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 and 15.207

NIE ..... :	30931RET.001
Approved by (name / position & signature) ..... :	A. Llamas / RF Lab. Manager
Elaboration date ..... :	19/01/2010

Alejandro Llamas Rodríguez
Firmado digitalmente por Alejandro Llamas Rodríguez
Fecha: 2010.01.19 12:32:45 +01'00'

Identification of item tested ..... :	PDA
Trademark ..... :	Genus
Model and/or type reference ..... :	TSN-1.1
Serial number ..... :	Serial number (PSN): EBL0002154, EBL 0002205
Other identification of the product ..... :	Commercial name: TERRESTAR GENUS FCC ID: OBW120897 IC: 3282A-120897
Features ..... :	GSM850/GSM900/GSM1800/GSM1900/WCDMA FDD V/ WCDMA FDD II / GMR-1 3G / BT / WiFi / A-GPS
Description ..... :	PDA

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 10-1-08 Edition
	USA FCC Part 15.207 07-10-08 Edition: Conducted limits
Test procedure .....:	1. PEET000: Medidas de equipos radioeléctricos en condiciones radiadas.
	2. PEET003: Medidas conducidas de equipos radioeléctricos.
	3. PEEM002: Medida de la emisión conducida según EN55022.
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	2008-01	2010-01
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
15.	Transient limiter. HP 11947A	2007-01	2010-01
16.	Line Impedance Stabilization Network (L.I.S.N.) R&S. ESH2-Z5	2008-01	2010-01

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

Sample M/02 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
30391/05	Mobile phone with antenna connector	TSN-1.1	EBL0002154	2009-12-21
29742/19	Dummy battery	---	---	2009-09-28

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
30931/22	PDA (FF3.), R&D (SAT FCC)	TSN1.1	EBL0002205	2009-12-21
30931/15	PDA Battery cover	---	---	2009-12-21
30931/09	Battery	---	001014	2009-12-21
29742/74	AC/DC adapter	---	---	2009-11-09

Sample S/04 (Computer Peripheral device mode) is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
30931/22	PDA (FF3.), R&D (SAT FCC)	TSN1.1	EBL0002205	2009-12-21
30931/15	PDA Battery cover	---	---	2009-12-21
30931/09	Battery	---	001014	2009-12-21
29742/64	USB cable	---	---	2009-11-02

With the sample S/04 it was used the next auxiliary element:

Control Nº	Description	Manufacturer	Model	Serial Nº	Date of reception
---	Tabletop mounted tower PC	Cofiman	---	---	Property of AT4 wireless.
---	Keyboard	Logitech	Deluxe keyboard	867640 0104	Property of AT4 wireless.
---	Mouse	---	CLLMEASY	08040 1626	Property of AT4 wireless.
---	Monitor	Philips	170S	BZ000544231961	Property of AT4 wireless.
---	Serial/parallel ports loads	---	---	---	Property of AT4 wireless.

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

2. Sample M/02 has undergone following test(s).
   All tests indicated in appendix A, except radiated tests.

3. Samples S/02 & S/04 have undergone the next test(s):
   Continuous conducted emission, power leads, in appendix B.

Testing period

The performed test started on 2009-12-21 and finished on. 2009-12-28.

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. = 23.3 ºC Max. = 24.4 ºC
Relative humidity	Min. = 53.9 % Max. = 60.9 %
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. = 22.4 ºC Max. = 23.2 ºC
Relative humidity	Min. = 59.4 % Max. = 61.3 %
Air pressure	Min. = 1016 mbar Max. = 1016 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. = 24.3 ºC Max. = 25.6 ºC
Relative humidity	Min. = 51.3 % Max. = 52.6 %
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 25 and 15.207, 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)

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		P		
Clause 25.202 (f): (1-3): Emission limitations		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		

FCC PART 15 PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 15.207. Conducted limits		P		

APPENDIX A: Test results

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TEST CONDITIONS

Power supply (V):

V_{nom} = 3.7 Vdc

V_{max} = 4.2Vdc

V_{min} = 3.5 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 rechargeable Li-ion polymer battery

Type of antenna = Integral 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.

Occupied Bandwidth

SPECIFICATION

§2.1049

METHOD

The EUT was configured to transmit a modulated carrier signal. An IF bandwidth of 1 kHz was used for modulation π/2 BPSK and nominal bandwidth of 31.25 kHz, π/4 QPSK and nominal bandwidth of 31.25 kHz, and π/4 QPSK and nominal bandwidth of 62.5 kHz. An IF bandwidth of 2 kHz was used for modulation π/4 QPSK and nominal bandwidth of 156.25 kHz.

The 99 % and -26 dB bandwidth are measured with the built in function of the spectrum analyser (see next plots)

RESULTS

π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

Channel	Lowest	Middle	Highest
99% bandwidth (kHz)	27.35	27.15	27.42
-26 dB bandwidth (kHz)	31.53	31.59	31.77
Measurement uncertainty (kHz)	<±6.5		

π/4 QPSK modulation and nominal bandwidth of 31.25 kHz

Channel	Lowest	Middle	Highest
99% bandwidth (kHz)	28.02	28.04	27.99
-26 dB bandwidth (kHz)	31.84	31.96	32.01
Measurement uncertainty (kHz)	<±6.5		

π/4 QPSK modulation and nominal bandwidth of 62.5 kHz

Channel	Lowest	Middle	Highest
99% bandwidth (kHz)	55.01	55.60	55.52
-26 dB bandwidth (kHz)	63.39	62.99	63.87
Measurement uncertainty (kHz)	<±6.5		

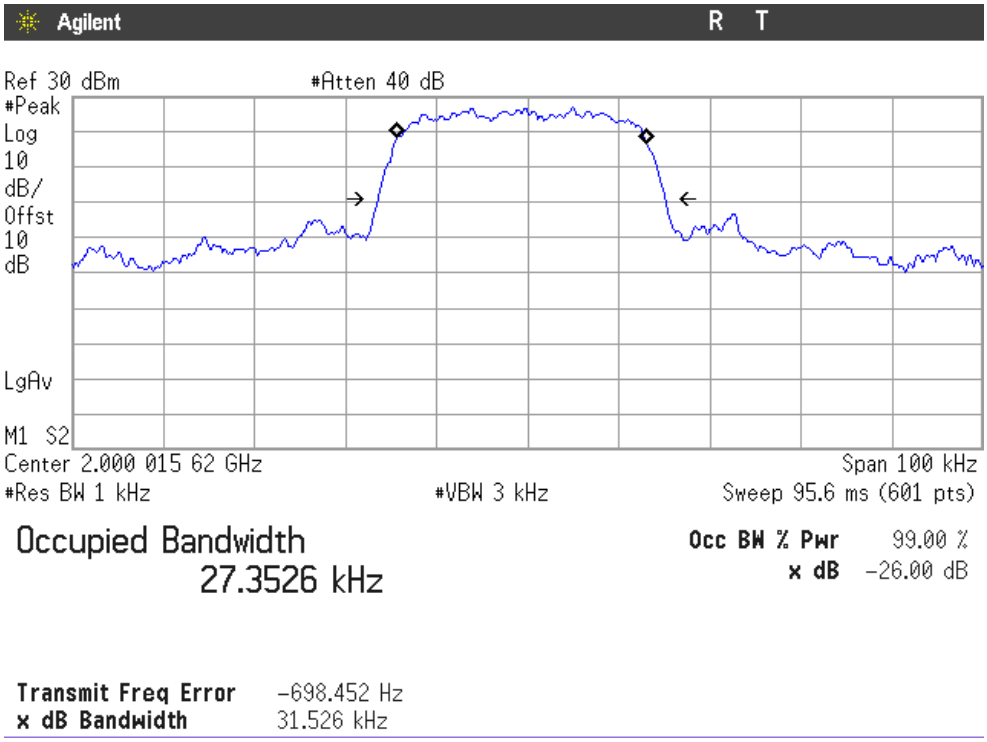
π/4 QPSK modulation and nominal bandwidth of 156.25 kHz

Channel	Lowest	Middle	Highest
99% bandwidth (kHz)	138.34	138.07	137.63
-26 dB bandwidth (kHz)	157.33	158.40	158.69
Measurement uncertainty (kHz)	<±6.5		

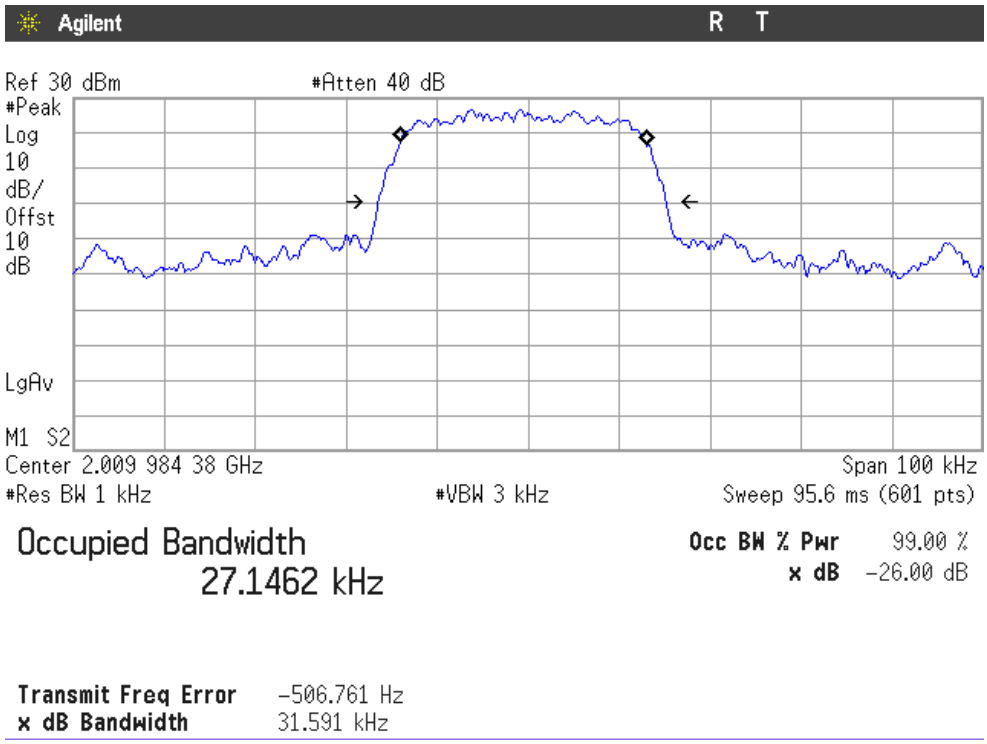
99% OCCUPIED BANDWIDTH

π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

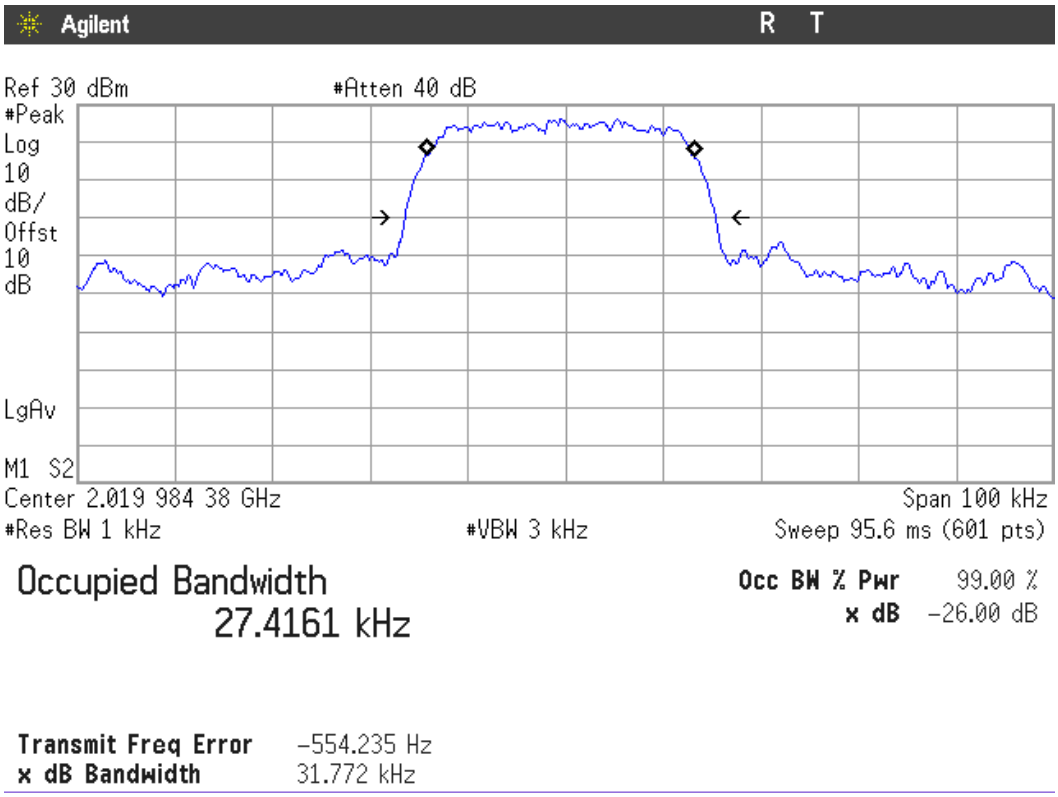
Lowest Channel



Middle Channel

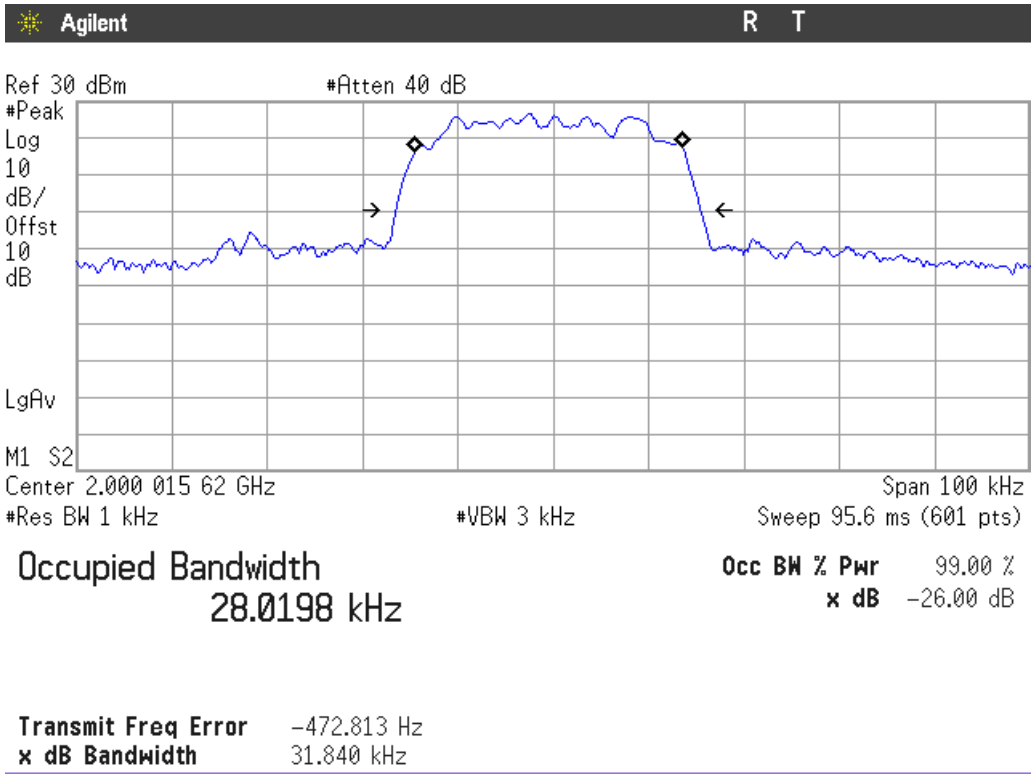


Highest Channel

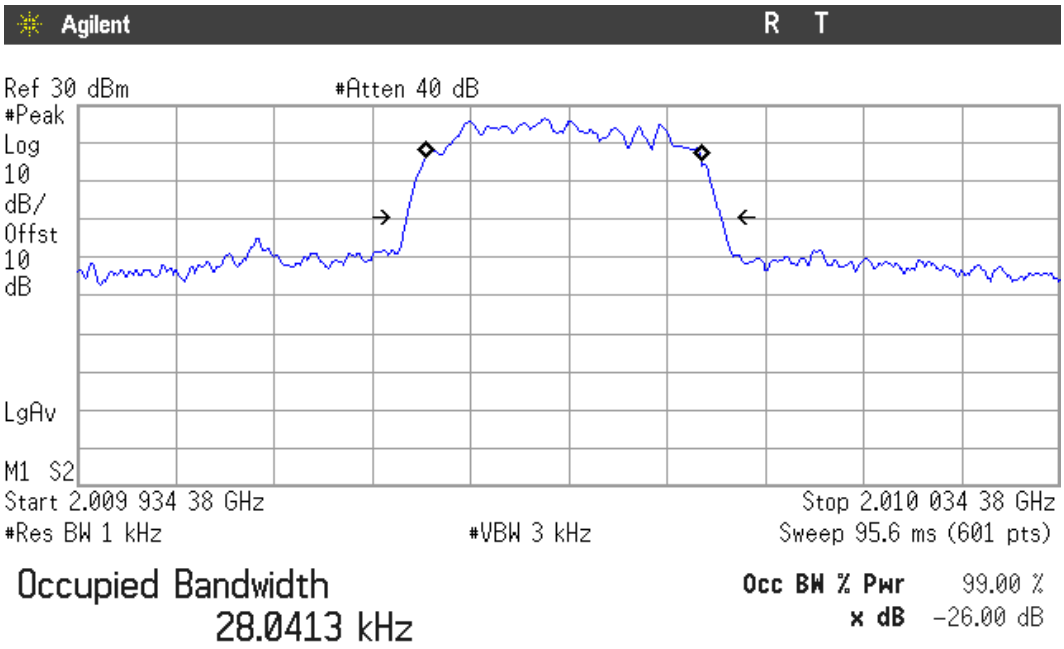


π/4 QPSK modulation and nominal bandwidth of 31.25 kHz

Lowest Channel



Middle Channel



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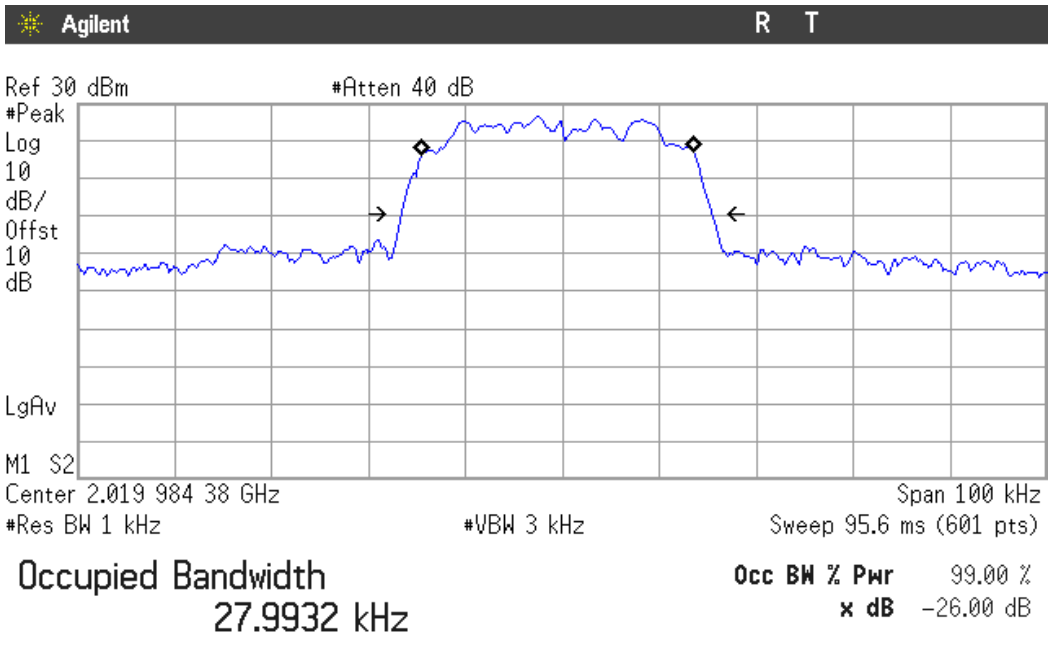
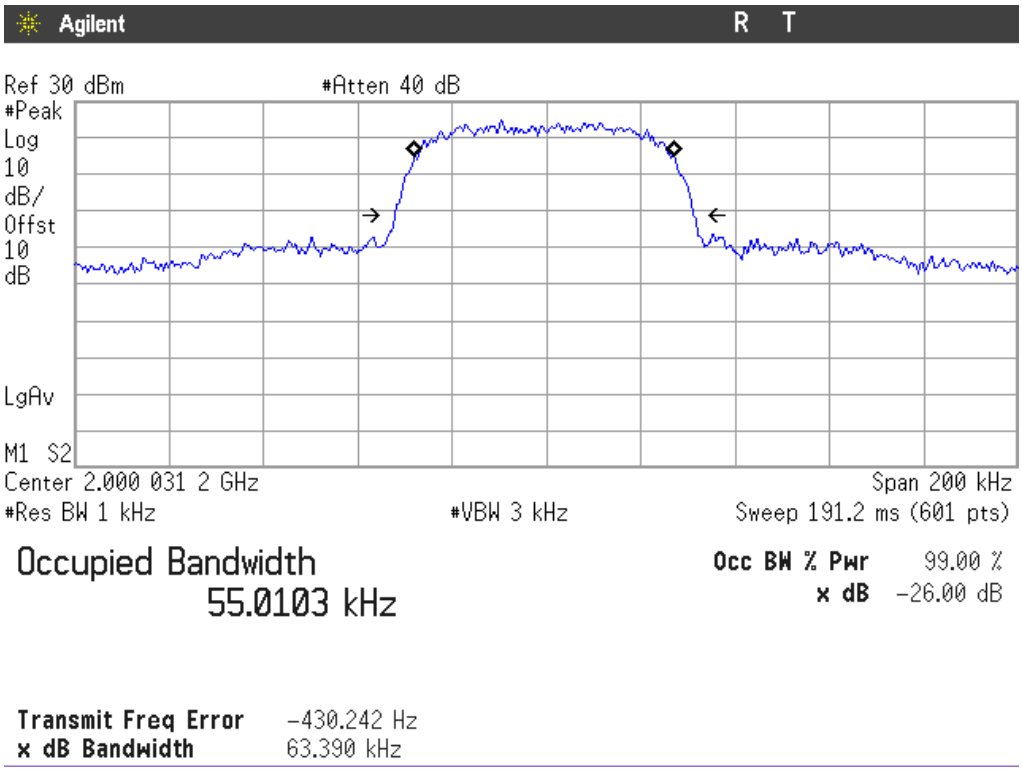
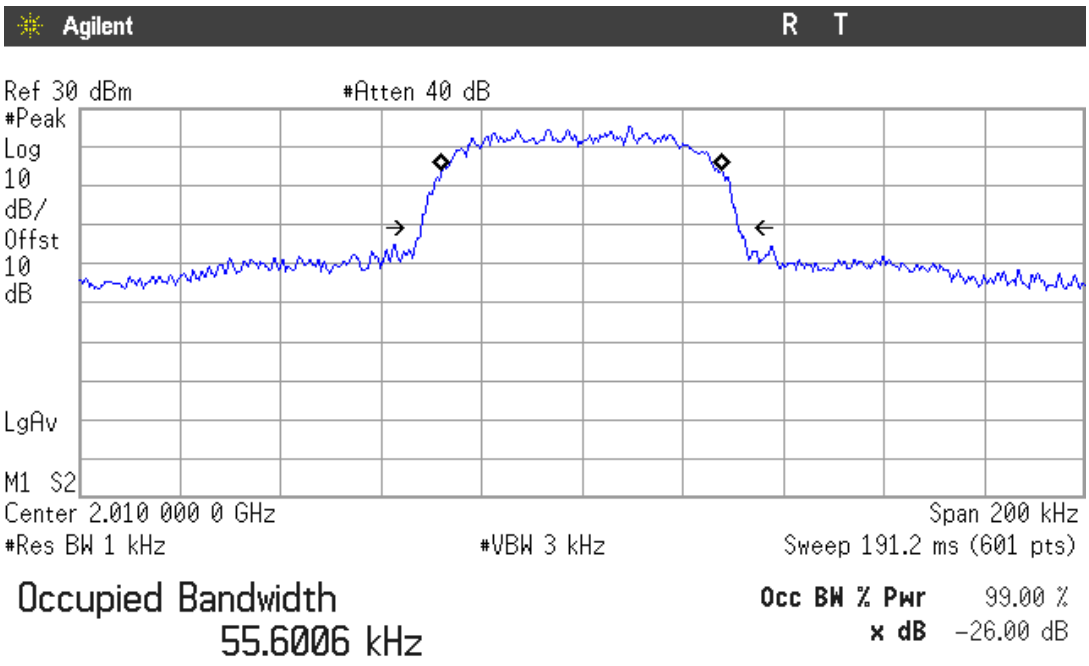


π/4 QPSK modulation and nominal bandwidth of 62.5 kHz

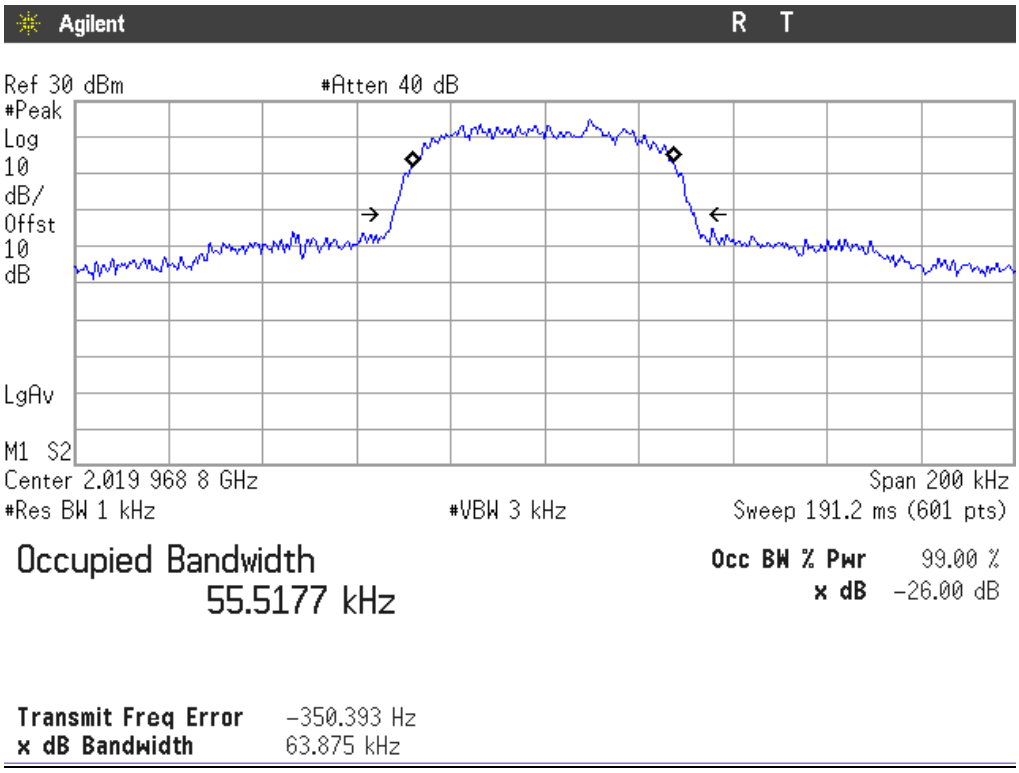
Lowest Channel



Middle Channel

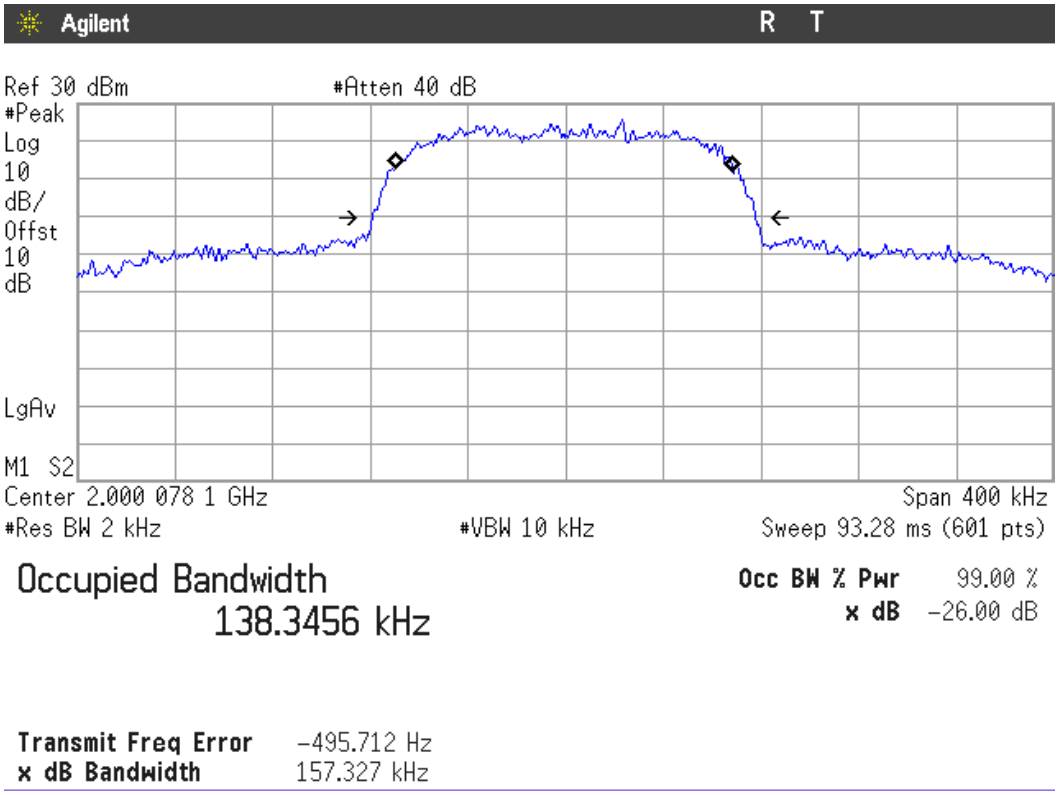


Highest Channel

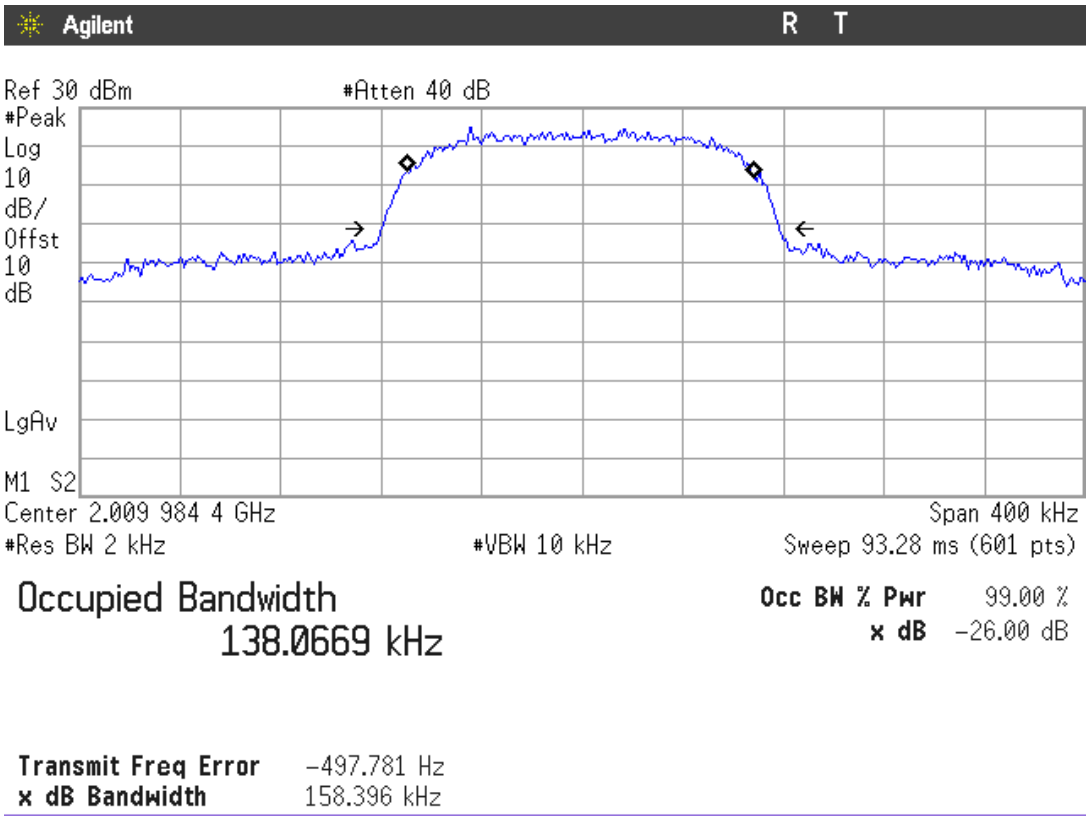


π/4 QPSK modulation and nominal bandwidth of 156.25 kHz

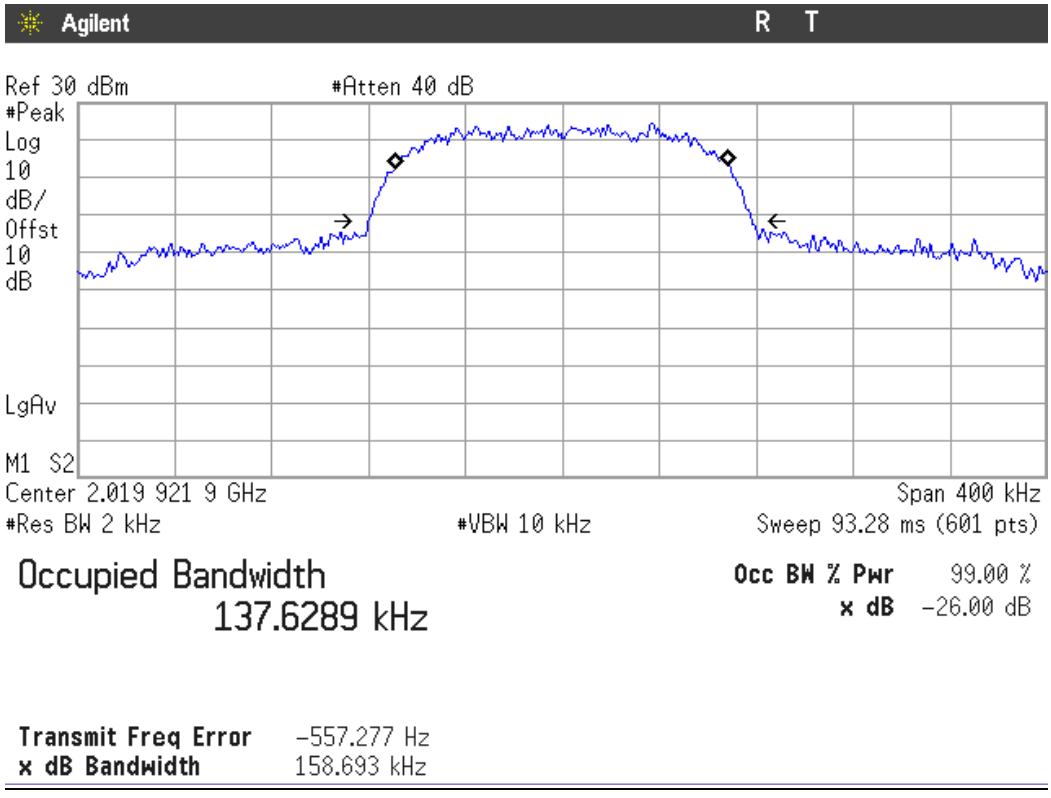
Lowest Channel



Middle Channel



Highest Channel



Frequency Tolerance

SPECIFICATION

§2.1055 and §25.202(d)

The carrier frequency of each earth station transmitter shall be maintained within 0.001 percent (10 ppm) of the reference frequency.

METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of –30ºC to +50ºC. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10ºC steps from –30ºC up to +50ºC.

The EUT was set in continuous transmission without modulation (continuous wave), in the middle channel and the maximum frequency error was measured using a spectrum analyser.

RESULTS

Frequency stability over temperature variations.

Frequency measured at ambient temperature: 2009.983709 MHz (Reference).

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
+50	150	0.0746	0.00000746
+40	131	0.0652	0.00000652
+30	41	0.0204	0.00000204
+20	-168	-0.0836	-0.00000836
+10	-240	-0.1194	-0.00001194
0	-354	-0.1761	-0.00001761
-10	-352	-0.1751	-0.00001751
-20	-380	-0.1891	-0.00001891
-30	-587	-0.2920	-0.00002920

Frequency stability over voltage variations.

Frequency measured at ambient temperature: 2009.983709 MHz (Reference).

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	4.2	-69	-0.0343	-0.00000343
Vmin	3.5	-64	-0.0318	-0.00000318

RF Output Power (conducted.)

SPECIFICATION

§2.1046

METHOD

The conducted RF output power measurements were made at the RF output terminals of the EUT using an attenuator and a spectrum analyser. The EUT was set in continuous transmission and different modes of modulation and nominal bandwidths.

RESULTS

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

π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	32.92	32.55	32.27
Maximum peak power (W)	1.96	1.80	1.69
Measurement uncertainty (dB)	±0.5		

π/4 QPSK modulation and nominal bandwidth of 31.25 kHz

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	33.19	32.89	32.82
Maximum peak power (W)	2.08	1.94	1.91
Measurement uncertainty (dB)	±0.5		

π/4 QPSK modulation and nominal bandwidth of 62.5 kHz

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	33.36	33.09	32.79
Maximum peak power (W)	2.17	2.04	1.90
Measurement uncertainty (dB)	±0.5		

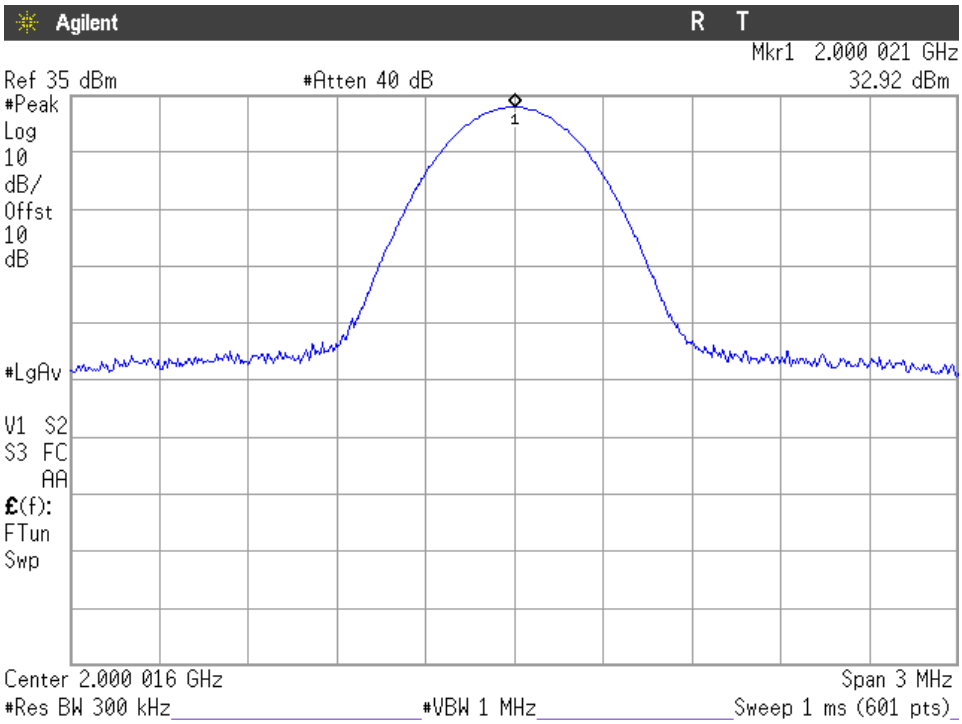
π/4 QPSK modulation and nominal bandwidth of 156.25 kHz

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	33.47	33.28	33.0
Maximum peak power (W)	2.22	2.13	2.00
Measurement uncertainty (dB)	±0.5		

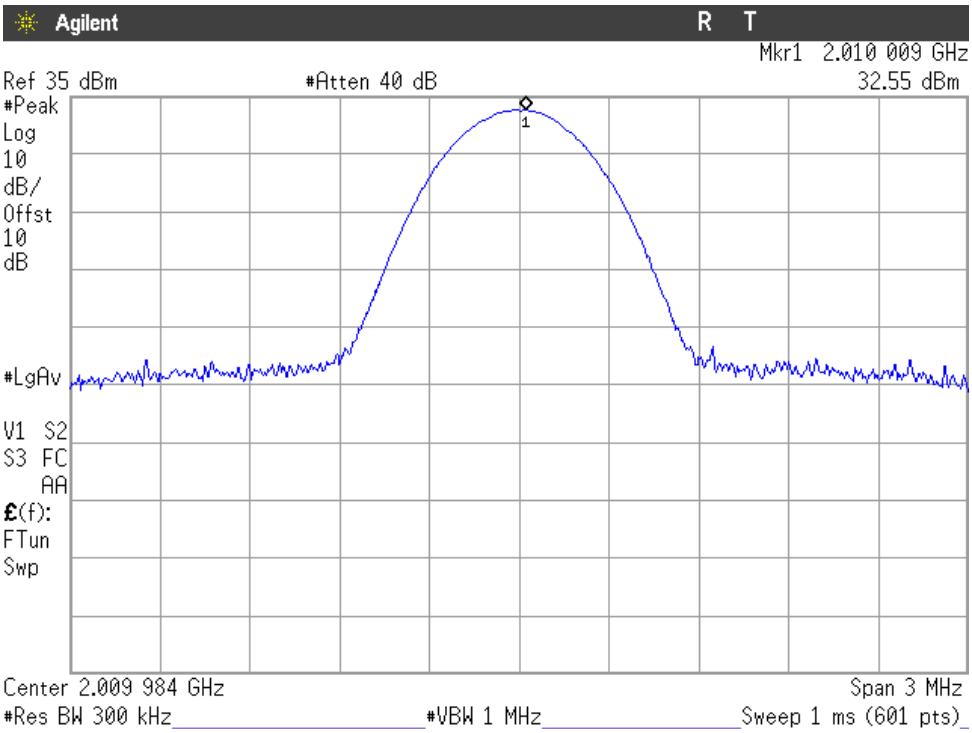
PEAK OUTPUT POWER (CONDUCTED).

π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

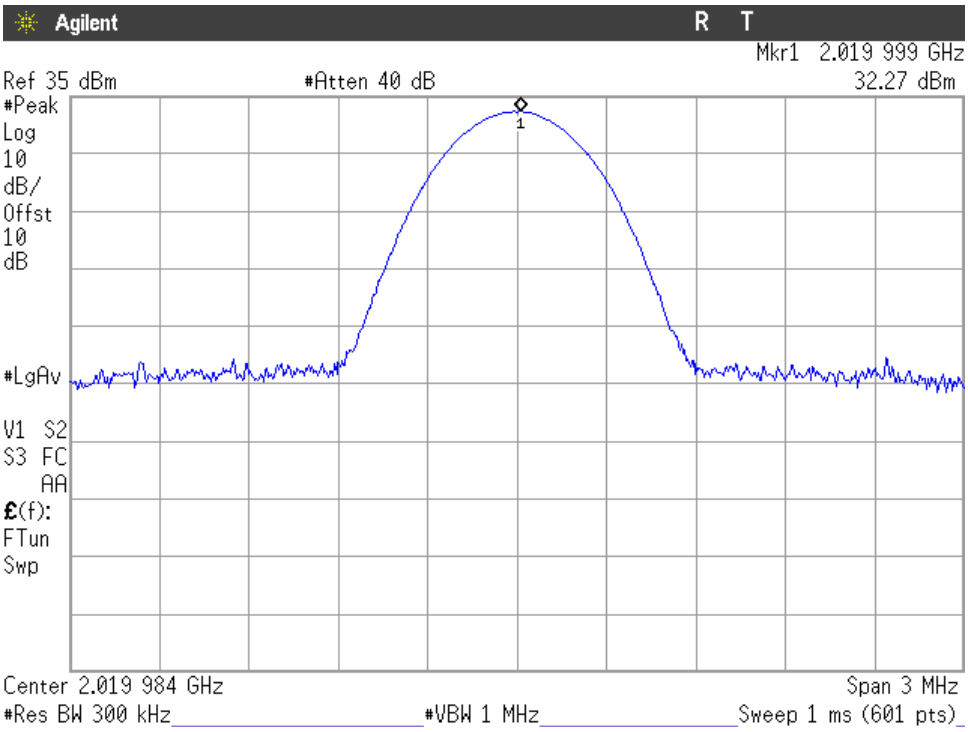
Lowest Channel



Middle Channel

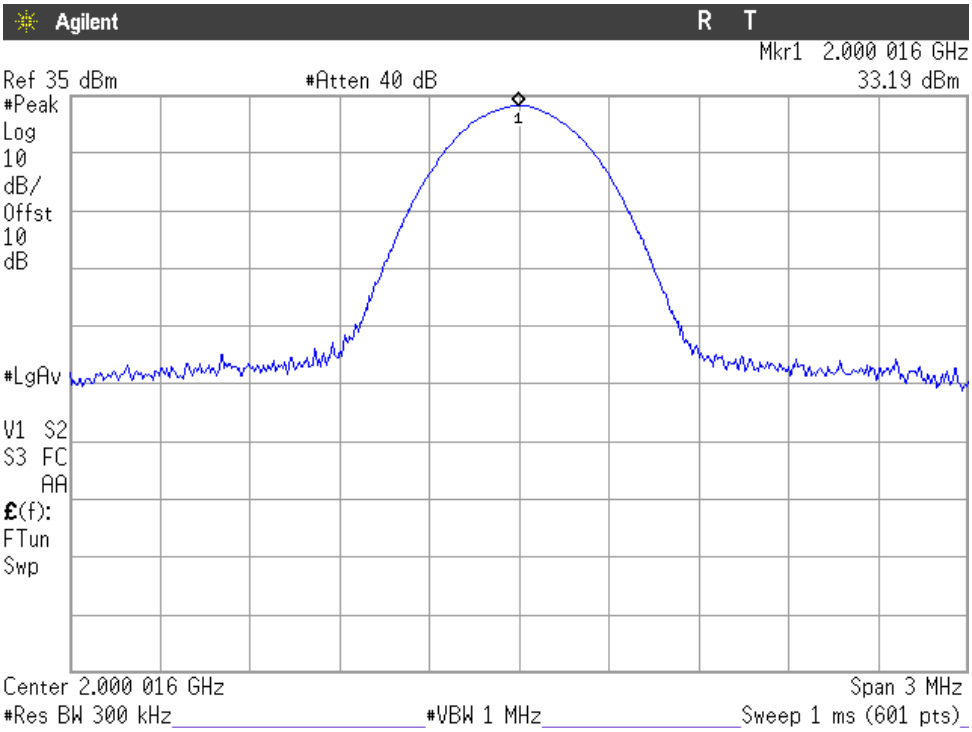


Highest Channel

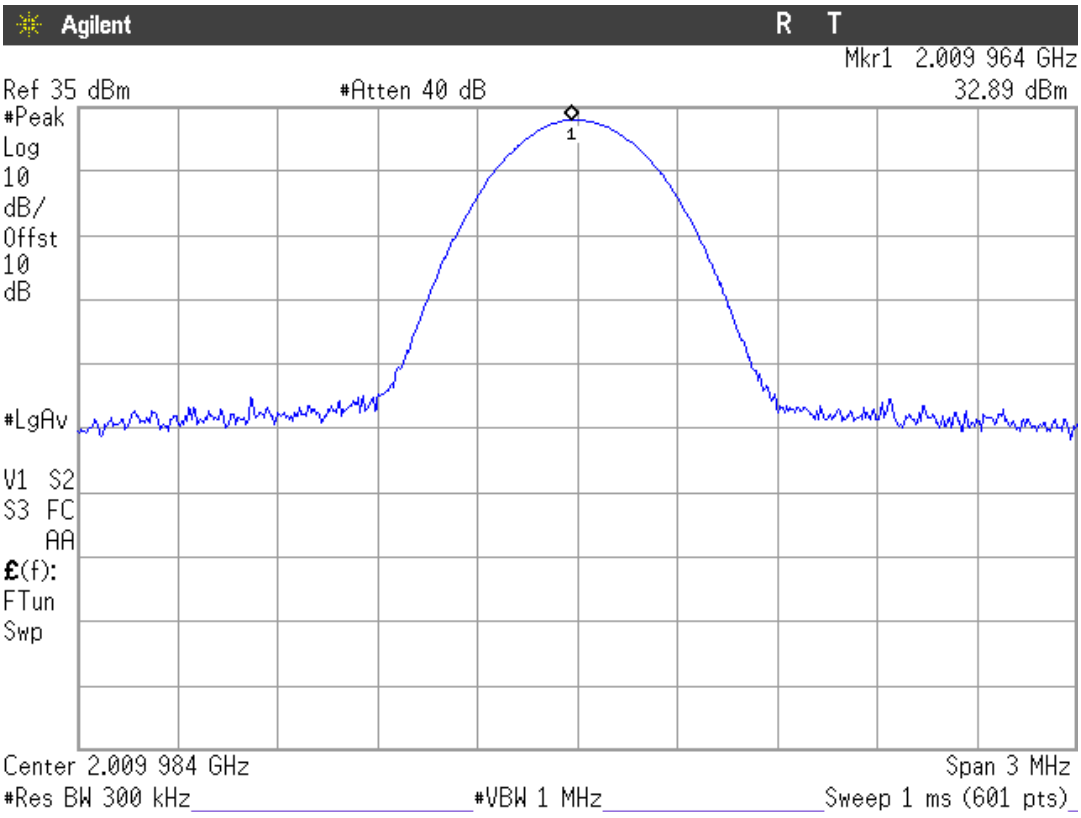


π/4 QPSK modulation and nominal bandwidth of 31.25 kHz

Lowest Channel



Middle Channel



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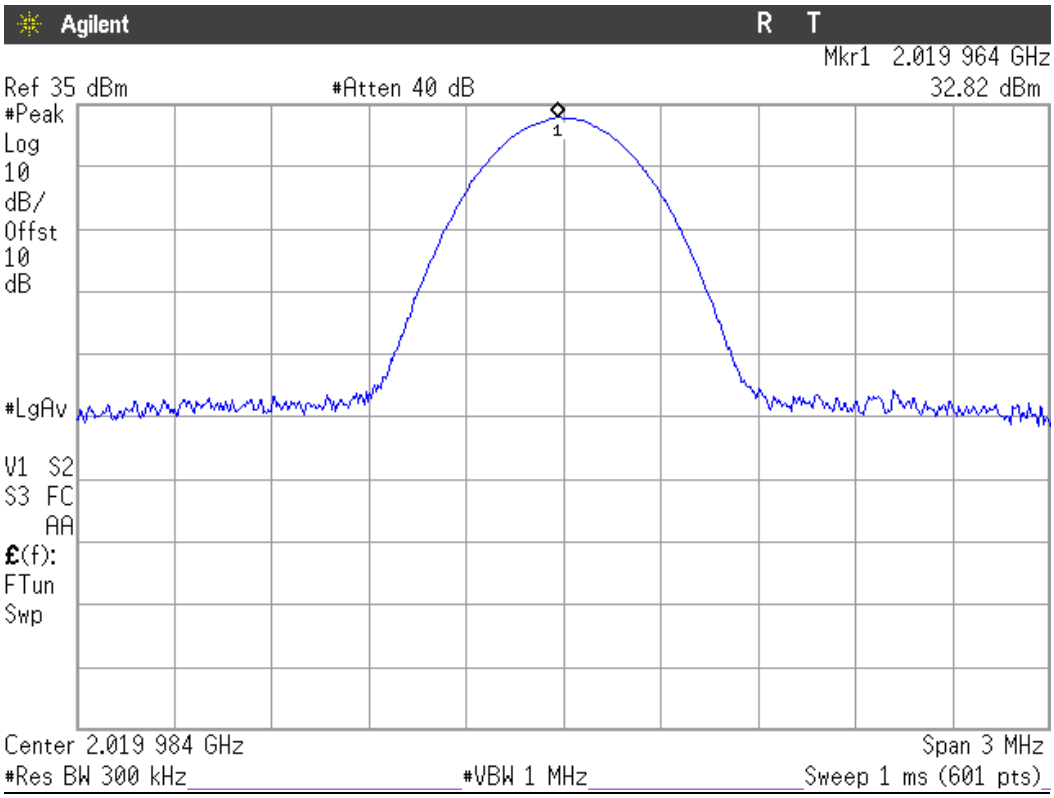
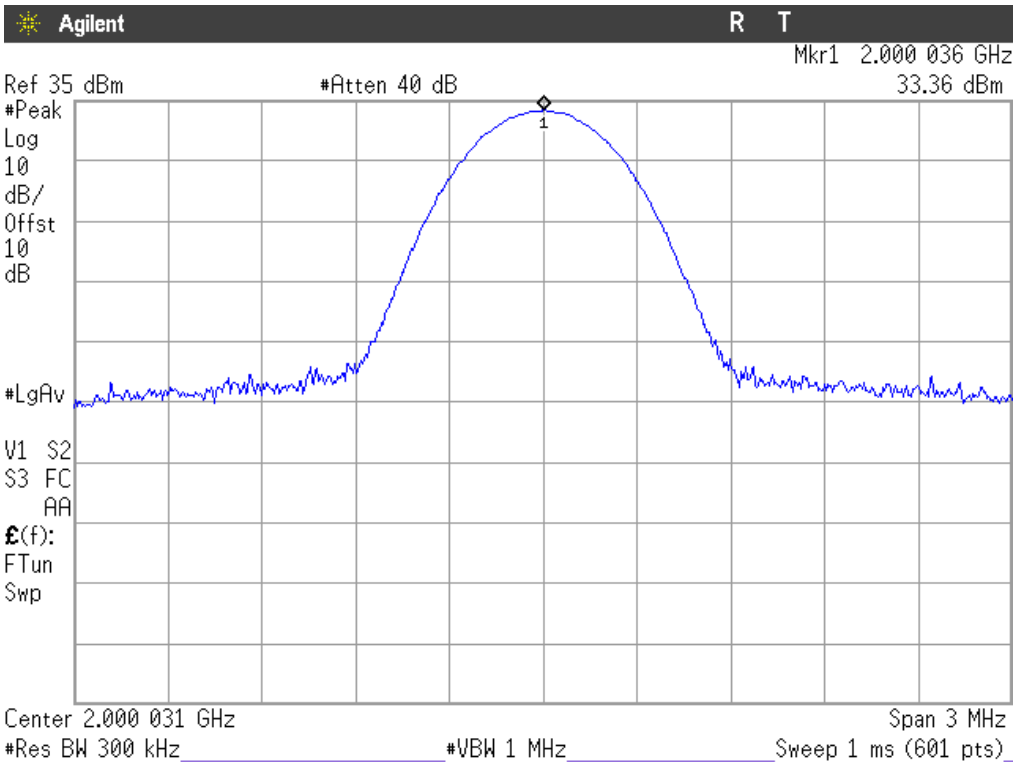
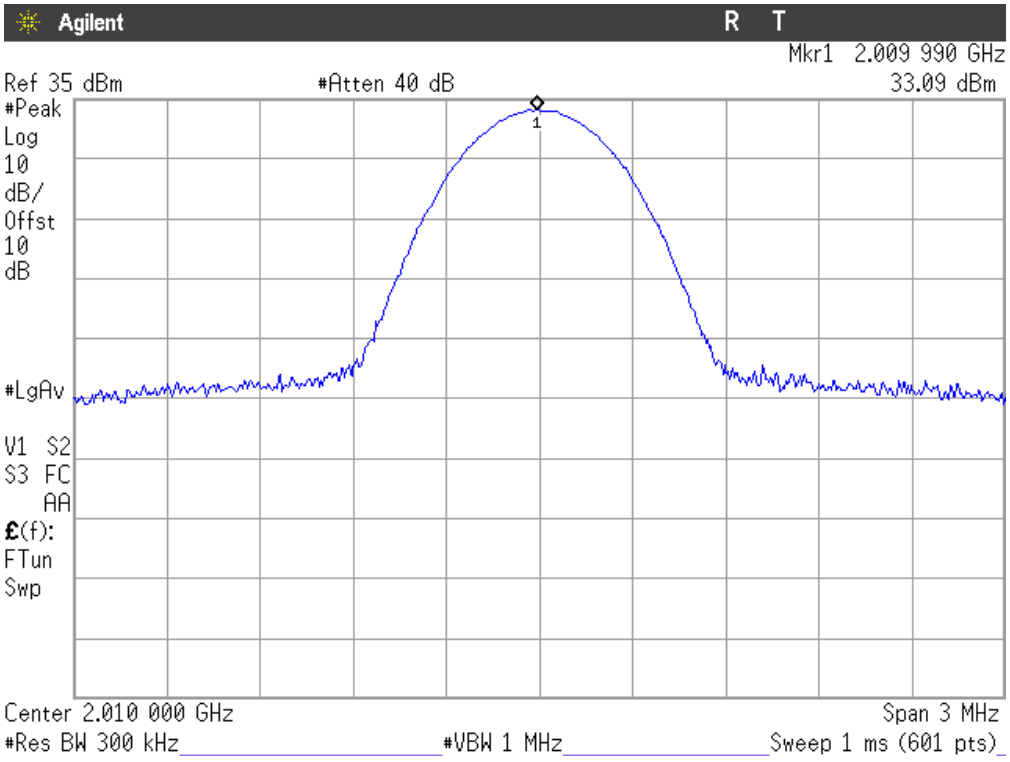


π/4 QPSK modulation and nominal bandwidth of 62.5 kHz

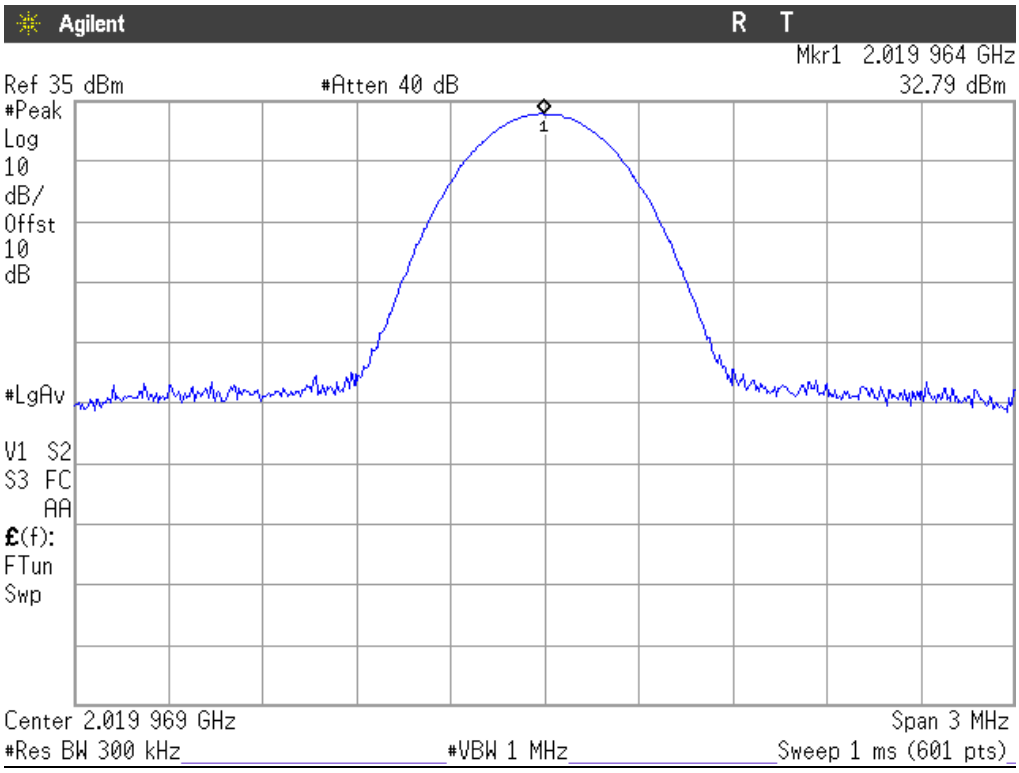
Lowest Channel



Middle Channel

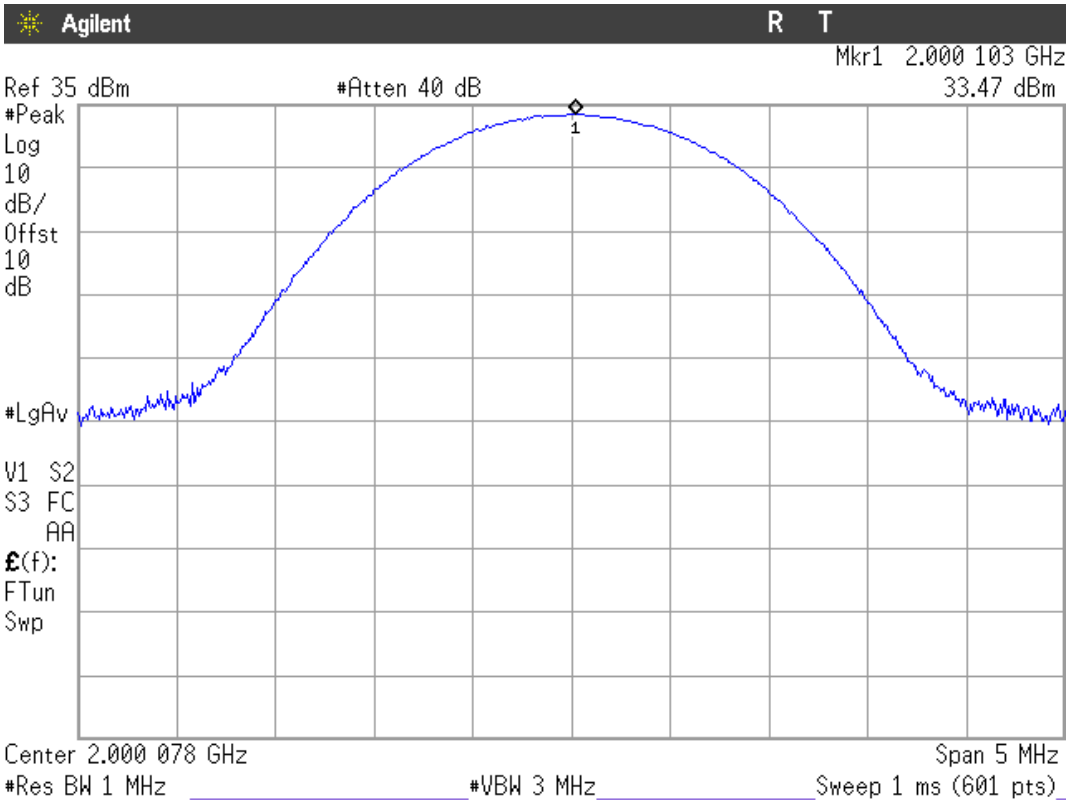


Highest Channel

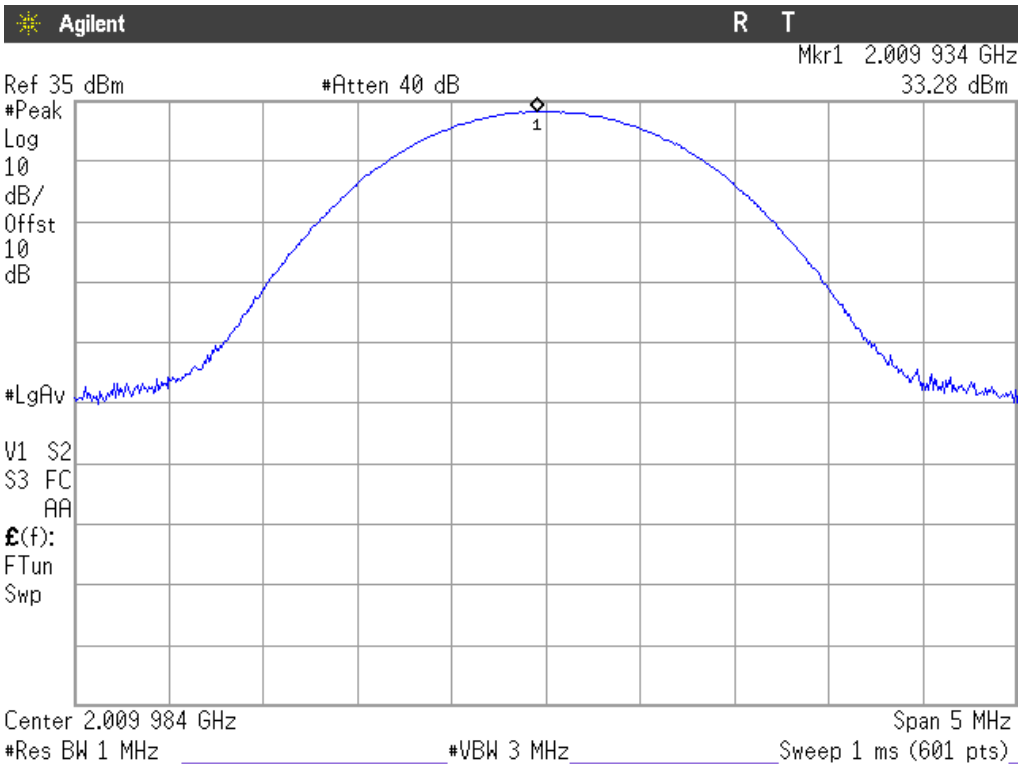


π/4 QPSK modulation and nominal bandwidth of 156.25 kHz

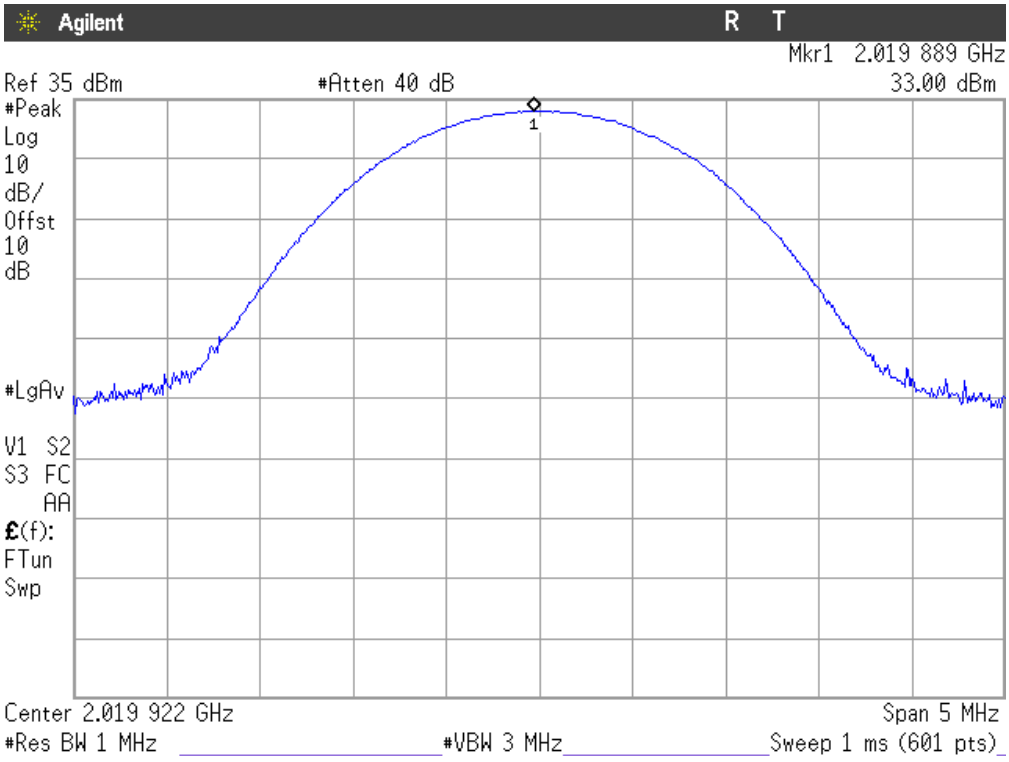
Lowest Channel



Middle Channel



Highest Channel



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
2000.0096	-5.74	Horizontal	20.91	0.9	7.65	27.66	28.91
2009.9778	-5.55	Horizontal	21.10	0.9	7.65	27.85	29.10
2019.9782	-5.61	Horizontal	21.14	0.9	7.65	27.89	29.14

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	28.91	29.10	29.14
Maximum peak power (W)	0.78	0.81	0.82
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
2000.0086	-6.67	Horizontal	19.98	0.9	7.65	26.73	27.98
2009.9783	-6.54	Horizontal	20.11	0.9	7.65	26.86	28.11
2019.9772	-6.81	Horizontal	19.94	0.9	7.65	26.69	27.94

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	27.98	28.11	27.94
Maximum peak power (W)	0.63	0.65	0.62
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
2000.0272	-7.51	Horizontal	19.14	0.9	7.65	25.89	27.14
2009.9910	-7.67	Horizontal	18.98	0.9	7.65	25.73	26.98
2019.9663	-8.06	Horizontal	18.69	0.9	7.65	25.44	26.69

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	27.14	26.98	26.69
Maximum peak power (W)	0.52	0.50	0.47
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
2000.0328	-10.44	Horizontal	16.21	0.9	7.65	22.96	24.21
2009.9407	-10.52	Horizontal	16.13	0.9	7.65	22.88	24.13
2019.9078	-11.17	Horizontal	15.58	0.9	7.65	22.33	23.58

Channel	Lowest	Middle	Highest
Maximum peak power (dBm)	24.21	24.13	23.58
Maximum peak power (W)	0.26	0.26	0.23
Measurement uncertainty (dB)	± 4.0		

Emission limitations. Spurious emissions at antenna terminals

SPECIFICATION

§2.1051 and §25.202 (f)

METHOD

The EUT RF output connector was connected to a spectrum analyser using a 50 ohm attenuator and it is set in continuous transmission with different modes of modulation and nominal bandwidths. The spectrum was investigated from 30 MHz to 25 GHz using a resolution bandwidth of 100 kHz.

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.

Each emission peak detected is measured using a resolution bandwidth of 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, in any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power 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 (see plots in next pages)

π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

1. CHANNEL: LOWEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4000.0187	-32.50	-31.25
6000.0338	-39.23	-37.98
8000.0847	-34.76	-33.51

2. CHANNEL: MIDDLE

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4019.9797	-32.25	-31.00
6029.9704	-40.12	-38.87
8039.9167	-34.04	-32.79

3. CHANNEL: HIGHEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4039.9562	-32.37	-31.12
6059.9696	-39.51	-38.26
8079.9599	-35.05	-33.80

π/4 QPSK modulation and nominal bandwidth of 31.25 kHz

1. CHANNEL: LOWEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4000.0187	-32.31	-31.06
6000.0281	-40.12	-38.87
8000.0725	-35.26	-34.01

2. CHANNEL: MIDDLE

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4019.9555	-32.10	-30.85
6029.9648	-39.02	-37.77
8039.9482	-35.94	-34.69

3. CHANNEL: HIGHEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4039.9558	-32.58	-31.33
6059.9583	-40.17	-38.92
8079.9118	-34.65	-33.40

π/4 QPSK modulation and nominal bandwidth of 62.5 kHz

1. CHANNEL: LOWEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4000.0505	-32.41	-31.16
6000.0642	-40.60	-39.35
8000.1005	-35.19	-33.94

2. CHANNEL: MIDDLE

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4020.9882	-32.41	-31.16
6029.9916	-41.14	-39.89
8040.0218	-35.18	-33.93

3. CHANNEL: HIGHEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4039.9255	-32.29	-31.04
6059.8787	-40.33	-39.08
8079.8976	-35.26	-34.01

π/4 QPSK modulation and nominal bandwidth of 156.25 kHz

1. CHANNEL: LOWEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4000.1174	-36.35	-35.10
6000.3101	-43.40	-42.15
8000.3691	-36.19	-34.94

2. CHANNEL: MIDDLE

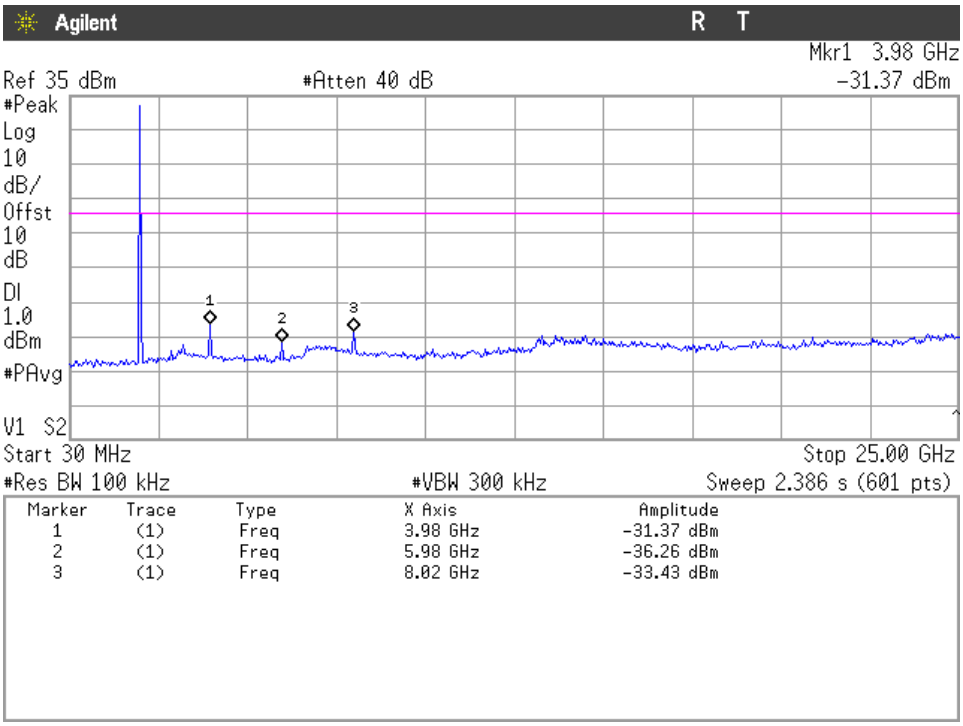
Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4020.0253	-34.68	-33.43
6029.9189	-43.52	-42.27
8039.8775	-36.57	-35.32

3. CHANNEL: HIGHEST

Spurious frequency (MHz)	Level (dBm) measured with 3 kHz BW	Level (dBm) corrected for 4 kHz BW
4039.8132	-32.94	-31.69
6059.8033	-42.69	-41.44
8079.6277	-36.10	-34.85

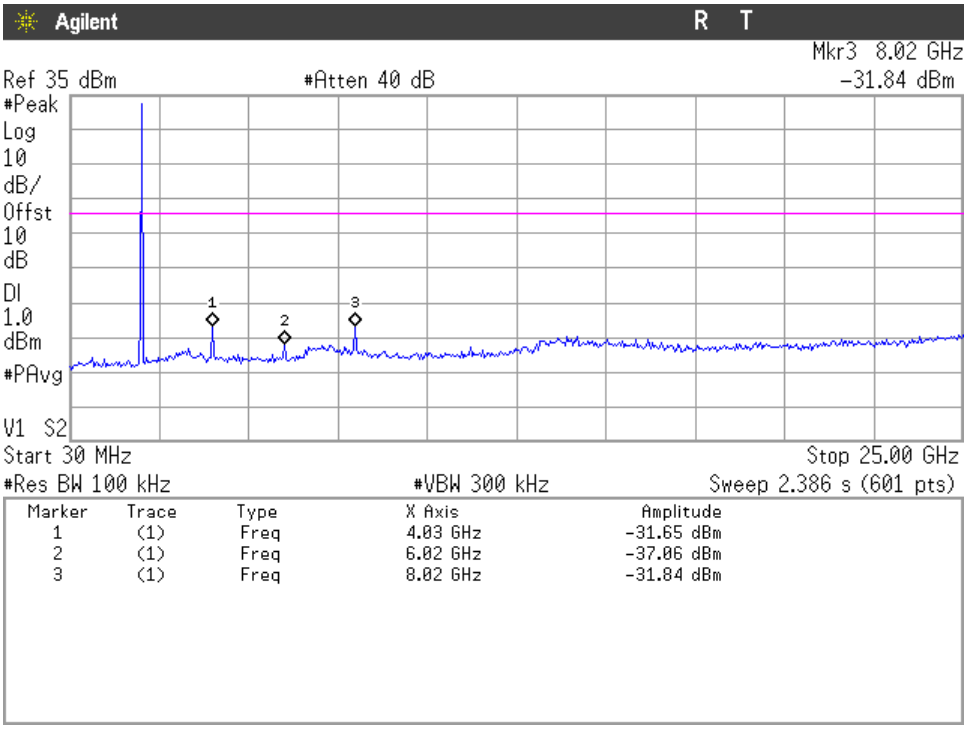
π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

1. CHANNEL: LOWEST



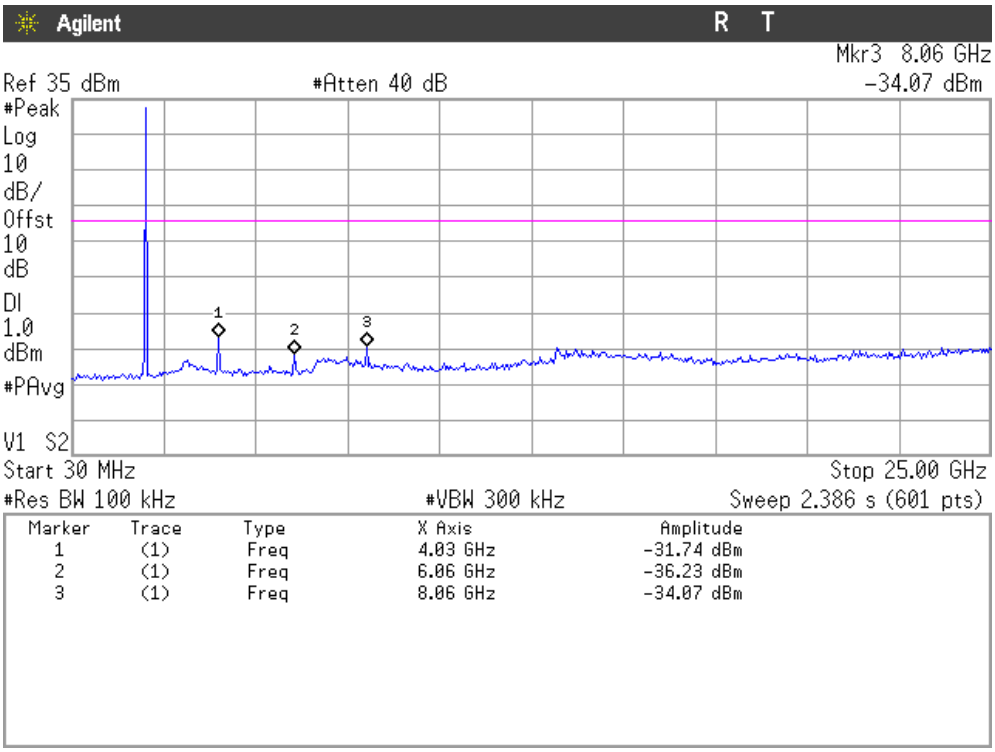
Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

2. 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.

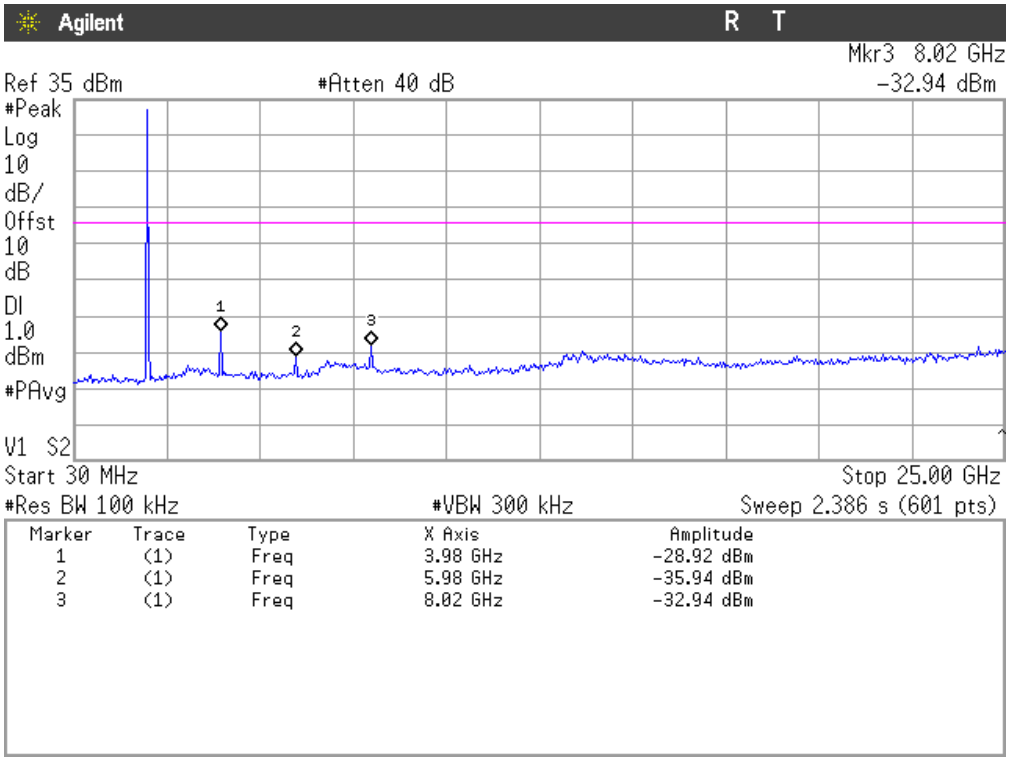
3. CHANNEL: HIGHEST



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

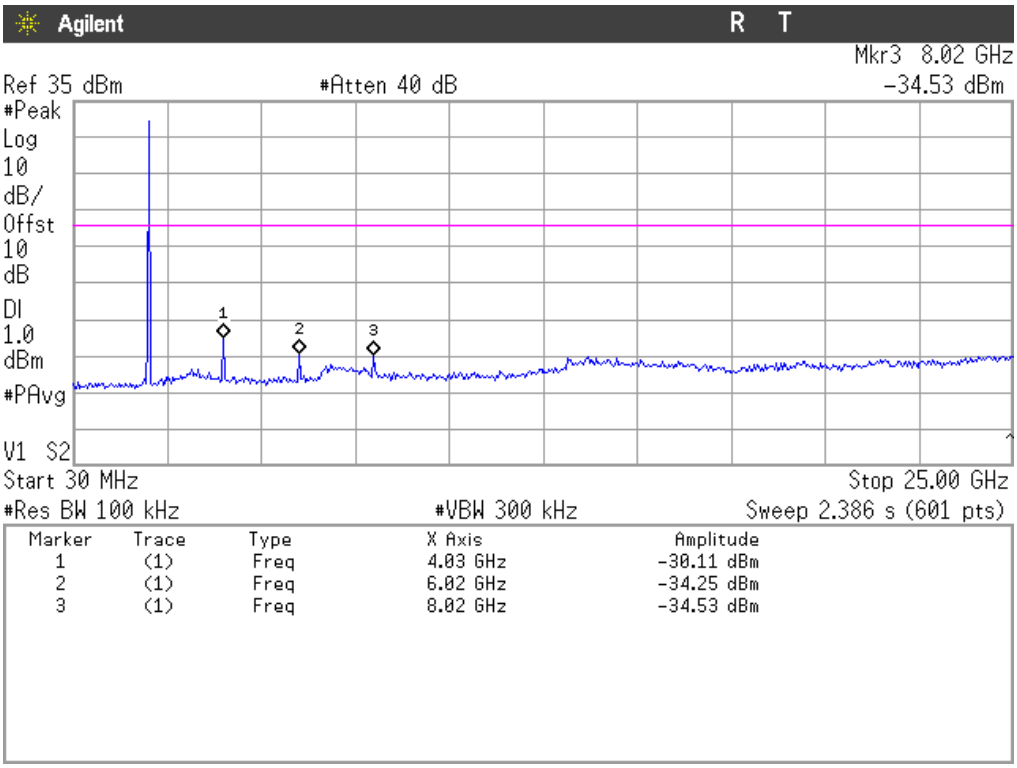
π/4 QPSK modulation and nominal bandwidth of 31.25 kHz

1. CHANNEL: LOWEST



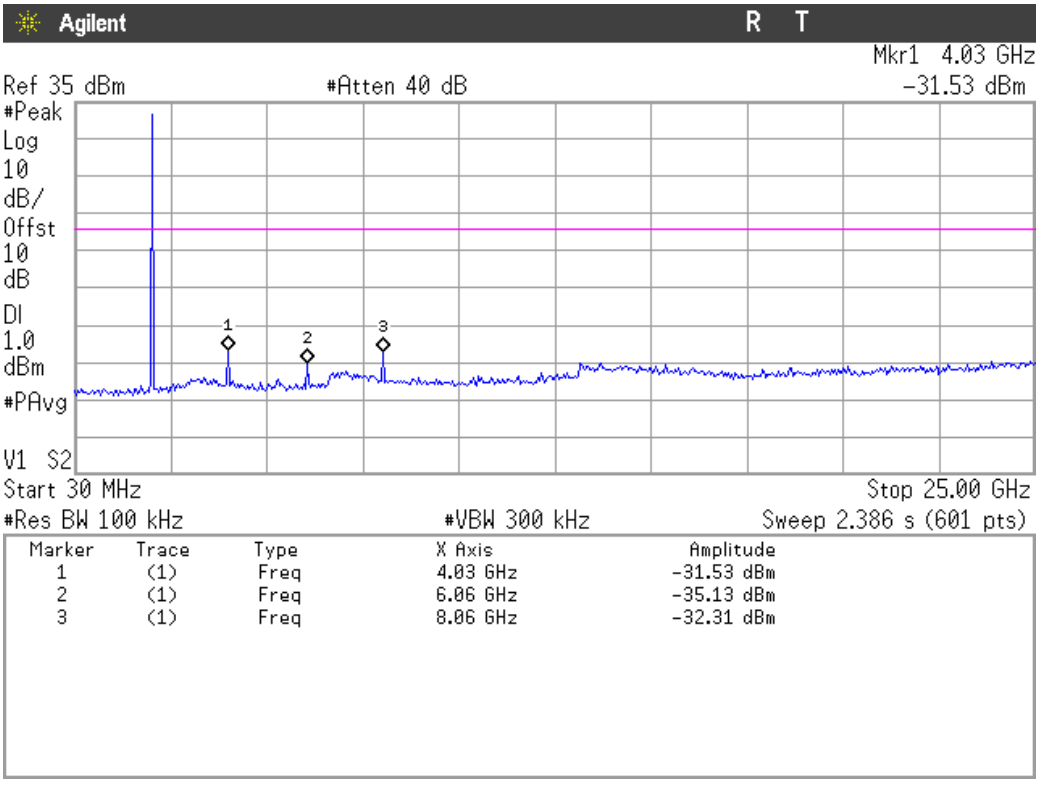
Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

2. 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.

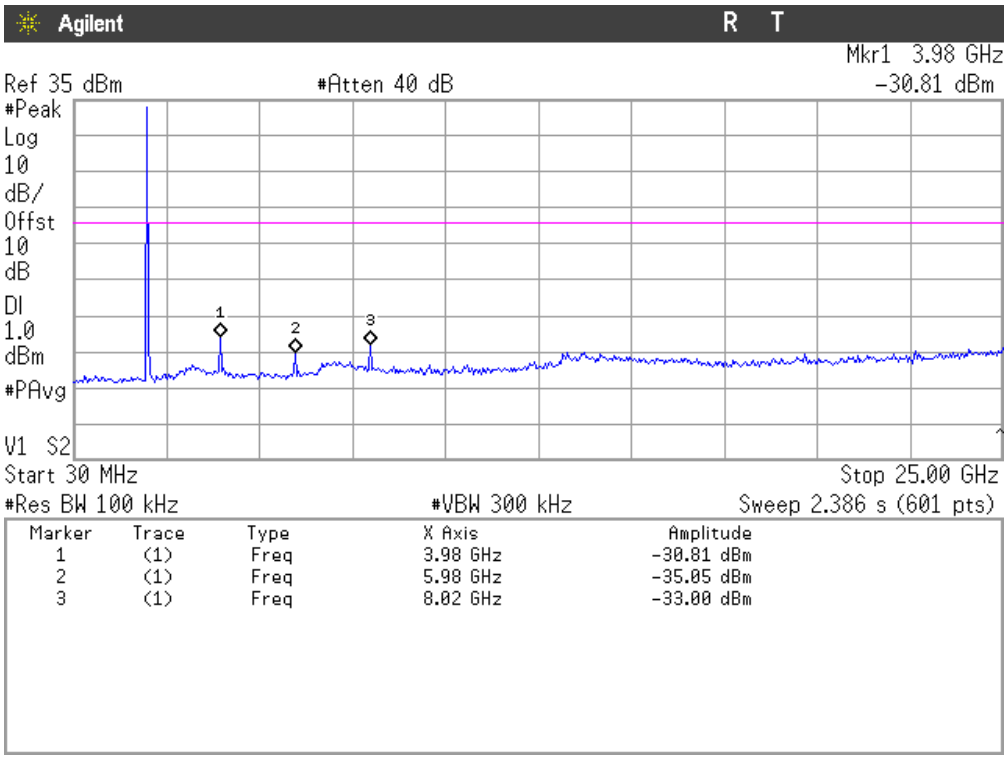
3. CHANNEL: HIGHEST



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

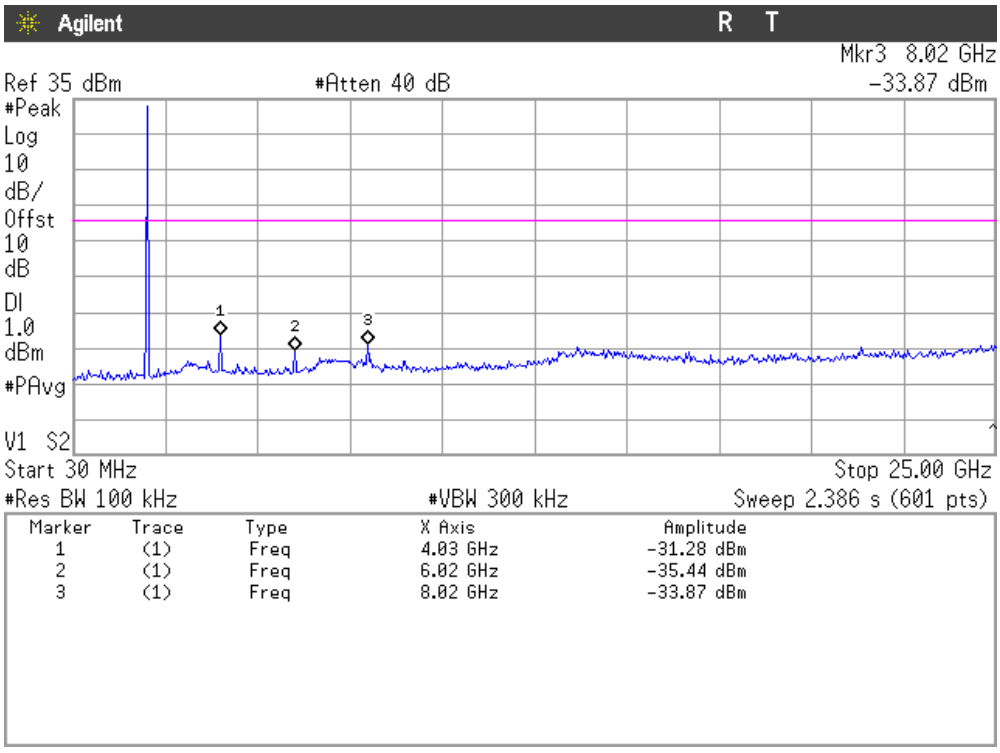
π/4 QPSK modulation and nominal bandwidth of 62.5 kHz

1. CHANNEL: LOWEST



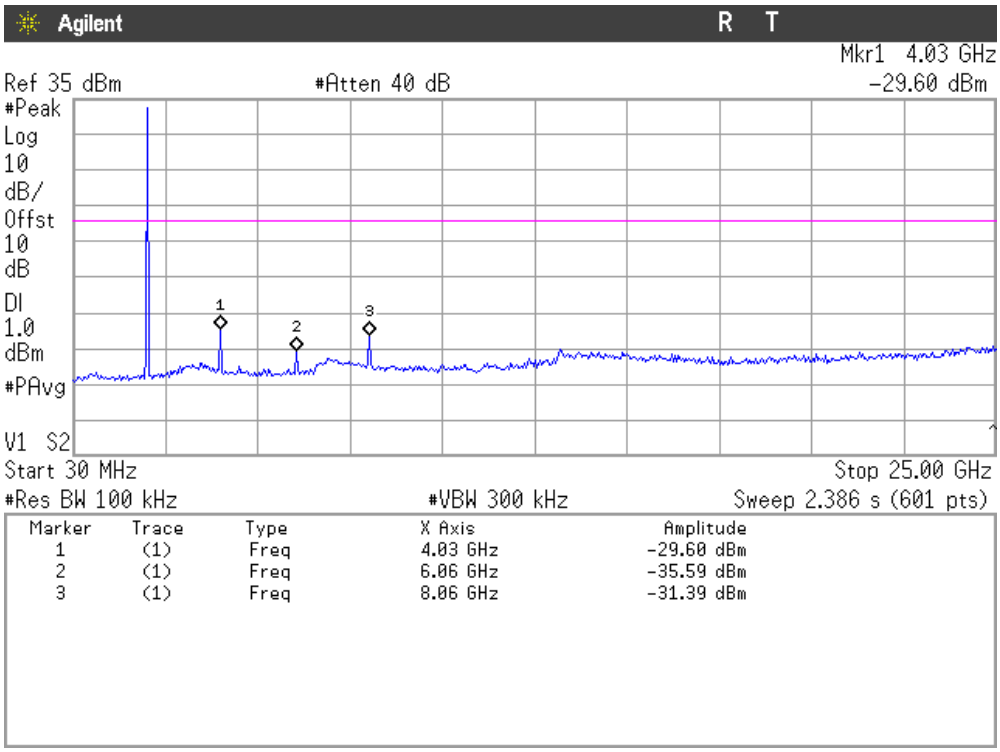
Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

2. 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.

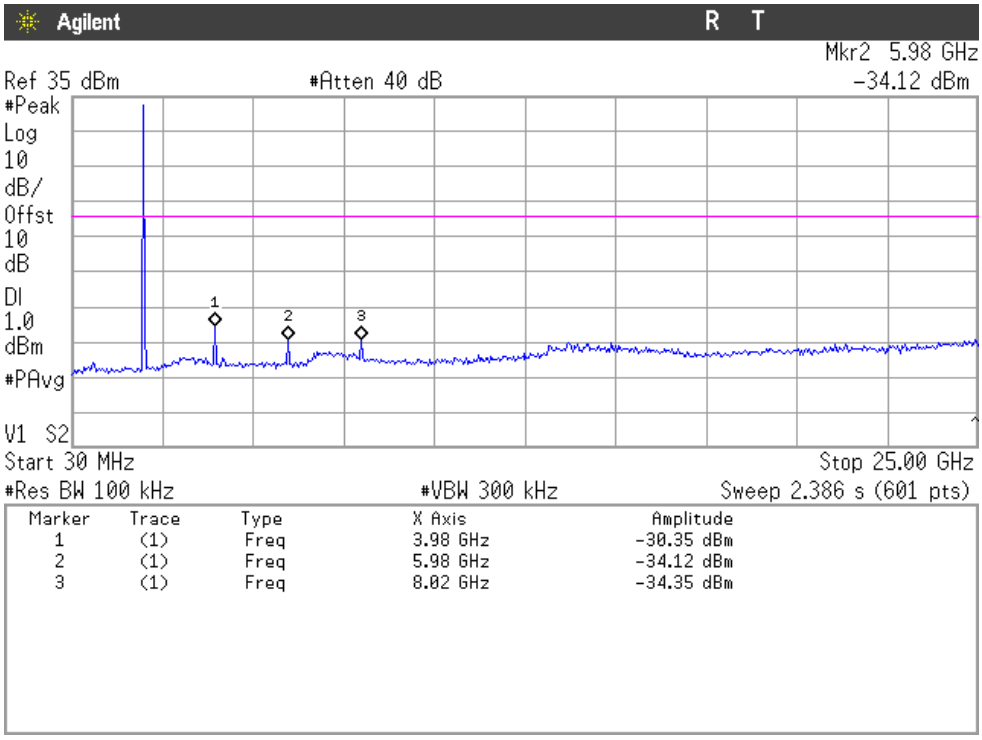
3. CHANNEL: HIGHEST



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

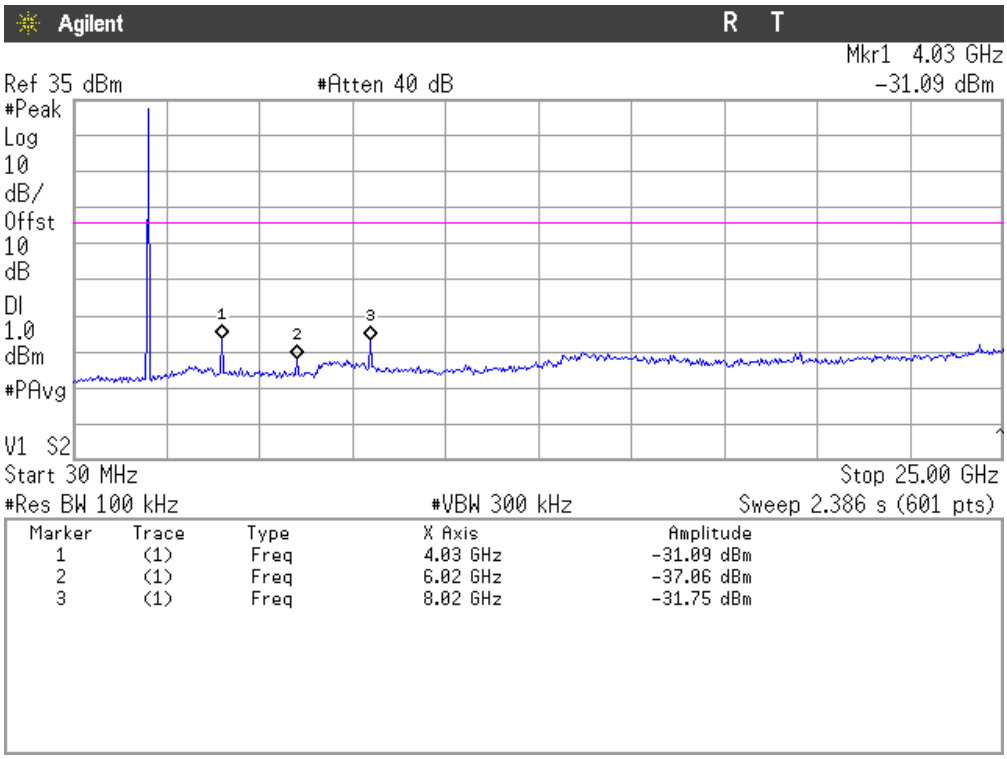
π/4 QPSK modulation and nominal bandwidth of 156.25 kHz

1. CHANNEL: LOWEST



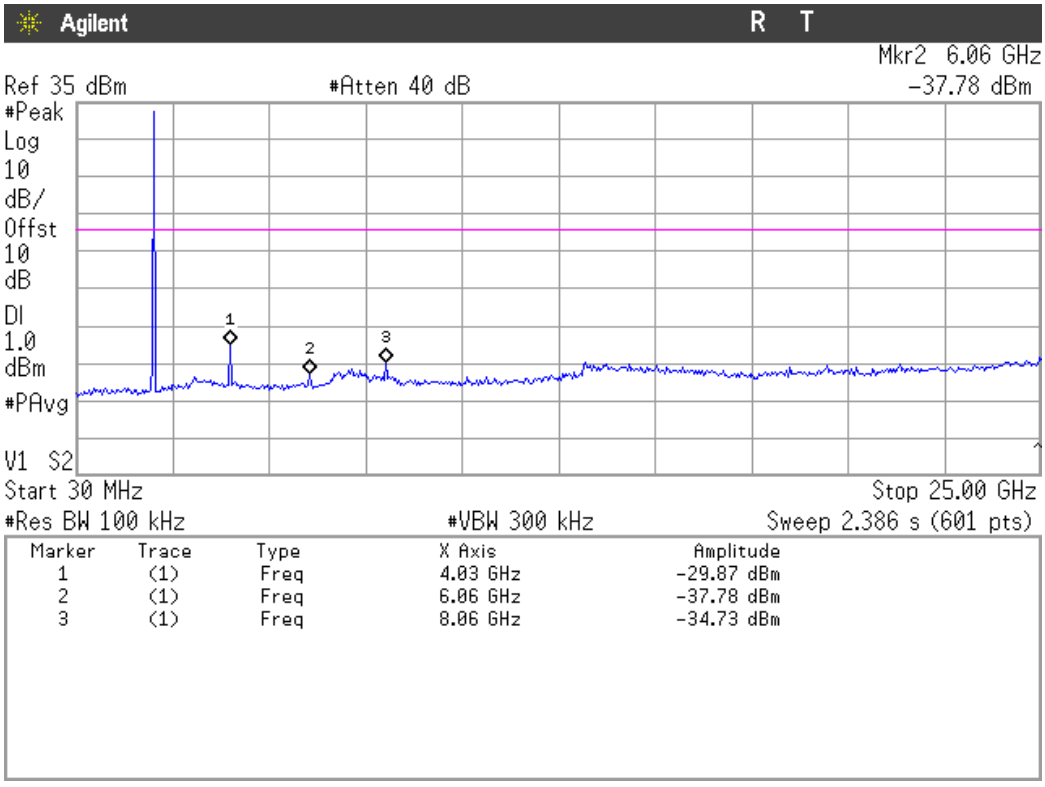
Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

2. 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.

3. 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.

Emission limitations. Emission mask

SPECIFICATION

§2.1051 and §25.202 (f)

METHOD

The EUT RF output connector was connected to a spectrum analyser using a 50 ohm attenuator and it is set in continuous transmission with different modes of modulation and nominal bandwidths.

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.

The resolution bandwidth used 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**:**

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;

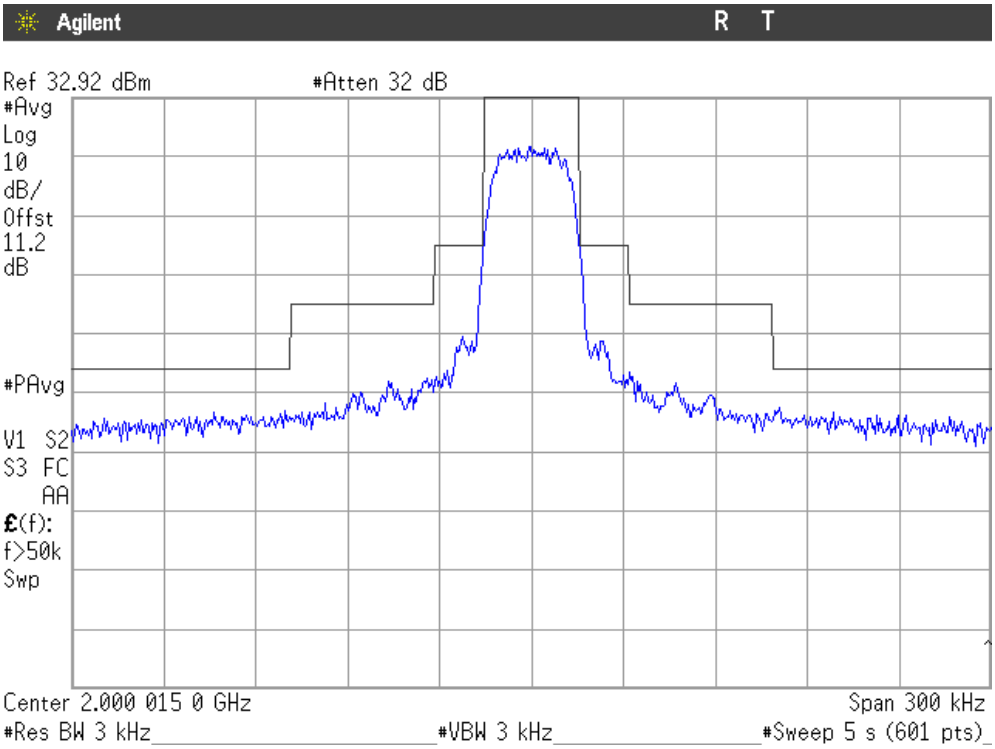
(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;
At Po transmitting power, the specified minimum attenuation becomes 43+10log (Po), and the level in dBm relative Po becomes:

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

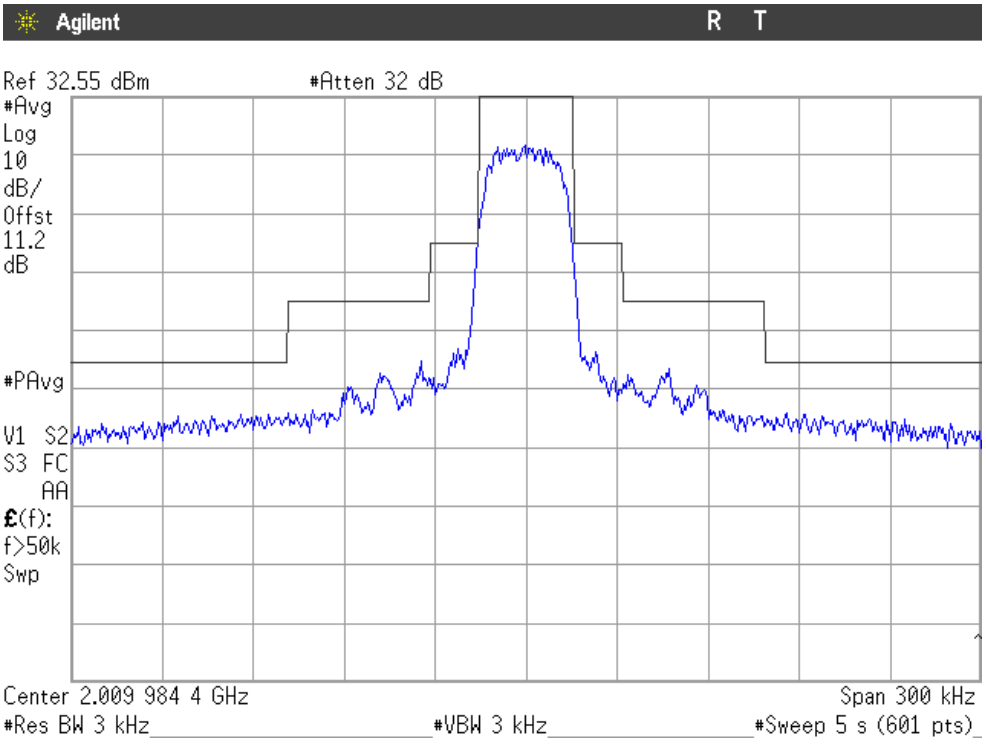
RESULTS (see plots in next pages)

π/2 BPSK modulation and nominal bandwidth of 31.25 kHz

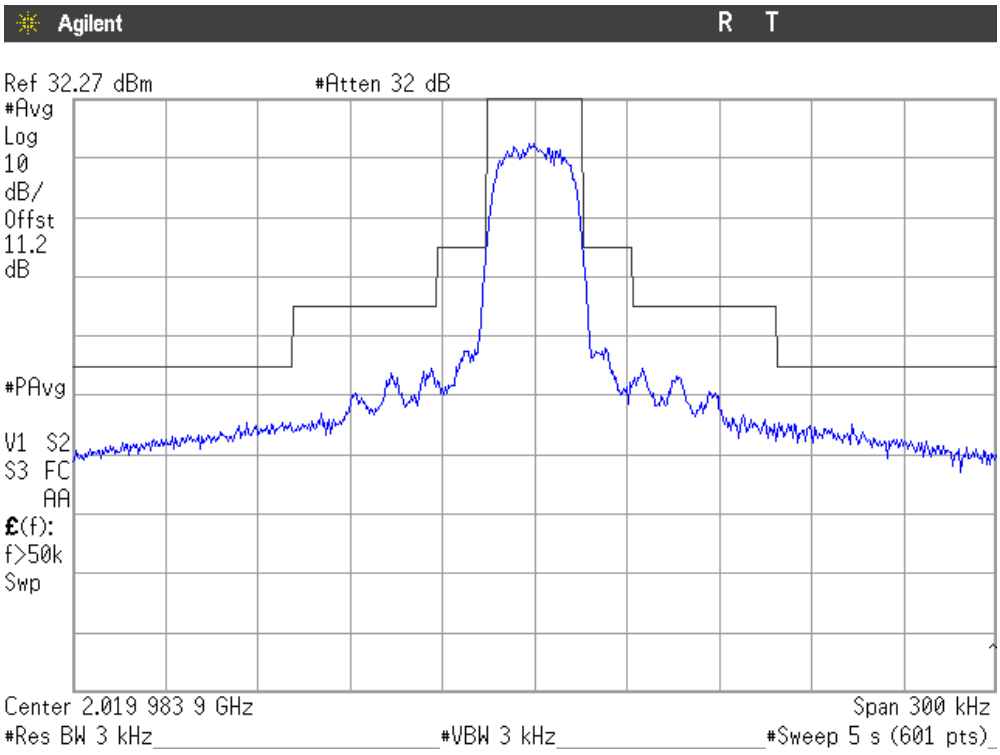
1. CHANNEL: LOWEST



2. CHANNEL: MIDDLE

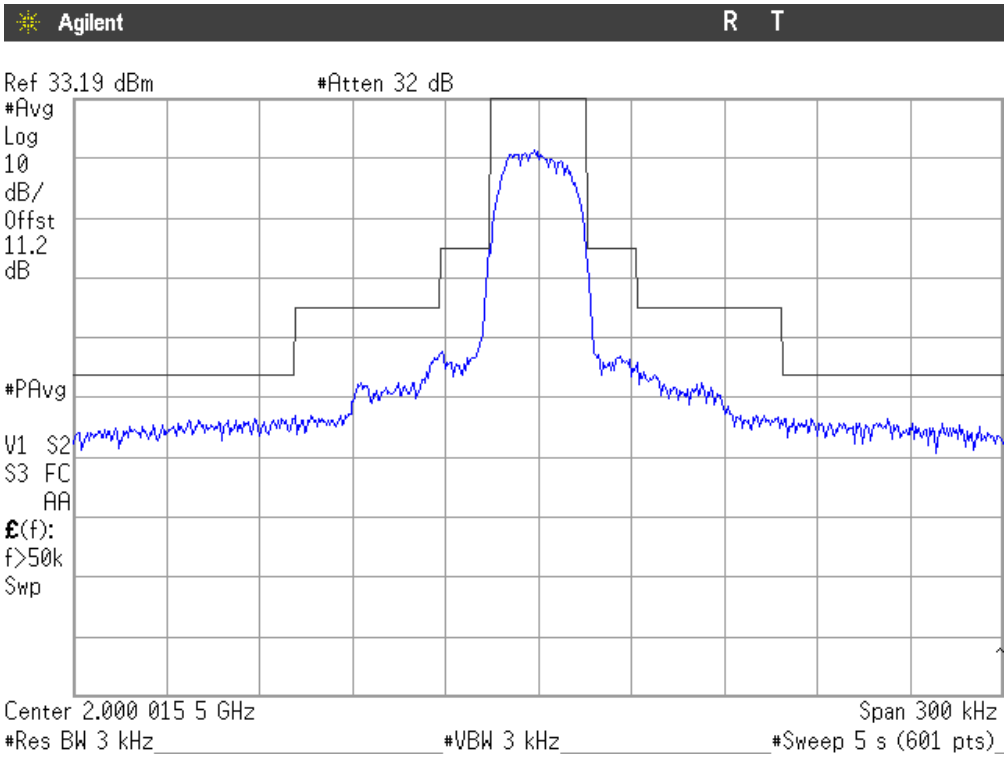


3. CHANNEL: HIGHEST

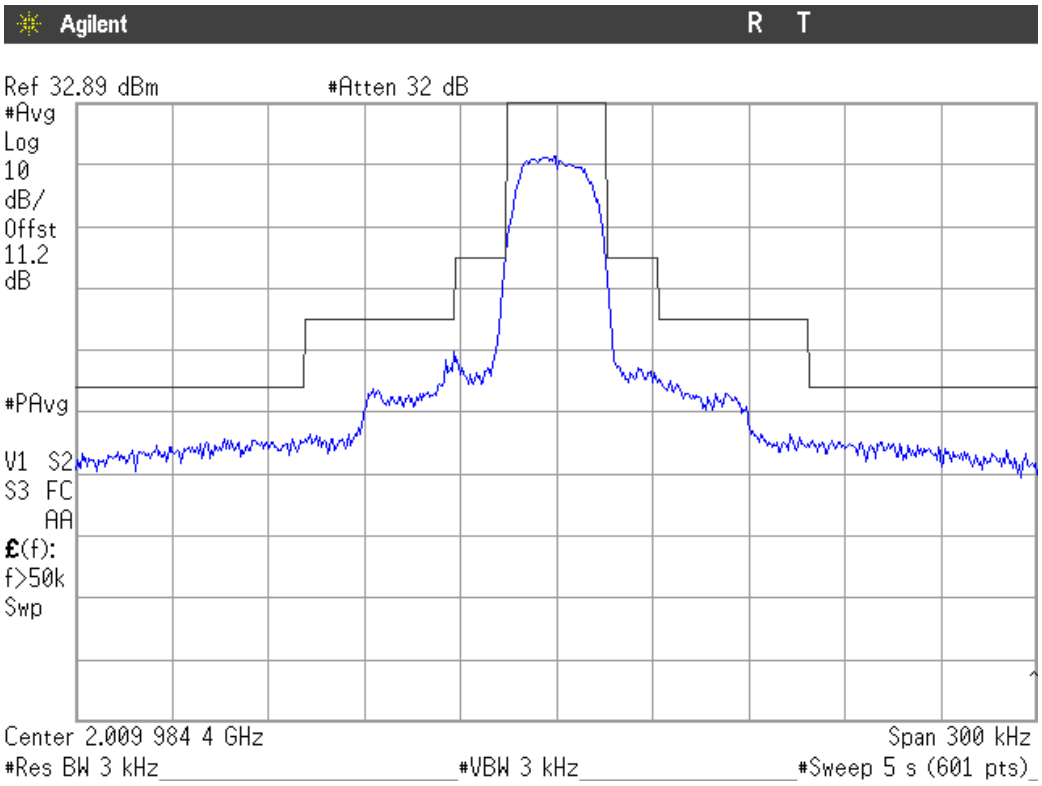


π/4 QPSK modulation and nominal bandwidth of 31.25 kHz

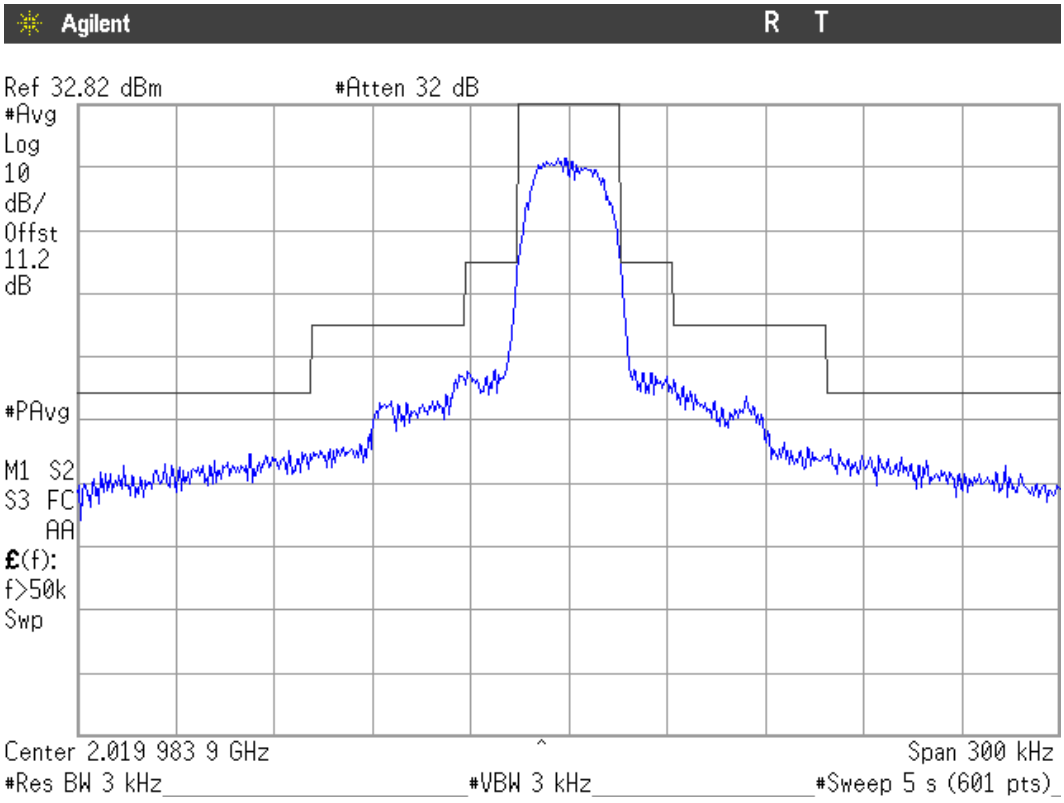
1. CHANNEL: LOWEST



2. CHANNEL: MIDDLE

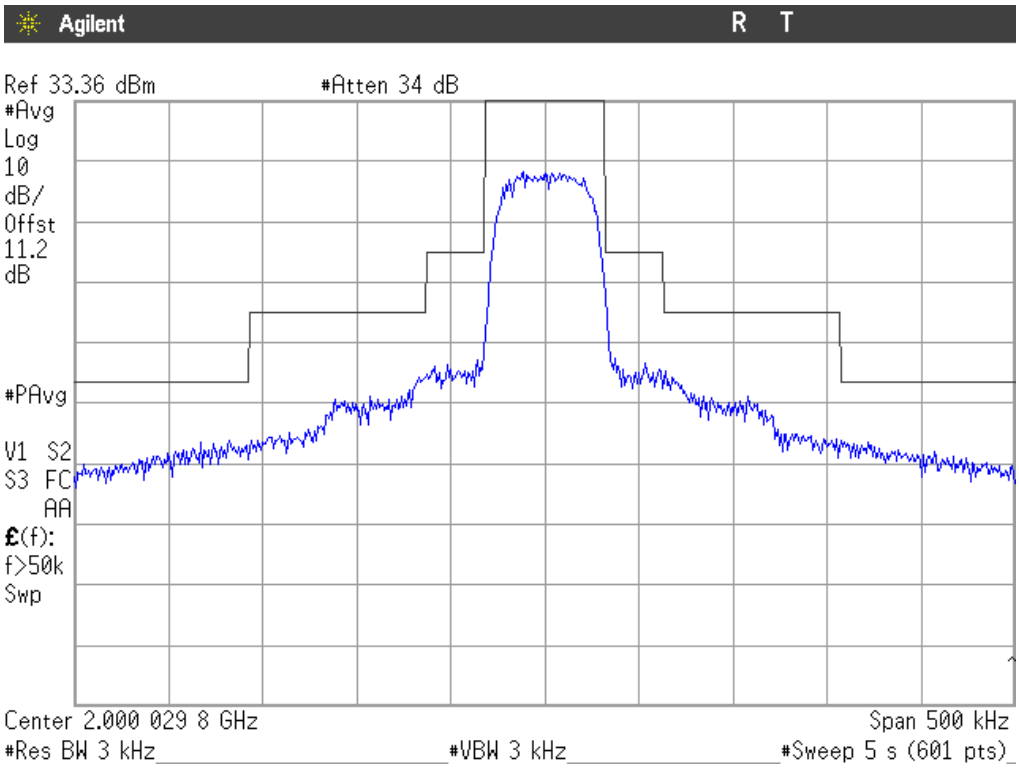


3. CHANNEL: HIGHEST

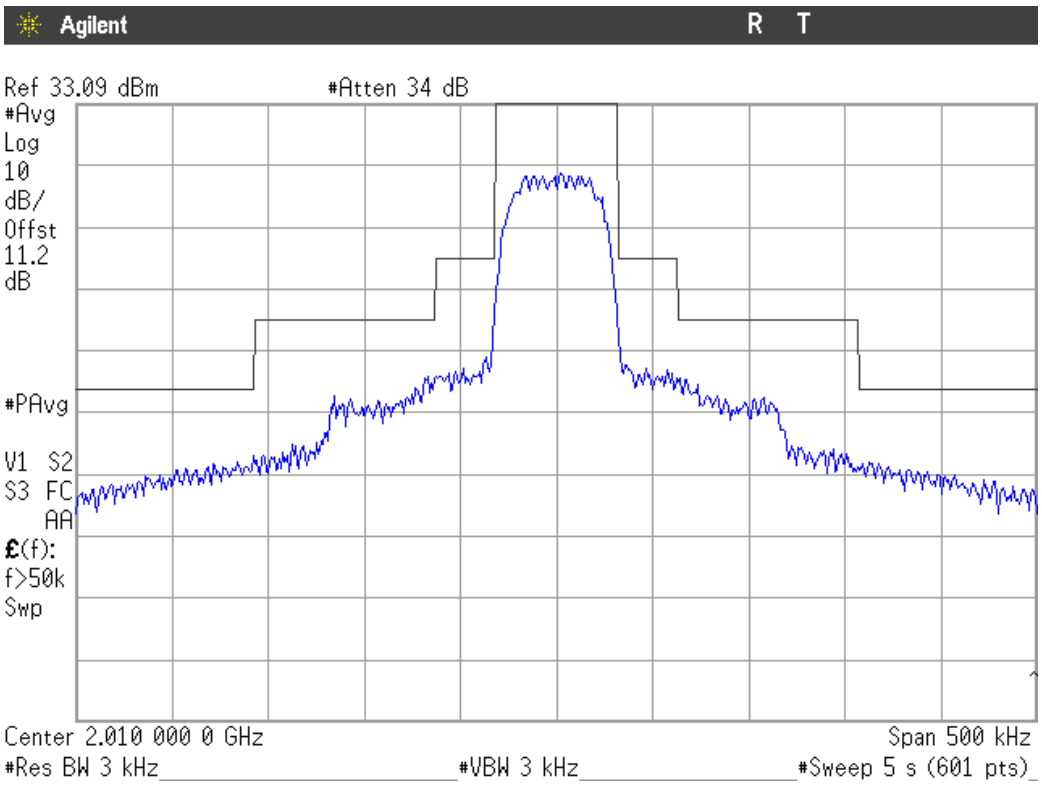


π/4 QPSK modulation and nominal bandwidth of 62.5 kHz

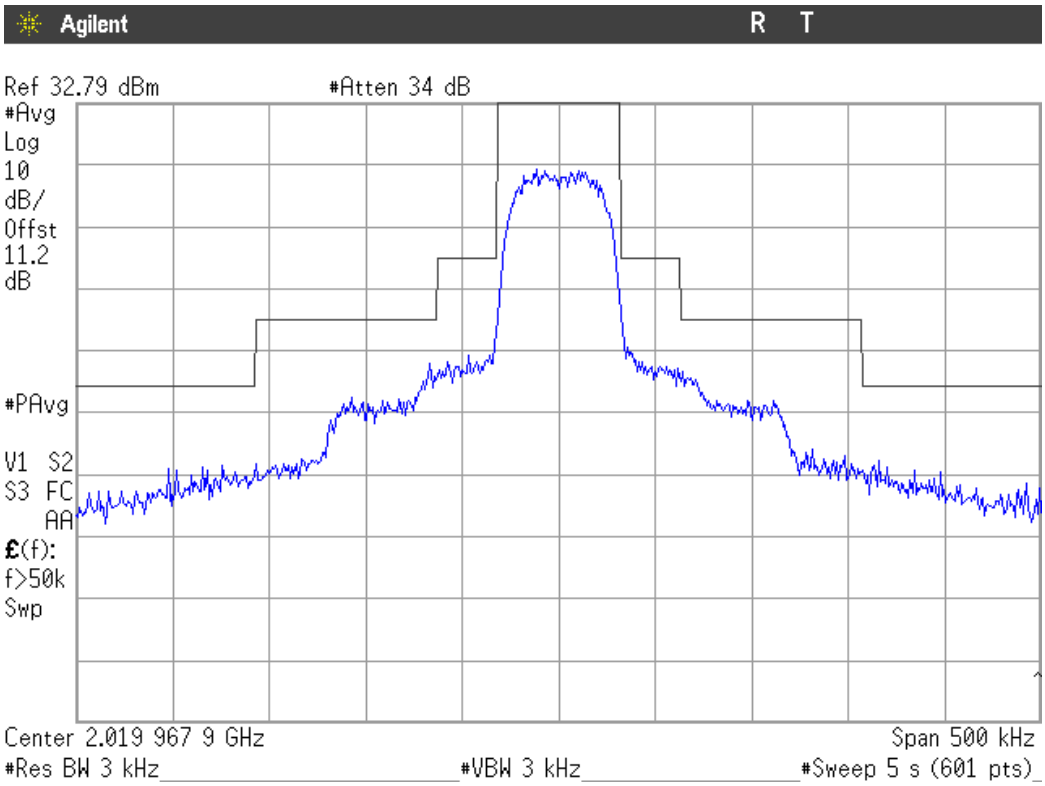
1. CHANNEL: LOWEST



2. CHANNEL: MIDDLE

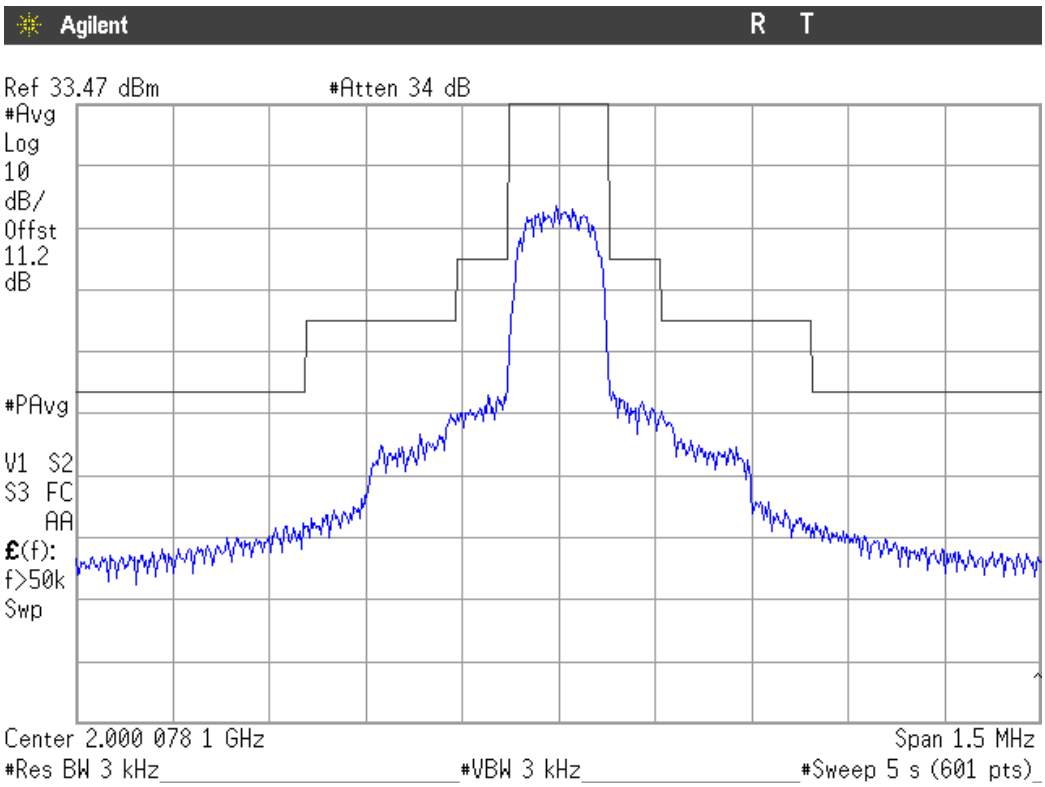


3. CHANNEL: HIGHEST

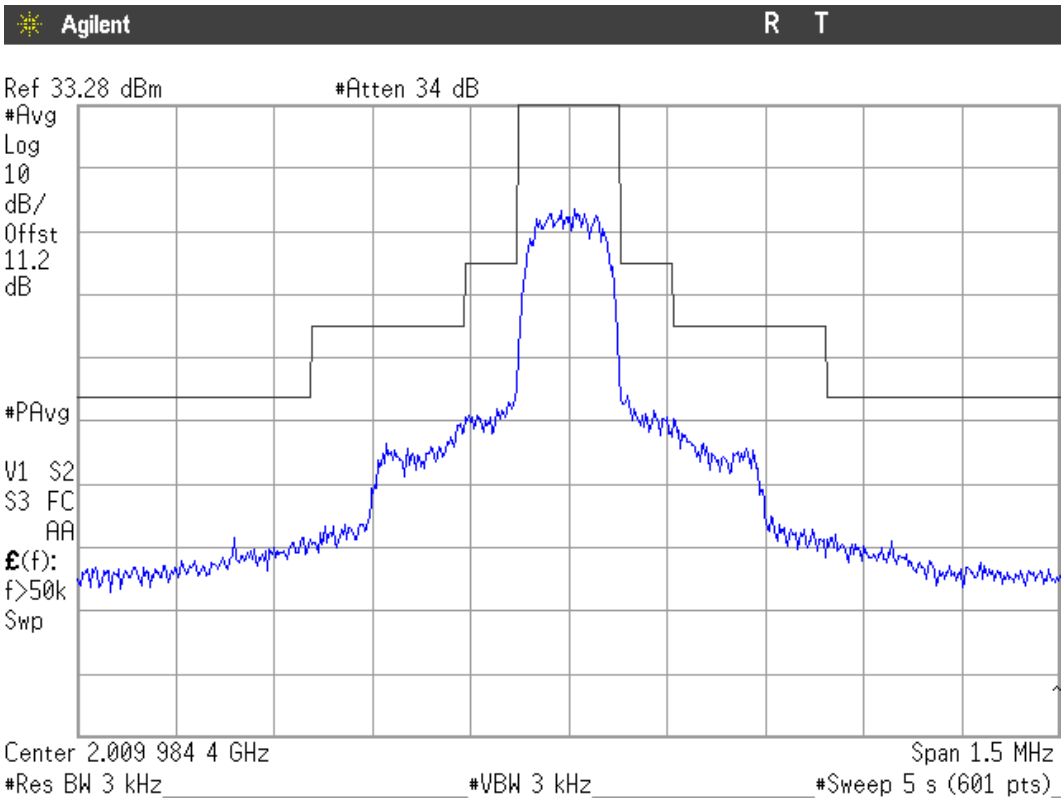


π/4 QPSK modulation and nominal bandwidth of 156.25 kHz

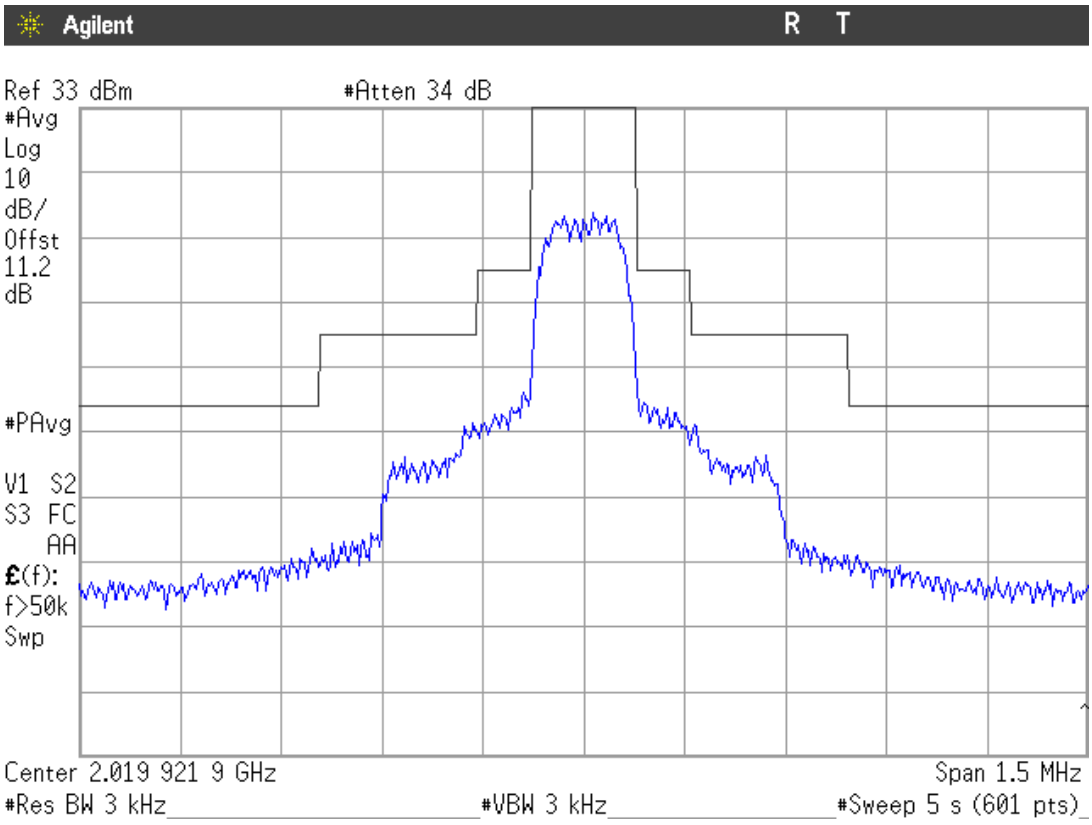
1. CHANNEL: LOWEST



2. CHANNEL: MIDDLE



3. CHANNEL: HIGHEST



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
4000.0433	-42.88	Vertical	-38.58	1.40	10.00	-29.98	-28.73
6000.0272	-49.25	Horizontal	-42.15	1.70	10.20	-33.65	-32.40
8000.0857	-54.53	Vertical	-42.33	2.00	10.90	-33.43	-32.18

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
4019.9567	-43.28	Vertical	-38.98	1.40	10.00	-30.38	-29.13
6029.9327	-50.64	Horizontal	-43.54	1.70	10.20	-35.04	-33.79
8039.9599	-54.95	Vertical	-42.75	2.00	10.90	-33.85	-32.60

3. CHANNEL: HIGHEST

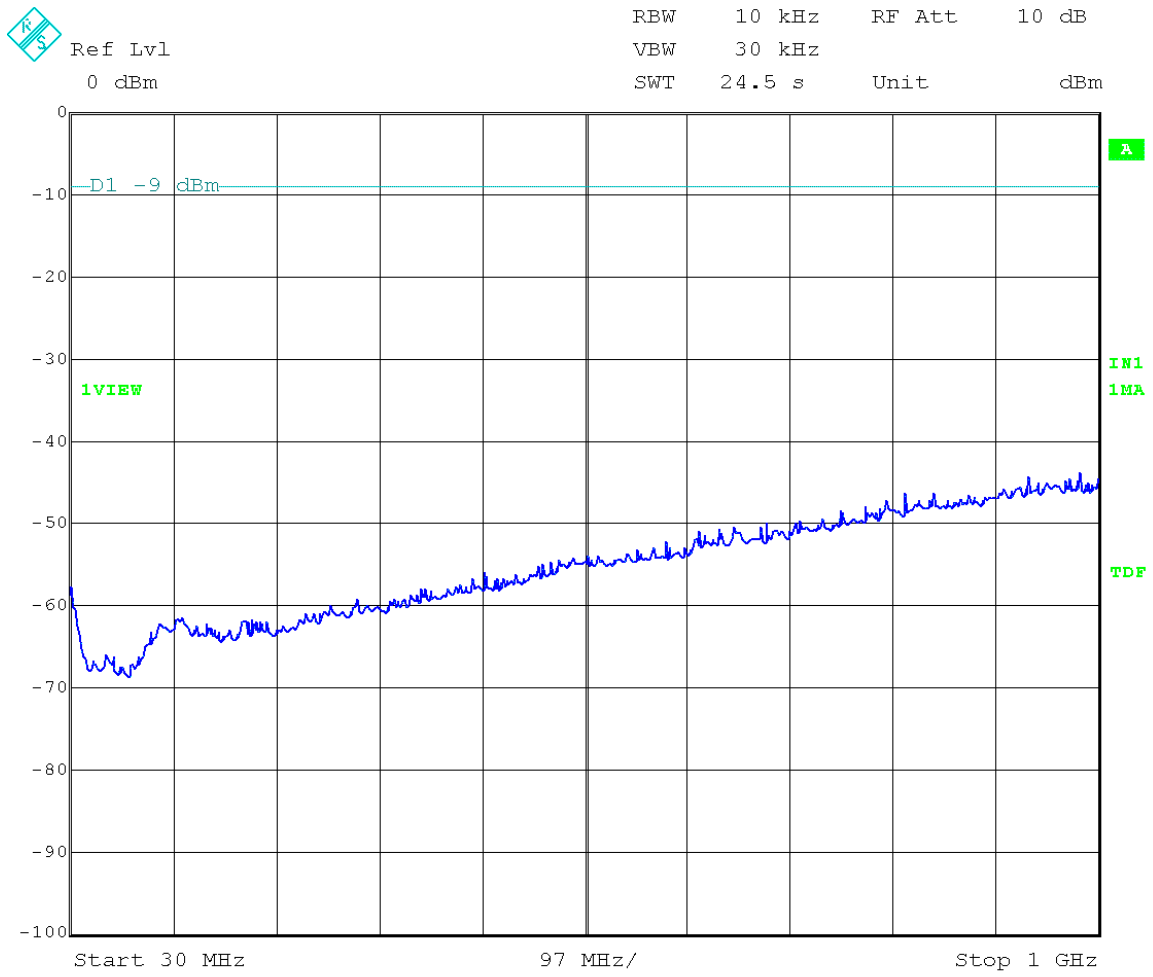
Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

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
4039.9800	-43.11	Vertical	-38.81	1.40	10.00	-30.21	-28.96
6059.9351	-51.97	Horizontal	-44.87	1.70	10.20	-36.37	-35.12
8079.9135	-55.73	Vertical	-43.53	2.00	10.90	-34.63	-33.38

FREQUENCY RANGE 30 MHz-1000 MHz.

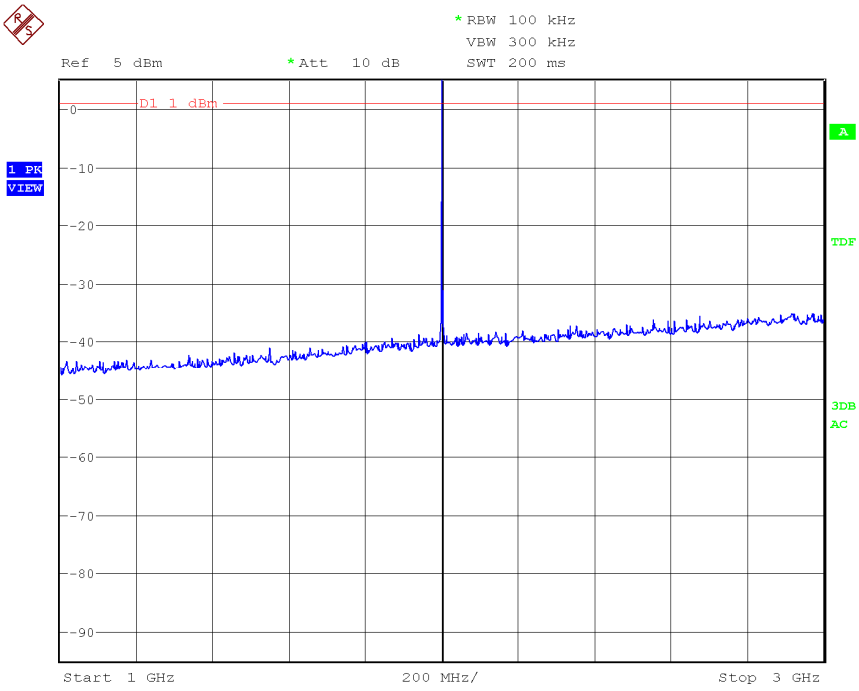


Note: The limit shown in the plot is extrapolated for 10 kHz measurement bandwidth.

(This plot is valid for all three channels)

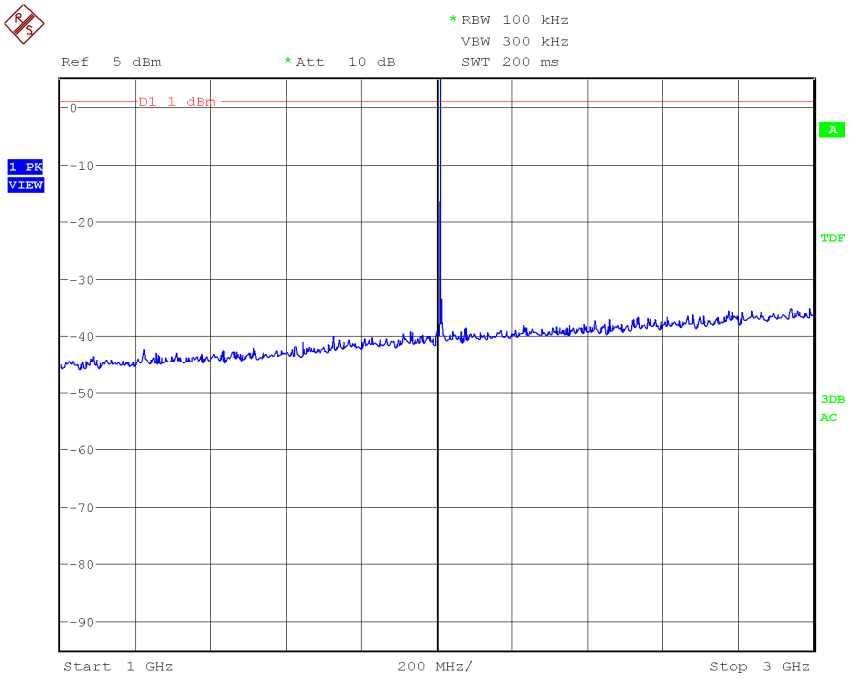
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: LOWEST



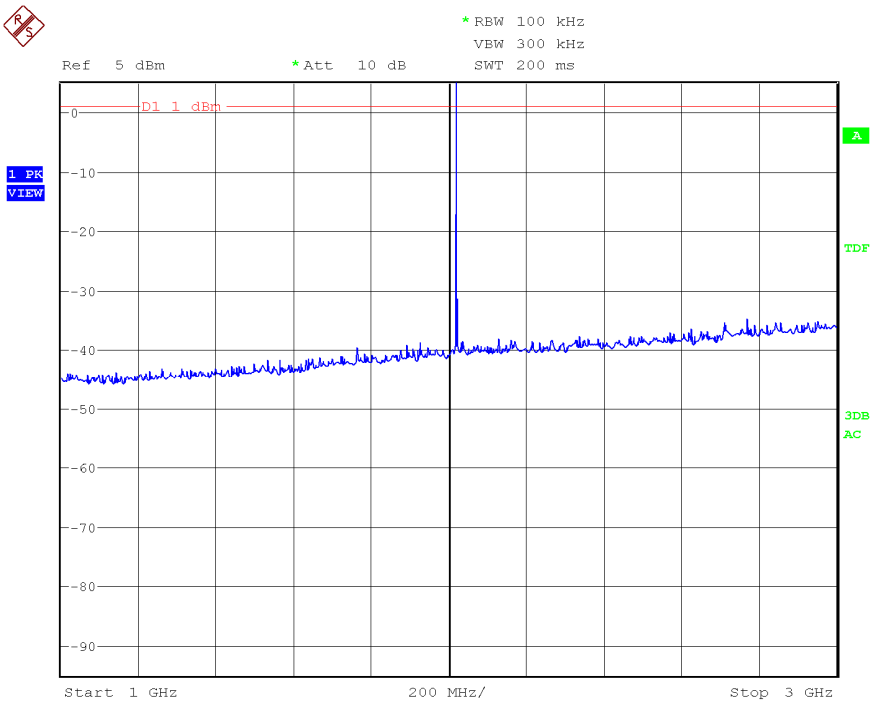
Note: The peak above the limit is the carrier frequency. The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

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.

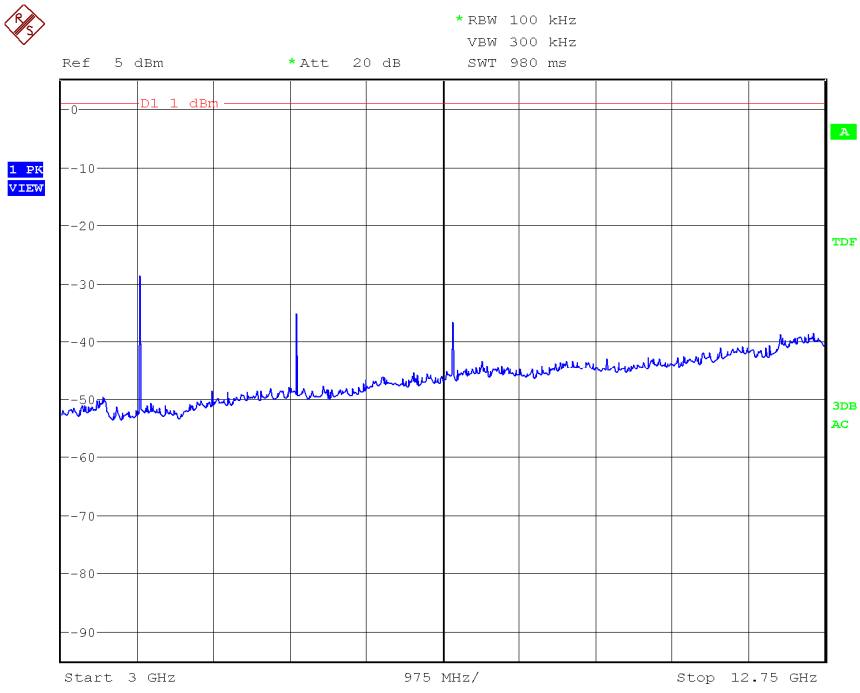
CHANNEL: HIGHEST



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

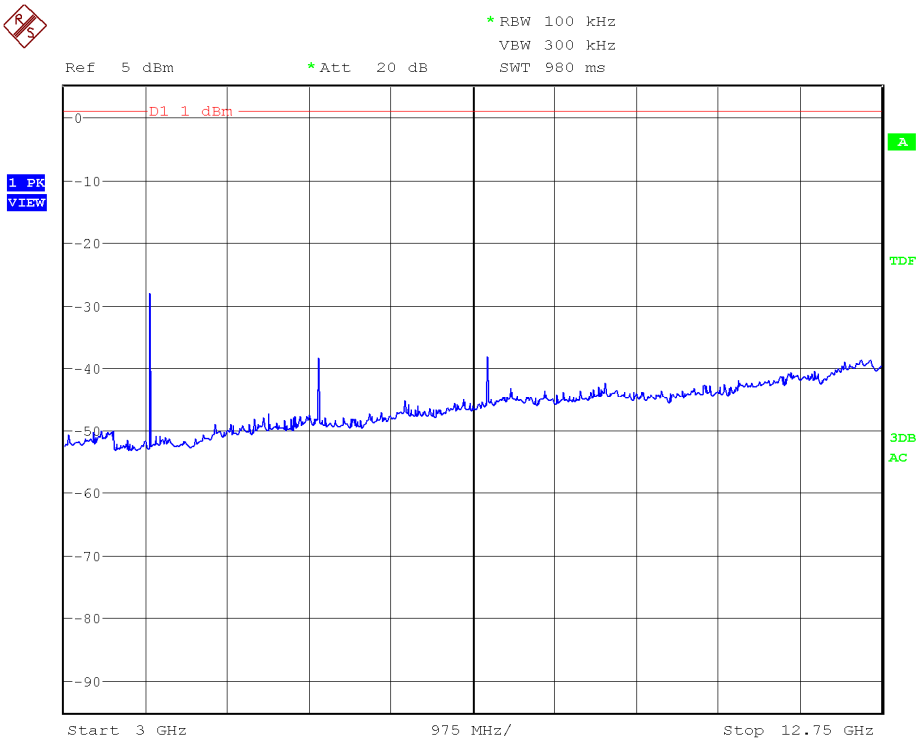
FREQUENCY RANGE 3 GHz to 12.75 GHz.

CHANNEL: LOWEST



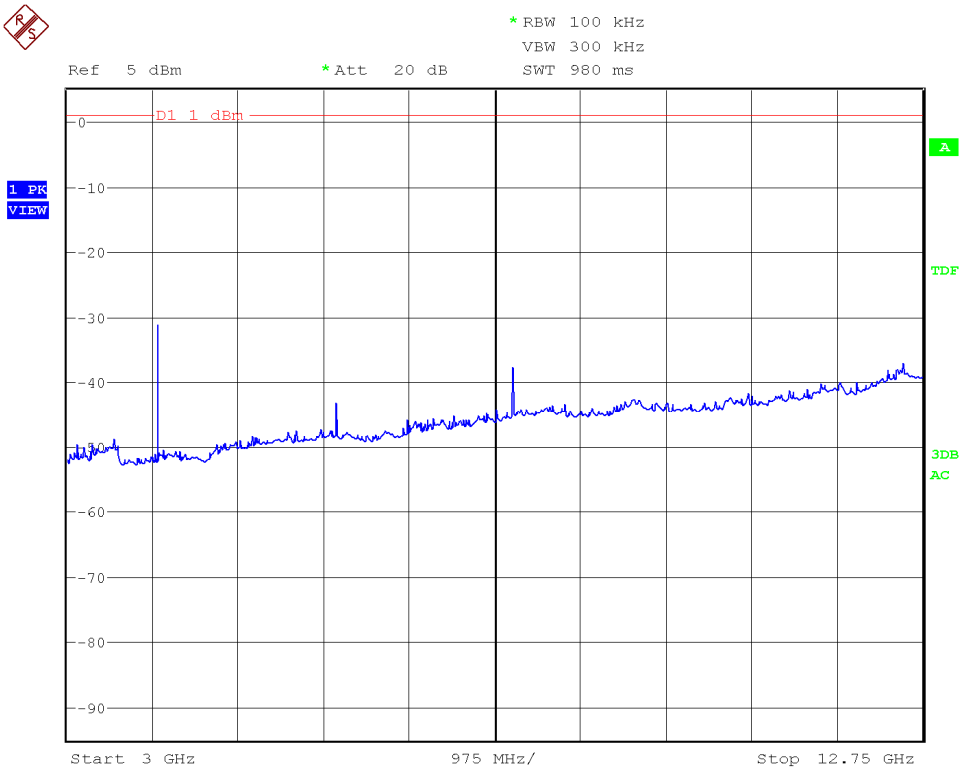
Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

CHANNEL: MIDDLE



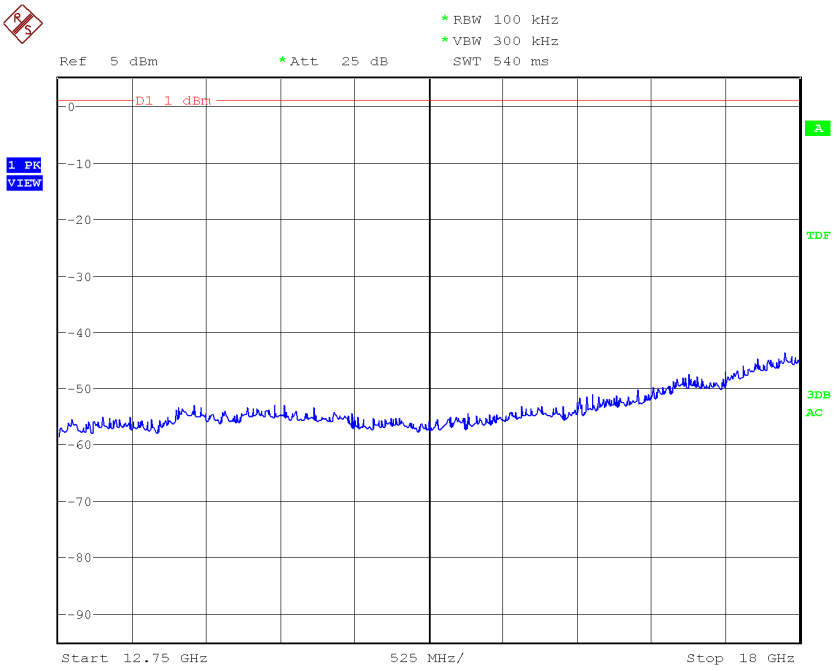
Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

CHANNEL: HIGHEST



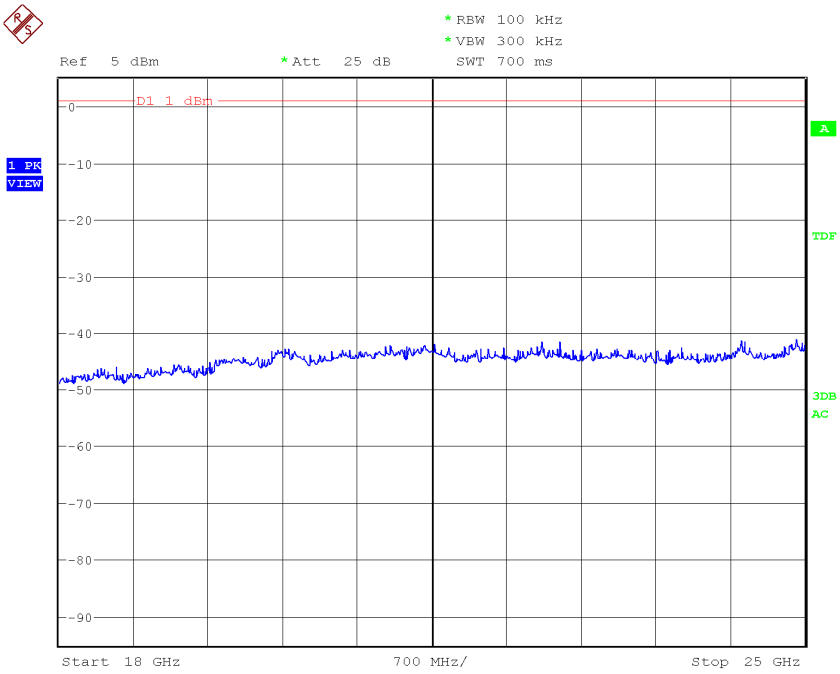
Note: The limit shown in the plot is extrapolated for 100 kHz measurement bandwidth.

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.

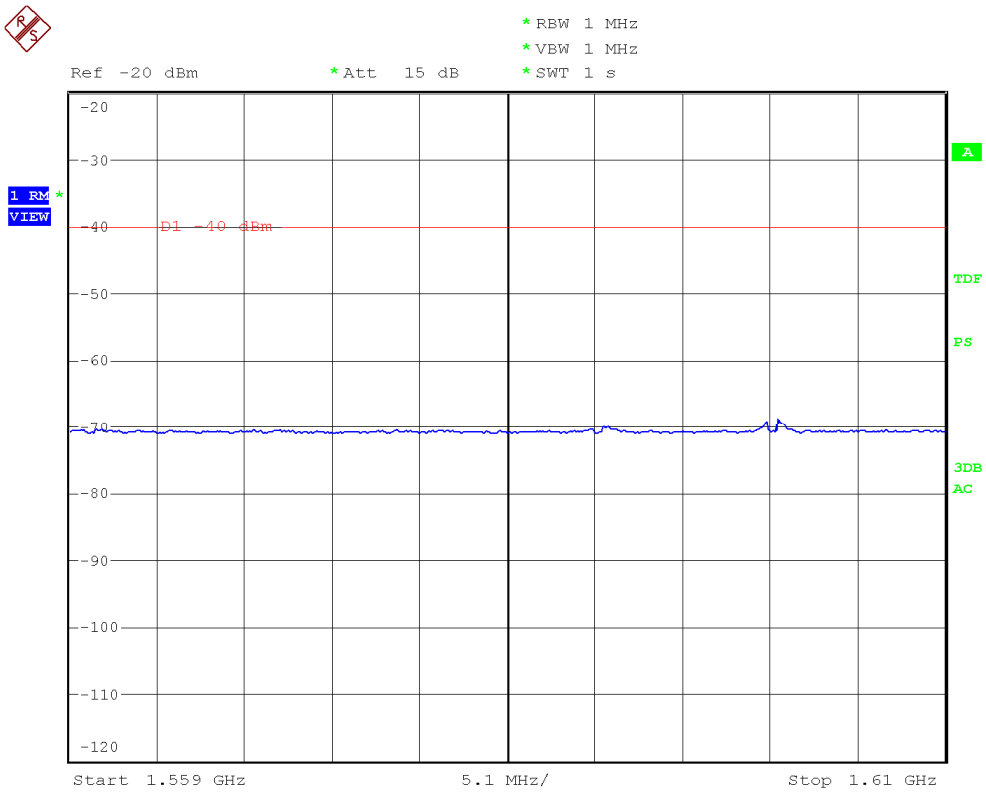
The spectrum was investigated in the range of frequencies between 1559 MHz and 1610 MHz.
The EUT was placed on a 1 meter high non-conductive stand and at a 1 m distance from the measuring antenna.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna 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: Measuring results for electromagnetic conducted emission

CONTENT:

DESCRIPTION OF THE OPERATION MODES

The operation modes described in this paragraph constitute a functionality of the sample under test for itself. Every operation mode takes a failure criteria for the immunity test that they were applying to it and a monitoring to guarantee performance of the same ones.

In the following table appears the operation modes used by the samples tested to that it refers the present test report.

OPERATION MODE	DESCRIPTION
OM#012	EUT ON. TCH SAT. Bluetooth Tx. Charging batteries.

*Power supply: 115Vac / 60Hz or by means of the Tabletop mounted tower PC USB port, depending of the used sample.

CONTINUOUS CONDUCTED EMISSION ON POWER LEADS

LIMITS:	Product standard :	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART C.
	Test standard :	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART C.

CLASS B

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart C in the frequency range 0,15 to 30 MHz, for Class B equipment was:

Frequency range (MHz)	**Limit (dBµV)**	
	Quasi-peak	**Average**
0,15 to 0,5	66-56	56-46
0,5 to 5	56	46
5 to 30	60	50

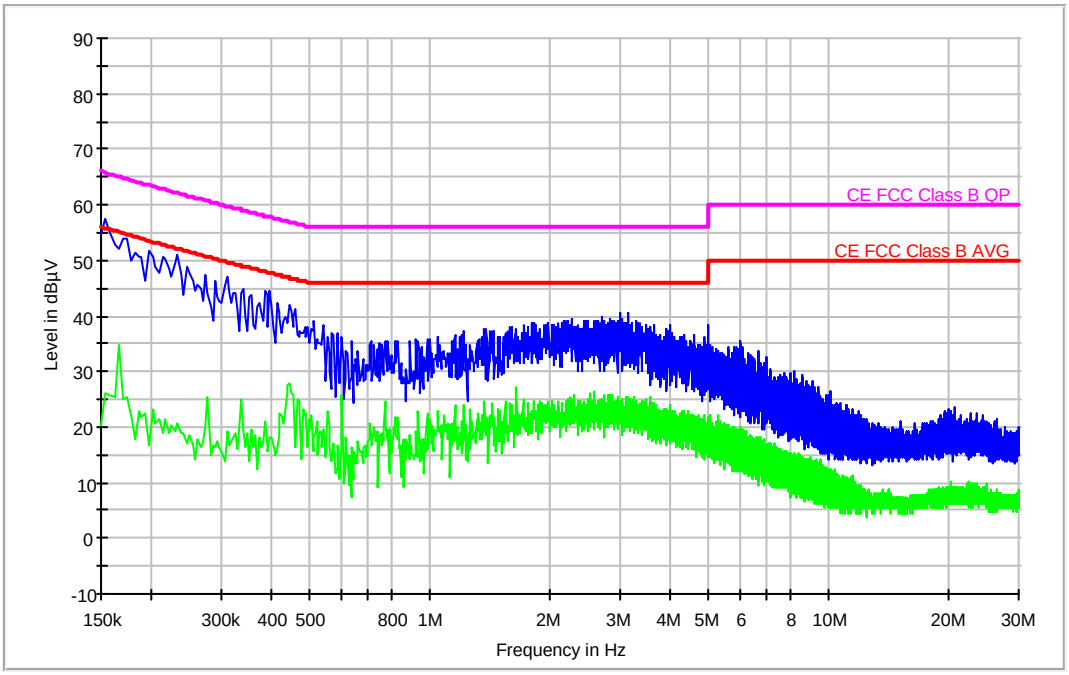
TESTED SAMPLES:	S/02 & 04
TESTED OPERATION MODES:	OM#12
TEST RESULTS :	CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Operation mode; hh: wire

CCmmnnhh	Description	Result
CC02120N	EUT ON. TCH SAT. Bluetooth Tx. Charging batteries. Neutral wire noise.	P
CC0212L1	EUT ON. TCH SAT. Bluetooth Tx. Charging batteries. Phase wire noise.	P
CC04120N	EUT ON. TCH SAT. Bluetooth Tx. Charging batteries. Neutral wire noise.	P
CC0412L1	EUT ON. TCH SAT. Bluetooth Tx. Charging batteries. Phase wire noise.	P

Continuous Conducted emission : CC02120N	Detector : Peak / Average / Cuasi-peak

Project:	30931iem.001
Company:	ELEKTROBIT
Sample:	S/02
Operation mode:	OM#12
Date:	2009-12-23 12:30
Setup:	EMI conducted
Mode:	EUT ON. Tx Sat + BT Tx. Neutral noise.

EC FCC Class B ESIB26 CC



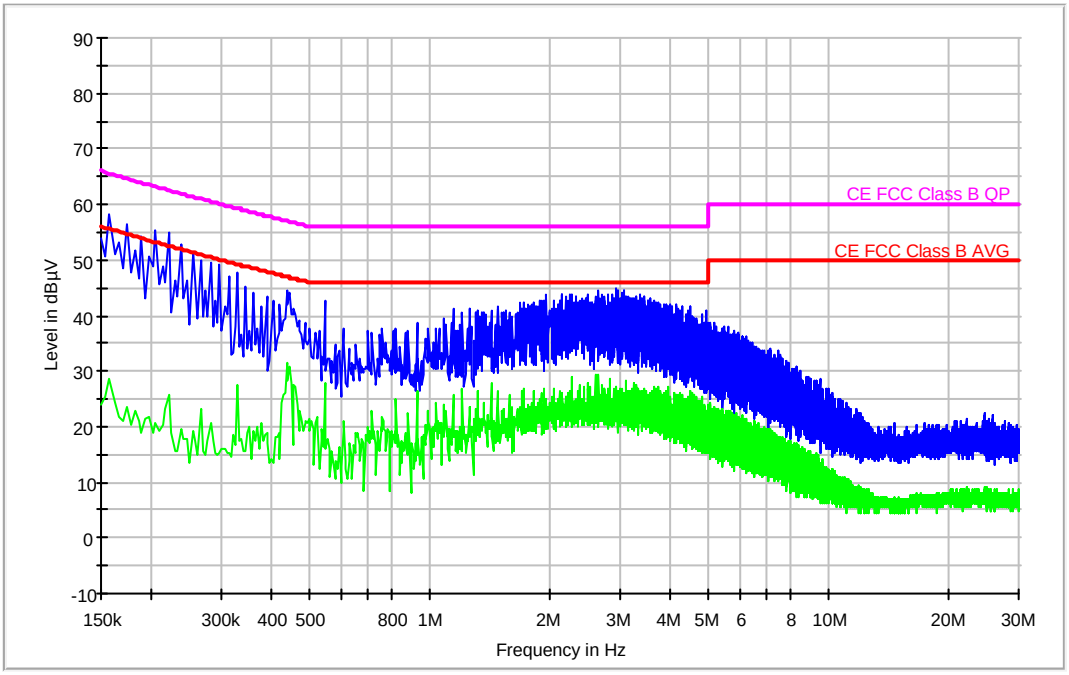
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.154000	57.4	26.2
0.234000	51.0	20.5
0.398000	44.5	18.2
0.570000	37.0	14.0
1.218000	37.2	24.0
1.978000	38.8	23.6
3.154000	40.4	25.0
3.306000	39.2	24.6
5.998000	35.6	18.1
8.186000	30.0	14.3
19.102000	22.2	8.7
20.670000	23.7	8.2

Continuous Conducted emission : CC0212L1	Detector : Peak / Average / Cuasi-peak

Project: 30931iem.001
Company: ELEKTROBIT
Sample: S/02
Operation mode: OM#12
Date: 2009-12-23 12:34
Setup: EMI conducted
Mode: EUT ON. Tx Sat + BT Tx. Phase noise

EC FCC Class B ESIB26 CC



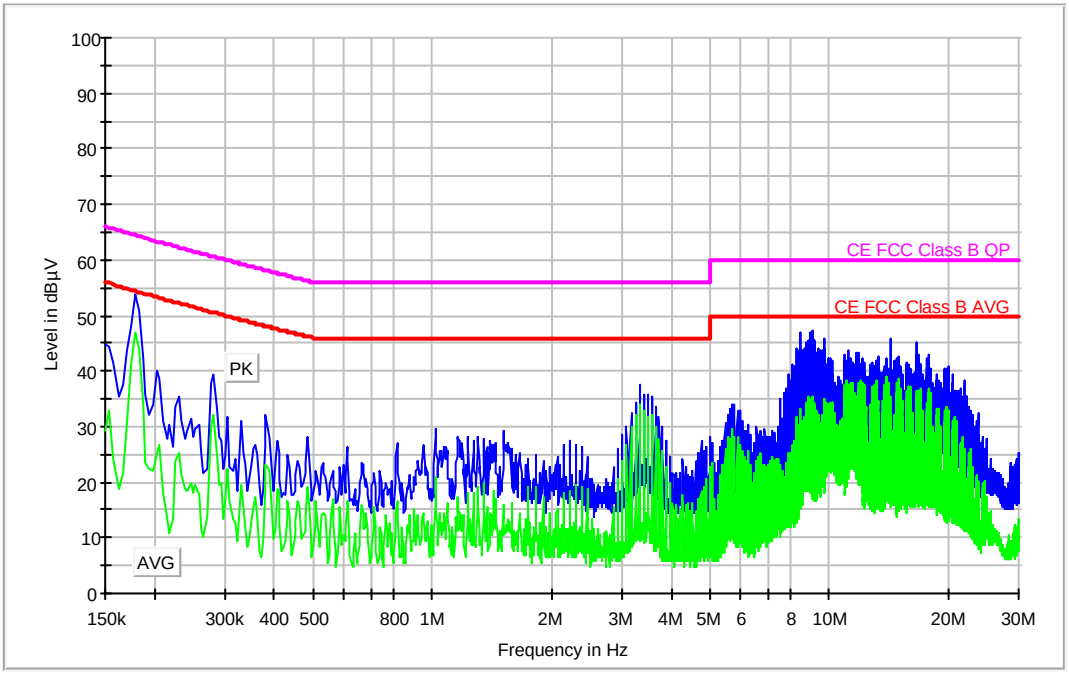
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.158000	58.2	28.5
0.238000	52.7	19.7
0.438000	44.4	31.5
0.826000	37.8	25.0
1.258000	41.4	23.5
1.966000	44.0	24.6
2.930000	44.9	27.1
3.370000	43.7	24.6
5.166000	38.8	22.4
8.266000	30.7	16.3
17.394000	20.9	6.2
24.658000	22.6	8.2

Continuous Conducted emission : CC04120N	Detector : Peak / Average / Cuasi-peak

Project: 30931iem.001
Company: ELEKTROBIT
Sample: S/04
Operation mode: OM#12
Date: 2009-12-28 11:35
Setup: EMI conducted
Mode: EUT ON. TCH SAT. BT activated. Charging batteries. Neutral noise.

EC FCC Class B ESIB26 ALC



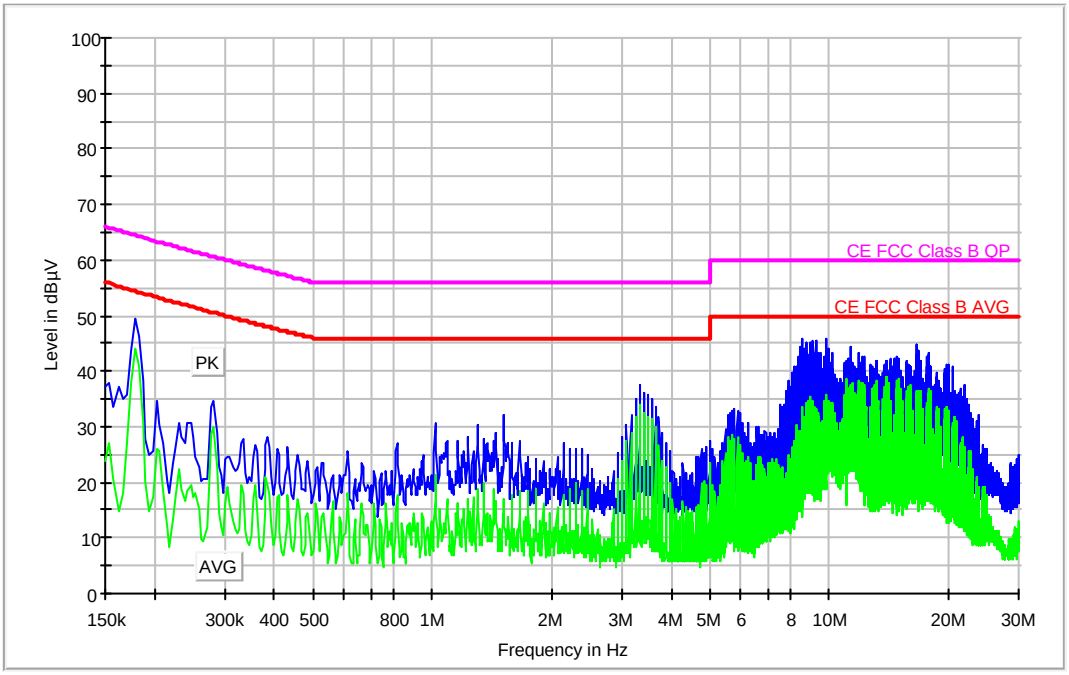
Max PK-AVG

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.150000	44.6	29.1
0.178000	53.8	47.0
8.490000	46.9	33.3
8.722000	45.1	32.5
8.878000	45.4	35.3
8.954000	47.0	33.5
9.038000	47.1	35.5
9.114000	46.1	33.8
9.194000	45.6	33.8
9.682000	45.7	35.0
14.186000	45.8	35.4
16.654000	45.1	21.1

Continuous Conducted emission : CC0412L1	Detector : Peak / Average / Cuasi-peak

Project: 30931iem.001
Company: ELEKTROBIT
Sample: S/04
Operation mode: OM#12
Date: 2009-12-28 11:39
Setup: EMI conducted
Mode: EUT ON. TCH SAT. BT activated. Charging batteries. Phase noise.

EC FCC Class B ESIB26 ALC



Max PK-AVG

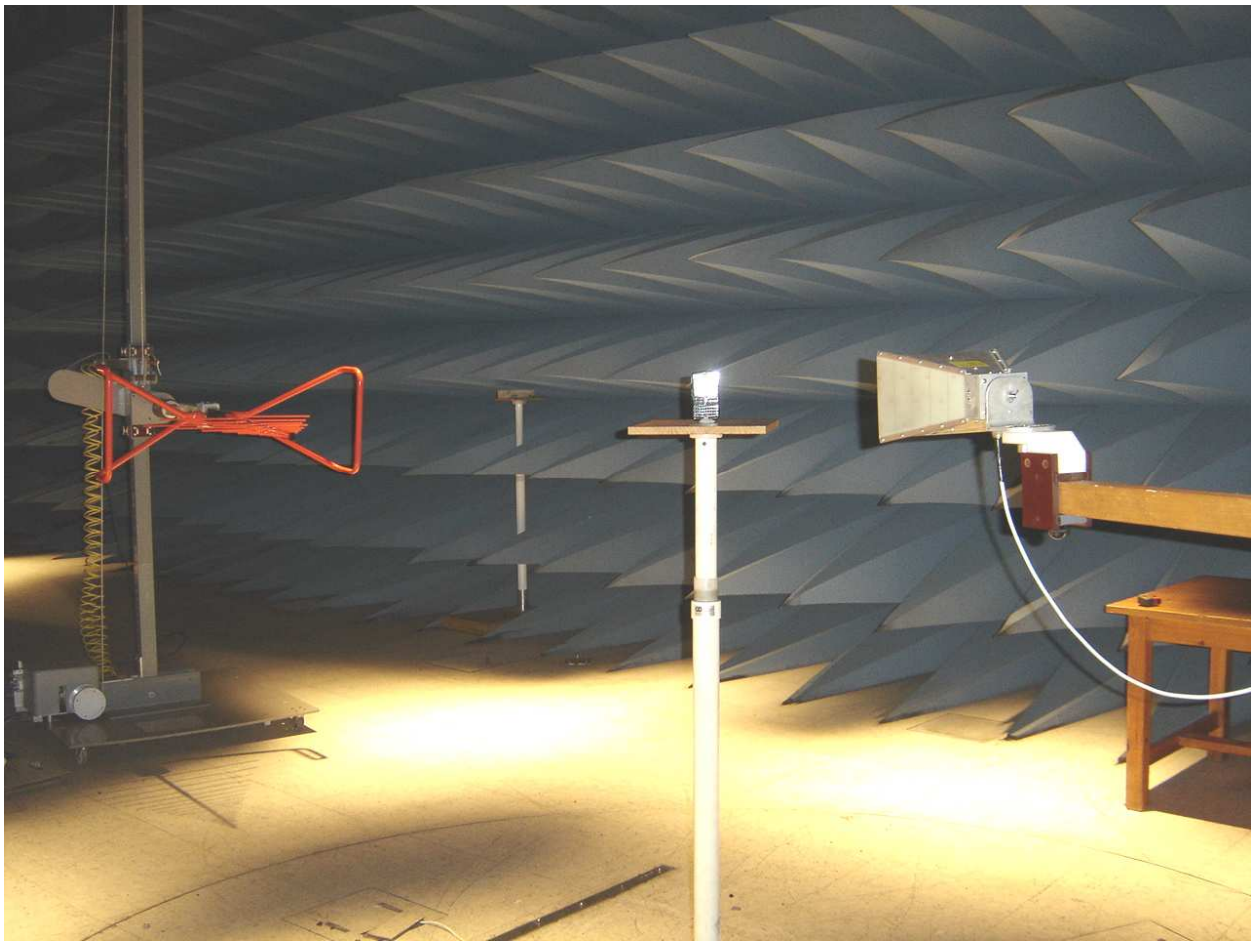
Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.178000	49.5	44.0
8.494000	44.5	28.9
8.570000	45.7	33.7
8.798000	45.0	34.4
8.958000	45.1	35.4
9.034000	45.3	32.8
9.114000	45.4	33.6
9.274000	45.6	33.2
9.838000	45.7	35.7
9.906000	44.1	34.8
11.246000	44.4	36.5
16.654000	44.7	21.0

APPENDIX C: Photographs

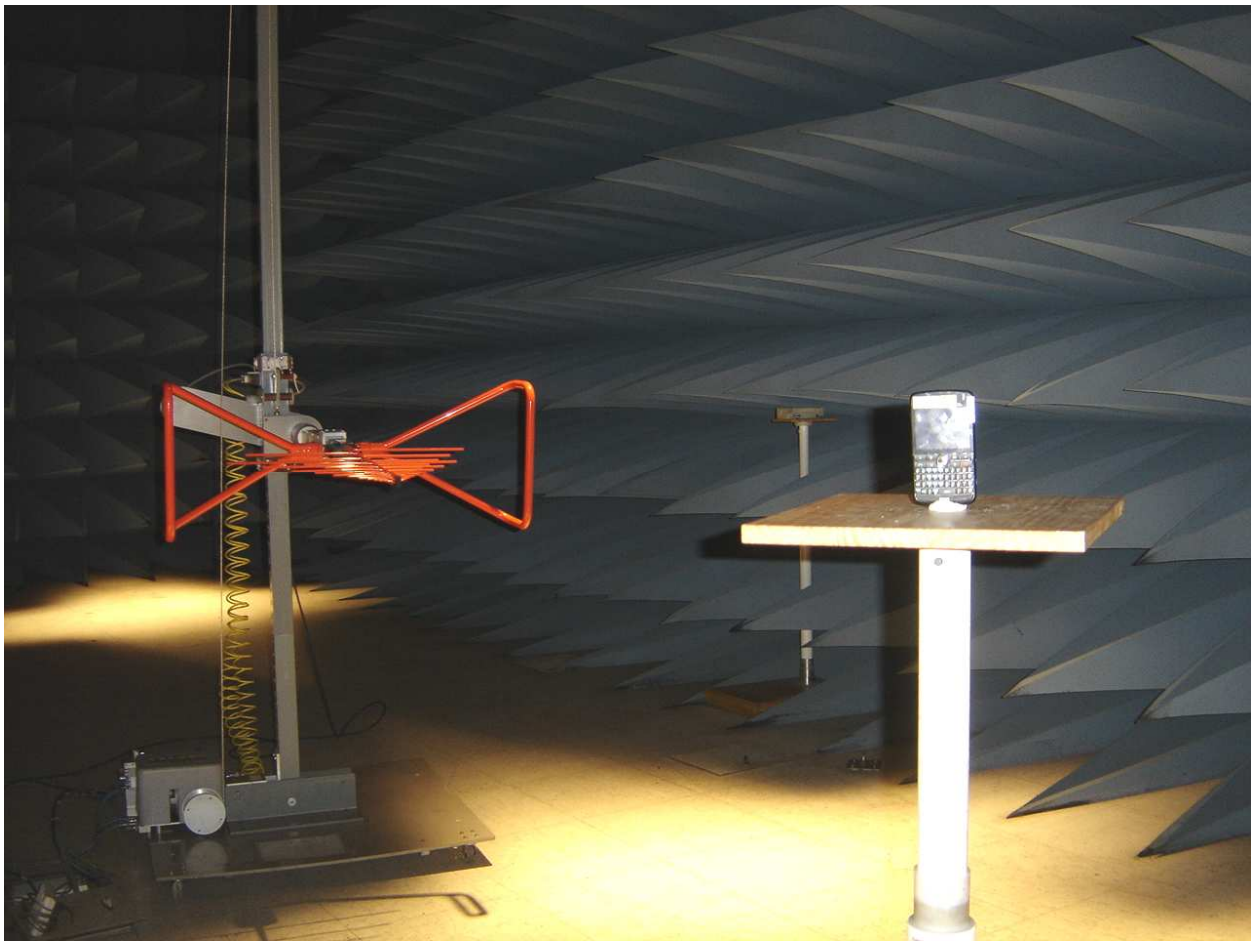

GENUS
FABER-CASTELL

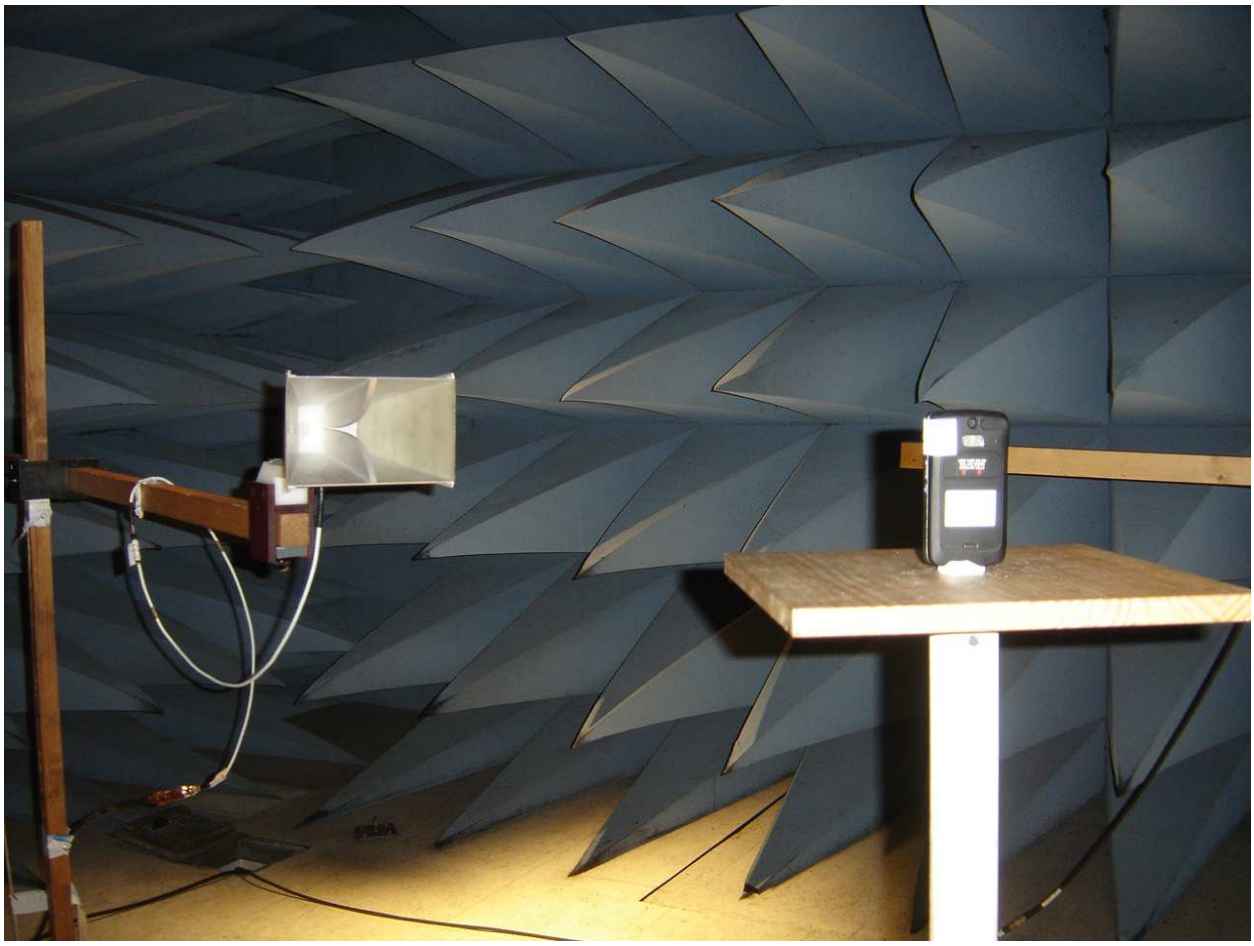

Terre Star
OK
GENUS
Ref. 101 050
SPAIN
PATENTADO


KEEP HAND BELOW
THIS LINE DURING
SATELLITE CALLS
Ref. 101 050
SPAIN
PATENTADO



TEST SET-UP FOR RADIATED MEASUREMENTS BELOW 1 GHz






DELL