



SAMSUNG ELECTRONICS Co., Ltd.,
Regulatory Compliance Group
IT R&D Center
416 Maetan3-Dong,
Yeongtong-gu, Suwon city,
Gyeonggi-Do, Korea 443-742

FCC CFR47 PART 24 SUBPART CERTIFICATION REPORT

Model Tested : **SGH-E490**
Additional Model : **SGH-E498**
FCC ID(Requested) : **A3LSGHE490**
Report No : **FD-199-R1**
Job No : **FD-199**
Date issued : **October 17, 2006**

- Abstract -

All measurement reported herein accordance with FCC Rules, 47CFR Part2, Part24.

Prepared By

SH ONG - Test Engineer

Checked By

WW JANG - Manager

Authorized By

SH PARK – Senior Manager

TABLE OF CONTENT

MEASUREMENT REPORT	Page
1. FCC CERTIFICATION INFORMATION	3
1.1. §2.1033 General Information	3
2. INTRODUCTION	4
2.1. General	4
3. MEASURING INSTRUMENT CALIBRATION	5
4. TEST EQUIPMENT LIST.....	6
5. DESCRIPTION OF TESTS.....	7
5.1. Effective Radiated Power / Equivalent Isotropic Radiated Power	7
5.2. Radiated Spurious & Harmonic Emission	8
5.3. Occupied Bandwidth	10
5.4. Spurious and Harmonic Emission at Antenna Terminal.....	10
5.4.1. Occupied Bandwidth Emission Limits	10
5.4.2. Conducted Spurious Emission	12
5.5. Frequency Stability / Temperature Variation.....	13
6. TEST DATA	14
6.1. Equivalent Isotropic Radiated Power (E.I.R.P.)	14
6.2. GSM1900 Radiated Spurious & Harmonic measurement	15
6.3. GSM1900 Radiated Spurious & Harmonic Conversion Table	16
6.4. Frequency Stability.....	17
6.4.1. GSM1900 Frequency Stability Table	17
6.4.2. GSM1900 Frequency Stability Graph.....	18
7. CONCLUSION.....	20
8. TEST PLOTS.....	21



MEASUREMENT REPORT

1. FCC Certification Information

The following information is in accordance with FCC Rules, 47CFR Part2, Subpart J, Sections 2.1033 – 2.1055.

1.1. §2.1033 General Information

- Applicant Name : SAMSUNG ELECTRONICS CO., LTD.
- Address : 416 Maetan3-Dong, Yeongtong-gu, Suwon City
Gyeonggi-Do, Korea 443-742
- Attention : SungJoo KIM, Engineering Manager (QA Lab)
- FCC ID : A3LSGHE490
- Additional Model : SGH-E498
- Quantity : Quantity production is planned
- Emission Designators : 250KGXW(GSM1900), 249KG7W(GSM1900 EDGE)
- Tx Freq. Range : 1850.2MHz -1909.8MHz (GSM1900)
- Rx Freq. Range : 1930.2MHz - 1989.8MHz (GSM1900)
- Max. Power Rating : 1.169 W EIRP GSM1900 (30.68dBm)
0.716 W EIRP GSM1900 EDGE(28.55dBm)
- FCC Classification(s) : Licensed Portable Tx Held to Ear (PCE)
- Equipment (EUT) Type : Single-Band PCS GSM/EDGE Phone with Bluetooth
- Frequency Tolerance : $\pm 0.00025\%$ (2.5ppm)
- FCC Rule Part(s) : §24(E), §2.
- Dates of Test : October 10-11, 2006
- Place of Test : SAMSUNG Lab,
- Test Report S/N : FD-199-R1

2. INTRODUCTION

2.1. General

These measurement test were conducted at **SAMSUNG ELECTRONICS CO., LTD(SUWON)**. The site address is 416 Maetan3-Dong, Yeongtong-gu, Suwon City, Gyeonggi-Do, Korea 443-742. The site have 1 Fully-anechoic chamber and measurement facility.



Figure1. Map of the Suwon City area.

Measurement Procedure

The radiated and spurious measurements were made Fully-anechoic chamber at a 3-meter test range (see Figure2). The equipment under testing was placed on a Non-conducted turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. The substitution antenna will replace the EUT antenna at the same position and in vertical polarization. The frequency of the signal generator shall be set to the frequencies that were measured on the EUT. The test antenna shall be raised and lowered, if necessary, to ensure that the maximum signal is still being received. The signal generator, output level, shall be adjusted until an equal or a known related level to what was measured from the EUT is obtained in the spectrum analyzer. This level was recorded.

3. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4. TEST EQUIPMENT LIST

Name Of Equipment	Model	Serial No.	Due Date
Spectrum Analyzer	E4440A(3Hz~26.5GHz)	MY41000236	2007-04-14
	E4440A(3Hz~26.5GHz)	MY41000233	2007-07-21
Signal Generator	SMIQ03B	83824/021	2006-12-07
	SMR20	835197/030	2007-01-10
Network Analyzer	8753E	JP38160590	2007-06-26
Power Meter	E4419B	GB41293846	2007-09-06
Power Sensor	8485A	3318A19924	2007-09-24
Amplifier	5S1G4	304866	2006-10-18
Pre-Amplifier	8449B	3008A00691	2007-01-02
Communication test set	8960	GB42230535	2007-01-02
	8960	GB42360886	2007-07-03
Antenna Master	MA240	240/618	Not Required
Controller	HD100	100/756	Not Required
Environmental Chamber	SH-241	92000548	2006-11-22
	SH-241	92000549	2006-11-22
Horn Antenna	HF906	360306/011	2007-03

5. DESCRIPTION OF TESTS

5.1. Effective Radiated Power / Equivalent Isotropic Radiated Power

Test Set-up for the ERP/EIRP TEST

Effective Radiated Power Output and Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004:

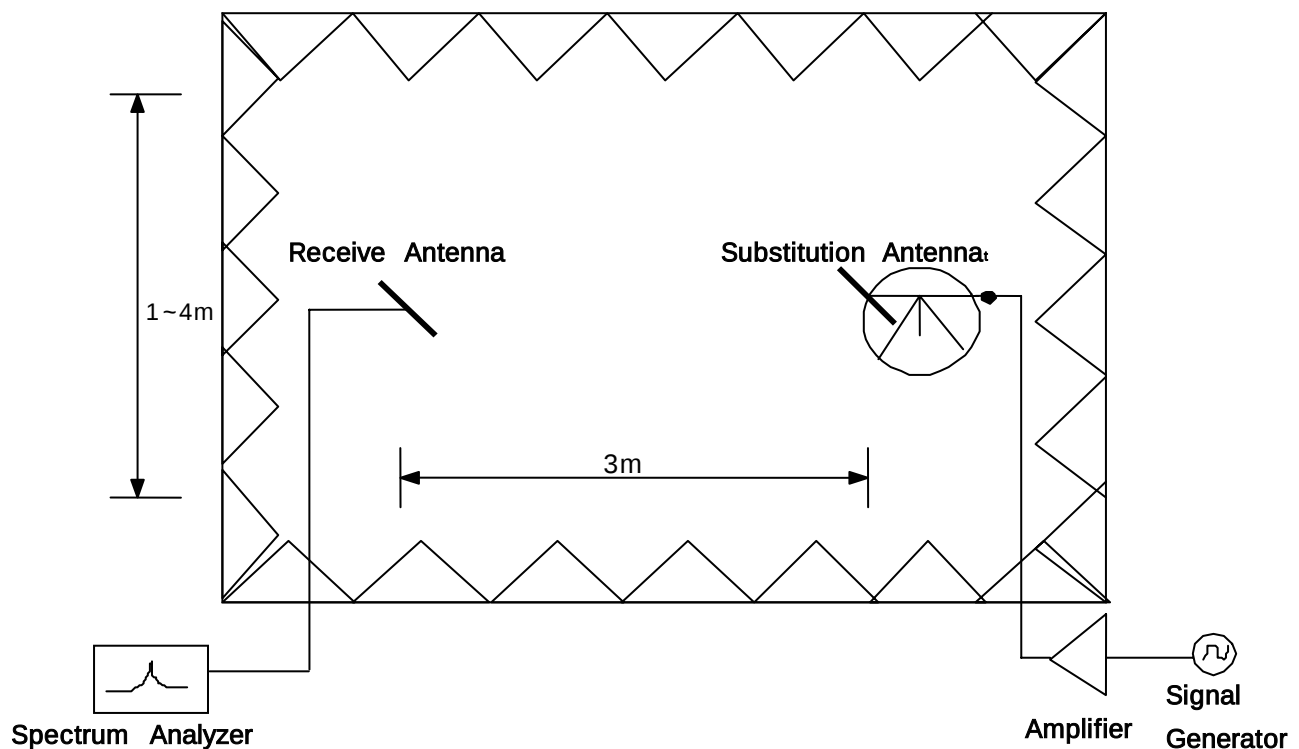


Figure 3. Diagram of ERP/EIRP test Set-up

The EUT was placed on a Non-conducted turntable 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For GSM signals, an average detector is used, with RBW=VBW=3MHz, SPAN=10MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of dipole is measured. The ERP and EIRP are recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

5.2. Radiated Spurious & Harmonic Emission

Test Set-up for the Radiated Emission TEST

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004

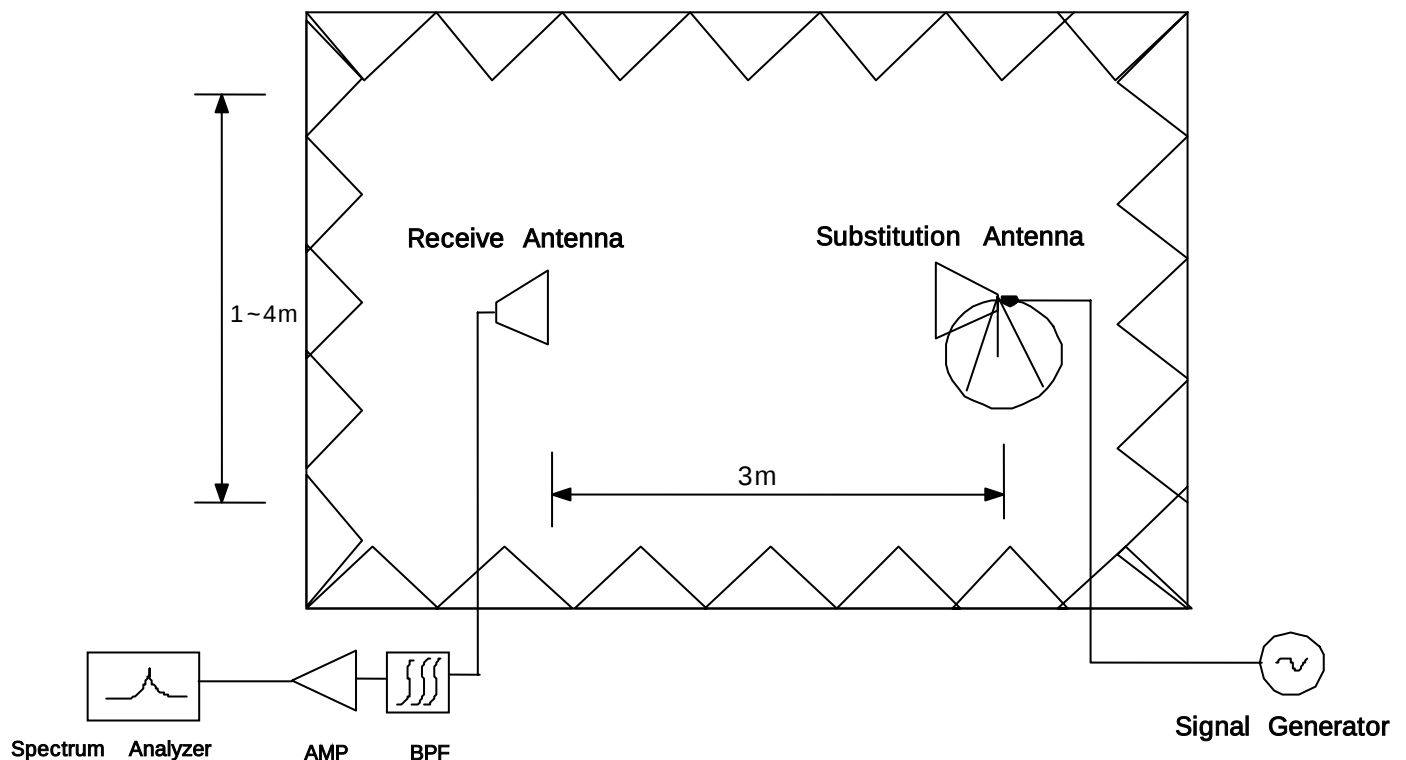


Figure 4. Diagram of Radiated Spurious & Harmonic test Set-up

The EUT was placed on a Non-conducted turntable 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. The Spectrum was investigated from 30MHz to the 10th Harmonic of the fundamental. A peak detector is used, with RBW=VBW=1MHz. The value that we could measure was only reported. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.



SAMPLE CALCULATION

Example: Channel 661 , Second Harmonic(3760.00MHz)

The receive analyzer reading at 3meters with the EUT on the turntable was -81.0dBm . The gain of the substituted antenna is 8.1dBi . The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0dBm of the receive analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0dB at 3760.00MHz . So 6.1dB is added to the signal generator reading of -30.9dBm yielding -24.8dBm . The fundamental EIRP was 25.5dBm so this harmonic was $25.5\text{dBm} - (-24.8) = 50.3\text{dBc}$.

5.3. Occupied Bandwidth

Test Procedure

The EUT was setup to maximum output power at its lowest channel. The occupied bandwidth was measured using a spectrum analyzer. The measurements are repeated for the highest and a middle channel. The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

Plots of the EUT's occupied bandwidth are shown herein.

5.4. Spurious and Harmonic Emission at Antenna Terminal

5.4.1. Occupied Bandwidth Emission Limits

- (a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB.
- (b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
- (c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (d) The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

BLOCK	Freq. Range (MHz) Transmitter (Tx)	Freq. Range (MHz) Receiver (Rx)
A	1850 – 1865	1930 – 1945
B	1870 – 1885	1950 – 1965
C	1895 – 1910	1975 – 1990
D	1865 – 1870	1945 – 1950
E	1885 – 1890	1965 – 1970
F	1890 – 1895	1970 – 1975

Table 1. Broadband PCS Service Frequency Blocks

BLOCK	Freq. Range (MHz) Transmitter (Tx)	Freq. Range (MHz) Receiver (Rx)
A* Low + A	824 ~ 835	869 ~ 880
B	835 ~ 845	880 ~ 890
A* High	845 ~ 846.5	890 ~ 891.5
B*	846.5 ~ 849	891.5 ~ 894

Table 2. Cellular Service Frequency Blocks

5.4.2. Conducted Spurious Emission

Minimum standard:

On any frequency outside a license frequency block, the power of any emission shall be attenuated below the transmitter power(P) by at least $43+10\log(P)$ dB. Limit equivalent to -13dBm, calculation shown below.

$$43 + 10\log (1.169 \text{ W}) = 43.68 \text{ dB}$$

$$30.68 \text{ dBm} - 43.68 \text{ dB} = -13 \text{ dBm}$$

Compliance with the out-of-band emissions requirement is based on test being performed with an analyzer resolution bandwidth of 1MHz. However in the 1MHz band immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1% of the fundamental emissions bandwidth may be employed.

In case of GSM : $0.01 * 273\text{KHz} = 2.73\text{KHz}$
A Resolution BW of 3KHz was used for measurement at the band edges.

Test Procedure:

The EUT was setup to maximum output power at its lowest channel. The Resolution BW of the analyzer is set to 1% of the emission bandwidth to show compliance with the -13dBm limit, in the 1MHz bands immediately outside and adjacent to the edge of the frequency block. The measurements are repeated for the EUT's highest channel. For the Out-of-Band measurements a 1MHz RBW was used to scan from 10MHz to 10GHz. (GSM1900 Mode : 10MHz to 20GHz). A display line was placed at -13dBm to show compliance. The high, lowest and a middle channel were tested for out of band measurements.

Plots are shown herein.

5.5. Frequency Stability / Temperature Variation

The frequency stability of the transmitter is measured by:

- a.) Temperature: The temperature is carried from -30°C to +60°C using an environmental chamber.
- b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification- The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.00025 ($\pm 2.5\text{ppm}$) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25°C to 27°C to provide a reference).
2. The equipment is subjected to an overnight "soak" at -30°C without any power applied.
3. After the overnight "soak" at -30°C (Usually 14~16 hours), the equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying to the transmitter.
4. Frequency measurements are made at 10°C interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting at -30°C up to +60°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

NOTE : The EUT is tested down to the battery endpoint.

6. TEST DATA

6.1. Equivalent Isotropic Radiated Power (E.I.R.P.)

Supply Voltage : 3.7VDC

Modulation : PCS 1900

■ Reference level

Frequency (MHz)	Output (dBm)	Polarization (H/V)	S/A (dBm)	Ant gain (dBi)	Ref level (dBm)
1850.20	27.00	H	-13.05	8.13	-21.18
		V	-13.35	8.13	-21.48
1880.00	27.00	H	-13.14	8.11	-21.25
		V	-13.13	8.11	-21.24
1909.80	27.00	H	-13.10	8.33	-21.43
		V	-13.46	8.33	-21.79

■ Result

Frequency (MHz)	Tested level (dBm)	Polarization (H/V)	Azimuth (angle)	EIRP (dBm)	EIRP (W)	Battery
1850.20	-17.50	H1	247	30.68	1.169	Standard

6.2. GSM1900 Radiated Spurious & Harmonic measurement

Operating Frequency : 1850.2 MHz(Low), 1880.00 MHz(Middle), 1909.80 MHz(High)

Measured Output Power : 30.68 dBm = 1.169 W

Modulation Signal : GSM1900

Limit : $43 + 10\log_{10}(P) = 43.68 \text{ dBc}$

■ Result

Channel	Harmonic	Frequency (MHz)	From EUT Tested level (dBm)	POL (H/V)	Result (dBc)
512	2	3700.40	-61.24	H1	67.42
	3	5550.60	-65.88	H1	65.72
	4	7400.80	-62.84	H2	58.30
	5	9251.00	-67.8	H2	59.49
	6	11101.20	-	-	-
	7	12951.40	-	-	-
661	2	3760.00	-60.26	H1	66.44
	3	5640.00	-67.83	H1	67.47
	4	7520.00	-63.57	H2	59.28
	5	9400.00			

6.3. GSM1900 Radiated Spurious & Harmonic Conversion Table

Date : 2006. 10. 10

Test Engineer : SH ONG

Tx Cable loss
 Tx Horn Ant Gain
 Rx Cable loss + HPF Insertion loss + Attenuator
 Pre-Amp gain
 Air loss
 Tested Level from EUT
 = + + -
 = EIRP -

CH	Har	Frequency (MHz)	Tx CL (dB)	Horn Gain (dB)	Tx Level @ (S/G 10dBm)	Tested Level EUT : H (dBm)	Tested Level EUT : V (dBm)	Amplitude of Emission EUT : H (dBm)	Amplitude of Emission EUT : V (dBm)	Result EUT : H (dBc)	Result EUT : V (dBc)
512	2	3700.40	11.49	9.73	8.24	-61.24	-62.62	-36.74	-37.31	67.42	67.99
	3	5550.60	14.56	11.55	6.99	-65.88	-68.19	-35.04	-38.01	65.72	68.69
	4	7400.80	17.57	11.44	3.87	-62.84	-64.24	-27.62	-31.06	58.30	61.74
	5	9251.00	20.18	12.17	1.99	-67.80	-68.66	-28.81	-29.59	59.49	60.27
	6	11101.20	22.70	13.66	0.96	-</					

6.4. Frequency Stability

6.4.1. GSM1900 Frequency Stability Table

Operating Frequency : 1,880,000,000 Hz

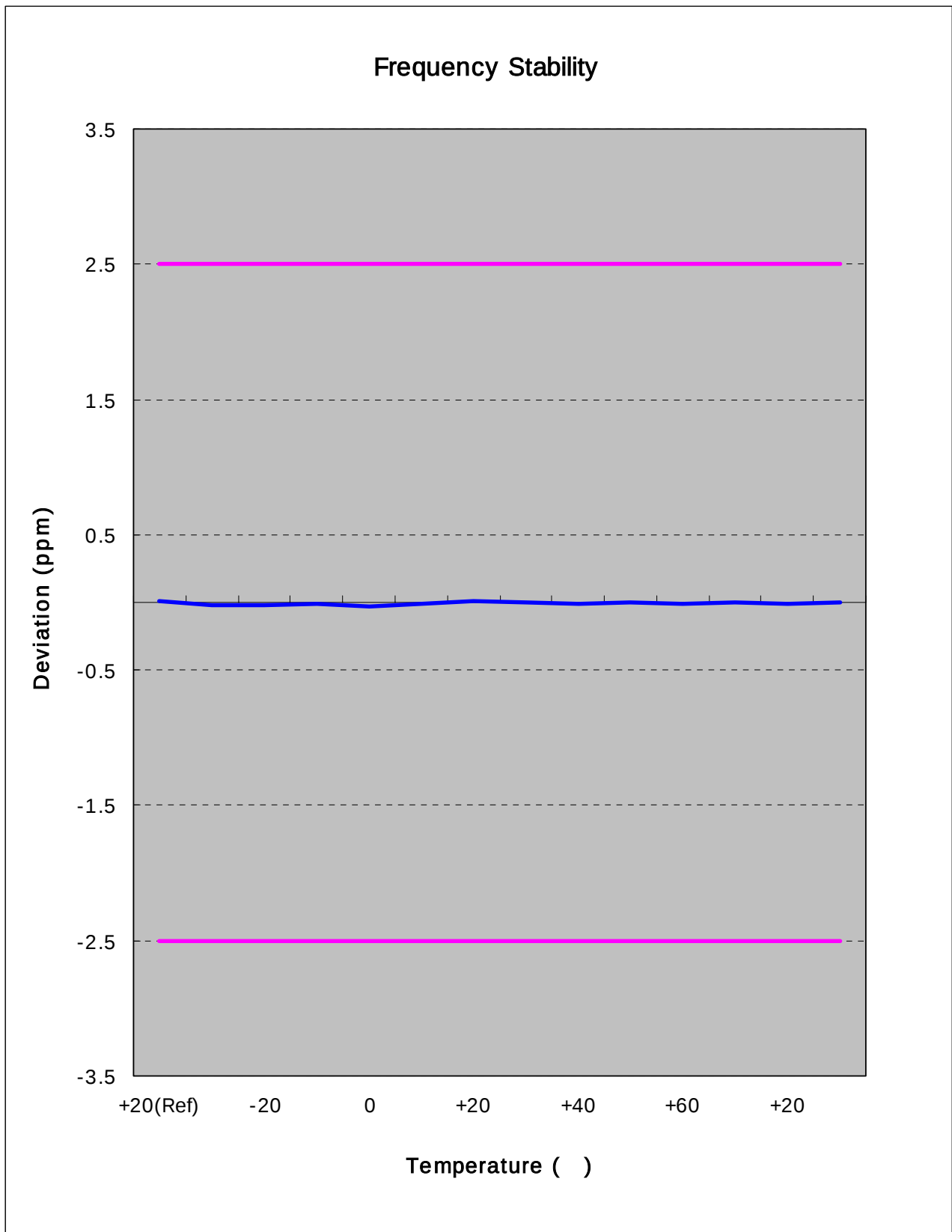
Channel : 661

Reference Voltage : 3.7VDC

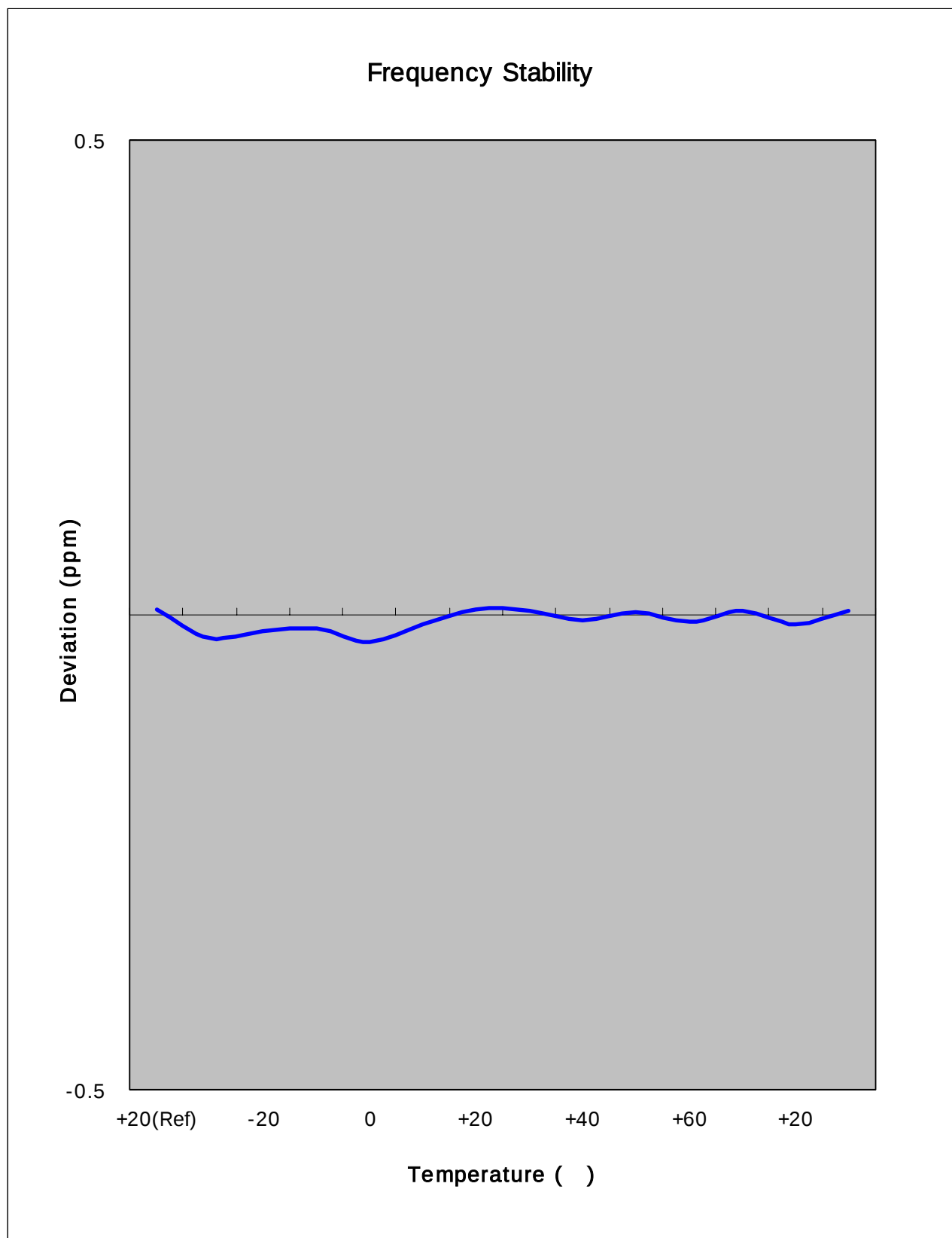
Deviation Limit : ± 0.00025 % or 2.5ppm

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency Error (Hz)	Frequency (Hz)	Deviation (%)	ppm
100%	3.70	+20(Ref)	9.87	1,880,000,010	0.000001	0.005
100%		-30	-46.06	1,879,999,954	-0.000002	-0.025
100%		-20	-32.72	1,879,999,967	-0.000002	-0.017
100%		-10	-25.59	1,879,999,974	-0.000001	-0.014
100%		0	-52.86	1,879,999,947	-0.000003	-0.028
100%		+10	-19.45	1,879,999,981	-0.000001	-0.010
100%		+20	9.78	1,880,000,010	0.000001	0.005
100%		+30	8			

6.4.2. GSM1900 Frequency Stability Graph



Zoom IN





7. CONCLUSION

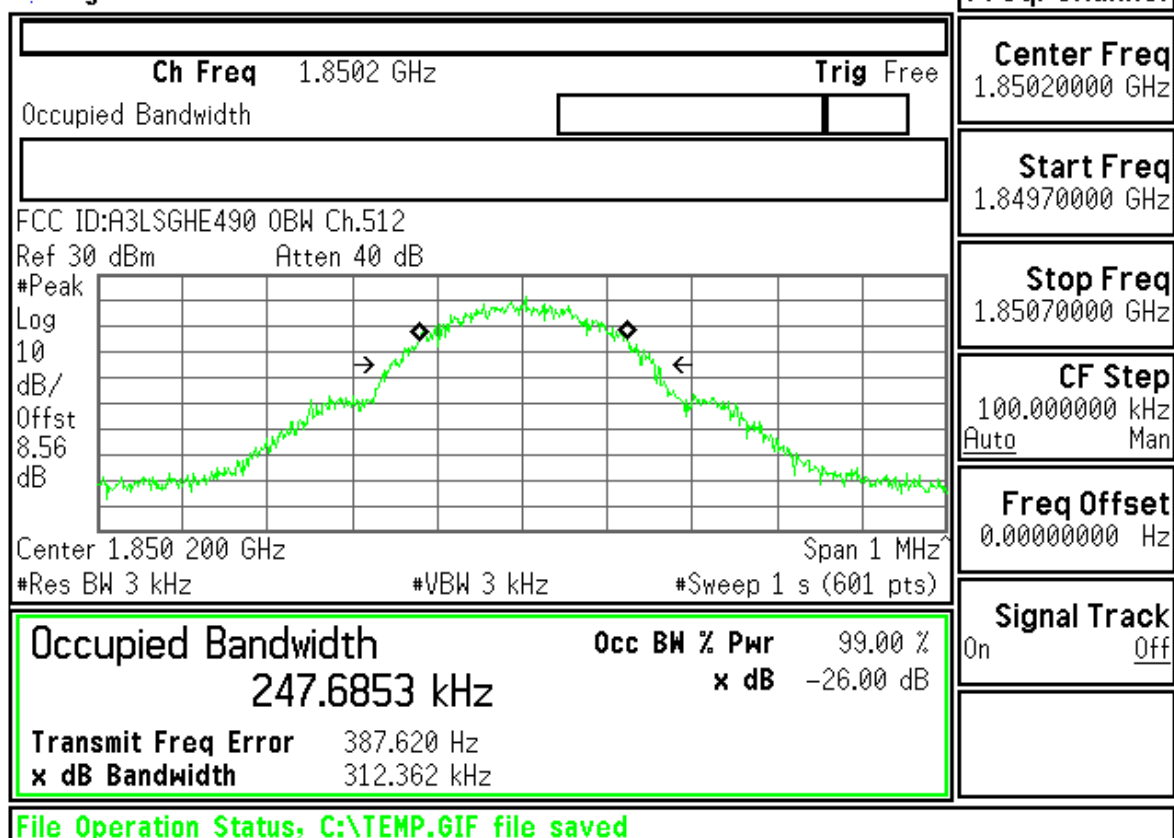
The data collected shows that the SAMSUNG Single-Band PCS GSM/EDGE Phone with Bluetooth. FCC ID : A3LSGHE490 complies with all the requirements of Parts 2,24 of the FCC Rules.

8. TEST PLOTS

GSM1900

Agilent

R T

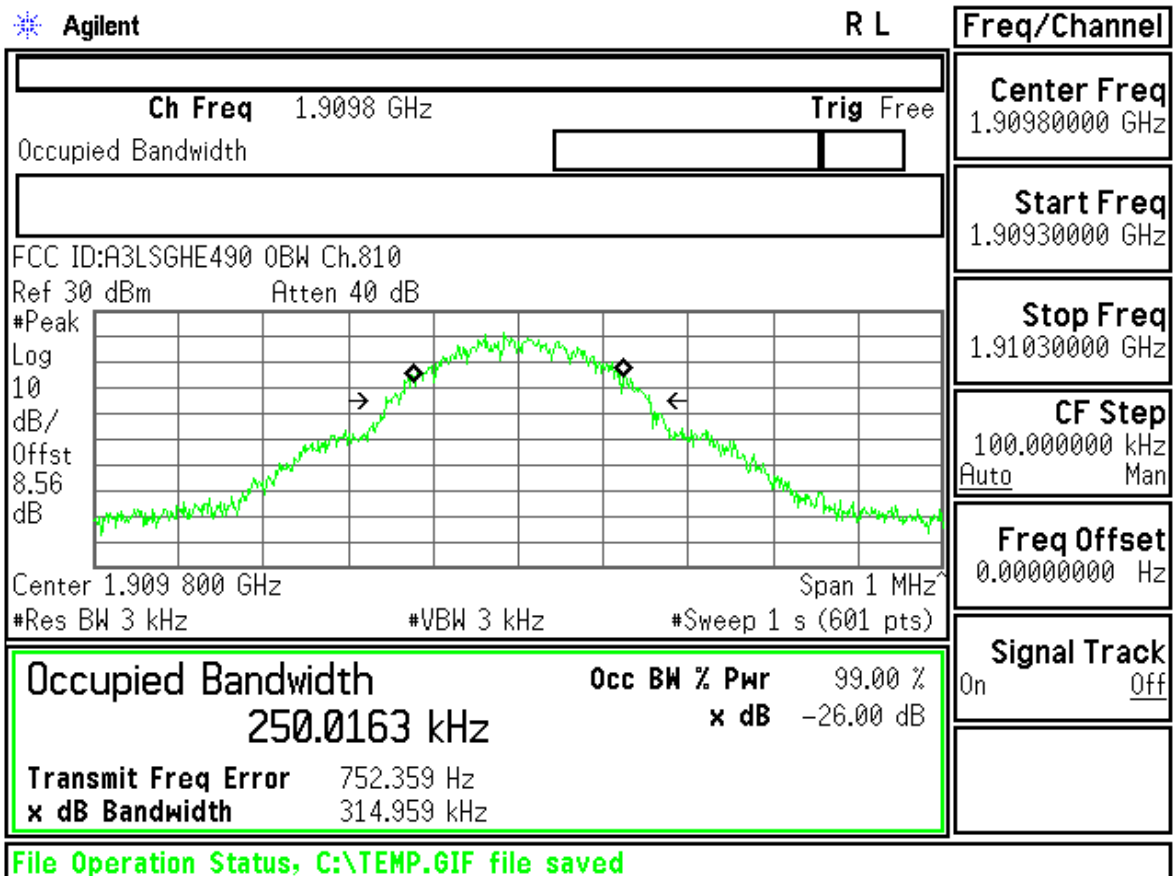


Freq/Channel

Center Freq
 1.85020000 GHz

Start Freq
 1.84970000 GHz

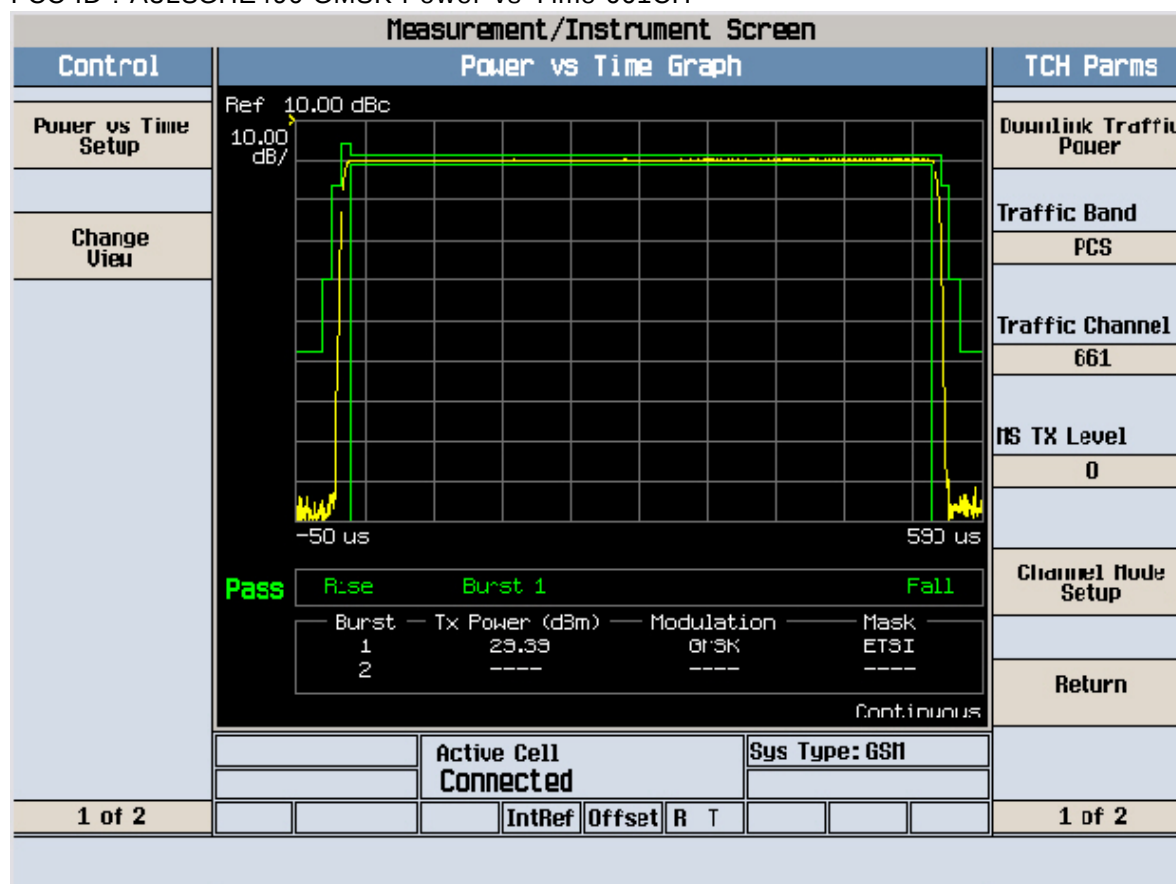
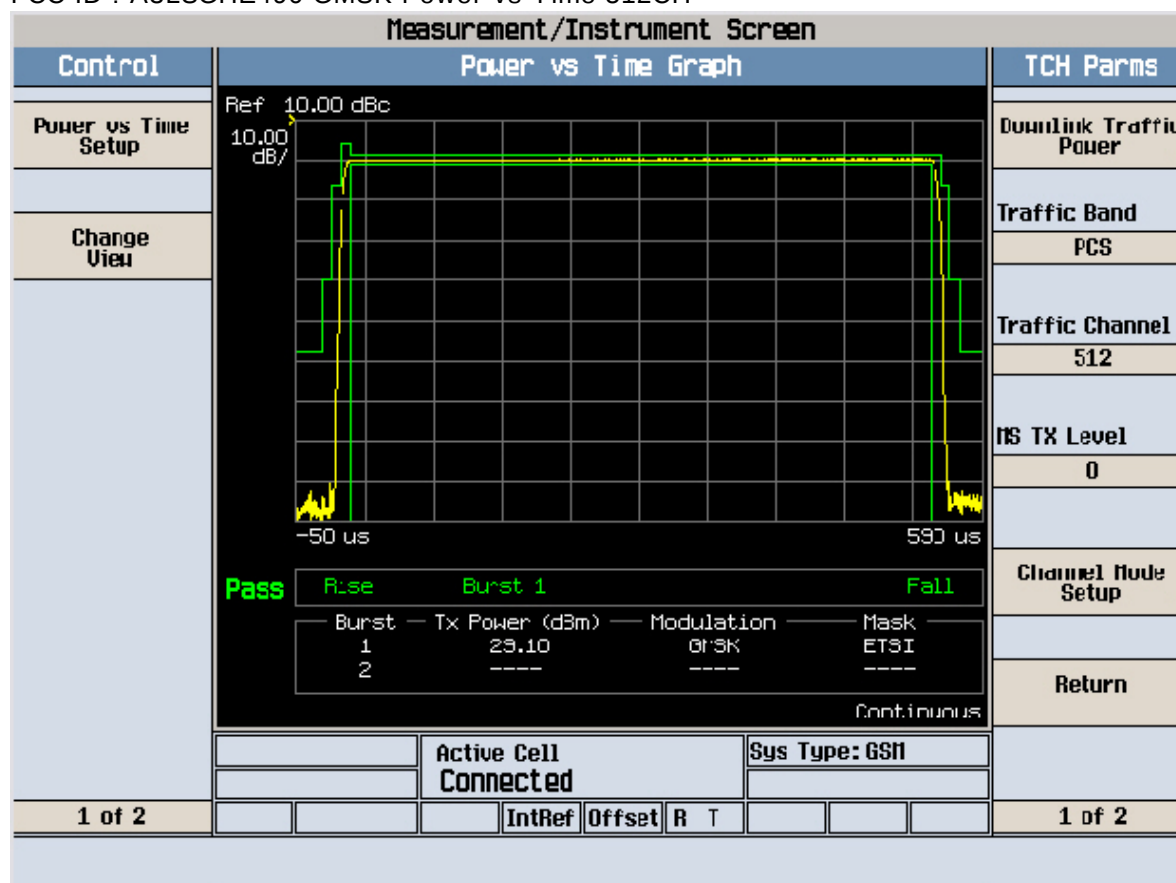
Stop Freq
 1.85070000 GHz

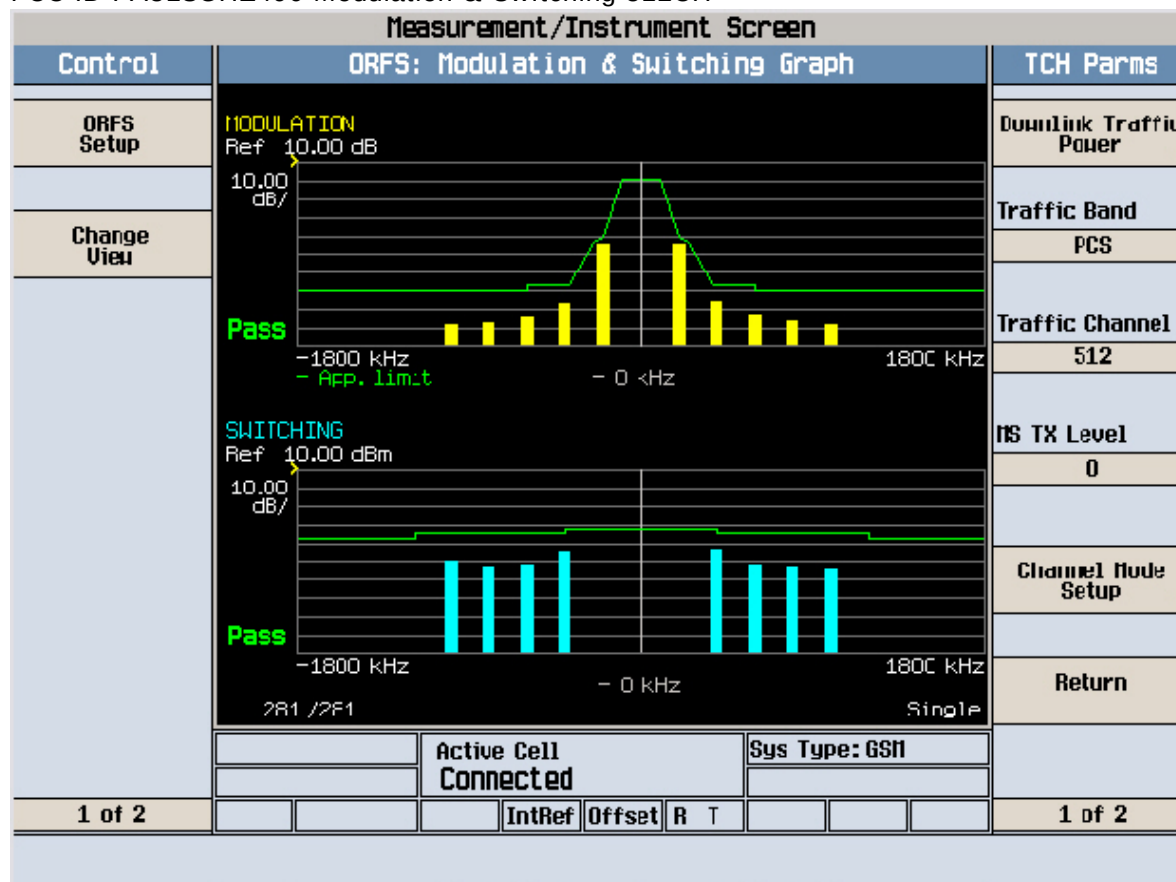
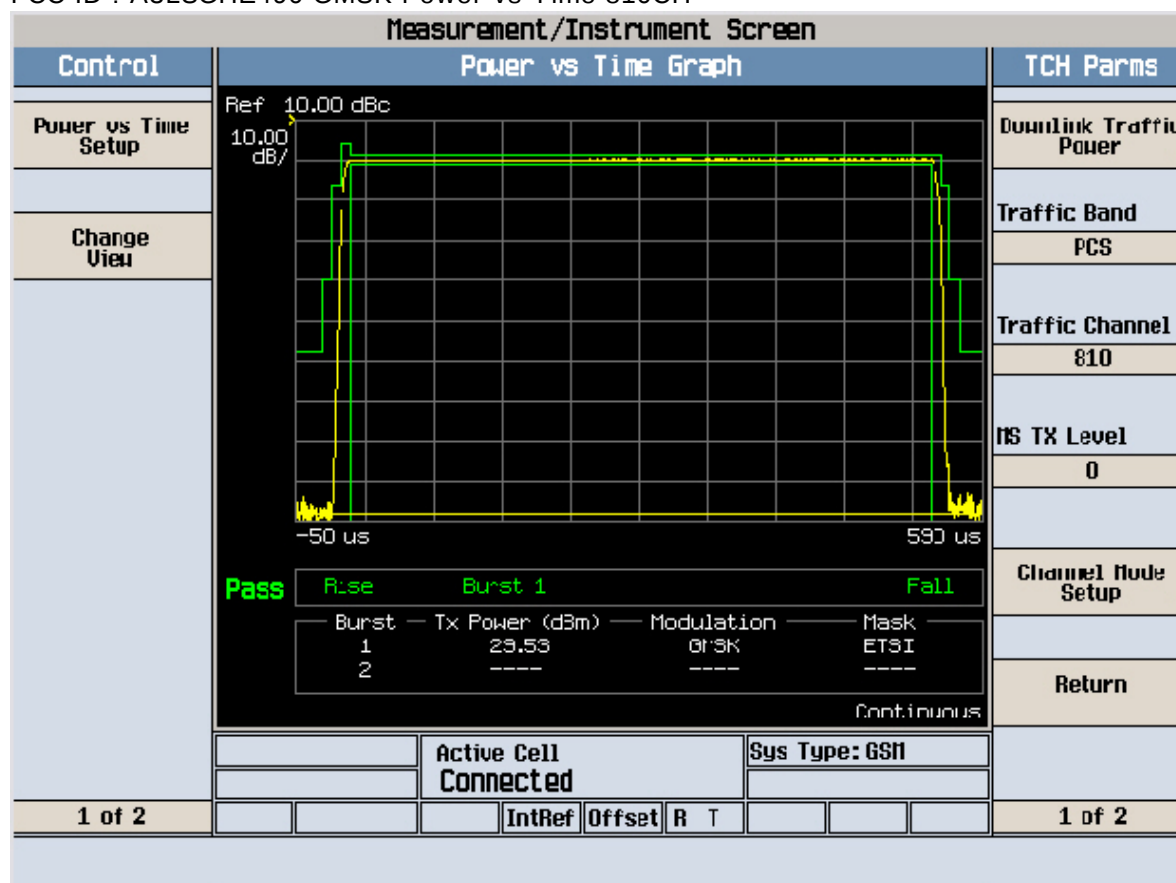


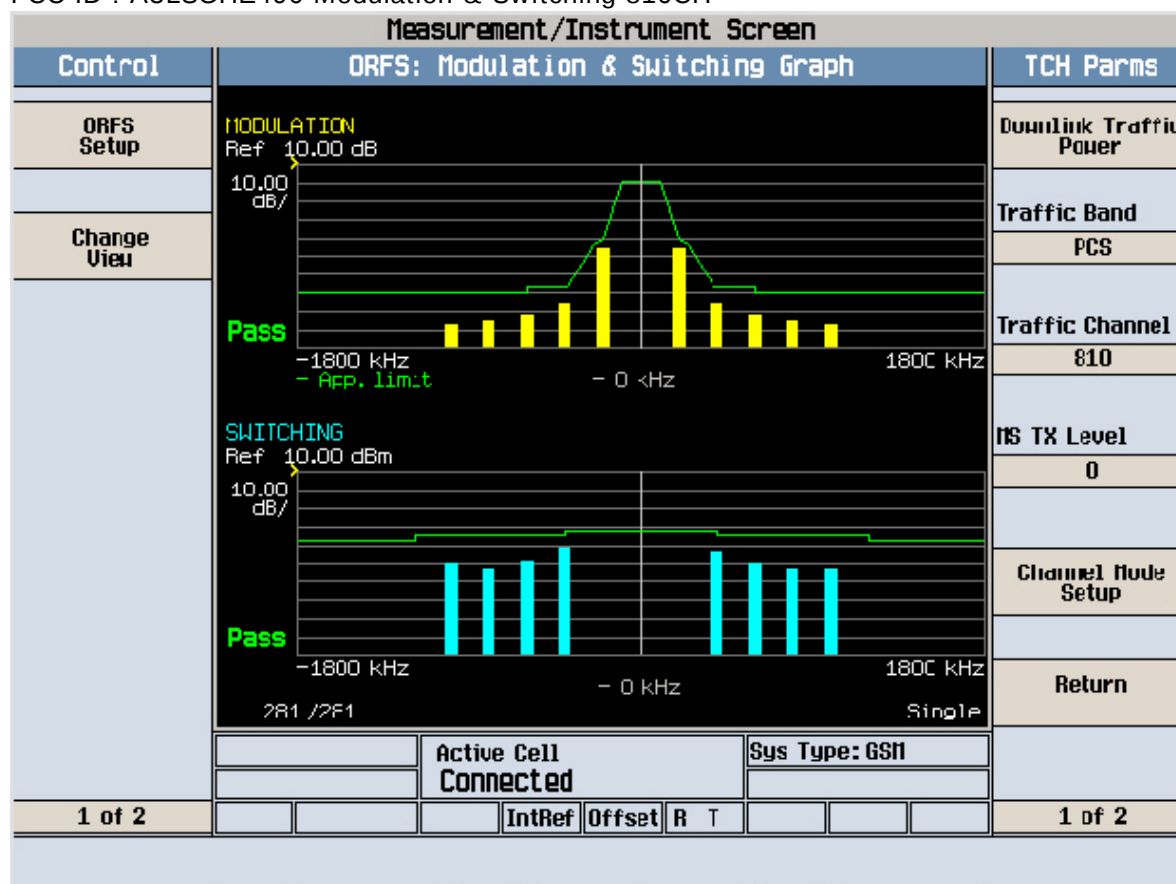
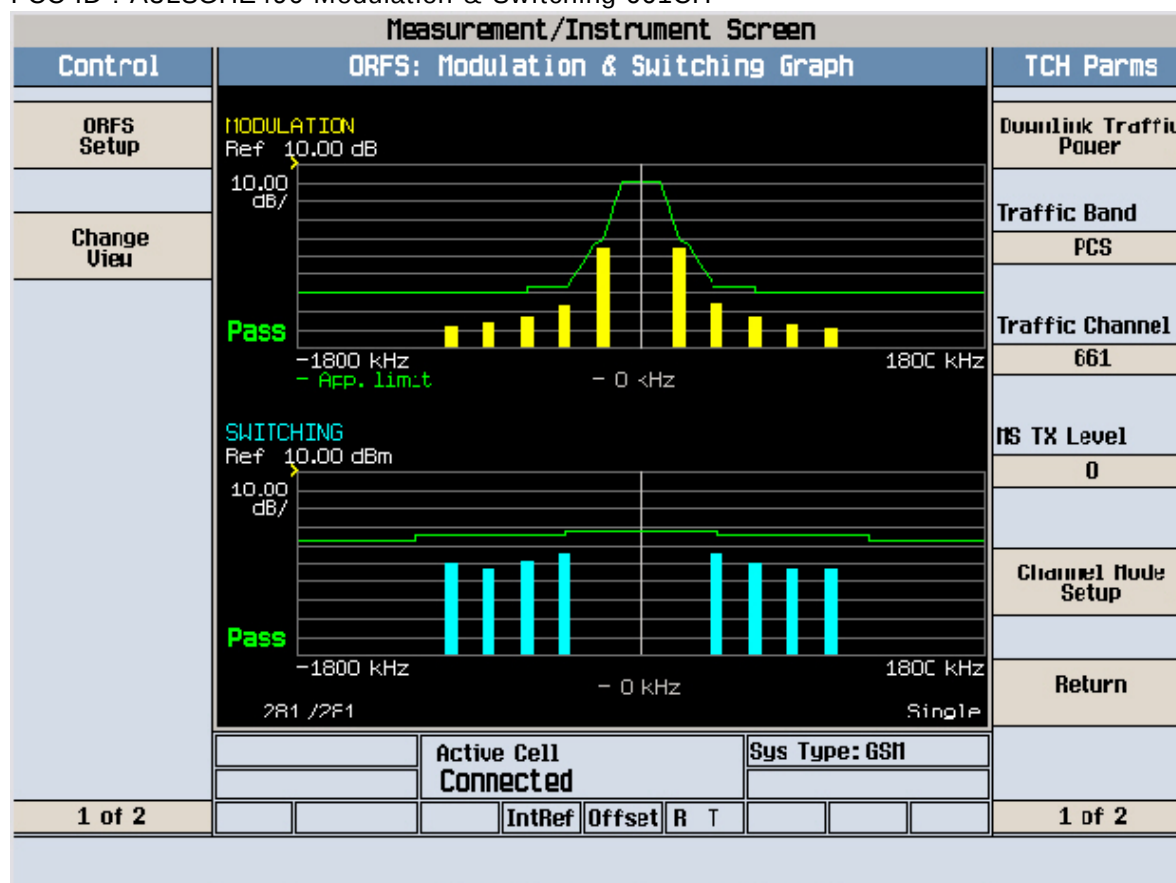
FCC ID : A3LSGHE490 Transmit Power 512CH

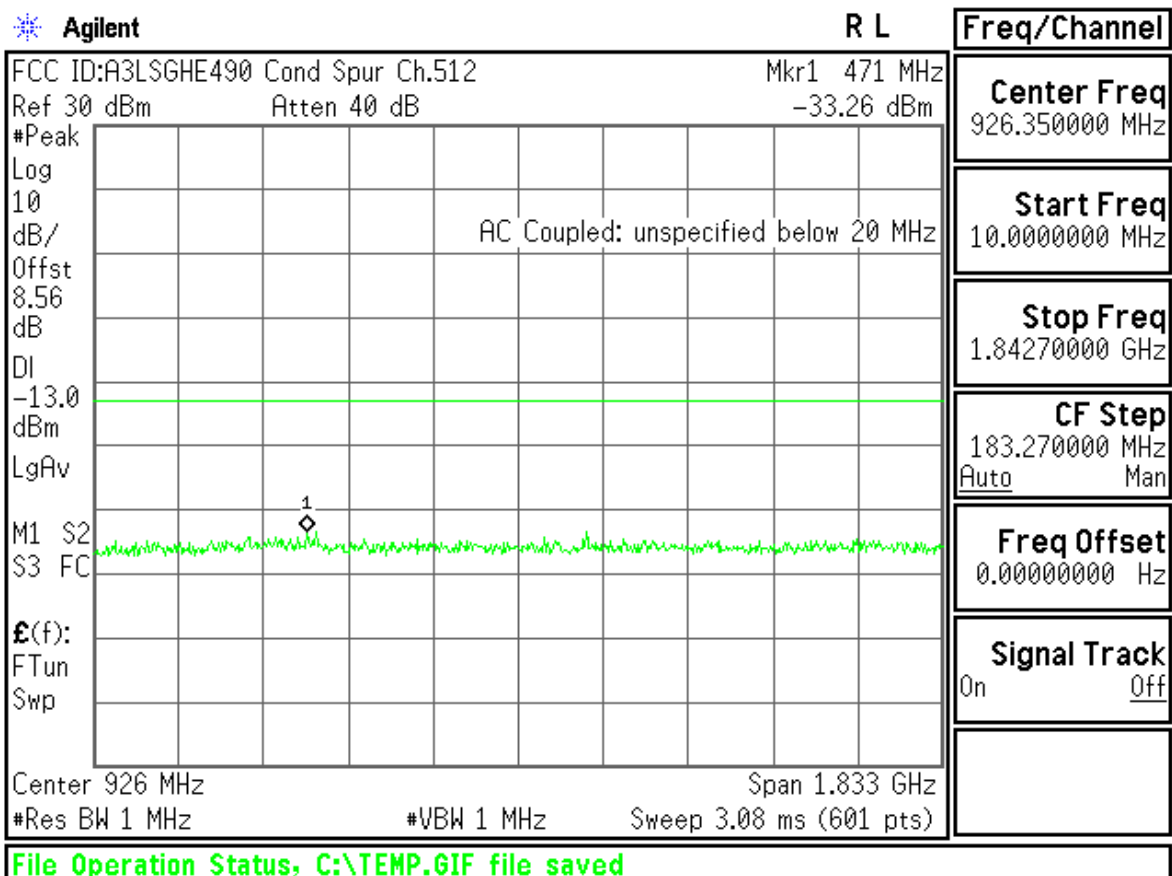
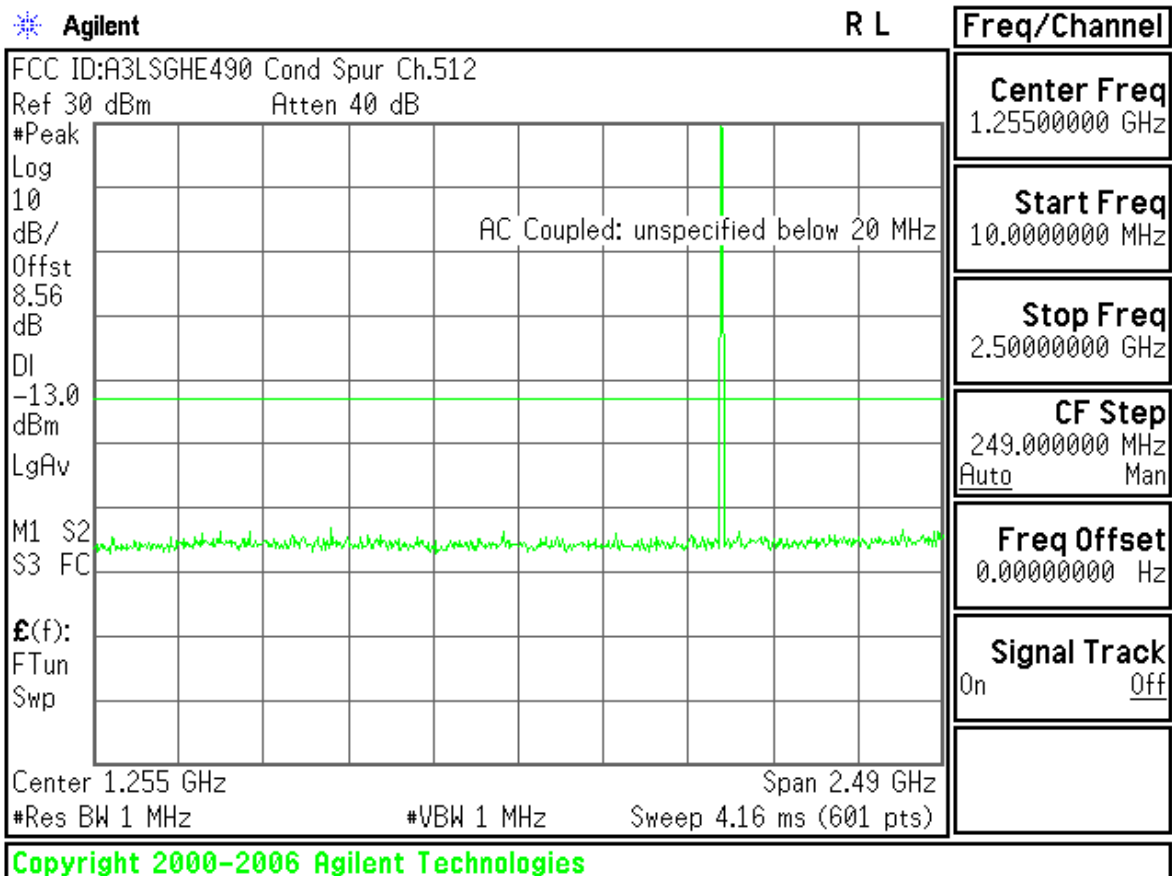
Measurement/Instrument Screen									
Control	GSM/GPRS Transmit Power						TCH Parms		
GSM/GPRS TX Power Setup ▾	GSMK Transmit Power 29.10 dBm						Downlink Traffic Power ▾		

Measurement/Instrument Screen															
Control	GSM/GPRS Transmit Power						TCH Parms								
GSM/GPRS TX Power Setup ▾	GSMK Transmit Power 29.39 dBm Single						Downlink Traffic Power ▾								
Swap Window Positions							Traffic Band	PCS							
							Traffic Channel	661							
							MS TX Level	0							
							Channel Mode Setup ▾								
							Return								
1 of 2	Phase & Frequency Error Single														





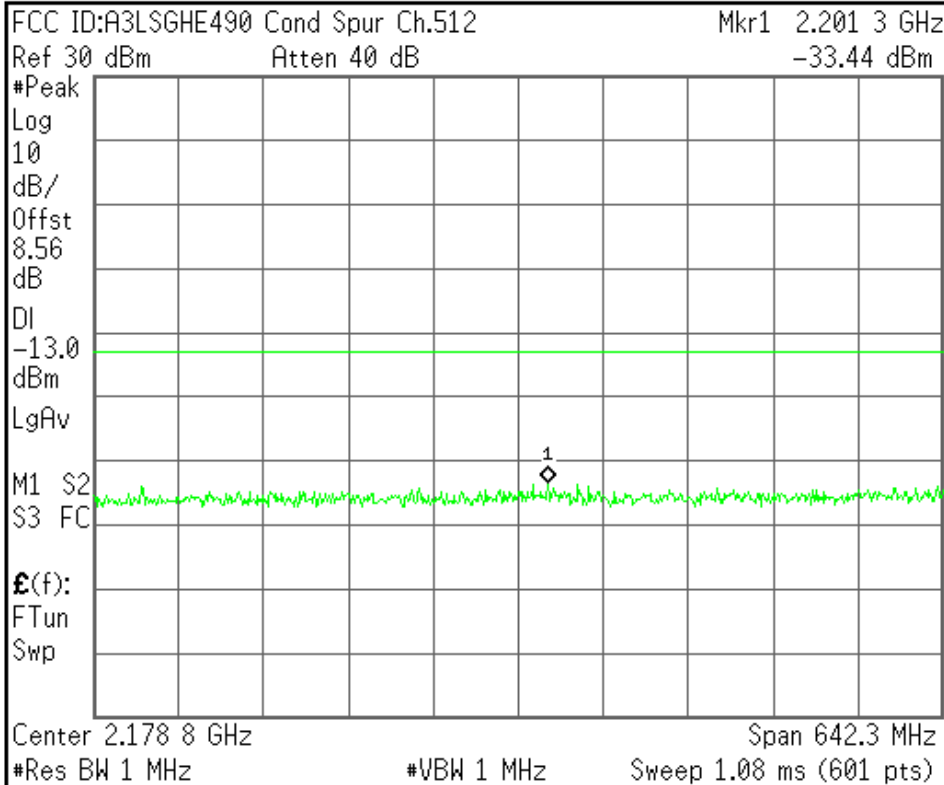




Agilent

R L

Freq/Channel



Center Freq
2.17885000 GHz

Start Freq
1.85770000 GHz

Stop Freq
2.50000000 GHz

CF Step
64.2300000 MHz
Auto Man

Freq Offset
0.00000000 Hz

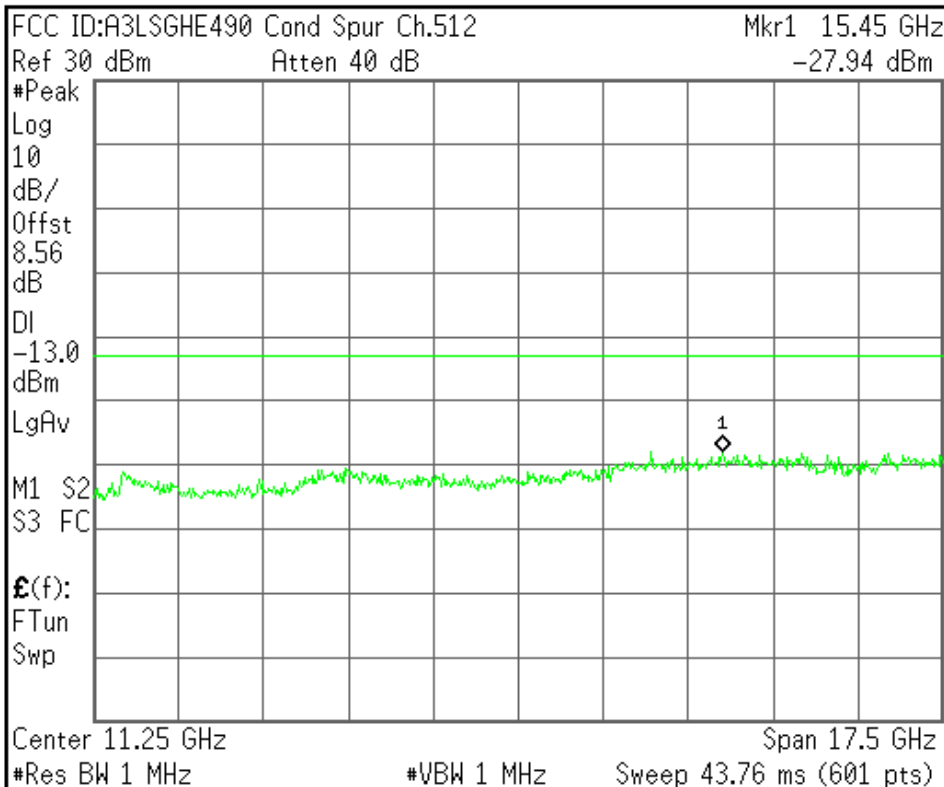
Signal Track
On Off

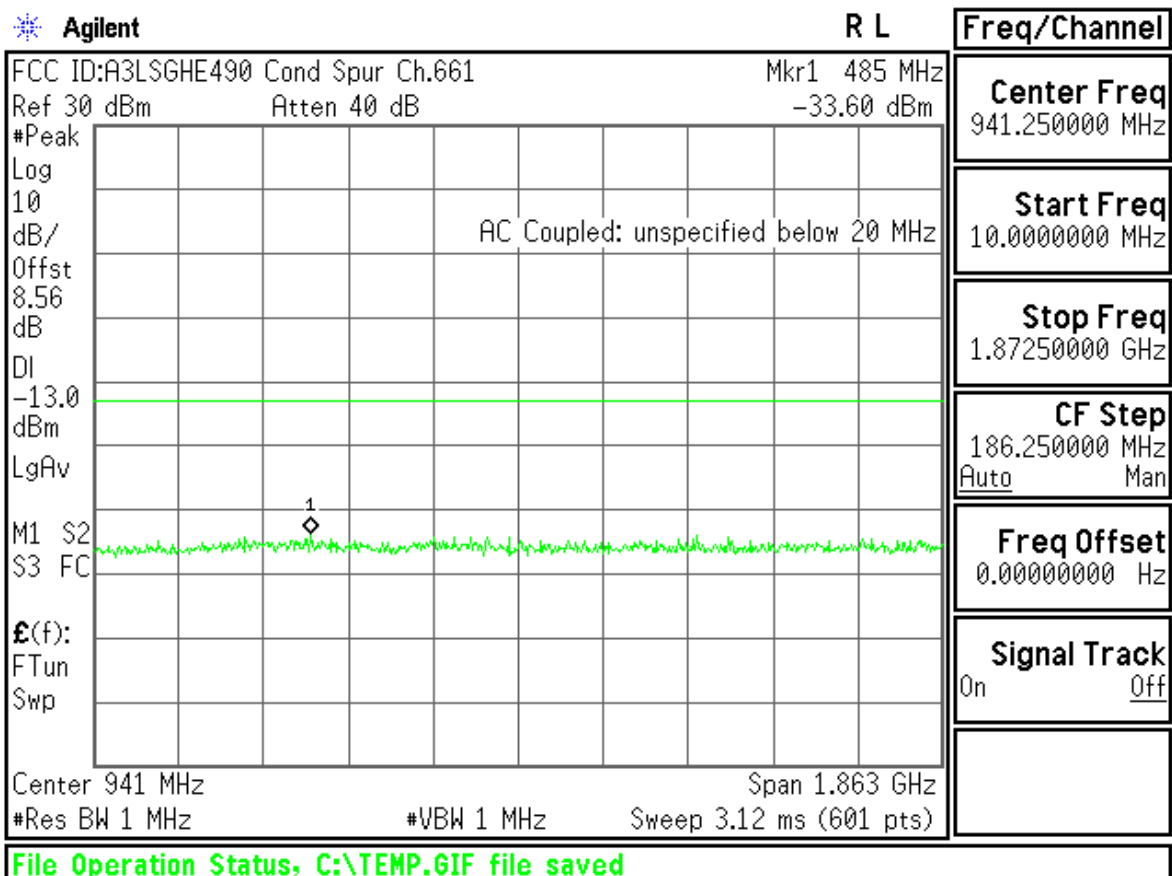
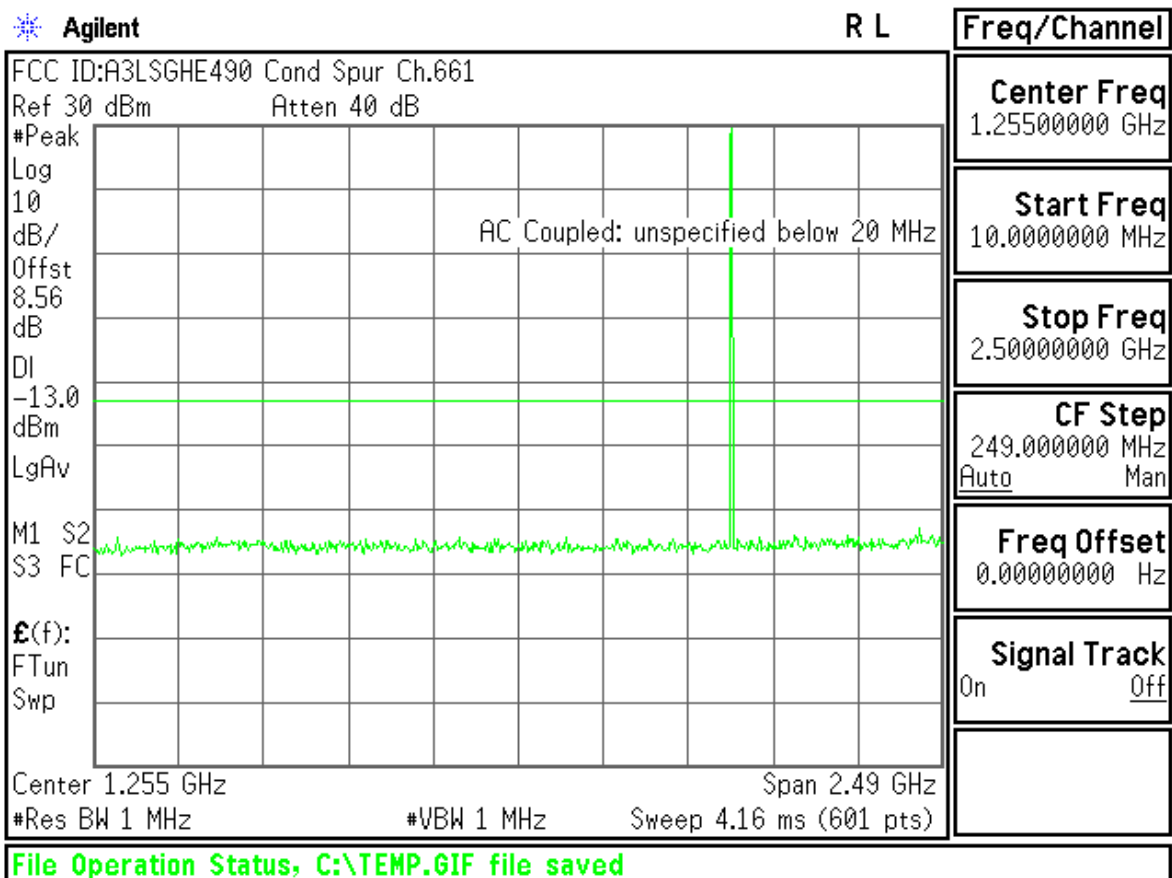
File Operation Status, C:\TEMP.GIF file saved

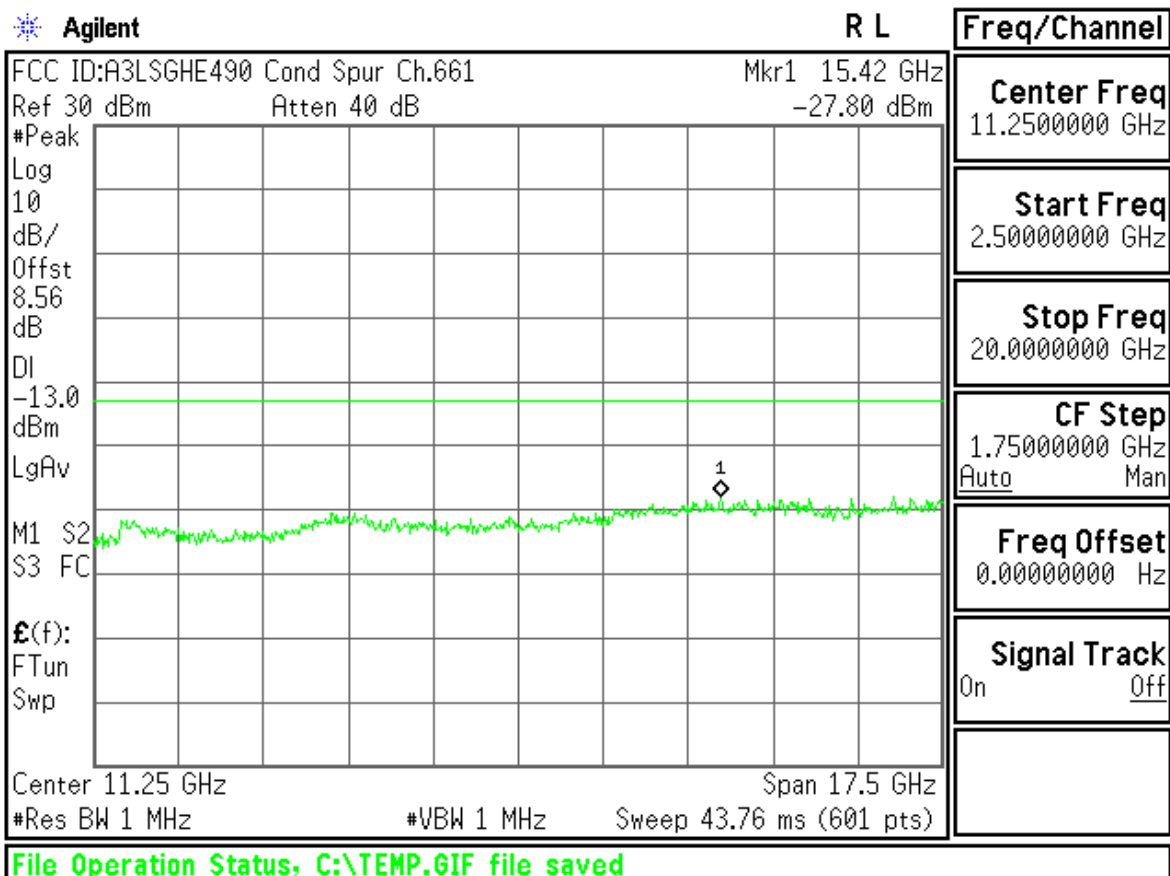
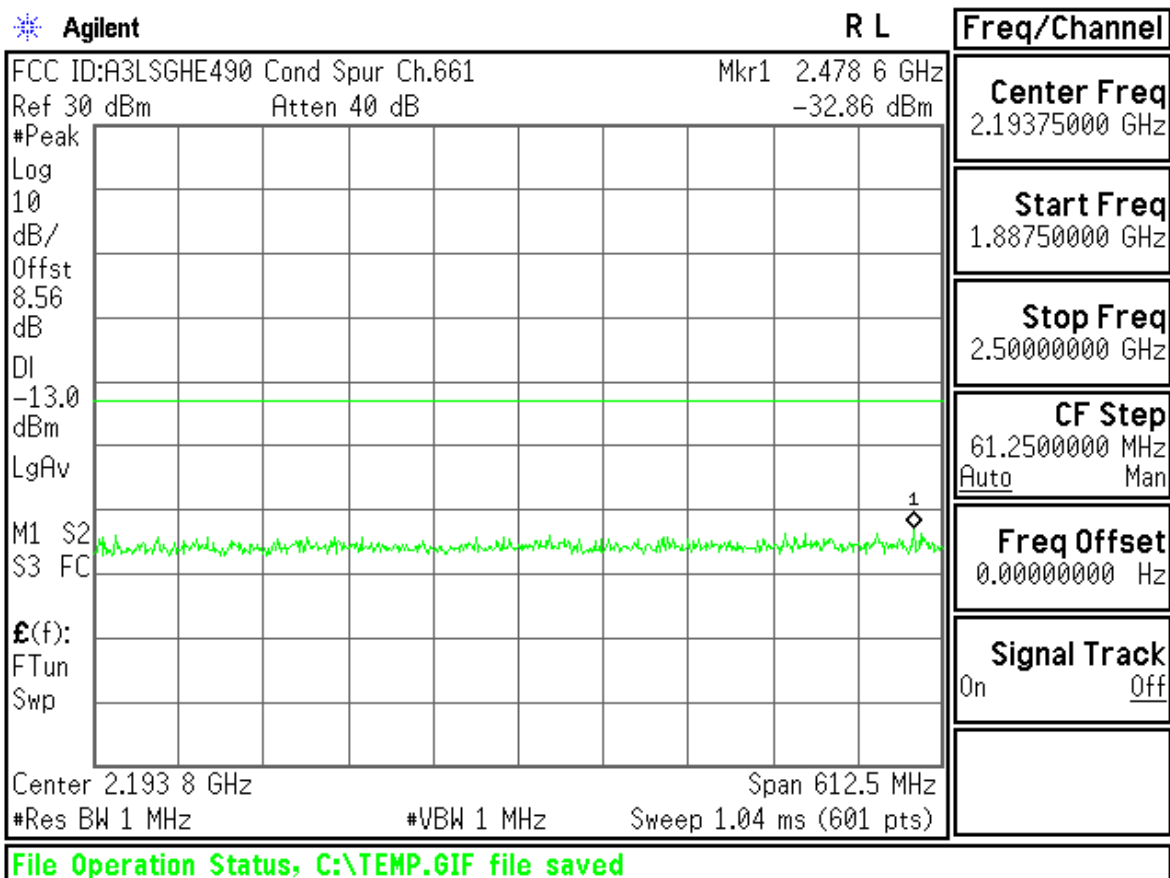
Agilent

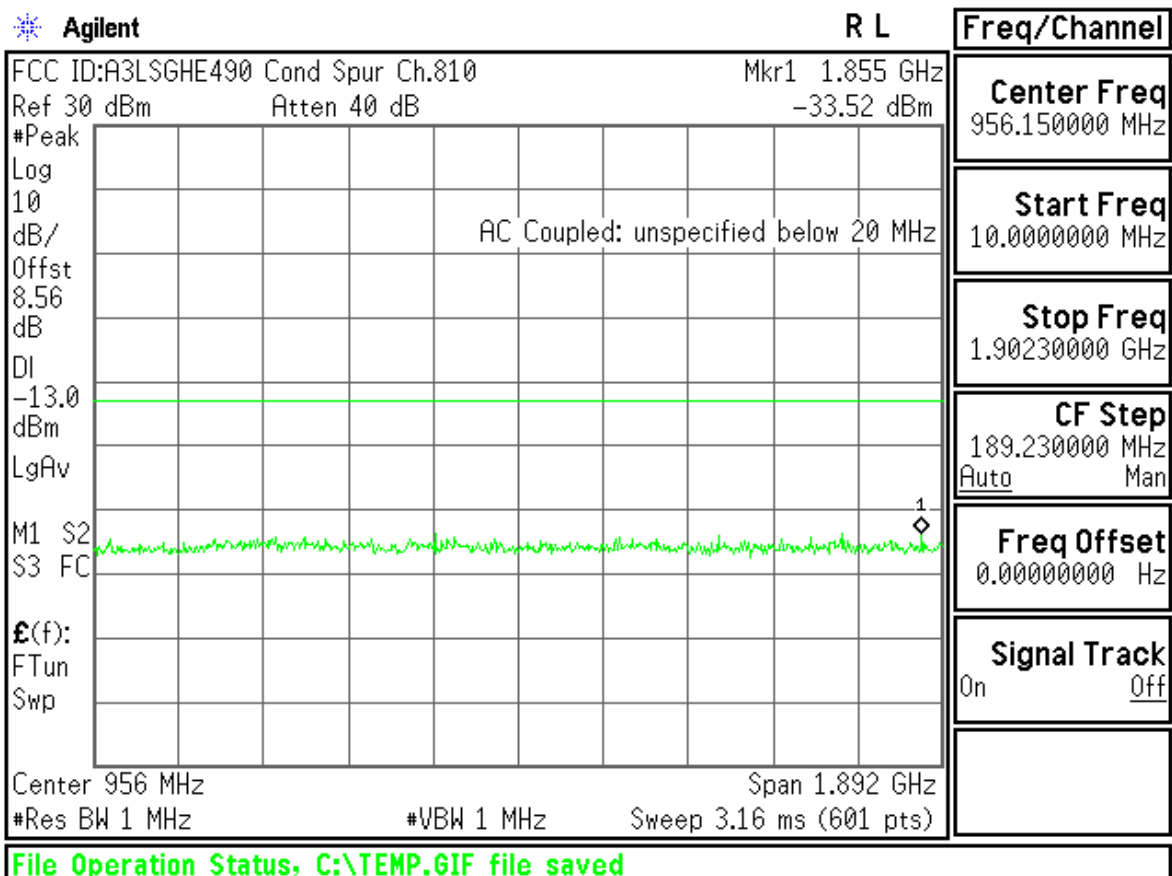
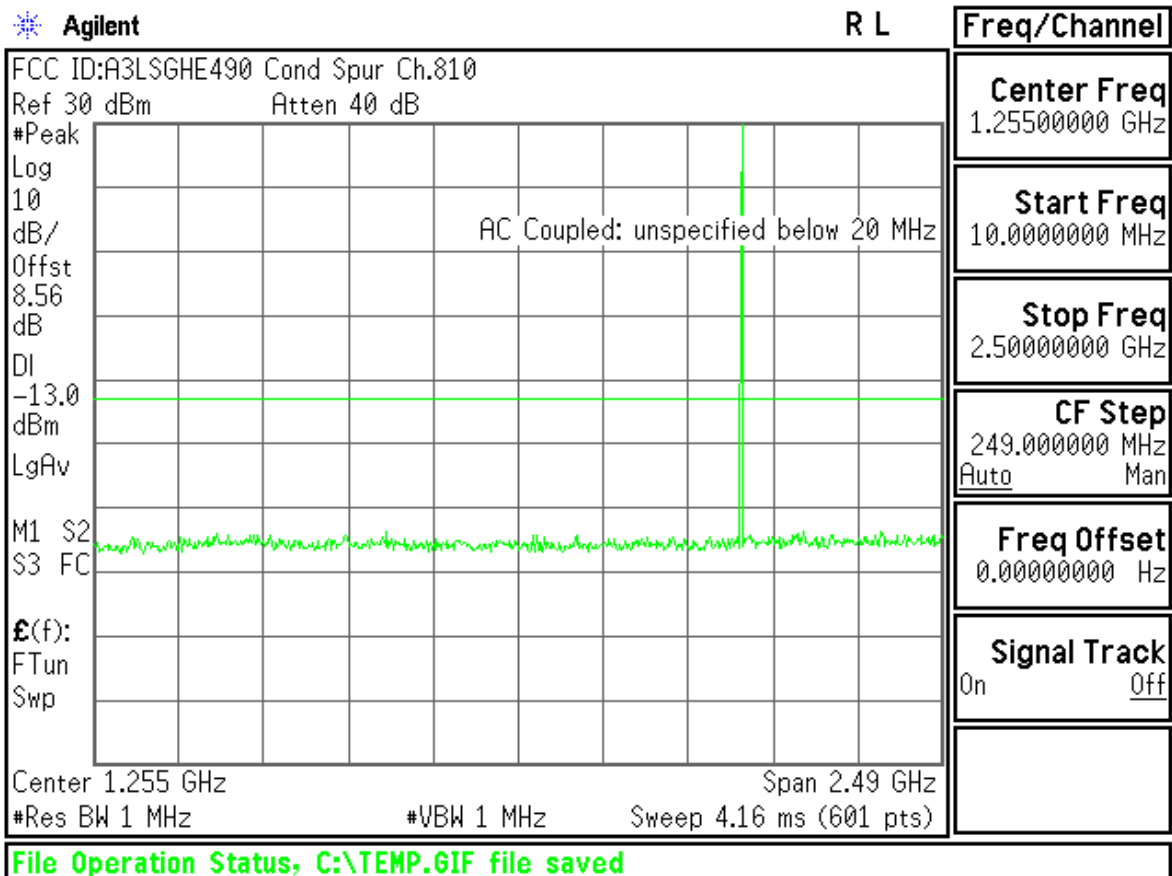
R L

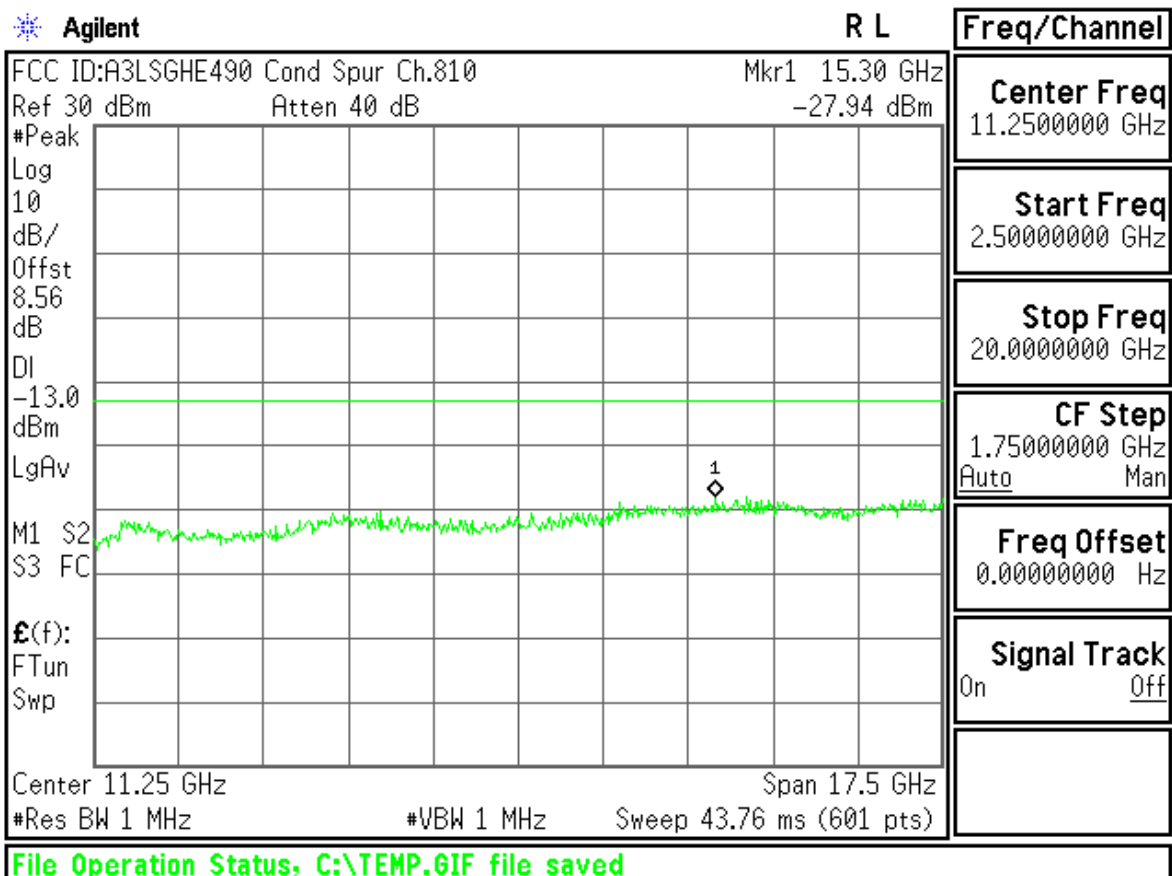
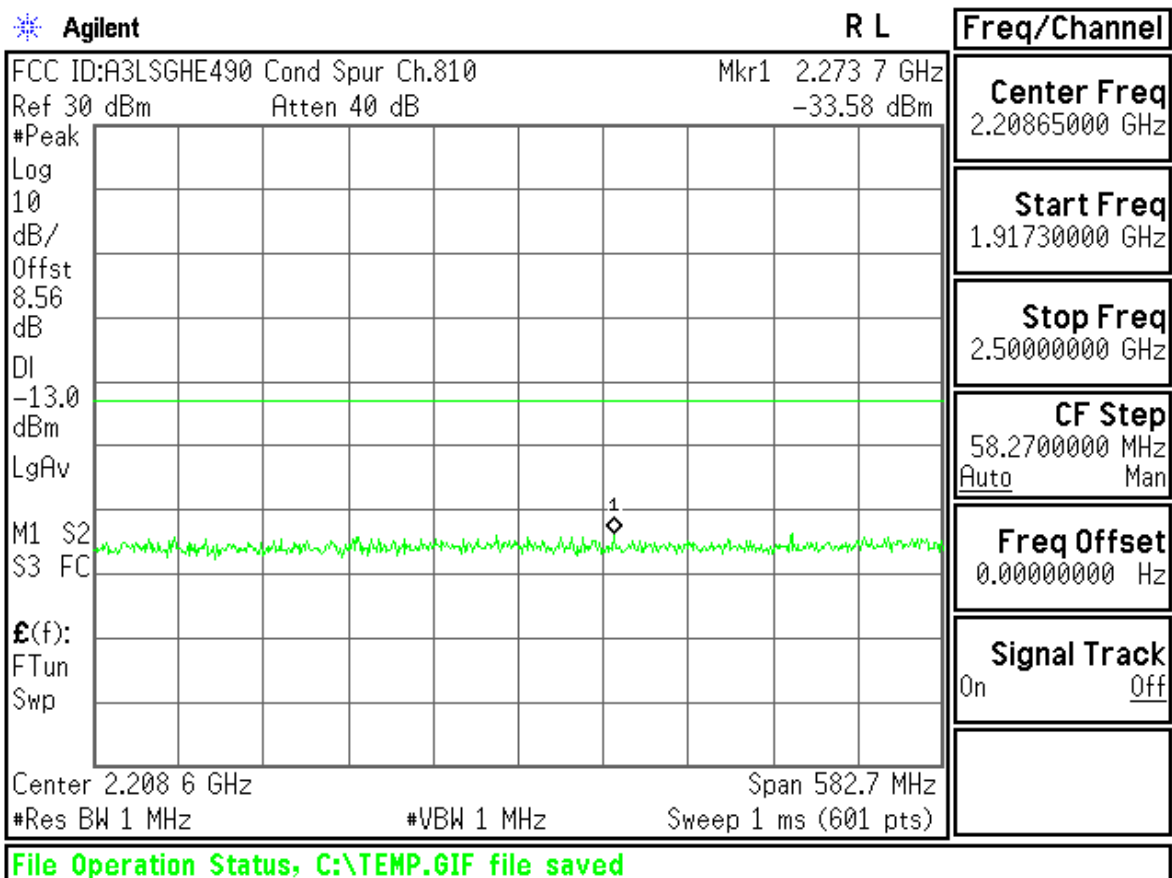
Freq/Channel











Agilent

R L

Freq/Channel

FCC ID:A3LSGHE490 Band Edge Ch.512

Ref 30 dBm

Atten 40 dB

#Avg

Log

10

dB/

Offst

8.56

dB

DI

-13.0

dBm

PAvg

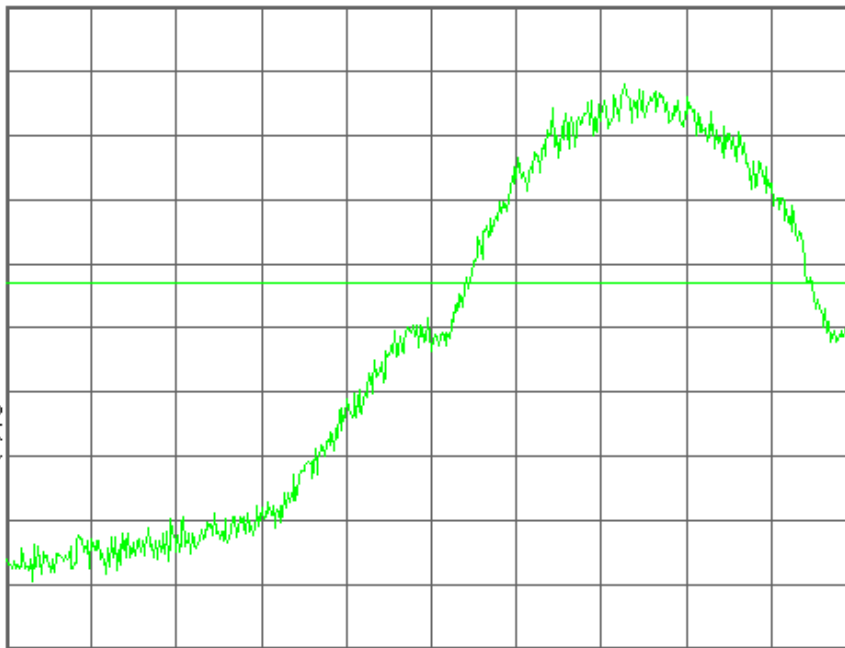
M1 S2

S3 FC

$E(f)$:

f>50k

Swp



Agilent

R L

Freq/Channel

FCC ID:A3LSGHE490 Band Edge Ch.810

Ref 30 dBm

Atten 40 dB

#Avg

Log

10

dB/

Offst

8.56

dB

DI

-13.0

dBm

PAvg

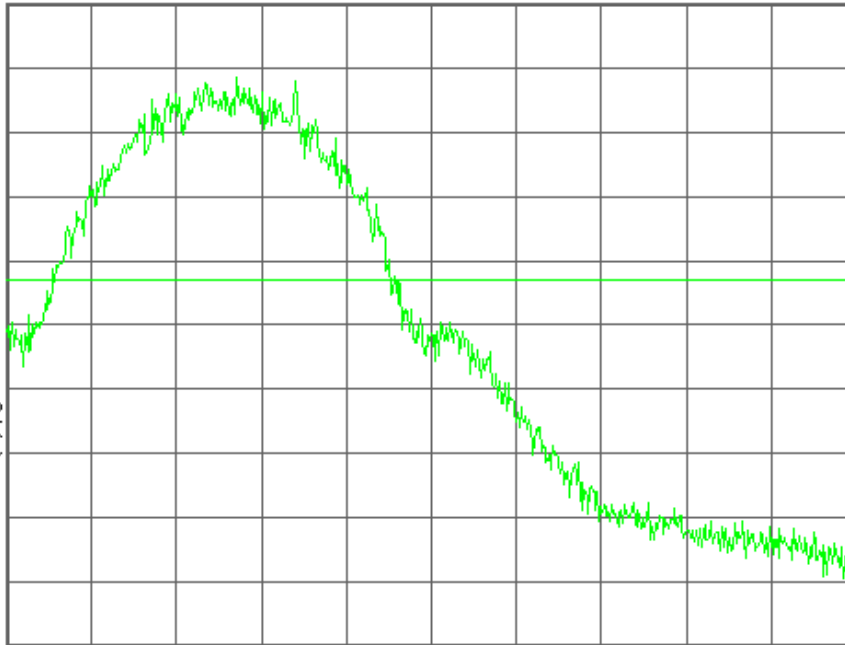
M1 S2

S3 FC

$E(f)$:

f>50k

Swp



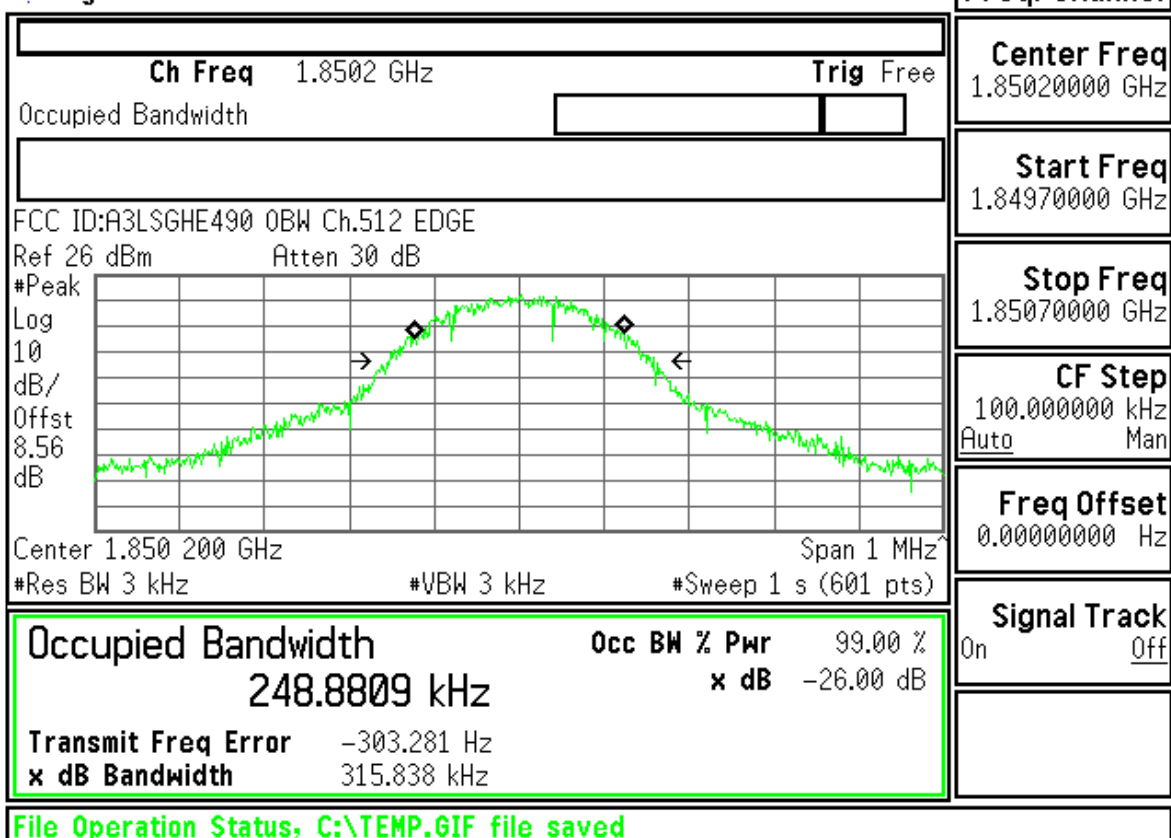
EDGE1900

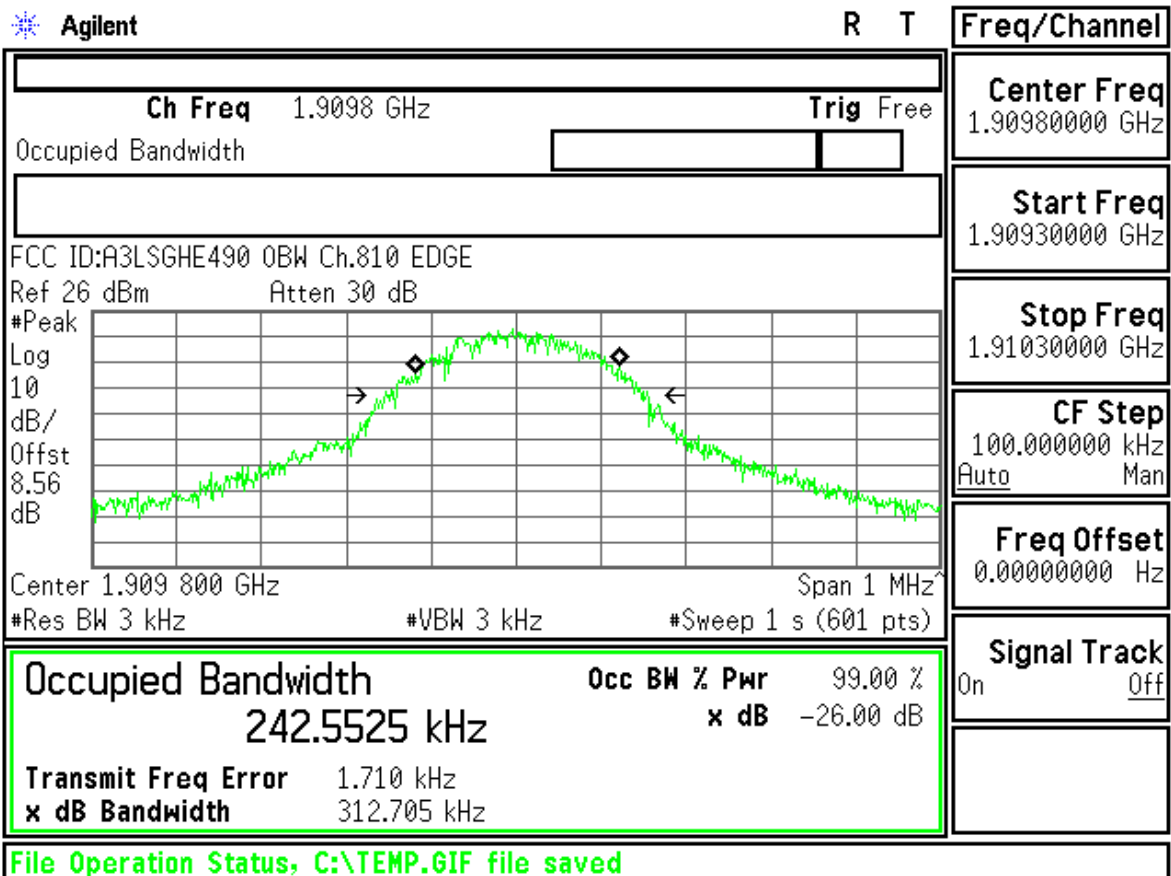


Agilent

R T

Freq/Channel

Center Freq
1.85020000 GHzStart Freq
1.84970000 GHzStop Freq
1.85070000 GHzCF Step
100.000000 kHz
Auto Man



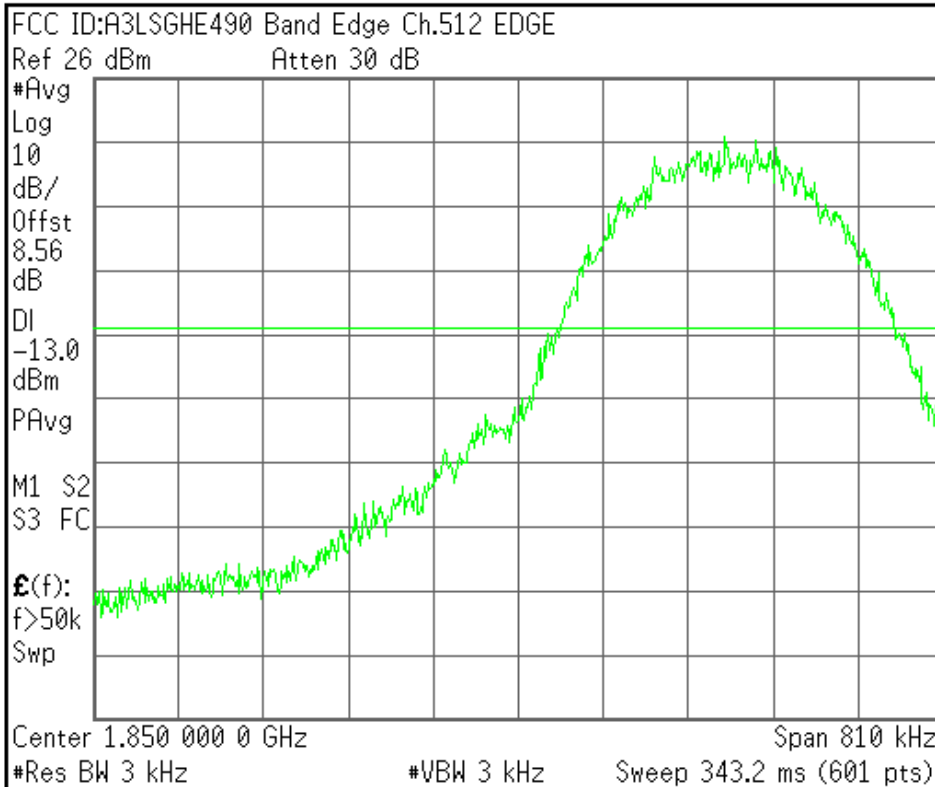
Measurement/Instrument Screen											
Control		EGPRS Transmit Power						PDCH Params			
EGPRS Transmit Power Setup ▾		EPSK Burst Power 26.32 dBm EPSK Est Carrier Power 26.17 dBm Single						Downlink Traffic Power ▾ Traffic Band PCS Traffic Channel 661 HS TX Level ▾ Modulation Coding Scheme ▾ Return			
1 of 2				Active Cell Transferring		Sys Type: EGPRS				1 of 2	
				IntRef	Offset	R	T				

Measurement/Instrument Screen											
Control		EGPRS Transmit Power						PDCH Params			
EGPRS Transmit Power Setup ▾		EPSK Burst Power 26.07 dBm EPSK Est Carrier Power 25.99 dBm Single						Downlink Traffic Power ▾ Traffic Band PCS Traffic Channel 810 HS TX Level ▾ Modulation Coding Scheme ▾ Return			
1 of 2				Active Cell Transferring		Sys Type: EGPRS				1 of 2	
				IntRef	Offset	R	T				

Agilent

R L

Freq/Channel



Center Freq
1.85000000 GHz

Start Freq
1.84959500 GHz

Stop Freq
1.85040500 GHz

CF Step
81.0000000 kHz
Auto Man

Freq Offset
0.00000000 Hz

Signal Track
On Off

Copyright 2000-2006 Agilent Technologies

Agilent

R L

Freq/Channel

Agilent

R T

Freq/Channel

FCC ID:A3LSGHE490 Band Edge Ch.810 EDGE

Ref 26 dBm

Atten 30 dB

#Avg

Log

10

dB/

Offst

8.56

dB

DI

-13.0

dBm

PAvg

M1 S2

S3 FC

$\mathcal{E}(f)$:

f>50k

Swp

