

TEST REPORT

FCC/IC Test for LCU-001

Certification

APPLICANT

LG Electronics Inc.

REPORT NO.

HCT-RF-2001-FI002-R2

DATE OF ISSUE

26 February 2020

HCT Co., Ltd.

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FCC ID/IC

BEJ-LCU001/2703N-LCU001

Applicant

LG Electronics Inc.

170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-

Eut Type
Model Name

UWB Module
LCU-001

Date of Test

December 06, 2019 ~ February 13, 2020

FCC Rule Parts:

CFR 47 Part 15, Subpart C

ISED Rule Parts:

RSS-220 (Issue 1, Amendment 1, July 2018)

This test results were applied only to the test methods required by the standard.

Tested by
Kyung Soo Kang

(signature)

Technical Manager
Jong Seok Lee

(signature)

HCT CO., LTD.

Soo Chan Lee

SooChan Lee

/ CEO

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	20 January 2020	Initial Release
1	17 February 2020	- Added the note on page 7 - Updated test results about 'Cessation Time', 'AC Power-line conducted emissions' and 'Receiver spurious emissions'. - Updated test equipment list.
2	26 February 2020	- Revised the FCC, ISED rule parts. - Deleted the section about 'Cessation Time'.

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

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.

CONTENTS

1. GENERAL INFORMATION	5
1.1. APPLICANT INFORMATION	5
1.2. PRODUCT INFORMATION	5
1.3. TEST INFORMATION	5
2. FACILITIES AND ACCREDITATIONS	6
2.1. FACILITIES	6
2.2. EQUIPMENT	6
3. ANTENNA REQUIREMENTS	6
4. TEST SPECIFICATIONS	7
4.1. STANDARDS	7
4.2. MEASUREMENT UNCERTAINTY	8
4.3. STANDARDS ENVIRONMENTAL TEST CONDITIONS	8
5. TEST EQUIPMENTS	9
6. TEST RESULT	10
6.1. -10 dB BANDWIDTH	10
6.2. PEAK POWER	13
6.3. RADIATED EMISSIONS ABOVE 960 MHz	16
6.4. RADIATED EMISSIONS BELOW 960 MHz	25
6.5. AC POWER-LINE CONDUCTED EMISSIONS	30
7. Annex A_EUT AND TEST SETUP PHOTO	35

1. GENERAL INFORMATION

1.1. APPLICANT INFORMATION

Company Name	LG Electronics Inc.
Company Address	170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, 51533, Korea 51533, Korea

1.2. PRODUCT INFORMATION

EUT Type	UWB Module
EUT Serial Number	EBR89663001-H-1, EBR89663001-H-2
Power Supply	DC 2.80 V
Frequency Range	6 GHz ~ 7 GHz
Tx Output Power	-35.0 dBm
Antenna type:	Metal Monopole type Antenna

1.3. TEST INFORMATION

Rule Parts	FCC	CFR 47 Part 15, Subpart C
	ISED	RSS-220 (Issue 1, Amendment 1, July 2018)
Measurement Standards	ANSI C63.10-2013	
Test Location	HCT CO., LTD. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA	

2. FACILITIES AND ACCREDITATIONS

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

2.2. 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.

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."

3. ANTENNA REQUIREMENTS

According to FCC 47 CFR § 15.203:

"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. (Please refer to Internal photos file.)

*The E.U.T Complies with the requirement of § 15.203

4. TEST SPECIFICATIONS

4.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15 / ISSED RSS-Gen, RSS-220.

Description	Reference		Results
	FCC	ISED	
- 10 dB Bandwidth	§ 15.250(a), (b)	RSS-220, Section 2, RSS-220, Section 5.1, RSS-220, Annex Section 2	Compliant
Peak Power	§ 15.250(d)(3)	RSS-220, Annex Section 2	Compliant
Radiated Emissions above 960 MHz	§ 15.250(d)(1), (2)	RSS-Gen, Section 6.13.2 RSS-220, Section 5.2	Compliant
Radiated Emissions below 960 MHz	§ 15.250(d)(4)	RSS-Gen, Section 6.13.2 RSS-220, Section 3.4	Compliant
AC Power-Line Conducted Emissions	§ 15.207	RSS-Gen, Section 8.8.	Compliant

*RSS-220, Section 3.3

Since the EUT is not a transmitters with external frequency selection controls and/or frequency programming capability, it is exempt from this requirement.

4.2. MEASUREMENT UNCERTAINTY

Description	Reference	Results
- 10 dB Bandwidth	6.5 GHz	± 5.70 dB
Peak Power		
Radiated Emissions above 960 MHz	$f \leq 1$ GHz	± 4.80 dB
	$f > 1$ GHz	± 5.70 dB
Radiated Emissions below 960 MHz	-	± 4.80 dB

* Coverage factor $k = 2$, Confidence levels of 95 %

4.3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature	+15 °C to +35 °C
Relative humidity	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar

5. TEST EQUIPMENTS

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/11/2019	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/18/2019	Annual	100584
Schwarzbeck	BBHA 9170 / Horn Antenna	11/29/2019	Biennial	BBHA9170541
Schwarzbeck	BBHA 9120D / Horn Antenna	11/18/2018	Biennial	9120D-1191
Keysight	N9030B / PXA Signal Analyzer	03/27/2019	Annual	MY55480167
Agilent	N9020A / MXA Signal Analyzer	08/21/2019	Annual	MY46471250
H.P.	11636B / Power Divider	03/26/2019	Annual	09601
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
Rohde&Schwarz	FSP / Spectrum Analyzer	09/11/2019	Annual	836650/016
Emco	2090 / Controller	N/A	N/A	060520
Ets	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	01/18/2019	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	08/31/2018	Biennial	9168-0895
Schwarzbeck	BBHA 9120D / Horn Antenna	11/18/2018	Biennial	9120D-1191
CERNEX	CBL18265035 / Power Amplifier	12/26/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/18/2019	Annual	25956

6. TEST RESULT

6.1. -10 dB BANDWIDTH

Test Requirement:

FCC Rules

§ 15.250 Operation of wideband systems within the band 5925-7250 MHz

- (a) The -10 dB bandwidth of a device operating under the provisions of this section must be contained within the 5925-7250 MHz band under all conditions of operation including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.
- (b) The -10 dB bandwidth of the fundamental emission shall be at least 50 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the -10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency following the provisions of § 15.31(m).

ISED Rules

RSS-220 Devices Using Ultra-Wideband (UWB) Technology.

2. General Information

A UWB device is an intentional radiator that has either a -10 dB bandwidth of at least 500 MHz or a -10 dB fractional bandwidth greater than 0.2.

5. Communication Devices Using UWB Technology

5.1 General Requirements and Specifications

The following general provisions apply to both indoor and hand-held communication devices.

- a. The -10 dB bandwidth of the device shall be totally contained in the band 3.1-10.6 GHz.
- b. The antenna of the UWB device shall be factory-installed and shall not be made modifiable by users.

Annex - Measurement of Transmission Levels from Devices Using UWB Technology

2. Definitions

"-10 dB bandwidth B-10" and "-10 dB fractional bandwidth μ -10" are defined as follows:

$$B-10 = f_H - f_L$$

$$\mu-10 = B-10/f_c$$

where:

f_M is the frequency of maximum UWB transmission;

f_H is the highest frequency at which the power spectral density of the UWB transmission is -10 dB relative to f_M ;

f_L is the lowest frequency at which the power spectral density of the UWB transmission is -10 dB relative to f_M ; and

$f_c = (f_H + f_L)/2$ is the centre frequency of the -10 dB bandwidth.

Test Procedures:

Measurements were in accordance with the test methods section 10.1 of ANSI C63.10-2013.

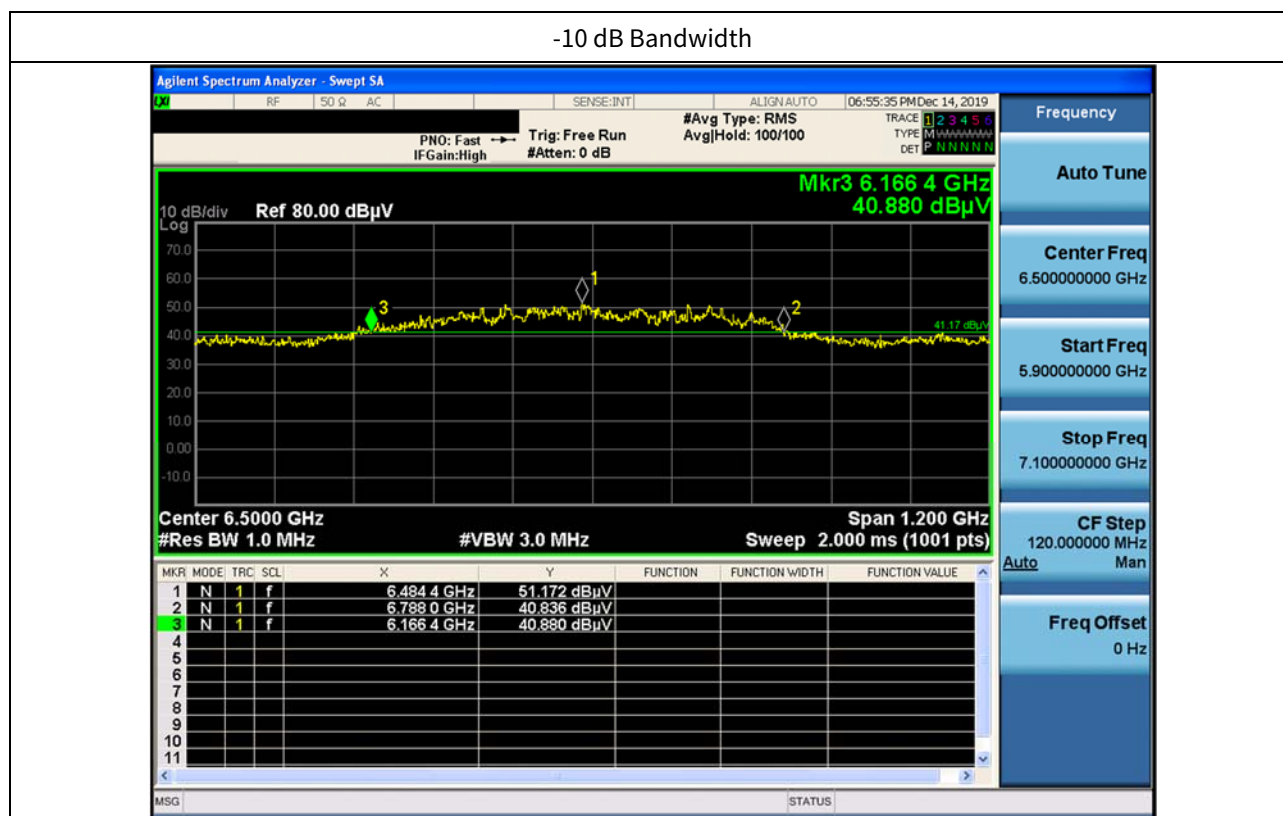
A UWB transmitter is defined as “an intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.”

The frequency at which the maximum power level is measured with the peak detector is designated f_m . The peak power measurements shall be made using a spectrum analyzer or EMI receiver with a 1 MHz resolution bandwidth and a video bandwidth of 1 MHz or greater. The instrument shall be set to peak detection using the maximum-hold trace mode. The outermost 1 MHz segments above and below f_m , where the peak power falls by 10 dB relative to the level at f_m , are designated as f_H and f_L , respectively:

- a) For the lowest frequency bound f_L , the emission is searched from a frequency lower than f_m that has, by inspection, a peak power much lower than 10 dB less than the power at f_m and increased toward f_m until the peak power indicates 10 dB less than the power at f_m . The frequency of that segment is recorded.
- b) This process is repeated for the highest frequency bound f_H , beginning at a frequency higher than f_m that has, by inspection, a peak power much lower than 10 dB below the power at f_m . The frequency of that segment is recorded.
- c) The two recorded frequencies represent the highest f_H and lowest f_L bounds of the UWB transmission, and the -10 dB bandwidth (B - 10) is defined as $(f_H - f_L)$. The center frequency (f_c) is mathematically determined from $(f_H - f_L) / 2$.
- d) The fractional bandwidth is defined as $2(f_H - f_L) / (f_H + f_L)$.
- e) Determine whether the -10 dB bandwidth $(f_H - f_L)$ is ≥ 500 MHz, or whether the fractional bandwidth $2(f_H - f_L) / (f_H + f_L)$ is ≥ 0.2 .

Test Results:

Operating Mode	Test Frequency (MHz)	Measurement item	Measured Bandwidth (MHz)	Limit
UWB	6 500.0	f_M	6 484.4	between 3100 MHz and 10,600 MHz.
		f_H	6 788.0	
		f_L	6 166.4	
		f_c	6 477.2	
	-10 dB Bandwidth ($f_H - f_L$)	621.6	≥ 500 MHz	



6.2. PEAK POWER

Test Requirement:

FCC Rules

§ 15.250 Operation of wideband systems within the band 5925-7250 MHz

- (3) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs and this 50 MHz bandwidth must be contained within the 5925-7250 MHz band. The peak EIRP limit is $20 \log(RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than RBW. If RBW is greater than 3 MHz, the application for certification filed with the Commission shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

ISED Rules

RSS-220 Devices Using Ultra-Wideband (UWB) Technology.

Annex - Measurement of Transmission Levels from Devices Using UWB Technology

2. Definitions

Peak power: the peak level of transmission contained within a 50 MHz bandwidth centred on the frequency at which the highest average radiated power occurs (f_M). If a resolution bandwidth (RBW) other than 50 MHz is employed, the peak e.i.r.p. limit shall be $20 \log(RBW/50)$ dBm where RBW is in units of megahertz.

Test Procedures:

Measurements were in accordance with the test methods section 10.3.5, 10.3.6 of ANSI C63.10-2013.

10.3.5 Peak power measurement

The spectral characterization of a UWB device shall begin with a peak-detected radiated measurement because the results obtained from this measurement could preclude the need for subsequent average measurements. For example, if the data collected from the peak-power measurement show that the radiated emissions levels are equal to, or less than, the applicable emissions limit, then these data are adequate to determine compliance. This is predicated on the fact that the average levels are always less than, or equal to, the peak signal level.

The peak detector of the instrument is selected and the maximum hold feature activated. The RBW is set to 1 MHz and the VBW is set to at least 1 MHz (3 MHz is recommended).

10.3.6 Bandwidth conversion of peak power measurements

It is acceptable to employ an RBW of less than 50 MHz (but no less than 1 MHz) when performing the required peak power measurements. When this approach is employed, the peak emissions EIRP limit (0 dBm / 50 MHz) is converted to a limit commensurate with the RBW by employing a $[20 \log (RBW/50 \text{ MHz})]$ relationship. For example, the peak power limit could be expressed in a 1 MHz bandwidth as follows in Equation:

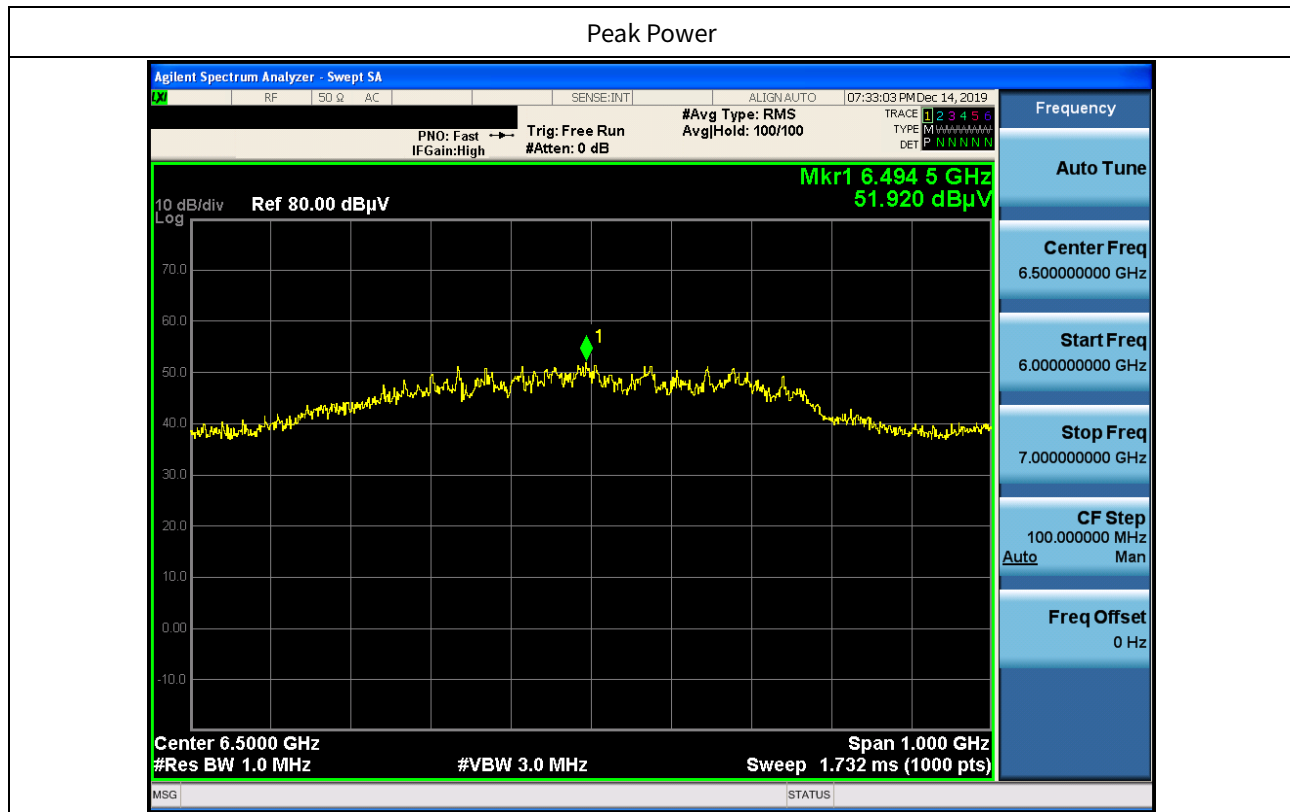
$$EIRP_{1 \text{ MHz}} = EIRP_{50 \text{ MHz}} + 20\log(1 \text{ MHz} / 50 \text{ MHz}) = 0 \text{ dBm} + (-34 \text{ dB}) = -34 \text{ dBm}$$

When a resolution bandwidth of less than 50 MHz is used, this measurement shall be performed over a 50 MHz span centered on the frequency associated with the highest detected average emission level.

Test Results:

Operating Mode	Test Frequency (MHz)	Measured Level (dBuV)	Measured Power (dBm)	Combination Factor	Result (dBm)	Limit (dBm)
UWB	6 500.00	51.92	-43.28	7.86	-35.42	-33.98

* Combination Factor: Antenna Factor + Cable Loss - Amp. Gain + Distance Factor



6.3. RADIATED EMISSIONS ABOVE 960 MHz

Test Requirement:

FCC Rules

§ 15.250 Operation of wideband systems within the band 5925-7250 MHz

- (1) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following RMS average limits based on measurements using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960-1610	−75.3
1610-1990	−63.3
1990-3100	−61.3
3100-5925	−51.3
5925-7250	−41.3
7250-10600	−51.3
Above 10600	−61.3

- (2) In addition to the radiated emission limits specified in the table in paragraph (d)(1) of this section, transmitters operating under the provisions of this section shall not exceed the following RMS average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	−85.3
1559-1610	−85.3

ISED Rules

RSS-Gen

6.13.2 Frequency range for measuring unwanted emission

Table 2 – Frequency range for radiated measurement for equipment with a digital device	
Highest frequency generated in the equipment (MHz)	Upper frequency limit of measurement range (MHz)
< 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
> 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower
< 1.705	30

It is not necessary to report the amplitude of spurious emissions attenuated more than 20 dB below the permissible value.

RSS-220 Devices Using Ultra-Wideband (UWB) Technology.

5.2.1 Standard Specifications

- d. Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Indoor Communication, Measurement, Location Sensing, and Tracking Devices	
Frequency	E.i.r.p. in a Resolution Bandwidth of 1 MHz
960-1 610 MHz	-75.3 dBm
1.61-4.75 GHz	-70.0 dBm
4.75-10.6 GHz	-41.3 dBm
Above 10.6 GHz	-51.3 dBm

- e. In addition to the limits specified in paragraph (d) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth greater than or equal to 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Frequency	E.i.r.p. in a Resolution Bandwidth of 1 kHz
1 164-1 240 MHz	-85.3 dBm
1 559-1 610 MHz	-85.3 dBm

- f. Within the tables in paragraphs (d) and (e) above, the tighter emission limit applies at the band edges.
- g. The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

Test Procedures:

Measurements were in accordance with the test methods section 10.3.7 of ANSI C63.10-2013.

The following procedure shall be used for evaluating rms-average power spectral density:

- a) Set the RBW to 1 MHz.
- b) Set the VBW to be at least 1 MHz (a VBW of 3 MHz is desirable).
- c) Set the frequency span to examine the spectrum across a convenient frequency segment (e.g., 600 MHz).
- d) Select the power averaging (rms) detector.
- e) Set the sweep time so that there is no more than a 1 ms integration period over each measurement bin.

Many older instruments use a default value of approximately 600 bins per scan. Assuming this value, a sweep time of 600 ms provides the required 1 ms integration period within each measurement bin. The number of measurement bins can be specified with many modern instruments, providing many other possible combinations of sweep time and number of measurement bins that also result in adherence to the 1 ms maximum integration time requirement. The rms-average power spectral density is the highest integrated power detected within a 1 MHz RBW over a 1 ms integration period.

Test Results:

Tabular data of Radiated Spurious Emissions above 960 MHz (1 MHz RBW)

Operating Mode	Test Frequency (MHz)	Measured Frequency (MHz)	Measured Level (dBuV)	Measured Power (dBm)	Combination Factor	Result (dBm)	Limit (dBm)	
							FCC	ISED
UWB	6 500.00	1 035.50	45.36	-49.84	-31.52	-81.36	-75.30	-75.30
		1 617.50	43.40	-51.80	-28.97	-80.77	-63.30	-70.00
		2 023.50	43.10	-52.10	-27.49	-79.59	-61.30	-70.00
		6 489.50	35.86	-59.34	7.88	-51.46	-41.30	-41.30
		14 529.50	31.92	-63.28	-4.02	-67.30	-51.30	-51.30
		29 140.00	73.67	-21.53	-60.10	-81.63	-61.30	-51.30

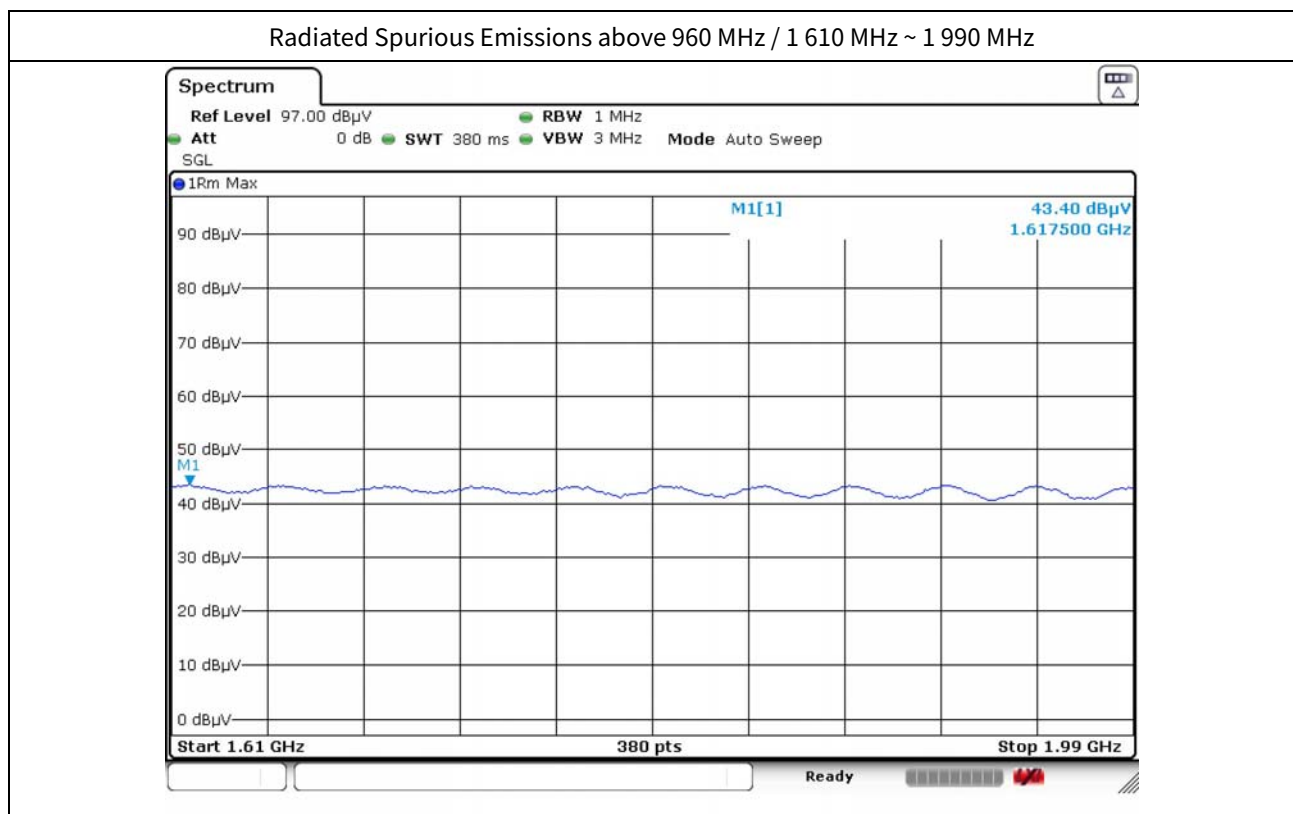
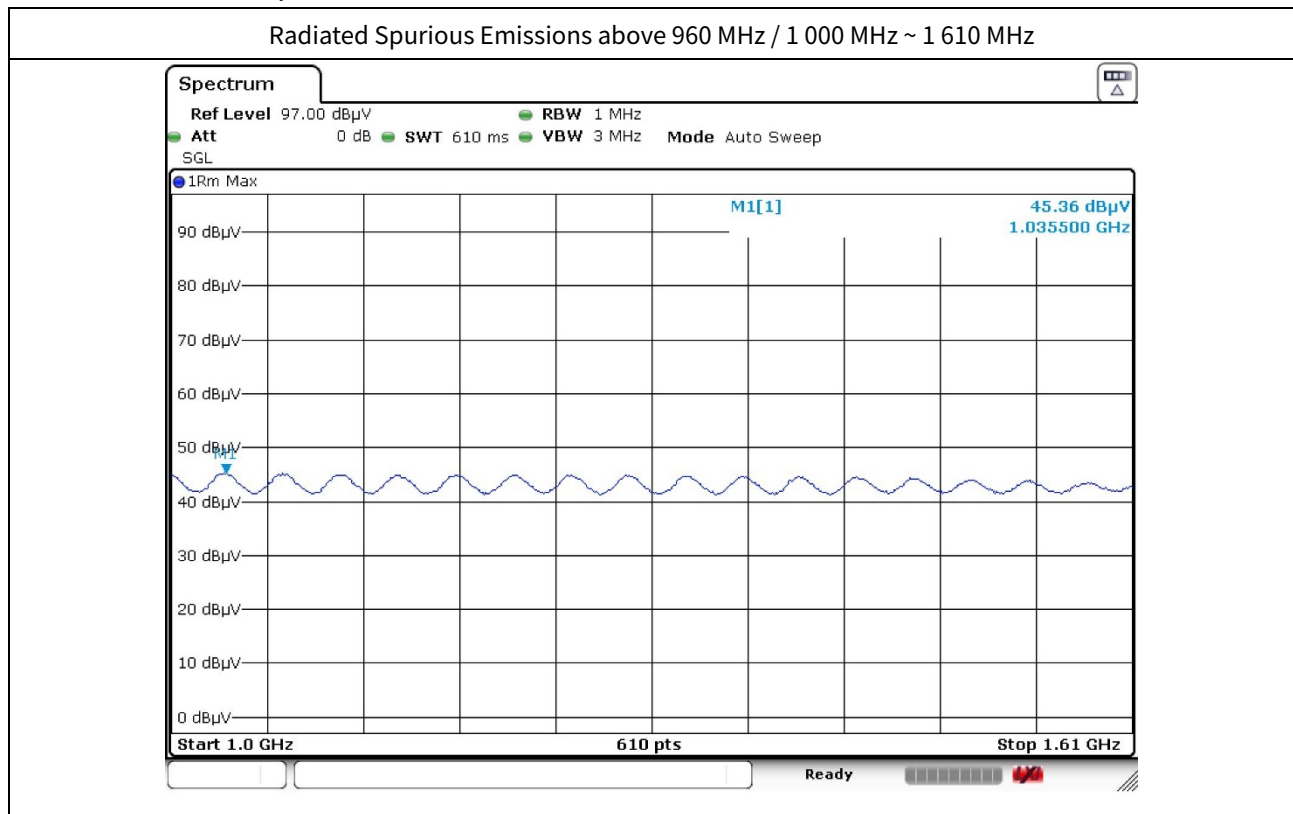
* Combination Factor: Antenna Factor + Cable Loss - Amp. Gain + Distance Factor

Tabular data of Radiated Spurious Emissions in the 1164-1240 MHz, 1559-1610 MHz (1 kHz RBW)

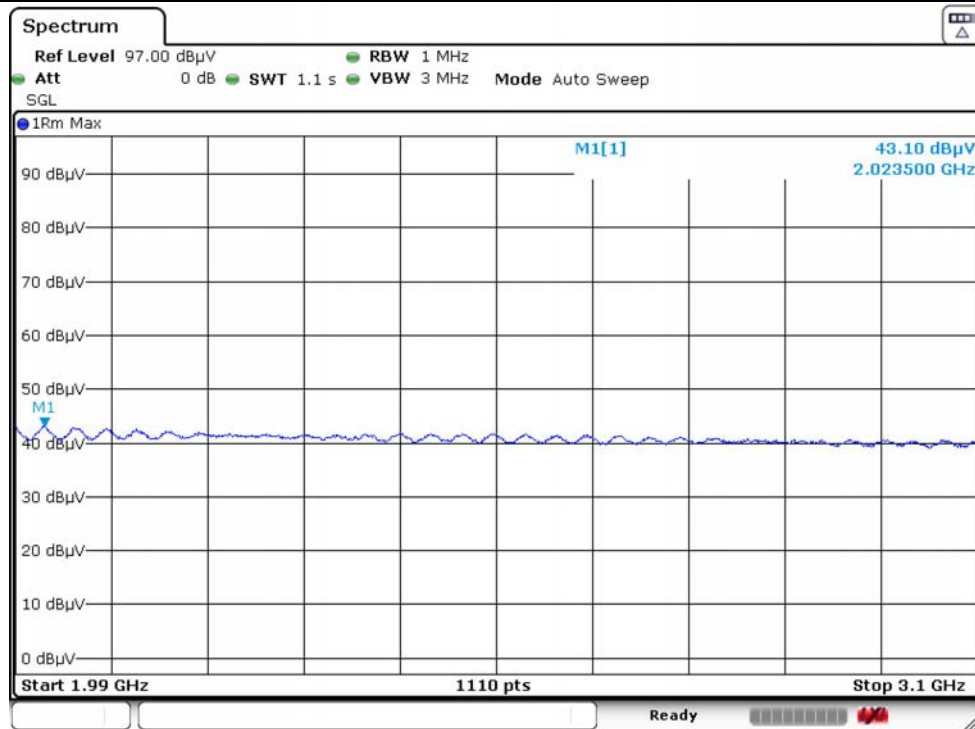
Operating Mode	Test Frequency (MHz)	Measured Frequency (MHz)	Measured Level (dBuV)	Measured Power (dBm)	Combination Factor	Result (dBm)	Limit (dBm)
UWB	6 500.00	1 176.03	68.79	-26.41	-65.32	-91.73	-85.30
		1 617.50	43.40	-27.18	-64.13	-91.31	-85.30

* Combination Factor: Antenna Factor + Cable Loss - Amp. Gain + Distance Factor

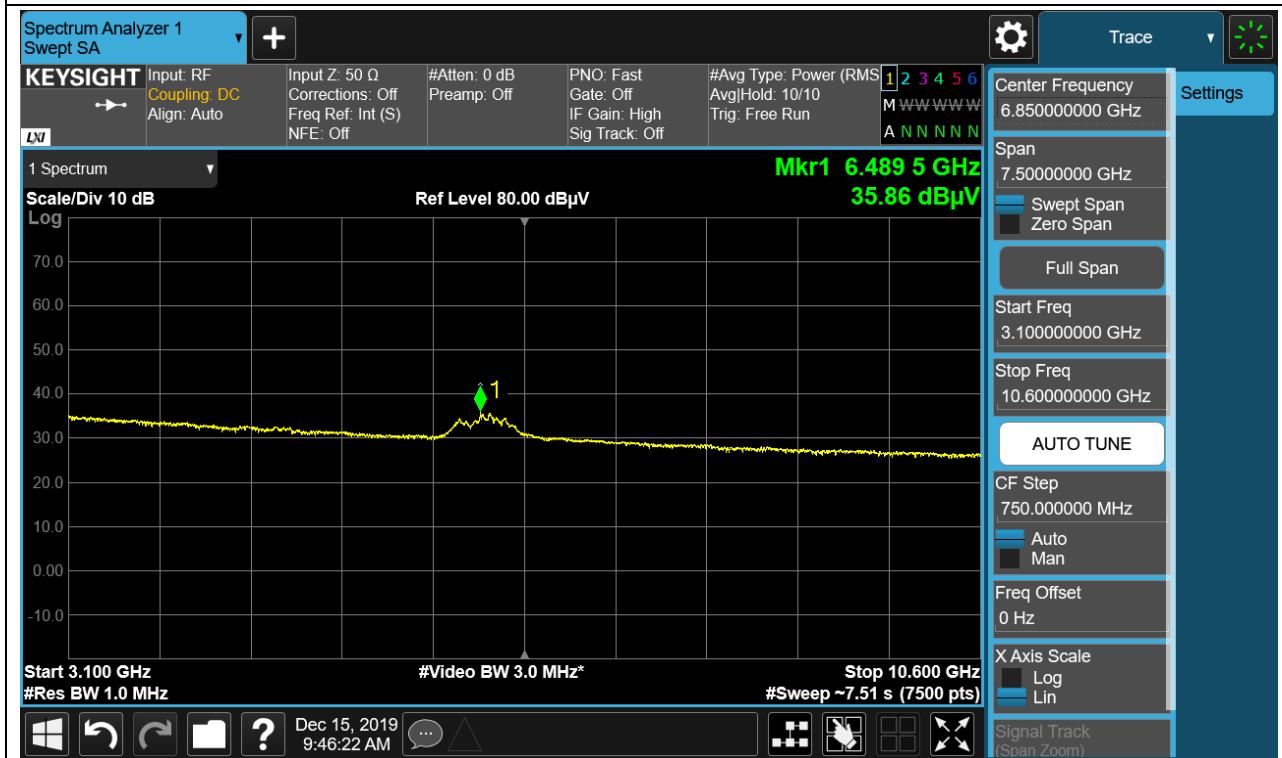
Plot data of Radiated Spurious Emissions above 960 MHz



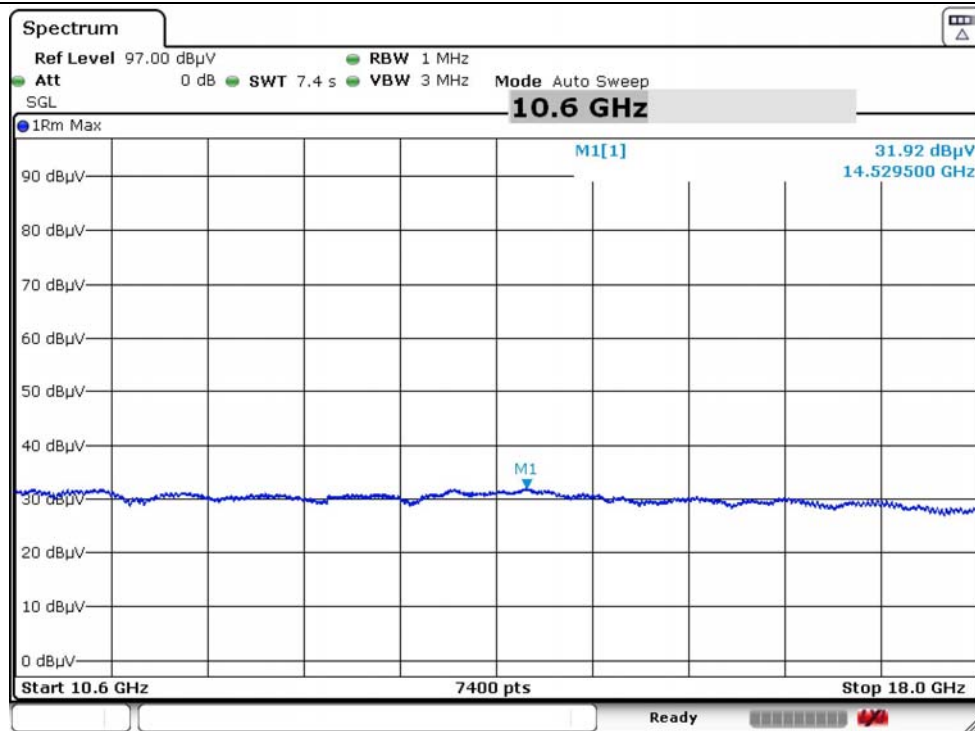
Radiated Spurious Emissions above 960 MHz / 1 990 MHz ~ 3 100 MHz



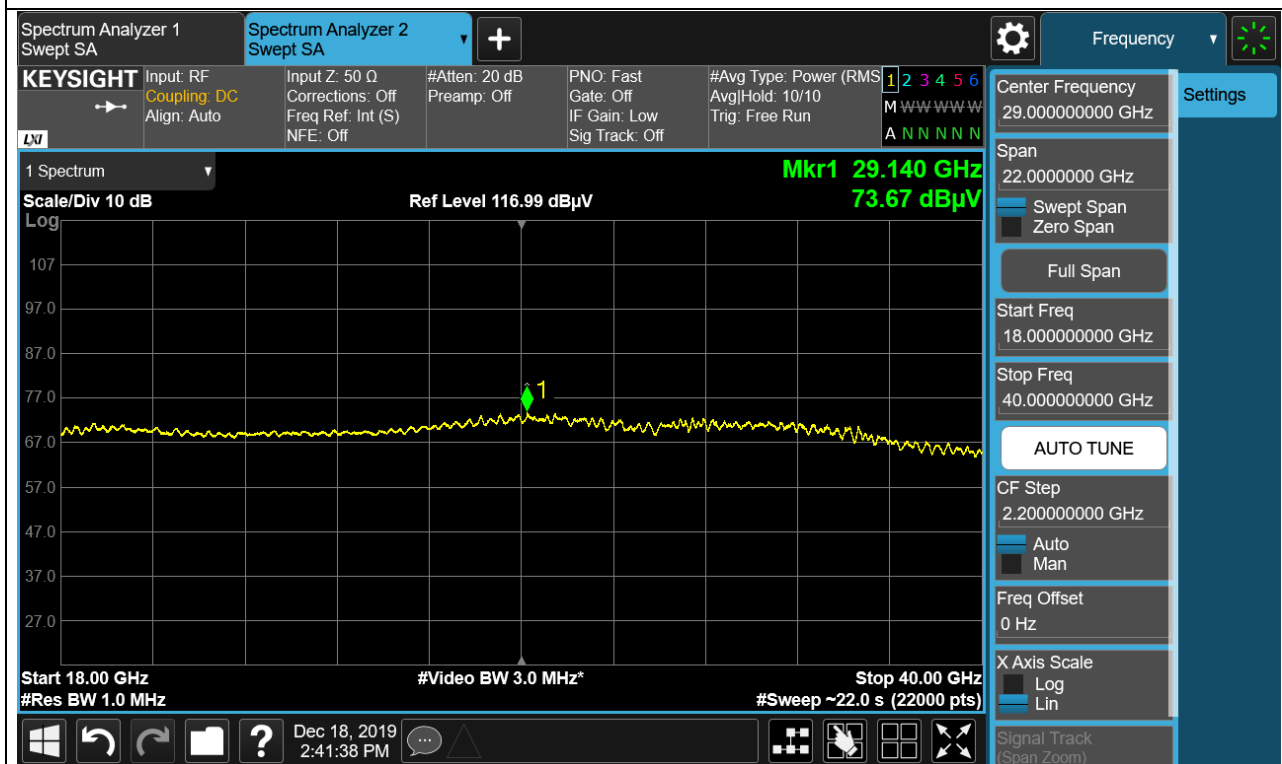
Radiated Spurious Emissions above 960 MHz / 3 100 MHz ~ 10 600 MHz



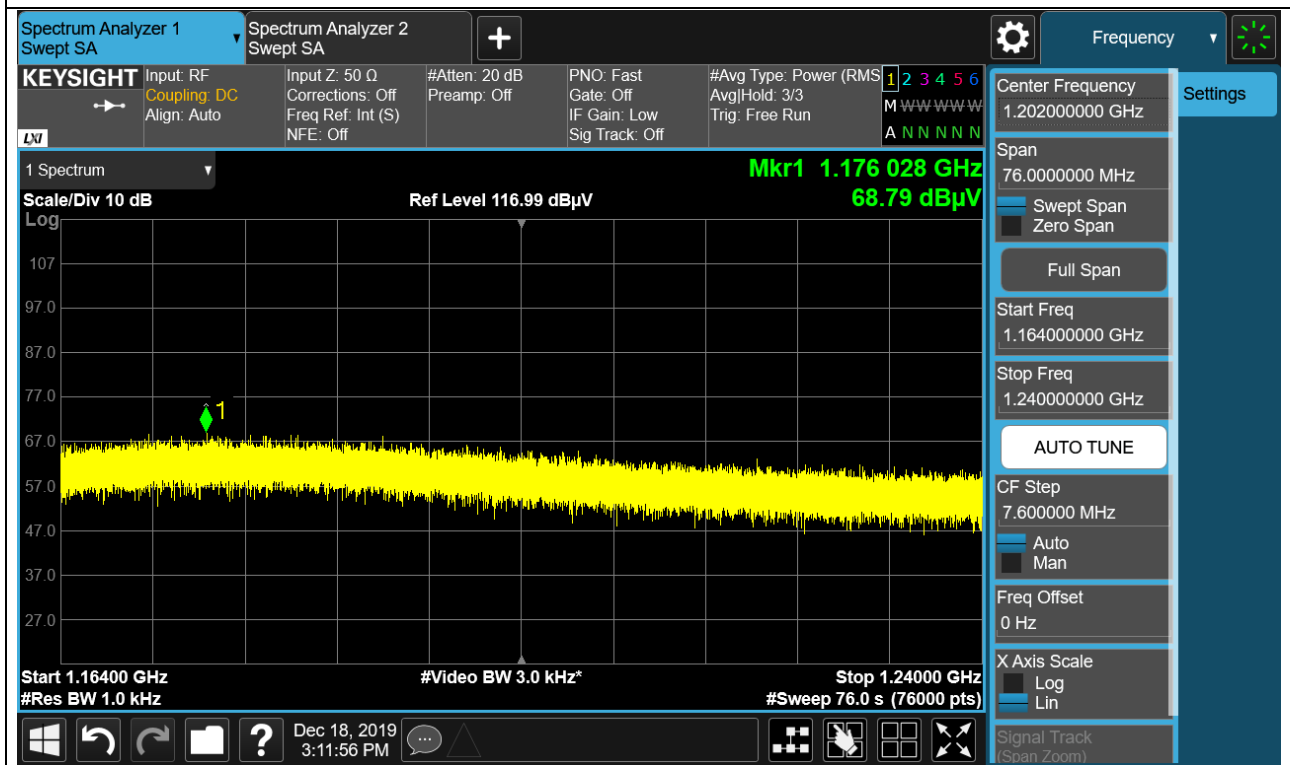
Radiated Spurious Emissions above 960 MHz / 10 600 MHz ~ 18 000 MHz



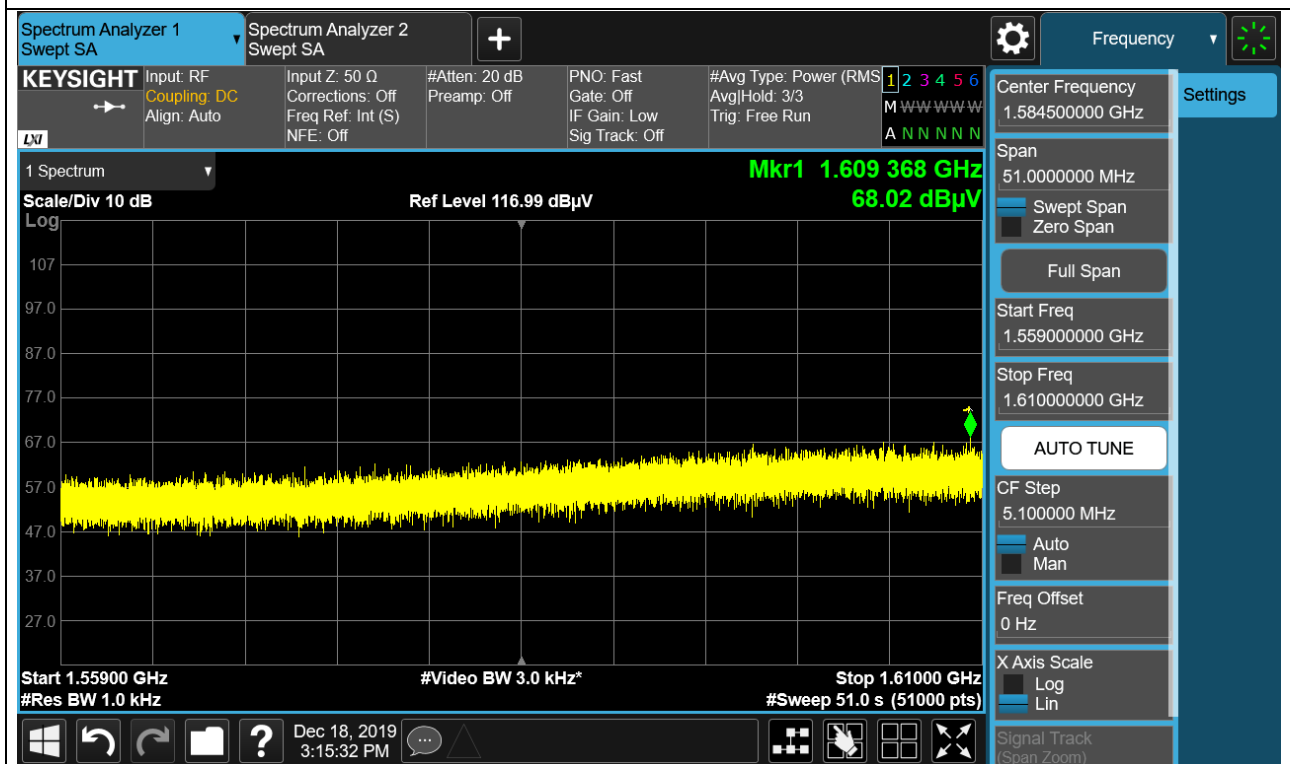
Radiated Spurious Emissions above 960 MHz / 18 000 MHz ~ 40 000 MHz



Radiated Spurious Emissions in the 1164-1240 MHz / 1 164 MHz ~ 1 240 MHz



Radiated Spurious Emissions in the 1559-1610 MHz / 1 559 MHz ~ 1 610 MHz



Receiver Spurious Emissions Test Result:

ISED Rule(s):

RSS-Gen

Test Requirements:

Blow the table

Operating conditions:

Under normal test conditions

Method of testing:

Radiated

F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak)

S/A. Settings:

F > 1 GHz: RBW: 1 MHz, VBW: 1 MHz (Peak)

Mode of operation:

Receive

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receive:

Above 960 MHz

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

6.4. RADIATED EMISSIONS BELOW 960 MHz

Test Requirement:

FCC Rules

§ 15.209 Radiated emission limits; general requirements.

- (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)	Field strength (microvolts/meter)	Measurement distance (meters)
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 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

However, operation within these frequency bands is permitted under other sections of this part, e.g., § 15.231 and 15.241.

- (b) In the emission table above, the tighter limit applies at the band edges.

§ 15.250 Operation of wideband systems within the band 5925-7250 MHz

- (4) The Radiated emissions at or below 960 MHz shall not exceed the emission levels in § 15.209.

ISED Rules

RSS-Gen

6.13.2 Frequency range for measuring unwanted emission

Table 2 – Frequency range for radiated measurement for equipment with a digital device	
Highest frequency generated in the equipment (MHz)	Upper frequency limit of measurement range (MHz)
< 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
> 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower
< 1.705	30

It is not necessary to report the amplitude of spurious emissions attenuated more than 20 dB below the permissible value.

RSS-220 Devices Using Ultra-Wideband (UWB) Technology.

3.4 Radiated Emissions at or Below 960 MHz

Radiated emissions at or below 960 MHz for all subclasses of UWB device shall not exceed the following limits.

Measurements of radiated emissions at and below 960 MHz are to be made using a CISPR quasi-peak detector.

CISPR measurement bandwidth specifications are to be used.

Frequency (MHz)	Field Strength (Microvolts/m)	Measurement Distance (Metres)	E.i.r.p. (dBmW)
0.009-0.490	2400/F (F in kHz)	300	10 log (17.28 / F ²) (F in kHz)
0.490-1.705	24000/F (F in kHz)	30	10 log (17.28 / F ²) (F in kHz)
1.705-30	30	30	-45.7
30-88	100	3	-55.2
88-216	150	3	-51.7
216-960	200	3	-49.2

Test Procedures:

Measurements were in accordance with the test methods section 10.2 of ANSI C63.10-2013.

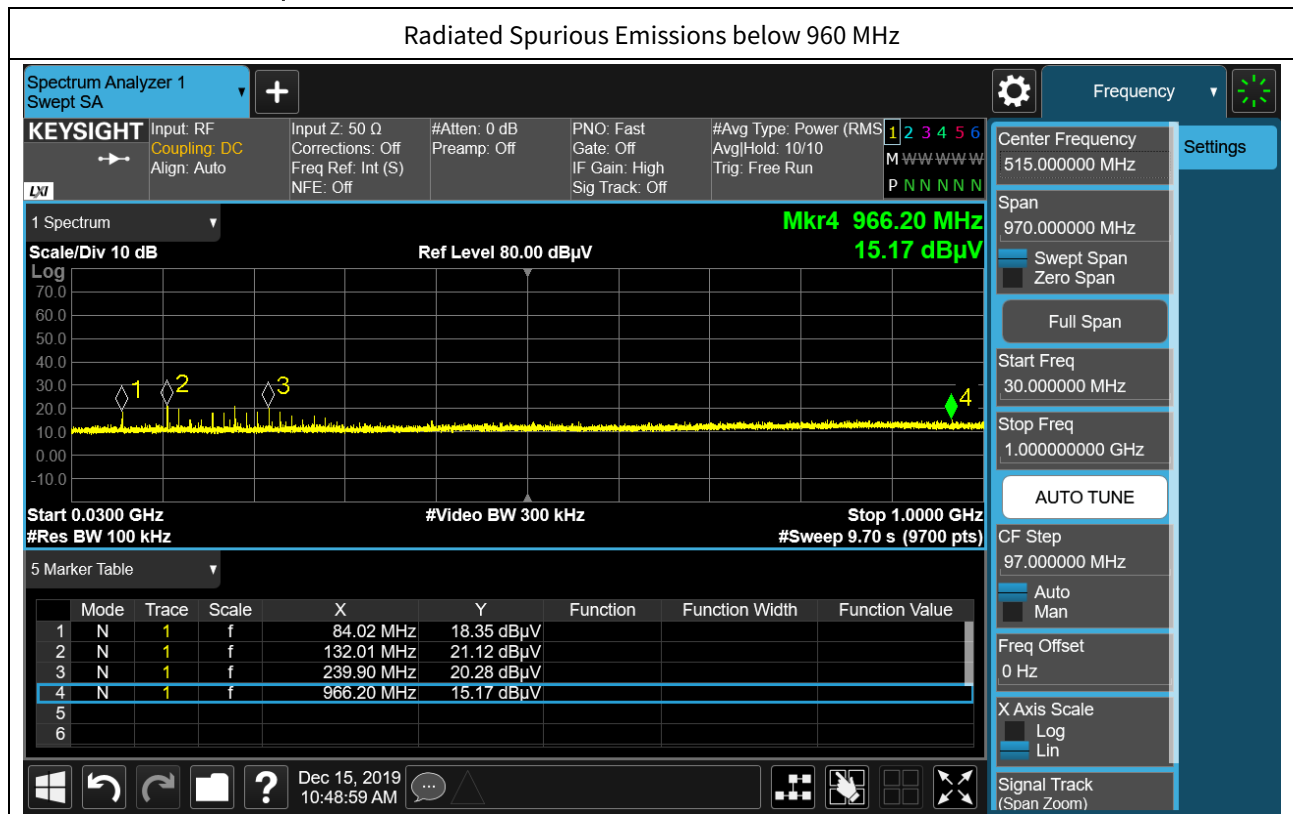
Test Results:

Tabular data of Radiated Spurious Emissions below 960 MHz

Operating Mode	Test Frequency (MHz)	Measured Frequency (MHz)	Measured Level (dBuV)	Combination Factor	Result (dBuV/m)	Limit (dBuV/m)
UWB	6 500.00	84.02	18.35	16.06	34.41	40.00
		132.01	21.12	21.06	42.18	43.52
		239.90	20.28	20.86	41.14	46.02
		966.20	15.17	34.90	50.07	53.98

* Combination Factor: Antenna Factor + Cable Loss + Distance Factor

Plot data of Radiated Spurious Emissions below 960 MHz



Receiver Spurious Emissions Test Result:**ISED Rule(s):****RSS-Gen****Test Requirements:****Blow the table****Operating conditions:****Under normal test conditions****Method of testing:****Radiated****S/A. Settings:****F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak)****Mode of operation:****Receive**

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receive:

Below 1 GHz

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

6.5. AC POWER-LINE CONDUCTED EMISSIONS

Test Requirement:

FCC Rules

§ 15.207 Conducted limits.

- (a) Except as shown in paragraphs (b) and (c) of this section, 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 Ω /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. strength levels specified in the following table:

Frequency Range (MHz)	Limits (dB μ V)	
	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.

ISED Rules

RSS-Gen

8.8 AC Power-line conducted emissions limits

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 Ω / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Frequency Range (MHz)	Limits (dB μ V)	
	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

*The level decreases linearly with the logarithm of the frequency.

Test Results:

Conducted Emissions (Line 1)

UWB_L1

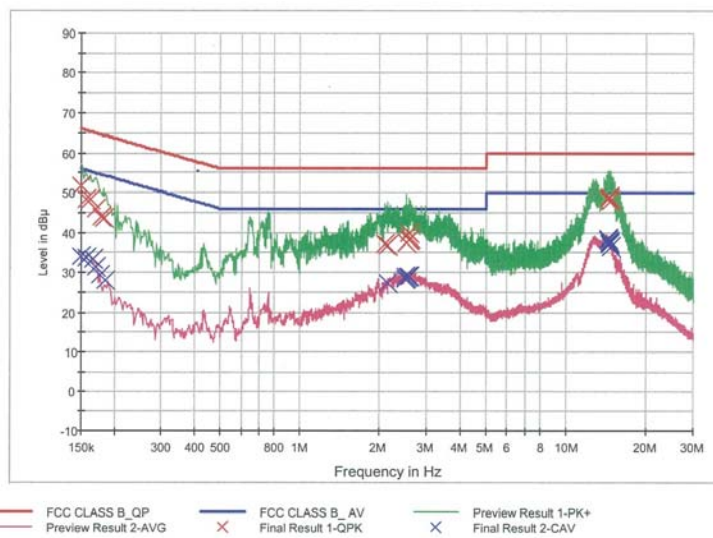
1 / 2

HCT TEST Report

Common Information

EUT: LCU-001
 Manufacturer: LG
 Test Site: SHIELD ROOM
 Operating Conditions: UWB L1

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	51.7	9.000	On	L1	9.7	14.3	66.0
0.158000	48.3	9.000	On	L1	9.7	17.2	65.6
0.162000	48.4	9.000	On	L1	9.7	17.0	65.4
0.170000	45.9	9.000	On	L1	9.7	19.1	65.0
0.178000	44.0	9.000	On	L1	9.7	20.6	64.6
0.182000	43.7	9.000	On	L1	9.7	20.7	64.4
2.092000	37.1	9.000	On	L1	9.8	18.9	56.0
2.124000	36.9	9.000	On	L1	9.8	19.1	56.0
2.506000	37.4	9.000	On	L1	9.8	18.6	56.0
2.576000	39.8	9.000	On	L1	9.8	16.2	56.0
2.584000	38.1	9.000	On	L1	9.8	17.9	56.0
2.614000	38.6	9.000	On	L1	9.8	17.4	56.0
14.296000	48.4	9.000	On	L1	10.0	11.6	60.0
14.328000	48.4	9.000	On	L1	10.0	11.6	60.0
14.536000	48.7	9.000	On	L1	10.0	11.3	60.0
14.554000	48.9	9.000	On	L1	10.0	11.1	60.0
14.582000	48.7	9.000	On	L1	10.0	11.3	60.0
14.772000	48.1	9.000	On	L1	10.0	11.9	60.0

2020-01-23

오후 1:36:22

UWB_L1

2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	34.0	9.000	On	L1	9.7	22.0	56.0
0.158000	33.7	9.000	On	L1	9.7	21.8	55.6
0.166000	33.3	9.000	On	L1	9.7	21.9	55.2
0.170000	31.5	9.000	On	L1	9.7	23.5	55.0
0.176000	29.4	9.000	On	L1	9.7	25.3	54.7
0.186000	28.0	9.000	On	L1	9.7	26.2	54.2
2.124000	27.4	9.000	On	L1	9.8	18.6	46.0
2.478000	28.8	9.000	On	L1	9.8	17.2	46.0
2.486000	28.4	9.000	On	L1	9.8	17.6	46.0
2.506000	28.7	9.000	On	L1	9.8	17.3	46.0
2.542000	28.9	9.000	On	L1	9.8	17.1	46.0
2.576000	28.8	9.000	On	L1	9.8	17.2	46.0
14.344000	38.2	9.000	On	L1	10.0	11.8	50.0
14.432000	38.6	9.000	On	L1	10.0	11.4	50.0
14.452000	37.9	9.000	On	L1	10.0	12.1	50.0
14.536000	37.6	9.000	On	L1	10.0	12.4	50.0
14.582000	37.3	9.000	On	L1	10.0	12.8	50.0
14.778000	36.5	9.000	On	L1	10.0	13.5	50.0

2020-01-23

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Conducted Emissions (Line 2)

UWB N

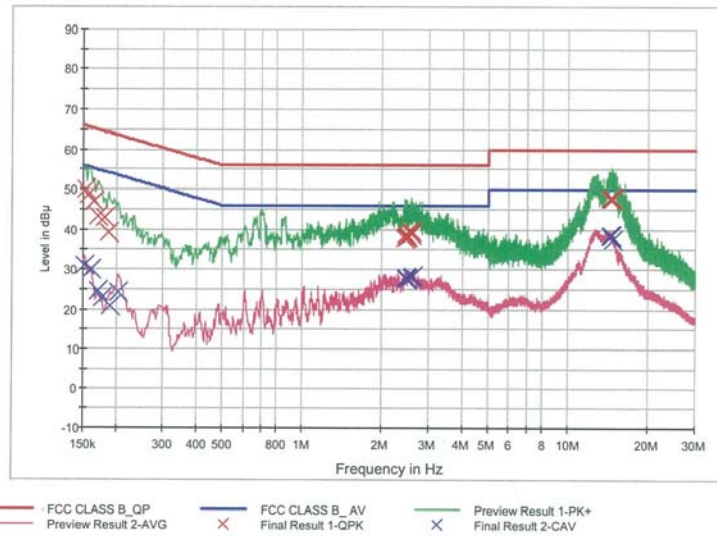
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HCT TEST Report

Common Information

EUT: LCU-001
 Manufacturer: LG
 Test Site: SHIELD ROOM
 Operating Conditions: UWB N

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.154000	49.8	9.000	On	N	9.7	15.9	65.8
0.158000	48.5	9.000	On	N	9.7	17.1	65.6
0.164000	47.0	9.000	On	N	9.7	18.3	65.3
0.170000	43.1	9.000	On	N	9.7	21.8	65.0
0.180000	42.8	9.000	On	N	9.7	21.7	64.5
0.188000	39.1	9.000	On	N	9.7	25.0	64.1
2.440000	37.7	9.000	On	N	9.8	18.3	56.0
2.446000	38.9	9.000	On	N	9.8	17.1	56.0
2.450000	38.0	9.000	On	N	9.8	18.0	56.0
2.484000	38.2	9.000	On	N	9.8	17.8	56.0
2.558000	38.8	9.000	On	N	9.8	17.2	56.0
2.574000	39.6	9.000	On	N	9.8	16.4	56.0
14.374000	47.5	9.000	On	N	10.0	12.5	60.0
14.458000	47.8	9.000	On	N	10.0	12.2	60.0
14.612000	47.8	9.000	On	N	10.0	12.2	60.0
14.660000	47.6	9.000	On	N	10.0	12.4	60.0
14.714000	47.5	9.000	On	N	10.0	12.5	60.0
14.730000	47.7	9.000	On	N	10.0	12.3	60.0

2020-01-23

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UWB N

2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	31.1	9.000	On	N	9.7	24.7	55.9
0.160000	29.8	9.000	On	N	9.7	25.6	55.5
0.170000	24.6	9.000	On	N	9.7	30.4	55.0
0.176000	22.7	9.000	On	N	9.7	31.9	54.7
0.190000	20.8	9.000	On	N	9.7	33.3	54.0
0.204000	24.1	9.000	On	N	9.7	29.3	53.4
2.446000	28.0	9.000	On	N	9.8	18.0	46.0
2.450000	27.7	9.000	On	N	9.8	18.3	46.0
2.460000	27.9	9.000	On	N	9.8	18.1	46.0
2.484000	27.7	9.000	On	N	9.8	18.3	46.0
2.574000	27.9	9.000	On	N	9.8	18.1	46.0
2.608000	28.2	9.000	On	N	9.8	17.8	46.0
14.374000	38.3	9.000	On	N	10.0	11.7	50.0
14.454000	38.4	9.000	On	N	10.0	11.6	50.0
14.458000	38.4	9.000	On	N	10.0	11.6	50.0
14.660000	37.6	9.000	On	N	10.0	12.4	50.0
14.688000	37.4	9.000	On	N	10.0	12.6	50.0
14.730000	37.3	9.000	On	N	10.0	12.7	50.0

2020-01-23

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7. Annex A_EUT AND TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2001-FI002-P