

47 CFR FCC
PART 90-PRIVATE LAND MOBILE RADIO
SERVICES
MEASUREMENT AND TEST REPORT

For

Pacific Crest Corporation

510 Deguigne Drive, Sunnyvale, CA 94085, USA

FCC ID: KEAADLV
Model: ADLV-1, ADLV-2


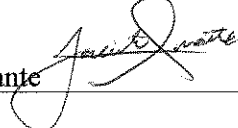
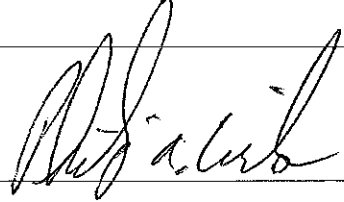
Report Type: Original Report	Product Type: UHF Transceiver
Test Engineer: Hui Chen 	Jacinto Amante 
Report Number: ADLVFCC063009	
Report Date: 2009-06-30	
Reviewed By: Philip Wilson 	
Prepared By: Pacific Crest Corporation 510 Deguigne Drive. Sunnyvale, CA 94085, USA Tel: (408) 481-8070 Fax: (408) 481-8984	

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GENERAL INFORMATION

Technical Summary

No. of Units: Two

Power Characteristics: Variable output power from 100 mW to 4 Watt.

Channel Spacing: 25 kHz & 12.5 kHz,

Unit No.1: Frequency Characteristics: 430 MHz to 470 MHz,

Test Frequency: 430.15 MHz, 449.85 MHz, 469.85 MHz

Product Serial Number: 09200001

Unit No.2: Frequency Characteristics: 390~430 MHz

Test Frequency: 390.15 MHz, 409.85 MHz, 429.85 MHz

Product Serial Number: 09260003

Temperature Range:-30°C to 60°C

DC power section: Incoming DC voltage is regulated with a switching DC to DC converter. The externally supplied DC voltage may vary from 9 V~30 V, if the external voltage is outside this range, it will not be allowed to operate. In following TX & RX testing, we use 12 VDC as our external supplied DC voltage.

EUT Photo



Objective

The following report is prepared for the Pacific Crest Corporation's product, model ADLV-1(390~430 MHz) & ADLV-2(430~470 MHz) in accordance with Part 2 and part 90 of the Federal Communication Commission rules.

The objective of the manufacturer is to determine compliance with FCC rules for output power, occupied bandwidth (emission mask), spurious emission at antenna terminal, frequency stability, spurious radiated emissions and transient frequency behavior.

Related Submittal(s)/Grant(s)

None

Test Methodology

All test and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 90-Private Land Mobile Radio Service

Applicable Standards: TIA/EIA-603-C, ANSI 63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz

All radiated emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna to EUT distance of 3 meters.

SYSTEM TEST CONFIGURATION

Justification

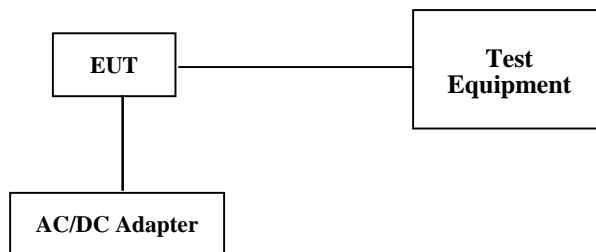
The host system was configured for testing according to TIA/EIA 603-C

The EUT was tested in the normal (native) operation mode to represent worst-case results during the final qualification test, the test software was provided by the Pacific crest Corp.

Equipment Modifications

No modifications were made to the EUT.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§2.1046 and §90.205	RF Output Power	Compliant
§2.1049 and §90.209	Emission Mask, Occupied BW	Compliant
§2.1051 and §90.210	Spurious Emissions	Compliant
§2.1053 and §90.210	Field Strength of Spurious Radiation	Compliant *
§2.1055 and §90.213	Frequency Stability	Compliant
§2.106 and §90.214	Transient Frequency Behavior	Compliant
§2.1091	RF Exposure	Compliant *

Note: * Please refer to the radiated emission test report released by BAACL, report number: R0907271-90

FCC §2.1046 - RF Output Power

Applicable Standard

Per FCC § 2.1046 and § 90.205, Maximum ERP is dependent upon the station's antenna HAAT and required service area.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer or a power meter through appropriate attenuator.

Test Equipment List

Manufacturer	Description	Model	S/N	Cal Due Date
TekPower	DC Power Supply	HY3005D	N/A	N/A
HP	Power sensor	8482A	US37293274	12/23/2009
HP	Power Meter	435B	2235A06162	12/23/2009
Agilent	Spectrum Analyzer	8562EC	3946A00187	12/23/2009

Test Environment Conditions

Temperature:	21~22 °C
Relative Humidity:	70~75 %

Test Engineer: JACINTO AMANTE

Test Date: 06/21/2009, 06/26/2009

Test Result

S/N: 09200001

Band	Frequency (MHz)	Conducted Output Power (dBm)
430~470 MHz	430.15	35.3
	449.85	35.3
	469.85	36.1
390~430 MHz	390.15	35.3
	409.85	35.2
	429.85	35.2

FCC §2.1049, §90.209 & §90.210 – Occupied Bandwidth and Emission Mask

Applicable Standard

§ 2.1049 and § 90.210

12.5 kHz bandwidth

For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 , 0 dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least $7.27(f_d - 2.88 \text{ kHz})$ dB.

On any frequency removed from the center of the authorized bandwidth by displacement frequency (f_d in kHz) of more than 12.5 kHz at least:
 $50 + 10 \log P$ or 70 dB

25 kHz Bandwidth

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz but no more than 10 kHz, at least $83 \log (f_d/5)$ dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz but no more than 250% of the authorized bandwidth, at least $29 \log (f_d/11)$ dB or 50 dB.

On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: at least $43 + 10 \log (P)$ dB.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer or a power meter through appropriate attenuator.

The resolution bandwidth of the spectrum analyzer was set at 100 Hz and spectrum was recorded in the frequency band ± 50 kHz or ± 25 kHz from the carrier frequency.

Test Equipment List

Manufacturer	Description	Model	S/N	Cal Due Date
TekPower	DC Power Supply	HY3005D	N/A	N/A
Agilent	Spectrum Analyzer	8562EC	3946A00187	12/23/2009

Test Environment Conditions

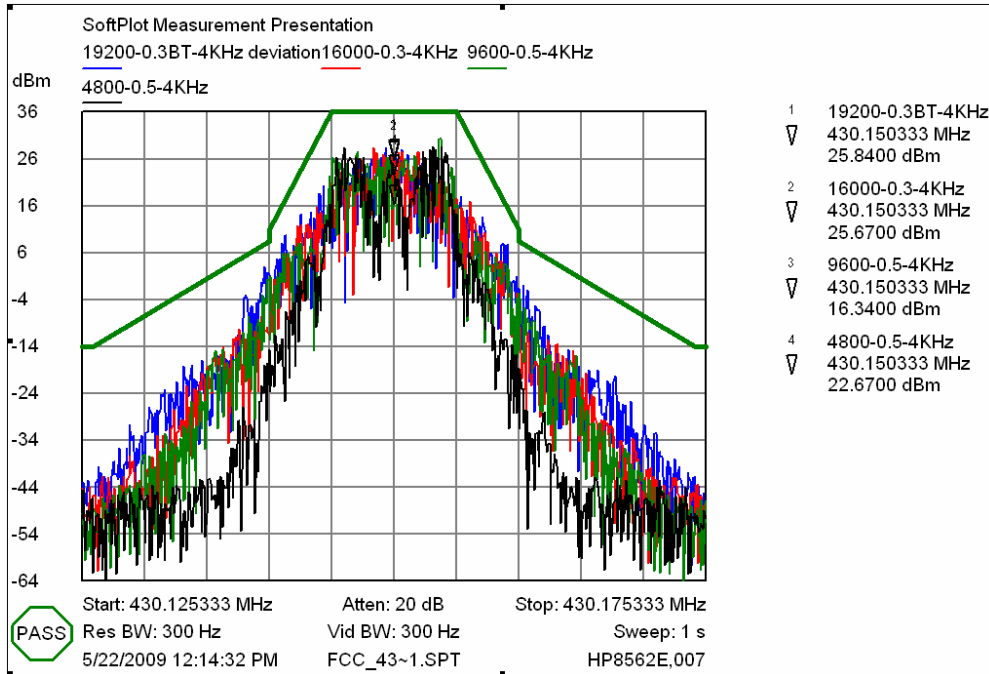
Temperature:	21~22 °C
Relative Humidity:	70~75 %

Test Engineer: Hui Chen

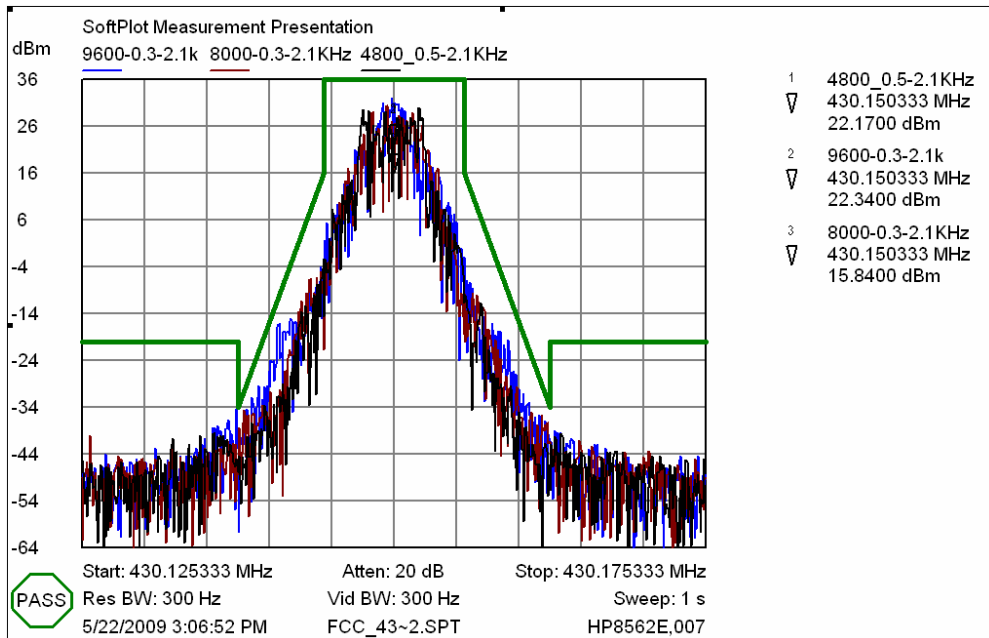
Test Date: 05/22/2009~05/26/2009, 06/23/2009~06/24/2009

S/N: 09200001(430~470 MHz)

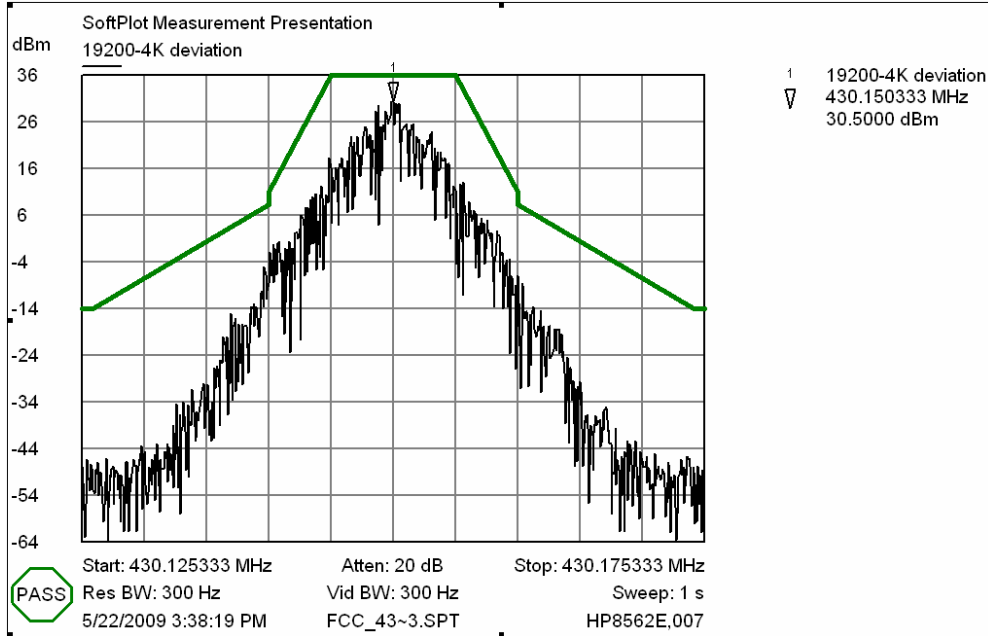
430.15 MHz_GMSK Emission C



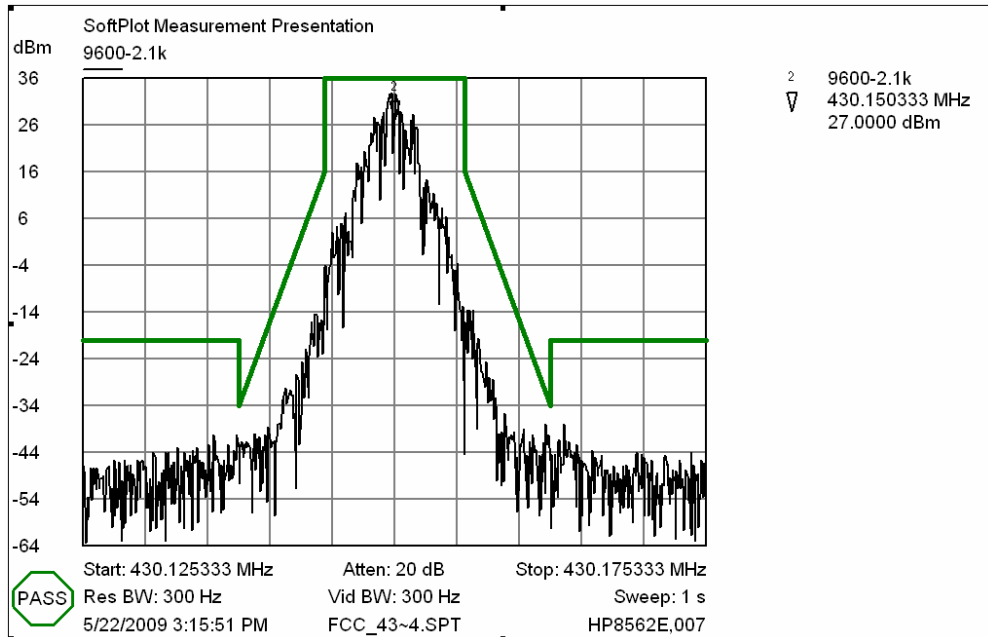
430.15 MHz GMSK Emission D



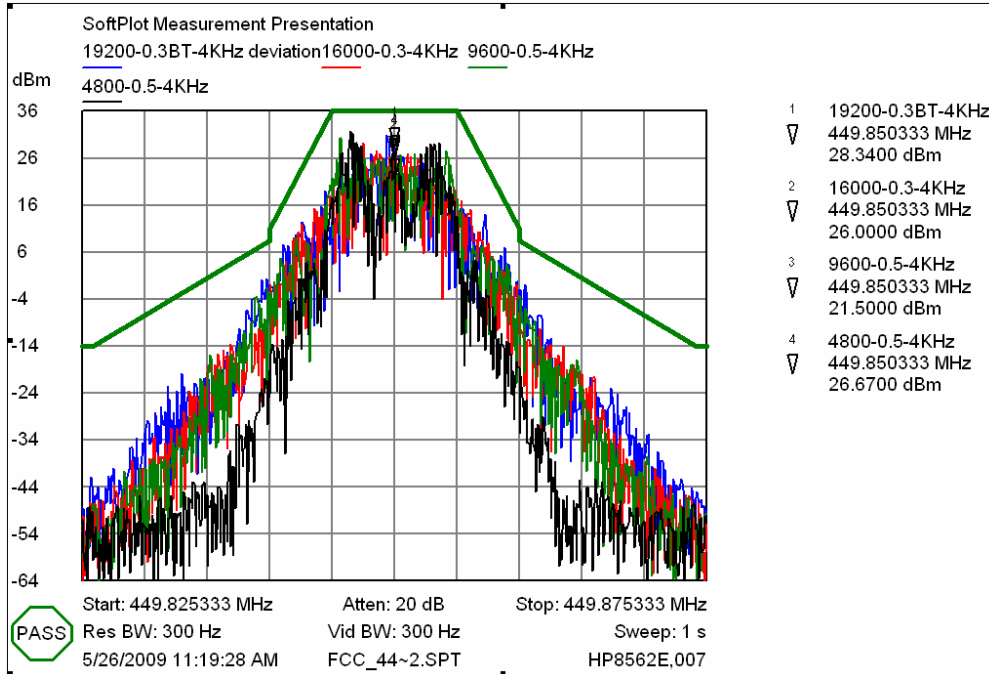
430.15 MHz 4LFSK Emissions C



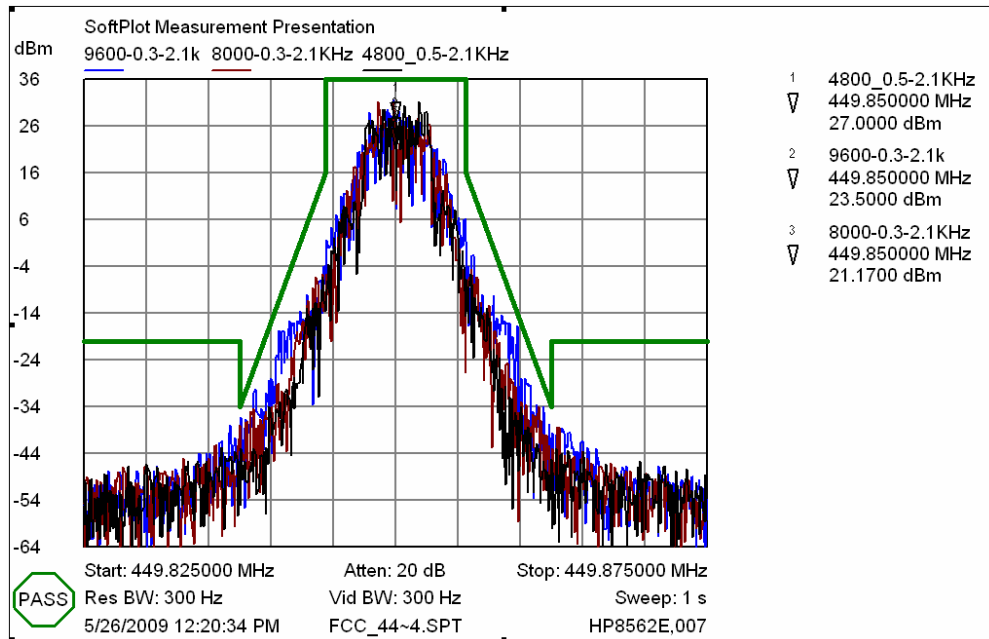
430.15 MHz 4LFSK Emissions D



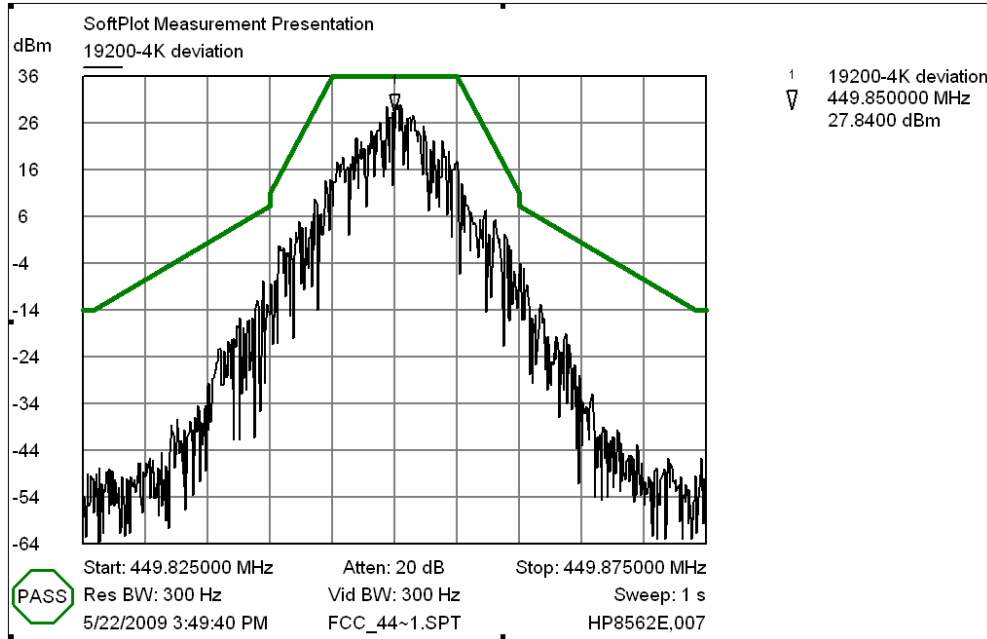
449.85 MHz GSMK Emissions C



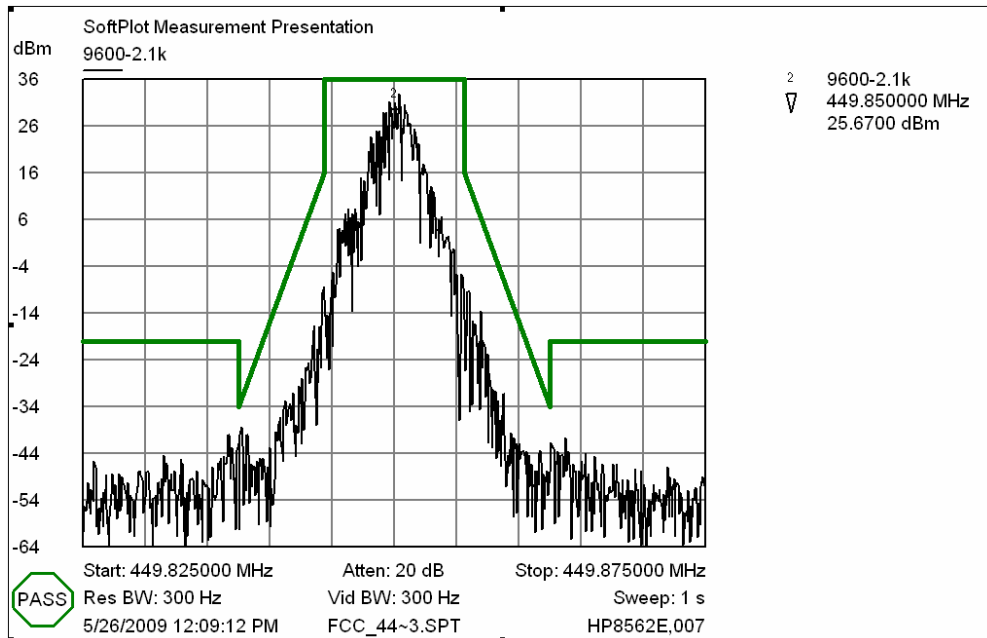
449.85 MHz GSMK Emission D



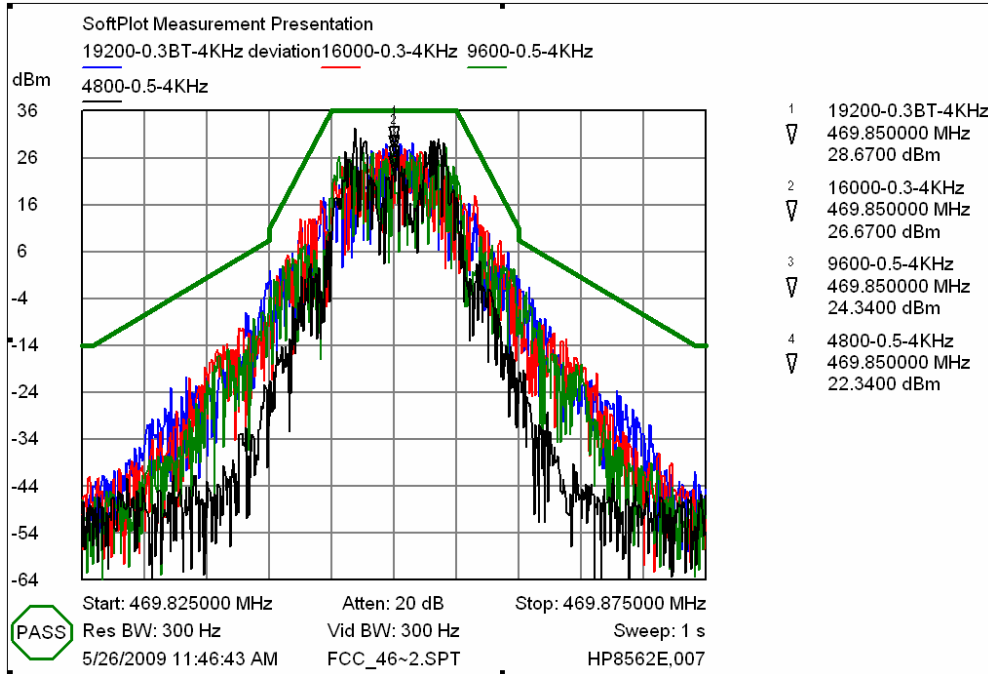
449.85 MHz 4LFSK Emissions C



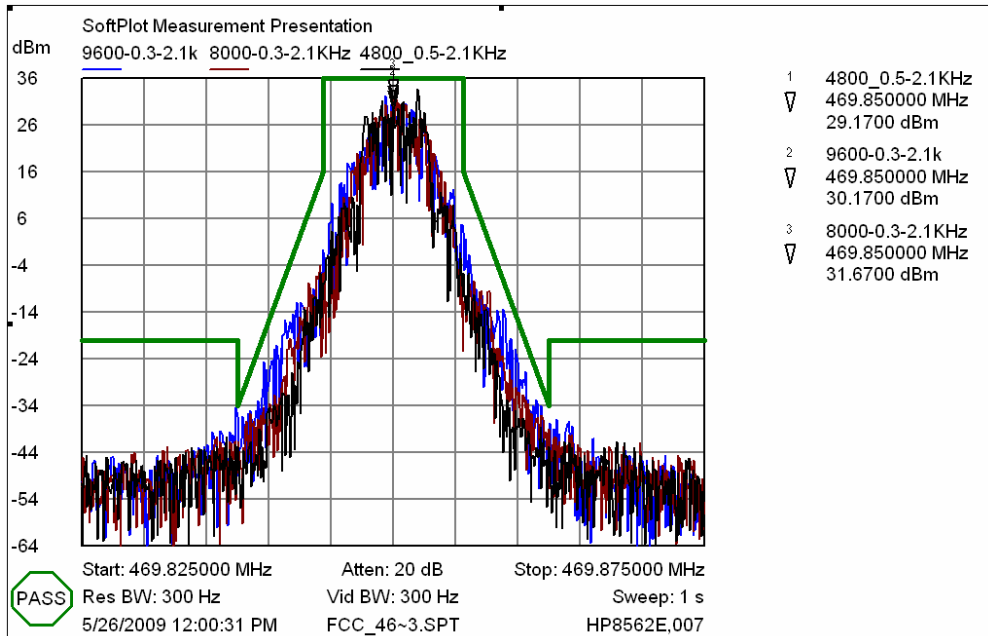
449.85 MHz 4LFSK Emissions D



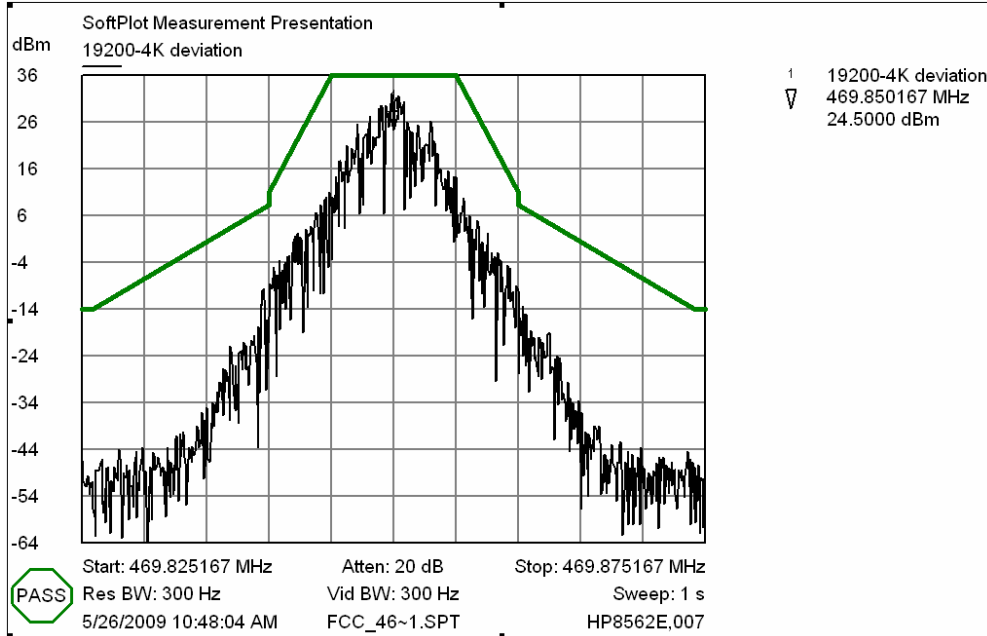
469.85 MHz GMSK Emissions C



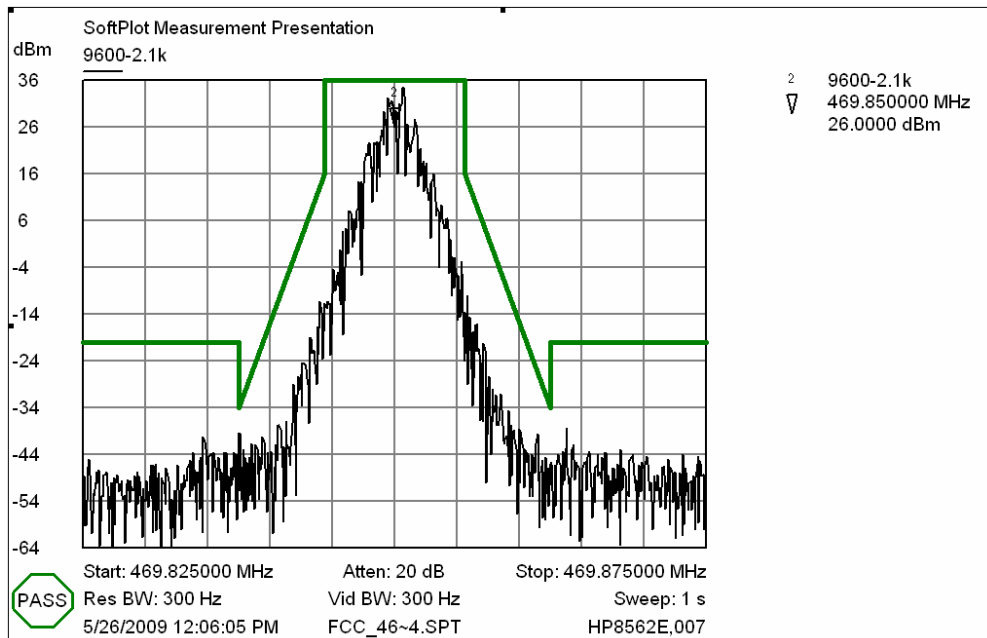
469.85 MHz GMSK Emission D



469.85 MHz 4LFSK Emissions C

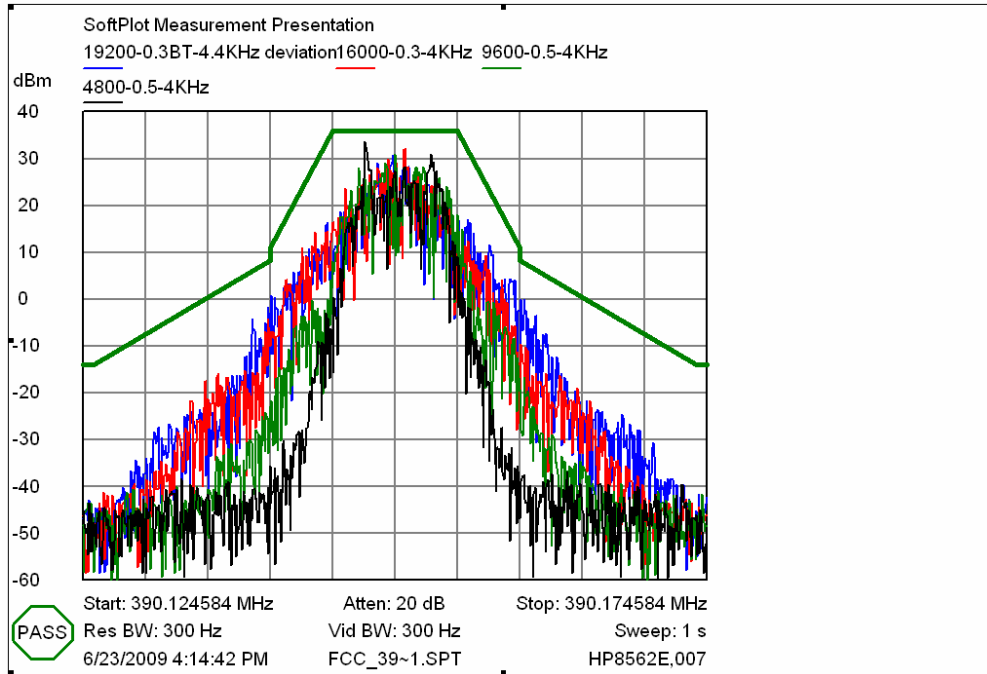


469.85 MHz 4LFSK Emissions D

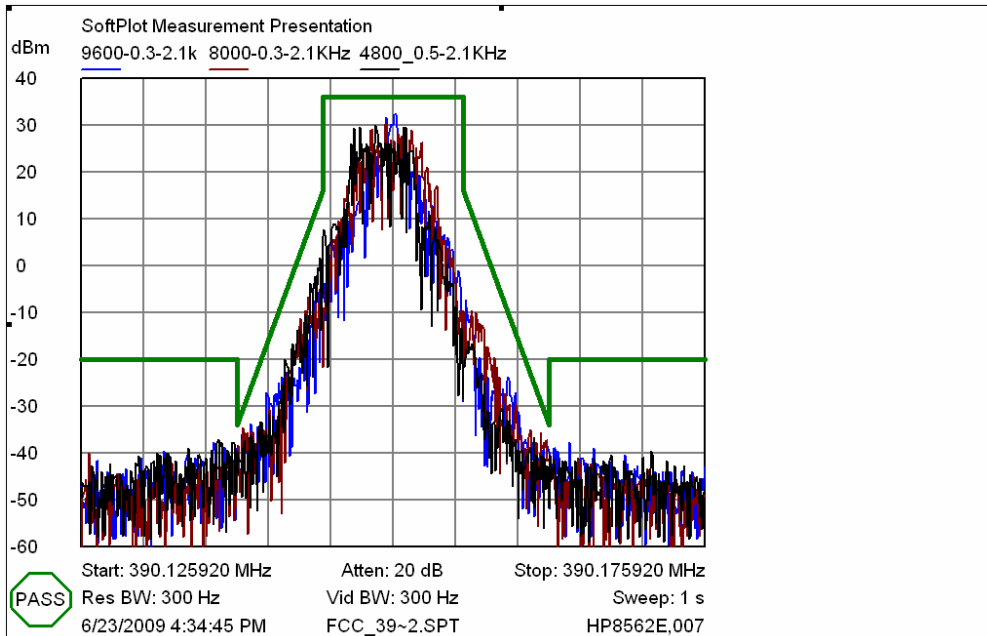


S/N: 09260003(390~430 MHz)

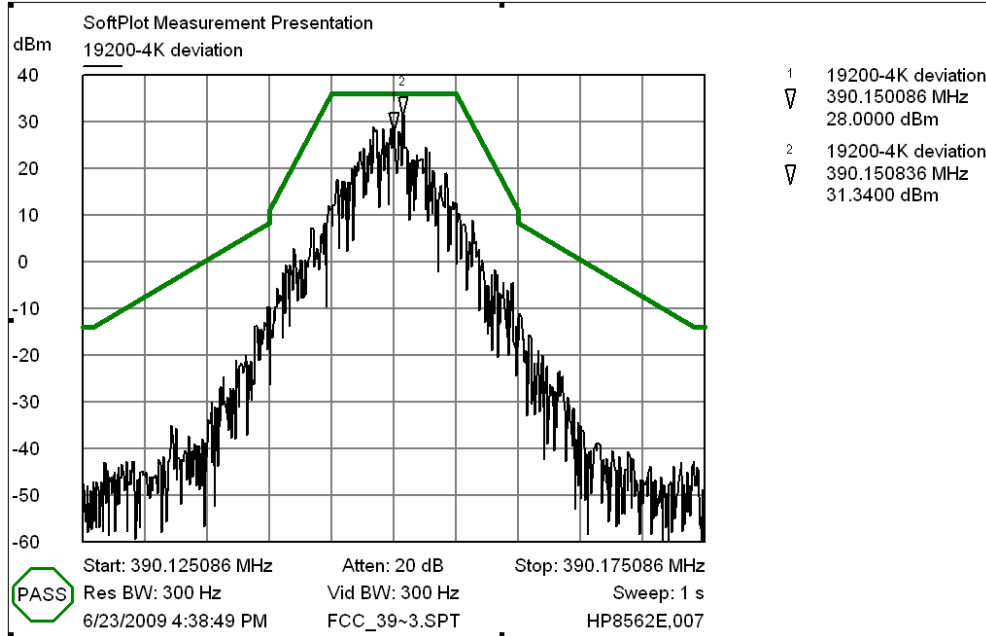
390.15 MHz GSMK Emissions C



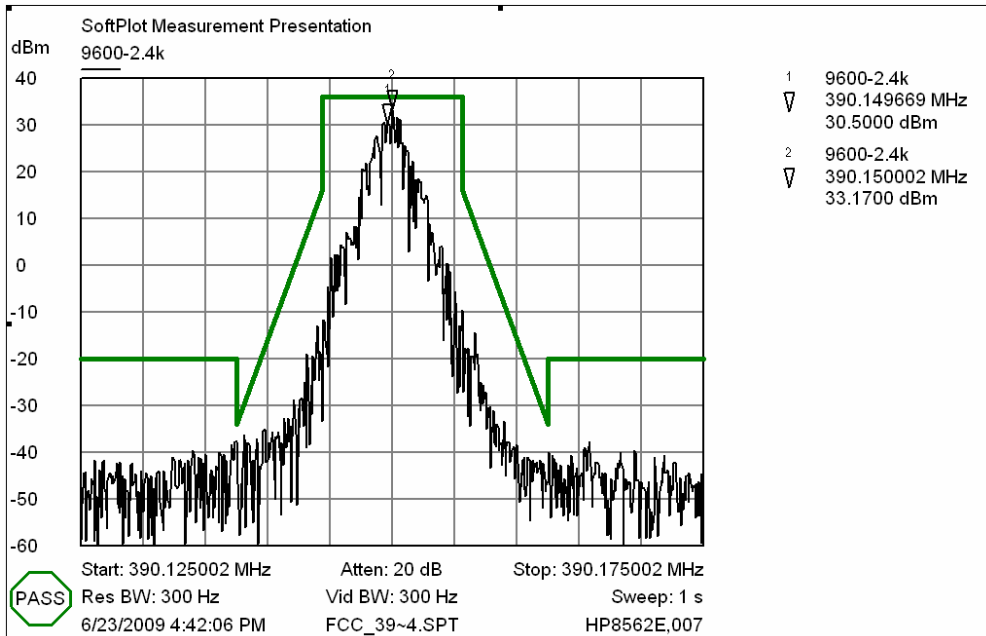
390.15 MHz GSMK Emission D



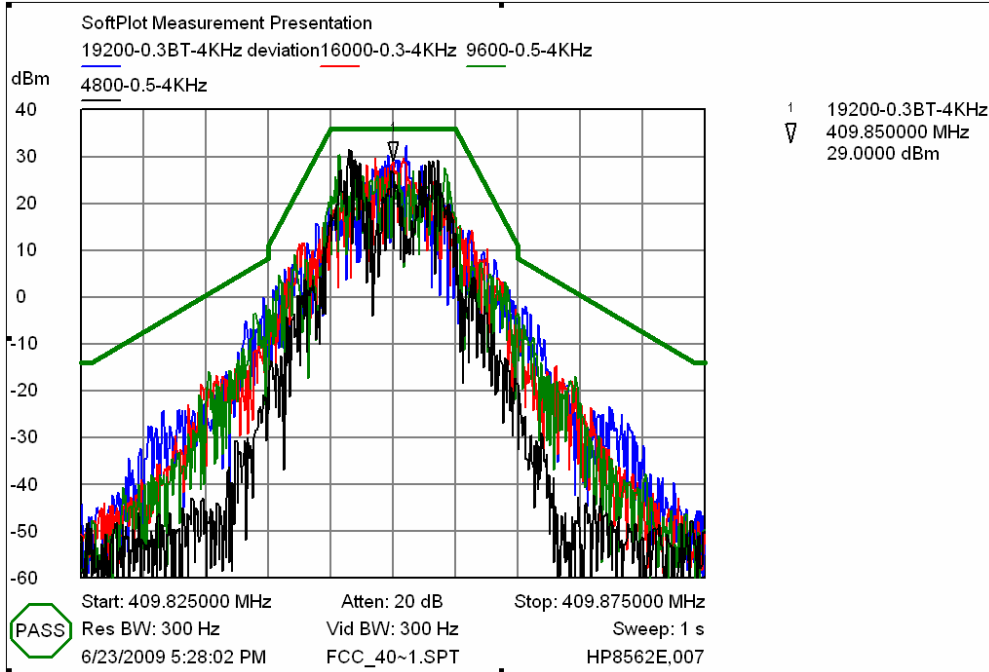
390.15 MHz 4LFSK Emissions C



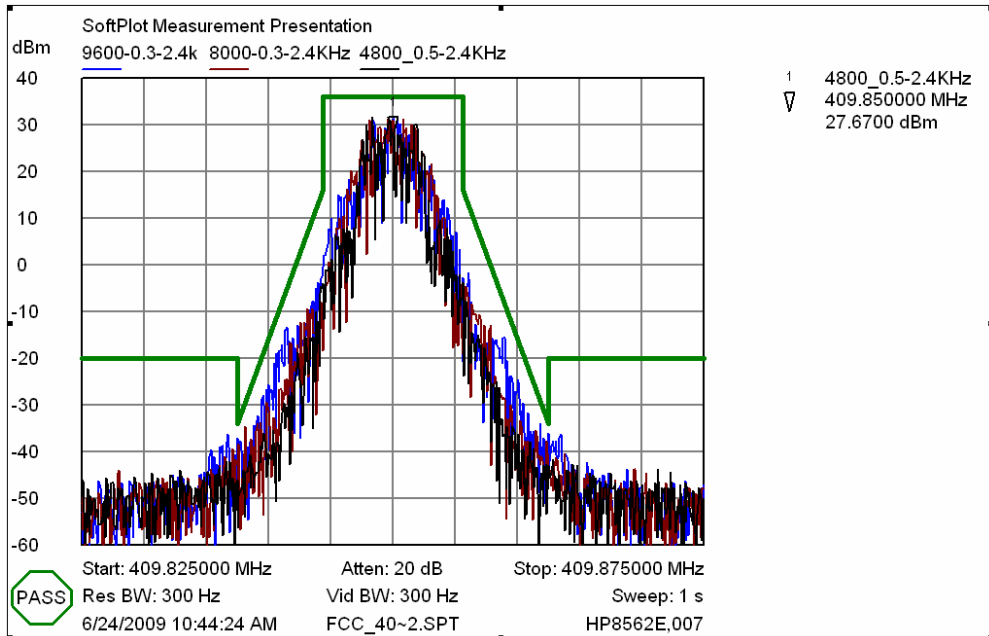
390.15 MHz 4LFSK Emissions D



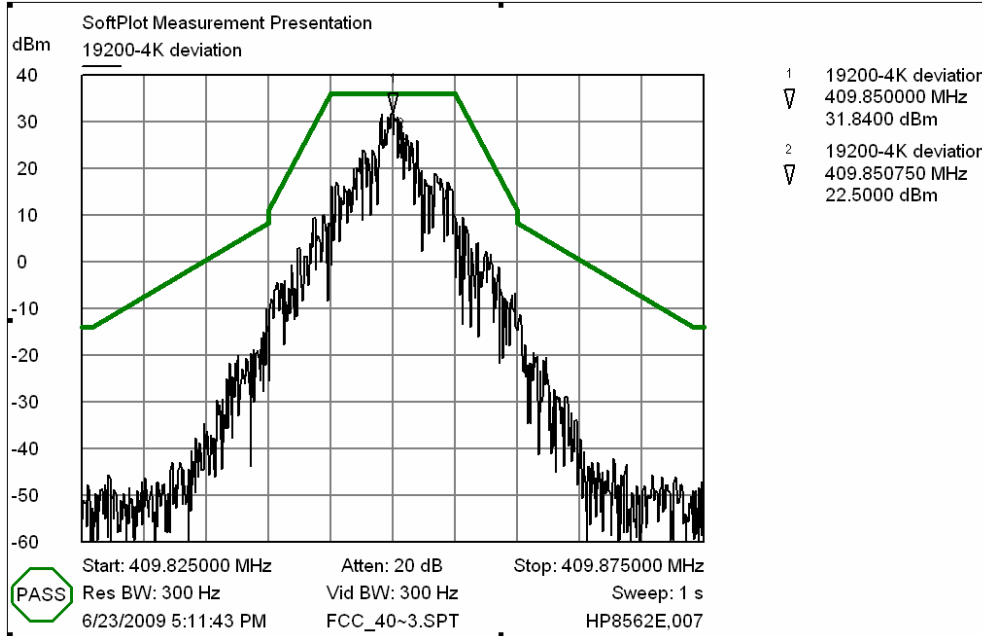
409.85 MHz GMSK Emissions C



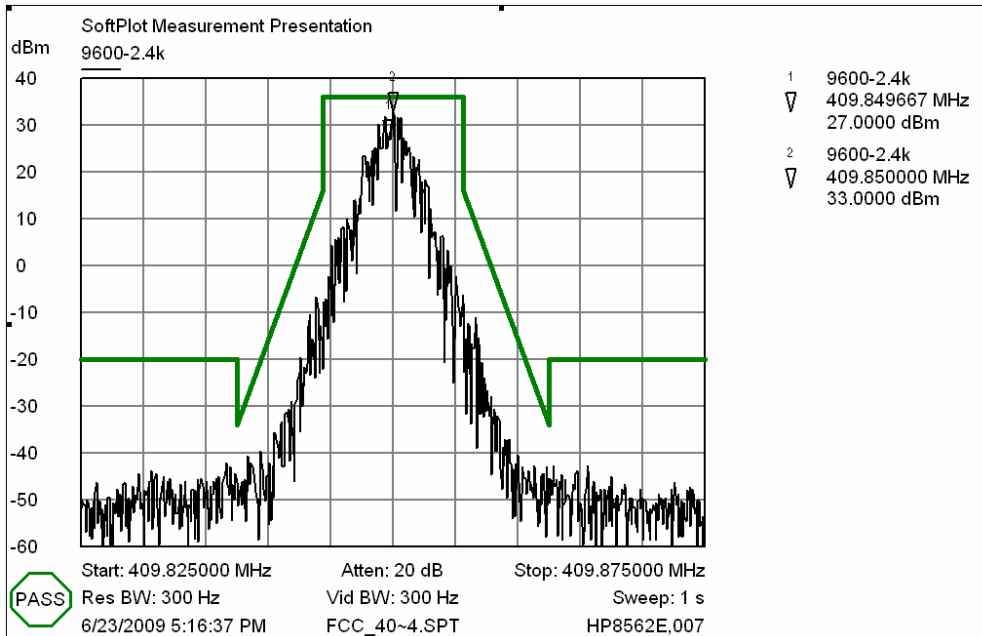
409.85 MHz GMSK Emission D



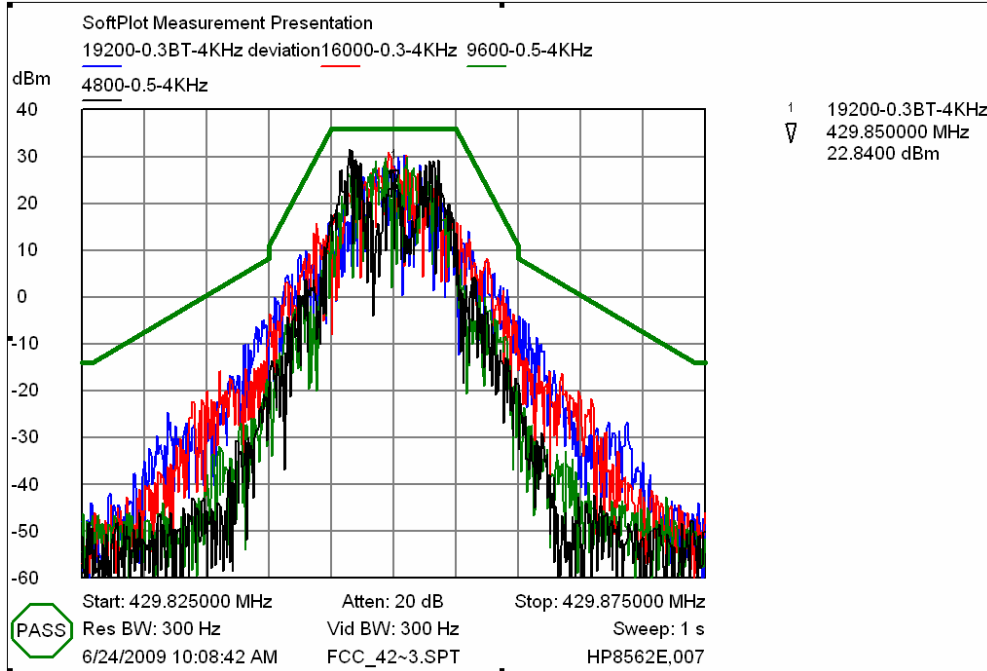
409.85 MHz 4LFSK Emissions C



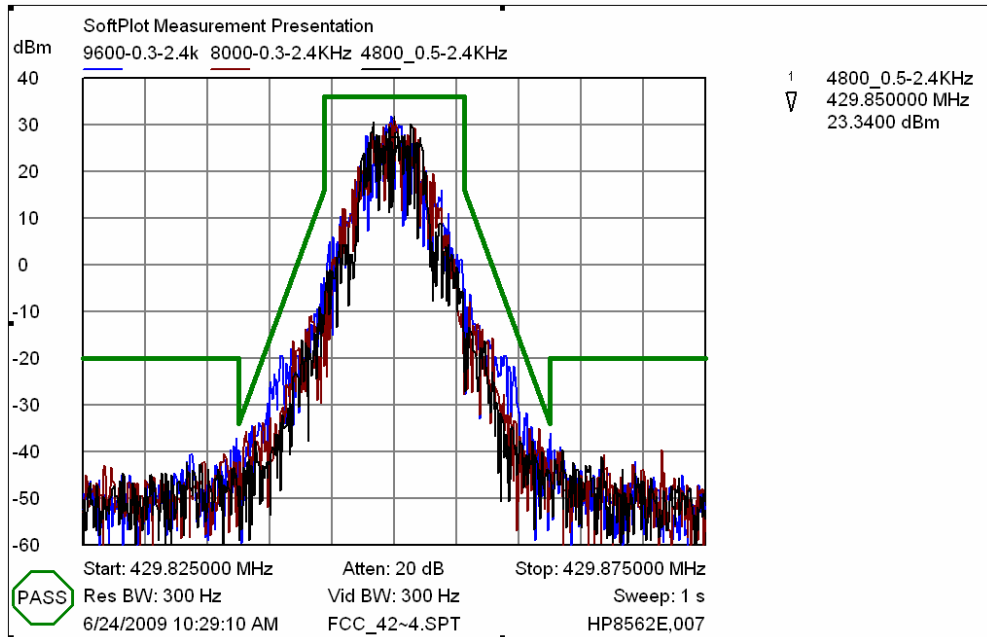
409.85 MHz 4LFSK Emissions D



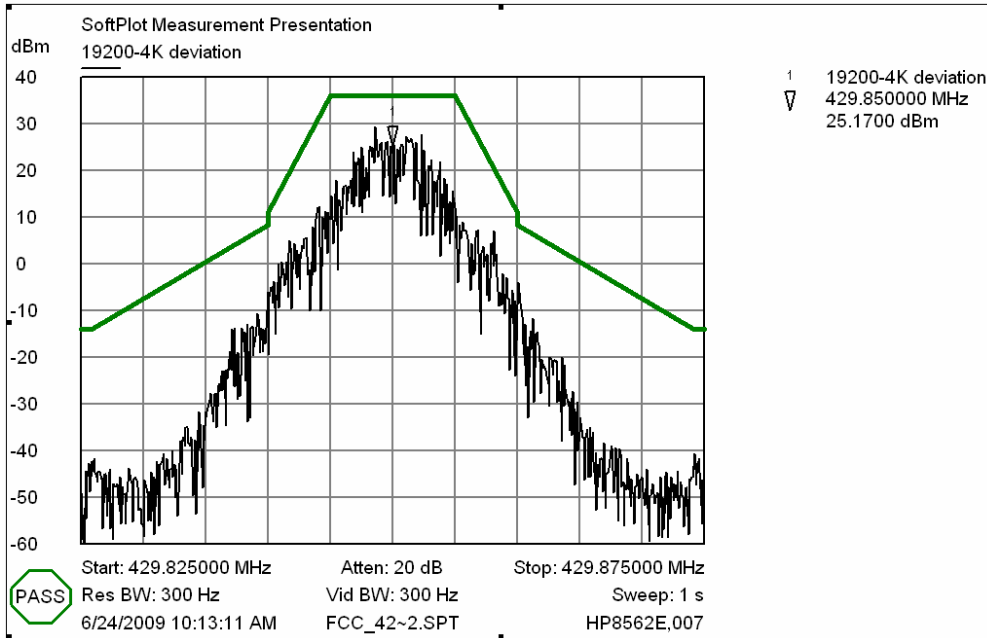
429.85 MHz GMSK Emissions C



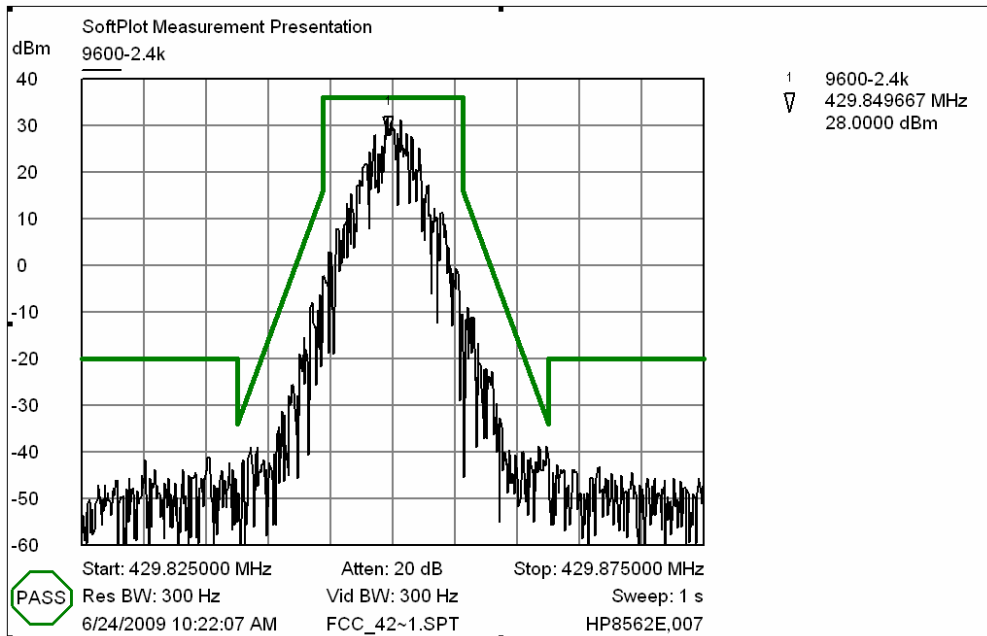
429.85 MHz GMSK Emission D



429.85 MHz 4LFSK Emissions C



429.85 MHz 4LFSK Emissions D



FCC § 2.1051 & §90.210 – Spurious Emission at Antenna Terminals

Applicable Standard

§ 2.1051 and § 90.210

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 KHz at least:

$50+10\log(P)$ or 70dB

On any frequency removed from the center of the assigned channel by more than 250 percent at least:
 $43+\log(P)$

Test Procedure

The RF output of the transceiver was connected a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100KHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic

Test Equipment List

Manufacturer	Description	Model	S/N	Cal Due Date
TekPower	DC Power Supply	HY3005D	N/A	N/A
Agilent	Spectrum Analyzer	8562EC	3946A00187	12/23/2009

Test Environment Conditions

Temperature:	20~22 °C
Relative Humidity:	70~75 %

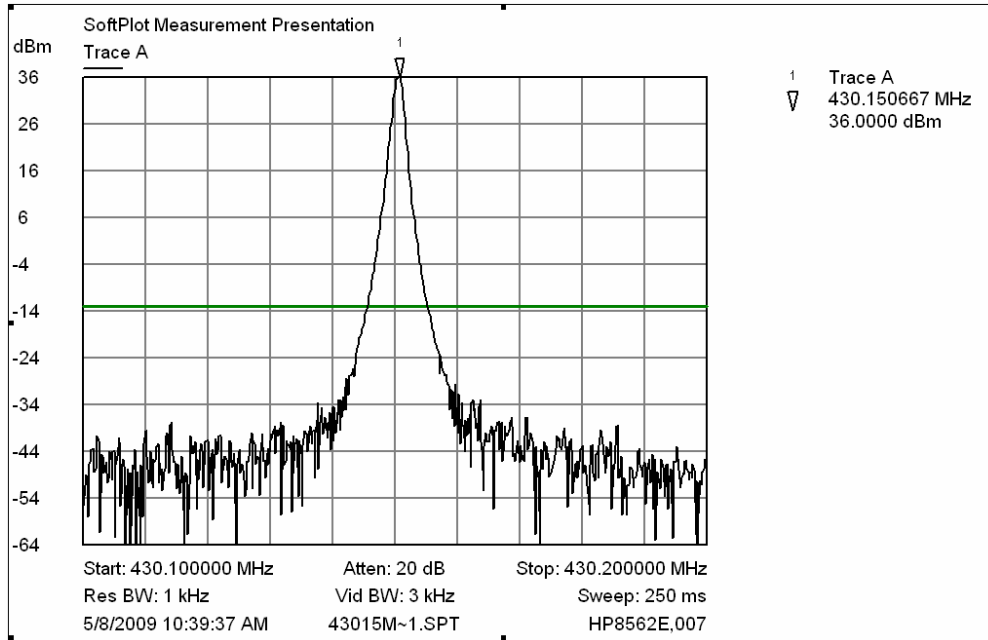
Test Engineer: Hui Chen
 Test Date: 05/08/2009, 06/23/2009

Test Result

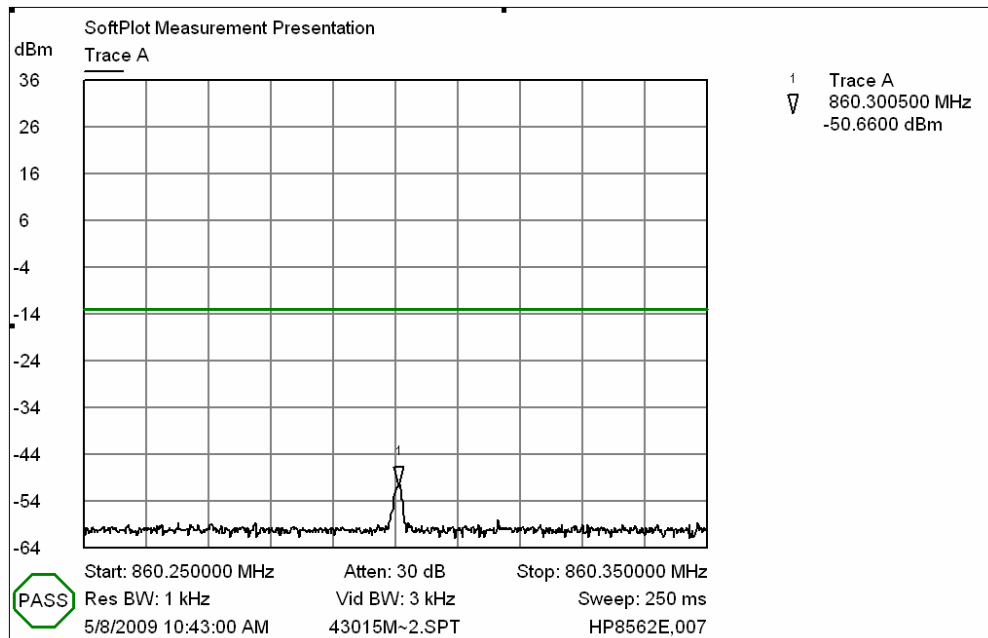
Please refer to the following plots.

S/N: 09200001 (430~470 MHz)

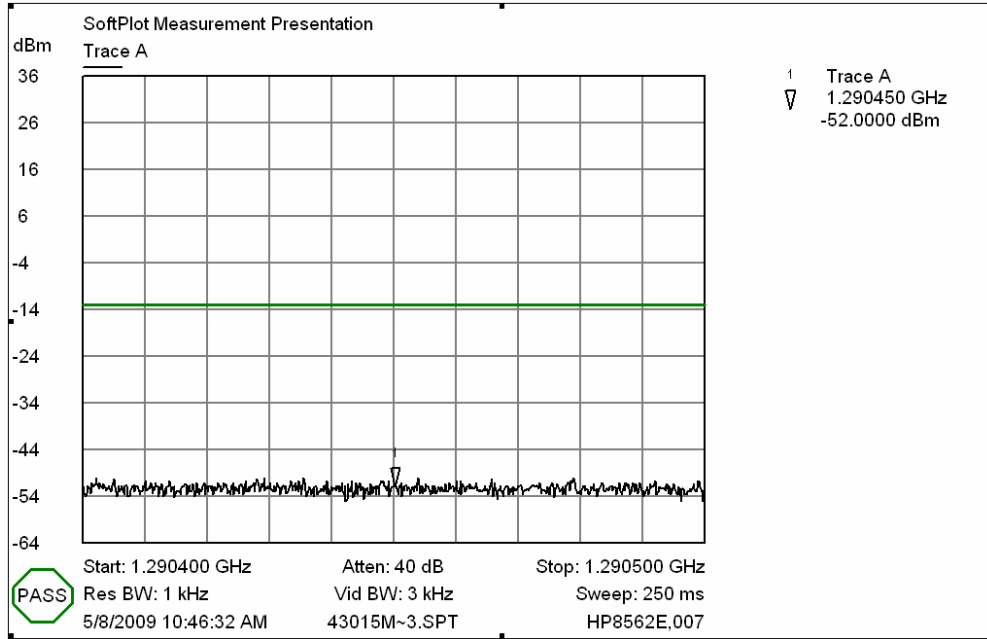
430.15 MHz_1st



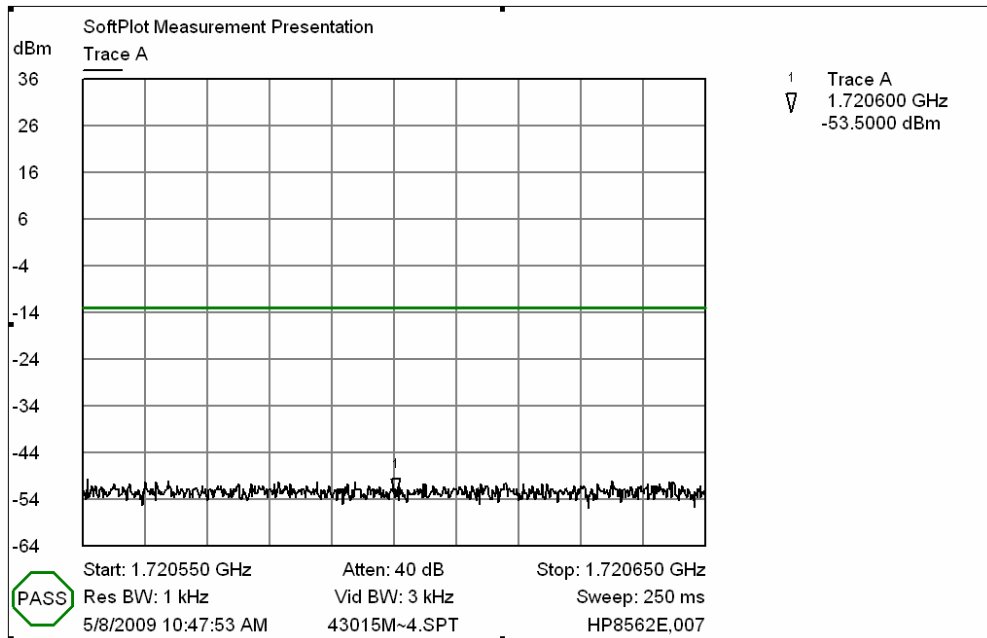
430.15 MHz_2nd



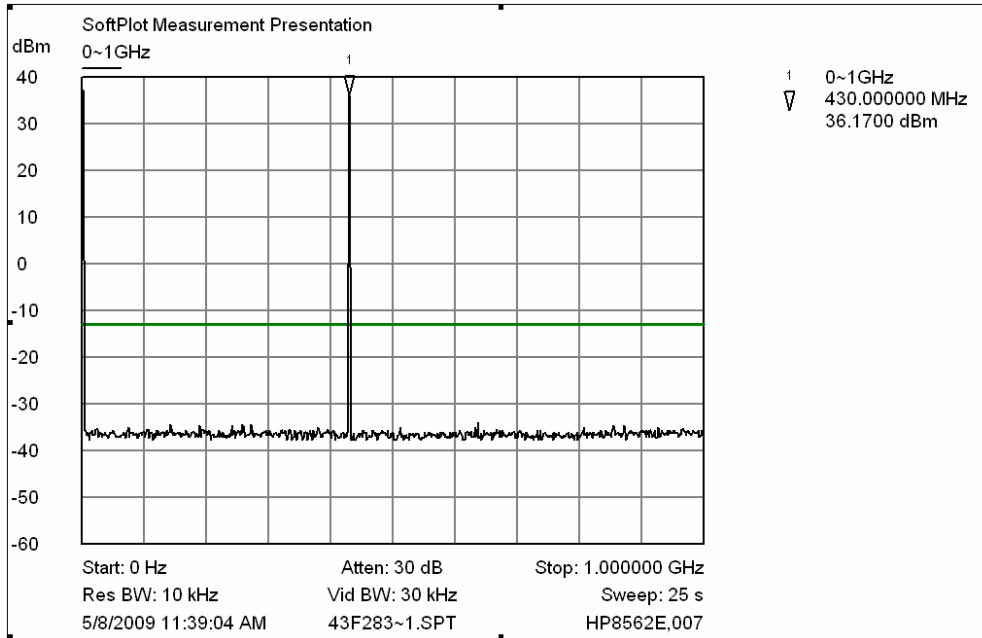
430.15 MHz_3rd



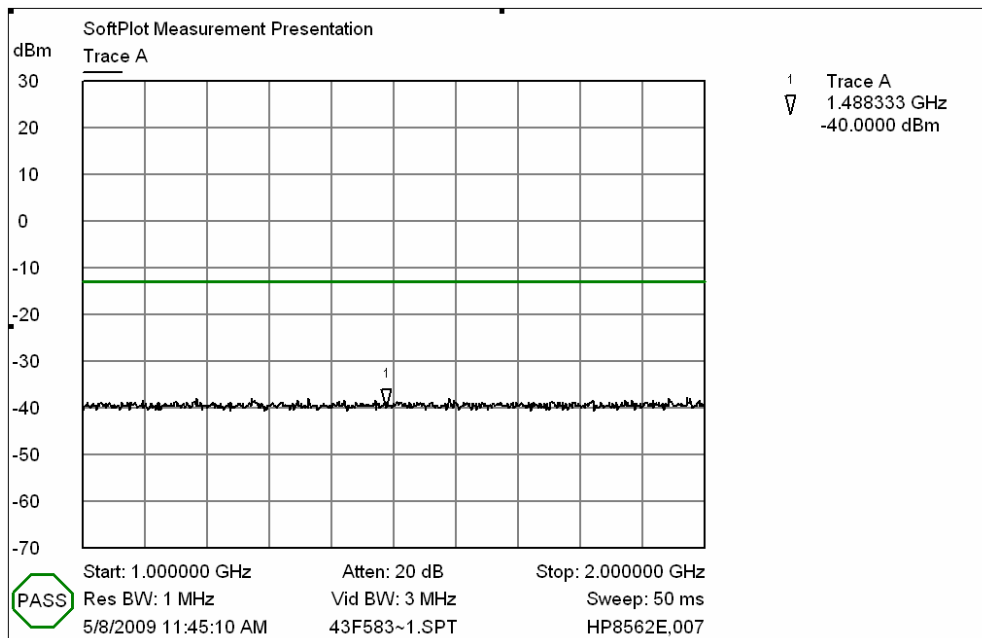
430.15 MHz_4th



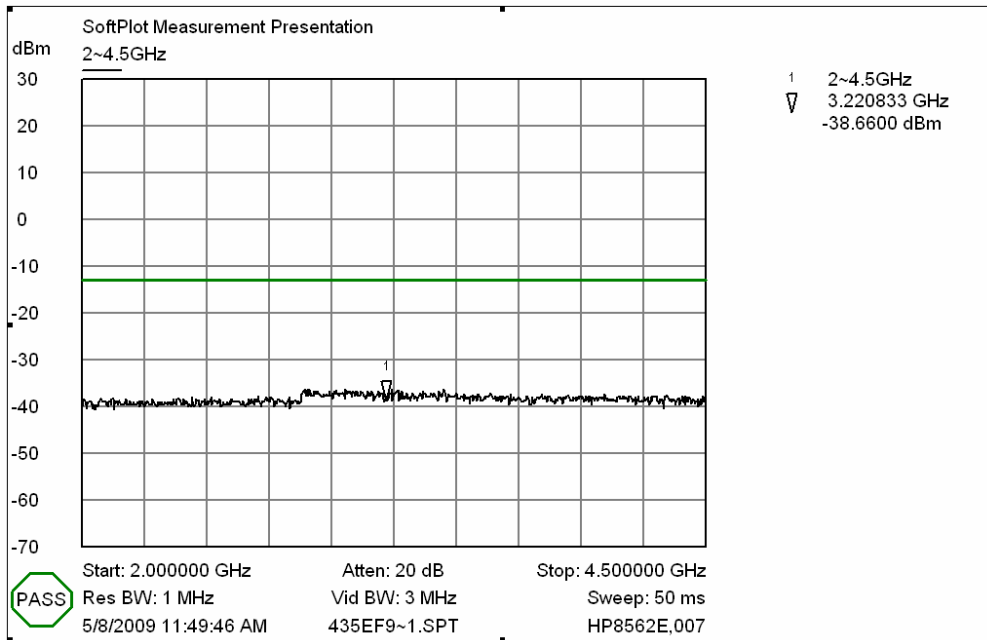
430.15 MHz_ 0~1 GHz



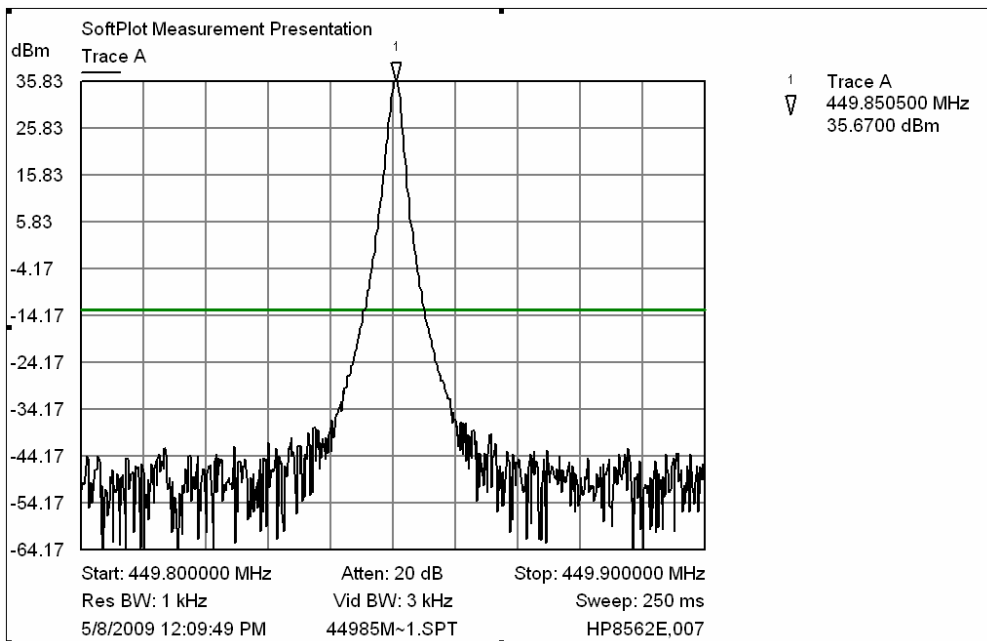
430.15 MHz_1~2 GHz



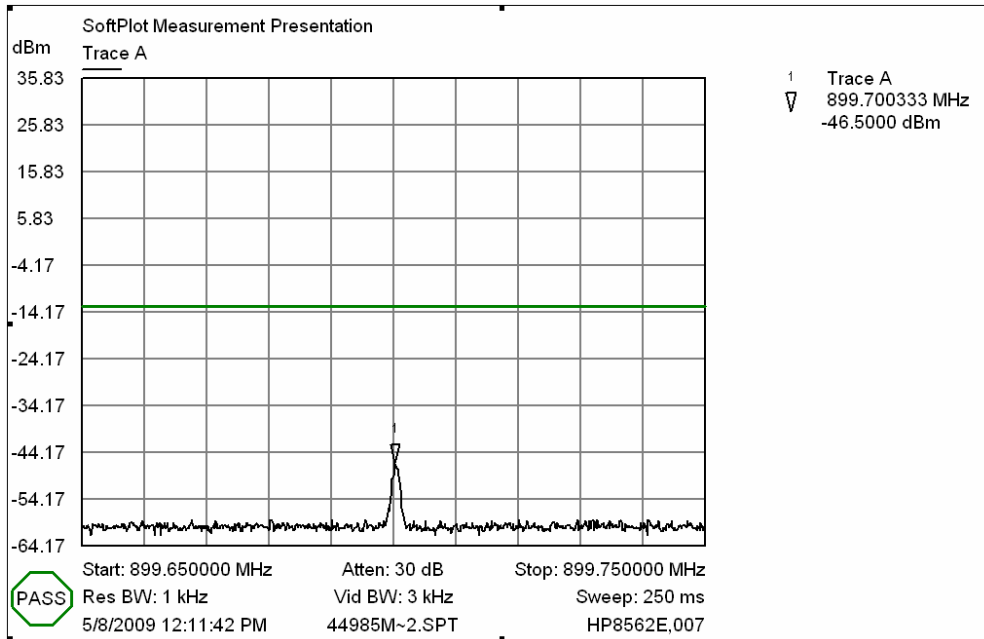
430.15 MHz_2~ 4.5 GHz (10th harmonic)



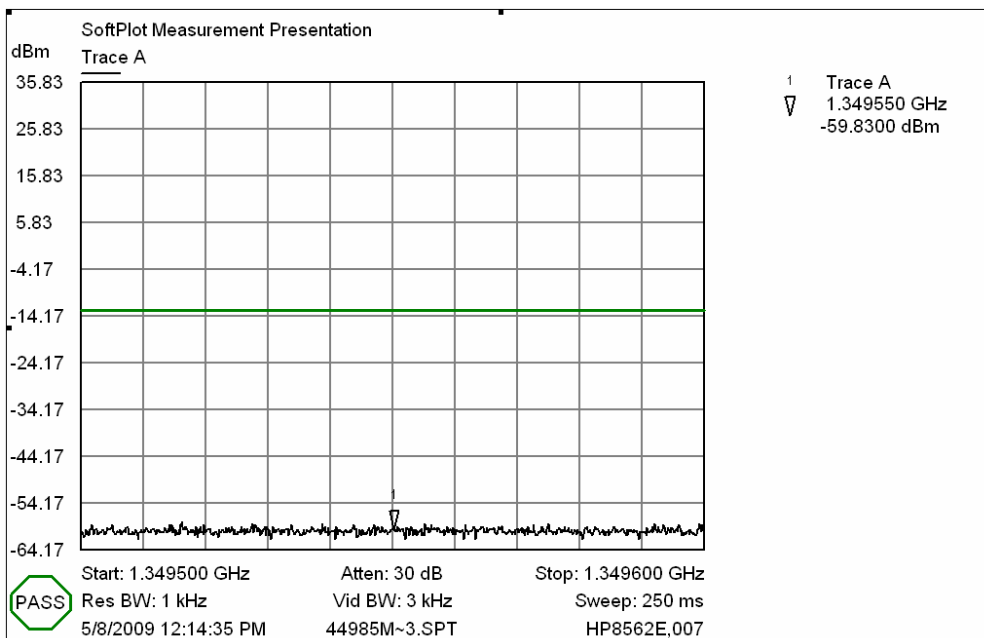
449.85 MHz_1st



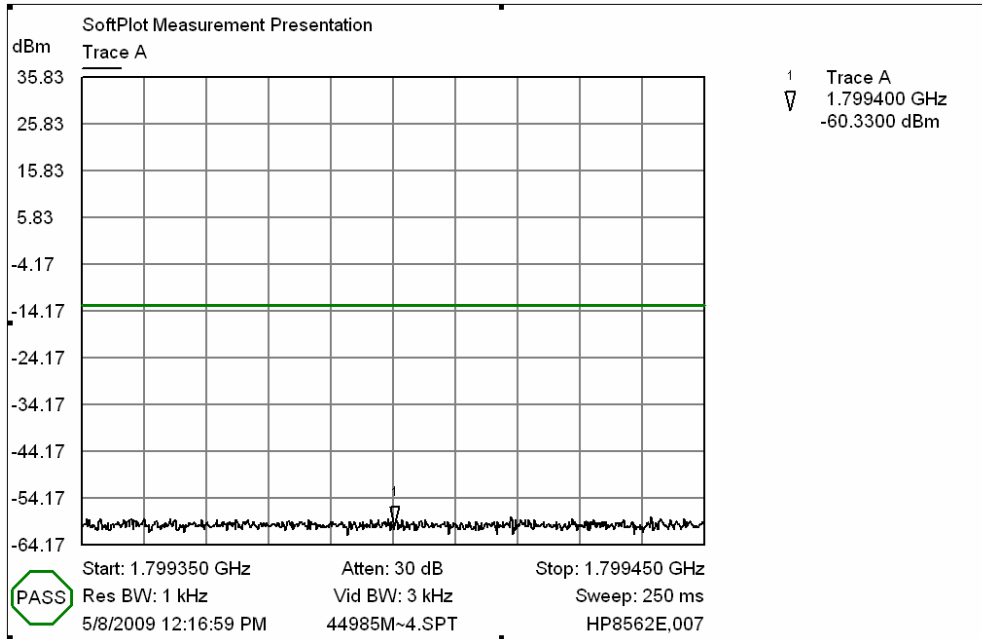
449.85 MHz_2nd



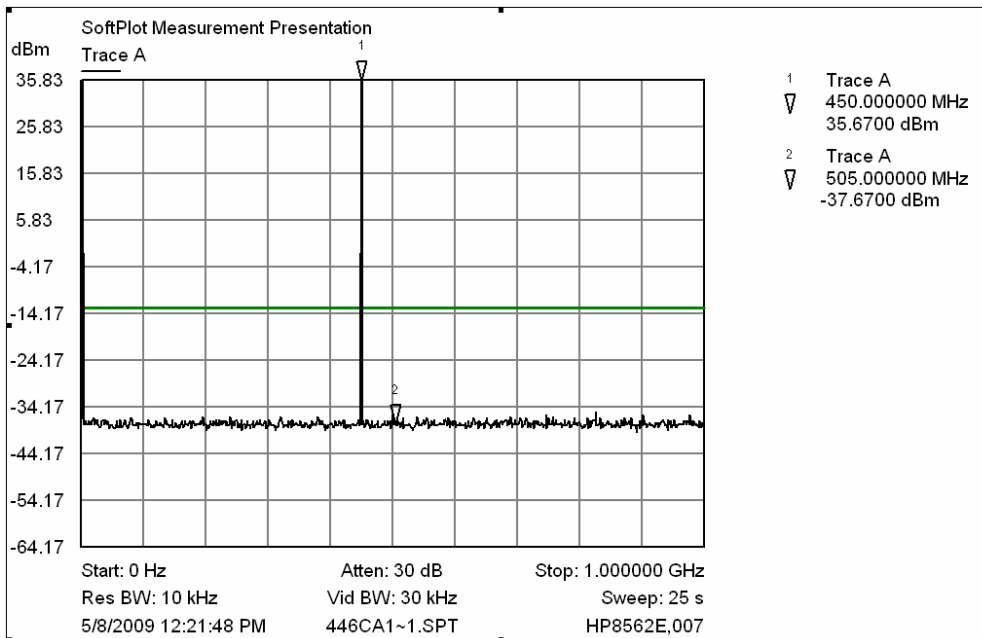
449.85 MHz_3rd



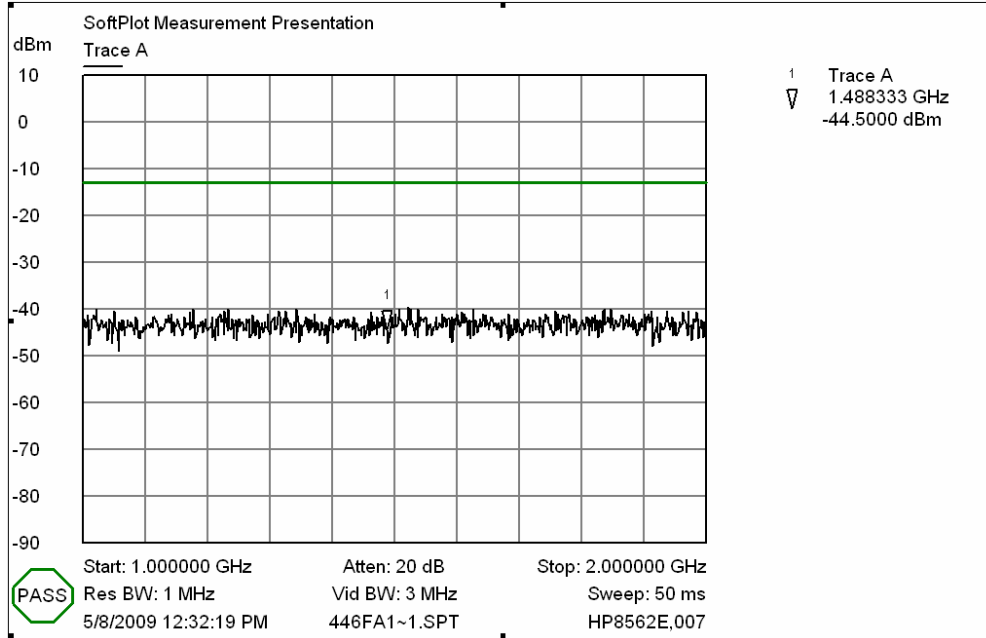
449.85 MHz_4th



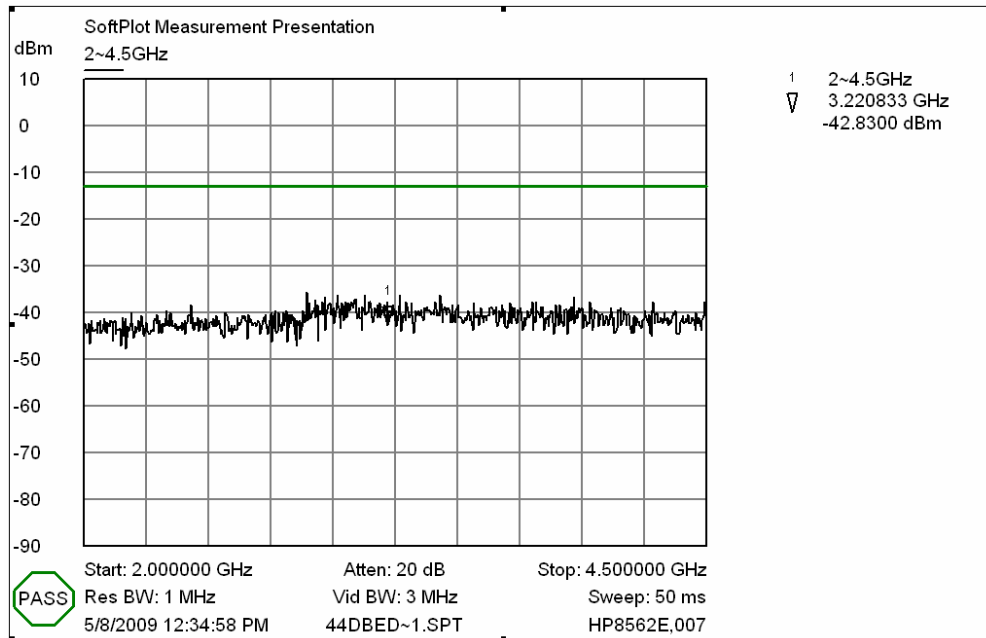
449.85 MHz_0~1 GHz



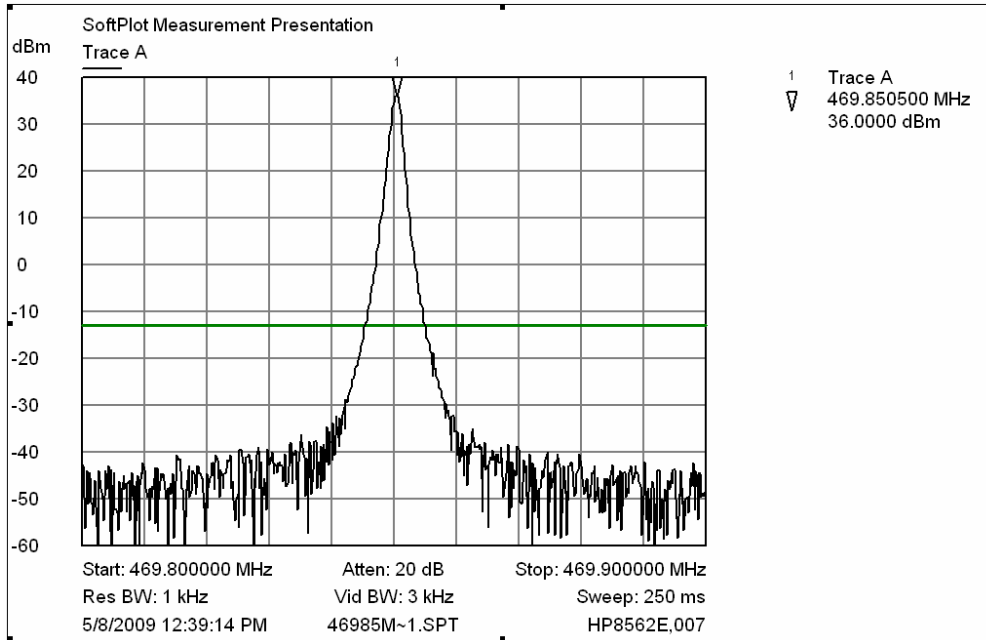
449.85 MHz_1~ 2 GHz



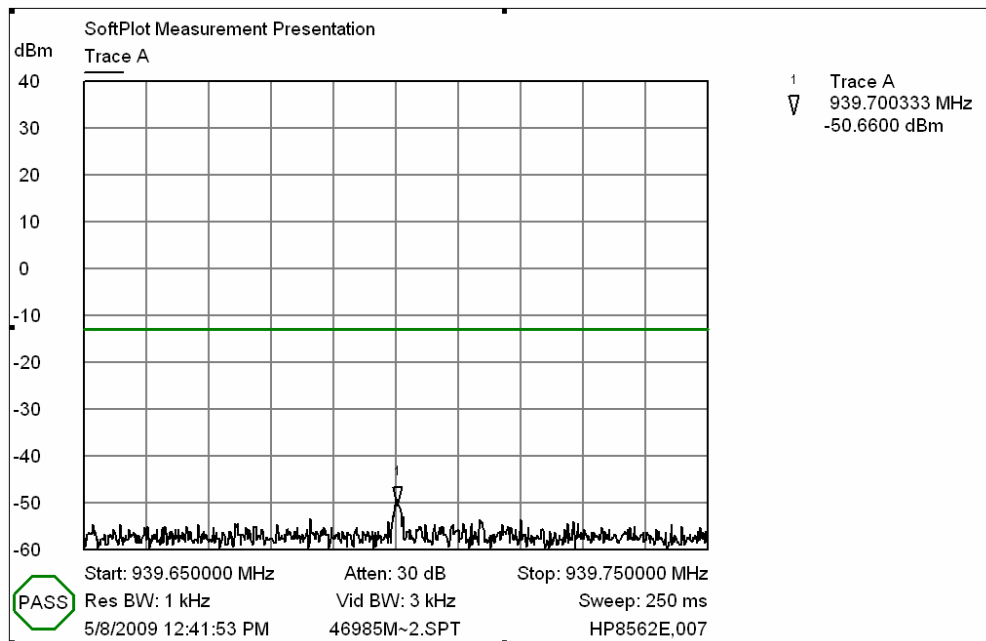
449.85 MHz_2 ~ 4.5 GHz (10th harmonic)



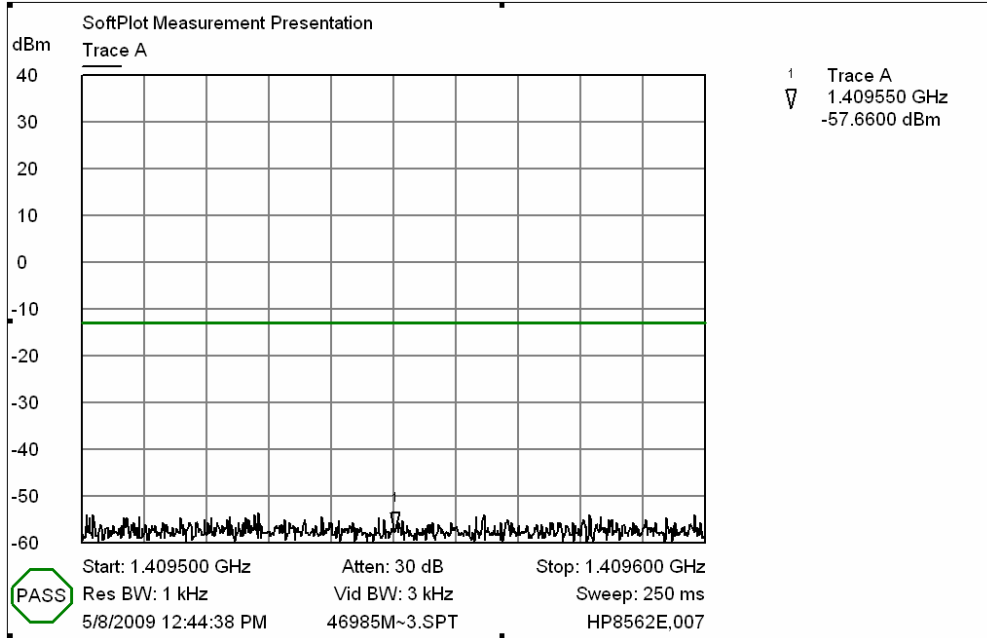
469.85 MHz_1st



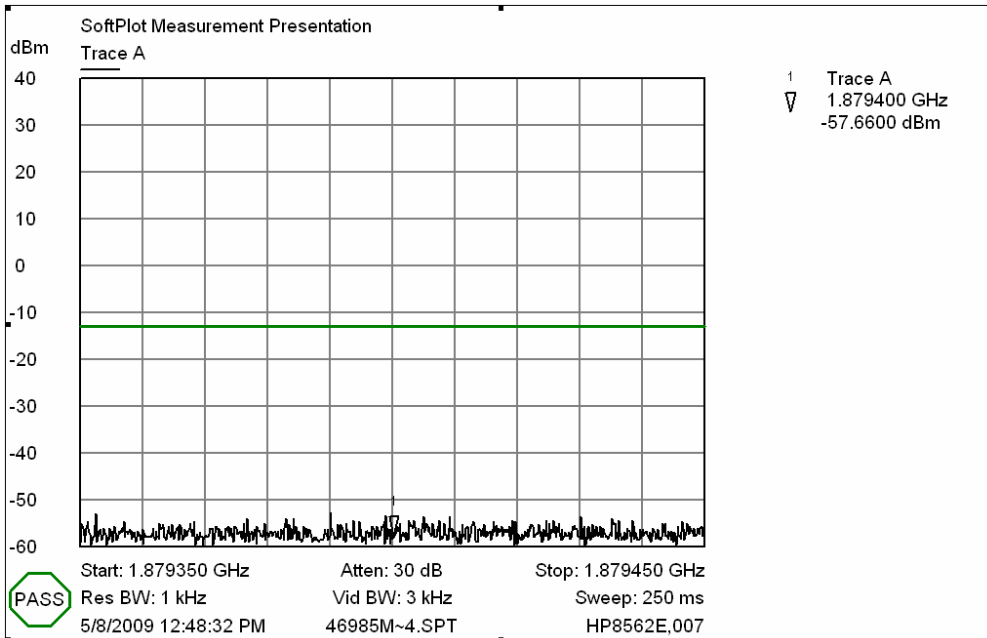
469.85 MHz_2nd



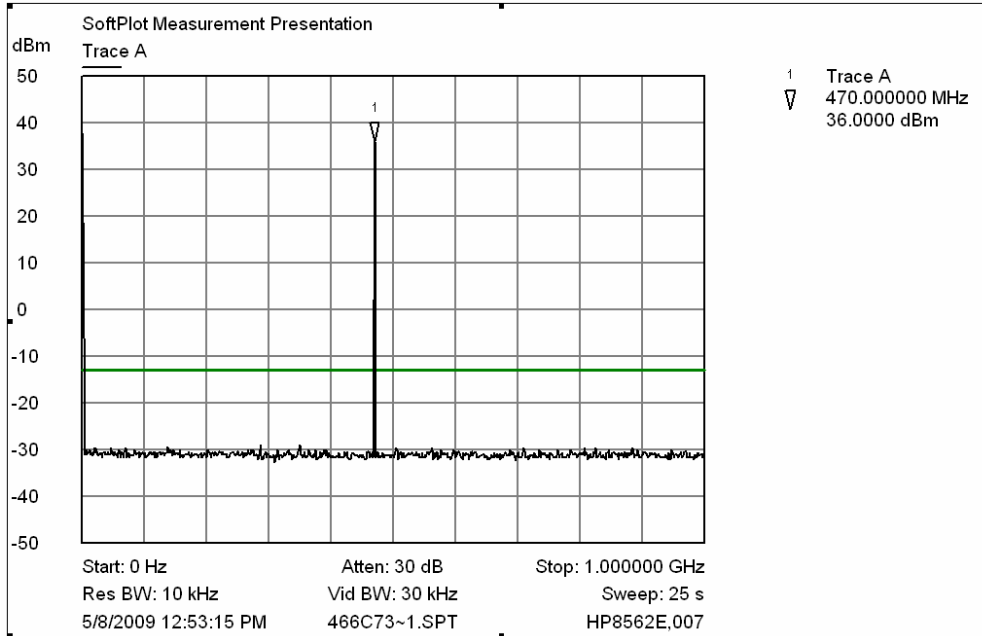
469.85 MHz_3rd



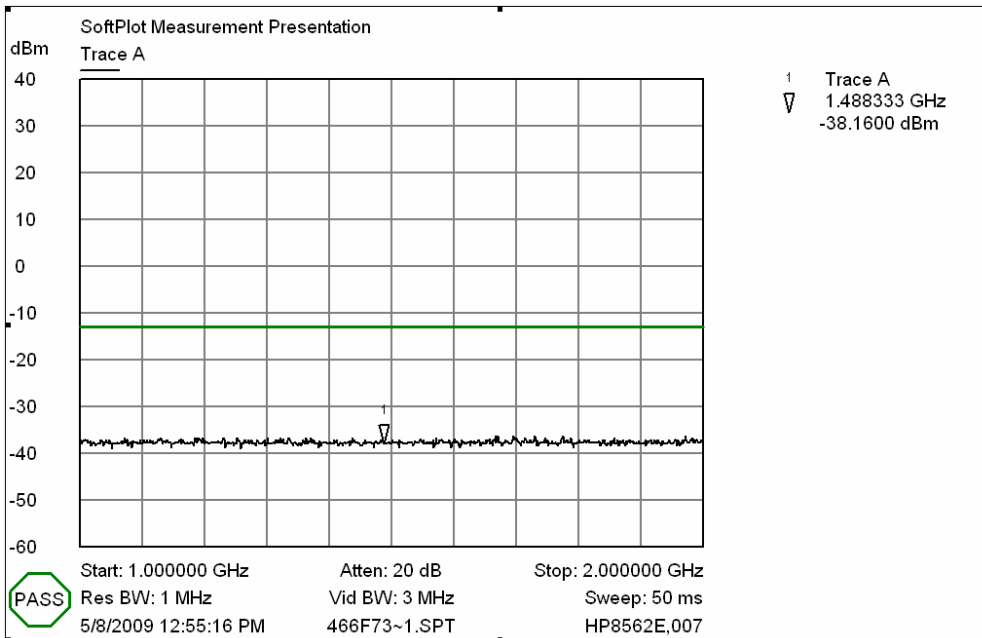
469.85 MHz_4th



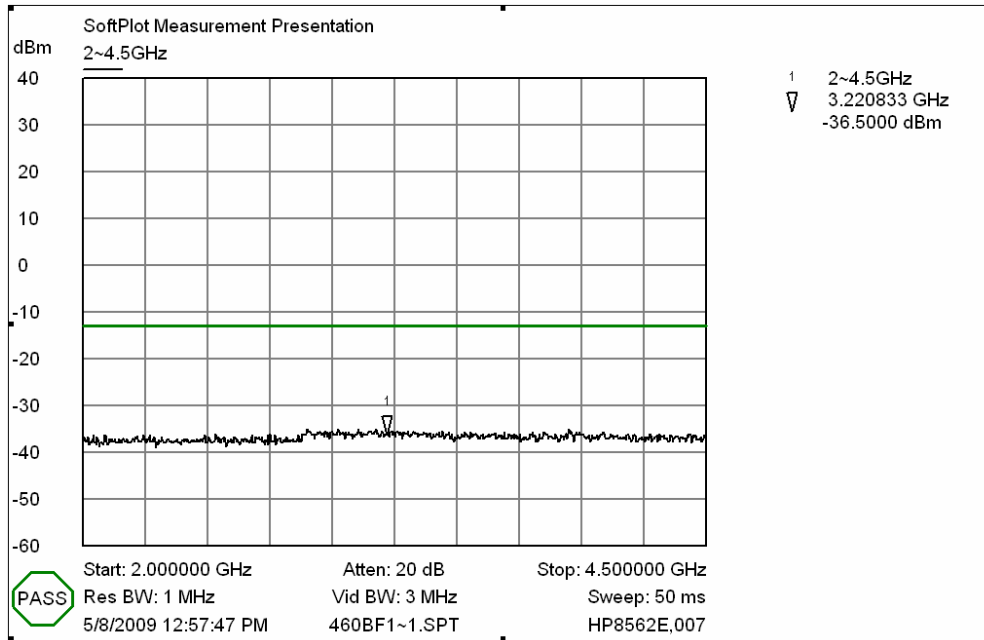
469.85 MHz_0~1 GHz



469.85 MHz_1~2 GHz

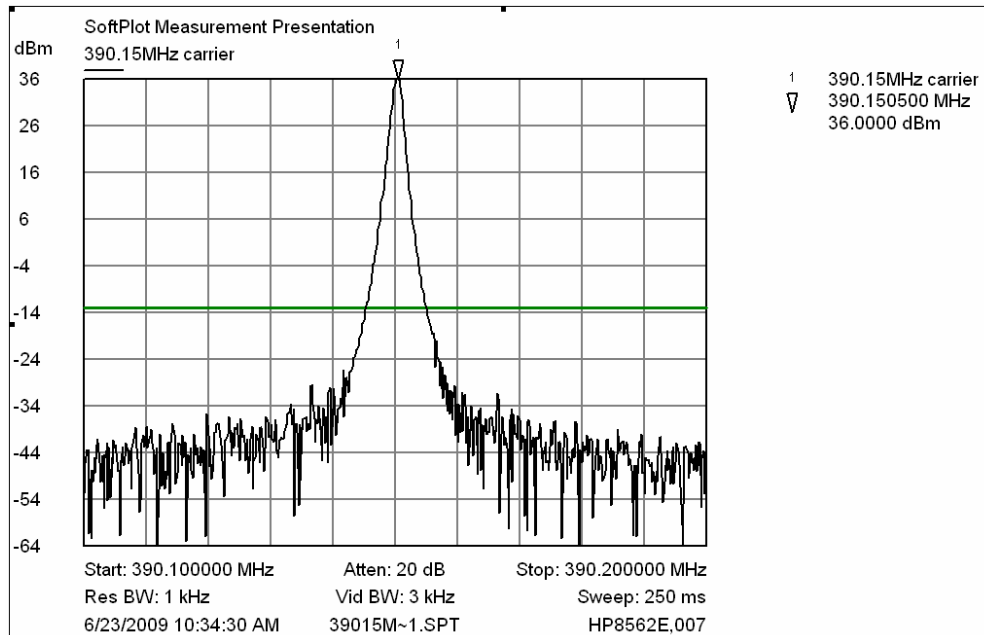


469.85 MHz_2~4.5 GHz (10th harmonic)

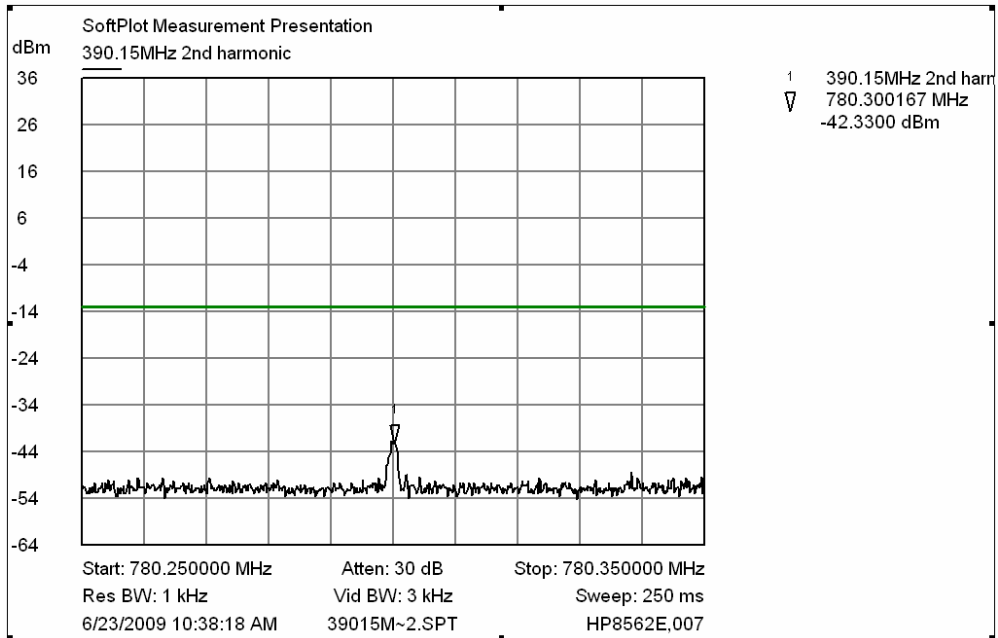


S/N: 09260003(390~430 MHz)

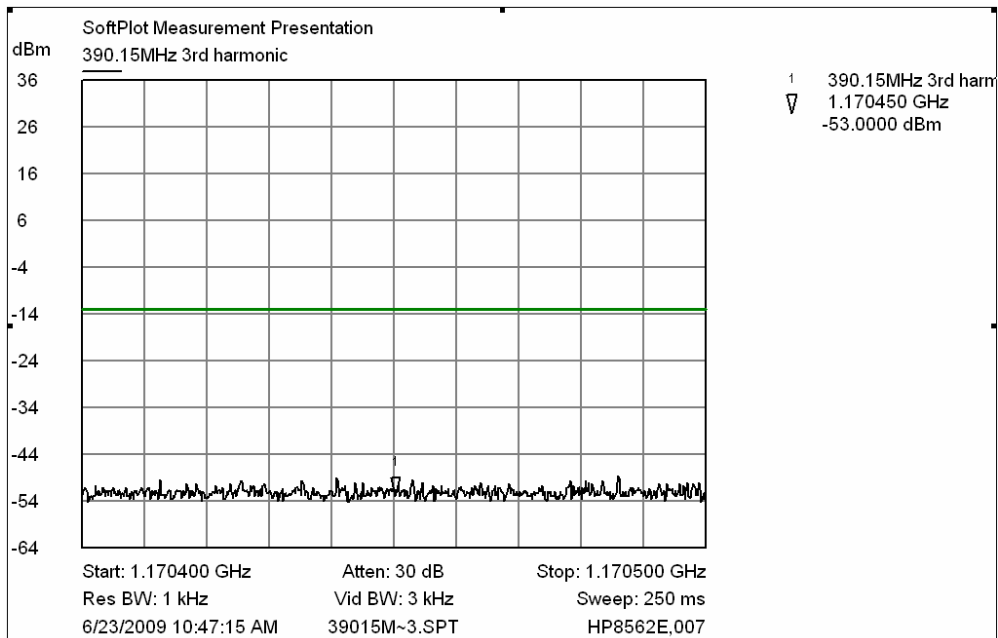
390.15 MHz_1st



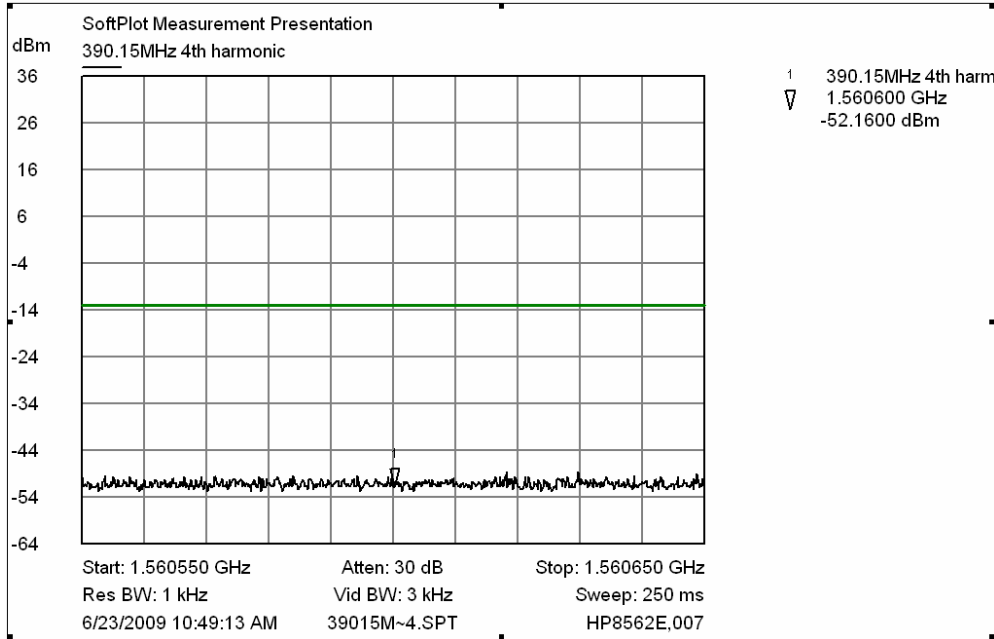
390.15 MHz_2nd



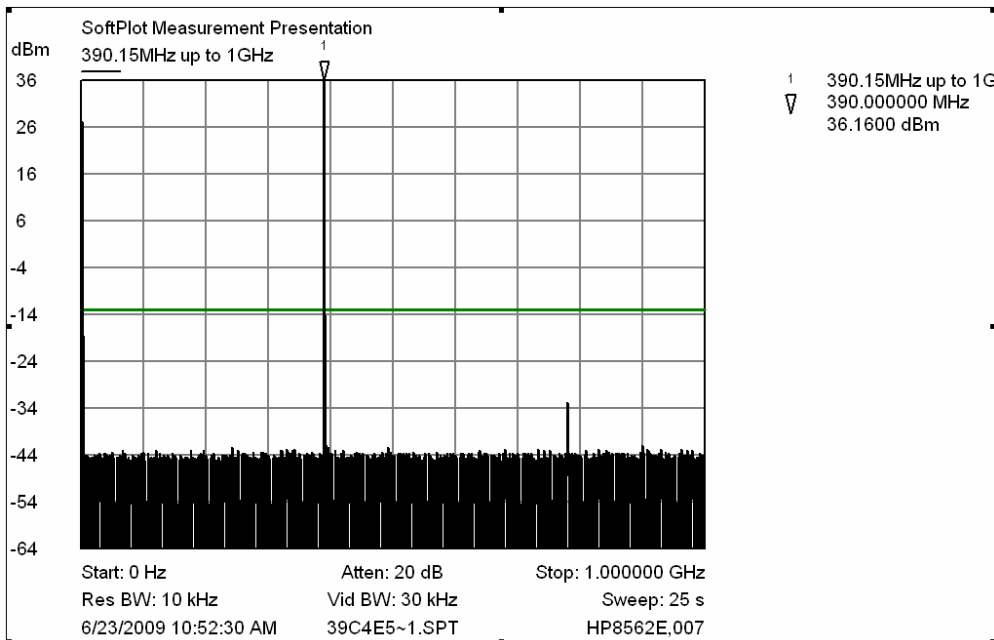
390.15 MHz_3rd



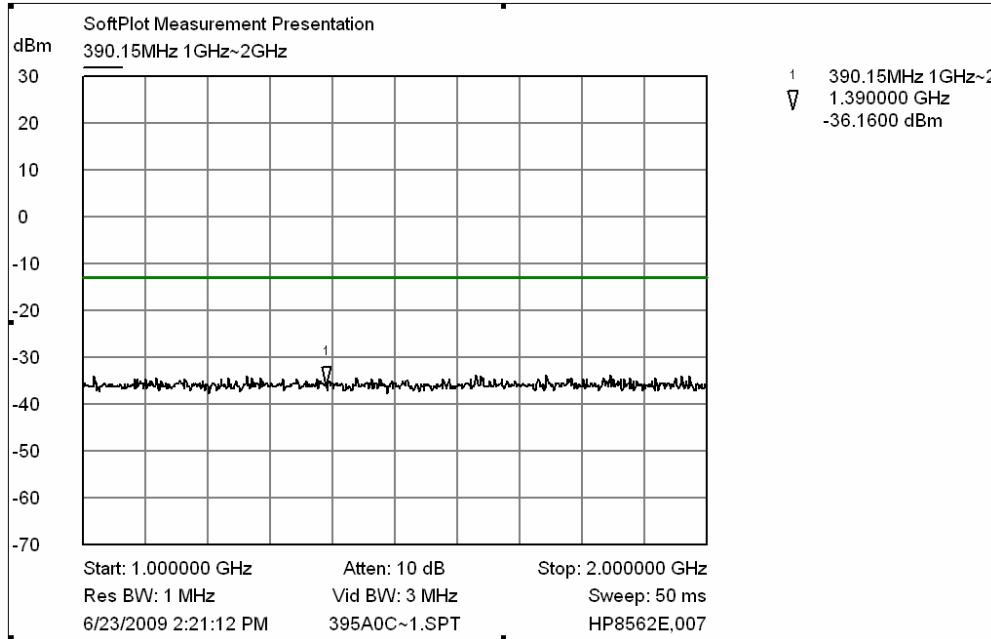
390.15 MHz_4th



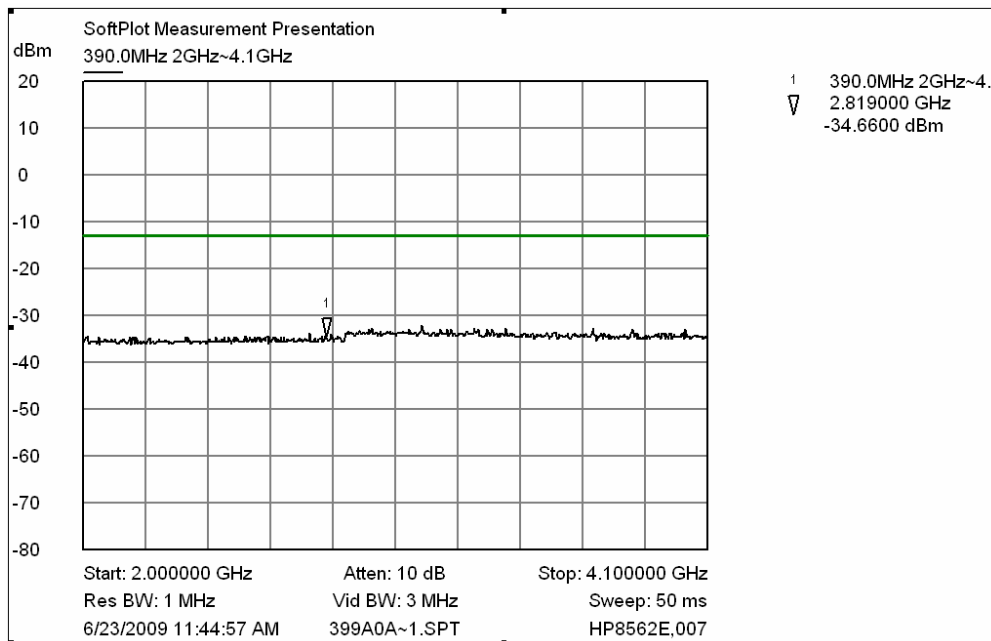
390.15 MHz_0~1 GHz



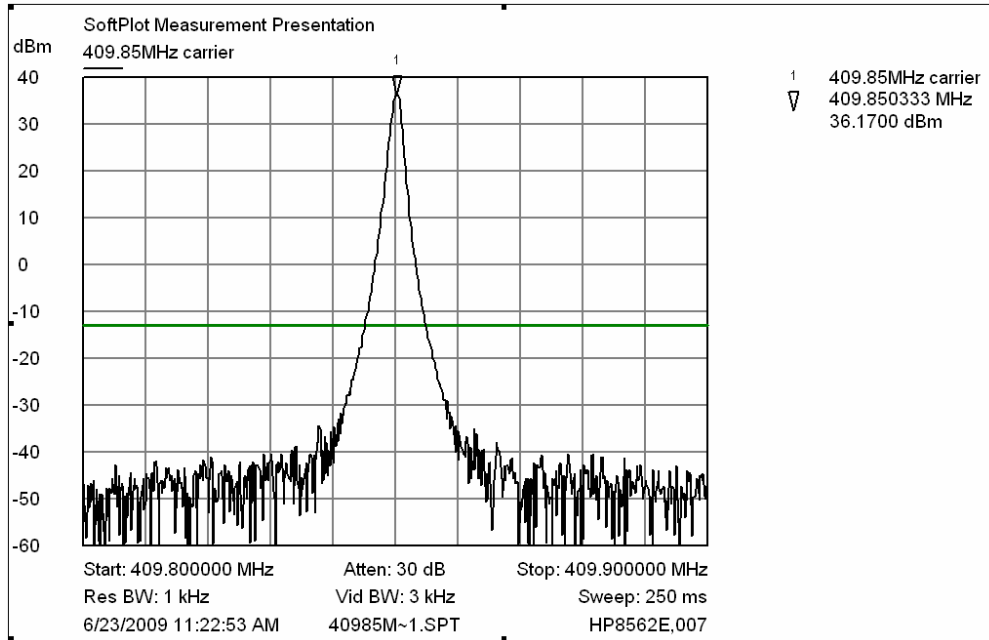
390.15 MHz_1~2 GHz



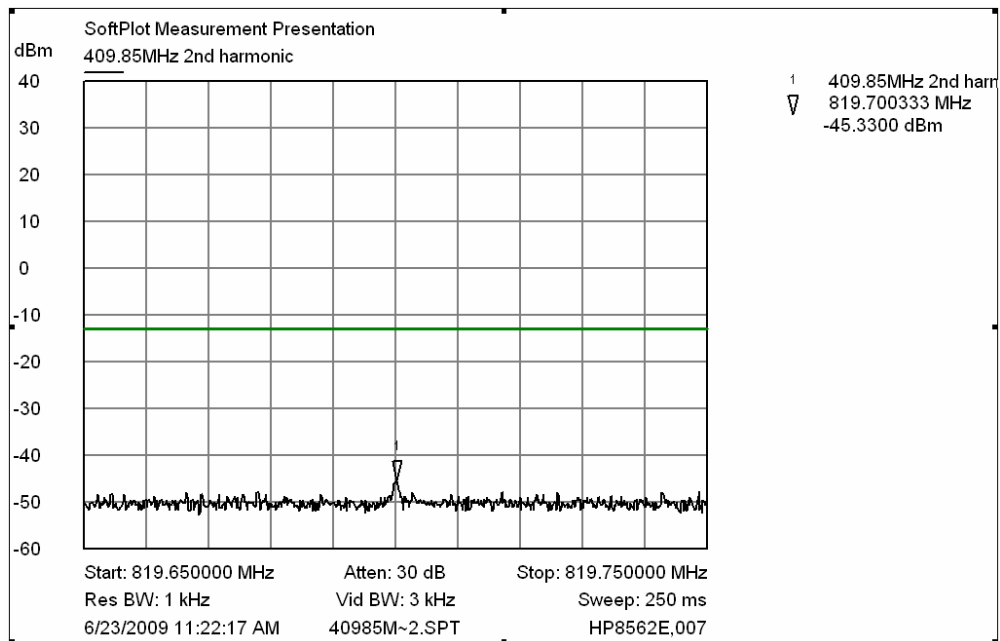
390.15 MHz_2 GHz~10th harmonic



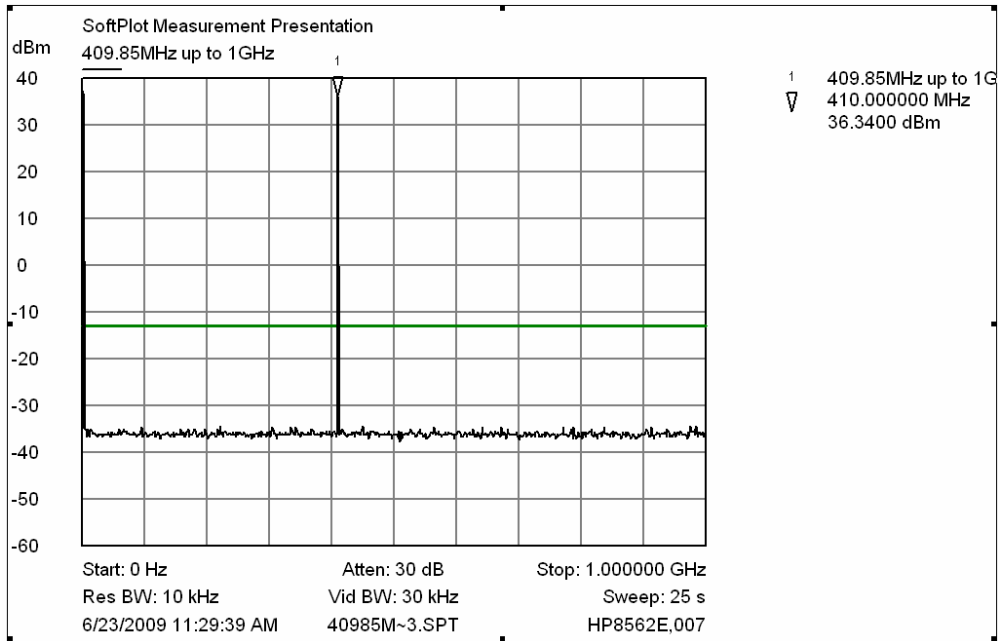
409.85 MHz_1st



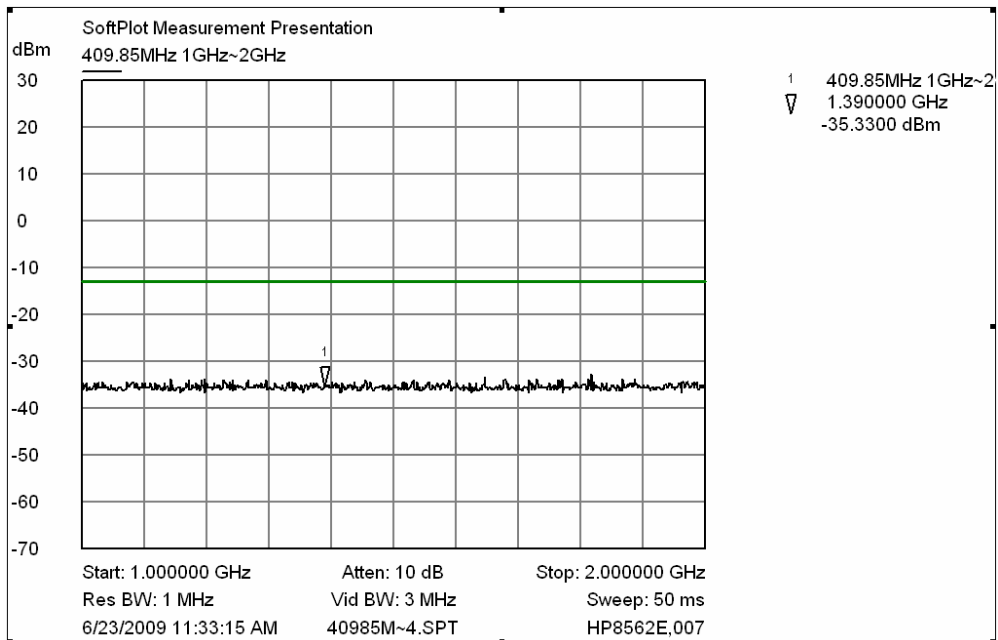
409.85 MHz_2nd



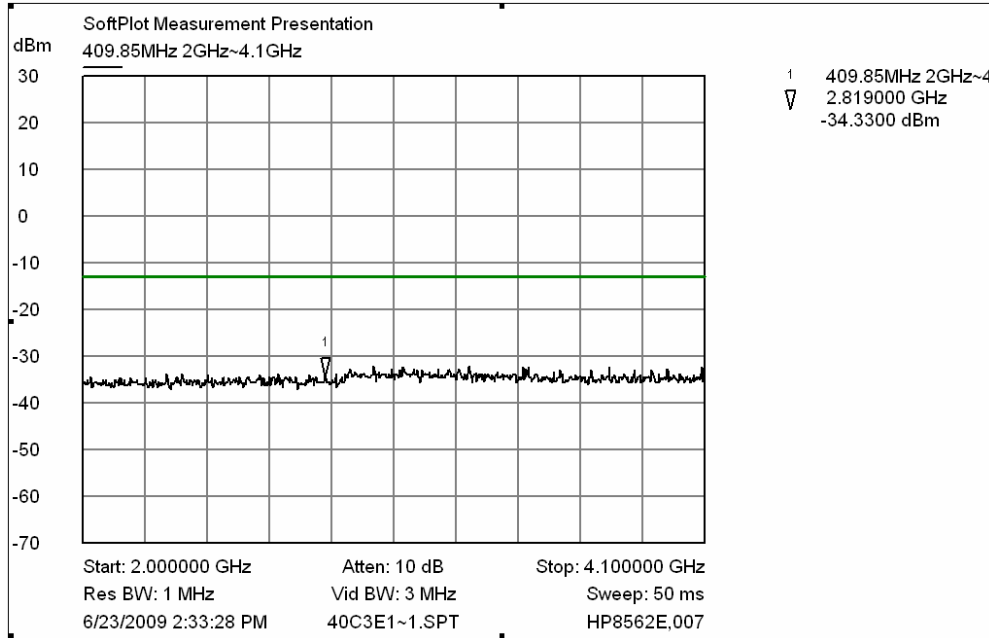
409.85 MHz_0~1GHz



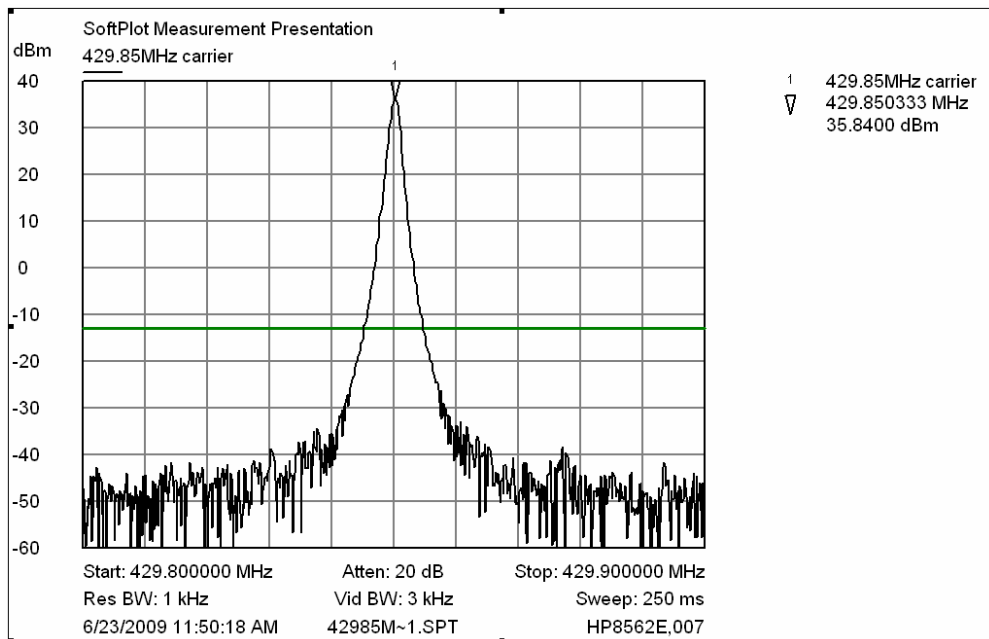
409.85 MHz_1~2 GHz



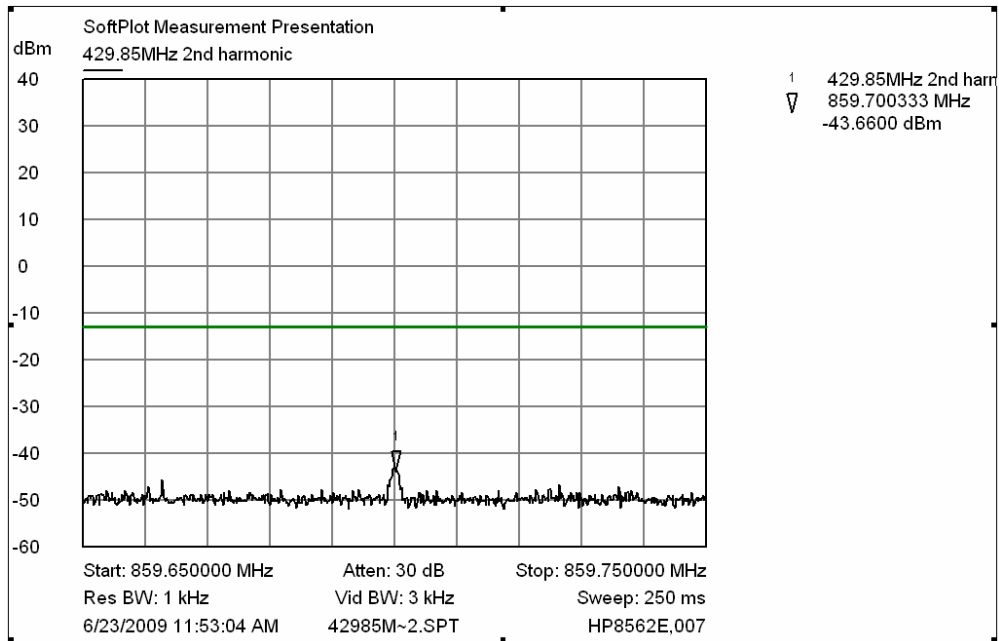
409.85 MHz_2 GHz~10th harmonic



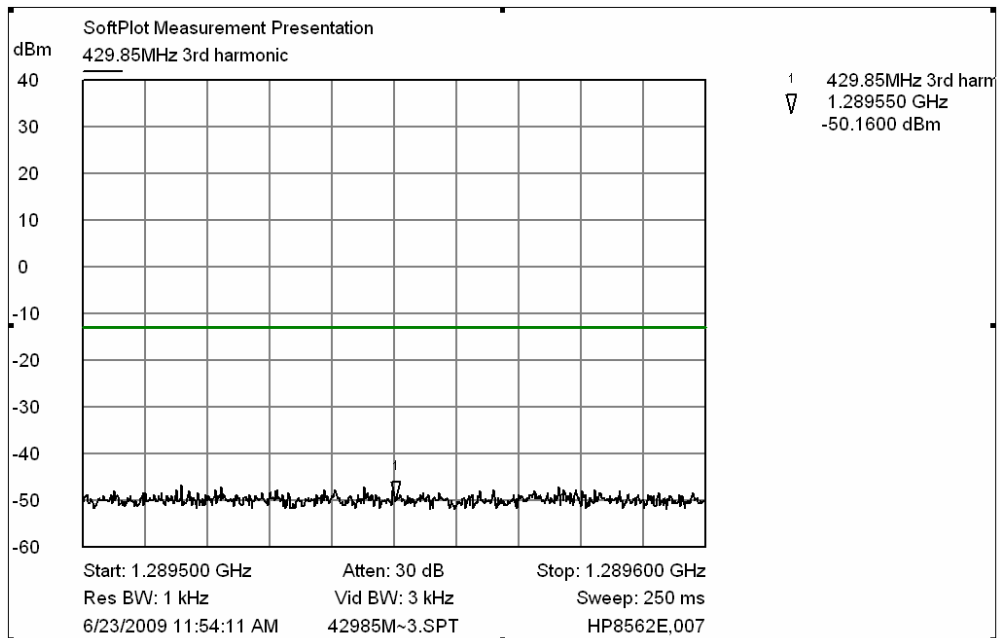
429.85 MHz_1st



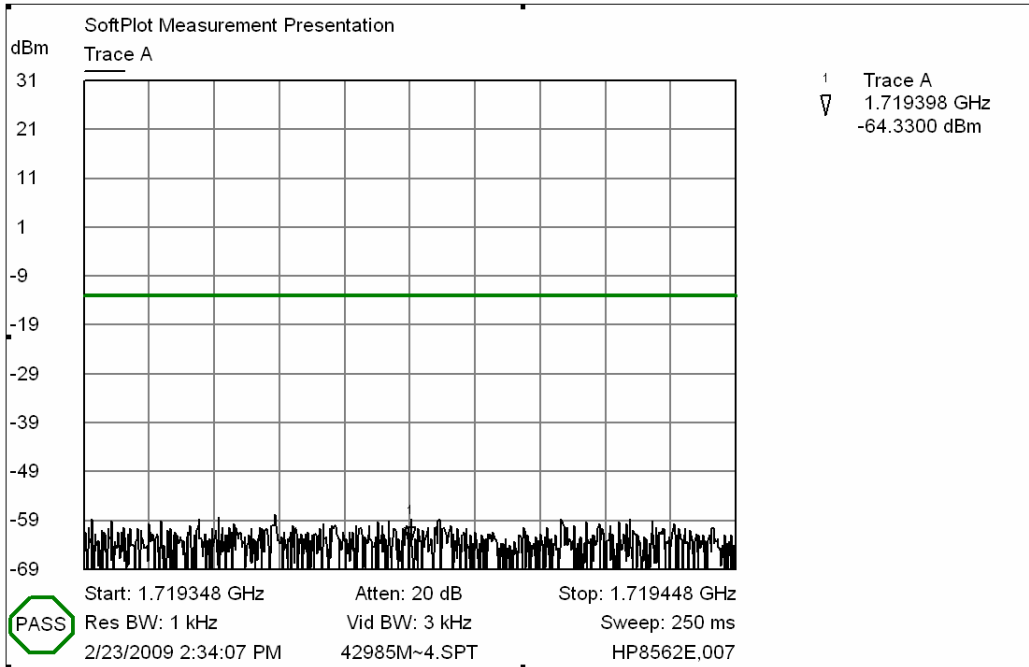
429.85 MHz_2nd



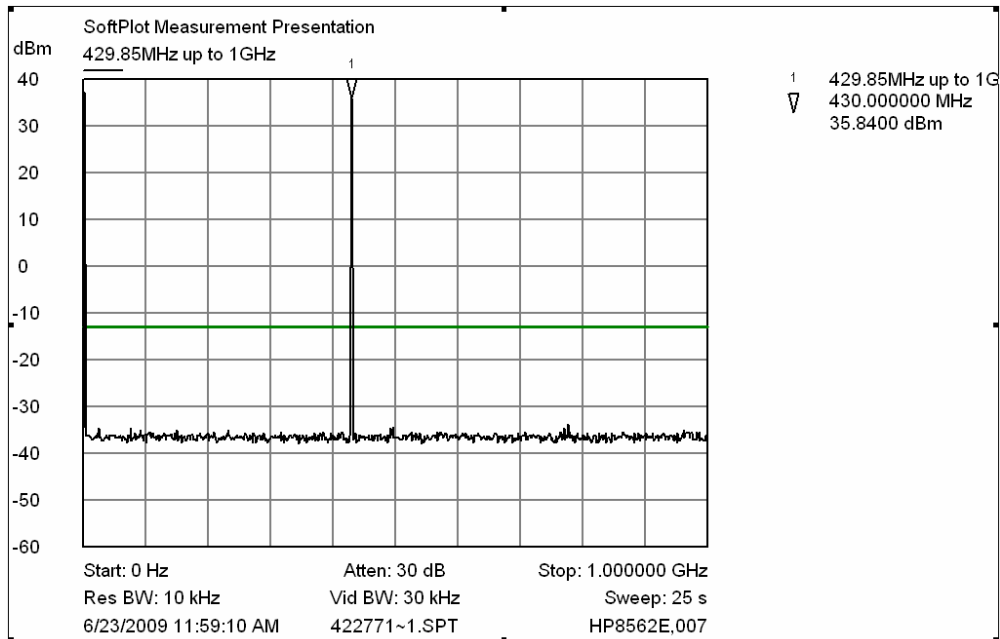
429.85 MHz_3rd



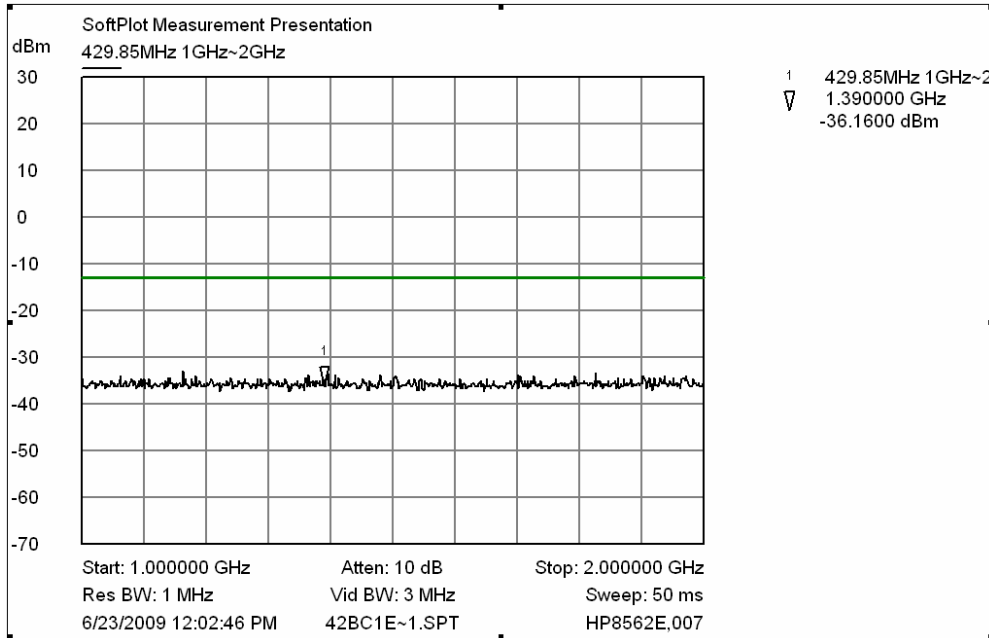
429.85 MHz_4th



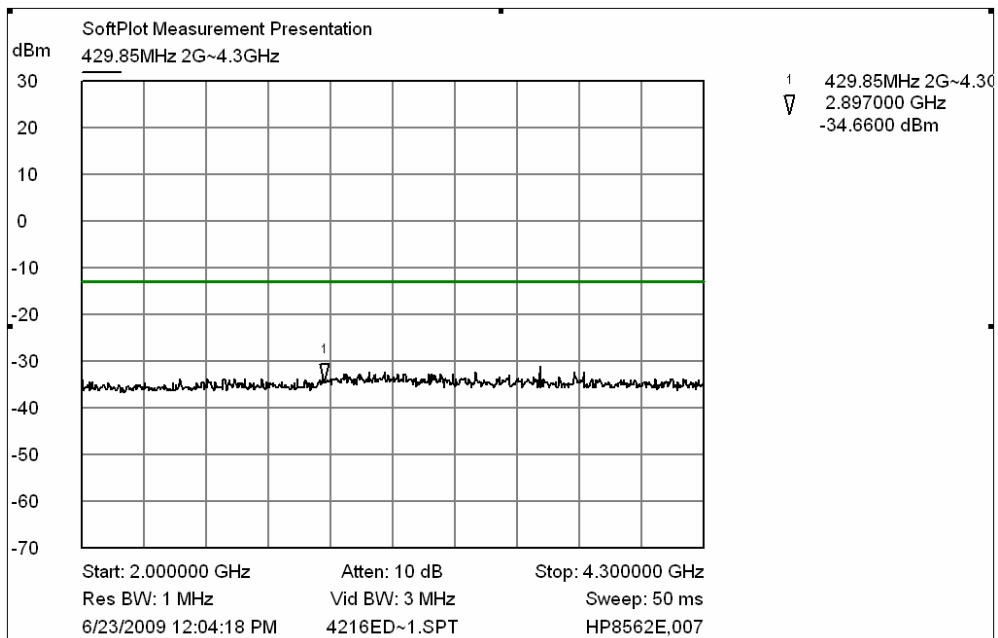
429.85 MHz_0~1GHz



429.85 MHz_1~2 GHz



429.85 MHz 2 GHz~10th harmonic



FCC §2.1053 & §90.210 – Radiated Spurious Emissions

Please refer to the radiated emission test report released by BACL, report number: R0907271-90

FCC §2.1055 & §90.213 – Frequency Stability

Applicable Standards

§ 90.213 for output power > 2 watts, the limit is 5.0ppm, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter (or spectrum analyzer) via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the equipment under test. The voltage was set from 85% to 115% of the nominal value. The output frequency was recorded for each voltage.

Test Equipment List

Manufacturer	Description	Model	S/N	Cal Due Date
TekPower	DC Power Supply	HY3005D	N/A	N/A
Agilent	Spectrum Analyzer	8562EC	3946A00187	12/23/2009
Tenney	Temperature Oven	Series 942	CL5CHAMBERS	N/A

Test Environment Conditions

Temperature:	20~22 °C
Relative Humidity:	70~75 %

Test Engineer: JACINTO AMANTE
 Test Date: 06/21/2009, 06/26/2009, 06/29/2009

Test Result

Please refer to the following tables.

S/N: 09200001(430~470 MHz)

430.15 MHz:

Frequency vs. Temperature

Reference Frequency 430.15 MHz, Limit: 2.5 ppm			
Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
60	12	0.015	0.034
50	12	0.001	0.002
40	12	0.006	0.014
30	12	0.044	0.102
20	12	0.046	0.107
10	12	0.06	0.139
0	12	0.06	0.139
-10	12	0.046	0.107
-20	12	0.06	0.139
-30	12	0.015	0.035

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
20	10.2	0.039	0.09
20	13.8	0.037	0.09

449.85 MHz:

Frequency vs. Temperature

Reference Frequency 449.85 MHz, Limit: 2.5 ppm			
Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
60	12	0.04	0.089
50	12	0.011	0.024
40	12	0.003	0.006
30	12	0.05	0.111
20	12	0.06	0.133
10	12	0.06	0.133
0	12	0.05	0.111
-10	12	0.035	0.078
-20	12	0.08	0.178
-30	12	-0.018	-0.04

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
20	10.2	0.038	0.08
20	13.8	0.05	0.111

469.85 MHz

Frequency vs. Temperature

Reference Frequency 469.85 MHz, Limit: 2.5 ppm			
Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
60	12	0.049	0.104
50	12	0.02	0.04
40	12	0.003	0.006
30	12	0.08	0.170
20	12	0.11	0.234
10	12	0.06	0.128
0	12	0.06	0.128
-10	12	0.034	0.07
-20	12	0.06	0.128
-30	12	0.025	0.05

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
20	10.2	0.11	0.234
20	13.8	0.11	0.234

S/N: 09260003 (390~430 MHz)

390.15MHz

Frequency vs. Temperature

Reference Frequency 390.15 MHz, Limit: 2.5 ppm			
Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
60	12	0.008	0.02
50	12	-0.038	0.10
40	12	-0.06	0.15
30	12	-0.045	0.11
20	12	0.031	0.08
10	12	-0.11	0.28
0	12	-0.11	0.28
-10	12	0.028	0.07
-20	12	0.022	0.05
-30	12	0.051	0.13

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
20	10.2	-0.029	0.07
20	13.8	-0.039	0.10

409.85 MHz

Frequency vs. Temperature

Reference Frequency 409.85 MHz, Limit: 2.5 ppm			
Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
60	12	0.017	0.04
50	12	-0.028	0.07
40	12	-0.06	0.15
30	12	-0.044	0.11
20	12	-0.031	0.07
10	12	-0.10	0.24
0	12	-0.11	0.27
-10	12	-0.04	0.10
-20	12	0.001	0.002
-30	12	-0.044	0.11

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
20	10.2	-0.022	0.05
20	13.8	-0.021	0.05

429.85 MHz

Frequency vs. Temperature

Reference Frequency 429.85 MHz, Limit: 2.5 ppm			
Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
60	12	0.016	0.04
50	12	-0.023	0.05
40	12	-0.07	0.16
30	12	-0.06	0.14
20	12	-0.08	0.19
10	12	-0.11	0.26
0	12	-0.12	0.28
-10	12	-0.06	0.14
-20	12	-0.04	0.09
-30	12	-0.06	0.14

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supply (Vdc)	Frequency Error (kHz)	Frequency Error (ppm)
20	10.2	-0.028	0.07
20	13.8	-0.028	0.07

FCC §90.214 – Transient Frequency Behavior

Applicable Standards

§90.214 Transmitters designed to operate in the 421~512MHz frequency bands must maintain transient frequencies within maximum frequency difference limits.

Test Method

TIA/EIA-603 C 2.2.19. The output at the DOP, due to the change in the ration of power between the signal generator input power and the transmitter output power will produce a change in display: For the first part of the sweep it will show the 1KH test signal, then once the receiver's demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the 1 KHz test signal is completely suppressed is considered to be ton; toff is the instant of 1 KHz signal start to rise. The trace should be maintained within the allowed division defined by 47 CFR 90.214 and outlined in 3.2.2.

Test Equipment List

Manufacturer	Description	Model	S/N	Cal Due Date
Agilent	Spectrum Analyzer	8562EC	3946A00288	12/22/2009
TekPower	DC power supply	HY3005D	N/A	N/A
HP	RF Communications Test Set	8920A	274652140	12/23/2009
Tectronix	Scope	TDS 220	B067544	12/23/2009
HP	Signal Generator	8648A	3426A00120	12/23/2009

Test Environment Conditions

Temperature:	20~22 °C
Relative Humidity:	70~75 %

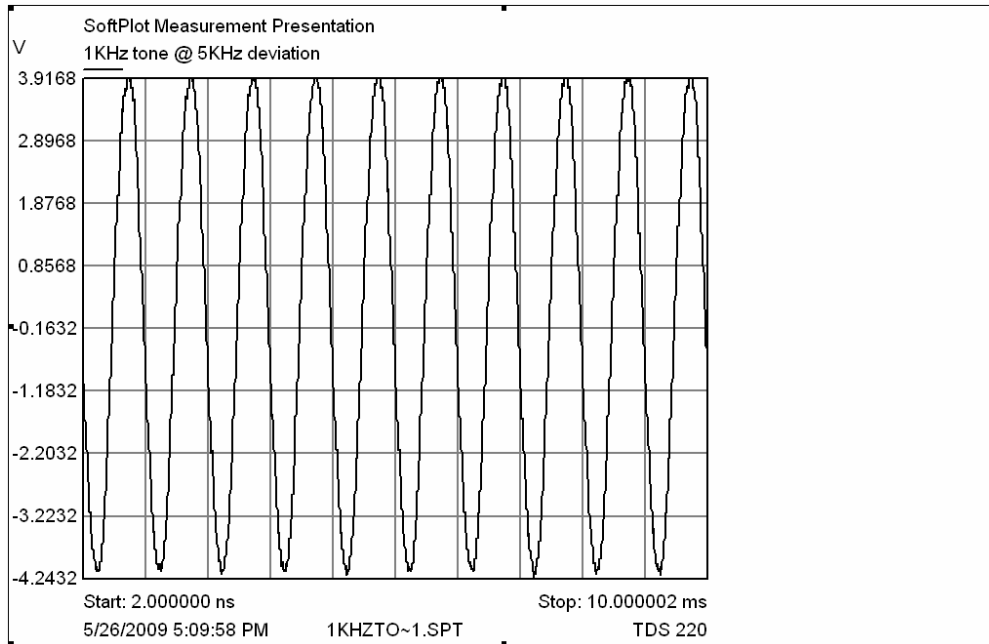
Test Engineer: Hui Chen
 Test Date: 05/26/2009~05/27/2009, 06/25/2009

Test Result

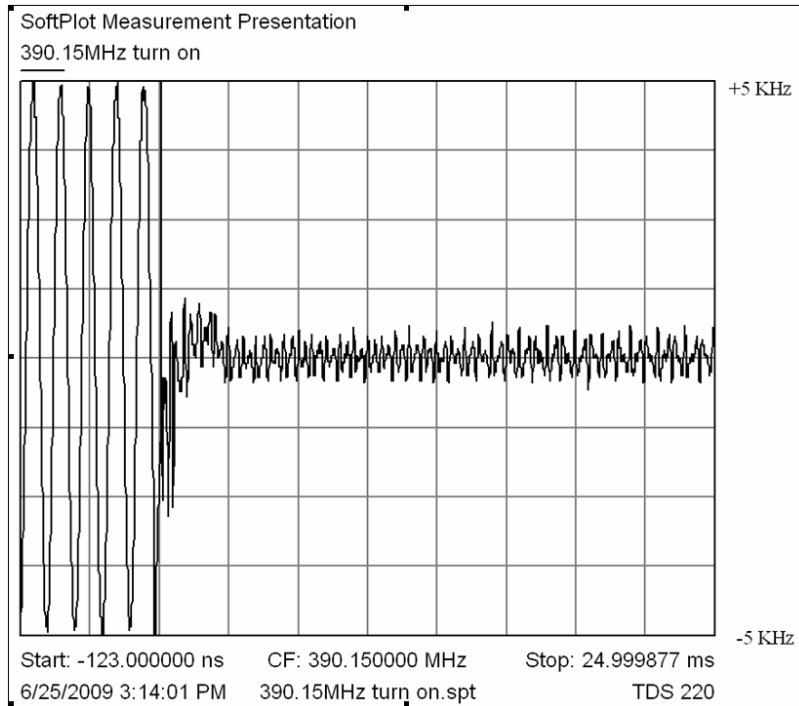
Please refer to the following plots.

S/N: (390~430 MHz)

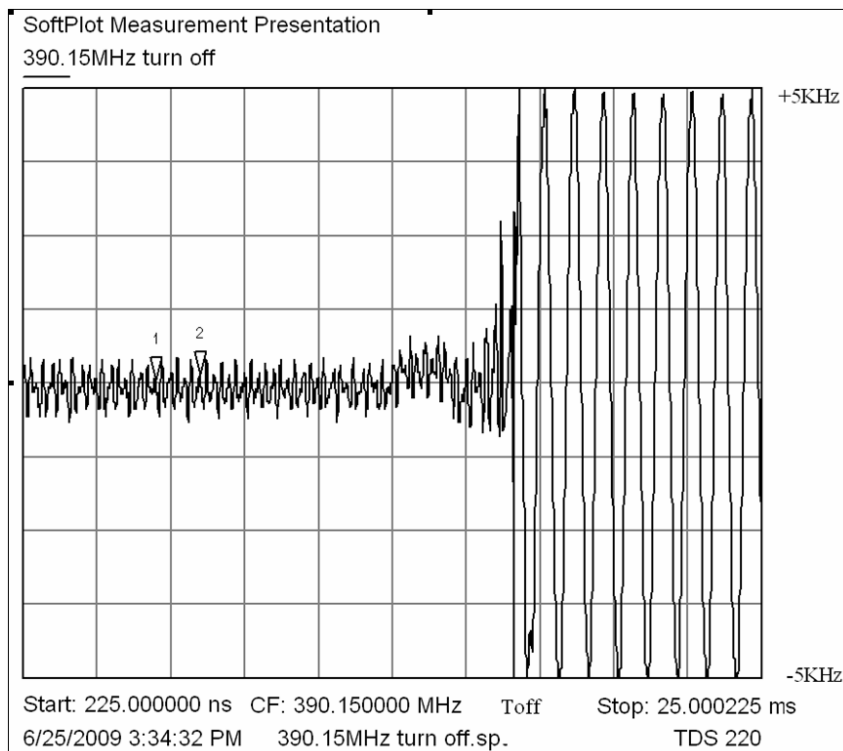
1 kHz tone at +/-5 kHz deviation



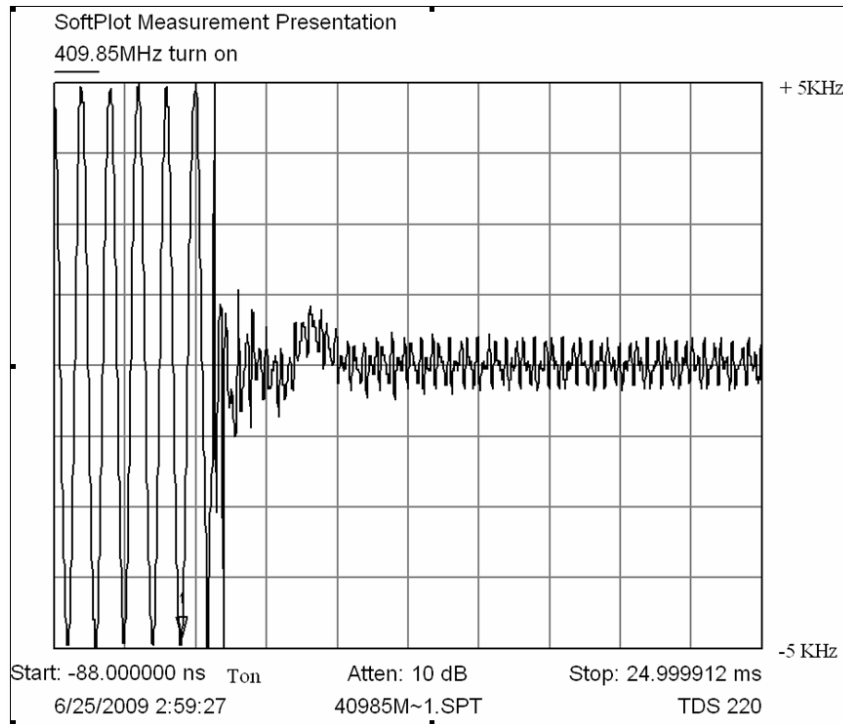
390.15 MHz Turn on transient frequency



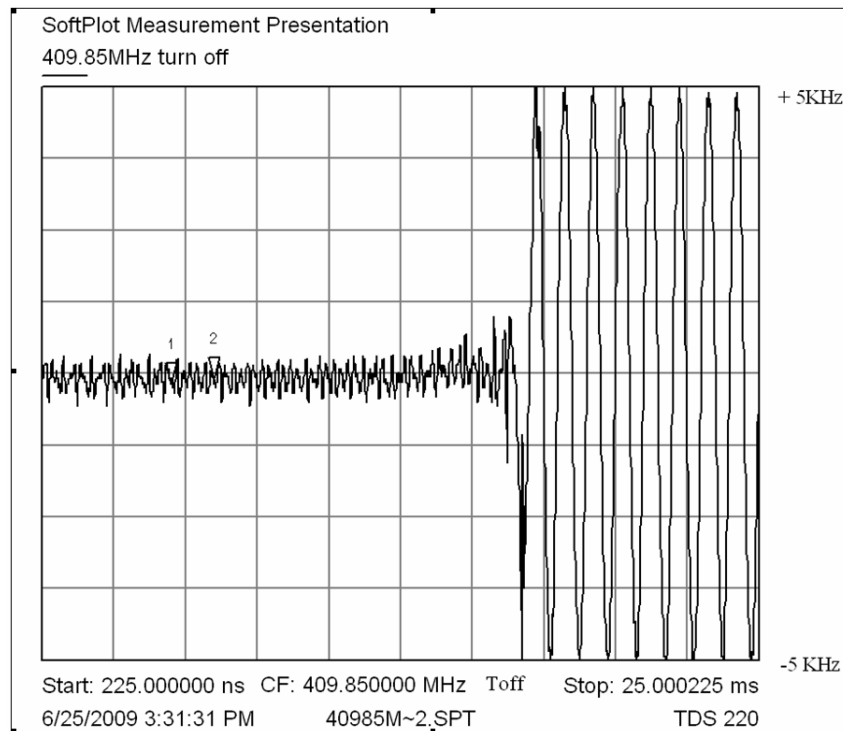
390.15 MHz Turn off transient frequency



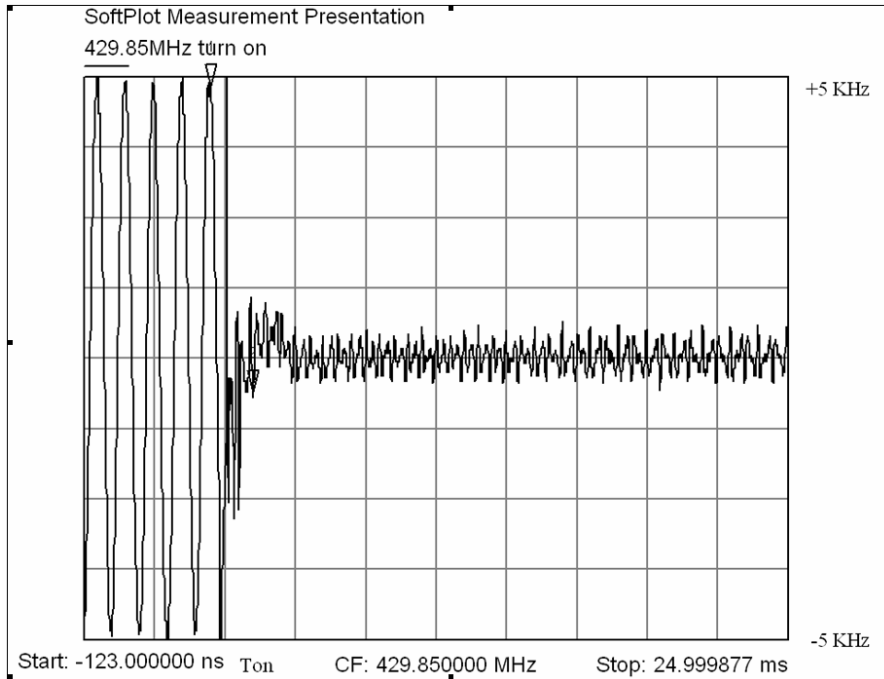
409.85 MHz Turn on transient frequency



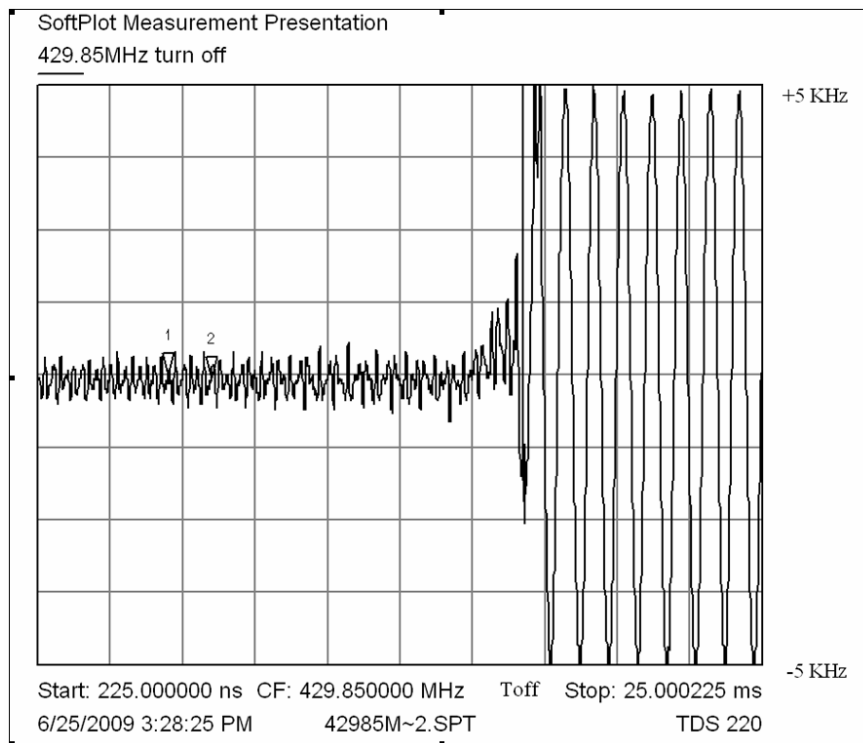
409.85 MHz Turn off transient frequency



429.85 MHz Turn on transient frequency

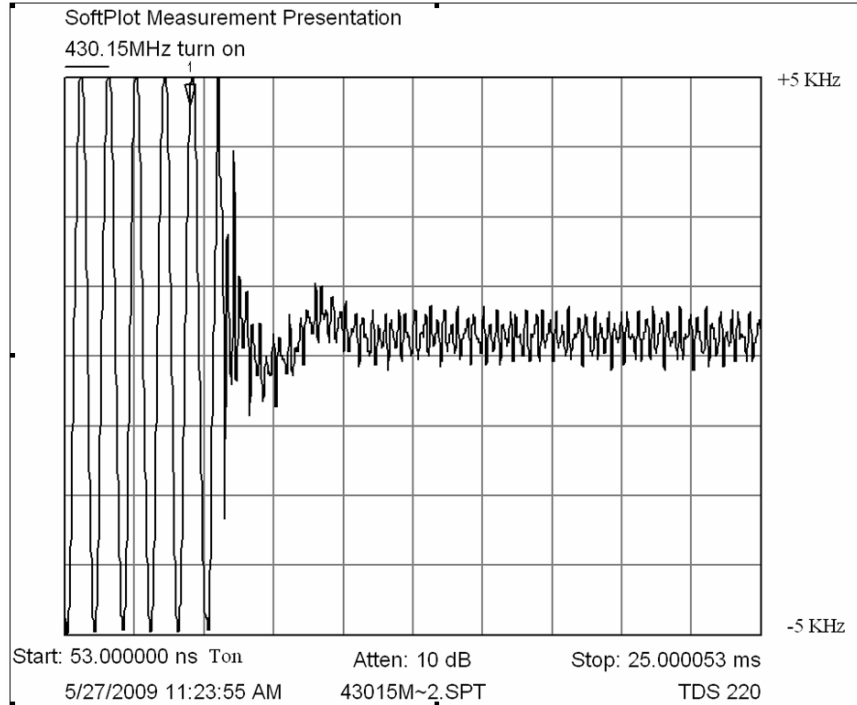


429.85 MHz Turn off transient frequency

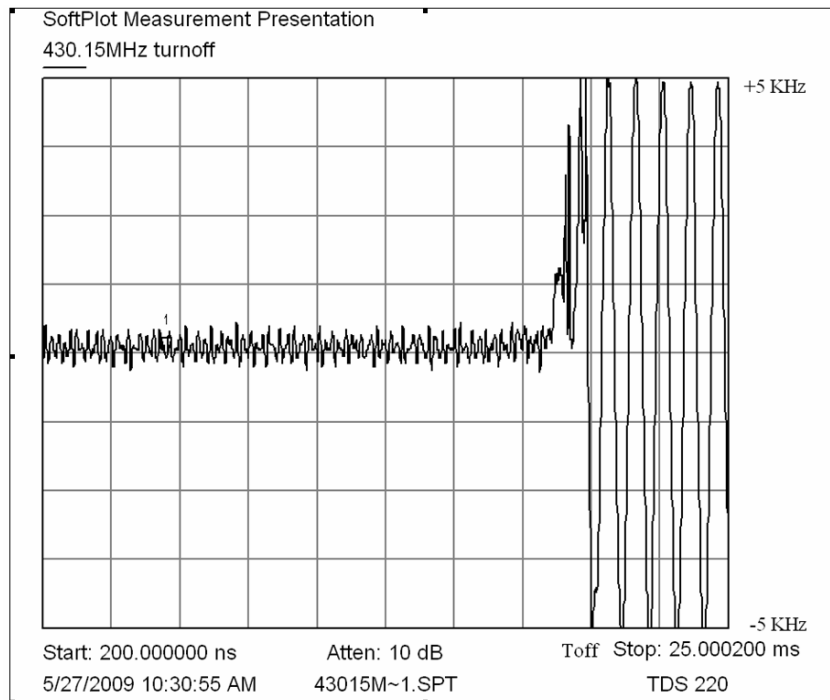


S/N: 09200001 (430~470 MHz)

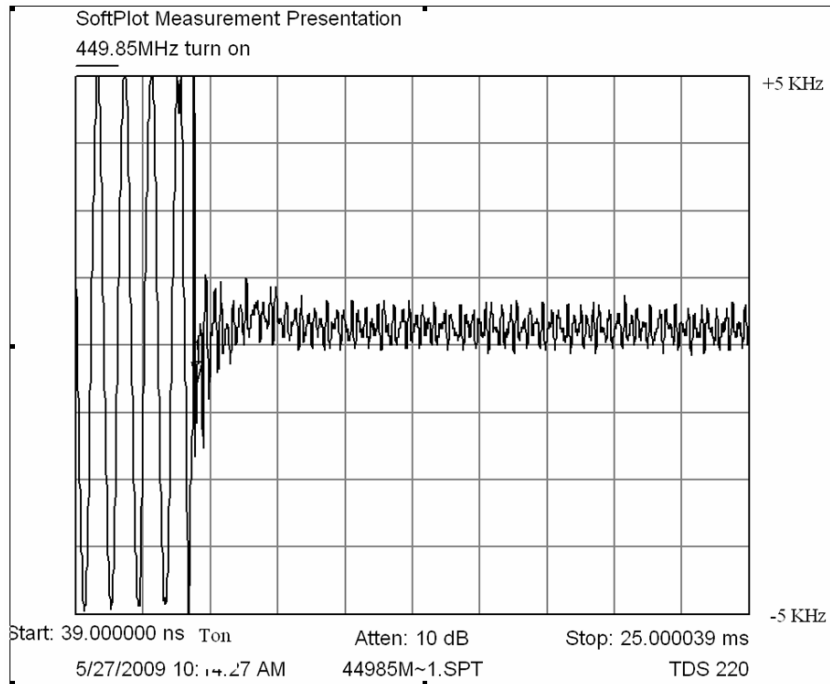
430.15 MHz Turn on transient frequency



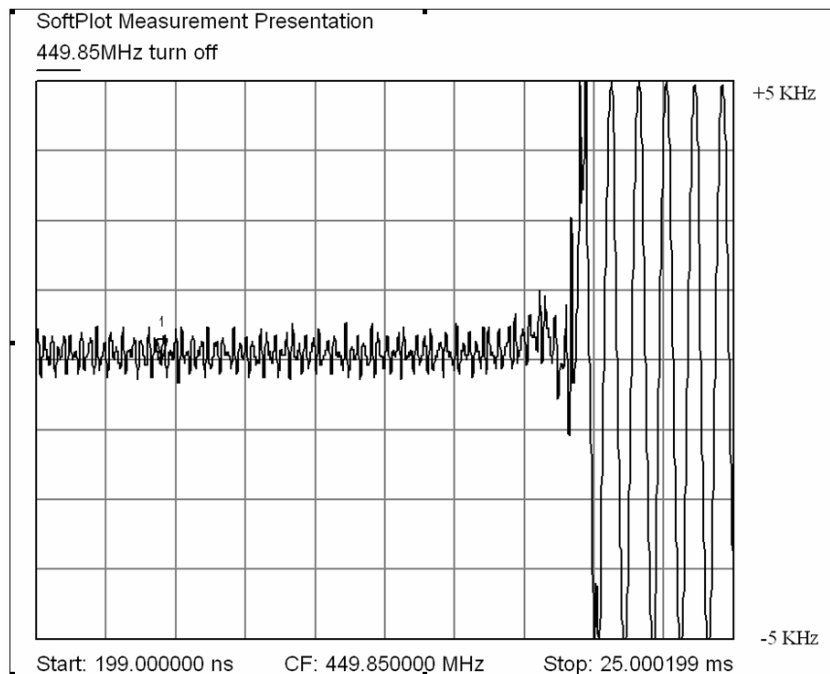
430.15 MHz Turn off transient frequency



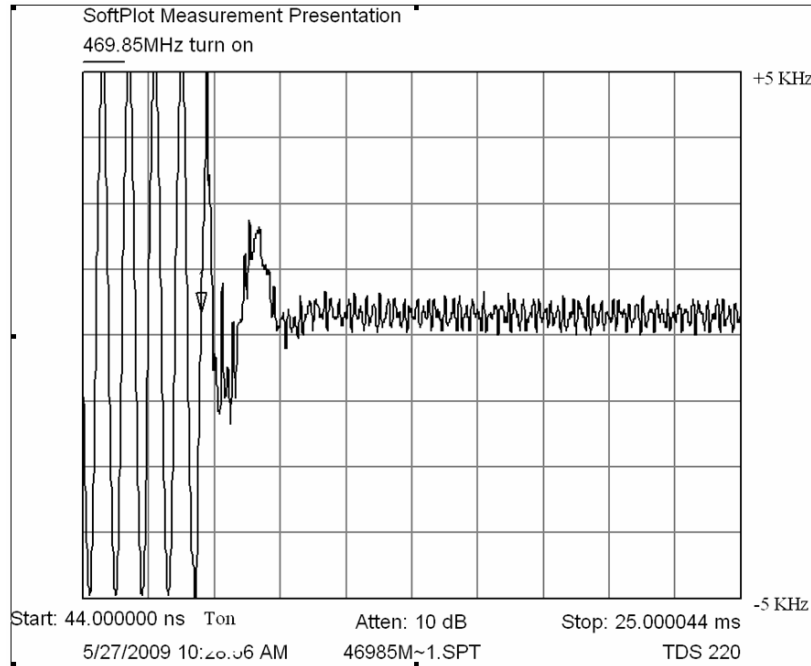
449.85 MHz Turn on transient frequency



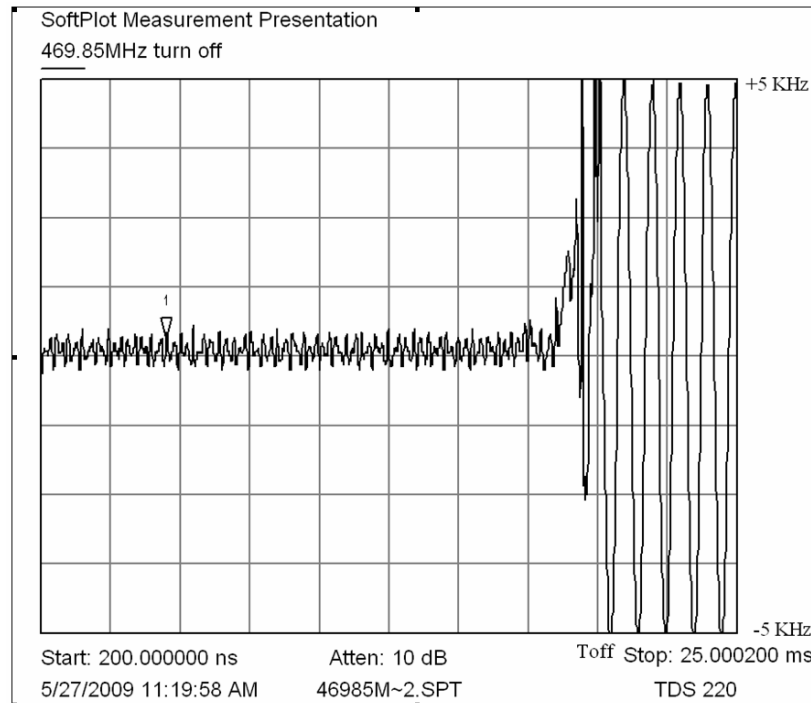
449.85 MHz Turn off transient frequency



469.85 MHz Turn on transient frequency



469.85 MHz Turn off transient frequency



FCC §2.1091 – RF Exposure Information

Applicable Standard

According to § 2.1091 and § 1.1307(b)(1). Systems operation under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Test Result

Please refer to the radiated emission test report released by BACL, report number: R0907271-90

******* END OF REPORT *******