

RF Test Report

Test in accordance with
Federal Communications Commission(FCC)
CFR TITLE 47, Parts 2, 22, 24

Product Name : GNSS receiver

Model No. : N72 WXYZ

FCC ID : SY4-A02003

Applicant : Shanghai Huace Navigation Technology LTD.
Address : Building C,599 Gaojing Road,Qingpu District,Shanghai

Date of Receipt : 03-12-2015

Test Date : 03-13-2015~04-25-2015

Issued Date : 05-04-2015

Report No.: UL41320150312CE/FCC003-2

Report Version : V1.0

Notes:

The test results only relate to these samples which have been tested.
Partly using this report will not be admitted unless been allowed by Unilab.
Unilab is only responsible for the complete report with the reported stamp of Unilab.

Test Report Certification

Issued Date : 05-04-2015

Report No. : UL41320150312CE/FCC003-2

Product Name : GNSS receiver
Podel No : N72 WXYZ
Model Description: See Part1.1 EUT Description NOTE
Applicant : Shanghai Huace Navigation Technology LTD.
Address : Building C,599 Gaojing Road,Qingpu District,Shanghai
Manufacturer : Shanghai Huace Navigation Technology LTD.
Address : Building C,599 Gaojing Road,Qingpu District,Shanghai
EUT Voltage : MIN: 12V, NOR:12V, MAX: 36V



Brand Name :
FCC ID: SY4-A02003
Applicable Standard : ANSI/TIA-603-D-2010; FCC CFR Title 47 Part 2;
FCC CFR Title 47 Part22 Subpart H;
FCC CFR Title 47 Part24 Subpart E;
Test Result : Complied
Performed Location : Unilab (Shanghai) Co., Ltd.
FCC 2.948 register number is 714465
No. 1350, Lianxi Rd. Pudong New District, Shanghai, China
TEL: +86-21-50275125 FAX: +86-21-50275126

Documented By :

Jeffrey. wang

(Technical Engineer: Jeffrey Wang)

Reviewed By :

Forest cao

(Senior Engineer: Forest Cao)

Approved By :

Eva wang

(Supervisor: Eva Wang)

TABLE OF CONTENTS

1. General Information	5
1.1. EUT Description	5
1.2. Mode of Operation	5
1.3. Tested System Details	7
1.4. Configuration of Tested System.....	7
1.5. EUT Exercise Software	8
2. Technical Test	8
2.1. Test Environment	8
3. Peak Output Power	9
3.1. Test Equipment	9
3.2. Test Setup.....	9
3.3. Limit.....	10
3.4. Test Procedure	10
3.5. Uncertainty	11
3.6. Test Result	12
4. Occupied Bandwidth	16
4.1. Test Equipment	16
4.2. Test Setup	16
4.3. Limit.....	16
4.4. Test Procedure	16
4.5. Uncertainty	16
4.6. Test Result	17
5.Spurious Emission At Antenna Terminals (+/- 1MHz)	29
5.1. Test Equipment	29
5.2. Test Setup	29
5.3. Limit.....	29
5.4. Test Procedure	29
5.5. Uncertainty	29
5.6. Test Result	30
6.Spurious Emission.....	35
6.1. Test Equipment	35
6.2. Test Setup	35
6.3. Limit.....	36
6.4. Test Procedure	37
6.5. Uncertainty	37
6.6. Test Result	39
7. Frequency Stability Under Temperature & Voltage Variations.....	52
7.1. Test Equipment	52
7.2. Test Setup	52
7.3. Limit.....	52
7.4. Test Procedure	53
7.5. Uncertainty	53
7.6. Test Result	54
8. Peak to Average	58
8.1. Test Equipment	58
8.2. Test Setup	58
8.3. Limit.....	58
8.4. Test Procedure	58
8.5. Uncertainty	59
8.6. Test Result	59
9.Attachment.....	61

SUMMARY OF TEST RESULT

Report Section	SPECIFICATION	Description	Limit	Result
3	part2.1046	Conducted Output Power	N/A	PASS
3	part 22.913(a)(2)	Effective Radiated Power	<7 Watts	PASS
3	part 24.232(c)	Equivalent Isotropic Radiated Power	<2 Watts	PASS
4	part 2.1049 part 22.917(a) part 24.238(a)	Occupied Bandwidth	N/A	PASS
5	part 2.1051 part 22.917(a) part 24.238(a)	Band Edge Measurement	$<43+10\lg(P[\text{Watts}])$	PASS
6	part 2.1051 part 22.917(a) part 24.238(a)	Conducted Spurious Emission	$<43+10\lg(P[\text{Watts}])$	PASS
6	part 2.1053 part 22.917(a) part 24.238(a)	Field Strength of Supurious Radiation	$<43+10\lg(P[\text{Watts}])$	PASS
7	part 2.1055 part 22.355 part 24.235	Frequency Stability for Temperature & Voltage	<2.5 ppm	PASS
8	part 24.232(d)	Peak-to-Average	<13dB	PASS

1.General Information

1.1. EUT Description

Product Name:	GNSS receiver
Model Name:	N72 WXYZ
Hardware Version:	V2.2
Software Version:	1.0.11
RF Exposure Environment:	Uncontrolled
GPRS/ EGPRS	
Support Band:	GSM 850/GSM 1900
GPRS Class:	12
Tx Frequency Range:	GSM 850: 824.2MHz to 848.8MHz GSM 1900: 1850.2MHz to 1909.8MHz
Rx Frequency Range:	GSM 850: 869.2MHz to 893.8MHz GSM 1900: 1930.2MHz to 1989.8MHz
Type of modulation:	GPRS for GMSK EGPRS for 8PSK
Antenna Type:	Connector
Antenna Peak Gain:	GSM 850: 5dBi GSM 1900: 5dBi
UMTS/HSPA+	
Support Band:	WCDMA Band II / V
Tx Frequency Range:	WCDMA Band II : 1850MHz ~1910MHz WCDMA Band V: 824MHz ~849MHz
Rx Frequency Range:	WCDMA Band II : 1930MHz ~1990MHz WCDMA Band V: 869MHz ~894MHz
Type of modulation:	WCDMA(UMTS/HSPA+): QPSK&16QAM
Antenna Type:	Connector
Antenna Peak Gain:	WCDMA Band II / V: 5.0dBi
Component	
AC Adapter	Input: AC 100-240V 50/60Hz
	Output: DC 12V 2A

Note: Model N72 WXYZ, W is variable, it indicated A-Z or 0-9 or blank, X is variable, it indicated A-Z or 0-9 or blank, Y is variable, it indicated A-Z, 0-9 or blank. Z is variable, it indicated A-Z, 0-9 or blank. due to sales purpose in different countries or regions. The internal PCB design are no difference, but only distinct in colours and model names. This test model name is N72.

1.2. Mode of Operation

Unilab has verified the construction and function in typical operation. EUT is inlink mode with base station emulator at maximum power level. All the test modes were carried out with the EUT in normal operation, which was shown in this test report is the worst test mode and defined as:

Test Mode		
Band	Radiated TCs	Conducted TCs
GSM 850	GPRS 8 Link EGPRS 8 Link	GPRS 8 Link EGPRS 8 Link
GSM1900	GPRS 8 Link EGPRS 8 Link	GPRS 8 Link EGPRS 8 Link
WCDMA Band V	RMC 12.2Kbps Link	RMC 12.2Kbps Link
WCDMA Band II	RMC 12.2Kbps Link	RMC 12.2Kbps Link

Note:

1. Regards to the frequency band operation: the lowest、middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. The maximum power levels are GPRS multi-slot class 8 for GMSK link, EGPRS multi-slot class 8 mode for 8PSK link, RMC 12.2Kbps mode for WCDMA band V , and RMC 12.2Kbps mode for WCDMA band II when power supply was 12V, only these modes were used for all tests.
3. For the ERP/EIRP and radiated emission test, every axis (X, Y, Z) was verified, and show the worst (Z axis) result on this report.

The conducted power table is as follows:

Conducted Power (Unit: dBm)						
Band	GSM 850			GSM 1900		
Channel	128	189	251	512	661	810
Frequency	824.2	836.4	848.8	1850.2	1880	1909.8
GPRS (GMSK, 1 Tx slot) CS1	32.13	32.35	32.11	29.44	29.28	28.98
GPRS (GMSK, 2 Tx slot) CS1	31.34	31.79	31.44	28.30	28.49	28.05
GPRS (GMSK, 3 Tx slot) CS1	29.46	30.00	29.59	26.45	26.68	26.21
GPRS (GMSK, 4 Tx slot) CS1	28.47	29.05	28.61	25.32	25.57	25.06
EGPRS (GMSK, 1 Tx slot) MCS5	27.11	27.03	27.13	26.88	26.30	26.47
EGPRS (GMSK, 2 Tx slot) MCS5	25.84	25.79	25.64	25.14	25.16	25.20
EGPRS (GMSK, 3 Tx slot) MCS5	24.55	24.49	24.45	24.88	24.85	24.91
EGPRS (GMSK, 4 Tx slot) MCS5	22.40	22.41	22.36	22.80	22.83	22.97

Conducted Power (Unit: dBm)						
Band	WCDMA Band V			WCDMA Band II		
Tx Channel	4132	4182	4233	9262	9400	9538
Rx Channel	4357	4408	4458	9662	9800	9938
Frequency	826.4	836.4	846.6	1852.4	1880	1907.6
RMC 12.2K	22.64	22.68	22.60	23.00	23.01	23.36
HSPA+ Subtest-1	22.43	22.50	22.33	22.87	22.66	22.89
HSPA+ Subtest-2	21.77	21.84	21.62	21.91	21.75	21.94
HSPA+ Subtest-3	21.06	21.11	21.02	21.60	21.44	21.74
HSPA+ Subtest-4	20.98	21.03	20.85	21.32	21.17	21.56

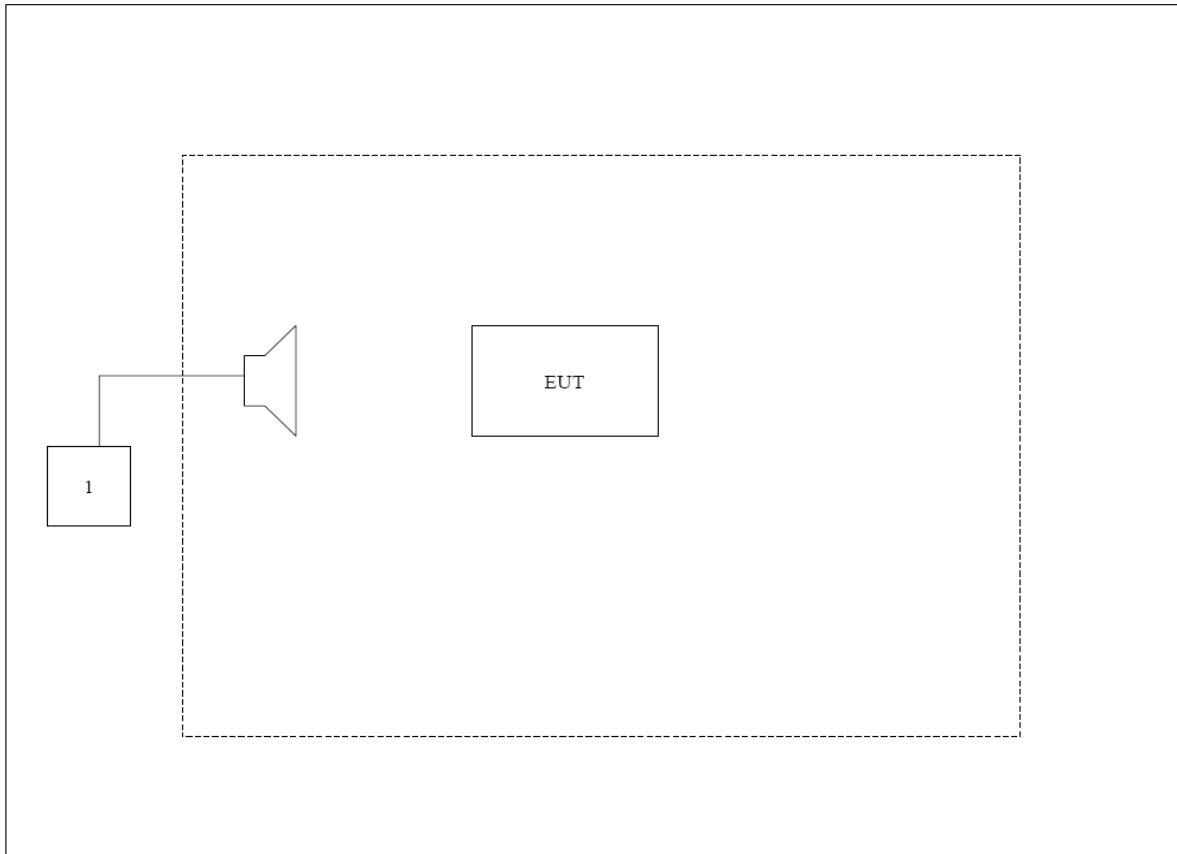
1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model	Serial No.	Power Cord
1 Agilent8960	Agilent	E5515C	GB46581718	N/A
2 CMW500	R&S	CMW500	147483	N/A

1.4. Configuration of Tested System

Connection Diagram



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	EUT Communicate with E5515C/CMW500, then select channel to test.

2. Technical Test

2.1. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	56
Barometric pressure (mbar)	860-1060	950-1000

3. Peak Output Power

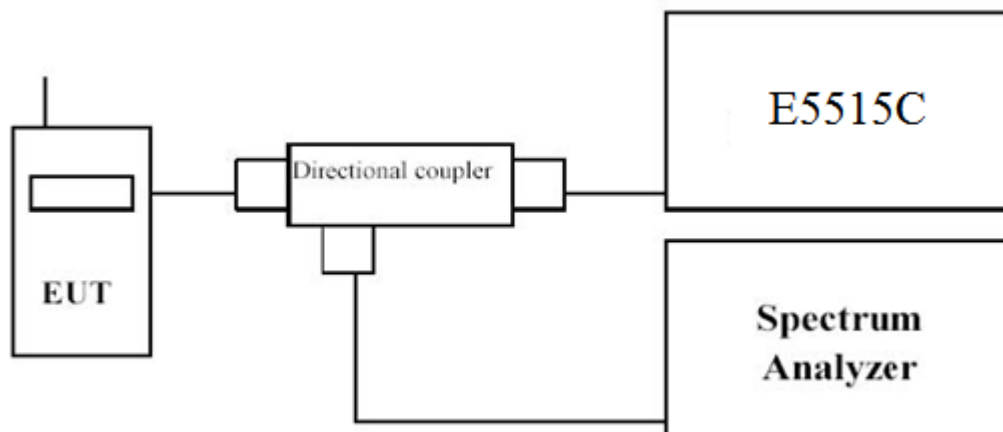
3.1. Test Equipment

Instrument	Manufacturer	Model	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9038A	MY51210142	11.11.2015
Radio Communication Tester	Agilent	E5515C	GB46581718	11.11.2015
Signal Generator	Agilent	N5183A	MY50140938	02.01.2016
Preamplifier	CEM	EM30180	3008A0245	27.02.2016
DC Power Supply	Agilent	6612C	MY43002989	02.03.2016
Bilog Antenna	Schwarzbeck	VULB9160	9160-3316	18.07.2015
VHF-UHF-Biconical Antenna	Schwarzbeck	VUBA9117	9117-263	18.07.2015
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-942	18.07.2015
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-943	18.07.2015

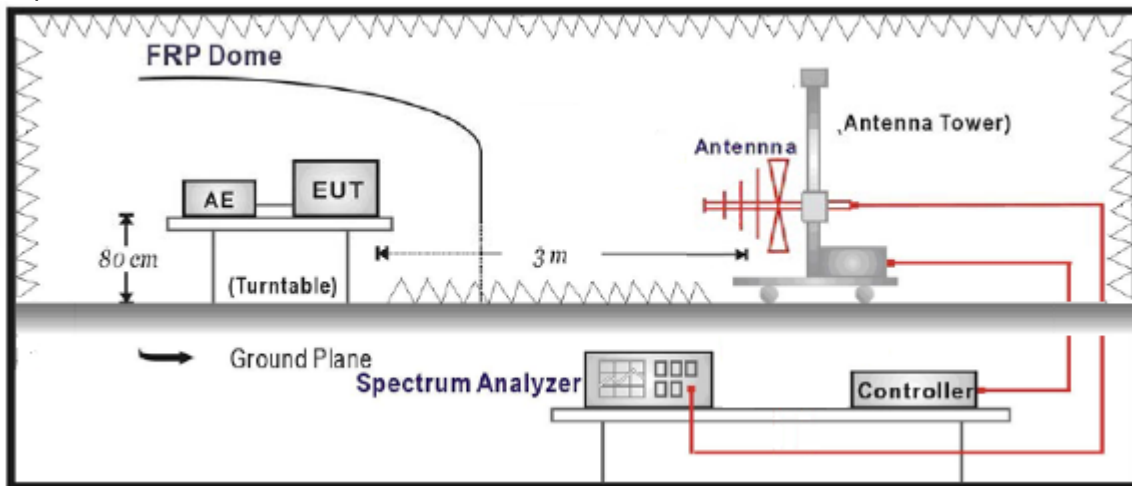
The measure equipment had been calibrated once a year.

3.2. Test Setup

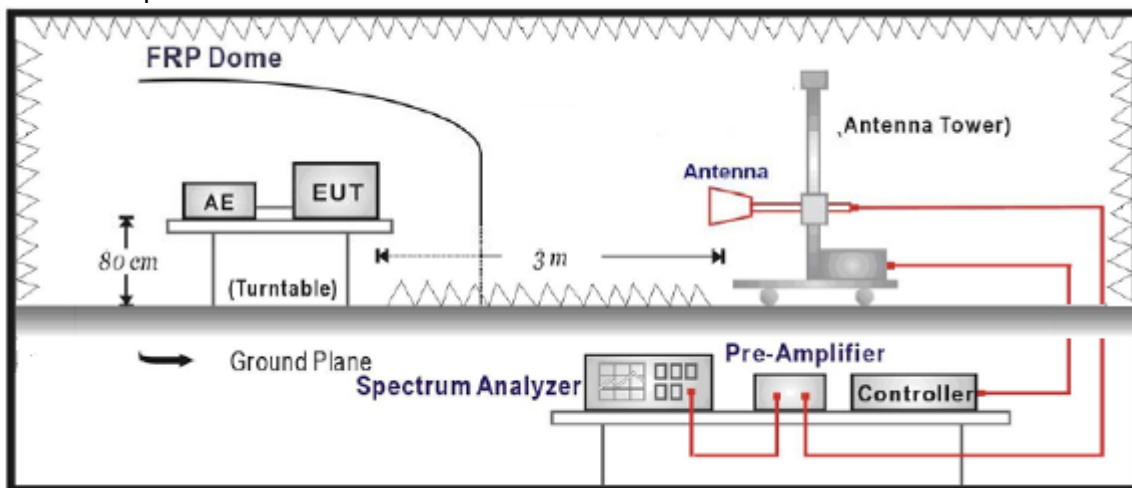
Conducted Power Measurement:



Radiated Spurious Measurement: below 1GHz



Radiated Spurious Measurement: above 1GHz



3.3. Limit

For FCC Part 22.913(a)(2):

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

For FCC Part 24.232(c):

The EIRP of mobile transmitters and auxiliary test transmitters must not exceed 2 Watts.

3.4. Test Procedure

Conducted Power Measurement:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a spectrum analyzer and E5515C by a Directional Couple.
- EUT Communicate with E5515C, then selects a channel for testing.
- Add a correction factor to the display of spectrum, and then test.

Radiated Power Measurement:

- a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
- c. The output of the test antenna shall be connected to the measuring receiver.
- d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- h. The maximum signal level detected by the measuring receiver shall be noted.
- i. The transmitter shall be replaced by a substitution antenna.
- j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- k. The substitution antenna shall be connected to a calibrated signal generator.
- l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- q. Test site anechoic chamber refer to ANSI C63.4: 2009.

3.5. Uncertainty

The measurement uncertainty is defined as for Conducted Power Measurement ± 1.1 dB,
for Radiated Power Measurement ± 3.1

3.6. Test Result

The following table shows the conducted power measured:

Table 1

Cellular Band				
Modes	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)
GSM850 (GPRS 8)	128(Low)	824.2	32.13	1.63
	189(Mid)	836.4	32.35	1.72
	251(High)	848.8	32.11	1.62
GSM850 (EGPRS 8)	128(Low)	824.2	27.11	0.51
	189(Mid)	836.4	27.03	0.50
	251(High)	848.8	27.13	0.52
WCDMA Band V (RMC 12.2Kbps)	4132(Low)	826.4	22.64	0.18
	4182(Mid)	836.4	22.68	0.19
	4233(High)	846.6	22.60	0.18

Table 2

PCS Band				
Modes	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)
GSM1900 (GPRS 8)	512(Low)	1850.2	29.44	0.88
	661(Mid)	1880.0	29.28	0.85
	810(High)	1909.8	28.98	0.79
GSM1900 (EGPRS 8)	512(Low)	1850.2	26.88	0.49
	661(Mid)	1880.0	26.30	0.43
	810(High)	1909.8	26.47	0.44
WCDMA Band II (RMC 12.2Kbps)	9262(Low)	1852.4	23.00	0.20
	9400(Mid)	1880.0	23.01	0.20
	9538(High)	1907.6	23.36	0.22

GPRS850 (8Link)

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	ERP (W)
Low Channel 128 (824.20MHz)						
824.2	H	36.93	3.83	-2.99	30.11	1.03
824.2	V	36.89	3.83	-2.99	30.07	1.01
Middle Channel 189 (836.40MHz)						
836.4	H	38.26	3.96	-3.04	31.26	1.34
836.4	V	37.64	3.96	-3.04	30.64	1.16
High Channel 251 (848.80MHz)						
848.8	H	36.85	3.97	-3.10	29.85	0.97
848.8	V	37.50	3.97	-3.10	30.43	1.10

GSM850 (EGPRS 8 Link)

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	ERP (W)
Low Channel 128 (824.20MHz)						
824.2	H	35.96	3.83	-2.99	29.14	0.82
824.2	V	35.36	3.83	-2.99	28.54	0.71
Middle Channel 189 (836.40MHz)						
836.4	H	36.05	3.96	-3.04	29.05	0.80
836.4	V	35.30	3.96	-3.04	28.30	0.68
High Channel 251 (848.80MHz)						
848.8	H	37.09	3.97	-3.10	30.02	1.00
848.8	V	38.34	3.97	-3.10	29.27	0.85

GPRS1900 (8 Link)

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	EIRP (W)
Low Channel 512(1850.20MHz)						
1850.2	H	31.41	6.26	10.40	27.27	0.53
1850.2	V	32.63	6.26	10.40	28.49	0.71
Middle Channel 661 (1880.00MHz)						
1880.0	H	32.27	6.19	10.43	28.03	0.64
1880.0	V	32.95	6.19	10.43	28.71	0.74
High Channel 810 (1909.80MHz)						
1909.8	H	31.41	6.15	10.44	27.12	0.52
1909.8	V	32.39	6.15	10.44	28.10	0.65

GSM1900 (EGPRS 8 Link)

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	EIRP (W)
Low Channel 512(1850.20MHz)						
1850.2	H	31.76	6.26	10.40	27.62	0.58
1850.2	V	31.59	6.26	10.40	27.45	0.56
Middle Channel 661 (1880.00MHz)						
1880.0	H	31.54	6.19	10.43	27.30	0.54
1880.0	V	32.50	6.19	10.43	28.26	0.67
High Channel 810 (1909.80MHz)						
1909.8	H	31.47	6.15	10.44	27.18	0.52
1909.8	V	32.62	6.15	10.44	28.33	0.68

WCDMA Band V (RMC 12.2Kbps)

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	ERP (W)
Low Channel 4132(826.4MHz)						
826.4	H	26.58	3.83	-2.99	19.76	0.095
826.4	V	26.77	3.83	-2.99	19.95	0.099
Middle Channel 4182 (836.4MHz)						
836.4	H	27.01	3.96	-3.04	20.01	0.100
836.4	V	27.31	3.96	-3.04	20.31	0.107
High Channel 4233 (846.6MHz)						
846.6	H	28.27	3.97	-3.10	21.20	0.132
846.6	V	28.98	3.97	-3.10	21.91	0.155

WCDMA Band II (RMC 12.2Kbps)

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	EIRP (W)
Low Channel 9262(1852.40MHz)						
1850.2	H	18.76	6.26	10.40	22.90	0.19
1850.2	V	18.44	6.26	10.40	22.58	0.18
Middle Channel 9400 (1880.00MHz)						
1880.0	H	17.39	6.19	10.43	21.63	0.15
1880.0	V	17.71	6.19	10.43	21.95	0.16
High Channel 9538 (1907.60MHz)						
1909.8	H	17.49	6.15	10.44	21.78	0.15
1909.8	V	18.37	6.15	10.44	22.66	0.18

4. Occupied Bandwidth

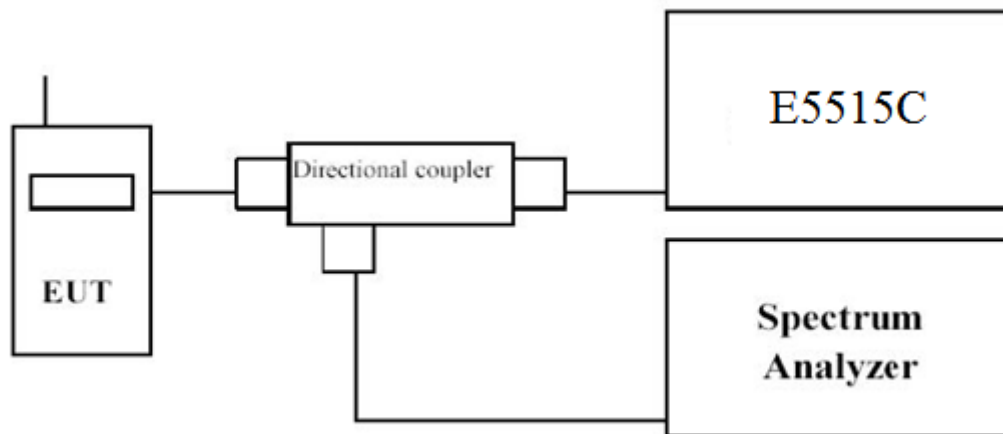
4.1. Test Equipment

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial No	Cal. Due Date
Radio Communication Tester	Agilent	E5515C	GB46581718	11.11.2015
Spectrum Analyzer	Agilent	N9038A	MY51210142	11.11.2015
DC Power Supply	Agilent	6612C	MY43002989	02.03.2016

The measure equipment had been calibrated once a year.

4.2. Test Setup



4.3. Limit

N/A

4.4. Test Procedure

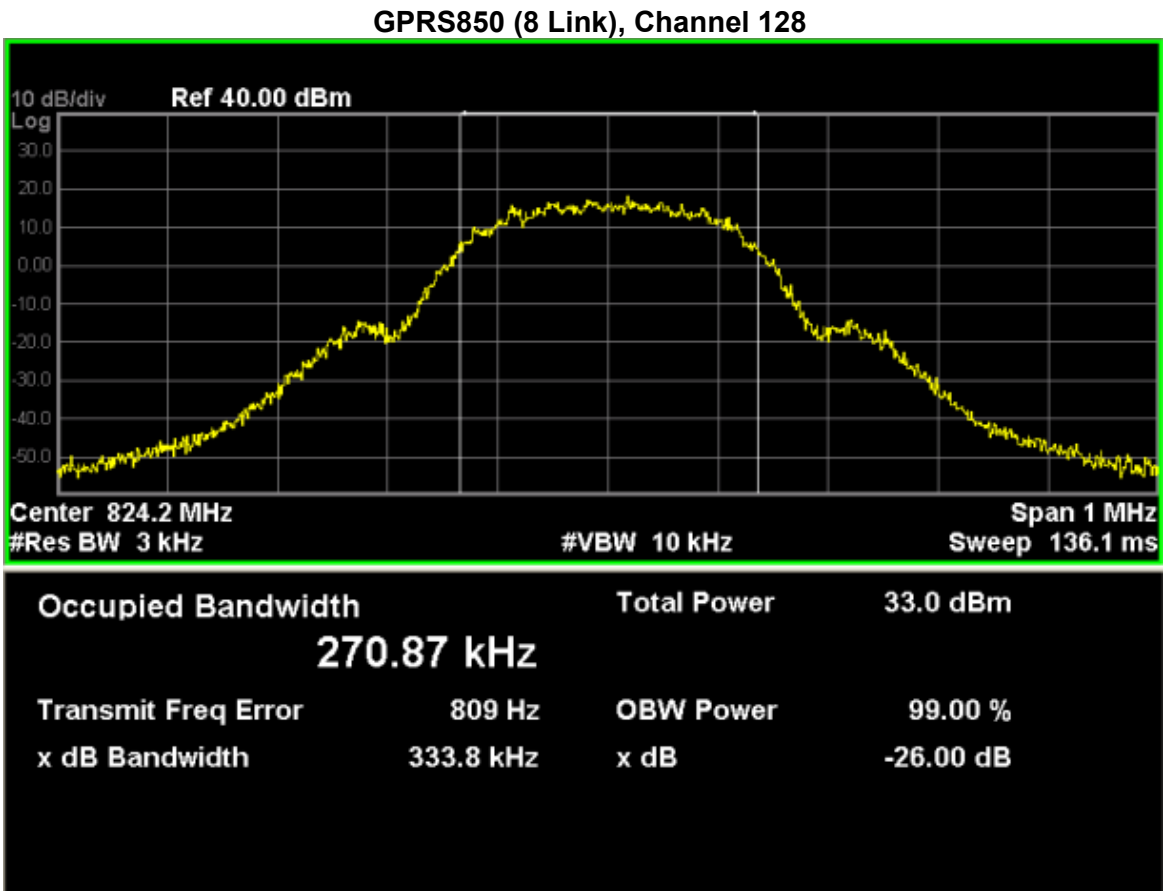
Using Occupied Bandwidth measurement function of spectrum analyzer, and setting as follows:
For GSM850/1900 test --- RBW = 3 kHz and VBW = 10 kHz
For WCDMA Band V/II test --- RBW = 100 kHz and VBW = 300 kHz

4.5. Uncertainty

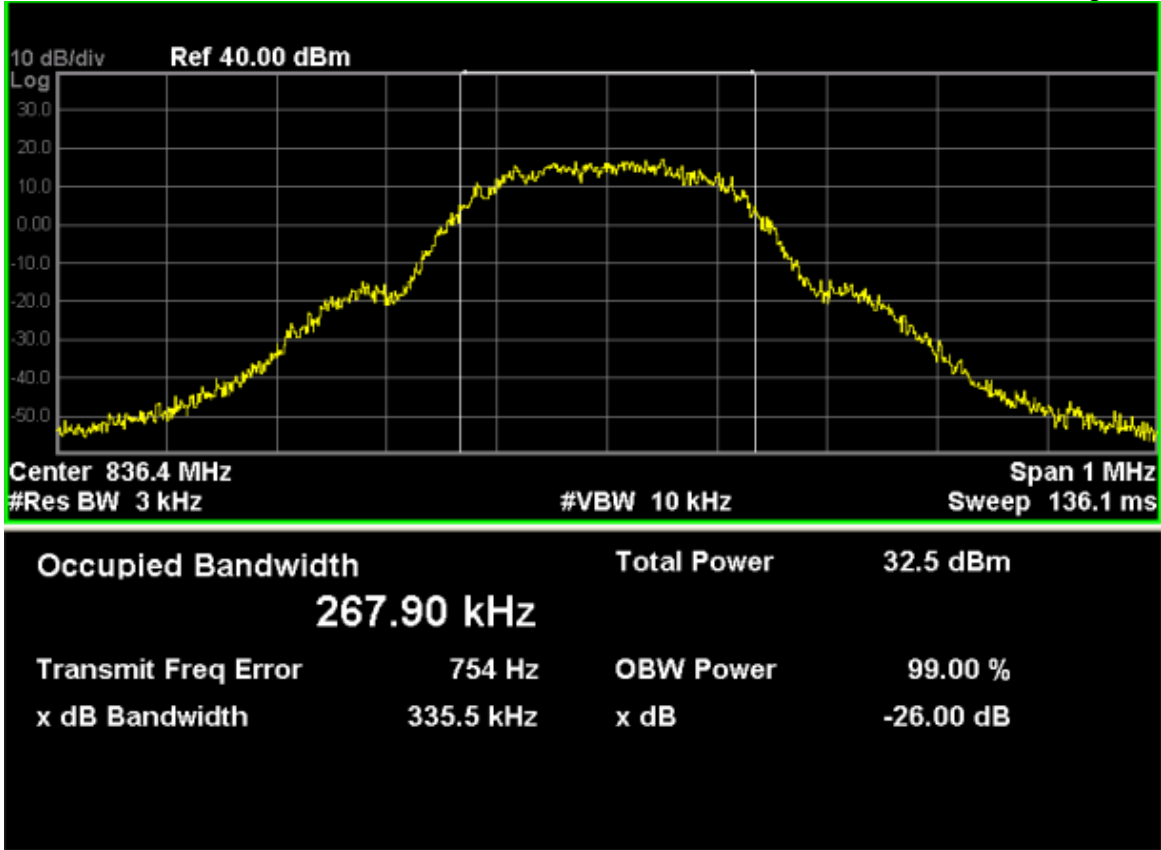
The measurement uncertainty is defined as ± 10 Hz

GPRS850 (8Link)

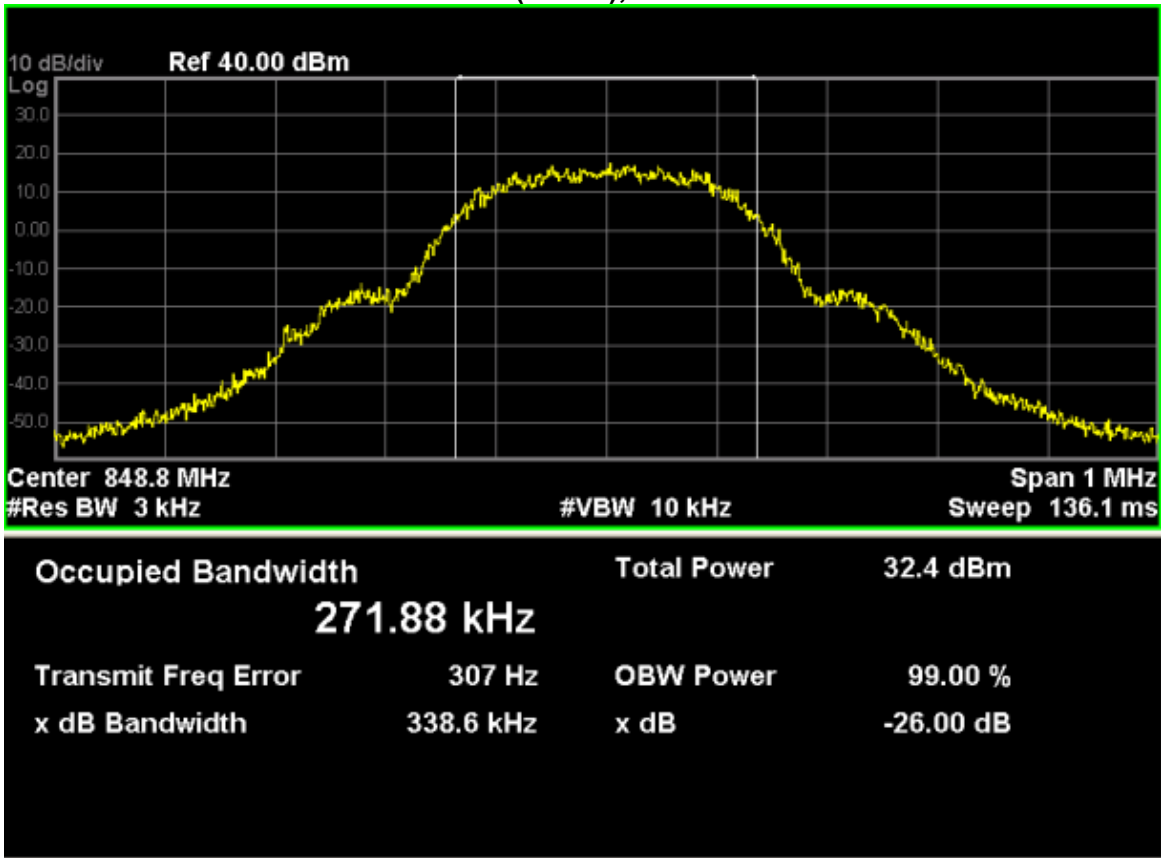
Channel No.	Frequency (MHz)	-26dB Occupied Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
128	824.20	333.8	270.9
189	836.40	335.5	267.9
251	848.80	338.6	271.9



GPRS850 (8 Link), Channel 189

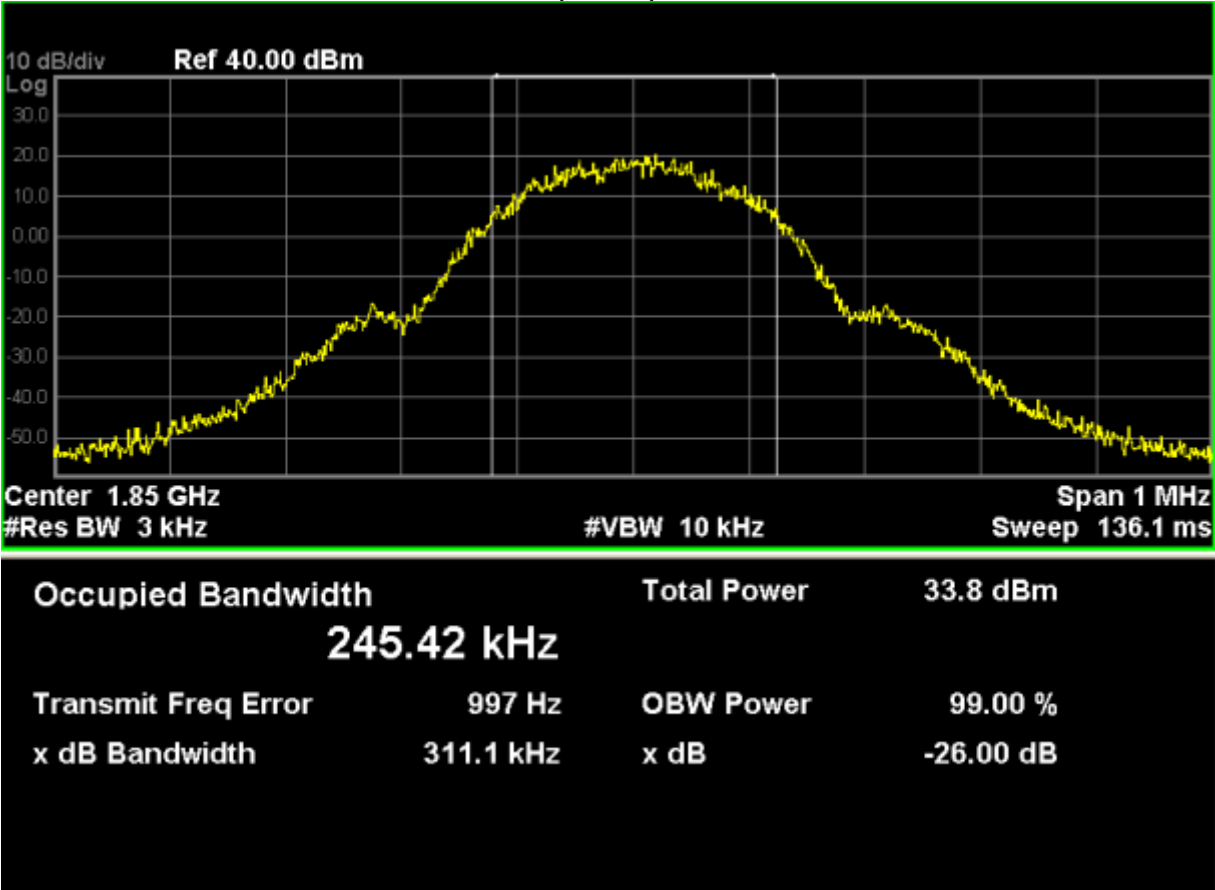


GPRS850 (8 Link), Channel 251

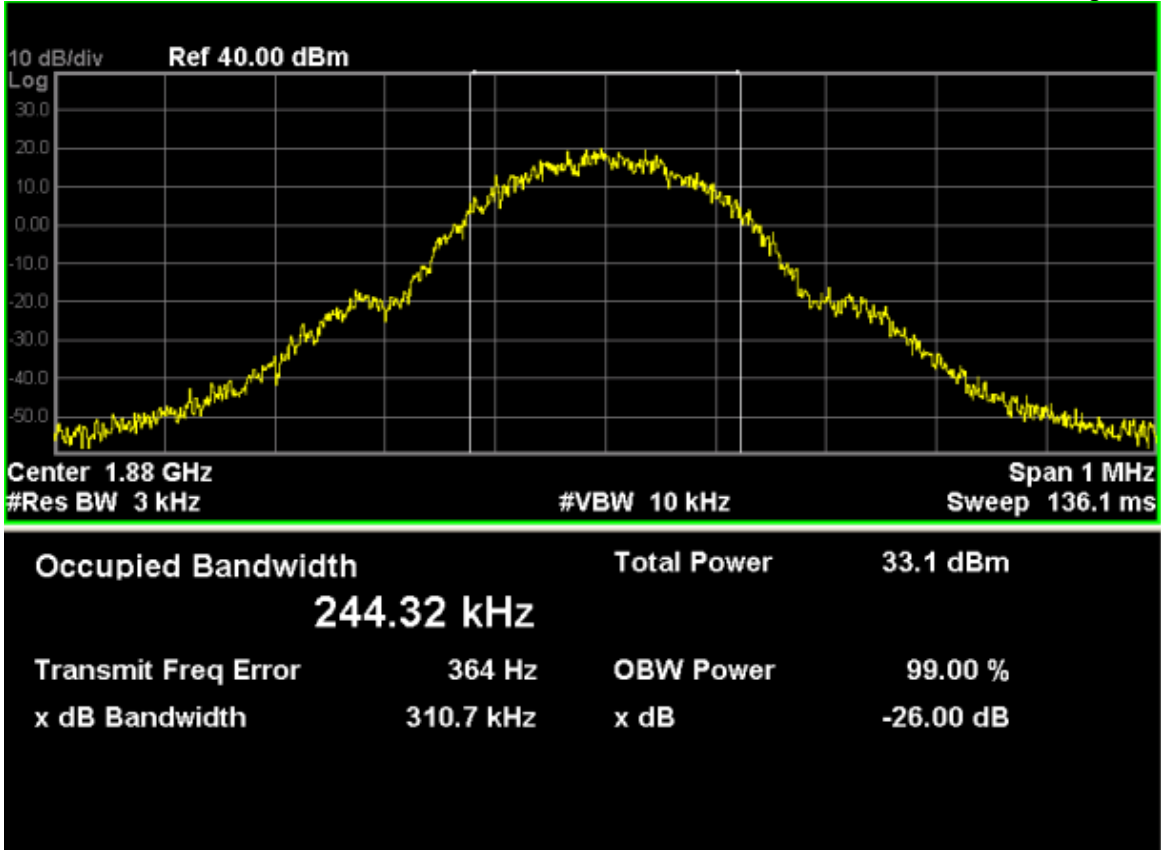


Channel No.	Frequency (MHz)	-26dB Occupied Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
512	1850.20	311.1	245.4
661	1880.00	310.7	244.3
810	1909.80	309.3	245.6

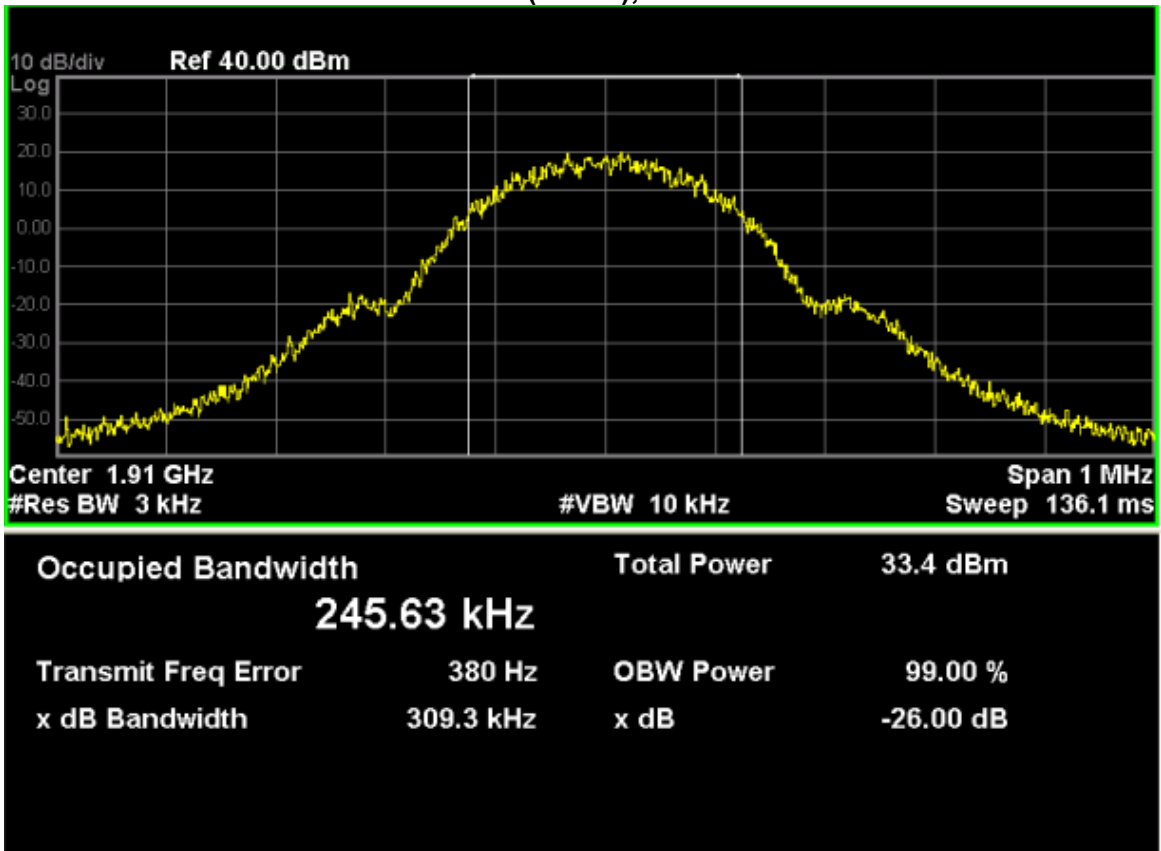
GPRS 1900 (8 Link), Channel 512



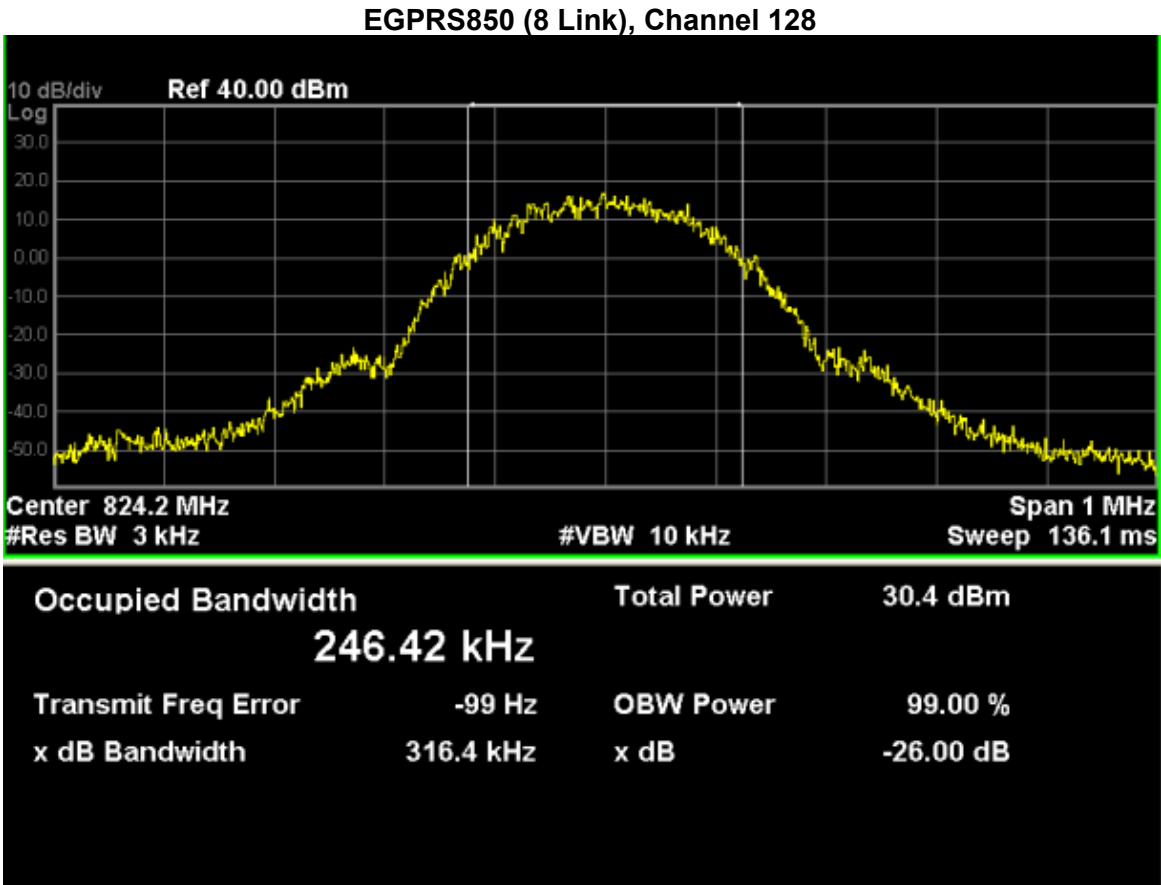
GPRS 1900 (8 Link), Channel 661



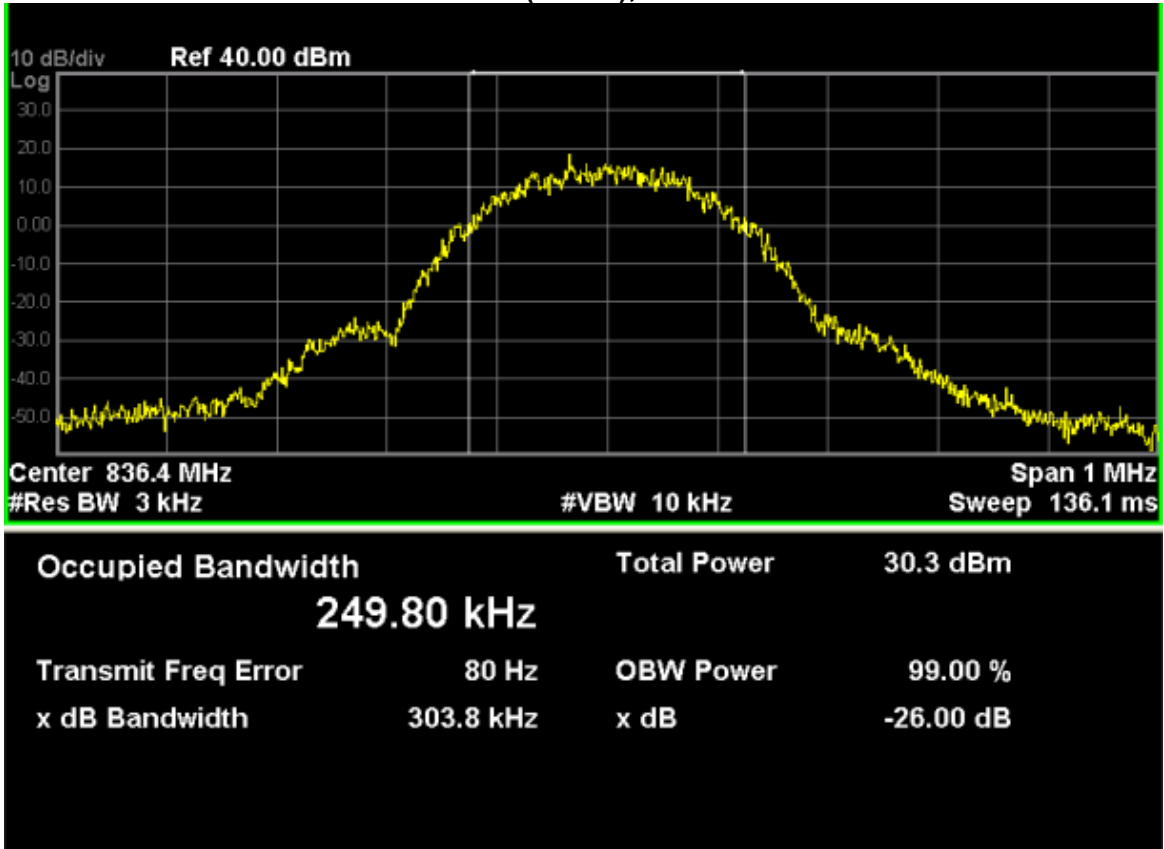
GPRS 1900 (8 Link), Channel 810



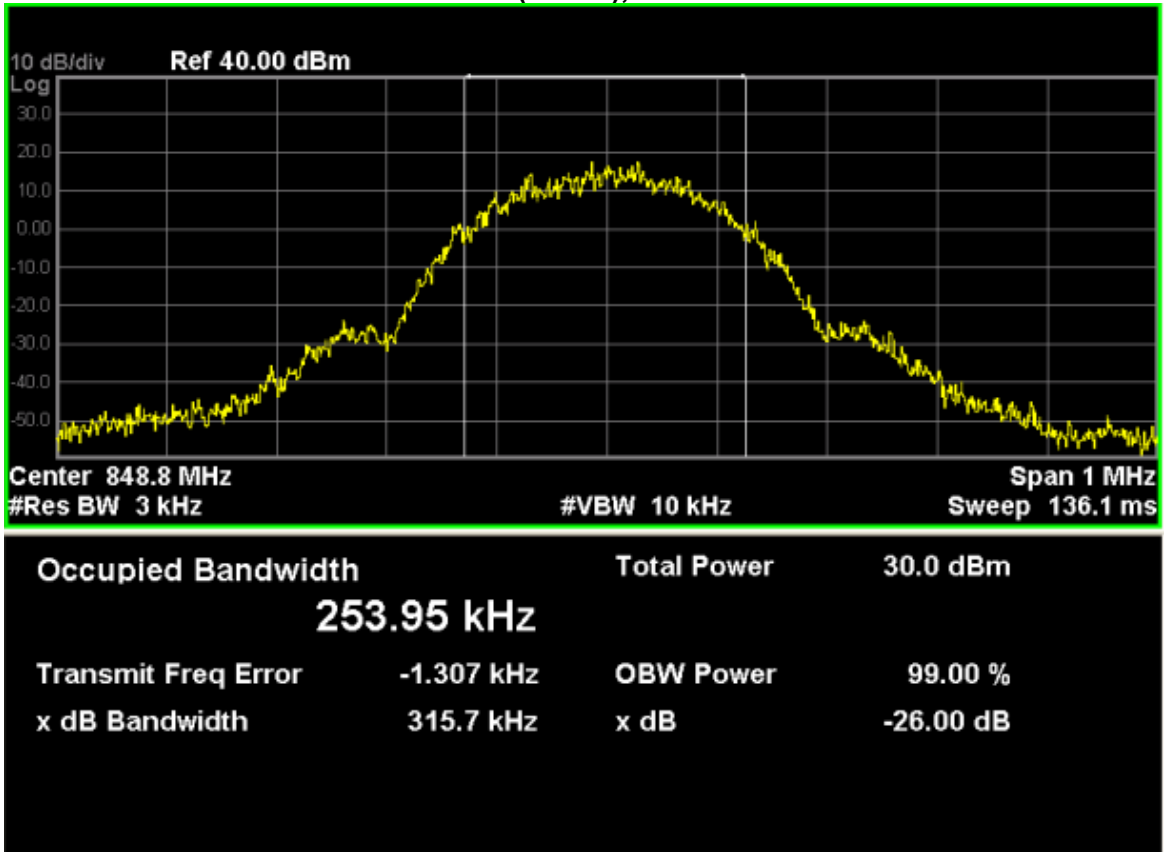
Channel No.	Frequency (MHz)	-26dB Occupied Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
128	824.20	316.4	246.4
189	836.40	303.8	249.8
251	848.80	315.7	253.9



EGPRS850 (8 Link), Channel 189

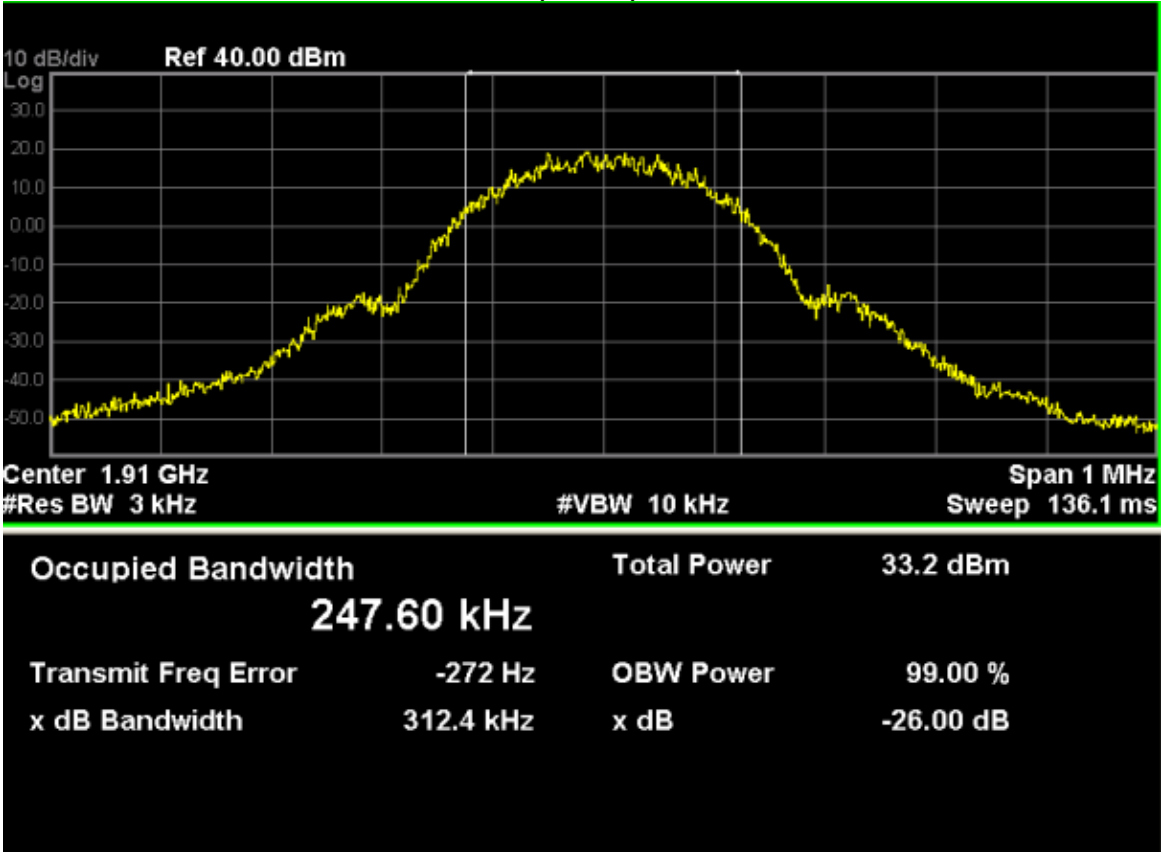


EGPRS850 (8 Link), Channel 251

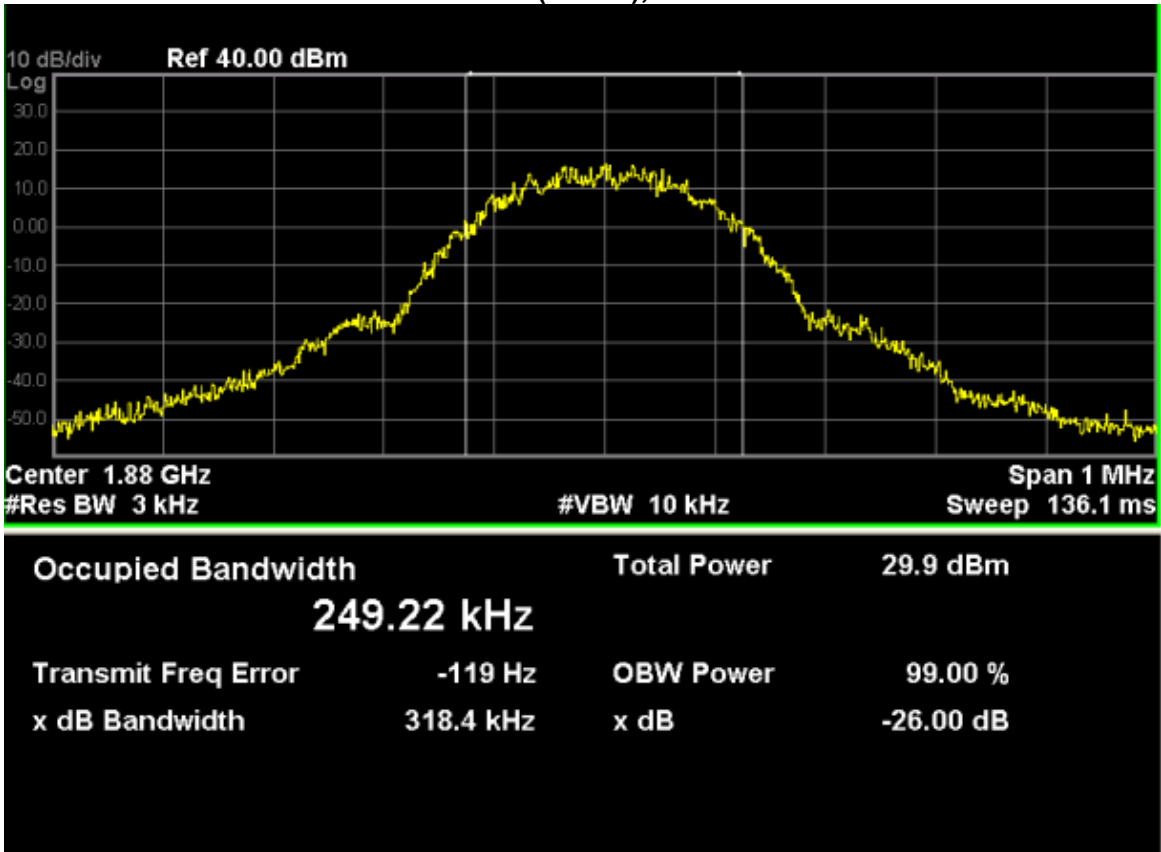


Channel No.	Frequency (MHz)	-26dB Occupied Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
512	1850.20	312.4	247.6
661	1880.00	318.4	249.2
810	1909.80	324.5	251.1

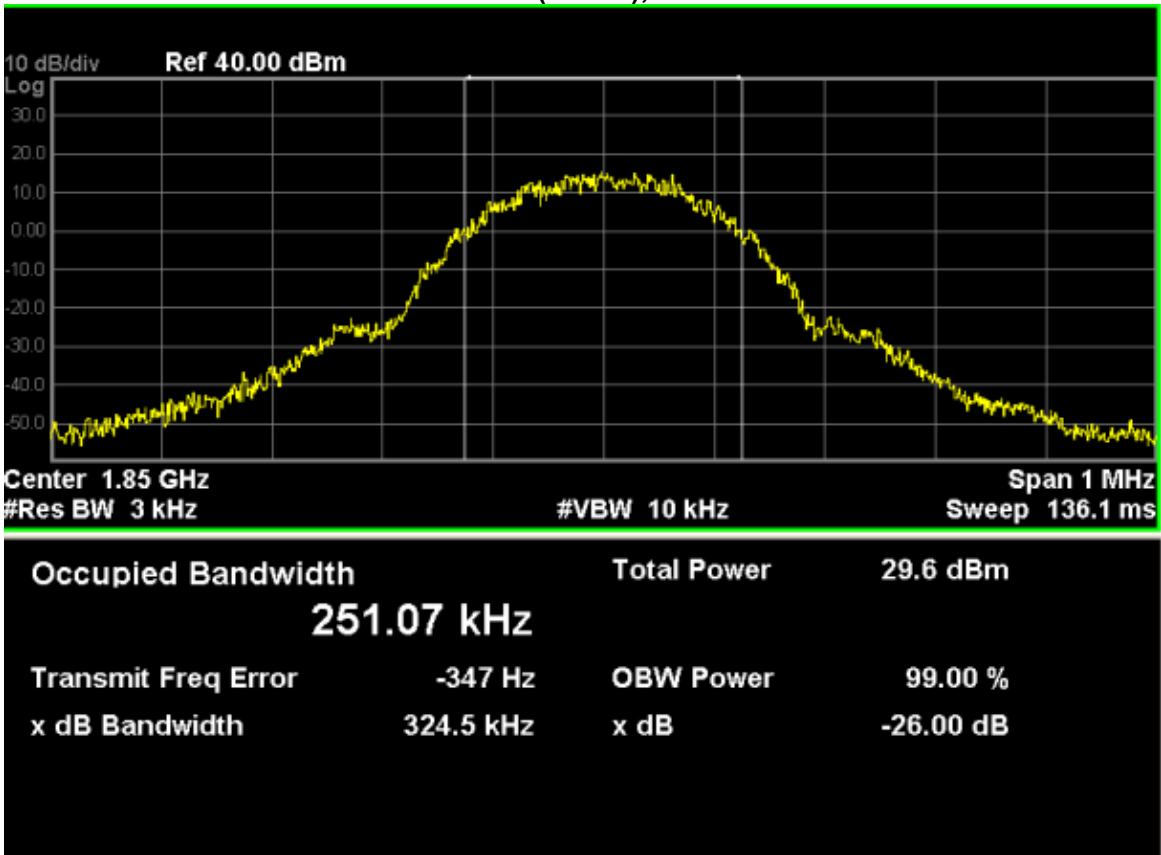
EGPRS 1900 (8 Link), Channel 512



EGPRS 1900 (8 Link), Channel 661

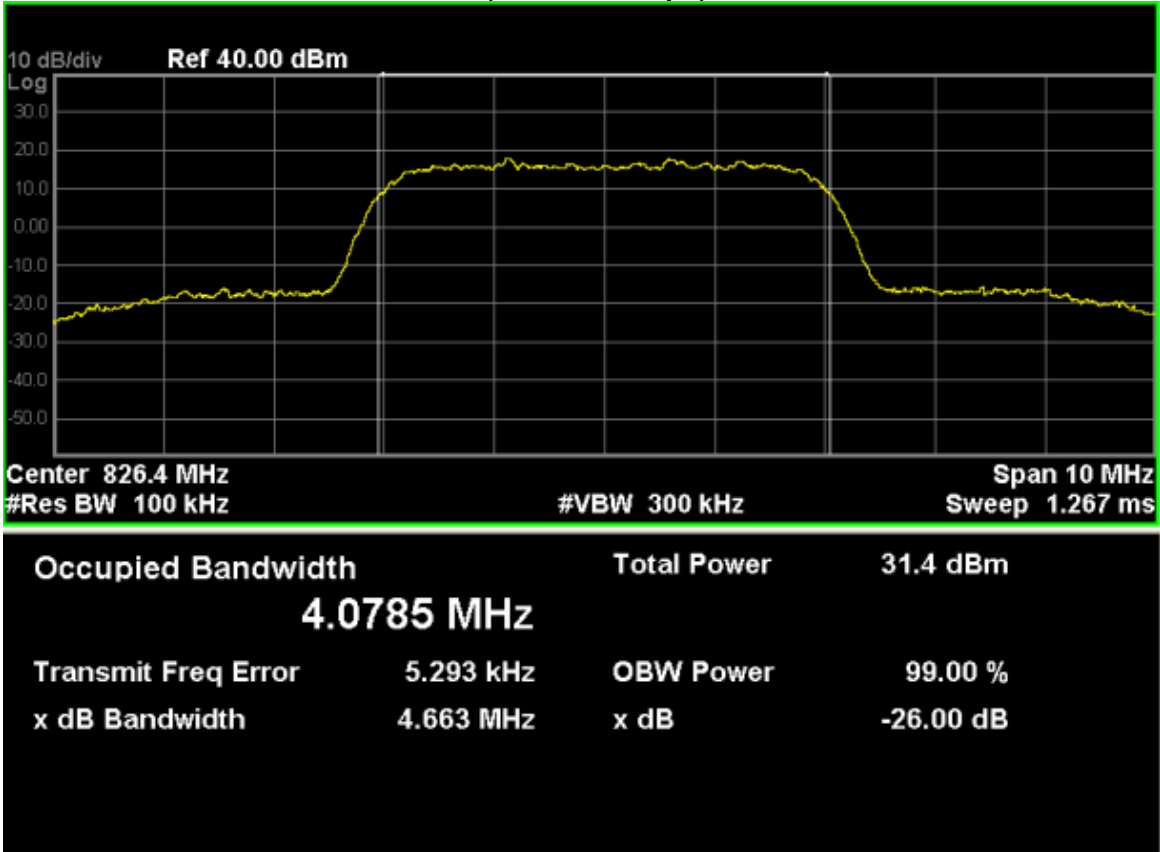


EGPRS 1900 (8 Link), Channel 810

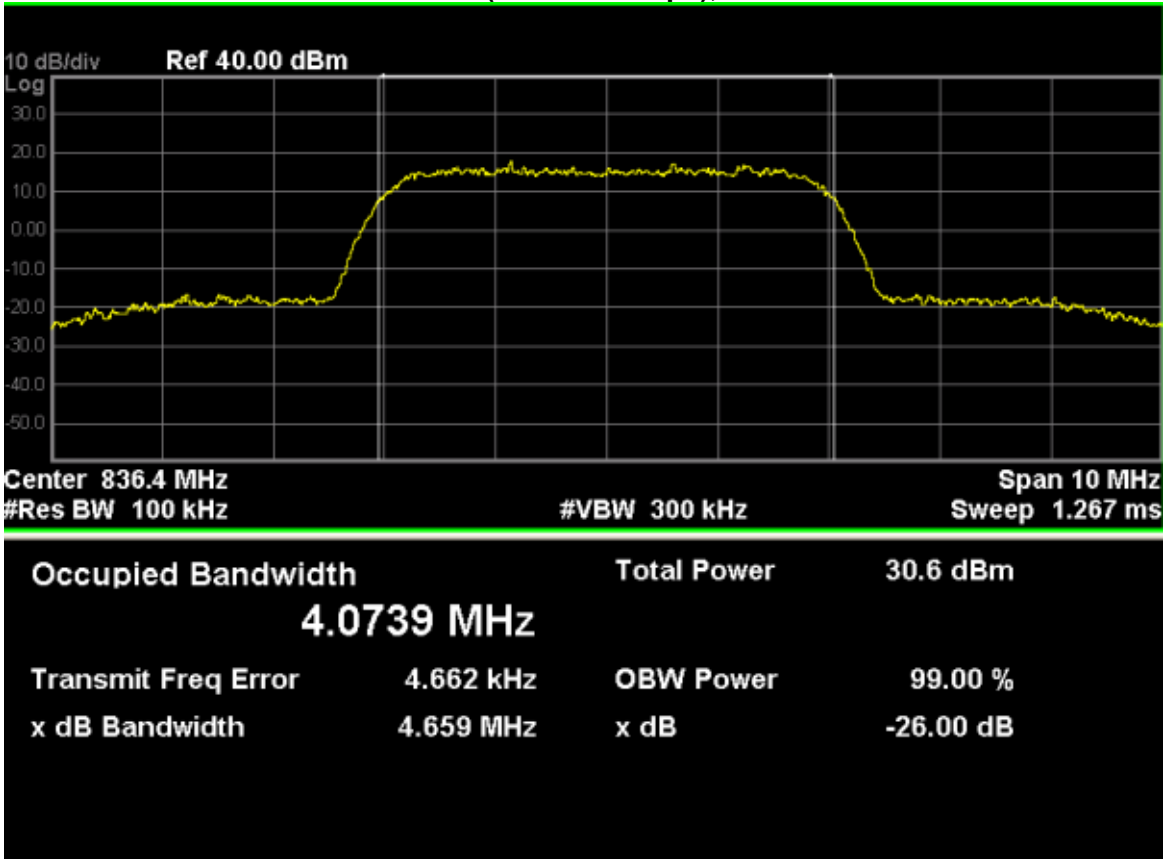


Channel No.	Frequency (MHz)	-26dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
4132	826.4	4.663	4.079
4182	836.4	4.660	4.074
4233	846.6	4.654	4.074

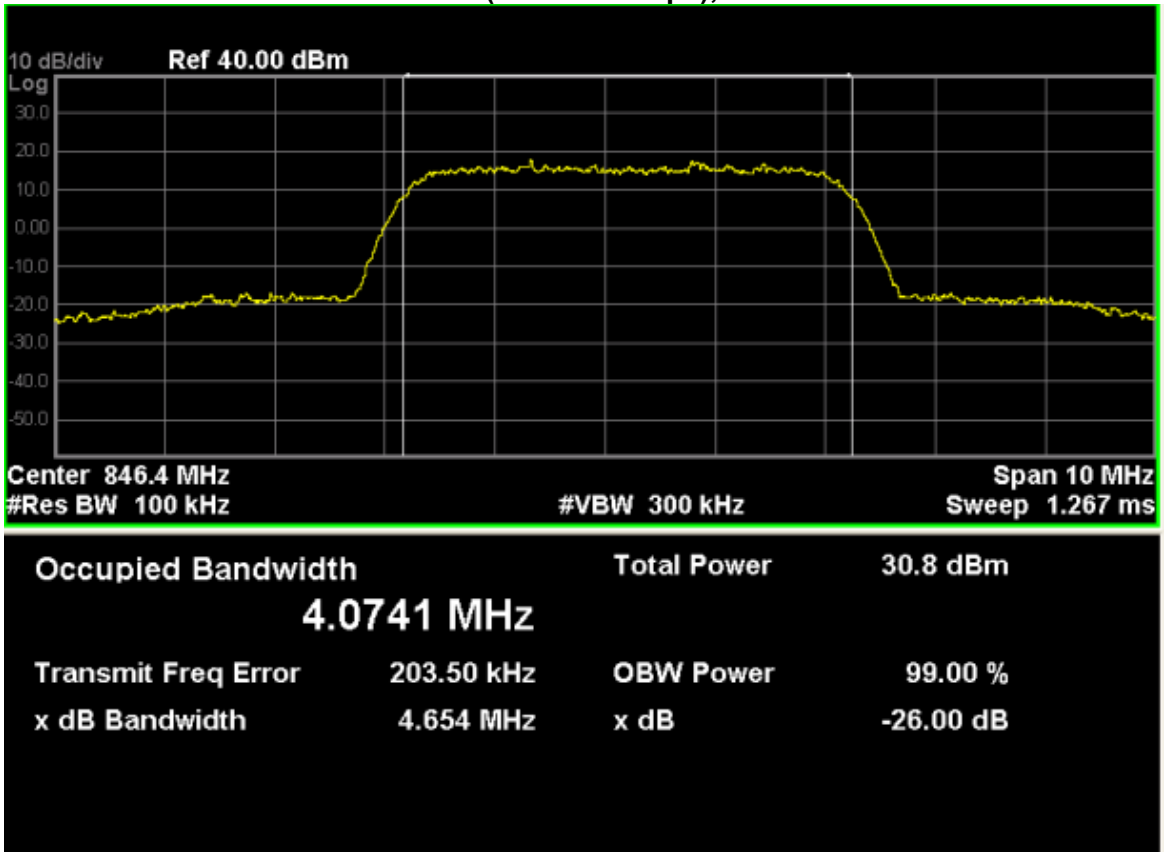
WCDMA Band V (RMC 12.2Kbps), Channel 4132



WCDMA Band V (RMC 12.2Kbps), Channel 4182



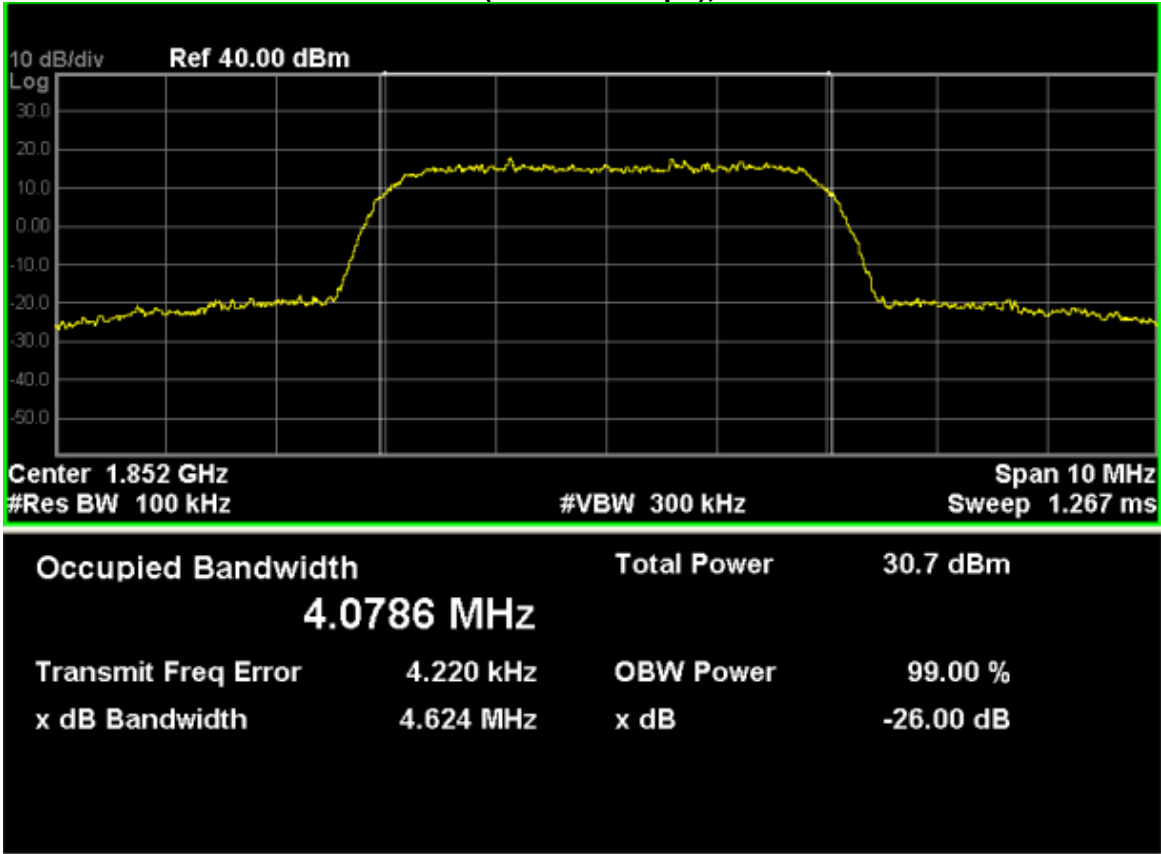
WCDMA Band V (RMC 12.2Kbps), Channel 4233



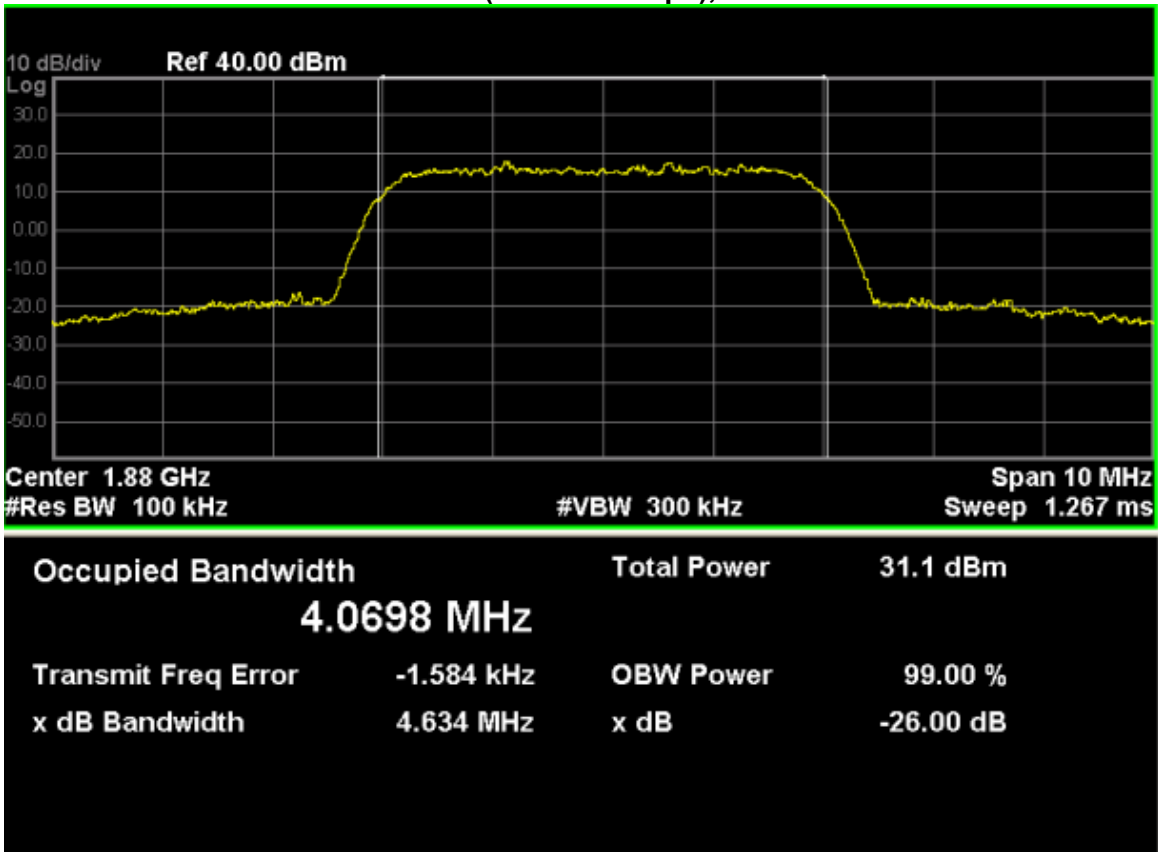
WCDMA Band II (RMC 12.2Kbps)

Channel No.	Frequency (MHz)	-26dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
9262	1852.4	4.624	4.079
9400	1880.0	4.634	4.070
9538	1907.6	4.641	4.071

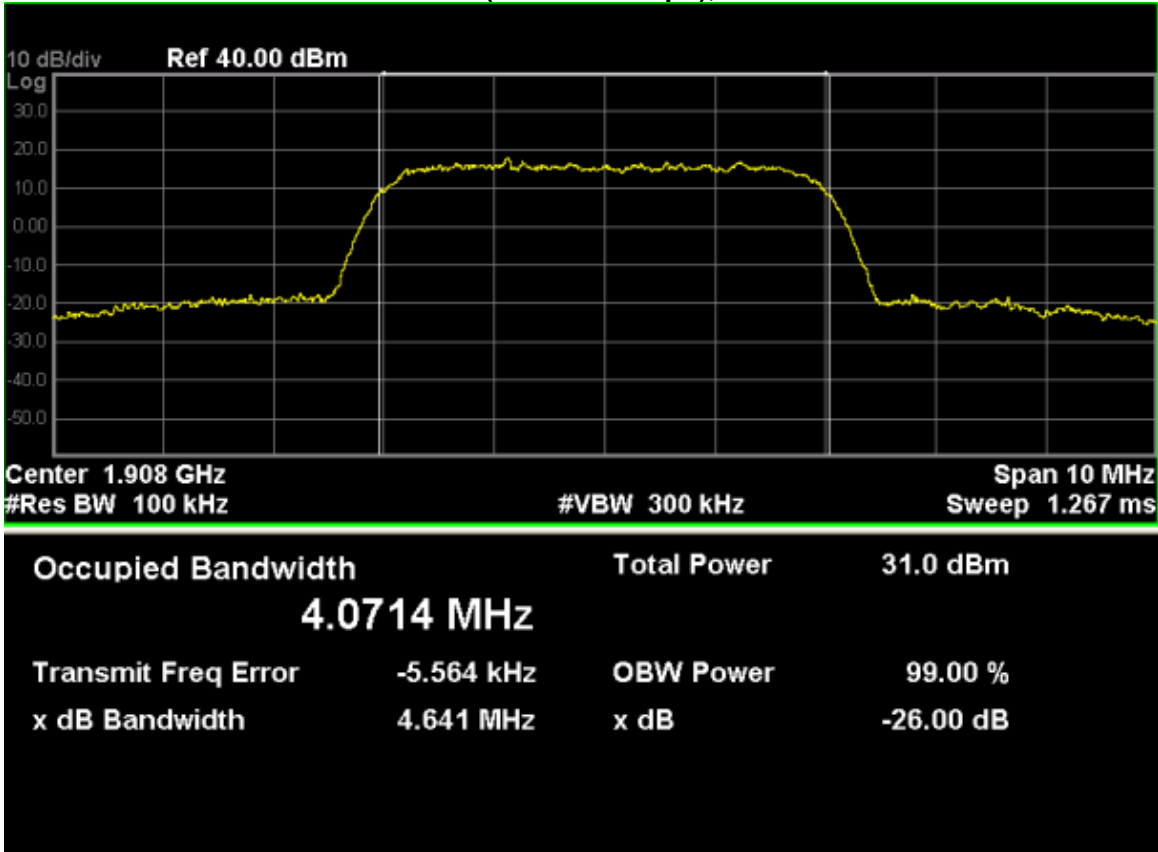
WCDMA Band II (RMC 12.2Kbps), Channel 9262



WCDMA Band II (RMC 12.2Kbps), Channel 9400



WCDMA Band II (RMC 12.2Kbps), Channel 9400



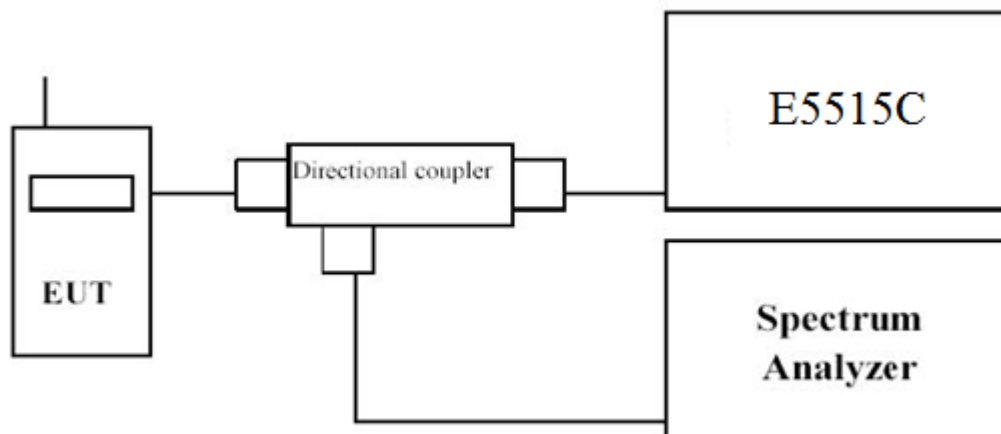
5.Spurious Emission At Antenna Terminals (+/- 1MHz)

5.1. Test Equipment

Instrument	Manufacturer	Model	Serial No	Cal. Date
Radio Communication Tester	Agilent	E5515C	GB46581718	11.11.2015
Spectrum Analyzer	Agilent	N9038A	MY51210142	11.11.2015
DC Power Supply	Agilent	6612C	MY43002989	02.03.2016

The measure equipment had been calibrated once a year.

5.2. Test Setup



5.3. Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

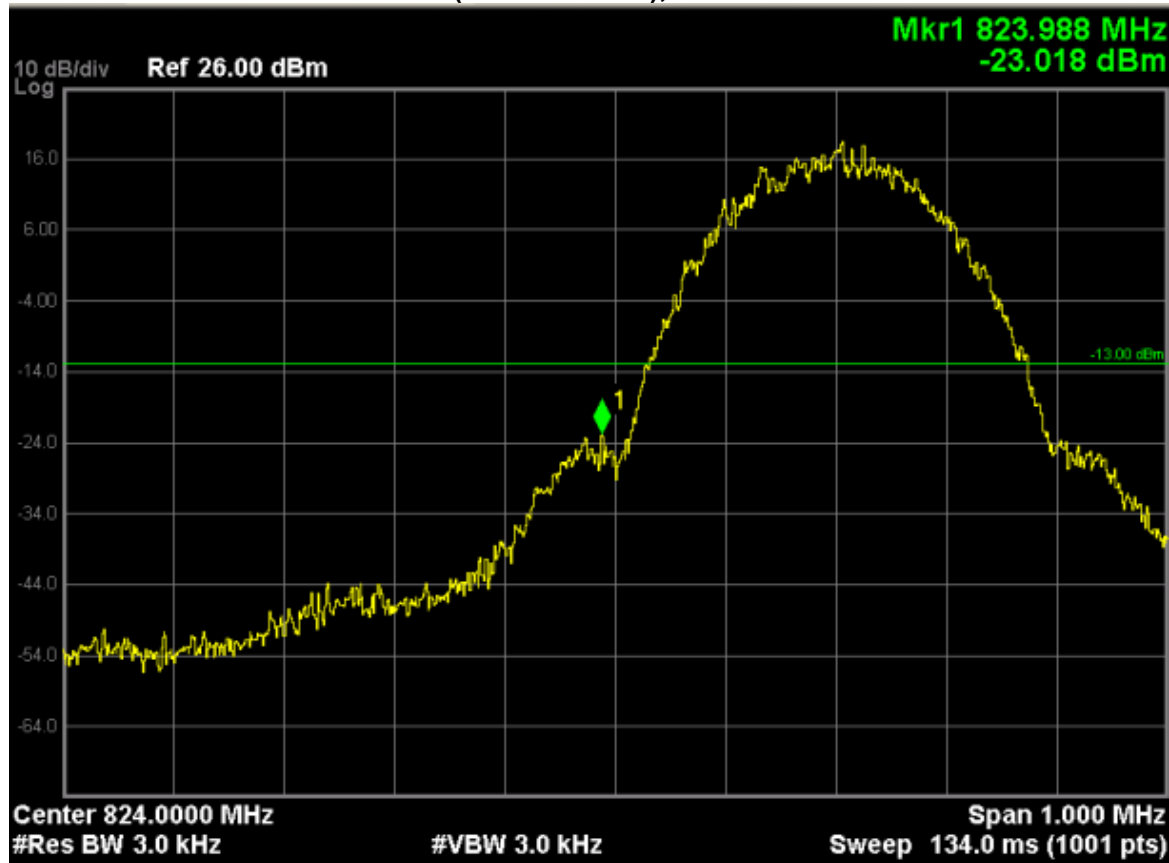
5.4. Test Procedure

In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.

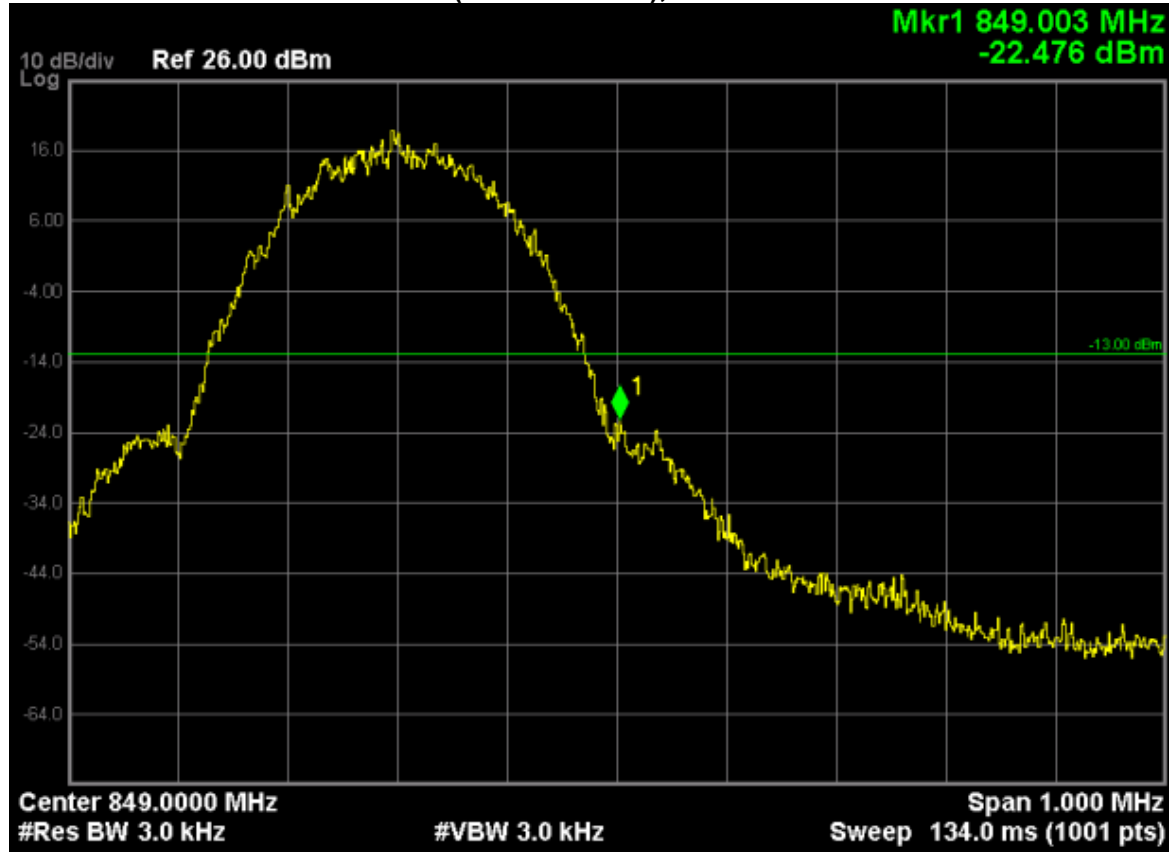
5.5. Uncertainty

The measurement uncertainty is defined as ± 1.2 dB.

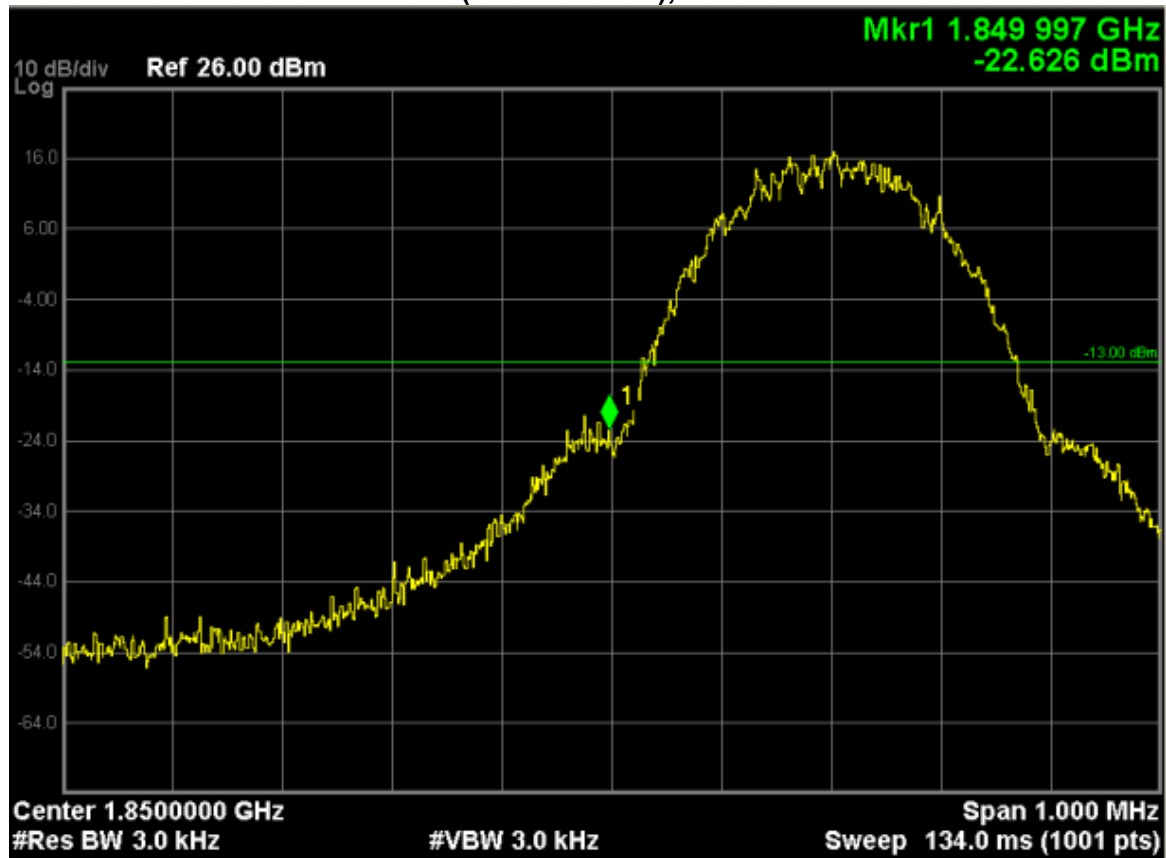
GSM850 (EGPRS 8Link), Channel 128



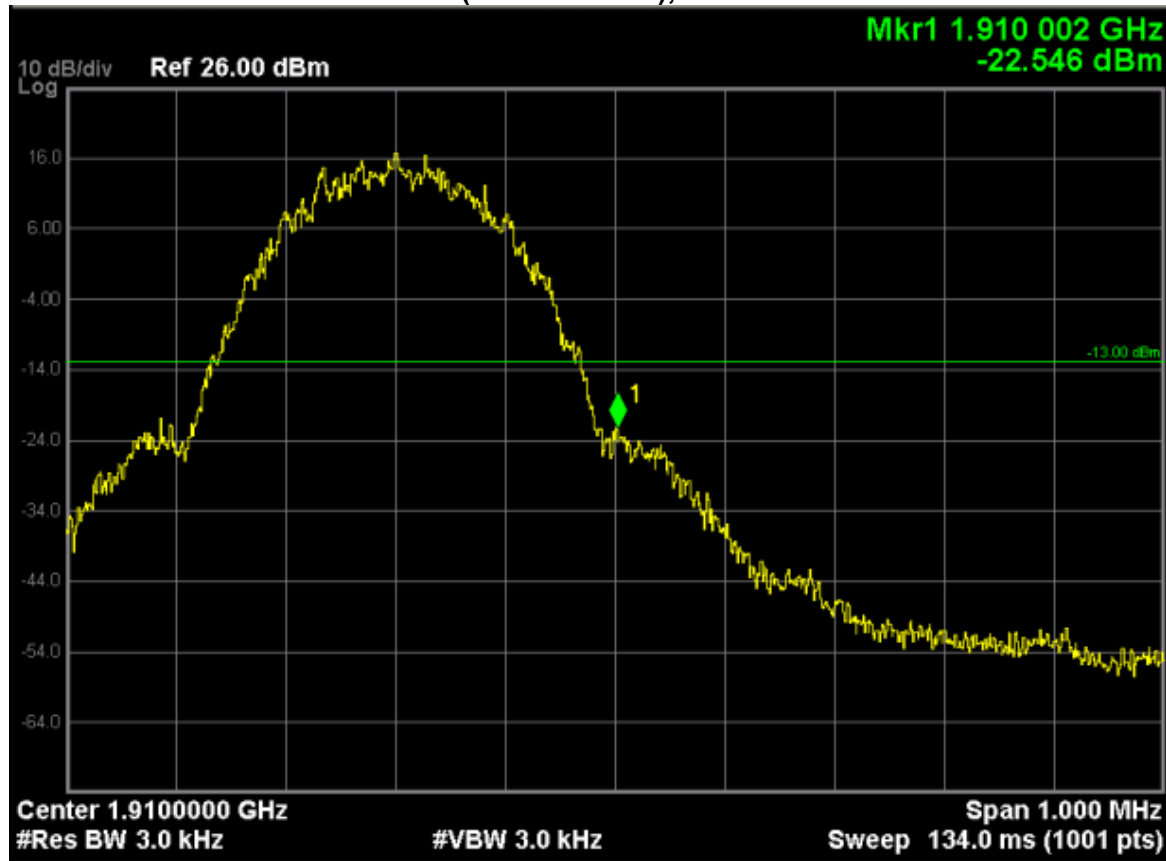
GSM850 (EGPRS 8Link), Channel 251



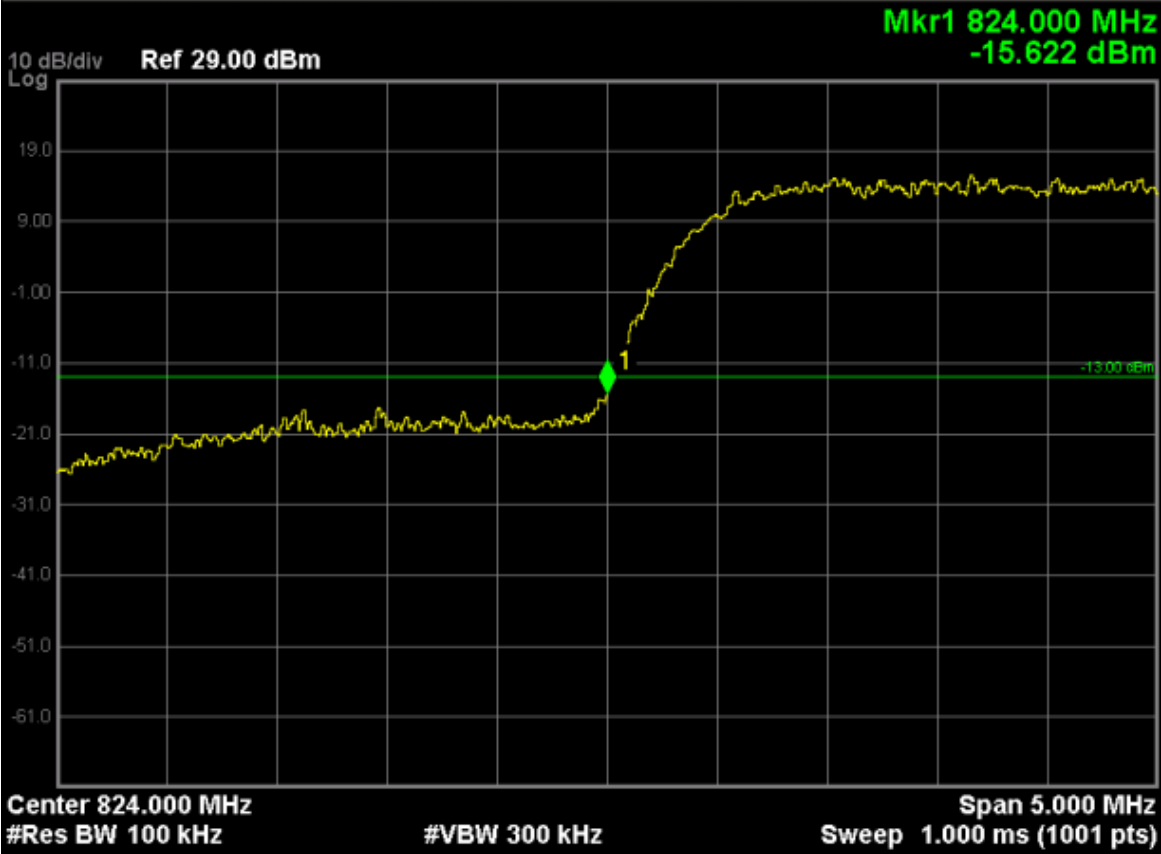
GSM1900 (EGPRS 8Link), Channel 512



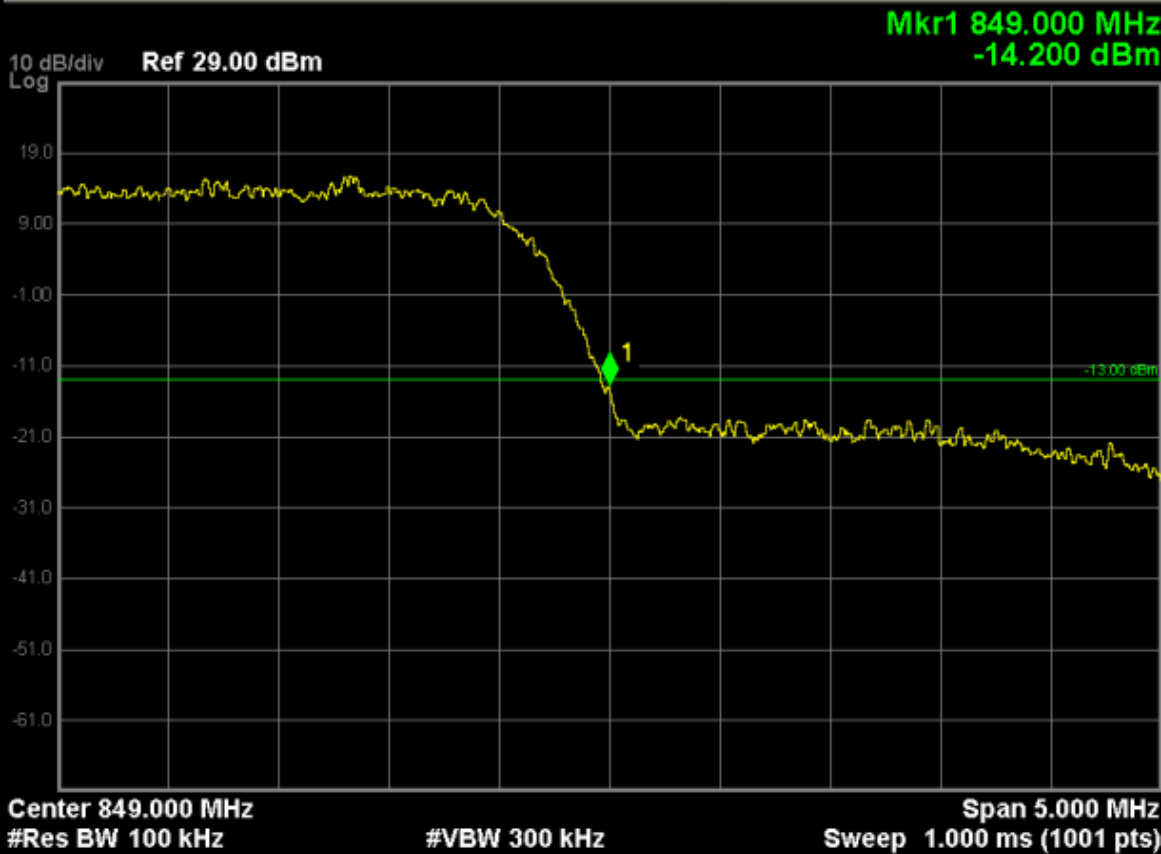
GSM1900 (EGPRS 8Link), Channel 810



WCDMA Band V (RMC 12.2Kbps) Channel 4132



WCDMA Band V (RMC 12.2Kbps) Channel 4233



6.Spurious Emission

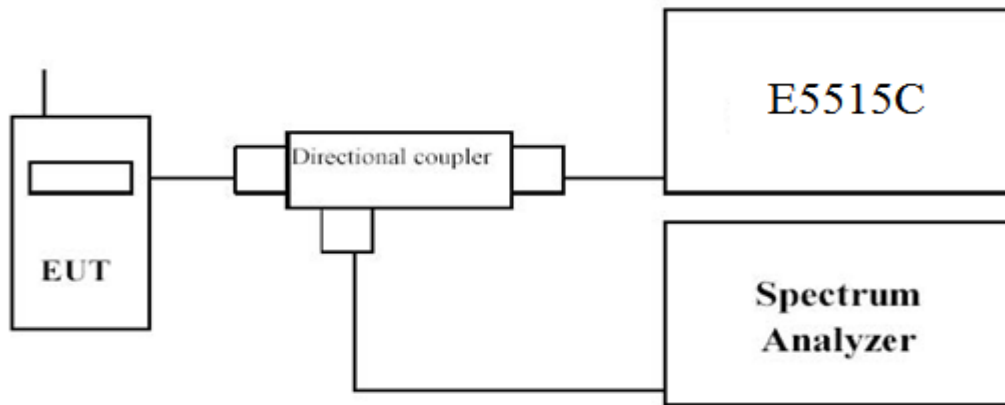
6.1. Test Equipment

Instrument	Manufacturer	Model	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9038A	MY51210142	11.11.2015
Radio Communication Tester	Agilent	E5515C	GB46581718	11.11.2015
Signal Generator	Agilent	N5183A	MY50140938	02.01.2016
Preamplifier	CEM	EM30180	3008A0245	27.02.2016
Loop Antenna	Schwarzbeck	FMZB1519	1519-020	25.03.2016
Bilog Antenna	Schwarzbeck	VULB9160	9160-3316	18.07.2015
VHF-UHF-Biconical Antenna	Schwarzbeck	VUBA9117	9117-263	18.07.2015
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-942	18.07.2015
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-943	18.07.2015
Horn Antenna(18-40)	ETS	3116	00070497	18.07.2015

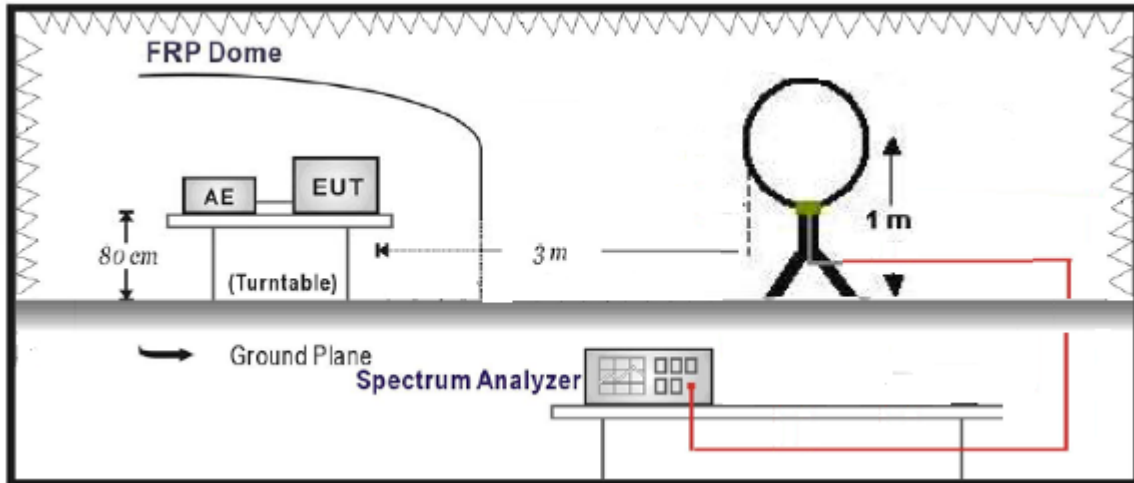
The measure equipment had been calibrated once a year.

6.2. Test Setup

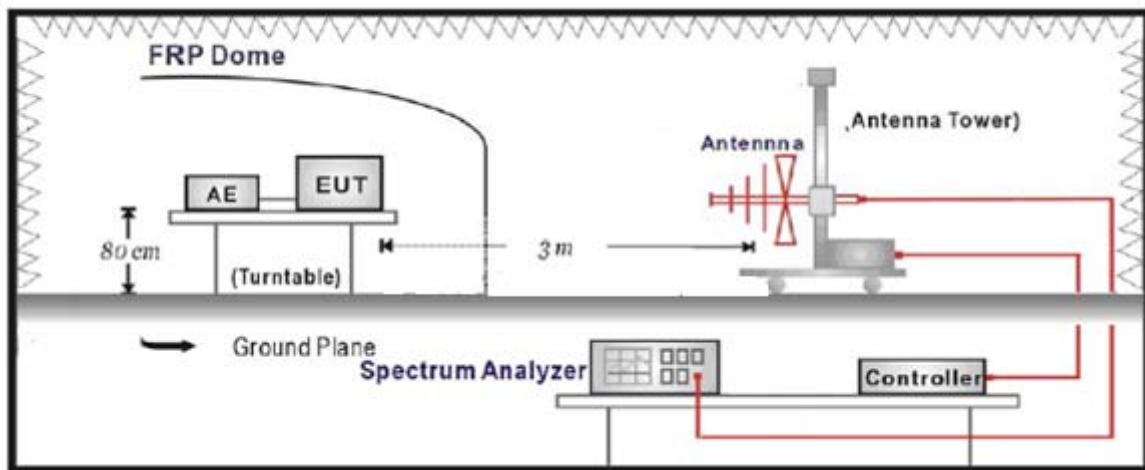
Conducted Spurious Emission Measurement:



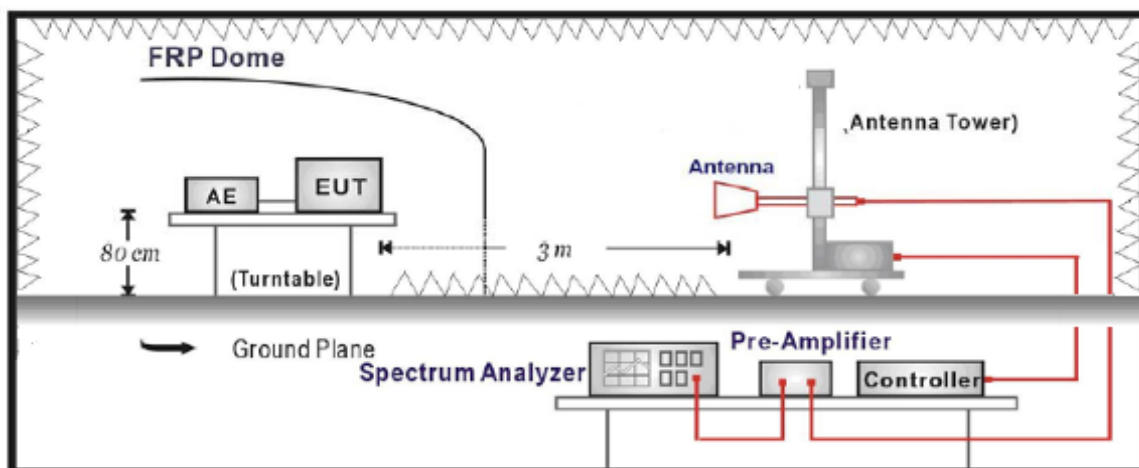
Radiated Spurious Measurement: below 30MHz



Radiated Spurious Measurement: 30MHz to 1GHz



Radiated Spurious Measurement: above 1GHz



6.3. Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

6.4. Test Procedure

Conducted Spurious Measurement:

- a. Place the EUT on a bench and set it in transmitting mode.
- b. Connect a low loss RF cable from the antenna port to a spectrum analyzer and E5515C by a Directional Couple.
- c. EUT Communicate with E5515C, then select a channel for testing.
- d. Add a correction factor to the display of spectrum, and then test.
- e. The resolution bandwidth of the spectrum analyzer was set at 1 MHz, sufficient scans were taken to show the out of band Emission if any up to 10th harmonic.

Radiated Spurious Measurement:

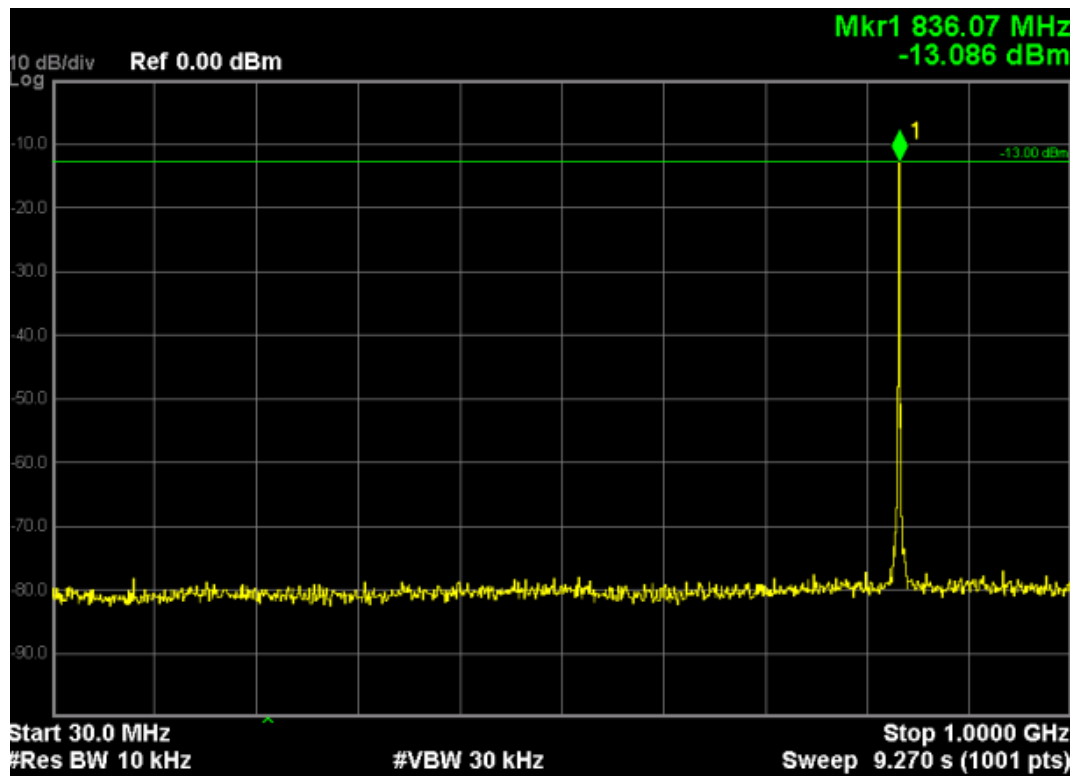
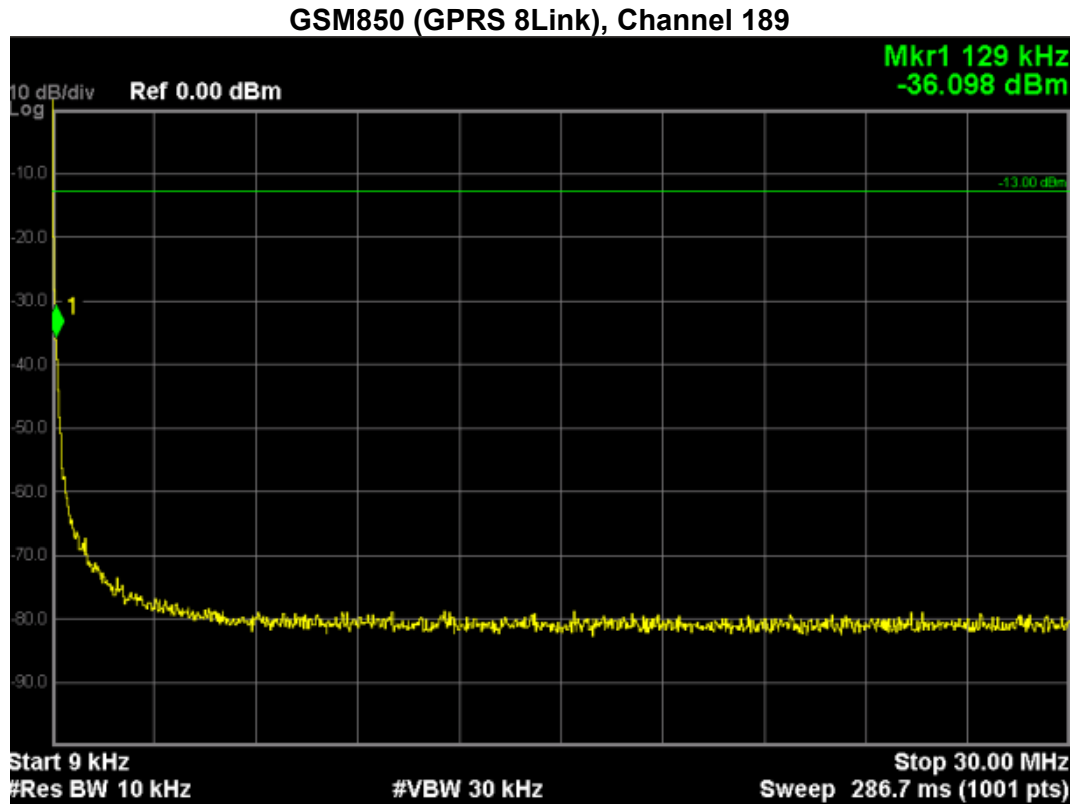
- a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
- b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
- c. The output of the test antenna shall be connected to the measuring receiver. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- d. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- e. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- f. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- h. The maximum signal level detected by the measuring receiver shall be noted.
- i. The transmitter shall be replaced by a substitution antenna.
- j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- k. The substitution antenna shall be connected to a calibrated signal generator.
- l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
- q. The frequency range was checked up to 10th harmonic.
- r. Test site anechoic chamber refer to ANSI/TIA-603-C-2004.

6.5. Uncertainty

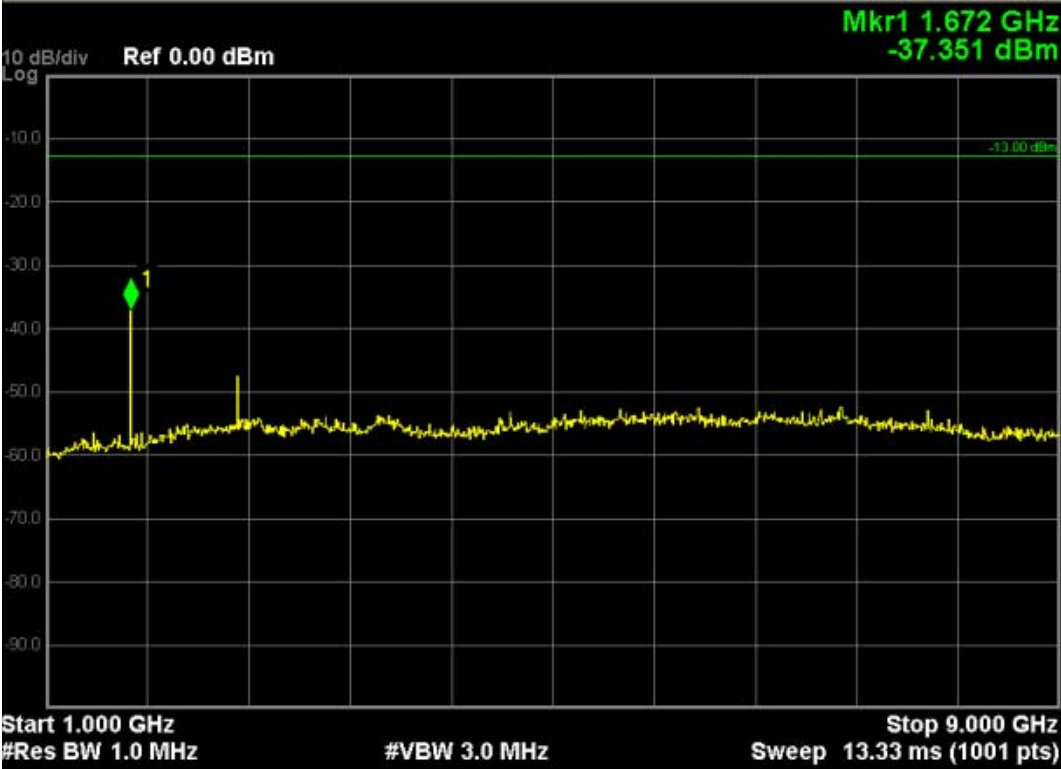
The measurement uncertainty is defined as 3.2 dB for Radiated Power Measurement.

6.6. Test Result

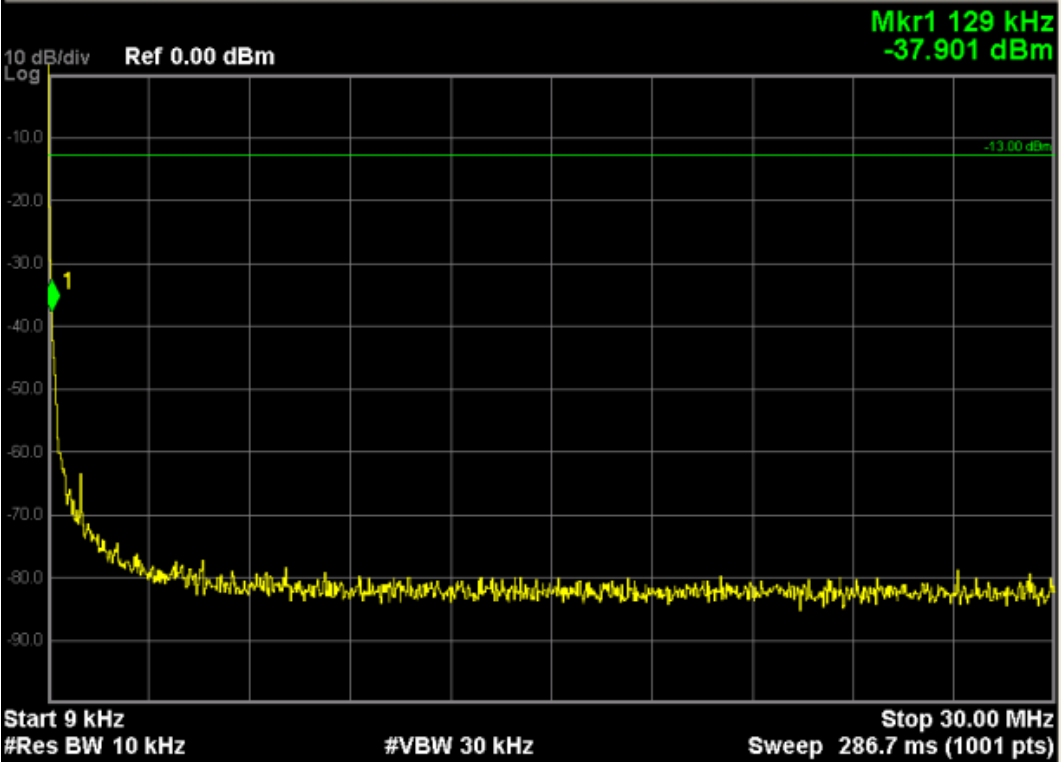
Conducted Spurious Measurement:

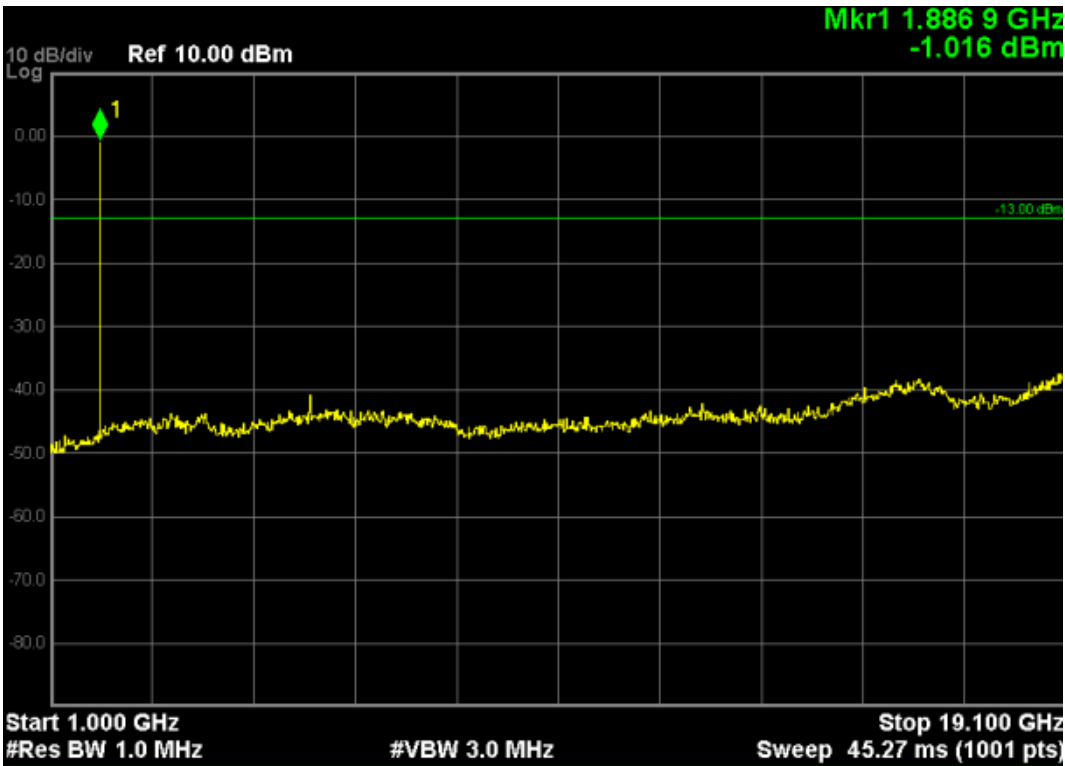
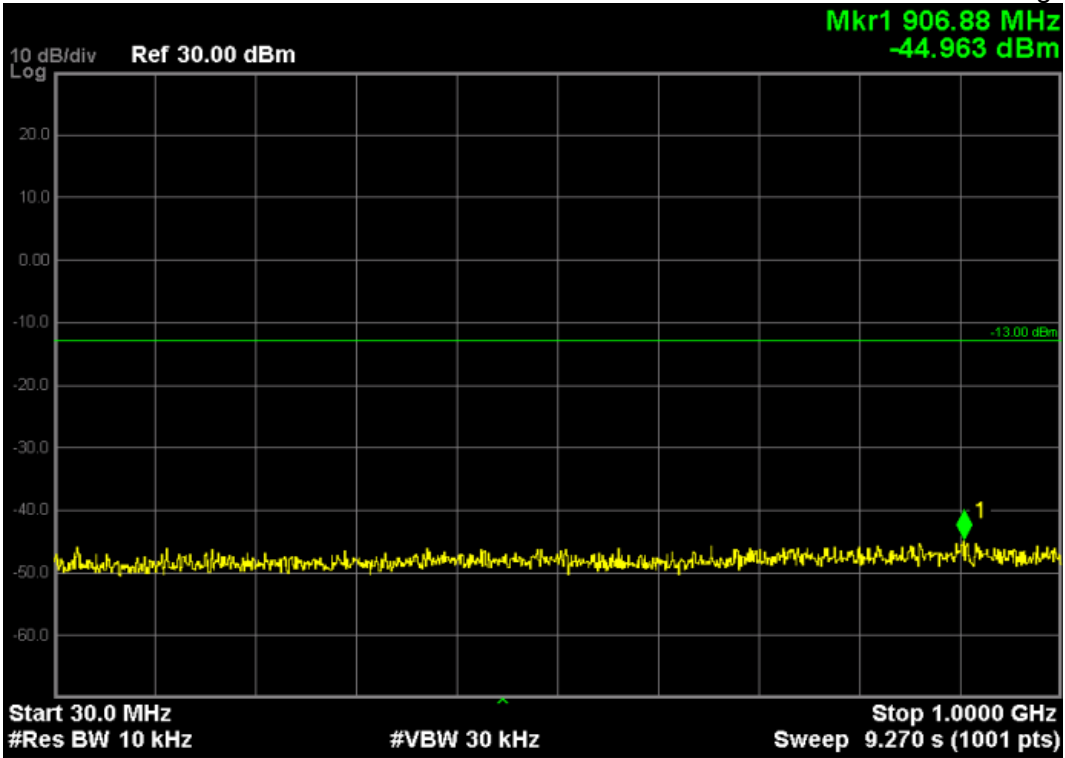


Note: The signal at point 1 is carrier

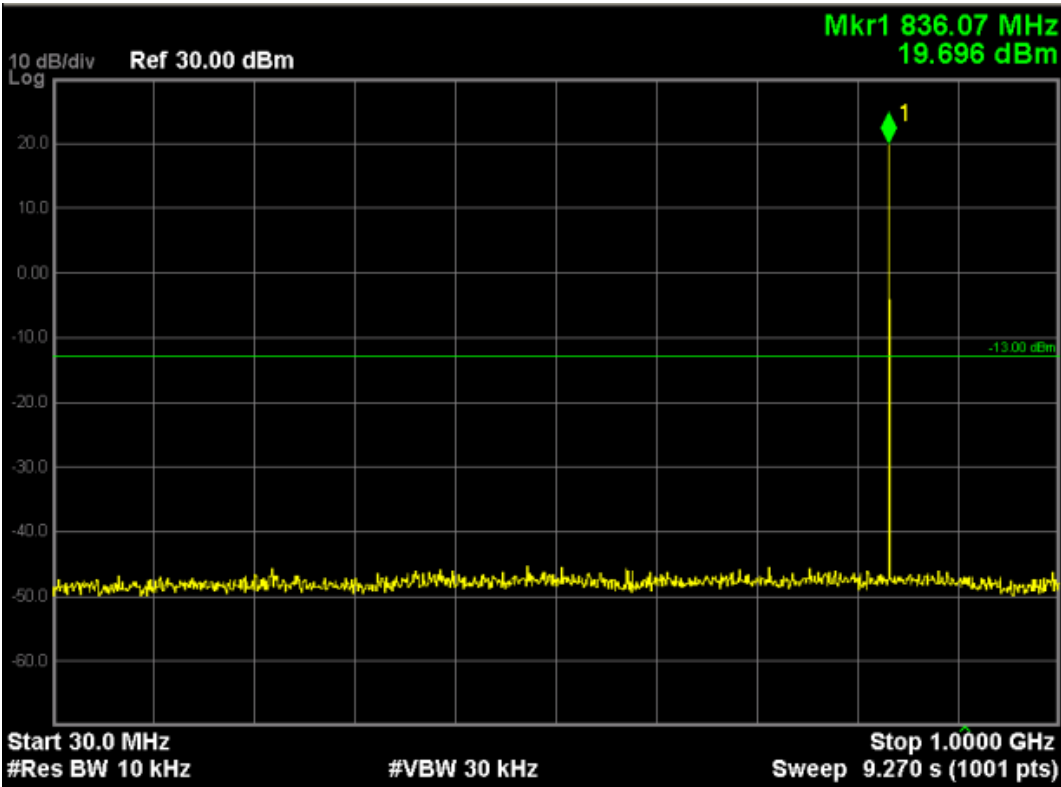
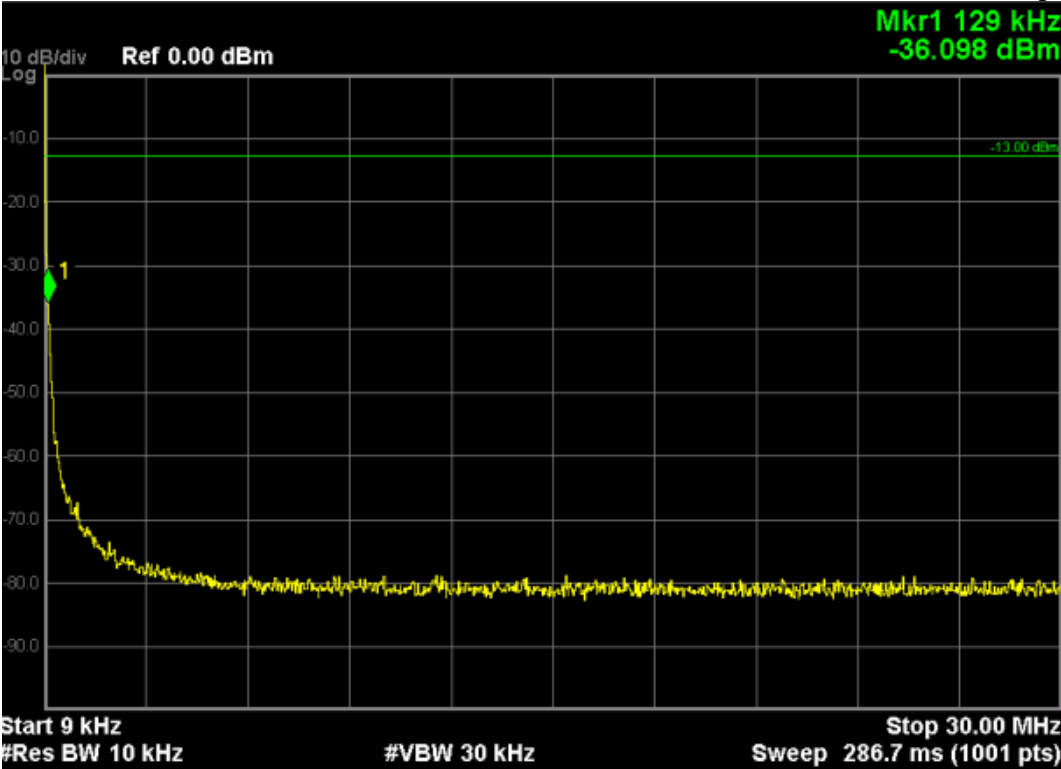


GSM 1900 (GPRS 8Link), Channel 661

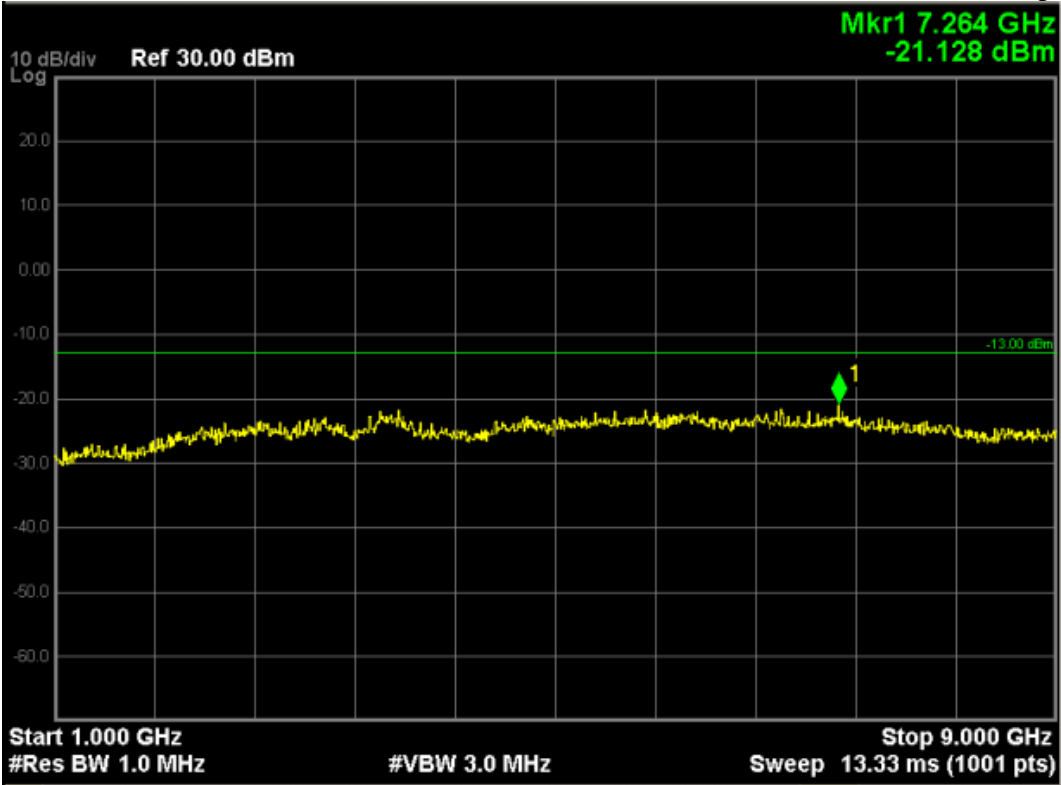




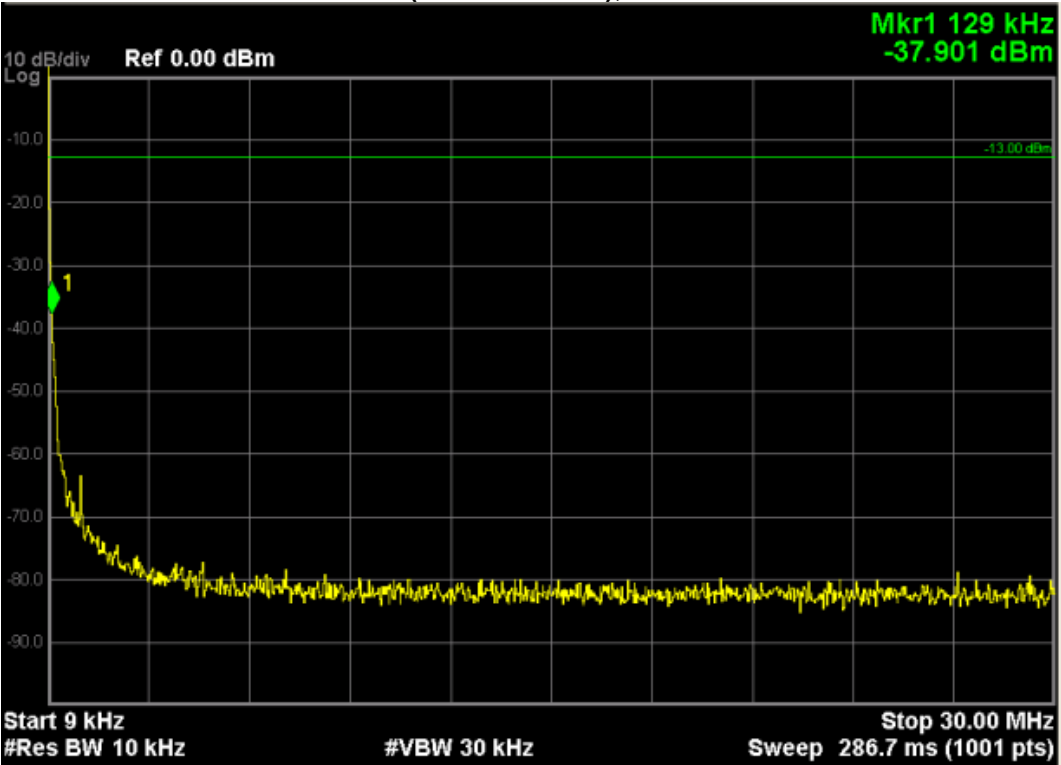
Note: The signal at point 1 is carrier

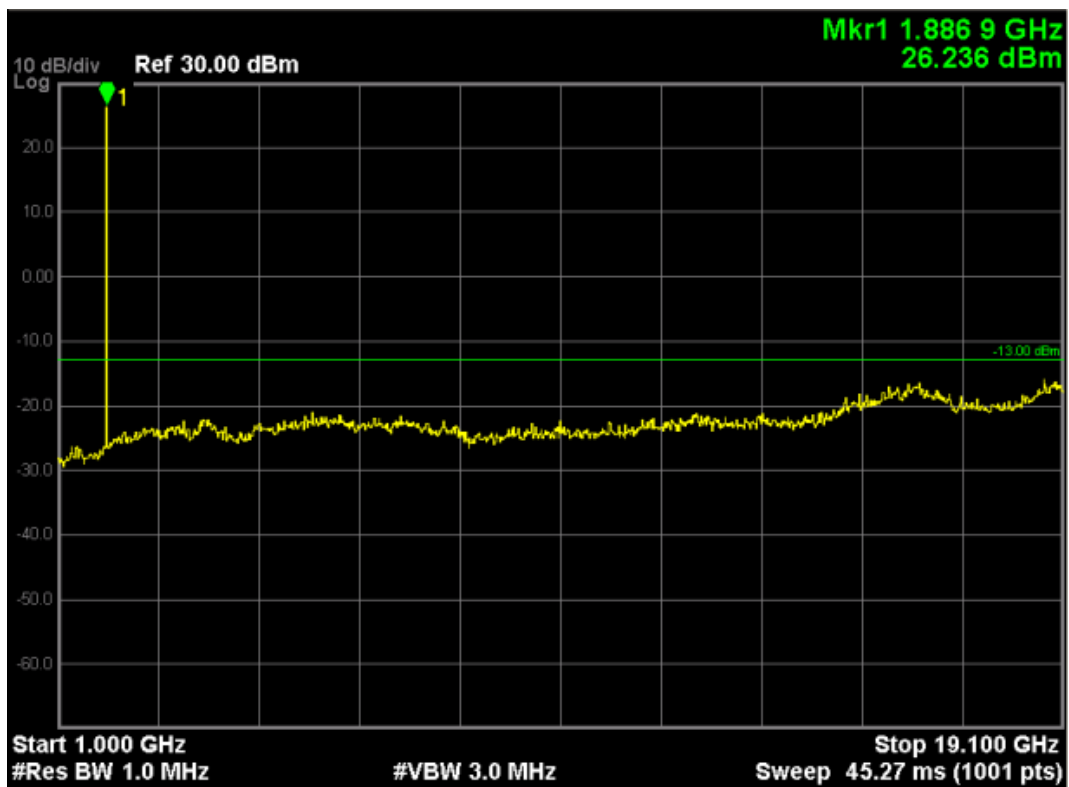
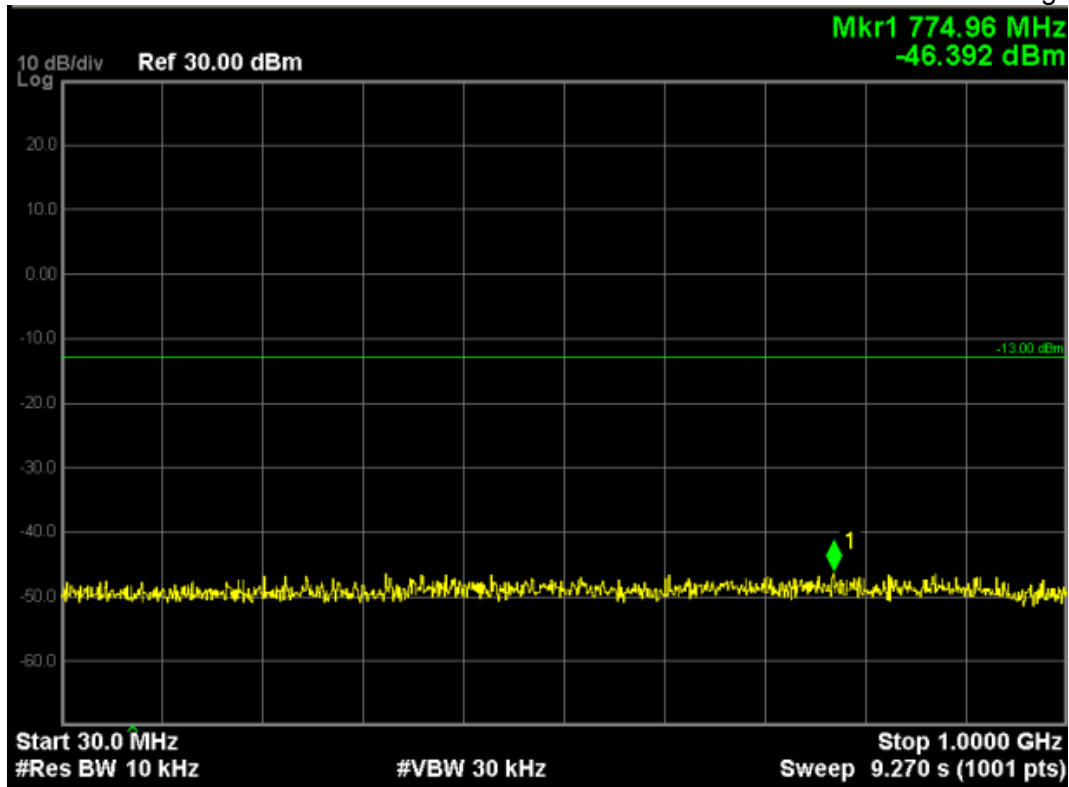


Note: The signal at point 1 is carrier.



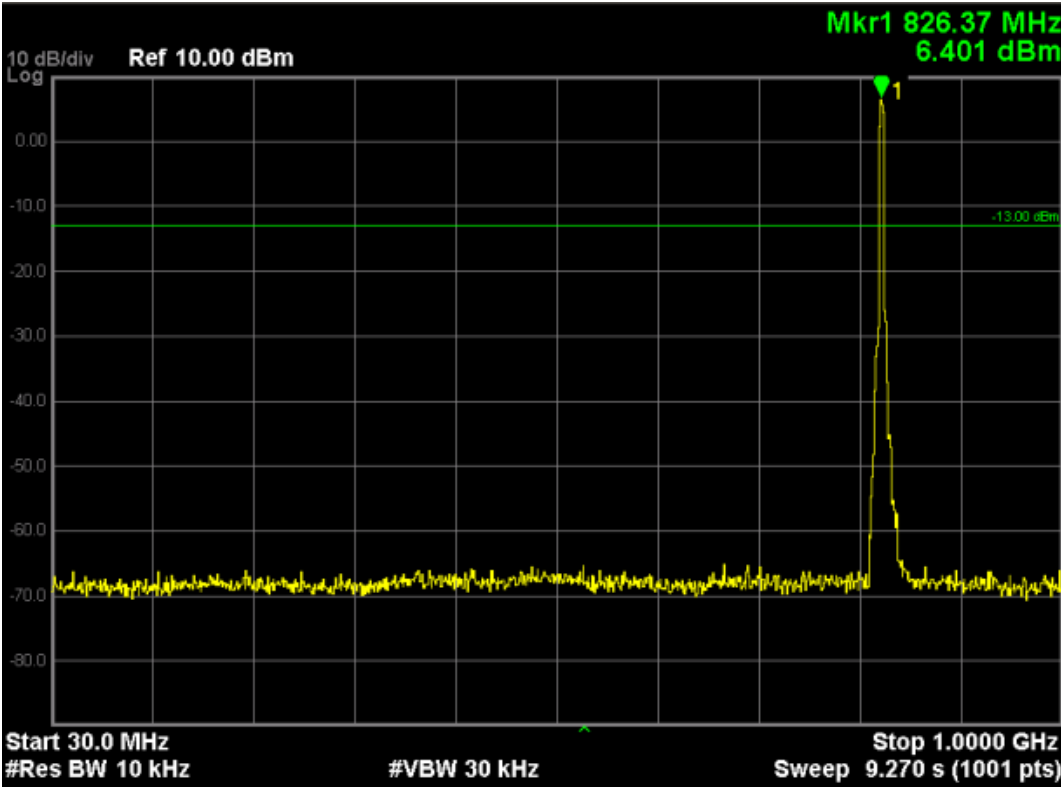
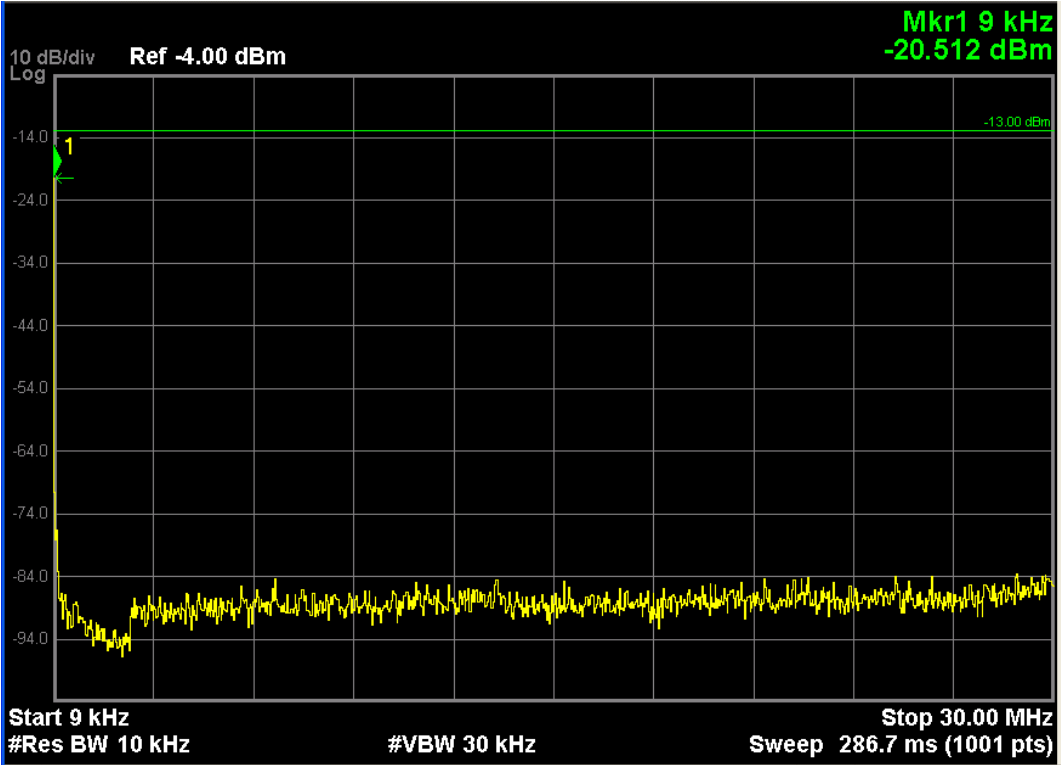
GSM 1900 (EGPRS 8Link), Channel 661



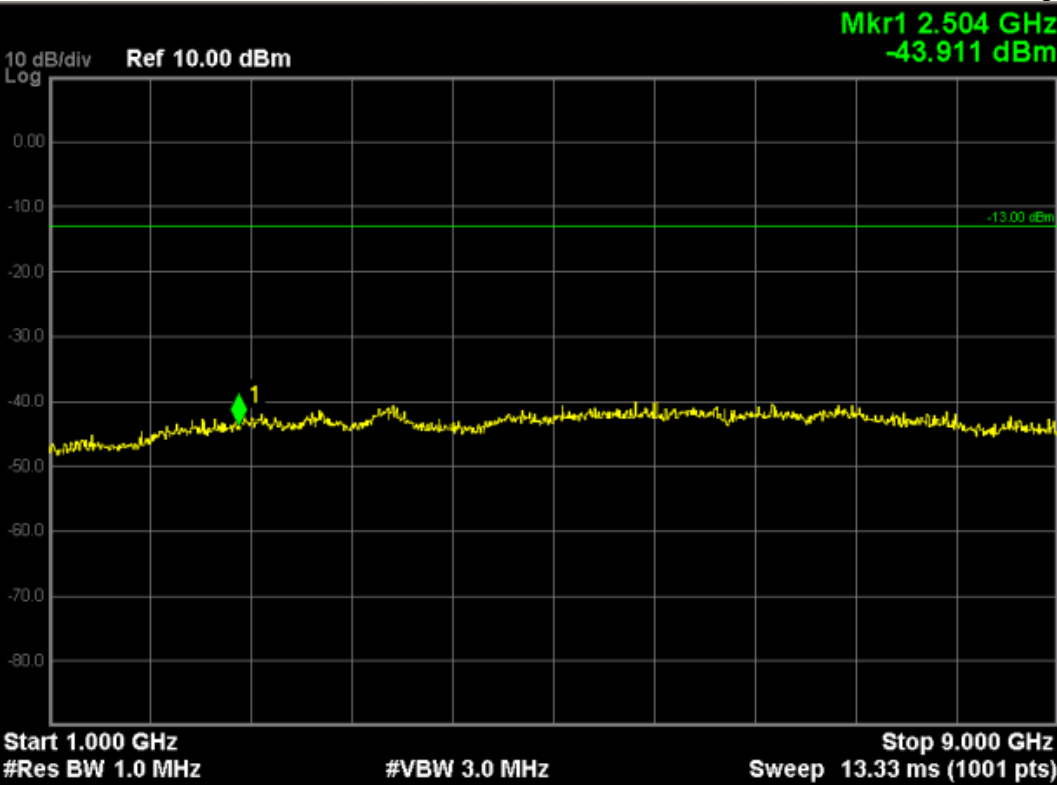


Note: The signal at point 1 is carrier.

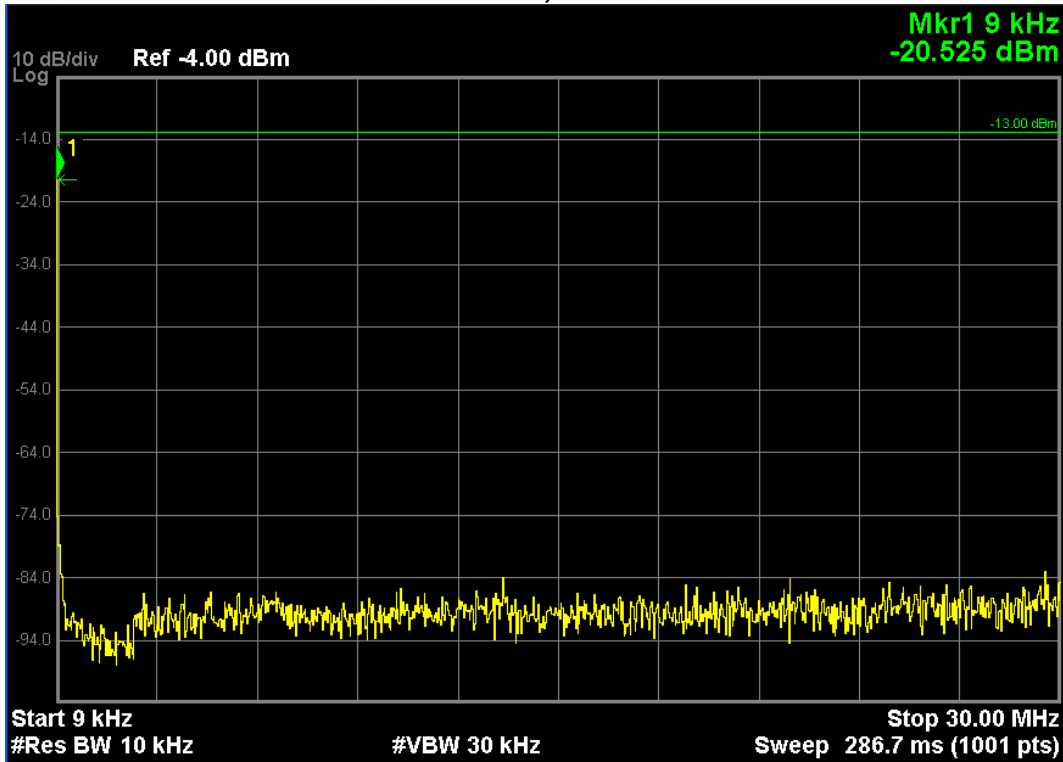
WCDMA Band V, Channel 661

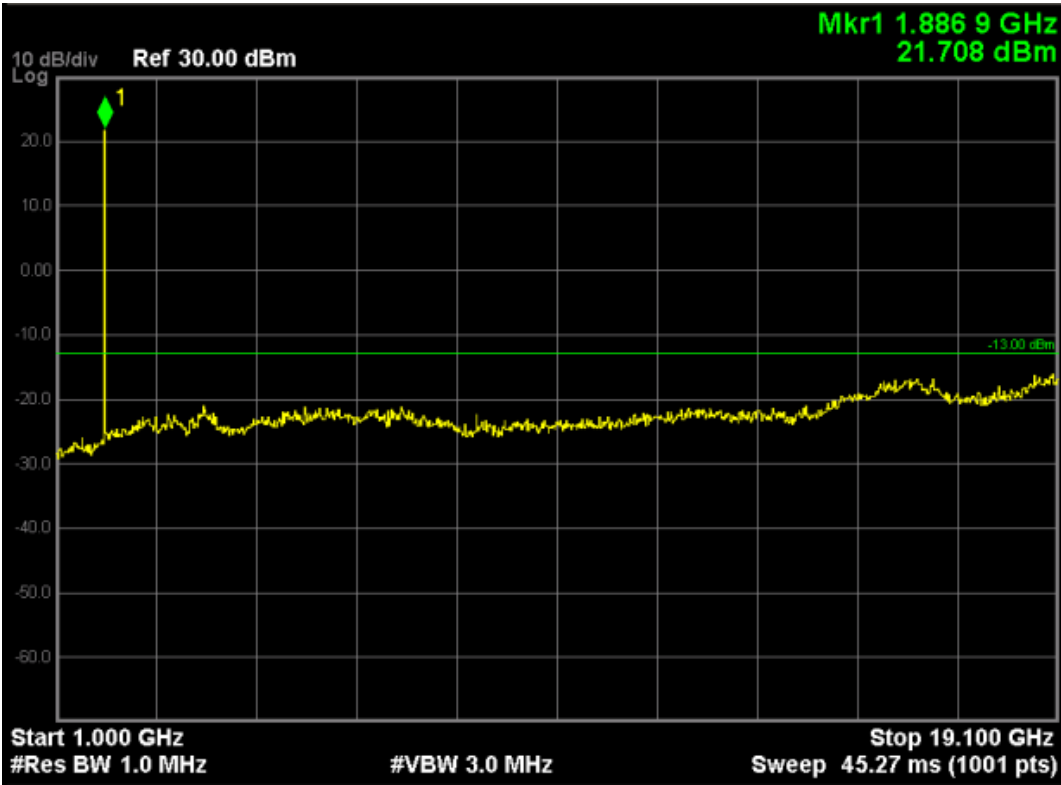
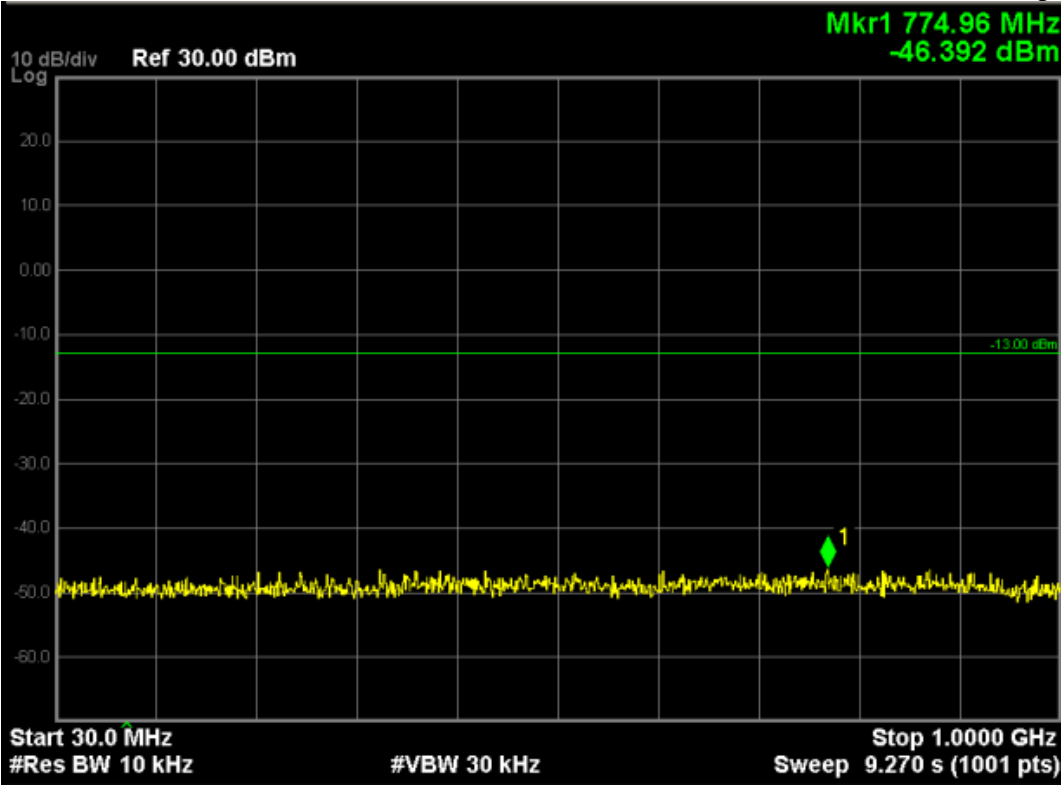


Note: The signal at point 1 is carrier.



WCDMA Band II, Channel 9400





Note: The signal at point 1 is carrier.

GSM850 (GPRS 8Link), 9KHz to 30MHz

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line, and that was not reported per 2.1057 (c).

GSM850 (GPRS 8Link), 30MHz to 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 189 (836.40MHz)							
568	H	-45.86	3.12	-2.57	-51.55	-13.00	-38.55
568	V	-43.48	3.12	-2.57	-49.17	-13.00	-36.17

GSM850 (GPRS 8Link), Above 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 189 (836.40MHz)							
1682.9	H	-43.29	6.13	-2.59	-52.01	-13.00	-39.01
1682.9	V	-43.86	6.13	-2.59	-52.58	-13.00	-39.58
2539.2	H	-53.37	7.32	-2.86	-63.55	-13.00	-50.55
2539.2	V	-50.50	7.32	-2.86	-60.68	-13.00	-47.68

GSM850 (EGPRS 8Link), 9KHz to 30MHz

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line, and that was not reported per 2.1057 (c).

GSM850 (EGPRS 8Link), 30MHz to 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 189 (836.40MHz)							
611	H	-44.76	3.12	-2.57	-50.45	-13.00	-37.45
611	V	-42.57	3.12	-2.57	-48.26	-13.00	-35.26

GSM850 (EGPRS 8Link), Above 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 189 (836.40MHz)							
1782.9	H	-47.13	6.13	-2.59	-55.85	-13.00	-42.85
1782.9	V	-46.28	6.13	-2.59	-55.00	-13.00	-42.00
2439.6	H	-54.32	7.32	-2.86	-64.50	-13.00	-51.50
2439.6	V	-52.53	7.32	-2.86	-62.71	-13.00	-49.71

GSM1900 (GPRS 8Link), 9KHz to 30MHz

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line, and that was not reported per 2.1057 (c).

GSM 1900 (GPRS 8Link), 30MHz to 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 661 (1880.00MHz)							
569	H	-45.21	3.16	-2.63	-51.00	-13.00	-38.00
569	V	-42.64	3.16	-2.63	-48.43	-13.00	-35.43

GSM 1900 (GPRS 8Link), Above 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 661 (1880.00MHz)							
3751	H	-48.00	8.85	-3.28	-60.12	-13.00	-47.12
3751	V	-46.88	8.85	-3.28	-59.01	-13.00	-46.01

GSM1900 (EGPRS 8Link), 9KHz to 30MHz

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line, and that was not reported per 2.1057 (c).

GSM 1900 (EGPRS 8Link), 30MHz to 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 661 (1880.00MHz)							
592	H	-46.94	3.16	-2.63	-52.73	-13.00	-39.73
592	V	-43.80	3.16	-2.63	-48.59	-13.00	-35.59

GSM 1900 (EGPRS 8Link), Above 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 661 (1880.00MHz)							
3850	H	-49.39	8.85	-3.28	-61.52	-13.00	-48.52
3850	V	-47.11	8.85	-3.28	-59.24	-13.00	-46.24

WCDMA Band V (RMC 12.2Kbps) Below 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 189 (836.40MHz)							
150.3	H	-64.31	2.09	-0.71	-67.11	-13.00	-54.11
755.6	H	-61.22	3.78	-2.41	-67.41	-13.00	-54.41
150.3	V	-67.18	2.09	-0.71	-69.98	-13.00	-56.98
755.3	V	-64.37	3.78	-2.41	-70.56	-13.00	-57.56

WCDMA Band V (RMC 12.2Kbps) Above 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 189 (836.40MHz)							
1678	H	-40.84	6.00	7.80	-39.04	-13.00	-26.04
2509	H	-31.64	7.36	8.46	-30.54	-13.00	-17.54
1678	V	-38.35	6.00	7.80	-36.55	-13.00	-23.55
2509	V	-30.16	7.36	8.46	-29.06	-13.00	-16.06

WCDMA Band II (RMC 12.2Kbps) Below 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 9400 (1880.0MHz)							
150.3	H	-54.31	2.09	-0.71	-57.11	-13.00	-44.11
755.6	H	-65.21	3.78	-2.41	-71.40	-13.00	-48.40
150.3	V	-67.10	2.09	-0.71	-69.90	-13.00	-56.90
755.3	V	-69.25	3.78	-2.41	-75.44	-13.00	-62.44

WCDMA Band II (RMC 12.2Kbps) Above 1GHz

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	ERP (dBm)	Limit (dBm)	Margin (dB)
Middle Channel 9400 (1880.0MHz)							
3760.0	H	-41.64	6.00	12.73	-34.91	-13.00	-21.91
5462.8	H	-35.66	7.36	13.12	-29.90	-13.00	-16.90

3760.4	V	-36.37	6.00	12.73	-29.64	-13.00	-16.64
5462.8	V	-32.16	7.36	13.12	-26.40	-13.00	-13.40

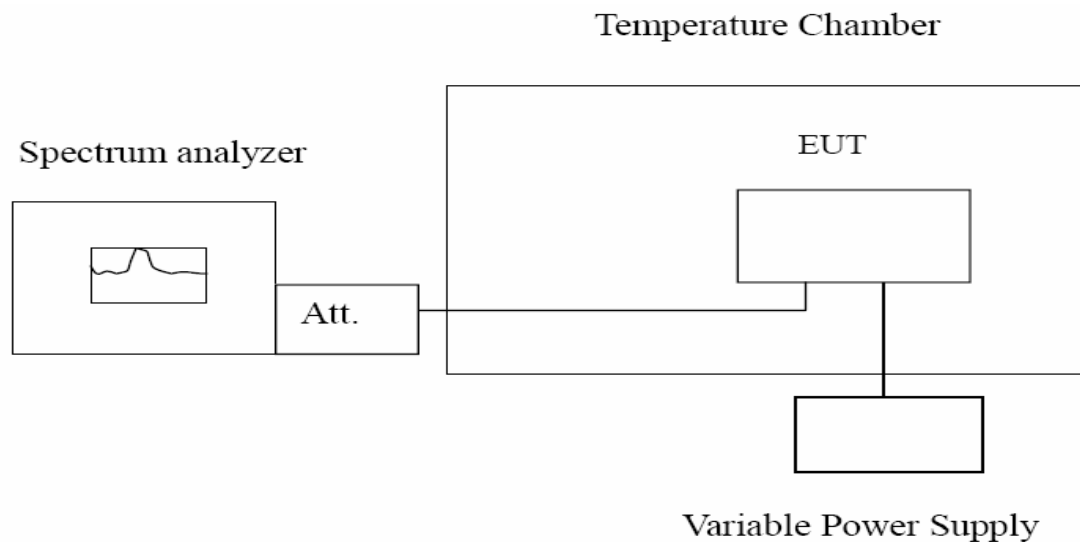
7. Frequency Stability Under Temperature & Voltage Variations

7.1. Test Equipment

Instrument	Manufacturer	Model	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9038A	MY51210142	11.11.2015
Radio Communication Tester	Agilent	E5515C	GB46581718	11.11.2015
DC Power Supply	Agilent	6612C	MY43002989	02.03.2016
Temperature Chamber	WEISS	DU/20/40	58226017340050	02.01.2016

The measure equipment had been calibrated once a year.

7.2. Test Setup



7.3. Limit

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Limit	< ± 2.5 ppm
-------	-----------------

7.4. Test Procedure

Frequency Stability Under Temperature Variations:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.

7.5. Uncertainty

The measurement uncertainty is defined as ± 10 Hz.

7.6. Test Result

GSM850 (GPRS 8Link)

Frequency Stability under Temperature

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
-30	836.40	-33.10	± 2091
-20	836.40	-44.71	± 2091
-10	836.40	-25.38	± 2091
0	836.40	-21.35	± 2091
10	836.40	-16.46	± 2091
20	836.40	-30.24	± 2091
30	836.40	-30.25	± 2091
40	836.40	-36.59	± 2091
50	836.40	-25.64	± 2091

Frequency Stability under Voltage

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
10.2	836.40	-18.49	± 2091
12	836.40	-20.66	± 2091
13.8	836.40	-29.55	± 2091

GSM850 (EGPRS 8 Link)

Frequency Stability under Temperature

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
-30	836.40	-23.12	± 2091
-20	836.40	-27.56	± 2091
-10	836.40	-22.09	± 2091
0	836.40	-40.72	± 2091
10	836.40	-28.46	± 2091
20	836.40	-30.17	± 2091
30	836.40	-21.15	± 2091
40	836.40	-34.58	± 2091
50	836.40	-30.64	± 2091

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
10.2	836.40	-18.40	±2091
12	836.40	-29.66	±2091
13.8	836.40	-35.63	±2091

GSM 1900 (GPRS 8Link):

Frequency Stability under Temperature

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
-30	1880.00	-37.72	±4700
-20	1880.00	-28.21	±4700
-10	1880.00	-26.57	±4700
0	1880.00	-30.36	±4700
10	1880.00	-24.79	±4700
20	1880.00	-41.57	±4700
30	1880.00	-31.56	±4700
40	1880.00	-23.59	±4700
50	1880.00	-25.69	±4700

Frequency Stability under Voltage

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
10.2	1880.00	-19.36	±4700
12	1880.00	-28.79	±4700
13.8	1880.00	20.59	±4700

GSM 1900 (EGPRS 8Link):

Frequency Stability under Temperature

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
-30	1880.00	-22.30	±4700
-20	1880.00	-38.21	±4700
-10	1880.00	-36.57	±4700
0	1880.00	-29.36	±4700
10	1880.00	-24.79	±4700
20	1880.00	-30.81	±4700
30	1880.00	-31.56	±4700
40	1880.00	-23.59	±4700
50	1880.00	-15.62	±4700

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
10.2	1880.00	-20.74	±4700
12	1880.00	-19.25	±4700
13.8	1880.00	-11.49	±4700

WCDMA Band V (RMC 12.2Kbps)

Frequency Stability under Temperature

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
-30	836.40	-18.3	±2091
-20	836.40	16.2	±2091
-10	836.40	-17.2	±2091
0	836.40	-18.2	±2091
10	836.40	-16.8	±2091
20	836.40	15.2	±2091
30	836.40	19.2	±2091
40	836.40	22.3	±2091
50	836.40	-30.2	±2091

Frequency Stability under Voltage

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit(Hz)
10.2	836.40	-21.64	±2091
12	836.40	-15.57	±2091
13.8	836.40	-28.60	±2091

WCDMA Band II (RMC 12.2Kbps)

Frequency Stability under Temperature

Temperature Interval (°C)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
-30	1880.00	-27.0	±4700
-20	1880.00	-25.1	±4700
-10	1880.00	-25.6	±4700
0	1880.00	-24.2	±4700
10	1880.00	-29.6	±4700
20	1880.00	-24.7	±4700
30	1880.00	-36.3	±4700
40	1880.00	-28.3	±4700
50	1880.00	-37.6	±4700

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit(Hz)
10.2	1880.00	-16.76	± 4700
12	1880.00	-28.52	± 4700
13.8	1880.00	-23.77	± 4700

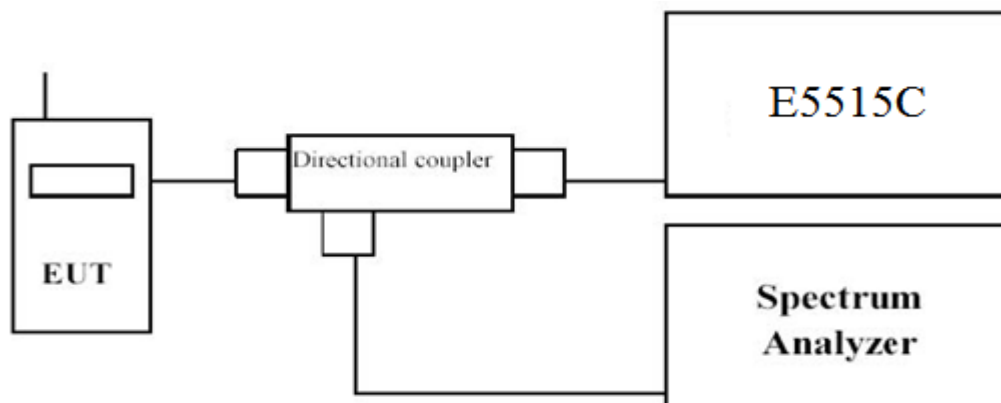
8. Peak to Average

8.1. Test Equipment

Instrument	Manufacturer	Model	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9038A	MY51210142	11.11.2015
Radio Communication Tester	Agilent	E5515C	GB46581718	11.11.2015
Signal Generator	Agilent	N5183A	MY50140938	02.01.2016
Preamplifier	CEM	EM30180	3008A0245	27.02.2016
DC Power Supply	Agilent	6612C	MY43002989	02.03.2016

The measure equipment had been calibrated once a year.

8.2. Test Setup



8.3. Limit

In addition, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

8.4. Test Procedure

A peak to average ratio measurement is performed at the conducted port of the EUT. For WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The

traces are generated with the spectrum analyzer set to zero span mode.

Procedure:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a spectrum analyzer and E5515C by a Directional Couple.
- EUT Communicate with E5515C, then select a channel for testing.
- Add a correction factor to the display of spectrum, and then test.
- The resolution bandwidth of the spectrum analyzer was set at 1 MHz.

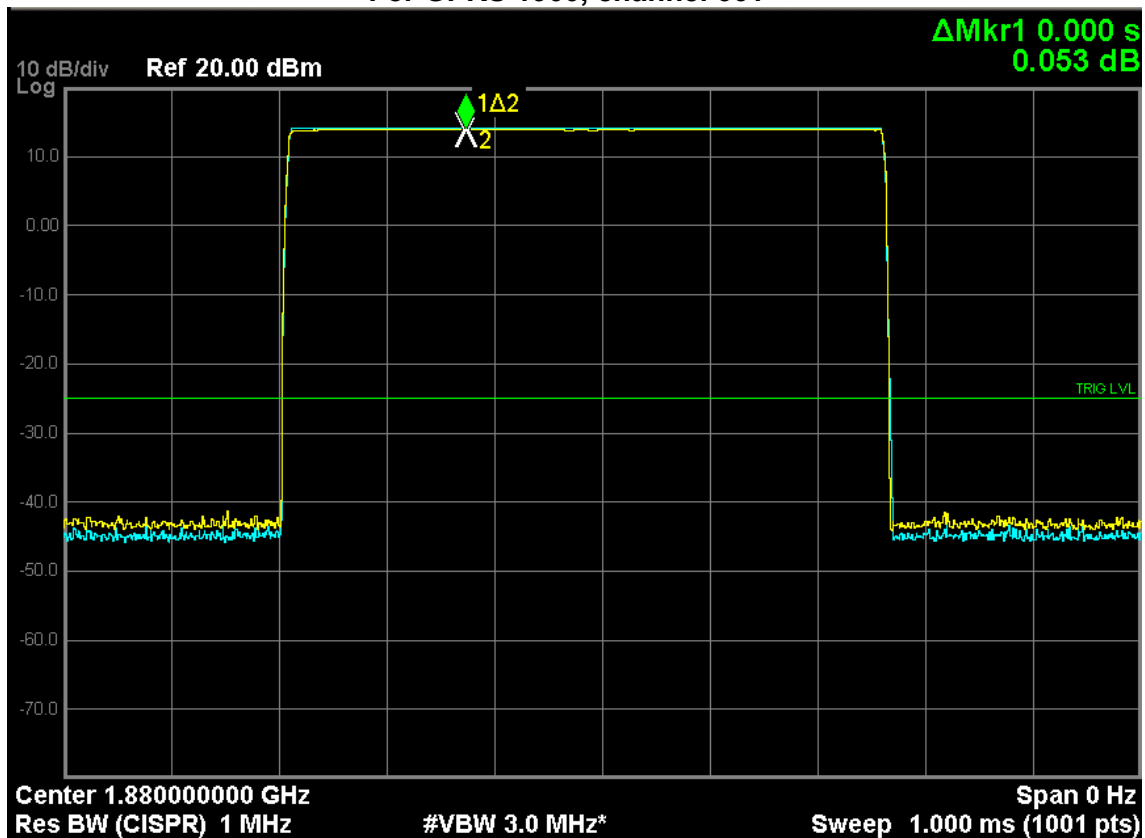
8.5. Uncertainty

The measurement uncertainty is defined as ± 1.2 dB.

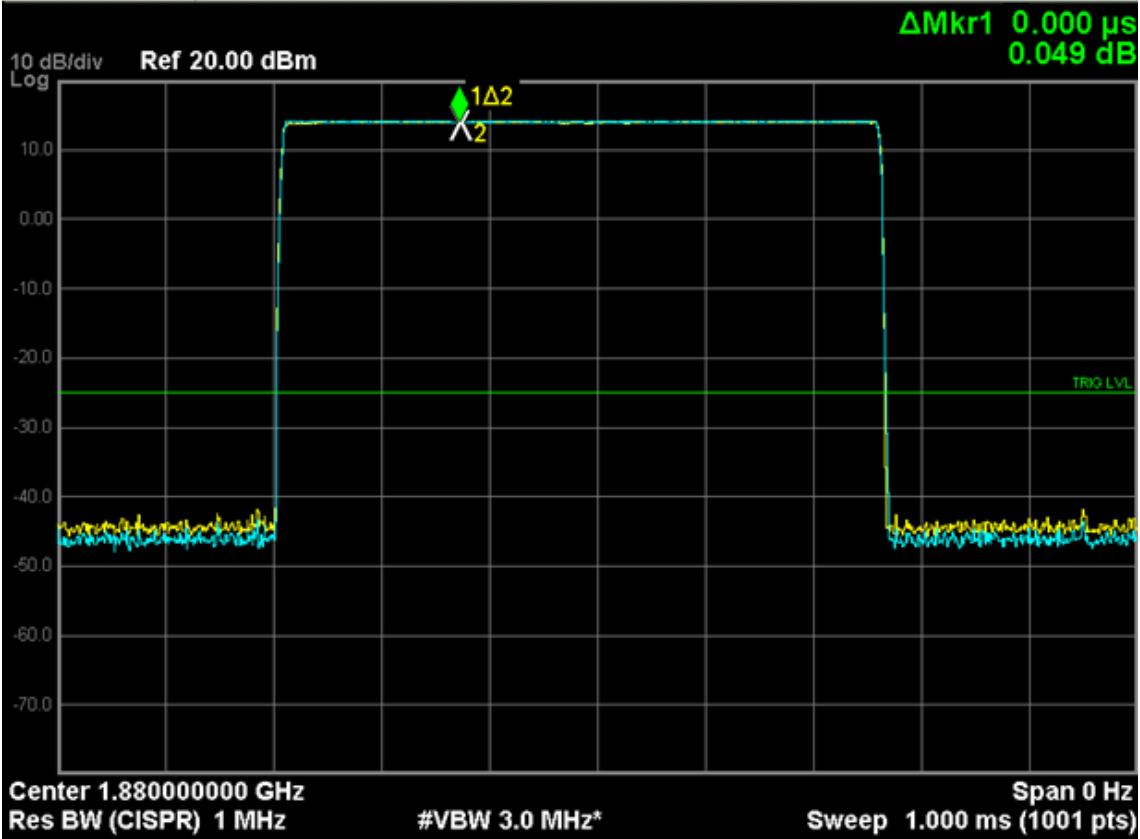
8.6. Test Result

Band	Channel No.	Limit (dB)	Result (dB)
GPRS 1900	661	<13	0.053
EGPRS 1900	661	<13	0.049
WCDMA BAND II	9800	<13	7.66

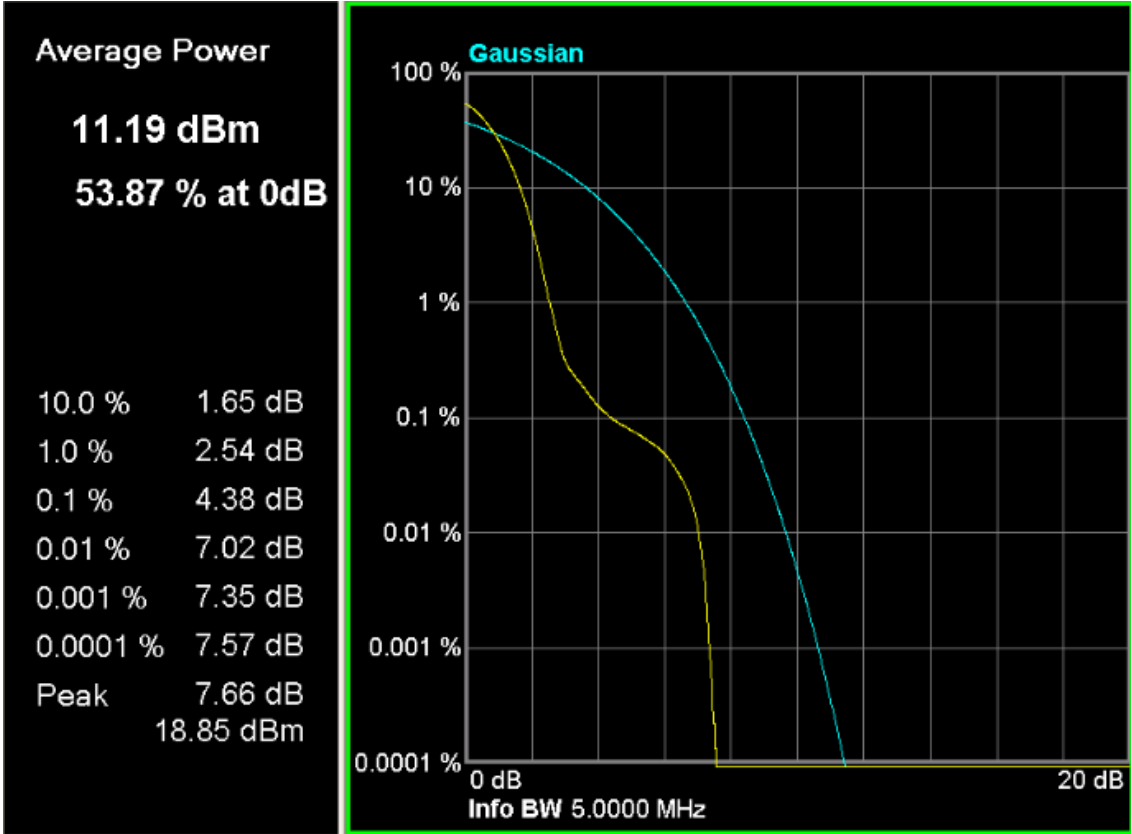
For GPRS 1900, channel 661



For EGPRS 1900, channel 661



For WCDMA BAND II, channel 9800



9.Attachment

PHOTOGRAPHS OF TEST SETUP

Please refer to the file named “N72 WXYZ_Part22&24 15C Test Setup Photos”.

PHOTOGRAPHS OF EUT

Please refer to the files named “N72 WXYZ _EUT External Photos” and “N72 WXYZ _EUT Internal Photos”.

-----End of the report-----