

FCC TEST REPORT

For

WCDMA/GPRS Module

Model Number: N51

FCC ID: PJ7-1712

Report Number : WT198006830

Test Laboratory	:	Shenzhen Academy of Metrology and Quality Inspection
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Test report declaration

Applicant : Shenzhen Neoway Technology Co.,Ltd.
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Longhua District, Shenzhen City, Guangdong Province,P.R.China
Manufacturer : Shenzhen Neoway Technology Co.,Ltd.
Address : 4F-2#, Lianjian Science&Industry Park, Huarong Road, Dalang,
Longhua District, Shenzhen City, Guangdong Province,P.R.China
EUT : WCDMA/GPRS Module
Description
Model No : N51
Trade mark : Neoway
FCC ID : PJ7-1712

Test Standards:

FCC PART 22H AND 24E (2018)

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.26 (2015) & KDB971168 and the energy emitted by the sample EUT tested as described in this report is in compliance with FCC Rules Part 22H AND 24E.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

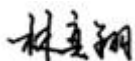
Project
Engineer:



(Chen Silin 陈司林)

Date: Dec. 17, 2019

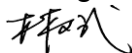
Checked by:



(Lin Yixiang 林奕翔)

Date: Dec. 17, 2019

Approved by:



(Lin Bin 林斌)

Date: Dec. 17, 2019

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1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
2.1046	22.913 24.232	Effective Radiated Power of Transmitter	PASS
2.1046	22.913 24.232	Peak to Average Ratio	PASS
2.1049	22.917(b) 24.238(b)	Occupied Bandwidth	PASS
2.1051	22.917 24.238	Spurious Emission at Antenna Terminal	PASS
2.1053	22.917 24.238	Radiated Spurious Emissions	PASS
2.1055	22.355 24.235	Frequency Stability	PASS

Remark: "N/A" means "Not applicable."

The tests documented in this report were performed in accordance with ANSI C63.26 (2015), FCC CFR 47 Part 2, Part 22H AND 24E.

2. GENERAL INFORMATION

2.1. Report information

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

The samples mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is Accredited Testing Laboratory of FCC with Designation number CN1165 and Site registration number 582918.

The Laboratory is registered to perform emission tests with Innovation, Science and Economic Development (ISED), and the registration number is 11177A.

2.3.Measurement Uncertainty

For a 95% confidence level ($k = 2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Radiated Emission

30MHz~1000MHz 4.5dB

1GHz~26.5GHz 4.6dB

26dB & Occupied Bandwidth: $\pm 0.39\%$

Frequency Stability: $\pm 0.42\%$

Peak to Average Ratio: 0.45 dB

Conducted power: 0.3 dB

Temperature: ± 0.698

Supply voltages: $\pm 0.15\%$

3. PRODUCT DESCRIPTION

3.1.EUT Description

Table 2 Specification of the Equipment under Test

Product Type:	WCDMA/GPRS Module
Hardware Revision :	1712-V1.0
Software Revision :	N51WW_E2F368_BZ_V003B
FCC ID:	PJ7-1712
Frequency:	GSM850: TX 824MHz~849MHz RX 869MHz~894MHz PCS1900: TX 1850MHz~1910MHz RX 1930MHz~1990MHz WCDMA 850: TX 824MHz~849MHz RX 869MHz~894MHz WCDMA 1900: TX 1850MHz~1910MHz RX 1930MHz~1990MHz
Type(s) of Modulation:	GSM:GMSK WCDMA:QPSK
Antenna Type:	Glue stick antenna
Antenna Gain:	824MHz~849MHz: 1dBi 1850MHz~1910MHz: 1dBi
Operating voltage:	DC: 3.3V (Low)/3.8V (Nominal)/ 4.3V (Max)

Table 3 Identification of the Equipment Under Test (EUT)

EUT	Serial Number/IMEI	HW Version	SW Version	Notes
1	861365045681835	1712-V1.0	N51WW_E2F368_BZ_V003B	Conducted testing sample.
2	861365045681819	1712-V1.0	N51WW_E2F368_BZ_V003B	Radiated testing sample.

Table 4 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
--	--	--	--	--

3.2.Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: PJ7-1712 filing to comply with FCC PART 22H, 24E.

3.3. Block Diagram of EUT Configuration

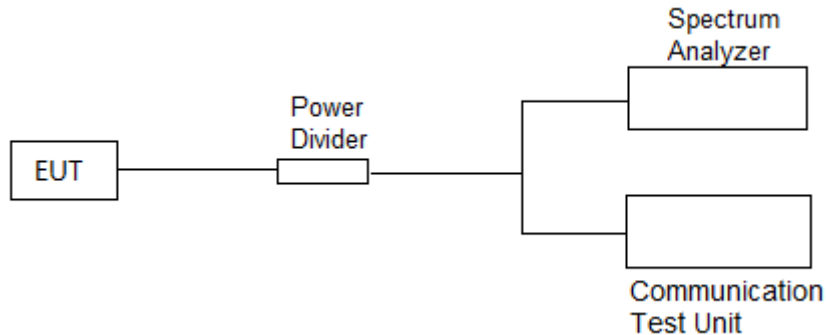


Figure 1 EUT setup of test mode 1, 2

3.4. Operating Condition of EUT

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission (X plane).

TM1: GSM Mode with GMSK Modulation

TM2: WCDMA Mode with QPSK Modulation

The maximum power levels are GSM mode for GMSK(GPRS 1 Tx slot) link, WCDMA mode for QPSK(HSUPA Subtest-5) link, only these modes were used for all tests.

The conducted power tables are as follows:

Band: GSM850	Average Power [dBm]		
Channel	128	190	251
Frequency (MHz)	824.2	836.6	848.8
GSM (GMSK, 1 Tx slot)	33.03	33.09	33.08
GPRS (GMSK, 1 Tx slot)	33.05	33.13	33.10
GPRS (GMSK, 2 Tx slots)	31.48	31.56	31.58
GPRS (GMSK, 3 Tx slots)	30.11	30.18	30.15
GPRS (GMSK, 4 Tx slots)	28.36	28.49	28.51

Band: GSM1900	Average Power [dBm]		
Channel	512	661	810
Frequency (MHz)	1850.2	1880	1909.8
GSM (GMSK, 1 Tx slot)	30.42	30.36	30.32
GPRS (GMSK, 1 Tx slot)	30.43	30.37	30.33
GPRS (GMSK, 2 Tx slots)	28.05	28.13	28.10
GPRS (GMSK, 3 Tx slots)	26.54	26.61	26.60
GPRS (GMSK, 4 Tx slots)	24.79	24.90	24.88

Band: WCDMA Band II	Average Power [dBm]		
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6
RMC 12.2K	23.08	22.9	22.79
HSDPA Subtest-1	22.84	22.76	22.94
HSDPA Subtest-2	22.77	22.77	22.87
HSDPA Subtest-3	22.84	22.77	22.89
HSDPA Subtest-4	22.77	22.74	22.84
HSUPA Subtest-1	22.22	22.32	22.5
HSUPA Subtest-2	22.11	22.09	22.11
HSUPA Subtest-3	22.66	22.65	22.73
HSUPA Subtest-4	22.66	22.58	22.63
HSUPA Subtest-5	23.66	23.62	23.77

Band :WCDMA Band V	Average Power [dBm]		
Channel	4,132	4,182	4,233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	23.26	23.22	23.1
HSDPA Subtest-1	23.27	23.11	23.11
HSDPA Subtest-2	23.18	23.23	23.19
HSDPA Subtest-3	23.07	23.18	23.12
HSDPA Subtest-4	23.04	23.14	23.09
HSUPA Subtest-1	22.75	22.66	22.63
HSUPA Subtest-2	22.25	22.32	22.24
HSUPA Subtest-3	22.89	22.93	22.86
HSUPA Subtest-4	22.7	22.83	22.73
HSUPA Subtest-5	23.83	23.95	23.84

3.5.Support Equipment List

Table 5 Support Equipment List

Name	Model No	S/N	Manufacturer
--	--	--	--

3.6.Test Conditions

Date of test : Dec.01, 2019 - Dec.16, 2019

Date of EUT Receive : Nov.023, 2019

Temperature: -30~50 °C

Relative Humidity: 39~56%

3.7.Special Accessories

Not available for this EUT intended for grant.

3.8.Equipment Modifications

Not available for this EUT intended for grant.

4. TEST EQUIPMENT USED

Table 6 Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB8501/09	EMI Test Receiver	Rohde & Schwarz	ESU40	Mar.11, 2019	1 Year
SB5472/02	Bilog Antenna	Schwarzbeck	VULB9163	May.31, 2019	1 Year
SB3435	Horn Antenna	Rohde & Schwarz	HF906	Jan.01, 2019	1 Year
SB8501/11	Horn Antenna	ETS-Lindgren	3160-09	Jan.21,2017	3 Years
SB8501/17	Preamplifier	Rohde & Schwarz	SCU-18	Feb.20, 2019	1 Year
SB8501/16	Preamplifier	Rohde & Schwarz	SCU-26	Feb.18, 2019	1 Year
SB8501/14	Preamplifier	Rohde & Schwarz	SCU-03	Feb.20, 2019	1 Year
SB8501/02	Communication Test Unit	Rohde & Schwarz	CMU200	Nov.18, 2019	1 Year
SB12724/08	Wideband Radio communication Tester	Rohde & Schwarz	CMW500	May.29, 2019	1 Year
SB9721/02	Signal Analyzer	Agilent	N9020A	Nov.18, 2019	1 Year
SB7941/02	Signal Analyzer	Rohde & Schwarz	FSU26	May.29, 2019	1 Year
SB9721/07	DC Power Supply	Agilent	66319D	---	---
SB11818	Temperature & Humidity Test chamber	Espec	EH-010U	Mar.25, 2019	1 Year
--	Test Software	Tonscend	JS1120-4 GSM	--	--
--	Test Software	Tonscend	JS-1120-3 WCDMA	--	--
--	Radiated Test Software	Rohde & Schwarz	EMC 32 8.50.0	--	--

5. TEST RESULTS

5.1.RF Power Output

5.1.1.Test Standard

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232

5.1.2.Test Limit

FCC 22.913 (a) Effective radiated power limits.

The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

FCC 24.232 (b)(c) Power limits.

(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP). (c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement over the full bandwidth of the channel.

5.1.3.Test Procedure

ANSI C63.26:2015

KDB 971168 Section 5.6

$EIRP\ (dBm) = ERP\ (dBm) + 2.15\ (dB)$

$ERP/EIRP = P_{Meas} + GT - LC$

where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same

units as P_{Meas} , typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.2

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted and ERP/EIRP output powers as follows:

5.1.4.Test Data

GSM MODES:

Modulation	Channel	Frequency (MHz)	Conducted Average Power [dBm]	Antenna Gain [dBi]	ERP [dBm]	ERP Limit [dBm]	Verdict
GSM850(GMSK)	128	824.2	33.05	1	31.9	38.5	Pass
	190	836.6	33.13	1	31.98	38.5	Pass
	251	848.8	33.10	1	31.95	38.5	Pass

Modulation	Channel	Frequency (MHz)	Conducted Average Power [dBm]	Antenna Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
GSM1900(GMSK)	512	1850.2	30.43	1	31.43	33	Pass
	661	1880	30.37	1	31.37	33	Pass
	810	1909.8	30.33	1	31.33	33	Pass

WCDMA MODES:

Modulation	Channel	Frequency (MHz)	Conducted Average Power [dBm]	Antenna Gain [dBi]	ERP [dBm]	ERP Limit [dBm]	Verdict
WCDMA 850(QPSK)	4,132	826.4	23.83	1	22.68	38.5	Pass
	4,182	836.4	23.95	1	22.8	38.5	Pass
	4,233	846.6	23.84	1	22.69	38.5	Pass

Modulation	Channel	Frequency (MHz)	Conducted Average Power [dBm]	Antenna Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
WCDMA1900(QPSK)	9262	1852.4	23.66	1	24.66	33	Pass
	9400	1880.0	23.62	1	24.62	33	Pass
	9538	1907.6	23.77	1	24.77	33	Pass

5.2. Peak to Average Ratio

5.2.1. Test Standard

CFR 47 (FCC) part 24 subpart E

5.2.2. Test Limit

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

5.2.3. 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. For LTE operating mode: a. The EUT was connected to spectrum and system simulator via a power divider. b. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer. c. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1%. d. Record the deviation as Peak to Average Ratio.

5.2.4. Test Data

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
GSM1900	GPRS/TM1	1850.2	0.20	<13	PASS
		1880	0.22	<13	PASS
		1909.8	0.21	<13	PASS

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
WCDMA1900	UMTS/TM3	1852.4	2.90	<13	PASS
		1880	3.28	<13	PASS
		1907.6	3.09	<13	PASS

5.3.Occupied Bandwidth/Emission Bandwidth

5.3.1.Test Standard

FCC: CFR Part 2.1049, CFR Part 22.917, CFR Part 24.238

5.3.2.Test Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.

(h) Transmitters employing digital modulation techniques-when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated.

5.3.3.Test Procedure

1. Connect the equipment as shown in the above diagram.
 2. Adjust the settings of the Universal Radio Communication Tester (CMU/CMW) to set the EUT to its maximum power at the required channel.
 3. Set the spectrum analyzer to measure the 99% occupied bandwidth. Record the value.
 4. Set the spectrum analyzer to measure the -26 dB emission bandwidth. Record the value.
 5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
- Spectrum analyzer settings: Measurement bandwidth of at least 1% of the occupied bandwidth.

5.3.4. Test Data

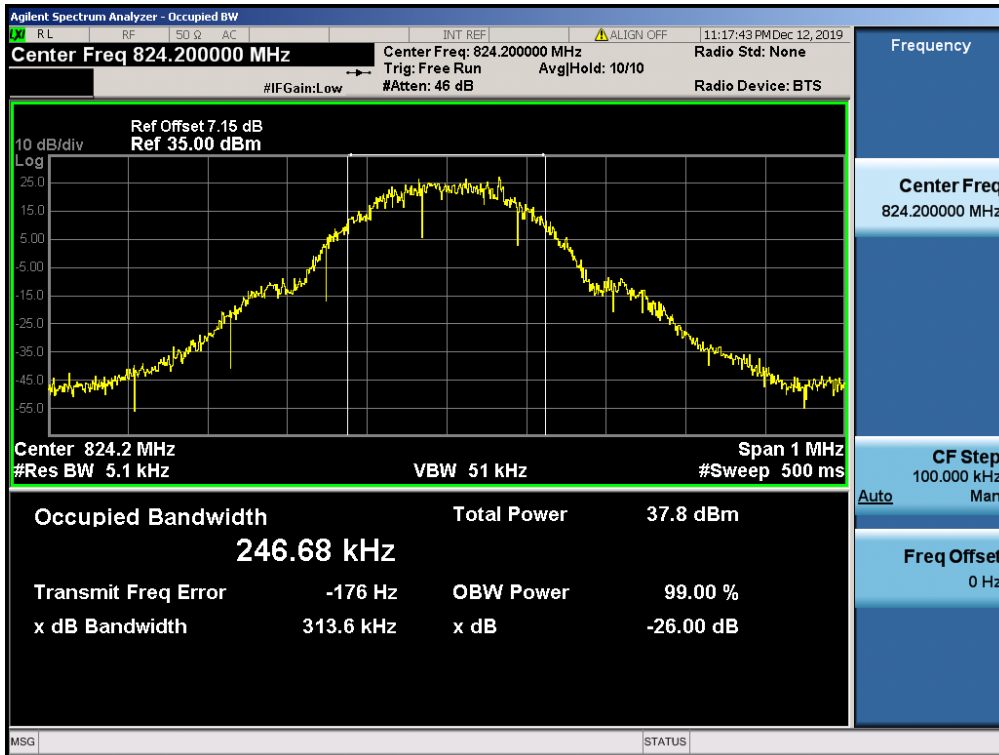
Table 7 Occupied Bandwidth Test Data

Test Band	Test Mode	Test Channel	99% OBW (kHz)	26dBc BANDWIDTH (kHz)	Verdict
GSM850	GPRS/TM1	LCH	246.68	313.62	PASS
		MCH	248.05	320.15	PASS
		HCH	245.60	319.76	PASS
GSM1900	GPRS/TM1	LCH	246.49	316.57	PASS
		MCH	246.07	317.59	PASS
		HCH	245.70	314.51	PASS

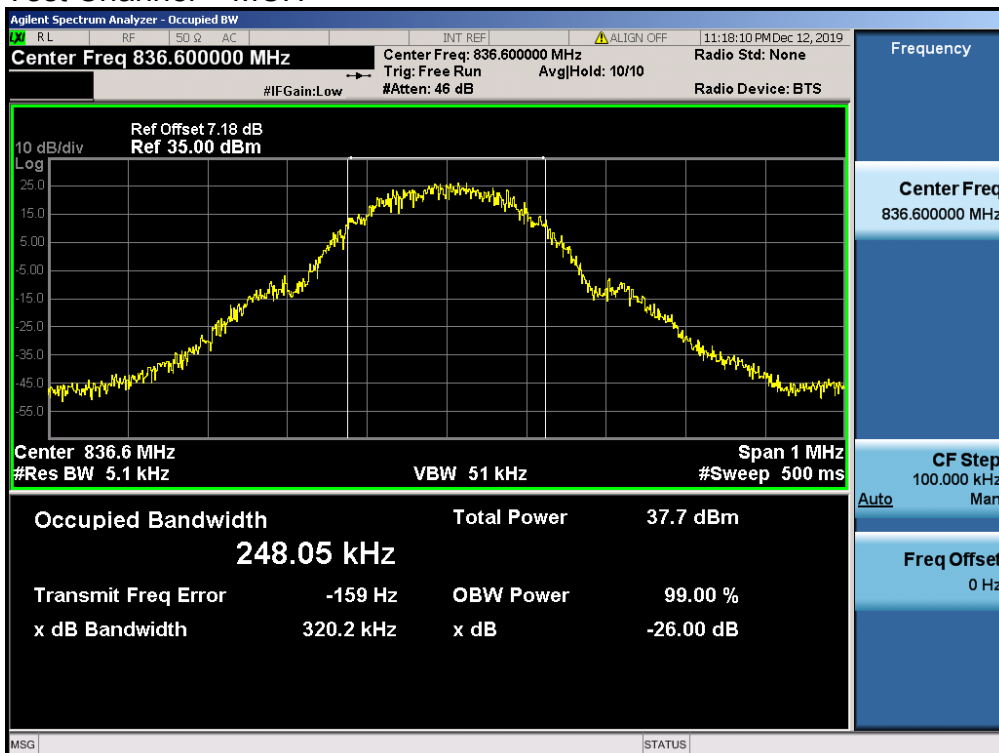
Table 8 Occupied Bandwidth Test Data

Test Band	Test Mode	Test Channel	99% OBW (kHz)	26dBc BANDWIDTH (kHz)	Verdict
WCDMA850	UMTS/TM3	LCH	4096.3	4677	PASS
		MCH	4111.6	4675	PASS
		HCH	4093.9	4664	PASS
WCDMA1900	UMTS/TM3	LCH	4087.9	4640	PASS
		MCH	4087.0	4640	PASS
		HCH	4091.7	4634	PASS

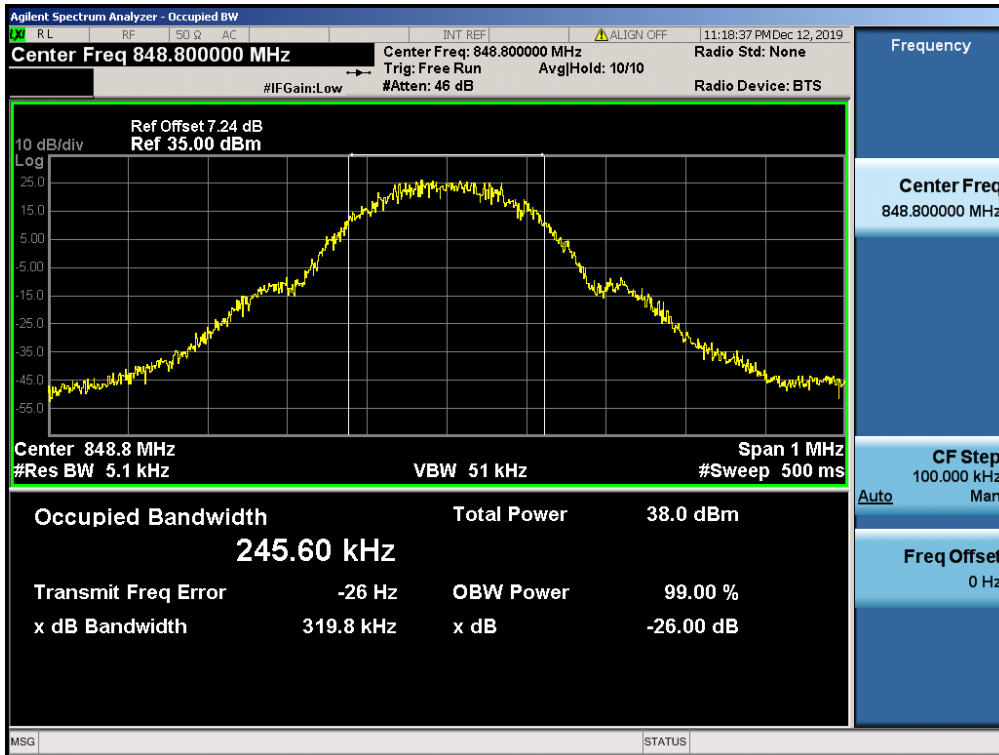
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 Test Mode = GSM/TM1
 Test Channel = LCH



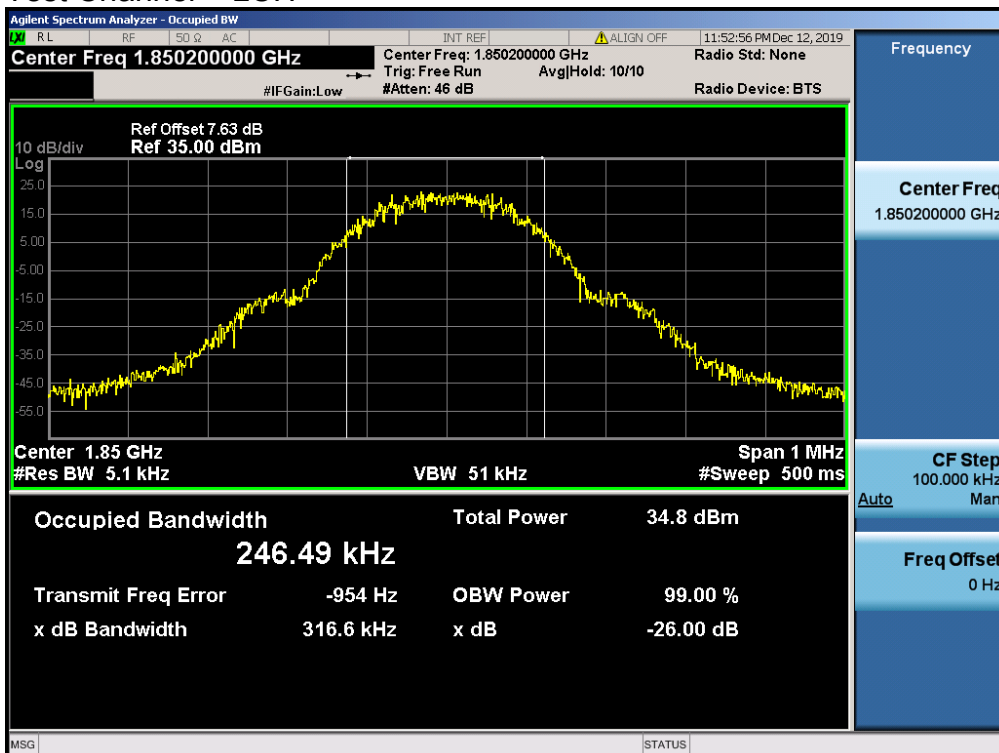
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 Test Channel = MCH



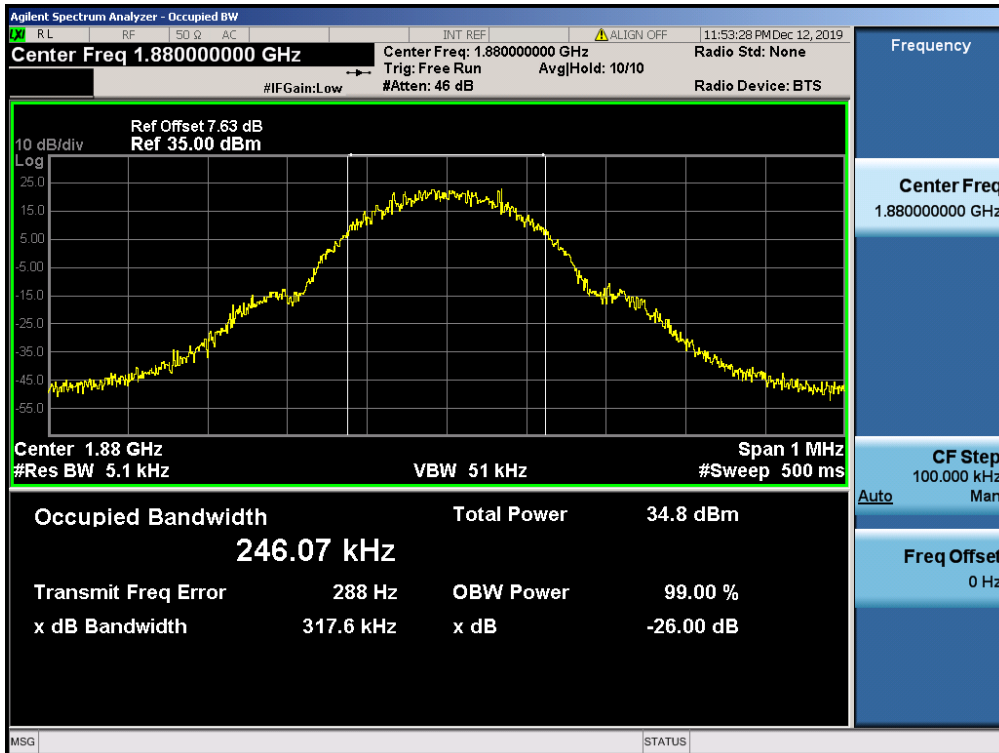
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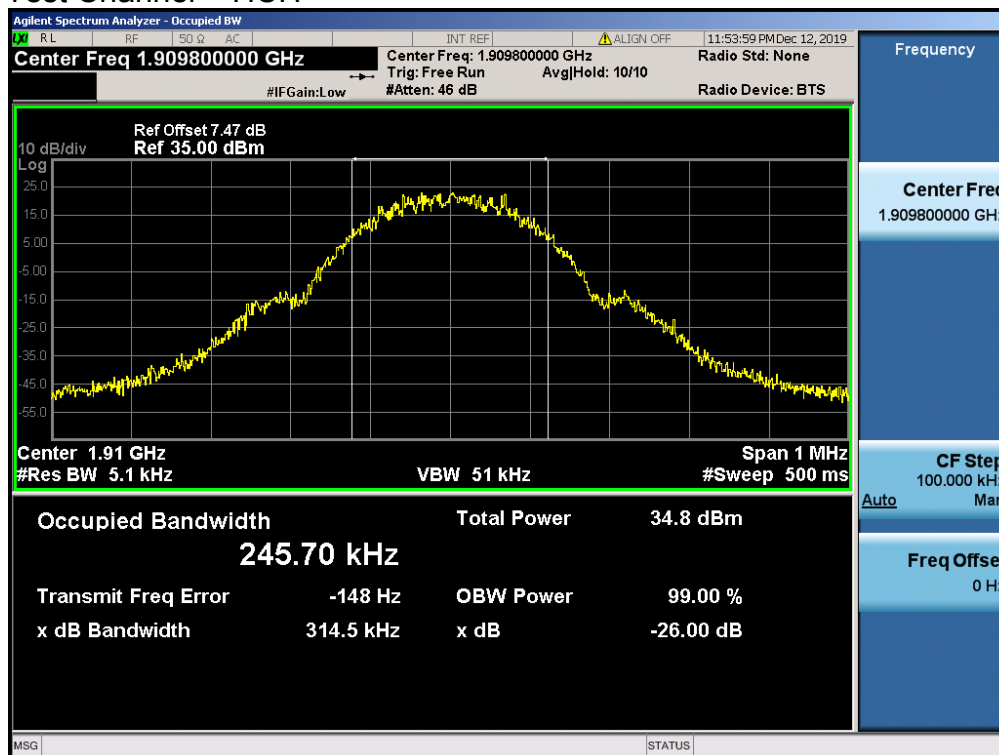
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 Test Channel = LCH



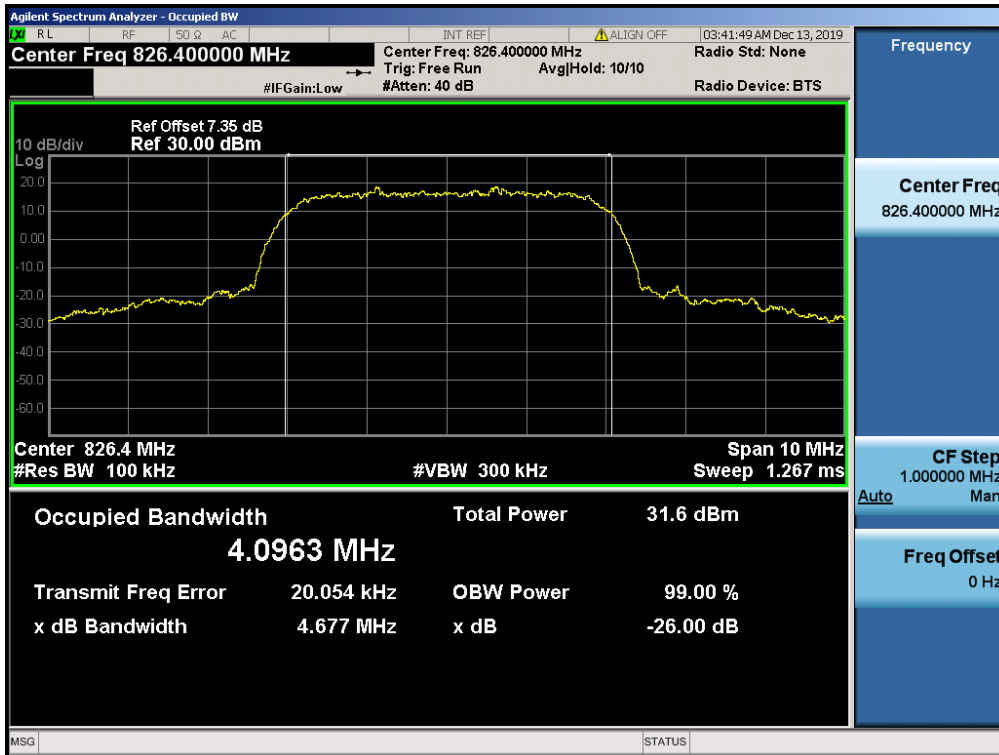
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 Test Mode = GSM/TM1
 Test Channel = MCH



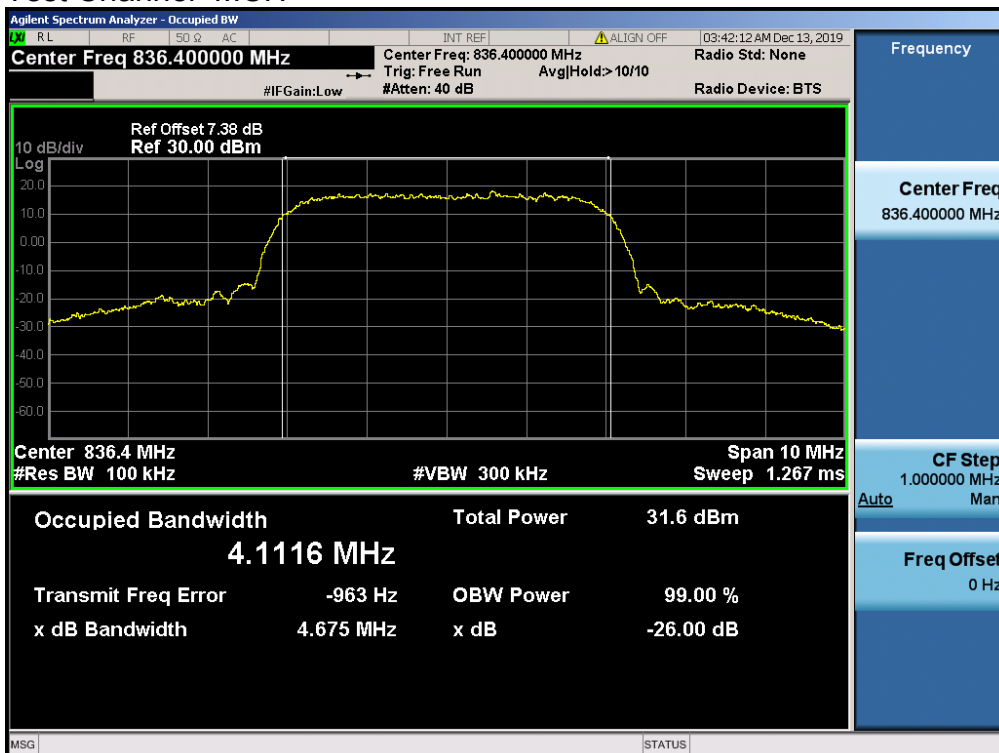
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 Test Channel = HCH



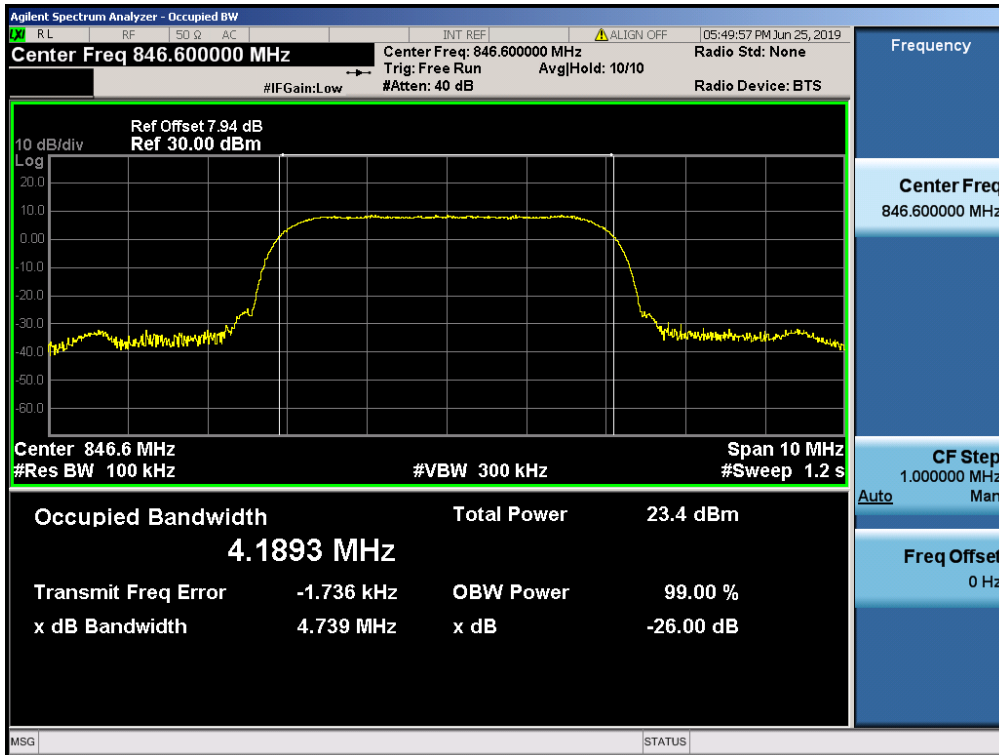
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 Test Mode=UMTS/TM2
 Test Channel=LCH



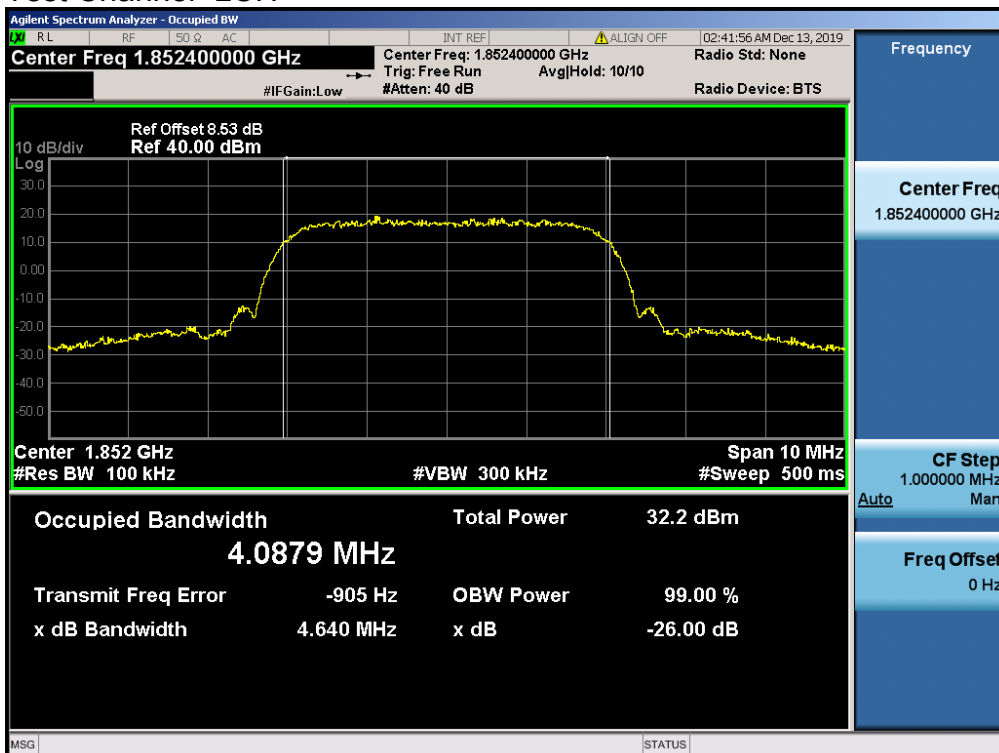
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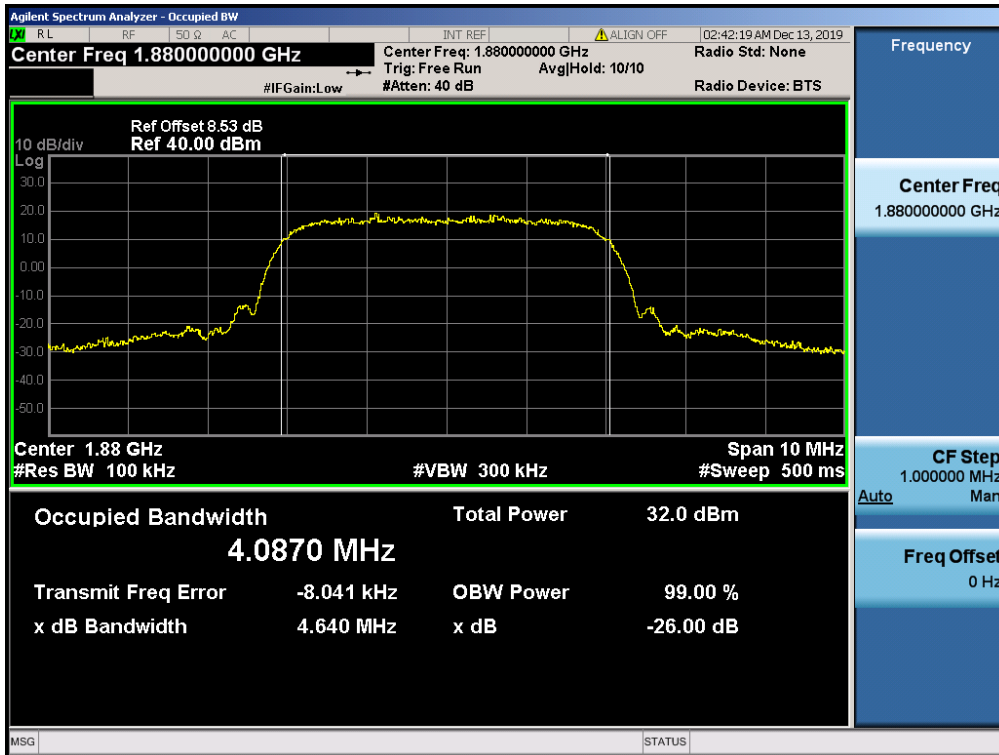
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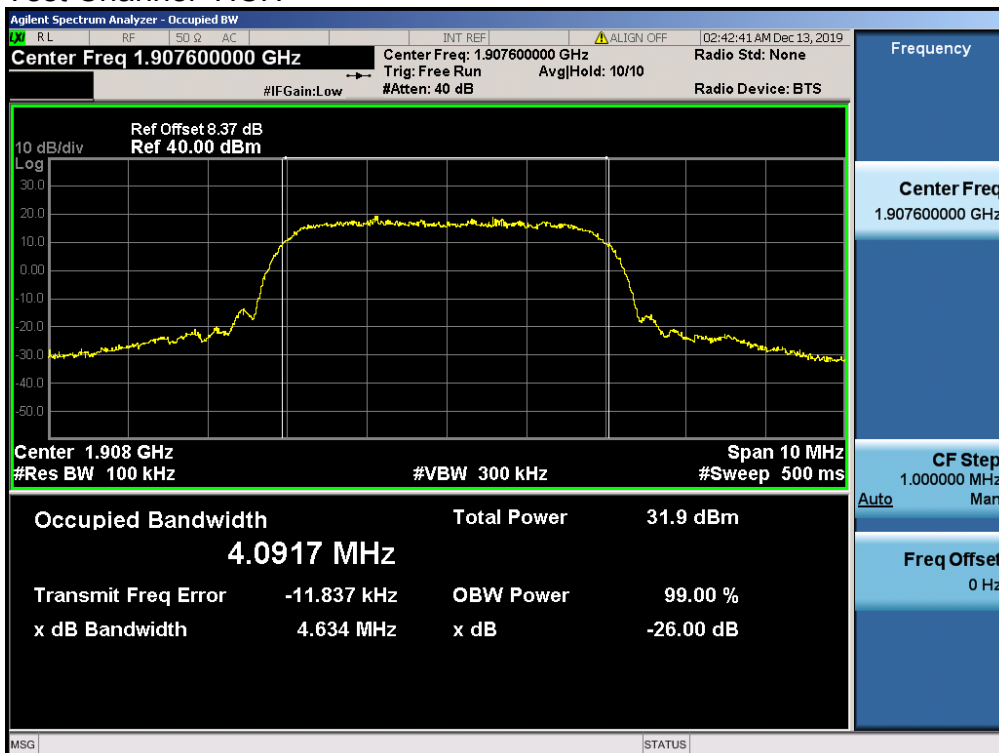
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 Test Mode=UMTS/TM2
 Test Channel=LCH



Test Band=WCDMA1900
 Test Mode=UMTS/TM2
 Test Channel=MCH



Test Band=WCDMA1900
 Test Mode=UMTS/TM2
 Test Channel=HCH



5.4. Spurious Emission at Antenna Terminal

5.4.1. Test Standard

FCC: CFR Part 2.1051, CFR Part 22.917, CFR Part 24.238

5.4.2. Test Limit

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in FCC 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

(a) Out of band emissions. 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. For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radio telephone Service.

(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

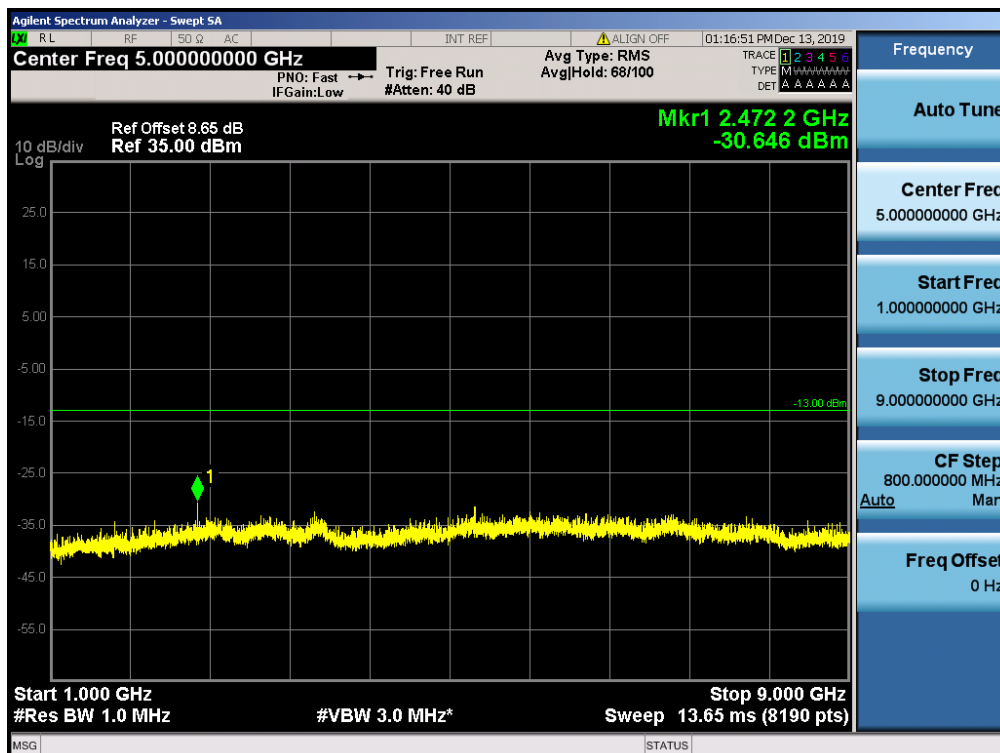
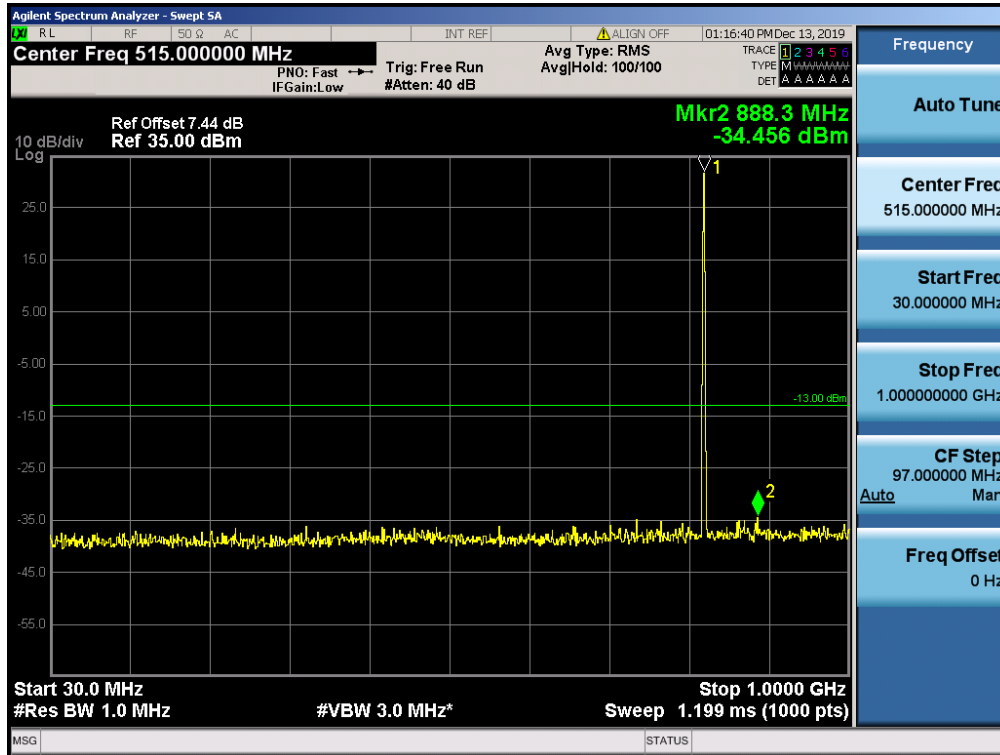
(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.4.3. Test Procedure

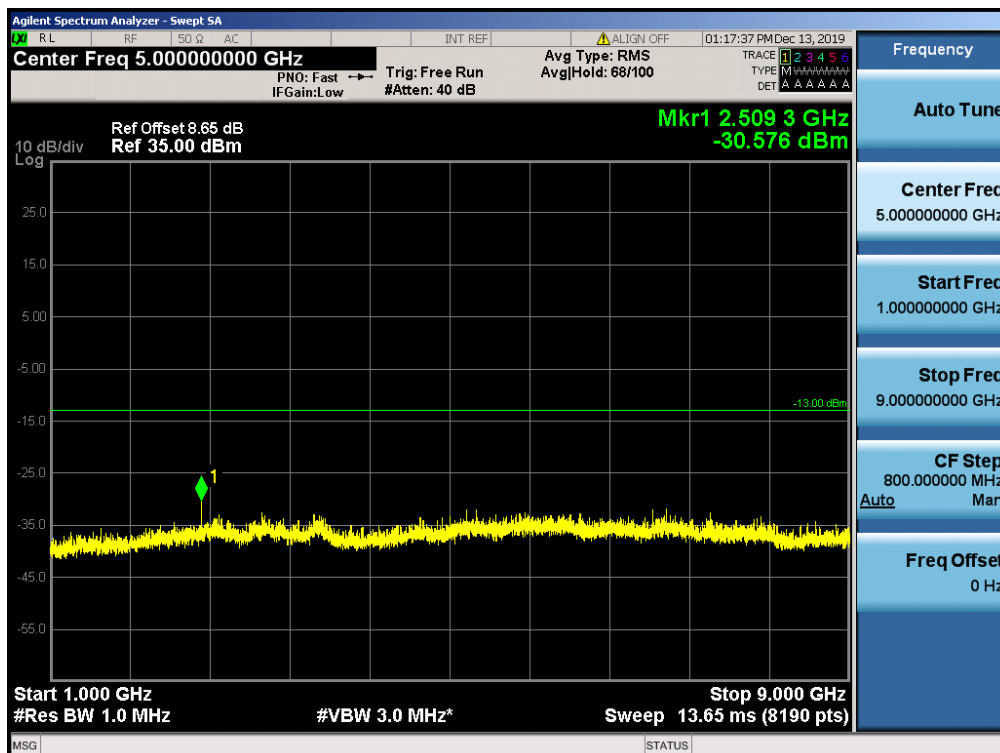
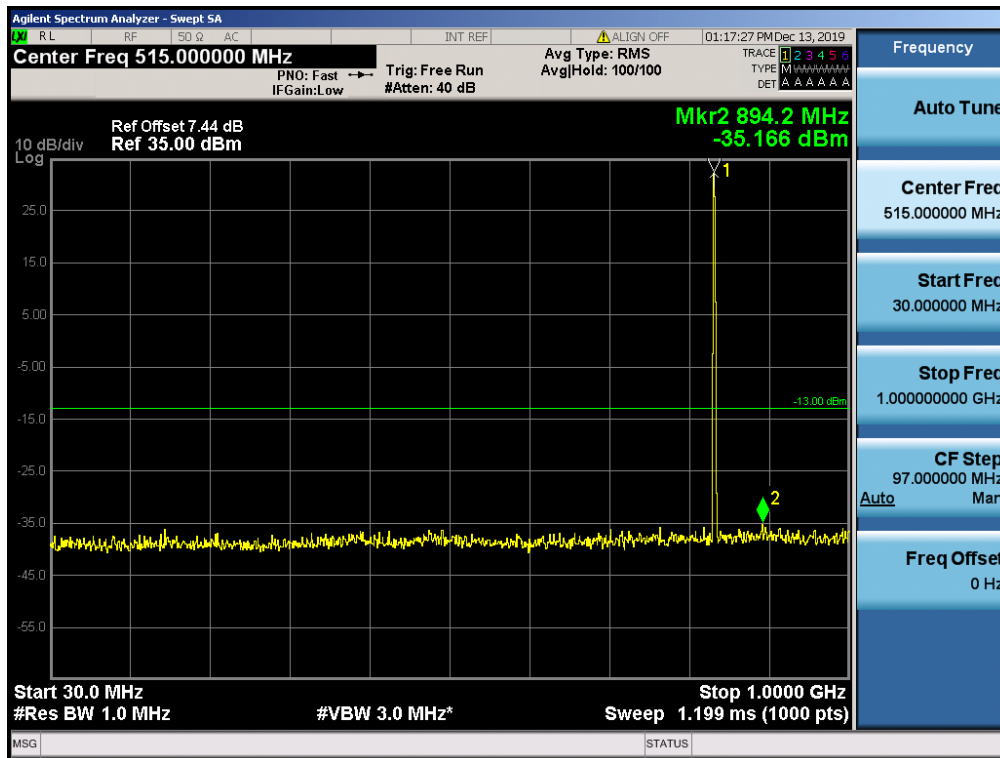
1. Connect the equipment as shown in the above diagram.
 2. Set the spectrum analyzer to measure peak hold with the required settings.
 3. Set the signal generator to a known output power and record the path loss in dB (LOSS) for frequencies up to the tenth harmonic of the EUT's carrier frequency.
 $\text{LOSS} = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$.
 4. Replace the signal generator with the EUT.
 5. Adjust the settings of the Universal Radio Communication Tester (CMU) to set the EUT to its maximum power at the required channel.
 6. Set the spectrum analyzer to measure peak hold with the required settings. Offset the spectrum analyzer reference level by the path loss measured above.
 7. Measure and record all spurious emissions up to the tenth harmonic of the carrier frequency.
 8. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
 9. If necessary steps 6 and 7 may be performed with the spectrum analyzer set to average detector.
- (Note: Step 3 above is performed prior to testing and LOSS is recorded by test software. Steps 2, 6, and 7 above are performed with test software.)

5.4.4. Test Data

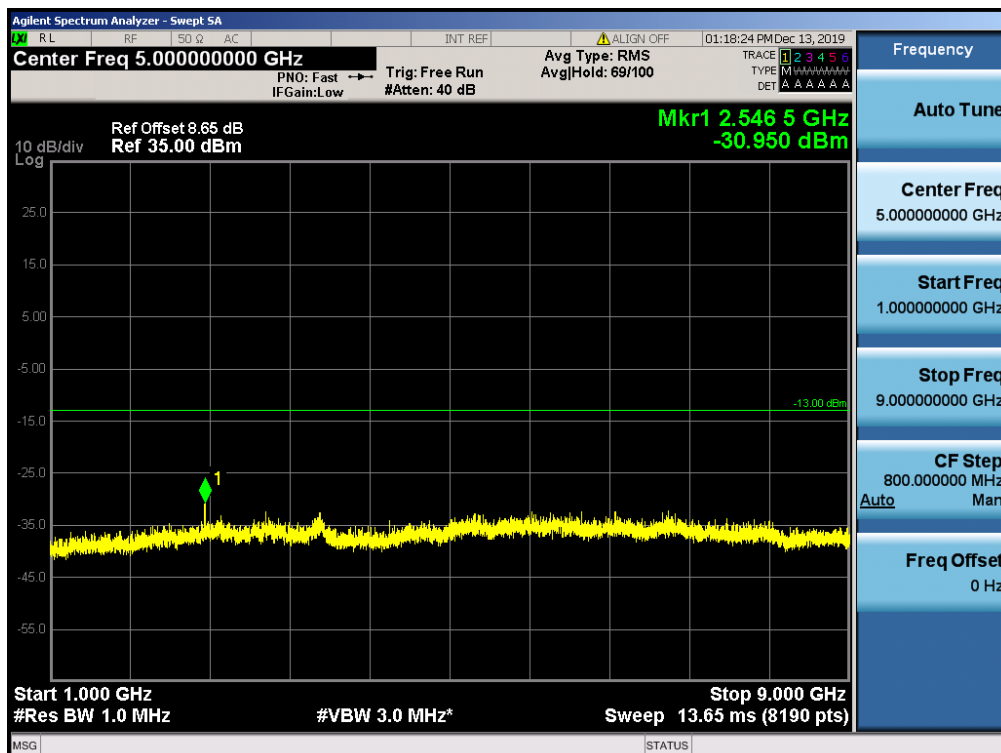
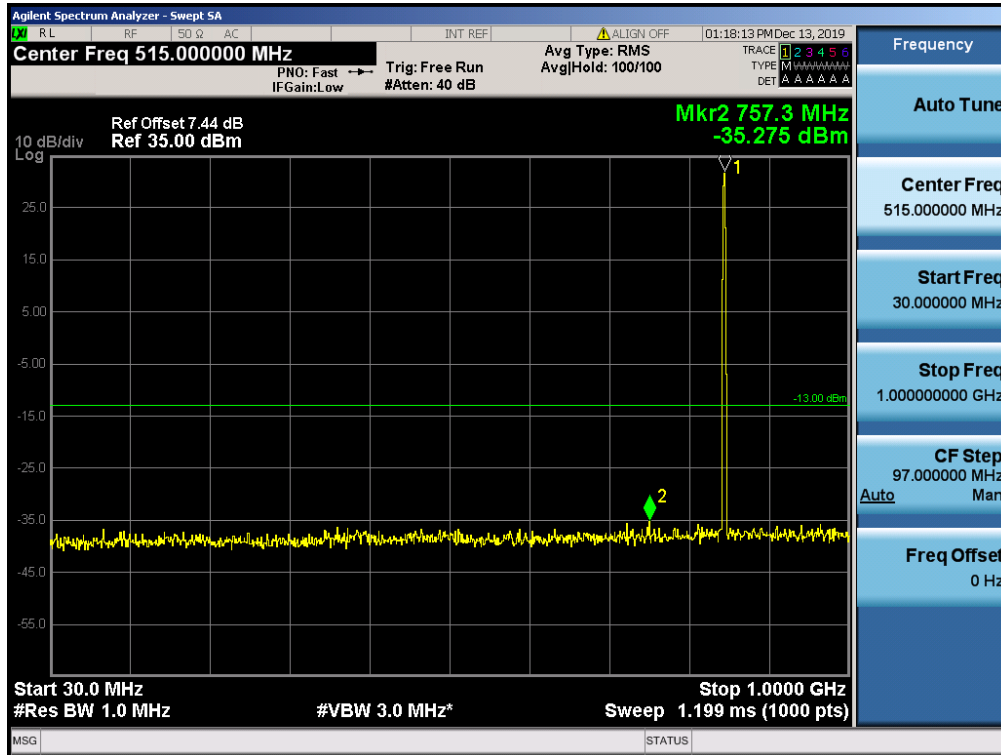
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 Test Mode = GSM /TM1
 Test Channel = LCH



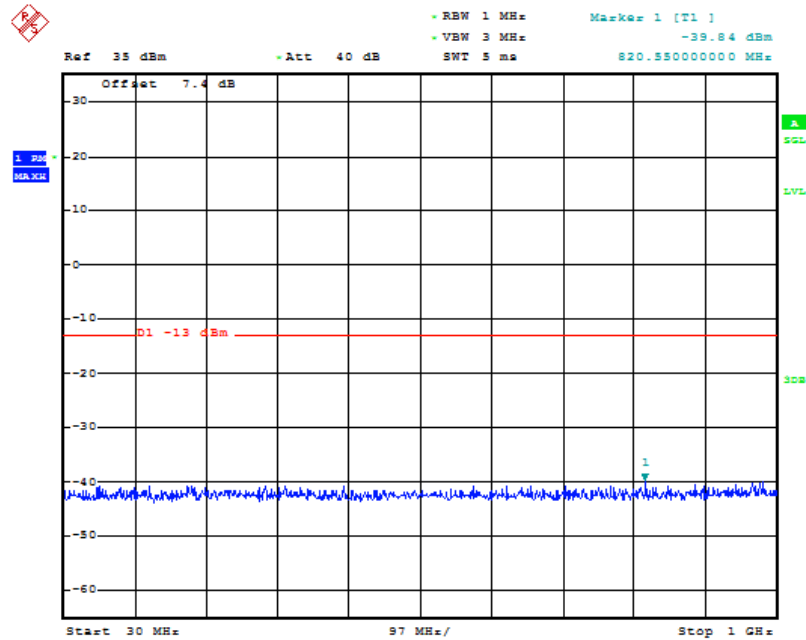
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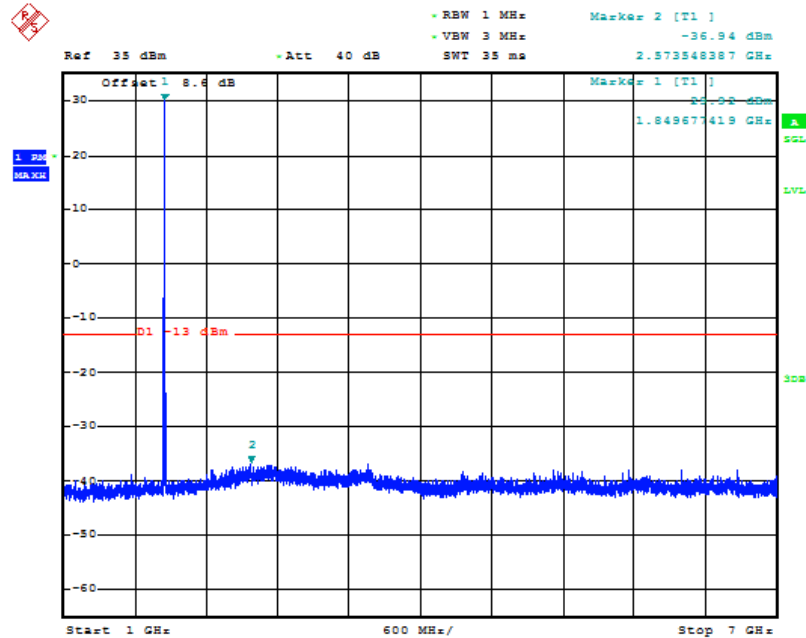
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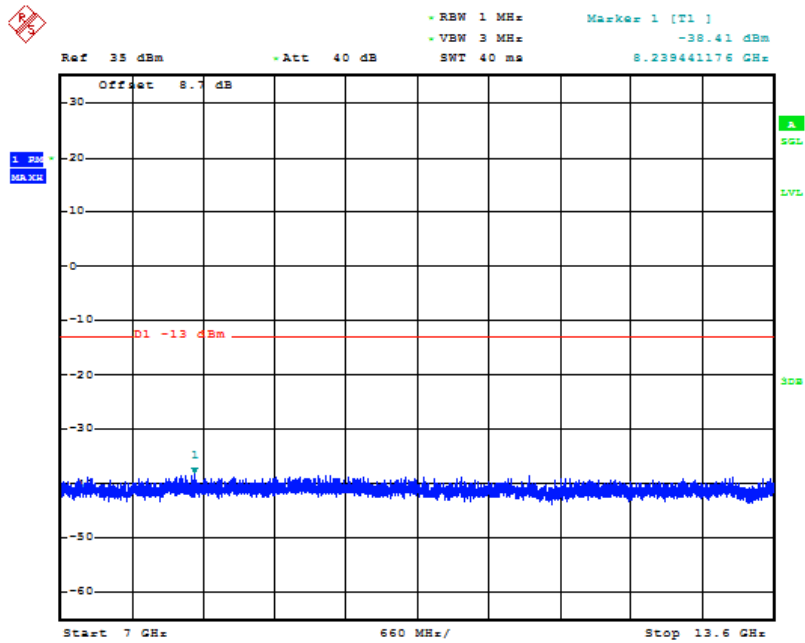
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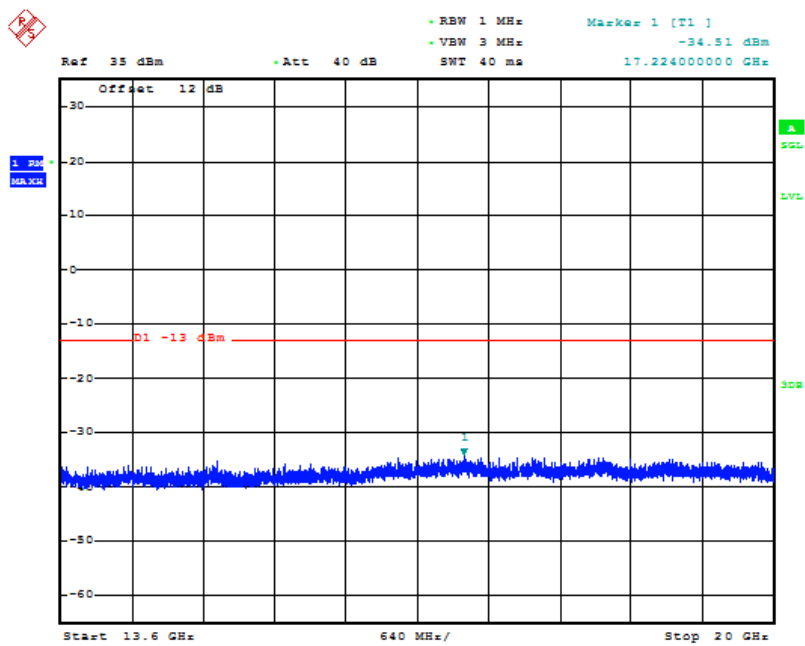
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Date: 13.DEC.2019 14:24:04

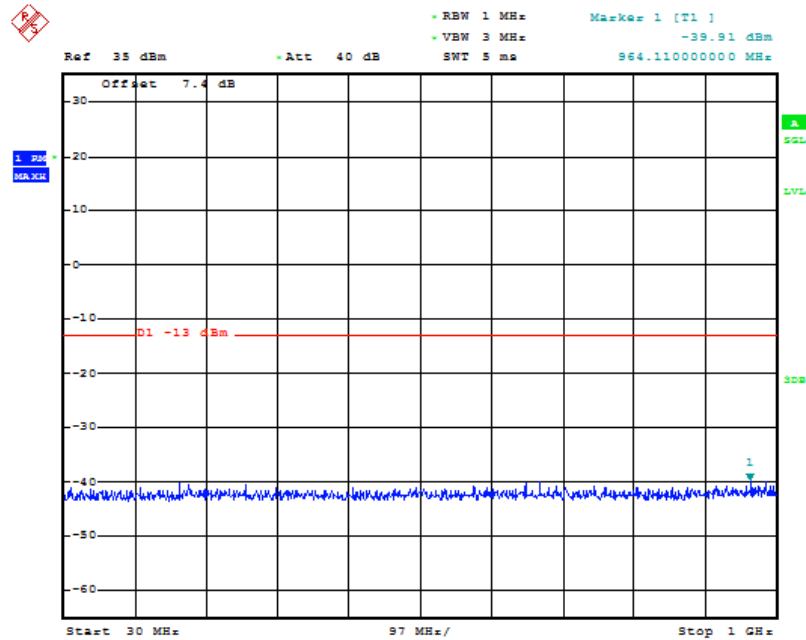


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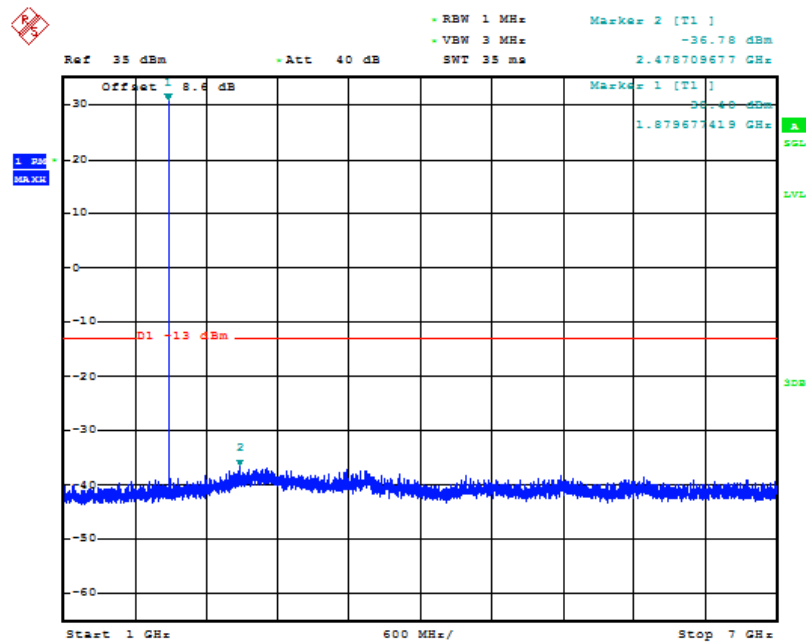


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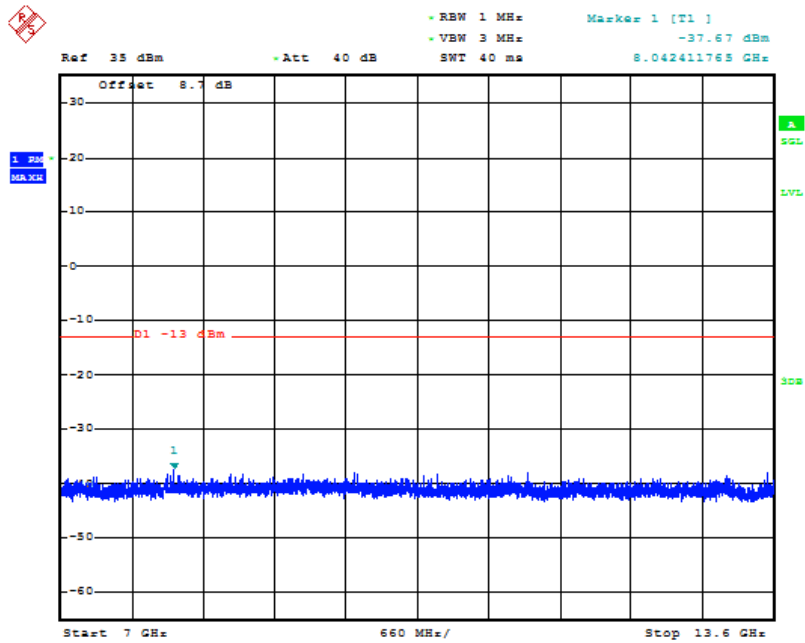
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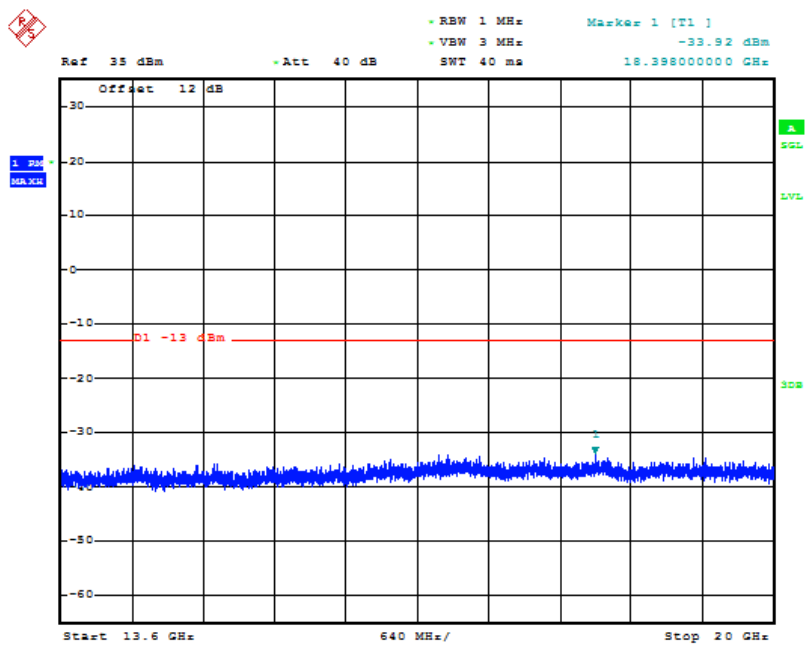
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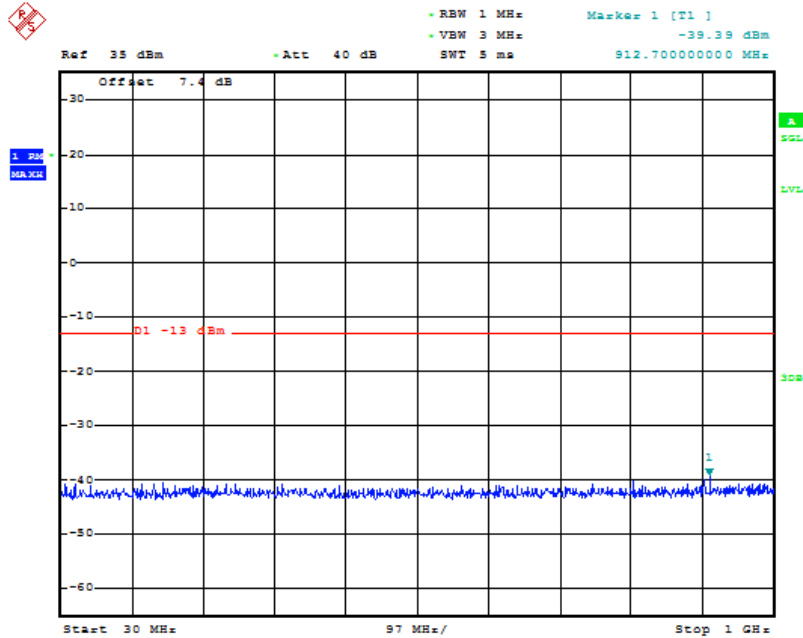


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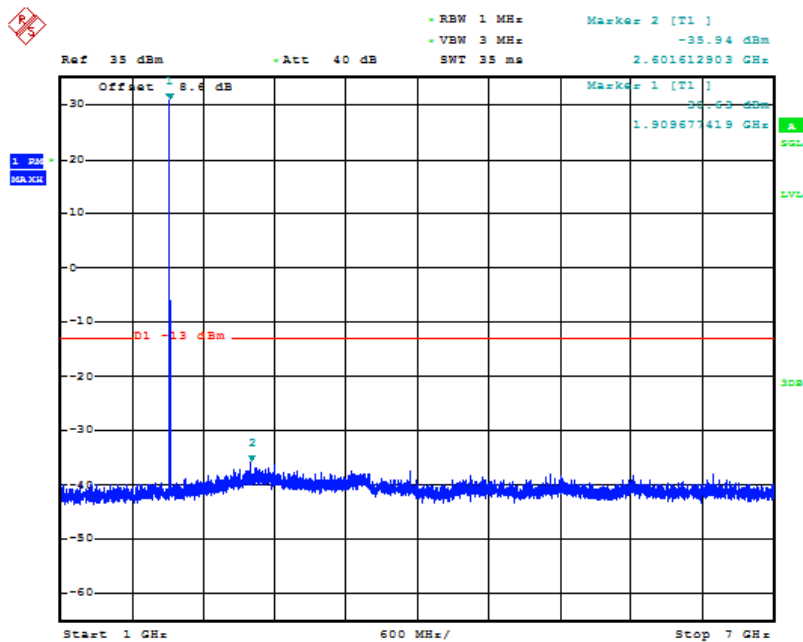


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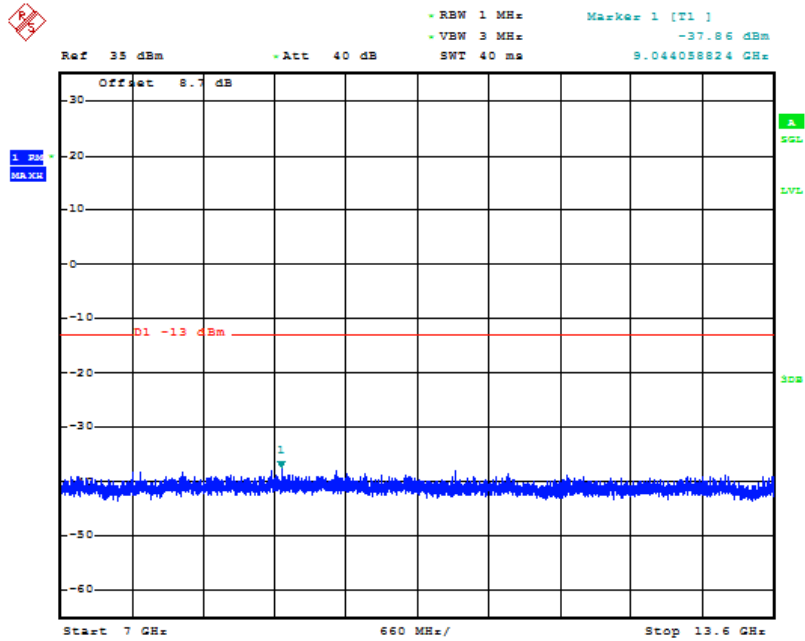
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 Test Mode = GSM /TM1
 Test Channel = HCH



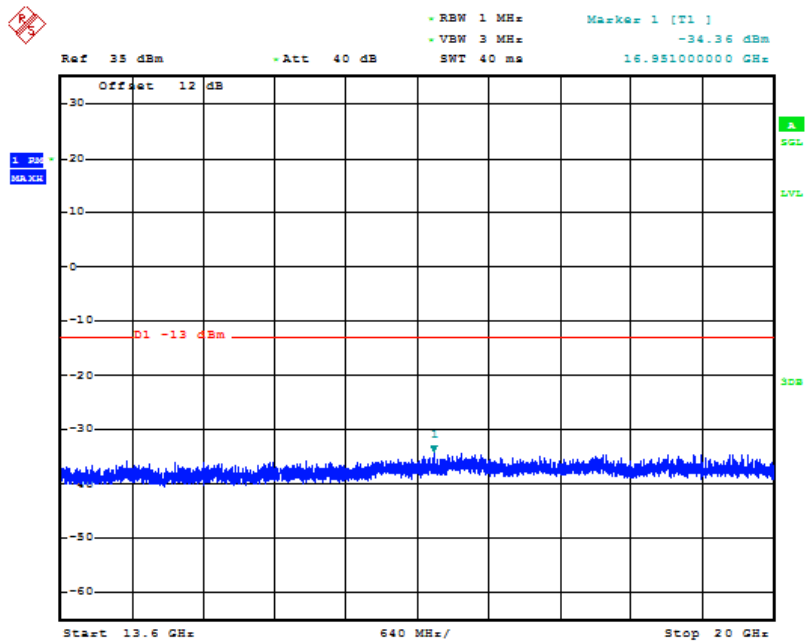
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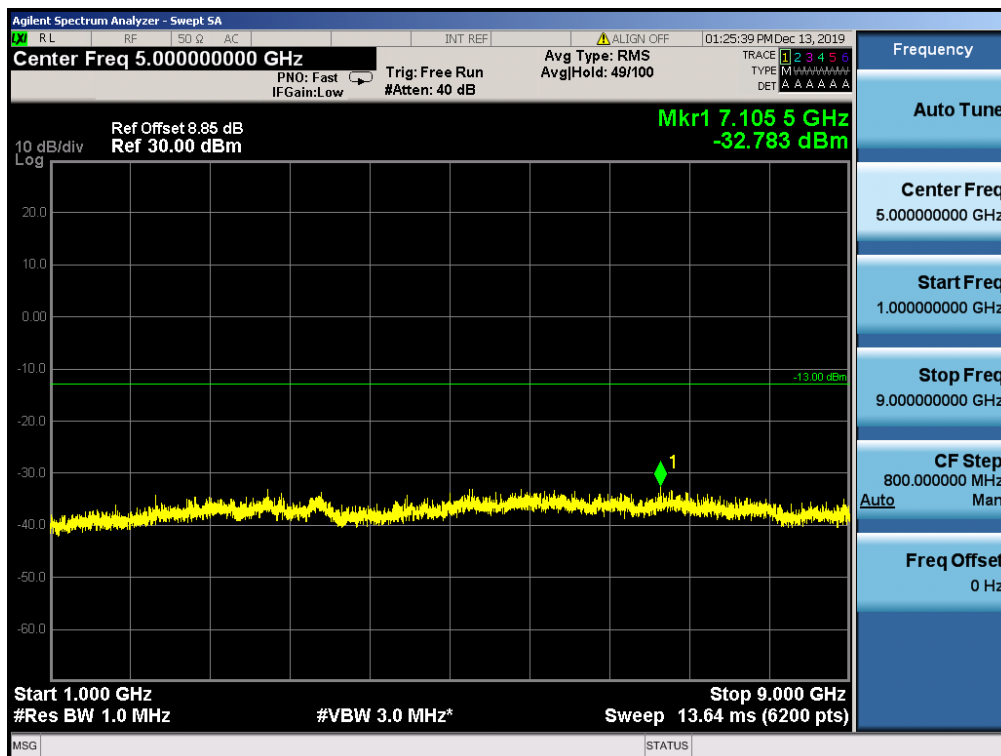
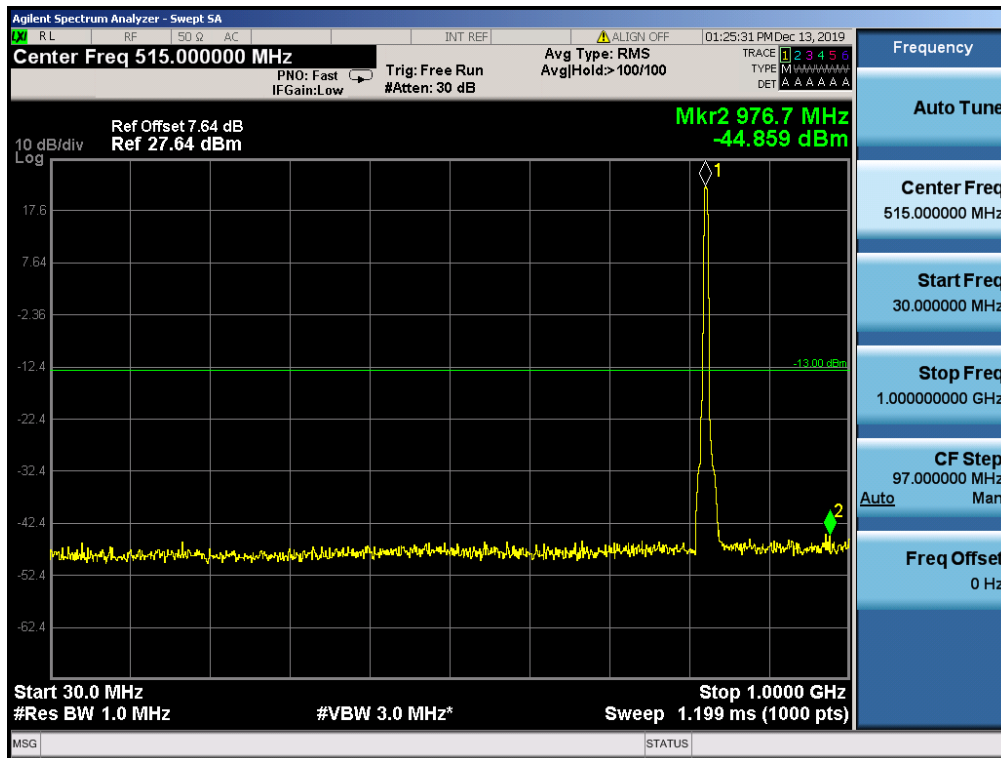


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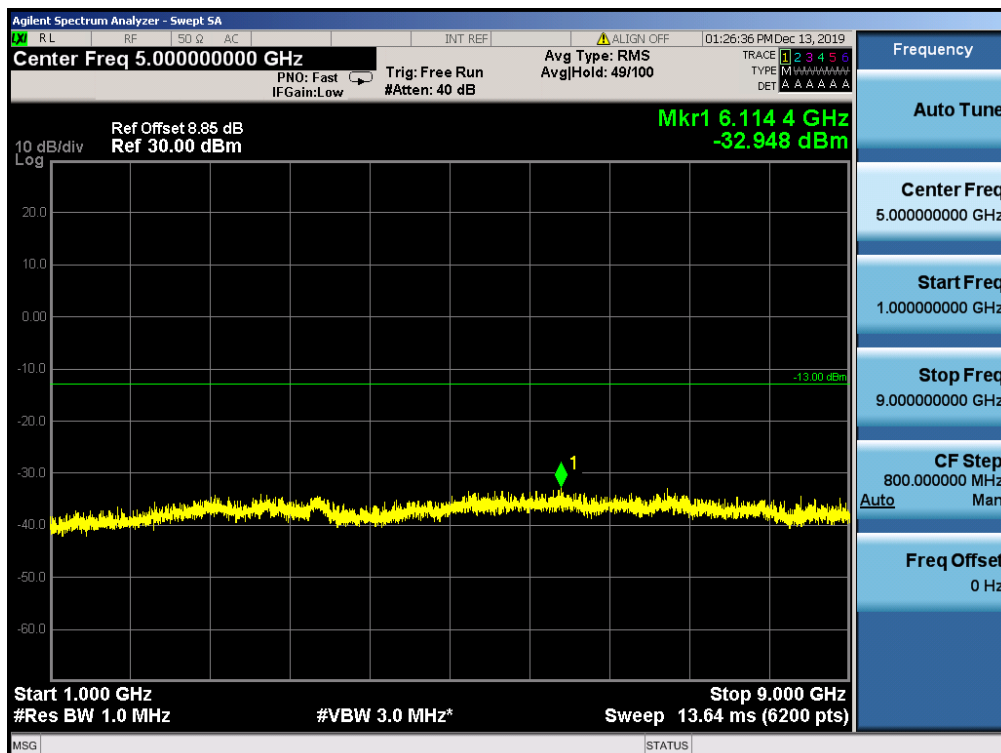
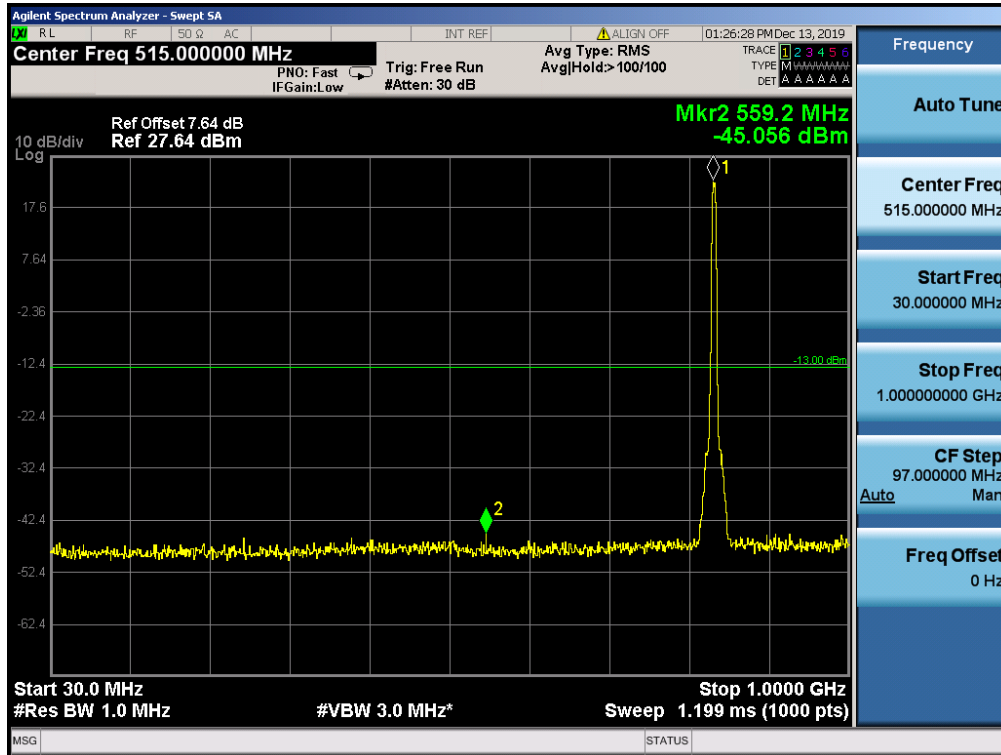


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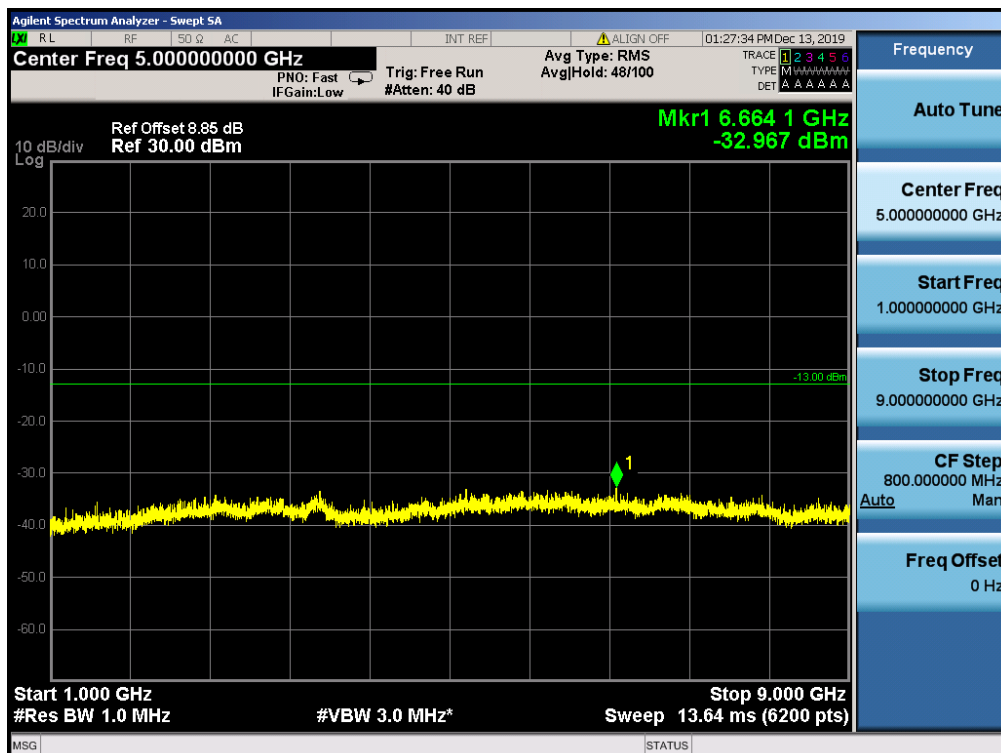
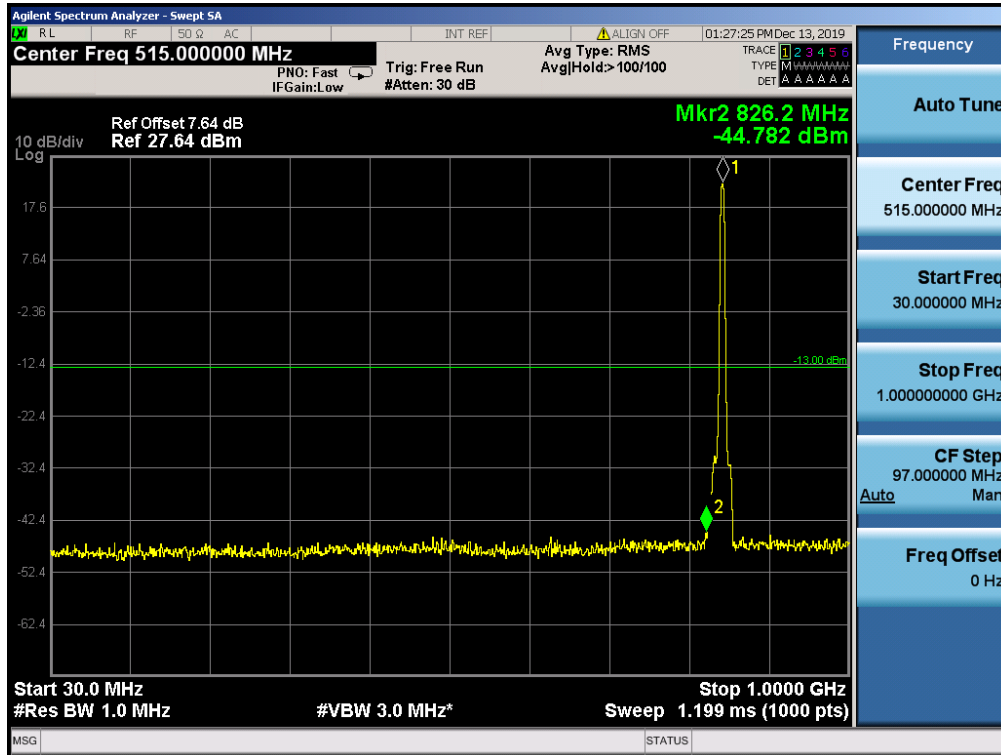
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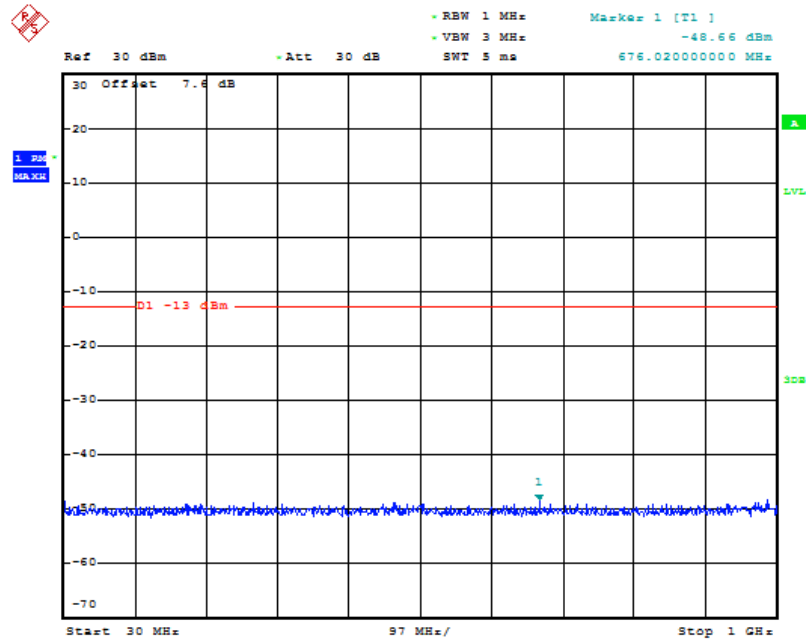
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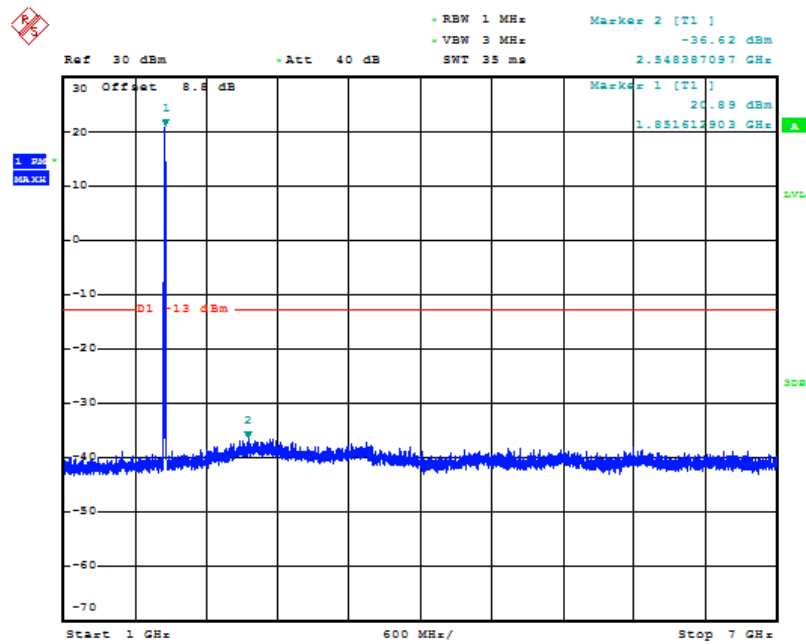
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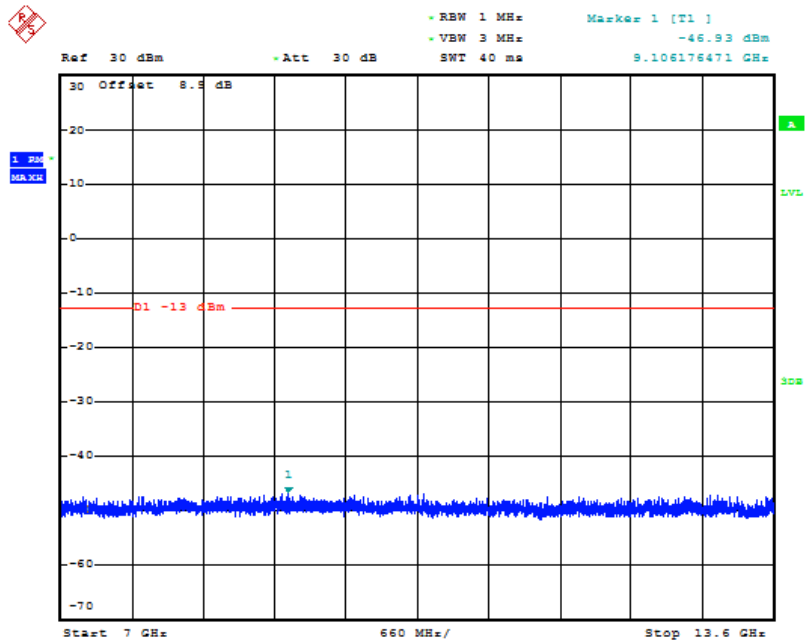
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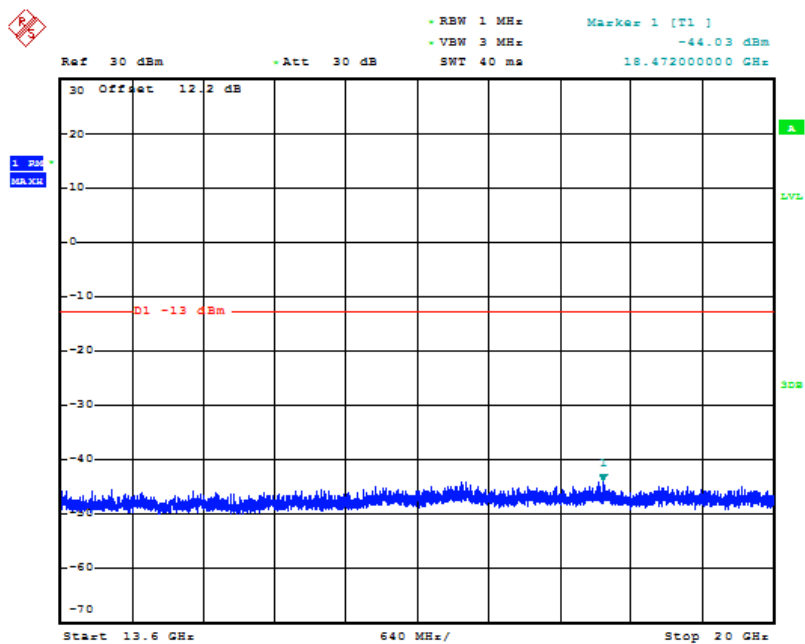
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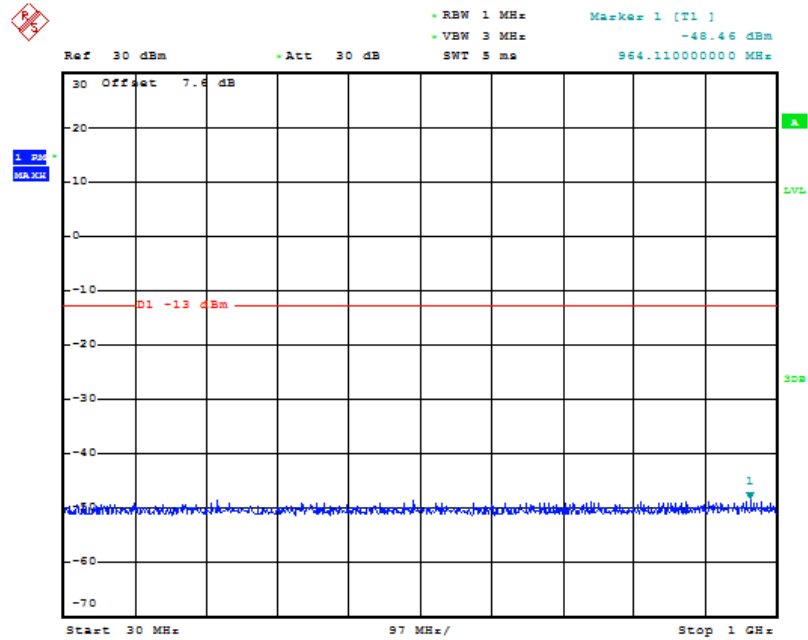


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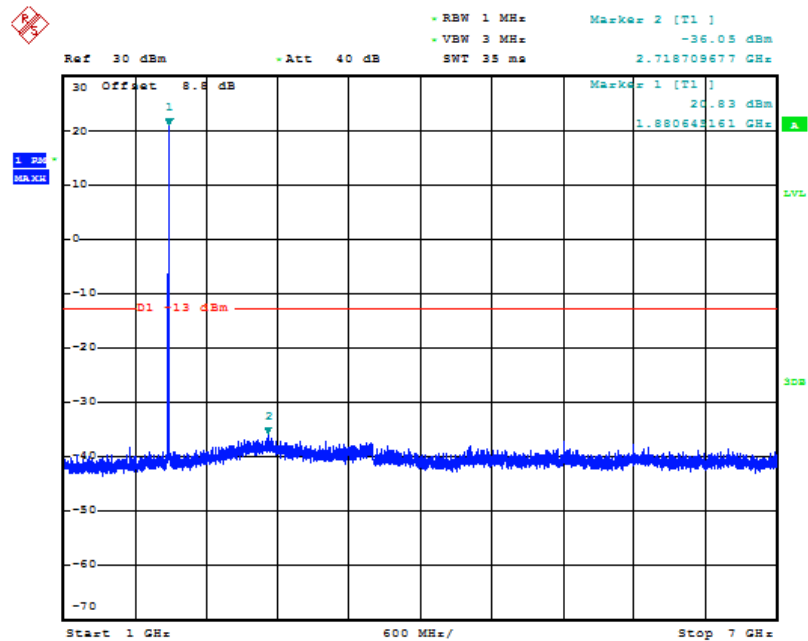


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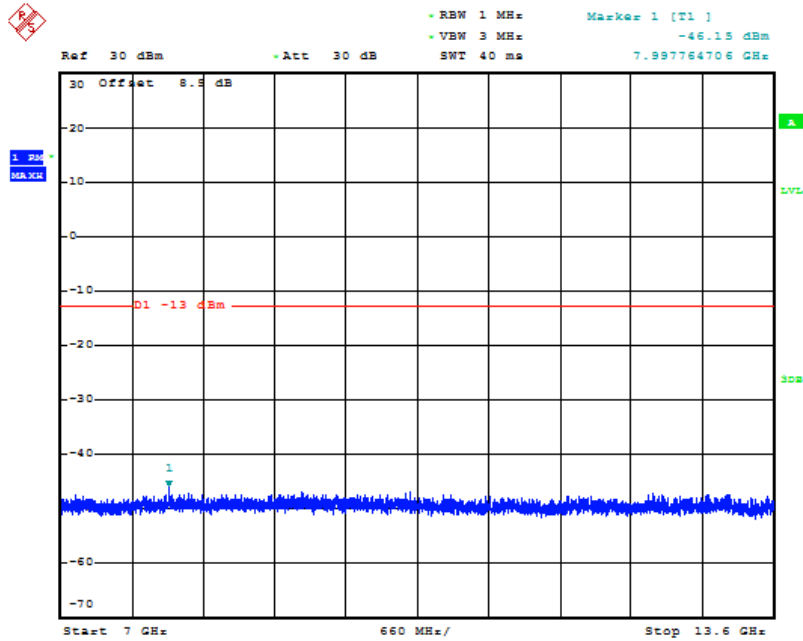
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 Test Channel=MCH



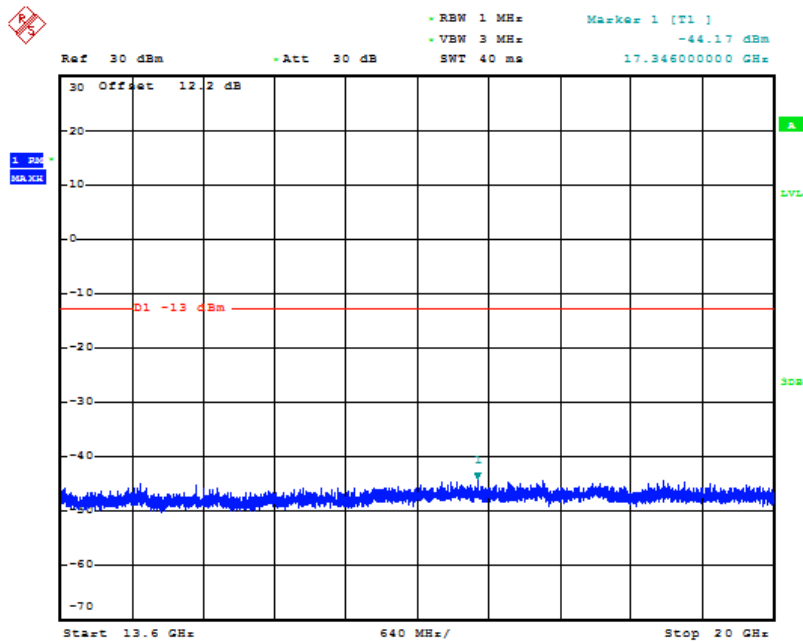
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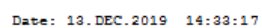
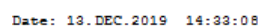
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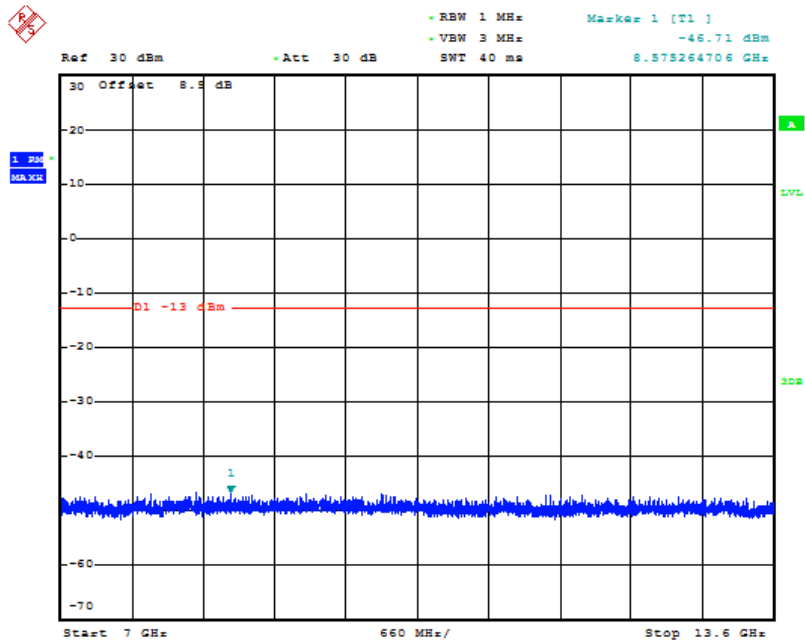


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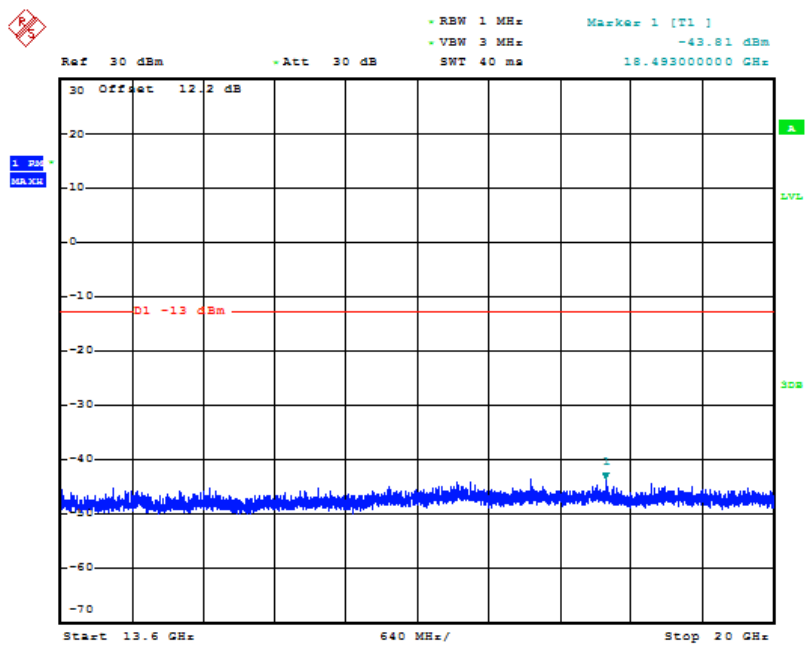


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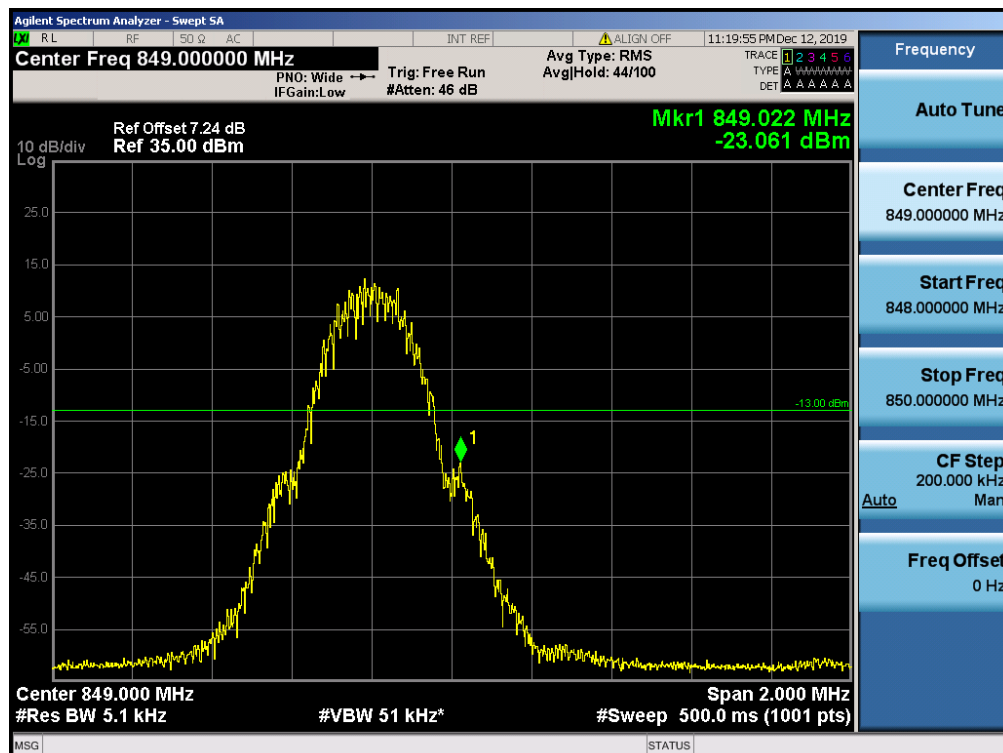
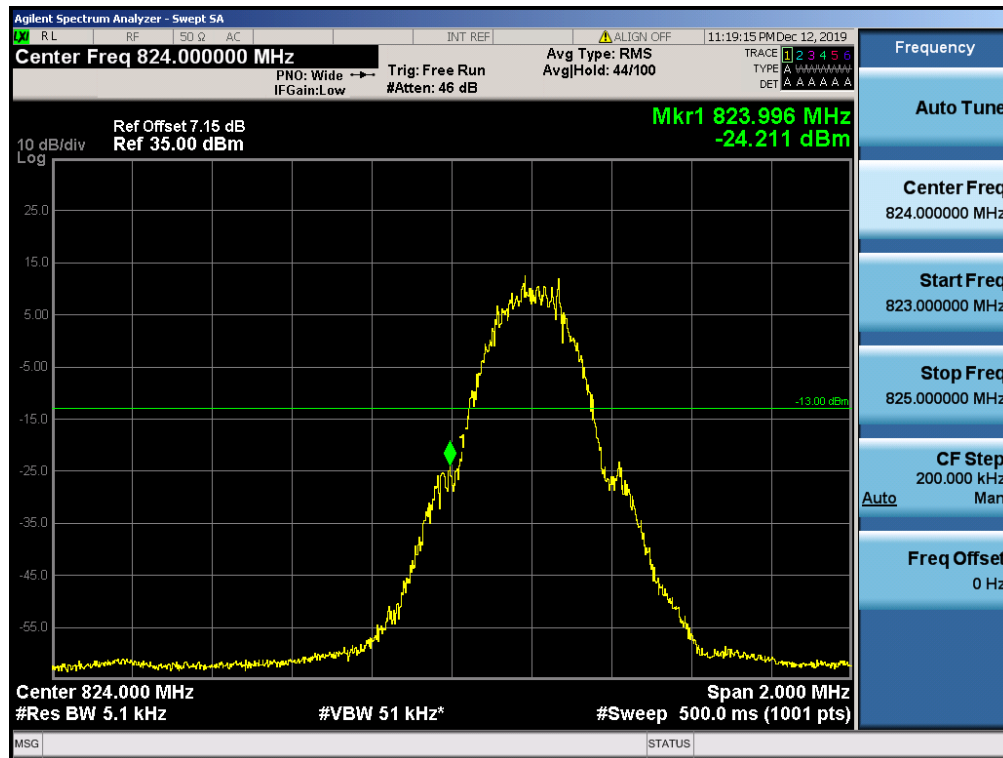


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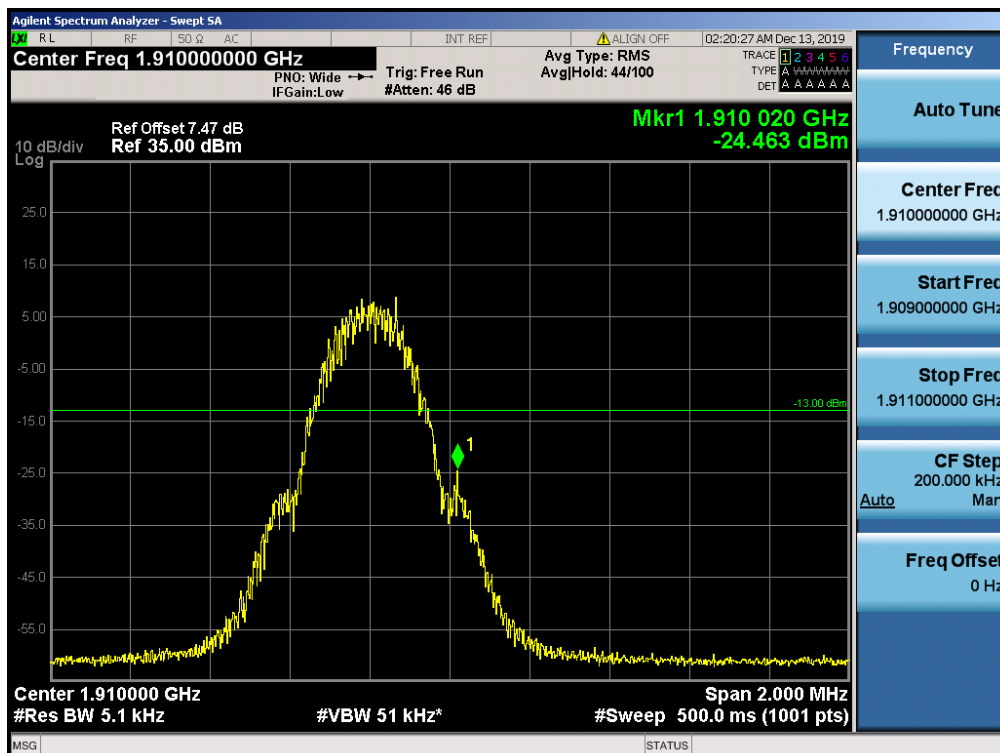
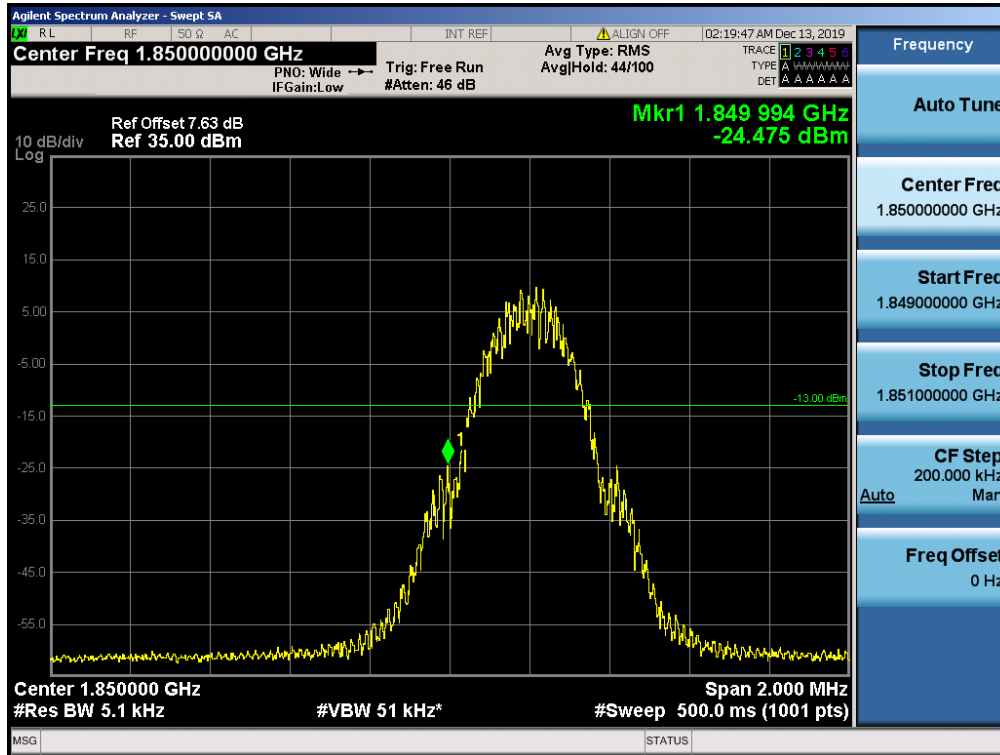


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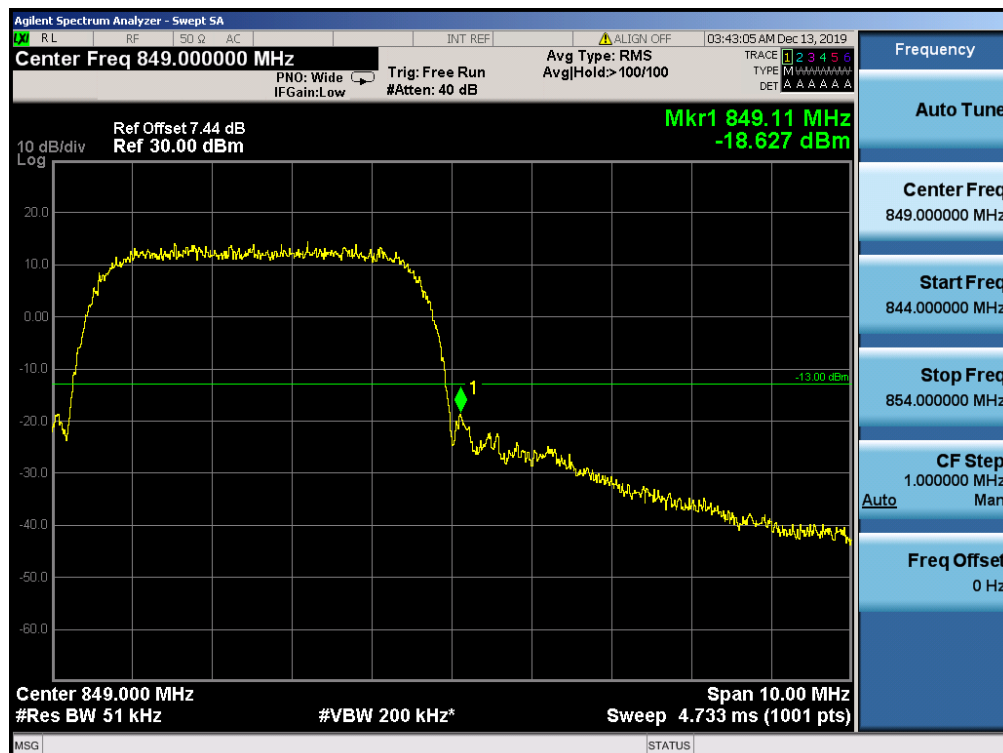
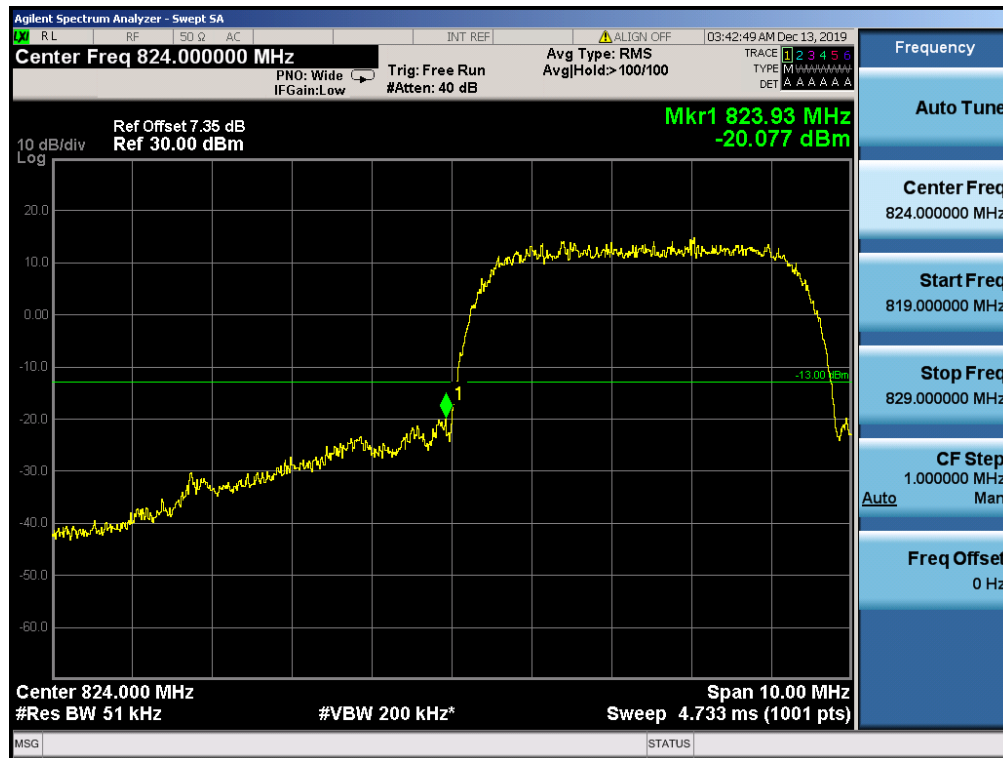
Band edge measurement
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 Test Mode = GSM /TM1
 Test Channel = LCH/HCH



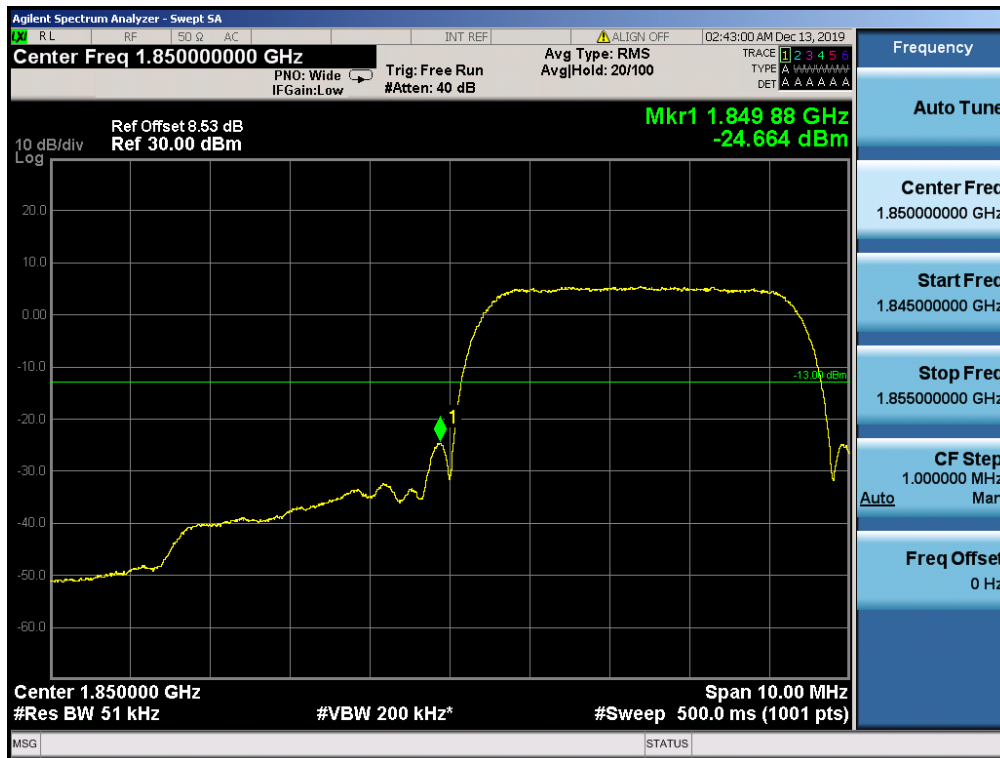
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 Test Band = GSM1900
 Test Mode = GSM /TM1
 Test Channel = LCH/HCH



Band edge measurement
 Test Band = WCDMA850
 Test Mode = UMTS/TM2
 Test Channel = LCH/HCH



Band edge measurement
Test Band = WCDMA1900
Test Mode = UMTS/TM2
Test Channel = LCH/HCH



5.5. Spurious Emissions Radiated

5.5.1. Test Standard

FCC: CFR Part 2.1051, CFR Part 22.917, CFR Part 24.238

5.5.2. Test Limit

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in FCC 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

(a) Out of band emissions. 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. For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radio telephone Service.

(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

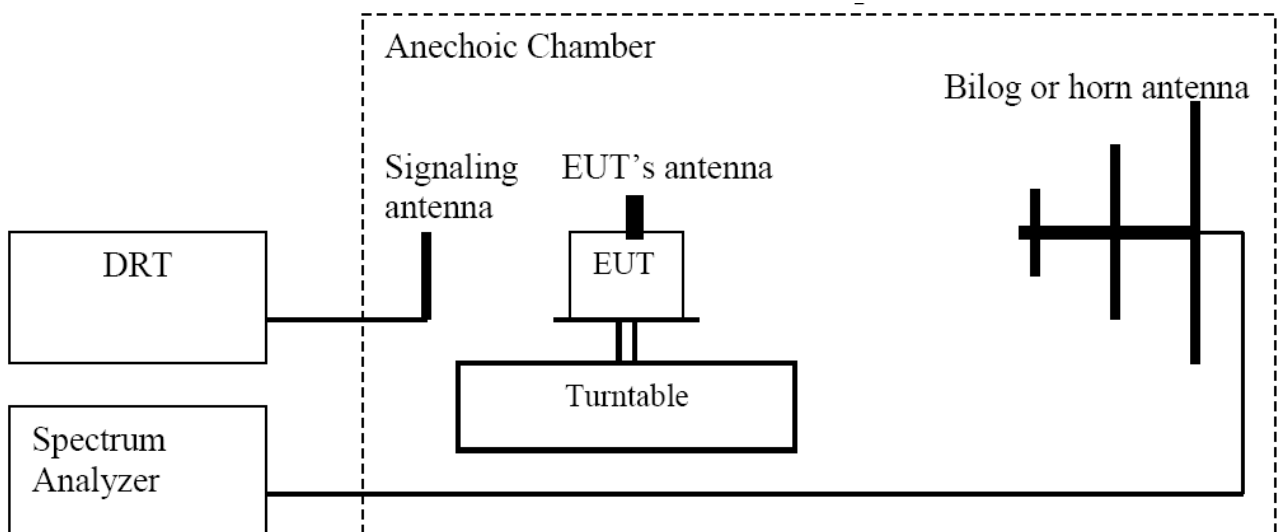
(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.5.3.Test Procedure

1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
 2. Adjust the settings of the Wideband Radio Communication Tester (CMW500) to set the EUT to its maximum power at the required channel.
 3. Set the spectrum analyzer to measure peak hold with the required settings.
 4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360 at each height to maximize all emissions. Measure and record all spurious emissions (LVL) up to the tenth harmonic of the carrier frequency.
 5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
 6. Connect the antenna to a signal generator with known output power and record the path loss in dB (LOSS). $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$.
 7. Determine the level of spurious emissions using the following equation:
 $\text{Spurious (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$
 8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
 9. Determine the level of spurious emissions using the following equation:
 $\text{Spurious (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$
 10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
- (Note: Steps 5 and 6 above are performed prior to testing and LOSS is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

Spectrum analyzer settings: RBW=VBW=1MHz

5.5.4.Test Setup



5.5.5. Test Data

Test Band = GSM850
 Test Mode = GSM /TM1
 Test Channel = MCH

Freq.	SG. Level	Cable Loss	Antenna Gain	Preamp	Substitution	polarization	Limit
[MHz]	[dBm]	[dB]	[dBd]	dB	Level (ERP) [dBm]		[dBm]
1673.2	-0.57	0.9	6.77	40.6	-35.3	Horizontal	-13
2510.4	-5.45	2.1	7.45	40.1	-40.2	Horizontal	-13
3347.2	-3.11	4.1	9.41	39	-36.8	Horizontal	-13
1673.2	3.23	0.9	6.77	40.6	-31.5	Vertical	-13
2510.4	-6.75	2.1	7.45	40.1	-41.5	Vertical	-13
3347.2	-3.51	4.1	9.41	39	-37.2	Vertical	-13

Test Band = WCDMA850
 Test Mode = UMTS/TM3
 Test Channel = MCH

Freq.	SG. Level	Cable Loss	Antenna Gain	Preamp	Substitution	polarization	Limit
[MHz]	[dBm]	[dB]	[dBd]	dB	Level (ERP) [dBm]		[dBm]
1674.7	2.63	0.9	6.77	40.6	-32.1	Horizontal	-13
1670.1	4.53	0.9	6.77	40.6	-30.2	Vertical	-13

Test Band = GSM1900
 Test Mode = GSM /TM1
 Test Channel = MCH

Freq.	SG. Level	Cable Loss	Antenna Gain	Preamp	Substitution	polarization	Limit
[MHz]	[dBm]	[dB]	[dBi]	dB	Level (EIRP) [dBm]		[dBm]
3760.5	-1.13	4.6	9.53	39	-35.2	Horizontal	-13
3760.5	-2.93	4.6	9.53	39	-37	Vertical	-13

Test Band = WCDMA1900

Test Mode = UMTS /TM3

Test Channel = MCH

Freq.	SG. Level	Cable Loss	Antenna Gain	Preamp	Substitution	polarization	Limit
[MHz]	[dBm]	[dB]	[dBi]	dB	Level (EIRP) [dBm]		[dBm]
3757.5	-8.73	4.6	9.53	39	-42.8	Horizontal	-13
5235	-7.08	6.32	10	38.5	-41.9	Horizontal	-13
3760.5	-8.23	4.6	9.53	39	-42.3	Vertical	

5.6. Frequency Stability

5.6.1. Test Standard

CFR 47 (FCC) part 2.1055, 22.355 and 24.235

5.6.2. Test Limit

According to part 22.355, from 821MHz to 896MHz, for mobile device, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5ppm.

§24.235

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

5.6.3. Test Procedure

GSM/WCDMA

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&SCMU 200 Universal Radio Communication Tester.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30 °C.
3. With the EUT, powered via nominal voltage, connected to the CMU 200 and in a simulated call on mid channel (190 for GSM 850 & 4183 for WCDMA 850& 661 for PCS1900 & 9400), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10 °C increments from -30 °C to +50 °C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Re-measure carrier frequency at low and high voltage. Power at nominal voltage for 1/2 hours un-powered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50 °C.
7. With the EUT, powered via nominal voltage, connected to the CMU 200 and in a simulated call on mid channel (190 for GSM 850 & 4183 for WCDMA 850& 661 for PCS1900 & 9400 for WCDMA 1900), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 °C increments from +50 °C to -30 °C. Allow at least 1/2 hours at each temperature, un-powered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 °C during the measurement procedure.

5.6.4. Test Setup

Connect the EUT to the Wireless Communication test set CMU200 or CMW 500 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200/CMW 500. The EUT's output is matched with a 50 Ω load.

5.6.5. Test Data

Measurement Results vs. Variation of Temperature— GSM850

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	836.6	-10.07	Pass
-20 °C	836.6	-9.17	Pass
-10 °C	836.6	-9.17	Pass
0 °C	836.6	-10.98	Pass
+10 °C	836.6	-12.20	Pass
+20 °C	836.6	-9.04	Pass
+30 °C	836.6	-10.53	Pass
+40 °C	836.6	-10.53	Pass
+50 °C	836.6	-9.94	Pass

Measurement Results vs. Variation of Voltage— GSM850

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.3 V	836.6	-10.14	Pass
3.8 V	836.6	-10.85	Pass
4.3 V	836.6	-9.81	Pass

Measurement Results vs. Variation of Temperature—WCDMA850

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	836.6	-7.42	Pass
-20 °C	836.6	-7.32	Pass
-10 °C	836.6	-6.00	Pass
0 °C	836.6	-6.41	Pass
+10 °C	836.6	-4.35	Pass
+20 °C	836.6	-5.36	Pass
+30 °C	836.6	-6.59	Pass
+40 °C	836.6	-4.76	Pass
+50 °C	836.6	-9.48	Pass

Measurement Results vs. Variation of Voltage—WCDMA850

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.3 V	836.6	-7.63	Pass
3.8 V	836.6	-7.81	Pass
4.3 V	836.6	-4.43	Pass

Measurement Results vs. Variation of Temperature— GSM1900

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1880.0	-16.14	Pass
-20 °C	1880.0	-15.63	Pass
-10 °C	1880.0	-15.69	Pass
0 °C	1880.0	-17.89	Pass
+10 °C	1880.0	-15.95	Pass
+20 °C	1880.0	-16.72	Pass
+30 °C	1880.0	-15.05	Pass
+40 °C	1880.0	-16.14	Pass
+50 °C	1880.0	-16.47	Pass

Measurement Results vs. Variation of Voltage— GSM1900

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.3 V	1880.0	-16.59	Pass
3.8 V	1880.0	-16.72	Pass
4.3 V	1880.0	-16.21	Pass

Measurement Results vs. Variation of Temperature—WCDMA1900

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1880.0	3.39	Pass
-20 °C	1880.0	6.71	Pass
-10 °C	1880.0	9.83	Pass
0 °C	1880.0	3.30	Pass
+10 °C	1880.0	4.49	Pass
+20 °C	1880.0	8.19	Pass
+30 °C	1880.0	7.92	Pass
+40 °C	1880.0	9.93	Pass
+50 °C	1880.0	6.55	Pass

Measurement Results vs. Variation of Voltage—WCDMA1900

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.3 V	1880.0	3.34	Pass
3.8 V	1880.0	4.18	Pass
4.3 V	1880.0	3.57	Pass

END OF REPORT