Shenzhen Huatongwei International Inspection Co., Ltd.
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Phone:86-755-26748019 Fax:86-755-26748089 http://www.szhtw.com.cn

FCC REPORT

Report Reference No……:	**TRE17090085**	R/C…….: 20531
FCC ID……...:	**PX8mBDA-80**	
Applicant's name……...:	**Comba Telecom Ltd.**	
Address……..:	611 East Wing, 8 Science Park West Avenue, Hong Kong Science Park, Hong kong	
Manufacturer.....:	Comba Telecom Systems(China) Ltd.	
Address.....:	No.10 Shenzhou Road, Guangzhou Science City, Guangzhou 510663, Guangdong, P.R. China	
Test item description ……...:	**mBDA Band Selective Repeater**	
Trade Mark……:	-	
Model/Type reference……..:	mBDA-80	
Listed Model(s)……..:	-	
Standard……:	**FCC Part 2, FCC Part 90**	
Date of receipt of test sample…….:	Aug. 06, 2017	
Date of testing……...:	Aug. 07, 2017 – Aug. 28, 2017	
Date of issue……..:	Aug. 28, 2017	
Result……...:	**Pass**	

Compiled by (position+printedname+signature):	File administrators Shayne Zhu	Shayne Zhu
Supervised by (position+printedname+signature):	Project Engineer Jerry Wang	Jerry Wang
Approved by (position+printedname+signature):	Manager Hans Hu	Hans Hu

Testing Laboratory Name…….:	**Shenzhen Huatongwei International Inspection Co., Ltd.**
Address……..:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

1 Test Summary

Test Item	Test Requirement	Test Method	Result
Output Power	FCC part90.635	FCC part 2.1046 2-11-04/EAB/RF KDB935210 D05	PASS
Conducted Spurious Emissions	FCC part90.210(h),90.691	FCC part 2.1051 2-11-04/EAB/RF KDB935210 D05	PASS
Band Edge& Intermodulation	FCC part90.210(g),90.691	FCC part 2.1051 2-11-04/EAB/RF KDB935210 D05	PASS
Radiated Spurious Emissions	FCC part90.210, 90.691	FCC part 2.1053 2-11-04/EAB/RF KDB935210 D05	PASS
Occupied Bandwidth	FCC part 2.1049	FCC part 2.1049 2-11-04/EAB/RF KDB935210 D05	PASS
Out of Band Rejection	2-11-04/EAB/RF	2-11-04/EAB/RF KDB935210 D05	PASS
Frequency Stablility	FCC part90.213	FCC part 2.1055	PASS

Remark:
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.

1.1. Report version

Version No.	Date of issue	Description
00	Aug. 28, 2017	Original

2 Contents

3 General Information

3.1 Client Information

Applicant Name:	Comba Telecom Ltd.
Applicant Address:	611 East Wing, 8 Science Park West Avenue, Hong Kong Science Park, Hong kong
Manufacturer:	Comba Telecom Systems(China) Ltd.
Address of Manufacturer:	No.10 Shenzhou Road, Guangzhou Science City, Guangzhou 510663, Guangdong, P.R. China

3.2 General Description of E.U.T.

Product Name:	mBDA Band Selective Repeater
Model No.:	mBDA-80
Power Supply:	AC 100-240V 47-63Hz
Test power:	AC 120V 60Hz
Operating Temperature:	-20 °C to +40°C
Operating Humidity:	≤ 95%

3.3 Details of E.U.T.

Type of Modulation	CDMA & LTE
Emission Designator:	F9W(CDMA), G7D(LTE)
Frequency Band:	Downlink: 862MHz to 869MHz include the Modulation: CDMA, LTE Uplink: 817MHz to 824MHz include the Modulation: CDMA, LTE
Nominal Power Output:	27,30,33dBm for downlink:862-869MHz 17dBm for uplink 817-824MHz
Nominal System Gain:	80dB for downlink & uplink

3.4 **Product** Description

mBDA is a wireless enhanced solution where high-quality voice or high-speed data service is not available between a mobile and a base station.mBDA is ideal for the first phase of the network rollout and for any subsequent phase where cost,coverage,and quality need to be optimized.

mBDA offers a modular,robust design that is easy to install,manage an upgrade.It supports three

individually adjustable sub-bands for flexibility and high RF performance,supports multi-carrier and multi-band opearation.

Remote configuration and surveillance is possible through Comba's remote and monitoring system via PC or wireless modem to the OMT/OMC.

3.5 **Standards** Applicable for Testing

The standard used was FCC part 2 & FCC part 90

3.6 **Test Location**

All tests were performed at:
SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663
Tel: +86 20 82155555 Fax: +86 20 82075059
No tests were sub-contracted.

3.7 Other Information **Requested** by the Customer

None.

3.8 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **NVLAP (Lab Code: 200611-0)**

  SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

  The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

  Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **Industry Canada (Registration No.: 4620B-1)**

  The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

  The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584，G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

  SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

4 Equipment Used during Test

RE in Chamber						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date (YYYY-MM-DD)	Cal.Due date (YYYY-MM-DD)
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2016-12-04	2019-12-03
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2017-01-20	2018-01-19
EMC0056	EMI Test Receiver	Rohde & Schwarz	ESCI	100236	2017-01-20	2018-01-19
EMC0528	RI High frequency Cable	SGS	20 m	N/A	2016-04-19	2018-04-18
EMC2025	Trilog Broadband Antenna 30-1000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9160	9160-3372	2016-09-08	2019-09-07
SEM003-18	Trilog Broadband Antenna 25-2000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	665	2016-06-29	2019-06-28
EMC0524	Bi-log Type Antenna	Schaffner -Chase	CBL6112B	2966	2016-09-08	2019-09-07
EMC0519	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	2017-05-04	2020-05-03
EMC2026	Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-841	2016-09-09	2019-09-08
EMC0521	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A01649	2017-01-20	2018-01-19
EMC2065	Amplifier	HP	8447F	N/A	2017-06-19	2018-06-18
EMC2086	PRE AMPLIFIER MH648A	ANRITSU CORP	MH648A	N/A	2016-12-02	2017-12-01
EMC2063	Pre-amplifier 1GHz-26GHz	Compliance Direction Systems Lnc.	PAP-1G26-48	6279.628	2016-12-02	2017-12-01
EMC0523	Active Loop Antenna	EMCO	6502	42963	2016-02-27	2018-02-26
EMC2041	Broad-Band Horn Antenna (14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONI	BBHA 9170	9170-375	2017-05-23	2020-05-22
EMC2079	High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	009	2017-01-20	2018-01-19
EMC2069	2.4GHz Filter	Micro-Tronics	BRM 50702	149	2017-01-20	2018-01-19
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2016-04-30	2018-04-29

Other Equipment

No:	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (dd-mm-yy)	Cal. Due Date (dd-mm-yy)
NA	Power Meter	Agilent	E4419B	MY45100856	2017-06-12	2018-06-11
NA	Signal Generator	Agilent	E4437B	US39260800	2017-6-17	2018-06-16
NA	Signal Generator	Agilent	E4438C	US39260800	2017-6-14	2018-06-13
NA	Spectrum Analyzer	Agilent	N9020A	MY48011385	2017-06-14	2018-06-13
NA	Spectrum Analyzer	Rohde&Schwarz	FSQ 8	SN0805772	2017-06-14	2018-06-13
NA	Attenuator	SHX manufacturer	30dB/50W	09031816	----	----
NA	Attenuator	SHX manufacturer	40dB/50W	09031312	----	----
NA	Attenuator	SHX manufacturer	50dB/50W	09053023	----	----
NA	Signal Generator	Rohde&Schwarz	SMU 200A	08103303	2017-06-12	2018-06-11

General used equipment

No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date (YYYY-MM-DD)	Cal.Due date (YYYY-MM-DD)
EMC0006	DMM	Fluke	73	70681569	2017-06-12	2018-06-11
EMC0007	DMM	Fluke	73	70671122	2017-06-12	2018-06-11

5 Test Results

5.1 E.U.T. test conditions

Input Voltage:	AC 120V
Operating Environment:	
Temperature:	22°C ~26°C
Humidity:	46%~56% RH
Atmospheric Pressure:	990~1005mbar
Test Requirement:	The RF output power of the EUT was measured at the antenna port, by adjusting the input power of signal generter to drive the EUT to get to maximum output power point and keep the EUT at maximum gain setteing for all tests. The device should be tested on downlink. For detail test Modulation and Frequency, please refer to 7.2.

Remark:

FIBER-OPTIC AND OTHER SIMILAR RF DISTRIBUTION SYSTEMS

Fiber-optic distribution systems are a type of in-building radiation system that receives RF signals from an antenna, distributes the signal over fiber-optic cable, and then retransmits at another location for example within a building or tunnel. Most fiber-optic systems are signal boosters; however, some may be repeaters. These systems generally have two enclosures typically called host (or local or donor unit) and remote. Some systems may also have an optional expander box for fan-out to multiple remotes. The system transmits downlink signals from the remote unit to handsets, portables, or clients, and transmits uplink signals via from the host unit. Usually but not always the uplink goes through an intermediate amplifier to a “donor” antenna. Therefore both uplink and downlink must be tested, unless filing effectively documents how connection of uplink to donor antenna with or without an intermediate amplifier will be prevented, such as for always only a cabled connection to a base station. Fiber-optic systems are not amplifiers (AMP equipment class) – they are equipment class TNB or PCB. The same approval procedures also apply for multiple-enclosure systems connected by coax cable.

Synonyms and related terms: in-building radiation system, coverage enhancer, distributed antenna system, fiber-optic distribution system, converter, donor anten

Typical in-building or distributed antenna systems can consist of five different components (enclosures), not counting antennas:

1) host unit
a) transmits uplink to base station via antenna thru coax, ***passive interface unit*** , or ***active interface unit*** (amplifier)
b) sends base-station downlink via fiber-optic or coax to ***remote***
c) receives handset uplink via fiber-optic or coax from ***remote***
d) optional connection to ***expansion unit*** via fiber-optic
e) separate FCC ID from ***remote***, unless electrically identical
f) ***non-transmitting host unit***
i) connects directly to a base station via coax cable but does not connect to antenna or amplifier
ii) Part 15 digital device subject to Verification, no FCC ID
2) remote unit
a) receives base-station downlink via fiber-optic or coax from ***host***, transmits via antenna to handsets
b) returns handset uplink via fiber-optic or coax to ***host***
c) separate FCC ID from ***remote***, unless electrically identical

3) expansion unit
a) fiber-optic or coax from ***host***
b) fiber-optic or coax fan-out to ***remote(s)***
c) Part 15 digital device subject to Verification, no FCC ID
4) *passive interface unit*

a) contains attenuators, splitters, combiners
b) coax cable connection between ***host*** and base-station
c) passive device, no FCC ID
5) *active interface unit*
a) amplifies uplink signal from ***host unit*** for transmit by donor antenna
b) attenuates downlink from donor antenna
c) coax cable connection between ***host*** and ***active interface unit***
d) usually has separate FCC ID; in some cases could be combined/included with ***host*** as one enclosure

GENERAL DEFINITIONS FOR CERTIFICATION PURPOSES:
The following three general definitions follow from those stated in the Part 22, 24, and 90 rule sections as listed above. Two of the definitions replace previous EAB internal definitions given for booster, repeater and extender. The general term “extender” is the same as booster, but booster should be used rather than extender. The general term “translator” is the same as repeater, but repeater should be used rather than translator.
External radio frequency power amplifier (ERFPA) - any device which, (1) when used in conjunction with a radio transmitter signal source, is capable of amplification of that signal, and (2) is not an integral part of a radio transmitter as manufactured. The EAS equipment class AMP is used only for an ERFPA device inserted between a transmitter (TNB/PCB) and an antenna (has only one antenna port)
Booster is a device that automatically reradiates signals from base transmitters without channel translation, for the purpose of improving the reliability of existing service by increasing the signal strength in dead spots. An “in-building radiation system” is a signal booster. These devices are not intended to extend the size of coverage from the originating base station. A booster can be either single or multiple channels***.***
Repeater is a device that retransmits the signals of other stations. Repeaters are different from boosters in that they can include frequency translation and can extend coverage beyond the design of the original base station. A repeater is typically single channel but can also be multiple channels.
ERFPA (AMP) and boosters/repeaters (TNB/PCB) can generally be authorized for all rule parts except 15 and 18.
Tests should be done with each typical signal. e.g., for F3E emissions use 2500 Hz with 2.5 or 5 kHz deviation. Use of CW signal for some tests is acceptable in lieu of actual emission, in some cases when CW signal gives worst case.
The GX system working principle: the RF signal coupled from BTS is transferred into optical signal, and then transmitted via a fiber to remote unit.the remote re-transfers the optical signal back to RF signal, through the frequency translation and after power amplifiers,can extend the BTS coverage to another desired area, the GX system is compliant with the description about repeater in FCC rules, So **the Equipment belongs to the repeater and TNB class.**

,

5.2 Test **Procedure** & Measurement Data

Test Modulation and Frequency

Downlink: 862MHz to 869MHz

Modulation	Lowest frequency	Middle frequency	Highest frequency
CDMA	863	865.5	868
LTE	865	865.5	866

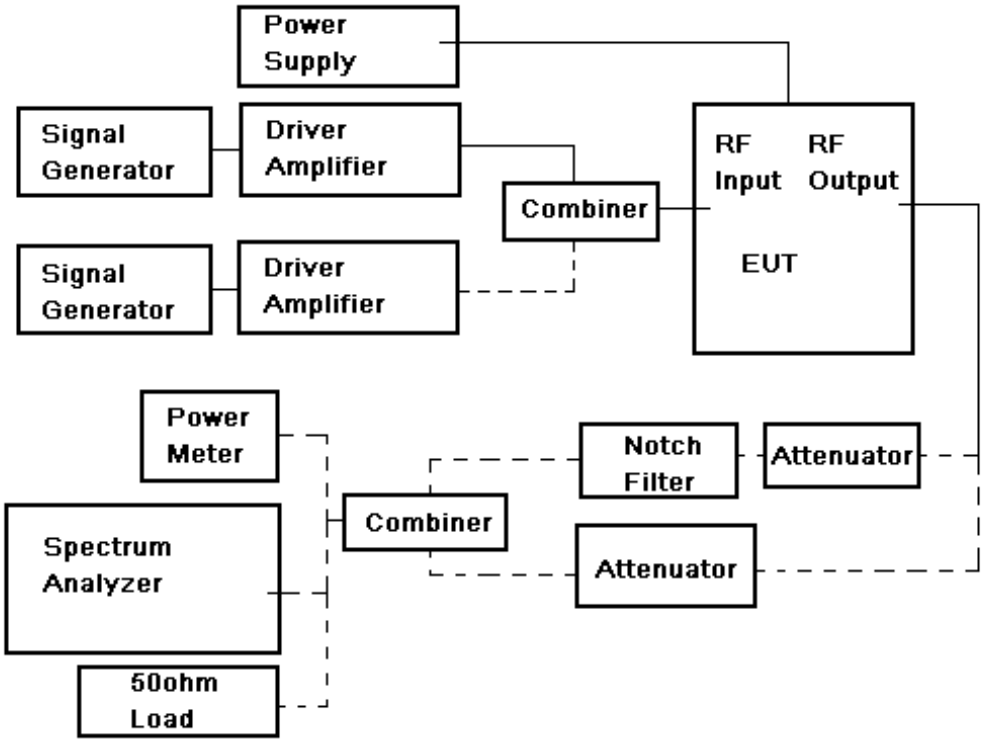
Uplink: 817MHz to 824MHz

Modulation	Lowest frequency	Middle frequency	Highest frequency
CDMA	818	820.5	823
LTE	820	820.5	821

Remark:

1) We test the downlink and uplink in the lowest band; the middle band; the hightest band and test the respective frequency as above table;

General Test Setup:



5.2.1 RF Output Power

Test Requirement: FCC part 90.635

90.635(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt(30dBW) and 304m.(1,000ft.) above average terrain(AAT),respectively,or the equivalent thereof as etermined from the Table. These are maximum values,and applicants will be required to justify power levels and antenna heights requested.

Test Method: FCC part 2.1046

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

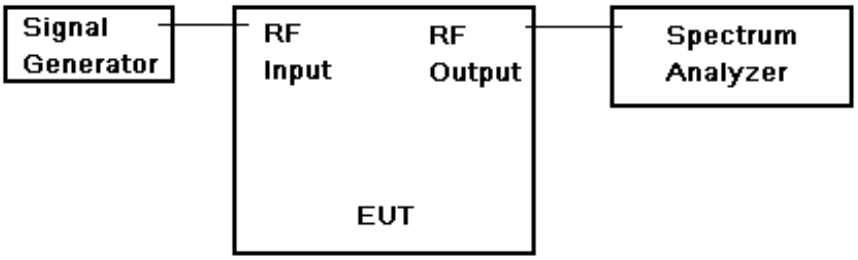


Fig.1 RF Output Power test configuration

Test Procedure: RF output power test procedure:

1.

a) Connect the equipment as illustrated, when the output power is over the max value of the Spectrum Analyzer, add the attenuator to avoid destroying the facility.

b) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.

c) do not apply any tone to modulate the EUT.

d1) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth >> the carrier bandwidth,

2) Video Bandwidth refer to standard requirement.

d2) Use spectrum analyzer channel power measurement function;

e) Record the frequencies and levels of carrier power;

f) Calculate the signal link way loss and final power value.

Or 2.

a) Connect the equipment as illustrated;

b) Read the value from the power meter;

c) Calculate the signal link way loss and final power value.

Remark: Output power –

Power on Form 731 should be clearly understood as either composite of multichannels or per carrier. If power is composite include in comments field: "Power output listed is composite for multi-channel operation."

Check that the input drive level is at maximum input rating and maximum gain

settings for all tests. Check both uplink and downlink input levels. See manual or brochures/technical description for maximum rating. May need to check FCC identifier of transmitter used for tests.

Confirm device can not operate in saturation. Are there means to control maximum power and to assure linear operation (use in system configuration may be necessary)? How is saturation or over-modulation prevented for pulsed signal inputs?

5.2.1.1 Measurement Record:

Downlink: 862MHz ~ 869MHz

Per channel Power Input=-47dBm for downlink			
Modulation	**Lowest frequency**	**Middle frequency**	**Highest frequency**
CDMA	32.8dBm (1905.461mW)	32.7dBm (1862.087mW)	32.6dBm (1819.701mW)
LTE	32.8dBm (1905.461mW)	32.6dBm (1819.701mW)	32.8dBm (1905.461mW)

Downlink: 817MHz ~ 824MHz

Per channel Power Input=-63dBm for downlink			
Modulation	**Lowest frequency**	**Middle frequency**	**Highest frequency**
CDMA	17.2dBm (52.481mW)	17.6dBm (57.544mW)	17.4dBm (54.954mW)
LTE	17.0dBm (50.119mW)	16.9dBm (48.978mW)	17.0dBm (50.119mW)

5.2.2 Conducted Spurious Emissions

Test Requirement: FCC part 90.210,part90.691

90.210,table"Application Emission Mask"

Frequency Band(MHz)	Mask for equipment with Audio Low pass filter	Mask for equipment without Audio Low pass filter
806-809/851-854	B	H
809-824/854-869 [3]	B	G

(g)Emission Mask G. For transmitters that are not equipped with an audio low-pass filter,the power of an emission must be attenuated below the unmodulated carrier power(P)as follows:

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

90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

Test Method: FCC part 2.1051

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

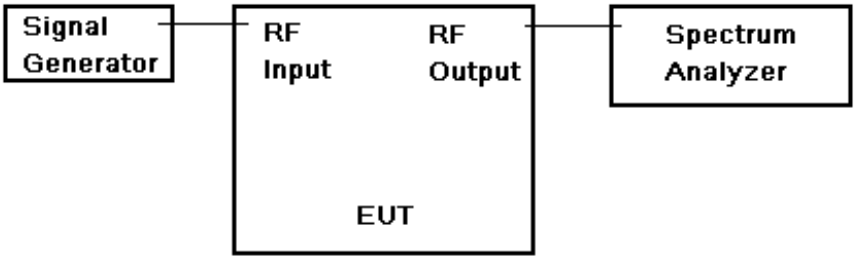
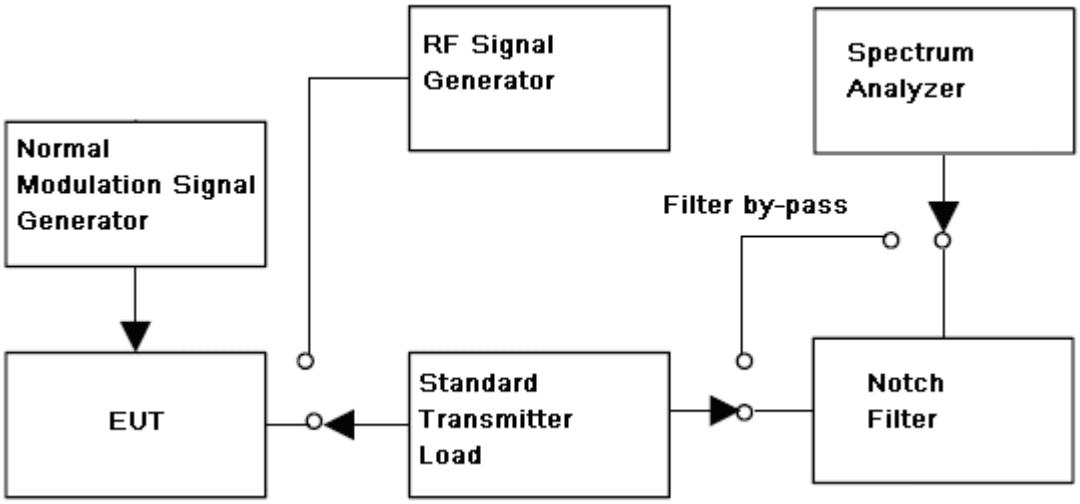


Fig.2. Conducted Spurious Emissions test configuration



Test Procedure: Conducted Emissions test procedure:

a) Connect the equipment as illustrated, with the notch filter by-passed, when the output power is over the max value of the Spectrum Analyzer, add the attenuator to avoid destroying the facility.

b) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.

c) do not apply any tone to modulate the EUT.

d) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth,(base the standard, apply the different set),her is 100KHz for frequency band less than 1GHz, 1MHz for frequency over 1GHz;

2) Video Bandwidth refer to standard requirement.

e) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from:

1) the lowest radio frequency generated in the equipment, it can be 9KHz base the test method, here select 30MHz as lowest frequency start point;

2) the highest radion frequency shall higher than 10 times of carrier frequency;

f) Record the frequencies and levels of spurious emissions from step e)

Remark:

The notch filter is used for avoid the EUT fundamental carrier output power making the spectrum overload and the harmonic spurious brought by it.

When the EUT fundamental carrier is not enough to make the status, the notch filter could be not used.

5.2.2.1 Measurement Record:

2.Downlink: 862MHz ~ 869MHz

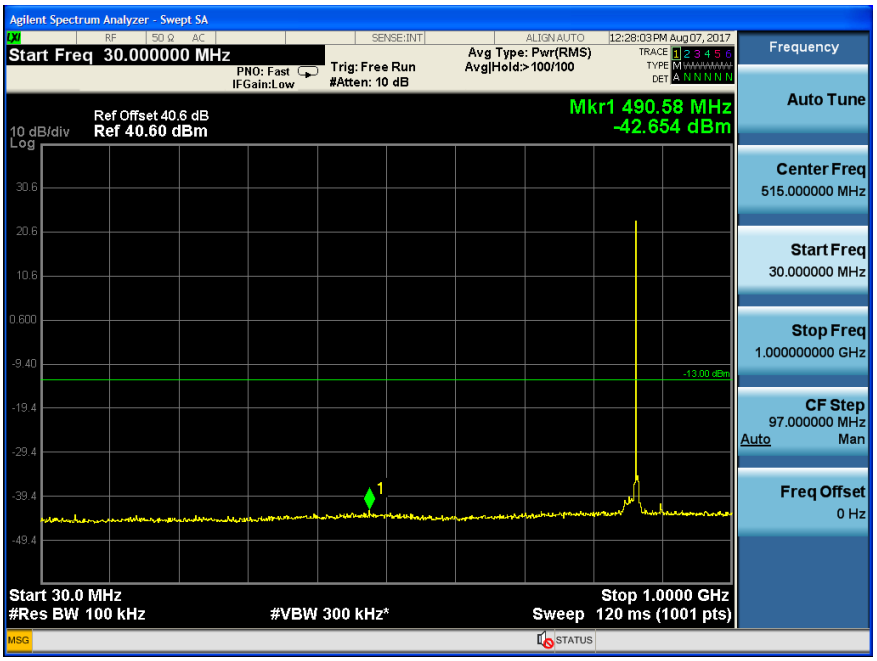
Remark:

The data of the CDMA mode is almost the same with LTE mode, so we only show the photo in the LTE mode,others record the data.

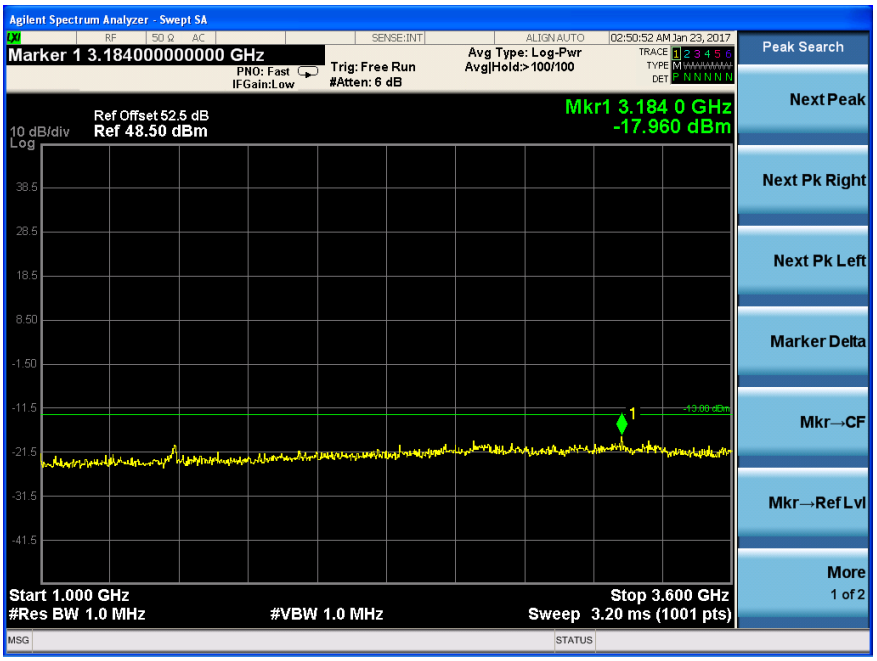
1.1 For LTE mode:

1)Lowest frequency

9KHz to 1GHz

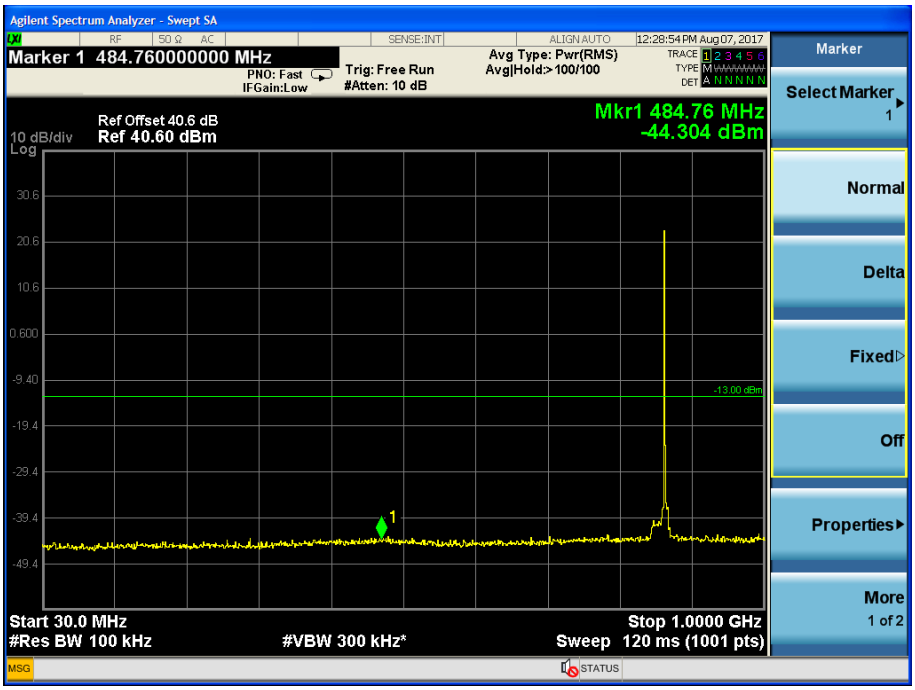


1GHz to 3.7GHz

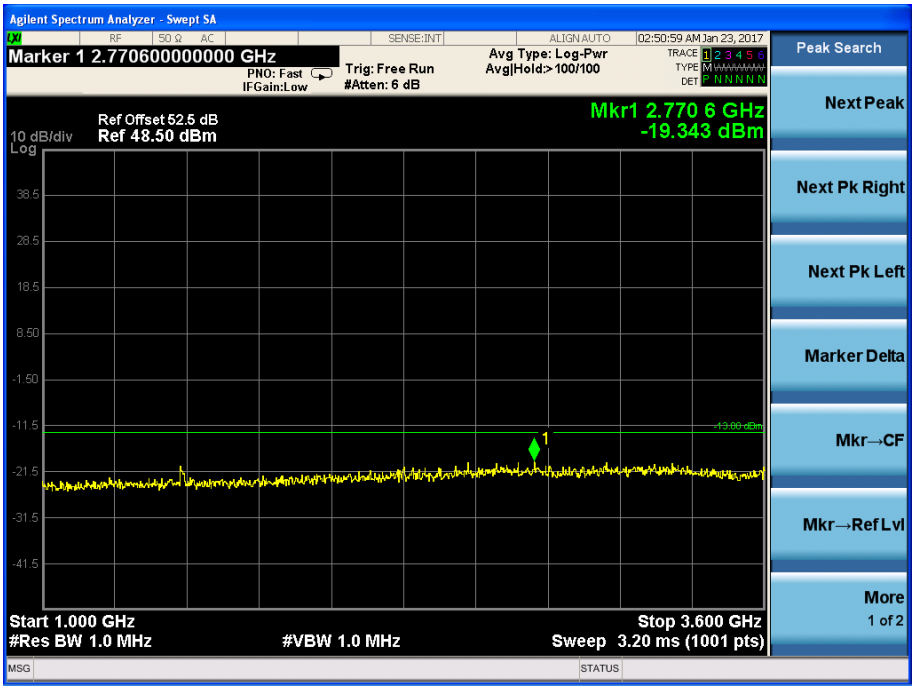


2)Middle frequency

9KHz to 1GHz

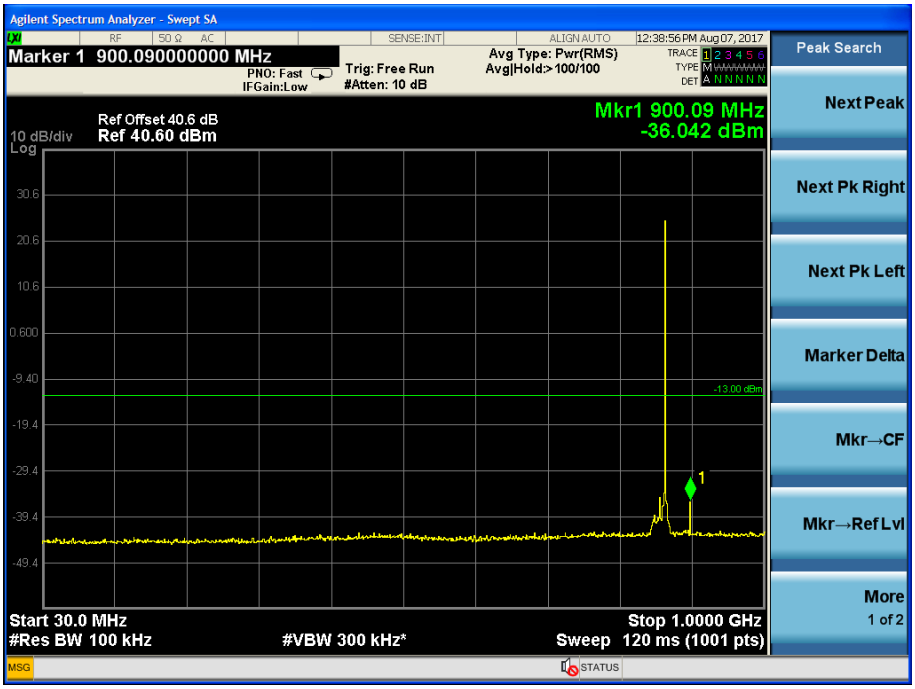


1GHz to 3.7GHz

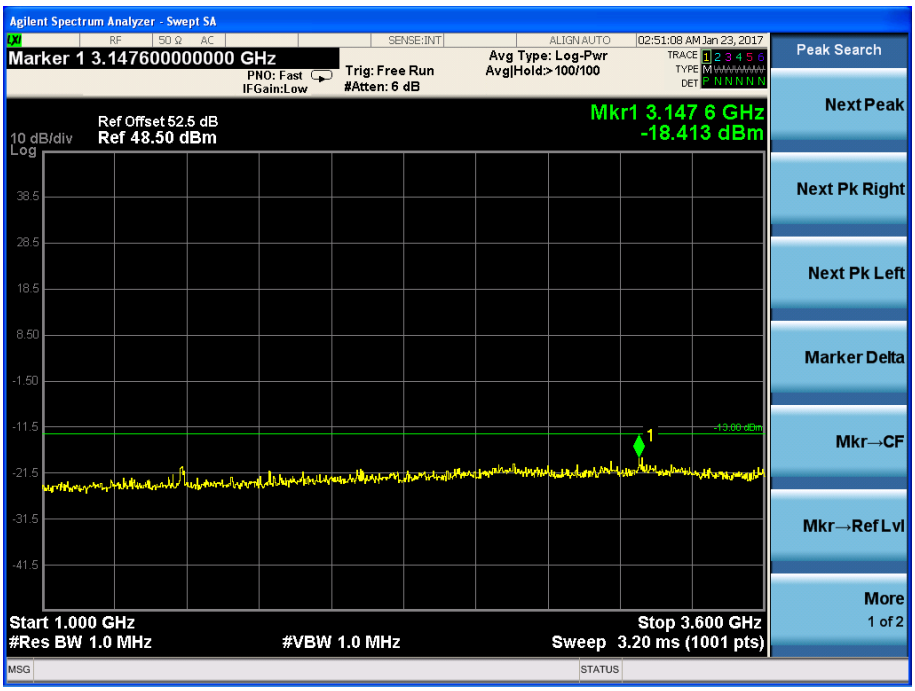


3)highest frequency

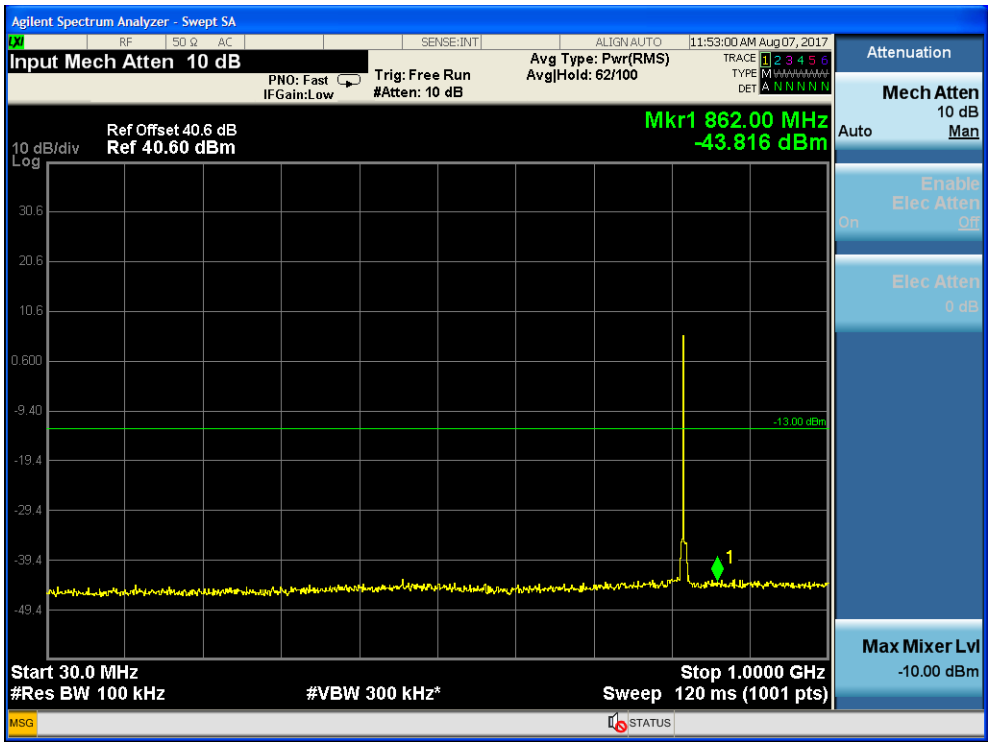
9KHz to 1GHz



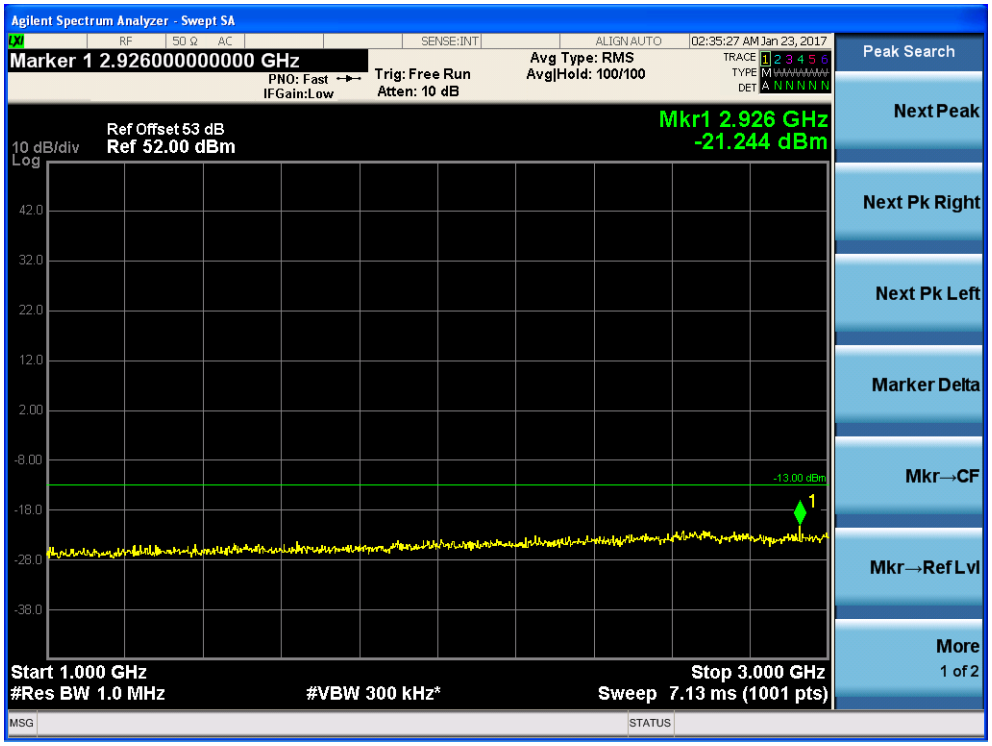
1GHz to 3.7GHz



3.Uplink: 817MHz ~ 824MHz
2.1 For LTE mode:
1)lowest frequency
9KHz to 1GHz

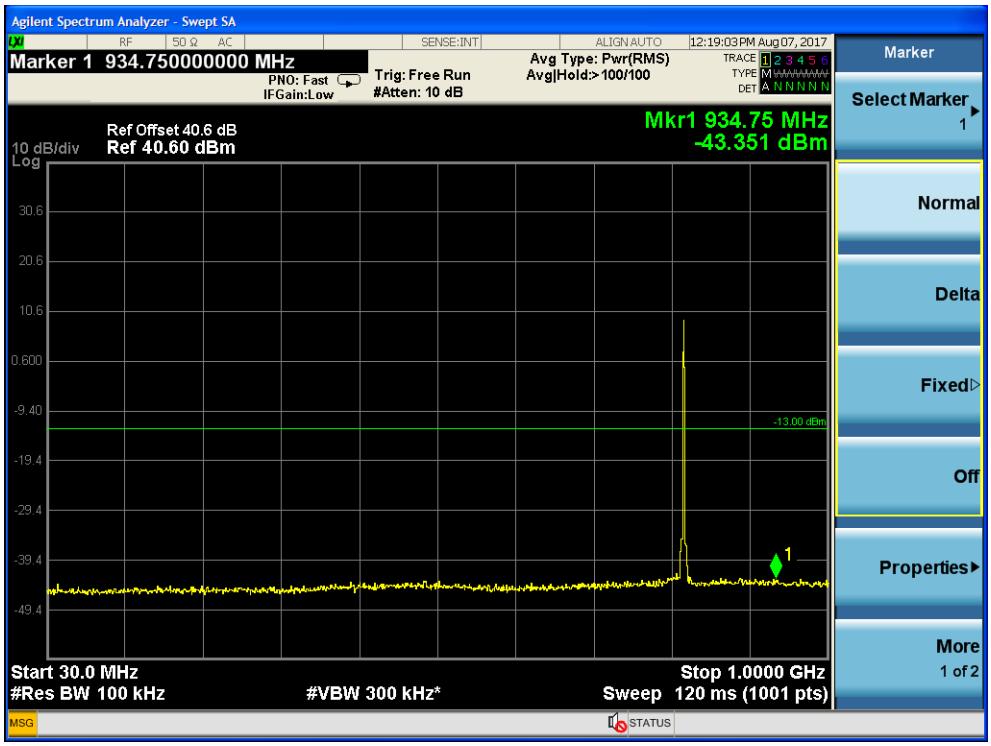


1GHz to 3.7GHz

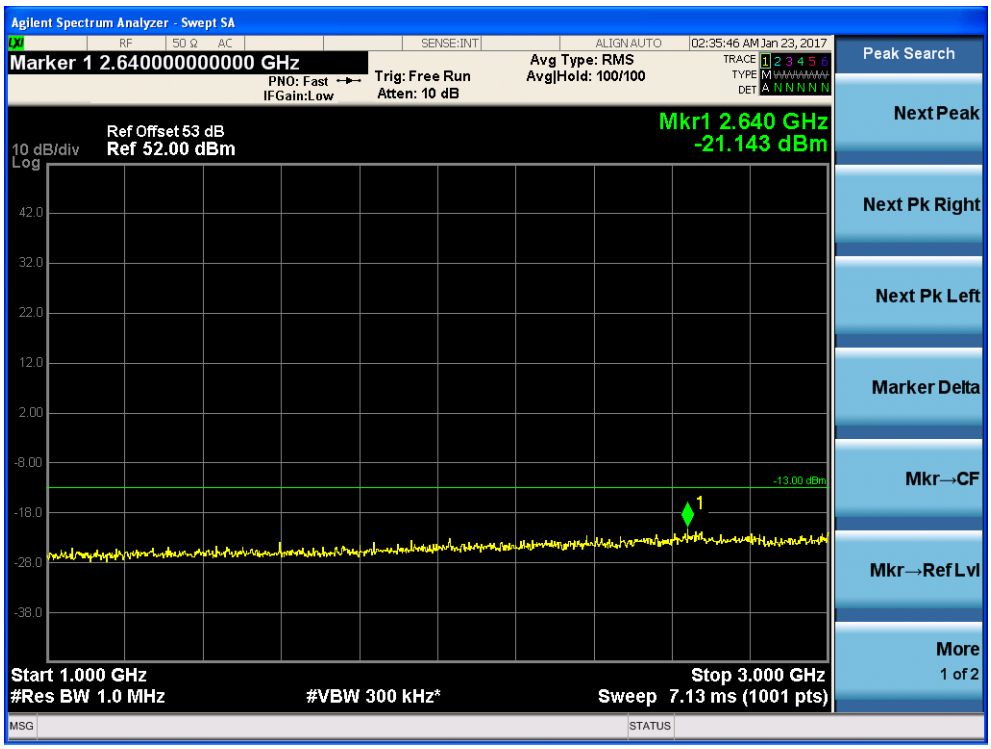


2)Middle frequency

9KHz to 1GHz

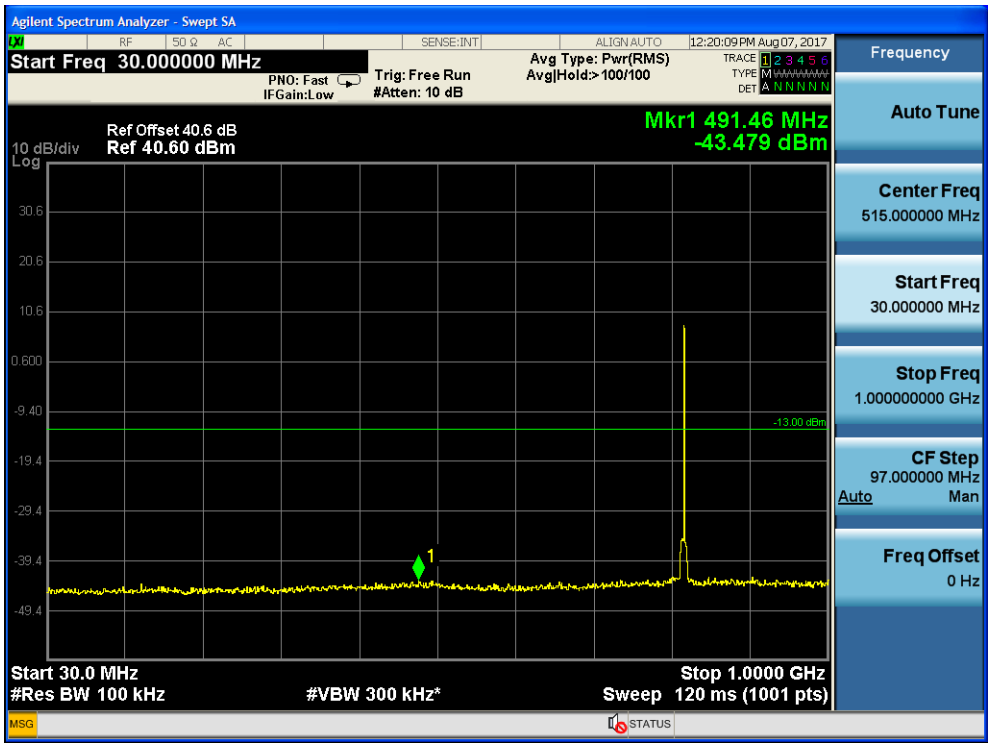


1GHz to 3.7GHz

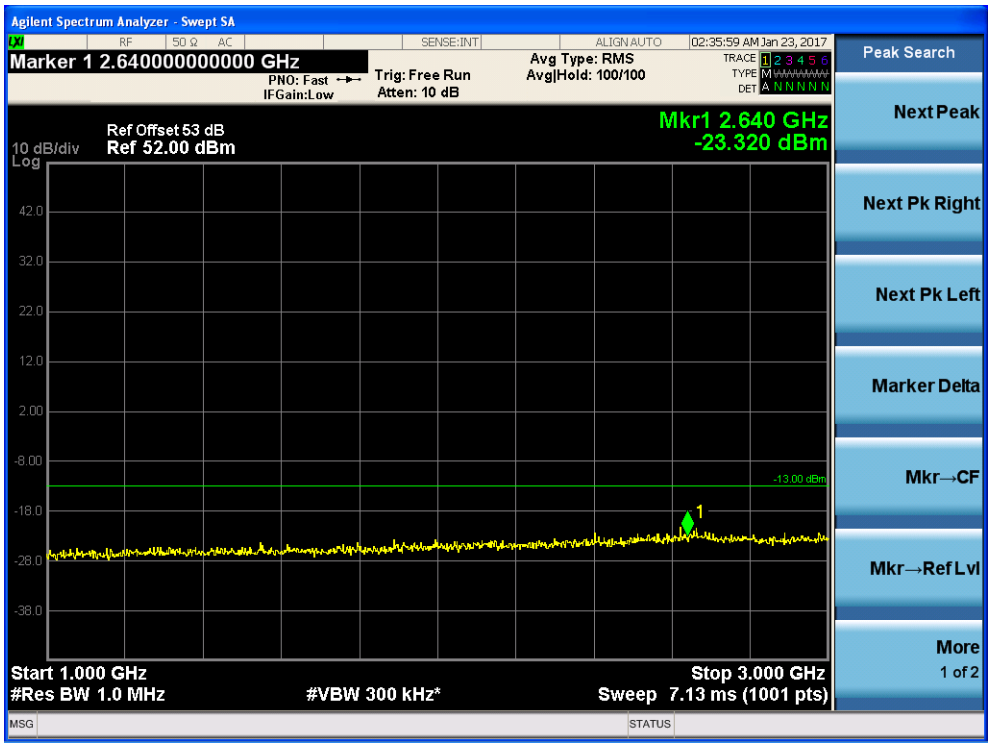


3)highest frequency

9KHz to 1GHz



1GHz to 3.7GHz



2.3 For CDMA mode:

1)lowest frequency:

Measurement Record:				
Frequency range	**Measurement bandwidth**	**Spurious Emission Level(dBm)**	**Limit(dBm)**	**Over Limit(dB)**
9KHz to 1GHz	RBW=100KHz	-37.45	-13.0	-24.45
1GHz to 10GHz	RBW=1MHz	-29.72	-13.0	-16.72

2)Middle frequency:

Measurement Record:				
Frequency range	**Measurement bandwidth**	**Spurious Emission Level(dBm)**	**Limit(dBm)**	**Over Limit(dB)**
9KHz to 1GHz	RBW=100KHz	-38.61	-13.0	-25.61
1GHz to 10GHz	RBW=1MHz	-29.83	-13.0	-16.83

3)highest frequency

Measurement Record:				
Frequency range	**Measurement bandwidth**	**Spurious Emission Level(dBm)**	**Limit(dBm)**	**Over Limit(dB)**
9KHz to 1GHz	RBW=100KHz	-39.72	-13.0	-26.72
1GHz to 10GHz	RBW=1MHz	-28.92	-13.0	-15.92

5.2.3 Band Edge& Intermodulation

Test Requirement: FCC part 90.210,part 90.691

90.210,table"Application Emission Mask"

Frequency Band(MHz)	Mask for equipment with Audio Low pass filter	Mask for equipment without Audio Low pass filter
806-809/851-854	B	H
809-824/854-869 [3]	B	G

(g)Emission Mask G. For transmitters that are not equipped with an audio low-pass filter,the power of an emission must be attenuated below the unmodulated carrier power(P)as follows:

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

90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log_{10}(f/6.1) decibels or 50 + 10 Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

Test Method: FCC part 2.1051&2-11-04/EAB/RF

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

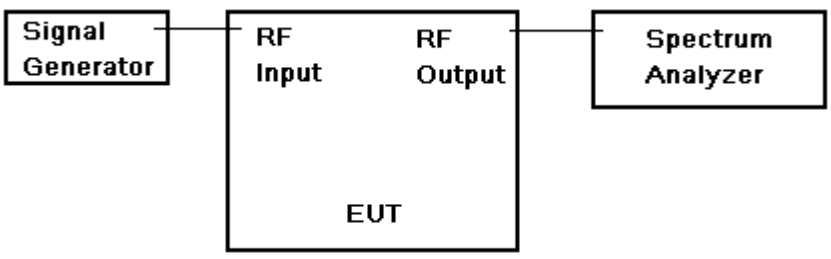
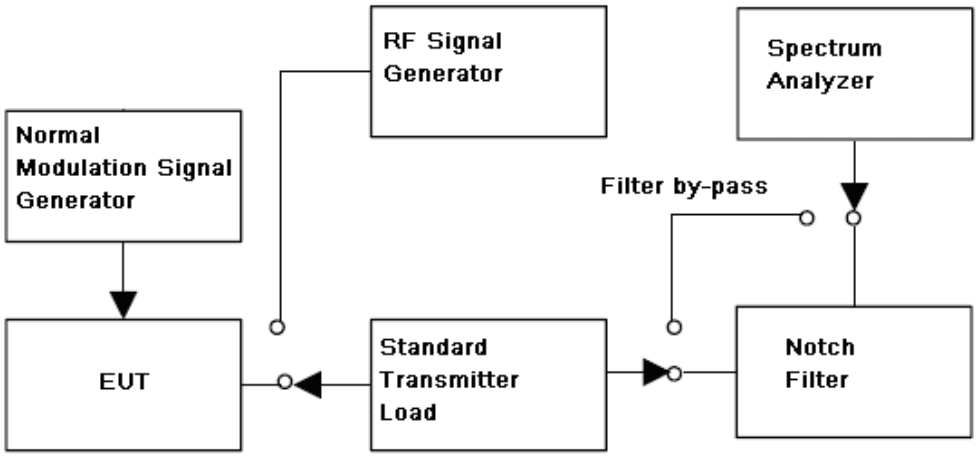


Fig.3. Band edge and Intermodulation test configuration


RF Signal Generator
Spectrum Analyzer
Normal Modulation Signal Generator
Filter by-pass
EUT
Standard Transmitter Load
Notch Filter

Test Procedure: Measurements were in accordance with the test methods section 3.5.2 of KDB 935210 D05v01.

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 of (f0) 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 the output power of the EUT and record (Power measurement with a spectrum

g) Remove the EUT from the measurement setup and using the same signal generator settings, repeat the power measurement on the input signal to the EUT and record as input power.

h) Repeat the procedure with the narrowband test signal.

i) Repeat the procedure for both test signals with input signal amplitude set to 3 dB above the AGC threshold level.

j) Repeat for all frequency bands authorized for use by the EUT.

Power measurement Method :

Guidance for performing input/output power measurements using a spectrum or signal analyzer is provided in 5.2 of KDB Publication 971168

Remark:

The notch filter is used for avoid the EUT fundamental carrier output power making the spectrum overload and the harmonic spurious brought by it.

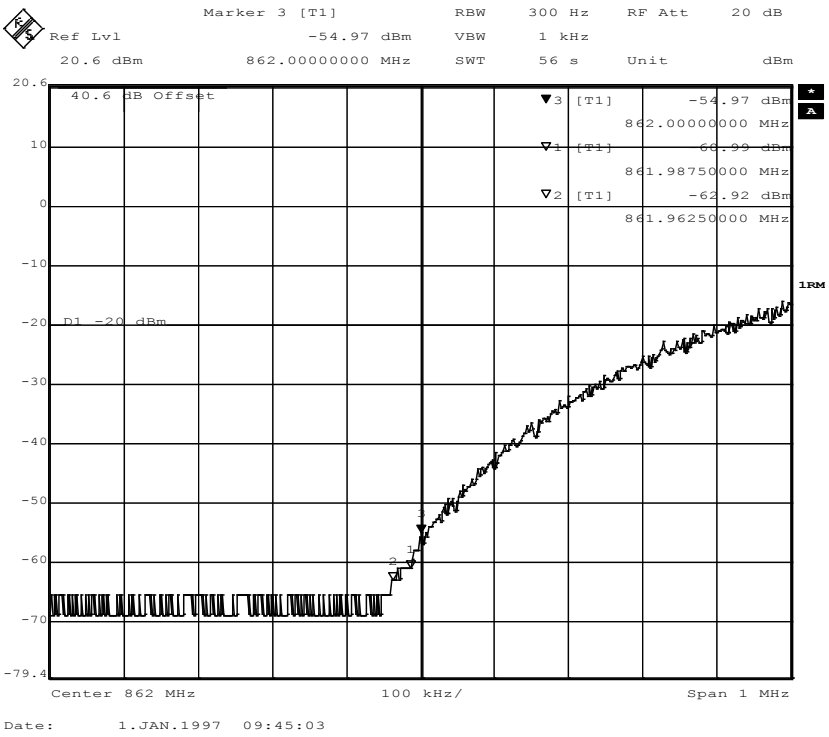
When the EUT fundamental carrier is not enough to make the status, the notch filter could be not used.

5.2.3.1 Measurement Record:

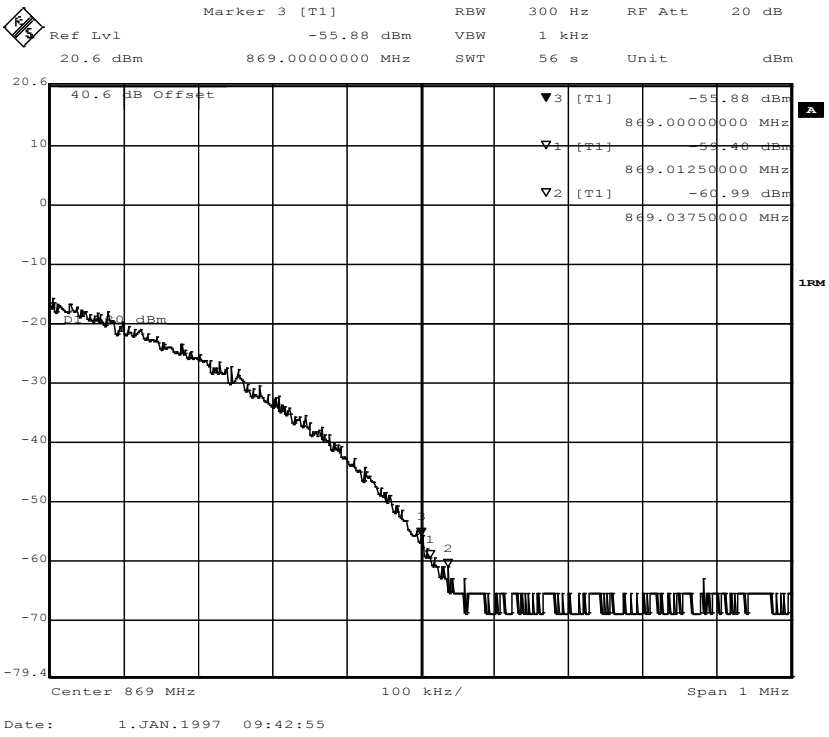
1.Downlink: 862MHz to 869MHz(4.1M AWGN for boardband)

1.1 less than 37.5k greater than 12.5k

1.1.1 one signal input —Lower Edge

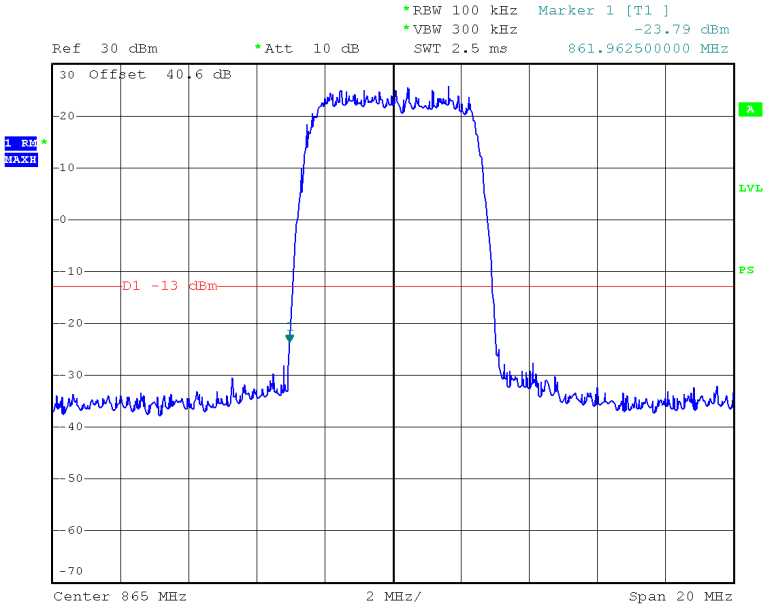


1.1.2 one signal input — Upper Edge



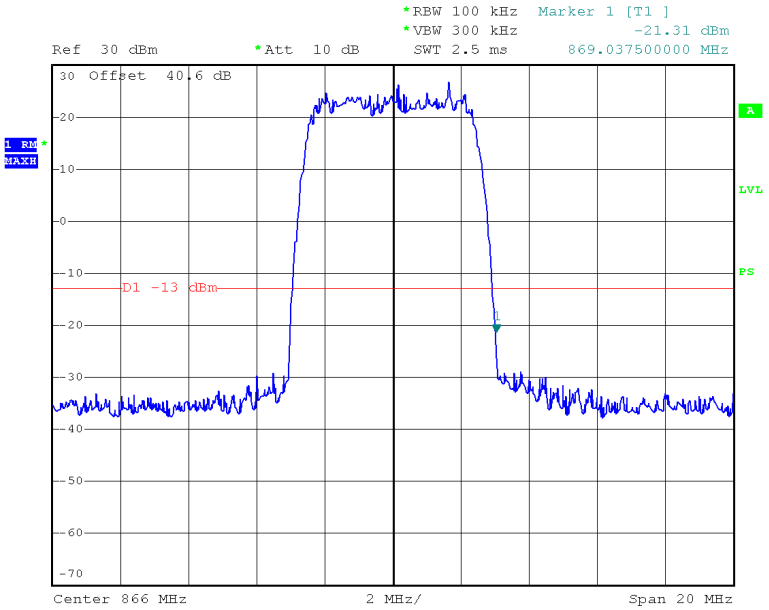
1.2 Greater than 37.5k

1.2.1two signal input —Lower Edge



Date: 13.NOV.2017 11:30:10

1.1.2 two signal input —Upper Edge

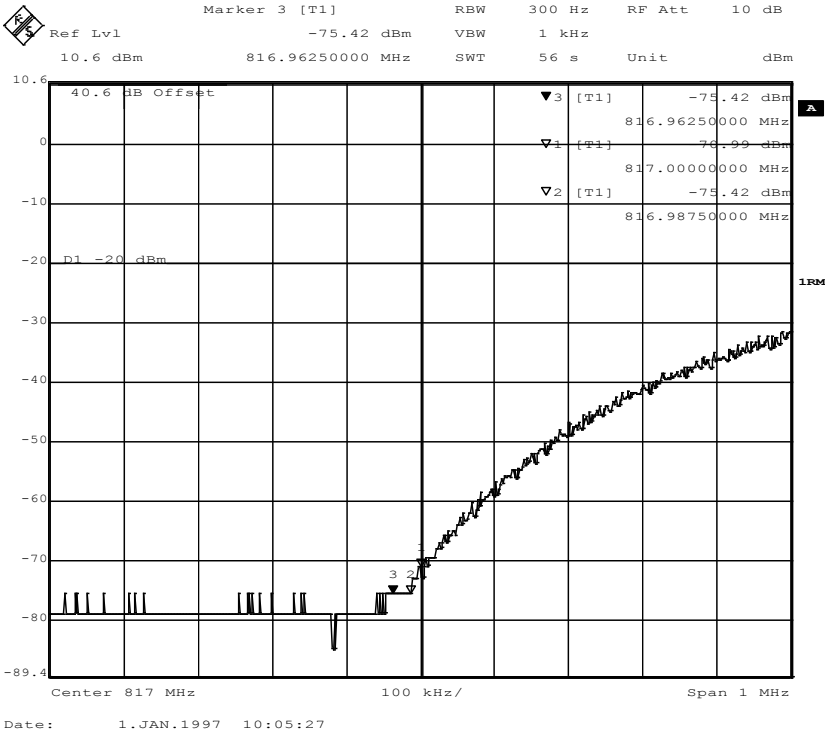


Date: 13.NOV.2017 11:29:20

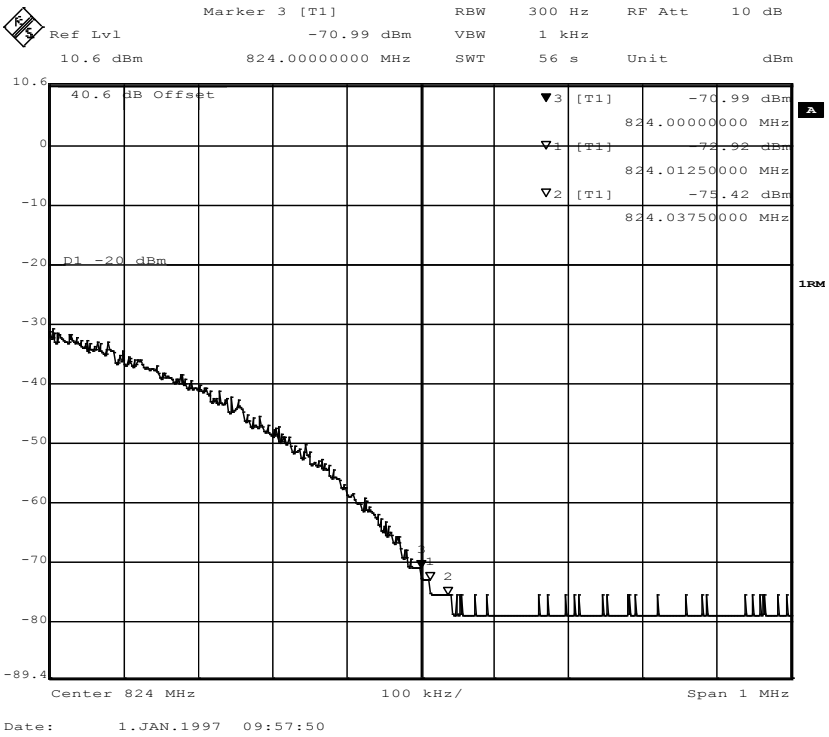
1.Uplink: 817MHz to 824MHz((4.1M AWGN for boardband))

1.1 less than 37.5k greater than 12.5k

1.1.3 one signal input —Lower Edge

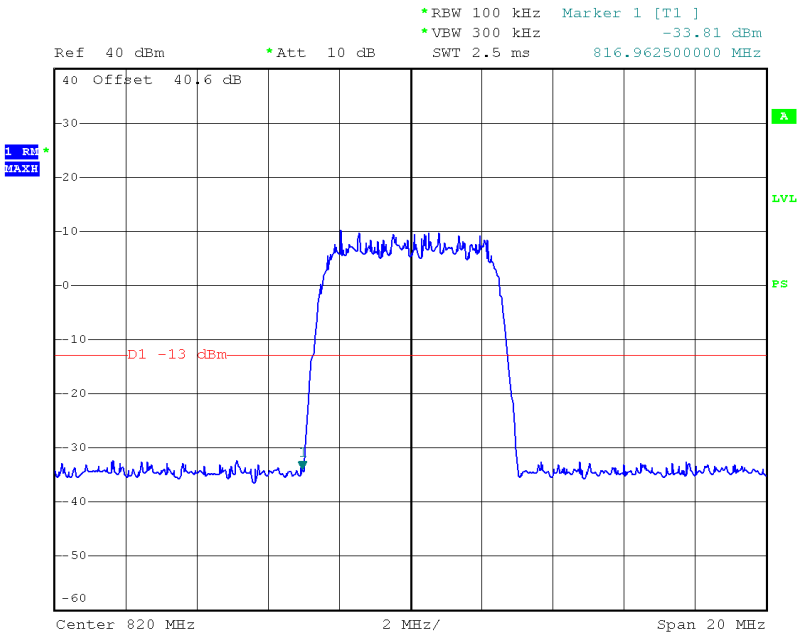


1.1.4 one signal input — Upper Edge

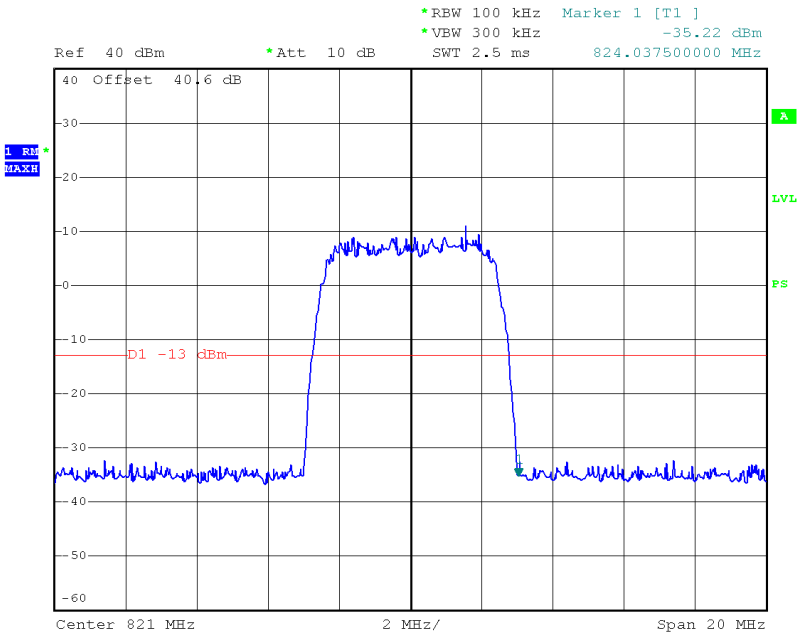


1.2 Greater than 37.5k

1.2.1two signal input —Lower Edge



1.2.2 two signal input —Upper Edge



5.2.4 Radiated Spurious Emissions

Test Requirement: FCC part 90.210

90.210,table"Application Emission Mask"

Frequency Band(MHz)	Mask for equipment with Audio Low pass filter	Mask for equipment without Audio Low pass filter
806-809/851-854	B	H
809-824/854-869 [3]	B	G

(g)Emission Mask G. For transmitters that are not equipped with an audio low-pass filter,the power of an emission must be attenuated below the unmodulated carrier power(P)as follows:

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

90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log_{10}(f/6.1) decibels or 50 + 10 Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

Test Method: FCC part 2.1053

ANSI/TIA-603-C-2004

EUT Operation:

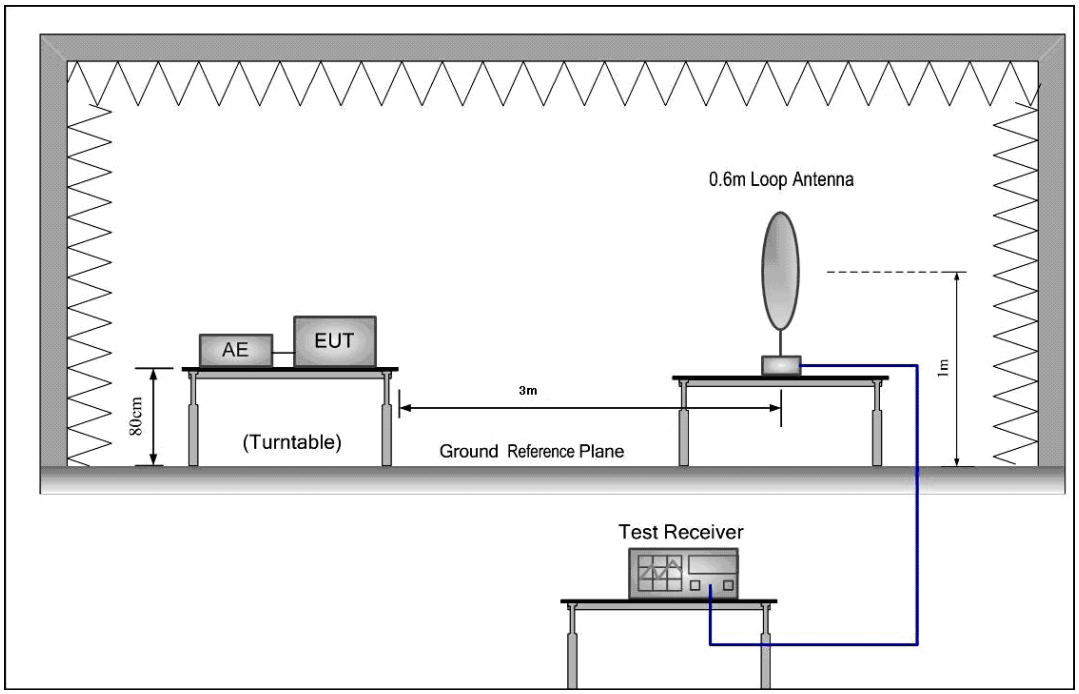
Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

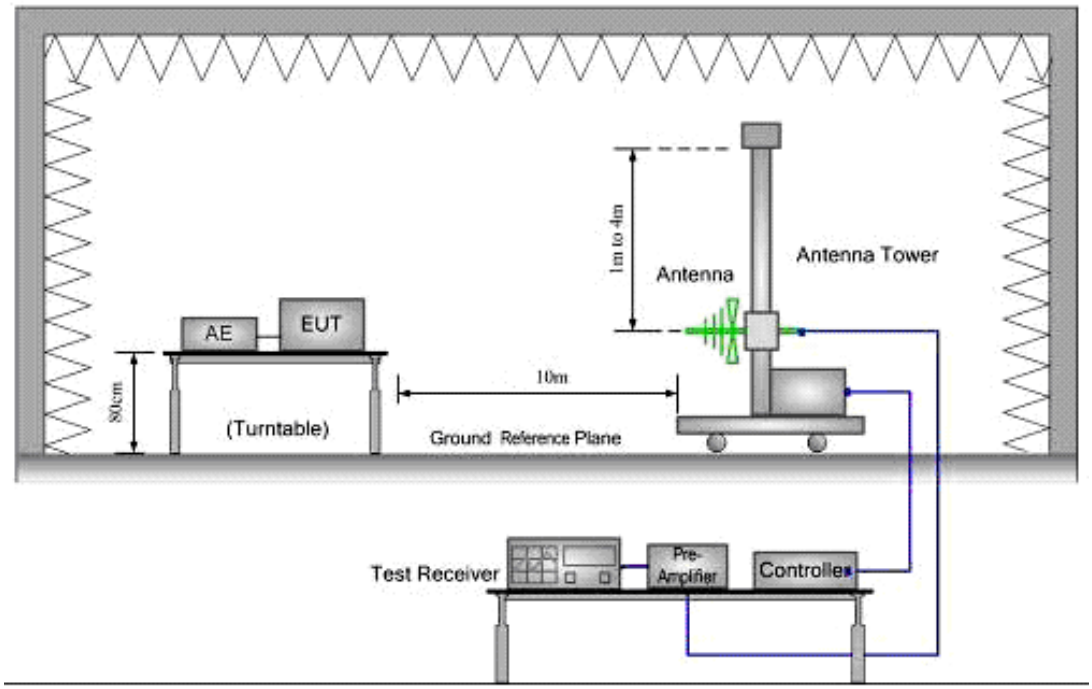
Application: Enclosure

Test Configuration:

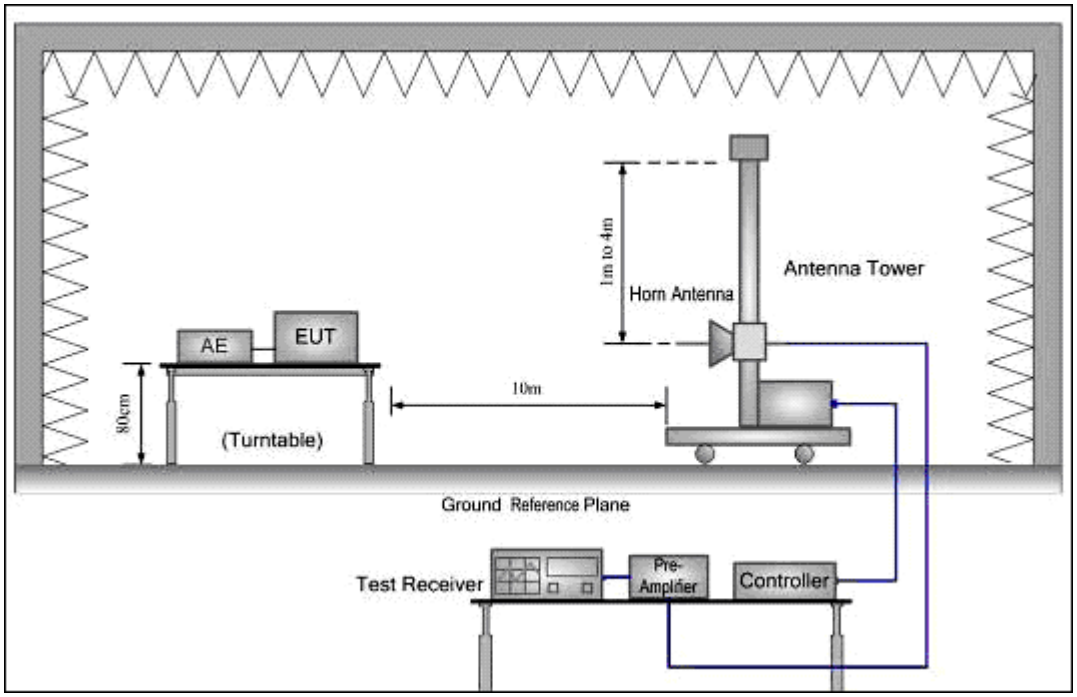
9 kHz to 30 MHz emissions:



30MHz to 1GHz emissions:



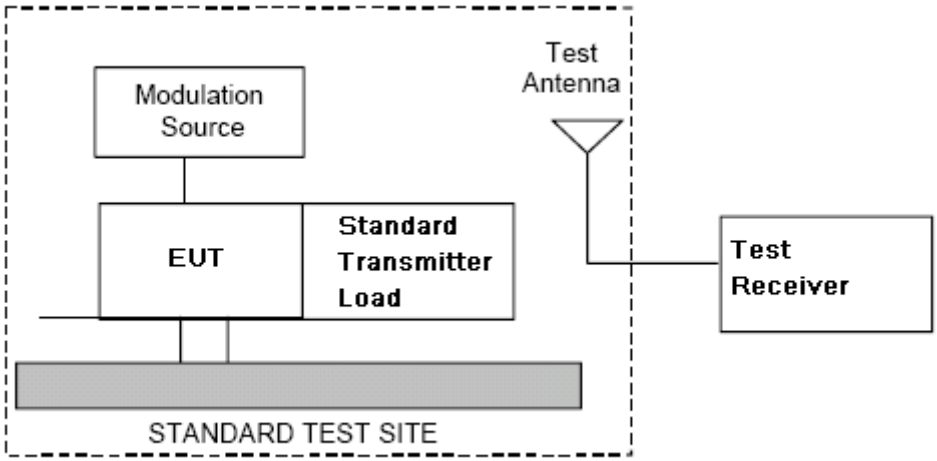
1GHz to 40GHz emissions:



Test Procedure:

1. Test the background noise level with all the test facilities;
2. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;
3. Select the suitable RF notch filter to avoid the test receiver or spectrum analyzer produce unwanted spurious emissions;
4. Keep the EUT continuously transmitting in max power;
5. Read the radiated emissioins of the EUT enclosure.

Radiated Emissions Test Procedure:



a) Connect the equipment as illustrated.

b) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.

2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.

3) Sweep Speed slow enough to maintain measurement calibration.

4) Detector Mode = Positive Peak.

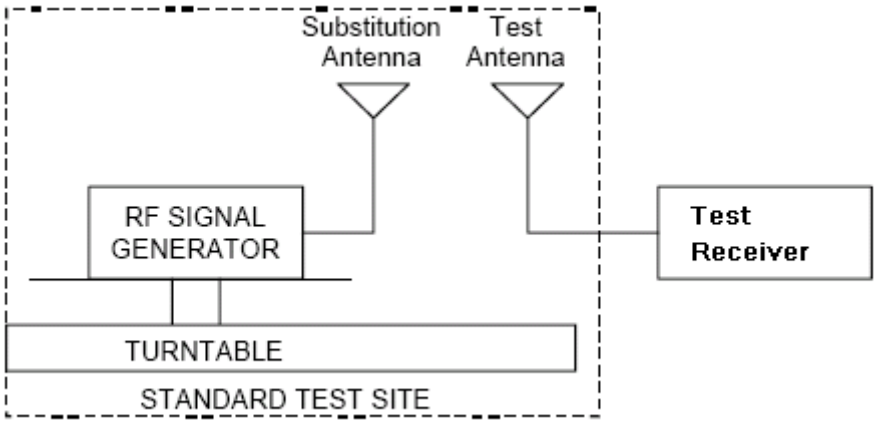
c) Place the transmitter to be tested on the turntable in the standard test site, The transmitter is transmitting into a nonradiating load that is placed on the turntable. The RF cable to this load should be of minimum length.

d) Measurements shall be made from30MHz to 10 tims of fundamental carrier, except for the region close to the carrier equal to ± the carrier bandwidth.

e) Key the transmitter without modulation or normal modulation base the standard.

f) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.



h) Reconnect the equipment as illustrated.

i) Keep the spectrum analyzer adjusted as in step b).

j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where

the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to

obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

l) Repeat step k) with both antennas vertically polarized for each spurious frequency.

m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole

antenna by the following formula:

Pd(dBm) = *Pg*(dBm) – *cable loss* (dB) + *antenna gain* (dB)

where:

Pd is the dipole equivalent power and

Pg is the generator output power into the substitution antenna.

NOTE: It is permissible to use other antennas provided they can be referenced to a dipole.

NOTE: Effective radiated power (e.r.p) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2.15 dB between e.i.r.p. and e.r.p.
e.r.p (dBm) = e.i.r.p. (dBm) – 2.15

5.2.4.1 Measurement Record: (need to change data)

No emissions were detected within 20dB below the limit for the Downlink and Uplink direction.

Remark:

The cabinet radiation was measured with the equipment transmitting a CW signal into a non-radiating 50 Ohm load at maximum output power on a signal frequency .

Measured were performed in the lowest, middle and hightest frequency for the Downlink of products which included AC and DC Unit.

The spectrum was searched from 9KHz to 12.5GHz (10th Harmonic) for downlink;

5.2.5 Occupied Bandwidth

Test Requirement: KDB935210 D02;2-11-04/EAB/RF

Test Method: FCC part 2.1049, 2-11-04/EAB/RF

The spectral shape of the output should look similar to input for all modulations.

EUT Operation:

Status: Drive the EUT to maximum output power. .

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

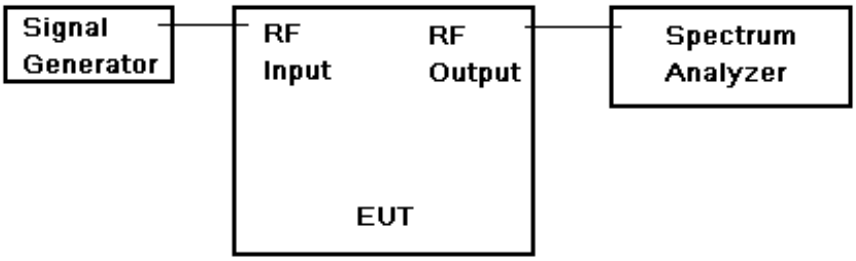


Fig.2. Conducted Spurious Emissions test configuration

Test Procedure: a) Set the spectrum analyzer RBW 300 Hz or >1%&<2% emission bandwidth of carrier.

b) Capture the trace of input signal;

c) Connect the equipment as illustrated;

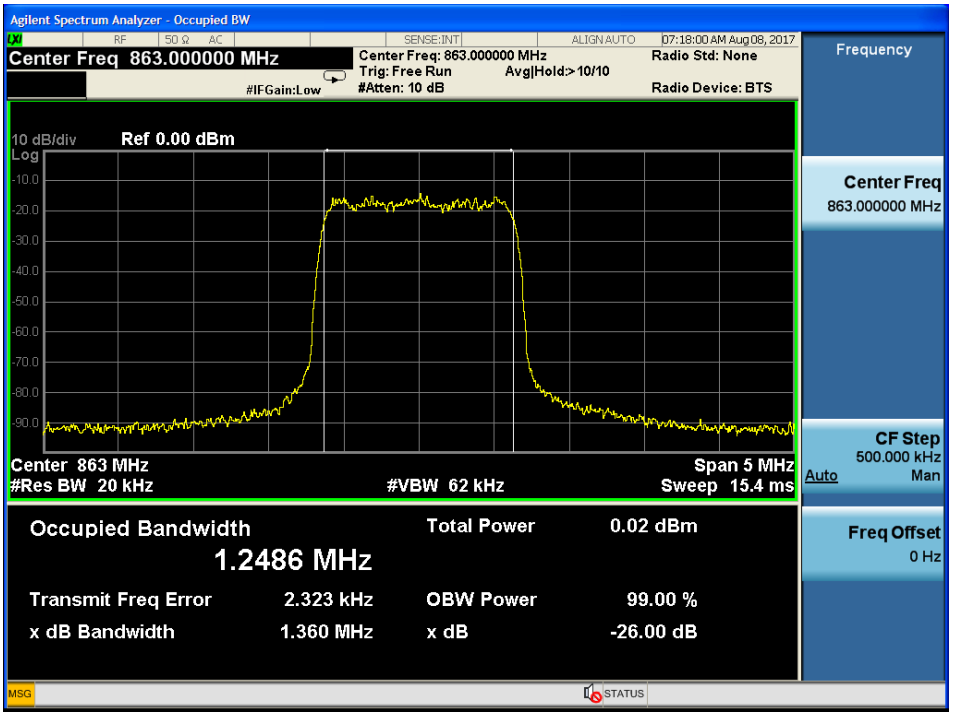
d) Capture the trace of output signal;

5.2.5.1 Measurement Record:

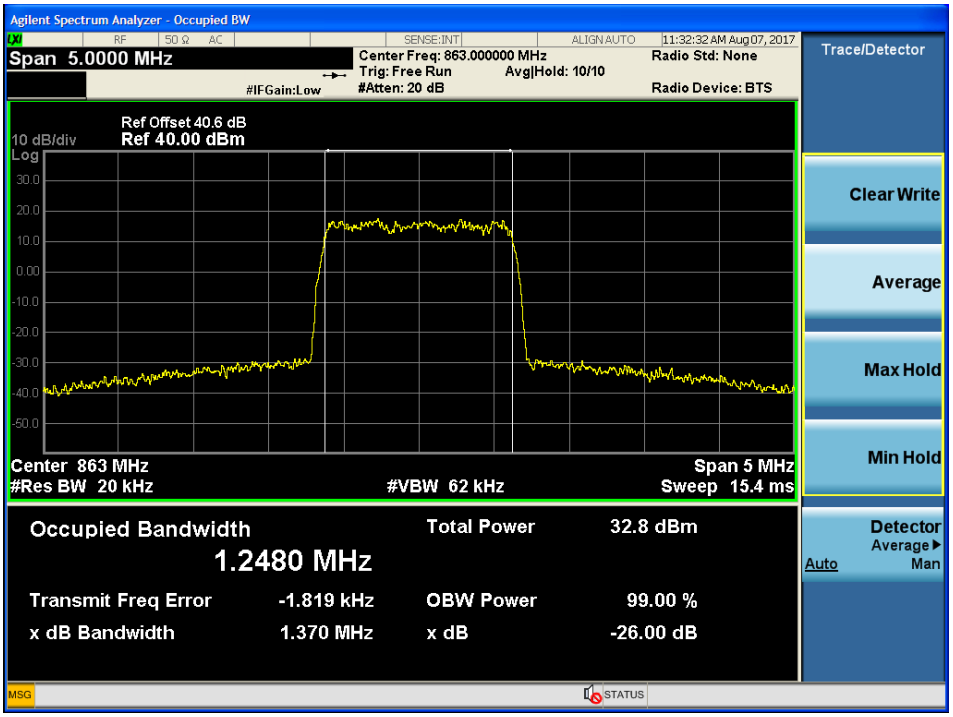
1.Downlink: 862MHz to 869MHz(CDMA, LTE)

1.1 CDMA Mode:

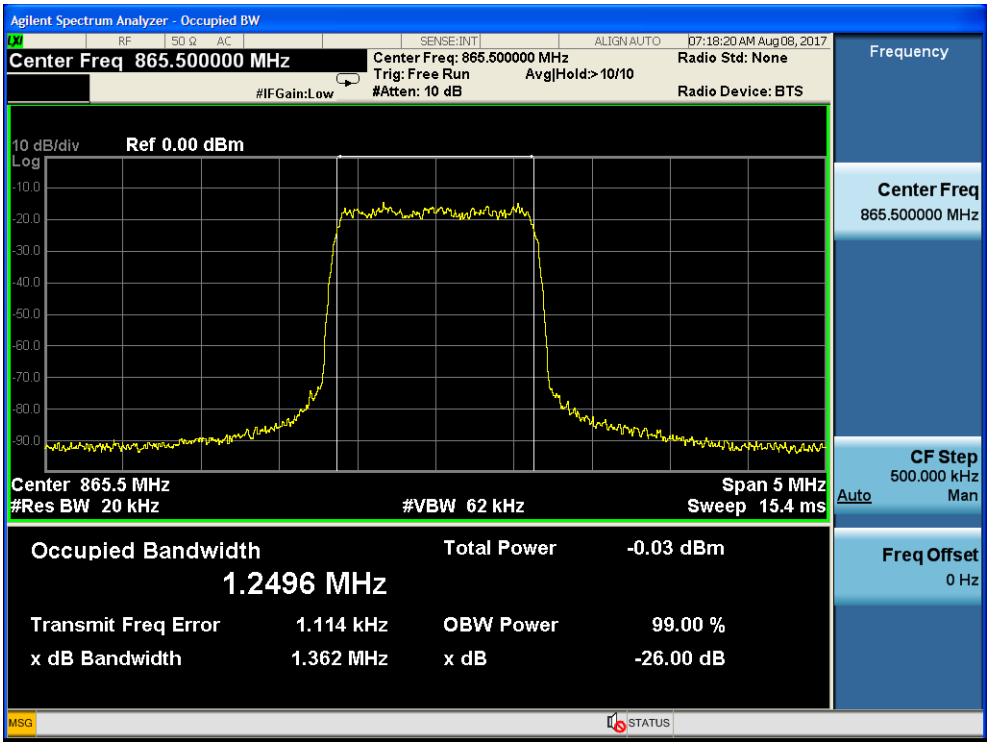
1.1.1 lowest frequency– Input



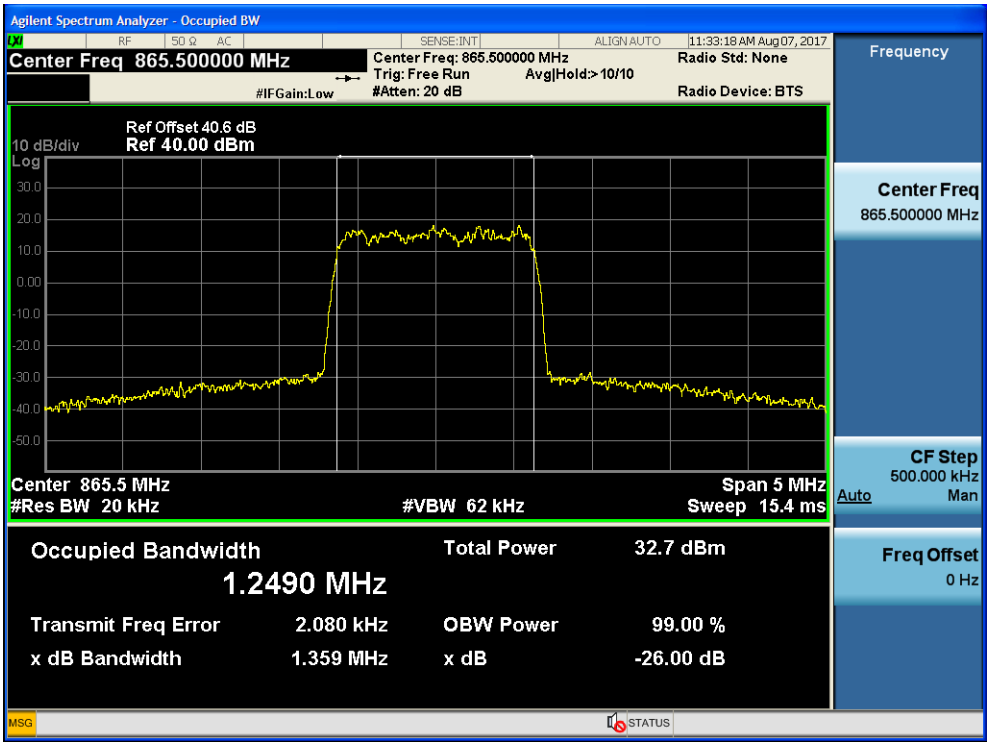
1.1.2 lowest frequency—Output



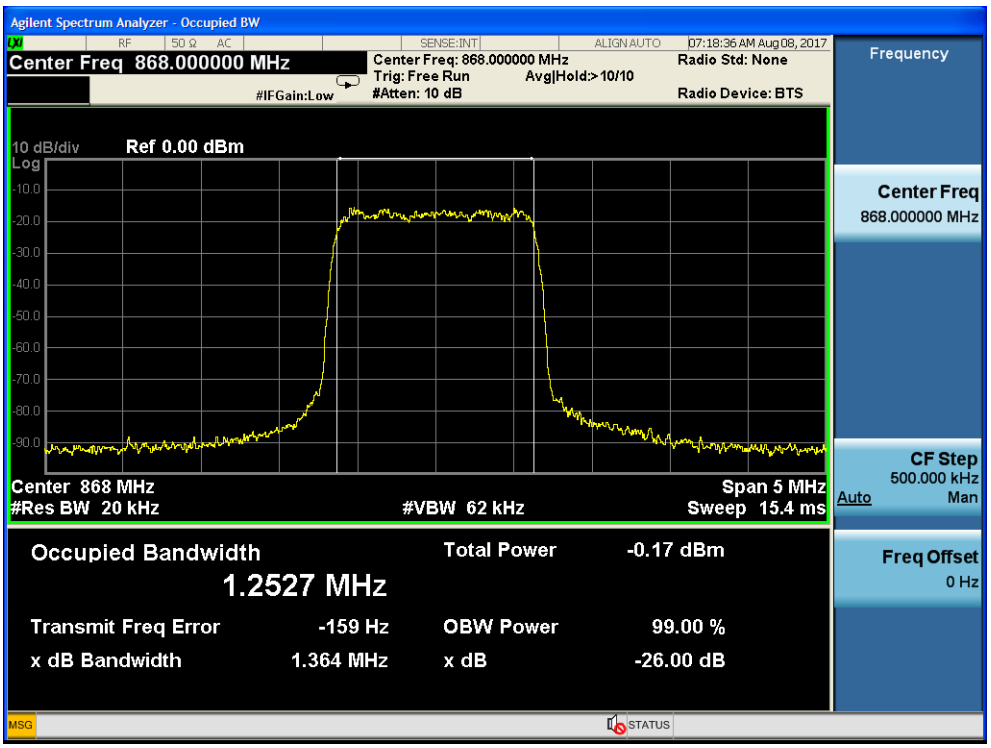
1.1.3 middle frequency—Input



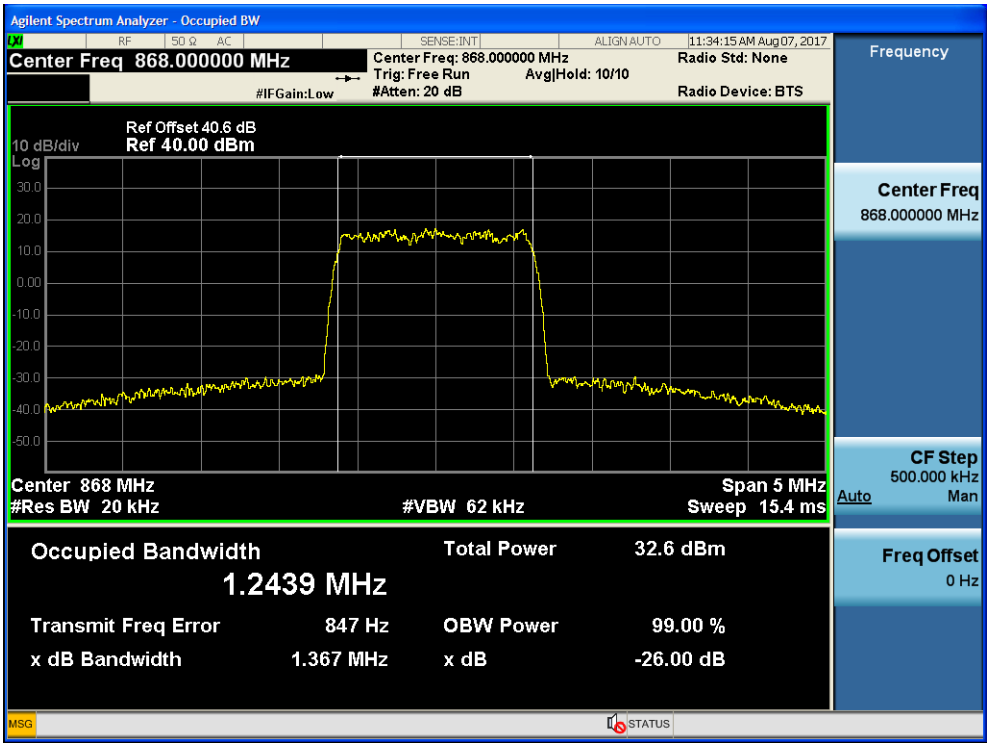
1.1.4 middle frequency—Output



1.1.5 highest frequency—Input

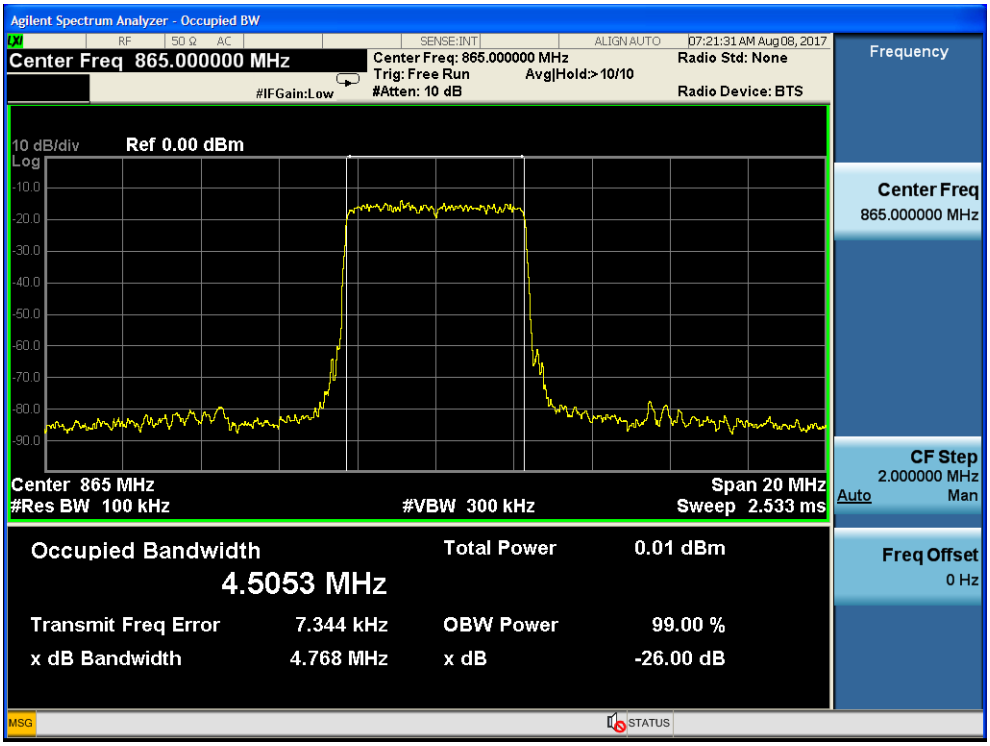


1.1.6 highest frequency—Output

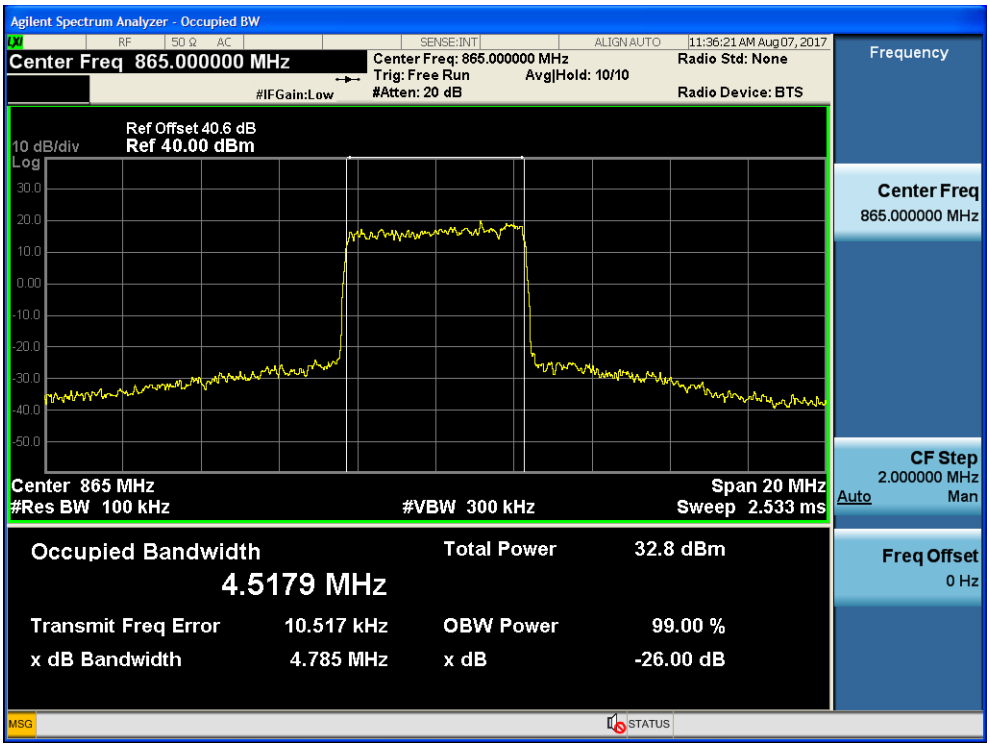


1.3 LTE Mode:

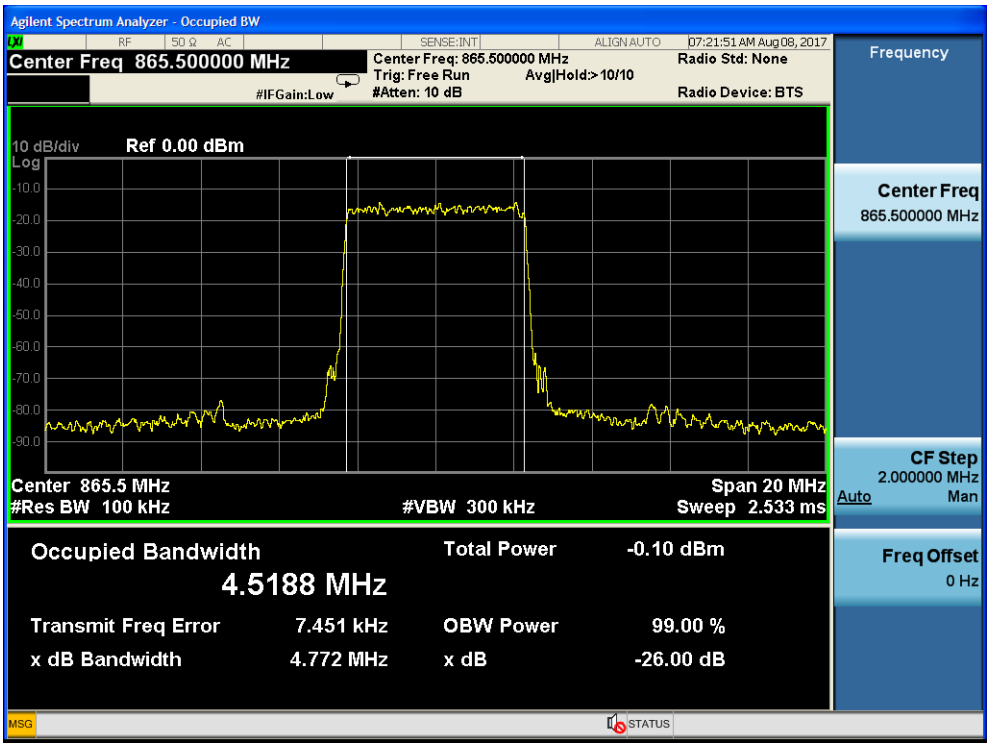
1.3.1 Lowest frequency—Input



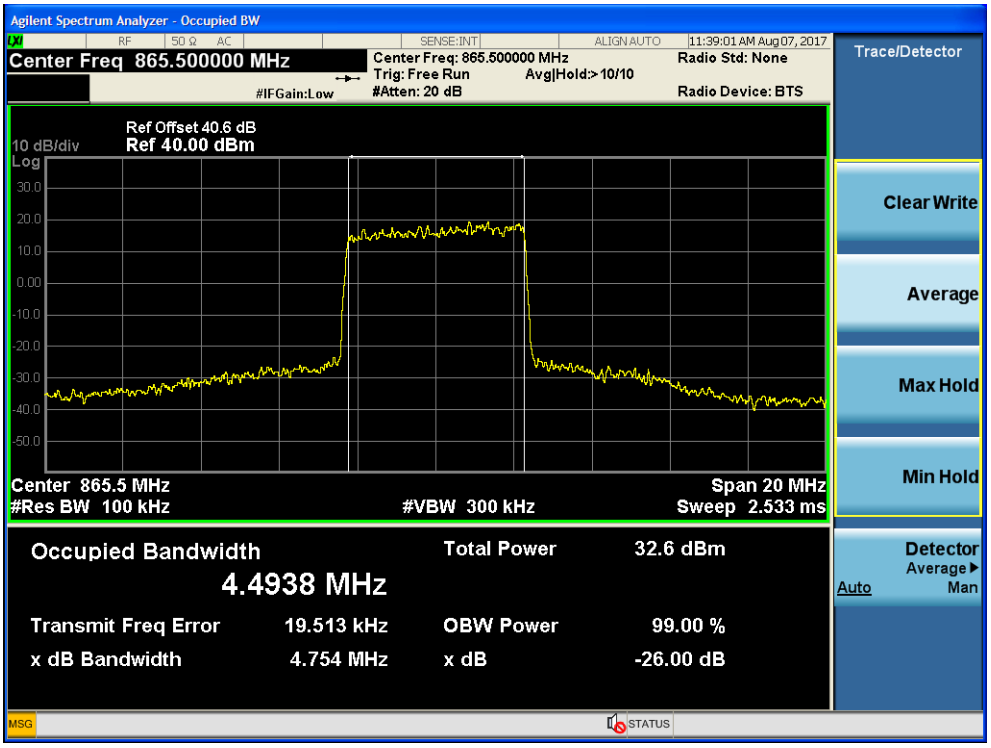
1.3.2 Lowest frequency—Output



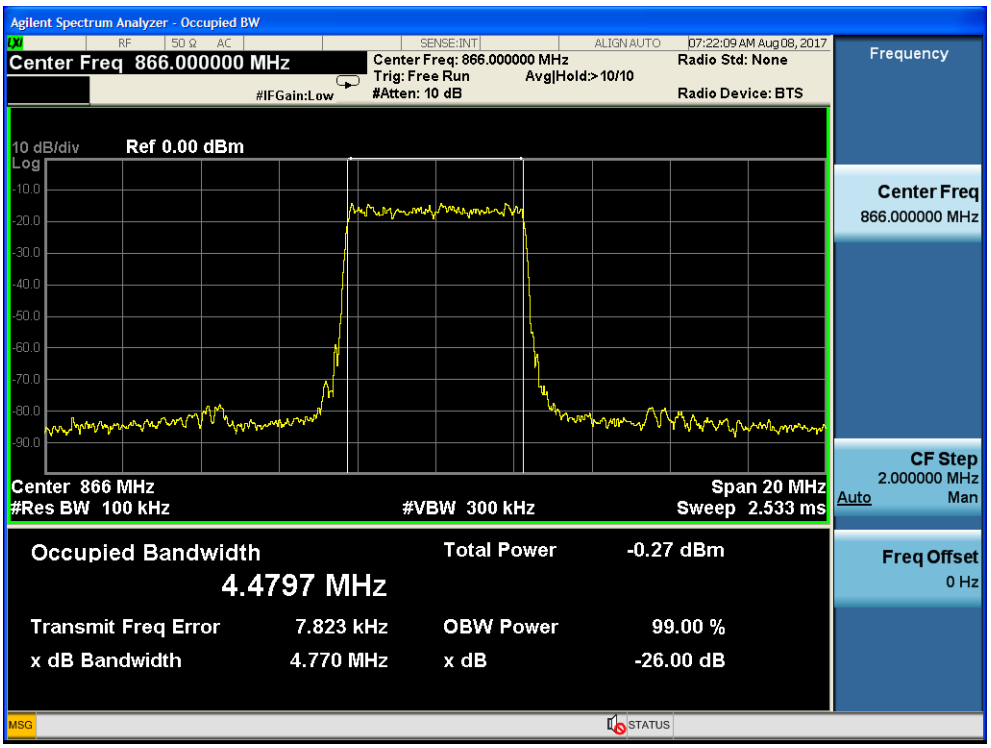
1.3.3 middle frequency-- Input



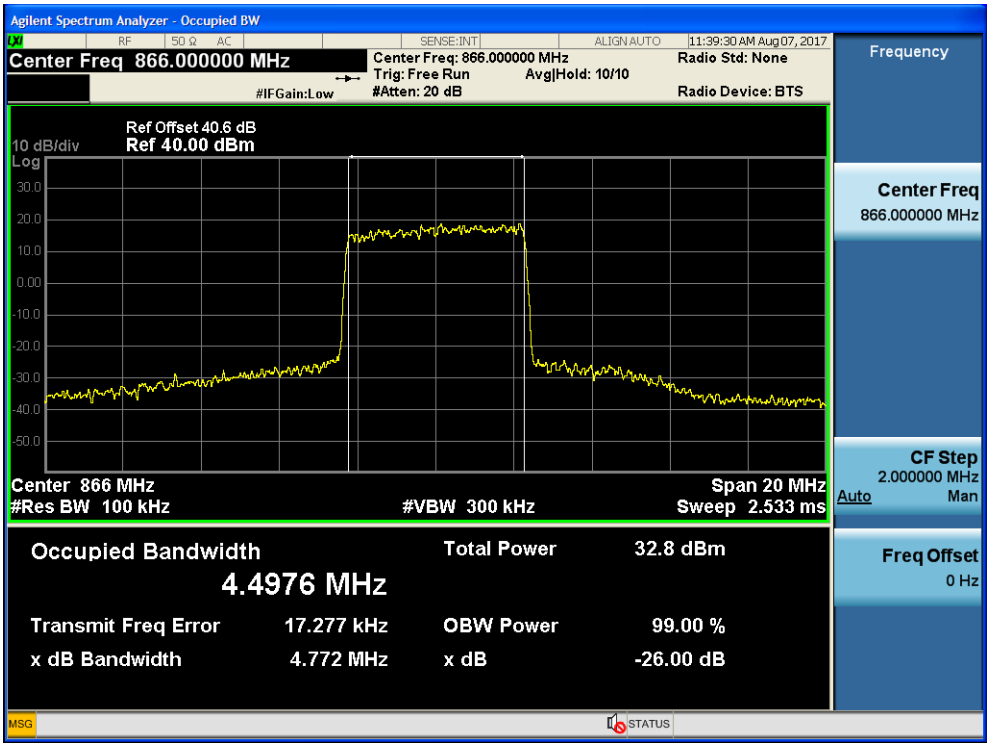
1.3.4 middle frequency-- Output



1.3.5 highest frequency-- Input



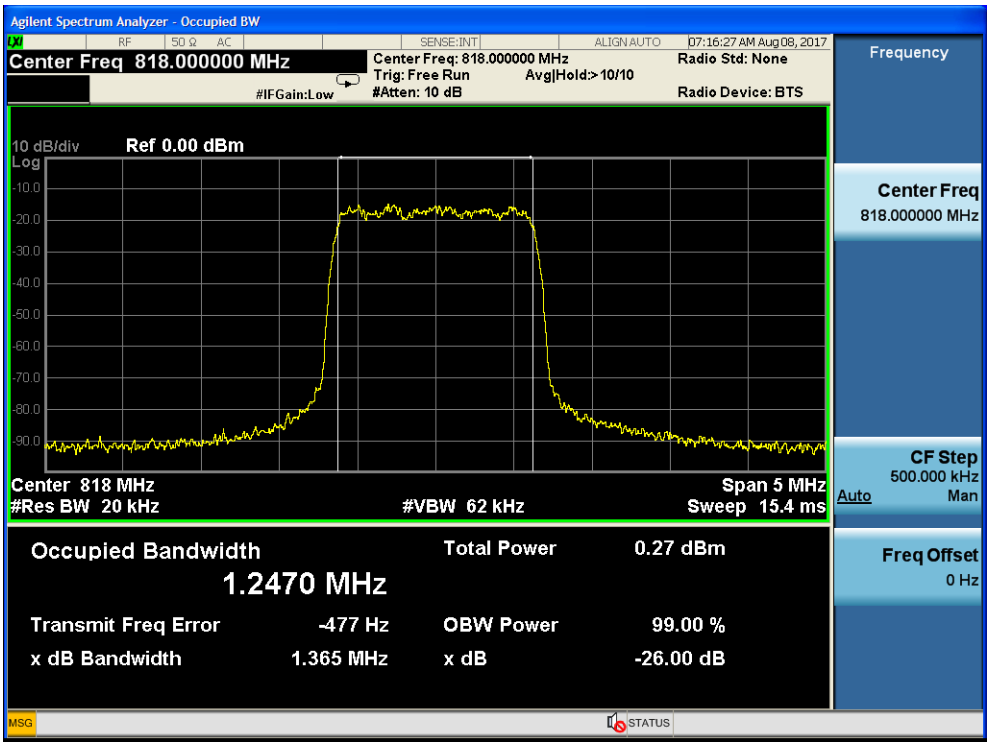
1.3.6 highest frequency-- Output



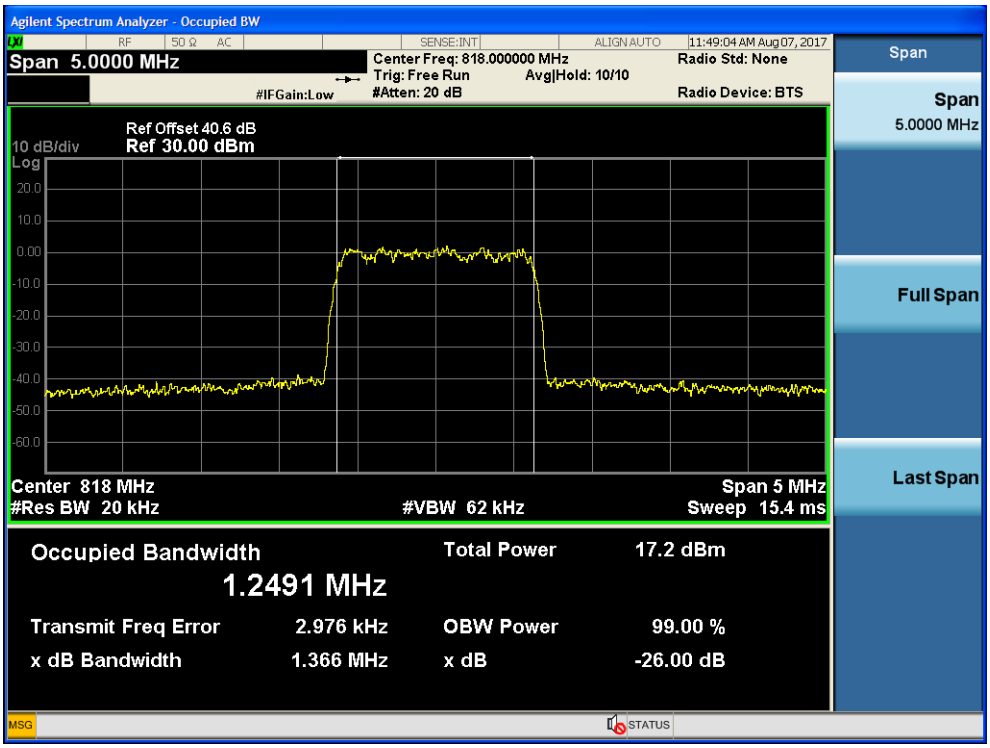
2.Uplink: 817MHz to 824MHz(CDMA, LTE)

1.1 CDMA Mode:

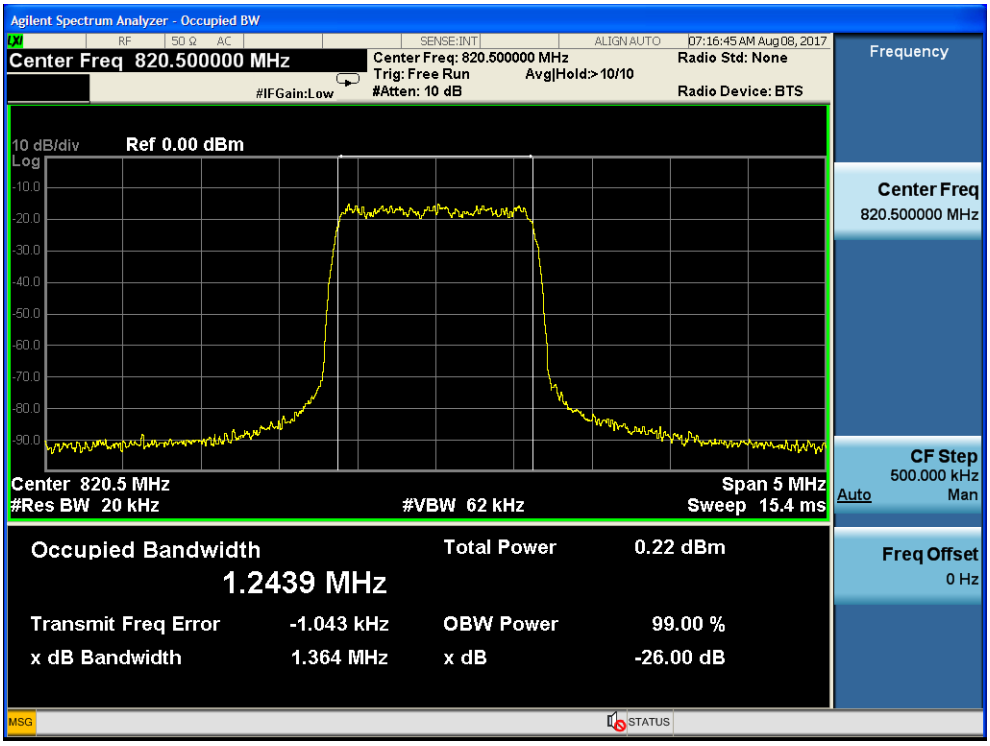
1.1.1 lowest frequency– Input



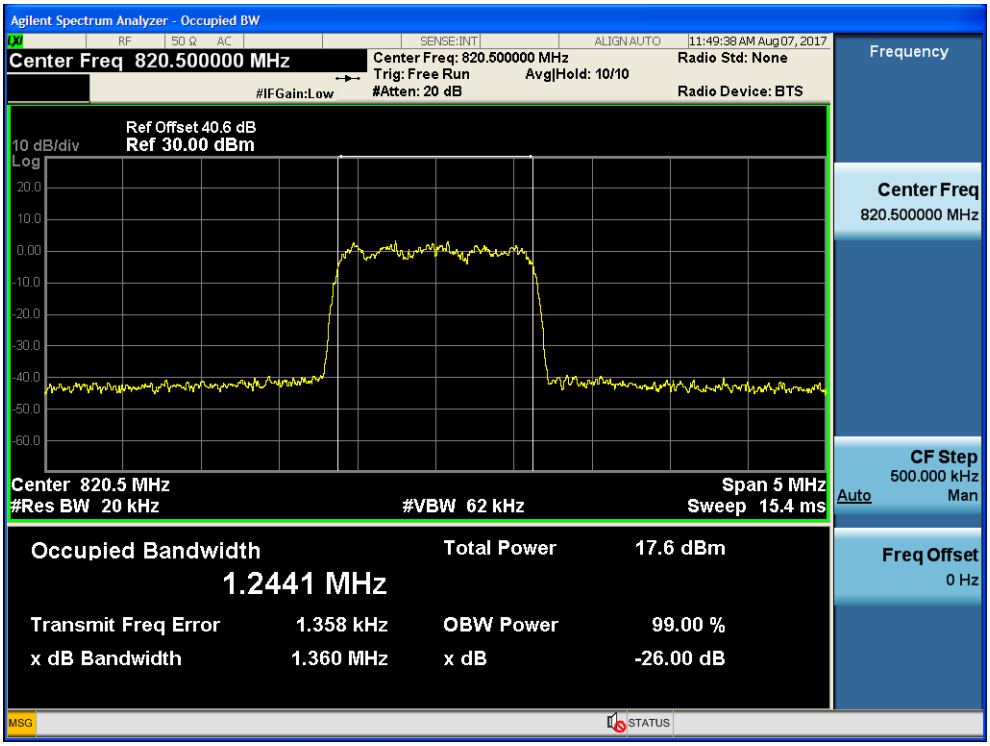
1.1.2 lowest frequency—Output



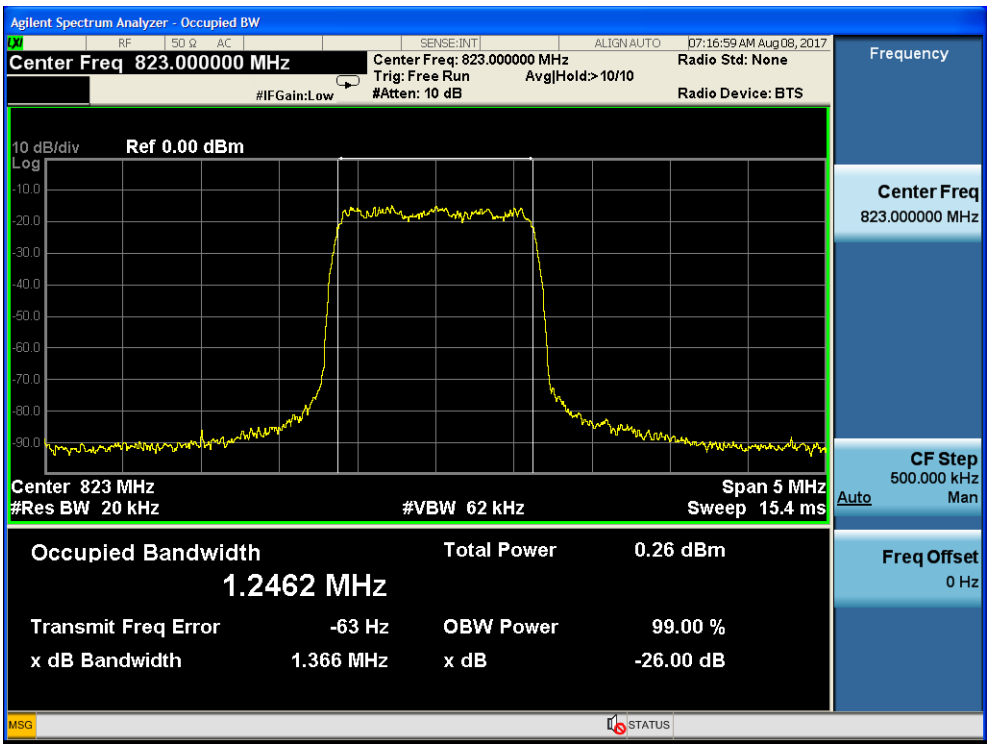
1.1.3 middle frequency—Input



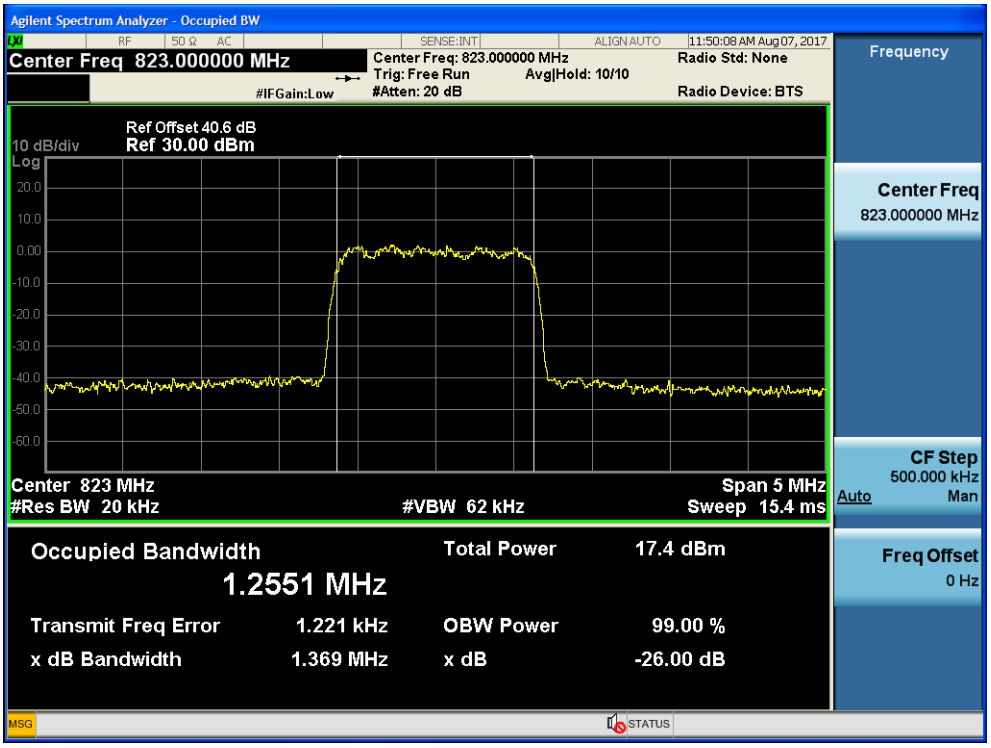
1.1.4 middle frequency—Output



1.1.5 highest frequency—Input

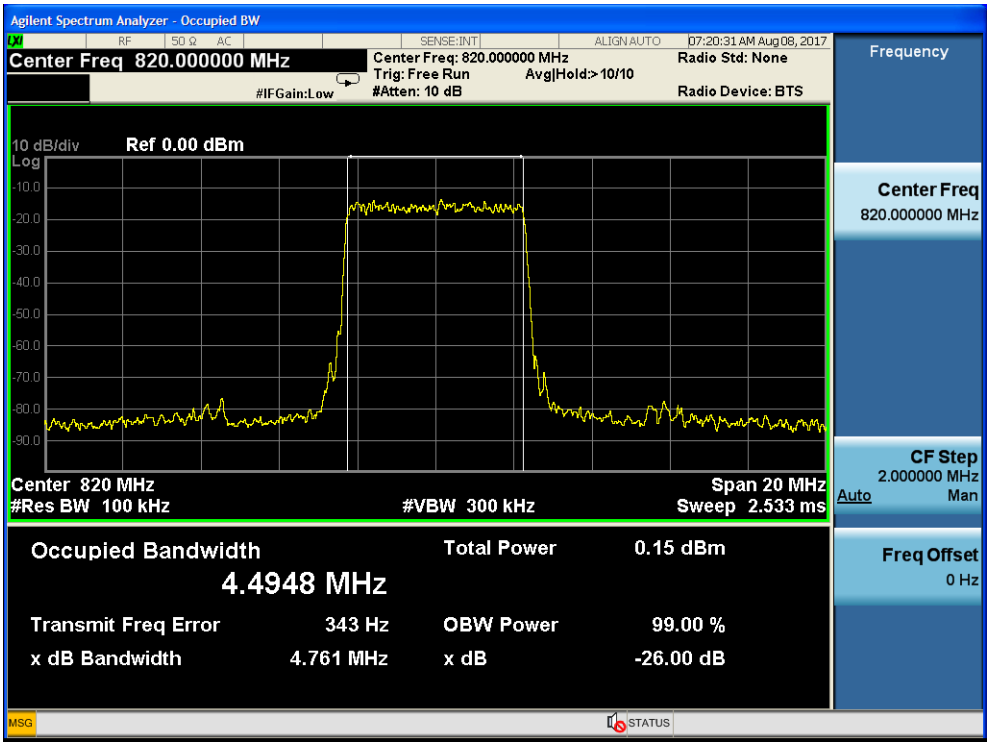


1.1.6 highest frequency—Output

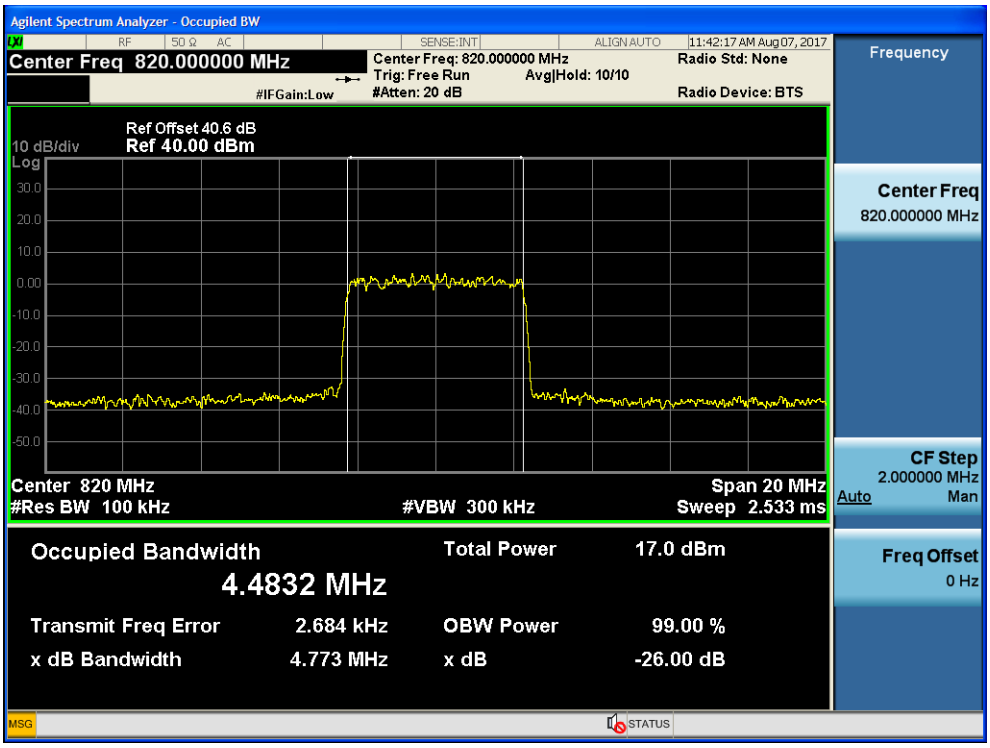


1.3 LTE Mode:

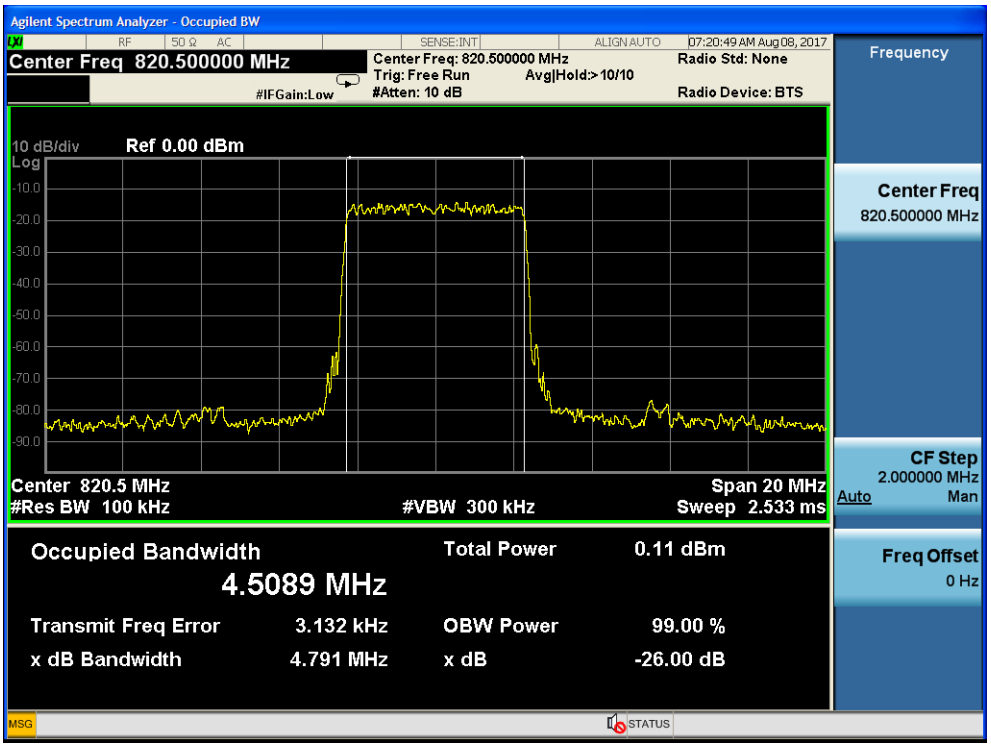
1.3.1 Lowest frequency—Input



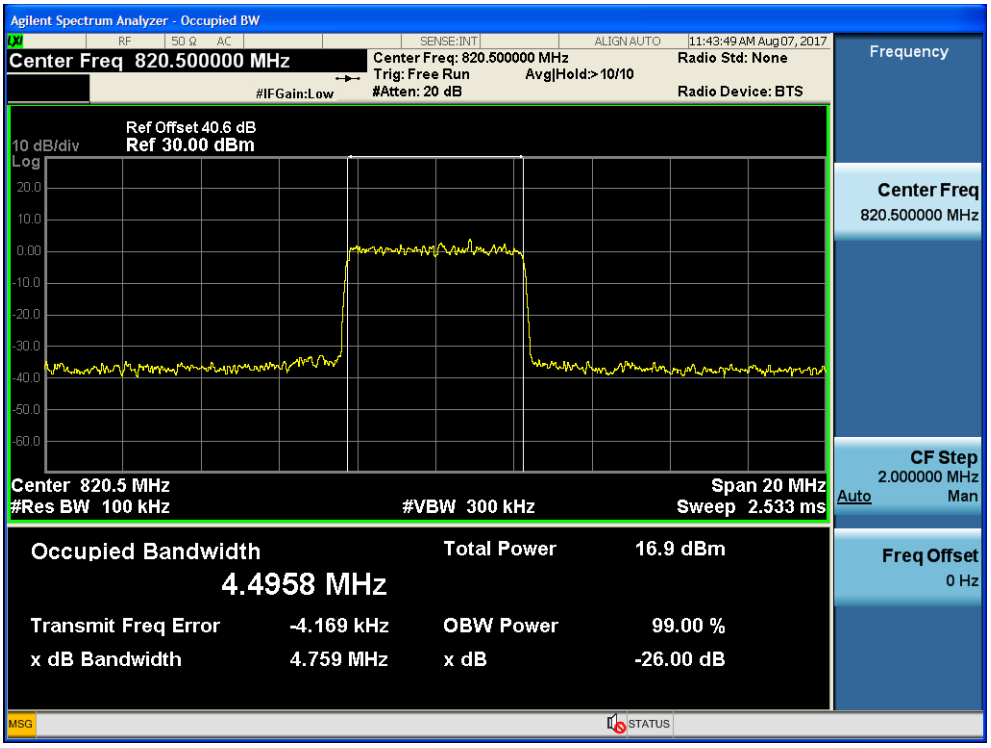
1.3.2 Lowest frequency—Output



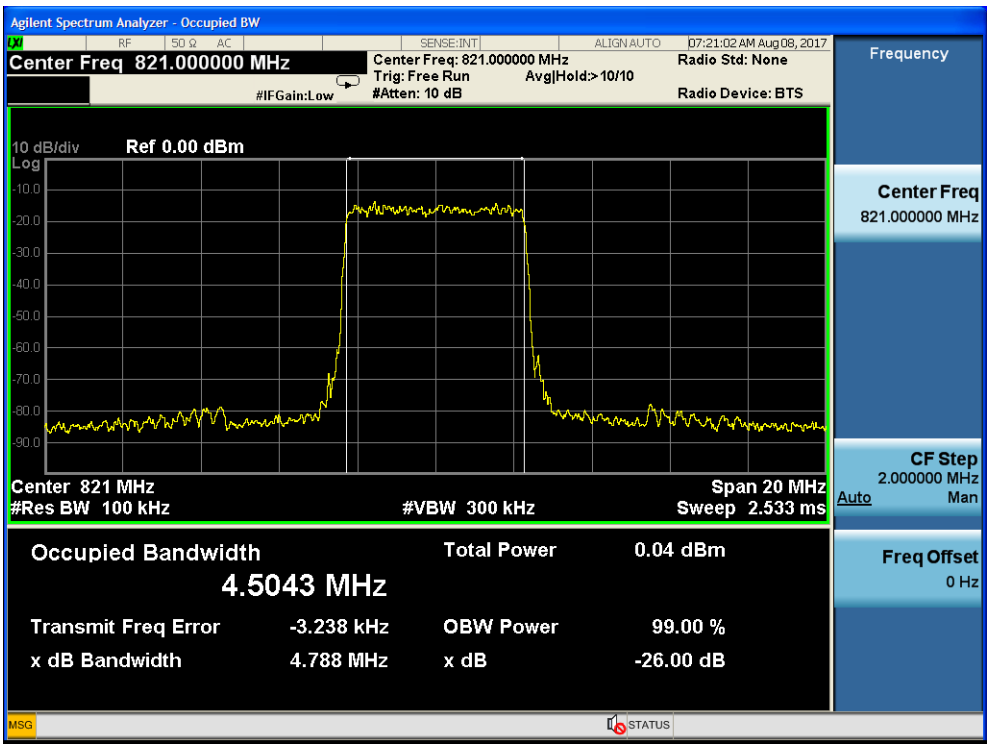
1.3.3 middle frequency-- Input



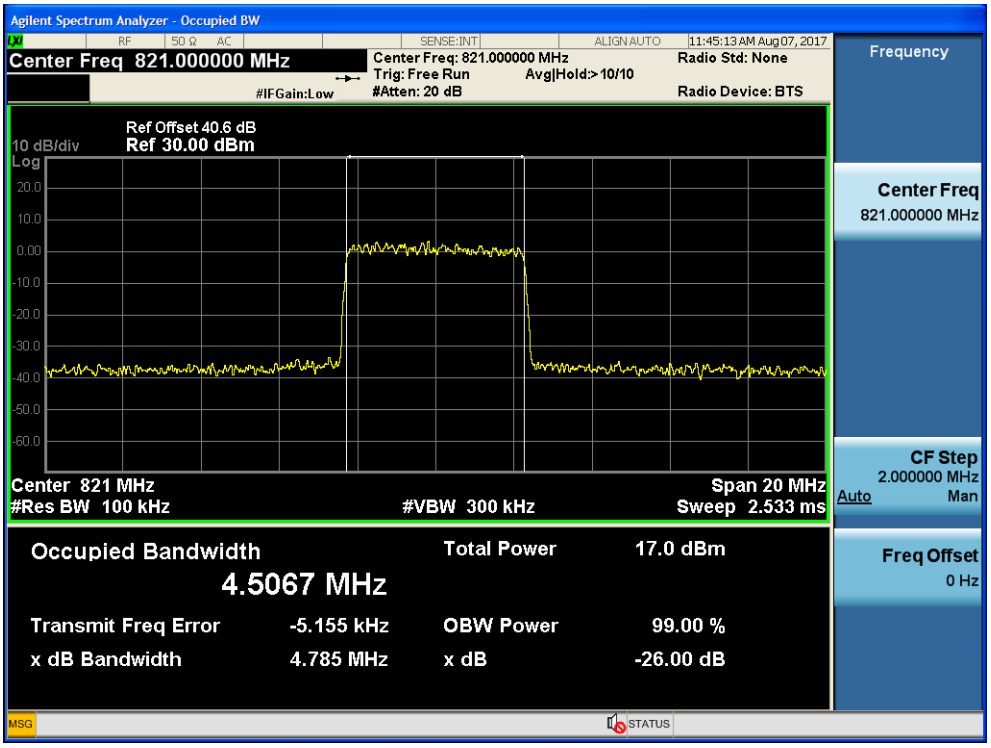
1.3.4 middle frequency-- Output



1.3.5 highest frequency-- Input



1.3.6 highest frequency-- Output



5.2.6 Out of Band Rejection

Test Requirement: KDB935210 D02;2-11-04/EAB/RF

Test for rejection of out of band signals. Filter freq. response plots are acceptable.

Test Method: KDB935210 D02;2-11-04/EAB/RF

EUT Operation:

Status: Drive the EUT to maximum output power. .

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

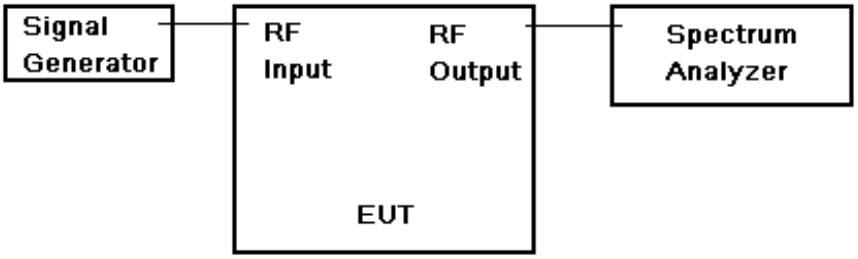


Fig.4. Out of Band rejection test configuration

Test Procedure: 1. Connect the equipment as illustrated;

2. Test the background noise level with all the test facilities;

3. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;

4. Select the attenuator to avoid the test receiver or spectrum analyzer being destroied;

5. Keep the EUT continuously transmitting in max power;

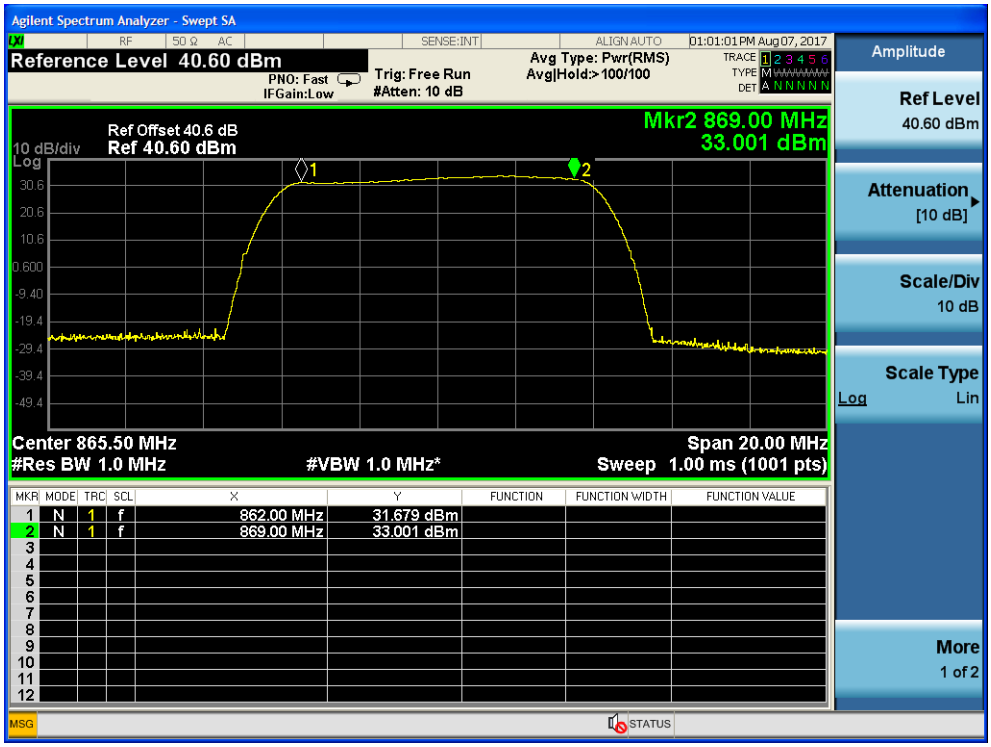
6. Signal generator sweep from the frequency more lower than the product frequency to the frequency more higher than it, find the product band filter characteristic;

· CW signal rather than typical signal is acceptable (for FM).

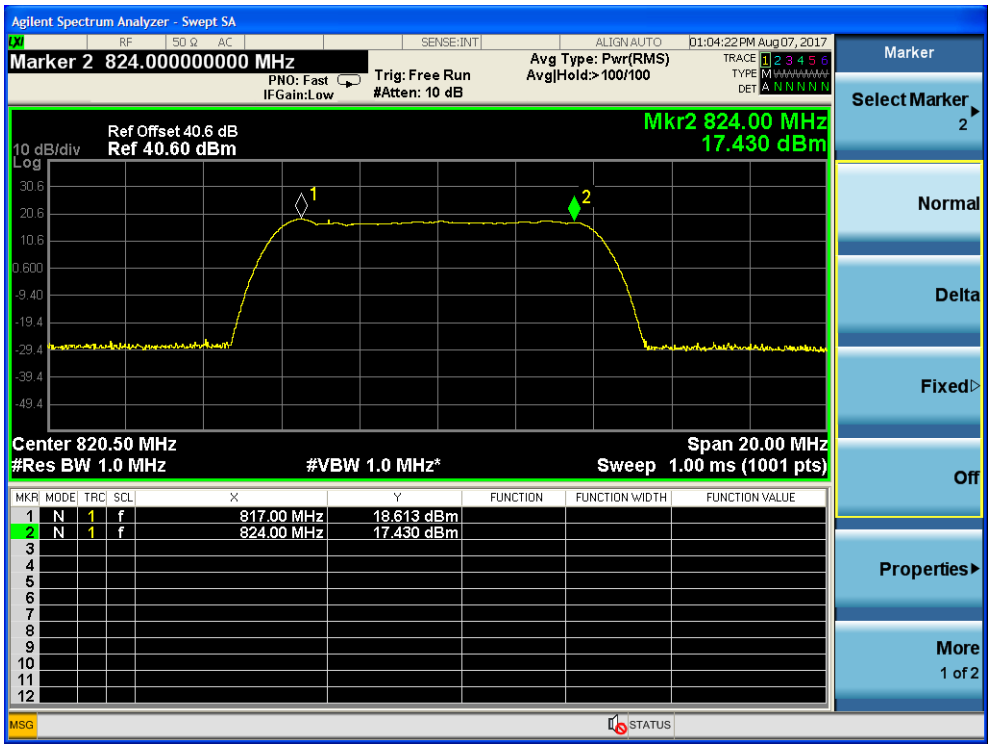
· Multiple band filter will need test each other.

5.2.6.1 Measurement Record:

1. Test for Downlink: 862MHz to 869MHz



2. Test for Uplink: 817MHz to 824MHz



5.2.7 Frequency Stability

Test Requirement: FCC part 90.213

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Test Method: FCC part 2.1055

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Temperature conditions, voltage conditions

Application: Cellular Band RF output ports

Test Procedure:

1. Temperature conditions:
   a) The RF output port of the EUT was connected to Frequency Meter;
   b) Set the working Frequency in the middle channel;
   c) record the 20°C and norminal voltage frequency value as reference point;
   d) vary the temperature from -40°C to 50°C with step 10°C
   e) when reach a temperature point, keep the temperature banlance at least 1 hour to make the product working in this status;
   f) read the frequency at the relative temperature.

2. Voltage conditions:
   a) record the 20°C and norminal voltage frequency value as reference point;
   b) vary the voltage from -15% norminal voltage to +15% voltage;
   c) read the frequency at the relative voltage.

5.2.7.1 Measurement Record:

1) Frequency Stability vs temperature:

1.1) Test for Downlink: 862~869MHz (middle channel 865.5MHz)

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	865.5000023	0.00011554
40	865.5000019	-0.00069324
30	865.5000022	0.00034662
20	865.5000025	Reference
10	865.5000023	-0.00023108
0	865.5000016	-0.00103986
-10	865.5000021	0.000462160
-20	865.5000018	-0.00080878
-30	865.5000025	0
-40	865.5000024	-0.00011554

1.1) Test for Downlink: 817~824MHz (middle channel 820.5MHz)

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	820.5000017	0.00073126
40	820.5000019	0.00048750
30	820.5000016	0.00085314
20	820.5000023	Reference
10	820.5000021	0.00024375
0	820.5000025	-0.00024375
-10	820.5000022	-0.00011554
-20	820.5000018	-0.00060938
-30	820.5000021	0.00024375
-40	820.5000023	0

2) Frequency Stability vs voltage:

2.1) **For AC supplied:**

2.1.1) Test for Downlink: 862~869MHz (middle channel 865.5MHz)

Voltage(V AC)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	865.5000021	-0.00011554
120	865.5000022	Reference
138 (120*1.15)	865.5000024	0.00023108

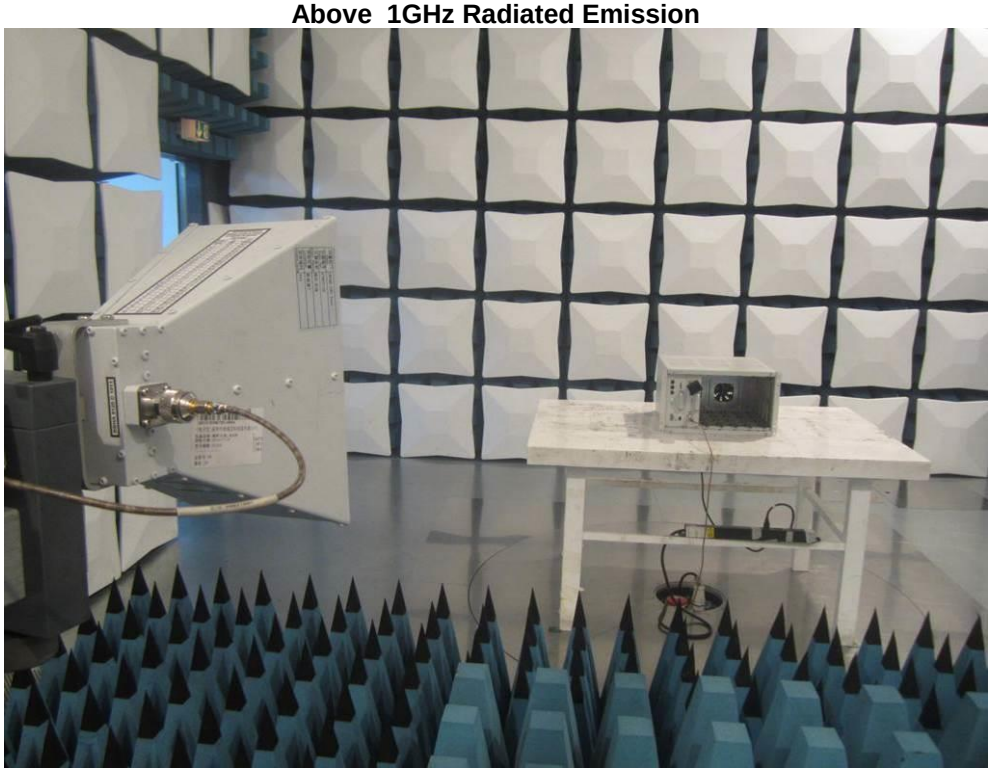
2.1.1) Test for Uplink: 817~824MHz (middle channel 820.5MHz)

Voltage(V AC)	Frequency(MHz)	Tolerance(ppm)
102 (120*0.85)	820.5000019	-0.00012188
120	820.5000020	Reference
138 (120*1.15)	820.5000023	0.00036563

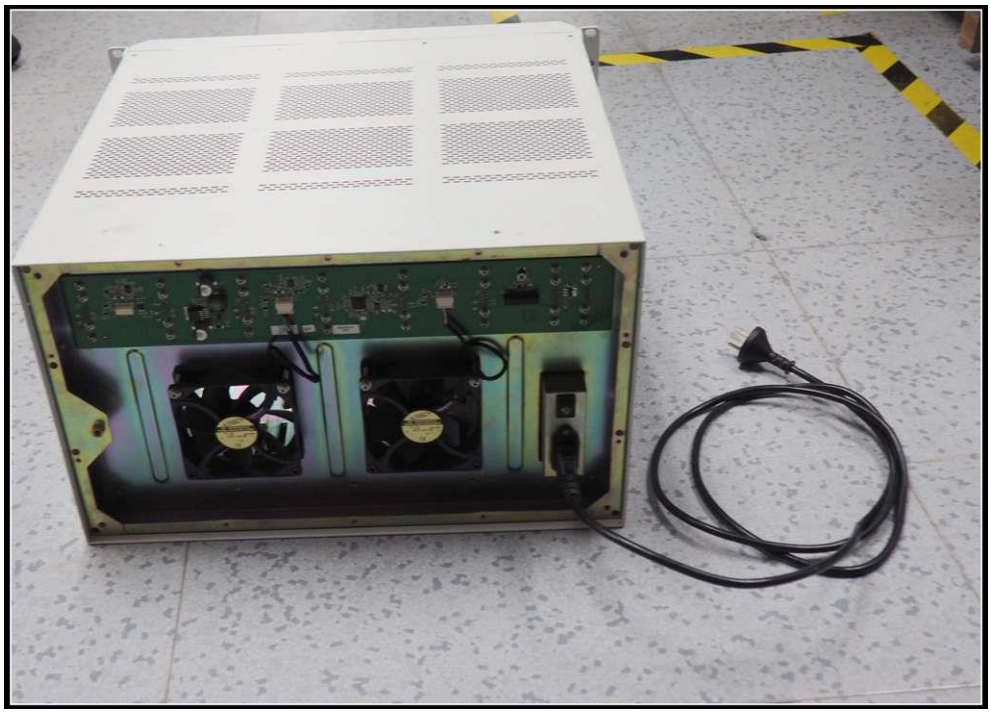
6 Photographs - Test Setup

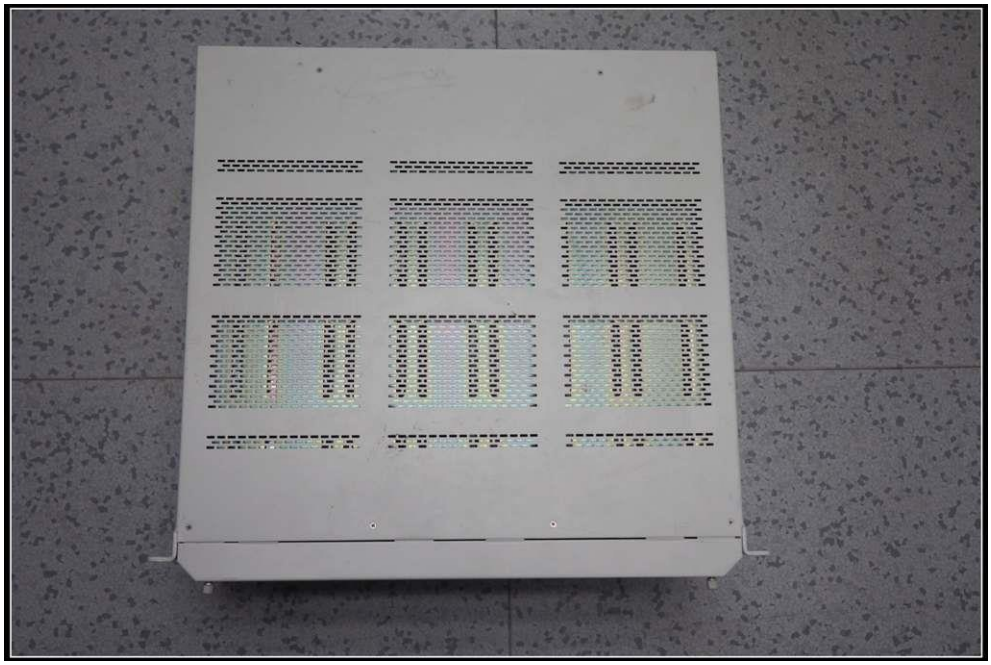
30MHz ~ 1GHz Radiated Emission

Above 1GHz Radiated Emission



7 Photographs - EUT Constructional Details

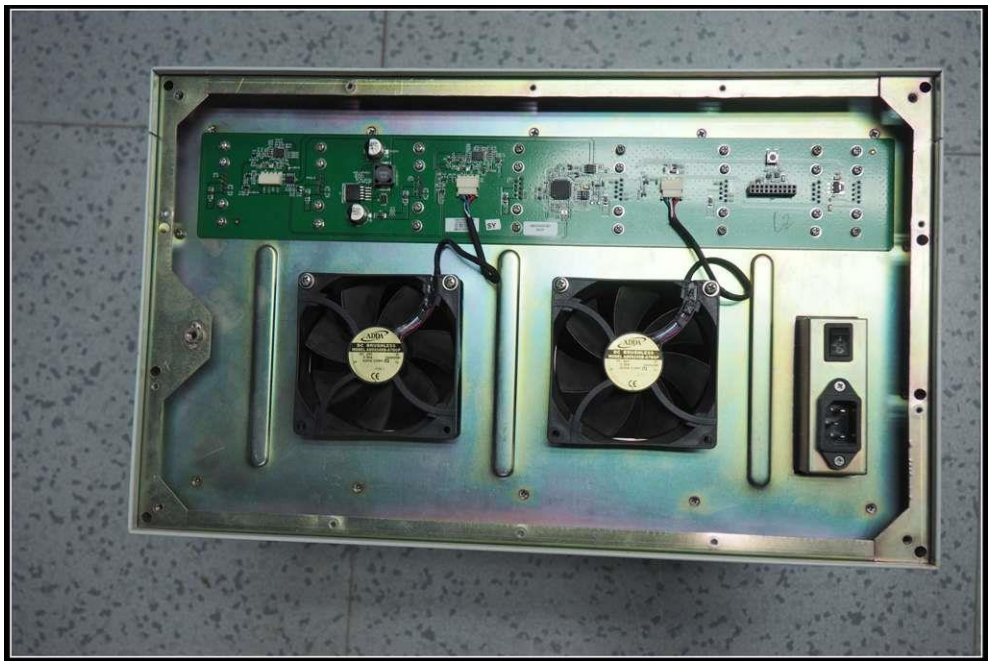


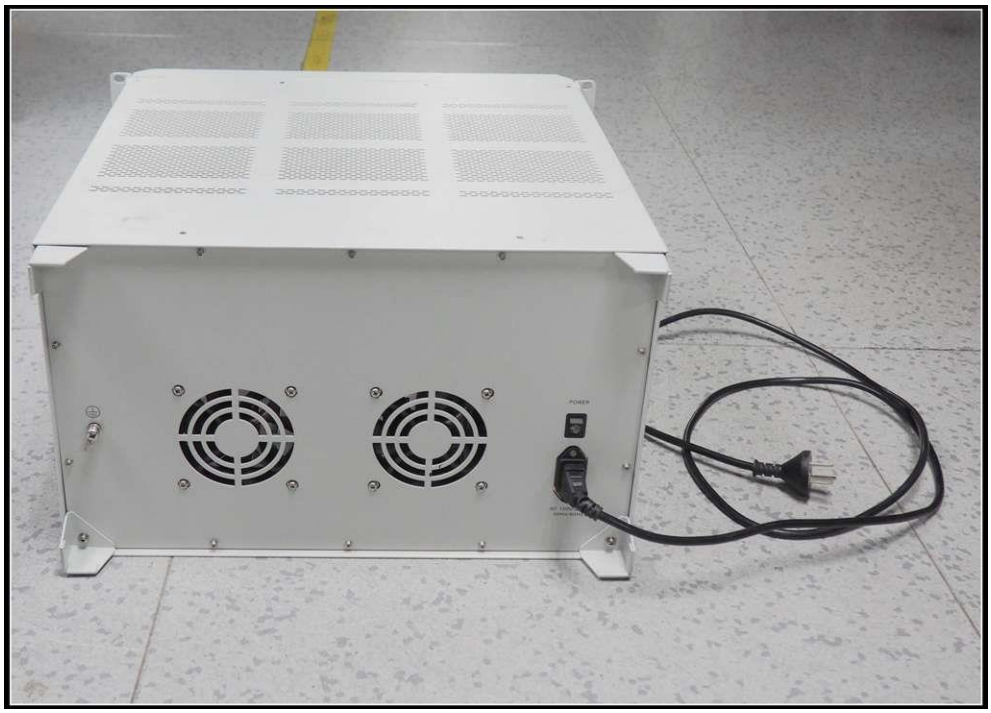


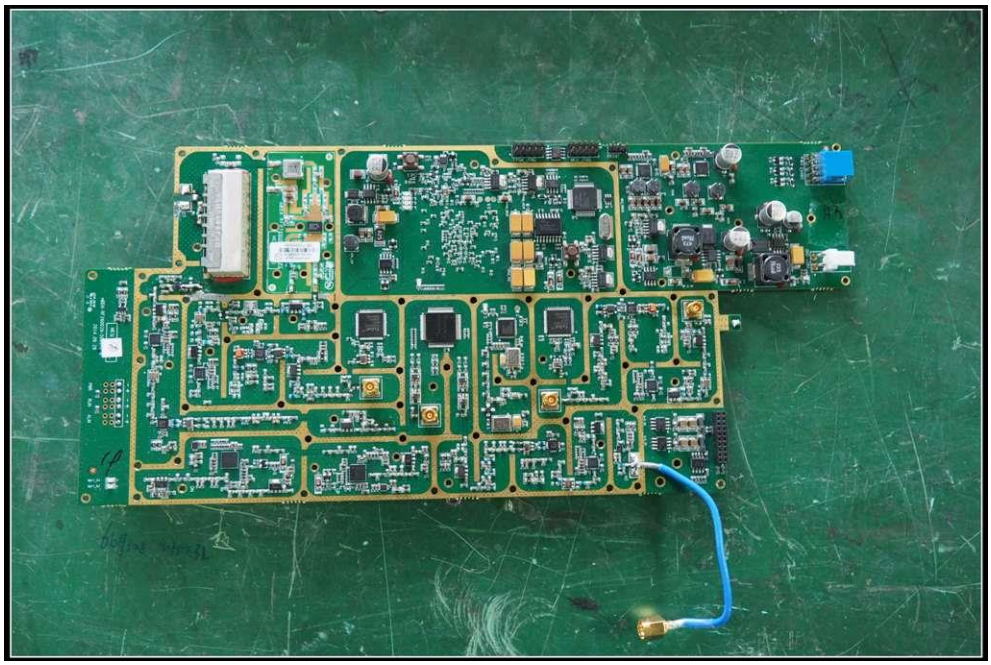

Comba
mBDA ①
美国版

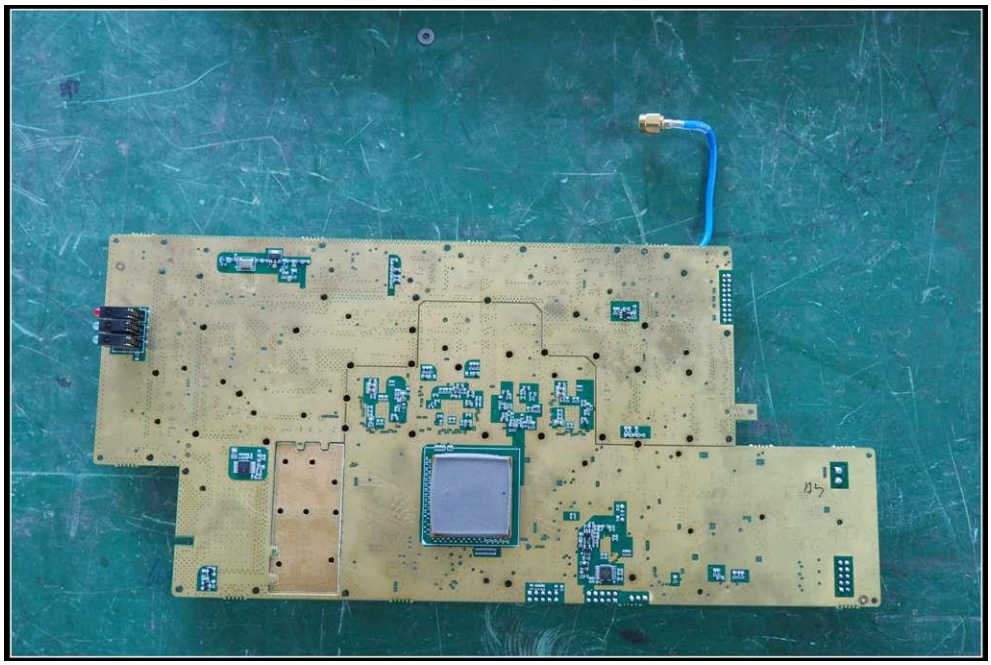

Comba
Comba

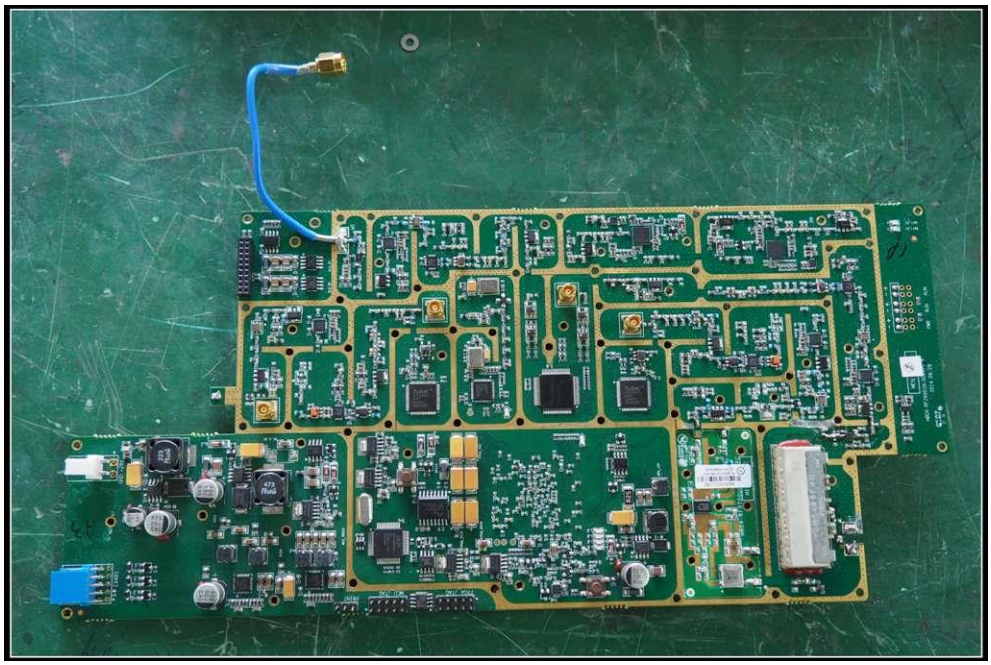

Comba

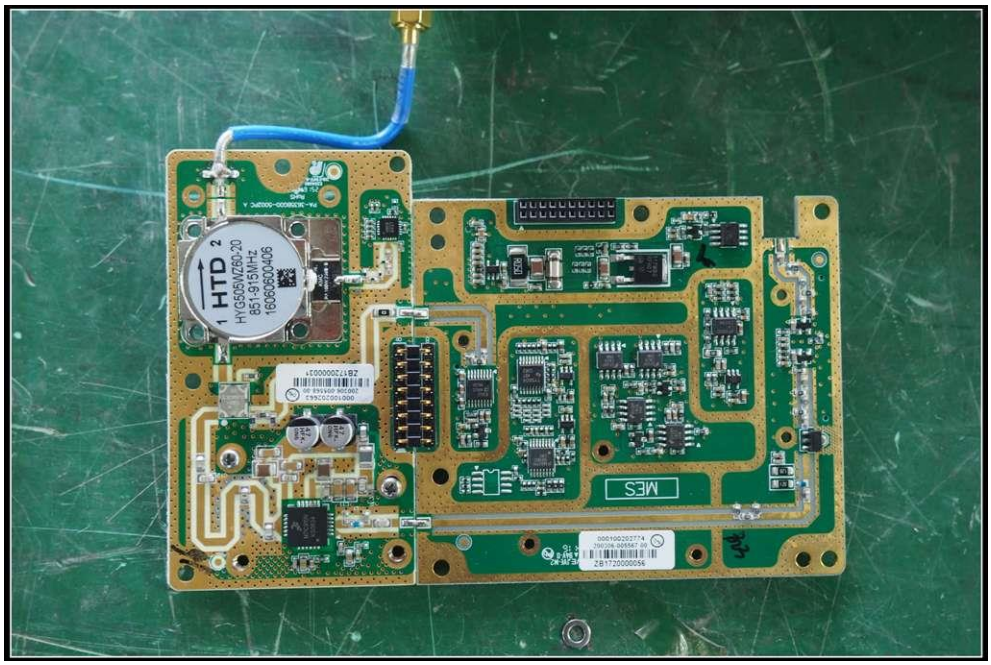








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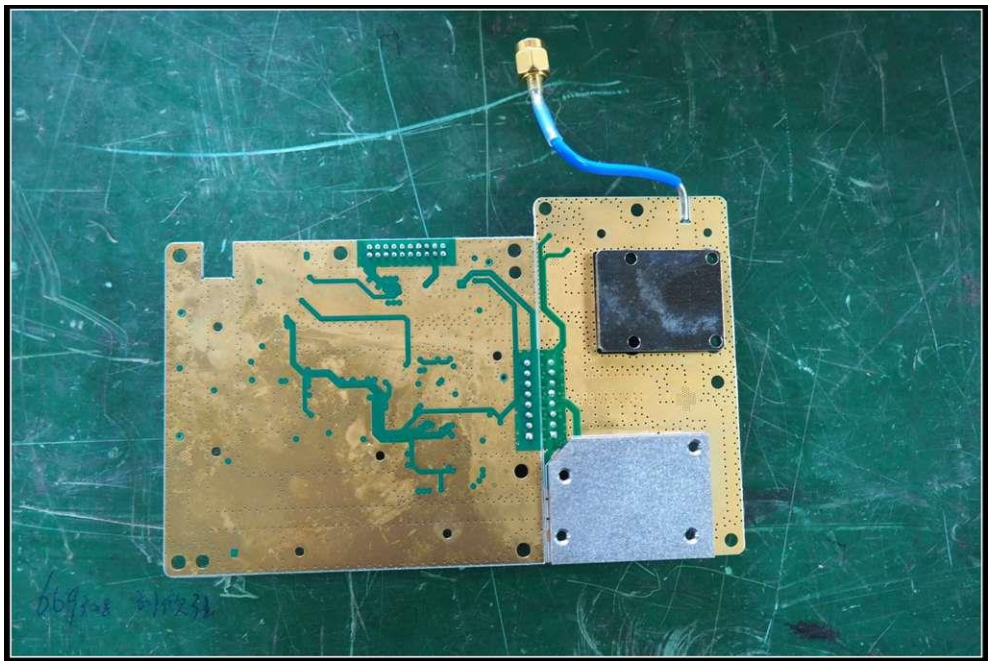
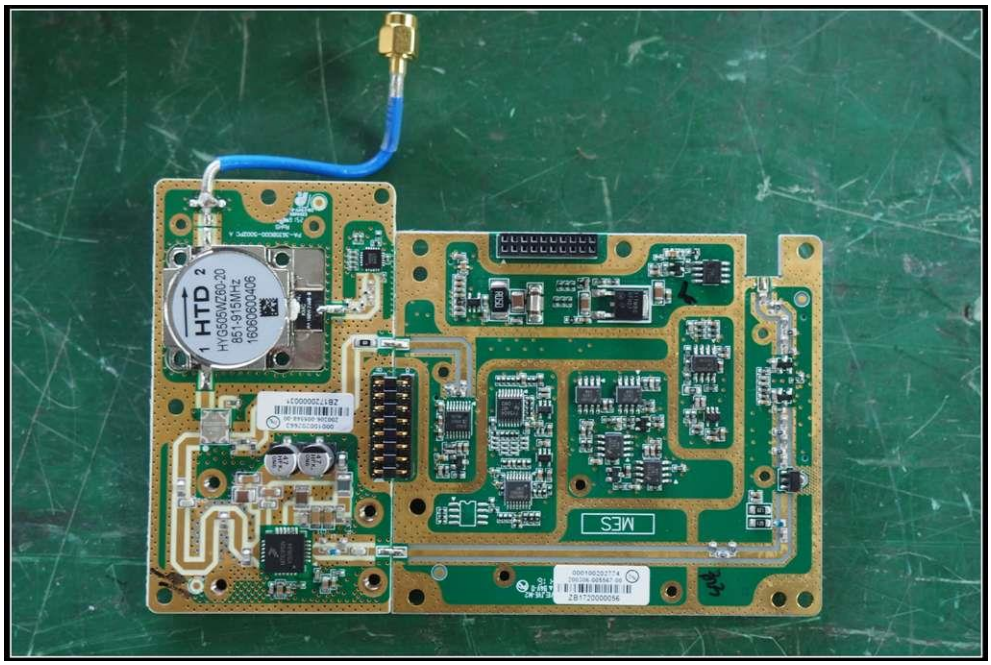
HYG505MZB0-20
8511-9150MHZ
1606060406
MES





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