



FCC/IC Test Report

FOR:

**Model Name: SSI I210 3G
Wireless Utility Meter**

**FCC ID: QHC-I2103G
IC ID: 4393B-I2103G**

**47 CFR Part 15.247
RSS- 210**

**TEST REPORT #: EMC_SMAR1_037_11001_FCC15.247_Rev1
DATE: Jan 4, 2012**



**FCC listed
A2LA Accredited

IC recognized #
3462B**

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1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 210 Issue 7 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
SmartSynch Inc.	Wireless Utility Meter	SSI I210 G3 Smart Meter

Responsible for Testing Laboratory:

2012-01-04	Compliance	Sajay Jose (Test Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2012-01-04	Compliance	Calvin Lee (EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
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Test Lab Director:	Heiko Strehlow
Responsible Project Leader:	David Lang

2.2 Identification of the Client

Applicant's Name:	SmartSync Inc
Street Address:	4400 Old Canton Road, Suite 300
City/Zip Code	Jackson / 39211 Mississippi
Country	U.S.A.
Contact Person:	Eric Fortenberry, Mike Mathis
Phone No.	601-362-1780 ext 1089
Fax:	601-362-1787
e-mail:	efortenberry@smartsynch.com , mmathis@smartsynch.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as above applicant.
Manufacturers Address:	---
City/Zip Code	---
Country	---

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name / Model No:	SSI I210 3G SmartMeter
HW / SW Revision :	55M-000600033 / Meter: 660-040401-P01 Modem: S2.0.0.19
FCC-ID :	QHC-I2103G
IC ID:	4393B-I2103G
Product Description:	Wireless Utility Meter
Frequency Range / number of channels:	GSM 850: 824.2-848.8MHz / 125; PCS 1900: 1850.2-1909.8MHz / 300; WCDMA FDD2: 1852.4-1907.6MHz/depends on service ; WCDM FDD5: 826.4-846.6MHz/ depends on service; ZigBee: 2405-2475MHz / 15; <i>(Note: The manufacturer declares to lock channel 26 through firmware as declared in the Operational Description).</i>
Type(s) of Modulation:	Cellular/PCS: GMSK/ 8-PSK UMTS: QPSK ZigBee: OQPSK
Antenna Type / gain / position / min. distance to other antenna (if appl):	<i>(Antenna information has been taken from the operational description.)</i> Cellular/PCS: Dual band di-pole, Gain= +2dBi. ZigBee: PCB Embedded, Gain= +3.3 dBi
Output Power in dBm (Measured across all channels):	Conducted: Low Channel: -1.24 Mid Channel: 19.23 High Channel: -2.74 Radiated: Low Channel: 0.00 Mid Channel: 19.11 High Channel: -0.59
Power Supply	115V / 60Hz
Operating Temperature Range	0°C to 45°C
Prototype / Production unit	Production

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	44336829	55M-000600033	Meter: 660-040401-P01 Modem: S2.0.0.19	Conducted sample
2	44336829	55M-000600033	Meter: 660-040401-P01 Modem: S2.0.0.19	Radiated Sample

4 Subject Of Investigation

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS-210 Issue 7.

This test report is to support a request for new equipment authorization under the FCC ID **QHC-I2103G** and IC ID **4393B-I2103G**.

All testing was performed on the product referred to in Section 3 as EUT.

This test report contains full radiated and conducted testing results as per

- 47 CFR Part 15: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter A- General, Part 15- Radio Frequency Devices.
- RSS-210 Issue 7: Spectrum Management and Telecommunications- Radio Standards Specification. Low-power Licence-exempt radio communication devices (All frequency bands): Category 1 equipment.

During the testing process the EUT was tested on a single channel using test software- on Channels 11 (2405MHz), 18 (2440 MHz) and 25 (2475 MHz).

Radiated testing: All data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§15.247(b)(4) RSS210 A8.4(2)	Antenna Gain	Nominal	Zigbee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§15.247(e) RSS210 A8.2(b)	Power Spectral Density	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(a)(1) RSS210 A8.1(b)	Carrier Frequency Separation	Nominal	Zigbee	<input type="checkbox"/>	<input type="checkbox"/>	■	<input type="checkbox"/>	-
§15.247(a)(1) RSS210 A8.1(d)	Number of Hopping Channels	Nominal	Zigbee	<input type="checkbox"/>	<input type="checkbox"/>	■	<input type="checkbox"/>	-
§15.247(a)(1)(iii) RSS210 A8.3(1)	Time of occupancy	Nominal	Zigbee	<input type="checkbox"/>	<input type="checkbox"/>	■	<input type="checkbox"/>	-
§15.247(a)(1) RSS210 A8.2(a)	Spectrum Bandwidth	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(b)(1) RSS210 A8.4(2)	Maximum Output Power	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(d) RSS210 A8.5	Band edge compliance-Conducted	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-
§15.247(d) RSS210 A8.5	Band edge compliance-Radiated	Nominal	Zigbee	<input type="checkbox"/>	<input type="checkbox"/>	■	<input type="checkbox"/>	See Note 1
§15.247(d) RSS210 A8.5	TX Spurious emissions-Conducted	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(d) RSS210 A8.5	TX Spurious emissions-Radiated	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.209(a) RSS Gen	TX Spurious Emissions Radiated<30MHz	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.109 RSS Gen	RX Spurious Emissions Radiated	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.107(a)	Conducted Emissions <30MHz	Nominal	Zigbee	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

Note: NA= Not Applicable; NP= Not Performed.

1. Band Edge compliance-conducted is NOT PERFORMED as the device passes radiated measurement.

6 Measurements

6.1 Radiated Measurement Procedure

ANSI C63.4 (2003) Section 8.3.1.1: Exploratory radiated emission measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for exploratory testing, but may have anomalies that can lead to significant errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed in an OATS with strong ambient signals. Caution should be taken if either antenna height between 1 and 4 meters or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

The EUT should be set up in its typical configuration and arrangement, and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A step-by-step technique for determining this emission can be found in Annex C.

When measuring emissions above 1 GHz, the frequencies of maximum emission shall be determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. It will be advantageous to have prior knowledge of the frequencies of emissions above 1 GHz. If the EUT is a device with dimensions approximately equal to that of the measurement antenna beamwidth, the measurement antenna shall be aligned with the EUT.

ANSI C63.4 (2003) Section 8.3.1.2: Final radiated emission measurements

Based on the measurement results in 8.3.1.1, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. The final measurement is then performed on a site meeting the requirements of 5.3, 5.4, or 5.5 as appropriate without variation of the EUT arrangement or EUT mode of operation. If the EUT is relocated from an exploratory test site to a final test site, the highest emission shall be remaximized at the final test location before final radiated emissions measurements are performed. However, antenna height and polarity and EUT azimuth are to be varied. In addition, the full frequency spectrum (for the range to be checked for meeting compliance) shall be investigated.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency spectrum investigation, particular focus should be made on those frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full spectrum test constitutes the compliance measurement.

For measurements above 1 GHz, use the cable, EUT arrangement, and mode of operation determined in the exploratory testing to produce the emission that has the highest amplitude relative to the limit. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the antenna in the “cone of radiation” from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response. The antenna may have to be higher or lower than the EUT, depending on the EUT’s size and mounting height, but the antenna should be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. If the transmission line for the measurement antenna restricts its range of height and polarization, the steps needed to ensure the correct measurement of the maximum emissions, shall be described in detail in the report of measurements. Data collected shall satisfy the report requirements of Clause 10.

NOTES

- 1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
- 3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

6.2 Sample Calculations for Radiated Measurements

6.2.1 Field Strength Measurements:

Field Strength measurements are directly taken from the Spectrum Analyzer/ Receiver, taking into account the cable loss between the Receiving Antenna and the Spectrum Analyzer/ Receiver. Antenna Factor is accounted for by the test SW.

$FS (dB\mu V/m) = \text{Measured Value on SA } (dB\mu V) + \text{Cable Loss } (dB)$

Eg:

Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Field Strength Result (dB μ V/m)
1000	95.5	3.5	99.0

6.2.2 Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure.

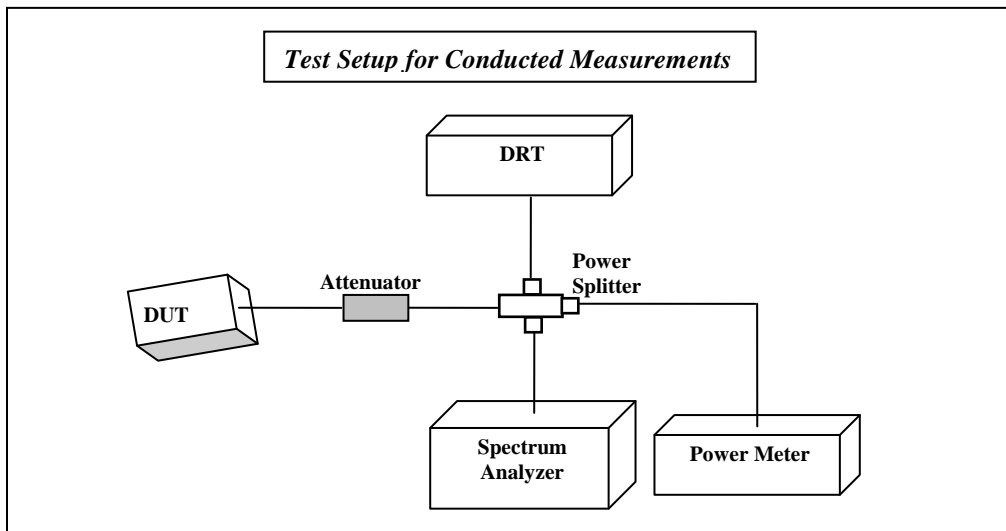
The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

$EIRP (dBm) = \text{Signal Generator setting } (dBm) - \text{Cable Loss } (dB) + \text{Antenna Gain } (dBi)$

Eg:

Frequency (MHz)	Measured SA (dB μ V)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	EIRP (dBm)
1000	95.5	24.5	6.5	0	3.5	27.5

6.3 Conducted Measurement Procedure



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to connect the EUT at the required channel (OR) alternatively use the EUT to set to transmit at a specific mode.
3. Measurements are to be performed with the EUT set to the low, middle and high channels.

6.4 Maximum Peak Output Power

6.4.1 Limits:

6.4.1.1 §15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

6.4.1.2 RSS 210- A8.4(2)

Nominal Peak Output Power < 30 dBm (1W)

EIRP < 36dBm

6.4.2 Test Conditions:

Tnom: 20.5°C; Vnom: 110V

Spectrum Analyzer settings:

RBW=3MHz, VBW=3MHz, Detector: Peak- Max Hold.

Sweep Time: Auto

Span=10MHz

6.4.3 Test Result: 2.4 GHz Band

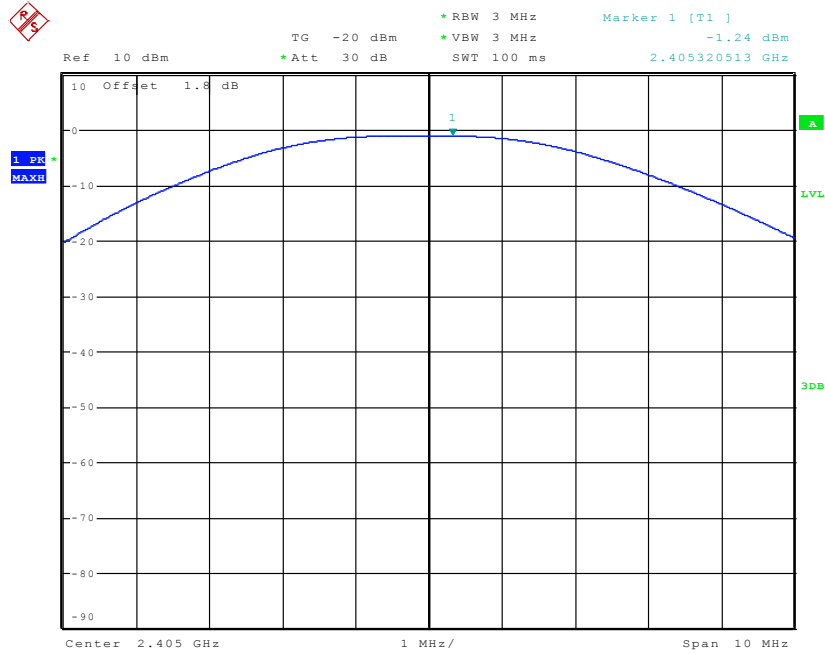
Output Power- Conducted (dBm)			
Modulation	Frequency (MHz)		
	2405 Ch 11	2440 Ch 18	2475 Ch 25
OQPSK	-1.24	19.23	-2.74
Measurement Uncertainty: $\pm 0.5\text{dB}$			

Max Peak Output Power (EIRP)- Radiated (dBm)			
Modulation	Frequency (MHz)		
	2405 Ch 11	2440 Ch 18	2475 Ch 25
OQPSK	0.00	19.11	-0.59
Measurement Uncertainty: $\pm 3.0\text{dB}$			

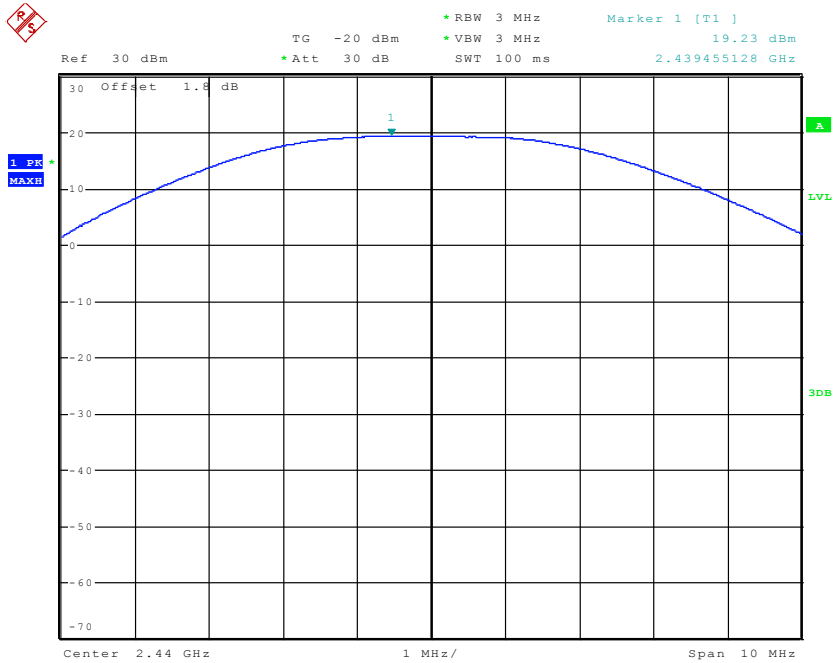
Antenna Gain (Calculated) (dBi)			
Modulation	Frequency (MHz)		
	2405 Ch 11	2440 Ch 18	2475 Ch 25
OQPSK	1.24	-0.12	2.15
Measurement Uncertainty: $\pm 3.0\text{dB}$			

Note: The Gain was calculated as follows:

Ant. Gain [dBi] = Peak Output Power EIRP [dBm] – Peak Output Power Conducted [dBm]

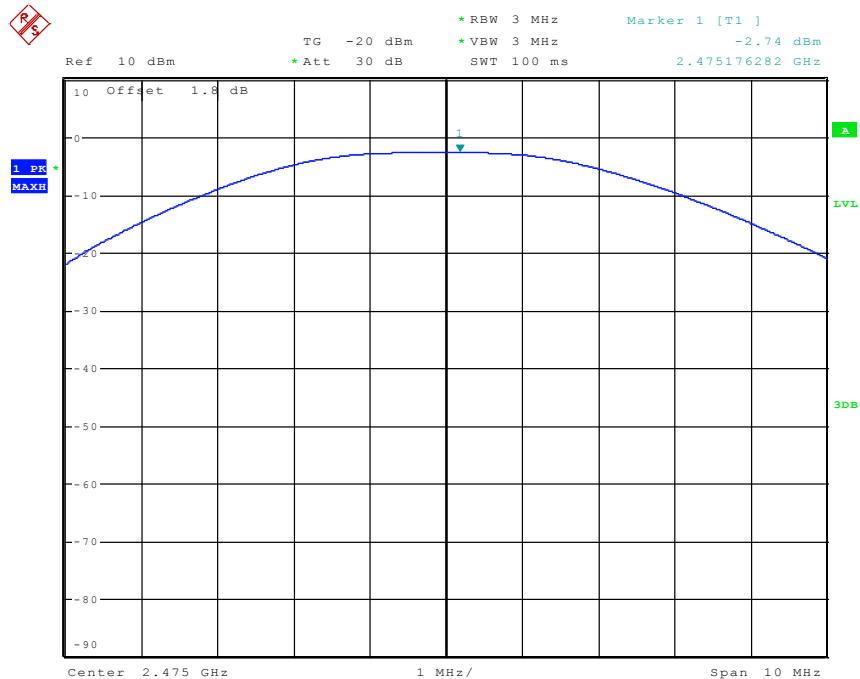
6.4.4 Test Data/plots:**Conducted Peak Power 2405 MHz**

Date: 22.DEC.2011 15:18:47

Conducted Peak Power 2440 MHz

Date: 22.DEC.2011 15:23:44

Conducted Peak Power 2475 MHz



Date: 22.DEC.2011 15:25:16

6.5 Restricted Band Edge Compliance

6.5.1 Requirements and Limits: §15.247/15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

6.5.2 Measurement Procedure:

Peak measurements are made using a peak detector and RBW=1MHz.

Average measurements performed using a peak detector and according to video averaging procedure with RBW=1MHz and VBW=10Hz.

*PEAK LIMIT= 74dBμV/m

*AVG. LIMIT= 54dBμV/m

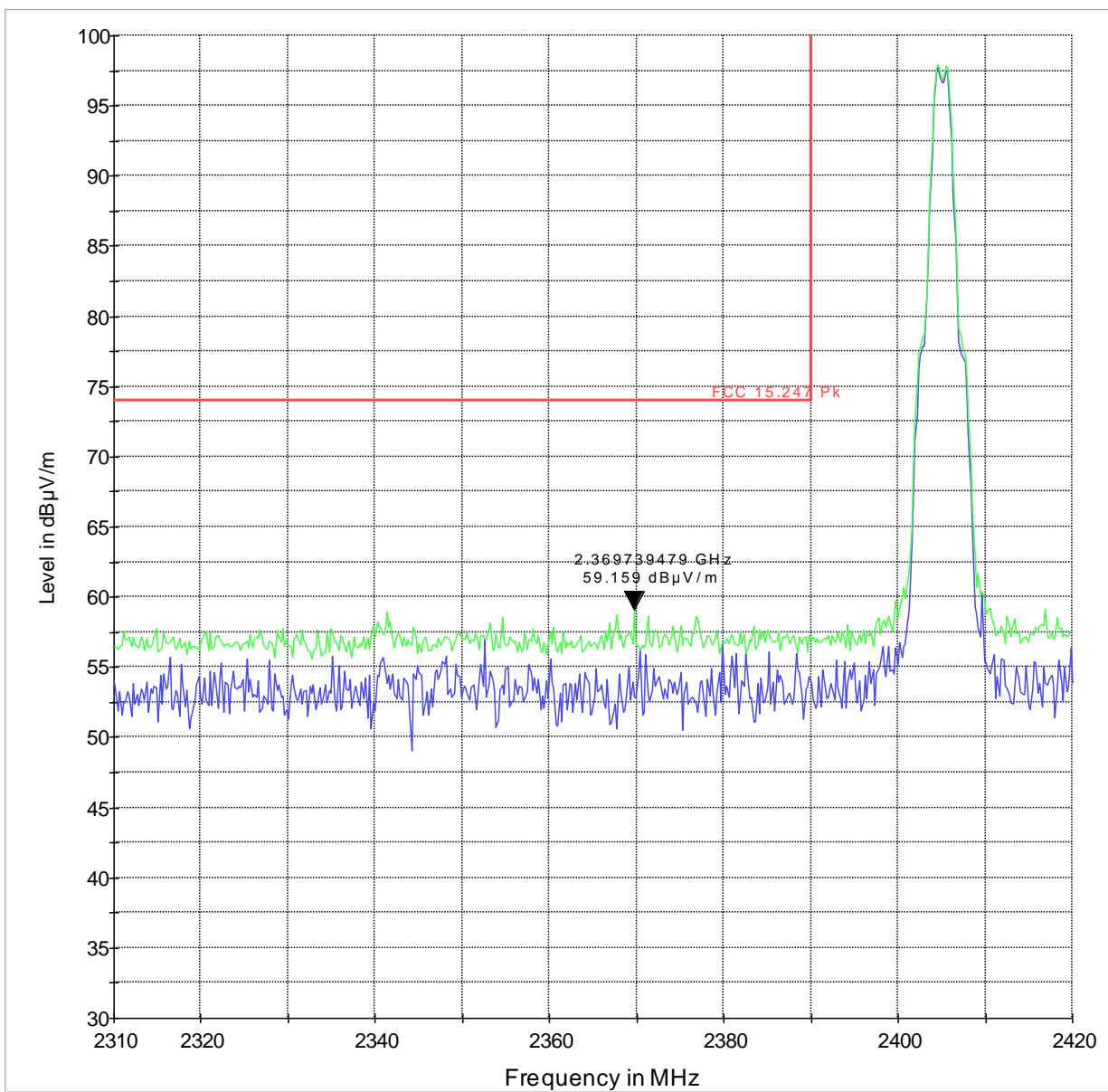
Measurement Uncertainty: ±3.0dB

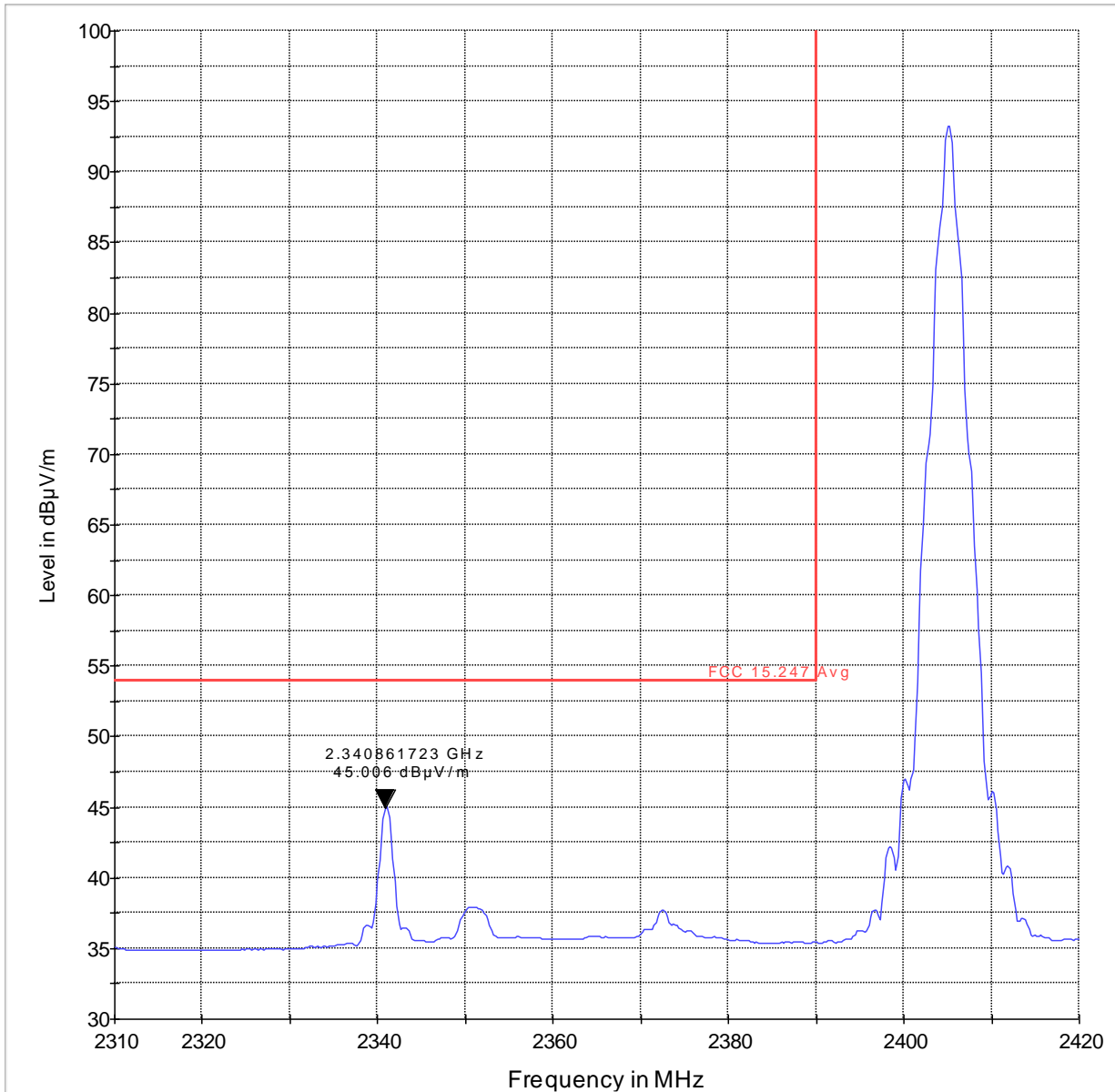
6.5.2.1 Measurement Result

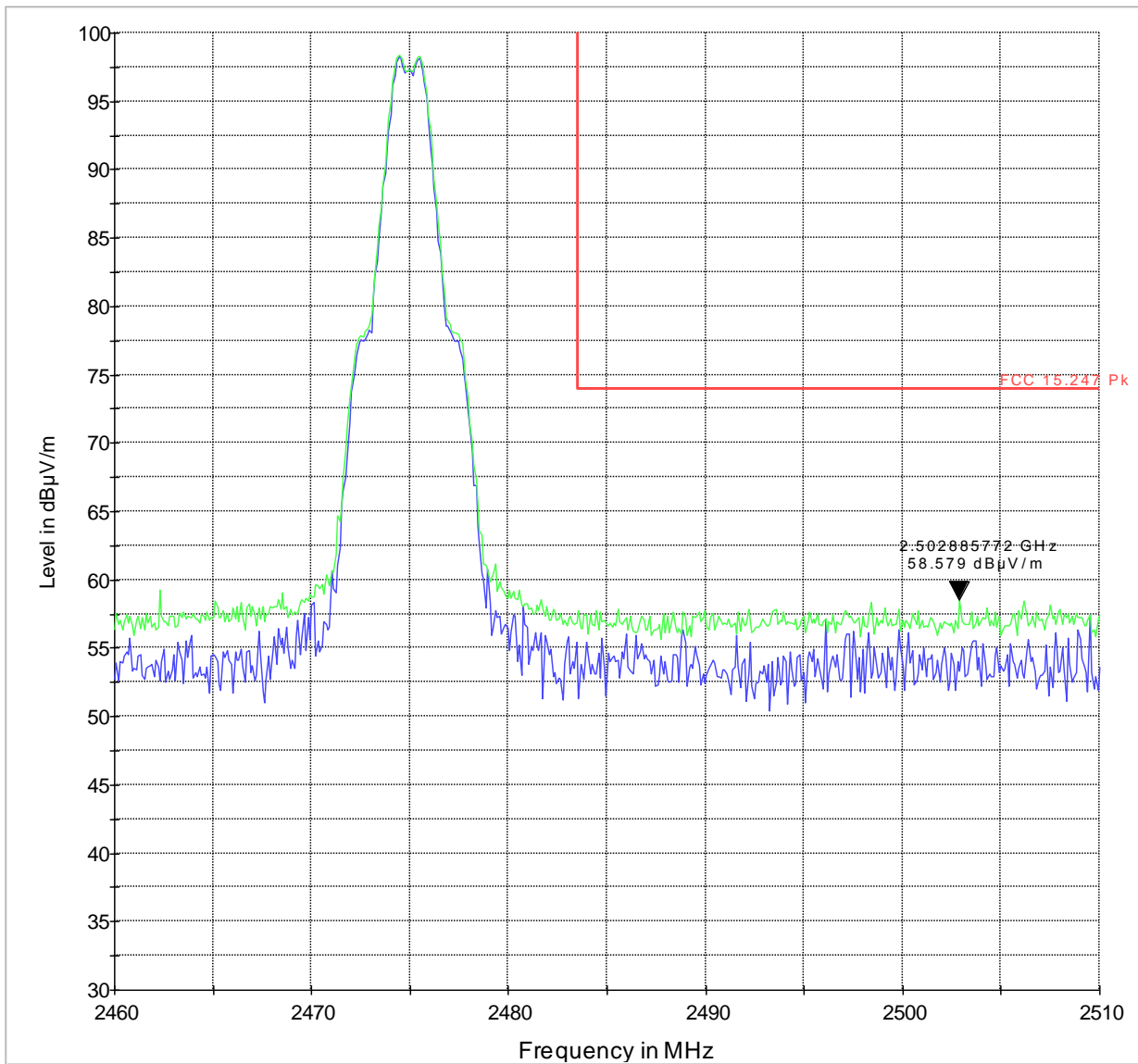
Pass.

6.5.3 Test Data/plots:

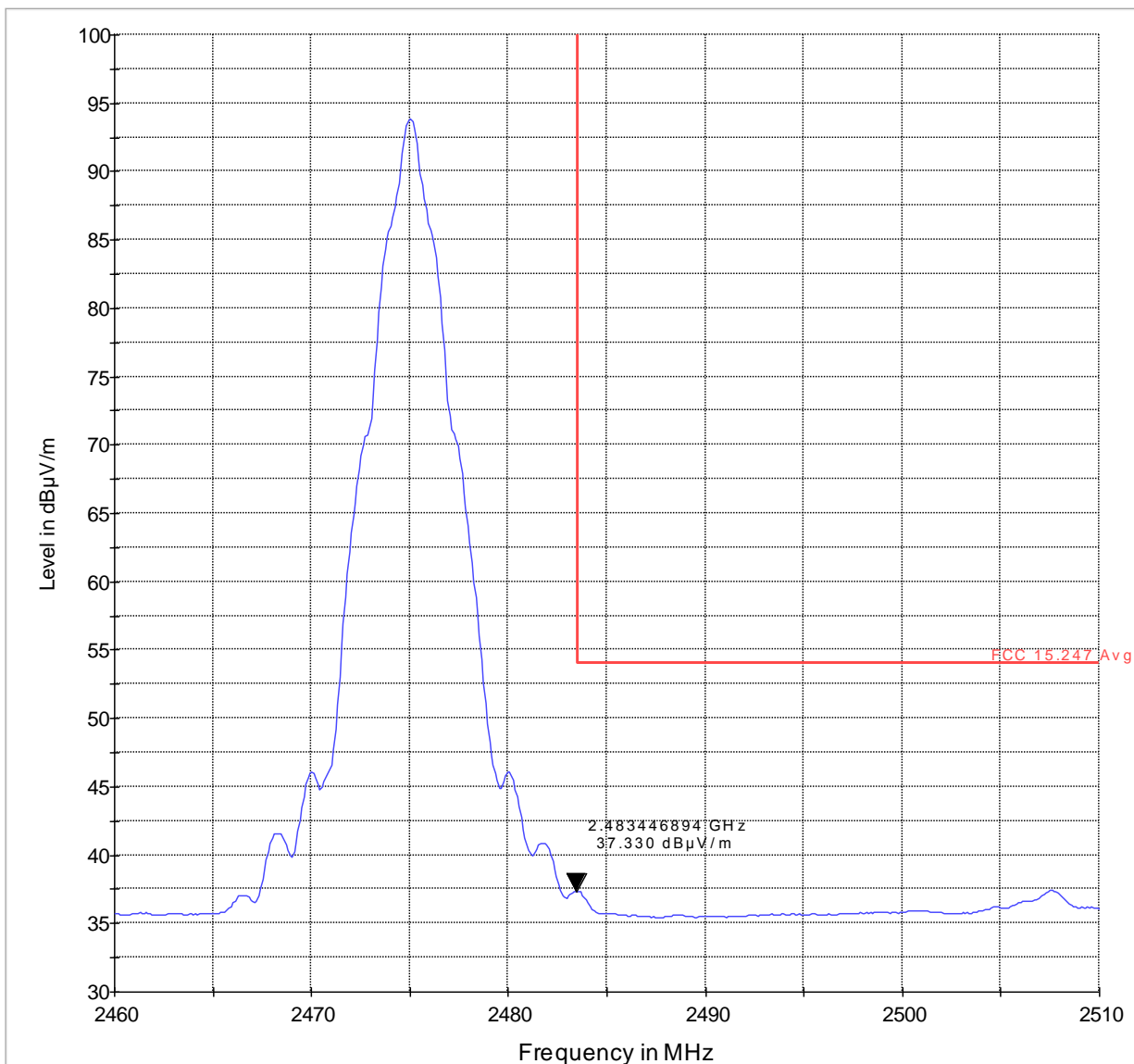
Lower band edge peak -OQPSK modulation



Lower band edge average -OQPSK modulation

Higher band edge peak -OQPSK modulation

MaxPeak-ClearWrite MaxPeak-MaxHold FCC 15.247 Pk

Higher band edge average-OQPSK modulation

— MaxPeak-MaxHold — FCC 15.247 Avg

6.6 Occupied Bandwidth/ 20dB Bandwidth**6.6.1 Limits:**

6.6.1.1 §15.247 (a)(2)

6.6.1.2 RSS 210- A8.2(a)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.6.2 Test Conditions:

Tnom: 20.3°C; Vnom: 110V

Spectrum Analyzer settings:

RBW=100kHz, VBW=300kHz, Detector: Peak- Max hold;

Sweep Time: Auto

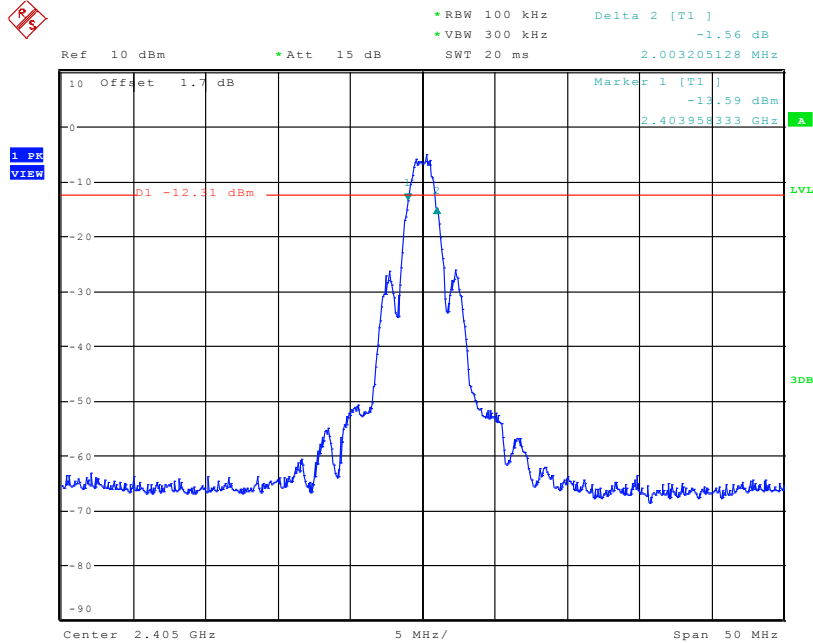
Span=50MHz

6.6.3 Test Result:

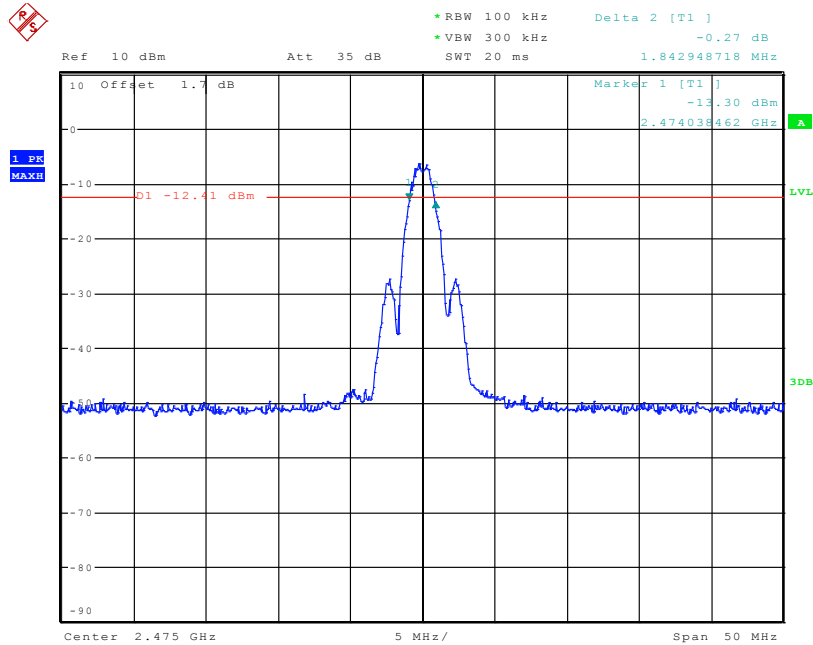
Occupied Bandwidth (MHz)						
Modulation	Frequency (MHz)					
	2405 Ch 11		2440 Ch 18		2475 Ch 25	
	6dB	20dB/ 99%	6dB	20dB/ 99%	6dB	20dB/ 99%
QPSK	2.003	3.044	2.439	3.044	1.842	2.884
Measurement Uncertainty: ±100 kHz						

6.6.3.1 Measurement Result

Pass.

6.6.4 Test Data/plots:**6dB Bandwidth 2405 MHz**

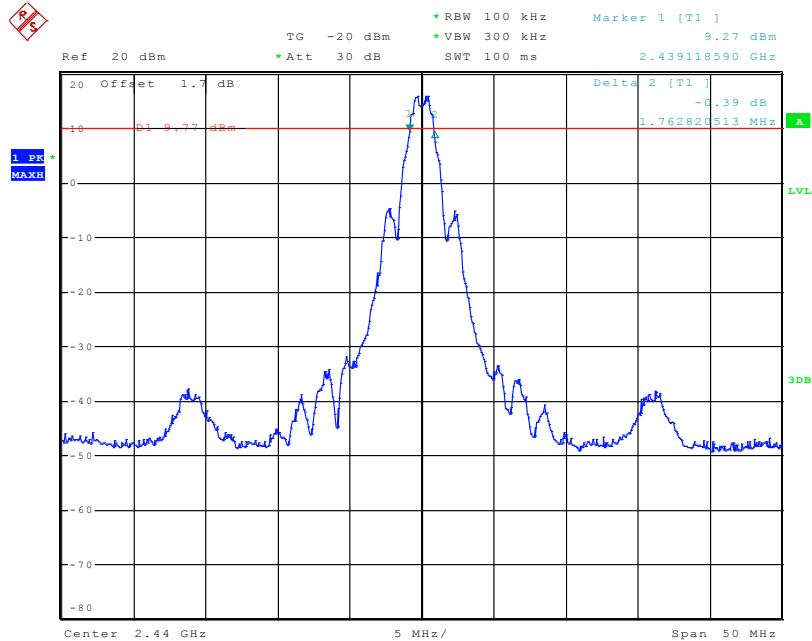
Date: 26.DEC.2011 13:43:56

6dB Bandwidth 2440 MHz

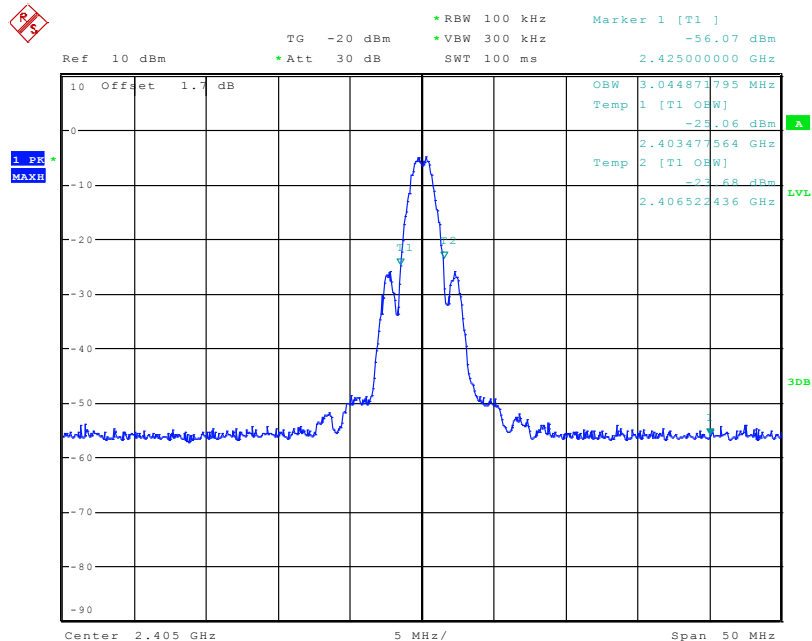
Date: 26.DEC.2011 13:28:58



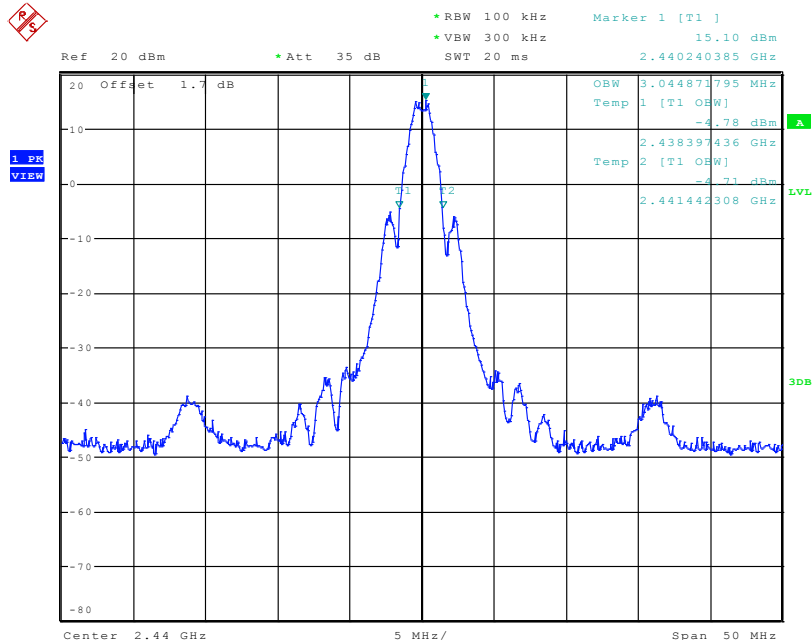
6dB Bandwidth 2475 MHz



Date: 26.DEC.2011 11:51:23

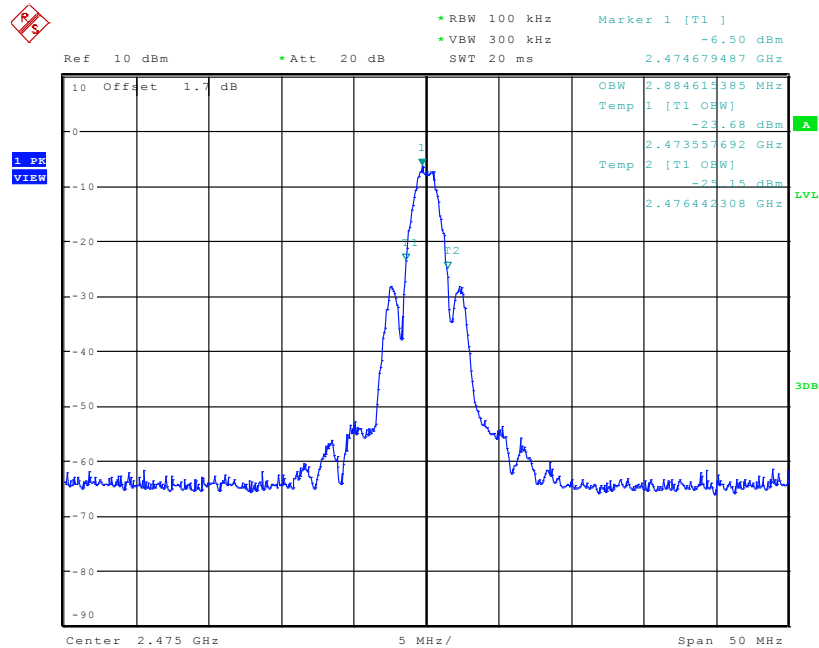
20dB Bandwidth 2405 MHz

Date: 26.DEC.2011 12:00:25

20dB Bandwidth 2440 MHz

Date: 26.DEC.2011 13:40:37

20dB Bandwidth 2475 MHz



Date: 26.DEC.2011 13:22:26

6.7 Power Spectral Density

6.7.1 Limits:

6.7.1.1 § 15.247 (e)

6.7.1.2 RSS 210- A8.2(b)

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

6.7.2 Measurement procedure:

1. Determine the highest peak level for a sweep with RBW=VBW=100kHz and span =10MHz.
2. Set the peak level at the center of the screen and sweep again for a span of 5MHz.
3. Repeat step 2 with a span of 1MHz.
4. Set the peak level at the center of the screen and sweep with RBW=3kHz, VBW=10kHz, Span=300kHz and sweep time of 100sec.
5. Allow two sweeps to complete to determine the highest level as the PSD.

6.7.3 Test results: 2.4 GHz

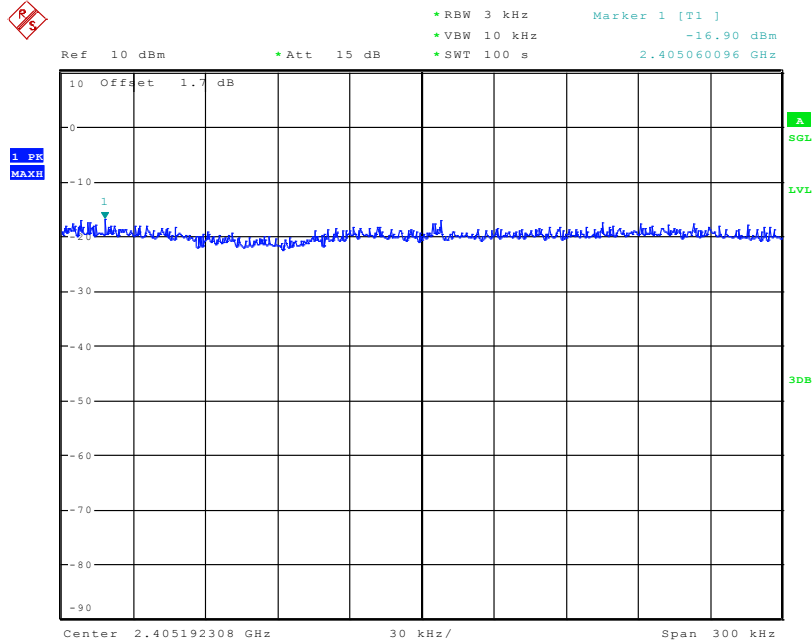
Power Spectral Density (dBm)			
Modulation	Frequency (MHz)		
	2405 Ch 11	2440 Ch 18	2475 Ch 25
OQPSK	-16.90	4.01	-18.47
Measurement Uncertainty: $\pm 0.5\text{dB}$			

6.7.3.1 Measurement Result

Pass.

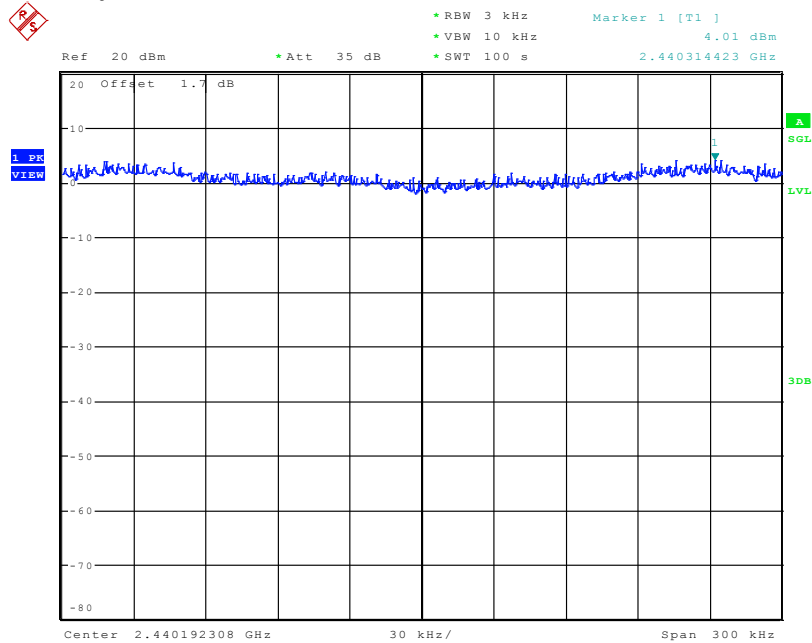
6.7.4 Test Data/plots:

Power Spectral Density 2405 MHz



Date: 26.DEC.2011 13:50:17

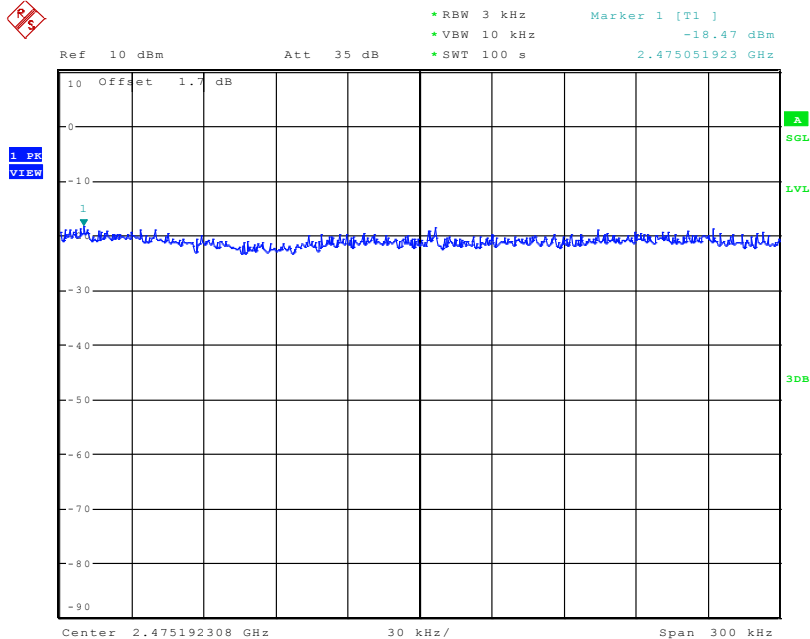
Power Spectral Density 2440 MHz



Date: 26.DEC.2011 13:38:51



Power Spectral Density 2475 MHz



Date: 26.DEC.2011 13:32:43

6.8 Transmitter Spurious Emissions- Conducted § 15.247 (c)**6.8.1 Reference and Limits:**

6.8.1.1 § 15.247 (d)

6.8.1.2 RSS 210-A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

30dBm for the transmitter.

-20dBc in the frequency range 30MHz- 25GHz.

6.8.2 Test Conditions:**Spectrum Analyzer settings:**

RBW=100kHz, VBW=300kHz, Detector: Peak- Max hold;

Sweep Time: Auto

Span=Full range

6.8.3 Test data/ plots:

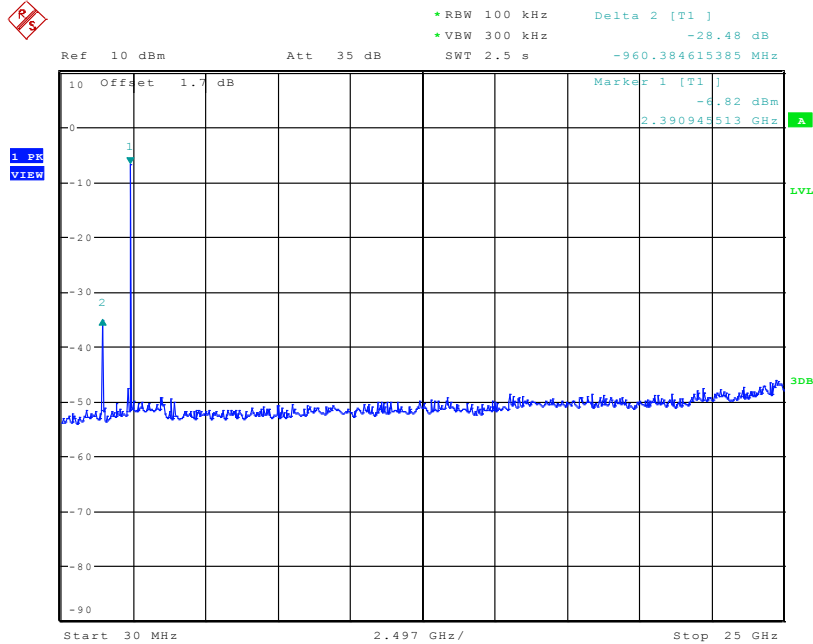
Conducted Spurious Emissions			
Channel	Frequency (MHz)	Amplitude (dBm)	Limits
		QPSK	
11	Fundamental	-6.82	30dBm
	Spurious	All other peaks >20dB below limit	-20dBc
18	Fundamental	13.43	30 dBm
	Spurious	All other peaks >20dB below limit	-20dBc
25	Fundamental	-8.03	30 dBm
	Spurious	All other peaks >20dB below limit	-20dBc
Measurement Uncertainty: ±1.0 dB			

6.8.3.1 Measurement Result

Pass.

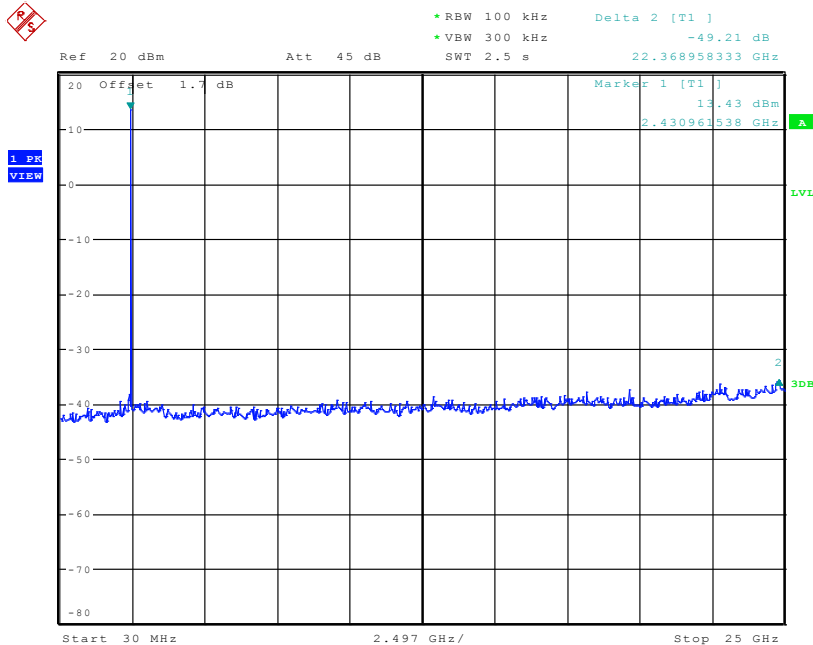
6.8.4 Test data/ plots:

Conducted Spurious Emission 2405 MHz



Date: 26.DEC.2011 13:00:52

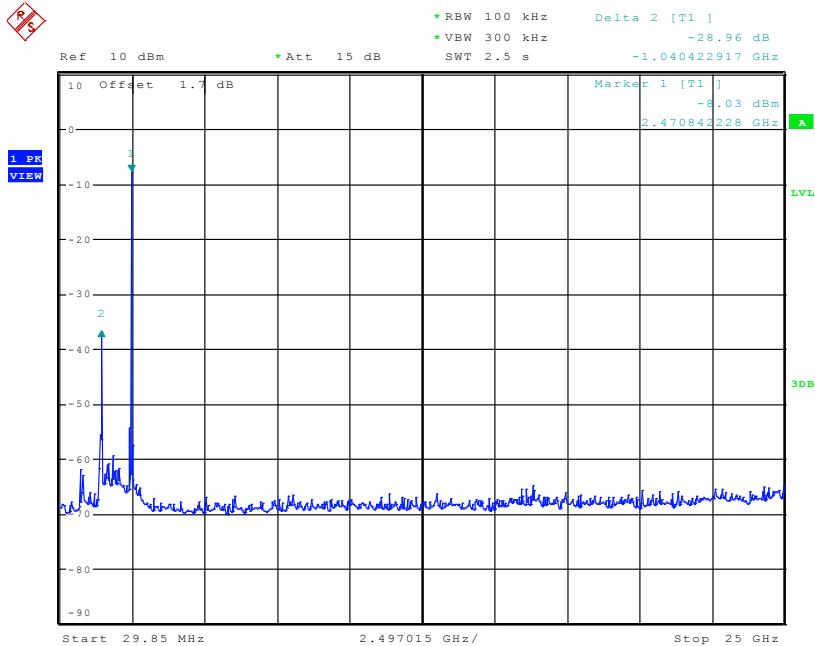
Conducted Spurious Emission 2440 MHz



Date: 26.DEC.2011 13:02:57



Conducted Spurious Emission 2475 MHz



Date: 26.DEC.2011 13:56:16

6.9 Transmitter Spurious Emissions- Radiated

6.9.1 Limits:

§15.247/15.205

RSS 210-A8.5

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB.

*PEAK LIMIT= 74dB μ V/m

*AVG. LIMIT= 54dB μ V/m

Table 1:

Frequency of emission (MHz)	Field strength (μ V/m)
30–88	100 (40dB μ V/m)
88–216	150 (43.5 dB μ V/m)
216–960	200 (46 dB μ V/m)
Above 960	500 (54 dB μ V/m)

Table 2:

Frequency of emission (MHz)	Field strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30

6.9.2 Test Result:**Test mode:** *Zigbee mode.*

Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.

Plots reported here represent the worse case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT.

Measurement Uncertainty: $\pm 3.0\text{dB}$

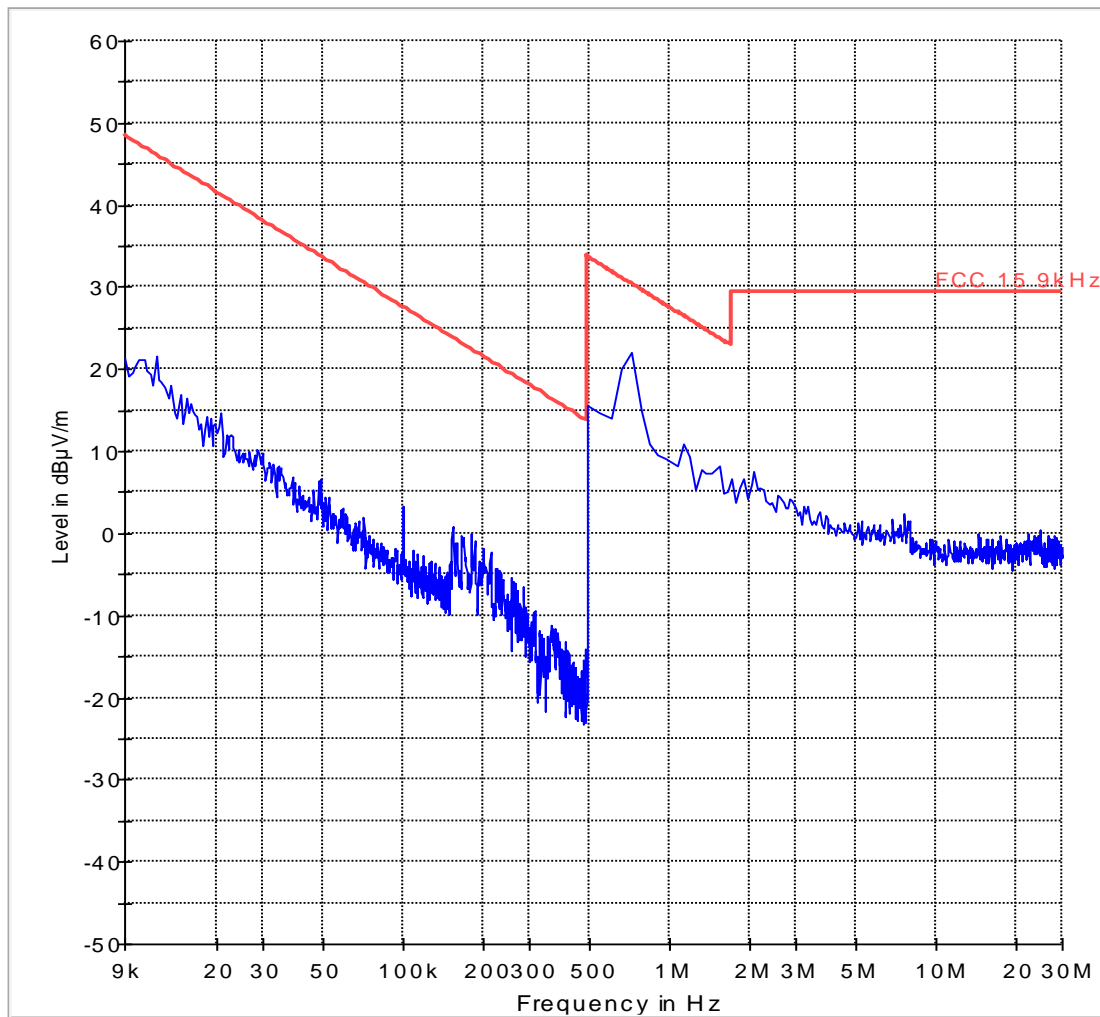
6.9.2.1 Measurement Result

Pass.

6.9.3 Test data/ plots:**Transmitter Radiated Spurious Emission:<30MHz****Note: Worst case representation for all modes of operation in this frequency range-****Limits adjusted for 3m measurement.****Transmitter Spurious Emission – 9k-30MHz**

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V

FCC 15 9kHz - 30 MHz



— FCC 15 9 kHz Limit — Preview Result 1

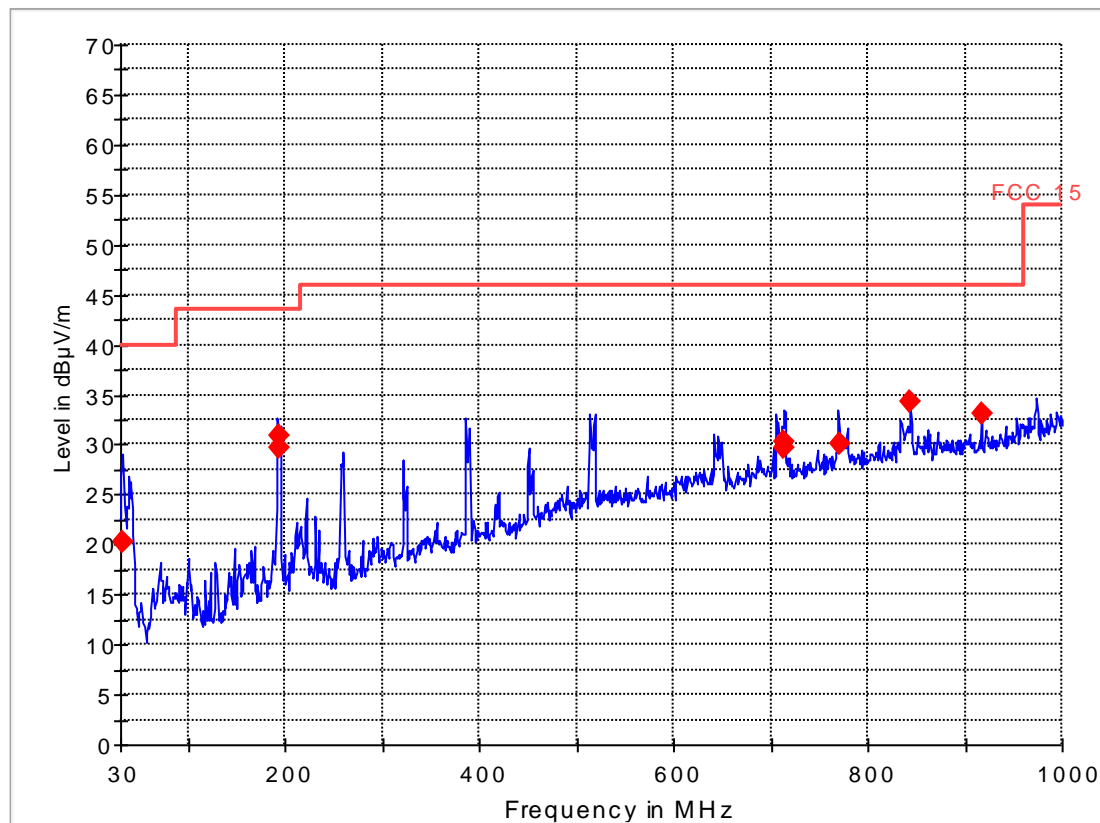
Transmitter Radiated Spurious Emission - 30M-1GHz – 2405MHz

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V

Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
32.565770	20.2	20.0	120.000	139.0	V	271.0	6.9	19.8	40.0
192.477373	30.9	20.0	120.000	120.0	H	253.0	11.4	12.6	43.5
192.590782	29.7	20.0	120.000	120.0	H	241.0	11.4	13.8	43.5
713.574751	29.7	20.0	120.000	120.0	H	68.0	24.3	16.3	46.0
714.034476	30.2	20.0	120.000	120.0	H	62.0	24.3	15.8	46.0
769.886065	30.0	20.0	120.000	120.0	H	0.0	25.0	16.0	46.0
843.391495	34.2	20.0	120.000	152.0	H	21.0	25.8	11.8	46.0
916.420262	33.1	20.0	120.000	120.0	V	67.0	25.9	12.9	46.0

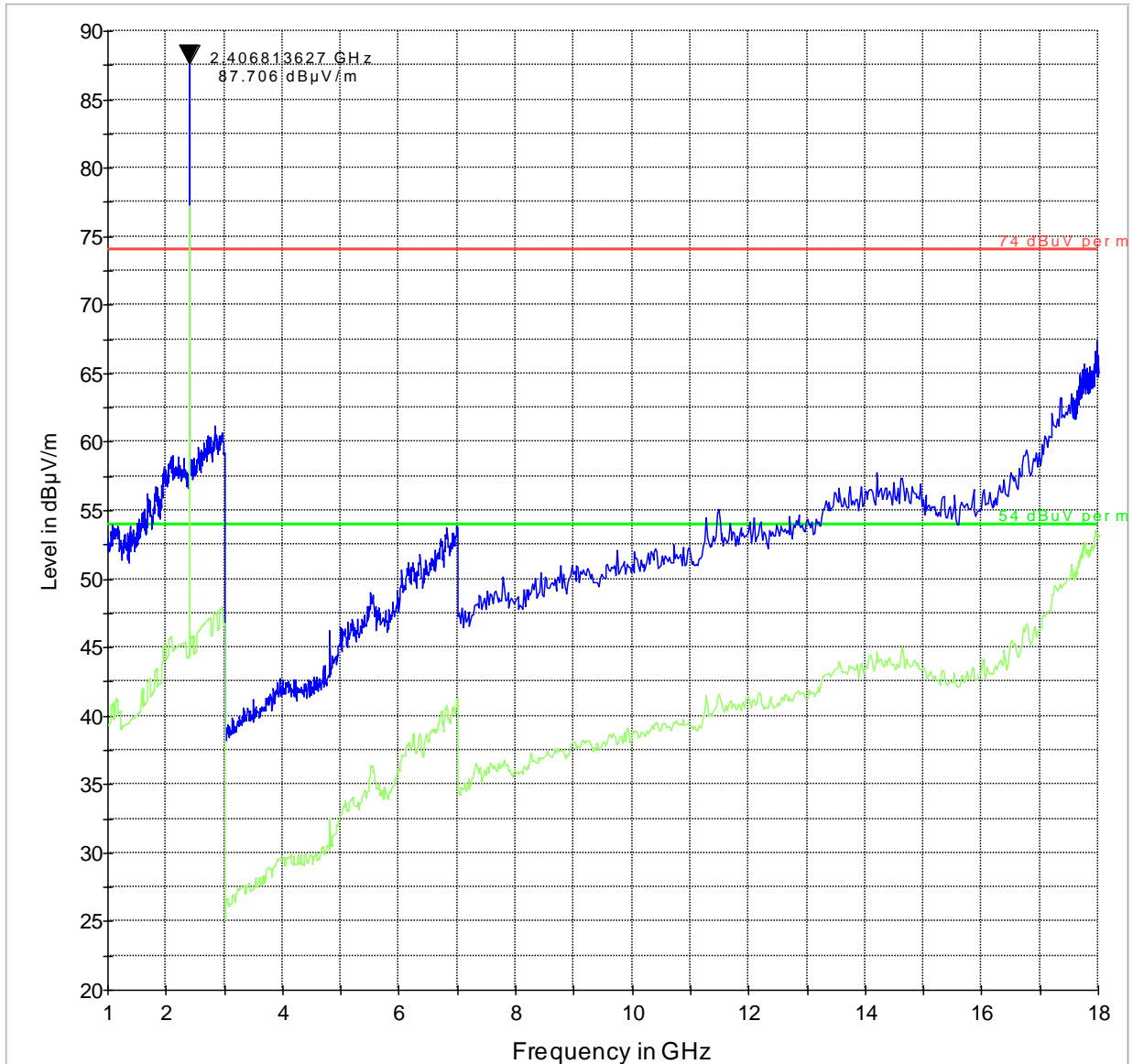
FCC 15 30-1000MHz



— FCC 15.LimitLine — MaxPeak-ClearWrite
* Data Reduction Result ◆ Final Measurement Result

Transmitter Radiated Spurious Emission - 1G-18GHz – 2405MHz**Note: Signal over Limit is carrier frequency.**

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V



— 74 dB μ V per m — 54 dB μ V per m
— MaxPeak-ClearWrite — Average-ClearWrite

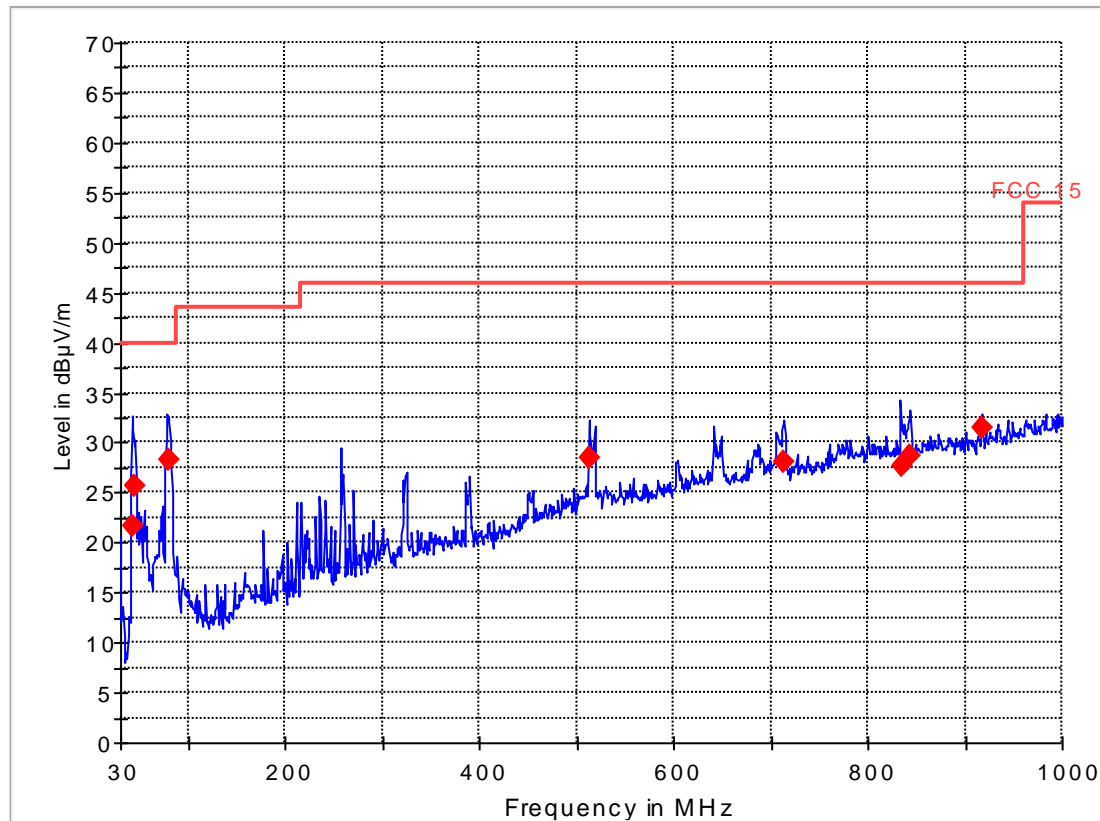
Transmitter Radiated Spurious Emission – 30M – 18GHz – 2440MHz

EUT Name: SSI I210 3G
 Manufacturer: SmartSynch
 Serial: 44336829
 Comment: AC 110V

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)
43.126958	21.6	20.0	120.000	121.0	V	90.0	5.9	18.4	40.0
45.298250	25.6	20.0	120.000	121.0	V	225.0	6.2	14.4	40.0
79.040896	28.3	20.0	120.000	121.0	V	0.0	9.4	11.7	40.0
512.934634	28.5	20.0	120.000	121.0	V	254.0	21.3	17.5	46.0
713.248142	28.0	20.0	120.000	121.0	H	79.0	24.3	18.0	46.0
833.923343	27.6	20.0	120.000	121.0	V	315.0	25.6	18.4	46.0
843.816603	28.6	20.0	120.000	121.0	H	15.0	25.8	17.4	46.0
916.420262	31.4	20.0	120.000	121.0	V	57.0	25.9	14.6	46.0

FCC 15 30-1000MHz

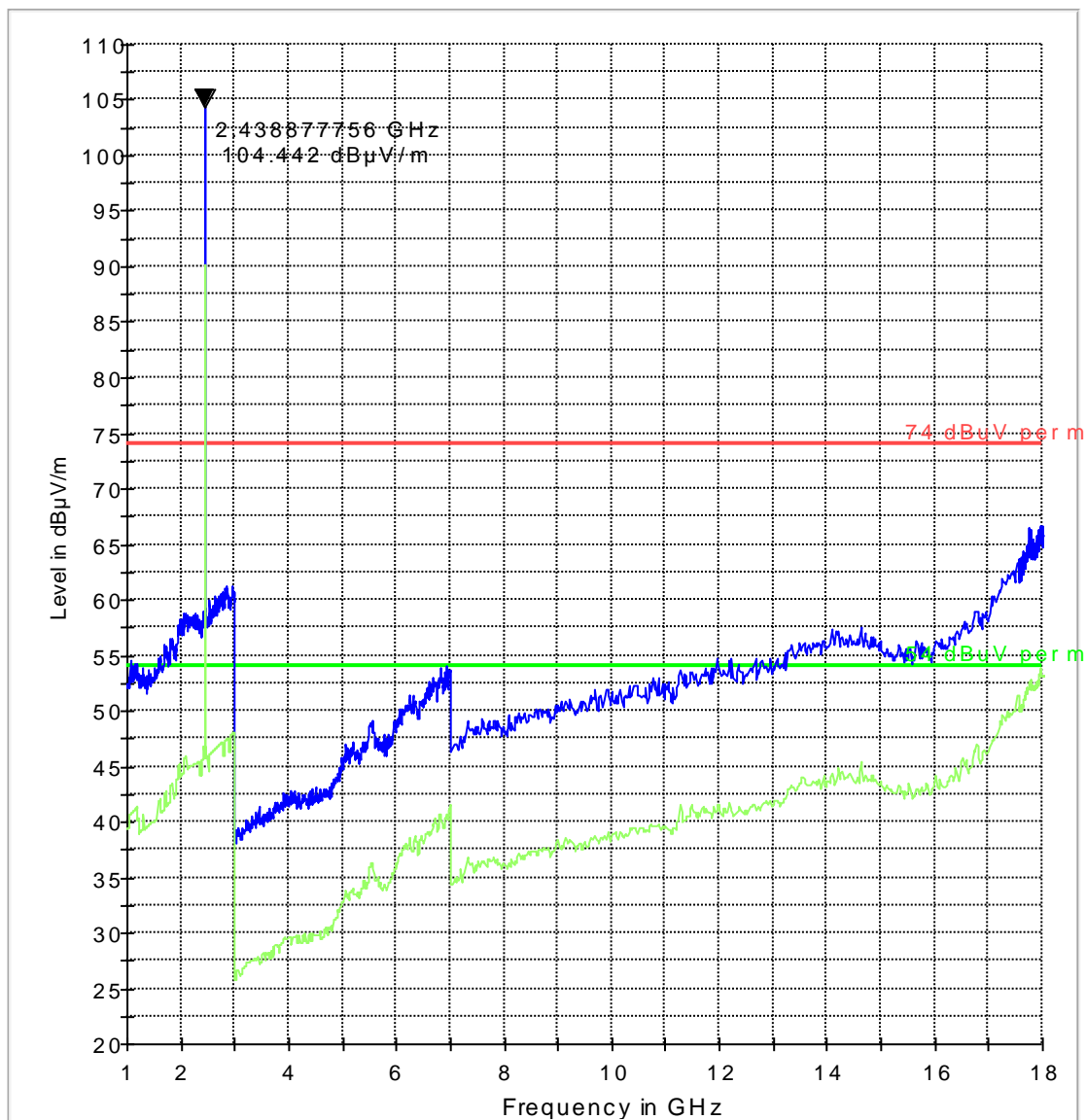


— FCC 15.LimitLine — MaxPeak-ClearWrite
 * Data Reduction Result ♦ Final Measurement Result

Transmitter Radiated Spurious Emission - 1G-18GHz – 2440MHz**Note: Signal over Limit is carrier frequency.**

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V

FCC 15 1-18GHz



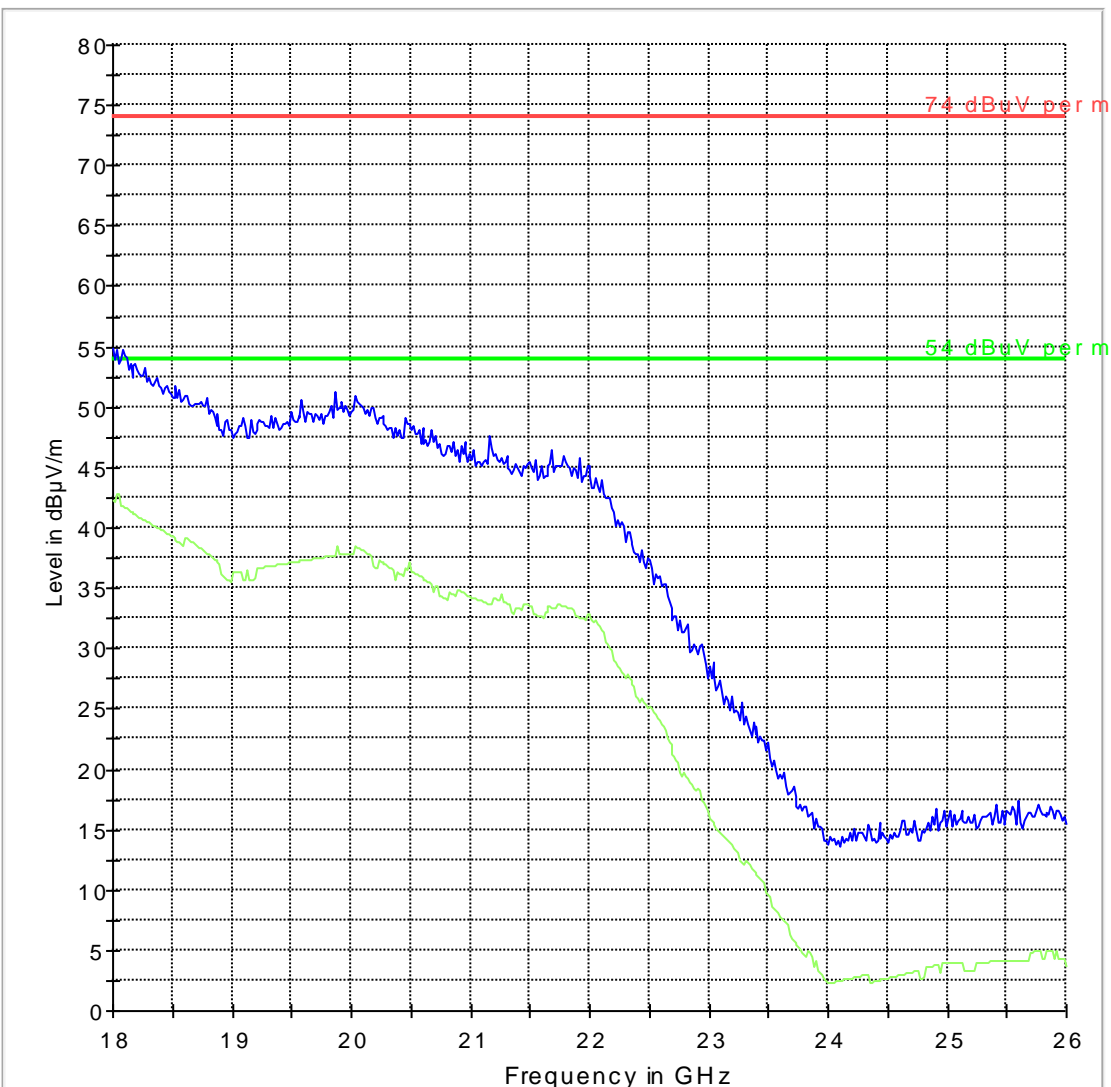
— 74 dBuV per m — 54 dBuV per m
— MaxPeak-ClearWrite — Average-ClearWrite

Transmitter Radiated Spurious Emission - 18G-26GHz – 2440MHz

Note: This plot represents worst case emissions in this frequency range for all channels.

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V

FCC 15 18-26GHz



74 dBμV per m Limit Line 54 dBμV per m Limit Line
Preview Result 1 Preview Result 2

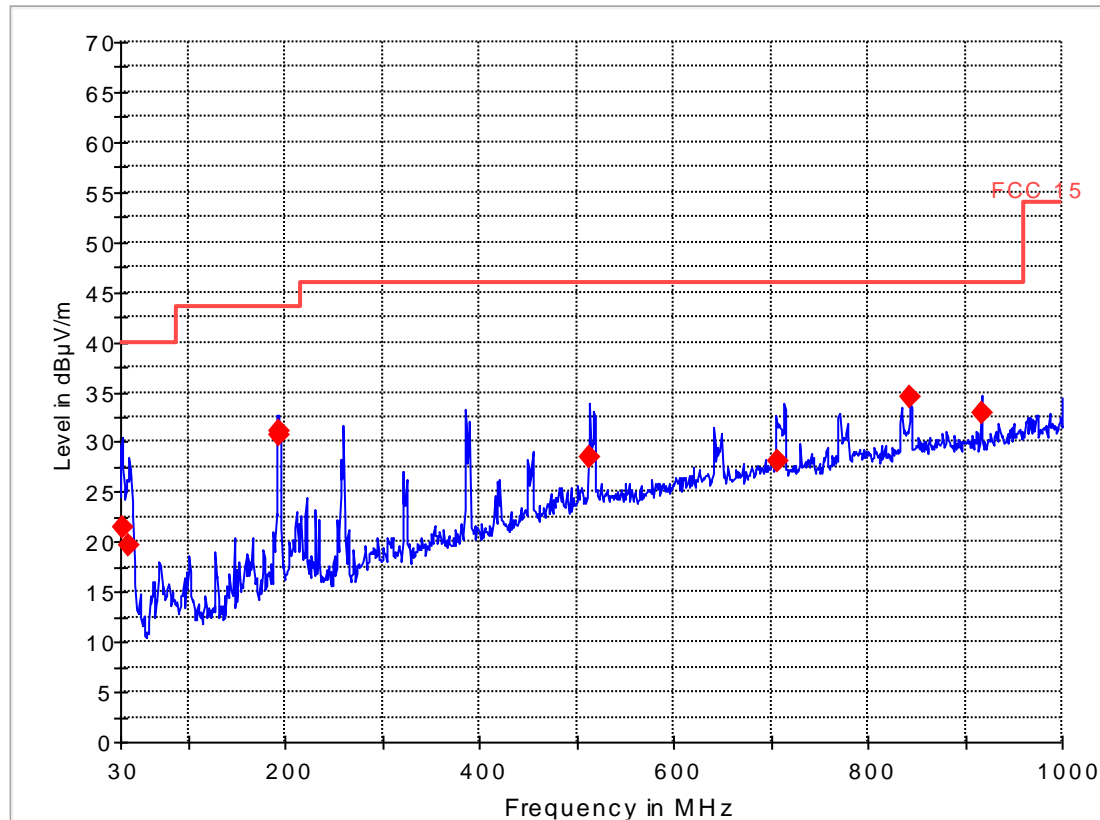
Transmitter Radiated Spurious Emission – 30M – 18GHz – 2475MHz

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V

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)
31.920503	21.4	20.0	120.000	139.0	V	116.0	7.1	18.6	40.0
38.814329	19.7	20.0	120.000	146.0	V	194.0	5.7	20.3	40.0
192.555458	31.2	20.0	120.000	120.0	H	259.0	11.4	12.3	43.5
192.588238	30.8	20.0	120.000	120.0	H	261.0	11.4	12.7	43.5
513.617207	28.4	20.0	120.000	120.0	H	62.0	20.5	17.6	46.0
706.171130	28.1	20.0	120.000	120.0	H	0.0	24.4	17.9	46.0
843.645106	34.6	20.0	120.000	152.0	H	27.0	25.8	11.4	46.0
916.420262	32.9	20.0	120.000	120.0	V	68.0	25.9	13.1	46.0

FCC 15 30-1000MHz

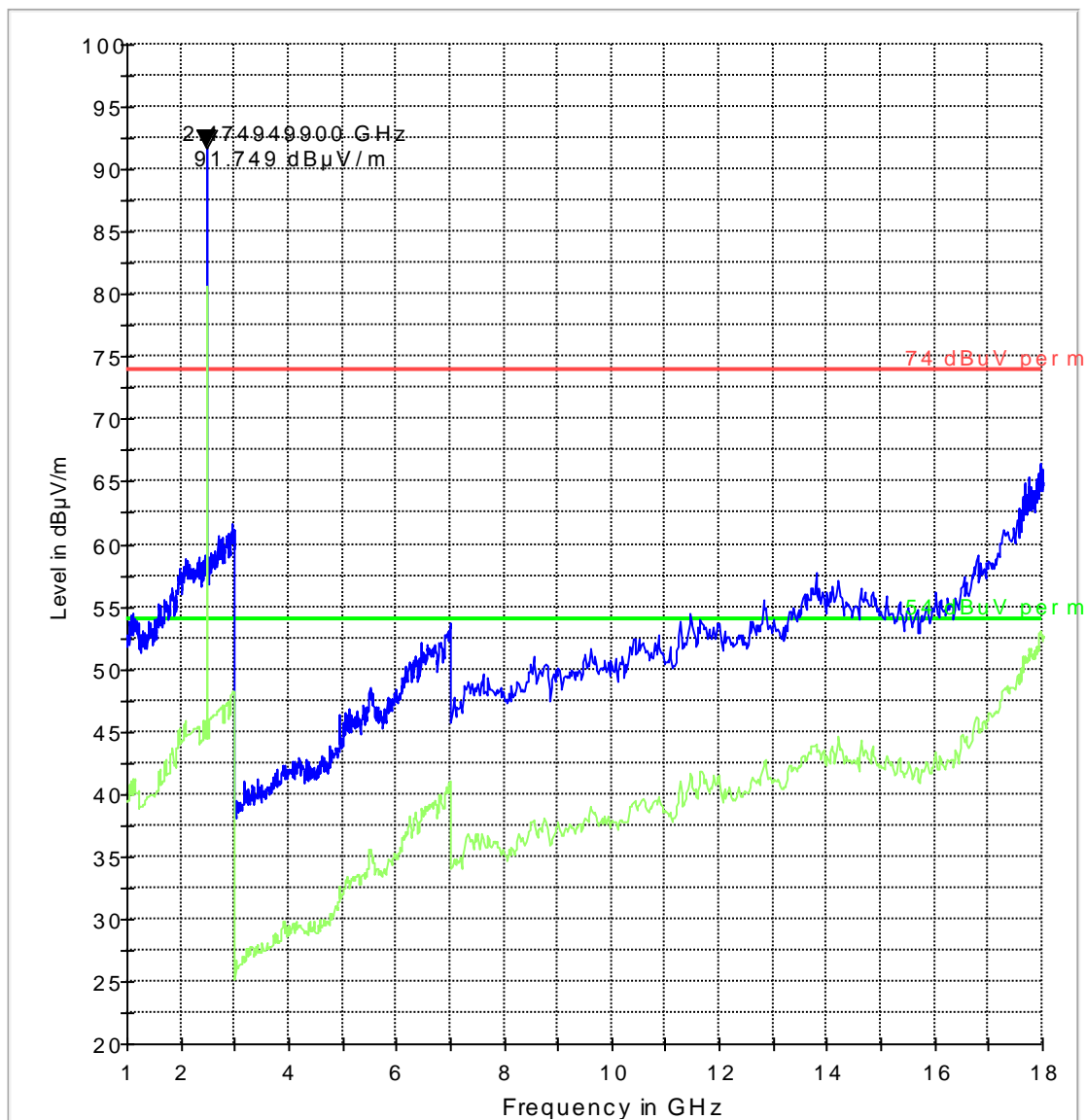


— FCC 15.LimitLine — MaxPeak-ClearWrite
* Data Reduction Result ♦ Final Measurement Result

Transmitter Radiated Spurious Emission - 1G-18GHz – 2475MHz**Note: Signal over Limit is carrier frequency.**

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V

FCC 15 1-18GHz



— 74 dBuV per m — 54 dBuV per m
— MaxPeak-ClearWrite — Average-ClearWrite

6.10 Receiver Spurious Emissions- Radiated**6.10.1 Limits:**6.10.1.1 FCC CFR §15.1096.10.1.2 RSS-210

Frequency of emission (MHz)	Field strength (μV/m)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 (40dBμV/m)	3
88–216	150 (43.5 dBμV/m)	3
216–960	200 (46 dBμV/m)	3
Above 960	500 (54 dBμV/m)	3

6.10.2 Test Conditions:

Mode: Receive mode

Measurement Uncertainty: ±3.0dB

6.10.3 Test Result:

No significant emissions measurable. Plots reported here represent the worse case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT.

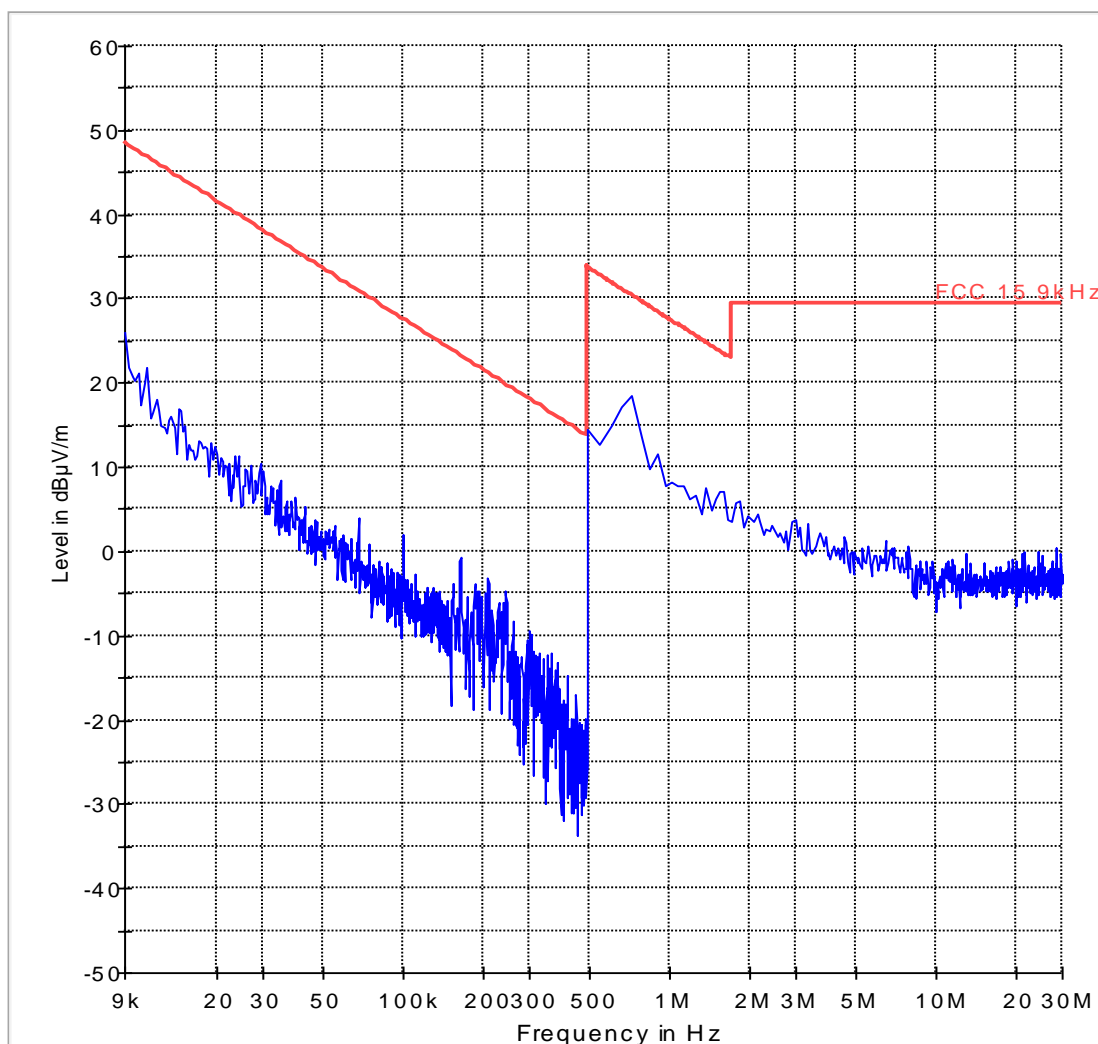
6.10.3.1 Measurement Result

Pass.

6.10.4 Test data/ plots:**Receive Mode: <30MHz****Note: Limits adjusted for 3m measurement.****Receiver Spurious Emission – 9k-30MHz – Rx Mode**

EUT Name:	SSI I210 3G
Manufacturer:	SmartSynch
Serial:	44336829
Comment:	AC 110V

FCC 15 9kHz - 30 MHz



FCC 15 9 kHz Limit Line Preview Result 1

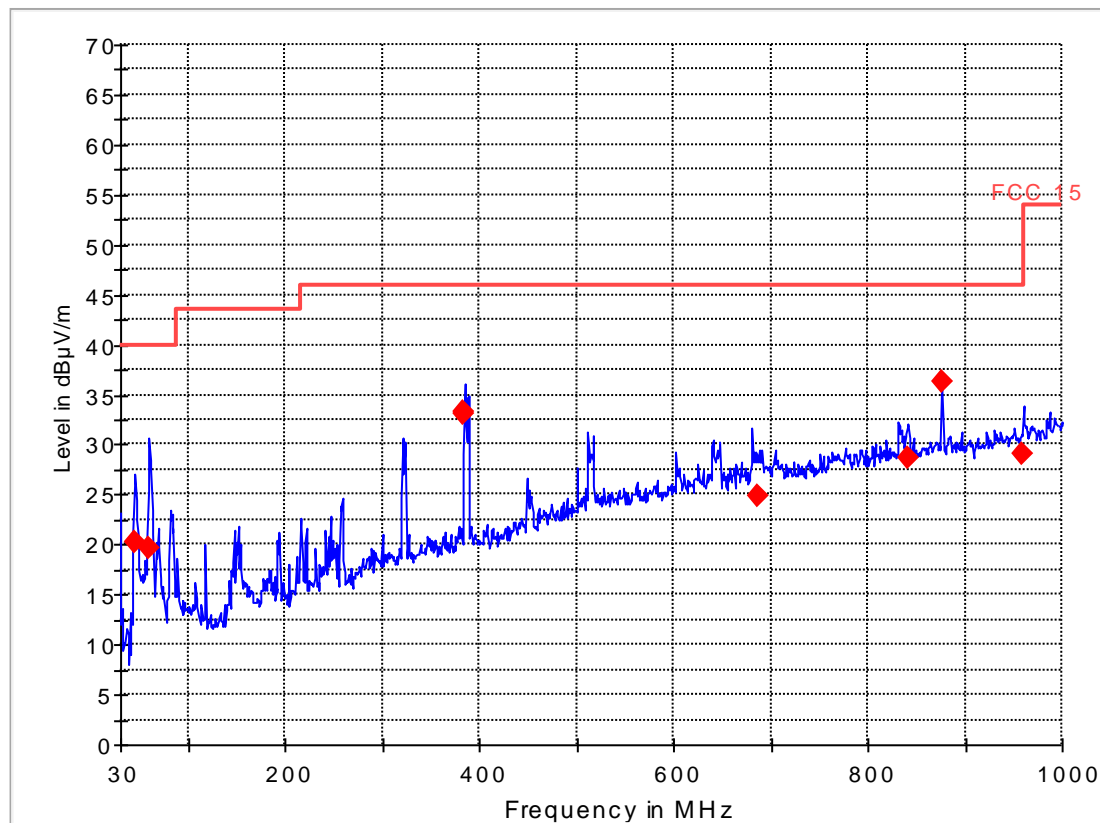
Receive Mode: 30MHz-1GHz - Rx Mode

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
IMEI: 44336829
Comment: AC 110V

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)
45.122086	20.3	20.0	120.000	138.0	V	315.0	6.2	19.7	40.0
58.975952	19.6	20.0	120.000	120.0	V	291.0	7.8	20.4	40.0
383.733958	33.1	20.0	120.000	120.0	V	0.0	17.2	12.9	46.0
383.782633	33.2	20.0	120.000	120.0	V	0.0	17.2	12.8	46.0
686.257630	24.9	20.0	120.000	210.0	H	244.0	24.2	21.1	46.0
840.871587	28.6	20.0	120.000	120.0	V	0.0	25.6	17.4	46.0
876.058633	36.2	20.0	120.000	270.0	H	261.0	26.3	9.8	46.0
959.198457	29.0	20.0	120.000	120.0	V	118.0	26.5	17.0	46.0

FCC 15 30-1000MHz

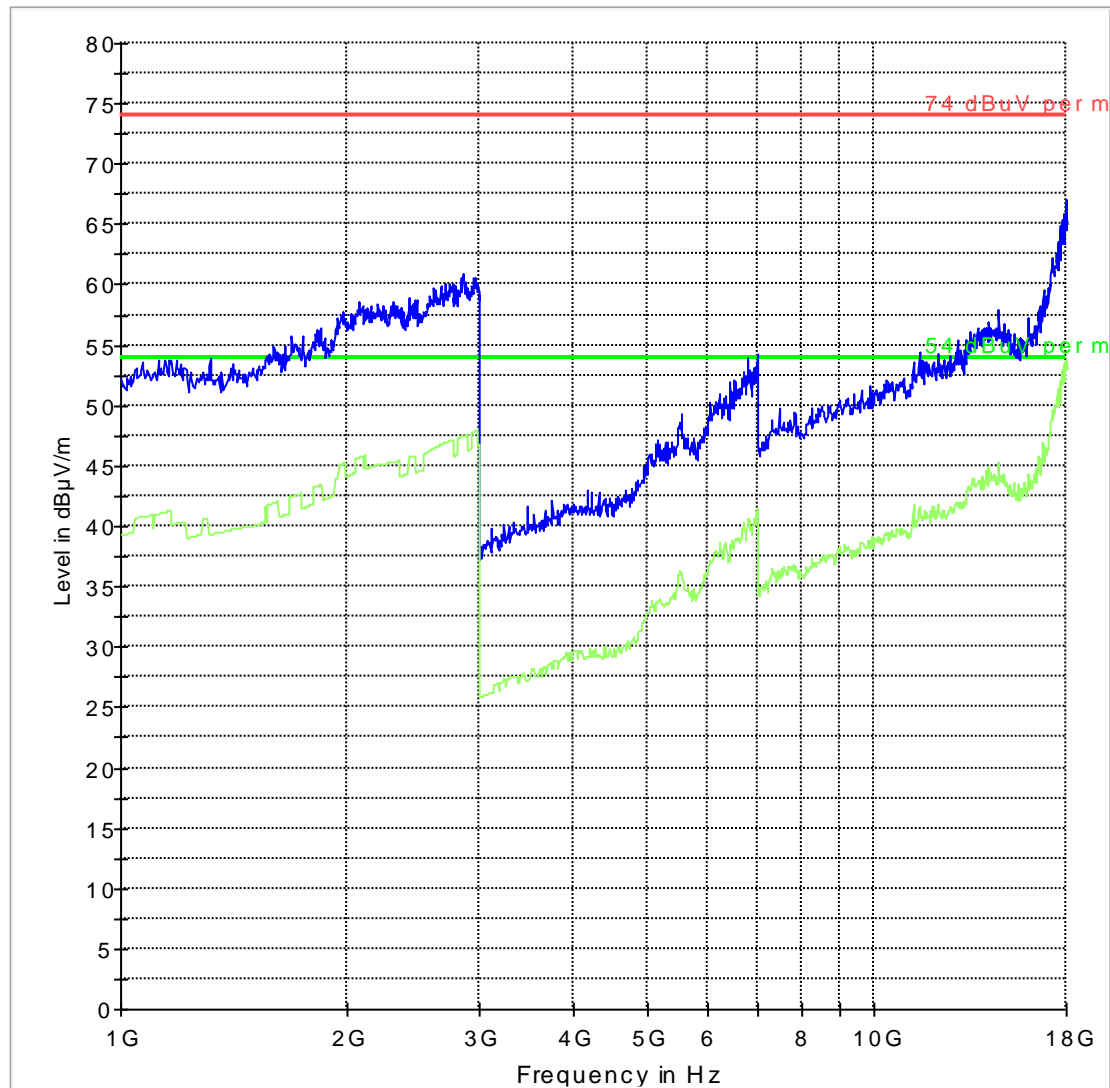


— FCC 15.LimitLine — MaxPeak-ClearWrite
* Data Reduction Result ♦ Final Measurement Result

Receive Mode: 30MHz-1GHz – Rx Mode

EUT Name: SSI I210 3G
Manufacturer: SmartSynch
Serial: 44336829
Comment: AC 110V

FCC 15 1-18GHz



74 dBuV perm. Limit Line 54 dBuV perm. Limit Line
Preview Result 1 Preview Result 2

6.11 AC Power Line Conducted Emissions

6.11.1 References:

FCC: CFR Part 15.207

IC: RSS-Gen Section 7.2.2

The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

6.11.2 Limits:

6.11.2.1 §15.207 Conducted limits- Intentional Radiators:

(a) Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

6.11.2.2 RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown below. The tighter limit applies at the frequency range boundaries.

Table 1:

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

Analyzer Settings: CISPR Bandwidth- 9KHz.

6.11.3 Test Conditions:

Test mode: Zigbee- Transmit and Receive modes of operation

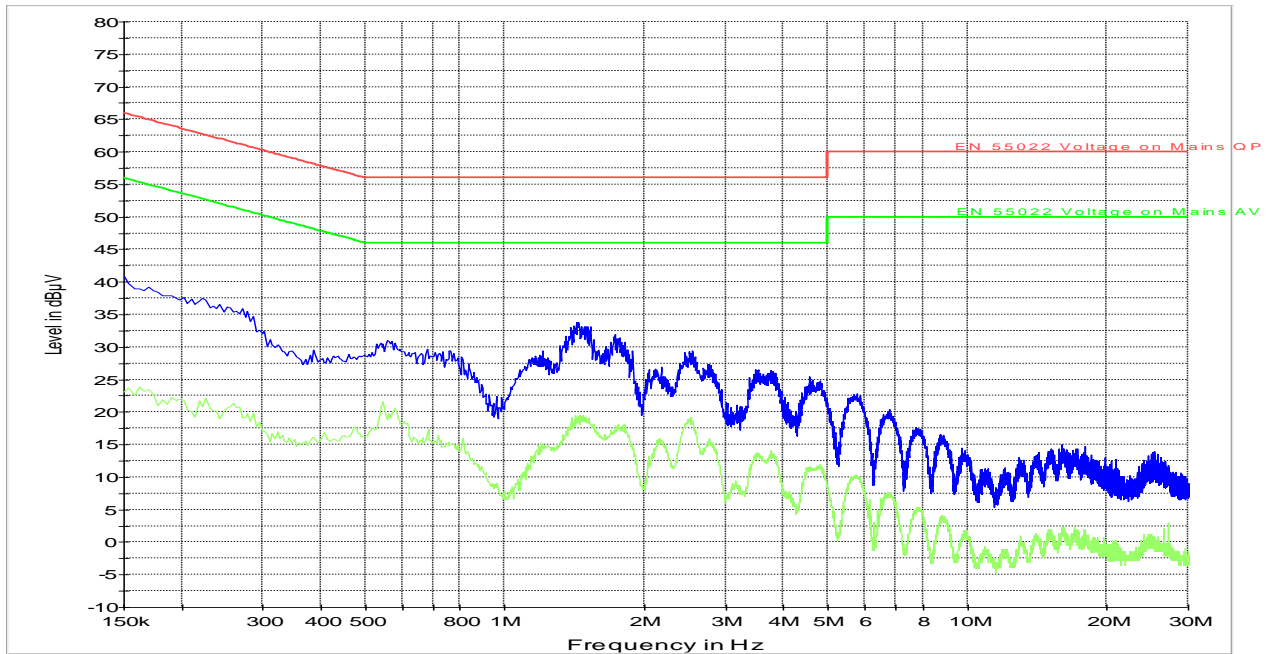
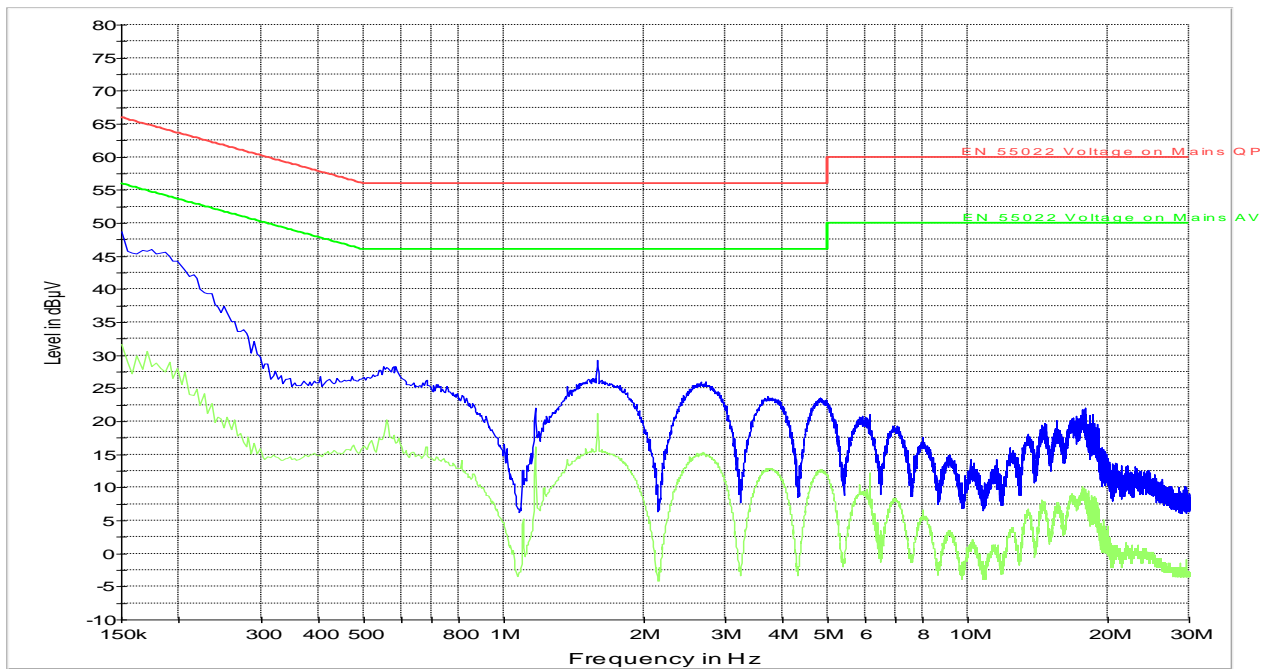
Measurement Uncertainty: ± 3.0 dB

6.11.4 Results

Plots shown here represent the combined worse case emissions for power lines, phases and neutral line.

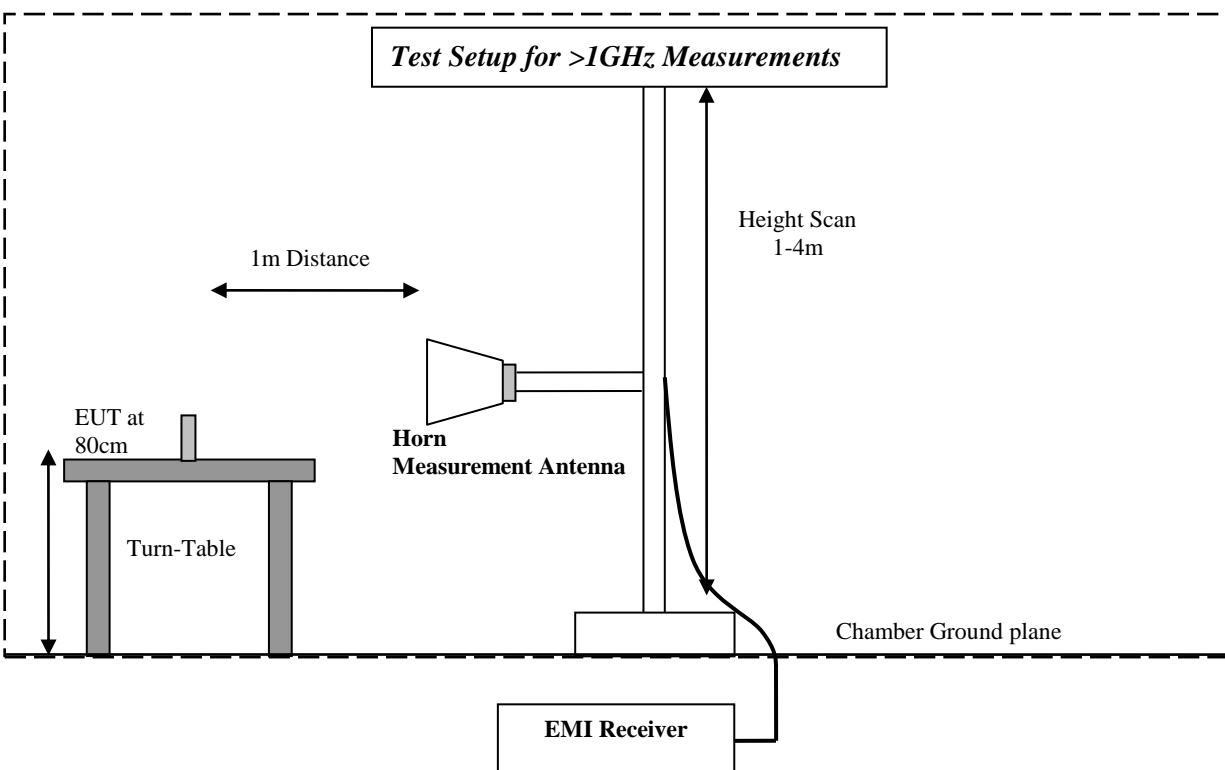
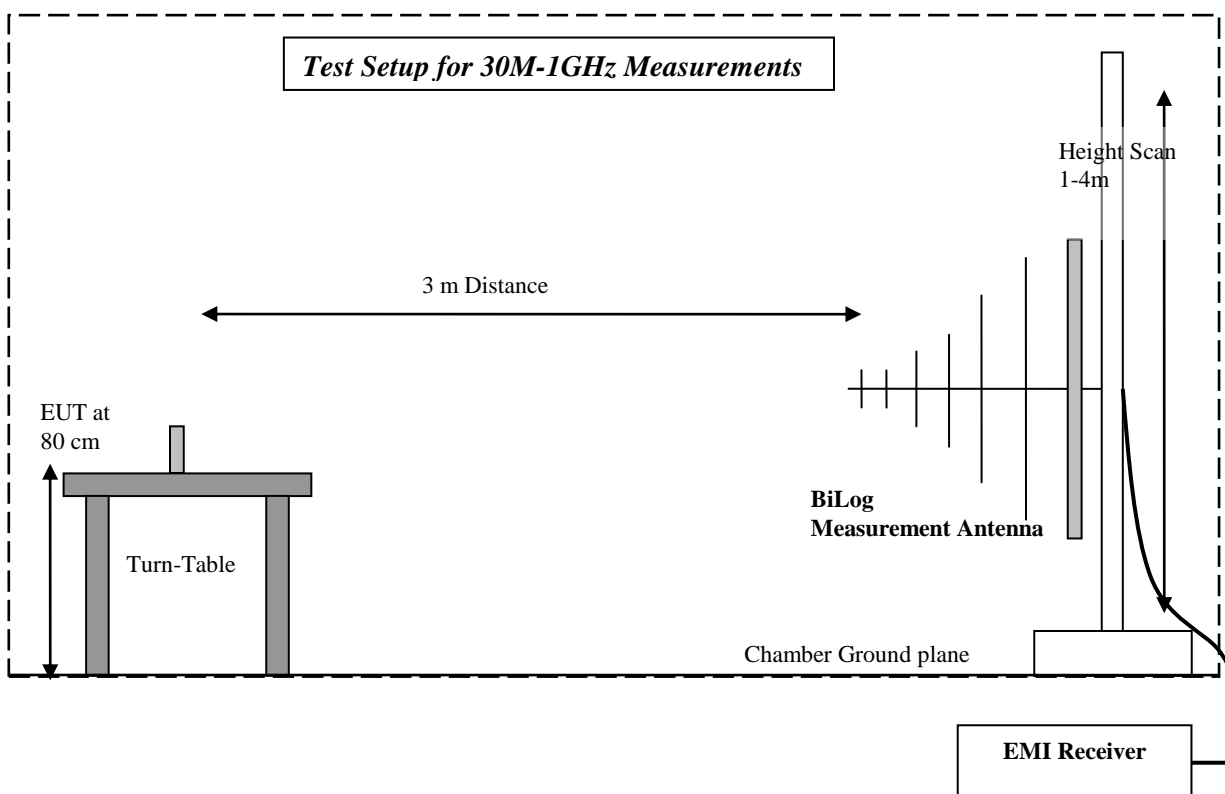
6.11.4.1 Measurement Result

Pass.

6.11.5 Test Results:**ZigBee TX Mode:****ZigBee RX Mode:**

7 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2011	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	1 year
Loop Antenna	6512	EMCO	00049838	April 2009	3 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Oct 2011	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
LISN	50-25-2-08	FCC	08014	June 2011	1 year
Power Smart Sensor	R&S	NRP-Z81	100161	May 2011	1 Year
DC Power Supply	E3610A	Hewlett Packard	KR83021224	n/a	n/a
Multimeter	MM200	Klein	N/A	Apr 2011	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2011	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2011	1 Year

8 Block Diagrams

9 Revision History

Date	Report Name	Changes to report	Report prepared by
2011-12-05	EMC_SMAR1_037_11001_FCC15.247	First Version	D Lang
2012-01-04	EMC_SMAR1_037_11001_FCC15.247_Rev1	Conducted measurements added.	C Lee