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Korea Testing & Research Institute

TEST REPORT

FCC Part 15 Subpart C § 15.247

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Testing Laboratory :	Korea Testing & Research institute (KTR)
Address :	98, Gyoyukwon-ro, Gwacheon-si, Gyeonggi-do, 13810, Korea
Applicant` s name :	CoX Space Co., Ltd
Address :	858ho, Business Support Hub, 815, Daewangpangyo-ro, Sujeong-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Manufacturer` s name :	CoX Space Co., Ltd
Address :	858ho, Business Support Hub, 815, Daewangpangyo-ro, Sujeong-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Test specification :	
Standard :	FCC Part 15 Subpart C § 15.247
Test procedure :	ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02
Non-standard test method:	N/A
Test Report Form No :	KTR-QI-Y10053-F19(00)
Test Reoprt Form(s) Originator :	Korea Testing & Research institute
Master TRF:	Dated 2012-06

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Test item description	
Trade Mark :	
Manufacturer :	CoX Space Co., Ltd
Model/Type reference :	COXi / SNOWL (Gesture Ring Mouse)
Ratings :	DC 3.7 V(Battery)

QR Code for forgery

Revision History

The Revision history of this test report is shown below.

Revision	Report No.	Date of Issue	Description
0	EFC-2020-000005	2020.10.23	Initial

CONTENTS

1. General Information

1.1. Testing Laboratory

Laboratory	KOREA TESTING & RESEARCH INSTITUTE
Address	98, Gyoyukwon-ro, Gwacheon-si, Gyeonggi-do, 13810, Korea
Phone No	+ 82-2-2164-0011
Fax No.	+ 82-2-2634-1008
Accrediations	KOLAS : KT011, KC : J, VCCI Reg. : C-2363, R-2183 KCC & FCC : KR0030(Designation), FCC : 503434(Registration)

1.2. Applicant Information

Applicant(Company)	CoX Space Co., Ltd
Address	858ho, Business Support Hub, 815, Daewangpangyo-ro, Sujeong-gu, Seongnam-si, Gyeonggi-do, Korea
Contact Person	Name : Kim, Ho Yeon // E-mail : hans.kim@coxspace.com Phone No. : +82-10-3240-4464

1.3. Manufacturer Information

Same as the application information

1.4. Product Information

Equipment under test	SNOWL (Gesture Ring Mouse)
Model name	COXi
Frequency Range	2 402 MHz ~ 2 480 MHz
Modulation technique	FHSS(GFSK)
Number of channels	40
Antenna type // Antenna gain	Chip Antenna // 2.3 dBi(Peak Gain)
Power source	DC 3.7 V(Battery)
Software Version	COXI_SW_V1.0
Hardware Version	COXI_HW_V1.0
Serial Number	N/A
Variant Model	N/A
Date of Test(s)	2020.08.20 ~ 2020.09.04

1.5. Peripheral Devices

Device	Manufacturer	Model	Serial No.
Labtop	Lenovo Information Products Co., Ltd.	81CT	N/A
AC/DC Adapter	Flextronics Power Systems (Dongguan)	A1205	N/A
Charger Cradle	CoX Space Co., Ltd	COXiC	N/A

1.6. Summary of Test Results

FCC Part 15 Subpart C § 15.247		
Section	Test Item	Result
§ 15.247(b)(3)	Maximum Peak Output Power	Complied
§ 15.247(e)	Peak Power Spectral Density	Complied
§ 15.247(a)(2)	6 dB Bandwidth	Complied
§ 15.205(a) § 15.209 § 15.247(d)	Spurious Emission Band Edge and Restricted Bands	Complied
§ 15.207(a)	AC Power Line Conducted Emissions	Complied

Notes :

1. The measurement procedures described in the American National Standard of Procedure for Compliance Testing of Unlicensed Wireless Devices(ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 15.247 Meas Guidance v05r02 were used in the measurement of the EUT
2. All modes of operation and data rates were investigated. The test result shown in the following sections Represents the worst case emissions.
3. The fundamental of the EUT was investigated in three orthogonal position X, Y and Z. It was determined that X position was the worst in three orthogonal position. As a result, all final radiated testing was conducted with the EUT in X position.

1.7. 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 indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determined compliance.

Parameter	Expanded Uncertainty
Conducted Emissions(150 kHz ~ 30 MHz)	± 2.30 dB
Radiated Spurious Emissions(9 kHz ~ 30 MHz)	± 1.70 dB
Radiated Spurious Emissions(Below 1 GHz)	± 3.80 dB
Radiated Spurious Emissions(Above 1 GHz)	± 2.20 dB

1.8. Conducted Test for Offset Level

The offset level is set in the spectrum analyzer to compensate the RF Cable loss factor between EUT conducted output port and spectrum analyzer.
With the offset compensation, the spectrum analyser reading level is exactly the EUT RF output level.

Frequency(MHz)	Factor(dB)
30	9.90
100	10.14
200	10.27
300	10.30
400	10.42
500	10.47
600	10.50
700	10.40
800	10.56
900	10.53
1 000	10.56
2 000	10.76
3 000	11.08
4 000	10.37
5 000	9.81
6 000	10.86
7 000	11.08
8 000	11.57
9 000	11.54
10 000	12.25
11 000	12.43
12 000	12.69
13 000	12.75
14 000	13.21
15 000	12.85
16 000	13.96
17 000	13.31
18 000	13.45
19 000	13.78
20 000	13.80
21 000	13.58
22 000	14.11
23 000	13.97
24 000	14.72
25 000	14.97
26 000	14.19
26 500	14.03

1.9. Test Frequency(Channel)

Ch.	Frequency(MHz)
0(Low)	2 402
⋮	⋮
19(Middle)	2 440
⋮	⋮
39(High)	2 480

〈Bluetooth Low Energy〉

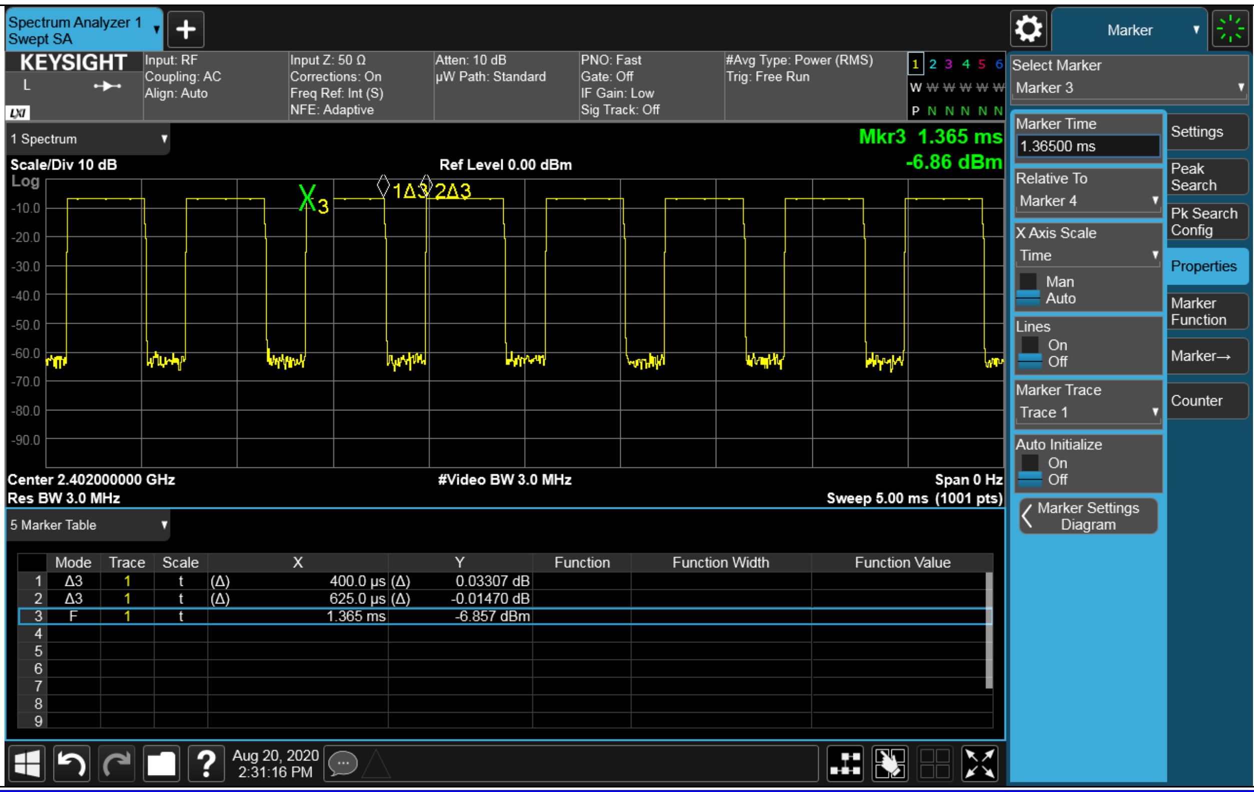
1.10. Duty Cycle

Regarding to KDB 558074 D01 15.247 Meas Guidance v05r02, 6, the maximum duty cycle was investigated and set the spectrum analyser as below;
Set RBW ≥ OBW if possible; set RBW to the largest available value. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100.

Frequency(MHz)	Duty Cycle(%)	Correction Factor(dB)
2 402	64	1.94
2 440	64	1.94
2 480	64	1.94

Notes :
1. Duty Cycle (%) = (Tx On Time / Tx On Time + Off Time) x 100 = (400 / 625) x 100 = 64 %
2. Correction Factor (dB) = 10 log (1 / Duty Cycle) = 10 log (1 / 64) = 1.94

1M Bit/s(37 Byte) / CH 0(Low)



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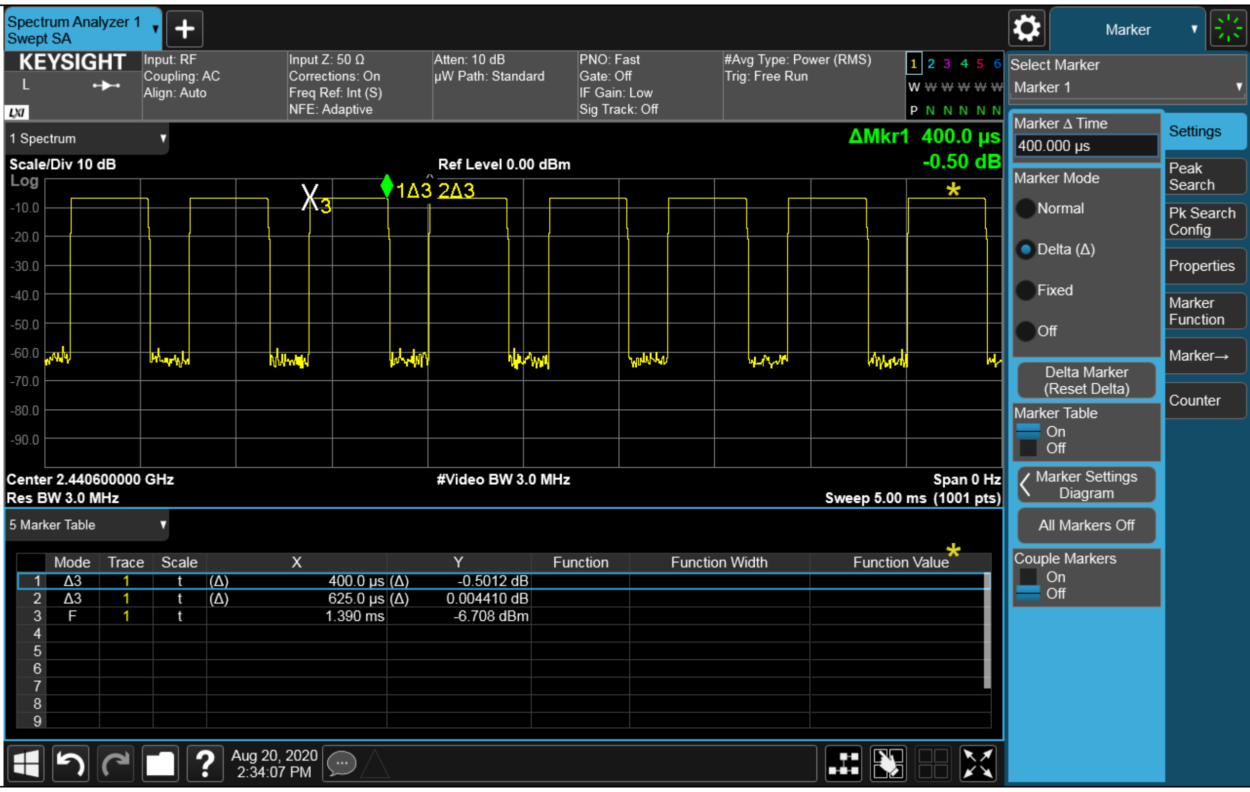

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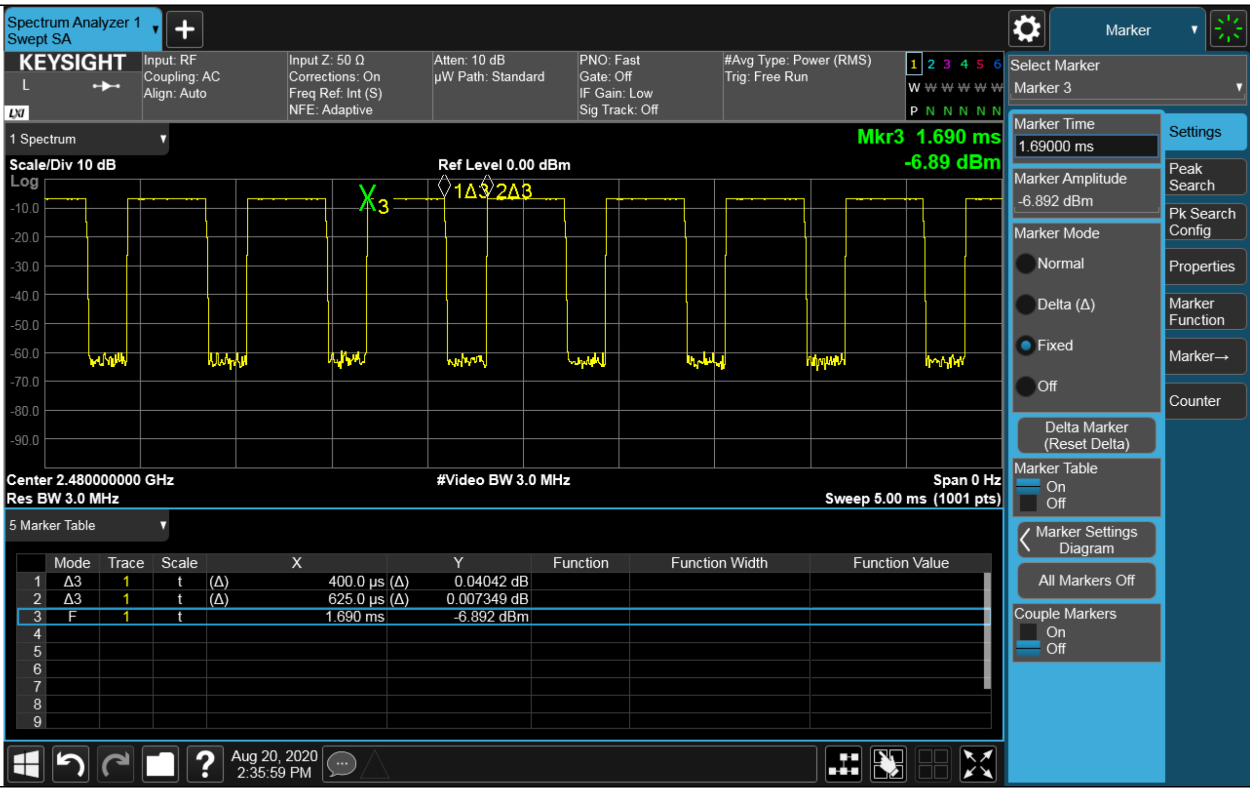


2. Antenna Requirement

According to FCC 47 CFR §15.203:
An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by 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 intentional radiator shall be considered sufficient to comply the provision of this section.
And according to FCC 47 CFR Section §15.247(b) if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

(1) The Transmitter has permanently attached Chip Antenna(Internal antenna) on board.

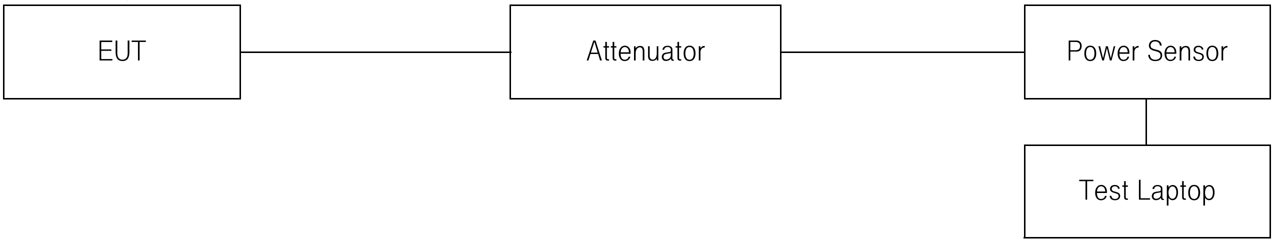
(2) Antenna Peak Gain : 2.3 dBi

(3) The E.U.T complies with the requirement of §15.203, §15.247.

3. Test Result

3.1. Maximum Peak Output Power

▣ Test Setup



▣ Limit

According to § 15.247(b)(3), for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to § 15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

▣ Test procedure

ANSI C63.10 2013 Section 11.9.1.3 & Section 11.9.2.3.1

98 %) is permitted, if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

If continuous transmission (or at least 98 % duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level, with the transmit duration as long as possible, and the duty cycle as high as possible during which sweep triggering/signal gating techniques may be used to perform the measurement over the transmission duration.

11.9.1.3 PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

11.9.2.3.1 Method AVGPM

Method AVGPM is a measurement using an RF average power meter, as follows:

a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:

1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.

2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.

3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

b) If the transmitter does not transmit continuously, measure the duty cycle, D, of the transmitter output signal as described in 11.6.

c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.

d) Adjust the measurement in dBm by adding [10 log (1 / D)], where D is the duty cycle.

▣ Test Result

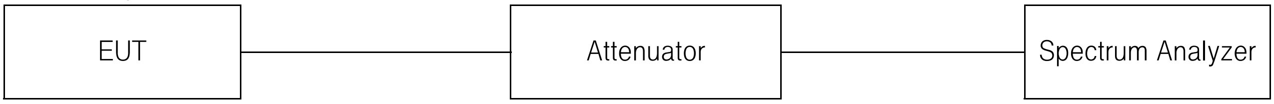
Test Mode	Frequency (MHz)	Peak Power Result(dBm)	Average Power			Limit(dBm)
			Measured Average Power(dBm)	Duty Cycle Correction Factor(dB)	Average Power Result(dBm))	
BLE 1 M Bit/s 37 Byte	2 402	<u>-6.31</u>	-8.39	1.94	<u>-6.45</u>	30
	2 440	-6.32	-8.40		-6.46	
	2 480	-6.35	-8.43		-6.49	

Note :

The offset value(Attenuator and RF Cable Loss) was compensated in test program(Keysight BenchVue : Ver. 3.5) before measuring.

3.2. Peak Power Spectral Density

▣ Test Setup



▣ Limit

According to §15.247(e), (e) for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

▣ Test procedure

ANSI C63.10 2013 Section 11.10.2

11.10.2 Method PKPSD (peak PSD)

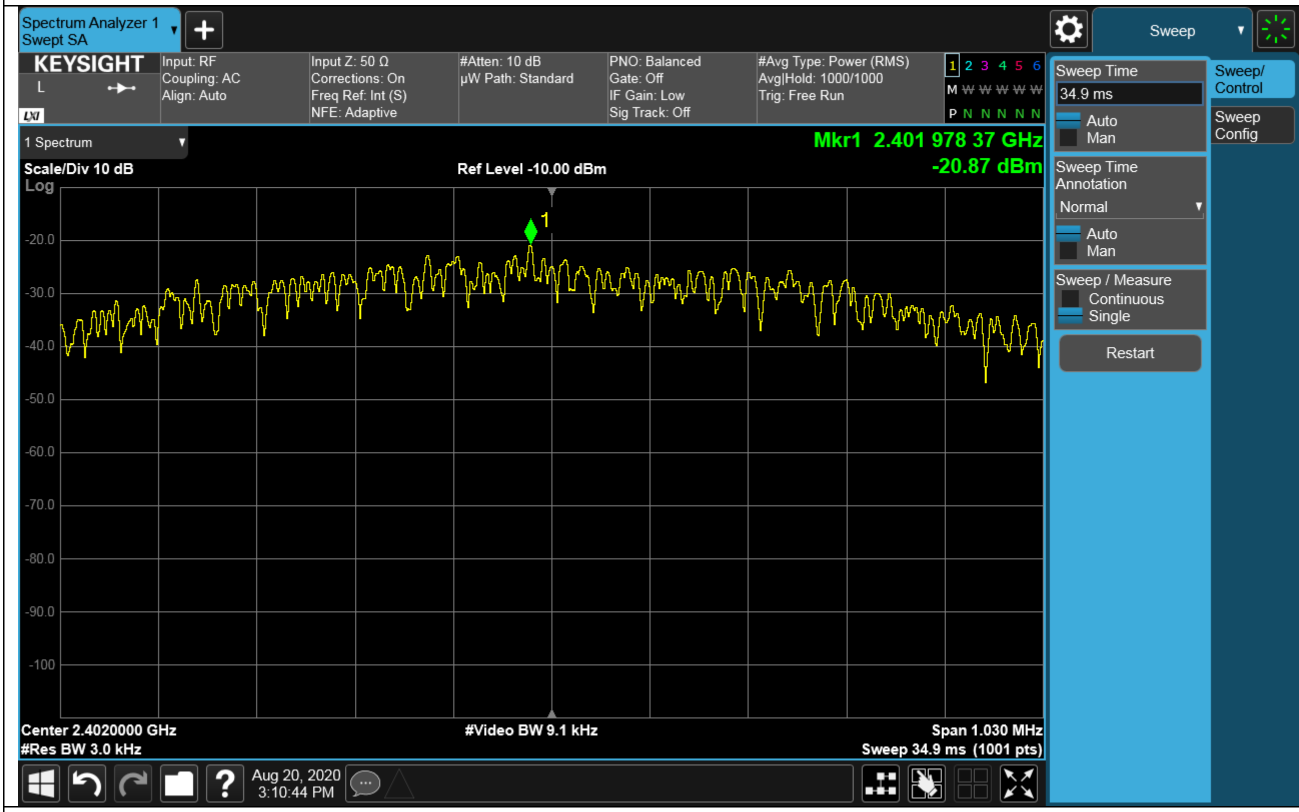
The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

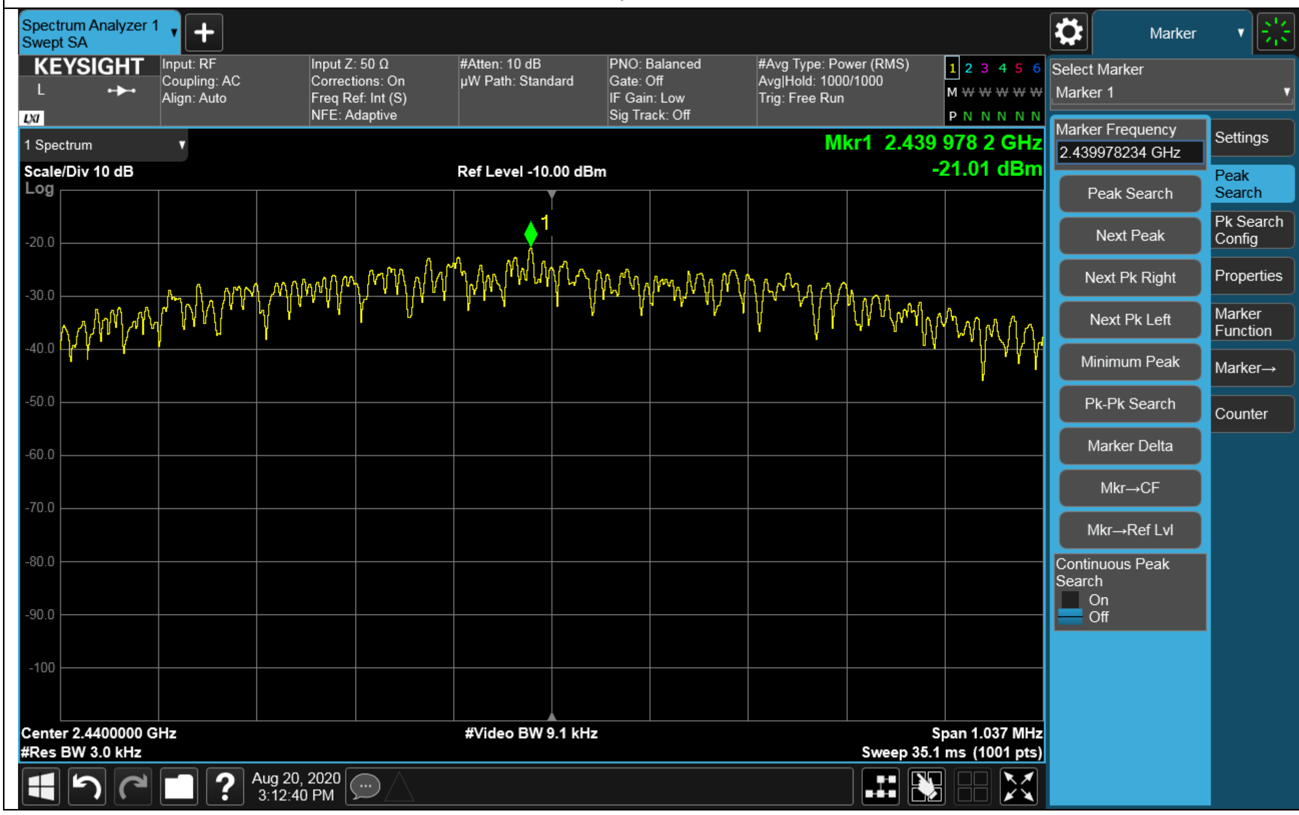
▣ Test Result

Test Mode	Frequency(MHz)	PSD Result (dBm/3 kHz)	Limit(dBm/3 kHz)
BLE 1 M Bit/s 37 Byte	2 402	-20.87	8
	2 440	-21.01	
	2 480	-20.83	

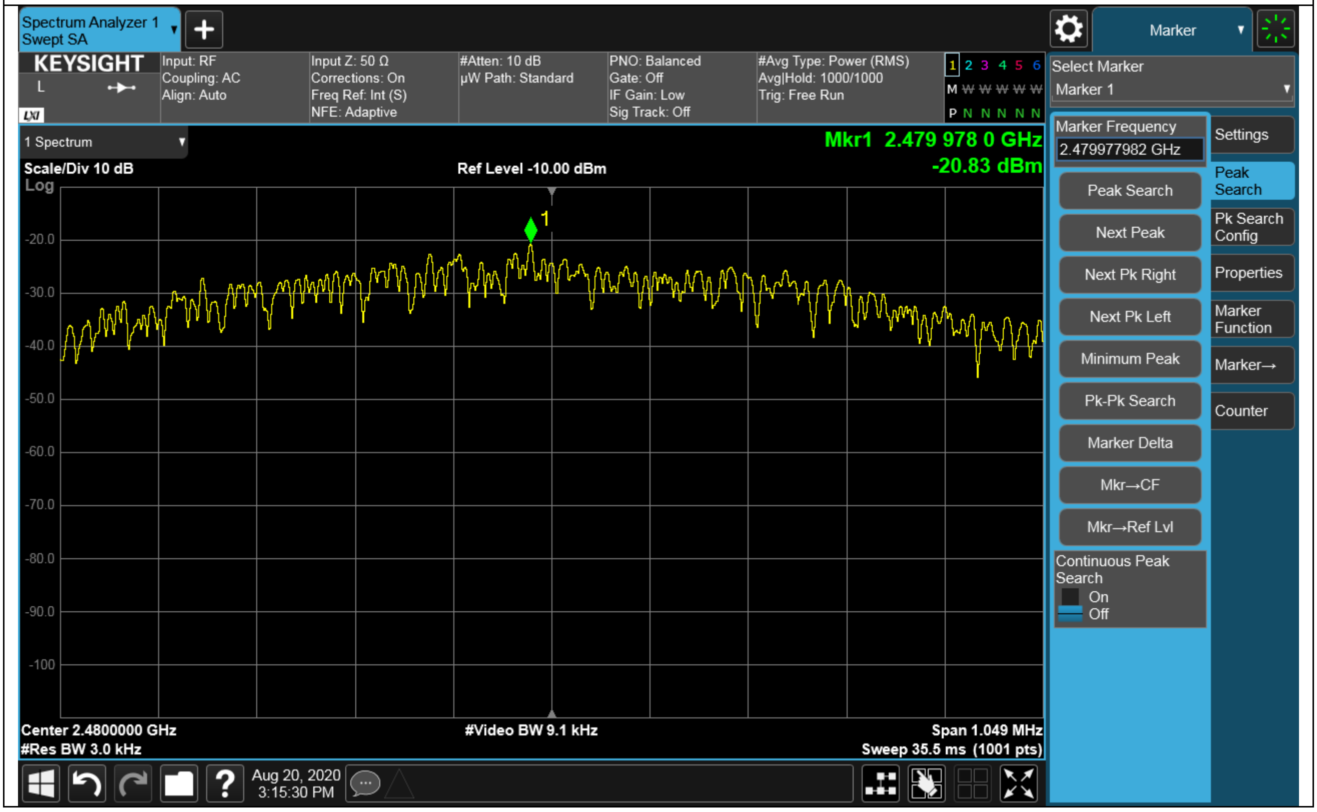
1M Bit/s(37 Byte) / CH 0(Low)



1M Bit/s(37 Byte) / CH 19(Middle)

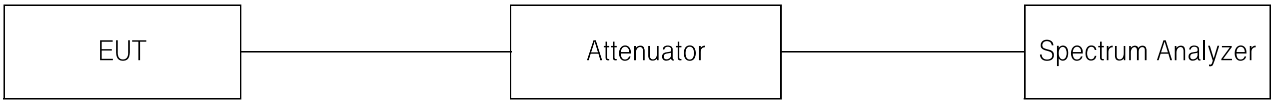


1M Bit/s(37 Byte) / CH 39(High)



3.3. 6 dB Bandwidth

▣ Test Setup



▣ Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

▣ Test procedure

ANSI C63.10 2013 Section 11.8 DTS bandwidth 11.8.1 Option1

11.8.1 Option 1

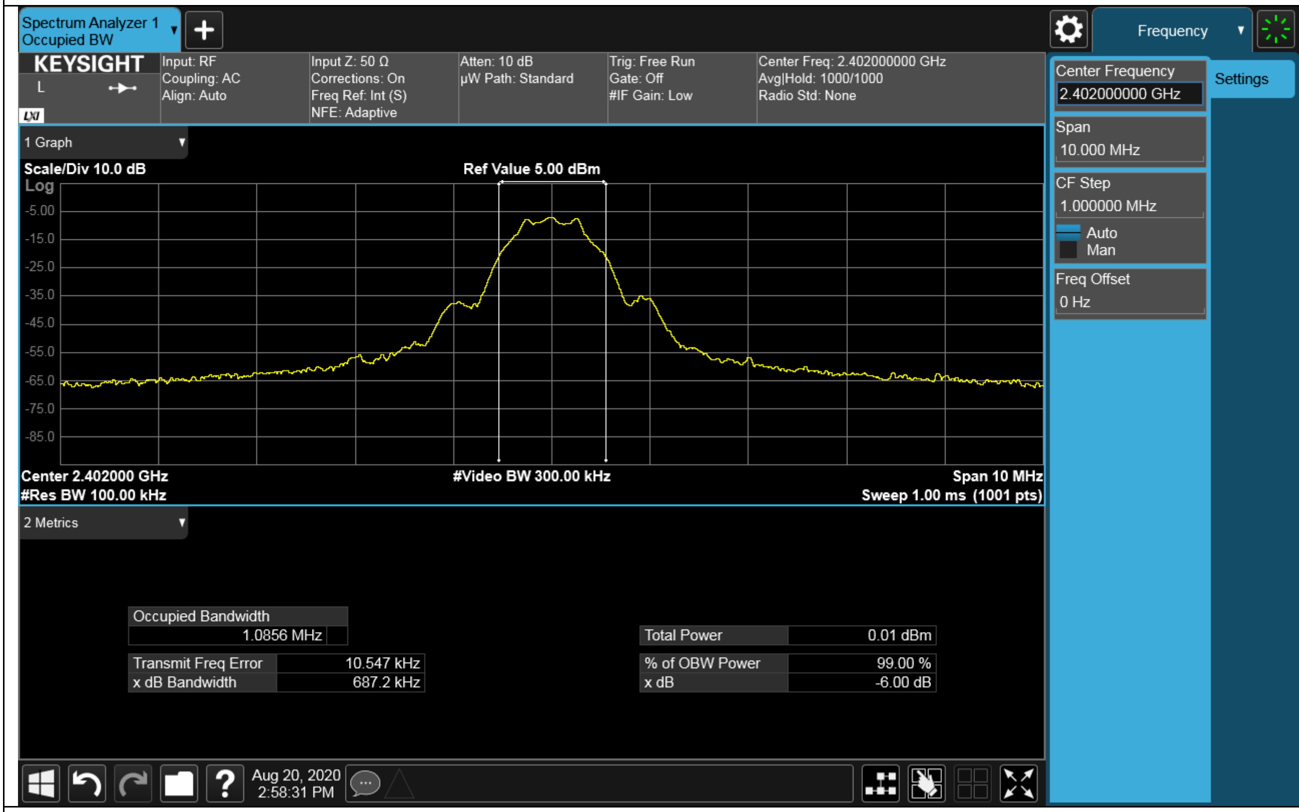
The steps for the first option are as follows:

a) Set RBW = 100 kHz.
b) Set the VBW ≥ [3 × RBW].
c) Detector = peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

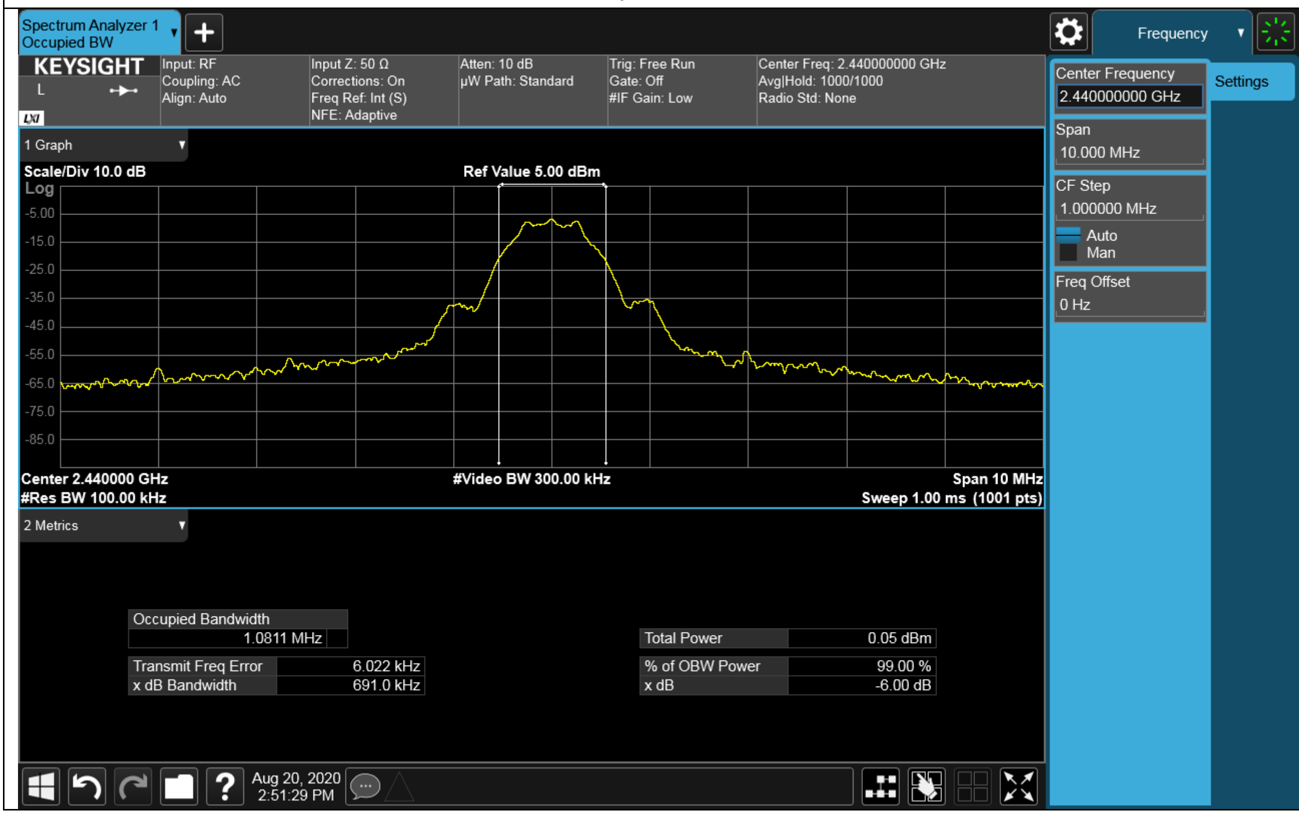
▣ Test Result

Test Mode	Frequency(MHz)	6 dB Bandwidth Result (MHz)	Limit(MHz)
BLE 1 M Bit/s 37 Byte	2 402	0.687	≥ 0.5
	2 440	0.691	
	2 480	0.699	

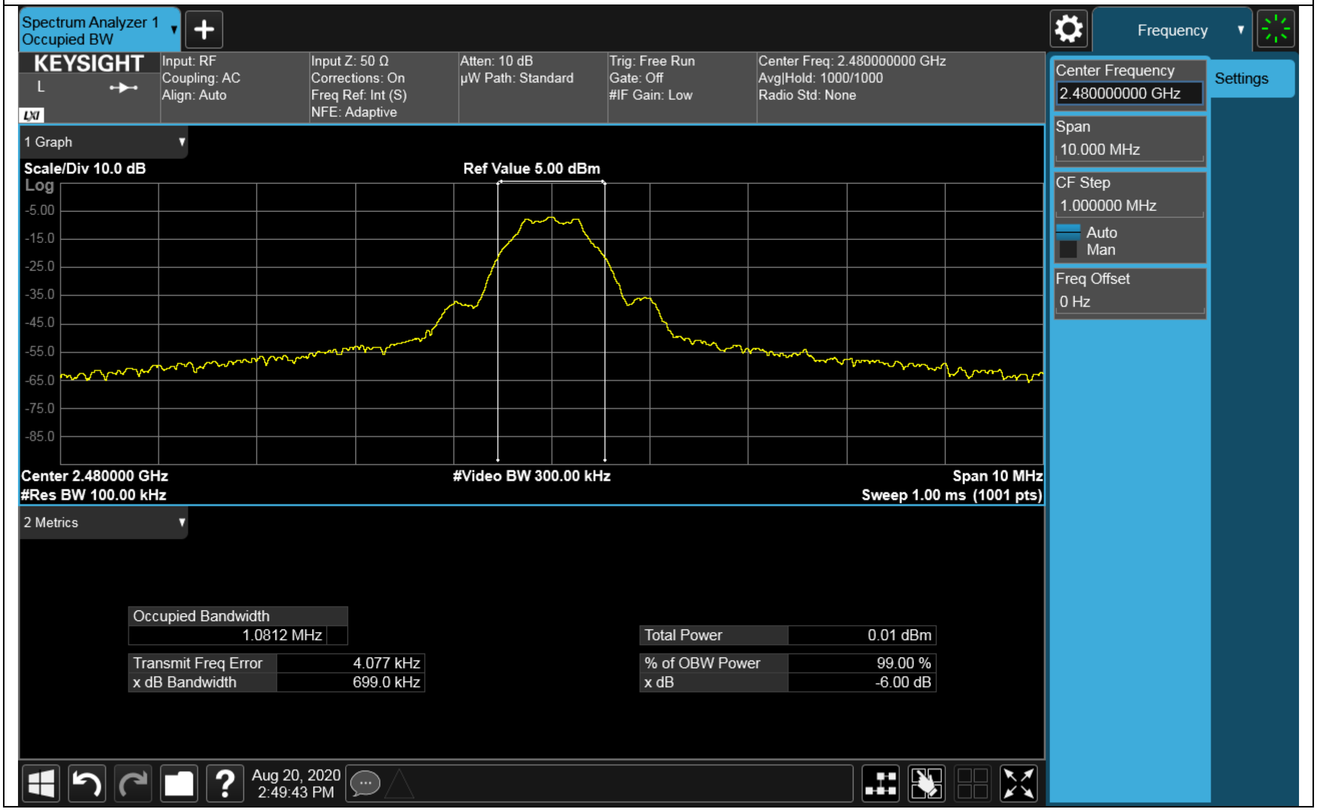
1M Bit/s(37 Byte) / CH 0(Low)



1M Bit/s(37 Byte) / CH 19(Middle)



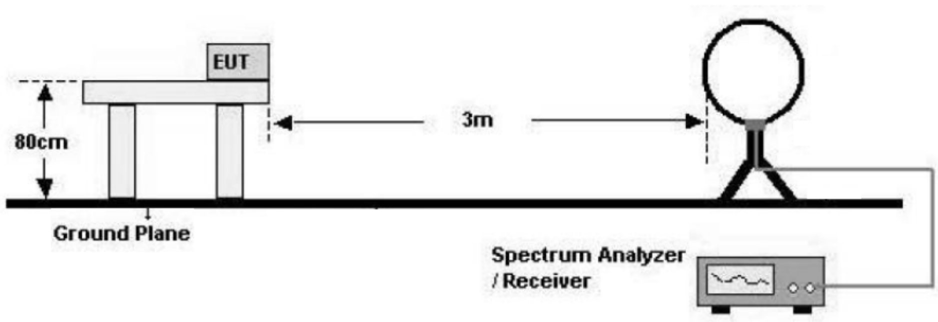
1M Bit/s(37 Byte) / CH 39(High)



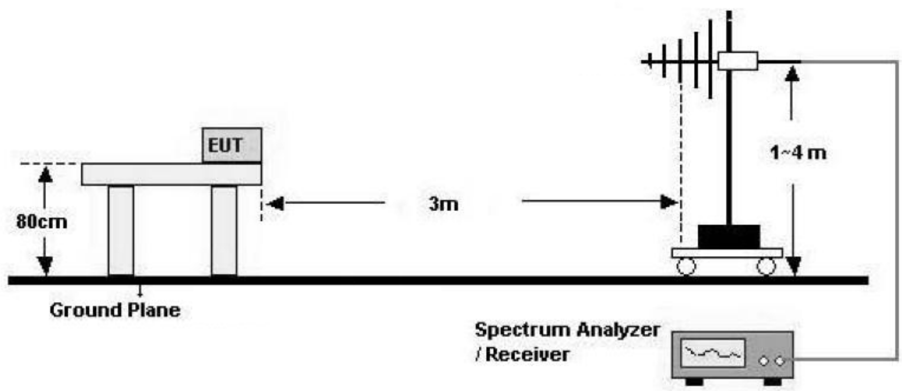
3.4. Radiated Spurious Emission, Band Edge and Restricted Bands

▣ Test Setup

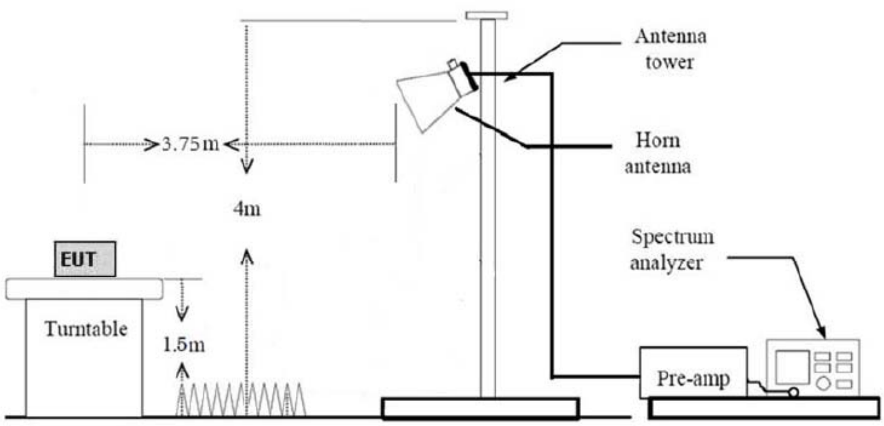
The diagram below shows the test setup that is utilized to make the measurement for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurement for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurement for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz Emissions, whichever is lower



▣ Limit

According to § 15.209(a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Radiated (μV/m)	Distance (m)
0.009 – 0.490	2400 / F(kHz)	300
0.490 – 1.705	24000 / F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 – 216	150**	3
216 – 960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 MHz – 72 MHz, 76 MHz – 88 MHz, 174 MHz – 216 MHz or 470 MHz – 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections § 15.231 and § 15.241.

According to § 15.205(a), Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 –16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.694 75 – 16.695 25	608 – 614	5.35 – 5.46
2.1735 – 2.190 5	16.804 25 – 16.804 75	960 – 1 240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1 427	8.025 – 8.5
4.177 25 – 4.177 75	37.5 – 38.25	1 435 – 1 626.5	9.0 – 9.2
4.207 25 – 4.207 75	73 – 74.6	1 645.5 – 1 646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1 660 – 1 710	10.6 – 12.7
6.267 75 – 6.268 25	108 – 121.94	1 718.8 – 1 722.2	13.25 – 13.4
6.311 75 – 6.312 25	123 – 138	2 200 – 2 300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2 310 – 2 390	15.35 – 16.2
8.362 – 8.366	156.524 75 – 156.525 25	2 483.5 – 2 500	17.7 – 21.4
8.376 25 – 8.386 75	156.7 – 156.9	2 690 – 2 900	22.01 – 23.12
8.414 25 – 8.414 75	162.012 5 – 167.17	3 260 – 3 267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3 332 – 3 339	31.2 – 31.8
12.519 75 – 12.520 25	240 – 285	3 345.8 – 3 358	36.43 – 36.5
12.576 75 – 12.577 25	322 –335.4	3 600 – 4 400	Above 38.6
13.36 – 13.41			

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▣ Test procedure
ANSI C63.10 2013

■ Test procedure for radiated emission below 30 MHz
1. The EUT is placed on a non-conductive table 0.8 m above the ground at a 3 m semi-anechoic chamber.
   The table rotated 360 degrees to determine the position of the highest emission level.
2. The loop Antenna was placed at a location 3 m from the EUT and fixed at 1 m above the ground to determine the maximum value of the field strength.
3. The measurement performed X, Y, Z planes in EUT and horizontal, vertical polarization in the antenna.
4. The spectrum analyser or receiver was set to Peak or Quasi-peak function and specified bandwidth maximum hold mode.

■ Test procedure for radiated emission Above 30 MHz
1. The EUT is placed on a non-conductive table 0.8 m above the ground at a 3 m semi-anechoic chamber for below 1 GHz and table 1.5 m above the ground at a 3 m semi-anechoic chamber for 1 GHz.
   The table rotated 360 degrees to determine the position of the highest emission level.
2. During performing radiated emission below 1 GHz, the EUT was set 3 m distance from the interference receiving antenna, which was mounted on the top of variable-height antenna tower.
   For radiated emission above 1 GHz, the EUT was set 3.75 m distance from the interference receiving Antenna
3. The tower height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength.
4. The Bi-log antenna is used for measuring emission below 1 GHz. The Horn antenna is used for measuring emission above 1 GHz
5. The measurement performed X, Y, Z axes in EUT and horizontal, vertical polarization in the antenna.
6. The spectrum analyser or receiver was set to Peak or Quasi-peak function and specified bandwidth maximum hold mode for below 1 GHz.
7. The spectrum analyser or receiver was set to Peak and Average function and specified bandwidth maximum hold mode for above 1 GHz.

■ Emissions in Non-Restricted Frequency Bands
ANSI C63.10 2013 Section 11.11.2 & Section 11.11.2

- Reference Level Measurement
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.
Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

– Level Measurement
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz
c) Set the VBW ≥ [3 × RBW].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

■ Emissions in Restricted Frequency Bands
ANSI C63.10 2013 Section 11.12.2.4 & Section 11.12.2.5

– Peak Emission Measurement
a) RBW = as specified in below table
b) VBW ≥ [3 × RBW].
c) Detector = peak.
d) Sweep time = auto.
e) Trace mode = max hold.

Frequency	RBW
9 kHz to 150 kHz	200 Hz to 300 Hz
0.15 kHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1 000 MHz	100 kHz to 120 kHz
> 1 000 MHz	1 MHz

Table. RBW as a function of frequency

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

– Average Emission Measurement

1. Trace averaging with continuous EUT transmission at full power

If the EUT can be configured or modified to transmit continuously (D ≥ 98%), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):
a) RBW = 1 MHz (unless otherwise specified).
b) VBW ≥ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms):
  1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
  2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces.

2. Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), then the following procedure shall be used:
a) The EUT shall be configured to operate at the maximum achievable duty cycle.
b) Measure the duty cycle D of the transmitter output signal as described in 11.6.
c) RBW = 1 MHz (unless otherwise specified).
d) VBW ≥ [3 × RBW].
e) Detector = RMS (power averaging), if span / (# of points in sweep) ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
f) Averaging type = power (i.e., rms):
  1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
  2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
g) Sweep time = auto.
h) Perform a trace average of at least 100 traces.
i) A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
  1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
  2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
  3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF

Note :
1. Frequency < 30 MHz, extrapolation factor of 40 dB/decade of distance $F_d = 40\log(D_m/D_s)$
  * 0.009 MHz – 0.490 MHz : 40log(3 m/300 m) = −80 dB, 0.490 MHz – 30 MHz : 40log(3 m/30 m) = −40 dB
2. Frequency > 30 MHz, extrapolation factor of 20 dB/decade of distance $F_d = 20\log(D_m/D_s)$
  * Above 1 GHz : 20log(3.75 m/3 m) = 1.94 dB
  * F_d = Distance Factor, D_m = Measurement Distance(m), D_s = Specification Distance(m)
3. The worst case axis : X-Axis

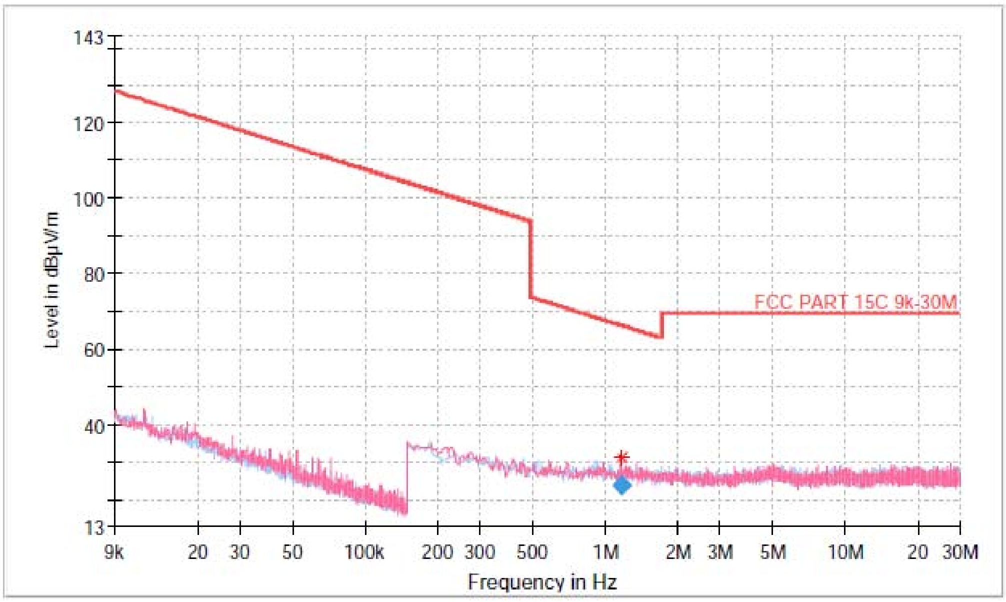
▣ Test Result (Below 30 MHz)

Radiated emissions			Ant.	Correction factors					Total	Limit	
Frequency	Reading	Detect	Pol.	AF	CL	Amp	F_d	DF	Final Result	Limit	Margin
MHz	dBμV	Quasi Peak	H/V	dB/m	dB	dB	dB	dB	dBμV/m	dBμV/m	dB
9 kHz ~ 30 MHz : No spurious emissions were detected within 20 dB of the limit.											

Note :

1. Reported spurious emissions are in Low Channel as worst case among the other channels.
2. According to § 15.31(o), emissions level are not reported much lower than the limit by over 20 dB

1M Bit/s(37 Byte) / CH 0(Low)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1.178945	23.74	66.17	42.43	1000.0	9.000	100.0	V	217.0	19.3

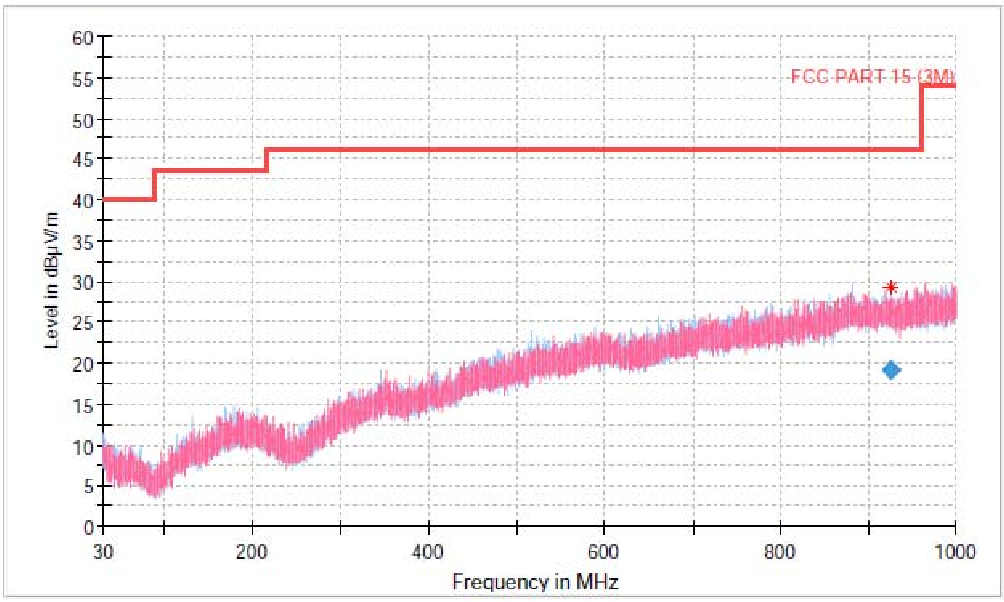
▣ Test Result (Below 1 GHz)

Radiated emissions			Ant.	Correction factors					Total	Limit	
Frequency	Reading	Detect	Pol.	AF	CL	Amp	F_d	DF	Final Result	Limit	Margin
MHz	dBμV	Quasi Peak	H/V	dB/m	dB	dB	dB	dB	dBμV/m	dBμV/m	dB
9 kHz ~ 30 MHz : No spurious emissions were detected within 20 dB of the limit.											

Note :

1. Reported spurious emissions are in Low Channel as worst case among the other channels.
2. According to § 15.31(o), emissions level are not reported much lower than the limit by over 20 dB

1M Bit/s(37 Byte) / CH 0(Low)



Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
925.575500	19.15	46.02	26.87	1000.0	120.000	100.0	H	194.0	28.1

▣ Test Result (Above 1 GHz)

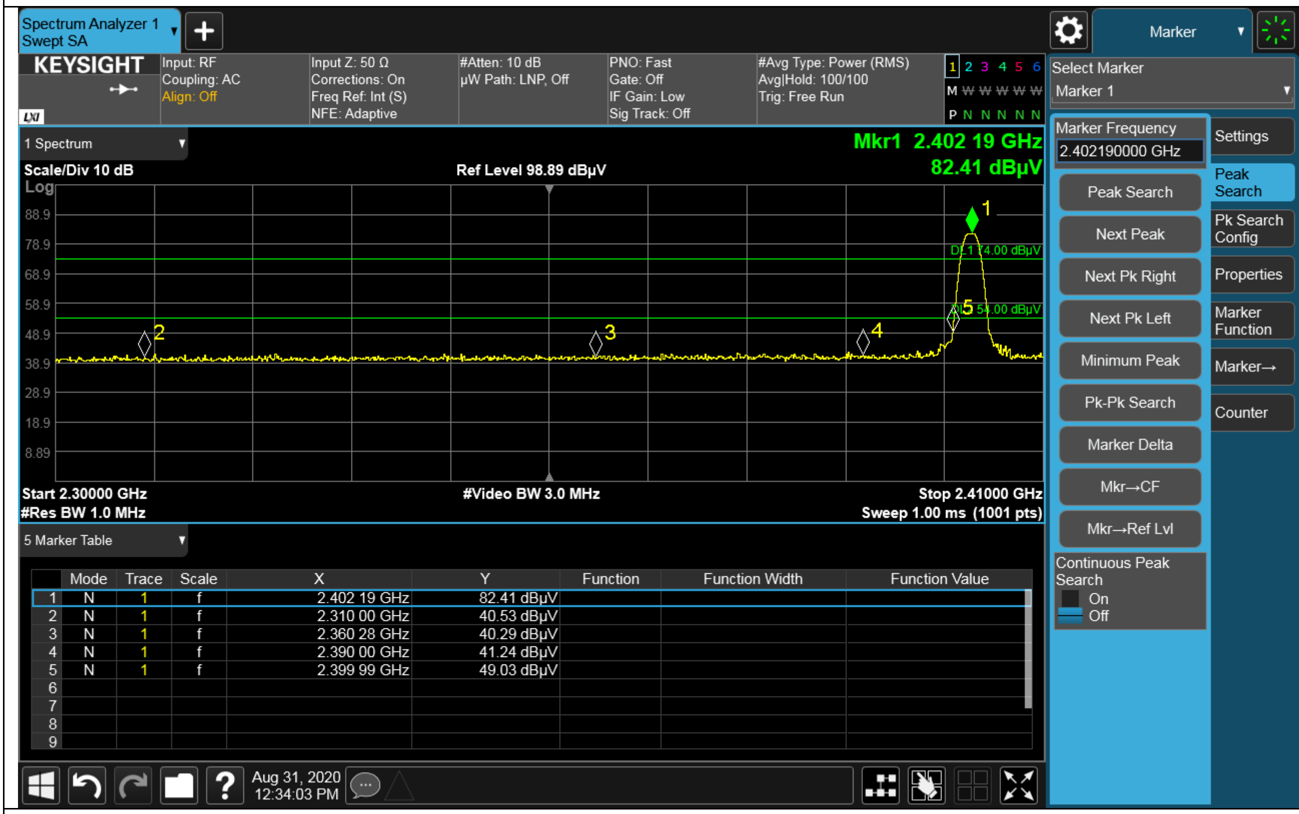
〈1M Bit/s(37 Byte) / CH 0(Low)〉

Radiated emissions			Ant.	Correction factors					Total	Limit	
Frequency	Reading	Detect	Pol.	AF	CL	Amp	F_d	DF	Final Result	Limit	Margin
MHz	dBμV	PK/AV	H/V	dB/m	dB	dB	dB	dB	dBμV/m	dBμV/m	dB
*2 310.00	41.43	PK	H	31.40	8.76	43.00		–	40.53	74.00	33.47
*2 310.00	41.27	PK	V	31.40	8.76	43.00		–	40.37	74.00	33.63
*2 390.00	41.50	PK	H	31.90	8.90	43.00		–	41.24	74.00	32.76
*2 390.00	41.02	PK	V	31.90	8.90	43.00		–	40.76	74.00	33.24
*4 805.00	41.96	PK	H	34.20	13.25	41.20		–	50.15	74.00	23.85
*4 805.00	36.80	PK	V	34.20	13.25	41.20		–	44.99	74.00	29.01
7 212.00	32.86	PK	V	35.70	16.16	40.40		–	46.26	74.00	27.74
14 041.50	29.62	PK	H	39.00	22.86	36.80		–	56.62	74.00	17.38
14 041.50	11.01	AVG	H	39.00	22.86	36.80		1.94	39.95	54.00	14.05
15 129.00	29.70	PK	H	39.80	23.63	35.70	1.94	–	59.37	74.00	14.63
15 129.00	10.57	AVG	H	39.80	23.63	35.70		1.94	42.18	54.00	11.82
*15 535.00	29.81	PK	V	40.00	23.80	34.60		–	60.95	74.00	13.05
*15 535.00	9.85	AVG	V	40.00	23.80	34.60		1.94	42.93	54.00	11.07
*15 926.50	28.43	PK	H	40.80	24.23	34.60		–	60.80	74.00	13.20
*15 926.50	7.28	AVG	H	40.80	24.23	34.60		1.94	41.59	54.00	9.05
16 941.50	28.00	PK	H	41.60	25.08	34.30		–	62.32	74.00	11.68
16 941.50	8.69	AVG	H	41.60	25.08	34.30		1.94	44.95	54.00	9.05
16.956.00	28.55	PK	V	41.60	25.08	34.30		–	62.87	74.00	11.13
16.956.00	7.61	AVG	V	41.60	25.08	34.30		1.94	43.87	54.00	10.13
18 GHz ~ 26.5 GHz : No spurious emissions were detected within 20 dB of the limit.											

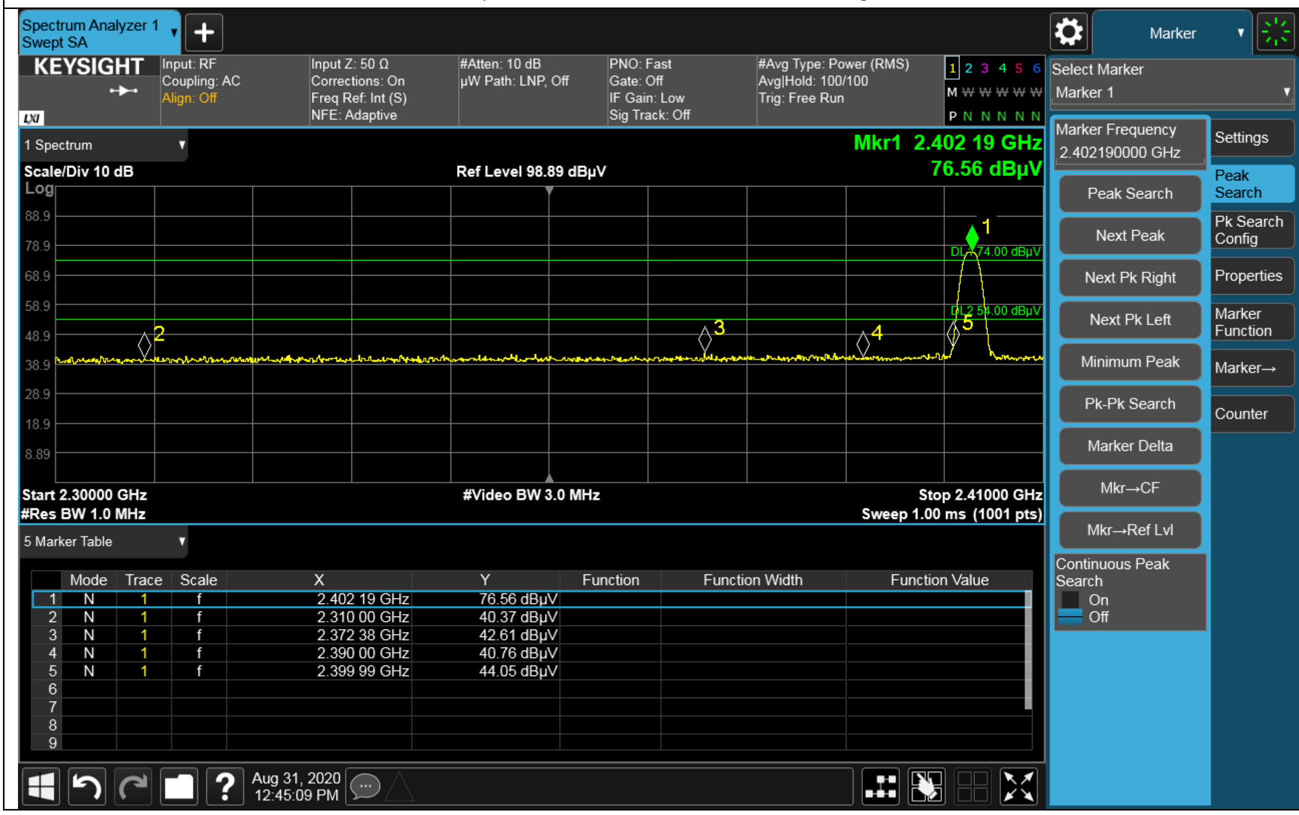
Note :

1. "*" means the restricted band.
2. According to § 15.31(o), emissions level are not reported much lower than the limit by over 20 dB
3. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.
4. Frequency < 30 MHz, extrapolation factor of 40 dB/decade of distance $F_d = 40\log(D_m/D_s)$
   * 0.009 MHz – 0.490 MHz : 40log(3 m/300 m) = –80 dB, 0.490 MHz – 30 MHz : 40log(3 m/30 m) = –40 dB
5. Frequency > 30 MHz, extrapolation factor of 20 dB/decade of distance $F_d = 20\log(D_m/D_s)$
   * Above 1 GHz : 20log(3.75 m/3 m) = 1.94 dB
   * F_d = Distance Factor, D_m = Measurement Distance(m), D_s = Specification Distance(m)
6. Detect : Detector, Pol : Polarization, AF : Antenna Factor, CL : Cable Loss, Amp : Preamp Gain
   DF : Duty Cycle Factor
7. Final Result(dBμV/m) = Reading(dBμV) + AF(dB/m) + CL(dB) – Amp(dB) + F_d(dB) + DF(dB)
8. Test plot data does not contain DF for average detector.
   Test plot data = Reading(dBμV) + AF(dB/m) + CL(dB) – Amp(dB) + F_d(dB)

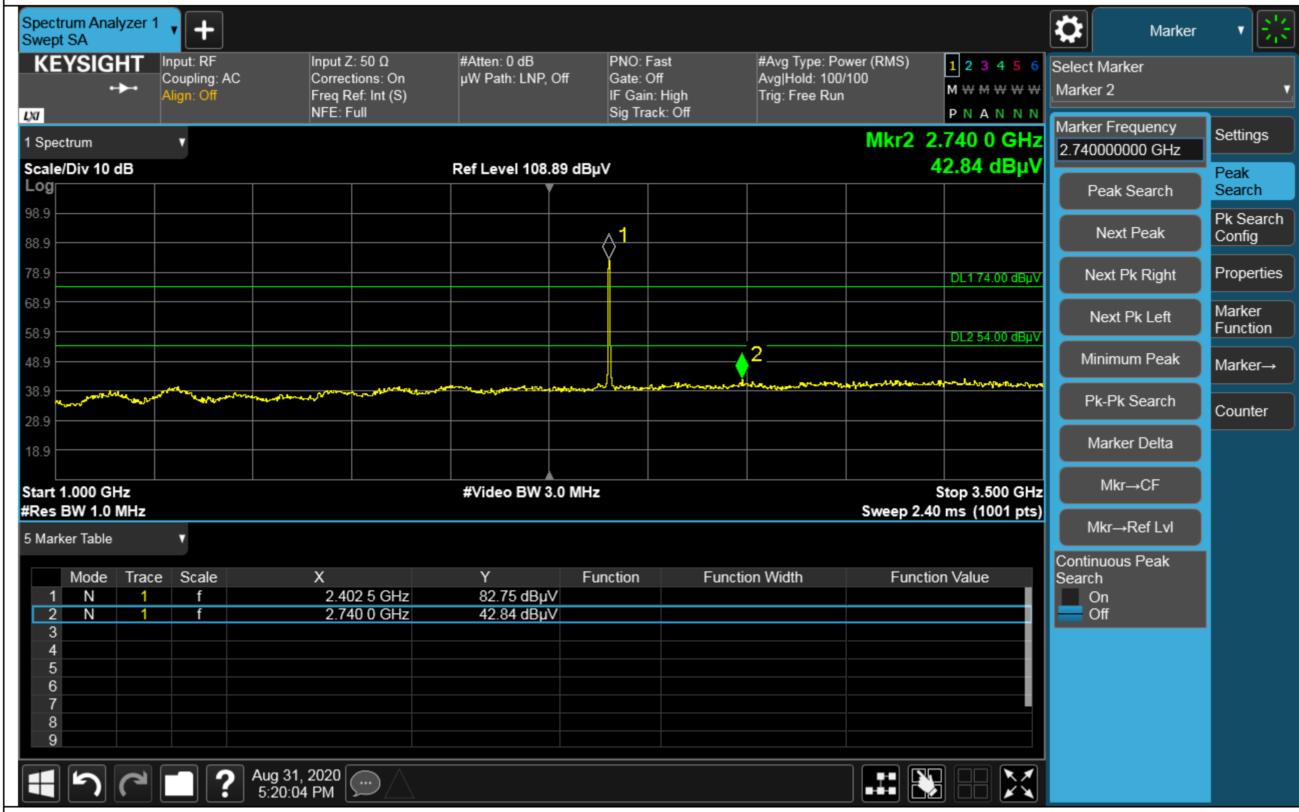
1M Bit/s(37 Byte) / CH 0(Low) / (PK) Band Edge(Horizontal)



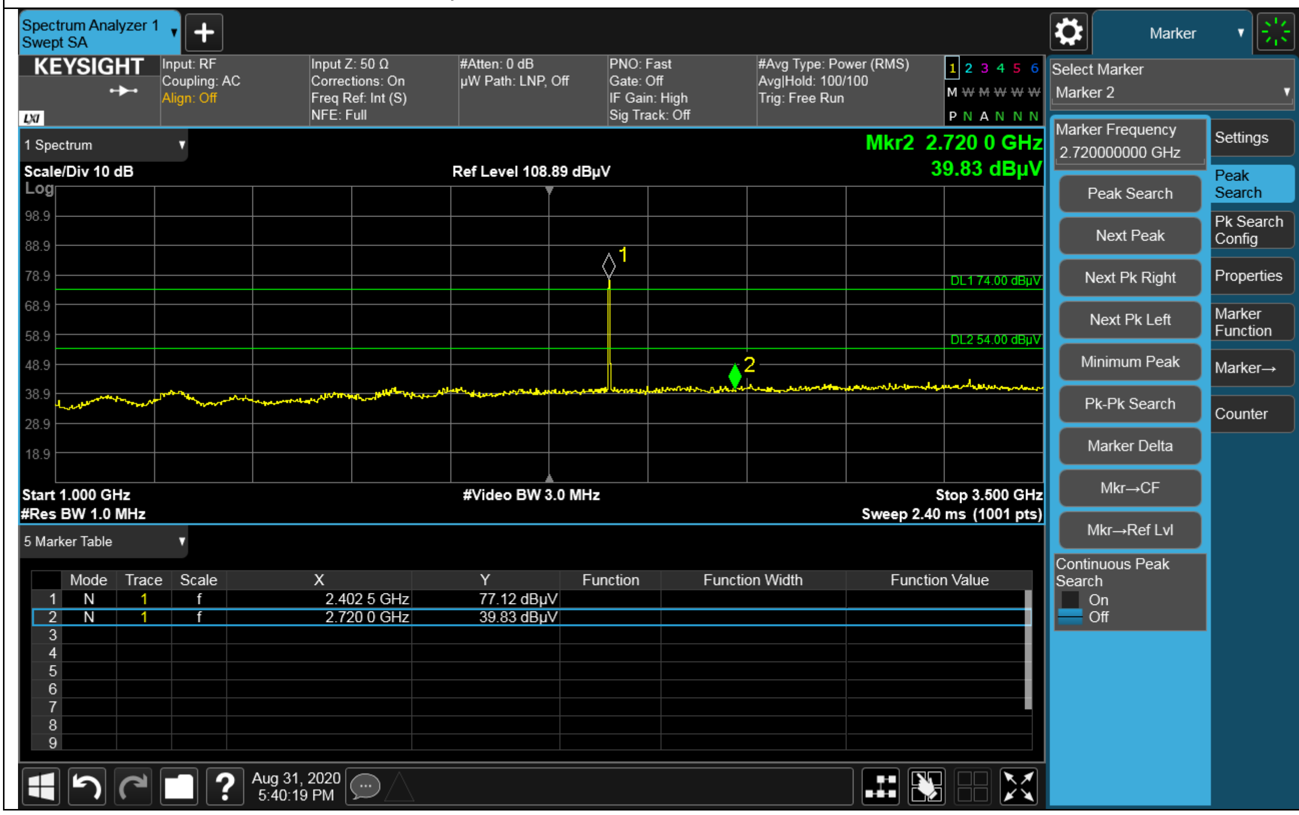
1M Bit/s(37 Byte) / CH 0(Low) / (PK) Band Edge(Vertical)



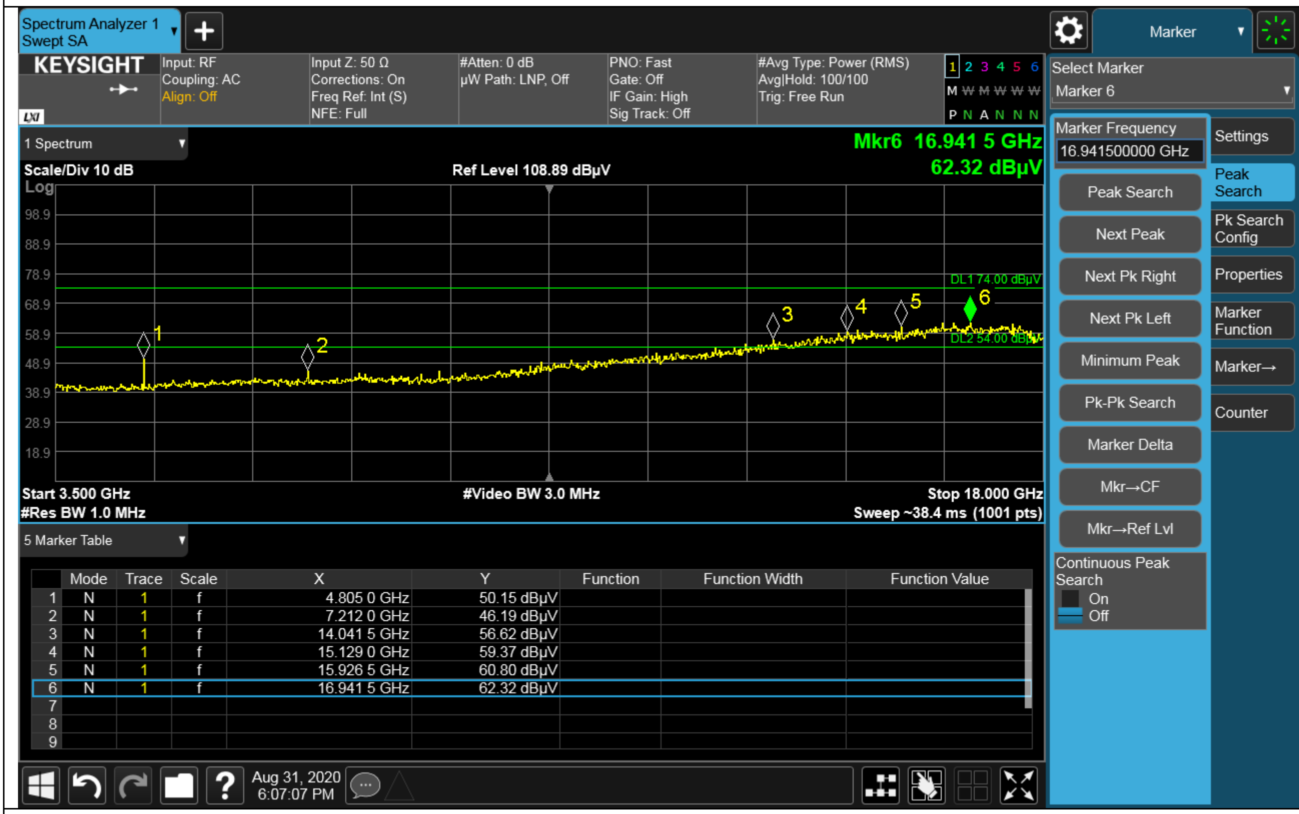
1M Bit/s(37 Byte) / CH 0(Low) / (PK) 1 GHz ~ 3.5 GHz(Horizontal)



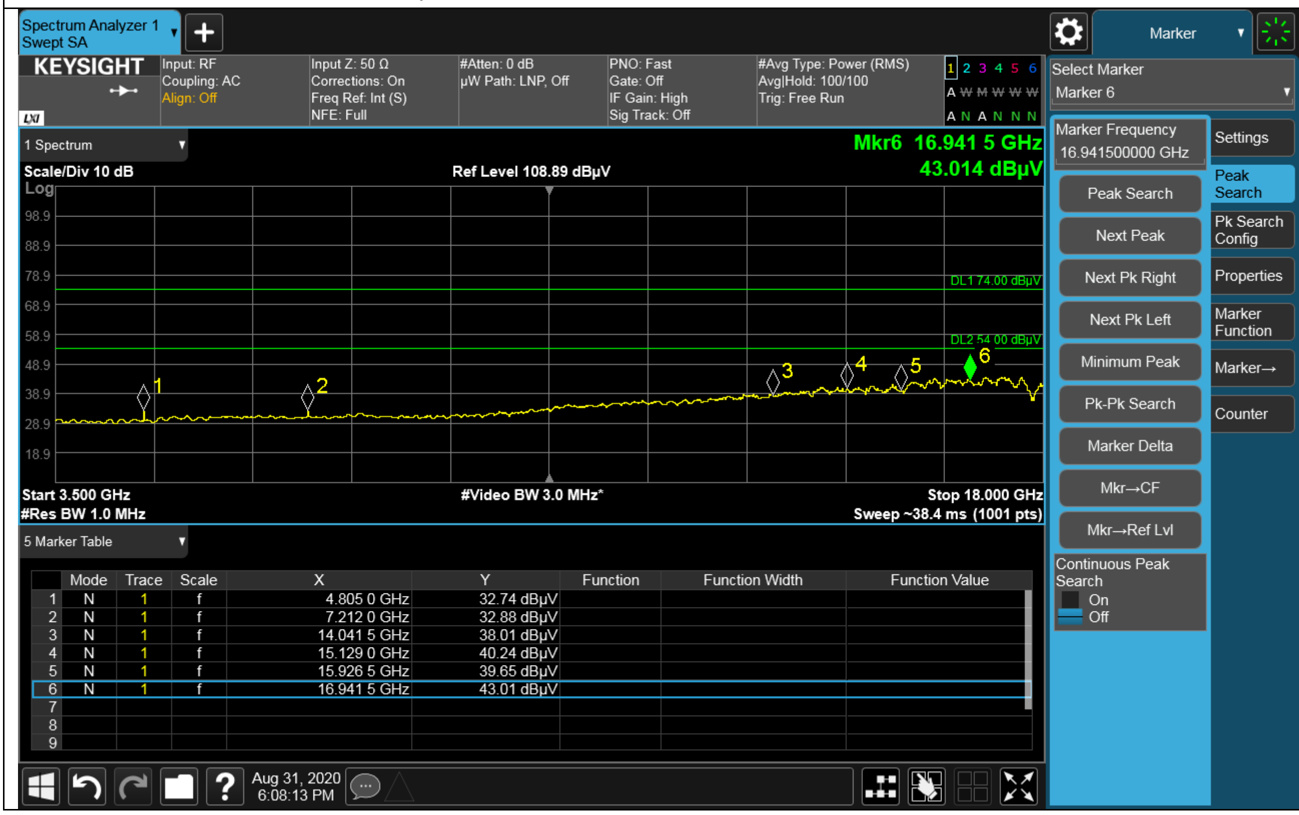
1M Bit/s(37 Byte) / CH 0(Low) / (PK) 1 GHz ~ 3.5 GHz(Vertical)



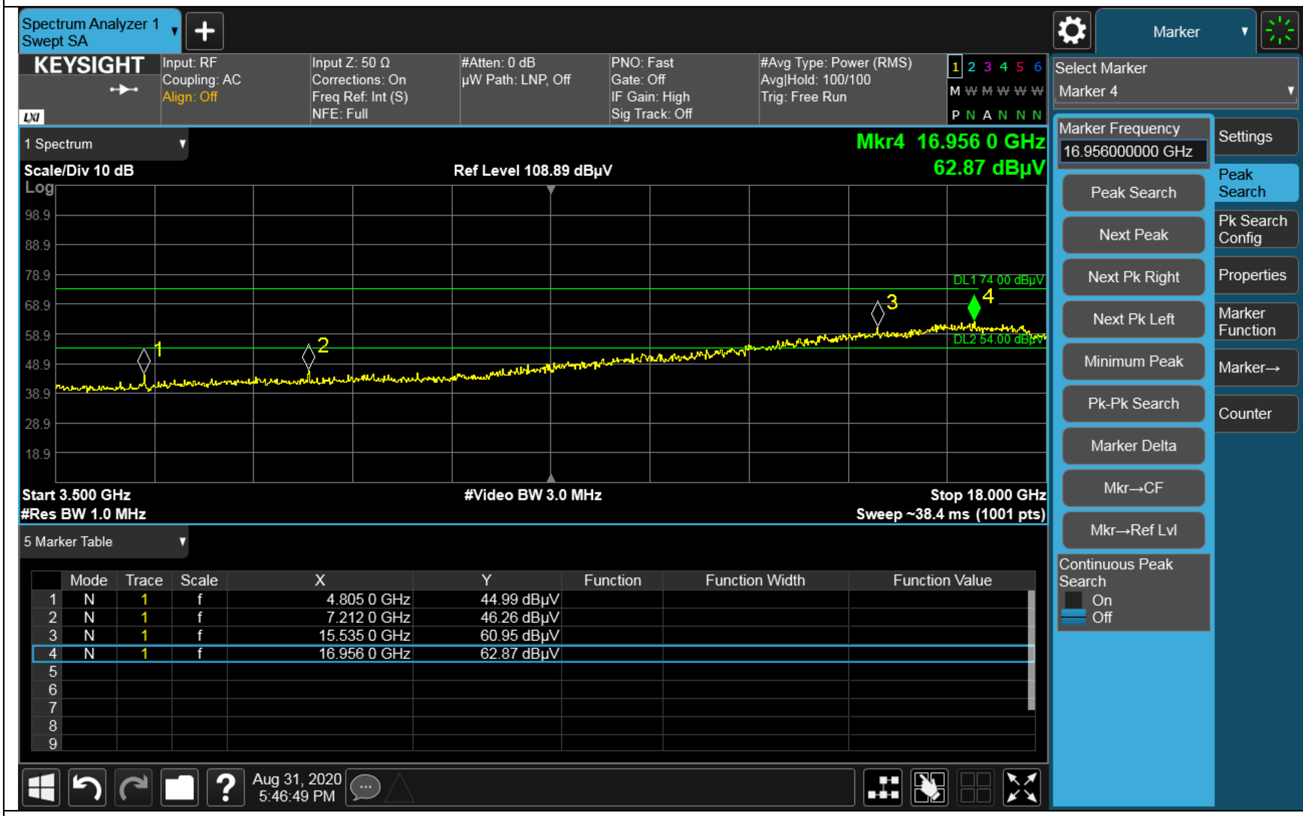
1M Bit/s(37 Byte) / CH 0(Low) / (PK) 3.5 GHz ~ 18 GHz(Horizontal)



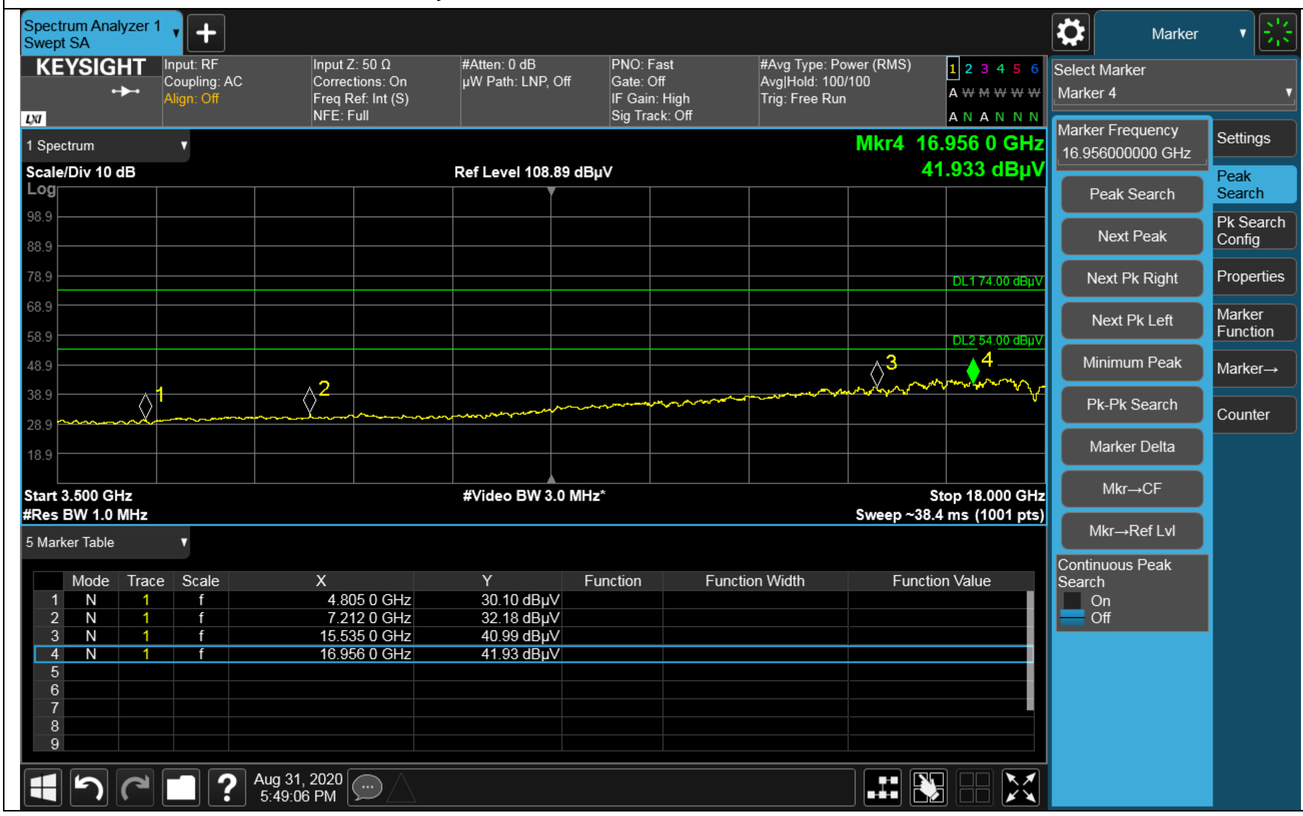
1M Bit/s(37 Byte) / CH 0(Low) / (AVG) 3.5 GHz ~ 18 GHz(Horizontal)



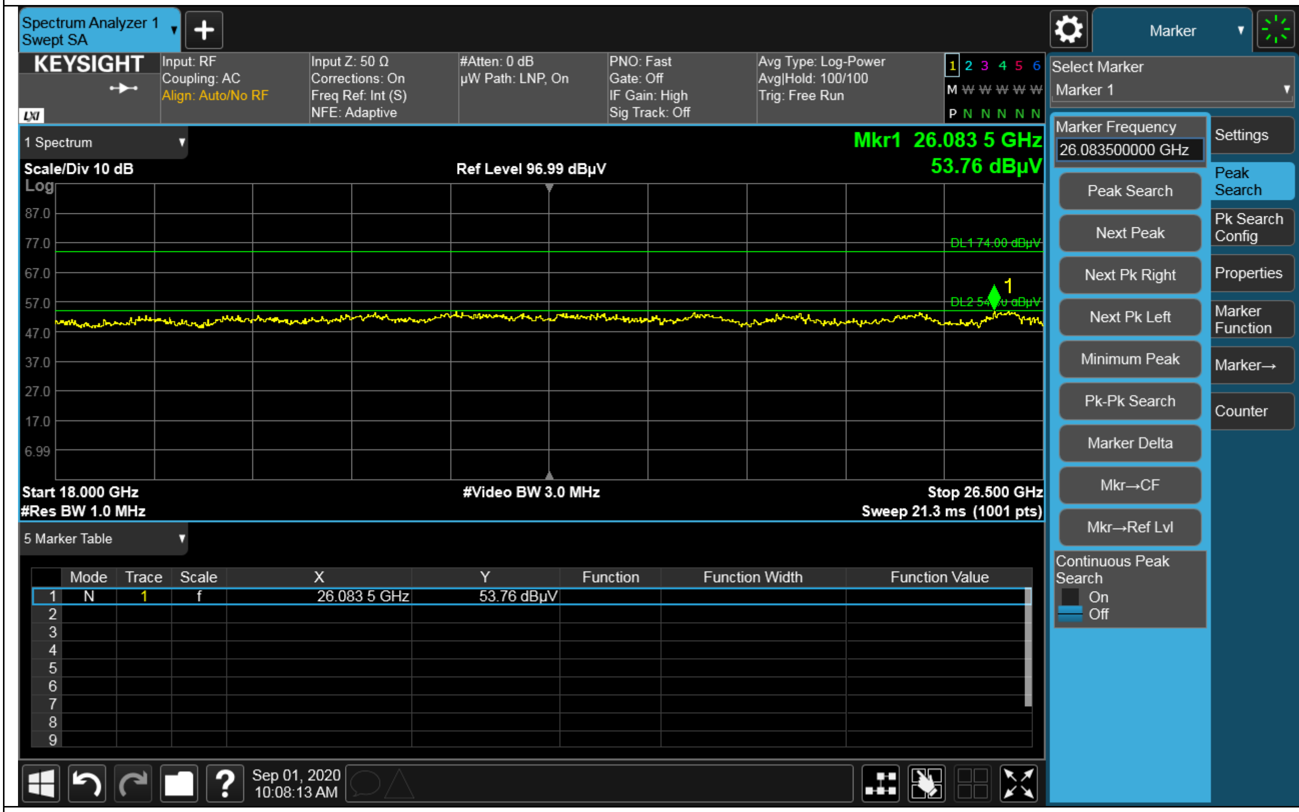
1M Bit/s(37 Byte) / CH 0(Low) / (PK) 3.5 GHz ~ 18 GHz(Vertical)



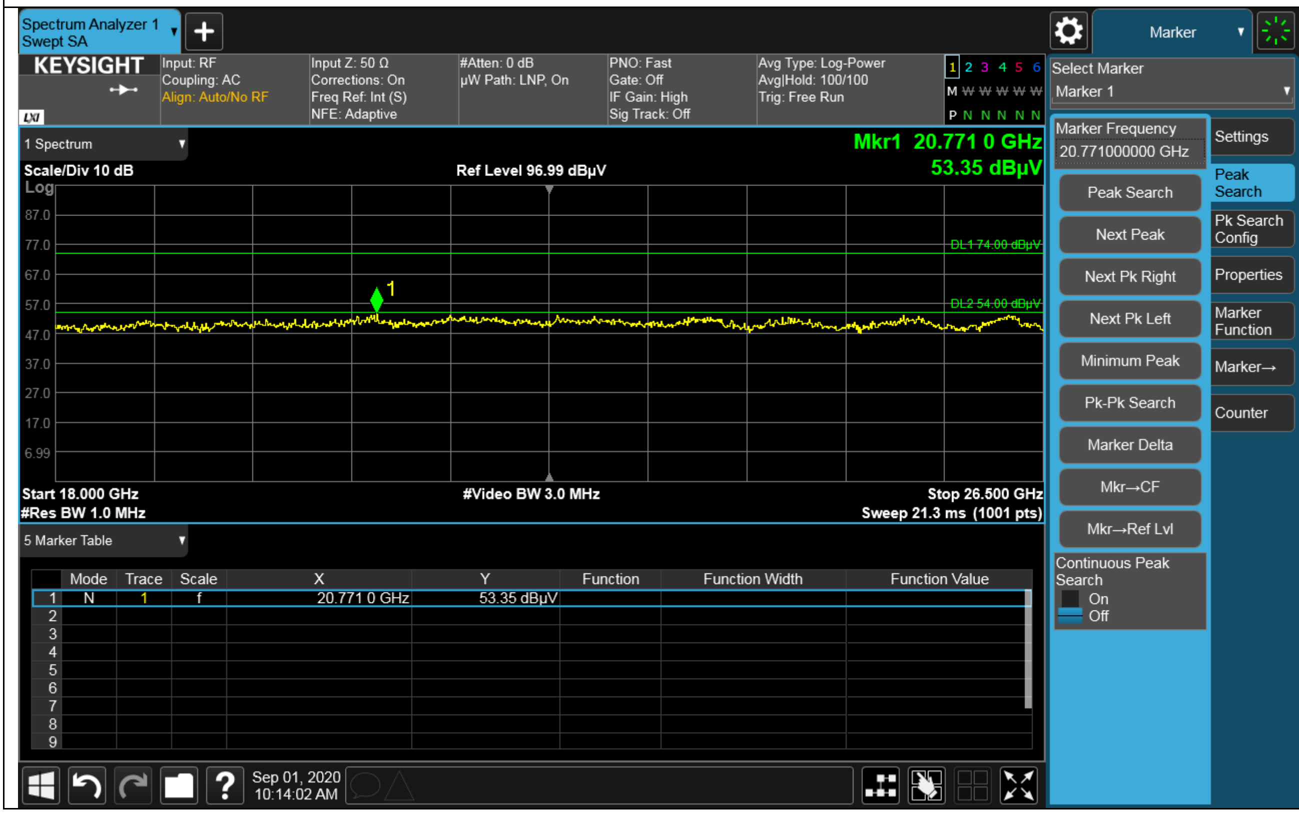
1M Bit/s(37 Byte) / CH 0(Low) / (AVG) 3.5 GHz ~ 18 GHz(Vertical)



1M Bit/s(37 Byte) / CH 0(Low) / (PK) 18 GHz ~ 26.5 GHz(Horizontal)



1M Bit/s(37 Byte) / CH 0(Low) / (PK) 18 GHz ~ 26.5 GHz(Vertical)

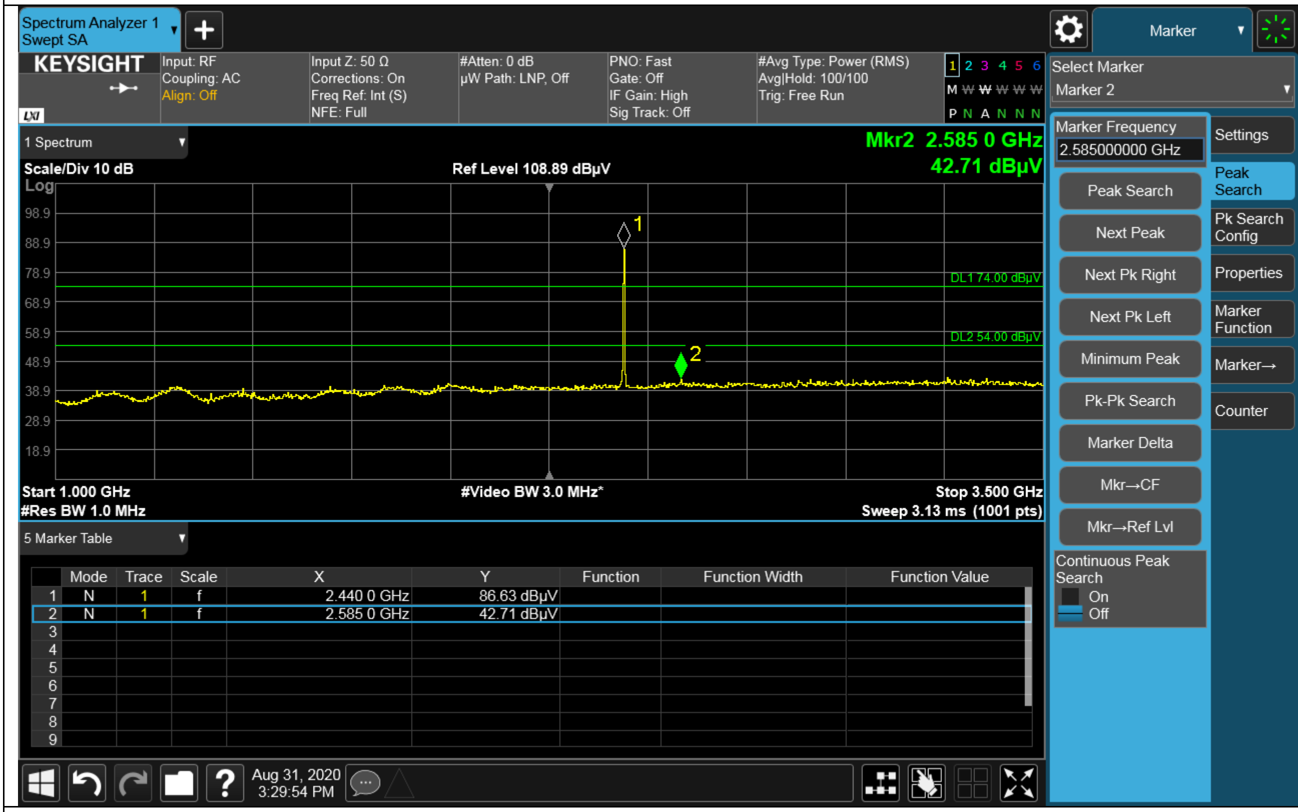


<1M Bit/s(37 Byte) / CH 19(Middle)>

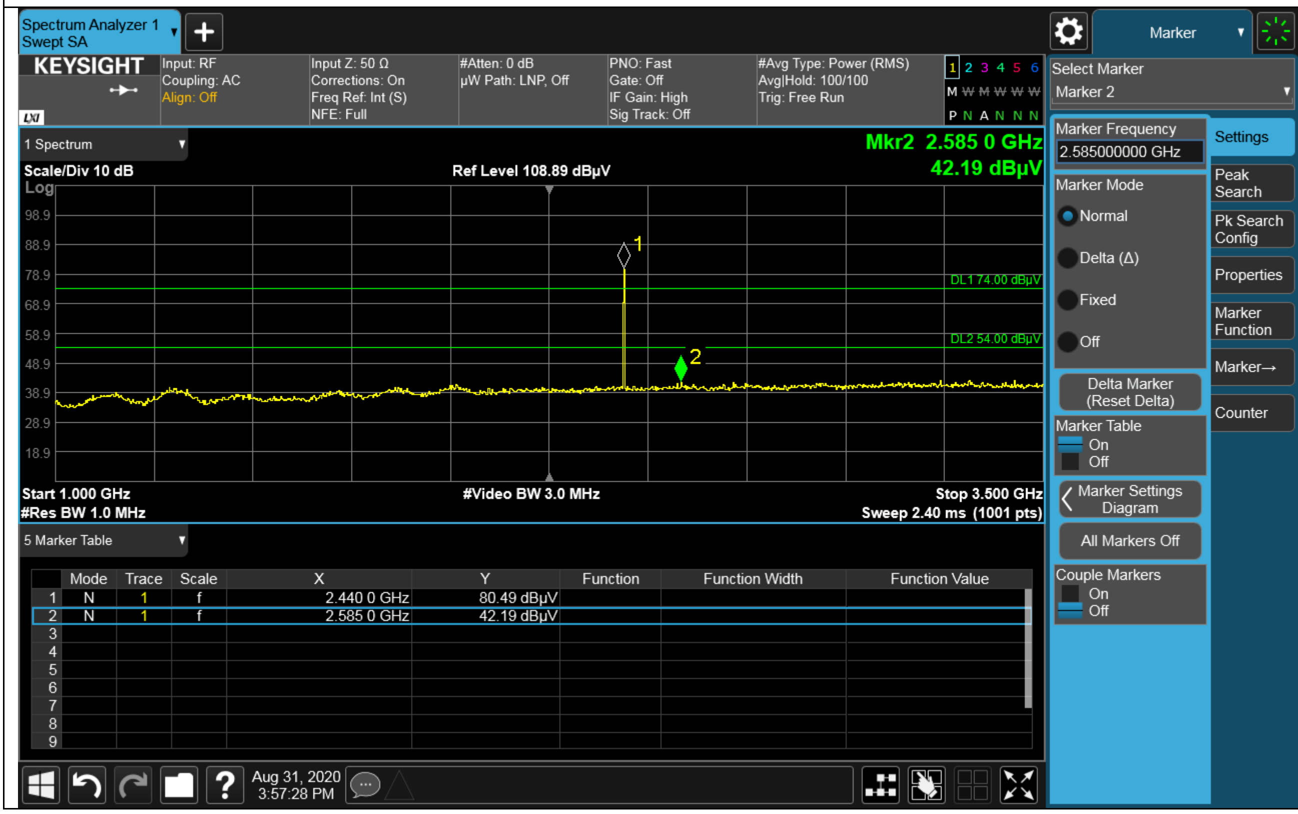
Radiated emissions			Ant.	Correction factors					Total	Limit	
Frequency	Reading	Detect	Pol.	AF	CL	Amp	F_d	DF	Final Result	Limit	Margin
MHz	dBμV	PK/AV	H/V	dB/m	dB	dB	dB	dB	dBμV/m	dBμV/m	dB
*4 877.50	41.03	PK	H	34.20	13.25	41.20	1.94	-	49.22	74.00	24.78
*4 877.50	39.99	PK	V	34.20	13.25	41.20		-	48.18	74.00	25.82
*7 315.50	33.73	PK	H	35.60	16.19	40.40		-	47.06	74.00	26.94
17 318.50	29.91	PK	H	41.00	25.70	35.80		-	62.75	74.00	11.25
17 318.50	9.29	AVG	H	41.00	25.70	35.80		1.94	44.07	54.00	9.93
17 318.50	30.11	PK	V	41.00	25.70	35.80		-	62.95	74.00	11.05
17 318.50	10.18	AVG	V	41.00	25.70	35.80		1.94	44.96	74.00	9.04
18 GHz ~ 26.5 GHz : No spurious emissions were detected within 20 dB of the limit.											

Note :
1. "*" means the restricted band.
2. According to § 15.31(o), emissions level are not reported much lower than the limit by over 20 dB
3. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.
4. Frequency < 30 MHz, extrapolation factor of 40 dB/decade of distance F_d = 40log(D_m/D_s)
   * 0.009 MHz – 0.490 MHz : 40log(3 m/300 m) = -80 dB, 0.490 MHz – 30 MHz : 40log(3 m/30 m) = -40 dB
5. Frequency > 30 MHz, extrapolation factor of 20 dB/decade of distance F_d = 20log(D_m/D_s)
   * Above 1 GHz : 20log(3.75 m/3 m) = 1.94 dB
   * F_d = Distance Factor, D_m = Measurement Distance(m), D_s = Specification Distance(m)
6. Detect : Detector, Pol : Polarization, AF : Antenna Factor, CL : Cable Loss, Amp : Preamp Gain
   DF : Duty Cycle Factor
7. Final Result(dBμV/m) = Reading(dBμV) + AF(dB/m) + CL(dB) - Amp(dB) + F_d(dB) + DF(dB)
8. Test plot data does not contain DF for average detector.
   Test plot data = Reading(dBμV) + AF(dB/m) + CL(dB) - Amp(dB) + F_d(dB)

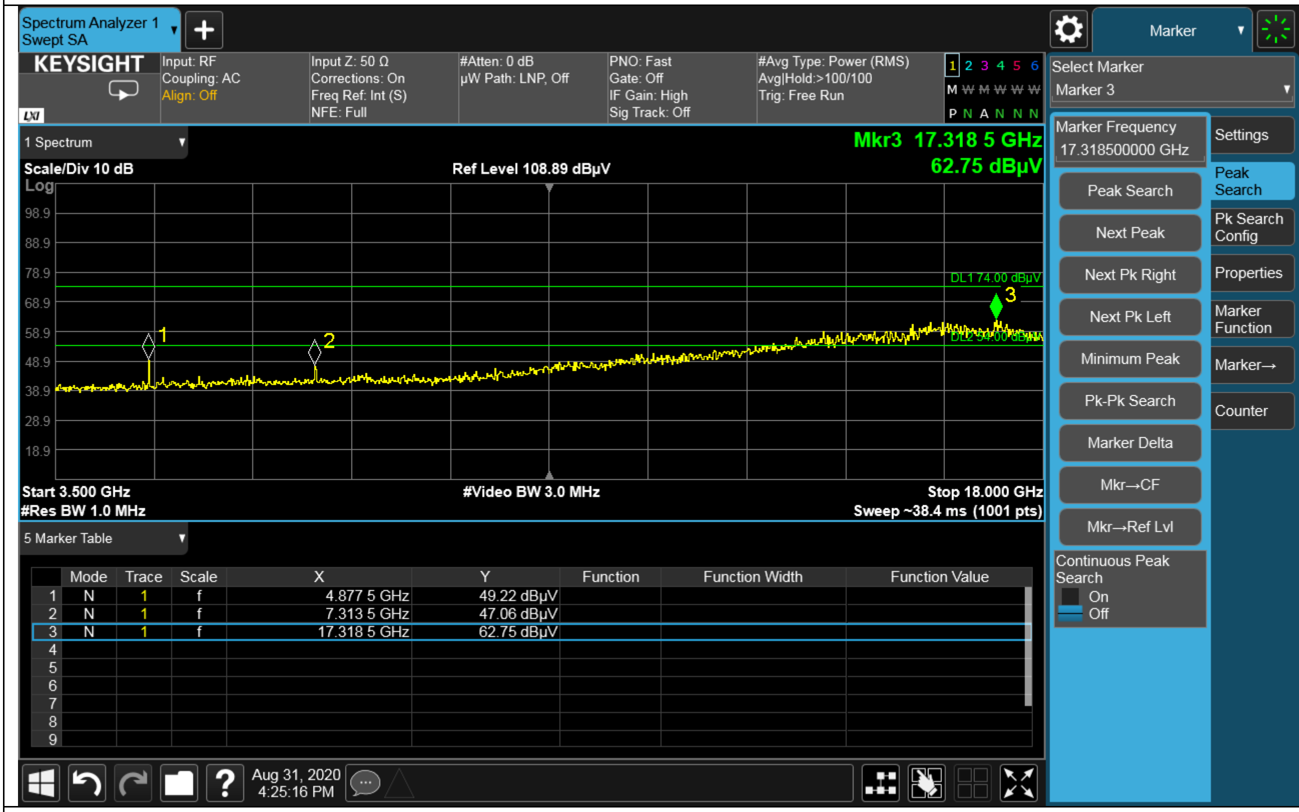
1M Bit/s(37 Byte) / CH 19(Middle) / (PK) 1 GHz ~ 3.5 GHz(Horizontal)



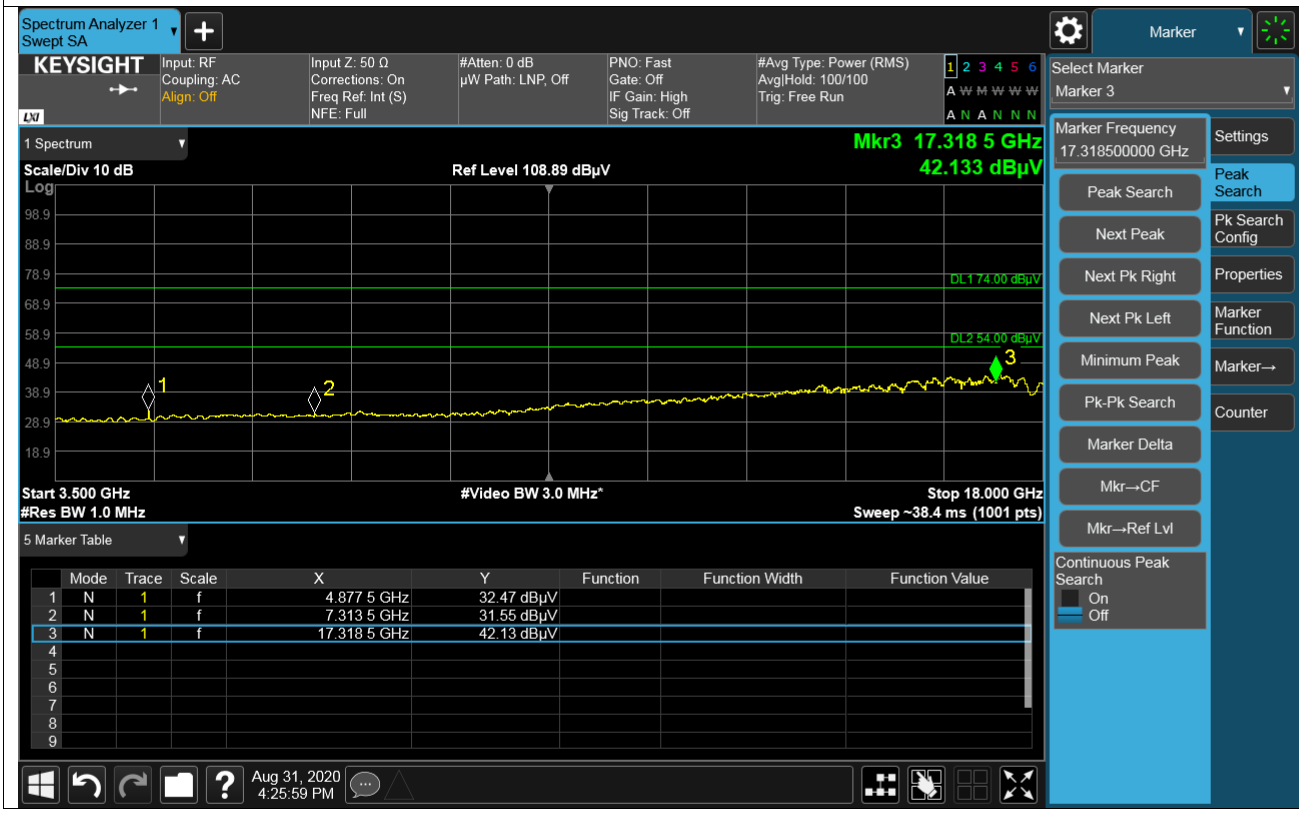
1M Bit/s(37 Byte) / CH 19(Middle) / (PK) 1 GHz ~ 3.5 GHz(Vertical)



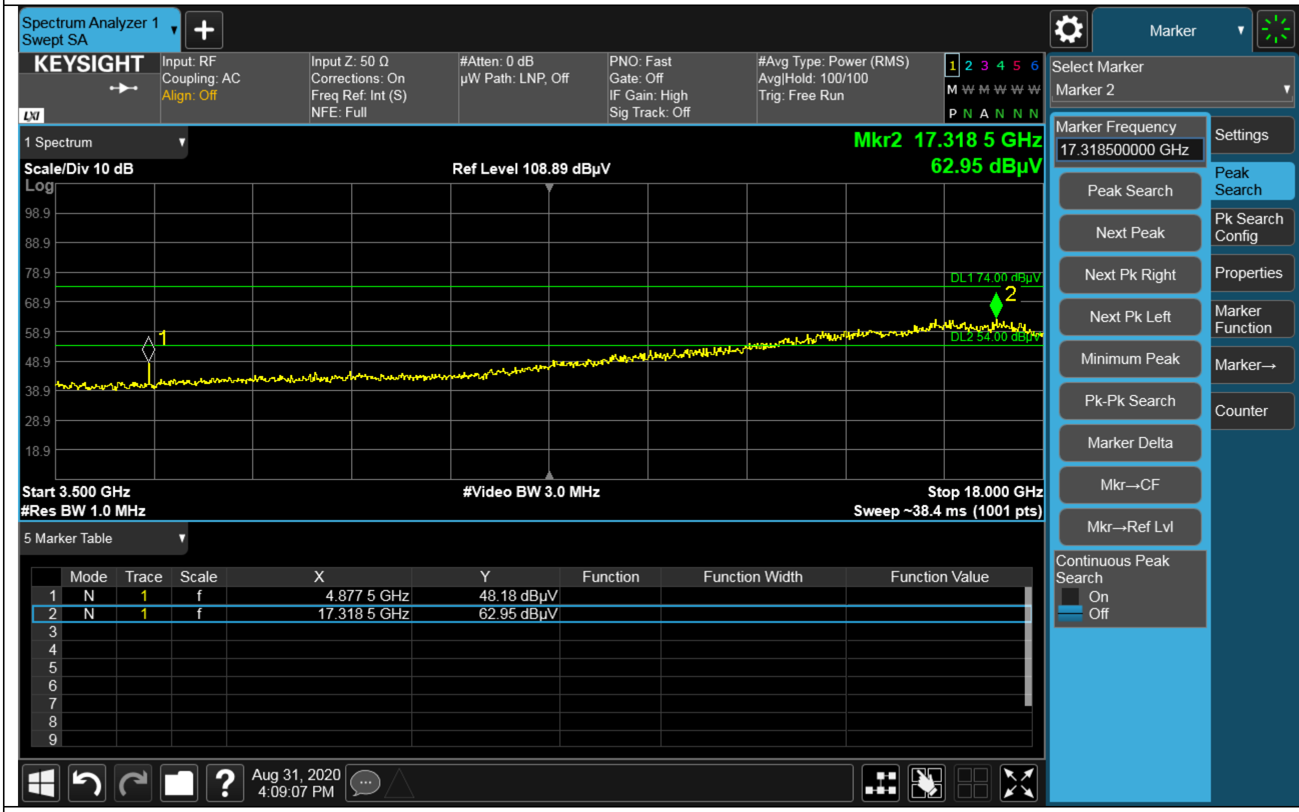
1M Bit/s(37 Byte) / CH 19(Middle) / (PK) 3.5 GHz ~ 18 GHz(Horizontal)



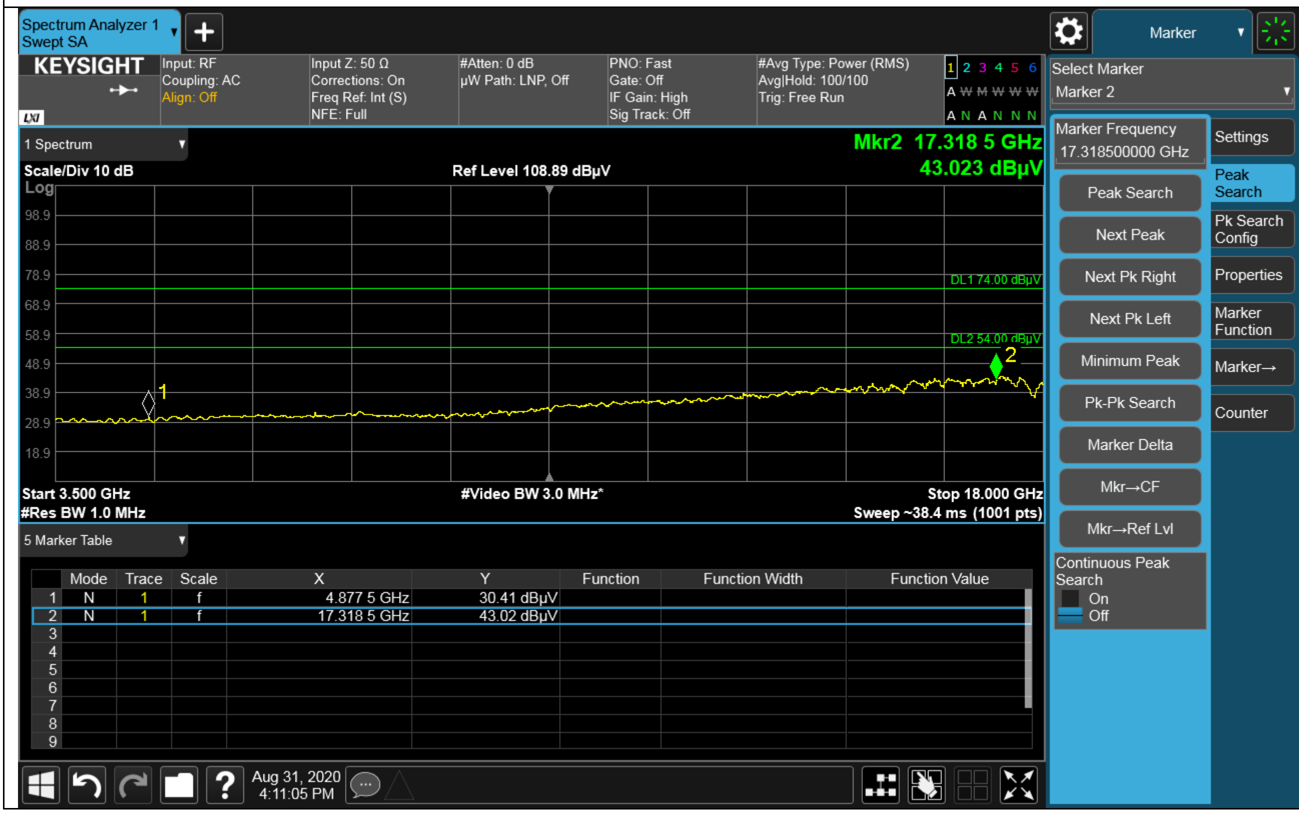
1M Bit/s(37 Byte) / CH 19(Middle) / (AVG) 3.5 GHz ~ 18 GHz(Horizontal)

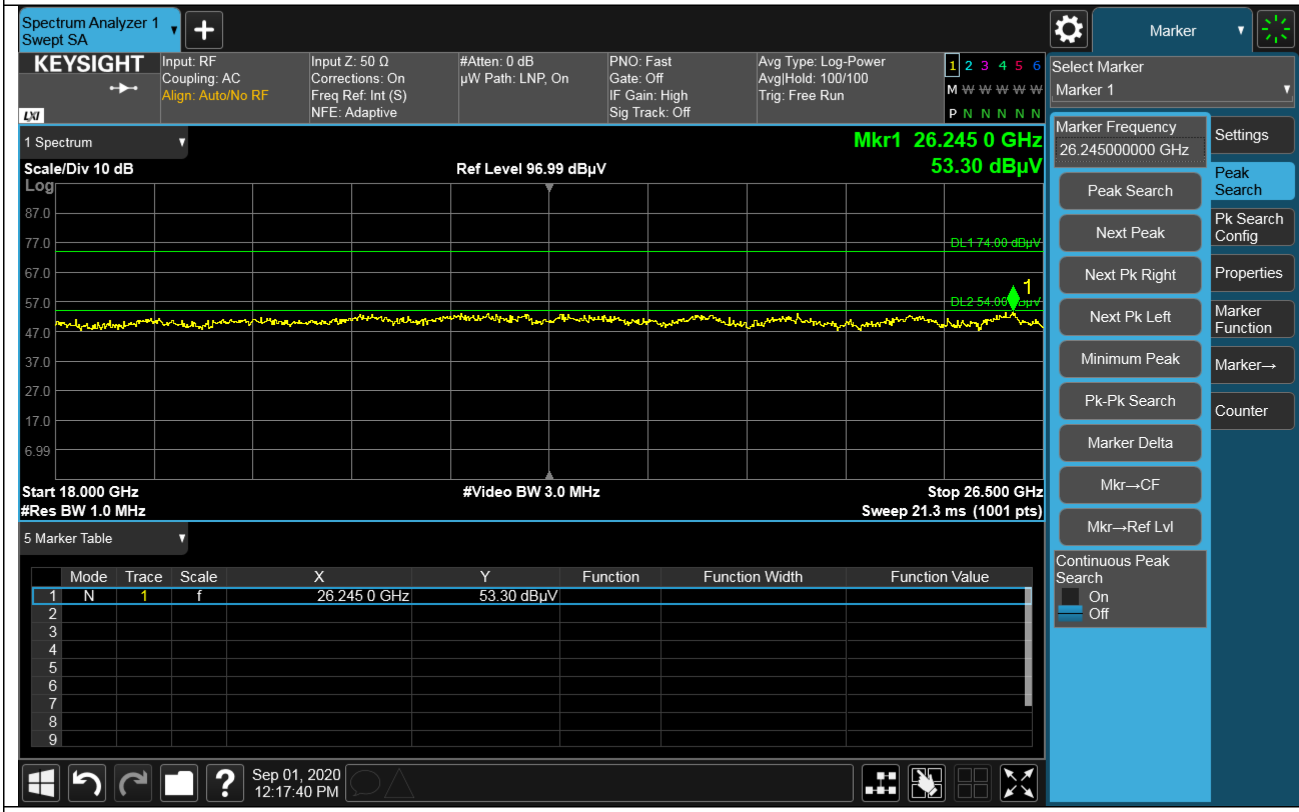
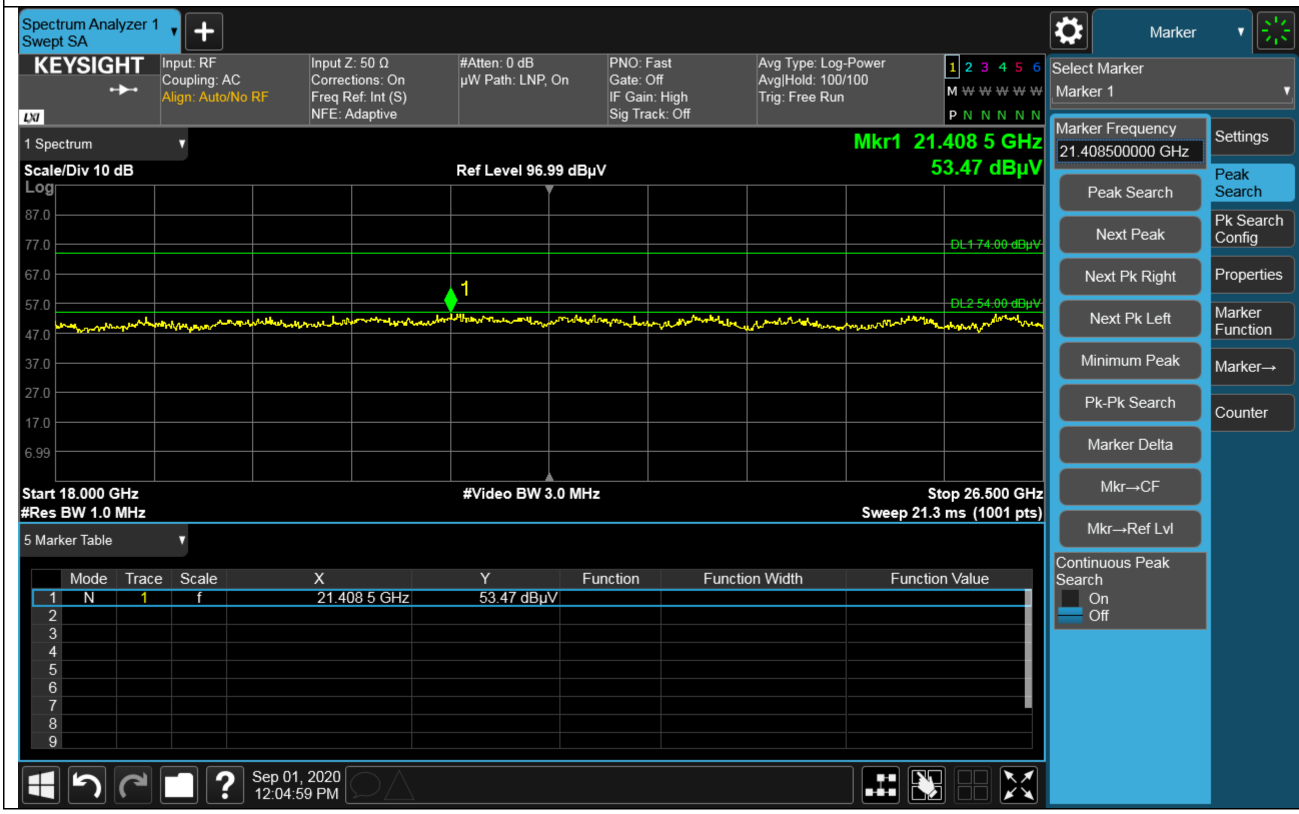


1M Bit/s(37 Byte) / CH 19(Middle) / (PK) 3.5 GHz ~ 18 GHz(Vertical)



1M Bit/s(37 Byte) / CH 19(Middle) / (AVG) 3.5 GHz ~ 18 GHz(Vertical)



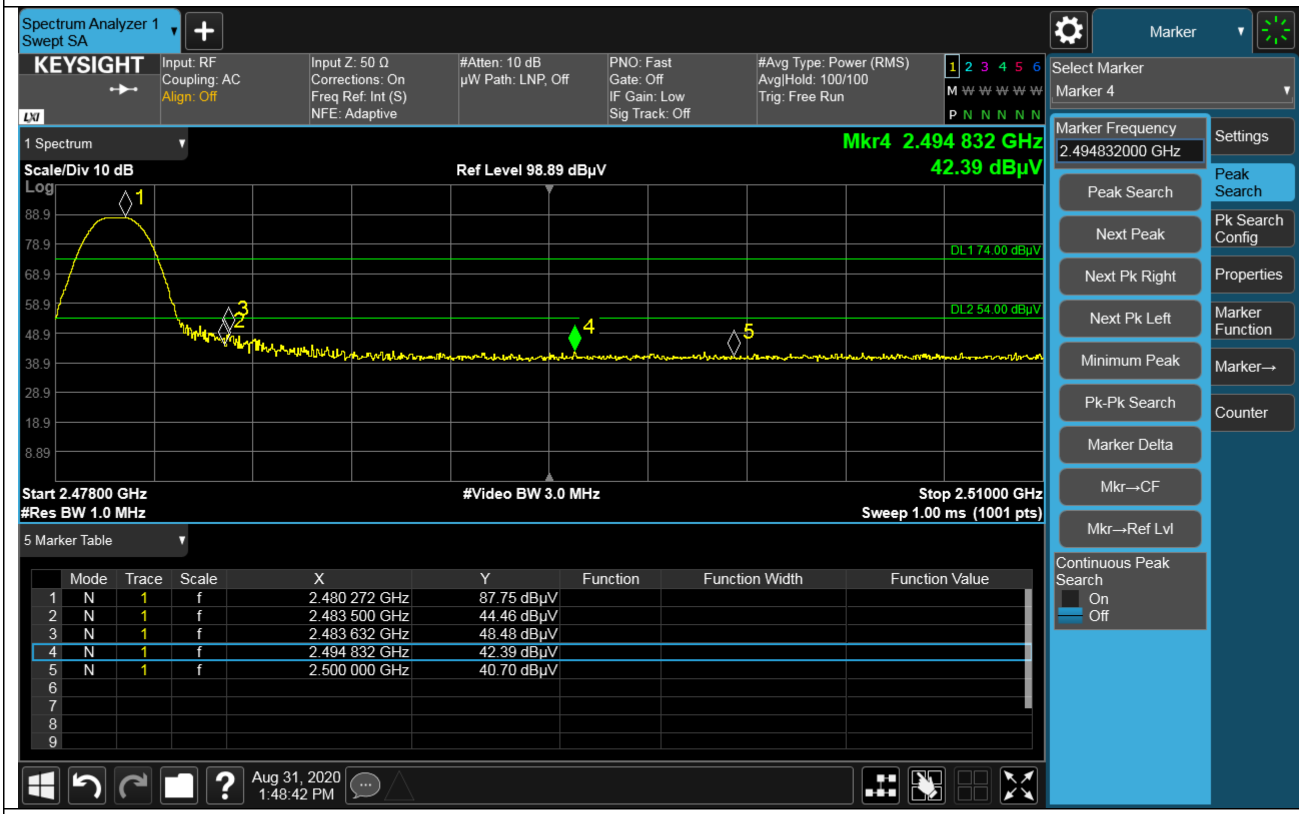
1M Bit/s(37 Byte) / CH 19(Middle) / (PK) 18 GHz ~ 26.5 GHz(Horizontal)

1M Bit/s(37 Byte) / CH 19(Middle) / (PK) 18 GHz ~ 26.5 GHz(Vertical)


<1M Bit/s(37 Byte) / CH 39(High)>

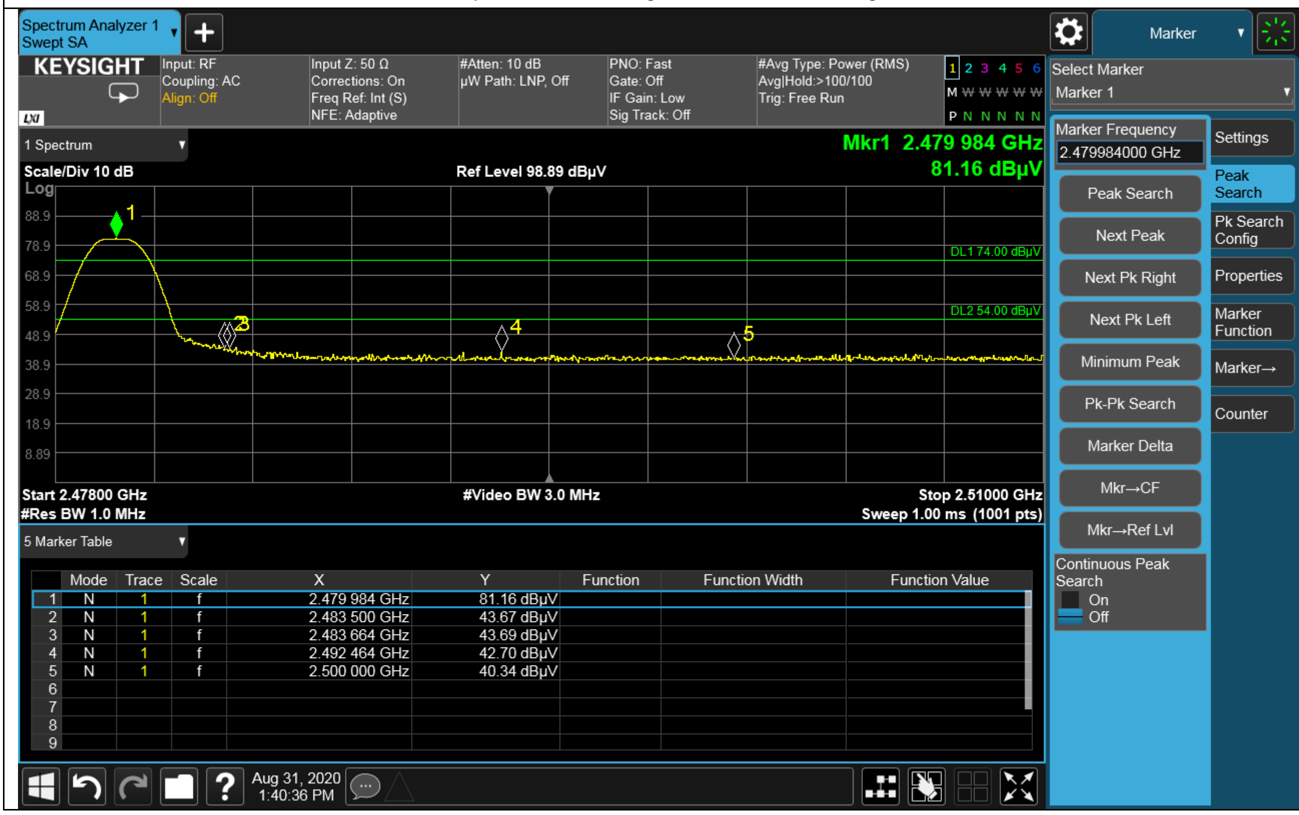
Radiated emissions			Ant.	Correction factors					Total	Limit	
Frequency	Reading	Detect	Pol.	AF	CL	Amp	F_d	DF	Final Result	Limit	Margin
MHz	dBμV	PK/AV	H/V	dB/m	dB	dB	dB	dB	dBμV/m	dBμV/m	dB
*2 483.50	44.56	PK	H	31.90	9.06	43.00	1.94	–	44.46	74.00	29.54
*2 483.50	43.77	PK	V	31.90	9.06	43.00		–	43.67	74.00	30.33
*2 483.63	48.58	PK	H	31.90	9.06	43.00		–	48.48	74.00	25.52
*2 483.66	52.54	PK	V	31.90	9.06	43.00		–	52.44	74.00	21.56
*2 500.00	40.18	PK	H	32.20	9.08	42.70		–	40.70	74.00	33.30
*2 500.00	48.01	PK	V	32.20	9.08	42.70		–	48.53	74.00	25.47
*4 964.50	40.07	PK	H	34.30	13.08	41.20		–	48.19	74.00	25.81
*4 964.50	40.41	PK	V	34.30	13.08	41.20		–	48.53	74.00	25.47
*7 444.00	33.32	PK	H	35.70	16.41	40.40		–	46.97	74.00	27.03
14 433.00	29.80	PK	V	39.40	23.17	36.80		–	57.51	74.00	16.49
14 433.00	11.52	AVG	V	39.40	23.17	36.80		1.94	41.17	54.00	12.83
16 753.00	27.52	PK	V	41.90	24.97	34.30		–	62.03	74.00	11.97
16 753.00	7.86	AVG	V	41.90	24.97	34.30		1.94	44.31	54.00	9.69
17 623.00	29.68	PK	H	41.20	25.69	35.40		–	63.11	74.00	10.89
17 623.00	8.82	AVG	H	41.20	25.69	35.40		1.94	44.19	54.00	9.81
18 GHz ~ 26.5 GHz : No spurious emissions were detected within 20 dB of the limit.											

Note :
1. "*" means the restricted band.
2. According to § 15.31(o), emissions level are not reported much lower than the limit by over 20 dB
3. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.
4. Frequency < 30 MHz, extrapolation factor of 40 dB/decade of distance $F_d = 40\log(D_m/D_s)$
   * 0.009 MHz – 0.490 MHz : 40log(3 m/300 m) = –80 dB, 0.490 MHz – 30 MHz : 40log(3 m/30 m) = –40 dB
5. Frequency > 30 MHz, extrapolation factor of 20 dB/decade of distance $F_d = 20\log(D_m/D_s)$
   * Above 1 GHz : 20log(3.75 m/3 m) = 1.94 dB
   * F_d = Distance Factor, D_m = Measurement Distance(m), D_s = Specification Distance(m)
6. Detect : Detector, Pol : Polarization, AF : Antenna Factor, CL : Cable Loss, Amp : Preamp Gain
   DF : Duty Cycle Factor
7. Final Result(dBμV/m) = Reading(dBμV) + AF(dB/m) + CL(dB) – Amp(dB) + F_d(dB) + DF(dB)
8. Test plot data does not contain DF for average detector.
   Test plot data = Reading(dBμV) + AF(dB/m) + CL(dB) – Amp(dB) + F_d(dB)

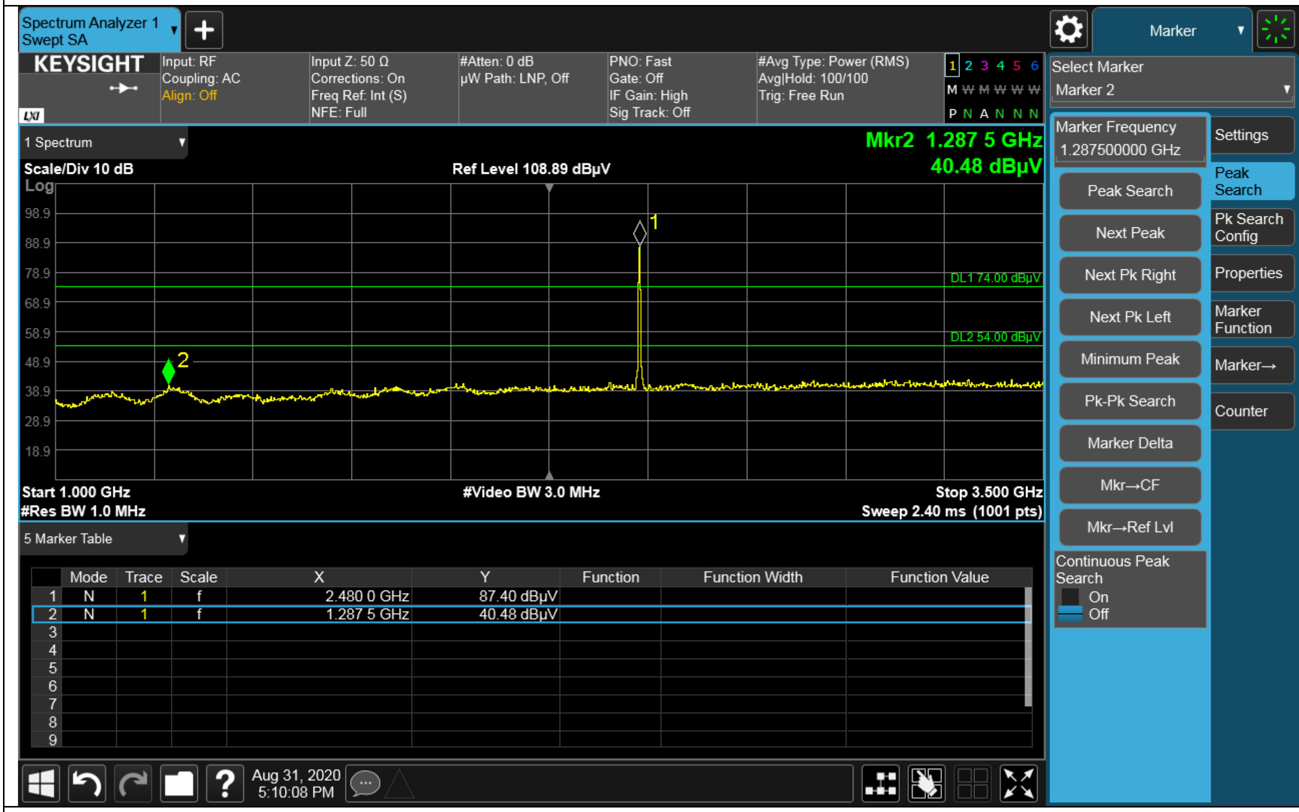
1M Bit/s(37 Byte) / CH 39(High) / (PK) Band Edge(Horizontal)



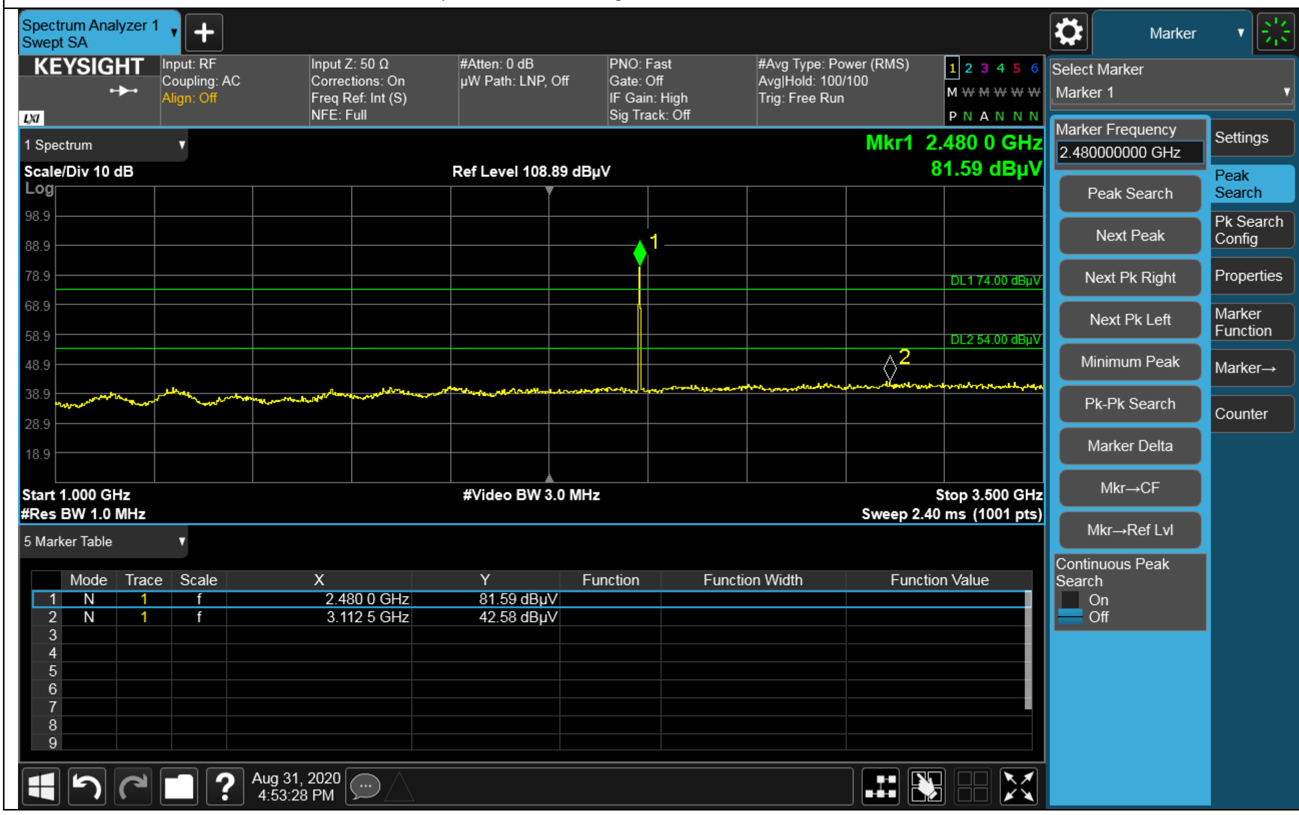
1M Bit/s(37 Byte) / CH 39(High) / (PK) Band Edge(Vertical)



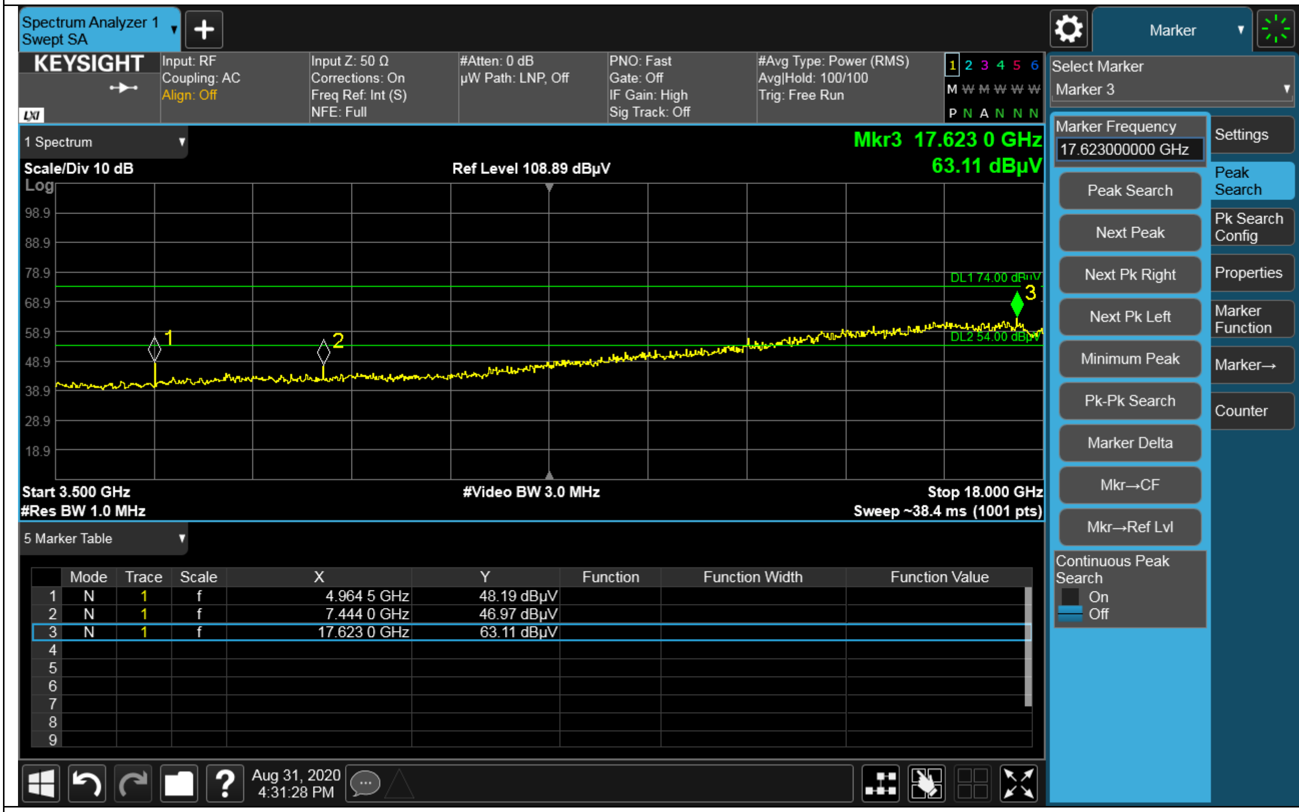
1M Bit/s(37 Byte) / CH 39(High) / (PK) 1 GHz ~ 3.5 GHz(Horizontal)



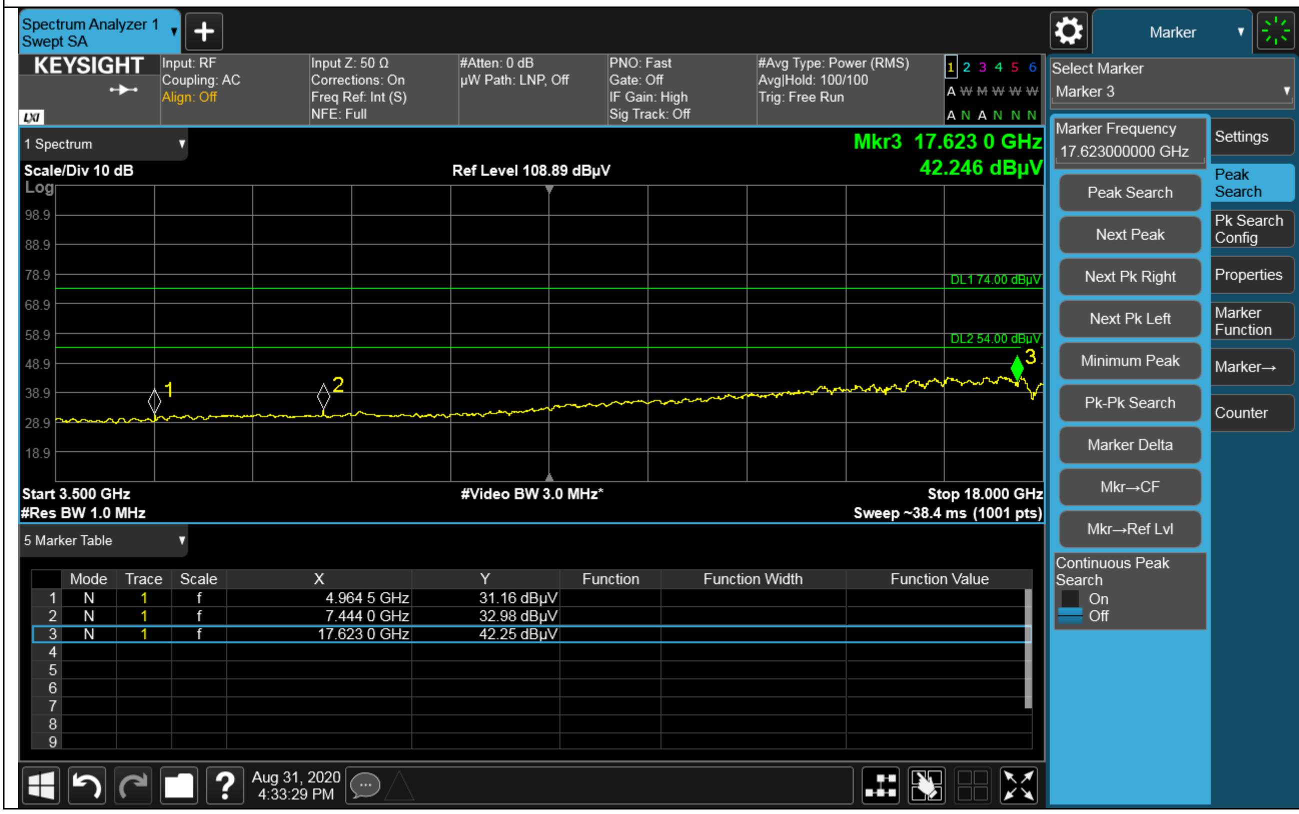
1M Bit/s(37 Byte) / CH 39(High) / (PK) 1 GHz ~ 3.5 GHz(Vertical)



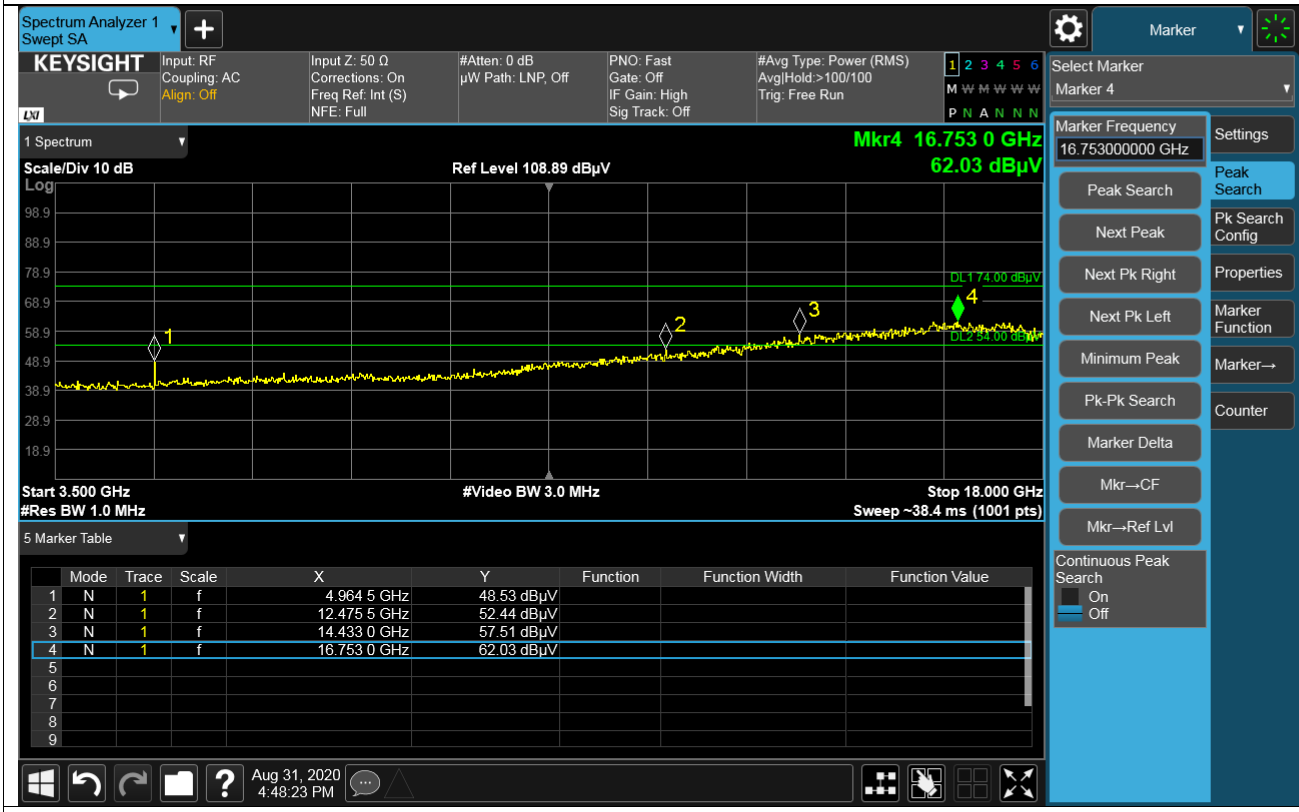
1M Bit/s(37 Byte) / CH 39(High) / (PK) 3.5 GHz ~ 18 GHz(Horizontal)



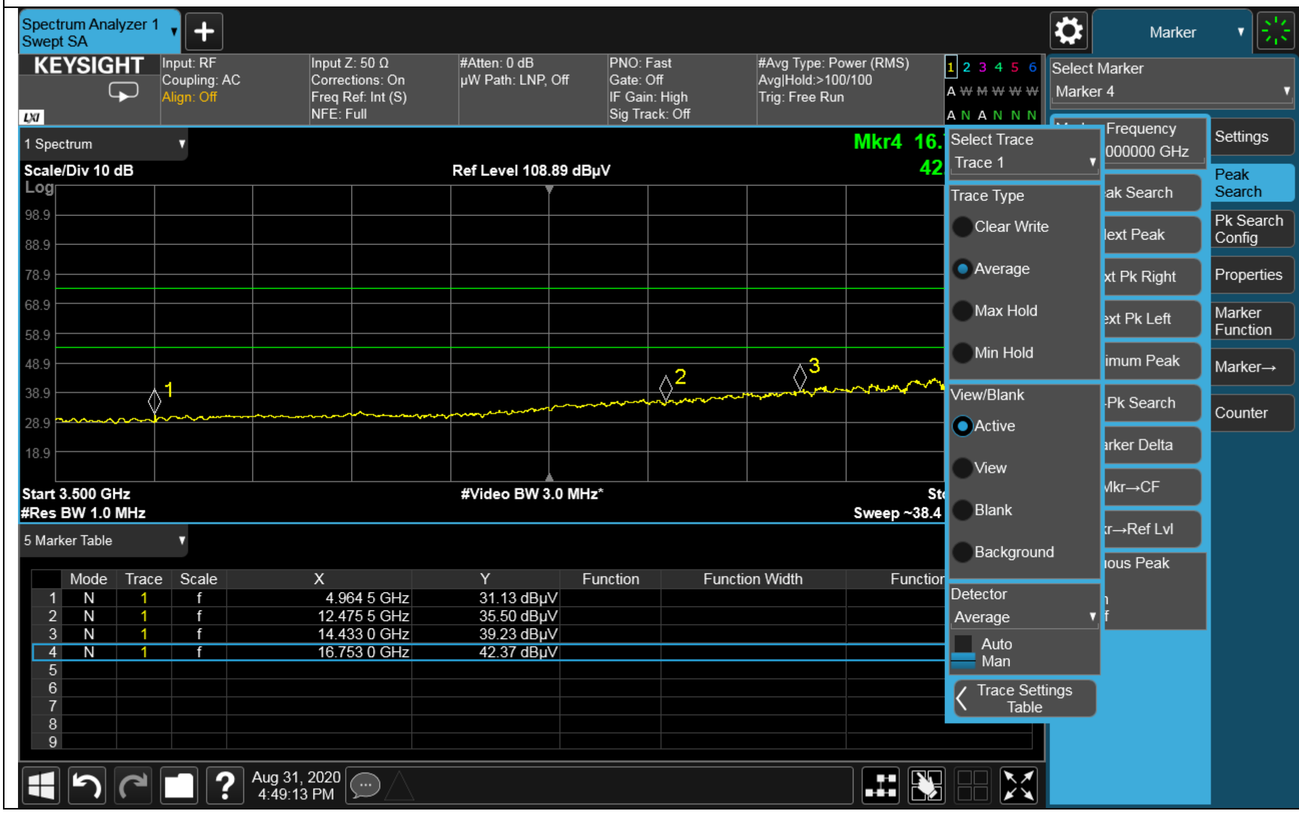
1M Bit/s(37 Byte) / CH 39(High) / (AVG) 3.5 GHz ~ 18 GHz(Horizontal)



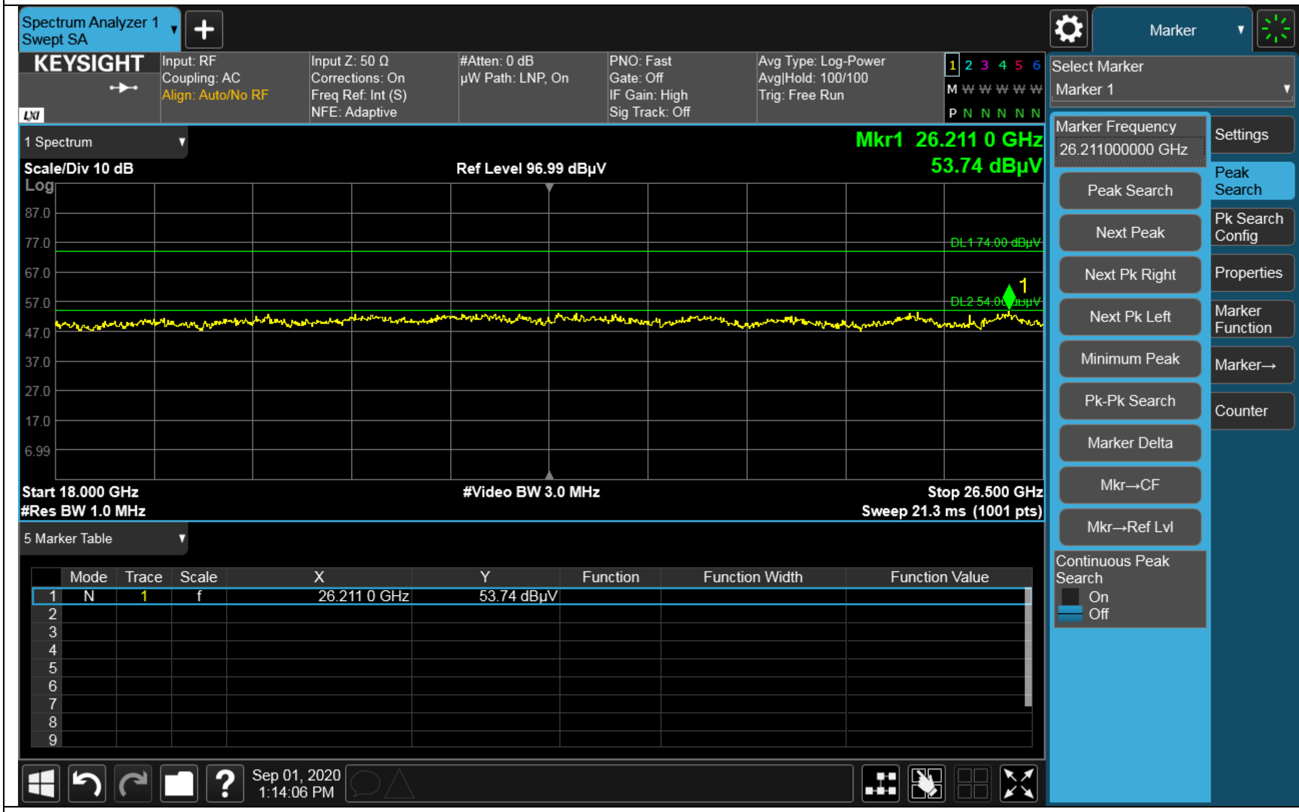
1M Bit/s(37 Byte) / CH 39(High) / (PK) 3.5 GHz ~ 18 GHz(Vertical)



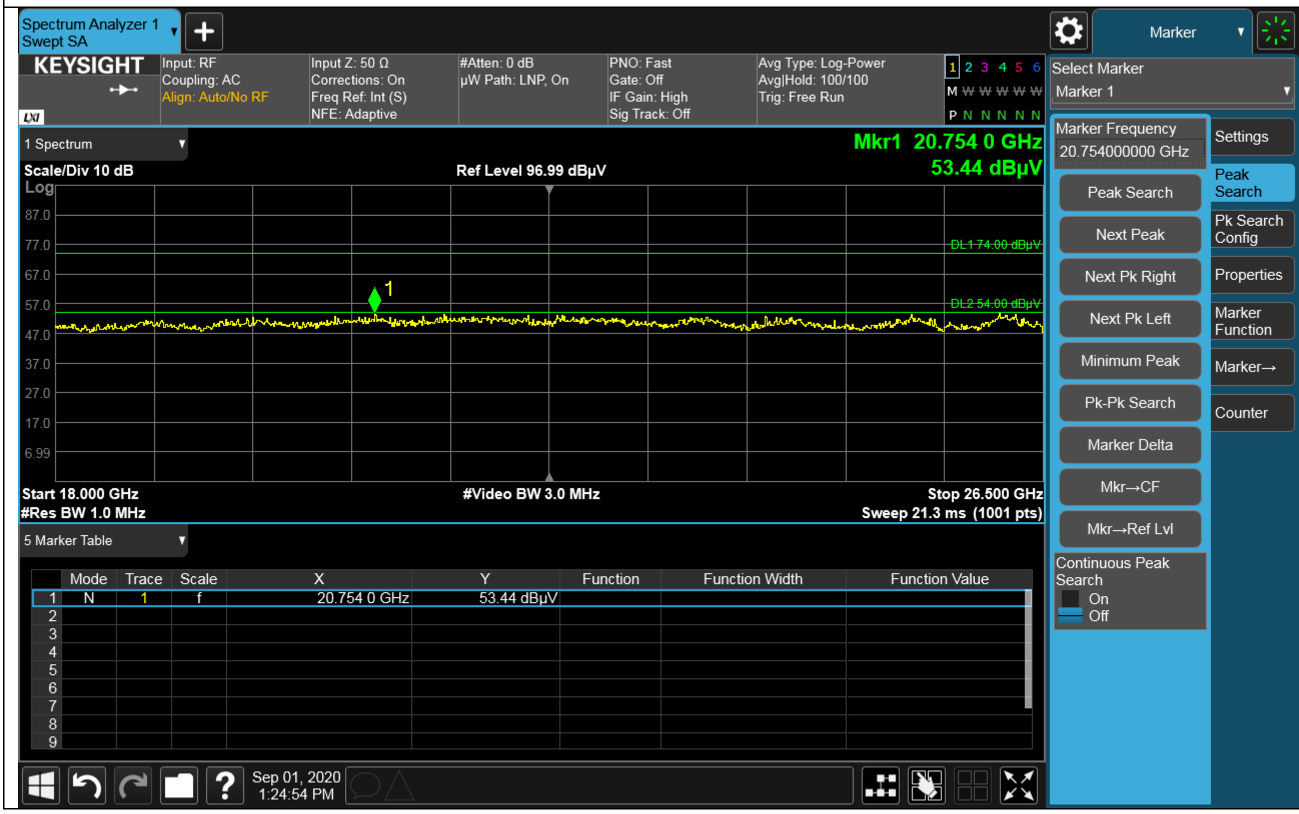
1M Bit/s(37 Byte) / CH 39(High) / (AVG) 3.5 GHz ~ 18 GHz(Vertical)



1M Bit/s(37 Byte) / CH 39(High) / (PK) 18 GHz ~ 26.5 GHz(Horizontal)

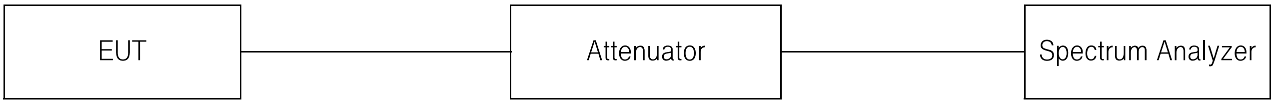


1M Bit/s(37 Byte) / CH 39(High) / (PK) 18 GHz ~ 26.5 GHz(Vertical)



3.5. Conducted Spurious Emission

▣ Test Setup



▣ Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

▣ Test procedure

ANSI C63.10 2013 Section 6.10.4 & Section 7.8.8 & Section 11.11

6.10.4 Authorized-band band-edge measurements (relative method)

1) Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation.
2) Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.
3) Attenuation: Auto (at least 10 dB preferred).
4) Sweep time: Coupled.
5) Resolution bandwidth: 100 kHz
6) Video bandwidth: 300 kHz
7) Detector: Peak
8) Trace: Max hold

7.8.8 Conducted spurious emissions test methodology

1) Span : 30 MHz to 10 times the operating frequency in GHz,
2) RBW = 100 kHz.
3) VBW = 300 kHz.
4) Sweep time = Coupled.
5) Detector = peak.

11.11.3 Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured.

b) Set the RBW = 100 kHz.

c) Set the VBW ≥ [3 × RBW].

d) Detector = peak.

e) Sweep time = auto couple.

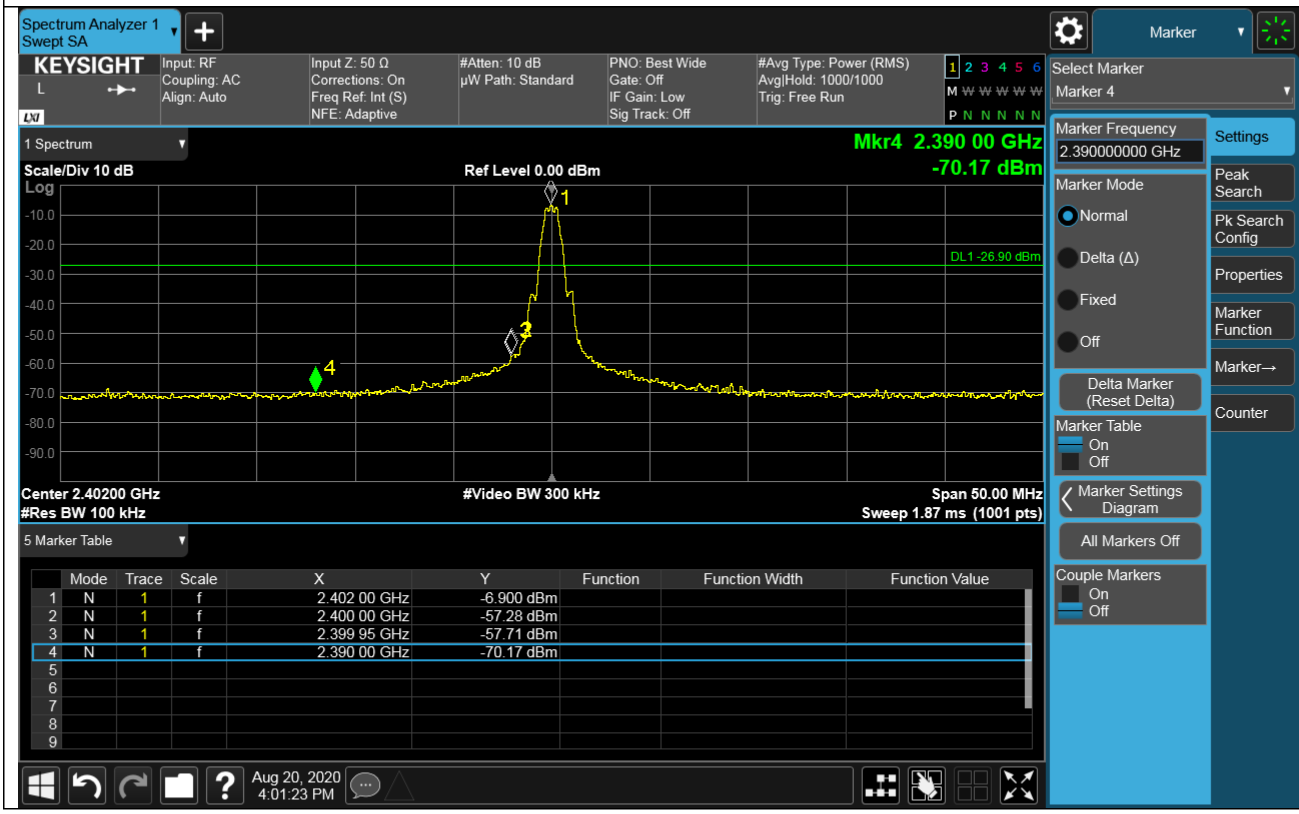
f) Trace mode = max hold.

g) Allow trace to fully stabilize.

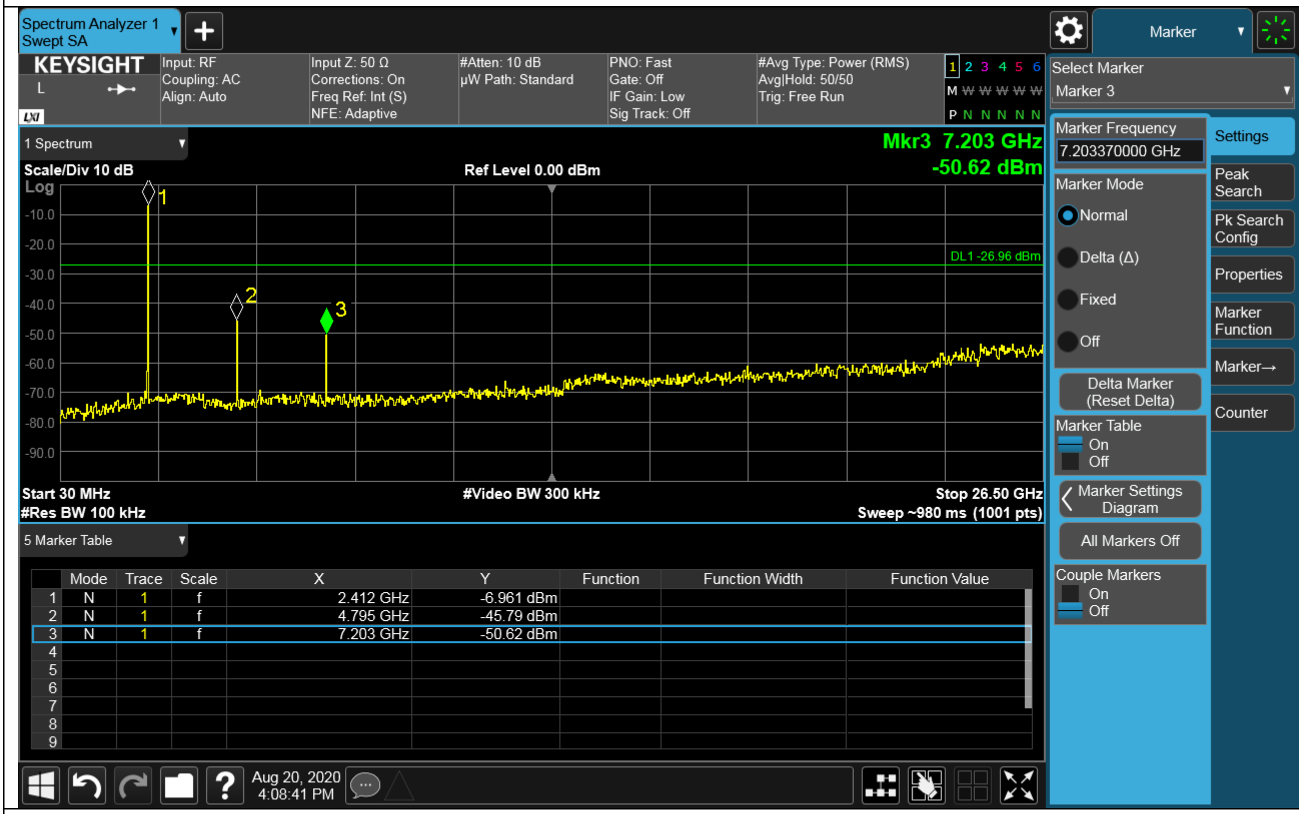
h) Use the peak marker function to determine the maximum amplitude level.

▣ Test Result

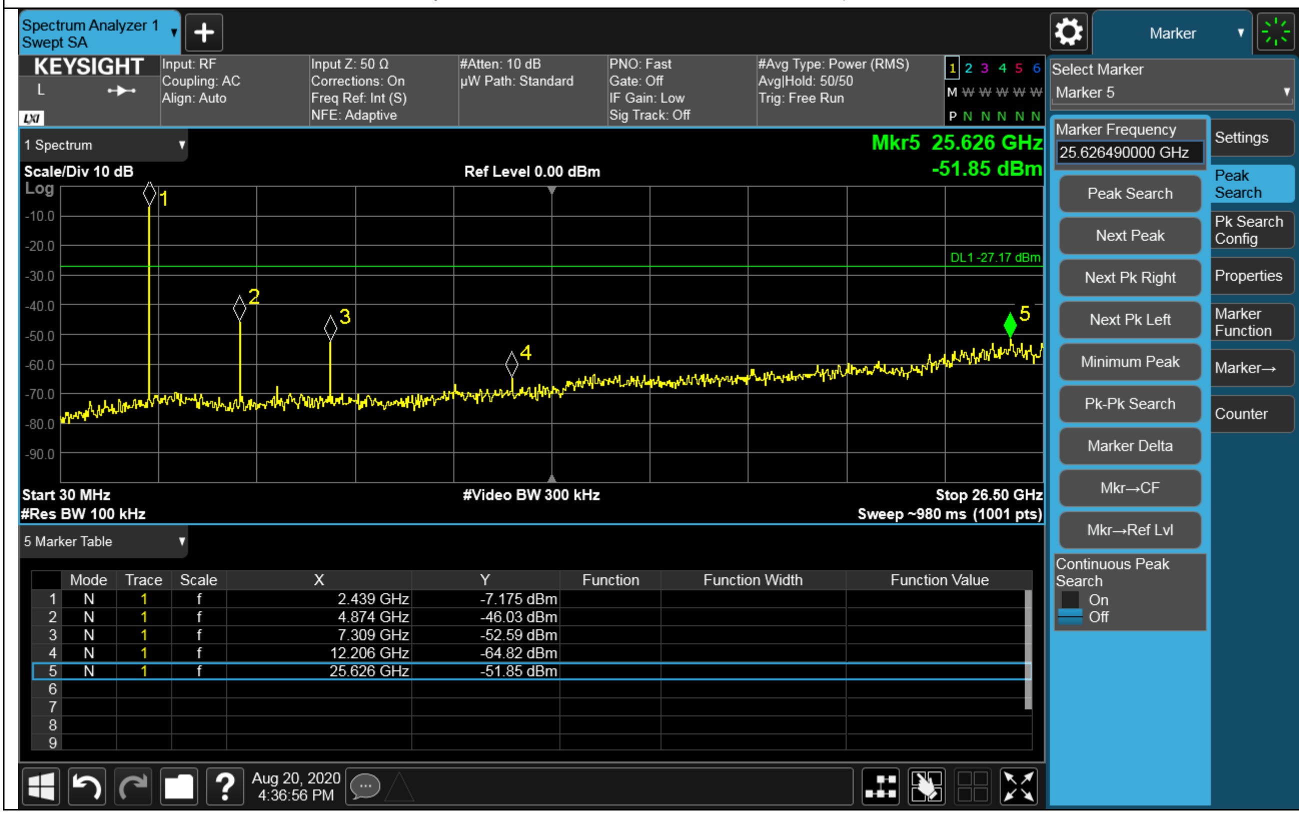
1M Bit/s(37 Byte) / CH 0(Low) / Band Edge



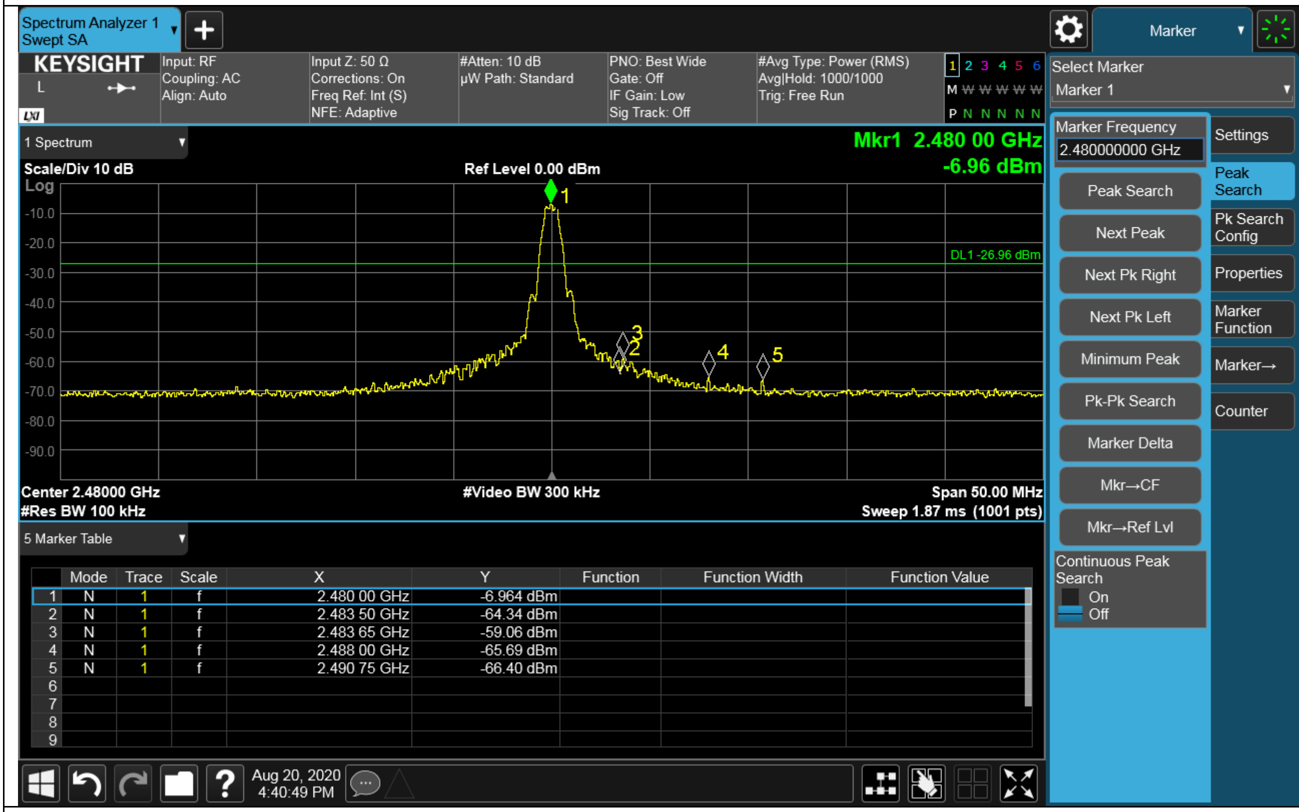
1M Bit/s(37 Byte) / CH 0(Low) / Conducted Spurious Emission



1M Bit/s(37 Byte) / CH 19(Middle) / Conducted Spurious Emission

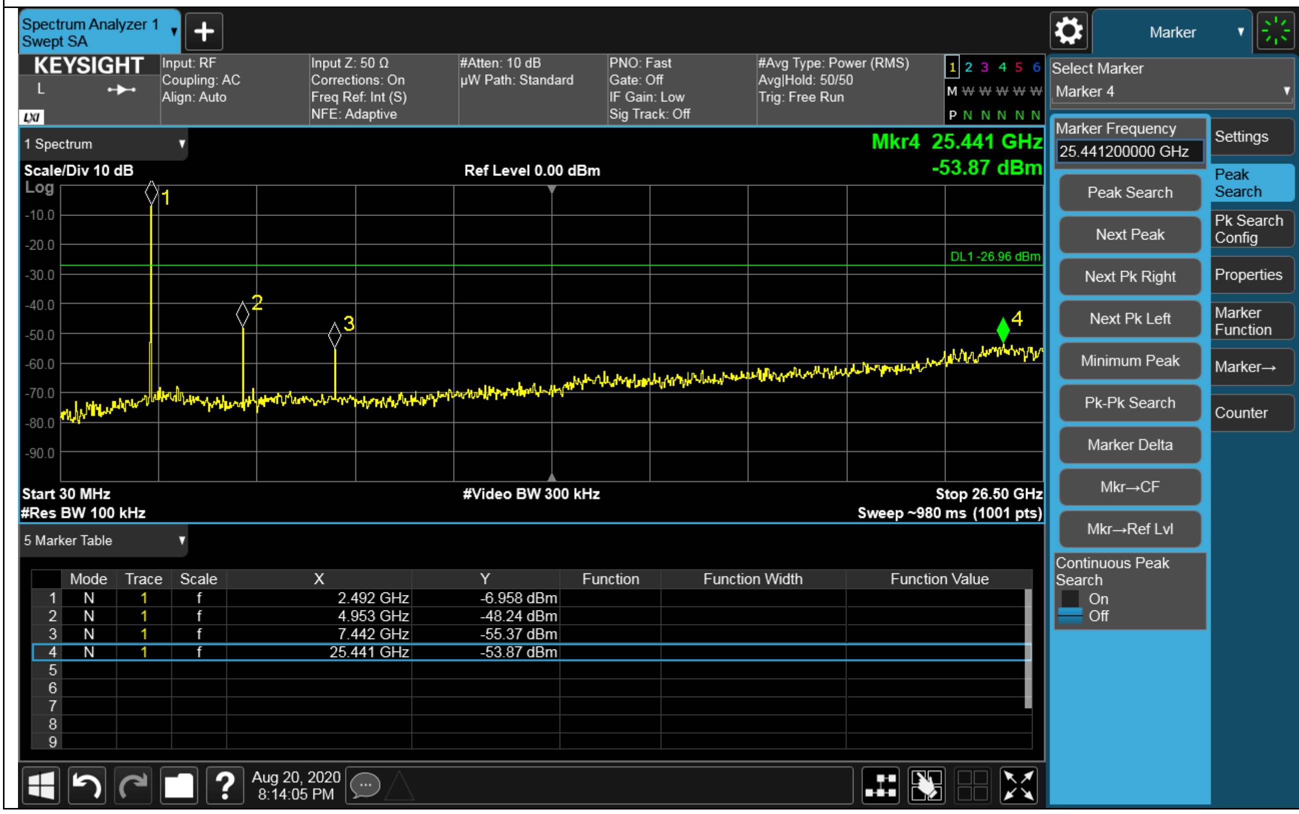


1M Bit/s(37 Byte) / CH 39(High) / Band Edge



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.480 00 GHz	-6.964 dBm			
2	N	1	f	2.483 50 GHz	-64.34 dBm			
3	N	1	f	2.483 65 GHz	-59.06 dBm			
4	N	1	f	2.488 00 GHz	-65.69 dBm			
5	N	1	f	2.490 75 GHz	-66.40 dBm			

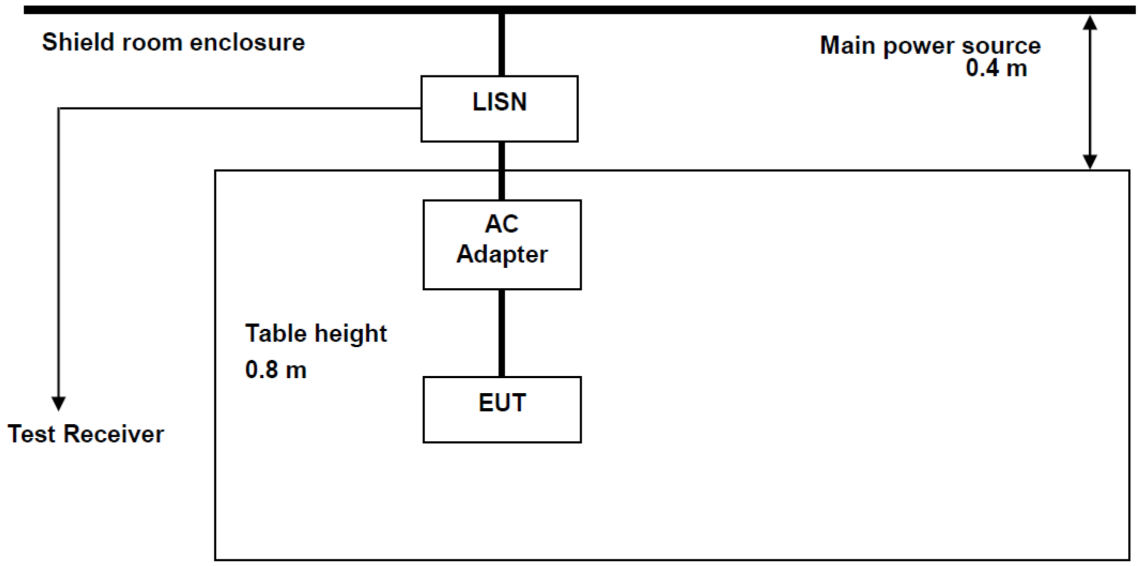
1M Bit/s(37 Byte) / CH 39(High) / Conducted Spurious Emission



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.492 GHz	-6.958 dBm			
2	N	1	f	4.953 GHz	-48.24 dBm			
3	N	1	f	7.442 GHz	-55.37 dBm			
4	N	1	f	25.441 GHz	-53.87 dBm			

3.6. AC Power Line Conducted Emissions

▣ Test Setup



▣ Limit

According to §15.207(a), 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). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges

Frequency of Emission (MHz)	Conducted limit (dBμV)	
	Quaisi-Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

*Decreases with the logarithm of the frequency.

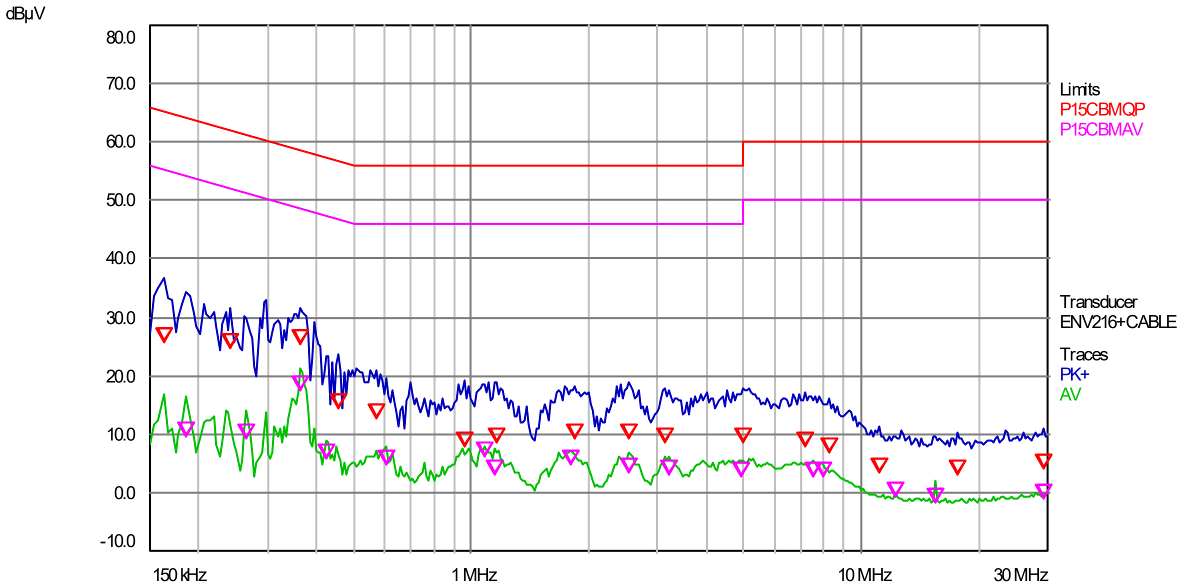
▣ Test procedure

ANSI C63.10 2013 Section 6.2

1. The EUT is placed on a wooden table 80 cm above the reference ground plane and 40 cm from the conducting wall of the shielding room.
2. Connect EUT to the power mains through a line impedance stabilization network(LISN) which provides 50 ohm coupling impedance for measuring instrument.
3. All peripherals are connecting to the other LISN
4. The frequency range from 150 kHz to 30 MHz was performed.
5. Set the test receiver to Peak detector and a bandwidth of 9 kHz with maximum hold mode. And then measurement is also performed by Average and Quasi-Peak detector
6. The EUT is transmitting mode during the measurement.

▣ Test Result

1M Bit/s(37 Byte) / CH 0(Low) / LIVE



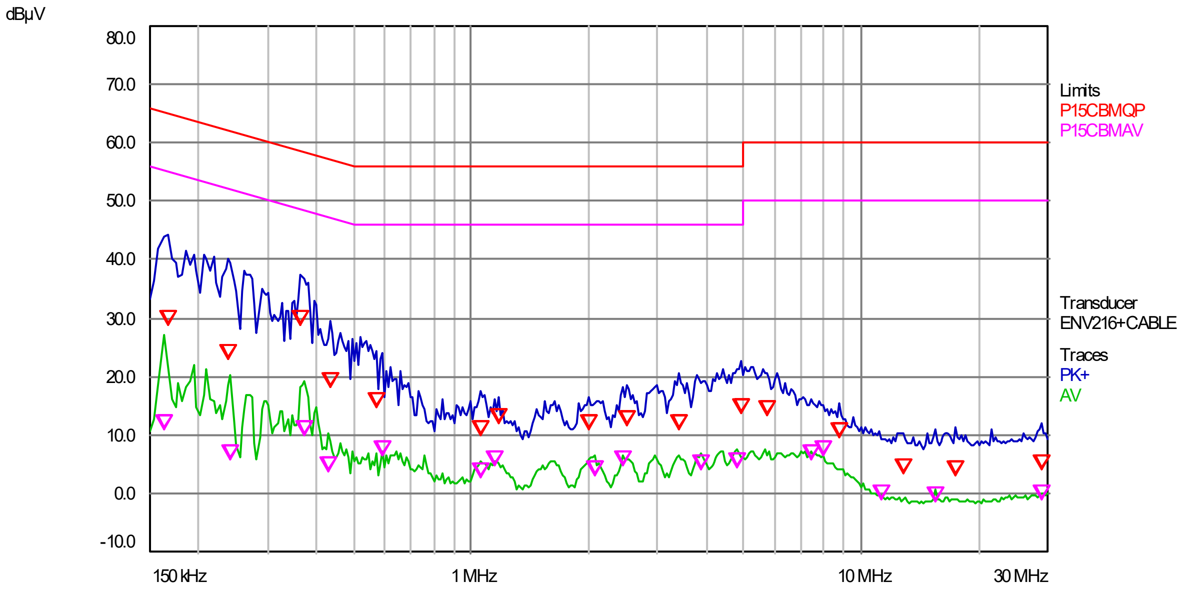
Frequency [MHz]	Correction Factor [dB]		LISN Line	QuasiPeak [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.162	9.60	0.01	L	25.57	65.36	⟨⟨
0.242	9.62	0.01	L	24.55	62.03	⟨⟨
0.366	9.63	0.01	L	25.43	58.59	⟨⟨
0.458	9.64	0.01	L	14.31	56.73	⟨⟨
0.574	9.64	0.01	L	12.75	56.00	⟨⟨
2.522	9.68	0.02	L	9.34	56.00	⟨⟨

Frequency [MHz]	Correction Factor [dB]		LISN Line	CAverage [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.266	9.62	0.01	L	9.23	51.24	⟨⟨
0.366	9.63	0.01	L	17.36	48.59	⟨⟨
0.426	9.63	0.01	L	5.74	47.33	⟨⟨
0.602	9.64	0.01	L	4.75	46.00	⟨⟨
1.082	9.65	0.01	L	6.32	46.00	⟨⟨
1.798	9.67	0.02	L	4.61	46.00	⟨⟨

Note :

1. QuasiPeak(dBμV) and CAverage(dBμV) contain the values of Correction Factor(dB).
2. "⟨⟨" means a margin of more than 20 dB.

1M Bit/s(37 Byte) / CH 0(Low) / NEUTRAL



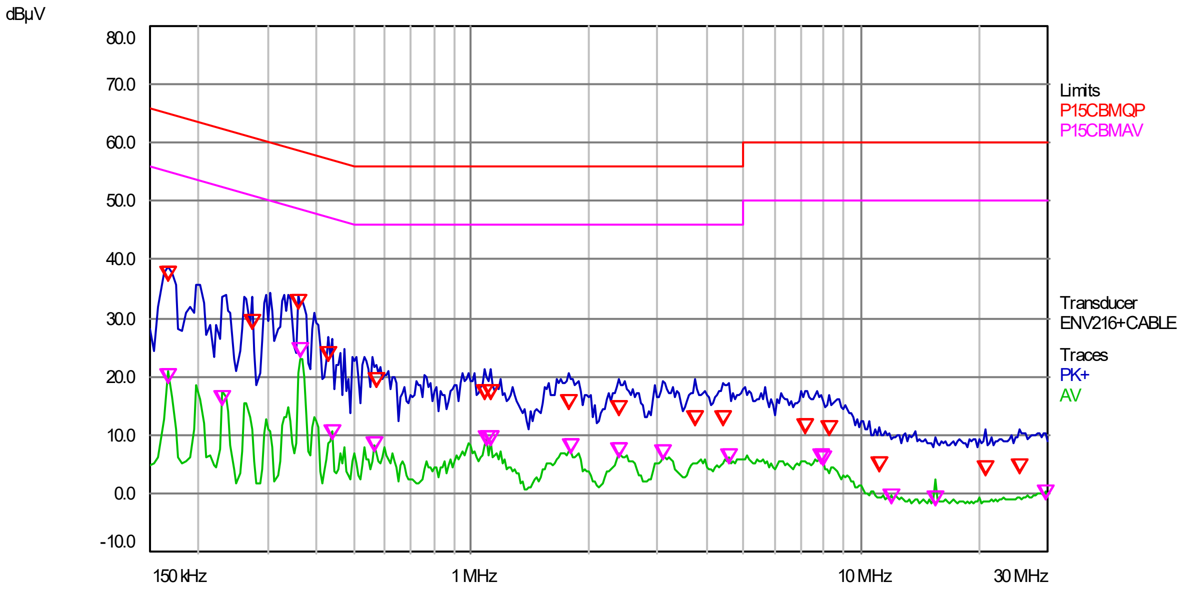
Frequency [MHz]	Correction Factor [dB]		LISN Line	QuasiPeak [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.166	9.60	0.01	N	28.84	65.16	≪
0.238	9.62	0.01	N	23.13	62.17	≪
0.366	9.63	0.01	N	28.79	58.59	≪
0.434	9.63	0.01	N	18.16	57.18	≪
0.574	9.64	0.01	N	14.71	56.00	≪
4.920	9.75	0.03	N	13.54	56.00	≪

Frequency [MHz]	Correction Factor [dB]		LISN Line	CAverage [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.374	9.63	0.01	N	9.82	48.41	≪
0.590	9.64	0.01	N	6.49	46.00	≪
1.150	9.65	0.01	N	4.75	46.00	≪
2.454	9.68	0.02	N	4.64	46.00	≪
3.900	9.72	0.03	N	4.22	46.00	≪
4.772	9.74	0.03	N	4.51	46.00	≪

Note :

1. QuasiPeak(dBμV) and CAverage(dBμV) contain the values of Correction Factor(dB).
2. "≪" means a margin of more than 20 dB.

1M Bit/s(37 Byte) / CH 19(Middle) / LIVE



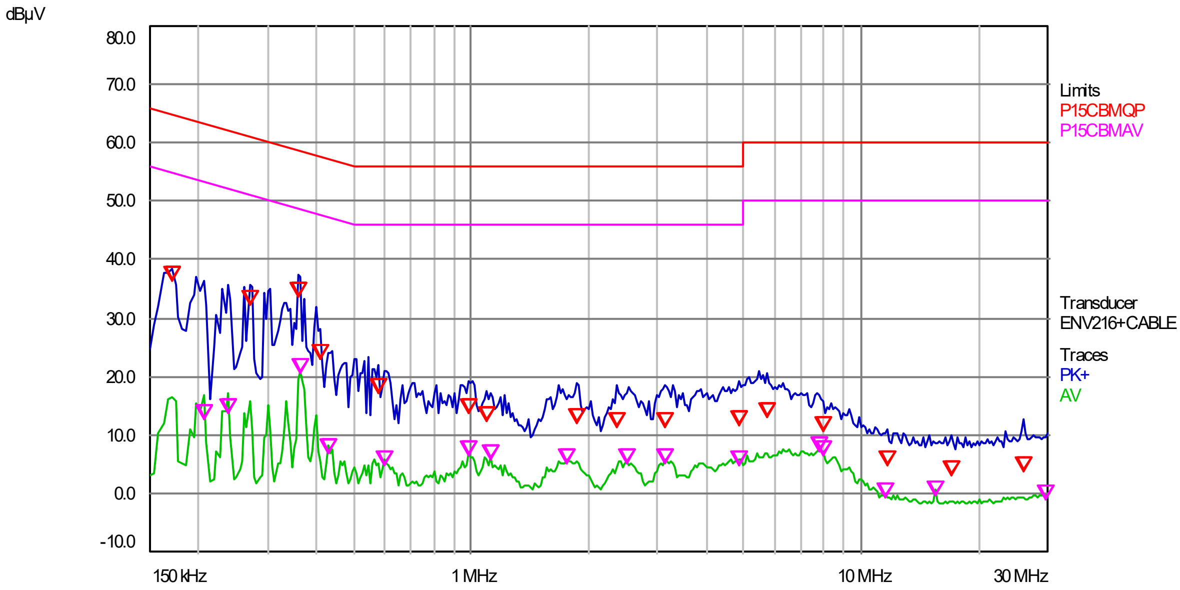
Frequency [MHz]	Correction Factor [dB]		LISN Line	QuasiPeak [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.166	9.60	0.01	L	36.48	65.16	《
0.274	9.62	0.01	L	28.20	61.00	《
0.362	9.63	0.01	L	31.41	58.68	《
0.430	9.63	0.01	L	22.57	57.25	《
0.574	9.64	0.01	L	18.34	56.00	《
1.122	9.65	0.01	L	16.23	56.00	《

Frequency [MHz]	Correction Factor [dB]		LISN Line	CAverage [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.166	9.60	0.01	L	18.81	55.16	《
0.230	9.62	0.01	L	15.14	52.45	《
0.366	9.63	0.01	L	23.25	48.59	《
0.438	9.63	0.01	L	9.08	47.10	《
1.090	9.65	0.01	L	8.20	46.00	《
1.122	9.65	0.01	L	8.20	46.00	《

Note :

1. QuasiPeak(dBμV) and CAverage(dBμV) contain the values of Correction Factor(dB).
2. "《" means a margin of more than 20 dB.

1M Bit/s(37 Byte) / CH 19(Middle) / NEUTRAL



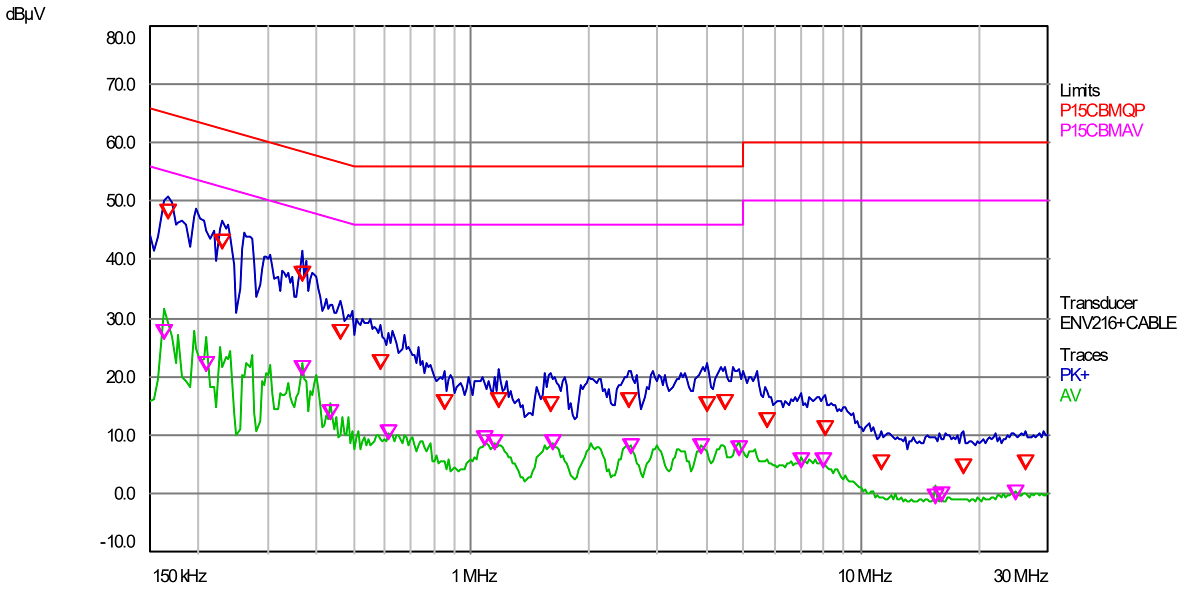
Frequency [MHz]	Correction Factor [dB]		LISN Line	QuasiPeak [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.170	9.60	0.01	N	36.48	64.96	《
0.270	9.62	0.01	N	32.39	61.12	《
0.362	9.63	0.01	N	33.47	58.68	《
0.410	9.63	0.01	N	22.83	57.65	《
0.578	9.64	0.01	N	17.27	56.00	《
0.978	9.65	0.01	N	13.84	56.00	《

Frequency [MHz]	Correction Factor [dB]		LISN Line	CAverage [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.206	9.61	0.01	N	12.77	53.37	《
0.238	9.62	0.01	N	13.66	52.17	《
0.366	9.63	0.01	N	20.73	48.59	《
0.430	9.63	0.01	N	6.99	47.25	《
0.986	9.65	0.01	N	6.63	46.00	《
1.114	9.65	0.01	N	5.82	46.00	《

Note :

1. QuasiPeak(dBμV) and CAverage(dBμV) contain the values of Correction Factor(dB).
2. "《" means a margin of more than 20 dB.

1M Bit/s(37 Byte) / CH 39(High) / LIVE



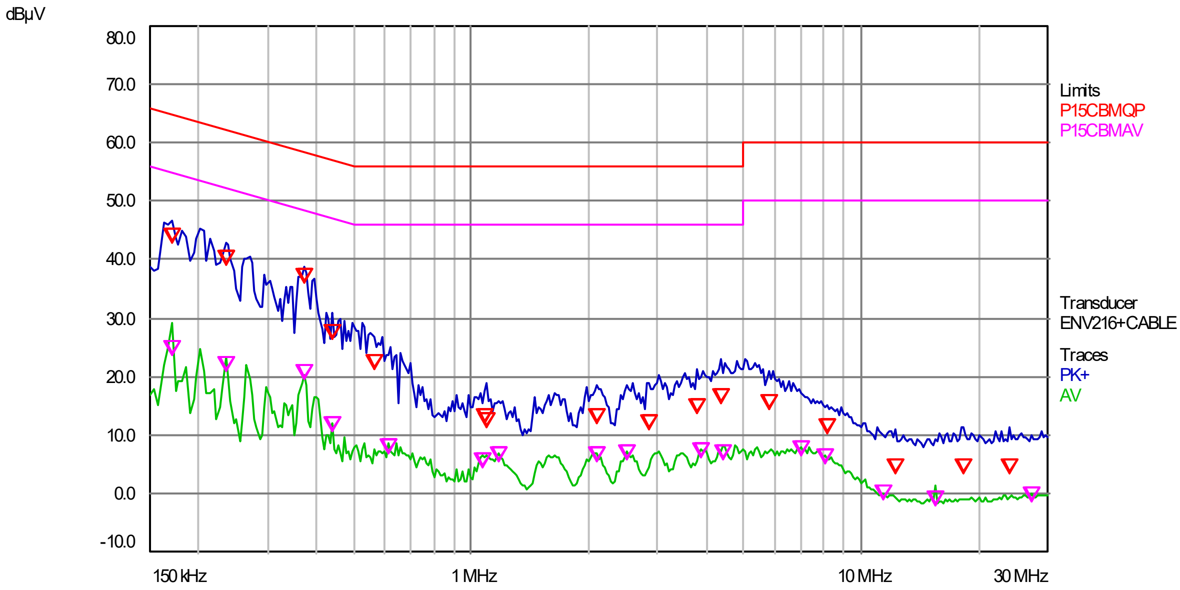
Frequency [MHz]	Correction Factor [dB]		LISN Line	QuasiPeak [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.166	9.60	0.01	L	46.88	65.16	18.28
0.230	9.62	0.01	L	41.91	62.45	《
0.370	9.63	0.01	L	36.32	58.50	《
0.462	9.64	0.01	L	26.41	56.66	《
0.586	9.64	0.01	L	21.29	56.00	《
2.542	9.68	0.02	L	14.71	56.00	《

Frequency [MHz]	Correction Factor [dB]		LISN Line	CAverage [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.162	9.60	0.01	L	26.44	55.36	《
0.210	9.61	0.01	L	20.86	53.21	《
0.370	9.63	0.01	L	20.31	48.50	《
0.434	9.63	0.01	L	12.67	47.18	《
0.610	9.64	0.01	L	9.32	46.00	《
1.086	9.65	0.01	L	8.27	46.00	《

Note :

1. QuasiPeak(dBμV) and CAverage(dBμV) contain the values of Correction Factor(dB).
2. "《" means a margin of more than 20 dB.

1M Bit/s(37 Byte) / CH 39(High) / NEUTRAL



Frequency [MHz]	Correction Factor [dB]		LISN Line	QuasiPeak [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.170	9.60	0.01	N	42.88	64.96	≪
0.234	9.62	0.01	N	39.26	62.31	≪
0.374	9.63	0.01	N	35.93	58.41	≪
0.442	9.63	0.01	N	26.43	57.02	≪
0.566	9.64	0.01	N	21.25	56.00	≪
4.376	9.73	0.03	N	15.55	56.00	≪

Frequency [MHz]	Correction Factor [dB]		LISN Line	CAverage [dB(μV)]	Limit [dB(μV)]	Margin [dB]
	LISN	Cable Loss				
0.170	9.60	0.01	N	23.61	54.96	≪
0.234	9.62	0.01	N	20.93	52.31	≪
0.374	9.63	0.01	N	19.44	48.41	≪
0.438	9.63	0.01	N	10.57	47.10	≪
0.614	9.64	0.01	N	6.68	46.00	≪
3.892	9.72	0.03	N	6.06	46.00	≪

Note :

1. QuasiPeak(dBμV) and CAverage(dBμV) contain the values of Correction Factor(dB).
2. "≪" means a margin of more than 20 dB.

4. Test Equipment List

Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Interval	Calibration Due Date
Signal Analyzer	Keysight	N9040B	US55230181	07/01/2020	Annual	07/01/2021
EMI Receiver	R&S	ESR3	102635	09/10/2020	Annual	09/10/2021
EMI Receiver	R&S	ESCI	101138	11/28/2019	Annual	11/28/2020
Signal Generator	Keysight	N5173B	MY53270648	04/28/2020	Annual	04/28/2021
USB Power Sensor	Keysight	U2022XA	MY55270005	07/01/2020	Annual	07/01/2021
Attenuator	HP	8495D	3308A01321	09/04/2020	Annual	09/04/2021
Function Power Supply	Agilent	6673A	MY41000334	09/09/2020	Annual	09/09/2021
DC Power Supply	Agilent	E3643A	KR03400220	09/09/2020	Annual	09/09/2021
LISN	R&S	ENV216	101365	09/02/2020	Annual	09/02/2021
Loop Antenna	R&S	HFH2-Z2	825841/008	09/02/2020	Annual	09/02/2021
Bi-Log Antenna	TDK	HLP-3003C	130962	12/09/2019	Annual	12/09/2020
Horn Antenna	ETS-LINDGREN	3117	00227635	07/16/2020	Annual	07/16/2020
Horn Antenna	ETS-LINDGREN	3116C	00201452	11/29/2019	Annual	11/29/2020
Pre-Amplifier	TESTEK	TK-PA18	120006	02/26/2020	Annual	02/26/2021
Pre-Amplifier	ETS-LINDGREN	3116C-PA	00201452	02/12/2020	Annual	02/12/2021
Low Pass Filter	WAINWRIGHT	WLK12-2000-2120-11000-40SS	1	07/01/2020	Annual	07/01/2021
High Pass Filter	WAINWRIGHT	WHKX12-935-1000-15000-40SS	16	07/01/2020	Annual	07/01/2021
High Pass Filter	WAINWRIGHT	WHNX3.5/26.5G-6SS	13	04/28/2020	Annual	04/28/2021
Antenna Position Tower	Innco Systems GmbH	MA4640/800-XP-ET	N/A	N/A	N/A	N/A
Antenna Mast	Innco Systems GmbH	MHE-0200-MA	N/A	N/A	N/A	N/A
Controller	Innco Systems GmbH	CO3000	CO3000/1036/41320817/P	N/A	N/A	N/A
Coaxial Cable	HUBER+SUHNER	SCOFLEX102	38169/2	N/A	N/A	N/A
Coaxial Cable	HUBER+SUHNER	SCOFLEX102	38172/2	N/A	N/A	N/A
Coaxial Cable	HUBER+SUHNER	SCOFLEX104	MY32577/4	N/A	N/A	N/A
Coaxial Cable	HUBER+SUHNER	SCOFLEX104	MY31218/4	N/A	N/A	N/A
Coaxial Cable	HUBER+SUHNER	SCOFLEX104	MY31117/4	N/A	N/A	N/A
Coaxial Cable	HUBER+SUHNER	SCOFLEX104	MY31217/4	N/A	N/A	N/A

- End of Test Report -