

FCC Radio Test Report

FCC ID: 2ALJ8-CTL001A

This report concerns (check one): ☒ Original Grant ☐ Class II Change

Project No. : 1702C003
Equipment : WCDMA/GPRS Wireless Data Terminal
Test Model : CTL-001A
Series Model : CTL-001
Applicant : Cathay Tri-Tech., Inc
Address : 3-24-5, Shinyokohama Kohoku-ku, Yokohama
222-0033, Japan

Date of Receipt : Feb. 05, 2017
Date of Test : Feb. 05, 2017 ~ Apr. 07, 2017
Issued Date : Apr. 10, 2017
Tested by : BTL Inc.

Technical Engineer

: Shawn Xiao
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Authorized Signatory

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For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1702C003	Original Issue.	Apr. 10, 2017

1. CERTIFICATION

Equipment : WCDMA/GPRS Wireless Data Terminal
Brand Name : Cathay Tri-Tech.,Inc
Test Model : CTL-001A
Series Model : CTL-001
Applicant : Cathay Tri-Tech.,Inc
Manufacturer : Cathay Tri-Tech.,Inc
Address : 3-24-5,Shinyokohama Kohoku-ku,Yokohama 222-0033,Japan
Factory : Shanghai Simcom Wireless Solutions Limited
Address : SIM Technology Building, No.633 Jinzhong Road, Changning District,
Shanghai P.R.China 200335
Date of Test : Feb. 05, 2017 ~ Apr. 07, 2017
Test Sample : Engineering Sample
Standard(s) : 47 CFR FCC Part 22 Subpart H
47 CFR FCC Part 2
ANSI/TIA-603-D-2010
KDB 971168 D01 Power Meas License Digital Systems v02r02

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1702C003) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

Test result included in this report is only for the GSM850, WCDMA Band 5 part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 22 Subpart H& Part 2			
Standard(s) Section	Test Item	Judgment	Tested By
2.1046 22.913(a)	Radiated power	PASS	Paul Li
2.1046 22.913(a)	Conducted Output Power	PASS	Paul Li
2.1049(h) 22.917(a)	Occupied Bandwidth	PASS	Paul Li
2.1051 22.917(a)	Conducted Spurious Emissions	PASS	Paul Li
2.1053 22.917(a)	Radiated Spurious Emissions	PASS	Paul Li
22.917(a)	Band Edge Measurements	PASS	Paul Li
-	Peak To Average Ratio	PASS	Paul Li
2.1055 22.355	Frequency Stability	PASS	Paul Li

NOTE:

(1) "N/A" denotes test is not applicable to this device.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.
BTL's test firm number for FCC: 319330

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	9KHz ~ 30MHz	V	3.79
		9KHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	3.82
		30MHz ~ 200MHz	H	3.78
		200MHz ~ 1,000MHz	V	4.10
		200MHz ~ 1,000MHz	H	4.06

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 18GHz	V	3.12
		1GHz ~ 18GHz	H	3.68

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (1m)	CISPR	18GHz ~ 40GHz	V	4.15
		18GHz ~ 40GHz	H	4.14

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	WCDMA/GPRS Wireless Data Terminal			
Brand Name	Cathay Tri-Tech.,Inc			
Test Model	CTL-001A			
Model Name	CTL-001			
Model Difference	Only differ in model name.			
Modulation Type	GPRS	GMSK		
	EDGE	GMSK, 8PSK		
	WCDMA	Uplink: BPSK Downlink: QPSK		
	WCDMA(HSDPA)	16QAM/64QAM		
Operation Frequency	EDGE/GPRS	824.2 ~ 848.8 MHz		
	WCDMA Band 5	826.4 ~ 846.6 MHz		
Max. ERP Power	GPRS/EDGE	GMSK	30.93	dBm
	EDGE	8PSK	24.00	dBm
	WCDMA	BPSK	19.90	dBm
	WCDMA_HSDPA	16QAM	19.82	dBm
Antenna Type	External Antenna			
Antenna Gain	GSM 850 & WCDMA Band 5	-0.97dBi		
IMEI No.	014682000628106			
Power Source	DC Voltage Supplied from AC/DC Adapter.			
Power Rating	I/P: 100-240Vac, 50/60Hz 0.35A O/P: 5V --- 2A			

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

3.2 DESCRIPTION OF TEST MODES AND TEST CONDITION

Following channel(s) was (were) selected for the final test as listed below:

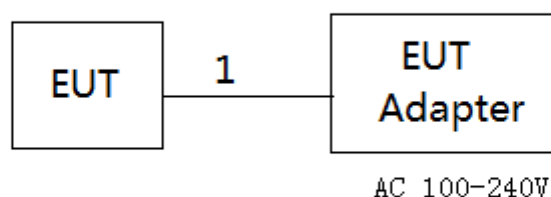
GSM MODE			
Test Item	Available Channel	Tested Channel	Mode
ERP	128 to 251	128, 190, 251	GPRS, EDGE
Conducted Output Power	128 to 251	128, 190, 251	GPRS, EDGE
Occupied Bandwidth	128 to 251	128, 190, 251	GPRS, EDGE
Conducted Emission	128 to 251	190	GPRS, EDGE
Radiated Emission	128 to 251	251	GPRS
	128 to 251	128	EDGE
Band Edge	128 to 251	128, 251	GPRS, EDGE
Peak to Average Ratio	128 to 251	128, 190, 251	GPRS, EDGE
Frequency Stability	128 to 251	190	GPRS, EDGE

WCDMA MODE			
Test Item	Available Channel	Tested Channel	Mode
ERP	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA,
Conducted Output Power	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA,
Conducted Emission	4132 to 4233	4182	WCDMA, HSDPA,
Radiated Emission	4132 to 4233	4312	WCDMA, HSDPA,
Band Edge	4132 to 4233	4132, 4233	WCDMA, HSDPA,
Peak to Average Ratio	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA,
Frequency Stability	4132 to 4233	4182	WCDMA, HSDPA,

EUT TEST CONDITIONS:

Test Item	Environmental Conditions	Test Voltage
ERP	25°C, 60%RH	AC 120V/60Hz
Conducted Output Power	25°C, 65%RH	AC 120V/60Hz
Occupied Bandwidth	25°C, 65%RH	AC 120V/60Hz
Conducted Emission	25°C, 65%RH	AC 120V/60Hz
Radiated Emission	25°C, 60%RH	AC 120V/60Hz
Band Edge	25°C, 65%RH	AC 120V/60Hz
Peak to Average Ratio	25°C, 65%RH	AC 120V/60Hz
Frequency Stability	25°C, 65%RH	AC 120V/60Hz

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED FOR RADIATED



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
-	-		-	-	-

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.5m	AC Cable

Note:

- (1) For detachable type I/O cable should be specified the length in m in 『Length』 column.

4. TEST RESULT

4.1 OUTPUT POWER MEASUREMENT

4.1.1 LIMIT

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 TEST PROCEDURE

EIRP/ERP:

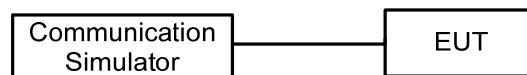
1. EIRP= Conducted Power +Antenan gain
ERP power=EIPR power-2.15dBi.

Conducted Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 TESTSETUP LAYOUT

Conducted Power Measurement



4.1.4 TEST DEVIATION

No deviation

4.1.5 TEST RESULTS

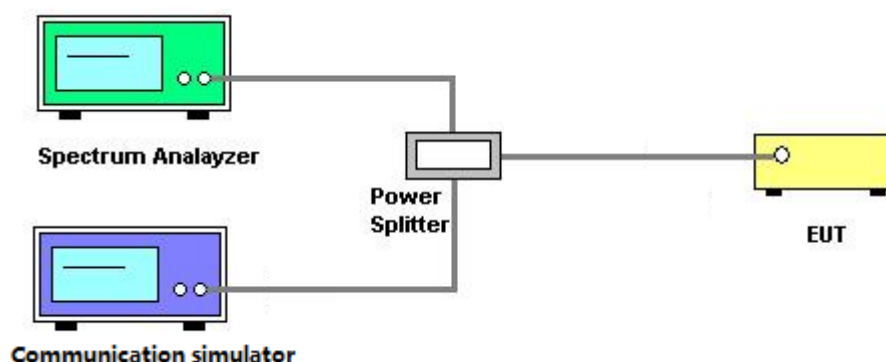
Please refer to the Attachment A.

4.2 OCCUPIED BANDWIDTH MEASUREMENT

4.2.1 TEST PROCEDURE

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth and 26dB bandwidth.

4.2.2 TEST SETUP LAYOUT



4.2.3 TEST DEVIATION

No deviation

4.2.4 TEST RESULTS

Please refer to the Attachment B.

4.3 CONDUCTED EMISSIONS MEASUREMENT

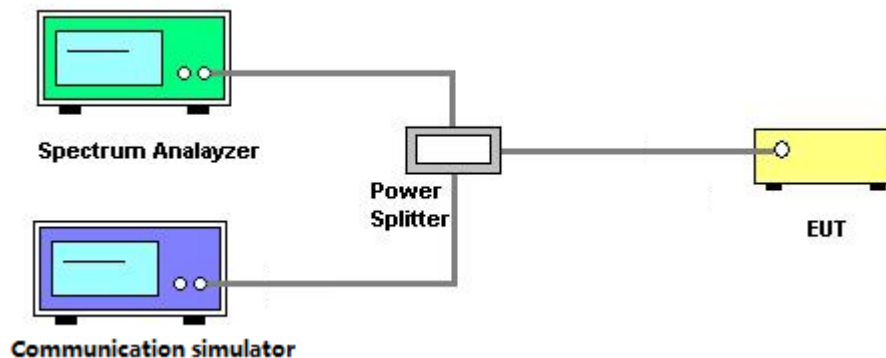
4.3.1 LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

4.3.2 TEST PROCEDURES

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured. Set $RBW \geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from $43 + 10 \log(P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10 \log(P)](dB)$
 $= [30 + 10 \log(P)](dBm) - [43 + 10 \log(P)](dB)$
 $= -13dBm$

4.3.3 TESTSETUP LAYOUT



4.3.4 TESTDEVIATION

No deviation

4.3.5 TEST RESULTS

Please refer to the Attachment C.

4.4 RADIATED EMISSIONS MEASUREMENT

4.4.1 LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

4.4.2 TEST PROCEDURES

1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
2. 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 a. Record the power level of S.G
3. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.4.3 TESTSETUP LAYOUT

This test setup layout is the same as that shown in **section 4.1.3**.

4.4.4 TESTDEVIATION

No deviation

4.4.5 TEST RESULTS

Please refer to the Attachment D.

4.5 BAND EDGE MEASUREMENT

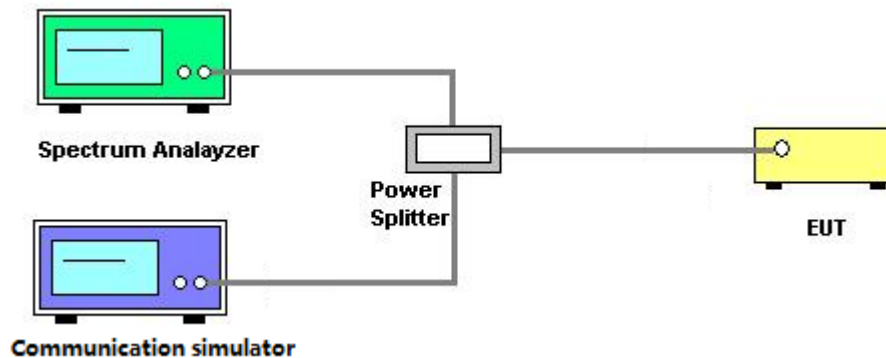
4.5.1 LIMIT

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

4.5.2 TEST PROCEDURES

1. All measurements were done at low and high operational frequency range.
2. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 3kHz and VB of the spectrum is 10kHz (GSM/GPRS/EDGE).
3. The center frequency of spectrum is the band edge frequency and span is 5MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA).
4. Record the max trace plot into the test report.

4.5.3 TESTSETUP LAYOUT



4.5.4 TESTDEVIATION

No deviation

4.5.5 TEST RESULTS

Please refer to the Attachment E.

4.6 PEAK TO AVERAGE RATIO MEASUREMENT

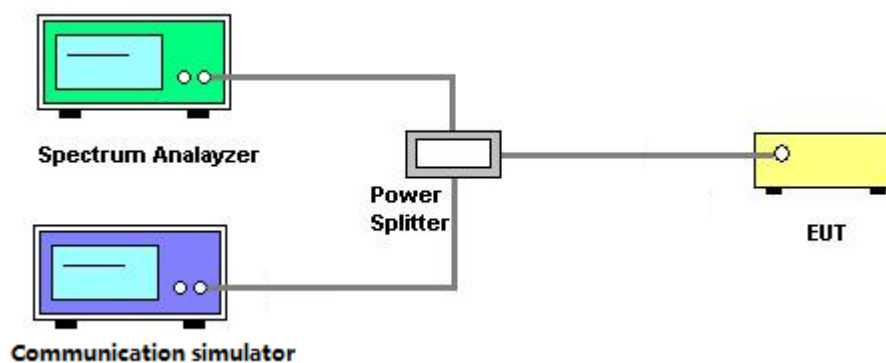
4.6.1 LIMIT

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

4.6.2 TEST PROCEDURES

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.3 TESTSETUP LAYOUT



4.6.4 TESTDEVIATION

No deviation

4.6.5 TEST RESULTS

Please refer to the Attachment F.

4.7 FREQUENCY STABILITY MEASUREMENT

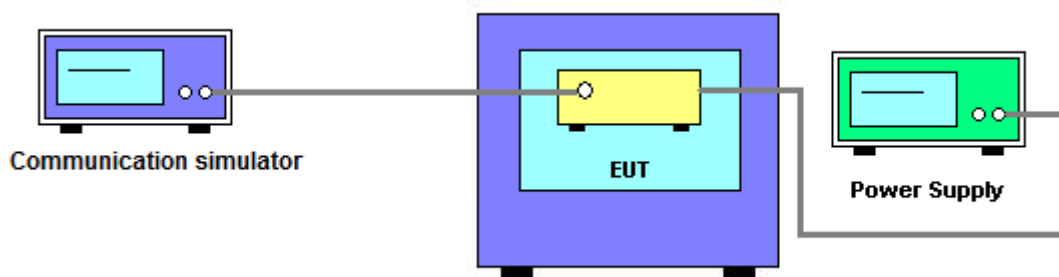
4.7.1 LIMIT

1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.7.2 TEST PROCEDURES

1. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
2. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
3. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.
4. The frequency error was recorded frequency error from the communication simulator.

4.7.3 TESTSETUP LAYOUT



4.7.4 TESTDEVIATION

No deviation

4.7.5 TEST RESULTS

Please refer to the Attachment G.

5. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Test receiver	R&S	ESU26	100387	Jul. 21, 2017
2	LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100263	Apr. 29, 2017
3	Spectrum analyzer	R&S	FSU3	200474	May 24, 2017
4	Spectrum analyzer	R&S	FSU43	100144	Jun. 02, 2017
5	Trilog Broadband Antenna (30M~3GHz)	SCHWARZBECK	VULB 9163	9163-521	Apr. 07, 2018
6	Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100304	Apr. 29, 2017
7	Pyramidal Horn Antenna(18GHz-26.5 GHz)	ETS-Lindgren	Sep-60	5140299	Jul. 14, 2017
8	Radio Communication Tester	R&S	CMU200	3608082535	Mar. 29, 2018
9	Radio Communication Tester	Anritsu	MT8820C	A110518805	May 23, 2017

Conducted Emission & Band Edge & Occupied Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Mar. 26, 2018
2	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 26, 2018
3	Spectrum Analyzer	R&S	FSP40	100185	Sep. 04, 2017
4	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Feb. 25, 2018
5	wideband radio communication tester	R&S	CMW500	152372	Mar. 26, 2018
6	Cable	N/A	RG316(0.3m)	N/A	Jul. 06, 2017
7	Cable	N/A	RG316(0.3m)	N/A	Jul. 06, 2017

Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Mar. 26, 2018
2	DC power supply	GW Instek	GPC-3030DN	EK880675	Oct. 13, 2017
3	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Feb. 25, 2018
4	wideband radio communication tester	R&S	CMW500	152372	Mar. 26, 2018
5	Const Temp,& Humidity Chamber	Giant?Force	ITH-225-20-S	IAB0309-001	Sep. 04, 2017
6	Cable	N/A	RG316(0.3m)	N/A	Jul. 06, 2017

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

5. EUT TEST PHOTO

Radiated Measurement Photos

9KHz to 30MHz



Radiated Measurement Photos

30MHz to 1000MHz



Radiated Measurement Photos

Above 1GHz



ATTACHMENT A - OUTPUT POWER

Conducted Power:

GSM850 (Capsensor Off)	Burst Conducted Power (dBm)		
	128CH	190CH	251CH
	824.2MHz	836.6MHz	848.8MHz
GPRS/EDGE (GMSK)	33.87	33.94	34.05
	29.80	30.05	30.32
	28.80	29.02	29.25
	30.63	30.86	31.12
EDGE (8PSK)	27.12	26.74	27.01
	25.98	26.20	26.42
	25.03	25.15	25.39
	23.91	24.10	24.34

Modulation	Band	WCDMA V(Capsensor Off)		
	Tx Channel	4132CH	4182CH	4233CH
	Rx Channel	4357CH	4407CH	4458CH
	Frequency	826.4MHz	836.4MHz	846.6MHz
BPSK	RMC 12.2K	23.02	22.44	22.88
	RMC 64K	22.91	22.41	22.90
	RMC 144K	21.98	22.53	22.74
	RMC 384K	22.83	22.34	22.83
16QAM	HSDPA Subtest-1	22.48	22.54	22.94
	HSDPA Subtest-2	22.52	22.64	22.61
	HSDPA Subtest-3	22.50	22.66	22.57
	HSDPA Subtest-4	22.47	22.65	22.58

ERP Power:

GSM850 (Capsensor Off)	ERP Power (dBm)		
	128CH	190CH	251CH
	824.2MHz	836.6MHz	848.8MHz
GPRS/EDGE (GMSK)	30.75	30.82	30.93
	26.68	26.93	27.20
	25.68	25.90	26.13
	27.51	27.74	28.00
EDGE (8PSK)	24.00	23.62	23.89
	22.86	23.08	23.30
	21.91	22.03	22.27
	20.79	20.98	21.22

Modulation	Band	WCDMA V(Capsensor Off)		
	Tx Channel	4132CH	4182CH	4233CH
	Rx Channel	4357CH	4407CH	4458CH
	Frequency	826.4MHz	836.4MHz	846.6MHz
BPSK	RMC 12.2K	19.90	19.32	19.76
	RMC 64K	19.79	19.29	19.78
	RMC 144K	18.86	19.41	19.62
	RMC 384K	19.71	19.22	19.71
16QAM	HSDPA Subtest-1	19.36	19.42	19.82
	HSDPA Subtest-2	19.40	19.52	19.49
	HSDPA Subtest-3	19.38	19.54	19.45
	HSDPA Subtest-4	19.35	19.53	19.46

ATTACHMENT B - OCCUPIED BANDWIDTH

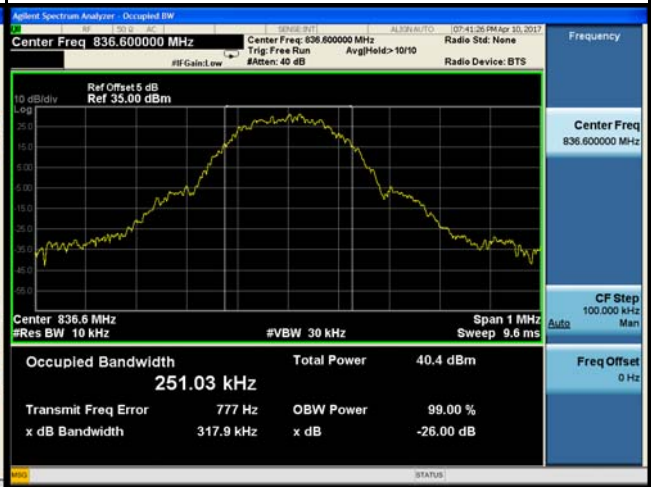
GSM850					
GPRS			EDGE		
GMSK			8PSK		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
128	824.2	0.245	128	824.2	0.245
190	836.6	0.251	190	836.6	0.243
251	848.8	0.244	251	848.8	0.245
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
128	824.2	0.306	128	824.2	0.310
190	836.6	0.318	190	836.6	0.309
251	848.8	0.315	251	848.8	0.317

Spectrum Plot

GPRS -128



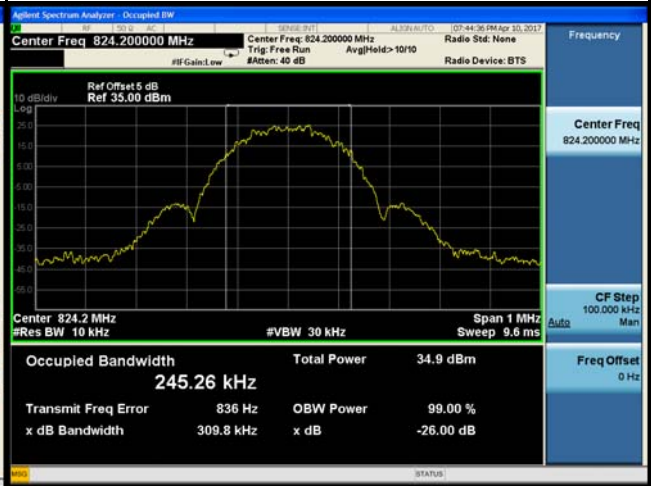
GPRS -190



GPRS -251



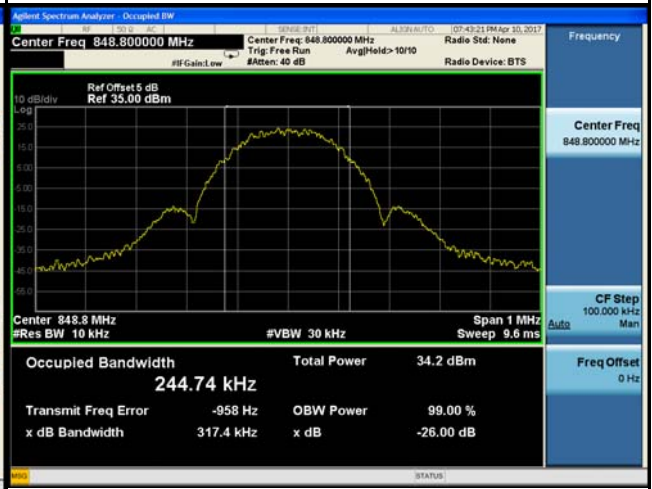
EDGE-128



EDGE-190



EDGE-251



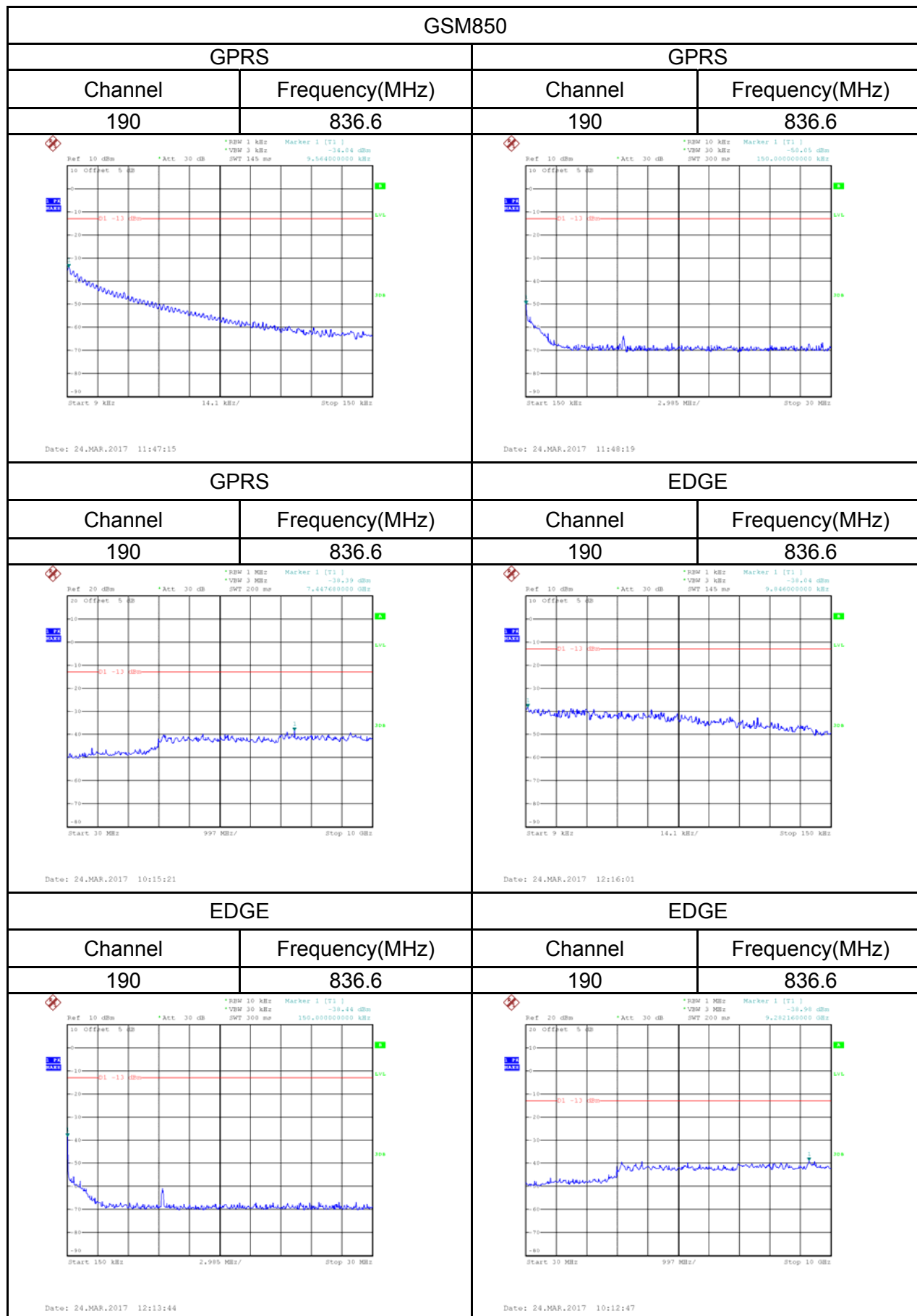
WCDMA Band V					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
4132	826.4	4.1692	4132	826.4	4.684
4182	836.4	4.1692	4182	836.4	4.689
4233	846.6	4.1684	4233	846.6	4.685

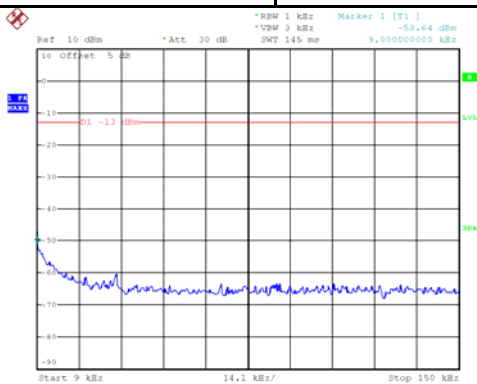
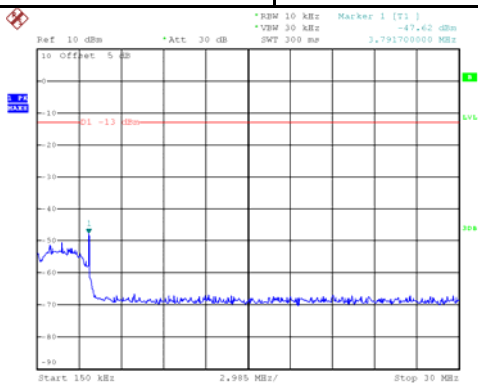
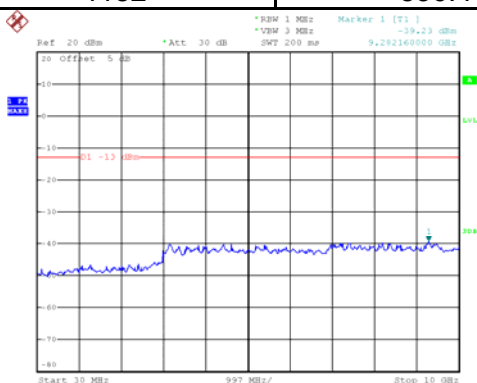


WCDMA_HSDPA Band V					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
4132	826.4	4.1190	4132	826.4	4.681
4182	836.4	4.1313	4182	836.4	4.681
4233	846.6	4.1094	4233	846.6	4.672



ATTACHMENT C - CONDUCTED EMISSIONS



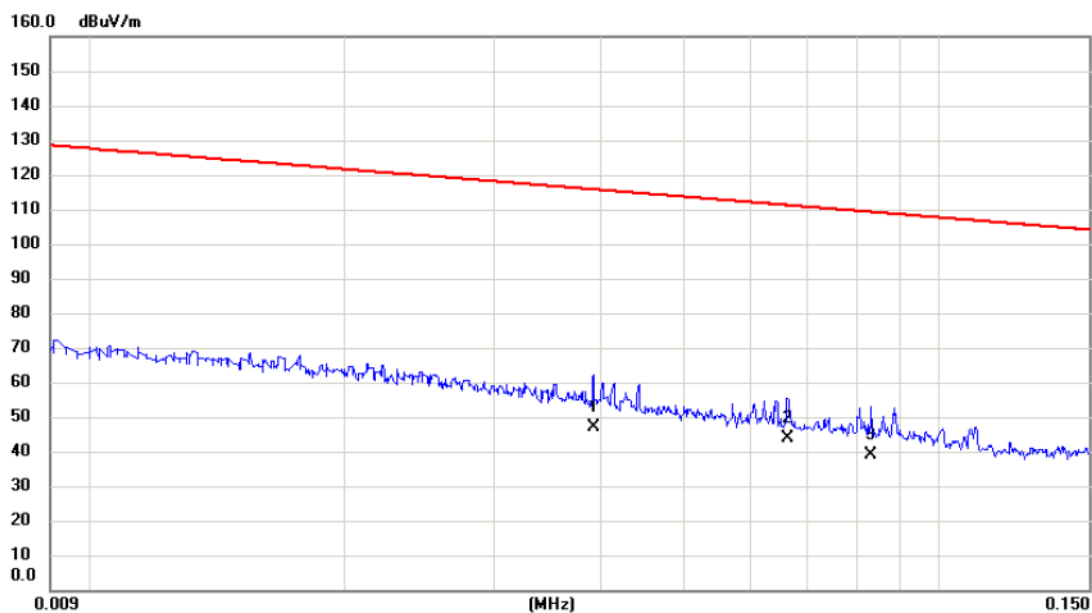
WCDMA Band V			
Channel	Frequency(MHz)	Channel	Frequency(MHz)
4182	836.4	4182	836.4
 Date: 24.MAR.2017 15:13:53		 Date: 24.MAR.2017 15:16:10	
Channel	Frequency(MHz)	-	-
4182	836.4	-	-
 Date: 24.MAR.2017 10:23:23		-	

WCDMA_HSDPA Band V			
Channel	Frequency(MHz)	Channel	Frequency(MHz)
4182	836.4	4182	836.4
Channel	Frequency(MHz)	-	-
4182	836.4	-	-

ATTACHMENT D - RADIATED EMISSION

Test Mode:	TX Mode
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Ant 0°

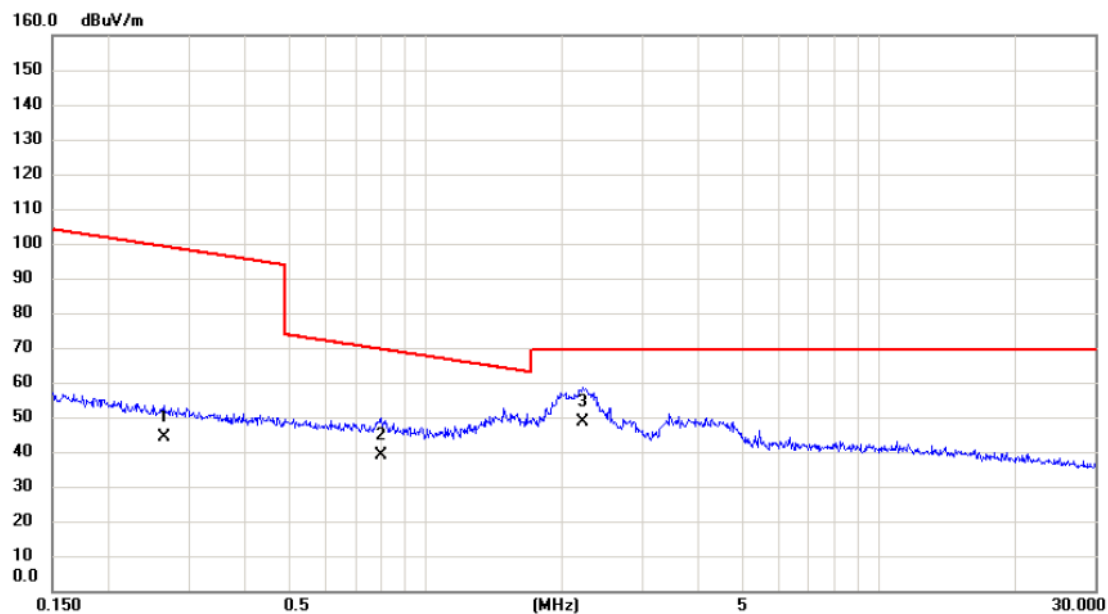


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.0393	26.03	21.14	47.17	115.72	-68.55	AVG	
2	*	0.0663	24.06	19.63	43.69	111.17	-67.48	AVG	
3		0.0831	20.03	19.17	39.20	109.21	-70.01	AVG	

Test Mode:

TX Mode

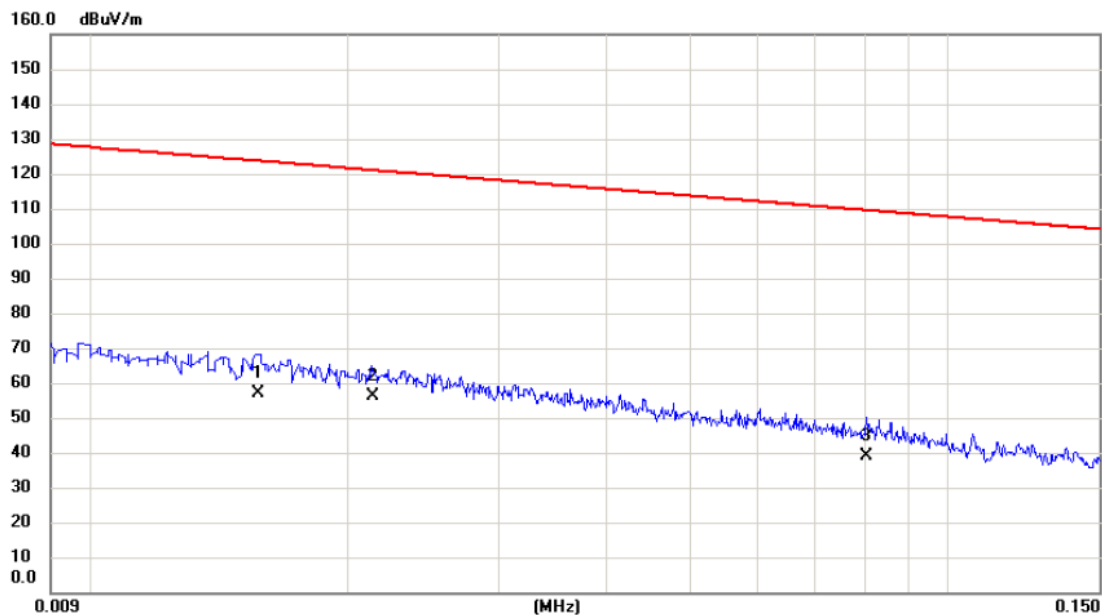
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.2644	25.60	18.63	44.23	99.16	-54.93	AVG	
2		0.7960	20.70	18.33	39.03	69.59	-30.56	QP	
3	*	2.2250	31.06	17.62	48.68	69.54	-20.86	QP	

Test Mode: TX Mode

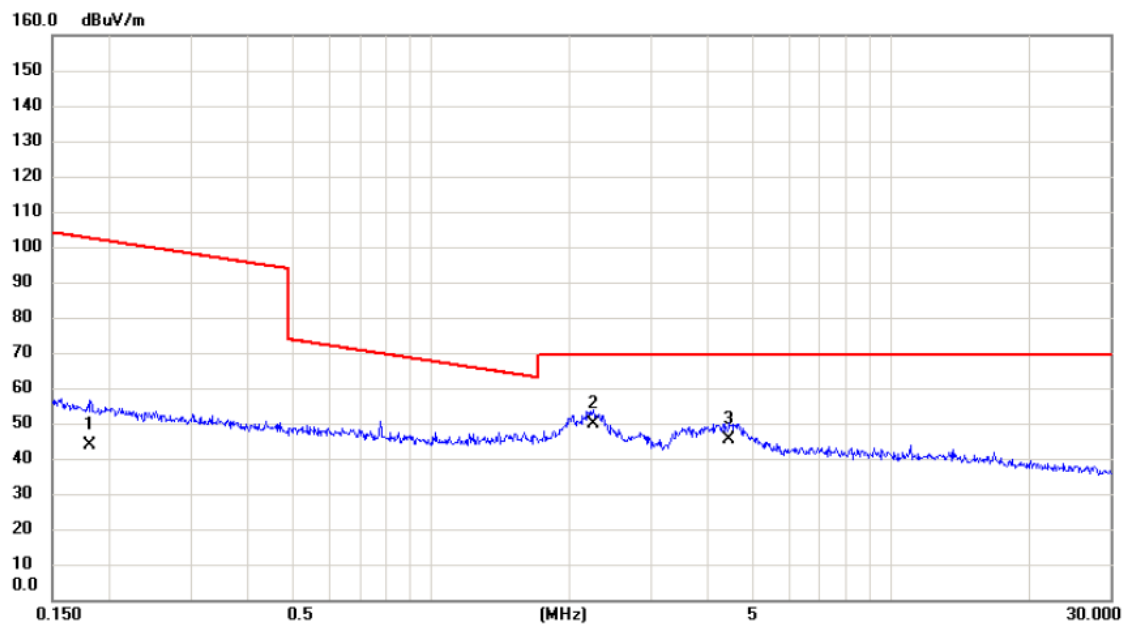
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.0157	33.39	23.78	57.17	123.69	-66.52	AVG	
2	*	0.0214	32.79	23.35	56.14	121.00	-64.86	AVG	
3		0.0803	19.60	19.30	38.90	109.51	-70.61	AVG	

Test Mode: TX Mode

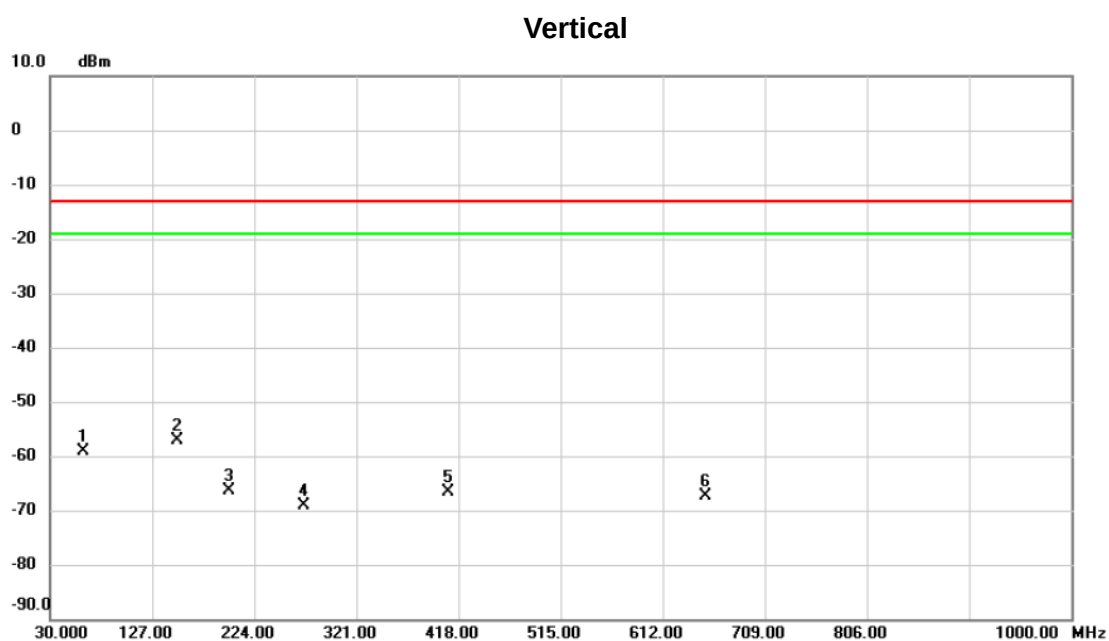
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.1815	24.90	18.71	43.61	102.43	-58.82	AVG	
2	*	2.2486	32.11	17.59	49.70	69.54	-19.84	QP	
3		4.4305	27.50	17.87	45.37	69.54	-24.17	QP	

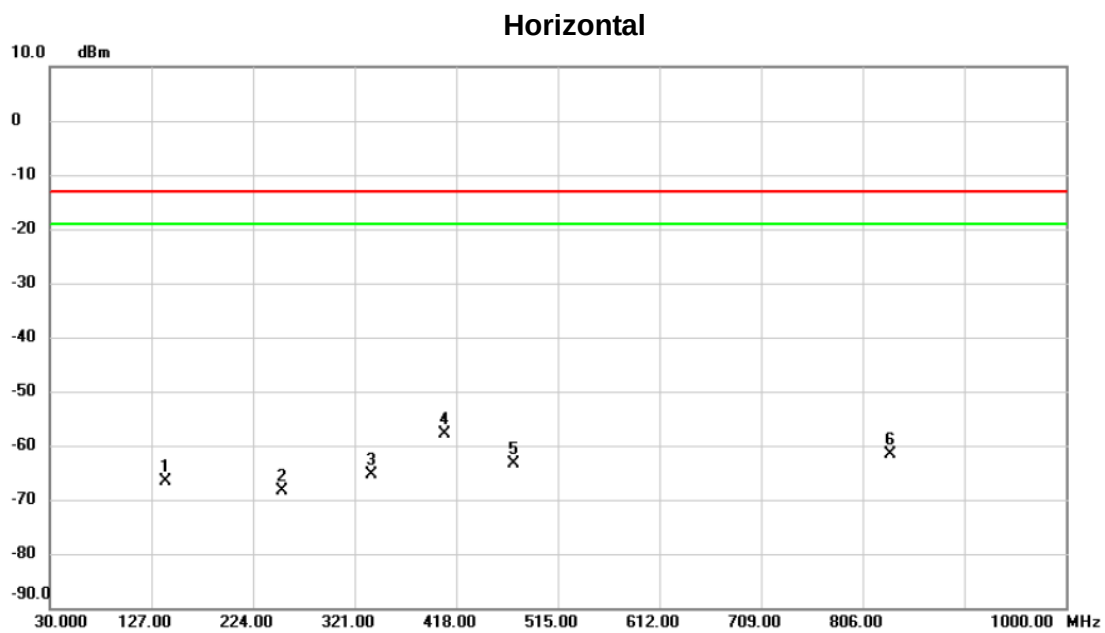
Test Mode:

GSM850_TX CH251_GPRS



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		62.010	-59.85	0.73	-59.12	-13.00	-46.12	peak	
2	*	150.280	-60.23	3.15	-57.08	-13.00	-44.08	peak	
3		199.750	-63.97	-2.30	-66.27	-13.00	-53.27	peak	
4		270.560	-71.37	2.22	-69.15	-13.00	-56.15	peak	
5		408.300	-70.88	4.33	-66.55	-13.00	-53.55	peak	
6		652.740	-77.60	10.14	-67.46	-13.00	-54.46	peak	

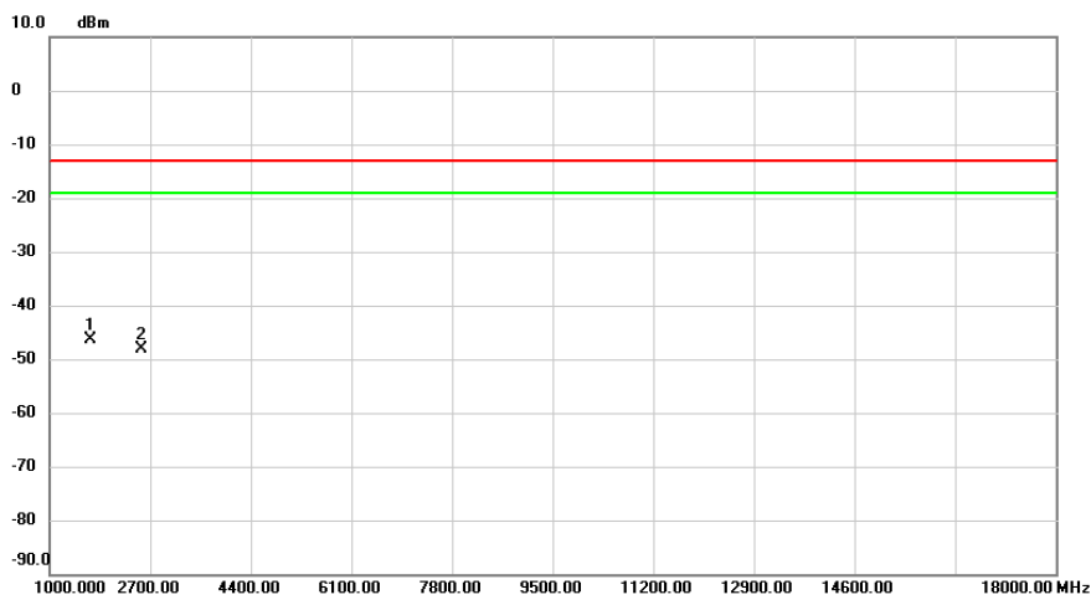
Test Mode: GSM850_TX CH251_GPRS



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		140.580	-69.84	3.19	-66.65	-13.00	-53.65	peak	
2		251.160	-70.14	1.88	-68.26	-13.00	-55.26	peak	
3		336.520	-67.75	2.49	-65.26	-13.00	-52.26	peak	
4	*	407.330	-64.21	6.25	-57.96	-13.00	-44.96	peak	
5		472.320	-69.62	6.26	-63.36	-13.00	-50.36	peak	
6		832.190	-73.52	11.91	-61.61	-13.00	-48.61	peak	

Test Mode:	GSM850_TX CH251_GPRS
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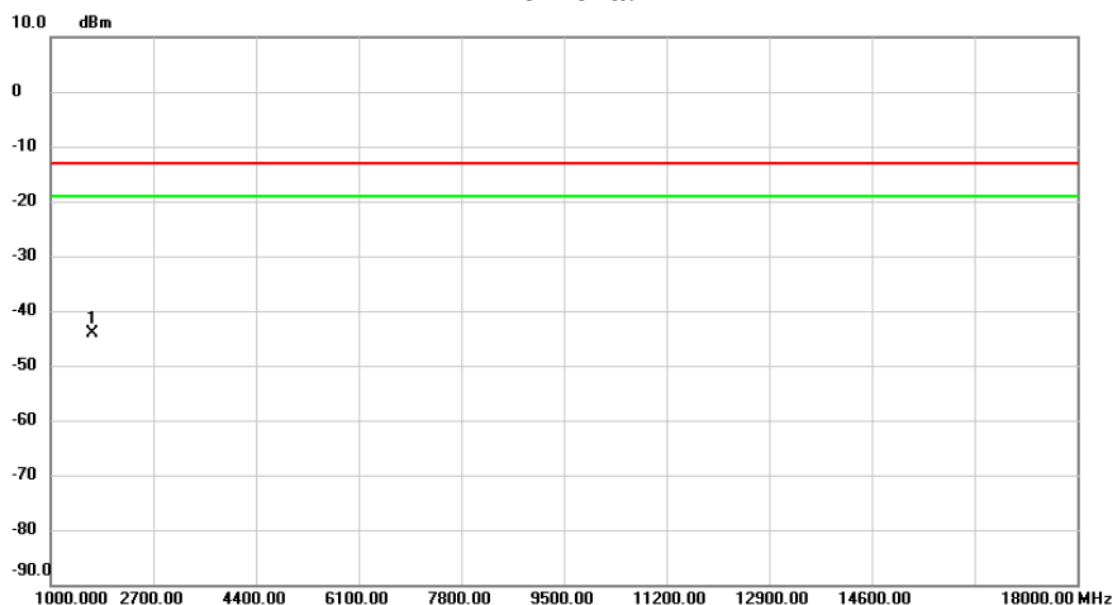
Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	1697.000	-53.23	6.82	-46.41	-13.00	-33.41	peak	
2		2547.000	-60.38	12.22	-48.16	-13.00	-35.16	peak	

Test Mode:	GSM850_TX CH251_GPRS
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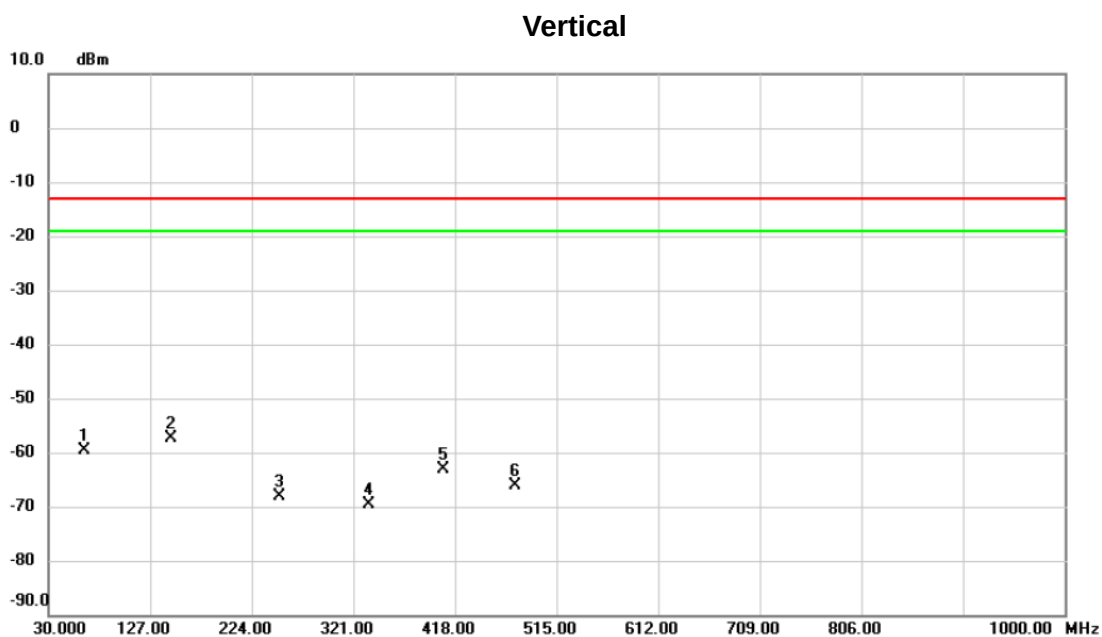
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1697.000	-52.17	8.17	-44.00	-13.00	-31.00	peak	

Test Mode:

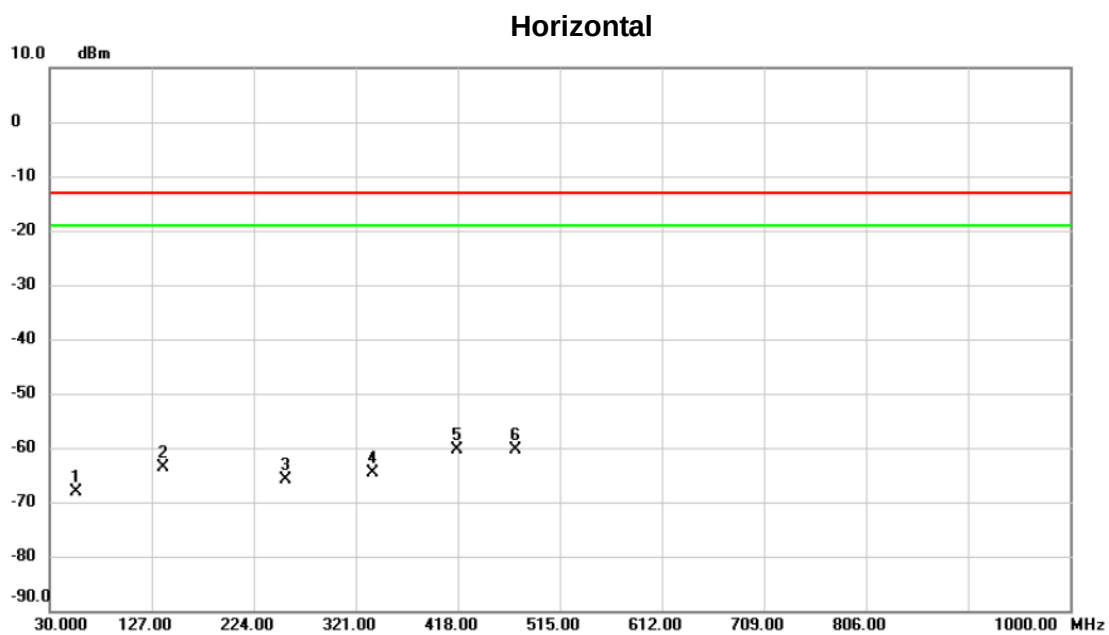
GSM850_TX CH128_EDGE



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin		
		MHz	Level	Factor	ment			Detector	Comment
			dBm	dB	dBm	dBm	dB		
1		63.950	-60.67	0.98	-59.69	-13.00	-46.69	peak	
2	*	147.370	-60.14	2.89	-57.25	-13.00	-44.25	peak	
3		250.190	-68.36	0.16	-68.20	-13.00	-55.20	peak	
4		335.550	-71.10	1.42	-69.68	-13.00	-56.68	peak	
5		407.330	-67.47	4.31	-63.16	-13.00	-50.16	peak	
6		475.230	-72.50	6.26	-66.24	-13.00	-53.24	peak	

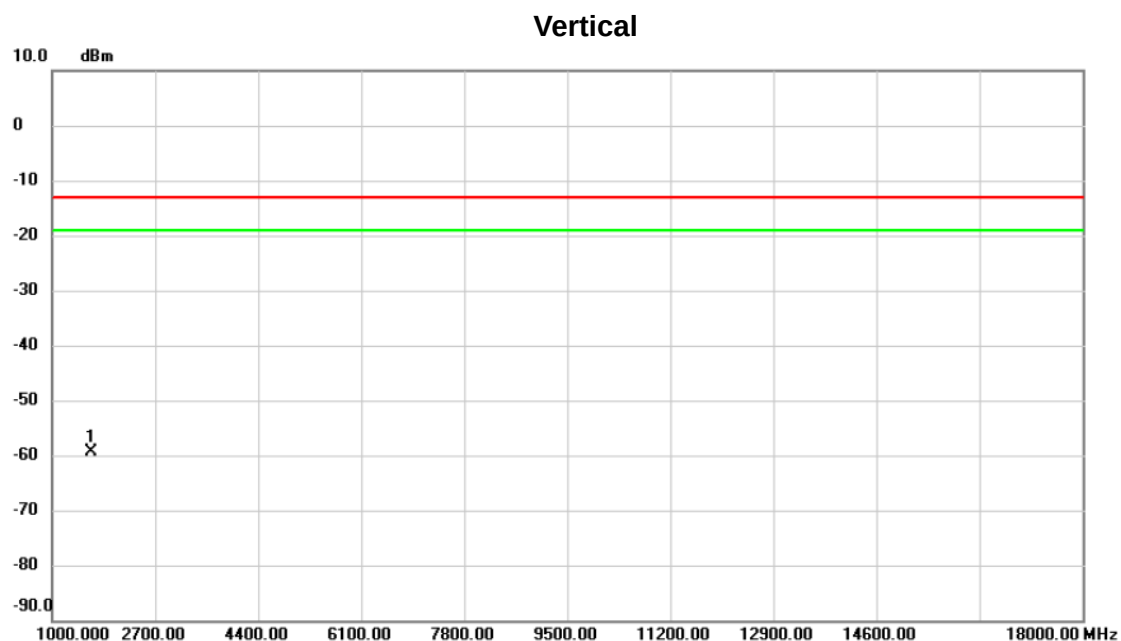
Test Mode:

GSM850_TX CH128_EDGE



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		55.220	-70.73	2.53	-68.20	-13.00	-55.20	peak	
2		138.640	-66.22	2.61	-63.61	-13.00	-50.61	peak	
3		254.070	-67.86	1.89	-65.97	-13.00	-52.97	peak	
4		336.520	-66.99	2.49	-64.50	-13.00	-51.50	peak	
5	*	417.030	-67.09	6.73	-60.36	-13.00	-47.36	peak	
6		473.290	-66.67	6.31	-60.36	-13.00	-47.36	peak	

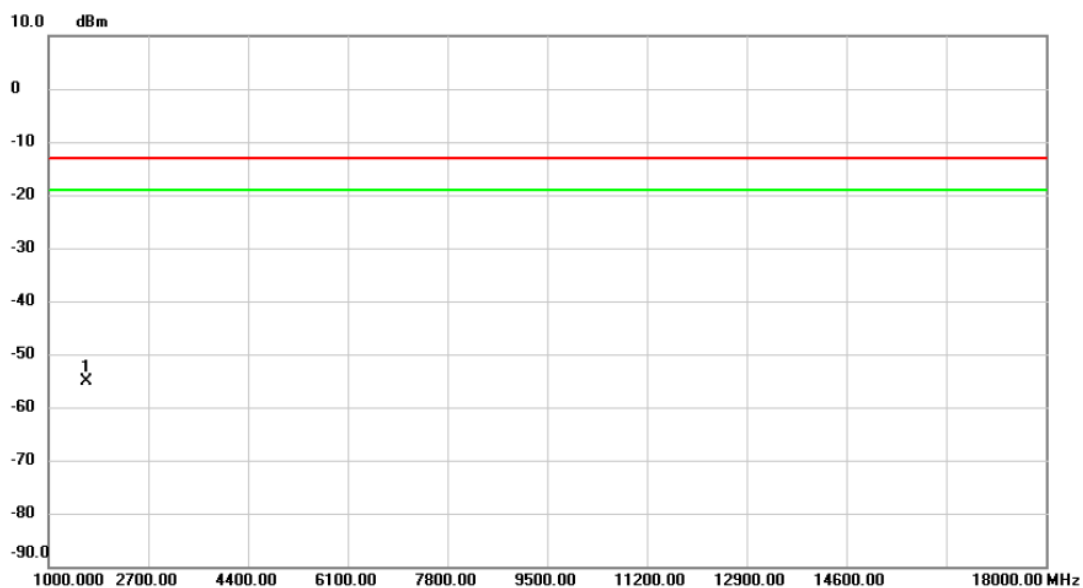
Test Mode:	GSM850_TX CH128_EDGE
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1646.000	-65.61	6.12	-59.49	-13.00	-46.49	peak	

Test Mode:	GSM850_TX CH128_EDGE
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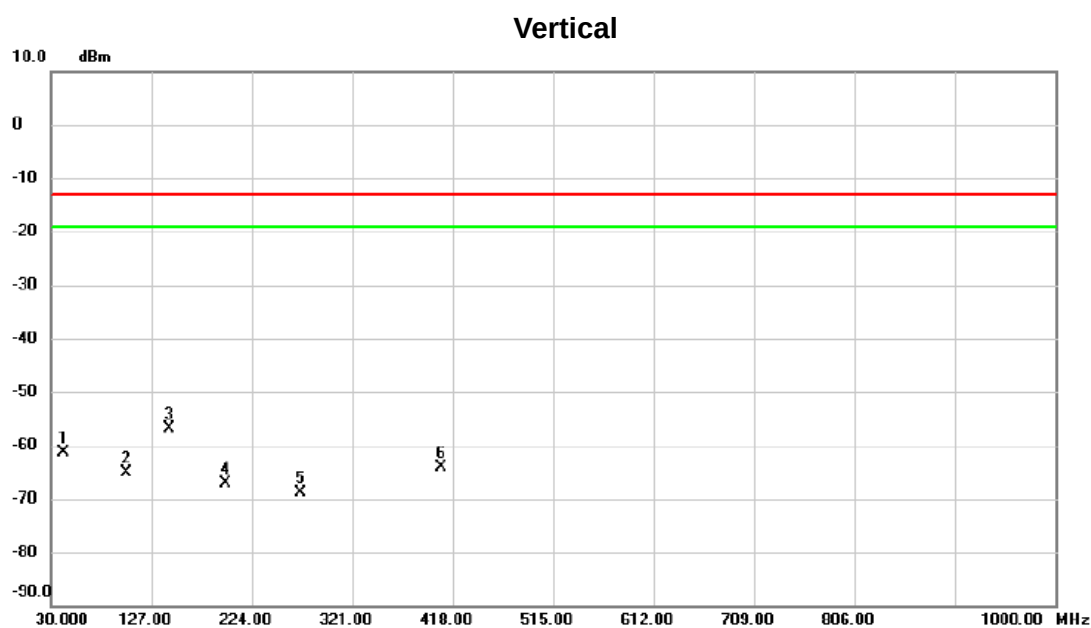
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1646.000	-63.35	8.15	-55.20	-13.00	-42.20	peak	

Test Mode:

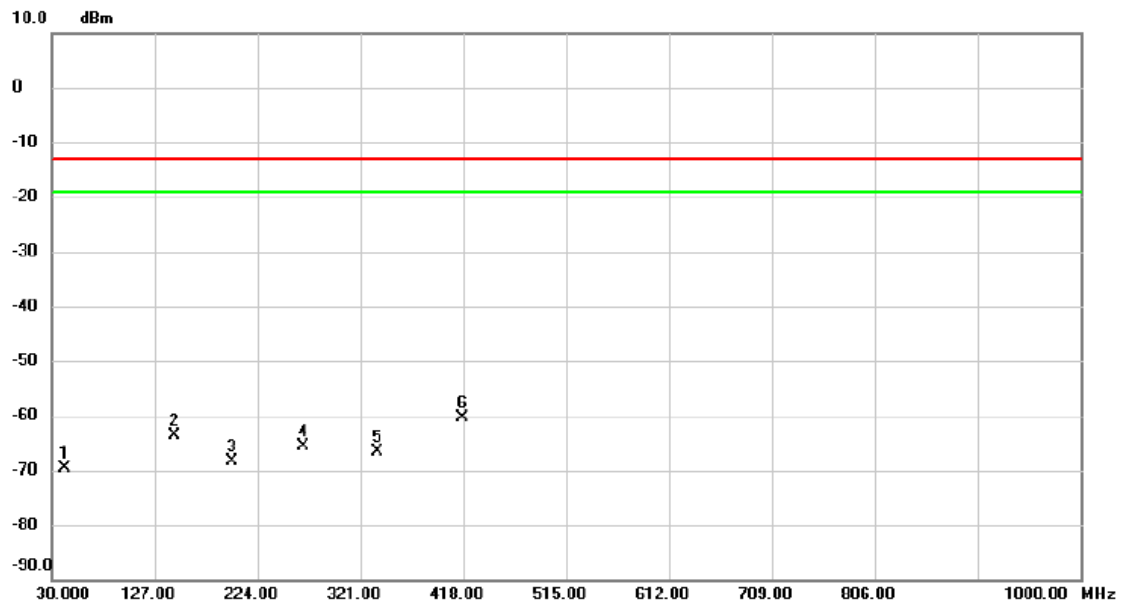
WCDMA Band V_TX CH4132



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		41.640	-63.54	2.06	-61.48	-13.00	-48.48	peak	
2		102.750	-63.92	-1.28	-65.20	-13.00	-52.20	peak	
3	*	144.460	-59.59	2.60	-56.99	-13.00	-43.99	peak	
4		198.780	-64.76	-2.25	-67.01	-13.00	-54.01	peak	
5		270.560	-71.09	2.22	-68.87	-13.00	-55.87	peak	
6		407.330	-68.47	4.31	-64.16	-13.00	-51.16	peak	

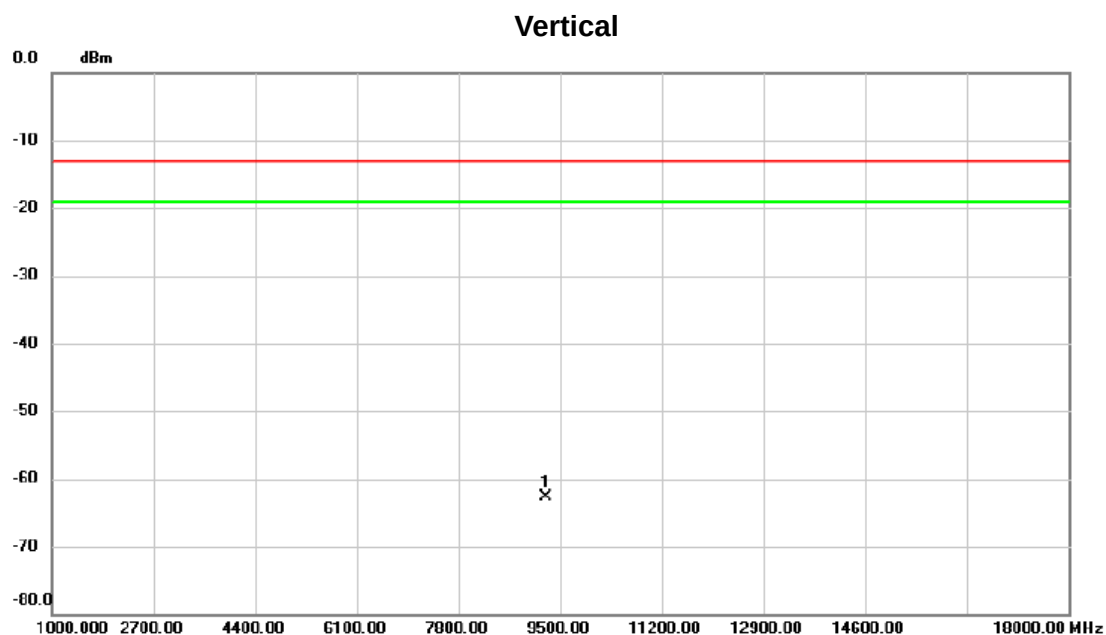
Test Mode:	WCDMA Band V_TX CH4132
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Horizontal



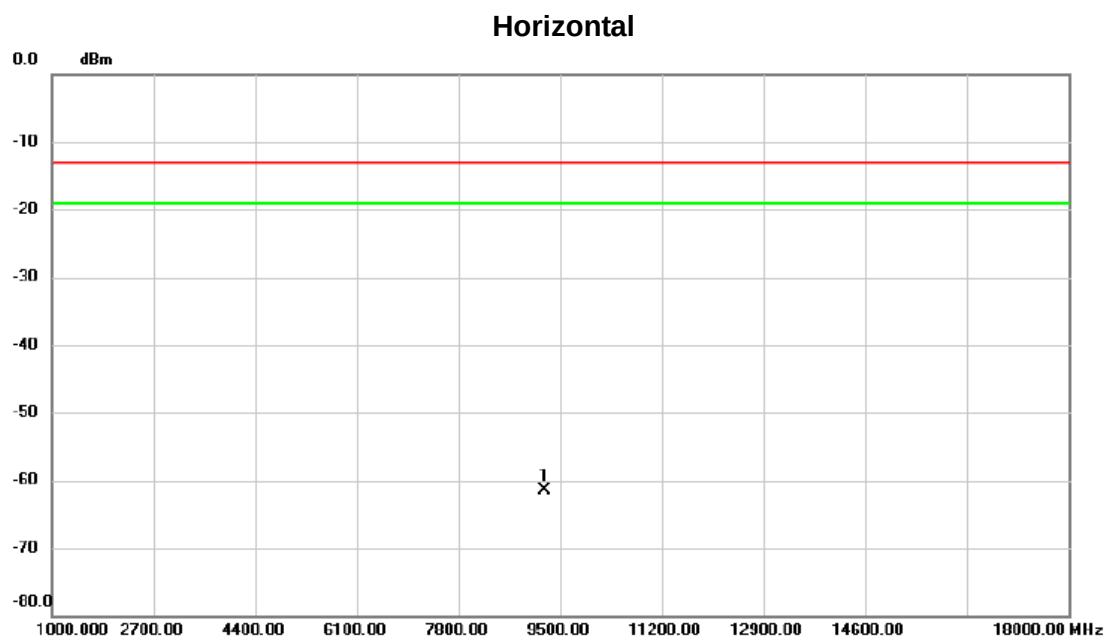
No. Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	41.640	-71.99	2.40	-69.59	-13.00	-56.59	peak	
2	145.430	-67.42	3.73	-63.69	-13.00	-50.69	peak	
3	199.750	-66.57	-1.90	-68.47	-13.00	-55.47	peak	
4	267.650	-68.49	2.76	-65.73	-13.00	-52.73	peak	
5	336.520	-68.99	2.49	-66.50	-13.00	-53.50	peak	
6 *	417.030	-67.09	6.73	-60.36	-13.00	-47.36	peak	

Test Mode:	WCDMA Band V_TX CH4132
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No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	9255.550	-81.87	19.17	-62.70	-13.00	-49.70	peak	

Test Mode:	WCDMA Band V_TX CH4132
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	9245.060	-81.87	20.38	-61.49	-13.00	-48.49	peak	

Test Mode:	WCDMA Band V_TX CH4132_HSDPA
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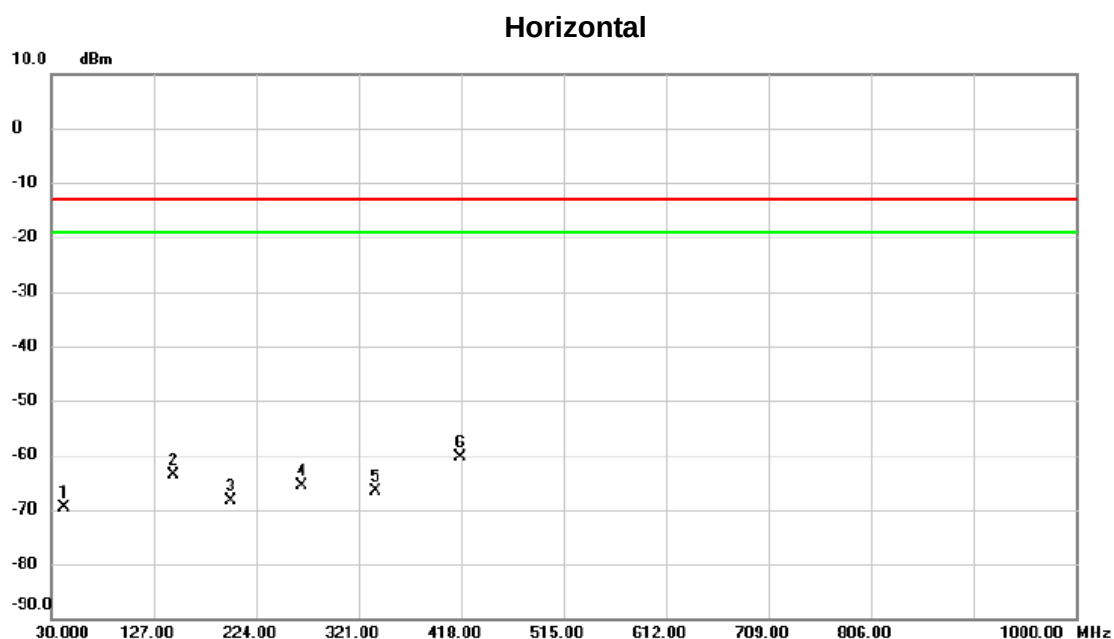
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		41.640	-63.54	2.06	-61.48	-13.00	-48.48	peak	
2		102.750	-63.92	-1.28	-65.20	-13.00	-52.20	peak	
3	*	144.460	-59.59	2.60	-56.99	-13.00	-43.99	peak	
4		198.780	-64.76	-2.25	-67.01	-13.00	-54.01	peak	
5		270.560	-71.09	2.22	-68.87	-13.00	-55.87	peak	
6		407.330	-68.47	4.31	-64.16	-13.00	-51.16	peak	

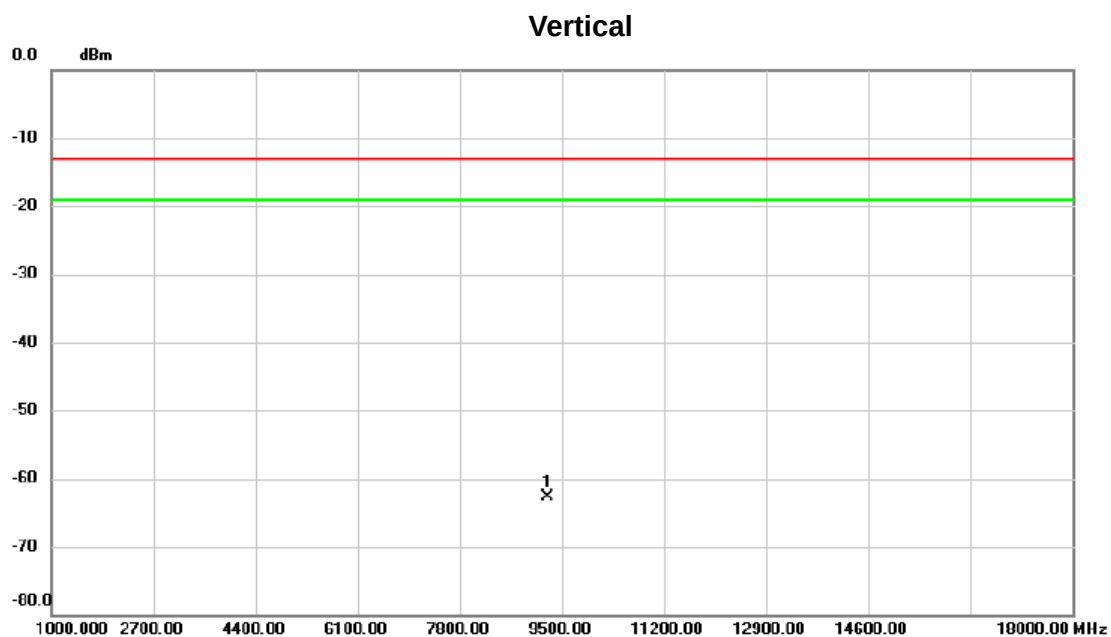
Test Mode:

WCDMA Band V_TX CH4132_HSDPA



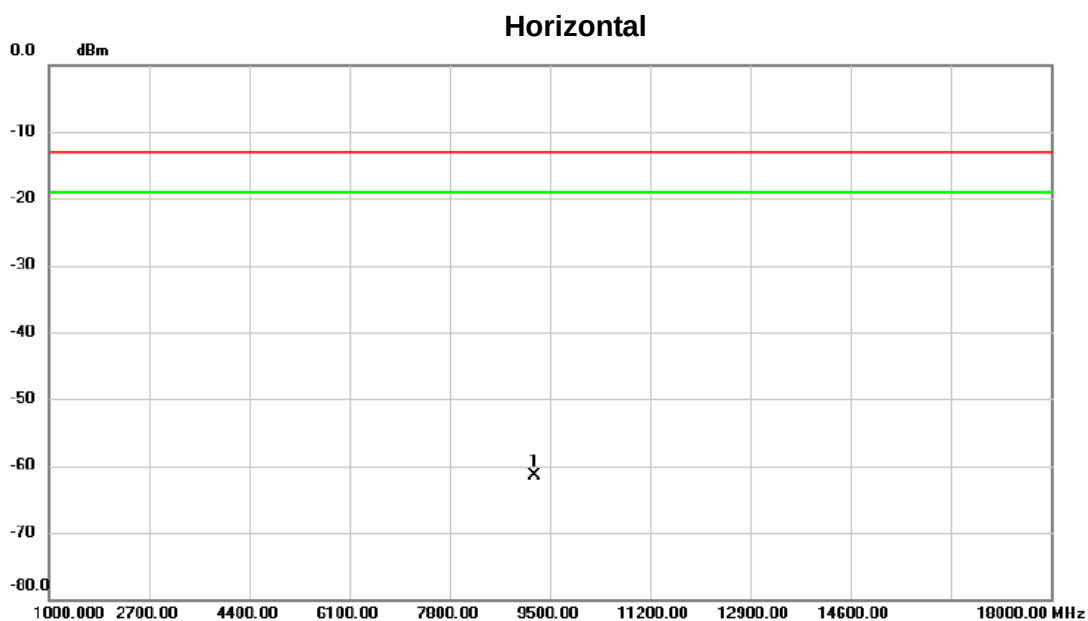
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		41.640	-71.99	2.40	-69.59	-13.00	-56.59	peak	
2		145.430	-67.42	3.73	-63.69	-13.00	-50.69	peak	
3		199.750	-66.57	-1.90	-68.47	-13.00	-55.47	peak	
4		267.650	-68.49	2.76	-65.73	-13.00	-52.73	peak	
5		336.520	-68.99	2.49	-66.50	-13.00	-53.50	peak	
6	*	417.030	-67.09	6.73	-60.36	-13.00	-47.36	peak	

Test Mode:	WCDMA Band V_TX CH4132_HSDPA
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	9255.550	-81.87	19.17	-62.70	-13.00	-49.70	peak	

Test Mode:	WCDMA Band V_TX CH4132_HSDPA
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No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure- ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	9245.060	-81.87	20.38	-61.49	-13.00	-48.49	peak	

ATTACHMENT E - BAND EDGE

GSM850

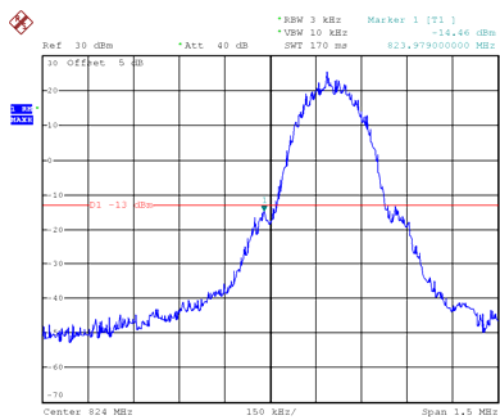
GPRS

Channel

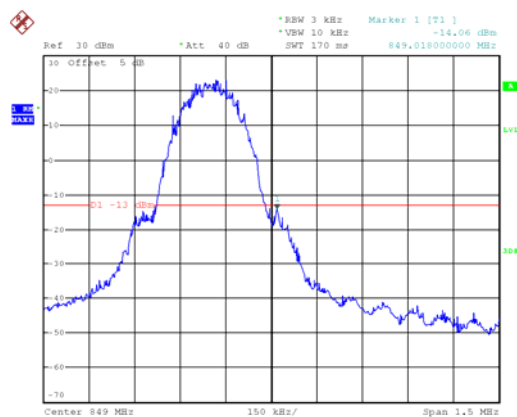
128

Channel

251



Date: 29.MAR.2017 12:17:10



Date: 29.MAR.2017 12:26:57

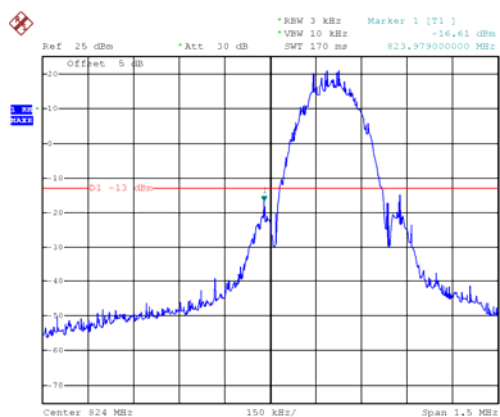
EDGE

Channel

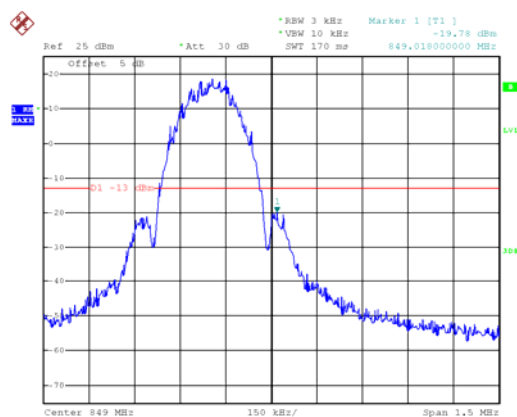
128

Channel

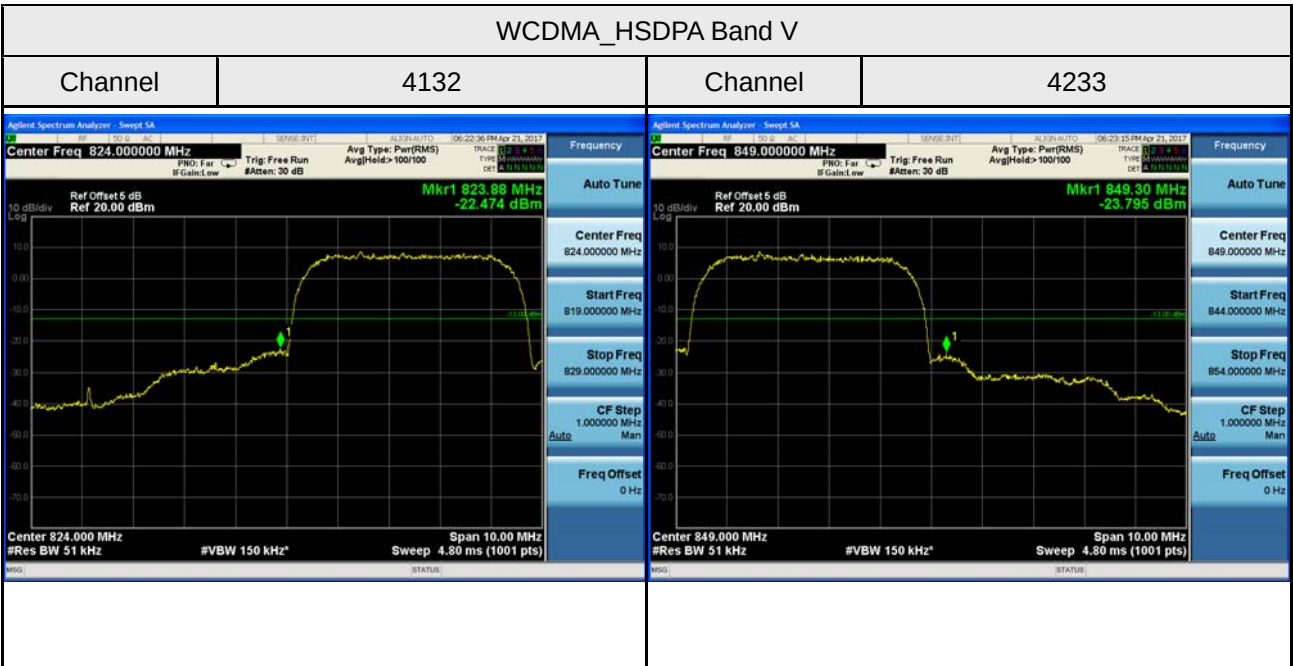
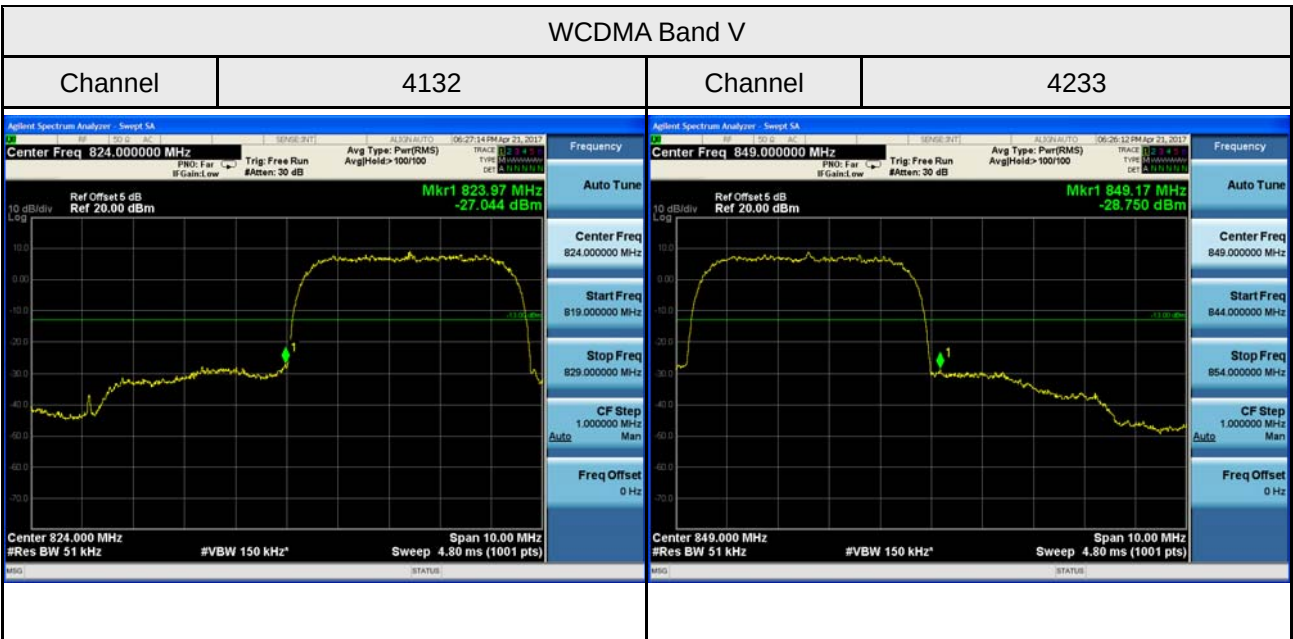
251



Date: 24.MAR.2017 14:30:00



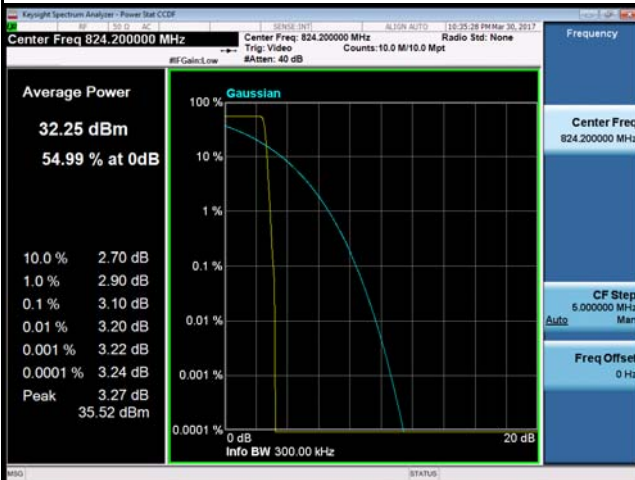
Date: 24.MAR.2017 14:31:40



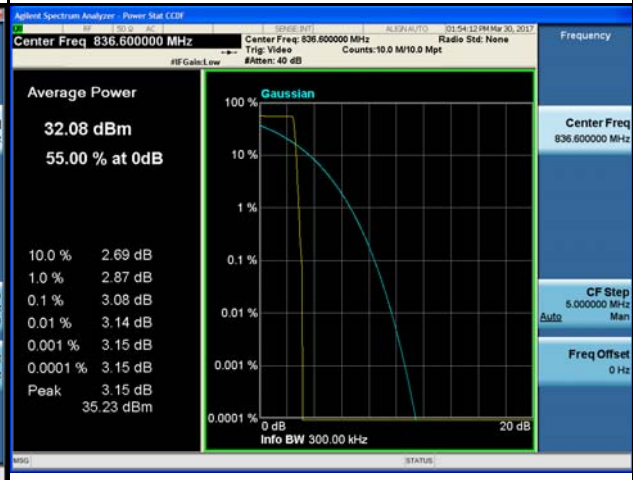
ATTACHMENT F - PEAK TO AVERAGE RATIO

GSM 850 Spectrum Plot

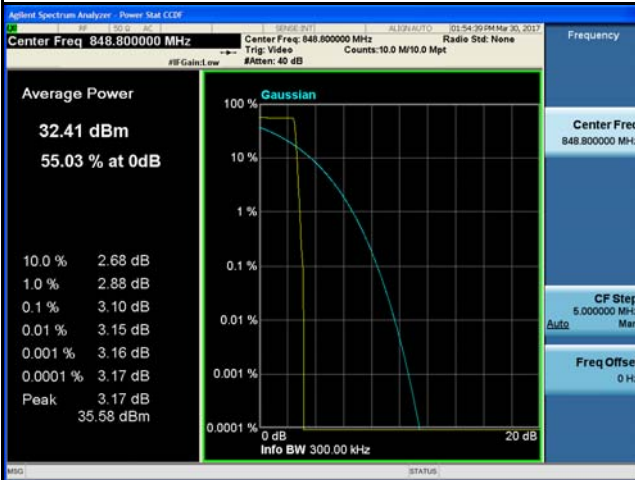
GPRS -128



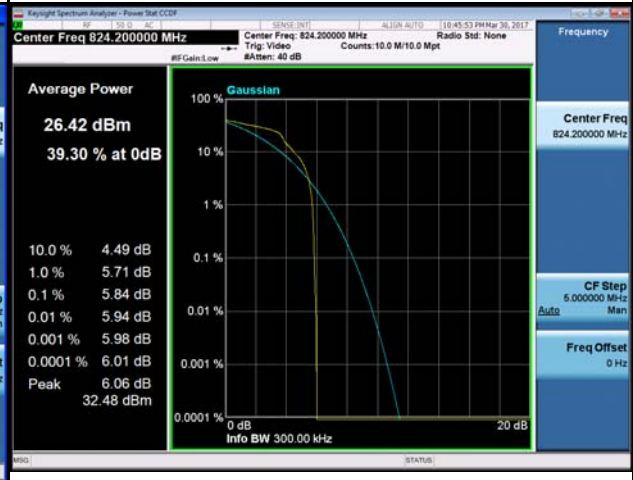
GPRS -190



GPRS -251



EDGE-128



EDGE-190



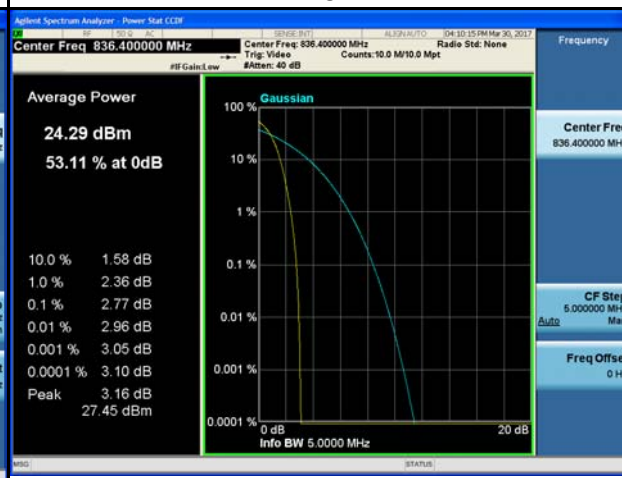
EDGE-251



WCDMA Band V Spectrum Plot

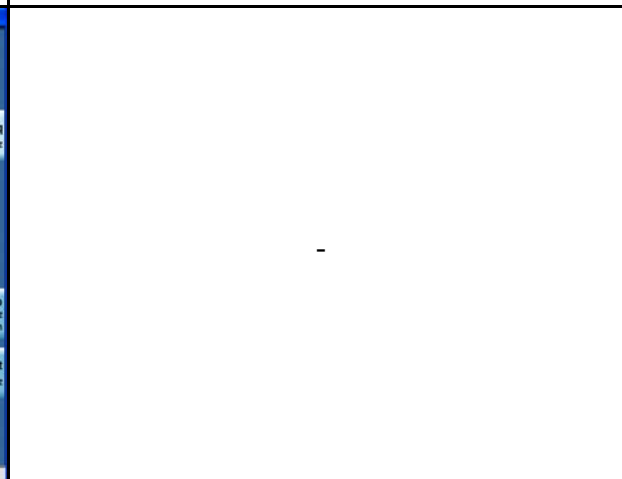
4132

4182



4233

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WCDMA_HSDPA Band V Spectrum Plot

4132



4182



4233



-

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ATTACHMENT G - FREQUENCY STABILITY

Test Mode:	GSM850_CH190
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Temperature vs. Frequency Stability

Temperature(°C)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
-20	8.46	0.010264499	2.5
-10	7.17	0.008699345	2.5
0	3.84	0.004659063	2.5
10	5.69	0.006903664	2.5
20	7.32	0.008881339	2.5
30	8.06	0.00977918	2.5
40	5.51	0.006685271	2.5
50	8.44	0.010240233	2.5
60	6.12	0.007425382	2.5
Max. Deviation (ppm)	8.46	0.010264499	2.5

Voltage vs. Frequency Stability

Voltage(Volts)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
Low	2.46	0.002984712	2.5
Middle	4.51	0.005471973	2.5
High	3.93	0.00476826	2.5
Max. Deviation (ppm)	4.51	0.005471973	2.5

Test Mode:	WCDMA Band 5_CH4182
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Temperature vs. Frequency Stability

Temperature(°C)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
-20	8.34	0.009971306	2.5
-10	7.43	0.008883309	2.5
0	8.44	0.010090866	2.5
10	7.54	0.009014825	2.5
20	8.93	0.01067671	2.5
30	7.29	0.008715925	2.5
40	7.98	0.00954089	2.5
50	6.66	0.007962697	2.5
60	8.27	0.009887614	2.5
Max. Deviation (ppm)	8.93	0.01067671	2.5

Voltage vs. Frequency Stability

Voltage(Volts)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
Low	9.27	0.011083214	2.5
Middle	7.54	0.009014825	2.5
High	8.81	0.010533238	2.5
Max. Deviation (ppm)	9.27	0.011083214	2.5