

FCC Radio Test Report

FCC ID: 2AF8B-Z1

Original Grant

Report No. : TB-FCC145633
Applicant : Karacus LLC
Equipment Under Test (EUT)
EUT Name : Zeta smart watch
Model No. : Z1
Series No. : N/A
Brand Name : N/A
Receipt Date : 2015-10-08
Test Date : 2015-10-08 to 2015-10-23
Issue Date : 2015-10-24
Standards : FCC Part 2
FCC Part 22 Subpart H, FCC Part 24 Subpart E, 2014
ANSI/TIAC603D: 2010
Conclusions : **PASS**

In the configuration tested, the EUT complied with the standards specified above,
The EUT technically complies with the FCC requirements

Test/Witness Engineer :

LIWAN SU

Approved & Authorized :

Ray Lai



This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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1. General Information about EUT

1.1 Client Information

Applicant : Karacus LLC

Address : 428, Ridgefield Rd, Chapel Hill, NC 27517, USA

Manufacturer : Shenzhen LEDO Technology Co., LTD

Address : RM 9C 9th Floor, A Block, Modern Window Building, Huaqiang North Rd, FuTian Area, Shenzhen, China

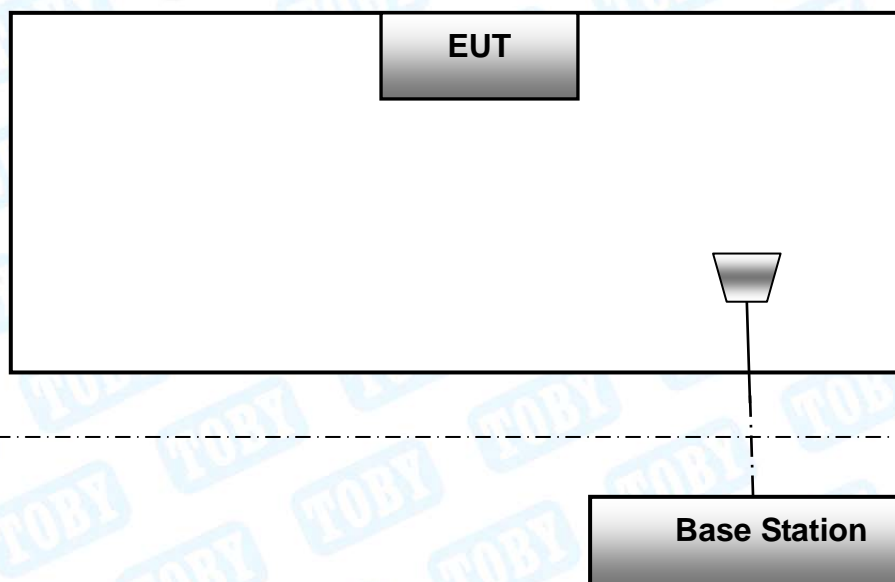
1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Zeta smart watch
Models No.	:	Z1
Model Difference	:	N/A
Product Description	:	Frequency Bands: GSM850; PCS1900; UMTS FDD Band V
		GSM 850 Power : Cond:33.86 dBm ERP:32.41 dBm
		PCS 1900 Power : Cond:30.49 dBm EIRP:31.65 dBm
		UMTS Band V Power: Cond:22.96 dBm ERP:20.14 dBm
	:	Antenna Gain: GSM 850: 0.01 dBi PCS 1900: 0.73 dBi WCDMA Band V: 0.09 dBi
		Modulation Type: GSM/GPRS:GMSK EDGE: 8PSK UMTS:QPSK
FCC Operating Frequency	:	GSM 850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz UMTS Band V:826.40MHz-846.60MHz
Emission Designator	:	GSM 850: 253KGXW, PCS 1900: 249KGXW GPRS 850: 252KG7W, GPRS 1900: 245KG7W UMTS Band V: 4M16F9W
Power Supply	:	DC Voltage supplied from Host System by USB cable. DC power by Li-ion Battery.
Power Rating	:	DC 5.0V by USB cable. DC 3.8V 450mAh Li-ion Battery.
Connecting I/O Port(S)	:	Please refer to the User's Manual

Note:

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. The EUT has also been tested and complied the FCC 15C for Bluetooth and WiFi function, and recorded in the separate test report.
- (2) This test report only product for PCS Licensed Transmitter (PCB).

1.3 Block Diagram Showing the Configuration of System Tested



The above block diagram of setup is the normal mode. And more detail please refer to the test setup of each test item of bellow.

1.4 Description of Support Units

The EUT has been tested as an independent unit.

1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

During all testing, EUT is link mode with base station at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range. Frequency range investigated for radiated emission as below:

1. 9kHz~10GHz for GSM850 and UMTS Band V.
2. 9kHz~20GHz for PCS1900.

Test Channel		
Mode	Channel	Frequency(MHz)
GSM 850	128	824.20
	190	836.60
	251	848.80
PCS 1900	512	1850.20
	661	1880.00
	810	1909.80
UMTS Band V	4132	826.40
	4175	835.00
	4233	846.60
Pre-scanning test Mode		Description
GSM 850		highest , middle, lowest channels
GPRS 850		highest , middle, lowest channels
GSM 1900		highest , middle, lowest channels
GPRS 1900		highest , middle, lowest channels
RMC UMTS Band V		highest , middle, lowest channels
HSDPA UMTS Band V		highest , middle, lowest channels
HSUPA UMTS Band V		highest , middle, lowest channels
Final test Mode		Description
GSM 850		highest , middle, lowest channels
GSM 1900		highest , middle, lowest channels
RMC UMTS 850		highest , middle, lowest channels

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) During the testing procedure, the EUT is in link mode with base station emulator at maximum power level in each test mode.
- (3) The EUT has GSM, GPRS functions, and after pre-testing, GSM function is the worst case for all the emission tests.
- (4) The EUT has RMC, HSDP, HSUP functions in UMTS band V, and after pre-testing, RMC mode is the worst case for all the emission tests.
- (5) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on Z-plane as the normal use. Therefore only the test data of this Z-plane was used for radiated emission measurement test.

1.6 Measurement Uncertainty

Test Item	Parameters	Expanded Uncertainty (U_{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz	± 3.42 dB
	150kHz to 30MHz	± 3.42 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	± 4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	± 4.40 dB
Radiated Emission	Level Accuracy: Above 1000MHz	± 4.20 dB

1.7 Test Facility

The testing was performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at: 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China.

At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

FCC List No.: (811562)

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

2. Test Summary

Test Standards and Test Results			
Standard	Document Title		
FCC Part 2 (10-1-05 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations		
FCC Part 22 (10-1-05 Edition)	Public Mobile Services		
FCC Part 24 (10-1-05 Edition)	Personal Communications Services		
Standard Section	Test Item	Judgment	Remark
2.1046	Conducted RF Output Power	PASS	N/A
24.232(d)	Peak-Average Ratio	PASS	N/A
2.1049; 22.917; 24.238	99% & -26 dB Occupied Bandwidth	PASS	N/A
2.1055; 22.355; 24.235	Frequency Stability	PASS	N/A
2.1051; 2.1057; 22.917; 24.238	Conducted Out of Band Emissions	PASS	N/A
2.1051; 2.1057; 22.917; 24.238	Band Edge	PASS	N/A
22.913; 24.238	Transmitter Radiated Power (EIRP/ERP)	PASS	N/A
2.1053; 2.1057; 22.917; 24.238	Radiated Out of Band Emissions	PASS	N/A
Note: N/A is an abbreviation for Not Applicable.			

3. Test Equipment

AC Main Conducted Emission					
Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	100321	Aug. 07, 2015	Aug. 06, 2016
50ΩCoaxial Switch	Anritsu	MP59B	X10321	Aug. 07, 2015	Aug. 06, 2016
L.I.S.N	Rohde & Schwarz	ENV216	101131	Aug. 07, 2015	Aug. 06, 2016
L.I.S.N	SCHWARZBECK	NNBL 8226-2	8226-2/164	Aug. 07, 2015	Aug. 06, 2016
Radiation Spurious Emission					
Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Aug. 29, 2015	Aug. 28, 2016
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Aug. 07, 2015	Aug. 06, 2016
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 28, 2015	Mar. 27, 2016
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 28, 2015	Mar. 27, 2016
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 28, 2015	Mar. 27, 2016
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 28, 2015	Mar. 27, 2016
Pre-amplifier	Sonoma	310N	185903	Mar. 28, 2015	Mar. 27, 2016
Pre-amplifier	HP	8447B	3008A00849	Aug. 29, 2015	Aug. 28, 2016
Cable	HUBER+SUHNER	100	SUCOFLEX	Aug. 07, 2015	Aug. 06, 2016
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Mar. 28, 2015	Mar. 27, 2016
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	103903	Mar. 21, 2015	Mar. 20, 2016
Antenna Conducted Emission					
Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Aug. 29, 2015	Aug. 28, 2016
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Aug. 07, 2015	Aug. 06, 2016
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	103903	Mar. 21, 2015	Mar. 20, 2016

4. Frequency Stability

4.1 Test Standard and Requirement

4.1.1 Test Standard

FCC Part 2.1055

FCC Part 22.355

FCC Part 24.235

4.1.2 Requirement

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

(1) Temperature:

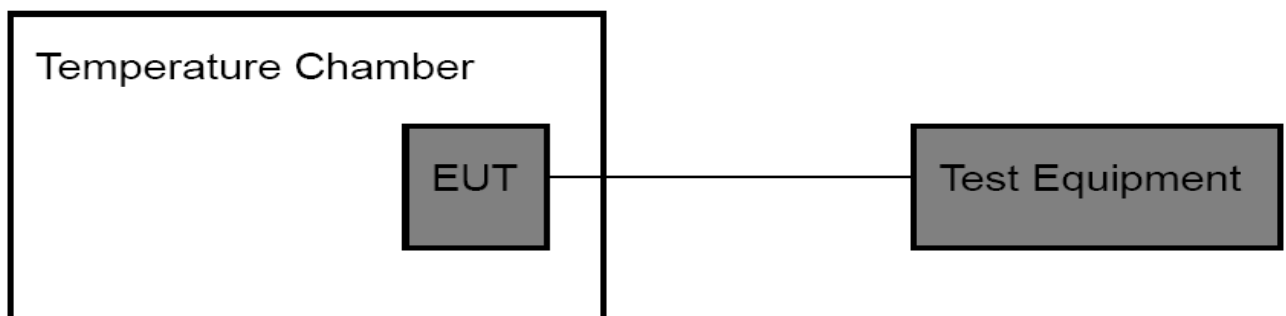
The temperature is varied from -30°C to $+50^{\circ}\text{C}$ at intervals of not more than 10°C .

(2) Primary Supply Voltage:

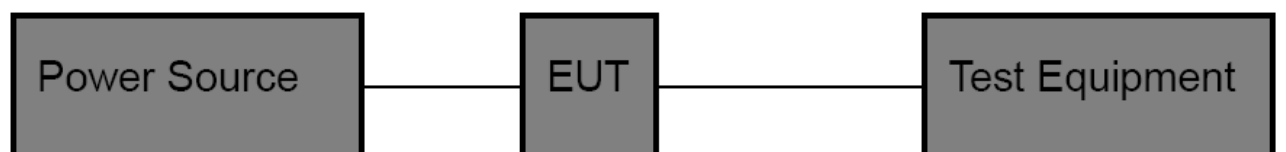
For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided.

4.2 Test Setup

For Temperature Test:



For Voltage Test:



4.3 Test Procedure

Test Procedures for Temperature Variation:

- (1) The EUT was set up in the thermal chamber and connected with the base station.
- (2) With power off, the temperature was decreased to -30°C and the EUT was stabilized for three hours. Power was applied and the maximum change in frequency was recorded within one minute.
- (3) With power off, the temperature was raised in 10°C set up to 50°C and the EUT was stabilized for three hours. Power was applied and the maximum change in frequency was recorded within one minute.
- (4) If the EUT cannot be turned on at -30°C , the testing lowest temperature will be raised in 10°C step until the EUT can be turned on.

Test Procedures for Voltage Variation:

- (1) The EUT was placed in a temperature chamber at $25 \pm 5^{\circ}\text{C}$ and connected with the base station.
- (2) Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.
- (3) The variation in frequency was measured for the worst case.

4.4 EUT Operating Condition

The Equipment Under Test was set to Communication with the Base Station.

3.5 Test Data

Please refer the following pages.

Temperature Variation

Temperature Variation GSM 850 (CH190)				
Temperature (°C)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
-30	21	0.025	18	0.022
-20	19	0.023	19	0.023
-10	22	0.026	17	0.020
0	18	0.022	18	0.022
10	21	0.025	16	0.019
20	20	0.024	15	0.018
30	19	0.023	17	0.020
40	23	0.027	18	0.022
50	24	0.029	16	0.019
60	20	0.024	19	0.023
Limit	2.5 (ppm)			
Result	PASS			

Temperature Variation GSM 1900 (CH661)				
Temperature (°C)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
-30	21	0.032	20	0.030
-20	22	0.033	19	0.029
-10	20	0.030	21	0.032
0	24	0.036	18	0.027
10	23	0.035	19	0.029
20	20	0.030	20	0.030
30	22	0.033	17	0.026
40	21	0.032	19	0.029
50	22	0.033	21	0.032
60	24	0.036	20	0.030
Limit	2.5 (ppm)			
Result	PASS			

Temperature Variation UMTS Band V (CH 4182)		
Temperature (°C)	RMC Mode	
	Freq. Dev. (Hz)	Deviation (ppm)
-30	16	0.019
-20	18	0.022
-10	19	0.023
0	20	0.024
10	19	0.023
20	18	0.022
30	19	0.023
40	17	0.020
50	21	0.025
60	20	0.024
Limit	2.5 (ppm)	
Result	PASS	

Voltage Variation

Voltage Variation GSM 850 (CH190)				
Voltage (V)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
3.15	22	0.026	19	0.023
3.70	20	0.024	17	0.020
4.26	19	0.023	18	0.022
Limit	2.5 (ppm)			
Result	PASS			

Voltage Variation GSM 1900 (CH661)				
Voltage (V)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
3.15	19	0.029	17	0.026
3.70	18	0.027	16	0.024
4.26	21	0.032	19	0.029
Limit	2.5 (ppm)			
Result	PASS			

Voltage Variation UMTS Band V (CH 4182)		
Voltage (V)	RMC Mode	
	Freq. Dev. (Hz)	Deviation (ppm)
3.15	20	0.024
3.70	19	0.023
4.26	21	0.025
Limit	2.5 (ppm)	
Result	PASS	

5. Conducted RF Output Power

5.1 Test Standard and Limit

5.1.1 Test Standard

FCC Part 2: 2.1046

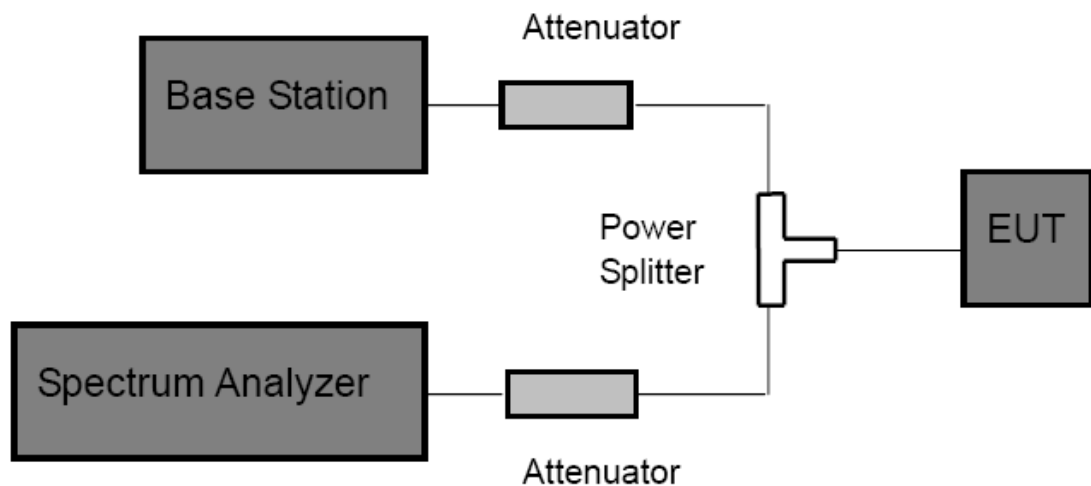
FCC Part 22H : 22.913 (a)

FCC Part 24E: 24.232 (c)

5.1.2 Test Limit

GSM850/UMTS Band V	PCS 1900/UMTS Band II
38.5 dBm (ERP)	33 dBm (EIRP)

5.2 Test Setup



5.3 Test Procedure

- (1) The EUT is coupled to the Spectrum Analyzer and the Base Station with the suitable Attenuators through the Power Splitter, the path loss is calibrated to correct the reading.
- (2) A call is set up by the Base Station to the generic call set up procedure.
- (3) Set EUT at maximum power level through base station by power level command.
- (4) Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak and mark it; finally record the peak and the plot.

5.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

5.5 EUT Operating Condition

GSM 850				
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)
GSM 850	128	824.2	32.90	1.950
	190	836.6	32.97	1.982
	251	848.8	32.94	1.968
GPRS 850 (1 Slot)	128	824.2	33.80	2.399
	190	836.6	33.86	2.432
	251	848.8	33.83	2.415
GPRS 850 (2 Slot)	128	824.2	33.80	2.399
	190	836.6	33.85	2.427
	251	848.8	33.82	2.410
GPRS 850 (3 Slot)	128	824.2	33.82	2.410
	190	836.6	33.85	2.427
	251	848.8	33.83	2.415
GPRS 850 (4 Slot)	128	824.2	33.82	2.410
	190	836.6	33.82	2.410
	251	848.8	33.82	2.410

PCS 1900				
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)
GSM 1900	512	1850.2	30.30	1.072
	661	1880.0	30.24	1.057
	810	1909.8	30.11	1.026
GPRS 1900 (1 Slot)	512	1850.2	30.49	1.119
	661	1880.0	30.38	1.091
	810	1909.8	30.25	1.059
GPRS 1900 (2 Slot)	512	1850.2	30.48	1.117
	661	1880.0	30.48	1.117
	810	1909.8	30.26	1.062
GPRS 1900 (3 Slot)	512	1850.2	30.45	1.109
	661	1880.0	30.35	1.084
	810	1909.8	30.25	1.059
GPRS 1900 (4 Slot)	512	1850.2	30.48	1.117
	661	1880.0	30.38	1.091
	810	1909.8	30.26	1.062

UMTS Band V				
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)
Band V RMC	4132	826.4	22.35	0.1718
	4175	835.0	21.85	0.1531
	4233	846.6	22.25	0.1679
HSDPA Subtest 1	4132	826.4	22.84	0.1923
	4175	835.0	22.92	0.1959
	4233	846.6	22.78	0.1897
HSDPA Subtest 2	4132	826.4	22.88	0.1941
	4175	835.0	22.40	0.1738
	4233	846.6	22.76	0.1888
HSDPA Subtest 3	4132	826.4	22.95	0.1972
	4175	835.0	22.86	0.1932
	4233	846.6	22.51	0.1782
HSDPA Subtest 4	4132	826.4	22.95	0.1972
	4175	835.0	22.32	0.1706
	4233	846.6	22.00	0.1585
HSUPA Subtest 1	4132	826.4	22.96	0.1977
	4175	835.0	22.56	0.1803
	4233	846.6	22.47	0.1766
HSUPA Subtest 2	4132	826.4	22.58	0.1811
	4175	835.0	22.65	0.1841
	4233	846.6	22.38	0.1730
HSUPA Subtest 3	4132	826.4	22.48	0.1770
	4175	835.0	22.58	0.1811
	4233	846.6	22.47	0.1766
HSUPA Subtest 4	4132	826.4	22.68	0.1854
	4175	835.0	22.84	0.1923
	4233	846.6	22.34	0.1714
HSUPA Subtest 5	4132	826.4	22.67	0.1849
	4175	835.0	22.54	0.1795
	4233	846.6	22.38	0.1730

6. Peak-Average Ratio

6.1 Test Standard and Limit

6.1.1 Test Standard

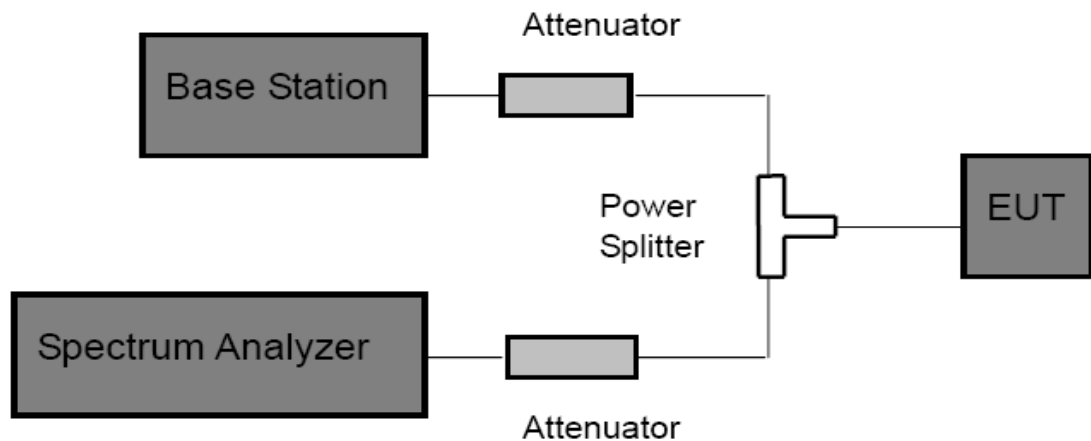
FCC Part 24E: 24.232 (d)

6.1.2 Test Limit

PCS 1900

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

6.2 Test Setup



6.3 Test Procedure

According with KDB 971168

- (1) The signal analyzer's CCDF measurement profile is enabled.
- (2) Frequency = carrier center frequency.
- (3) Measurement BW > Emission bandwidth of signal.
- (4) The signal analyzer was set to collect one million samples to generate the CCDF curve.
- (5) The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which of the transmitter is operating at maximum power.

6.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

6.5 Test Data

PCS 1900					
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)		Peak-Average Ratio (PAR)
			Peak	Average	
PCS 1900	512	1850.2	32.19	30.28	1.91
	661	1880.0	32.12	31.01	1.11
	810	1909.8	32.33	30.24	2.09
Limit	13 dB				
Result	PASS				

7. Radiated Output Power

7.1 Test Standard and Limit

7.1.1 Test Standard

FCC Part 22H : 22.913 (a)

FCC Part 24E: 24.232 (c)

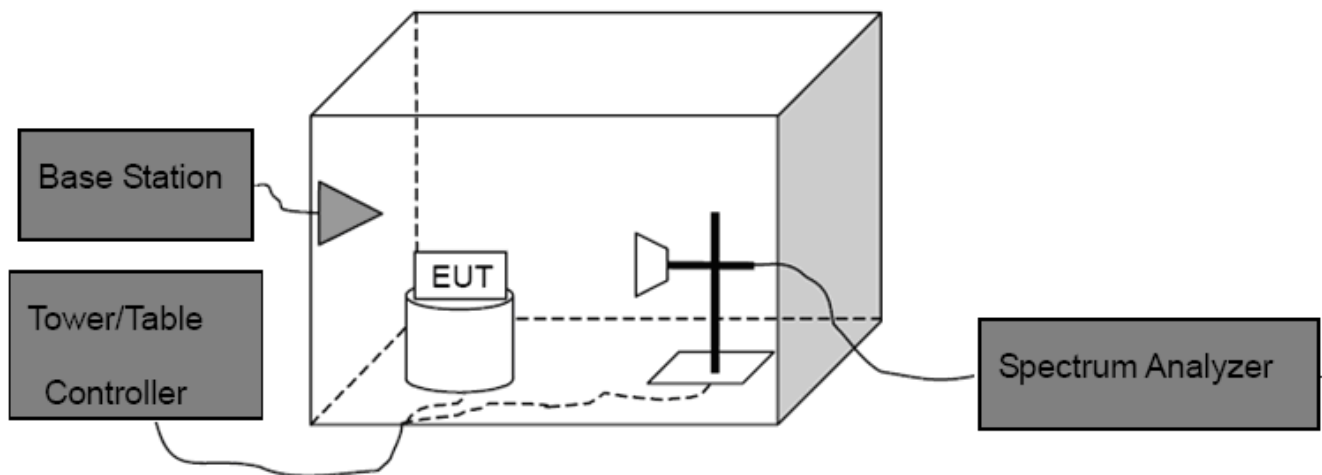
7.1.2 Test Limit

According to FCC Part 22.913 (a), the ERP of Cellular mobile transmitters must not exceed 7 Watts(38.5 dBm).

According to FCC Part 24.232 (c), the Mobile/portable stations are limited to 2 Watts(33 dBm) EIRP peak power.

Cellular Band		PCS Band
GSM850	UMTS Band V	PCS 1900
38.5 dBm (ERP)		33 dBm (EIRP)

7.2 Test Setup



7.3 Test Procedure

- (1) The EUT was placed on an non-conductive rotating platform with 0.8 meter height in an anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RBW=3 MHz, VBW=3 MHz and peak detector settings.
- (2) During the measurement, the EUT was enforced in maximum power and linked with the Base

Station. The highest was recorded from analyzer power level (LVT) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.

- (3) Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-D. The EUT was replaced by dipole antenna (for frequency below 1 GHz) or Horn antenna (for frequency above 1 GHz) at same location with same polarize of receiver antenna and then a known power of each measure frequency from S.G. was applied into the dipole antenna or Horn antenna through a TX cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna.

Then the EUT's EIRP and ERP was calculated with the correction factor:

$ERP = S.G. Level + Antenna Gain Cord.(dBd) - Cable Loss(dB)$

$EIRP = S.G. Level + Antenna Gain Cord.(dBi) - Cable Loss(dB)$

7.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

7.5 Test Data

Measurement Data (worst case)

GSM 850					
Mode	Channel	Frequency (MHz)	Antenna (H&V)	ERP Power (dBm)	ERP Power (W)
GSM 850	128	824.2	H	31.58	1.439
			V	31.52	1.419
	190	836.6	H	32.14	1.637
			V	31.89	1.545
	251	848.8	H	31.85	1.531
			V	32.03	1.596
GPRS 850 (1 Slot)	128	824.2	H	32.12	1.629
			V	31.38	1.374
	190	836.6	H	32.41	1.742
			V	31.58	1.439
	251	848.8	H	31.89	1.545
			V	32.33	1.710
Limit				38.5	7

PCS 1900					
Mode	Channel	Frequency (MHz)	Antenna (H&V)	EIRP Power (dBm)	EIRP Power (W)
GSM 1900	512	1850.2	H	30.25	1.059
			V	30.95	1.245
	661	1880.0	H	31.24	1.330
			V	30.88	1.225
	810	1909.8	H	31.21	1.321
			V	30.98	1.253
GPRS 1900 (1 Slot)	512	1850.2	H	31.54	1.426
			V	31.38	1.374
	661	1880.0	H	31.65	1.462
			V	30.94	1.242
	810	1909.8	H	31.05	1.274
			V	31.57	1.435
Limit				33	2

UMTS Band V					
Mode	Channel	Frequency (MHz)	Antenna (H&V)	ERP Power (dBm)	ERP Power (W)
Band V RMC	4132	826.4	H	18.36	0.069
			V	19.68	0.093
	4175	835.0	H	19.86	0.097
			V	20.14	0.103
	4233	846.6	H	19.68	0.093
			V	18.99	0.079
Limit				38.5	7

8. Occupied Bandwidth

8.1 Test Standard and Limit

8.1.1 Test Standard

FCC Part 2: 2.1049

FCC Part 22H : 22.913 (a)

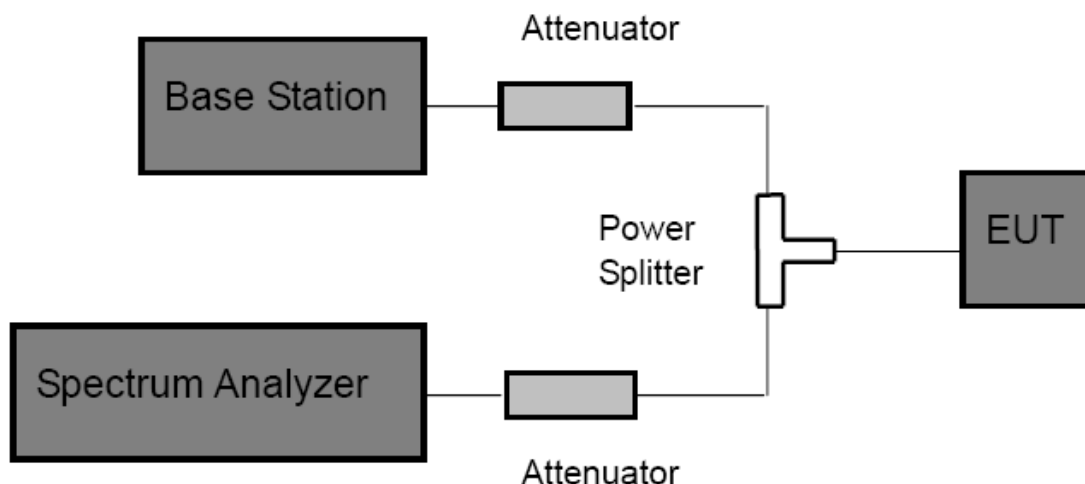
FCC Part 24E: 24.232 (c)

8.1.2 Test Requirement

According to FCC section 2.1049, 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 radiated by a given emission.

Occupied bandwidth is also known as 99% power and -26dBC occupied bandwidths.

8.2 Test Setup



8.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and Base station via power splitter as show in the block diagram above.
- (2) The resolution bandwidth of the Spectrum Analyzer is set to at least 1% of the occupied bandwidth.
- (3) The low, middle and the high channels are selected to perform tests respectively.
- (4) Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak; make a line whose value is 26dB lower than the peak; mark two points which the line intersected the waveform at; finally record the delta of the two points as the occupied bandwidth and the plot.
- (5) Set the Spectrum Analyzer Occupied bandwidth function to measure the 99% occupied bandwidth.

8.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

8.5 Test Data

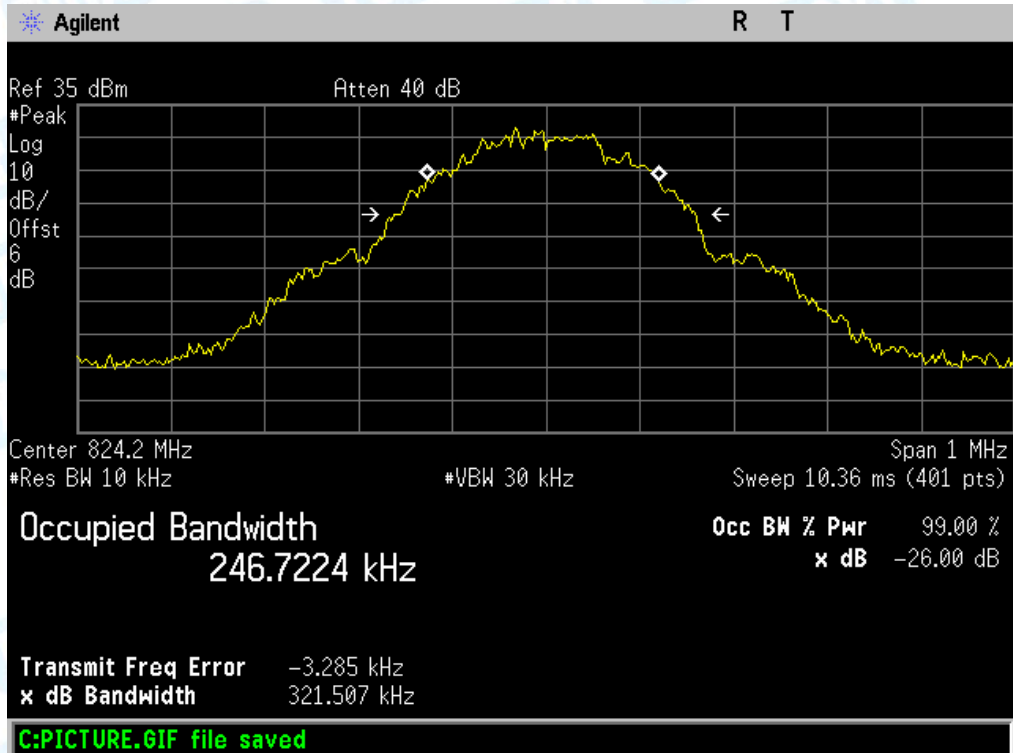
Please refer following pages.

GSM 850				
Mode	Channel	Frequency (MHz)	99% OBW (KHz)	-26dB Bandwidth (kHz)
GSM 850	128	824.2	246.7224	321.507
	190	836.6	248.2484	316.796
	251	848.8	252.5626	323.192
GPRS 850 (1 Slot)	128	824.2	251.9500	322.492
	190	836.6	249.1553	324.791
	251	848.8	247.7757	321.480
PCS 1900				
Mode	Channel	Frequency (MHz)	99% OBW (KHz)	-26dB Bandwidth (kHz)
GSM 1900	512	1850.2	248.5190	321.750
	661	1880.0	247.0900	320.300
	810	1909.8	245.5786	318.147
GPRS 1900 (1 Slot)	512	1850.2	243.3741	320.511
	661	1880.0	244.5505	318.354
	810	1909.8	245.3328	319.723

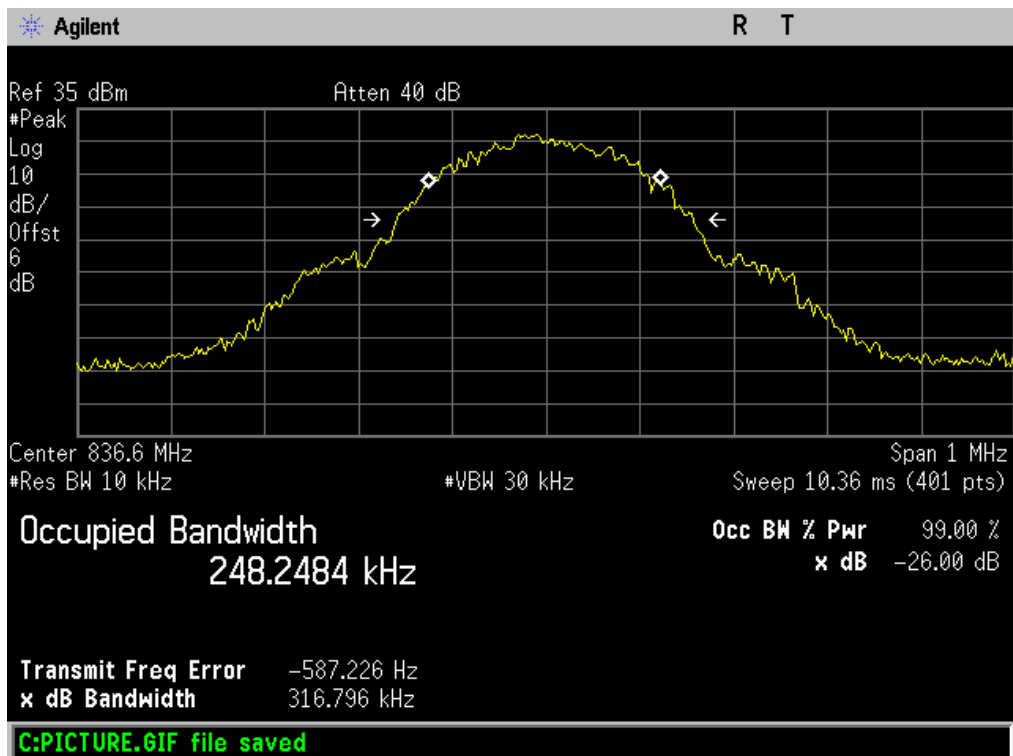
UMTS Band V				
Mode	Channel	Frequency (MHz)	99% OBW (MHz)	-26dB Bandwidth (MHz)
Band V RMC	4132	826.4	4.1544	4.694
	4175	835.0	4.1578	4.713
	4233	846.6	4.1484	4.736
Band V HSDPA	4132	826.4	4.1517	4.715
	4175	835.0	4.1565	4.714
	4233	846.6	4.1431	4.699
Band V HSUPA	4132	826.4	4.1505	4.711
	4175	835.0	4.1589	4.708
	4233	846.6	4.1597	4.726

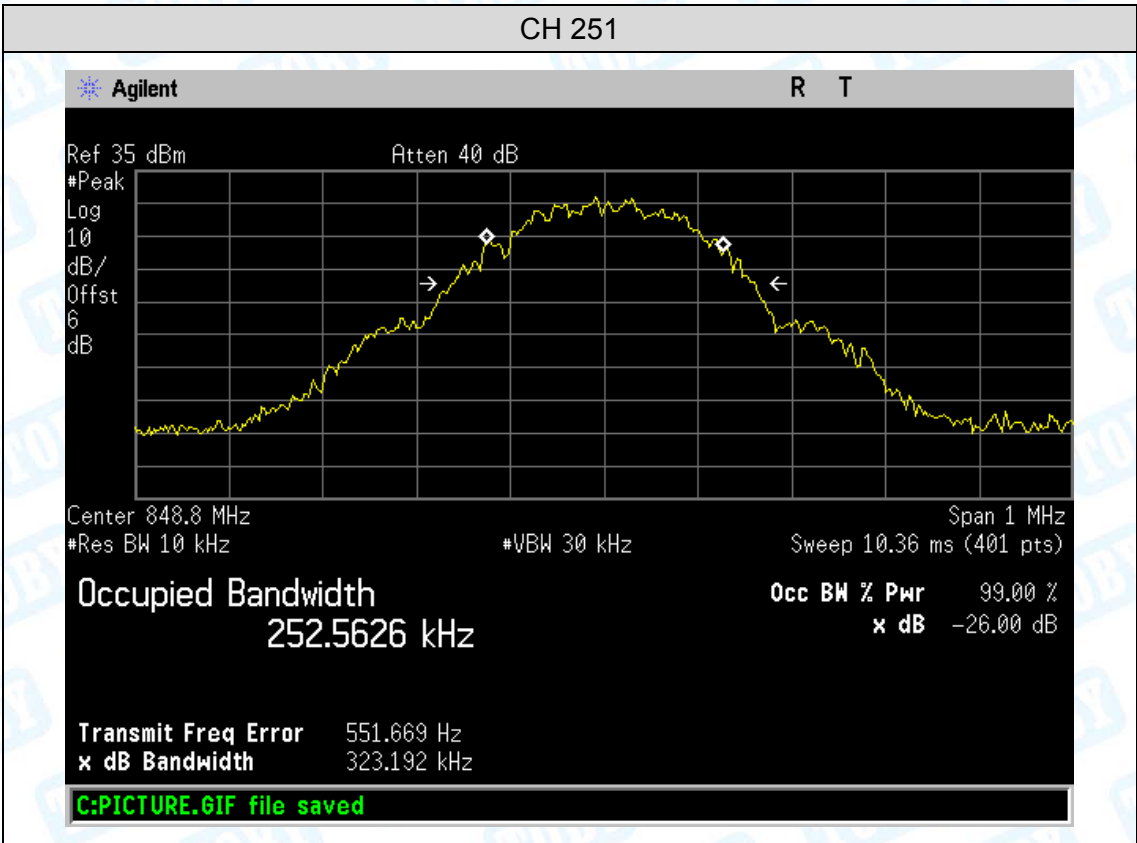
GSM850

CH 128



CH 190



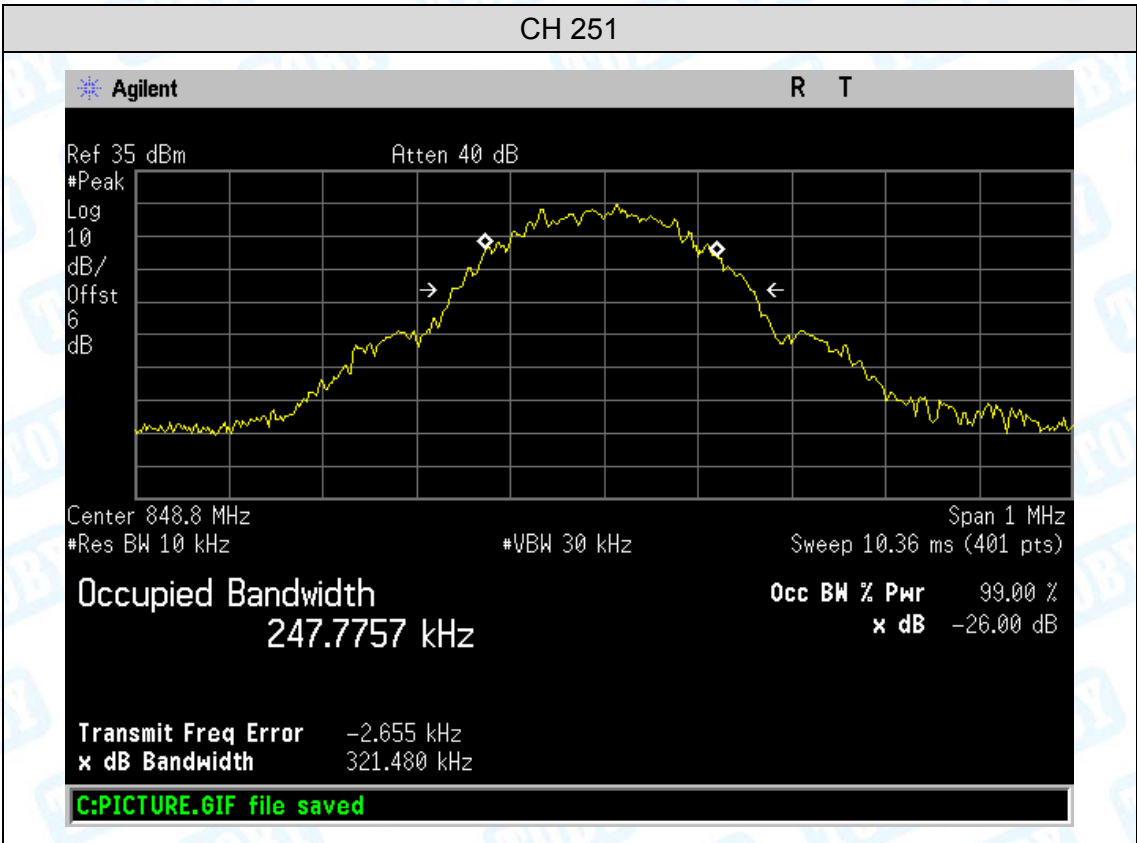


CH 128



CH 190





Occupied Bandwidth

247.7757 kHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

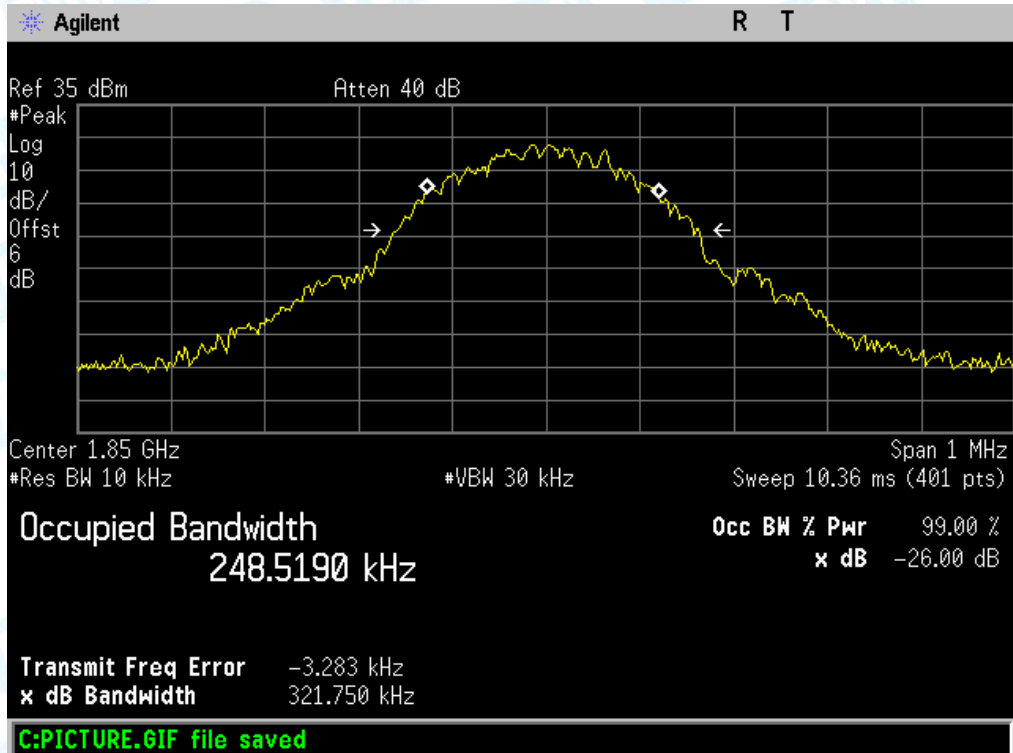
Transmit Freq Error -2.655 kHz

x dB Bandwidth 321.480 kHz

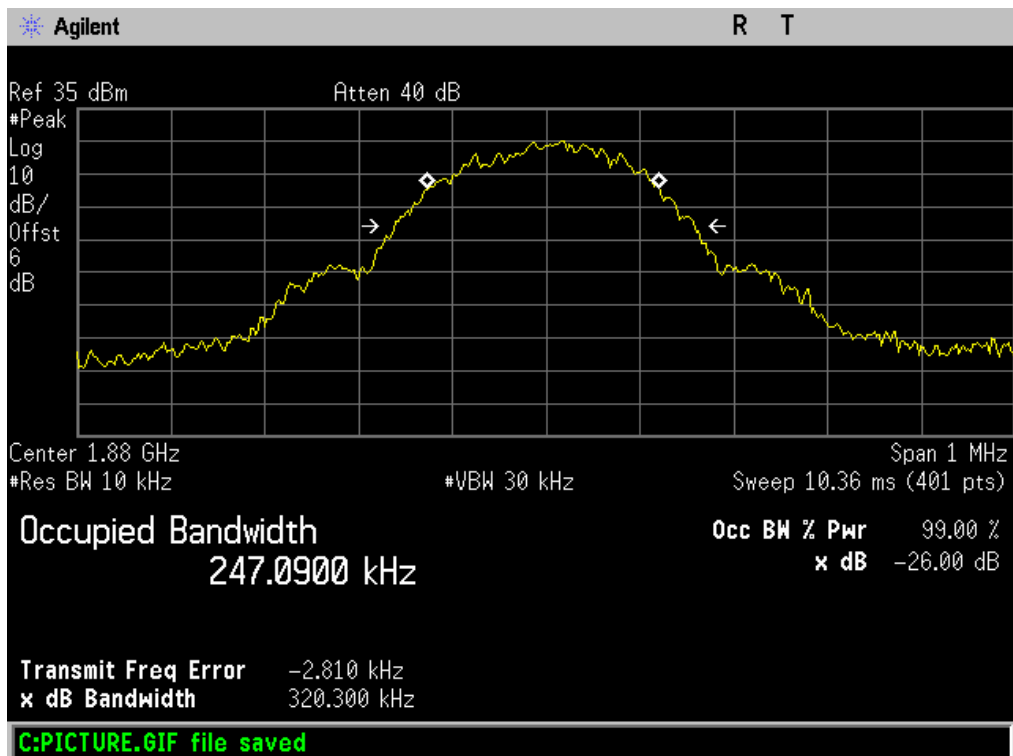
C:PICTURE.GIF file saved

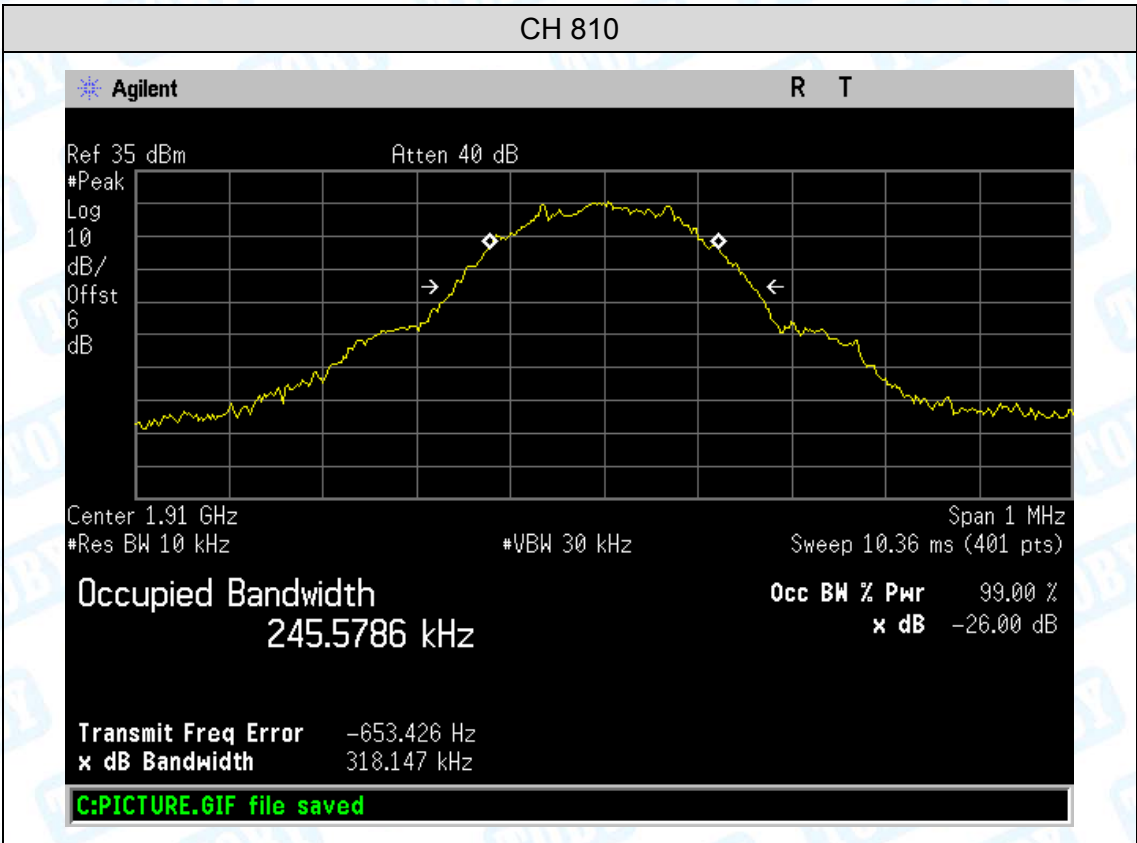
PCS 1900

CH 512



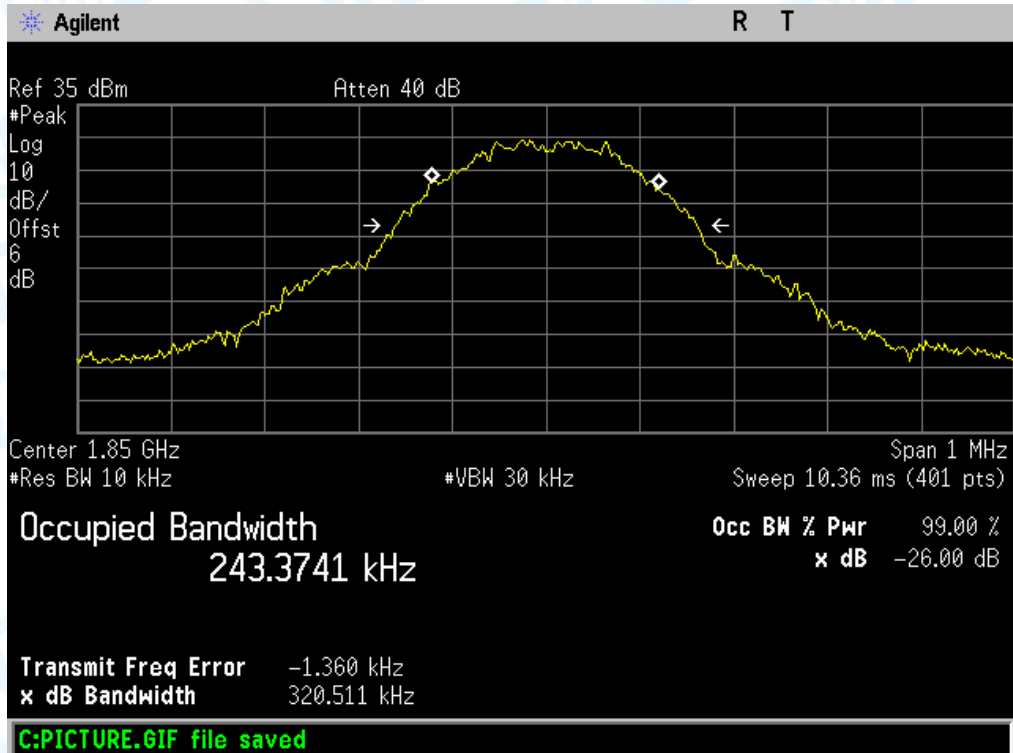
CH 661



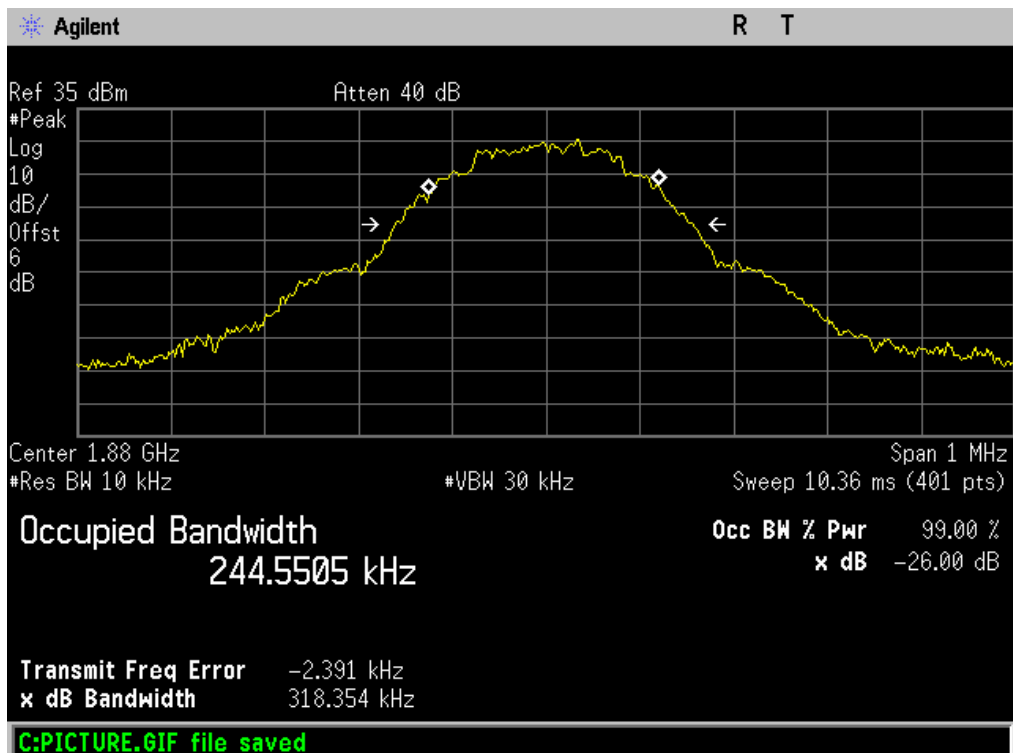


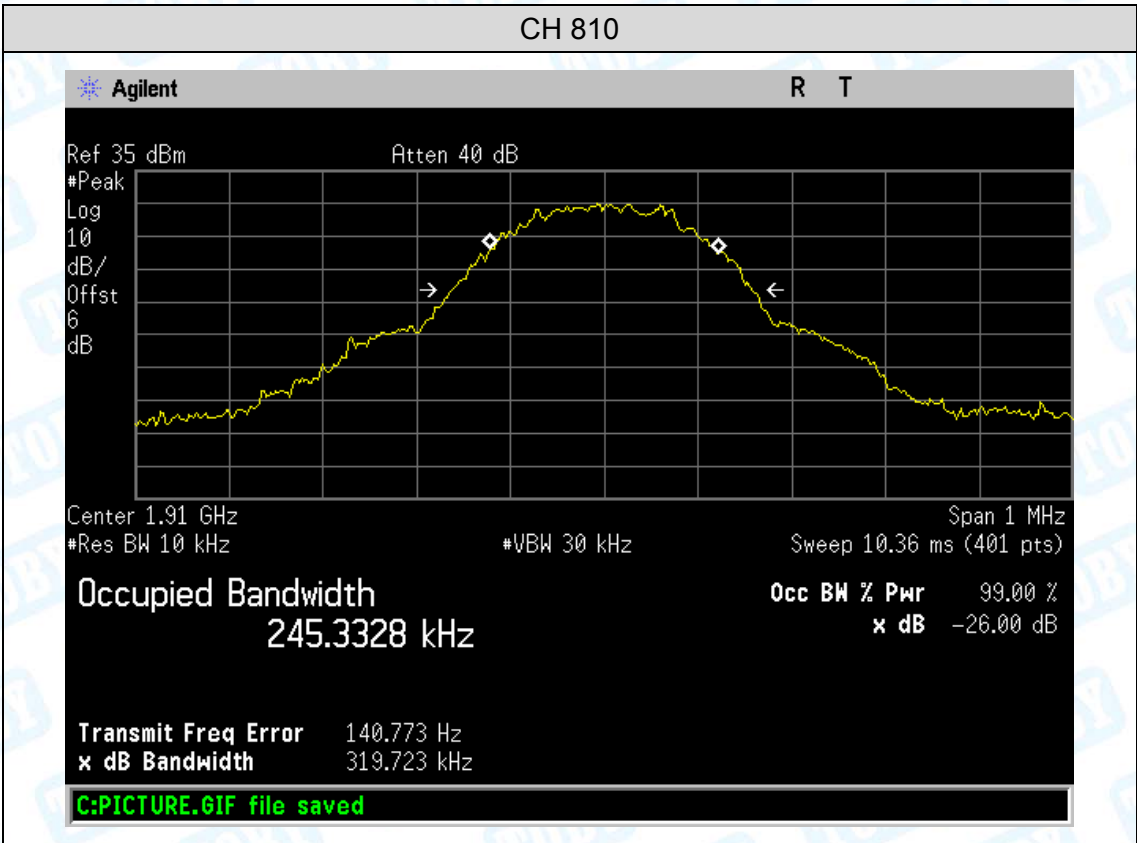
GPRS 1900

CH 512



CH 661





Occupied Bandwidth

245.3328 kHz

Occ BW % Pwr

99.00 %

x dB

-26.00 dB

Transmit Freq Error

140.773 Hz

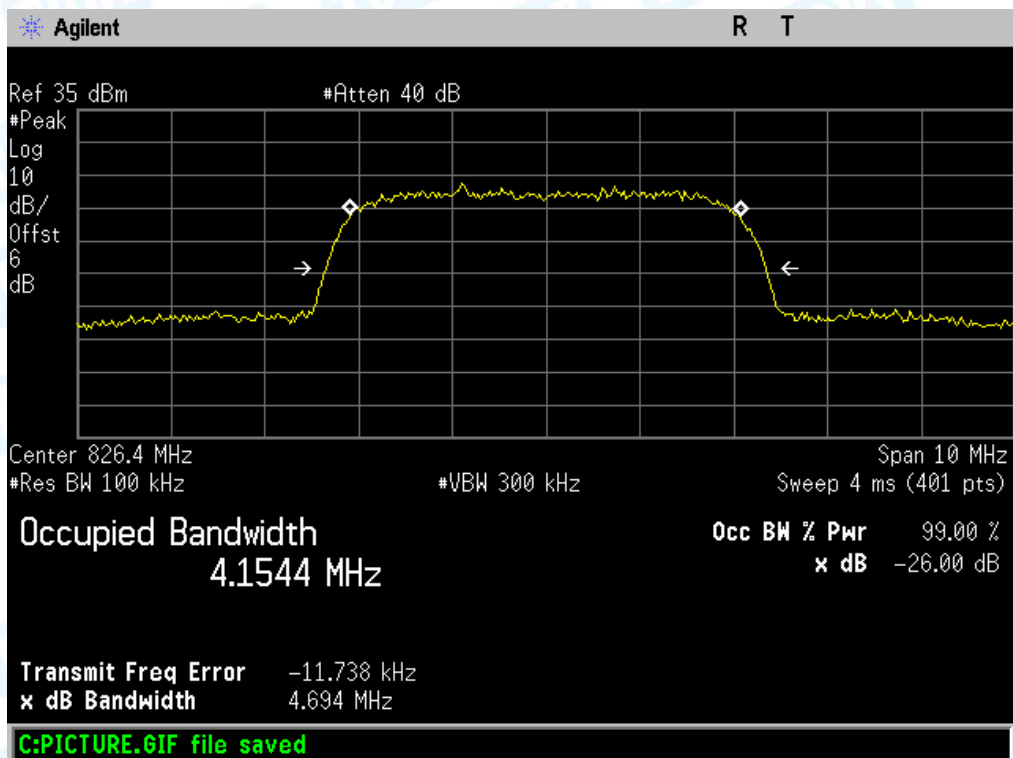
x dB Bandwidth

319.723 kHz

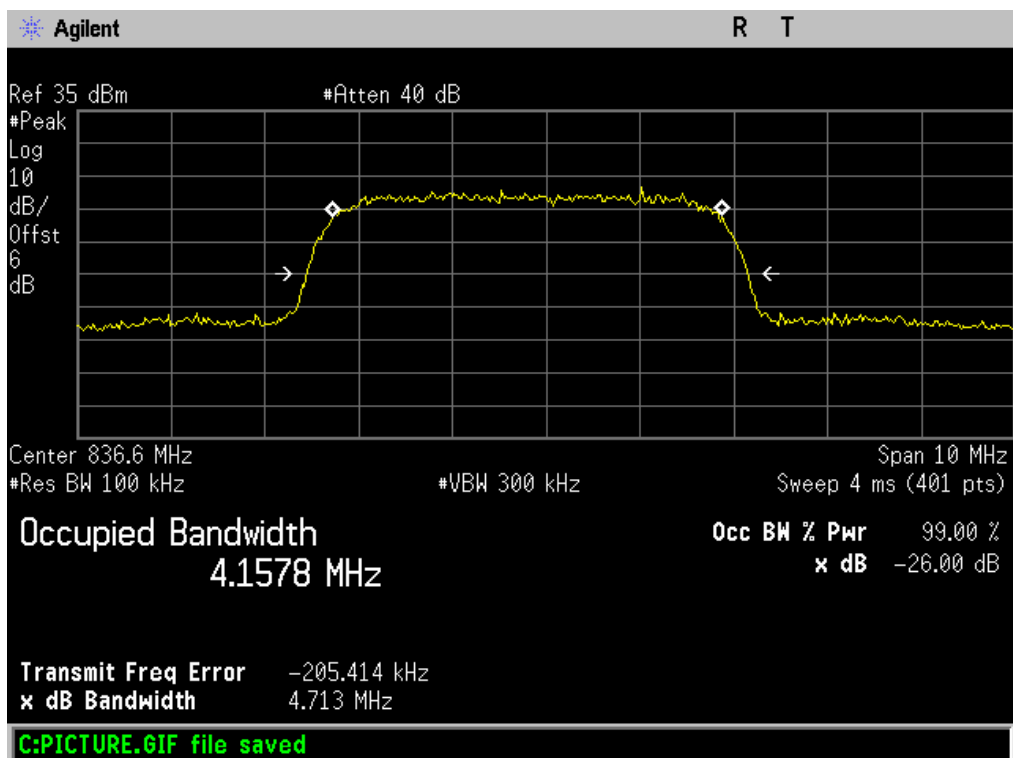
C:PICTURE.GIF file saved

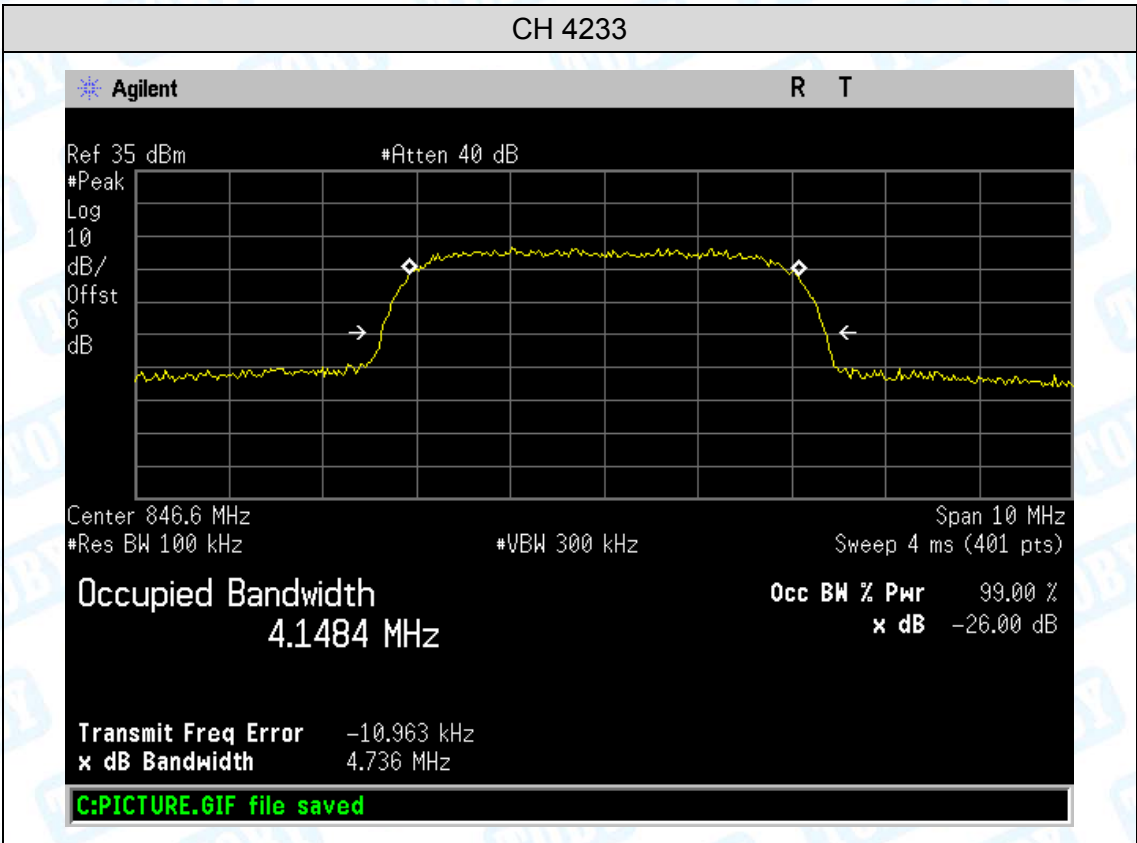
UMTS Band V (RMC)

CH 4132



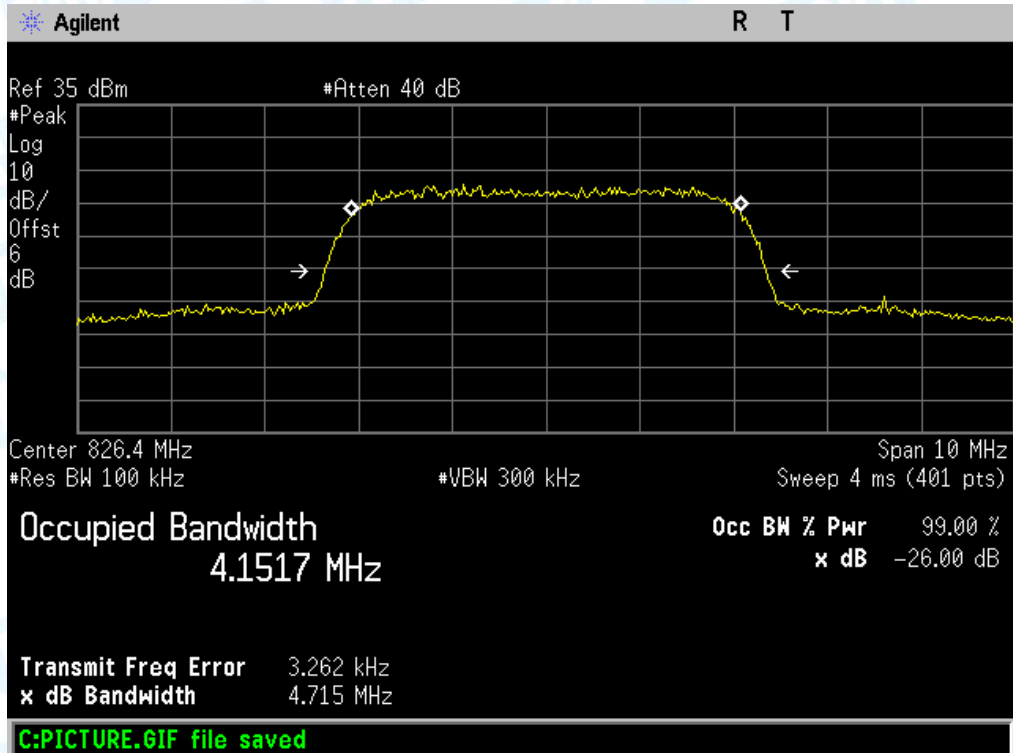
CH 4175



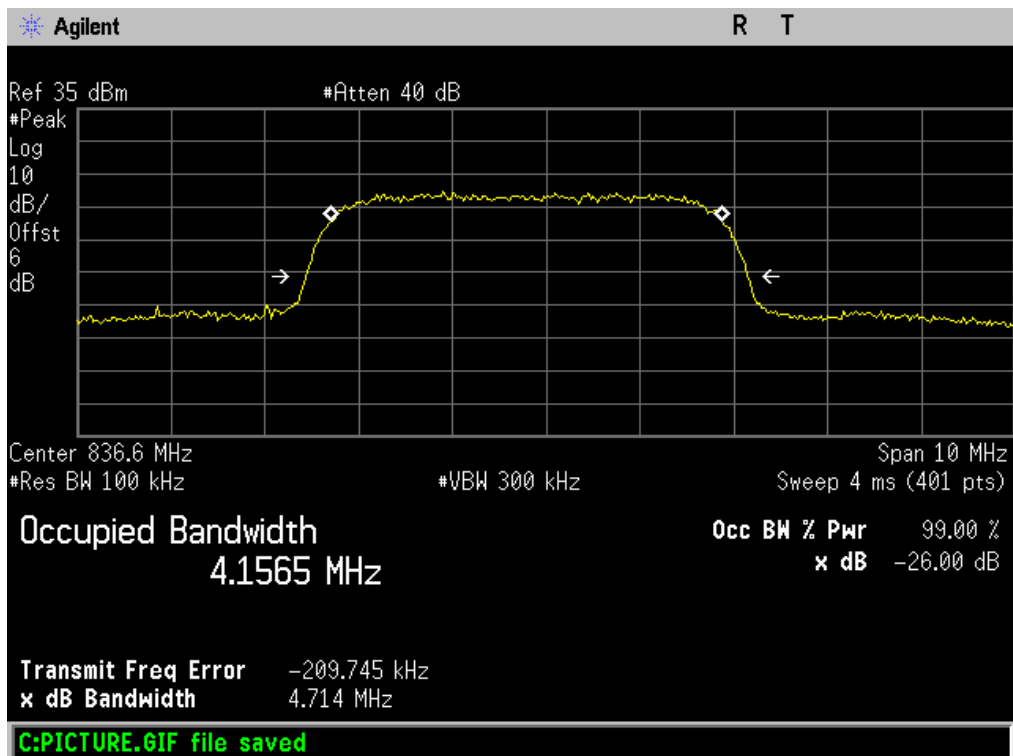


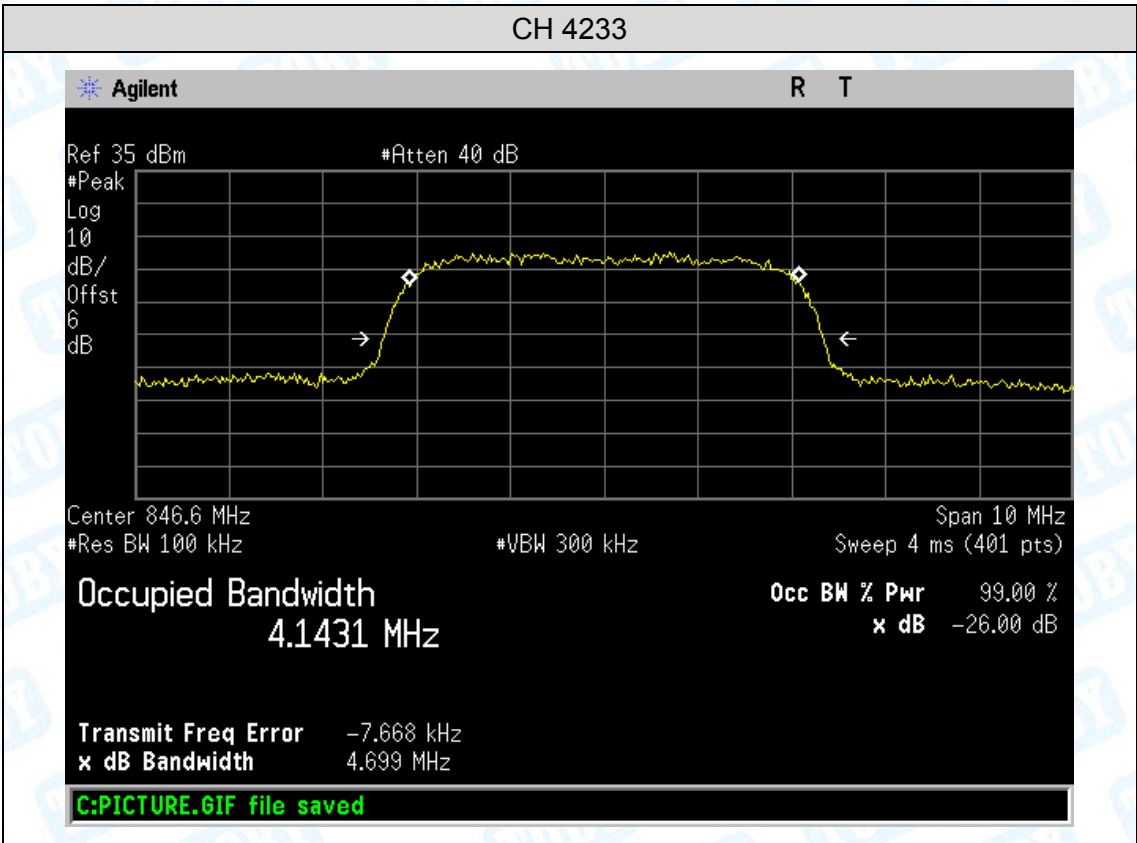
UMTS Band V (HSDPA)

CH 4132



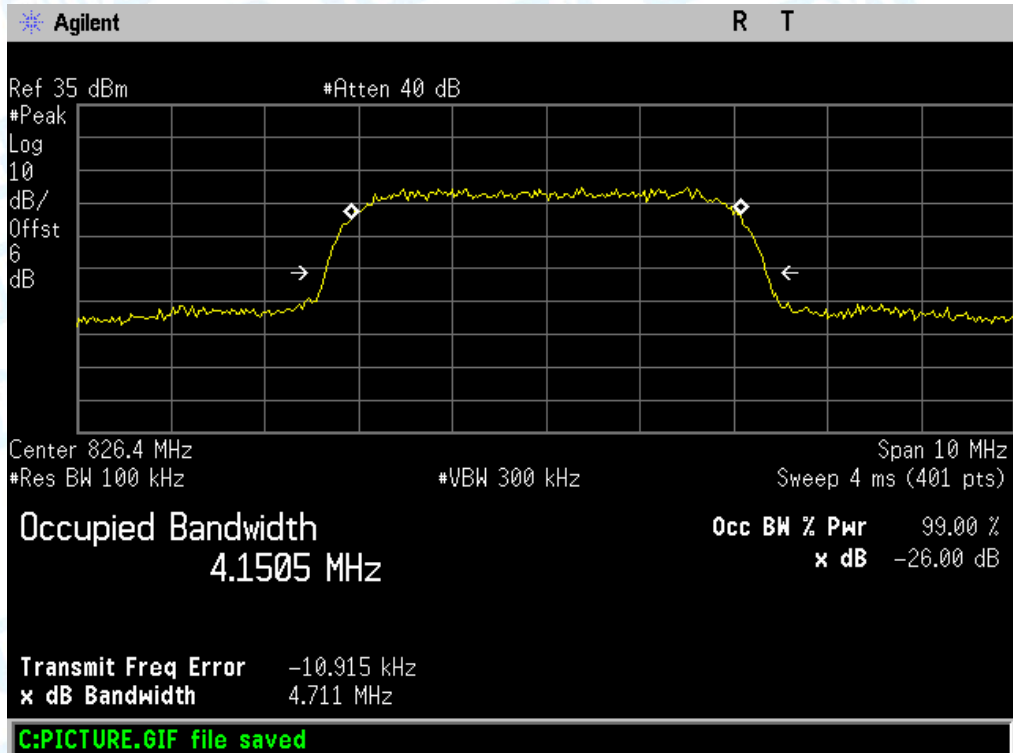
CH 4175



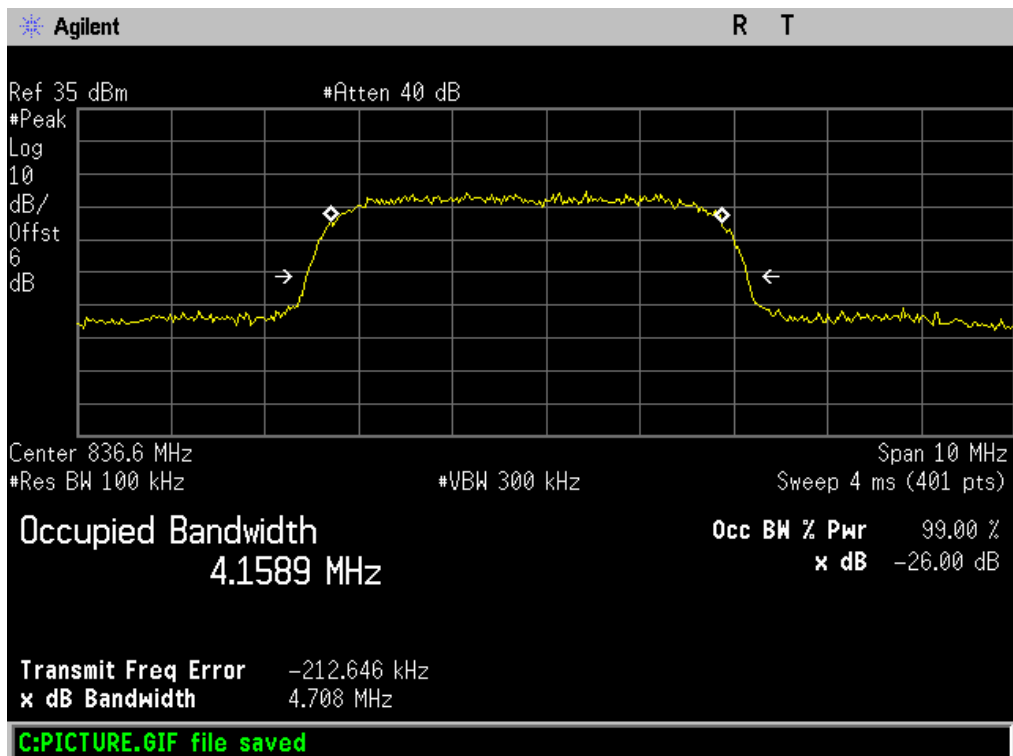


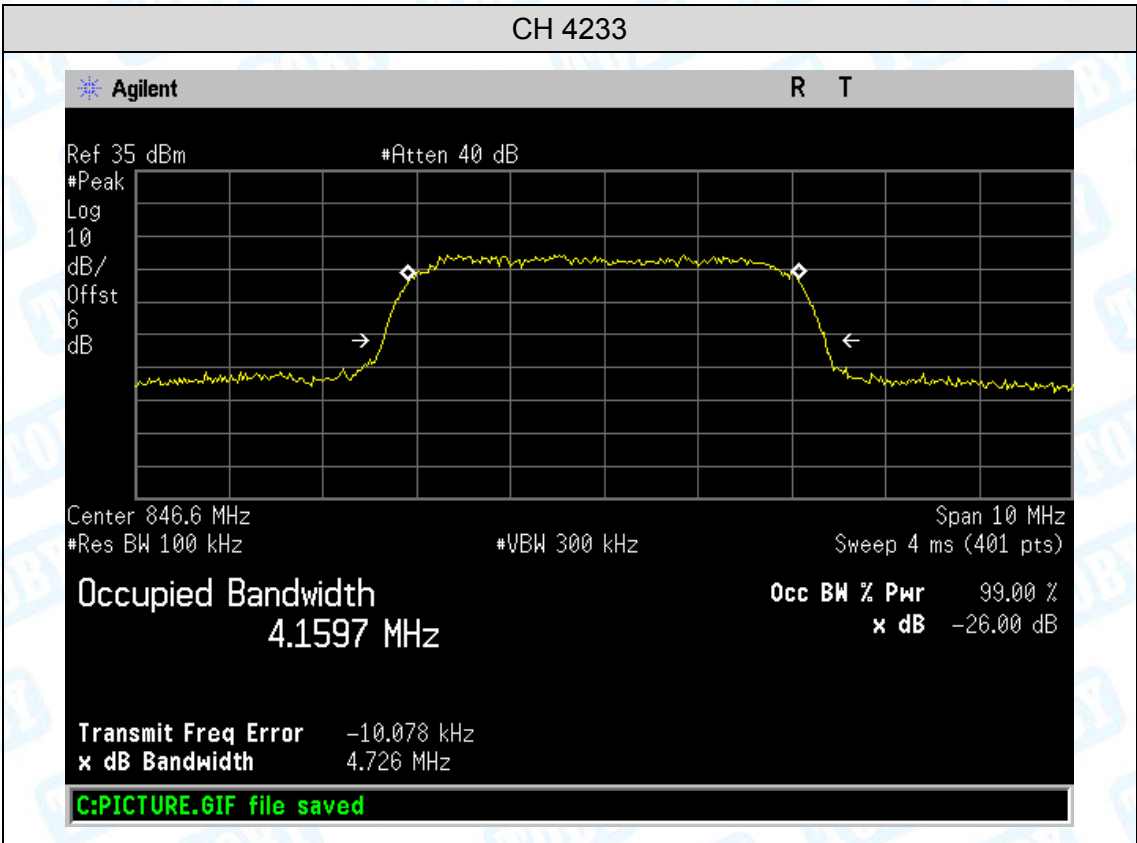
UMTS Band V (HSUPA)

CH 4132



CH 4175





9. Conducted Out of Band Emissions

9.1 Test Standard and Limit

9.1.1 Test Standard

FCC Part 2: 2.1051, 2.1057

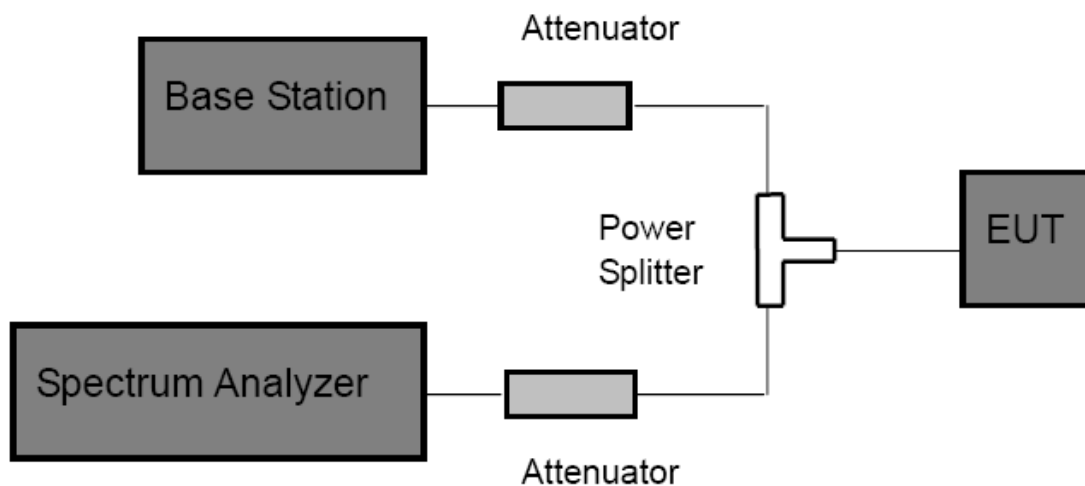
FCC Part 22H: 22.917(a)

FCC Part 24E: 24.238(a)

9.1.2 Test 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. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

9.2 Test Setup



9.3 Test Procedure

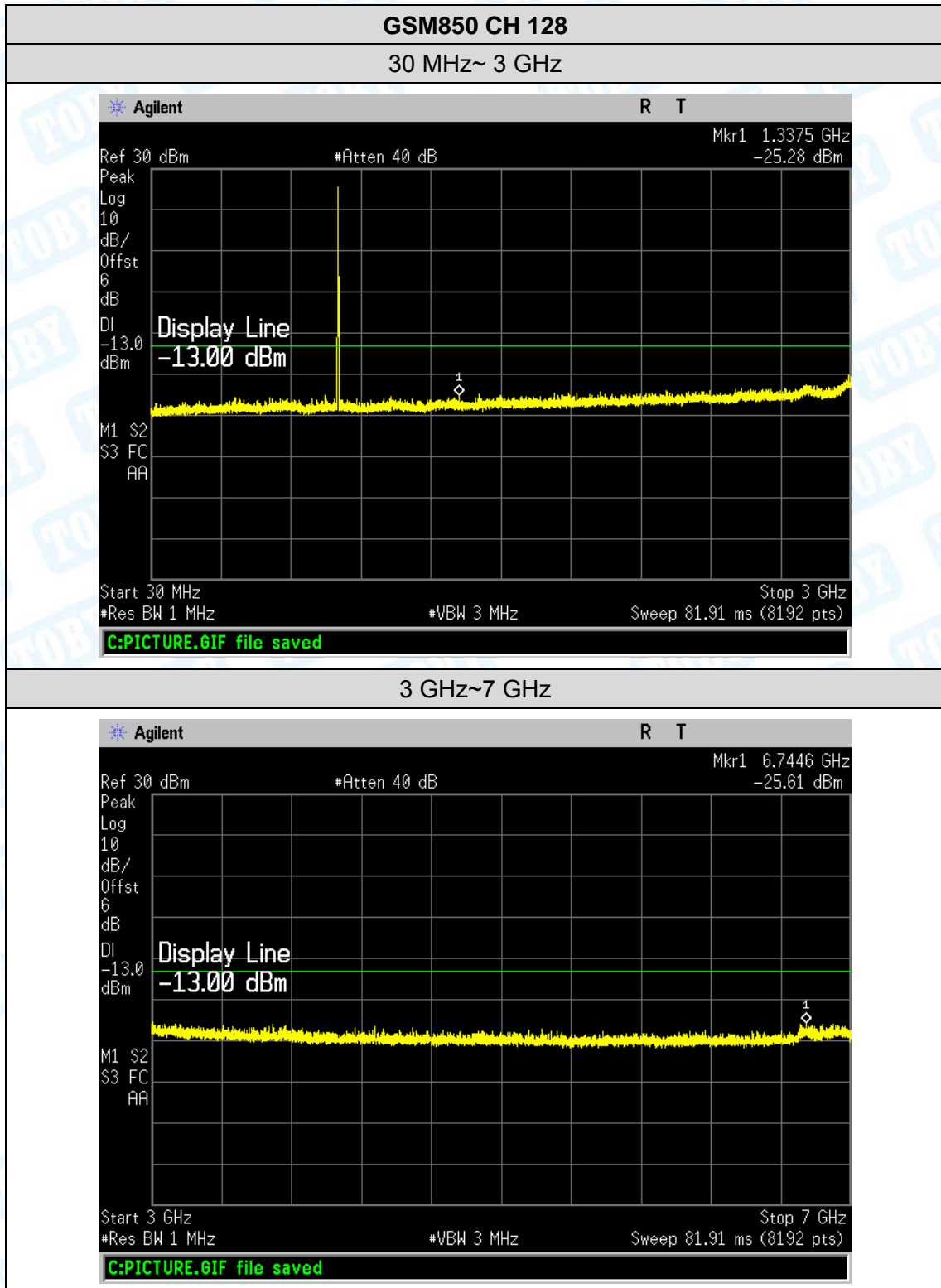
- (1) The EUT was directly connected to the spectrum analyzer and Base station via power splitter as show in the block diagram above.
- (2) Spectrum Setting:
Frequency bellow 1 GHz: RBW=100 kHz, VBW=300 kHz.
Frequency above 1 GHz: RBW=1 MHz, VBW=3 MHz.
- (3) The low, middle and high channels of each band and mode's spurious emissions for 30 MHz to 10th Harmonic were measured by Spectrum analyzer.

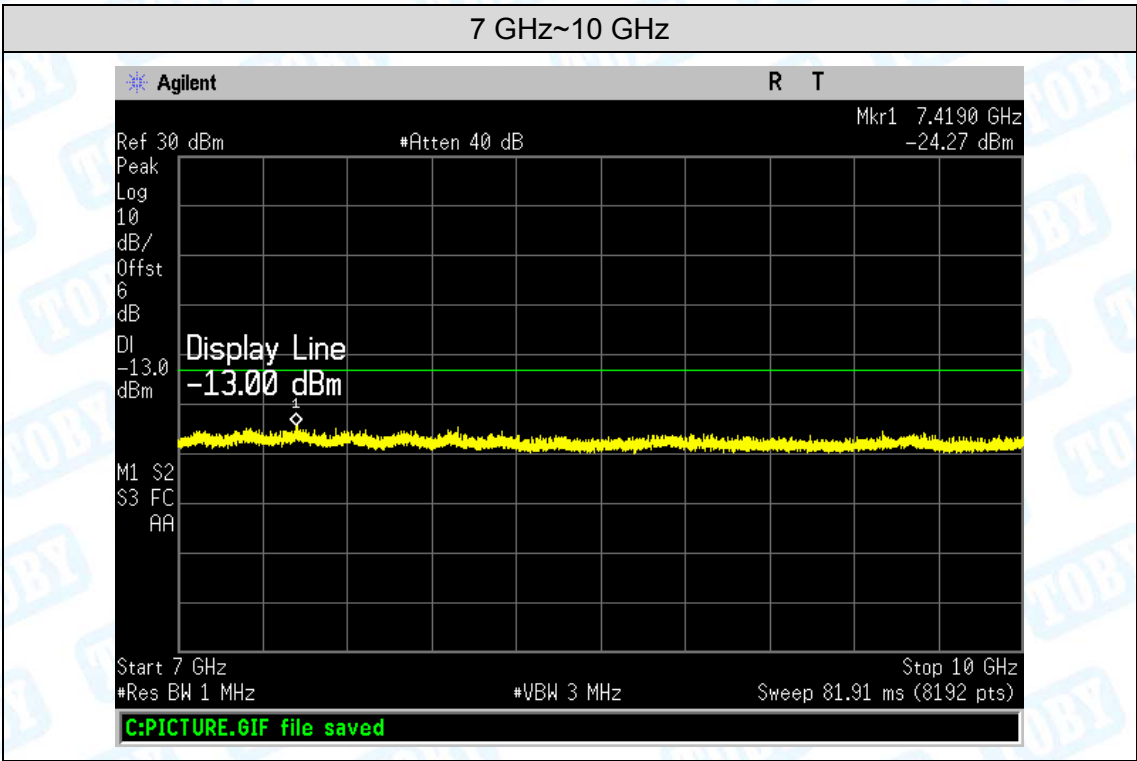
9.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

9.5 Test Data

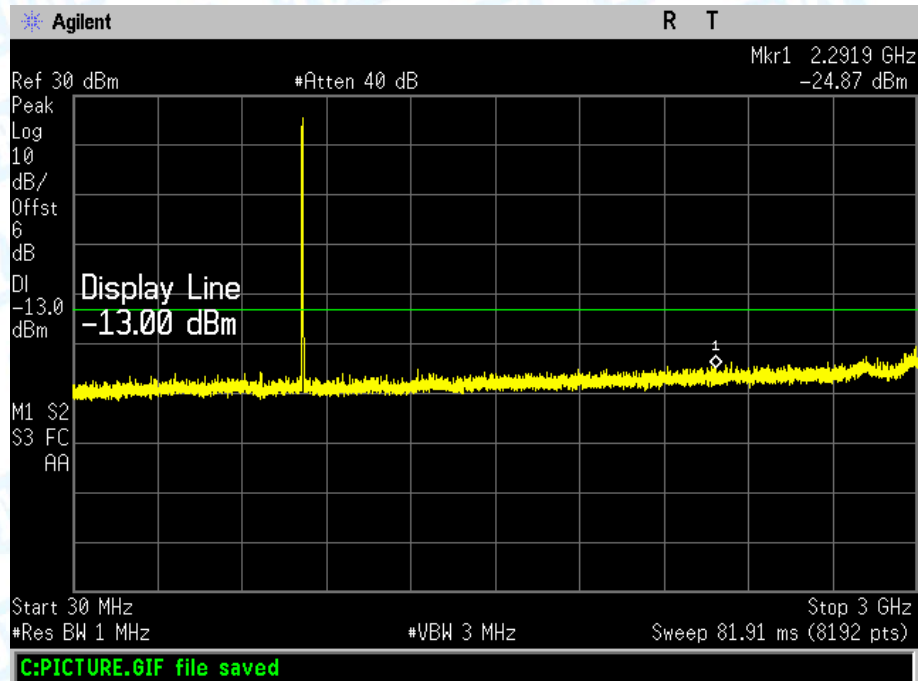
Please refer following plots:



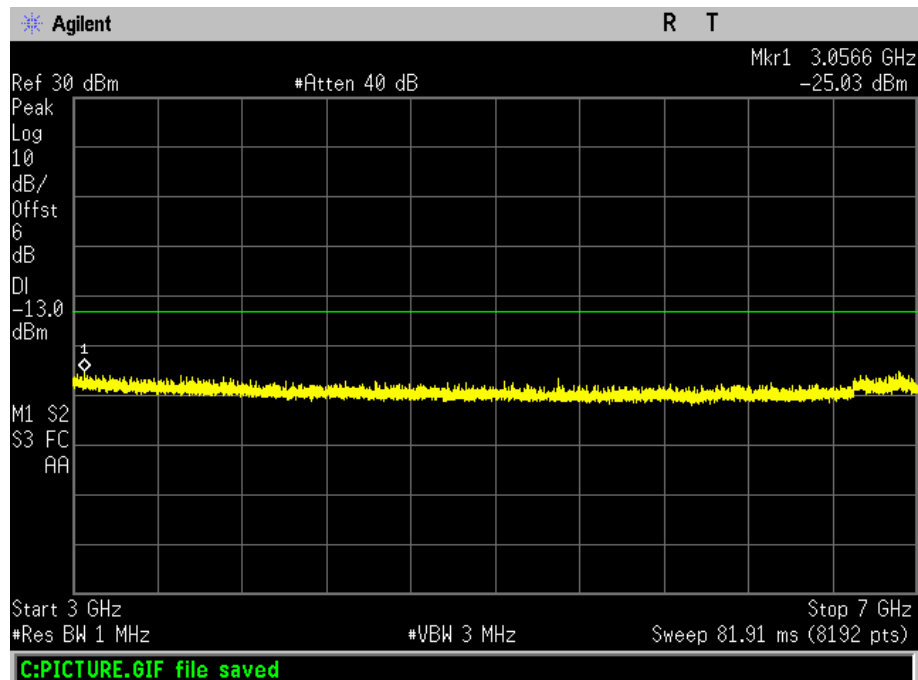


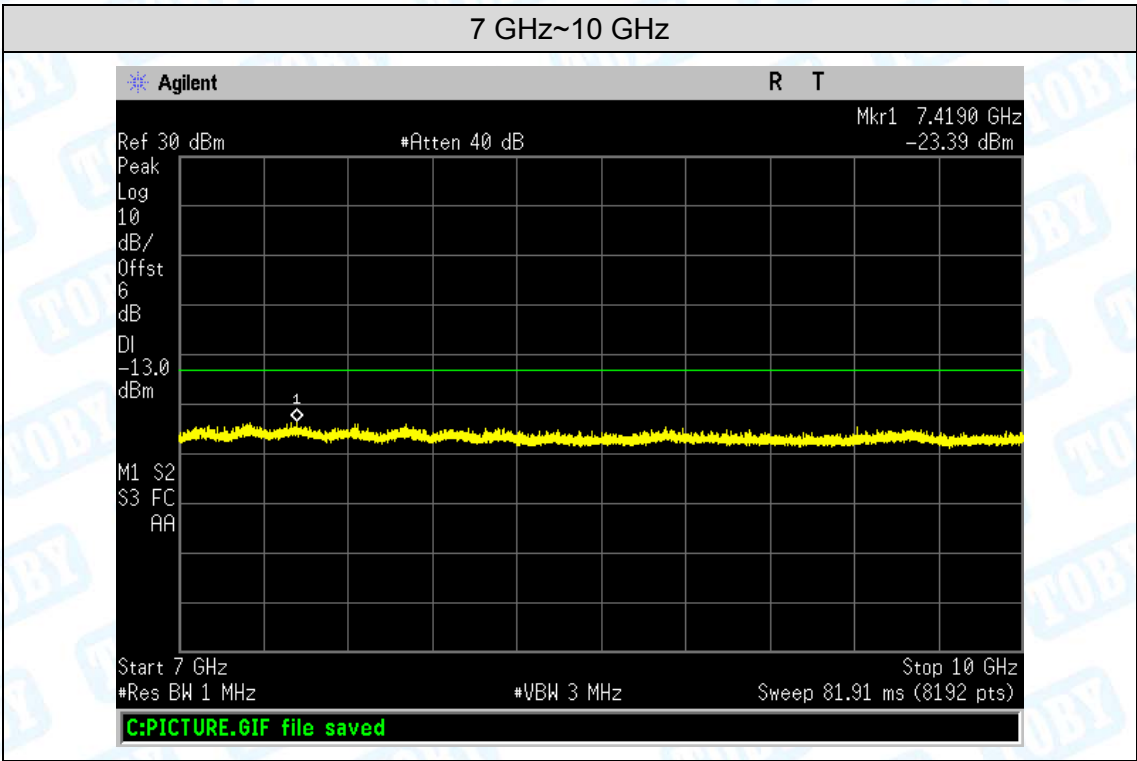
GSM850 CH 190

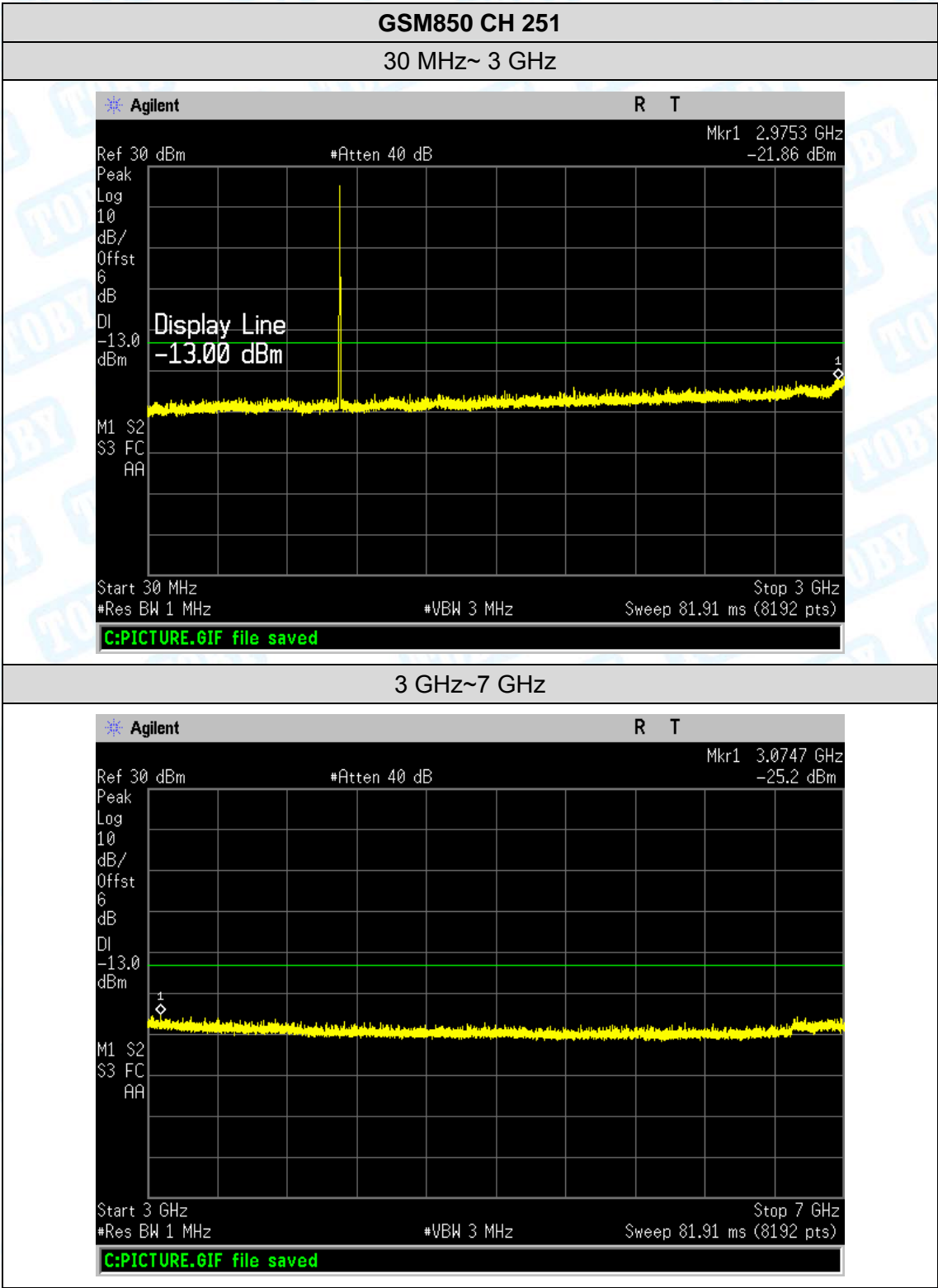
30 MHz~ 3 GHz

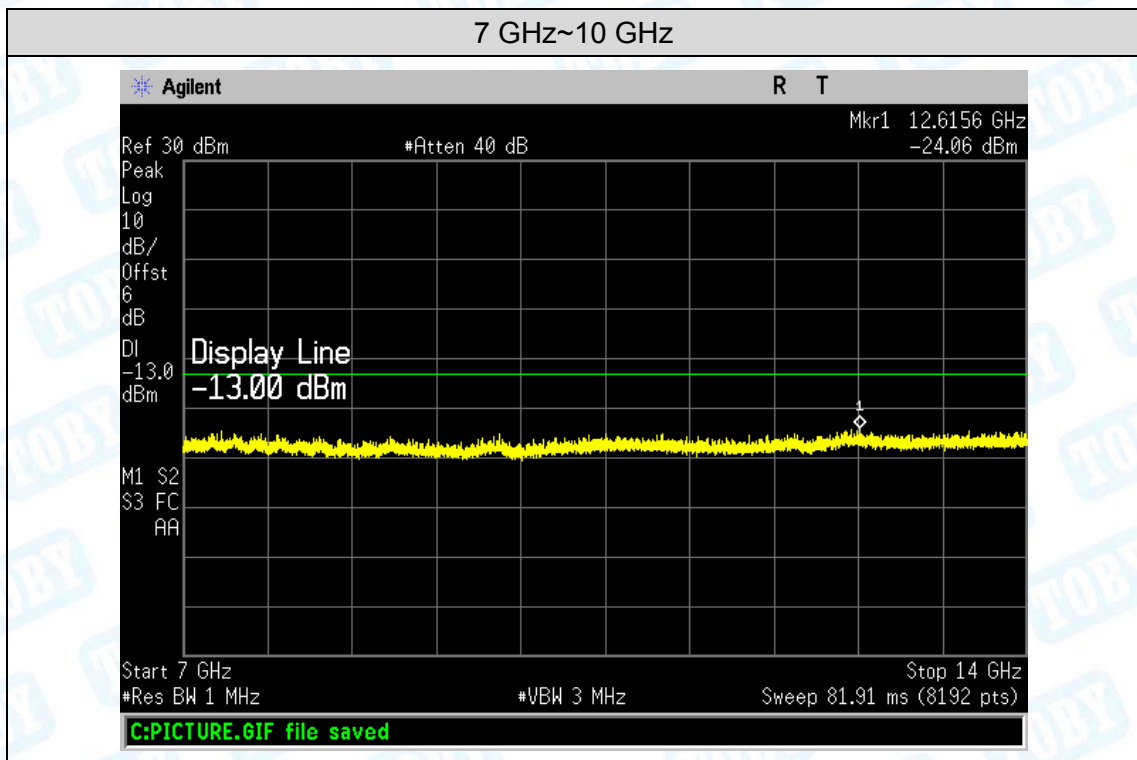


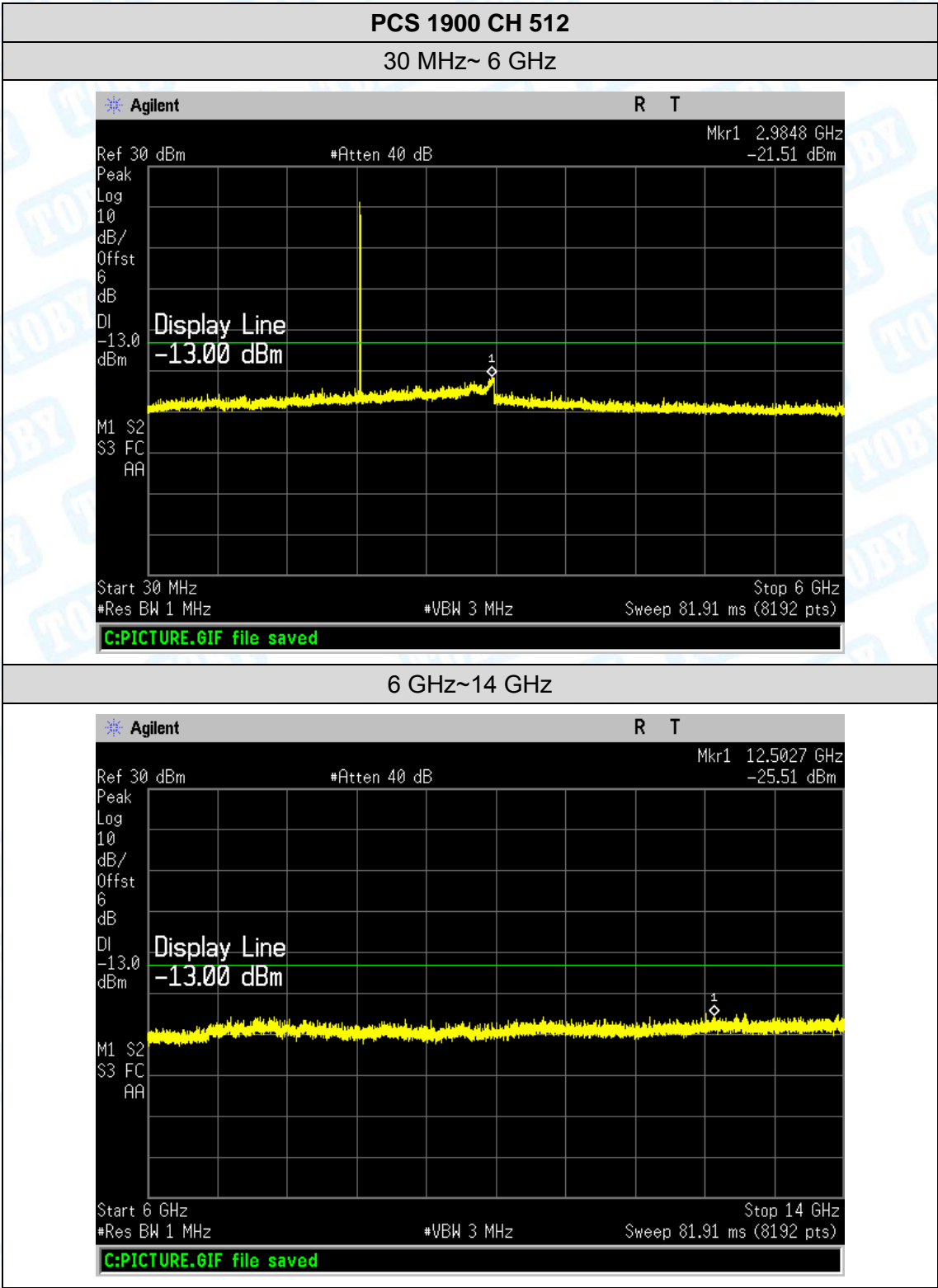
3 GHz~7 GHz

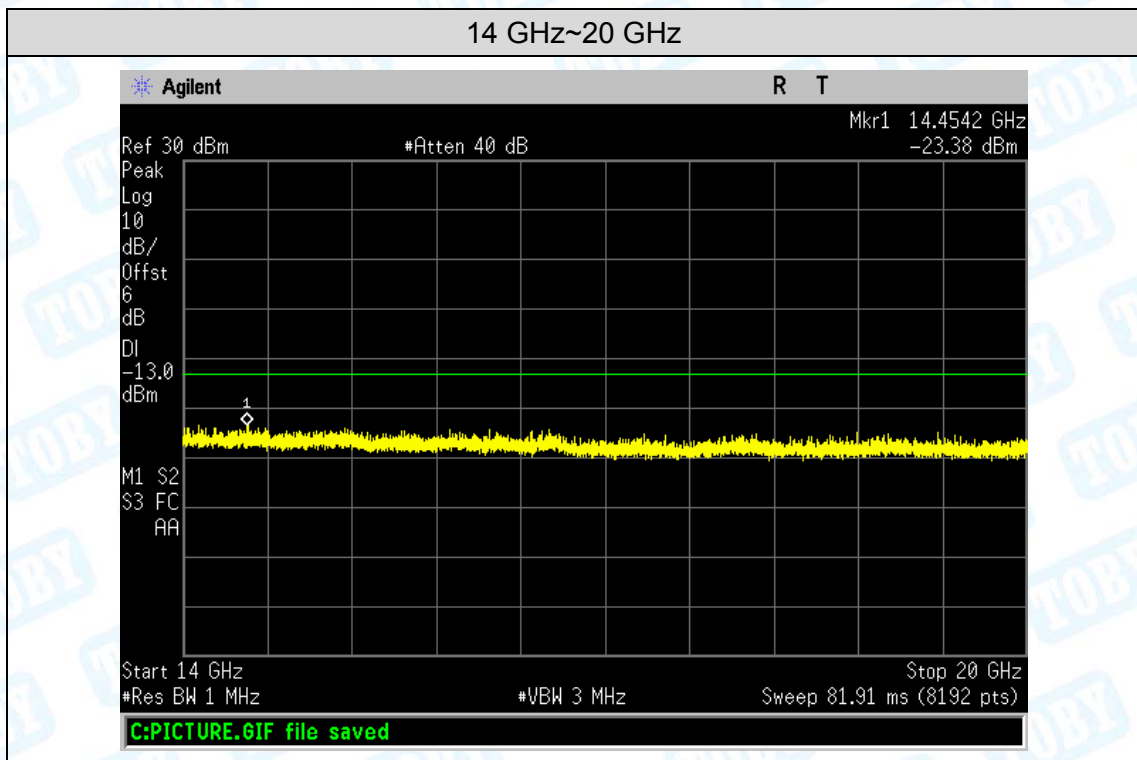


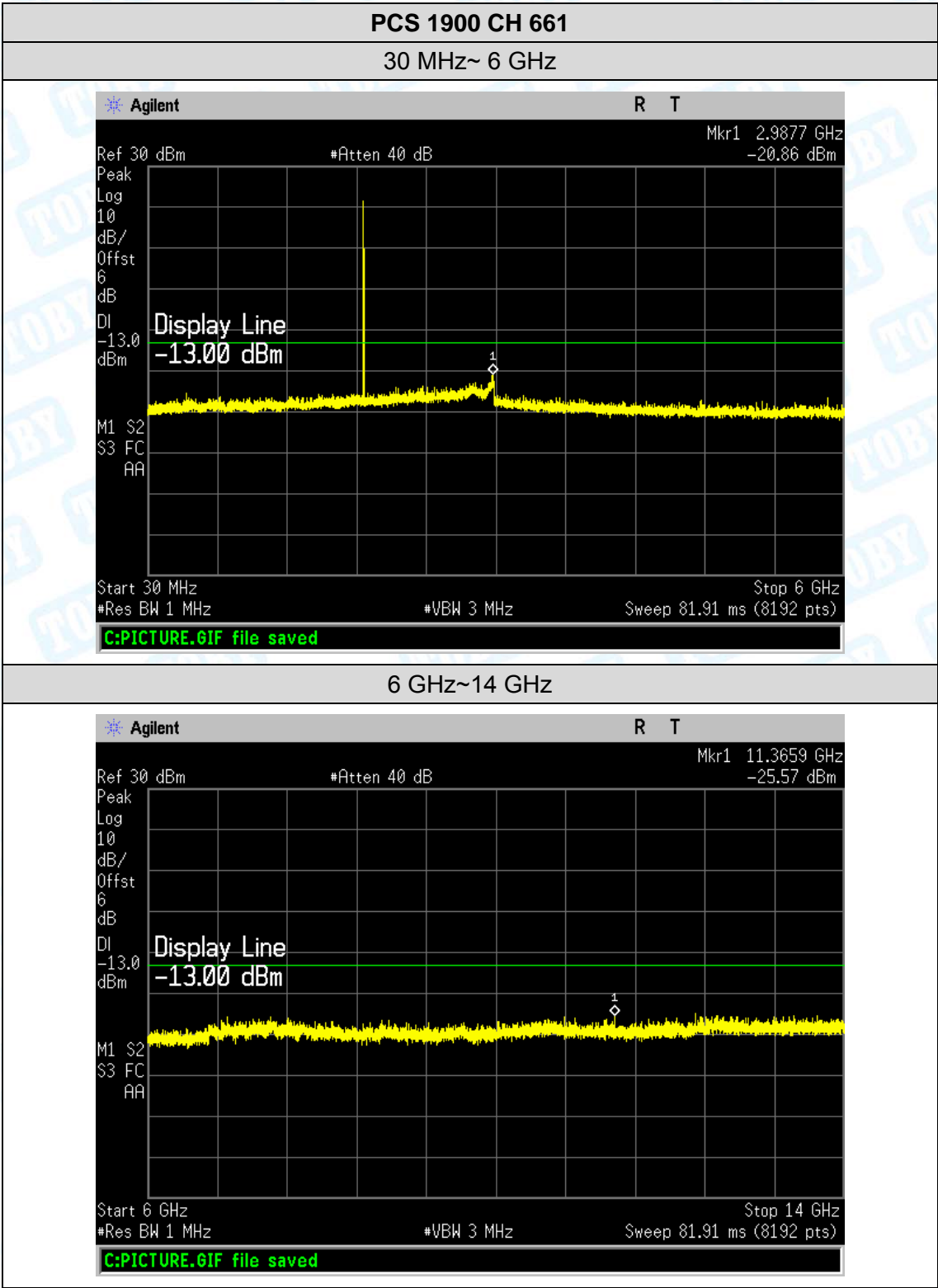


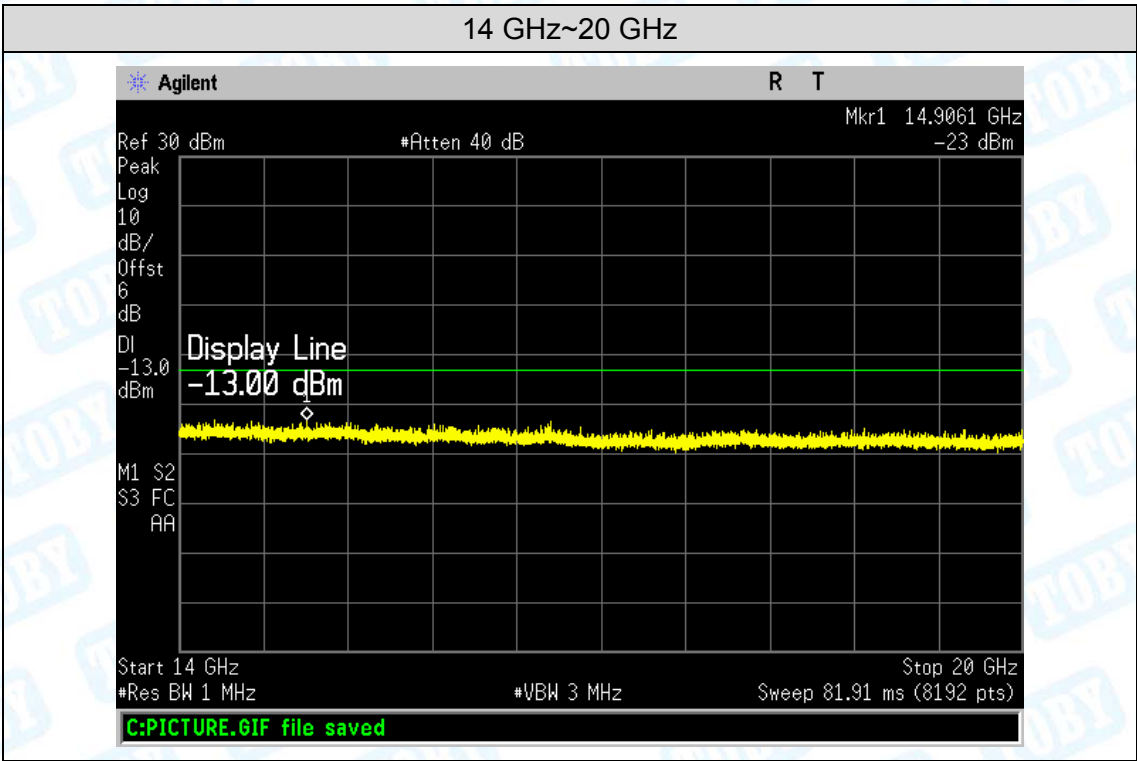


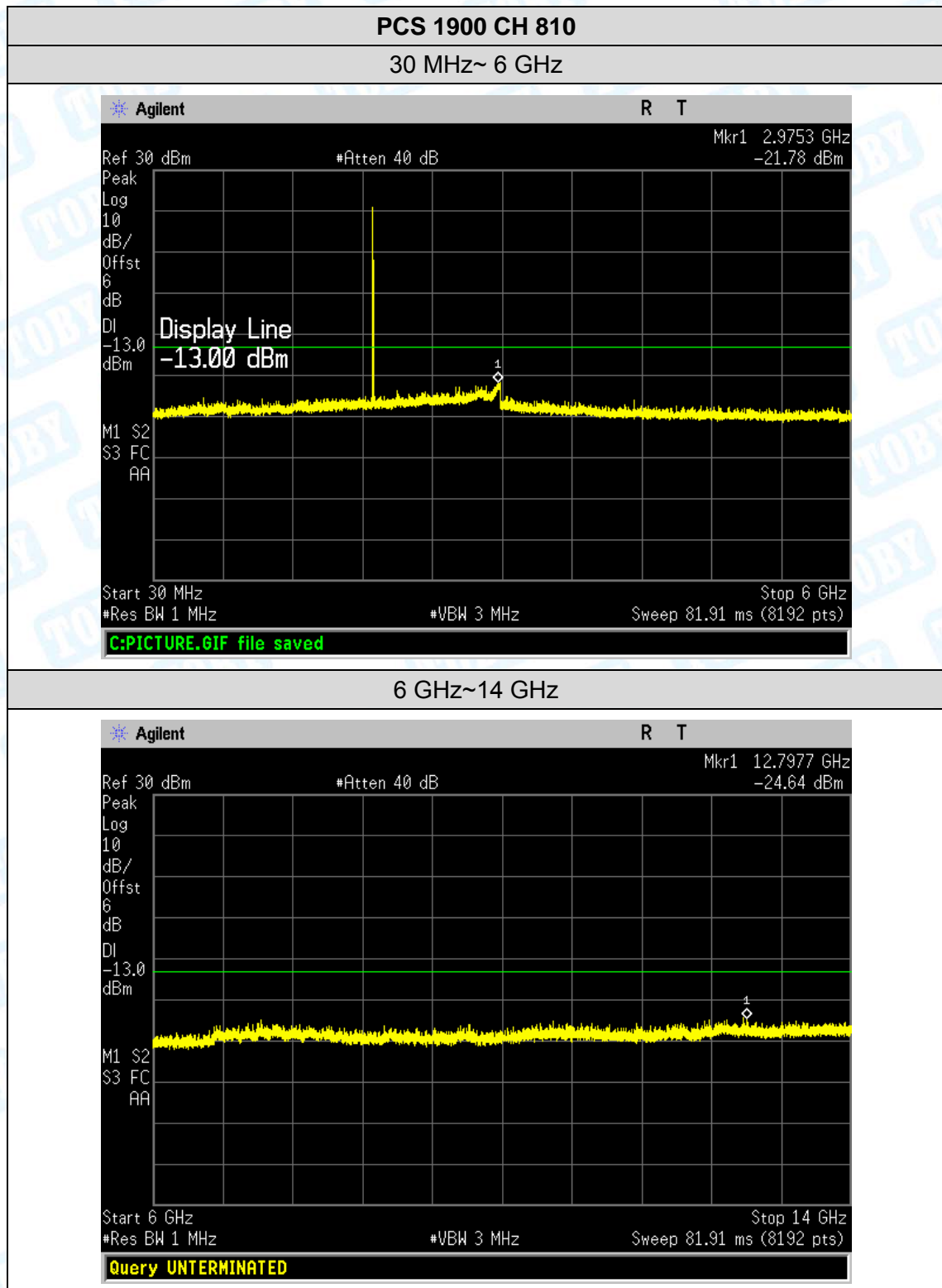


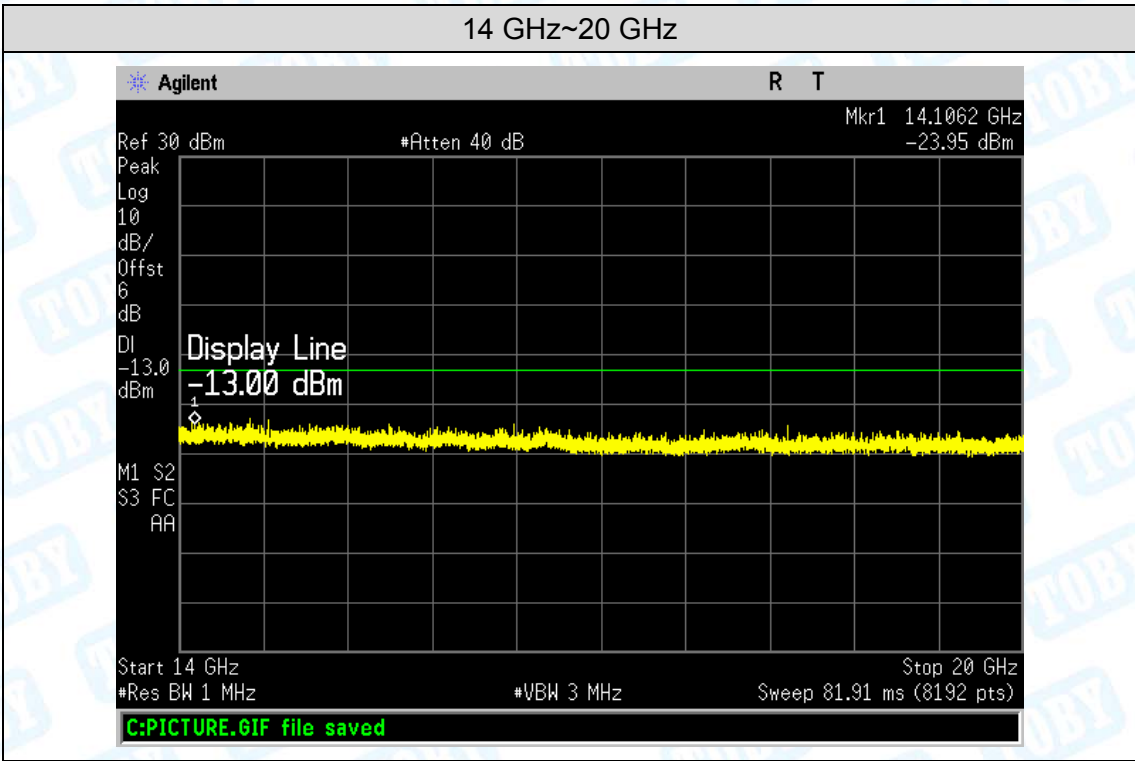


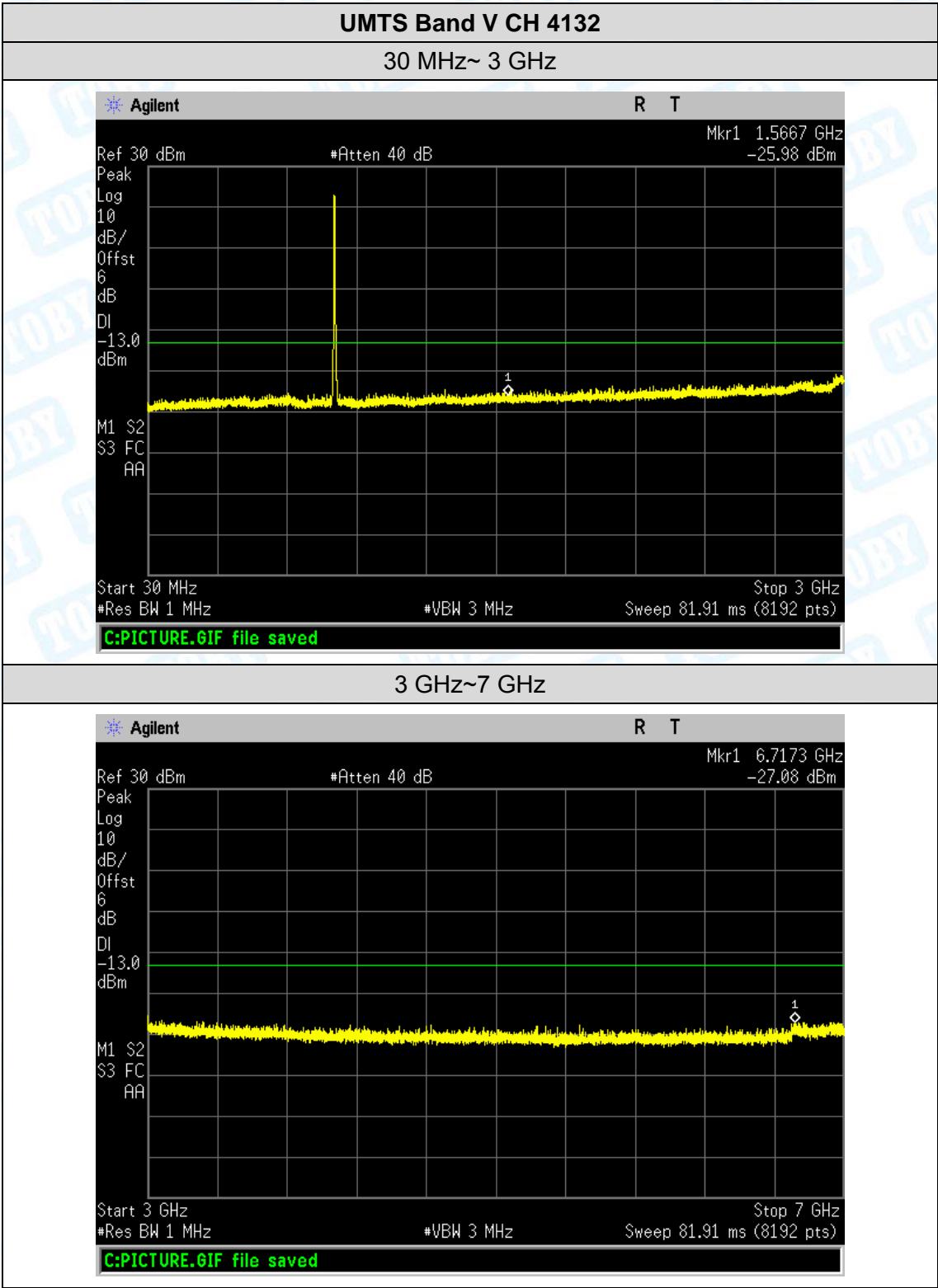


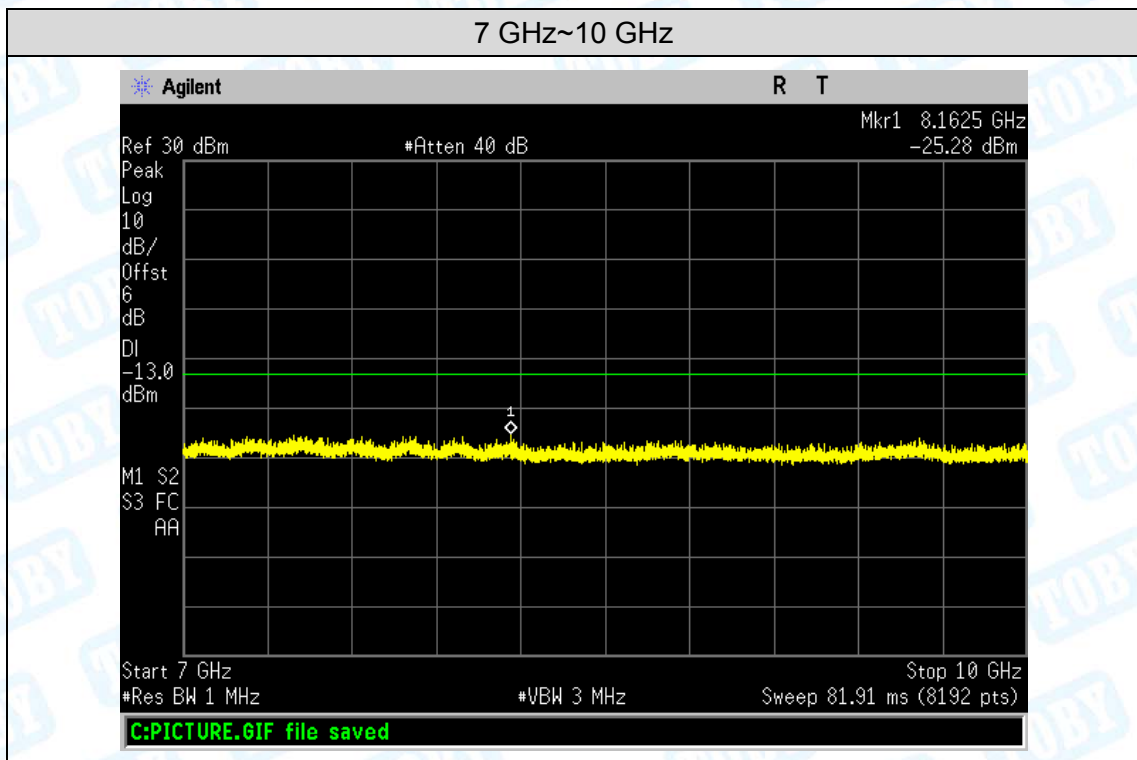


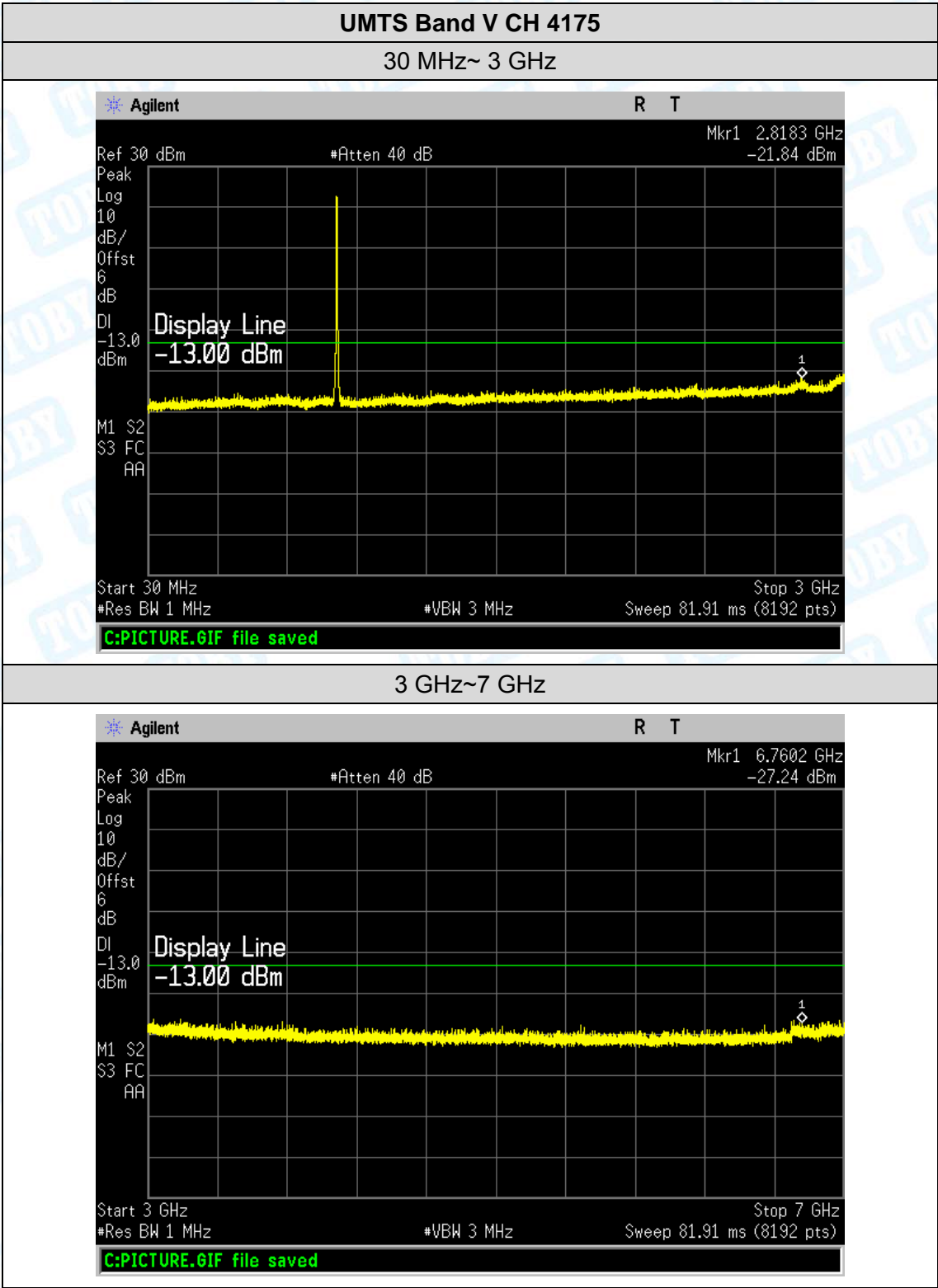


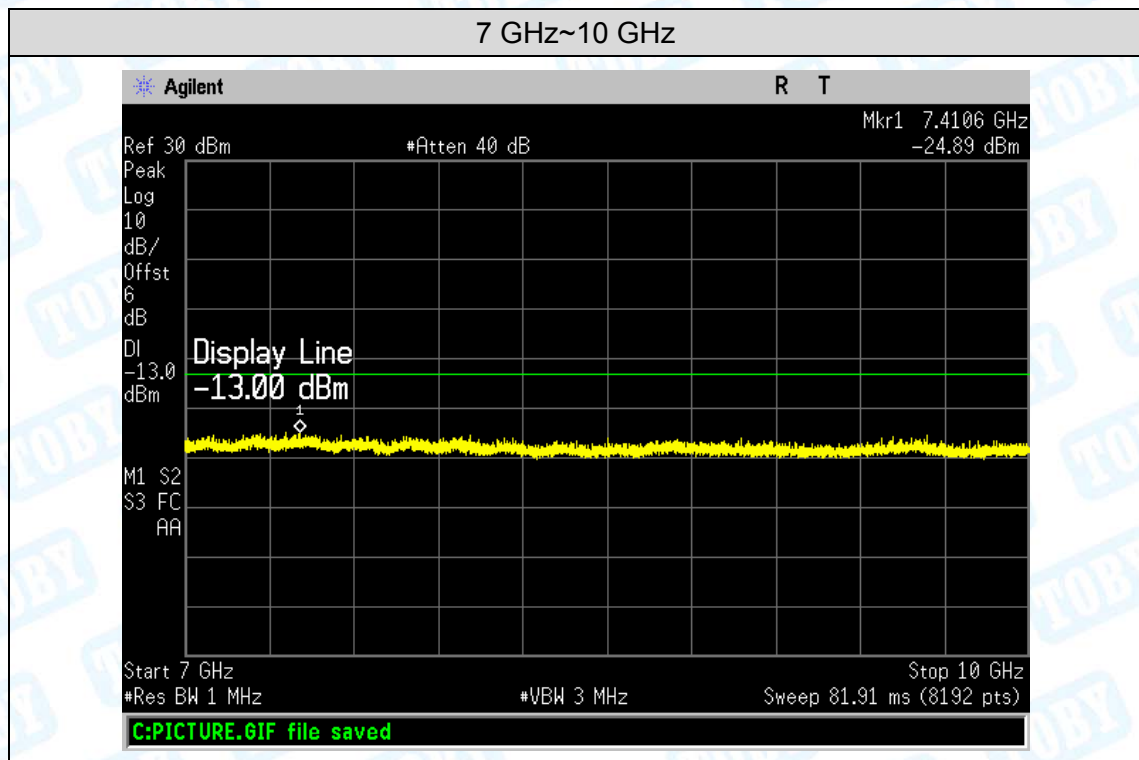






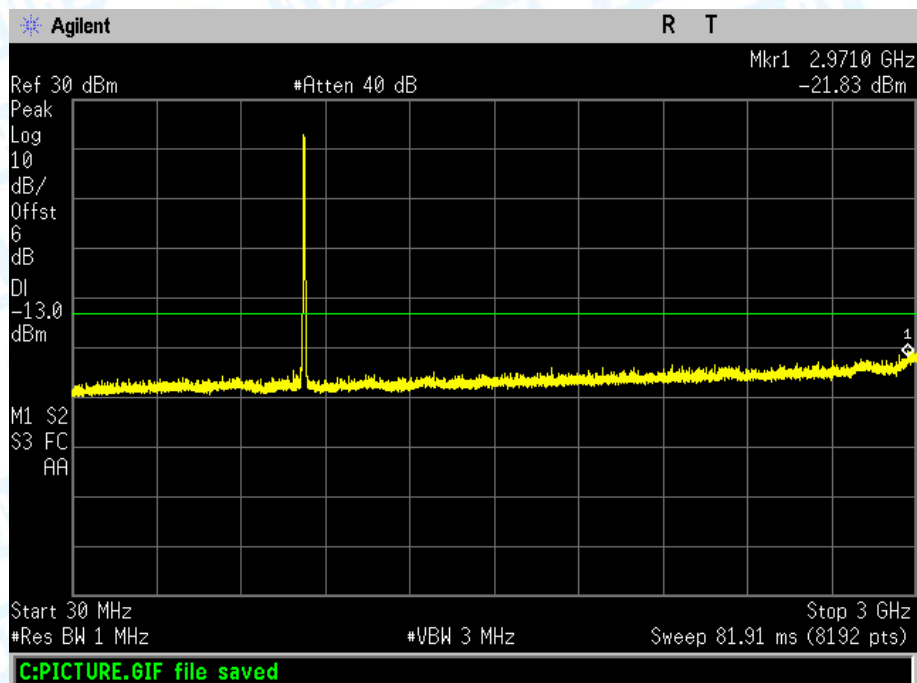




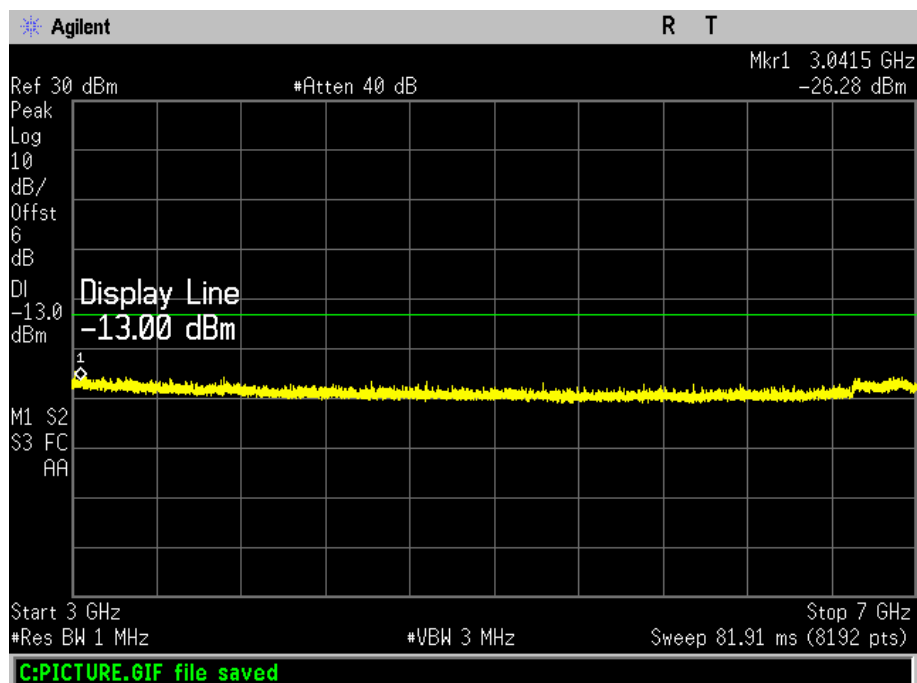


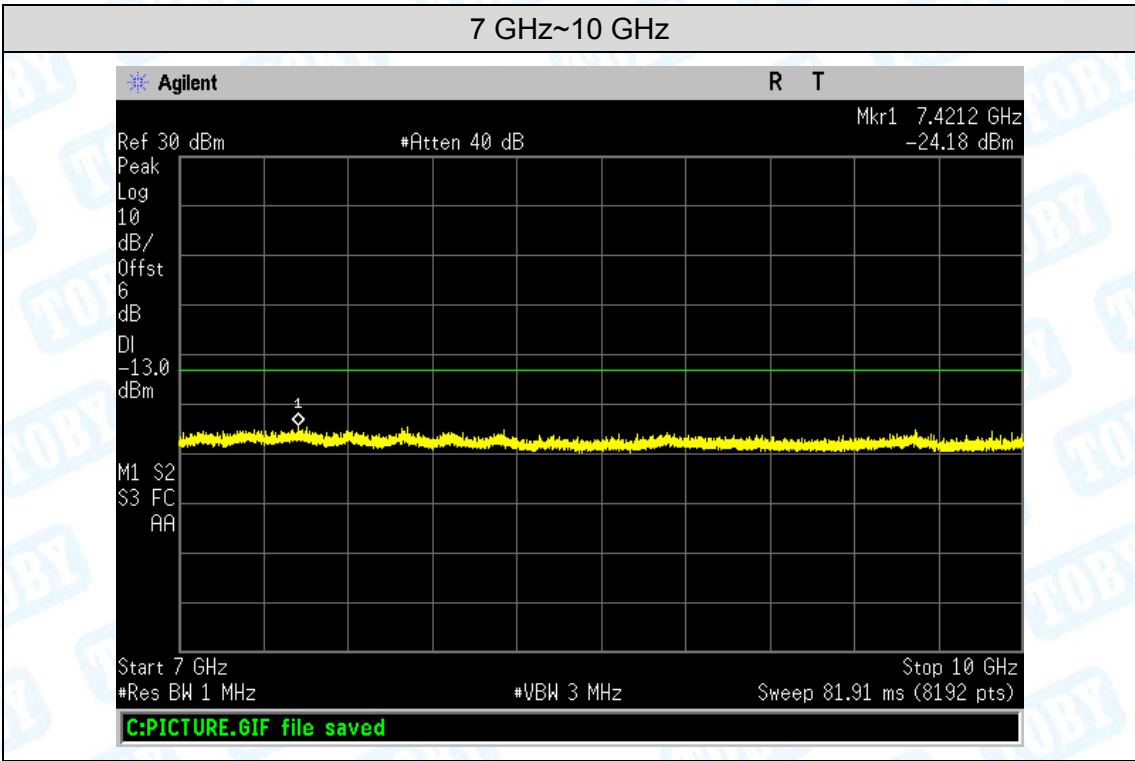
UMTS Band V CH 4233

30 MHz~ 3 GHz



3 GHz~7 GHz





10. Band Edge Test

10.1 Test Standard and Limit

10.1.1 Test Standard

FCC Part 2: 2.1051, 2.1057

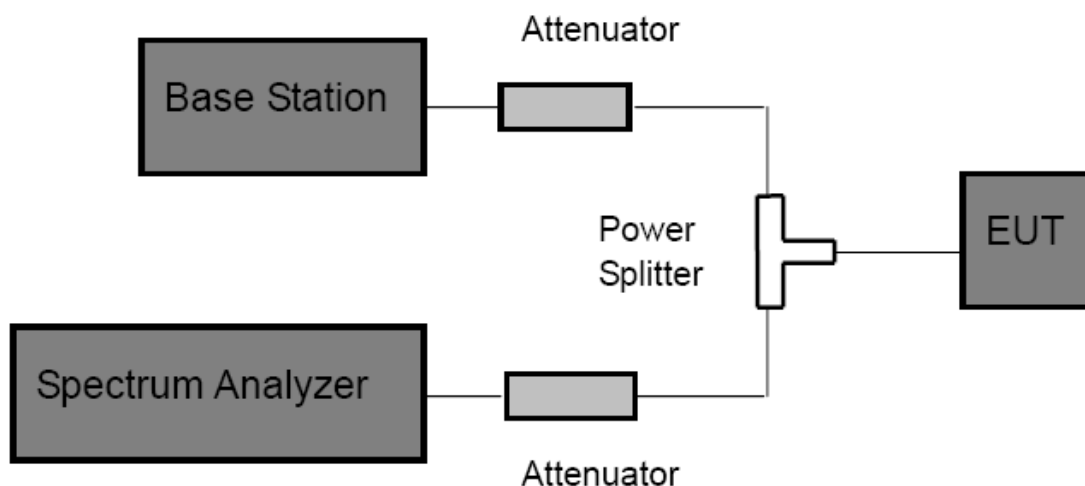
FCC Part 22H: 22.917(a)

FCC Part 24E: 24.238(a)

10.1.2 Test 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. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

10.2 Test Setup



10.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and Base station via power splitter as show in the block diagram above.
- (2) Spectrum Setting:
GSM and PCS: RBW=3 kHz, VBW=10 kHz, Span 1 MHz, Detector: Peak Mode.
WCDMA: RBW=100 kHz, VBW=300 kHz, Span 5 MHz, Detector: Peak Mode.
- (3) The band edges of low and high channels for the highest RF powers were measured.

10.4 EUT Operating Condition

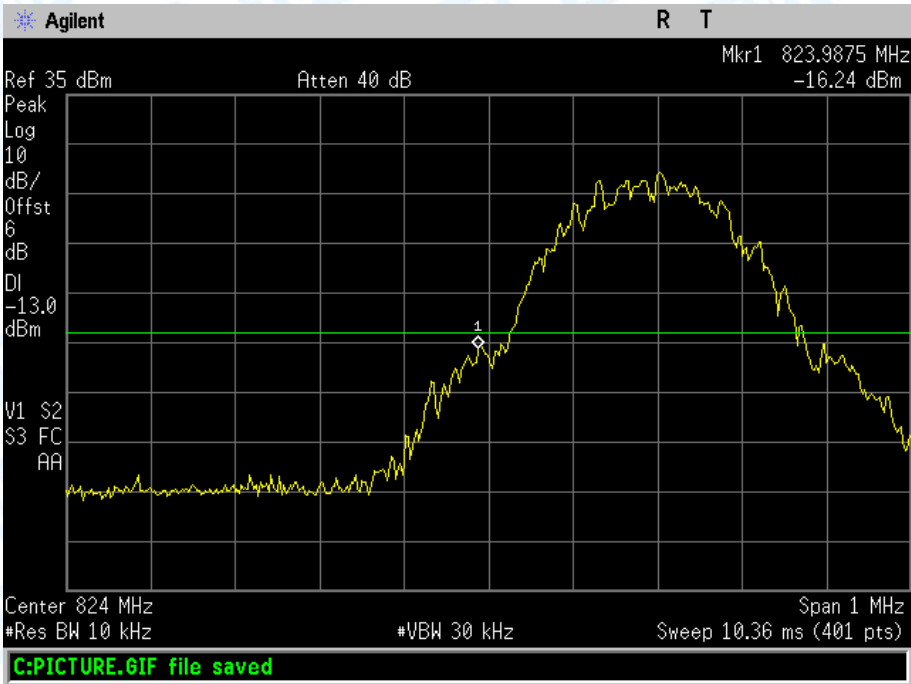
The EUT was continuously connected with the Base station and transmitting in the max power during the test.

10.5 Test Data

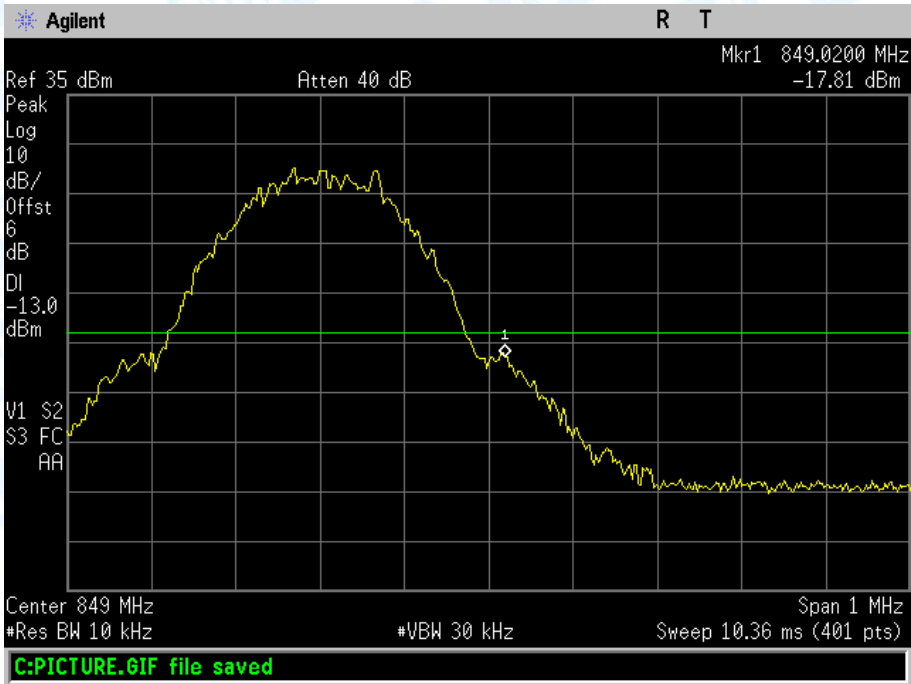
Please refer the following plots:

Band edge emission:

Test Mode:	GSM850
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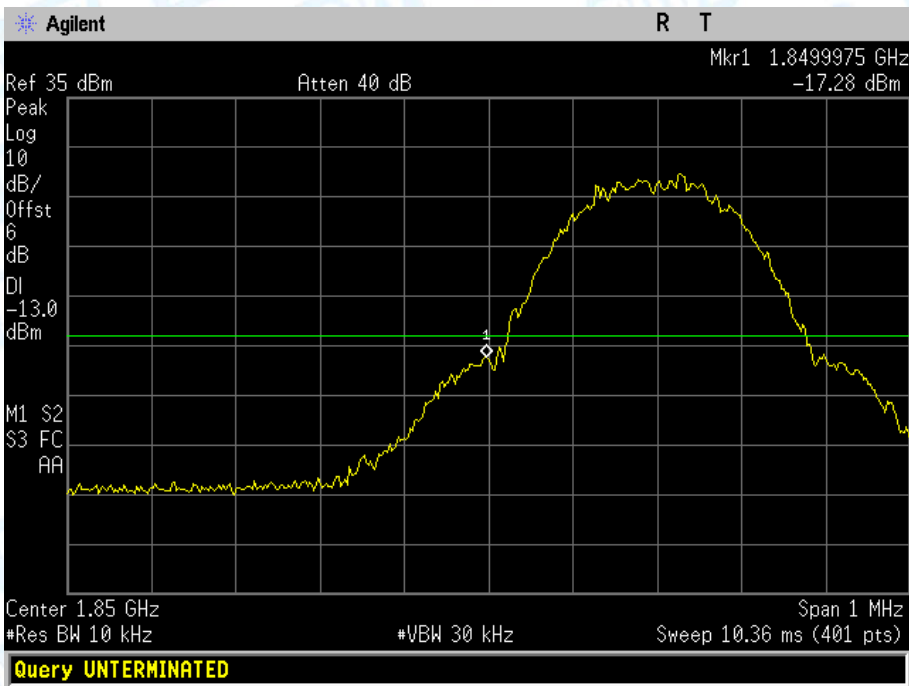


Lowest channel

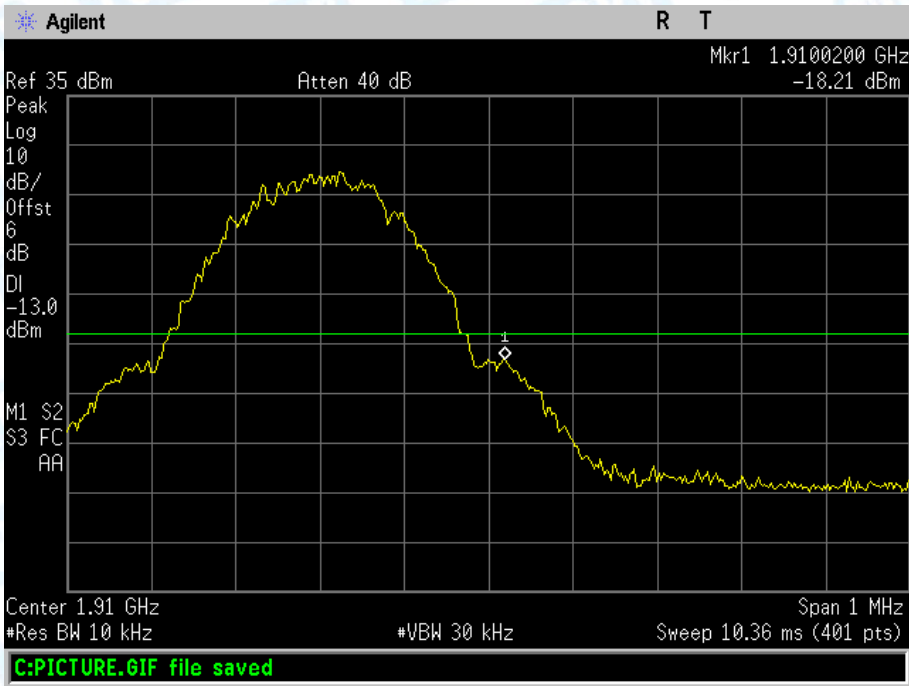


Highest channel

Test Mode:	PCS1900
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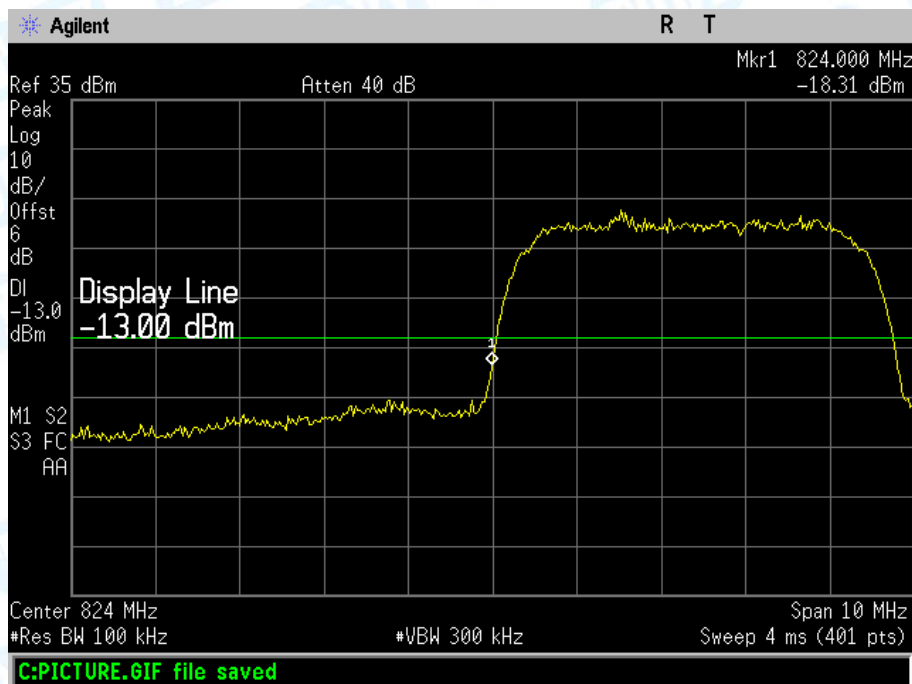
Lowest channel



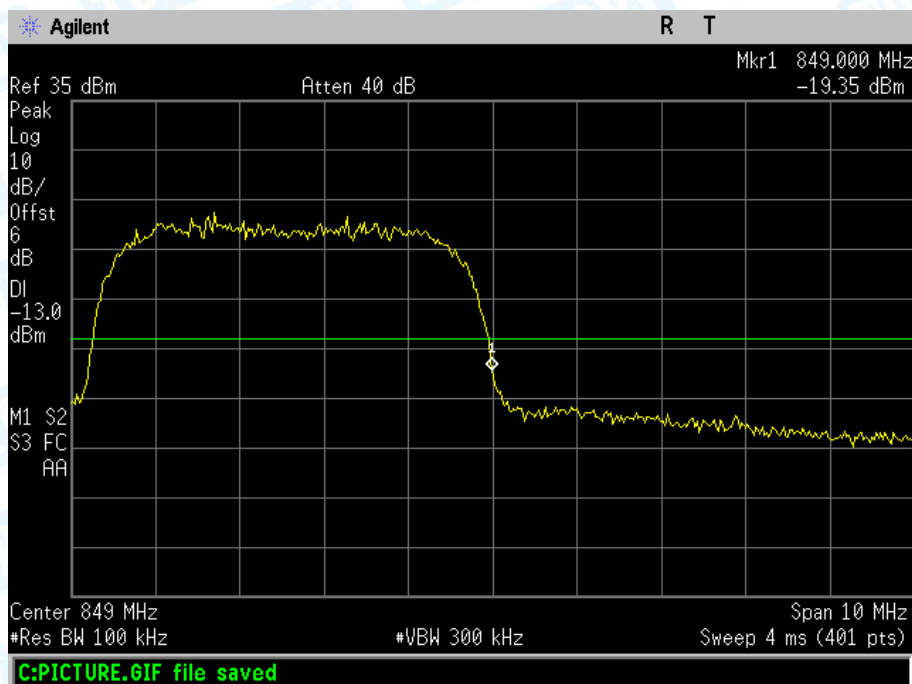
Highest channel

Test Mode:

UMTS Band V 12.2k RMC



Lowest channel



Highest channel

11. Radiated Out Band of Emissions

11.1 Test Standard and Limit

11.1.1 Test Standard

FCC Part 2: 2.1053, 2.1057

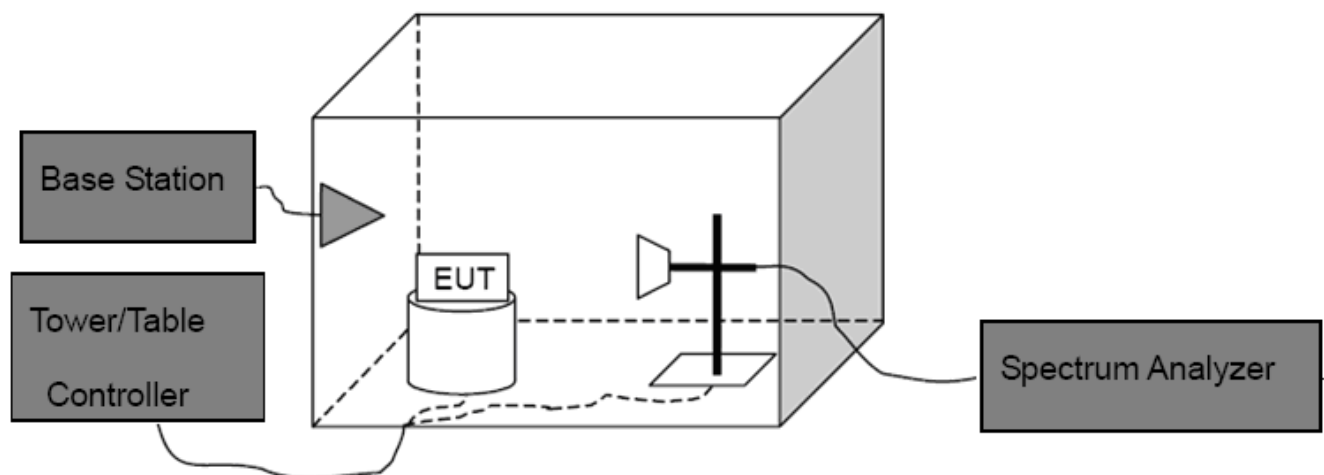
FCC Part 22H: 22.917

FCC Part 24E: 24.238

11.1.2 Test 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. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

11.2 Test Setup



11.3 Test Procedure

- (1) The test system setup as show in the block diagram above.
- (2) The EUT was placed on an non-conductive rotating platform in an anechoic chamber. The radiated spurious emissions from 30MHz to 10^{th} harmonious of fundamental frequency were measured at 3 m with a test antenna and a spectrum analyzer with RBW=1 MHz, VBW=1 MHz, peak detector settings.
- (3) During the measurement, the EUT was enforced in maximum power and linked with a base station. All the spurious emissions at 3m were measured by rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
- (4) When found the maximum level of emissions from the EUT. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB=10 log(TX power in Watts/0.001)-the absolute level
Spurious attenuation limit in dB=43+10 log(power out in Watts)

11.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

11.5 Test Data

Please refer the following pages.

Measurement Data (worst case)

Test mode:	GSM850		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1648.40	Vertical	-30.02	-13.00	Pass
2472.60	V	-40.15		
3297.00	V	-25.18		
4121.00	V	---		
4945.20	V	---		
5769.40	V	---		
1648.40	Horizontal	-28.19	-13.00	Pass
2472.60	H	-32.17		
3297.00	H	-33.22		
4121.00	H	---		
4945.20	H	---		
5769.40	H	---		
Test mode:	GSM850		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-27.23	-13.00	Pass
2509.80	V	-31.28		
3346.40	V	-30.65		
4183.00	V	---		
5019.60	V	---		
5856.20	V	---		
1673.20	Horizontal	-26.06	-13.00	Pass
2509.80	H	-34.13		
3346.40	H	-30.24		
4183.00	H	---		
5019.60	H	---		
5856.20	H	---		

Remark :

1. The emission behavior belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	GSM850		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1696.60	Vertical	-22.19	-13.00	Pass
2546.40	V	-30.58		
3395.20	V	-20.63		
4244.00	V	---		
5092.80	V	---		
5941.60	V	---		
1697.60	Horizontal	-29.53	-13.00	Pass
2546.40	H	-28.85		
3395.20	H	-27.19		
4244.00	H	---		
5092.80	H	---		
5941.60	H	---		
Test mode:	PCS1900		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3700.40	Vertical	-27.68	-13.00	Pass
5550.60	V	-23.48		
7400.80	V	-25.25		
9251.00	V	---		
11101.20	V	---		
12951.40	V	---		
3700.40	Horizontal	-30.19	-13.00	Pass
5550.60	H	-27.28		
7400.80	H	-26.32		
9251.00	H	---		
11101.20	H	---		
12951.40	H	---		

Remark :

1. The emission behavior belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	PCS1900		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-29.57	-13.00	Pass
5640.00	V	-22.25		
7520.00	V	-20.57		
9400.00	V	---		
11280.00	V	---		
13160.00	V	---		
3760.00	Horizontal	-23.55	-13.00	Pass
5640.00	H	-21.09		
7520.00	H	-22.34		
9400.00	H	---		
11280.00	H	---		
13160.00	H	---		
Test mode:	PCS1900		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3819.60	Vertical	-29.71	-13.00	Pass
5729.40	V	-24.19		
7639.20	V	-22.34		
9549.00	V	---		
11458.80	V	---		
13368.60	V	---		
3819.60	Horizontal	-30.58	-13.00	Pass
5729.40	H	-24.25		
7639.20	H	-20.49		
9549.00	H	---		
11458.80	H	---		
13368.60	H	---		

Remark :

1. The emission behavior belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	UMTS Band V 12.2k RMC		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1652.80	Vertical	-30.05	-13.00	Pass
2479.20	V	-28.11		
3305.60	V	---		
4132.00	V	---		
4958.40	V	---		
5784.80	V	---		
1652.80	Horizontal	-30.74	-13.00	Pass
2479.20	H	-28.49		
3305.60	H	---		
4132.00	H	---		
4958.40	H	---		
5784.80	H	---		
Test mode:	UMTS Band V 12.2k RMC		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1672.00	Vertical	-28.35	-13.00	Pass
2508.00	V	-30.77		
3344.00	V	---		
4180.00	V	---		
5016.00	V	---		
5852.00	V	---		
1672.00	Horizontal	-29.89	-13.00	Pass
2508.00	H	-30.38		
3344.00	H	---		
4180.00	H	---		
5016.00	H	---		
5852.00	H	---		

Remark :

- The emission behavior belongs to narrowband spurious emission.
- Remark"---" means that the emission level is too low to be measured
- The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	UMTS Band V 12.2k RMC		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.20	Vertical	-31.67	-13.00	Pass
2539.80	V	-30.25		
3386.40	V	---		
4233.00	V	---		
5079.60	V	---		
5926.20	V	---		
1693.20	Horizontal	-34.61	-13.00	Pass
2539.80	H	-32.68		
3386.40	H	---		
4233.00	H	---		
5079.60	H	---		
5926.20	H	---		

Remark :

1. The emission behavior belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

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