HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

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CERTIFICATE OF COMPLIANCE (ERM EVALUATION)

Manufacture: GSTeletech Co., Ltd.

1385-14, Juan-Dong, Nam-Ku, Incheon,,402-200 Korea

FRN: 0016367252

Date of Issue : August 10, 2007

Test Report No.: HCT-R07-031

Test Site: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.

HCT FRN: 0005-8664-21

FCC ID : **U88GSTR-815DC-SPR**

APPLICANT : **GSTeletech Co., Ltd.**

EUT Type:	**iDEN In-Building RF Repeater**
MODEL:	**GSTR-815DC-SPR**
Frequency Ranges:	**iDEN800: 806 – 824 MHz(Uplink), 851 – 869 MHz(Downlink)**
	iDEN900: 896 – 901 MHz(Uplink), 935 – 940 MHz(Downlink)
RF Output Power:	**Downlink : 15.0 dBm**
	Uplink : 15.0 dBm
FCC Rules Part(s):	**CFR Title 47 Part 90 Subpart I**
Emission Designators:	**GXW**

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 90 Subpart I of the FCC Rules under normal use and maintenance.

Youn Seok Jung

Report prepared by
: Youn Seok Jung
Test engineer of RF Part

Sang Jun Lee

Approved by
: Sang Jun Lee
Manager of RF Part

CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	**GSTeletech Co., Ltd**
Contact Point	1385-14, Juan-Dong, Nam-Ku, Incheon,,402-200 Korea

- **EUT Type:** **iDEN Inbuilding RF Repeater**
- **FCC ID:** **U88GSTR-815DC-SPR**
- **Frequency Ranges:** **iDEN800: 806 – 824 MHz(Uplink), 851 – 869 MHz(Downlink)**

  iDEN900: 896 – 901 MHz(Uplink), 935 – 940 MHz(Downlink)
- **RF Output Power:** **Downlink : 15.0 dBm**

  Uplink : 15.0 dBm
- **FCC Rules Part(s):** **CFR Title 47 Part 90 Subpart I**
- **Emission Designators:** **GXW**

2. TEST SPECIFICATIONS

2.1 Standards

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance With Part 90 Subpart I in accordance with **HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.**

Reference	Description	Compliant
§2.1046; §90.205	RF Power Output	Yes
§2.1049	Occupied Bandwidth	Yes
§2.1053; §2.1057, §90.210	Spurious Emissions at Antenna Terminals and Inter-Modulation	Yes
§2.1053; §2.1057, §90.210	Radiated Spurious Emissions	Yes
§2.1055; §90.213	Frequency Stability	Yes

3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	**+ 15 ℃ to + 35 ℃**
Relative humidity:	**30 % to 60 %**
Air pressure	**860 mbar to 1060 mbar**

4. TEST SUMMARY

The results in this report apply only to sample tested:

Test Case	Applied standard	Result
RF Power Output	§2.1046; §90.205	PASS
Occupied Bandwidth	§2.1049	PASS
Spurious Emissions at Antenna Terminals and Inter-Modulation	§2.1053; §2.1057, §90.210	PASS
Radiated Spurious Emissions	§2.1053; §2.1057, §90.210	PASS
Frequency Stability	§2.1055; §90.213	PASS

5. TEST EQUIPMENT

Equipment	Manufacturer	Model	S/N	Cal Due Date
Spectrum Analyzer	ADVANTEST	R3671	150900068	06/15/2007
Signal Generator	AGILENT	E4438C	MY42082646	12/14/2007
Power Meter	AGILENT	E4416A	GB41291412	01/22/2008
ATTENUATOR	WEINSCHEL	67-30-33	BR0530	01/22/2008
Double Ridged Horn Antenna	Schwarzbeck	BBHA 9120D	296	05/02/2007
Double Ridged Horn Antenna	Schwarzbeck	BBHA 9120D	147	03/30/2008
Temperature and Humidity Chamber	Korea Eng	KR-1005L	KRAC05063-3CH	12/29/2007
Pre-Amplifier	MITEQ	AMF-60-0010 1800-35-20P	1200937	01/24/2008
EMC Analyzer	AGILENT	E7405A	US40240290	10/02/2007
ATTENUATOR	WEINSCHEL	2-10	BR0554	01/22/2008

6. RF POWER OUTPUT

Test Requirements:

§ 2.1046 Measurements required: RF power output

§ 2.1046 (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8).The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§ 2.1046 (b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

§ 2.1046 (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

§ 90.205 Power and antenna height limits. Refer to § 90.635

§ 90.635(b): The Effective radiated power (ERP) of base transmitters and cellular IDEN Inbuilding RF Repeaters must not exceed 500 watts.

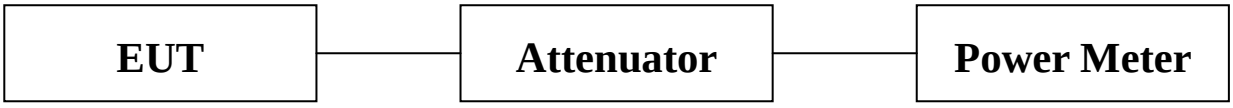
Test Procedures:

As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. This test was performed in all applicable modulations.

Test Results:

The EUT complies with the requirements of this section. The EUT conducted power does not exceed limit at the carrier frequency.

NOTE: The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.



Block Diagram 1. RF Power Output Test Setup

iDEN800 DownLink		
Carrier Channel	**Frequency (MHz)**	**Measured Average Output Power (dBm)**
Low	851.0125	14.96
Mid	858.6125	14.26
High	868.9875	14.50

iDEN800 UpLink		
Carrier Channel	**Frequency (MHz)**	**Measured Average Output Power (dBm)**
Low	806.0125	14.26
Mid	813.6125	14.66
High	823.9875	14.99

iDEN900 DownLink		
Carrier Channel	**Frequency (MHz)**	**Measured Average Output Power (dBm)**
Low	935.0125	14.98
\Mid	937.5000	13.78
High	939.9875	13.38

iDEN900 UpLink		
Carrier Channel	**Frequency (MHz)**	**Measured Average Output Power (dBm)**
Low	896.0125	14.93
Mid	898.5000	14.78
High	900.9875	13.89

Note: The input power to both Uplink and Downlink ports was – 51.28 dBm.

7. OCCUPIED BANDWIDTH

Test Requirement(s):

§ 2.1049 Measurements required: Occupied bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures:

As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports for both Uplink and Downlink. The signal generator was connected to the EUT and the output of the EUT was connected to the spectrum analyzer. The output waveform after amplification was then compared to the original input signal to ensure that no significant differences occurred between the input signal and the amplified signal.

Test Results:

The EUT complies with the requirements of this section.

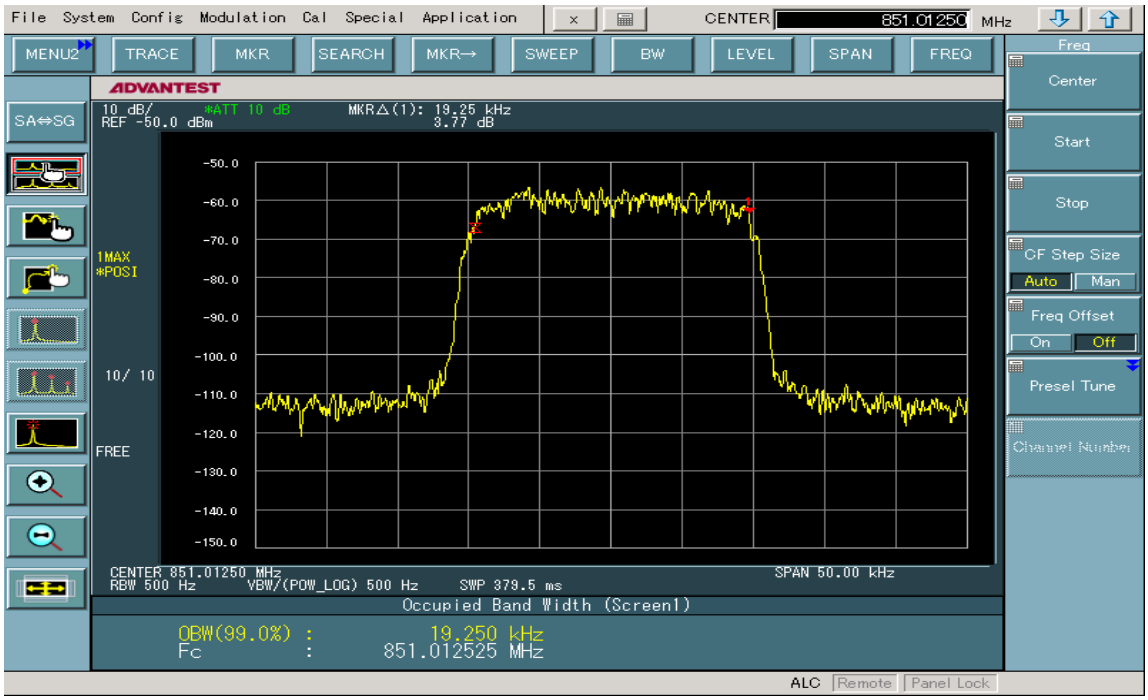
NOTE: The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

iDEN800			
Downlink		Uplink	
Frequency (MHz)	Occupied Bandwidth (KHz)	Frequency (MHz)	Occupied Bandwidth (KHz)
851.0125	19.45	806.0125	19.20
858.6125	19.40	813.6125	19.45
868.9875	19.35	823.9875	19.45

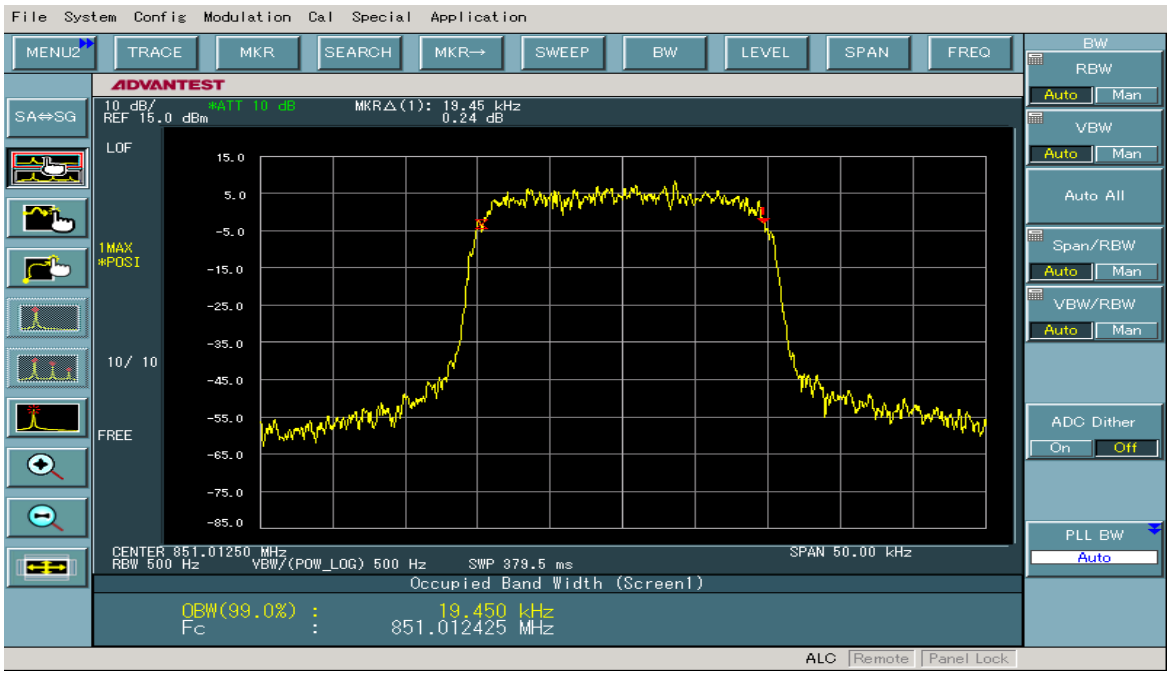
iDEN900			
Downlink		Uplink	
Frequency (MHz)	Occupied Bandwidth (KHz)	Frequency (MHz)	Occupied Bandwidth (KHz)
935.0125	19.25	896.0125	19.35
937.5000	19.30	898.5000	19.35
939.9875	19.45	900.9875	19.35

§ 2.1049 Plots of Occupied Bandwidth, IDEN800

(Input Signal)

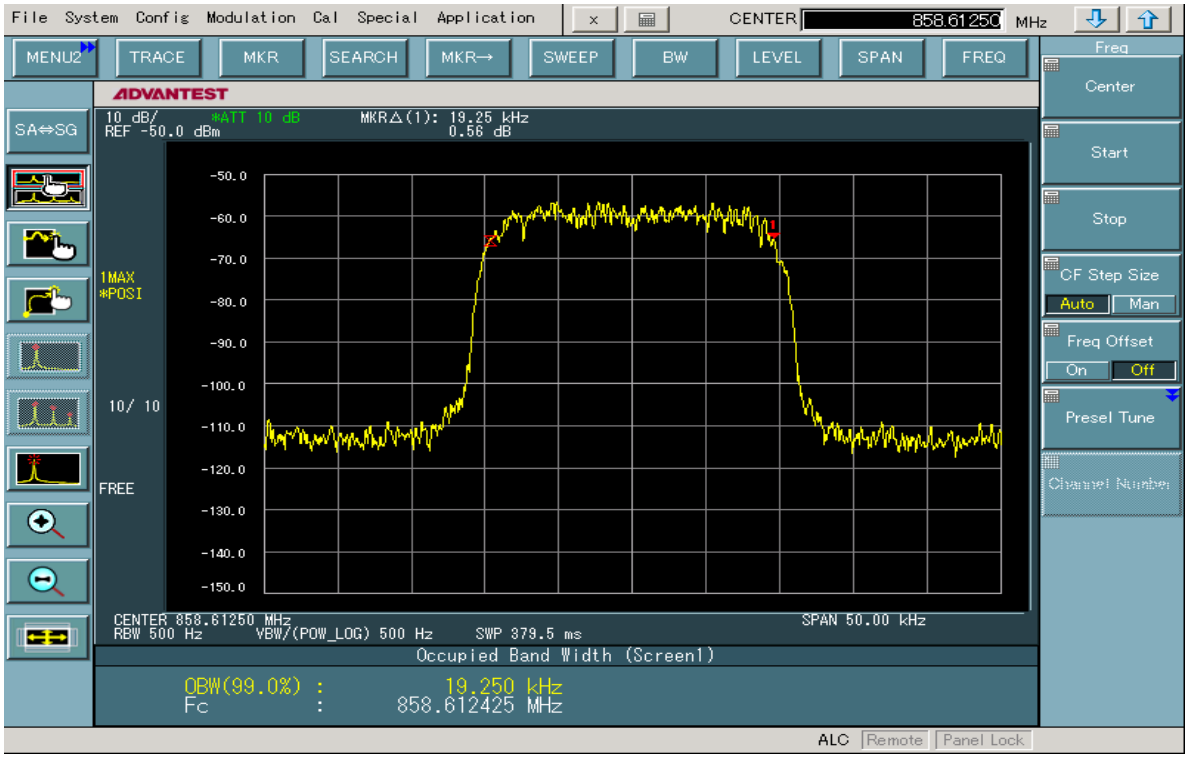


(Output Signal)

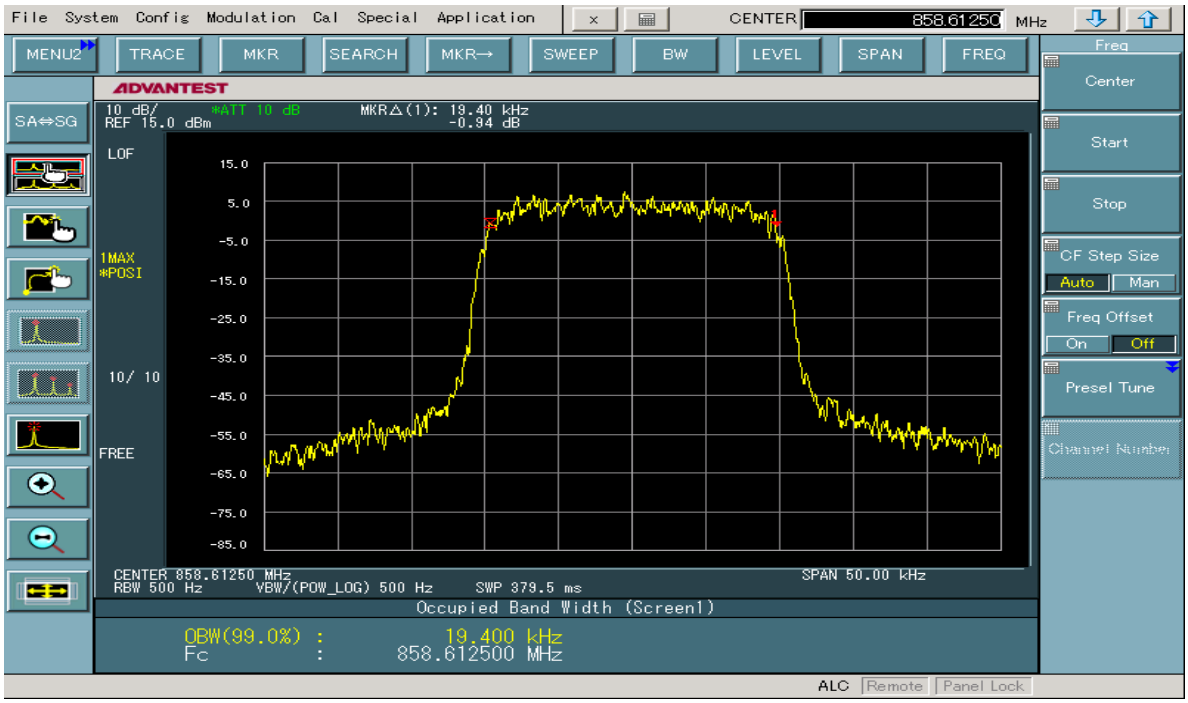


Plot 1. Occupied Bandwidth Low CH Downlink

(Input Signal)

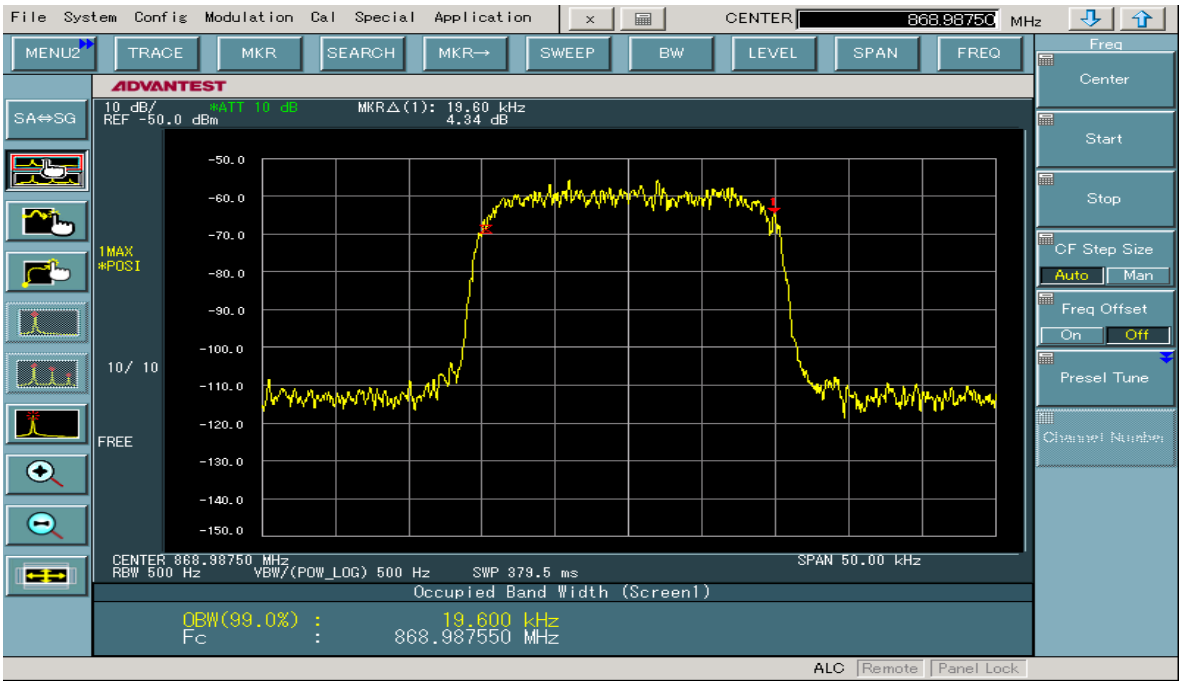


(Output Signal)

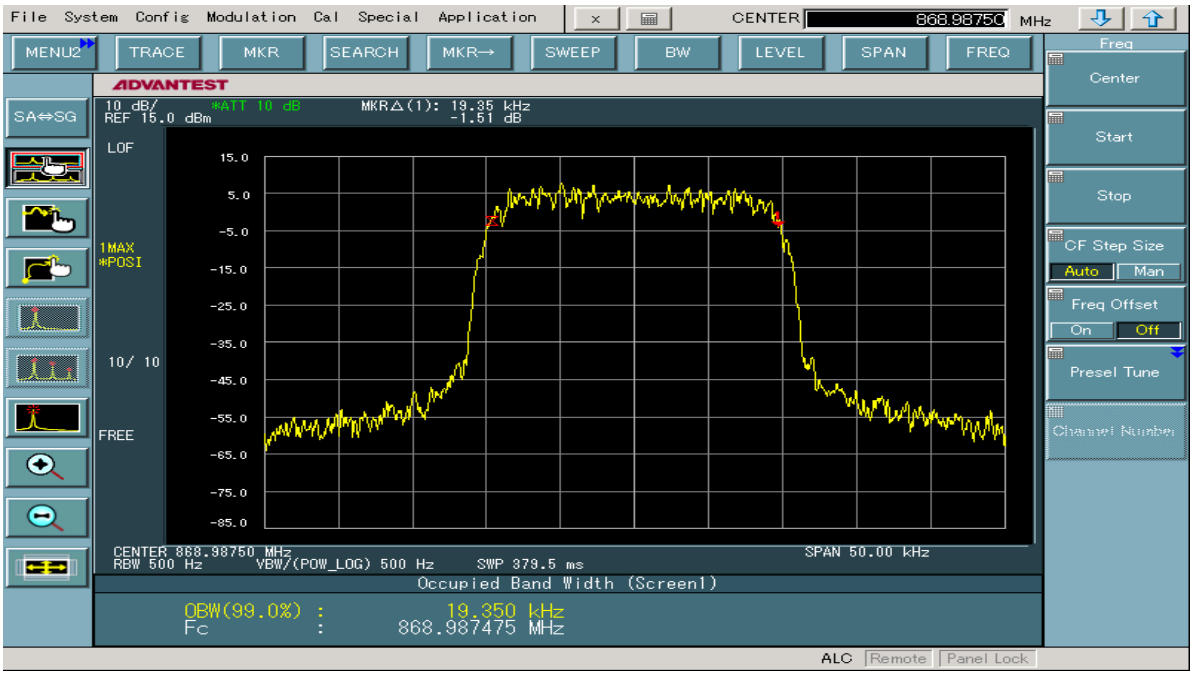


Plot 2. Occupied Bandwidth Mid CH Downlink

(Input Signal)

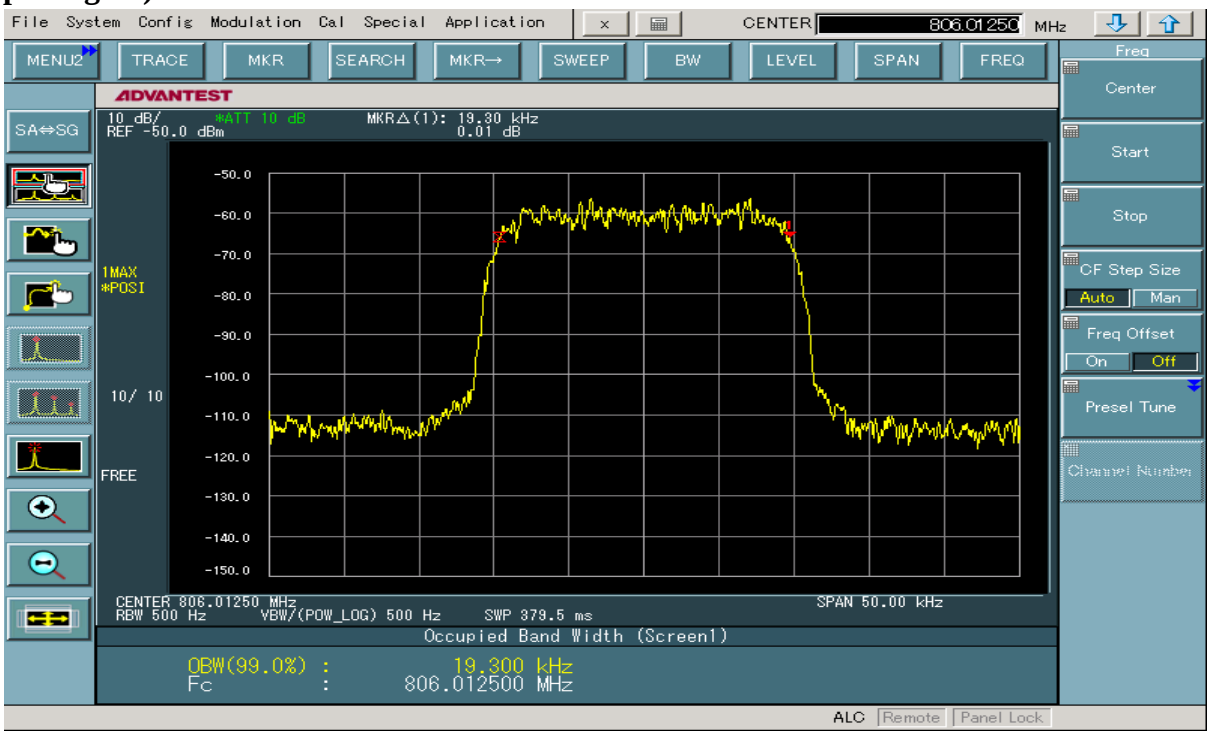


(Output Signal)

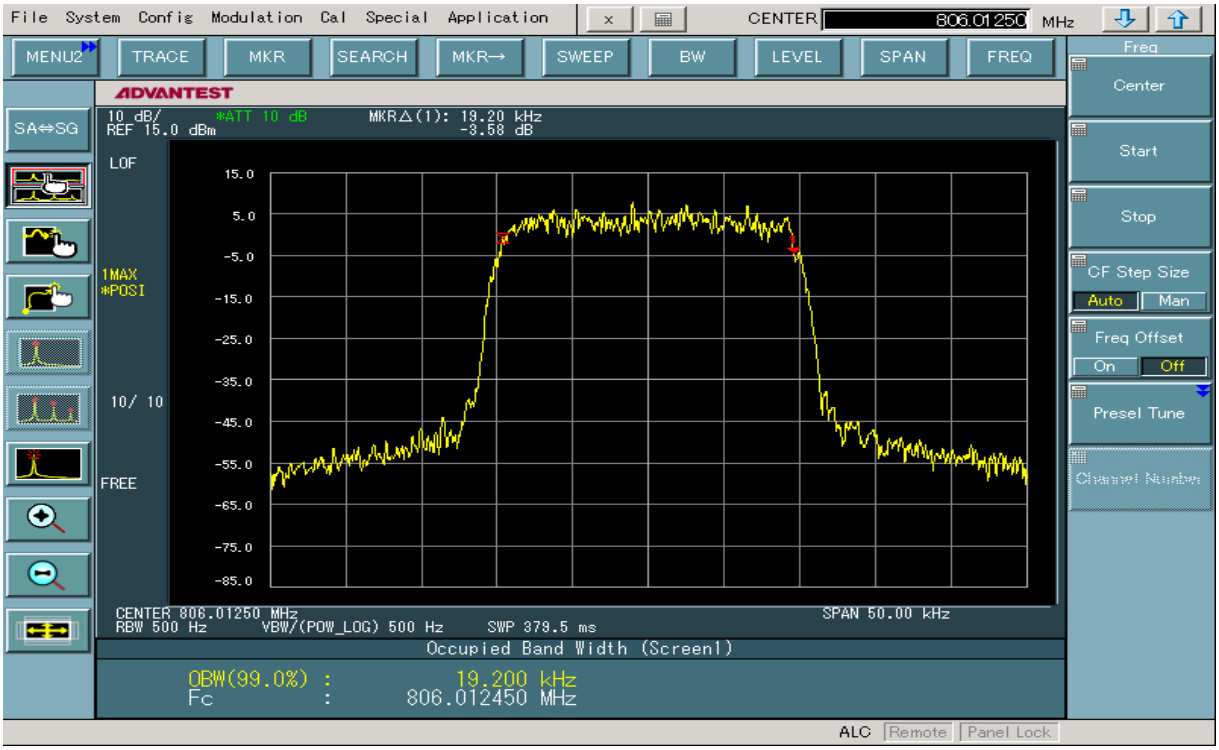


Plot 3. Occupied Bandwidth High CH Downlink

(Input Signal)

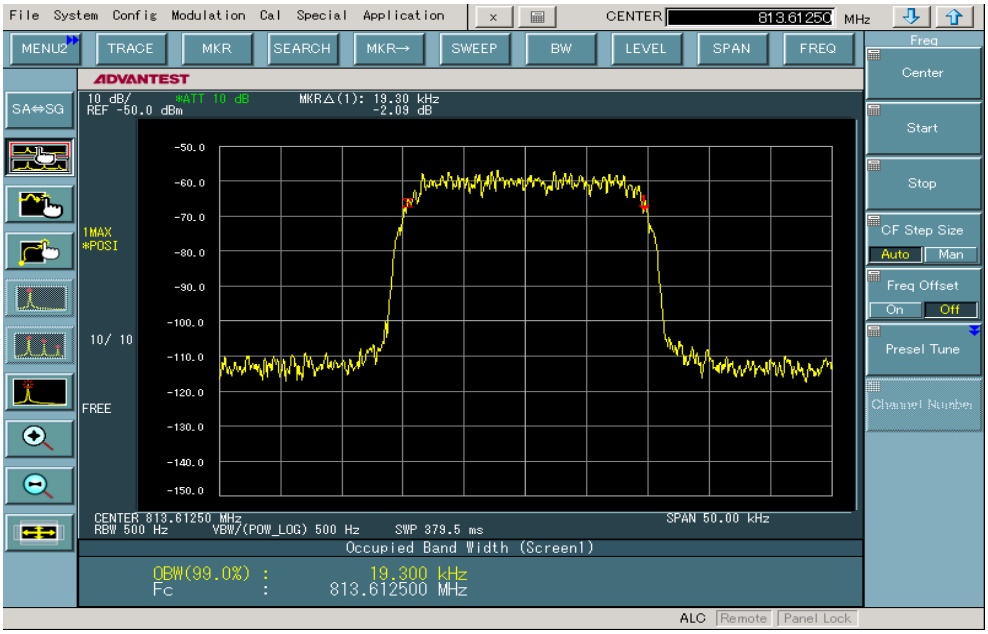


(Output Signal)

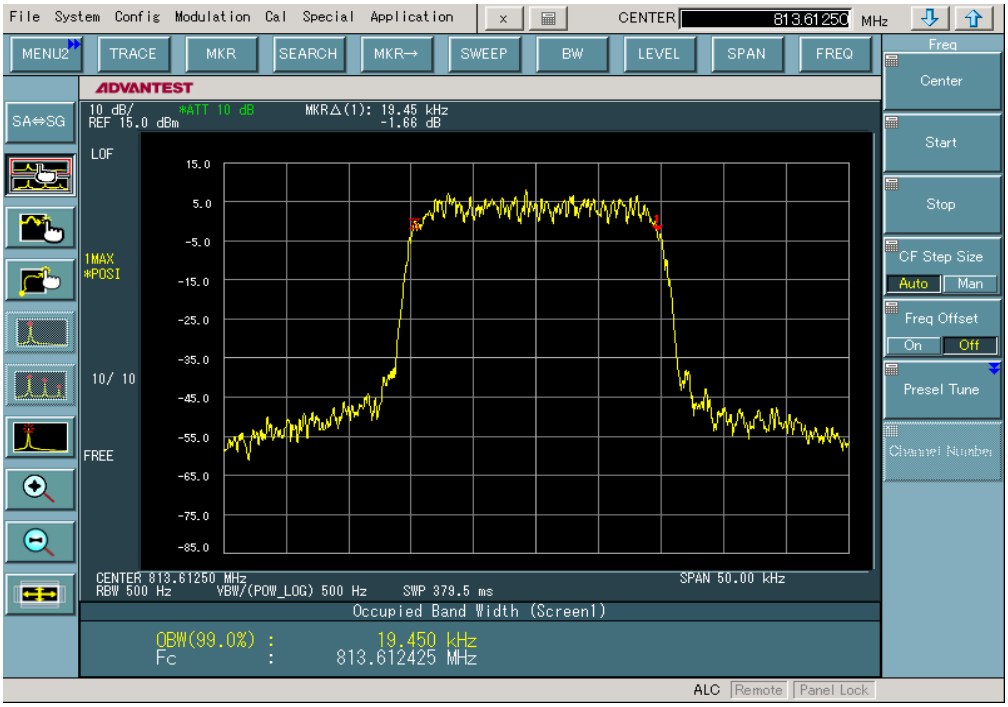


Plot 4. Occupied Bandwidth Low CH Uplink

(Input Signal)

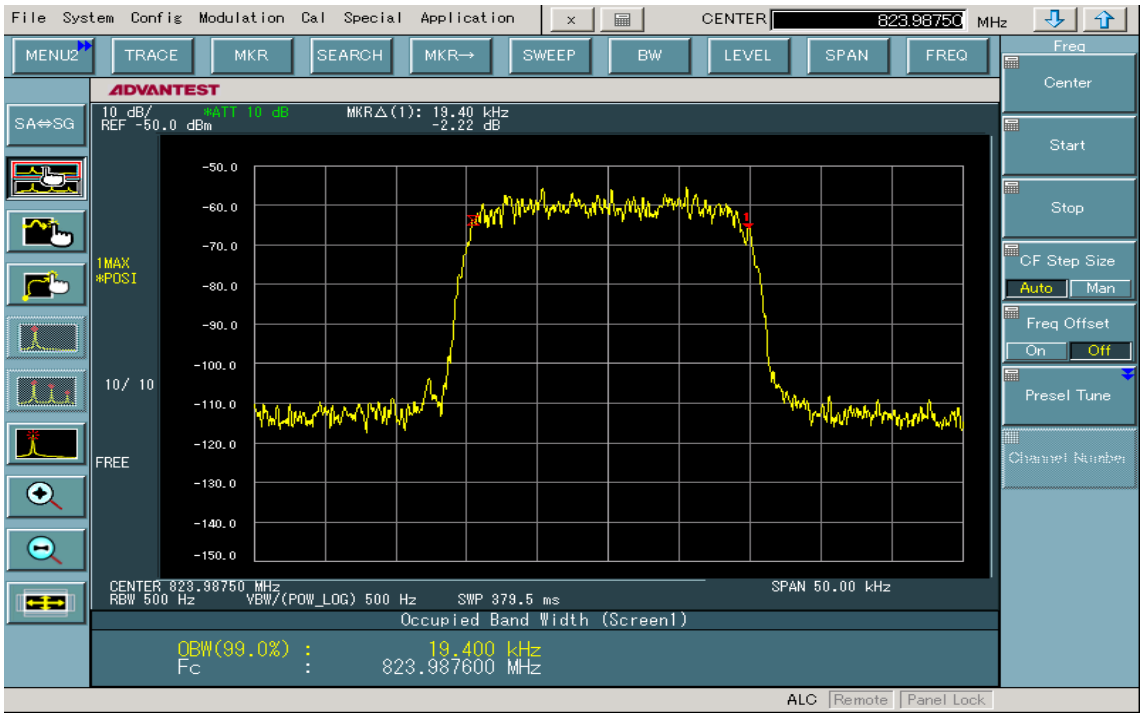


(Output Signal)

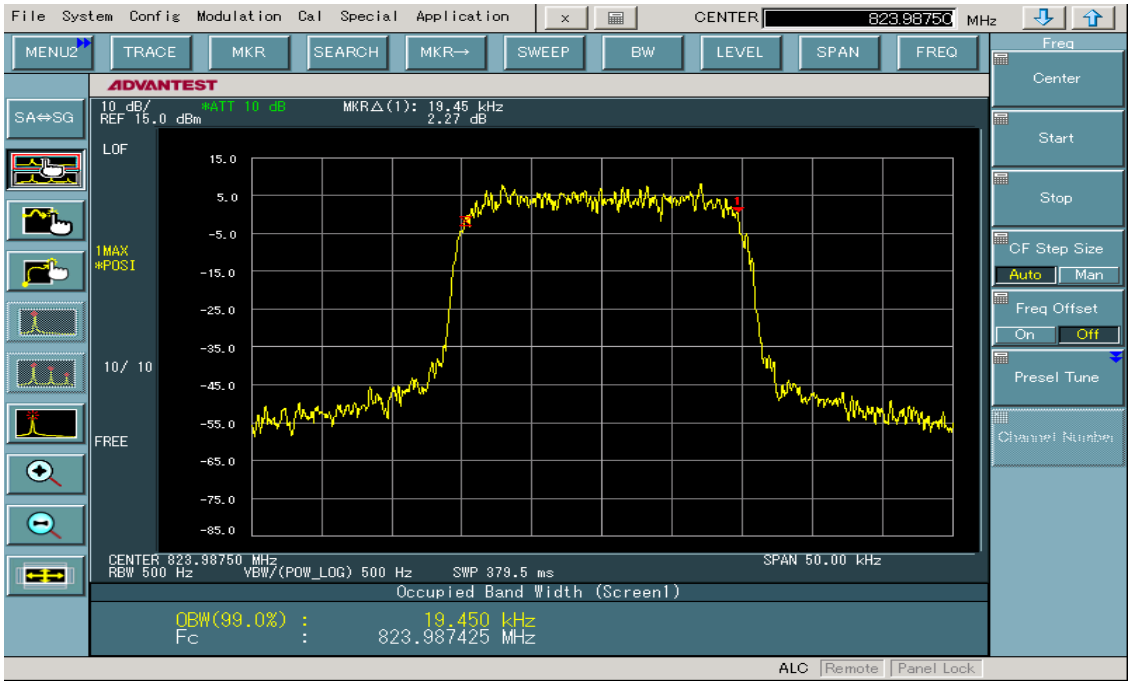


Plot 5. Occupied Bandwidth Mid CH Uplink

(Input Signal)



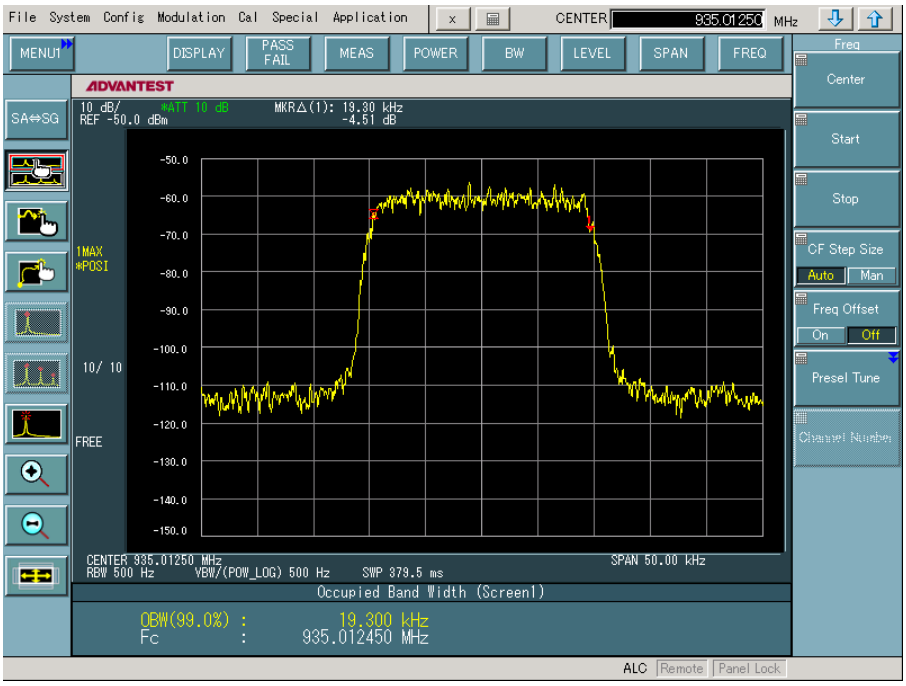
(Output Signal)



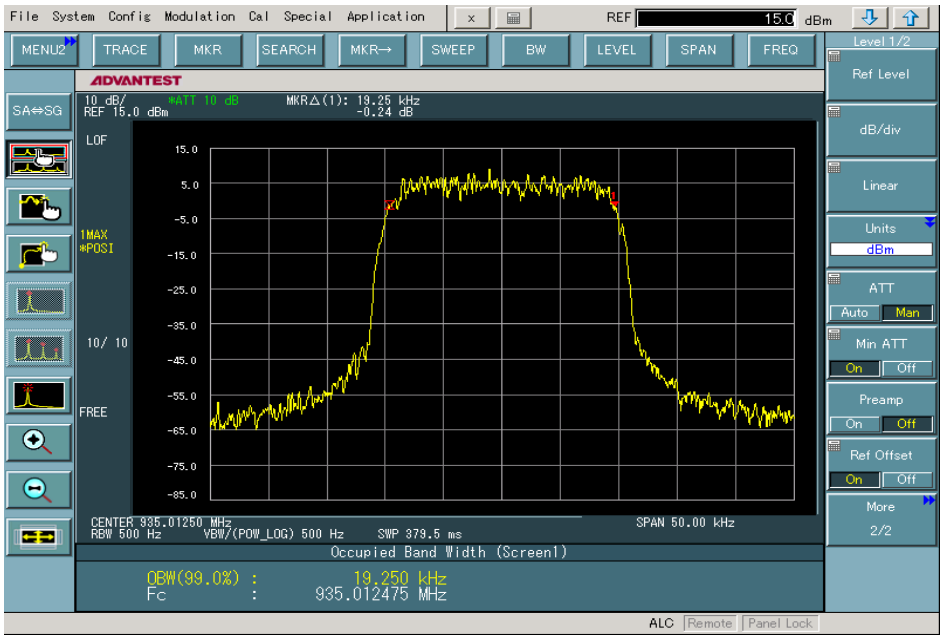
Plot 6. Occupied Bandwidth High CH Uplink

§ 2.1049 Plots of Occupied Bandwidth, IDEN900

(Input Signal)

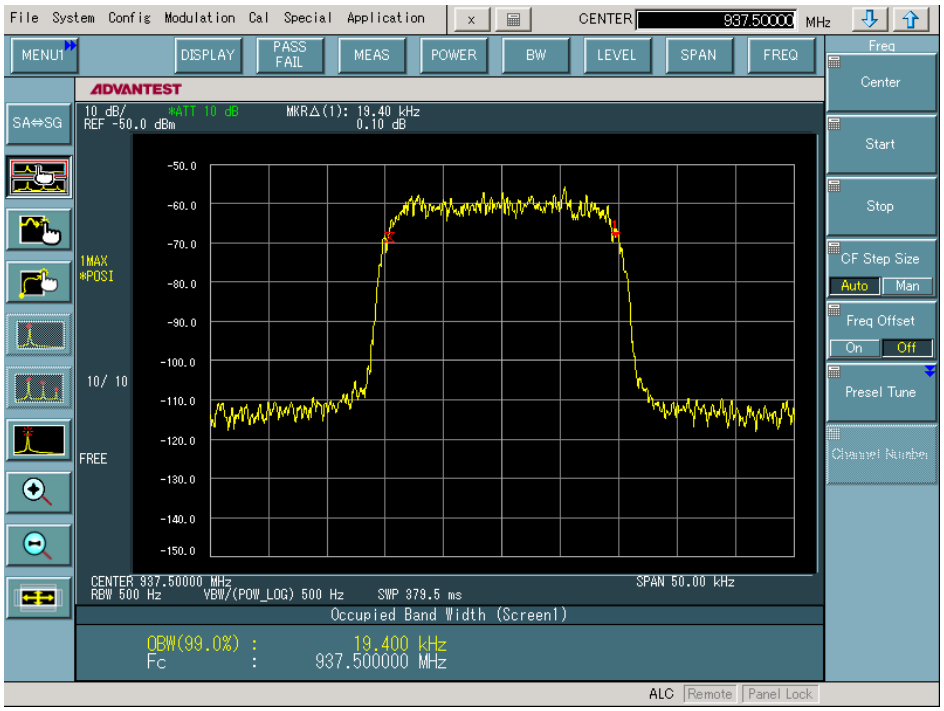


(Output Signal)

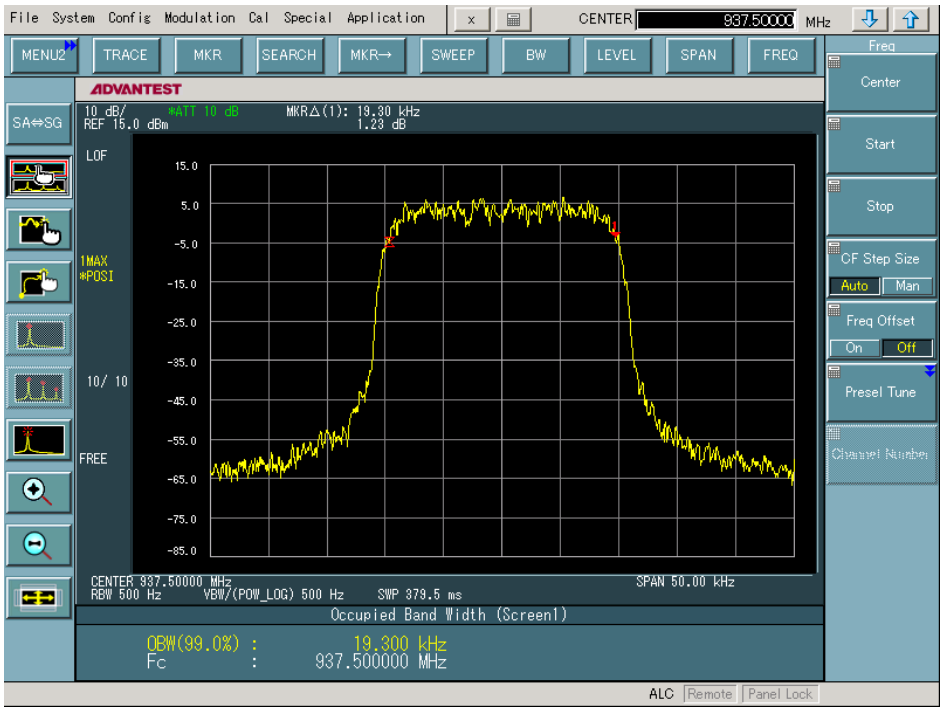


Plot 7. Occupied Bandwidth Low CH Downlink

(Input Signal)

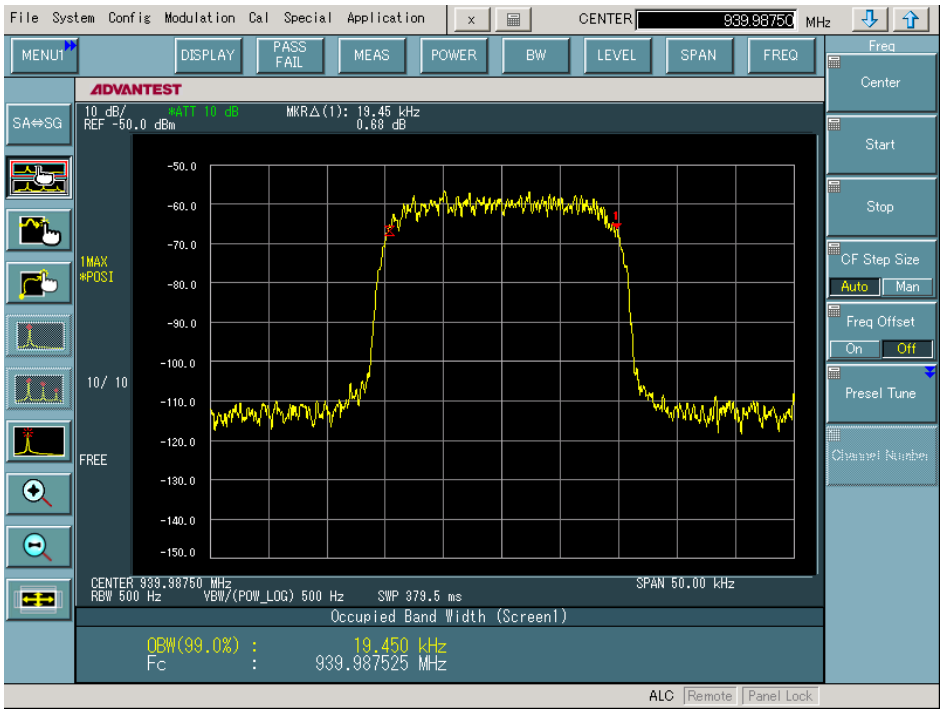


(Output Signal)

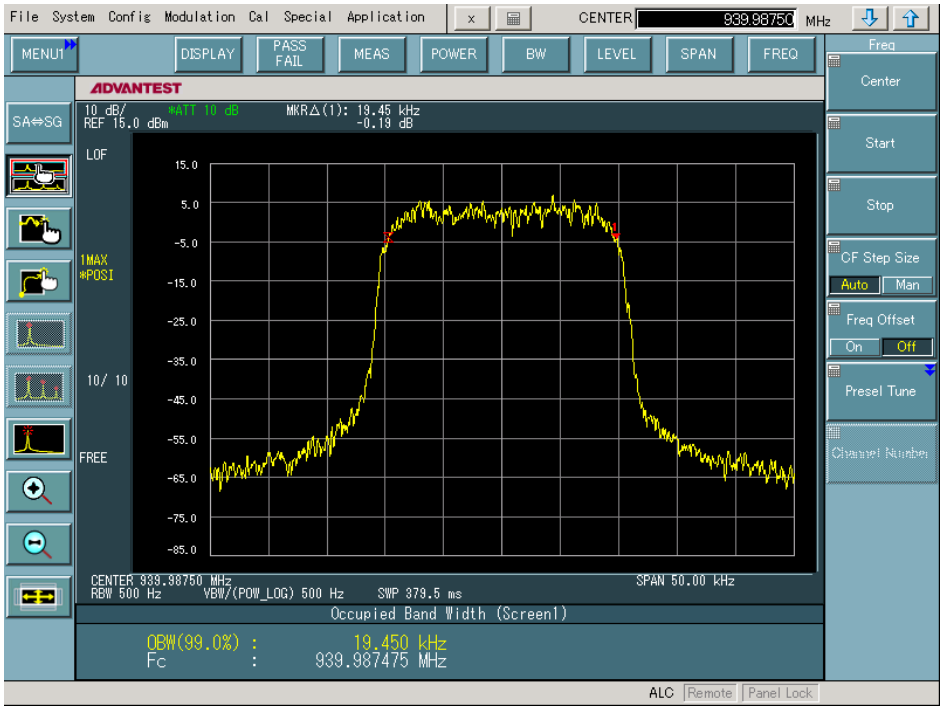


Plot 8. Occupied Bandwidth Mid CH Downlink

(Input Signal)

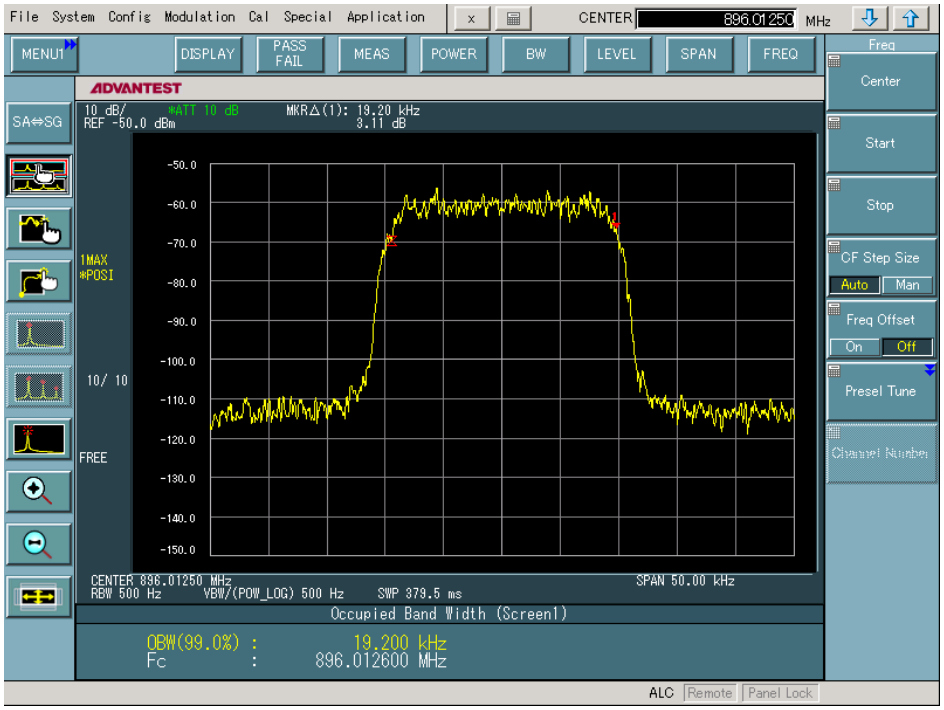


(Output Signal)

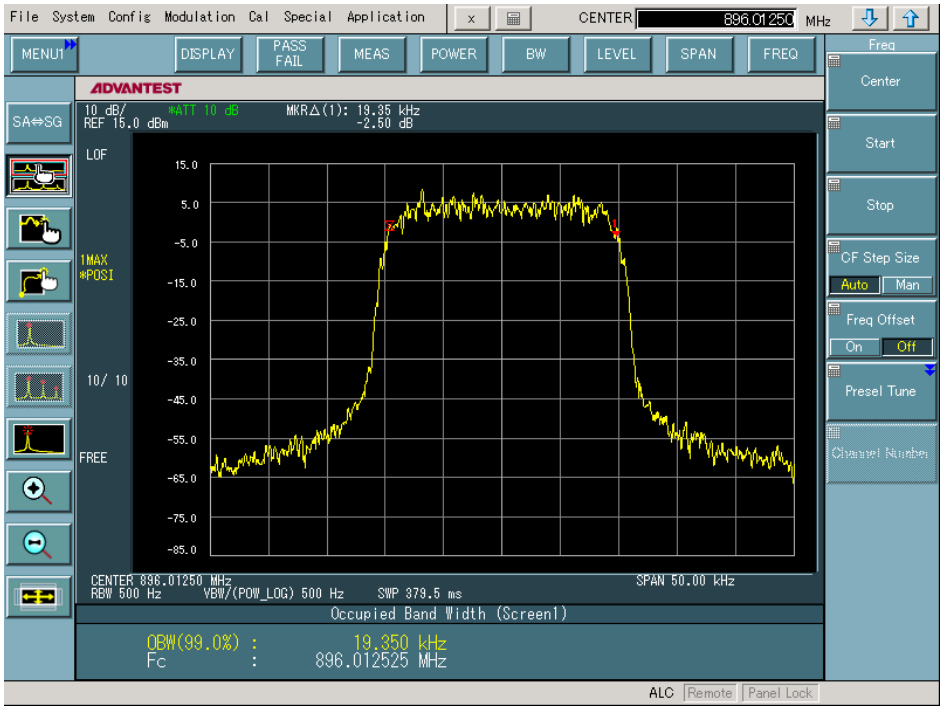


Plot 9. Occupied Bandwidth High CH Downlink

(Input Signal)

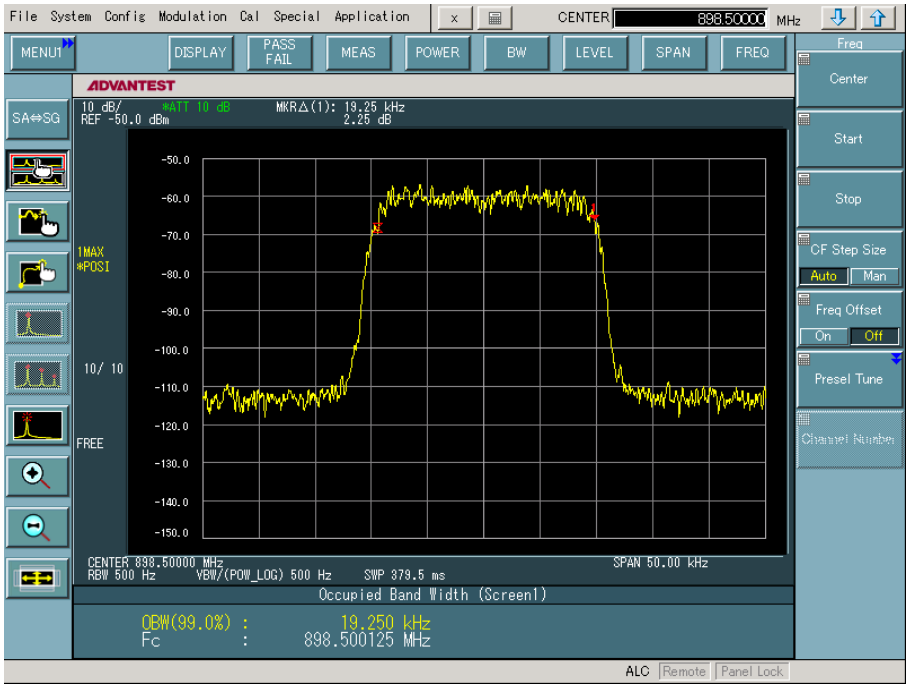


(Output Signal)

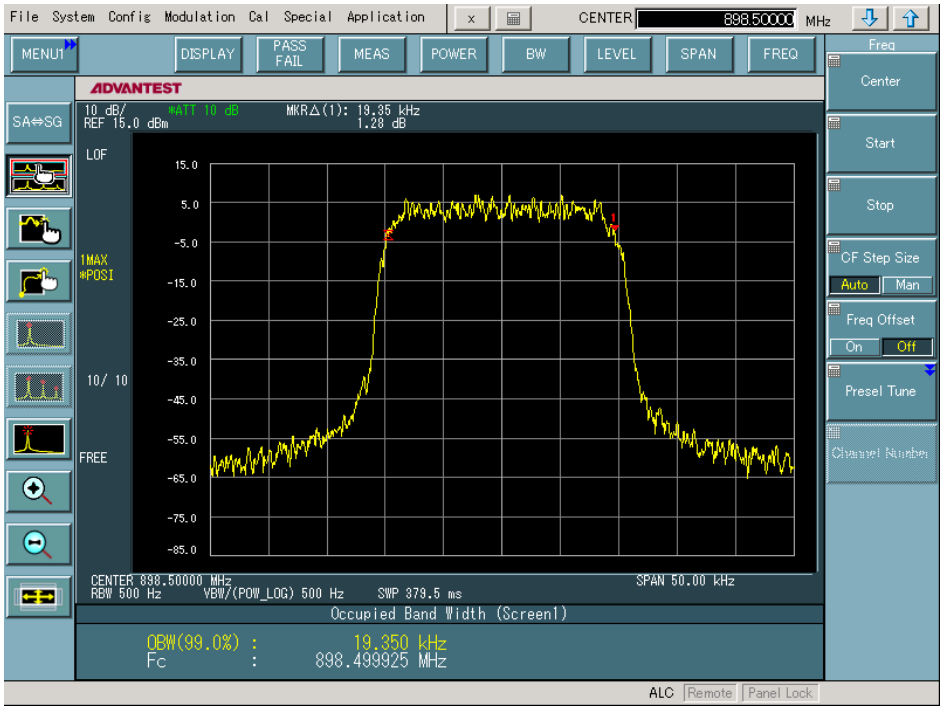


Plot 10. Occupied Bandwidth Low CH Upnlink

(Input Signal)

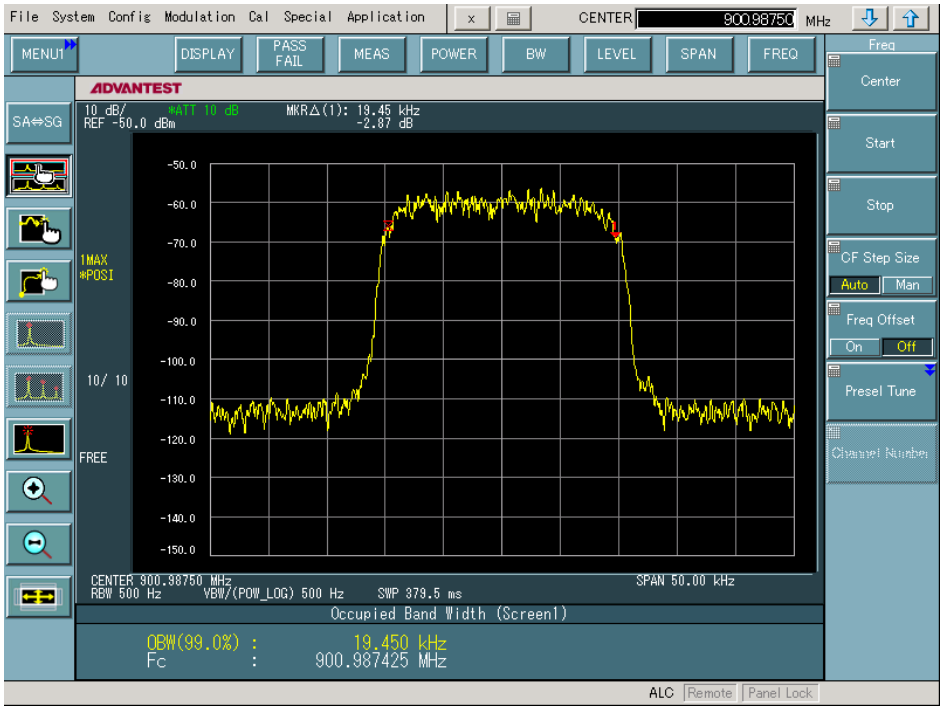


(Output Signal)

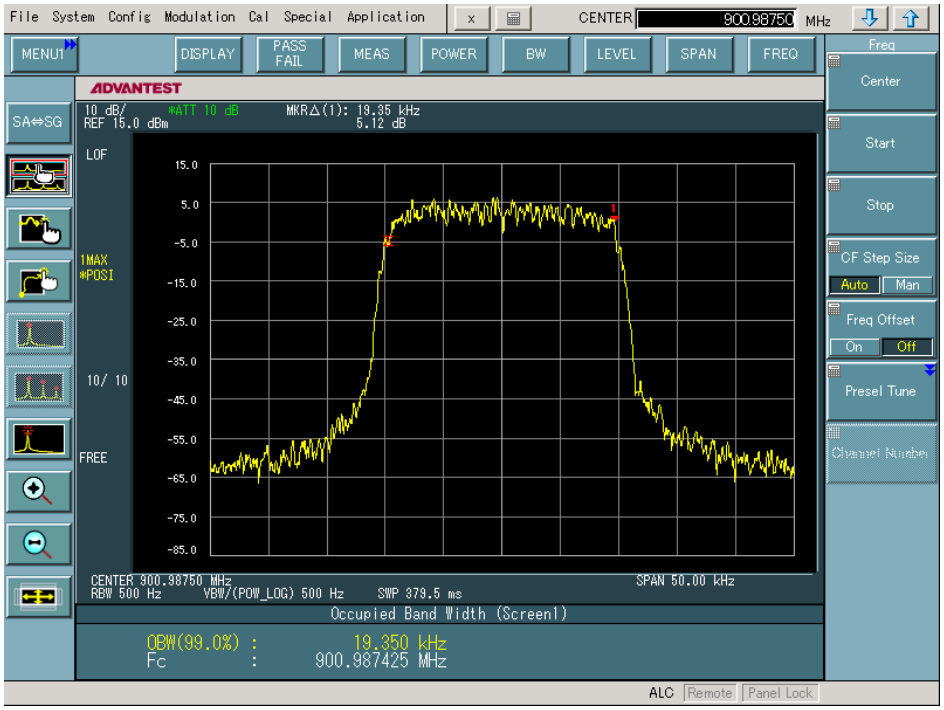


Plot 11. Occupied Bandwidth Mid CH Uplink

(Input Signal)



(Output Signal)



Plot 12. Occupied Bandwidth High CH Uplink

8. RADIATED SPURIOUS EMISSIONS

Test Requirement(s):

§ 2.1053 Measurements required: Field strength of spurious radiation.

§ 2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

§ 2.1053 (b): The measurements specified in paragraph (a) of this section shall be made for the Following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

§ 90.210 Emission limits: The rules in this section govern the spectral characteristics of emissions in the Radiotelephone Service. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) or 80 dB whichever is the lesser attenuation.

Test Procedures:

As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-B **(**NOVEMBER 2002)

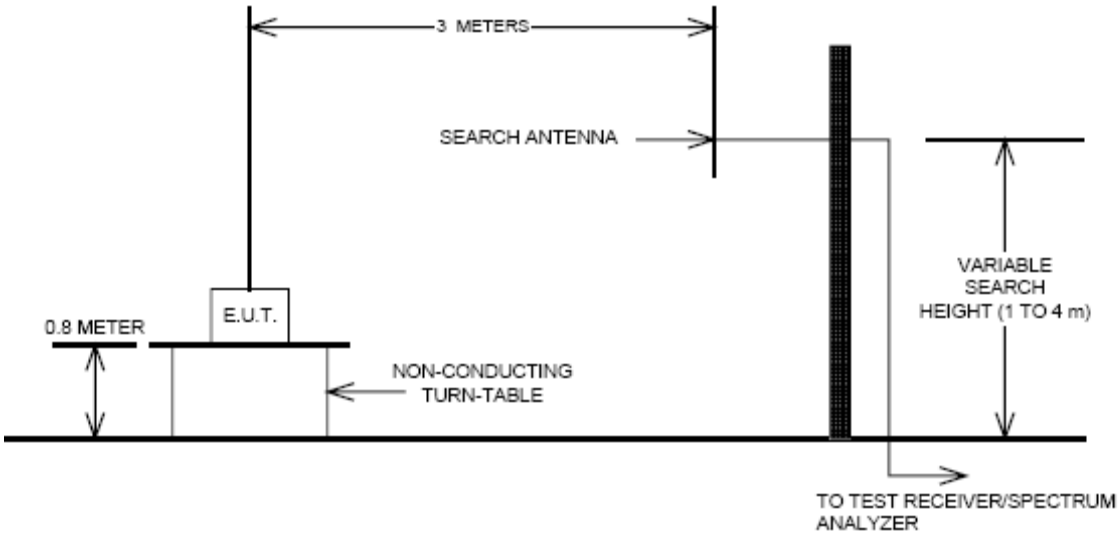
Radiated emission measurements were performed at an open Site.
The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360^{0} and the receiving antenna scanned from 1-4m in order to capture the maximum emission.
A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10_{th} or 40GHz, whichever was the lesser, were investigated.

Test Results:

There were no emissions detected above the noise floor which was at least 20 dB below the limit.

NOTE: The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

Radiated Spurious Emissions Test Setup



9. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Requirement(s):

§2.1051 Measurements required: Spurious emissions at antenna terminals: The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 90.210 Emission limits: The rules in this section govern the spectral characteristics of emissions in the Radiotelephone Service. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) or 80 dB whichever is the lesser attenuation.

Test Procedures:

A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level . A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured.
The spectrum analyzer were set to 100 KHz RBW, 300 KHz VBW.
The spectrum was investigated from 30 MHz to the 10_{th} harmonic of the carrier.

The inter-modulation requirements were performed in a similar manner as described above.
The spectrum analyzer was set to 100 KHz RBW and 300 KHz VBW. Two modulated carriers were injected into the EUT. The inband spurious emissions were investigated.

Test Results:

The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

NOTE: The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

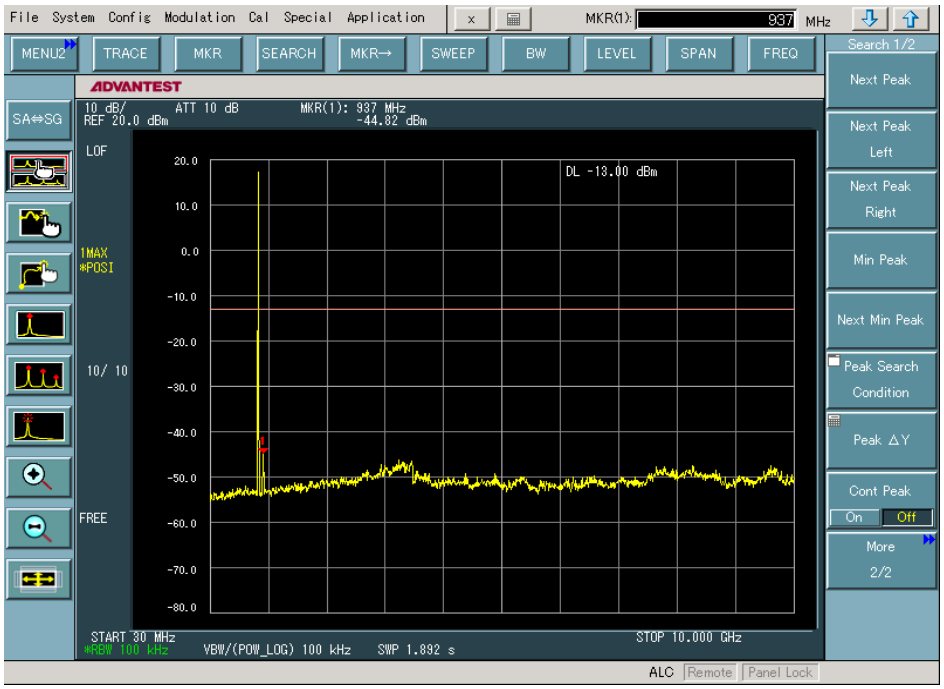
iDEN800 DownLink				
Conducted Spurious Emission				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	851.0125	-44.82	-13	31.82
Mid	858.6125	-45.49	-13	32.49
High	868.9875	-44.27	-13	31.27
Two Tone Intermodulation				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	851.0125	-40.76	-13	27.76
High	868.9875	-40.86	-13	27.86

iDEN800 UpLink				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	806.0125	-45.45	-13	32.45
Mid	813.6125	- 45.49	-13	32.49
High	823.9875	- 44.96	-13	31.96
Two Tone Intermodulation				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	806.0125	-40.23	-13	27.23
High	823.9875	- 40.76	-13	27.76

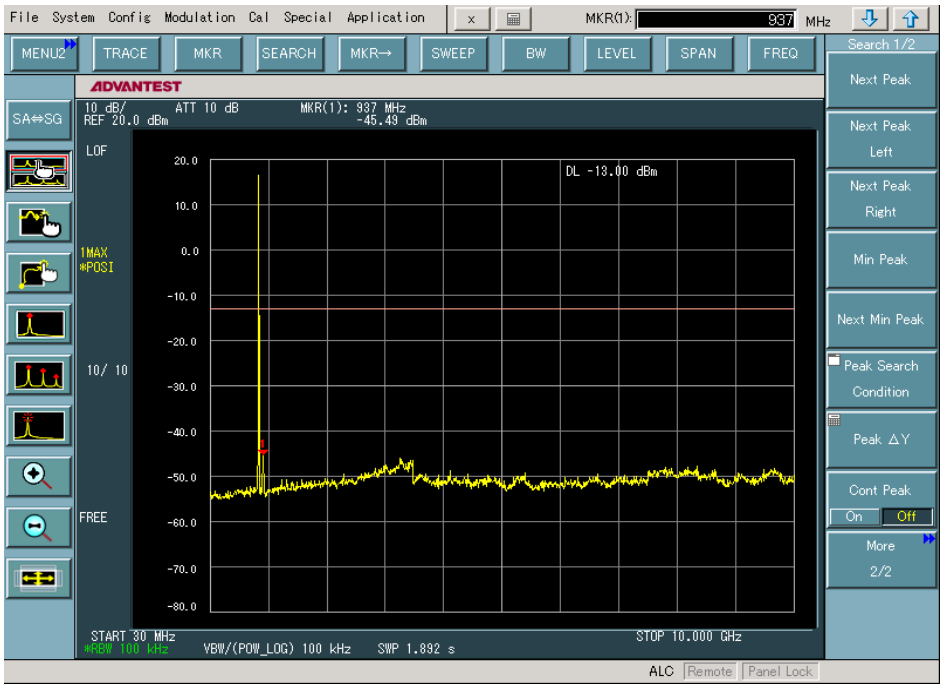
iDEN900 DownLink				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	935.0125	-44.10	-13	31.10
Mid	937.5000	- 43.59	-13	30.59
High	939.9875	- 44.45	-13	31.45
Two Tone Intermodulation				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	935.0125	- 40.52	-13	27.52
High	939.9875	- 40.35	-13	27.35

iDEN900 UpLink				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	896.0125	-43.24	-13	30.24
Mid	898.5000	- 42.48	-13	29.48
High	900.9875	- 43.89	-13	30.89
Two Tone Intermodulation				
Carrier Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	896.0125	- 41.75	-13	28.75
High	900.9875	- 40.84	-13	27.84

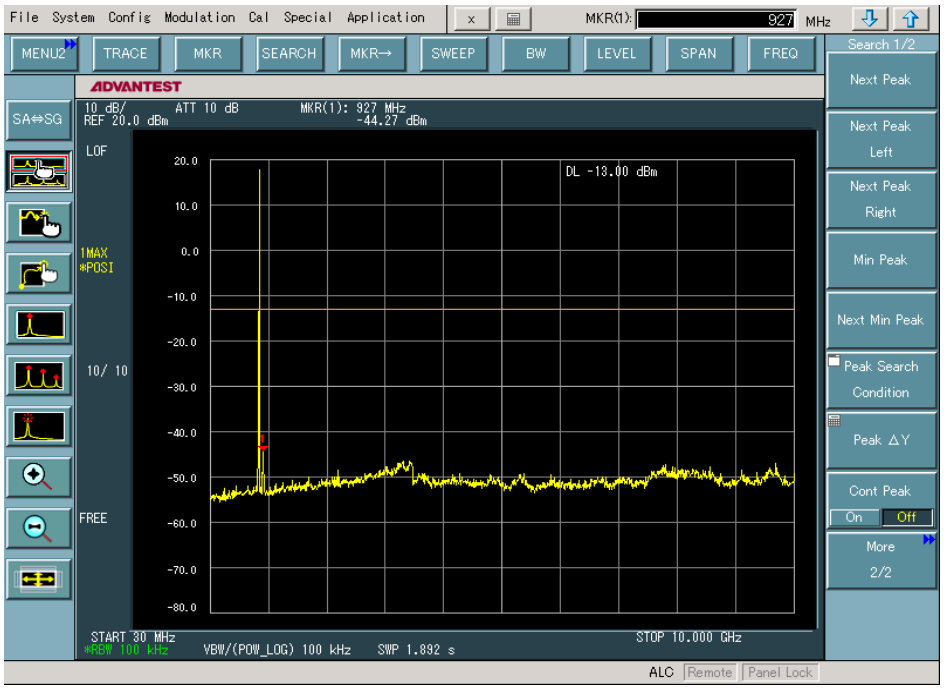
§ 2.1051 Spurious Emissions at Antenna Terminals, IDEN800



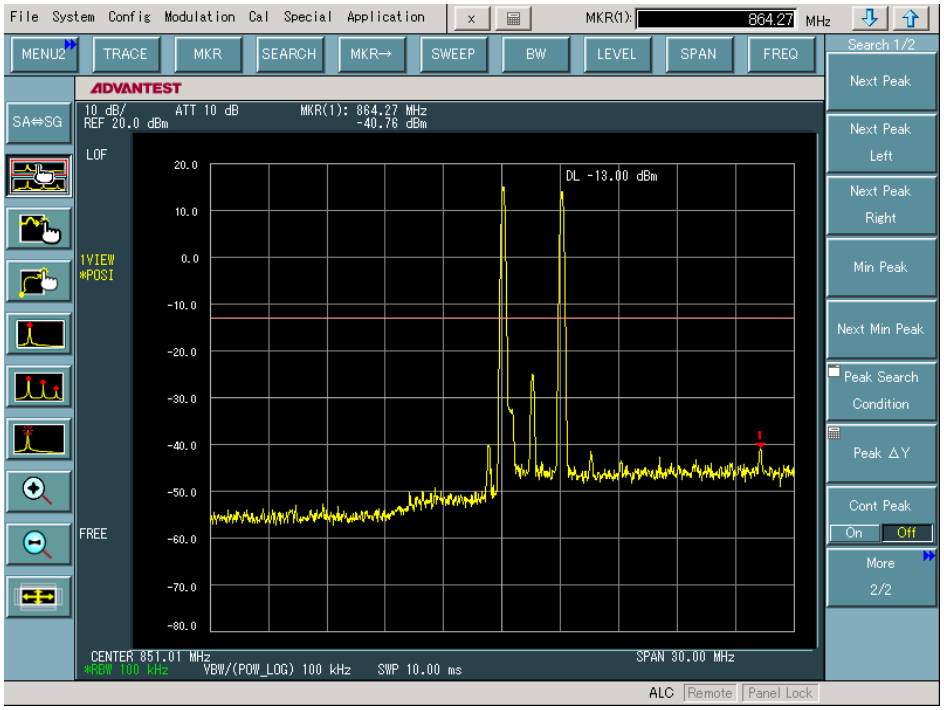
Plot 13. Conducted Spurious Emissions Downlink Low CH (30 MHz – 10 GHz)



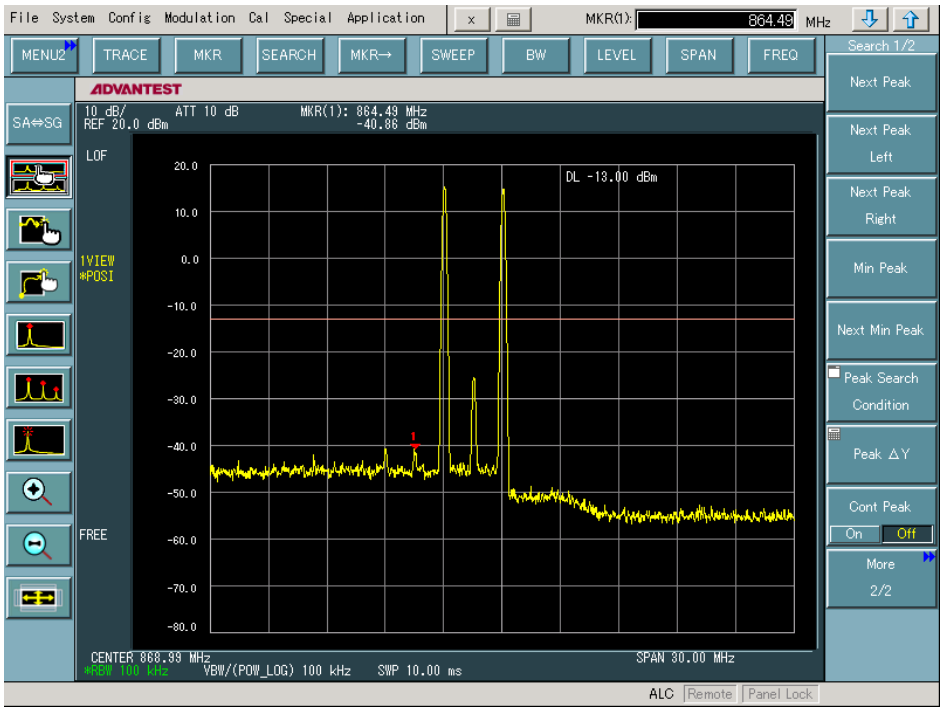
Plot 14. Conducted Spurious Emissions Downlink Mid CH (30 MHz – 10 GHz)



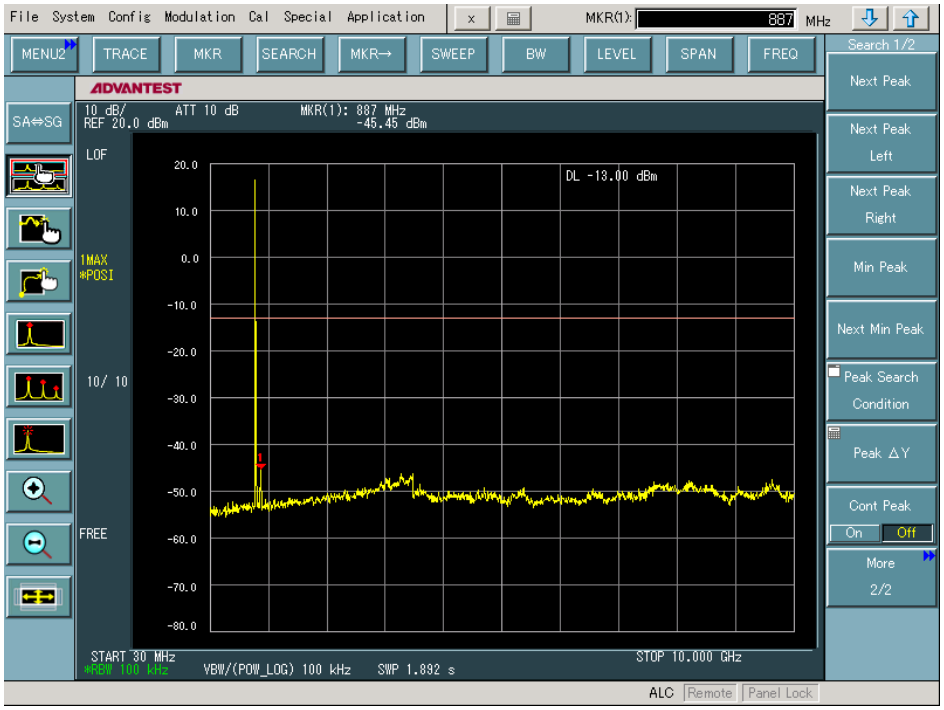
Plot 15. Conducted Spurious Emissions Downlink High CH (30 MHz – 10 GHz)



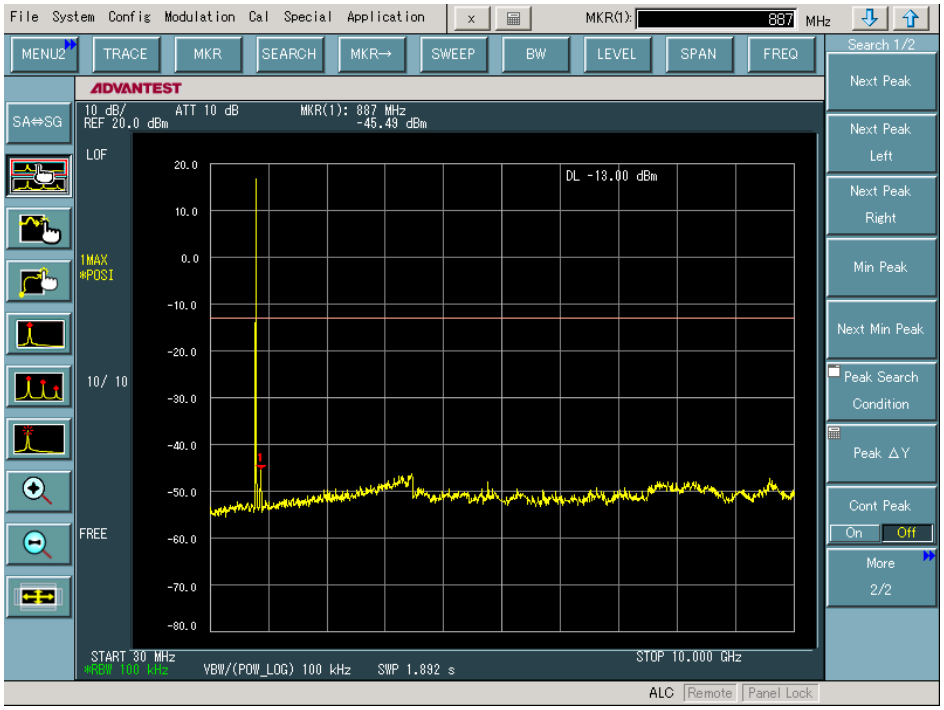
Plot 16. Conducted Spurious Emissions Uplink Low CH (30 MHz – 10 GHz)



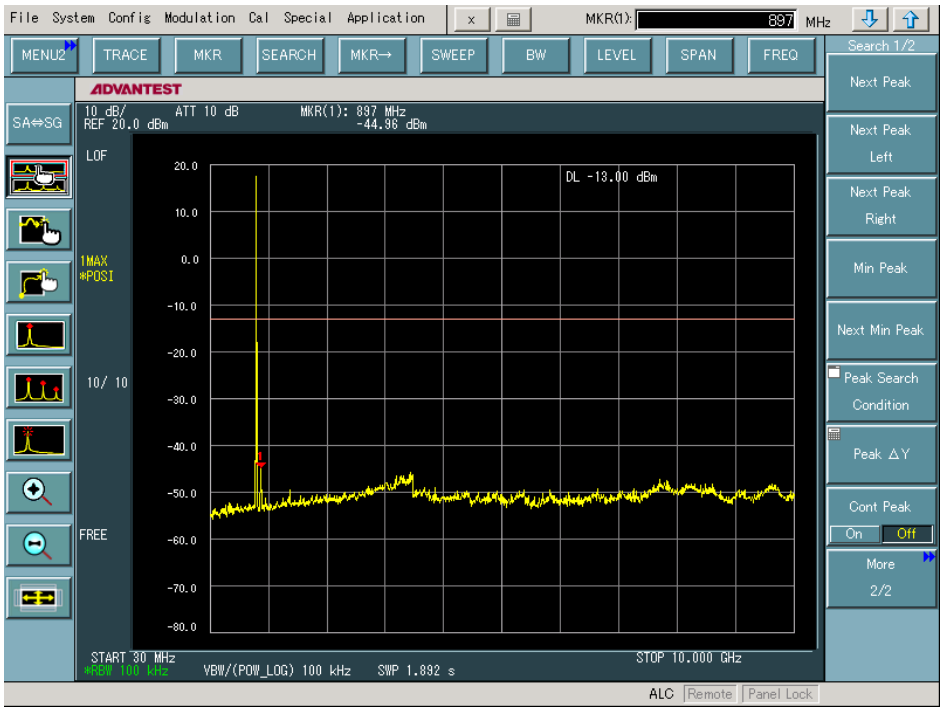
Plot 17. Conducted Spurious Emissions Uplink Mid CH (30 MHz – 10 GHz)



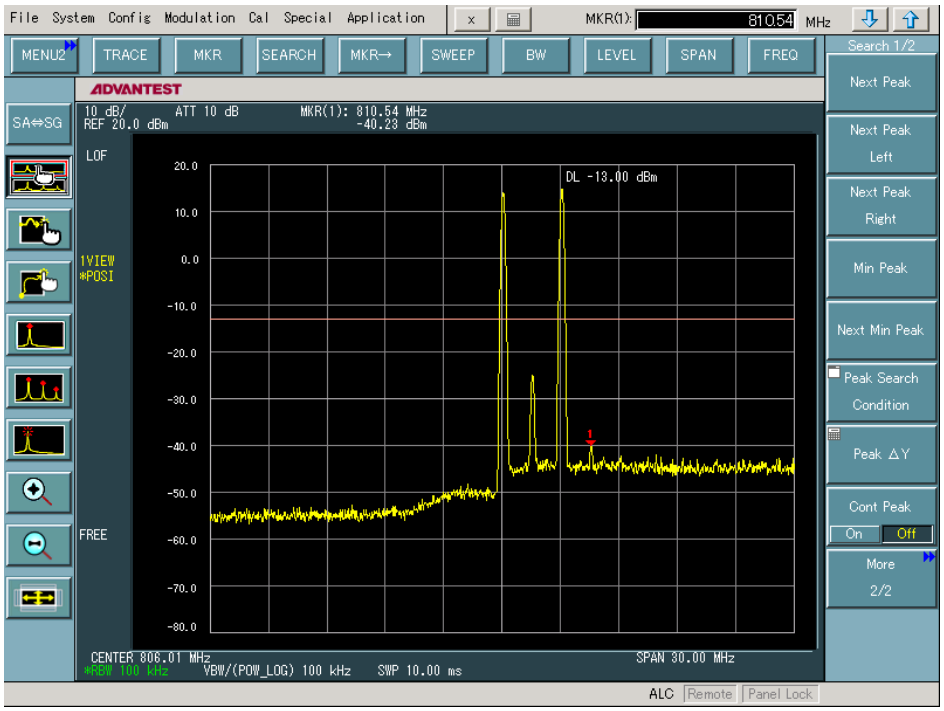
Plot 18. Conducted Spurious Emissions Uplink High CH (30 MHz – 10 GHz)



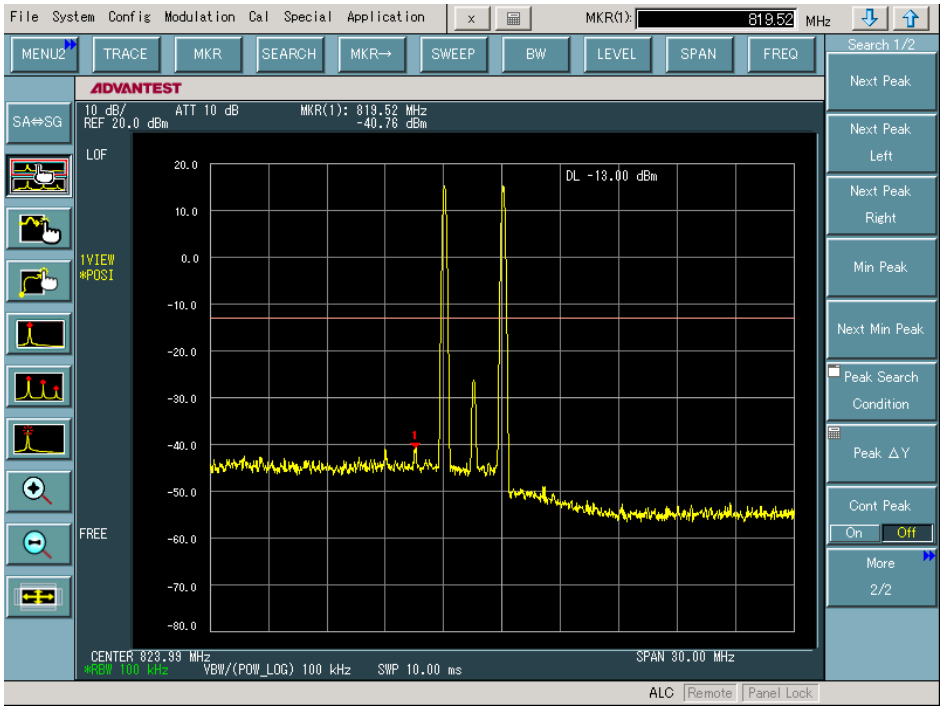
Plot 19. Two Tone Downlink Low End Intermodulation



Plot 20. Two Tone Downlink Hi End Intermodulation

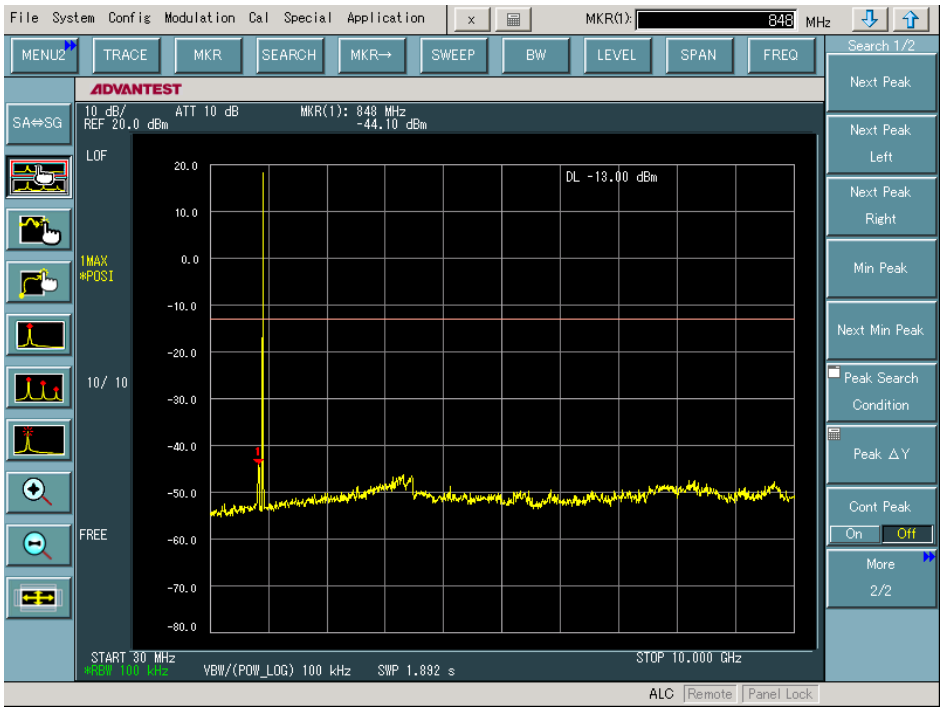


Plot 21. Two Tone Uplink Low End Intermodulation

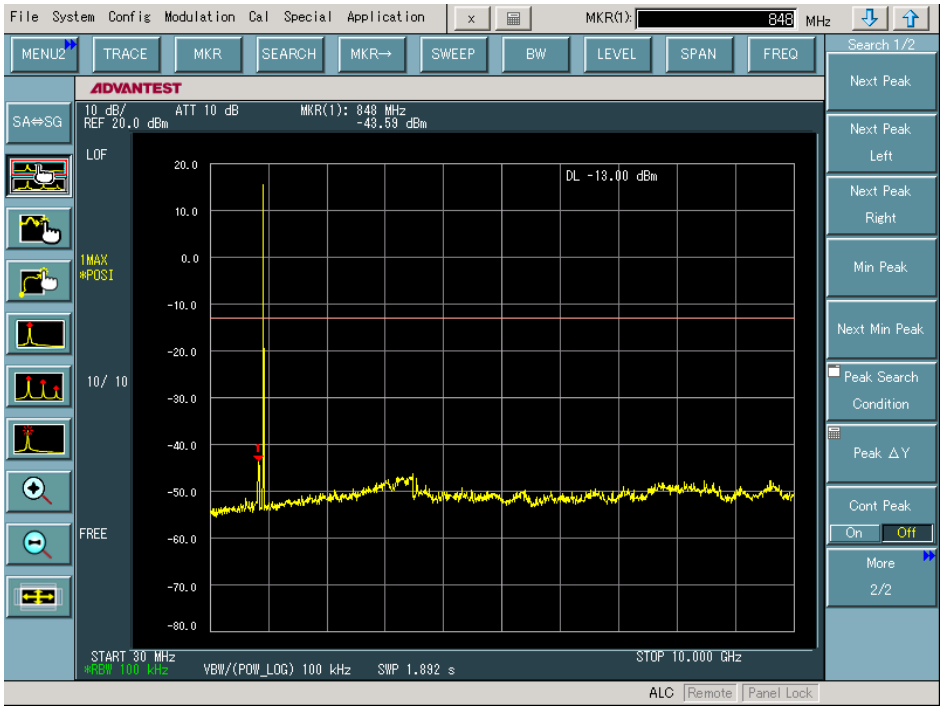


Plot 22. Two Tone Uplink Hi End Intermodulation

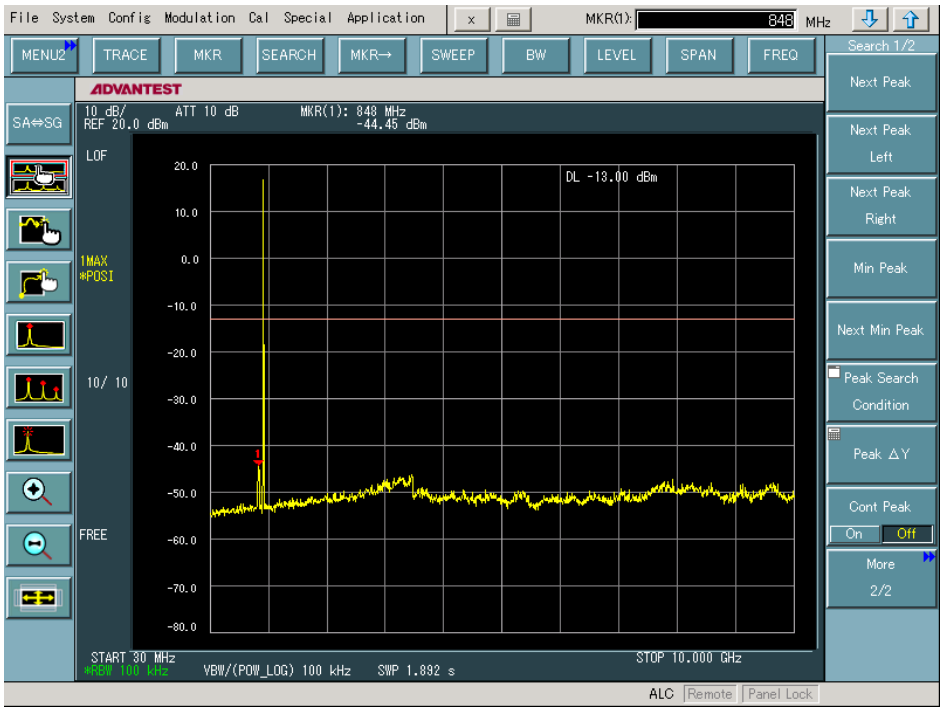
§ 2.1051 Spurious Emissions at Antenna Terminals, IDEN900



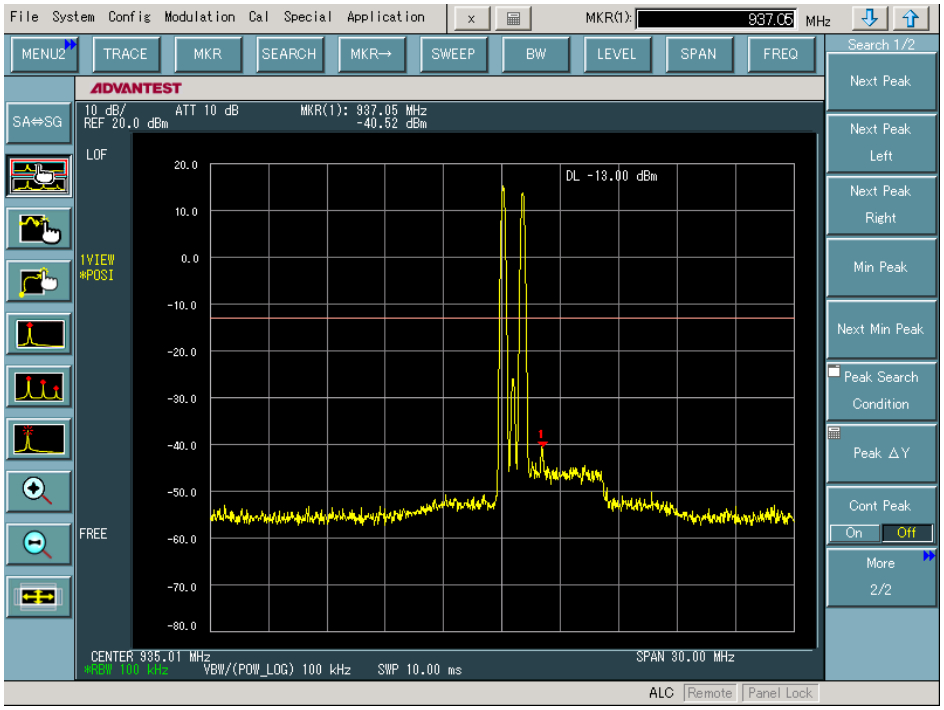
Plot 23. Conducted Spurious Emissions Downlink Low CH (30 MHz – 10 GHz)



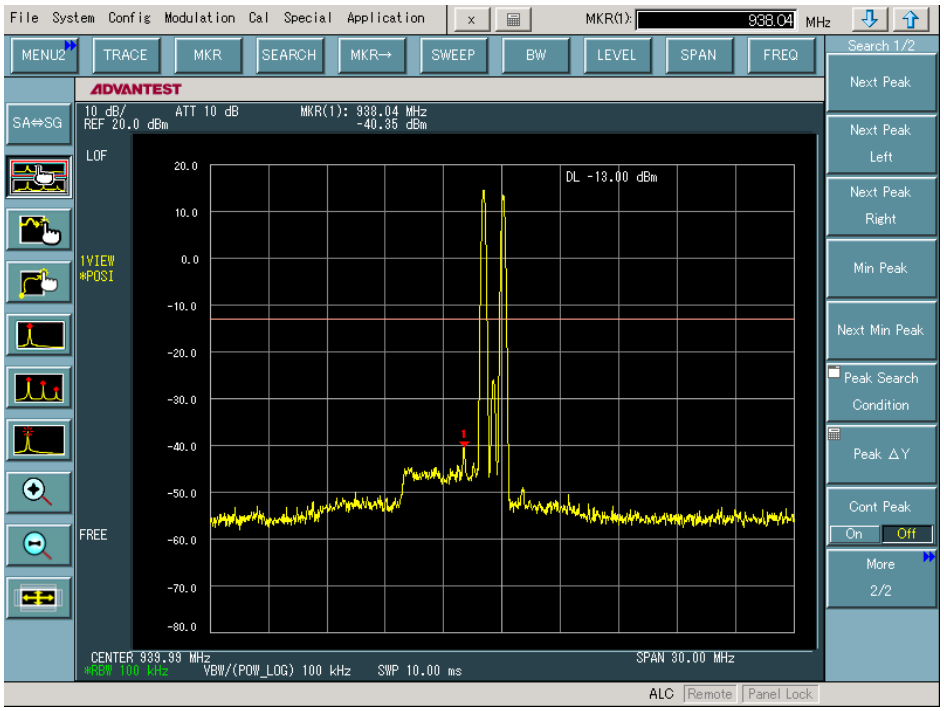
Plot 24. Conducted Spurious Emissions Downlink Mid CH (30 MHz – 10 GHz)



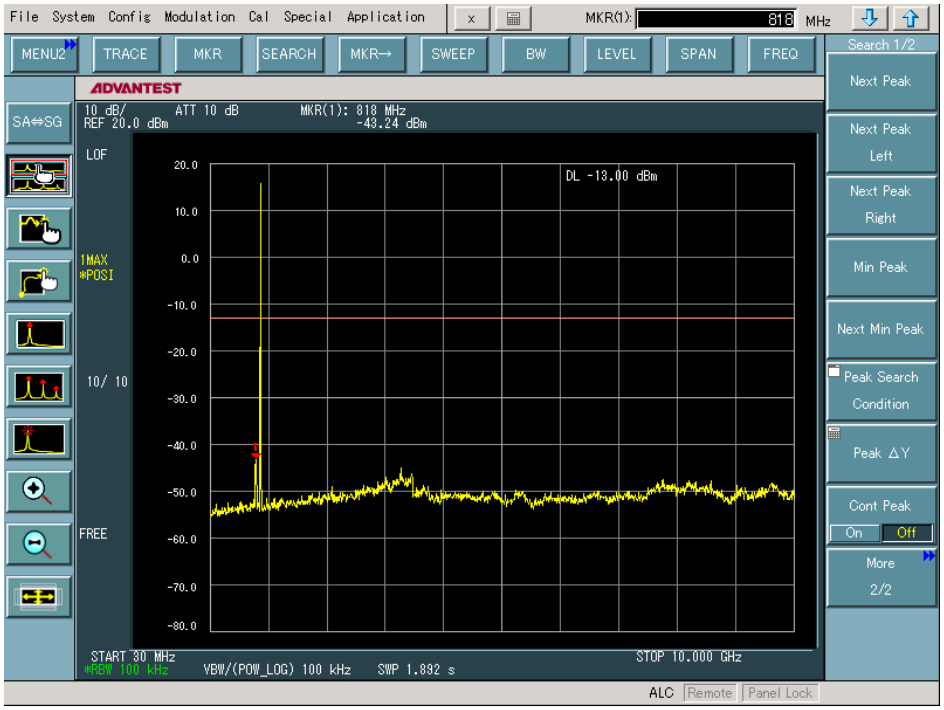
Plot 25. Conducted Spurious Emissions Downlink High CH (30 MHz – 10 GHz)



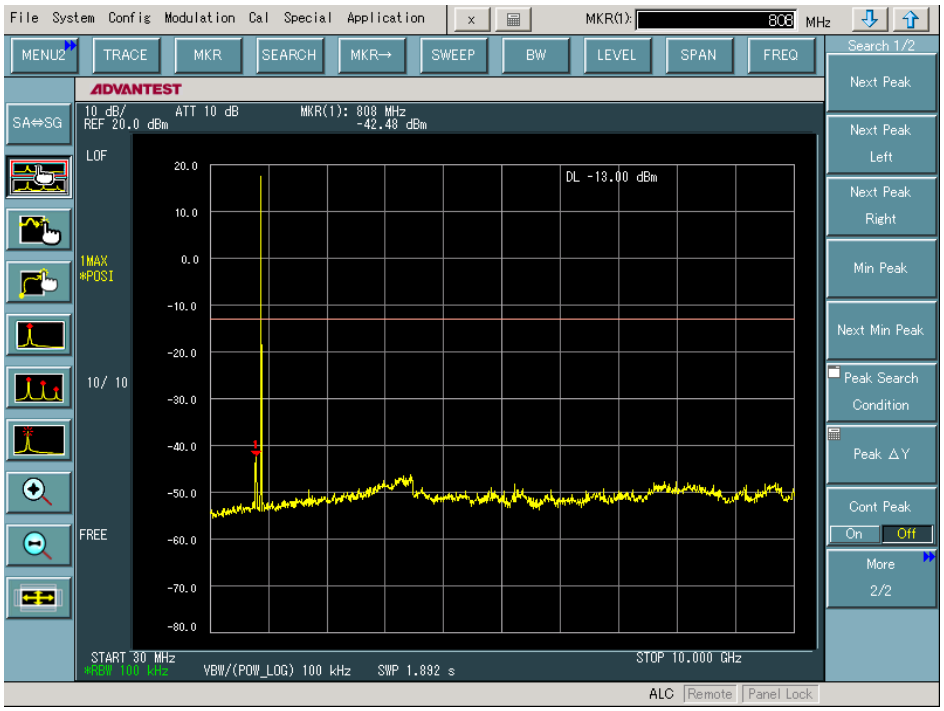
Plot 26. Conducted Spurious Emissions Uplink Low CH (30 MHz – 10 GHz)



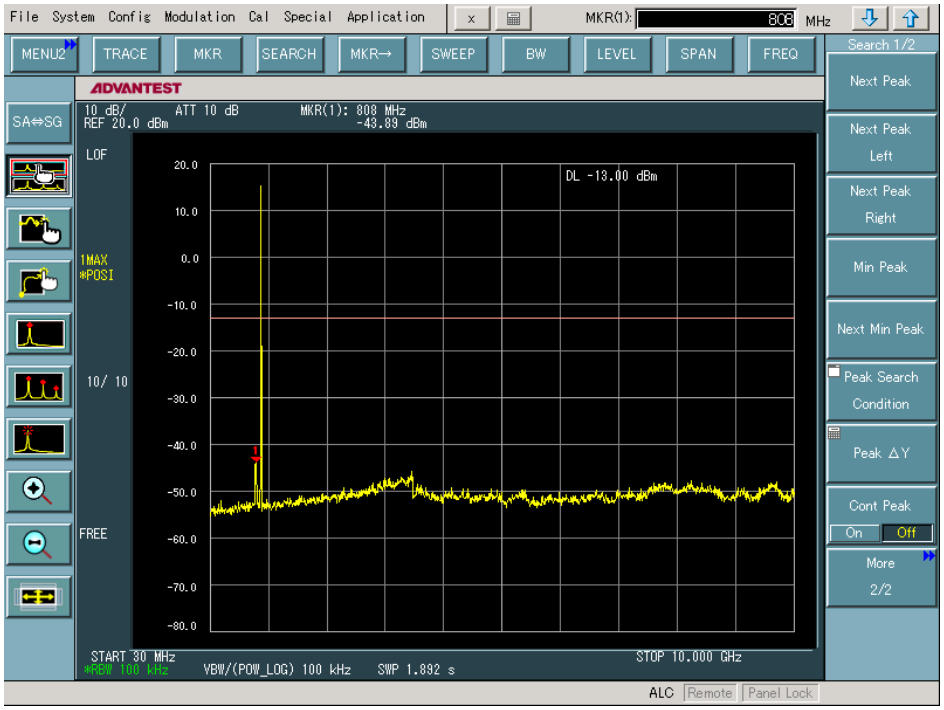
Plot 27. Conducted Spurious Emissions Uplink Mid CH (30 MHz – 10 GHz)



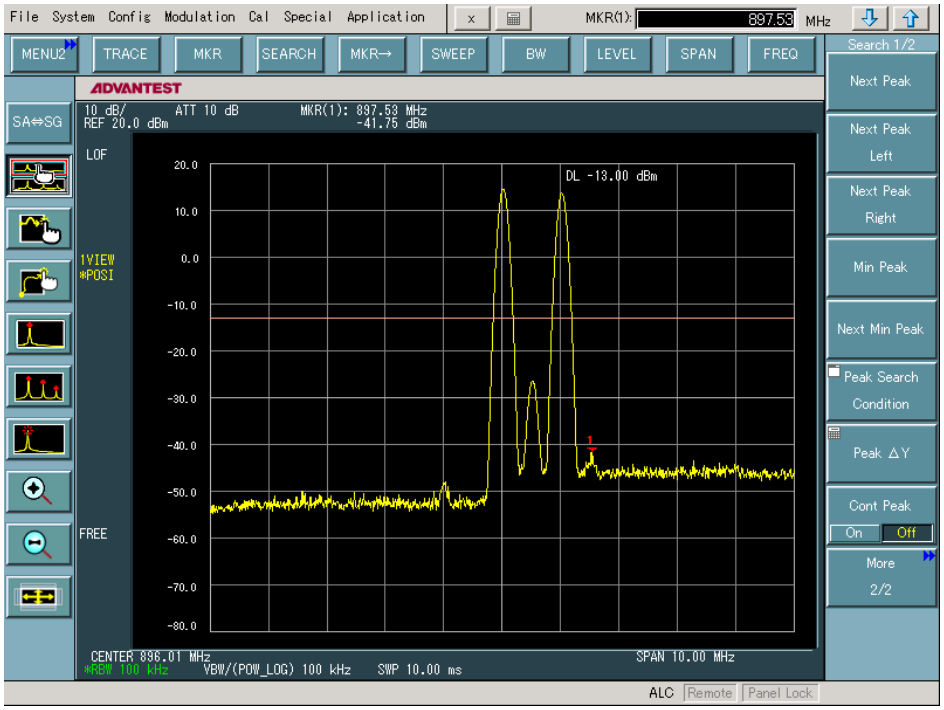
Plot 28. Conducted Spurious Emissions Uplink High CH (30 MHz – 10 GHz)



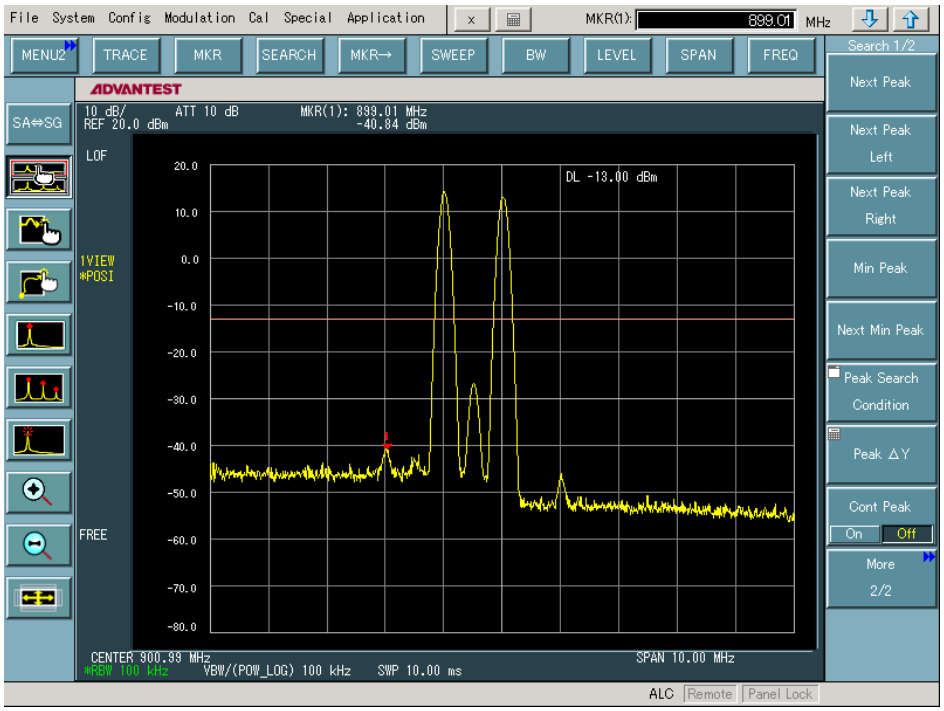
Plot 29. Two Tone Downlink Low End Intermodulation



Plot 30. Two Tone Downlink Hi End Intermodulation



Plot 29. Two Tone Uplink Low End Intermodulation



Plot 30. Two Tone Uplink Hi End Intermodulation

10. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

Test Requirement(s):

§2.1055(a)(1) §90.213

Test Procedures:

As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Spectrum Analyzer.

The EUT was placed in the Environmental Chamber.

A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations.

The frequency drift was investigated for every 10 ℃ increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50 ℃.

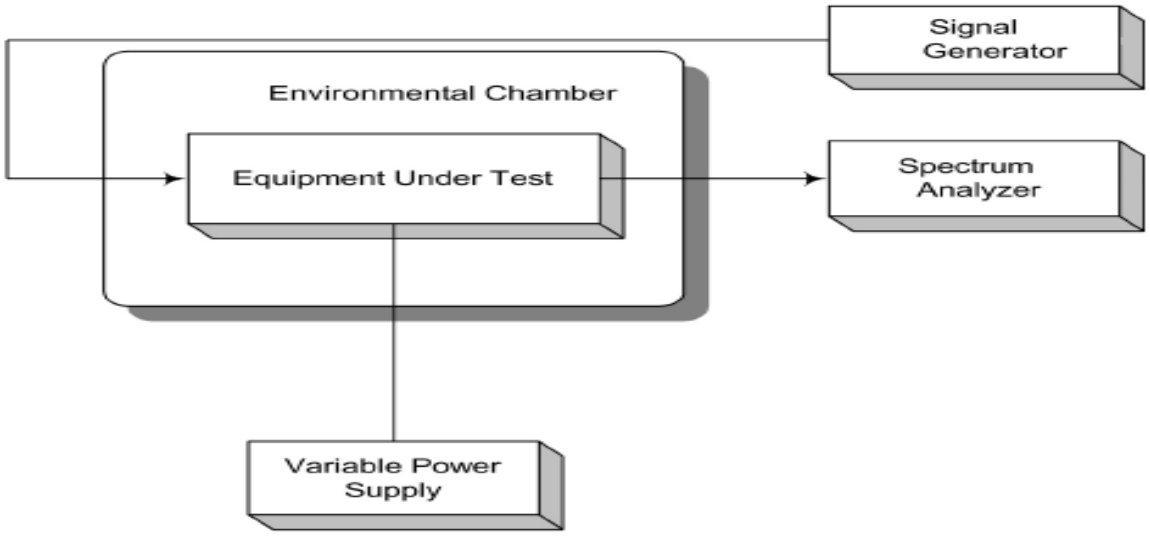
Voltage supplied to EUT is 120 Vac reference temperature was done at 20℃. The voltage was varied by ± 15 % of nominal

Test Results:

The E.U.T was found in compliance for Frequency Stability and Voltage Test

NOTE: The EUT is a band selective repeater. The test was performed using all selective bands and there was not much difference between them. The test result is reported using the widest bands.

Test Setup:



Frequency Stability and Voltage Test Results

Reference: 120 Vac at 20°c **Freq.** = 813.612487 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift ppm
50	813.612478	-0.000009
40	813.612481	-0.000006
30	813.612488	0.000001
20	Reference	
10	813.612491	0.000004
0	813.612493	0.000006
-10	813.612497	0.000010
-20	813.612501	0.000014
-30	813.612509	0.000022

Reference: 120 Vac at 20°c **Freq.** = 813.612487 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	813.612480	-0.000007
138	813.612499	0.000012

Uplink Mid CH, iDEN 800

Reference: 120 Vac at 20°C **Freq.** = 858.612486 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift Ppm
50	858.612499	0.000013
40	858.612491	0.000005
30	858.612489	0.000003
20	Reference	
10	858.612493	0.000007
0	858.612485	0.000001
-10	858.612483	-0.000003
-20	858.612480	-0.000006
-30	858.612471	-0.000015

Reference: 120 Vac at 20°C **Freq. =** 858.612486 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	858.612485	-0.000001
138	858.612489	0.000002

Downlink Mid CH, iDEN 800

Reference: 120 Vac at 20°c **Freq.** = 898.499990 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift Ppm
50	898.499981	-0.000009
40	898.499985	-0.000005
30	898.499988	-0.000002
20	Reference	
10	898.499980	-0.000010
0	898.499978	-0.000012
-10	898.499975	-0.000015
-20	898.499970	-0.000020
-30	898.499969	-0.000021

Reference: 120Vac at 20°c **Freq.** = 898.499990 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	898.499987	-0.000003
138	898.499993	0.000003

Uplink Mid CH, iDEN 900

Reference: 120 Vac at 20°C **Freq.** = 937.499985 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift Ppm
50	937.499990	0.000005
40	937.499987	0.000002
30	937.499983	-0.000002
20	Reference	
10	937.499980	-0.000005
0	937.499976	-0.000009
-10	937.499975	-0.000010
-20	937.499970	-0.000015
-30	937.499967	-0.000018

Reference: 120Vac at 20°c **Freq.** = 937.499985 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (Hz)
102	937.499990	0.000005
138	937.499997	0.000007

Downlink Mid CH, iDEN 900