

# **FCC Test Report**

Test report no.: EMC 544FCC22-24 2003 AC555

FCC Part 22,24 / RSS 133

**EUT: Tablet PC Model: iX104-CDMA** 

with CDMA Module Model: AC555

FCC ID: Q2GIX104-113 IC ID: 4596A-iX104-CDMA







Bluetooth Qualification Test Facility (BQTF)



FCC listed # 101450

IC recognized # 3925

#### CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.



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- 1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. does not assume responsibility for any conclusions and generalisations 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.

# TEST REPORT PREPARED BY: EMC Engineer: Harpreet Sidhu

# 1.2 Testing laboratory

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Internet: www.cetecom.com



# 1.3 Details of applicant

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 :
 Douglas L. Fowler

 Telephone
 :
 +1 512 336 7797

 Tele-fax
 :
 +1 512 336 7791

e-mail : dfowler@xploretech.com

1.4 Application details

Date of receipt test item : 2003-09-02 Date of test : 2003-09-04/08

1.5 Test item

Manufacturer : Applicant

CDMA Module Mfg'er : Sierra Wireless, Inc.
Street : 13811 Wireless Way
City / Zip Code : Richmond, BC V6V 3A4

Country : Canada

Model No. (EUT) : iX104-CDMA

Model No. (CDMA) : AC555

Description : CDMA module in Tablet PC

FCC ID : Q2GIX104-113

IC-ID : 4596A-iX104-CDMA

**Additional information** 

Frequency: 825.25MHz – 847.75MHz for Cellular 850,

1851.25MHz – 1908.75MHz for PCS 1900

Type of modulation : OQPSK

Number of channels : 833(Cellular)/1199 (PCS)

Antenna : Embedded

Power supply : 5.0VDC from Host

Output power : 27.07dBm (509.33mW) max. ERP measured in Cellular 850

26.97dBm (497.73mW) max. EIRP measured in PCS 1900

Extreme temp. Tolerance : Lower:-30°C Upper: +50°C

# 1.6 Test standards

FCC Part 22,24 / RSS133 r1

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.



### 2 Technical test

# 2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests  Performed	
Final Verdict: (only "passed" if all single measurements are "passed")	Passed

NOTE: This test report covers only radiated testing and conducted power done on Tablet PC model# iX104 with CDMA module model# AC555. For all other measurements on the CDMA module please refer to test report# 2054479

Technical responsibility for area of testing:

2003-10-31	EMC & Radio	Lothar Schmidt (Technical Manager)	lduni de
Date	Section	Name	Signature

Responsible for test report and project leader:

2003-10-31 EMC & Radio Harpreet Sidhu (EMC Engineer)

Date Section Name Signature



2.2 Test report

**TEST REPORT** 

**Test report no.: EMC\_544FCC22-24\_2003\_AC555** 



# TEST REPORT REFERENCE

PARAMETER TO BE MEASURED	PARAGRAPH	PAGE
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### **POWER OUTPUT**

§ 22.913(a) / § 24.232 (b)

#### **Summary:**

During the process of testing, the EUT was set to transmit on low, mid & high channels.

This paragraph contains average output power, peak output power, EIRP & ERP measurements for the EUT. In all cases, the peak output power is within the specified limits.

#### **Method of Measurements:**

The EUT was set up for the max. Output power with pseudo random data modulation.

The power was measured with R&S Spectrum Analyzer ESIB 40 (peak)

These measurements were done at 3 frequencies,

825.25 MHz, 836.5 MHz and 847.75 MHz (bottom, middle and top of operational frequency range) for Cellular-850 1851.25 MHz, 1880.0 MHz and 1908.75 MHz (bottom, middle and top of operational frequency range) for PCS-1900



# **CONDUCTED OUTPUT POWER**

Cellular-850

Limits:

Conducted peak power
≤33dBm (2W)

Frequency	Conducted peak power
(MHz)	(dBm)
825.25	26.28
836.5	27.10
847.75	26.03
Measurement uncertainty	±0.5 dB

ANALYZER SETTINGS: RBW = VBW = 3MHz

# **PCS-1900**

Limits:

Limits.		
	Conducted peak power	
	≤30dBm (1W)	

Frequency	Conducted peak power
(MHz)	(dBm)
1851.2	25.80
1880	26.59
1908.75	25.17
Measurement uncertainty	±0.5 dB

ANALYZER SETTINGS: RBW = VBW = 3MHz



ERP (Cellular-850) §22.913(a)

**Limits:** 

Burst Peak ERP	
≤38.45dBm (7W)	

# EIRP

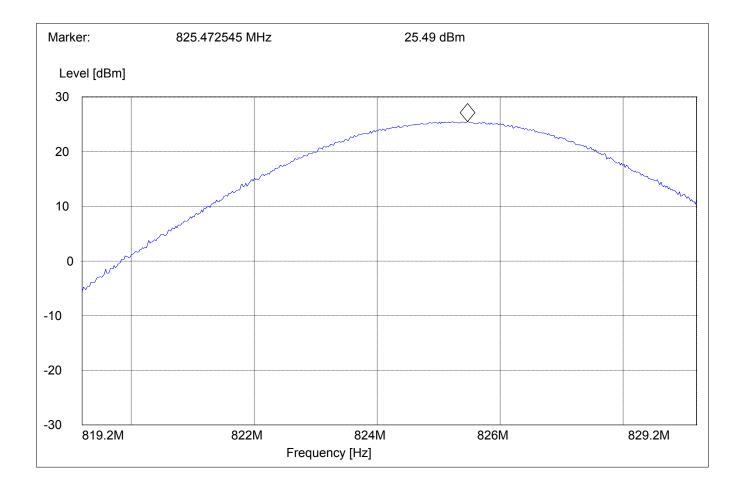
Frequency (MHz)	Burst Pea (dBm)	ak
(HIII)	EIRP	ERP
825.25	25.49	23.39
836.5	26.65	24.55
847.75	29.17	27.07
Measurement uncertainty	±0.5 dB	

ANALYZER SETTINGS: RBW = VBW = 3MHz



EIRP (Cellular-850) §22.913(a)

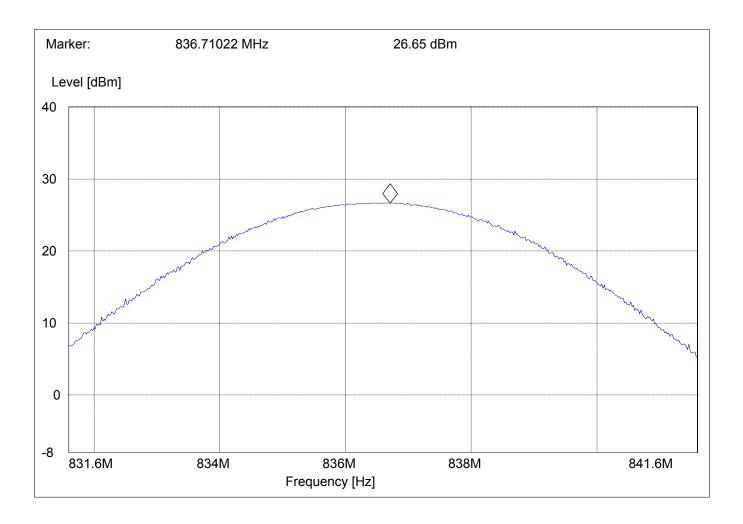
**CHANNEL:** Low





EIRP (Cellular-850) §22.913(a)

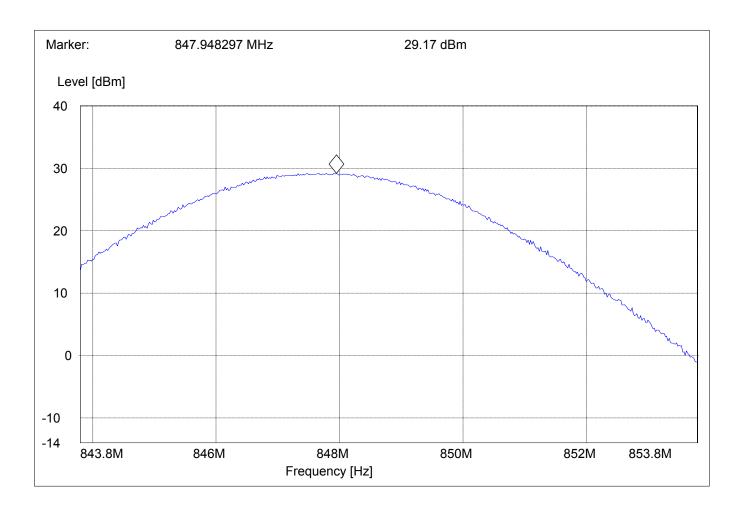
**CHANNEL: Mid** 





EIRP (Cellular-850) §22.913(a)

**CHANNEL:** High





EIRP (PCS-1900) §24.232(b)

**Limits:** 

Burst Peak EIRP
≤33dBm (1W)

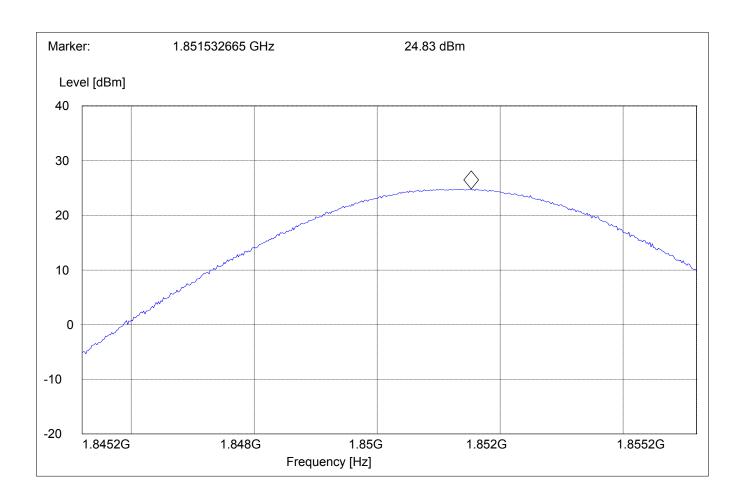
# EIRP

Frequency	Burst Peak
(MHz)	(dBm)
	EIRP
1851.25	24.83
1880	26.97
1908.75	26.33
Measurement uncertainty	±0.5 dB

ANALYZER SETTINGS: RBW = VBW = 3MHz

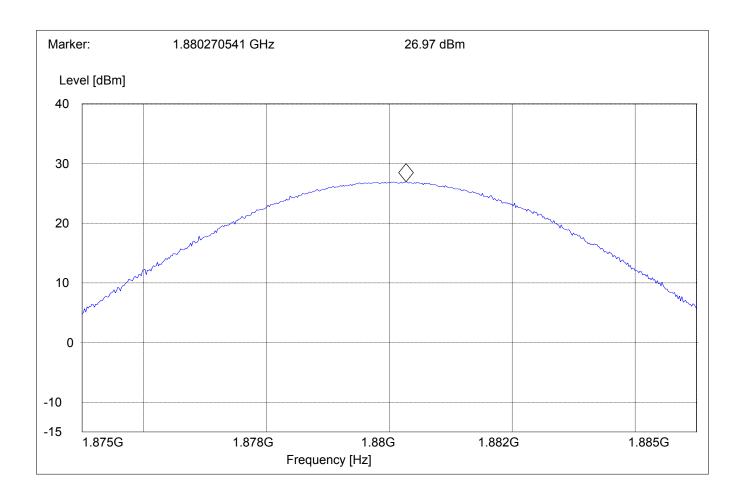


EIRP (PCS-1900) CHANNEL Low §24.232(b)



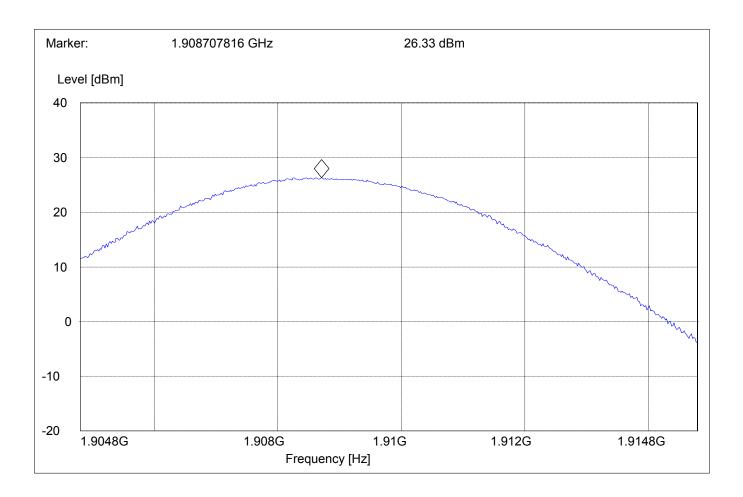


EIRP (PCS-1900) CHANNEL Mid §24.232(b)





EIRP (PCS-1900) CHANNEL High §24.232(b)





#### **EMISSION LIMITS TRANSMITTER**

**§2.1051 / §24.238** 

#### **Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the EUT. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 847.75MHz for Cellular-850 & 1908.75 MHz for PCS-1900 The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the Cellular-850 & PCS-1900 bands.

#### The final Radiated emission test procedure is as follows:

- a) The test item was placed on a 0. 8 meter high non-conductive stand at a 3 meter test distance from the receive antenna
- b) The antenna output was terminated in a 50-ohm load.
- c) A double-ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was determined by the substitution method described for ERP measurements.

#### **Measurement Limit:**

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

#### **Measurement Results:**

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the Cellular-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 Cellular-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 SPURIOUS EMISSIONS (Cellualr-850)**

Tx @ 825.25MHz: 30MHz - 1GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 30M-1G"

Start Stop Detector Meas. RBW/VBW

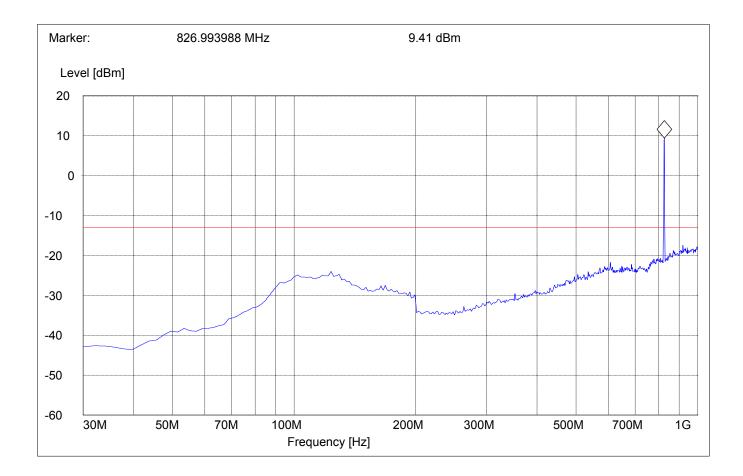
Frequency Frequency Time

30MHz 1GHz Max Peak Coupled 1 MHz

#### Note:

1. The peak above the limit line is the carrier freq.

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





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 825.25MHz: 1GHz – 1.58GHz

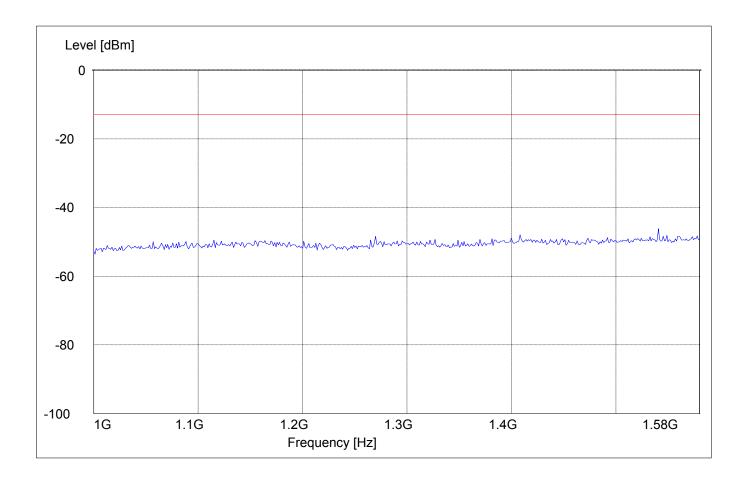
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1-1.58G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 1.58GHz Max Peak Coupled 1 MHz





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 825.25MHz: 1.58GHz – 3GHz

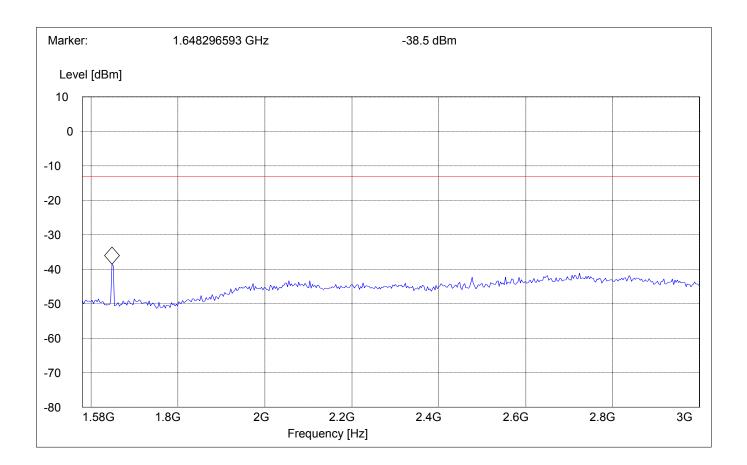
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1.58GHz 3GHz Max Peak Coupled 1 MHz





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 825.25MHz: 3GHz – 9GHz

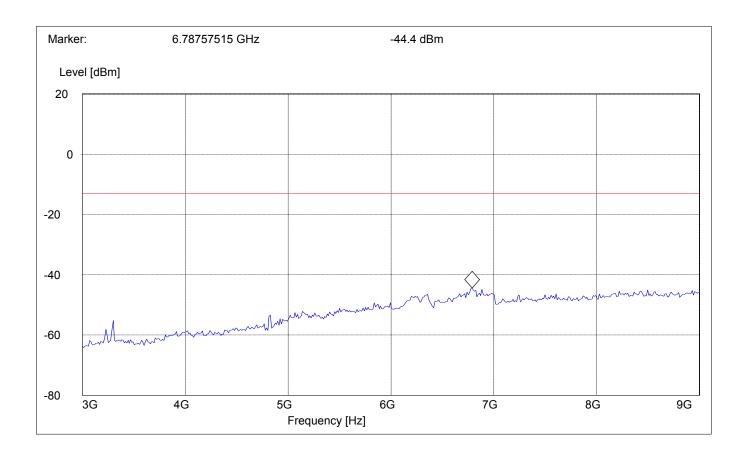
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 3-9G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 9GHz Max Peak Coupled 1 MHz





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 836.5MHz: 1GHz – 1.58GHz

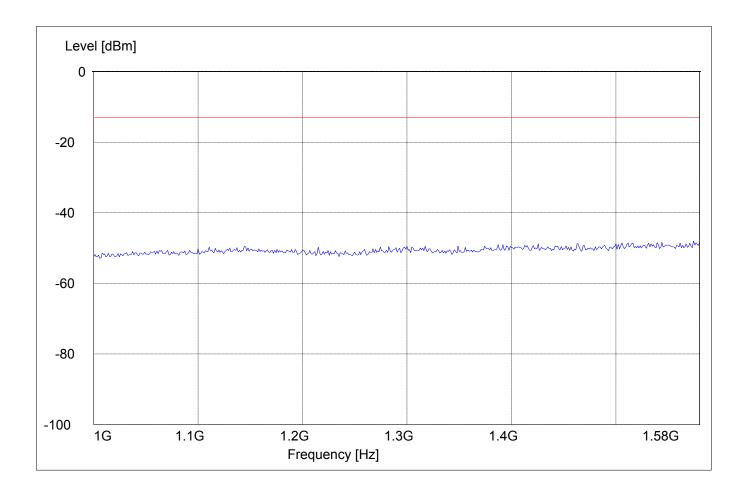
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1-1.58G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 1.58GHz Max Peak Coupled 1 MHz





# RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 836.5MHz: 1.58GHz – 3GHz

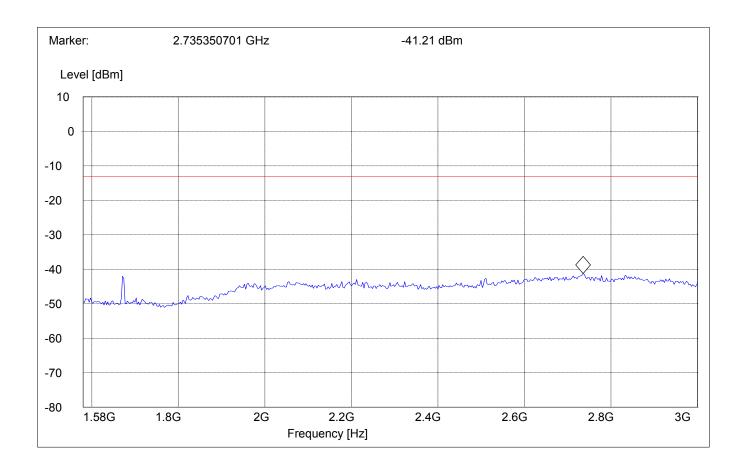
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1.58GHz 3GHz Max Peak Coupled 1 MHz





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 836.5MHz: 3GHz – 9GHz

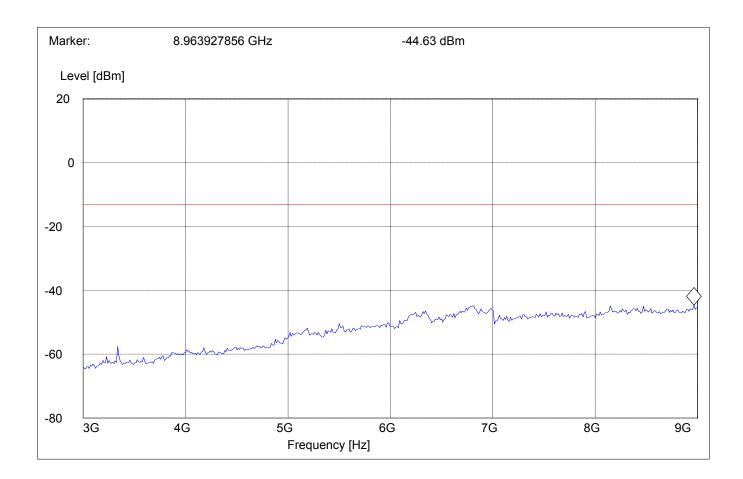
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 3-9G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 9GHz Max Peak Coupled 1 MHz





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 847.75MHz: 1GHz – 1.58GHz

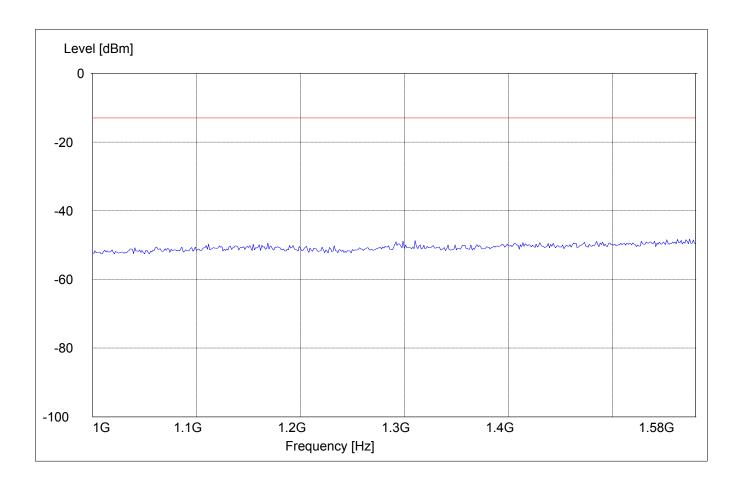
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1-1.58G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 1.58GHz Max Peak Coupled 1 MHz





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 847.75MHz: 1.58GHz – 3GHz

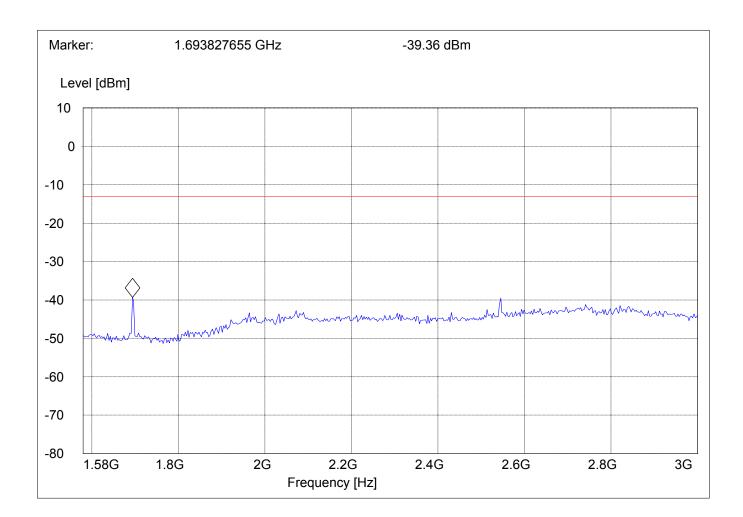
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1.58GHz 3GHz Max Peak Coupled 1 MHz





# **RADIATED SPURIOUS EMISSIONS (GSM-850)**

Tx @ 847.75MHz: 3GHz – 9GHz

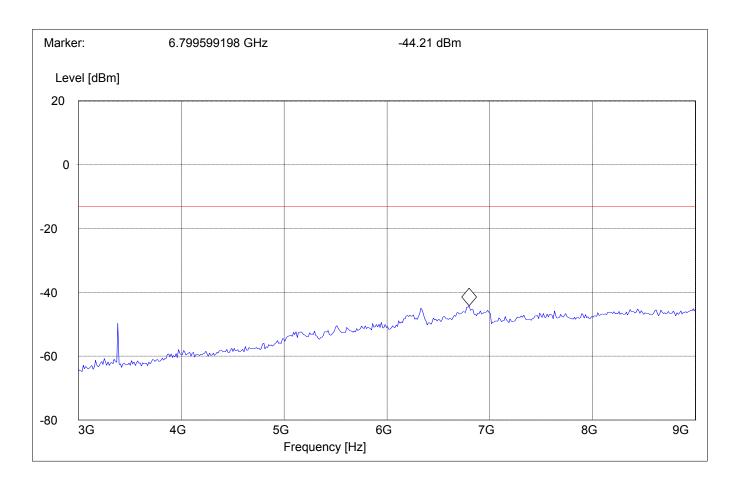
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 3-9G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 9GHz Max Peak Coupled 1 MHz





# RESULTS OF RADIATED TESTS PCS-1900:

### RADIATED SPURIOUS EMISSIONS

Tx @ 1851.25MHz: 30MHz - 1GHz

Spurious emission limit –13dBm

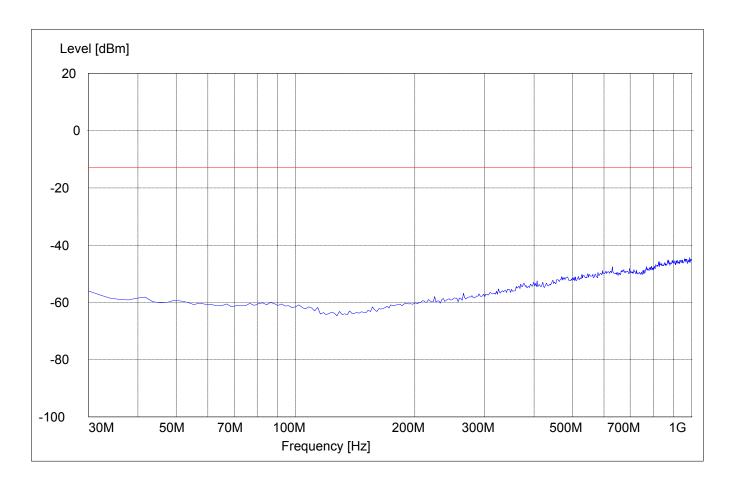
SWEEP TABLE: "FCC 24 Spur 30M-1G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

30MHz 1GHz Max Peak Coupled 1 MHz

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





### **RADIATED SPURIOUS EMISSIONS**

Tx @ 1851.25MHz: 1GHz – 3GHz

Spurious emission limit -13dBm

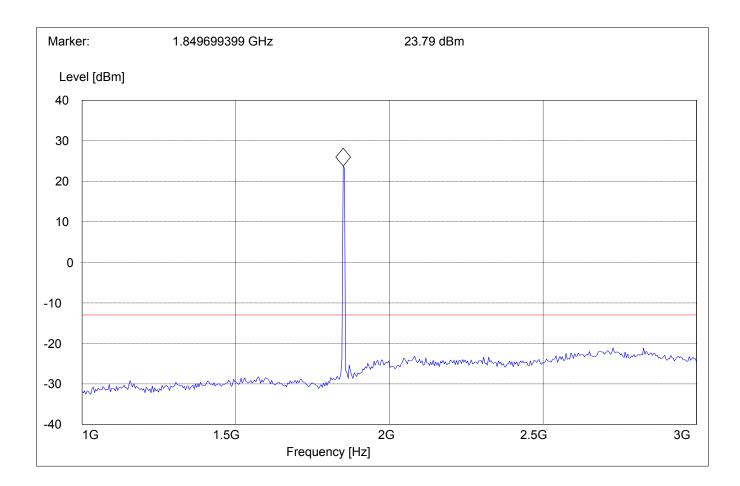
SWEEP TABLE: "FCC Spuri 1-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 3GHz Max Peak Coupled 1 MHz

Note: The peak above the limit line is the carrier freq.





# RADIATED SPURIOUS EMISSIONS

Tx @ 1851.25MHz: 3GHz – 18GHz

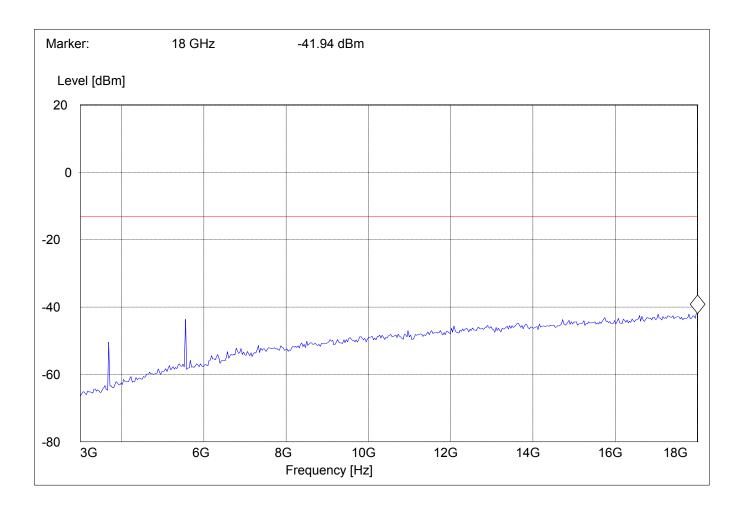
Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 18GHz Max Peak Coupled 1 MHz





### RADIATED SPURIOUS EMISSIONS

Tx @ 1880MHz: 1GHz – 3GHz Spurious emission limit –13dBm

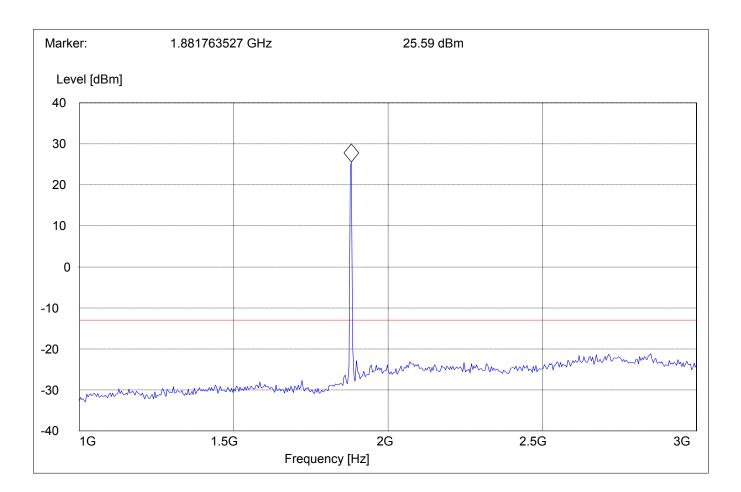
SWEEP TABLE: "FCC Spuri 1-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 3GHz Max Peak Coupled 1 MHz

Note: The peak above the limit line is the carrier freq.





### **RADIATED SPURIOUS EMISSIONS**

Tx @ 1880MHz: 3GHz - 18GHz

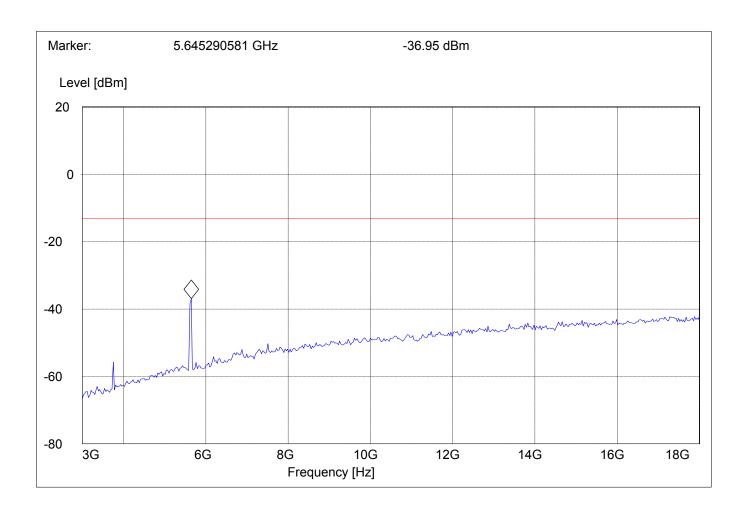
Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 18GHz Max Peak Coupled 1 MHz





### RADIATED SPURIOUS EMISSIONS

Tx @ 1908.75MHz: 1GHz – 3GHz

Spurious emission limit –13dBm

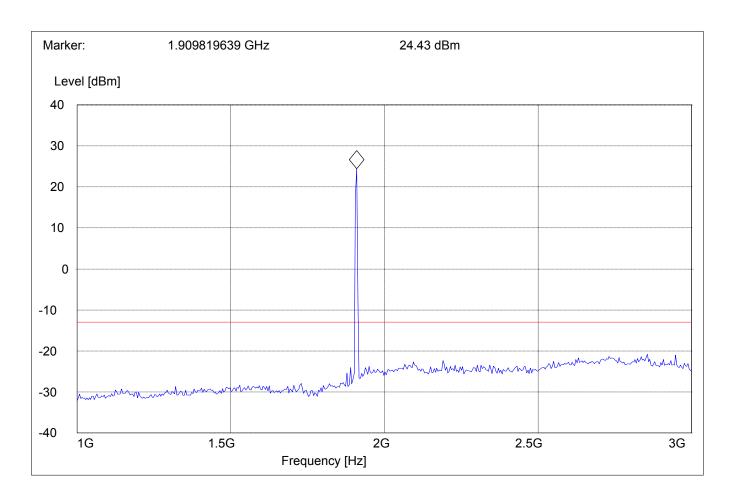
SWEEP TABLE: "FCC Spuri 1-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 3GHz Max Peak Coupled 1 MHz

Note: The peak above the limit line is the carrier freq.





### **RADIATED SPURIOUS EMISSIONS**

Tx @ 1908.75MHz: 3GHz – 18GHz

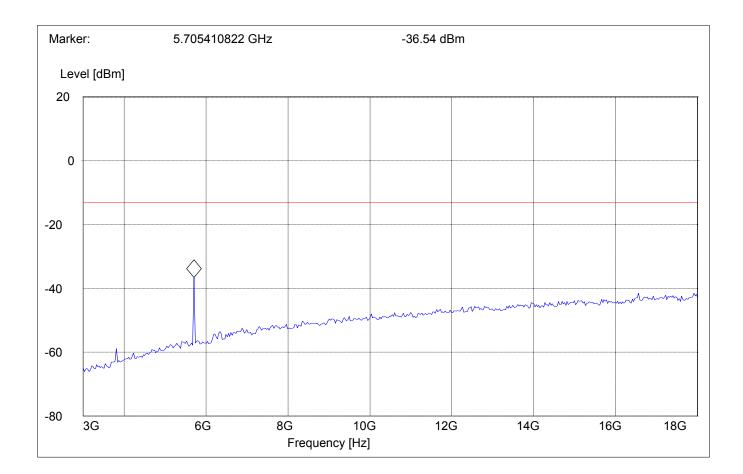
Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 18GHz Max Peak Coupled 1 MHz





# RADIATED SPURIOUS EMISSIONS

18GHz – 19.1GHz

Spurious emission limit –13dBm

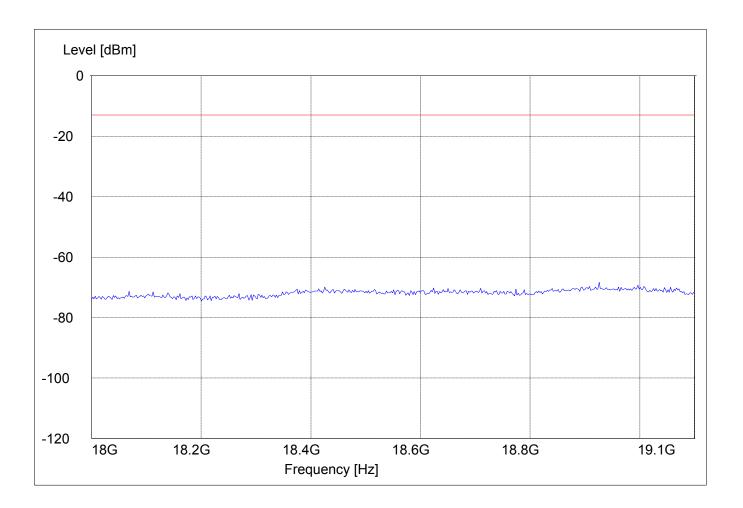
SWEEP TABLE: "FCC 24 spuri 18-19.1G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

18GHz 19.1GHz Max Peak Coupled 1 MHz

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





# RADIATED SPURIOUS EMISSIONS (IDLE MODE)

EUT in Idle Mode: 30MHz - 1GHz

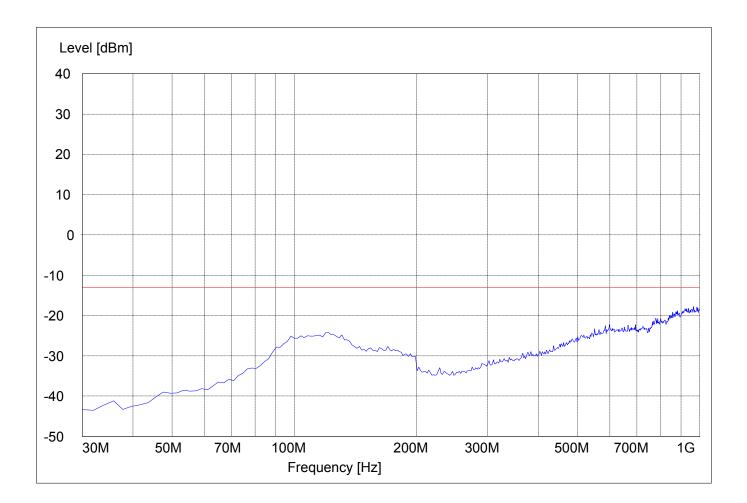
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 24 Spur 30M-1G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

30MHz 1GHz Max Peak Coupled 1 MHz





#### **RADIATED SPURIOUS EMISSIONS**

**EUT in Idle Mode: 1GHz – 3GHz** 

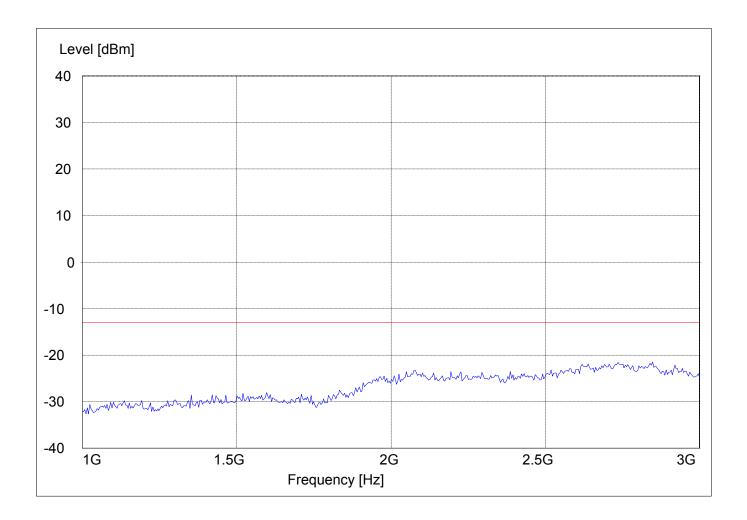
Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 3GHz Max Peak Coupled 1 MHz





#### **RADIATED SPURIOUS EMISSIONS**

**EUT in Idle Mode: 3GHz – 18GHz** 

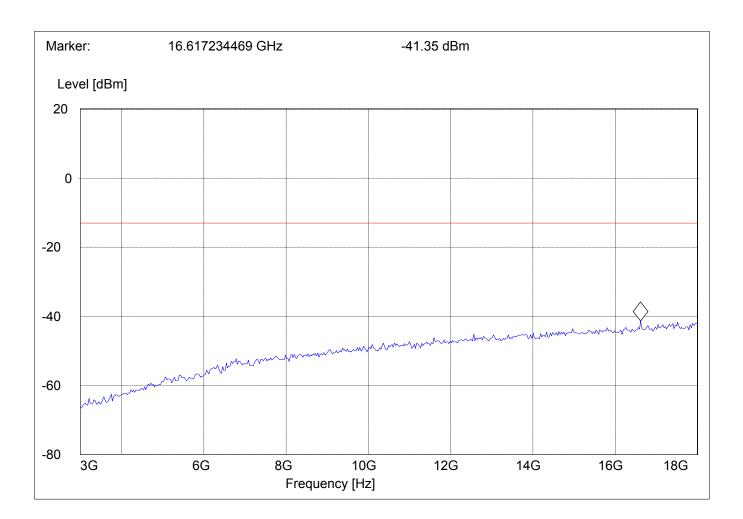
Spurious emission limit –13dBm

SWEEP TABLE: "FCC 24 spuri 3-18G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 18GHz Max Peak Coupled 1 MHz





## RADIATED SPURIOUS EMISSIONS EUT in Idle Mode: 18GHz – 19.1GHz

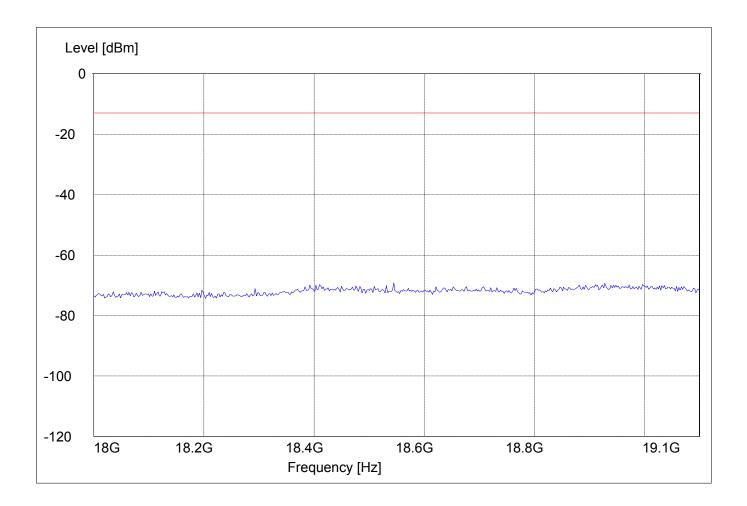
Spurious emission limit –13dBm

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

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

18GHz 19.1GHz Max Peak Coupled 1 MHz





#### RECEIVER RADIATED EMISSIONS

§ 2.1053 / RSS-133

NOTE: 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 18GHz and 19.1GHz very short cable connections to the antenna was used to minimize the noise level.

Limits

**SUBCLAUSE § 15.209** 

Frequency (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	3	
88 - 216	150	3	
216 - 960	200	3	
Above 960	500	3	



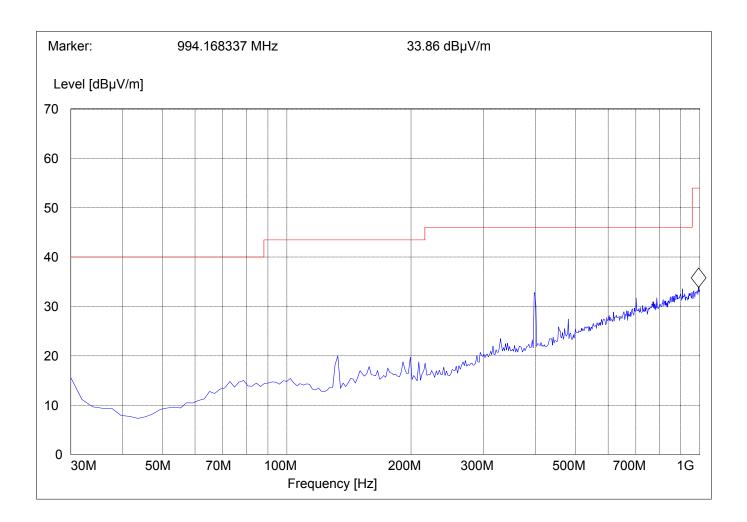
## RECEIVER RADIATED EMISSIONS EUT in Idle Mode: 30MHz – 1GHz

SWEEP TABLE: "FCC 24 Spur 30M-1G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

30MHz 1GHz Max Peak Coupled 100KHz





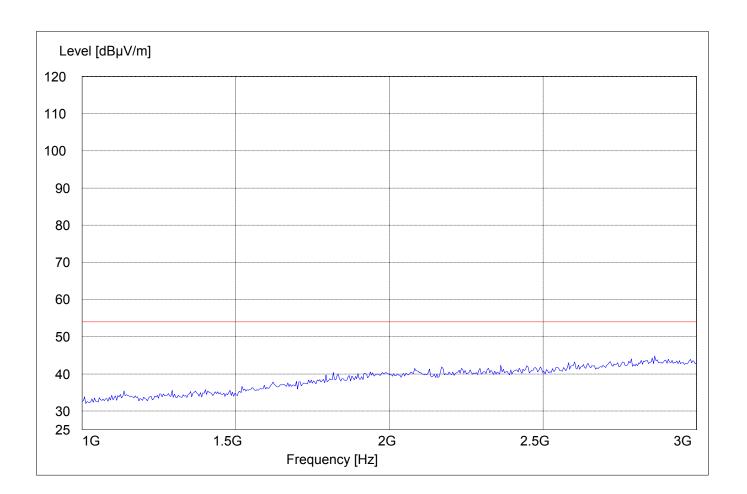
## RECEIVER RADIATED EMISSIONS EUT in Idle Mode: 1GHz – 3GHz

SWEEP TABLE: "FCC Spuri 1-3G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

1GHz 3GHz Max Peak Coupled 1 MHz





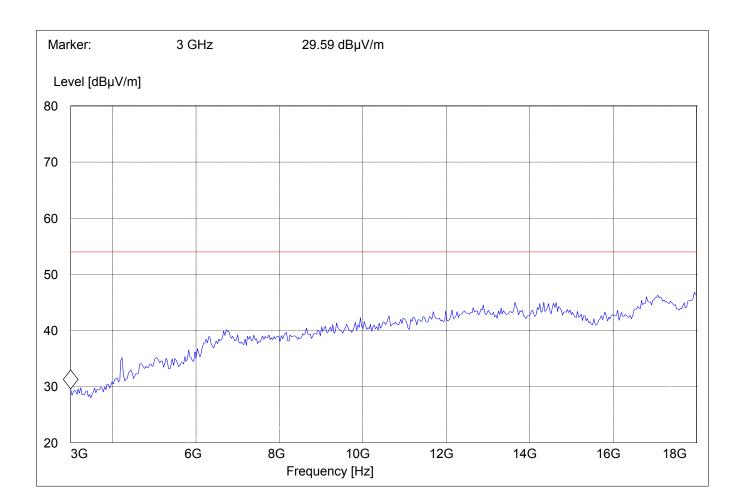
## RECEIVER RADIATED EMISSIONS EUT in Idle Mode: 3GHz – 18GHz

SWEEP TABLE: "FCC 24 spuri 3-18G"

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

3GHz 18GHz Max Peak Coupled 1 MHz





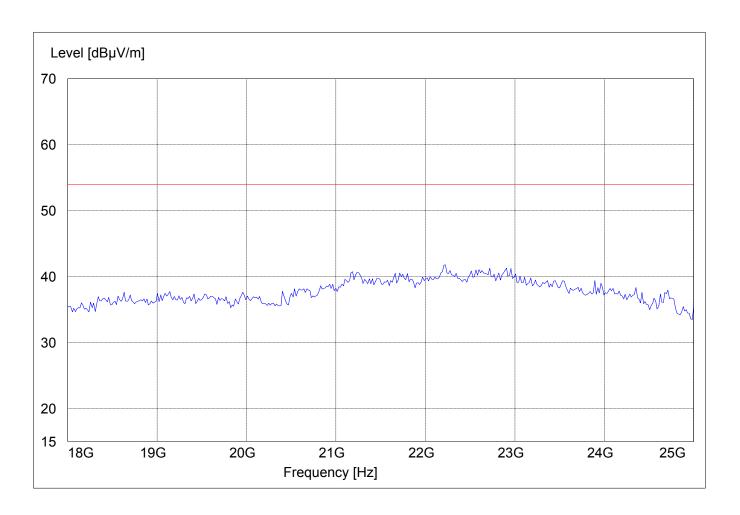
## RECEIVER RADIATED EMISSIONS EUT in Idle Mode: 18GHz – 19.1GHz

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

Start Stop Detector Meas. RBW/VBW

Frequency Frequency Time

18GHz 19.1GHz Max Peak Coupled 1 MHz





#### **CONDUCTED EMISSIONS**

§ 15.107/207

Measured with AC/DC power adapter plugged in LISN

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)

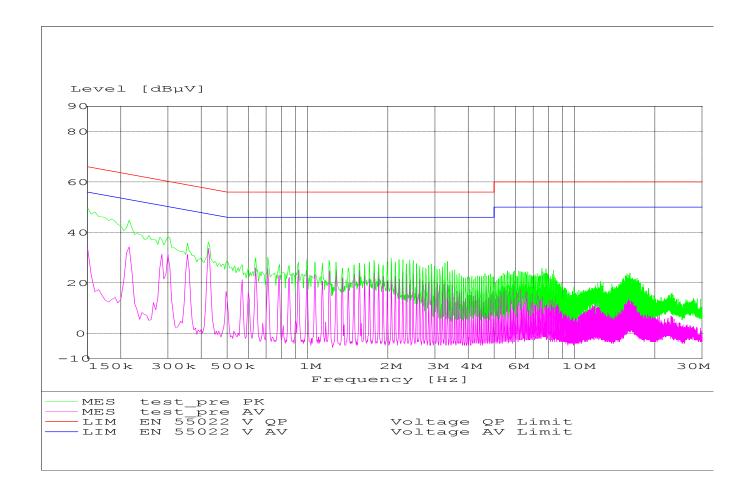
Limit

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 logarithm of the frequency					

\* Decreases with logarithm of the frequency

**ANALYZER SETTINGS: RBW = 10KHz** 

VBW = 10KHz



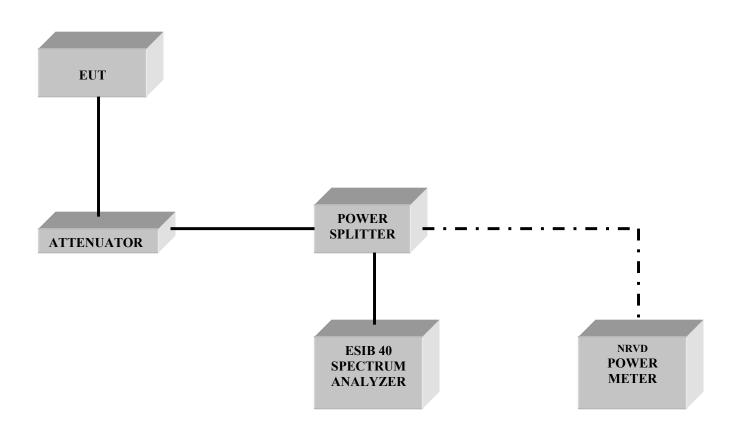


# TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
05	Biconilog Antenna	3141	EMCO	0005-1186
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
08	Power Splitter	11667B	Hewlett Packard	645348
09	Climatic Chamber	VT4004	Voltsch	G1115
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307
12	Pre-Amplifier	JS4-00102600	Miteq	00616
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06



# **BLOCK DIAGRAMS Conducted Testing**





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# **Radiated Testing**

#### **ANECHOIC CHAMBER**

