



FCC TEST REPORT

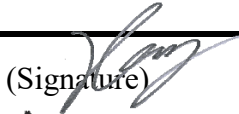
Product Name	Repeater
Model Name	CS40-734834-00D-A0
Applicant	Westell, Inc.
FCC ID	NVRDPSA81090-78

ESTECH CO., LTD

Rm. 1015 World Venture Center, 426-5 Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea. Tel:82-2-867-3201, Fax:82-2-867-3204



FCC Test Report

Report Number	ESTRFC2012-004			
Applicant	Company Name	Westell, Inc.		
	Address	750 North Commons Drive, Aurora, IL 60504, United States		
Product	Product Name	Repeater		
	Model No.	CS40-734834-00D-A0	Manufacturer	Innertron, Inc,
	Serial No.	Non	Country of origin	Republic of Korea
Other	Issued Date	2020-12-18	Tested Date	2020-10-19~ 2020-11-17
Test Result	Pass			
Standard	FCC PART 20			
Tested by	Engineering Manager I.K. Hong		(Signature) 	
Approved by	Engineering manager Keum-Bum Lee		(Signature) 	
ESTECH CO., LTD				
Rm. 1015 World Venture Center, 426-5 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea. Tel:82-2-867-3201, Fax:82-2-867-3204				
o This is certified that the above mentioned products have been tested for the sample provided by client.				
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1. General Information

1.1 EUT Description

FCC ID	NVRDPSA81090-78
Product Name	Repeater
Model Name	CS40-734834-00D-A0
Frequency	Uplink : 817 ~ 824 MHz , Downlink : 862~ 869 MHz
Power Rating	Input: 120VAC 60Hz
conducted output power	Downlink : 34 dBm , Uplink : 27 dBm
Gain	Downlink : 90 dB , Uplink : 80 dB
Antenna Gain	698 ~ 800 MHz : 7.5 dBi 800 ~ 960 MHz : 8.5 dBi

1.2 EUT Operating mode

The following Modulations were used during the tests:

AWGN : Broadband modulation an occupied bandwidth (OBW) of 4.1 MHz. This is representative of a 5 MHz LTE channel.

CW : No Modulation.

MSK : Narrowband MSK modulation.

2. Laboratory Information

2.1 Laboratory Name Estech Co., Ltd.

2.2 Location

Head Office Rm. 1015, World Venture Center II, 426-5 Gasan-dong
 Geumcheon-gu, Seoul, 153-803. Korea.

EMC Lab(Yanggi) 347-69, Jungbu-daero 147beon-gil, Majang-myeon, Icheon-si,
 Gyeonggi-do 467-811, R. O. Korea

2.3 Major Accredited Mark



3. Summary of Test Results

Test Item	Standard	Result
AGC threshold	935210 D05 3.2	PASS
Out of Band Rejection	935210 D05 3.3	PASS
Input vs Output Signal Comparison	935210 D05 3.4	PASS
Input/output power and amplifier gain	935210 D05 3.5	PASS
Out-of-band/out-of-block emissions conducted measurements	935210 D05 3.7.2	PASS
EUT spurious emissions conducted measurements	935210 D05 3.7.3	PASS
Frequency stability measurements	935210 D05 3.7	N/A* ¹
Spurious emissions radiated measurements	935210 D05 3.8	PASS

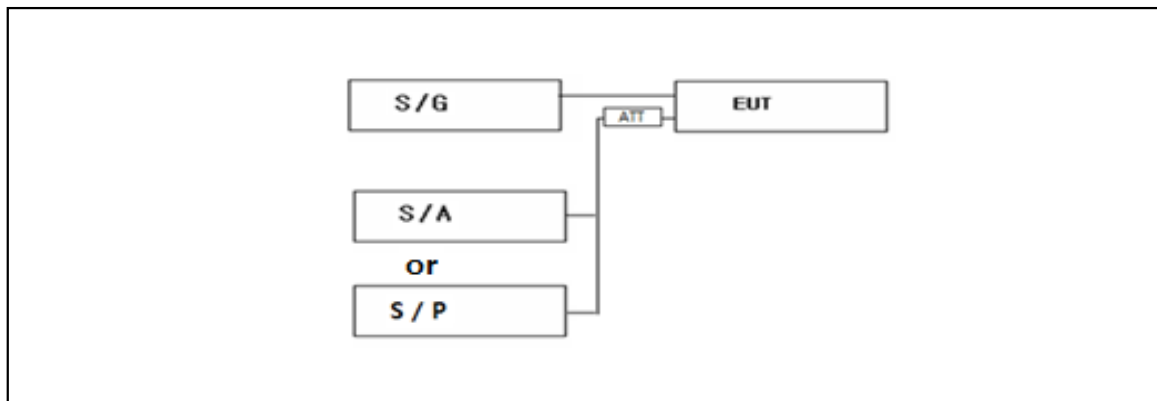
*¹: Test not required since the amplifier, repeater does not alter the input signal in any way

4. AGC threshold

4.1 Test Procedure according to KDB935210 D5 3.2

- a) Connect a signal generator to the input of the EUT.
- b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
- c) The signal generator should initially be configured to produce either of the required test signals (i.e., broadband or narrowband).
- d) Set the signal generator frequency to the center frequency of the EUT operating band.
- e) While monitoring the output power of the EUT, measured using the methods of 3.5.3 or 3.5.4, increase the input level until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
- f) Record this level as the AGC threshold level.
- g) Repeat the procedure with the remaining test signal.

Test setup for RF Conducted measurement



4.2 Test Equipments

The following test equipments are used during tests

Equipment	Manufacturer	Model	Next Cal.
Spectrum Analyzer	Agilent	E4440A	2020-12-02
Signal Generator	E4438C	MY42081204	2020-12-03
Signal Generator	E4432B	GB40050840	2020-12-03
Attenuator	SRT	F04-K1830-01	2020-12-03
Attenuator	Bird Electronic Corp	100-SA-MFN-30	2020-12-03
Power Meter	Agilent	N1912A	2020-12-02
Power Sensor	Agilent	A1921A	2020-12-02

4.3 Test Results : Pass

Uplink

Freq (MHz)	Modulation	Input Level (dBm)	Output (dBm)	Gain (dB)
820.5	MSK	-55.0	25.2	80.2
820.5	MSK	-54.0	24.8	78.8
820.5	MSK	-53.0	27.0	80.0
820.5	MSK	-52.0	26.9	78.9
820.5	MSK	-51.0	26.8	77.8

Uplink

Freq (MHz)	Modulation	Input Level (dBm)	Output (dBm)	Gain (dB)
820.5	AWGN	-55.0	25.3	80.3
820.5	AWGN	-54.0	24.9	78.9
820.5	AWGN	-53.0	27.0	80.0
820.5	AWGN	-52.0	26.9	78.9
820.5	AWGN	-51.0	27.0	78.0

Downlink

Freq (MHz)	Modulation	Input Level (dBm)	Output (dBm)	Gain (dB)
865.5	MSK	-58.0	32.0	90.0
865.5	MSK	-57.0	32.9	89.9
865.5	MSK	-56.0	34.0	90.0
865.5	MSK	-55.0	33.8	88.8
865.5	MSK	-54.0	33.9	87.9

Downlink

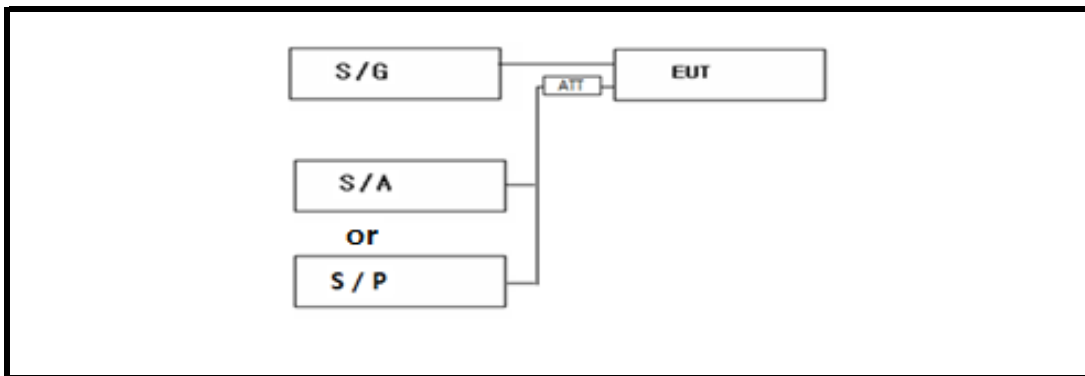
Freq (MHz)	Modulation	Input Level (dBm)	Output (dBm)	Gain (dB)
865.5	AWGN	-58.0	31.8	89.8
865.5	AWGN	-57.0	32.8	89.8
865.5	AWGN	-56.0	34.0	90.0
865.5	AWGN	-55.0	33.9	88.9
865.5	AWGN	-54.0	33.9	87.9

5. Out of Band Rejection

5.1 Test Procedure according to KDB935210 D5 3.3

- a) Connect a signal generator to the input of the EUT.
- b) Configure a swept CW signal with the following parameters:
 - 1) Frequency range = $\pm 250\%$ of the passband, for each applicable CMRS band (see also KDB Publication 935210 D02 [R7] and KDB Publication 634817 [R5] about selection of frequencies for testing and for grant listings).
 - 2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.
 - 3) Dwell time = approximately 10 ms.
 - 4) Number of points = $\text{SPAN}/(\text{RBW}/2)$.
- c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.
- e) Set the resolution bandwidth (RBW) of the spectrum analyzer to be 1 % to 5 % of the EUT passband, and the video bandwidth (VBW) shall be set to $\geq 3 \times \text{RBW}$.
- f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.
- g) Place a marker to the peak of the frequency response and record this frequency as f_0 .
- h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the -20 dB down amplitude, to determine the 20 dB bandwidth.

Test setup for RF Conducted measurement



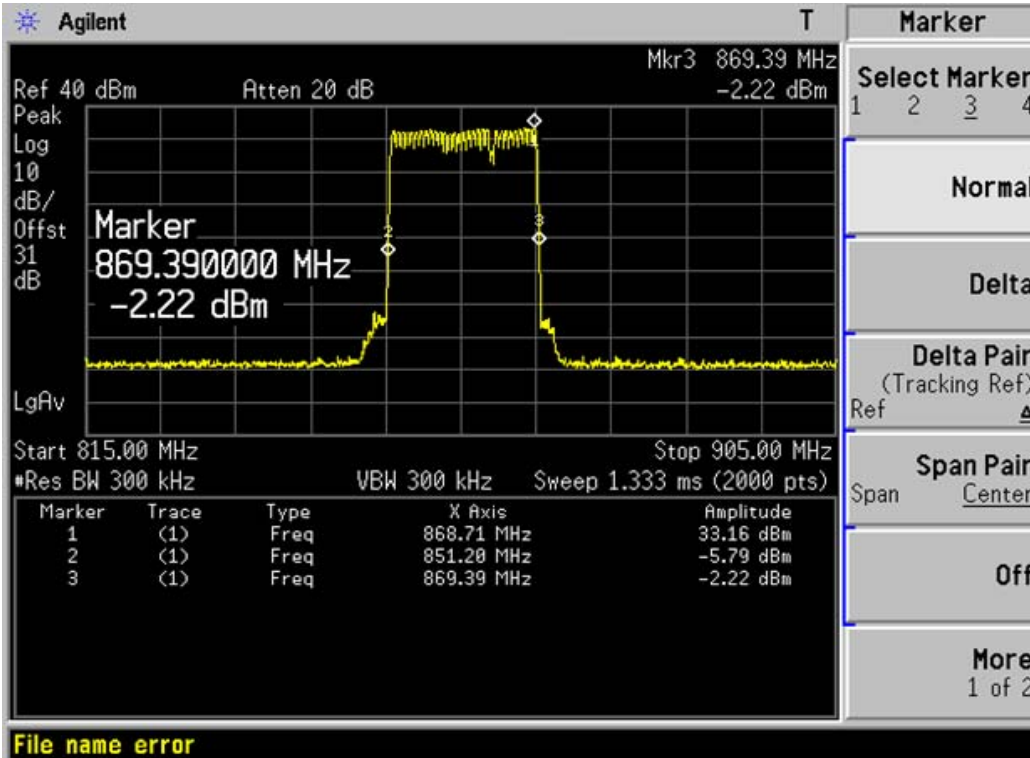
6.2 Test Equipments

The following test equipments are used during tests

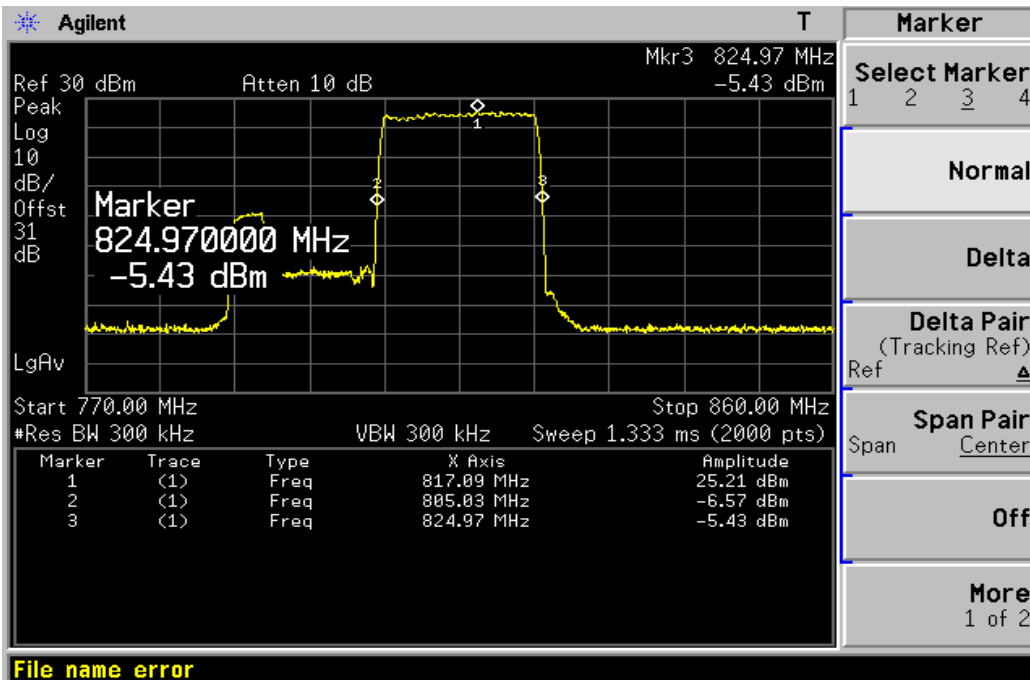
Equipment	Manufacturer	Model	Next Cal.
Spectrum Analyzer	Agilent	E4440A	2020-12-02
Signal Generator	E4438C	MY42081204	2020-12-03
Signal Generator	E4432B	GB40050840	2020-12-03
Attenuator	SRT	F04-K1830-01	2020-12-03
Attenuator	Bird Electronic Corp	100-SA-MFN-30	2020-12-03
Power Meter	Agilent	N1912A	2020-12-02
Power Sensor	Agilent	A1921A	2020-12-02



6.3 Test Results : Pass



	Frequency (MHz)
marker 1	851.20
marker 2	869.39



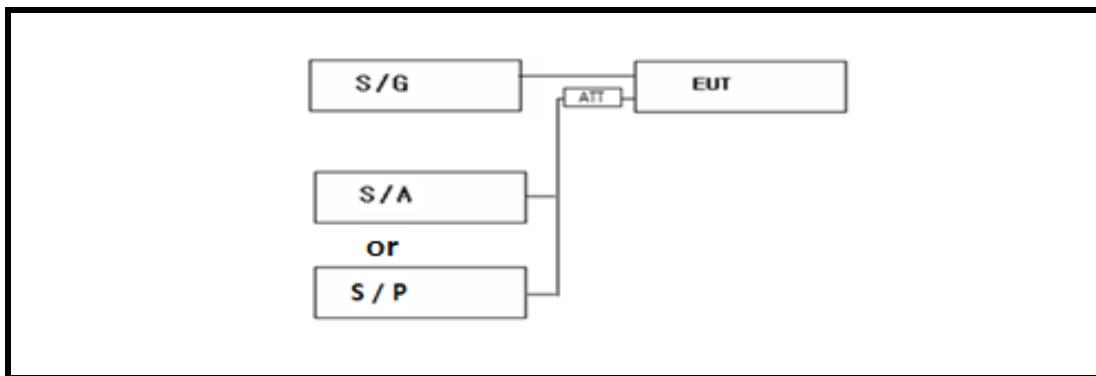
	Frequency (MHz)
marker 1	805.03
marker 2	824.97

6. Input-versus-output signal comparison

6.1 Test Procedure according to KDB935210 D5 3.4

- a) Connect a signal generator to the input of the EUT.
- b) Configure the signal generator to transmit the AWGN signal.
- c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.
- d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between $2 \times$ to $5 \times$ the emission bandwidth (EBW) or alternatively, the OBW.
- f) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be $\geq 3 \times$ RBW.
- g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than $[10 \log (\text{OBW} / \text{RBW})]$ below the reference level. Steps f) and g) may require iteration to enable adjustments within the specified tolerances.
- h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.
- i) Set spectrum analyzer detection function to positive peak.
- j) Set the trace mode to max hold.
- k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency.
- l) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the -26 dB down amplitude. The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the -26 dB down amplitude at multiple points, the lowest or highest frequency shall be selected as the frequencies that are the furthest removed from the center frequency at which the spectral envelope crosses the -26 dB down amplitude point.
- m) Repeat steps e) to l) with the input signal connected directly to the spectrum analyzer (i.e., input signal measurement).
- n) Compare the spectral plot of the input signal (determined from step m) to the output signal (determined from step l) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.
- o) Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.
- p) Repeat steps e) to o) with the signal generator set to the narrowband signal.
- q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

Test setup for RF Conducted measurement



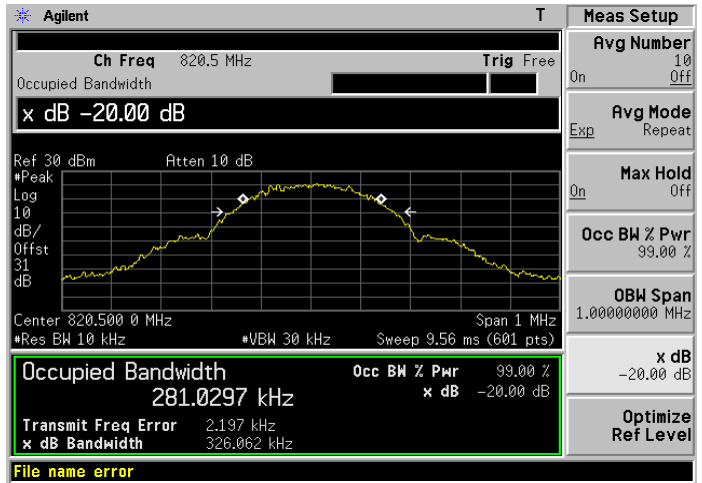
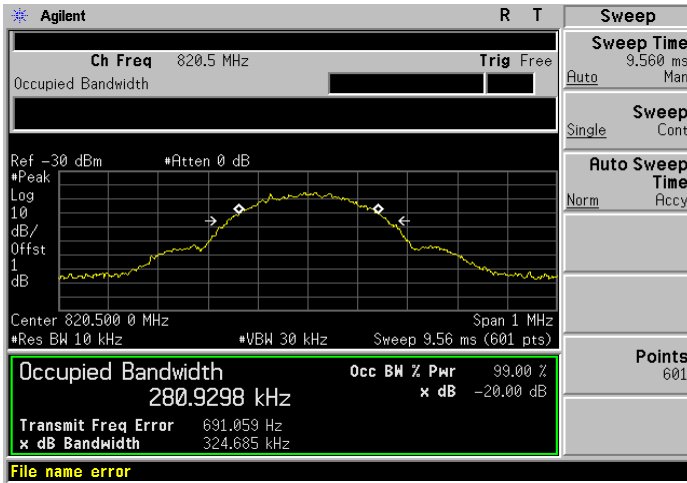
6.2 Test Equipments

The following test equipments are used during tests

Equipment	Manufacturer	Model	Next Cal.
Spectrum Analyzer	Agilent	E4440A	2020-12-02
Signal Generator	E4438C	MY42081204	2020-12-03
Signal Generator	E4432B	GB40050840	2020-12-03
Attenuator	SRT	F04-K1830-01	2020-12-03
Attenuator	Bird Electronic Corp	100-SA-MFN-30	2020-12-03

6.3 Test Results : Pass

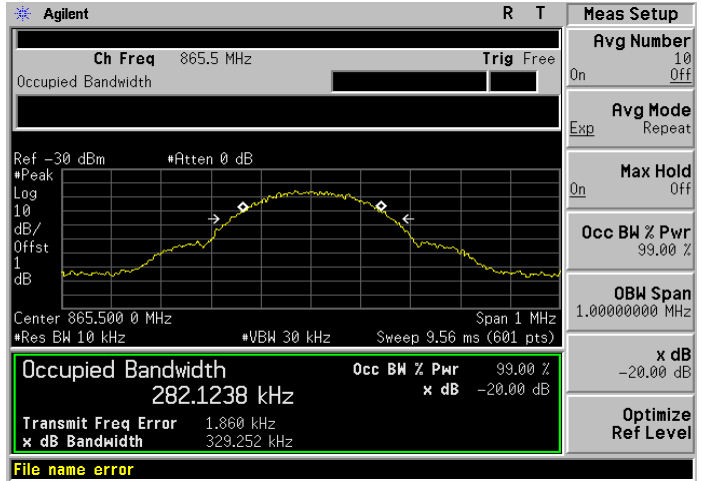
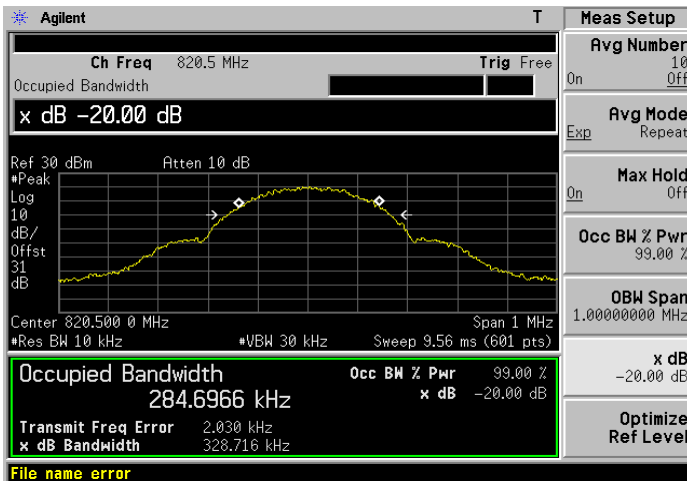
820.5 MHz



Input : MSK

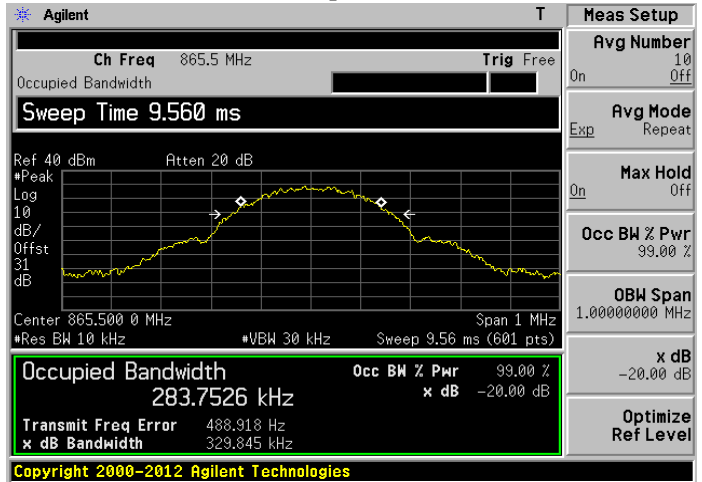
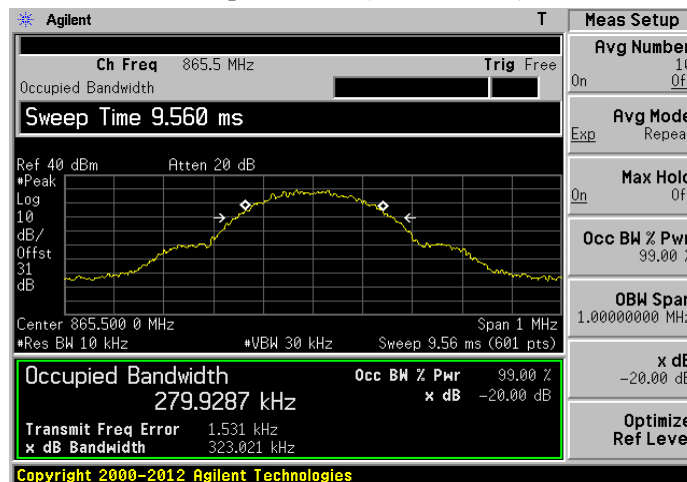
Output : MSK (Below AGC)

866.5 MHz



Output : MSK (Above AGC)

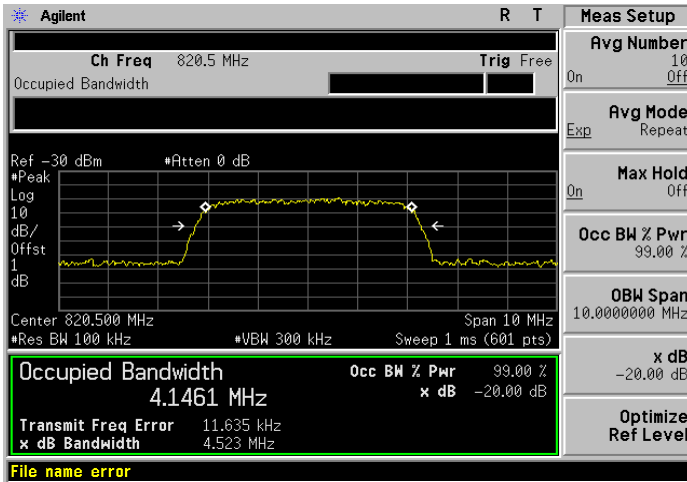
Input : MSK



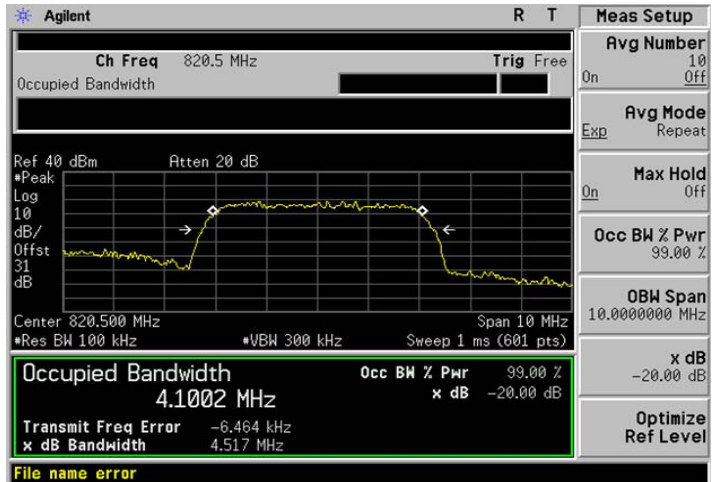
Output : MSK (Below AGC)

Output : MSK (Above AGC)

820.5 MHz

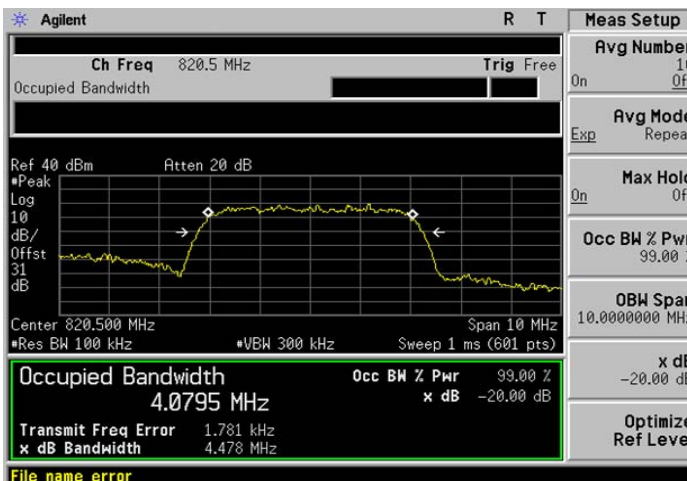


Input : AWGN

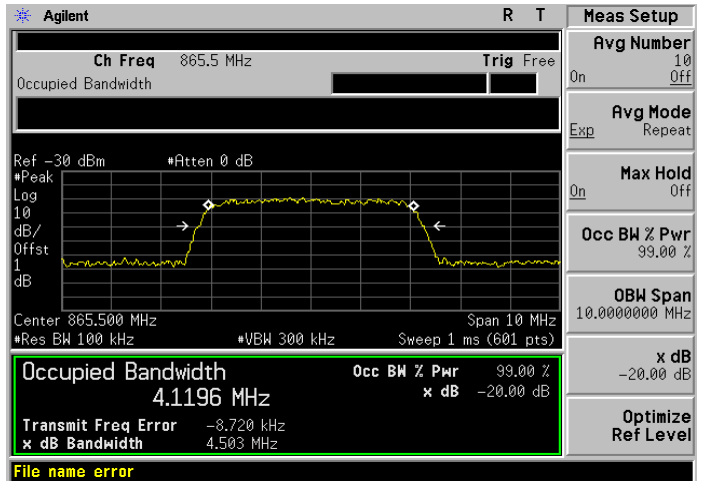


Output : AWGN (Below AGC)

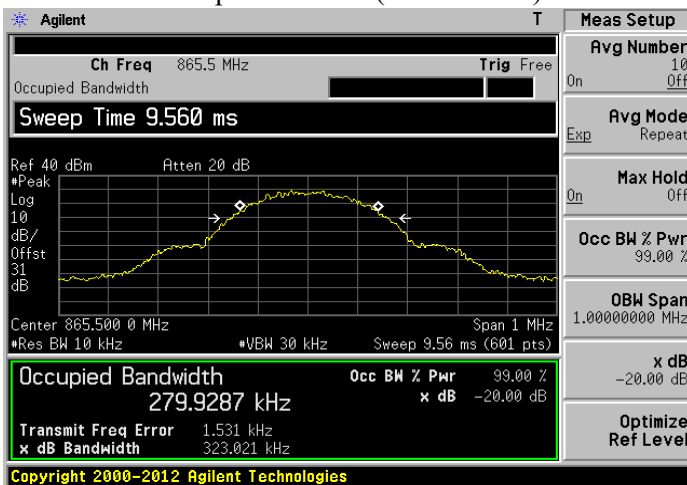
866.5 MHz



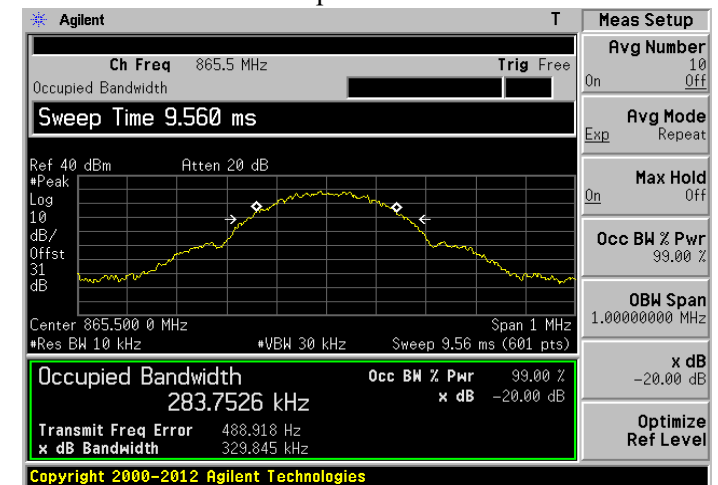
Output : AWGN (Above AGC)



Input : AWGN



Output : AWGN (Below AGC)



Output : AWGN (Above AGC)

7. Input/output power and amplifier gain

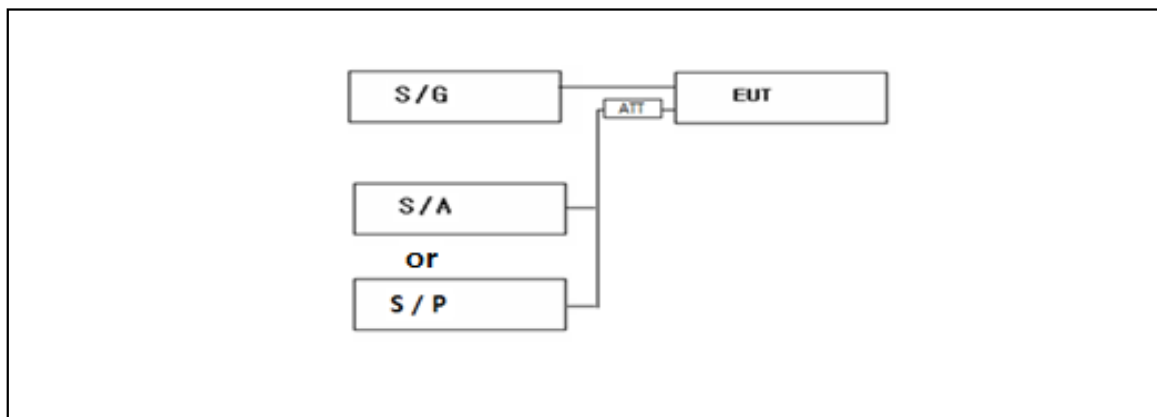
7.1 Test Procedure according to KDB935210 D5 3.5

Adjust the internal gain control of the EUT to the maximum gain for which the equipment certification is being sought. Any EUT attenuation settings shall be set to their minimum value.

Input power levels (uplink and downlink) should be set to maximum input ratings while confirming that the device is not capable of operating in saturation (non-linear mode) at the rated input levels, including during the performance of the input/output power measurements.

- a) Connect a signal generator to the input of the EUT.
- b) Configure to generate the AWGN (broadband) test signal.
- c) The frequency of the signal generator shall be set to the frequency f_0 as determined from 3.3.
- d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
- e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
- f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.
- g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.
- h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.
- i) Repeat steps e) to h) with the narrowband test signal.
- j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.

Test setup for RF Conducted measurement



7.2 Test Equipments

The following test equipments are used during tests

Equipment	Manufacturer	Model	Next Cal.
Spectrum Analyzer	Agilent	E4440A	2020-12-02
Signal Generator	E4438C	MY42081204	2020-12-03
Signal Generator	E4432B	GB40050840	2020-12-03
Attenuator	SRT	F04-K1830-01	2020-12-03
Attenuator	Bird Electronic Corp	100-SA-MFN-30	2020-12-03
Power Meter	Agilent	N1912A	2020-12-02
Power Sensor	Agilent	A1921A	2020-12-02

7.3 Test Results : Pass

Uplink

Freq (MHz)	Mod	AGC	Input Level (dBm)	Output (dBm)	Gain (dB)
820.5	MSK	Below	-53.0	26.9	79.9
820.5	MSK	Above	-50.0	27.0	77.0

Uplink

Freq (MHz)	Mod	AGC	Input Level (dBm)	Output (dBm)	Gain (dB)
820.5	AWGN	Below	-53.0	26.9	79.9
820.5	AWGN	Above	-50.0	27.0	77.0

Downlink

Freq (MHz)	Mod	AGC	Input Level (dBm)	Output (dBm)	Gain (dB)
866.5	MSK	Below	-56.0	34.0	90.0
866.5	MSK	Above	-53.0	33.9	86.9

Downlink

Freq (MHz)	Mod	AGC	Input Level (dBm)	Output (dBm)	Gain (dB)
866.5	AWGN	Below	-56.0	34.0	90.0
866.5	AWGN	Above	-53.0	33.9	86.9

8. Spurious emissions

8.1 Test Procedure according to KDB935210 D5 3.6.2

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

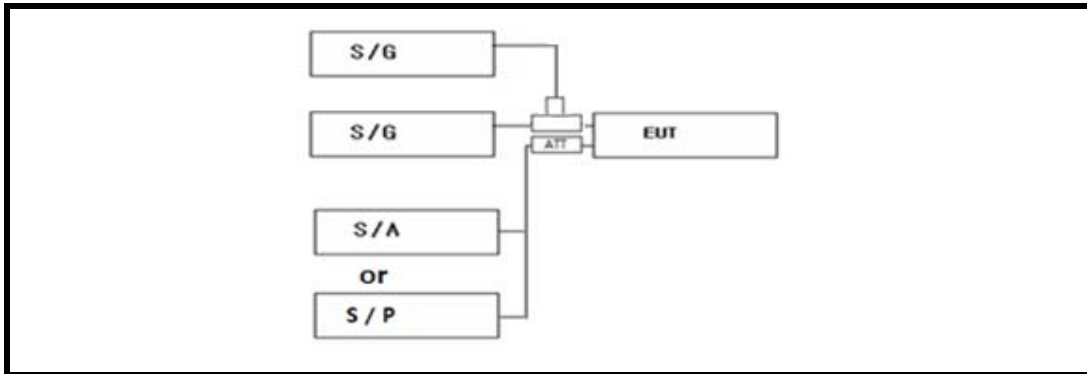
Two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

A single test signal, sequentially tuned to the lowest and highest frequencies or channels within the Frequency band/block under examination.

- a) Connect a signal generator to the input of the EUT.
- b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW).
- c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.
- d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168 [R8], but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168 [R8].
- e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
- f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the EBW or 100 kHz or 1 MHz)
- g) Set the VBW = $3 \times$ RBW.
- h) Set the detector to power averaging (rms) detector.
- i) Set the Sweep time = auto-couple.
- j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.
- k) Trace average at least 100 traces in power averaging (rms) mode.
- l) Use the marker function to find the maximum power level.
- m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.
- n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.
- o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.
- p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.

- q) Repeat steps k) to n).
- r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.
- s) Repeat steps a) to r) with the narrowband test signal.
- t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

Test setup for RF Conducted measurement



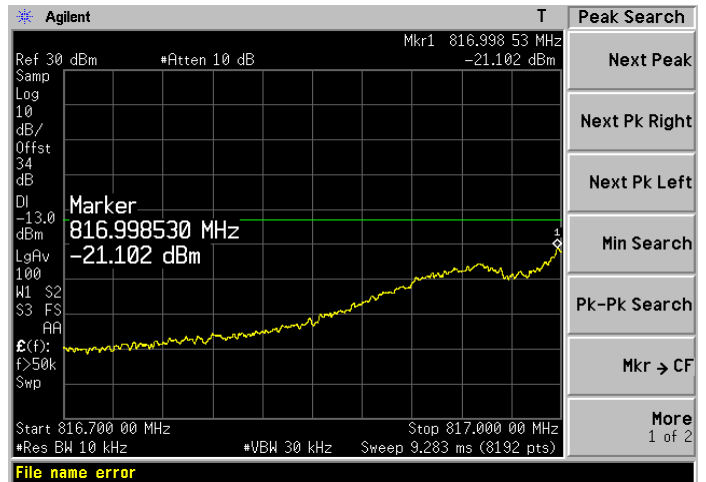
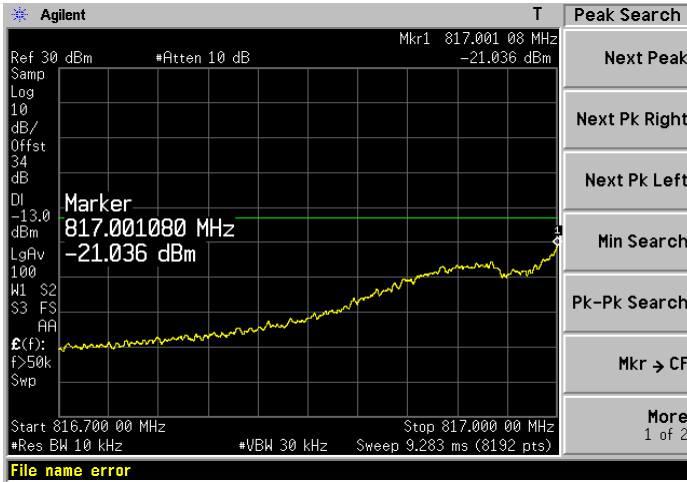
8.2 Test Equipments

The following test equipments are used during tests

Equipment	Manufacturer	Model	Next Cal.
Spectrum Analyzer	Agilent	E4440A	2020-12-02
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Signal Generator	E4432B	GB40050840	2020-12-03
Attenuator	SRT	F04-K1830-01	2020-12-03
Attenuator	Bird Electronic Corp	100-SA-MFN-30	2020-12-03

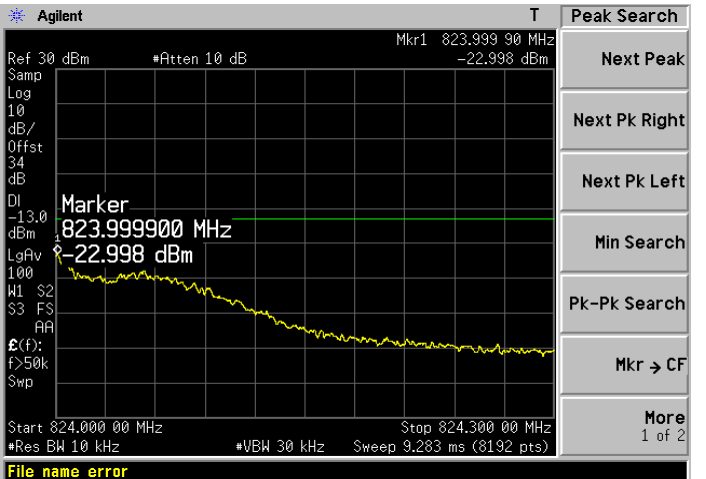
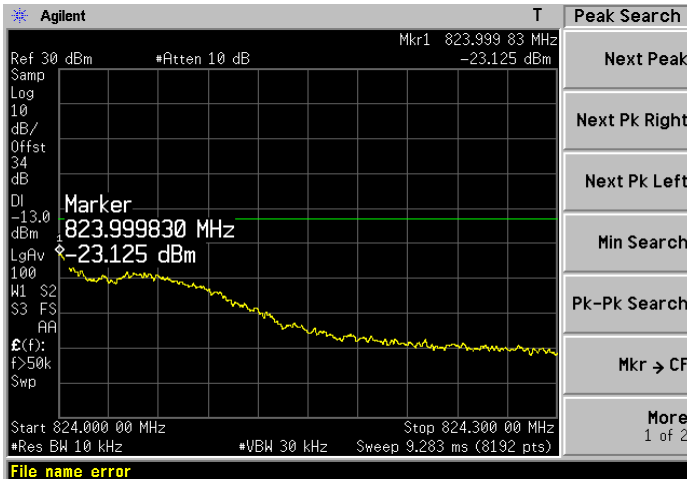
8.3 Test Results : Pass

Tow input signals (Uplink)



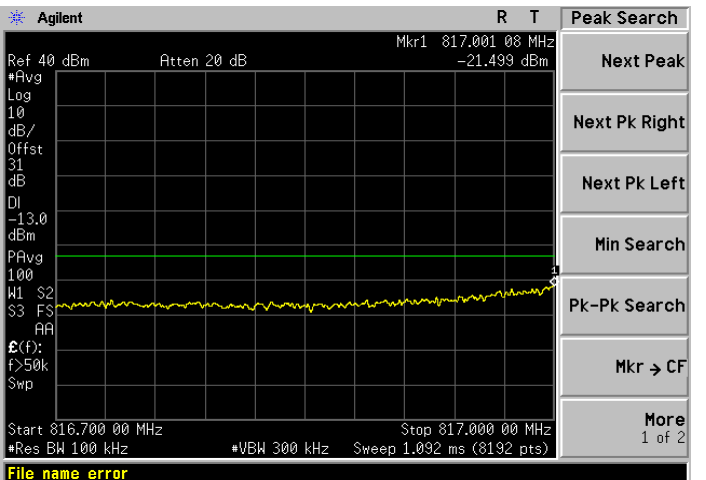
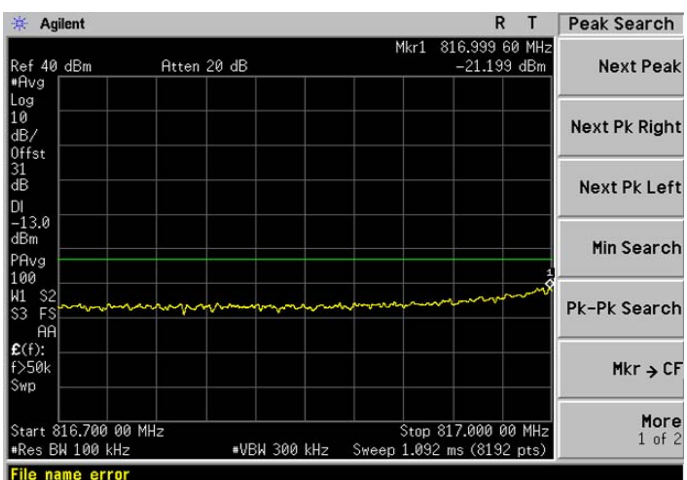
Output : MSK (Below AGC)

Output : MSK (Above AGC)



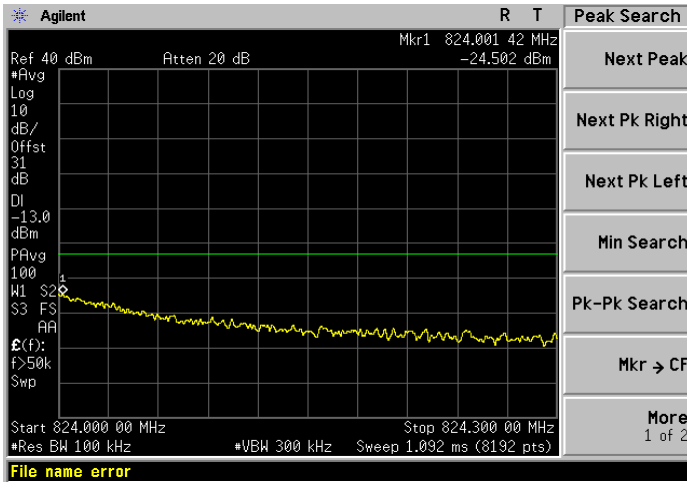
Output : MSK (Below AGC)

Output : MSK (Above AGC)

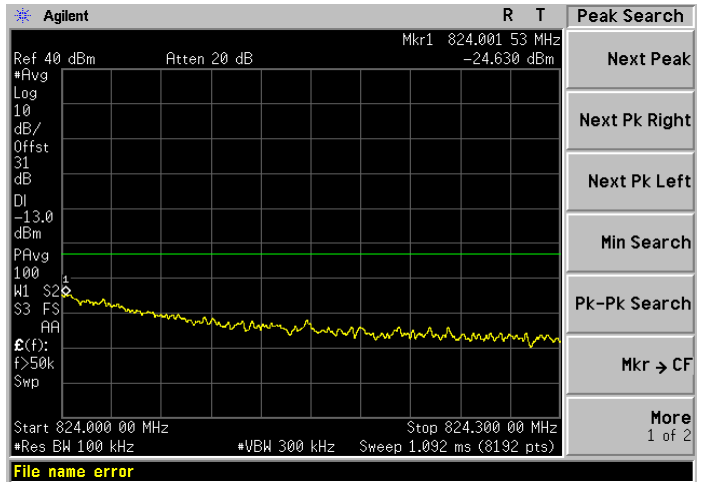


Output : AWGN (Below AGC)

Output : AWGN (Above AGC)

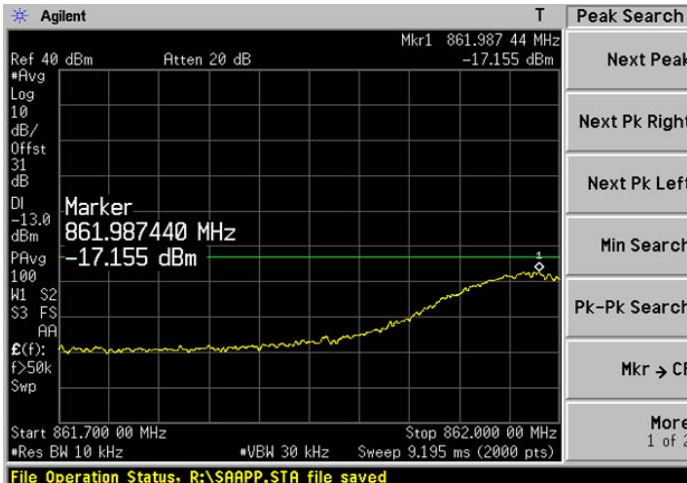


Output : AWGN (Below AGC)

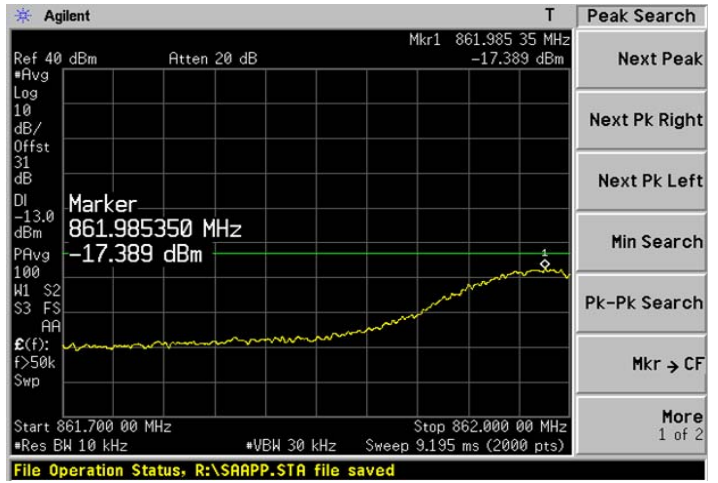


Output : AWGN (Above AGC)

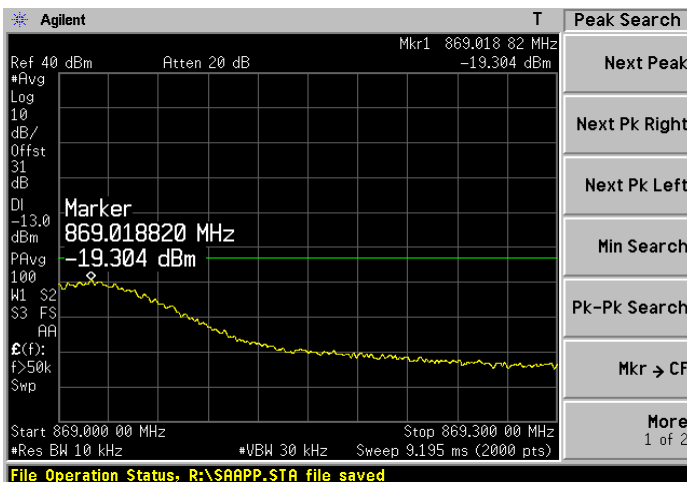
Tow input signals (Downlink)



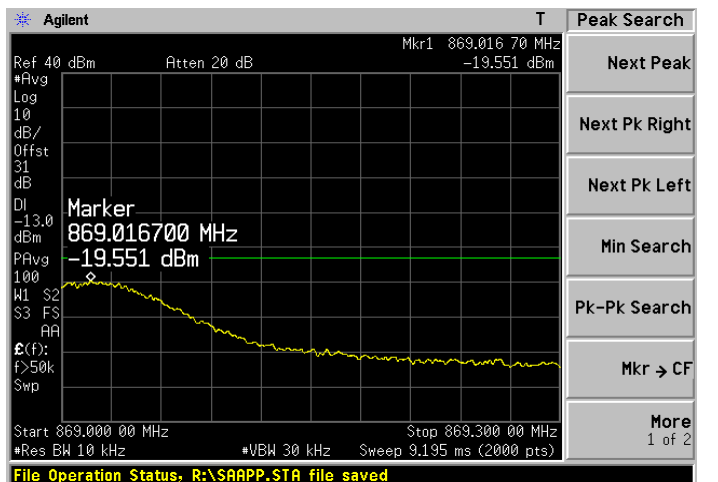
Output : MSK (Below AGC)



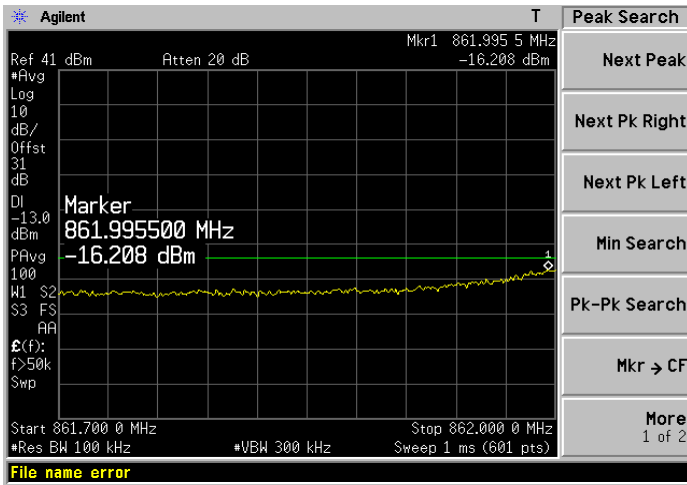
Output : MSK (Above AGC)



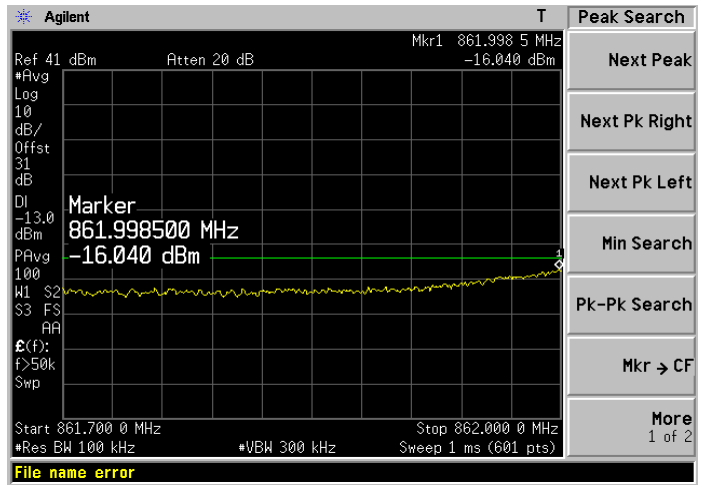
Output : MSK (Below AGC)



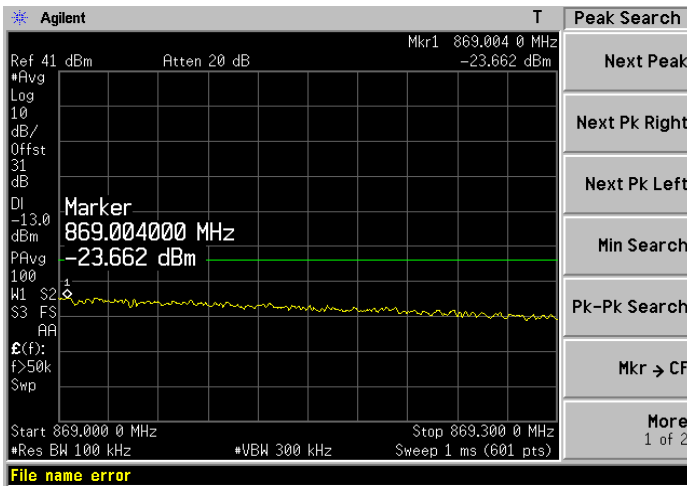
Output : MSK (Above AGC)



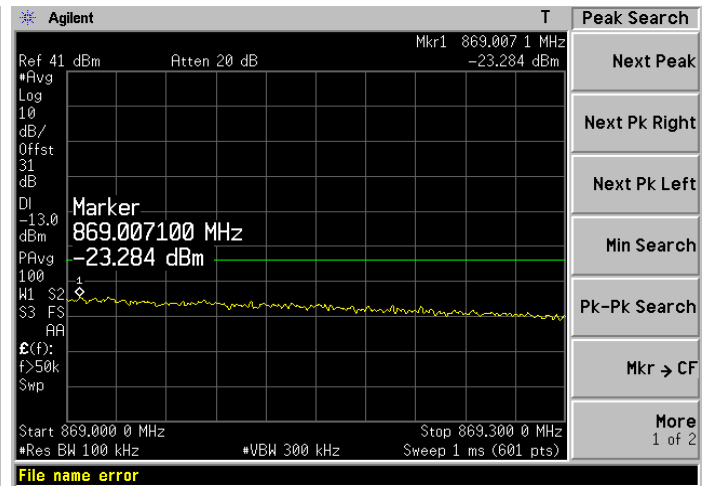
Output : AWGN (Below AGC)



Output : AWGN (Above AGC)



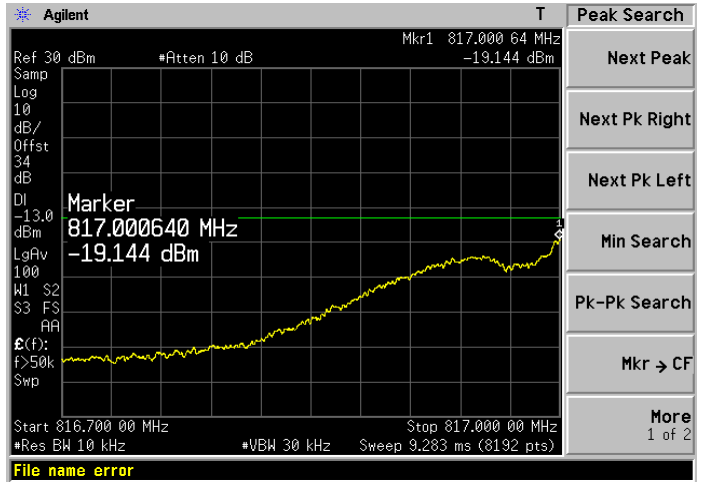
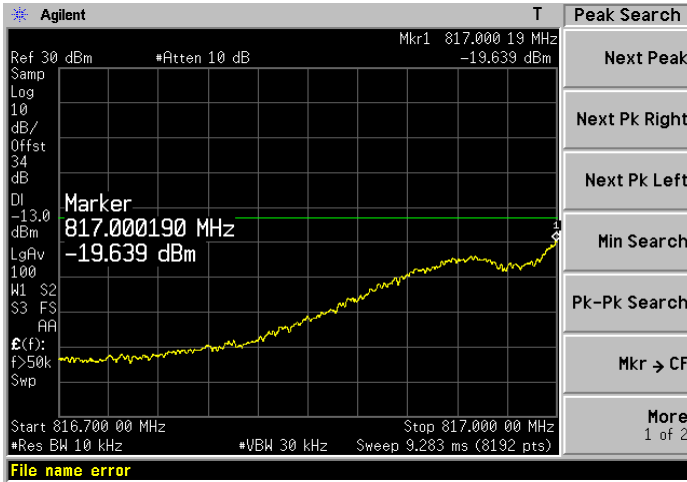
Output : AWGN (Below AGC)



Output : AWGN (Above AGC)

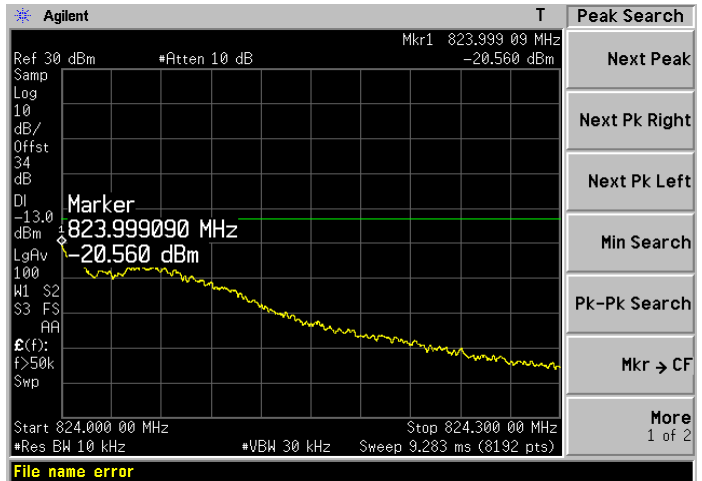
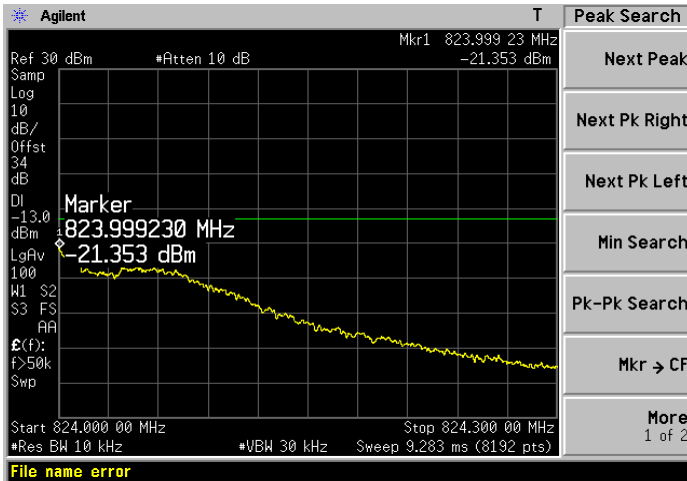


Single input signals (Uplink)



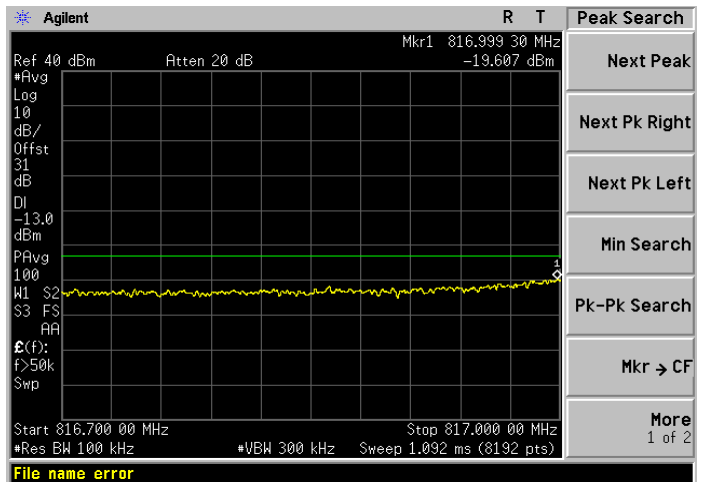
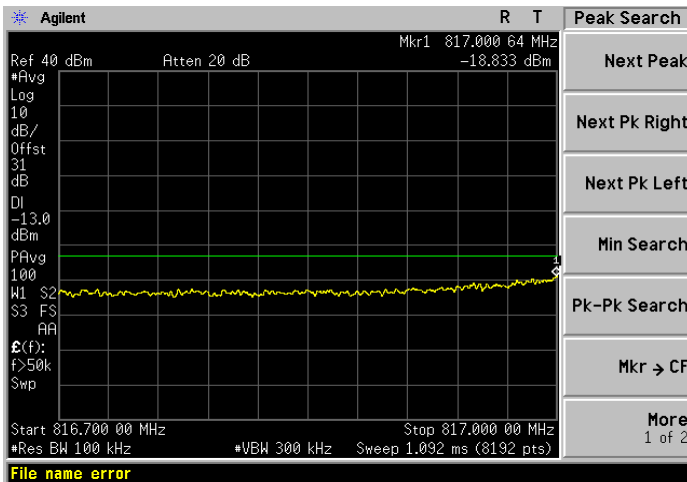
Output : MSK (Below AGC)

Output : MSK (Above AGC)



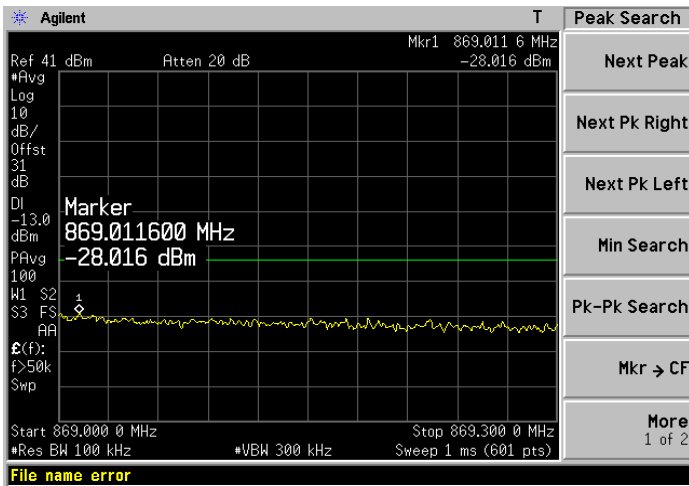
Output : MSK (Below AGC)

Output : MSK (Above AGC)

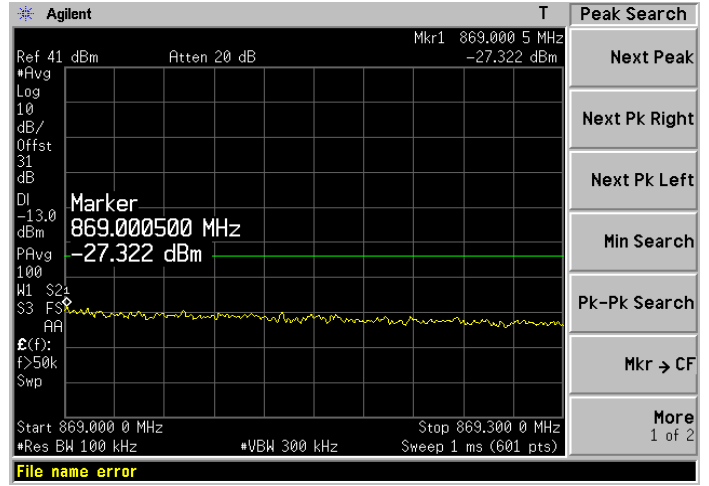


Output : AWGN (Below AGC)

Output : AWGN (Above AGC)

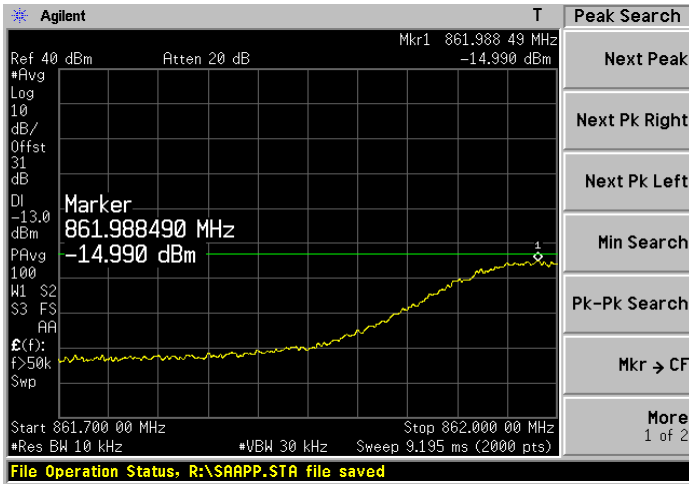


Output : AWGN (Below AGC)

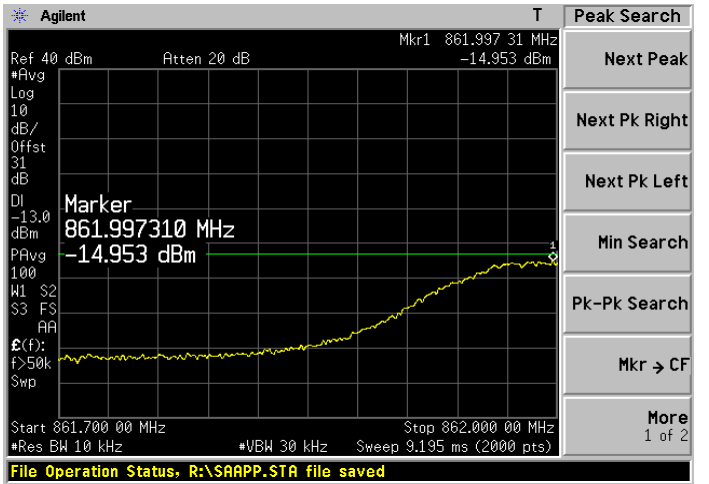


Output : AWGN (Above AGC)

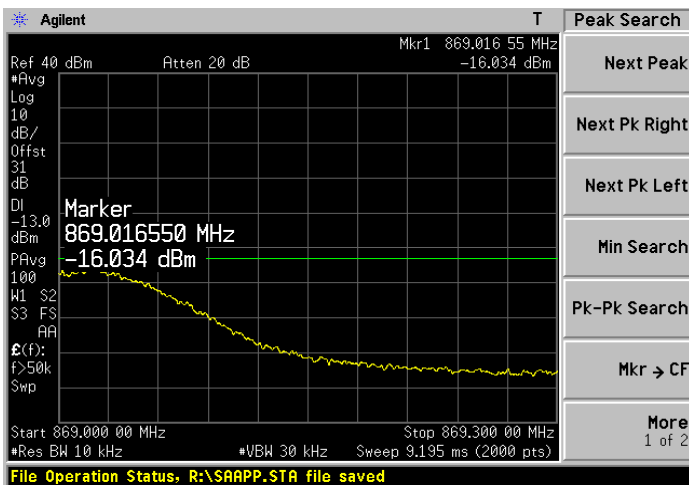
Single input signals (Downlink)



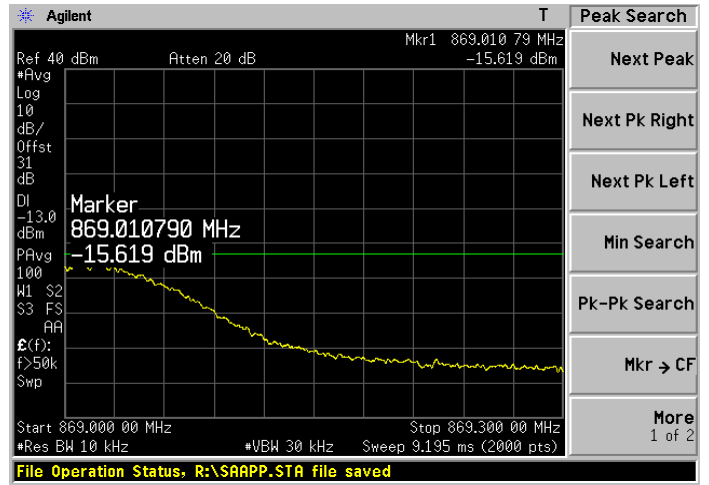
Output : MSK (Below AGC)



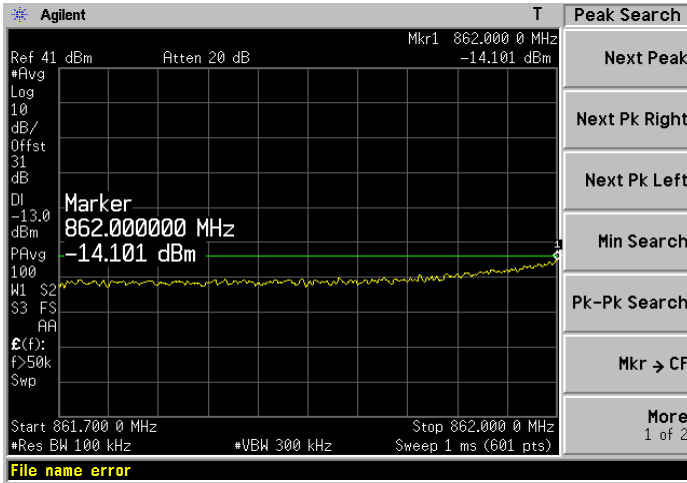
Output : MSK (Above AGC)



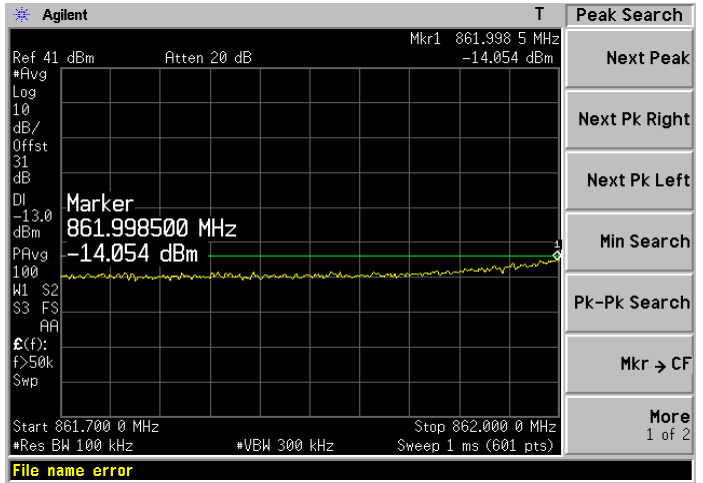
Output : MSK (Below AGC)



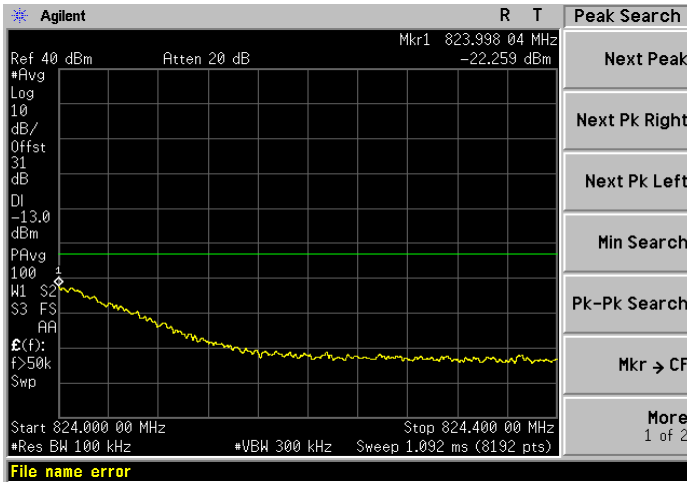
Output : MSK (Above AGC)



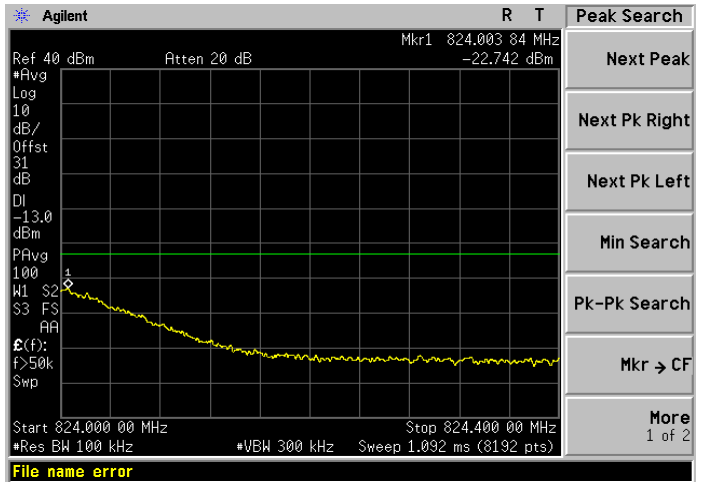
Output : AWGN (Below AGC)



Output : AWGN (Above AGC)



Output : AWGN (Below AGC)



Output : AWGN (Above AGC)

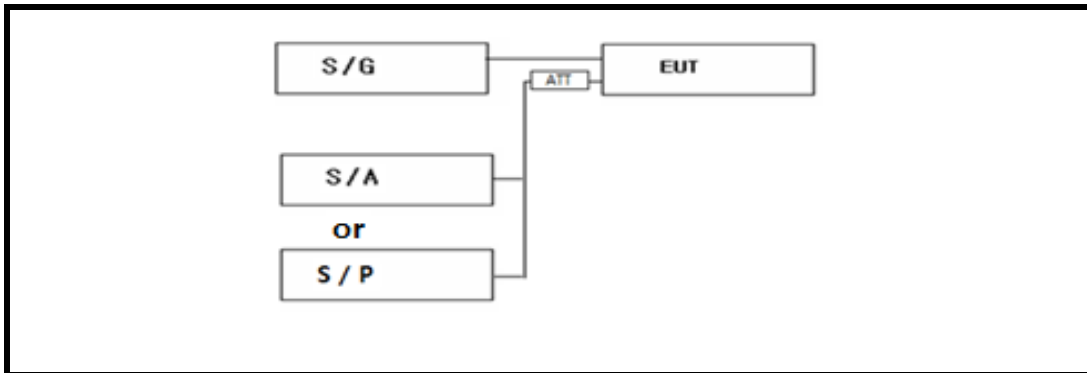
8.4 Test Procedure according to KDB935210 D5 3.6.3

- a) Connect a signal generator to the input of the EUT.
- b) Set the signal generator to produce the broadband test signal as previously described (i.e., 4.1 MHz OBW AWGN).
- c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.
- d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
- e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
- f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).
- g) Set the VBW $\geq 3 \times$ RBW.
- h) Set the Sweep time = auto-couple.
- i) Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.

The number of measurement points in each sweep must be $\geq (2 \times \text{span}/\text{RBW})$, which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.⁴

- j) Select the power averaging (rms) detector function.
- k) Trace average at least 10 traces in power averaging (rms) mode.
- l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.
- m) Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to $10 \times$ the highest frequency of the fundamental emission (see Section 2.1057). The number of measurement points in each sweep must be $\geq (2 \times \text{span}/\text{RBW})$, which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
- n) Trace average at least 10 traces in power averaging (rms) mode.
- o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.
- p) Repeat steps i) to o) with the input test signals firstly tuned to a middle band/block frequency/channel, and then tuned to a high band/block frequency/channel.
- q) Repeat steps b) to p) with the narrowband test signal.
- r) Repeat steps b) to q) for all authorized frequency bands/blocks used by the EUT

Test setup for RF Conducted measurement

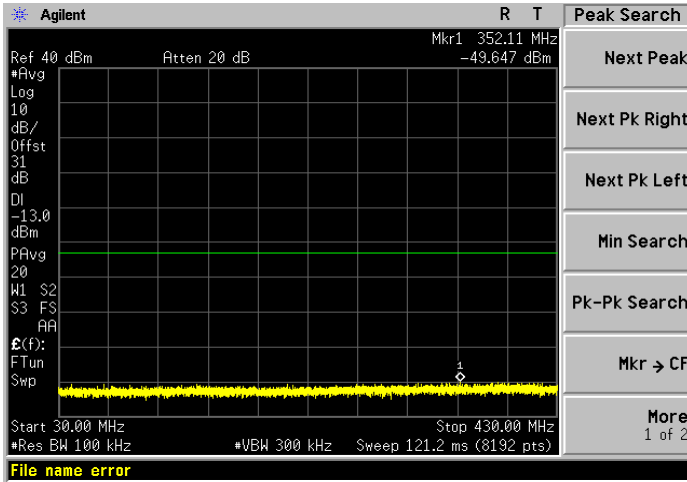


8.5 Test Equipments

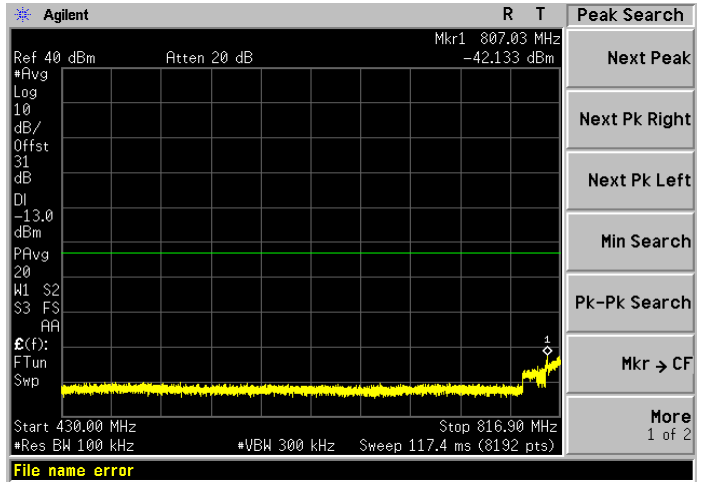
The following test equipments are used during tests

Equipment	Manufacturer	Model	Next Cal.
Spectrum Analyzer	Agilent	E4440A	2020-12-02
Signal Generator	E4438C	MY42081204	2020-12-03
Signal Generator	E4432B	GB40050840	2020-12-03
Attenuator	SRT	F04-K1830-01	2020-12-03
Attenuator	Bird Electronic Corp	100-SA-MFN-30	2020-12-03

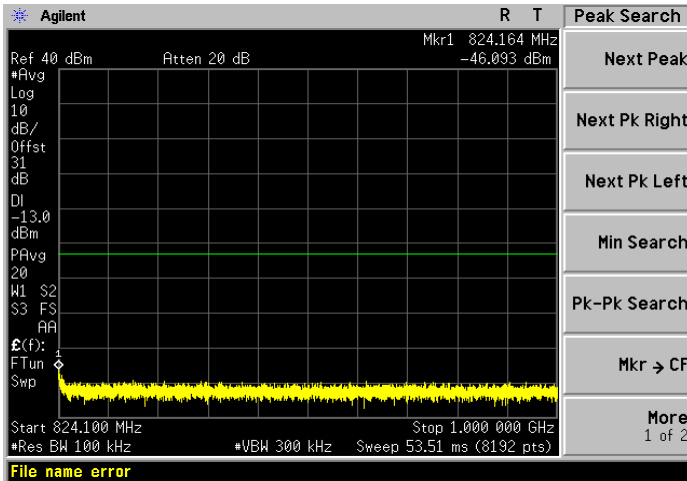
8.6 Test Results : Pass



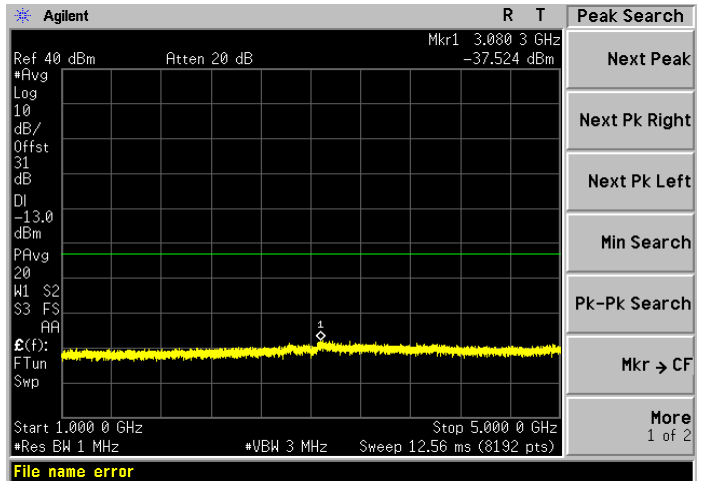
Output : MSK (Uplink, Low channel)



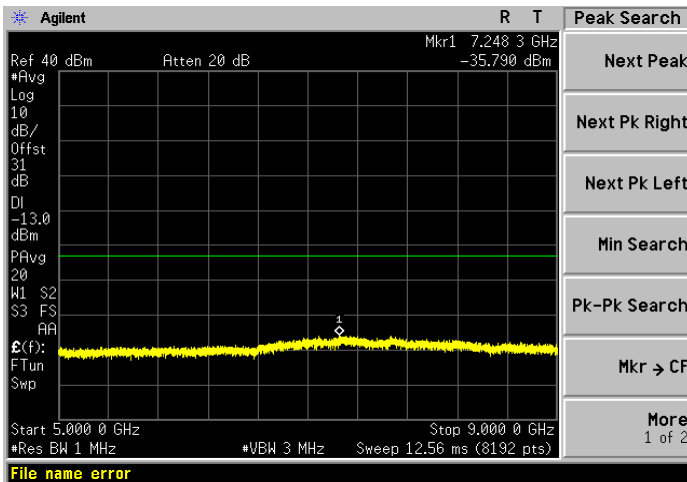
Output : MSK (Uplink, Low channel)



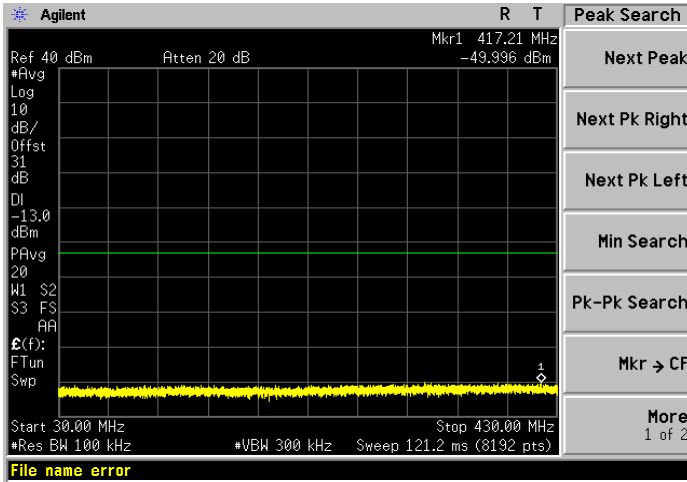
Output : MSK (Uplink, Low channel)



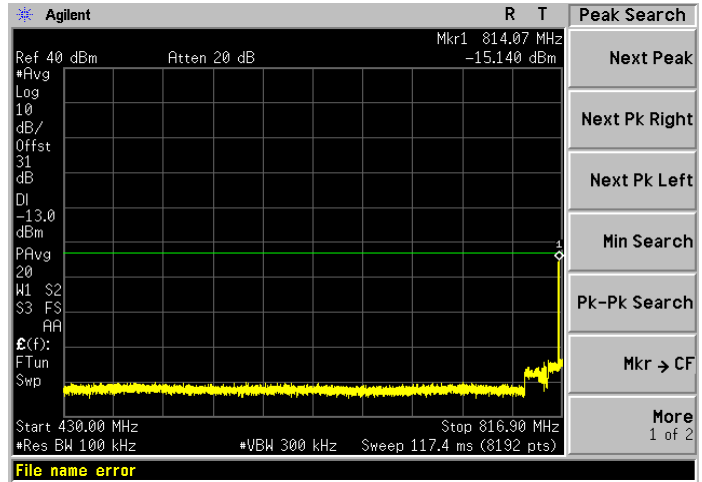
Output : MSK (Uplink, Low channel)



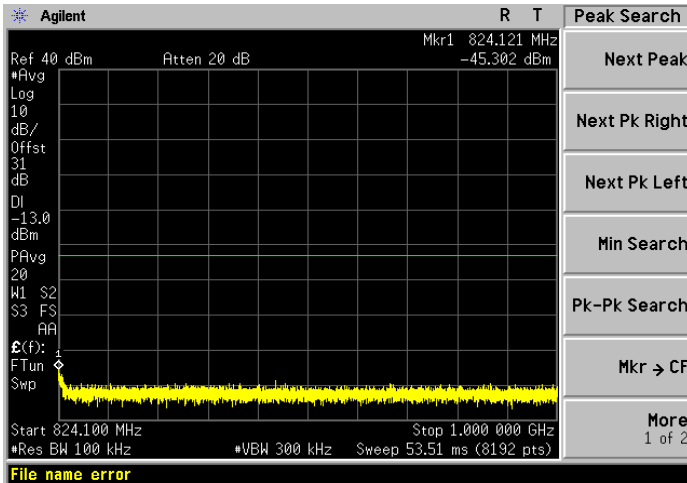
Output : MSK (Uplink, Low channel)



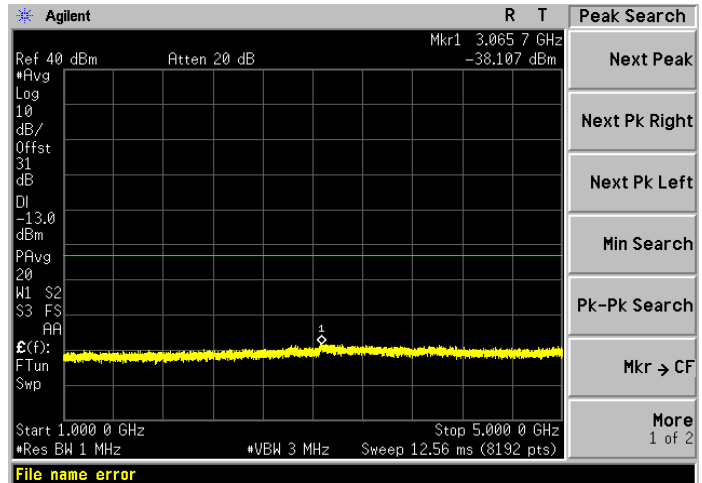
Output : MSK (Uplink, Mid channel)



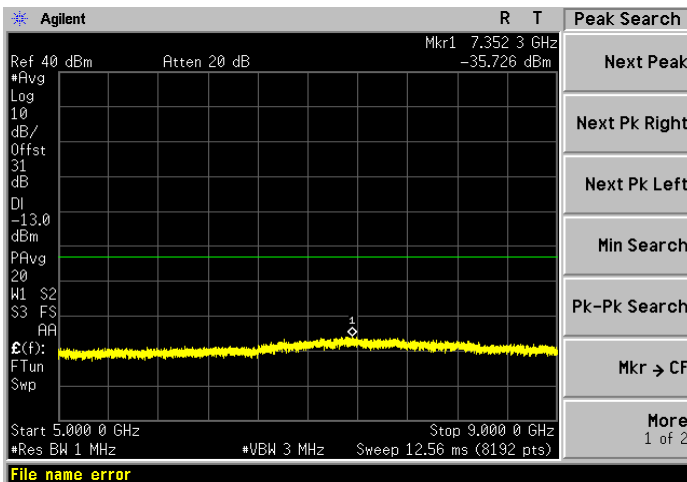
Output : MSK (Uplink, Mid channel)



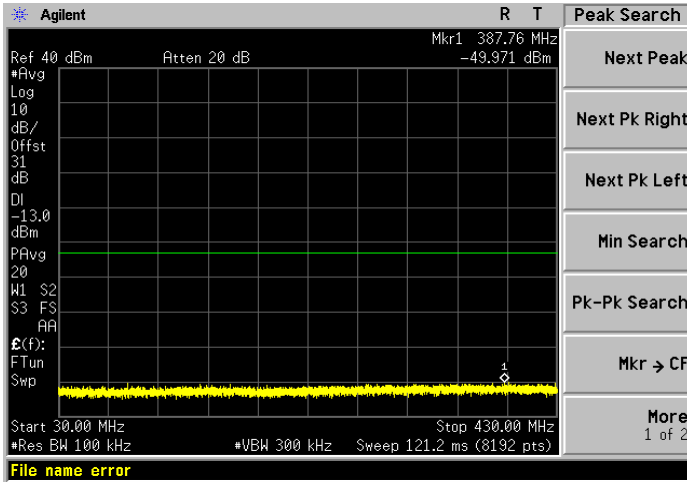
Output : MSK (Uplink, Mid channel)



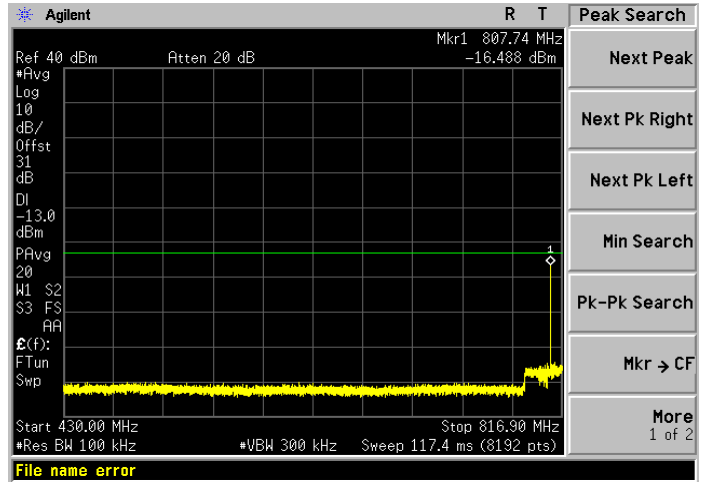
Output : MSK (Uplink, Mid channel)



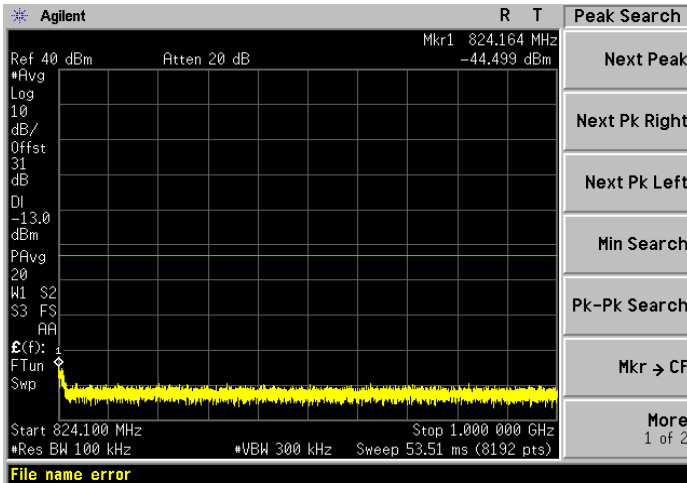
Output : MSK (Uplink, Mid channel)



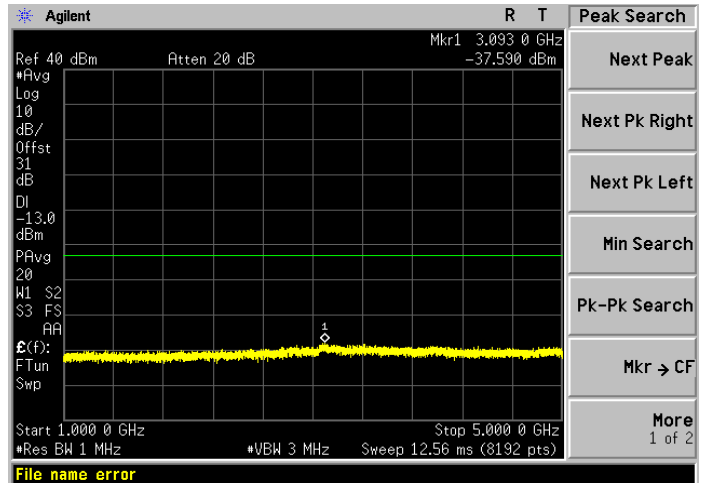
Output : MSK (Uplink, Hi channel)



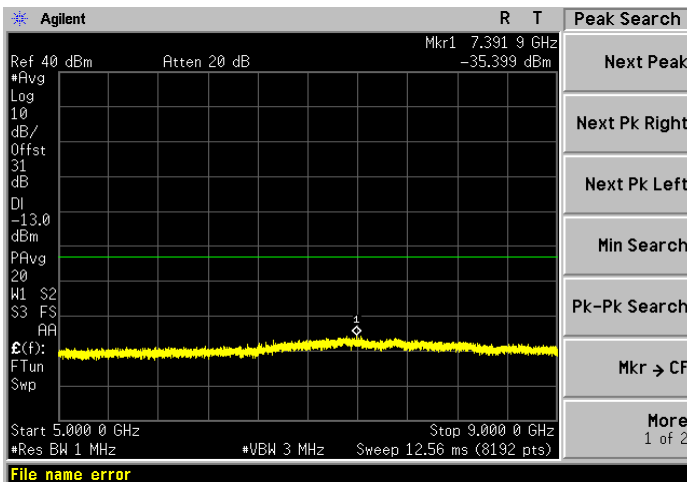
Output : MSK (Uplink, Hi channel)



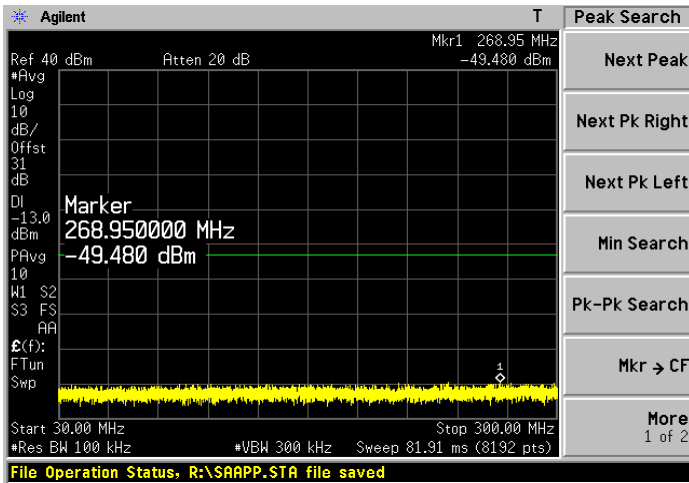
Output : MSK (Uplink, Hi channel)



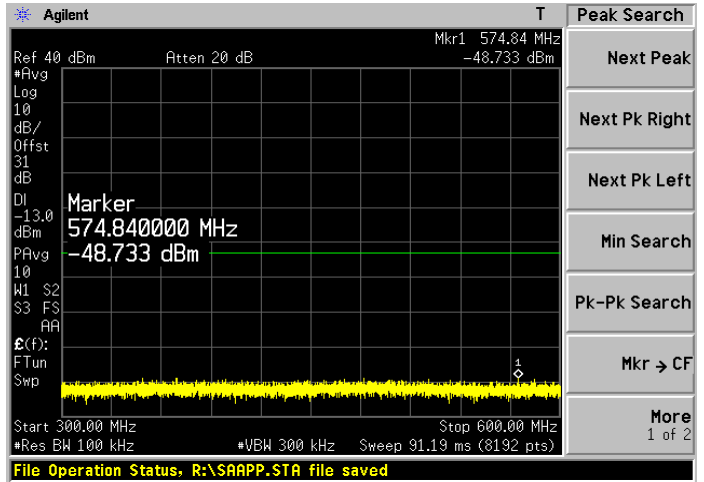
Output : MSK (Uplink, Hi channel)



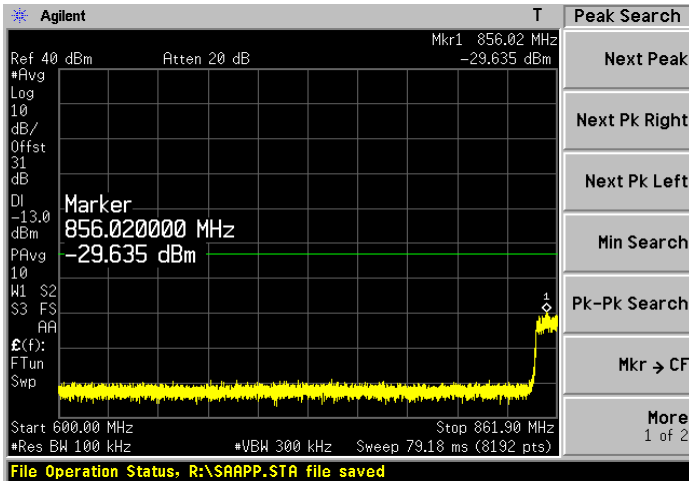
Output : MSK (Uplink, Hi channel)



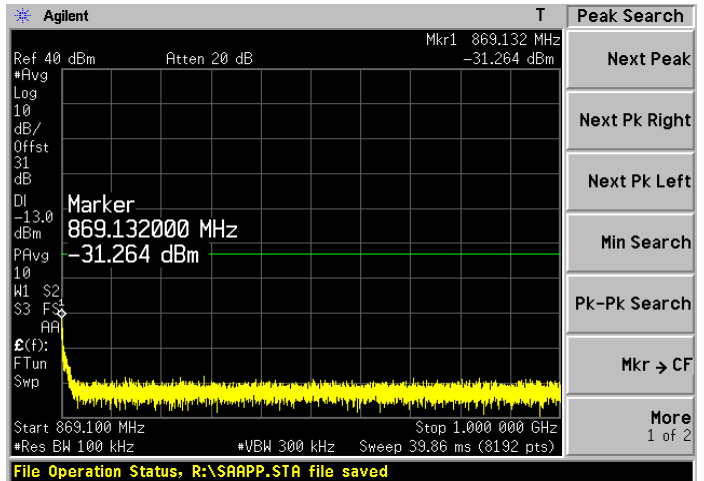
Output : MSK (Downlink, Low channel)



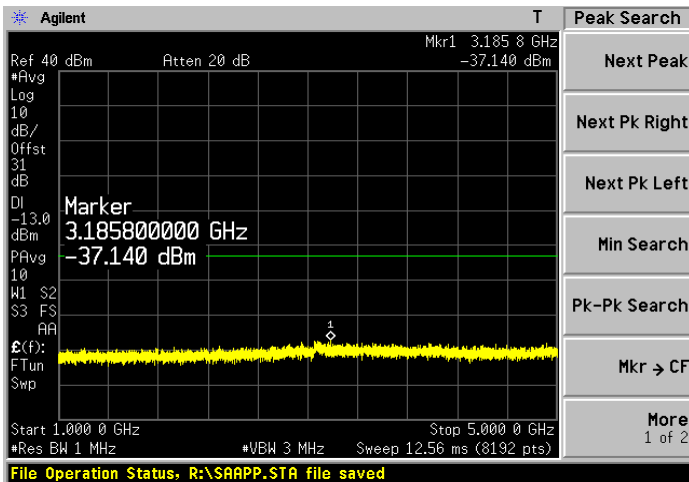
Output : MSK (Downlink, Low channel)



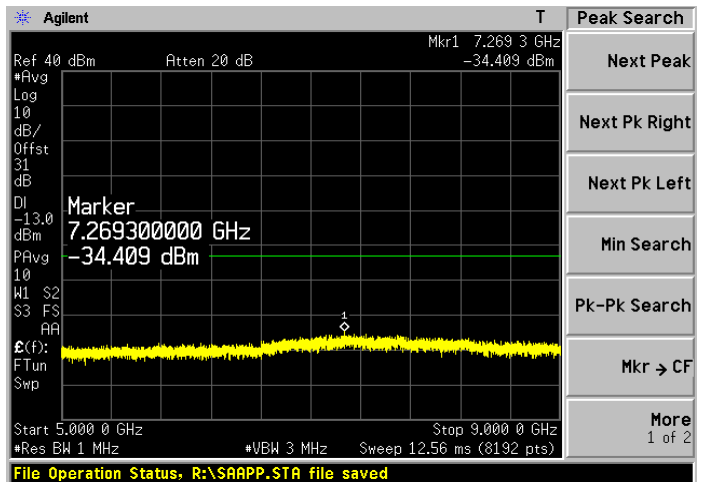
Output : MSK (Downlink, Low channel)



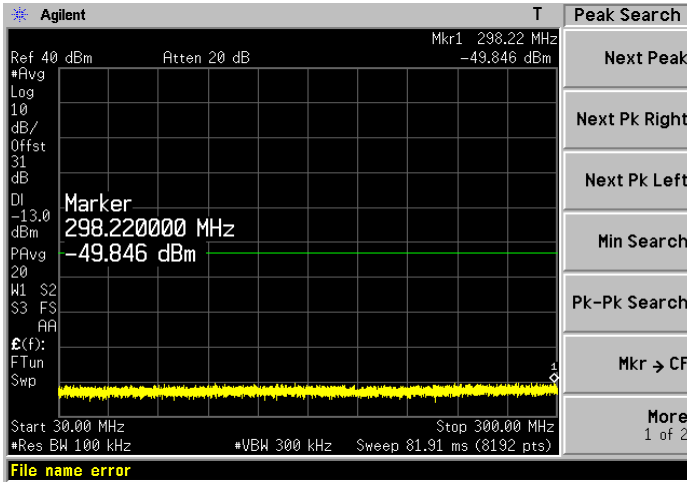
Output : MSK (Downlink, Low channel)



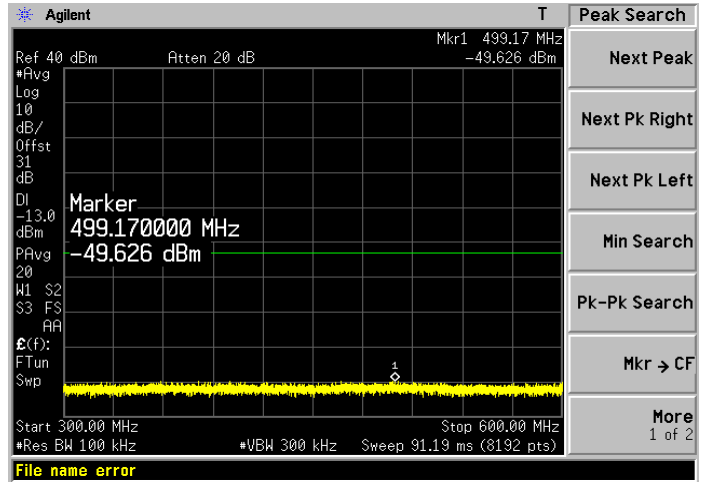
Output : MSK (Downlink, Low channel)



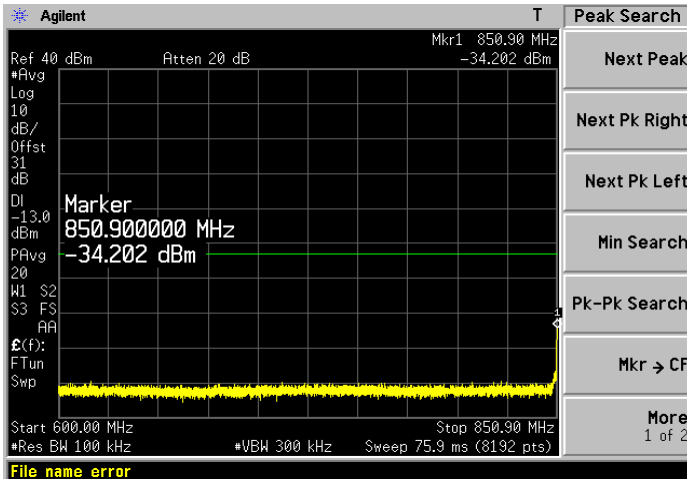
Output : MSK (Downlink, Low channel)



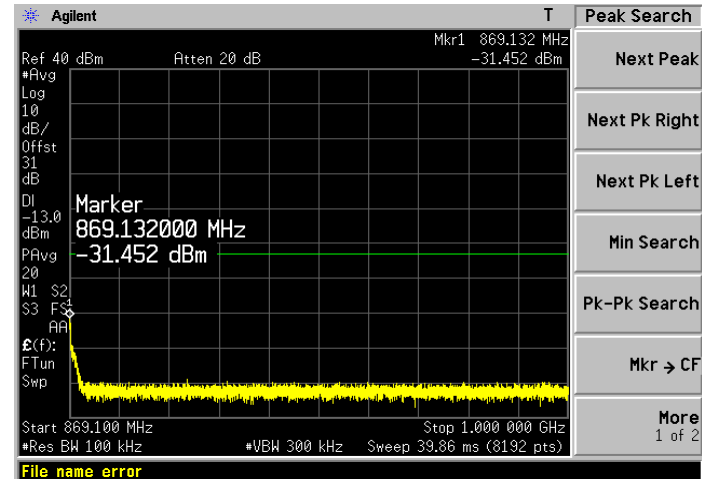
Output : MSK (Downlink, Mid channel)



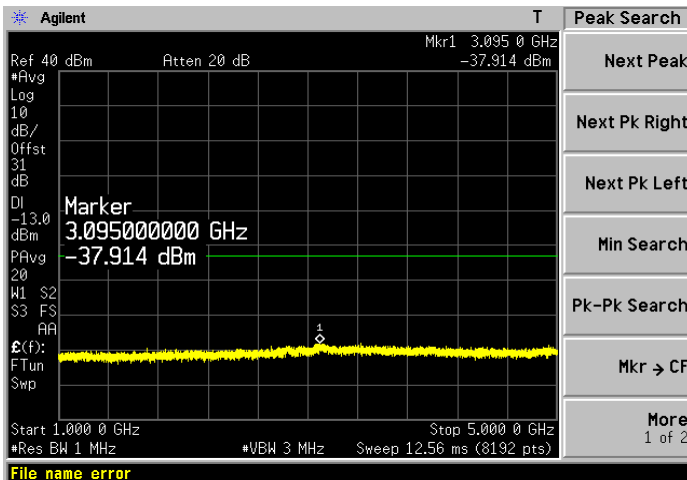
Output : MSK (Downlink, Mid channel)



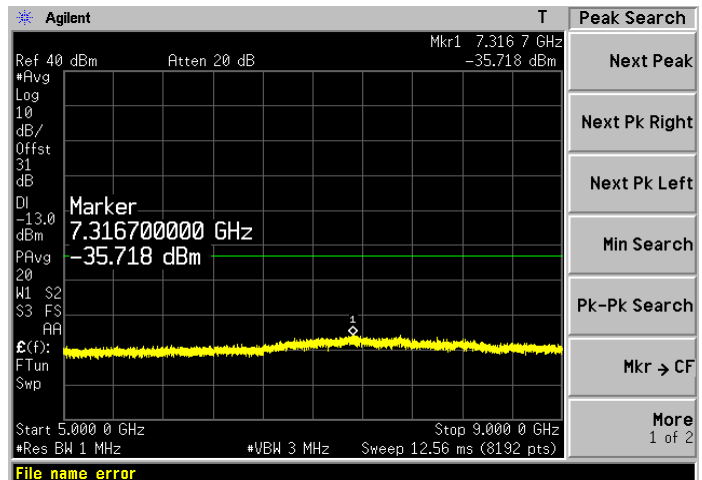
Output : MSK (Downlink, Mid channel)



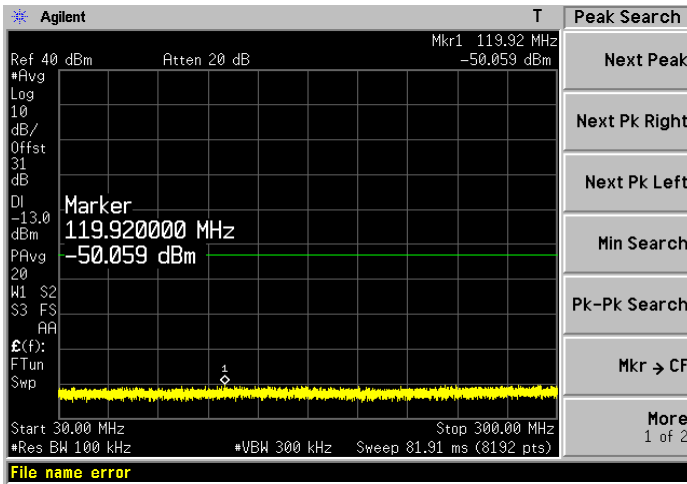
Output : MSK (Downlink, Mid channel)



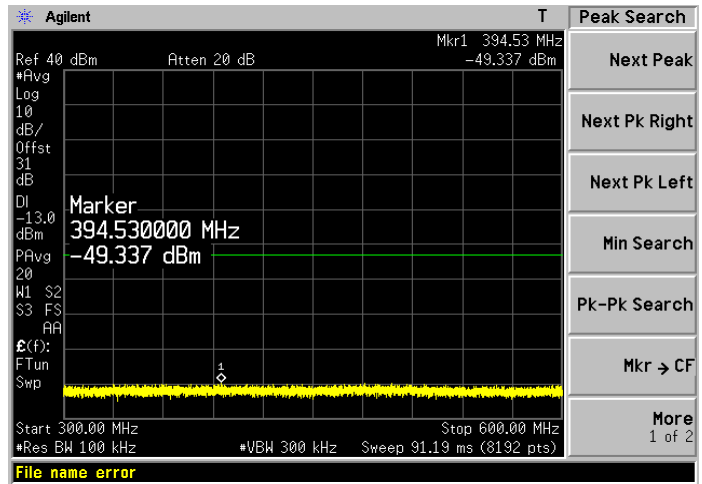
Output : MSK (Downlink, Mid channel)



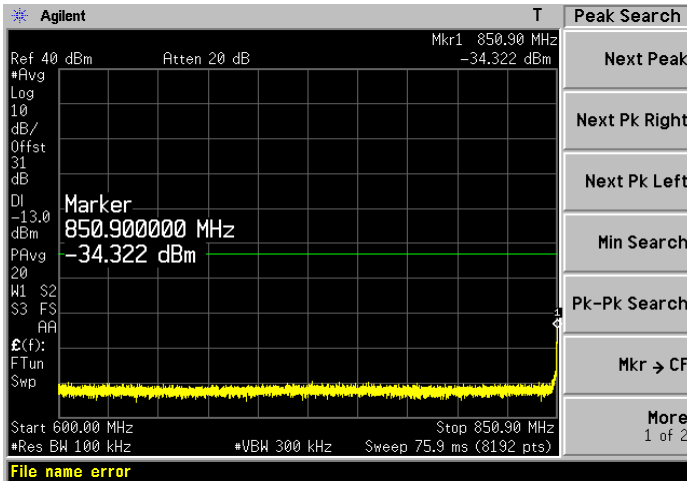
Output : MSK (Downlink, Mid channel)



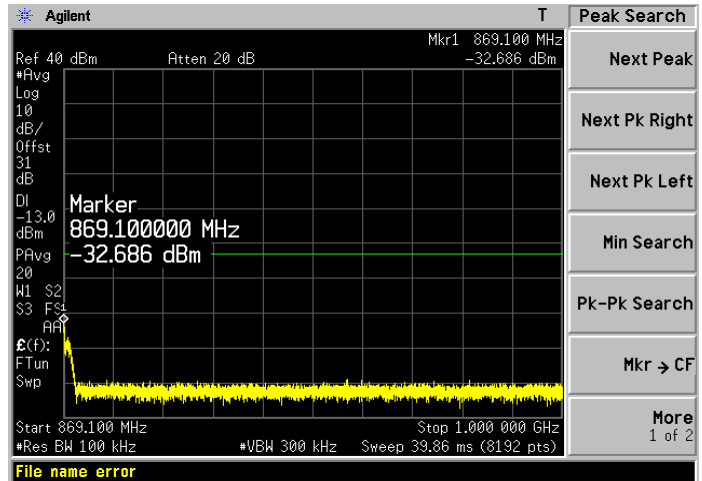
Output : MSK (Downlink, Hi channel)



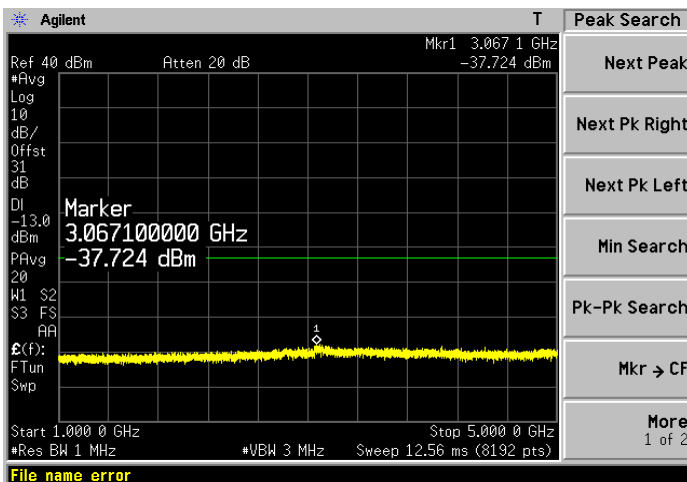
Output : MSK (Downlink, Hi channel)



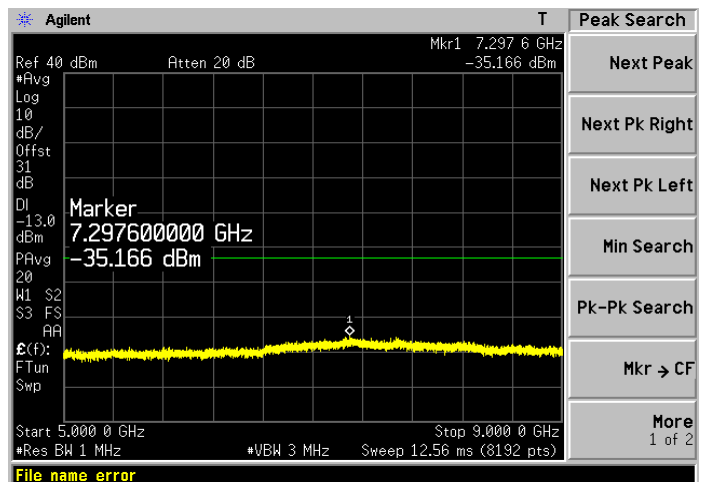
Output : MSK (Downlink, Hi channel)



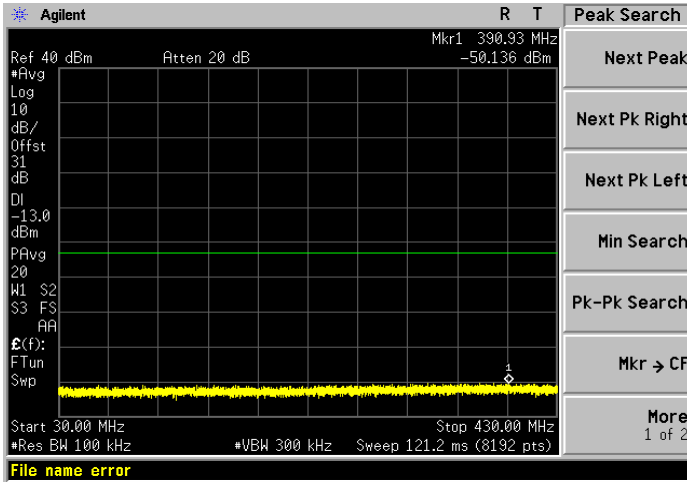
Output : MSK (Downlink, Hi channel)



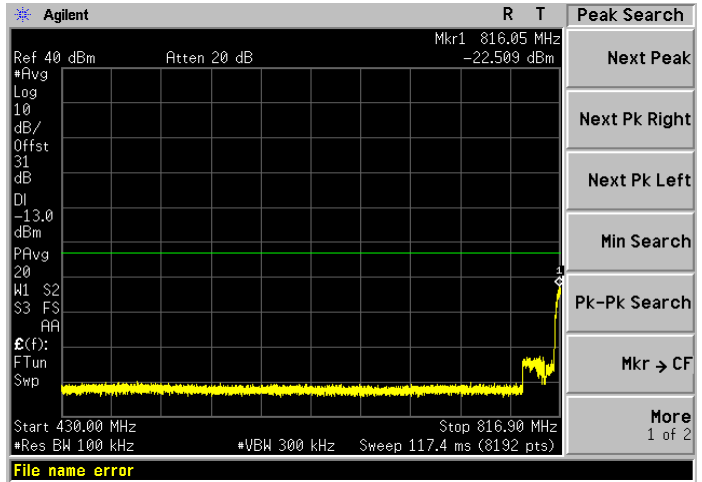
Output : MSK (Downlink, Hi channel)



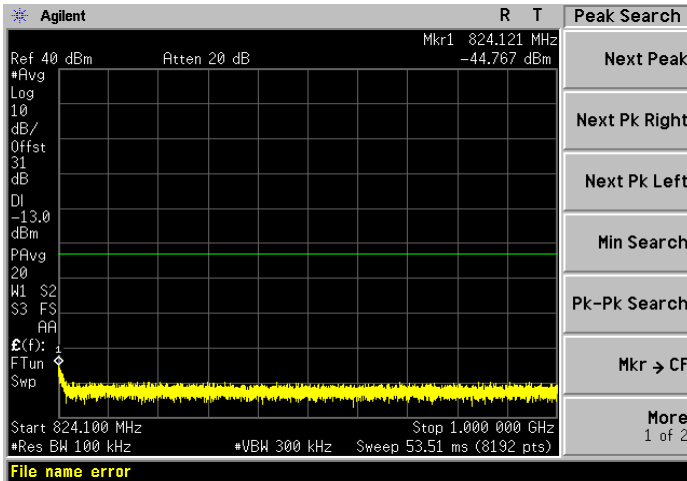
Output : MSK (Downlink, Hi channel)



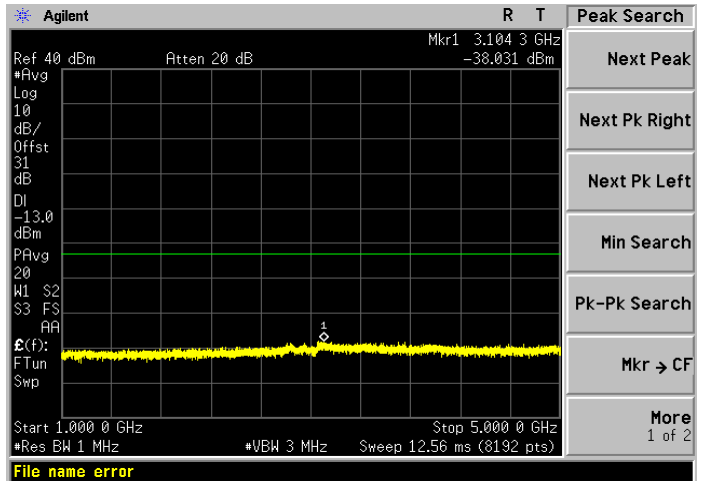
Output : AWGN (Uplink, Low channel)



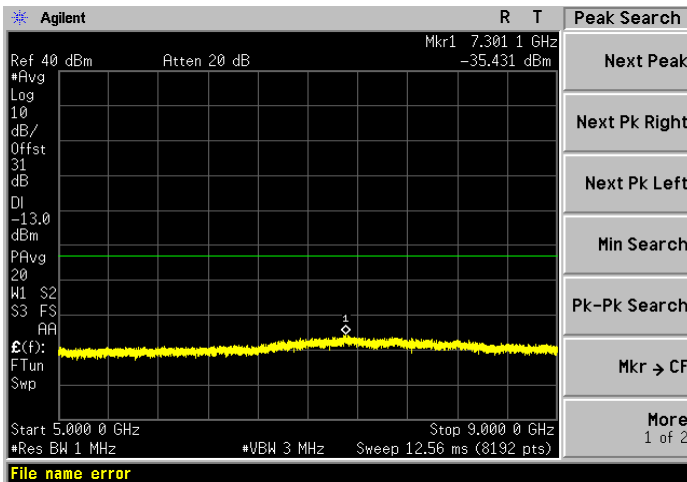
Output : AWGN (Uplink, Low channel)



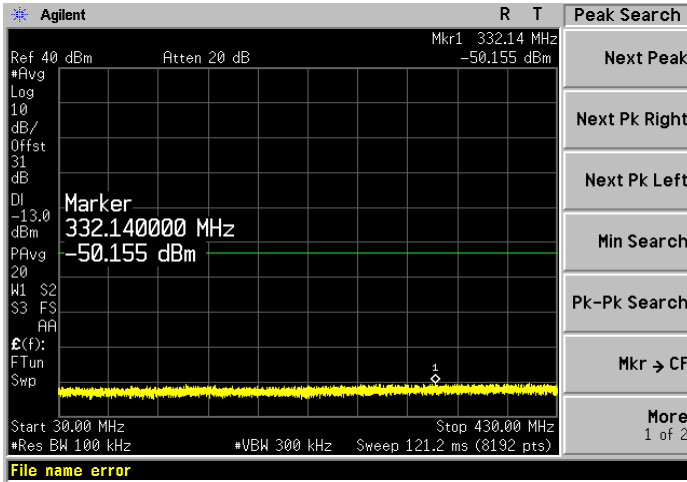
Output : AWGN (Uplink, Low channel)



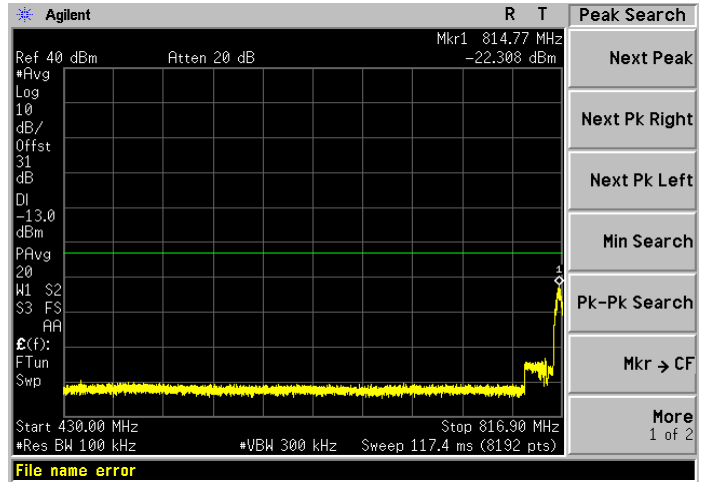
Output : AWGN (Uplink, Low channel)



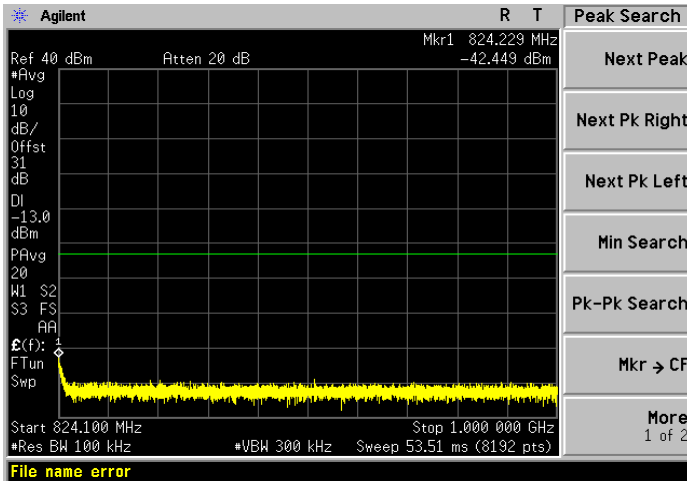
Output : AWGN (Uplink, Low channel)



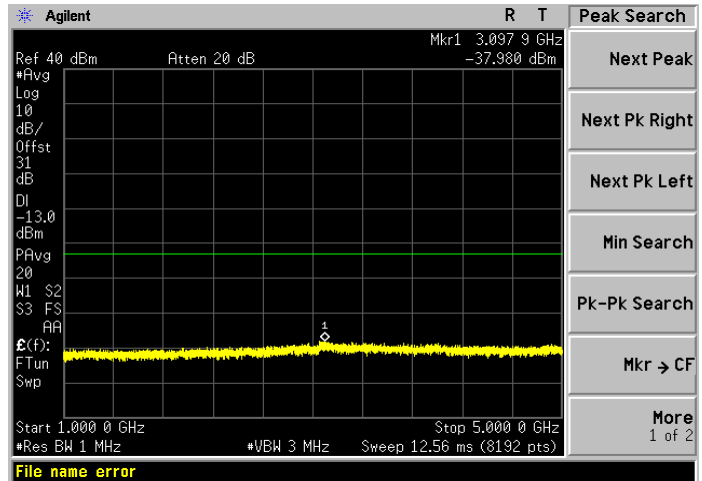
Output : AWGN (Uplink, Mid channel)



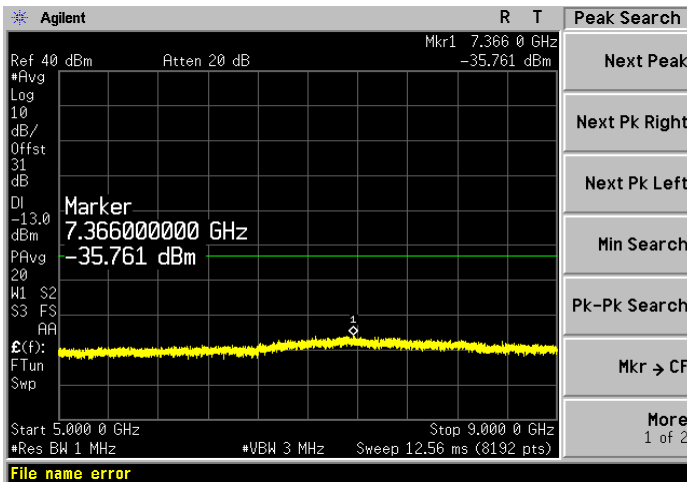
Output : AWGN (Uplink, Mid channel)



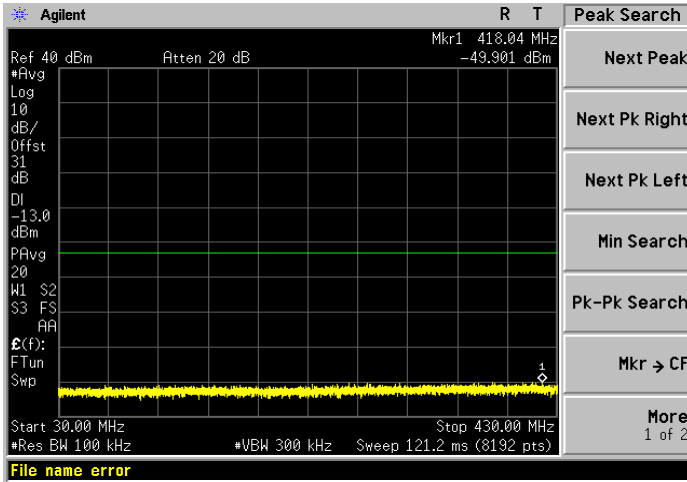
Output : AWGN (Uplink, Mid channel)



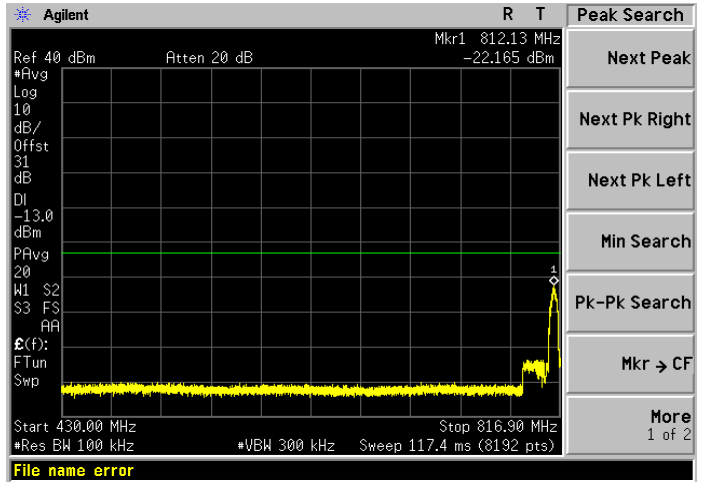
Output : AWGN (Uplink, Mid channel)



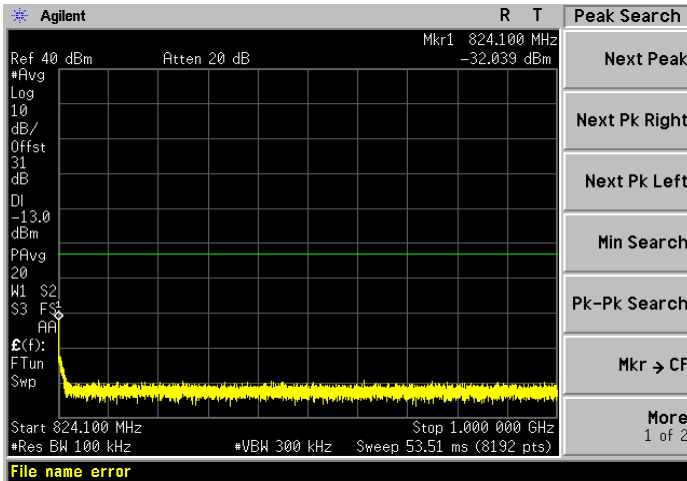
Output : AWGN (Uplink, Mid channel)



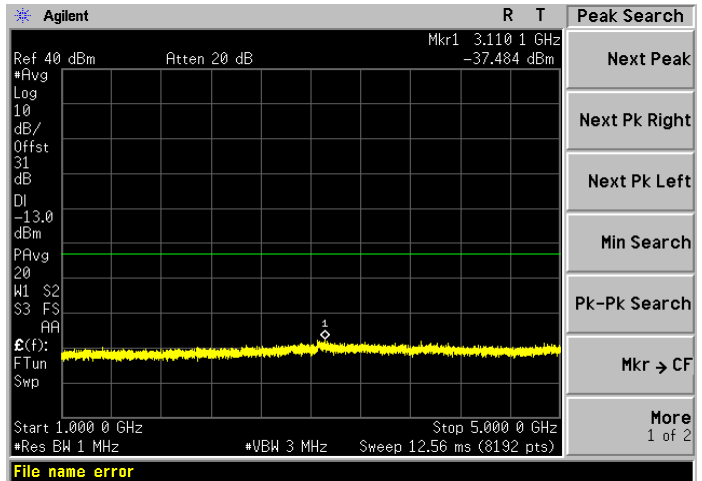
Output : AWGN (Uplink, Hi channel)



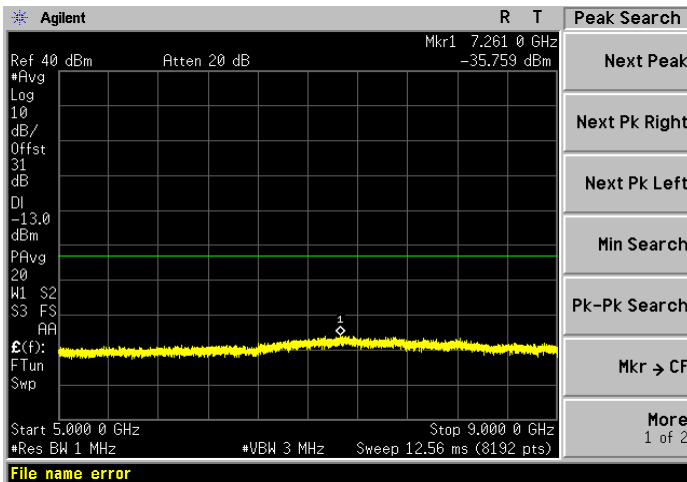
Output : AWGN (Uplink, Hi channel)



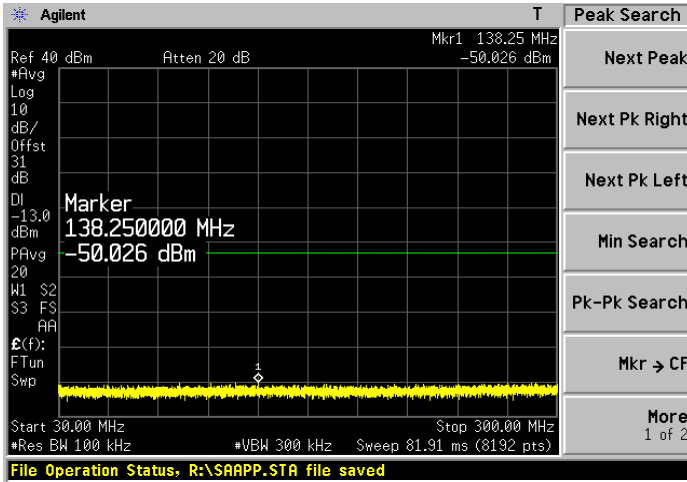
Output : AWGN (Uplink, Hi channel)



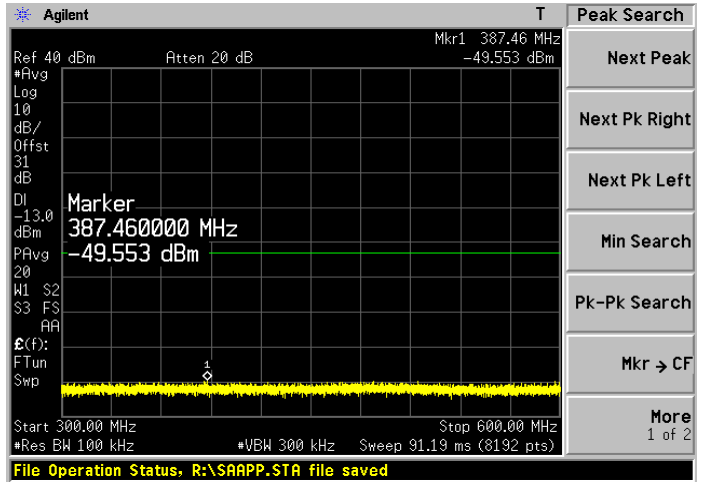
Output : AWGN (Uplink, Hi channel)



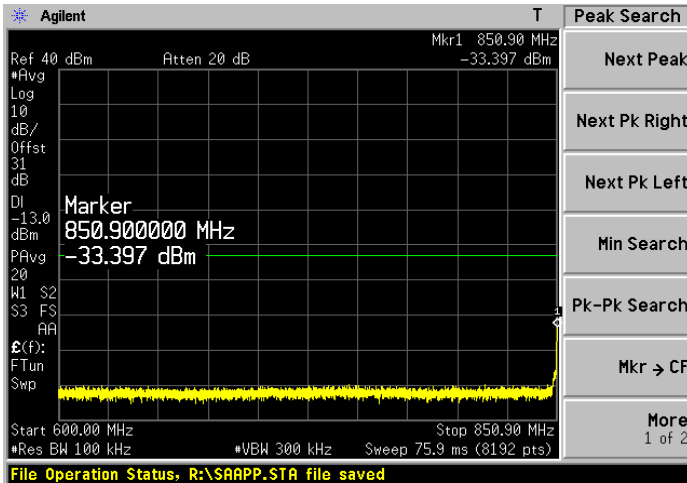
Output : AWGN (Uplink, Hi channel)



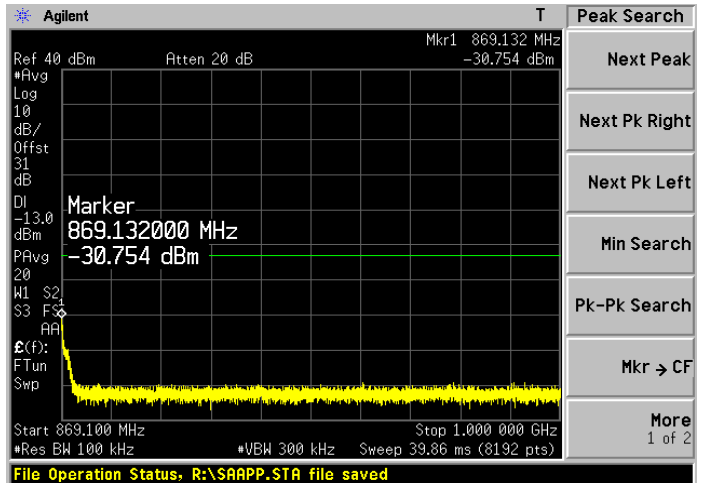
Output : AWGN (Downlink, Low channel)



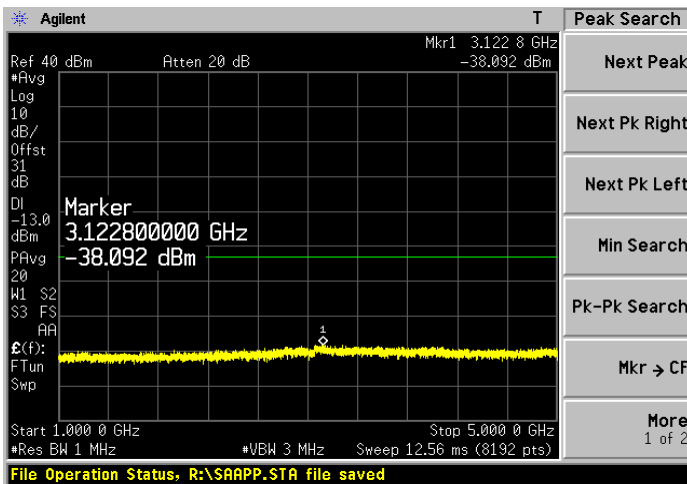
Output : AWGN (Downlink, Low channel)



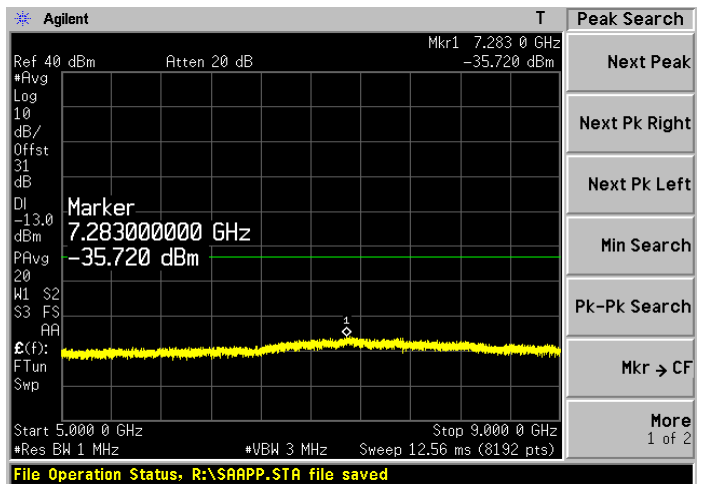
Output : AWGN (Downlink, Low channel)



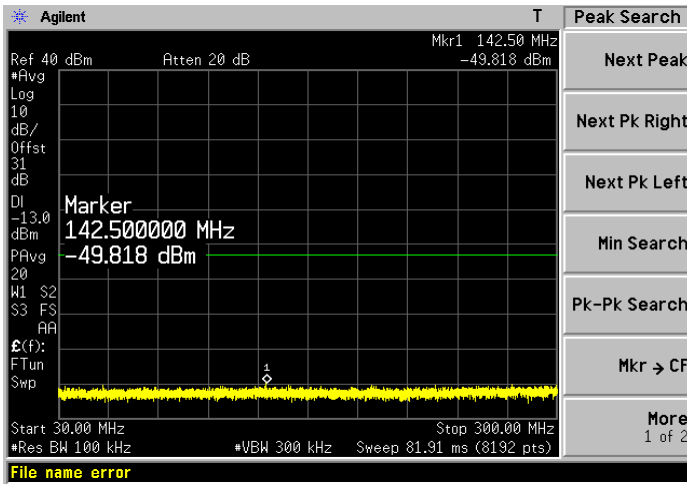
Output : AWGN (Downlink, Low channel)



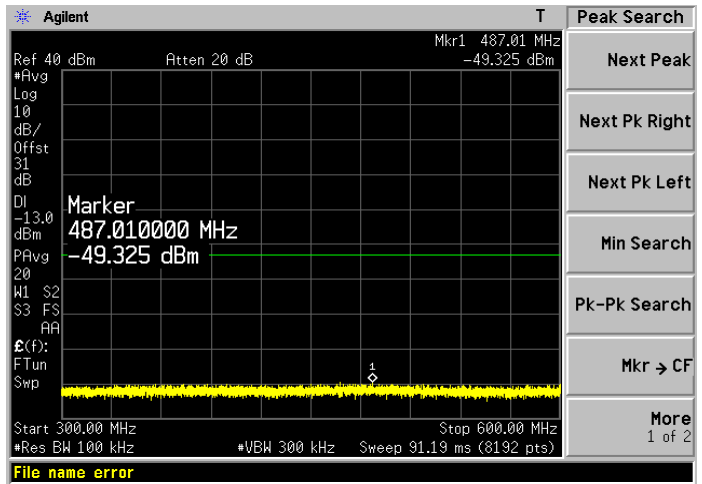
Output : AWGN (Downlink, Low channel)



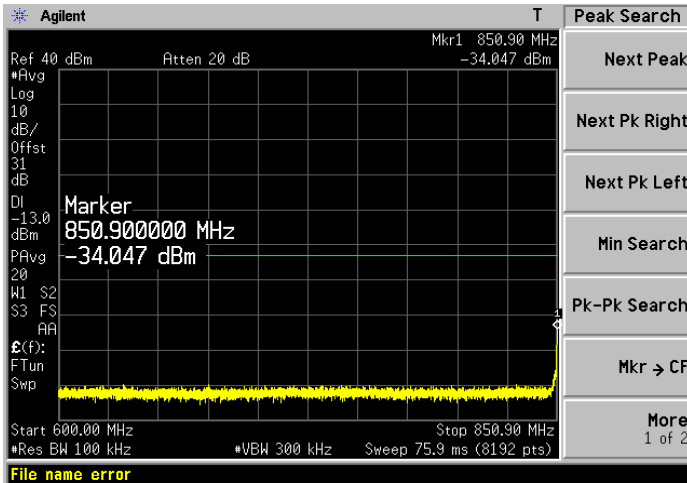
Output : AWGN (Downlink, Low channel)



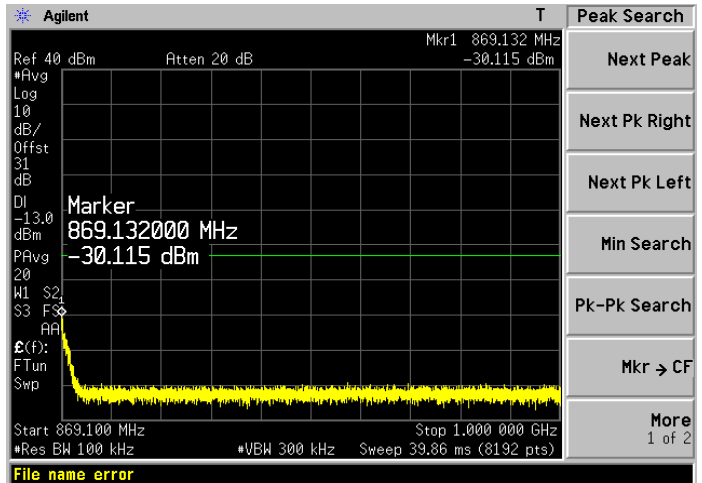
Output : AWGN (Downlink, Mid channel)



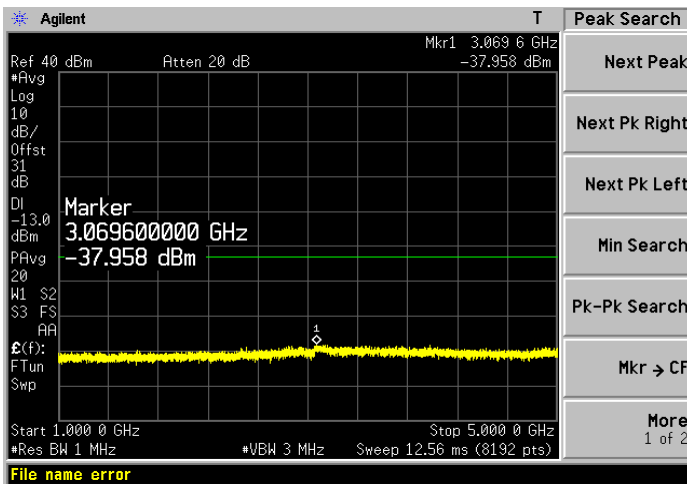
Output : AWGN (Downlink, Mid channel)



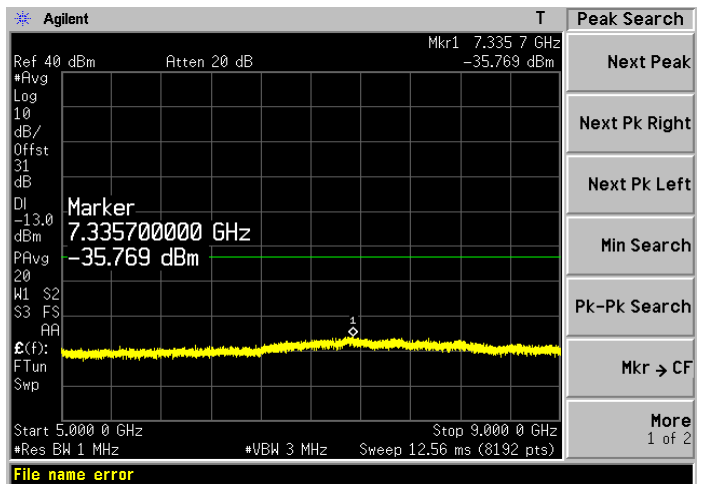
Output : AWGN (Downlink, Mid channel)



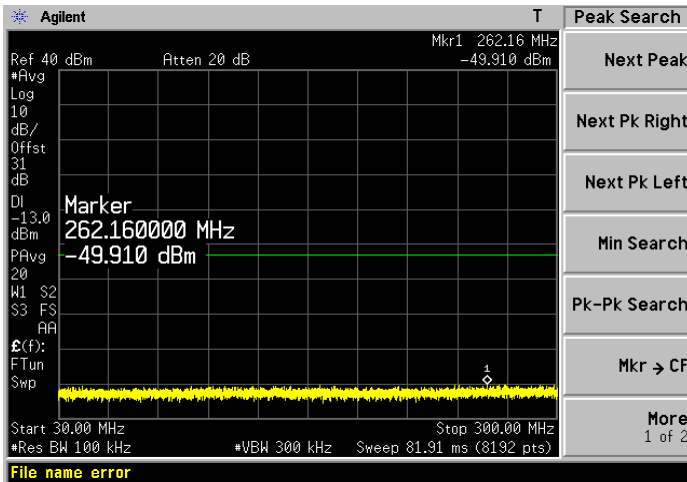
Output : AWGN (Downlink, Mid channel)



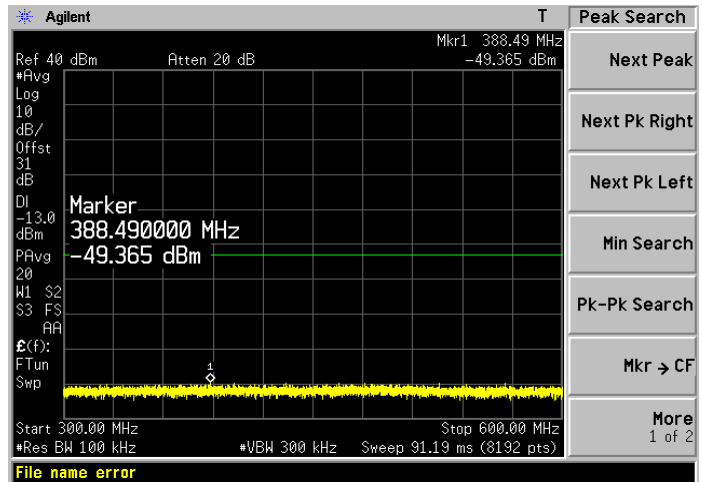
Output : AWGN (Downlink, Mid channel)



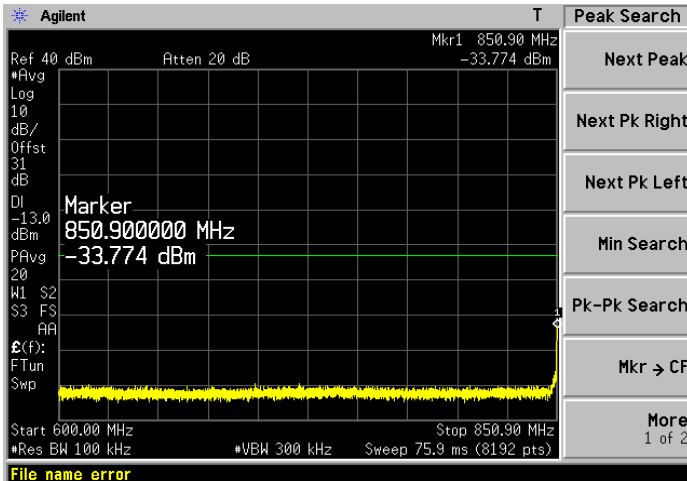
Output : AWGN (Downlink, Mid channel)



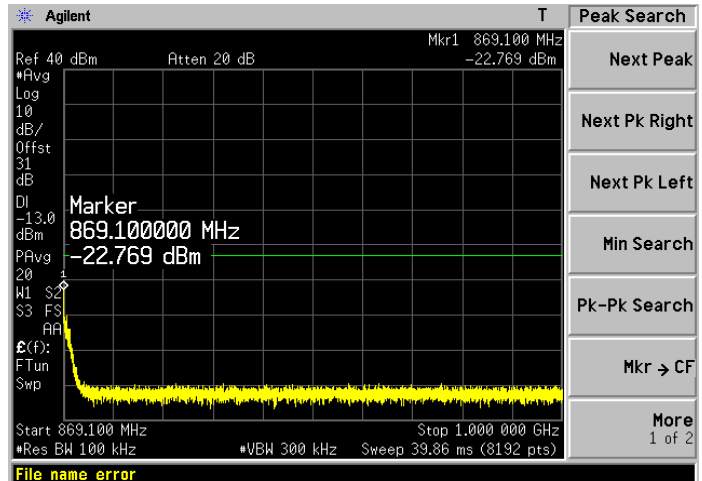
Output : AWGN (Downlink, Hi channel)



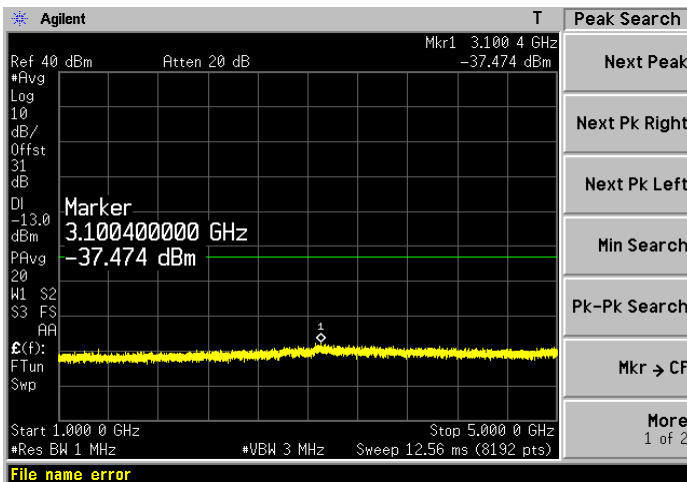
Output : AWGN (Downlink, Hi channel)



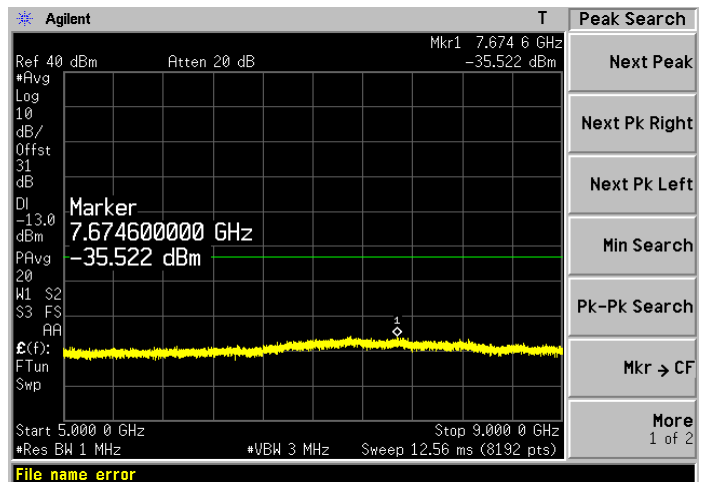
Output : AWGN (Downlink, Hi channel)



Output : AWGN (Downlink, Hi channel)



Output : AWGN (Downlink, Hi channel)



Output : AWGN (Downlink, Hi channel)

9. Radiated Spurious Emission

9.1 Test Procedure according to KDB935210 D5 3.8

This measurement is intended to produce test data necessary to demonstrate compliance to the radiated spurious emission requirements specified in Section 2.1053 of the FCC rules. This test is intended to capture any emissions that radiate directly from the case, cabinet, control circuits, etc., instead of via the antenna output port, and thus would not be captured in conducted spurious emission measurements.

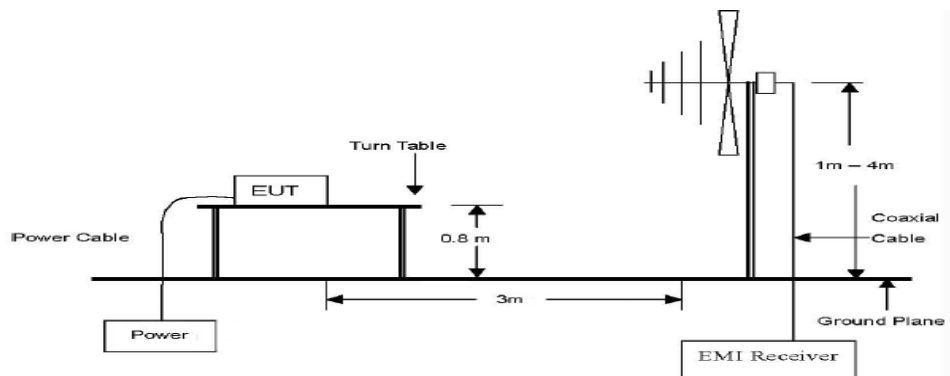
9.2 Test Equipments

The following test equipments are used during tests

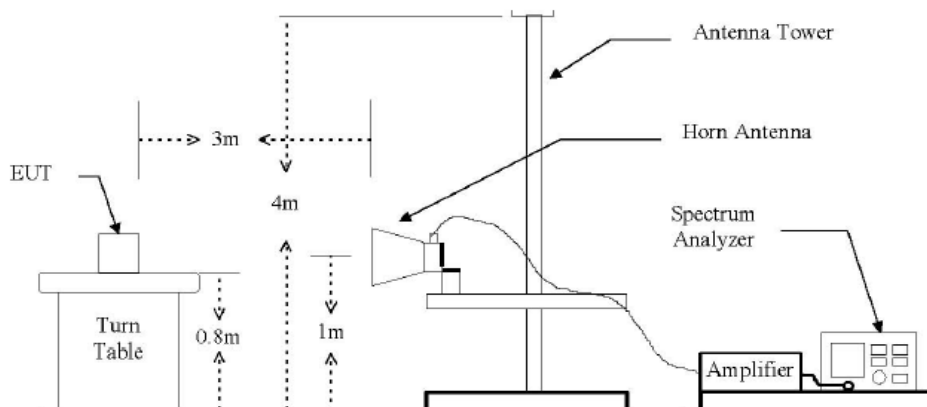
Equipment	Manufacturer	Model		Next Cal.
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	100939	2020-12-02
Signal Generator	ROHDE&SCHWARZ	SMBV100A	2566633	2020-12-03
TEST Receiver	ROHDE & SCHWARZ	ESCI7	100185	2021-08-24
Logbicon Antenna	SCHWARZBECK	VULB 9168	237	2022-01-14
PREAMPLIFIER	AGILENT	8449B	3008A00595	2021-08-25
Signal Generator	HP	E4432B	GB40050840	2020-12-03
Signal Generator	ROHDE & SCHWARZ	SMB 100A	177653	2020-12-03
Horn Antenna	SCHWARZBECK	BBHA 9120 D	469	2021-03-11

9.3 Test Setup

Test setup for 30 MHz to 1 GHz



Test setup for above 1 GHz





9.4 Test Results : Pass

Uplink

Ant. Po	Frequency (MHz)	Dect mode	Reading (dBm)	A/F (dB)	C/L (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
H	78.44	Peak	-77.30	10.66	1.34	-65.30	-13.00	52.30
H	125.00	Peak	-65.84	10.80	1.71	-53.33	-13.00	40.33
H	152.76	Peak	-76.31	13.04	1.88	-61.39	-13.00	48.39
H	200.64	Peak	-74.43	9.92	2.21	-62.30	-13.00	49.30
H	210.00	Peak	-74.29	10.00	2.27	-62.02	-13.00	49.02
H	216.08	Peak	-77.99	10.13	2.30	-65.56	-13.00	52.56
H	1125.00	Peak	-57.17	24.63	-31.36	-63.91	-13.00	50.91
H	1641.00	Peak	-45.99	25.04	-30.40	-51.35	-13.00	38.35
H	1840.00	Peak	-56.08	25.46	-30.18	-60.80	-13.00	47.80
H	2250.00	Peak	-60.72	27.95	-29.90	-62.67	-13.00	49.67
H	8495.50	Peak	-61.61	36.60	-24.83	-49.84	-13.00	36.84
V	31.24	Peak	-64.81	12.02	0.81	-51.99	-13.00	38.99
V	37.60	Peak	-68.85	12.13	0.88	-55.83	-13.00	42.83
V	62.84	Peak	-66.61	13.23	1.20	-52.19	-13.00	39.19
V	79.12	Peak	-64.78	10.67	1.35	-52.77	-13.00	39.77
V	125.00	Peak	-65.23	10.80	1.71	-52.72	-13.00	39.72
V	203.72	Peak	-75.02	9.99	2.23	-62.80	-13.00	49.80
V	1125.00	Peak	-59.63	24.63	-31.36	-66.37	-13.00	53.37
V	1641.00	Peak	-28.35	25.04	-30.40	-33.71	-13.00	20.71
V	1839.00	Peak	-60.24	25.46	-30.18	-64.96	-13.00	51.96
V	2461.50	Peak	-42.84	27.59	-29.77	-45.02	-13.00	32.02
V	3282.00	Peak	-54.21	28.31	-29.07	-54.97	-13.00	41.97
V	8555.50	Peak	-62.21	37.20	-24.88	-49.89	-13.00	36.89

*A/F : Antenna factor

C/L : Cable loss



Downlink

Ant. Po	Frequency (MHz)	Dect mode	Reading (dBm)	A/F (dB)	C/L (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
H	32.28	Peak	-76.25	12.03	0.81	-63.41	-13.00	50.41
H	77.48	Peak	-74.43	10.64	1.34	-62.45	-13.00	49.45
H	80.52	Peak	-73.56	9.11	1.37	-63.08	-13.00	50.08
H	125.00	Peak	-66.11	10.80	1.71	-53.60	-13.00	40.60
H	180.56	Peak	-76.38	11.61	2.08	-62.69	-13.00	49.69
H	210.00	Peak	-73.85	10.00	2.27	-61.58	-13.00	48.58
H	1125.00	Peak	-57.79	24.63	-31.36	-64.53	-13.00	51.53
H	1731.00	Peak	-55.31	25.16	-30.32	-60.47	-13.00	47.47
H	1839.75	Peak	-57.06	25.46	-30.18	-61.78	-13.00	48.78
H	4532.75	Peak	-62.10	30.87	-27.49	-58.72	-13.00	45.72
H	5282.25	Peak	-62.25	31.90	-27.00	-57.35	-13.00	44.35
H	7389.55	Peak	-62.40	36.60	-25.37	-51.17	-13.00	38.17
V	32.24	Peak	-63.10	12.03	0.81	-50.26	-13.00	37.26
V	37.52	Peak	-70.67	12.13	0.88	-57.66	-13.00	44.66
V	63.52	Peak	-69.87	13.24	1.20	-55.43	-13.00	42.43
V	80.92	Peak	-66.00	9.12	1.37	-55.51	-13.00	42.51
V	125.00	Peak	-70.22	10.80	1.71	-57.71	-13.00	44.71
V	202.64	Peak	-75.93	9.96	2.22	-63.74	-13.00	50.74
V	1731.00	Peak	-25.61	25.16	-30.32	-30.77	-13.00	17.77
V	1840.50	Peak	-57.48	25.46	-30.18	-62.19	-13.00	49.19
V	2389.50	Peak	-57.91	27.89	-29.82	-59.84	-13.00	46.84
V	2596.50	Peak	-36.43	27.88	-29.72	-38.27	-13.00	25.27
V	3462.00	Peak	-47.99	28.61	-28.74	-48.12	-13.00	35.12
V	4327.50	Peak	-58.86	30.48	-27.53	-55.91	-13.00	42.91

*A/F : Antenna factor

C/L : Cable loss



Appendix 1. Uncertainty

Description	Frequency Range	Uncertainty
Conducted RF Output Power	25 to 7000 MHz	± 0.45 dB
Occupied Bandwidth	25 to 7000 MHz	± 41 kHz
Out of Band Rejection	25 to 7000 MHz	± 0.48 MHz
Spurious Emissions at Antenna Terminals	-	± 1.31 dB
Radiated Spurious Emissions	25 to 1000 MHz	± 3.5 dB
	1000 to 40000 MHz	± 5.2 dB