CONFORMANCE TEST REPORT

FOR

Subpart F UWB Part 15.517

Report No. : JNDL-NU-13R-0001

Client:	**S1 Corporation**
Product:	***UWB Sensor***
Model:	**URS-0030W**
Manufacture/supplier:	**S1 Corporation**
Date test item received:	**2013/05/30**
Date test campaign completed:	**2013/06/17**
Date of issue:	**2013/06/18**
Date of Reissue:	**2013/12/09**

ATTESTATION STAEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards.

All **JNDL Laboratory. CO., LTD** instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements**.**

Total number of pages of this test report : 30 pages

Test engineer	Report reviewed by
	
Sang-hun kang	**Kyoung-Pil, Yeom**

REPORT SUMMARY

Purpose of Test :	To demonstrate the EUT in compliance with FCC Part 15.517 for indoor UWB systems.
Disclaimer :	The test results relate only to the items tested.
Applicable Standards :	Pt 15.517, Pt 15.209, ANSI 63.4:2009

TEST ENVIRONMENT AND TEST SETUP

Test Facilities :	Test Firm Registration # : 748649 3m & 10m Open Site : 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 3m semi-Anechoic chamber : B 114~115, 810 Kwanyang-Dong, dongan-Gu, Anyang-Si, Kyunggi-Do, 431-060, Korea
Laboratory Test Conditions :	Open Site : Temperature 27 ºC, Humidity : 56 % 3m anechoic chamber : Temperature 23 ºC, Humidity : 45 %
Test Exercise :	The EUT was set in continuous transmit mode of operation unless stated otherwise.
Modification to the EUT :	- MCU & FPGA Version Upgrade.(V1.0 →V1.1) - Changed UWB Pulse width (-20% decrees) and Pulse level (-15% decrees) at MCU & FPGA - No modification hardware changed.
Supporting Accessories :	None

REVISION HISTORY

Revison	Date	Desriptions
0	2013. 06. 18	Original release
1	2013. 09. 11	Correction Measurement Data & Plot in chapter 10. Peak Emissions within a 50 MHz Bandwidth. - correct Peak Data & Plot instead of Average Data & Plot - 28~29 pages - Measurement date : 2013/06/17
2	2013. 12. 09	- Test Fail at FCC the Commission's Laboratory Over than 10 dBuV/m limit. (the Reference Number : 44625, 2013/11/08) - Change test equipment(Amplifier) and verifcaiton Original smaple. - Verification Original sample level is 82.4 dBuV/m(FCC 80.6 dBuV/m) * Diffierent reason : microwave amplifier gain level unstable, wrong applied Antenna Factor (dB/m) and short cable loss (50 cm) missing calculation. - Full Testing after Firmware Upgrade EUT

Table of Contents

1. General Remarks

The test results in this report apply to the particular Equipment under Test (EUT) as declared in this report.
The test results presented in this report relate only to the item tested.

2. Test Site

2.1 Location

JNDL Laboratory. CO., LTD. .(Test Firm Registration # : 748649)

3m anechoic chamber : B 114~115, 810 Kwanyang-Dong, dongan-Gu, Anyang-Si, Kyunggi-Do, Korea
3m & 10m Open site : 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea

2.2 List of Test equipment used for tests

No.	Instrument	Model No.	Due to Calibration	Manufactor	Serial No.
☒	PSA SPECTRUM ANALYZER (3 Hz ~ 26.5 GHz)	E4440A	2014-10-15	Agilent Technologies	MY46185375
☒	EMI TEST RECEIVER (20Hz ~ 40 GHz)	ESI	2014-05-10	Rohde & Schwarz	831564/005
☒	SIGNAL GENERATOR (10 MHz ~ 40 GHz)	MG3694B	2014-10-15	Anritsu Corp	062513
☒	POWER METER (DC ~ 67 GHz)	NRP2	2014-10-15	Rohde & Schwarz	100973
☒	POWER SENSOR (50 MHz ~ 40 GHz)	NRP-Z85	2014-10-15	Rohde & Schwarz	101121
☒	POWER SENSOR (9 KHz ~ 6 GHz)	NRP-Z92	2014-10-15	Rohde & Schwarz	100093
☐	EMI TEST RECEIVER (9 KHz ~ 7 GHz)	ESCI7	2014-07-11	Rohde & Schwarz	100933
☒	EMI TEST RECEIVER (20 MHz ~ 1000 MHz)	ESVS30	2014-10-15	Rohde & Schwarz	828525/005
☒	AUTORAING POWER SUPPLY	E3630A	2014-10-15	Agilent Technologies	MY40005094
☒	BILOG ANTENNA (30 MHz ~ 1000 MHz)	VULB 9168	2015-02-17	Schwarzbeck	9168-505
☐	BILOG ANTENNA (30 MHz ~ 1000 MHz)	VULB 9168	2014-10-23	Schwarzbeck	9168-506
☒	HORN ANTENNA (1 GHz ~ 18 GHz)	BBHA 9120D	2014-12-12	Schwarzbeck	568
☐	HORN ANTENNA (1 GHz ~ 18 GHz)	3117	2014-10-24	ETS-Lindgren	00135889
☐	HORN ANTENNA (1 GHz ~ 18 GHz)	3117	2014-07-29	ETS-Lindgren	00135878
☒	HORN ANTENNA (18 GHz ~ 40 GHz)	BBHA 9170	2014-10-03	Schwarzbeck	9170-499
☒	HORN ANTENNA (18 GHz ~ 40 GHz)	BBHA 9170	2014-10-03	Schwarzbeck	9170-500
☒	Low Noise Amplifier (100 MHz ~ 26.5 GHz)	NSP2650-NVG	2014-08-27	MITEQ	1745668
☒	Low Noise Amplifier (18 GHz ~ 40 GHz)	AMF-6F-18004000-37-8P	2014-05-23	MITEQ	1568695

➔ All equipment is calibrated with traceable calibrations.
Each calibration is traceable to the national or international standards.

2.3 Test Date

Date of Application: 2013 - 06 - 13
Date of Test: 2013 - 06 - 13 ~ 2013 - 06 - 17
Date of RETEST 2013 - 11 - 25 ~ 2013 - 12 - 08

3. Description of the Equipment under Test

3.1 Manufacturers declarations

Manufacturer :	**S1 Corporation**
Product Description :	A wireless devices intended to be used for the real-time location of objects within indoor. It is able to detect moving objects in predefined area or to provide both low cost comparable to PIR(passive infrared) sensor and high detection probability with low false-alarm rate especially in high-temperature variation enviroments.
FCC ID :	Q54URS0030X
Model Name :	URS-0030W
Multiple Model Name :	URS-0030A
Operationg Frequency :	8.5 ~ 9.5 GHz
Signal Bandwidth :	≥ 500 MHz (at – 10 dB)
EUT Power Source :	Primary power – 12 Vdc, 30 mA (Not use AC adapter)
	Secondary Power – N/A
Test Item :	Protype
Type of Equipment :	Fixed wall
Antennas :	Patch type(Permanently Attached)
Antenna Connector :	None

➔ URS-0030W : White Front Cover Case, URS-0030A : Black Front Cover Case

➔All the testing were performed according to the procedures in FCC Parts 15.517
The EUT was operation in special test mode.

3.2 Information about UWB intrusion Detection Sensor

- Indoor UWB sensor is able :

  to detect moving objects in predefined area

  to provide both low cost comparable to PIR(passive infrared) sensor and high detection probability with low false-alarm rate especially in high-temperature variation environments

- Frequency band - from 8.5 GHz to 9.5 GHz
- Signal bandwidth – more than 500 MHz at -10 dB
- Maximum moving objects detection range (human target) - to 10 meters
- Detection range :

  Distance Control – 3m ~ 10m(1m Unit)

  Width – 8m at 5m

- Intruder indicator:

  Internal – LED(Red)

  Installation(Indoor) – Wall of the 2m ~ 3m(Height)

4. List of Measurements

Guide Lines	FCC Rules Part 15	Result
Transmitter Characteristics	15.517	PASS
UWB Bandwidth	15.517 (b)	PASS
Spurious Radiated Emissions	15.209(a), 15.517(c)	PASS
Radiated Emissions in GPS Bands	15.517 (d)	PASS
Peak Emissions within a 50 MHz Bandwidth	15.517 (e)	PASS
Power Line Conducted	15.207	N/A

➔ PowerLine Conducted is not applicable. EUT use 12 Vdc.(Not use AC adapter)

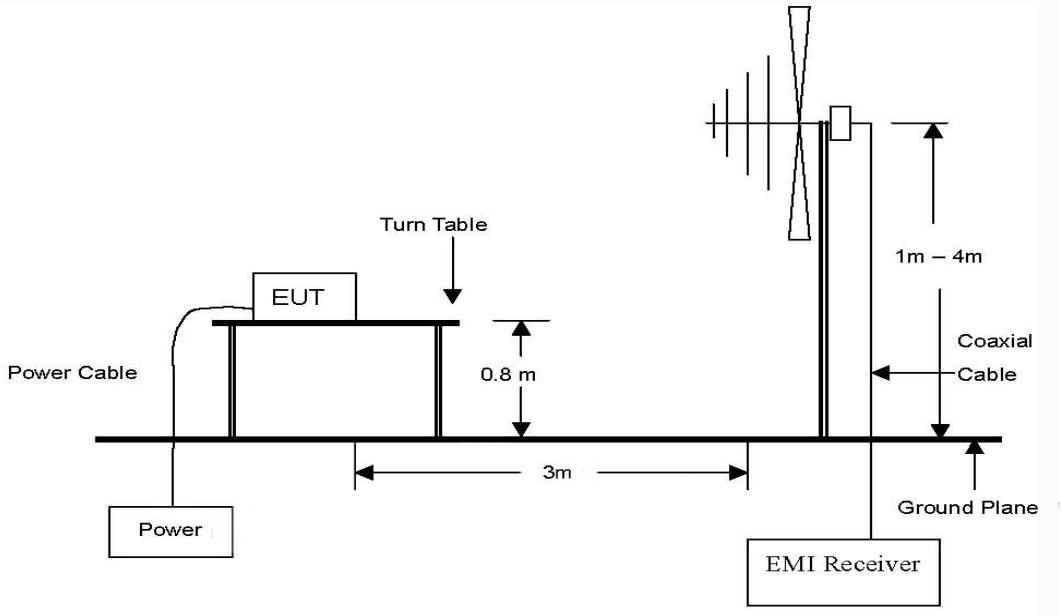
5. Transmitter radiated emissions setup

5.1 Test setup for 9 KHz ~ 30 MHz

Testing not necessary as device is exclusively DC powered

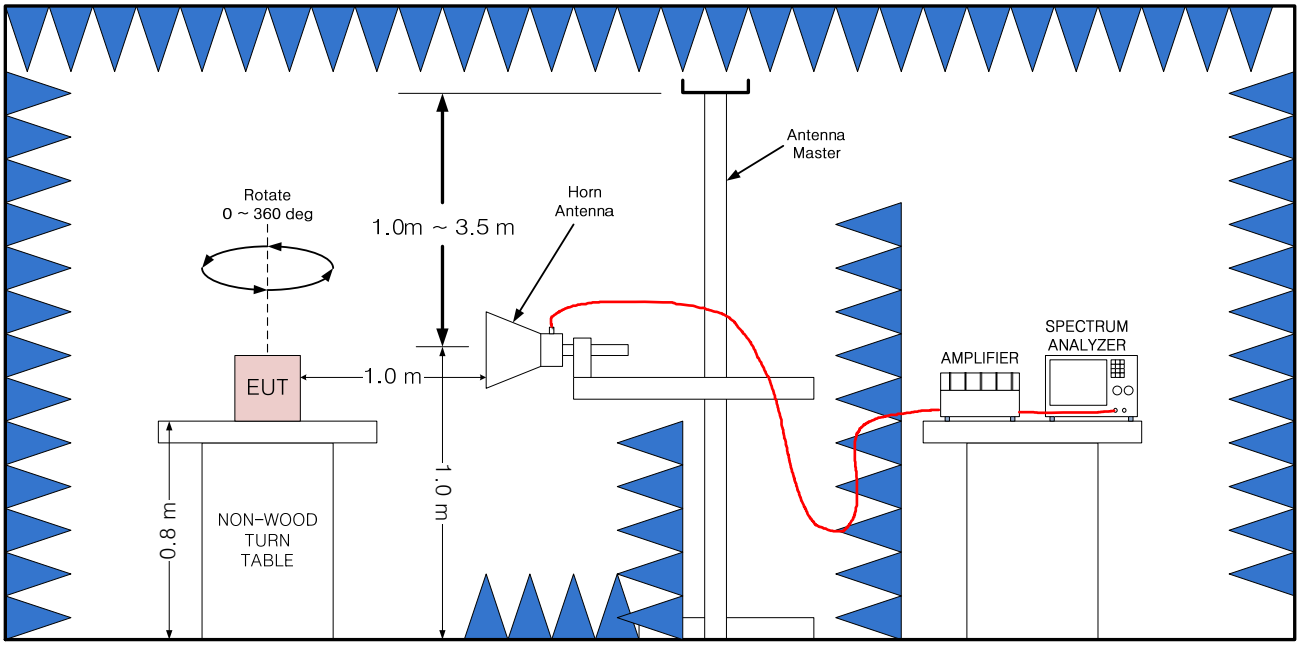
5.2 Test setup for 30 MHz ~ 1 GHz

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions



5.3 Test setup for 1GHz ~ 40 GHz

The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 40 GHz emissions. As required by subpart 15.33 emissions were measured to 40 GHz.



6. Transmitter Characteristics

6.1 Requirements

Operation under the provisions of this section is limited to UWB transmitters employed solely for indoor operation.

(1) Indoor UWB devices, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.
(2) The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building.
(3) The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.
(4) Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.
(5) A communications system shall transmit only when the intentional radiator is sending information to an associated receiver

6.2 Results

- The URS-0030W is a wireless device intended to be used for the real-time location of objects within predefined area and will be marketed as such.
- The URS-0030W will not transmit ultra-wideband signals unless it receives suitable trigger commands from an associated control unit by terminal
- The URS-0030W User's Guide (see Exhibits) also stresses the requirement for indoor use, and reiterates the technical requirements for indoor UWB systems listed in §15.517.
- The URS-0030W has Patch type antenna(Permanently Attached)

7. UWB Bandwidth

7.1 Definition

Per section 15.517(b), the UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10600 MHz.

7.2 Test Procedure

The UWB bandwidth was measured with a spectrum analyzer connected to a double-ridged guide horn while the EUT was operating in continuous transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency.
The test procedure used was ANSI C63.4-2009 using a Agilent Technologies E4440A spectrum analyzer. The bandwidth (RBW) of the spectrum analyzer was typically 100 kHz up to 1GHz and 1.0MHz above 1GHz. Measurements above 1GHz used the RMS detector function on the spectrum analyzer, with a sweep time set to 500ms or less – the spectrum analyzer scan had 601 points, and so a sweep time of 500ms or less ensured that the averaging time per point was 1ms or less. The VBW was always greater than or equal to the RBW unless noted. Emissions from the DUT were maximized by rotating the DUT and adjusting the height of the measurement antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

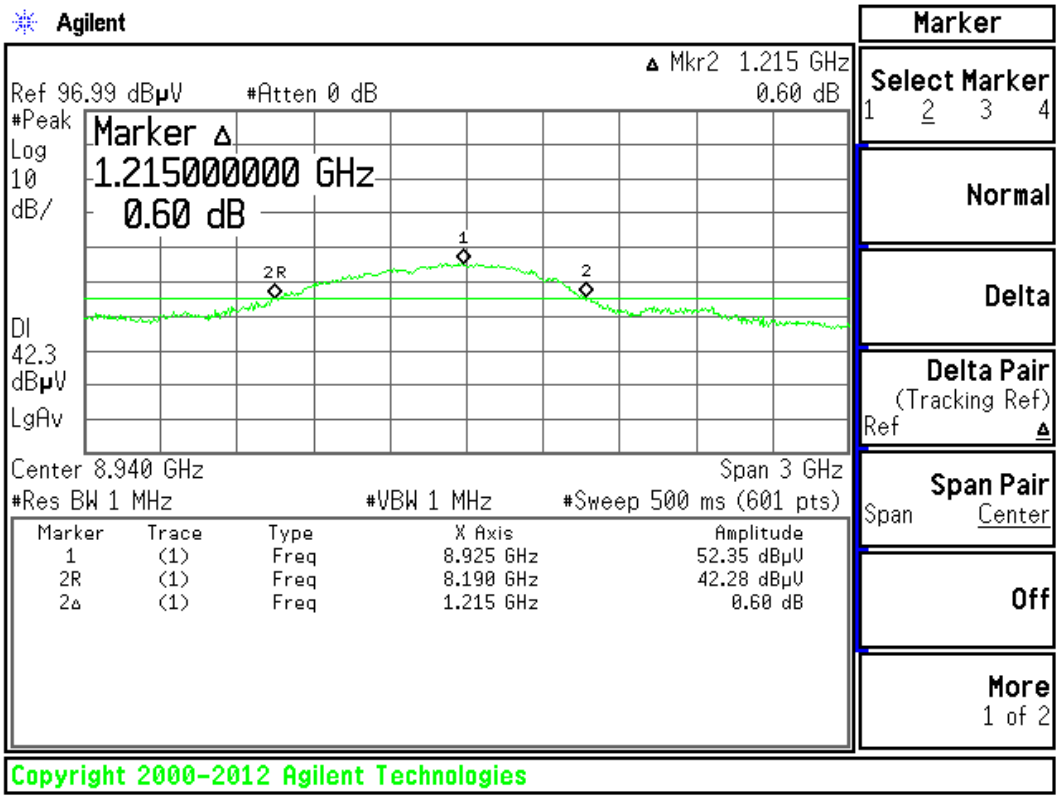
7.3 Test Criteria

A UWB transmitter is defined as an intentional radiator that, at any point in time, has a fractional bandwidth equal or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth. The UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated fH and the lower boundary is designated fL. The frequency at which the highest radiated emission occurs is designated fM. The center frequency, fC, equals (fH + fL)/2. Fractional bandwidth. The fractional bandwidth equals 2(fH – fL)/ (fH + fL).

7.4 Test Result

The frequency with the highest emission is : 8.925 GHz
The lower -10dB point is: 8.190 GHz
The upper -10dB point is: 9.405 GHz
The 10 dB bandwidth is 1.215 GHz

7.5 Test Plots



8. Spurious Radiated Emissions

8.1 Definition

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in § 15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz

Frequency in MHz	EIRP in dBm
960 - 1610	-75.3
1610 - 1990	-53.3
1990 – 3100	-51.3
3100 – 10600	-41.3
Above 10600	-51.3

8.2 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 3 meters from the measurement antenna.

For spurious emissions below 1 GHz quasi-peak detection is used with a resolution bandwidth of 120 kHz. The emissions were maximized by rotating the EUT and raising and lowering the measurement antenna from 1~4 meters(above 1 GHz, measure antenna from 1 ~ 3.5 meters)
Spurious/harmonic emissions above 1 GHz peak are measured with average and peak detection with a resolution bandwidth of 1 MHz and measured at a distance of 1 meter.

Average detection is used to determine compliance of the EUT if the peak does not meet the average limit. Non-harmonic emissions must satisfy the average limit and the peak limit (20 dB above average).

The procedures of ANSI C63.4:2009 were followed with the exception that the measurement distance was reduced to that shown in the table below and an RMS detector was used as required in 15.521 (d).

Correction factor is a combination of cable loss (CL), microwave amplifier gain (G amp), antenna factor (AF), and 'measurement distance' correction factor (Dcf = 20 log [D/3], where D is the measurement distance in meters).
Example correction factor calculation: F/S(Field Strength) = Measuring Value +AF-(G amp-CL)-Dcf

The EIRP limits in dBm were converted to field strength limits in dBμV/m @ 3m.
Example EIRP limit conversion: F/S(Field Strength) =EIRP + 95.2

Both vertical and horizontal polarities were tested and the worst case presented. In all cases the vertical polarization resulted in the greatest signal.

There were no measurable emissions above 18 GHz, up to 40 GHz. The measurement noise floor is well below the specified limit. Measurements in the table above for emissions greater than 18 GHz are of the noise floor.

8.3 Test Criteria

8.3.1 Limit below 960 MHz

Frequency in MHz	Field strength
0.009-0.490	2400/F(kHz) μV/m @ 300 meters
0.490-1.705	24000/F(kHz) μV/m @ 30 meters
1.705-30.0	29.54 dBμV/m @ 30 meters
30 – 88	40.0 dBμV/m @ 3 meters
88 – 216	43.5 dBμV/m @ 3 meters
216 – 960	46.0 dBμV/m @ 3 meters
Above 960	54.0 dBμV/m @ 3 meters

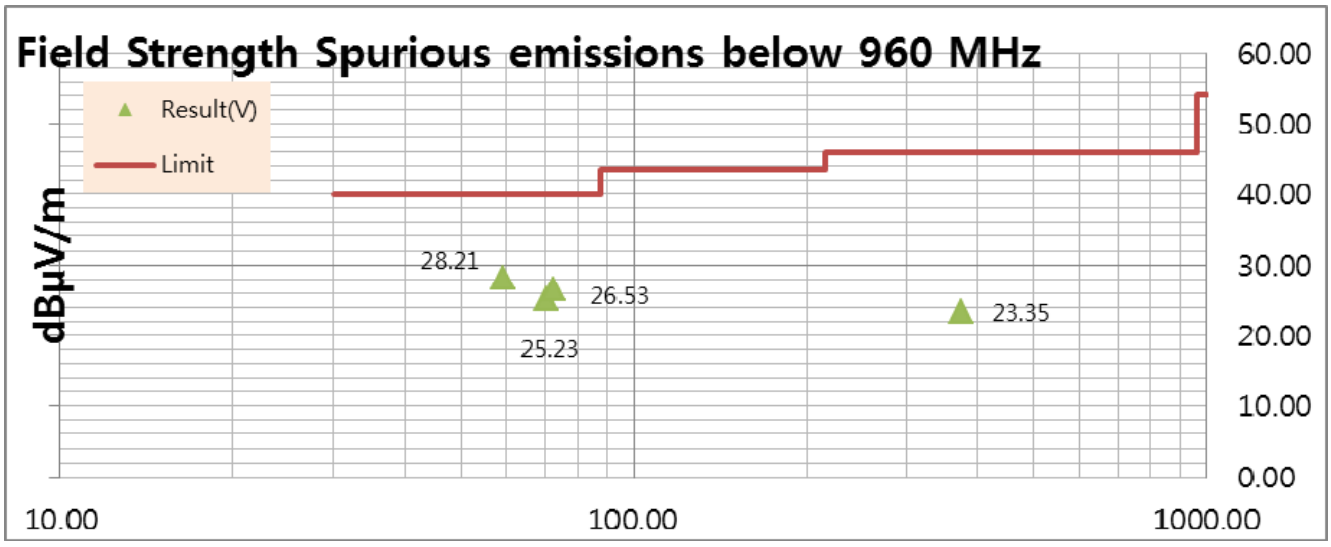
8.3.2 Limit above 960 MHz

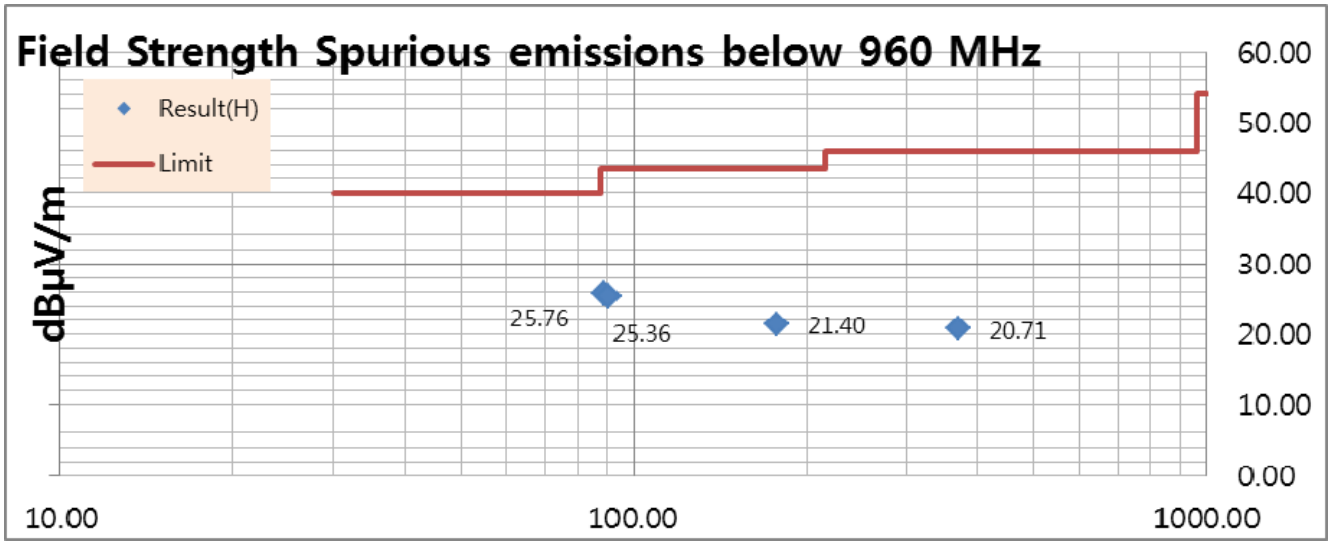
Frequency in MHz	EIRP	Field strength
960 - 1610	-75.3 dBm @ 3 meters	19.9 dBμV/m @ 3 meters
1610 - 1990	-53.3 dBm @ 3 meters	41.9 dBμV/m @ 3 meters
1990 – 3100	-51.3 dBm @ 3 meters	43.9 dBμV/m @ 3 meters
3100 – 10600	-41.3 dBm @ 3 meters	53.9 dBμV/m @ 3 meters
Above 10600	-51.3 dBm @ 3 meters	43.9 dBμV/m @ 3 meters

8.4 Test Results

8.4.1 Test Result below 960 MHz

Emission Frequency [MHz]	Measure Value [dBµV]	Antenna Polar V/H	Cable Loss [dB]	Antenna Factor [dB/m]	Field Strength dBµV/m @ 3m	Limit dBµV/m @ 3m	Margin [dB]
59.44	15.31	V	12.22	0.68	28.21	40.0	11.79
70.57	13.69	V	10.82	0.72	25.23	40.0	14.77
72.30	15.25	V	10.48	0.80	26.53	40.0	13.47
375.00	6.43	V	14.94	1.98	23.35	46.0	22.65
89.15	17.01	H	7.94	0.81	25.76	43.5	17.74
90.40	16.63	H	7.88	0.85	25.36	43.5	18.14
178.30	9.08	H	11.23	1.09	21.40	43.5	22.10
370.30	4.10	H	14.83	1.78	20.71	46.0	25.29





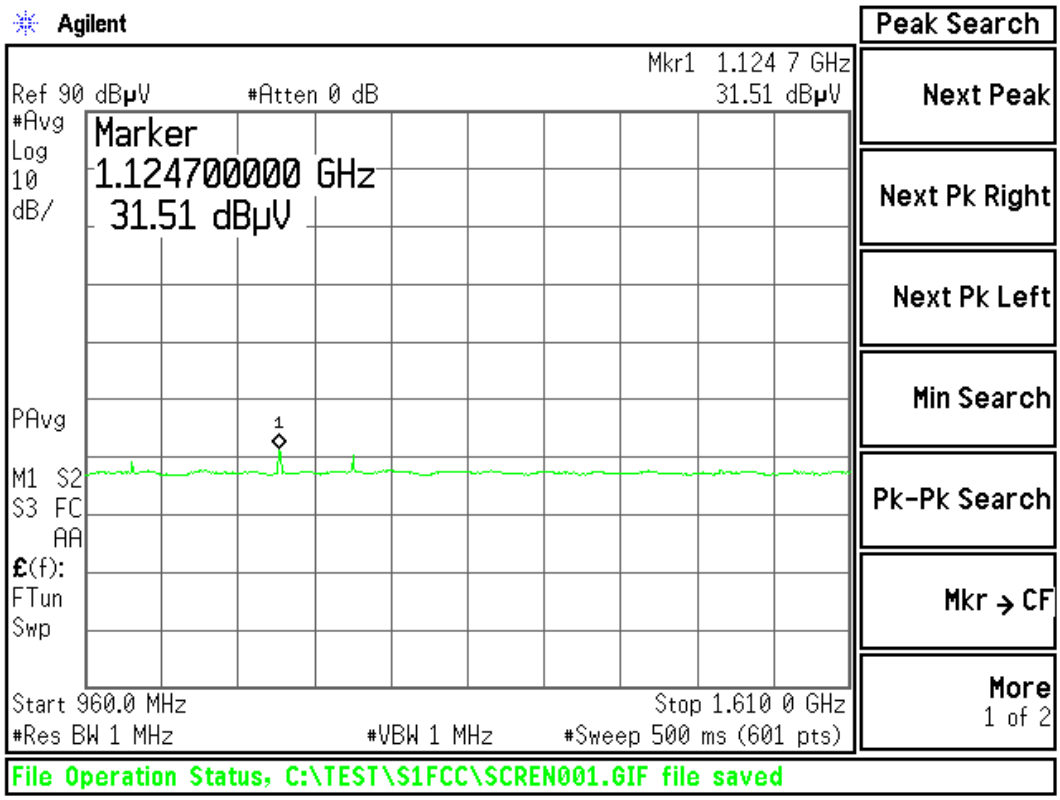
8.4.2 Test Result above 960 MHz

8.4.2.1 Antenna polarity ”V” (measure distance 1 meter)

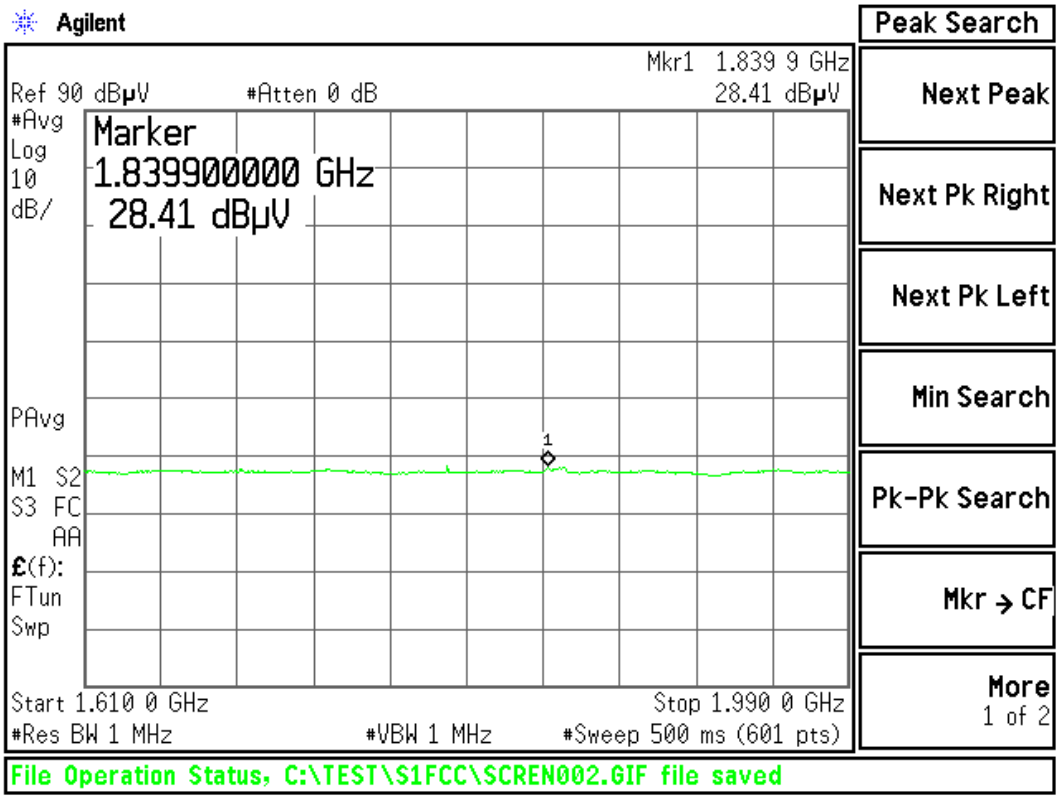
Emission Frequency [MHz]	Measure Value [dBµV]	Plot #	Cable Loss [dB]	Antenna Factor [dB/m]	Amp Gain [dB]	Dist. Correct [dB]	F/S dBµV/m @ 3m	Limit dBµV/m @ 3m	Margin [dB]
1124.70	31.51	1	2.07	24.72	31.52	-9.54	17.25	19.90	2.65
1839.90	28.41	2	2.59	25.64	31.75	-9.54	15.35	41.90	26.55
2167.60	29.77	3	2.79	26.29	31.87	-9.54	17.43	43.90	26.47
3837.50	28.52	4	3.68	29.67	32.23	-9.54	20.11	53.90	33.79
8868.00	27.60	5	5.79	36.69	29.69	-9.54	30.85	53.90	23.05
11167.00	25.82	6	6.51	40.10	29.28	-9.54	33.61	43.90	10.29
26500.00	38.04	7	9.62	39.39	43.75	-9.54	33.76	43.90	10.14
35326.65	40.68	8	10.77	42.08	44.27	-9.54	39.71	43.90	4.19

* F/S(Field Strength) = Measuring Value + CL + AF -G amp + Dcf

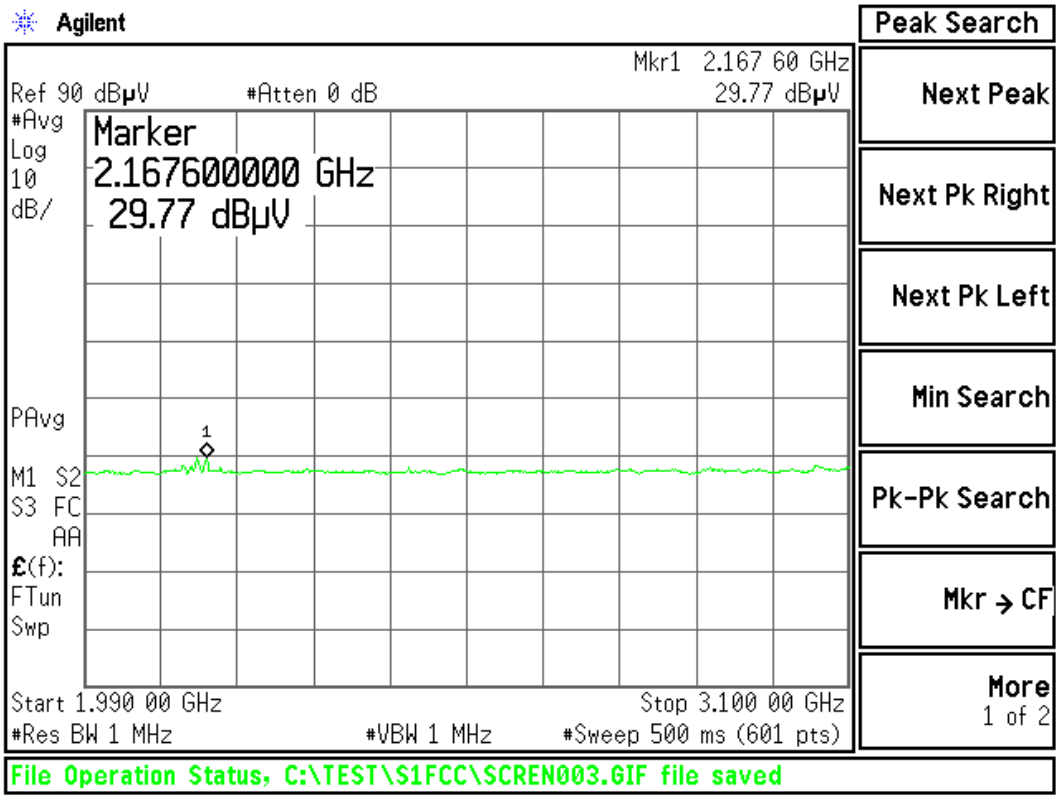
Plot #1



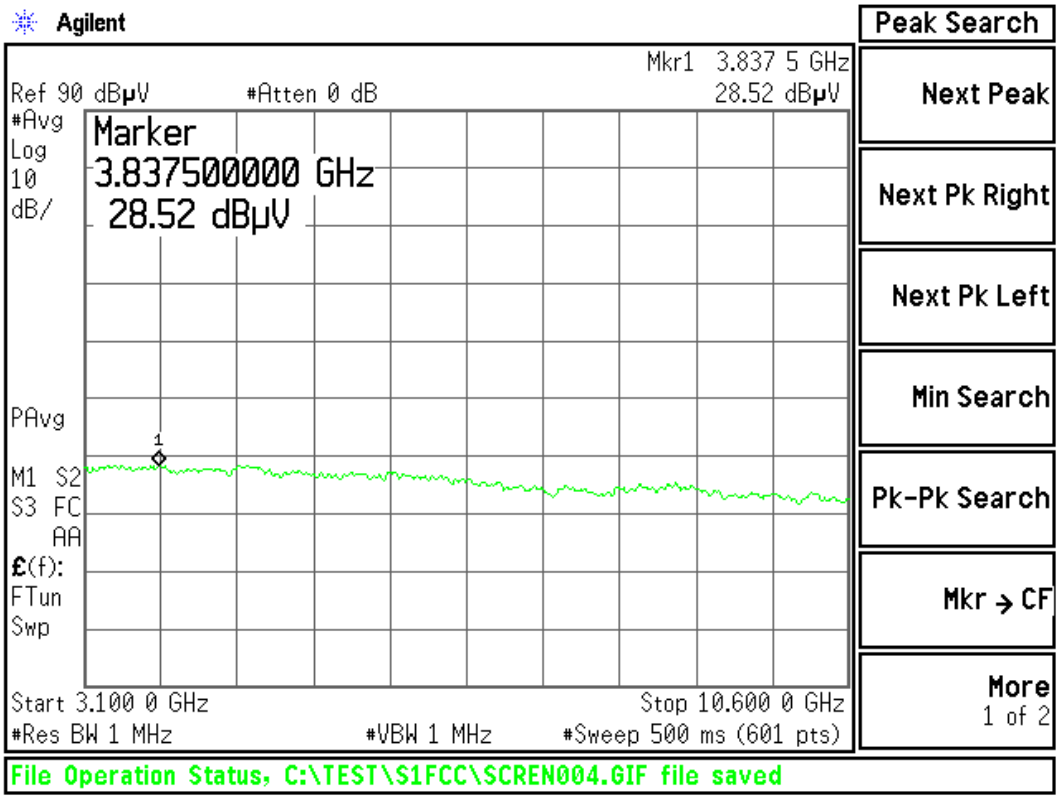
Plot #2


Agilent
Peak Search
Mkr1 1.839 9 GHz
Ref 90 dBµV
#Atten 0 dB
28.41 dBµV
Next Peak
#Avg
Log
10
dB/
Marker
1.839900000 GHz
28.41 dBµV
Next Pk Right
Next Pk Left
Min Search
PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 1.610 0 GHz
Stop 1.990 0 GHz
#Res BW 1 MHz
#VBW 1 MHz
#Sweep 500 ms (601 pts)
File Operation Status, C:\TEST\S1FCC\SCREN002.GIF file saved

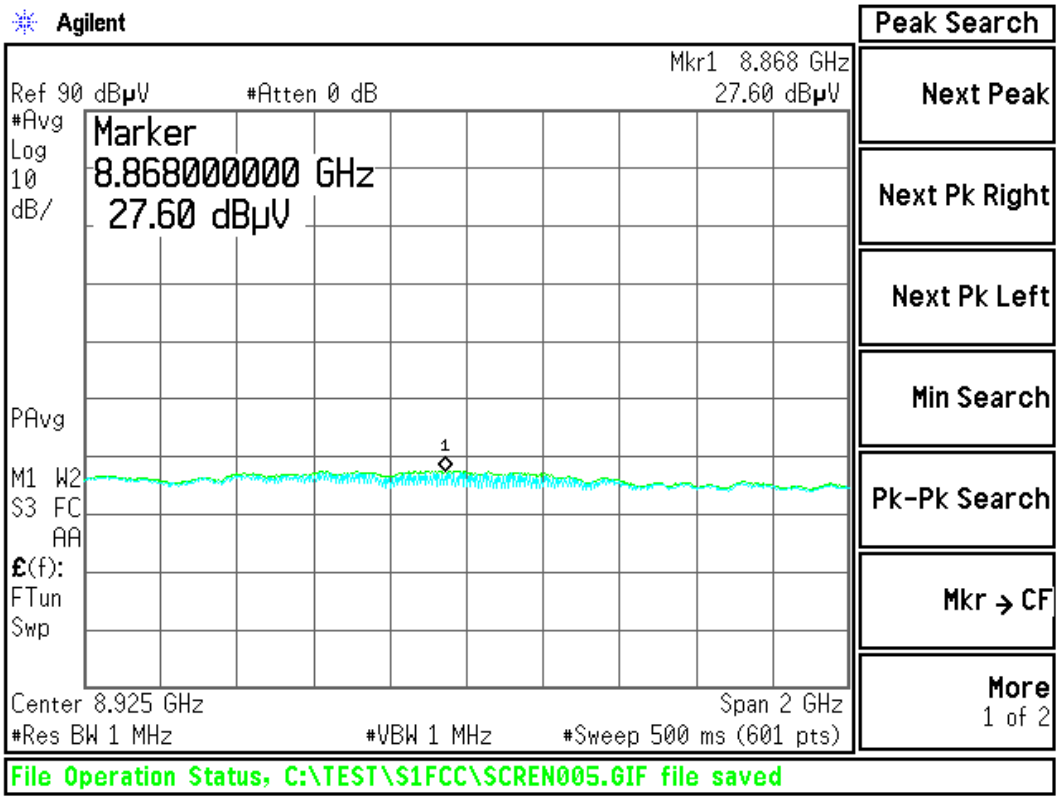
Plot #3


Agilent
Peak Search
Mkr1 2.167 60 GHz
Ref 90 dBµV
#Atten 0 dB
29.77 dBµV
Next Peak
#Avg
Log
10
dB/
Marker
2.167600000 GHz
29.77 dBµV
Next Pk Right
Next Pk Left
Min Search
PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 1.990 00 GHz
Stop 3.100 00 GHz
#Res BW 1 MHz
#VBW 1 MHz
#Sweep 500 ms (601 pts)
File Operation Status, C:\TEST\S1FCC\SCREN003.GIF file saved

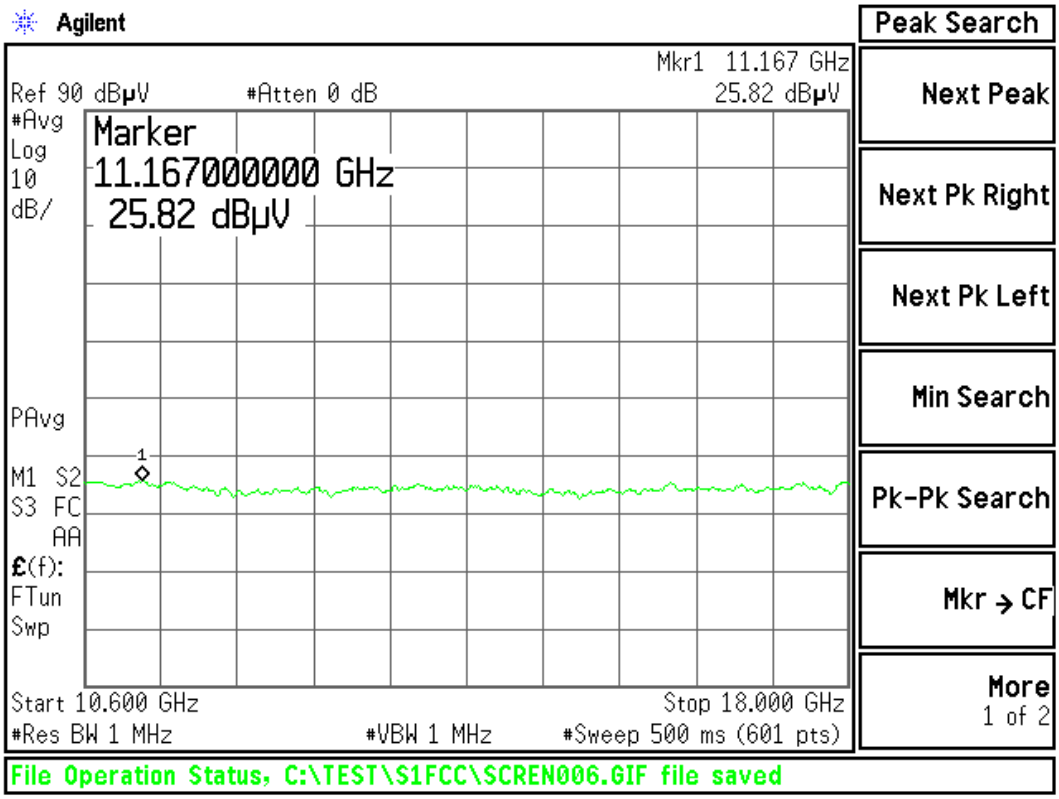
Plot #4


Agilent
Peak Search
Mkr1 3.837 5 GHz
Ref 90 dBµV
#Atten 0 dB
28.52 dBµV
Next Peak
#Avg
Log
10
dB/
Marker
3.837500000 GHz
28.52 dBµV
Next Pk Right
Next Pk Left
Min Search
PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 3.100 0 GHz
Stop 10.600 0 GHz
#Res BW 1 MHz
#VBW 1 MHz
#Sweep 500 ms (601 pts)
File Operation Status, C:\TEST\S1FCC\SCREN004.GIF file saved

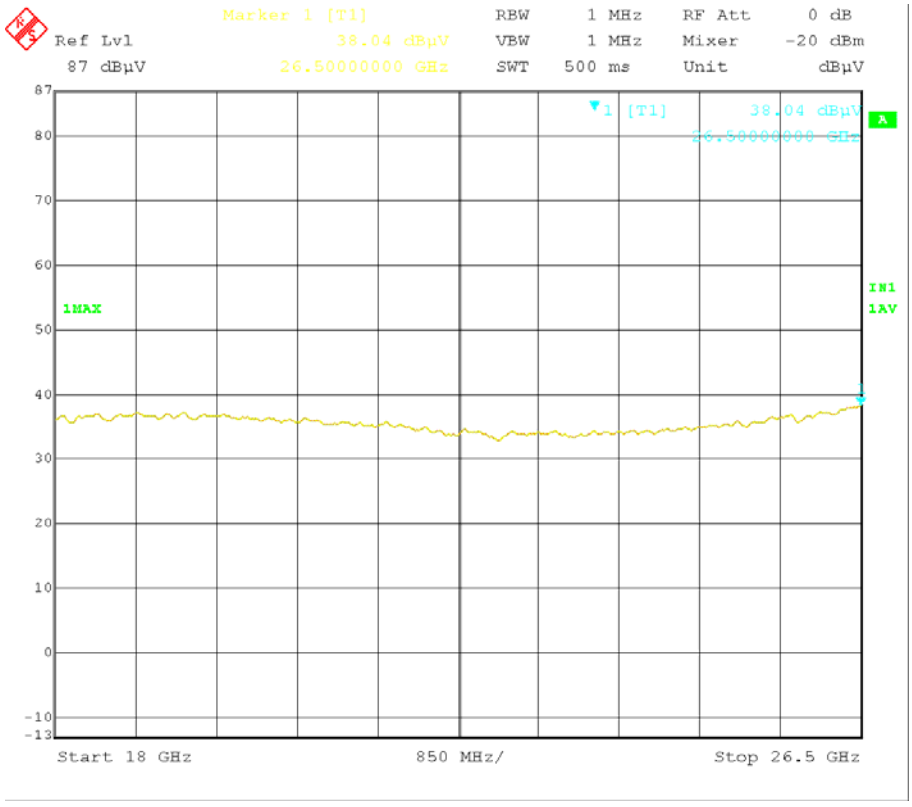
Plot #5


Agilent
Peak Search
Mkr1 8.868 GHz
Ref 90 dBµV
#Atten 0 dB
27.60 dBµV
Next Peak
#Avg
Log
10
dB/
Marker
8.868000000 GHz
27.60 dBµV
Next Pk Right
Next Pk Left
Min Search
PAvg
M1 W2
S3 FC
AA
£(f):
FTun
Swp
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 8.925 GHz
Span 2 GHz
#Res BW 1 MHz
#VBW 1 MHz
#Sweep 500 ms (601 pts)
File Operation Status, C:\TEST\S1FCC\SCREN005.GIF file saved

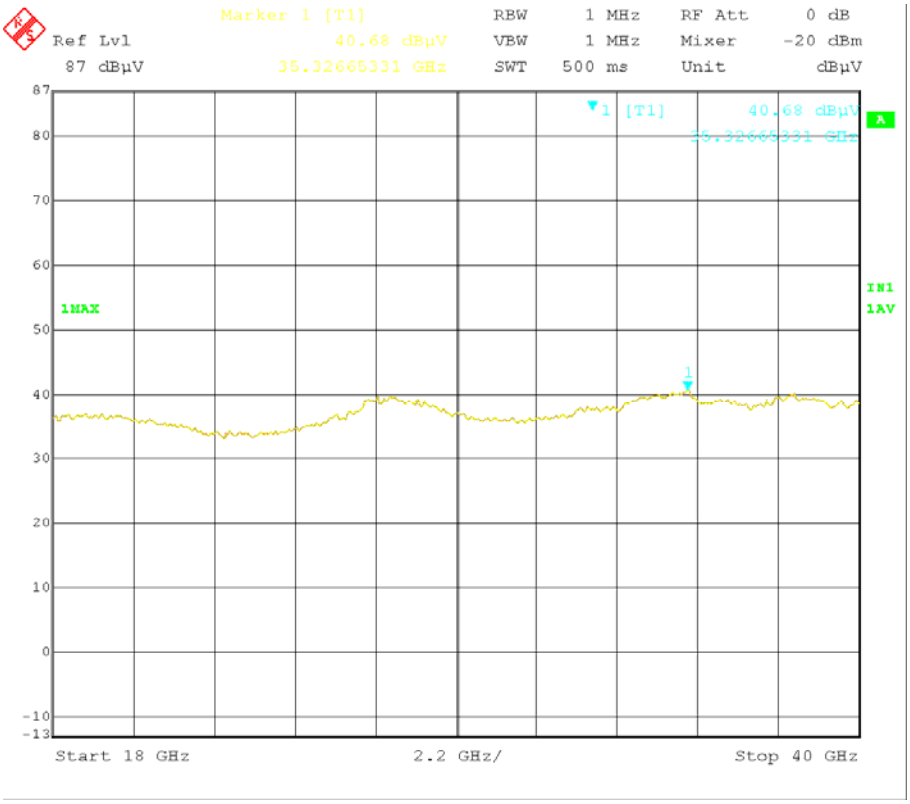
Plot #6


Agilent
Peak Search
Mkr1 11.167 GHz
Ref 90 dBµV
#Atten 0 dB
25.82 dBµV
Next Peak
#Avg
Log
10
dB/
Marker
11.167000000 GHz
25.82 dBµV
Next Pk Right
Next Pk Left
Min Search
PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 10.600 GHz
Stop 18.000 GHz
#Res BW 1 MHz
#VBW 1 MHz
#Sweep 500 ms (601 pts)
File Operation Status, C:\TEST\S1FCC\SCREN006.GIF file saved

Plot #7


Marker 1 [T1]
RBW 1 MHz
RF Att 0 dB
Ref Lvl
38.04 dBµV
VBW 1 MHz
Mixer -20 dBm
87 dBµV
26.50000000 GHz
SWT 500 ms
Unit dBµV
1 [T1] 38.04 dBµV
26.50000000 GHz
1MAX
IN1
1AV
87
80
70
60
50
40
30
20
10
0
-10
-13
Start 18 GHz
850 MHz/
Stop 26.5 GHz

Plot #8

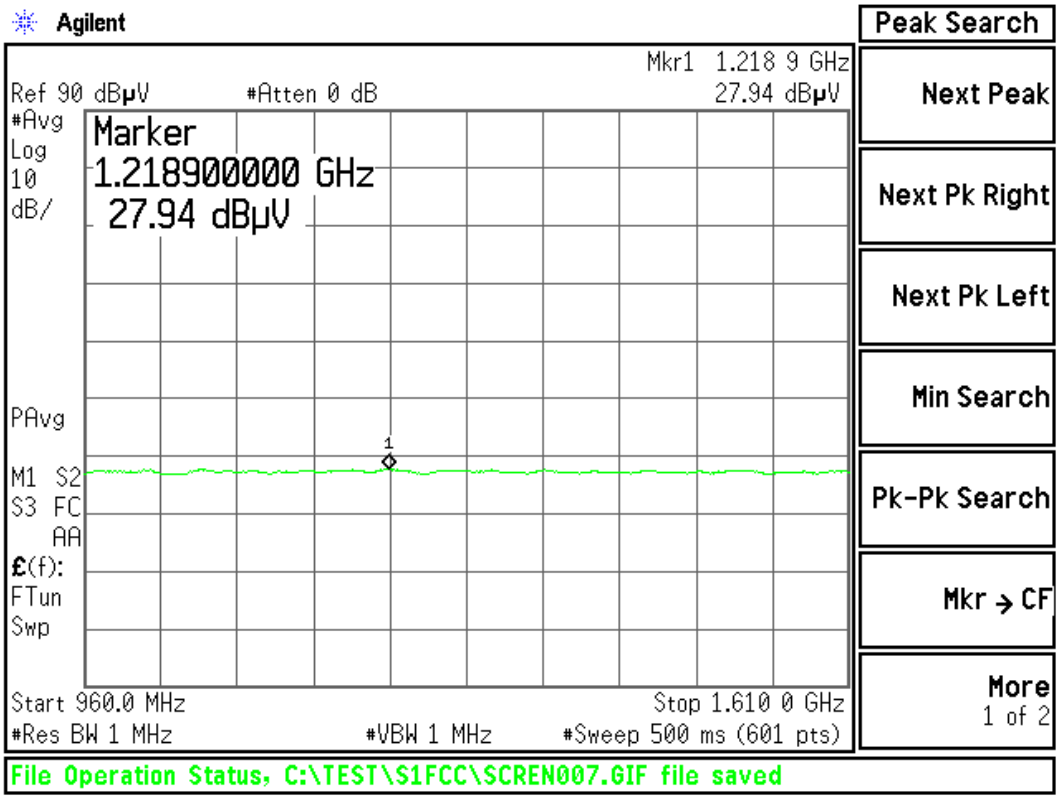

Marker 1 [T1]
RBW 1 MHz
RF Att 0 dB
Ref Lvl
40.68 dBµV
VBW 1 MHz
Mixer -20 dBm
87 dBµV
35.32665331 GHz
SWT 500 ms
Unit dBµV
1 [T1] 40.68 dBµV
35.32665331 GHz
1MAX
1AV
Start 18 GHz
2.2 GHz/
Stop 40 GHz

8.4.2.2 Antenna polarity ”H” (measure distance 1 meter)

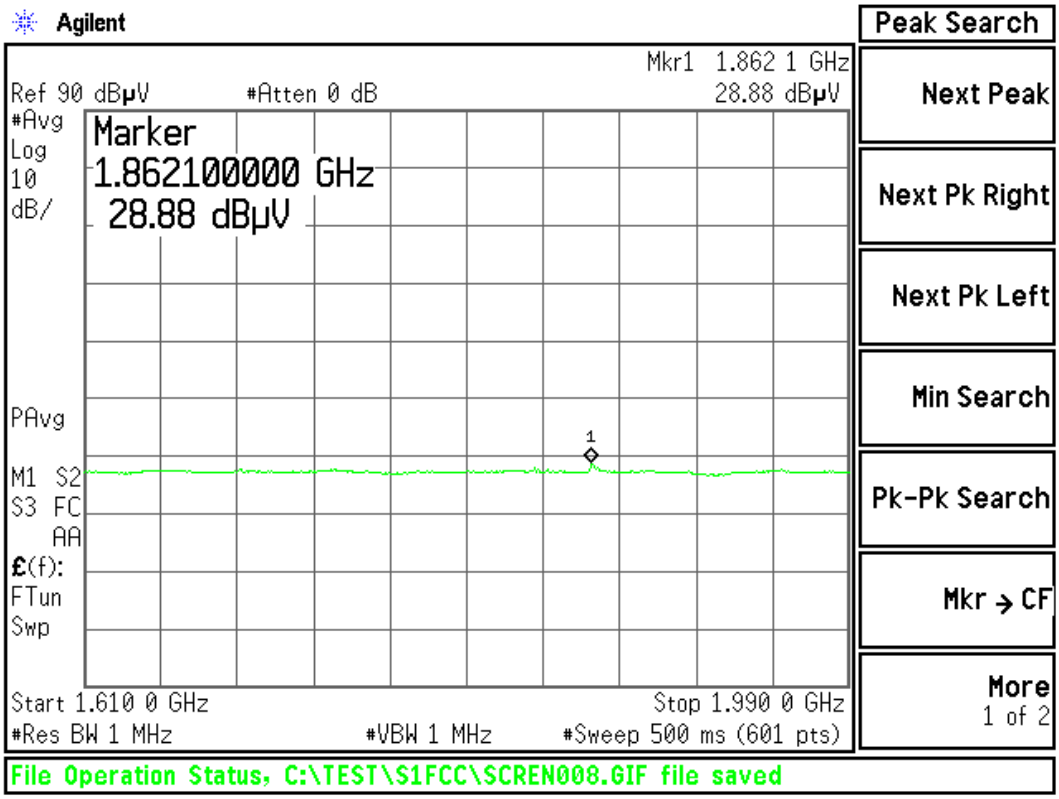
Emission Frequency [MHz]	Measure Value [dBµV]	Plot #	Cable Loss [dB]	Antenna Factor [dB/m]	Amp Gain [dB]	Dist. Correct [dB]	F/S dBµV/m @ 3m	Limit dBµV/m @ 3m	Margin [dB]
1218.90	27.94	9	2.15	24.93	31.54	-9.54	13.93	19.90	5.97
1862.10	28.88	10	2.60	25.65	31.76	-9.54	15.83	41.90	26.07
2167.60	30.84	11	2.79	26.29	31.87	-9.54	18.50	43.90	25.40
3400.00	28.60	12	3.46	28.98	32.18	-9.54	19.32	53.90	34.58
8848.00	29.05	13	5.78	36.68	29.69	-9.54	32.28	53.90	21.62
11167.00	26.05	14	6.51	40.10	29.28	-9.54	33.84	43.90	10.06
26500.00	37.84	15	9.62	39.39	43.75	-9.54	33.56	43.90	10.34
35326.65	40.59	16	10.77	42.08	44.27	-9.54	39.62	43.90	4.28

* F/S(Field Strength) = Measuring Value + CL + AF -G amp + Dcf

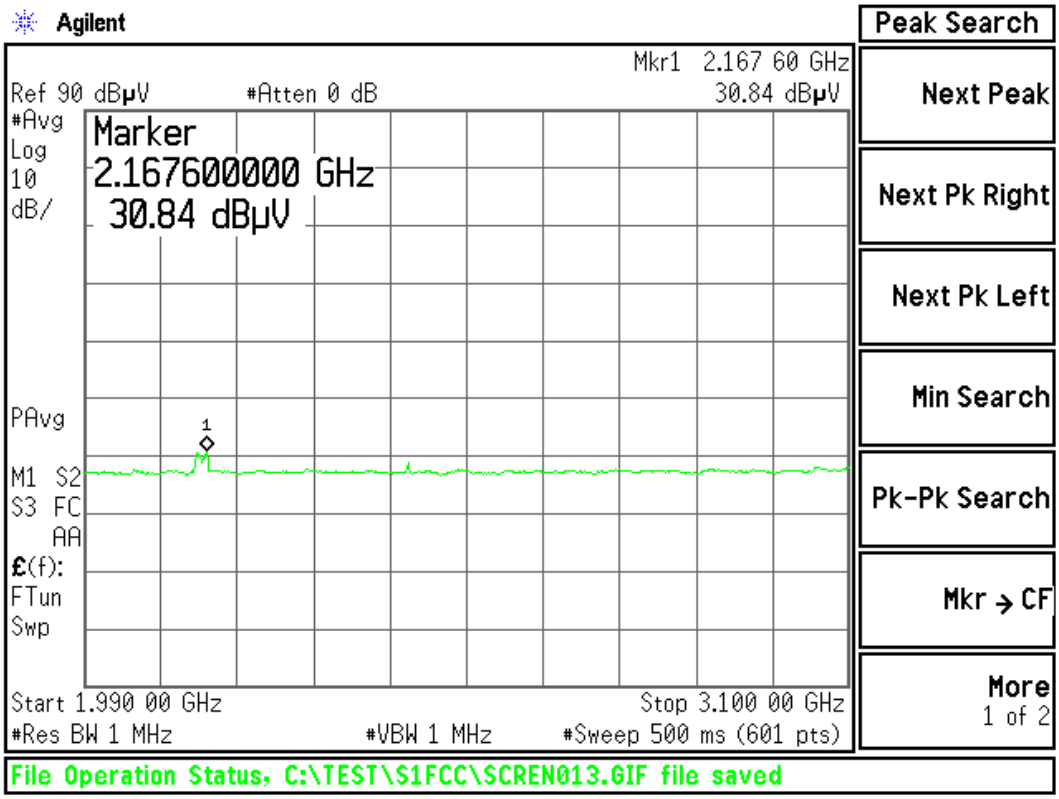
Plot #9



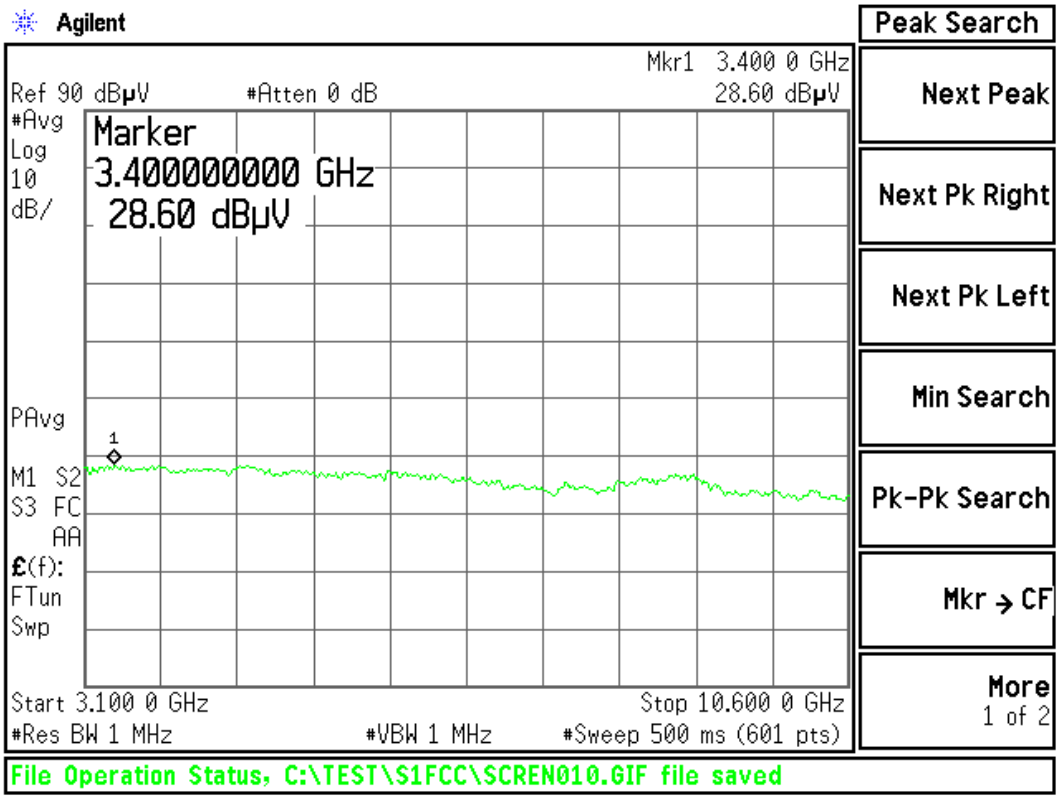
Plot #10



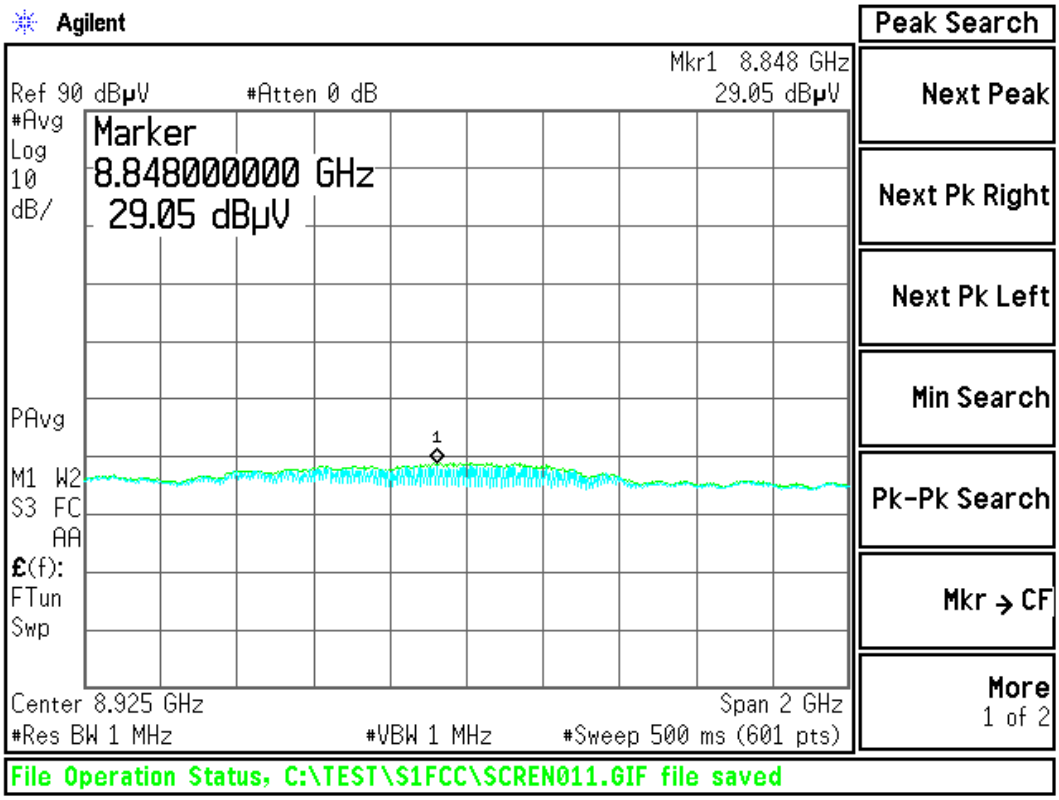
Plot #11



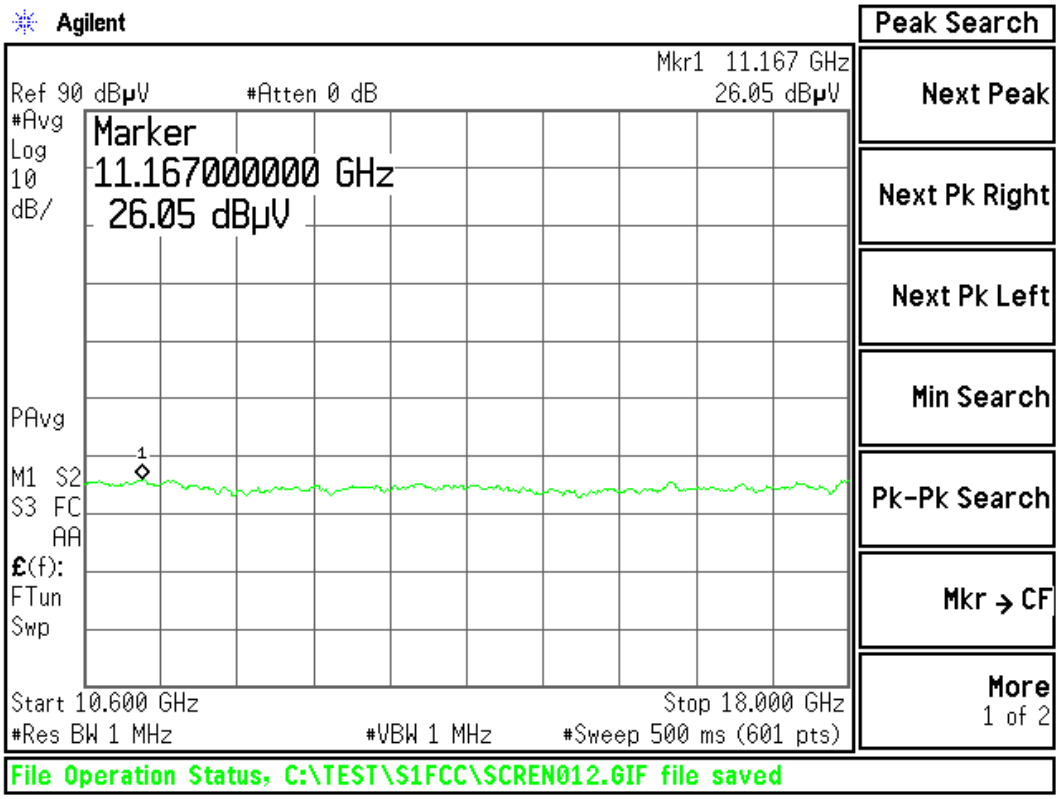
Plot #12



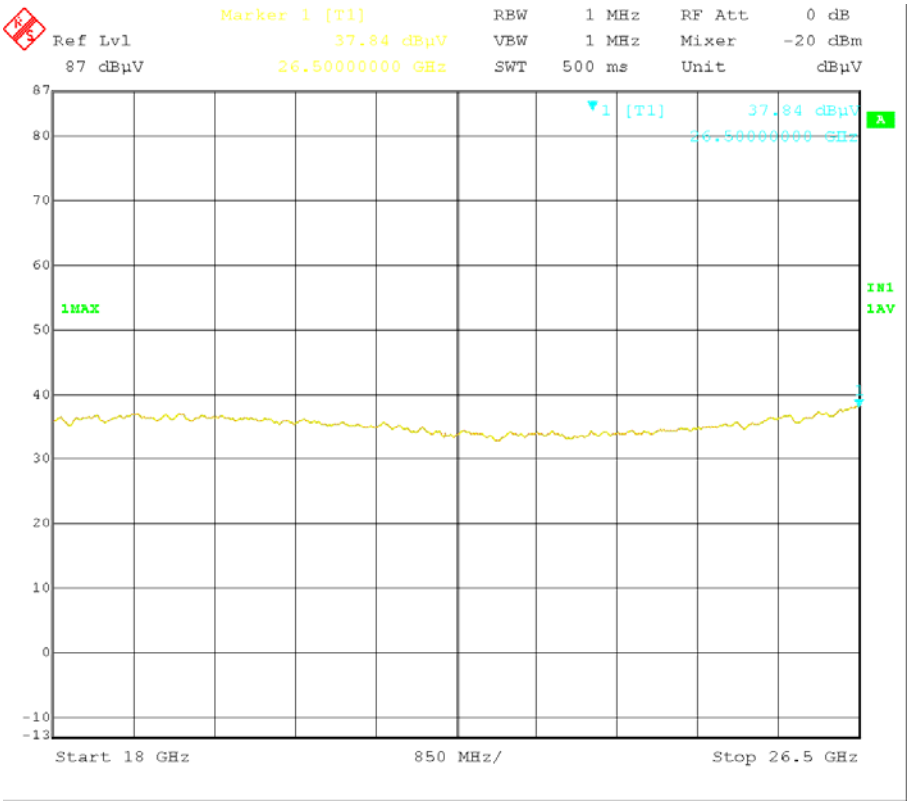
Plot #13



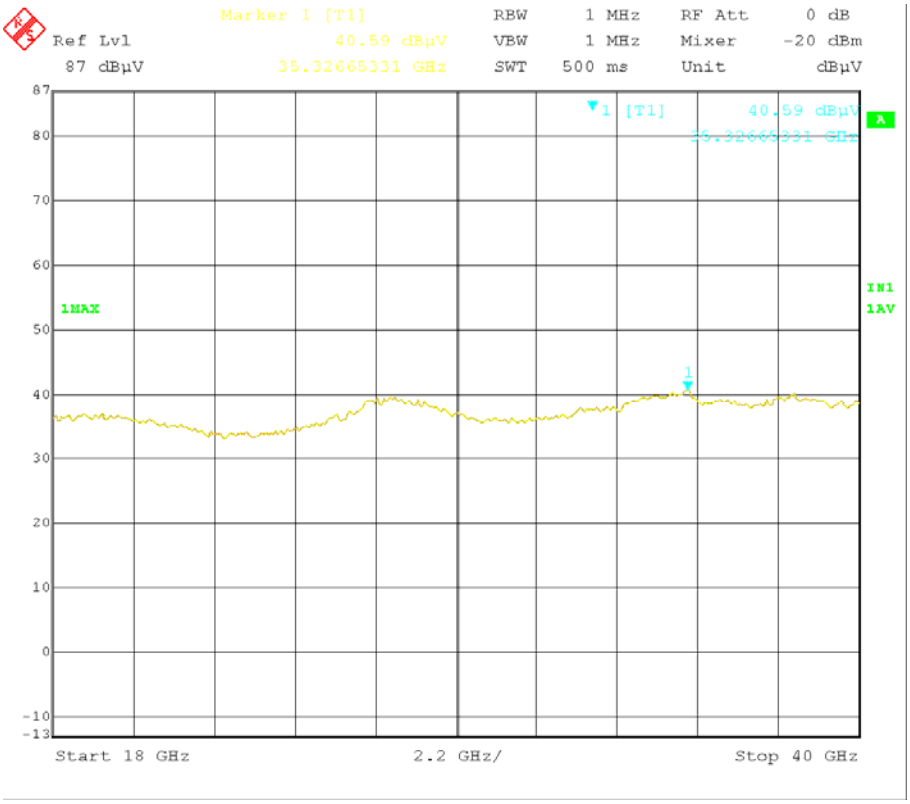
Plot #14



Plot #15



Plot #16


Marker 1 [T1]
RBW 1 MHz
RF Att 0 dB
Ref Lvl
40.59 dBµV
VBW 1 MHz
Mixer -20 dBm
87 dBµV
35.32665331 GHz
SWT 500 ms
Unit dBµV
1 [T1] 40.59 dBµV
35.32665331 GHz
1MAX
1AV
Start 18 GHz
2.2 GHz/
Stop 40 GHz

9. Radiated Emissions in GPS Bands

9.1 Definition

Radiated emissions measurements were performed on the EUT to determine compliance to FCC 15.517(d).

9.2 Test Procedure

It measurement refer to *8.2 Test Procedure*

The measurements made over the frequency range from 1164 MHz to 1240 MHz and from 1559 MHz to 1610 MHz were maximized using a spectrum analyzer with RMS detector capabilities.

9.3 Test Criteria

In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz

Frequency in MHz	EIRP	Field strength
1164 ~ 1240	-85.3 dBm @ 3 meters	9.9 dBμV/m @ 3 meters
1559 ~ 1610	-85.3 dBm @ 3 meters	9.9 dBμV/m @ 3 meters

9.4 Test Results

9.4.1 Antenna polarity ”V” (measure distance 1 meter)

Emission Frequency [MHz]	Measure Value [dBμV]	Plot #	Cable Loss [dB]	Antenna Factor [dB/m]	Amp Gain [dB]	Dist. Correct [dB]	F/S dBμV/m @ 3m	Limit dBμV/m @ 3m	Margin [dB]
1187.56	21.70	17	2.12	24.86	31.54	-9.54	7.61	9.90	2.29
1562.66	16.54	18	2.41	25.56	31.65	-9.54	3.32	9.90	6.58

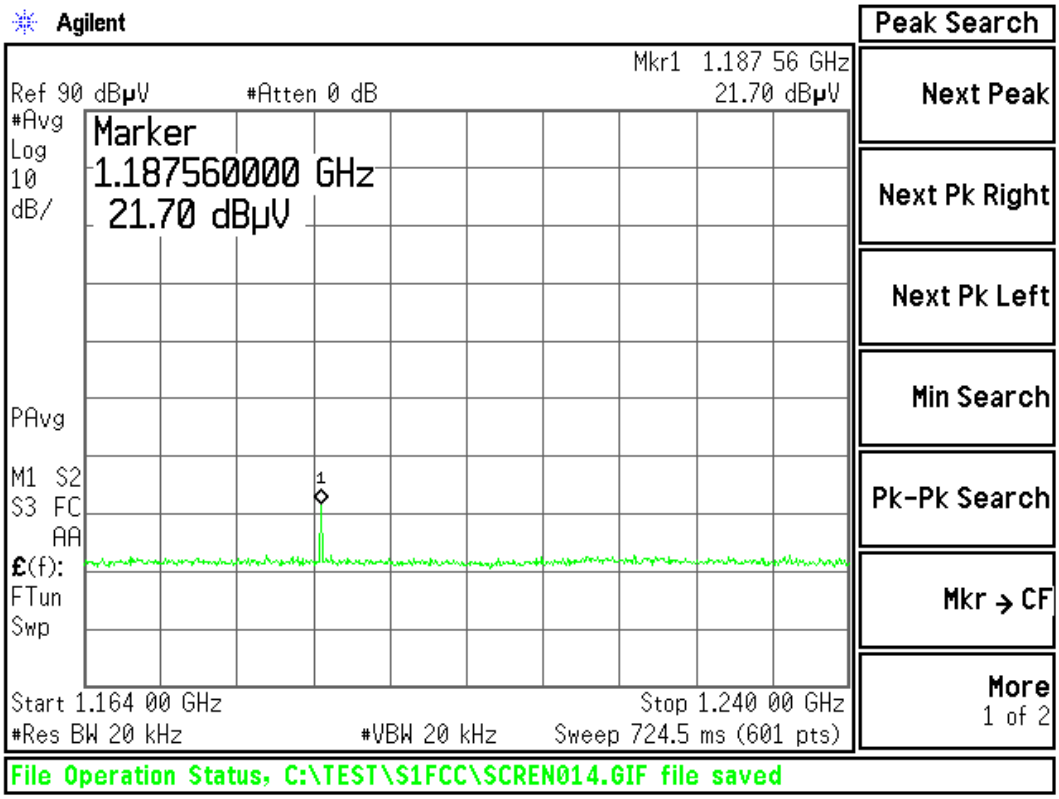
* F/S(Field Strength) = Measuring Value + CL + AF -G amp + Dcf

9.4.2 Antenna polarity ”H” (measure distance 1 meter)

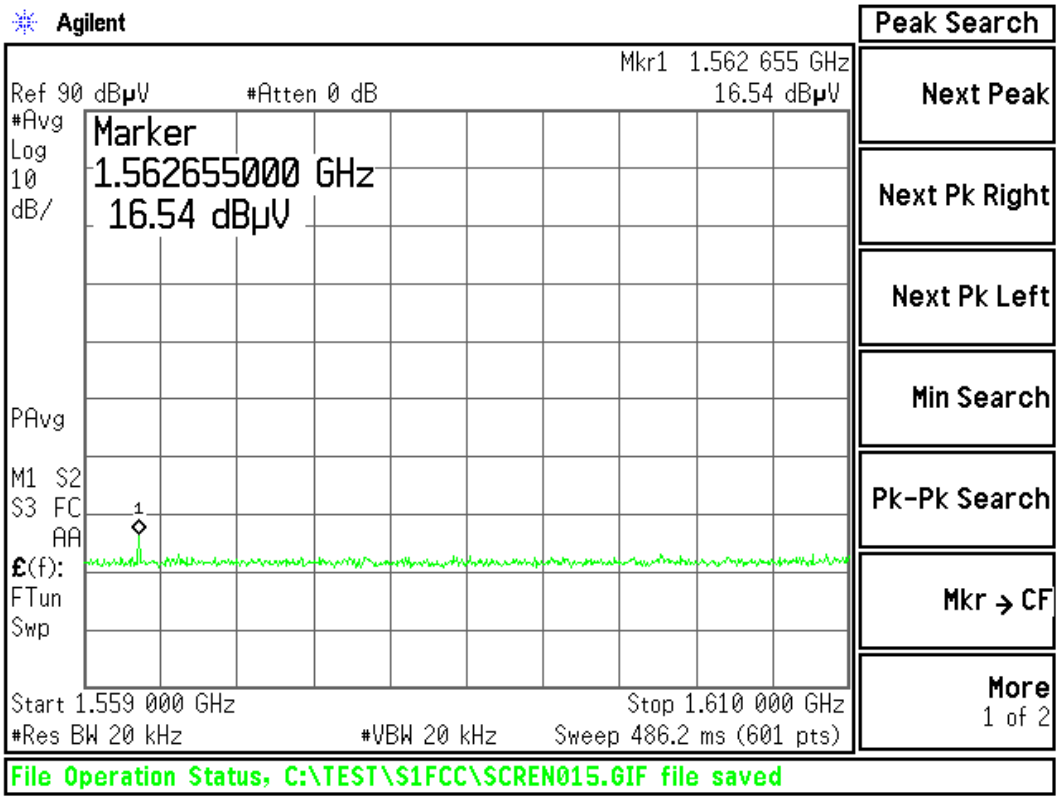
Emission Frequency [MHz]	Measure Value [dBμV]	Plot #	Cable Loss [dB]	Antenna Factor [dB/m]	Amp Gain [dB]	Dist. Correct [dB]	F/S dBμV/m @ 3m	Limit dBμV/m @ 3m	Margin [dB]
1187.56	21.59	19	2.12	24.86	31.54	-9.54	7.50	9.90	2.40
1562.66	15.52	20	2.41	25.56	31.65	-9.54	2.30	9.90	7.60

* F/S(Field Strength) = Measuring Value + CL + AF -G amp + Dcf

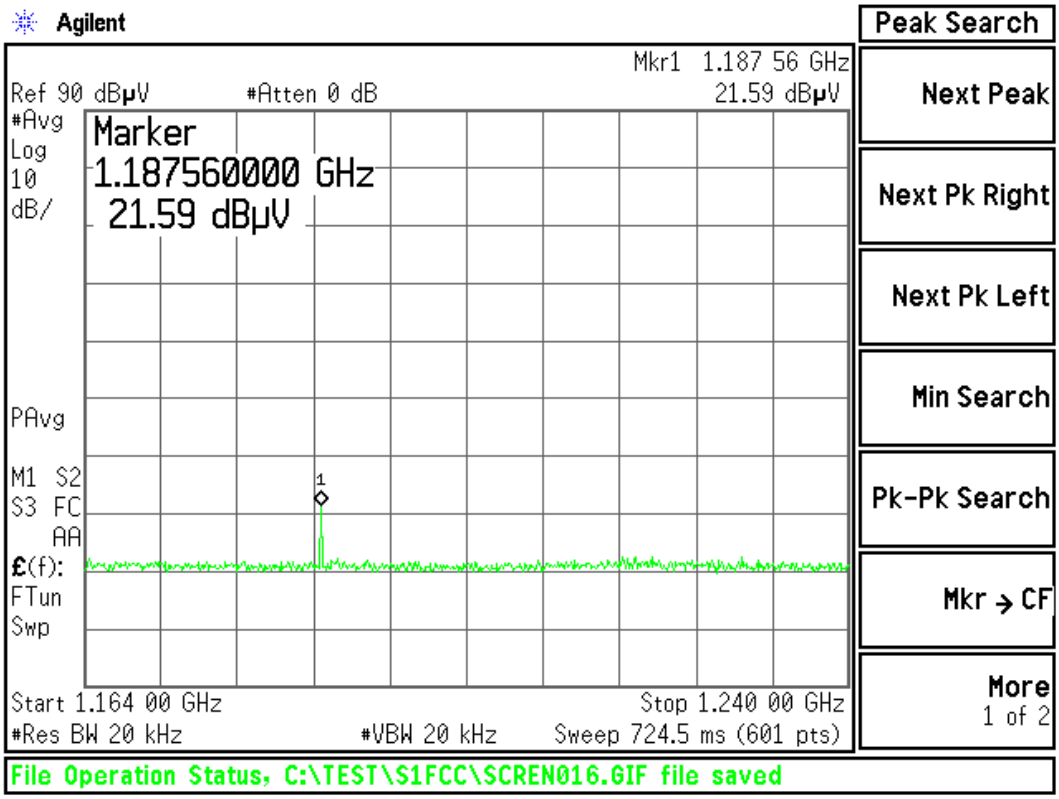
Plot #17



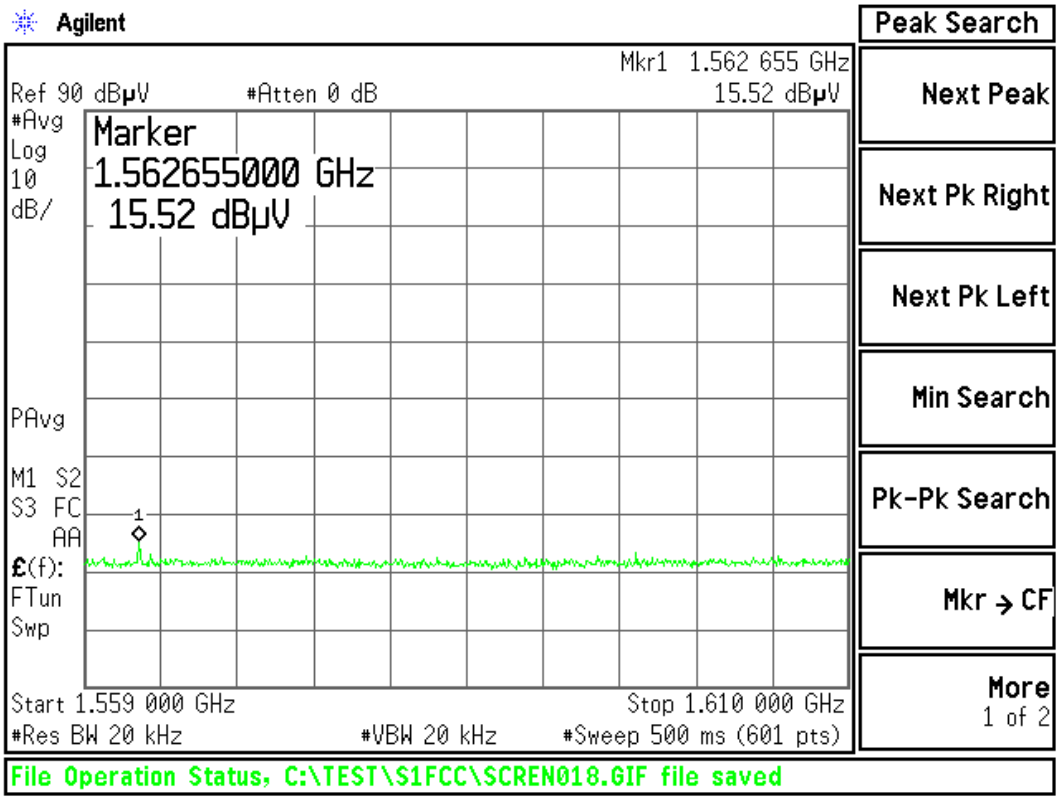
Plot #18



Plot #19



Plot #20



10. Peak Emissions within a 50 MHz Bandwidth

10.1 Definition

The EUT was evaluated to determine compliance with FCC 15.517(e) following the procedures described in FCC Section 15.521

10.2 Test Procedure

It measurement refer to *8.2 Test Procedure*

The measurements made over the intentionally radiating frequency range of the EUT, from 3100 MHz to 10600 MHz, were maximized using a spectrum analyzer with peak detector capabilities.
A spectrum analyzer was used for the final measurement utilizing a peak detector at the frequency with the largest amplitude. The spectrum analyzer did not support the prescribed resolution bandwidth of 50 MHz. However, when a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in 47 CFR Part 15, Subpart F.
The resolution bandwidth for the measurement was set to 3 MHz. The measurement was centered on the frequency at which the highest radiated emission occurred, fM. The video bandwidth was 3 MHz. Since a resolution bandwidth other than 50 MHz was used, the peak EIRP limit has to be adjusted by the resolution bandwidth ratio of 20 log (RBW/50) dB, where RBW is the resolution bandwidth used for the measurement expressed in MHz

Pursuant to Pt 15.521(g), the peak EIRP limit = 20log(3 MHz/50) = -24.4 dBm.
The equivalent filed strength at 3 meters = (-24.4) + 95.2 = 70.8 dBμV/m

10.3 Test Criteria

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP. The EUT was evaluated to determine compliance with FCC 15.517(e) following the procedures described in FCC Section 15.521

10.4 Test Results

10.4.1 Antenna polarity ”V” (measure distance 1 meter)

Emission Frequency [MHz]	Measure Value [dBμV]	Plot #	Cable Loss [dB]	Antenna Factor [dB/m]	Amp Gain [dB]	Dist. Correct [dB]	F/S dBμV/m @ 3m	Limit dBμV/m @ 3m	Margin [dB]
8915.00	61.47	21	5.81	36.70	29.68	-9.54	64.76	70.80	6.04

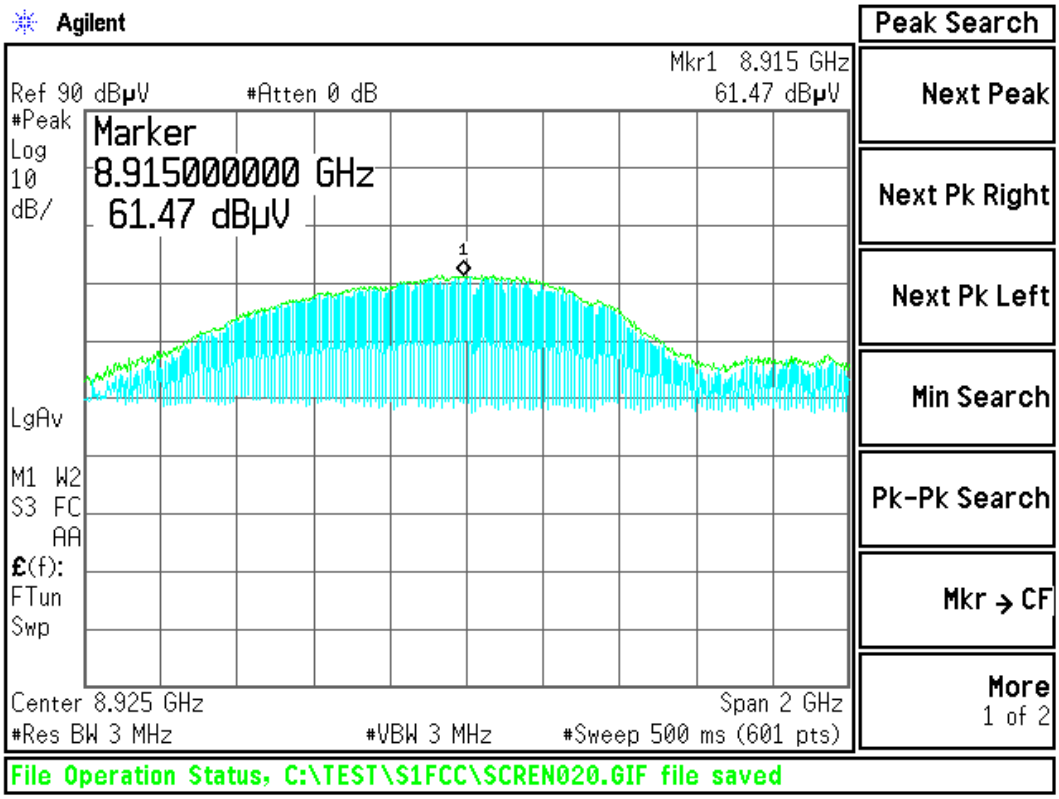
* F/S(Field Strength) = Measuring Value + CL + AF -G amp + Dcf

10.4.2 Antenna polarity ”H” (measure distance 1 meter)

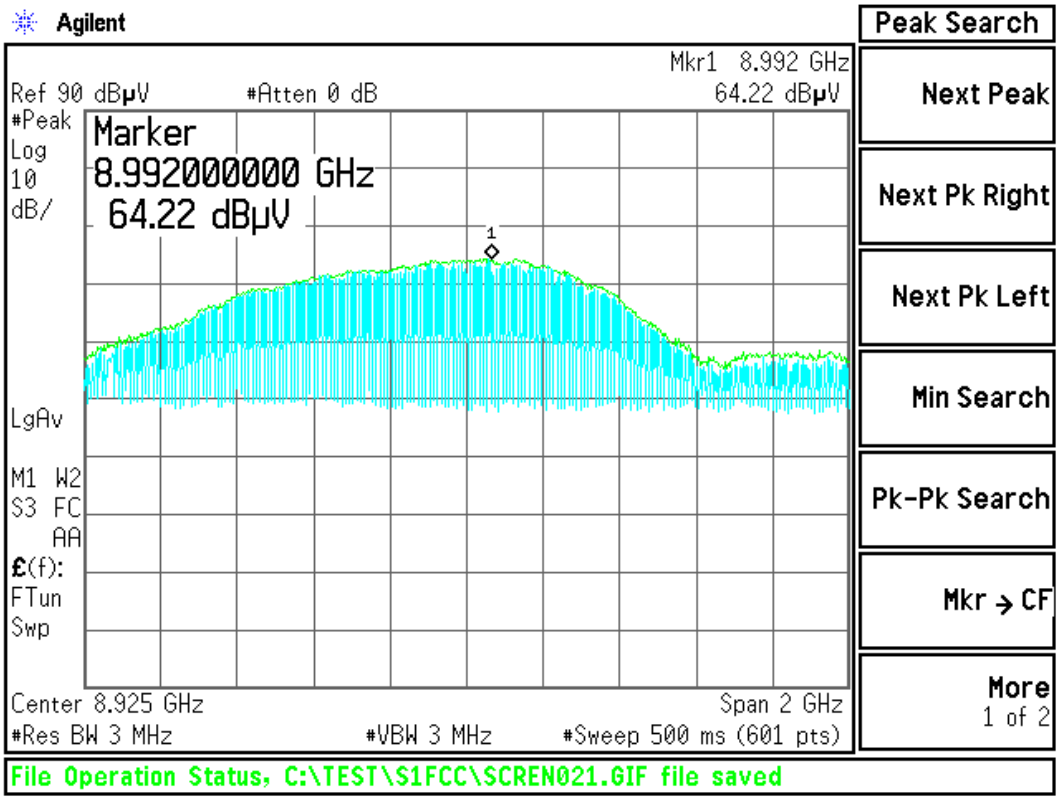
Emission Frequency [MHz]	Measure Value [dBμV]	Plot #	Cable Loss [dB]	Antenna Factor [dB/m]	Amp Gain [dB]	Dist. Correct [dB]	F/S dBμV/m @ 3m	Limit dBμV/m @ 3m	Margin [dB]
8992.00	64.22	22	5.84	36.72	29.67	-9.54	67.57	70.80	3.23

* F/S(Field Strength) = Measuring Value + CL + AF -G amp + Dcf

Plot #21



Plot #22



11. Power Line Conducted

11.1 Definition

The EUT was evaluated to determine compliance with FCC section 15.207

11.2 Test Criteria

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges

Frequency in emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5.0	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

11.3 Test Results

Not applicable because the EUT is DC operated exclusively. Also not use AC adapter.