ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 22 SUBPART H, PART 24 SUBPART E REQUIREMENT

OF

Applicant:	Sharp Corporation, Mobile Communication B.U. 2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi, Hiro-shima, 739-0192, Japan
Manufacturer:	Sharp Corporation 1 Takumi-cho, Sakai-ku, Sakai City,Osaka 590-8522,Japan
Product Name:	Cellular Phone
Report Number:	ER/2018/C0133
FCC ID:	APYHRO00271
FCC Rule Part:	2 , 22H & 24E
Issue Date:	Jan. 11, 2019
Date of Test:	Oct. 25, 2018 ~ Nov. 27, 2018
Date of EUT Received:	Oct. 25, 2018

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 C63.26-2015 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.

Tested By: Marcus Tseng

Marcus Tseng / Engineer

Approved By: Jazz Huang

Jazz Huang / Asst. Supervisor

Testing Laboratory
0513

Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2018/C0133	Rev.00	Initial creation of document	All	Dec. 20, 2018	Stefanie Yu
ER/2018/C0133	Rev.01	Updated KDB 971168 D01 version	5	Jan. 11, 2019	Stefanie Yu

Contents

1. GENERAL PRODUCT INFORMATION

1.1. Product Description

General:

Product Name:	Cellular Phone
Hardware Version:	DVT
Software Version:	N/A
Power Supply:	3.8V from Rechargeable Li-ion Battery
IMEI:	004401116602182 / 004401116602216

1.2. GSM / WCDMA: Cellular Phone Standards Frequency Range

Operating Frequency (MHz)			
GSM/GPRS 850	824.2	-	848.8
GSM/GPRS 1900	1850.2	-	1909.8

Operating Frequency (MHz)			
WCDMA / HSPA+ Band V	826.4	-	846.6

1.3. Type of Emission & Max ERP/EIRP Power Measurement Result:

	ERP / EIRP (dBm)		(W)	Type of Emission
GSM 850	29.72	ERP	0.938	246KGXW
GPRS 850	29.01	ERP	0.796	246KGXW
GSM 1900	31.49	EIRP	1.409	250KGXW
GPRS 1900	29.78	EIRP	0.951	246KGXW

	ERP / EIRP (dBm)		(W)	Type of Emission
WCDMA Band V	26.82	ERP	0.481	4M14F9W
HSDPA Band V	23.04	ERP	0.201	4M14F9W
HSUPA Band V	24.21	ERP	0.264	4M13F9W

1.4. Test Methodology of Applied Standards

CC 47 CFR Part 2, 22, 24.

ANSI C63.26-2015

KDB971168 D01 Power Meas license Digital System v03r01

KDB941225 D01 SAR test for 3G devices v03r01 (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.

1.5. Test Facility

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

FCC Registration Numbers are: 509634 / TW0001

1.6. Special Accessories

No special accessories were used during testing.

1.7. Equipment Modifications

There were no modifications incorporated into the EUT.

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 C63.26-2015, 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 C63.26-2015, The EUT is a placed on as turn table, for emission measurements below 1 GHz is 0.8 m above ground plane, for emission measurements above 1 GHz, the table height shall be 1.5 m. 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.

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 in physical test.

	RF cable loss (dB)	Attenuation factor(dB)	offset(dB)
Low Band (Below 1GHz)	4.5	10	14.5
High Band (Above 1 GHz)	5	10	15

2.5. Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
GSM 850	3.8	135
GSM 1900		187
WCDMA B5		129

2.6. Configuration of Tested System

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

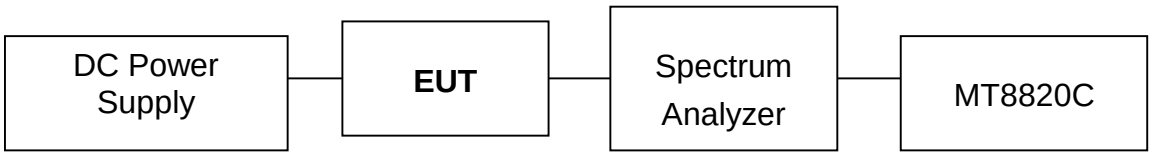


Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)

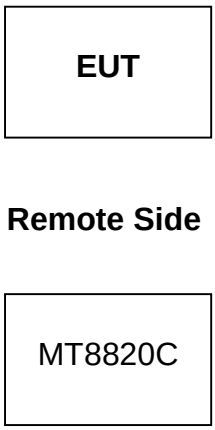


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Radio Communication Analyer	Anritsu	MT8820C	6201465317	shielded	Un-shielded

3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§2.1046(a) §22.913(a)(5) §24.232(c)	ERP/ EIRP measurement	Compliant
§2.1049(h)	99% & 26dB Occuupied Bandwidth	Compliant
§2.1051 §22.917(a) §24.238(a)	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	Compliant
§24.232(d) §22.913	Peak to Average Ratio	Compliant
§2.1055(a)(1) §22.355 §24.235	Frequency Stability	Compliant

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, X(E1)Y(E2)Z(H) 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	E2-plan
GSM/GPRS 1900	H-plan	E2-plan
WCDMA/HSPA Band V	H-plan	E2-plan

GSM/GPRS 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 850 GSM/GPRS 1900
BAND EDGE	128 to 251 512 to 810	128, 251 512, 810	GSM/GPRS 850 GSM/GPRS 1900
CONDCUDETED EMISSION	128 to 251 512 to 810	128, 190, 251 512, 661, 810	GSM/GPRS 850 GSM/GPRS 1900
RADIATED EMISSION	128 to 251 512 to 810	128, 190, 251 512, 661, 810	GPRS 850 GPRS 1900

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	4132, 4183, 4233	WCDMA/HSPA Band V
PEAK TO AVERAGE RATIO	4132 to 4233	4132, 4183, 4233	WCDMA/HSPA Band V
BAND EDGE	4132 to 4233	4132, 4233	WCDMA Band V
CONDCUDETED EMISSION	4132 to 4233	4132, 4183, 4233	WCDMA/HSPA Band V
RADIATED EMISSION	4132 to 4233	4132, 4183, 4233	WCDMA Band V

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

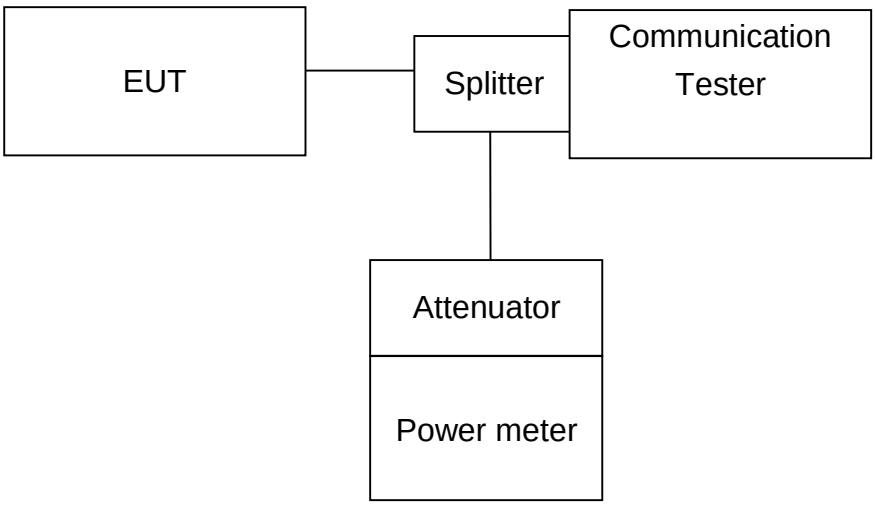
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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

6.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Radio Communica-tion Analyer	Anritsu	MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019

6.5. Measurement Result

RF Conducted Output Power

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

EUT Mode	Frequency (MHz)	CH	Average Burst Power (1DN 1UP) Class 8 (dBm)
GSM 850	824.2	128	31.72
	836.6	190	31.91
	848.8	251	32.05
GSM 1900	1850.2	512	29.22
	1880.0	661	29.33
	1909.8	810	28.96

EUT Mode	Frequency (MHz)	CH	Average Burst Power (1DN 1UP) Class 8 (dBm)	Average Burst Power (1DN 2UP) Class 10 (dBm)	Average Burst Power (1DN 3UP) Class 12 (dBm)	Average Burst Power (1DN 4UP) Class 12 (dBm)
GPRS 850	824.2	128	31.75	29.54	27.62	26.48
	836.6	190	31.97	29.58	27.59	26.38
	848.8	251	32.08	29.44	27.52	26.31
GPRS 1900	1850.2	512	29.28	26.72	24.92	23.65
	1880.0	661	29.37	26.67	24.93	23.79
	1909.8	810	29.01	26.65	24.73	23.78

WCDMA MODE:

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 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:

WCDMA/HSUPA/HSDPA Band V Result:

EUT Mode	Freq. (MHz)	CH	Conducted Avg. Power (dBm)
WCDMA	826.4	4132	23.05
	836.6	4183	23.26
	846.6	4233	23.44
HSDPA	826.4	4132	22.19
	836.6	4183	22.23
	846.6	4233	22.24
HSUPA	826.4	4132	21.82
	836.6	4183	22.09
	846.6	4233	21.43

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 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 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} (*Note1, 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 Limitation (dBm)	Comments
		4132	4183	4233		
HSDPA V	1	22.19	22.23	22.24	20.3dBm – 25.7dBm	Pass
	2	21.49	21.69	21.62	20.3dBm – 25.7dBm	Pass
	3	21.45	21.66	21.82	19.8dBm – 25.7dBm	Pass
	4	21.44	21.56	21.80	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 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 RMC 12.2kps is used for this testing

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} (Codes)	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	β_{ed}1: 47/15 β_{ed}2: 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 V	1	21.82	22.09	21.43	17.3dBm – 25.7dBm	Pass
	2	20.03	20.26	20.66	16.8dBm – 25.7dBm	Pass
	3	19.88	20.05	20.09	17.8dBm – 25.7dBm	Pass
	4	20.94	21.08	21.02	16.8dBm – 25.7dBm	Pass
	5	21.90	22.00	22.10	20.3dBm – 25.7dBm	Pass

Minimum Communications Power Measurement

PCS 1900 band

PCL	0	1	2	3	4	5	6	7	8
Output power (dBm)	28.47	26.54	25.11	23.17	21.09	19.31	17.17	15.14	13.22

PCL	9	10	11	12	13	14	15
Output power (dBm)	11.08	9.12	7.07	5.24	3.11	1.03	-0.68

Note: The EUT output power was controlled by simulator. Set Communication Tester MT8820C 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 MT8820C 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.

7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED POWER MEASUREMENT

7.1. Standard Applicable

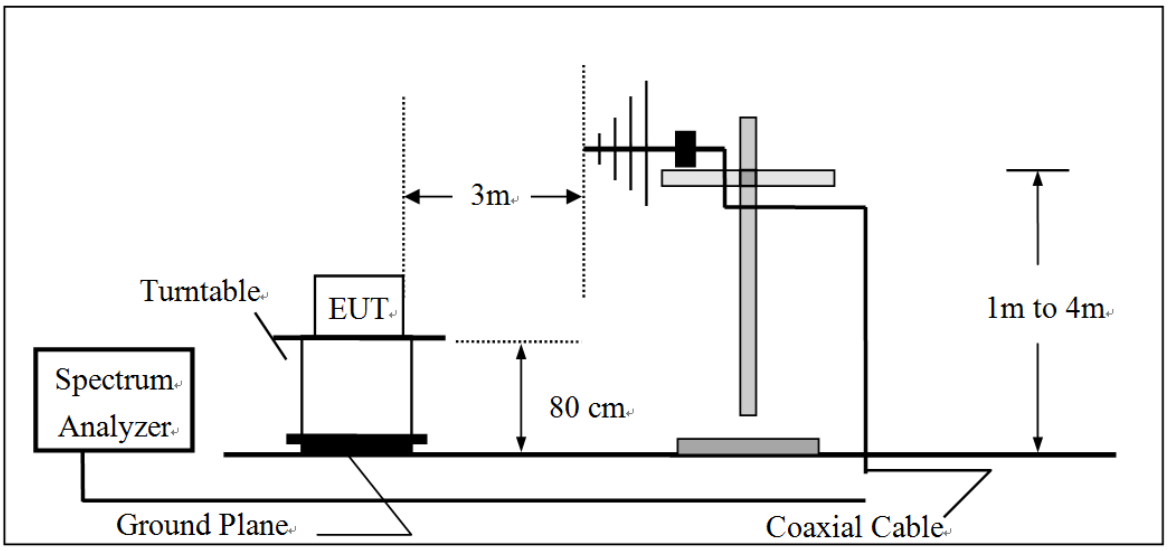
According to FCC §2.1046

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

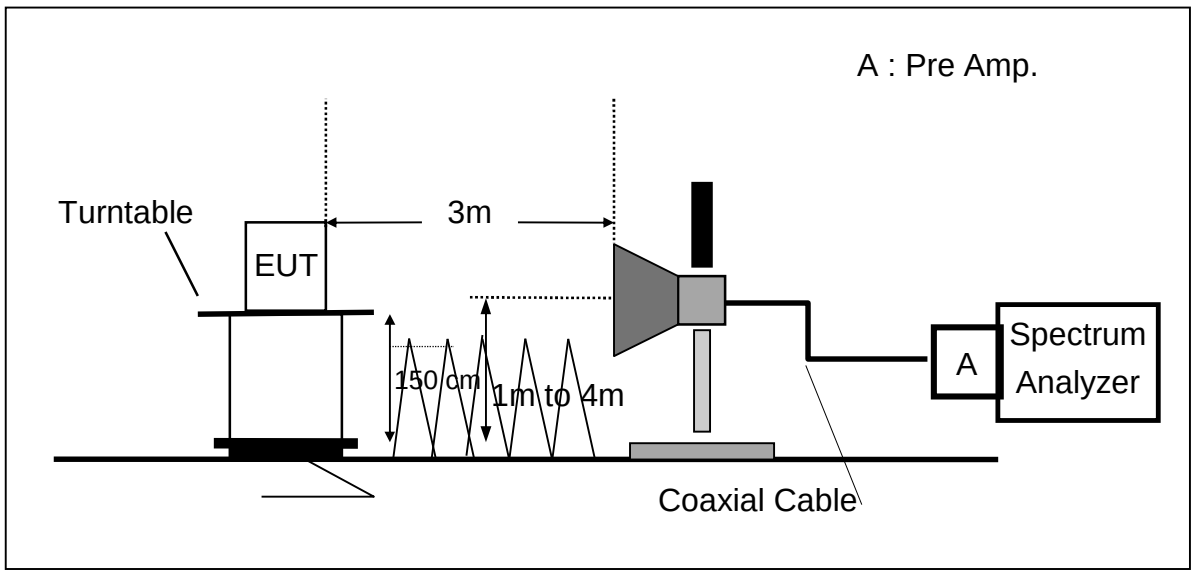
FCC 24.232(b) Mobile and portable stations are limited to 2W EIRP.

7.2. Test SET-UP

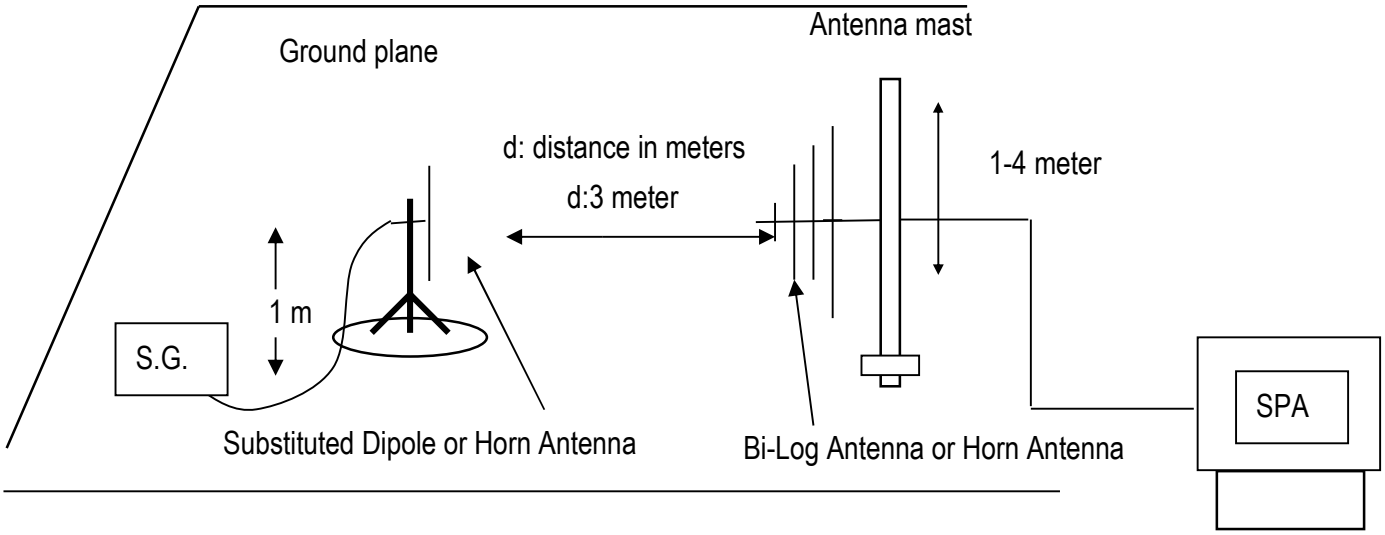
(A) Radiated Power Test Set-Up, Frequency Below1000MHz



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



(C) Substituted Method Test Set-UP



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. output (dBm) + Antenna Gain (dBd) – Cable Loss (dB)
7. EIRP = S.G. output (dBm) + Antenna Gain (dBi) – 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 > =3xRBW.
   (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 ≈ 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 sweet time = 601*10^-3 = 6s.

   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*log (TBW/RBW), where TBW is the transmission of UE exceeding the maximum BW UE can extends, and RBW is the resolution BW in UE.

7.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2018/08/16	2019/08/15
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2018/10/08	2019/10/07
3m Site NSA	SGS	966 chamber	N/A	2018/01/02	2019/01/01
Spectrum Analyzer	Agilent	E4446A	MY51100003	2018/05/15	2019/05/14
Network Analyze	Anritsu	MS4644A	1216312	2018/06/19	2019/06/18
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instru-ments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01

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	15.19	3.45	-3.11	15.53	38.45
			H	28.28	3.45	-3.11	28.62	38.45
	836.6	190	V	23.5	3.45	-3.32	23.64	38.45
			H	29.28	3.45	-3.32	29.42	38.45
	848.8	251	V	25.4	3.46	-3.16	25.7	38.45
			H	29.42	3.46	-3.16	29.72	38.45
GPRS 850	824.2	128	V	14.96	3.45	-3.11	15.3	38.45
			H	27.1	3.45	-3.12	27.43	38.45
	836.6	190	V	22.22	3.45	-3.32	22.35	38.45
			H	28.8	3.45	-3.32	28.94	38.45
	848.8	251	V	24.92	3.46	-3.16	25.22	38.45
			H	28.71	3.46	-3.16	29.01	38.45

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

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	17.41	9.77	-4.66	22.52	33.00
			H	26.38	9.77	-4.66	31.49	33.00
	1880.0	661	V	16.8	9.86	-4.7	21.96	33.00
			H	25.51	9.86	-4.7	30.67	33.00
	1909.8	810	V	17.88	9.94	-4.72	23.1	33.00
			H	24.96	9.94	-4.72	30.18	33.00
GPRS 1900	1850.2	512	V	16.34	9.77	-4.66	21.44	33.00
			H	24.68	9.77	-4.66	29.78	33.00
	1880.0	661	V	16.08	9.86	-4.7	21.24	33.00
			H	23.74	9.86	-4.7	28.9	33.00
	1909.8	810	V	16.05	9.94	-4.72	21.27	33.00
			H	23.79	9.94	-4.72	29.01	33.00

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

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 Band V	826.4	4132	V	21.42	3.45	-3.18	21.7	38.45
			H	26.53	3.45	-3.16	26.82	38.45
	836.6	4183	V	19.89	3.45	-3.32	20.03	38.45
			H	25.03	3.45	-3.32	25.17	38.45
	846.6	4233	V	22.14	3.46	-3.3	22.3	38.45
			H	25.19	3.46	-3.31	25.34	38.45
HSDPA Band V	826.4	4132	V	19.67	3.45	-3.18	19.94	38.45
			H	22.76	3.45	-3.17	23.04	38.45
	836.6	4183	V	18.46	3.45	-3.31	18.61	38.45
			H	22.17	3.45	-3.31	22.32	38.45
	846.6	4233	V	19.32	3.46	-3.36	19.42	38.45
			H	22.63	3.46	-3.31	22.78	38.45
HSUPA Band V	826.4	4132	V	20.1	3.45	-3.17	20.38	38.45
			H	23.94	3.45	-3.18	24.21	38.45
	836.6	4183	V	19.73	3.45	-3.32	19.86	38.45
			H	23.36	3.45	-3.31	23.51	38.45
	846.6	4233	V	19.83	3.46	-3.38	19.91	38.45
			H	23.79	3.46	-3.35	23.91	38.45

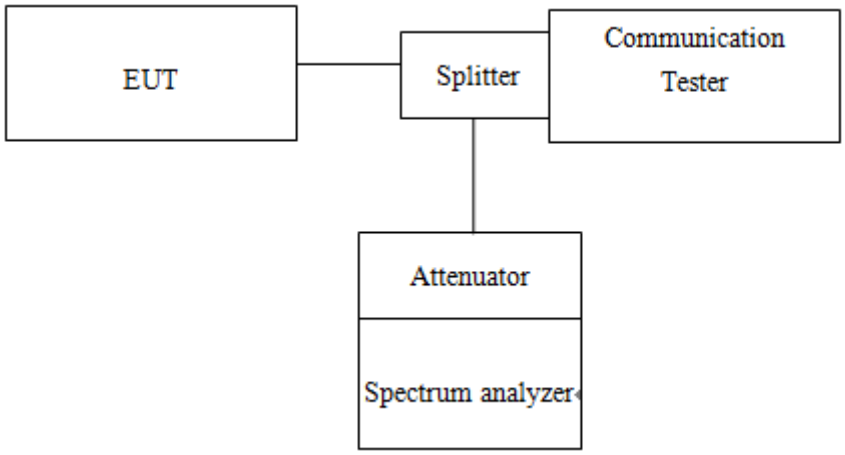
Remark： (1)The RBW,VBW of SPA for frequency RBW=300 KHz, VBW=1MHz

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

99% &26dB Bandwidth with detector peak

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%.

99% Bandwidth with detector sample

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% ~ 5% of emission BW, VBW= 3 times RBW, -20dBc display line was placed on the screen (or 20dB bandwidth). Set RBW to 99% bandwidth, RBW= 1% ~ 5%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

8.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/03/2018	05/02/2019
Radio Communication Analyer	Anritsu	MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019
2WayDivider	Woken	DSU7AMK1A1	N/A	01/02/2018	01/01/2019
Coaxial Cable	Huber Suhner	SUCOFLEX 102EPA	MY2616/2	01/02/2018	01/01/2019

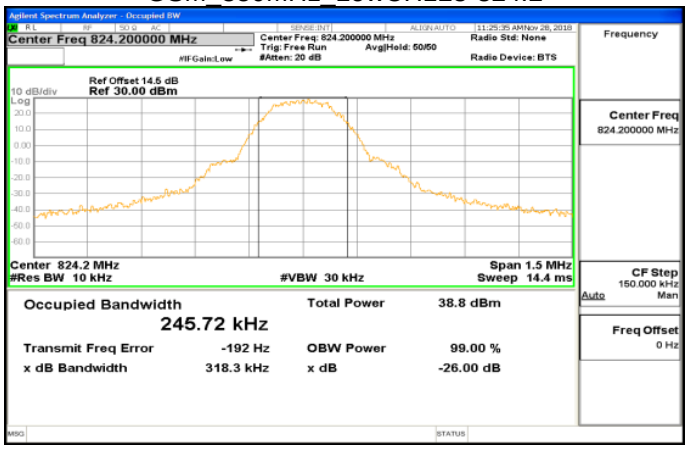
8.5. Measurement Result

Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		GSM 850	GPRS 850	GSM 850	GPRS 850
824.2	128	0.24572	0.24394	**0.318**	0.319
836.6	190	**0.24576**	**0.24642**	0.314	0.314
848.8	251	0.24493	0.24208	0.311	**0.322**

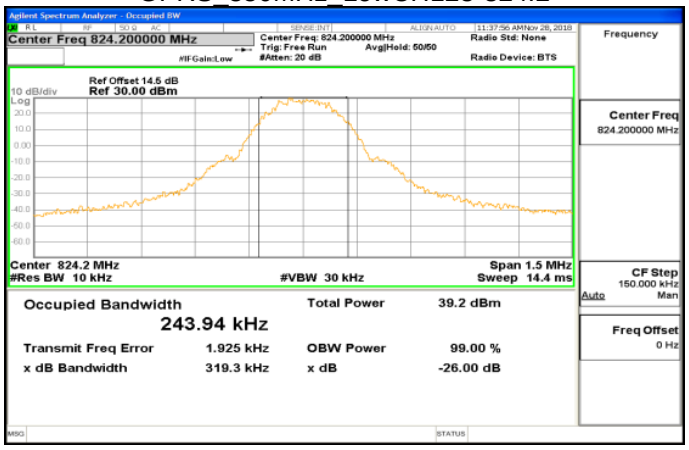
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		GSM 1900	GPRS 1900	GSM 1900	GPRS 1900
1850.2	512	**0.24958**	0.24241	0.316	**0.321**
1880.0	661	0.24365	**0.24606**	0.311	0.320
1909.8	810	0.24625	0.24186	**0.319**	0.315

Freq. (MHz)	CH	99% BW (MHz)			26 dB BW (MHz)		
		WCDMA V	HSDPA V	HSUPA V	WCDMA V	HSDPA V	HSUPA V
826.40	4132	4.11710	4.13260	**4.13440**	4.690	4.708	4.702
836.60	4183	4.12450	4.12400	4.12900	4.703	4.716	4.701
846.60	4233	**4.13840**	**4.13960**	4.13190	**4.732**	**4.723**	**4.721**

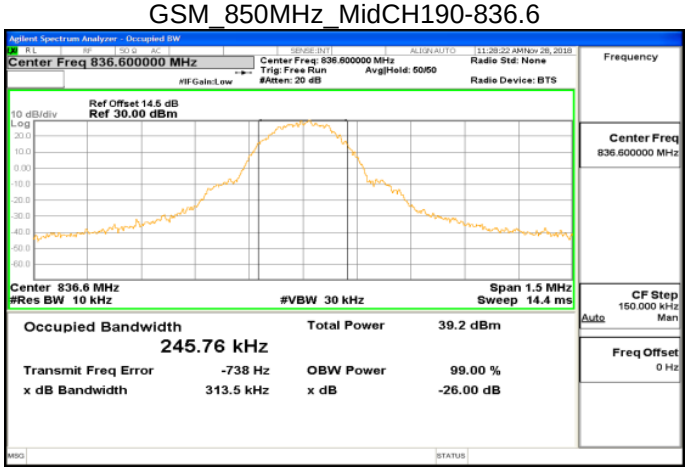
GSM_850MHz_LowCH128-824.2



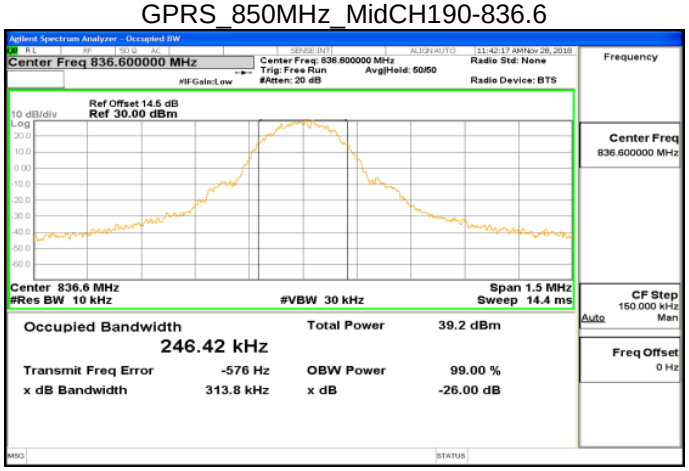
GPRS_850MHz_LowCH128-824.2



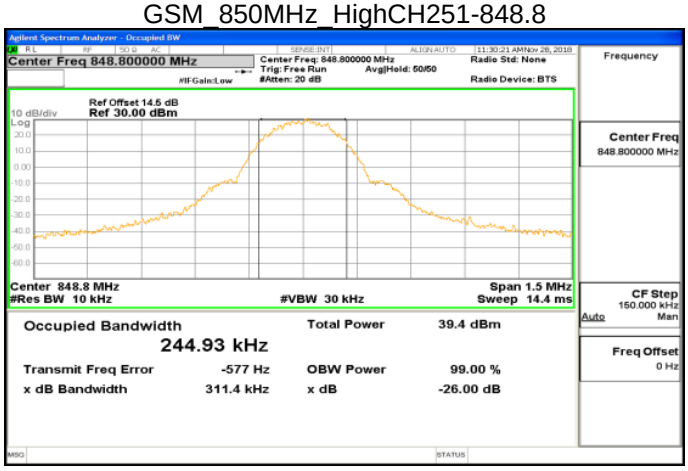
GSM_850MHz_MidCH190-836.6



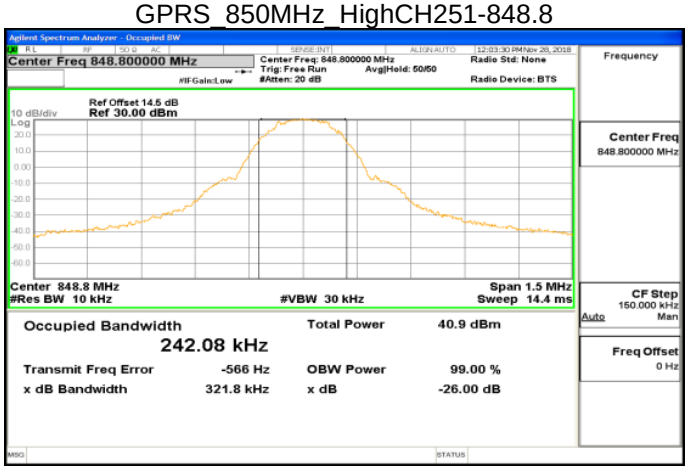
GPRS_850MHz_MidCH190-836.6



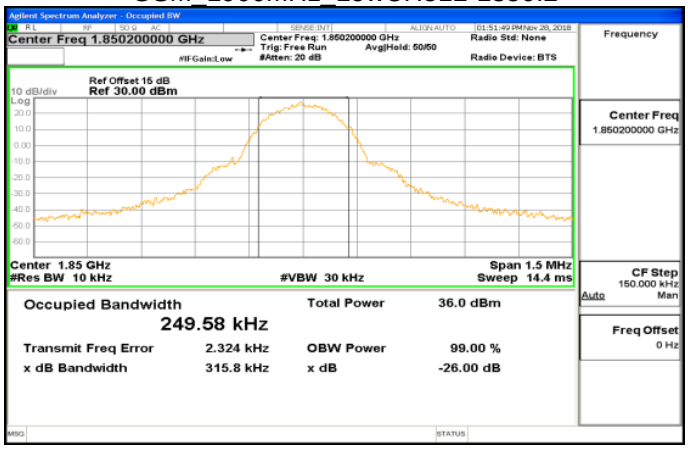
GSM_850MHz_HighCH251-848.8



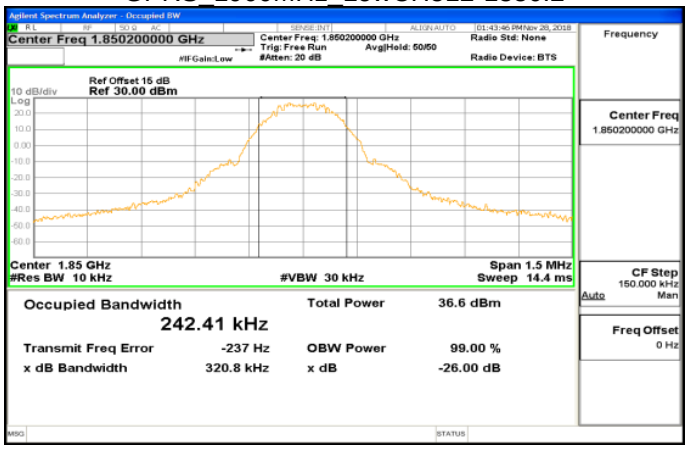
GPRS_850MHz_HighCH251-848.8



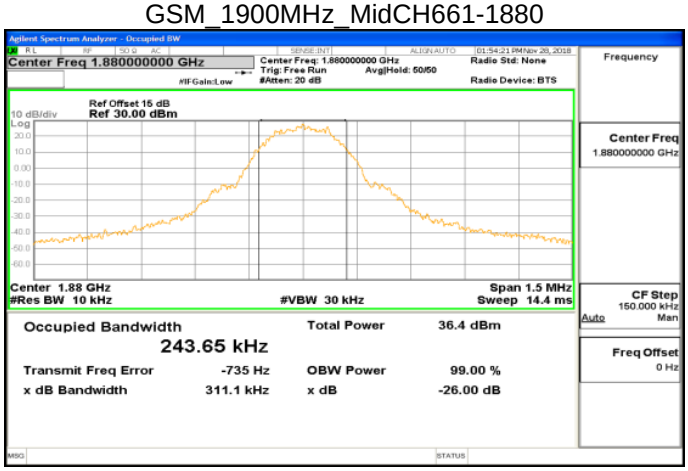
GSM_1900MHz_LowCH512-1850.2



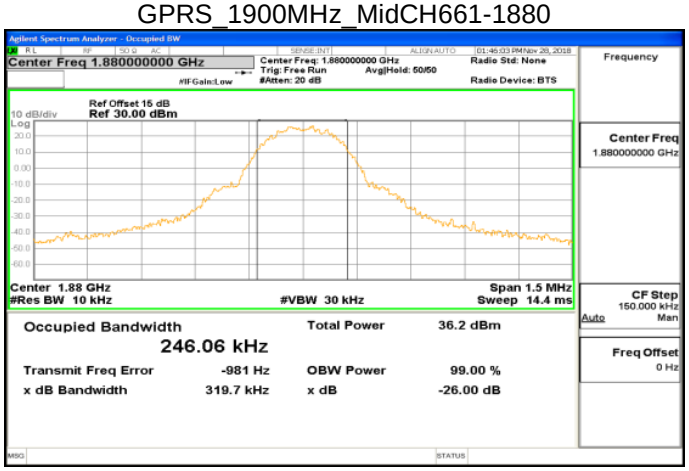
GPRS_1900MHz_LowCH512-1850.2



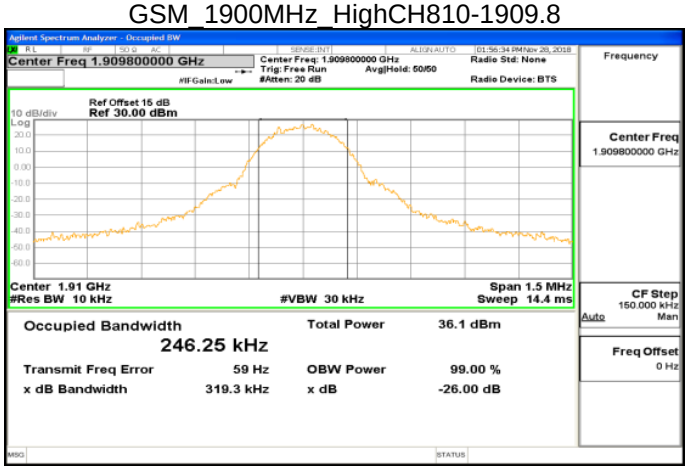
GSM_1900MHz_MidCH661-1880



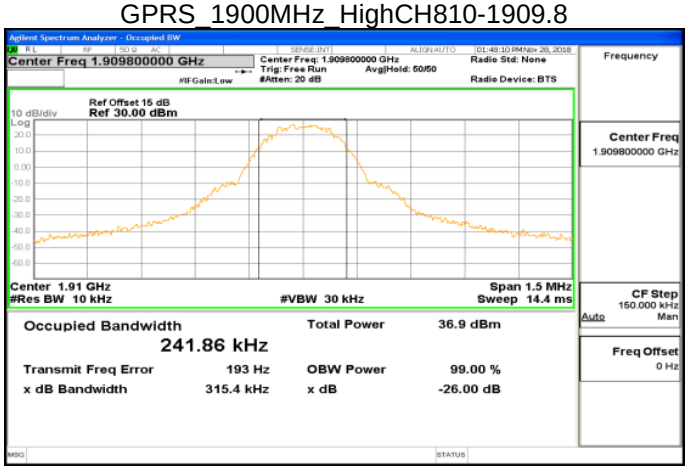
GPRS_1900MHz_MidCH661-1880



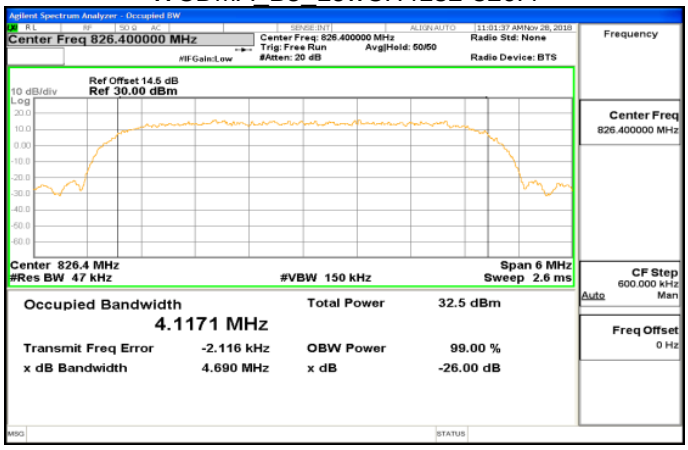
GSM_1900MHz_HighCH810-1909.8



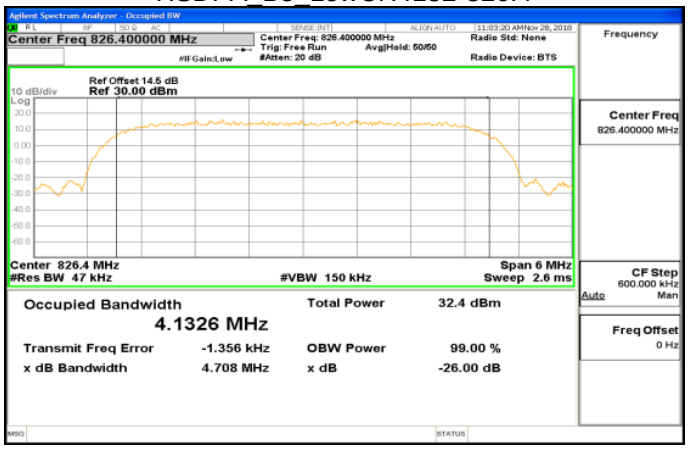
GPRS_1900MHz_HighCH810-1909.8



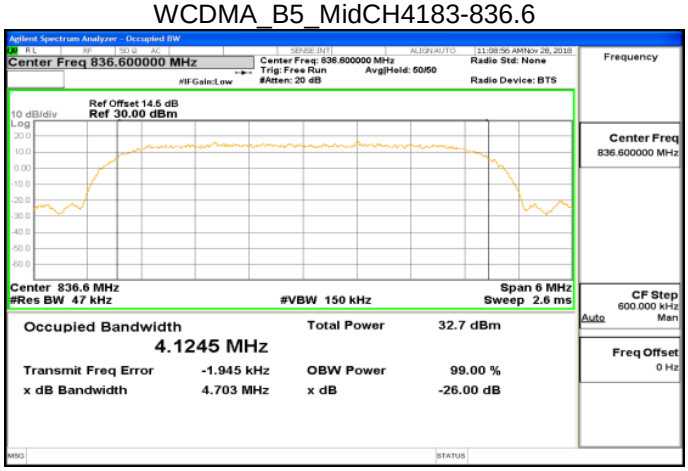
WCDMA_B5_LowCH4132-826.4



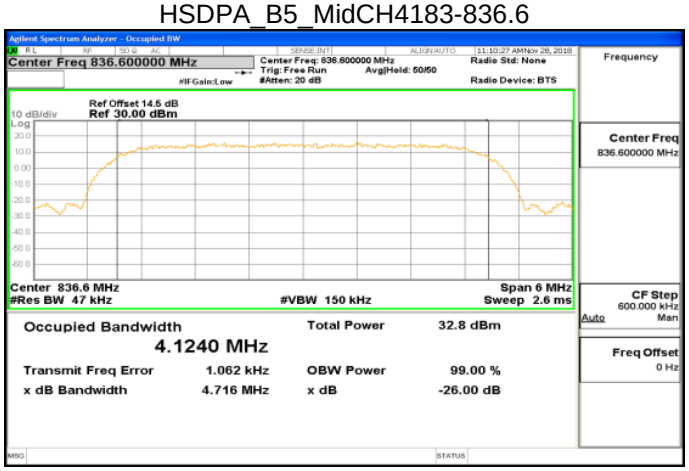
HSDPA_B5_LowCH4132-826.4



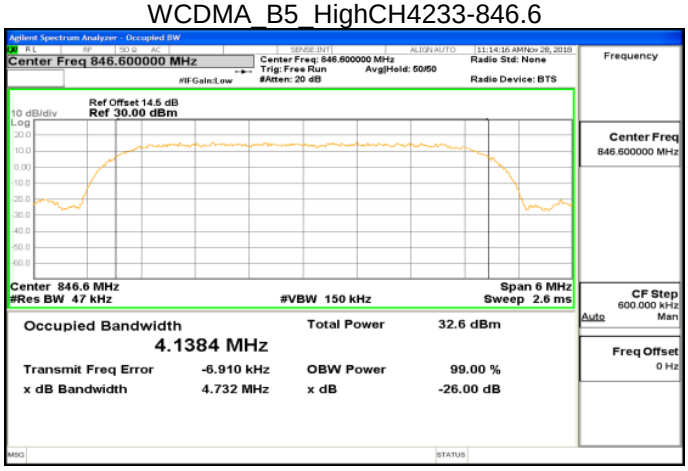
WCDMA_B5_MidCH4183-836.6



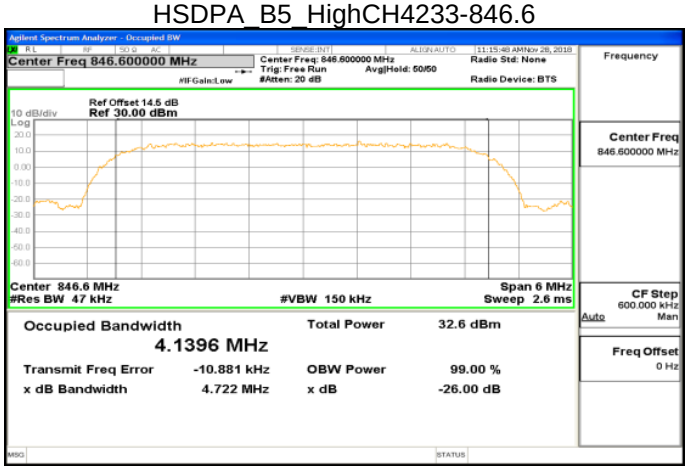
HSDPA_B5_MidCH4183-836.6



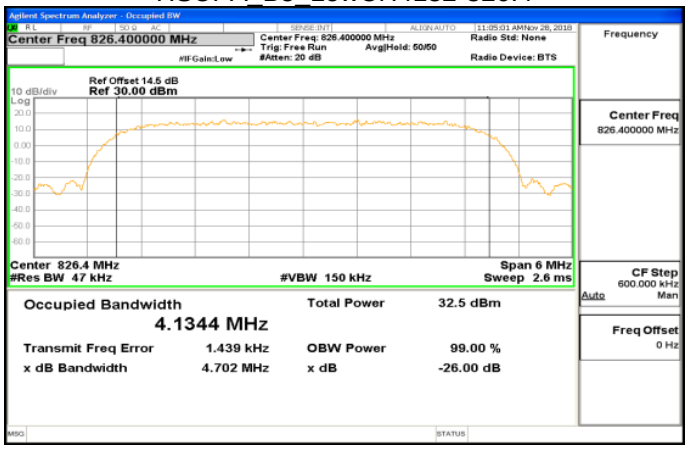
WCDMA_B5_HighCH4233-846.6



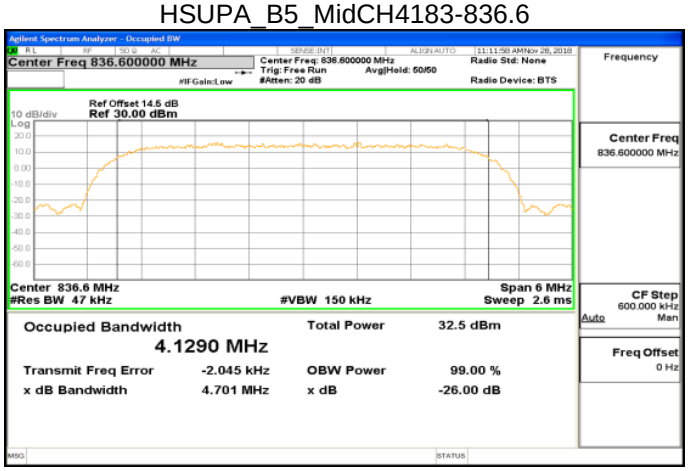
HSDPA_B5_HighCH4233-846.6



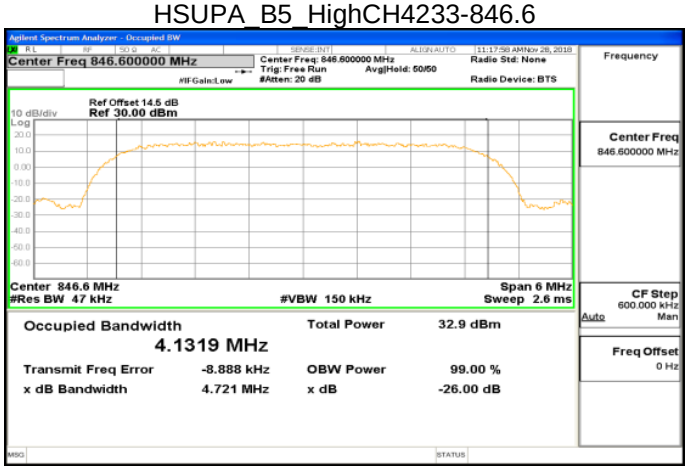
HSUPA_B5_LowCH4132-826.4



HSUPA_B5_MidCH4183-836.6



HSUPA_B5_HighCH4233-846.6

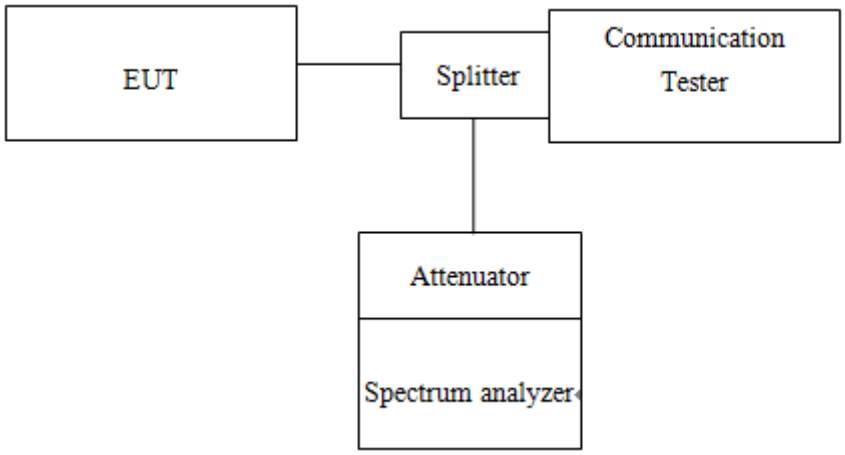


9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

9.1. Standard Applicable

FCC §22.917(a), §24.238(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.

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.

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 ≥ 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

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM-BER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2018/08/16	2019/08/15
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2018/10/08	2019/10/07
3m Site NSA	SGS	966 chamber	N/A	2018/01/02	2019/01/01
Spectrum Analyzer	Agilent	E4446A	MY51100003	2018/05/15	2019/05/14
Network Analyze	Anritsu	MS4644A	1216312	2018/06/19	2019/06/18
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instru-ments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01

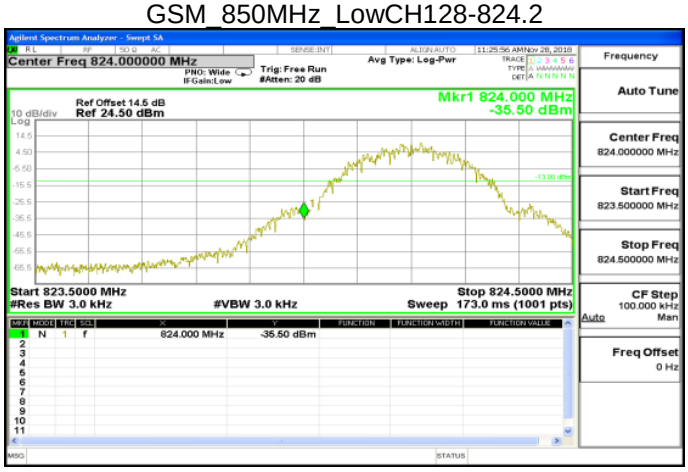
9.5. Measurement Result:

Refer to next pages.

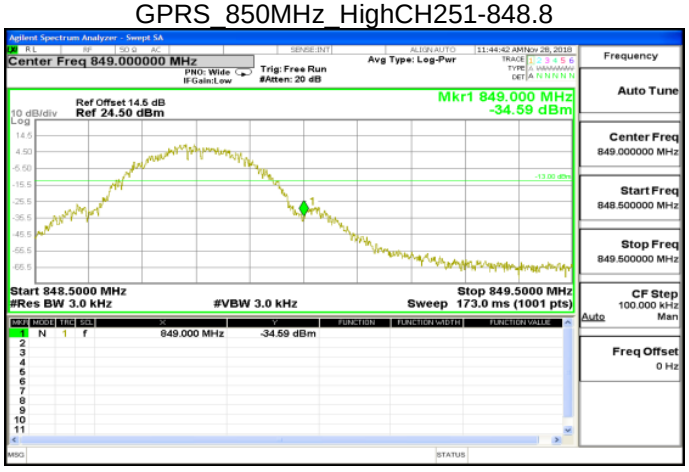
NOTE: The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

Band Edge

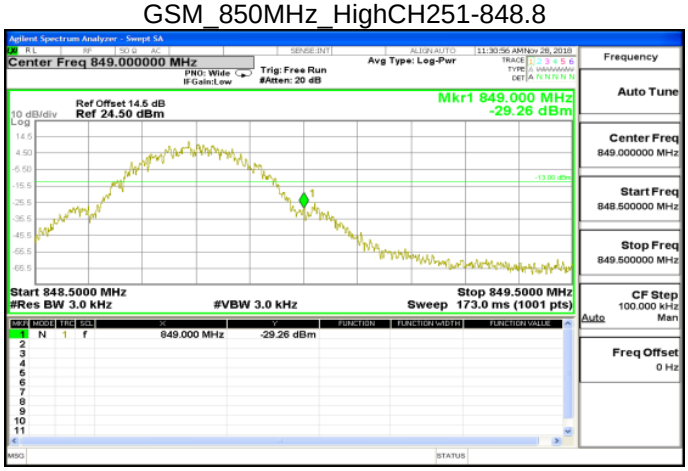
GSM_850MHz_LowCH128-824.2



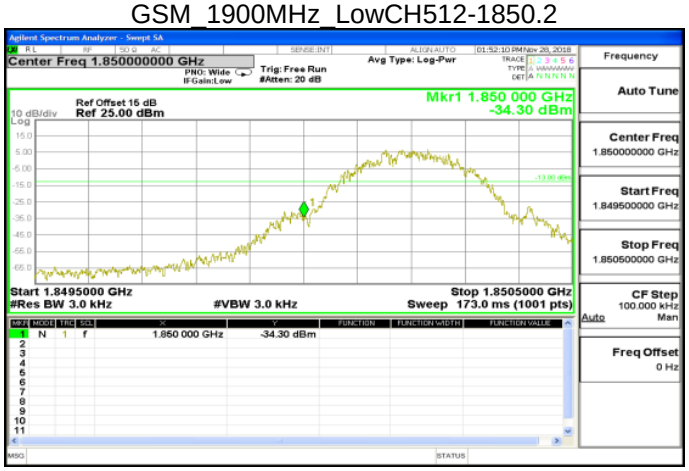
GPRS_850MHz_HighCH251-848.8



GSM_850MHz_HighCH251-848.8

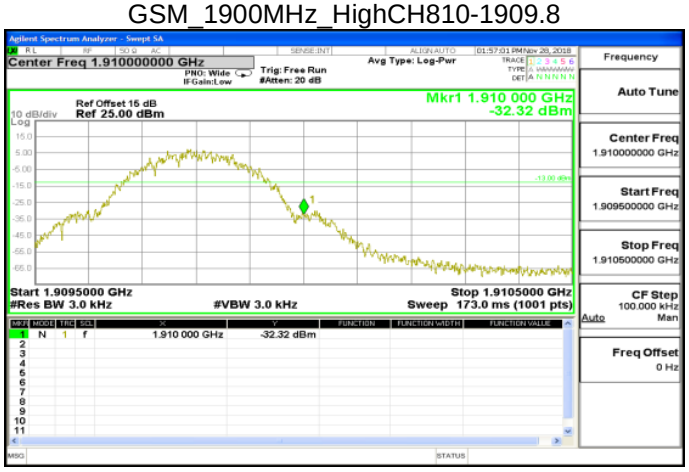


GSM_1900MHz_LowCH512-1850.2

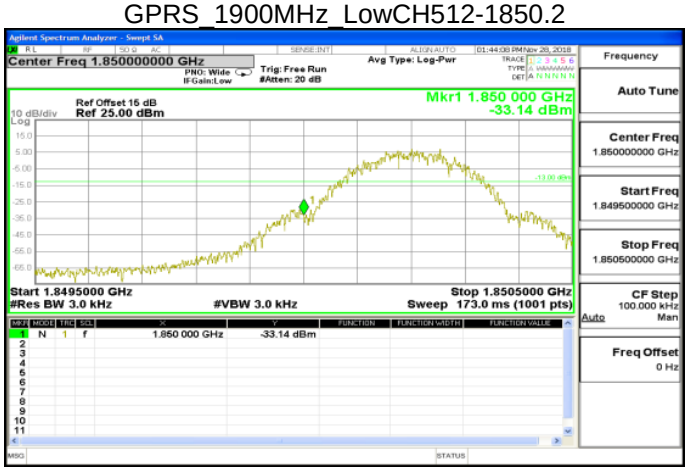


GPRS_850MHz_LowCH128-824.2

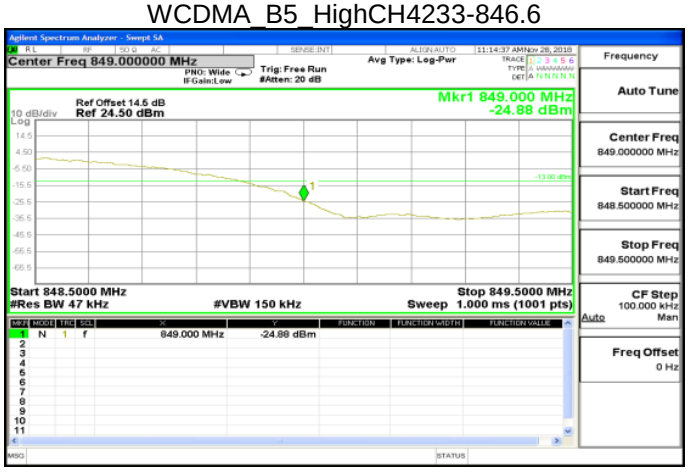
GSM_1900MHz_HighCH810-1909.8



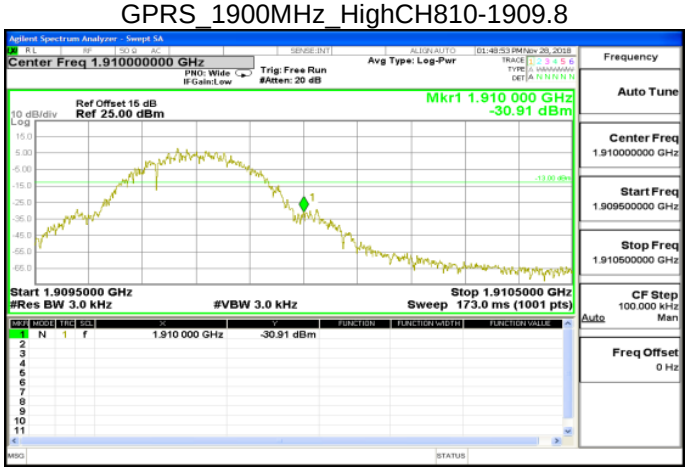
GPRS_1900MHz_LowCH512-1850.2



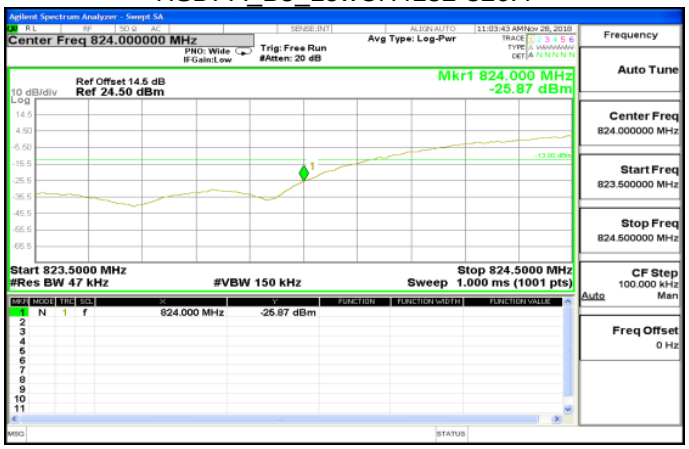
WCDMA_B5_HighCH4233-846.6



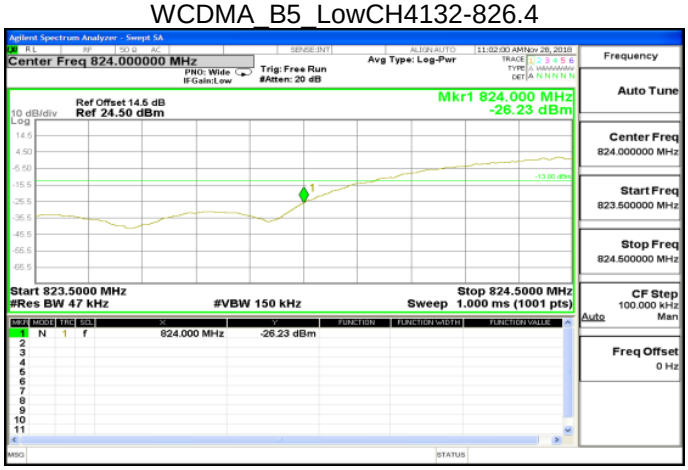
GPRS_1900MHz_HighCH810-1909.8



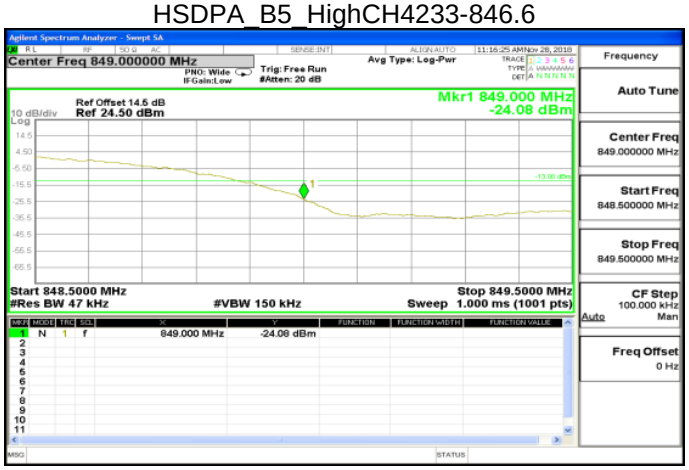
HSDPA_B5_LowCH4132-826.4



WCDMA_B5_LowCH4132-826.4



HSDPA_B5_HighCH4233-846.6



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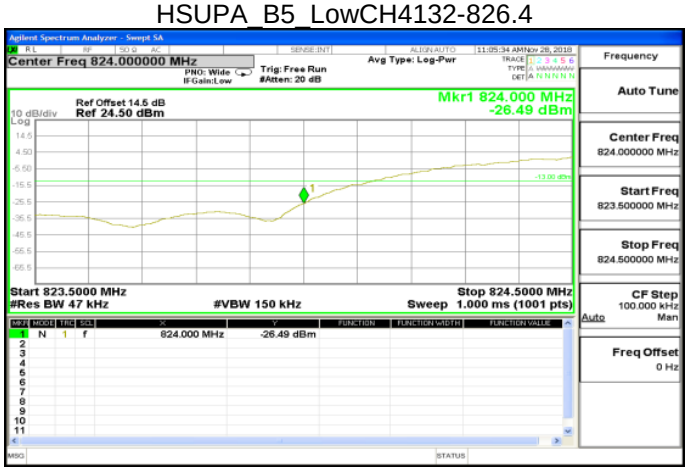

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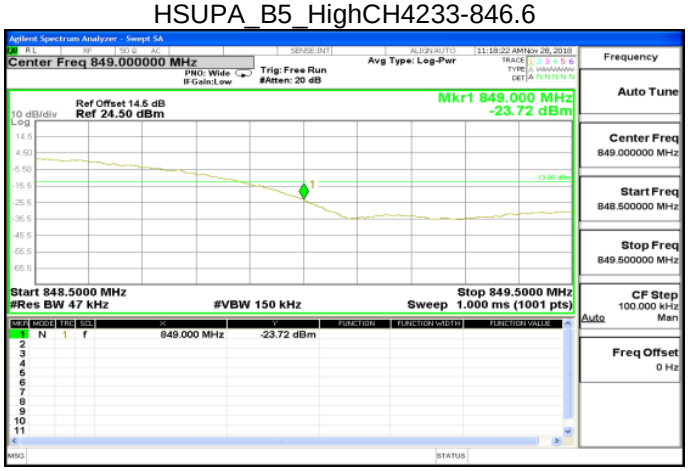
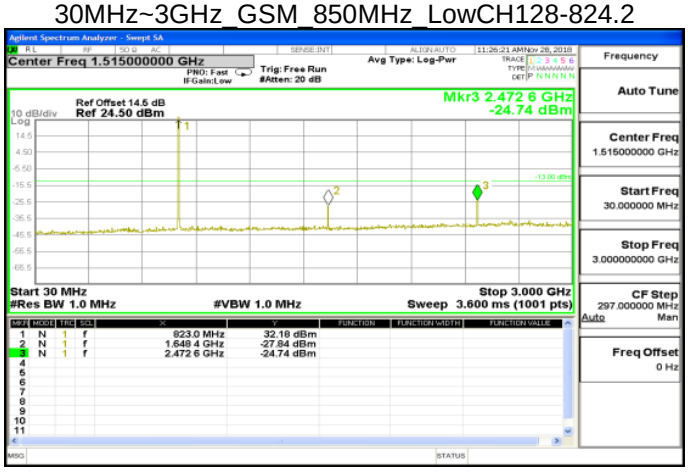


Out of Band Emission

30MHz~3GHz_GSM_850MHz_LowCH128-824.2



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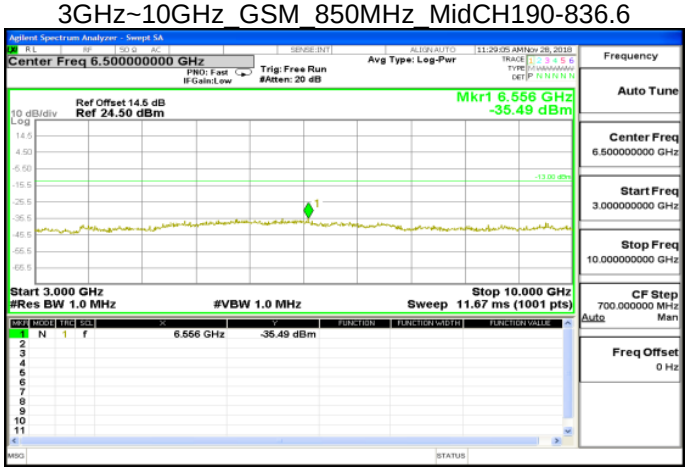

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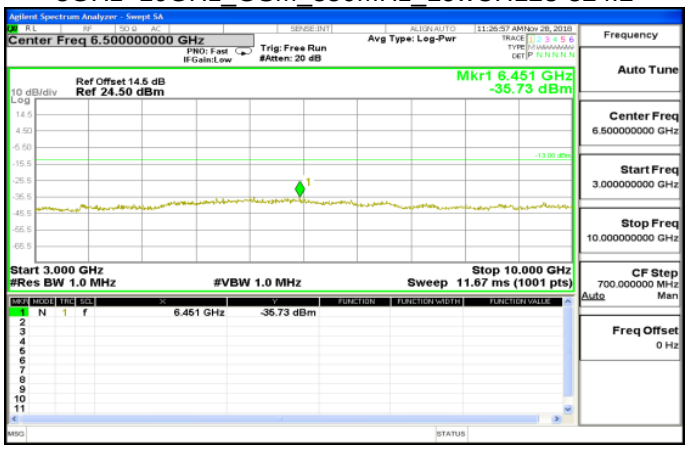
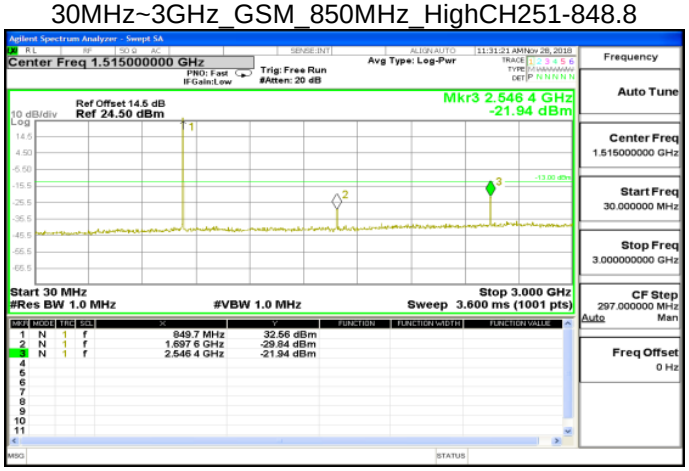


30MHz~3GHz_GSM_850MHz_HighCH251-848.8



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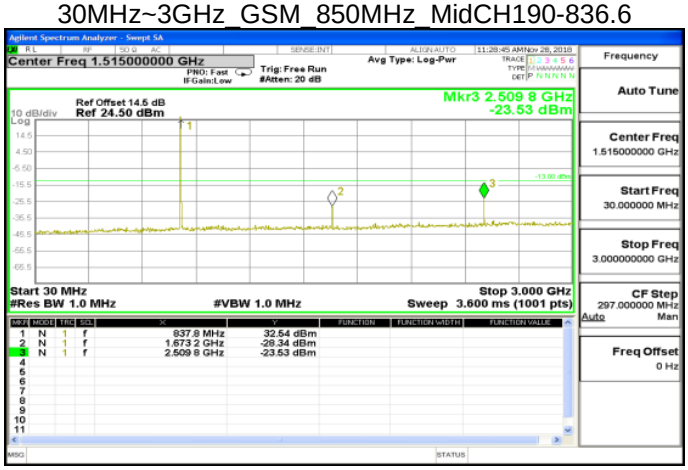

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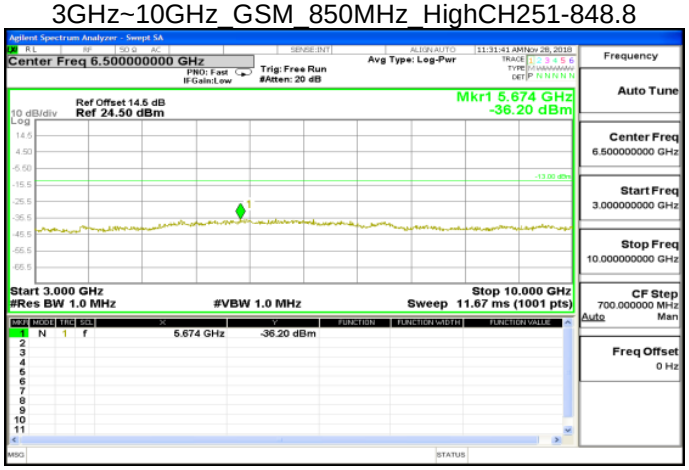

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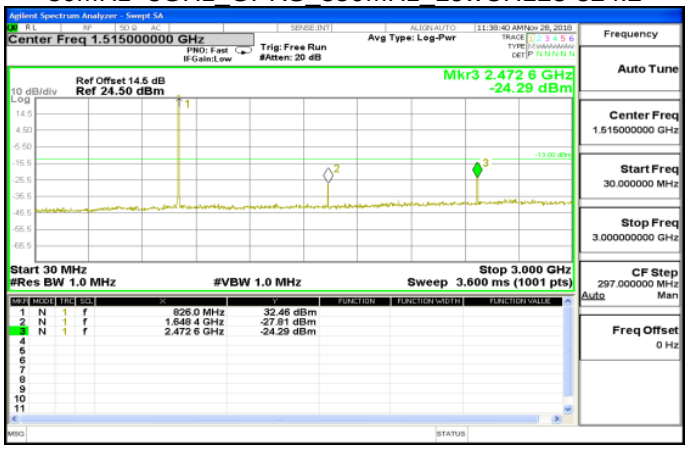

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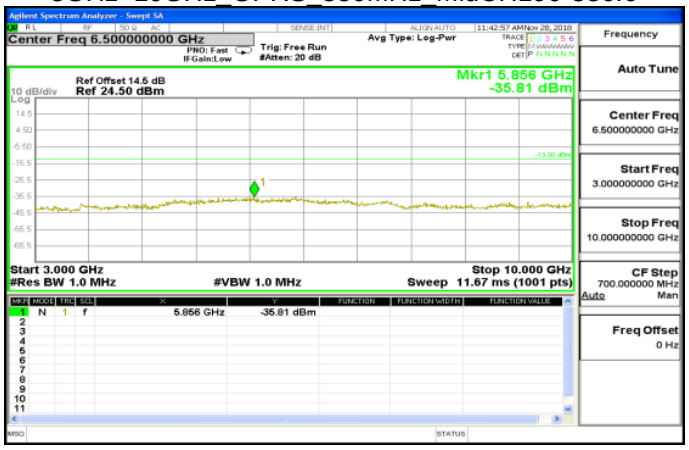

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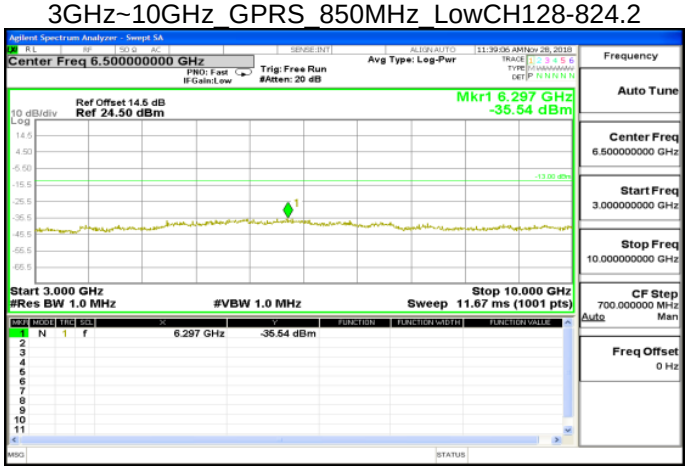

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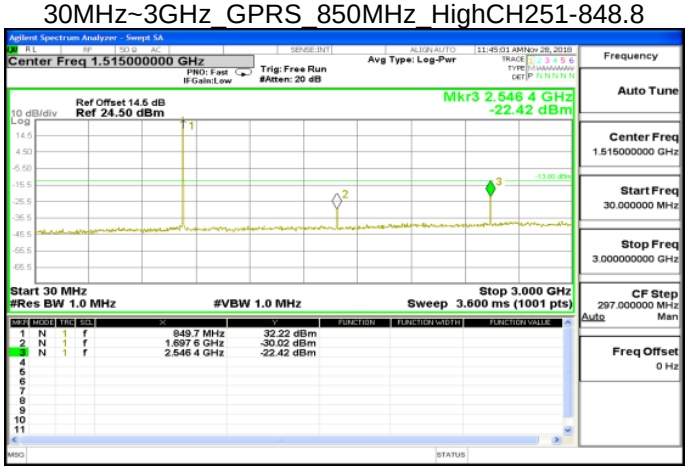

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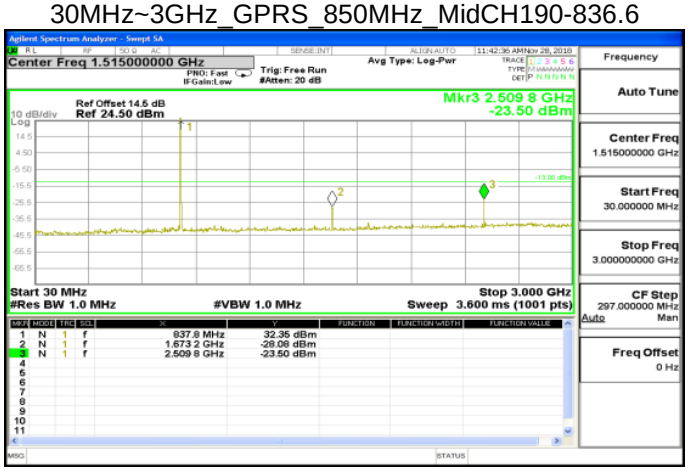

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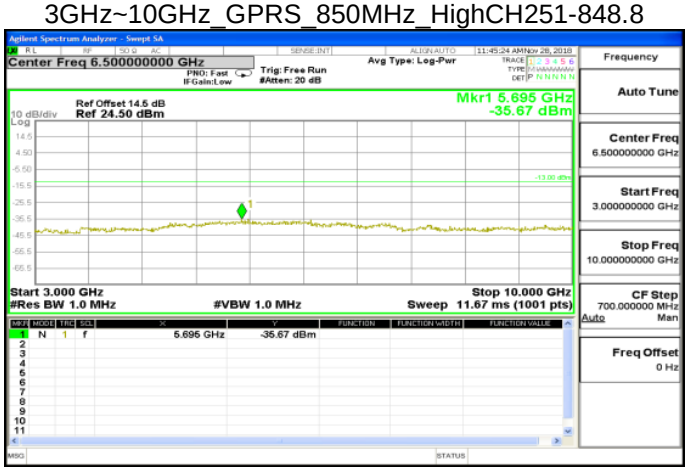
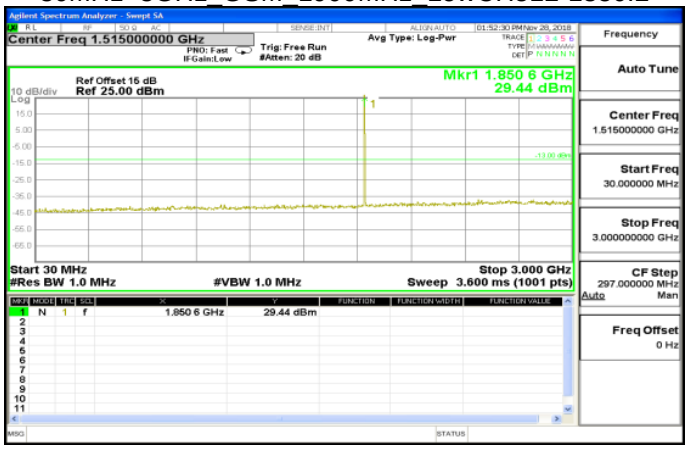
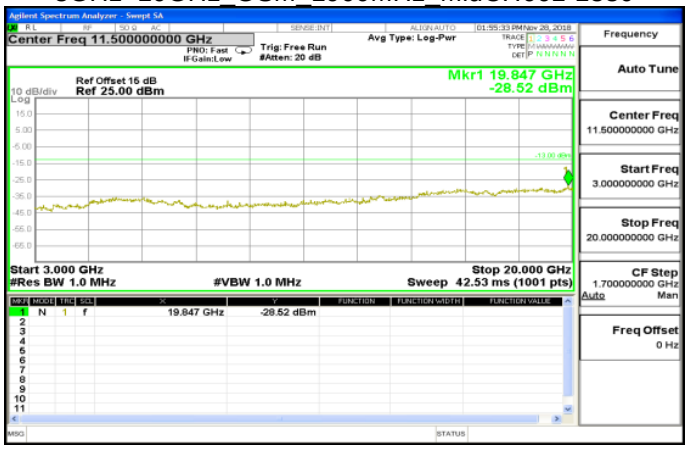


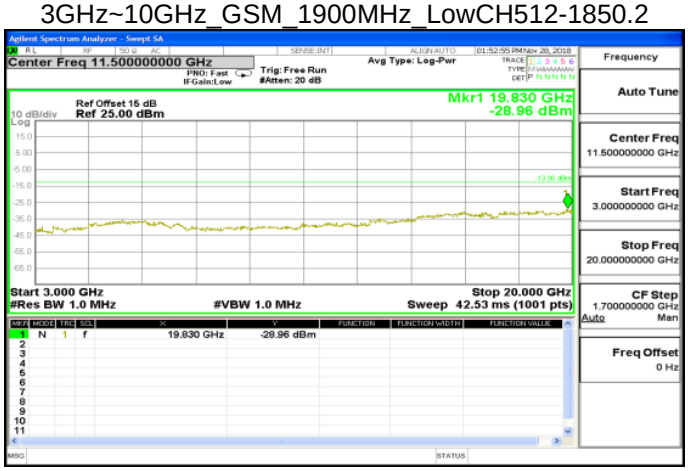
30MHz~3GHz_GSM_1900MHz_LowCH512-1850.2



3GHz~10GHz_GSM_1900MHz_MidCH661-1880



3GHz~10GHz_GSM_1900MHz_LowCH512-1850.2



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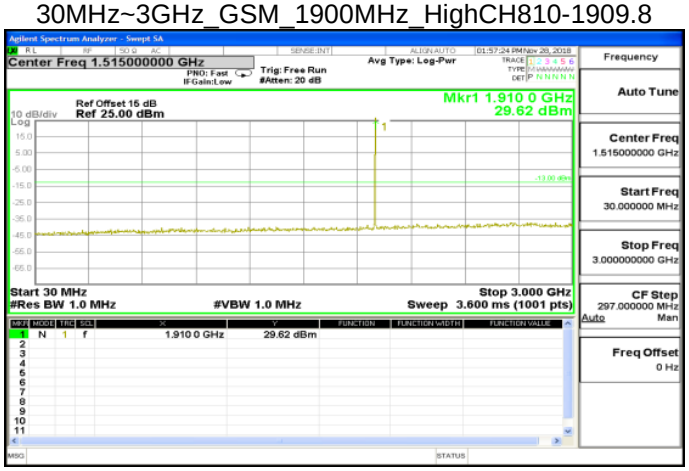

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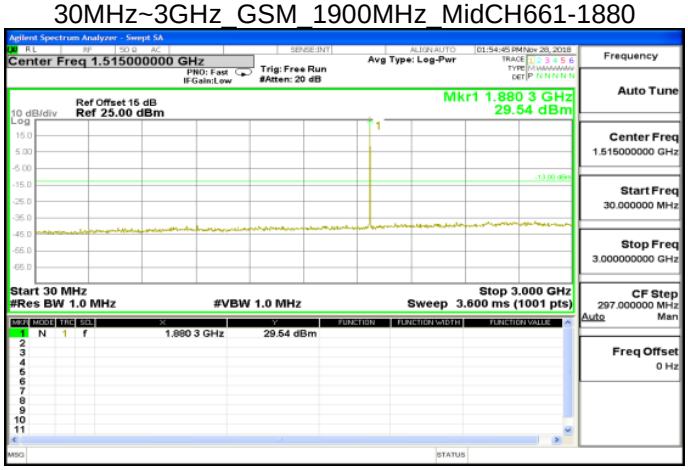

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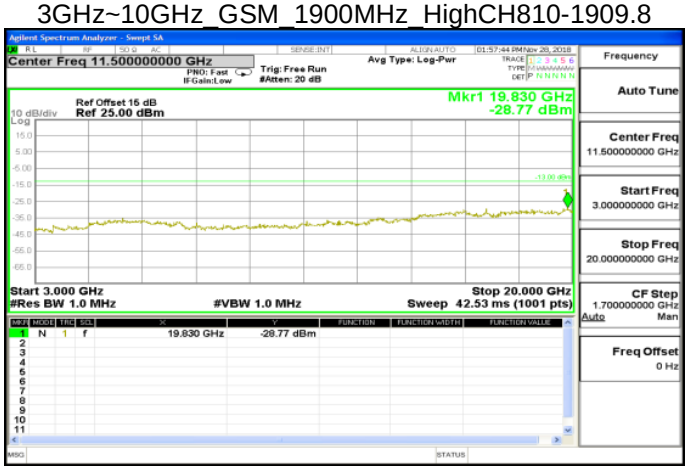

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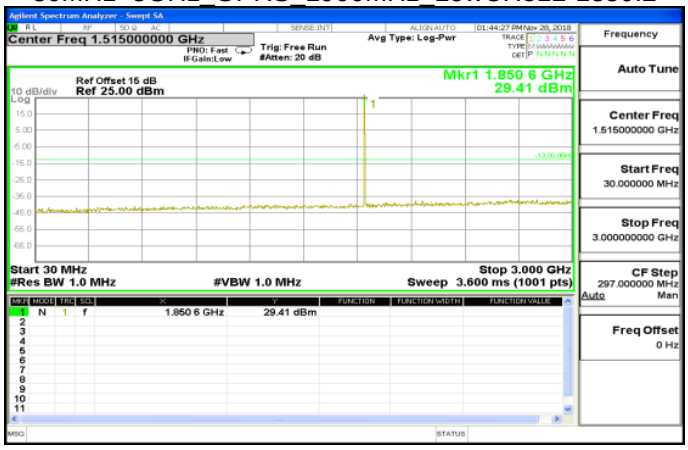

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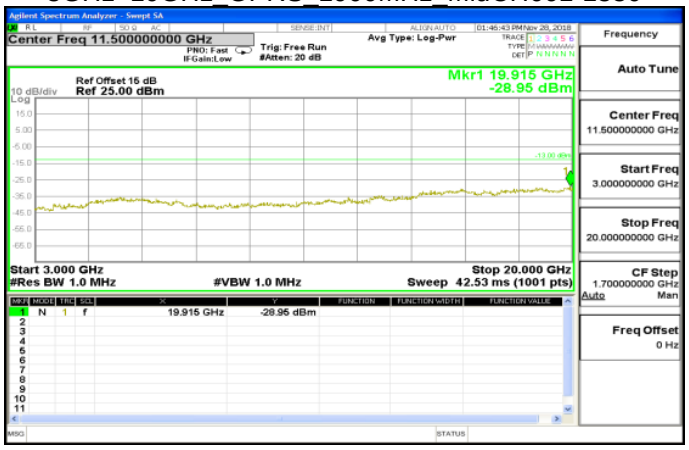

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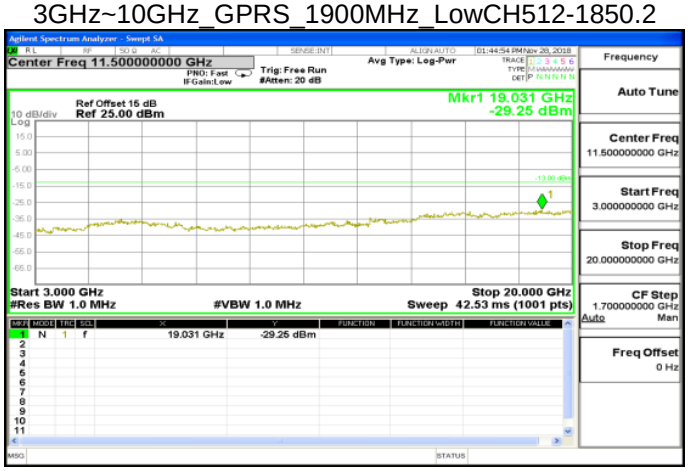

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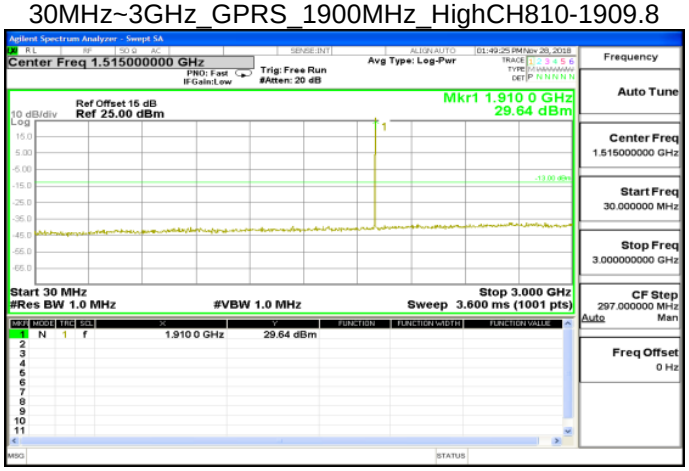

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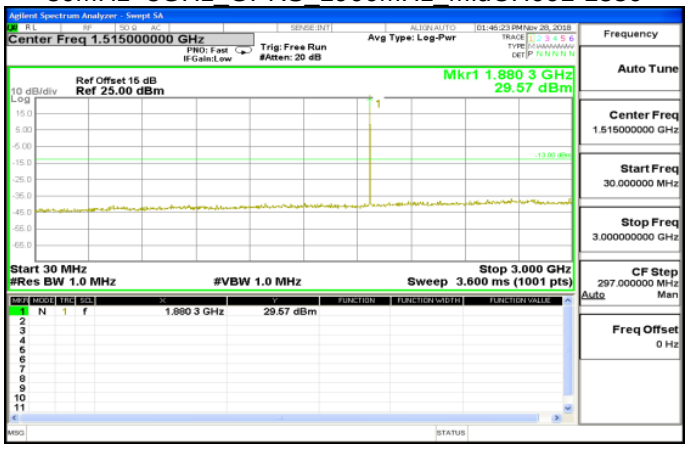

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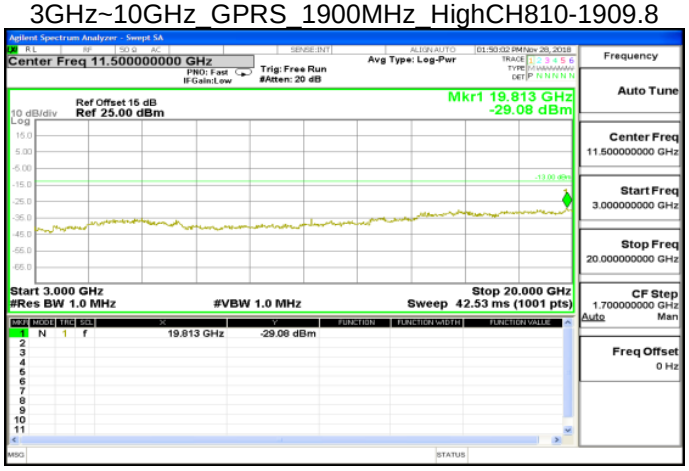
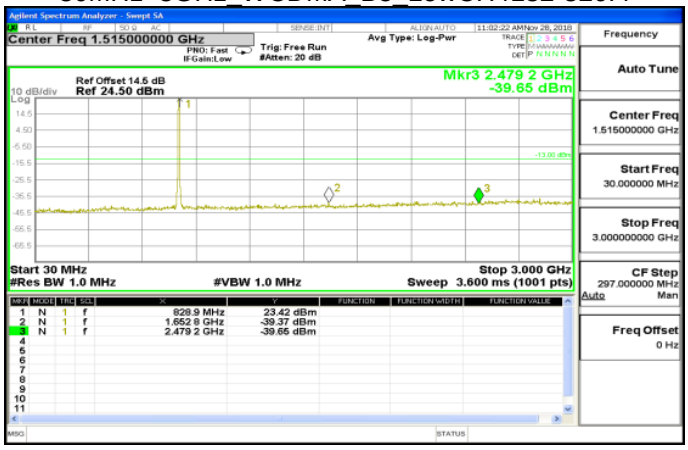


30MHz~3GHz_WCDMA_B5_LowCH4132-826.4



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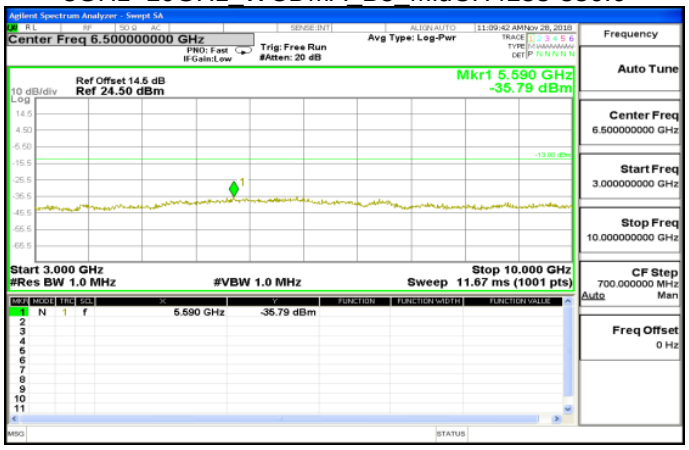

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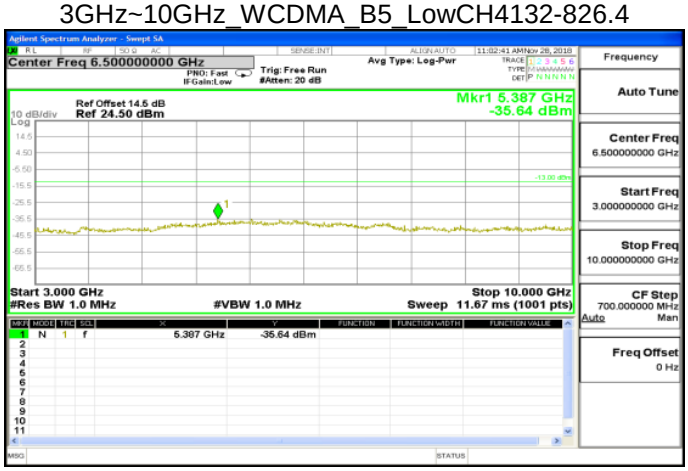

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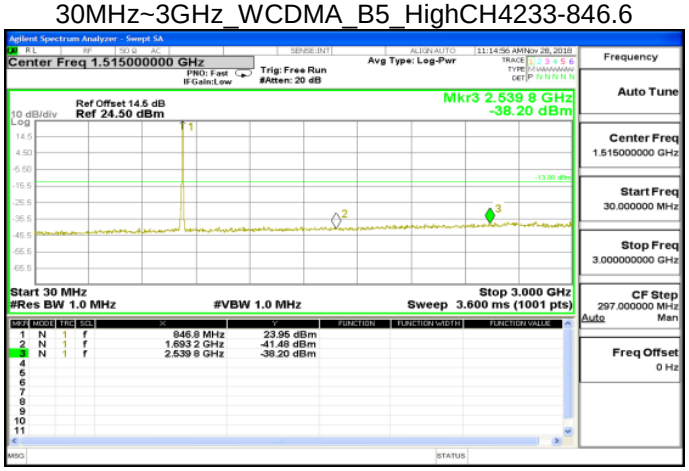

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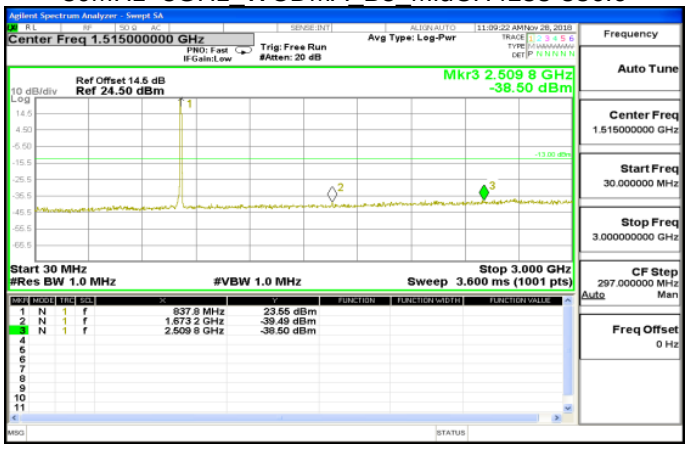

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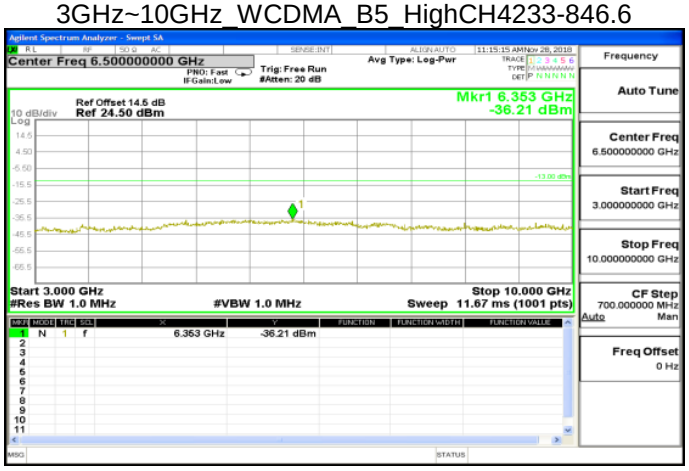

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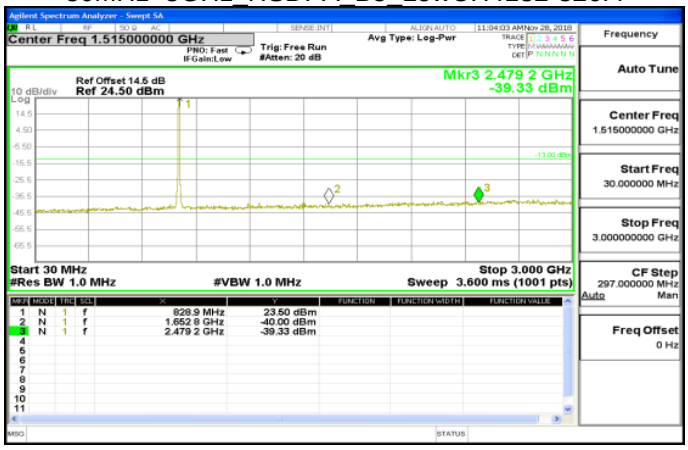

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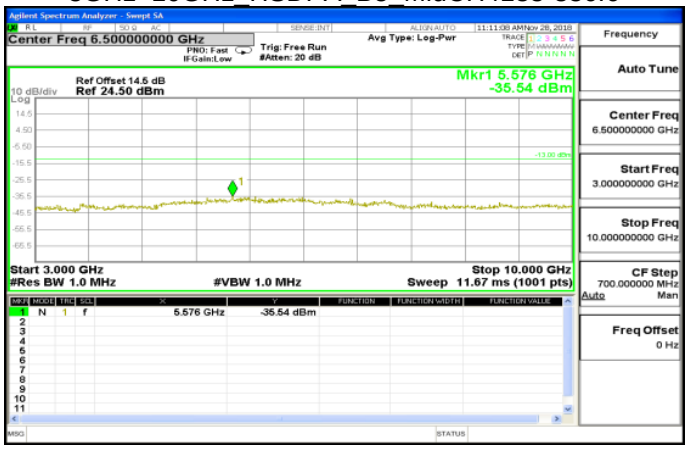

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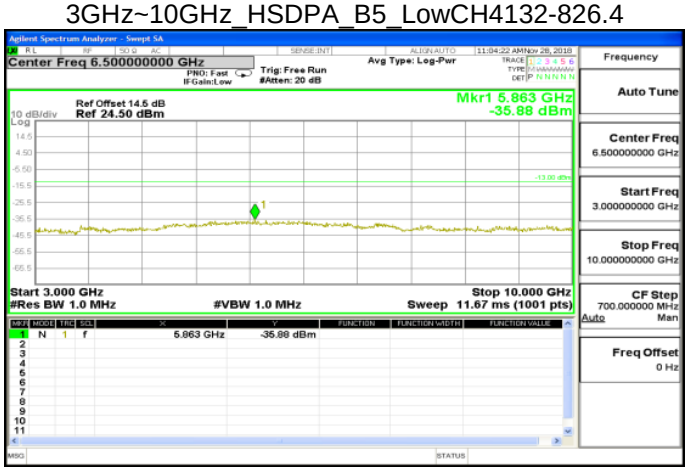

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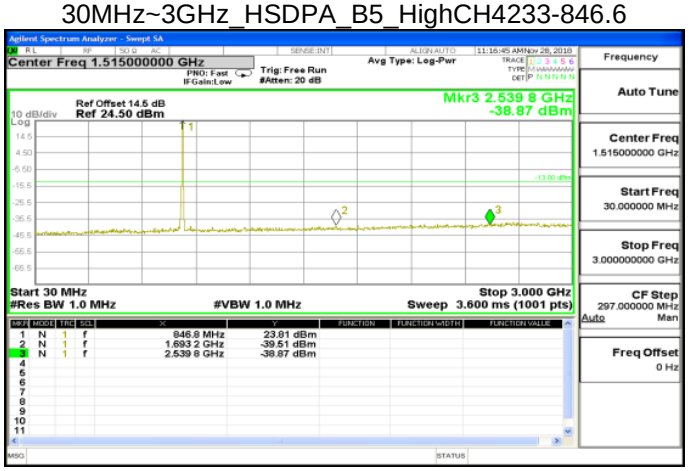

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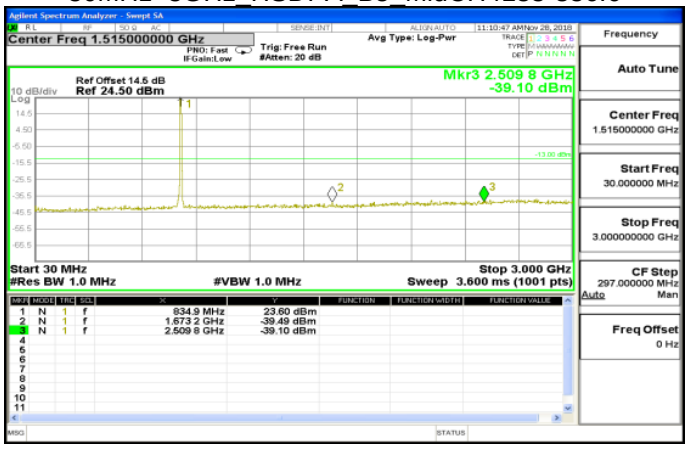

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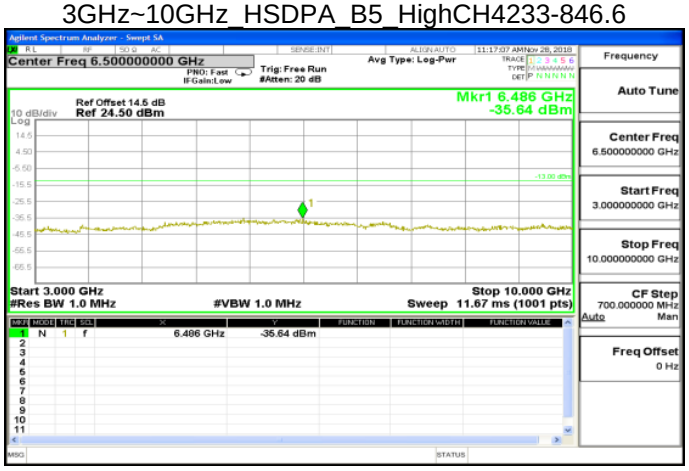

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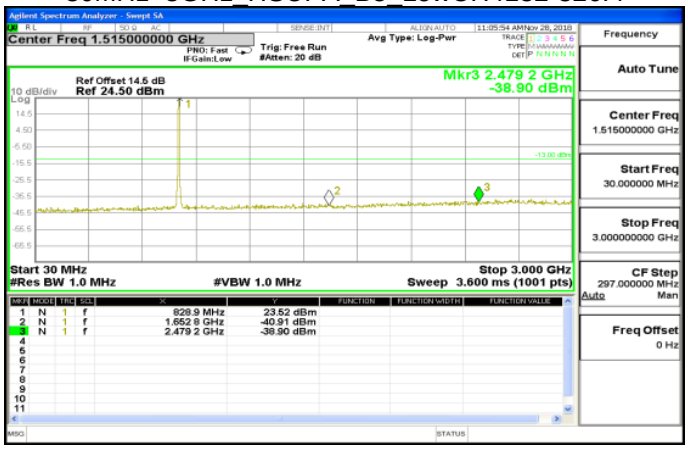
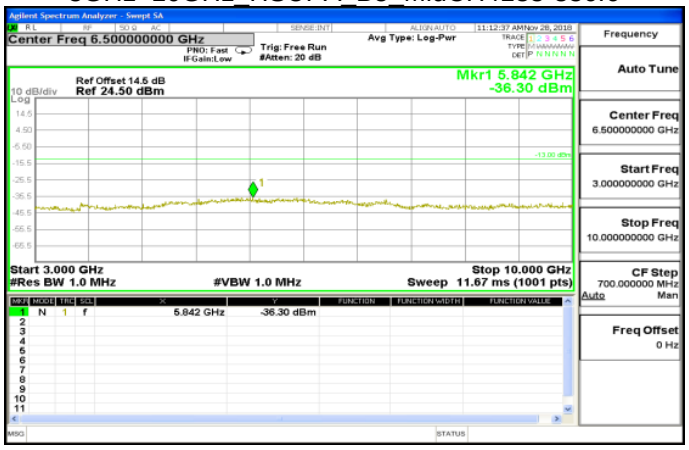


3GHz~10GHz_HSUPA_B5_MidCH4183-836.6



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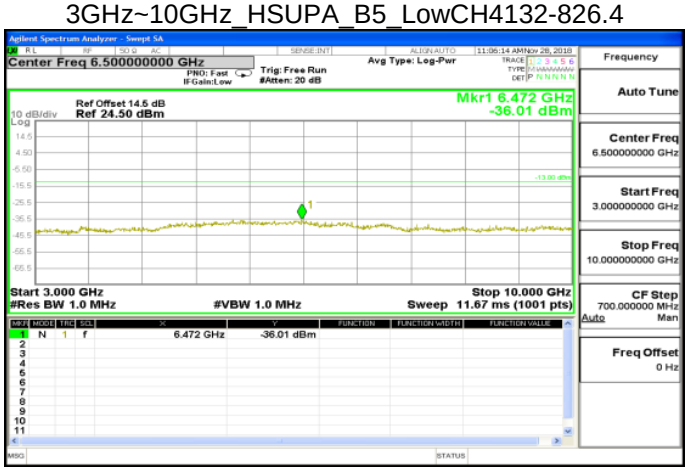

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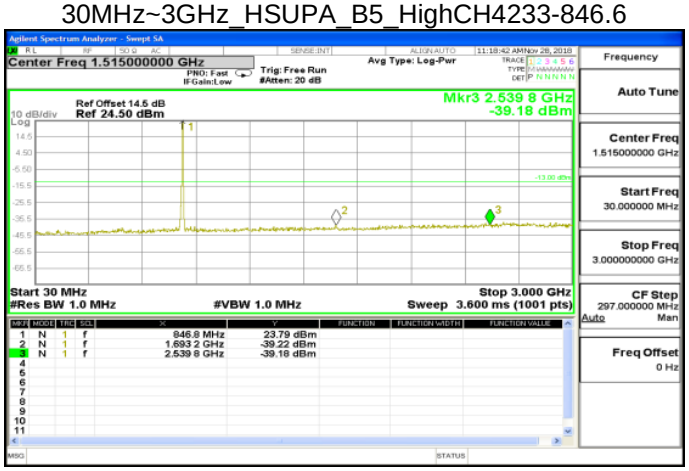

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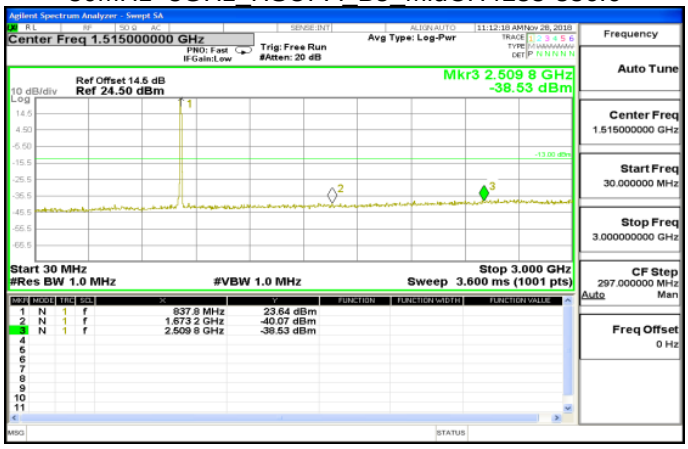

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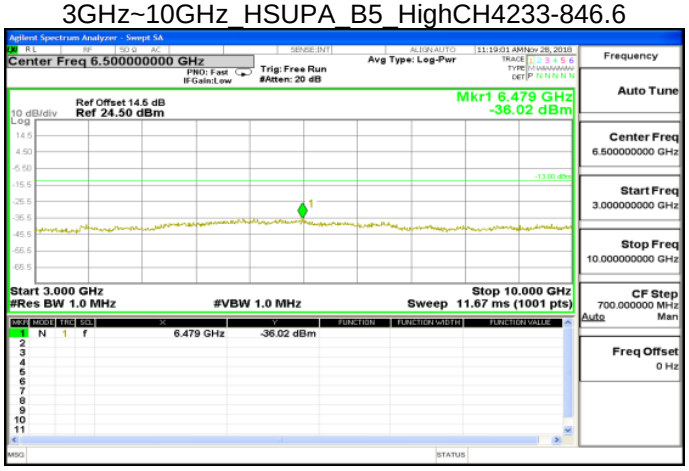


10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

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).

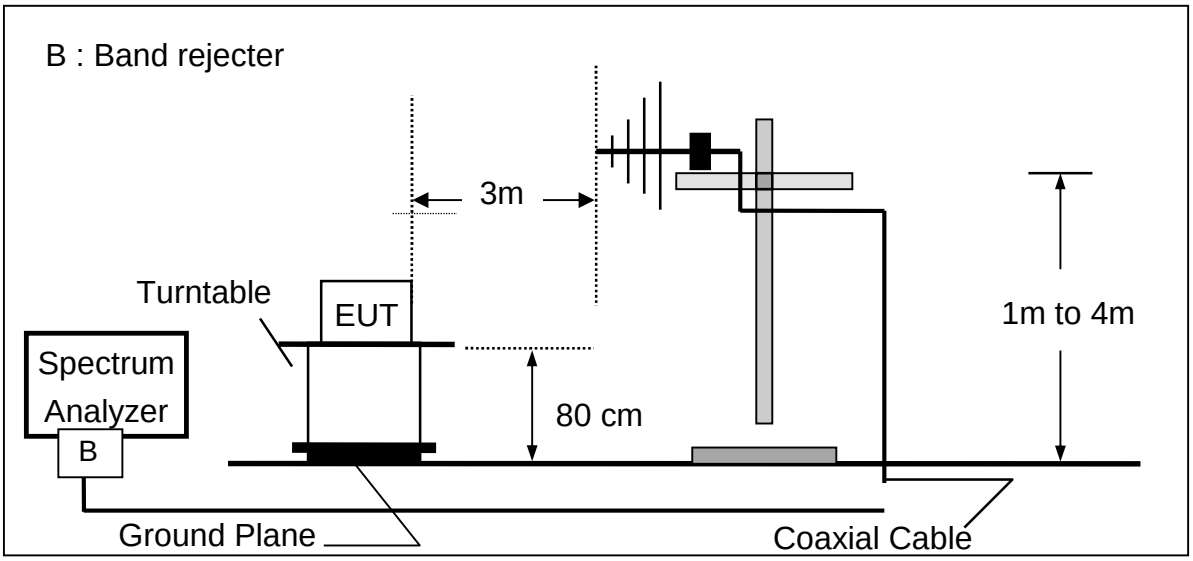
Table 2 — Unwanted Emissions for Mobile, Portable and Low-Power Fixed Subscriber Equipment

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2288	$70 + 10 \log_{10}(p)$
2288 - 2292	$67 + 10 \log_{10}(p)$
2292 - 2296	$61 + 10 \log_{10}(p)$
2296 - 2300	$55 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)^{Note}$
2320 - 2324	$55 + 10 \log_{10}(p)$
2324 - 2328	$61 + 10 \log_{10}(p)$
2328 - 2337	$67 + 10 \log_{10}(p)$
2337 - 2341	$61 + 10 \log_{10}(p)$
2341 - 2345	$55 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)^{Note}$
2360 - 2365	$43 + 10 \log_{10}(p)$
2365 - 2395	$70 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

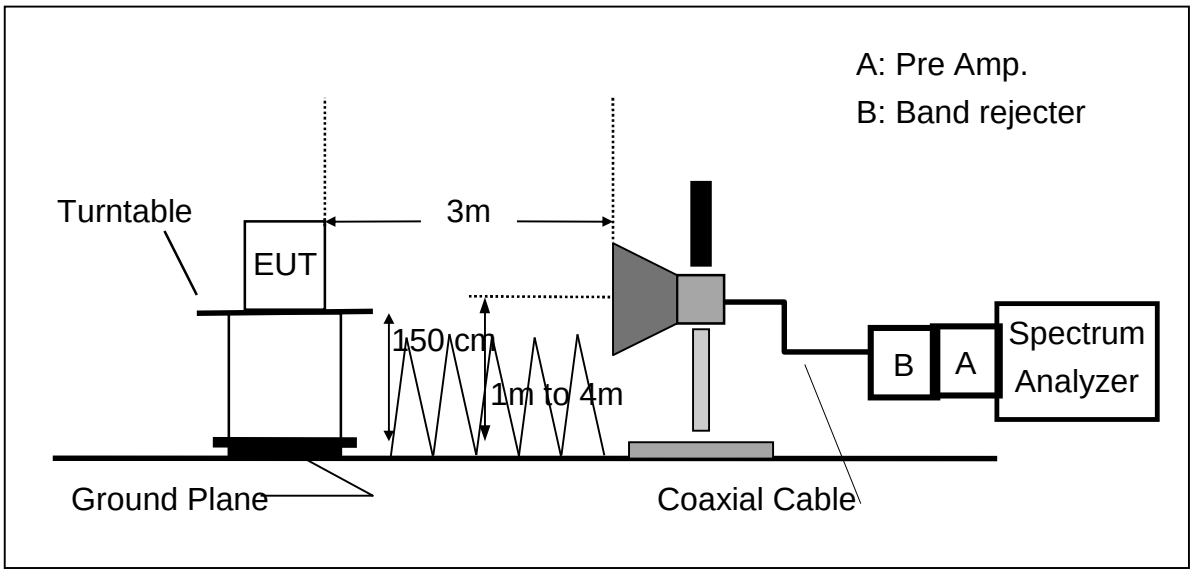
Note: Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 1.2 for the permitted frequency ranges for various equipment types.

10.2. EUT Setup

Radiated Emission Test Set-Up, Frequency Below 1000MHz



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 (dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

EIRP (dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

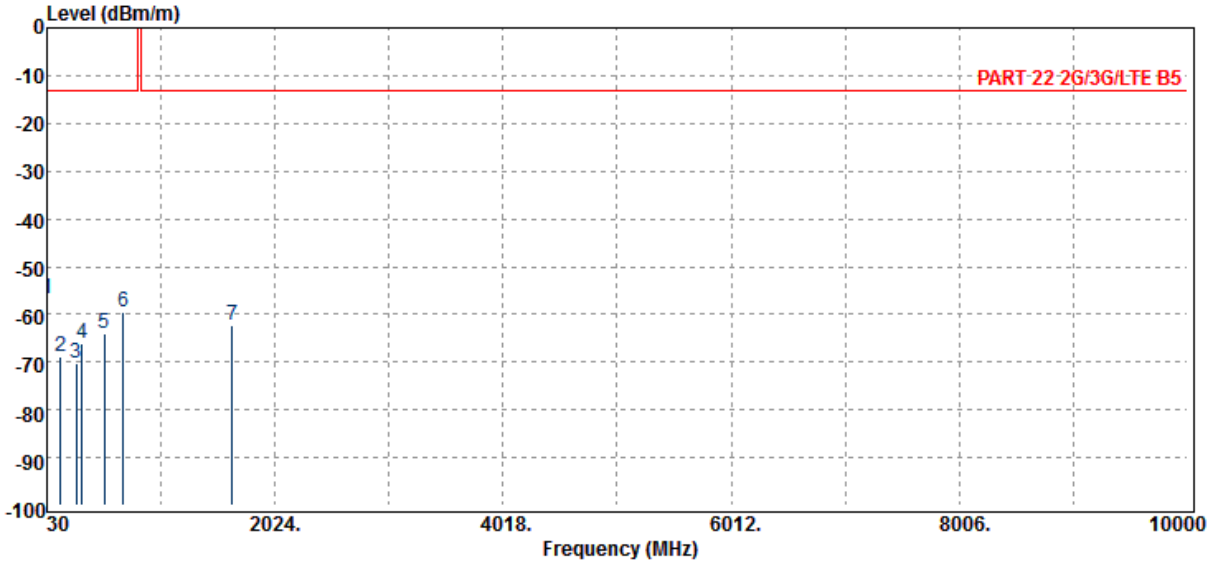
10.4. Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2018/08/16	2019/08/15
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2018/10/08	2019/10/07
3m Site NSA	SGS	966 chamber	N/A	2018/01/02	2019/01/01
Spectrum Ana-lyzer	Agilent	E4446A	MY51100003	2018/05/15	2019/05/14
Network Analyze	Anritsu	MS4644A	1216312	2018/06/19	2019/06/18
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instru-ments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01

10.5. Measurement Result:

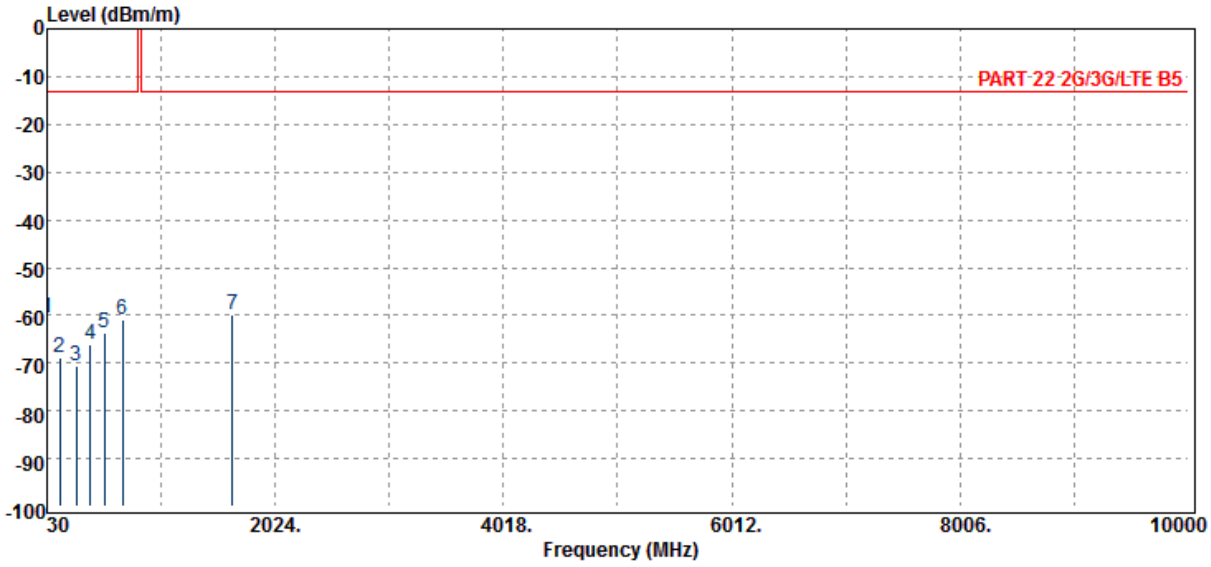
Radiated Spurious Emission Measurement Result: GSM 850 Mode

Operation Band	:GSM 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:824.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



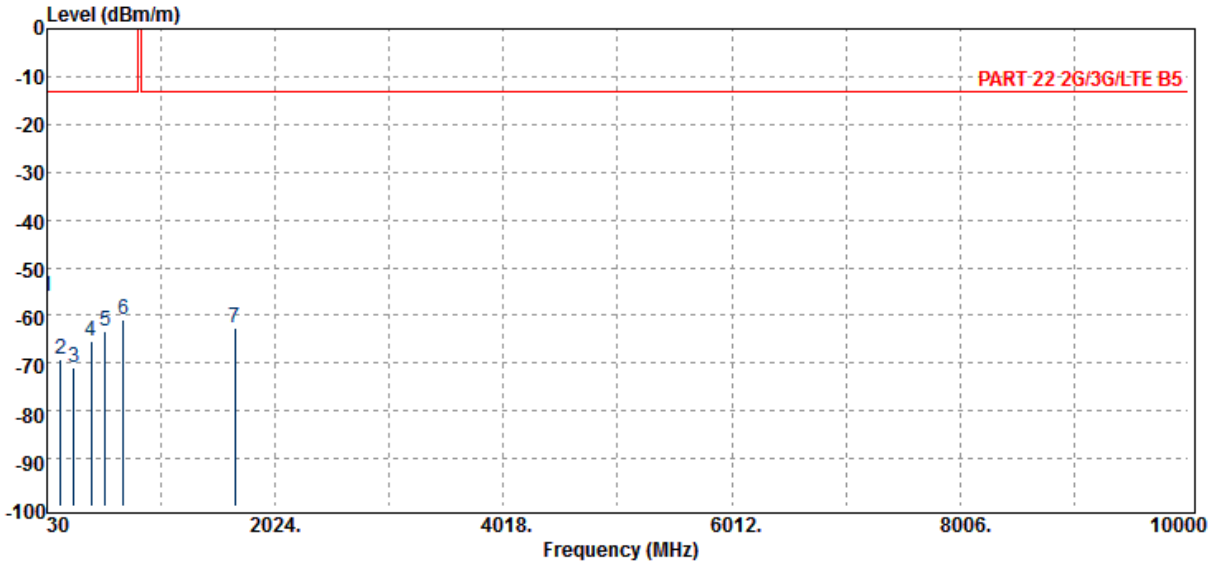
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-56.58	-41.42	-14.58	-0.58	-13.00	-43.58
148.34	-68.93	-65.75	-1.89	-1.29	-13.00	-55.93
288.99	-70.17	-71.82	3.42	-1.78	-13.00	-57.17
337.49	-65.97	-67.81	3.80	-1.96	-13.00	-52.97
534.40	-63.93	-65.74	4.00	-2.19	-13.00	-50.93
696.39	-59.69	-60.92	3.69	-2.46	-13.00	-46.69
1648.40	-62.37	-65.00	6.97	-4.35	-13.00	-49.37

Operation Band	:GSM 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:824.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



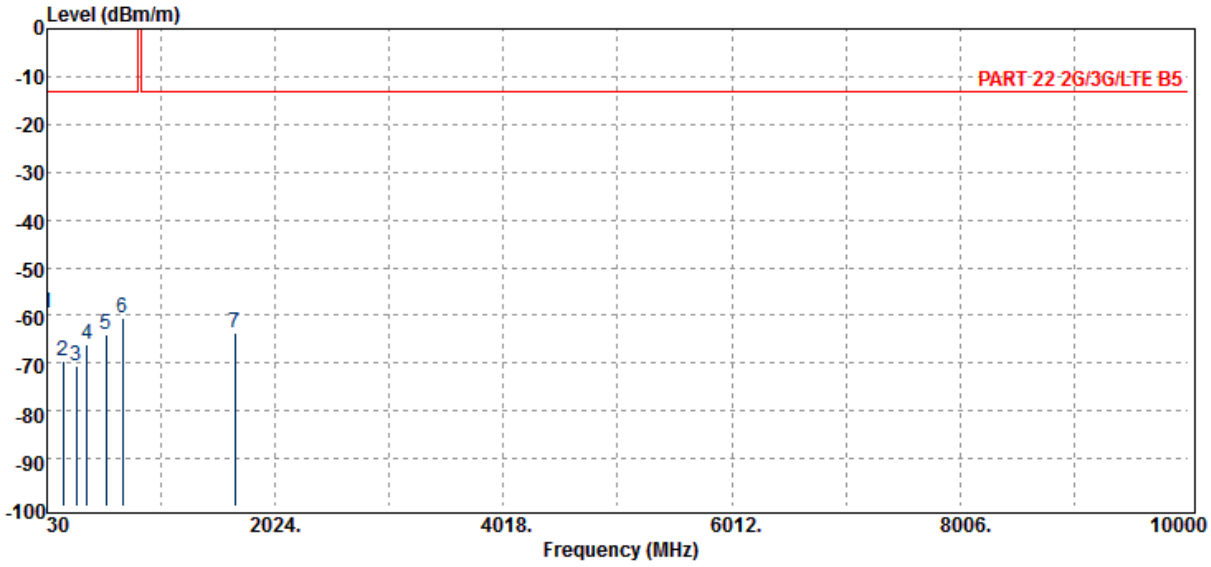
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-60.42	-45.26	-14.58	-0.58	-13.00	-47.42
143.49	-68.77	-65.36	-2.13	-1.28	-13.00	-55.77
288.99	-70.73	-72.37	3.42	-1.78	-13.00	-57.73
405.39	-66.17	-67.71	3.69	-2.15	-13.00	-53.17
534.40	-63.67	-65.49	4.00	-2.19	-13.00	-50.67
692.51	-60.86	-61.80	3.70	-2.76	-13.00	-47.86
1648.40	-59.94	-62.57	6.97	-4.35	-13.00	-46.94

Operation Band	:GSM 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



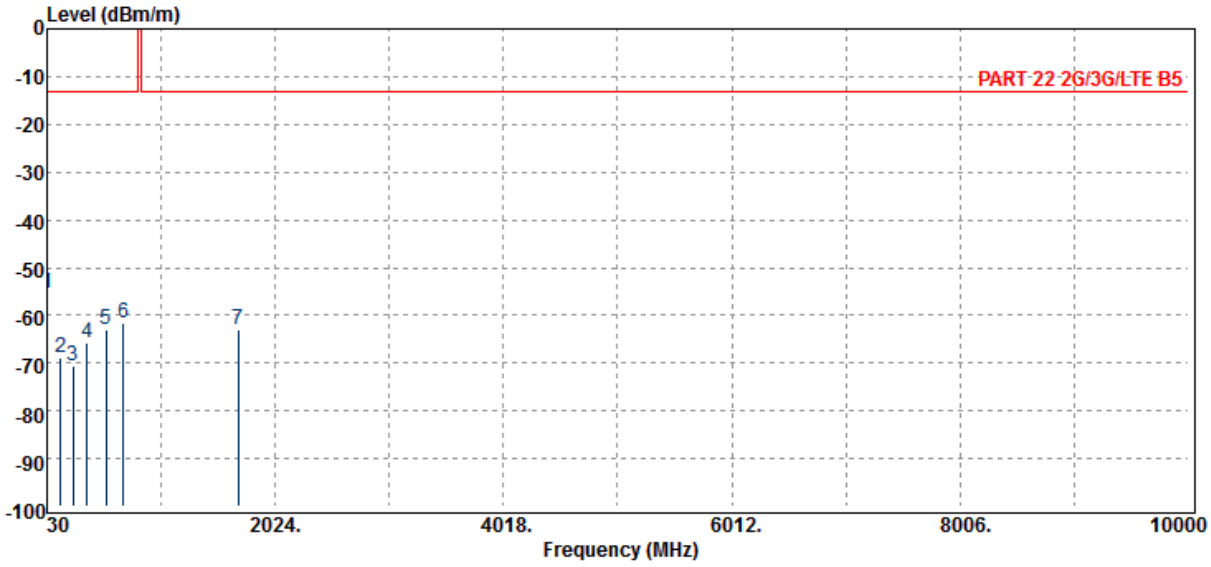
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-56.02	-40.86	-14.58	-0.58	-13.00	-43.02
149.31	-69.34	-66.21	-1.84	-1.29	-13.00	-56.34
262.80	-70.90	-72.81	3.62	-1.71	-13.00	-57.90
418.00	-65.45	-66.98	3.65	-2.11	-13.00	-52.45
541.19	-63.43	-65.52	3.99	-1.91	-13.00	-50.43
694.45	-60.92	-62.00	3.69	-2.61	-13.00	-47.92
1673.20	-62.61	-65.28	7.06	-4.39	-13.00	-49.61

Operation Band	:GSM 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



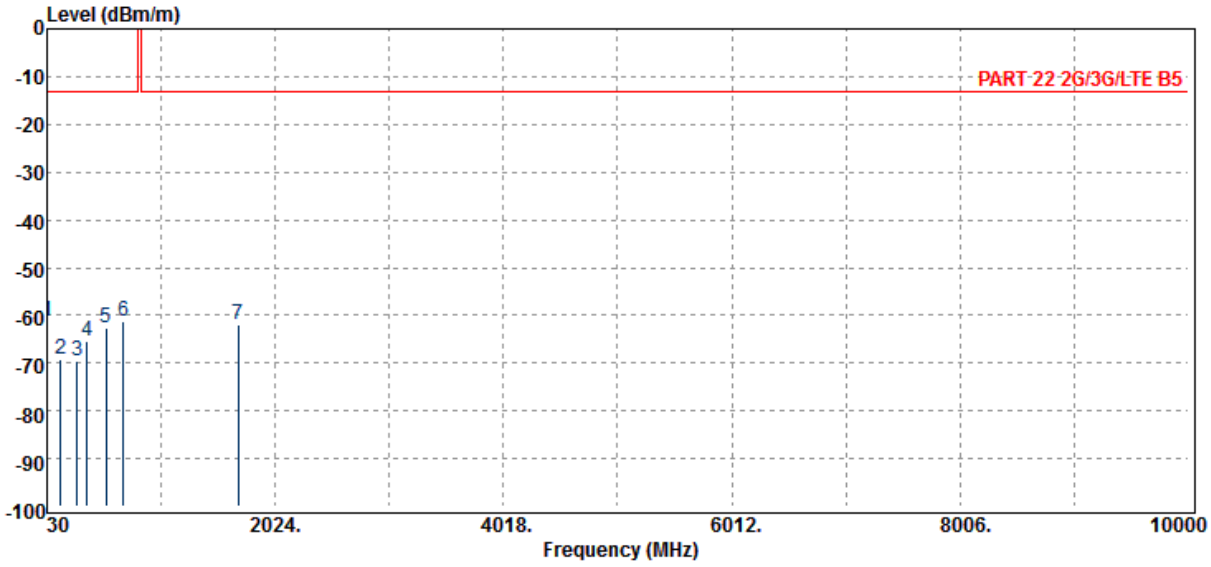
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
31.94	-59.50	-44.82	-14.08	-0.59	-13.00	-46.50
172.59	-69.54	-68.00	-0.20	-1.34	-13.00	-56.54
288.99	-70.58	-72.23	3.42	-1.78	-13.00	-57.58
381.14	-66.04	-67.78	3.77	-2.02	-13.00	-53.04
547.01	-63.92	-66.04	3.98	-1.86	-13.00	-50.92
691.54	-60.72	-61.59	3.70	-2.83	-13.00	-47.72
1673.20	-63.54	-66.20	7.06	-4.39	-13.00	-50.54

Operation Band	:GSM 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:848.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-55.43	-40.27	-14.58	-0.58	-13.00	-42.43
148.34	-68.89	-65.72	-1.89	-1.29	-13.00	-55.89
259.89	-70.46	-72.43	3.67	-1.70	-13.00	-57.46
382.11	-65.91	-67.65	3.76	-2.02	-13.00	-52.91
548.95	-62.89	-64.90	3.98	-1.97	-13.00	-49.89
694.45	-61.47	-62.55	3.69	-2.61	-13.00	-48.47
1697.60	-63.12	-65.82	7.14	-4.43	-13.00	-50.12

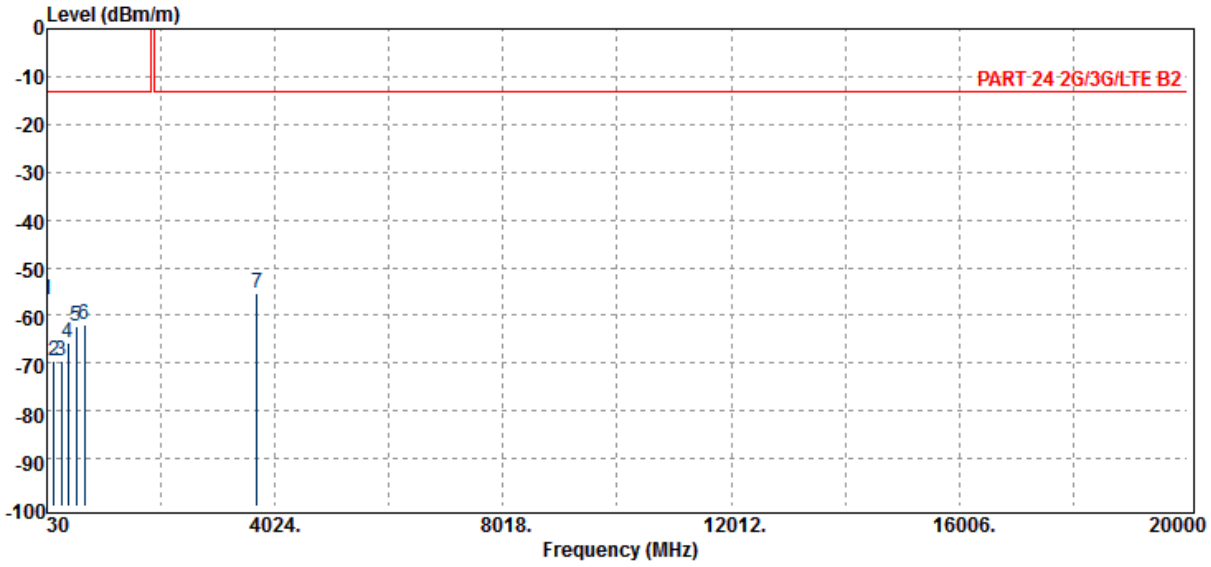
Operation Band	:GSM 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:848.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-61.18	-46.03	-14.58	-0.58	-13.00	-48.18
146.40	-69.12	-65.85	-1.98	-1.29	-13.00	-56.12
291.90	-69.43	-71.10	3.46	-1.79	-13.00	-56.43
376.29	-65.52	-67.26	3.78	-2.03	-13.00	-52.52
544.10	-62.75	-64.95	3.99	-1.79	-13.00	-49.75
694.45	-61.31	-62.39	3.69	-2.61	-13.00	-48.31
1697.60	-61.99	-64.69	7.14	-4.43	-13.00	-48.99

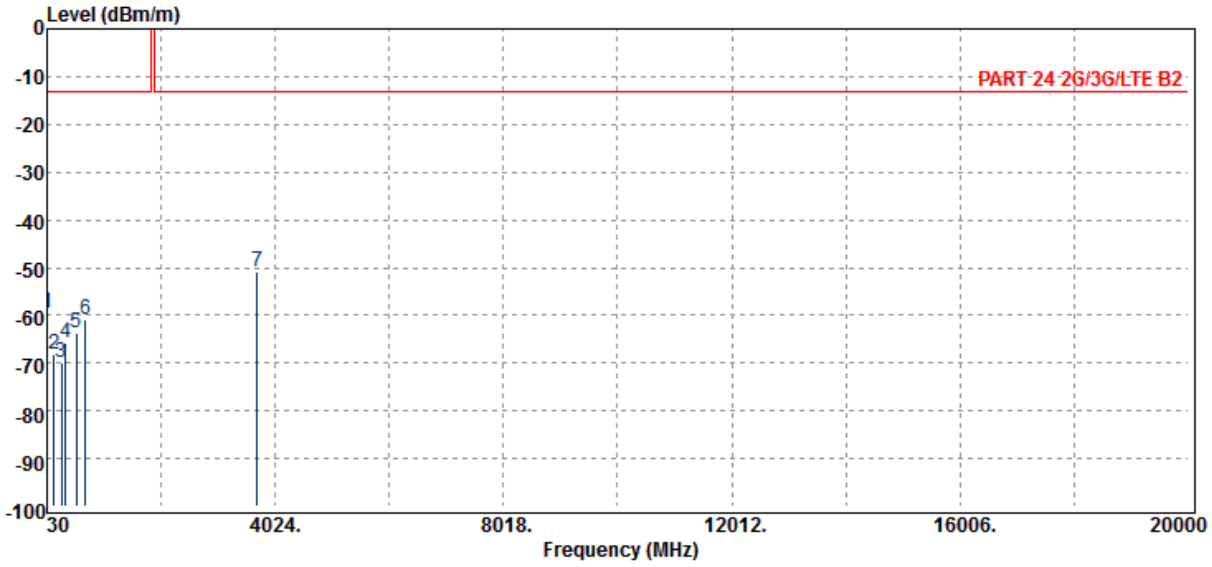
Radiated Spurious Emission Measurement Result: GSM 1900 Mode

Operation Band	:GSM 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1850.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



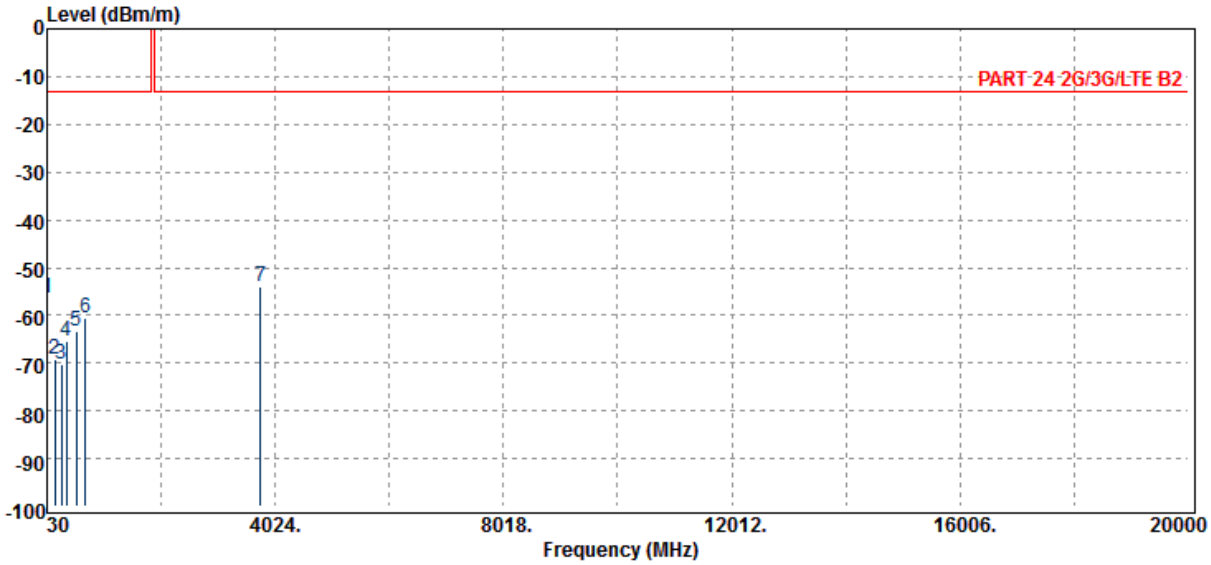
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-56.58	-41.42	-14.58	-0.58	-13.00	-43.58
148.34	-69.39	-66.21	-1.89	-1.29	-13.00	-56.39
282.20	-69.72	-71.39	3.42	-1.75	-13.00	-56.72
393.75	-65.61	-67.27	3.73	-2.07	-13.00	-52.61
546.04	-62.40	-64.57	3.99	-1.81	-13.00	-49.40
694.45	-61.84	-62.92	3.69	-2.61	-13.00	-48.84
3700.40	-55.47	-61.12	12.57	-6.91	-13.00	-42.47

Operation Band	:GSM 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1850.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



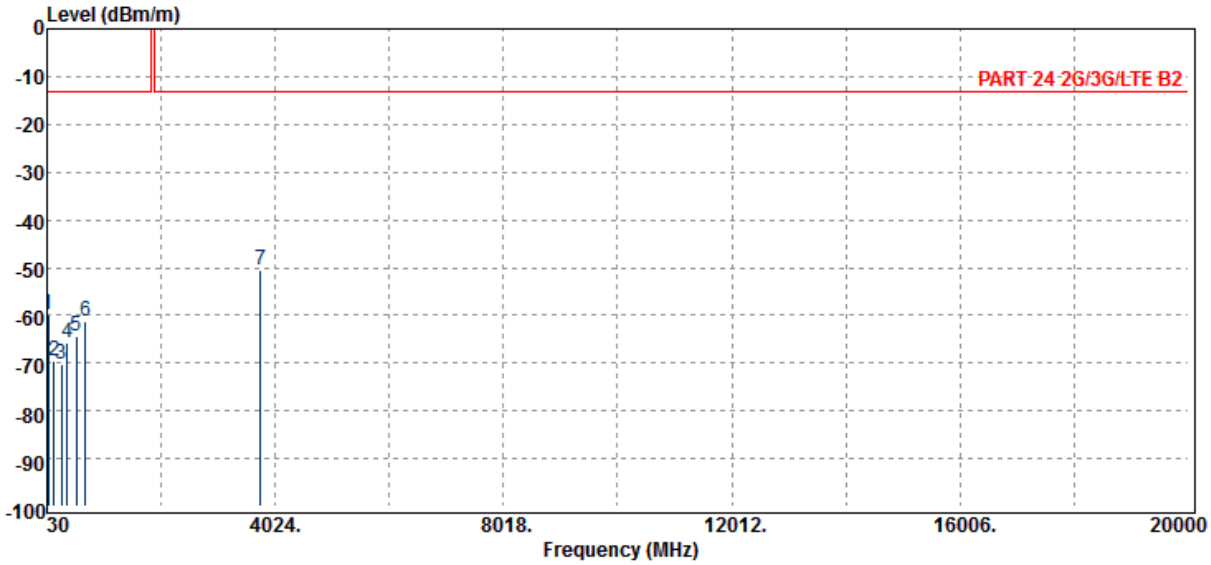
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-59.36	-44.20	-14.58	-0.58	-13.00	-46.36
148.34	-67.99	-64.82	-1.89	-1.29	-13.00	-54.99
284.14	-70.04	-71.70	3.42	-1.76	-13.00	-57.04
359.80	-65.61	-67.38	3.83	-2.06	-13.00	-52.61
536.34	-63.77	-65.66	4.00	-2.11	-13.00	-50.77
699.30	-60.73	-62.17	3.68	-2.24	-13.00	-47.73
3700.40	-50.86	-56.52	12.57	-6.91	-13.00	-37.86

Operation Band	:GSM 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1880 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



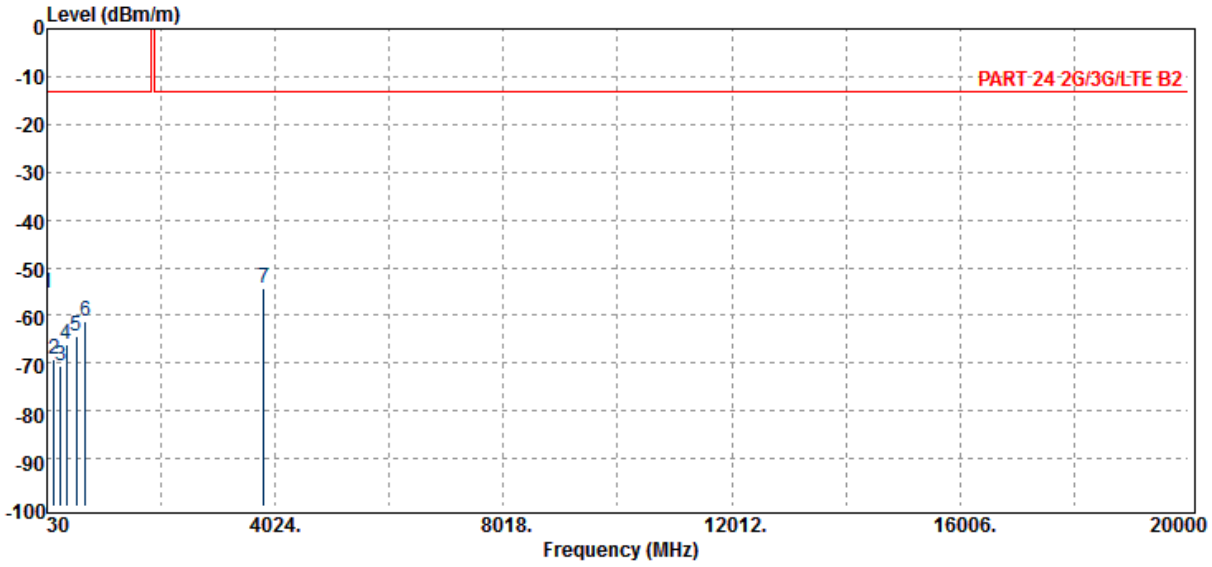
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-56.47	-41.31	-14.58	-0.58	-13.00	-43.47
168.71	-69.17	-67.14	-0.70	-1.33	-13.00	-56.17
289.96	-70.27	-71.91	3.42	-1.78	-13.00	-57.27
362.71	-65.39	-67.15	3.82	-2.07	-13.00	-52.39
544.10	-63.18	-65.38	3.99	-1.79	-13.00	-50.18
699.30	-60.50	-61.94	3.68	-2.24	-13.00	-47.50
3760.00	-54.06	-59.79	12.61	-6.89	-13.00	-41.06

Operation Band	:GSM 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1880 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



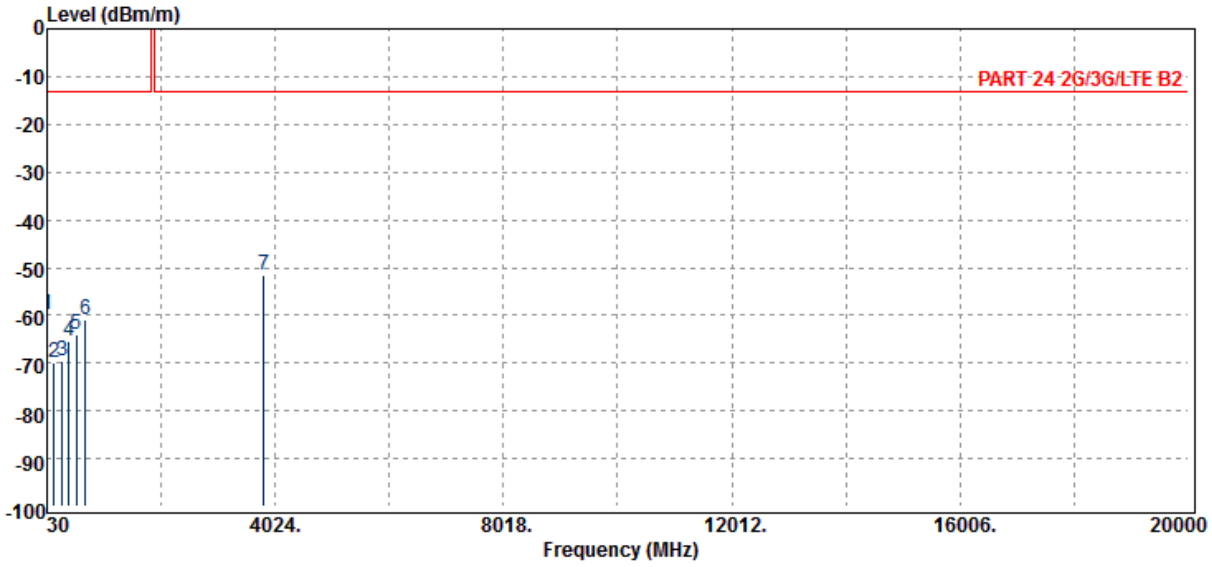
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
46.49	-59.99	-47.47	-11.81	-0.71	-13.00	-46.99
146.40	-69.60	-66.33	-1.98	-1.29	-13.00	-56.60
289.96	-70.39	-72.03	3.42	-1.78	-13.00	-57.39
381.14	-65.67	-67.41	3.77	-2.02	-13.00	-52.67
537.31	-64.49	-66.42	4.00	-2.07	-13.00	-51.49
699.30	-61.39	-62.83	3.68	-2.24	-13.00	-48.39
3760.00	-50.48	-56.21	12.61	-6.89	-13.00	-37.48

Operation Band	:GSM 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-55.42	-40.26	-14.58	-0.58	-13.00	-42.42
154.16	-69.26	-66.39	-1.57	-1.30	-13.00	-56.26
272.50	-70.57	-72.32	3.48	-1.73	-13.00	-57.57
371.44	-66.01	-67.75	3.79	-2.05	-13.00	-53.01
542.16	-64.39	-66.52	3.99	-1.87	-13.00	-51.39
699.30	-61.30	-62.74	3.68	-2.24	-13.00	-48.30
3819.60	-54.50	-60.14	12.66	-7.02	-13.00	-41.50

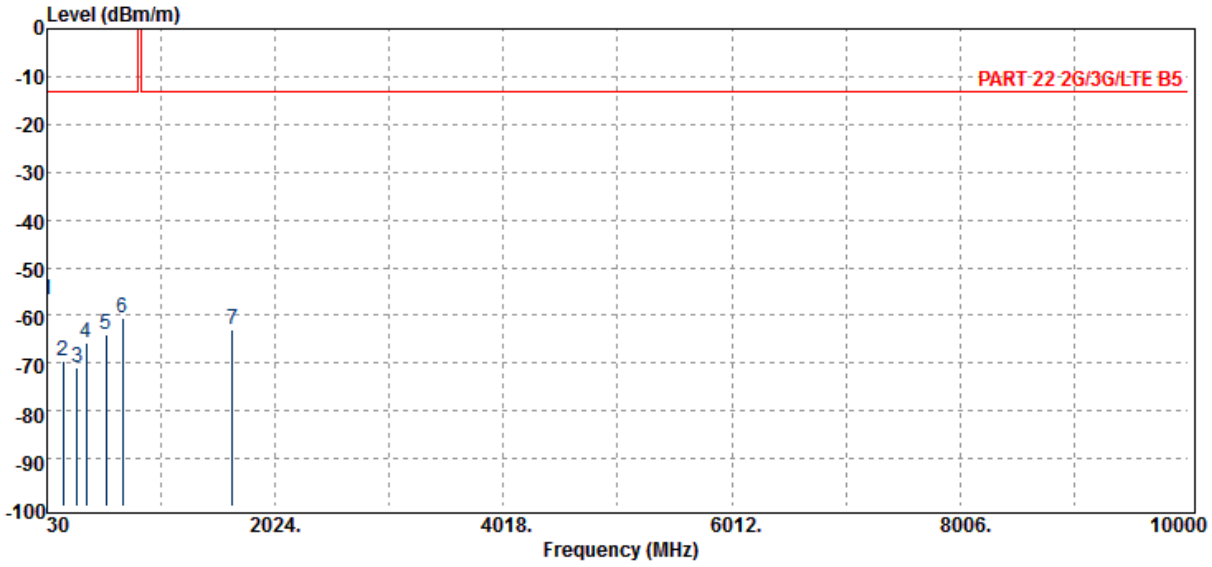
Operation Band	:GSM 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-60.03	-44.87	-14.58	-0.58	-13.00	-47.03
146.40	-69.75	-66.48	-1.98	-1.29	-13.00	-56.75
291.90	-69.70	-71.37	3.46	-1.79	-13.00	-56.70
408.30	-65.45	-66.99	3.68	-2.14	-13.00	-52.45
548.95	-63.98	-65.99	3.98	-1.97	-13.00	-50.98
696.39	-60.89	-62.12	3.69	-2.46	-13.00	-47.89
3819.60	-51.61	-57.25	12.66	-7.02	-13.00	-38.61

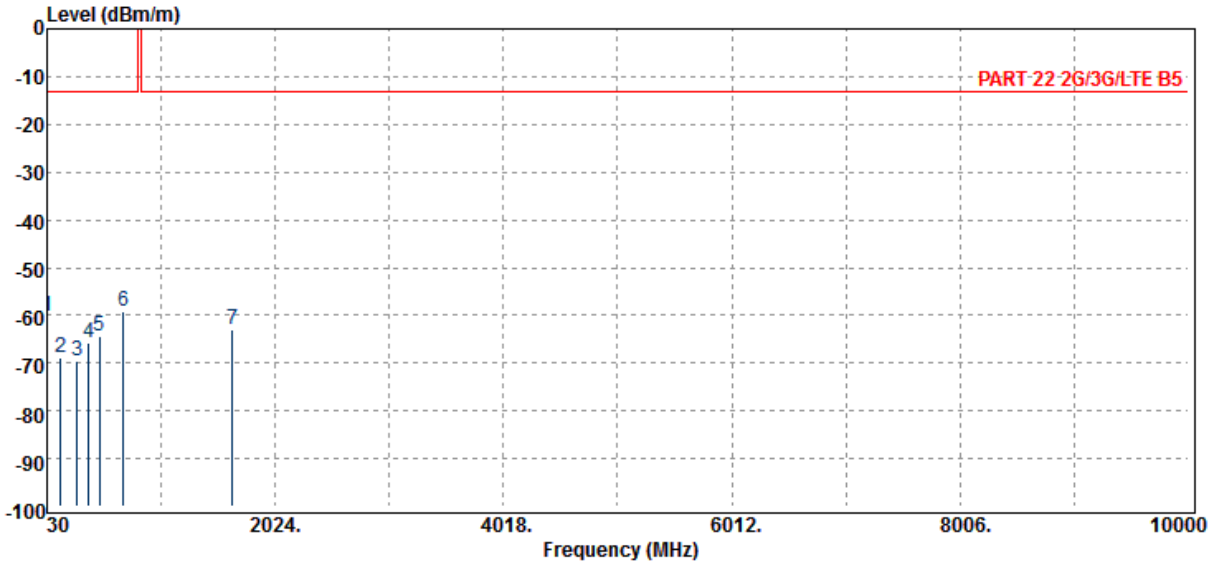
Radiated Spurious Emission Measurement Result: WCDMA Band V Mode

Operation Band	:WCDMA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:826.4 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



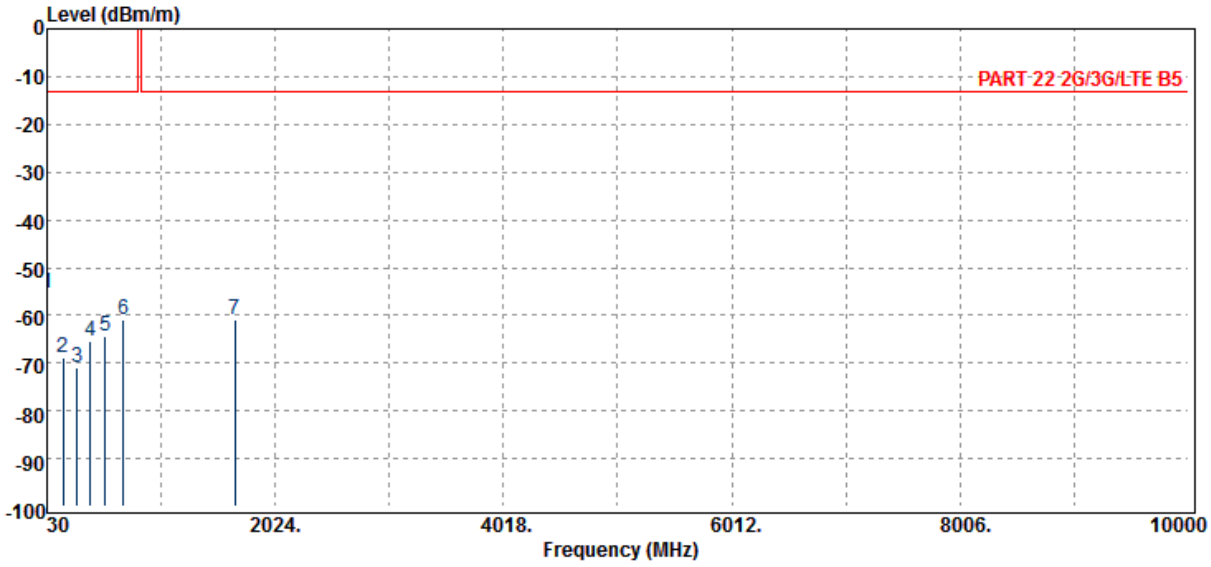
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-56.62	-41.46	-14.58	-0.58	-13.00	-43.62
173.56	-69.40	-68.02	-0.04	-1.35	-13.00	-56.40
293.84	-70.90	-72.60	3.50	-1.80	-13.00	-57.90
371.44	-65.73	-67.47	3.79	-2.05	-13.00	-52.73
547.01	-64.08	-66.20	3.98	-1.86	-13.00	-51.08
692.51	-60.63	-61.57	3.70	-2.76	-13.00	-47.63
1652.80	-63.07	-65.70	6.99	-4.36	-13.00	-50.07

Operation Band	:WCDMA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:826.4 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



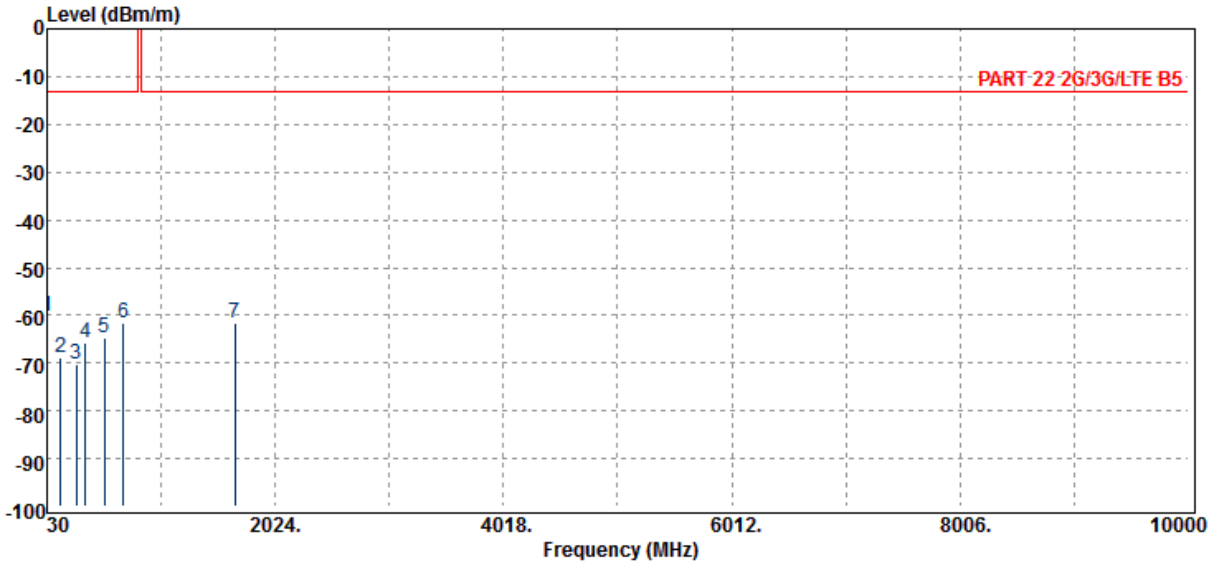
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-60.36	-45.20	-14.58	-0.58	-13.00	-47.36
151.25	-68.93	-65.90	-1.73	-1.29	-13.00	-55.93
294.81	-69.60	-71.31	3.52	-1.80	-13.00	-56.60
395.69	-65.90	-67.54	3.73	-2.08	-13.00	-52.90
485.90	-64.48	-66.56	3.91	-1.84	-13.00	-51.48
699.30	-59.00	-60.44	3.68	-2.24	-13.00	-46.00
1652.80	-62.96	-65.59	6.99	-4.36	-13.00	-49.96

Operation Band	:WCDMA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



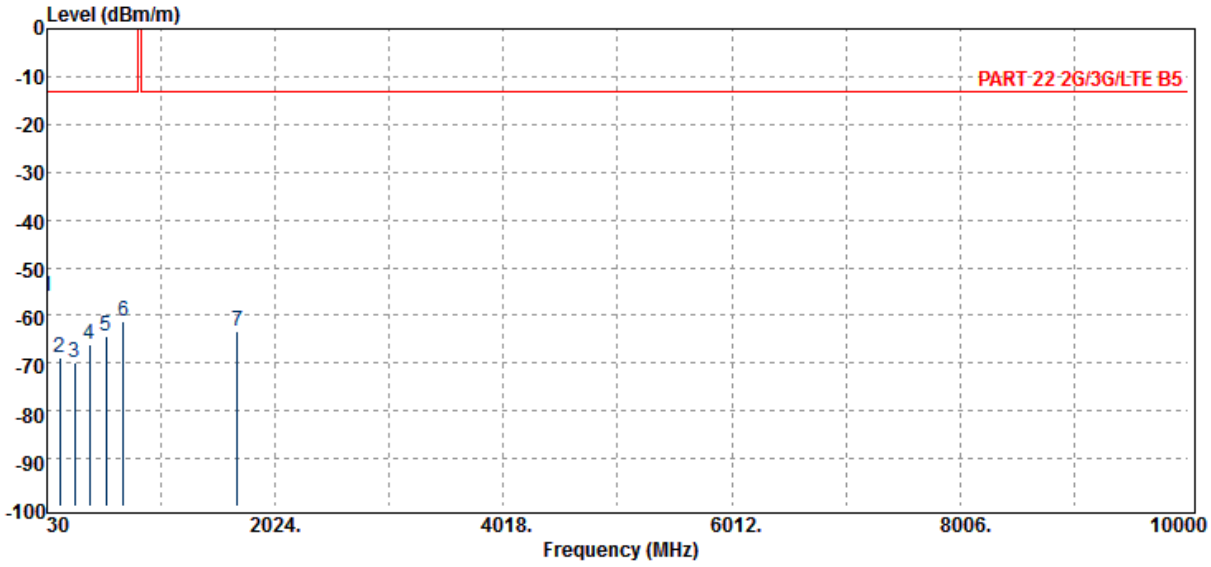
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
30.00	-55.48	-40.32	-14.58	-0.58	-13.00	-42.48
167.74	-69.02	-66.95	-0.76	-1.32	-13.00	-56.02
293.84	-70.77	-72.47	3.50	-1.80	-13.00	-57.77
405.39	-65.51	-67.06	3.69	-2.15	-13.00	-52.51
542.16	-64.39	-66.51	3.99	-1.87	-13.00	-51.39
694.45	-61.01	-62.09	3.69	-2.61	-13.00	-48.01
1673.20	-60.80	-63.47	7.06	-4.39	-13.00	-47.80

Operation Band	:WCDMA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



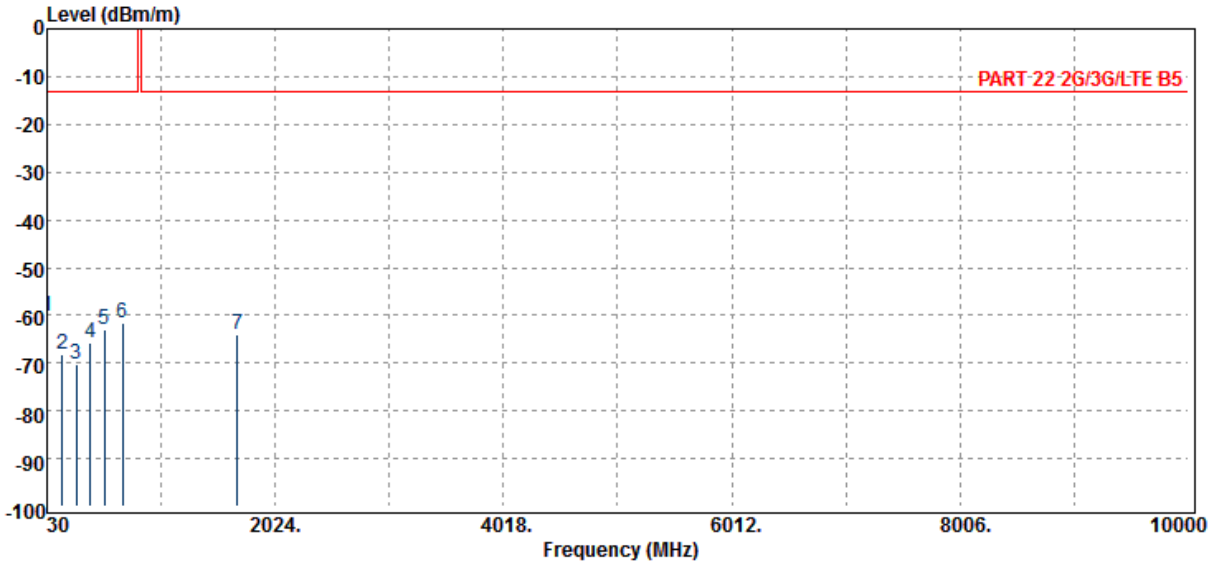
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
31.94	-60.24	-45.56	-14.08	-0.59	-13.00	-47.24
148.34	-69.02	-65.84	-1.89	-1.29	-13.00	-56.02
288.99	-70.25	-71.89	3.42	-1.78	-13.00	-57.25
362.71	-65.71	-67.46	3.82	-2.07	-13.00	-52.71
534.40	-64.71	-66.52	4.00	-2.19	-13.00	-51.71
697.36	-61.47	-62.77	3.68	-2.38	-13.00	-48.47
1673.20	-61.42	-64.08	7.06	-4.39	-13.00	-48.42

Operation Band	:WCDMA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:846.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
31.94	-55.99	-41.32	-14.08	-0.59	-13.00	-42.99
144.46	-69.00	-65.64	-2.08	-1.28	-13.00	-56.00
274.44	-69.95	-71.68	3.46	-1.73	-13.00	-56.95
401.51	-66.05	-67.64	3.71	-2.13	-13.00	-53.05
544.10	-64.28	-66.48	3.99	-1.79	-13.00	-51.28
699.30	-61.38	-62.82	3.68	-2.24	-13.00	-48.38
1693.20	-63.27	-65.97	7.12	-4.43	-13.00	-50.27

Operation Band	:WCDMA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequency	:846.6 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



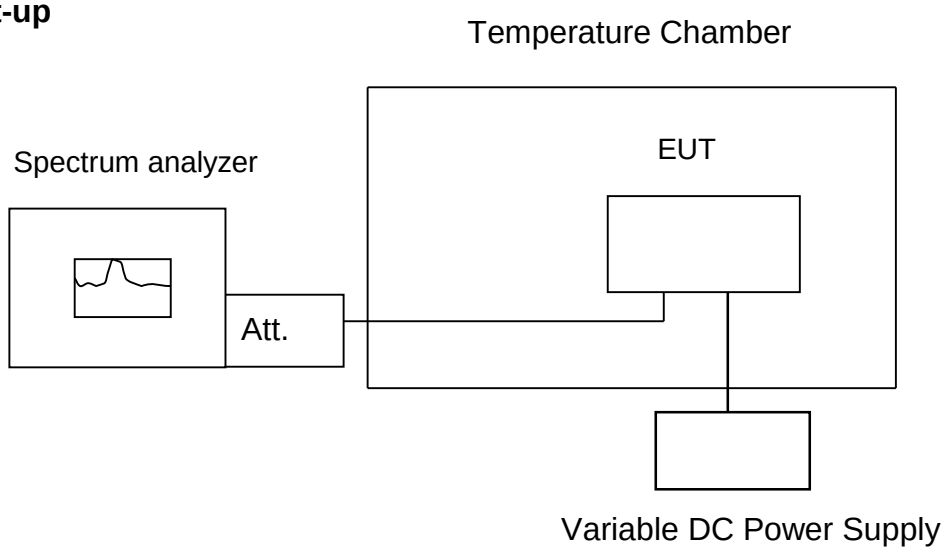
Freq. MHz	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBd/dBi	Cable Loss dB	Limit dBm	Margin dB
31.94	-60.12	-45.45	-14.08	-0.59	-13.00	-47.12
165.80	-68.30	-66.11	-0.88	-1.31	-13.00	-55.30
284.14	-70.30	-71.96	3.42	-1.76	-13.00	-57.30
410.24	-65.71	-67.25	3.68	-2.13	-13.00	-52.71
531.49	-63.00	-64.69	4.01	-2.31	-13.00	-50.00
691.54	-61.56	-62.42	3.70	-2.83	-13.00	-48.56
1693.20	-63.89	-66.59	7.12	-4.43	-13.00	-50.89

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℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

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

11.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/03/2018	05/02/2019
Radio Communication Analyer	Anritsu	MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019
2WayDivider	Woken	DSU7AMK1A1	N/A	01/02/2018	01/01/2019
Coaxial Cable	Huber Suhner	SUCOFLEX 102EPA	MY2616/2	01/02/2018	01/01/2019

11.5. Measurement Result

FREQUENCY ERROR vs. VOLTAGE

GPRS 850 Mid Channel		836.6	MHz	
Limit: +/- 2.5 ppm				
Vdc	Temp. (℃)	Freq. (MHz)	Delta (Hz)	Limit (Hz)
FREQUENCY ERROR vs. VOLTAGE				
4.37	20	836.60036	360	2091
3.8	20	836.5986	-1400	2091
3.23	20	836.60161	1610	2091
3 (End point)	20	836.59866	-1340	2091

FREQUENCY ERROR vs. TEMPERATURE

FREQUENCY ERROR vs. Temp.				
3.8	50	836.5988	-1200	2091
3.8	40	836.60033	330	2091
3.8	30	836.59894	-1060	2091
3.8	20	836.5986	-1400	2091
3.8	10	836.59951	-490	2091
3.8	0	836.59951	-490	2091
3.8	-10	836.60127	1270	2091
3.8	-20	836.59891	-1090	2091
3.8	-30	836.60186	1860	2091

FREQUENCY ERROR vs. VOLTAGE

GPRS 1900 Mid Channel		1880		MHz
Limit: +/- 2.5 ppm				
Vdc	Temp. (℃)	Freq. (MHz)	Delta (Hz)	Limit (Hz)
FREQUENCY ERROR vs. VOLTAGE				
4.37	20	1879.99871	-1290	4700
3.8	20	1880.001	1000	4700
3.23	20	1880.00268	2680	4700
3 (End point)	20	1879.99724	-2760	4700

FREQUENCY ERROR vs. TEMPERATURE

FREQUENCY ERROR vs. Temp.				
3.8	50	1879.99826	-1740	4700
3.8	40	1880.00145	1450	4700
3.8	30	1879.99814	-1860	4700
3.8	20	1880.001	1000	4700
3.8	10	1880.00203	2030	4700
3.8	0	1880.00019	190	4700
3.8	-10	1879.99798	-2020	4700
3.8	-20	1879.99788	-2120	4700
3.8	-30	1880.00237	2370	4700

FREQUENCY ERROR vs. VOLTAGE

WCDMA V Mid Channel 836.6 MHz				
Limit: +/- 2.5 ppm				
Vdc	Temp. (℃)	Freq. (MHz)	Delta (Hz)	Limit (Hz)
FREQUENCY ERROR vs. VOLTAGE				
4.37	20	836.59871	-1290	2091
3.8	20	836.59838	-1620	2091
3.23	20	836.59968	-320	2091
3 (End point)	20	836.60122	1220	2091

FREQUENCY ERROR vs. TEMPERATURE

FREQUENCY ERROR vs. Temp.				
3.8	50	836.6006	600	2091
3.8	40	836.59816	-1840	2091
3.8	30	836.59906	-940	2091
3.8	20	836.59838	-1620	2091
3.8	10	836.59845	-1550	2091
3.8	0	836.60078	780	2091
3.8	-10	836.59896	-1040	2091
3.8	-20	836.5982	-1800	2091
3.8	-30	836.59867	-1330	2091

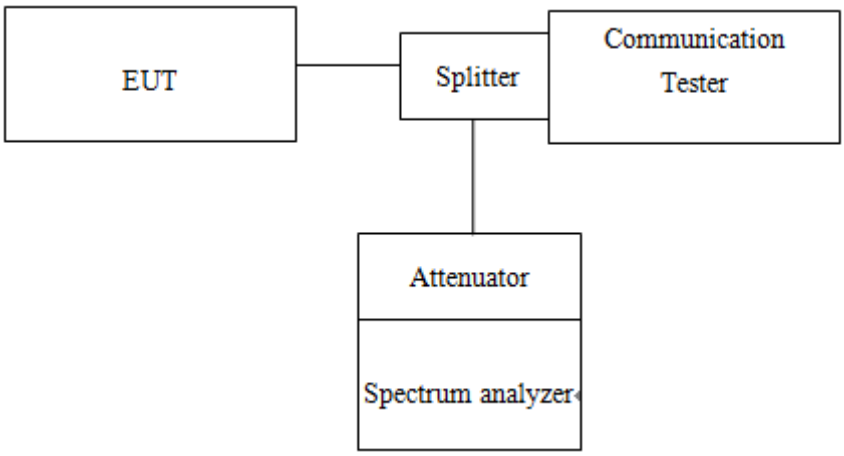
Note: The battery is rated 3.8V dc.

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 ≥ 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

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/03/2018	05/02/2019
Radio Commu-nication Analyer	Anritsu	MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Sup-ply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019
2WayDivider	Woken	DSU7AMK1A1	N/A	01/02/2018	01/01/2019
Coaxial Cable	Huber Su-hner	SUCOFLEX 102EPA	MY2616/2	01/02/2018	01/01/2019

12.5. Measurement Result

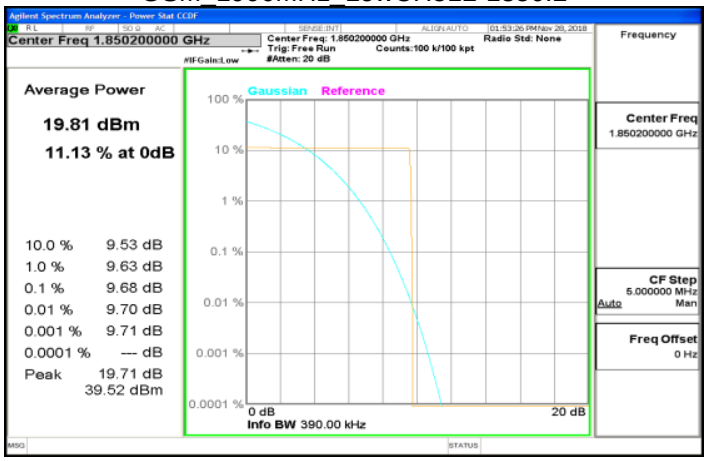
Tabular Results:

Freq. (MHz)	CH	Peak-to-Average Ratio (dB)	
		GSM 1900	GPRS 1900
1850.2	512	9.68	**9.2**
1880	661	**9.65**	9.32
1909.8	810	9.64	8.89

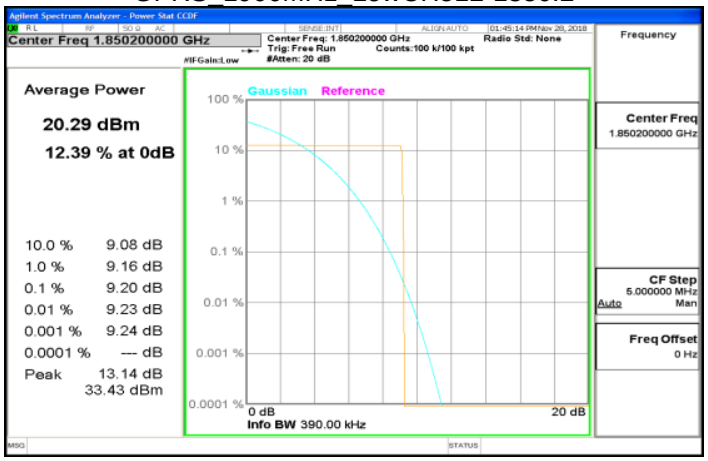
Measurement Results:

Please refer to next page.

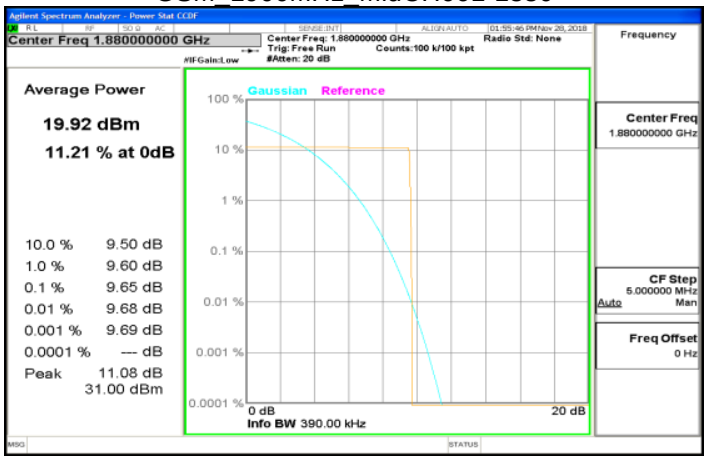
GSM_1900MHz_LowCH512-1850.2



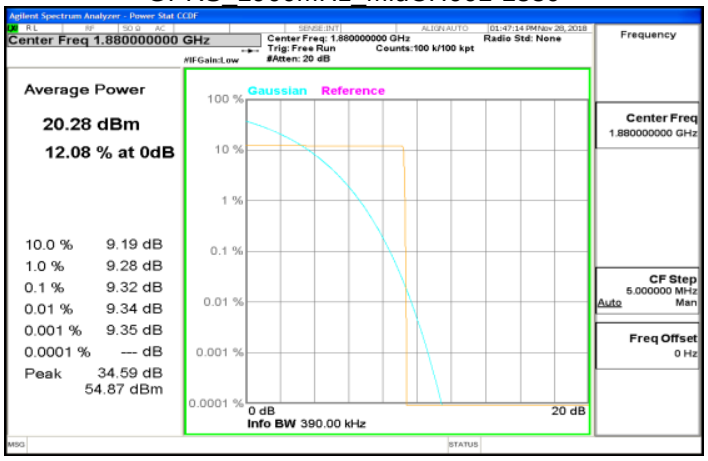
GPRS_1900MHz_LowCH512-1850.2



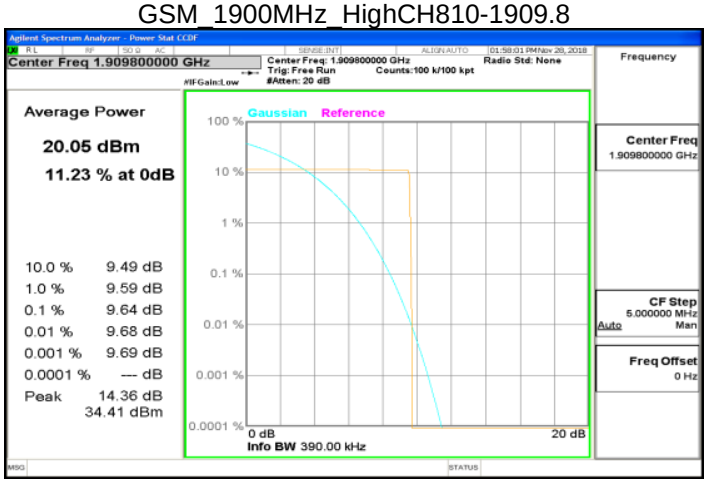
GSM_1900MHz_MidCH661-1880



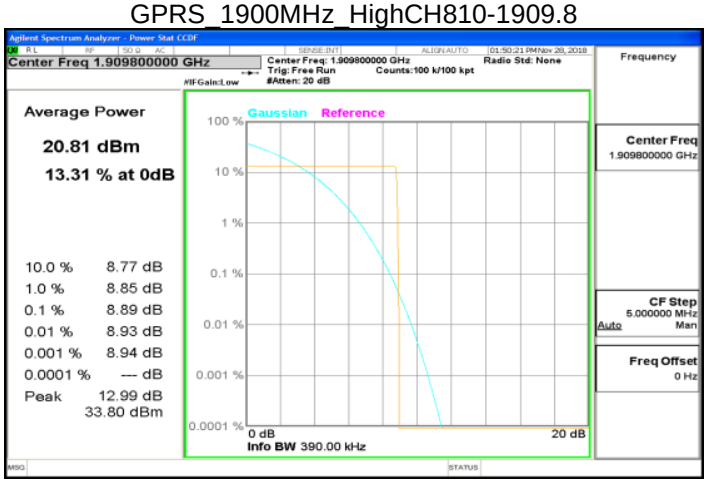
GPRS_1900MHz_MidCH661-1880



GSM_1900MHz_HighCH810-1909.8



GPRS_1900MHz_HighCH810-1909.8



~ End of Report ~

SGS Taiwan Ltd. | No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號
台灣檢驗科技股份有限公司 | t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group