FCC LISTED, REGISTRATION NUMBER: 905266 **IC LISTED REGISTRATION NUMBER IC 4621**	**AT4 wireless, S.A.** Parque Tecnológico de Andalucía, c/ Severo Ochoa nº 2 29590 Campanillas/ Málaga/ España Tel. 952 61 91 00 - Fax 952 61 91 13 MÁLAGA, C.I.F. A29 507 456 Registro Mercantil de Málaga,Tomo 1169, Libro 82, Folio 133, Hoja MA3729

TEST REPORT
REFERENCE STANDARD:
USA FCC Part 25

NIE ..... :	31473RET.001
Approved by (name / position & signature) ..... :	A. Llamas / RF Lab. Manager
Elaboration date ..... :	2010-06-29

Alejandro Llamas Rodríguez
Firmado digitalmente por Alejandro Llamas Rodríguez
Fecha: 2010.06.29 09:58:46 +02'00'

Identification of item tested ..... :	PDA with external satellite antenna
Trademark ..... :	Genus
Model and/or type reference ..... :	TSN-1.1
Serial number ..... :	Serial number (PSN): EBL 0002205
Other identification of the product ..... :	Commercial name: TERRESTAR GENUS HW version: PDA HWID 5.19.00, Ext Ant. HWID 20.10.01 SW version: SG65 FCC ID: OBW120897
Features ..... :	GSM850/GSM900/GSM1800/GSM1900/WCDMA FDD V/ WCDMA FDD II / GMR-1 3G / BT / WiFi / A-GPS
Description ..... :	PDA + External Satellite Antenna
Applicant ..... :	ELEKTROBIT INC.
Address ..... :	22745 29TH DRIVE SE, SUITE 200 BOTHELL, WASHINGTON 98021 USA
CIF/NIF/Passport ..... :	91-1746142
Contact person:	Tuomo Väinämö
Telephone / Fax ..... :	+358 40 3442000 / : +358 8 343 032
e-mail: ..... :	tuomo.vainamo@elektrobit.com
Test samples supplier ..... :	Same as applicant
Manufacturer ..... :	Same as applicant

Test method requested .....:	See Standard
Standard .....:	USA FCC Part 25 10-1-09 Edition: Clause 25.202 (f): Emission limitations (radiated). Clause 25.204 (a): Power Limits (radiated e.i.r.p.). Clause 25.216 (e): Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service.
Test procedure .....:	1. PEET000: Medidas de equipos radioeléctricos en condiciones radiadas.
Non-standardized test method .....:	N/A

Used instrumentation .....:

		Last Cal.	Cal. due date
1.	Semianechoic Absorber Lined Chamber IR 11. BS	N.A.	N.A.
2.	Control Chamber IR 12.BC	N.A.	N.A.
3.	Hybrid Bilog antenna Sunol Sciences Corporation JB6	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	2011-09
9.	Multi Device Controller EMCO 2090	N.A.	N.A.
10.	Spectrum Analyzer R&S ESU40	2009-11	2011-11
11.	Spectrum Analyzer Agilent E4440A	2010-02	2012-02
12.	Power amplifier AMF-4D-00400600-50-30P	2009-04	2011-04
13.	Log-Periodic antenna R&S HL 040	2009-10	2012-10
14.	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 conjuction 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 documents:

PODT000: : Procedimiento para el cálculo de incertidumbres de medida

FEM12_07: Formato de cálculo de incertidumbre a aplicar en la medida de la tensión perturbadora en bornes de alimentación según EN 55022.

Usage of samples

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

Sample M/01 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
30391/22	Mobile phone with integral antenna	TSN-1.1	EBL0002205	2009-12-21
31473/01	External satellite antenna	SC-A1	---	2010-05-13

1. Sample M/01 has undergone following test(s).
   Radiated tests indicated in appendix A.

Testing period

The performed test started on 2010-05-17 and finished on the same day.

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. = 22.7 ºC Max. = 23.1 ºC
Relative humidity	Min. = 41.2 % Max. = 43.5 %
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. = 21.3 ºC Max. = 22.4 ºC
Relative humidity	Min. = 50 % Max. = 52 %
Air pressure	Min. = 1018 mbar Max. = 1019 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).

Summary

Considering the results of the performed tests according to standards USA FCC Part 25, 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

1. The system does not support ATC (Ancillary Terrestrial Component).

2. Test not requested.

Testing verdicts

Not applicable ..... : NA

Pass..... : P

Fail ..... : F

Not measured..... : NM

FCC PART 25 PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 25.202 (d): Frequency tolerance				NM[2]
Clause 25.202 (f): Emission limitations. Emission mask				NM[2]
Clause 25.202 (f): Emission limitations (radiated)		P		
Clause 25.204 (a): Power Limits (radiated e.i.r.p.)		P		
Clause 25.216 (e): Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service		P		

2: See point "Remarks and comments"

APPENDIX A: Test results

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TEST CONDITIONS

Power supply (V):

V_{nom} = 3.7 Vdc

V_{max} = N/A

V_{min} = N/A

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 rechargeable Li-ion polymer battery

Type of antenna = External attachable antenna

TEST FREQUENCIES:

Lowest channel:

2000.015625 MHz for 31.25 kHz bandwidth

2000.03125 MHz for 62.5 kHz bandwidth

2000.078125 MHz for 156.25 kHz bandwidth

Middle channel:

2009.984375 MHz for 31.25 kHz bandwidth

2010.00000 MHz for 62.5 kHz bandwidth

2009.984375 MHz for 156.25 kHz bandwidth

Highest channel:

2019.984375 MHz for 31.25 kHz bandwidth

2019.968750 MHz for 62.5 kHz bandwidth

2019.921875 MHz for 156.25 kHz bandwidth

The Equipment Under Test (EUT) is set in continuous transmission in the above indicated channels with different modulation modes and nominal bandwidths using a PC laptop and AT commands.

Power limits (radiated e.i.r.p.)

SPECIFICATION

§25.204 (a)

In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

+40 dBW (70 dBm) in any 4 kHz band for θ <= 0º
+40 + 3 θ dBW in any 4 kHz band for 0º < θ <= 5º

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

METHOD

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 connected to a spectrum analyser. The EUT is set in continuous transmission with different modes of modulation and nominal bandwidths. The orientation of the EUT is varied for maximum output power.

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

The resolution bandwidth used is 3 kHz and an additional correction of 1.25 dB (10*log 4/3) is added to extrapolate the result for 4 kHz measurement bandwidth.

RESULTS

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

π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

Substitution method data

Frequency (MHz) at max. reading	Max. Instrument reading (dBm)	Polarization	(1) Generator +power amplifier output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)	E.I.R.P. (dBm) corrected for 4 kHz BW
2000.0093	-5.59	Horizontal	21.06	0.9	7.65	27.81	29.06
2009.9895	-5.64	Horizontal	21.01	0.9	7.65	27.76	29.01
2019.9897	-5.66	Horizontal	21.09	0.9	7.65	27.84	29.09

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	29.06	29.01	29.09
Maximum peak power (W)	0.81	0.80	0.81
Measurement uncertainty (dB)	± 4.0		

π/4 QPSK modulation and nominal bandwidth of 31.25 kHz
Substitution method data

Frequency (MHz) at max. reading	Max. Instrument reading (dBm)	Polarization	(1) Generator +power amplifier output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)	E.I.R.P. (dBm) corrected for 4 kHz BW
2000.0084	-5.60	Horizontal	21.05	0.9	7.65	27.80	29.05
2009.9928	-5.42	Horizontal	21.23	0.9	7.65	27.98	29.23
2019.9931	-6.14	Horizontal	20.61	0.9	7.65	27.36	28.61

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	29.05	29.23	28.61
Maximum peak power (W)	0.80	0.84	0.73
Measurement uncertainty (dB)	± 4.0		

π/4 QPSK modulation and nominal bandwidth of 62.5 kHz
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)	E.I.R.P. (dBm) corrected for 4 kHz BW
2000.0481	-6.55	Horizontal	20.10	0.9	7.65	26.85	28.10
2010.0105	-7.32	Horizontal	19.33	0.9	7.65	26.08	27.33
2019.9640	-7.60	Horizontal	19.15	0.9	7.65	25.90	27.15

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	28.10	27.33	27.15
Maximum peak power (W)	0.65	0.54	0.52
Measurement uncertainty (dB)	± 4.0		

π/4 QPSK modulation and nominal bandwidth of 156.25 kHz
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)	E.I.R.P. (dBm) corrected for 4 kHz BW
2000.0797	-9.22	Horizontal	17.43	0.9	7.65	24.18	25.43
2009.9635	-9.43	Horizontal	17.22	0.9	7.65	23.97	25.22
2019.9194	-9.86	Horizontal	16.89	0.9	7.65	23.64	24.89

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	25.43	25.22	24.89
Maximum peak power (W)	0.35	0.33	0.31
Measurement uncertainty (dB)	± 4.0		

Emission limitations. Radiated emissions

SPECIFICATION

§ 25.202 (f)

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, using a resolution bandwidth of 10 kHz in the range 30 MHz to 1 GHz and 100 kHz in the range 1 GHz to 25 GHz.
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.
Each detected emissions were substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-C: 2004.

The resolution bandwidth used for measuring each emission peak detected is 3 kHz and an additional correction of 1.25 dB (10*log 4/3) is added to the instrument reading to extrapolate the result for 4 kHz measurement bandwidth.

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

Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = - 13 dBm

RESULTS

Preliminary tests were done with the equipment operating with the different possible modulations and bandwidths and the worst case was for π/2 BPSK modulation and nominal bandwidth of 31.25 kHz. Results shown below correspond to π/2 BPSK modulation and nominal bandwidth of 31.25 kHz.

1. CHANNEL: LOWEST

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-25 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)	E.I.R.P. (dBm) corrected for 4 kHz BW
4000.0193	-55.74	Vertical	-51.44	1.40	10.00	-42.84	-41.59
6000.0279	-60.68	Horizontal	-53.58	1.70	10.20	-45.08	-43.83

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-25 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)	E.I.R.P. (dBm) corrected for 4 kHz BW
4019.9563	-55.51	Vertical	-51.21	1.40	10.00	-42.61	-41.36
6030.9328	-62.52	Horizontal	-55.42	1.70	10.20	-46.92	-45.67

3. CHANNEL: HIGHEST

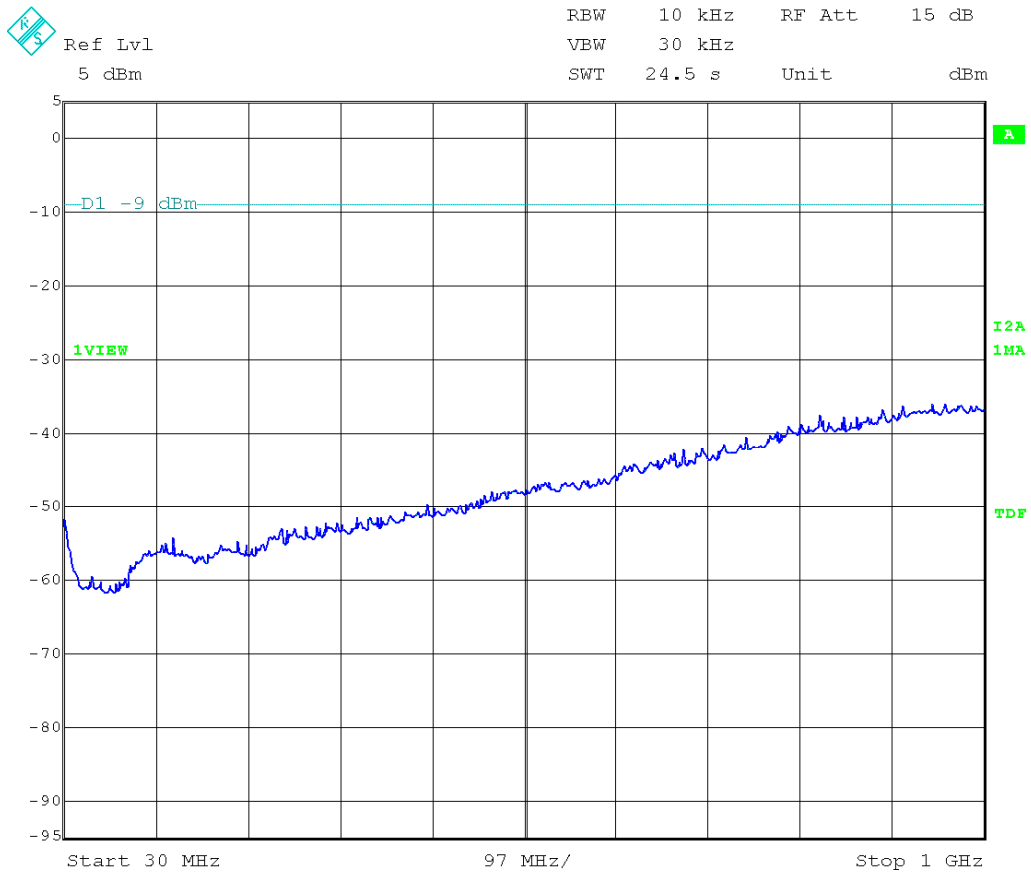
Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-25 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)	E.I.R.P. (dBm) corrected for 4 kHz BW
4039.9799	-54.86	Vertical	-50.56	1.40	10.00	-41.96	-40.71
6059.9339	-62.82	Horizontal	-55.72	1.70	10.20	-47.22	-45.97

FREQUENCY RANGE 30 MHz-1000 MHz.

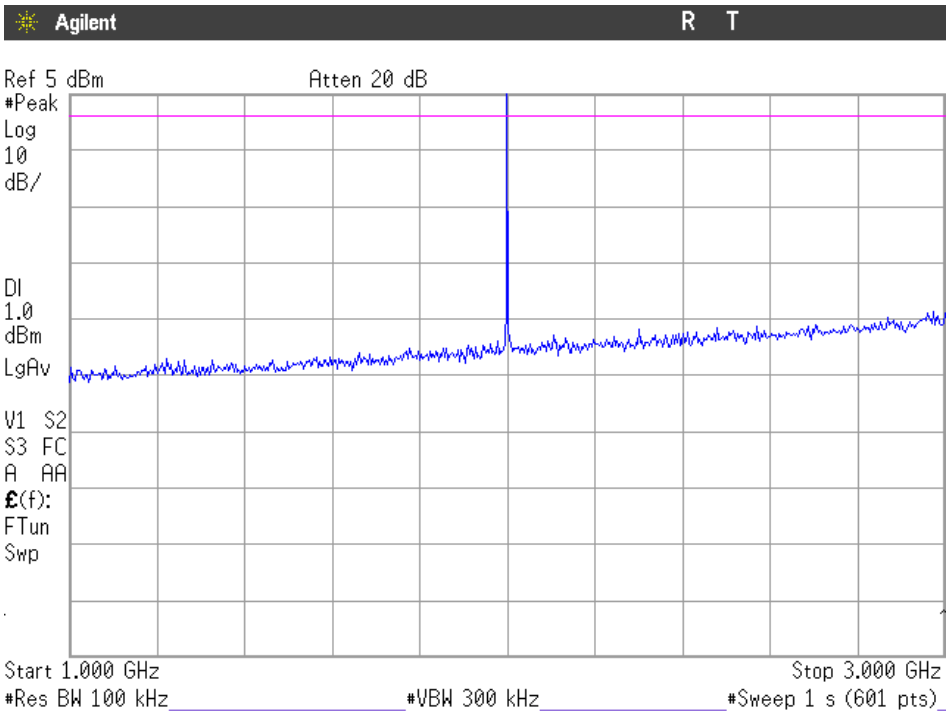


Note: The limit shown in the plot is extrapolated for 10 kHz measurement bandwidth.

(This plot is valid for all three channels)

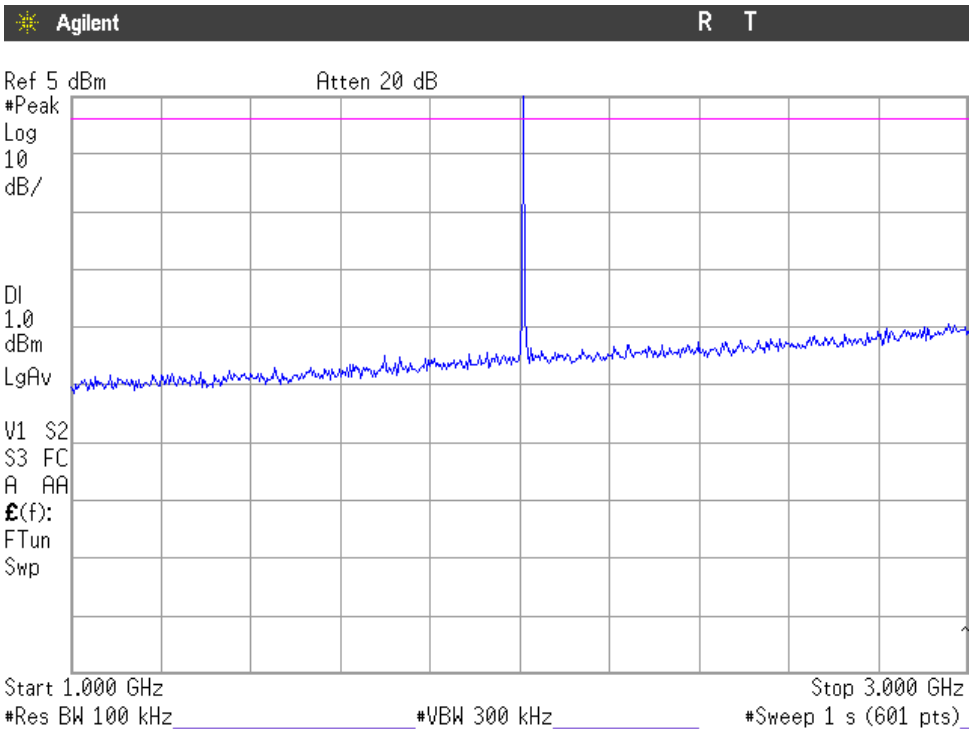
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: LOWEST



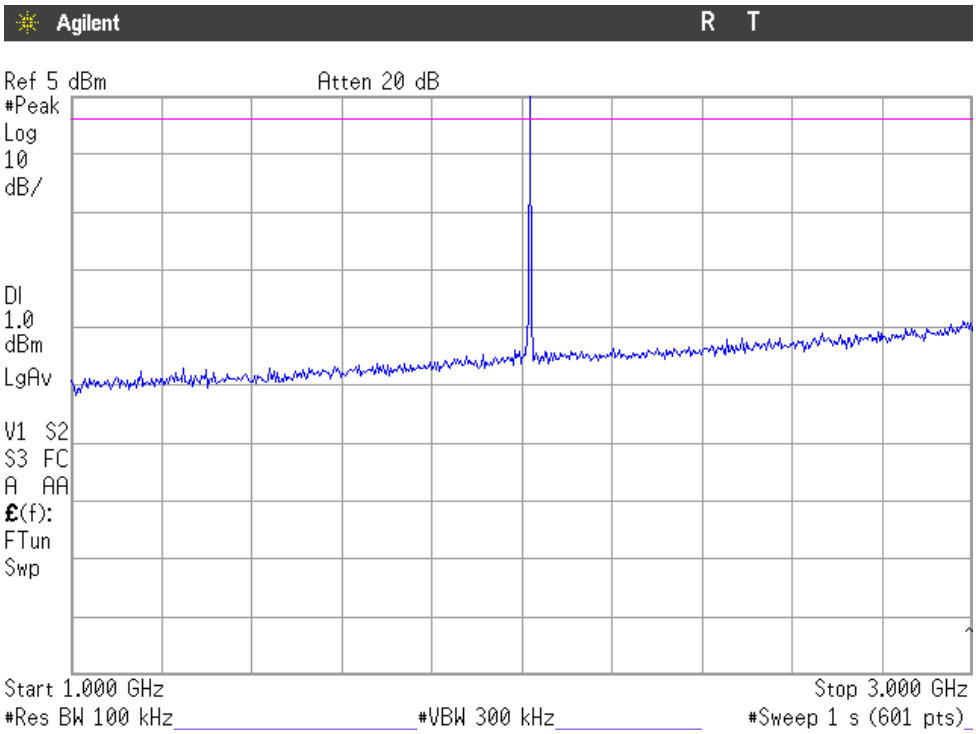
Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

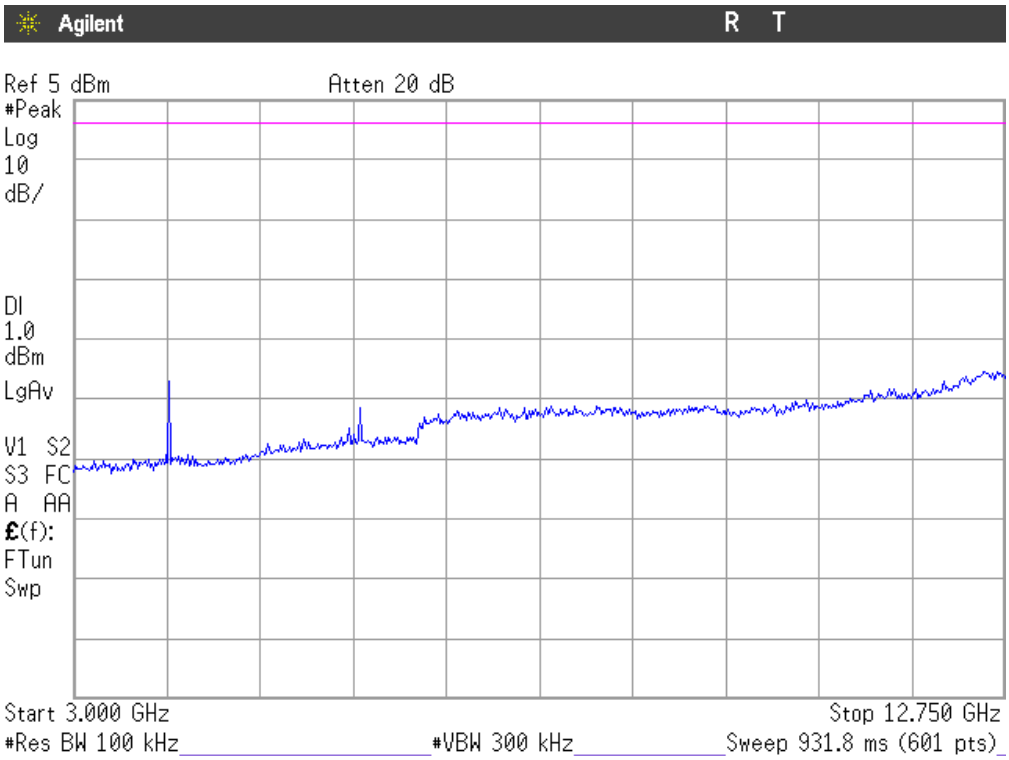
CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

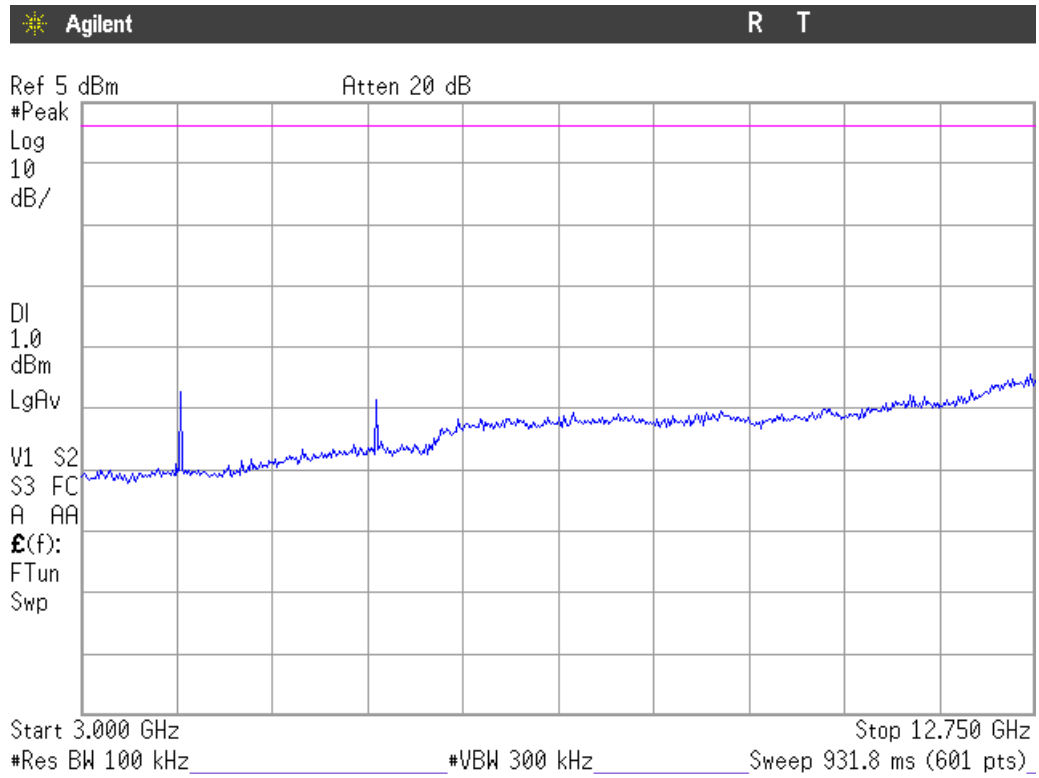
FREQUENCY RANGE 3 GHz to 12.75 GHz.

CHANNEL: LOWEST



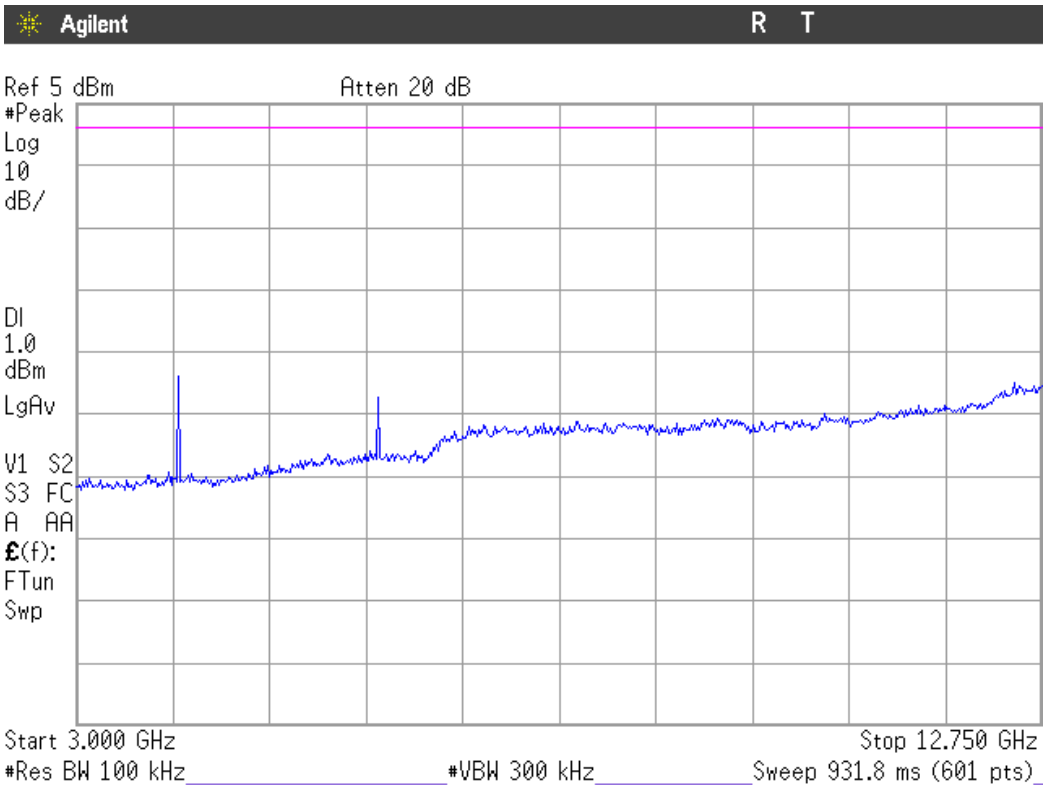
Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

CHANNEL: MIDDLE



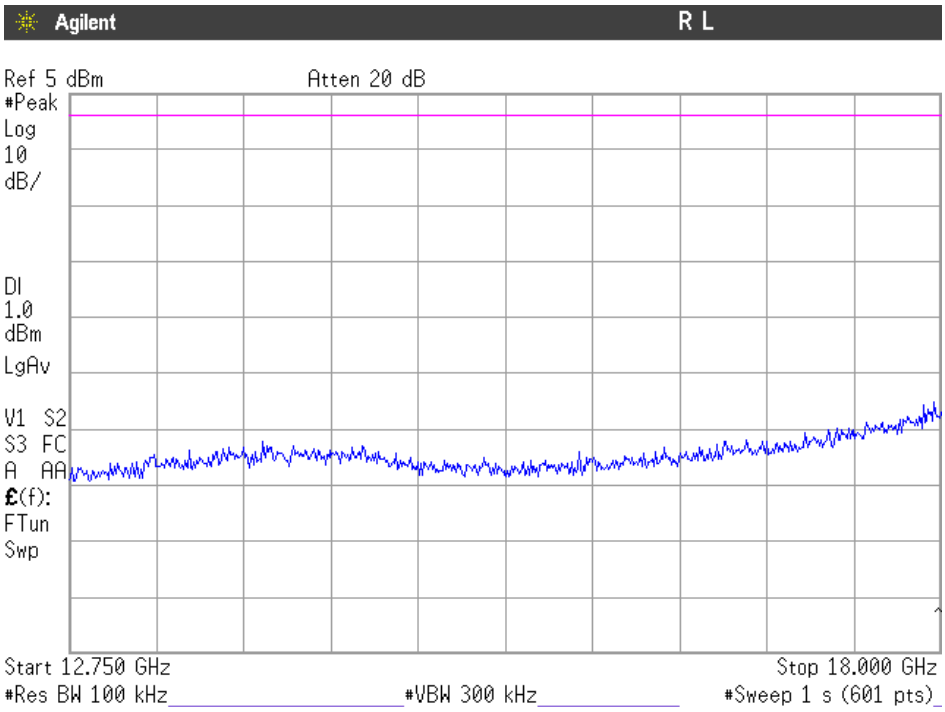
Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

CHANNEL: HIGHEST



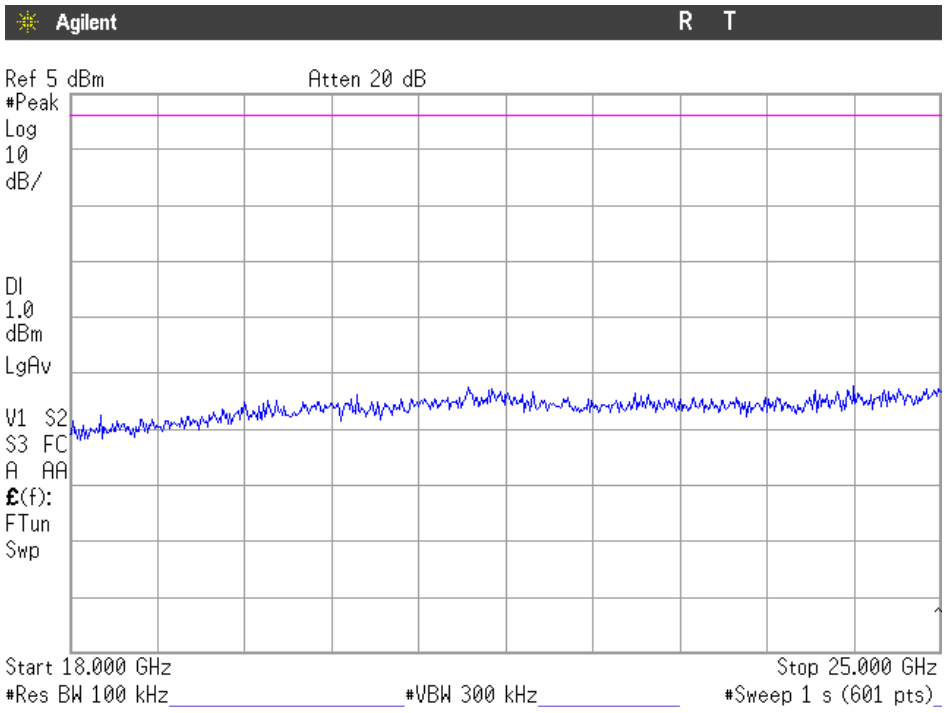
Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

FREQUENCY RANGE 12.75 GHz TO 18 GHz.



Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth. (This plot is valid for all three channels).

FREQUENCY RANGE 18 GHz TO 25 GHz.



Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth. (This plot is valid for all three channels).

Limits on emissions from mobile earth stations for protection of aeronautical radionavigation satellite service

SPECIFICATION

§ 25.216 (e)

METHOD

The measurement was performed with the EUT inside an anechoic chamber. The EUT is set in continuous transmission with different modes of modulation and nominal bandwidths.

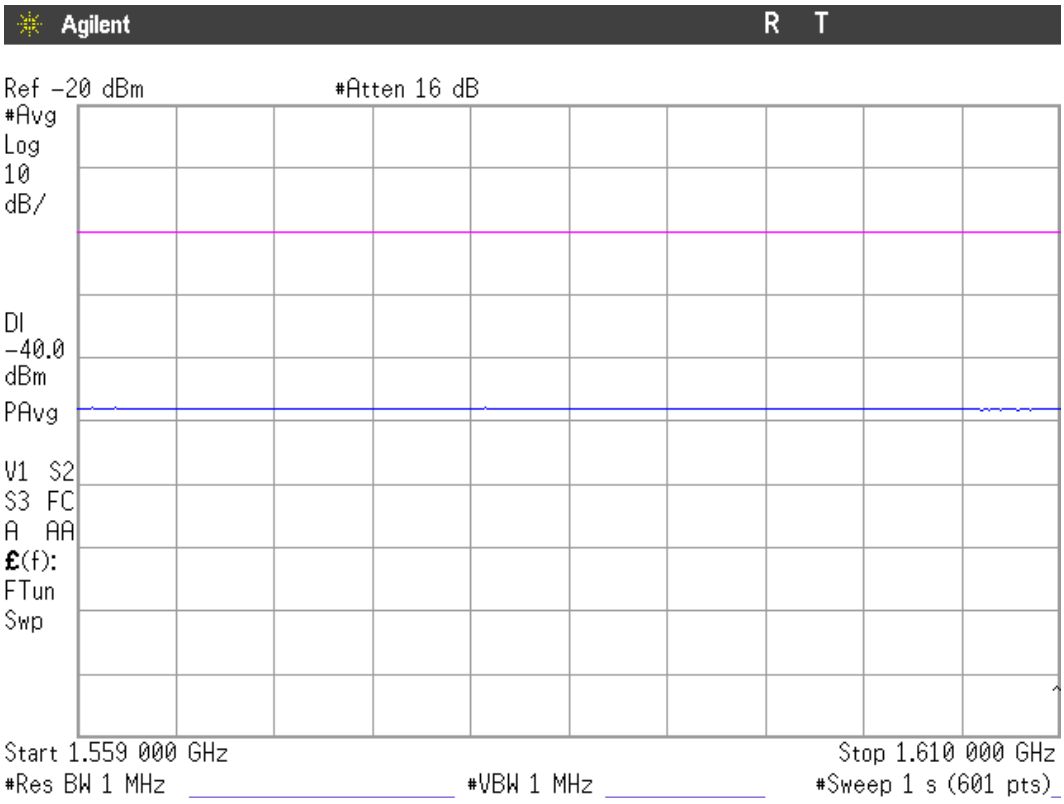
The spectrum was investigated in the range of frequencies between 1559 MHz and 1610 MHz.
The EUT was placed on a 1 meter high non-conductive stand and at a 1 m distance from the measuring antenna.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.
Each detected emissions were substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-C: 2004.

RESULTS

1. CHANNEL: LOWEST
No spurious signals were found in all the range for all modulation modes.

2. CHANNEL: MIDDLE
No spurious signals were found in all the range for all modulation modes.

3. CHANNEL: HIGHEST
No spurious signals were found in all the range for all modulation modes.

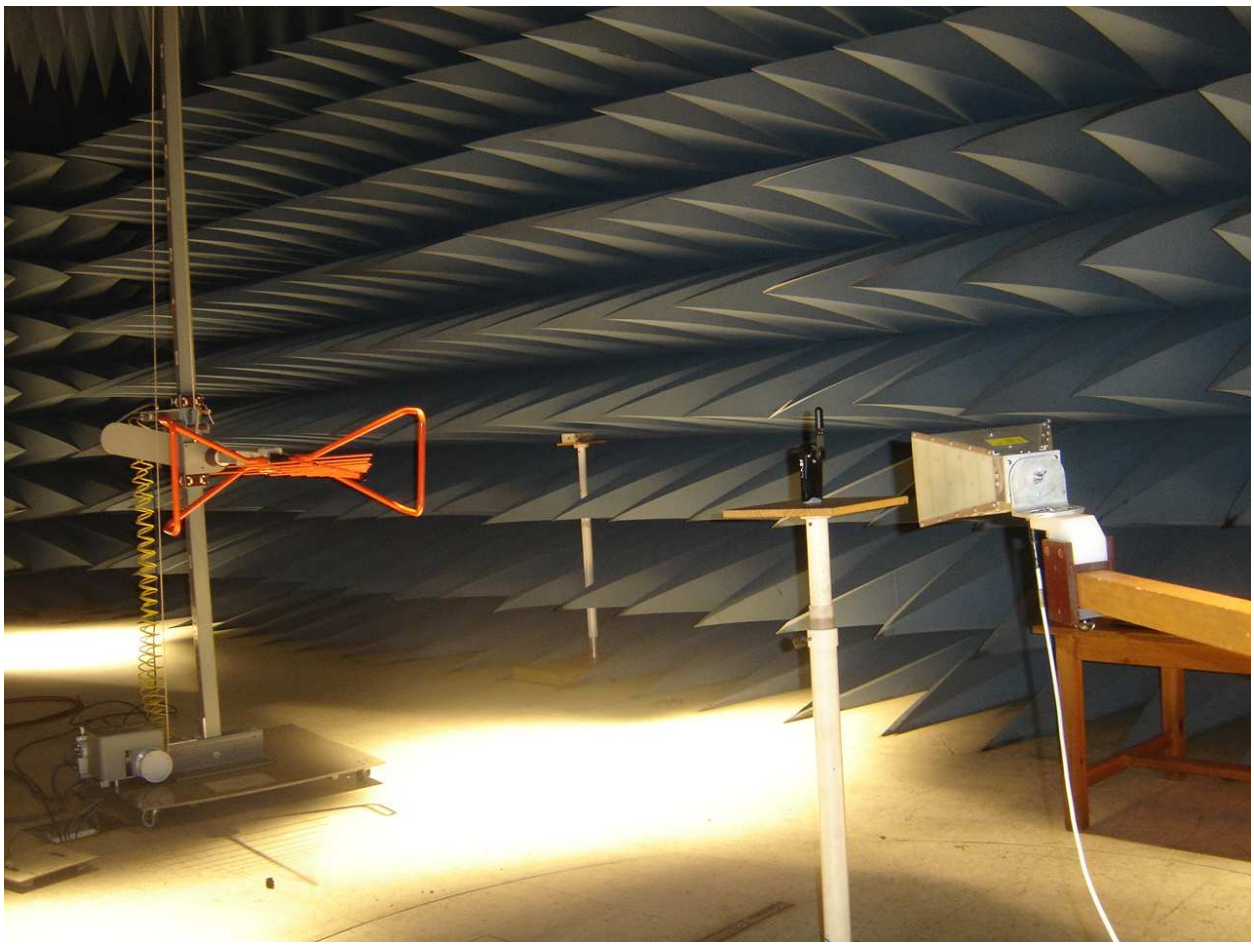


(This plot is valid for all three channels and all modulation modes)

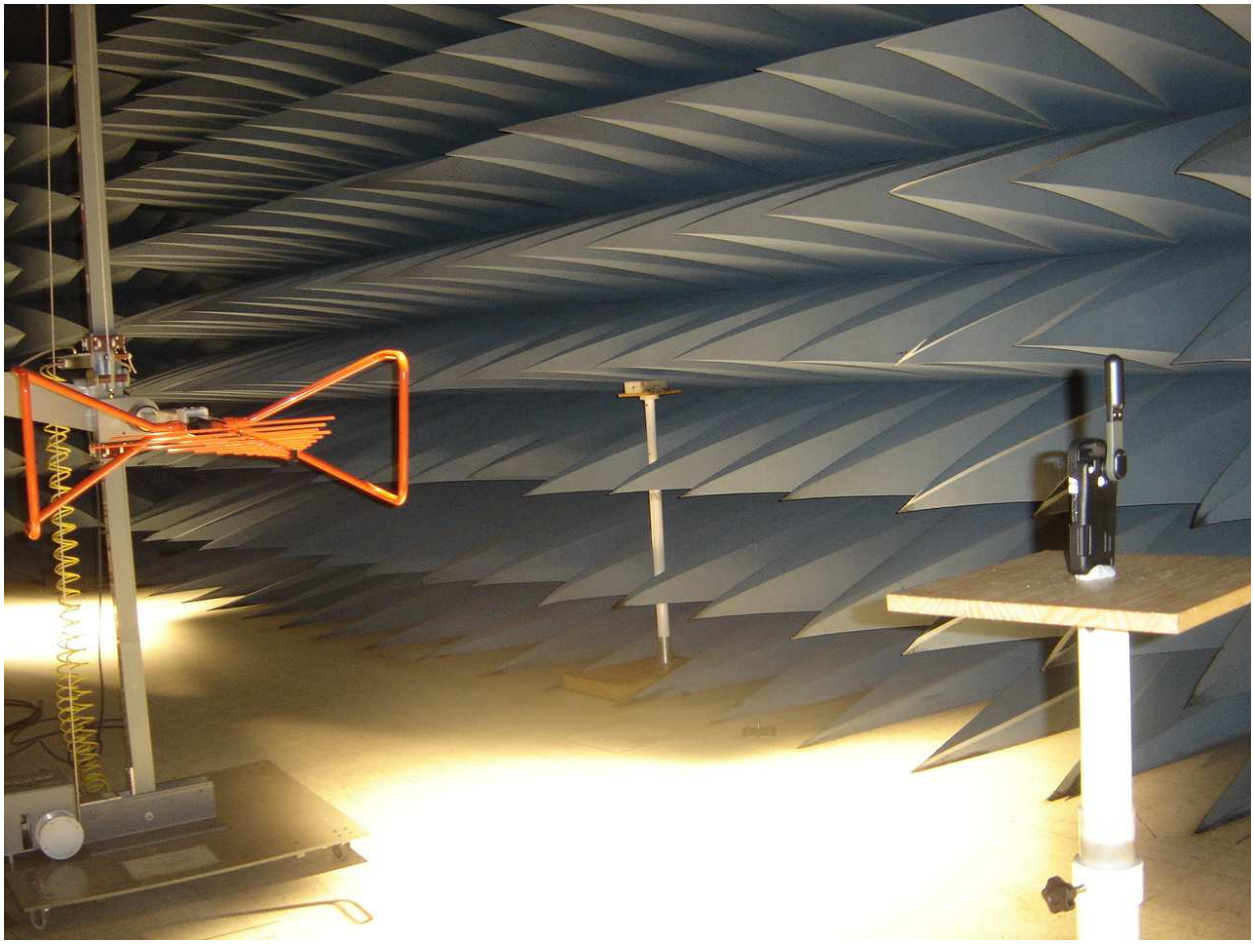
APPENDIX B: Photographs


Terra Star
GENUS
OK
FABER-CASTELL


AT4 wireless, S.A.
31473
1
FABER-CASTELL



TEST SET-UP FOR RADIATED MEASUREMENTS BELOW 1 GHz



TEST SET-UP FOR RADIATED MEASUREMENTES ABOVE 1GHz