



# FCC Test Report

**FOR:**

**Model Number: 0247908**  
**Model Name: nuLink! 2390**  
**Personal Navigation Device**

**FCC ID: IPH-0247908**

**47 CFR Part 2, 22, 24**

**TEST REPORT #: EMC\_GARMI\_036\_11002\_FCC22\_24\_Rev1**  
**DATE: 2011-04-12**



FCC listed:  
A2LA Accredited

IC recognized #  
3462B-1

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**1 Assessment**

**The following device was tested against the applicable criteria specified in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations. No deviations were ascertained during the course of the tests performed.**

Company	Description	Model #
Garmin International	Connected Personal Navigation Device	0247908 nuLink!2390

**Responsible for Testing Laboratory:**

2011-04-12	Compliance	Sajay Jose (Test Lab Manager)	
Date	Section	Name	Signature

**Responsible for the Report:**

2011-04-12	Compliance	Josie Sabado (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

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Address:</b>	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
<b>Telephone:</b>	+1 (408) 586 6200
<b>Fax:</b>	+1 (408) 586 6299
<b>Test Lab Director:</b>	Heiko Strehlow
<b>Responsible Project Leader:</b>	Rami Saman

### 2.2 Identification of the Client

<b>Applicant's Name:</b>	Garmin International Inc.
<b>Street Address:</b>	1200 E. 151 <sup>st</sup> Street
<b>City/Zip Code</b>	Olathe KS 66062
<b>Country</b>	USA
<b>Contact Person:</b>	Van Ruggles
<b>Phone No.</b>	913.397.8448
<b>Fax:</b>	913.397.8282
<b>e-mail:</b>	van.ruggles@garmin.com

### 2.3 Identification of the Manufacturer

<b>Manufacturer's Name:</b>	Garmin International Inc.
<b>Manufacturers Address:</b>	No. 68 Jangshu 2 <sup>nd</sup> Road
<b>City/Zip Code</b>	Shijr, Taipei County
<b>Country</b>	Taiwan

### 3 Equipment under Test (EUT)

#### 3.1 Specification of the Equipment under Test

<b>Marketing Name:</b>	nuLink! 2390
<b>Model No:</b>	0247908
<b>Product Type:</b>	Connected Personal Navigation Device with Quadband GSM/GPRS cellular modem and GPS Receiver.
<b>HW / SW Revision :</b>	6.0/2.10
<b>Module Information:</b>	Telit GE865-QUAD HW: 4 SW: 10.00.003
<b>FCC-ID :</b>	IPH-0247908
<b>Frequency:</b>	GSM 850: 824.2-848.8MHz; PCS 1900: 1850.2-1909.8MHz
<b>Type(s) of Modulation:</b>	GMSK
<b>Number of channels:</b>	GSM850: 125 and PCS 1900: 300
<b>Other radios supported:</b>	Bluetooth: 2400- 2483.5 MHz GFSK, DQPSK, 8DPSK Modulations.
<b>Antenna Type:</b>	IFA Antenna 0dBi Peak gain 824-960MHz; 2 dBi Peak gain 1710-1990MHz
<b>Power Supply:</b>	Lithium battery pack (dedicated), 5.0 VDC;
<b>Operating Temperature Range:</b>	-20°C to 55°C
<b>Prototype / Production unit:</b>	Prototype Sample

### **3.2 Identification of the Equipment Under Test (EUT)**

<b>EUT #</b>	<b>Serial Number</b>	<b>HW Version</b>	<b>SW Version</b>	<b>Model</b>	<b>Notes</b>
<b>1</b>	3817573229b	6	2.10	nuLink! 2390	Radiated Sample
<b>2</b>	29D000022	6	2.10	nuLink! 2390	Radiated Sample

### **3.3 Identification of Accessory equipment**

<b>AE #</b>	<b>Type</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>
<b>1</b>	Vehicle Charger	Garmin	CLA05D-050G	320-00239-40
<b>2</b>	Car Holder	Garmin	N/A	N/A
<b>3</b>	USB Cable	Garmin	N/A	N/A
<b>4</b>	Laptop Computer	Dell	E6400	14686084801

#### **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 the following test standards:

- 47 CFR Part 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR Part 22: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 22- Public mobile services
- 47 CFR Part 24: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 24- Personal communication services

This test report is to support a request for new equipment authorization under the FCC ID: **IPH-0247908**.

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

## 5 Summary of Measurement Results

### 850 Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a)	RF Output Power	Nominal	GSM 850	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1055 §22.355	Frequency Stability	Nominal	GSM 850	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1049 §22.917(b)	Occupied Bandwidth	Nominal	GSM 850	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1051 §22.917	Band Edge Compliance	Nominal	GSM 850	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1051 §22.917	Conducted Spurious Emissions	Nominal	GSM 850	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1053 §22.917	Radiated Spurious Emissions	Nominal	GSM 850	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.107 §15.207	Line Conducted Emissions	Nominal	GSM 850	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§2.1053 §15.109	Receiver Emissions-Radiated	Nominal	RX Mode	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

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

1. Tests marked NP are leveraged from the GE865-QUAD Module with FCC ID: RI7GE865



**1900 Band:**

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a)	RF Output Power	Nominal	GSM 1900	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1055 §24.235	Frequency Stability	Nominal	GSM 1900	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1049 §24.238(b)	Occupied Bandwidth	Nominal	GSM 1900	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1051 §24.238	Band Edge Compliance	Nominal	GSM 1900	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1051 §24.238	Conducted Spurious Emissions	Nominal	GSM 1900	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Complies
§2.1053 §24.238	Radiated Spurious Emissions	Nominal	GSM 1900	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.107 §15.207	Line conducted Emissions	Nominal	GSM 1900	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§2.1053 §15.109	Receiver Emissions-Radiated	Nominal	RX Mode	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

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

1. Tests marked NP are leveraged from the GE865-QUAD Module with FCC ID: RI7GE865

## **6 Measurements**

### **6.1 RF Power Output**

#### **6.1.1 References**

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232

#### **6.1.2 Measurement requirements:**

##### **6.1.2.1 FCC 2.1046: RF power output.**

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

#### **6.1.3 Limits:**

##### **6.1.3.1 FCC 22.913 (a) Effective radiated power limits.**

The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

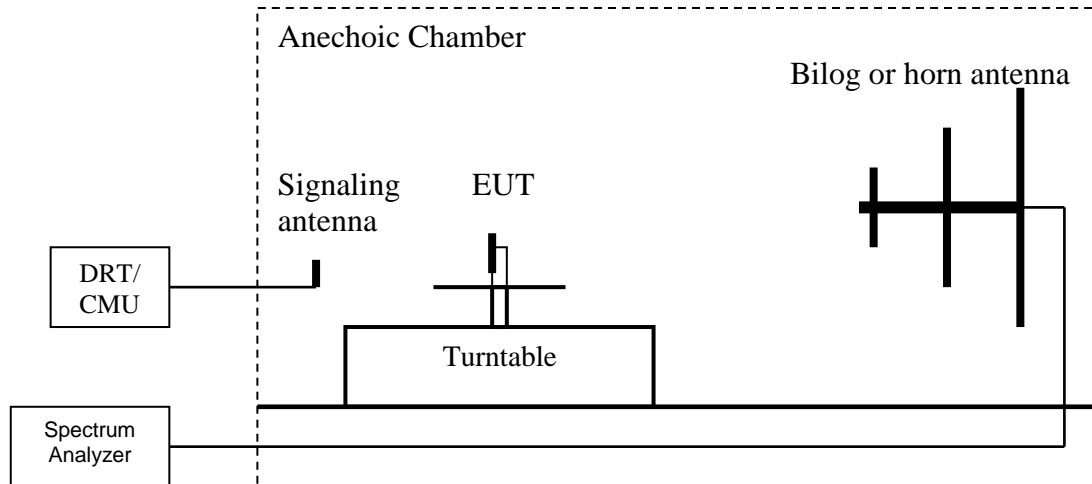
##### **6.1.3.2 FCC 24.232 (b)(c) Power limits.**

(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).

(c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement over the full bandwidth of the channel.

#### 6.1.4 Radiated Output Power Measurement procedure

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:  
**ERP (dBm) = LVL (dBm) + LOSS (dB)**
8. Determine the EIRP using the following equation:  
**EIRP (dBm) = ERP (dBm) + 2.14 (dB)**
9. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

**Spectrum analyzer settings: RBW=VBW=5MHz**

(Note: Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4, 7 and 8 above are performed with test software.)

### 6.1.5 RF Power Output 850MHz band

**Limit: FCC: Nominal Peak Output Power < 38.45 dBm (7W)**

**Measurement Uncertainty (Conducted): ±0.5 dB**

**Measurement Uncertainty (Radiated): ±3.0 dB**

GSM 850: GMSK Mode	
Frequency (MHz)	Radiated Power ERP (dBm)
824.2	27.6
836.6	29.5
848.8	32.0

#### 6.1.5.1 Measurement Result

Pass.

### 6.1.6 RF Power Output 1900MHz band

**Limit: Nominal Peak Output Power < 33 dBm (2W)**

**Measurement Uncertainty (Conducted):  $\pm 0.5$  dB**

**Measurement Uncertainty (Radiated):  $\pm 3.0$  dB**

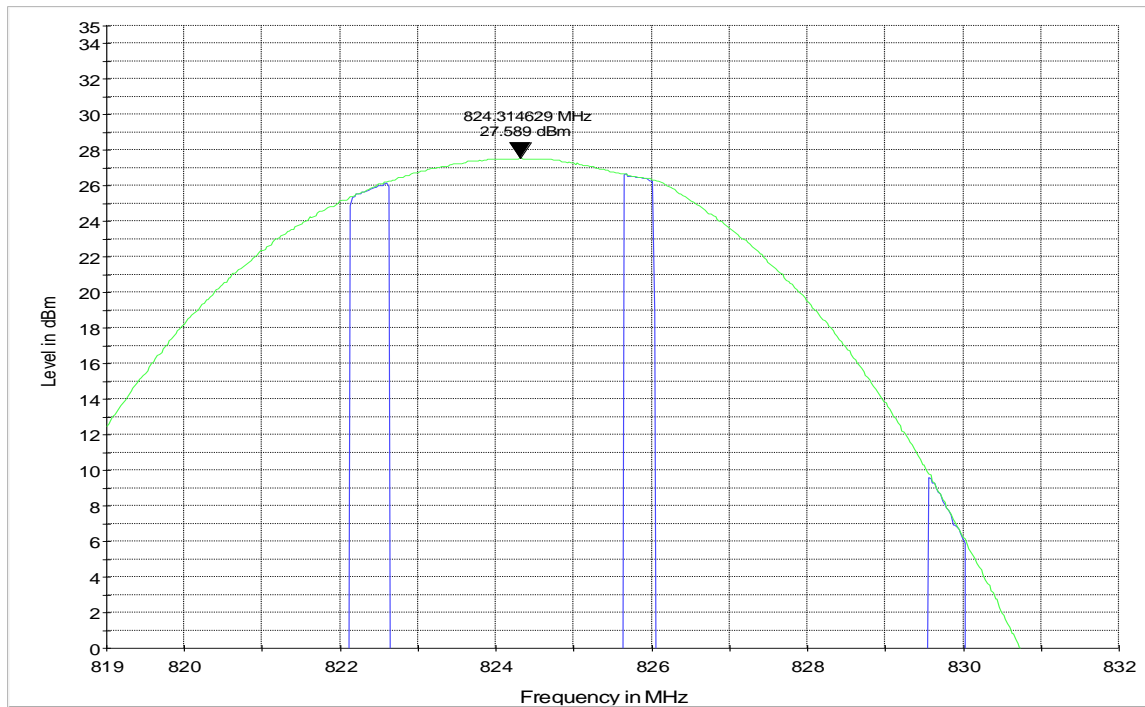
<b>GSM 1900: GMSK Mode</b>	
<b>Frequency (MHz)</b>	<b>Radiated Power EIRP (dBm)</b>
<b>1850.2</b>	30.4
<b>1880.0</b>	28.6
<b>1909.8</b>	30.5

#### 6.1.6.1 Measurement Result

Pass.

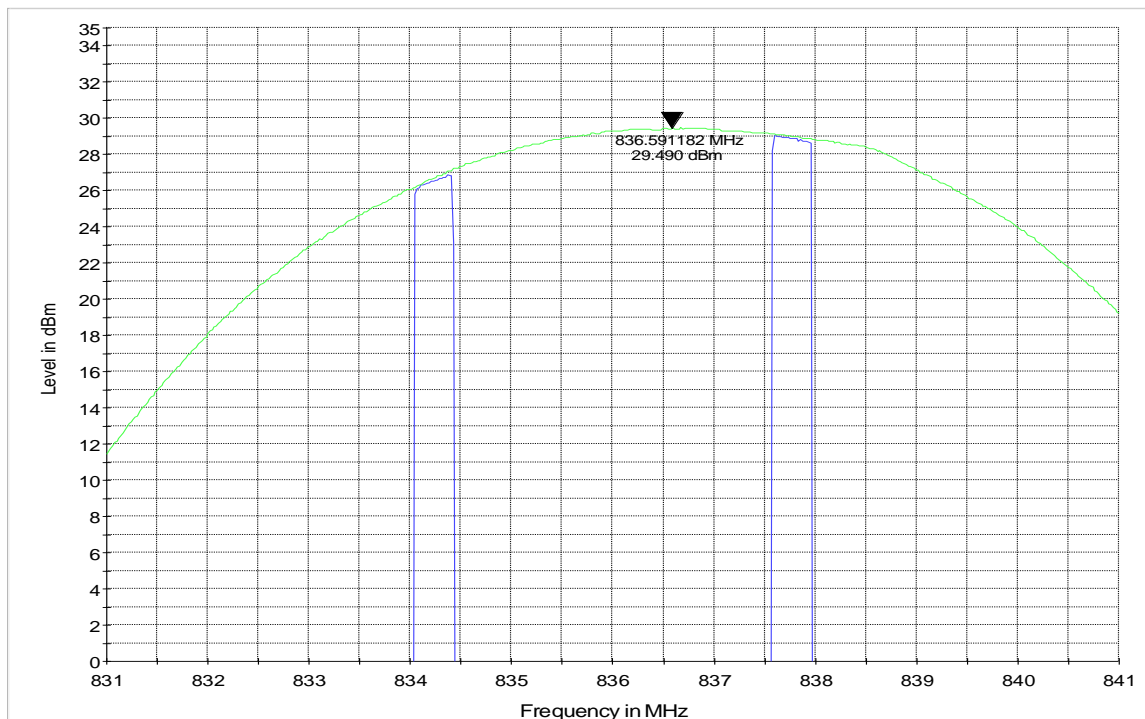
### 6.1.7 Results

#### ERP (GSM 850) CHANNEL 128



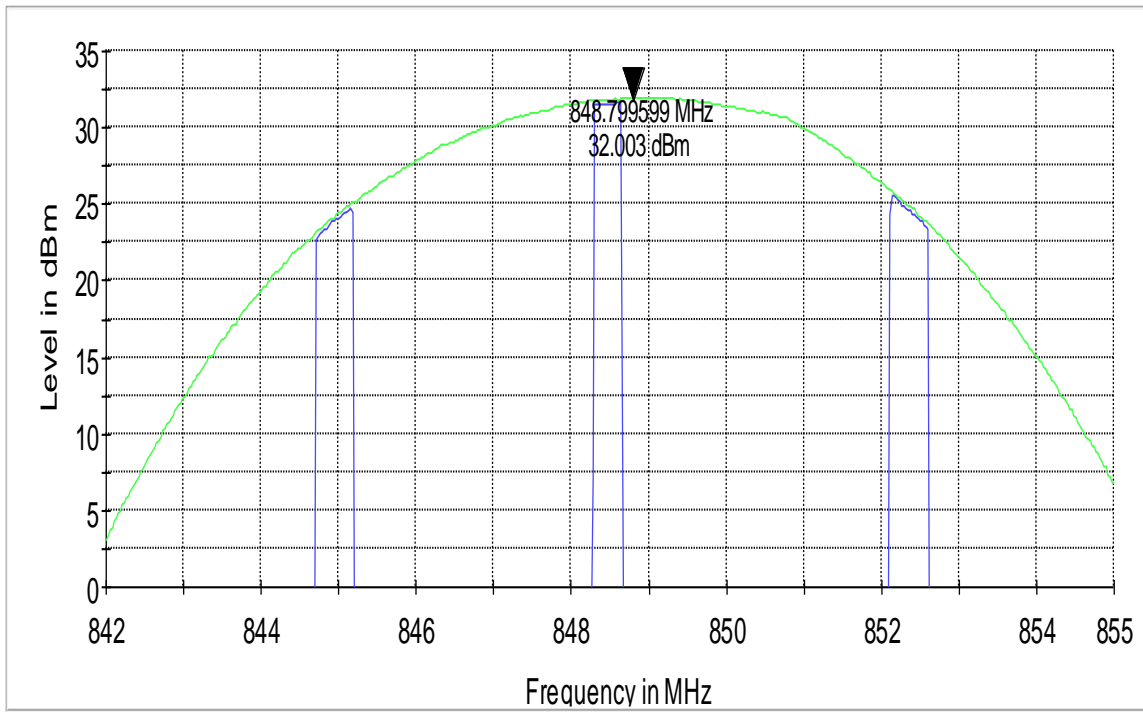
MaxPeak-ClearWrite    MaxPeak-MaxHold

#### ERP (GSM 850) CHANNEL 190



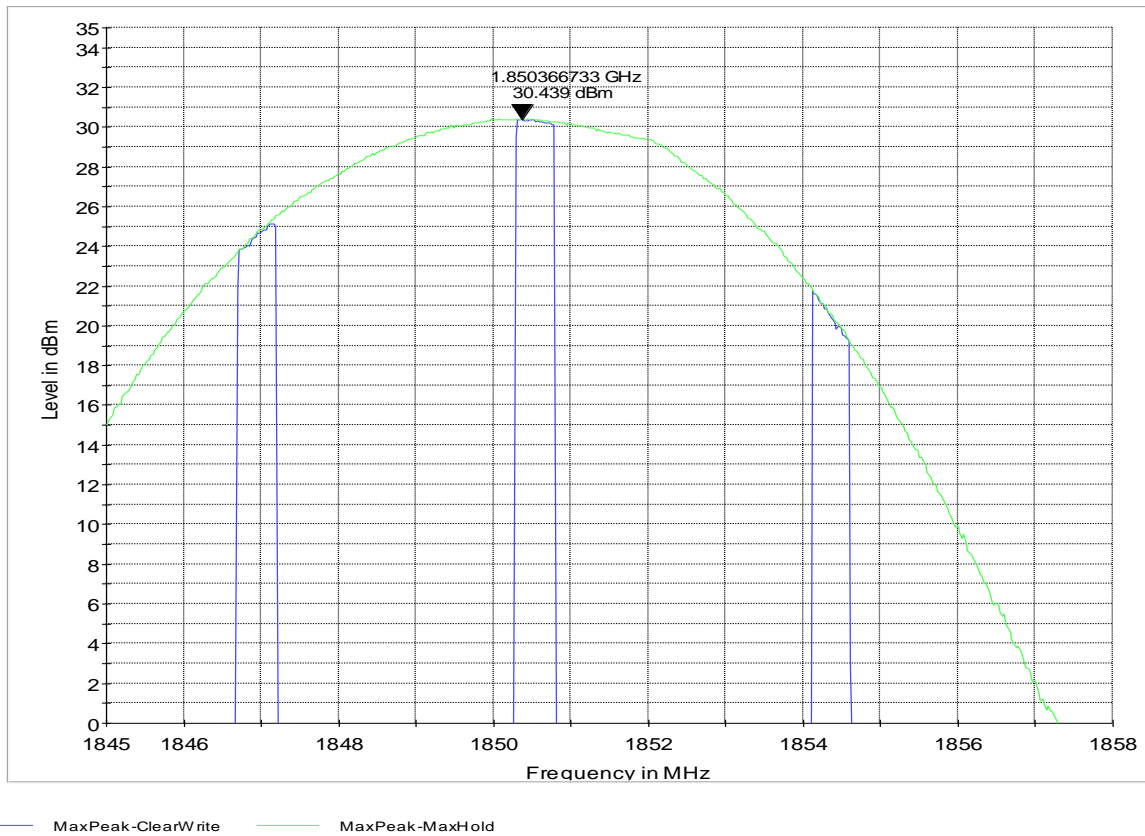
MaxPeak-ClearWrite    MaxPeak-MaxHold

**ERP (GSM 850) CHANNEL 251**

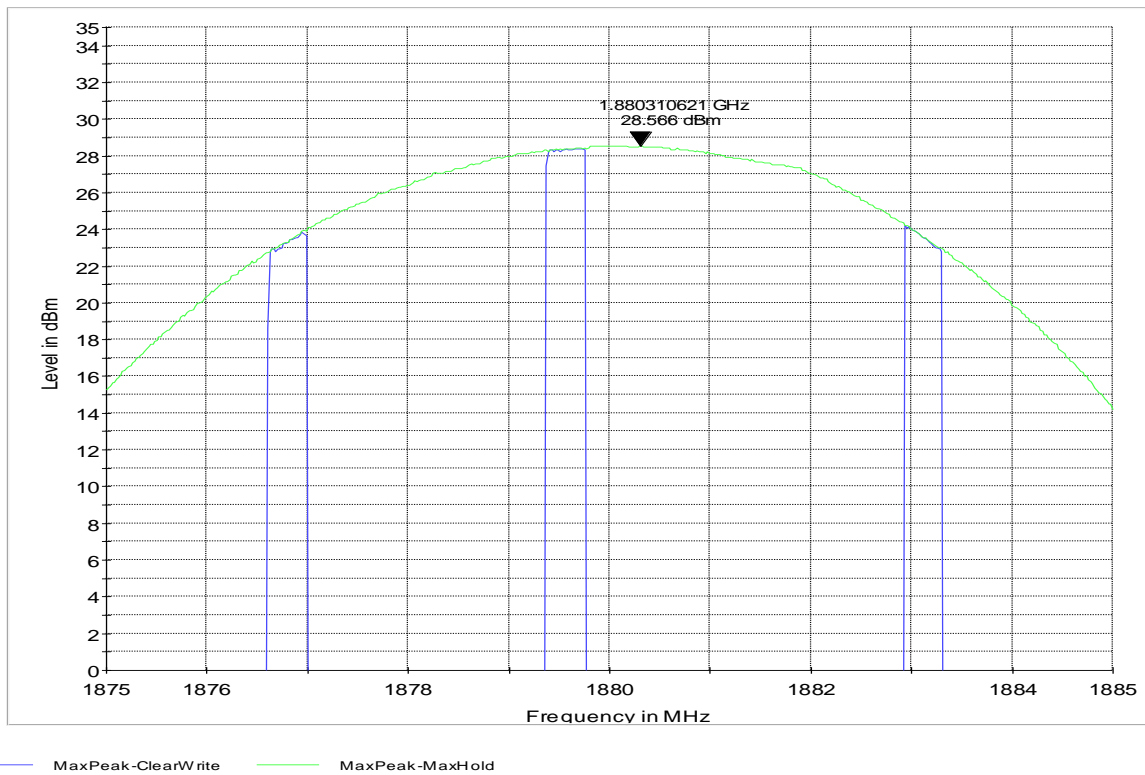


— MaxPeak-ClearWrite    — MaxPeak-MaxHold

### EIRP (PCS-1900) CHANNEL 512

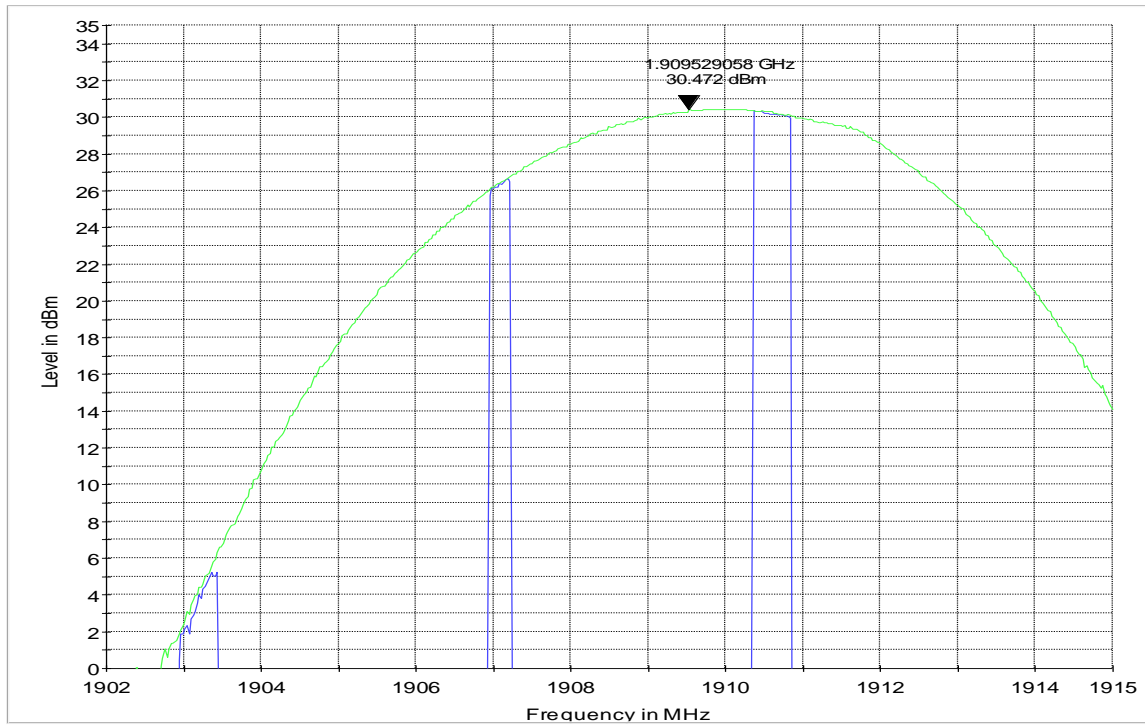


### EIRP (PCS-1900) CHANNEL 661





### EIRP (PCS-1900) CHANNEL 810



— MaxPeak-ClearWrite — MaxPeak-MaxHold

## **6.2 Spurious Emissions Radiated**

### **6.2.1 References**

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238

### **6.2.2 Measurement requirements:**

#### **6.2.2.1 FCC 2.1053: Field strength of spurious radiation.**

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

### **6.2.3 Limits:**

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

#### **6.2.3.1 FCC 22.917 Emission limitations for cellular equipment.**

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

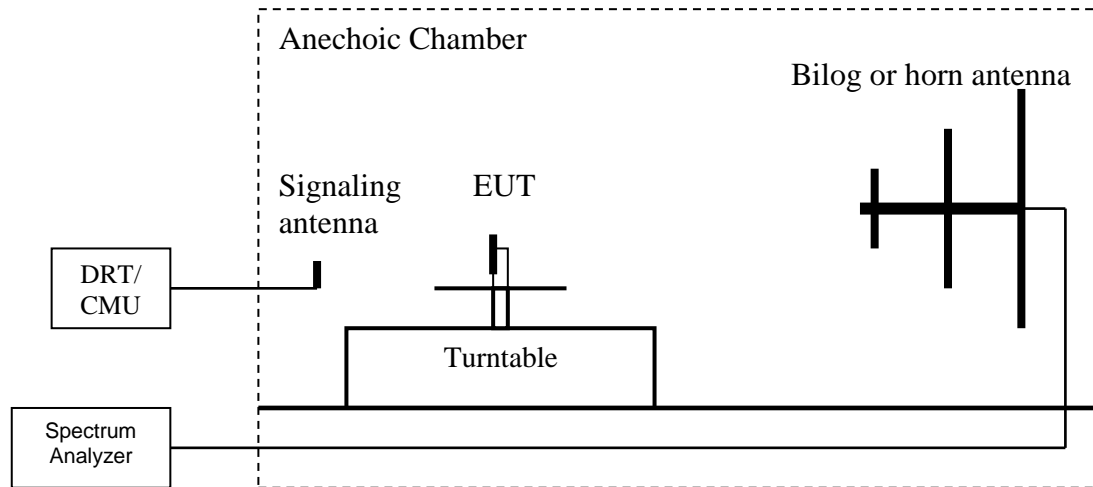
#### **6.2.3.2 FCC 24.238 Emission limitations for Broadband PCS equipment.**

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

#### 6.2.4 Radiated out of band measurement procedure:

Ref: TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation:  
**Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation:  
**Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.  
(**Note:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

**Spectrum analyzer settings: RBW=VBW=1MHz**

### **Measurement Survey:**

The site is constructed in accordance with ANSI C63.4 requirements and is recognized by the FCC to be in compliance for a 3m site. The spectrum is scanned from 30MHz to the 10<sup>th</sup> harmonic of the highest frequency generated by the EUT.

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the GSM-850 & PCS-1900 bands. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the GSM-850 & PCS-1900 band into any of the other blocks respectively. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

Radiated emission measurements were made only with Circuit Switched mode GMSK modulation because this mode represents the worse case emission for all the modulations for GSM. All measurements are done in horizontal and vertical antenna polarization; and on three orientations of the EUT. The plots show the worst case where it is not indicated otherwise. Unless mentioned otherwise, the peaks in the plots are from the carrier frequency.

**6.2.5 Radiated out of band emissions results on EUT- Transmit Mode:**





**6.2.5.1 Test Results Transmitter Spurious Emission GSM850:**

Harmonic	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
1	824.2	-	836.6	-	848.8	-
2	1648.4	NF	1673.2	NF	1697.6	NF
3	2472.6	NF	2509.8	NF	2546.4	-35
4	3296.8	NF	3346.4	NF	3395.2	NF
5	4121	NF	4183	NF	4244	NF
6	4945.2	NF	5019.6	NF	5092.8	NF
7	5769.4	NF	5856.2	NF	5941.6	NF
8	6593.6	NF	6692.8	NF	6790.4	NF
9	7417.8	NF	7529.4	NF	7639.2	NF
10	8242	NF	8366	NF	8488	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

**6.2.5.2 Measurement Result**

Pass.

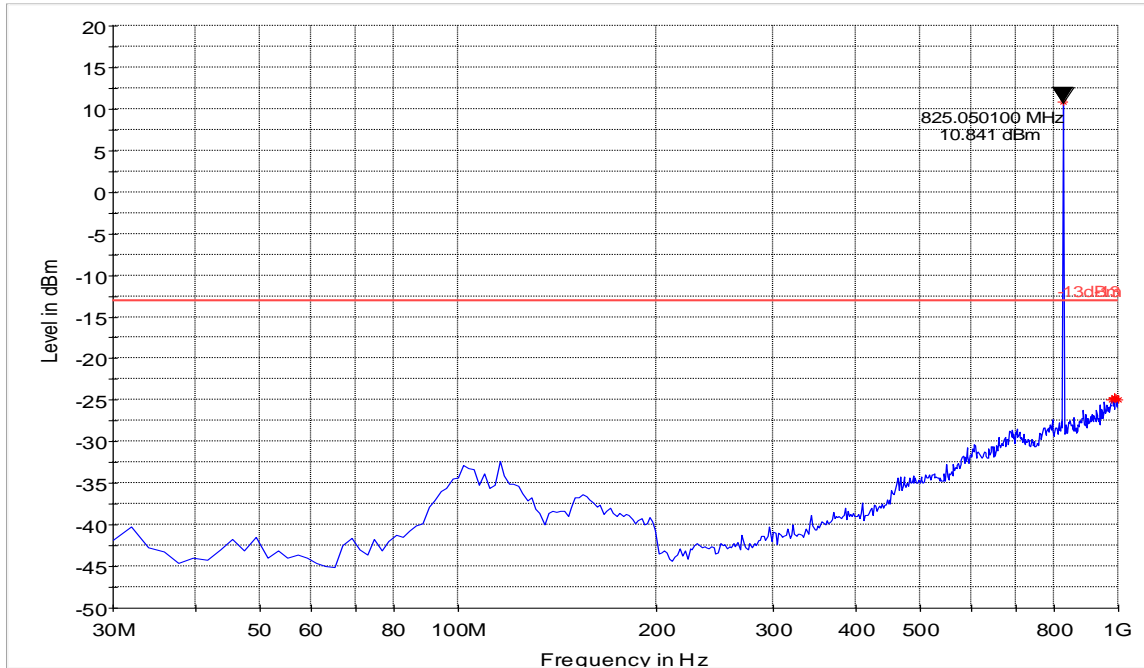
**Legend for the plots:**

-  -13dBm.LimitLine
-  Preview Result
-  Data Reduction Result
-  Final Measurement Result

### Radiated Spurious Emissions (GSM-850) Tx: Low Channel

#### Test results 30M-1GHz

Spur above the limit line is the TX signal



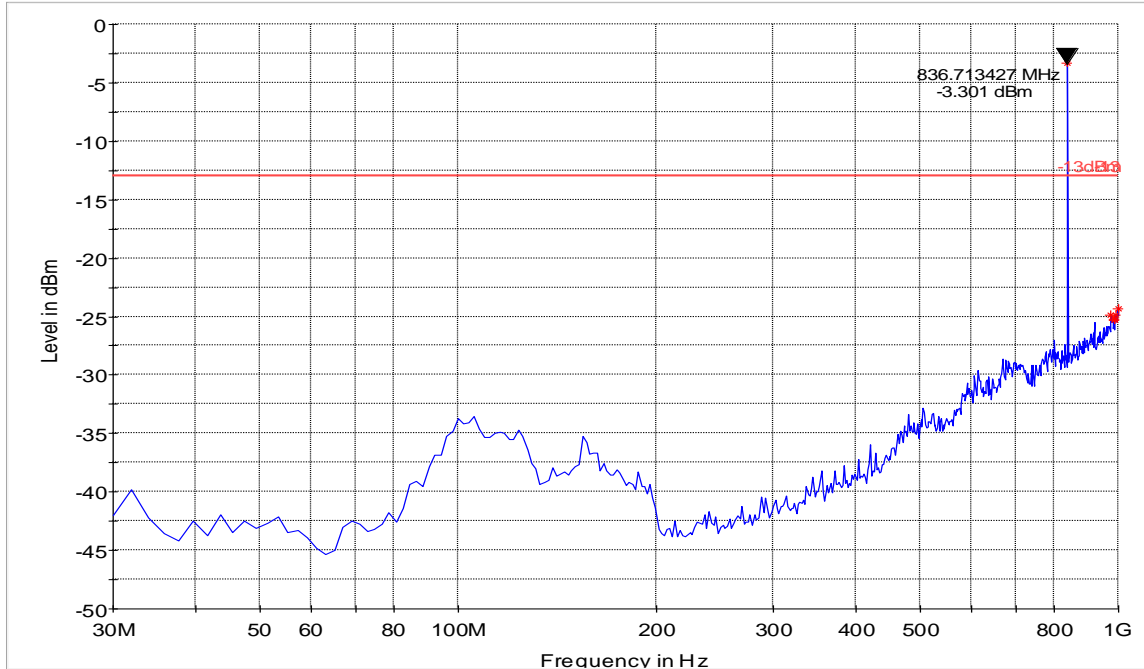
#### Test results 1GHz-9GHz



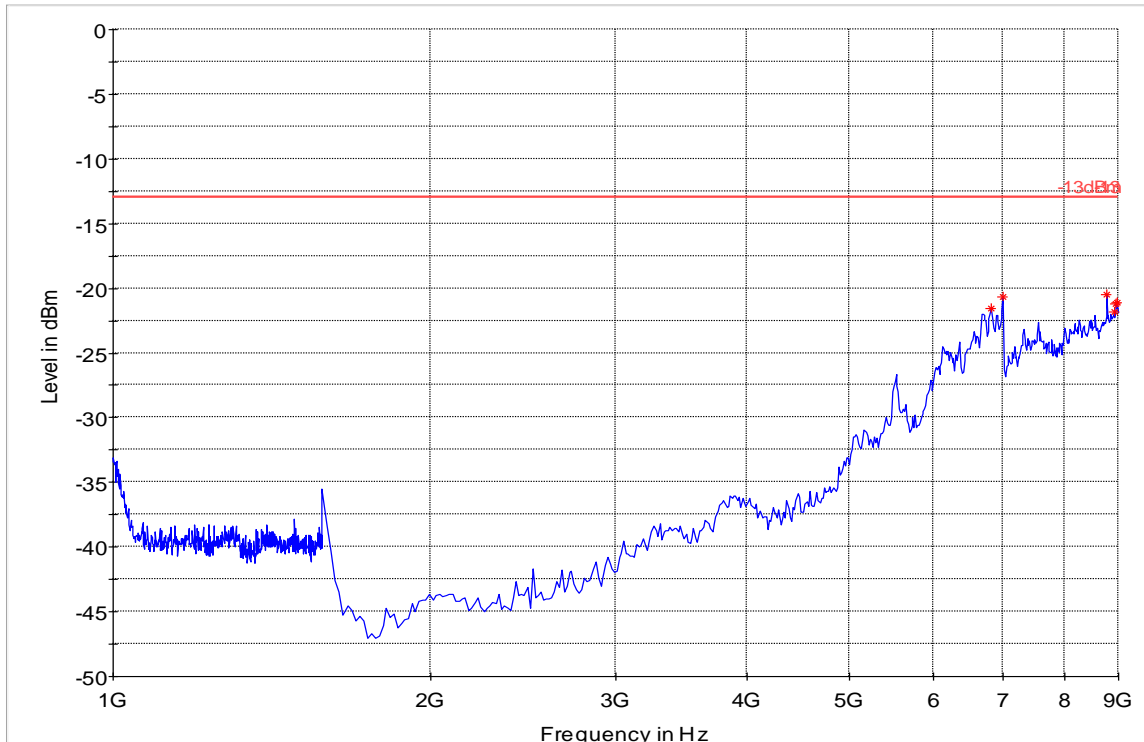
### Radiated Spurious Emissions (GSM-850) Tx: Mid Channel

#### Test results 30M-1GHz

Spur above the limit line is the TX signal



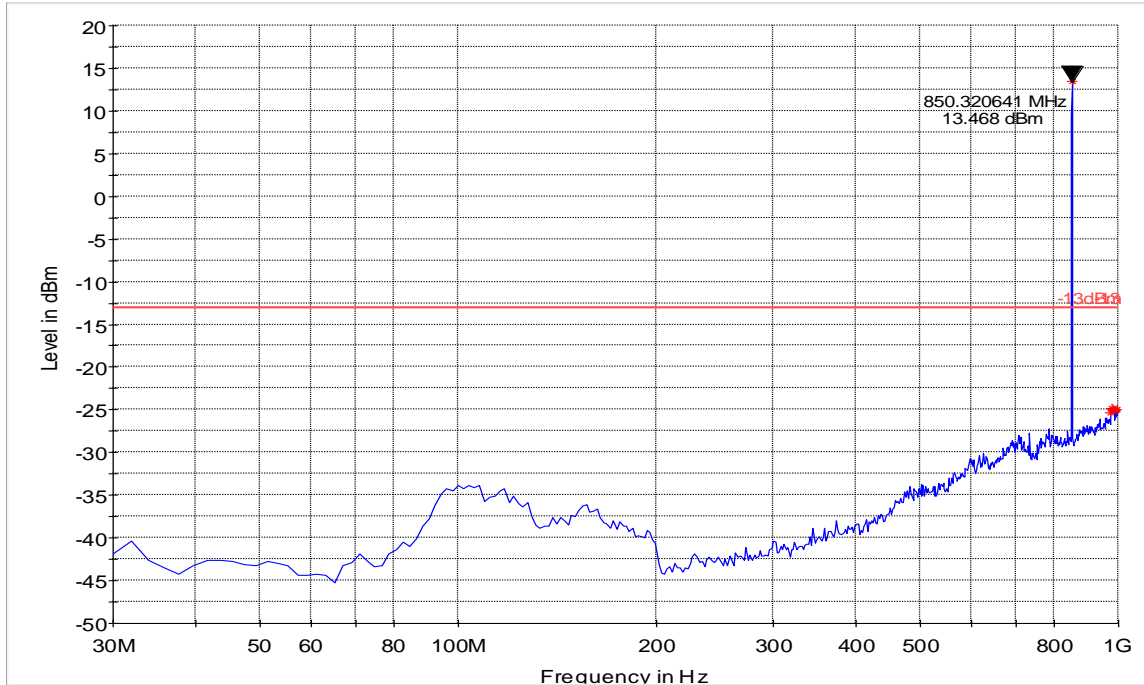
#### Test results 1GHz-9GHz



### Radiated Spurious Emissions (GSM-850) Tx: High Channel

#### Test results 30M-1GHz

Spur above the limit line is the TX signal



— -13dBm.LimitLine — Preview Result 1 — -13 \* Data Reduction Result 1 [1]

#### Test results 1GHz-9GHz



— -13dBm.LimitLine — Preview Result 1 — -13 \* Data Reduction Result 1 [2]







**6.2.5.3 Test Results Transmitter Spurious Emission PCS-1900:**

Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
1	1850.2	-	1880.0	-	1909.8	-
2	3700.4	-42	3760	-44	3819.6	-40
3	5550.6	-42	5640	-39	5729.4	-39
4	7400.8	NF	7520	-39	7639.2	NF
5	9251	NF	9400	NF	9549	NF
6	11101.2	NF	11280	NF	11458.8	NF
7	12951.4	NF	13160	NF	13368.6	NF
8	14801.6	NF	15040	NF	15278.4	NF
9	16651.8	NF	16920	NF	17188.2	NF
10	18502	NF	18800	NF	19098	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

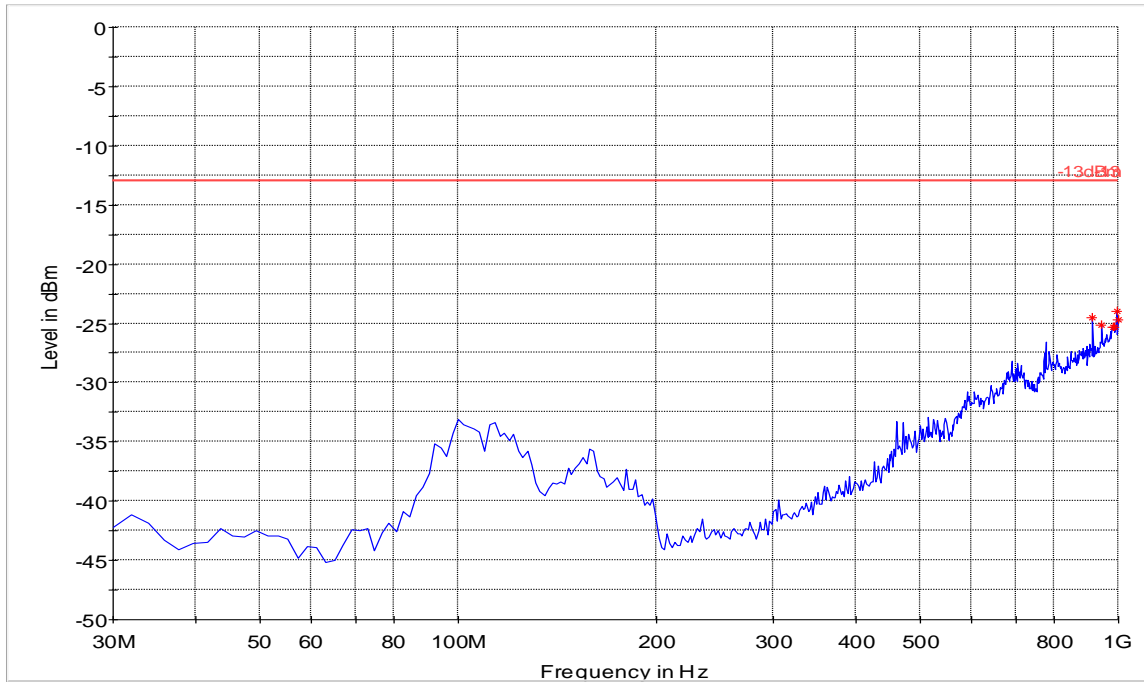
**6.2.5.4 Measurement Result**

Pass.

**Legend for the plots:**

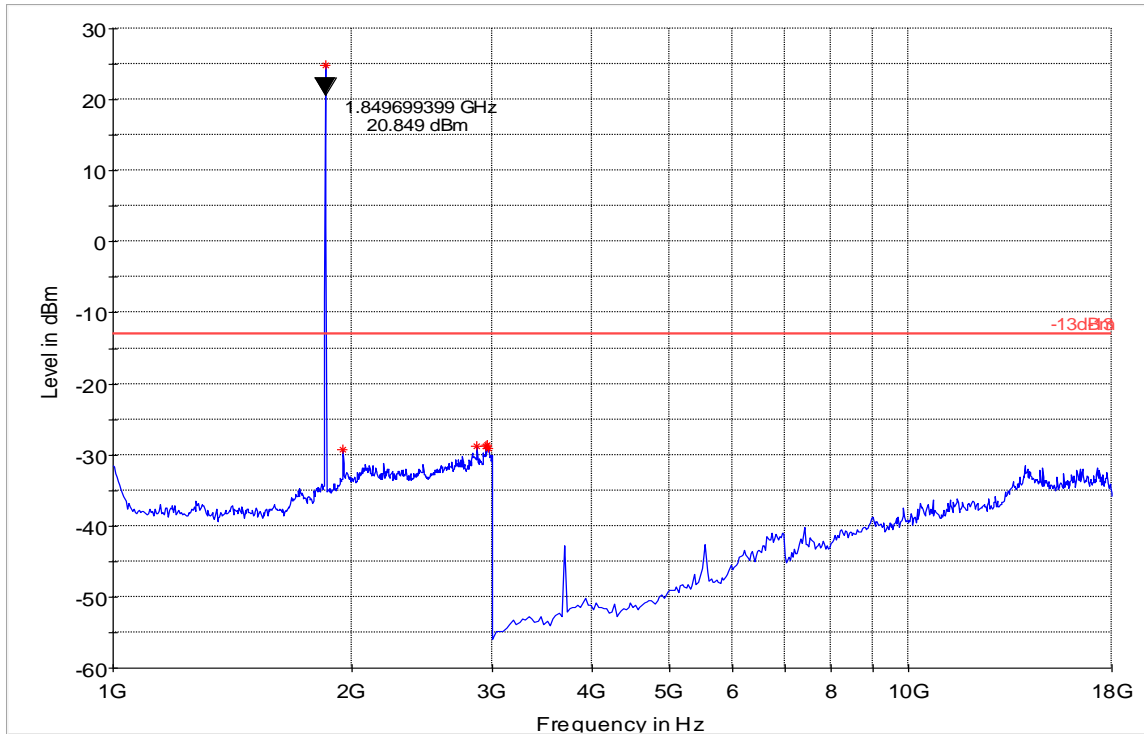
-  -13dBm.LimitLine
-  Preview Result
-  Data Reduction Result
-  Final Measurement Result

**Radiated Spurious Emissions (GSM-1900) Tx: Low Channel**  
**Test results 30M-1GHz**



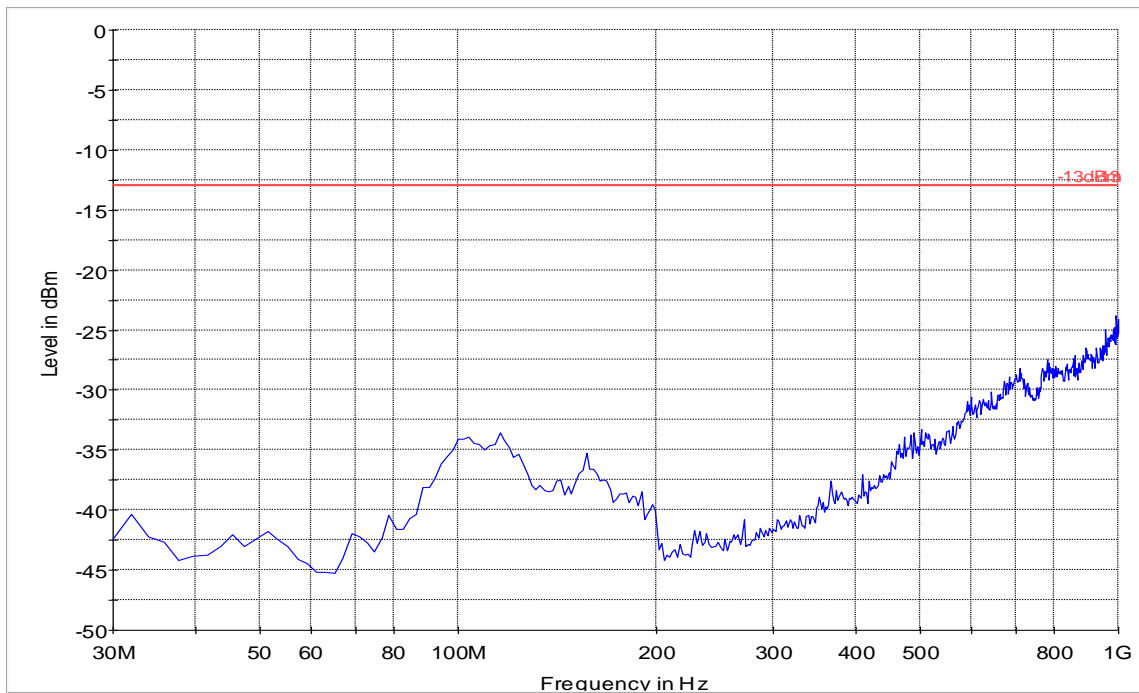
— -13dBm.LimitLine — -13 — Preview Result 1 \* Data Reduction Result 1 [1]

**Test results 1GHz-18GHz**  
 Spur above the limit line is the TX signal



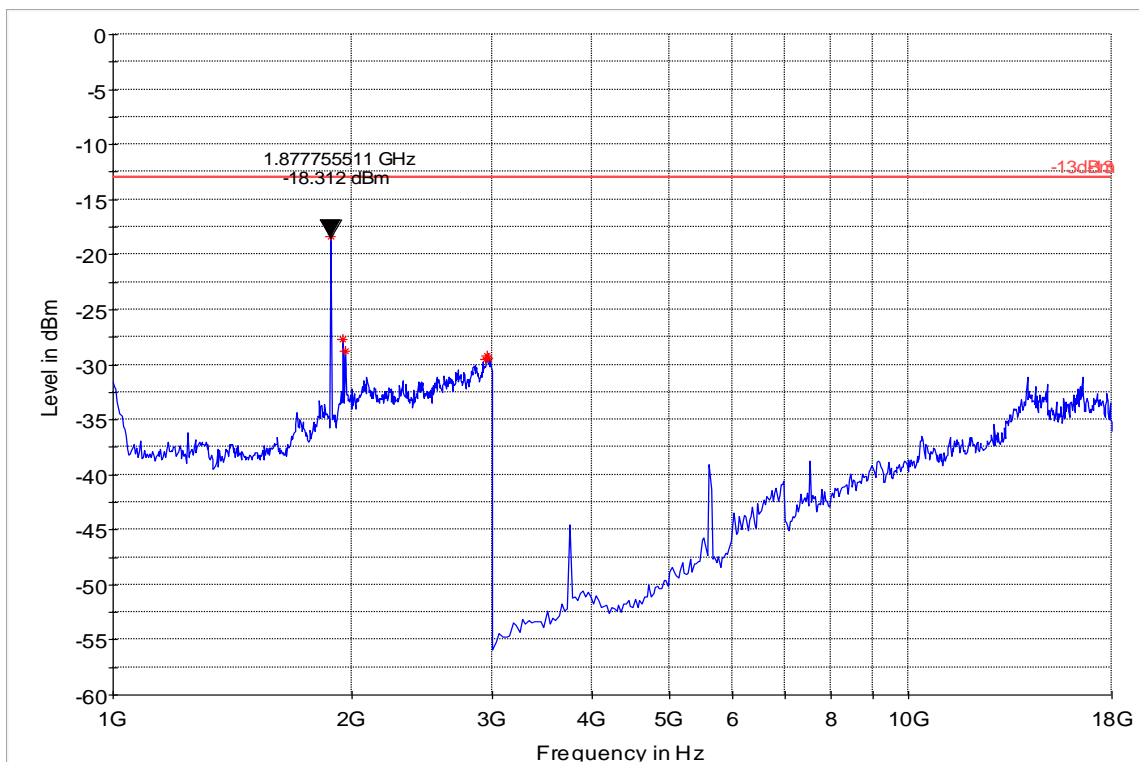
— -13dBm.LimitLine — Preview Result 1 — -13 \* Data Reduction Result 1 [2]

### Radiated Spurious Emissions (GSM-1900) Tx: Mid Channel Test results 30M-1GHz



— -13dBm.LimitLine — Preview Result 1 — -13

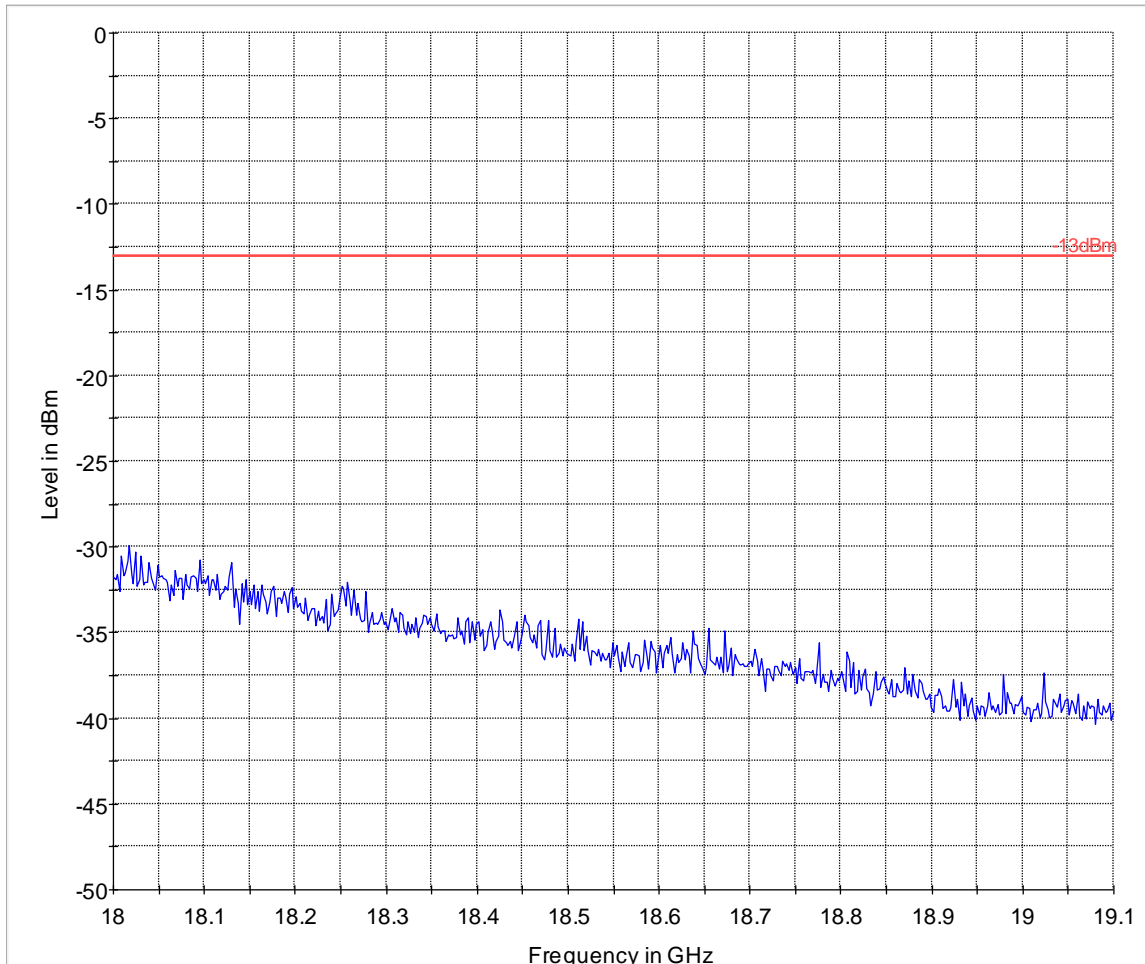
### Test results 1GHz-18GHz



— -13dBm.LimitLine — -13 — Preview Result 1 \* Data Reduction Result 1 [2]

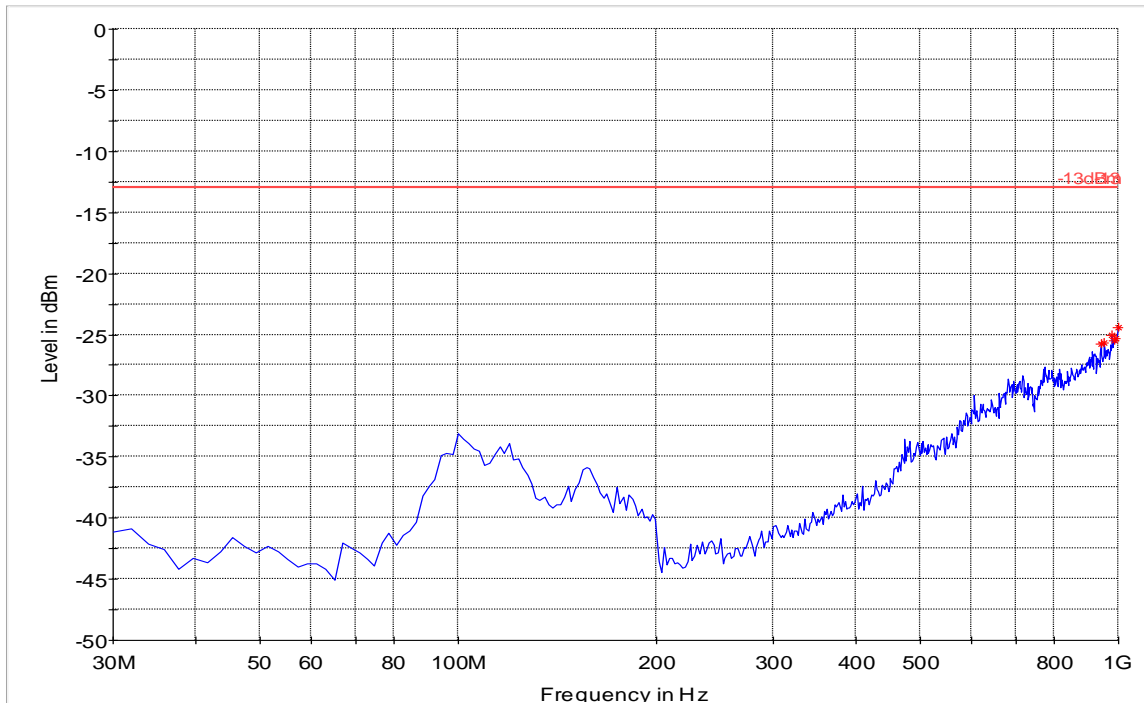
### Test results 18GHz-19.1GHz

Worst case representation for all channels in this frequency range.



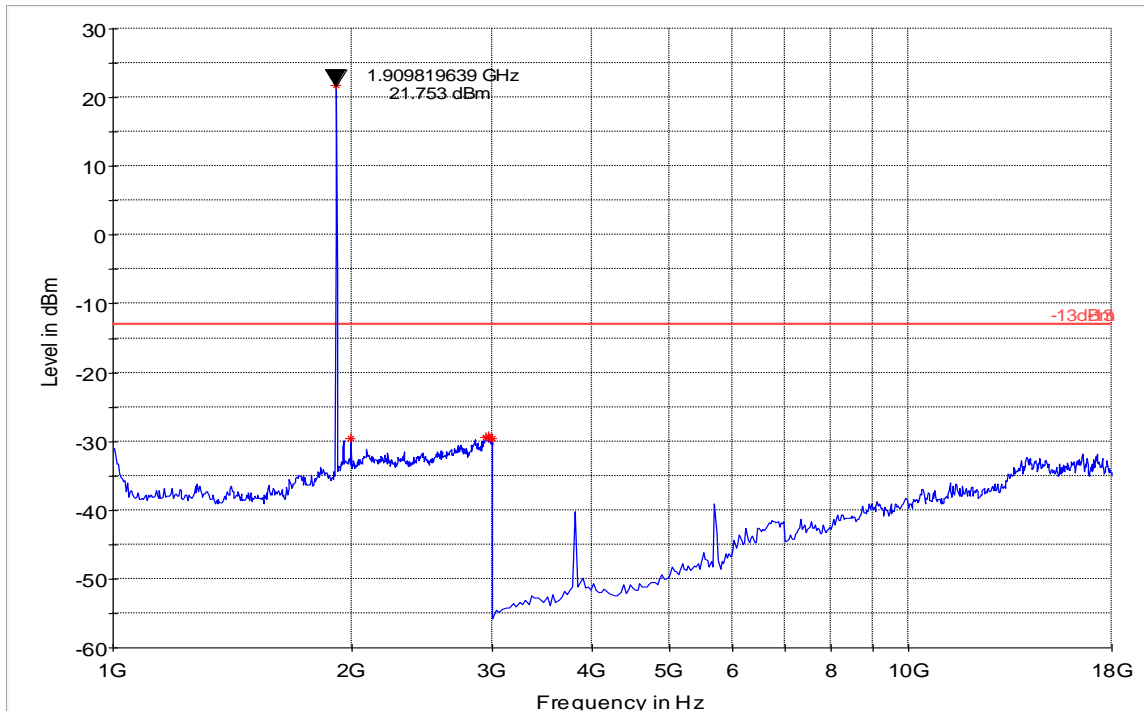
— -13dBm.LimitLine — Preview Result 1

**Radiated Spurious Emissions (GSM-1900) Tx: High Channel**  
**Test results 30M-1GHz**



— -13dBm.LimitLine — Preview Result 1 — -13 \* Data Reduction Result 1 [1]

**Test results 1GHz-18GHz**  
 Spur above the limit line is the TX signal



— -13dBm.LimitLine — -13 — Preview Result 1 \* Data Reduction Result 1 [2]

### **6.3 Radiated out of band emissions results on EUT- Receive Mode:**

#### **6.3.1 References**

FCC: CFR Part 15.109, 2.1053

#### **6.3.2 Limits**

##### **6.3.2.1 §15.109 Radiated emission limits- Unintentional Radiators:**

If a radiated measurement is made, all spurious emissions shall comply with the limits of table (1) as shown.

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

<b>Frequency of emission (MHz)</b>	<b>Field strength (<math>\mu\text{V/m}</math>)</b>
30–88	100 (40dB $\mu\text{V/m}$ )
88–216	150 (43.5 dB $\mu\text{V/m}$ )
216–960	200 (46 dB $\mu\text{V/m}$ )
Above 960	500 (54 dB $\mu\text{V/m}$ )

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

<b>Frequency of emission (MHz)</b>	<b>Field strength (<math>\mu\text{V/m}</math>)</b>
30–88	90
88–216	150
216–960	210
Above 960	300

#### **6.3.3 Measurement settings:**

RBW= 120kHz below 1GHz and 1MHz above 1GHz.

#### **6.3.4 Results**

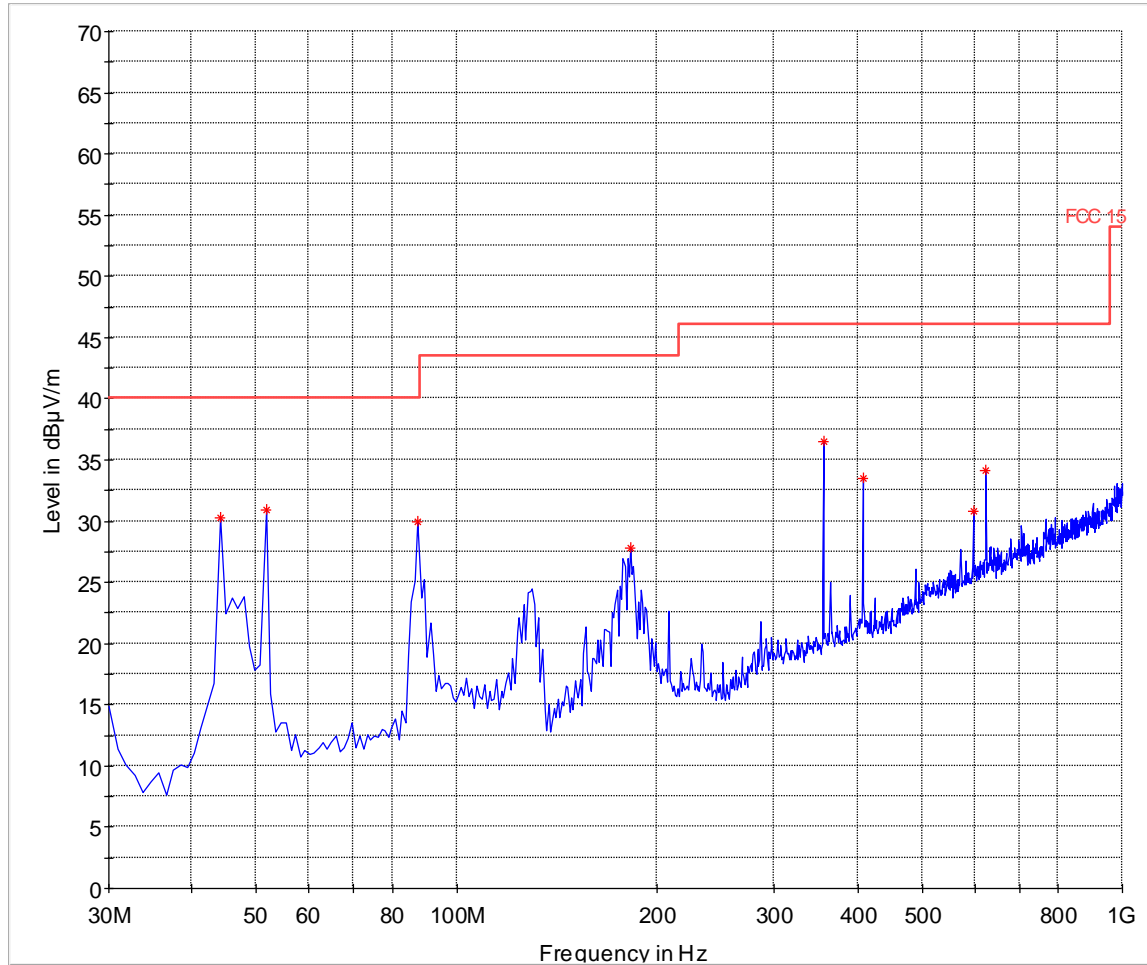
Plots reported here represent the worse case emissions for all EUT orientations and horizontal/vertical polarizations of the measurement antenna.

##### **6.3.4.1 Measurement Result**

Pass.

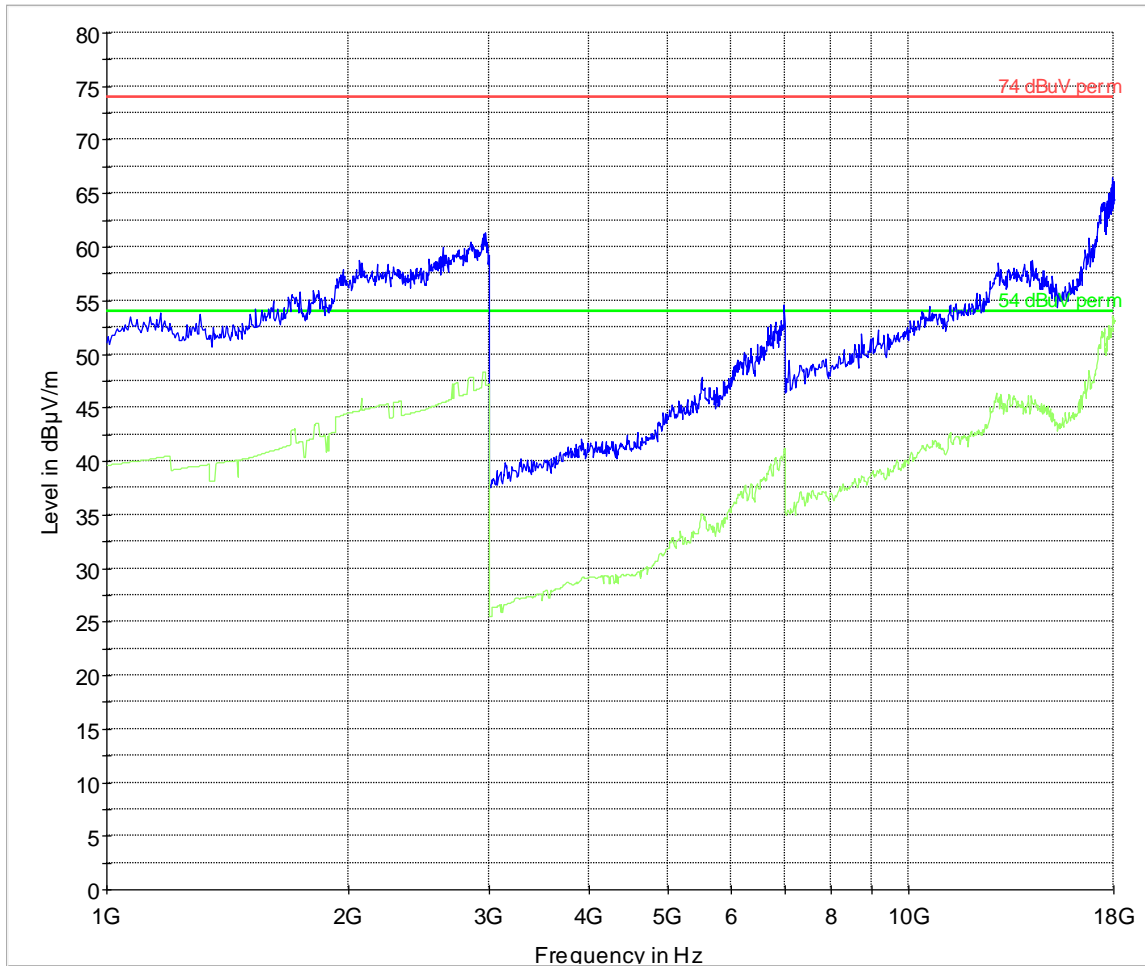
### 6.3.4.2 Test Results Receiver Spurious Emission

Receive Mode: 30MHz-1GHz



— FCC 15.LimitLine    — Preview Result 1    \* Data Reduction Result 1 [3]

**Receive Mode: 1GHz-18GHz**  
**Peak and Average mode measurement data.**



74 dBuV perm.LimitLine    54 dBuV perm.LimitLine    Preview Result 1    Preview Result 2



**6.4 AC Power Line Conducted Emissions**

**6.4.1 References:**

FCC: CFR Part 15.207

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.

**6.4.2 Limits:**

**6.4.2.1 §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 μH/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.

**Table 1:**

Frequency of emission (MHz)	Conducted limit (dBμV)	
	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.

**6.4.3 Measurement settings:**

RBW= 9kHz

**6.4.4 Results**

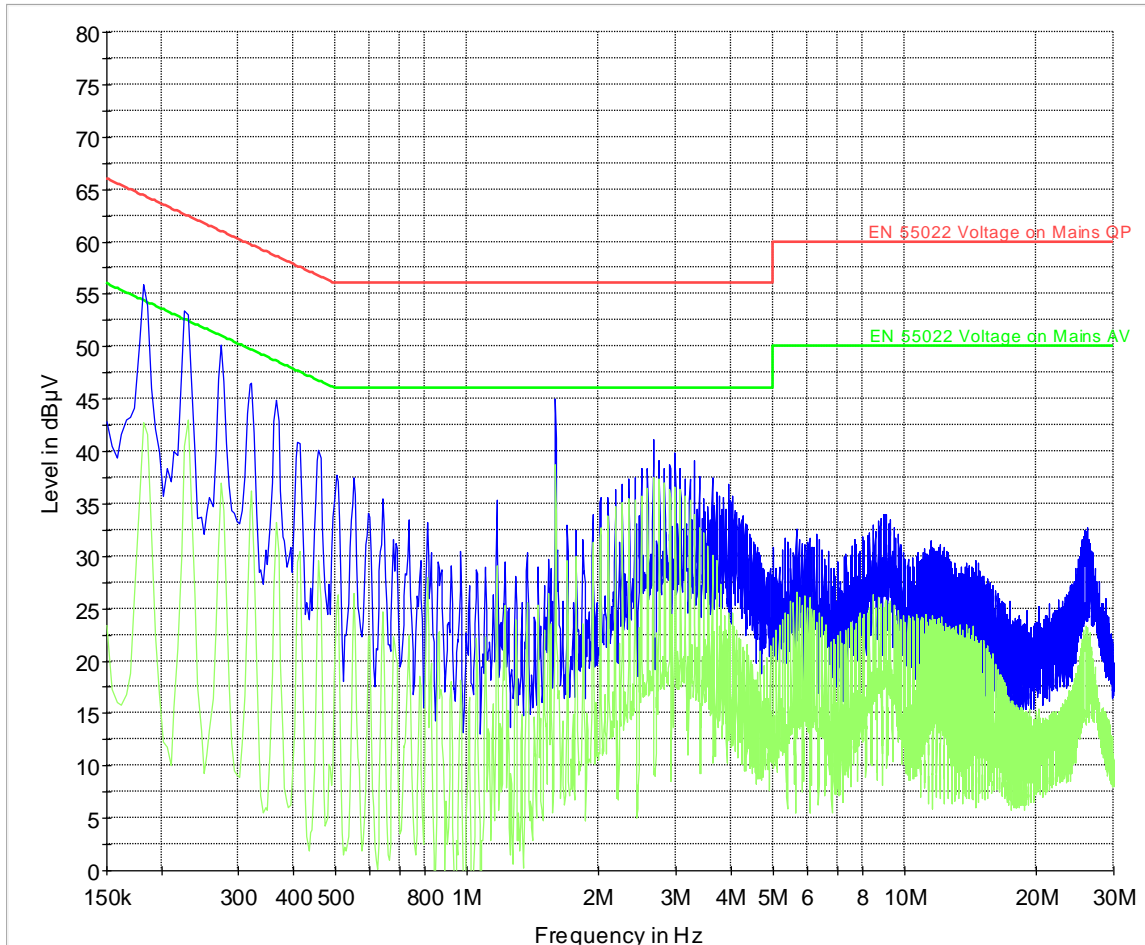
Plots shown here represent the combined worse case emissions for Lines, Phase and Neutral.

**6.4.4.1 Measurement Result**

Pass.

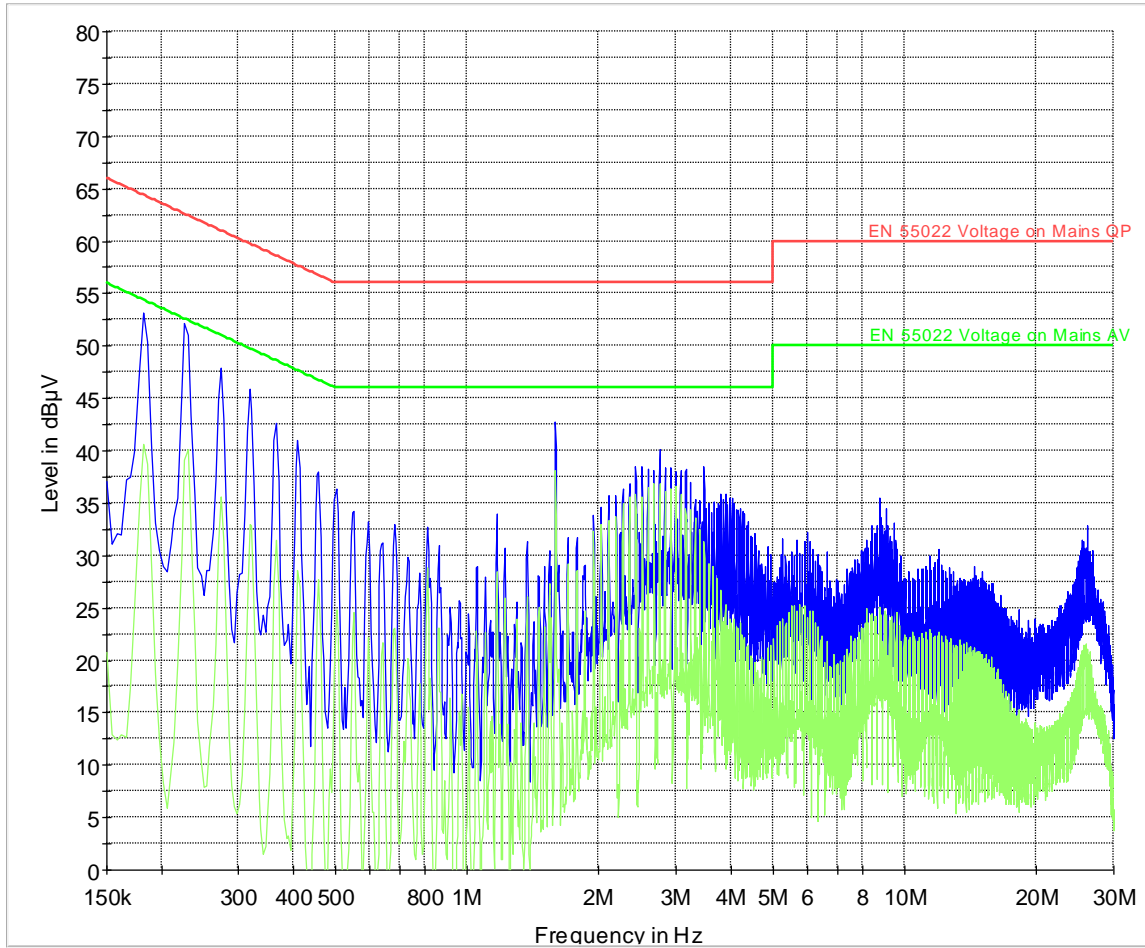
### 6.4.5 Test Results:

#### 850 TX Mode:



— EN 55022 Voltage on Mains QP.LimitLine — EN 55022 Voltage on Mains AV.LimitLine  
— Preview Result 1 — Preview Result 2

**1900 TX Mode:**

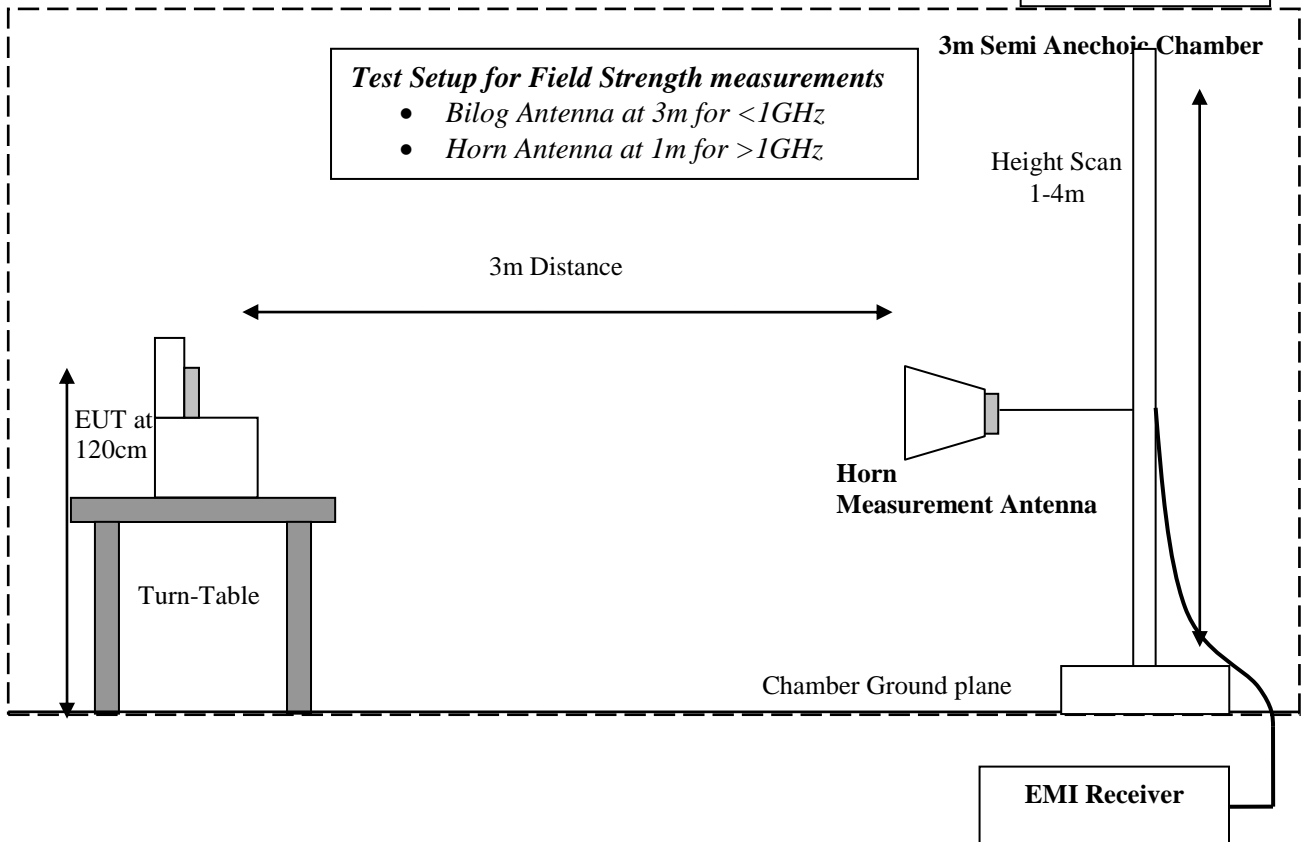
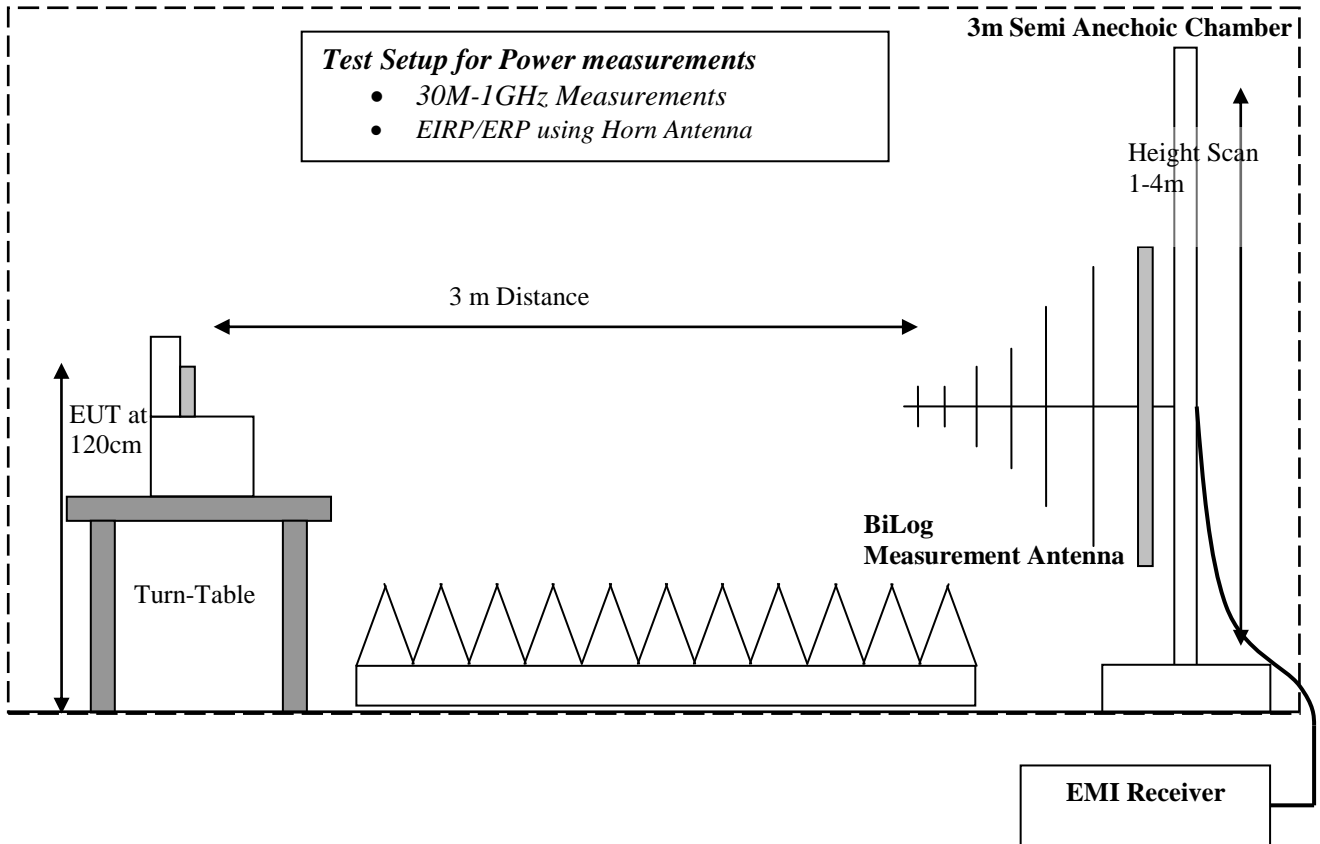


— EN 55022 Voltage on Mains QP.LimitLine      — EN 55022 Voltage on Mains AV.LimitLine  
— Preview Result 1                                      — Preview Result 2

**6.5 Test Equipment and Ancillaries used for tests**

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	June 2010	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	June 2010	1 year
Bluetooth Tester	CBT	Rohde & Schwarz	100212	May 2009	2 Years
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2010	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	Jul 2010	1 year
Loop Antenna	6512	EMCO	00049838	April 2009	2 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	2 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Jan 2009	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	R&S	ESH3-Z6	836154/011	May 2009	2 Years
Power Smart Sensor	R&S	NRP-Z81	100161	June 2010	1 Year
DC Power Supply	6632A	Hewlett Packard	3524A-12822	n/a	n/a
DC Power Supply	6655A	Hewlett Packard	3403A-00487	n/a	n/a
Multimeter	179	Fluke	N/A	Feb 2010	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2010	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2010	1 Year

## 7 Block Diagrams





**8 Revision History**

Date	Report Name	Changes to report	Report prepared by
2011-04-07	EMC_GARMI_036_11002_FCC22_24	First Version	J Sabado
2011-04-12	EMC_GARMI_036_11002_FCC22_24_Rev1	Updated Model number to include only 0247908.	J Sabado