

TEST REPORT
IC/FCC
IC RSS-Gen Issue 3 and RSS-210 Issue8
FCC 47CFR Part 15/C Section 15.249

Transmitter Intentional Radiator

Report Reference No. : E10385-1106

Date of issue : Revision 5.0 December 09, 2011

Total number of pages : 27

Testing Laboratory : Quality Auditing Institute

Address : 16 – 211 Schoolhouse Street, Coquitlam, BC, V3K 4X9, Canada

Accreditations :



IAS ISO17025 Accredited Laboratory No TL-239

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Applicant's name : Nyce Control Inc.

Address : 103 – 8525 Baxter Place Burnaby BC, V5A 4V7, Canada

Contact : Matthew Battistel

mbattistel@nycecontrol.com

Industry Canada Registration : **9488A-Z30411**

FCC Registration: **Y8R-Z30411**

Test specification:

Standard : RSS-Gen; RSS-210; FCC Part 15.249

Test procedure : RSS-Gen; FCC Part15/C; ANSI C63.4-2009

Non-standard test method : N/A

Test item description.....: Occupancy sensor for Zigbee home automation system



Trade Mark.....:

Manufacturer.....: Nyce Control Inc.

Model/Type reference: NCZ3041

Ratings.....: +3Vdc Type CR2 Lithium Battery



Testing procedure and testing location:

Testing Laboratory: Quality Auditing Institute
Testing location/ address: 16 – 211 Schoolhouse Street, Coquitlam, BC, 3K 4X9, Canada
Associated Laboratory: Quality Auditing Institute (Remote location)
Testing location/ address: 19473 Fraser Way, Pitt Meadows, BC, V3Y 2V4, Canada
FCC Test Site Registration Number (OATS 10m and SAC-3m): 226383
Industry Canada Site Registration Number (SAC-3m).....: 9543B-1
Industry Canada Test Site Registration Number (OATS-10m)..: 9543C-1

Testing procedure:

Tested by (name + signature).....: Bruce Balston / David Johanson
Approved by (+ signature): Parminder Singh
Testing location/ address: 19473 Fraser Way, Pitt Meadows, BC, V3Y 2V4, Canada

Sample Information:

Model Number.....: NCZ3041
Company:.....: Nyce Control Inc.
Received Date:.....: September 26, 2011
Received By.....: Bruce Balston
Sample Log.....: QAI Product Control Log (QM 1301 - Sample Inventory)

Environmental Conditions:

Day 1: Sep 26-2011	Indoor Temperature: 23°C R.H.: 65%
Day 2: Sep 27-2011	Indoor Temperature: 23°C R.H.: 55%
Day 3: Sep 28-2011	Indoor Temperature: 22°C R.H.: 52%



The following tests demonstrate the testimony to FCC and IC Electromagnetic compatibility testing for this product.

EMISSIONS

North America Regions:

- CFR 47 Part 15 Subpart B and Subpart C, Section 15.249
- Industry Canada ICES-003, RSS-Gen and RSS-210

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Industry Canada and FCC Regulations for an un-licensed Intentional Radiator. Nyce Control Inc. is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products, as required.

This is to certify that the following report is true and correct to the best of our knowledge.

X

Tested By
David Johanson RF/EMC Test Engineer

X

Reviewed By
Aman Jathaul RF/ EMC Engineer



Measurement Uncertainty

Radio Frequency: $\pm 1.5 \times 10^{-5}$

Total RF power, conducted.....: ± 1 dB

RF power density, conducted.....: ± 2.75 dB

Spurious emissions, conducted.....: ± 3 dB

All emissions, radiated.....: ± 3.5 dB

Temperature.....: $\pm 1^{\circ}\text{C}$

Humidity.....: ± 5 %

DC and low frequency voltages.....: ± 3 %

Test Equipment List

Emissions

Manufacturer	Model	Description	Serial No.	Cal Due Date
ETS Lindgren	S201	3M Chamber 40GHz	1030	N/R
ETS Lindgren	Custom	Mast with Motor	N/R	N/R
ETS Lindgren	Custom	Turntable	N/R	N/R
Sunol Sciences	JB3	Biconilog Antenna 20MHz-3GHz	A120106	28-Oct-2011
Com-Power	AHA-118	Horn Antenna 1- 18GHz	711041	11-Mar-2014
AH Systems	SAS-562B	18" Loop Antenna 9kHz-30MHz	252	02-Feb-2013
Com-Power	LI-115	LISN	241036	11-Feb-2012
Rohde & Schwarz	ESU	EMI Receiver	100011	29-Mar-2012



Product Description

The NYCE Control HomeWatch Wireless Contact Switch combines the features of a passive infrared motion detector and ZigBee® (802.15.4) radio into a single, small device. Packed with intelligent features, the Wireless Occupation /Motion Sensor enables the detection of moving objects in a room.

Operational Description

The NCZ3041 is a wireless motion/occupancy sensor that is used as part of a home automation or security system that is manufactured by NYCE Control Inc. It is designed to produce a momentary transmission indicating a change in the occupancy state of a room using a Zigbee transmitter. The transmitter is installed with a 3V DC cylindrical lithium battery.

EUT Testing Configuration

For the purpose of compliance testing, the EUT was powered using the on-board battery. The EUT was programmed to transmit the maximum output power at the low, mid and high channels of the Zig-Bee band (2405, 2440 and 2480 MHz respectively) in a continuous transmission mode, with and without modulation, using a laptop and interface module.

Manufacturer	Nyce Control Inc.
Product Name	Occupancy sensor for Zigbee home automation system
Model No.	NCZ3041
Serial No.	17
Product Software/Firmware Revision	NCZ3041-FCC20110914 (test firmware only)

Auxiliary Equipment – Used only for the setup and programming of the EUT.

Description	Netbook PC
Manufacturer	Compaq
Model No.	Mini CQ10
Operating System	Windows XP
Software	Ember InSight Desktop Version 2.1.58 (Beta)
Description	ISA Programming pod
Manufacturer	Ember
Model No.	ISA3
Description	Ethernet Switch - POE
Manufacturer	Netgear
Model No.	FS108P

Cables – only during setup

Description	Length	Connector A	Connector B	Shielded	Ferrites
Ribbon cable from ISA3	1ft	Ribbon plug	Ribbon plug	No	No



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Section I: Requirements for the Canadian Market- IC (Exigences pour le marché Canadien)

Summary for RSS-Gen issue 3 and RSS-210 Issue 8

Testing was performed pursuant to Industry Canada standards

Test	Standard	Description	Result
Digital Circuits AC Mains Conducted Emissions	RSS-Gen (7.1.4) ICES-003	The AC mains Conducted emissions are measured in the 0.15 to 30MHz range	Not Applicable Battery operated
Digital Circuits Radiated Emissions	RSS-Gen (7.1.4) ICES-003	The radiated emissions are measured in the 30-1000MHz range	Complies
Antenna Requirement	RSS-Gen(7.1.2)	Replaceable Antenna must use a unique connector	Complies Soldered non-replaceable antenna
Radiated Peak Power and Harmonics	RSS-210 (A2.9)(a)	Peak Power and Harmonics shall be measured at 3meters	Complies
Spurious Emissions outside of the band	RSS-210 (A2.9)(b)	Radiated Spurious emissions shall be 50dBc or 54dBuV in accordance with table 2, whichever is less stringent 30-18000MHz	Complies
Occupied Bandwidth	RSS-GEN (4.6.1)	When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, is measured.	Complies
Transmitter Frequency Stability	RSS-GEN (4.7) and (7.2.6)	Measure the Frequency Stability over Voltage and temperature ranges	Not Applicable



Part 1 - Digital Circuits Radiated Emission Testing

DATE: September 26, 2011

TEST STANDARD: ICES-003 Issue 4

TEST METHOD: RSS-Gen (7.1.4); CAN/CSA – CEI/IEC CISPR 22: 02

TEST VOLTAGE: 3Vdc

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Maximum Field Strength (calculated) dB μ V/m at 3 m	Maximum Field Strength dB μ V/m at 10 m
30 - 230	40.45	30.0
230 - 1000	47.45	37.0

Note 1. The lower limit shall apply at the transition frequency
Note 2. Additional provisions may be required for cases where interference occurs
Note 3. The 3meter calculation is done for measurements performed at 3meters.

METHOD OF MEASUREMENT: The equipment was set up in 3m Semi Anechoic Chamber (SAC) for preliminary and final measurements; Radiated Emissions were performed at 3 meters for this unit. A typical application was tested.

Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

This product is designed to be mounted on a wall. The EUT was investigated in 3 orthogonal planes and the worst case data and plots were taken.

The transmitter was OFF and set for Receive mode for this test.

MODIFICATIONS: The EUT did not require any modifications.

MEASUREMENT DATA: The plots and data are contained in Appendix A.

PERFORMANCE: Complies with Standard



Part 2 - Antenna Requirements

DATE: September 26, 2011

TEST STANDARD: IC RSS-Gen Section 7.1.2

APPLICABLE REGULATIONS : - "An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited."... "the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded."

RESULT : This unit meets this requirement. The antenna is soldered to the circuit board and is not accessible to the end-user.

ZigBee transceiver – Johanson Technology 2450AT18A100E



Part 3 - Radiated Peak Power of the Fundamental and Harmonics

DATE: September 27, 2011

TEST STANDARD: IC RSS-210 Annex 2 Section (A2.9)(a)

TEST VOLTAGE: 3Vdc

MINIMUM STANDARD:

(a) The field strengths measured at 3 meters shall not exceed the following:

Fundamental Frequencies (MHz)	Field Strength (millivolts/m)	
	Fundamental	Harmonics
902-928	50 (94dBuV)	0.5 (54dBuV)
2400-2483.5	50 (94dBuV)	0.5 (54dBuV)
5725-5875	50 (94dBuV)	0.5 (54dBuV)

TEST SETUP: The EUT was tested in our 3meter SAC and was positioned on the center of the Turntable and connected to a 3Vdc battery. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels in the 2400-2483.5MHz band were measured for all radiated emissions 30MHz to 26GHz.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 1MHz RBW, Average detector using the appropriate Antennas, amplifiers and filters.

The EUT was investigated in 3 orthogonal planes and the worst case data and plots were taken.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup Section.

EMISSIONS DATA: No emissions were detected above 7.5GHz using the appropriate antennas and amplifiers. See data in Appendix B

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.



Part 4 - Spurious Radiated Emissions Testing

DATE: September 28, 2011

TEST STANDARD: IC RSS-210 Annex 2 Section (A2.9)(b)
RSS-Gen Section (7.2.5)

TEST VOLTAGE: 3Vdc

MINIMUM STANDARD: (b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

Table 5: General Field Strength Limits for Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dB μ V/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 +	500	54.0

TEST SETUP: The EUT was tested in our 3meter SAC and was positioned on the center of the Turntable and connected to a 3Vdc power supply. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels in the 2400-2483.5MHz band were measured for all radiated emissions 9kHz to 26GHz.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 120kHz RBW Quasi-Peak or 1MHz RBW Average detector using the appropriate Antennas, amplifiers and filters.

The EUT was investigated in 3 orthogonal planes and the worst case data and plots were taken.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup Section.

EMISSIONS DATA: No emissions were detected 9kHz to 2.4Ghz and above 7.5GHz using the appropriate antennas and amplifiers. See data and plots in Appendix A.

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.



Part 5 - Occupied Bandwidth Testing

DATE:	September 28, 2011
TEST STANDARD:	RSS-Gen Section (4.6.1)
TEST VOLTAGE:	3Vdc
MINIMUM STANDARD:	When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.
TEST SETUP:	The EUT was tested in our 3meter SAC and was positioned on the center of the Turntable and connected to a 3Vdc Battery. The Transmitter was set for Continuous transmission. The highest power channel was measured.
MEASUREMENT METHOD:	Measurements were made using an EMI Receiver with 100kHz RBW Sample Detector set on maximum hold using the appropriate Antennas, amplifiers and filters. The EUT was investigated in 3 orthogonal planes and the worst case data and plots were taken.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup Section.
EMISSIONS DATA:	See Data and Plots in Appendix B
OBSERVATIONS:	Since this product was tested per the requirements of RSS-210 A2.9, there was no reference to a required Bandwidth. It was decided that the 99% bandwidth was the appropriate measurement. The EUT performed as expected.
PERFORMANCE:	Complies.



Section II: Requirements for the US Market - FCC

General

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC CFR47 Part 15 subpart B - Unintentional Radiators, Class B and subpart C – Intentional Radiators

Summary for FCC CFR47, Part 15 Subpart B and Subpart C Section 15.249

Test	Standard	Description	Result
AC Mains Conducted Emissions	15.107	The AC mains Conducted emissions are measured in the 0.15 to 30MHz range	Not Applicable Battery Operated
Digital Circuits Radiated Emissions	15.109	The radiated emissions are measured in the 30-1000MHz range	Complies
Antenna Requirement	15.203	Replaceable Antenna must use a unique connector	Complies
Radiated Fundamental and Harmonics Emissions	15.249(a)	Peak Fundamental and Harmonics shall be measured at 3meters	Complies
Spurious Emissions outside of the band and Bandedge	15.249(d) and (e)	Radiated Spurious emissions shall be 50dBc or the levels in 15.209	Complies
Transmitter Frequency Stability	15.215(c)	The 20dB bandwidth must remain within the designated frequency band over the expected variations in temperature and voltage range	Not Applicable



Part 1 - Digital Circuits Radiated Emission Testing

DATE: September 26, 2011

TEST STANDARD: FCC Part 15/B

TEST VOLTAGE: 3Vdc

MINIMUM STANDARD: Class B Limit:

+Frequency (MHz)	Field Strength	
	uV/m @ 3-m	dB μ V/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 1000	500	54.0

METHOD OF MEASUREMENT: The equipment was set up in 3m Semi Anechoic Chamber (SAC) for preliminary and final measurements; Radiated Emissions were performed at 3 meters for this unit. A typical application was tested.

Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

The EUT was investigated in 3 orthogonal planes and the worst case data and plots were taken.

The transmitter was OFF and set for Receive mode for this test.

MODIFICATIONS: The EUT did not require any modifications.

MEASUREMENT DATA: See Appendix A for emissions plots and corresponding data

PERFORMANCE: Complies with Standard



Part 2 - Antenna Requirements

DATE: September 26, 2011

TEST STANDARD: FCC Part 15.203

APPLICABLE REGULATIONS : - "An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited."... "the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded."

RESULT : This unit meets this requirement. The antenna is soldered to the circuit board and is not accessible to the end-user.

ZigBee transceiver – Johanson Technology 2450AT18A100E



Part 3 - Radiated Peak Power of the Fundamental and Harmonics

DATE: September 27, 2011

TEST STANDARD: FCC Part 15.249(a)

TEST VOLTAGE: 3Vdc

TEST CONDITIONS: Indoor, Temperature and Humidity: 25°C, 62%

MINIMUM STANDARD:

(a) The field strengths measured at 3 meters shall not exceed the following:

Fundamental Frequencies (MHz)	Field Strength (millivolts/m)	
	Fundamental	Harmonics
902-928	50 (94dBuV)	0.5 (54dBuV)
2400-2483.5	50 (94dBuV)	0.5 (54dBuV)
5725-5875	50 (94dBuV)	0.5 (54dBuV)

TEST SETUP:

The EUT was tested in our 3meter SAC and was positioned on the center of the Turntable and connected to a 3Vdc power supply. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels in the 2400-2483.5MHz band were measured for all radiated emissions 30MHz to 26GHz.

MEASUREMENT METHOD:

Measurements were made using an EMI Receiver with 1MHz RBW, Average detector, using the appropriate Antennas, amplifiers and filters.

The EUT was investigated in 3 orthogonal planes and the worst case data and plots were taken.

DEVICE DESCRIPTIONS:

As described in the above EUT description and setup Section.

EMISSIONS DATA:

No emissions were detected above 7.5GHz using the appropriate antennas and amplifiers. See data in Appendix B

OBSERVATIONS:

The EUT performed as expected.

PERFORMANCE:

Complies.



Part 4 - Spurious Radiated Emissions and Bandedge Testing

DATE: September 27, 2011

TEST STANDARD: FCC Part 15.249(d) and (e)

TEST VOLTAGE: 3Vdc

MINIMUM STANDARD: (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.
(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

15.209 General Field Strength Limits

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dB μ V/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 +	500	54.0

TEST SETUP: The EUT was tested in our 3meter SAC and was positioned on the center of the Turntable and connected to a 3Vdc power supply. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels in the 2400-2483.5MHz band were measured for all radiated emissions 9kHz to 26GHz.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 120kHz RBW Quasi-Peak or 1MHz RBW Average detector using the appropriate Antennas, amplifiers and filters.

The EUT was investigated in 3 orthogonal planes and the worst case data and plots were taken.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup Section.

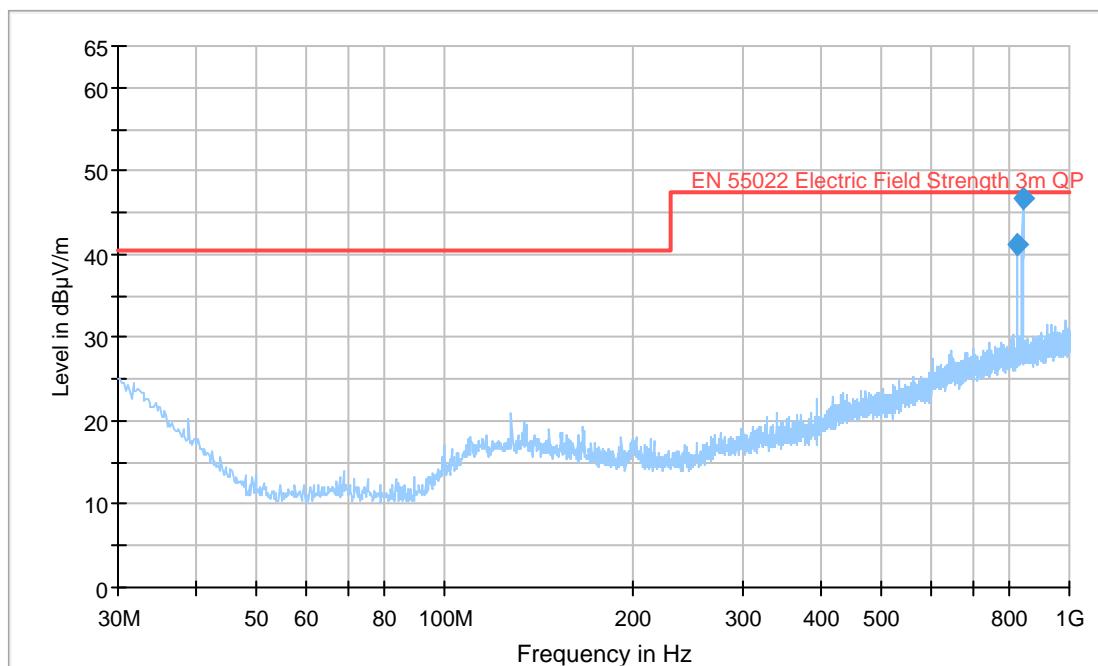
EMISSIONS DATA: No emissions were detected 9kHz to 2.4Ghz and above 7.5GHz using the appropriate antennas and amplifiers. See data and plots in Appendix A.

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Appendix A: Report of Measurements Data and Plots

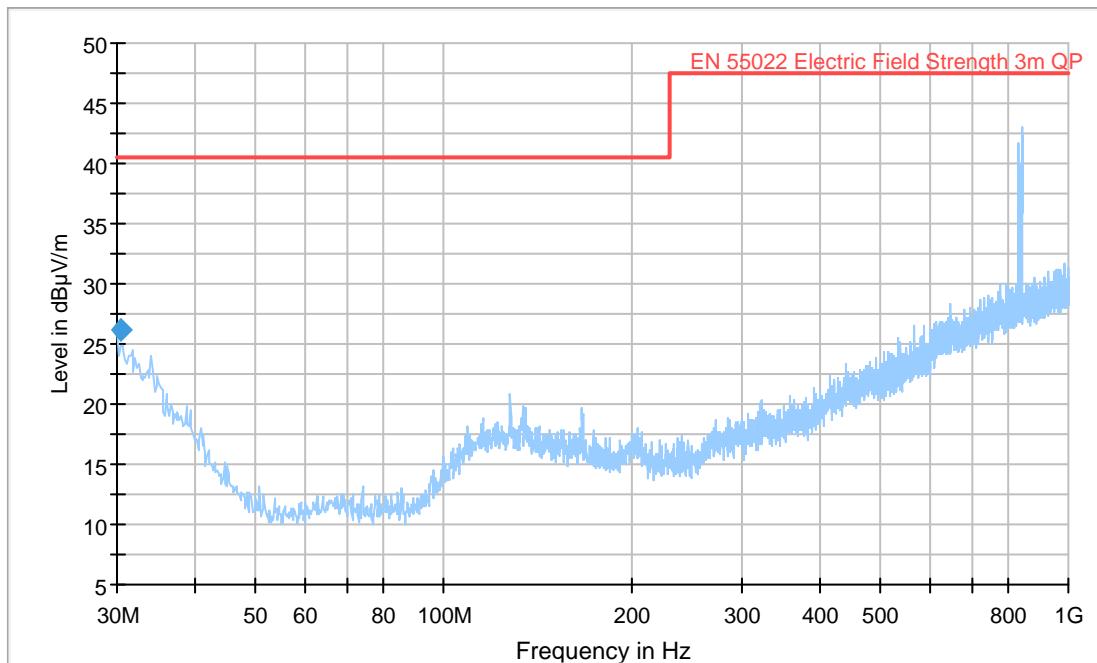
Quiescent Mode/Transmitter turned off



Plot for reference purposes only
(indicated emissions are from ambient sources)

All emissions are 20dB or greater below the limit line 9kHz to 2.4GHz

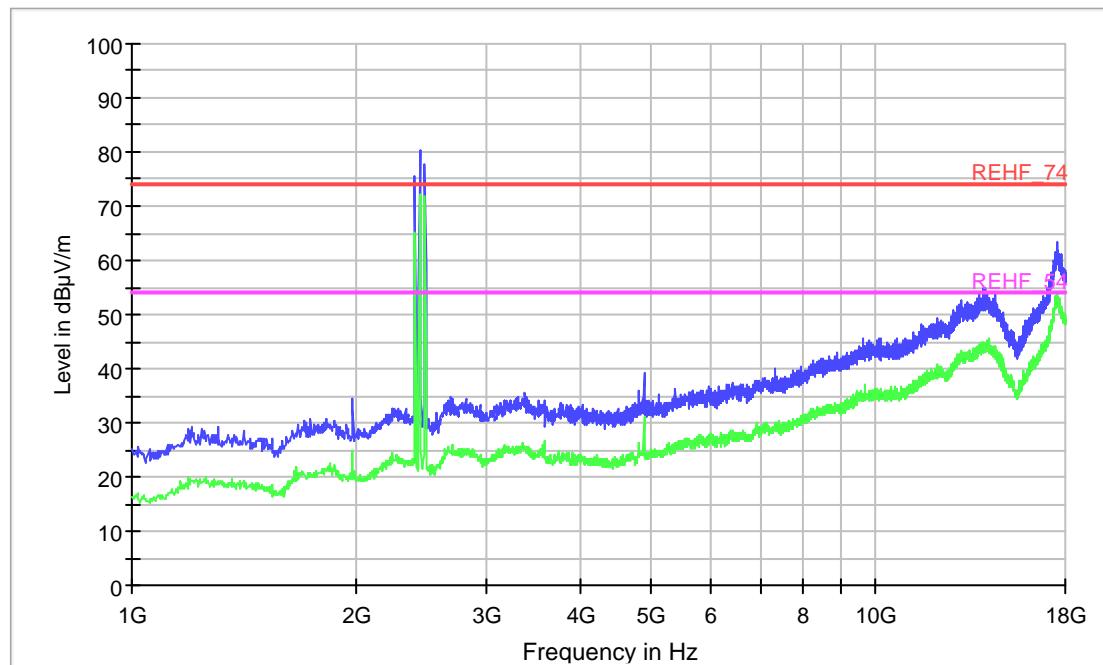
Spurious Emissions Transmitter On Channel 11 - 2.405GHz; 18 - 2.440GHz; 26 - 2.480GHz



Plot for Reference purposes only

All Emissions are from Ambient sources

**Same results for all 3 channels; no channel specific emissions detected.
No Spurious Emissions detected 9kHz to 30MHz and 1.0 to 2.4GHz**



**Plot: Low middle and high channel harmonic emissions 1 to 18GHz
Reference only**

**No harmonics or spurious emissions detected above 5GHz
(some emissions at 2GHz are from ambient sources)**



Channel 11 - 2.405GHz Modulated Fundamental and Harmonics 2.4-25GHz Average

Frequency (GHz)	Corrected Average (dB μ V/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Average Limit (dB μ V/m)	Margin (dB)
2.4050	76.2	113	V	143	94.0	17.8
4.8100	26.2	130	V	93	54.0	27.8

Channel 11 - 2.405GHz Modulated Fundamental and Harmonics 2.4-25GHz Peak

Frequency (GHz)	Corrected Peak (dB μ V/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Peak Limit (dB μ V/m)	Margin (dB)
2.4050	79.4	113	V	143	114.0	34.6
4.8100	35.8	130	V	93	74.0	38.2

Channel 18 - 2.440GHz Modulated Fundamental and Harmonics 2.4-25GHz Average

Frequency (GHz)	Corrected Average (dB μ V/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Average Limit (dB μ V/m)	Margin (dB)
2.4400	79.6	108	V	49	94.0	14.4
4.8800	32.1	100	V	23	54.0	21.9

Channel 18 - 2.440GHz Modulated Fundamental and Harmonics 2.4-25GHz Peak

Frequency (GHz)	Corrected Peak (dB μ V/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Peak Limit (dB μ V/m)	Margin (dB)
2.4400	81.2	108	V	49	114.0	32.8
4.8800	38.1	100	V	23	74.0	35.9

Channel 26 - 2.480GHz Modulated Fundamental and Harmonics 2.4-25GHz Average

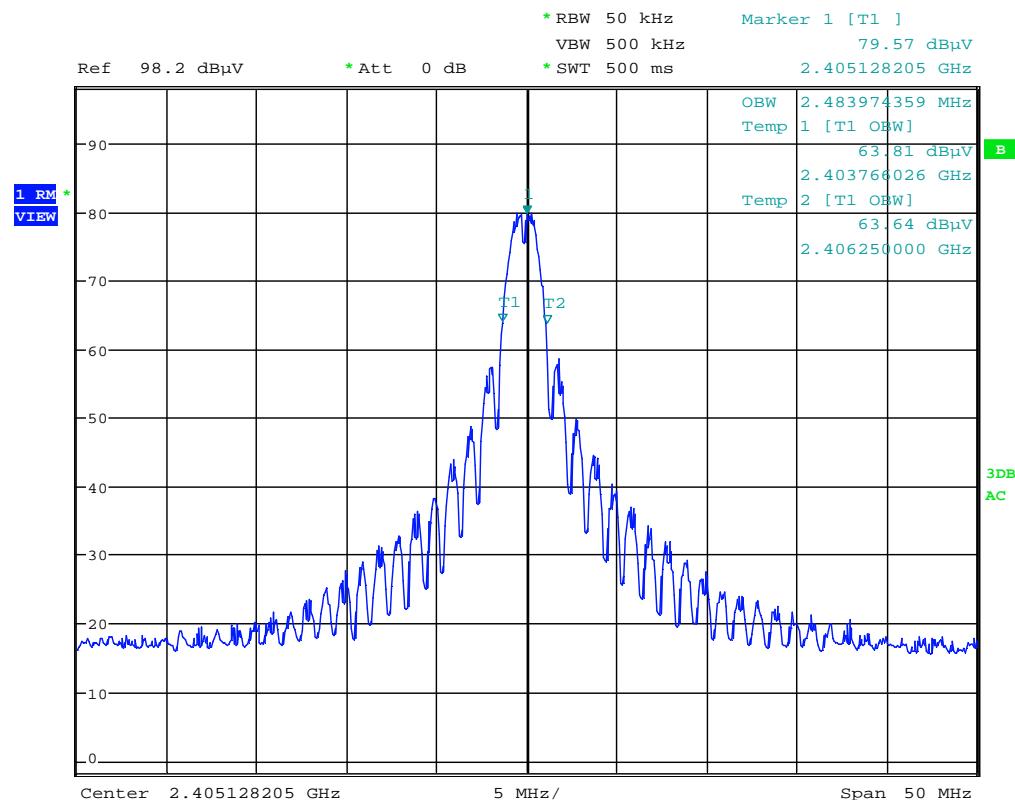
Frequency (GHz)	Corrected Average (dB μ V/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Average Limit (dB μ V/m)	Margin (dB)
2.4801	82.4	100	V	230	94.0	11.6
4.9600	33.2	100	V	46	54.0	20.8

Channel 26 - 2.480GHz Modulated Fundamental and Harmonics 2.4-25GHz Peak

Frequency (GHz)	Corrected Peak (dB μ V/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Peak Limit (dB μ V/m)	Margin (dB)
2.4801	84.1	100	V	230	114.0	29.9
4.9600	39.8	100	V	46	74.0	34.2

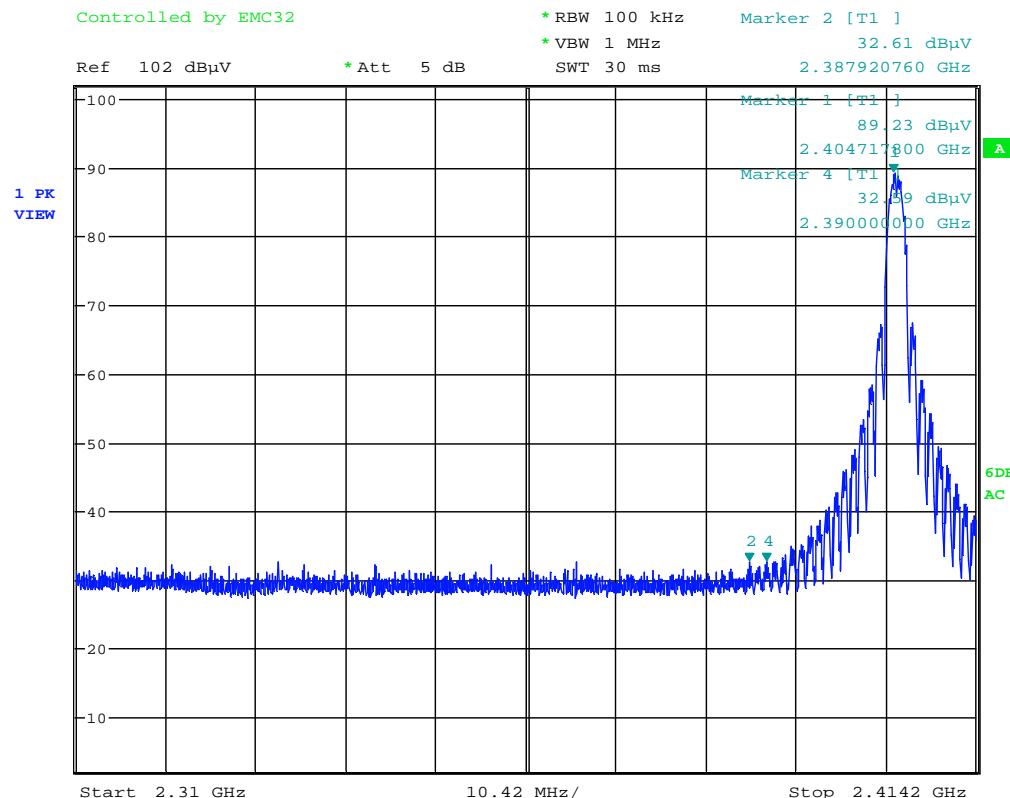
All other emissions and harmonics were undetectable after 5GHz up to 25GHz.

Appendix B: Bandwidth and Bandedge Plots



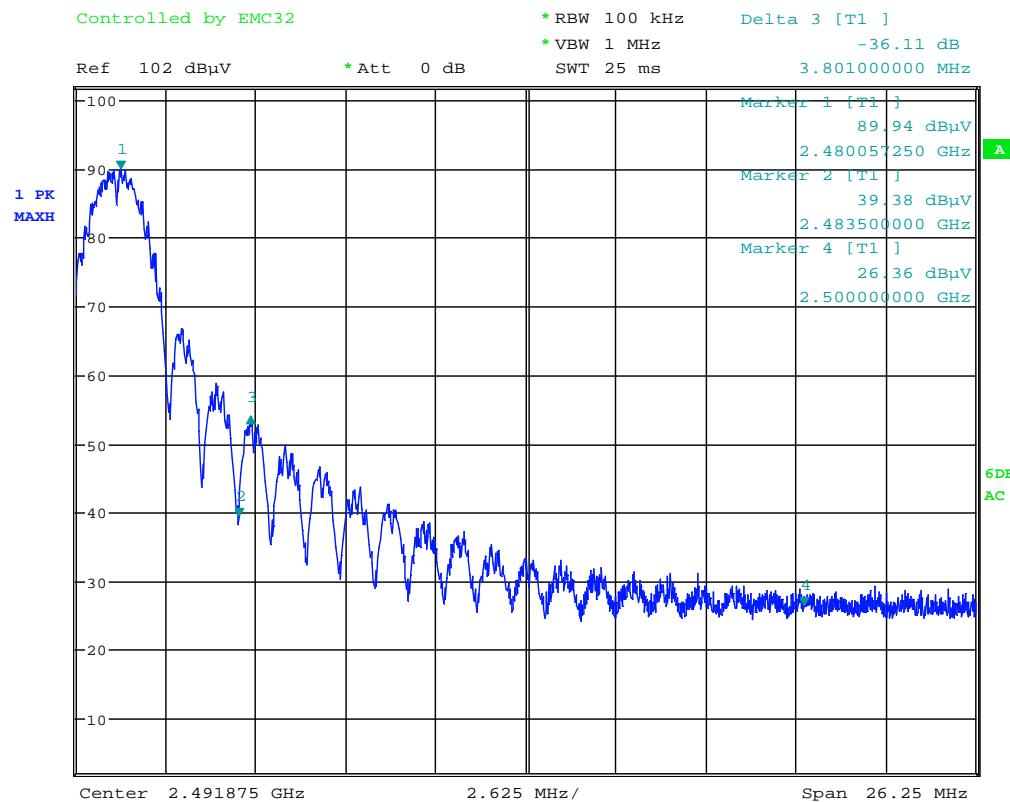
Date: 29.SEP.2011 00:03:15

99% Bandwidth Measurement



Date: 28.SEP.2011 23:58:45

Low Channel Band Edge



Date: 29.SEP.2011 00:28:15

High Channel Band Edge

Appendix C: EUT photos during the testing



