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FCC/IC BT REPORT

FCC/IC Class II Permissive Change

Applicant Name:
LG Electronics MobileComm U.S.A., Inc.

Address:
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Date of Issue:
March 11, 2016
Test Site/Location:
HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,Majang-myeo,Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-R-1603-F060
HCT FRN: 0005866421
IC Recognition No.: 5944A-5

FCC ID	**:ZNFR105**
IC	**:2703C-R105**
APPLICANT	**:LG Electronics MobileComm U.S.A., Inc.**

FCC/IC Model(s):	LG-R105
EUT Type:	360 Camera
Frequency Range:	2402 MHz - 2480 MHz (Bluetooth)
Modulation type	GFSK(Normal), π/4DQPSK and 8DPSK(EDR)
FCC Classification:	FCC Part 15 Spread Spectrum Transmitter
FCC Rule Part(s):	Part 15 subpart C 15.247
IC Rule Part(s):	RSS-247 Issue 1 (May 2015) , RSS-GEN Issue 4(November 2014)
Note :	The device, LG-R105 is electrically identical for conducted characteristic compare to original LG-R105(report No. HCT-R-1602-F055), confirmed by spot-check tests. Therefore, the conducted test result data is provided in the report No. HCT-R-1602-F055.

The measurements shown in this report were made in accordance with the procedures specified in §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by
: Kyung Soo Kang
Test Engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1603-F060	March 11, 2016	- First Approval Report

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1. GENERAL INFORMATION

Applicant:	LG Electronics MobileComm U.S.A., Inc
Address:	1000 Sylvan Avenue, Englewood Cliffs NJ 07632
FCC ID:	ZNFR105
IC:	2703C-R105
EUT Type:	360 Camera
FCC/IC Model name(s):	LG-R105
Date(s) of Tests:	February 17, 2016 ~ March 08, 2016
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea (IC Recognition No. : 5944A-5)

2. EUT DESCRIPTION

FCC/ IC Model Name	LG-R105
EUT Type	360 Camera
Power Supply	DC 3.7 V
Frequency Range	2402 MHz - 2480 MHz (Bluetooth)
BT Operating Mode	Normal, EDR, AFH
Modulation Type	GFSK(Normal), π/4DQPSK and 8DPSK(EDR)
Modulation Technique	FHSS
Number of Channels	79Channels, Minimum 20 Channels(AFH)
Antenna Specification	Manufacturer: Ace Technology Antenna type: Internal ANTENNA Peak Gain : -0.98 dBi

※ 15.247 Requirements for Bluetooth transmitter

▪ This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:

1) This system is hopping pseudo-randomly.

2) Each frequency is used equally on the average by each transmitter.

3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters

4) The receiver shifts frequencies in synchronization with the transmitted signals.

▪ 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.

▪ 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

3. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) is used in the measurement of the **LG Electronics MobileComm U.S.A., Inc 360 Camera FCC ID: ZNFR105 IC:2703C-R105**

3.1 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.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose 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 / the RSS-GEN issue 4, RSS-247 issue 1.

3.3 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 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 8 of ANSI C63.10. (Version: 2013). To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120 kHz for frequencies below 1 GHz or 1 MHz for frequencies above 1 GHz. For average measurements above 1 GHz, the analyzer was set to peak detector with a reduced VBW setting(RBW = 1 MHz, VBW = 1/T Hz, where T = Pulse width).

Conducted Antenna Terminal

See Section from 7.8.2 to 7.8.8.(ANSI 63.10-2013)

3.4 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.
Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

4. 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 equipments, which is traceable to recognized national standards.
All equipments(spectrum, antenna, accessory, etc.) for measurement is calibrated in accordance with the requirements of C63.5 (latest edition).

5. FACILITIES AND ACCREDITATIONS

5.1 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, 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 July 07, 2015 (Registration Number: 90661) / June 22, 2015 (IC Registration Number: 5944A-5)

5.2 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. 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.”

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203 / RSS-GEN(Issue 4) Section 8.3:

“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 / RSS-GEN

7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

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)	6.07

8. SUMMARY OF TEST RESULTS

8.1 FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	cf. Section 8.6.2	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 8.6.3		PASS

8.2 IC Part

Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
Radiated Spurious Emissions	RSS-GEN, 8.9	RSS-GEN section 8.9 table 4, 5	RADIATED	PASS
Radiated Restricted Band Edge	RSS-GEN, 8.10	RSS-GEN section 8.10 table 6		PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.1.2	RSS-GEN section 7.1.2 table 2		PASS

9. RADIATED MEASUREMENT

9.1 RADIATED SPURIOUS EMISSIONS

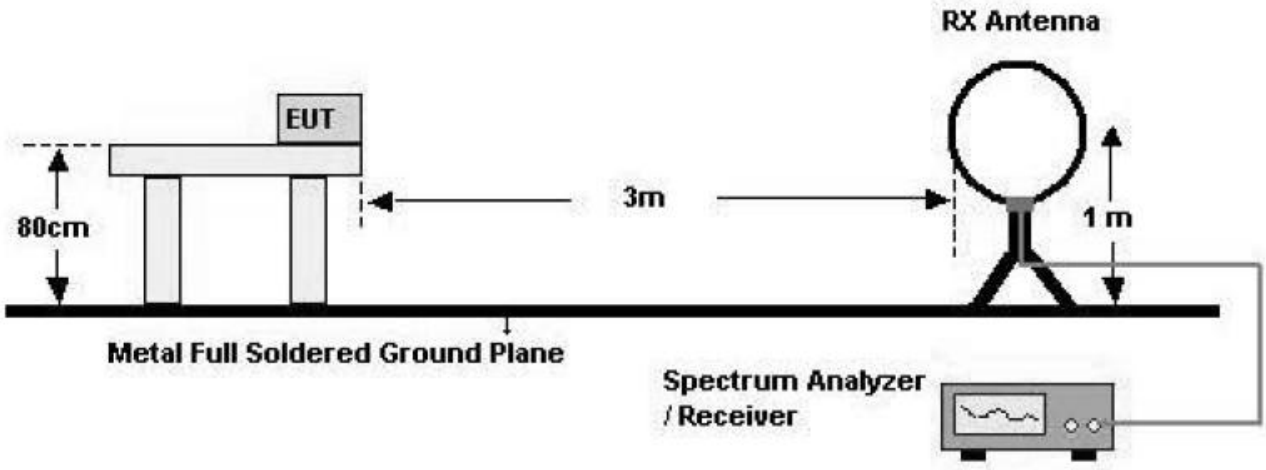
LIMIT : §15.247(d), §15.205, §15.209 / RSS-GEN(Issue 4) Section 8.9

1. 20dBc in any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

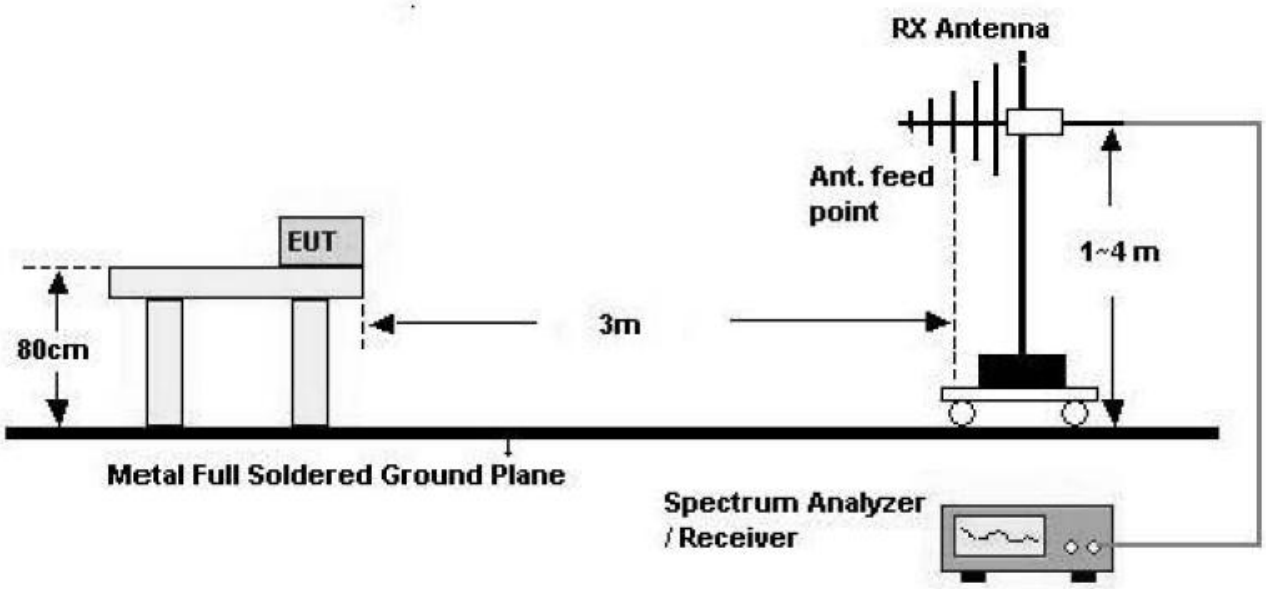
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

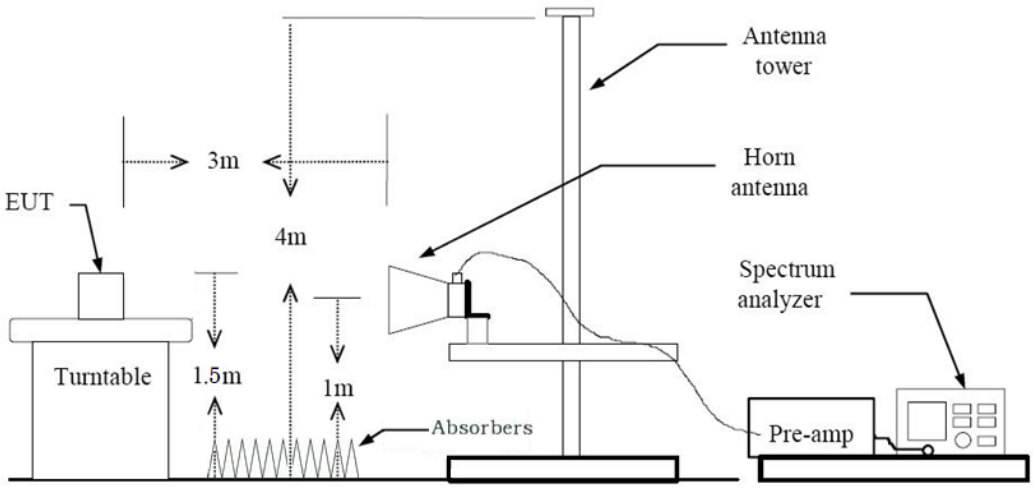
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Spectrum Setting
   a. Peak: 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥3*RBW
   b. Average: 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.

Note :

1. We are performed the RSE and radiated band edge using standard radiated method.
2. The duty cycle factor for BT mode.

BT Mode	T_{on} (ms)	VBW(1/T) (Hz)	The actual setting value of VBW (Hz)
	2.885	347	1000
	2.890	346	1000

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

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

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. This test is performed with hopping off.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

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

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. This test is performed with hopping off.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz

Operation Mode: CH Low(GFSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	52.22	0.11	V	52.33	73.98	21.65	PK
4804	43.48	0.11	V	43.59	53.98	10.39	AV
7206	49.00	6.86	V	55.86	73.98	18.12	PK
7206	35.34	6.86	V	42.20	53.98	11.78	AV
4804	52.97	0.11	H	53.08	73.98	20.90	PK
4804	44.54	0.11	H	44.65	53.98	9.33	AV
7206	49.04	6.86	H	55.90	73.98	18.08	PK
7206	35.38	6.86	H	42.24	53.98	11.74	AV

Operation Mode: CH Low(8DPSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	51.67	0.11	V	51.78	73.98	22.20	PK
4804	40.21	0.11	V	40.32	53.98	13.66	AV
7206	48.85	6.86	V	55.71	73.98	18.27	PK
7206	35.27	6.86	V	42.13	53.98	11.85	AV
4804	52.53	0.11	H	52.64	73.98	21.34	PK
4804	41.00	0.11	H	41.11	53.98	12.87	AV
7206	48.94	6.86	H	55.8	73.98	18.18	PK
7206	35.30	6.86	H	42.16	53.98	11.82	AV

Operation Mode: CH Low(π/4DQPSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	51.32	0.11	V	51.43	73.98	22.55	PK
4804	40.18	0.11	V	40.29	53.98	13.69	AV
7206	48.89	6.86	V	55.75	73.98	18.23	PK
7206	35.30	6.86	V	42.16	53.98	11.82	AV
4804	51.86	0.11	H	51.97	73.98	22.01	PK
4804	40.99	0.11	H	41.10	53.98	12.88	AV
7206	48.97	6.86	H	55.83	73.98	18.15	PK
7206	35.32	6.86	H	42.18	53.98	11.80	AV

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.
   We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done Normal Mode and EDR Mode test.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode: CH Mid(GFSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	49.03	0.23	V	49.26	73.98	24.72	PK
4882	37.43	0.23	V	37.66	53.98	16.32	AV
7323	48.40	7.06	V	55.46	73.98	18.52	PK
7323	34.55	7.06	V	41.61	53.98	12.37	AV
4882	49.85	0.23	H	50.08	73.98	23.90	PK
4882	38.30	0.23	H	38.53	53.98	15.45	AV
7323	48.47	7.06	H	55.53	73.98	18.45	PK
7323	34.57	7.06	H	41.63	53.98	12.35	AV

Operation Mode: CH Mid(8DPSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	48.91	0.23	V	49.14	73.98	24.84	PK
4882	35.84	0.23	V	36.07	53.98	17.91	AV
7323	48.24	7.06	V	55.30	73.98	18.68	PK
7323	34.50	7.06	V	41.56	53.98	12.42	AV
4882	49.64	0.23	H	49.87	73.98	24.11	PK
4882	36.58	0.23	H	36.81	53.98	17.17	AV
7323	48.42	7.06	H	55.48	73.98	18.50	PK
7323	34.50	7.06	H	41.56	53.98	12.42	AV

Operation Mode: CH Mid(π/4DQPSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	48.97	0.23	V	49.2	73.98	24.78	PK
4882	35.89	0.23	V	36.12	53.98	17.86	AV
7323	48.27	7.06	V	55.33	73.98	18.65	PK
7323	34.53	7.06	V	41.59	53.98	12.39	AV
4882	49.62	0.23	H	49.85	73.98	24.13	PK
4882	36.61	0.23	H	36.84	53.98	17.14	AV
7323	48.44	7.06	H	55.5	73.98	18.48	PK
7323	34.52	7.06	H	41.58	53.98	12.40	AV

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.
   We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done Normal Mode and EDR Mode test.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode: CH High(GFSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	48.59	0.98	V	49.57	73.98	24.41	PK
4960	35.64	0.98	V	36.62	53.98	17.36	AV
7440	49.41	7.69	V	57.1	73.98	16.88	PK
7440	35.58	7.69	V	43.27	53.98	10.71	AV
4960	48.68	0.98	H	49.66	73.98	24.32	PK
4960	35.72	0.98	H	36.7	53.98	17.28	AV
7440	49.46	7.69	H	57.15	73.98	16.83	PK
7440	35.62	7.69	H	43.31	53.98	10.67	AV

Operation Mode: CH High(8DPSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	48.73	0.98	V	49.71	73.98	24.27	PK
4960	35.14	0.98	V	36.12	53.98	17.86	AV
7440	49.33	7.69	V	57.02	73.98	16.96	PK
7440	35.48	7.69	V	43.17	53.98	10.81	AV
4960	48.77	0.98	H	49.75	73.98	24.23	PK
4960	35.22	0.98	H	36.2	53.98	17.78	AV
7440	49.37	7.69	H	57.06	73.98	16.92	PK
7440	35.51	7.69	H	43.2	53.98	10.78	AV

Operation Mode: CH High (π/4DQPSK)

Frequency [MHz]	Reading DBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	48.77	0.98	V	49.75	73.98	24.23	PK
4960	35.18	0.98	V	36.16	53.98	17.82	AV
7440	49.38	7.69	V	57.07	73.98	16.91	PK
7440	35.52	7.69	V	43.21	53.98	10.77	AV
4960	48.81	0.98	H	49.79	73.98	24.19	PK
4960	35.23	0.98	H	36.21	53.98	17.77	AV
7440	49.39	7.69	H	57.08	73.98	16.90	PK
7440	35.54	7.69	H	43.23	53.98	10.75	AV

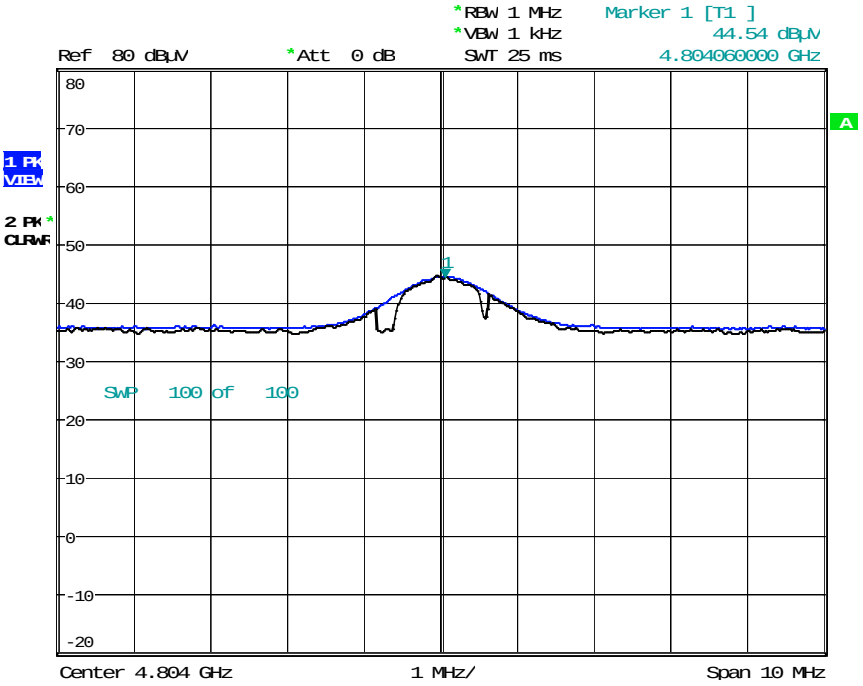
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show 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.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.
   We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done Normal Mode and EDR Mode test.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

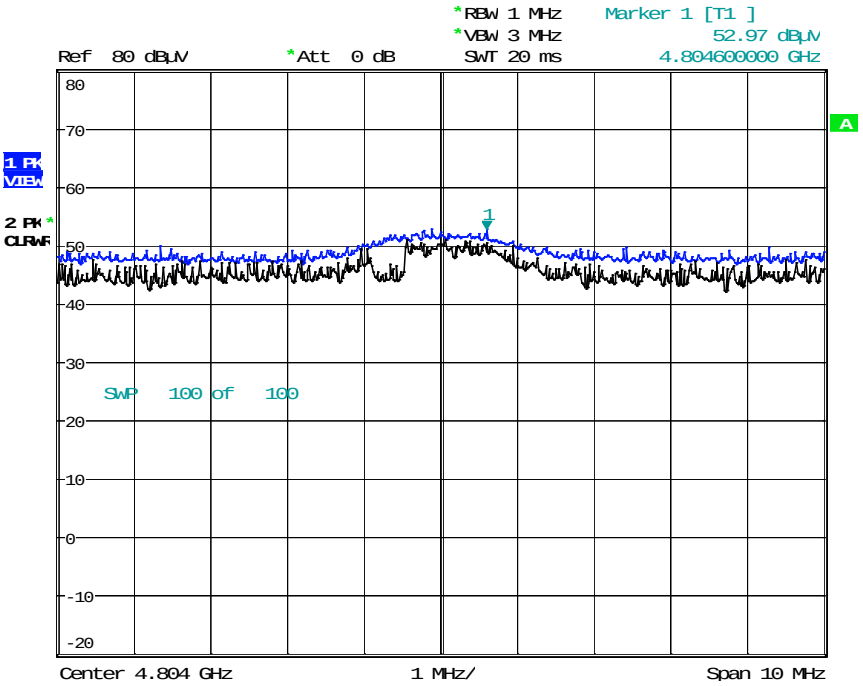
▣ RESULT PLOTS (Worst Case : z-H)

Radiated Spurious Emissions plot – Average Reading (GFSK, Ch. Low 2rd Harmonic)



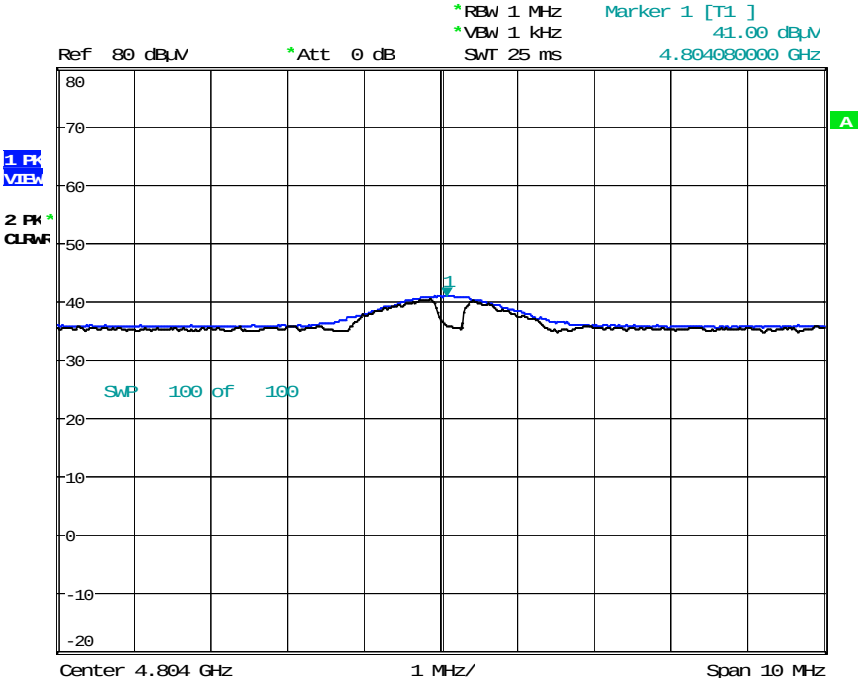
Date: 6.MAR.2016 14:38:30

Radiated Spurious Emissions plot – Peak Reading (GFSK, Ch. Low 2rd Harmonic)



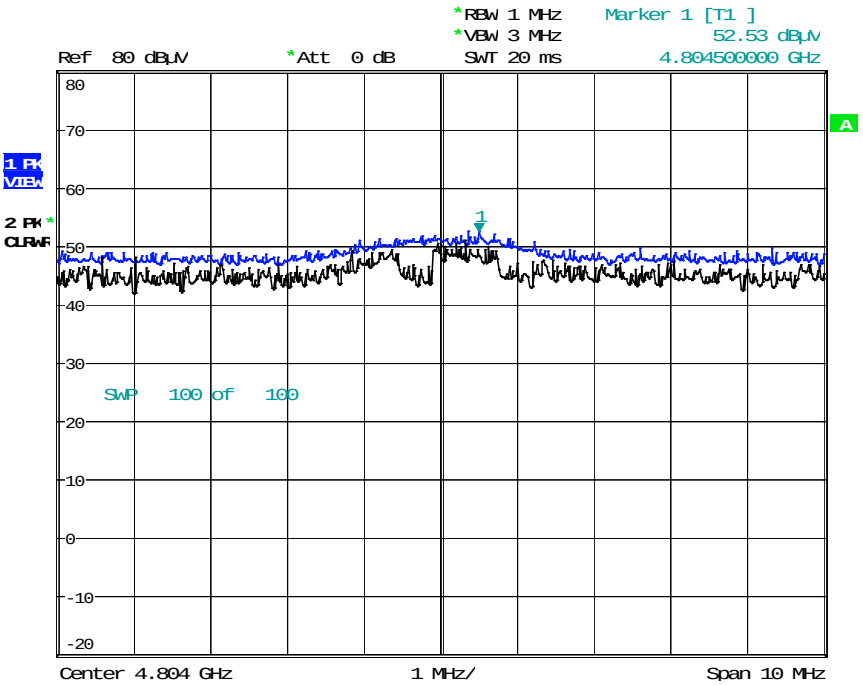
Date: 6.MAR.2016 14:39:29

Radiated Spurious Emissions plot – Average Reading (8DPSK, Ch. Low 2rd Harmonic)



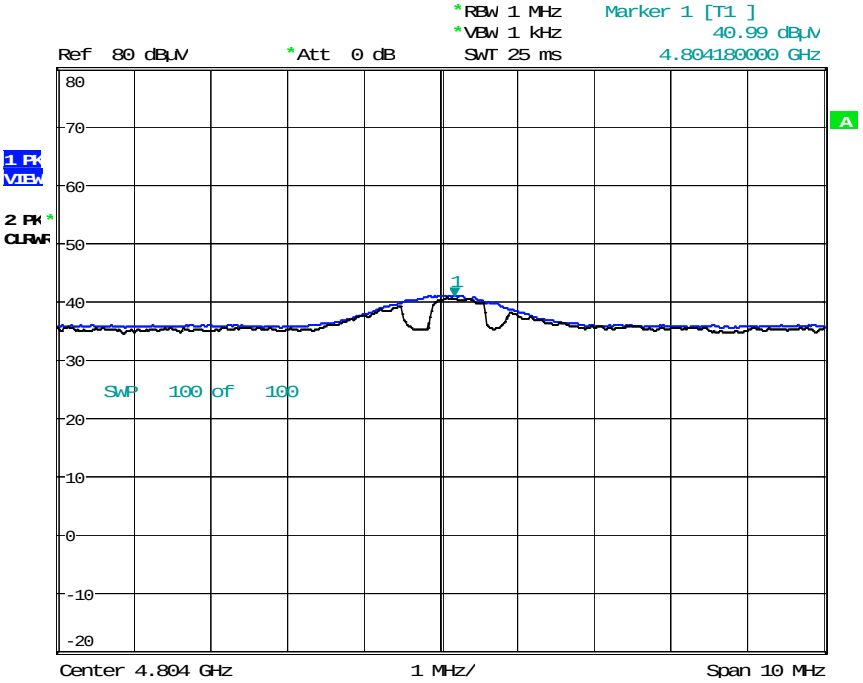
Date: 6.MAR.2016 14:41:33

Radiated Spurious Emissions plot – Peak Reading (8DPSK, Ch. Low 2rd Harmonic)



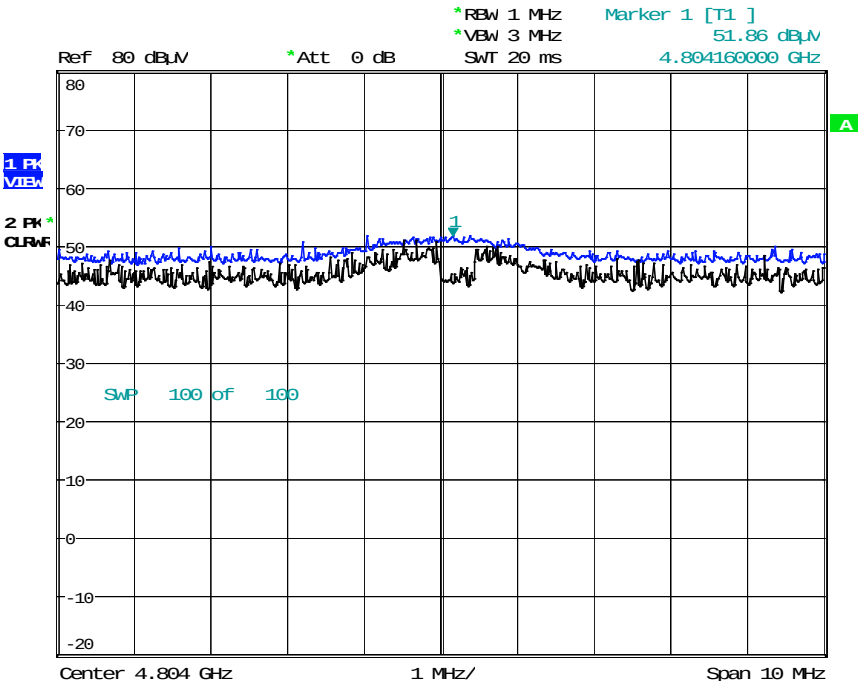
Date: 6.MAR.2016 14:40:58

Radiated Spurious Emissions plot – Average Reading (π/4DQPSK, Ch. High 2rd Harmonic)



Date: 6.MAR.2016 14:42:09

Radiated Spurious Emissions plot – Peak Reading (π/4DQPSK, Ch. High 2rd Harmonic)



Date: 6.MAR.2016 14:40:26

Note : Only the worst case plots for Radiated Spurious Emissions.

9.2 RECEIVER SPURIOUS EMISSIONS

IC 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)** **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:

30 MHz ~ 1 GHz

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

Above 1 GHz

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

9.3 RADIATED RESTRICTED BAND EDGES

Test Requirements and limit, §15.247(d), §15.205, §15.209 / RSS-GEN(Issue 4) Section 8.10

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c).

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	25.22	32.32	H	0	57.54	73.98	16.44	PK
2390.0	12.34	32.32	H	-24.73	19.93	53.98	34.05	AV
2390.0	25.18	32.32	V	0	57.50	73.98	16.48	PK
2390.0	12.24	32.32	V	-24.73	19.83	53.98	34.15	AV
2483.5	33.00	32.68	H	0	65.68	73.98	8.30	PK
2483.5	29.74	32.68	H	-24.73	37.69	53.98	16.29	AV
2483.5	30.67	32.68	V	0	63.35	73.98	10.63	PK
2483.5	27.58	32.68	V	-24.73	35.53	53.98	18.45	AV

Operation Mode EDR(8DPSK)
Operating Frequency 2402 MHz , 2480 MHz
Channel No CH 0, CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	25.34	32.32	H	0	57.66	73.98	16.32	PK
2390.0	12.29	32.32	H	-24.73	19.88	53.98	34.10	AV
2390.0	25.10	32.32	V	0	57.42	73.98	16.56	PK
2390.0	12.20	32.32	V	-24.73	19.79	53.98	34.19	AV
2483.5	33.60	32.68	H	0	66.28	73.98	7.70	PK
2483.5	28.52	32.68	H	-24.73	36.47	53.98	17.51	AV
2483.5	31.32	32.68	V	0	64.00	73.98	9.98	PK
2483.5	26.34	32.68	V	-24.73	34.29	53.98	19.69	AV

Operation Mode EDR(π/4DQPSK)
Operating Frequency 2402 MHz , 2480 MHz
Channel No CH 0, CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	25.38	32.32	H	0	57.70	73.98	16.28	PK
2390.0	12.28	32.32	H	-24.73	19.87	53.98	34.11	AV
2390.0	25.17	32.32	V	0	57.49	73.98	16.49	PK
2390.0	12.22	32.32	V	-24.73	19.81	53.98	34.17	AV
2483.5	33.94	32.68	H	0	66.62	73.98	7.36	PK
2483.5	28.47	32.68	H	-24.73	36.42	53.98	17.56	AV
2483.5	31.50	32.68	V	0	64.18	73.98	9.80	PK
2483.5	26.26	32.68	V	-24.73	34.21	53.98	19.77	AV

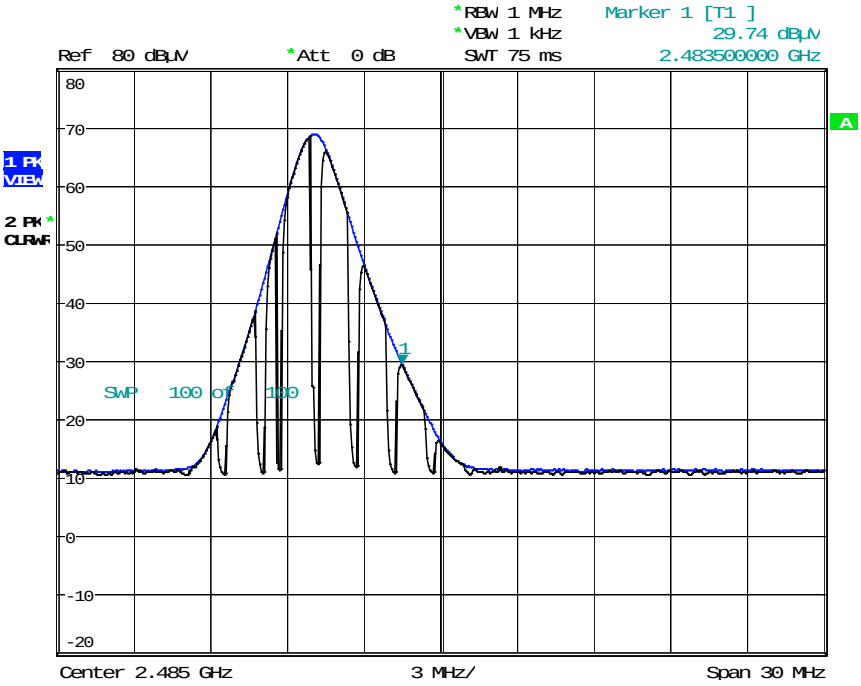
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Frequency range of measurement = 2483.5 MHz ~ 2500 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Duty Cycle Correction Factor
3. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.
   We performed using a reduced video BW method was done with the analyzer in linear mode.
4. FYI : Duty Cycle Correction Factor (79 channel hopping)
   a. Time to cycle through all channels= Δ t= τ [ms] x 79 channels = 229.100 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' =1*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 2.900 ms
   d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB
5. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
   a. Time to cycle through all channels= Δ t= τ [ms] x 20 channels = 58.00 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' = 2*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 5.800 ms
   d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB
   e. We applied DCCF in the test result which hopping channel number is 20.
6. We have done Normal Mode, EDR Mode.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

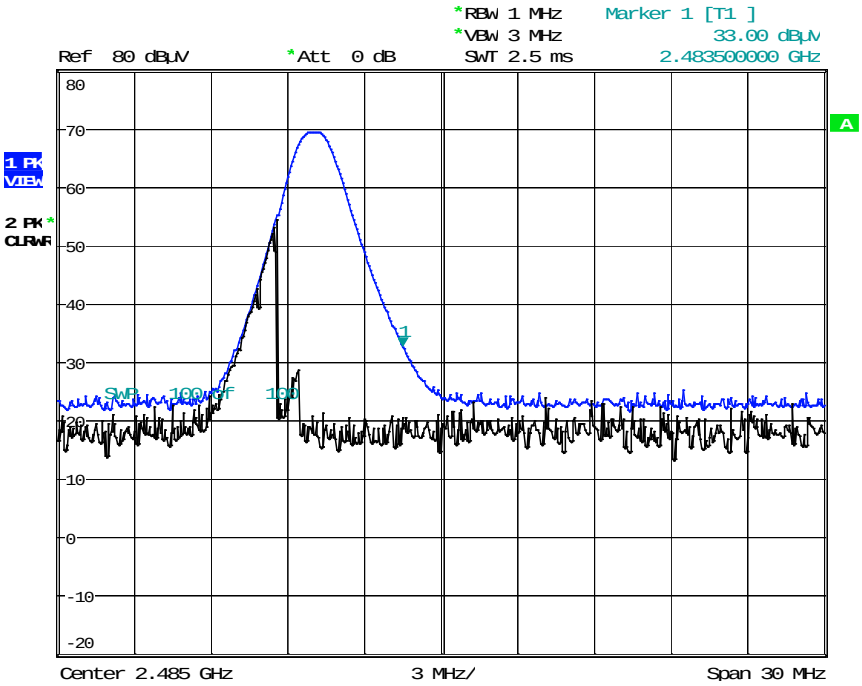
▣ RESULT PLOTS (Worst Case : y-H)

Radiated Restricted Band Edges plot – Average Reading (GFSK, Ch.78)



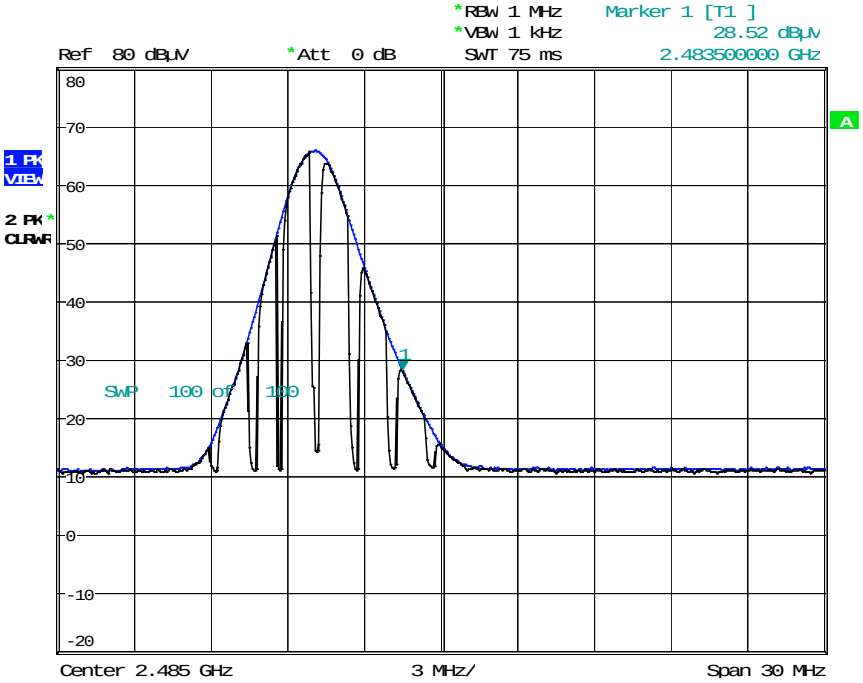
Date: 7.MAR.2016 13:43:52

Radiated Restricted Band Edges plot – Peak Reading (GFSK, Ch.78)



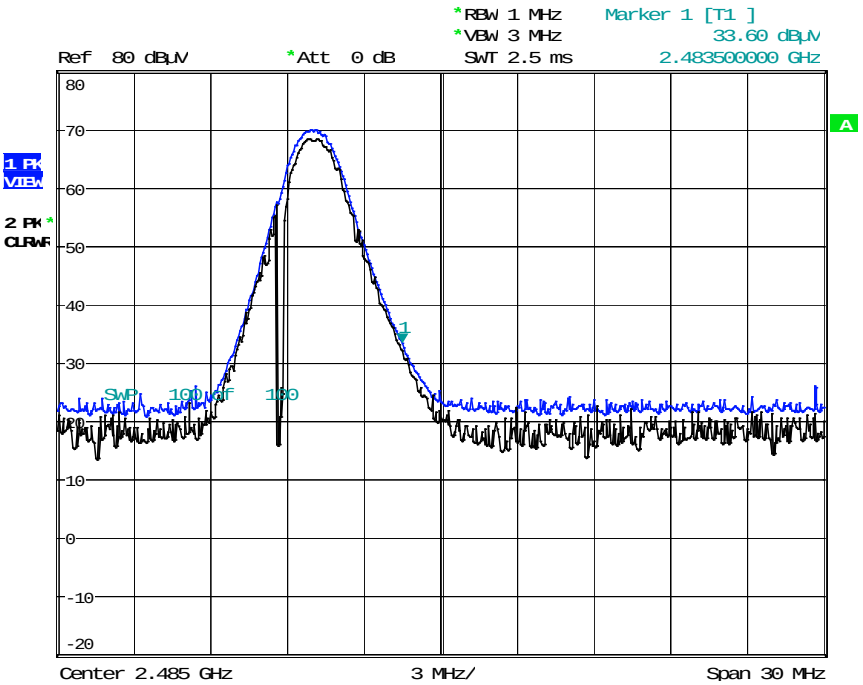
Date: 7.MAR.2016 13:44:35

Radiated Restricted Band Edges plot – Average Reading (8DPSK, Ch.78)



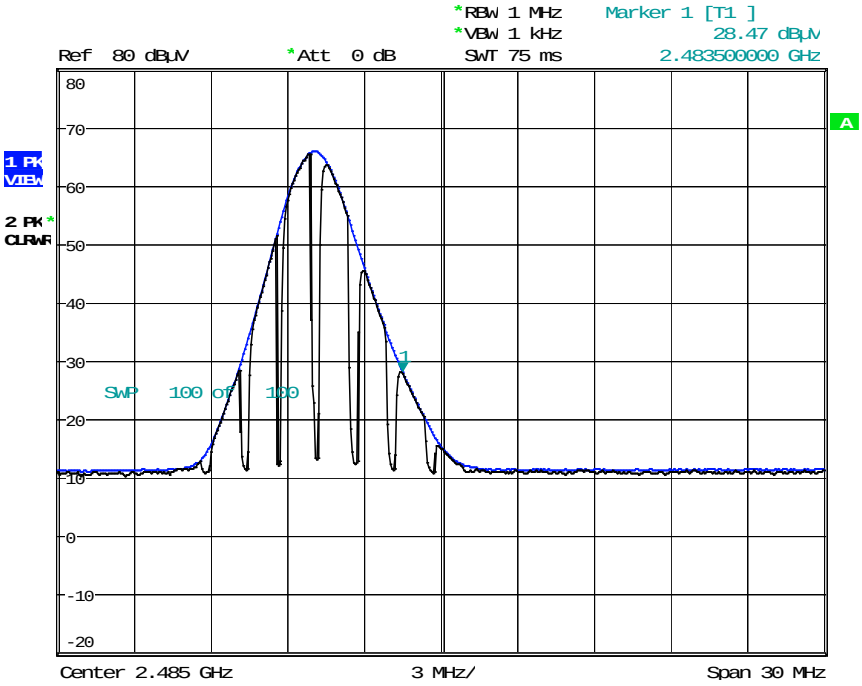
Date: 7.MAR.2016 13:38:37

Radiated Restricted Band Edges plot – Peak Reading (8DPSK, Ch.78)



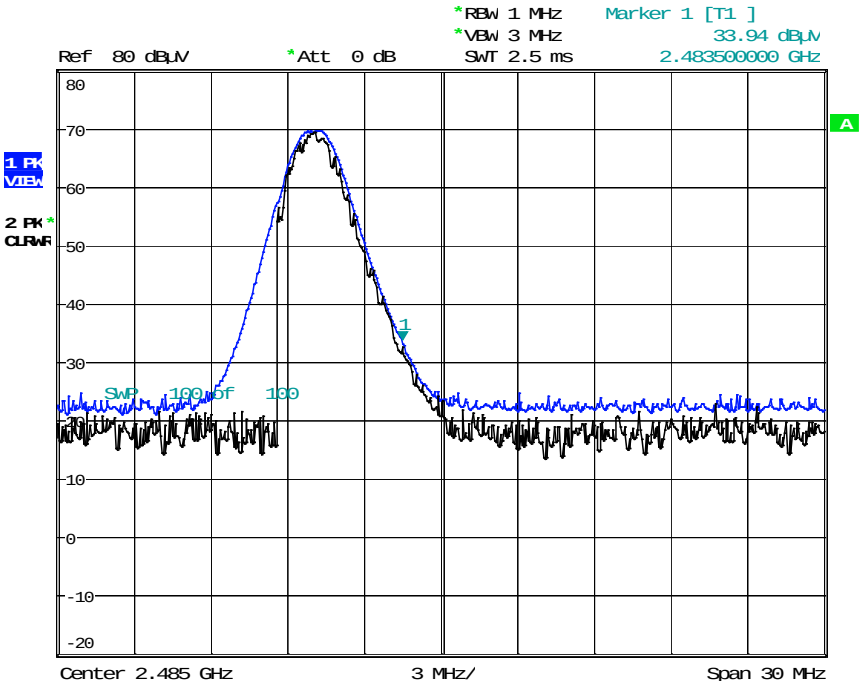
Date: 7.MAR.2016 14:09:16

Radiated Restricted Band Edges plot – Average Reading (π/4DQPSK, Ch.78)



Date: 7.MAR.2016 13:35:46

Radiated Restricted Band Edges plot – Peak Reading (π/4DQPSK, Ch.78)



Date: 7.MAR.2016 14:08:34

Note : Only the worst case plots for Radiated Restricted Band Edges.

10. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Audix	ACT-A400 / Antenna Master	N/A	N/A	N/A
Audix	ACT-T150 / Turn Table	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	C060518
Rohde & Schwarz	Loop Antanna	02/04/2016	Biennial	100179
Schwarzbeck	VULB 9160 / Trilog Antenna	10/10/2014	Biennial	3368
Schwarzbeck	BBHA 9120D / Horn Antenna	07/31/2015	Biennial	1151
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	09/03/2015	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	01/15/2016	Annual	839117/011
Wainwright Instruments	F6_HPF 3.0 / High Pass Filter	09/11/2015	Annual	F6
Wainwright Instruments	WHKX8-6090-7000-18000-40SS / High Pass Filter	09/11/2015	Annual	34
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	07/06/2015	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/26/2016	Annual	2
Weinshel	2-3 / Attenuator(3 dB)	10/26/2015	Annual	BR0617
CERNEX	CBLU1183540B-01 / Low Noise Amplifier	07/21/2015	Annual	25539
Rohde & Schwarz	SCU-18 / Signal Condigioning Unit	09/07/2015	Annual	10094
CERNEX	CBL18265035 / Power Amplifier	07/27/2015	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	07/09/2015	Annual	25956
Rohde & Schwarz	CBT / Bluetooth Tester	05/11/2015	Annual	100422
TESCOM	TC-3000C / Bluetooth Tester	04/07/2015	Annual	3000C000276