

FCC EVALUATION REPORT FOR CERTIFICATION

Applicant: Clipcomm, Inc.

**E.S.T Bldg, 229-15, Nonhyeon-dong, Gangnam-gu,
Seoul, 135-830 South Korea**

Attn: Mr. Tae-Yoon Lim / Assistant Research Engineer

Date of Issue: October 9, 2012

Order Number: GETEC-C1-12-289

Test Report Number: GETEC-E3-12-100

Test Site: GUMI COLLEGE EMC CENTER

FCC Registration Number: (100749, 443957)

FCC ID. : UXZBSH200

Applicant : Clipcomm, Inc.

Rule Part(s) : FCC Part 15 Subpart C-Intentional Radiator § 15.247

Test method : ANSI C63.10 (2009)

Equipment Class : Part 15 Spread Spectrum Transmitter (DSS)

EUT Type : Bluetooth Analog Telephone adapter

Type of Authority : Certification

Model Name : BS-H200

Trade Name : Oticon

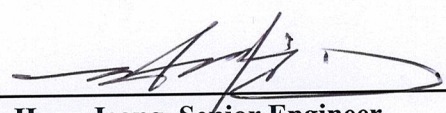
This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4 (2009)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,


Seung-Chul Lee, Associate Engineer
GUMI COLLEGE EMC CENTER

Reviewed by,


Jae-Hoon Jeong, Senior Engineer
GUMI COLLEGE EMC CENTER



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Scope: Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.

1. General Information

Applicant: Clipcomm, Inc.

Applicant address: E.S.T Bldg, 229-15, Nonhyeon-dong, Gangnam-gu, Seoul, 135-830 South Korea

Manufacturer: Clipcomm, Inc.

**Manufacturer address: E.S.T Bldg, 229-15, Nonhyeon-dong, Gangnam-gu, Seoul, 135-830
South Korea**

Contact person: Mr. Tae-Yoon Lim / Assistant Research Engineer

Telephone number: +82-2-541-9081 Fax number: +82-2-541-9085

- **FCC ID.** UXZBSH200
- **Equipment Class** Spread Spectrum Transmitter (DSS)
- **EUT Type** Bluetooth Analog Telephone adapter
- **Model Name** BS-H200
- **Rule Part(s)** FCC Part 15, Subpart C-Intentional Radiator § 15.247
- **Test Method** ANSI 63.10 (2009)
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2009)
- **Dates of Test** October 4 ~ 8, 2012
- **Place of Test** **GUMI COLLEGE EMC CENTER** (FCC Registration No.: 100749, 443957)
37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.
- **Test Report Number** GETEC-E3-12-100
- **Dates of Issue** October 9, 2012

EUT Type: Bluetooth Analog Telephone adapter

FCC ID.: UXZBSH200



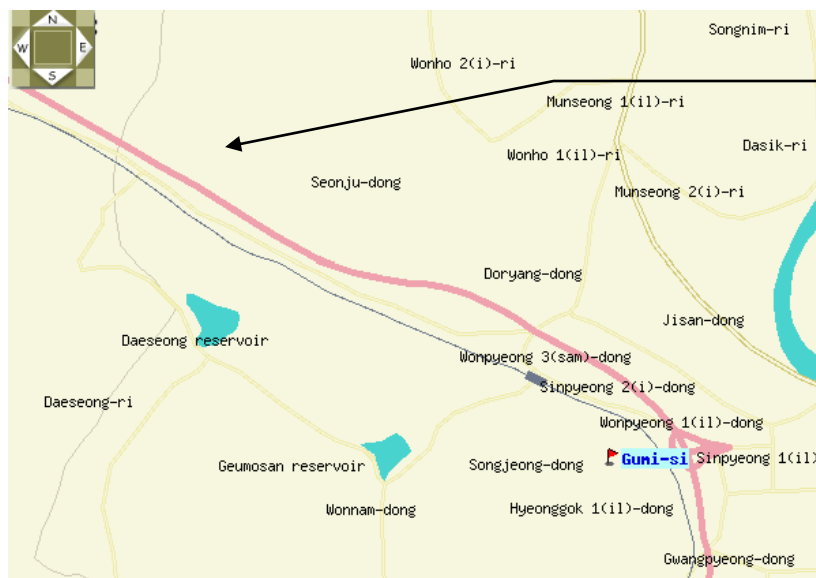
2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **Clipcomm, Inc. Bluetooth Analog Telephone adapter (Model name: BS-H200)**

These measurement tests were conducted at **GUMI COLLEGE EMC CENTER**.

The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.

This test site is one of the highest point of Gumi 1 college at about 200 kilometers away from Seoul city and 40 kilometers away from Daejeon city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 (2009)



GUMI COLLEGE EMC CENTER
37 Yaeun-ro, Gumi-si,
Gyeongsangbuk-do, 730-711,
Republic of Korea
Tel: +82-54-440-1195
Fax: +82-54-440-1199

Fig 1. The map above shows the Gumi College in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **Clipcomm, Inc. Bluetooth Analog Telephone adapter**
(Model Name: BS-H200) FCC ID.: UXZBSH200

Specification

Bluetooth	: Version 2.1 + EDR
Rated Voltage	: DC 5 V, 0.2 A
I/O Port	: USB (Charging port), 4-pol 3.5 mm jack, Land line port, Phone port

Frequency List

Frequency Band (MHz)	Channel	Freq. [MHz]	Channel	Freq. [MHz]	Channel	Freq. [MHz]	Channel	Freq. [MHz]
2 402 ~ 2 480	0	2 402	20	2 422	40	2 442	60	2 462
	1	2 403	21	2 423	41	2 443	61	2 463
	2	2 404	22	2 424	42	2 444	62	2 464
	3	2 405	23	2 425	43	2 445	63	2 465
	4	2 406	24	2 426	44	2 446	64	2 466
	5	2 407	25	2 427	45	2 447	65	2 467
	6	2 408	26	2 428	46	2 448	66	2 468
	7	2 409	27	2 429	47	2 449	67	2 469
	8	2 410	28	2 430	48	2 450	68	2 470
	9	2 411	29	2 431	49	2 451	69	2 471
	10	2 412	30	2 432	50	2 452	70	2 472
	11	2 413	31	2 433	51	2 453	71	2 473
	12	2 414	32	2 434	52	2 454	72	2 474
	13	2 415	33	2 435	53	2 455	73	2 475
	14	2 416	34	2 436	54	2 456	74	2 476
	15	2 417	35	2 437	55	2 457	75	2 477
	16	2 418	36	2 438	56	2 458	76	2 478
	17	2 419	37	2 439	57	2 459	77	2 479
	18	2 420	38	2 440	58	2 460	78	2 480
	19	2 421	39	2 441	59	2 461		



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
Bluetooth Analog Telephone adapter	Clipcomm, Inc.	BS-H200	S/N: None. FCC ID.: UXZBSH200

See "Appendix E – Test Setup Photographs" for actual system test set-up

3.2.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
Adapter #1 ¹⁾	UE Electronic	UE05WCP-050100SPC	S/N: None. FCC ID.: N/A
Adapter #2 ²⁾	Phihong	PSAC05R-050T	S/N: None. FCC ID.: N/A

1) Input ratings: AC (100 – 240) V~, (50/60) Hz, 0.18 A / Output ratings: DC 5 V, 1.0 A

2) Input ratings: AC (100 – 240) V~, (50 – 60) Hz, (12 – 18) V, Output ratings: DC 5 V, 1.0 A

3.2.3 Used Cable(s)

Cable Name	Condition	Description
USB(Charging) cable	Connected to the EUT and adapter	1.80 m shielded
Aux cable	Connected to the EUT and Bluetooth analog telephone adapter	1.00 m shielded
Land line cable	Connected to the EUT and Bluetooth analog telephone adapter	1.80 m unshielded
Phone cable	Connected to the EUT and Bluetooth analog telephone adapter	4.00 m unshielded

3.3 Modification Item(s)

-. None



4. Description of tests

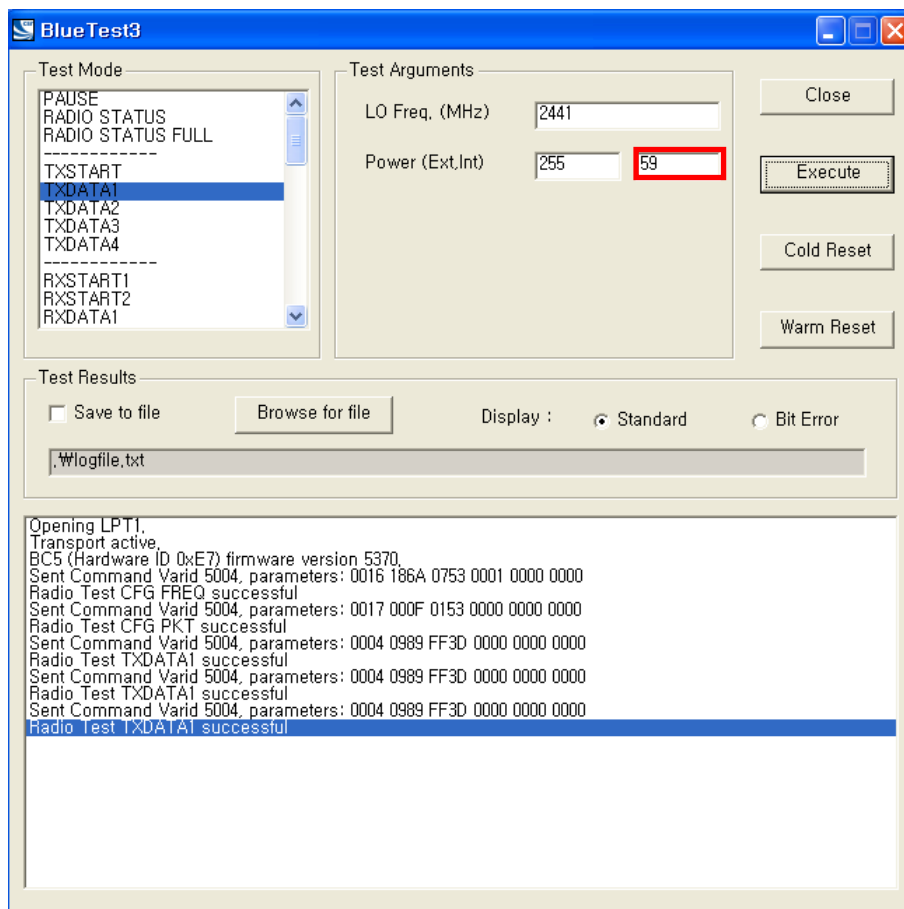
4.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used. The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency: AC 120 V / 60 Hz (Adapter DC 5 V)
- Test Mode(s):
 - . Executed “BlueTest3 (made by CSR)” to control the EUT continuously transmit RF signal.

Test Software Version	BlueTest3		
Frequency	2 402 MHz	2 441 MHz	2 480 MHz
Power setting value	59	59	59





5. Antenna Requirement - §15.203

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

5.1 Description of Antenna

The **Clipcomm, Inc. Bluetooth Analog Telephone adapter** comply with the requirement of §15.203 with a dual mode chip antenna permanently attached to the transmitter.



5.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (FCC Registration No.: 100749)

The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.8 m in height and 0.4 m away from the vertical wall of the shielded enclosure.

The EUT is powered from the Rohde & Schwarz LISN (ESH2-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH3-Z5). Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCS30).

The EMI test receiver was scanned from 150 kHz to 30 MHz with 20 ms sweep time to determine the frequency producing the maximum EME from the EUT. The frequency producing the maximum level was re-examined using Quasi-Peak mode of the EMI test receiver.

The bandwidth of Quasi-peak mode was set to 9 kHz. Each emission was maximized consistent with typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum diagram emission. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

Each EME reported was calibrated using the R/S signal generator

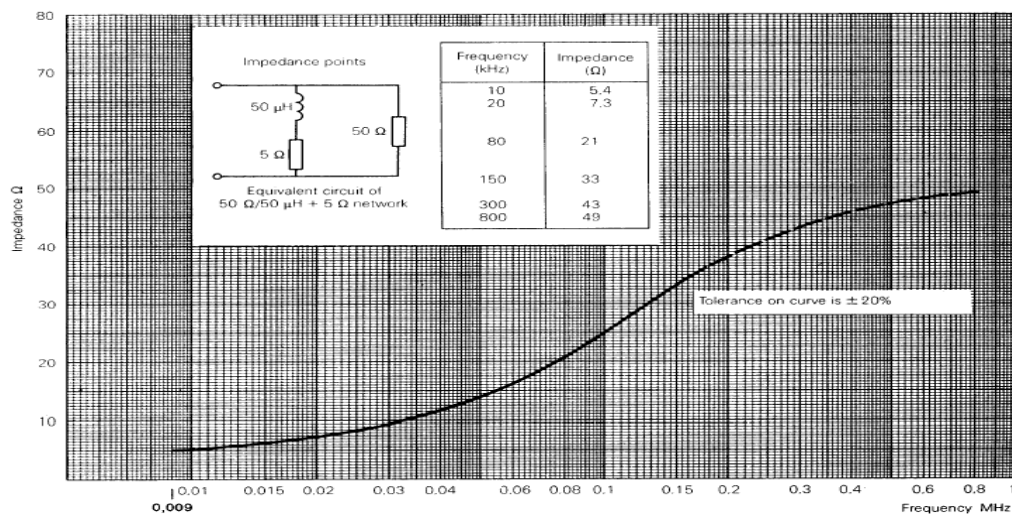


Fig 2. Impedance of LISN



5.3 Radiated Emission

Measurements (below 1 GHz) were made at Open area test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 m. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

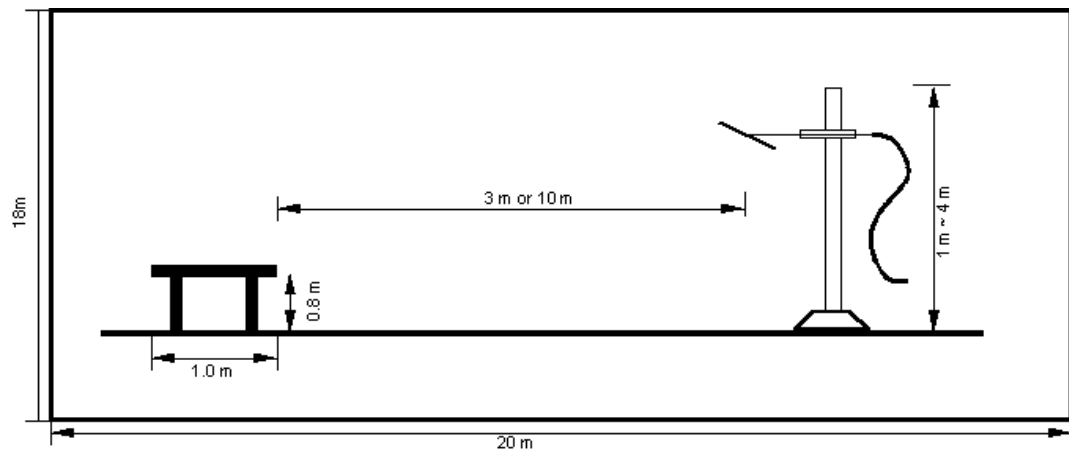


Fig 3. Dimensions of test site

The measurements (above 1 GHz) were made 3 m distance test site that complies to CISPR 16-1-4 (2007). In order to meet SVSWR Limit (Within 6 dB), the bottom side of test site was installed with absorbers. The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane. The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna. The measurements were conducted with Average and Peak value.

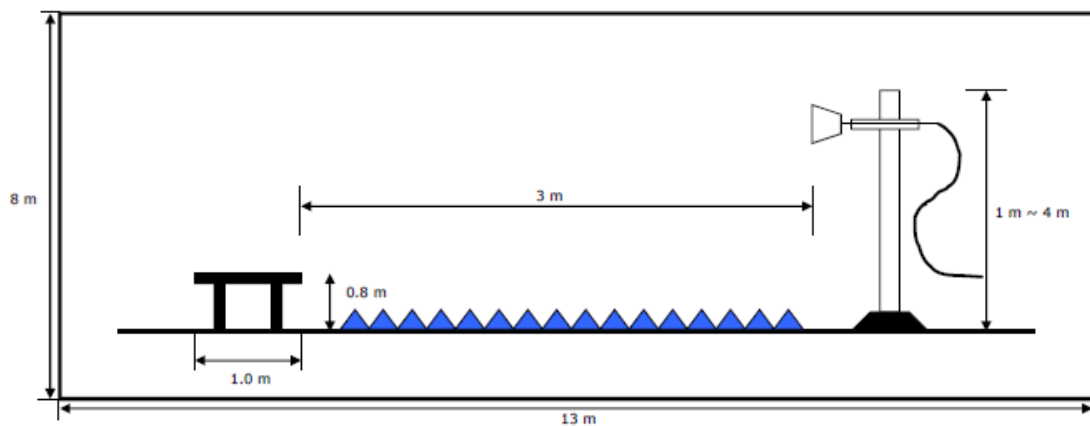


Fig 4. Dimensions of test site



6. CONDUCTED EMISSION

6.1 Operating Environment

Temperature : 23.0 °C
Relative Humidity : 41.0 % R.H.

6.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

6.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement.”

The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	± 2.71 dB	Confidence levels of 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	± 3.34 dB	Confidence levels of 95 % ($k = 2$)



6.4 Limit

RFI Conducted	FCC Limit(dB μ V/m) Class B	
Freq. Range	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

6.5 Test Equipment used

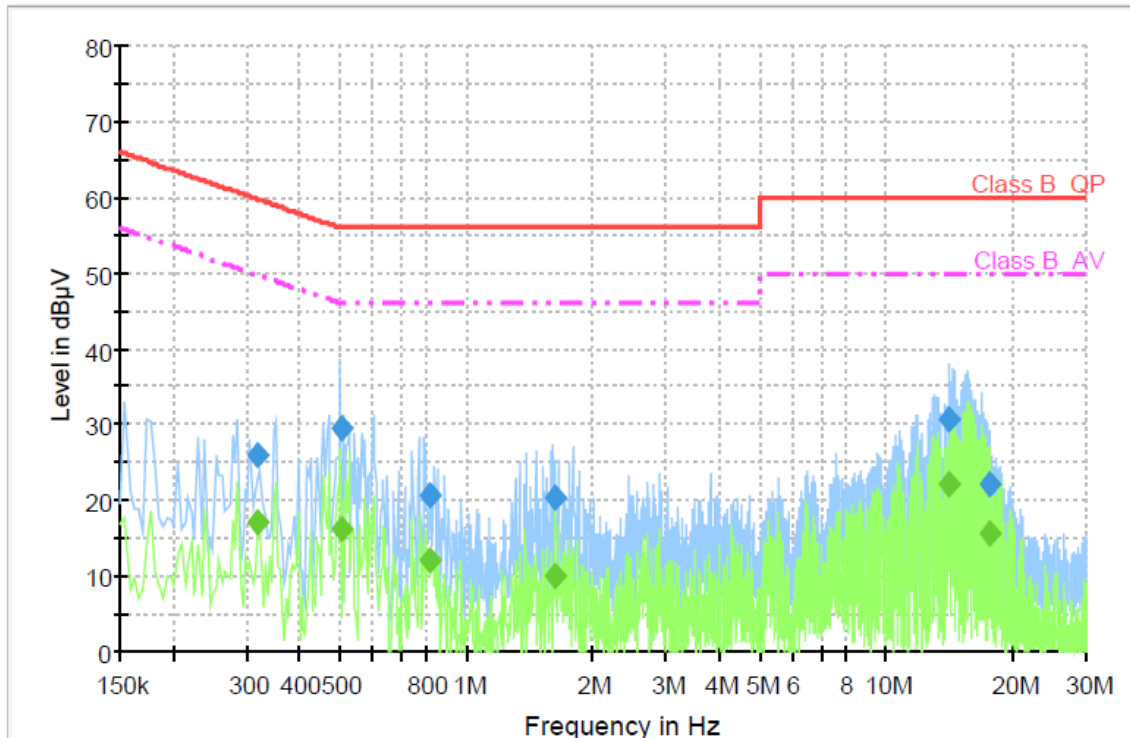
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	05. 22. 2013
□ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	05. 23. 2013
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	05. 23. 2013
□ - ENY81-CA6	Rohde & Schwarz	ISN	101573	07. 04. 2013

6.6 Test data for Conducted Emission

- Test Date : October 4, 2012
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz
- Line : L1: Live line, N: Neutral line



- Adapter #1 (Model name: UE05WCP-050100SPC)



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.320000	26.0	1000.0	9.000	GND	N	10.1	33.7	59.7	
0.508000	29.6	1000.0	9.000	GND	L1	10.1	26.4	56.0	
0.816000	20.6	1000.0	9.000	GND	N	10.1	35.4	56.0	
1.620000	20.3	1000.0	9.000	GND	N	10.2	35.7	56.0	
14.152000	30.8	1000.0	9.000	GND	L1	10.3	29.2	60.0	
17.724000	22.0	1000.0	9.000	GND	L1	10.3	38.0	60.0	

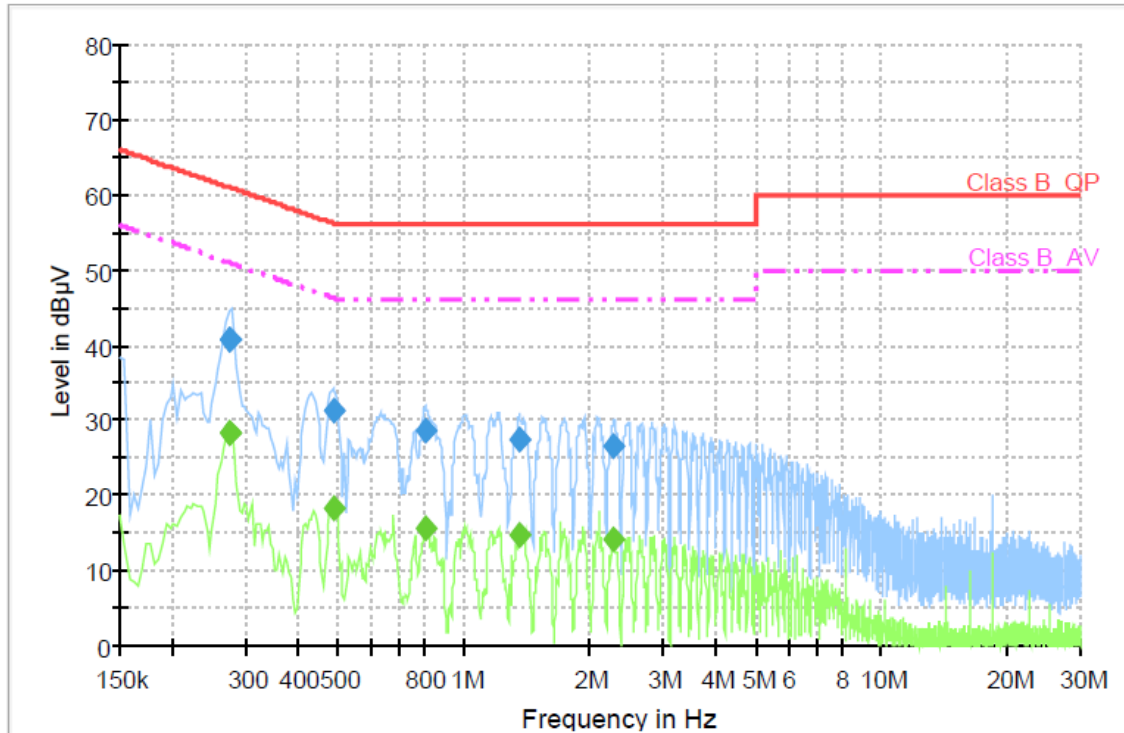
Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.320000	17.0	1000.0	9.000	GND	N	10.1	32.7	49.7	
0.508000	16.3	1000.0	9.000	GND	L1	10.1	29.7	46.0	
0.816000	12.1	1000.0	9.000	GND	N	10.1	33.9	46.0	
1.620000	10.1	1000.0	9.000	GND	N	10.2	35.9	46.0	
14.152000	22.3	1000.0	9.000	GND	L1	10.3	27.7	50.0	
17.724000	15.7	1000.0	9.000	GND	L1	10.3	34.3	50.0	

< Fig 5. Conducted emission result >



- Adapter #2 (Model name: PSAC05R-050T)



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.276000	40.7	1000.0	9.000	GND	N	10.1	20.2	60.9	
0.276000	40.7	1000.0	9.000	GND	N	10.1	20.2	60.9	
0.488000	31.2	1000.0	9.000	GND	N	10.1	25.0	56.2	
0.812000	28.6	1000.0	9.000	GND	L1	10.1	27.4	56.0	
1.356000	27.4	1000.0	9.000	GND	N	10.2	28.6	56.0	
2.284000	26.7	1000.0	9.000	GND	N	10.2	29.3	56.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.276000	28.4	1000.0	9.000	GND	N	10.1	22.5	50.9	
0.276000	28.3	1000.0	9.000	GND	N	10.1	22.7	50.9	
0.488000	18.2	1000.0	9.000	GND	N	10.1	28.0	46.2	
0.812000	15.7	1000.0	9.000	GND	L1	10.1	30.3	46.0	
1.356000	14.8	1000.0	9.000	GND	N	10.2	31.2	46.0	
2.284000	14.1	1000.0	9.000	GND	N	10.2	31.9	46.0	

< Fig 6. Conducted emission result >

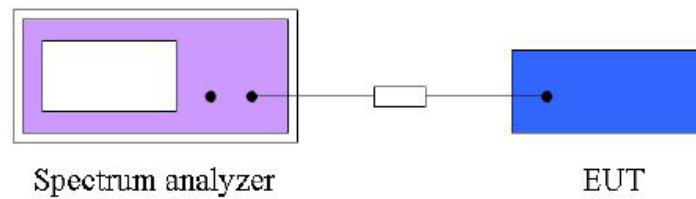


7. NUMBER OF HOPPING FREQUENCY USED

7.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 40.0 % R.H.

7.2 Test Set-up (Layout)



7.3 Limit

At least 15 channels frequencies, and should be equally spaced

7.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013

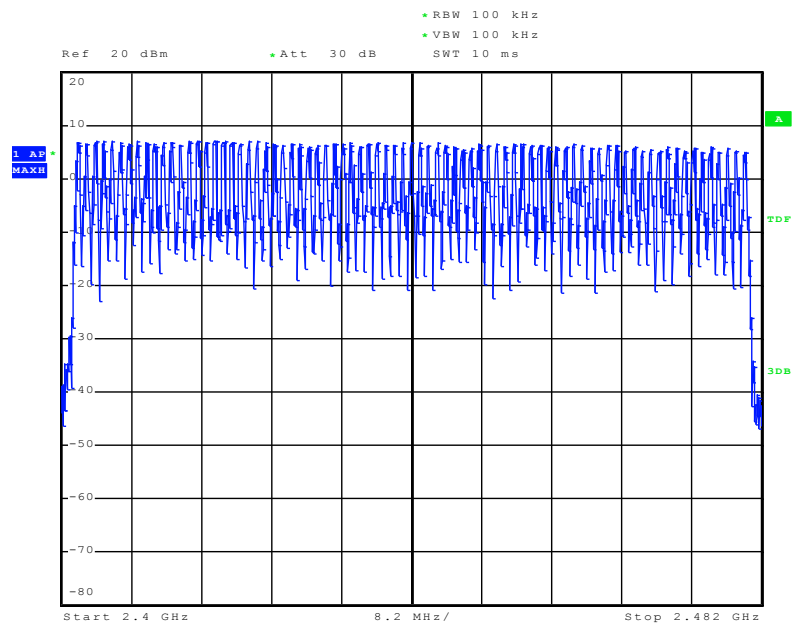
7.5 Test Result

- Test Date : October 5 ~ 10, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)(iii)
- Modulation : BDR (GFSK)
- Operating Condition : RF transmitting mode
- Power Source : AC 120 V / 60 Hz (Adapter DC 5 V)

Modulation	Total channel No.	Hopping channel No.	Limit	Result
BDR – DH5	79	79	> 15	Complies



Number of Hopping frequency used Plot on Configuration BDR (GFSK)



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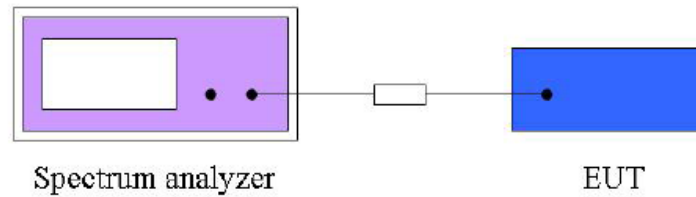


8. DWELL TIME ON EACH CHANNEL

8.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 40.0 % R.H.

8.2 Test Set-up (Layout)



8.3 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

8.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013

8.5 Test Result

- Test Date : October 5 ~ 9, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)(iii)
- Modulation : BDR (GFSK), EDR 2 Mbps ($\pi/4$ DQPSK), EDR 3 Mbps (8 DPSK)
- Operating Condition : RF transmitting mode
- Power Source : AC 120 V / 60 Hz (Adapter DC 5 V)

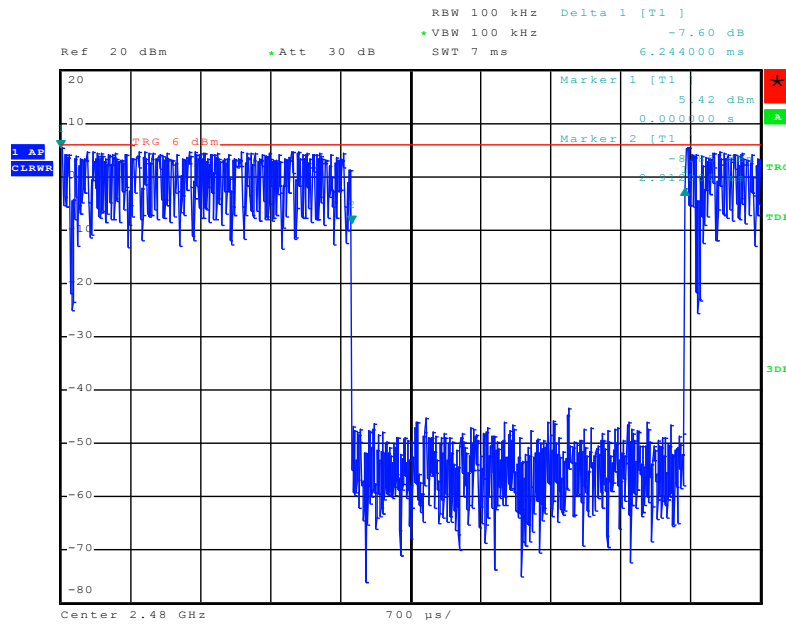
Spectrum Parameter

- Attenuation : Auto
- Span frequency : zero
- Resolution band width : 100 kHz
- Video band with : 100 kHz
- Sweep time : 5 ms

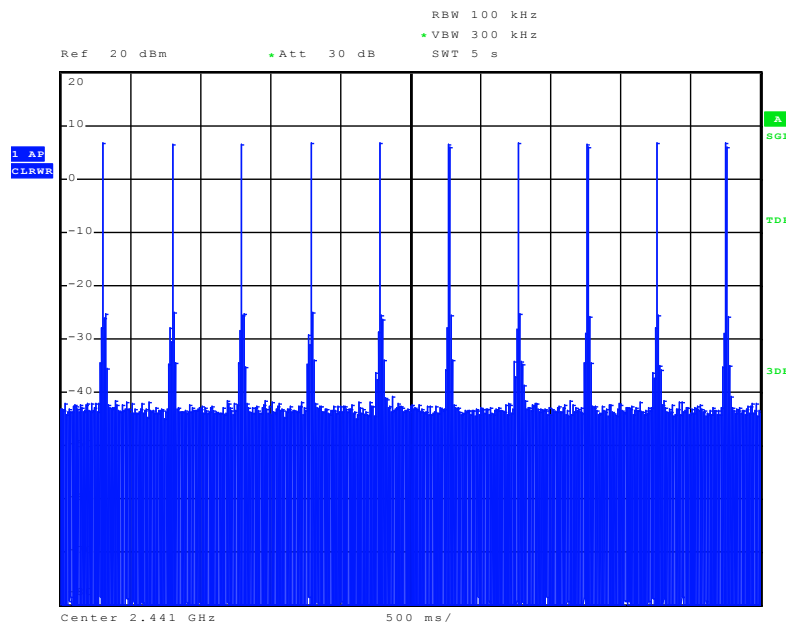
Mode	Number of transmission in a 31.6 (79 Hopping * 0.4)	Length of transmission time (ms)	Measured (ms)	Limit (ms)	Result
BDR – DH5	10 (times / 5 s) * 31.6 = 63.2	2.91	183.91	400	Complies
EDR 2 Mbps – DH5	10 (times / 5 s) * 31.6 = 63.2	2.91	183.91	400	Complies
EDR 3 Mbps – DH5	10 (times / 5 s) * 31.6 = 63.2	2.91	183.91	400	Complies



Dwell time on each time used Plot on Configuration BDR (GFSK)



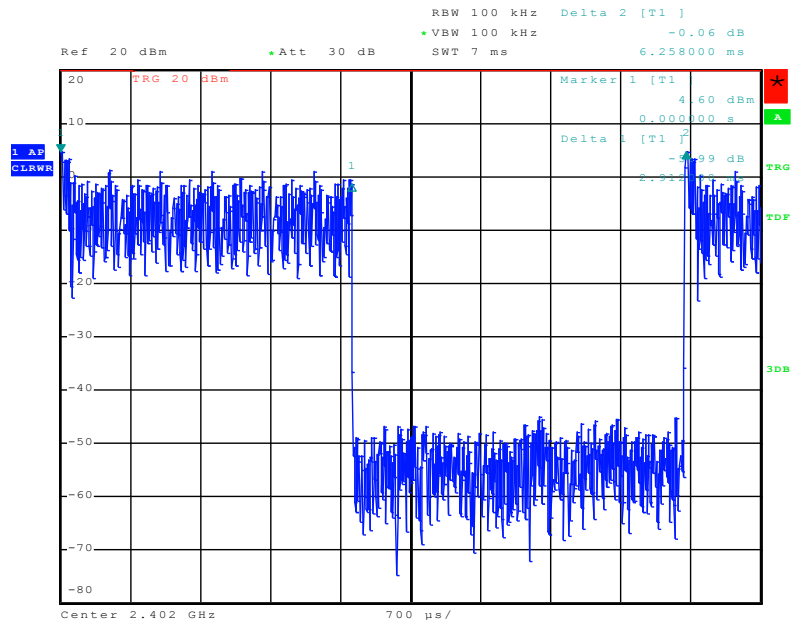
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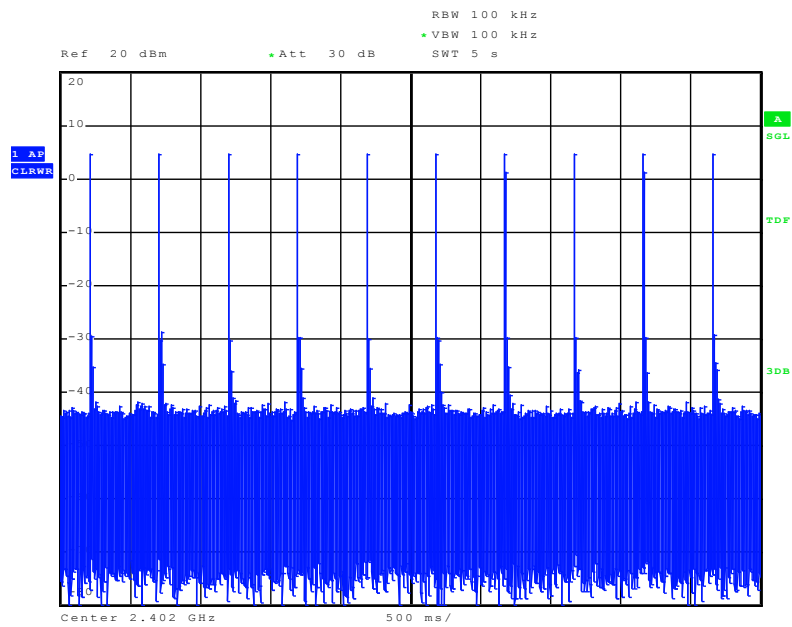
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Dwell time on each time used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK)



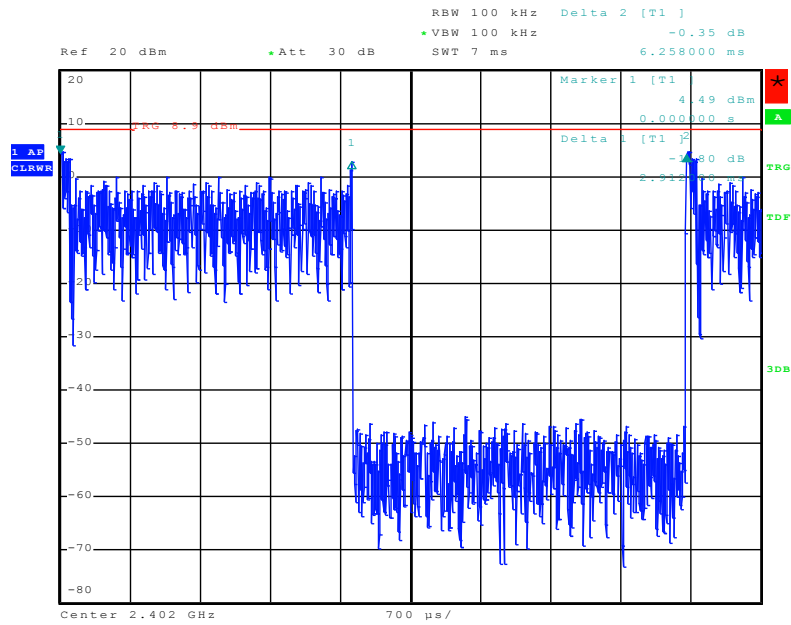
Date: 5.OCT.2012 08:06:12



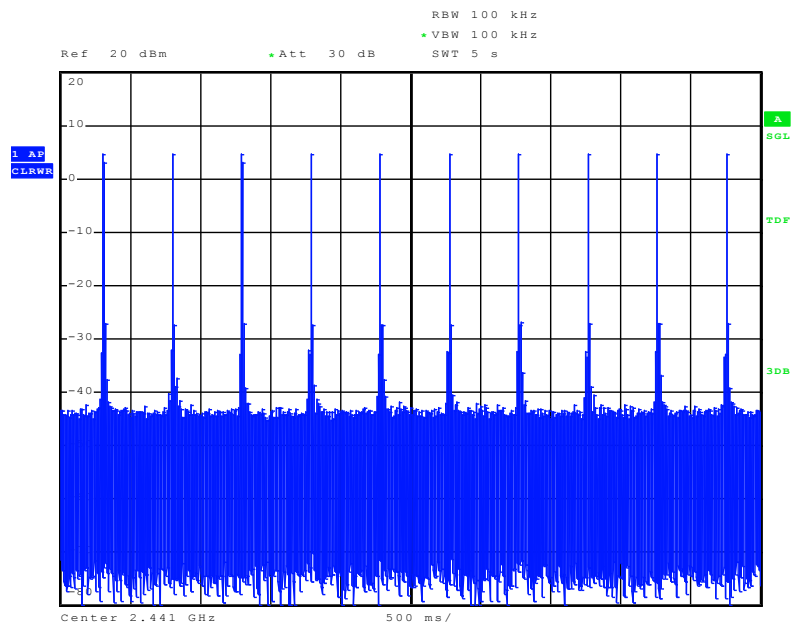
Date: 5.OCT.2012 08:03:26



Dwell time on each time used Plot on Configuration EDR 3 Mbps (8 DPSK)



Date: 5.OCT.2012 08:07:19



Date: 5.OCT.2012 08:09:11

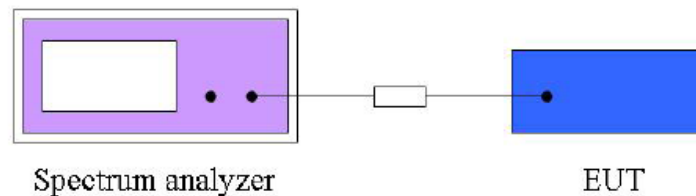


9. CHANNEL BANDWIDTH

9.1 Operating environment

Temperature : 24.0 °C
Relative Humidity : 40.0 % R.H.

9.2 Test Set-up (Layout)



9.3 Limit

For frequency hopping system operating in the 2 400 MHz ~ 2 483.5 MHz, If the 20 dB bandwidth of hopping channel is greater than 25 kHz, two-thirds 20 dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

9.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013

9.5 Test result

- Test Date : October 5 ~ 9, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)(iii)
- Modulation : BDR (GFSK), EDR 2 Mbps ($\pi/4$ DQPSK), EDR 3 Mbps (8 DPSK)
- Operating Condition : RF transmitting mode
- Power Source : AC 120 V / 60 Hz (Adapter DC 5 V)



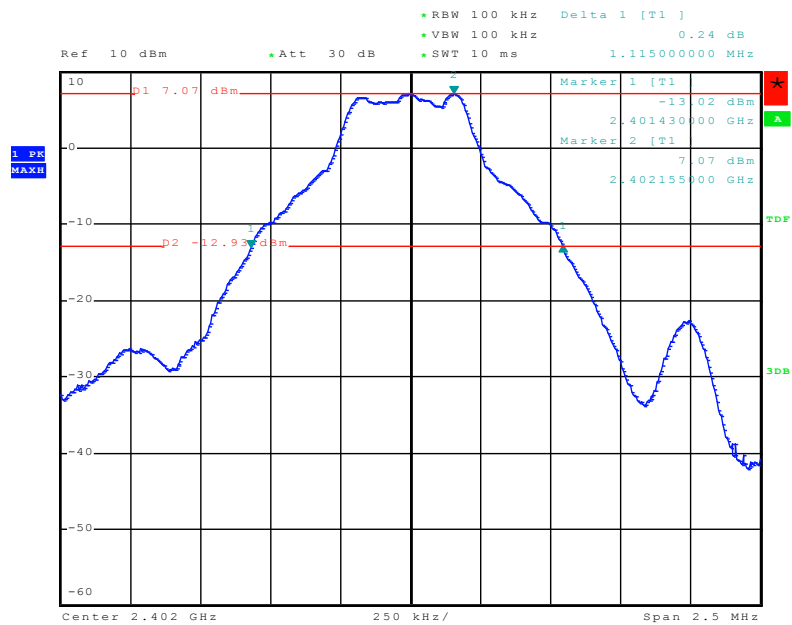
Spectrum Parameter

- Attenuation : Auto
- Span frequency : zero
- Resolution band width : 100 kHz
- Video band with : 100 kHz
- Sweep time : 10 ms

Channel / Modulation	Channel frequency (MHz)	20 dB bandwidth (MHz)	Result
0 CH / BDR – DH5	2 402	1.115	Complies
39 CH / BDR – DH5	2 441	1.110	Complies
78 CH / BDR – DH5	2 480	1.110	Complies
0 CH / EDR 2 Mbps – DH5	2 402	1.375	Complies
39 CH / EDR 2 Mbps – DH5	2 441	1.370	Complies
78 CH / EDR 2 Mbps – DH5	2 480	1.375	Complies
0 CH / EDR 3 Mbps – DH5	2 402	1.375	Complies
39 CH / EDR 3 Mbps – DH5	2 441	1.380	Complies
78 CH / EDR 3 Mbps – DH5	2 480	1.385	Complies

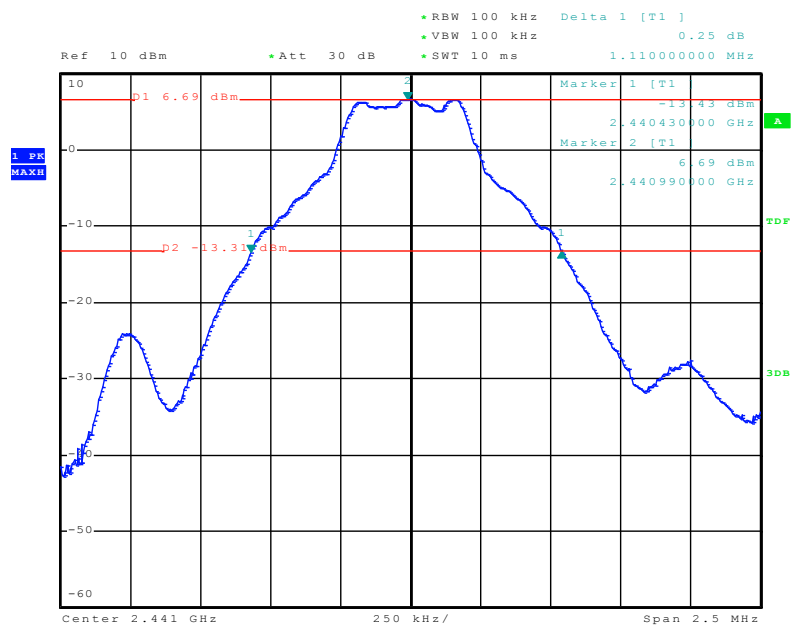


Channel bandwidth used Plot on Configuration BDR (GFSK) / 0 CH (2 402 MHz)



Date: 9.OCT.2012 10:56:17

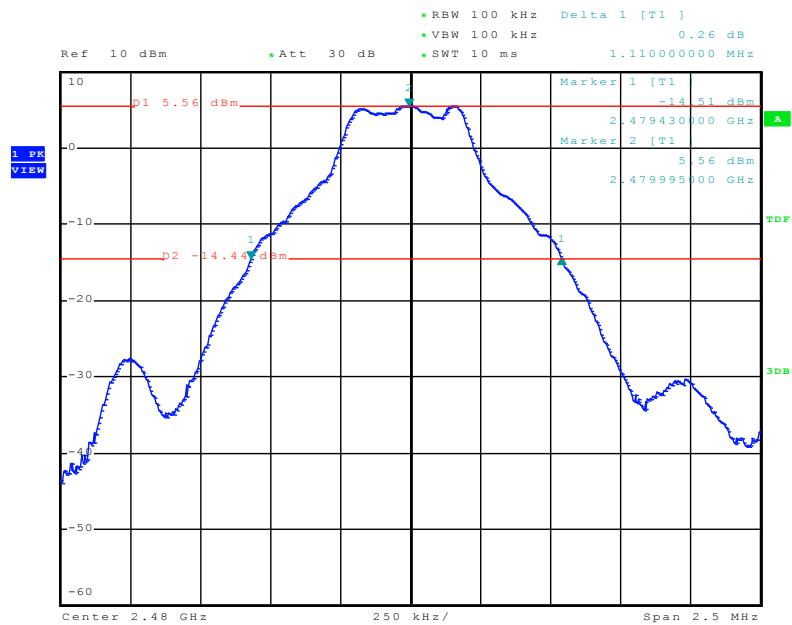
Channel bandwidth used Plot on Configuration BDR (GFSK) / 39 CH (2 441 MHz)



Date: 9.OCT.2012 10:58:02

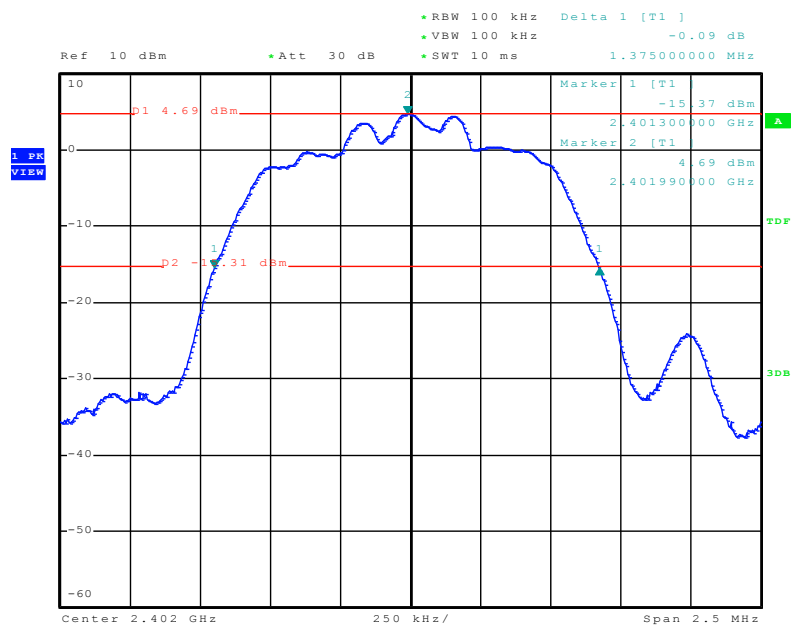


Channel bandwidth used Plot on Configuration BDR (GFSK) / 78 CH (2 480 MHz)



Date: 9.OCT.2012 10:59:47

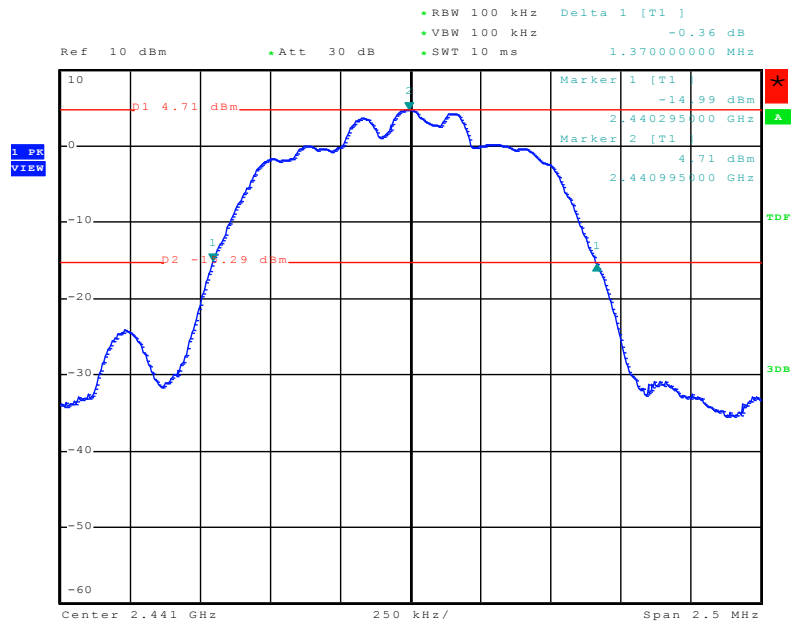
Channel bandwidth used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 0 CH (2 402 MHz)



Date: 5.OCT.2012 07:59:55

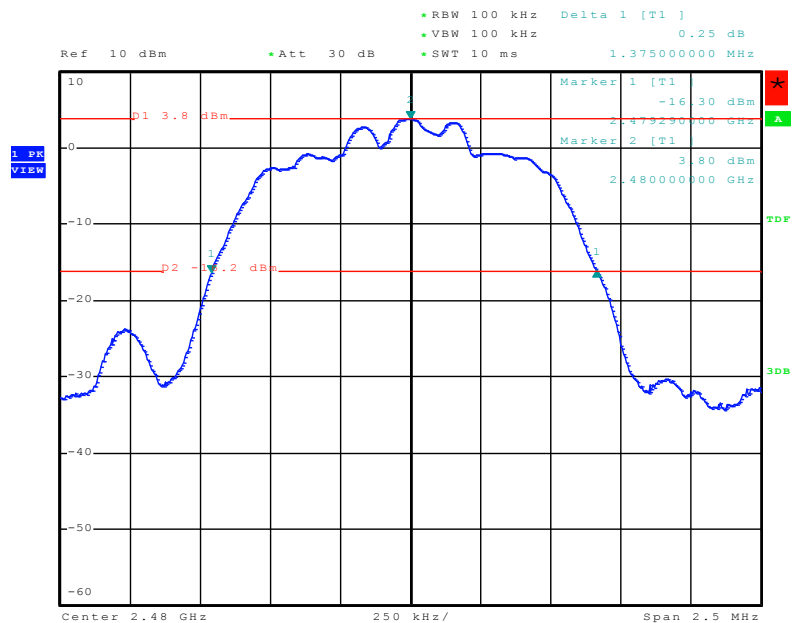


Channel bandwidth used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 39 CH (2 441 MHz)



Date: 5.OCT.2012 07:56:45

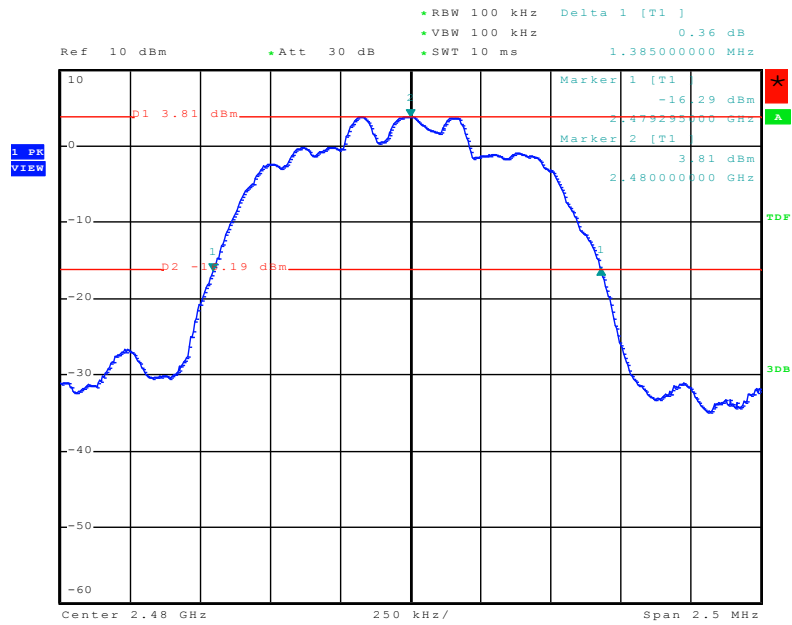
Channel bandwidth used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 78 CH (2 480 MHz)



Date: 5.OCT.2012 07:54:02



Channel bandwidth used Plot on Configuration EDR 3 Mbps (8 DPSK) / 78 CH (2 480 MHz)



Date: 5.OCT.2012 07:51:20

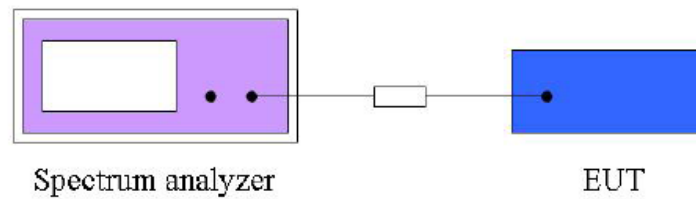


10. LIMIT OF HOPPING CHANNEL SEPARATION

10.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 40.0 % R.H.

10.2 Test Set-up (Layout)



10.3 Limit

For frequency hopping system operating in the 2 400 MHz ~ 2 483.5 MHz, If the 20 dB bandwidth of hopping channel is greater than 25 kHz, two-thirds 20 dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

10.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013

10.5 Test Result

- Test Date : October 5 ~ 9, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(1)
- Modulation : BDR (GFSK), EDR 2 Mbps ($\pi/4$ DQPSK), EDR 3 Mbps (8 DPSK)
- Operating Condition : RF transmitting mode
- Power Source : AC 120 V / 60 Hz (Adapter DC 5 V)



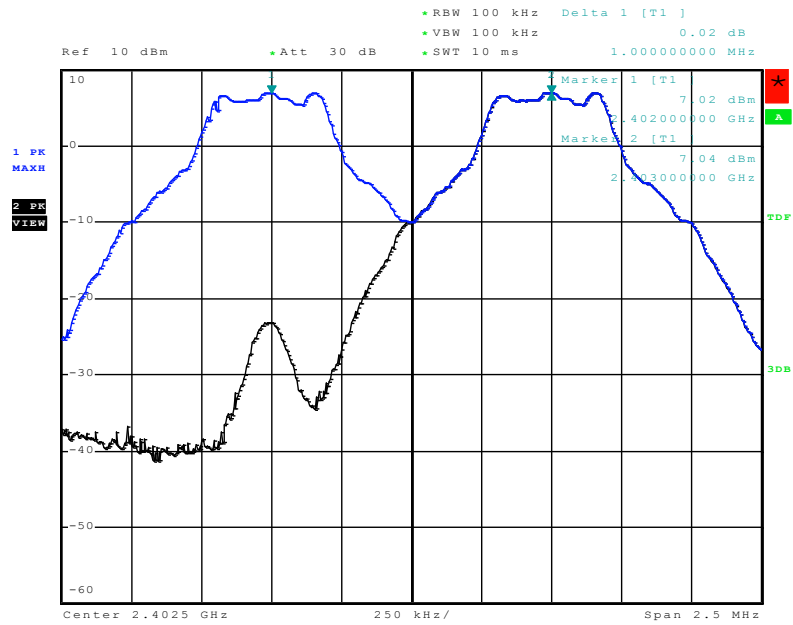
Spectrum Parameter

- Attenuation : Auto
- Span frequency : 10 MHz
- Resolution band width : 100 kHz
- Video band with : 100 kHz
- Sweep time : 10 ms

Channel / Modulation	Channel frequency (MHz)	Adjacent channel Separation (MHz)	Limit (MHz) [2/3 of 20 dB bandwidth]	Result
0 CH / BDR – DH5	2 402	1	> 0.743	Complies
39 CH / BDR – DH5	2 441	1	> 0.740	Complies
78 CH / BDR – DH5	2 480	1	> 0.740	Complies
0 CH / EDR 2 Mbps – DH5	2 402	1	> 0.917	Complies
39 CH / EDR 2 Mbps – DH5	2 441	1	> 0.913	Complies
78 CH / EDR 2 Mbps – DH5	2 480	1	> 0.917	Complies
0 CH / EDR 3 Mbps – DH5	2 402	1	> 0.917	Complies
39 CH / EDR 3 Mbps – DH5	2 441	1	> 0.920	Complies
78 CH / EDR 3 Mbps – DH5	2 480	1	> 0.923	Complies

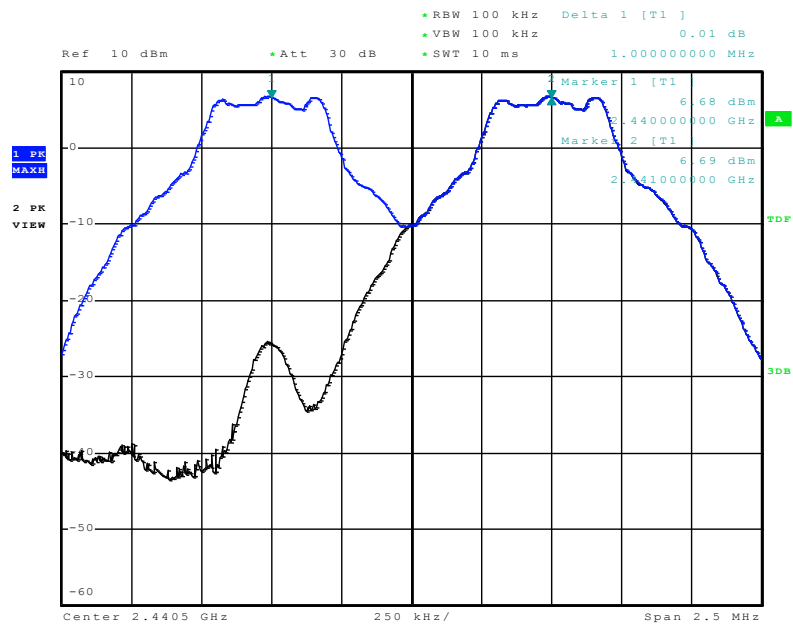


Channel separation used Plot on Configuration BDR (GFSK) / 0 CH (2 402 MHz)



Date: 9.OCT.2012 11:10:41

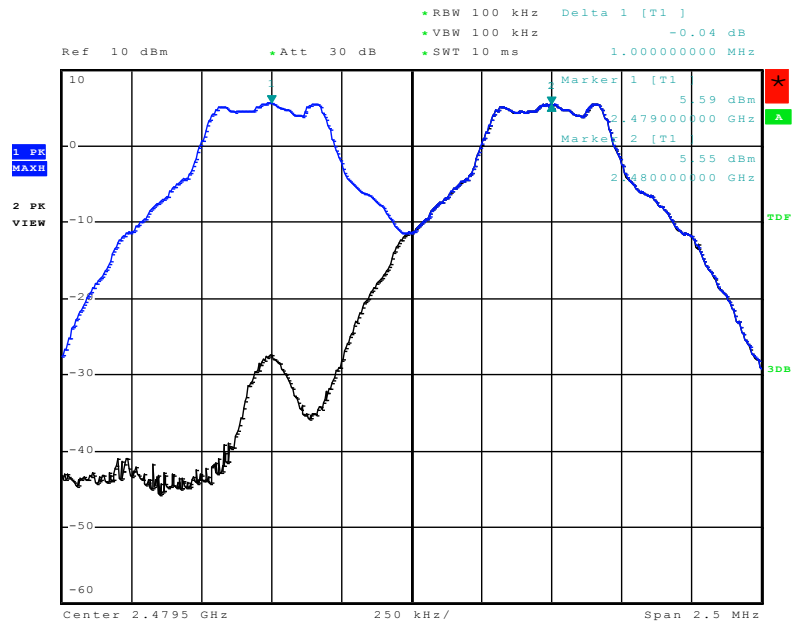
Channel separation used Plot on Configuration BDR (GFSK) / 39 CH (2 441 MHz)



Date: 9.OCT.2012 11:08:15

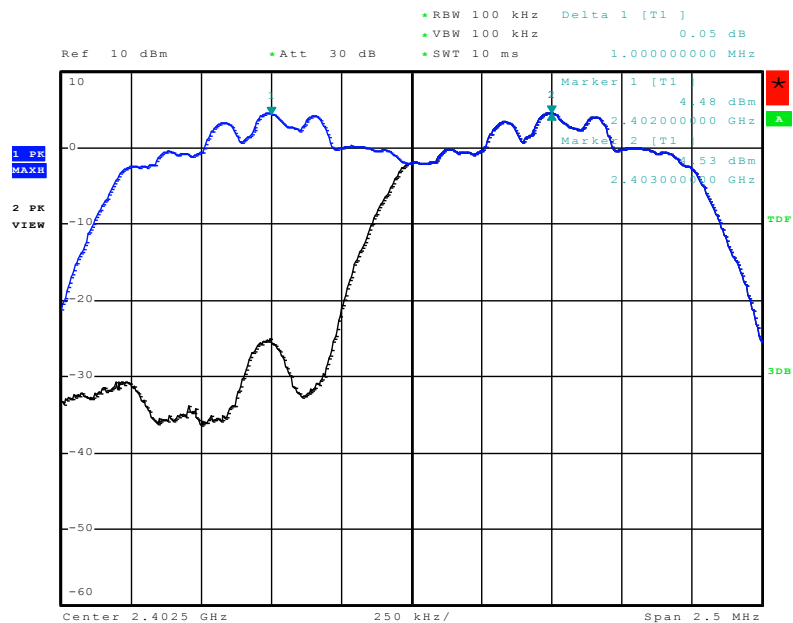


Channel separation used Plot on Configuration BDR (GFSK) / 78 CH (2 480 MHz)



Date: 9.OCT.2012 11:06:24

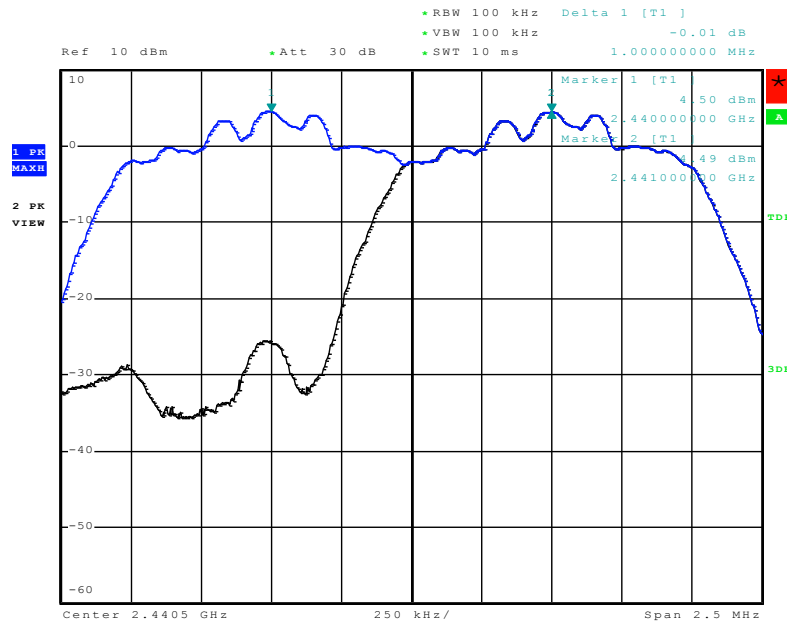
Channel separation used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 0 CH (2 402 MHz)



Date: 5.OCT.2012 10:02:21

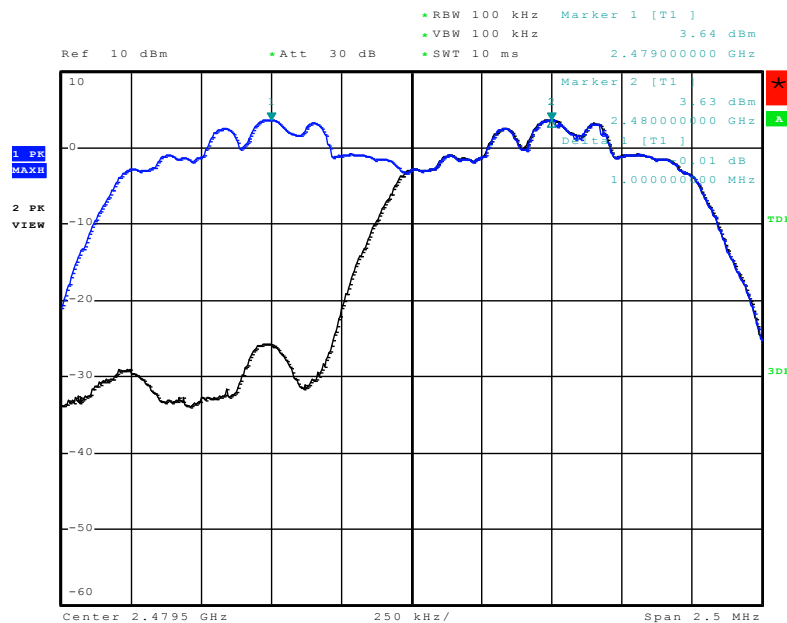


Channel separation used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 39 CH (2 441 MHz)



Date: 5.OCT.2012 09:57:14

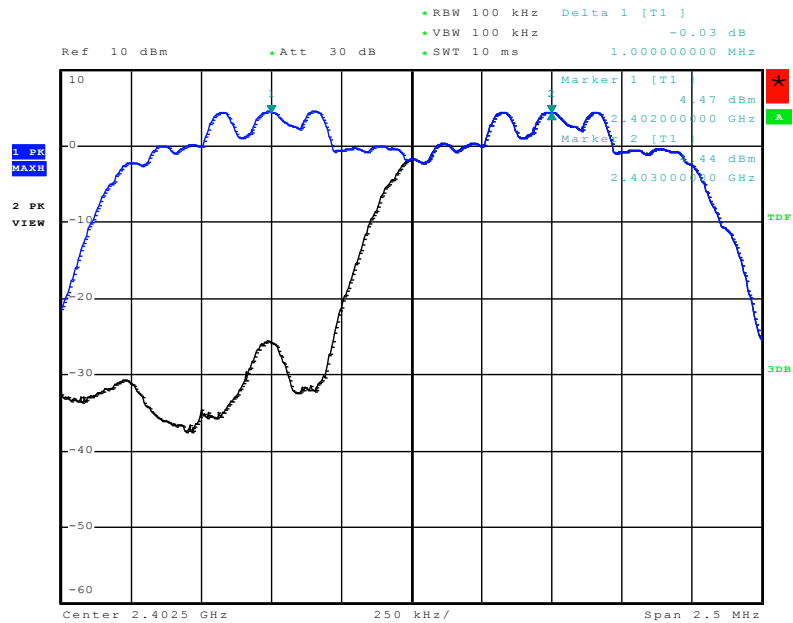
Channel separation used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 78 CH (2 480 MHz)



Date: 5.OCT.2012 09:54:25

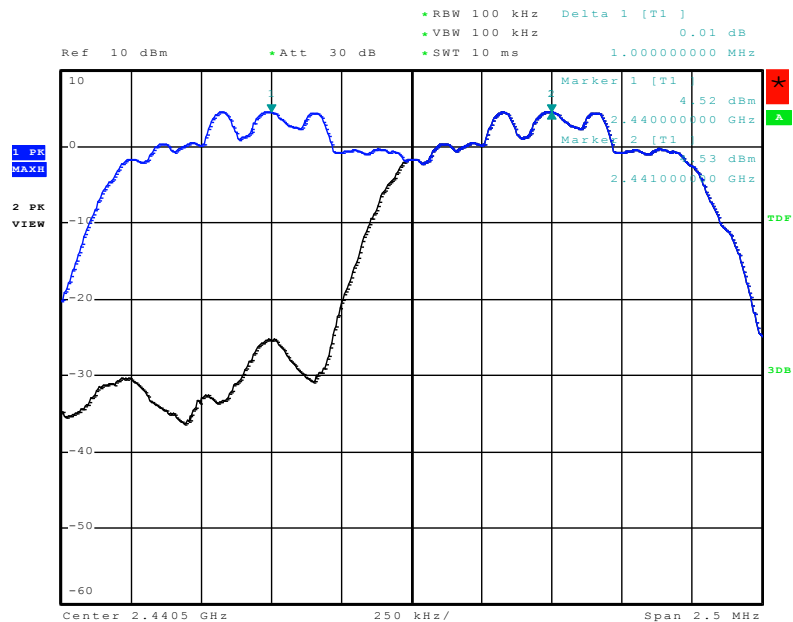


Channel separation used Plot on Configuration EDR 3 Mbps (8 DPSK) / 0 CH (2 402 MHz)



Date: 5.OCT.2012 10:15:26

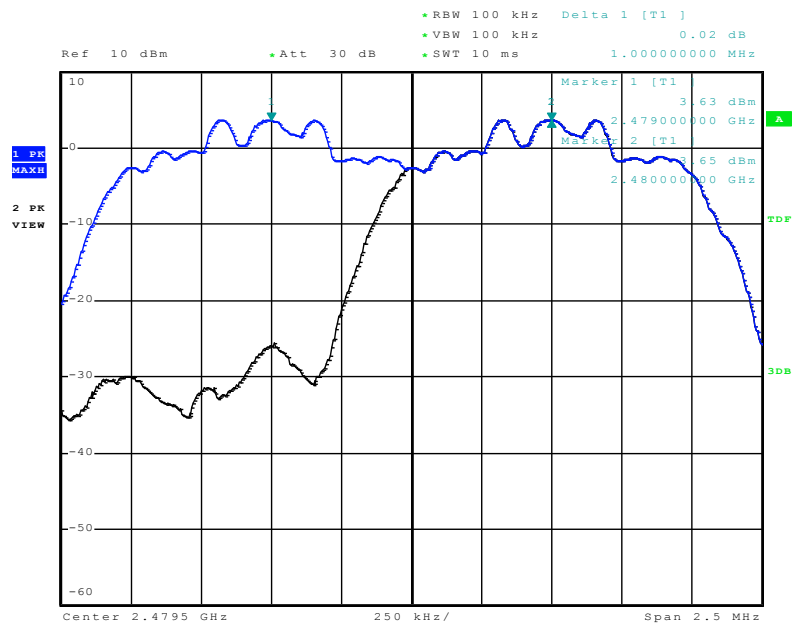
Channel separation used Plot on Configuration EDR 3 Mbps (8 DPSK) / 39 CH (2 441 MHz)



Date: 5.OCT.2012 10:20:09



Channel separation used Plot on Configuration EDR 3 Mbps (8 DPSK) / 78 CH (2 480 MHz)



Date: 5.OCT.2012 10:22:41

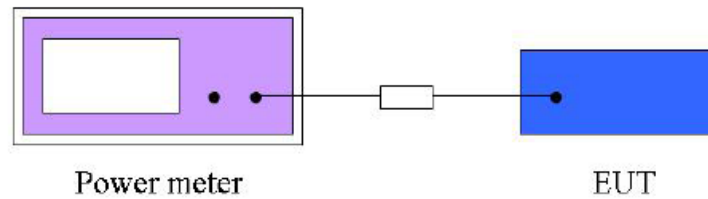


11. MAXIMUM PEAK OUTPUT POWER

11.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 40.0 % R.H.

11.2 Test Set-up (Layout)



11.3 Limit

The maximum peak output power measurement is 125 mW

11.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - NRVD	Rohde & Schwarz	Power meter	837794/048	05. 23. 2013
■ - NRP-Z32	Rohde & Schwarz	Power sensor	100062	05. 24. 2013

11.5 Test Result

- Test Date : October 5, 2012
 - Reference Standard : Part 15 Subpart C, Sec. 15.247(b)
 - Modulation : BDR (GFSK), EDR 2 Mbps ($\pi/4$ DQPSK), EDR 3 Mbps (8 DPSK)
 - Operating Condition : RF transmitting mode
 - Power Source : AC 120 V / 60 Hz (Adapter DC 5 V)

Channel / Modulation	Channel Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Limit (W)	Result
0 CH / BDR – DH5	2 402	7.09	5.12	1	Complies
39 CH / BDR – DH5	2 441	6.77	4.75	1	Complies
78 CH / BDR – DH5	2 480	5.64	3.66	1	Complies
0 CH / EDR 2 Mbps – DH5	2 402	5.15	3.27	1	Complies
39 CH / EDR 2 Mbps – DH5	2 441	5.14	3.27	1	Complies
78 CH / EDR 2 Mbps – DH5	2 480	4.23	2.65	1	Complies
0 CH / EDR 3 Mbps – DH5	2 402	5.40	3.47	1	Complies
39 CH / EDR 3 Mbps – DH5	2 441	5.22	3.33	1	Complies
78 CH / EDR 3 Mbps - DH5	2 480	4.26	2.67	1	Complies

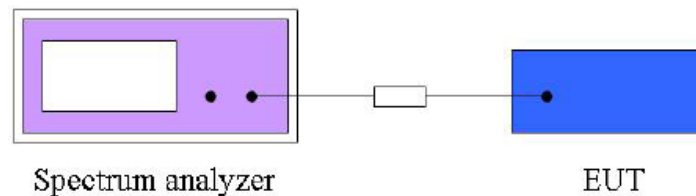


12. BAND EDGES MEASUREMENT

12.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 40.0 % R.H.

12.2 Test Set-up (Layout)



12.3 Limit

Below -20 dB of the highest emission level of operating band (in 100 kHz resolution band width)

12.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013

12.5 Test Result

- Test Date : October 5, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(b)
- Modulation : BDR (GFSK), EDR 2 Mbps ($\pi/4$ DQPSK), EDR 3 Mbps (8 DPSK)
- Operating Condition : RF transmitting mode
- Power Source : AC 120 V / 60 Hz (Adapter DC 5 V)

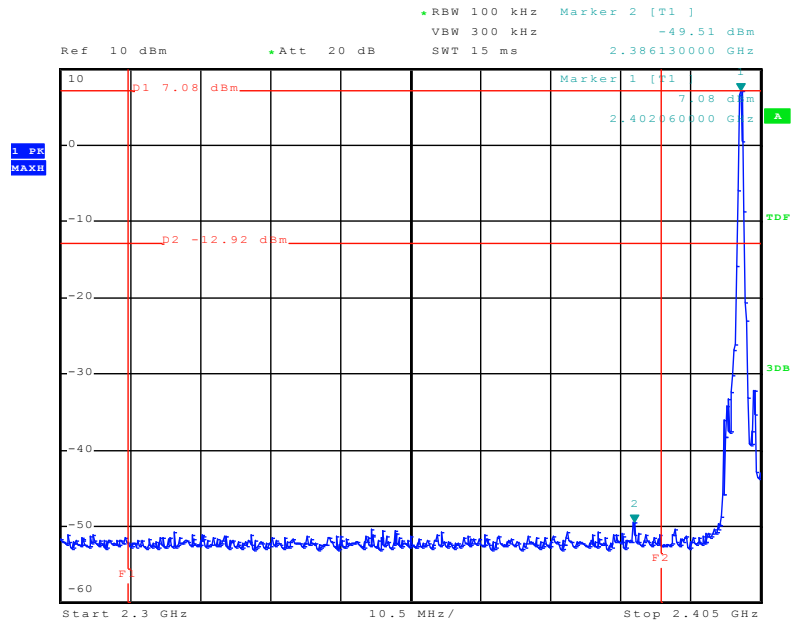
The spectrum plots are attached on the following 8 images, D1 line indicates the highest level, D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement in part 15.247(d)

Spectrum Parameter

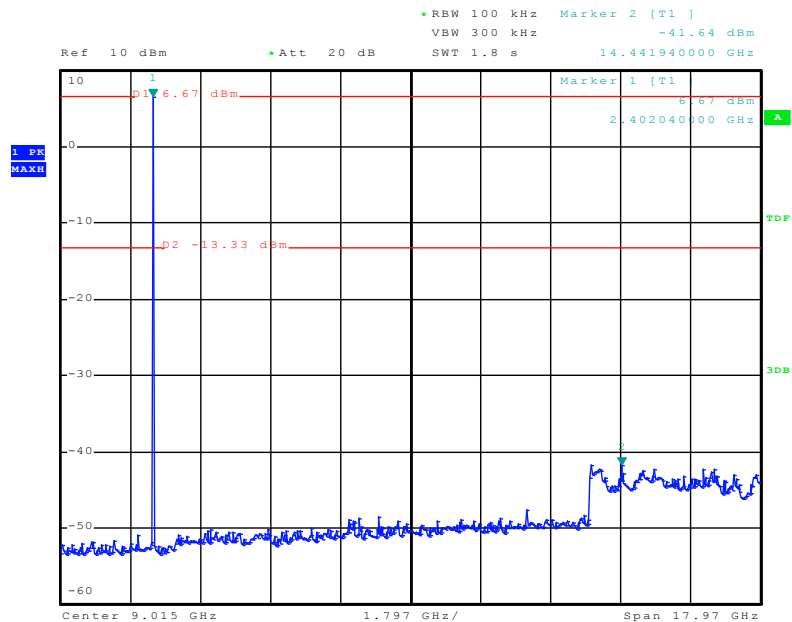
- Attenuation : Auto
- Resolution bandwidth : 100 kHz
- Video bandwidth : 300 kHz



Band edge used Plot on Configuration BDR (GFSK) / 0 CH (2 402 MHz)



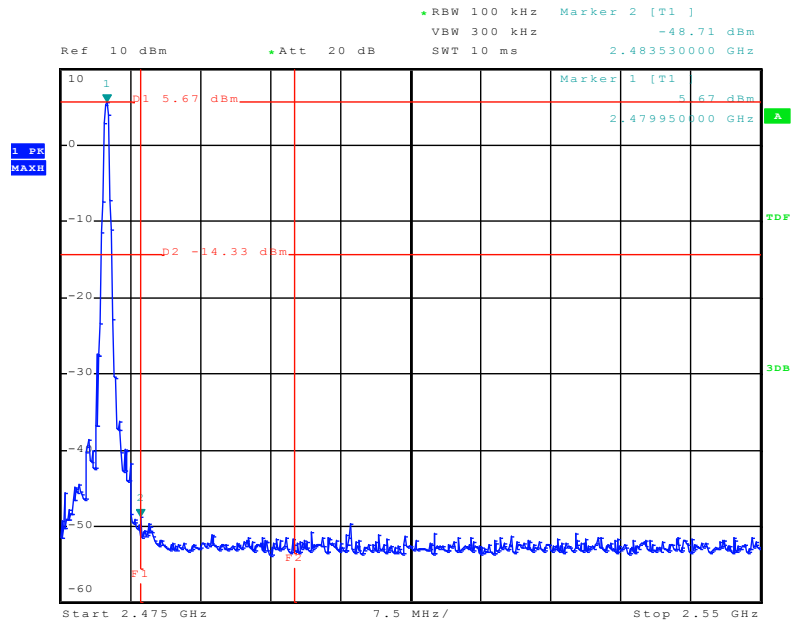
Date: 9.OCT.2012 11:13:20



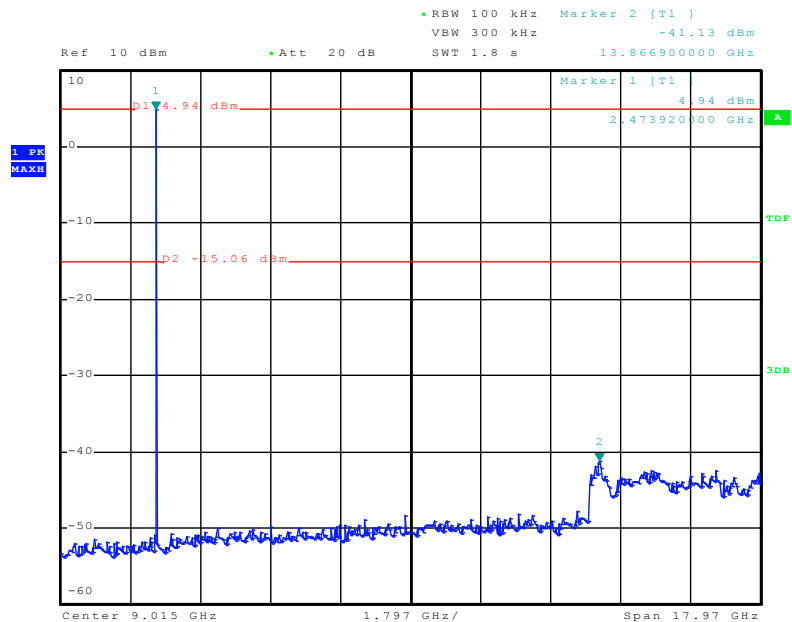
Date: 9.OCT.2012 11:14:32



Band edge used Plot on Configuration BDR (GFSK) / 78 CH (2 480 MHz)



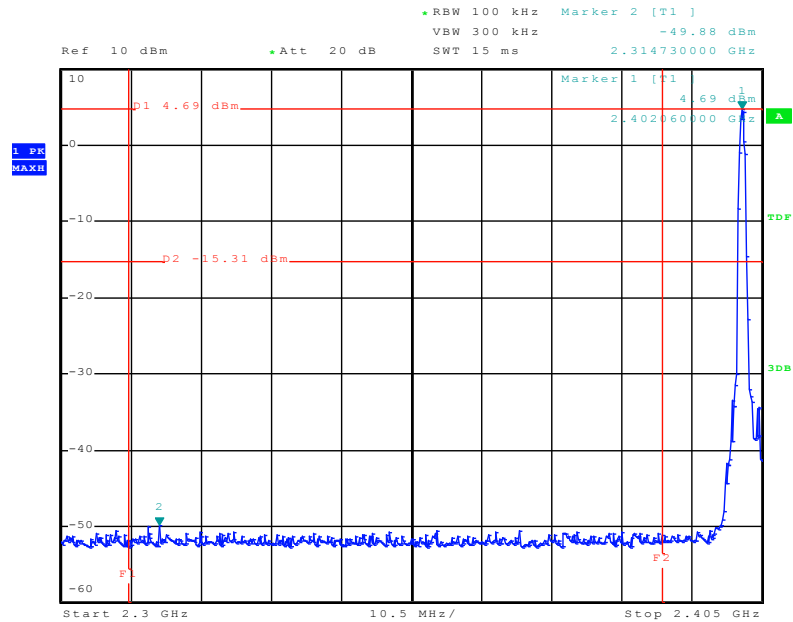
Date: 9.OCT.2012 11:17:30



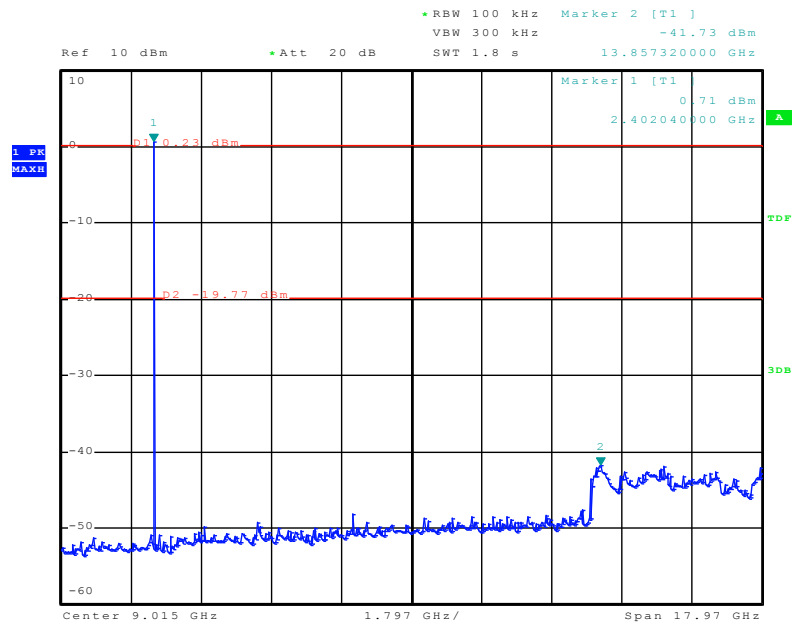
Date: 9.OCT.2012 11:15:54



Band edge used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 0 CH (2 402 MHz)



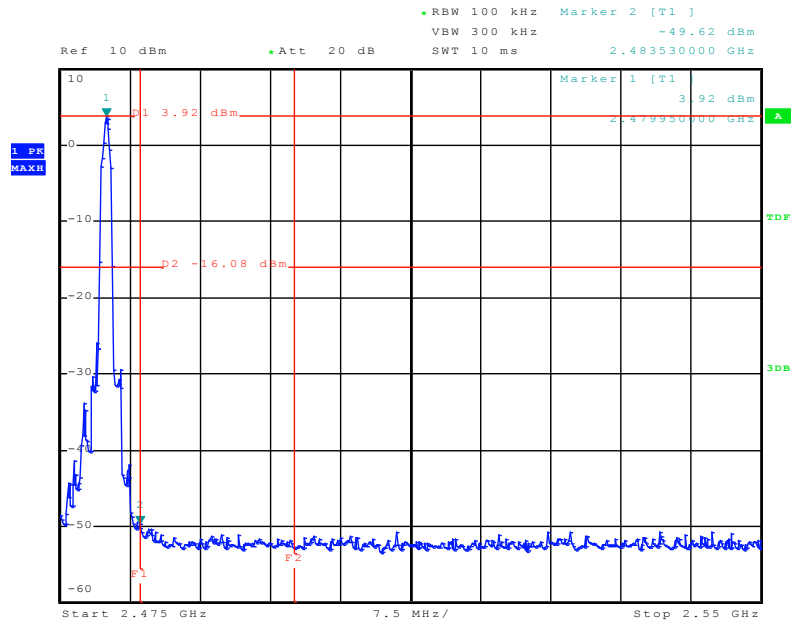
Date: 5.OCT.2012 09:12:18



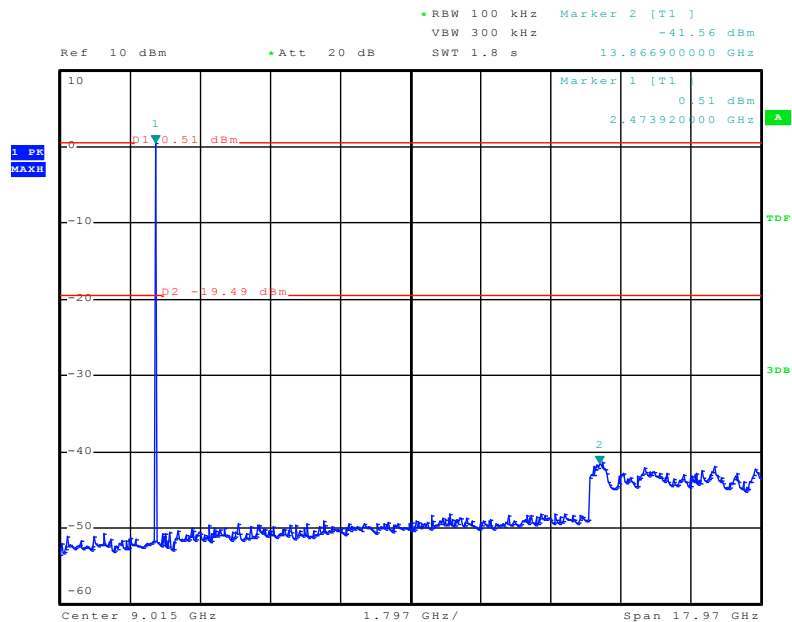
Date: 5.OCT.2012 09:08:11



Band edge used Plot on Configuration EDR 2 Mbps ($\pi/4$ DQPSK) / 78 CH (2 480 MHz)



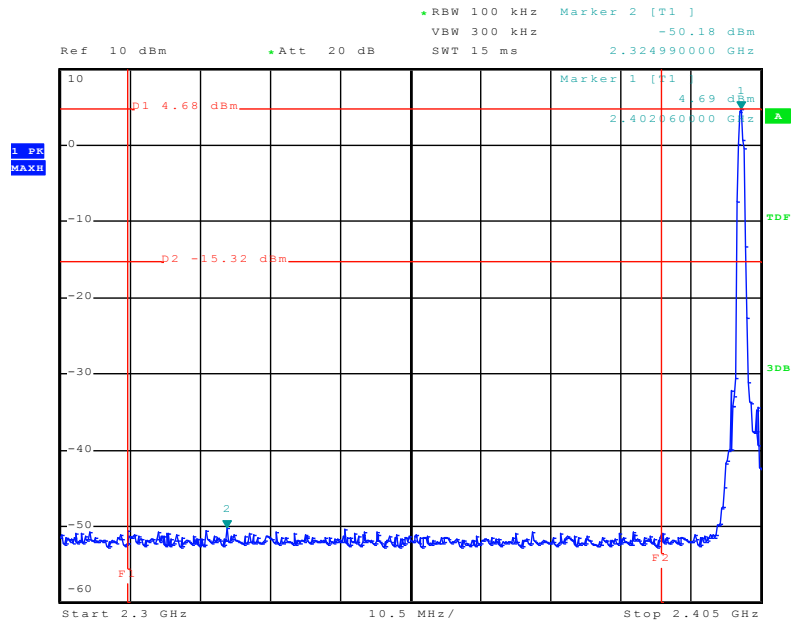
Date: 5.OCT.2012 09:06:30



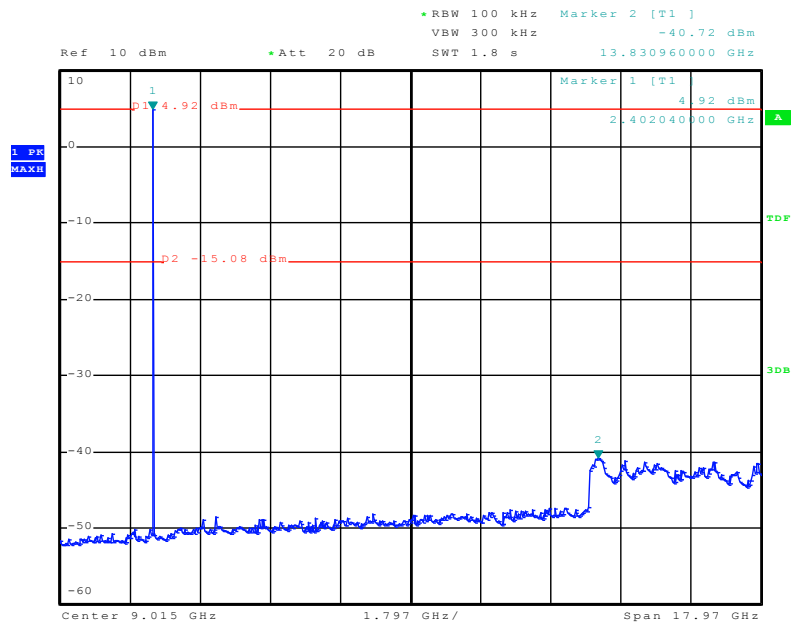
Date: 5.OCT.2012 09:03:07



Band edge used Plot on Configuration EDR 3 Mbps (8 DPSK) / 0 CH (2 402 MHz)



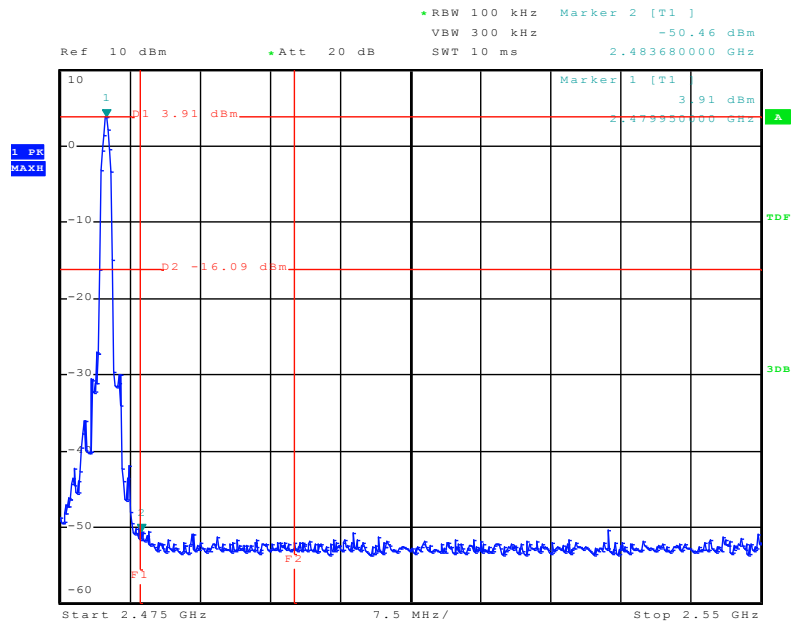
Date: 5.OCT.2012 08:53:34



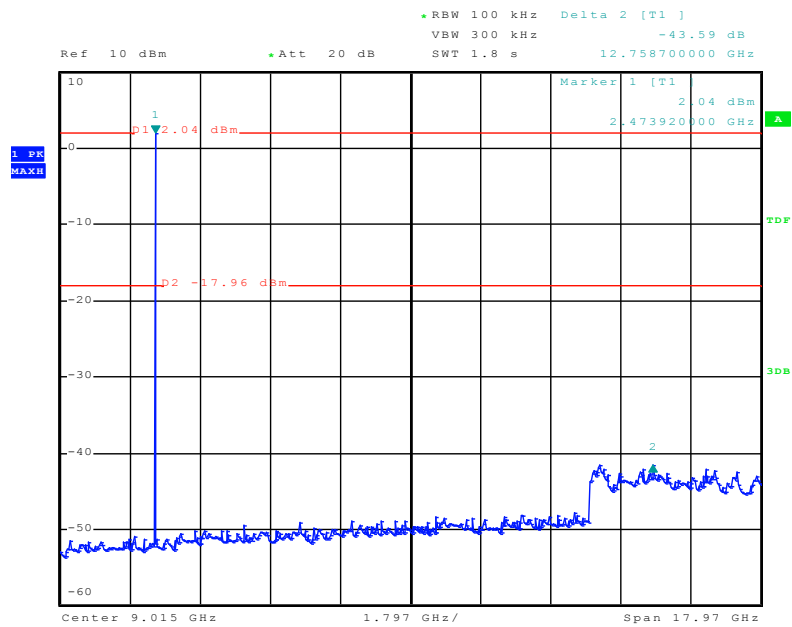
Date: 5.OCT.2012 08:48:26



Band edge used Plot on Configuration EDR 3 Mbps (8 DPSK) / 78 CH (2 480 MHz)



Date: 5.OCT.2012 08:55:51



Date: 5.OCT.2012 08:58:28



13. RADIATED EMISSION

13.1 Operating Environment

Temperature : 23.0 °C
Relative Humidity : 42.0 % R.H.

13.2 Test Set-up

The formal radiated emission was measured at 3 m distance anechoic chamber.

The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane.

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels.

This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

13.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 4.38 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 3.50 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 3.75 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 3.59 dB	Confidence levels of 95 % ($k = 2$)

12.4 Limit

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

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2 400/F (kHz)	300
0.490 ~ 1.705	2 400/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



13.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013
■ - VULB9160	Schwarzbeck	Broadband test antenna	3193	03. 14. 2013
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - AM4.0	maturo GmbH	Antenna Mast	1390308	N/A
■ - BBHA9120D	Schwarzbeck	Horn antenna	207	01. 23. 2013
■ - 3160-09	ETS LINDGREN	Horn antenna	LM3423	11. 14. 2013
■ - AFS44-00101800-25-10P-44	MITEQ	Preamplifier	1258942	11. 12. 2012
■ - AFS44-00101800-25-10P-44	MITEQ	Preamplifier	1258943	11. 12. 2012

13.6 Radiated emission test data

- Test Date	: October 4 ~ 5, 2012
- Reference Standard	: Part 15 Subpart C, Sec. 15.247(d)
- Modulation / Channel	: EDR 3 Mbps (8 DPSK)
- Operating Condition	: RF transmitting mode
- Measuring Distance	: 3 m
- Spectrum Resolution Bandwidth(6 dB)	: 120 kHz / 1 MHz / 10 Hz / 100 kHz
- Detector mode	: Peak detector mode / Quasi Peak detector mode / Average detector mode
- Power Source	: AC 120 V / 60 Hz (Adapter DC 5 V)
- Note	: None.

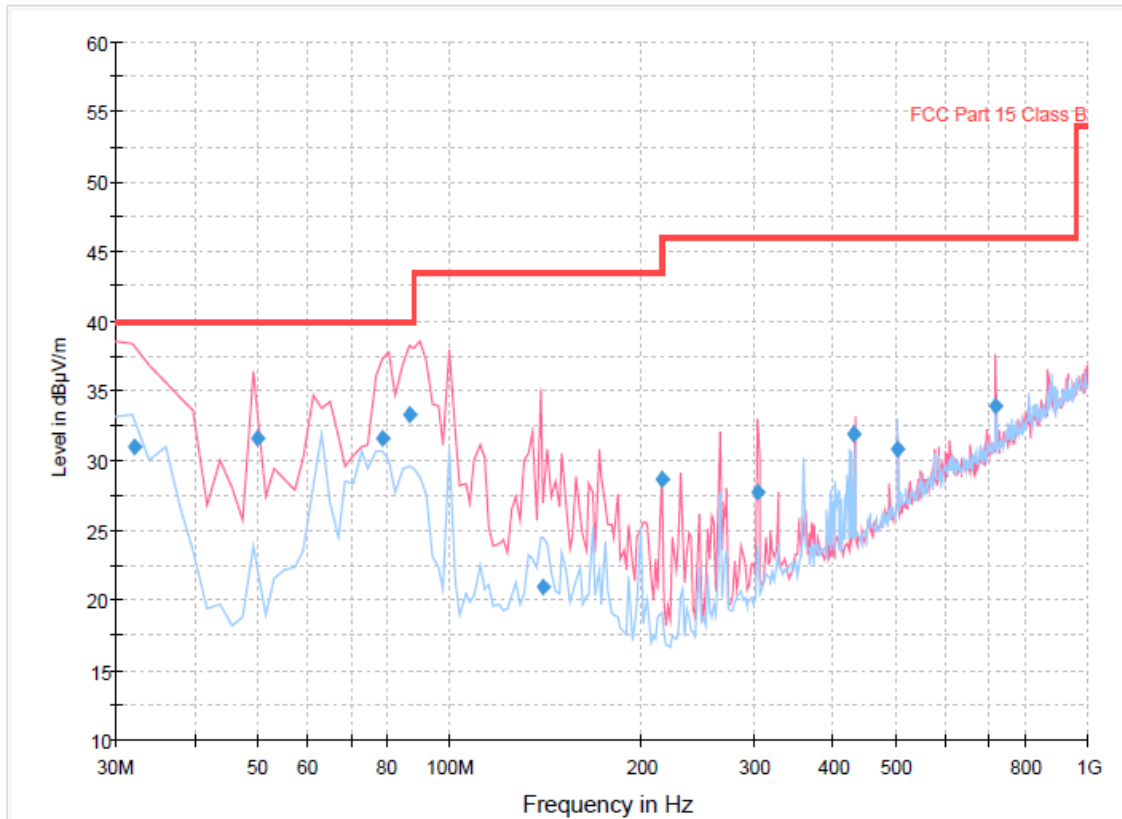


Result of radiated emission (9 kHz to 30 MHz)

No emission found between lowest internal used/generated frequency to 30 MHz.

Worst case result of radiated emission (30 MHz to 1 000 MHz): EDR 3 Mbps (8 DPSK)

- Adapter #1 (Model name: UE05WCP-050100SPC)

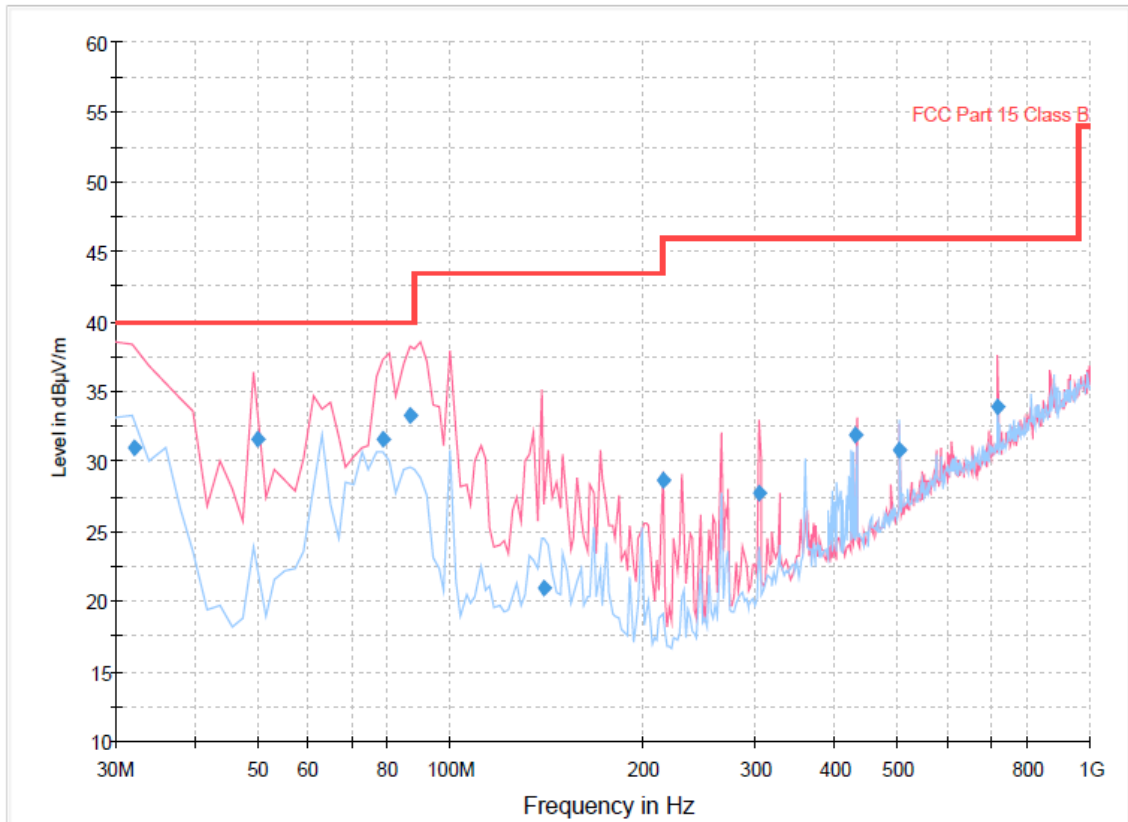


Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.200000	30.9	1000.0	120.000	100.0	V	118.0	11.1	9.1	40.0
50.138878	31.5	1000.0	120.000	125.0	V	225.0	12.7	8.5	40.0
78.761082	31.6	1000.0	120.000	100.0	V	88.0	9.7	8.4	40.0
86.712745	33.4	1000.0	120.000	136.0	V	156.0	9.2	6.6	40.0
139.917715	21.0	1000.0	120.000	100.0	V	7.0	14.2	22.5	43.5
215.689339	28.6	1000.0	120.000	100.0	V	89.0	12.1	14.9	43.5
303.748176	27.7	1000.0	120.000	100.0	V	268.0	16.2	18.3	46.0
431.324770	31.9	1000.0	120.000	350.0	V	150.0	19.7	14.2	46.0
503.168617	30.8	1000.0	120.000	165.0	H	27.0	21.3	15.2	46.0
718.860160	33.9	1000.0	120.000	150.0	V	230.0	25.6	12.1	46.0



- Adapter #2 (Model name: PSAC05R-050T)



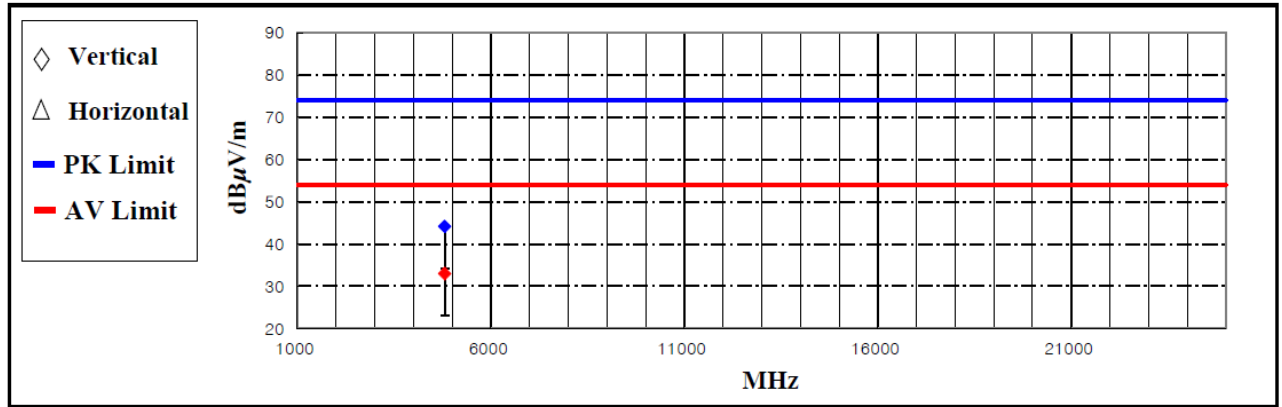
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.200000	30.9	1000.0	120.000	100.0	V	118.0	11.1	9.1	40.0
50.138878	31.5	1000.0	120.000	125.0	V	225.0	12.7	8.5	40.0
78.761082	31.6	1000.0	120.000	100.0	V	88.0	9.7	8.4	40.0
86.712745	33.4	1000.0	120.000	136.0	V	156.0	9.2	6.6	40.0
139.917715	21.0	1000.0	120.000	100.0	V	7.0	14.2	22.5	43.5
215.689339	28.6	1000.0	120.000	100.0	V	89.0	12.1	14.9	43.5
303.748176	27.7	1000.0	120.000	100.0	V	268.0	16.2	18.3	46.0
431.324770	31.9	1000.0	120.000	350.0	V	150.0	19.7	14.2	46.0
503.168617	30.8	1000.0	120.000	165.0	H	27.0	21.3	15.2	46.0
718.860160	33.9	1000.0	120.000	150.0	V	230.0	25.6	12.1	46.0



Worst case result of radiated emission (1 GHz to 25 GHz): EDR 3 Mbps (8 DPSK)

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
4810.00	45.82	34.62	31.21	-32.83	44.20	33.00	74.00	54.00	29.80	21.00	V	102	180



*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

Worst case result of radiated emission (Band Edge): EDR 3 Mbps (8 DPSK)

0 CH (2 402 MHz)

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
2385.43	56.49	40.49	26.95	-36.94	46.50	30.50	74.00	54.00	27.50	23.50	V	165	193

78 CH (2 480 MHz)

Frequency (MHz)	Measurement Level					Limit (dBμ V/m)		Margin (dB)		Positioning System			
	Reading Value (dBμ V)		AF	AMP / CL	Test Result (dBμ V/m)					Pol.	Height	Angle	
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	(H/V)	(cm)	(°)		
2483.50	63.77	48.47	27.21	-36.78	54.20	38.90	74.00	54.00	19.80	15.10	V	100	350

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBμV/m) = 20 log Emission level (μV/m).

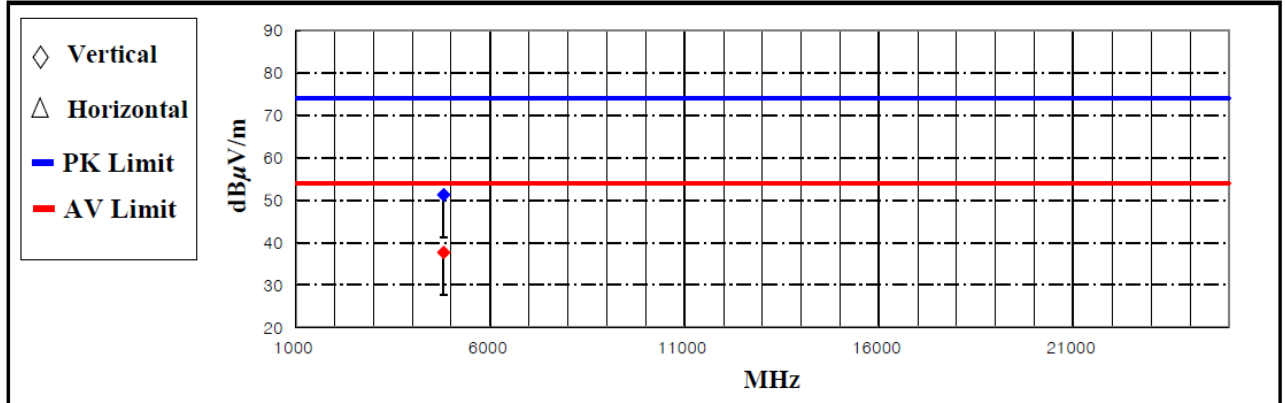
Corrected reading: Antenna factor + Cable loss + Preamplifier gain + Read value = Test result



Result of radiated emission (1 GHz to 10th harmonics)

(EDR 3 Mbps (8 DPSK), 0 CH / 2 402 MHz)

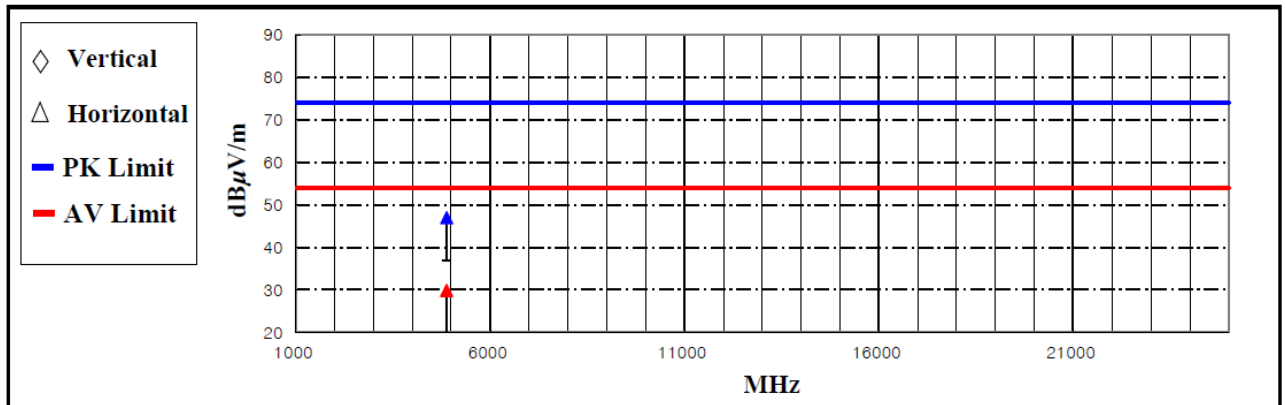
Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
4804.22	52.93	39.33	31.20	-32.83	51.30	37.70	74.00	54.00	22.70	16.30	V	100	0



*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

(EDR 3 Mbps (8 DPSK), 39 CH / 2 441 MHz)

Frequency (MHz)	Measurement Level					Limit (dBμ V/m)		Margin (dB)		Positioning System			
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)					Pol.	Height	Angle	
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	(H/V)	(cm)	(°)		
4881.93	48.43	31.33	31.34	-32.77	47.00	29.90	74.00	54.00	27.00	24.10	H	116	144

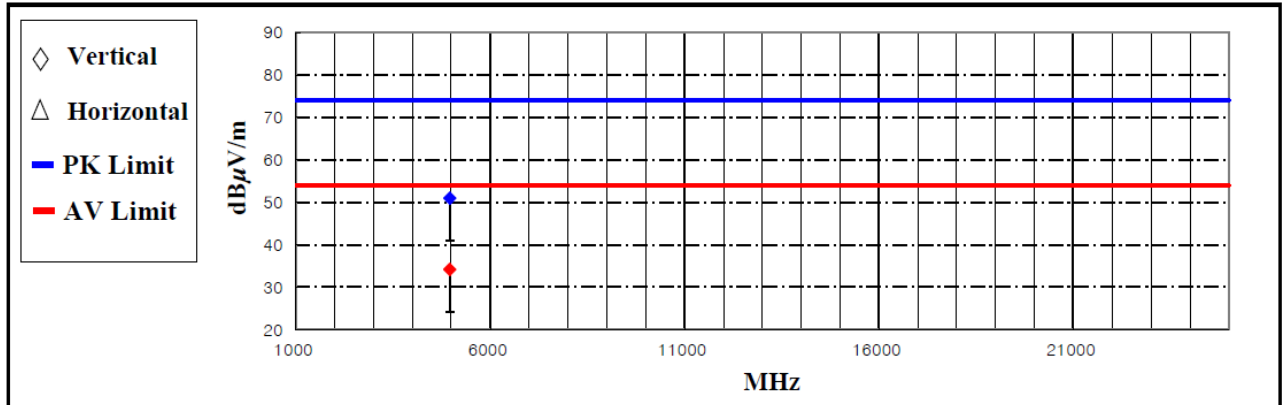


*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)



(EDR 3 Mbps (8 DPSK), 78 CH / 2 480 MHz)

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
4960.11	52.24	35.44	31.47	-32.71	51.00	34.20	74.00	54.00	23.00	19.80	V	100	89



*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

Note:

Emission level (dBμ V/m) = 20 log Emission level (μ V/m).

Corrected Reading: Reading value + AF (Antenna Factor) +AMP/CL (Cable Loss + Preamp factor) = Test result

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