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Radio Test Report

FCC Part 90
(410 MHz to 470 MHz)

Model: Hiper Ga (01-860805-01)

COMPANY:	Topcon Positioning Systems 7400 National Drive Livermore, CA 94550
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	July 1, 2013
REISSUE DATE:	July 19, 2013
FINAL TEST DATES:	June 17, 2013
TOTAL NUMBER OF PAGES:	36

PROGRAM MGR /
TECHNICAL REVIEWER:

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QUALITY ASSURANCE DELEGATE /
FINAL REPORT PREPARER:

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Senior Technical Writer

A2LA ACCREDITED
Testing Cert #0214.26

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	07/01/2013	First release	
1	07/19/2013	Added power measurements	Deniz Demirci

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SCOPE

Tests have been performed on the Topcon Positioning Systems model Hiper Ga (01-860805-01), pursuant to the relevant requirements of the following standard(s) in order to obtain class II permissive change/ re-assessment permissive change against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 90 (Private Land Mobile Radio Service)

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Topcon Positioning Systems model Hiper Ga (01-860805-01) and therefore apply only to the tested sample. The sample was selected and prepared by Ferdinand Riodique of Topcon Positioning Systems.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section with addition of 4LFSK modulation on 12.5 kHz and 25 kHz channel spacing modes.

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

Testing was performed only on model Hiper Ga (01-860805-01).

STATEMENT OF COMPLIANCE

The tested sample of Topcon Positioning Systems model Hiper Ga (01-860805-01) complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

FCC Part 90 and RSS-119

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 90.279 & 90.205	-	RF power output at the antenna terminals	Pass	5 watts e.r.p.	Pass
§2.1033 (c) (4) §2.1047 § 90.210	-	Emission types			
		Spectral mask	Pass	Ch spacing 12.5, Mask D Ch spacing 25, Mask C	Pass
§2.1049 § 90.209	-	Occupied BW / Authorized BW	6.4 kHz 16.6 kHz	Ch spacing 12.5, 11.25 Ch spacing 25, 20	Pass
§ 90.214	-	Transient frequency behavior	Pass	-	No change from original application
Transmitter spurious emissions					
§2.1051 §2.1057	-	At the antenna terminals	-26.9 dBm	-20 dBm	Pass
§2.1053 §2.1057	-	Field strength	-35.9 dBm	-20 dBm	No change from original application
Receiver spurious emissions					
§ 15.109	-	At the antenna terminals	-73.6 dBm	< 1GHz: 2nW > 1GHz: 5nW	No change from original application
15.109	-	Field strength	35.3 dBµV/m	See limit table on page 18	No change from original application
Other details					
§2.1055 § 90.213	-	Frequency stability	1.3 ppm	1.5 ppm	No change from original application
§2.1093	-	RF Exposure	See separate exhibit		
-	-	Antenna Gain	2.5 dBi ½ wave flexible cable antenna		
Notes					

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7,000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7,000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 40,000 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 40,000 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBμV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Topcon Positioning Systems model Hiper Ga (01-860805-01) is a GPS receiver with UHF, Bluetooth radio that is designed for land surveying. Since the EUT would be placed on a pole during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The EUT is internal battery operated. It has an external battery charging power supply which give 12 VDC 2.5 Amps. The electrical rating of the charger is 120 Volts, 60 Hz, 0.8 Amps.

The sample was received on June 17, 2013 and tested on June 17, 2013. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Topcon	HiPer Ga	GPS receiver with UHF and Bluetooth radio	457-04601	FCC ID: LCB-860805 IC: 6050B-860805
Phihong	PSC30U-120V	Power supply	PO3109830A1	N/A

OTHER EUT DETAILS

The EUT antenna is 2.5 dBi 1/2 wave flexible cable antenna.

The antenna connects to the EUT via BNC connector

ENCLOSURE

The EUT enclosure is primarily constructed of manganese zinc alloy. It measures approximately 16 cm wide by 16 cm deep by 10 cm high.

MODIFICATIONS

The following modification was made during testing to comply with the requirements:

1. Power was reduced from the maximum setting to 29 dBm for the 12.5 kHz BW operation

SUPPORT EQUIPMENT

A Notebook computer was used to configure the EUT. The computer was not connected during testing.

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
AC Power	AC Mains	Three wire	Unshielded	2
DC Power	EUT	Two wire	Unshielded	1.7

Note: The USB and serial ports (A and D) were not connected during testing. The manufacturer stated that these are for configuration purposes and therefore would not normally be connected.

EUT OPERATION

During emissions testing the UHF radio was configured to transmit at rated power with frequencies and modulations indicated in each run.

TESTING

GENERAL INFORMATION

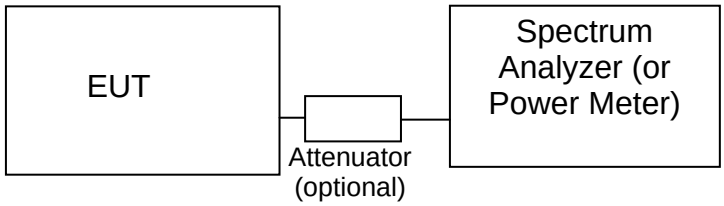
Antenna port measurements were taken at the National Technical Systems - Silicon Valley test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	211948	IC 2845B-4	
Chamber 5	211948	IC 2845B-5	
Chamber 7	A2LA Accredited	IC 2845B-7	

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RF PORT MEASUREMENT PROCEDURES

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.



Test Configuration for Antenna Port Measurements

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

CONDUCTED SPURIOUS EMISSIONS

Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode measurements). Where the limits are expressed as an average power the spectrum analyzer is tunes to that frequency with a narrow span (wide enough to capture the emission and its sidebands) and the resolution and video bandwidths are adjusted as required by the reference measurement standards. For transmitter measurements the appropriate detector (average, peak, normal ,sample, quasi-peak) is used when making measurements for licensed devices. For receiver conducted spurious measurements the detector is set to peak.

TRANSMITTER MASK MEASUREMENTS

The transmitter mask measurements are made using resolution bandwidths as specified in the pertinent rule part(s). Where narrower bandwidths are used the measurement is corrected to account for the reduced bandwidth by either using the adjacent channel power function of the spectrum analyzer to sum the power across the required measurement bandwidth. The frequency span of the analyzer is set to ensure the fundamental signal and all significant sidebands are displayed.

The top of the mask may be set by the total output power of the signal, the power of the un-modulated signal or the peak value of the signal in the reference bandwidth being used for the mask measurement.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the EUT antenna port or receiving antenna and the test receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- Db

Appendix A Test Equipment Calibration Data

Radio Antenna Port (Power and Spurious Emissions), 17-Jun-13/18-July-13

Manufacturer	Description	Model	Asset #	Cal Due
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	3/7/2014
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	1/3/2014
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12/12/2013

Appendix B Test Data

T92605 Pages 15 – 35

Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		-
Emissions Standard(s):	FCC Part 90	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Topcon Positioning Systems

Model

HiPer GA

Date of Last Test: 6/17/2013

Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

FCC part 90

Power, Occupied Bandwidth, Frequency Stability and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above. Frequency range of operation is 410 - 430 MHz and 450 - 470 MHz

General Test Configuration

With the exception of the radiated spurious emissions tests, all measurements are made with the EUT's rf port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument. For frequency stability measurements the EUT was place inside an environmental chamber.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 23 °C

Rel. Humidity: 37 %

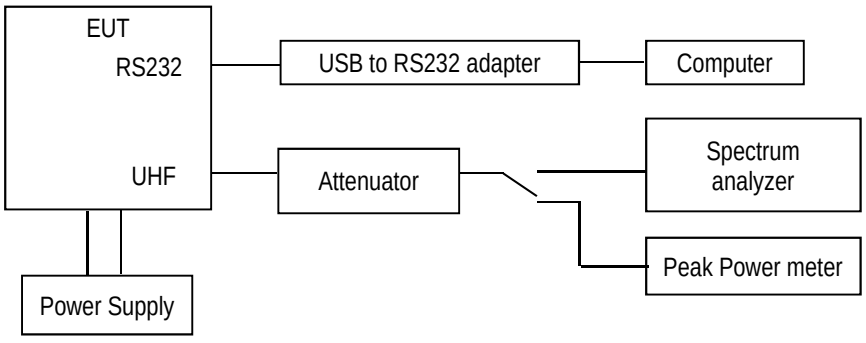
Modifications Made During Testing

Power was reduced from the maximum setting to 29 dBm for the 12.5 kHz BW operation in order to comply with conducted spurious.

Deviations From The Standard

No deviations were made from the requirements of the standard.

Conducted RF measurements setup



NTS WE ENGINEER SUCCESS

Radio Test Data

Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Summary of Results

Run #	Spacing	Data Rate	Test Performed	Limit	Pass / Fail	Result / Margin
1	12.5 kHz 25.0 kHz	-	Output Power § 90.279 & 90.205	5 watts e.r.p.	PASS	PASS
2	12.5 kHz 25.0 kHz	-	Spectral Mask § 90.210	Ch spacing:12.5, Mask D Ch spacing:25, Mask C	PASS	Meet the mask requirment Meet the mask requirment
3	12.5 kHz 25.0 kHz	-	Channel spacing, Occupied Bandwidth, Authorized bandwidth § 90.209	Ch spacing:12.5, 11.25 Ch spacing:25, 20	PASS	6.4 kHz 16.6 kHz
4	12.5 kHz 25.0 kHz	-	Tx Unwanted Emissions (conducted) §2.1051	-13 dBm, (C) -20 dBm, (D)	PASS	Below -13 dBm Below -20 dBm
5			Tx Unwanted Emissions (radiated) § 90.210	-13 dBm, (C) -20 dBm, (D)	N/A	N/A
6			Rx Spurious Emissions (conducted) § 90.210	-57 dBm <1 GHz -53 dBm >1 GHz	N/A	N/A
7			Rx Spurious emissions (radiated) RSS-119, 5.11 , RSS-Gen	Limits	N/A	N/A
8			Transient Frequency Behaviour § 90.214	Table 17 of RSS-119	N/A	N/A
9			Frequency Stability § 90.213	Ch spacing:12.5, 1.5 ppm Ch spacing:25, 2.5 ppm	N/A	N/A

Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Run #1: Output Power

Date: 7/18/2013 Engineer: Deniz Demirci Location: FT Lab# 4

Cable Loss: 0.4 dB Attenuator: 20.0 dB Total Loss: 20.4 dB

Cable ID(s): 492 Attenuator IDs: 1878

Power setting for channel spacing of 25 kHz

Power setting	Frequency (MHz)	Modulation	Output Power (dBm) [1]	Output Power mW	Duty Cycle %	Result
29 dBm	410.0000	CW	28.44	698.2	None	Pass
29 dBm	420.0000	CW	28.20	660.7	None	Pass
29 dBm	429.9875	CW	28.66	734.5	None	Pass
29 dBm	450.0125	CW	28.70	741.3	None	Pass
29 dBm	460.0000	CW	28.59	722.8	None	Pass
29 dBm	469.9875	CW	28.70	741.3	None	Pass

Note 1: Output power measured using a peak power meter

Note 2: Power setting - the power setting of 29 dBm was set with the control software during testing

Power setting for channel spacing of 12.5 kHz

Power setting	Frequency (MHz)	Modulation	Output Power (dBm) [1]	Output Power mW	Duty Cycle %	Result
29 dBm	410.0000	CW	28.44	698.2	None	Pass
29 dBm	420.0000	CW	28.20	660.7	None	Pass
29 dBm	429.9875	CW	28.66	734.5	None	Pass
29 dBm	450.0125	CW	28.70	741.3	None	Pass
29 dBm	460.0000	CW	28.59	722.8	None	Pass
29 dBm	469.9875	CW	28.70	741.3	None	Pass

Note 1: Output power measured using a peak power meter

Note 2: Power setting - the power setting of 29 dBm was set with the control software during testing

Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

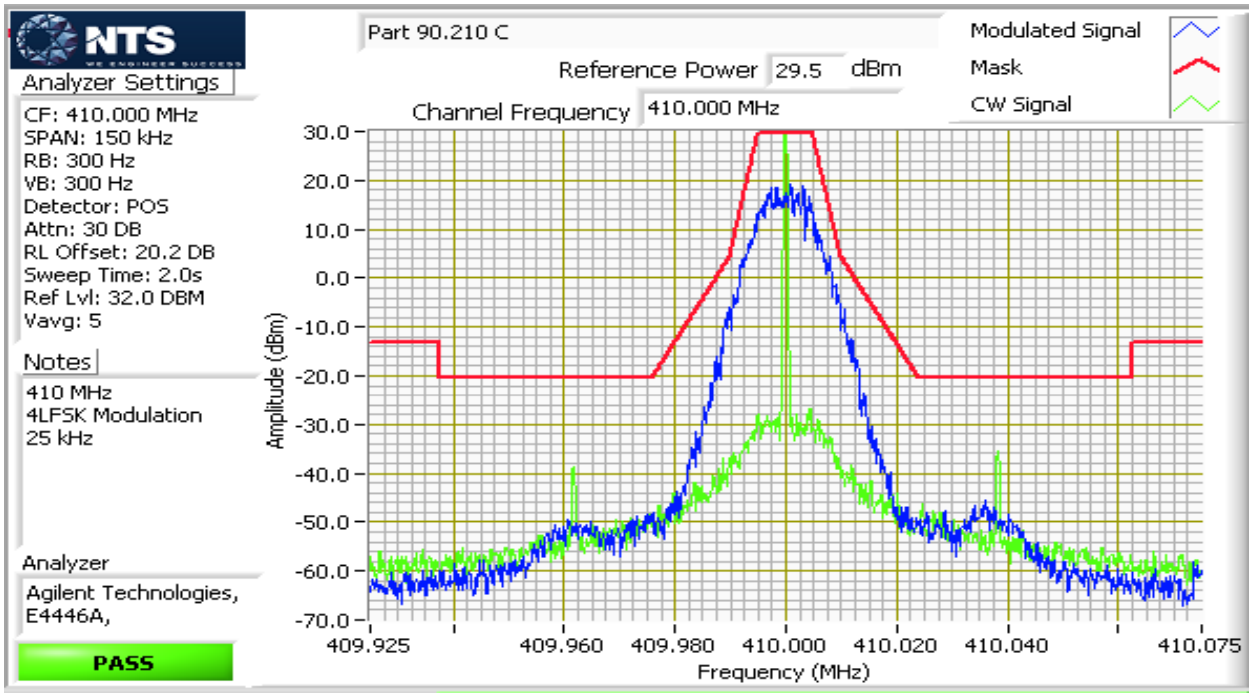
Run #2a: Spectral Mask, FCC Part 90 Mask C (Channel spacing 25 kHz)

Date: 6/17/2012 Engineer: M. Birgani Location: FT Lab# 4

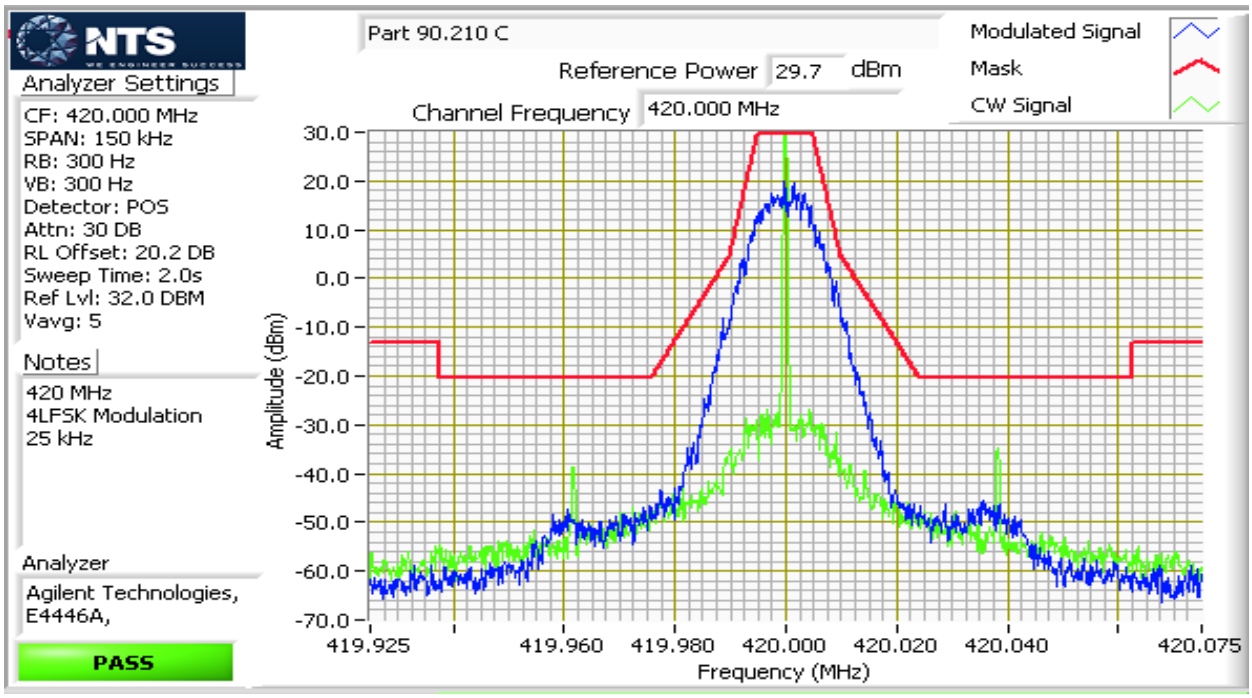
Note 1: RBW 300 Hz, VBW 300 Hz, Span 150 kHz, Detector Positive peak

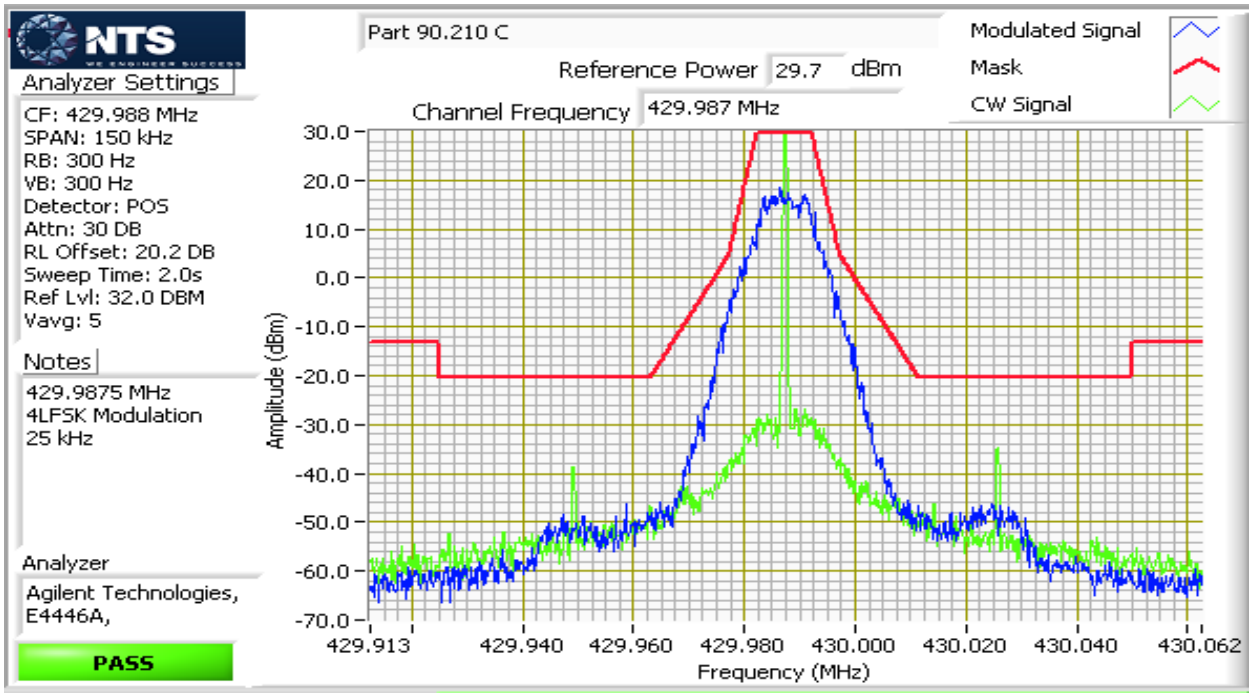
Note 2: Power setting: Maximum (worst case emission), Modulations: 4LFSK

Measure 4LFSK modulation @ 410.00 MHz, 420.00 MHz, 429.9875 MHz, 450.0125 MHz, 460.00 MHz and 469.9875 MHz with max TX power (worst case result for 29 dBm power)

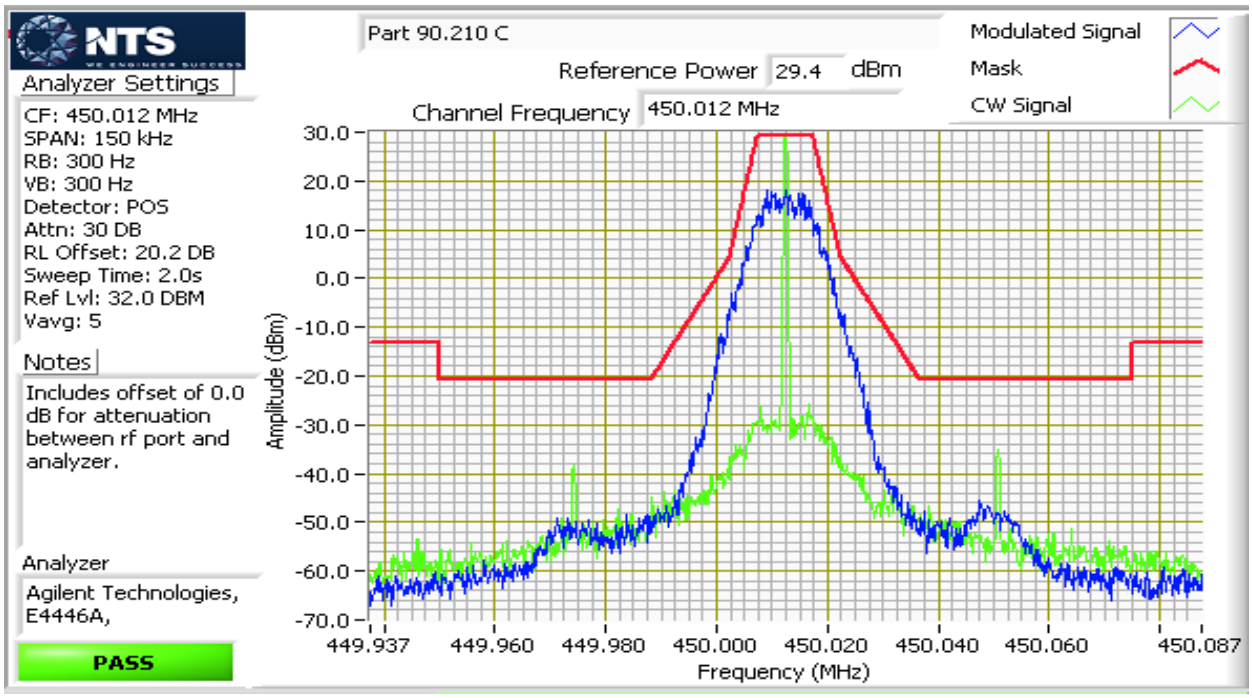


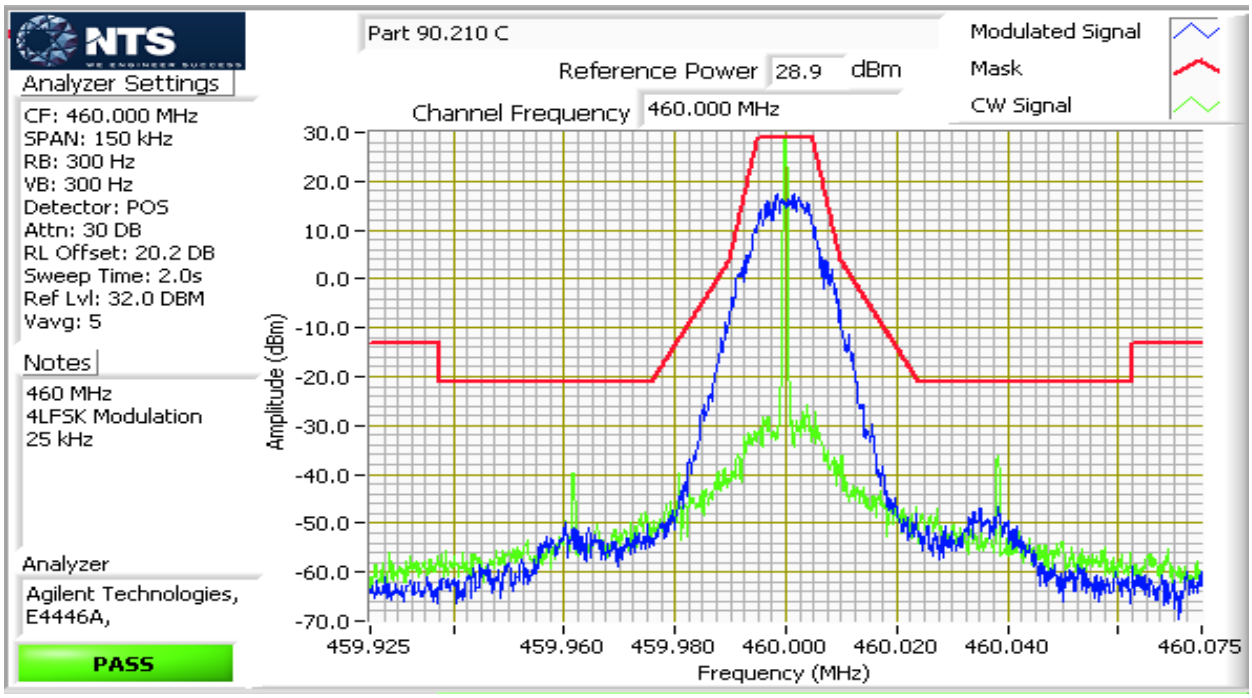
Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A





Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A





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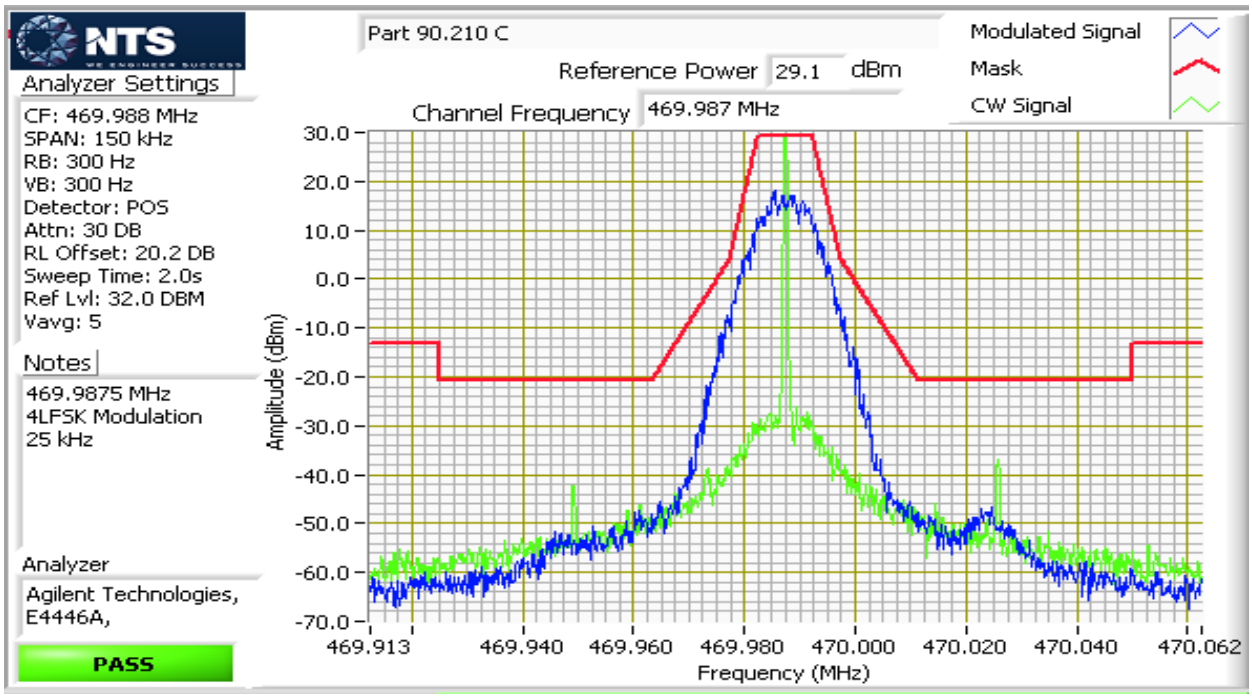
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A



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Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

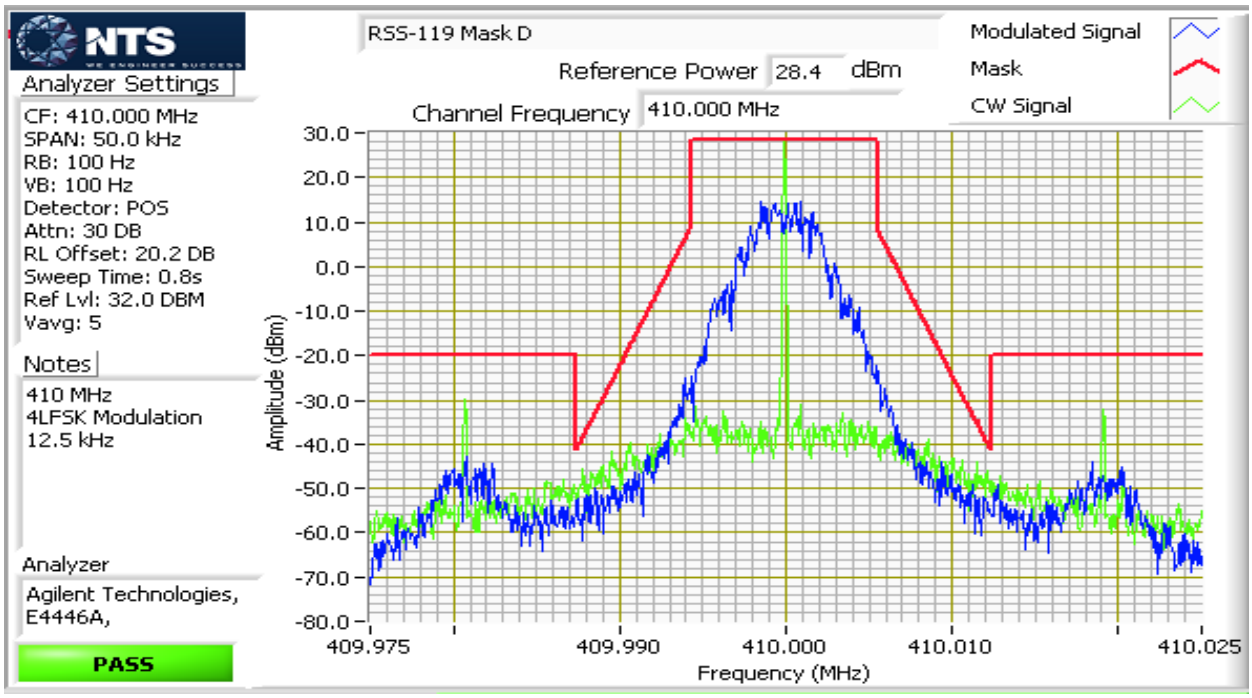
Run #2b: Spectral Mask, FCC Part 90 Mask D (Channel spacing 12.5 kHz)

Date: 6/17/2012 Engineer: M. Birgani Location: FT Lab# 4

Note 1: RBW 100 Hz, VBW 100 Hz, Span 50 kHz, Detector Positive peak

Note 3: Power setting: 29 dBm, Modulations: 4LFSK

Measure 4LFSK modulation @ 410.00 MHz, 420.00 MHz, 429.9875 MHz, 450.0125 MHz, 460.00 MHz and 469.9875 MHz with 29 dBm power



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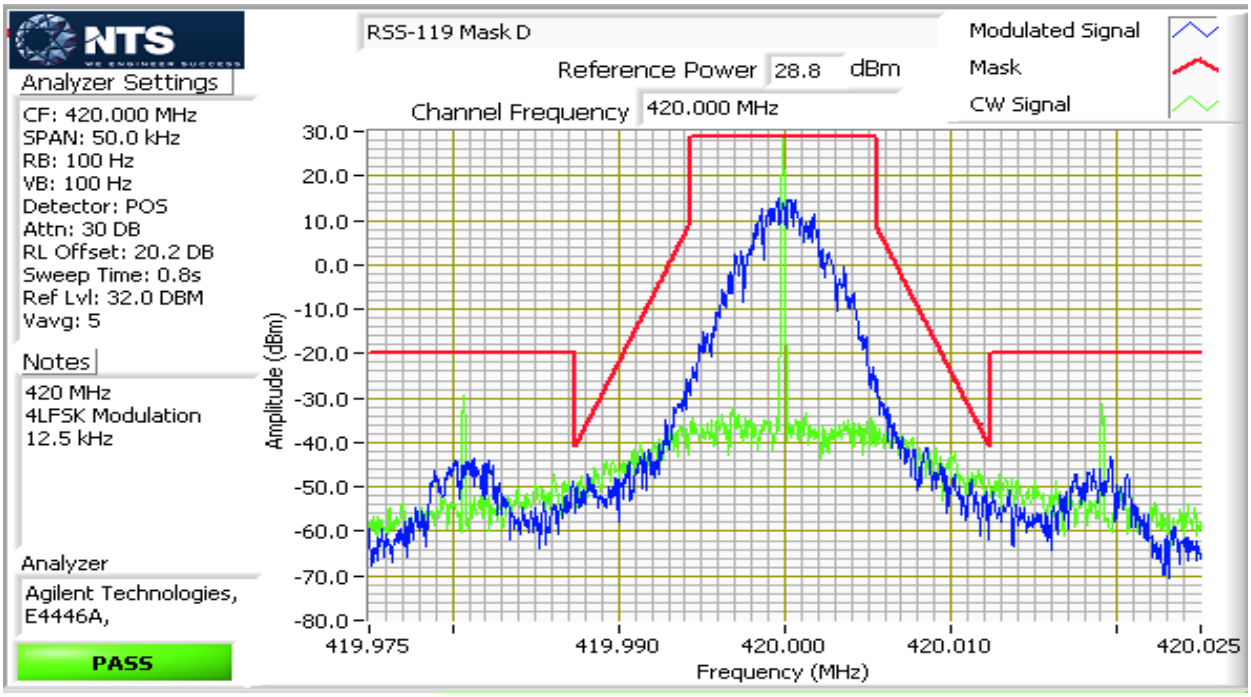
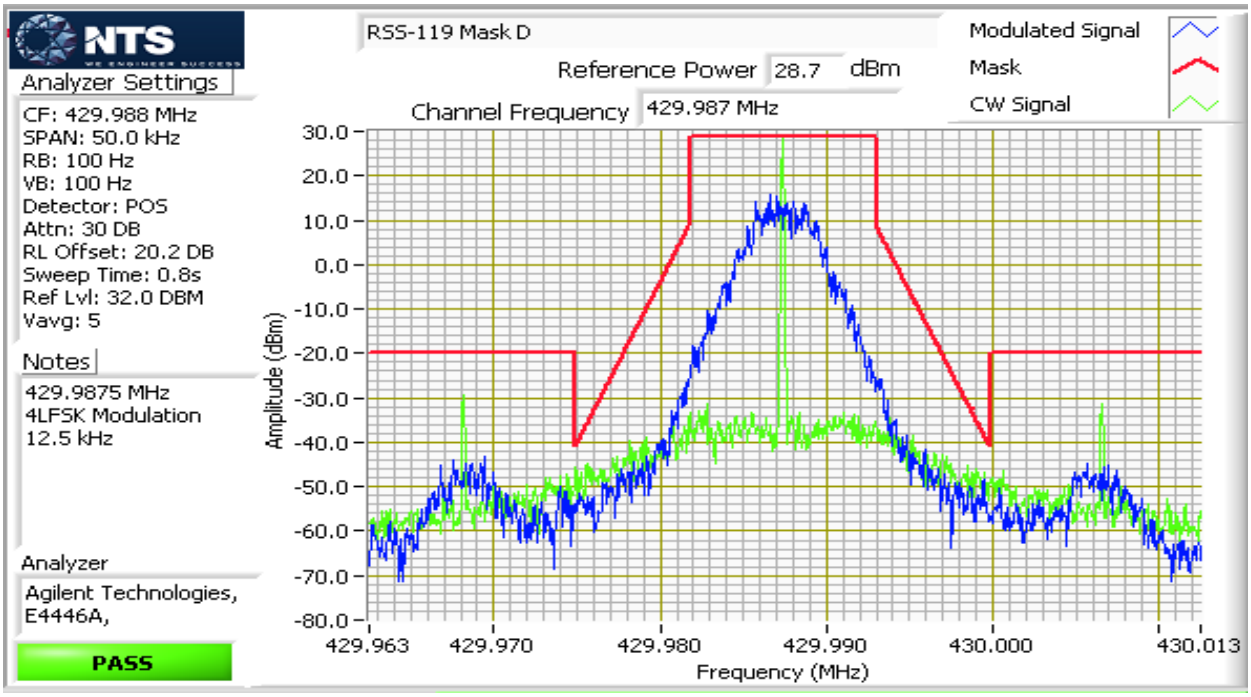
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A





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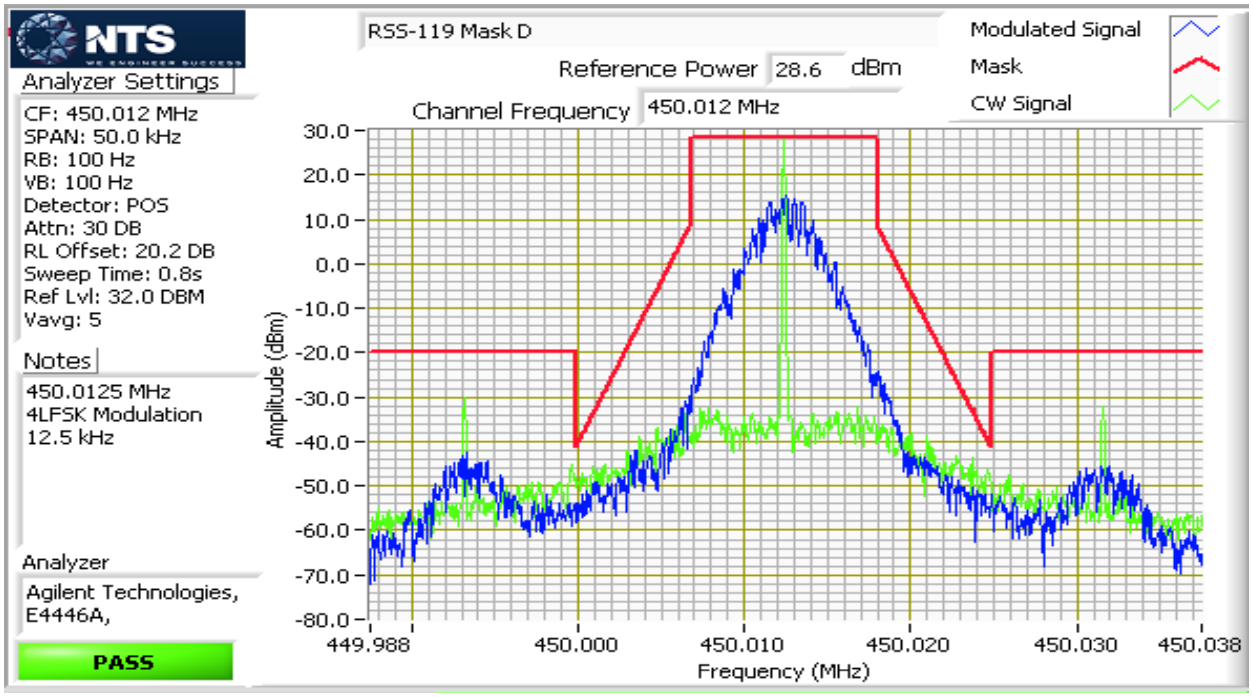
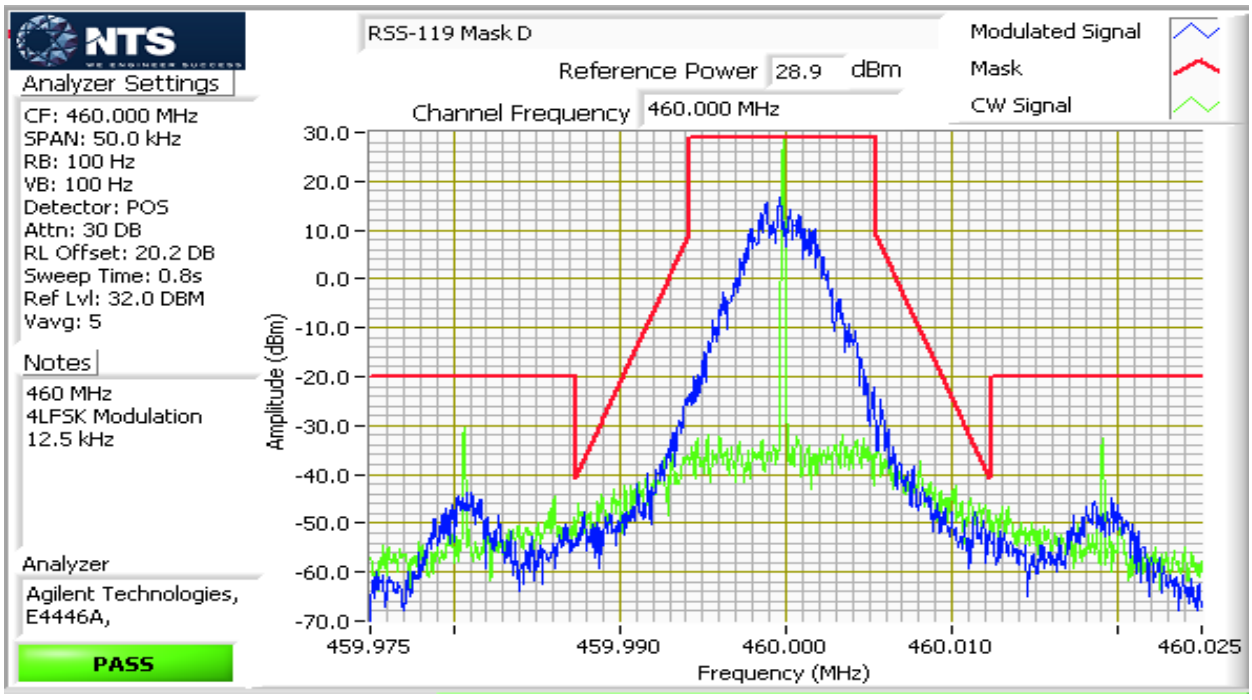
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A





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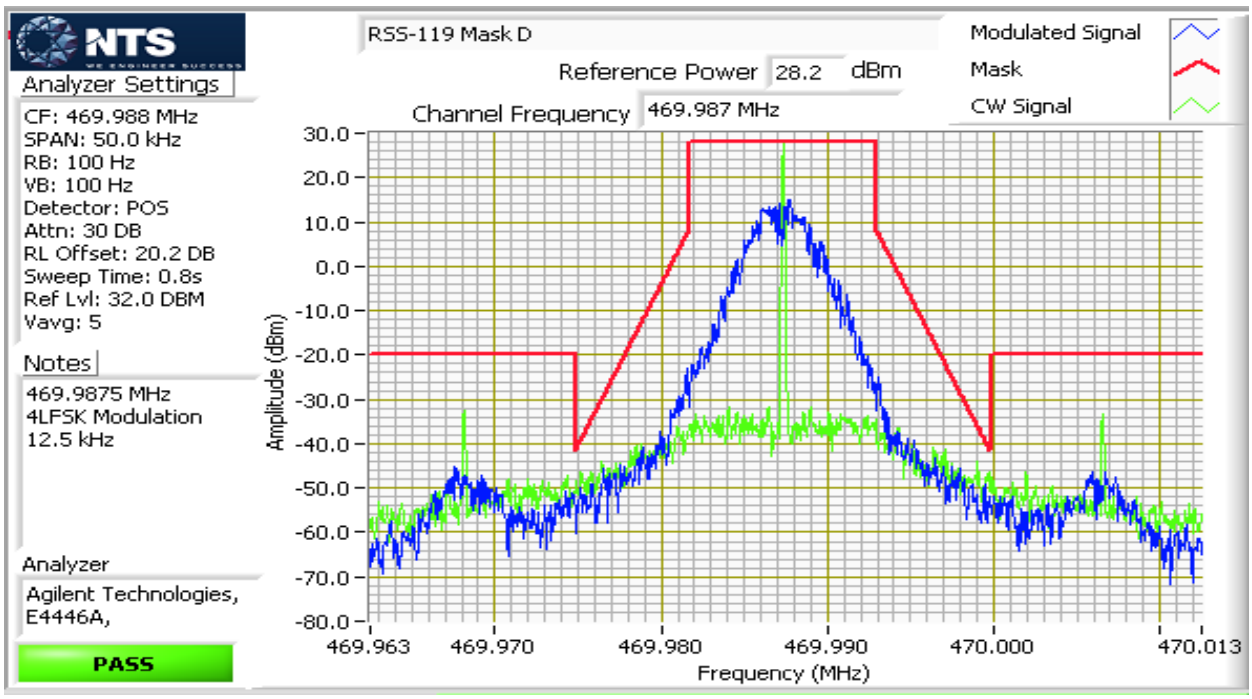
Standard:	FCC Part 90	Class:	N/A



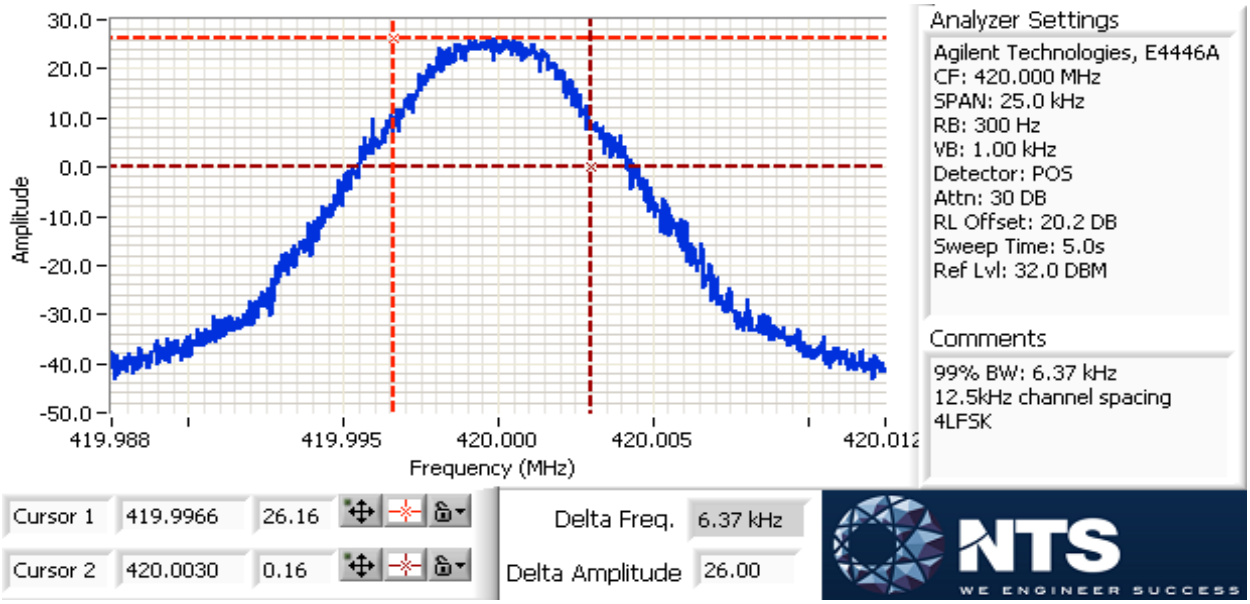
Run #3: Signal Bandwidth

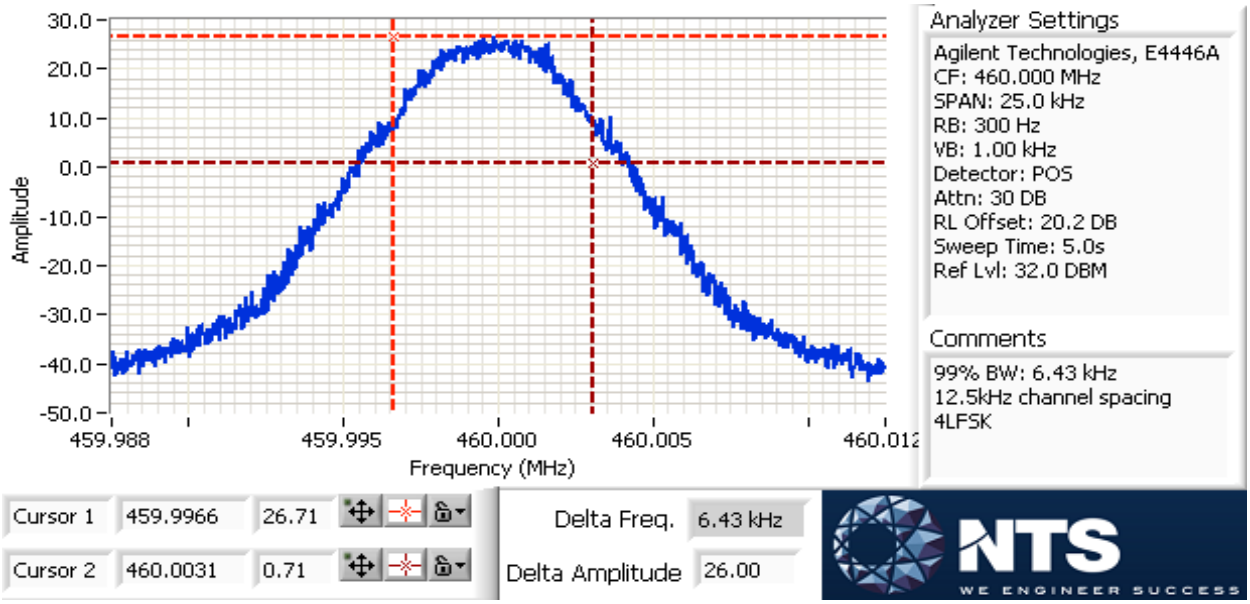
Date: 6/17/2012 Engineer: M. Birgani Location: FT Lab# 4

Frequency (MHz)	Power Setting	Modulation	Channel spacing	Authorized BW	Bandwidth (kHz)
420.0000	29 dBm	4LFSK	12.5 kHz	11.25 kHz	6.4
460.0000	29 dBm	4LFSK	12.5 kHz	11.25 kHz	6.4
420.0000	29 dBm	4LFSK	25 kHz	20 kHz	16.4
460.0000	29 dBm	4LFSK	25 kHz	20 kHz	16.6

Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB

Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A





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Model:	HiPer GA	T-Log Number:	T92605
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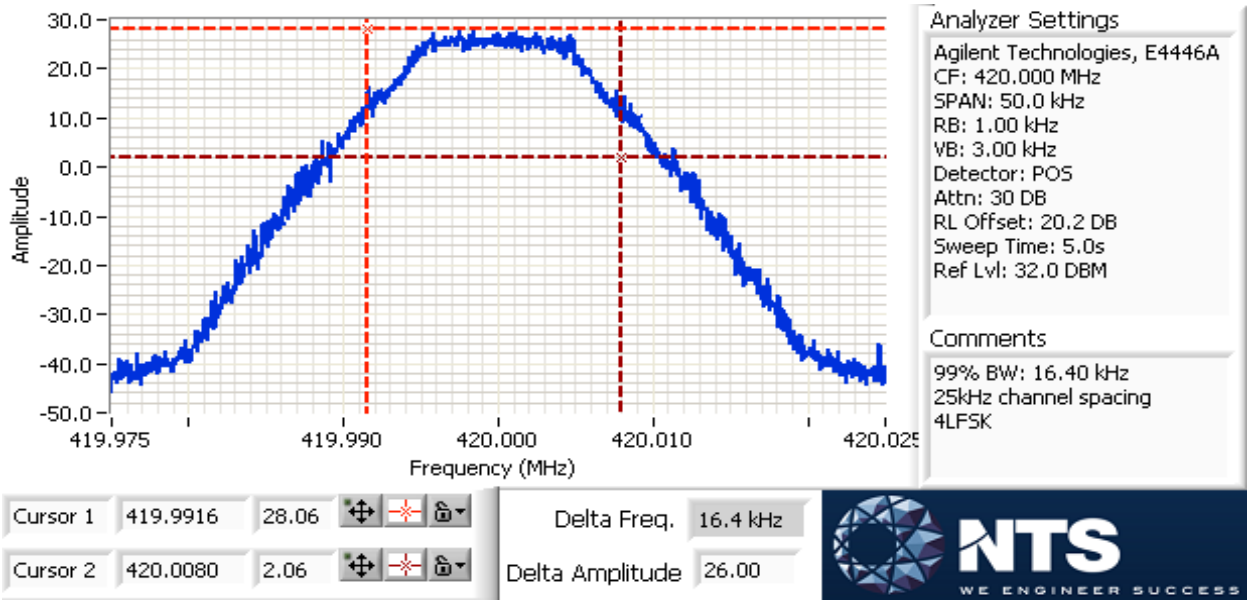
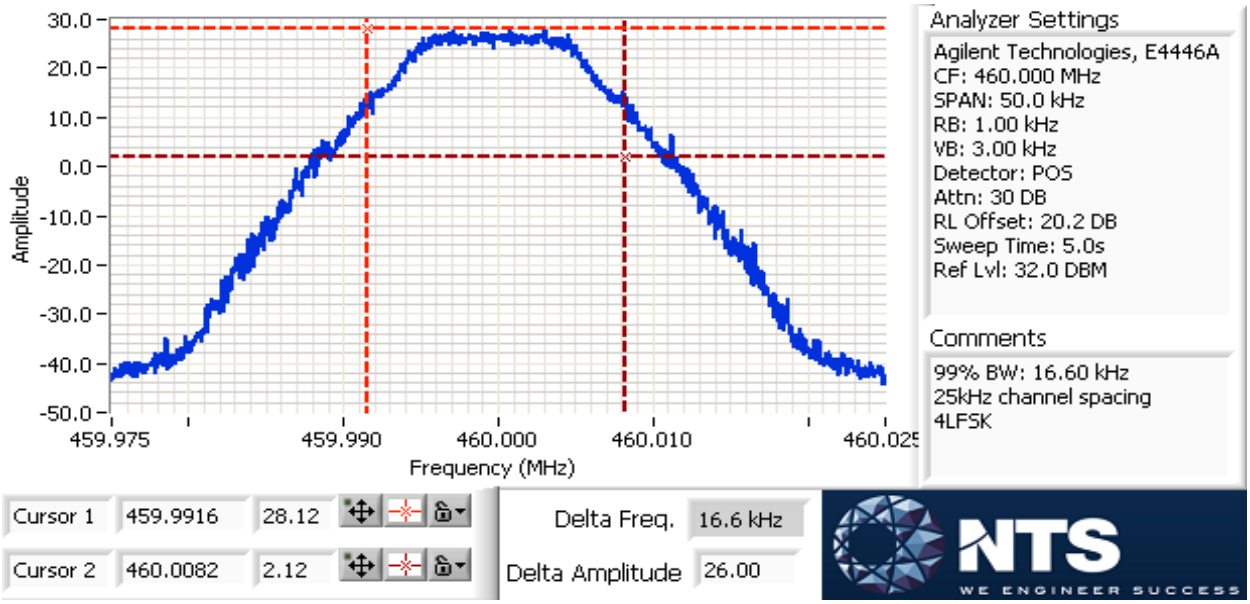
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A





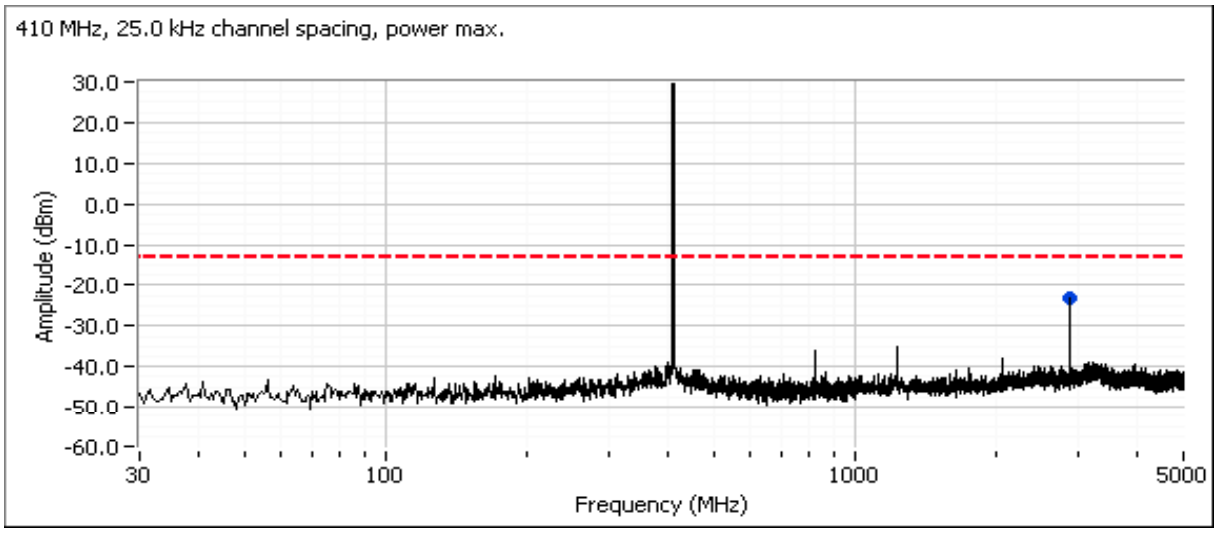
Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Run #4: Out of Band Spurious Emissions, Conducted

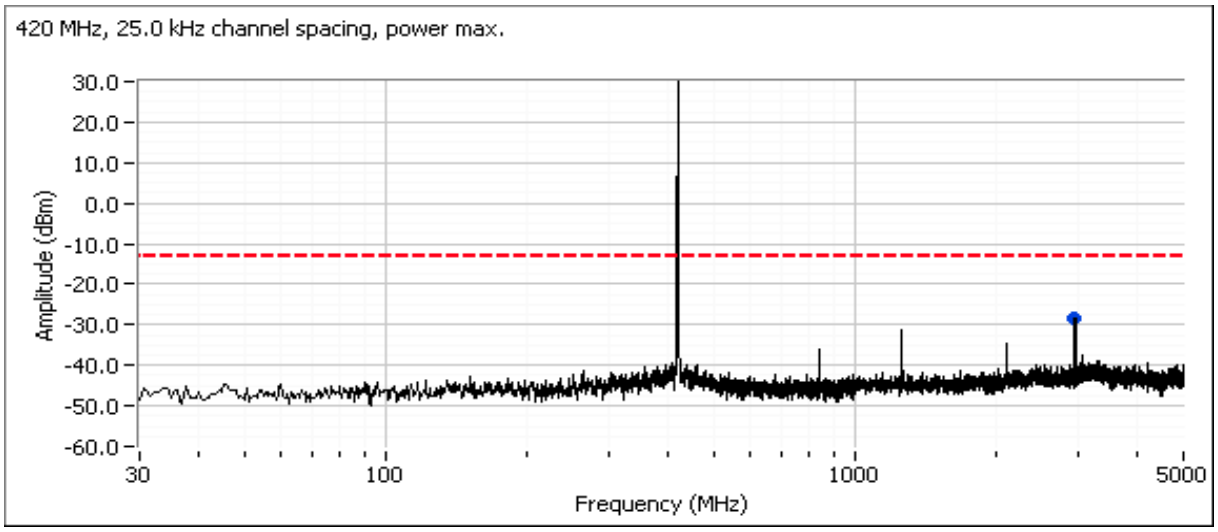
Date: 6/17/2012 Engineer: M. Birgani Location: FT Lab# 4

Measure 4LFSK modulation @ 410.00 MHz, 420.00 MHz, 429.9875 MHz, 450.0125 MHz, 460.00 MHz and 469.9875 MHz with maximum TX power (It will be the worst case for 29 dBm power setting results)

Plots for low channel, 410 MHz, 25 kHz Channel spacing, 4LFSK power setting(s) = Maximum (worst case)

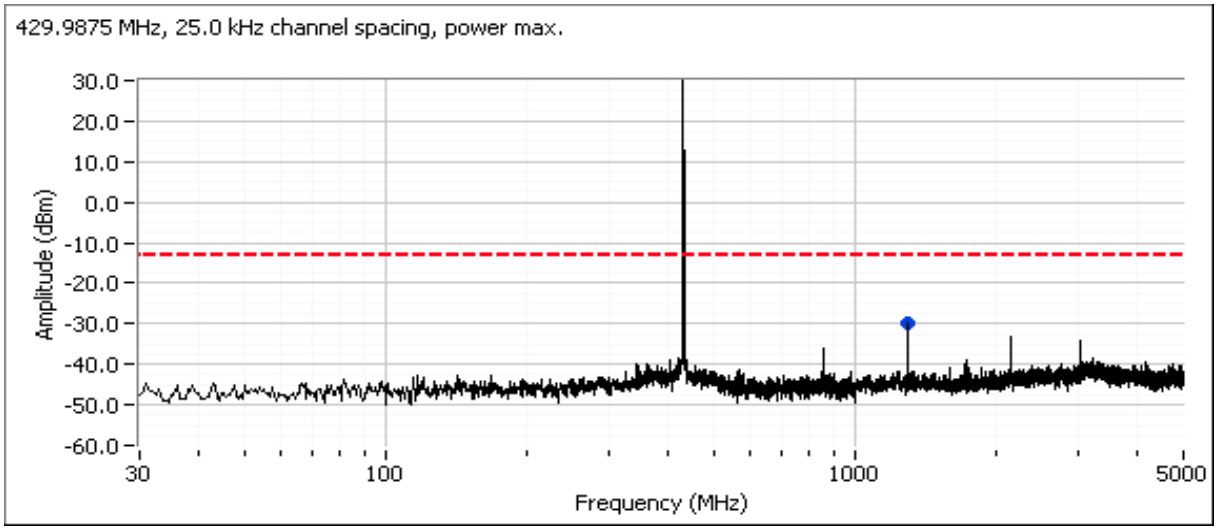


Plots for low channel, 420 MHz, 25 kHz Channel spacing, 4LFSK power setting(s) = Maximum (worst case)

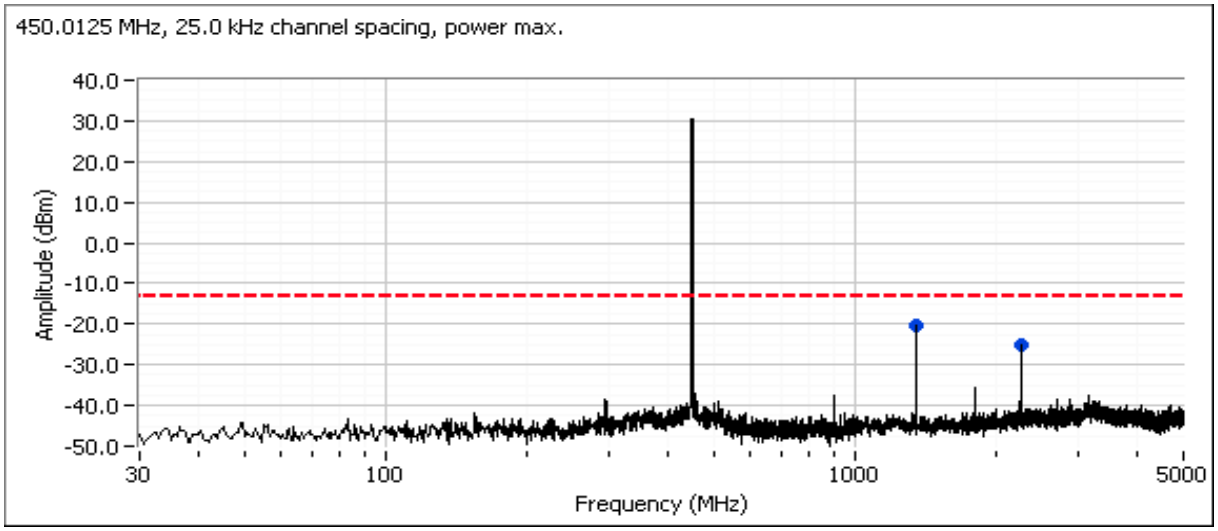


Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Plots for high channel, 429.9875 MHz, 25 kHz Channel spacing, 4LFSK power setting(s) = Maximum (worst case)

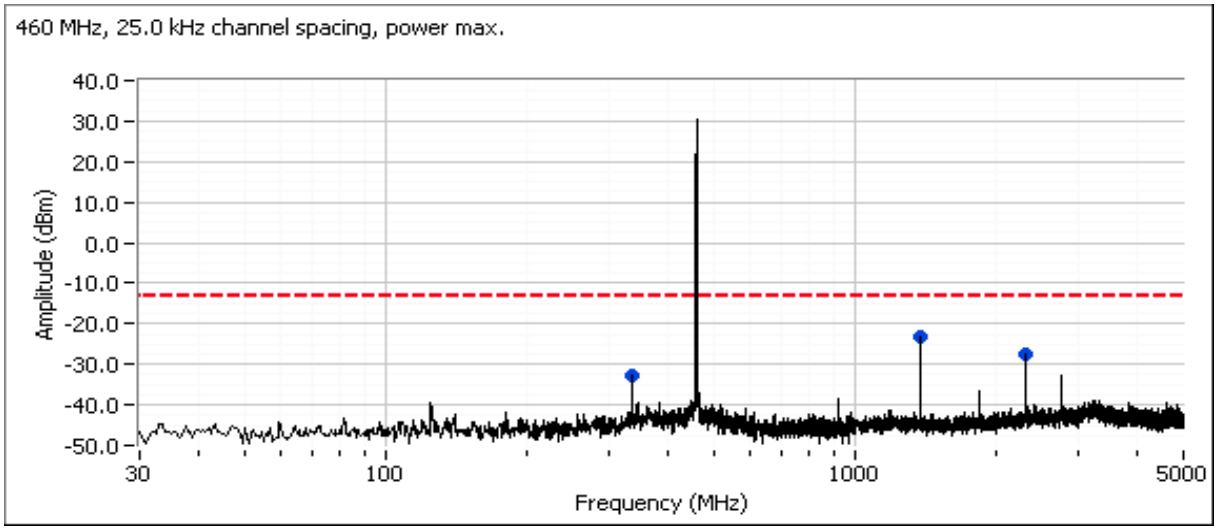


Plots for low channel, 450.0125 MHz, 25 kHz Channel spacing, 4LFSK power setting(s) = Maximum (worst case)

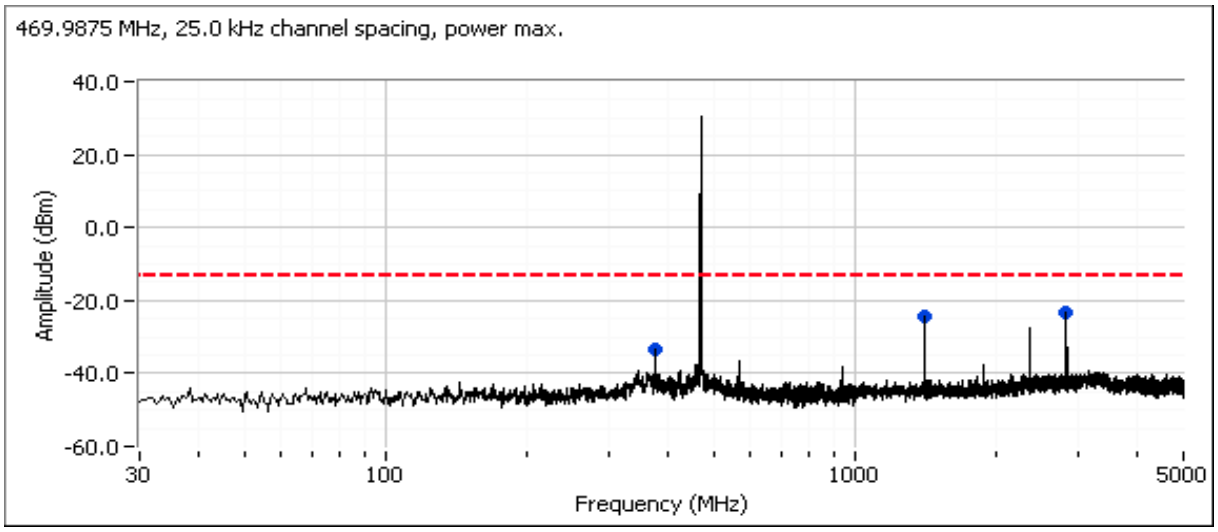


Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Plots for center channel, 460 MHz, 25 kHz Channel spacing, 4LFSK power setting(s) = Maximum (worst case)



Plots for high channel, 469.9875 MHz, 25 kHz Channel spacing, 4LFSK power setting(s) = Maximum (worstg case)

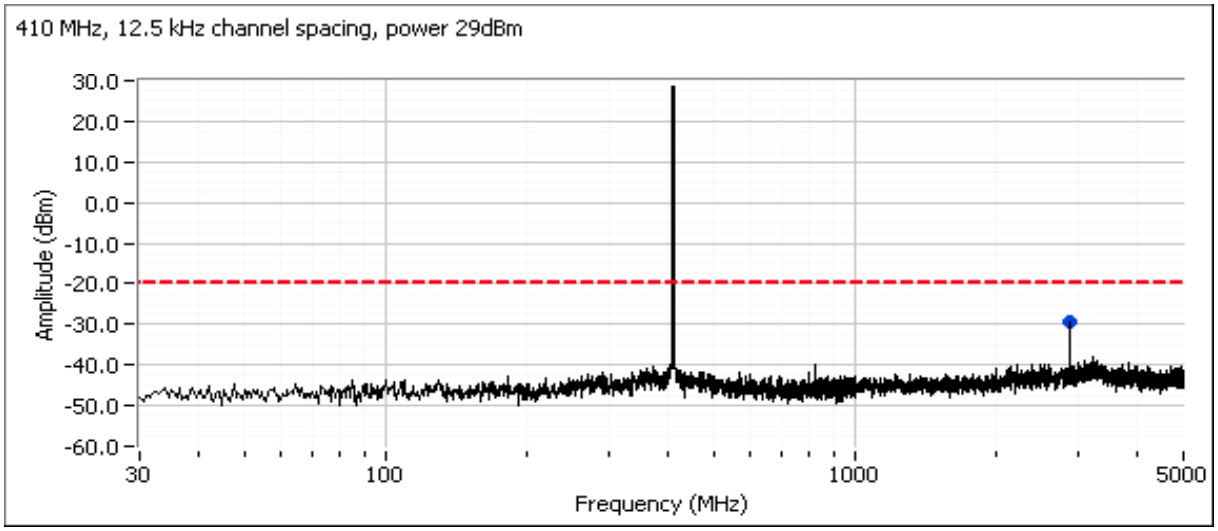


Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Frequency	Level	Port	FCC Part 90		Detector	Comments	
MHz	dBm	-	Limit	Margin	Pk/QP/Avg		Channel (MHz)
2869.960	*-23.0*	*RF Port*	*-13.0*	*-10.0*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*410.0000*
1289.430	*-29.7*	*RF Port*	*-13.0*	*-16.7*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*429.9875*
1349.450	*-20.1*	*RF Port*	*-13.0*	*-7.1*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*450.0125*
2249.750	*-24.9*	*RF Port*	*-13.0*	*-11.9*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*450.0125*
334.657	*-33.0*	*RF Port*	*-13.0*	*-20.0*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*460.0000*
1380.130	*-23.2*	*RF Port*	*-13.0*	*-10.2*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*460.0000*
2300.430	*-27.7*	*RF Port*	*-13.0*	*-14.7*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*460.0000*
374.678	*-33.3*	*RF Port*	*-13.0*	*-20.3*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*469.9875*
1409.470	*-24.6*	*RF Port*	*-13.0*	*-11.6*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*469.9875*
2819.270	*-23.3*	*RF Port*	*-13.0*	*-10.3*	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*469.9875*

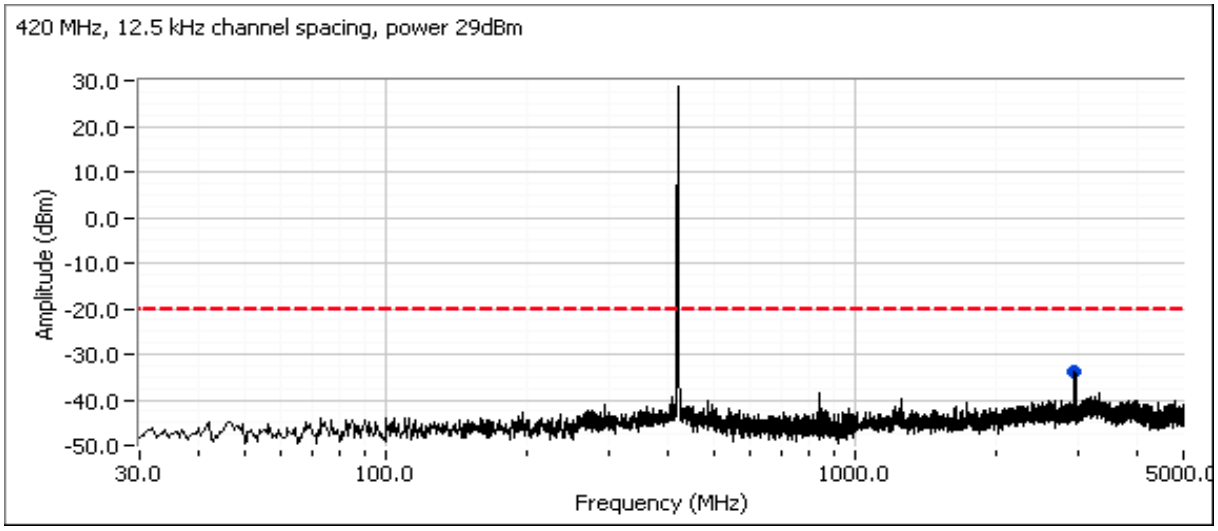
Measure 4LFSK modulation @ 410.00 MHz, 420.00 MHz, 429.9875 MHz, 450.0125 MHz, 460.00 MHz and 469.9875 MHz with 29 dBm power

Plots for low channel, 410 MHz, 12.5 kHz Channel spacing, 4LFSK power setting(s) = 29 dBm

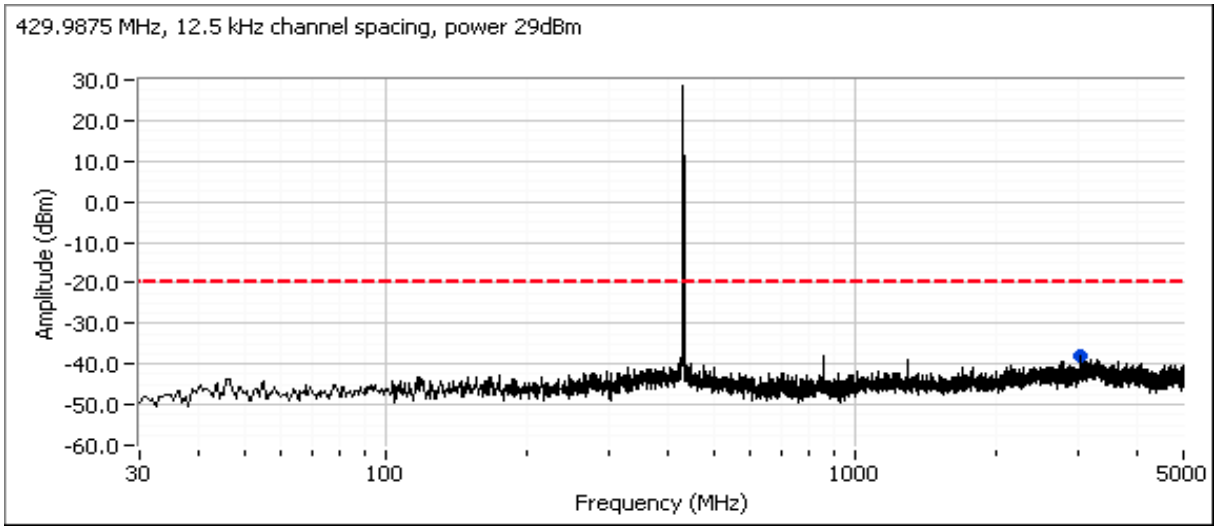


Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Plots for center channel, 420 MHz, 12.5 kHz Channel spacing, 4LFSK power setting(s) = 29 dBm

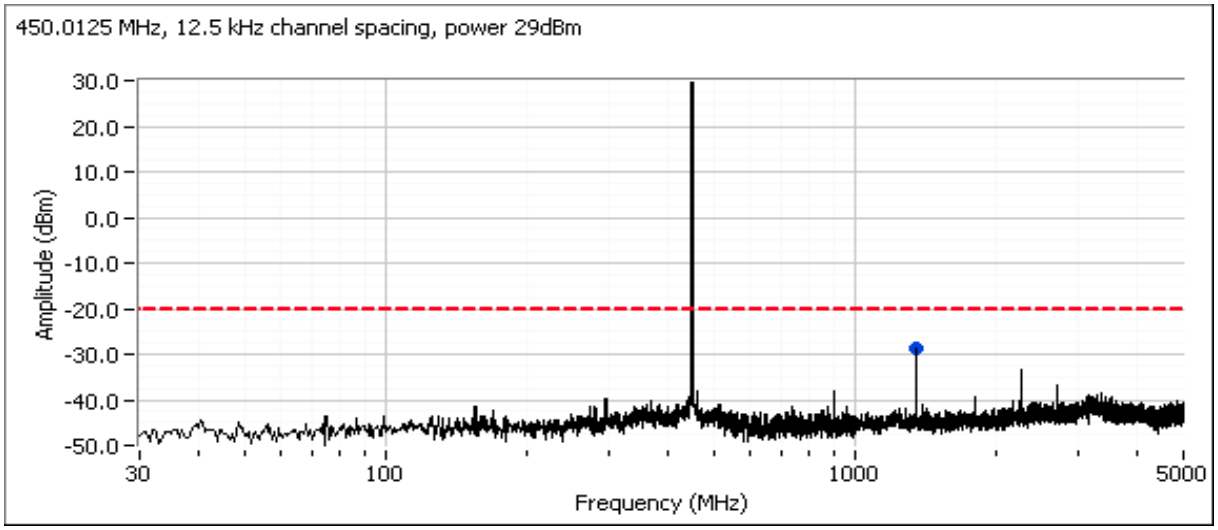


Plots for high channel, 429.9875 MHz, 12.5 kHz Channel spacing, 4LFSK power setting(s) = 29 dBm

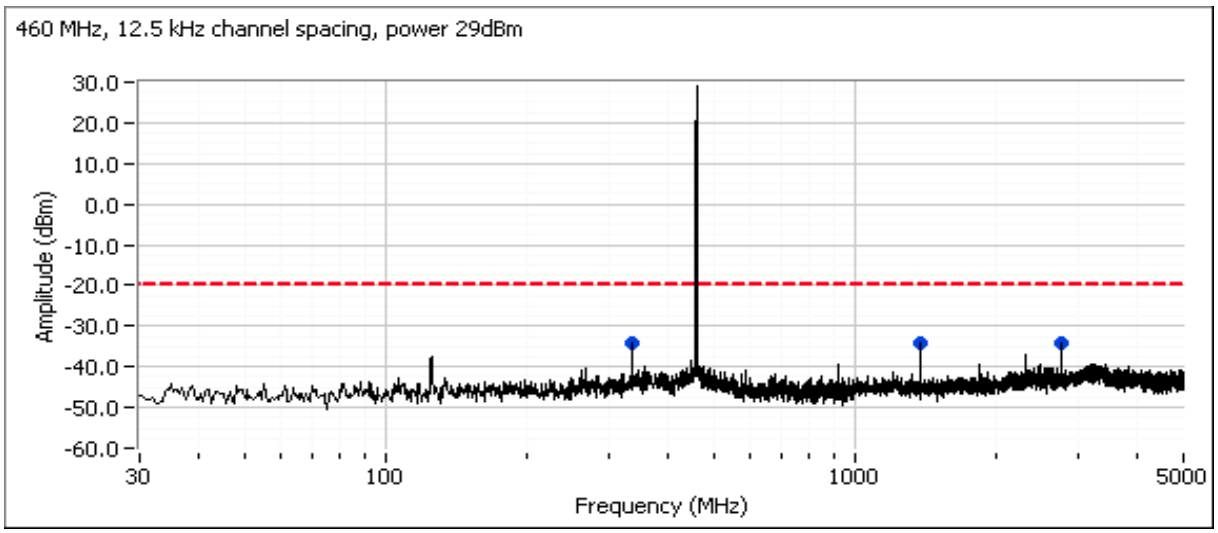


Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Plots for low channel, 450.0125 MHz, 12.5 kHz Channel spacing, 4LFSK power setting(s) = 29 dBm

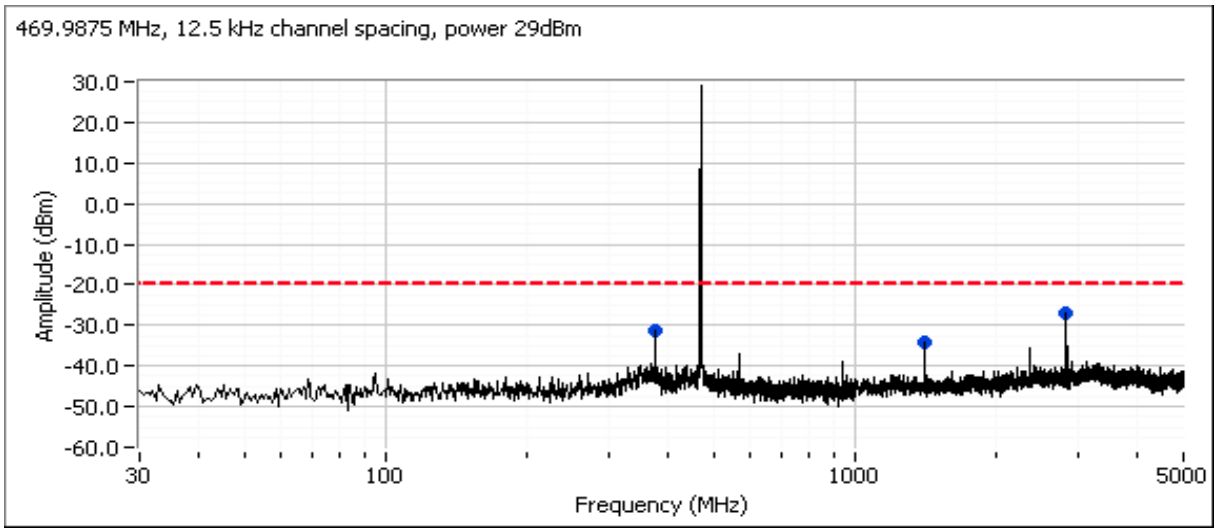


Plots for center channel, 460 MHz, 12.5 kHz Channel spacing, 4LFSK power setting(s) = 29 dBm



Client:	Topcon Positioning Systems	Job Number:	J92492
Model:	HiPer GA	T-Log Number:	T92605
		Account Manager:	Deepa Shetty
Contact:	Ferdinand Riodique		
Standard:	FCC Part 90	Class:	N/A

Plots for high channel, 469.9875 MHz, 12.5 kHz Channel spacing, 4LFSK power setting(s) = 29 dBm



Frequency	Level	Port	RSS-119		Detector	Comments	
MHz	dBm	-	Limit	Margin	Pk/QP/Avg		Channel
2869.960	*-29.5*	*RF Port*	-20.0	-9.5	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*410.000*
2939.310	*-33.8*	*RF Port*	-20.0	-13.8	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*420.000*
3010.000	*-38.1*	*RF Port*	-20.0	-18.1	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*429.988*
1349.450	*-28.6*	*RF Port*	-20.0	-8.6	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*450.013*
334.657	*-34.2*	*RF Port*	-20.0	-14.2	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*460.000*
2760.590	*-34.1*	*RF Port*	-20.0	-14.1	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*460.000*
1380.130	*-34.2*	*RF Port*	-20.0	-14.2	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*460.000*
374.678	*-31.5*	*RF Port*	-20.0	-11.5	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*469.988*
2819.270	*-26.9*	*RF Port*	-20.0	-6.9	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*469.988*
1409.470	*-34.1*	*RF Port*	-20.0	-14.1	*Peak*	PK (CISPR)-RB 1 MHz; VB: 8 MHz	*469.988*

End of Report

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