



FCC Test Report

FCC Part 22, 24 / RSS 132,133

For the
Garmin International

Nuvi 1690

Model Number:

01102291

With Sierra Wireless GSM Module Q2687

FCC ID: IPH-01102291

IC ID: 1792A-01102291

TEST REPORT #: EMC_GARMI_009_09001_FCC22_24_rev3

DATE: 2009-08-17



**FCC listed:
A2LA accredited**

**IC recognized #
3462B**

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and in compliance with the applicable criteria specified in Industry Canada rules RSS132 and RSS133.

Company	Description	Model #
Garmin International	Connected Personal Navigation Device	01102291

Technical responsibility for area of testing:

Heiko Strehlow
(Director Regulatory and
Antenna Services)

2009-08-17 EMC & Radio

Date	Section	Name	Signature
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This report is prepared by:

Josie Sabado
(Project Engineer)

2009-08-17 EMC & Radio

Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. The 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 the CETECOM Inc USA.

The test results of this test report relate exclusively to radiated measurement only. Radio module used in this product has been previously certified under its own FCC and IC ID.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	EMC
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Marc Douat
Responsible Project Leader:	Josie Sabado

2.2 Identification of the Client

Applicant's Name:	Garmin International
Street Address:	1200 E 151st Street
City/Zip Code	Olathe, KS 66062
Country	USA
Contact Person:	Van Ruggles
Phone No.	913.440.1321
e-mail:	Van.ruggles@garmin.com

2.3 Identification of the Manufacturer

Same as above applicant

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name of EUT (if not same as Model No.)	Nuvi 1690
Description	Connected Personal Navigation Device
Model No.	01102291
FCC-ID	IPH-01102291
IC-ID (Industry Canada)	1792A-01102291
Frequency Range:	824.2MHz – 848.8MHz for GSM 850 1850.2MHz – 1909.8MHz for PCS 1900
Type(s) of Modulation:	GMSK, 8PSK
Number of Channels:	124 for GSM-850, 299 for PCS-1900
Antenna Type:	PIFA with -3.5 dB gain for 824-960MHz, -5dB gain for 1710-1990MHz
Max. Output Power:	Conducted : See section 5.1.5. Radiated : see section 5.1.6 and 5.1.7. 27.4 dBm (0.55W) @ GSM 848.8MHz ERP values 26.6dBm (0.457W) @ PCS 1850.2MHz EIRP values

3.2 Identification of the Equipment Under Test (EUT)

EUT #	TYPE	MANF.	MODEL
1	EUT	Garmin International	01102291

3.3 Identification of Accessory equipment

AE #	TYPE	MODEL
1	AC Adapter	PSAA05A-050
2	Cradle	NA

4 Subject of Investigation

All testing was performed on the EUT listed in Section 3. The EUT was maximized in the X,Y, Z positions , all data in this report shows the worst case between horizontal and vertical polarization.

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 Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS132 and RSS133.

This EUT contains an FCC approved module with the FCC ID **O9EQ2687**. This report refers only to the radiated measurements in GSM technology.

5 Measurements

5.1 RF Power Output

5.1.1 FCC 2.1046 Measurements required: 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.

5.1.2 Limits:

5.1.2.1 FCC 22.913 (a) Effective radiated power limits.

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

5.1.2.2 FCC 24.232 (b)(c) Power limits.

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

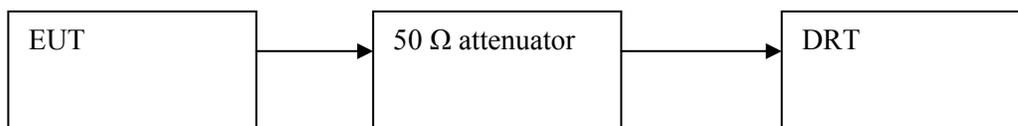
(d) In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

(e) 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.

5.1.3 Conducted Output Power Measurement procedure:

Based on TIA-603C 2004

2.2.1 Conducted Carrier Output Power Rating

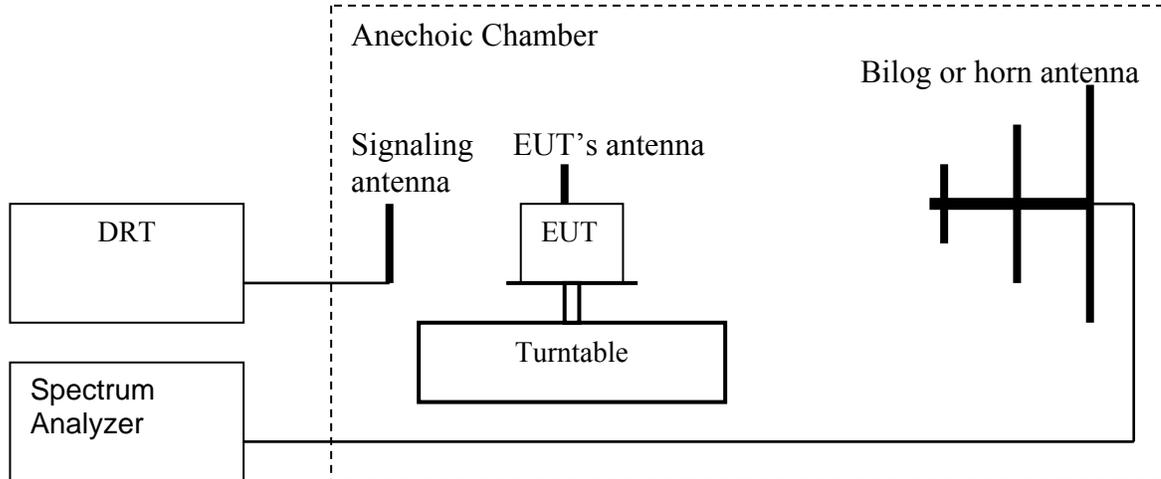


1. Connect the equipment as shown in the above diagram. A Digital Radiocommunication Tester (DRT) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the DRT to set the EUT to its maximum power at the required channel.
3. Record the output power level measured by the DRT.
4. Correct the measured level for all losses in the RF path.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

5.1.4 Radiated Output Power Measurement procedure:

Based on 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 a vertical 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 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:

$$\mathbf{ERP\ (dBm) = LVL\ (dBm) + LOSS\ (dB)}$$
 8. Determine the EIRP using the following equation:

$$\mathbf{EIRP\ (dBm) = ERP\ (dBm) + 2.14\ (dB)}$$
 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=3MHz**
- (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.)

5.1.5 Conducted average power

Conducted measurements were made using 2 uplink timeslots. The conducted link was made directly to the GSM module. Frame average power measurements were calculated using the burst peak power measurement:

$$\text{Frame average power} = \text{Burst Peak Power (W)} / 4$$

850 GPRS

Frequency/Channel	Burst Peak Power (dBm)	Burst Average Power (dBm)	Frame Average Power (W)
824.2 / 128	32.5	32.5	.4549
836.6 / 190	32.6	32.5	.455
848.8 / 251	32.5	31.9	.4446

850 EGPRS

Frequency/Channel	Burst Peak Power (dBm)	Burst Average Power (dBm)	Frame Average Power (W)
824.2 / 128	31.3	27	.3372
836.6 / 190	31.2	26.9	.3296
848.8 / 251	31.0	26.7	.3221

1900 GPRS

Frequency/Channel	Burst Peak Power (dBm)	Burst Average Power (dBm)	Frame Average Power (W)
1850.2 / 512	29.5	29.4	0.2128
1880 / 661	29.4	29.3	0.2177
1909.8 / 810	29.3	29.2	0.2177

1900 EGPRS

Frequency/Channel	Burst Peak Power (dBm)	Burst Average Power (dBm)	Frame Average Power (W)
1850.2 / 512	29.5	26.2	.2128
1880 / 661	29.4	26.1	.2128
1909.8 / 810	29.4	26.0	.2128

5.1.6 ERP Results 850 MHz band:

Power Control Level	Burst Peak ERP
5	≤38.45dBm (7W)

Frequency (MHz)	Effective Radiated Power (dBm)	
	GSM	EGPRS
824.2	26.8	26.5
836.6	26.8	26
848.8	27.4	26.6

5.1.7 EIRP Results 1900 MHz band:

Power Control Level	Burst Peak EIRP
0	≤33dBm (2W)

Frequency (MHz)	Effective Isotropic Radiated Power (dBm)	
	GSM	EGPRS
1850.2	26.6	26
1880.0	25.6	26.1
1909.8	26.0	25.7

5.1.8 Peak-to-average (PAR) Results 1900 MHz band

Peak and average measurements were taken from the module test report.

Frequency (MHz)	Peak-to-average ratio	
	GSM	EGPRS
1850.2	0.1	3.4
1880.0	0.1	3.6
1909.8	0.1	3.4

5.2 Spurious Emissions Radiated

5.2.1 FCC 2.1053 Measurements required: Field strength of spurious radiation.

- (a) 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.

5.2.2 Limits:

5.2.2.1 **FCC 22.917 Emission limitations for cellular equipment.**

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

- (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.

(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 or 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.

5.2.2.2 **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.

- (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.

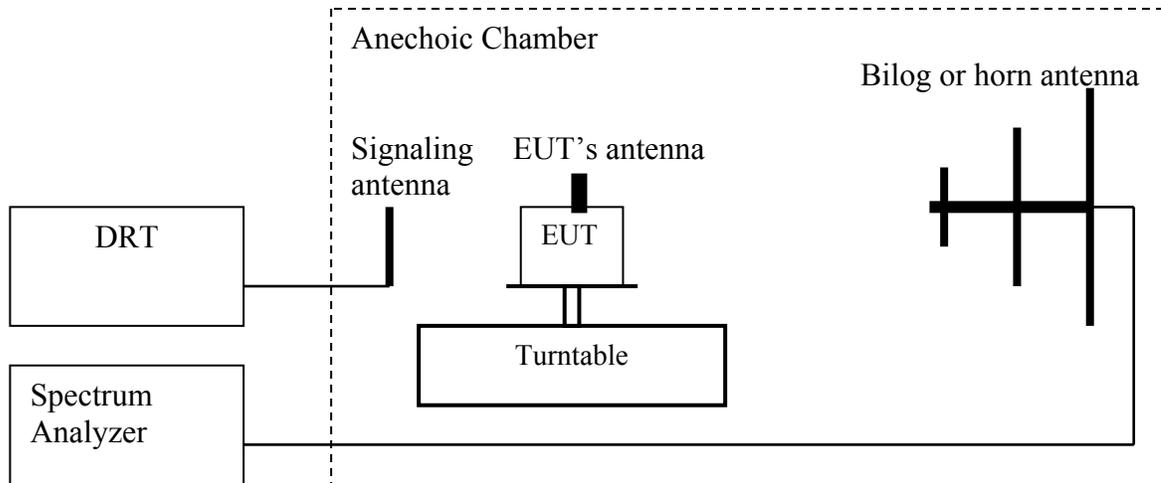
(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of 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.

5.2.3 Radiated out of band measurement procedure:

Based on 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:

Res B/W: 1 MHz

Vid B/W: 1 MHz

Measurement Survey:

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. See section 5.5.4.1 and 5.5.4.3

Radiated emissions measurements were made also with UMTS FDD mode. See section 5.5.4.2 and 5.5.4.4

5.2.4 Radiated out of band emissions results on EUT:

5.2.4.1 Test Results Transmitter Spurious Emission GSM850:

Harmonics	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
2	1648.4	NF	1673.2	NF	1697.6	NF
3	2472.6	NF	2509.8	NF	2546.4	NF
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						

RADIATED SPURIOUS EMISSIONS (GSM-850) TX: 30MHz - 1GHz

Channel 128

Spurious emission limit -13dBm

FCC 22 30-1000MHz Low Channel

1 / 1

EUT Information

Description:
 EUT Name: Nuvi 1690
 Manufacturer: Garmin
 Serial Number:
 Hardware Rev:
 Software Rev:
 Comment: AC; new unit

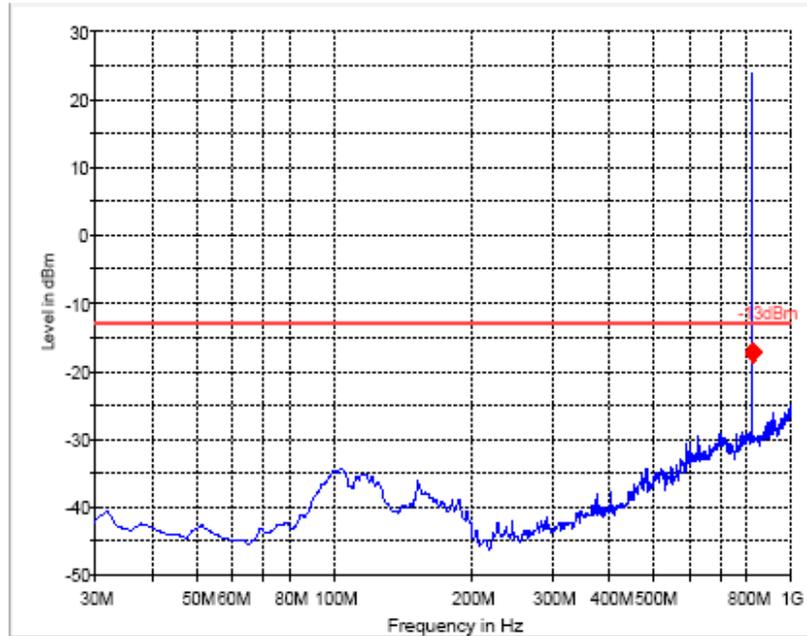
Final Result 1

Frequency (MHz)	MaxPeak (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
824.590180	-17.4	20.000	100.000	120.0	H	168.0	-71.3	4.4	-13.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
824.590180	Carrier Frequency

FCC 22 30-1000MHz



— -13dBm Limit Line — Preview Result 1 ◆ Final Result 1 — 0

RADIATED SPURIOUS EMISSIONS (GSM-850)TX: 30MHz - 1GHz

Channel 190

Spurious emission limit -13dBm

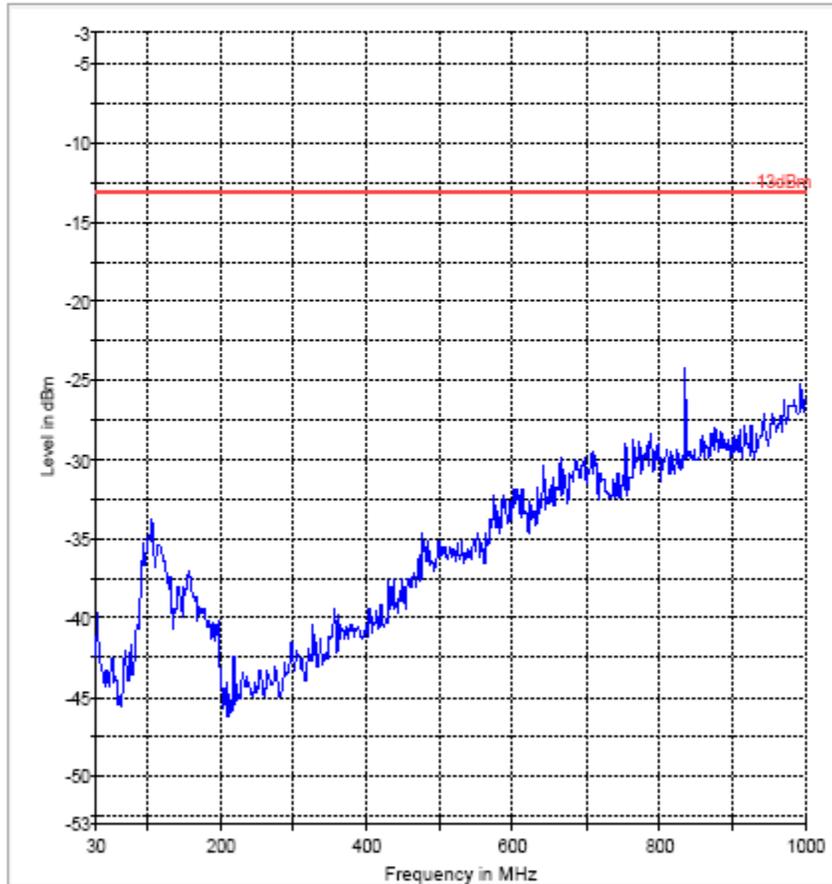
FCC 22 30-1000MHz Mid Channel

1 / 1

EUT Information

Description:
EUT Name: Nuvi 1890
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 22 30-1000MHz



— -13dBm Limit Line — Preview Result 1



RADIATED SPURIOUS EMISSIONS (GSM-850)TX: 30MHz - 1GHz

Channel 251

Spurious emission limit -13dBm

Note: Peak over the limit is the carrier frequency

FCC 22 30-1000MHz High Channel

1 / 1

EUT Information

Description:
 EUT Name: Nuvi 1690
 Manufacturer: Garmin
 Serial Number:
 Hardware Rev:
 Software Rev:
 Comment: AC; new unit

FCC 22 30-1000MHz High Channel

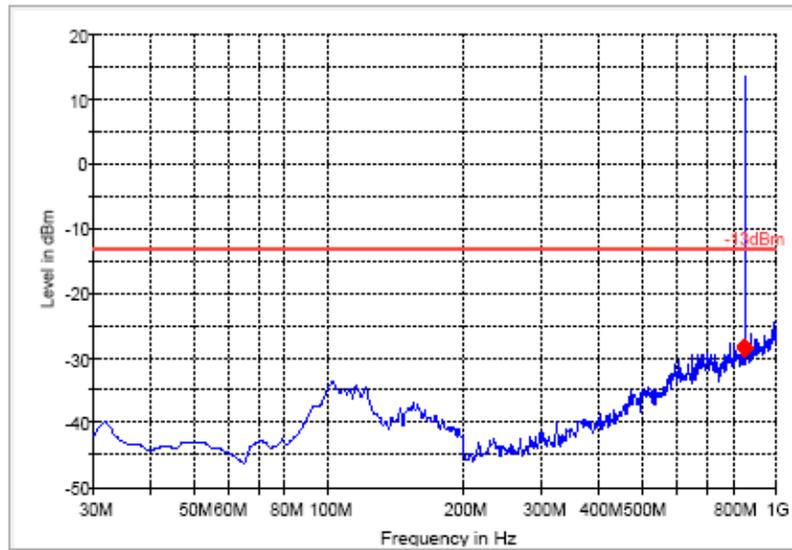
Final Result 1

Frequency (MHz)	MaxPeak (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
850.271543	-28.4	20.000	100.000	120.0	V	22.0	-70.7	15.4	-13.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
850.271543	

FCC 22 30-1000MHz



— -13dBm Limit Line — Preview Result 1 — -13 ◆ Final Result 1

RADIATED SPURIOUS EMISSIONS (GSM-850)TX: 1GHz - 9GHz

Channel 128

Spurious emission limit -13dBm

FCC 22 1-9GHz Low Channel

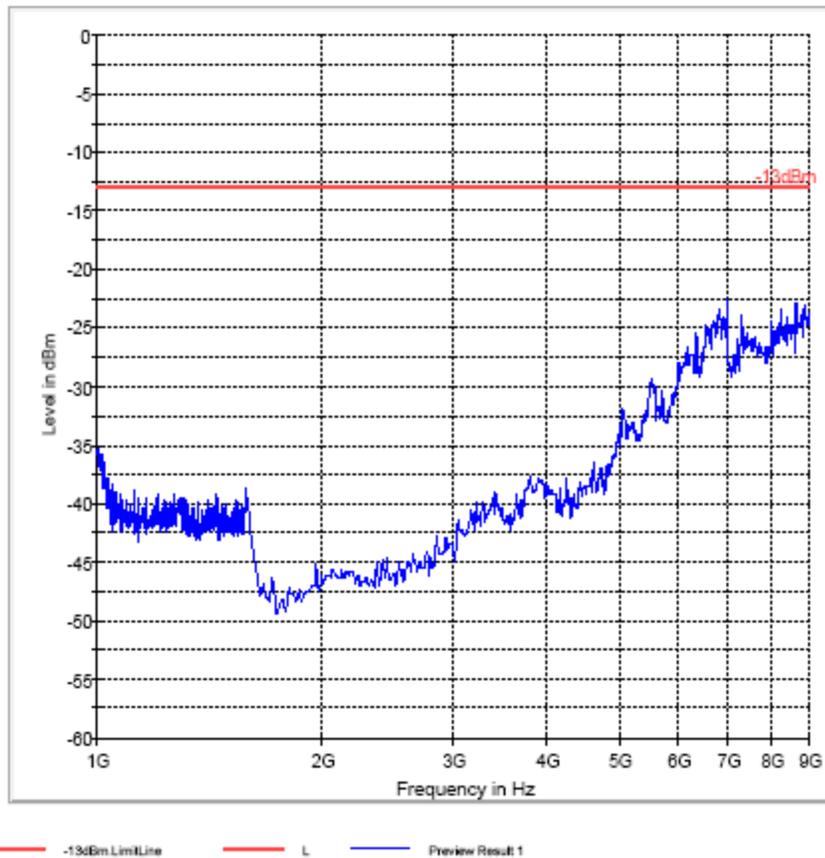
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 22 1-9GHz Low Channel

FCC 22 1-9GHz



RADIATED SPURIOUS EMISSIONS (GSM-850)TX: 1GHz - 9GHz

Channel 190

Spurious emission limit -13dBm

FCC 22 1-9GHz Mid Channel

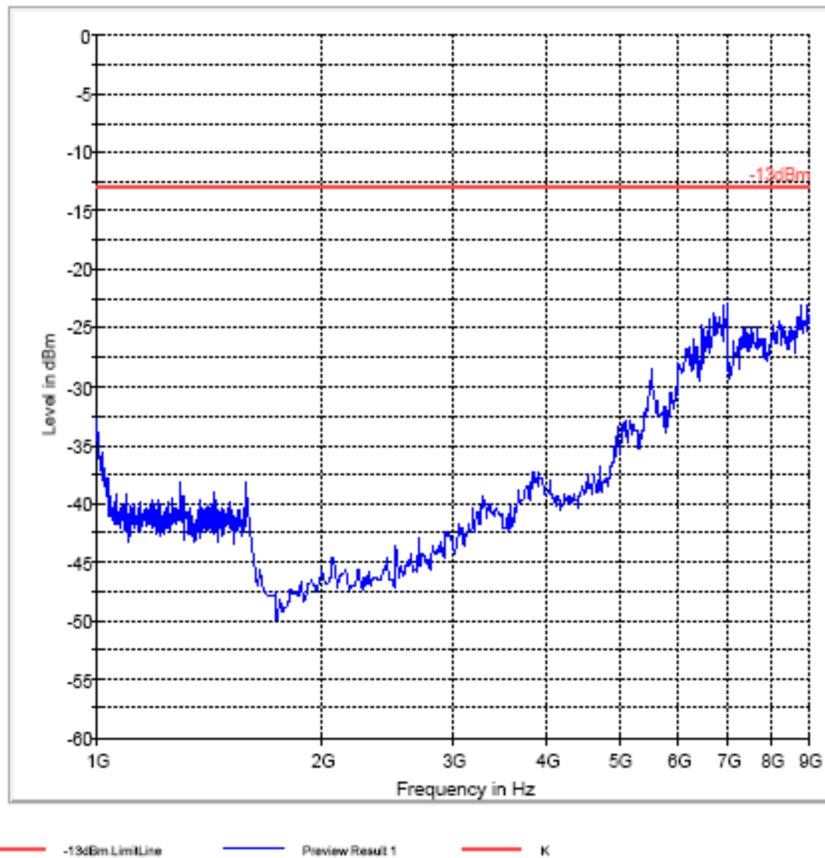
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 22 1-9GHz Mid Channel

FCC 22 1-9GHz



RADIATED SPURIOUS EMISSIONS (GSM-850)TX: 1GHz - 9GHz

Channel 251

Spurious emission limit -13dBm

FCC 22 1-9GHz High Channel

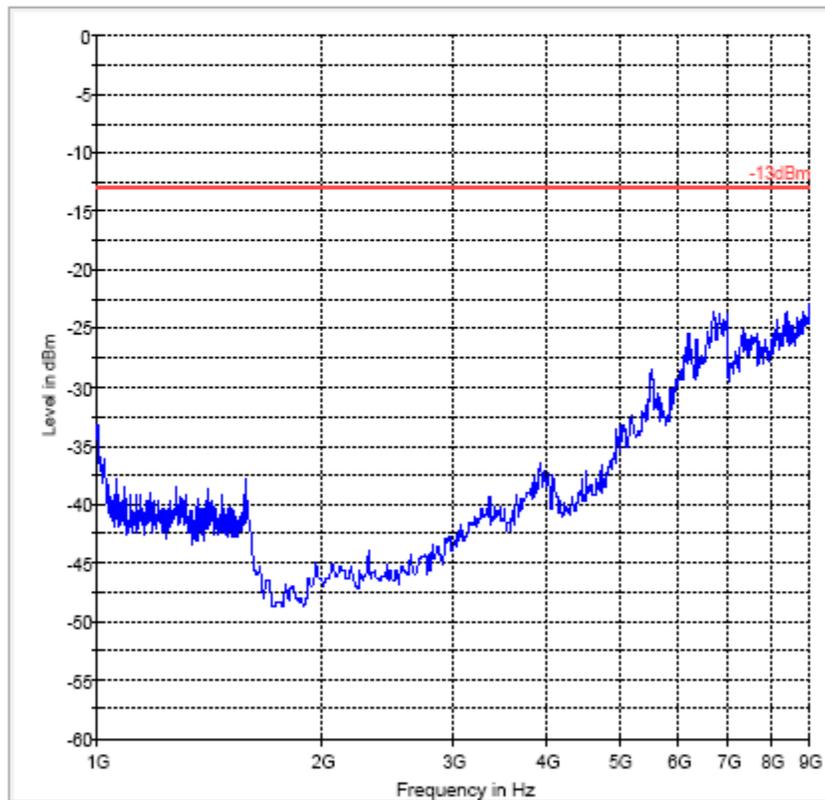
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 22 1-9GHz High Channel

FCC 22 1-9GHz



— -13dBm Limit Line — Preview Result 1 — KJ

5.2.4.2 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)
2	3700.4	NF	3760	NF	3819.6	NF
3	5550.6	NF	5640	NF	5729.4	NF
4	7400.8	NF	7520	NF	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						

**RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 30MHz - 1GHz
Channel 512**

FCC 24 30-1000MHz Low Channel

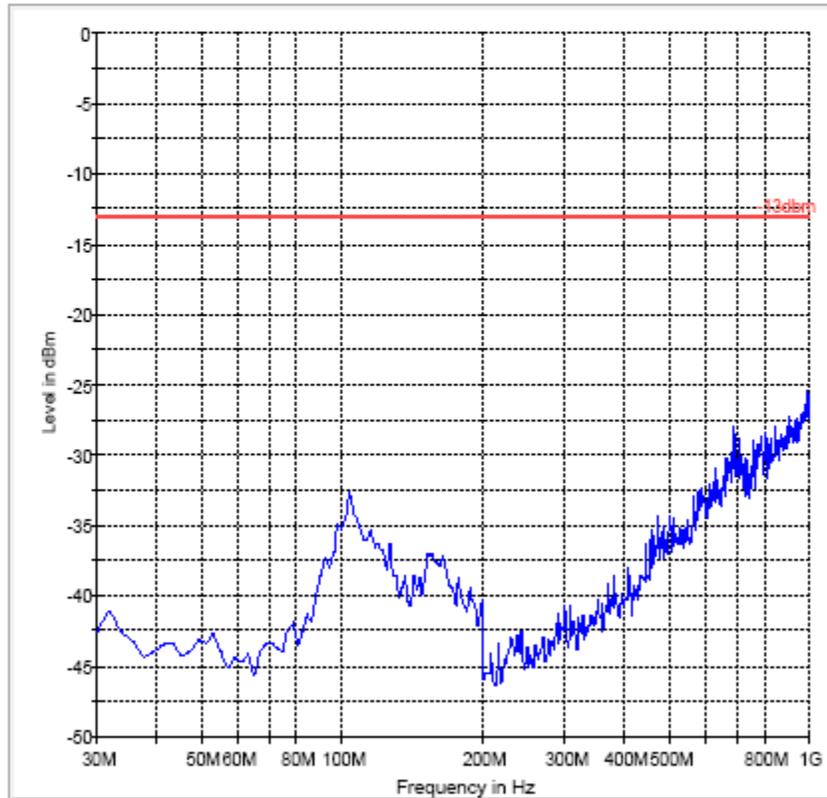
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 24 30-1000MHz Low Channel

FCC 22 30-1000MHz



8/24/2009 smoon

EMC32 V8.10.10

10:14:44

**RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 30MHz - 1GHz
Channel 661**

FCC 24 30-1000MHz Mid Channel

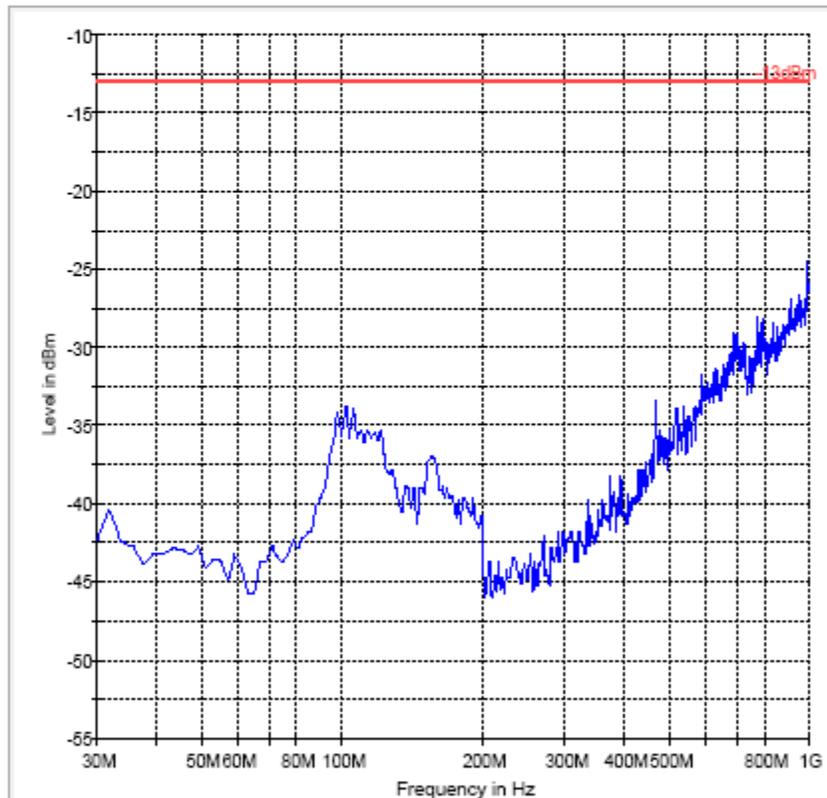
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 24 30-1000MHz Mid Channel

FCC 22 30-1000MHz



— -13dBm Limit Line — -13dB — Preview Result 1

**RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 30MHz - 1GHz
Channel 810**

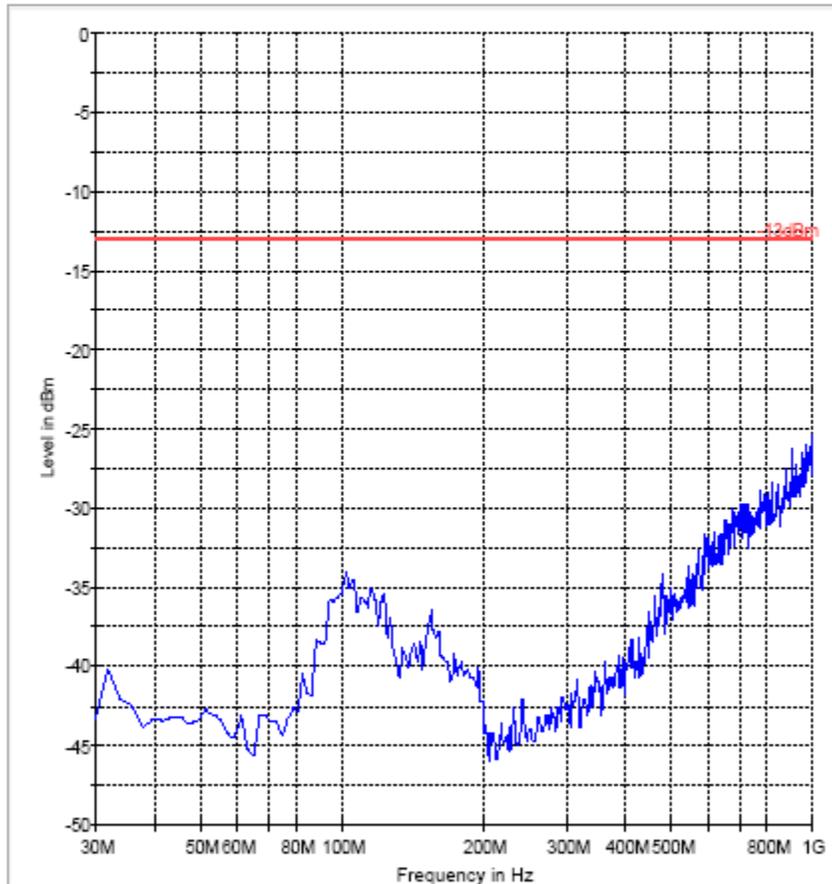
FCC 24 30-1000MHz High Channel

1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 22 30-1000MHz



— -12dBm Limit Line — Preview Result 1 — J

**RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 1GHz - 18GHz
Channel 512**

FCC 24 1-18GHz Low Channel

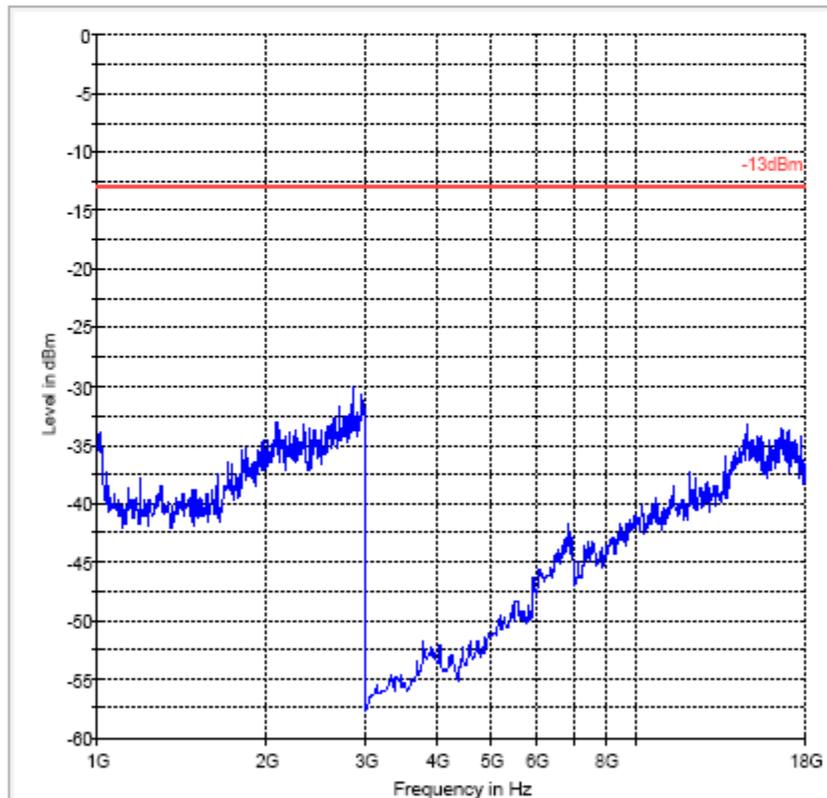
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 24 1-18GHz Low Channel

FCC 24 1-18GHz



— -13dBm Limit Line — KL — Preview Result 1

RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 1GHz - 18GHz Channel 661

FCC 24 1-18GHz Mid Channel

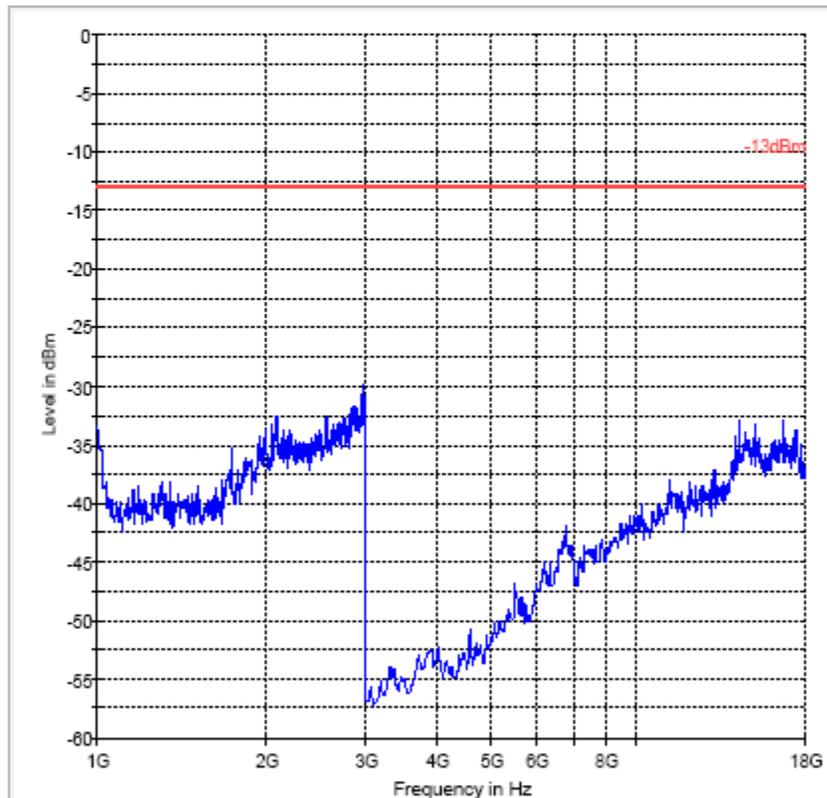
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 24 1-18GHz Mid Channel

FCC 24 1-18GHz



**RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 1GHz - 18GHz
Channel 810**

FCC 24 1-18GHz High Channel

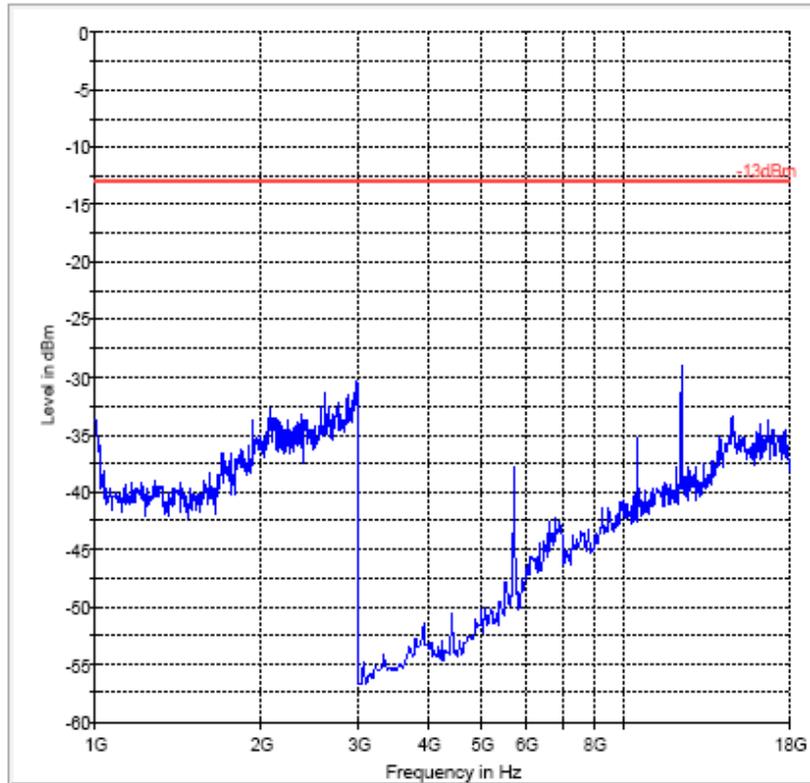
1 / 1

EUT Information

Description:
EUT Name: Nuvi 1690
Manufacturer: Garmin
Serial Number:
Hardware Rev:
Software Rev:
Comment: AC; new unit

FCC 24 1-18GHz High Channel

FCC 24 1-18GHz



— -13dBm Limit Line — J — Preview Result 1

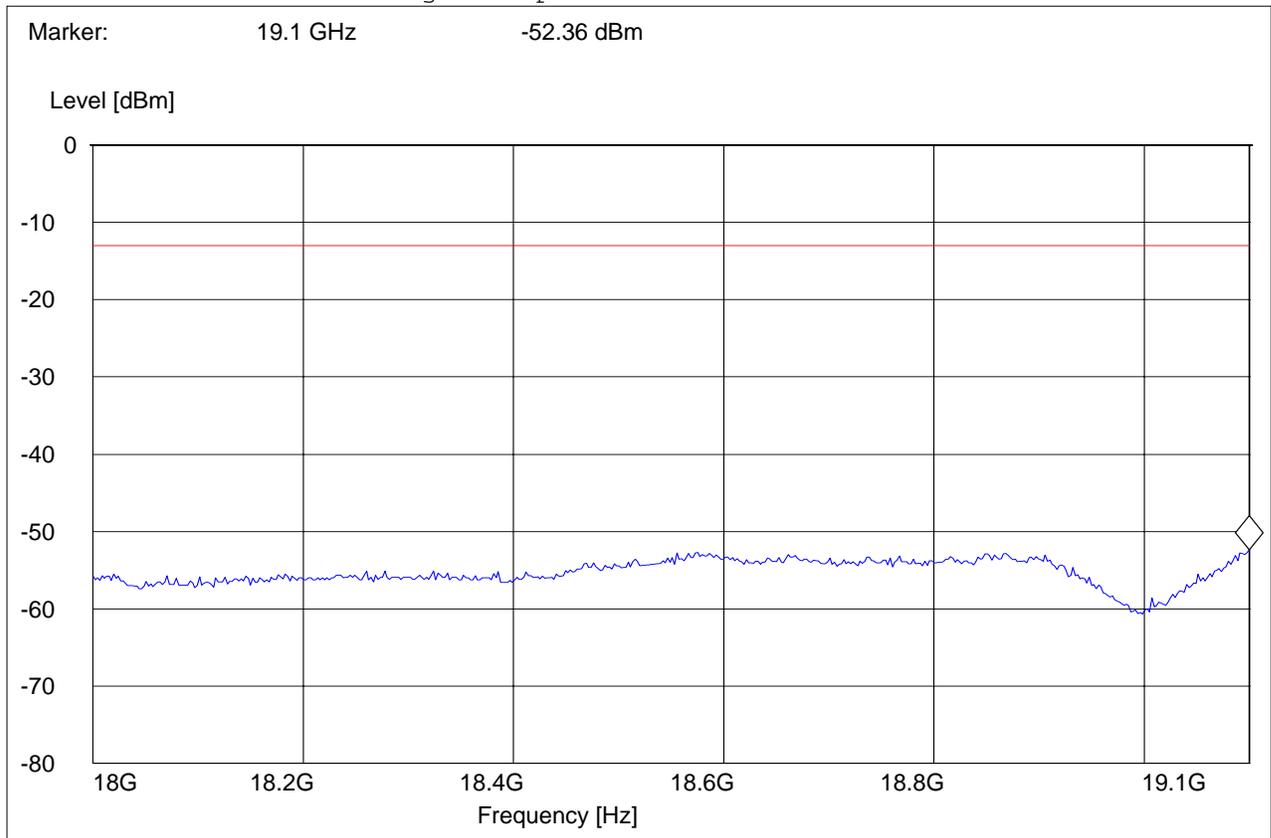


**RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 18GHz – 19.1GHz
Channel 512**

EUT: NUVI 1690
 Customer:: GARMIN
 Test Mode: GSM 1900 CH 512
 ANT Orientation: H
 EUT Orientation: V
 Test Engineer: SAM
 Voltage: AC
 Comments:

SWEEP TABLE: "FCC 24spuri 18-19.1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	19.1 GHz	Average	Coupled	1 MHz	DUMMY-DBM



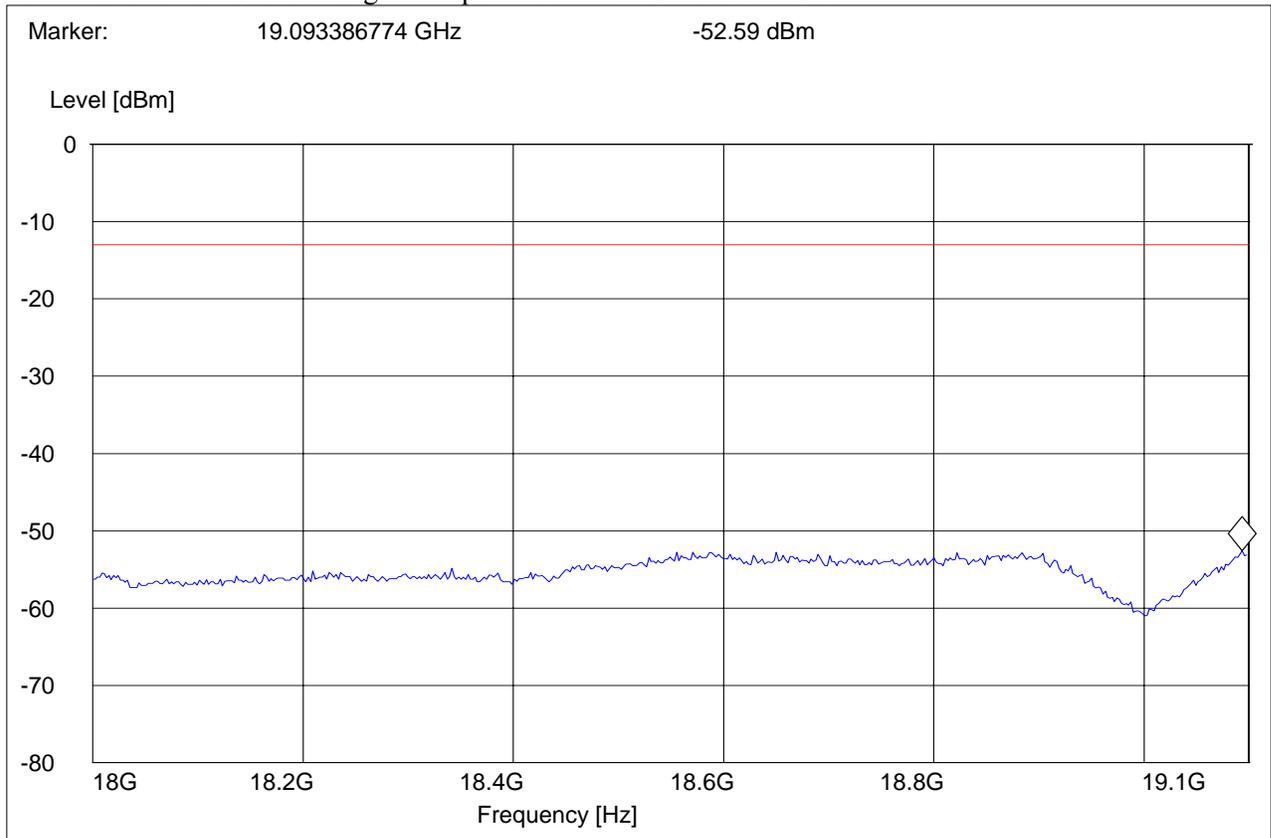


**RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 18GHz – 19.1GHz
Channel 661**

EUT: NUVI 1690
 Customer:: GARMIN
 Test Mode: GSM 1900 CH661
 ANT Orientation: H
 EUT Orientation: V
 Test Engineer: SAM
 Voltage: AC
 Comments:

SWEEP TABLE: "FCC 24spuri 18-19.1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	19.1 GHz	Average	Coupled	1 MHz	DUMMY-DBM





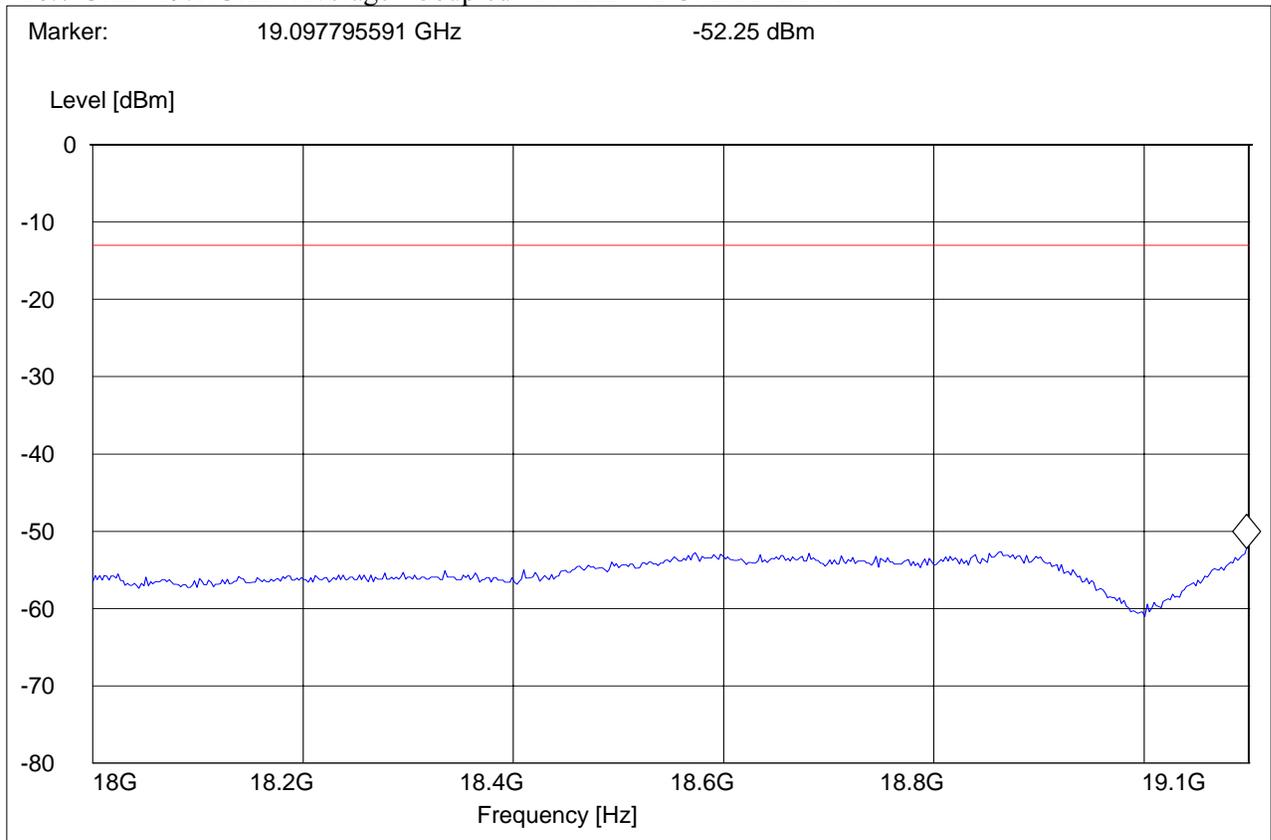
RADIATED SPURIOUS EMISSIONS(PCS 1900) TX: 18GHz – 19.1GHz

Channel 810

EUT: NUVI 1690
Customer:: GARMIN
Test Mode: GSM 1900 CH 810
ANT Orientation: H
EUT Orientation: V
Test Engineer: SAM
Voltage: AC
Comments:

SWEEP TABLE: "FCC 24spuri 18-19.1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	19.1 GHz	Average	Coupled	1 MHz	DUMMY-DBM



5.2.5 RECEIVER RADIATED EMISSIONS**§ 2.1053 / RSS-132 & 133****NOTE:**

1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3GHz and 26.5GHz very short cable connections to the antenna was used to minimize the noise level.

Limits**SUBCLAUSE § RSS-133**

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	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	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

No significant emissions measurable. Plots reported here represent the worse case emissions.

5.2.5.1 Test Results Receiver Spurious Emission: 30M-1GHz

This plot is valid for low, mid & high channels (worst-case plot)

Test

1 / 1

EUT Information

Description:
 EUT Name: Nuvi 1690
 Manufacturer: Garmin
 Serial Number:
 Hardware Rev:
 Software Rev:
 Comment: AC; new unit

Test

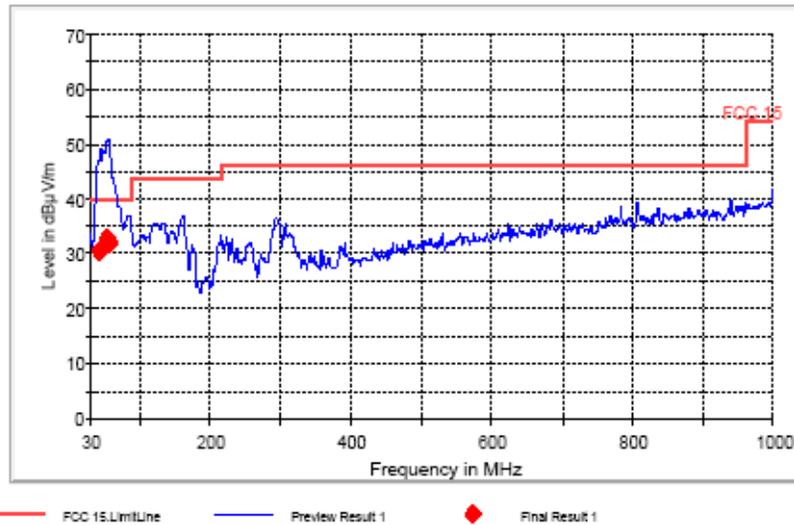
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
43.276553	30.5	20.000	120.000	120.0	V	77.0	5.9	9.5	40.0
51.693387	32.6	20.000	120.000	120.0	V	270.0	6.9	7.4	40.0
56.883767	32.0	20.000	120.000	139.0	V	287.0	7.6	8.0	40.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
43.276553	
51.693387	
56.883767	

FCC 15 30-1000MHz



Receiver Spurious Emission GSM850 IDLE: 1GHz - 18GHz
 This plot is valid for low, mid & high channels (worst-case plot)

Test

1 / 1

EUT Information

Description:
 EUT Name: Nuvi 1890
 Manufacturer: Garmin
 Serial Number:
 Hardware Rev:
 Software Rev:
 Comment: AC; new unit

Test

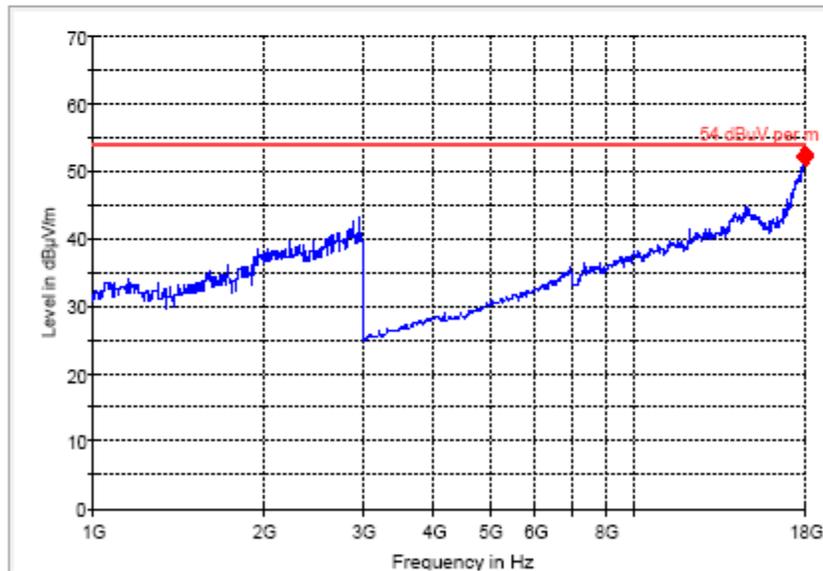
Final Result 1

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
17398.206413	52.3	20.000	1000.000	120.0	H	1.0	29.3	1.7	54.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
17398.206413	

FCC 15 1-18GHz



— 54 dBµV per m Limit Line — Preview Result 1 ◆ Final Result 1

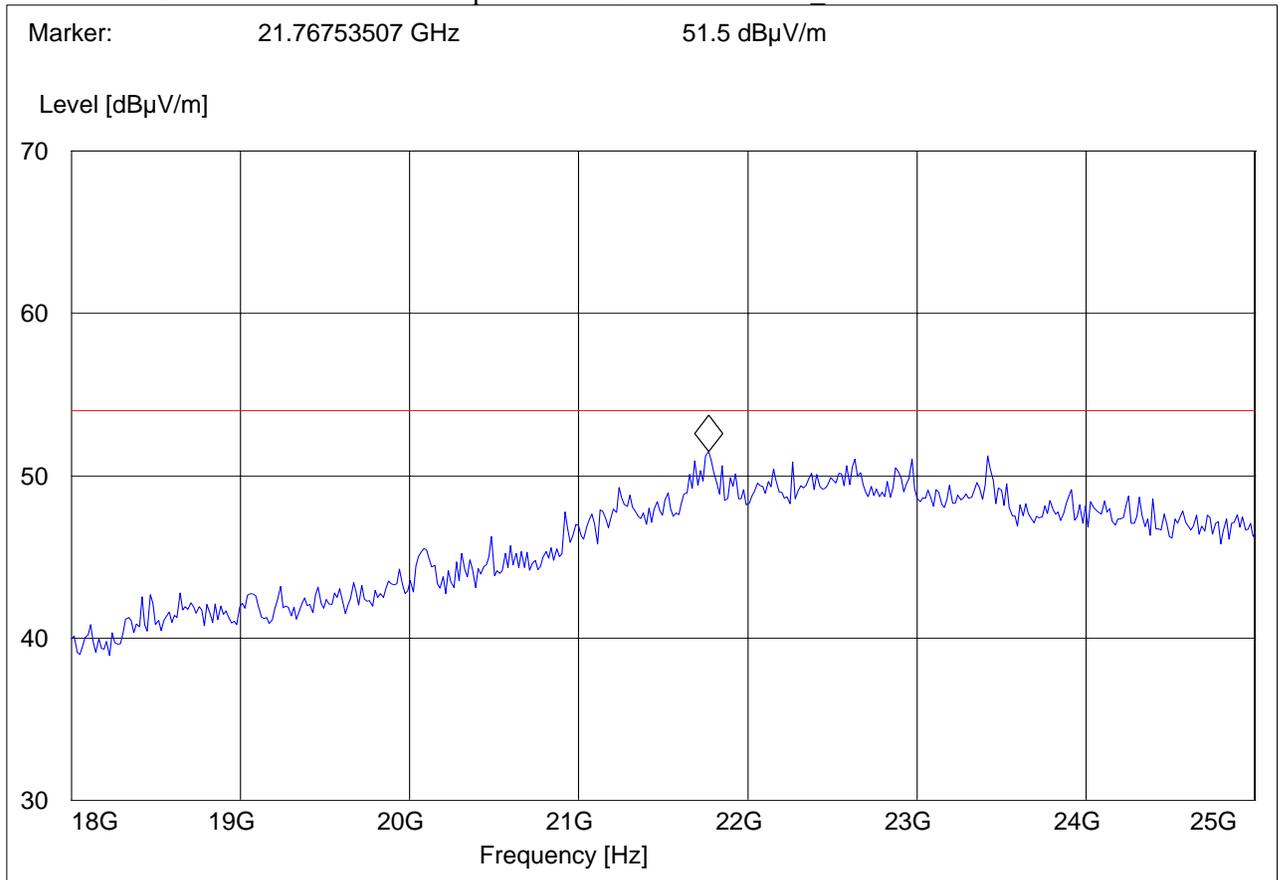


Receiver Spurious Emission GSM850 IDLE: 18GHz - 26GHz
This plot is valid for low, mid & high channels (worst-case plot)

EUT: NUVI 1690
 Customer:: GARMIN
 Test Mode: GSM 1900 RX
 ANT Orientation: H
 EUT Orientation: V
 Test Engineer: SAM
 Voltage: AC
 Comments:

SWEEP TABLE: "CANADA RE_18-26.5G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	26.0 GHz	MaxPeak	Coupled	1 MHz	Horn # 3116 18-40G



6 List of Equipment

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2009	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	May 2009	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2009	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2009	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2009	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2009	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2009	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2009	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2009	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2009	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2009	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2009	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2009	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2010	2 years

7 References

Title 47—Telecommunication, CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION, PART 2--FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS October 1, 2001.

Title 47—Telecommunication, CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION, PART 22 PUBLIC MOBILE SERVICES October 1, 1998.

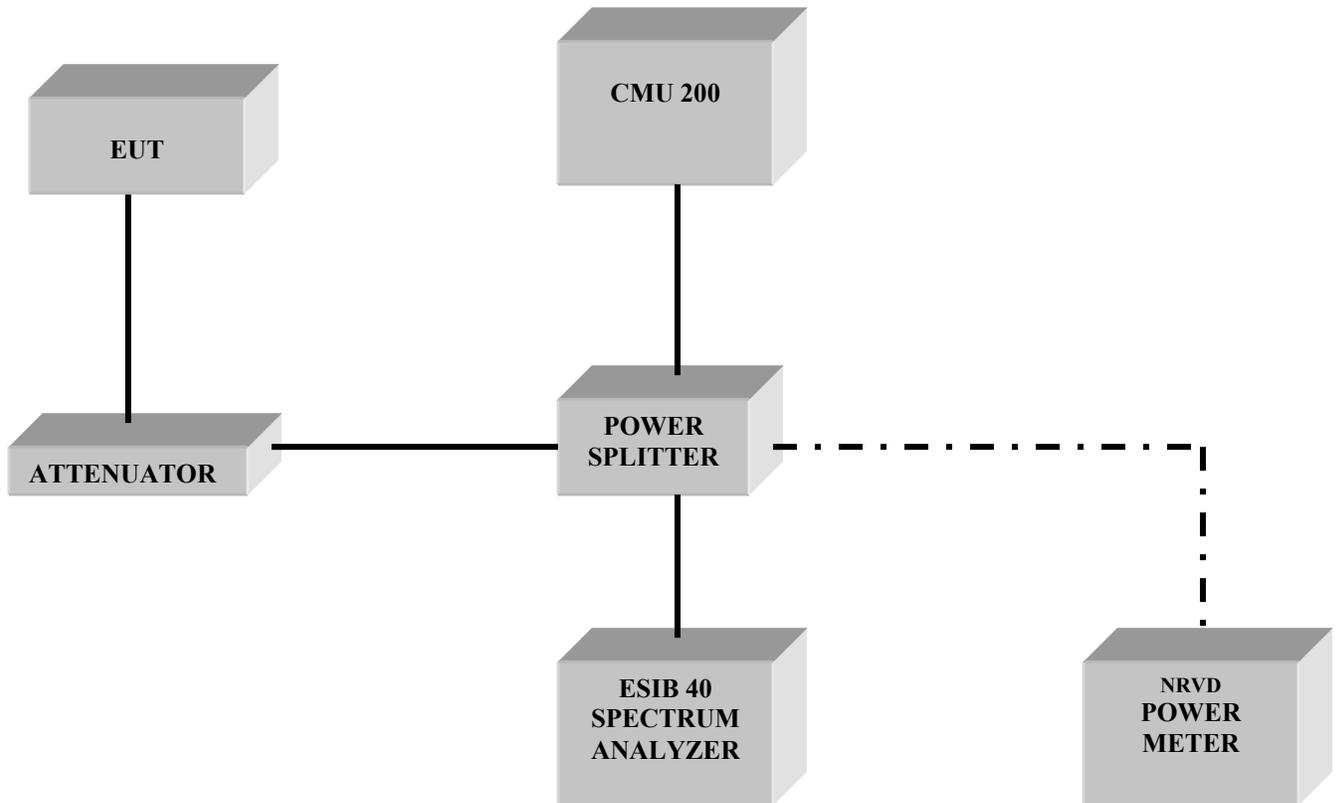
FCC Report and order 02-229 September 24, 2002.

Title 47—Telecommunication, CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION, PART 24 PERSONAL COMMUNICATIONS SERVICES October 1, 1998.

ANSI / TIA-603-C-2004 Land Mobile FM or PM Communications Equipment Measurement and Performance Standard November 7, 2002.

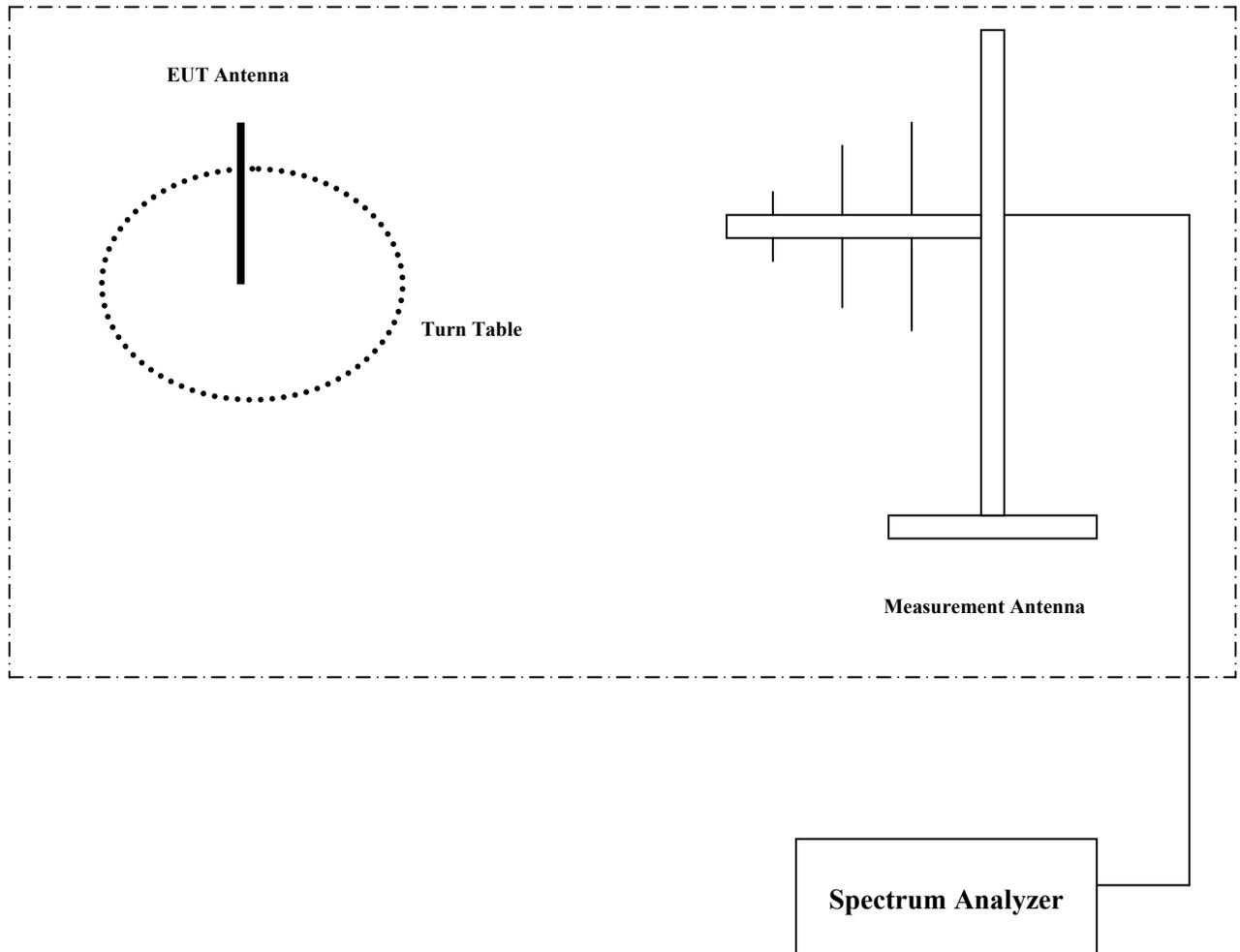
8 BLOCK DIAGRAMS

Conducted Testing



Radiated Testing

ANECHOIC CHAMBER



9 Revision History

Date	Report Name	Changes to report	Report prepared by
2009-07-03	EMC_GARMI_009_09001_FCC22_24	Original Document	Josie Sabado
2009-07-29	EMC_GARMI_009_09001_FCC22_24_rev1	Added plots above 18GHz	Josie Sabado
2009-08-17	EMC_GARMI_009_09001_FCC22_24_rev1	Conducted power measurement added	Josie Sabado