

FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer : OHSUNG ELECTRONICS CO., LTD.

Date of Issue: December 5, 2011

#181 Gongdan-dong, Gumi-si, Gyeongbuk,

Order Number: GETEC-C1-11-248

Republic of Korea

Test Report Number: GETEC-E3-11-125

Attn: Mr. Hak-Ki Kim / General Manager

Test Site: Gumi College EMC Center

FCC Registration Number: (100749, 443957)

FCC ID. : OZ5URCTHZ100

Applicant : OHSUNG ELECTRONICS CO., LTD.

Rule Part(s)	: FCC Part 15 Subpart C-Intentional Radiator § 15.247
Test method	: Public Notice FCC97-114 (Guidance on measurement for direct sequence spread spectrum systems)
Equipment Class	: Digital Transmission System(DTS)
EUT Type	: THERMOSTAT
Type of Authority	: Certification
Model Name	: THZ-100
Trade Name	: UNIVERSAL Remote Control

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 (2003)

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 vest 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,

Reviewed by,



Seung-Chul Lee, Associate Engineer
GUMI College EMC center



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: OHSUNG ELECTRONICS CO., LTD.

Applicant Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea

Manufacturer: OHSUNG ELECTRONICS CO., LTD.

Manufacturer Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea

Contact Person: Mr. Hak-Ki Kim / General Manager

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- **FCC ID.** OZ5URCTHZ100
- **Equipment Class** Digital Transmission System (DTS)
- **EUT Type** THERMOSTAT
- **Model Name** THZ-100
- **Rule Part(s)** FCC Part 15, Subpart C-Intentional Radiator § 15.247
- **Test Method** Public Notice FCC97-114
(Guidance on measurement for direct sequence spread spectrum systems)
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2003)
- **Dates of Test** November 21 ~ December 1, 2011
- **Place of Test** **Gumi College EMC Center** (FCC Registration No.: 100749, 443957)
407, Bugok-Dong, Gumi-si, Gyeongsangbuk-Do, Korea
- **Test Report Number** GETEC-E3-11-125
- **Dates of Issue** December 5, 2011

EUT Type: THERMOSTAT

FCC ID.: OZ5URCTHZ100



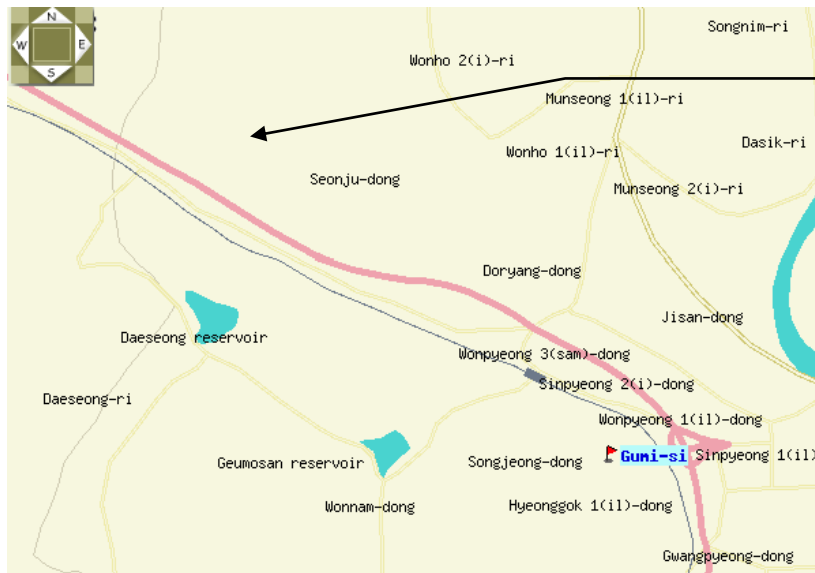
2. Introduction

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 (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **OHSUNG ELECTRONICS CO., LTD. THERMOSTAT (Model name: THZ-100)**

These measurement tests were conducted at **Gumi College EMC Center**.

The site address is 407, Bugok-Dong, Gumi-si, Gyeongsangbuk-Do, 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 Daege 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 on October 19, 1992



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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 **OHSUNG ELECTRONICS CO., LTD. THERMOSTAT**
(Model Name: THZ-100) FCC ID.: OZ5URCTHZ100

- **Microprocessor** : ARM 32-bit Cortex™-M3 150 MHz
- **Flash** : 128 Kbytes of SRAM, 512 Kbytes of flash memory
- **Display** : 2.0 inch QCIF
- **Display Resolution** : 176 (H) × RGB × 220 (V)
- **Dimension** : 3.25 inch × 1.00 inch × 2.75 inch
- **RF Range (Radio Frequency)** : 50 to 100 feet, depending upon the environment

- Frequency List

Frequency Band [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
2 405 – 2480	11	2 405	19	2 445
	12	2 410	20	2 450
	13	2 415	21	2 455
	14	2 420	22	2 460
	15	2 425	23	2 465
	16	2 430	24	2 470
	17	2 435	25	2 475
	18	2 440	26	2 480



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
AC/AC converter	LG Electronics Inc.	6870A90282B	S/N: None. FCC ID.: N/A

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.
None.	-	-	S/N: - FCC ID.: -

3.2.3 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected to the EUT and AC/AC converter	1.00 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 (AC 24 V supplied from the AC/AC converter)
- Test Mode(s): Executed “Tera term (Copyright by T.Teranishi)” to control the EUT continuously transmit RF signal.

Test Software Version	Tera term (Ver 4.64)		
Frequency	2 405 MHz	2 440 MHz	2 480 MHz
Transmit power level (0x00 ~ 0x12)	07 (+ 3 dBm)	07 (+3 dBm)	07 (+ 3 dBm)

```

----- Item Number -----
0x0000 : No operation
0x0003 : RF Power
0x1000 : Set MY_PanID
0x1001 : Set MY_MyAddr
0x1002 : Set MY_DstAddr
0x8001 : PER Parameter
0x8002 : PER Parameter 2
0x8010 : Display Rx Packet 's RSSI
0x8011 : Display Rx Packet

Input ItemCode : 0x0003 ==> OK

-----
- PowerLevel
-----
0x00 : 10 dBm(if supported) or 8 dBm
0x01 : 9 dBm(if supported) or 8 dBm
0x02 : 8 dBm
0x03 : 7 dBm
0x04 : 6 dBm
0x05 : 5 dBm
0x06 : 4 dBm
0x07 : 3 dBm
0x08 : 2 dBm
0x09 : 1 dBm
0x0A : 0 dBm
0x0B : -5 dBm
0x0C : -7 dBm
0x0D : -10 dBm
0x0E : -15 dBm
0x0F : -20 dBm
0x10 : -30 dBm
0x11 : -40 dBm
0x12 : -50 dBm

Input Power Level : 0x07 ==> OK

[Channel Change]
Current Channel : 26 (2480 MHz)
Input Channel (11 ~ 26) : 26 (2480 MHz) ==> OK

[TX : 16-bit Addr --> 16-bit Addr]
.....
.....

```

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 **OHSUNG ELECTRONICS CO., LTD RF Transmitter Universal Remote Control** comply with the requirement of §15.203 with a internal 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

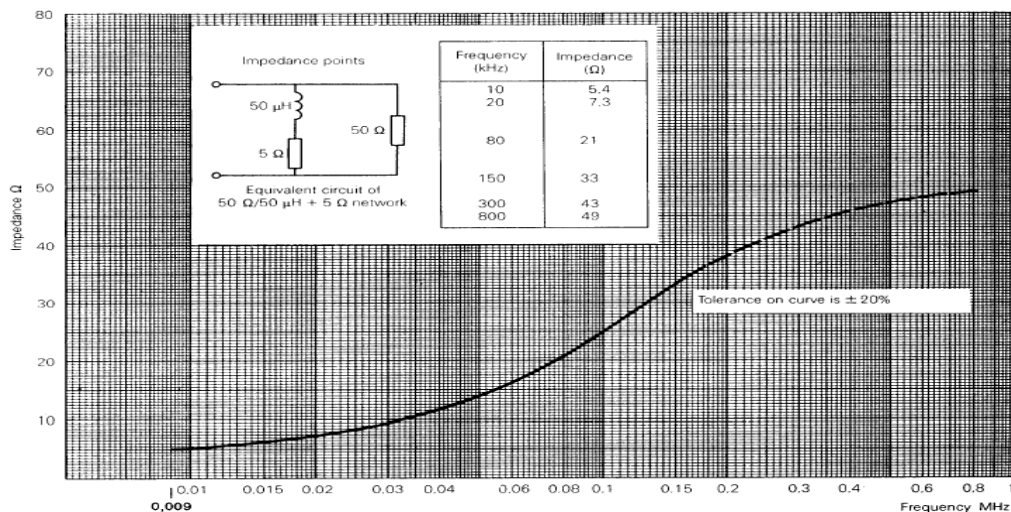


Fig 2. Impedance of LISN



5.3 Radiated Emission

Preliminary measurements were conducted 3 m semi anechoic chamber using broadband antennas to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The technology configuration, mode of operation and turntable azimuth with respect to antenna was note for each frequency found.

Final measurements were made 3 m chamber (FCC registration No.: 443957) and/or 10 m OATS (FCC registration No.: 100749).

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

Each frequency found during pre-scan measurements was re-examined and investigated using EMI test receiver. The detector function was set to CISPR quasi-peak mode average mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency or type of signal.

The EUT, support equipment and interconnecting cables were reconfigured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8 m high non-metallic 1.0 m × 1.5 m table.

The turntable containing the test sample was rotated; the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission.

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

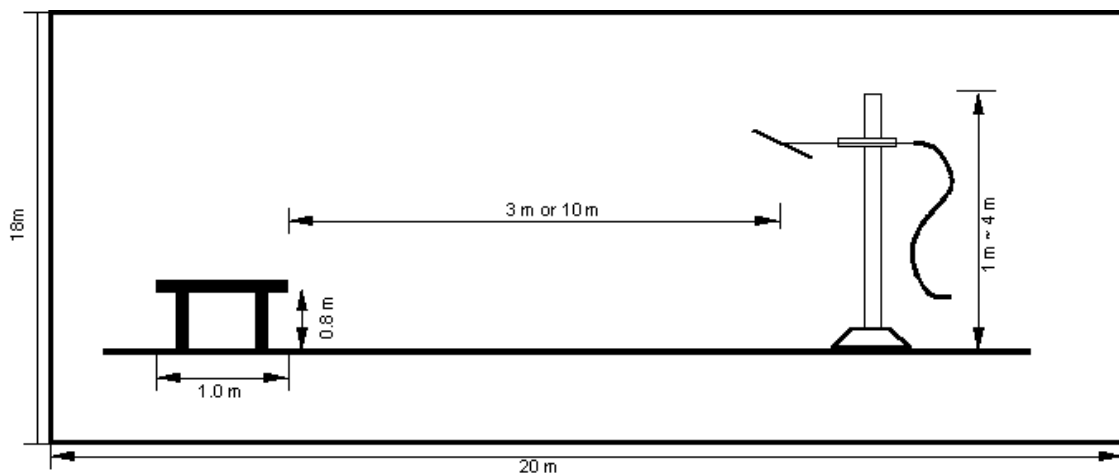


Fig 3. Dimensions of test site.



6. Conducted Emission

6.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 32.0 % 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) Class B	
	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

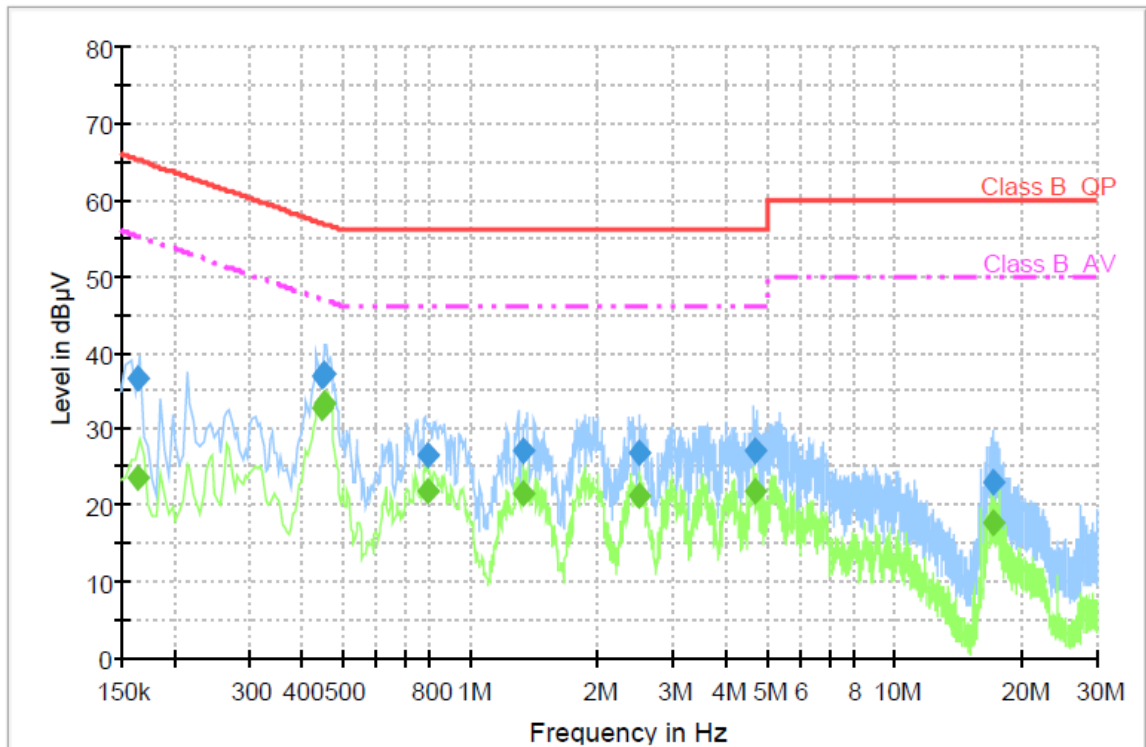
*Limits decreases linearly with the logarithm of frequency.

6.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 10. 2011
□- ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 10. 2011
■ - ESH3-Z5	Rohde & Schwarz	LISN	829991/009	12. 10. 2011
□ - ENV216	Rohde & Schwarz	LISN	100173	12. 10. 2011

6.6 Test data for Conducted Emission

- Test Date : November 28, 2011
- Reference Standard : Part 15 Subpart C, Sec. 15.207
- Operating Condition : Zigbee RF transmitting mode
- Frequency rage : 0.15MHz ~ 30 MHz
- Line : L1: Live line, N: Neutral line



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.164000	36.7	1000.0	9.000	GND	N	10.0	28.5	65.3	
0.448000	36.8	1000.0	9.000	GND	L1	10.0	20.1	56.9	
0.452000	37.1	1000.0	9.000	GND	N	10.0	19.8	56.8	
0.796000	26.7	1000.0	9.000	GND	N	10.0	29.3	56.0	
1.336000	27.2	1000.0	9.000	GND	N	10.1	28.8	56.0	
2.500000	26.9	1000.0	9.000	GND	L1	10.1	29.1	56.0	
4.668000	27.3	1000.0	9.000	GND	L1	10.2	28.7	56.0	
17.028000	23.0	1000.0	9.000	GND	L1	10.9	37.0	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.164000	23.6	1000.0	9.000	GND	N	10.0	31.7	55.3	
0.448000	32.7	1000.0	9.000	GND	L1	10.0	14.2	46.9	
0.452000	33.4	1000.0	9.000	GND	N	10.0	13.4	46.8	
0.796000	21.9	1000.0	9.000	GND	N	10.0	24.1	46.0	
1.336000	21.5	1000.0	9.000	GND	N	10.1	24.5	46.0	
2.500000	21.3	1000.0	9.000	GND	L1	10.1	24.7	46.0	
4.668000	22.0	1000.0	9.000	GND	L1	10.2	24.0	46.0	
17.028000	17.8	1000.0	9.000	GND	L1	10.9	32.2	50.0	

< Fig 4. Conducted emission result >

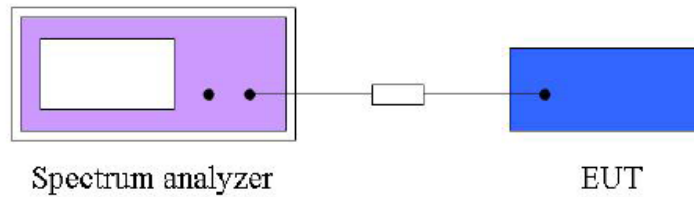


7. Maximum Peak Output Power Measurement

7.1 Operating environment

Temperature : 24.0 °C
 Relative Humidity : 32.0 % R.H.

7.2 Test Set-up (Layout)



7.3 Limit

For systems using digital modulation in the (2 400~2 483.5) MHz, the limit for peak output power is 30 dBm. The limit has to be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

7.4 Test Equipment used

Model Number	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	04.17.2012

7.5 Test Result

- Test Date : December 1, 2011
- Reference Standard : Part 15 Subpart C, Sec. 15.247(b)(3)
- Operating Condition : Zigbee RF transmitting mode
- Power Source : AC 120 V / 60 Hz (AC 24 V supplied from the AC/AC converter)

Parameter

- Filter no : Auto
- Measurement time : 0.135 s ~ 26 s

Configuration IEEE 802.15.4

Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Max. Limit (dBm)	Result
11	2 405	14.60	28.84	30	Complies
18	2 440	15.28	33.73	30	Complies
26	2 480	15.82	38.19	30	Complies

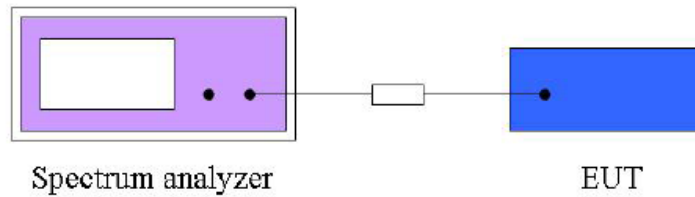


8. Power Spectral Density Measurement

8.1 Operating Environment

Temperature : 22.0 °C
 Relative Humidity : 41.0 % R.H.

8.2 Test Set-up (Layout)



8.3 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

8.4 Test Equipment used

Model Number	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12.10.2011

8.5 Test Result

- Test Date : November 30, 2011
 - Reference Standard : Part 15 Subpart C, Sec. 15.247(e)
 - Operating Condition : Zigbee RF transmitting mode
 - Power Source : AC 120 V / 60 Hz (AC 24 V supplied from the AC/AC converter)

Spectrum Parameter

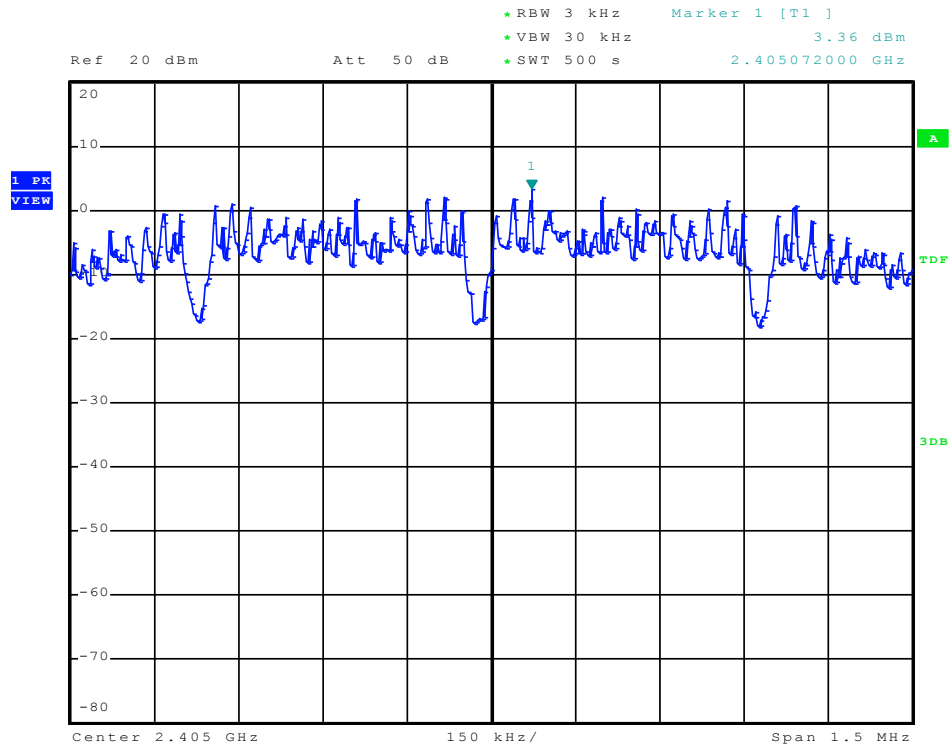
- Attenuation : Auto
 - Span frequency : 1.5 MHz
 - Resolution band width : 3 kHz
 - Video band with : 30 kHz
 - Sweep time : 500 s

Configuration IEEE 802.15.4

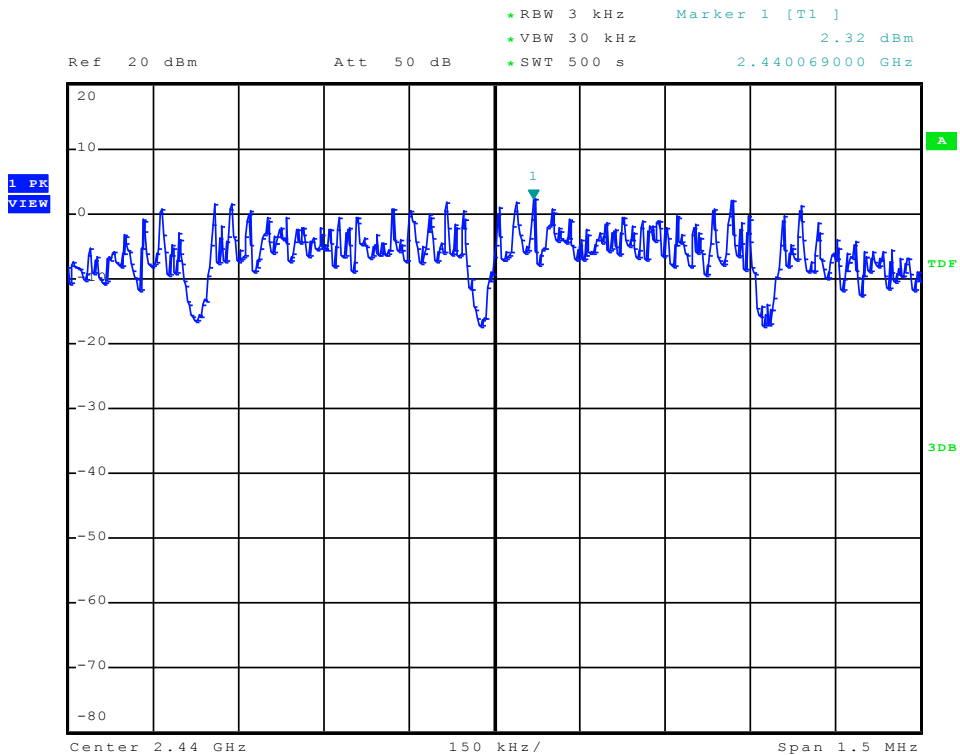
Channel	Frequency (MHz)	Conducted Power (dBm)	Max. Limit (dBm)	Result
11	2 405	3.36	8.00	Complies
18	2 450	2.32	8.00	Complies
26	2 480	4.13	8.00	Complies



Power Density Plot on configuration IEEE 802.15.4 / 2 405 MHz

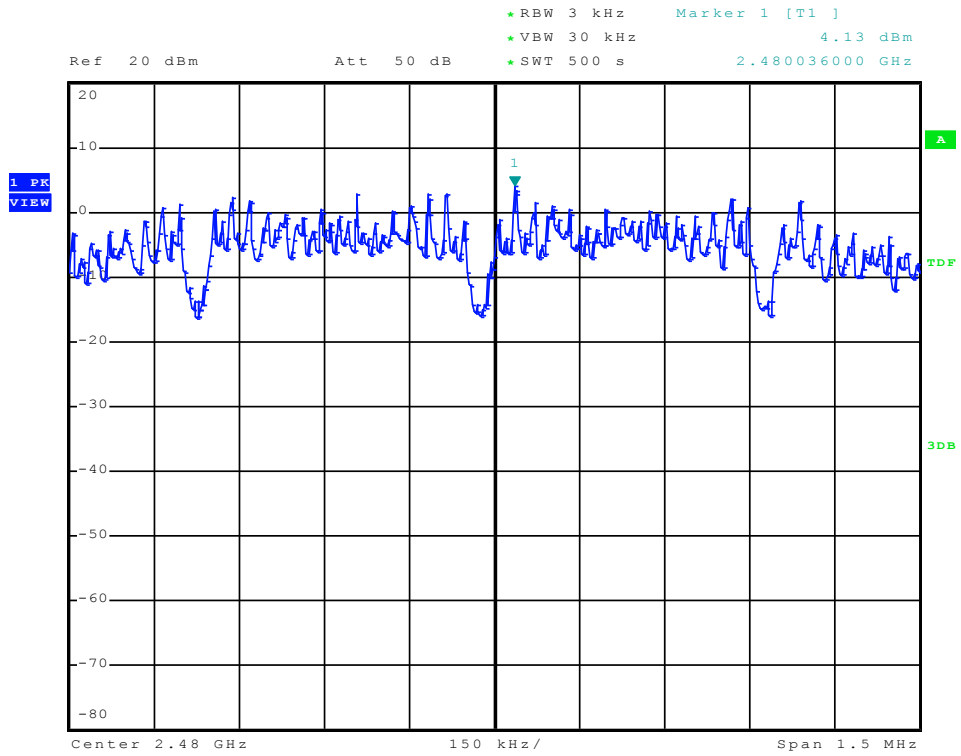


Power Density Plot on configuration IEEE 802.15.4 / 2 440 MHz



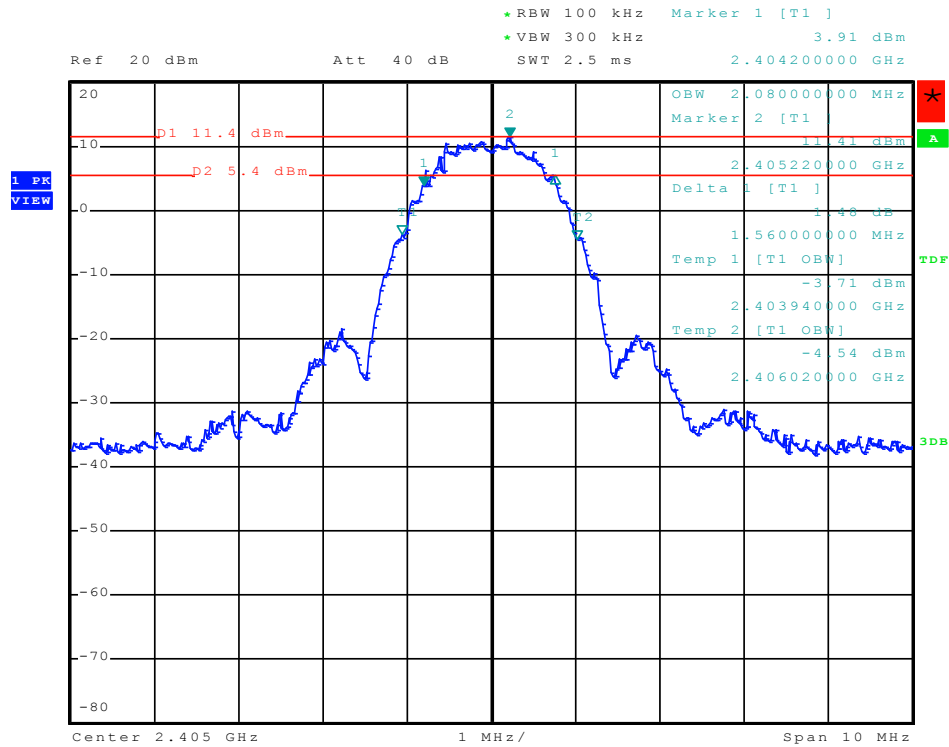


Power Density Plot on configuration IEEE 802.15.4 / 2 480 MHz

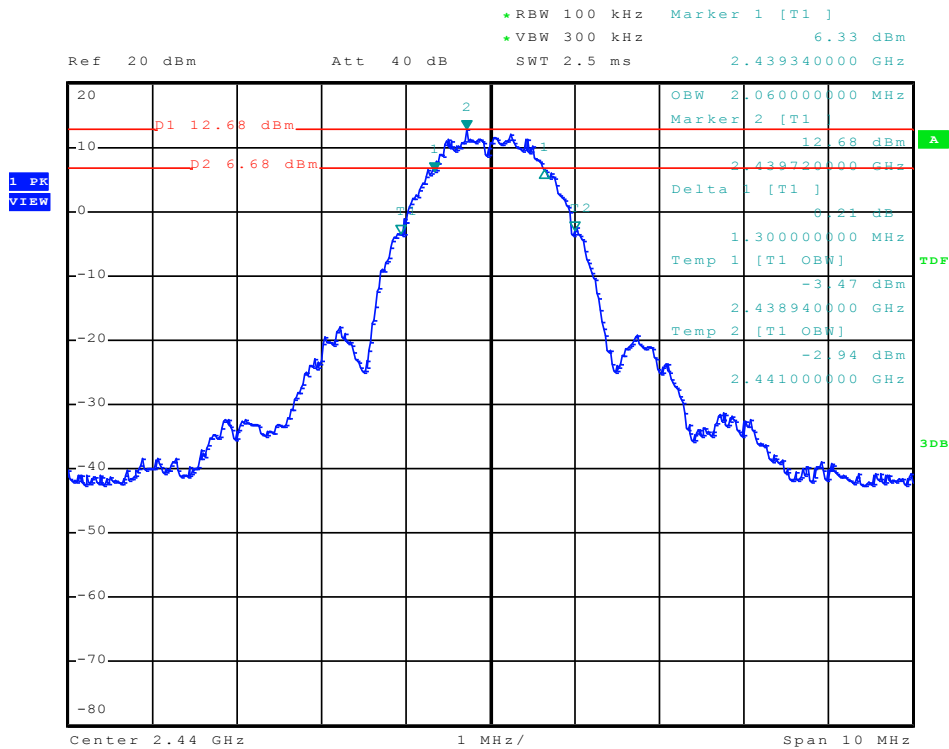




6 dB Bandwidth Plot on Configuration IEEE 802.15.4 / 2 405 MHz

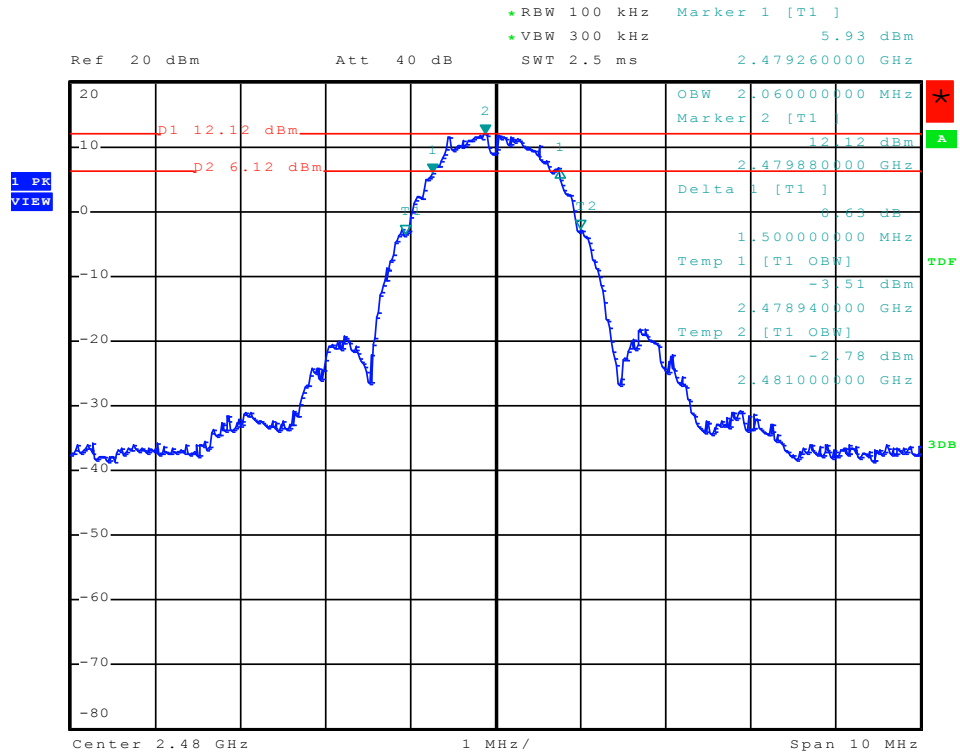


6 dB Bandwidth Plot on Configuration IEEE 802.15.4 / 2 440 MHz





6 dB Bandwidth Plot on Configuration IEEE 802.15.4 / 2 480 MHz



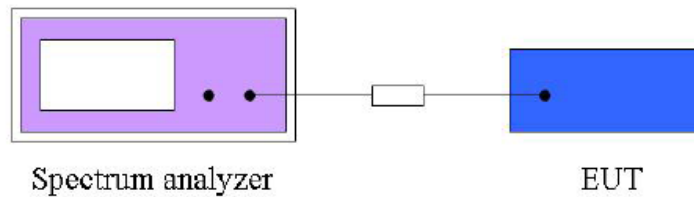


10. Band Edge Measurement

10.1 Operating environment

Temperature : 22.0 °C
 Relative Humidity : 41.0 % R.H.

10.2 Test set-up (Lay-out)



10.3 Limit

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

10.4 Test equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12. 10. 2011

10.5 Band Edge Radiated emission test data

- Test Date : November 30, 2011
 - Reference standard : Part 15 Subpart C, Sec. 15.247(d)
 - Operating condition : Zigbee RF transmitting mode
 - Measuring distance : 3 m
 - Power Source : AC 120 V / 60 Hz (AC 24 V supplied from the AC/AC converter)
 - Note : None.

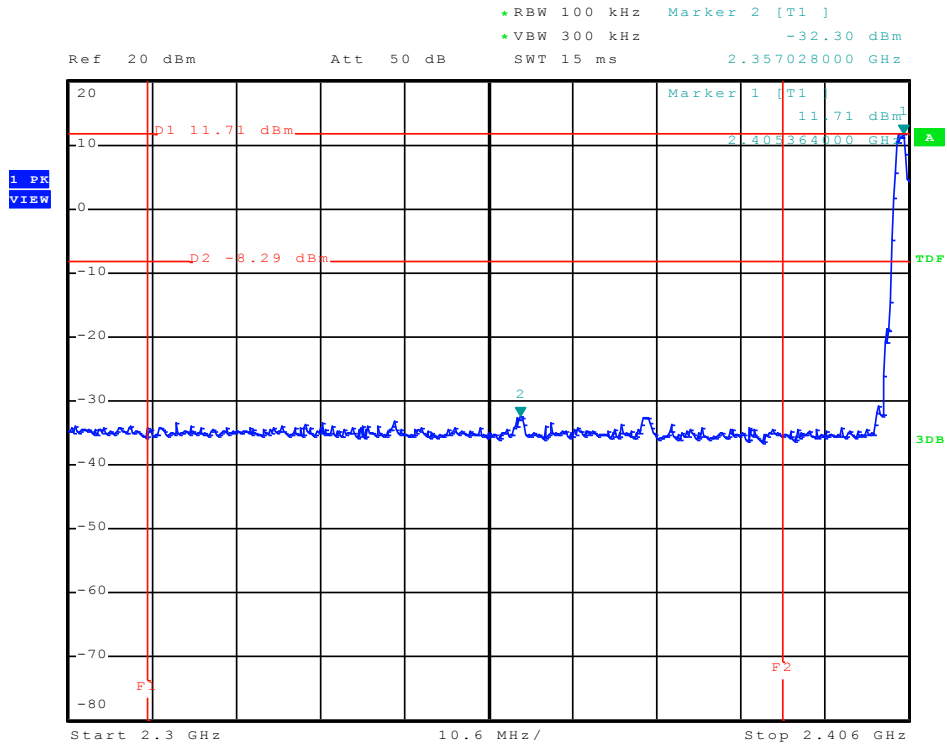
The spectrum plots are attached on the following 8 images, D1 line indicates the highest level, D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement in part 15.247(d)

Spectrum Parameter

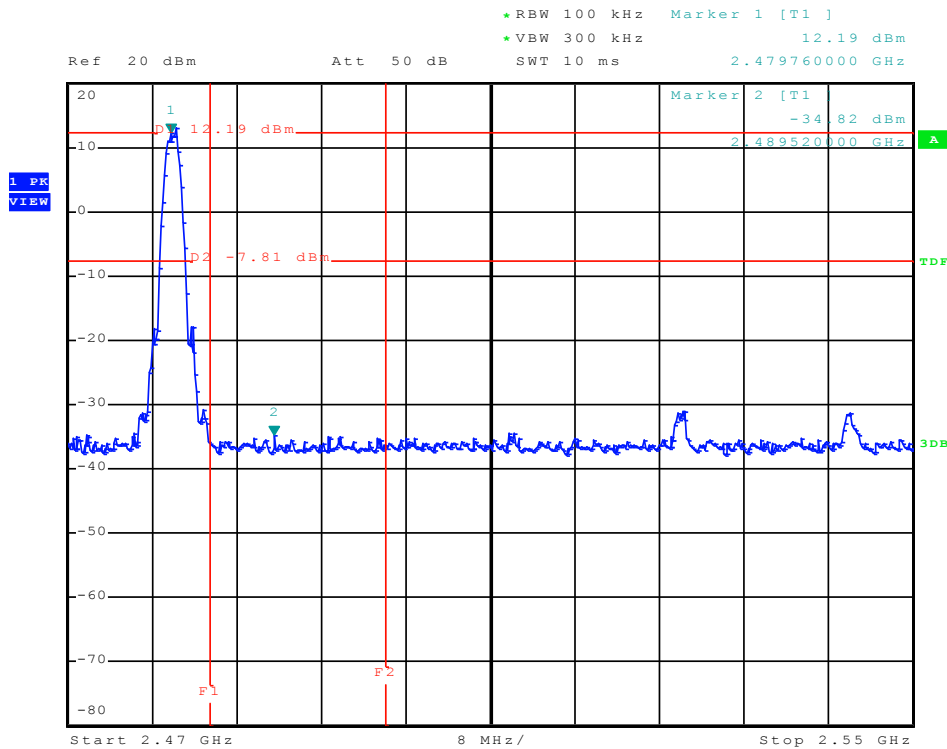
- Attenuation : Auto
 - Resolution bandwidth : 100 kHz
 - Video bandwidth : 100 kHz



For Emission not in Restricted Band Low Band Edge Plot on Configuration IEEE 802.15.4 / 2 405 MHz



High Band Edge Plot on Configuration IEEE 802.15.4 / 2 480 MHz





11. Radiated Emission

11.1 Operating Environment

Temperature : 22.0 °C
 Relative Humidity : 41.0 % R.H.

11.2 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.

11.3 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(Anechoic Chamber)	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 % ($k = 2$)

11.4 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	2400/F (kHz)	300
0.490 ~ 1.705	2400/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

$$[\text{Limit at 3 m}] = [\text{Limit at 300 m}] - 40 \times \log(3 \text{ [m]} / 300 \text{ [m]})$$

$$[\text{Limit at 3 m}] = [\text{Limit at 30 m}] - 40 \times \log(3 \text{ [m]} / 30 \text{ [m]})$$



11.5 Test equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12. 11. 2011
■ - BBHA9120D	Schwarzbeck	Horn Antenna	207	12. 22. 2011
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	100041	12. 15. 2011
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - AM 4.0	maturo GmbH	Antenna Mast	1390308	N/A
■ - 3160-09	ETS LINDGREN	Horn antenna	LM3423	04. 06. 2012
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258942	11. 12. 2012
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	11. 12. 2012

11.6 Radiated emission test data

- Test Date : November 30, 2011
- Reference standard : Part 15 Subpart C, Sec. 15.247(d)
- Operating condition : Zigbee RF transmitting mode
- Measuring distance : 3 m
- Power Source : AC 120 V / 60 Hz (AC 24 V supplied from the AC/AC converter)
- Note : None.
- Measurement

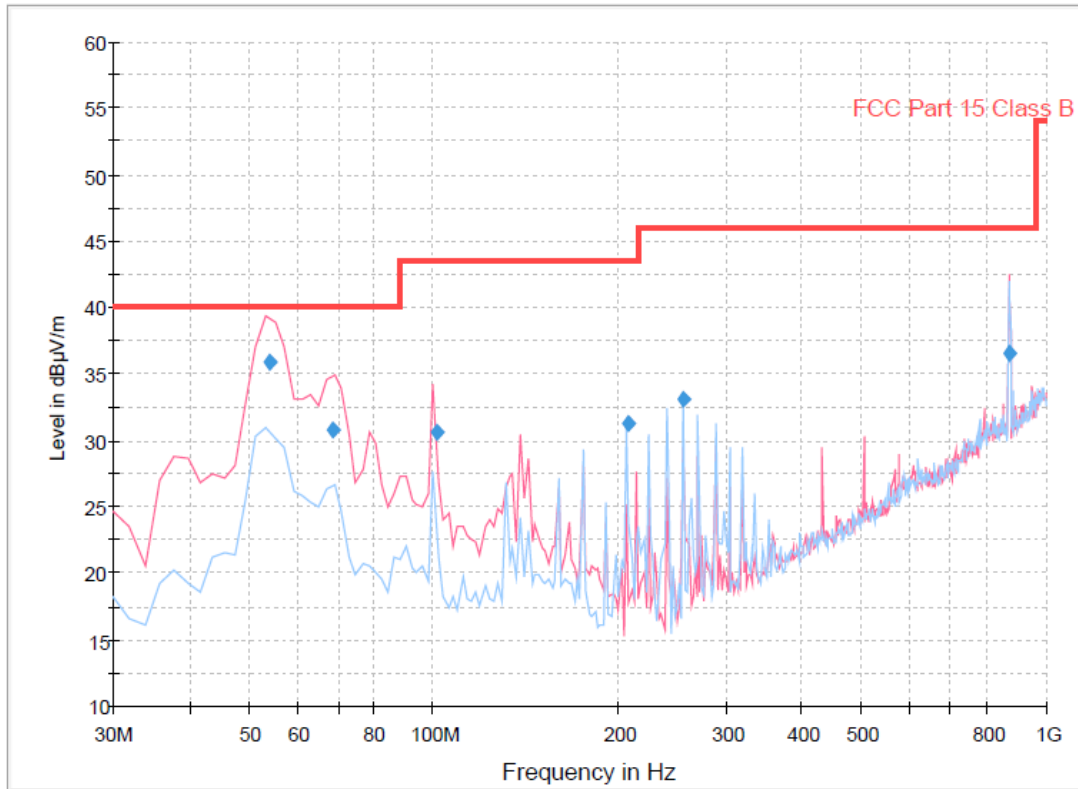
Frequency range	9 kHz ~ 90 kHz, 110 kHz ~ 150 kHz	90 kHz ~ 110 kHz	150 kHz ~ 490 kHz	490 kHz ~ 30 MHz	30 MHz ~ 1 GHz	Above 1 GHz
Detector type	Peak / Average	Quasi peak	Peak / Average	Quasi peak	Quasi peak	Peak / Average
IF bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz	1 MHz



Result of radiated emission (9 kHz to 30 MHz)

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

Result of radiated emission (30 MHz to 1 000 MHz)



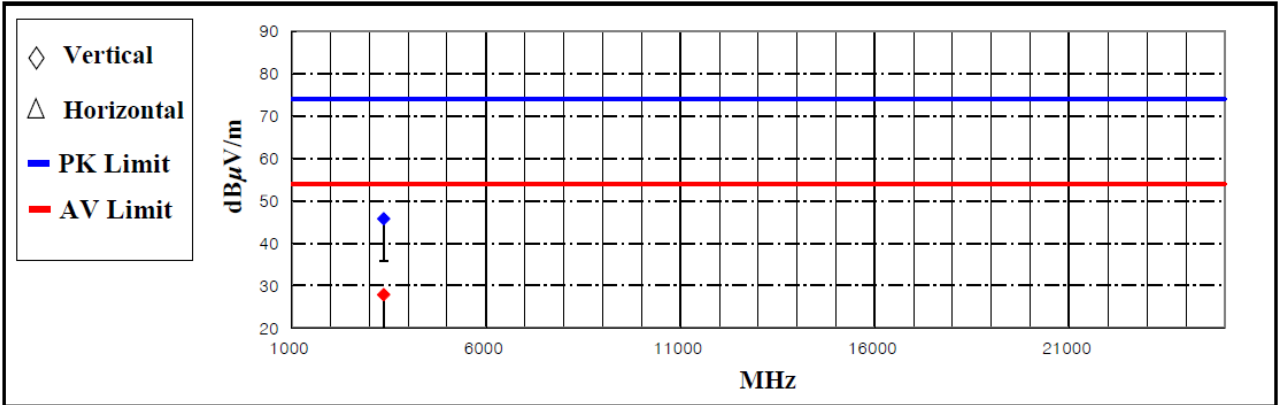
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
53.906653	36.0	1000.0	120.000	100.0	V	311.0	12.9	4.0	40.0
68.497756	30.9	1000.0	120.000	100.0	V	39.0	11.5	9.1	40.0
101.239960	30.6	1000.0	120.000	100.0	V	177.0	11.1	12.9	43.5
207.993788	31.3	1000.0	120.000	150.0	H	243.0	11.5	12.2	43.5
255.990982	33.1	1000.0	120.000	114.0	H	205.0	14.0	12.9	46.0
870.843407	36.6	1000.0	120.000	225.0	V	79.0	27.3	9.4	46.0



Worst case result of radiated emission (1 GHz to 25 GHz)

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF (dB/m)	AMP / CL (dB)	Test Result (dBμV/m)		Peak	Average	Peak	Average	Pol. (H/V)	Height (cm)	Angle (°)
	Peak	Average			Peak	Average							
3366.92	51.81	33.91	29.02	-35.03	45.80	27.90	74.00	54.00	28.20	26.10	V	188	58



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

Result of radiated emission (Band Edge)

Low band (2 310 MHz ~ 2 390 MHz)

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV)		AF (dB/m)	AMP / CL (dB)	Test Result (dBμV/m)		Peak	Average	Peak	Average	Pol. (H/V)	Height (cm)	Angle (°)
	Peak	Average			Peak	Average							
2388.40	63.59	55.09	26.95	-36.94	53.60	45.10	74.00	54.00	20.40	8.90	-	-	-

High band (2 483.5 MHz ~ 2 500 MHz)

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV)		AF (dB/m)	AMP / CL (dB)	Test Result (dBμV/m)		Peak	Average	Peak	Average	Pol. (H/V)	Height (cm)	Angle (°)
	Peak	Average			Peak	Average							
2483.50	69.07	59.27	27.21	-36.78	59.50	49.70	74.00	54.00	14.50	4.30	-	-	-

Note:

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

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

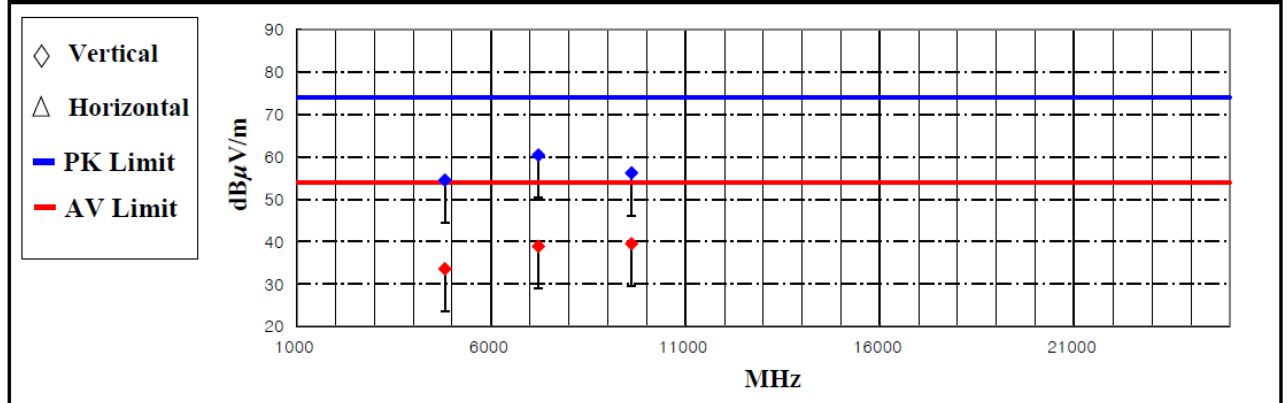
Corrected reading: Antenna factor + Cable loss + Pre-amplifier gain + Read value = Test result



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

802.15.4 / 2 405 MHz

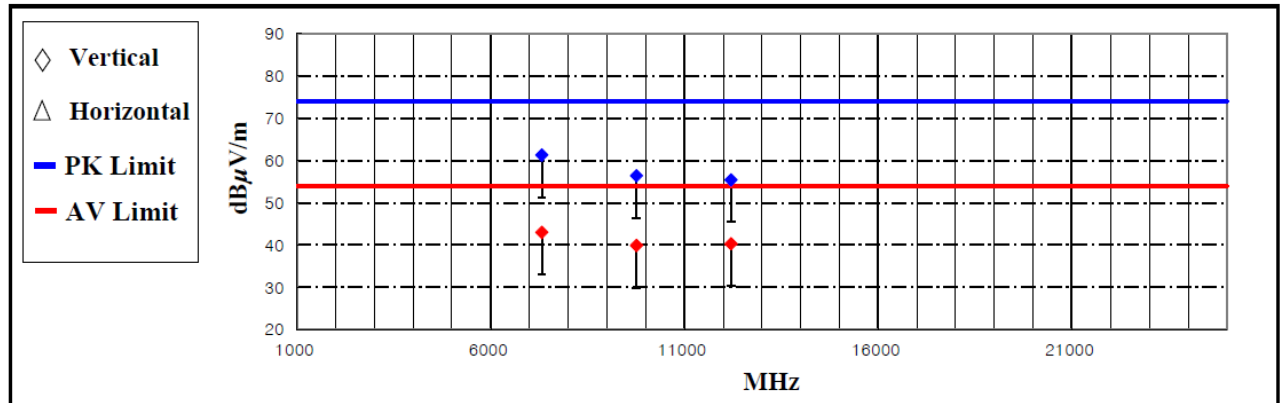
Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF (dB/m)	AMP / CL (dB)	Test Result (dBμV/m)		Peak	Average	Peak	Average	Pol. (H/V)	Height (cm)	Angle (°)
	Peak	Average			Peak	Average							
4811.01	56.12	35.22	31.21	-32.83	54.50	33.60	74.00	54.00	19.50	20.40	V	150	199
7216.62	52.02	30.52	35.76	-27.38	60.40	38.90	74.00	54.00	13.60	15.10	V	176	7
9612.83	40.12	23.42	38.77	-22.69	56.20	39.50	74.00	54.00	17.80	14.50	V	150	110



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

802.15.4 / 2 440 MHz

Frequency (MHz)	Measurement Level						Limit (dBμV/m)		Margin (dB)		Positioning System		
	Reading Value (dBμV/m)		AF (dB/m)	AMP / CL (dB)	Test Result (dBμV/m)		Peak	Average	Peak	Average	Pol. (H/V)	Height (cm)	Angle (°)
	Peak	Average			Peak	Average							
7318.46	52.52	34.22	35.96	-27.18	61.30	43.00	74.00	54.00	12.70	11.00	V	168	98
9762.13	39.71	23.21	39.02	-22.33	56.40	39.90	74.00	54.00	17.60	14.10	V	198	126
12202.20	37.85	22.75	39.21	-21.66	55.40	40.30	74.00	54.00	18.60	13.70	V	199	133

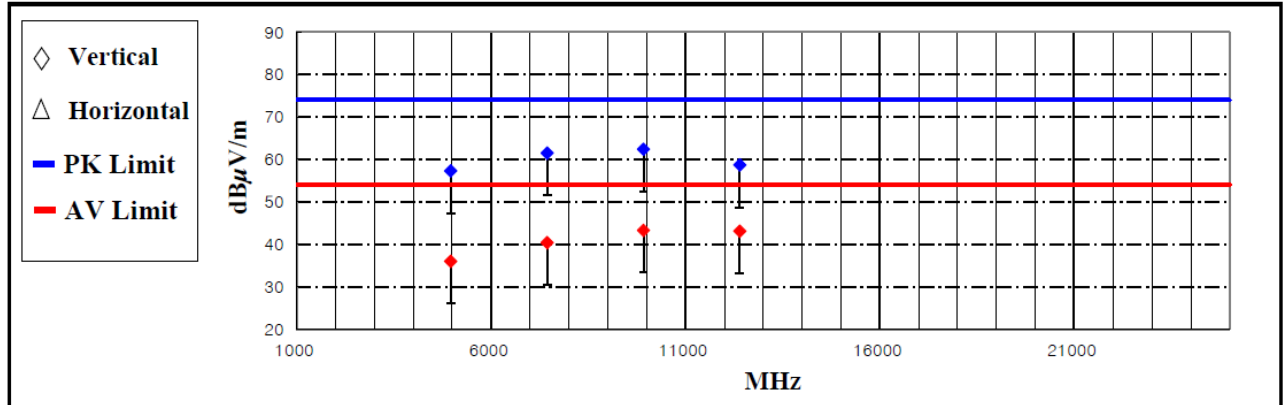


*Comment : AMP/CL_Cable loss value + AMP gain value
 AF : Antenna factor value
 Pol. : H(Horizontal), V(Vertical)



802.15.4 / 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)	(°)
4958.91	58.54	37.24	31.47	-32.71	57.30	36.00	74.00	54.00	16.70	18.00	V	137	65
7441.44	52.26	31.16	36.19	-26.95	61.50	40.40	74.00	54.00	12.50	13.60	V	177	162
9918.03	45.07	25.97	39.28	-21.95	62.40	43.30	74.00	54.00	11.60	10.70	V	150	94
12397.42	41.04	25.44	39.15	-21.49	58.70	43.10	74.00	54.00	15.30	10.90	V	176	145



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

Note:

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

Emission level (dBuV/m)= 20 log Emission level(uV/m).

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