47 CFR

FEDERAL COMMUNICATIONS COMMISSION

PART 90-PRIVATE LAND MOBILE RADIO SERVICES

MEASUREMENT AND TEST REPORT

For

Pacific Crest Corporation

510 Deguigne Drive, Sunnyvale, CA 94085, USA

FCC ID: KEAADLF

Model: ADLF

Report Type Original Report	**Equipment Type:** UHF Transceiver Module
Test Engineers:	Hui Chen Jacinto Amante
Report Number:	ADLFFCC051309
Report Date	2009-05-13
Reviewed By:	Philip Wilson
Prepared By:	Pacific Crest Corporation 510 Deguigne Drive. Sunnyvale, CA 94085, USA Tel: (408) 481-8070 Fax:(408) 481-8984

FCC Part 90 Measurement and Test Report

General Information

Objective:
The following report is prepared for the Pacific Crest Corporation's product, model ADL, SLR 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.

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 9KHz to 40GHz

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

Technical Summary

No. of Units: Two
Equipment Category:
Equipment Series Number (Model Number):

Power Characteristics: Variable output power form 100mW to 1W
Channel Spacing: 25 kHz & 12.5 kHz,
Unit No.1: Frequency Characteristics: 430MHz to 470MHz,
Test Frequency: 430.15 MHz, 449.85 MHz, 469.85 MHz
Serial Number: 187085
Unit No.2: Frequency Characteristics: 390~430MHz
Test Frequency: 390.15 MHz, 409.85 MHz, 429.85 MHz
Serial Number: 187093
Temperature Range:-30℃ to 60℃

DC power section: Incoming DC voltage is regulated with a switching DC to DC converter. The externally supplied DC voltage may vary from 6V~30V, If the external voltage is outside this range, it will not be allowed to operate. In following TX & RX testing, we use 12VDC as our external supplied DC voltage.

Summary of Test Results

FCC rule	Description	Result
ξ2.1046 and ξ90.205	RF output Power	Compliant
ξ2.1049 and ξ90.209	Emission mask, Occupied BW	Compliant
ξ2.1051and ξ90.210	Spurious emissions	Compliant
ξ2.1053 and ξ90.210	Field strength of spurious radiation	Compliant
ξ2.1055 and ξ90.213	Frequency stability	Compliant
ξ2.106 and ξ90.214	Transient Frequency Behavior	Compliant
ξ2.1091	RF Exposure	Compliant

Tests Results

ξ2.1046 Conducted Output Power

Applicable Standard

Per FCC ξ2.1046 and ξ90.205: 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:

Manufacturer	Description	Model	S/N	Cal 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

Environment conditions

Room Temperature	21℃~22℃
Relative Humidity	70%~75%

Test Engineer: JACINTO AMANTE

Test Date: 02/02/2009~02/06/2009

Test Results

S/N: 187085

430~470MHz

Band(MHz)	Frequency(MHz)	Output Power in dBm
430~470MHz	430.15	30.1
	449.85	30.1
	469.85	29.6
390~430MHz	390.15	29.2
	409.85	29.9
	429.85	29.5

ξ2.1049 and ξ90.209 Occupied Bandwidth and Emission Mask

Applicable Standard
ξ2.1049 and ξ90.210

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

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more that 5.626 KHz but no more than 12.5 kHz, at lease 7.27(fd-2.88 kHz) dB.

On any frequency removed from the center of the authorized bandwidth by displacement frequency (fd in kHz) of more that 12.5KHz at least:
50+10logP or 70dB

25 kHz Bandwidth
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more that 5 kHz but no more than 10 kHz, at lease 83log (fd/5) dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency(fd in kHz) of more that 10 kHz but no more than 250% of the authorized bandwidth, at least 29Log(fd2/11)dB or 50 dB.

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

Test Procedure
The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

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:

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

Environment conditions

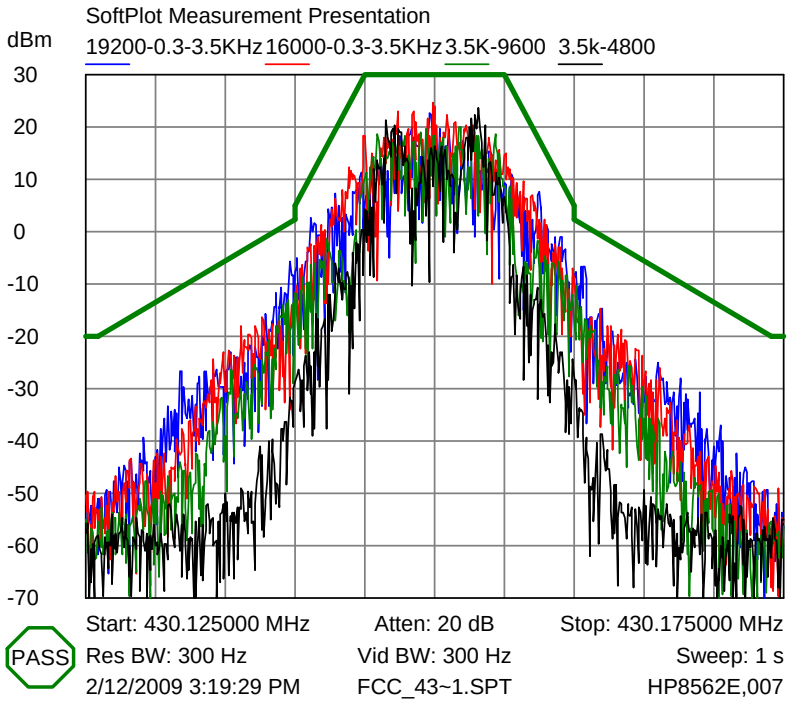
Room Temperature	21℃~22℃
Relative Humidity	70%~75%

Test Engineer: Hui Chen

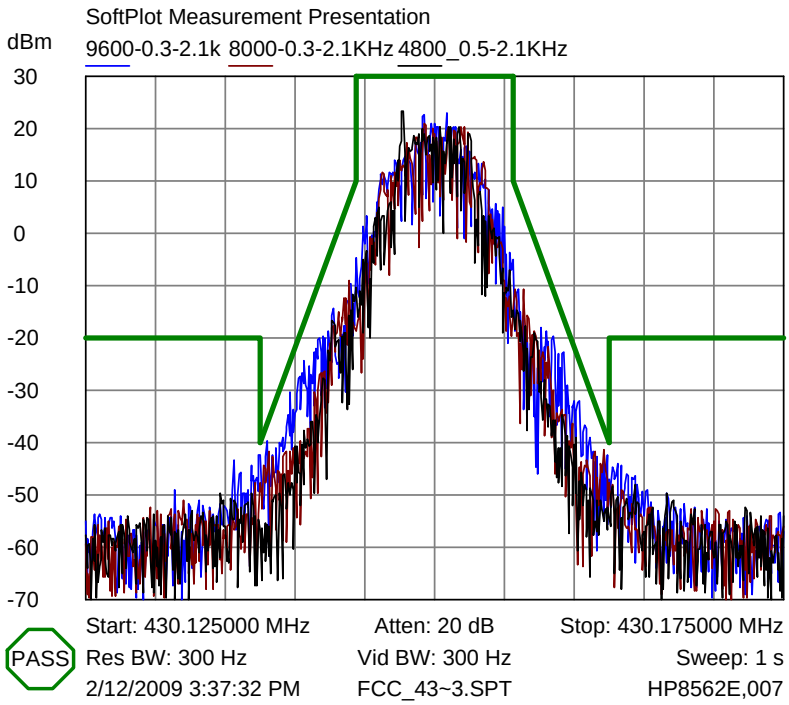
Test Date: 02/12/09~02/23/09

S/N: 187085 (430~470 MHz)

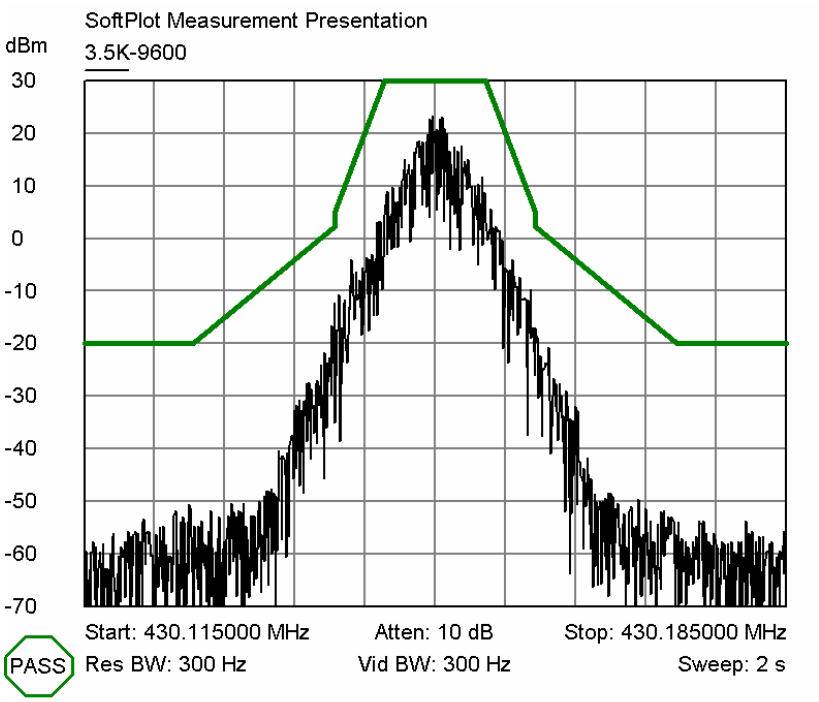
430.15MHz_GMSK Emission C



430.15 GMSK Emission D



430.15MHz 4LFSK Emission C



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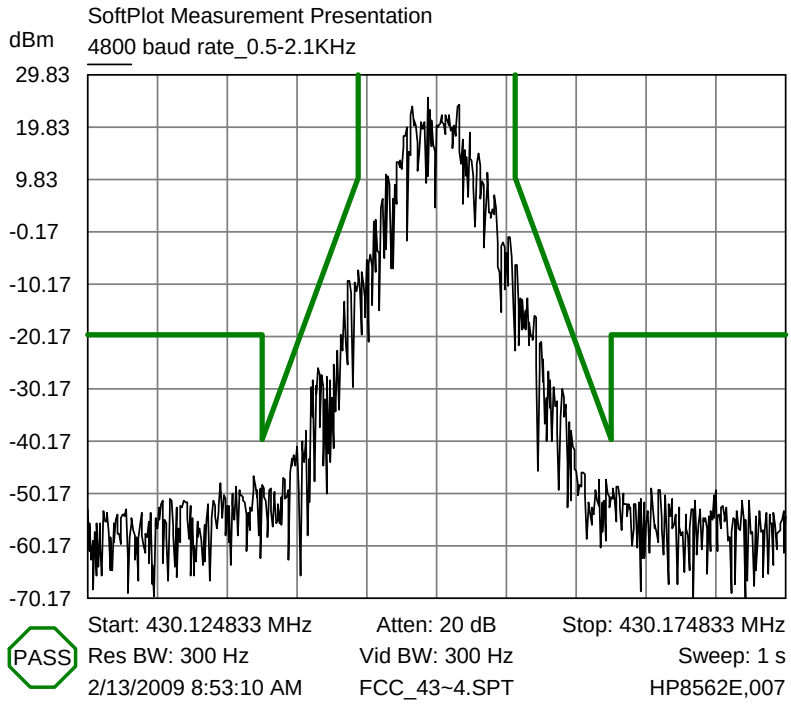
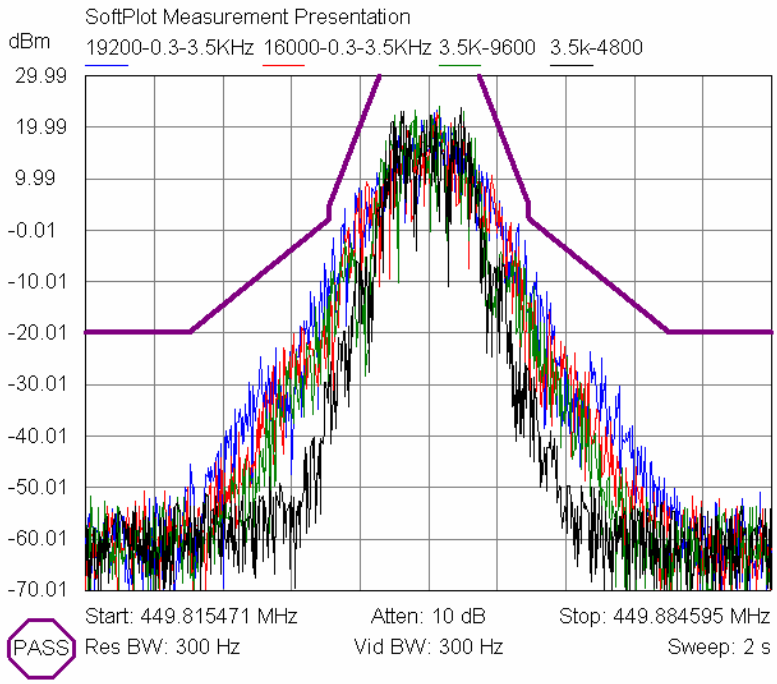


449.85 MHz GMSK Emissions C

449.85MHz GMSK Emission C



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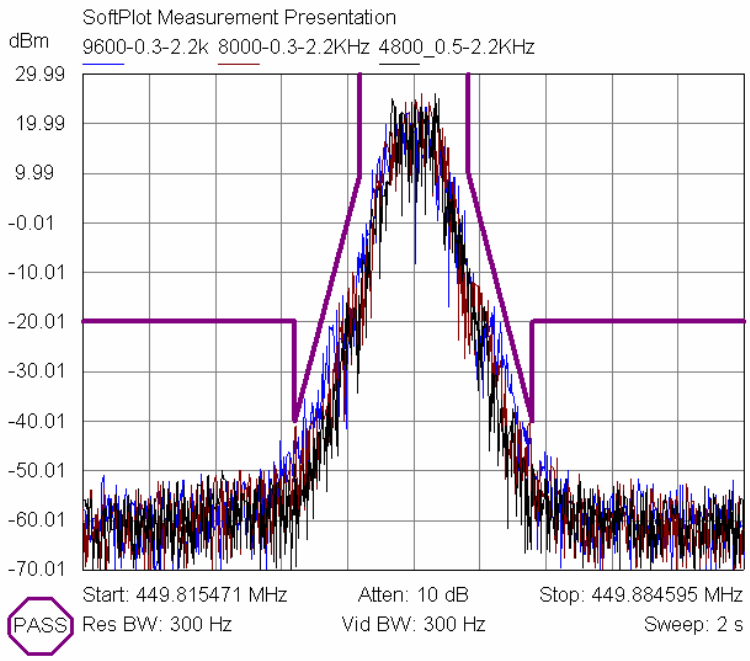
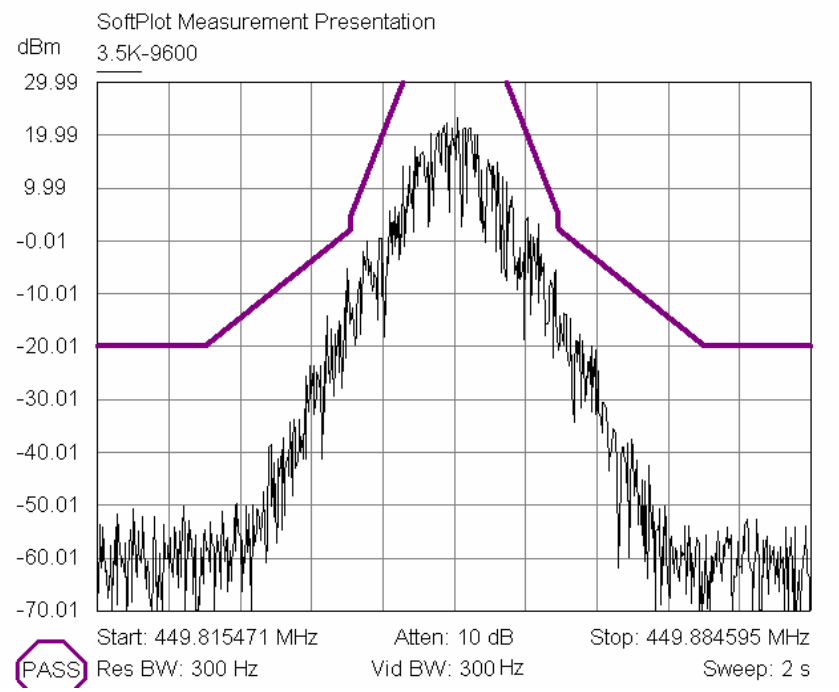
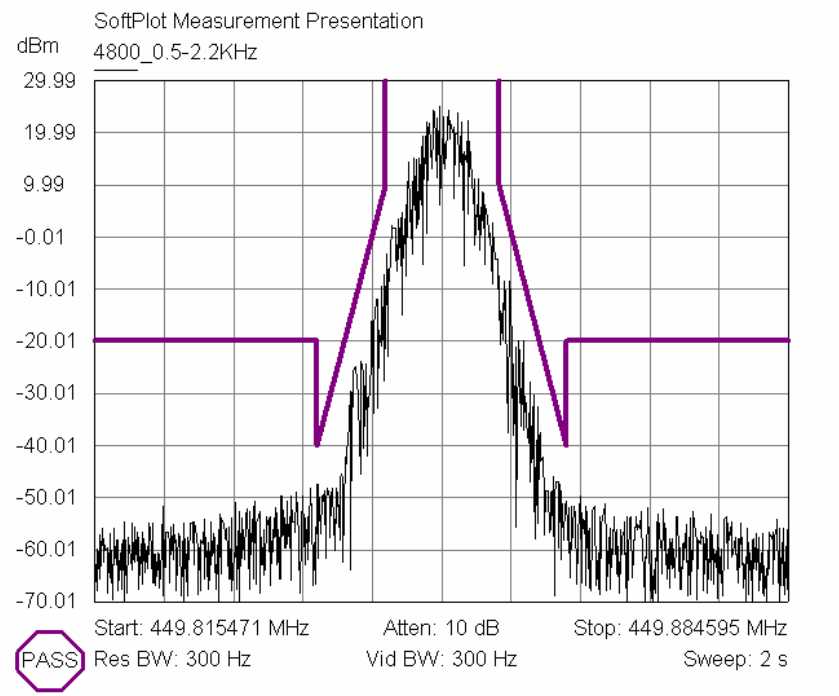


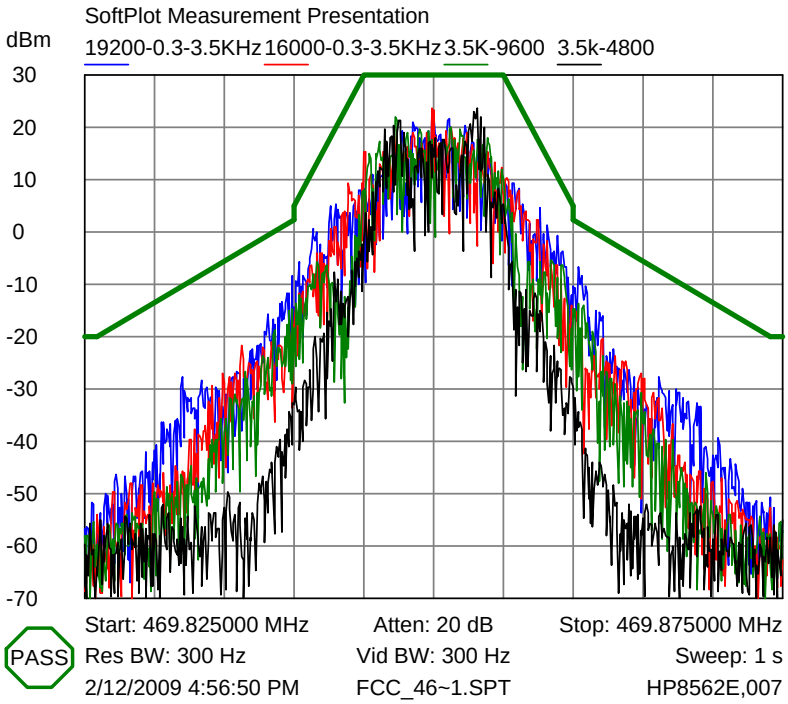
449.85 MHz 4LFSK Emissions C



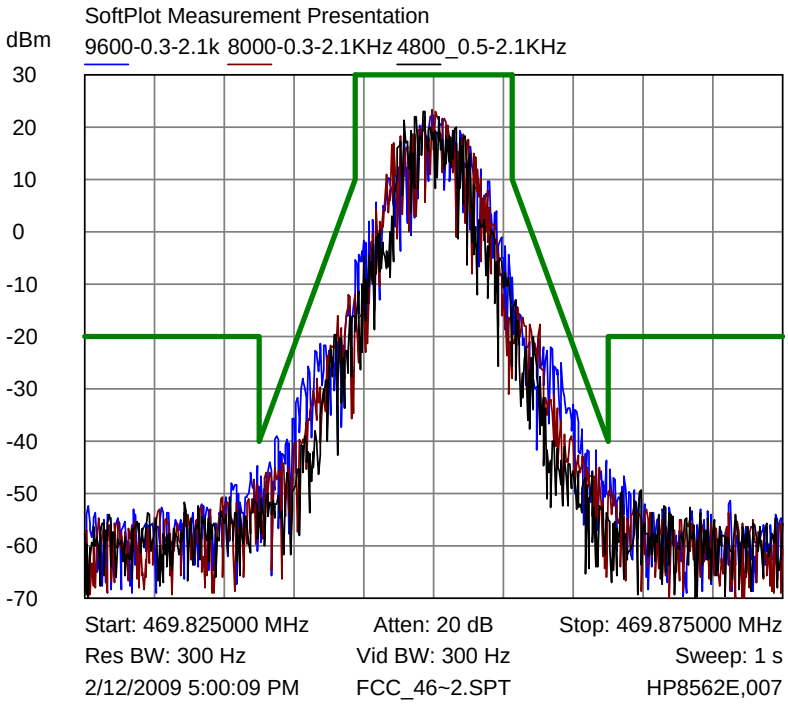
449.85 MHz 4LFSK Emissions D



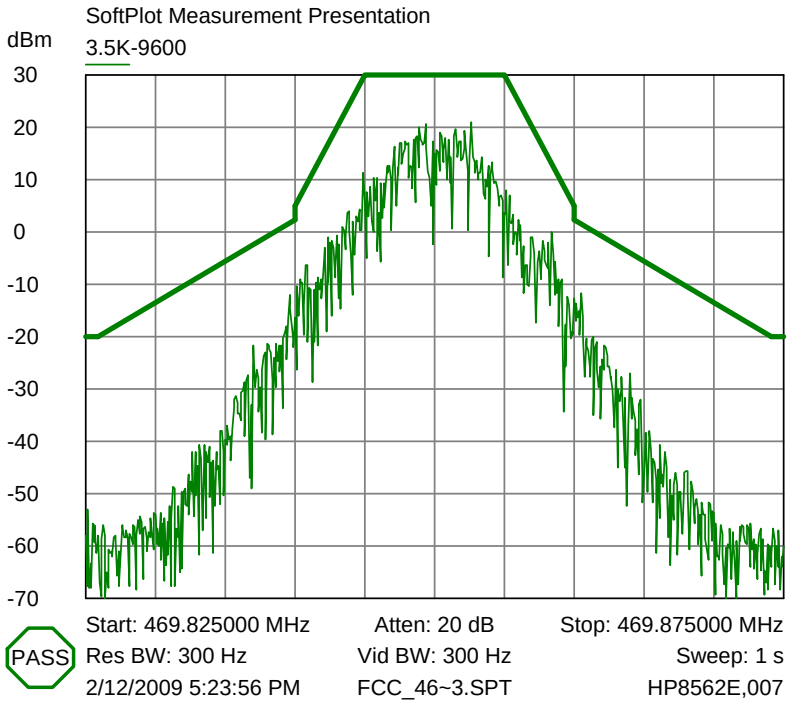
469.85 MHz GMSK Emissions C



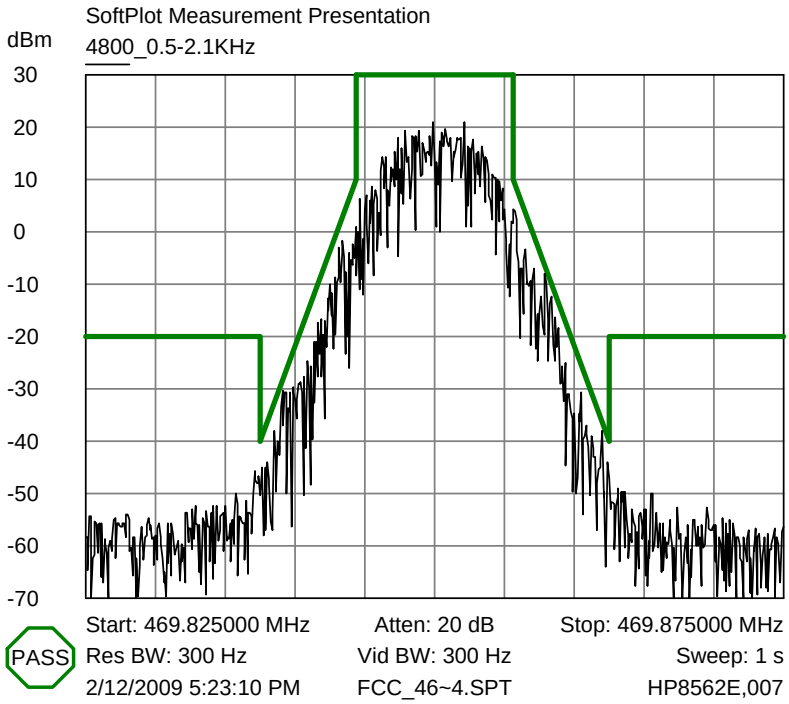
469.85MHz GMSK Emission D



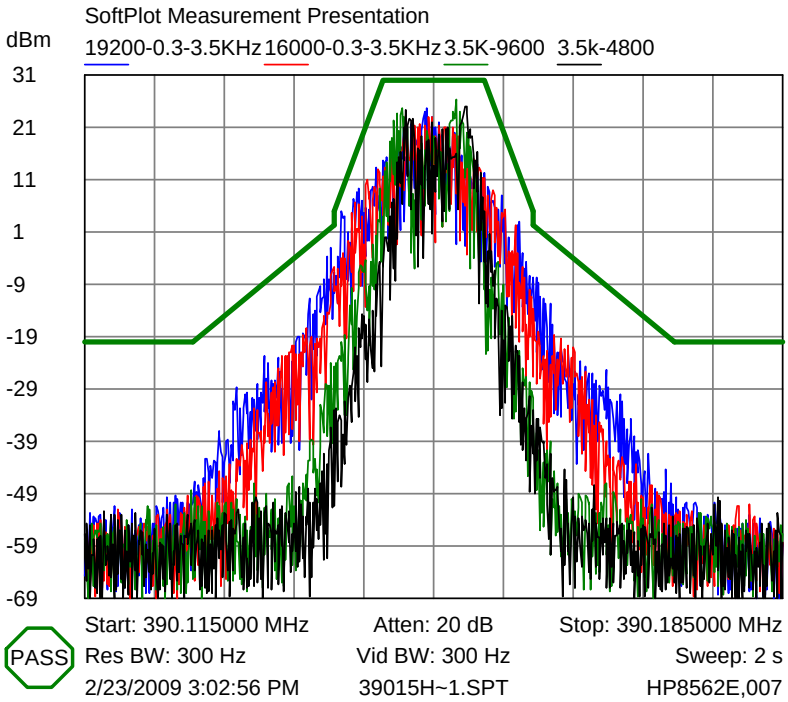
469.85 MHz 4LFSK Emissions C



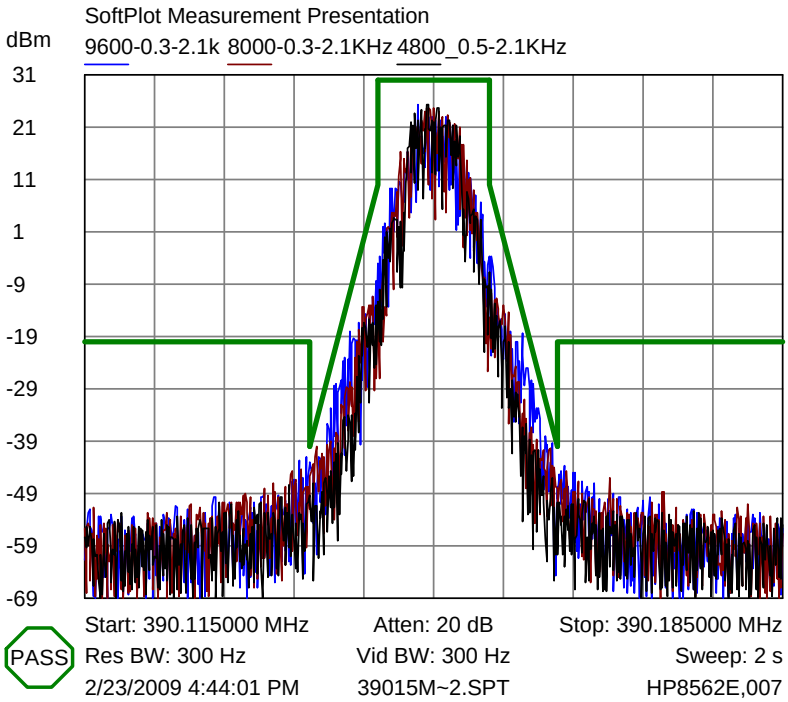
469.85 MHz 4LFSK Emissions D



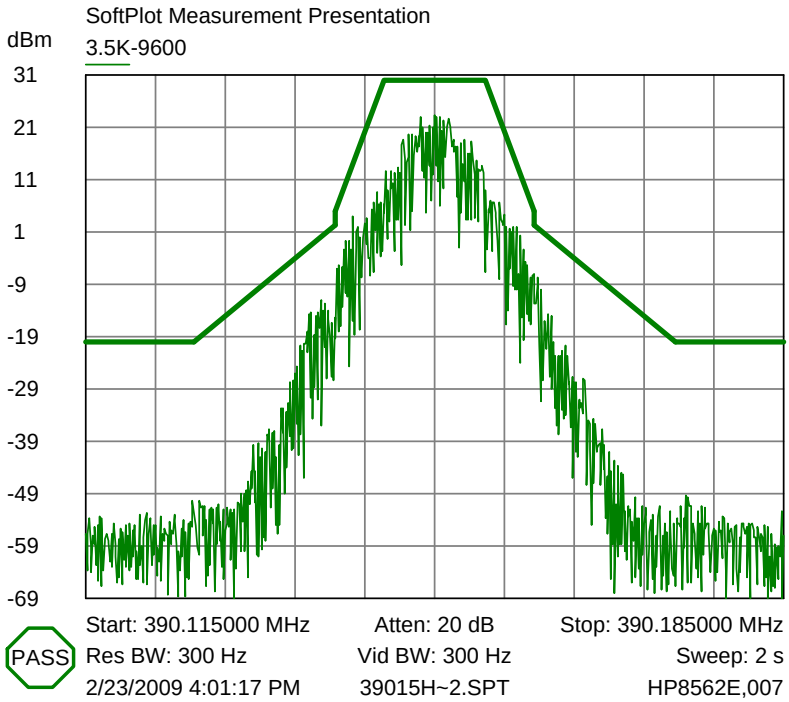
390.15 MHz GMSK Emissions C



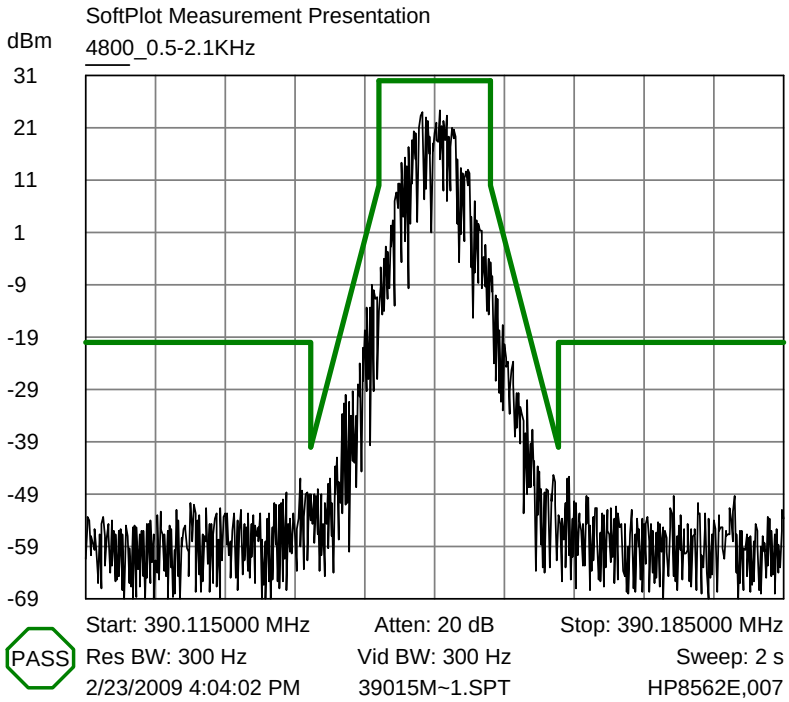
390.15MHz GMSK Emission D



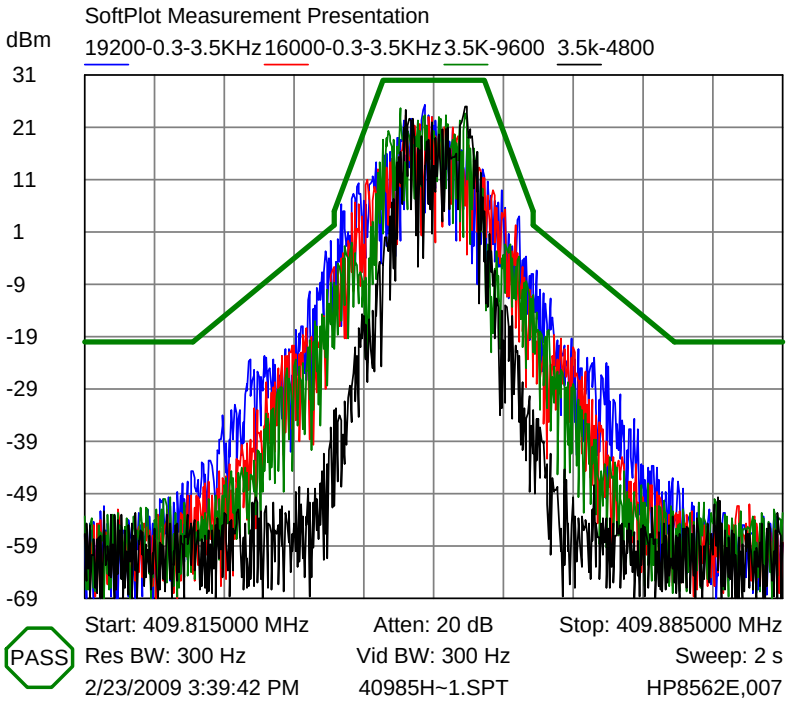
390.15 MHz 4LFSK Emissions C



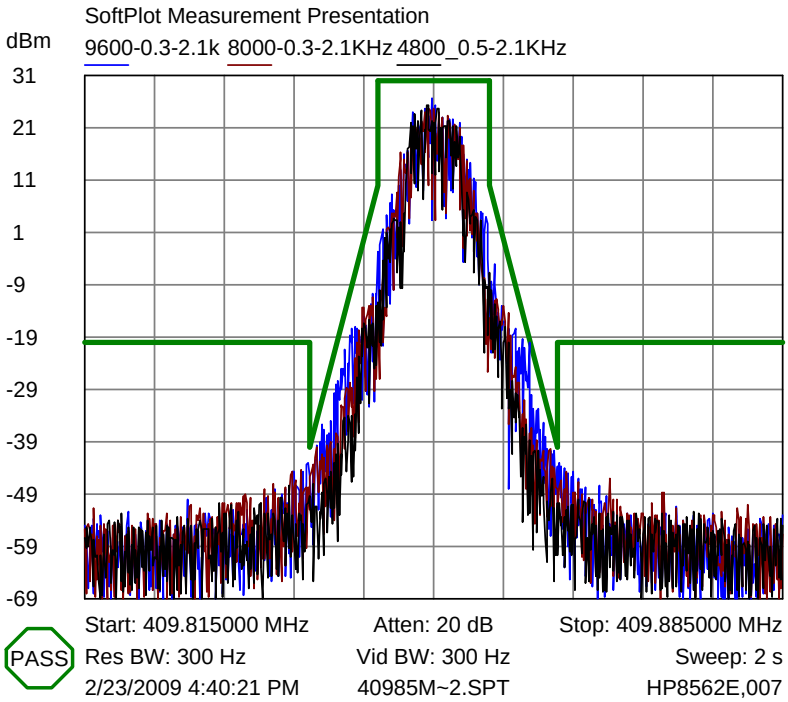
390.15 MHz 4LFSK Emissions D



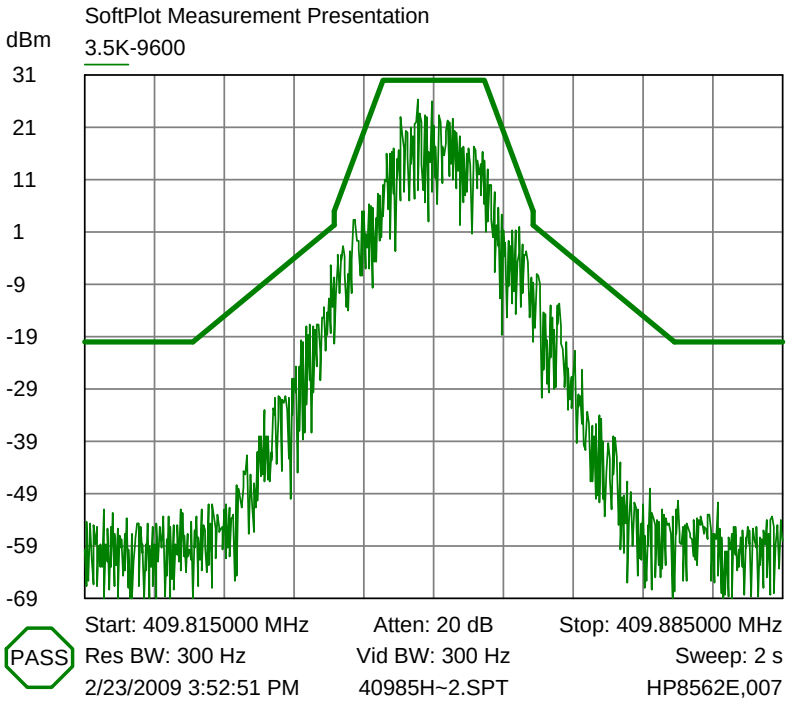
409.85 MHz GMSK Emissions C



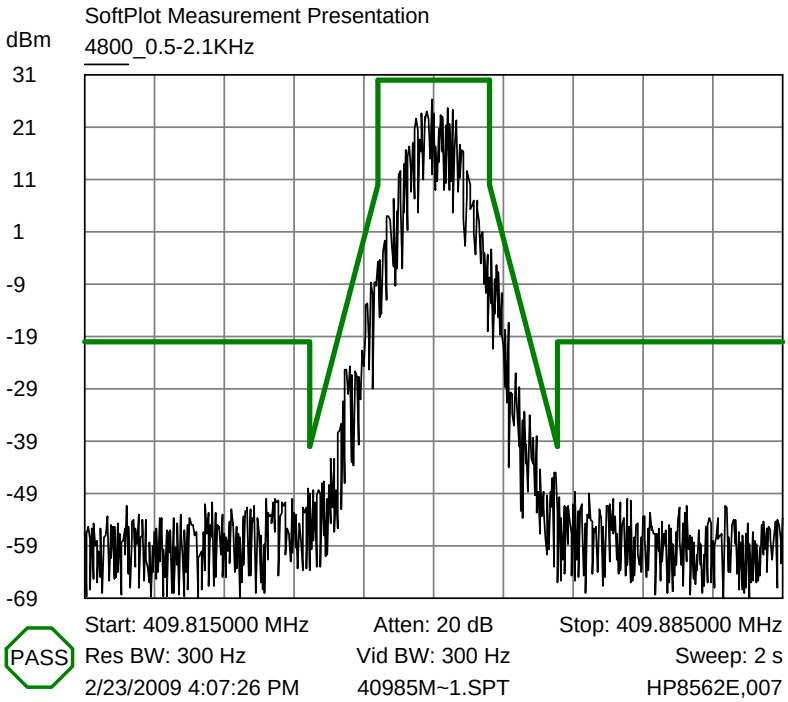
409.85MHz GMSK Emission D



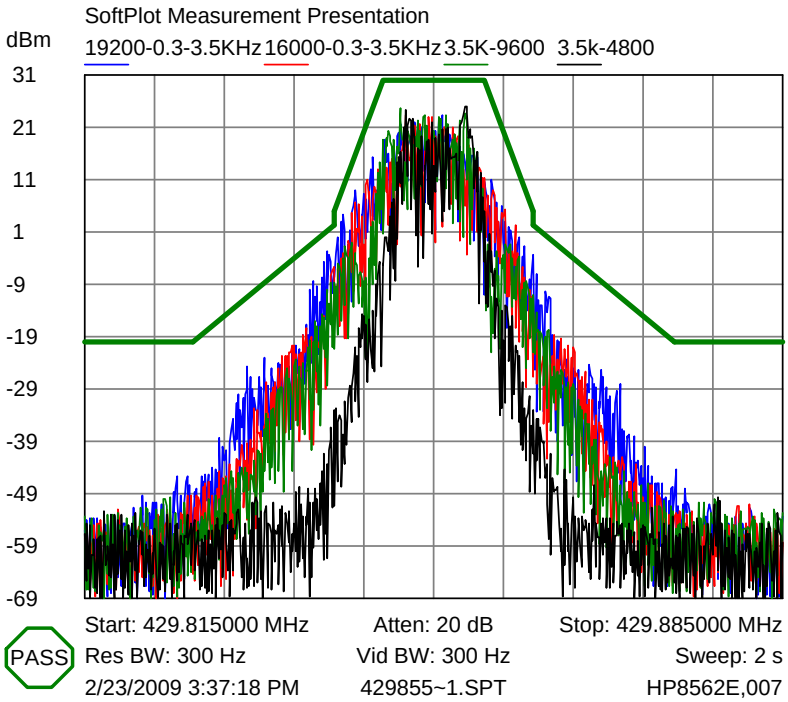
409.85 MHz 4LFSK Emissions C



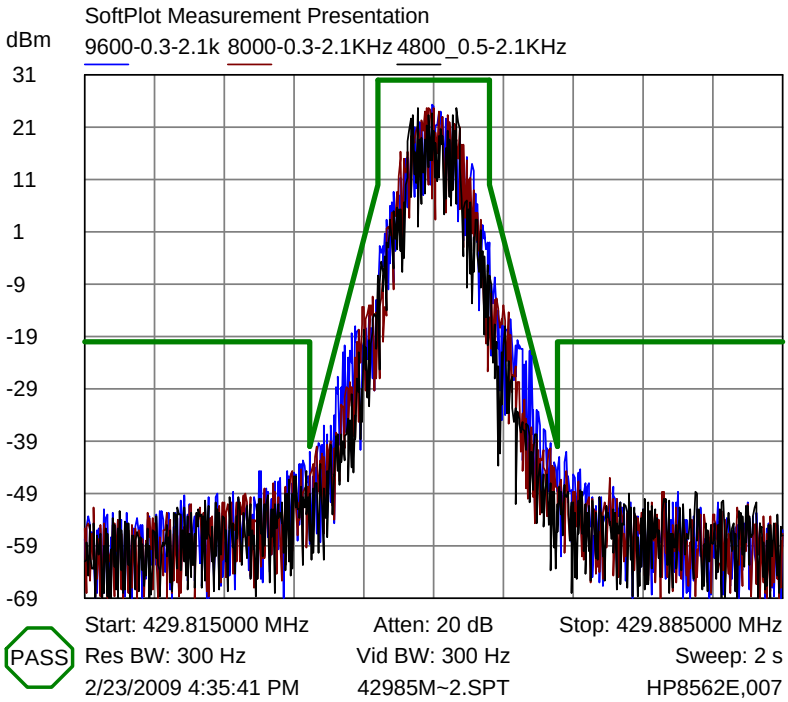
409.85 MHz 4LFSK Emissions D



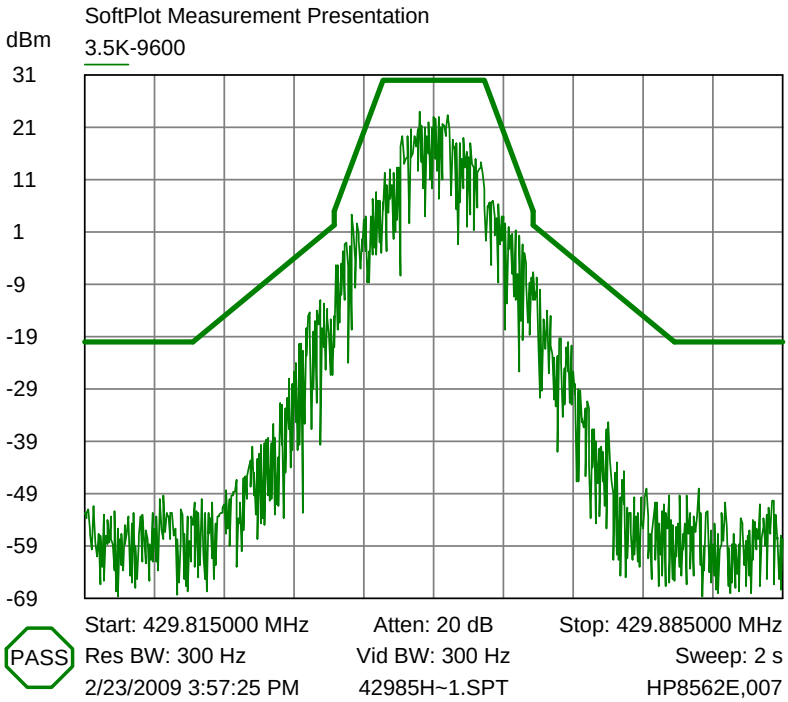
429.85 MHz GMSK Emissions C



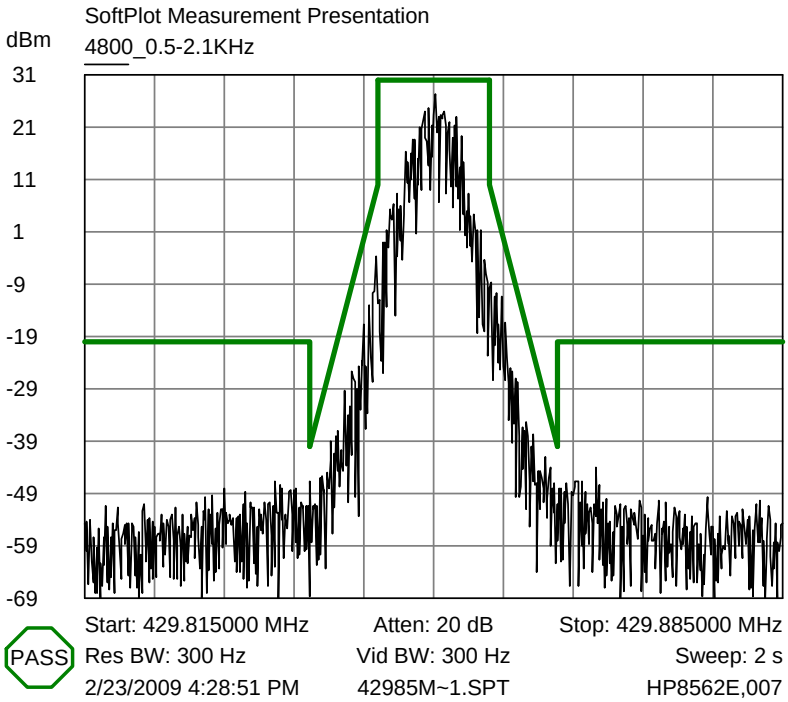
429.85MHz GMSK Emission D



429.85 MHz 4LFSK Emissions C



429.85 MHz 4LFSK Emissions D



ξ2.1051 and ξ90.210 Spurious Emissions at Antenna Terminals

Applicable Standard

ξ2.1051 and ξ90.210

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

50+10log (P) or 70dB

On any frequency removed from the center of the assigned channel by more that 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:

Manufacturer	Description	Model	S/N	Cal Date
Agilent	Spectrum Analyzer	8562EC	3946A00288	12/22/2009
TekPower	DC power supply	HY3005D	N/A	N/A

Environment conditions

Room Temperature	20℃~22℃
Relative Humidity	70%~75%

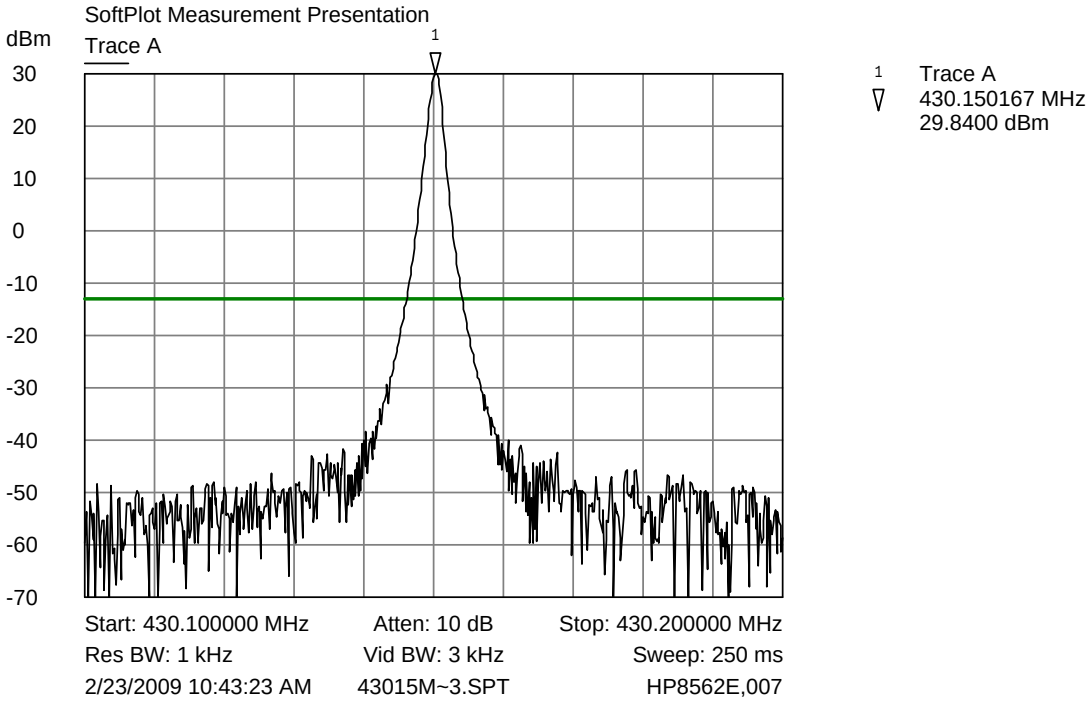
Test Engineer: Hui Chen

Test Date: 02/20/09~02/23/09

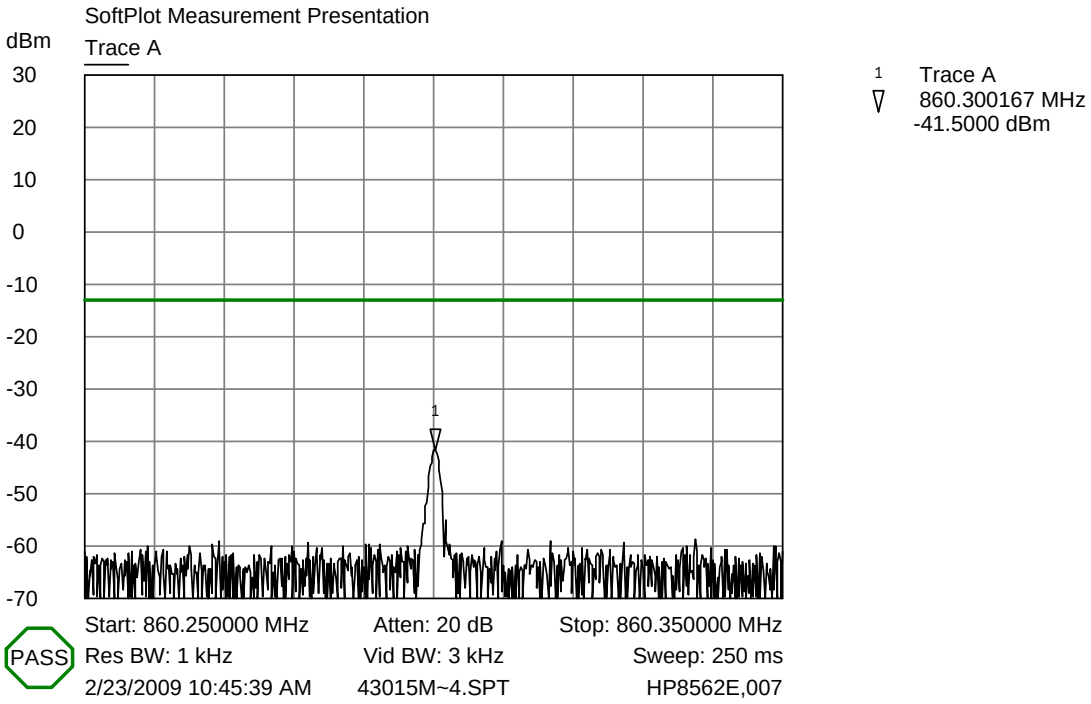
Test Results

S/N: 187085(430~470MHz)

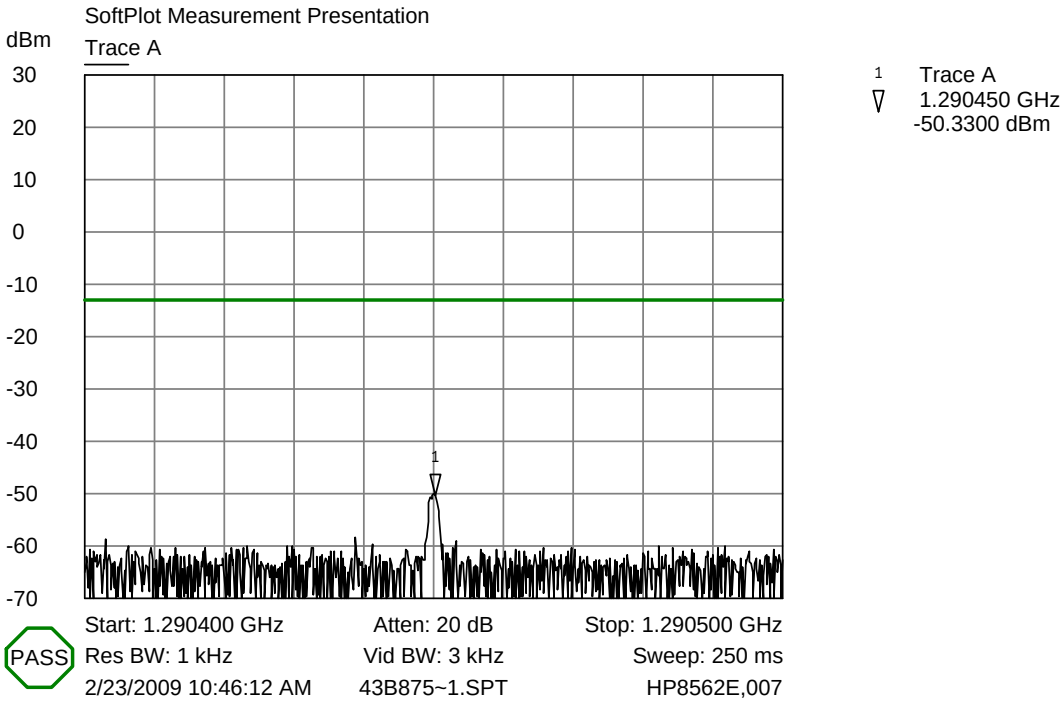
430.15MHz_1st



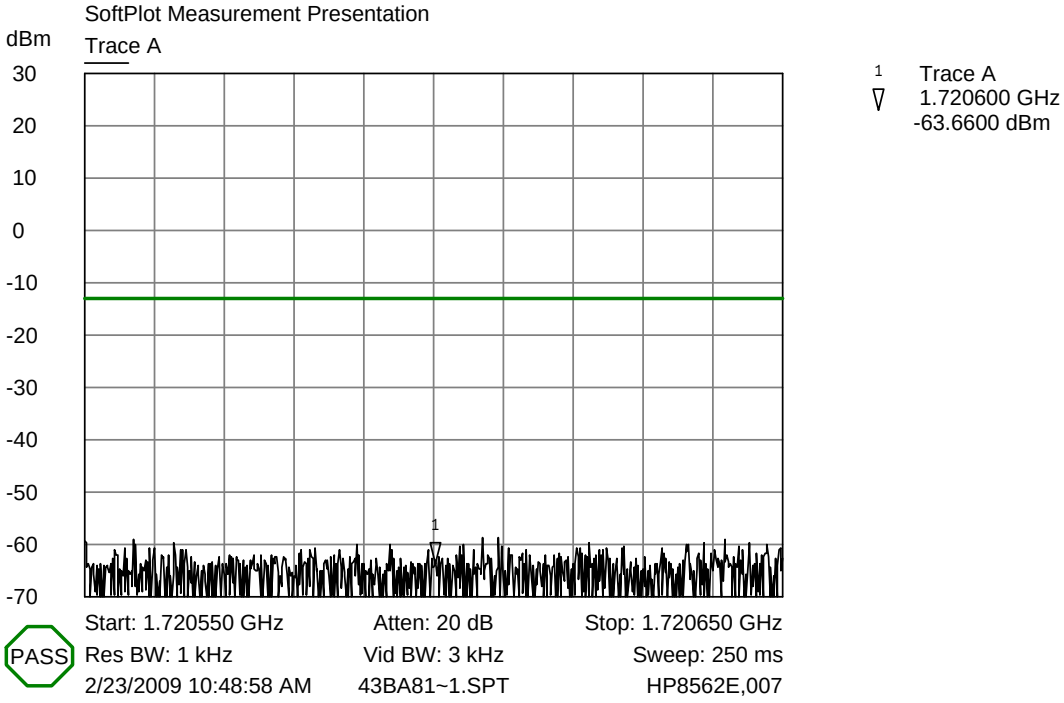
430.15MHz_2nd



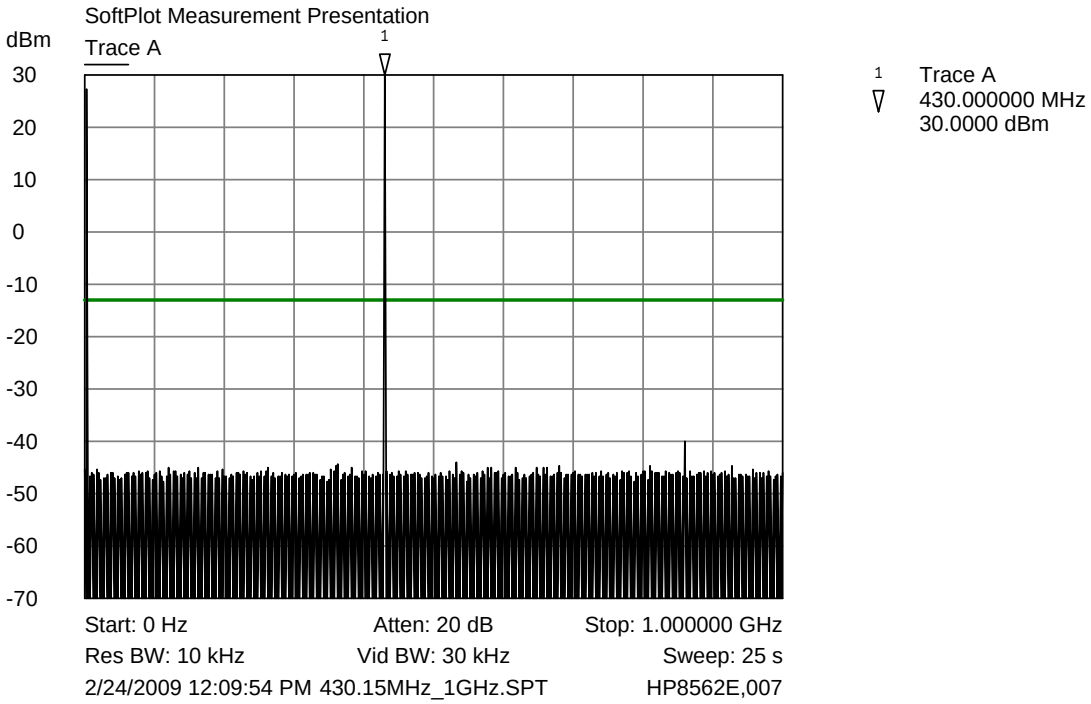
430.15MHz_3rd



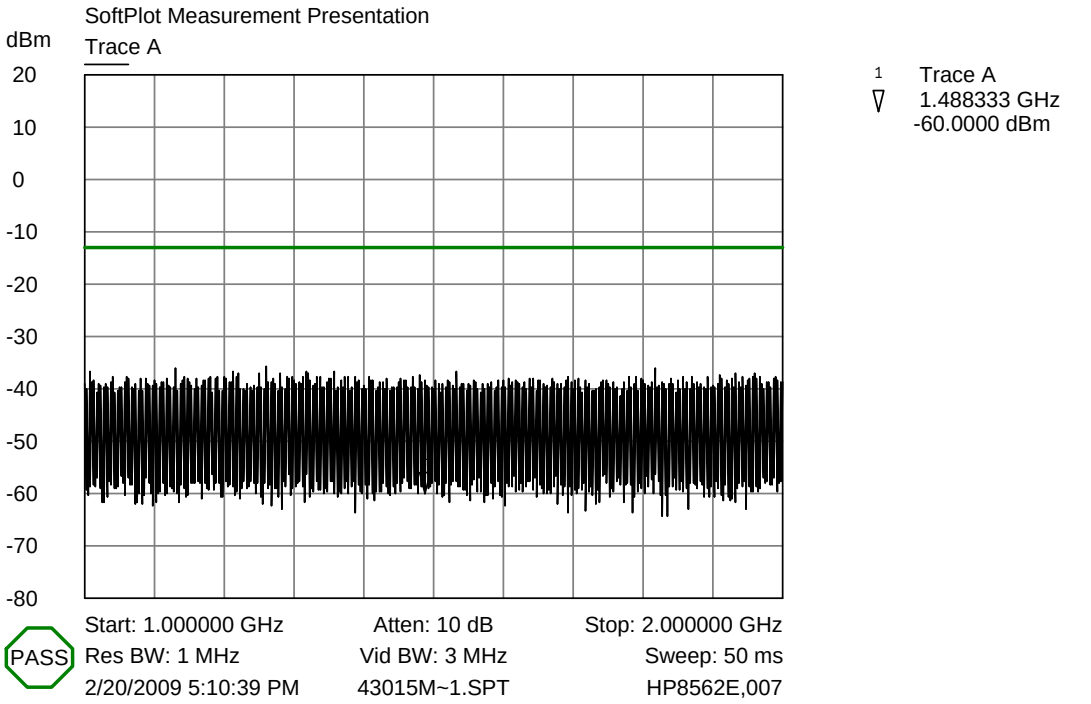
430.15MHz_4th



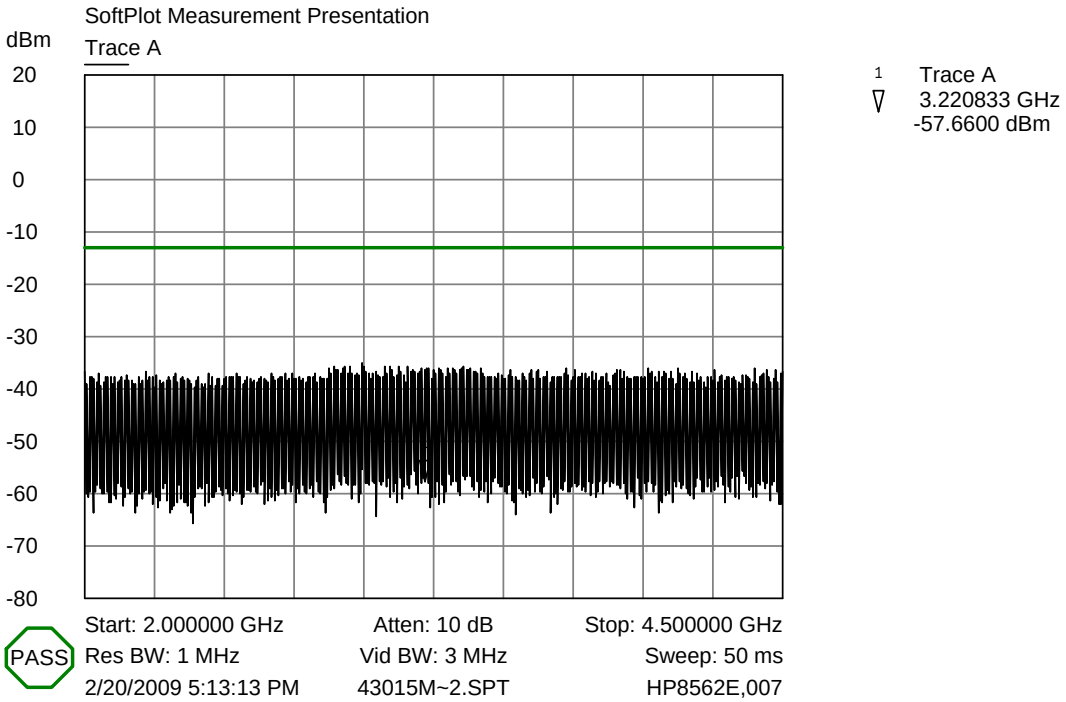
430.15MHz_1GHz



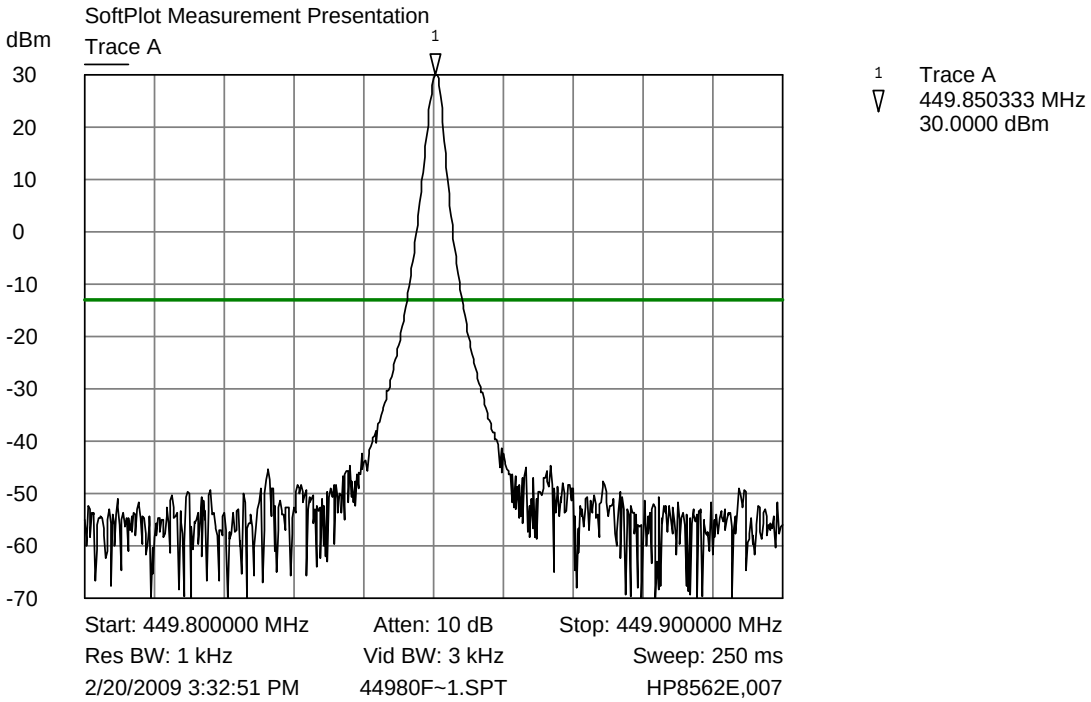
430.15MHz_1G~2GHz



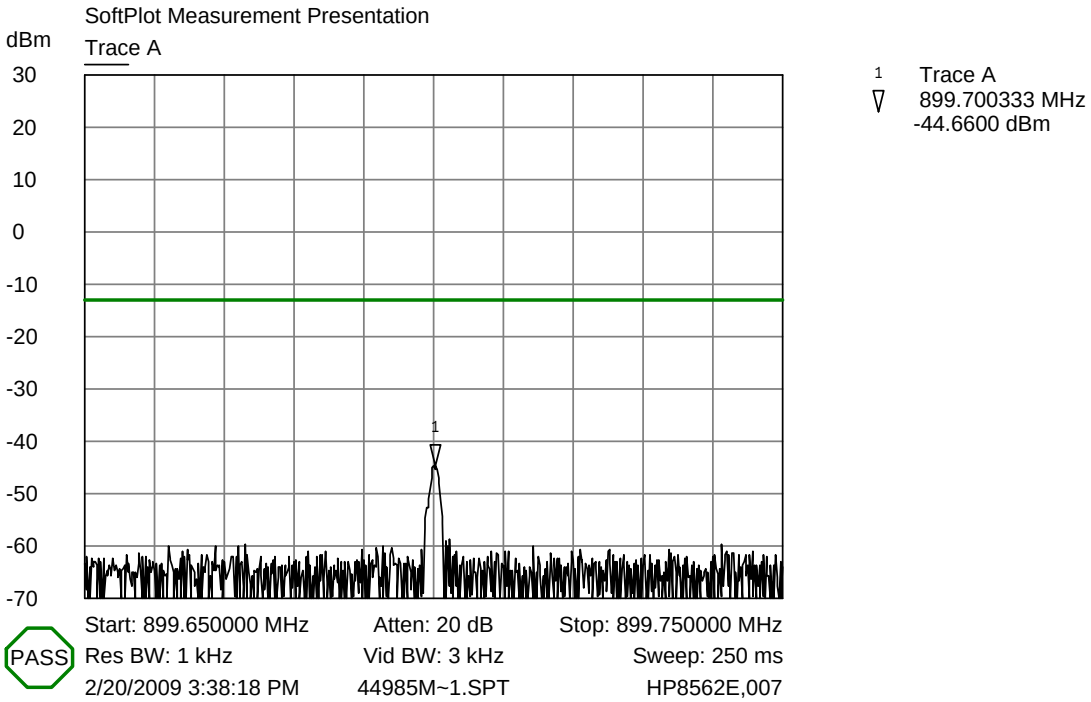
430.15MHz_2G~4.5G(10th harmonic)



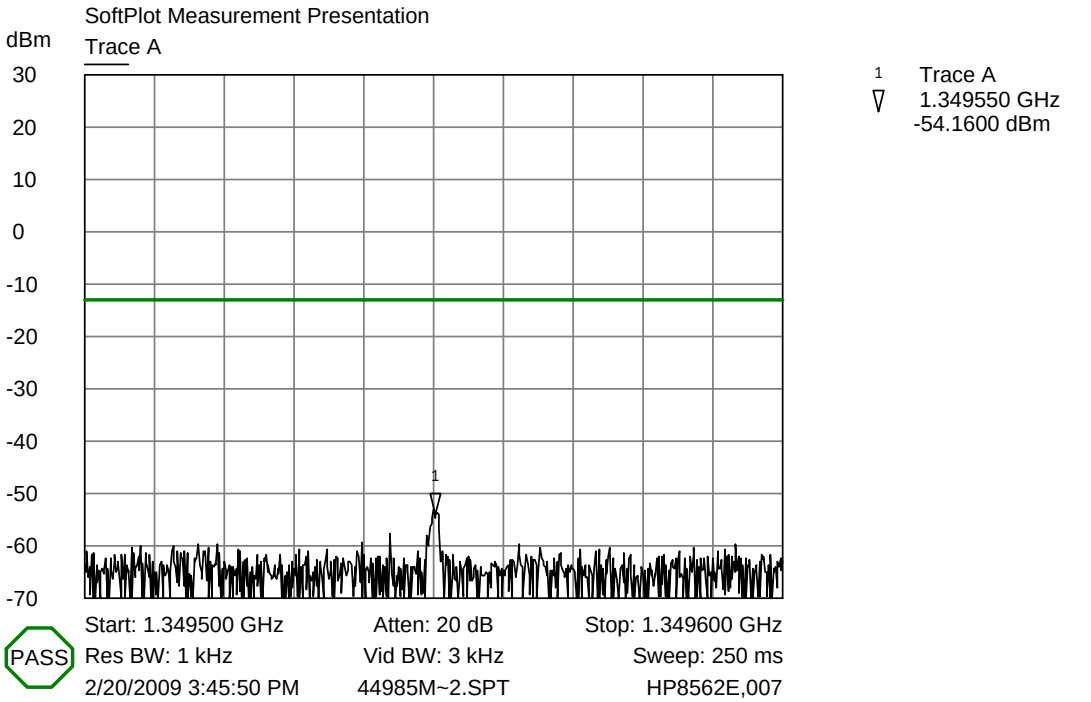
449.85MHz_1st



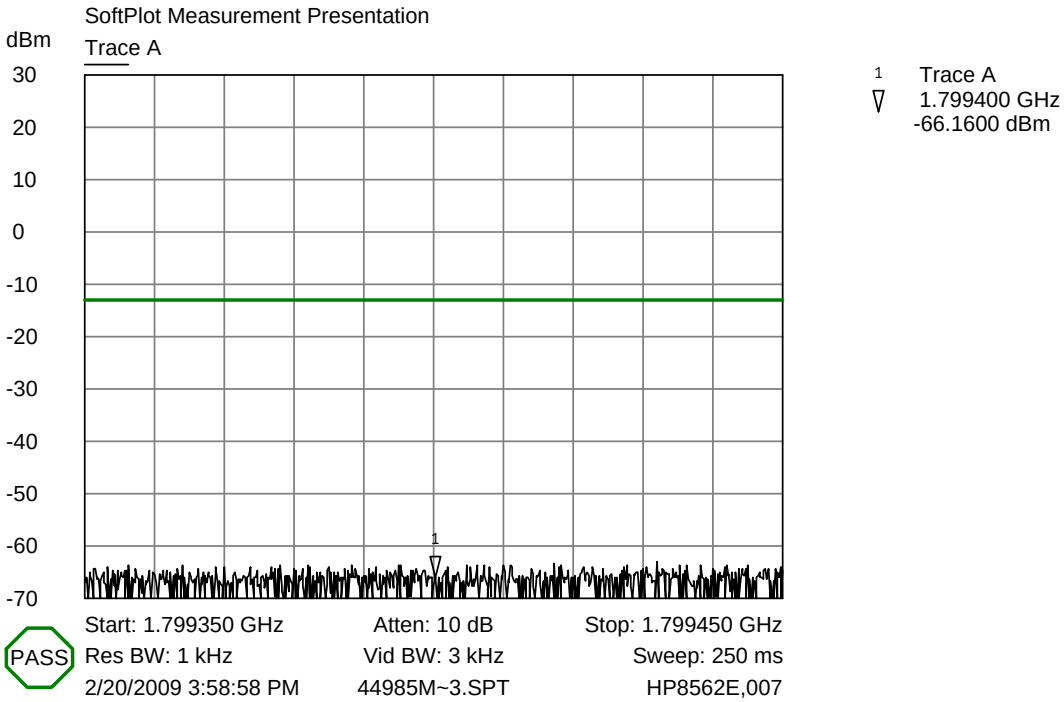
449.85MHz_2nd



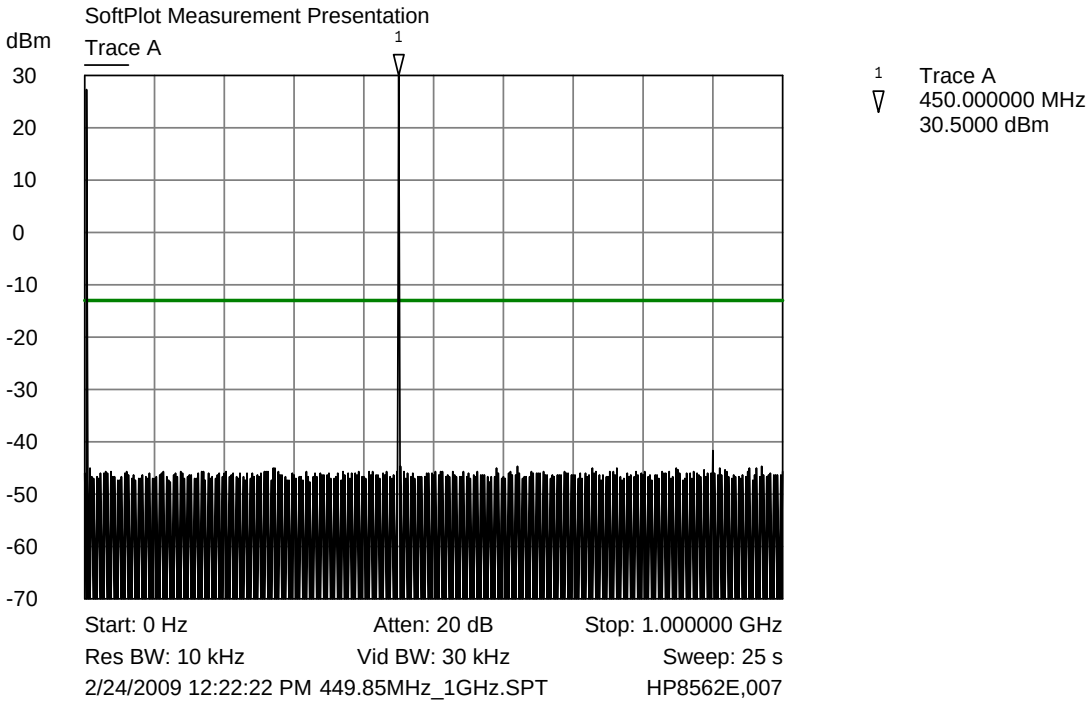
449.85MHz_3rd



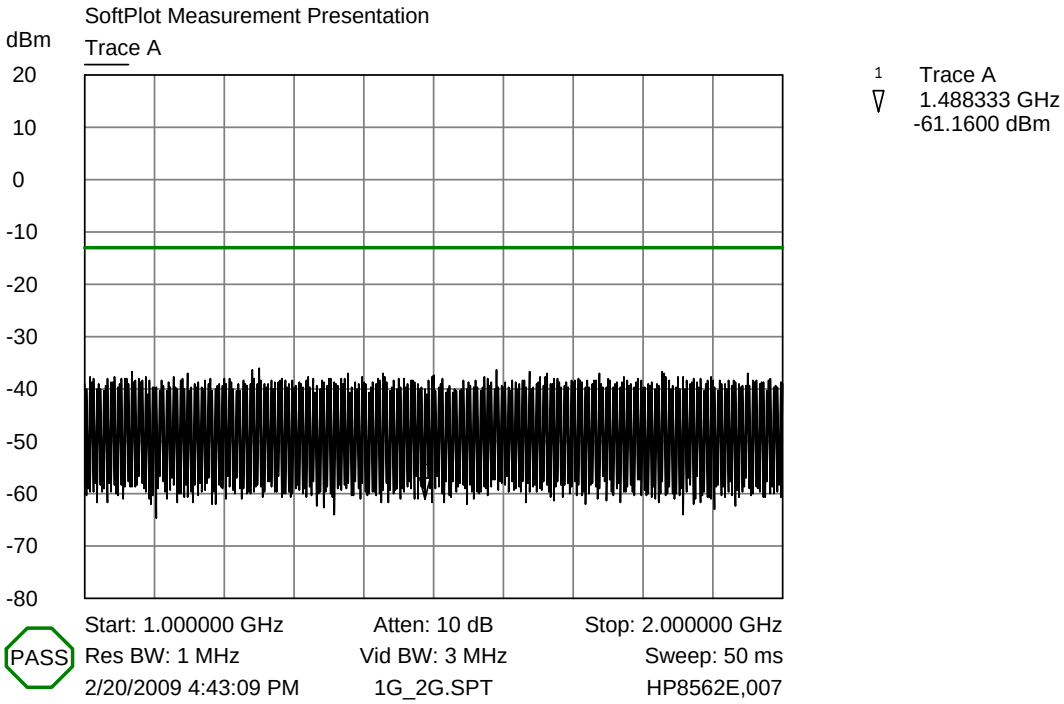
449.85MHz_4th



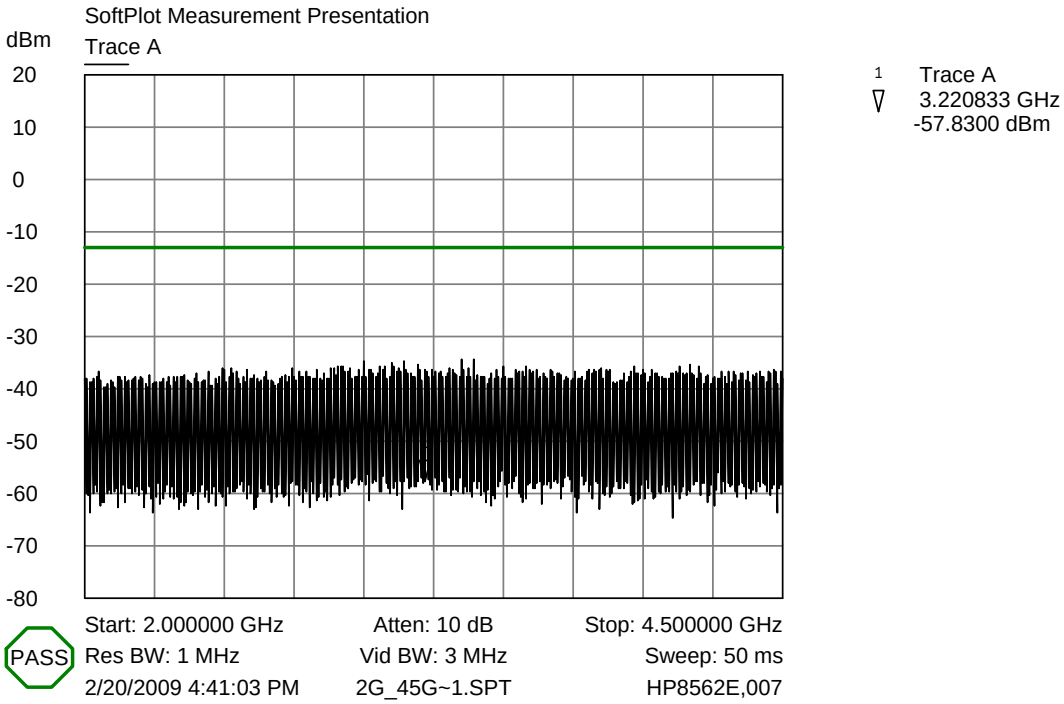
449.85MHz_1GHz



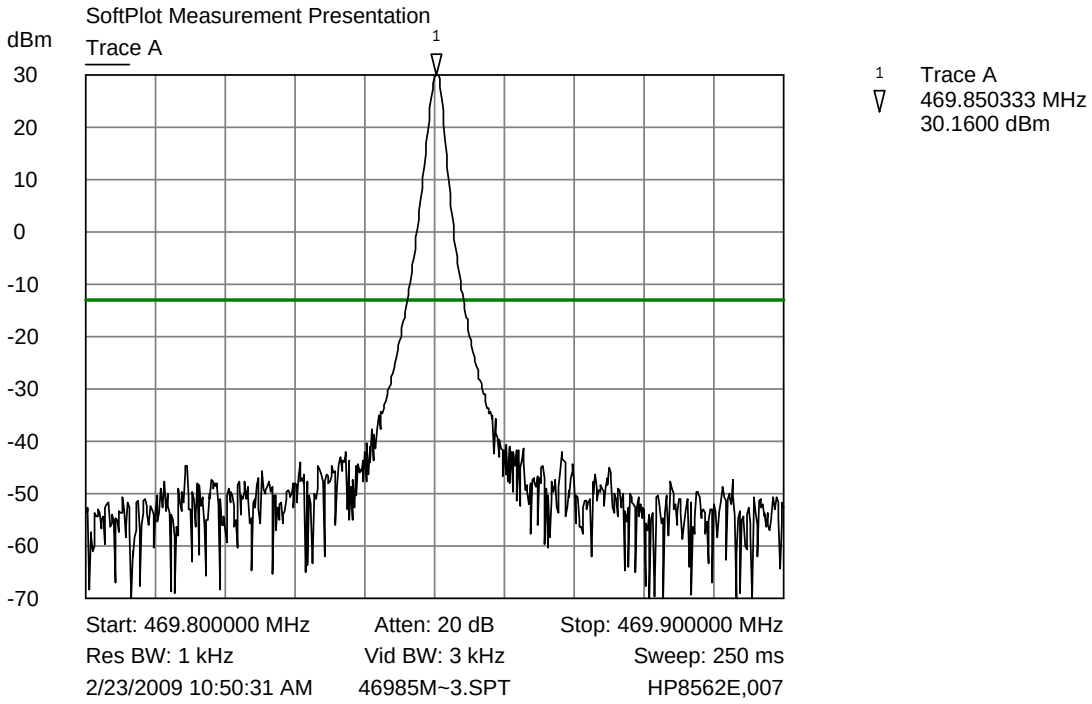
449.85MHz_1G~2GHz



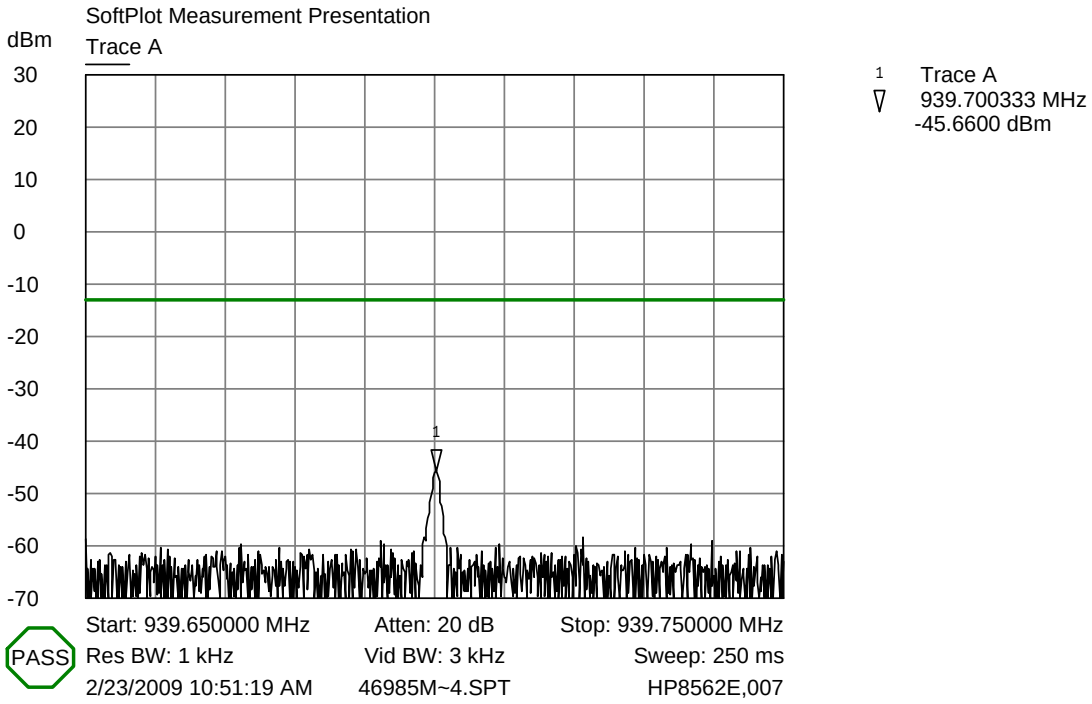
449.85MHz_2G~4.5GHz



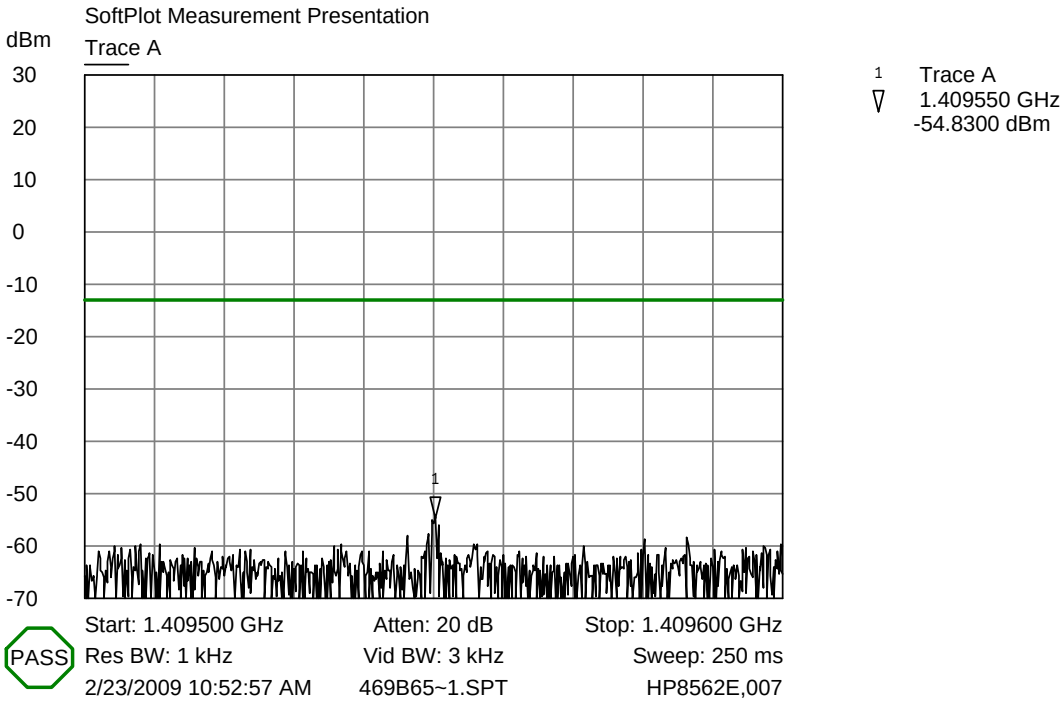
469.85MHz_1st



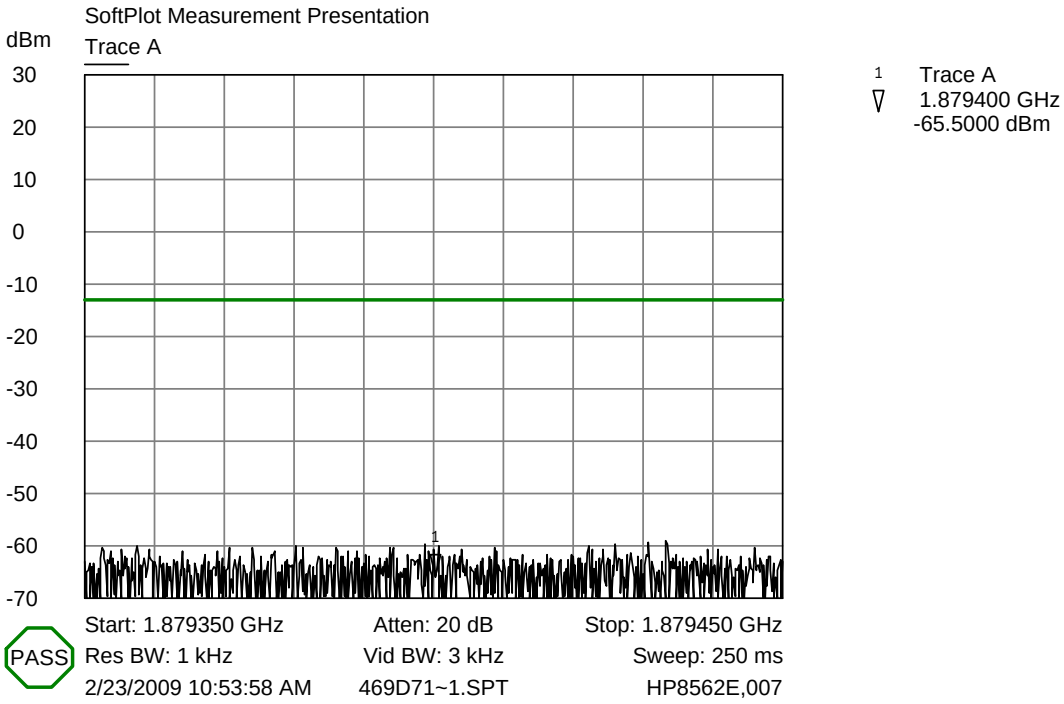
469.85MHz_2nd



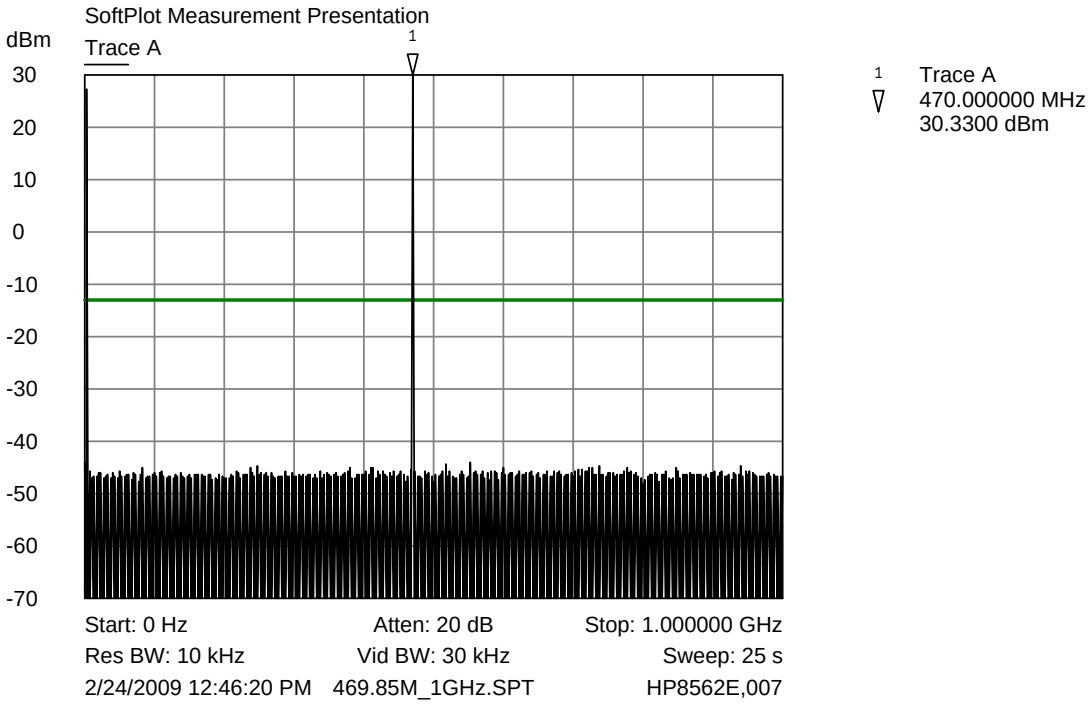
469.85MHz_3rd



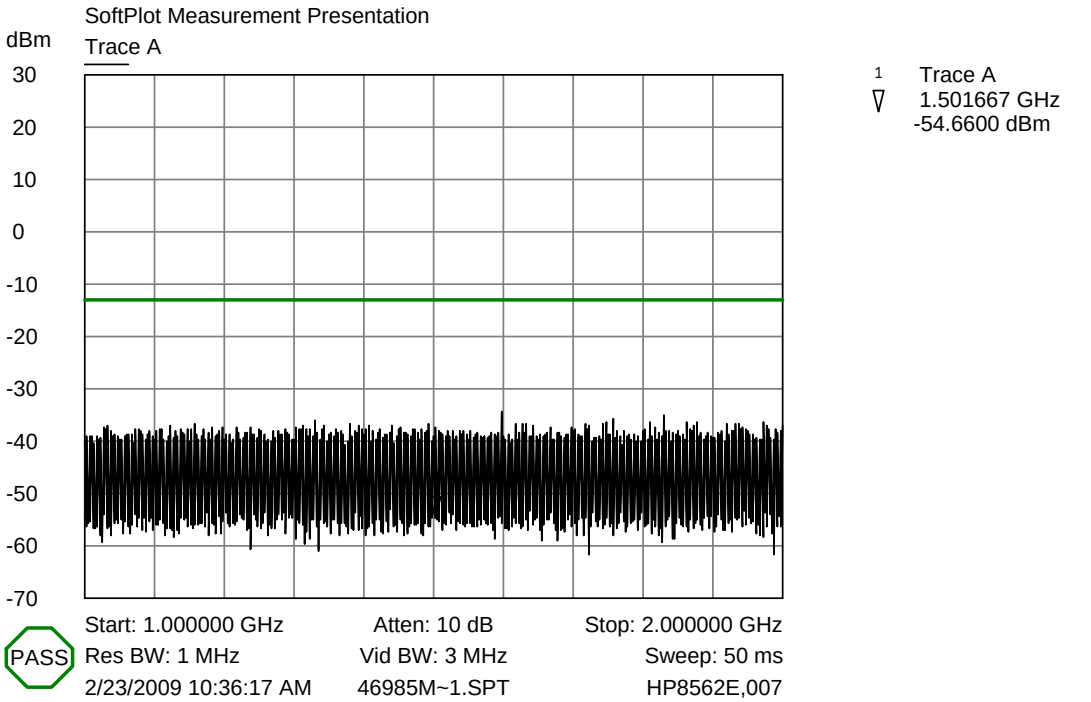
469.85MHz_4th



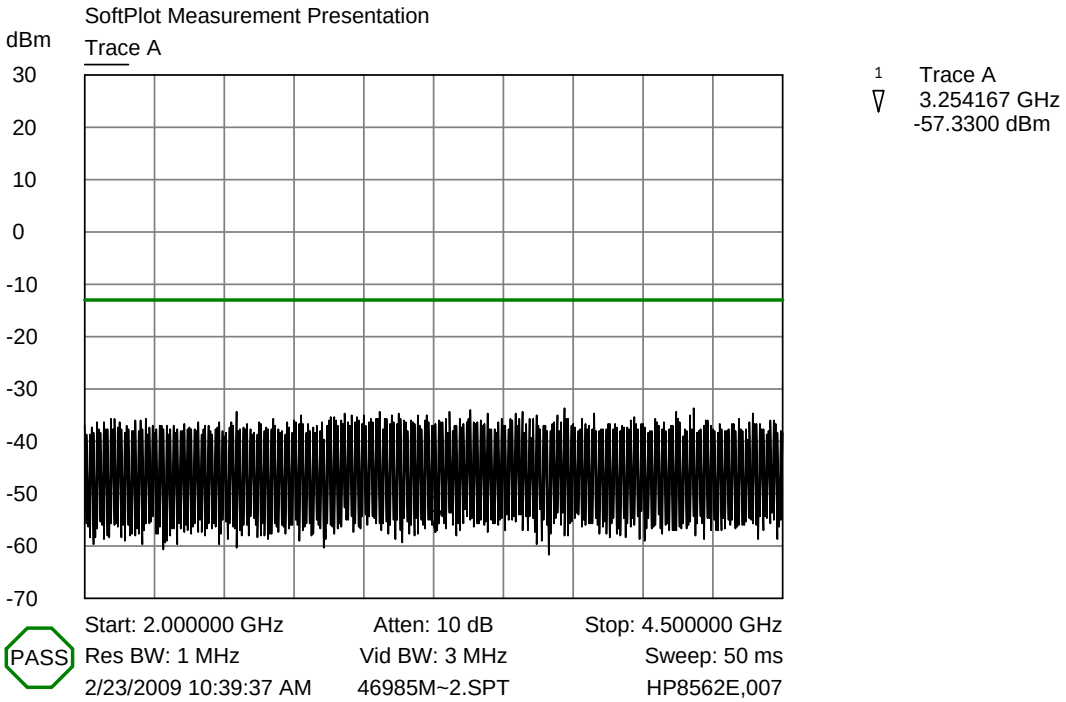
469.85MHz_1GHz



469.85MHz_1G~2GHz

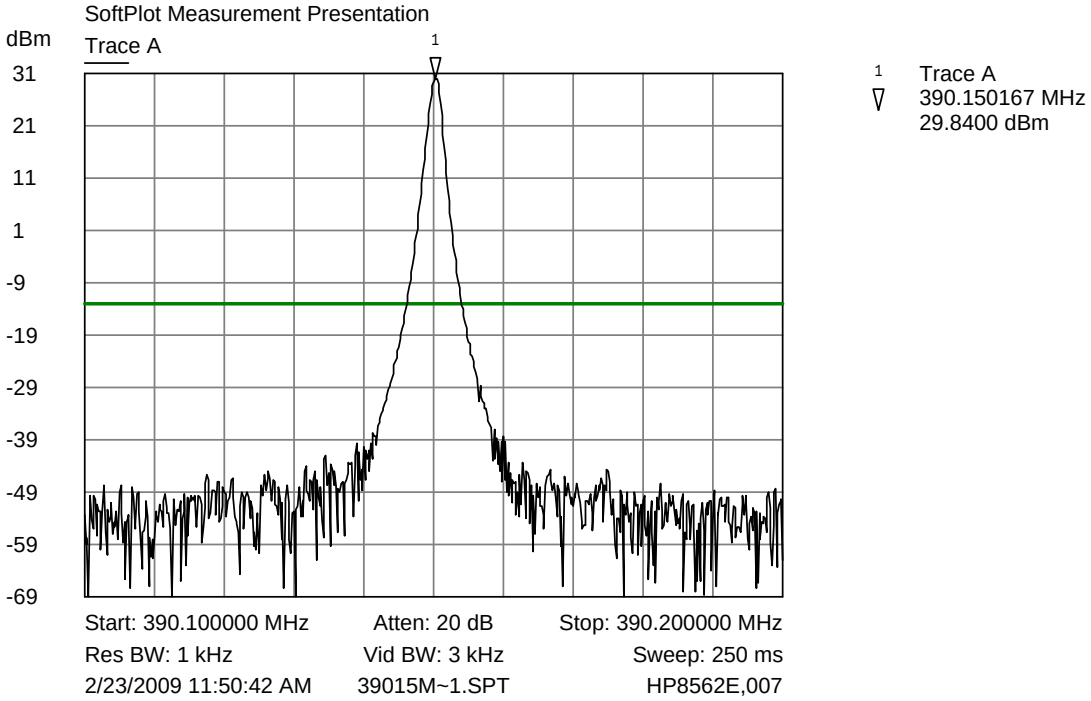


469.85MHz_2G~4.5GHz

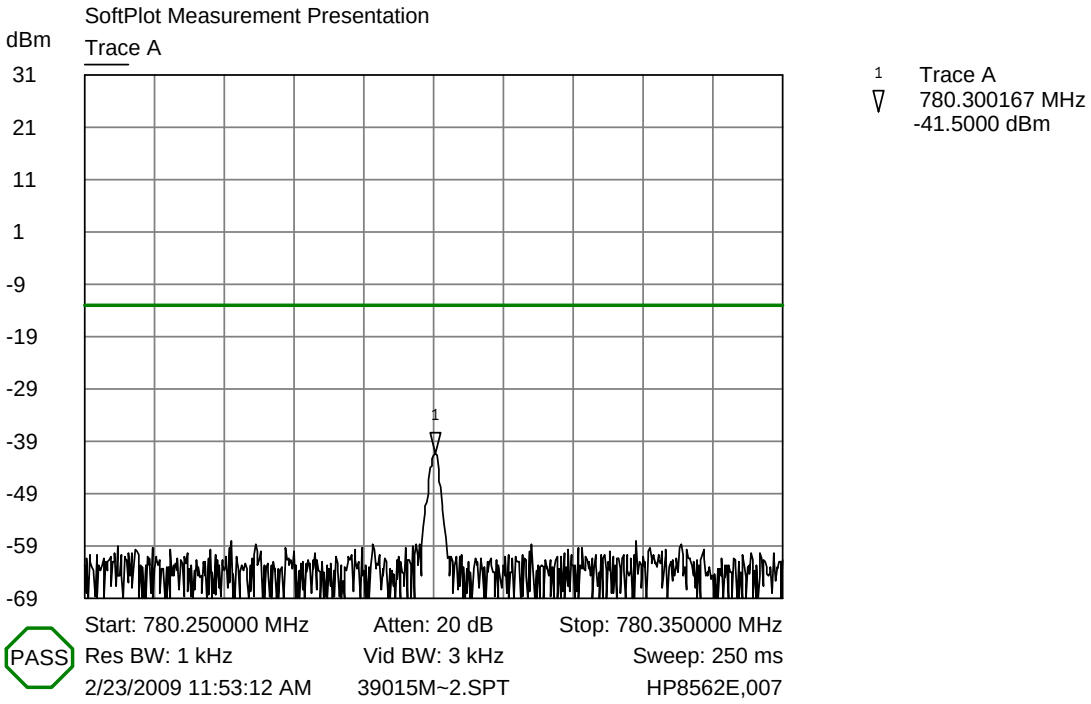


S/N: 187093(390~430MHz)

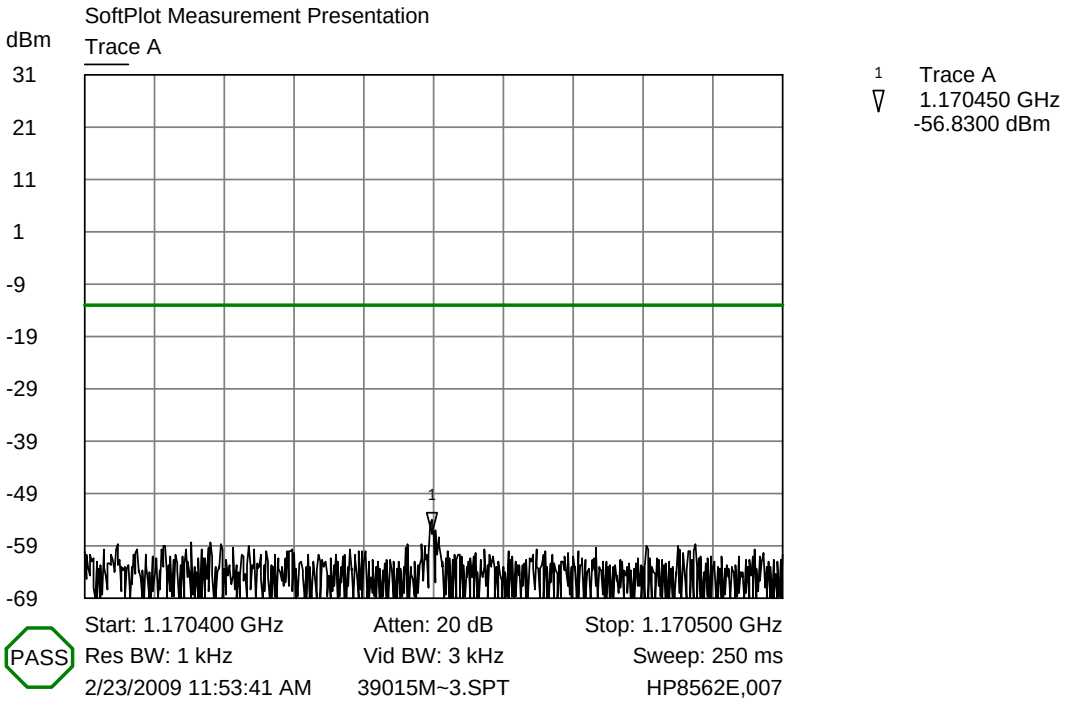
390.15MHz_1st



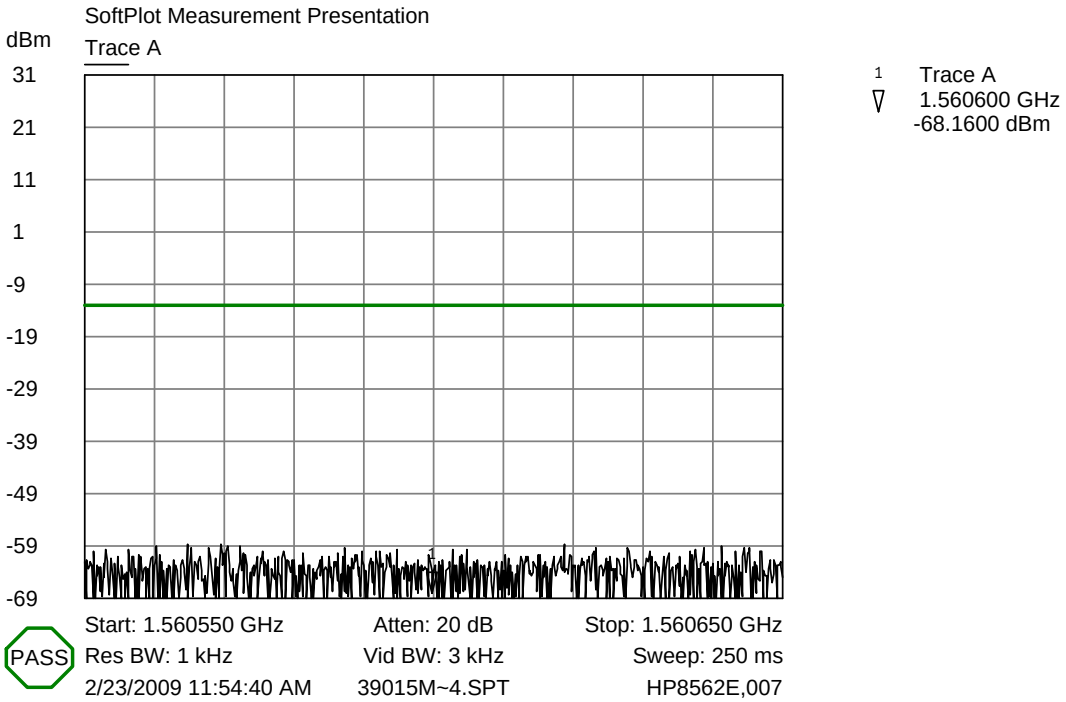
390.15MHz_2nd



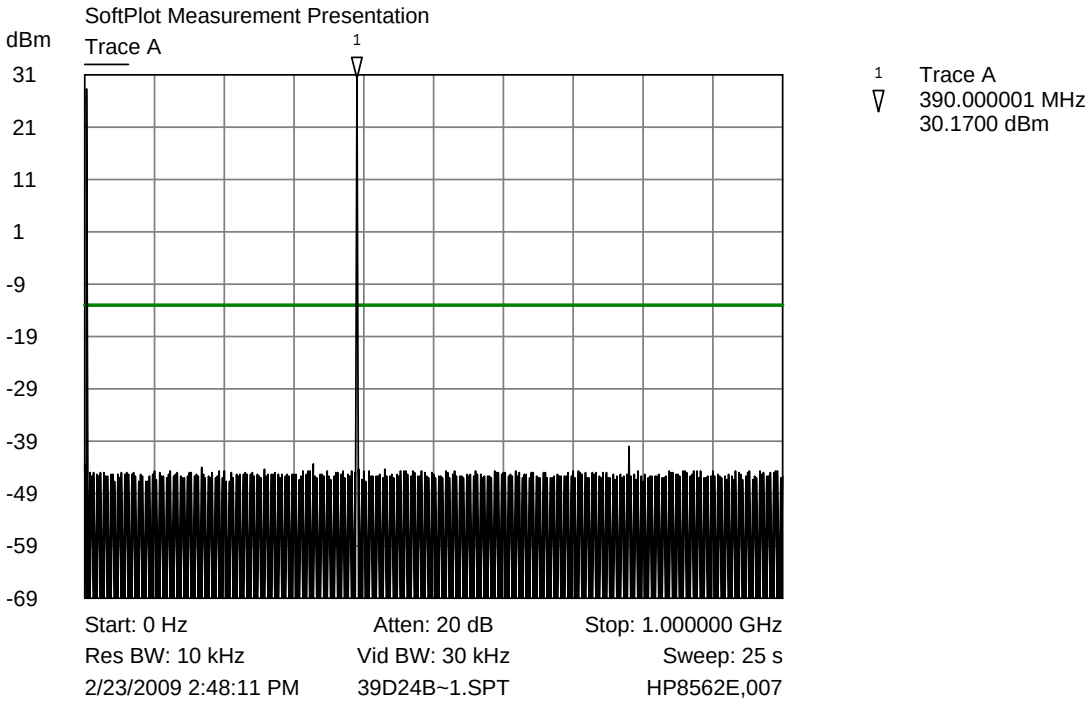
390.85MHz_3rd



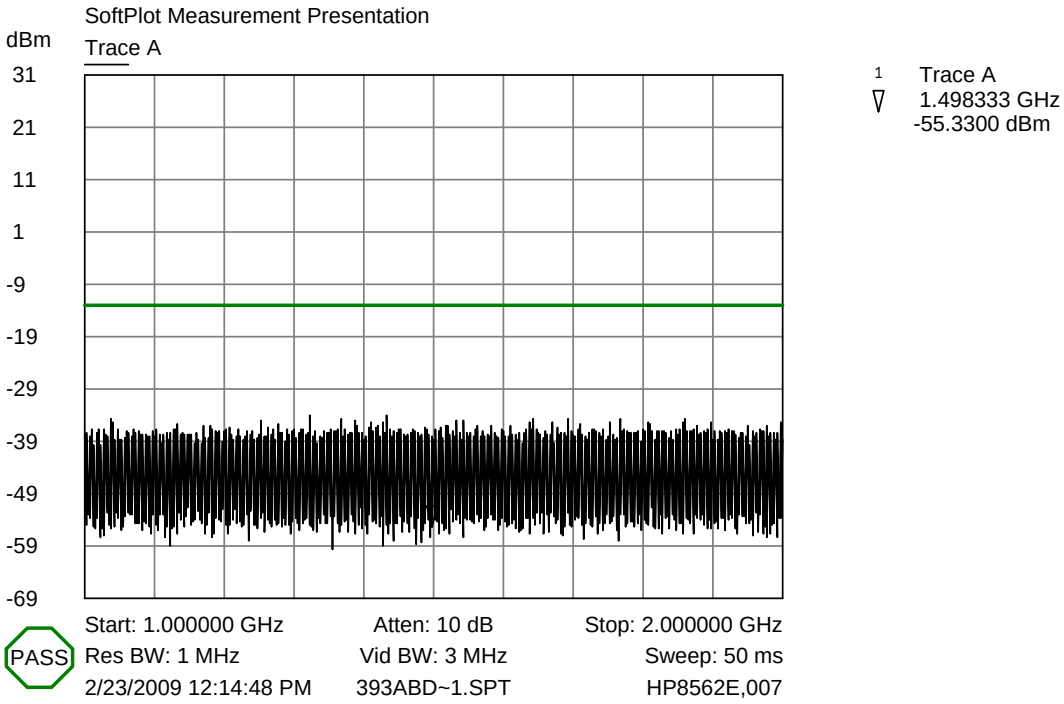
390.85MHz_4th



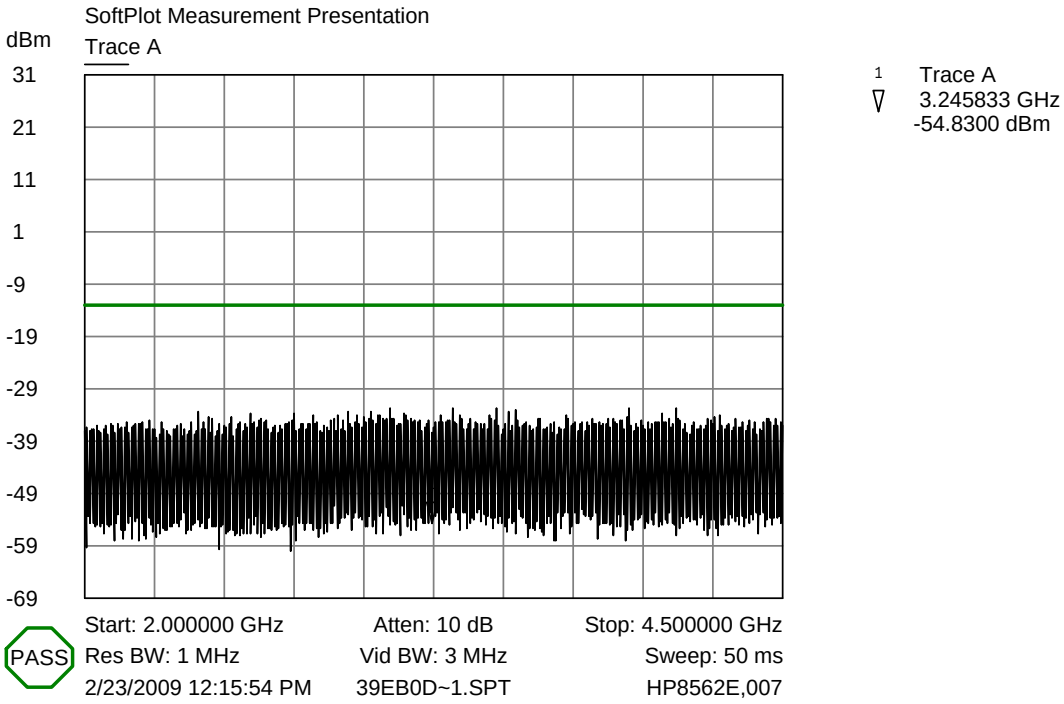
390.15MHz_1GHz



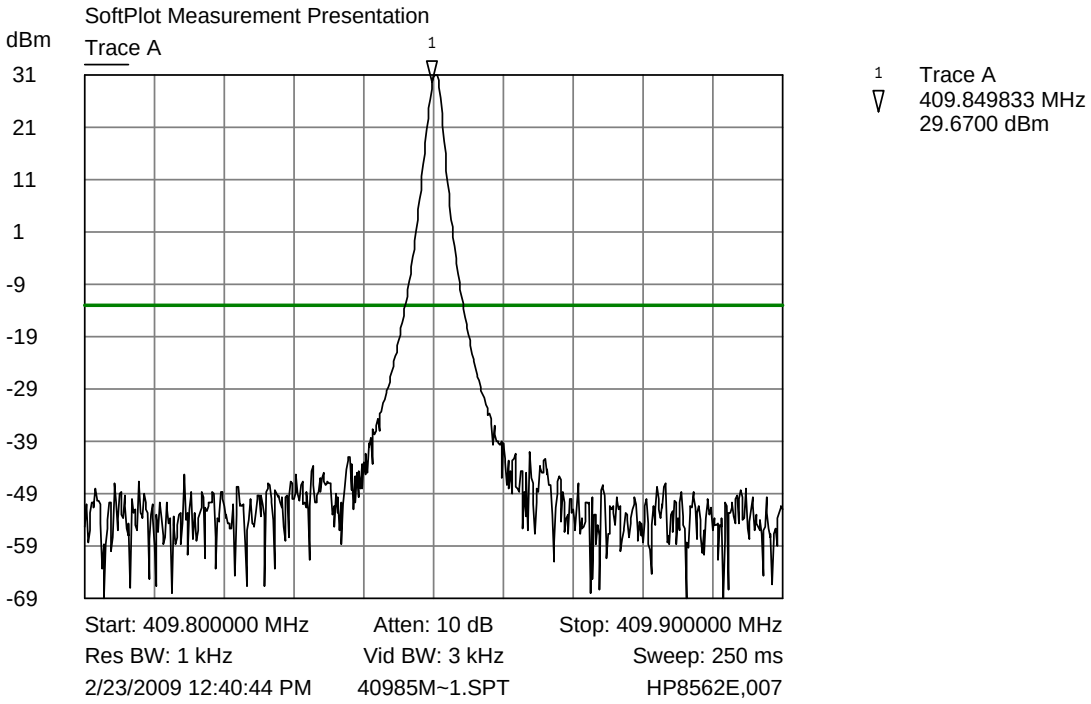
390.15MHz_1G~2GHz



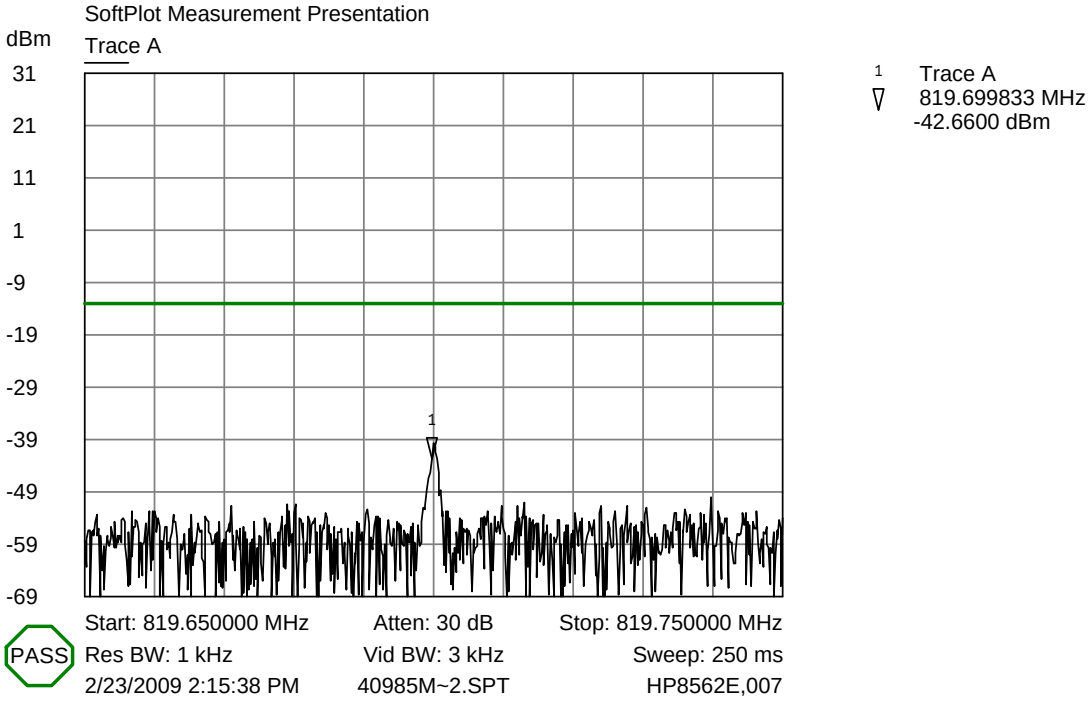
390.15MHz_2G~4.5GHz



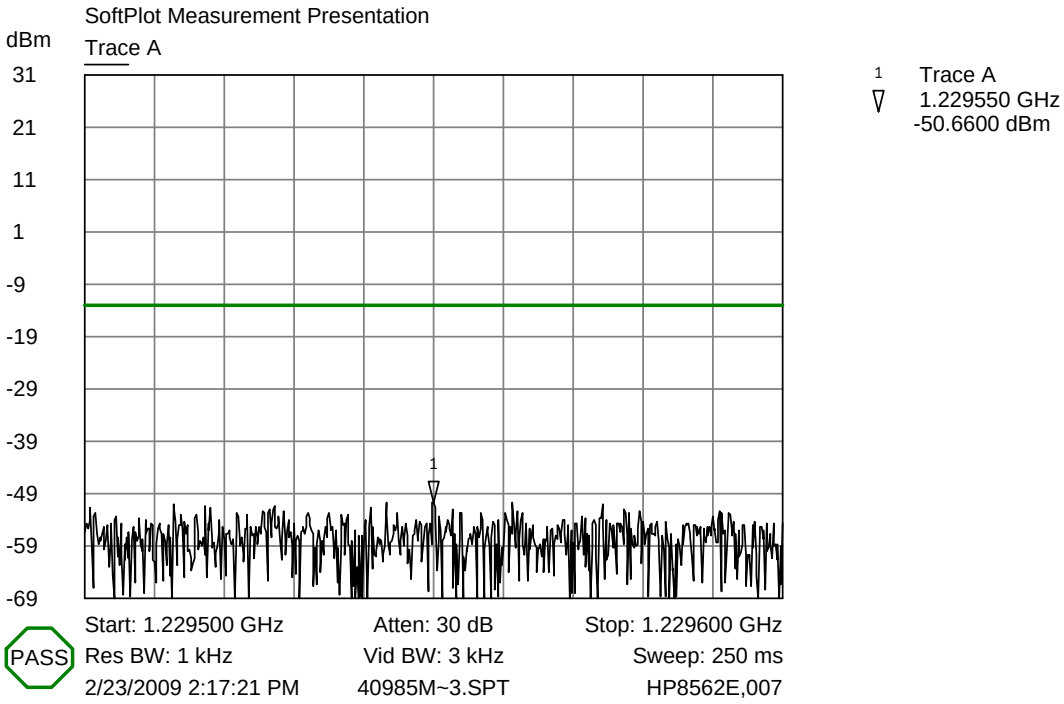
409.85MHz_1st



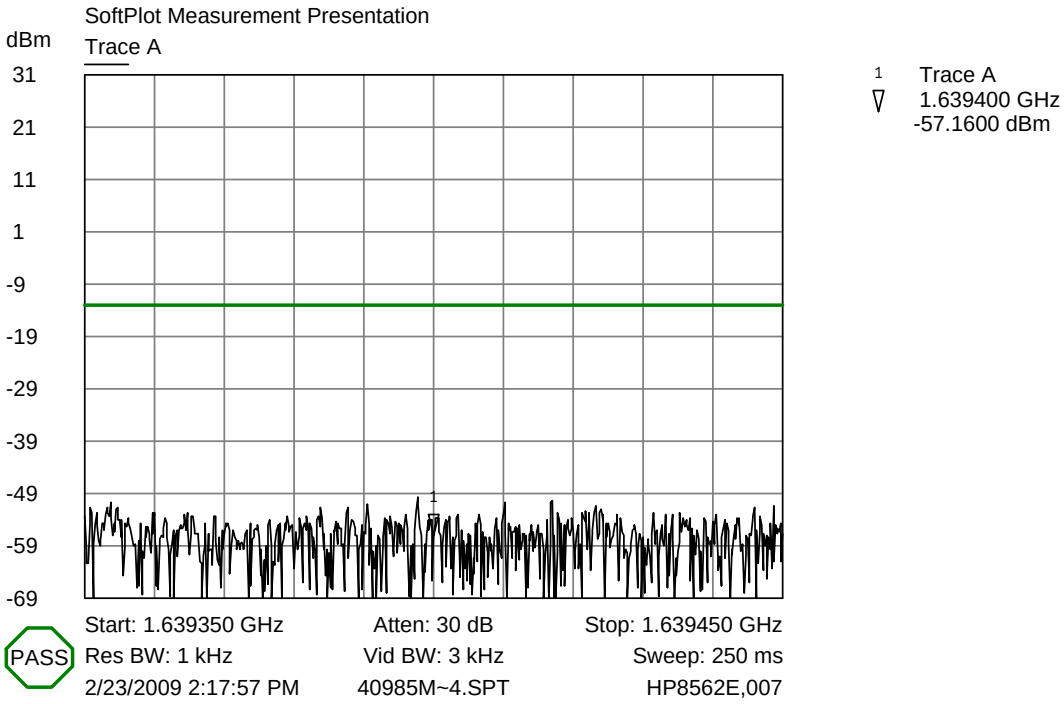
409.85MHz_2nd



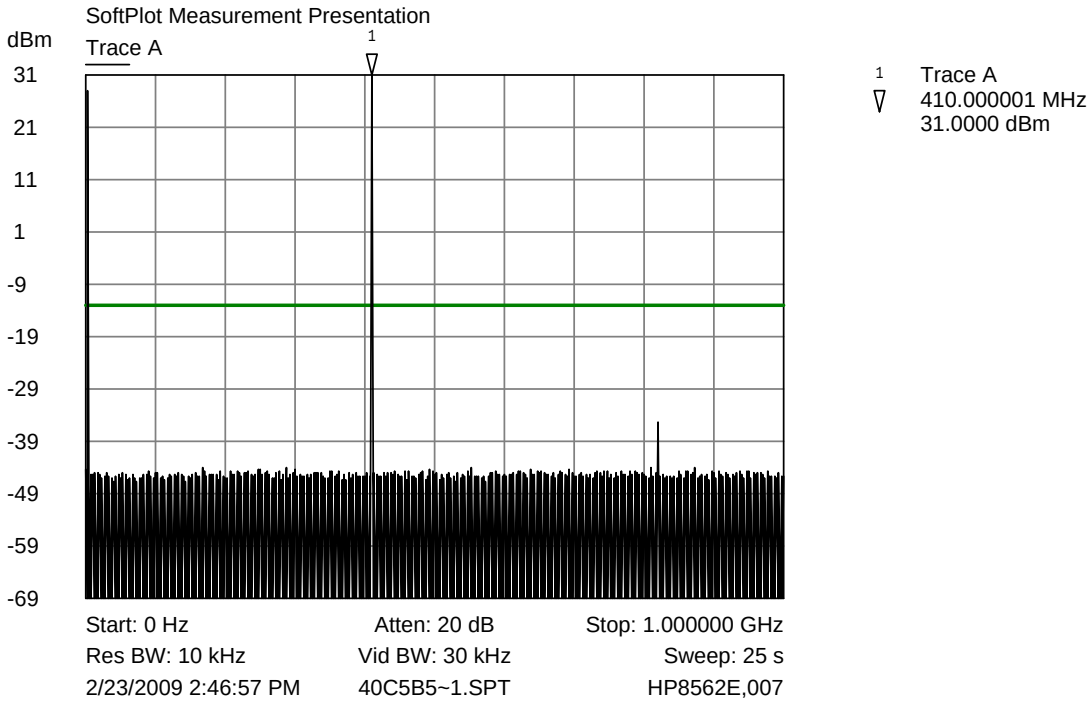
409.85MHz_3rd harmonic



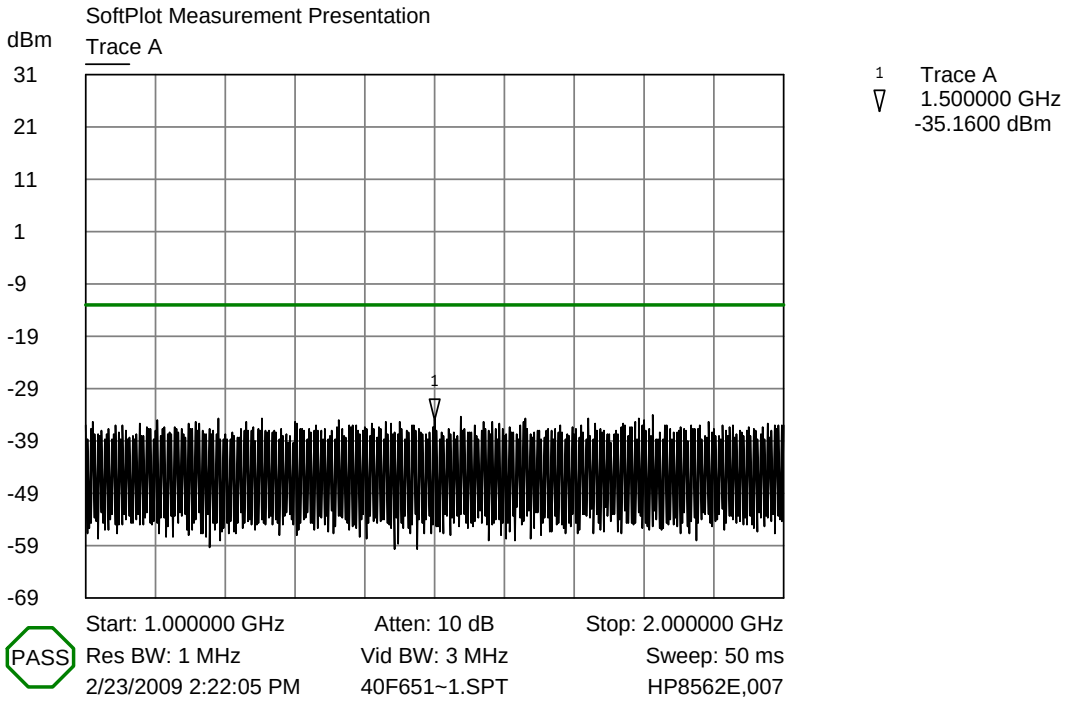
409.85MHz_4th harmonic



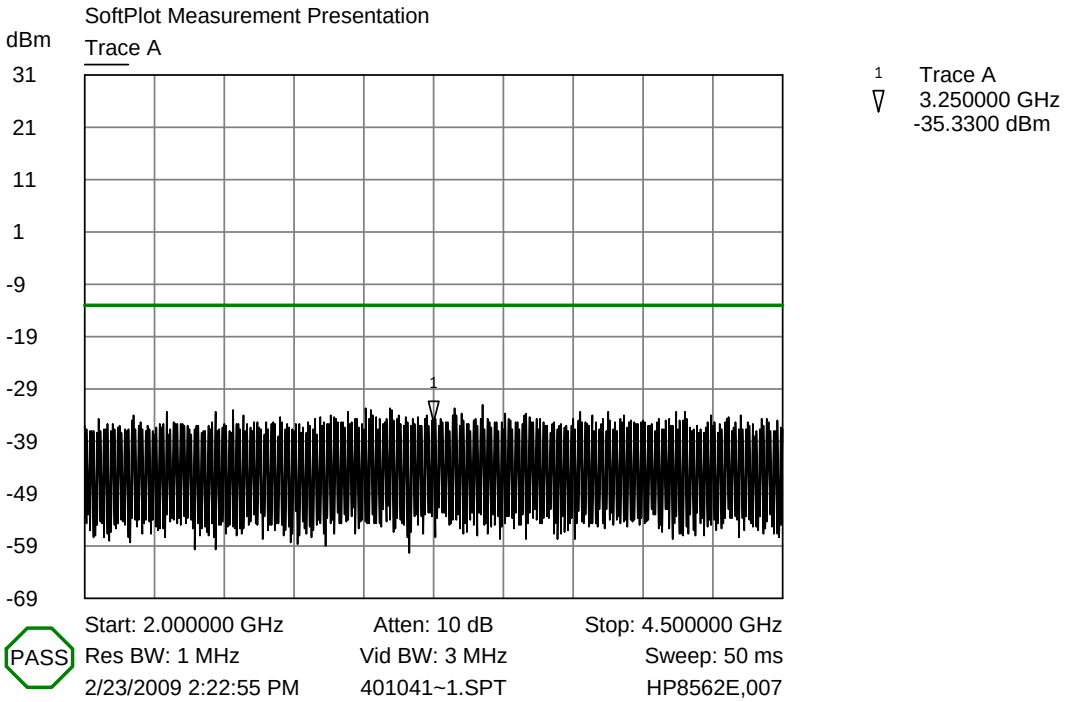
409.85MHz_1GHz



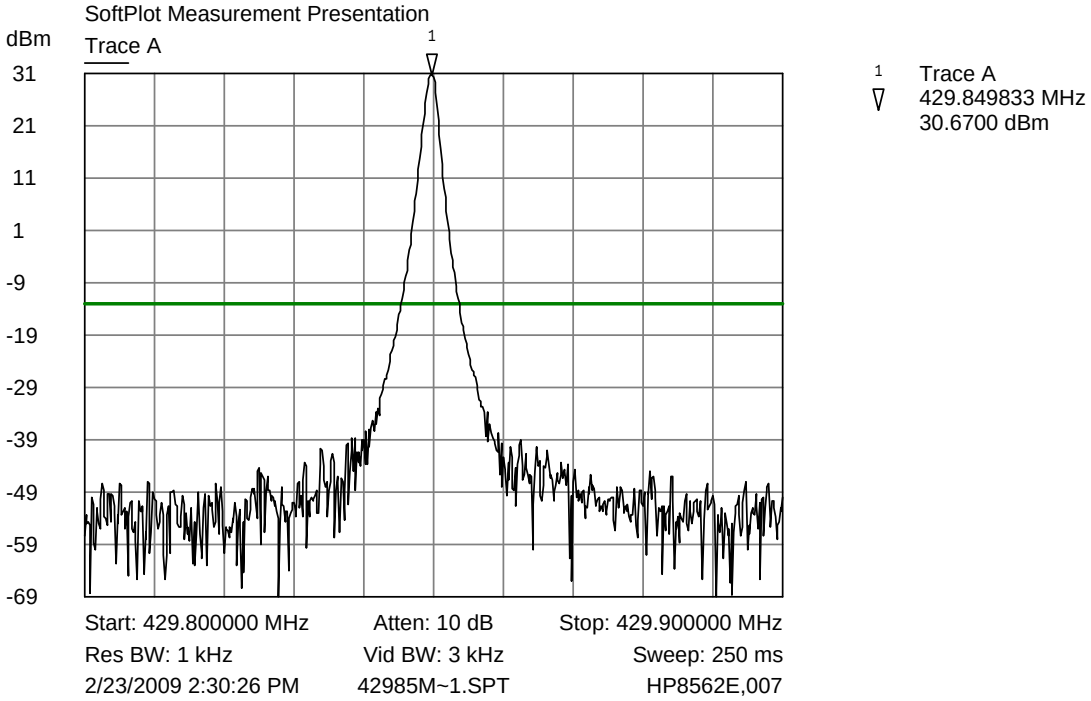
409.85MHz_1G~2GHz



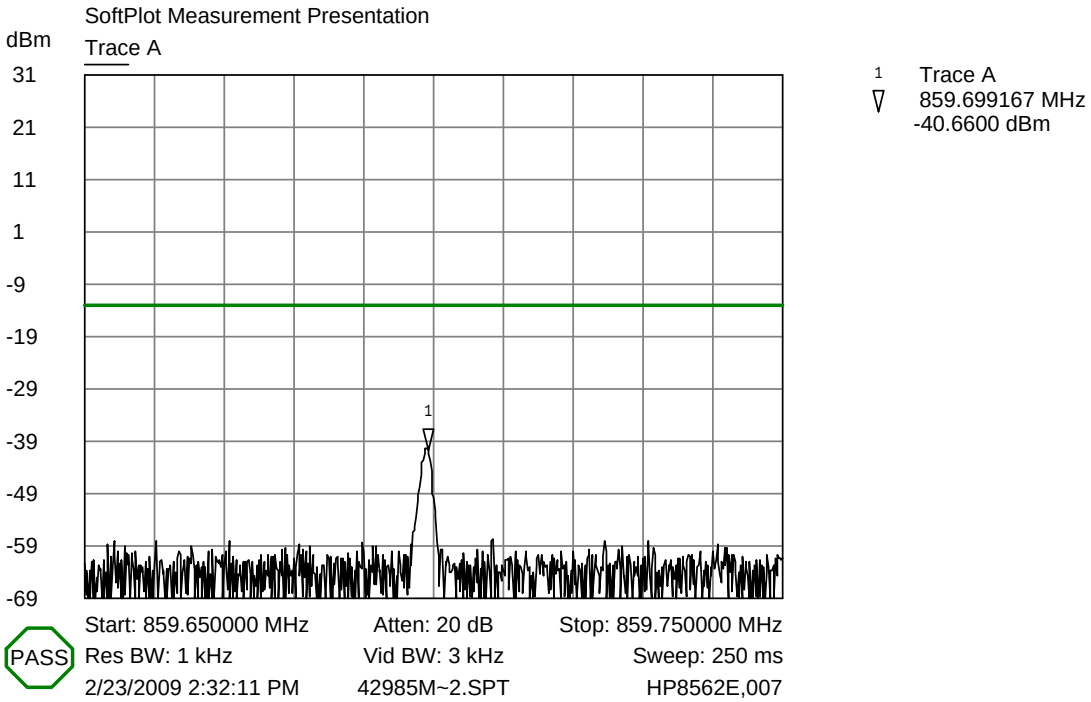
409.85MHz_2G~4.5GHz



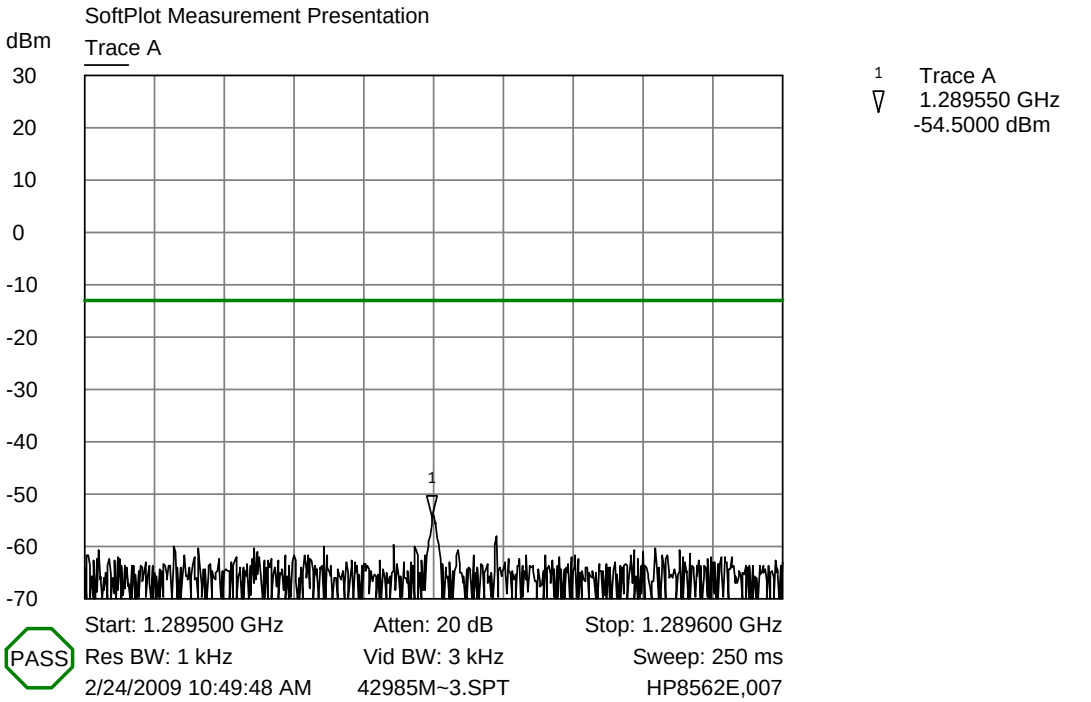
429.85MHz_1st



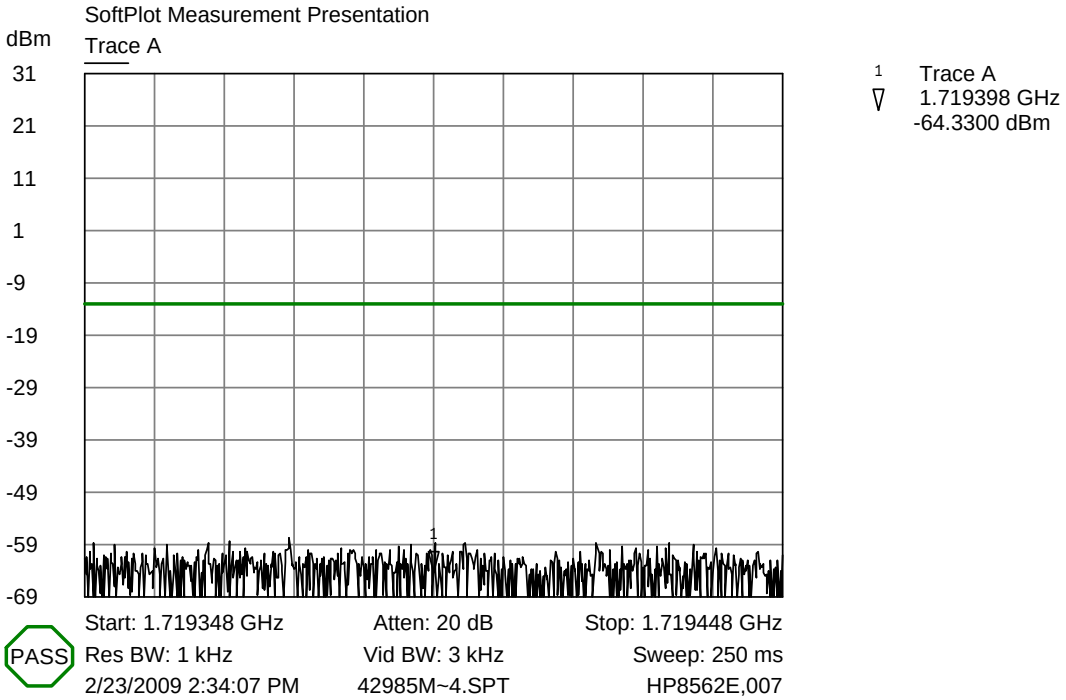
429.85MHz_2nd



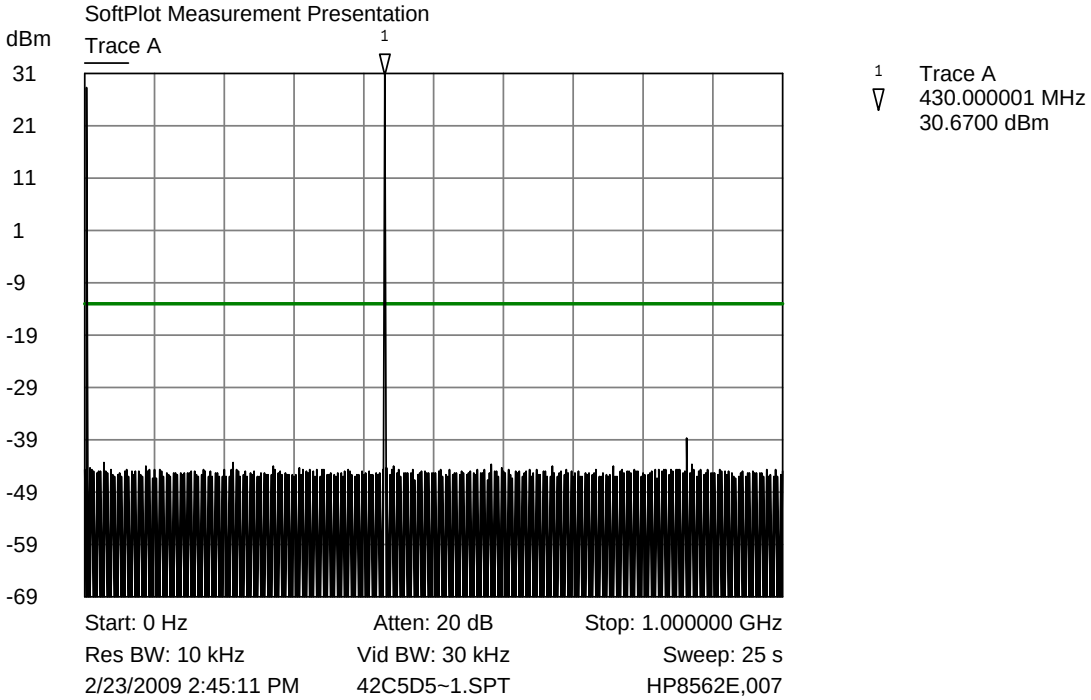
429.85MHz_3rd



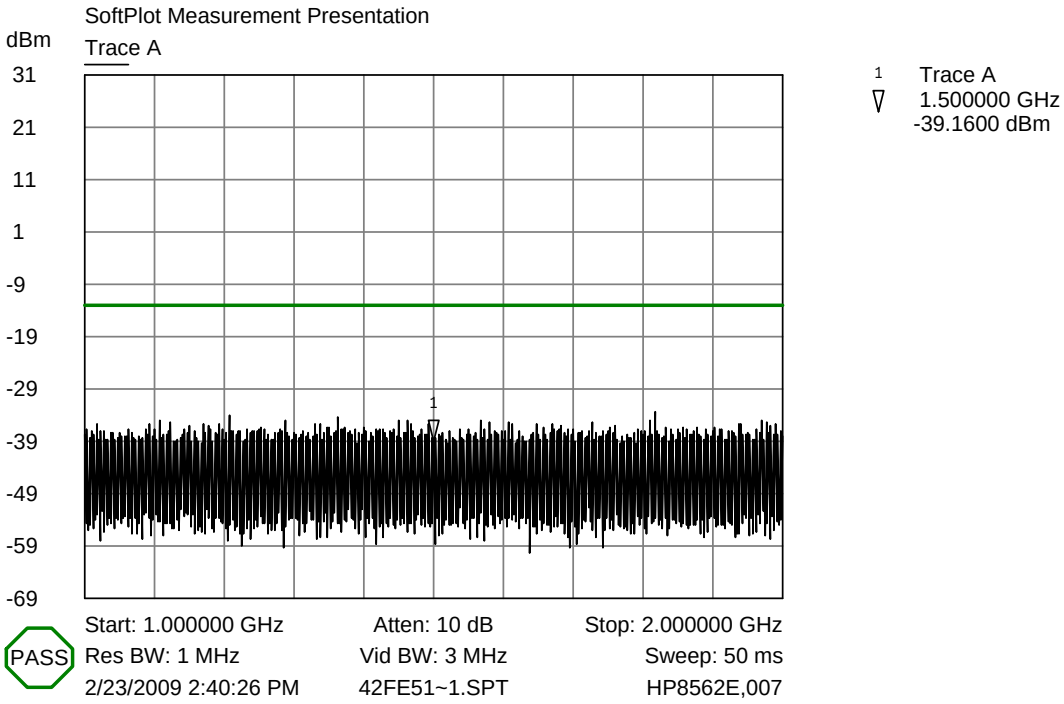
429.85MHz_4th



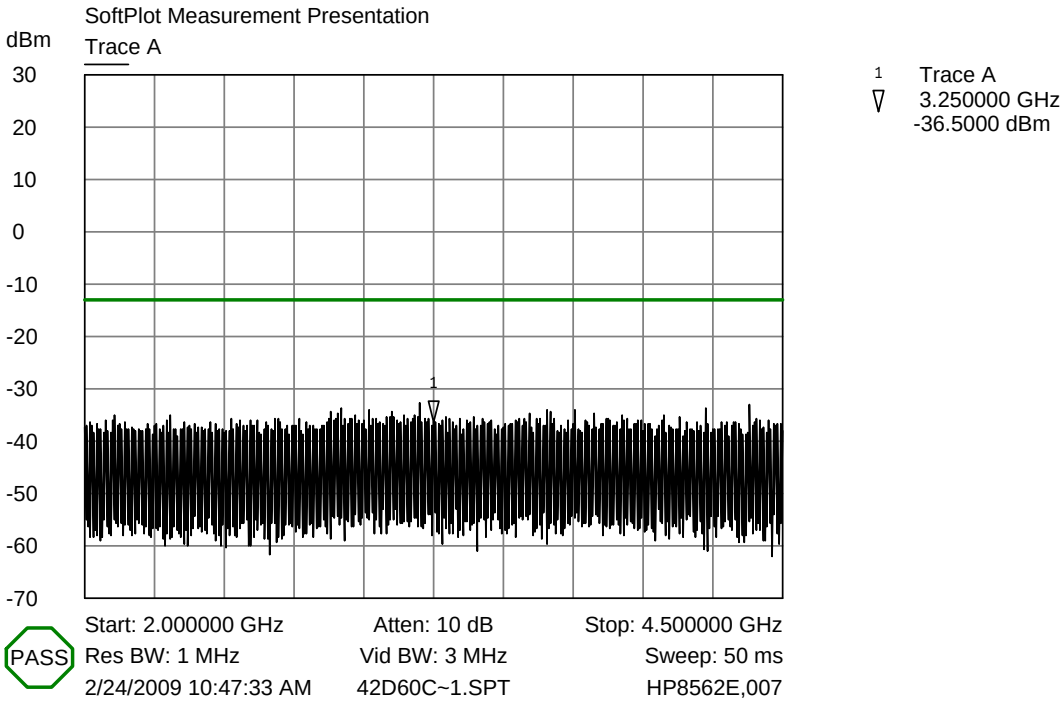
429.85MHz_1GHz



429.85MHz_1G~2GHz



429.85MHz 2G~4.5GHz



ξ2.1053 andξ90.210 Radiated Spurious Emissions

ξ2.1055(d) andξ90.213 Frequency Stability
Applicable Standard

ξ90.213 for output power < 2 watts, the limit is 5.0ppm

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:

Manufacturer	Description	Model	S/N	Cal Date
Agilent	Spectrum Analyzer	8562EC	3946A00288	12/22/2009
Tenney	Temperature Oven	Series 942	CL5CHAMBERS	N/A
TekPower	DC power supply	HY3005D	N/A	N/A

Environment conditions

Room Temperature	20℃~22℃
Relative Humidity	70%~75%

Test Engineer: JACINTO AMANTE
Test Date: 02/16/2009~02/21/2009

Test Results:

430~470MHz

1. 430.15MHz:

Frequency vs. Temperature

Reference Frequency 430.15MHz			
Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error (KHz)	ppm Error
60	12	-0.19	-0.44
50	12	-0.23	-0.54
40	12	-0.23	-0.54
30	12	-0.27	-0.63
20	12	-0.24	-0.56
10	12	-0.24	-0.56
0	12	-0.26	-0.60
-10	12	-0.20	-0.47
-20	12	-0.22	-0.51
-30	12	-0.22	-0.51

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error(KHz)	ppm Error
20	10.2	-0.24	-0.56
20	13.8	-0.23	-0.53

2. 449.85MHz:

Frequency vs. Temperature

Reference Frequency 449.85MHz			
Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error (KHz)	ppm Error
60	12	-0.20	-0.45
50	12	-0.23	-0.51
40	12	-0.25	-0.56
30	12	-0.28	-0.62
20	12	-0.25	-0.56
10	12	-0.25	-0.56
0	12	-0.28	-0.62
-10	12	-0.21	-0.47
-20	12	-0.23	-0.51
-30	12	-0.23	-0.51

Frequency Vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error (KHz)	ppm Error
20	10.2	-0.25	-0.56
20	13.8	-0.24	-0.54

3. 469.85MHz

Frequency vs. Temperature

Reference Frequency 469.85MHz			
Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error (KHz)	ppm Error
60	12	-0.21	-0.45
50	12	-0.25	-0.53
40	12	-0.25	-0.53
30	12	-0.30	-0.64
20	12	-0.25	-0.53
10	12	-0.26	-0.55
0	12	-0.29	-0.62
-10	12	-0.22	-0.47
-20	12	-0.24	-0.51
-30	12	-0.25	-0.53

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error (KHz)	ppm Error
20	10.2	-0.26	-0.55
20	13.8	-0.26	-0.55

390~430MHz

1. 390.15MHz:

Frequency vs. Temperature

Reference Frequency 390.15MHz			
Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error (KHz)	ppm Error
60	12	-0.22	-0.56
50	12	-0.24	-0.62
40	12	-0.22	-0.56
30	12	-0.17	-0.44
20	12	-0.12	-0.31
10	12	-0.11	-0.28
0	12	-0.12	-0.31
-10	12	-0.09	-0.23
-20	12	-0.11	-0.28
-30	12	-0.019	-0.05

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error (KHz)	ppm Error
20	10.2	-0.12	-0.31
20	13.8	-0.12	-0.31

2. 409.85MHz:

Frequency vs. Temperature

Reference Frequency 409.85MHz			
Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Measured Freq(KHz)	ppm Error
60	12	-0.23	-0.56
50	12	-0.25	-0.61
40	12	-0.24	-0.59
30	12	-0.19	-0.46
20	12	-0.13	-0.32
10	12	-0.11	-0.27
0	12	-0.13	-0.32
-10	12	-0.09	-0.22
-20	12	-0.12	-0.29
-30	12	-0.029	-0.07

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Measured Freq(KHz)	ppm Error
22	10.2	-0.13	-0.32
22	13.8	-0.13	-0.32

3. 429.85MHz

Frequency vs. Temperature

Reference Frequency 429.85MHz			
Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Measured Freq(KHz)	ppm Error
60	12	-0.24	-0.56
50	12	-0.26	-0.61
40	12	-0.24	-0.56
30	12	-0.19	-0.44
20	12	-0.14	-0.33
10	12	-0.12	-0.28
0	12	-0.14	-0.33
-10	12	-0.09	-0.21
-20	12	-0.12	-0.28
-30	12	-0.024	-0.06

Frequency vs. Voltage

Test Condition		Frequency Measure with Time Elapsed	
Temperature(℃)	Power Supply(VDC)	Freq Error(KHz)	ppm Error
22	10.2	-0.13	-0.30
22	13.8	-0.13	-0.30

ξ90.214- Transient Frequency Behavior

Applicable Standard

ξ90.214 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 1KHz 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

Manufacturer	Description	Model	S/N	Cal 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

Environment conditions

Room Temperature	20℃~22℃
Relative Humidity	70%~75%

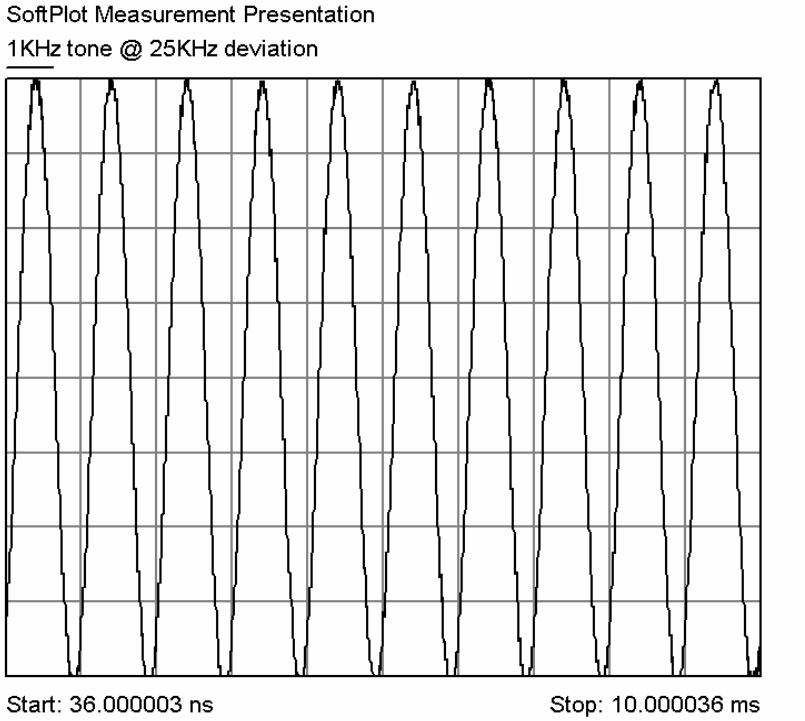
Test Engineer: Hui Chen
Test Date: 02/3/2009~02/21/2009

Test Results:

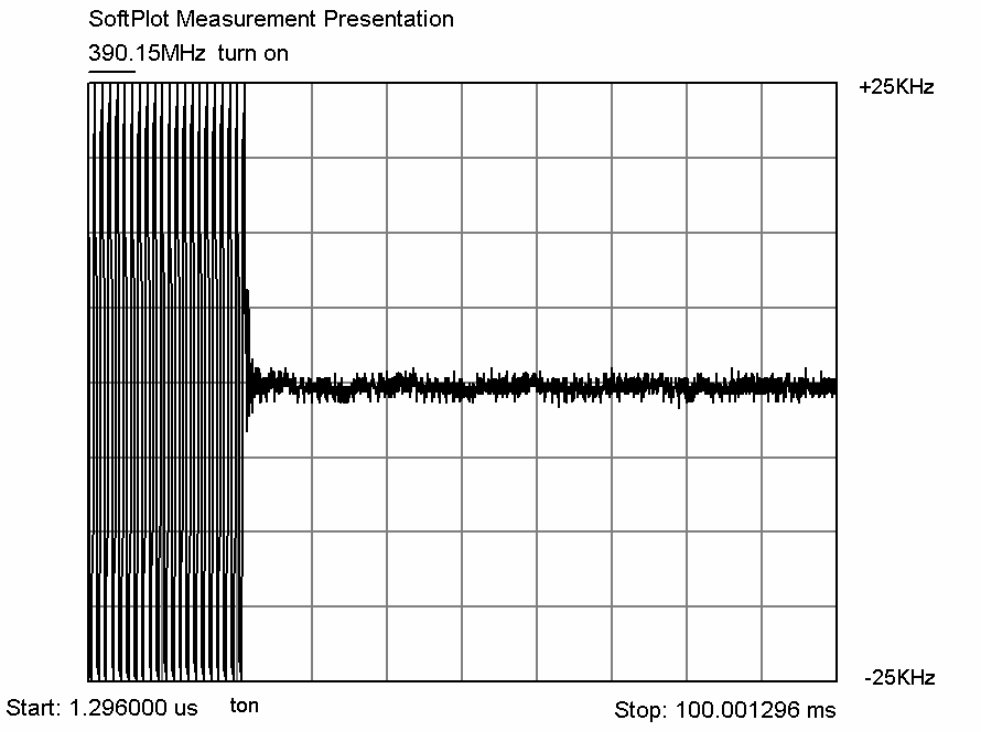
Please refer to the following plots

S/N: 187093(390~430 MHz)

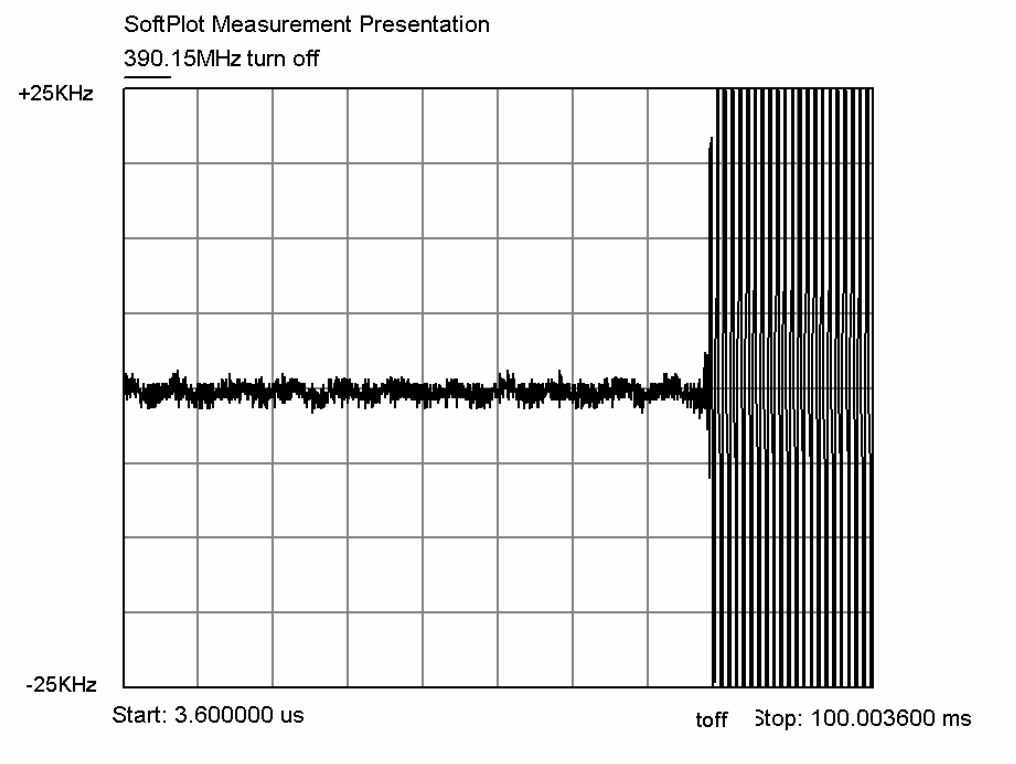
1 kHz tone at +/-25 kHz deviation



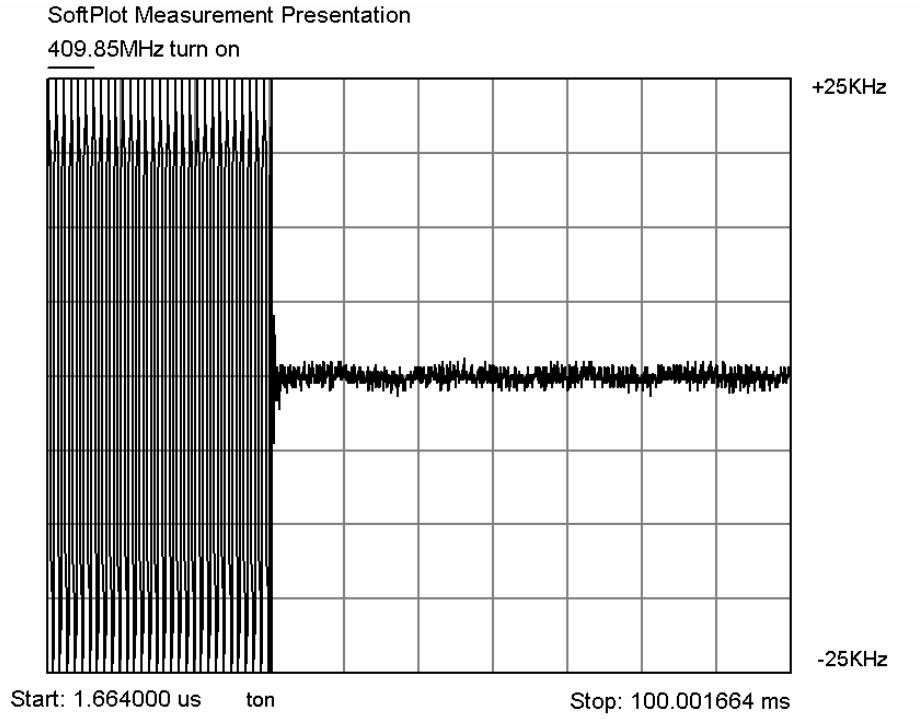
390.15 MHz turn on transient frequency



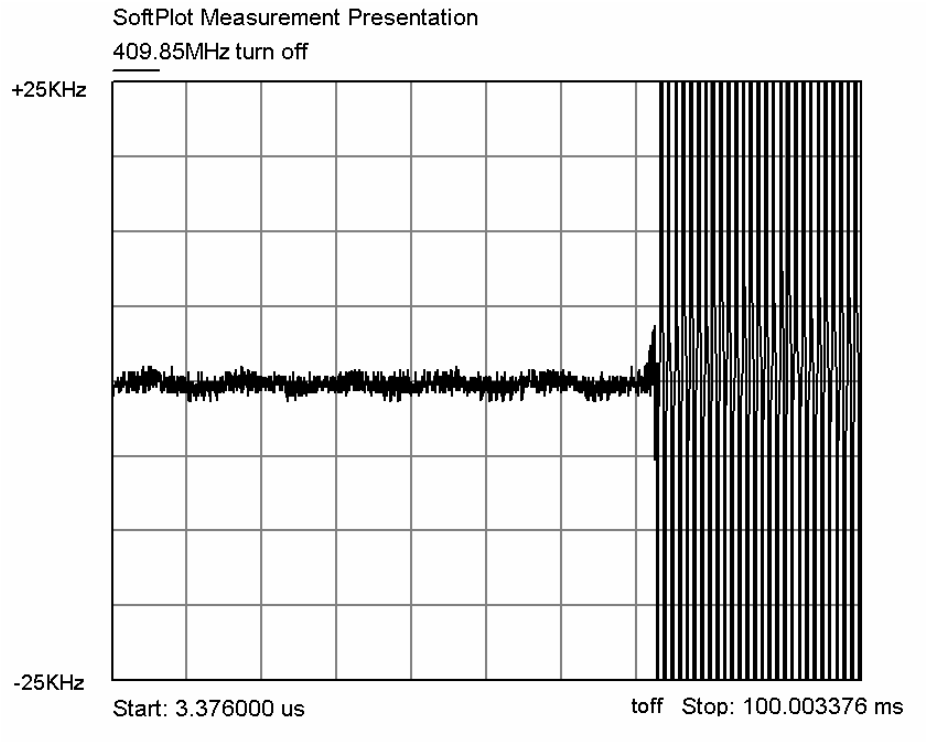
390.15 MHz turn off transient frequency



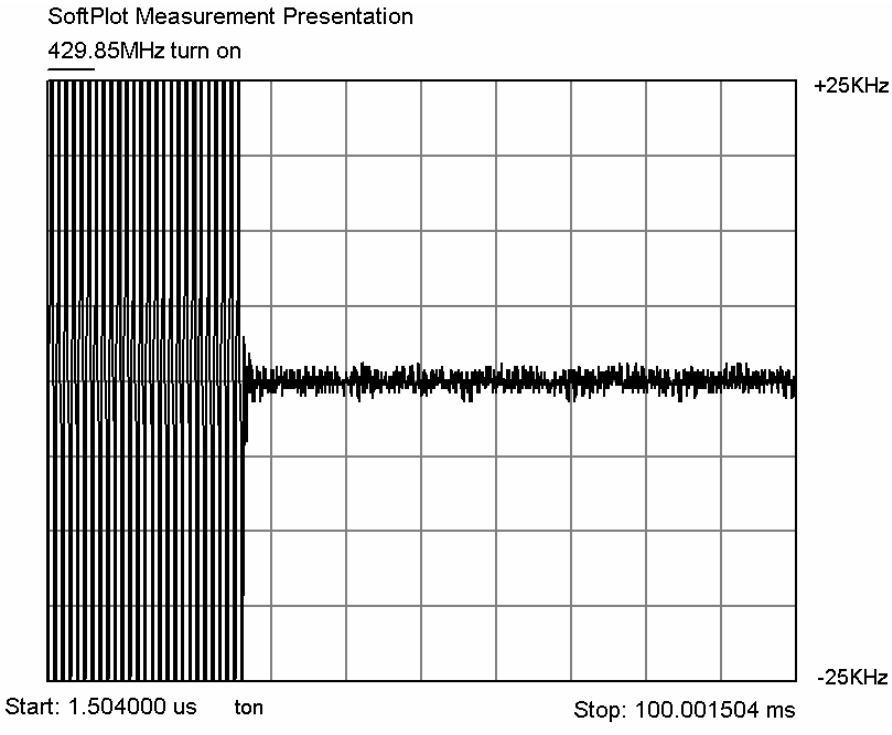
409.85 MHz turn on transient frequency



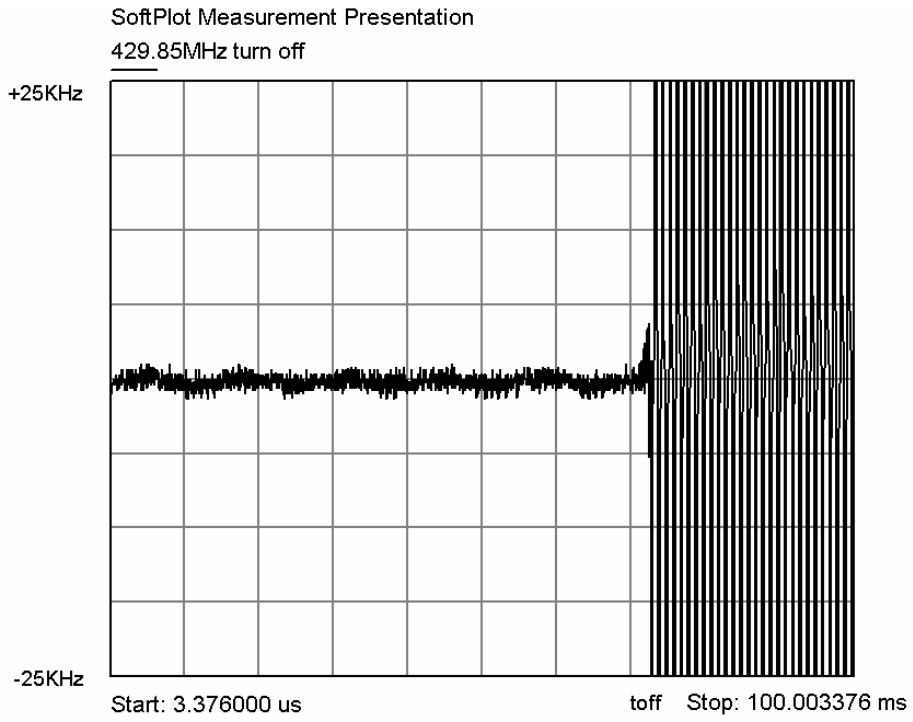
409.85 MHz turn off transient frequency



429.85 MHz turn on transient frequency

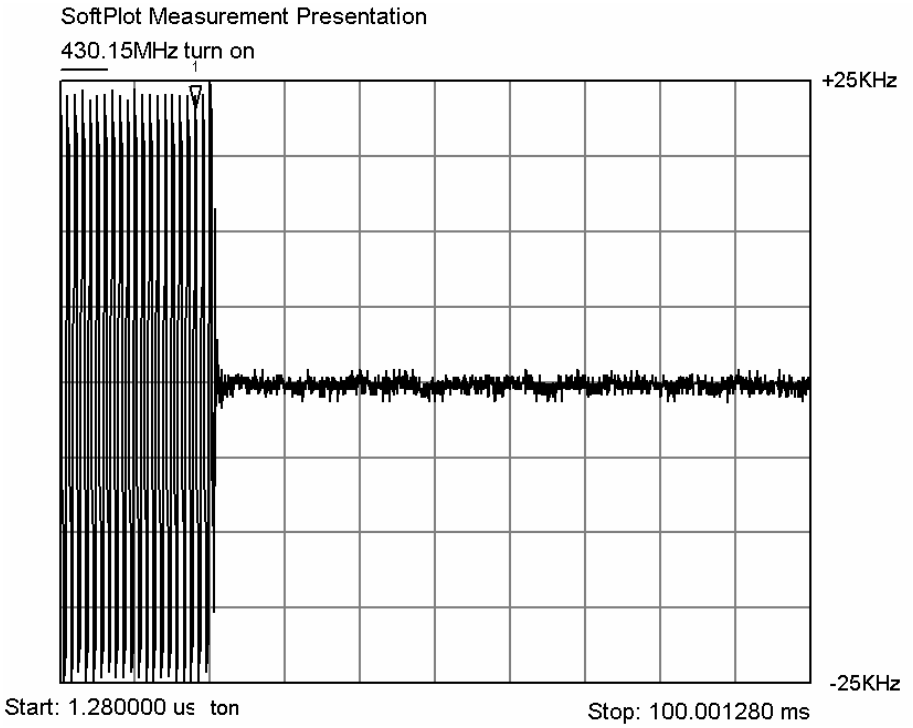


429.85 MHz turn off transient frequency

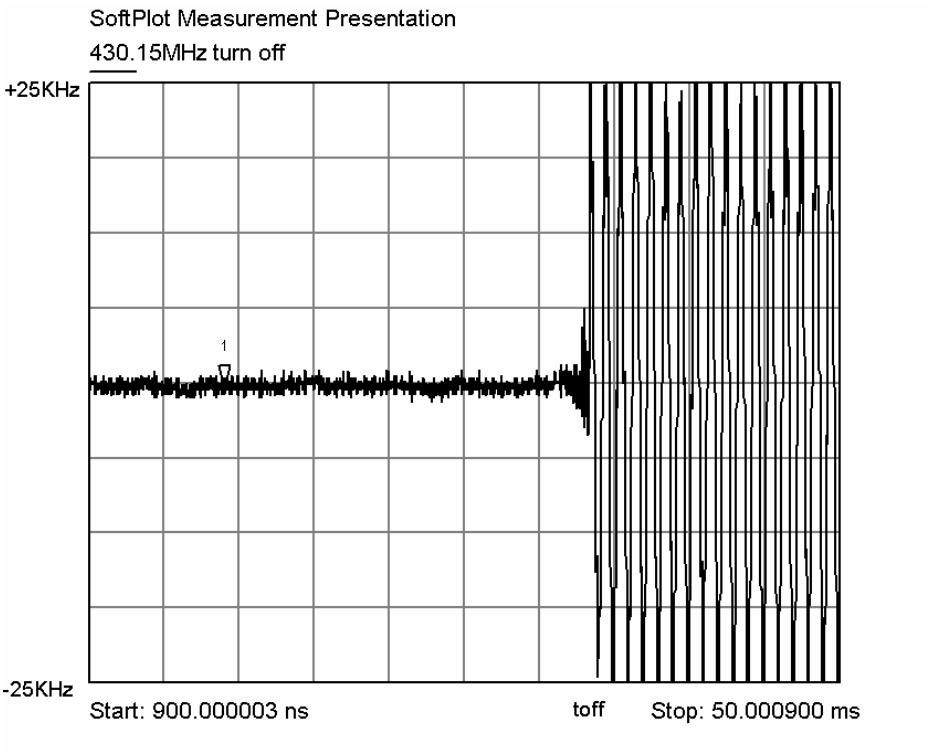


S/N: 187085(430~470 MHz)

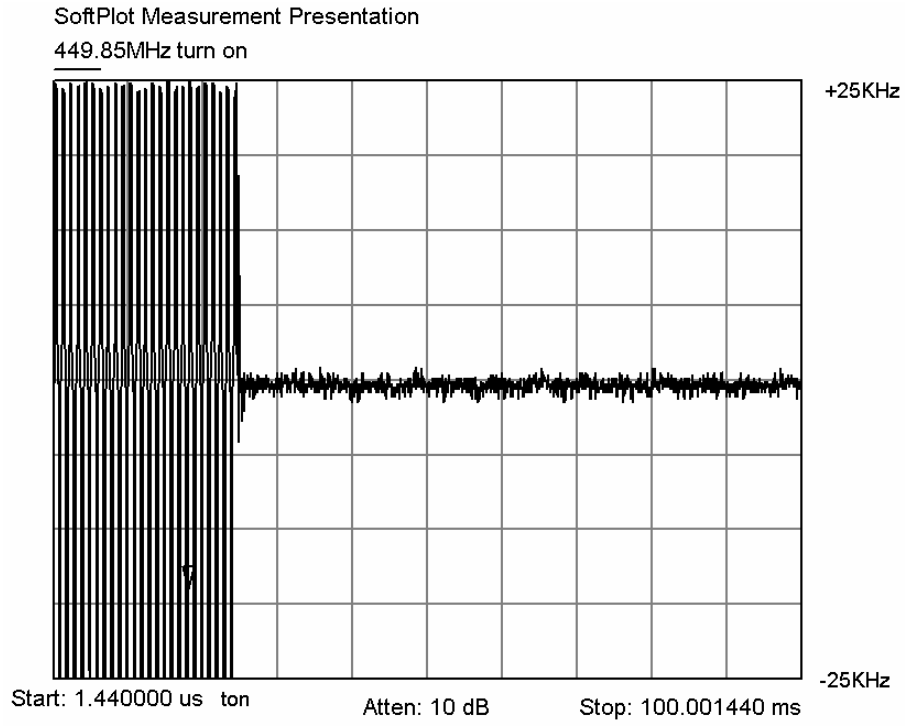
430.15 MHz turn on transient frequency



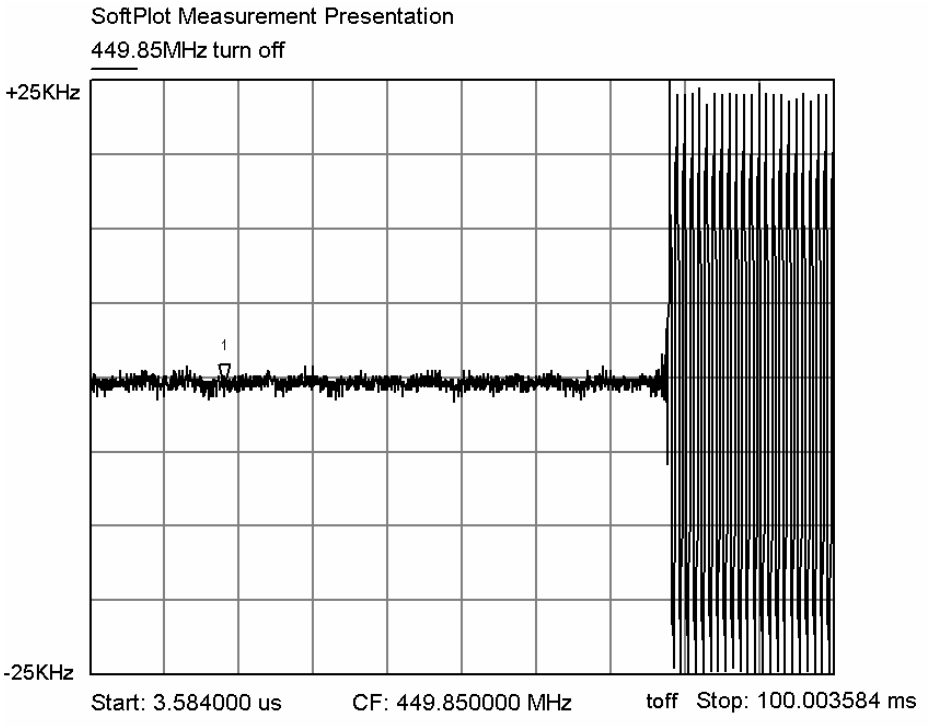
430.15 MHz turn off transient frequency



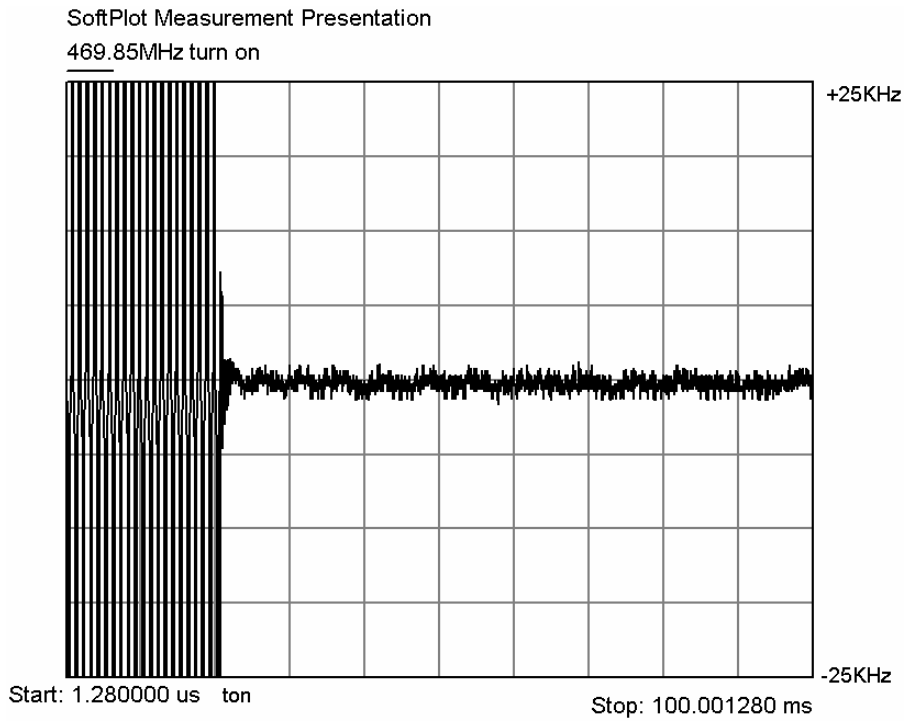
449.85 MHz turn on transient frequency



449.85 MHz turn off transient frequency



469.85 MHz turn on transient frequency



469.85 MHz turn off transient frequency