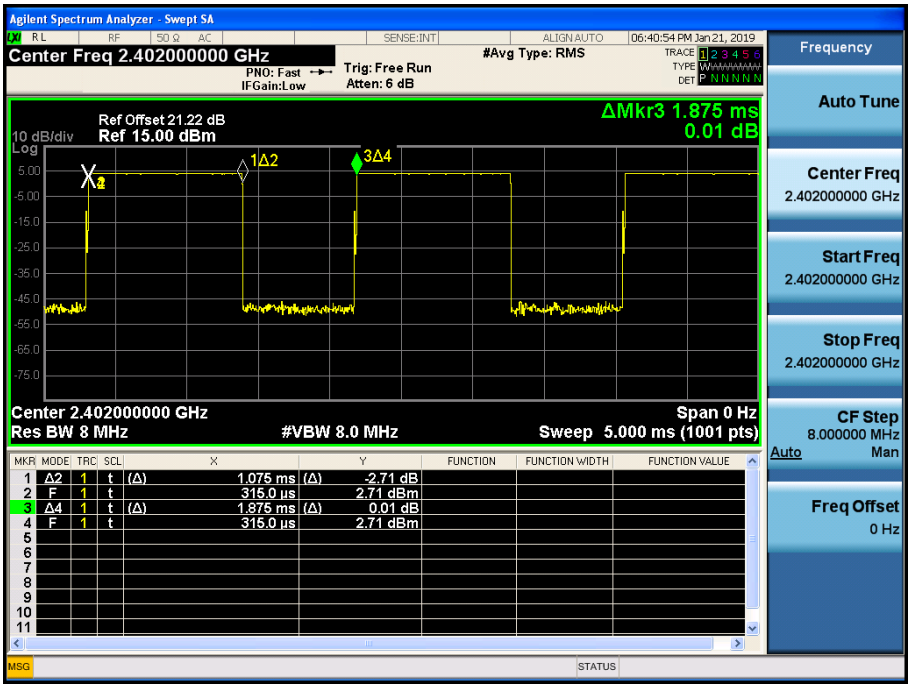


▣ 2M Bit/s (37 Byte) Test Plots

Duty Cycle (Low-CH 0)



▣ 2M Bit/s (255 Byte) Test Plots

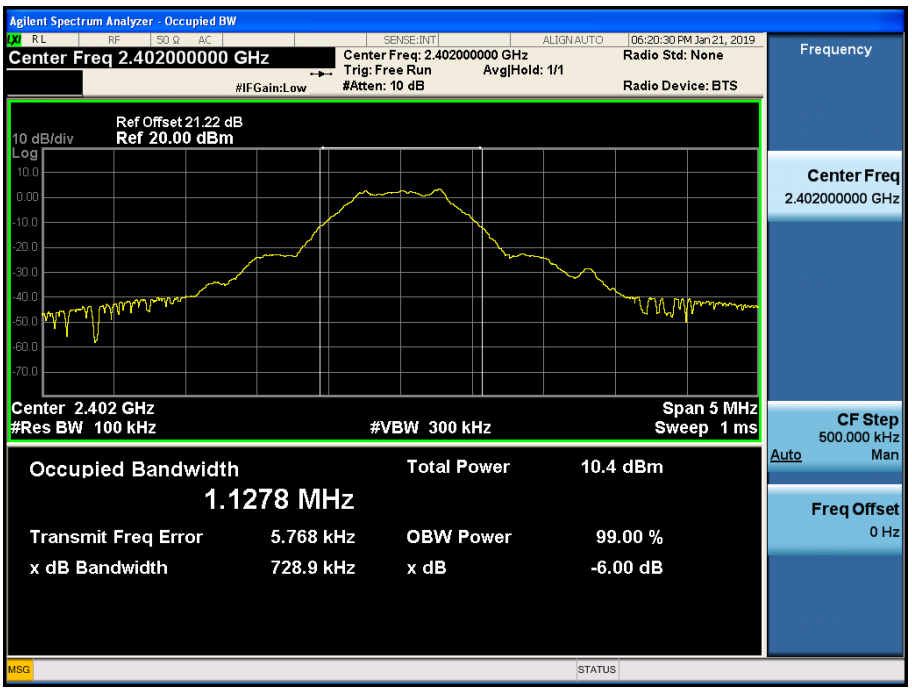


9.2 6dB BANDWIDTH & 99 % BANDWIDTH

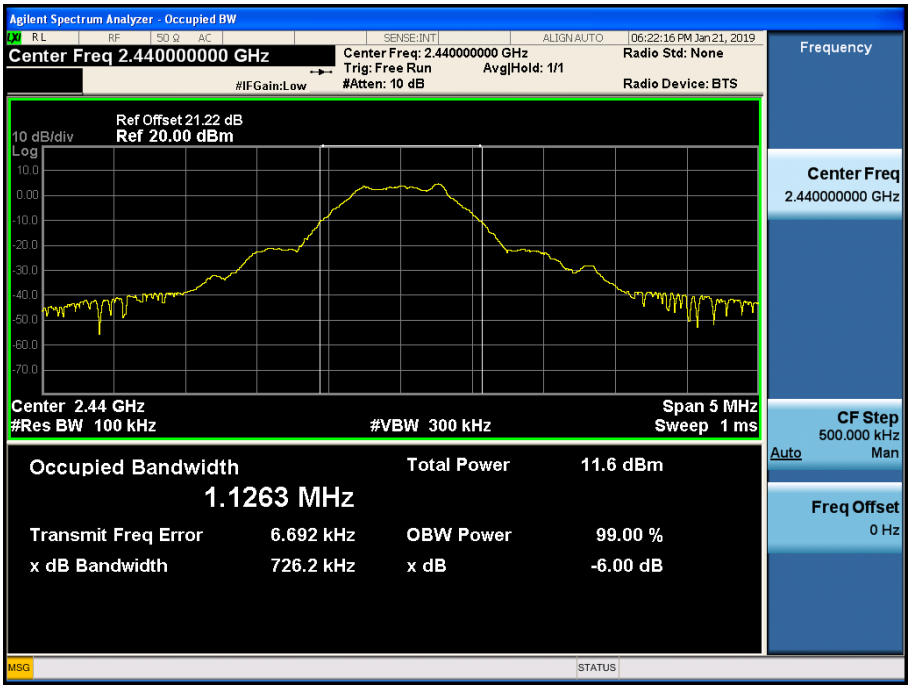
Mode (Bit/s)	Channel	6 dB Bandwidth (kHz)	99 % Measured Bandwidth [MHz]	Limit (kHz)
1M	0	728.9	1.1278	> 500
	19	726.2	1.1263	
	39	737.5	1.1195	
2M	0	1287.4	2.0809	> 500
	19	1290.3	2.0837	
	39	1288.9	2.0773	

▣ 1M Bit/s Test Plots

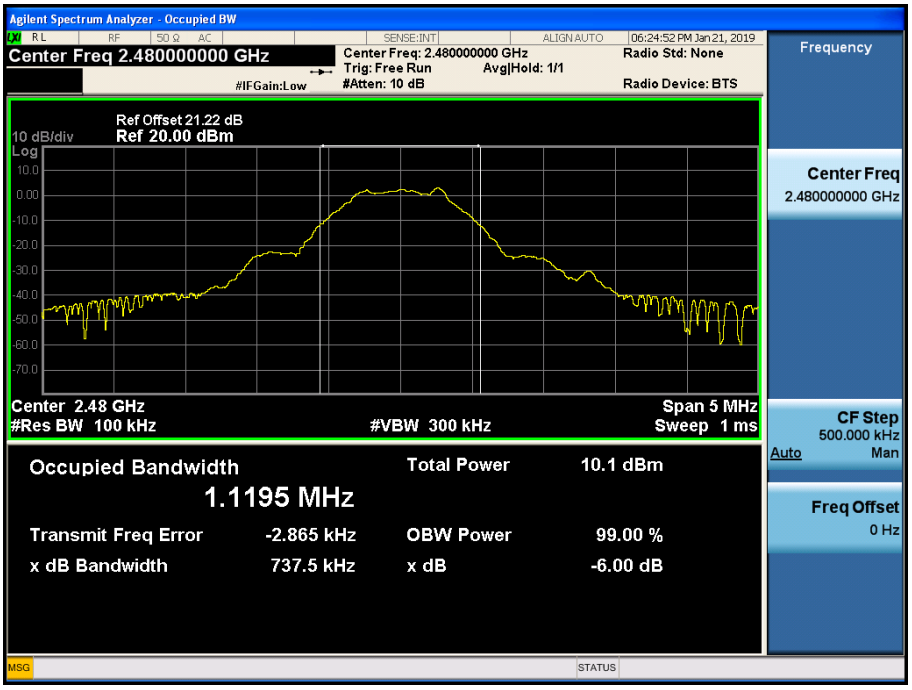
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

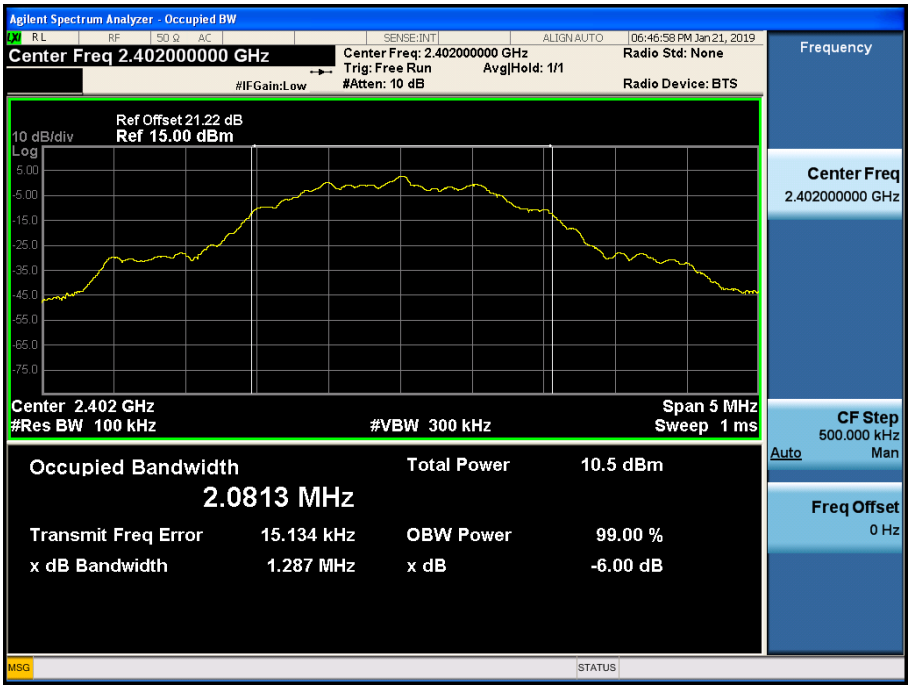


6 dB Bandwidth plot (High-CH 39)

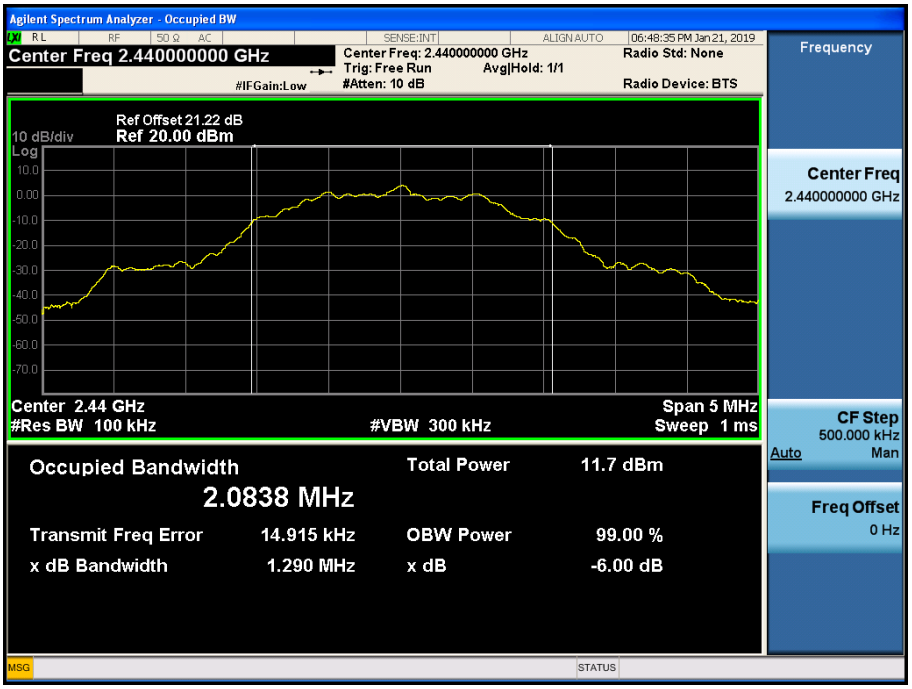


▣ 2M Bit/s Test Plots

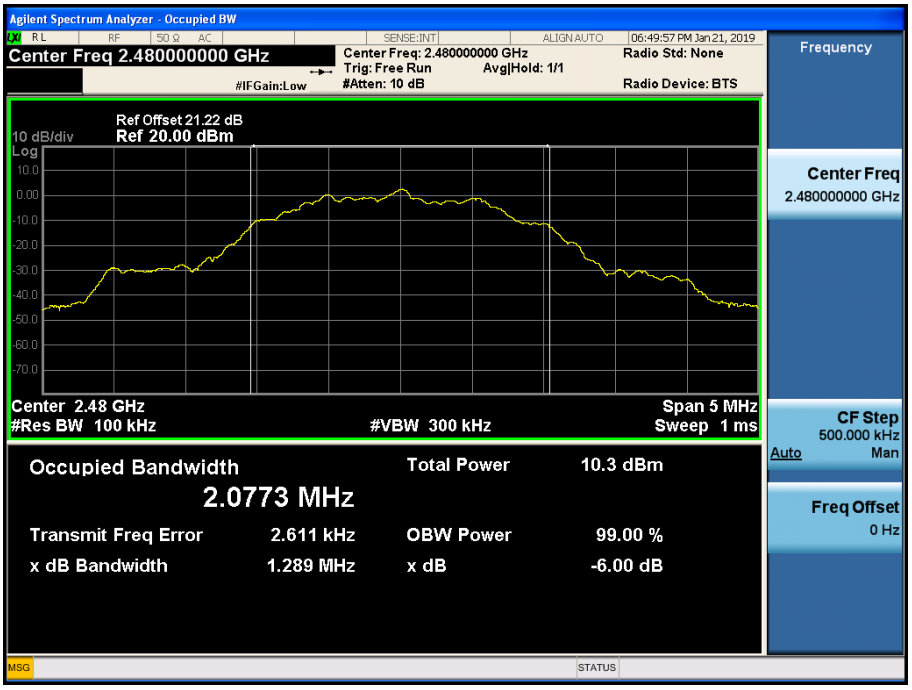
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)



6 dB Bandwidth plot (High-CH 39)



9.3 OUTPUT POWER

Peak Power

LE Mode		Data rate (Bit/s)	Packet length (Byte)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.				
2402	0	1M	37	3.861	30
			255	3.822	
		2M	37	4.184	
			255	4.145	
2440	19	1M	37	5.103	
			255	5.064	
		2M	37	5.455	
			255	5.406	
2480	39	1M	37	3.571	
			255	3.529	
		2M	37	4.024	
			255	3.984	

Average Power

LE Mode		Data rate	Packet length	Measured	Duty Cycle	Result	Limit
Frequency[MHz]	Channel No.	(Bit/s)	(Byte)	Power(dBm)	Factor (dB)	(dBm)	(dBm)
2402	0	1M	37	1.36	2.06	3.42	30
			255	2.80	0.69	3.49	
		2M	37	-1.24	4.89	3.65	
			255	0.74	2.42	3.16	
2440	19	1M	37	2.58	2.06	4.64	
			255	4.19	0.69	4.88	
		2M	37	-0.08	4.89	4.81	
			255	2.09	2.42	4.51	
2480	39	1M	37	1.29	2.06	3.35	
			255	2.69	0.69	3.38	
		2M	37	-1.21	4.89	3.68	
			255	1.12	2.42	3.54	

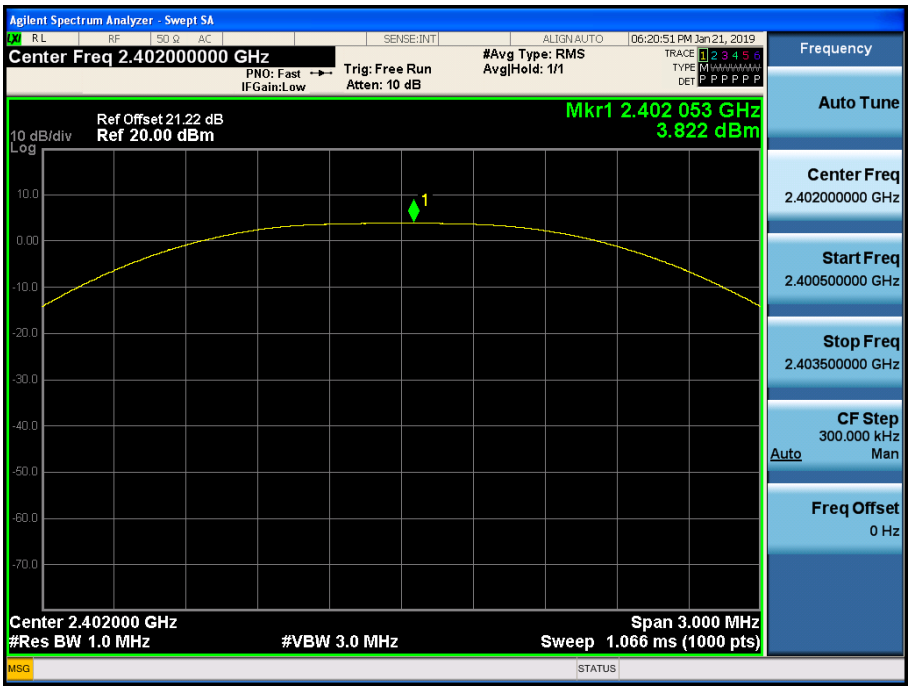
Note :

1. Spectrum reading values are not plot data.
   The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
   So, 21.22 dB is offset for 2.4 GHz Band.

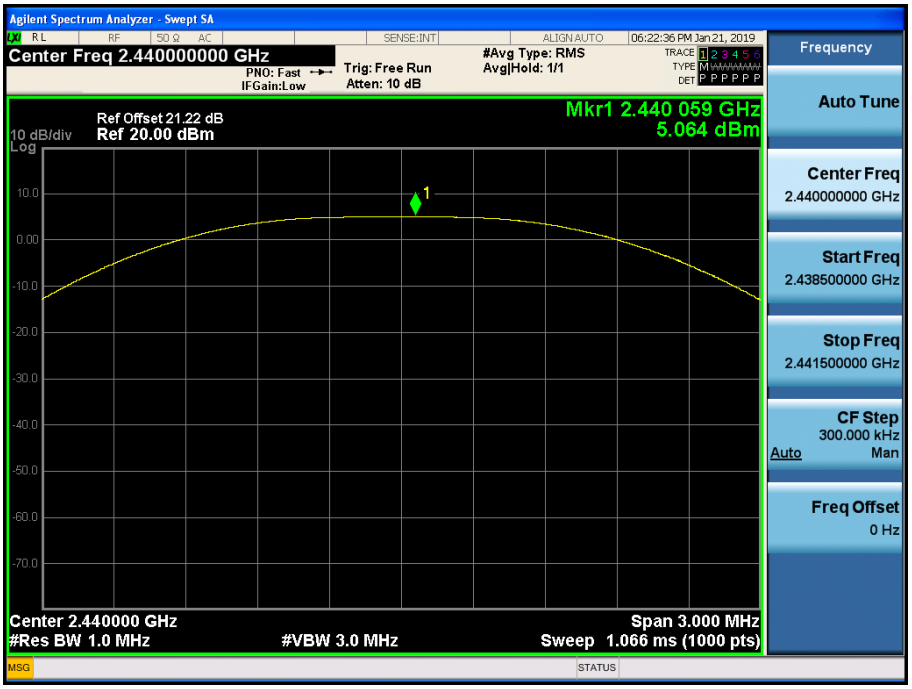
▣ 1M Bit/s(255 Byte) Test Plots

Peak Power

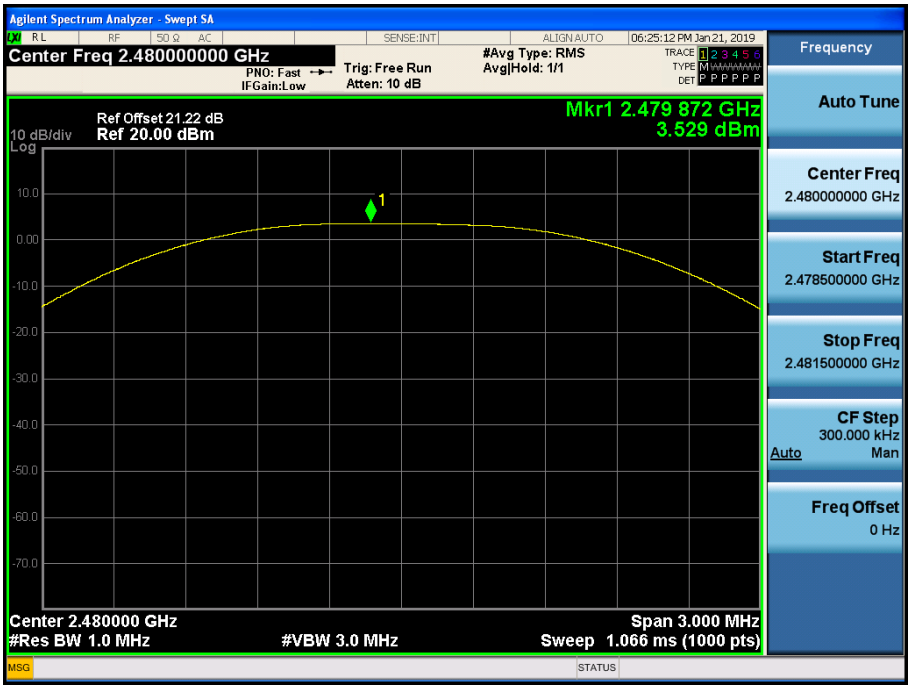
Conducted Output Power (Low-CH 0)



Conducted Output Power (Mid-CH 19)

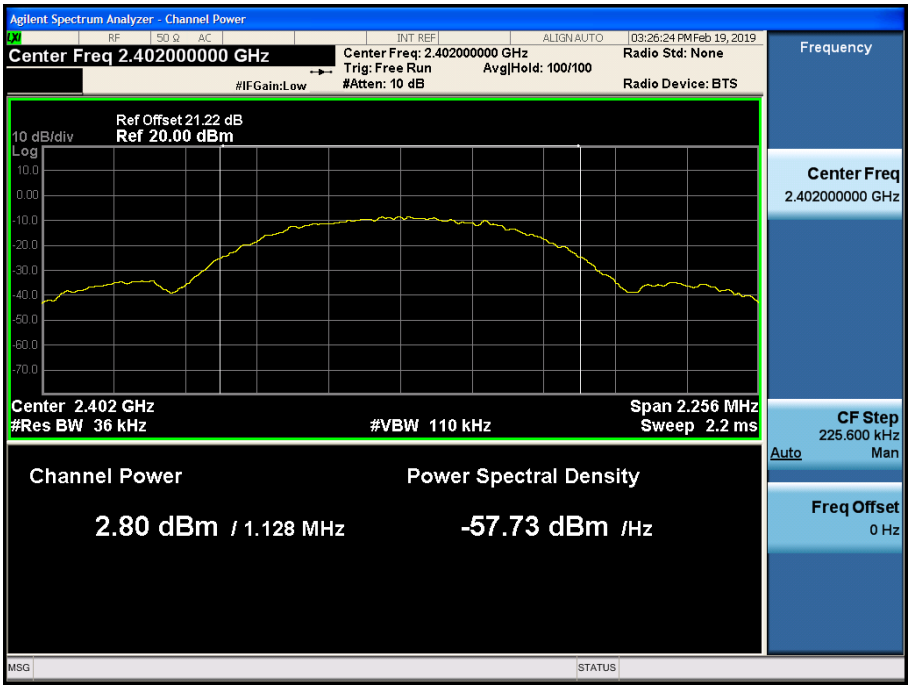


Conducted Output Power (High-CH 39)

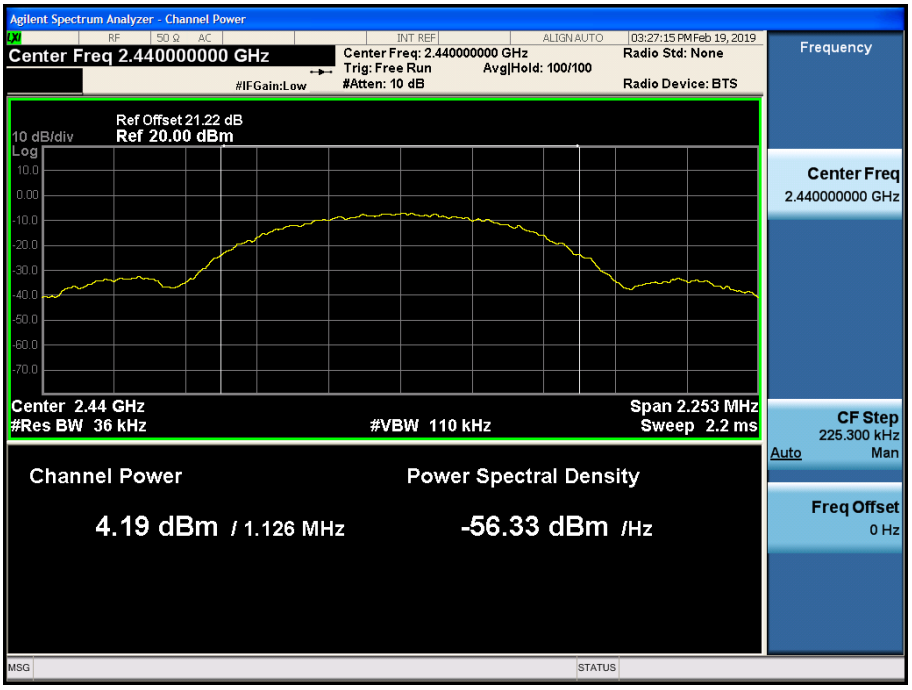


Average Power

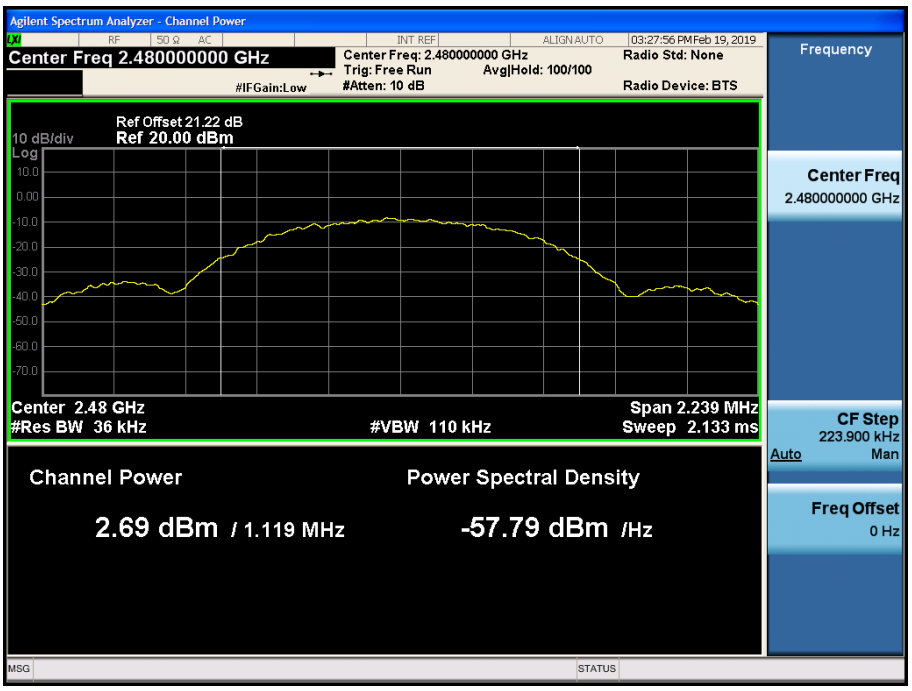
Conducted Output Power (Low-CH 0)



Conducted Output Power (Mid-CH 19)



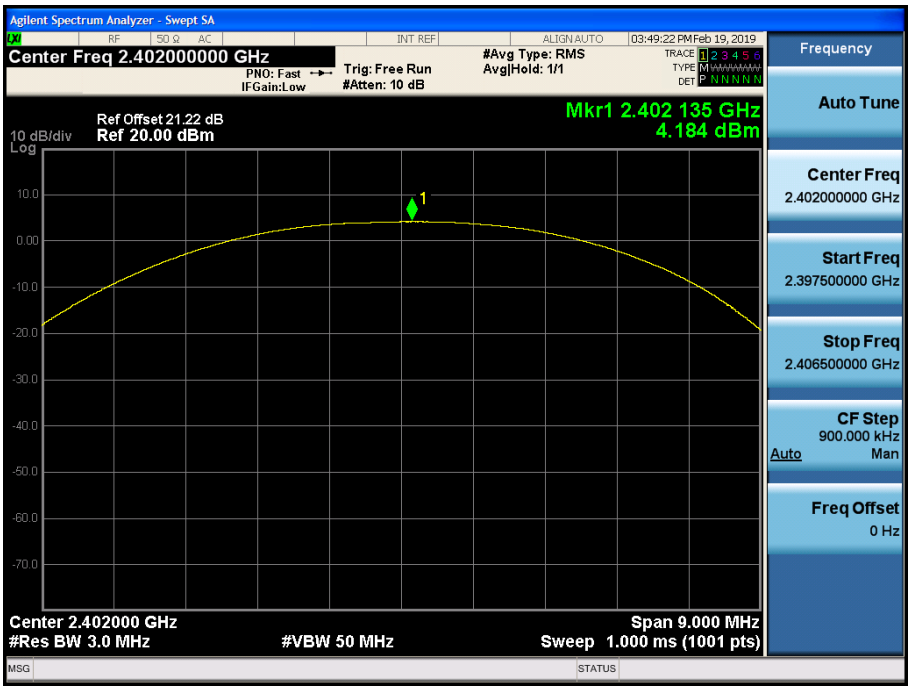
Conducted Output Power (High-CH 39)



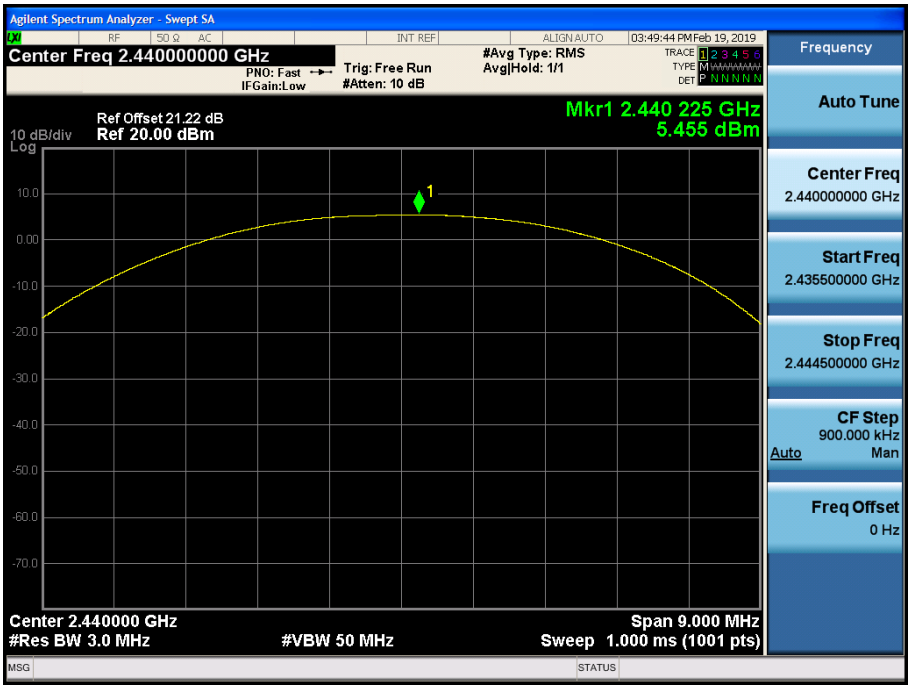
▣ 2M Bit/s(37 Byte) Test Plots

Peak Power

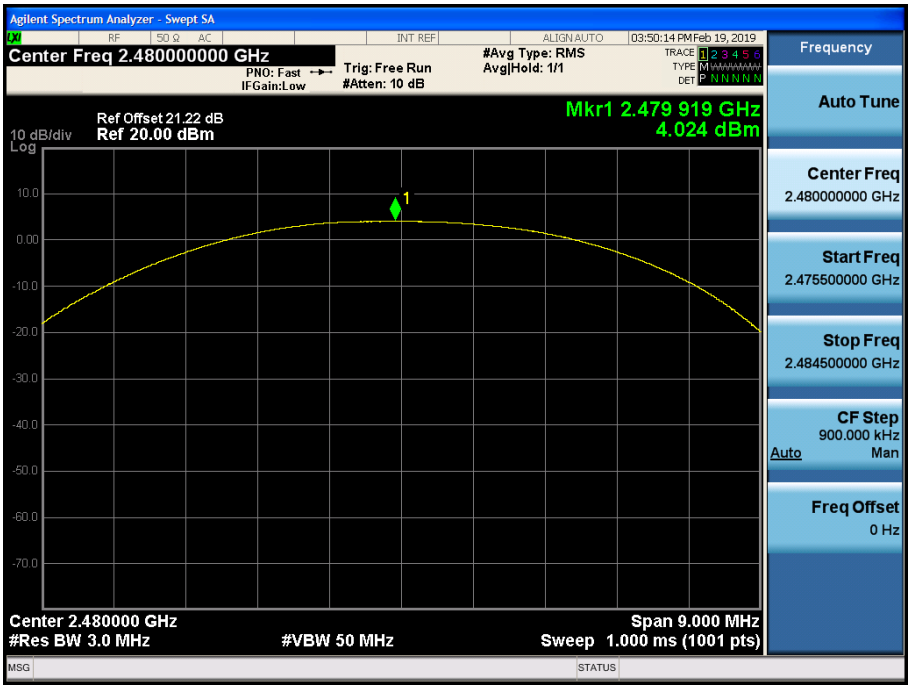
Conducted Output Power (Low-CH 0)



Conducted Output Power (Mid-CH 19)

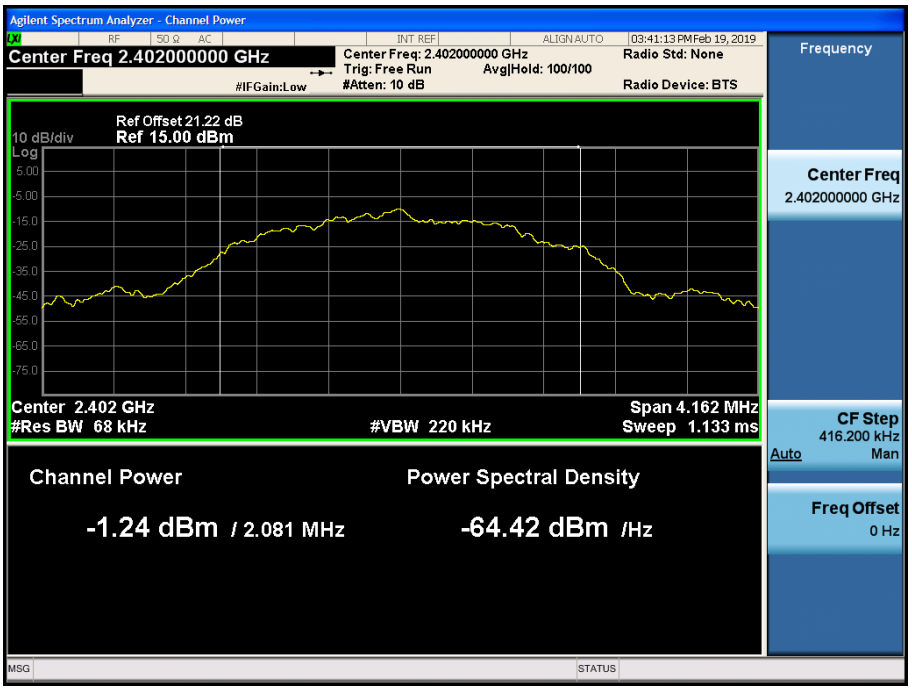


Conducted Output Power (High-CH 39)

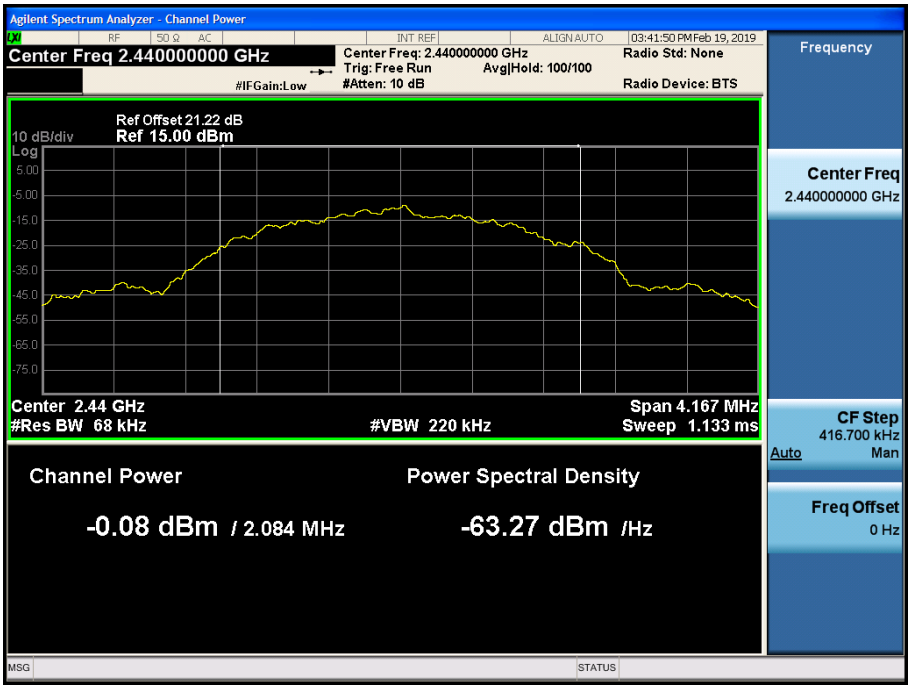


Average Power

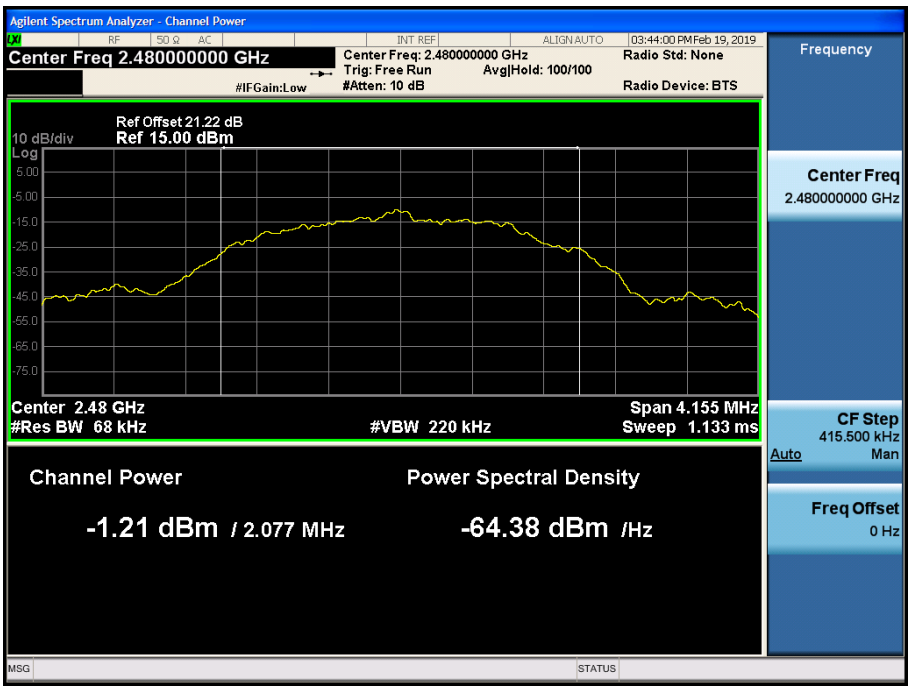
Conducted Output Power (Low-CH 0)



Conducted Output Power (Mid-CH 19)



Conducted Output Power (High-CH 39)



9.4 POWER SPECTRAL DENSITY

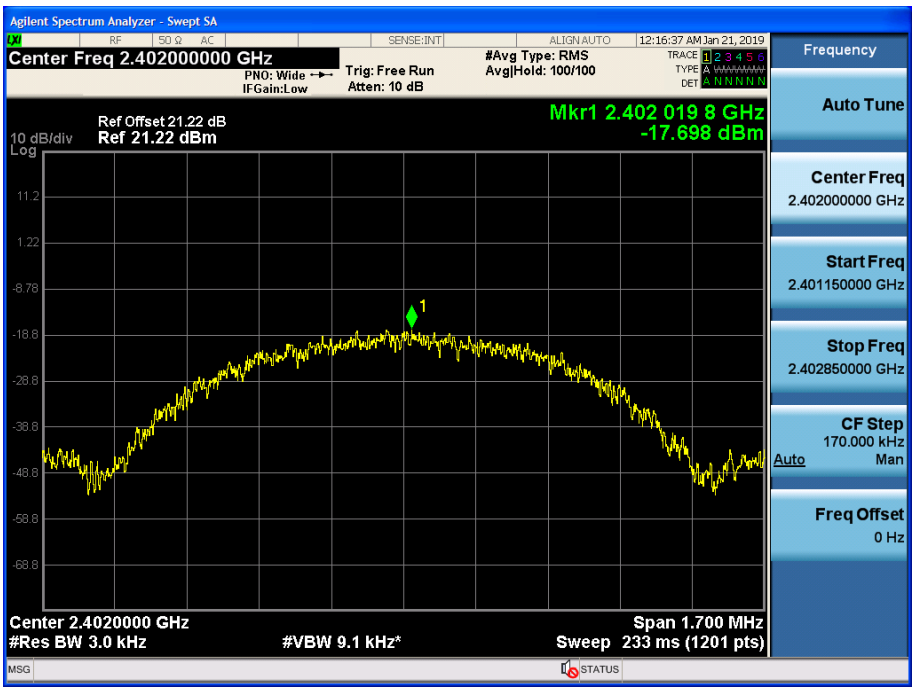
Frequency (MHz)	Channel No.	Mode	Test Result			
			Measured PSD (dBm)	Duty Cycle Factor	Measured PSD(dBm) + Duty Cycle Factor	Limit (dBm)
2402	0	1M Bit 255 Byte	-17.698	0.69	-17.008	8.000
2440	19		-16.487	0.69	-15.797	8.000
2480	39		-18.098	0.69	-17.408	8.000
2402	0	2M Bit 37 Byte	-20.486	4.89	-15.596	8.000
2440	19		-19.674	4.89	-14.784	8.000
2480	39		-20.847	4.89	-15.957	8.000

Note :

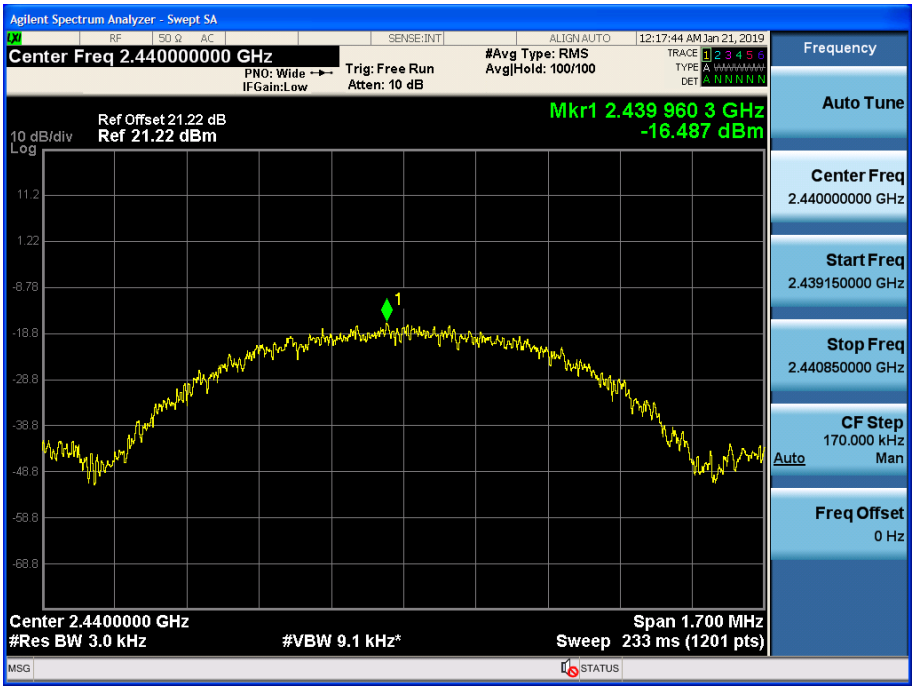
1. Spectrum reading values are not plot data.
   The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
   So, 21.22 dB is offset for 2.4 GHz Band.

▣ 1M Bit/s Test Plots

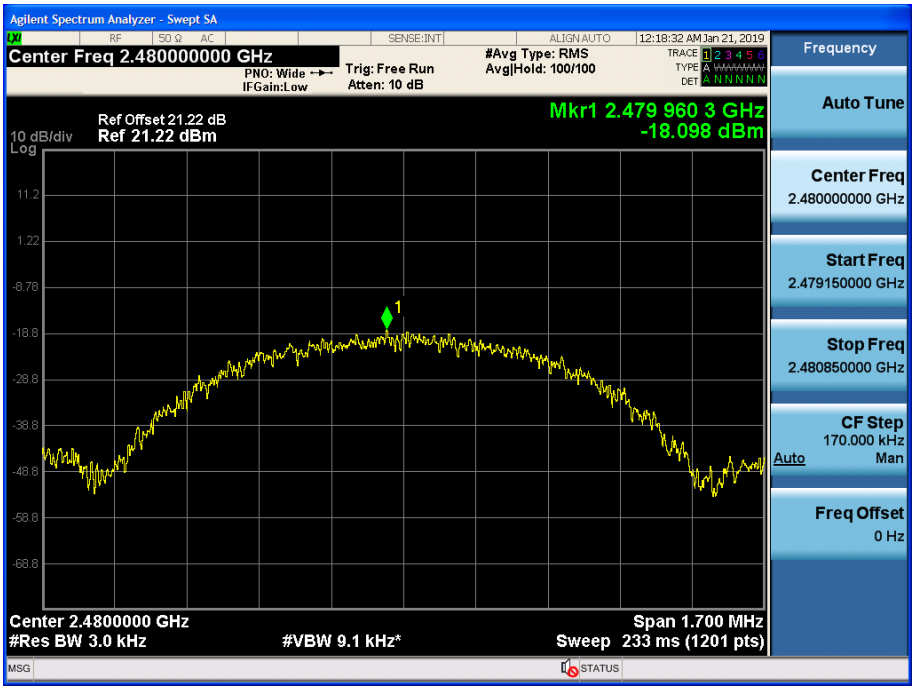
Power Spectral Density (Low-CH 0)



Power Spectral Density (Mid-CH 19)

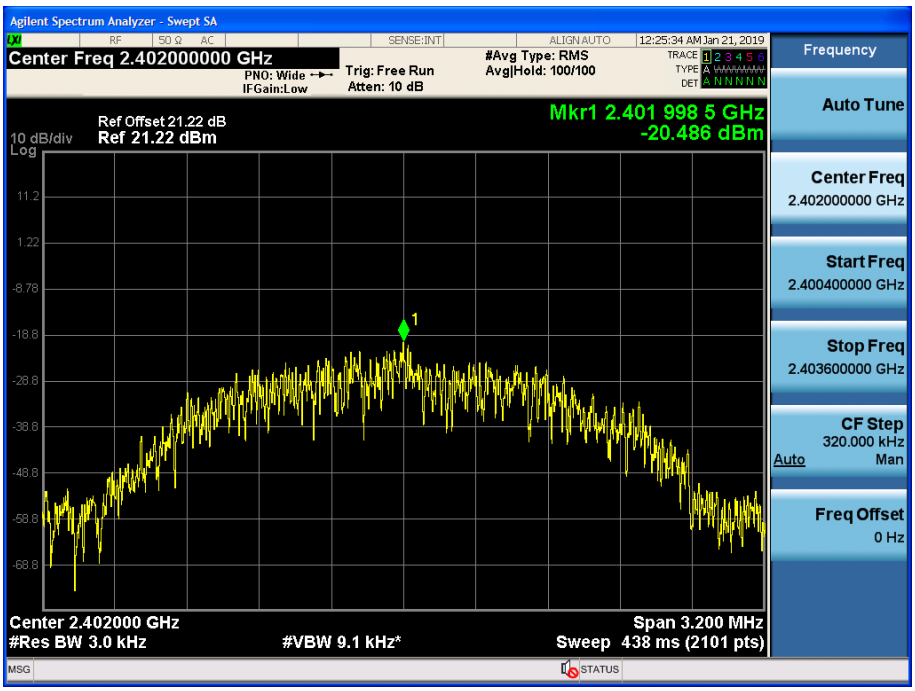


Power Spectral Density (High-CH 39)

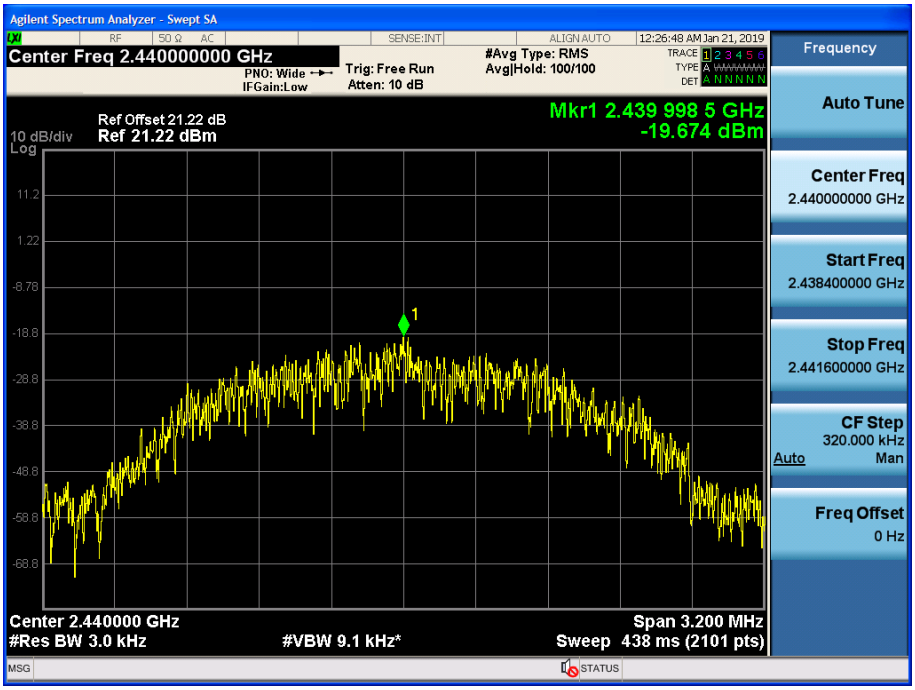


▣ 2M Bit/s Test Plots

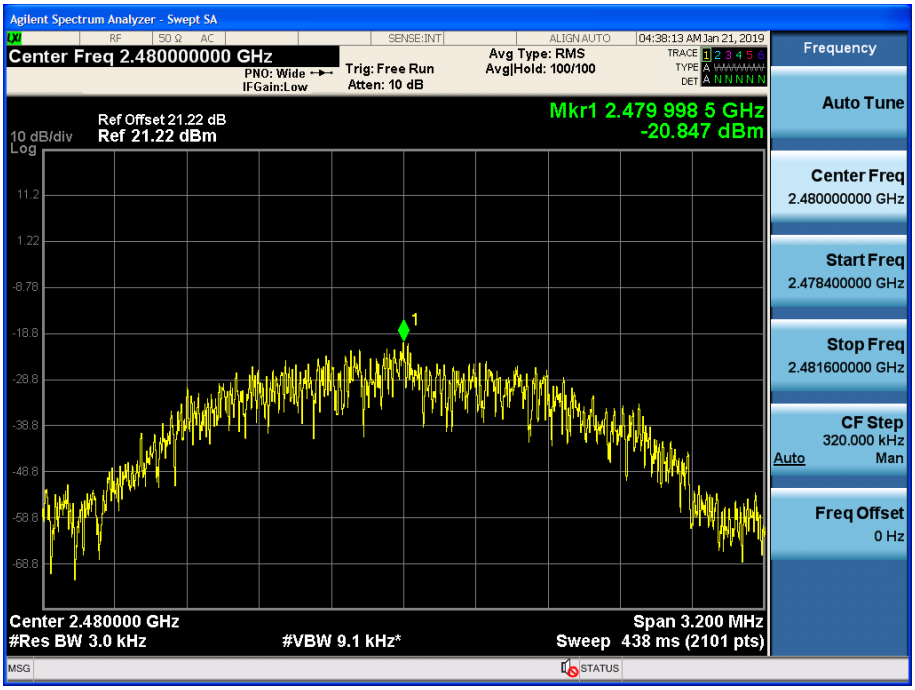
Power Spectral Density (Low-CH 0)



Power Spectral Density (Mid-CH 19)



Power Spectral Density (High-CH 39)



9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

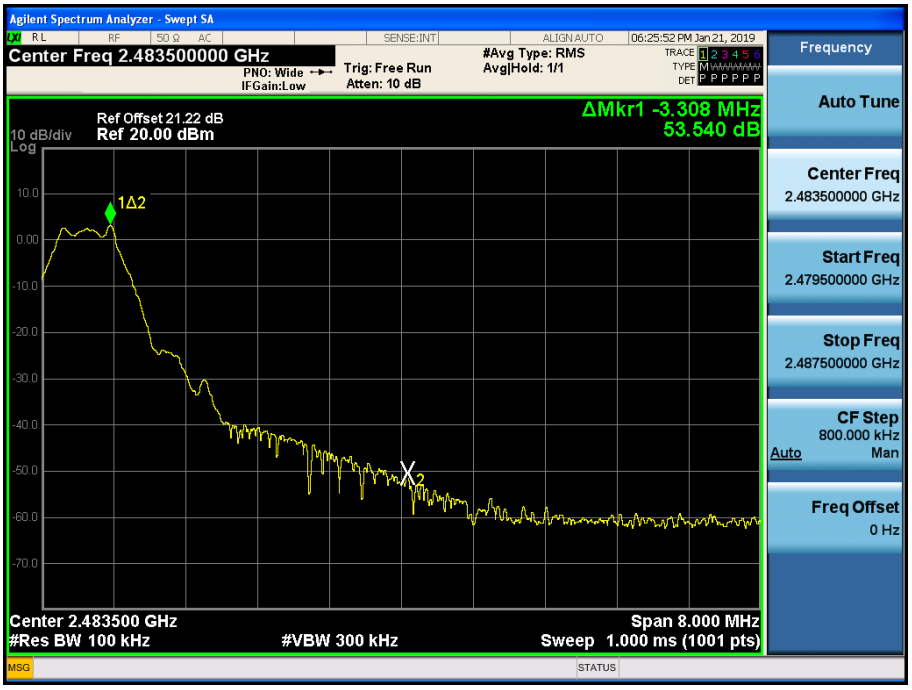
Test Result : please refer to the plot below.

In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ 1M Bit/s Test Plots (BandEdge)

Low-CH 0

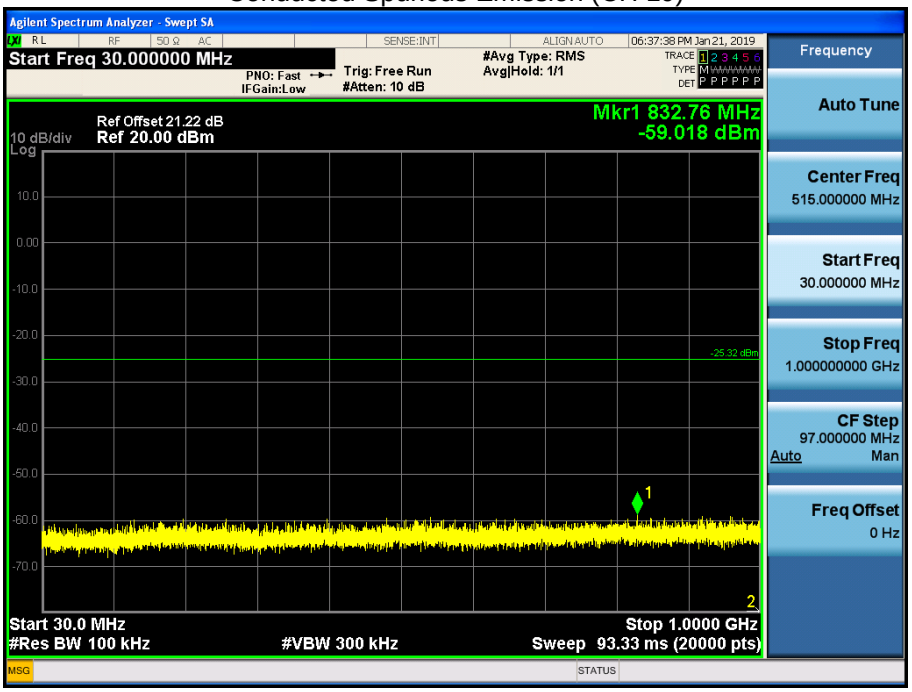
High-CH 39



▣ 1M Bit/s Test Plots (Conducted Spurious Emission)

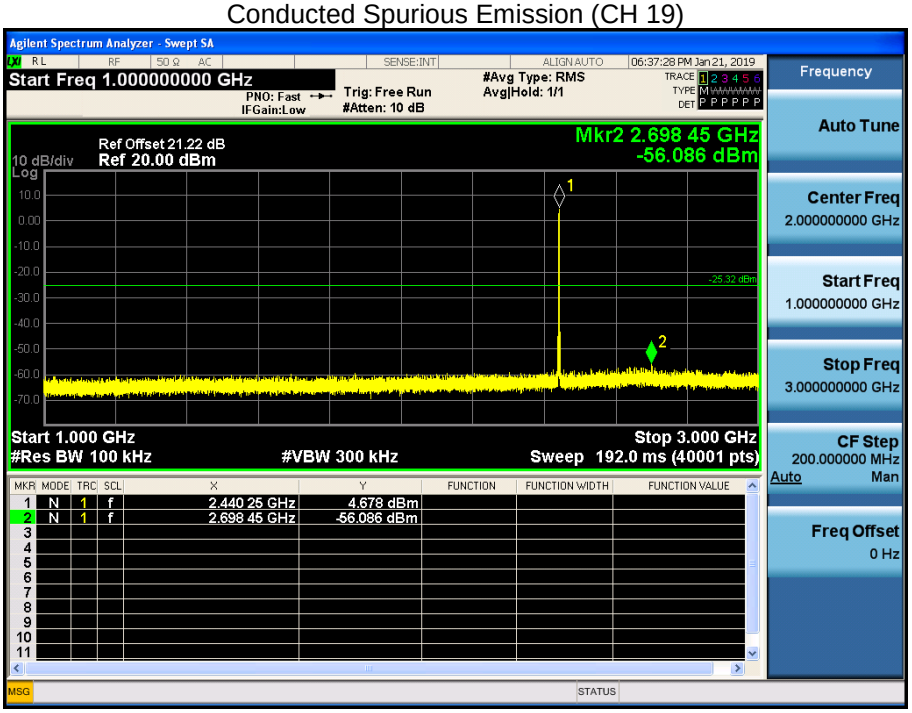
30 MHz ~ 1 GHz

Conducted Spurious Emission (CH 19)



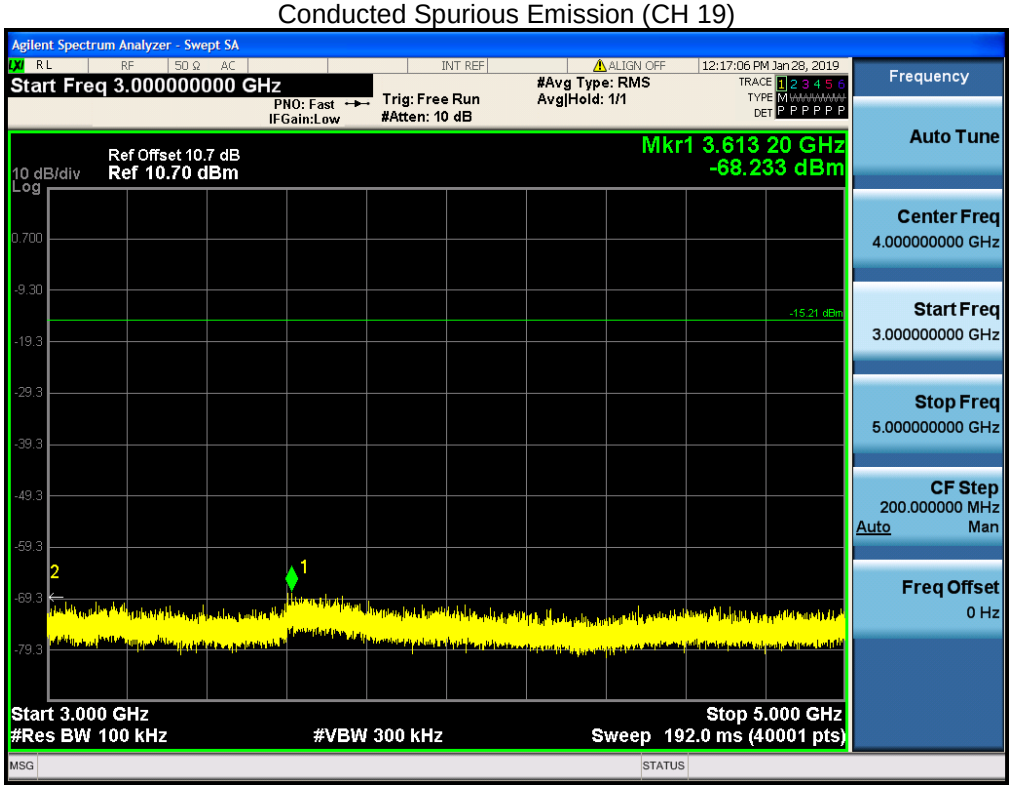
1 GHz ~ 3 GHz

Conducted Spurious Emission (CH 19)



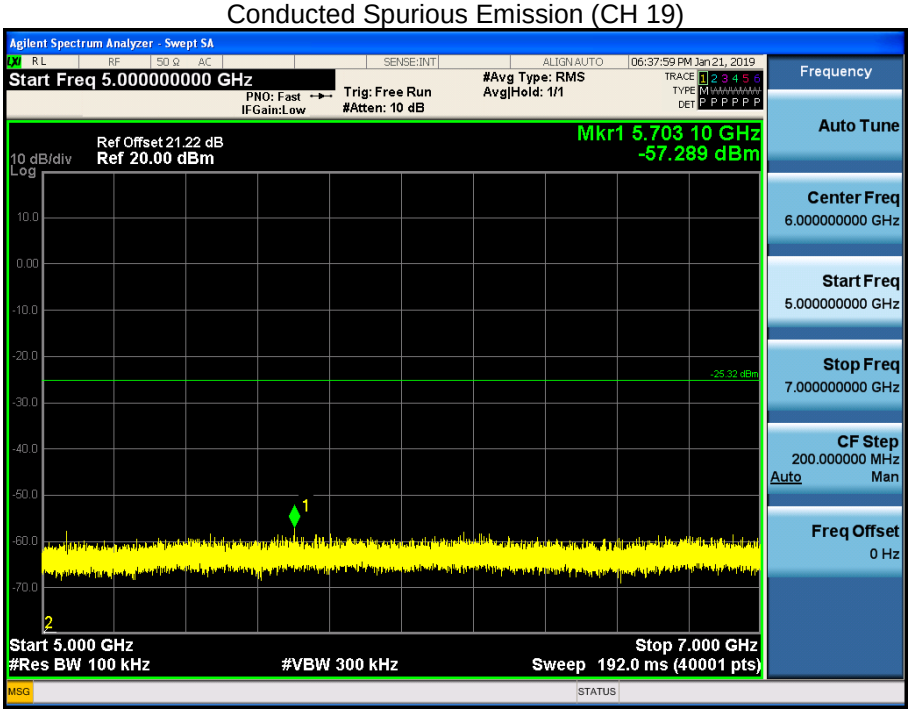
3 GHz ~ 5 GHz

Conducted Spurious Emission (CH 19)



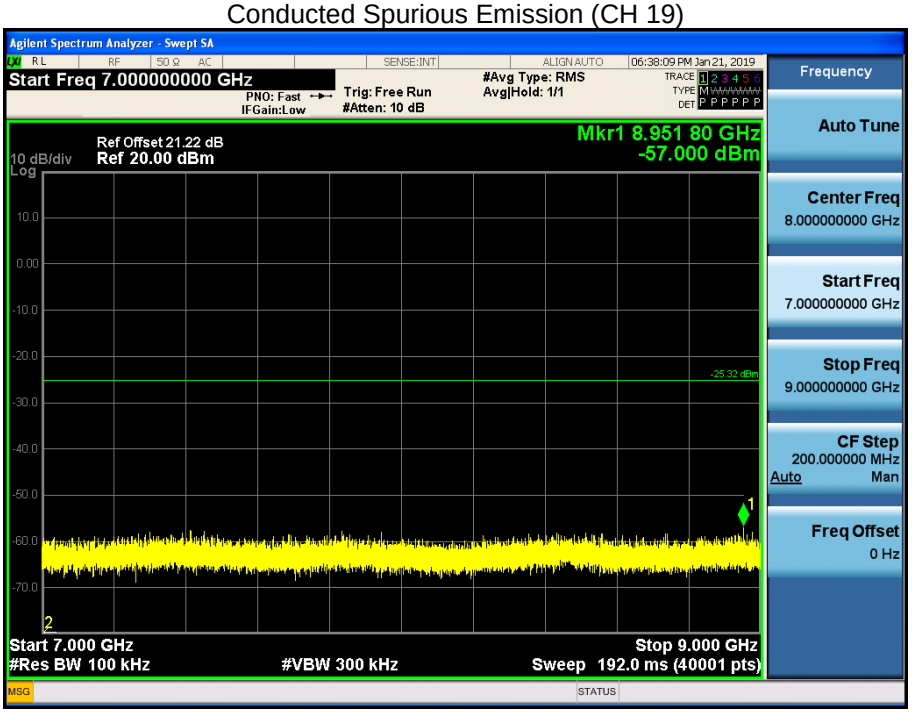
5 GHz ~ 7 GHz

Conducted Spurious Emission (CH 19)



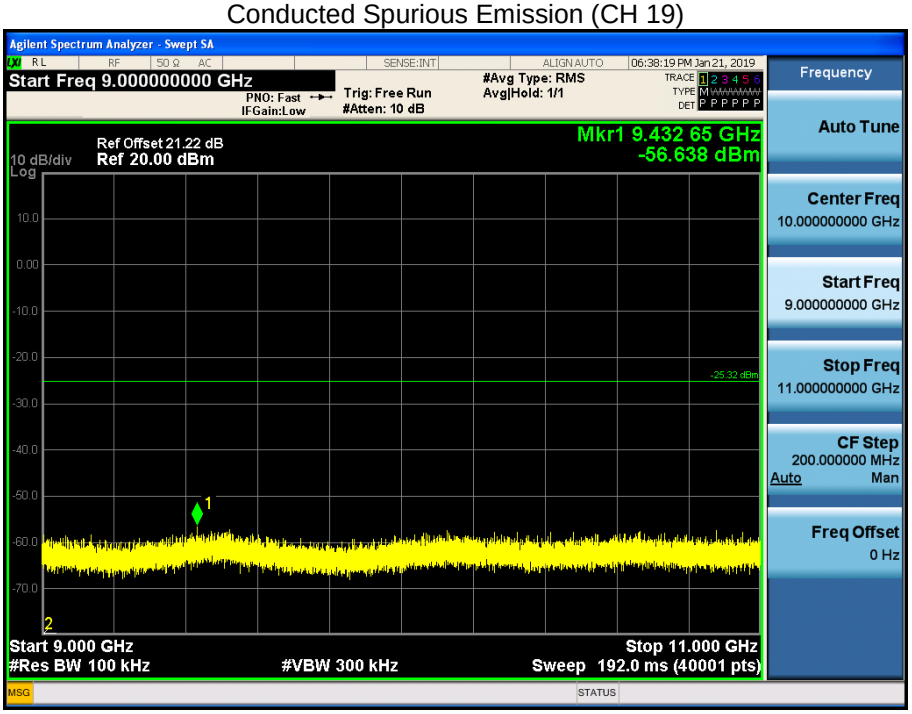
7 GHz ~ 9 GHz

Conducted Spurious Emission (CH 19)



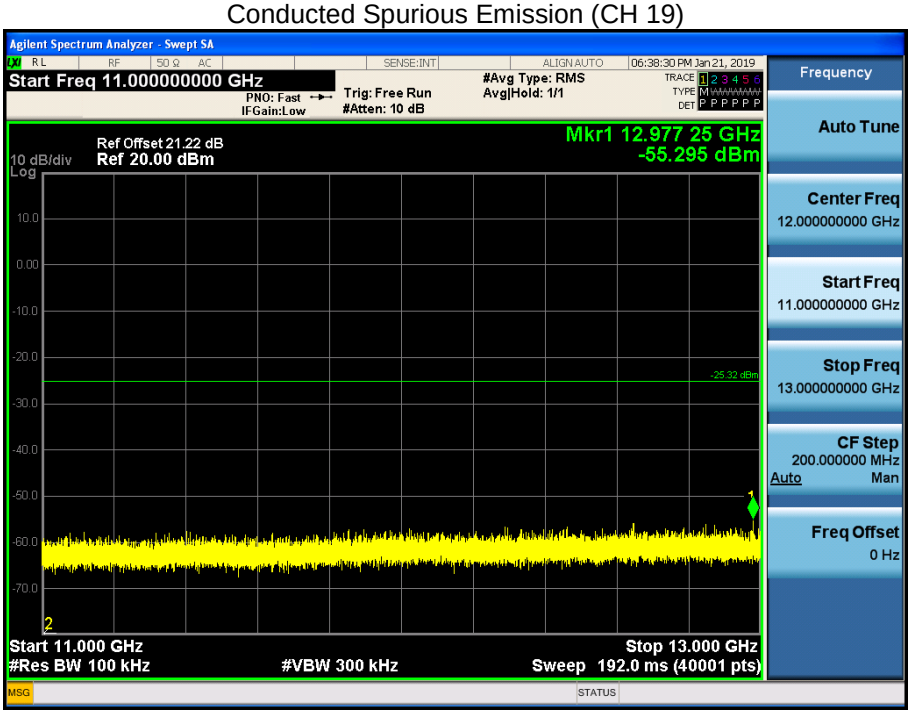
9 GHz ~ 11 GHz

Conducted Spurious Emission (CH 19)



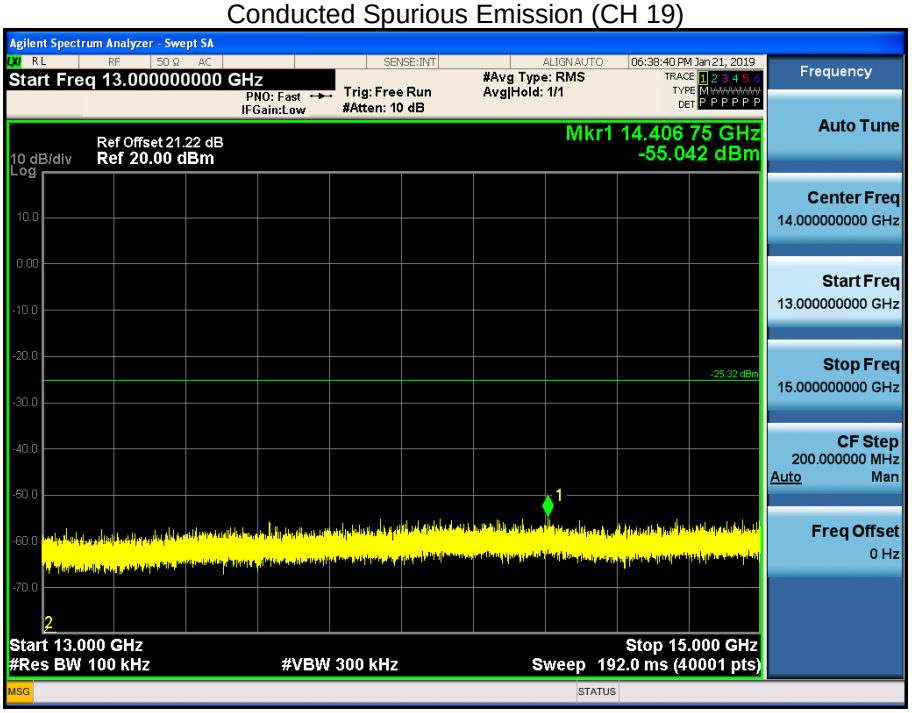
11 GHz ~ 13 GHz

Conducted Spurious Emission (CH 19)



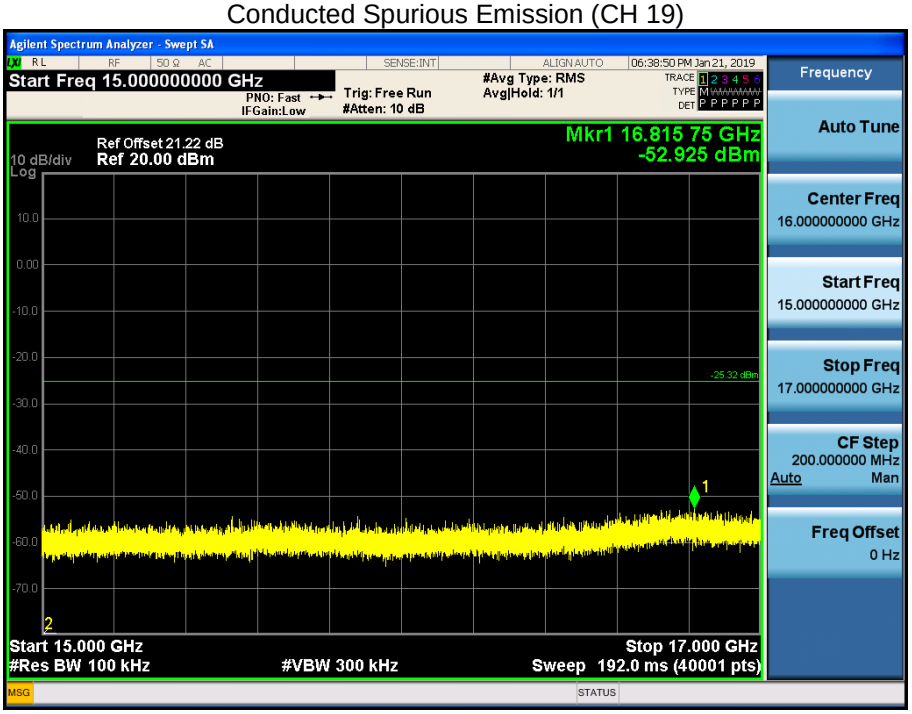
13 GHz ~ 15 GHz

Conducted Spurious Emission (CH 19)



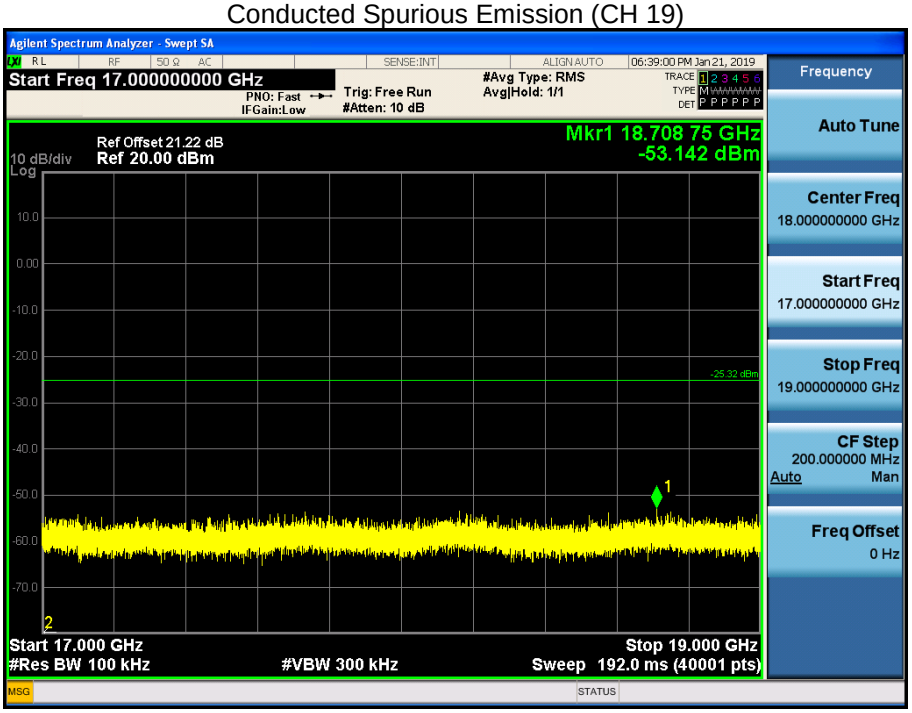
15 GHz ~ 17 GHz

Conducted Spurious Emission (CH 19)



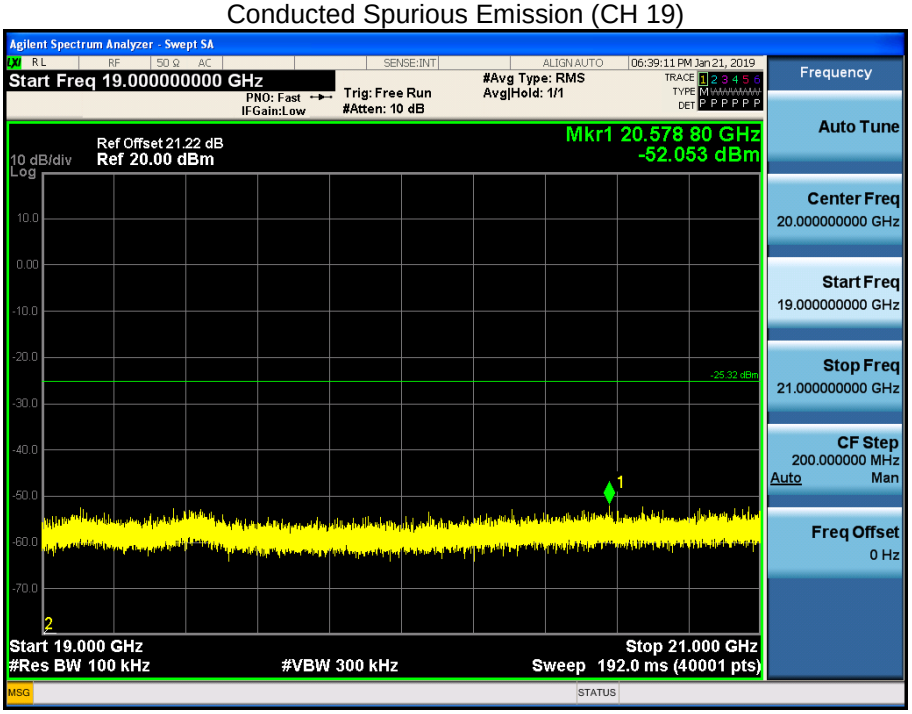
17 GHz ~ 19 GHz

Conducted Spurious Emission (CH 19)



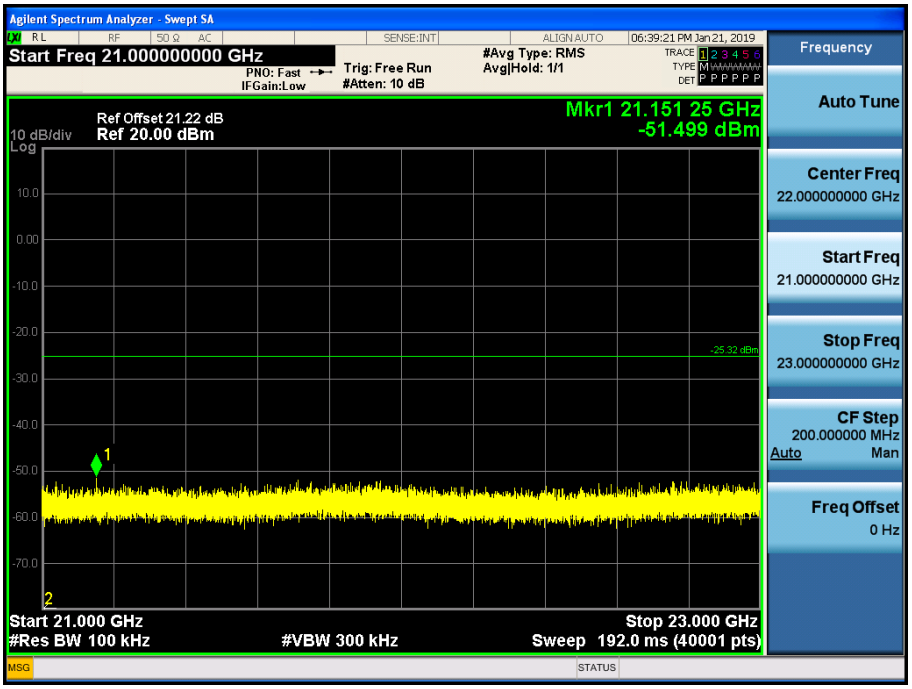
19 GHz ~ 21 GHz

Conducted Spurious Emission (CH 19)



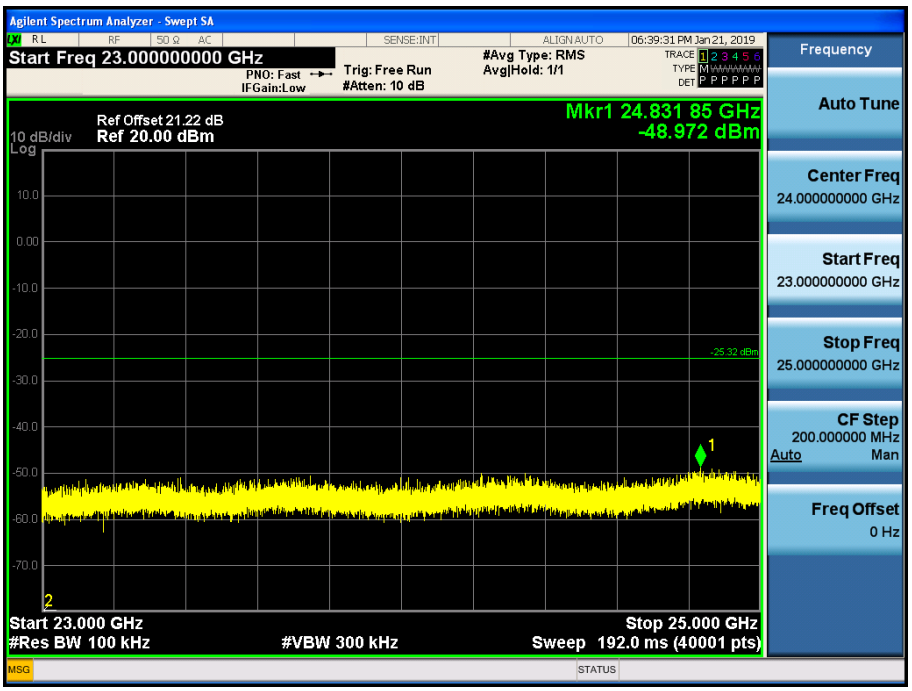
21 GHz ~ 23 GHz

Conducted Spurious Emission (CH 19)



23 GHz ~ 25 GHz

Conducted Spurious Emission (CH 19)



▣ 2M Bit/s Test Plots (BandEdge)

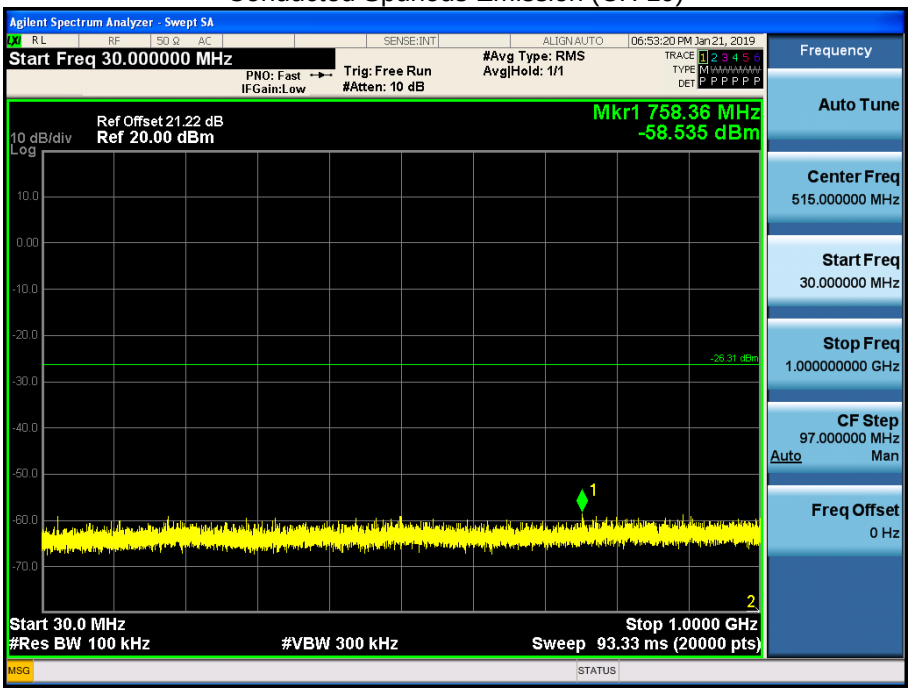
Low-CH 0

High-CH 39

▣ 2M Bit/s Test Plots (Conducted Spurious Emission)

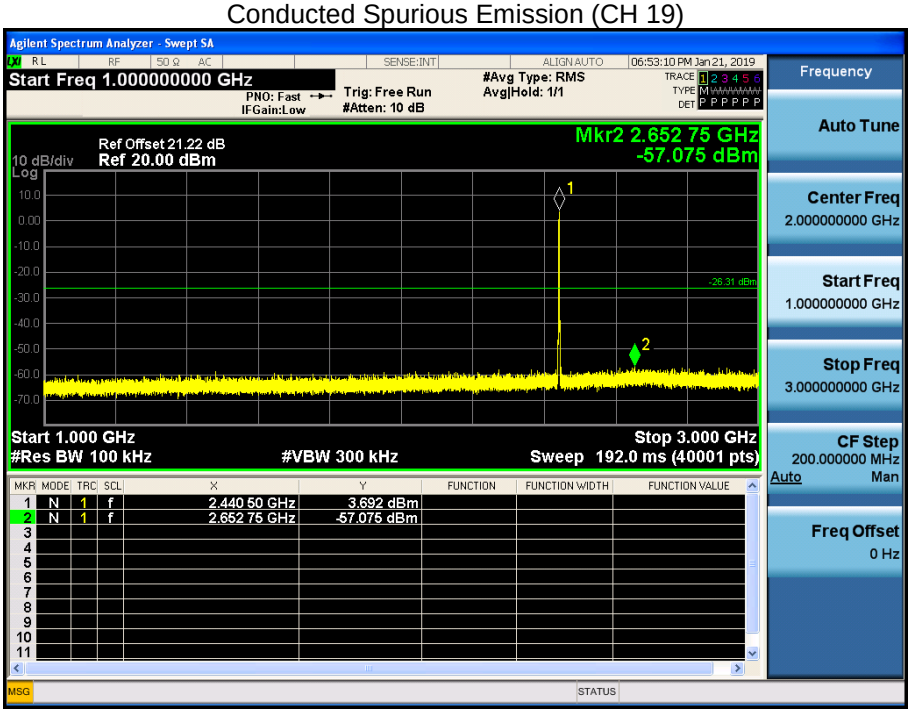
30 MHz ~ 1 GHz

Conducted Spurious Emission (CH 19)



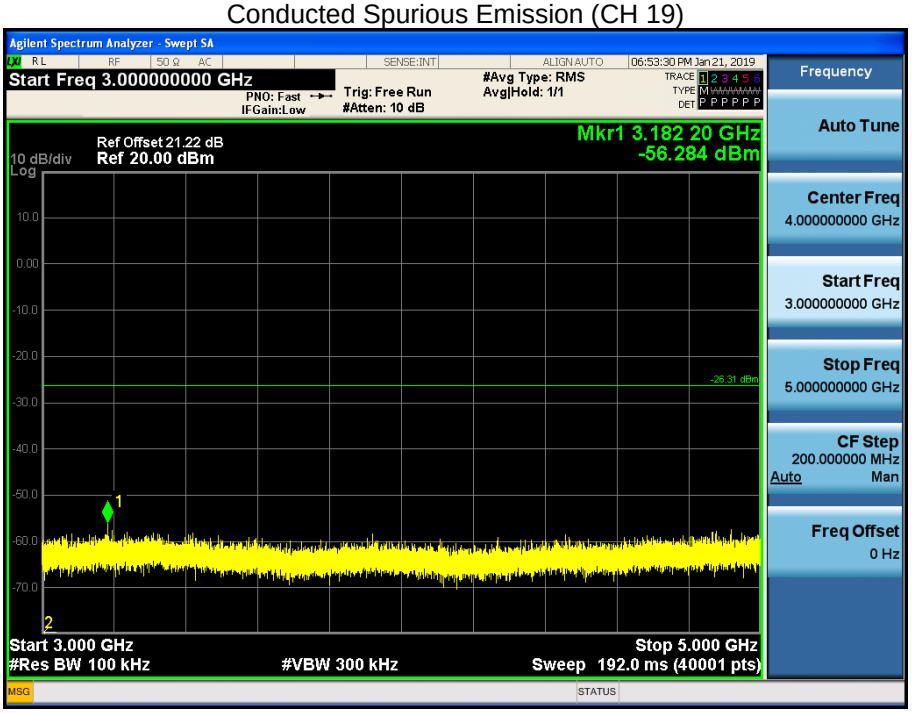
1 GHz ~ 3 GHz

Conducted Spurious Emission (CH 19)



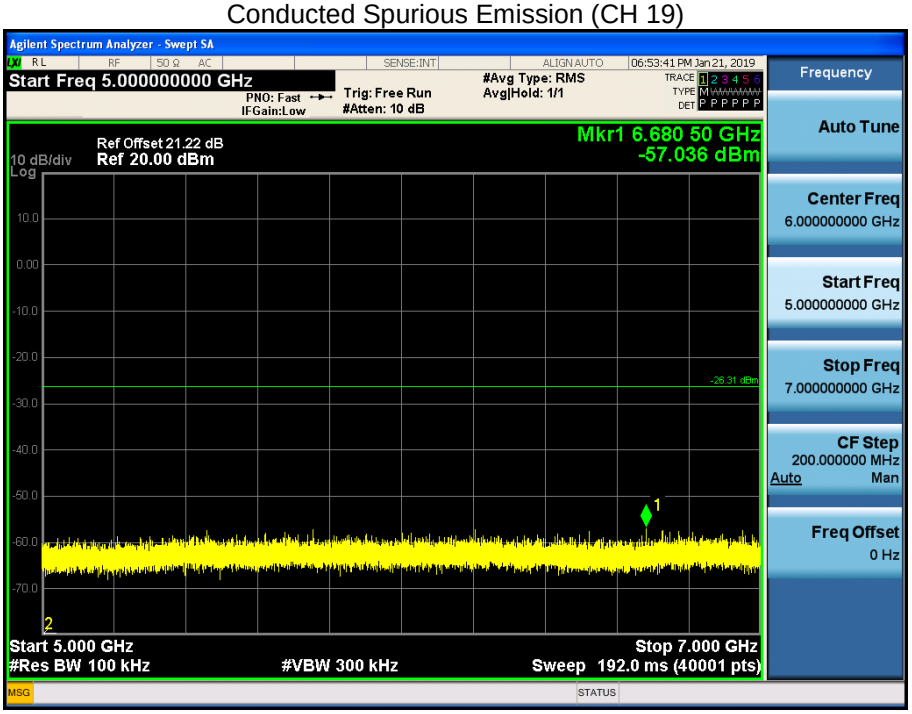
3 GHz ~ 5 GHz

Conducted Spurious Emission (CH 19)



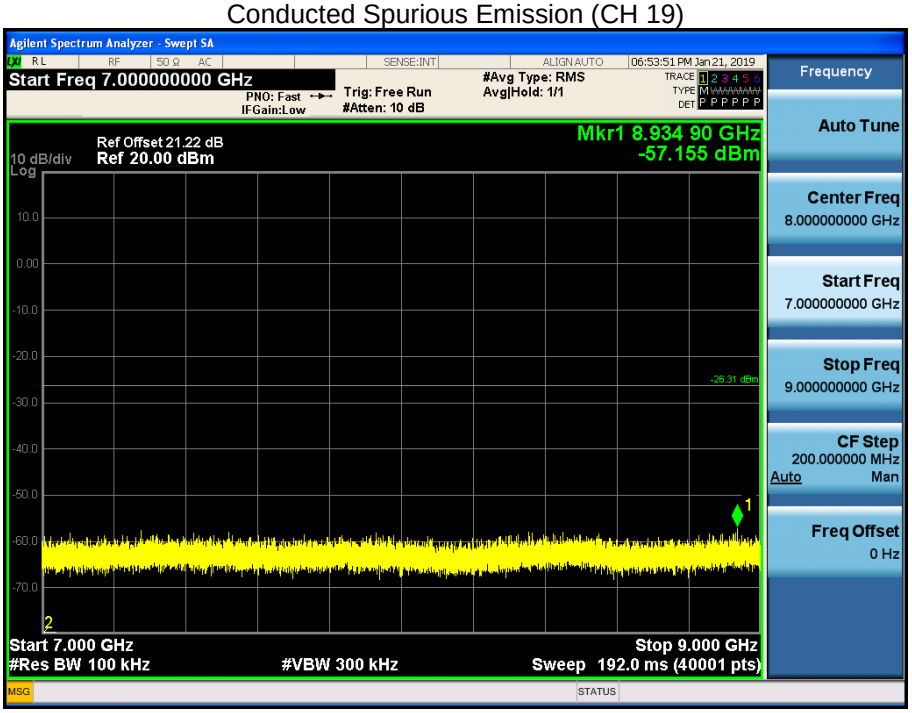
5 GHz ~ 7 GHz

Conducted Spurious Emission (CH 19)



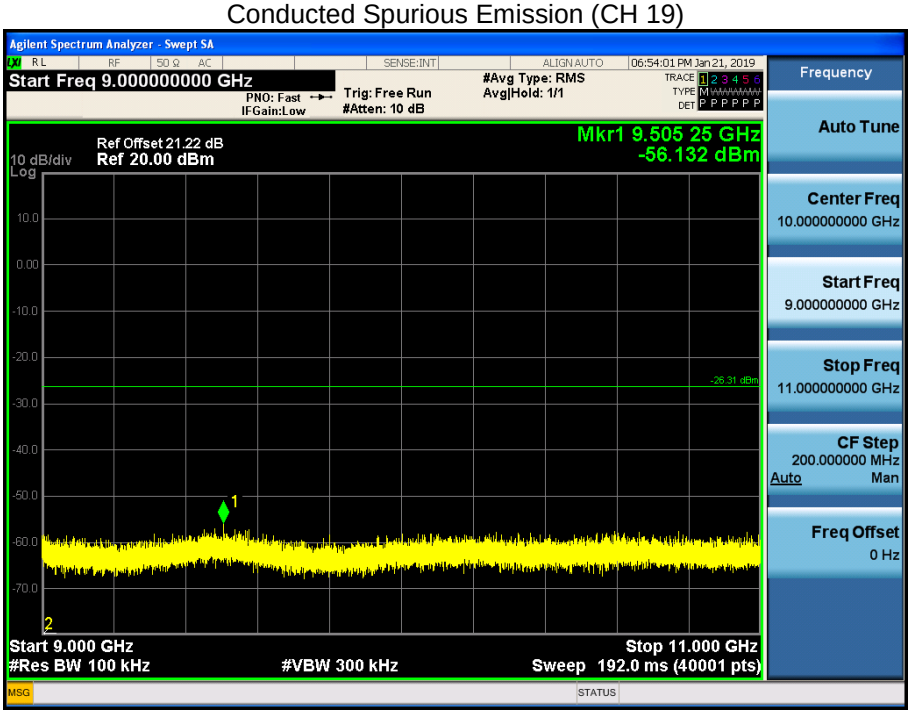
7 GHz ~ 9 GHz

Conducted Spurious Emission (CH 19)



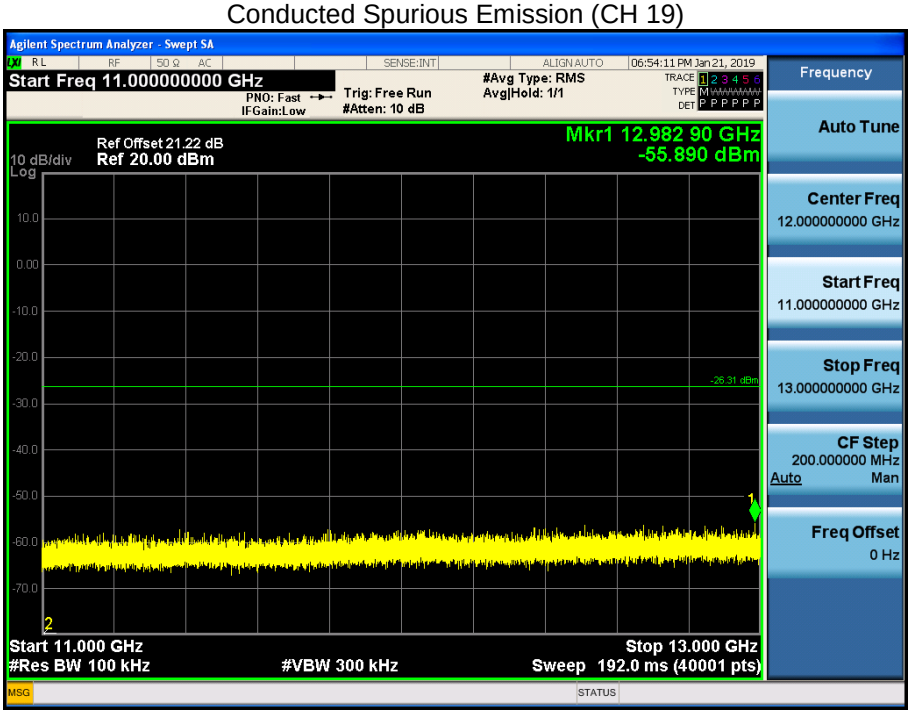
9 GHz ~ 11 GHz

Conducted Spurious Emission (CH 19)



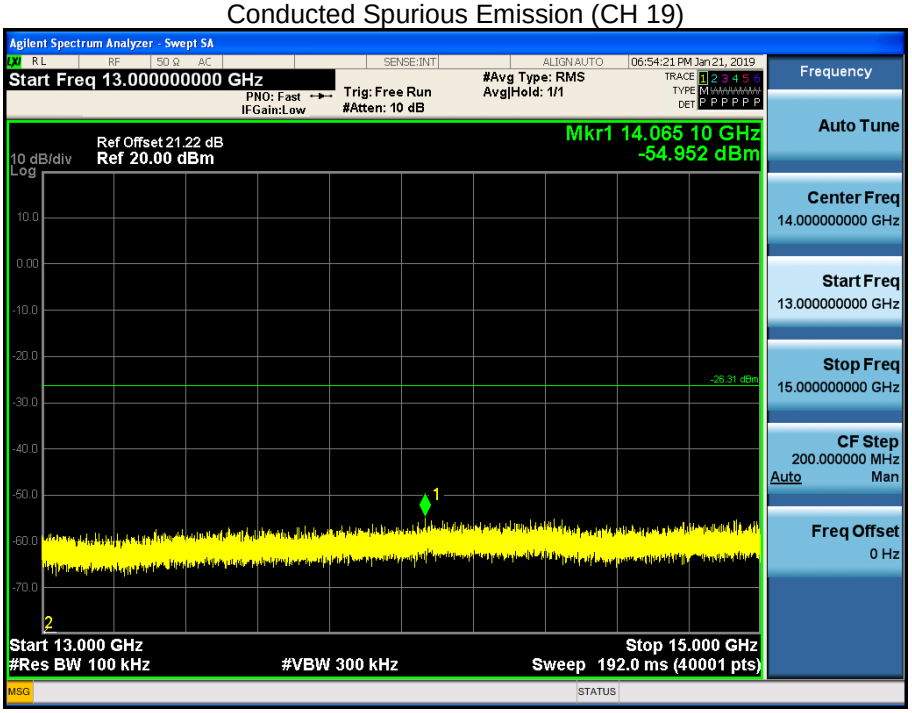
11 GHz ~ 13 GHz

Conducted Spurious Emission (CH 19)



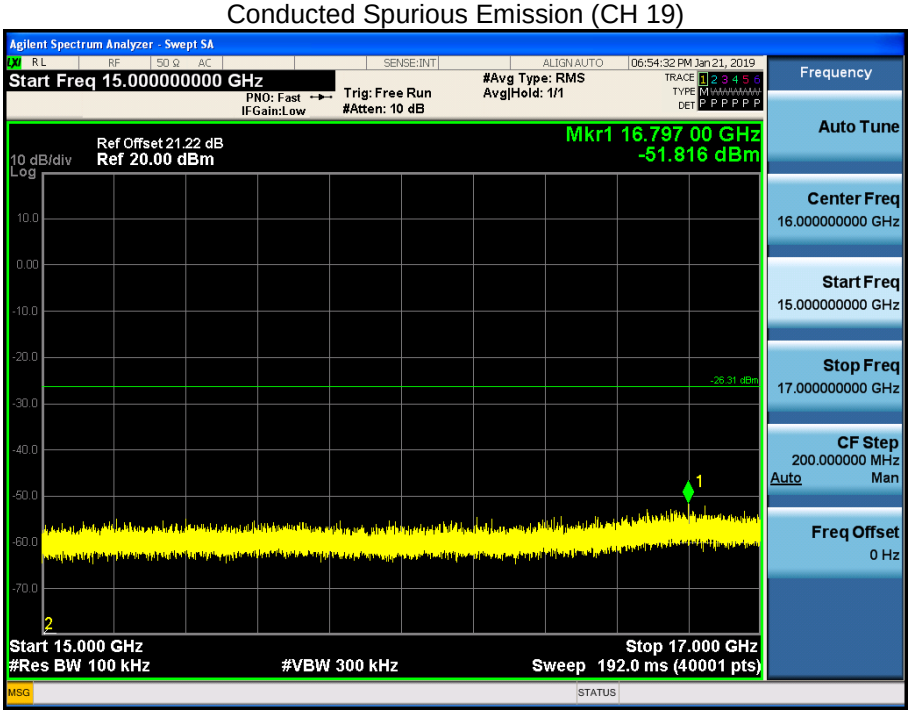
13 GHz ~ 15 GHz

Conducted Spurious Emission (CH 19)



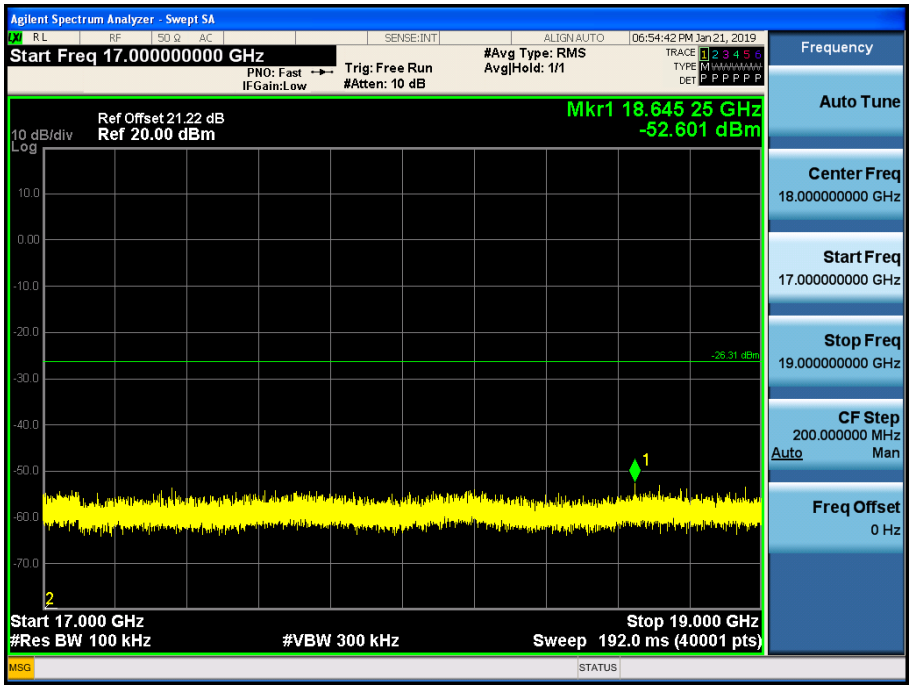
15 GHz ~ 17 GHz

Conducted Spurious Emission (CH 19)



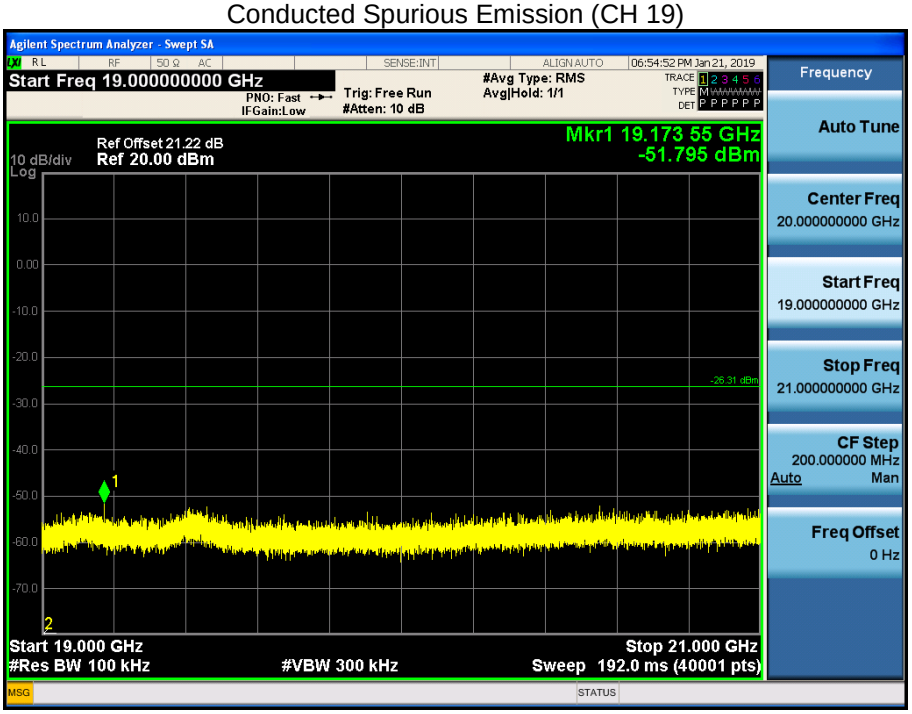
17 GHz ~ 19 GHz

Conducted Spurious Emission (CH 19)



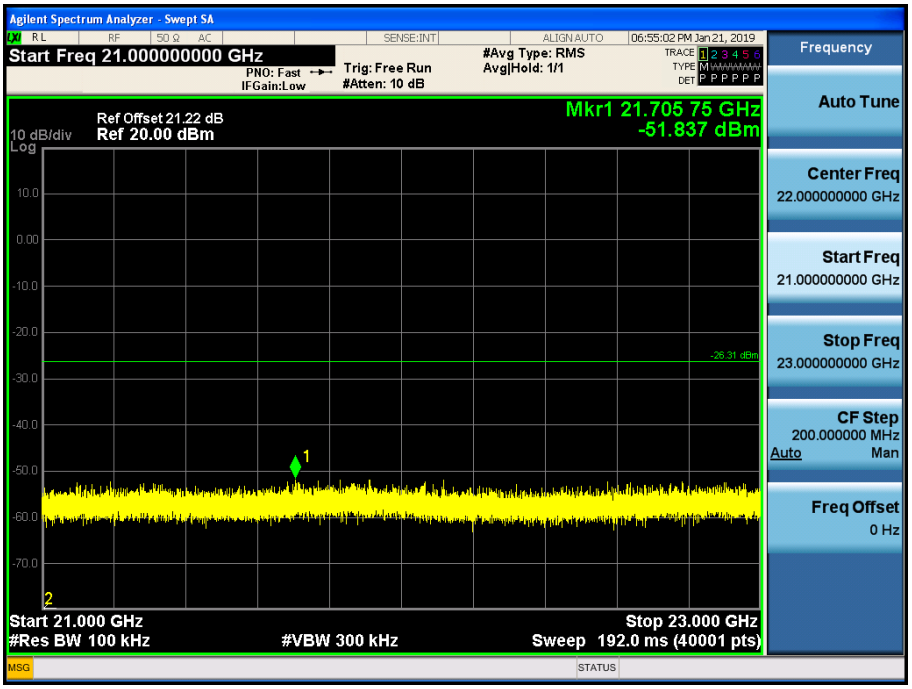
19 GHz ~ 21 GHz

Conducted Spurious Emission (CH 19)



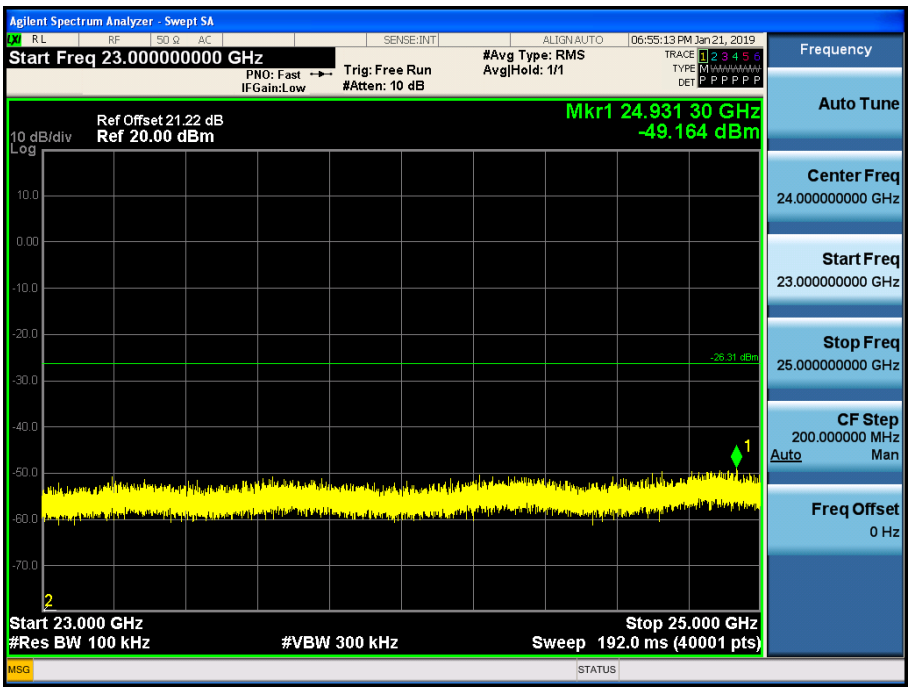
21 GHz ~ 23 GHz

Conducted Spurious Emission (CH 19)



23 GHz ~ 25 GHz

Conducted Spurious Emission (CH 19)



9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

Note:

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = 40*log (specific distance / test distance) (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor
4. Radiated test is performed with hopping off.
5. The test results for below 30 MHz is correlated to an open site.
   The result on OFS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

Frequency Range : Below 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

Frequency Range : Above 1 GHz

Mode : 1M Bit/s

Operation Mode: CH Low

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	49.00	0.00	0.74	V	49.74	73.98	24.24	PK
4804	37.20	0.69	0.74	V	38.63	53.98	15.35	AV
7206	45.91	0.00	9.25	V	55.16	73.98	18.83	PK
7206	34.05	0.69	9.25	V	43.99	53.98	10.00	AV
4804	48.54	0.00	0.74	H	49.28	73.98	24.70	PK
4804	37.01	0.69	0.74	H	38.44	53.98	15.54	AV
7206	45.72	0.00	9.25	H	54.97	73.98	19.02	PK
7206	34.00	0.69	9.25	H	43.94	53.98	10.05	AV

Operation Mode: CH Mid

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4880	49.21	0.00	1.16	V	50.37	73.98	23.61	PK
4880	37.25	0.69	1.16	V	39.10	53.98	14.88	AV
7320	46.13	0.00	9.14	V	55.27	73.98	18.71	PK
7320	33.93	0.69	9.14	V	43.76	53.98	10.22	AV
4880	48.96	0.00	1.16	H	50.12	73.98	23.86	PK
4880	37.20	0.69	1.16	H	39.05	53.98	14.93	AV
7320	45.96	0.00	9.14	H	55.10	73.98	18.88	PK
7320	33.89	0.69	9.14	H	43.72	53.98	10.26	AV

Operation Mode: CH High

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	50.41	0.00	0.76	V	51.17	73.98	22.81	PK
4960	37.91	0.69	0.76	V	39.36	53.98	14.62	AV
7440	46.58	0.00	9.86	V	56.44	73.98	17.54	PK
7440	33.60	0.69	9.86	V	44.15	53.98	9.83	AV
4960	49.68	0.00	0.76	H	50.44	73.98	23.54	PK
4960	37.83	0.69	0.76	H	39.28	53.98	14.70	AV
7440	46.06	0.00	9.86	H	55.92	73.98	18.06	PK
7440	33.51	0.69	9.86	H	44.06	53.98	9.92	AV

Mode : 2M Bit/s

Operation Mode: CH Low

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	48.70	0.00	0.74	V	49.44	73.98	24.54	PK
4804	37.19	4.89	0.74	V	42.82	53.98	11.16	AV
7206	46.54	0.00	9.25	V	55.79	73.98	18.20	PK
7206	34.08	4.89	9.25	V	48.22	53.98	5.77	AV
4804	47.79	0.00	0.74	H	48.53	73.98	25.45	PK
4804	37.11	4.89	0.74	H	42.74	53.98	11.24	AV
7206	46.12	0.00	9.25	H	55.37	73.98	18.62	PK
7206	33.98	4.89	9.25	H	48.12	53.98	5.87	AV

Operation Mode: CH Mid

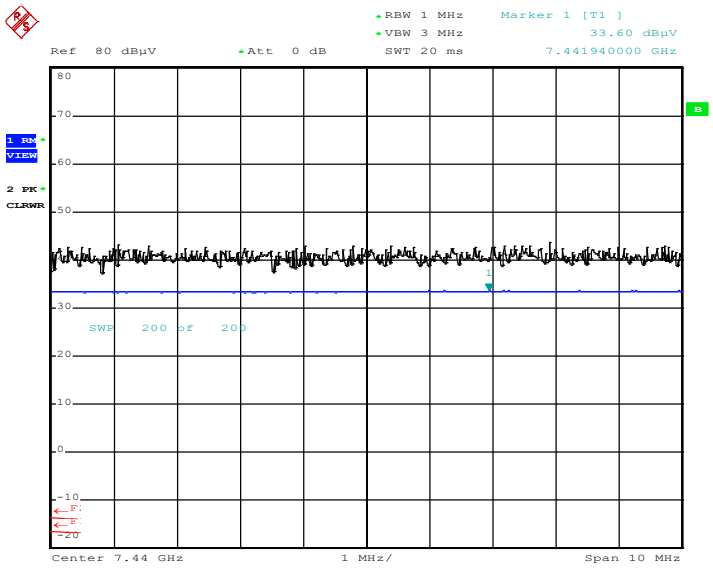
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4880	49.94	0.00	1.16	V	51.10	73.98	22.88	PK
4880	37.27	4.89	1.16	V	43.32	53.98	10.66	AV
7320	45.99	0.00	9.14	V	55.13	73.98	18.85	PK
7320	33.89	4.89	9.14	V	47.92	53.98	6.06	AV
4880	49.14	0.00	1.16	H	50.30	73.98	23.68	PK
4880	37.18	4.89	1.16	H	43.23	53.98	10.75	AV
7320	45.74	0.00	9.14	H	54.88	73.98	19.10	PK
7320	33.85	4.89	9.14	H	47.88	53.98	6.10	AV

Operation Mode: CH High

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	49.87	0.00	0.76	V	50.63	73.98	23.35	PK
4960	37.99	4.89	0.76	V	43.64	53.98	10.34	AV
7440	46.30	0.00	9.86	V	56.16	73.98	17.82	PK
7440	33.55	4.89	9.86	V	48.3	53.98	5.68	AV
4960	49.54	0.00	0.76	H	50.3	73.98	23.68	PK
4960	37.91	4.89	0.76	H	43.56	53.98	10.42	AV
7440	45.89	0.00	9.86	H	55.75	73.98	18.23	PK
7440	33.51	4.89	9.86	H	48.26	53.98	5.72	AV

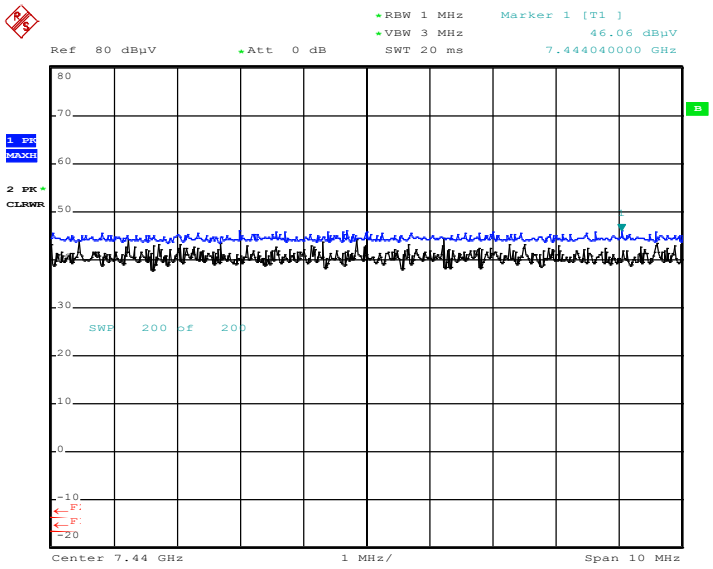
▣ 1M Bit 255 Byte Test Plots

Radiated Spurious Emissions plot – Average Reading (Ch.39 3rd Harmonic_X-V)



Date: 31.JAN.2019 14:21:18

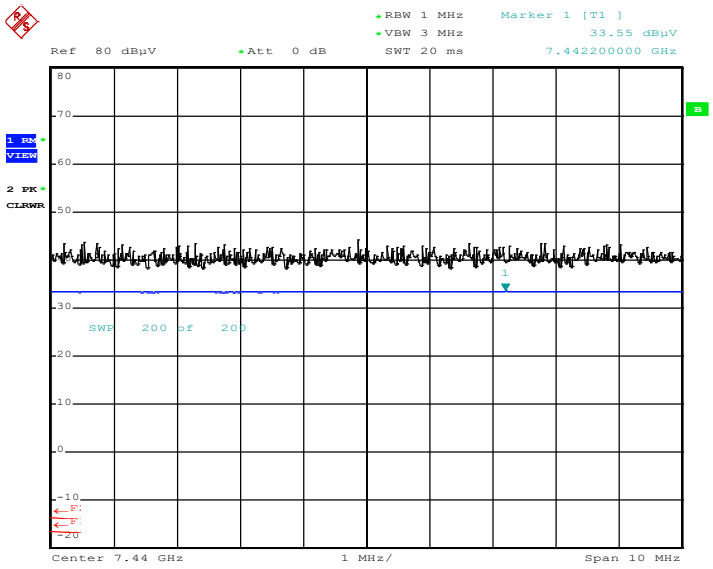
Radiated Spurious Emissions plot – Peak Reading (Ch.39 3rd Harmonic_H)



Date: 31.JAN.2019 14:20:32

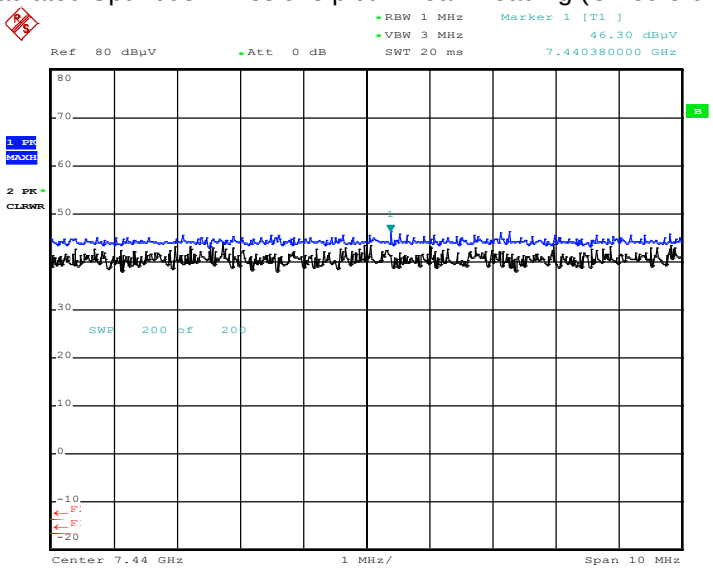
▣ 2M Bit 37 Byte Test Plots (Worst case : X-V)

Radiated Spurious Emissions plot – Average Reading (Ch.39 3rd Harmonic)



Date: 31.JAN.2019 14:37:42

Radiated Spurious Emissions plot – Peak Reading (Ch.39 3rd Harmonic)



Date: 31.JAN.2019 14:38:13

Note:

Plot of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

Mode : 1M Bit/s

Operating Frequency 2402 MHz

Channel No. 0

Frequency [MHz]	Reading [dBuV/m]	Duty Cycle Factor [dB]	A.F.+C.L.+D.F. [dB]	Ant. Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	18.61	0.00	33.29	H	51.90	73.98	22.08	PK
2390.0	7.45	0.69	33.29	H	41.43	53.98	12.55	AV
2390.0	18.41	0.00	33.29	V	51.70	73.98	22.28	PK
2390.0	7.33	0.69	33.29	V	41.31	53.98	12.67	AV

Operating Frequency 2480 MHz

Channel No. 39

Frequency [MHz]	Reading [dBuV/m]	Duty Cycle Factor [dB]	A.F.+C.L.+D.F. [dB]	Ant. Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	31.83	0.00	33.39	H	65.22	73.98	8.76	PK
2483.5	8.19	0.69	33.39	H	42.27	53.98	11.71	AV
2483.5	31.54	0.00	33.39	V	64.93	73.98	9.05	PK
2483.5	8.11	0.69	33.39	V	42.19	53.98	11.79	AV

Mode : 2M Bit/s

Operating Frequency 2402 MHz

Channel No. 0

Frequency [MHz]	Reading [dBuV/m]	Duty Cycle Factor [dB]	A.F.+C.L.+D.F. [dB]	Ant. Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	18.82	0.00	33.29	H	52.11	73.98	21.88	PK
2390.0	7.41	4.89	33.29	H	45.59	53.98	8.39	AV
2390.0	18.10	0.00	33.29	V	51.39	73.98	22.60	PK
2390.0	7.33	4.89	33.29	V	45.51	53.98	8.47	AV

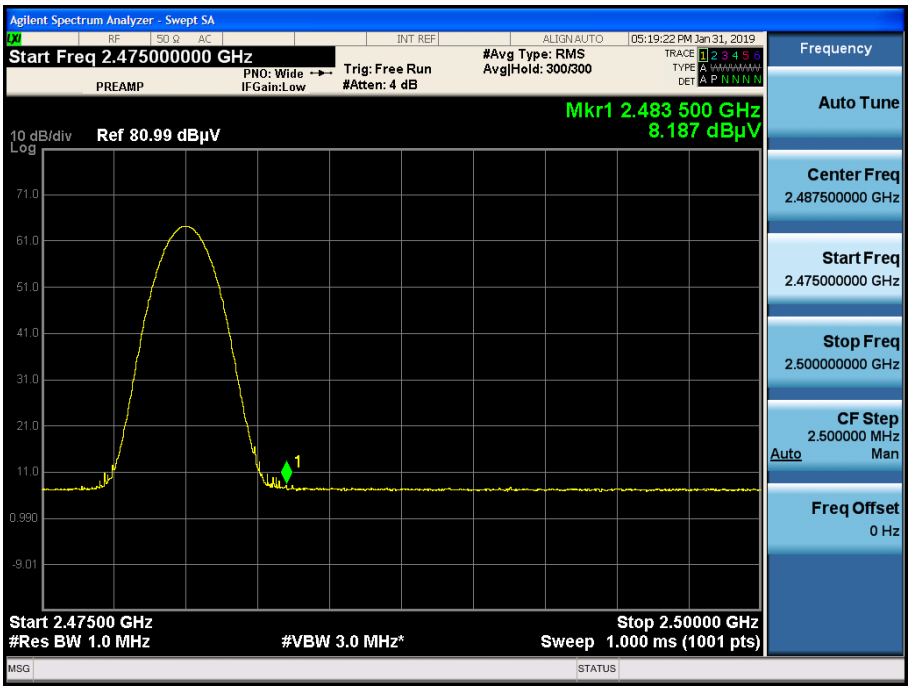
Operating Frequency 2480 MHz

Channel No. 39

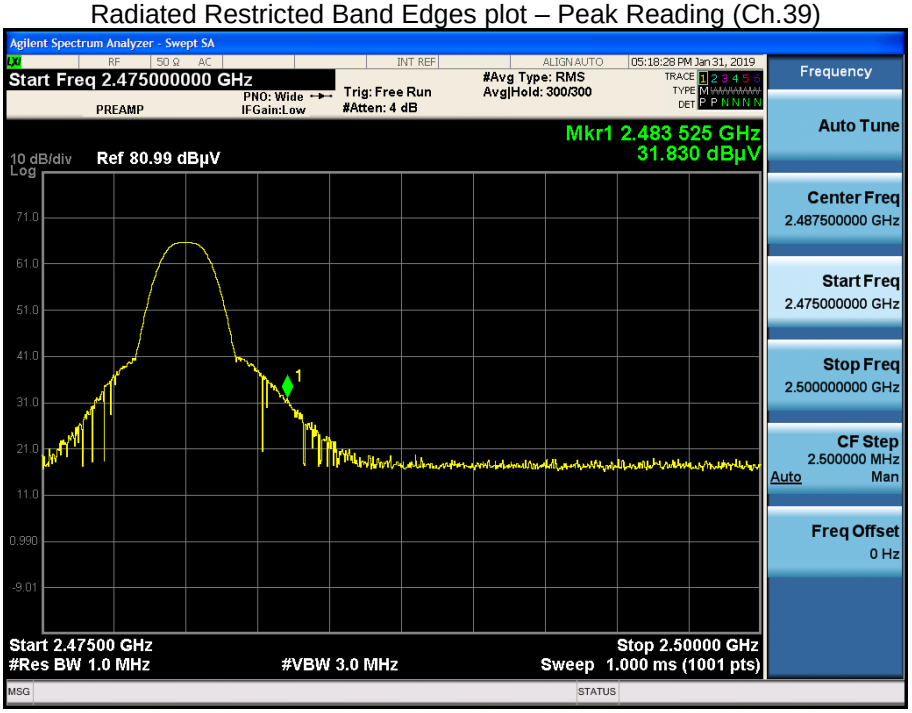
Frequency [MHz]	Reading [dBuV/m]	Duty Cycle Factor [dB]	A.F.+C.L.+D.F. [dB]	Ant. Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	32.45	0.00	33.39	H	65.84	73.98	8.14	PK
2483.5	10.36	4.89	33.39	H	48.64	53.98	5.34	AV
2483.5	31.47	0.00	33.39	V	64.86	73.98	9.12	PK
2483.5	9.85	4.89	33.39	V	48.13	53.98	5.85	AV

▣ Mode : 1M Bit/s Test Plots (Worst case : X-H)

Radiated Restricted Band Edges plot – Average Reading (Ch.39)

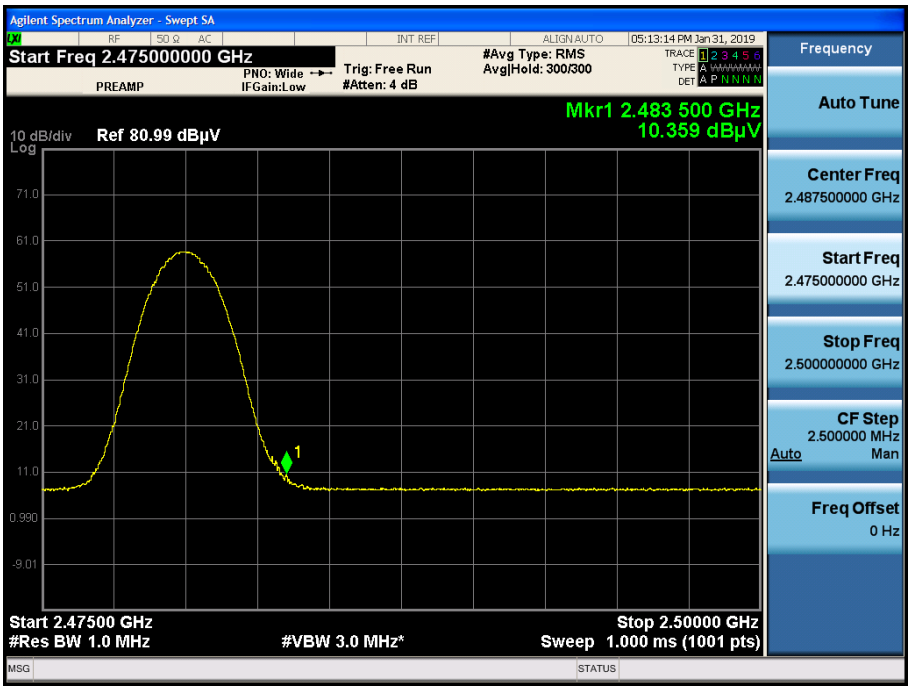


Radiated Restricted Band Edges plot – Peak Reading (Ch.39)

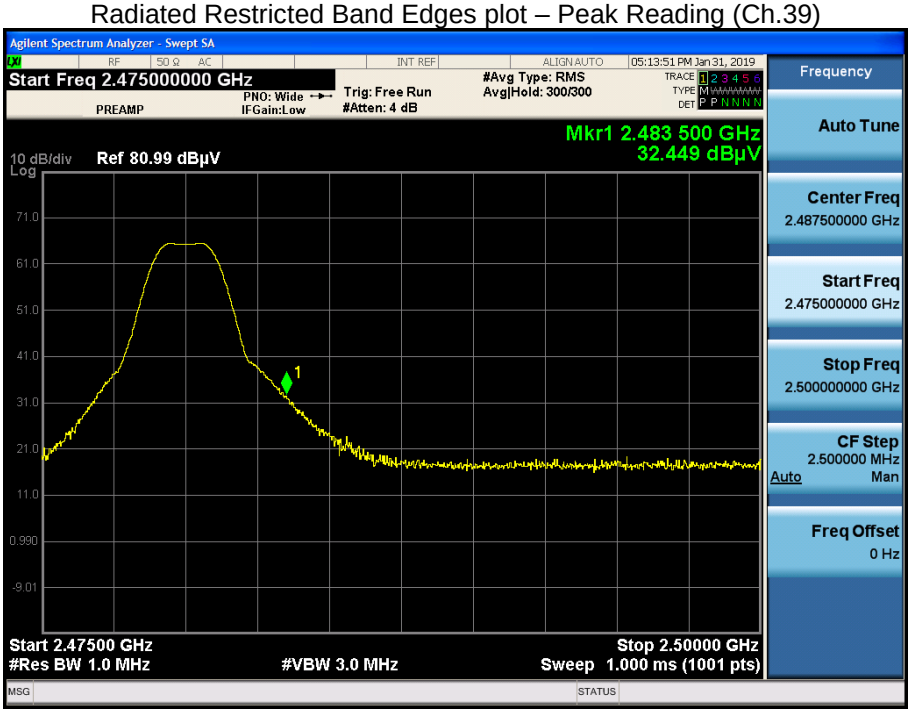


▣ Mode : 2M Bit/s Test Plots (Worst case : X-H)

Radiated Restricted Band Edges plot – Average Reading (Ch.39)



Radiated Restricted Band Edges plot – Peak Reading (Ch.39)



Note:

Plot of worst case are only reported.

9.8 RECEIVER SPURIOUS EMISSIONS

Frequency Range : Below 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

Frequency Range : Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

9.9 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

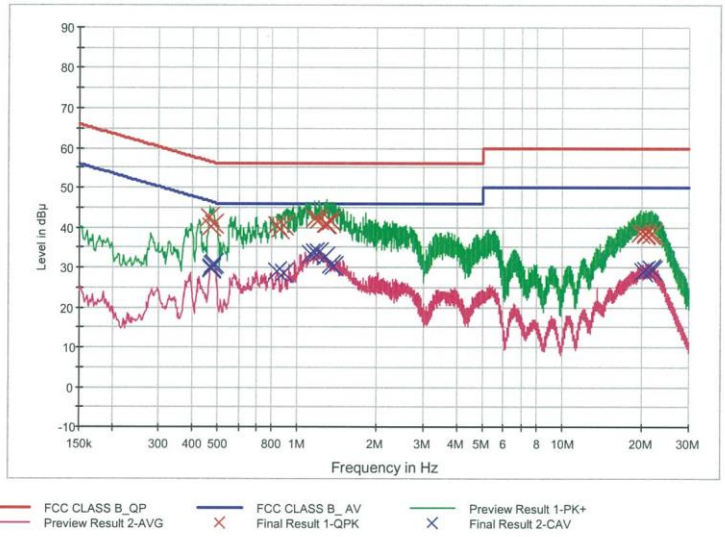
Test 1 / 2

HCT TEST Report

Common Information

EUT:	SM-T515
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	BT LE L1

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.468000	42.6	9.000	Off	L1	9.8	14.0	56.5
0.472000	40.0	9.000	Off	L1	9.8	16.5	56.5
0.482000	40.8	9.000	Off	L1	9.8	15.5	56.3
0.840000	40.5	9.000	Off	L1	9.8	15.5	56.0
0.858000	39.5	9.000	Off	L1	9.8	16.5	56.0
0.884000	40.7	9.000	Off	L1	9.8	15.3	56.0
1.166000	42.3	9.000	Off	L1	9.8	13.7	56.0
1.210000	42.0	9.000	Off	L1	9.8	14.0	56.0
1.274000	40.8	9.000	Off	L1	9.9	15.2	56.0
1.292000	40.8	9.000	Off	L1	9.9	15.2	56.0
1.340000	41.5	9.000	Off	L1	9.9	14.5	56.0
1.344000	41.4	9.000	Off	L1	9.9	14.6	56.0
19.580000	38.4	9.000	Off	L1	10.6	21.6	60.0
20.564000	38.6	9.000	Off	L1	10.6	21.4	60.0
20.614000	38.6	9.000	Off	L1	10.6	21.4	60.0
20.652000	38.2	9.000	Off	L1	10.6	21.8	60.0
21.624000	38.2	9.000	Off	L1	10.6	21.8	60.0
21.914000	38.4	9.000	Off	L1	10.7	21.6	60.0

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Test 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.470000	29.6	9.000	Off	L1	9.8	16.9	46.5
0.474000	30.0	9.000	Off	L1	9.8	16.4	46.4
0.478000	30.6	9.000	Off	L1	9.8	15.7	46.4
0.482000	30.9	9.000	Off	L1	9.8	15.4	46.3
0.840000	29.0	9.000	Off	L1	9.8	17.0	46.0
0.884000	28.5	9.000	Off	L1	9.8	17.5	46.0
1.120000	33.3	9.000	Off	L1	9.8	12.7	46.0
1.166000	33.6	9.000	Off	L1	9.8	12.4	46.0
1.210000	33.6	9.000	Off	L1	9.8	12.4	46.0
1.274000	32.6	9.000	Off	L1	9.9	13.4	46.0
1.340000	30.6	9.000	Off	L1	9.9	15.4	46.0
1.374000	30.2	9.000	Off	L1	9.9	15.8	46.0
20.240000	28.9	9.000	Off	L1	10.6	21.1	50.0
20.564000	29.3	9.000	Off	L1	10.6	20.7	50.0
20.616000	29.5	9.000	Off	L1	10.6	20.5	50.0
20.652000	29.4	9.000	Off	L1	10.6	20.6	50.0
21.730000	29.5	9.000	Off	L1	10.6	20.5	50.0
21.770000	29.3	9.000	Off	L1	10.6	20.7	50.0

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Conducted Emissions (Line 2)

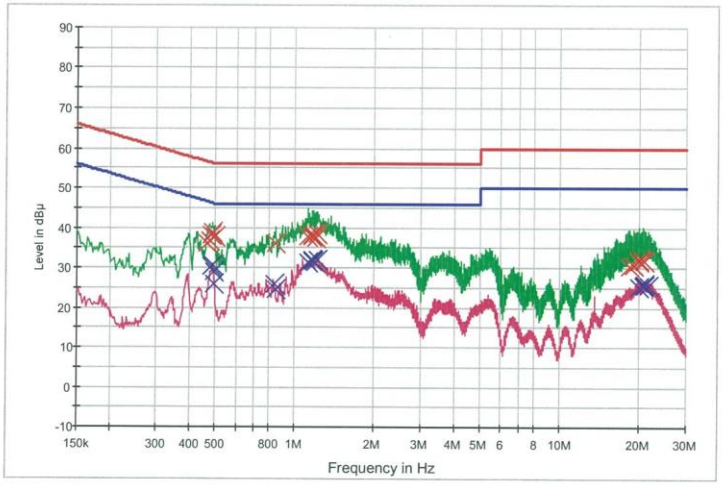
Test 1 / 2

HCT TEST Report

Common Information

EUT:	SM-T515
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	BT LE N

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.466000	36.1	9.000	Off	N	9.9	20.5	56.6
0.476000	36.9	9.000	Off	N	9.9	19.5	56.4
0.484000	38.1	9.000	Off	N	9.9	18.2	56.3
0.488000	38.7	9.000	Off	N	9.9	17.5	56.2
0.498000	37.7	9.000	Off	N	9.9	18.3	56.0
0.848000	36.0	9.000	Off	N	10.0	20.0	56.0
1.122000	37.7	9.000	Off	N	10.0	18.3	56.0
1.160000	37.8	9.000	Off	N	10.0	18.2	56.0
1.166000	38.1	9.000	Off	N	10.0	17.9	56.0
1.174000	38.3	9.000	Off	N	10.0	17.7	56.0
1.206000	37.4	9.000	Off	N	10.0	18.6	56.0
1.214000	38.5	9.000	Off	N	10.0	17.5	56.0
18.300000	30.3	9.000	Off	N	10.8	29.7	60.0
19.058000	30.6	9.000	Off	N	10.8	29.4	60.0
19.864000	31.7	9.000	Off	N	10.9	28.3	60.0
19.988000	31.9	9.000	Off	N	10.9	28.1	60.0
20.690000	32.0	9.000	Off	N	10.9	28.0	60.0
20.864000	31.8	9.000	Off	N	10.9	28.2	60.0

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Test 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.484000	30.5	9.000	Off	N	9.9	15.8	46.3
0.488000	30.6	9.000	Off	N	9.9	15.6	46.2
0.492000	28.8	9.000	Off	N	9.9	17.3	46.1
0.496000	26.0	9.000	Off	N	9.9	20.0	46.1
0.836000	25.9	9.000	Off	N	10.0	20.1	46.0
0.846000	24.5	9.000	Off	N	10.0	21.5	46.0
1.122000	31.5	9.000	Off	N	10.0	14.5	46.0
1.160000	31.7	9.000	Off	N	10.0	14.3	46.0
1.164000	31.9	9.000	Off	N	10.0	14.1	46.0
1.178000	31.8	9.000	Off	N	10.0	14.2	46.0
1.188000	31.3	9.000	Off	N	10.0	14.8	46.0
1.214000	31.9	9.000	Off	N	10.0	14.1	46.0
19.864000	25.2	9.000	Off	N	10.9	24.8	50.0
19.988000	25.4	9.000	Off	N	10.9	24.6	50.0
20.690000	25.6	9.000	Off	N	10.9	24.4	50.0
20.864000	25.8	9.000	Off	N	10.9	24.2	50.0
20.956000	25.6	9.000	Off	N	10.9	24.4	50.0
21.510000	25.5	9.000	Off	N	10.9	24.6	50.0

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10. LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/12/2018	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/27/2018	Annual	100033
ESPAC	SU-642 /Temperature Chamber	03/30/2018	Annual	0093008124
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY52090906
Agilent	N9030A / Signal Analyzer	01/10/2019	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/26/2018	Annual	101231
Agilent	N1911A / Power Meter	04/16/2018	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/16/2018	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/20/2018	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/07/2018	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/26/2018	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	07/10/2018	Annual	07560
Chang Woo Inc.	18N-20dB / Attenuator(20 dB)	05/09/2018	Annual	8
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Radiated Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	08/23/2018	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/06/2017	Biennial	760
Schwarzbeck	VULB 9160 / TRILOG Antenna	08/09/2018	Biennial	9160-3368
Schwarzbeck	BBHA 9120D / Horn Antenna	05/02/2017	Biennial	9120D-937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	12/04/2017	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer	09/03/2018	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/28/2018	Annual	101068-SZ
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/07/2018	Annual	8
Wainwright Instruments	WHKX7.0/18G-8SS / High Pass Filter	05/09/2018	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/29/2018	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/03/2019	Annual	2
Api tech.	18B-03 / Attenuator (3 dB)	06/07/2018	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	07/17/2018	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	07/10/2018	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	07/10/2018	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	01/03/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/29/2018	Annual	25956

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

11. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-1903-FI001-P
2	HCT-RF-1903-FI002-P
3	HCT-RF-1903-FI003-P
4	HCT-RF-1903-FI004-P
5	HCT-RF-1903-FI005-P
6	HCT-RF-1903-FI006-P