

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 22 SUBPART H, PART 24 SUBPART E REQUIREMENT**

OF

Product Name: Mobile phone
FCC ID: APYHRO00255
Report No.: ER/2017/90119
Issue Date: Oct. 26, 2017
FCC Rule Part: 2,22H & 24E

Prepared for: Sharp Corporation, IoT Communication B.U.
2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi, Hiroshima 739-0192, Japan

Manufacturer: Sharp Corporation
1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522, Japan
SGS Taiwan Ltd.
Electronics & Communication Laboratory

Prepared by: No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

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VERIFICATION OF COMPLIANCE

Applicant: Sharp Corporation, IoT Communication B.U.
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739-0192, Japan

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1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522, Japan

Product Name: Mobile phone

FCC ID: APYHRO00255

Report Number: ER/2017/90119

Date of test: Sep. 15, 2017~ Oct. 13, 2017

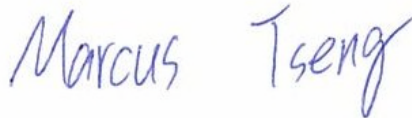
Date of EUT Received: Sep. 15, 2017

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI/TIA-603-E-2016 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:



Date:

Oct. 26, 2017

Marcus Tseng / Engineer

Prepared By:



Date:

Oct. 26, 2017

Stefanie Yu / Clerk

Approved By:



Date:

Oct. 26, 2017

Jim Chang / Asst. Manager

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Revision History

Report Number	Revision	Description	Issue Date
ER/2017/80119	Rev.00	Initial creation of document	Oct. 26, 2017

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1. GENERAL PRODUCT INFORMATION

1.1. Product Description

General:

Product Name:	Mobile Phone	
Hardware Version:	DVT	
Software Version:	N/A	
Power Supply:	3.85Vdc from Rechargeable Li-ion Battery	
	Battery:	Mode No.: SHF34UAA, Supplier: SHARP CORPORATION
IMEI:	0044-01111-6224-854	

GSM / WCDMA:

Cellular Phone Standards Frequency Range and Power	Operating Frequency		Rated Power
	GSM/GPRS 850	824.2 MHz– 848.8 MHz	33dBm
	GSM/GPRS 1900	1850.2MHz – 1909.8MHz	30dBm
	WCDMA/HSUPA/HSDPA Band V	826.4MHz - 846.6MHz	24dBm

Type of Emission:	GSM 850	247KGXW
	GPRS 850	245KGXW
	GSM 1900	247KGXW
	GPRS 1900	246KGXW
	WCDMA Band V	4M13F9W
	HSDPA Band V	4M14F9W
	HSUPA Band V	4M14F9W

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Max ERP/EIRP Power Measurement Result:

	dBm		W
GSM850	20.57	ERP	0.114
GSM1900	24.46	EIRP	0.279
GPRS850	26.26	ERP	0.423
GPRS1900	25.89	EIRP	0.388
WCDMABAND V	23.95	ERP	0.248
HSDPABAND V	28.95	ERP	0.785
HSUPABAND V	26.39	ERP	0.436

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1.2. Test Methodology of Applied Standards

FCC 47 CFR Part 2, 22, 24

ANSI/TIA-603-E-2016

KDB971168 D01 Power Meas license Digital System

KDB941225 of the Output power Procedure of (SAR Measurement Procedures for 3G Devices, WCDMA / HSPA) was used for EUT and Base station setting.

TS 151 010-1 is used to set, and measure the output power.

Note:

All test items have been performed and record as per the above standards.

1.3. Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Registration Numbers are: 509634 / TW0001

1.4. Special Accessories

No special accessories were used during testing.

1.5. Equipment Modifications

There were no modifications incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Measurement at Antenna Port

According to measurement procured ANSI/TIA-603-E-2016, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP)

According to measurement procured ANSI/TIA-603-E-2016, The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13.

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2.4. Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation example with cable loss, splitter and attenuator.

Low Band: Offset = RF cable loss (dB) + splitter(dB) + attenuation factor(dB)
=0.5+3.2+10=13.7(dB)

High Band: Offset = RF cable loss (dB) + splitter(dB) + attenuation factor(dB)
=0.8+3.2+10=14(dB)

2.5. Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
GSM 850	3.85	308
GSM 1900	3.85	358
GPRS 850	3.85	324
GPRS 1900	3.85	287
WCDMA B5	3.85	299
HSUPA B5	3.85	315
HSDPA B5	3.85	362

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2.6. Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed Channel-Conducted)

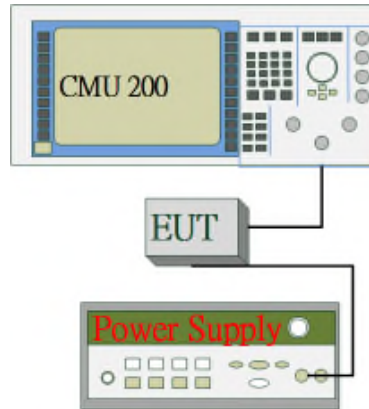


Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)



Remote Side

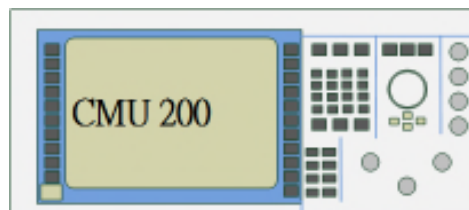


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model/ Model No.	Series No.	Data Cable	Power Cord
1.	Universal Radio Communication Tester	R&S	CMU200	102189	shielded	Un-shielded
2.	DC Power Supply	HP	E3640A	MY40005907	shielded	Un-shielded

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§2.1046(a) §22.913(a)(2) §24.232(c)	ERP/ EIRP measurement	Compliant
§2.1049(h)	Occupied Bandwidth	Compliant
§2.1051 §22.917(a) §24.238(a)	Out of Band Emissions at Antenna Terminals and Band Edge	Compliant
§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	Compliant
§24.232(d)	Peak to Average Ratio	Compliant
§2.1055(a)(1) §22.355 §24.235	Frequency Stability	Compliant

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4. DESCRIPTION OF TEST MODES

4.1. The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found as listed below. Following channel(s) was (were) selected for the final test as listed below:

BAND	ERP/EIRP	RADIATED EMISSION
GSM/GPRS 850	H-plan	H-plan
GSM/GPRS 1900	H-plan	H-plan
WCDMA/HSPA Band V	H-plan	H-plan

GSM/GPRS/EDGE MODE

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
ERP	128 to 251	128, 190, 251	GSM/GPRS 850
EIRP	512 to 810	512, 661, 810	GSM/GPRS 1900
FREQUENCY STABILITY	128 to 251 512 to 810	190 661	GPRS 850 GPRS 1900
OCCUPIED BANDWIDTH	128 to 251 512 to 810	190 661	GSM/GPRS 850 GSM/GPRS 1900
PEAK TO AVERAGE RATIO	128 to 251 512 to 810	128, 190, 251 512, 661, 810	GSM/GPRS 1900
BAND EDGE	128 to 251 512 to 810	128, 251 512, 810	GSM/GPRS 850 GSM/GPRS 1900
CONDUCTED EMISSION	128 to 251 512 to 810	128, 251 512, 810	GSM/GPRS 850 GSM/GPRS 1900
RADIATED EMISSION	128 to 251 512 to 810	128, 251 512, 810	GPRS 850 GPRS 1900

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WCDMA/HSPA MODE

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
ERP	4132 to 4233	4132, 4183, 4233	WCDMA/HSPA Band V
FREQUENCY STABILITY	4132 to 4233	4183	WCDMA Band V
OCCUPIED BANDWIDTH	4132 to 4233	4183	WCDMA/HSPA Band V
PEAK TO AVERAGE RATIO	N/A	N/A	N/A
BAND EDGE	4132 to 4233	4132, 4233	WCDMA Band V
CONDUCTED EMISSION	4132 to 4233	4132, 4183, 4233	WCDMA Band V
RADIATED EMISSION	4132 to 4233	4132, 4183, 4233	WCDMA Band V

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.10 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization = +/- 4.62dB
99% Occupied Bandwidth	+/- 5.19 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 0.70 dB
Peak to Average Ratio	+/- 0.70 dB
Frequency Stability vs. Temperature	+/- 5.19 Hz
Frequency Stability vs. Voltage	+/- 5.19 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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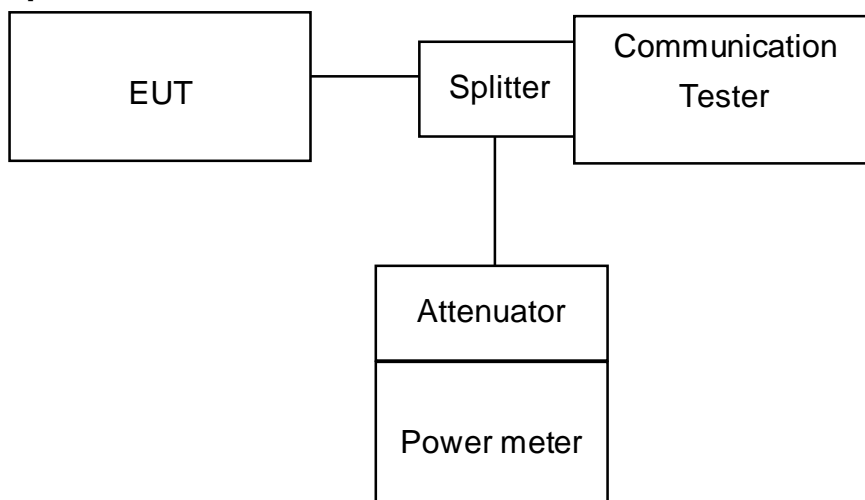
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6. RF CONDUCTED OUTPUT POWER MEASUREMENT

6.1. Standard Applicable

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

6.2. Test Set-up



Note: Measurement setup for testing on Antenna connector

6.3. Measurement Procedure

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading. TS 151 010-1 is reference to conduct the test measurement of output power.

The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, (WCDMA/HSPA) was used for EUT and Base station setting. RMC 12.2kps is used for this testing, and KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results

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6.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018
Coaxial Cable	HU-BER+SUHNER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2017	02/10/2018

6.5. Measurement Result

RF Conducted Output Power

GSM/GPRS (GMSK; 8-PSK) Result:

EUT Mode	Frequency (MHz)	CH	Averager Burst Power (dBm)
GSM 850	824.2	128	32.34
	836.6	190	32
	848.8	251	32.03
GSM 1900	1850.2	512	28.93
	1880.0	661	28.95
	1909.8	810	29.24

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EUT Mode	Frequency (MHz)	CH	Average Burst Power	Average Burst Power	Average Burst Power	Average Burst Power
			(4DN 1UP) Class 8 (dBm)	(4DN 2UP) Class 10 (dBm)	(4DN 3UP) Class 12 (dBm)	(4DN 4UP) Class 12 (dBm)
GPRS 850	824.2	128	32.34	30.09	28.41	28.02
	836.6	190	32	30	28.36	27.94
	848.8	251	32.03	29.99	28.3	27.88
GPRS 1900	1850.2	512	28.93	26.75	25.09	24.66
	1880.0	661	28.95	26.87	25.14	24.71
	1909.8	810	29.24	27.01	25.31	24.89

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WCDMA MODE:

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V8.4.0 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7). RMC 12.2kps is used for this testing.

Results:

EUT Mode	Frequency (MHz)	CH	Avg. Power (dBm)
WCDMA Band V	826.4	4132	23.48
	836.6	4183	23.37
	846.6	4233	23.39
HSDPA Band V	826.4	4132	22.43
	836.6	4183	22.35
	846.6	4233	22.38
HSUPA Band V	826.4	4132	22.53
	836.6	4183	22.46
	846.6	4233	22.48

Note: The results above reflect max power with all up bits.

Cable loss offset Low Band: 14.4dB

Cable loss offset High Band: 14.4dB

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HSDPA Release 6 MODE:

The following 4 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V8.4.0 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C10.1.4 & C11.1.3 in the 3GPP TS34.121-1 V8.4.0. RMC 12.2kps is used for this testing.

HSDPA SUB-TEST Setting

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH(FOR HSDPA)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)	RMC (Kbps)
1	2/15	15/15	64	2/15	4/15	0.0	0.0	12.2
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0	12.2
3	15/15	8/15	64	15/8	30/15	1.5	0.5	12.2
4	15/15	4/15	64	15/4	30/15	1.5	0.5	12.2

Note: The recommended HSDPA MPRs are implemented as per following sub-tests.

Results:

Mode	Sub-test	Avg. Power (dBm) Channel			Power Class 3 Lim- itation (dBm)	Comments
		4132	4183	4233		
HSDPA (B5)	1	22.43	22.35	22.38	20.3dBm – 25.7dBm	Pass
	2	22.4	22.43	22.35	20.3dBm – 25.7dBm	Pass
	3	21.88	21.92	21.84	19.8dBm – 25.7dBm	Pass
	4	21.9	21.82	21.86	19.8dBm – 25.7dBm	Pass

HSPA (HSDPA & HSUPA) Release 6 MODE

The following 5 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V8.4.0 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C11.1.3 in the 3GPP TS34.121-1 V8.4.0. RMC 12.2kps is used for this testing

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HSPA SUB-TEST Setting

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH(FOR HSUPA)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (Code s)	CM (dB)	MPR (dB)	AG Index	E-TFCI	RMC (Kbps)
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75	12.2
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67	12.2
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	4 4	2	2.0	1.0	15	92	12.2
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71	12.2
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81	12.2

Note: The recommended HSUPA MPRs are implemented as per following sub-tests.

Results:

Mode	Sub-test	Avg. Power (dBm) Channel			Power Class 3 Limitation (dBm)	Comments
		4132	4183	4233		
HSUPA(B5)	1	22.53	22.46	22.48	18.8dBm – 25.7dBm	Pass
	2	21.41	21.34	21.38	16.8dBm – 25.7dBm	Pass
	3	22.45	22.36	22.29	17.8dBm – 25.7dBm	Pass
	4	22.44	22.35	22.38	16.8dBm – 25.7dBm	Pass
	5	22.41	22.33	22.36	18.8dBm – 25.7dBm	Pass

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Minimum Communications Power Measurement

PCS 1900 band

PCL	0	1	2	3	4	5	6	7	8
Output power (dBm)	29.7	27.65	26.05	23.95	22.15	20.8	18.14	16.17	14.28

PCL	9	10	11	12	13	14	15
Output power (dBm)	12.36	10.38	8.16	6.01	3.87	1.58	-0.14

Note: The EUT output power was controlled by simulator. Set Communication Tester CMU200 PCL as above, and get the mobile phone output power reading.

WCDMA/HSDPA/HSUPA band V

The EUT output power was controlled by simulator. Set Communication Tester CMU200 function key "UE Power Control" and enter max rated power 24dBm. The EUT is going to be set to max output power to 24dBm. Then record the read (see page 15 for measurement data) . The min. power was measures by a function key "minimum power" then record the read. It is -52.3dBm. The power variation can be 0.1dB step by setting.

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7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED POWER MEASUREMENT

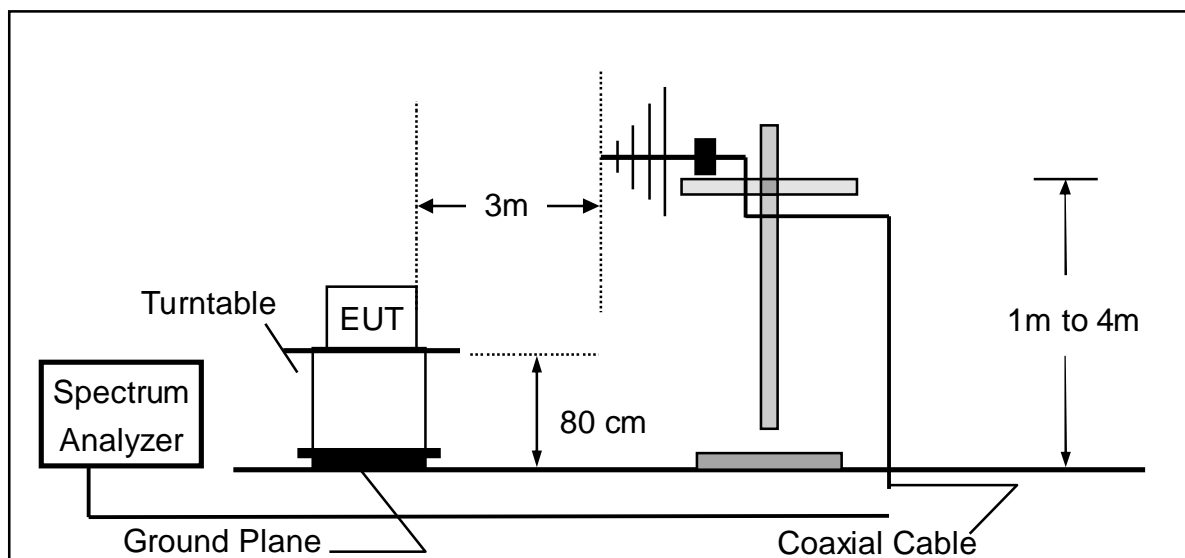
7.1 Standard Applicable

FCC 22.913(a) Mobile station is limited to 7W.

FCC 24.232(b) Mobile station is limited to 2W.

7.2 Test SET-UP

(A) Radiated Power Test Set-Up, Frequency Below 1000MHz



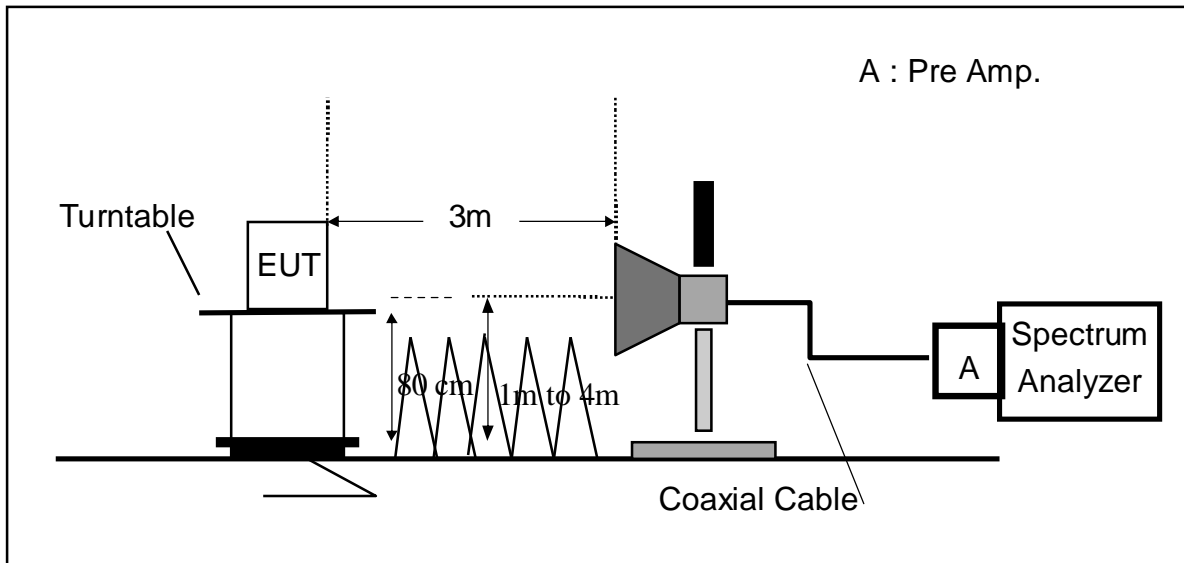
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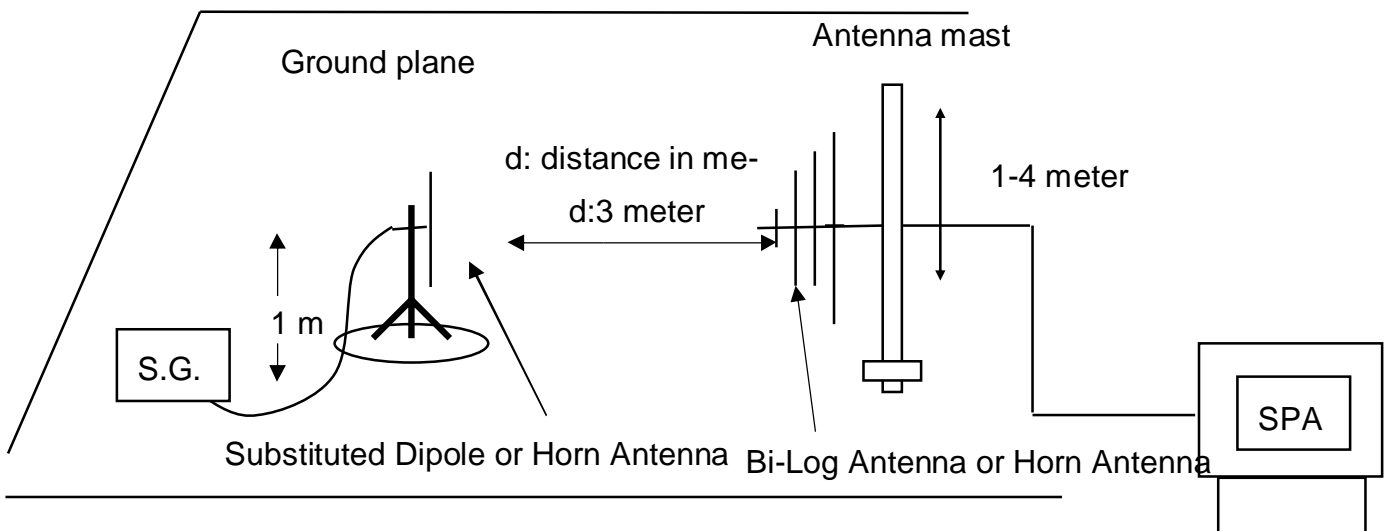
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(B) Radiated Power Test Set-UP Frequency Over 1 GHz



(C) Substituted Method Test Set-UP



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7.3 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 971168 D01
2. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
3. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated.
4. The testing follows the Measurement Procedure of FCC KDB 971168 D01
5. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
6. $ERP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$
7. $EIRP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$
8. Spectrum setting:
 - (1) Detector = Peak, marker the highest value of the detector by maximum hold, set RBW wide enough to capture the entire signal of emission, and $VBW \geq 3 \times RBW$.
 - (2) KDB 971168 D01 is adopted, and the procedure as lists under item 4, Measurement of the Average Power over the Fundamental Signal Bandwidth, is followed to set correspondingly for the acquisition of proper measurement data.
Set frequency = nominal signal center frequency;
Set span = 2 X occupied BW;
Set RBW \approx 1~5% of the span, not to exceed 1 MHz
Set VBW = 3 x RBW;
Select average power (RMS) detector
Set sweep time and number of measurement points to achieve a minimum of 1 millisecond/pt integration time (ex. Point = 601points, then sweep time = $601 \times 10^{-3} = 6s$).

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Activate trace averaging routine over a minimum of 10 sweeps;
Activate marker/span pair and set span = signal or channel bandwidth;
Activate the band/interval power marker function;
Record the band power level;

Record adjusted value as the average signal power level. Then activate the occupied bandwidth measurement function.

The proper adjustment due to limitation of spectrum capability is given compensated to spectrum with conversion factor of $10 \cdot \log(TBW/RBW)$, where TBW is the transmission of UE exceeding the maximum BW UE can extend, and RBW is the resolution BW in spectrum.

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7.4 Measurement Equipment Used

ERP, EIRP MEASUREMENT EQUIPMENT List 966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/25/2017	04/24/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2017	09/19/2018
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/19/2016	12/18/2017
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/04/2017	08/03/2018
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2017	01/02/2018
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/03/2017	01/02/2018
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/05/2017	01/04/2018
3m Site NSA	SGS	966 chamber	N/A	07/01/2017	06/30/2018
Low Loss Cable	Huber Suhner	966 TX	1	01/05/2017	01/04/2018
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2016	12/11/2017
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/05/2017	01/04/2018
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018

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7.5 Measurement Result: (Peak) –using option of peak measurement

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
GSM 850	824.2	128	V	23.9	3.31	-2.92	24.28	38.45
			H	17.55	3.31	-2.92	17.93	38.45
	836.6	190	V	23.56	3.29	-2.96	23.88	38.45
			H	14.84	3.29	-2.96	15.17	38.45
	848.8	251	V	24.11	3.27	-3	24.38	38.45
			H	17.62	3.27	-3	17.89	38.45

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
GPRS 850	824.2	128	V	25.88	3.31	-2.92	26.26	38.45
			H	20.42	3.31	-2.92	20.8	38.45
	836.6	190	V	24.87	3.29	-2.96	25.2	38.45
			H	16.93	3.29	-2.96	17.25	38.45
	848.8	251	V	25.34	3.27	-3	25.6	38.45
			H	20.2	3.27	-3	20.47	38.45

Remark : (1) The RBW,VBW of SPA for frequency RBW=300 KHz, VBW=1MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
GSM 1900	1850.2	512	V	17.75	9.94	-4.46	23.23	33.00
			H	12.34	9.94	-4.46	17.82	33.00
	1880.0	661	V	18.93	10.03	-4.51	24.46	33.00
			H	15.25	10.03	-4.51	20.77	33.00
	1909.8	810	V	17.75	10.13	-4.55	23.33	33.00
			H	14.41	10.13	-4.55	19.99	33.00

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
GPRS 1900	1850.2	512	V	19.57	9.94	-4.46	25.05	33.00
			H	15.16	9.94	-4.46	20.64	33.00
	1880.0	661	V	20.37	10.03	-4.51	25.89	33.00
			H	17.41	10.03	-4.51	22.94	33.00
	1909.8	810	V	19.85	10.13	-4.55	25.43	33.00
			H	17.02	10.13	-4.55	22.6	33.00

Remark :

- (1) The RBW,VBW of SPA for frequency RBW=300K, VBW=1MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
WCDMA B5	826.4	4132	V	20.94	3.3	-2.93	21.31	38.45
			H	14.79	3.3	-2.93	15.16	38.45
	836.6	4183	V	23.62	3.29	-2.96	23.95	38.45
			H	15.23	3.29	-2.96	15.56	38.45
	846.6	4233	V	19.03	3.27	-2.99	19.31	38.45
			H	20.03	3.27	-2.99	20.31	38.45

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
HSDPA B5	826.4	4132	V	23.92	3.3	-2.93	24.29	38.45
			H	19.24	3.3	-2.94	19.61	38.45
	836.6	4183	V	28.62	3.29	-2.96	28.95	38.45
			H	18.45	3.29	-2.96	18.78	38.45
	846.6	4233	V	21.04	3.27	-2.99	21.32	38.45
			H	22.91	3.27	-3	23.19	38.45

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
HSUPA B5	826.4	4132	V	21.5	3.3	-2.93	21.87	38.45
			H	16.91	3.3	-2.93	17.28	38.45
	836.6	4183	V	26.07	3.29	-2.97	26.39	38.45
			H	17.93	3.29	-2.97	18.25	38.45
	846.6	4233	V	19.7	3.27	-3	19.98	38.45
			H	20.85	3.28	-2.99	21.13	38.45

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Remark :

- (1) The RBW,VBW of SPA for frequency RBW= 5MHz , VBW= 8MHz

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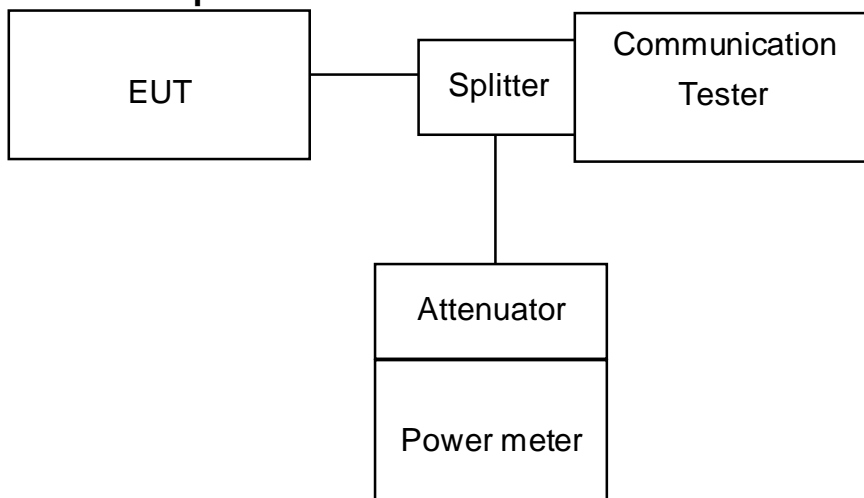
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8. OCCUPIED BANDWIDTH MEASUREMENT

8.1. Standard Applicable

The occupied bandwidth 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.

8.2. Test Set-up



8.3. Measurement Procedure

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

NOTE: For the plot of bandwidth measurement, the marker of the 99% bandwidth is diamond-shape while the marker of the 26dB BW is arrow-mark

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8.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018
Coaxial Cable	HU-BER+SUHNER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2017	02/10/2018
Radio Communication Analyzer	Anritsu	MT8820C	6201465317	01/03/2017	01/02/2018

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8.5. Measurement Result

Frequency (MHz)	CH	99% Bandwidth (MHz)	99% Bandwidth (MHz)
		GSM 850	GPRS 850
824.2	128	0.24518	0.24008
836.6	190	0.24682	0.24537
848.8	251	0.245	0.23983

Frequency (MHz)	CH	99% Bandwidth (MHz)	99% Bandwidth (MHz)
		GSM 1900	GPRS 1900
1850.2	512	0.24378	0.242
1880	661	0.24668	0.24368
1909.8	810	0.24477	0.24601

Frequency (MHz)	CH	26dB Bandwidth (MHz)	26dB Bandwidth (MHz)
		GSM 850	GPRS 850
824.2	128	0.317	0.311
836.6	190	0.319	0.319
848.8	251	0.318	0.314

Frequency (MHz)	CH	26dB Bandwidth (MHz)	26dB Bandwidth (MHz)
		GSM 1900	GPRS 1900
1850.2	512	0.318	0.314
1880	661	0.319	0.322
1909.8	810	0.323	0.319

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Frequency (MHz)	CH	99% Bandwidth (MHz)	99% Bandwidth (MHz)	99% Bandwidth (MHz)
		WCDMA V	HSDPA V	HSUPA V
826.4	4132	4.1320	4.1381	4.1273
836.6	4183	4.1329	4.1298	4.1380
846.6	4233	4.1342	4.1348	4.1353

Frequency (MHz)	CH	26dB Bandwidth (MHz)	26dB Bandwidth (MHz)	26dB Bandwidth (MHz)
		WCDMA V	HSDPA V	HSUPA V
826.4	4132	4.693	4.699	4.691
836.6	4183	4.681	4.698	4.691
846.6	4233	4.689	4.684	4.681

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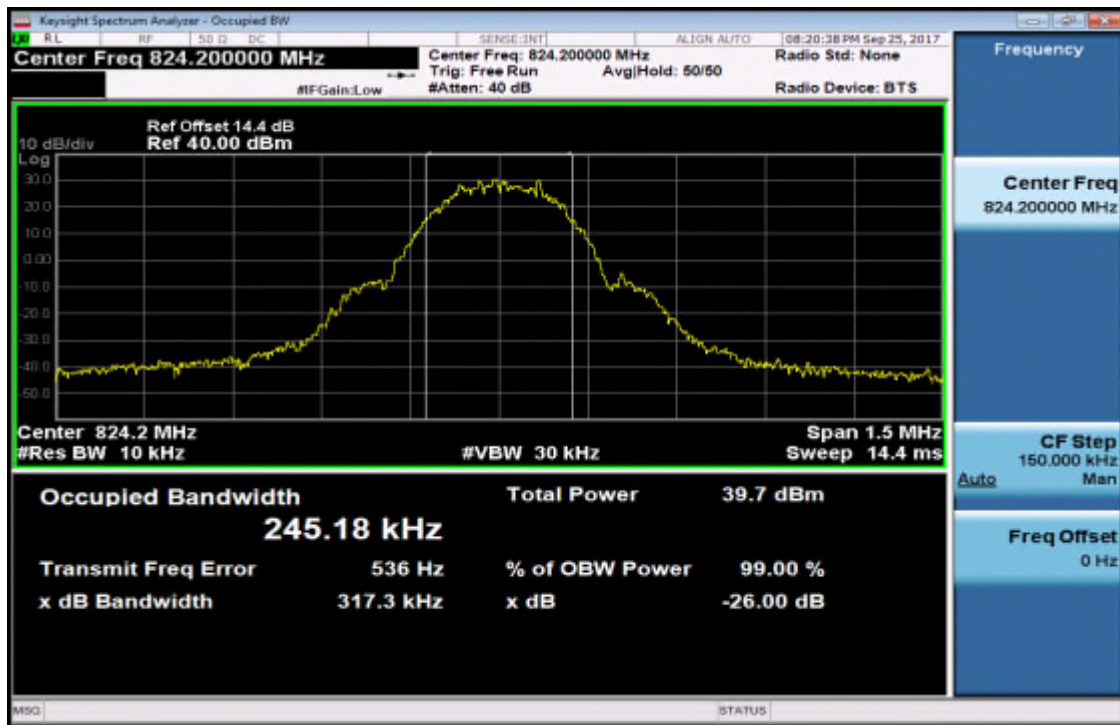
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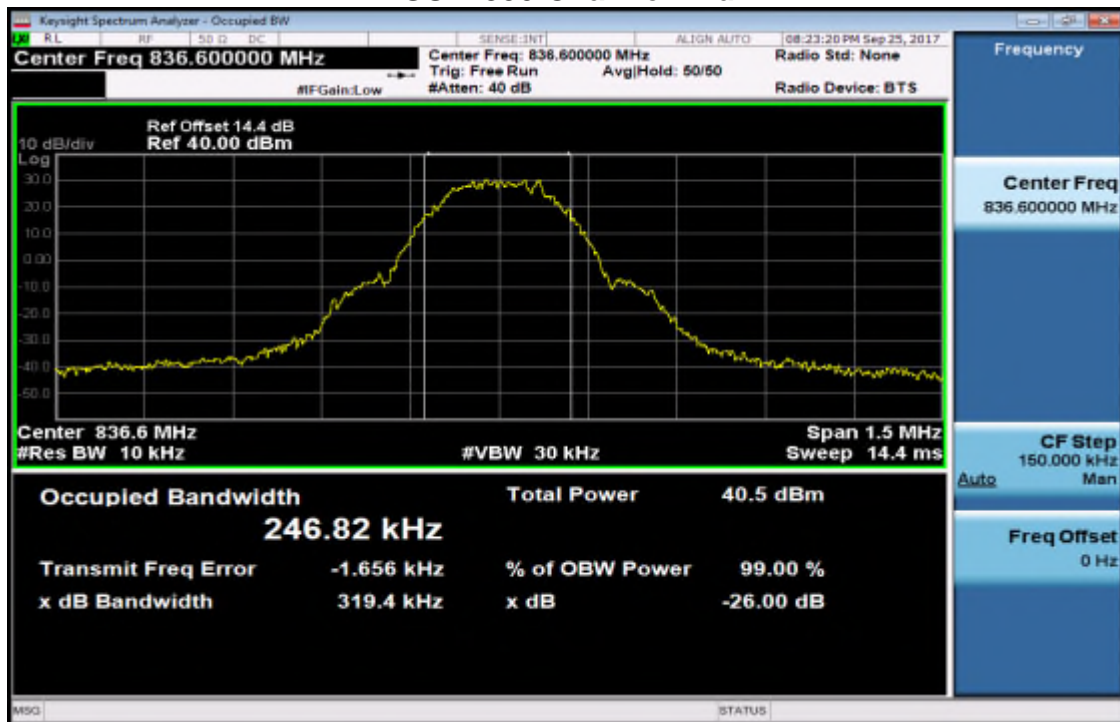
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99% & 26dB Bandwidth Test Data

GSM 850 Channel Low



GSM 850 Channel Mid



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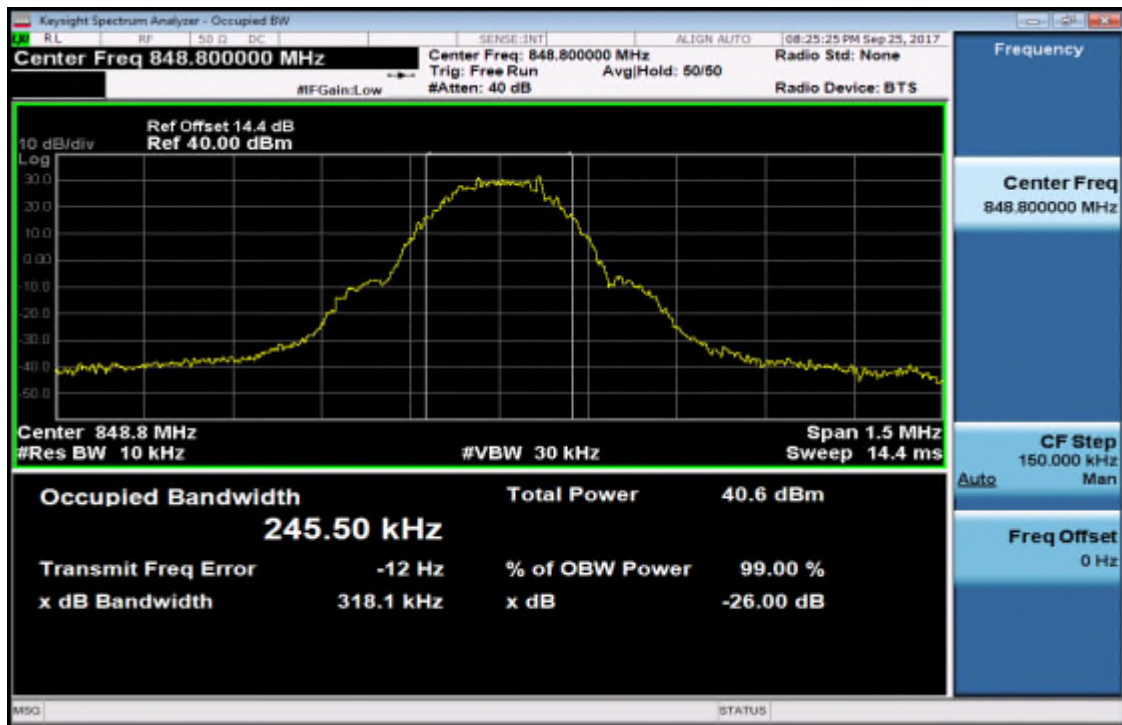
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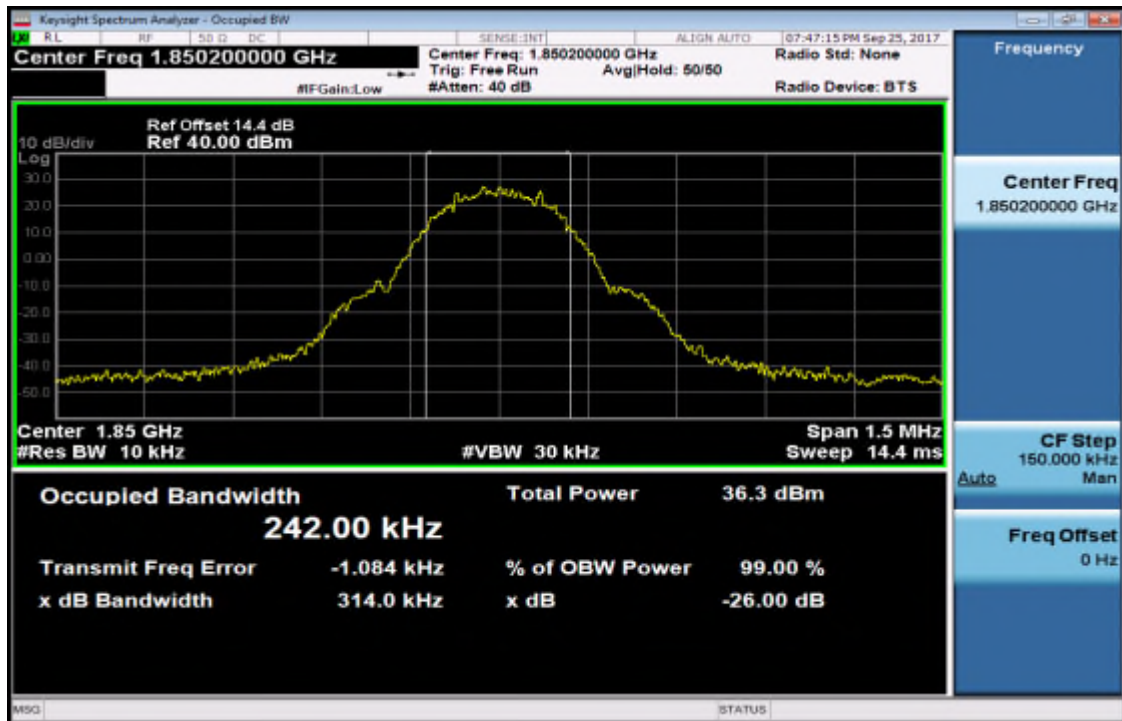
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GSM 850 Channel High



GSM 1900 Channel Low



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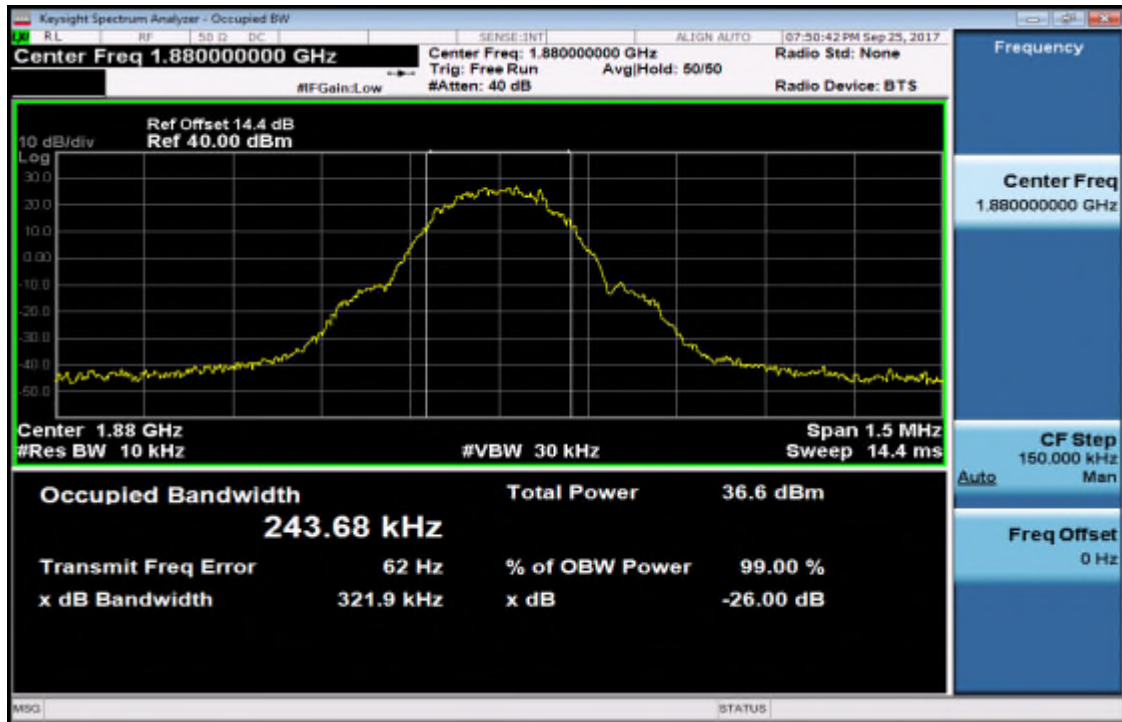
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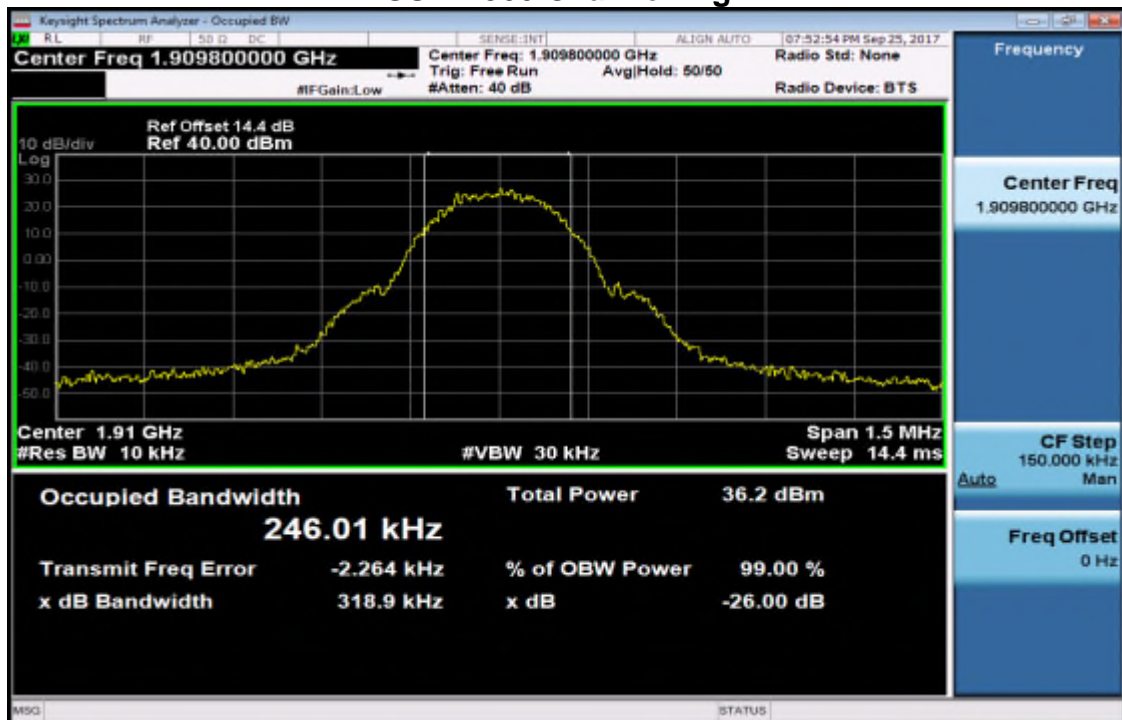
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GSM 1900 Channel Mid



GSM 1900 Channel High



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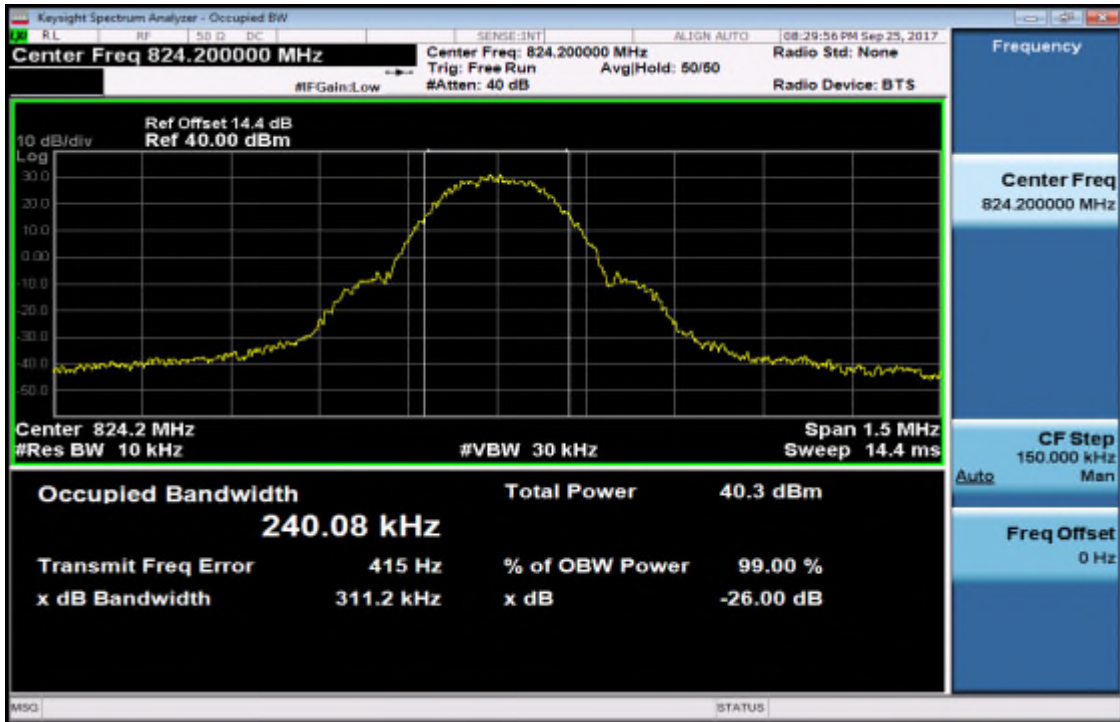
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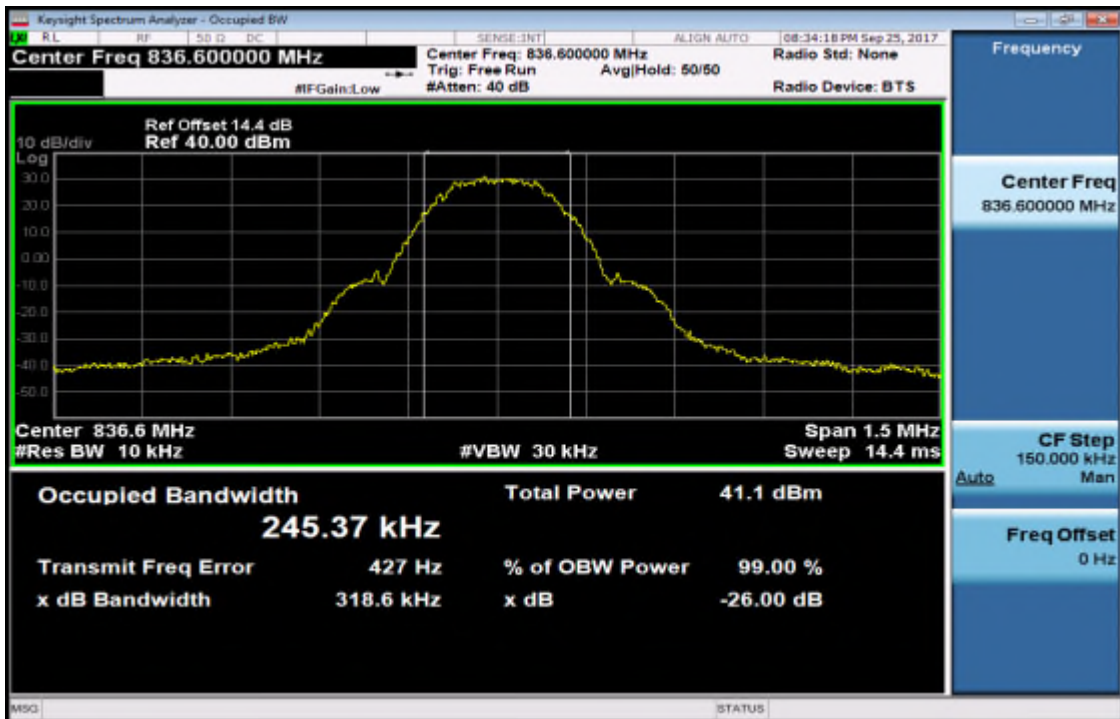
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GPRS 850 Channel Low



GPRS 850 Channel Mid



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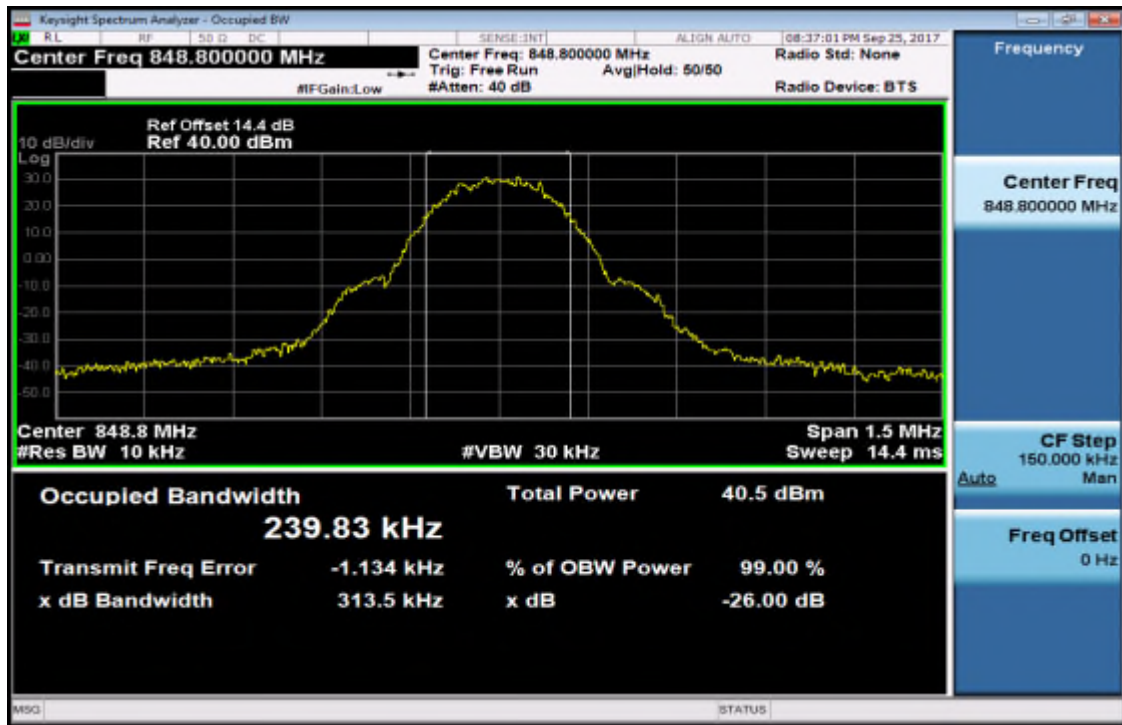
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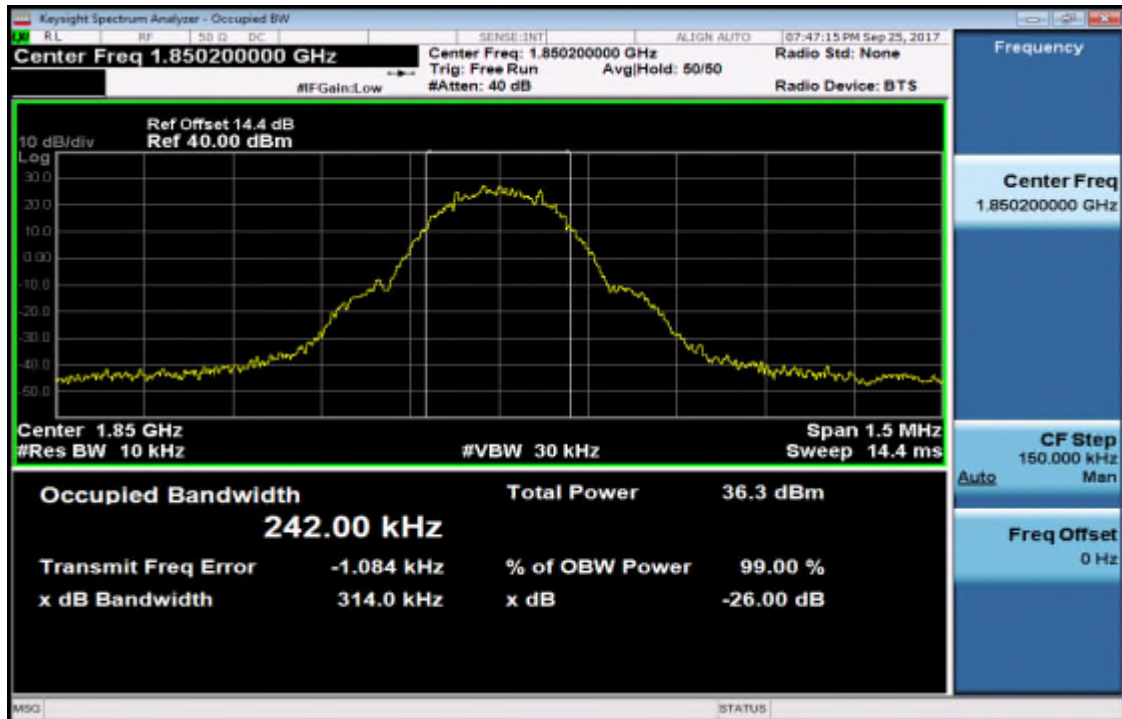
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GPRS 850 Channel High



GPRS 1900 Channel Low



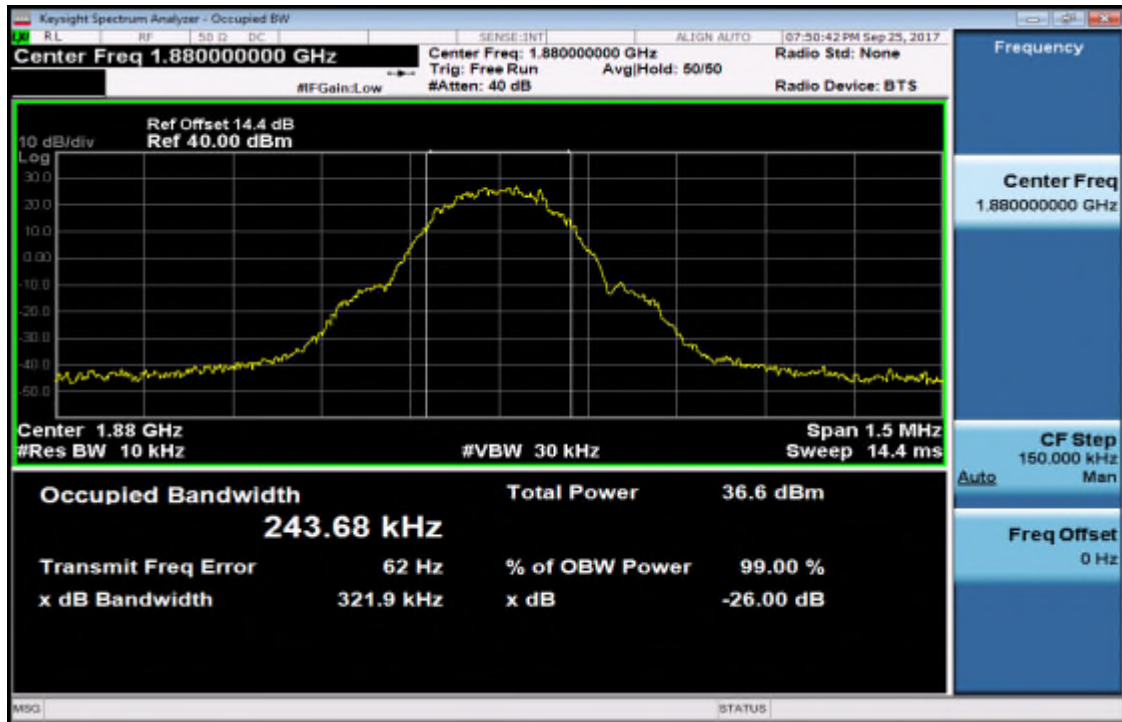
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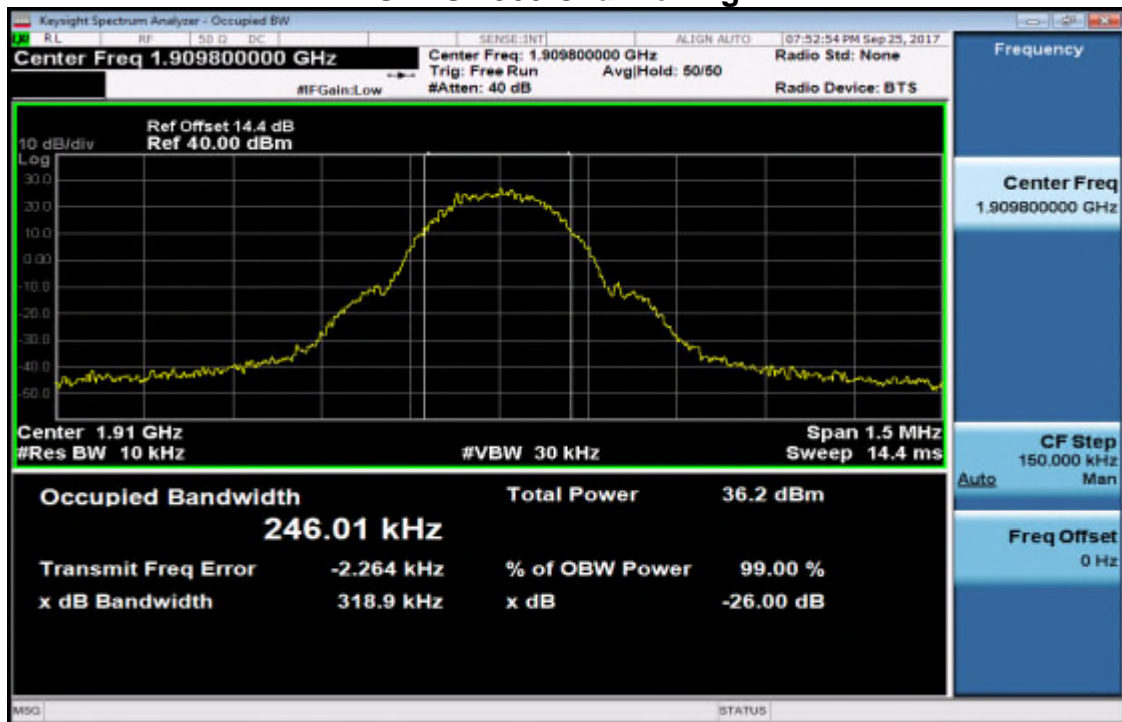
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GPRS 1900 Channel Mid



GPRS 1900 Channel High



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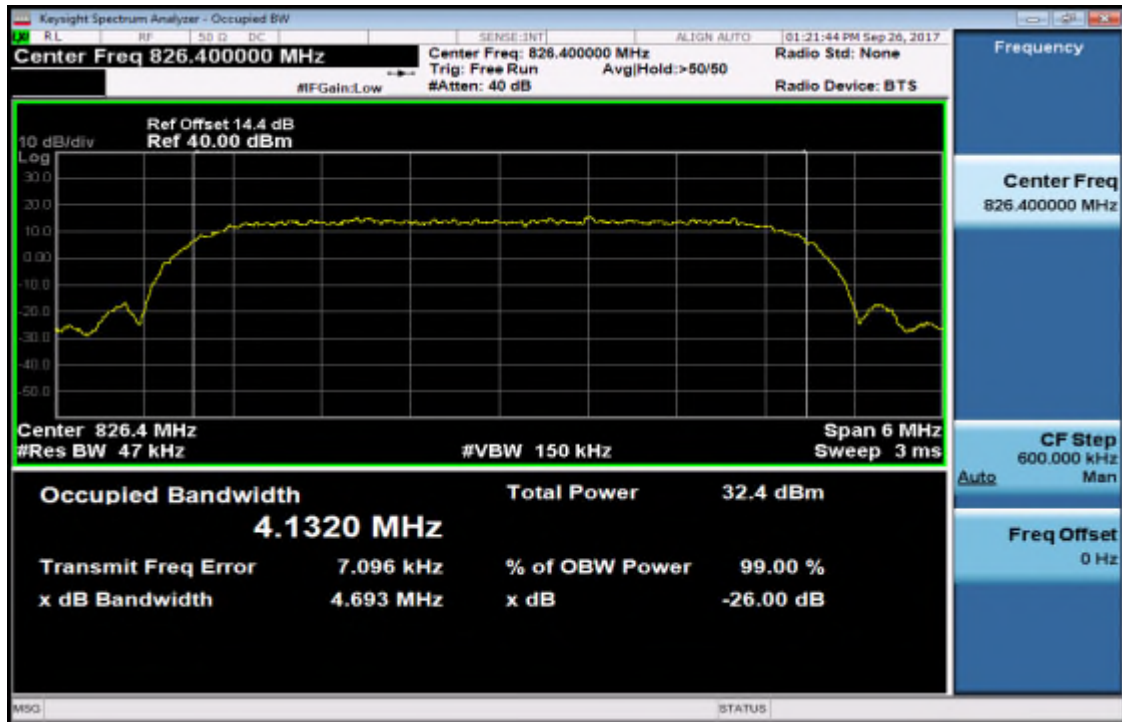
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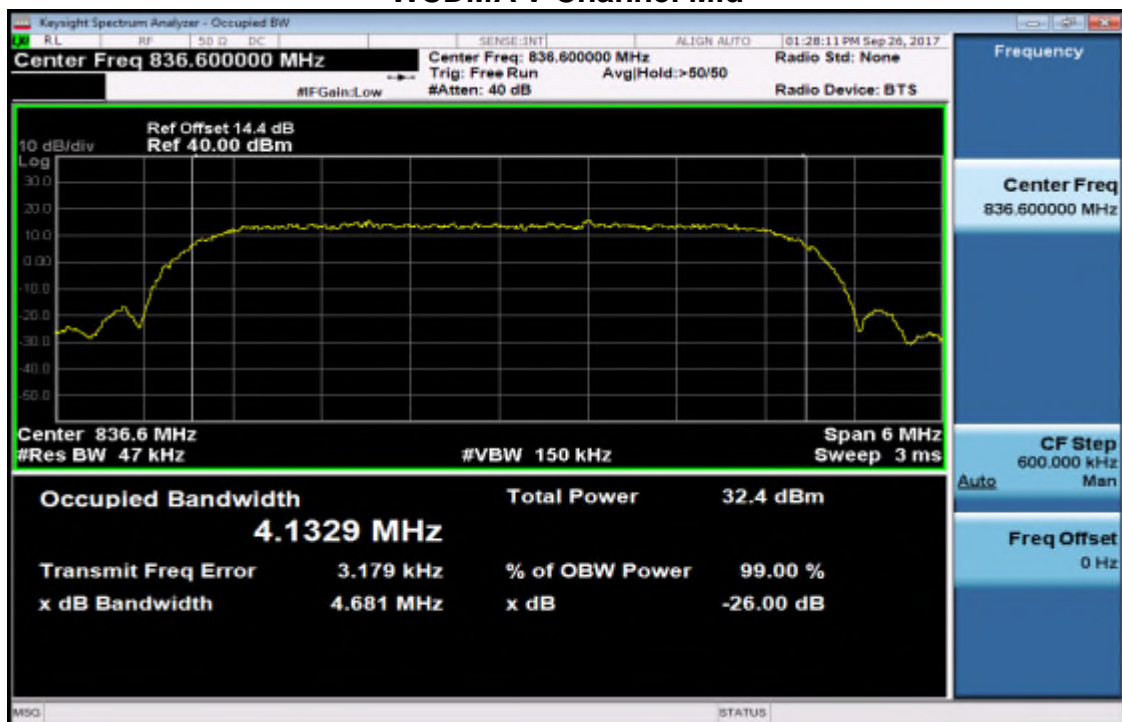
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WCDMA V Channel Low



WCDMA V Channel Mid



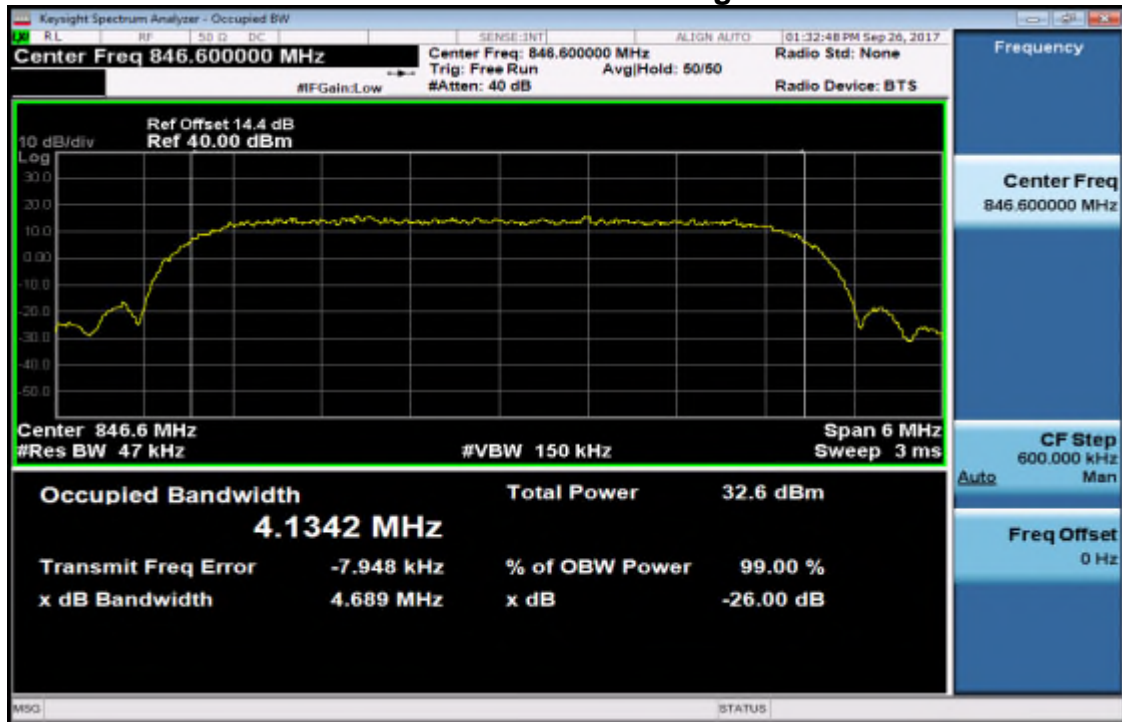
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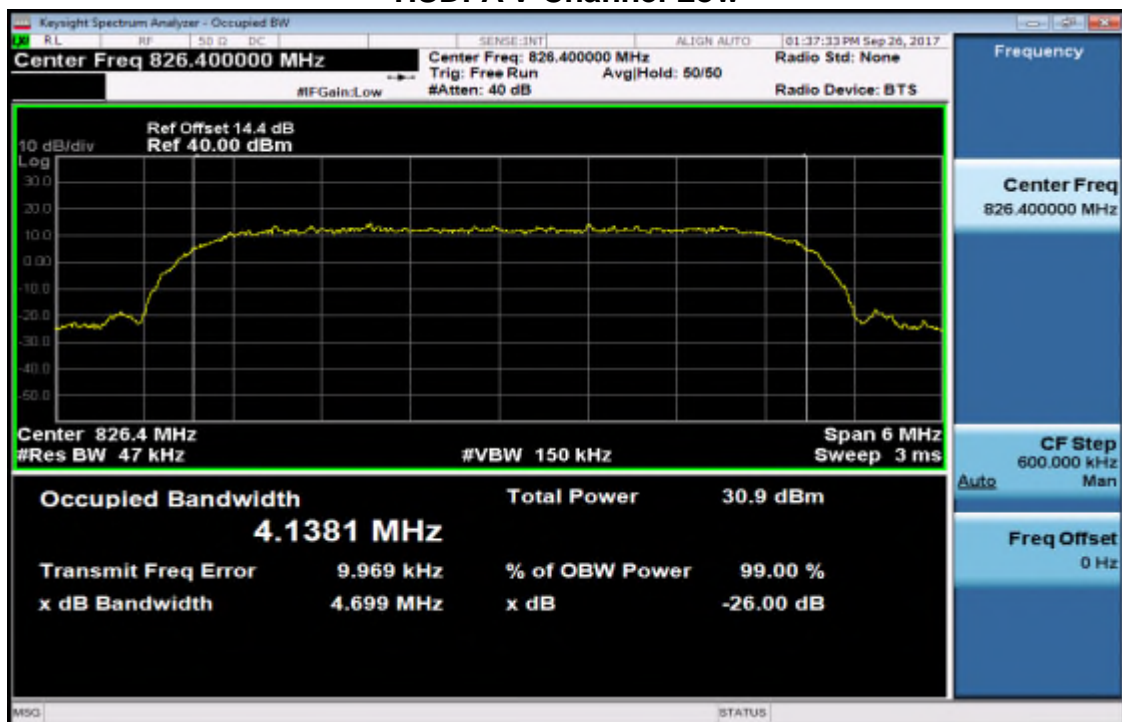
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WCDMA V Channel High



HSDPA V Channel Low



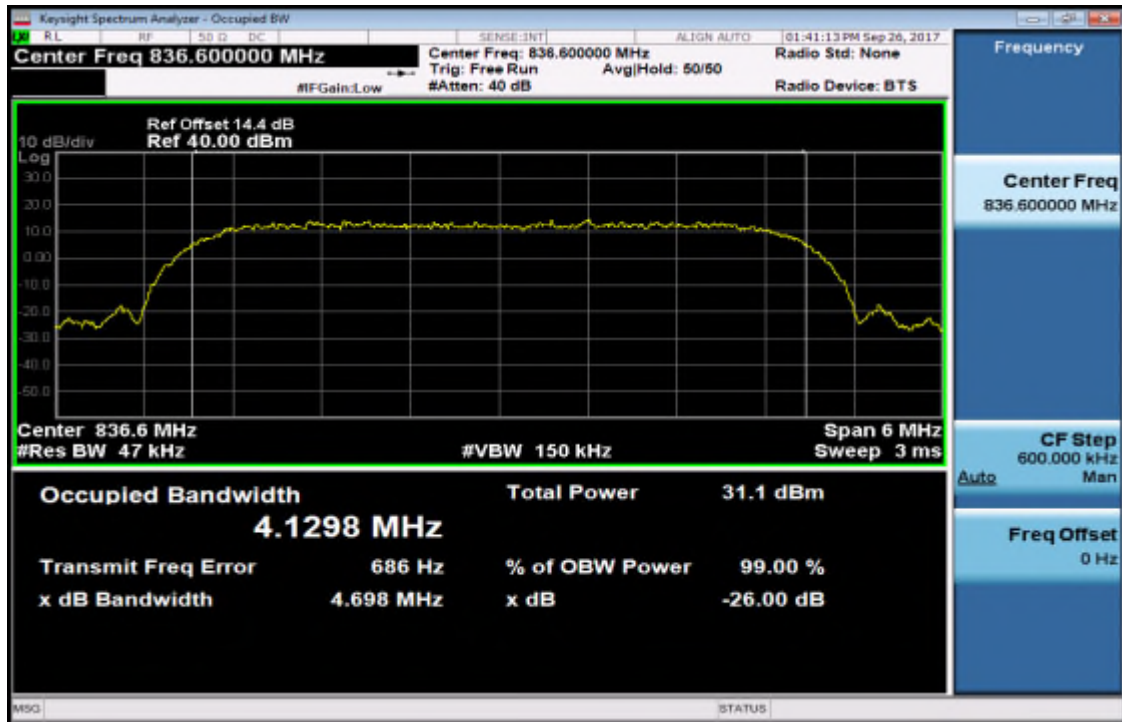
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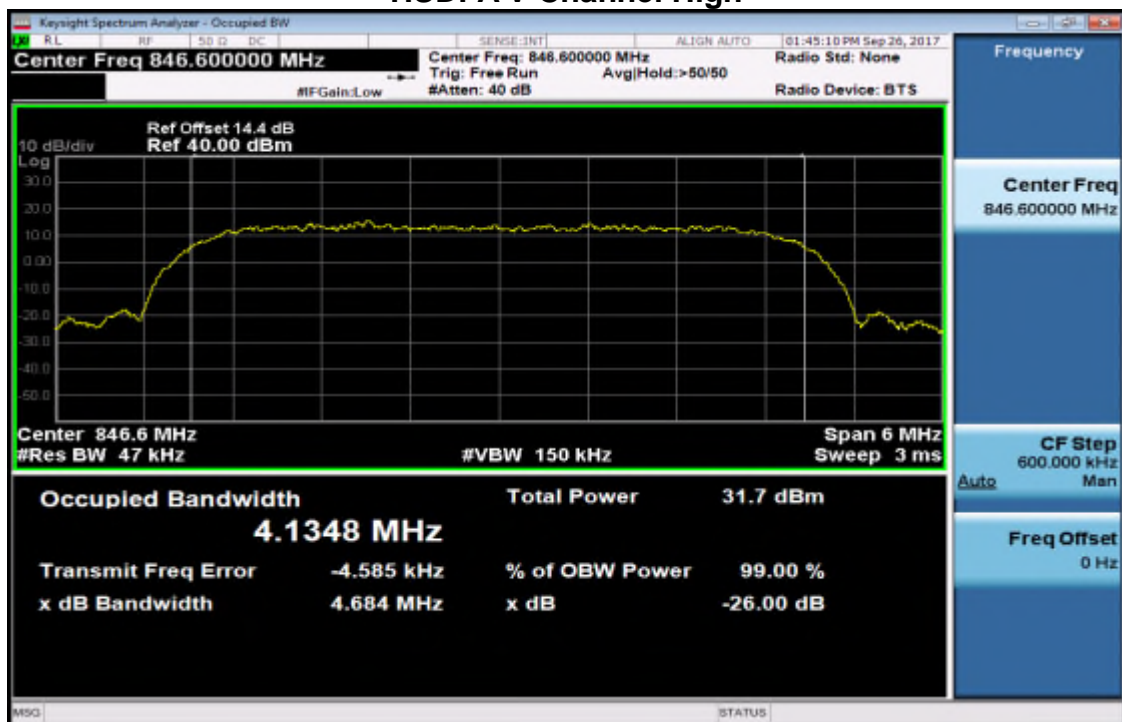
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HSDPA V Channel Mid



HSDPA V Channel High



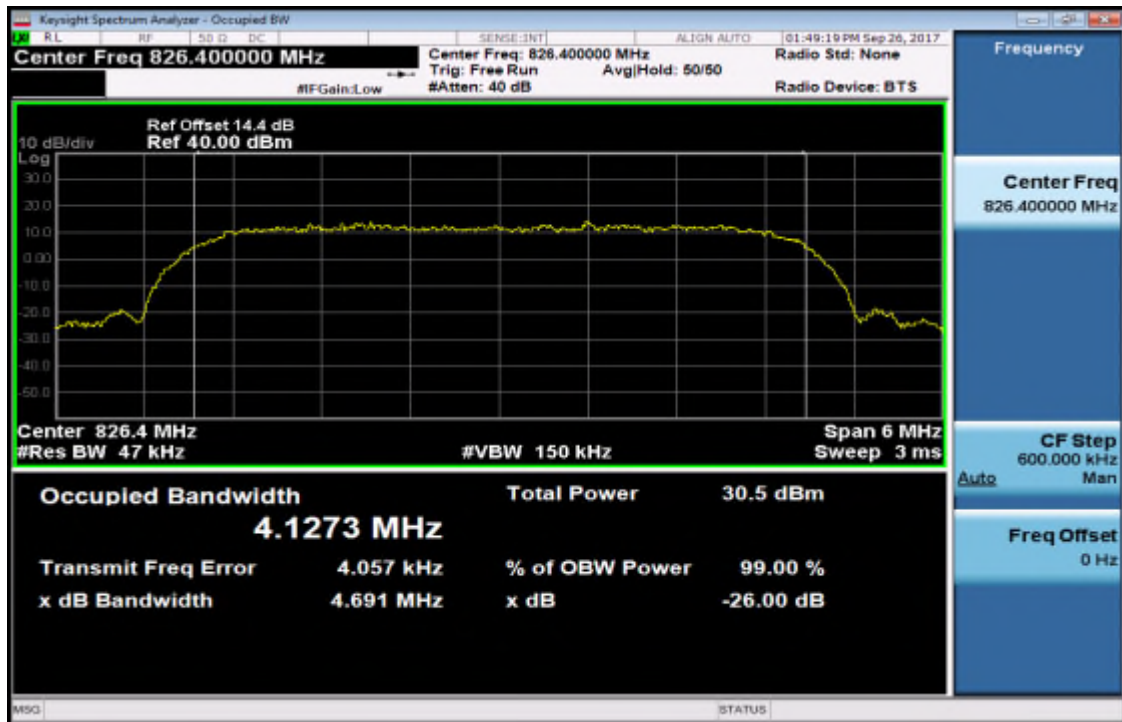
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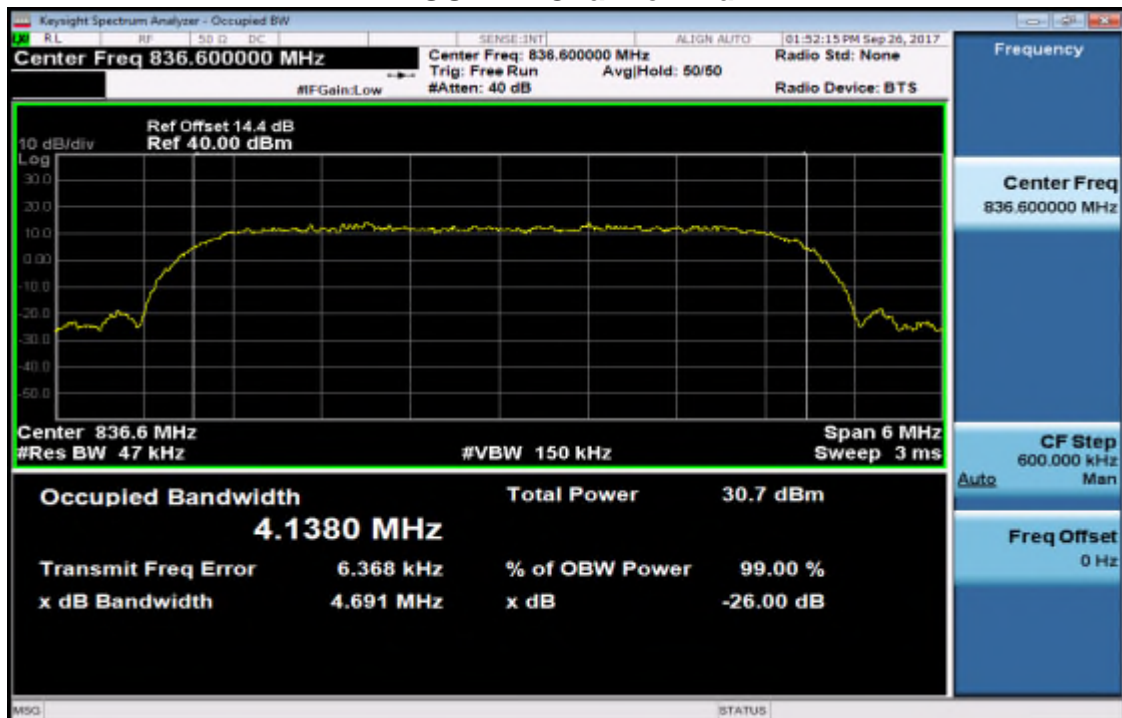
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HSUPA V Channel Low



HSUPA V Channel Mid



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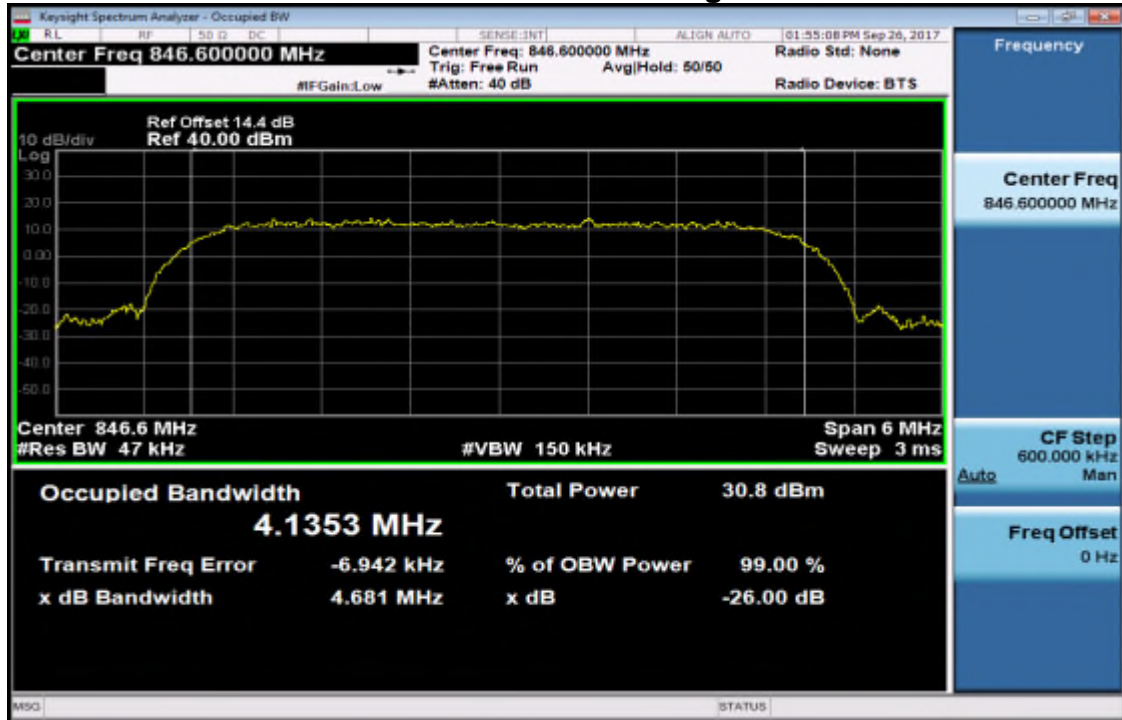
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HSUPA V Channel High



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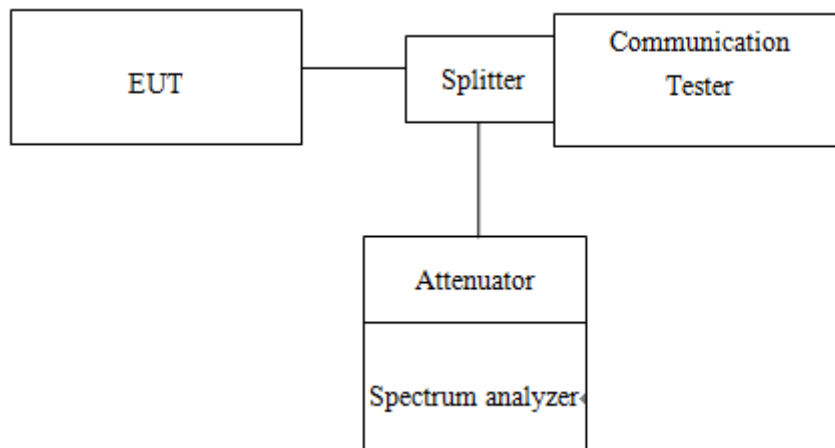
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9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

9.1. Standard Applicable

FCC §22.917(a), §24.238(a), the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than $43 + 10 \log$ (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

9.2. Test SET-UP



9.3. Measurement Procedure

Conducted Emission

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

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Band Edge

1. To connect Antenna Port of EUT to Spectrum.
2. The band edge of low and high channels for the highest RF powers was measured. Setting RBW \geq 1% EBW.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

9.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018
Coaxial Cable	HU-BER+SUHNER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2017	02/10/2018
Radio Communication Analyzer	Anritsu	MT8820C	6201465317	01/03/2017	01/02/2018

9.5. Measurement Result:

Refer to next pages.

NOTE: The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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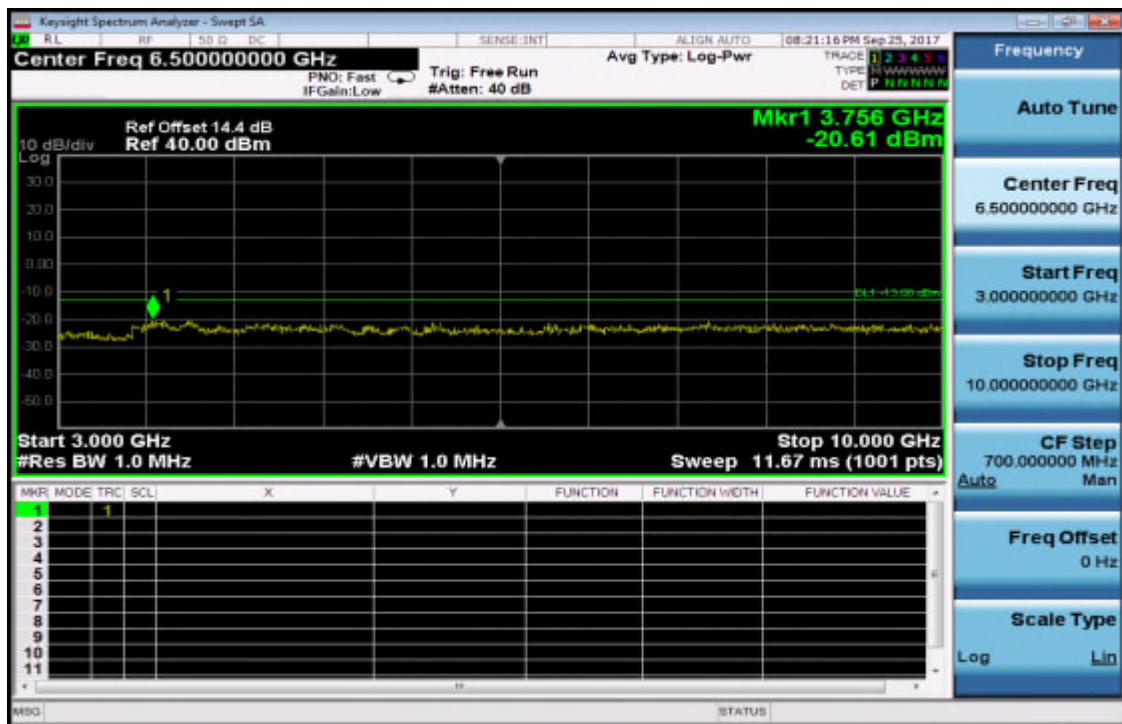
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Out of Band emission at antenna terminals – GSM 850 Channel Lowest



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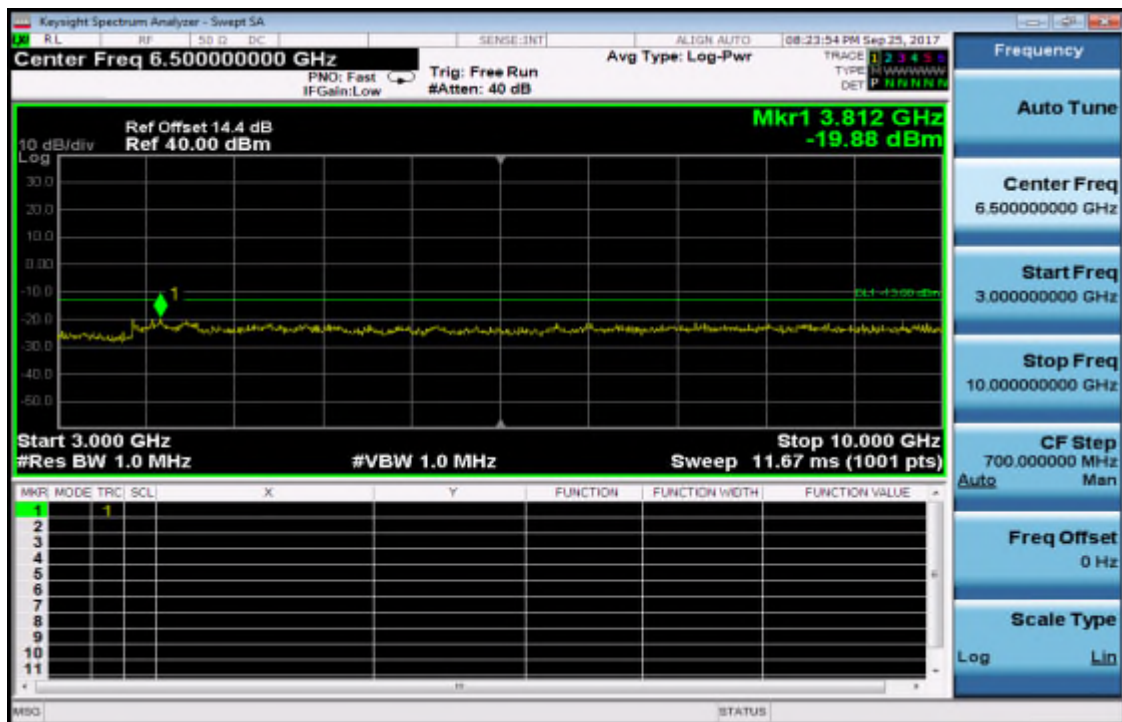
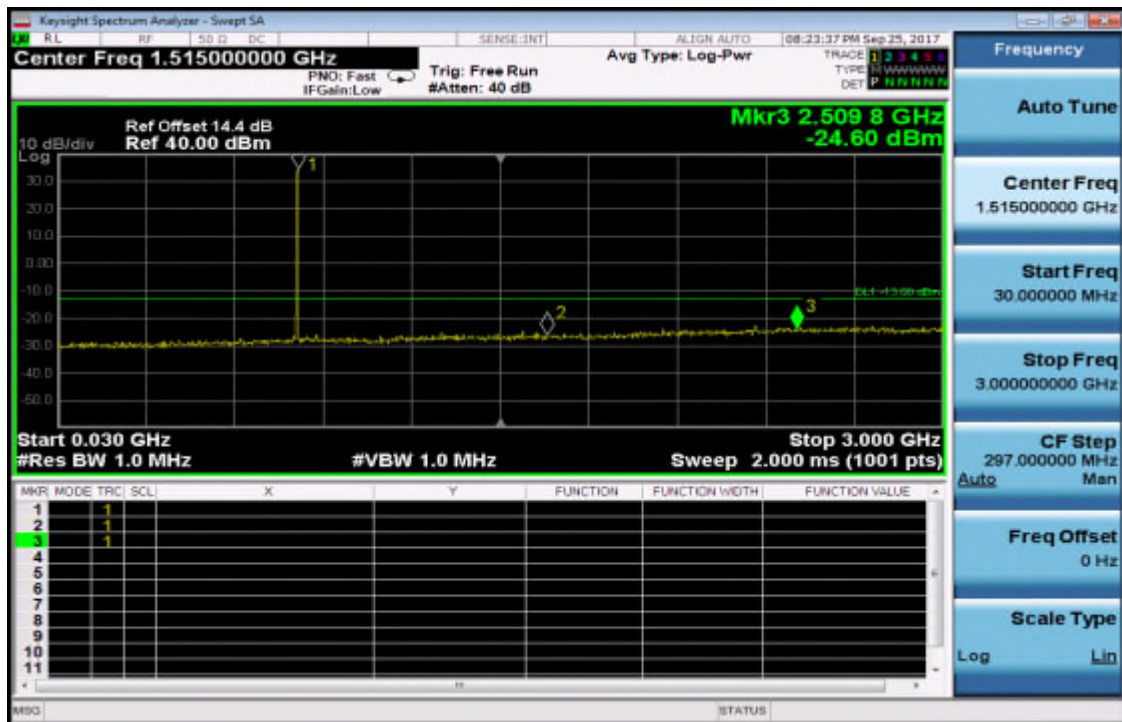
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Out of Band emission at antenna terminals – GSM 850 Channel Mid



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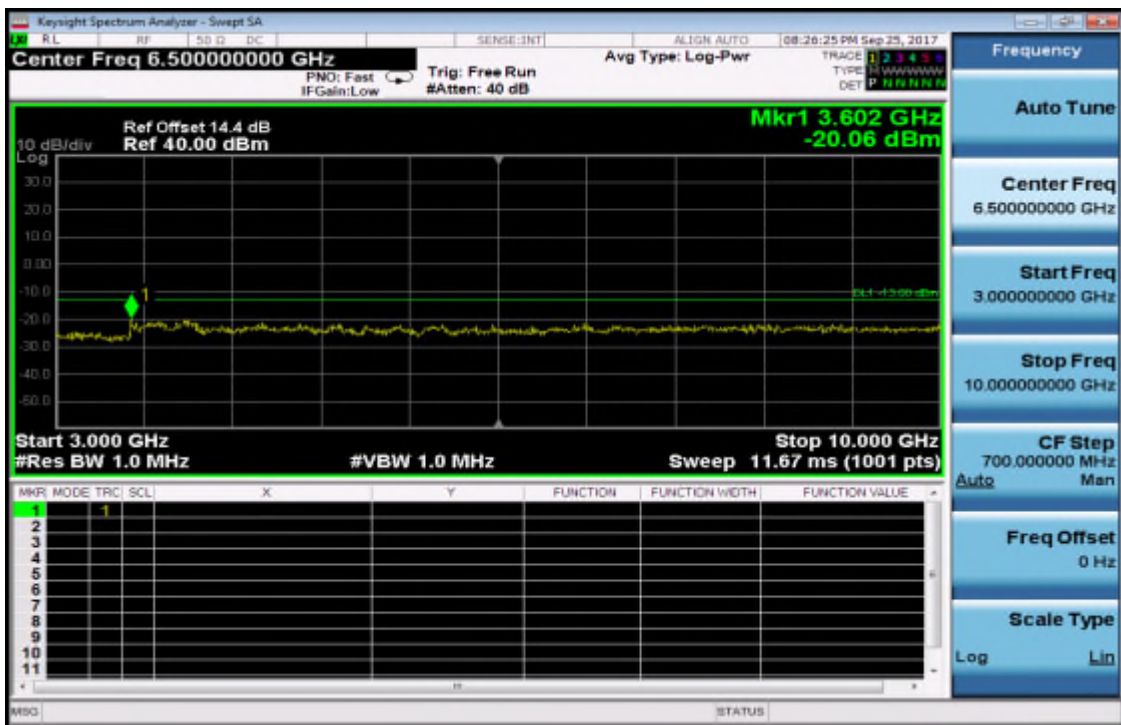
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Out of Band emission at antenna terminals – GSM 850 Channel Highest



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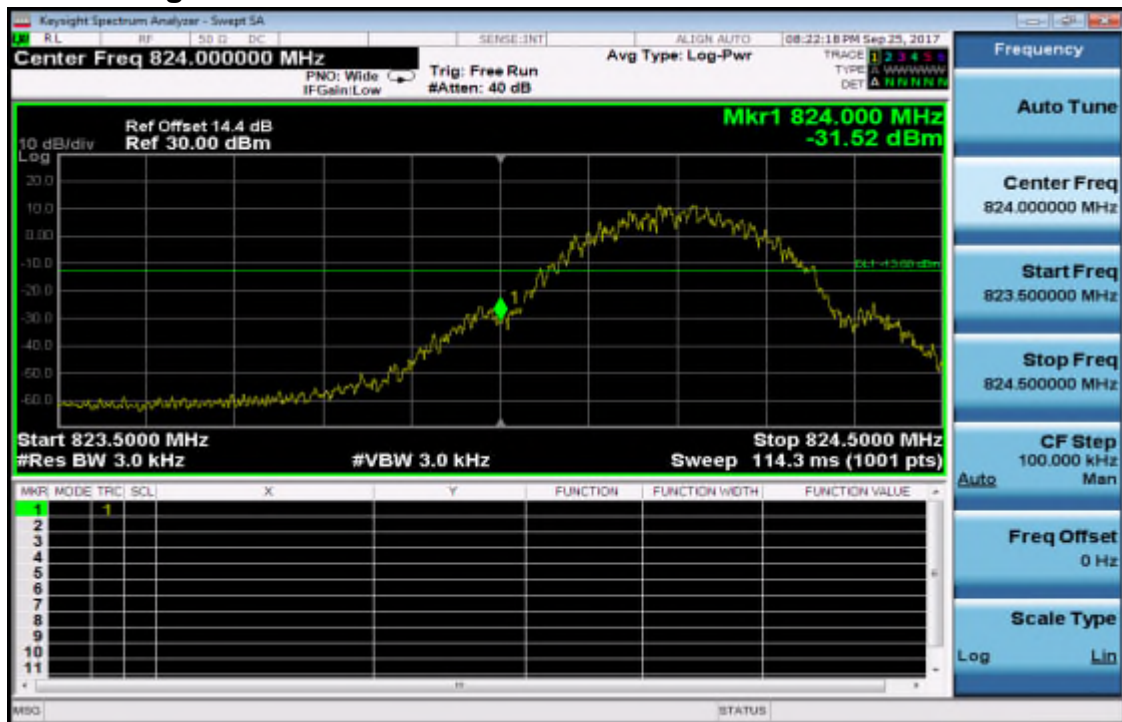
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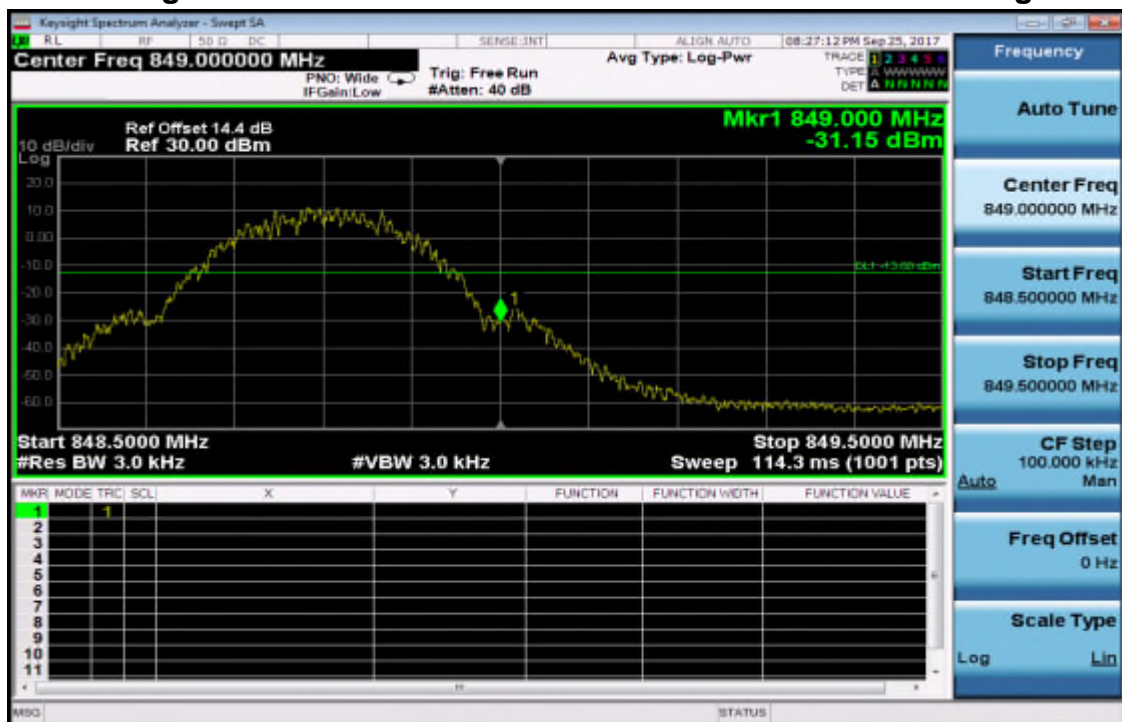
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Band edge emission at antenna terminals – GSM 850 Channel Lowest



Band edge emission at antenna terminals – GSM 850 Channel Highest



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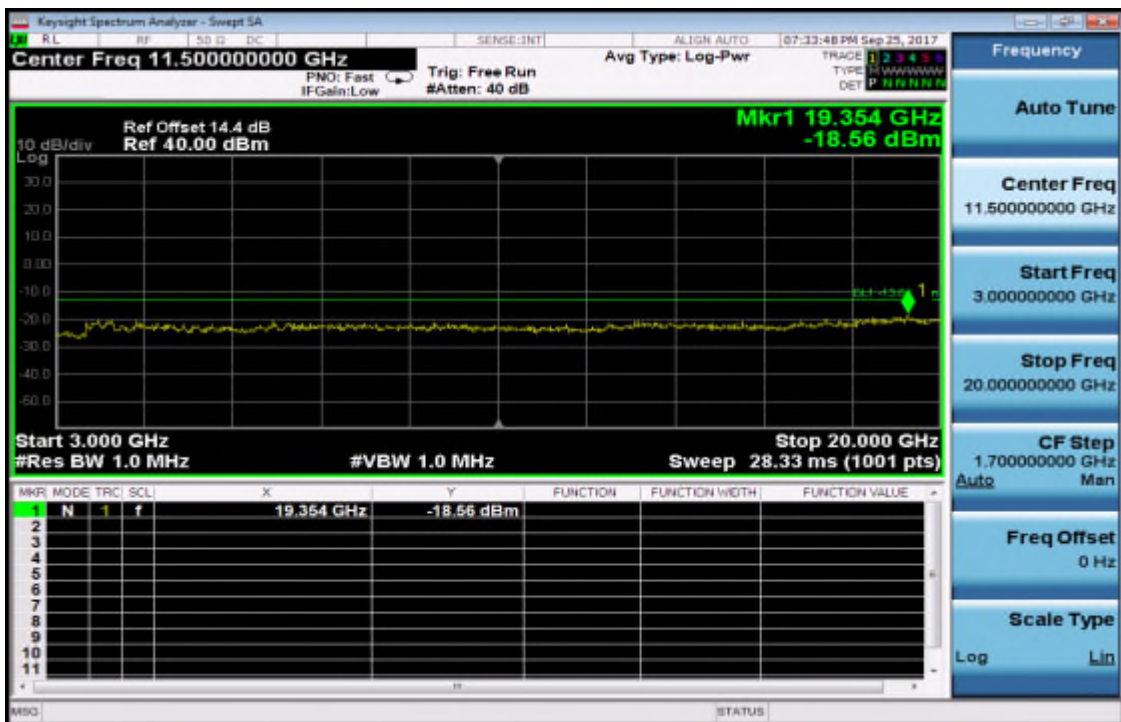
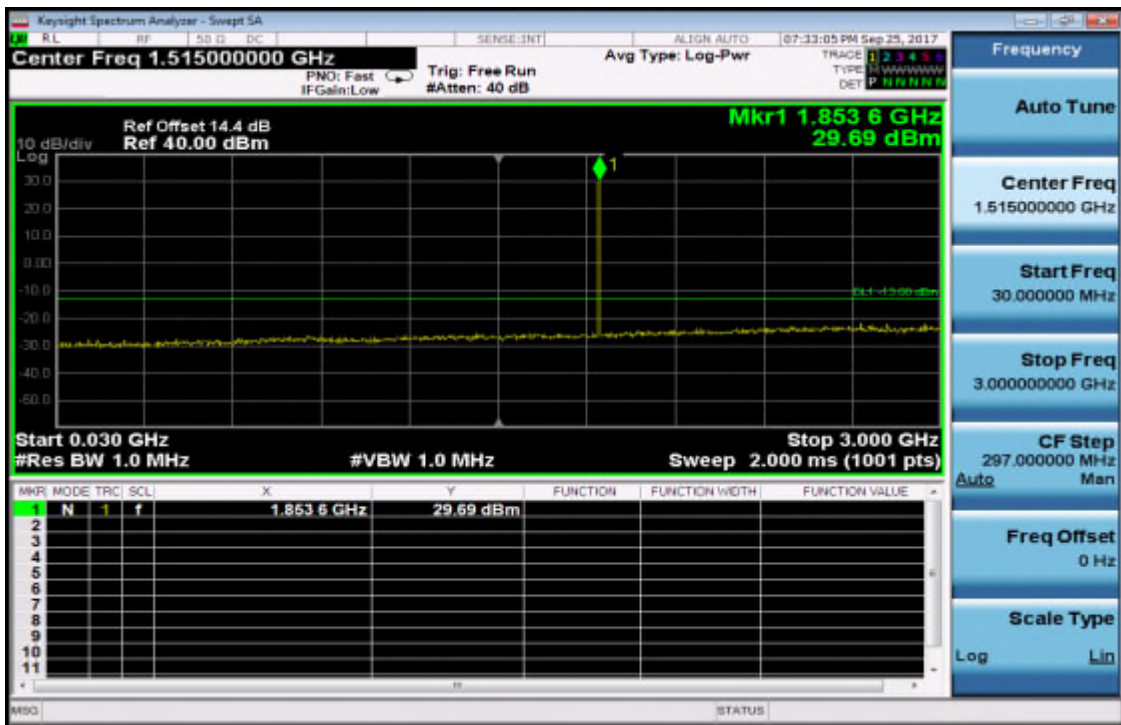
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Out of Band emission at antenna terminals – GSM 1900 Channel Lowest



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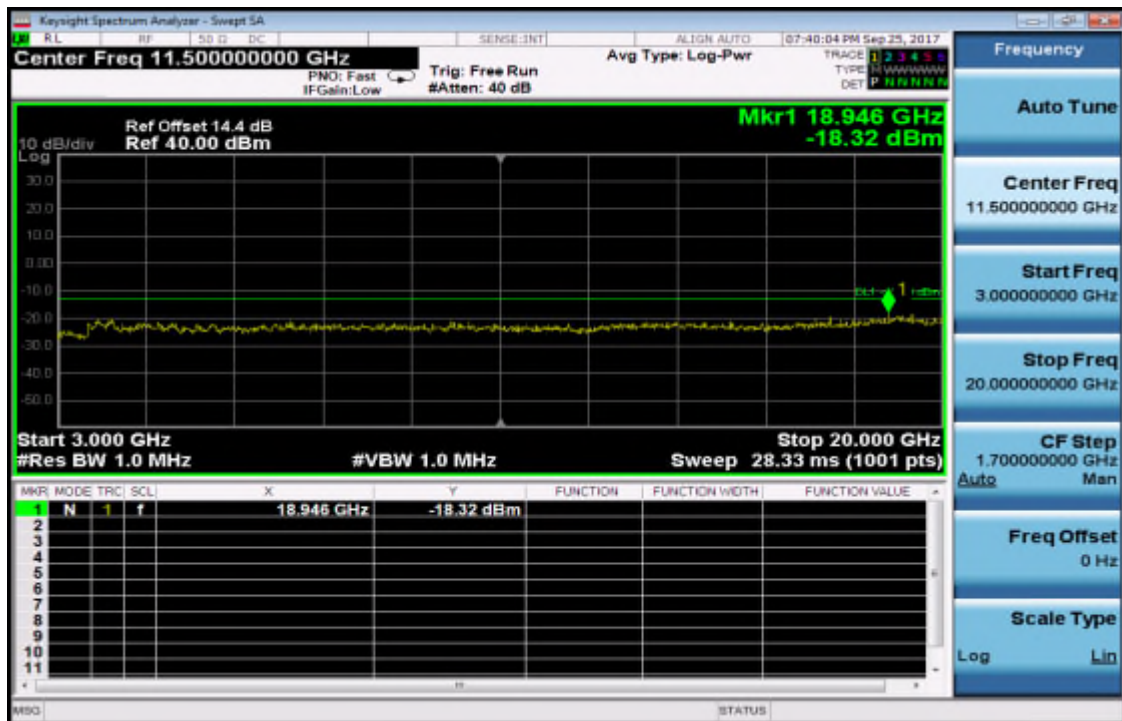
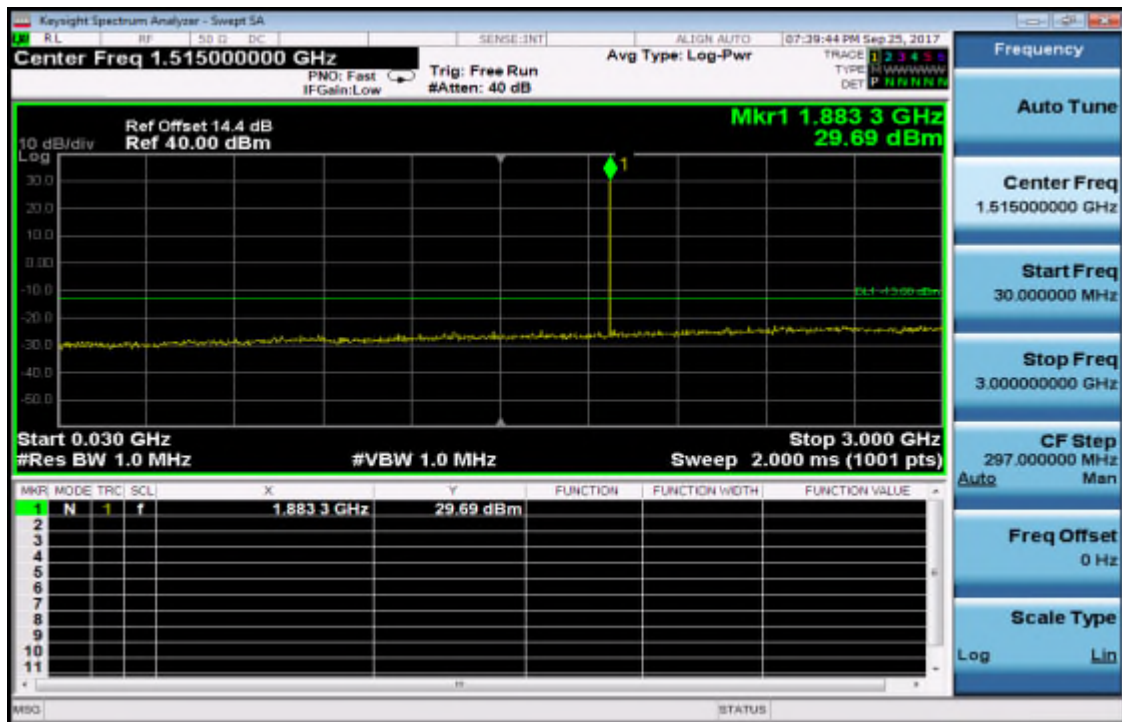
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Out of Band emission at antenna terminals – GSM 1900 Channel Mid



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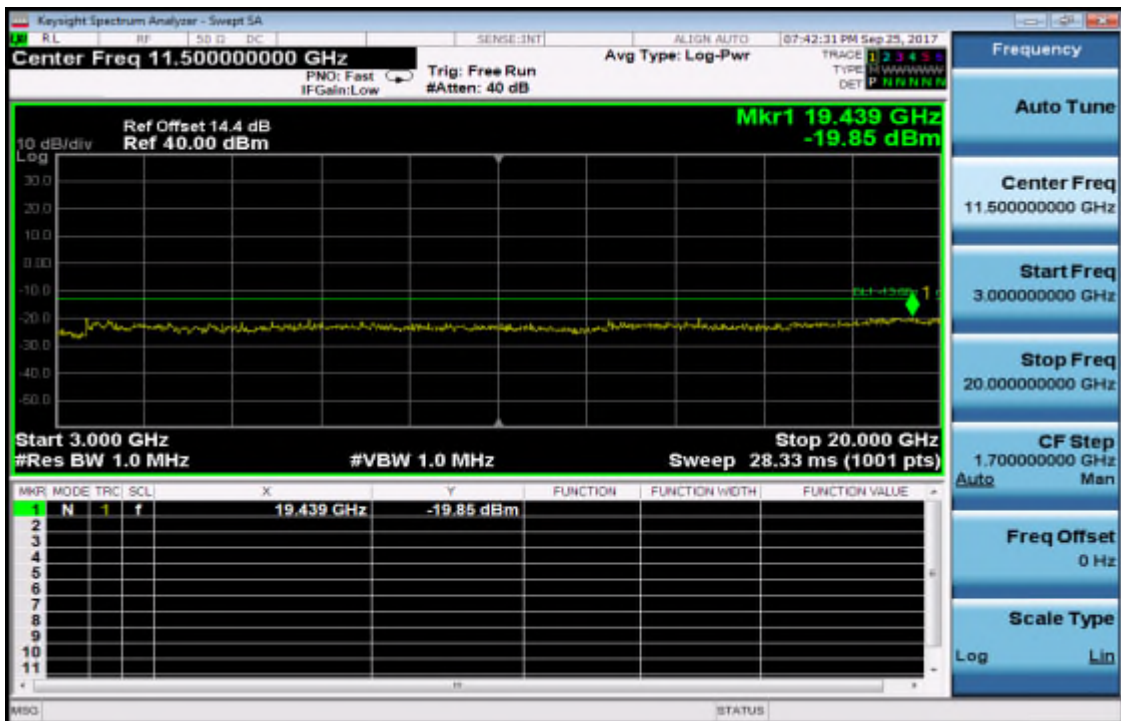
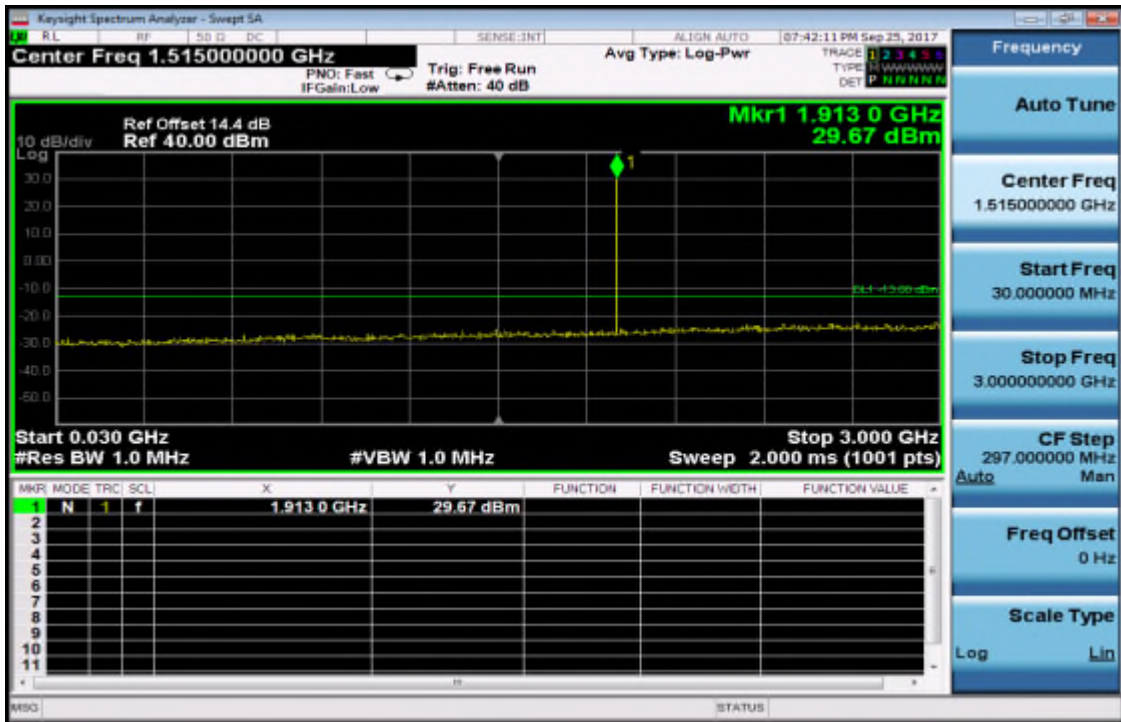
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Out of Band emission at antenna terminals – GSM 1900 Channel Highest



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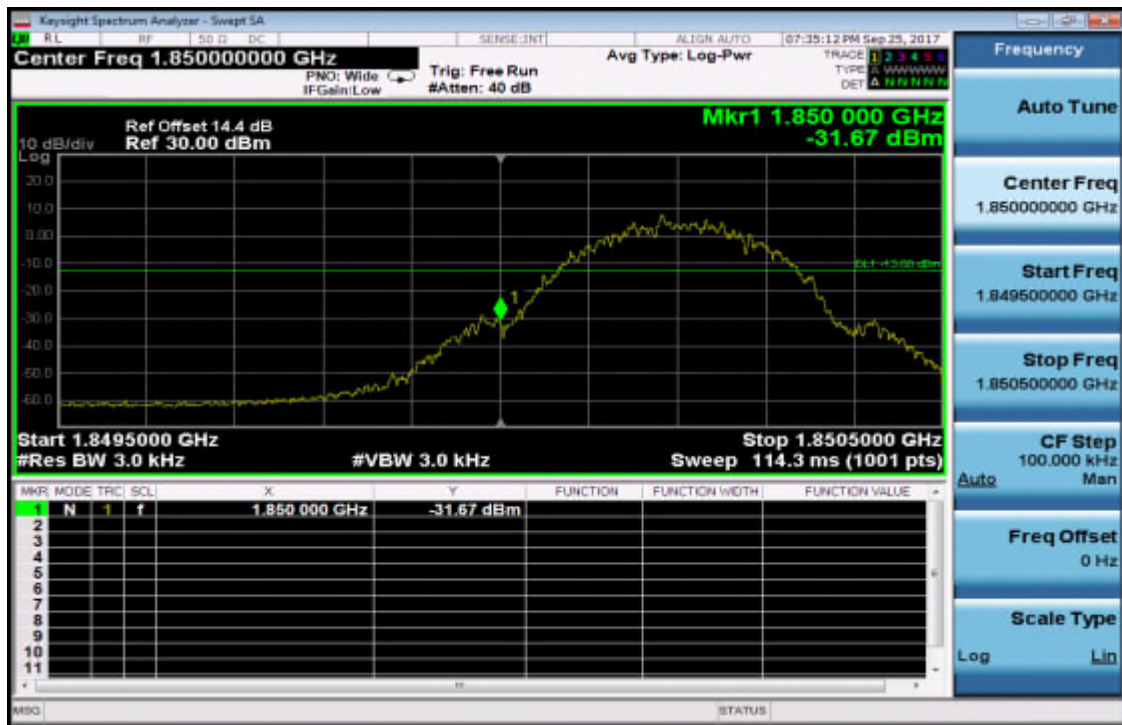
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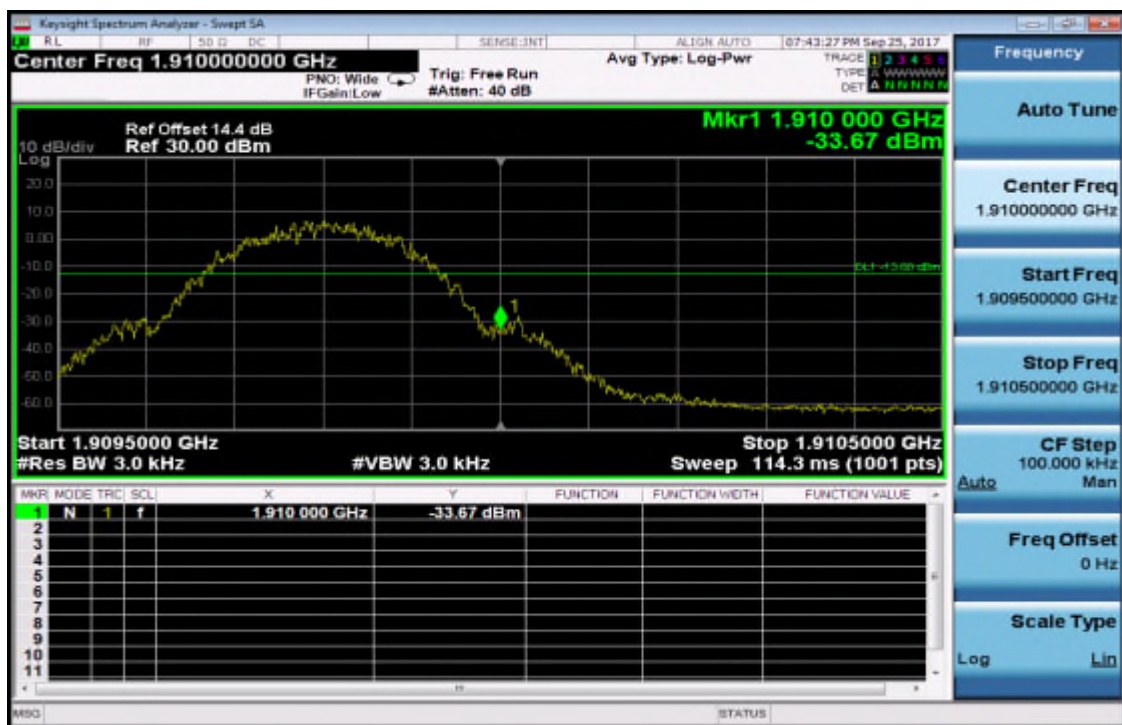
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Band edge emission at antenna terminals – GSM 1900 Channel Lowest



Band edge emission at antenna terminals – GSM 1900 Channel Highest



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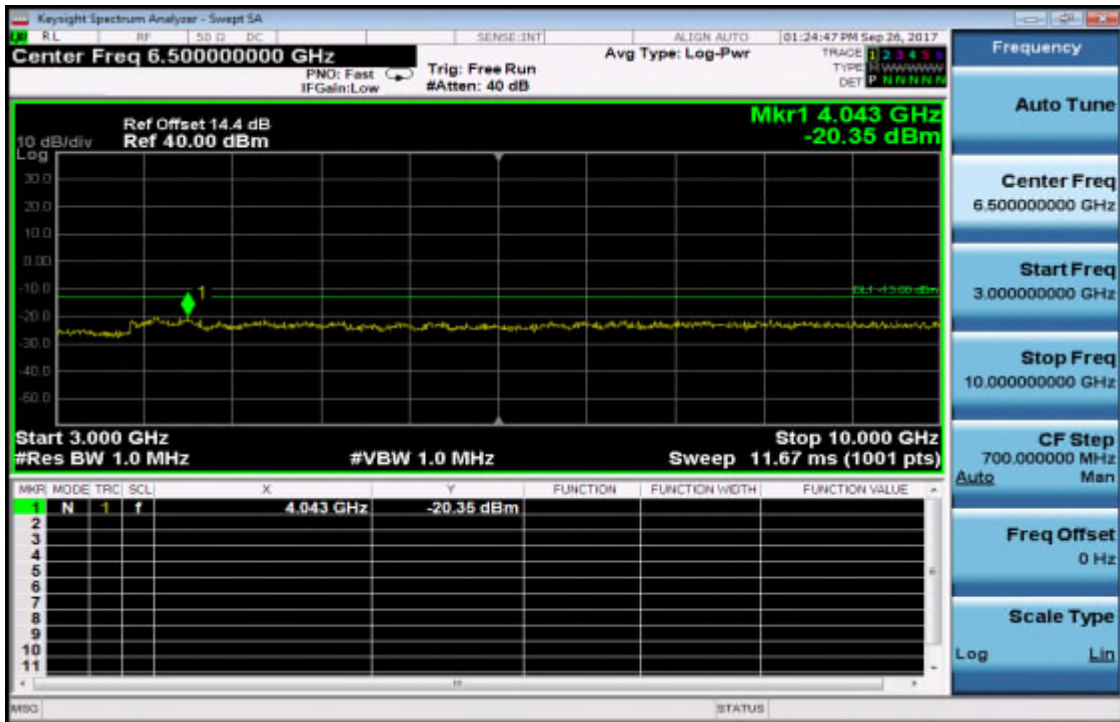
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Out of Band emission at antenna terminals – WCDMA V Channel Lowest



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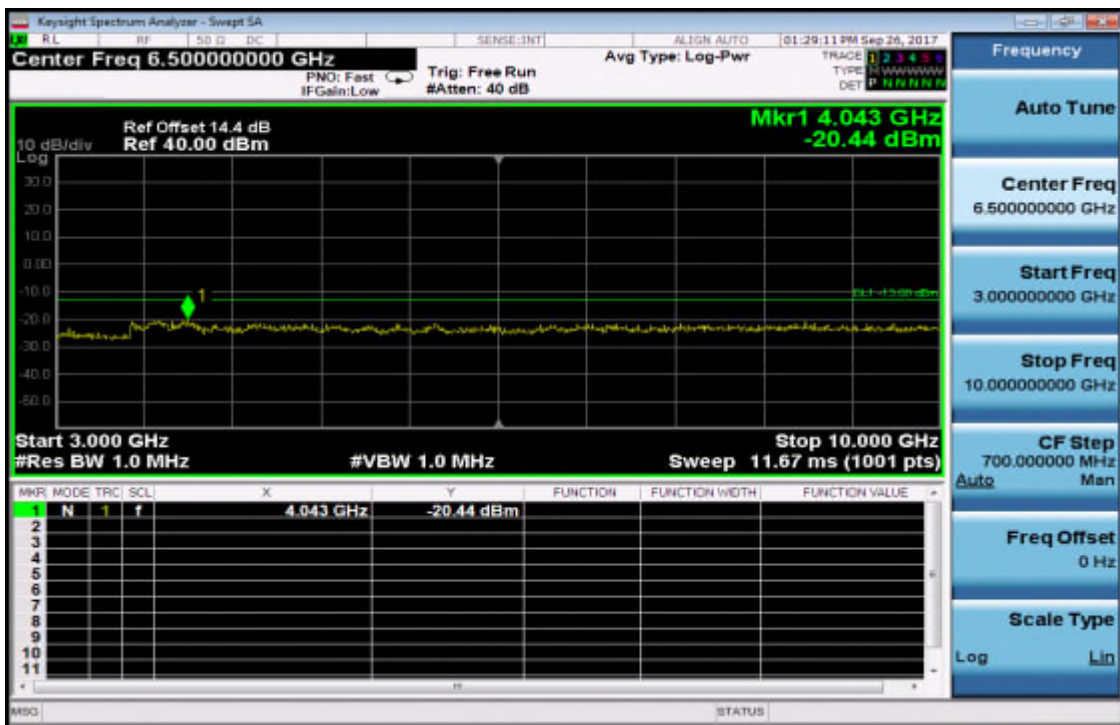
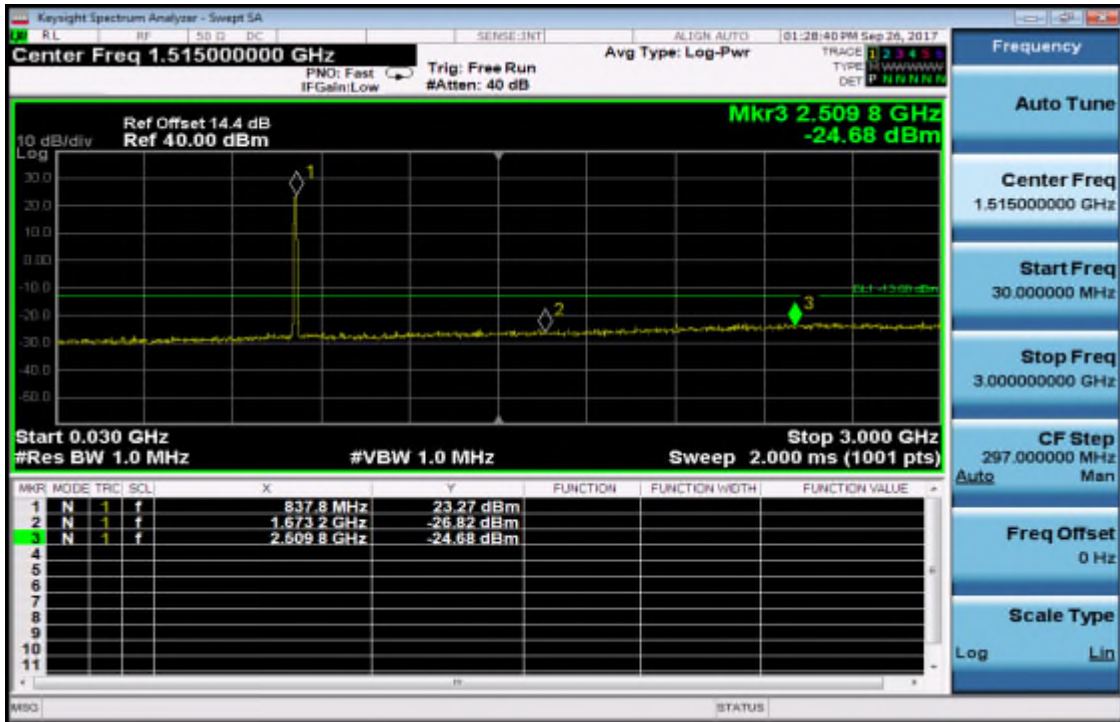
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Out of Band emission at antenna terminals – WCDMA V Channel Mid



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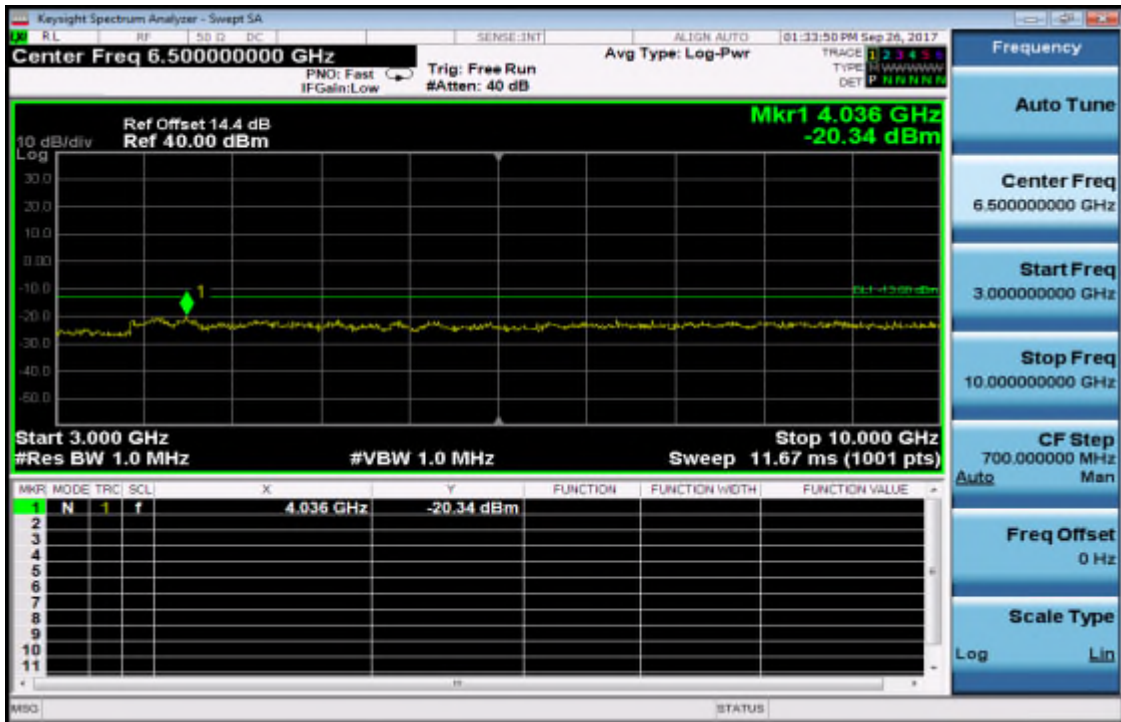
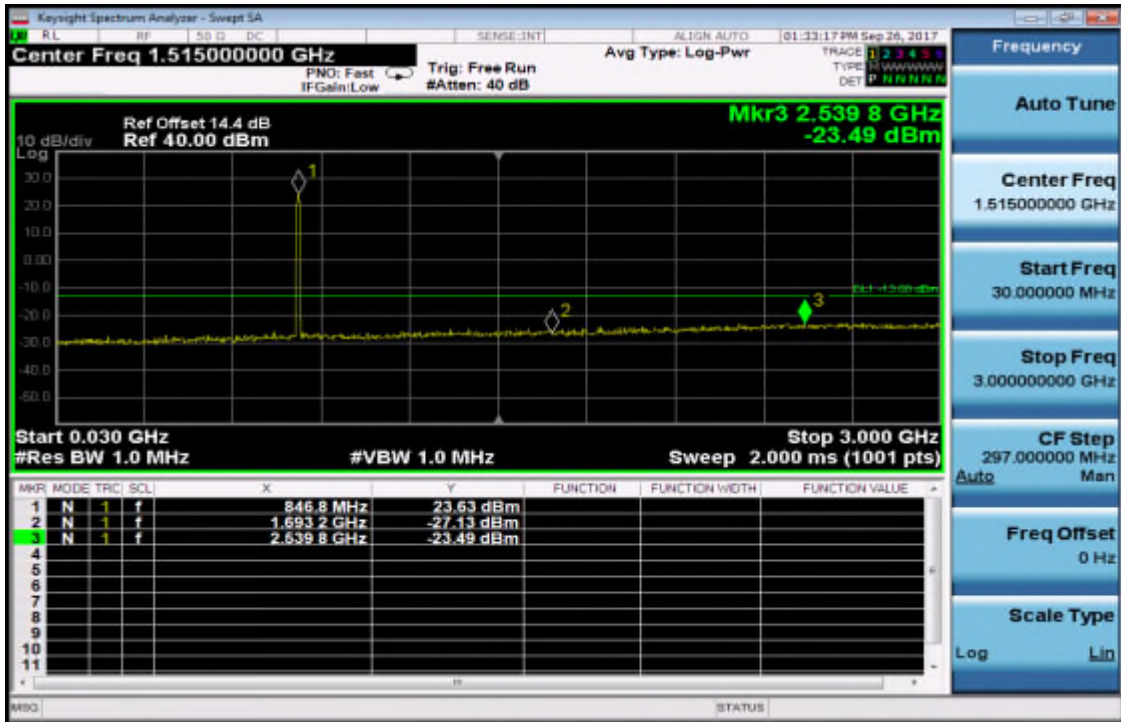
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Out of Band emission at antenna terminals – WCDMA V Channel Highest



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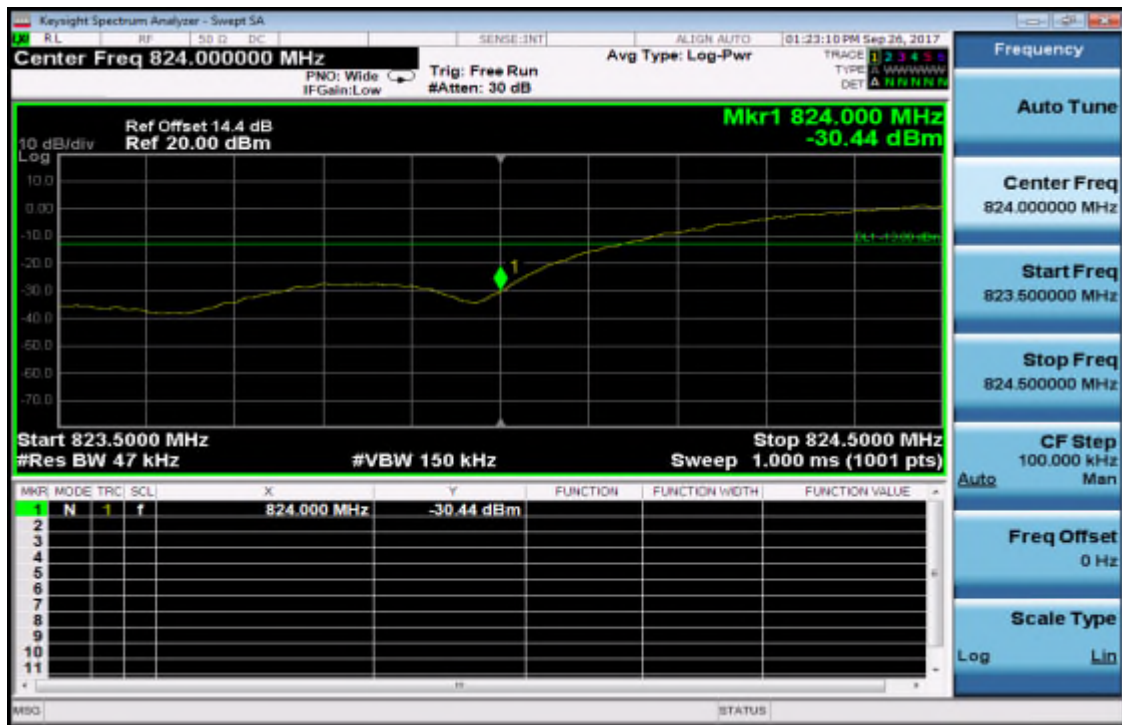
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Band edge emission at antenna terminals – WCDMA V Channel Lowest



Band edge emission at antenna terminals – WCDMA V Channel Highest



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10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

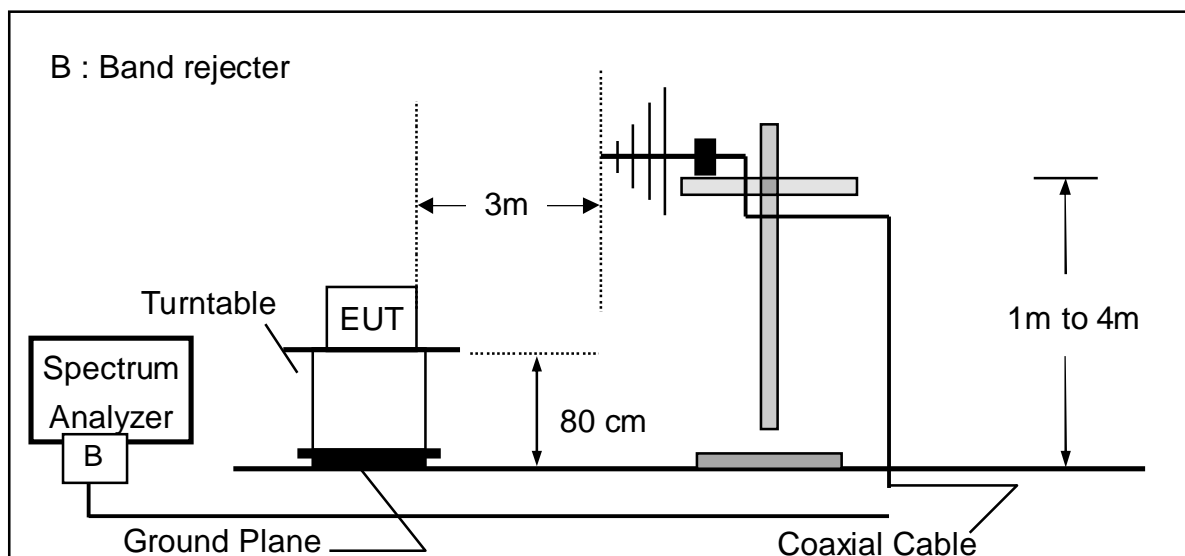
10.1. Standard Applicable

According to FCC §2.1053,

FCC §22.917(a) , §24.238(a) ,the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than $43 + 10 \log$ (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

10.2. EUT Setup

Radiated Emission Test Set-Up, Frequency Below 1000MHz



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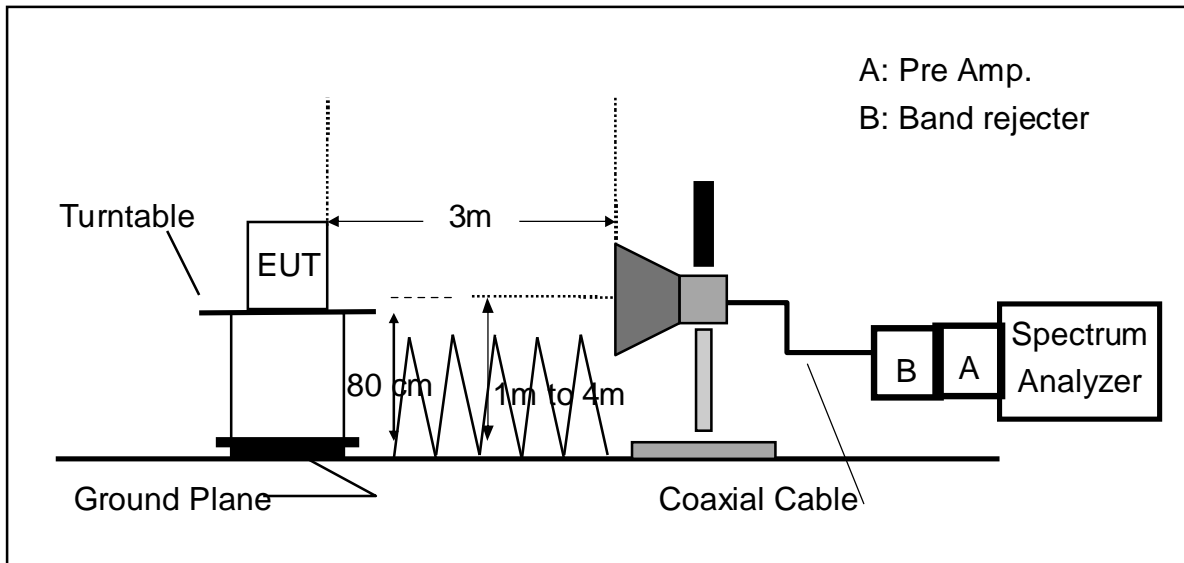
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Radiated Emission Test Set-UP Frequency Over 1 GHz



10.3. Measurement Procedure:

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$ERP = \text{S.G. output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$$

$$EIRP = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$$

$$EIRP \text{ (dBm)} = \text{SG Level (dBm)} + \text{Antenna Gain (dBi)} + \text{Cable Loss (dB)}$$

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.
“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.
“---” : denotes Noise Floor.

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10.4. Measurement Equipment Used:

ERP, EIRP MEASUREMENT EQUIPMENT List 966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESC17	100760	05/11/2017	05/10/2018
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/25/2017	04/24/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2017	09/19/2018
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/19/2016	12/18/2017
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/04/2017	08/03/2018
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2017	01/02/2018
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/03/2017	01/02/2018
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/05/2017	01/04/2018
3m Site NSA	SGS	966 chamber	N/A	07/01/2017	06/30/2018
Low Loss Cable	Huber Suhner	966 TX	1	01/05/2017	01/04/2018
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2016	12/11/2017
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/05/2017	01/04/2018
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2017	02/10/2018
Radio Communication Analyzer	Anritsu	MT8820C	6201465317	01/03/2017	01/02/2018

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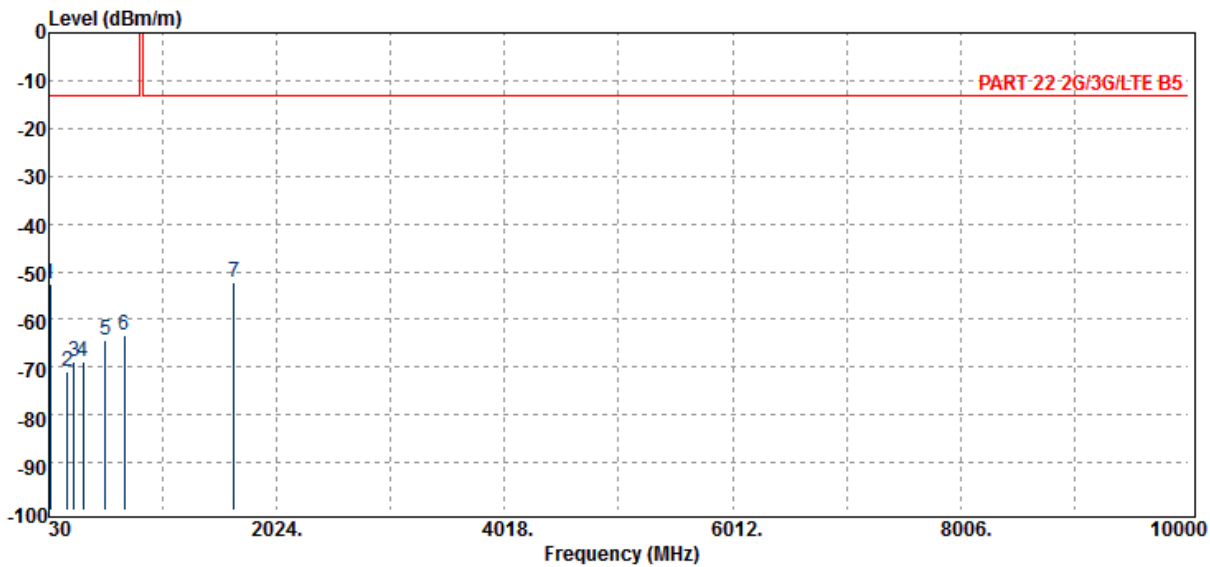
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10.5. Measurement Result:

Radiated Spurious Emission Measurement Result: GPRS 850 Mode

Operation Band :GPRS 850 Temp./Humi. :24 deg_C / 61 RH
 Fundamental Frequency :824.2 MHz Engineer :Tin
 Operation Mode :Tx CH LOW
 EUT Pol. :H Plane Measurement Antenna Pol.:VERTICAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
41.64	H	-52.77	-38.93	-12.83	-1.00	-13.00	-39.77
192.96	H	-71.02	-72.13	2.72	-1.61	-13.00	-58.02
248.25	H	-68.71	-70.36	3.41	-1.75	-13.00	-55.71
330.70	H	-68.79	-70.65	3.77	-1.91	-13.00	-55.79
527.61	H	-64.29	-65.53	3.71	-2.47	-13.00	-51.29
689.60	H	-63.29	-63.59	3.09	-2.79	-13.00	-50.29

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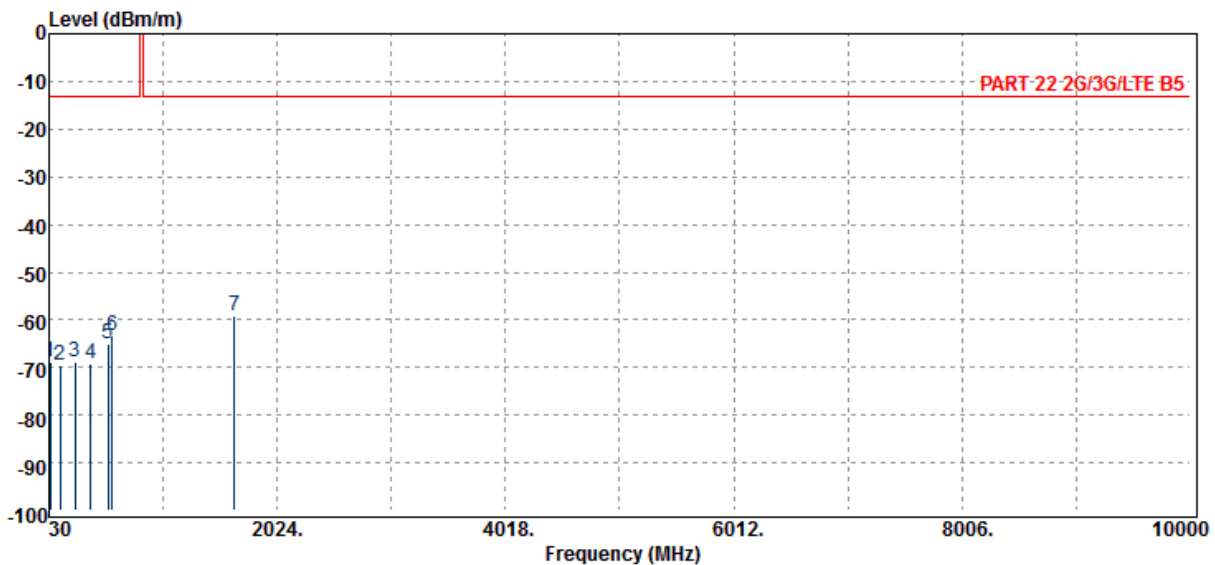
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Operation Band	:GPRS 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:824.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
41.64	H	-68.78	-54.95	-12.83	-1.00	-13.00	-55.78
128.94	H	-69.51	-65.53	-2.62	-1.36	-13.00	-56.51
257.95	H	-68.86	-70.72	3.63	-1.77	-13.00	-55.86
395.69	H	-69.37	-70.83	3.82	-2.35	-13.00	-56.37
548.95	H	-65.14	-66.04	3.59	-2.69	-13.00	-52.14
582.90	H	-63.18	-63.75	3.36	-2.79	-13.00	-50.18

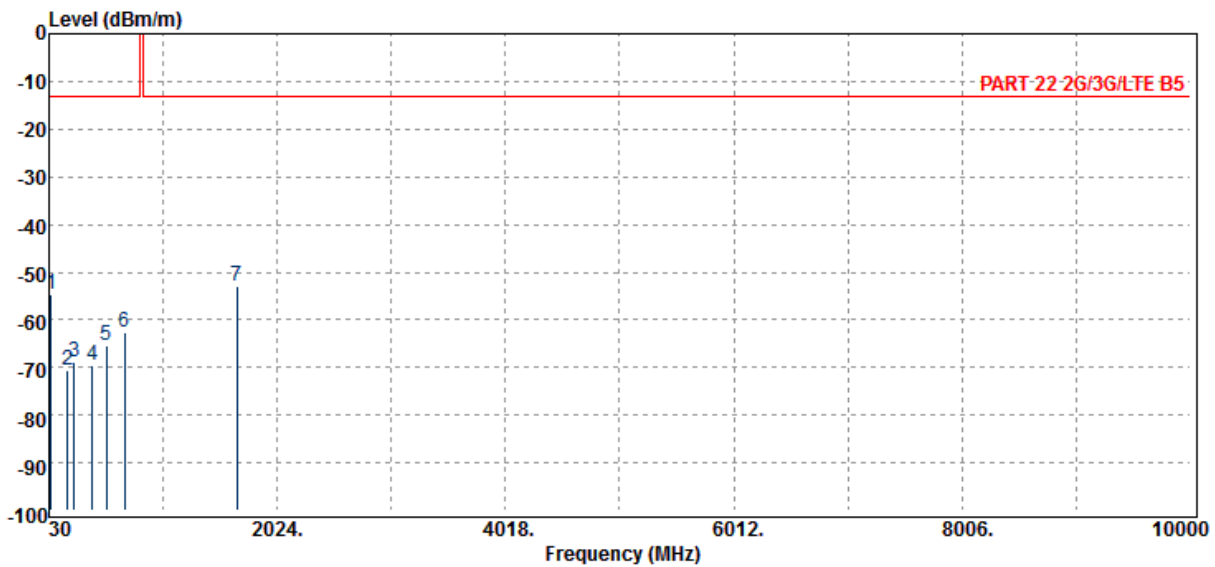
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Operation Band	:GPRS 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:H Plane	Measurement Antenna	:VERTICAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
44.55	H	-54.69	-41.26	-12.42	-1.02	-13.00	-41.69
194.90	H	-70.61	-71.82	2.83	-1.62	-13.00	-57.61
251.16	H	-68.74	-70.44	3.47	-1.76	-13.00	-55.74
410.24	H	-69.48	-70.86	3.78	-2.40	-13.00	-56.48
529.55	H	-65.46	-66.67	3.70	-2.49	-13.00	-52.46
686.69	H	-62.61	-62.97	3.10	-2.74	-13.00	-49.61

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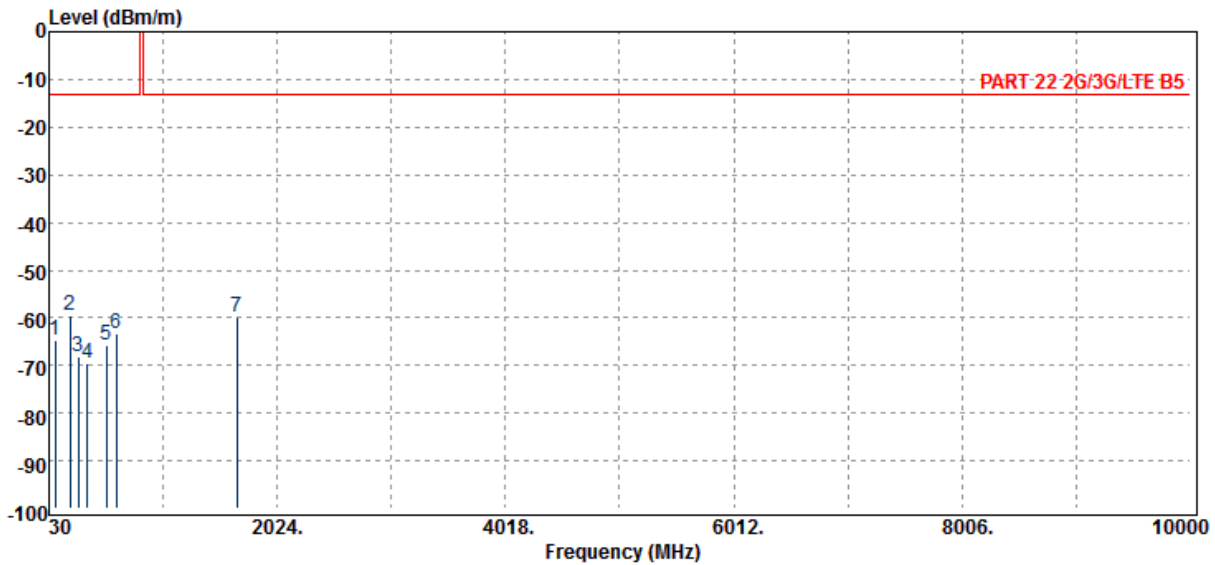
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Operation Band	:GPRS 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
83.35	H	-64.56	-61.37	-2.01	-1.18	-13.00	-51.56
211.39	H	-59.46	-61.28	3.50	-1.68	-13.00	-46.46
284.14	H	-68.28	-69.81	3.43	-1.89	-13.00	-55.28
364.65	H	-69.57	-71.26	3.85	-2.16	-13.00	-56.57
529.55	H	-65.59	-66.80	3.70	-2.49	-13.00	-52.59
618.79	H	-63.15	-63.79	3.20	-2.56	-13.00	-50.15

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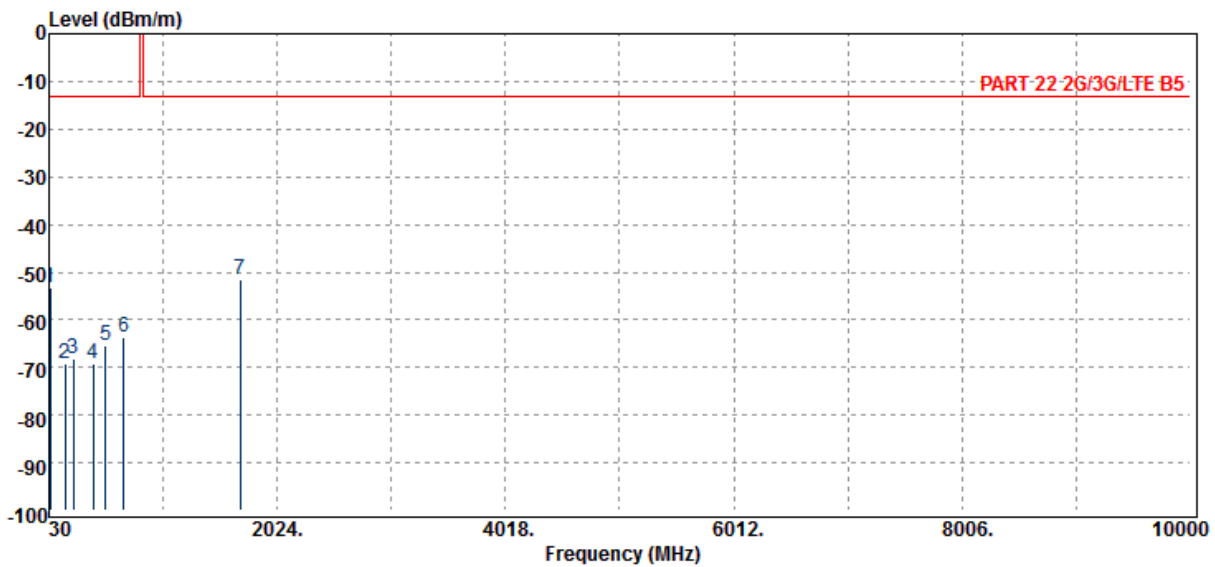
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Operation Band	:GPRS 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:848.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna	:VERTICAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
42.61	H	-53.18	-39.48	-12.69	-1.01	-13.00	-40.18
173.56	H	-69.21	-67.42	-0.26	-1.53	-13.00	-56.21
245.34	H	-68.32	-69.93	3.37	-1.75	-13.00	-55.32
413.15	H	-69.33	-70.72	3.77	-2.38	-13.00	-56.33
521.79	H	-65.43	-66.76	3.74	-2.41	-13.00	-52.43
684.75	H	-63.75	-64.14	3.10	-2.70	-13.00	-50.75

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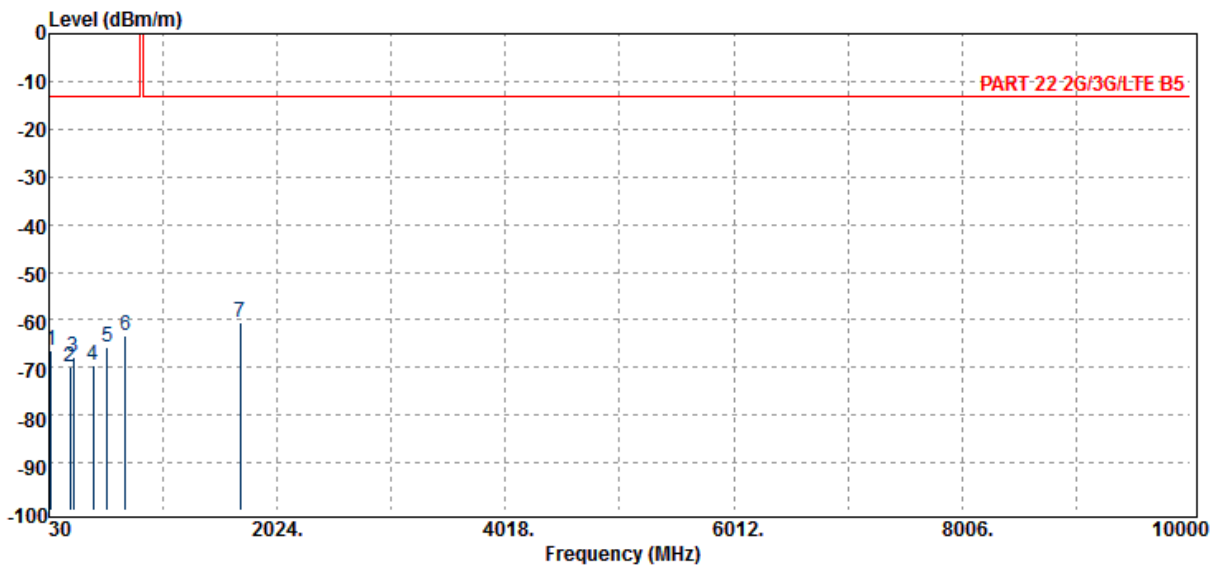
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Operation Band	:GPRS 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:848.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
49.40	H	-66.27	-53.77	-11.46	-1.04	-13.00	-53.27
217.21	H	-69.85	-71.54	3.38	-1.69	-13.00	-56.85
243.40	H	-67.88	-69.47	3.34	-1.75	-13.00	-54.88
416.06	H	-69.41	-70.81	3.76	-2.36	-13.00	-56.41
542.16	H	-65.85	-66.86	3.63	-2.62	-13.00	-52.85
699.30	H	-63.29	-63.41	3.08	-2.96	-13.00	-50.29

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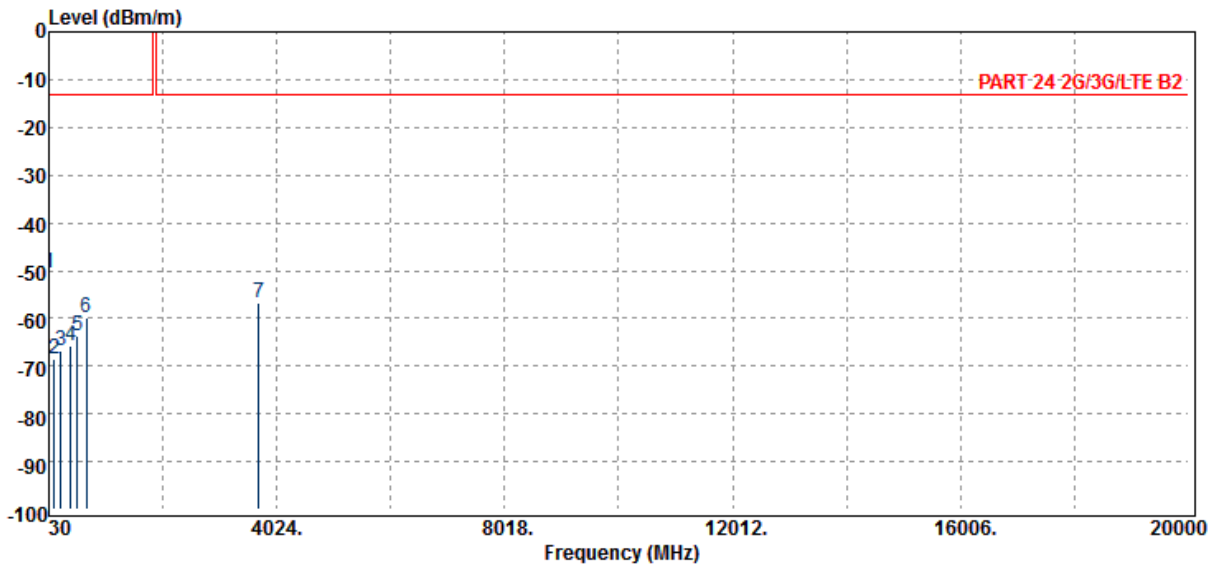
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Radiated Spurious Emission Measurement Result: GPRS 1900 Mode

Operation Band :GPRS 1900 Temp./Humi. :22 deg_C / 62 RH
 Fundamental Frequency :1850.2 MHz Engineer :Tin
 Operation Mode :Tx CH LOW
 EUT Pol. :H Plane Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
42.61	H	-50.55	-39.00	-10.54	-1.01	-13.00	-37.55
128.94	H	-68.48	-66.66	-0.47	-1.36	-13.00	-55.48
241.46	H	-66.94	-70.65	5.46	-1.74	-13.00	-53.94
415.09	H	-65.84	-69.39	5.92	-2.37	-13.00	-52.84
534.40	H	-63.75	-67.03	5.82	-2.54	-13.00	-50.75
691.54	H	-59.98	-62.39	5.24	-2.83	-13.00	-46.98

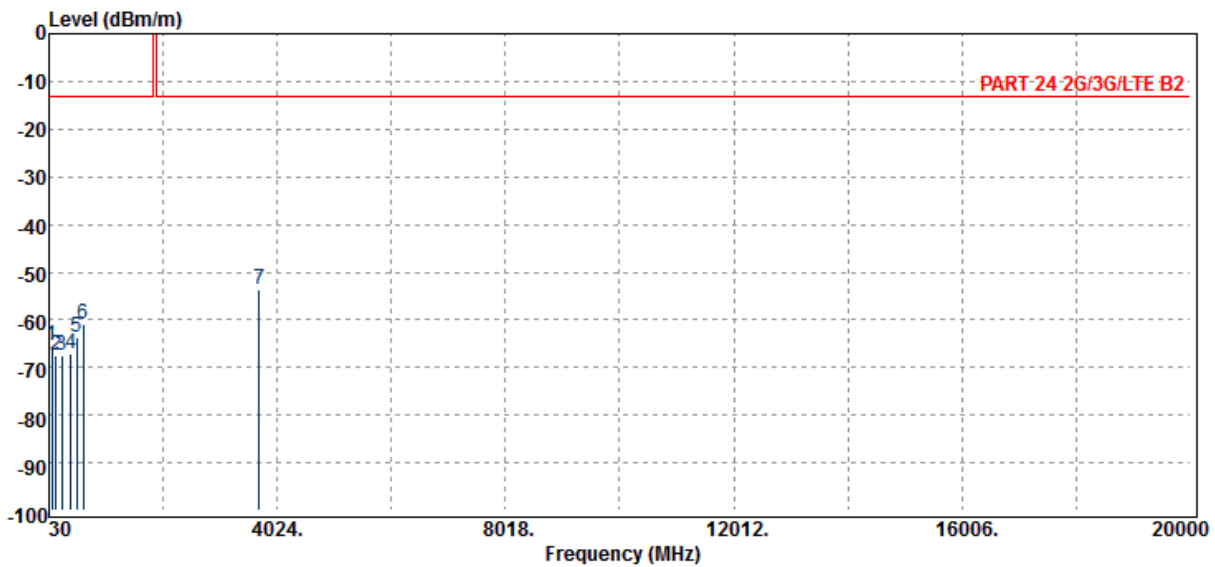
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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1850.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
81.41	H	-65.54	-64.03	-0.35	-1.17	-13.00	-52.54
159.01	H	-67.58	-66.58	0.47	-1.47	-13.00	-54.58
248.25	H	-67.39	-71.20	5.56	-1.75	-13.00	-54.39
406.36	H	-67.21	-70.75	5.95	-2.42	-13.00	-54.21
516.94	H	-63.82	-67.37	5.91	-2.37	-13.00	-50.82
626.55	H	-60.80	-63.65	5.34	-2.49	-13.00	-47.80

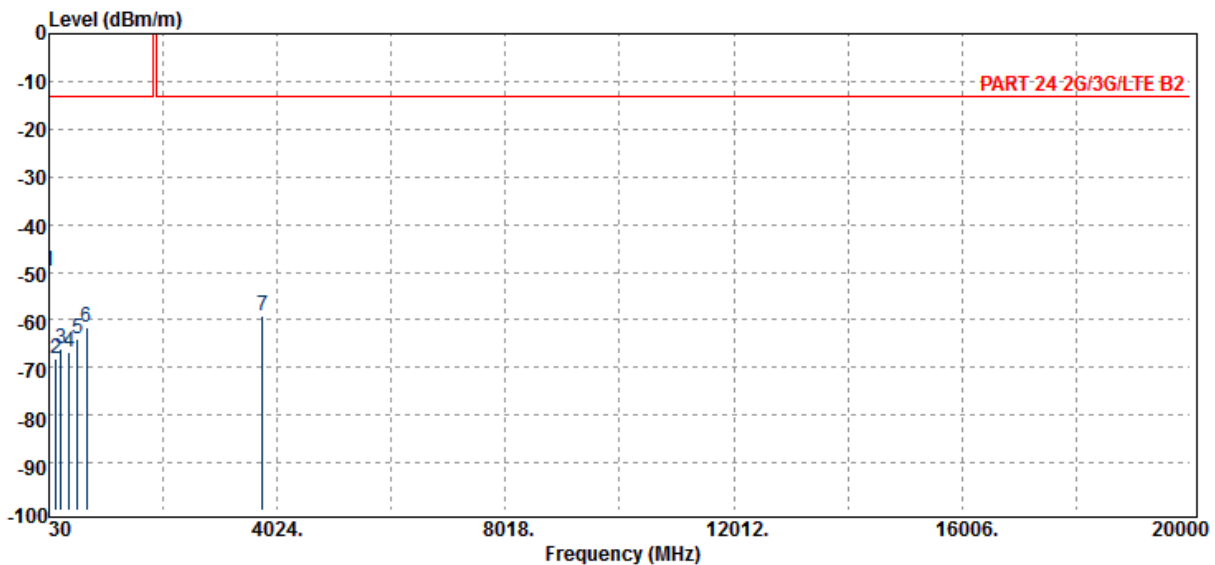
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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1880 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID	Measurement Antenna	:VERTICAL
EUT Pol.	:H Plane	Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
41.64	H	-49.96	-38.28	-10.68	-1.00	-13.00	-36.96
154.16	H	-68.06	-66.86	0.25	-1.45	-13.00	-55.06
246.31	H	-66.03	-69.81	5.53	-1.75	-13.00	-53.03
385.99	H	-66.72	-70.41	5.98	-2.30	-13.00	-53.72
526.64	H	-63.99	-67.39	5.86	-2.46	-13.00	-50.99
691.54	H	-61.53	-63.95	5.24	-2.83	-13.00	-48.53

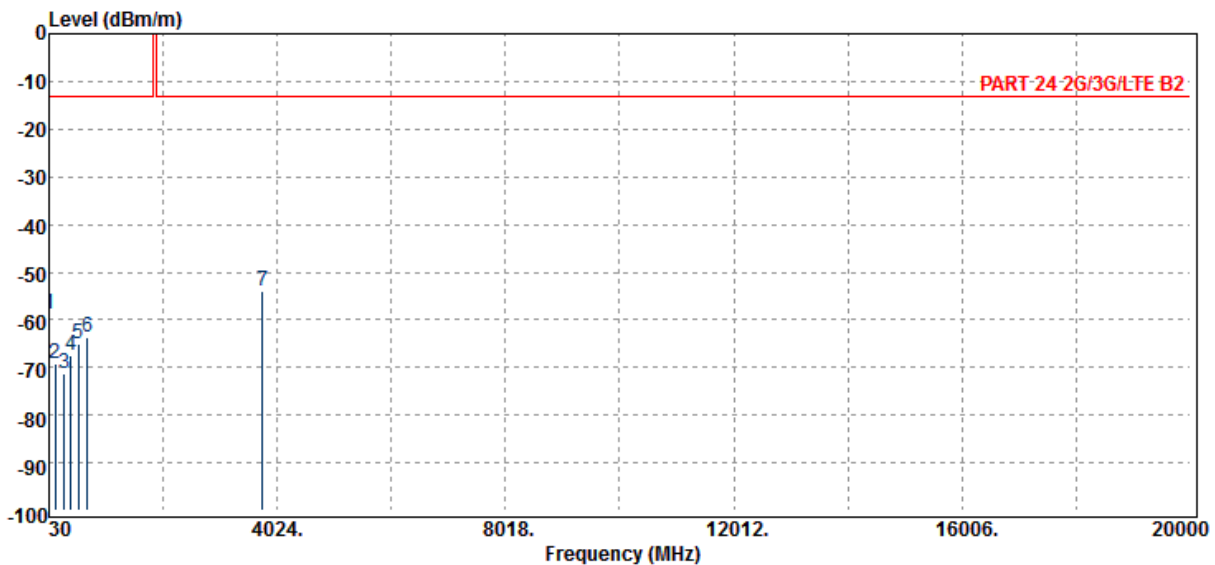
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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1880 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
30.00	H	-58.97	-45.39	-12.63	-0.96	-13.00	-45.97
143.49	H	-69.28	-67.54	-0.33	-1.41	-13.00	-56.28
294.81	H	-71.25	-74.98	5.67	-1.94	-13.00	-58.25
406.36	H	-67.33	-70.86	5.95	-2.42	-13.00	-54.33
548.95	H	-65.11	-68.16	5.74	-2.69	-13.00	-52.11
699.30	H	-63.52	-65.79	5.23	-2.96	-13.00	-50.52

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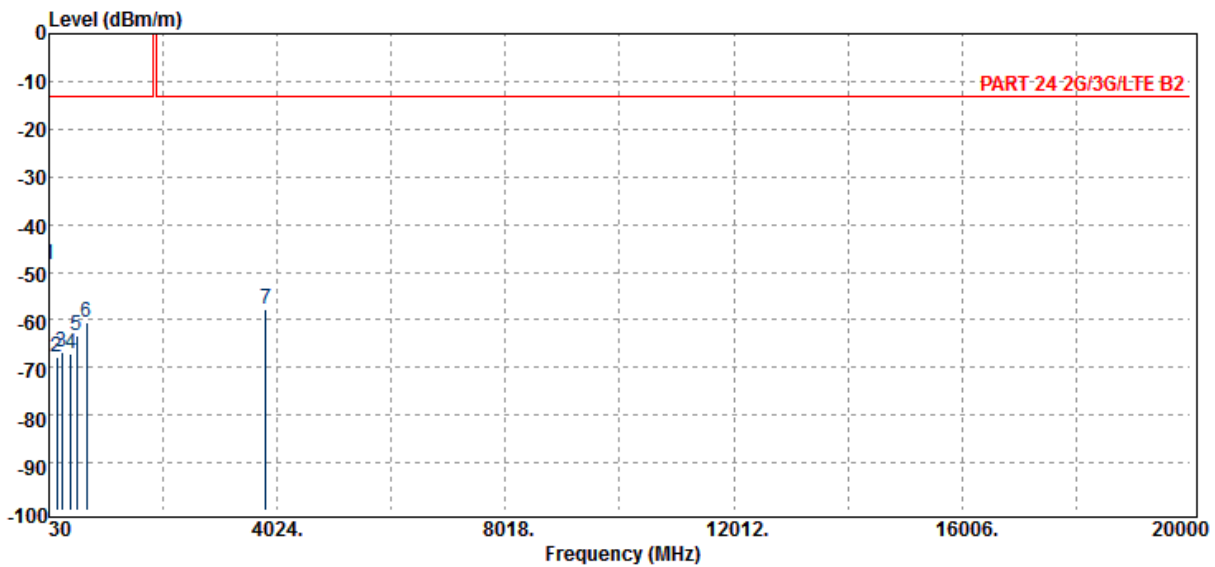
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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna	:VERTICAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
42.61	H	-48.35	-36.80	-10.54	-1.01	-13.00	-35.35
173.56	H	-67.78	-68.14	1.89	-1.53	-13.00	-54.78
250.19	H	-66.66	-70.49	5.59	-1.76	-13.00	-53.66
410.24	H	-67.28	-70.81	5.93	-2.40	-13.00	-54.28
513.06	H	-63.37	-66.95	5.94	-2.35	-13.00	-50.37
689.60	H	-60.57	-63.02	5.24	-2.79	-13.00	-47.57

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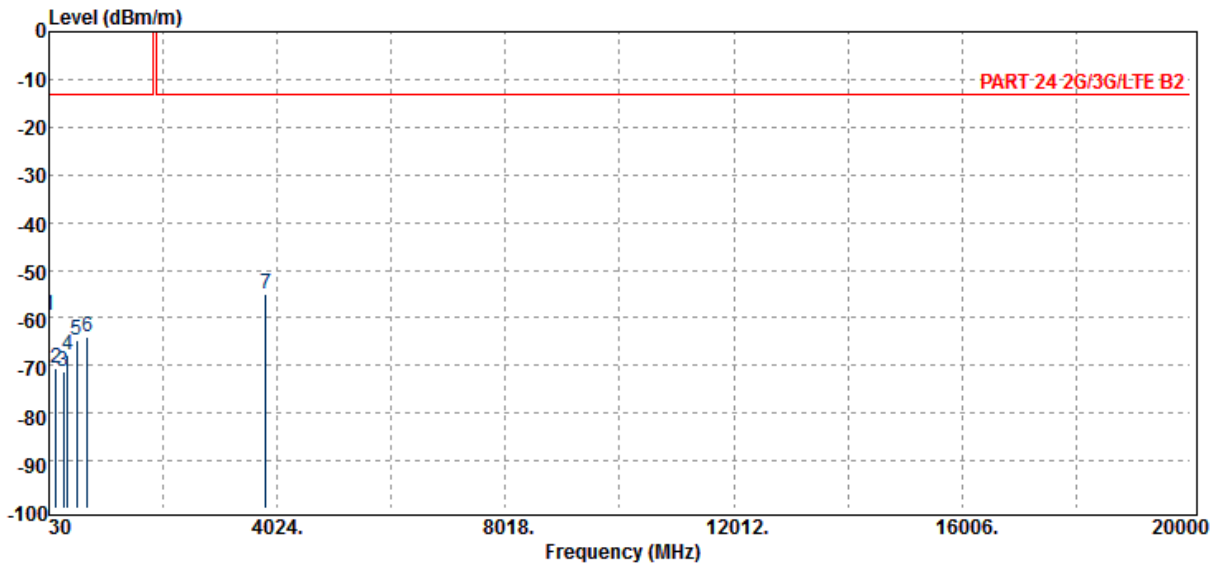
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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
30.00	H	-59.46	-45.88	-12.63	-0.96	-13.00	-46.46
146.40	H	-70.63	-69.06	-0.16	-1.42	-13.00	-57.63
284.14	H	-71.30	-74.98	5.58	-1.89	-13.00	-58.30
361.74	H	-67.72	-71.58	6.00	-2.14	-13.00	-54.72
517.91	H	-64.87	-68.41	5.91	-2.37	-13.00	-51.87
696.39	H	-63.91	-66.23	5.24	-2.91	-13.00	-50.91

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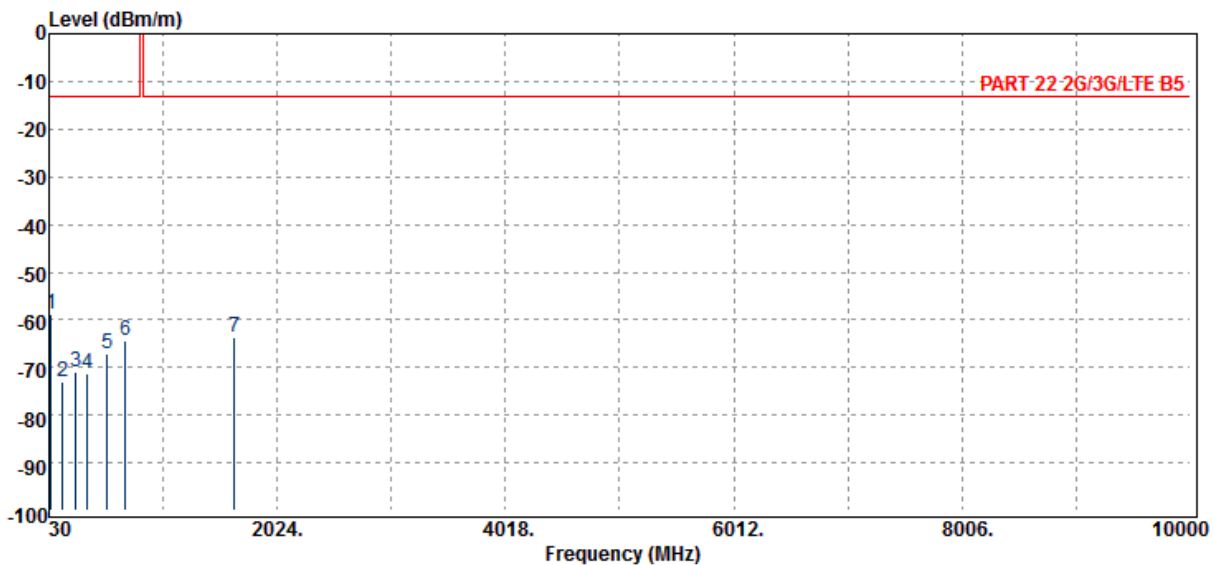
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Radiated Spurious Emission Measurement Result: HSDPA V Mode

Operation Band :HSDPA B5 Temp./Humi. :24 deg_C / 61 RH
 Fundamental Frequency :824.2 MHz Engineer :Tin
 Operation Mode :Tx CH LOW
 EUT Pol. :H Plane Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
47.46	H	-58.73	-45.86	-11.84	-1.03	-13.00	-45.73
148.34	H	-72.99	-69.38	-2.19	-1.42	-13.00	-59.99
261.83	H	-70.91	-72.77	3.65	-1.78	-13.00	-57.91
363.68	H	-71.21	-72.91	3.85	-2.15	-13.00	-58.21
542.16	H	-67.19	-68.19	3.63	-2.62	-13.00	-54.19
697.36	H	-64.35	-64.51	3.08	-2.93	-13.00	-51.35

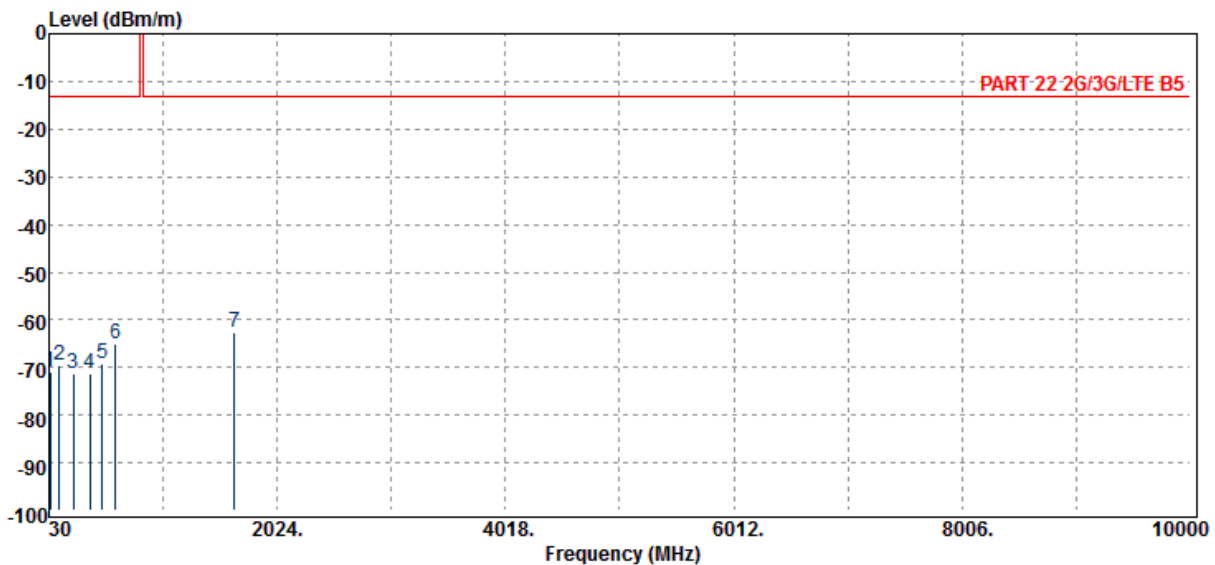
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Operation Band	:HSDPA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:824.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
43.58	H	-71.03	-57.46	-12.55	-1.01	-13.00	-58.03
120.21	H	-69.60	-65.83	-2.44	-1.33	-13.00	-56.60
245.34	H	-71.36	-72.98	3.37	-1.75	-13.00	-58.36
384.05	H	-71.35	-72.90	3.83	-2.29	-13.00	-58.35
498.51	H	-69.32	-70.87	3.85	-2.30	-13.00	-56.32
612.97	H	-65.00	-65.61	3.22	-2.61	-13.00	-52.00

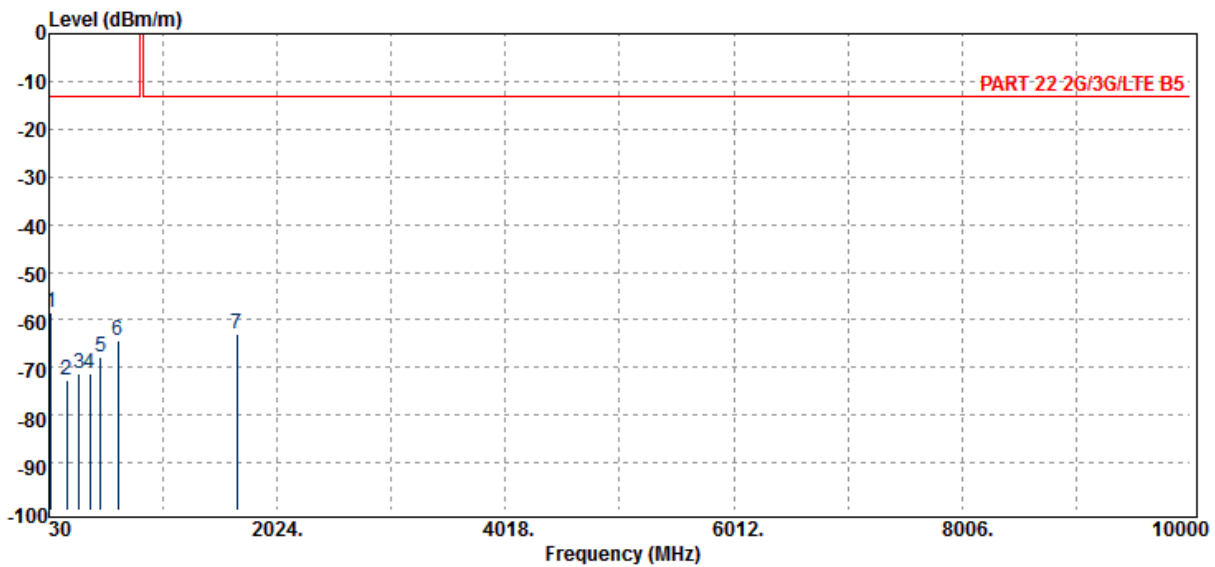
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Operation Band	:HSDPA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:H Plane	Measurement Antenna	:VERTICAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
50.37	H	-58.62	-46.34	-11.24	-1.04	-13.00	-45.62
182.29	H	-72.75	-72.46	1.28	-1.57	-13.00	-59.75
295.78	H	-71.32	-72.92	3.54	-1.95	-13.00	-58.32
385.99	H	-71.44	-72.98	3.83	-2.30	-13.00	-58.44
480.08	H	-67.92	-69.45	3.78	-2.24	-13.00	-54.92
635.28	H	-64.50	-65.22	3.17	-2.45	-13.00	-51.50

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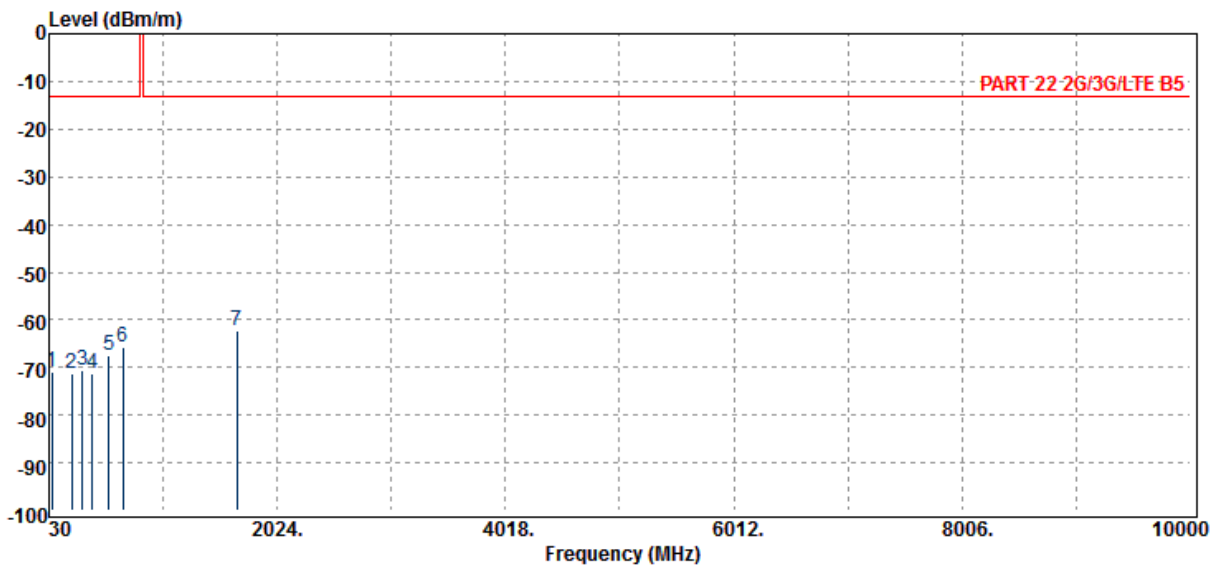
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Operation Band	:HSDPA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
55.22	H	-71.04	-60.05	-9.93	-1.06	-13.00	-58.04
226.91	H	-71.17	-72.63	3.18	-1.72	-13.00	-58.17
322.94	H	-70.74	-72.56	3.74	-1.92	-13.00	-57.74
410.24	H	-71.14	-72.52	3.78	-2.40	-13.00	-58.14
551.86	H	-67.54	-68.40	3.57	-2.72	-13.00	-54.54
676.02	H	-65.70	-66.26	3.11	-2.55	-13.00	-52.70

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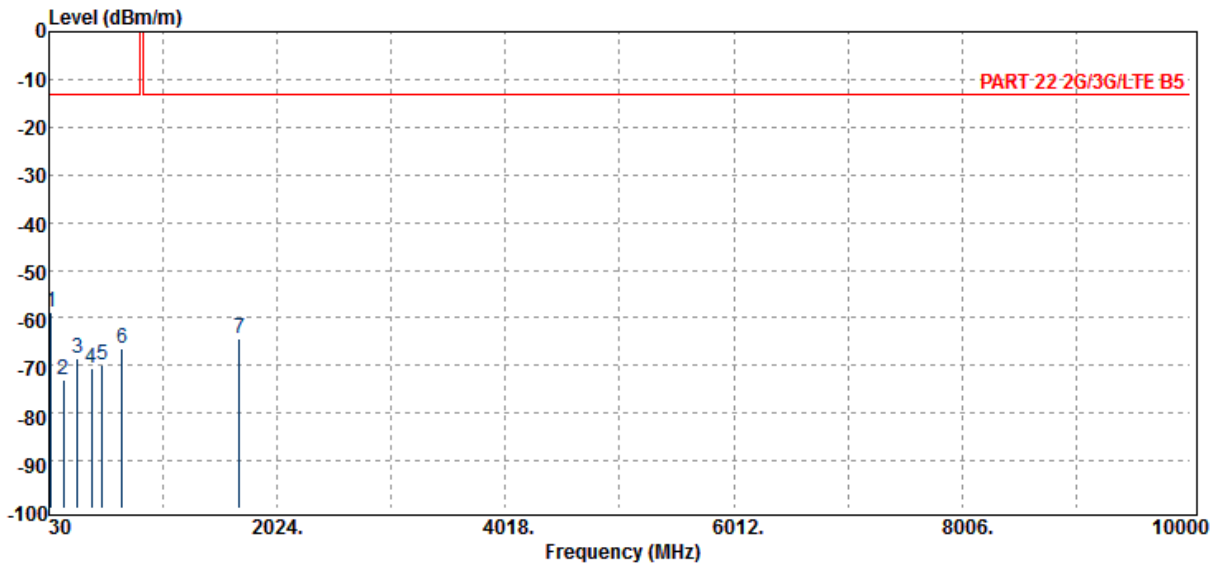
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Operation Band	:HSDPA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:848.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna	:VERTICAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
51.34	H	-58.95	-46.93	-10.97	-1.05	-13.00	-45.95
156.10	H	-72.86	-69.58	-1.81	-1.46	-13.00	-59.86
280.26	H	-68.59	-70.13	3.42	-1.88	-13.00	-55.59
398.60	H	-70.44	-71.89	3.82	-2.37	-13.00	-57.44
495.60	H	-69.86	-71.40	3.84	-2.29	-13.00	-56.86
669.23	H	-66.45	-67.15	3.12	-2.42	-13.00	-53.45

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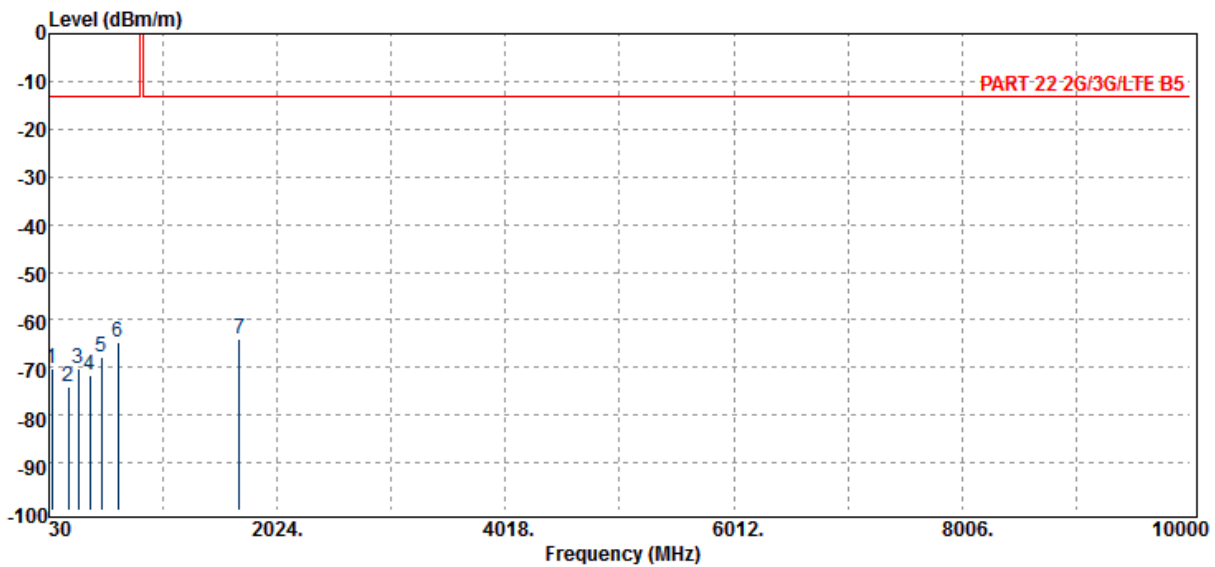
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Fundamental Frequency	:848.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna	:HORIZONTAL
		Pol.	



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd	Cable Loss dB	Limit dBm	Margin dB
56.19	H	-70.41	-59.65	-9.69	-1.07	-13.00	-57.41
202.66	H	-73.96	-75.53	3.22	-1.65	-13.00	-60.96
284.14	H	-70.27	-71.80	3.43	-1.89	-13.00	-57.27
388.90	H	-71.68	-73.19	3.83	-2.31	-13.00	-58.68
487.84	H	-67.75	-69.30	3.81	-2.26	-13.00	-54.75
631.40	H	-64.86	-65.57	3.18	-2.46	-13.00	-51.86

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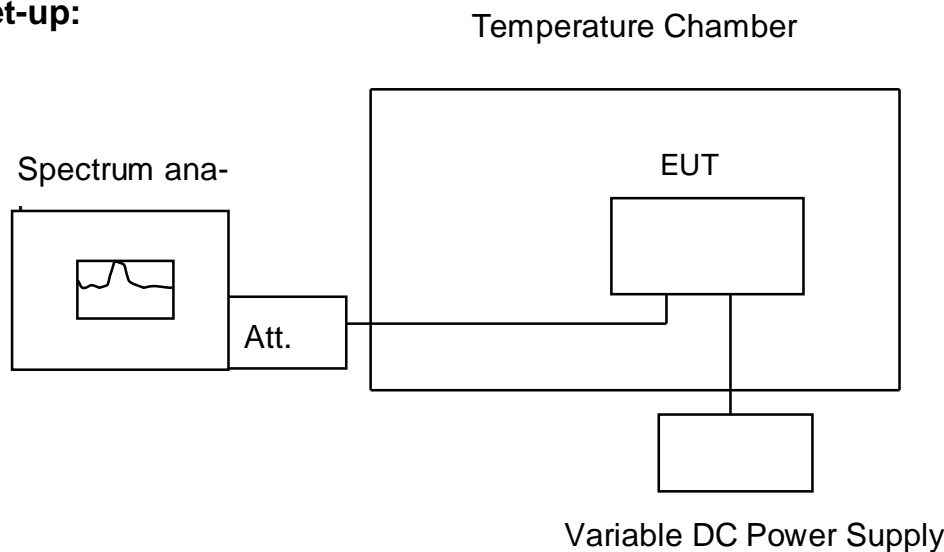
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11. FREQUENCY STABILITY MEASUREMENT

11.1. Standard Applicable:

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

11.2. Test Set-up:



Note: Measurement setup for testing on Antenna connector

11.3. Measurement Procedure:

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 EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°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.

Set chamber temperature to 25°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.

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Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint as declared by the manufacturer, record the maximum frequency change.

11.4. Measurement Equipment Used:

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018
Coaxial Cable	HU-BER+SUHNER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2017	02/10/2018
Radio Communication Analyzer	Anritsu	MT8820C	6201465317	01/03/2017	01/02/2018

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11.5. Measurement Result:

FREQUENCY ERROR vs. VOLTAGE

Reference Frequency: GPRS 850 Mid Channel 836.6 MHz				
Limit: +/- 2.5 ppm = 2091 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (°C)	(Hz)		
4.4	20	836.600045	45	2091
3.85	20	836.600061	61	2091
3.5	20	836.600035	35	2091
shutdown point				
2.5	20	836.600042	42	2091

FREQUENCY ERROR vs. TEMPERATURE

Reference Frequency: GPRS 850 Mid Channel 836.6 MHz				
Limit: +/- 2.5 ppm = 2091 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (°C)	(Hz)		
3.85	50	836.600015	15	2091
3.85	40	836.600017	17	2091
3.85	30	836.600021	21	2091
3.85	20	836.600022	22	2091
3.85	10	836.600029	29	2091
3.85	0	836.600028	28	2091
3.85	-10	836.600017	17	2091
3.85	-20	836.600019	19	2091
3.85	-30	836.600023	23	2091

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FREQUENCY ERROR vs. VOLTAGE

Reference Frequency: GPRS 1900 Mid Channel 1880 MHz				
Limit: +/- 2.5 ppm = 4700 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (°C)	(Hz)		
4.4	20	1879.999973	-27	4700
3.85	20	1879.999979	-21	4700
3.5	20	1879.999985	-15	4700
shutdown point				
2.5	20	1879.999984	-16	4700

FREQUENCY ERROR vs. TEMPERATURE

Reference Frequency: GPRS 1900 Mid Channel 1880 MHz				
Limit: +/- 2.5 ppm = 4700 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (°C)	(Hz)		
3.85	50	1879.999993	-7	4700
3.85	40	1879.999987	-13	4700
3.85	30	1879.999991	-9	4700
3.85	20	1879.999999	-10	4700
3.85	10	1879.999985	-15	4700
3.85	0	1879.999985	-23	4700
3.85	-10	1879.999979	-21	4700
3.85	-20	1879.999981	-19	4700
3.85	-30	1879.999982	-18	4700

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FREQUENCY ERROR vs. VOLTAGE

Reference Frequency: WCDMA V Mid Channel 836.6 MHz				
Limit: +/- 2.5 ppm = 2091 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (°C)	(Hz)		
4.4	20	836.600017	17	2091
3.85	20	836.600015	15	2091
3.5	20	836.60001	10	2091
shutdown point				
2.5	20	836.600021	21	2091

FREQUENCY ERROR vs. TEMPERATURE

Reference Frequency: WCDMA V Mid Channel 836.6 MHz				
Limit: +/- 2.5 ppm = 2091 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (°C)	(Hz)		
3.85	50	836.600021	21	2091
3.85	40	836.600025	25	2091
3.85	30	836.600016	16	2091
3.85	20	836.6000251	13	2091
3.85	10	836.6000252	19	2091
3.85	0	836.600022	22	2091
3.85	-10	836.600011	11	2091
3.85	-20	836.600017	17	2091
3.85	-30	836.600012	12	2091

Note: The battery is rated 3.85 Vdc.

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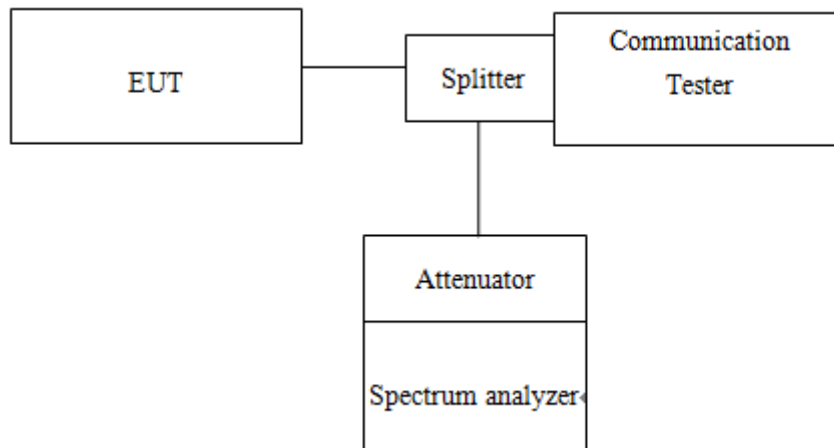
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12. PEAK TO AVERAGE RATIO

12.1. Standard Applicable

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

12.2. Test SET-UP



12.3. Measurement Procedure

1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:
2. Set resolution/measurement bandwidth \geq signal's occupied bandwidth; & internal = 1ms
3. Set the number of counts to a value that stabilizes the measured CCDF curve.

12.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018
Coaxial Cable	HUBER+SÜHNER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2017	02/10/2018
Radio Communication Analyzer	Anritsu	MT8820C	6201465317	01/03/2017	01/02/2018

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12.5. Measurement Result

Tabular Results:

Frequency (MHz)	CH	Peak-to-Average Ratio (dB)	
		GSM 1900	GPRS 1900
1850.20	512	10.08	9.75
1880.00	661	10.01	9.98
1909.80	810	10.11	9.14

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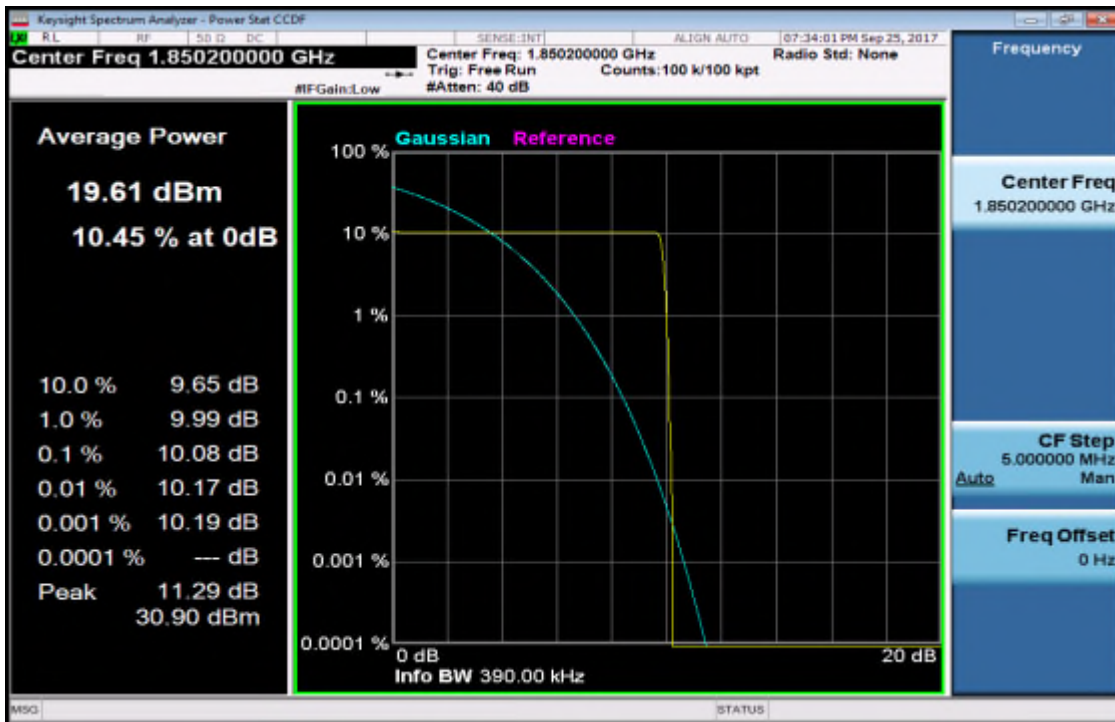
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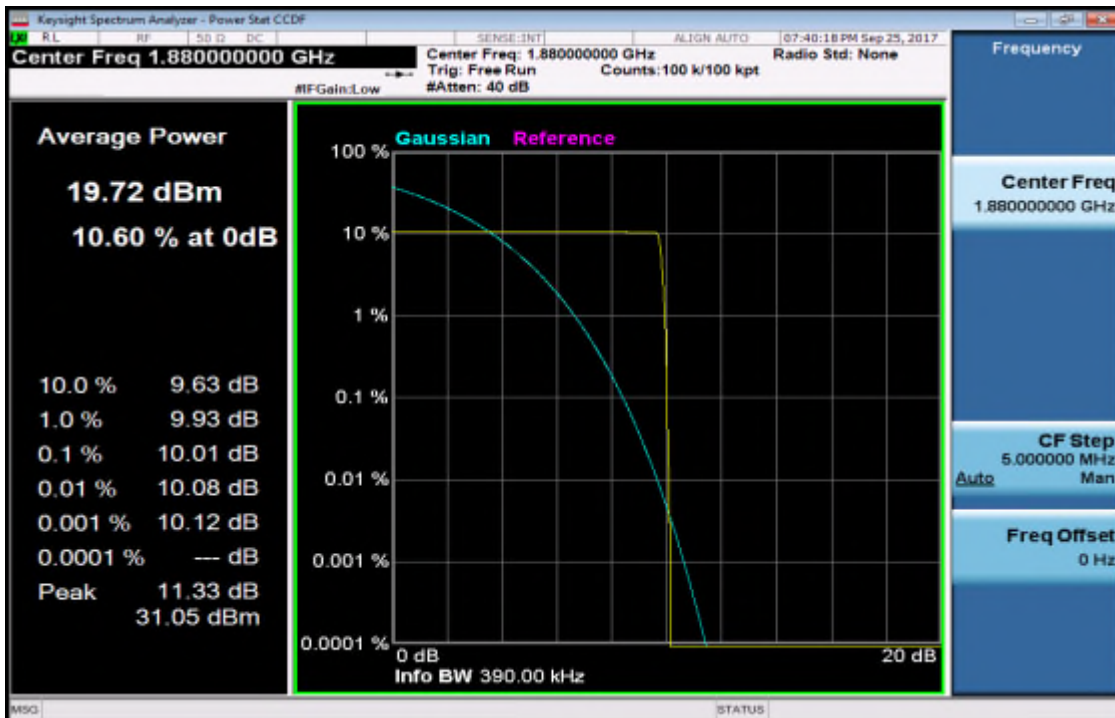
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Measurement Results:

GSM 1900 Channel Low



GSM 1900 Channel Mid



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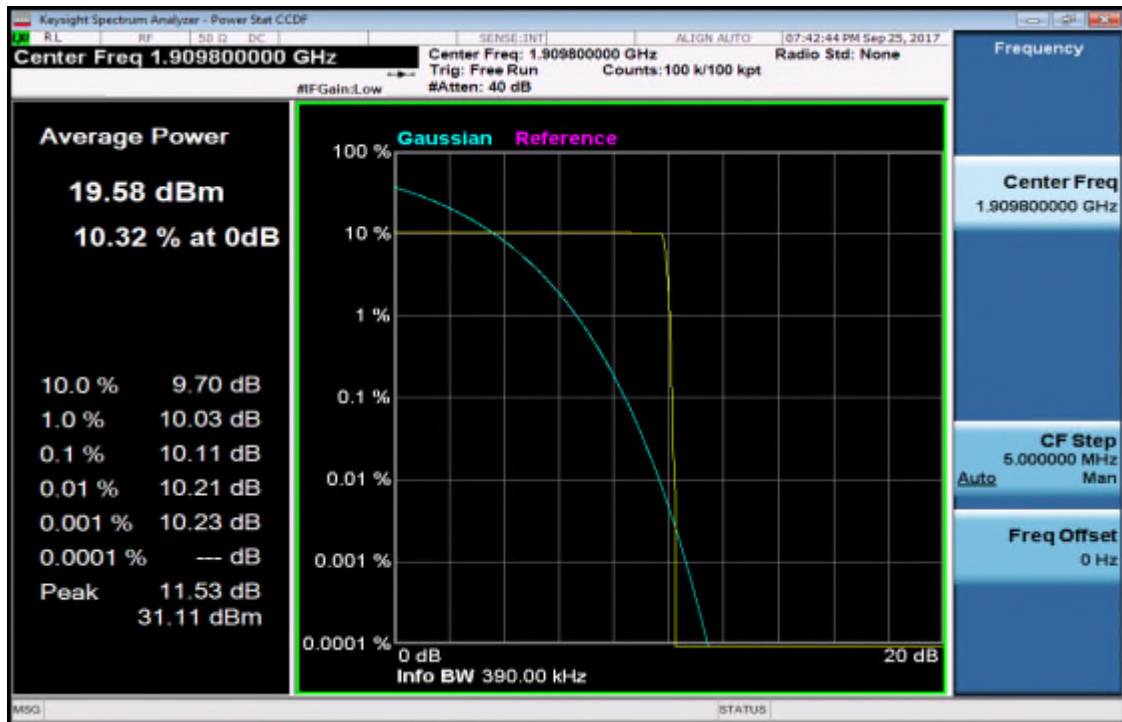
t (886-2) 2299-3279

f (886-2) 2298-0488

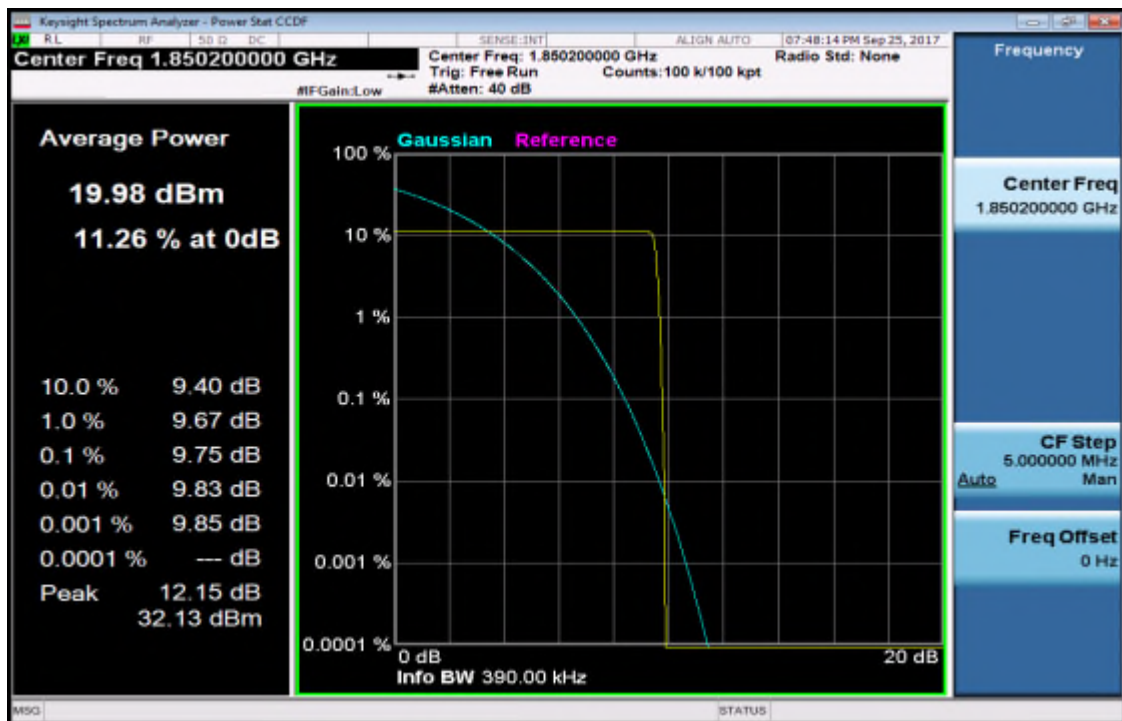
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GSM 1900 Channel High



GPRS 1900 Channel Low



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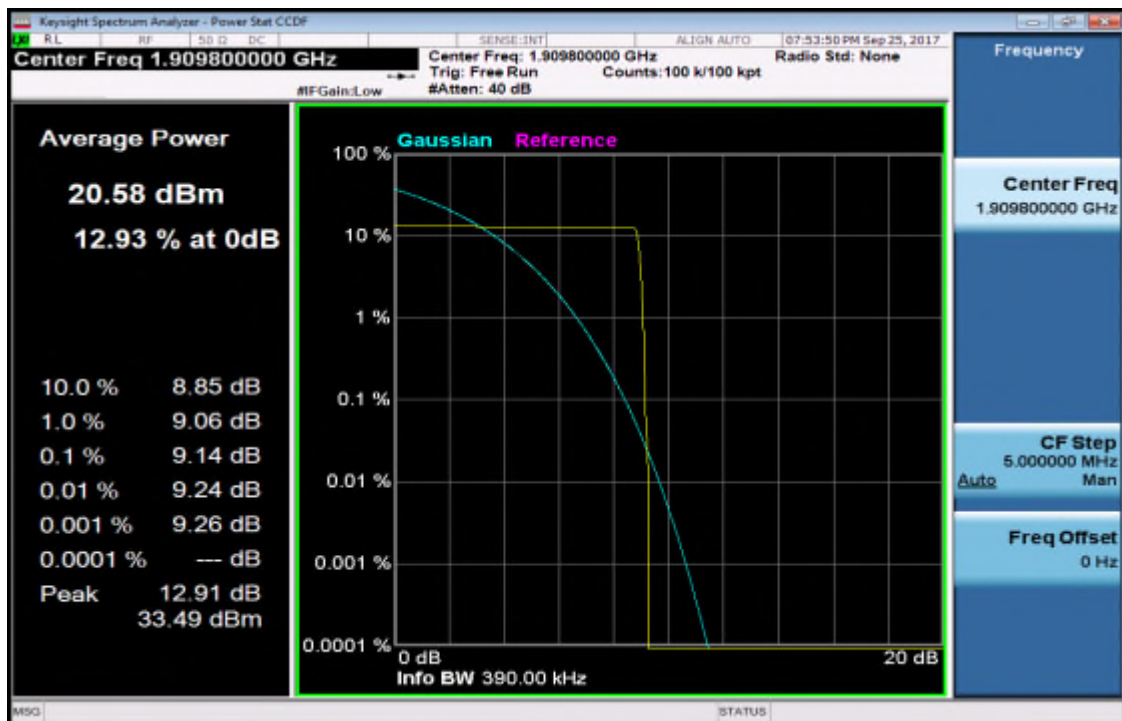
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GPRS 1900 Channel Mid



GPRS 1900 Channel High



~ End of Report ~

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