

**FCC LISTED, REGISTRATION
NUMBER: 720267**

Test report No:

**IC LISTED REGISTRATION
NUMBER IC 4621A-1**

NIE: 42773RRF.001

Test report

REFERENCE STANDARD: USA FCC Part 27 CANADA IC RSS-139

Identificación del objeto ensayado.....: Identification of item tested	ATOP MODULE 3.5G
Marca Trade	Telit
Modelo y/o referencia tipo Model and /or type reference	OM12030/210
Other identification of the product	FCC ID: RI7OM12030-210; IC: 5131A-OM12030210
Final HW version	B2.6
Final SW version	4.6
Características Features	GSM and GPS functionalities combined with flexible application SW stack. Security features.
Peticionario Applicant	Telit Communications S.p.A. Via Stazione di Prosecco, 5/B 34010 Sgonico. Trieste. ITALY VAT: IT03711600266 Contact person: Michel Eyckmans Telephone: +32 16390786 e-mail: Michel.Eyckmans@telit.com
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 27 10-01-13 Edition. CANADA IC RSS-139 Issue 2, Feb. 2009. Measurement Guidance 971168 D01 v02r01 for certification of Licensed Digital Transmitters
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) Approved by (name / position & signature)	A. Llamas RF Lab. Manager
Fecha de realización Date of issue	2015-02-18
Formato de informe No.: Report template No	FDT08_15

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Competences and guarantees

AT4 wireless 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: 720267.

AT4 wireless 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 4621A-1.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program 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.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of AT4 wireless.

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:

Control N°	Description	Model	Serial N°	Date of reception
42773/001	Module with external connectors	OM12030/210	354914060003104	2014-09-02
39838C/003	External GPS antenna	---	---	2014-03-07
39838C/004	External GPS antenna	---	---	2014-03-07
39838C/005	External NFC antenna board	PN532-C106	---	2014-03-07
39838C/068	External GSM/3G antenna	---	---	2014-09-17

1. Sample M/01 has undergone the test(s).

All tests indicated in appendix A.

Test sample description

The test sample consists of a 33 x 33 RF Module mounted on development board with GSM, 3G, 3.5 G.

Test samples supplier

Telit Communications S.p.A.

Via Stazione di Prosecco, 5/B 34010 Sgonico. Trieste. ITALY

Contact person: Michel Eyckmans

Telephone: +32 16390786

e-mail: Michel.Eyckmans@telit.com

Testing period

The performed test started on 2014-09-09 and finished on 2014-09-29.

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. = 21.66 °C Max. = 22.18 °C
Relative humidity	Min. = 43.65 % Max. = 44.32 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber the following limits were not exceeded during the test.

Temperature	Min. = 19.86 °C Max. = 20.2 °C
Relative humidity	Min. = 41.61 % Max. = 44.14 %
Air pressure	Min. = 1002 mbar Max. = 1004 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. = 23.7 °C Max. = 26.6 °C
Relative humidity	Min. = 41.6 % Max. = 54.6 %
Air pressure	Min. = 1005 mbar Max. = 1014 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

Remarks and comments

1: Used instrumentation.

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent PSA E4440A	2014/05	2016/05
2.	Climatic chamber HERAEUS VM 07/100	2012/10	2015/10
3.	DC power supply R&S NGPE 40/40	2011/11	2014/11
4.	Wideband Power sensor R&S NRP-Z81	2014/03	2016/03
5.	Universal Radio communication Tester R&S CMU200	2014-02	2016-02

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2014/03	2017/03
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2013/11	2016/11
5.	SHF-EHF Horn antenna 15-40 GHz Schwarbeck BBHA 9170	2014/03	2017/03
6.	EMI Test Receiver R&S ESU 26	2013/08	2015/08
7.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10
8.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2014/02	2015/02
9.	RF pre-amplifier 1-18 GHz Schwarzbek BBV 9718	2014/02	2015/02
10.	RF pre-amplifier BONN BLMA 1840-1M 18-40 GHz.	2014/02	2016/02
11.	Universal Radio communication Tester R&S CMU200	2014-02	2016-02

2. HSDPA modulation mode has not been tested to prove USA FCC Part 27 and Canada IC RSS-139 compliance because it is an improved mode of operation only for Downlink (UE reception), but using the normal WCDMA mode for UL (Up Link, UE transmission). Therefore HSDPA has no associated a Power class or modulation scheme different than WCDMA mode for the UL transmission.

Taking into account the above comments, testing in HSDPA modulation mode is redundant for FCC Part 27 and IC RSS-139 as it is the same as WCDMA mode as long as UE transmission is concerned. WCDMA modulation mode has been tested as indicated on the present test report.

Testing verdicts

Not applicable	N/A
Pass	P
Fail	F
Not measured	N/M

FCC PART 27/IC RSS-139 PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 27.50/RSS-139 Clause 6.4: RF output power		P		
Clause 2.1047/RSS-139 Clause 6.2: Modulation characteristics		P		
Clause 27.54/RSS-139 Clause 6.3: Frequency stability		P		
Clause 2.1049: Occupied Bandwidth		P		
Clause 27.53/RSS-139 Clause 6.5: Spurious emissions at antenna terminals		P		
Clause 27.53/RSS-139 Clause 6.5: Radiated emissions		P		

Appendix A – Test result for FCC Part 27/IC RSS-139

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TEST RESULTS FOR FCC PART 27 AND IC RSS-139

TEST CONDITIONS

Power supply (V):

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

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

$$V_{\text{min}} = 3.4 \text{ Vdc}$$

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 power supply

Type of antenna = external connectable antenna

TEST FREQUENCIES:

WCDMA MODULATION

Lowest channel (1312): 1712.4 MHz

Middle channel (1762): 1732.5 MHz

Highest channel (1513): 1752.6 MHz

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

SPECIFICATION

§2.1046 and §27.50. RSS-139 Clause 6.4.

Fixed, mobile and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to a peak Equivalent Isotropically Radiated Power (E.I.R.P.) of 1 Watt (30 dBm).

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

METHOD

The conducted RF output power measurements were made at the RF output terminals of the EUT using an attenuator, a power splitter and a calibrated wideband power sensor. The EUT was controlled via the Universal Radio Communication tester R&S CMU200 selecting maximum transmission power of the EUT and different modes of modulation.

The maximum effective radiated power e.i.r.p. is calculated by adding the declared maximum antenna gain (dBi).

RESULTS

Maximum declared antenna gain (dBi) = 2.14.

MAXIMUM OUTPUT POWER (CONDUCTED).

WCDMA MODULATION

Channel	Lowest	Middle	Highest
Measured maximum peak power (dBm) at antenna port	27.15	26.80	27.82
Maximum peak equivalent isotropically radiated power E.I.R.P. (dBm)	29.29	28.94	29.96
Measured maximum average power (dBm) at antenna port	19.92	19.69	19.80
Maximum average equivalent isotropically radiated power E.I.R.P. (dBm)	22.06	21.83	21.94
Peak-to-average ratio (PAR) (dB)	7.23	7.11	8.02
Measurement uncertainty (dB)	±0.5		

HSUPA MODULATION

Channel	Lowest	Middle	Highest
Measured maximum peak power (dBm) at antenna port	26.74	26.34	27.40
Maximum peak equivalent isotropically radiated power E.I.R.P. (dBm)	28.88	28.48	29.54
Measured maximum average power (dBm) at antenna port	19.52	19.41	19.52
Maximum average equivalent isotropically radiated power E.I.R.P. (dBm)	21.66	21.55	21.66
Peak-to-average ratio (PAR) (dB)	7.22	6.93	7.88
Measurement uncertainty (dB)	±0.5		

Verdict: PASS

Modulation Characteristics

SPECIFICATION

§2.1047. RSS-139 Clause 6.2.

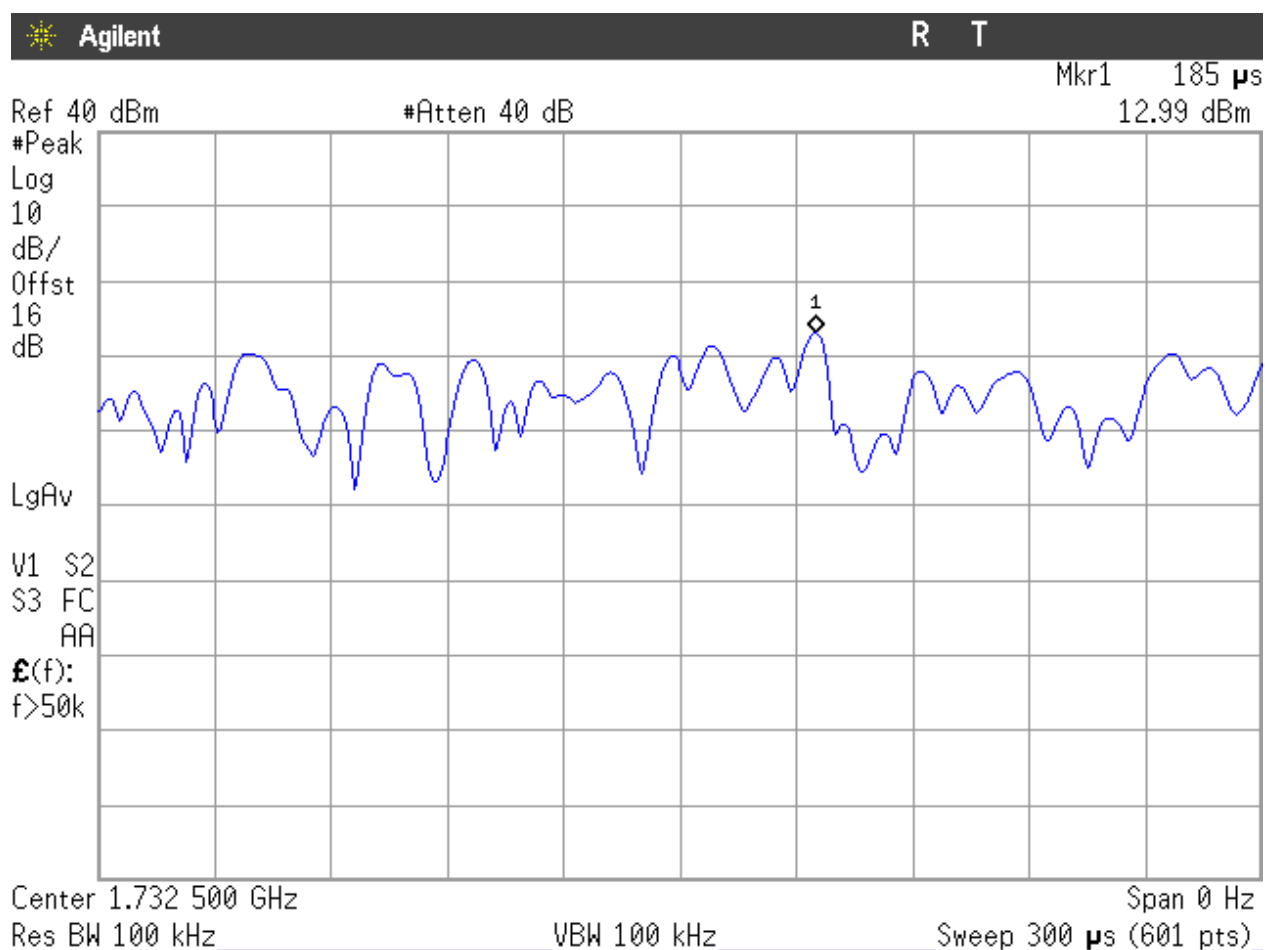
METHOD

The EUT operates with WCDMA (QPSK) and HSUPA (QPSK) modes, in which the information is digitised and coded into a bit stream.

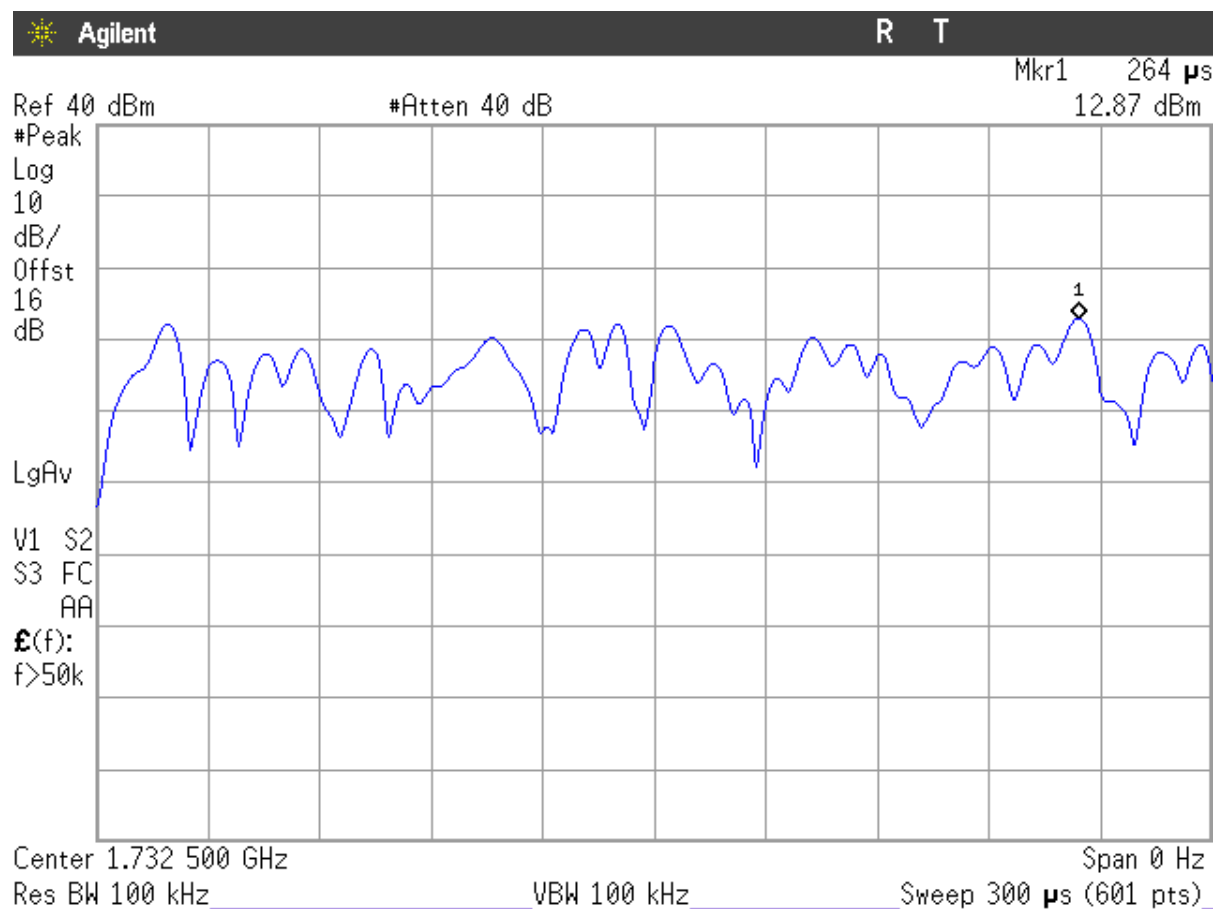
RESULTS

The following plots show the modulation schemes in the EUT.

WCDMA MODULATION



HSUPA MODULATION



Frequency Stability

SPECIFICATION

§2.1055 and §27.54. RSS-139 Clause 6.3.

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 built-in calibrated frequency meter of CMU200.

RESULTS

Frequency stability over temperature variations.

WCDMA MODULATION

Temperature ($^{\circ}\text{C}$)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
+50	19.7	0.0114	0.00000114
+40	-18.5	-0.0107	-0.00000107
+30	-6.2	-0.0036	-0.00000036
+20	-32.4	-0.0187	-0.00000187
+10	-18.0	-0.0104	-0.00000104
0	5.0	0.0029	0.00000029
-10	14.5	0.0084	0.00000084
-20	18.3	0.0106	0.00000106
-30	19.8	0.0114	0.00000114

HSUPA MODULATION

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
+50	27.3	0.0158	0.00000158
+40	29.2	0.0169	0.00000169
+30	21.3	0.0123	0.00000123
+20	11.4	0.0066	0.00000066
+10	7.6	0.0044	0.00000044
0	-22.0	-0.0127	-0.00000127
-10	6.7	0.0039	0.00000039
-20	19.2	0.0111	0.00000111
-30	23.5	0.0136	0.00000136

Frequency stability over voltage variations.

WCDMA MODULATION

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	4.2	24.5	0.0142	0.00000142
Vmin	3.4	13.5	0.0078	0.00000078

HSUPA MODULATION

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	4.2	-9.3	-0.0054	-0.00000054
Vmin	3.4	-17.0	-0.0098	-0.00000098

Occupied Bandwidth

SPECIFICATION

§2.1049

METHOD

The EUT was configured to transmit a modulated carrier signal. An IF bandwidth of 51 kHz for WCDMA and HSUPA modulation. The 99% occupied bandwidth and the -26 dBc bandwidth were measured directly using the built-in bandwidth measuring option of spectrum analyser E4440A.

The occupied Bandwidth was measured according to point 4.2 of Guidance 971168 D01 Power Meas License Digital Systems v02r01.

RESULTS

WCDMA MODULATION

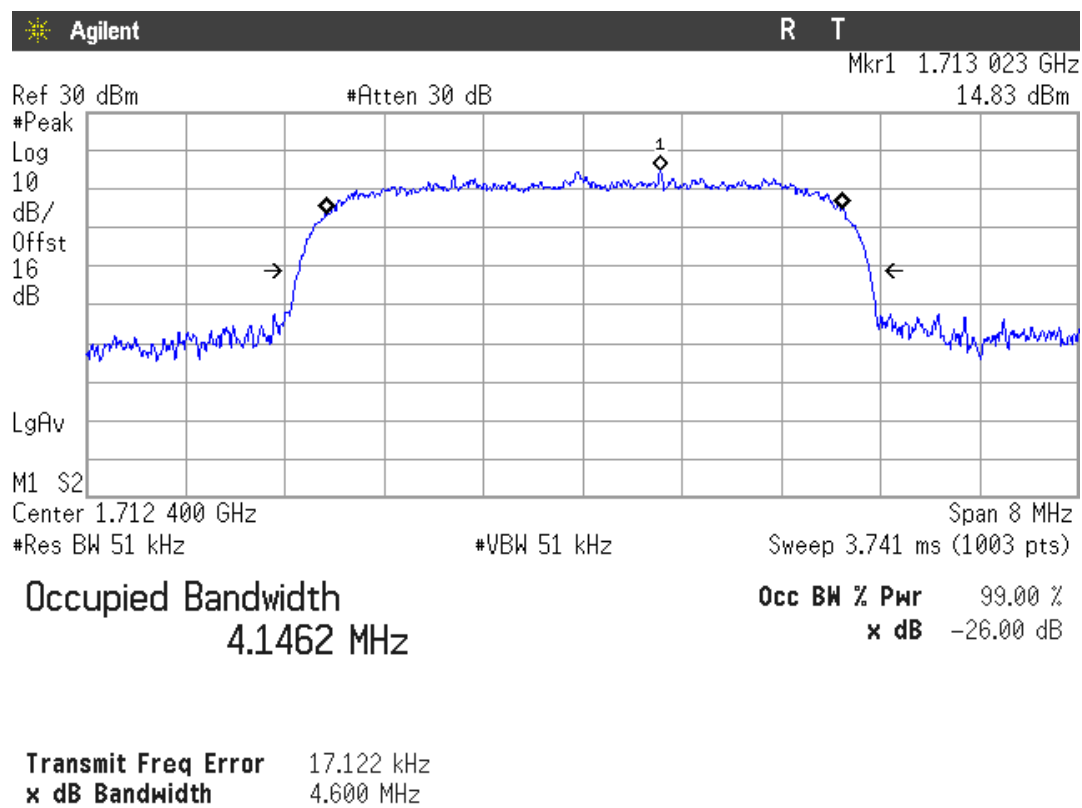
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (kHz)	4146.2	4135.4	4136.4
-26 dBc bandwidth (kHz)	4600	4611	4606
Measurement uncertainty (kHz)	<±13.3		

HSUPA MODULATION

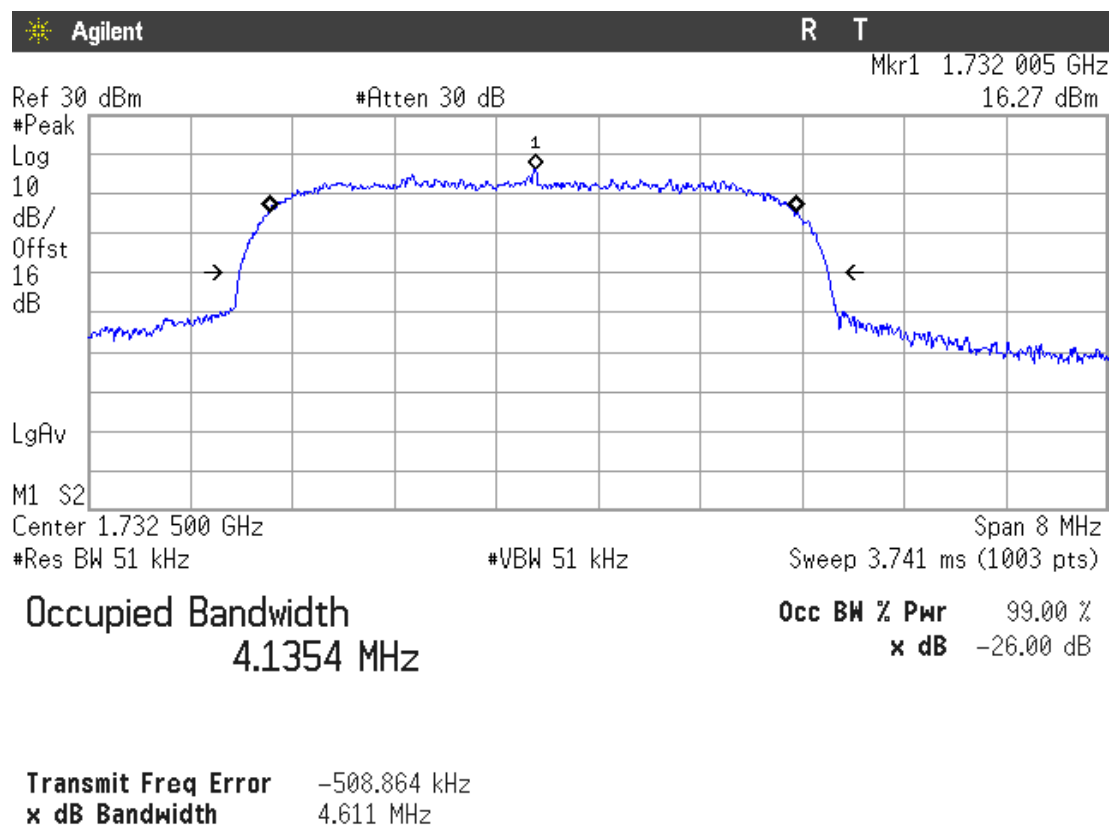
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (kHz)	4131.3	4131.0	4120.9
-26 dBc bandwidth (kHz)	4597	4603	4610
Measurement uncertainty (kHz)	<±13.3		

WCDMA MODULATION

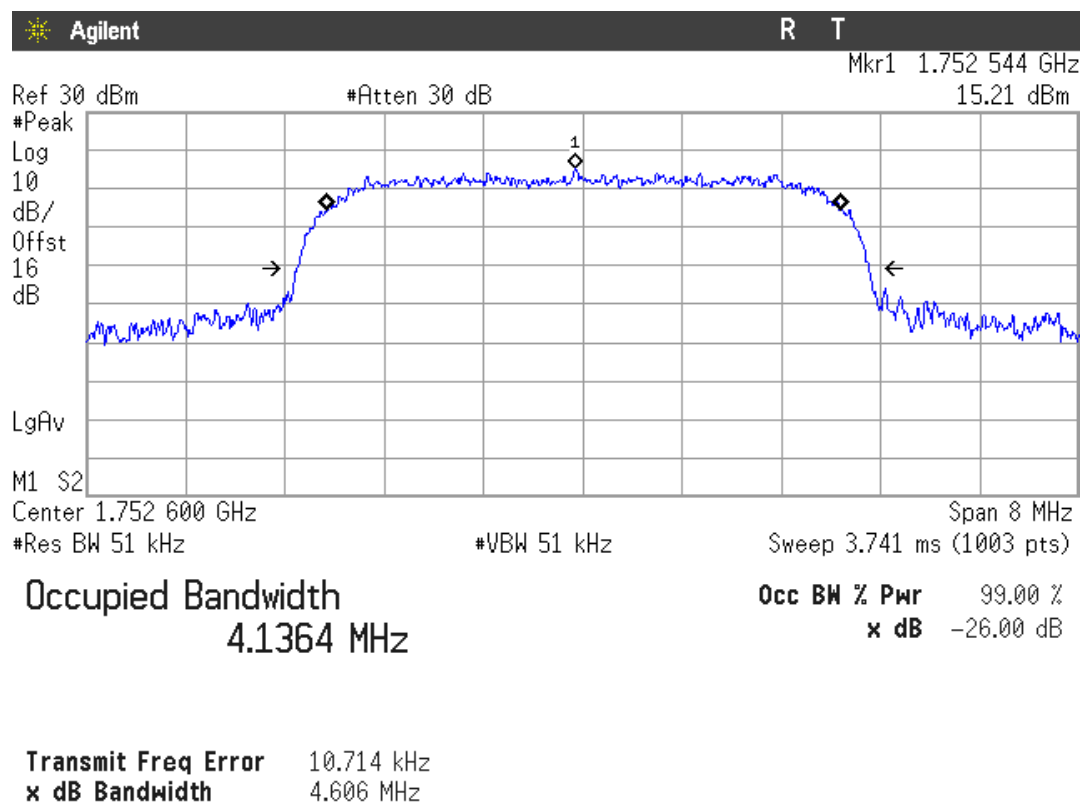
Lowest Channel



Middle Channel

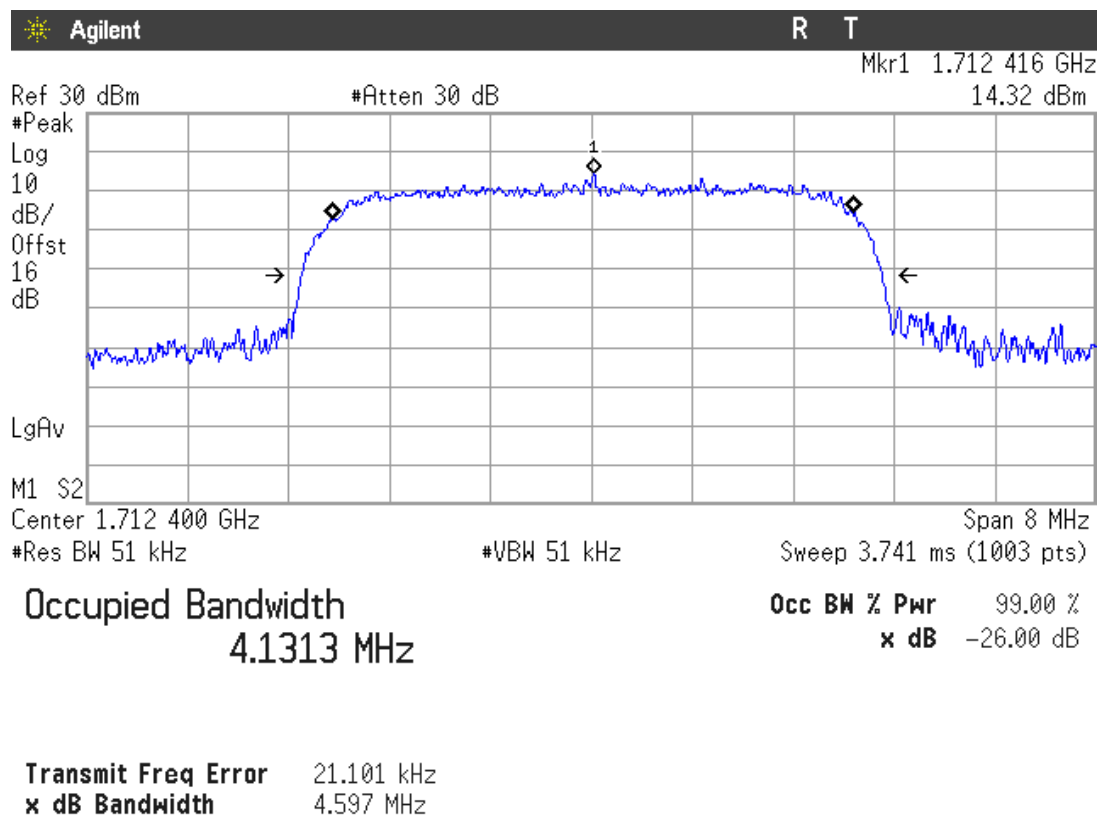


Highest Channel

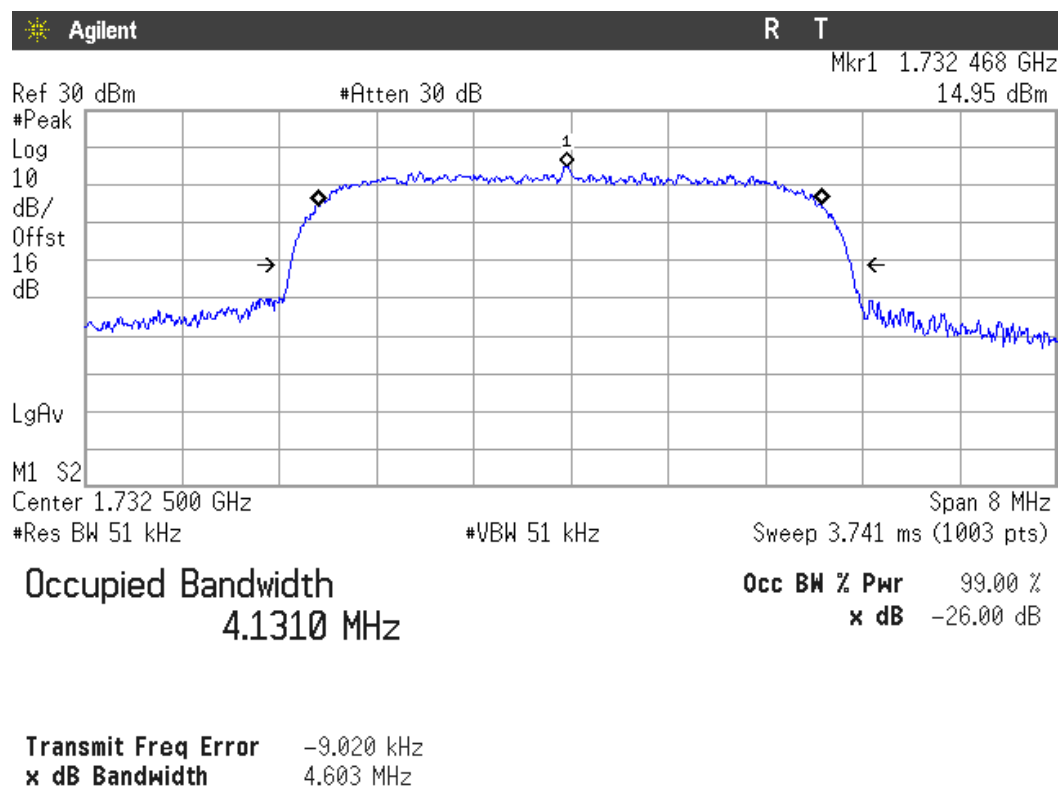


HSUPA MODULATION

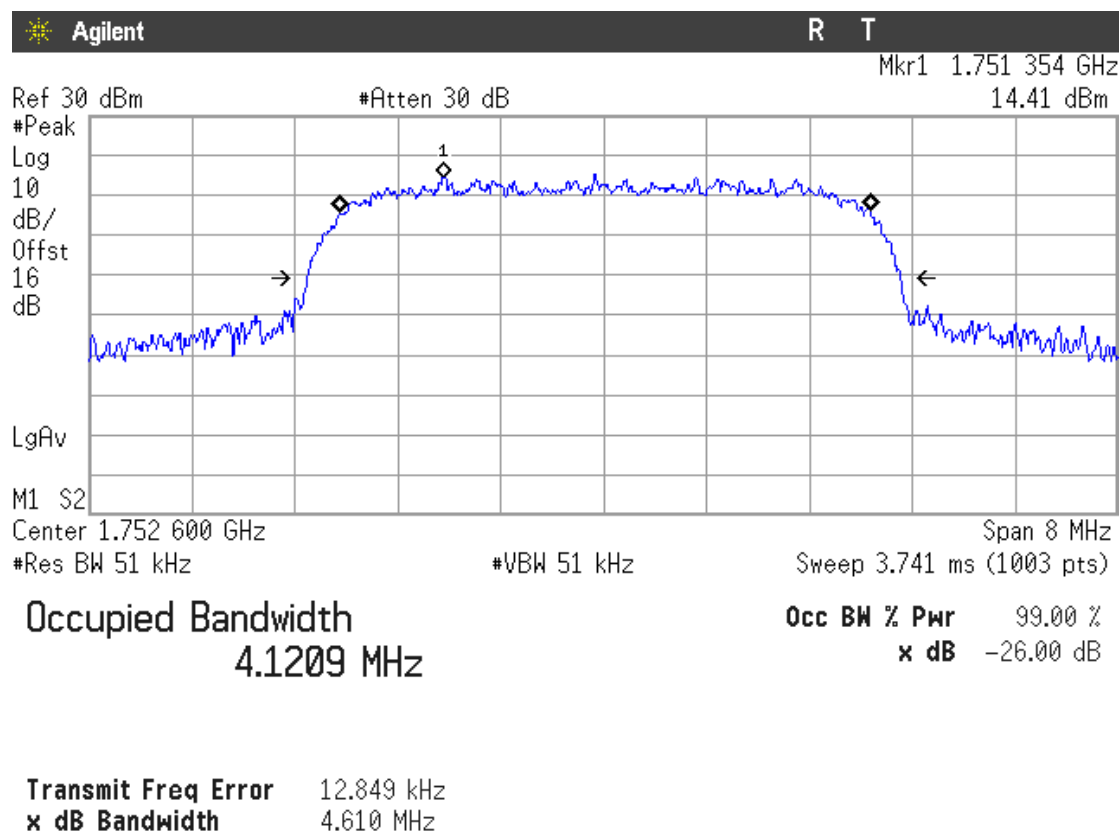
Lowest Channel



Middle Channel



Highest Channel



Spurious emissions at antenna terminals

SPECIFICATION

§2.1051 and §27.53. RSS-139 Clause 6.5.

METHOD

The EUT RF output connector was connected to a spectrum analyser using an 50 ohm attenuator and the resolution bandwidth of the spectrum analyser was set to at least 1 MHz. The spectrum was investigated from 9 kHz to 18 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 in the 1710-1755 MHz band 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)

WCDMA MODULATION

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.

HSUPA MODULATION

1. CHANNEL: LOWEST

No spurious signals were found in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found in all the range.

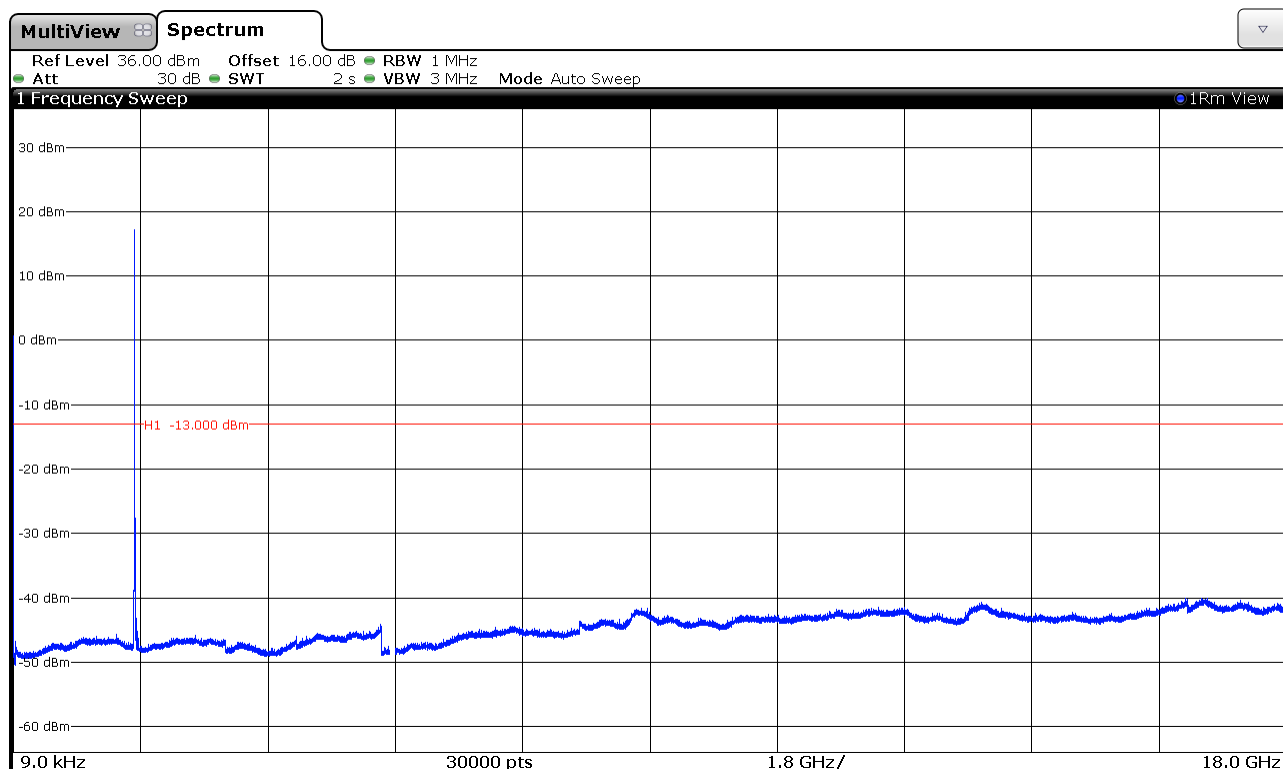
3. CHANNEL: HIGHEST

No spurious signals were found in all the range.

Verdict: PASS

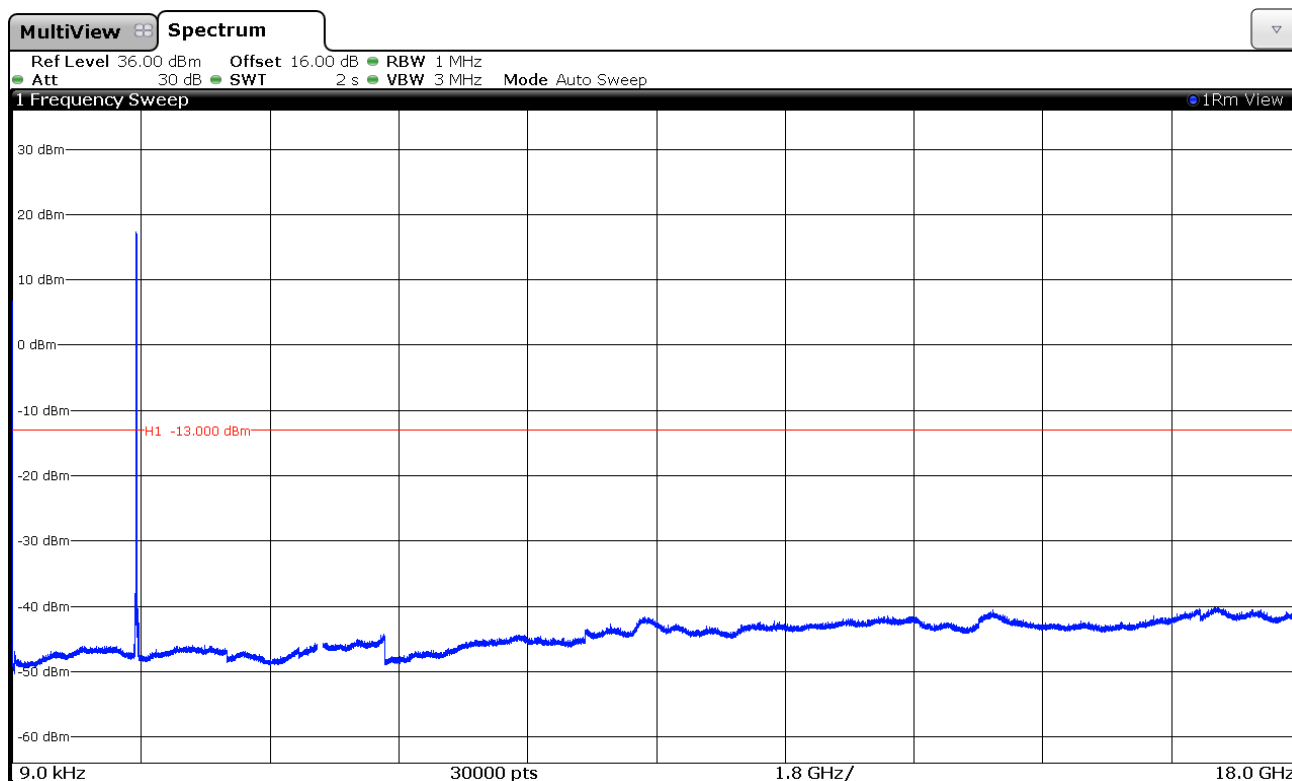
WCDMA MODULATION

1. CHANNEL: LOWEST



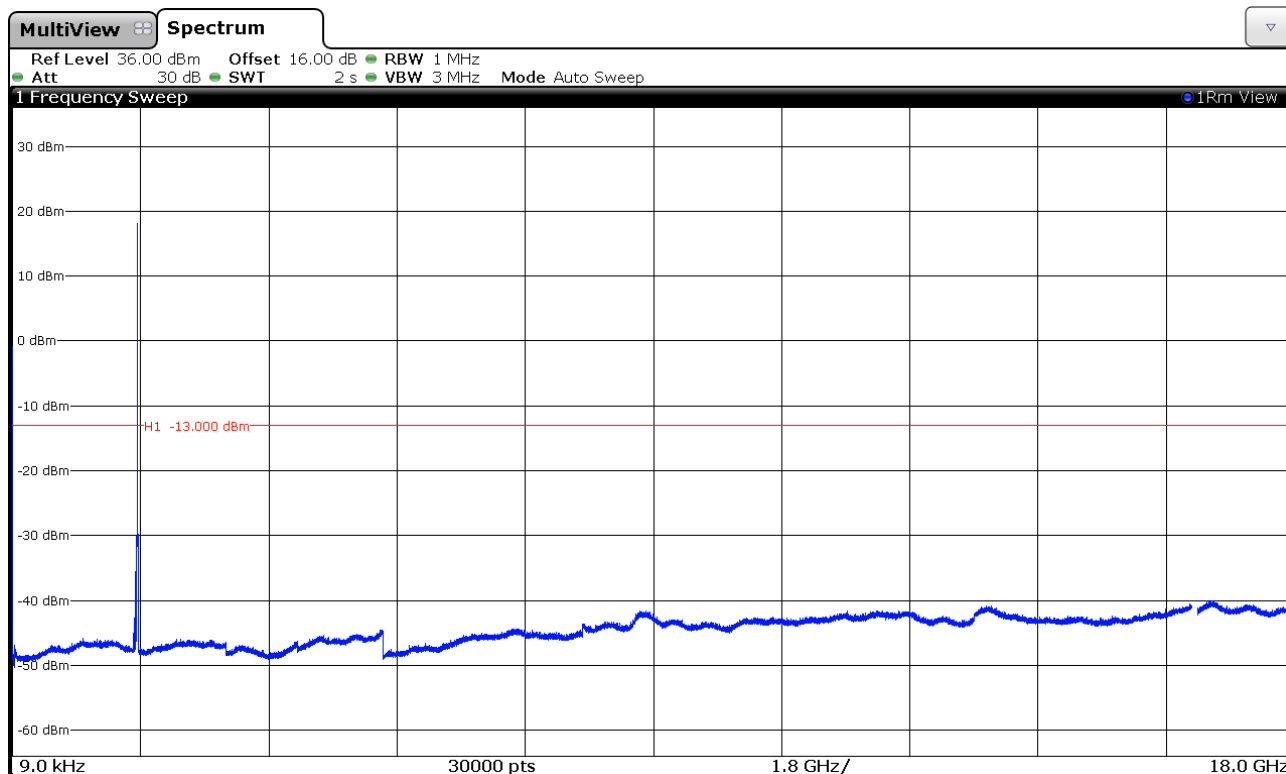
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



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

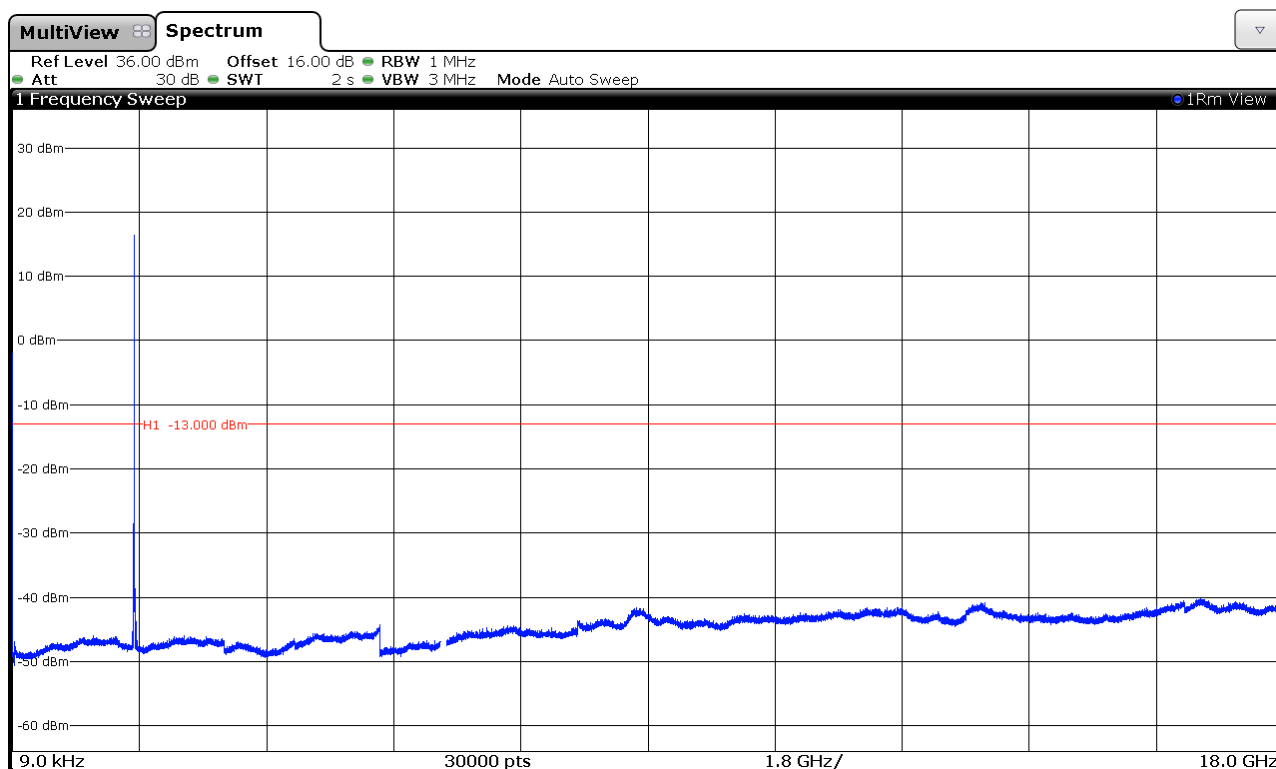
3. CHANNEL: HIGHEST



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

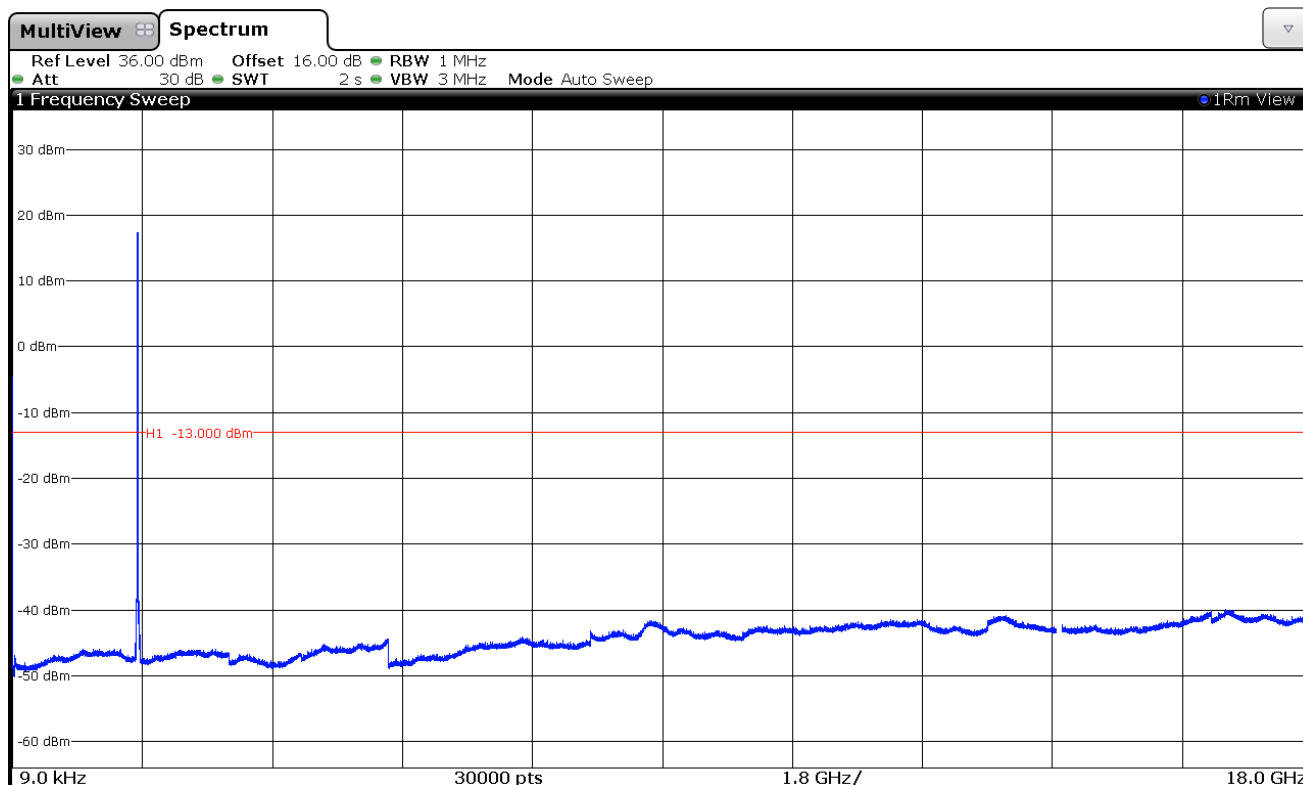
HSUPA MODULATION

1. CHANNEL: LOWEST



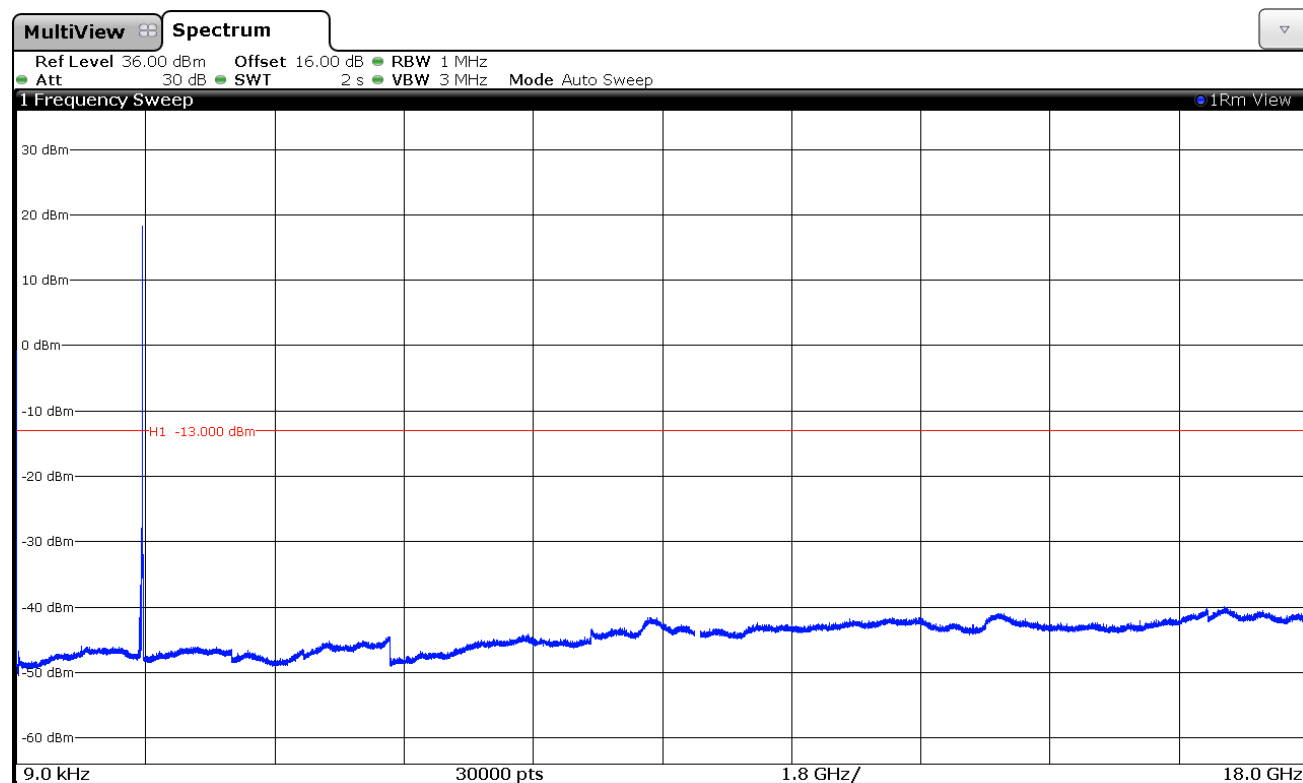
Note: The peak above the limit is the carrier frequency.

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 §27.53. RSS-139 Clause 6.5.

METHOD

As indicated in FCC part 27.53 in the 1 MHz bands immediately outside and adjacent to the licensee's 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 51 kHz for WCDMA and HSUPA modulations 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)

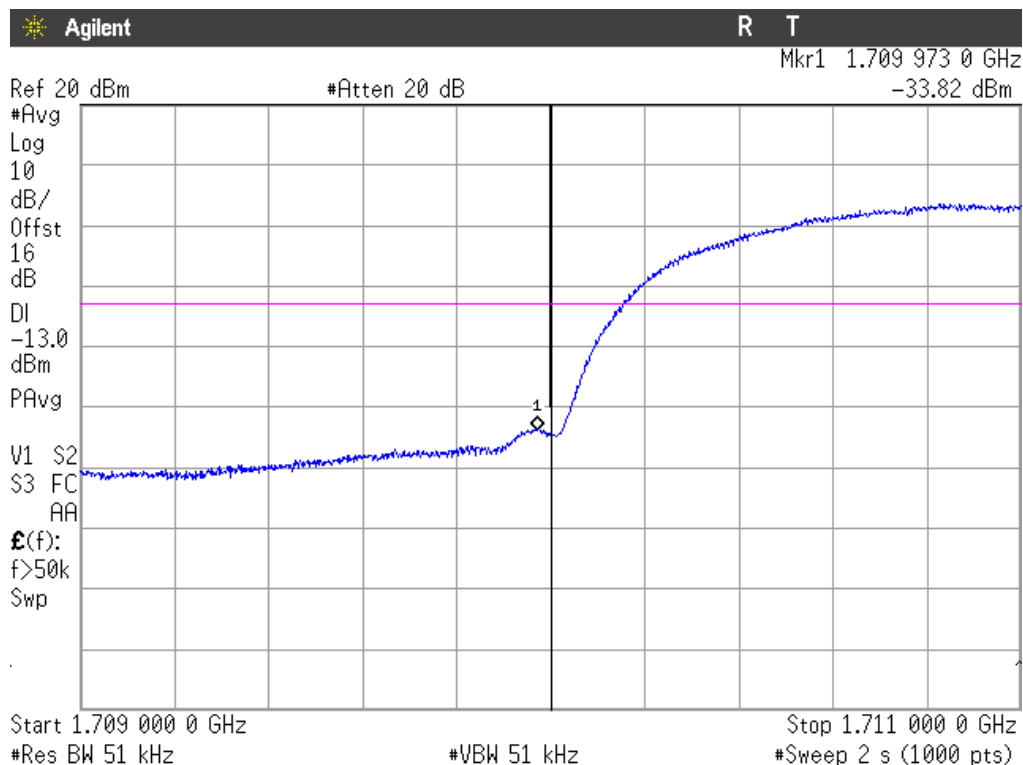
MODULATION:	WCDMA	HSUPA
Maximum measured level at lowest Block Edge at antenna port (dBm)	-33.82	-33.76

MODULATION:	WCDMA	HSUPA
Maximum measured level at highest Block Edge at antenna port (dBm)	-31.51	-32.49

Measurement uncertainty = ± 1.57 dB.

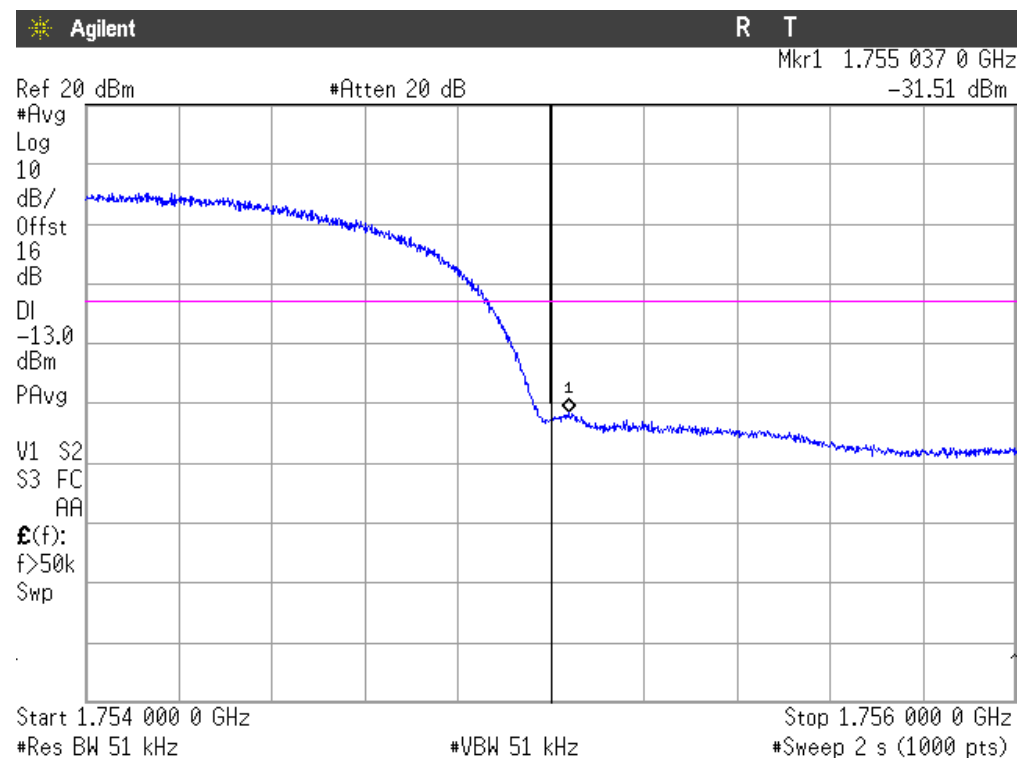
WCDMA MODULATION

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

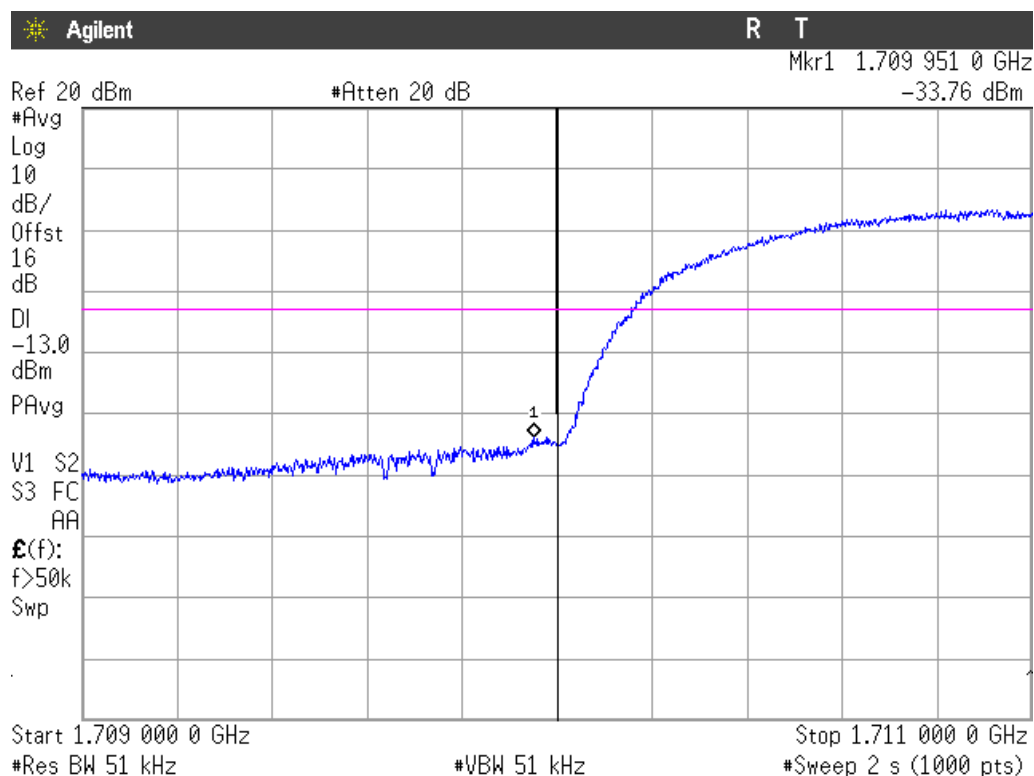


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

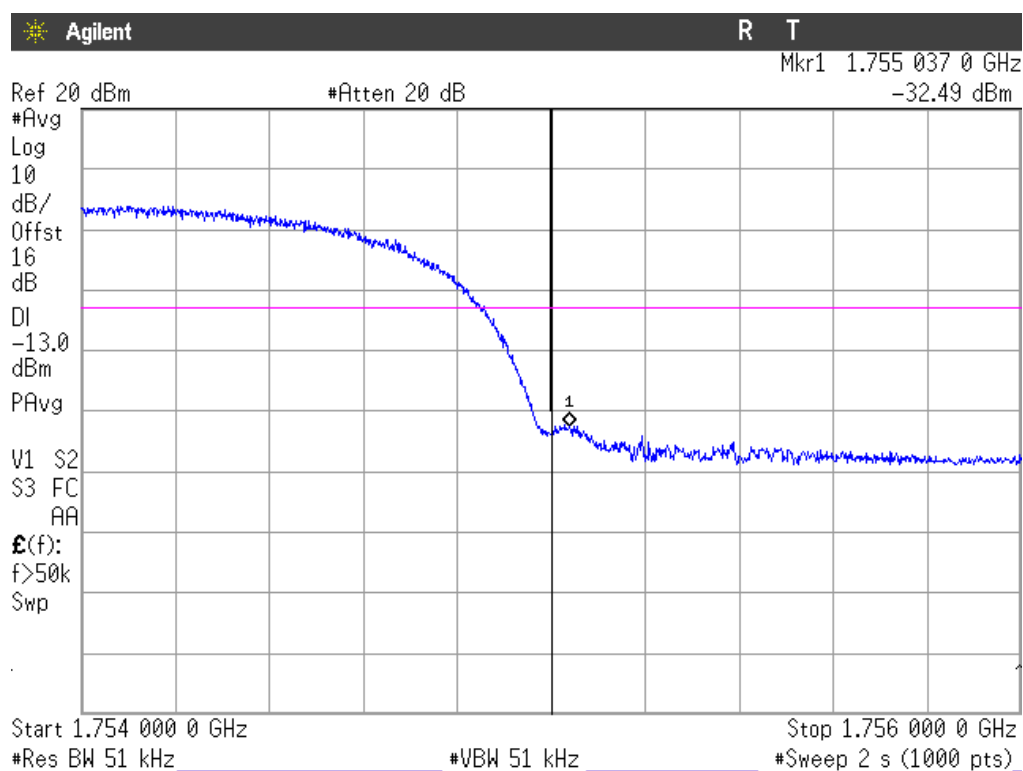
HSUPA MODULATION

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

§ 27.53. RSS-139 Clause 6.5.

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 emission is 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

WCDMA AND HSUPA MODULATION

A preliminary scan determined the WCDMA modulation as the worst case. The following tables and plots show the results for WCDMA modulation.

1. CHANNEL: LOWEST

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

Frequency range 1 GHz-18 GHz.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain G_i (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
3426.75	-28.10	Vertical	-36.22	5.81	12.30	-29.73
5140.75	-34.48	Vertical	-36.27	7.01	12.70	-30.58

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

Frequency range 1 GHz-18 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)
3463.25	-27.60	Vertical	-35.72	5.81	12.30	-29.23
5194.25	-36.23	Vertical	-38.02	7.01	12.70	-32.33
8661.25	-44.10	Vertical	-32.21	9.75	11.90	-30.06

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in all the range.

Frequency range 1 GHz-18 GHz.

Substitution method data

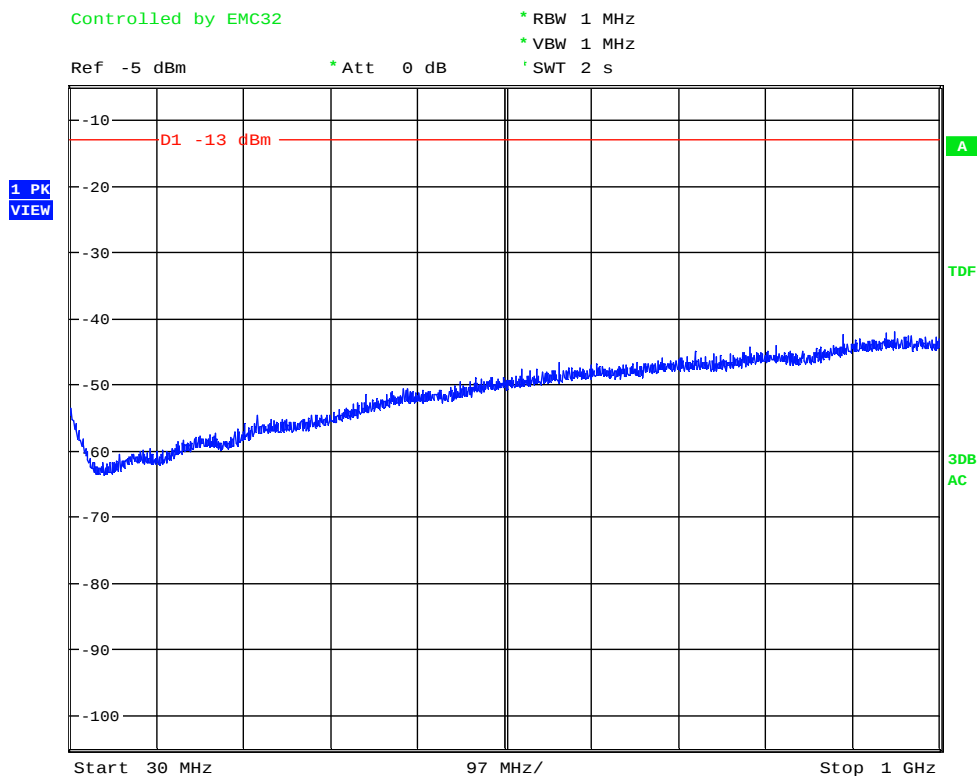
Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
3507.25	-25.45	Vertical	-33.57	5.81	12.30	-27.08
5253.75	-37.16	Vertical	-38.31	7.38	13.20	-32.49
8763.75	-43.27	Vertical	-29.82	10.34	11.70	-28.46

Verdict: PASS

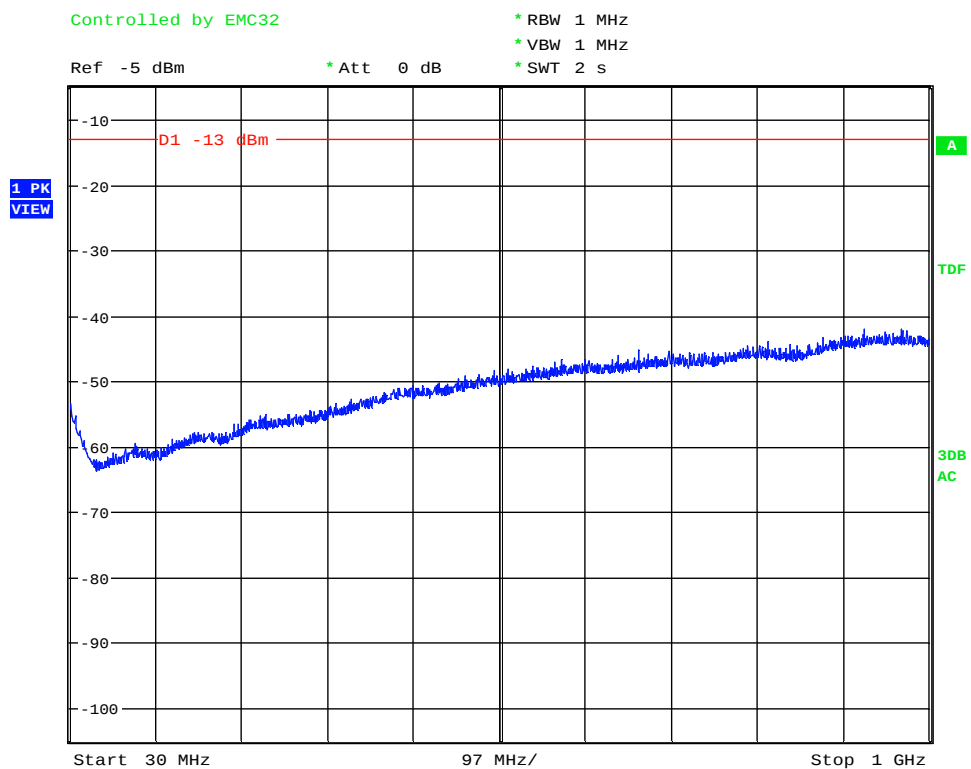
FREQUENCY RANGE 30 MHz-1000 MHz.

WCDMA MODULATION

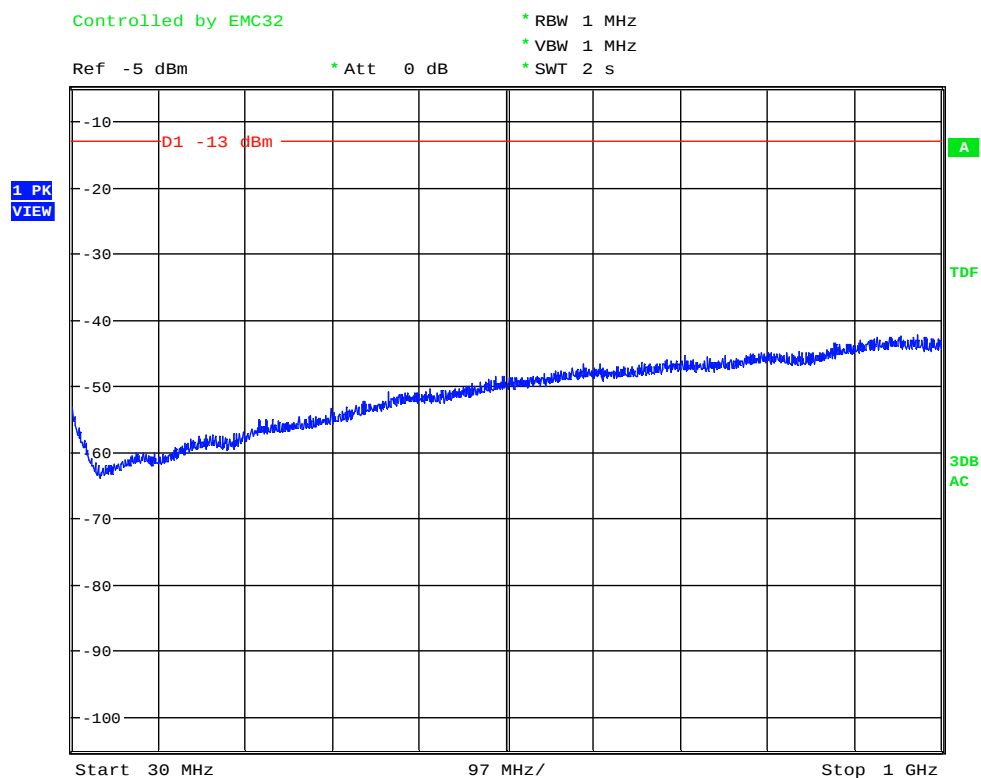
CHANNEL: LOWEST



CHANNEL: MIDDLE



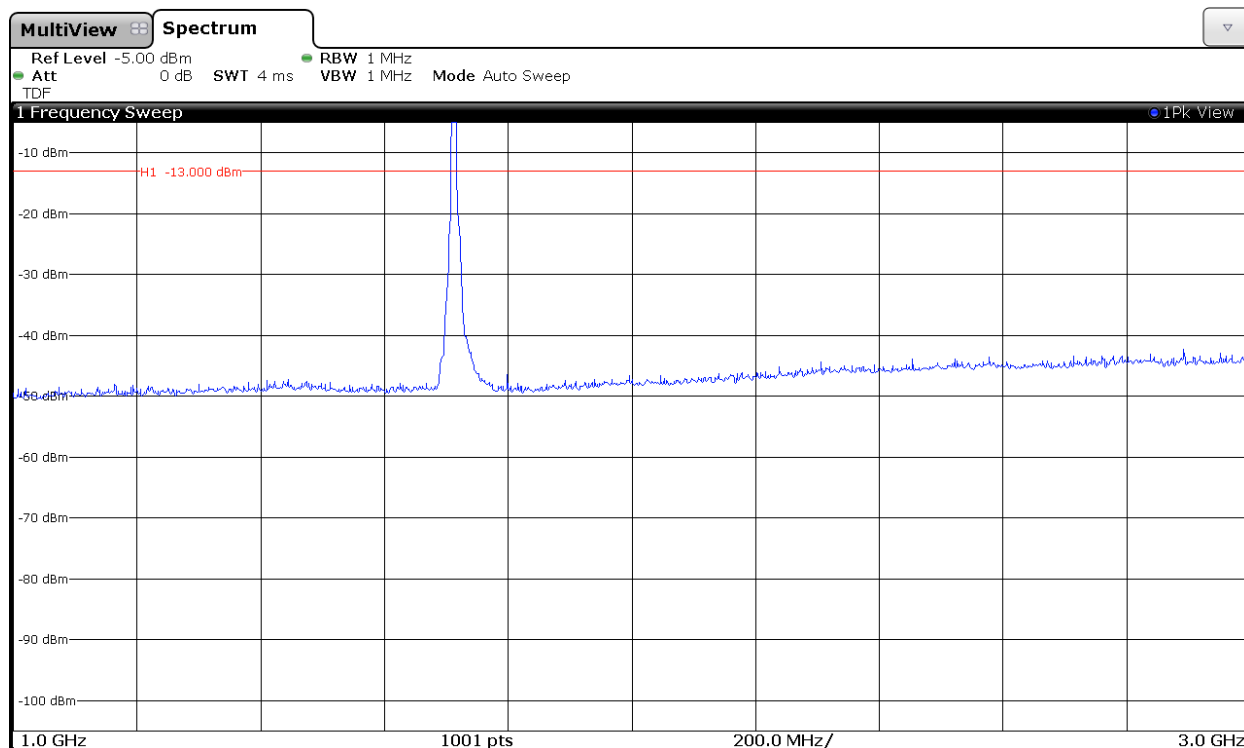
CHANNEL: HIGHEST



FREQUENCY RANGE 1 GHz to 3 GHz.

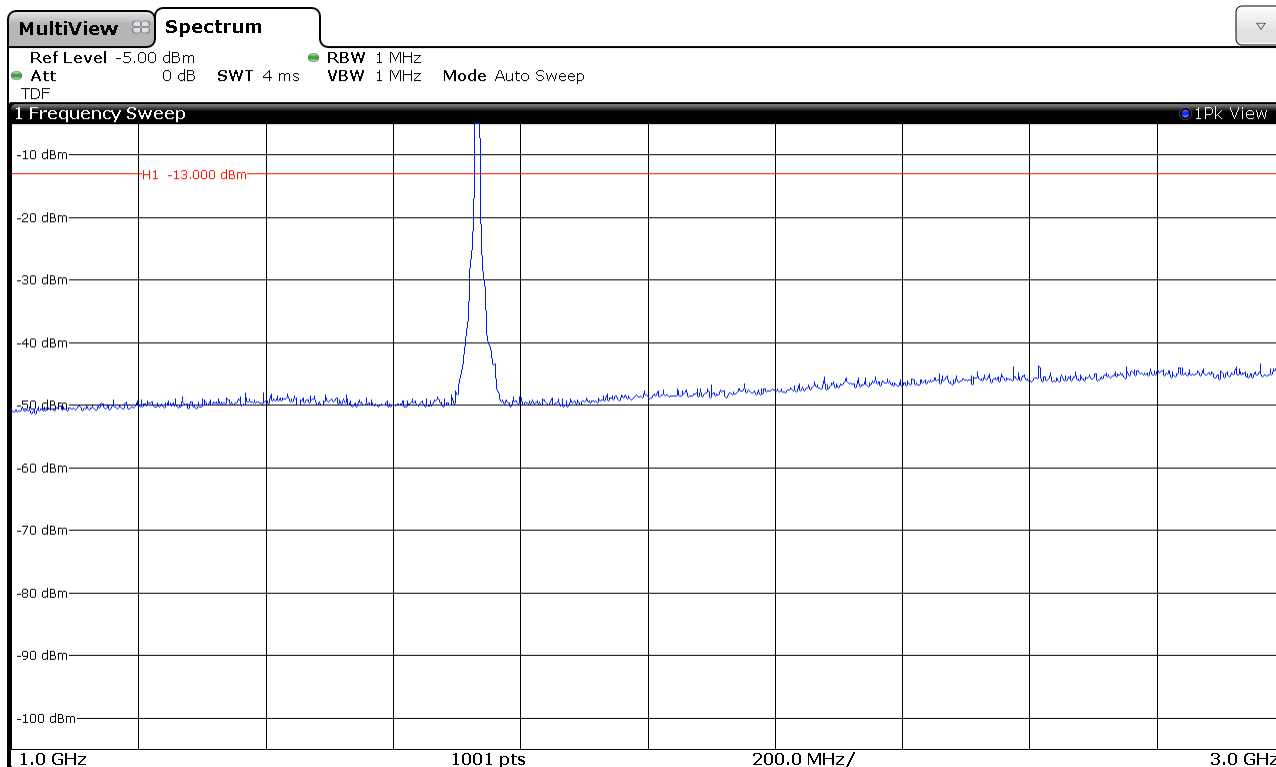
WCDMA MODULATION

CHANNEL: LOWEST



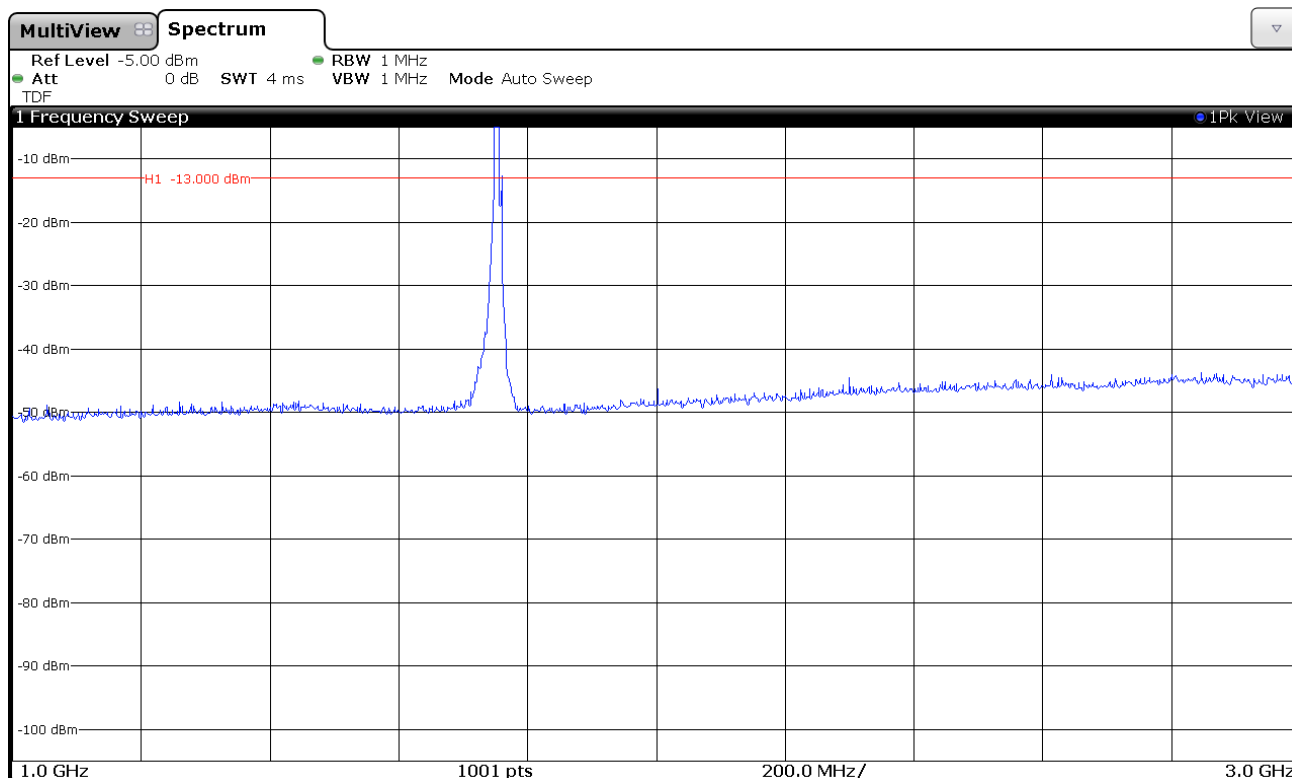
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



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

CHANNEL: HIGHEST

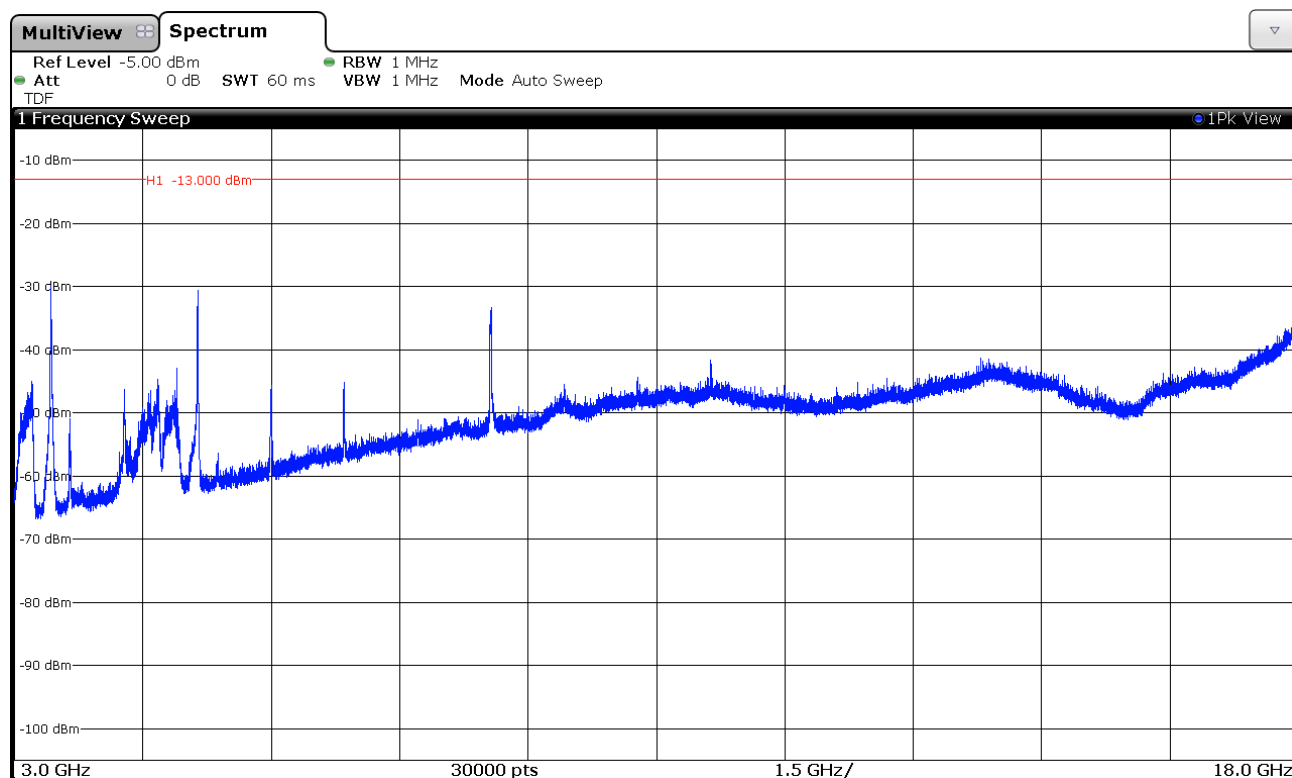


Note: The peak above the limit is the carrier frequency.

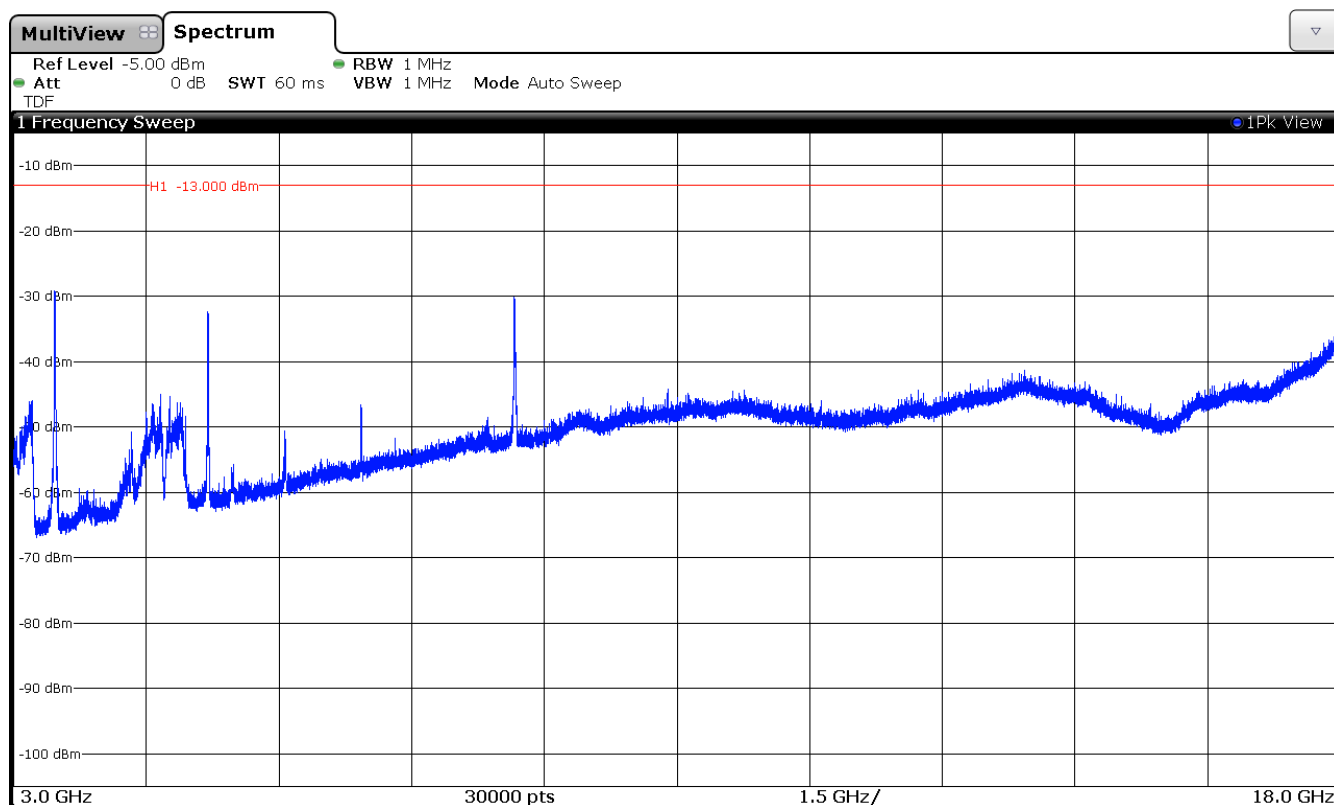
FREQUENCY RANGE 3 GHz to 18 GHz.

WCDMA MODULATION

CHANNEL: LOWEST



CHANNEL: MIDDLE



CHANNEL: HIGHEST

