

FCC LISTED, REGISTRATION NUMBER: 905266

**IC LISTED REGISTRATION NUMBER
IC 4621**

AT4 wireless, S.A.

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TEST REPORT

REFERENCE STANDARD:

USA FCC Part 22 & Part 24

NIE : 29609RET.001

Approved by : A. Llamas / RF Lab Manager
(name / position & signature)

Elaboration date : 21/10/2009

Identification of item tested : Quadband GSM/GPRS Module

Brand name : Teltonika

Model and/or type reference : GM1200

Serial number : S/N: 00543466 IMEI: 354330030212859

Other identification of the product : Commercial name: TM1Q

FCC ID: XOGGM12TLTK5

HW Version: GM1200_02 SW version: VilniusSMD 05.94.01

Features : GPRS Class 10, 3.8 Vdc from AC adaptor

Description : Quad band GSM/GPRS module

Applicant : TELTONIKA JSC

Address : Saltoniskiu str. 10c / LT-08105 Vilnius / Lithuania

CIF/NIF/Passport : ID: 124429895 / VAT No.: LT244298917

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Test samples supplier : Same as applicant

Manufacturer : Same as applicant

Test method requested	See Standard			
Standard	USA FCC Part 22 10-1-08 Edition USA FCC Part 24 10-1-08 Edition			
Test procedure	1. PEET000: Medidas de equipos radioeléctricos en condiciones radiadas. 2. PEET003: Medidas conducidas de equipos radioeléctricos.			
Non-standardized test method	N/A			
Used instrumentation				
			Last Cal.	Cal. due date
1.	Semianechoic Absorber Chamber IR 11. BS	Lined	N.A.	N.A.
2.	Control Chamber IR 12.BC		N.A.	N.A.
3.	Hybrid Bilog antenna Sciences Corporation JB6	Sunol	2008-10	2011-10
4.	Antenna mast EM 1072 NMT		N.A.	N.A.
5.	Rotating table EM 1084-4. ON		N.A.	N.A.
6.	Double-ridge Guide Horn antenna 1-18 GHz HP 11966E		2008-03	2011-03
7.	Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J		2008-09	2011-09
8.	EMI Test Receiver R&S ESIB26		2009-09	2010-09
9.	Universal Radio communication Tester R&S CMU200		2009-02	2011-02
10.	Multi Device Controller EMC0 2090		N.A.	N.A.
11.	Spectrum Analyzer R&S ESU40		2007-11	2009-11
12.	Spectrum Analyzer Agilent E4440A		2008-01	2010-01
13.	Power amplifier ENI 603L-1471		2008-01	2010-01
14.	Log-Periodic antenna R&S HL 040		2009-10	2012-10
15.	RF generator Agilent ESG E4438C		2008-09	2010-09

Report template No.: FDT08_11

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Competences and guarantees

AT4 wireless, S.A. is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

AT4 wireless, S.A. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance programme for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample M/01 is composed of the following elements

<u>Control No.</u>	<u>Description</u>	<u>Model</u>	<u>Serial No.</u>	<u>Date of reception</u>
29609/28	Development KIT for TM1Q GSM/GPRS module	GM1200	S/N: 00543466 IMEI: 354330030212859	14/09/2009
29609/29	AC Adaptor	SA-020091A-G	---	14/09/2009
29609/30	External GSM antenna	JCG016	---	14/09/2009

1. Sample M/01 has undergone the test(s) specified in subclause "Test method requested".

Testing period

The performed test started on 2009-09-29 and finished on 2009-10-08.

The tests have been performed at AT4 wireless.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 25 °C Max. = 26 °C
Relative humidity	Min. = 54 % Max. = 56 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters), the following limits were not exceeded during the test.

Temperature	Min. = 25 °C Max. = 26 °C
Relative humidity	Min. = 54 % Max. = 56 %
Air pressure	Min. = 1020 mbar Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements the following limits were not exceeded during the test:

Temperature	Min. = 24 °C Max. = 25 °C
Relative humidity	Min. = 55 % Max. = 56 %
Air pressure	Min. = 1020 mbar Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

Summary

Considering the results of the performed test according to standards USA FCC Part 22 and Part 24, the item under test is **IN COMPLIANCE** with the requested specifications specified in the standard.

NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".

Remarks and comments

None.

Testing verdicts

Not applicable	NA
Pass.....	P
Fail	F
Not measured.....	NM

FCC PART 22 PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 22.913: RF output power	P			
Clause 2.1047: Modulation characteristics	P			
Clause 22.355: Frequency stability	P			
Clause 2.1049: Occupied Bandwidth	P			
Clause 22.917: Spurious emissions at antenna terminals	P			
Clause 22.917: Radiated emissions	P			

FCC PART 24 PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 24.232: RF output power	P			
Clause 2.1047: Modulation characteristics	P			
Clause 24.235: Frequency stability	P			
Clause 2.1049: Occupied Bandwidth	P			
Clause 24.238: Spurious emissions at antenna terminals	P			
Clause 24.238: Radiated emissions	P			

APPENDIX A: Test results

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TEST RESULTS FOR FCC PART 22

TEST CONDITIONS

Power supply (V):

$$V_{\text{nom}} = 3.8 \text{ Vdc}$$

$$V_{\text{max}} = 4.2 \text{ Vdc}$$

$$V_{\text{min}} = 3.5 \text{ Vdc}$$

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC Voltage from external DC power supply.

Type of antenna = external connectable antenna.

TEST FREQUENCIES:

Lowest channel (128): 824.2 MHz

Middle channel (190): 836.6 MHz

Highest channel (251): 848.8 MHz

RF Output Power (conducted and E.R.P.)

SPECIFICATION

§2.1046 and 22.913.

The Effective Radiated Power (E.R.P.) of mobile transmitter and auxiliary test transmitter must not exceed 7 Watts (38.45 dBm).

METHOD

The conducted RF output power measurements were made at the RF output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMU200 selecting maximum transmission power of the EUT.

For radiated measurements the EUT was placed on a 1 m high non-conductive stand inside an anechoic chamber. The measuring antenna was placed at 3 m distance and the maximum field strength was measured for the three channels. The EUT was controlled via the Universal Radio Communication tester R&S CMU200 selecting maximum transmission power of the EUT.

The Effective Radiated Power (E.R.P.) is obtained by using the Substitution Method according to ANSI/TIA/EIA-603-C: 2004.

RESULTS

MAXIMUM OUTPUT POWER (CONDUCTED). See plots in next pages.

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	30.02	30.33	30.61
Maximum peak power (W)	1.00	1.08	1.15
Measurement uncertainty (dB)	±0.5		

MAXIMUM EFFECTIVE RADIATED POWER E.R.P. (RADIATED).

Substitution method data

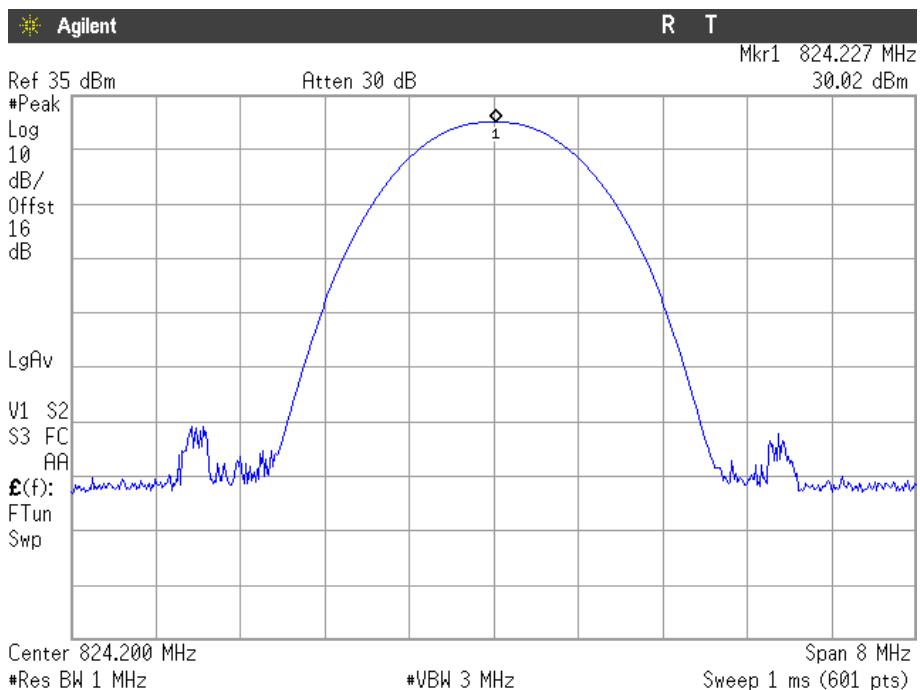
Frequency (MHz) at max. reading	Max. Instrument reading (dBm)	Polarization	(1) RF Generator (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gd (respect to $\lambda/2$ dipole) (dB)	E.R.P. (dBm) = (1) – (2) + (3)
824.2263	-22.21	Vertical	15.29	0.3	6.3	21.29
836.6114	-21.12	Vertical	16.98	0.3	6.2	22.88
848.7989	-20.57	Vertical	17.53	0.3	6.1	23.33

Channel	Lowest	Middle	Highest
Maximum peak power E.R.P. (dBm)	21.29	22.88	23.33
Maximum peak power (W)	0.13	0.19	0.21
Measurement uncertainty (dB)	± 3.8		

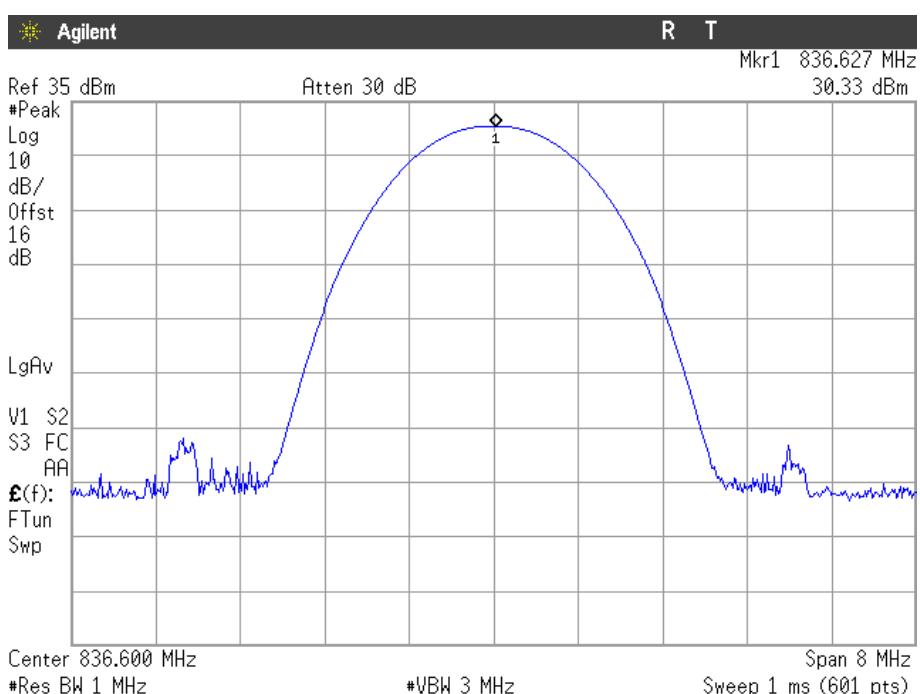
Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

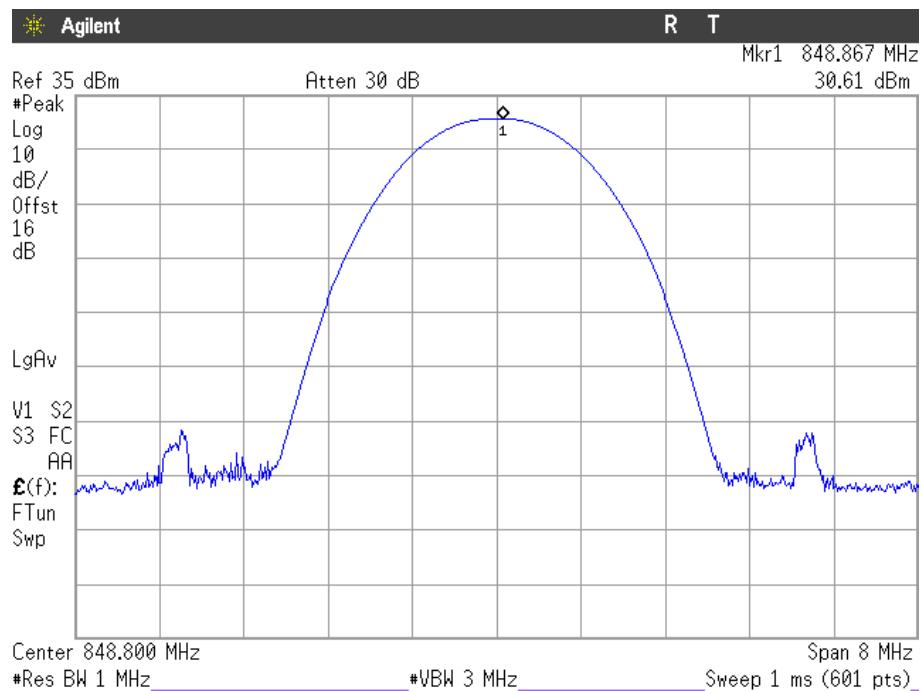
Lowest Channel.



Middle Channel.



Highest Channel.



Modulation Characteristics

SPECIFICATION

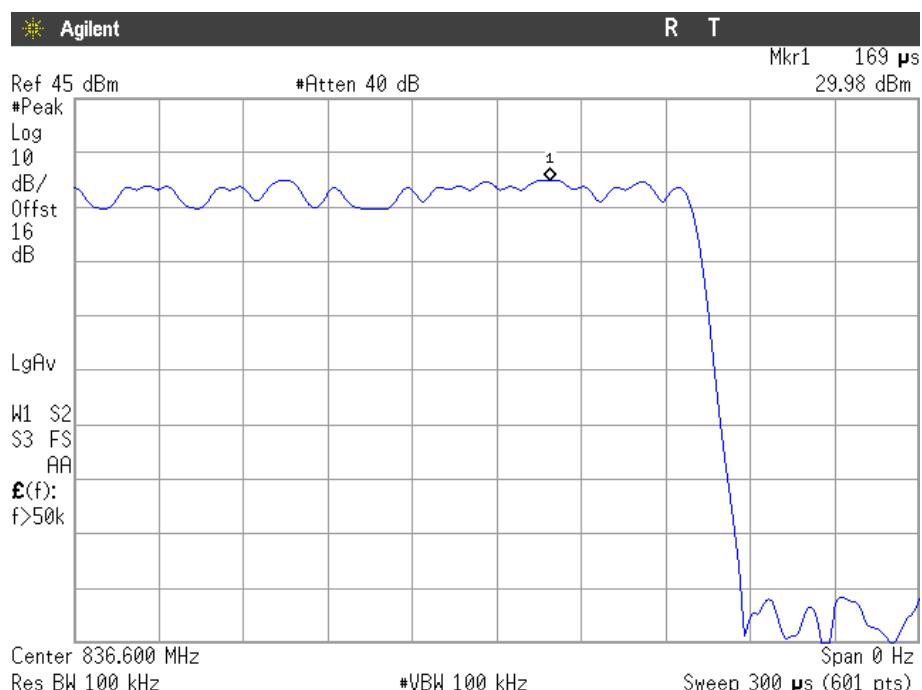
§2.1047

METHOD

The EUT operates with GPRS (GMSK) modulation mode, in which the information is digitised and coded into a bit stream.

RESULTS

The following plot shows the modulation scheme in the EUT.



Frequency Stability

SPECIFICATION

§2.1055 and §22.355

METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of -30°C to $+50^{\circ}\text{C}$. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10°C steps from -30°C up to $+50^{\circ}\text{C}$.

The EUT was set in “call mode” in the middle channel using the Universal Radio Communication tester R&S CMU200 and the maximum frequency error was measured using the frequency meter of CMU200.

RESULTS

Frequency stability over temperature variations.

Temperature ($^{\circ}\text{C}$)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
+50	2	0.0024	0.00000024
+40	5	0.0060	0.00000060
+30	3	0.0036	0.00000036
+20	-3	-0.0036	-0.00000036
+10	4	0.0048	0.00000048
0	2	0.0024	0.00000024
-10	5	0.0060	0.00000060
-20	9	0.0108	0.00000108
-30	2	0.0024	0.00000024

Frequency stability over voltage variations.

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	4.2	2	0.0024	0.00000024
Vmin	3.5	14	0.0167	0.00000167

Occupied Bandwidth

SPECIFICATION

§2.1049

METHOD

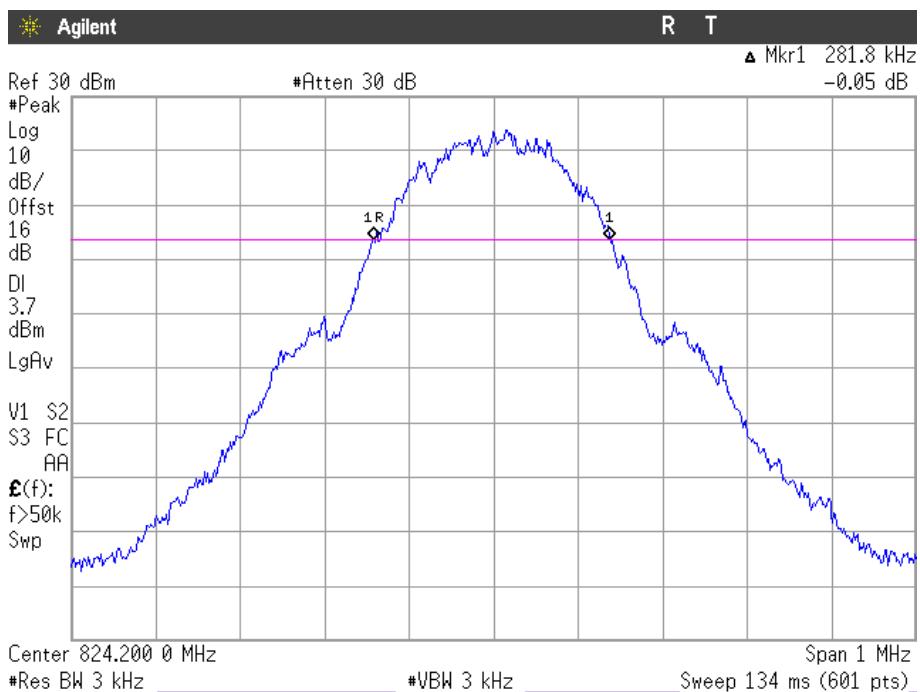
The EUT was configured to transmit a modulated carrier signal. An IF bandwidth of 3 kHz was used to determine the occupied bandwidth of the modulated emission.

RESULTS

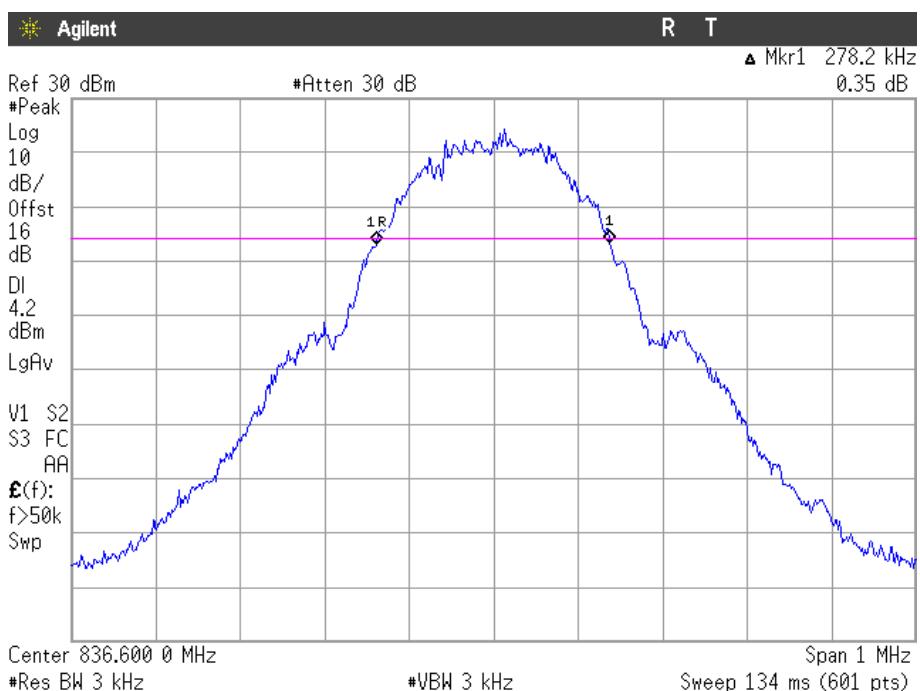
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (kHz)	281.8	278.2	289.1
-26 dBc bandwidth (kHz)	318.8	316.9	322.8
Measurement uncertainty (kHz)	<±6.5		

99% OCCUPIED BANDWIDTH

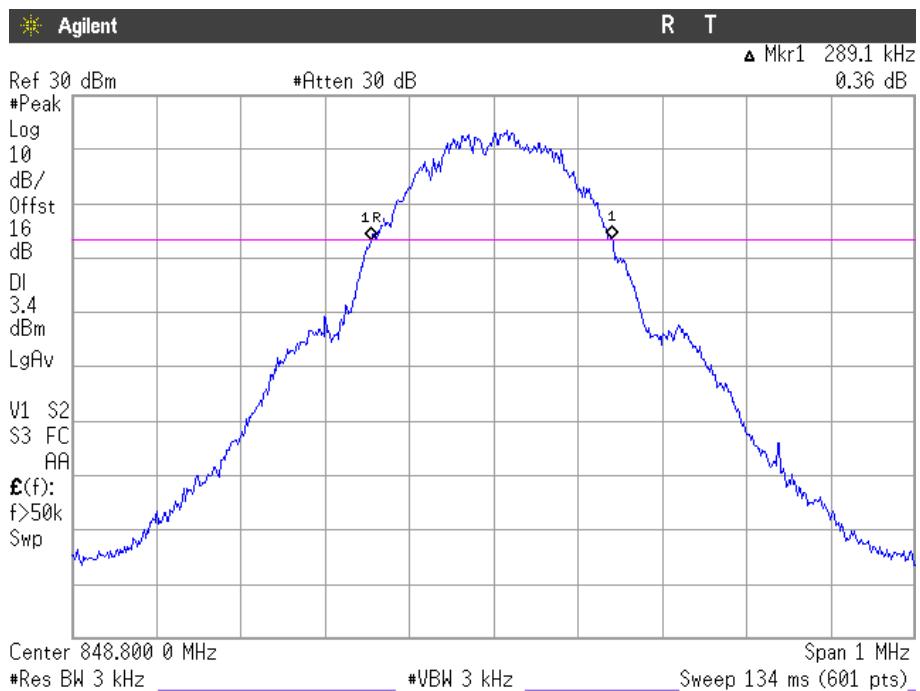
Lowest Channel



Middle Channel

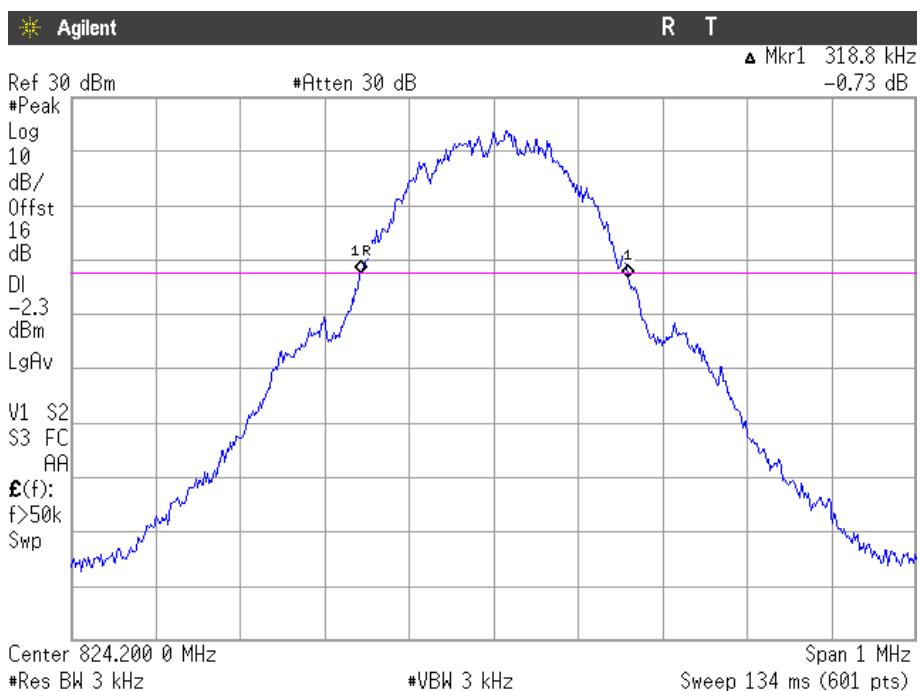


Highest Channel

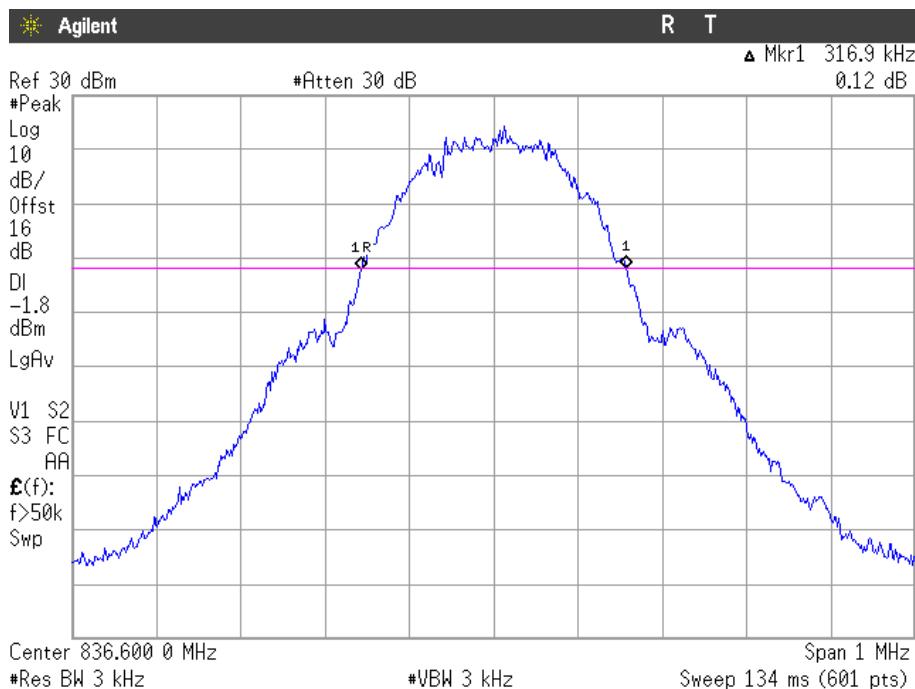


-26 dBc BANDWIDTH

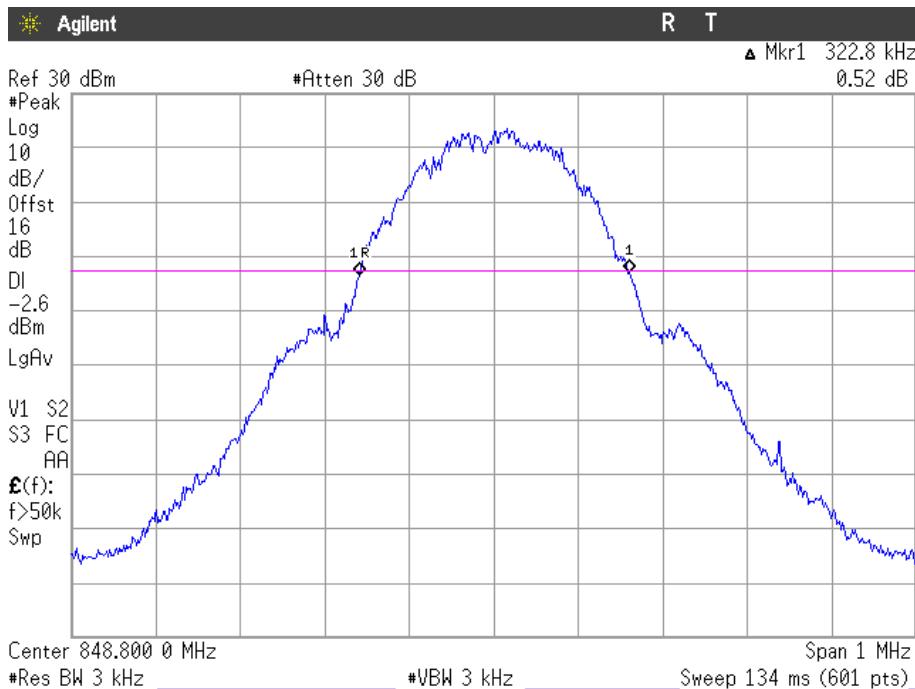
Lowest Channel



Middle Channel



Highest Channel



Spurious emissions at antenna terminals

SPECIFICATION

§2.1051 and §22.917

METHOD

The EUT RF output connector was connected to an spectrum analyser using an 50 ohm attenuator and the resolution bandwidth of the spectrum analyser was set to at least 100 kHz. The spectrum was investigated from 30 MHz to 10 GHz.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43+10\log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

RESULTS (see plots in next pages)

1. CHANNEL: LOWEST

No spurious signals were found in all the range.

2. CHANNEL: MIDDLE

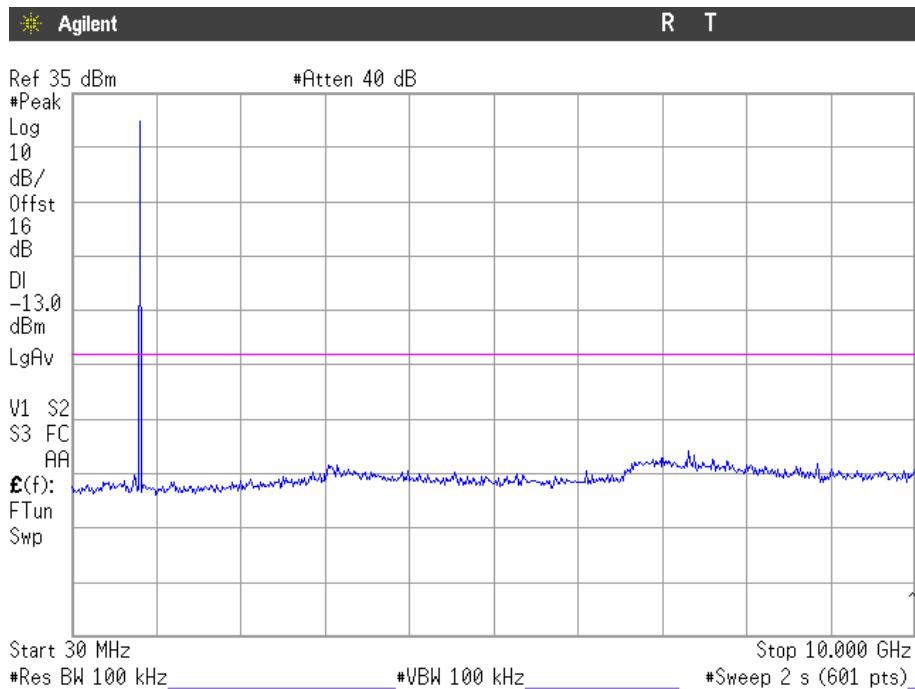
No spurious signals were found in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found in all the range.

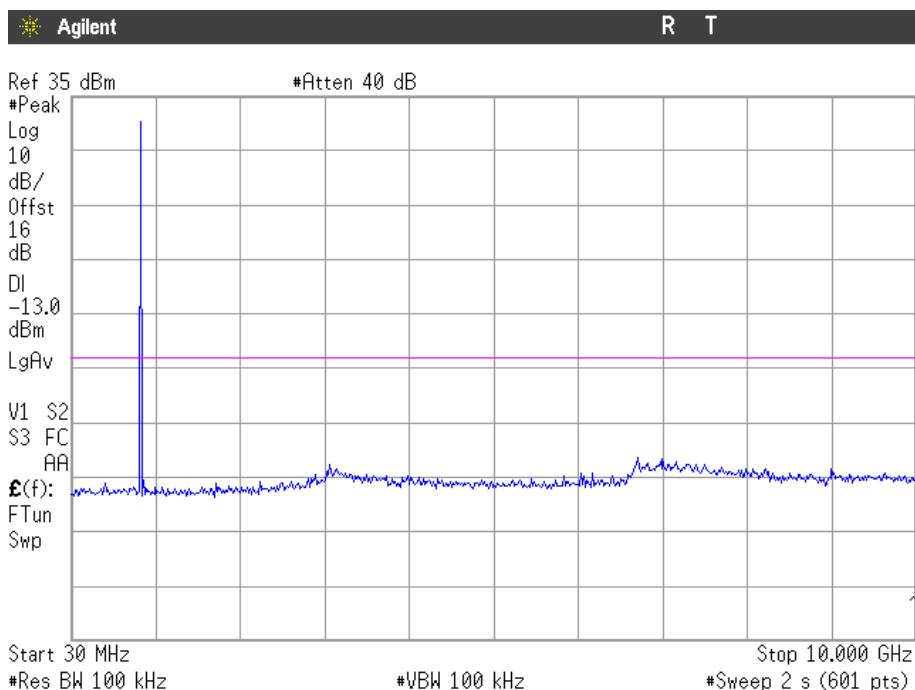
Verdict: PASS

1. CHANNEL: LOWEST



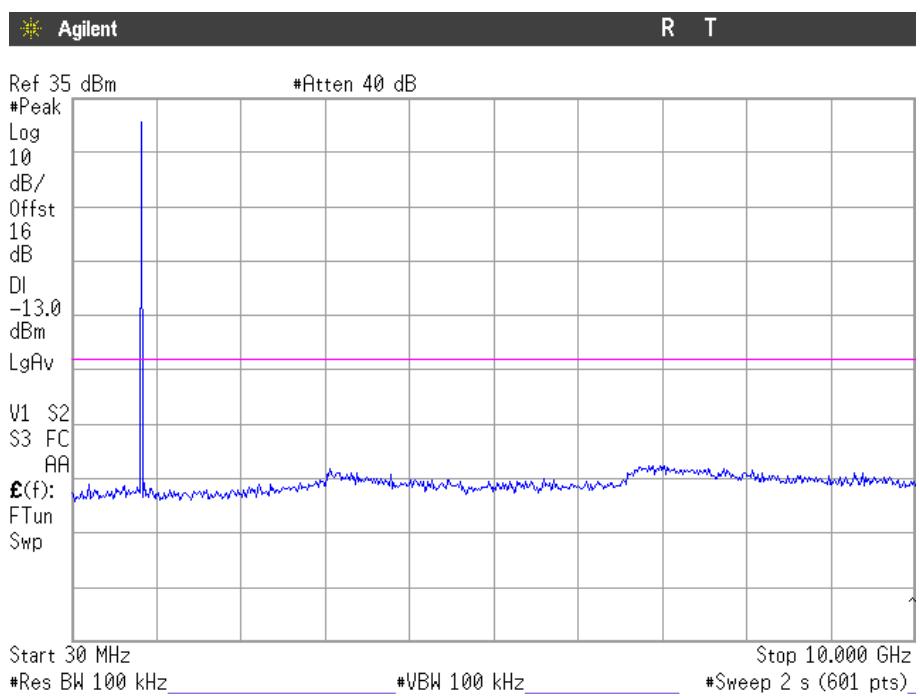
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

Spurious emissions at antenna terminals at Block Edges

SPECIFICATION

§2.1051 and §22.917

METHOD

As indicated in FCC part 22, in the 1 MHz bands immediately outside and adjacent to the frequency block or band a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A resolution bandwidth of 3.3 kHz was used.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43+10\log (P_o)$, and the level in dBm relative P_o becomes:

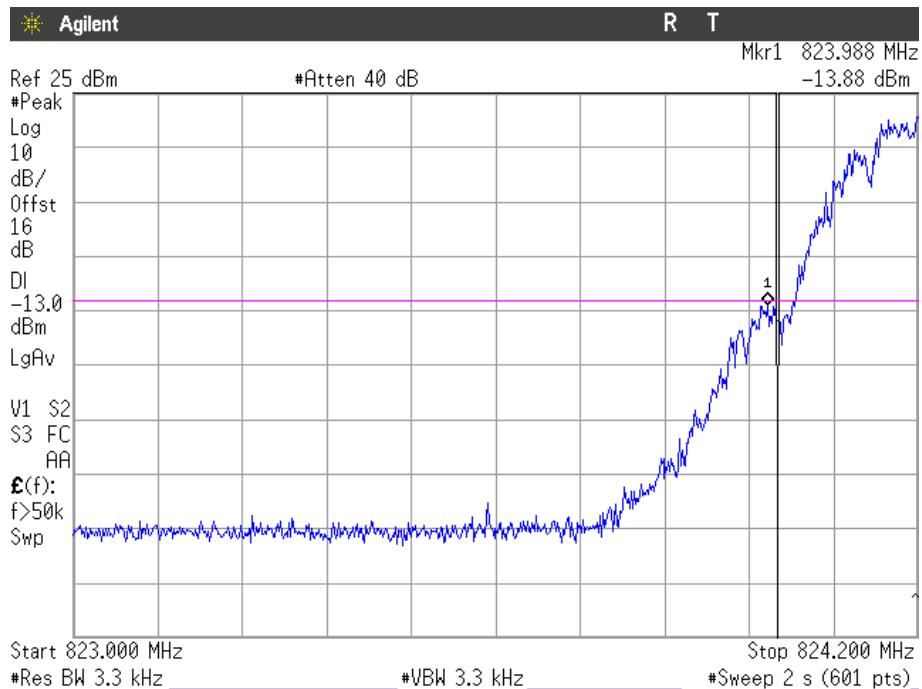
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

RESULTS (see plots in next pages)

Maximum level at lowest Block Edge (dBm)	Maximum level at highest Block Edge (dBm)
-13.88	-13.94

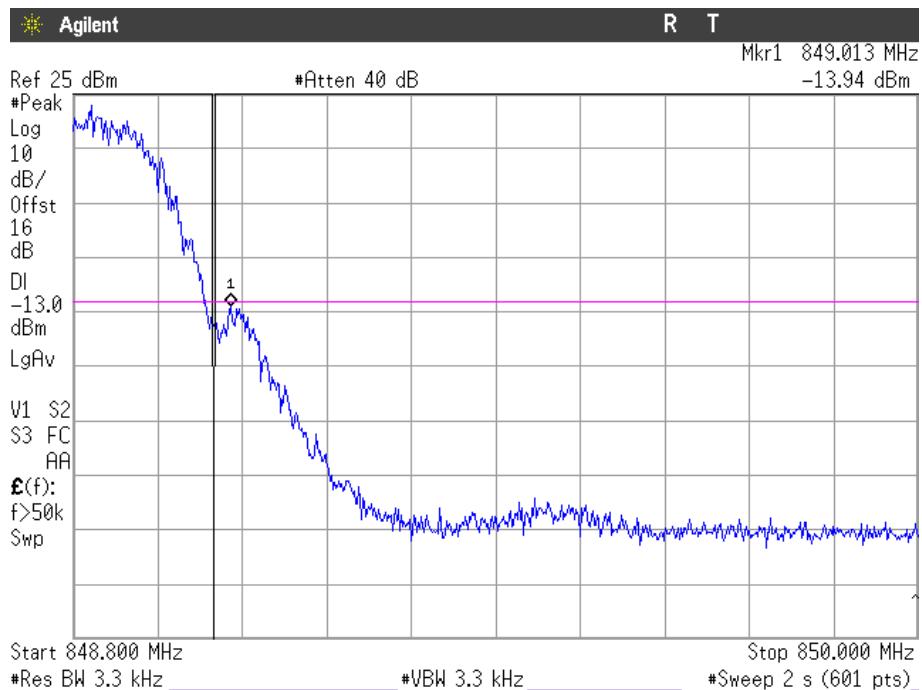
Measurement uncertainty = ± 1.57 dB.

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Radiated emissions

SPECIFICATION

§ 22.917

METHOD

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a 1 meter high non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Each detected emissions were substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-C: 2004.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43+10\log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

RESULTS

1. CHANNEL: LOWEST

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

Frequency range 1 GHz-12.75 GHz.

No spurious signals were found in all the range.

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

Frequency range 1 GHz-12.75 GHz.

No spurious signals were found in all the range.

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

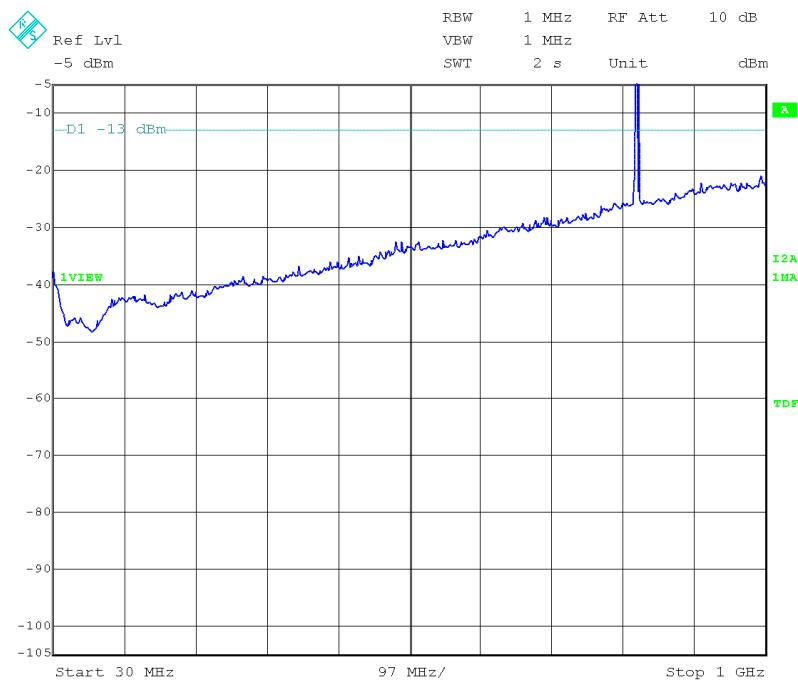
Frequency range 1 GHz-12.75 GHz.

No spurious signals were found in all the range.

Verdict: PASS

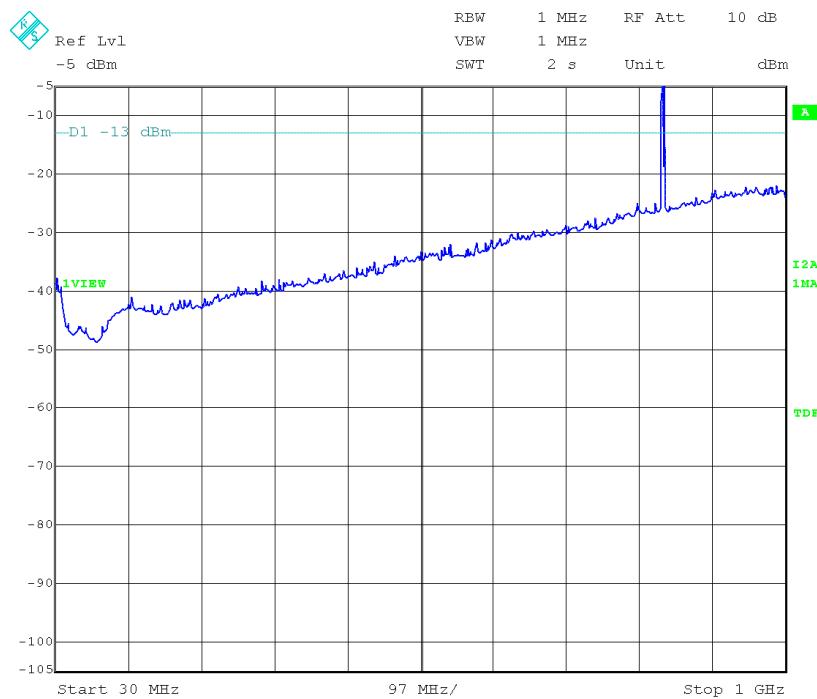
FREQUENCY RANGE 30 MHz-1000 MHz.

CHANNEL: LOWEST



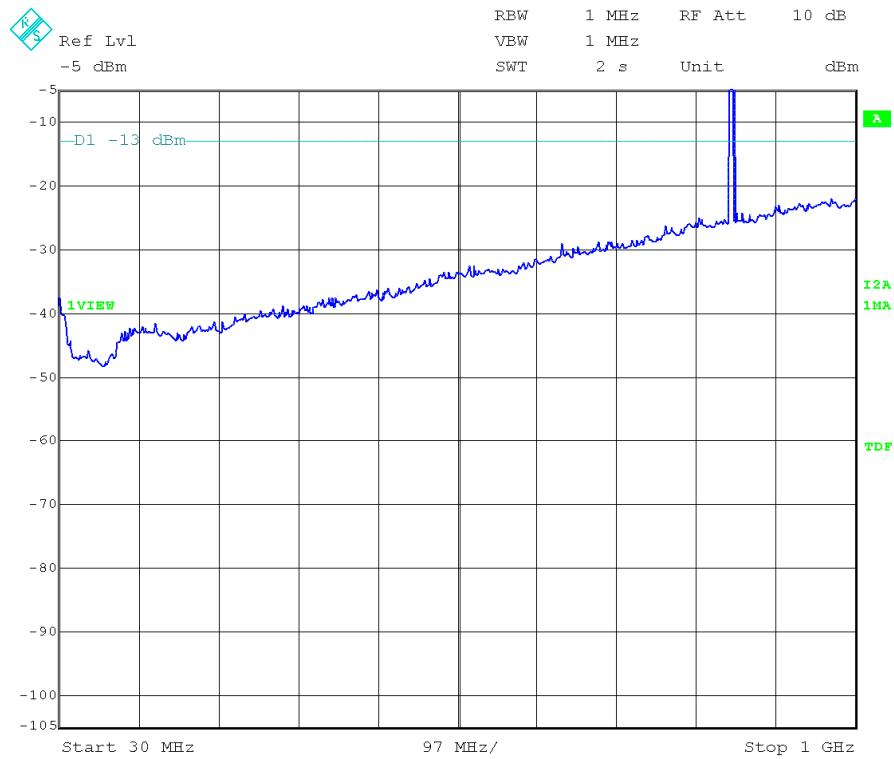
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



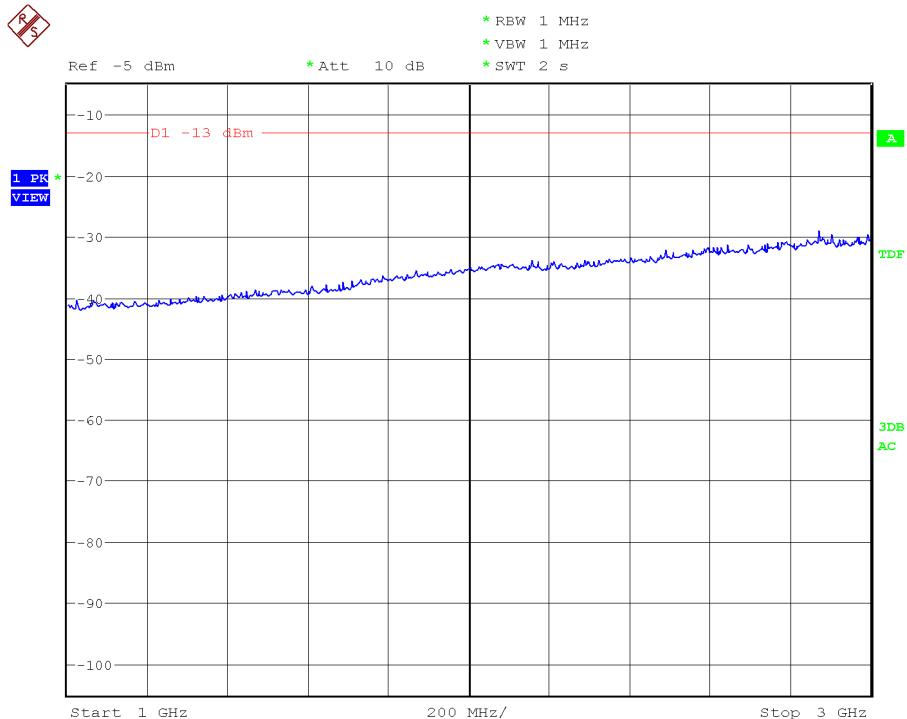
Note: The peak above the limit is the carrier frequency.

CHANNEL: HIGHEST



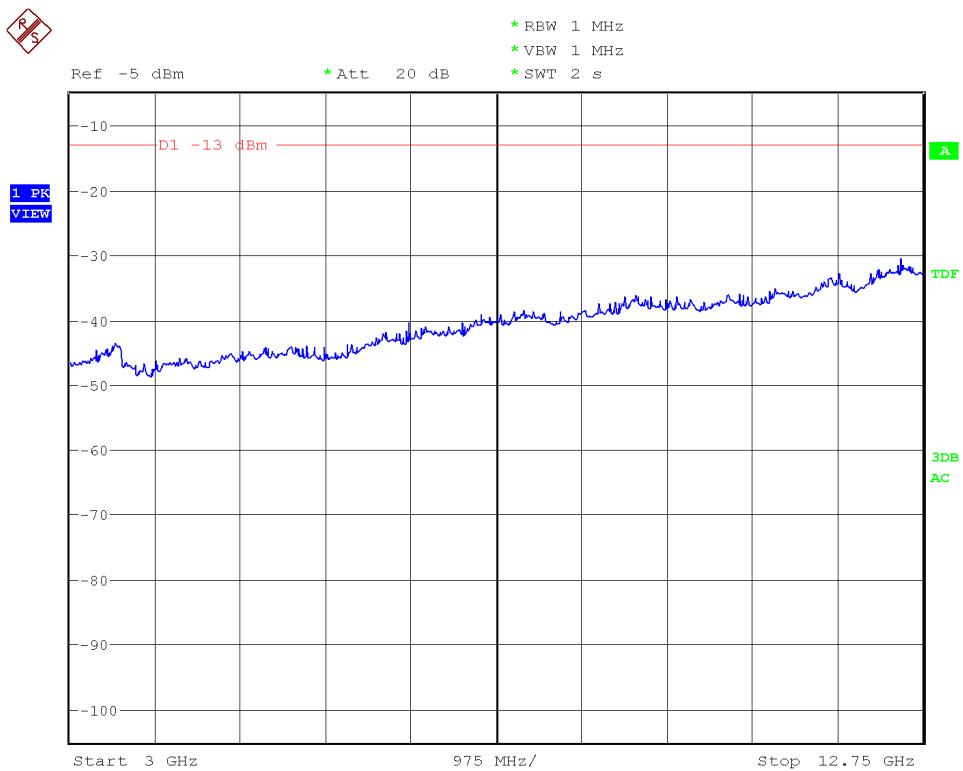
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 GHz to 3 GHz.



(This plot is valid for all three channels)

FREQUENCY RANGE 3 GHz to 12.75 GHz.



(This plot is valid for all three channels)

TEST RESULTS FOR FCC PART 24

TEST CONDITIONS

Power supply (V):

V_{nom} = 3.8 Vdc

V_{max} = 3.5 Vdc

V_{min} = 4.2 Vdc

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC Voltage from external DC power supply.

Type of antenna = external connectable antenna.

TEST FREQUENCIES:

Lowest channel (512): 1850.2 MHz

Middle channel (662): 1880.2 MHz

Highest channel (810): 1909.8 MHz

RF Output Power (conducted and E.I.R.P.)

SPECIFICATION

§2.1046 and 24.232

Mobile/portable stations are limited to 2 Watts (33 dBm) Effective Isotropic Radiated Power (E.I.R.P.) peak power.

METHOD

The conducted RF output power measurements were made at the RF output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMU200 selecting maximum transmission power of the EUT.

For radiated measurements the EUT was placed on a 1 m high non-conductive stand inside an anechoic chamber. The measuring antenna was placed at 1 m distance and the maximum field strength was measured for the three channels. The EUT was controlled via the Universal Radio Communication tester R&S CMU200 selecting maximum transmission power of the EUT.

The Effective Isotropic Radiated Power (E.I.R.P.) is obtained by using the Substitution Method according to ANSI/TIA/EIA-603-C: 2004.

RESULTS

MAXIMUM OUTPUT POWER (CONDUCTED). See plots in next pages.

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	28.87	28.19	27.51
Maximum peak power (W)	0.77	0.66	0.56
Measurement uncertainty (dB)	±0.5		

MAXIMUM EFFECTIVE ISOTROPIC RADIATED POWER E.I.R.P. (RADIATED).

Substitution method data

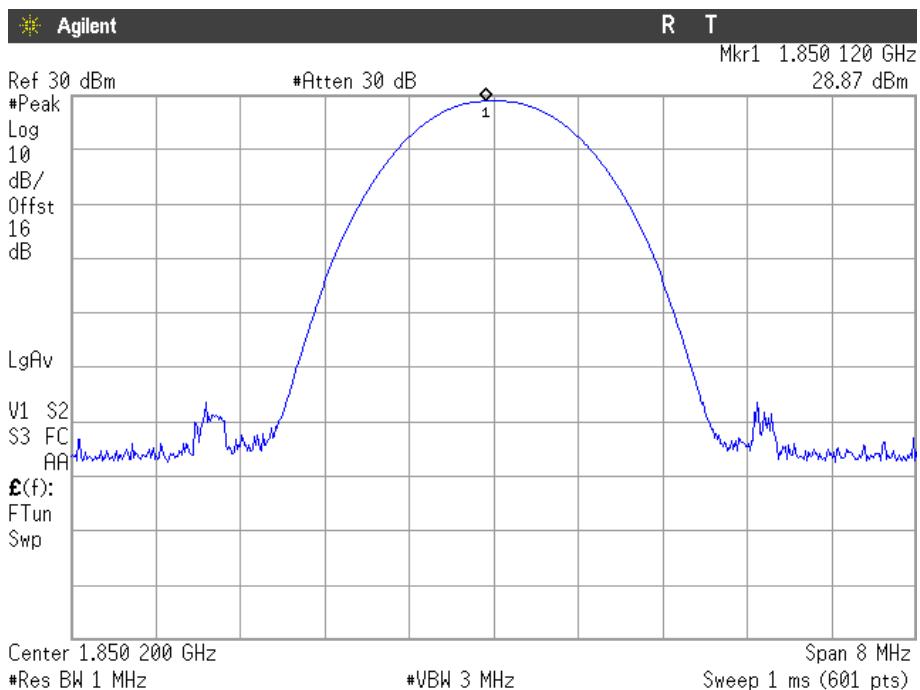
Frequency (MHz) at max. reading	Max. Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
1850.2116	-8.43	Vertical	15.97	0.5	8.6	24.07
1880.2231	-10.13	Vertical	14.77	0.5	8.3	22.57
1909.8108	-9.10	Vertical	16.20	0.5	8.0	23.70

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	24.07	22.57	23.70
Maximum peak power (W)	0.25	0.18	0.23
Measurement uncertainty (dB)	± 4.0		

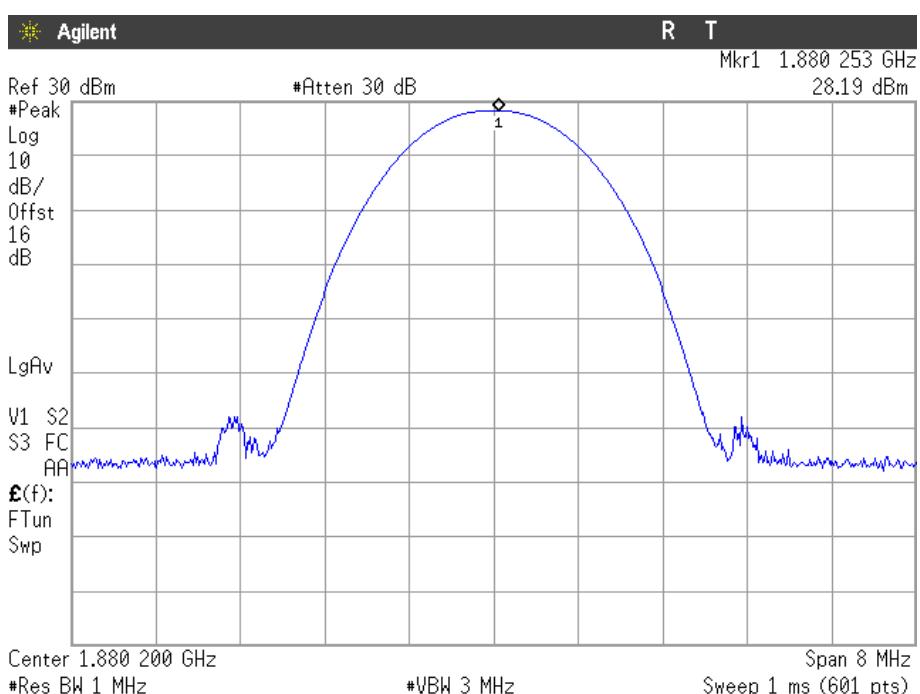
Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

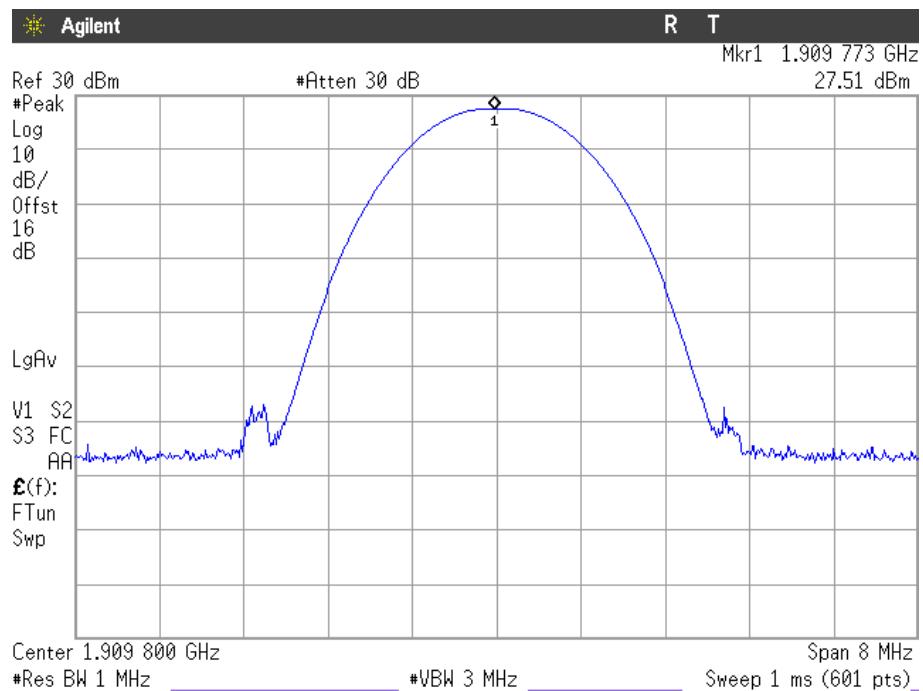
Lowest Channel.



Middle Channel.



Highest Channel.



Modulation Characteristics

SPECIFICATION

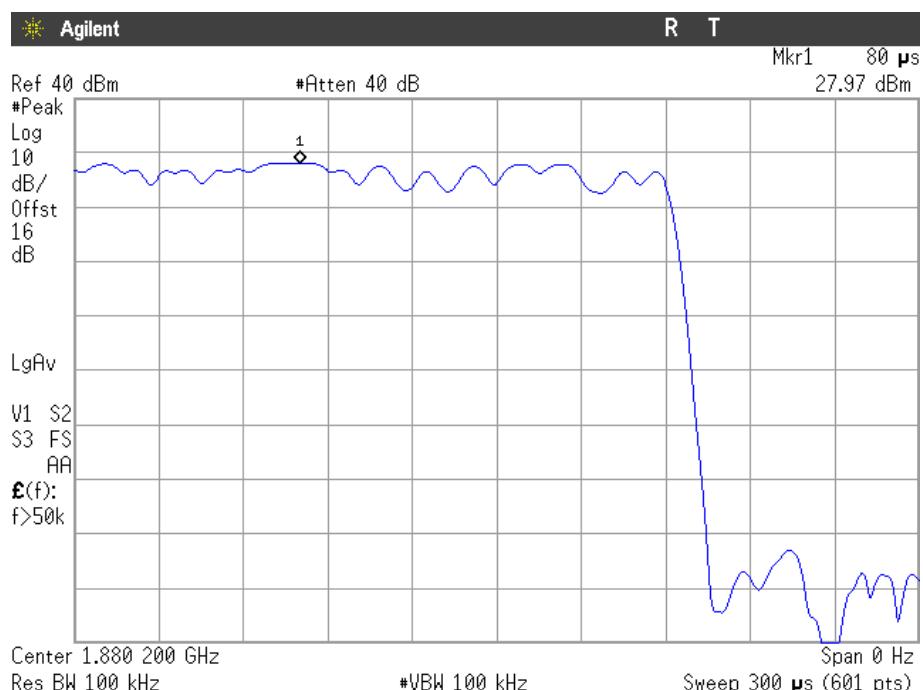
§2.1047

METHOD

The EUT operates with GPRS (GMSK) modulation mode, in which the information is digitised and coded into a bit stream.

RESULTS

The following plot shows the modulation schemes in the EUT.



Frequency Stability

SPECIFICATION

§2.1055 and 24.235

METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of -30°C to $+50^{\circ}\text{C}$. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10°C steps from -30°C up to $+50^{\circ}\text{C}$.

The EUT was set in “call mode” in the middle channel using the Universal Radio Communication tester R&S CMU200 and the maximum frequency error was measured using the frequency meter of CMU200.

RESULTS

Frequency stability over temperature variations.

Temperature ($^{\circ}\text{C}$)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
+50	20	0.0106	0.00000106
+40	19	0.0101	0.00000101
+30	22	0.0117	0.00000117
+20	12	0.0064	0.00000064
+10	23	0.0122	0.00000122
0	20	0.0106	0.00000106
-10	17	0.0090	0.00000090
-20	26	0.0138	0.00000138
-30	21	0.0112	0.00000112

Frequency stability over voltage variations.

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	4.2	17	0.0090	0.00000090
Vmin	3.5	20	0.0106	0.00000106

Occupied Bandwidth

SPECIFICATION

§2.1049

METHOD

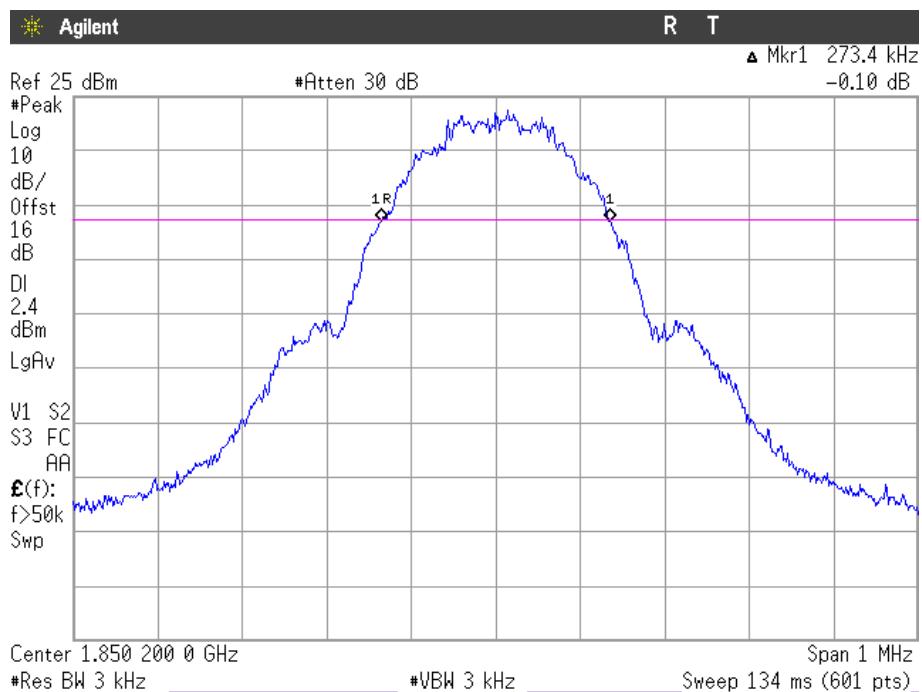
The EUT was configured to transmit a modulated carrier signal. An IF bandwidth of 3 kHz was used to determine the occupied bandwidth.

RESULTS

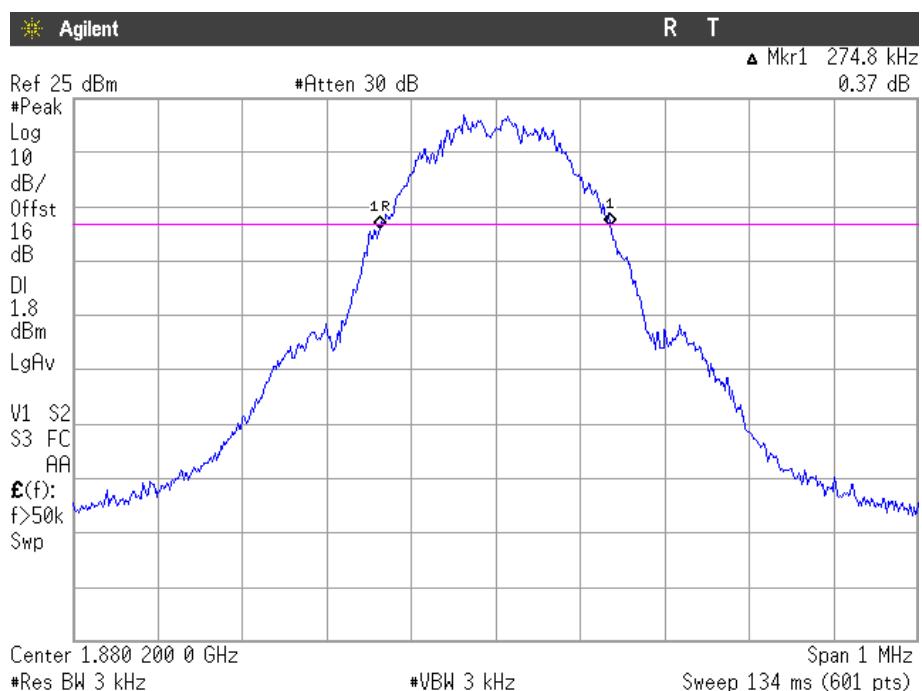
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (kHz)	273.4	274.8	270.2
-26 dBc bandwidth (kHz)	317.3	315.3	314.1
Measurement uncertainty (kHz)	<±6.5		

99% OCCUPIED BANDWIDTH

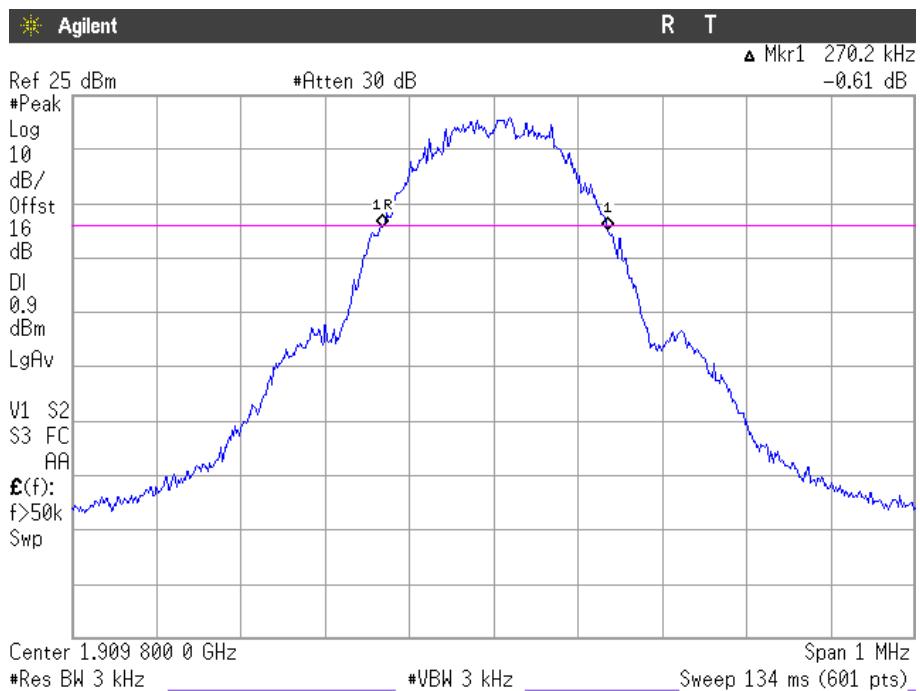
Lowest Channel



Middle Channel

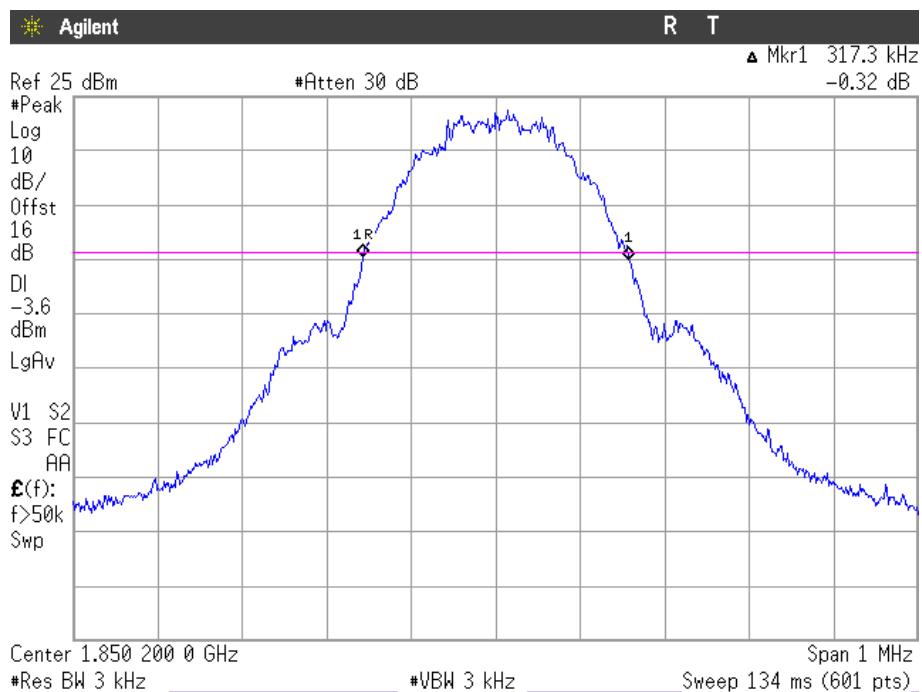


Highest Channel

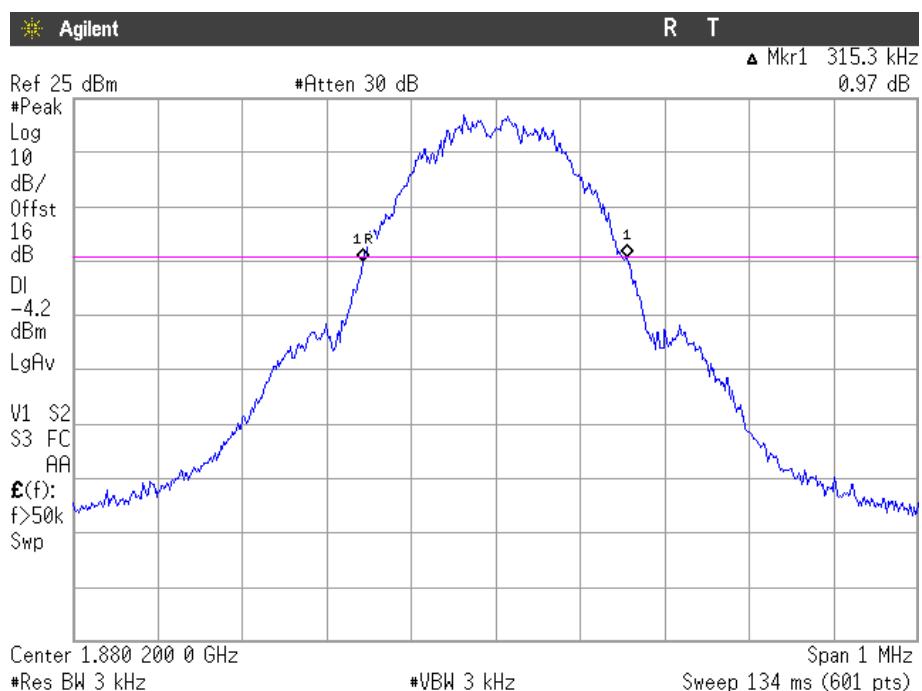


-26 dBc BANDWIDTH

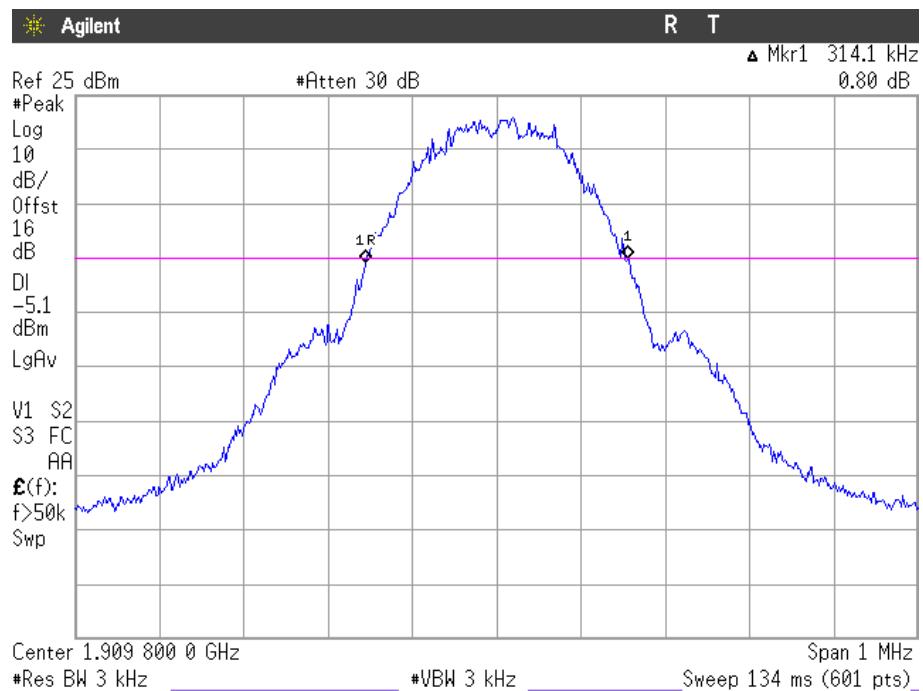
Lowest Channel



Middle Channel



Highest Channel



Spurious emissions at antenna terminals

SPECIFICATION

§2.1051 and §24.238

METHOD

The EUT RF output connector was connected to an spectrum analyser using an 50 ohm attenuator and the resolution bandwidth of the spectrum analyser was set to 1 MHz. The spectrum was investigated from 30 MHz to 20 GHz.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43 + 10 \log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

RESULTS (see plots in next pages)

1. CHANNEL: LOWEST

No spurious signals were found in all the range.

2. CHANNEL: MIDDLE

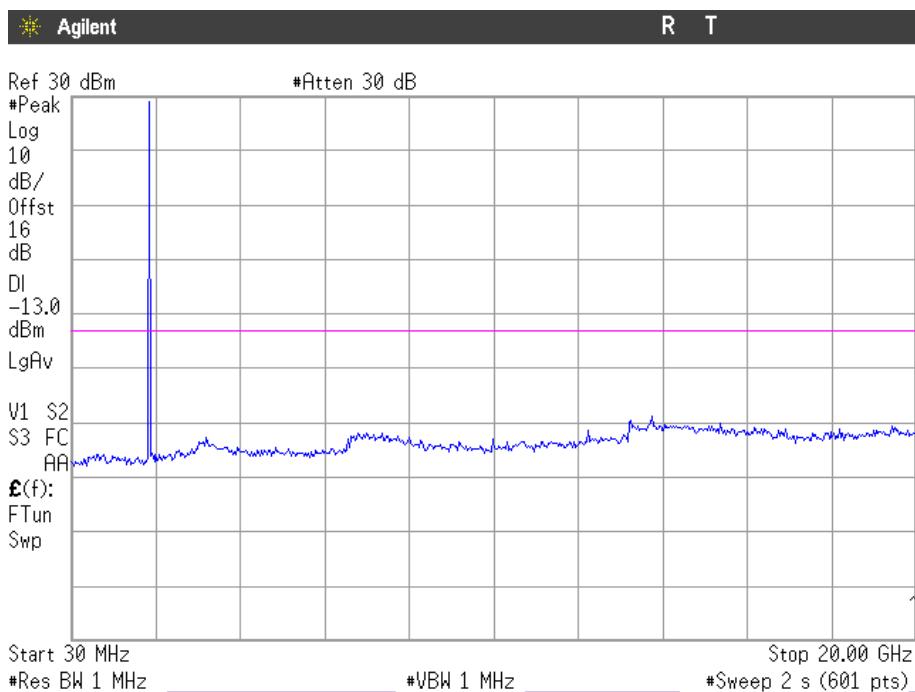
No spurious signals were found in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found in all the range.

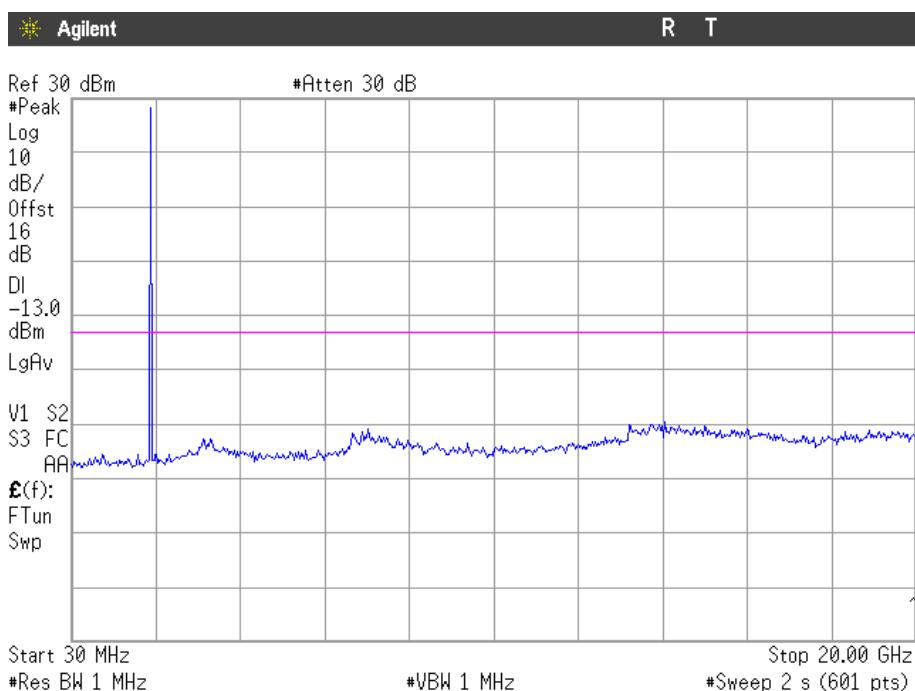
Verdict: PASS

1. CHANNEL: LOWEST



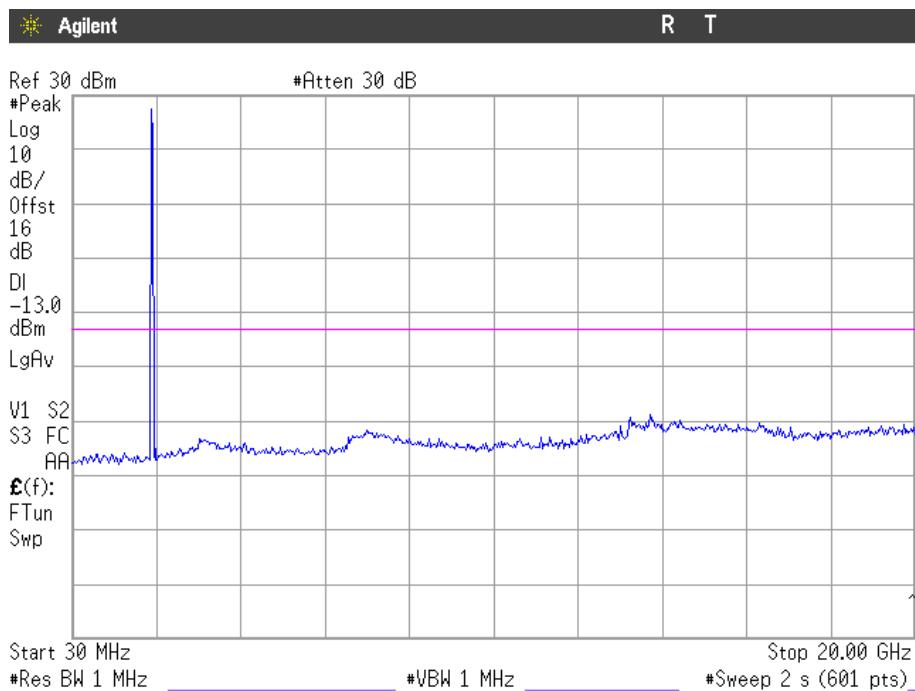
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

Spurious emissions at antenna terminals at Block Edges

SPECIFICATION

§2.1051 and §24.238

METHOD

As indicated in FCC part 24, in the 1 MHz bands immediately outside and adjacent to the frequency block or band a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A resolution bandwidth of 3.3 kHz was used.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43+10\log (P_o)$, and the level in dBm relative P_o becomes:

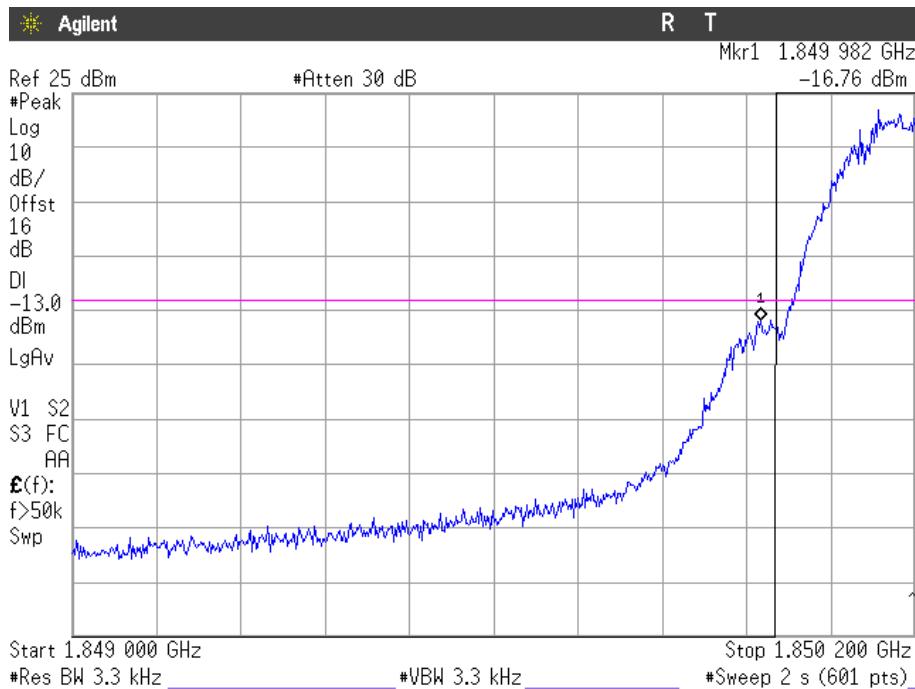
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

RESULTS (see plots in next pages)

Maximum level at lowest Block Edge (dBm)	Maximum level at highest Block Edge (dBm)
-16.76	-19.44

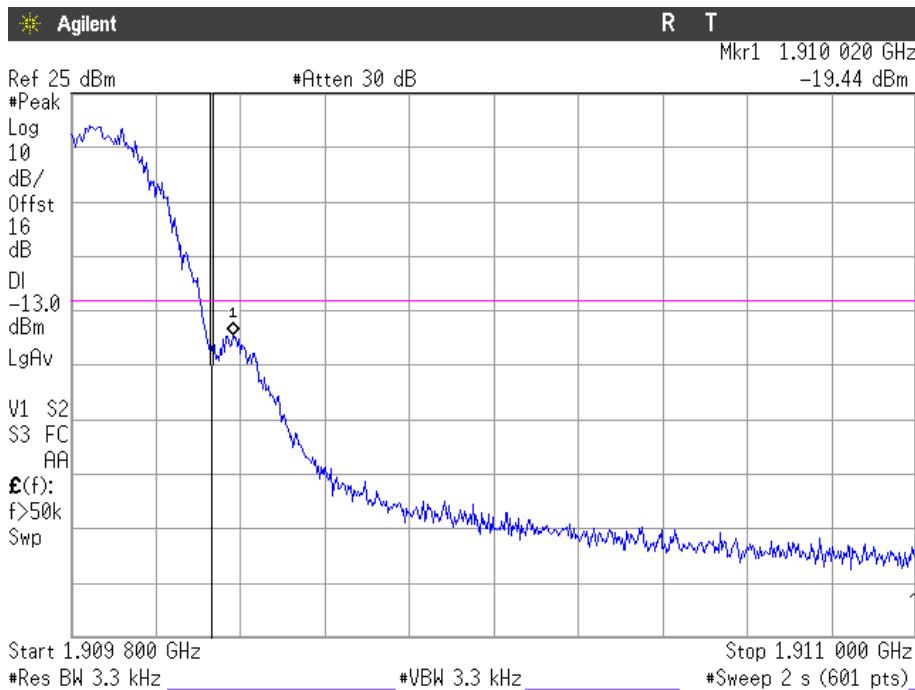
Measurement uncertainty = ± 1.57 dB.

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Radiated emissions

SPECIFICATION

§ 24.238

METHOD

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a 1 meter high non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Each detected emissions were substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-C: 2004.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43 + 10 \log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

RESULTS

1. CHANNEL: LOWEST

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

Frequency range 1 GHz-20 GHz.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) - (2) + (3)
3700.4967	-48.83	Vertical	-42.83	2.60	9.10	-36.33

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

Frequency range 1 GHz-20 GHz.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) - (2) + (3)
3760.5128	-47.78	Vertical	-41.78	2.60	9.10	-35.28

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

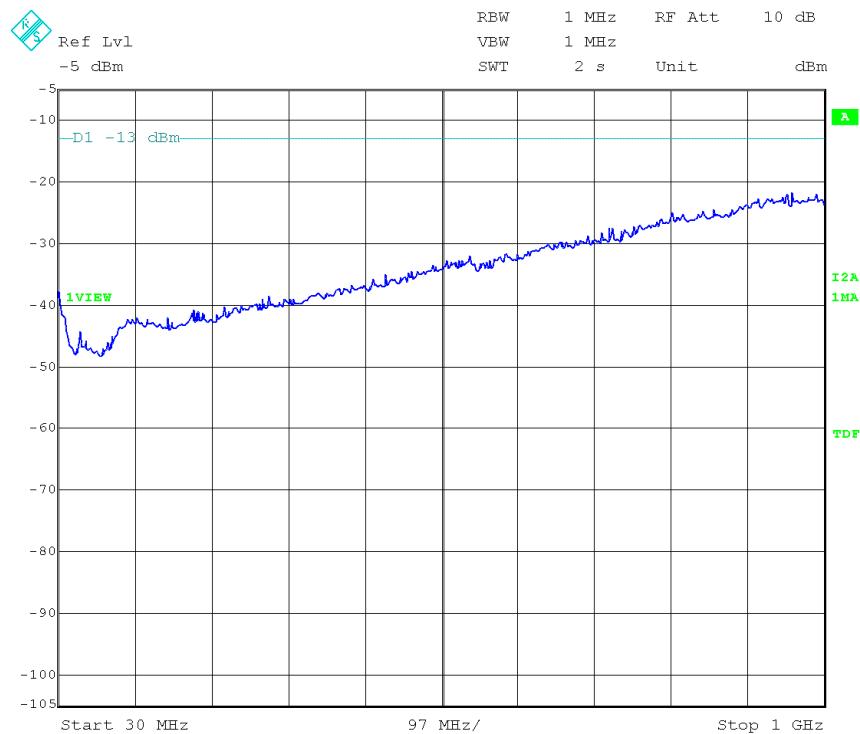
Frequency range 1 GHz-20 GHz.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) - (2) + (3)
3819.6474	-48.06	Vertical	-42.06	2.60	9.10	-35.56

Verdict: PASS

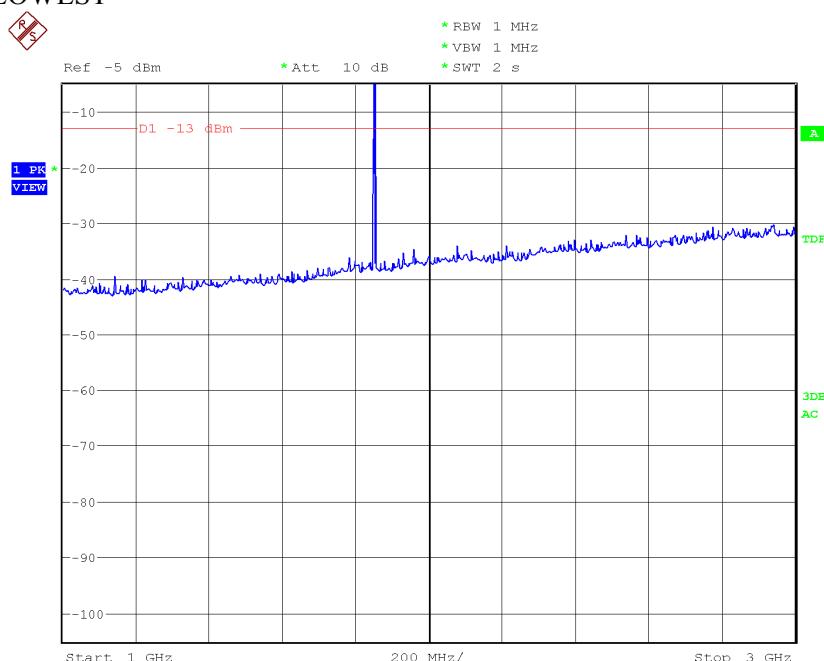
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

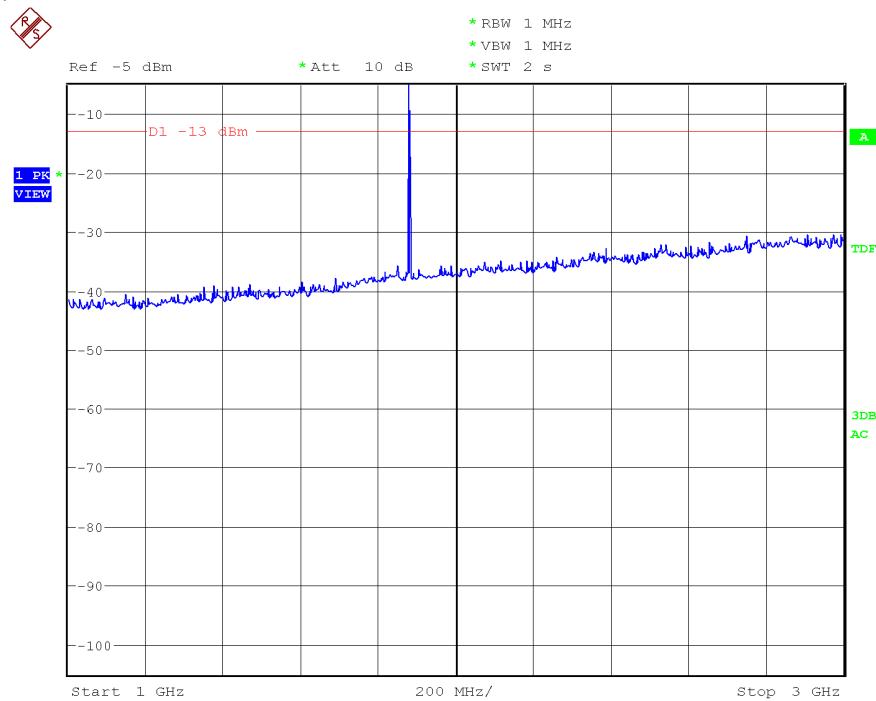
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: LOWEST



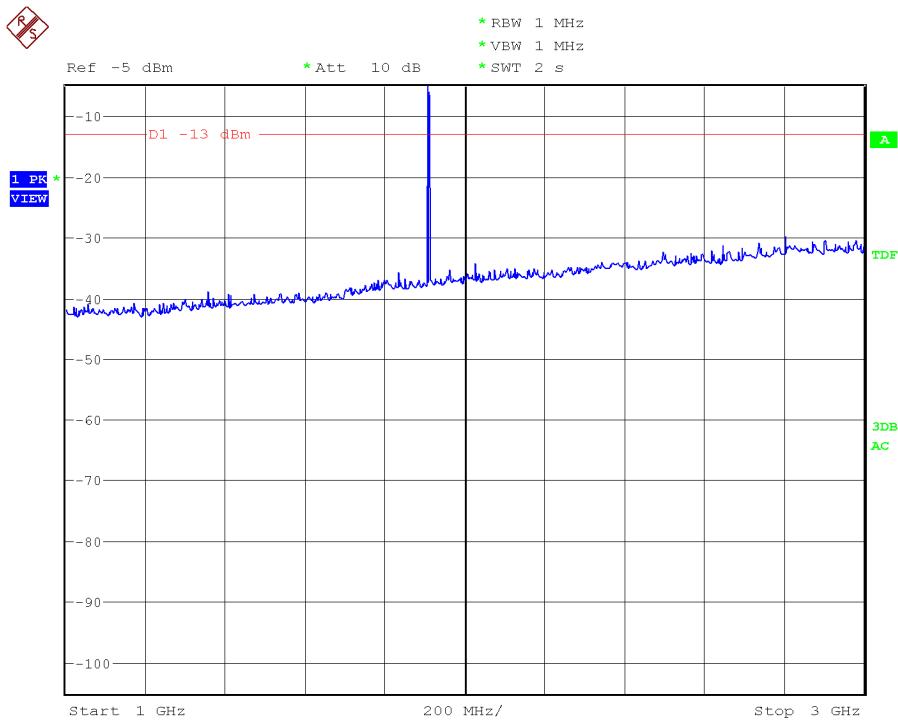
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

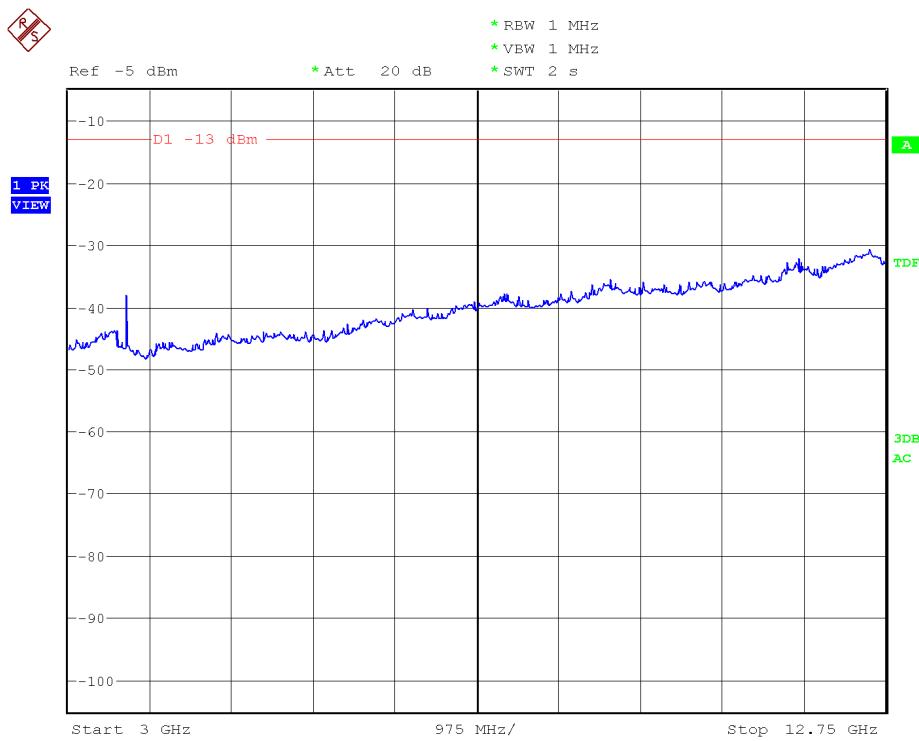
CHANNEL: HIGHEST



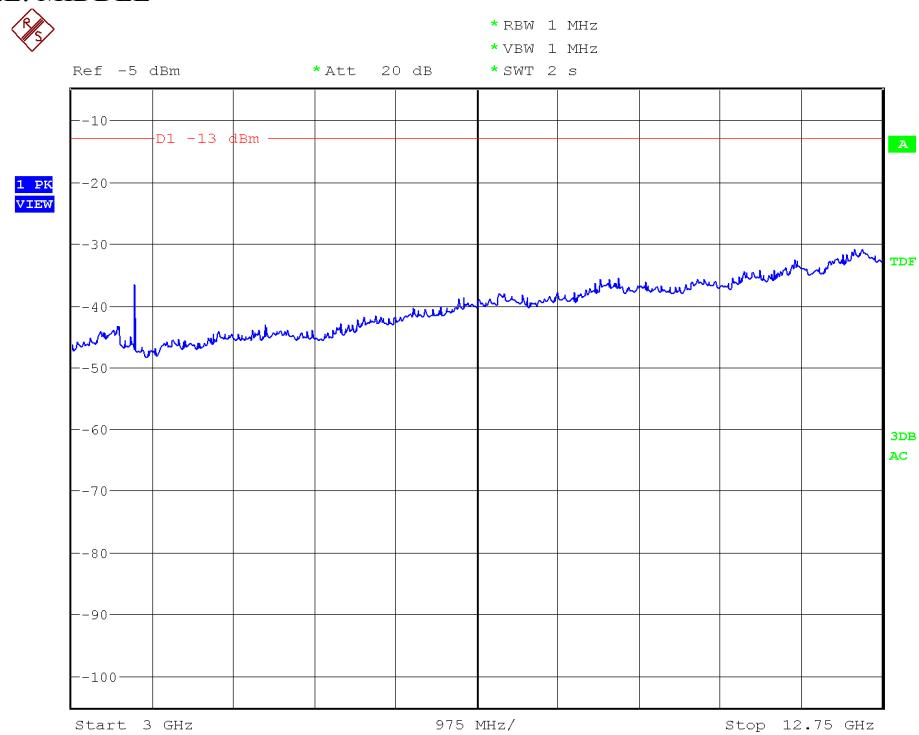
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 GHz to 12.75 GHz.

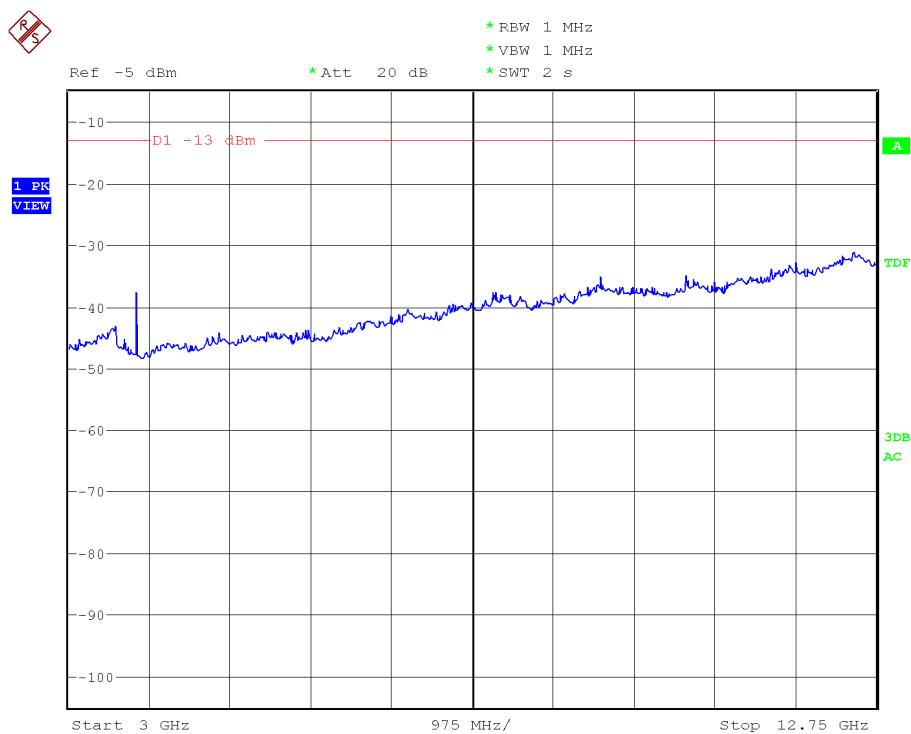
CHANNEL: LOWEST



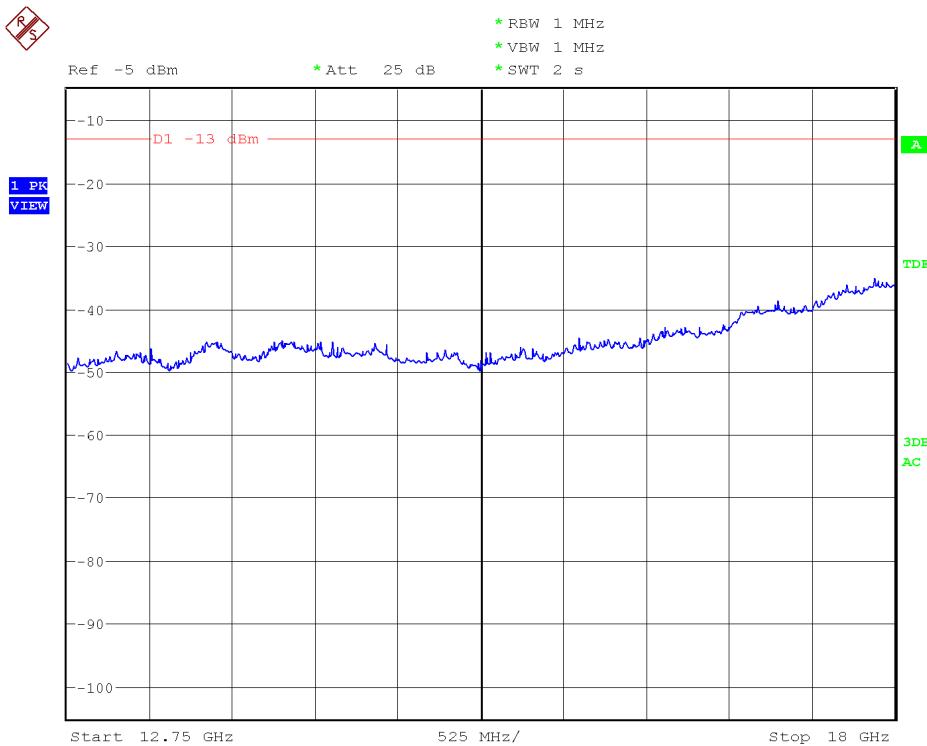
CHANNEL: MIDDLE



CHANNEL: HIGHEST

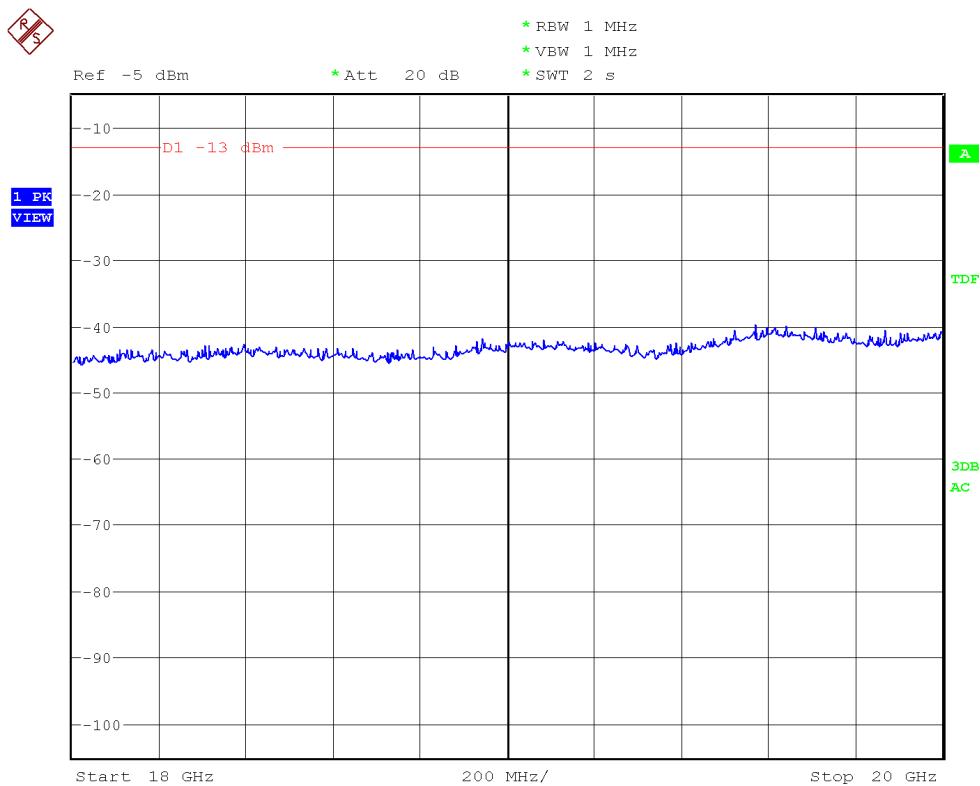


FREQUENCY RANGE 12.75 GHz TO 18 GHz.



(This plot is valid for all three channels).

FREQUENCY RANGE 18 GHz TO 20 GHz.



(This plot is valid for all three channels).

APPENDIX B: Photographs

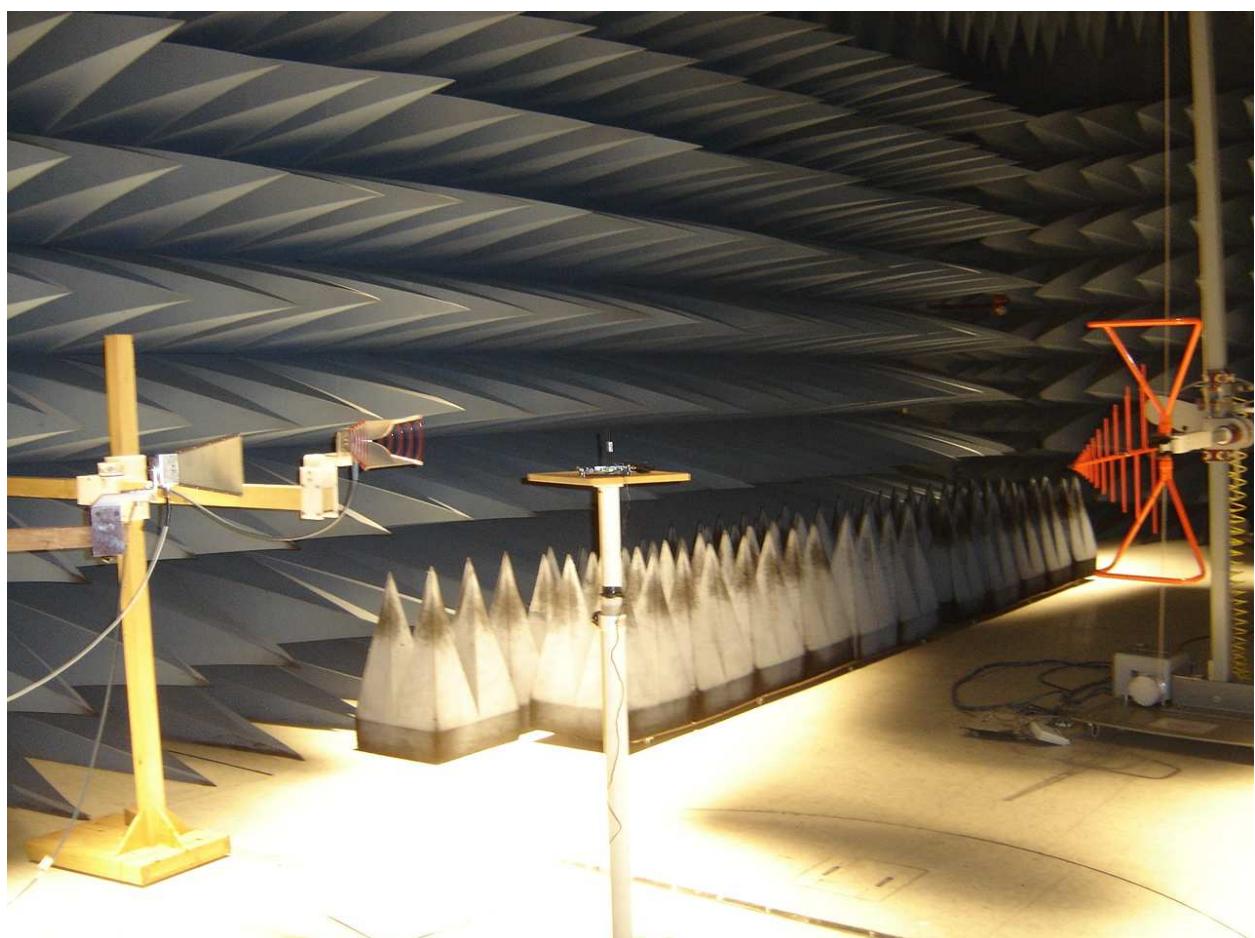
EQUIPMENT FOR CONDUCTED MEASUREMENTS (FRONT VIEW)



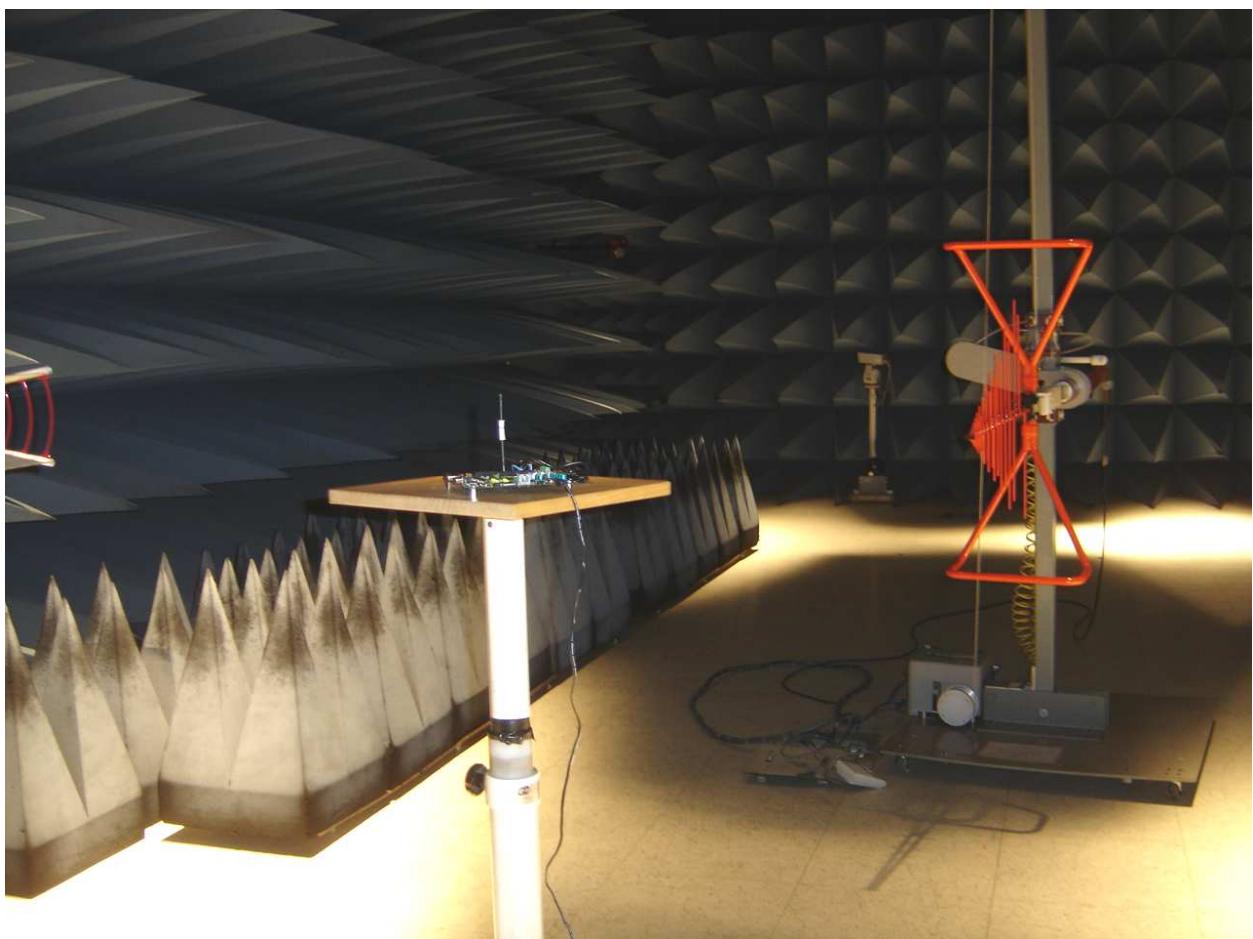
EQUIPMENT FOR CONDUCTED MEASUREMENTS (BACK VIEW)



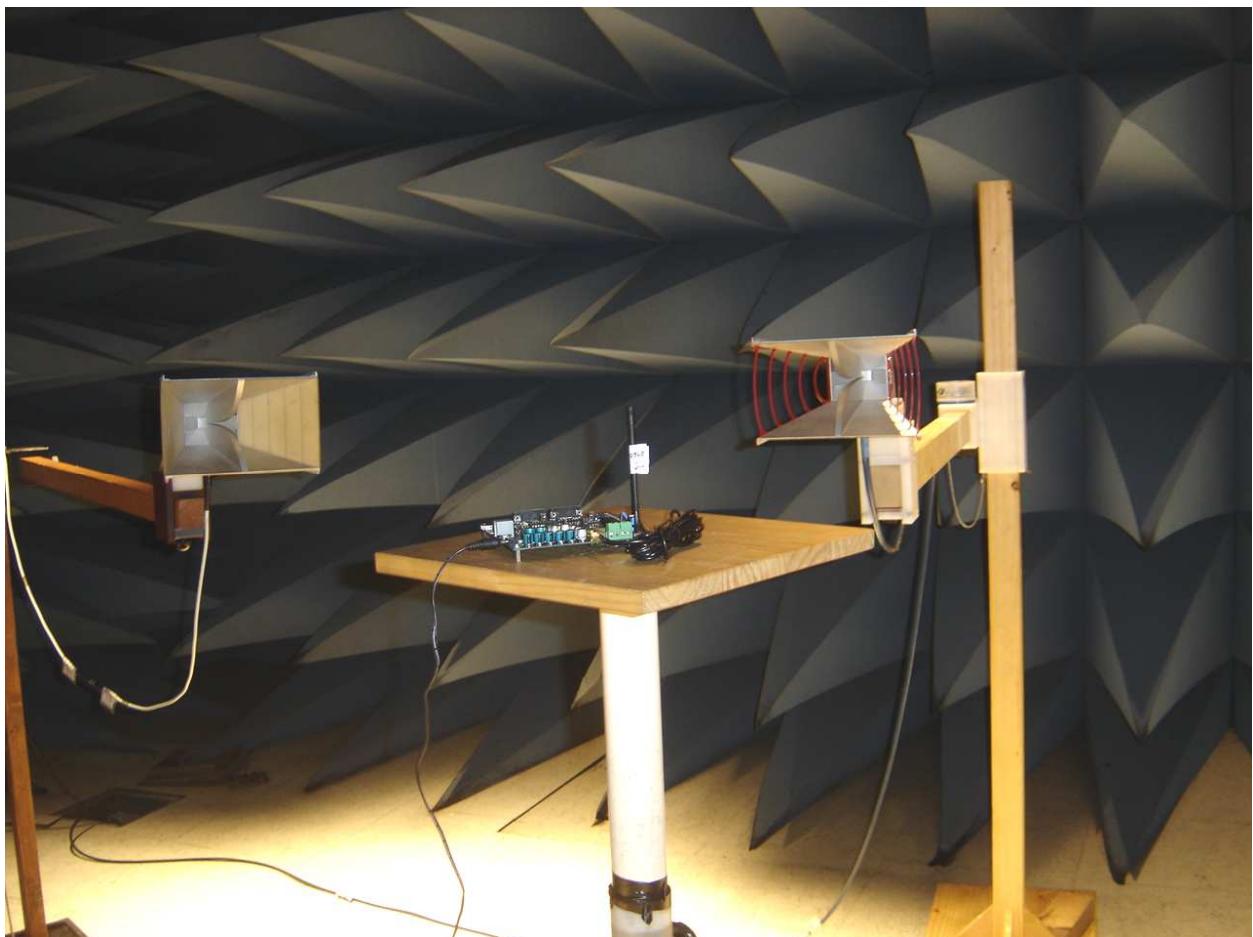
GENERAL SET-UP FOR RADIATED MEASUREMENTS



TEST SET-UP FOR RADIATED MEASUREMENTS BELOW 1 GHz



TEST SET-UP FOR RADIATED MEASUREMENTS ABOVE 1GHz



TEST SET-UP FOR CONDUCTED MEASUREMENTS

