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Report No.: GZEM191001624102

Page: 1 of 102

## TEST REPORT

**Application No.:** GZEM1910016241CR  
**Applicant:** Comba Telecom Ltd.  
**Address of Applicant:** 611 East Wing, No. 8 Science Park West Avenue, Hong Kong Science Park, Tai Po, Hong Kong  
**Manufacturer:** Comba Telecom Systems (China) Ltd.  
**Address of Manufacturer:** No. 10 Shenzhou Road, Guangzhou Science City, Guangzhou 510663, Guangdong, P.R. China  
**Factory:** Comba Telecom Technology (Guangzhou) Ltd.  
**Address of Factory:** 6 Jinbi Road, Guangzhou Economic and Technology District, Guangdong, P.R.China  
**Equipment Under Test (EUT):**  
**EUT Name:** High Power Remote Radio Head  
**Model No.:** CWS-4240-71  
**Trade Mark:** Parallel Wireless  
**Standard(s) :** FCC Part 27, FCC Part 2  
**Date of Receipt:** 2019-10-08  
**Date of Test:** 2019-10-08 to 2019-10-16  
**Date of Issue:** 2019-10-25

<b>Test Result:</b>	<b>Pass*</b>
---------------------	--------------

\* In the configuration tested, the EUT complied with the standards specified above.

*Kobe Jian*

Kobe Jian

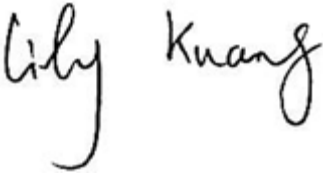

EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2019-10-25		Original

<b>Authorized for issue by:</b>			
<b>Tested By</b>			2019-10-08 to 2019-10-16
	<u>Lily_Kuang /Project Engineer</u>		<b>Date</b>
<b>Checked By</b>			2019-10-25
	<u>Ricky_Liu /Reviewer</u>		<b>Date</b>



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## 2 Test Summary

Test Item	Test Requirement	Test Method	Measurement Uncertainty	Result $\clubsuit$
99% Occupied Bandwidth & 26dB bandwidth	FCC part 2.1049	KDB 971168 D01 V03r01 and ANSIC63.26-2015	$\pm 3\%$	PASS
Output Power & PAPR	FCC part 27.50(c)	KDB 971168 D01 V03r01 and ANSIC63.26-2015	$\pm 0.68\text{dB}$	PASS
Band Edge & Intermodulation	FCC part 27.53(g)	KDB 971168 D01 V03r01 and ANSIC63.26-2015	$\pm 1.50\text{dB}$	PASS
Conducted Spurious Emissions	FCC part 27.53(g)	KDB 971168 D01 V03r01 and ANSIC63.26-2015	$\pm 1.04\text{dB}$	PASS
Frequency Stability	FCC part 27.54	KDB 971168 D01 V03r01 and ANSIC63.26-2015	$\pm 5.5 \times 10^{-8}$	PASS
Radiated Spurious Emissions	FCC part 27.53(g)	KDB 971168 D01 V03r01 and ANSIC63.26-2015	$\pm 4.5\text{dB}$ (30MHz-1GHz)	PASS
			$\pm 4.8\text{dB}$ (1GHz-18GHz)	PASS



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## 4 General Information

### 4.1 General Description of E.U.T.

Power Supply:	DC -48V
Test Power:	DC -48V
Cable:	DC mains (unshielded, 2m)
Operating Temperature:	-40 °C to +55°C
Operating Humidity:	≤ 95%

### 4.2 Details of E.U.T.

Type of Modulation	LTE (QPSK,16QAM/64QAM)
Multiple carrier :	Product support both single and dual-carrier configurations.
Channel Bandwidth:	Support 5MHz,10MHz,15MHz,20MHz
Frequency Band:	Transmitter: 617MHz to 652MHz
Nominal Power Output:	46dBm for transmitter single channel transmission Total 46dBm and 43dBm per channel for dual-carrer operation.

### 4.3 Product Description

The CWS-4240-71 named RRH is a part of OPEN RAN solution which includes a high-quality RRH and baseband unit. The product is built with state of art high power, high efficient linear power amplifiers and is a compact designed, light and low power consumption unit. It supports 2T2R configurations, multi-carries, also supports eCPRI protocol

The product has been completed integration test with Parallel Wireless and will provide all MNOs a cost effective, easy install, maintenance free and power saving Radio solutions, which will help customers cutting its cost in both CAPEX and OPEX.

### 4.4 Standards Applicable for Testing

The standard used was & FCC part 27 & FCC part 2



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#### 4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,  
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,  
Guangzhou, China 510663

Tel: +86 20 82155555

Fax: +86 20 82075059

No tests were sub-contracted.

#### 4.6 Other Information Requested by the Customer

None.



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## 5 Instruments Used during Test

No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0039	Temperature Chamber	GZ GongWen Co.Ltd.	GDJW-100	118	2019-05-01	2020-04-30
EMC2022	DC Power Supply	KIKUSUI ELECTRONICS CORP.	PAN60-20A	HH000269	2017-11-02	2019-11-01
EMC0007	DMM	Fluke	73	70671122	2019-05-16	2020-05-15
EMC0006	DMM	Fluke	73	70681569	2019-05-16	2020-05-15
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2016-12-04	2019-12-03
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2018-12-08	2019-12-07
EMC2026	Horn Antenna (Rx)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-84	2016-09-09	2019-11-08
EMC0519	Bilog Type Antenna	Schaffner Chase	CBL6143	5070	2017-05-04	2020-05-03
EMC0521	1-26.5GHz Pre Amplifier	Agilent	8449B	3008A01649	2019-01-07	2020-01-06
EMC2065	Amplifier 9kHz-1300MHz	HP	8447F	3113AU6624	2019-05-29	#N/A
EMC0507	Antenna Mask (Tx)	HD-GmbH	AS620M	620/408	N/A	N/A
EMC0508	Antenna Mask (Rx)	HD-GmbH	MA240	240/619	N/A	N/A
EMC0509	Turntable	HD-GmbH	DT430	N/A	N/A	N/A
EMC0510	Turntable & Antenna Mask Controller	HD-GmbH	HD100	N/A	N/A	N/A
EMC0512	EMI Test Software	Rohde & Schwarz	ES-K1	N/A	N/A	N/A
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2019-01-20	2020-01-19
EMC0516	Signal Generator	Rohde & Schwarz	SMR20	100416	2019-01-07	2020-01-06
EMC0032	Radio Communication Monitor	Rohde & Schwarz	CMS54	100137	2019-05-29	2020-05-28
EMC0904	Power Meter	Rohde & Schwarz	NRVS	825770/074	2018-12-04	2019-12-03
EMC0906	Dual Directional Coupler	Werlatone Inc.	C1795	6634	2019-05-29	2020-05-28
EMC2055	Oscilloscope 500MHz	Tektronix	TDS3052C	C011815	2019-01-07	2020-01-06
EMC0523	Active Loop Antenna	EMCO	6502	42963	2018-03-05	2020-03-04
EMC0069	Signal Analyzer (20Hz ~ 26.5Ghz)	R&S	FSIQ26	100312	2018-11-19	2019-11-18



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SEM003-18	Trilog Broadband Antenna 25-2000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	665	2019-02-22	2022-02-22
EMC2025	Trilog Broadband Antenna 30-1000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9160	9160-3372	2016-09-08	2019-11-07
EMC2142	966 Anechoic Chamber	C.R.T	9mX6mX6m	NA	2017-12-19	2019-12-18
EMC2139	MXE EMI Receiver	Keysight	N9038A	MY57290121	2018-11-19	2019-11-18
EMC2138	EXA Signal Analyzer	KEYSIGHT	N9010A	MY57120105	2018-11-19	2019-11-18
EMC2165	Wireless Conectivity Tester	R&S	CMW270	101312	2019-04-04	2020-04-03
EMC0078	Temperature, & Humidity	Shanghai Meteorological Instrument factory Co., Ltd.	ZJ1-2B	709131	2018-10-11	2019-11-10
EMC0068	Modulation Analyzer	HP	8901B	3438B05310	2019-02-25	2020-02-24



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Other Equipment					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (dd-mm-yy)	Cal. Due Date (dd-mm-yy)
Power Meter	Agilent	E4419B	MY45100856	2019.03.12	2020.03.11
Signal Generator	Agilent	E4437B	US39260800	2019.03.12	2020.03.11
Signal Generator	Agilent	E4438C	US39260800	2019.03.12	2020.03.11
Spectrum Analyzer	Agilent	N9020A	MY48011385	2019.03.12	2020.03.11
Spectrum Analyzer	Rohde&Schwarz	FSQ 8	SN0805772	2019.03.12	2020.03.11
Attenuator	SHX manufacturer	30dB/50W	09031816	----	----
Attenuator	SHX manufacturer	40dB/50W	09031312	----	----
Attenuator	SHX manufacturer	50dB/50W	09053023	----	----
Signal Generator	Rohde&Schwarz	SMU 200A	08103303	2019.03.12	2020.03.11



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## 6 Test Results

### 6.1 E.U.T. test conditions

Input Voltage:	DC -48V
Operating Environment:	
Temperature:	22°C ~26°C
Humidity:	46%~56% RH
Atmospheric Pressure:	990~1005M Modulationbar
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 setting for all tests. The device should be tested on Transmitter. For detail test Modulation and Frequency, please refer to 7.2.

### 6.2 Test Procedure & Measurement Data

Test Modulation and Frequency

Transmitter: 617MHz to 652MHz(5M Modulation)

Modulation	Lowest frequency	Middle frequency	Highest frequency
LTE	619.5	634.5	649.5

Transmitter: 617MHz to 652MHz(10M Modulation)

Modulation	Lowest frequency	Middle frequency	Highest frequency
LTE	622	634.5	647

Transmitter: 617MHz to 652MHz(15M Modulation)

Modulation	Lowest frequency	Middle frequency	Highest frequency
LTE	624.5	634.5	644.5

Transmitter: 617MHz to 652MHz(20M Modulation)

Modulation	Lowest frequency	Middle frequency	Highest frequency
LTE	627	634.5	642

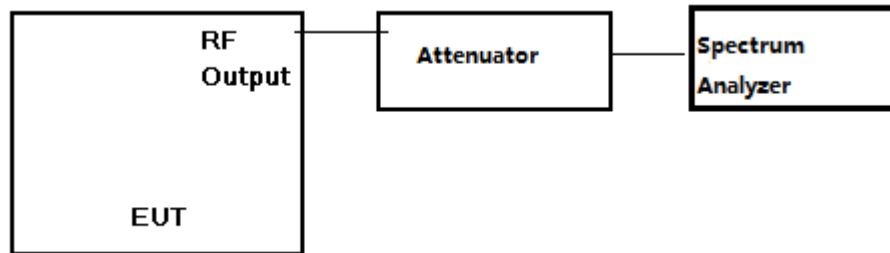


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**6.2.1 99% Occupied Bandwidth & 26 dB bandwidth**

Test Requirement: FCC part 2.1049  
 Test Method: Clause 4 of KDB 971168 D01 V03r01 and ANSIC63.26-2015  
 99% Occupied Bandwidth and 26dB bandwidth  
 EUT Operation:  
 Status: Drive the EUT to maximum output power. .  
 Conditions: Normal conditions  
 Application: Cellular Band RF output ports  
 Test Configuration:



Occupied Bandwidth test configuration

According to clause 5.4.4 of ANSI C63.26-2015

- Test Procedure:
- a) Set the spectrum analyzer about 1%&-5% OBW of carrier.
  - b) Connect the equipment as illustrated;
  - c) Capture the trace of output signal;



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**6.2.1.1 Measurement Record:**

ANT1 Port:

BW LTE Channel	Test item	Lowest frequency	middle frequency	Highest frequency
5M	99%	4.567	4.487	4.487
	26dB down	4.888	4.888	4.807
10M	99%	8.974	8.974	8.974
	26dB down	9.455	9.455	9.535
15M	99%	13.461	13.461	13.461
	26dB down	14.423	14.423	14.343
20M	99%	17.949	17.949	17.949
	26dB down	19.071	19.070	19.070

ANT2 Port:

BW LTE Channel	Test item	Lowest frequency	middle frequency	Highest frequency
5M	99%	4.487	4.487	4.567
	26dB down	4.888	4.807	4.808
10M	99%	8.974	8.974	8.974
	26dB down	9.455	9.455	9.455
15M	99%	13.541	13.461	13.542
	26dB down	14.342	14.423	14.423
20M	99%	17.949	17.949	17.949
	26dB down	18.990	18.990	19.070



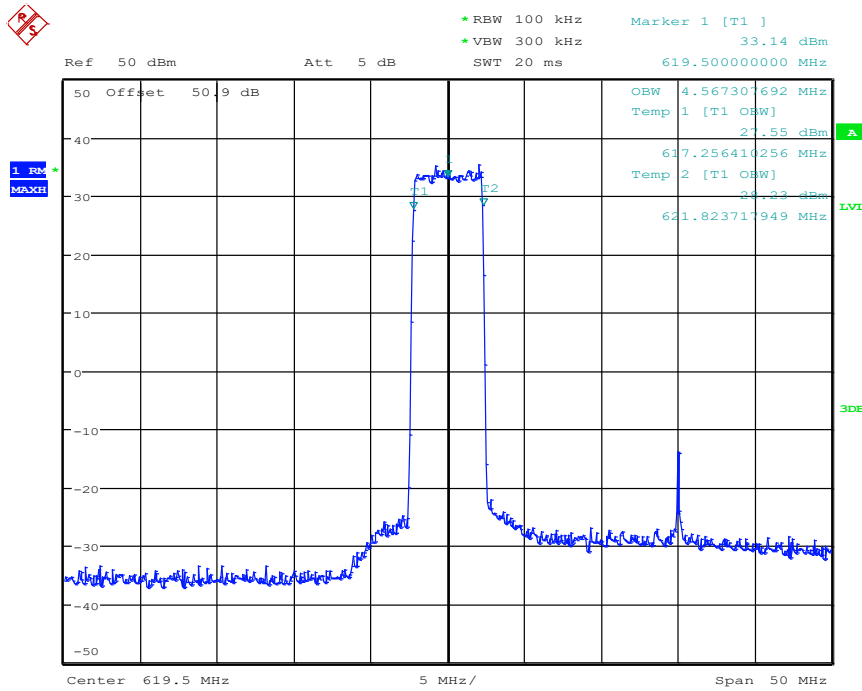
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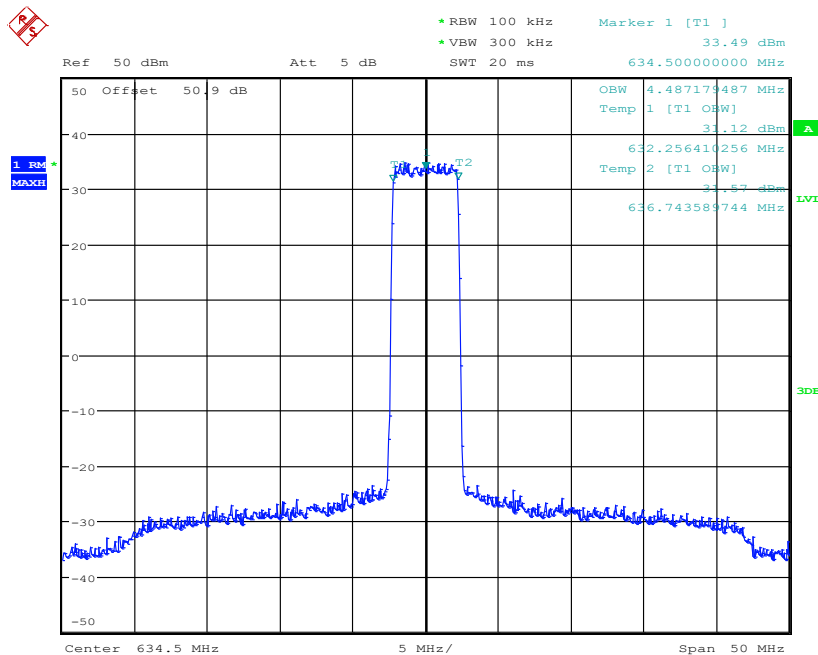
## 1) ANT1 Port:

### 1.1 99% Occupied Bandwidth

#### 1.1.1 Lowest frequency (5M Modulation)



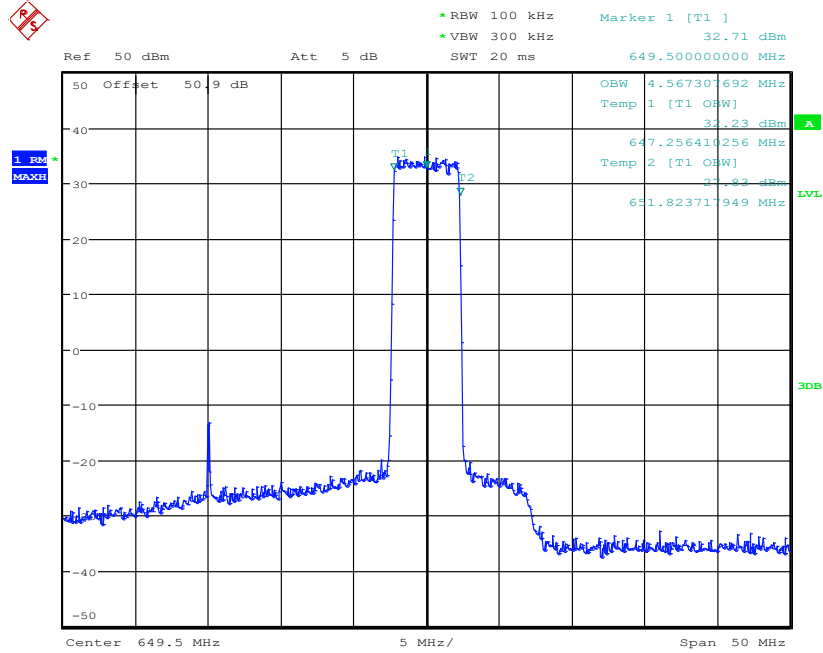
#### 1.1.2 middle frequency



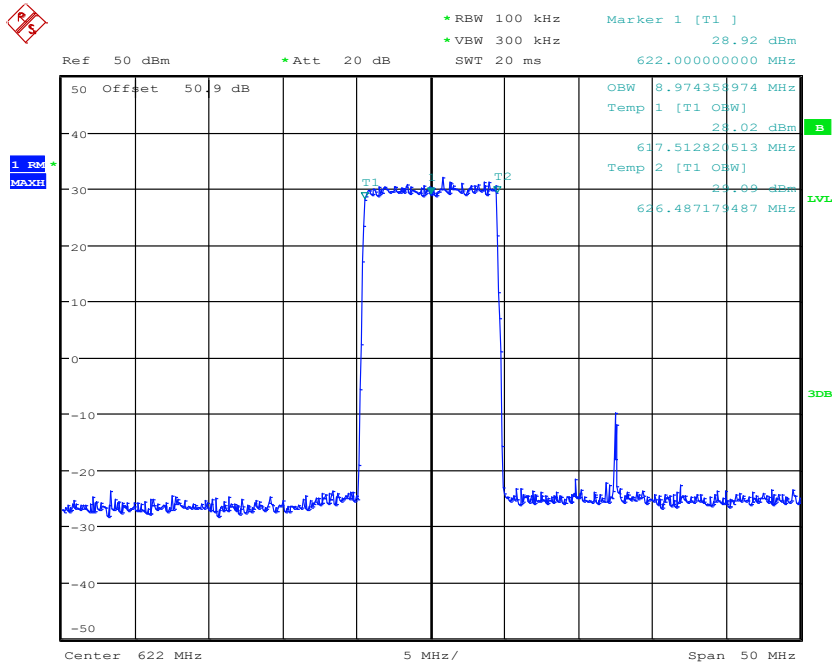
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### 1.1.3 Highest frequency:



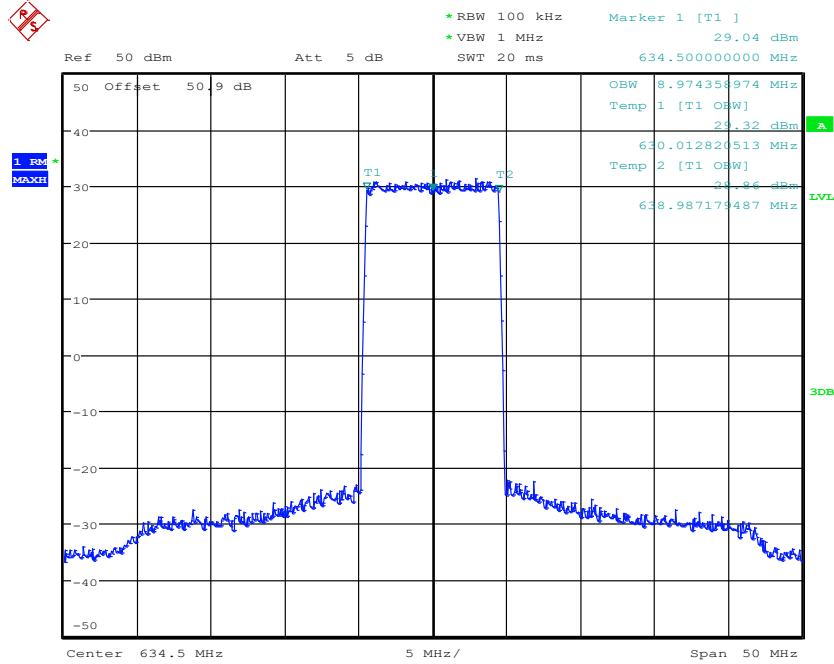
### 1.1.4 Lowest frequency (10M Modulation)



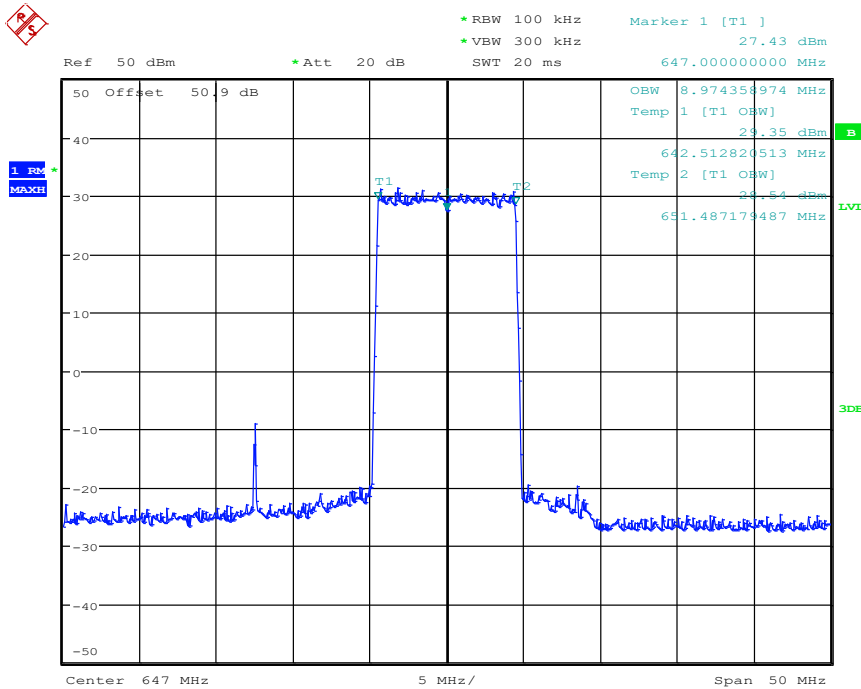
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1.1.5 middle frequency



1.1.6 Highest frequency:

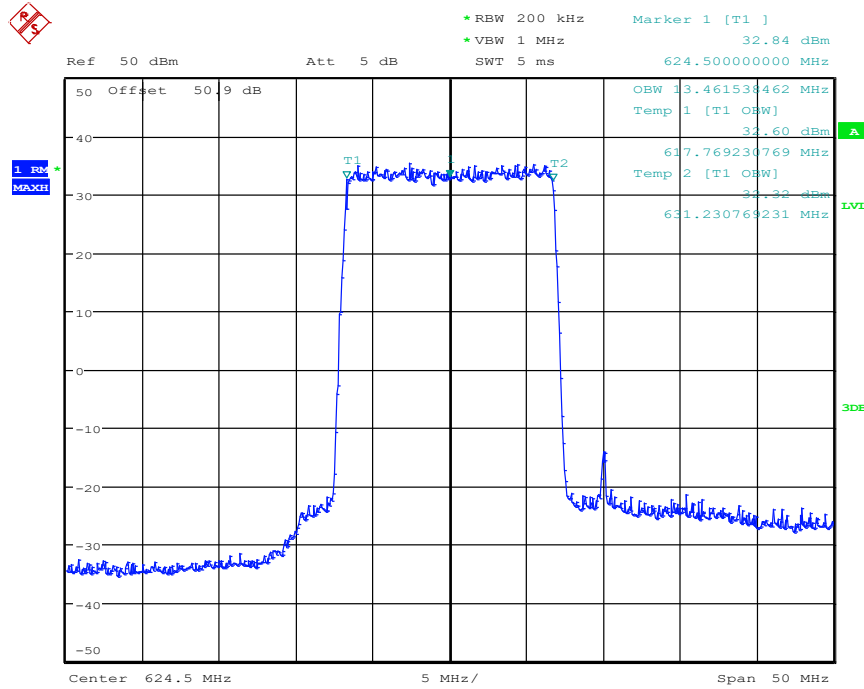


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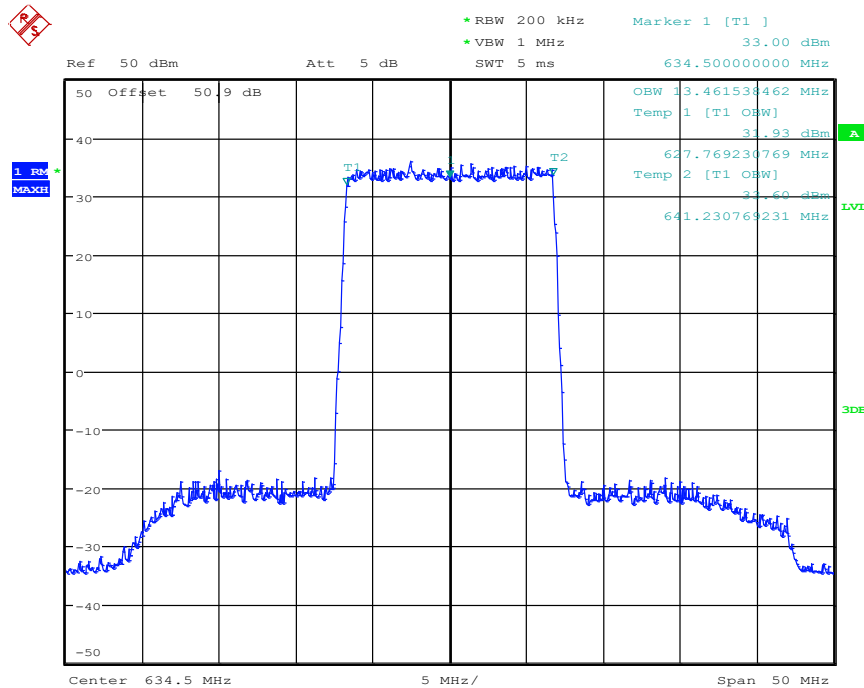
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### 1.1.7 Lowest frequency (15M Modulation)

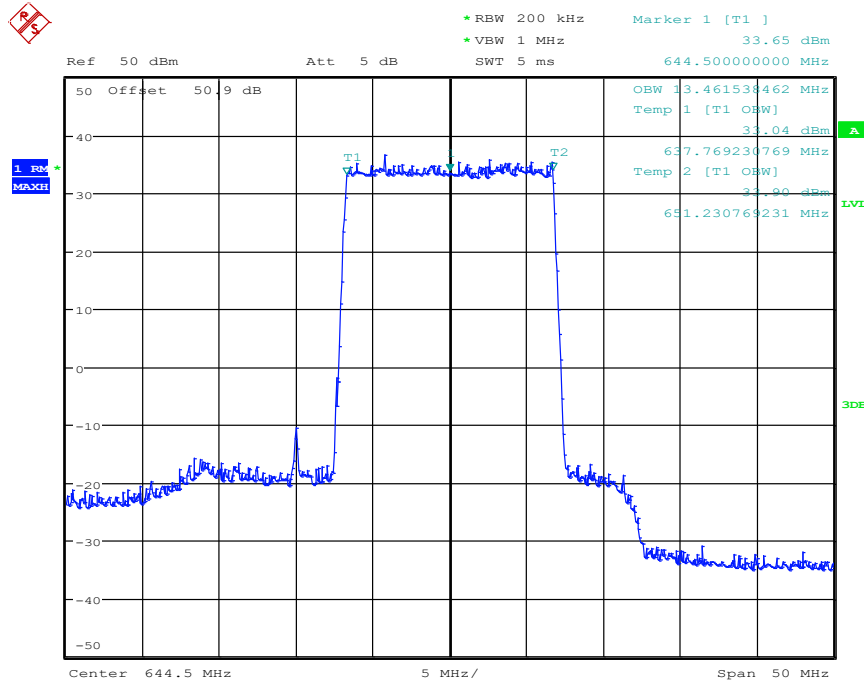


### 1.1.8 middle frequency

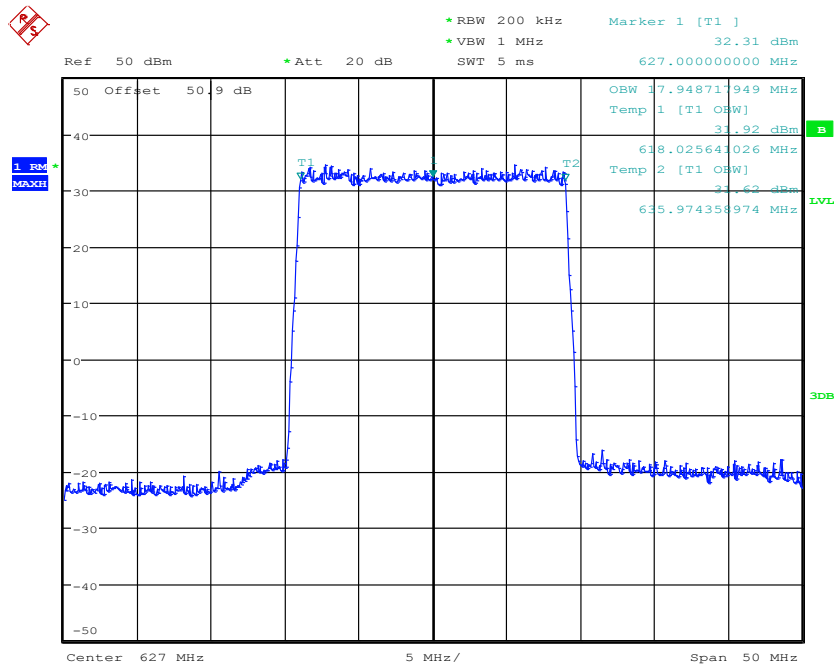


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1.1.9 highest frequency

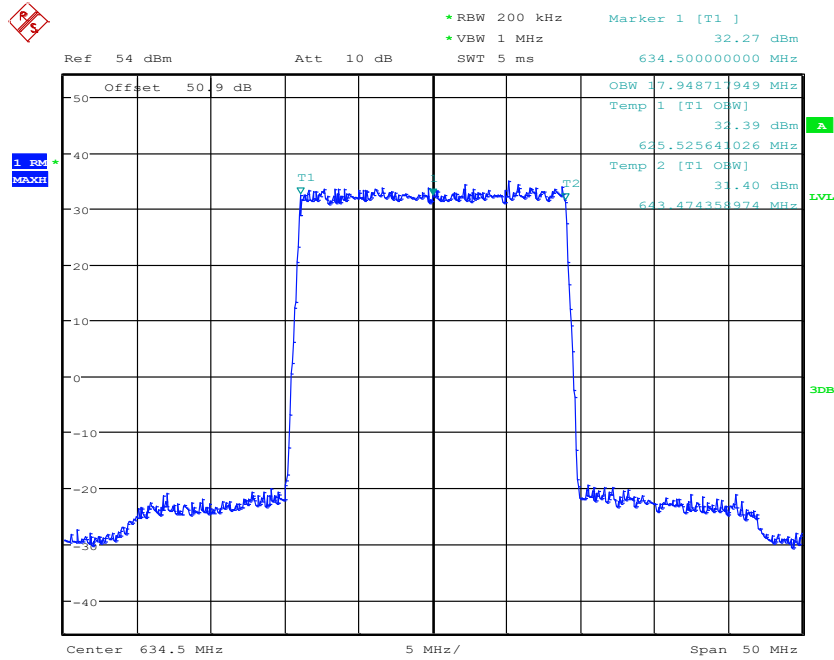


1.1.10 Lowest frequency (20M)

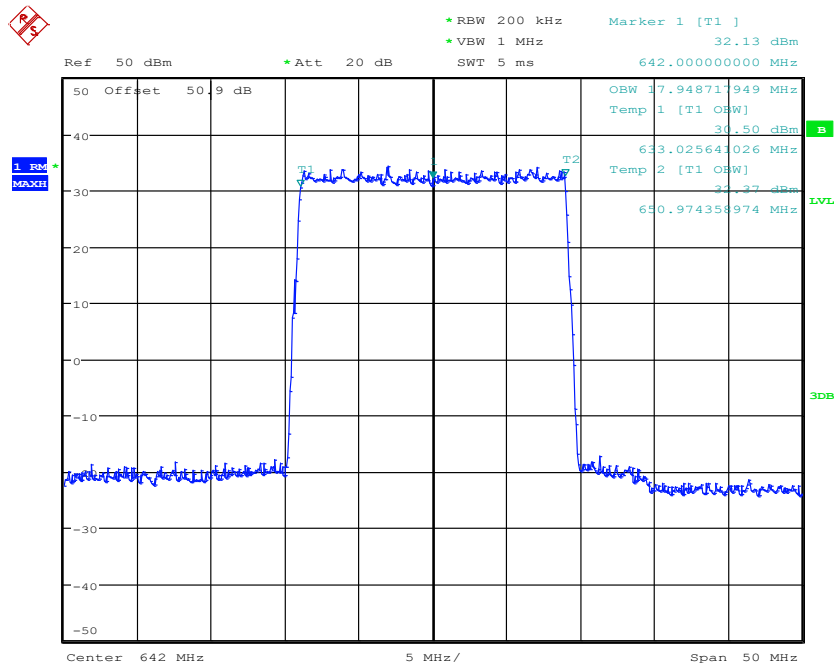


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### 1.1.11 middle frequency



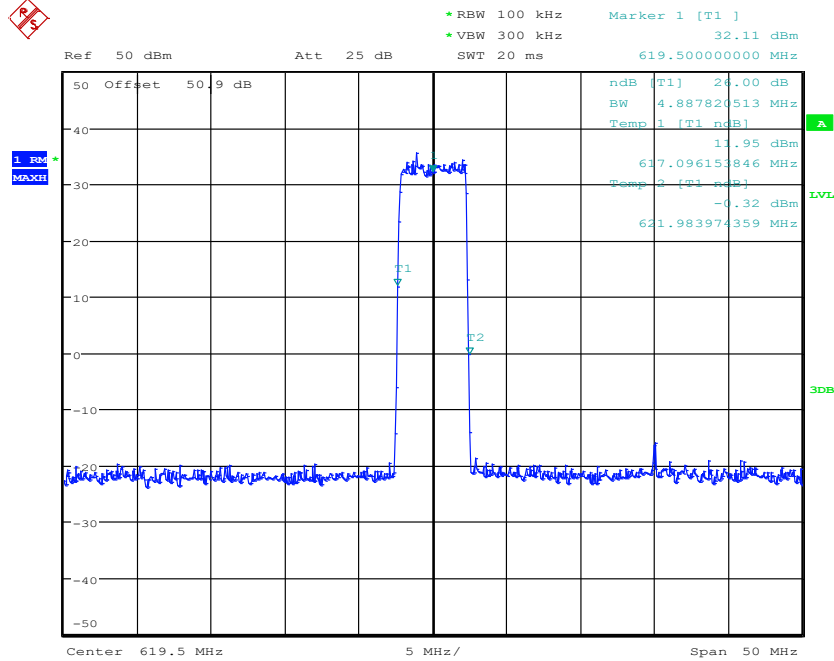
### 1.1.12 Highest frequency



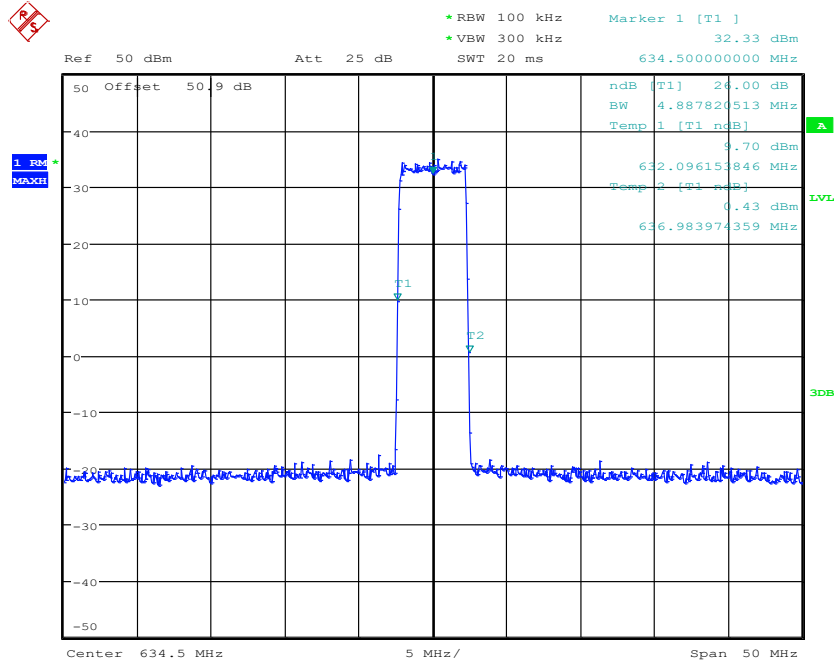
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**1.2 26dB down Bandwidth**

**1.2.1 lowest frequency(5M Modulation)**



**1.2.2 middle frequency**

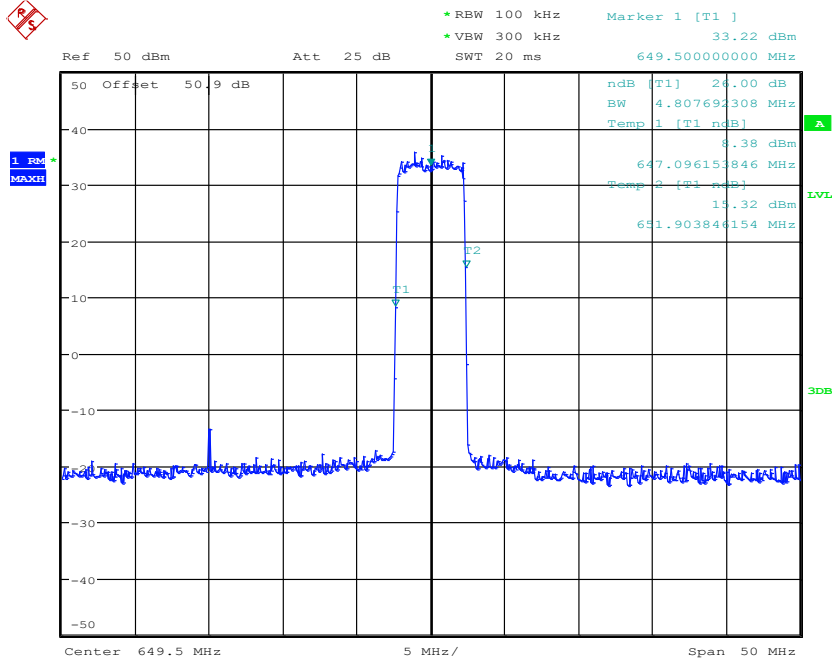


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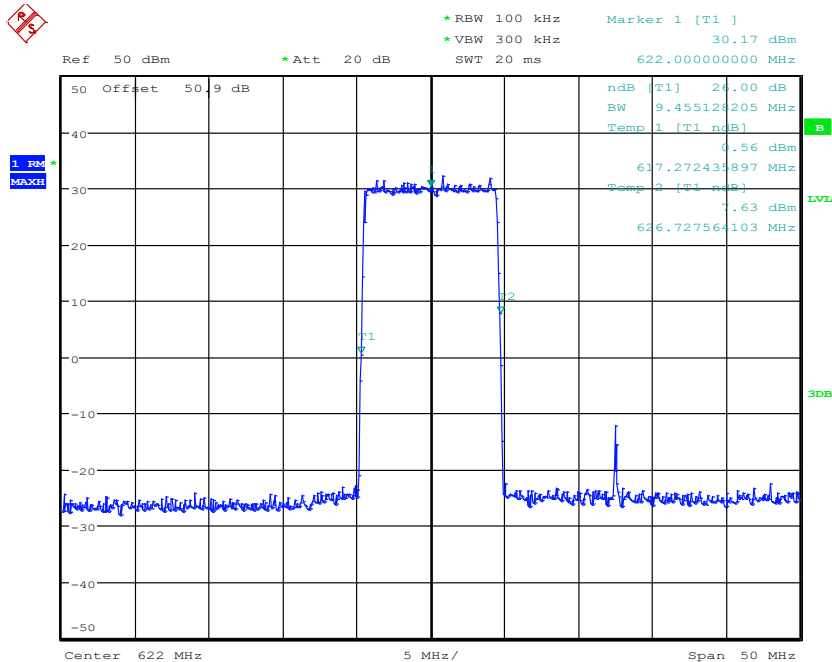
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1.2.3 Highest frequency



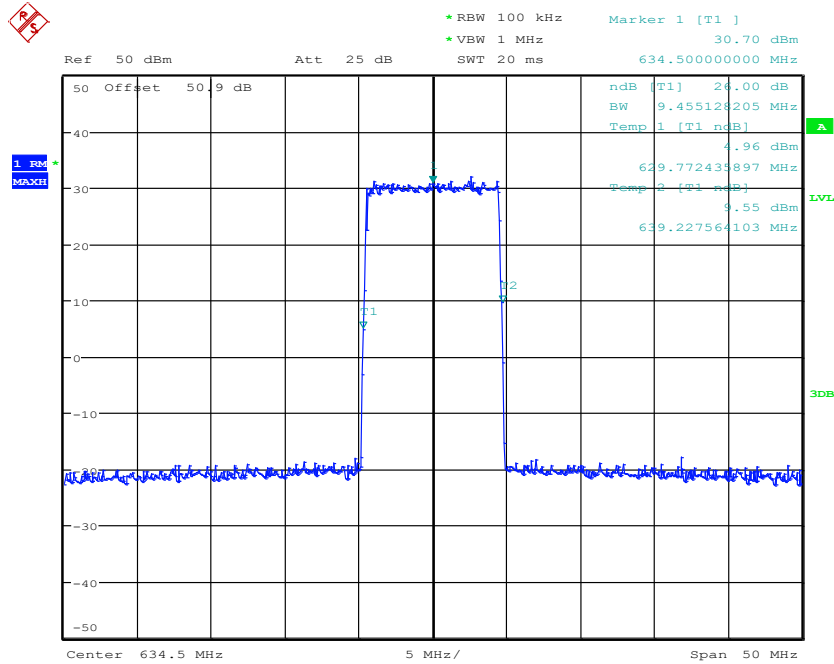
1.2.4 lowest frequency(10M Modulation)



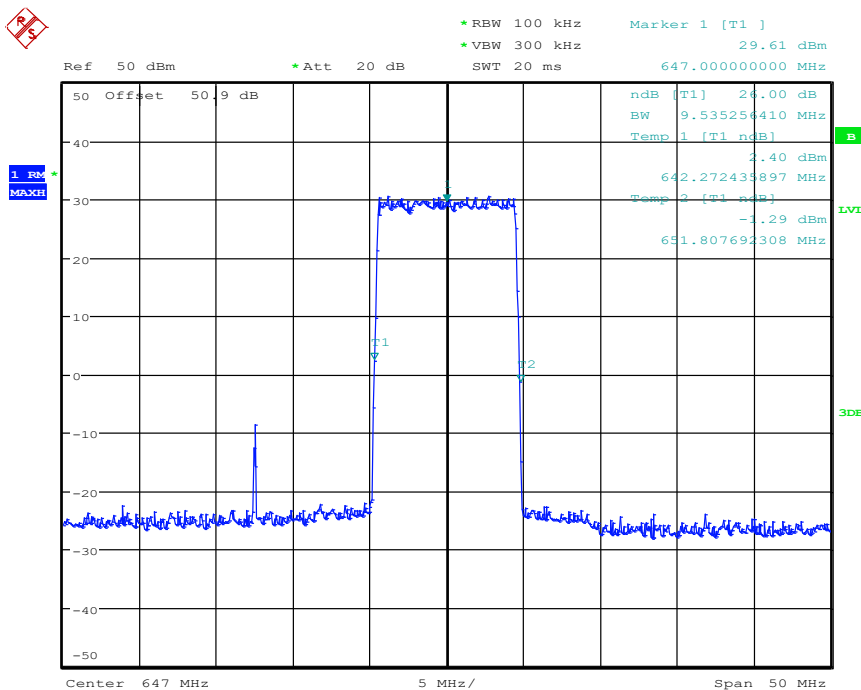
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1.2.5 middle frequency



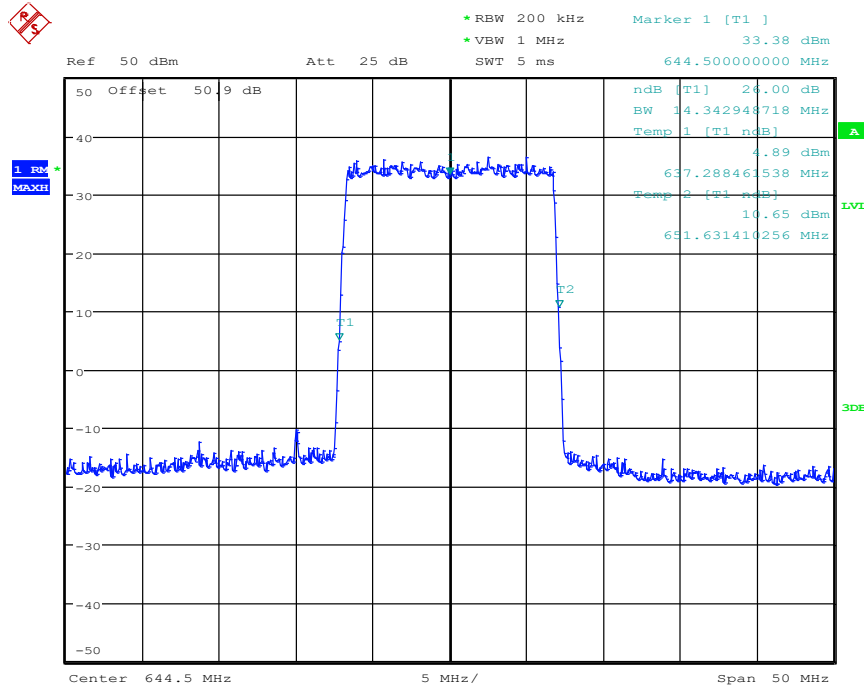
1.2.6 Highest frequency



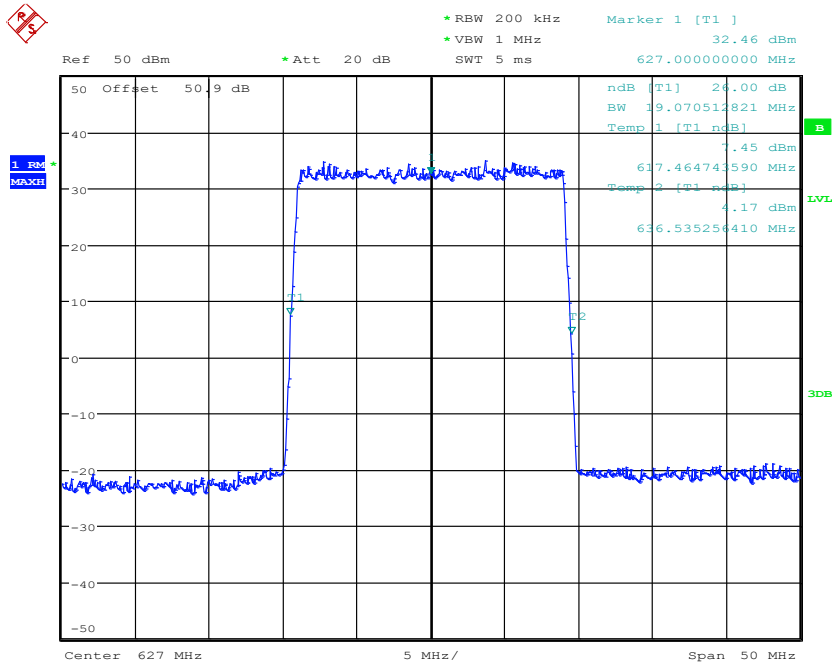
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1.2.9 Highest frequency

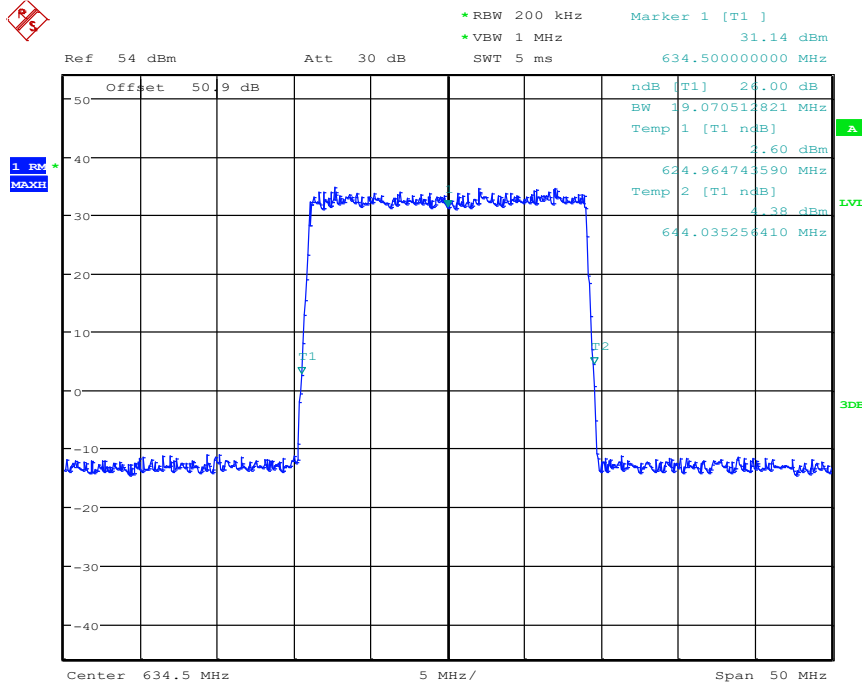


1.2.10 Lowest frequency(20M Modulation)

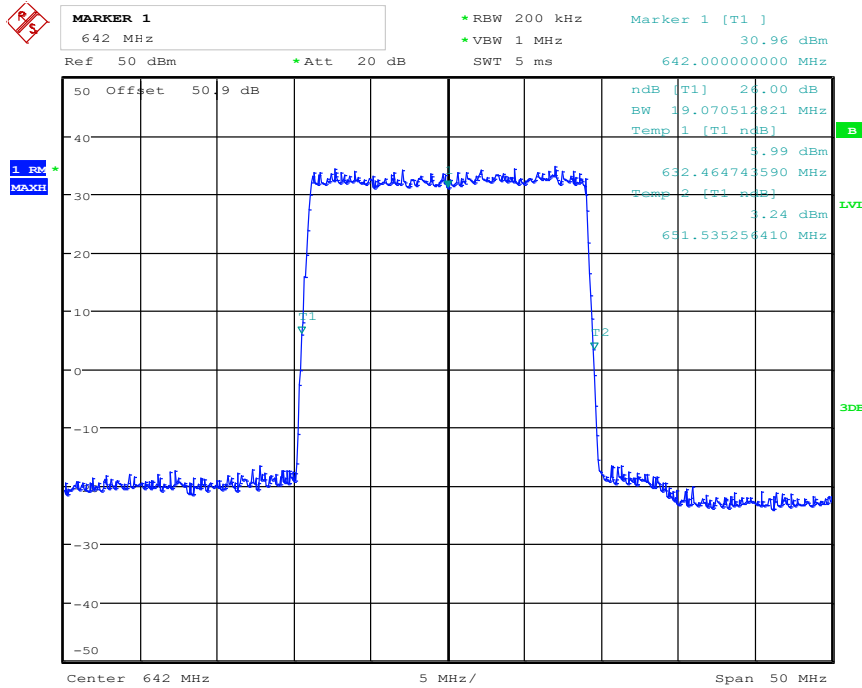


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1.2.11 middle frequency



1.2.12 Highest frequency

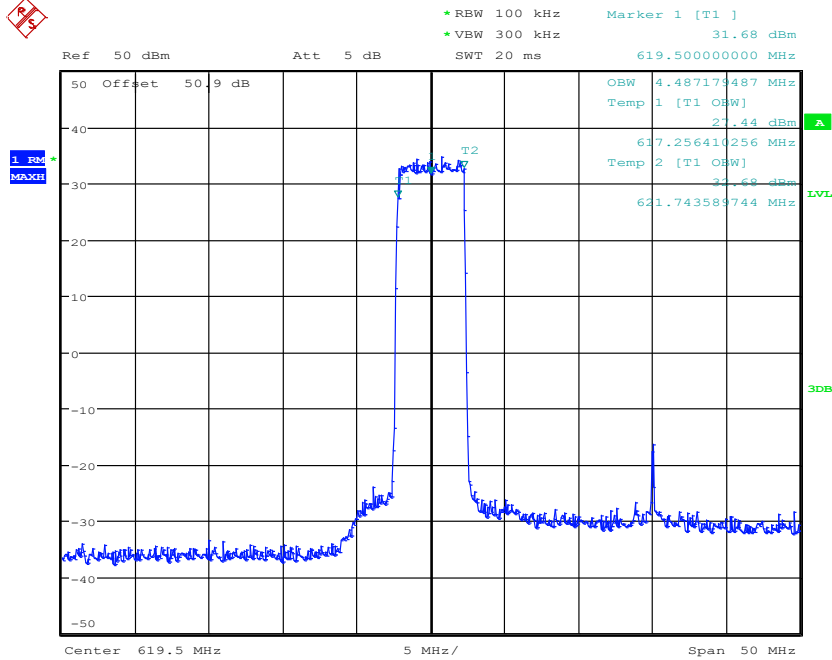


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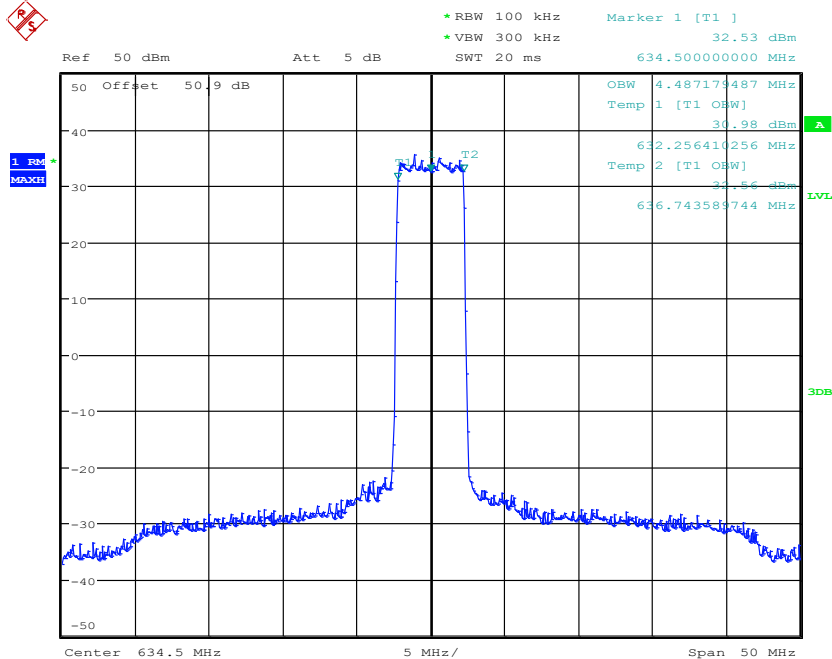
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**2) ANT2 Port:**  
**2.1 99% Occupied Bandwidth**  
 2.1.1 Lowest frequency (5M Modulation)

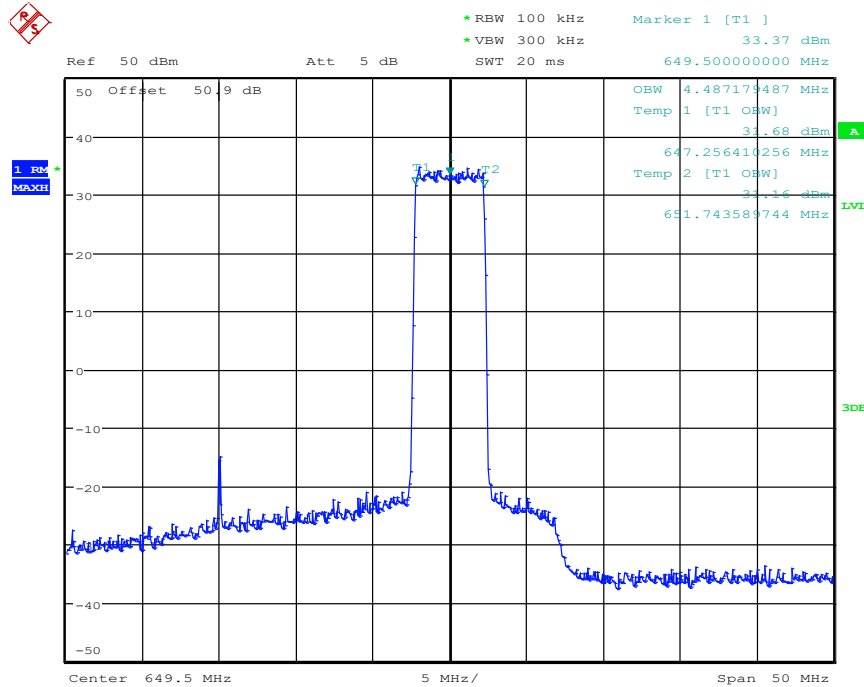


2.1.2 middle frequency

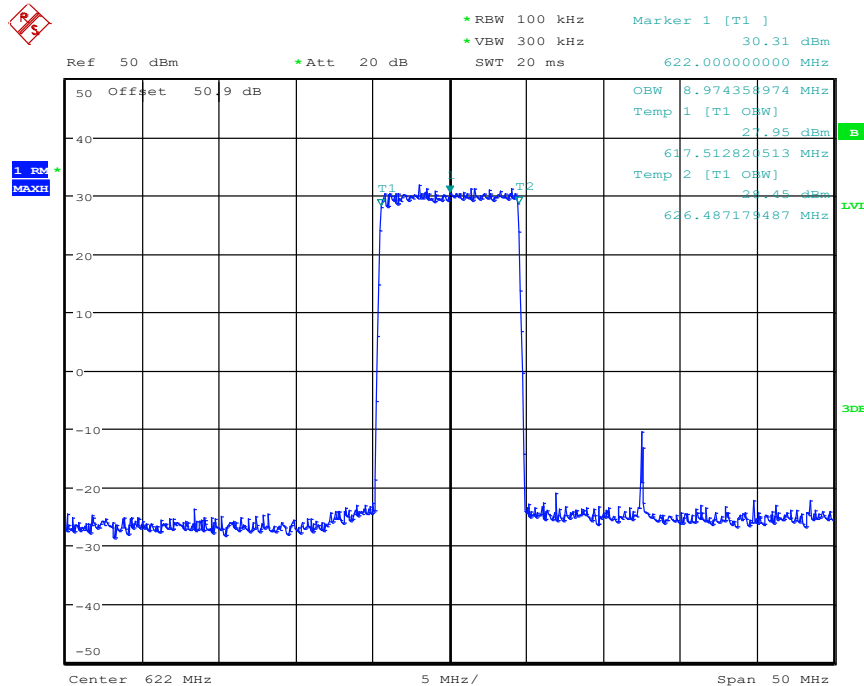


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### 2.1.3 highest frequency

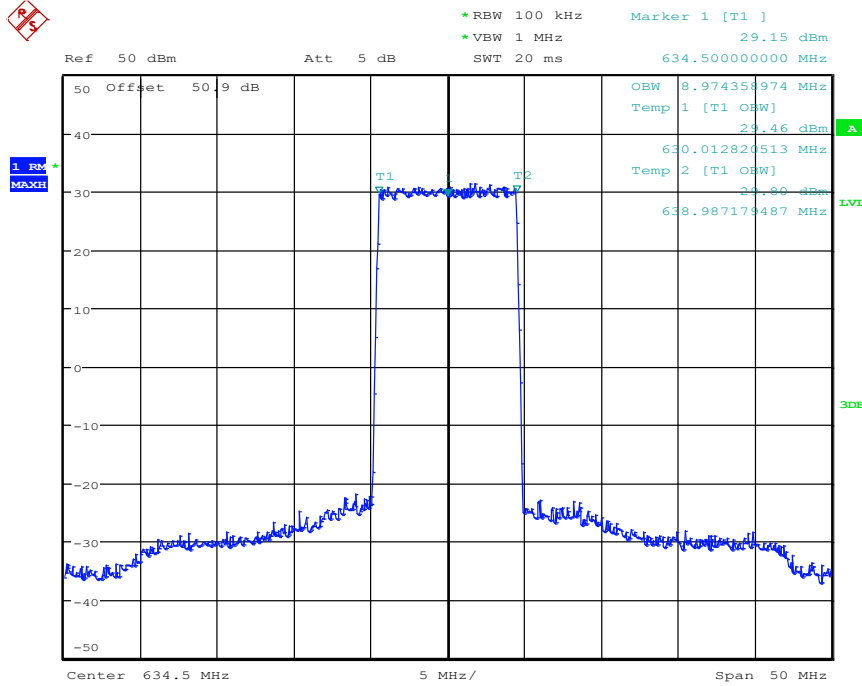


### 2.1.4 Lowest frequency (10M Modulation)

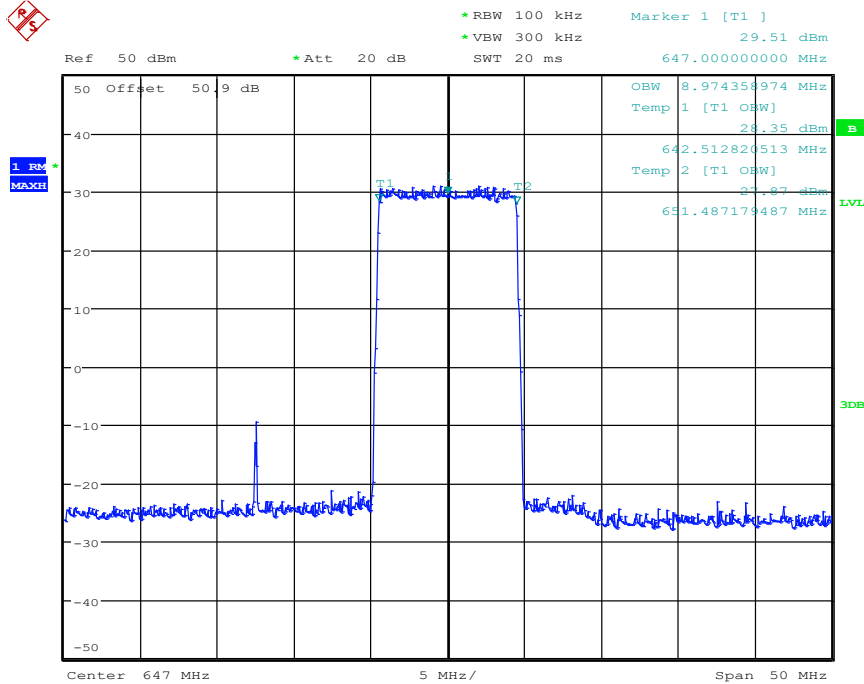


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2.1.5 middle frequency



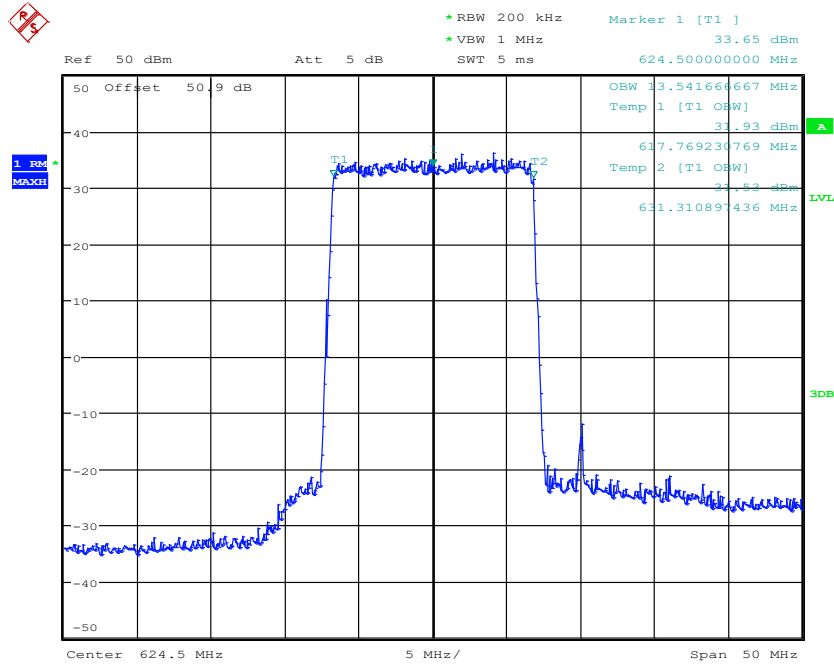
2.1.6 Highest frequency:



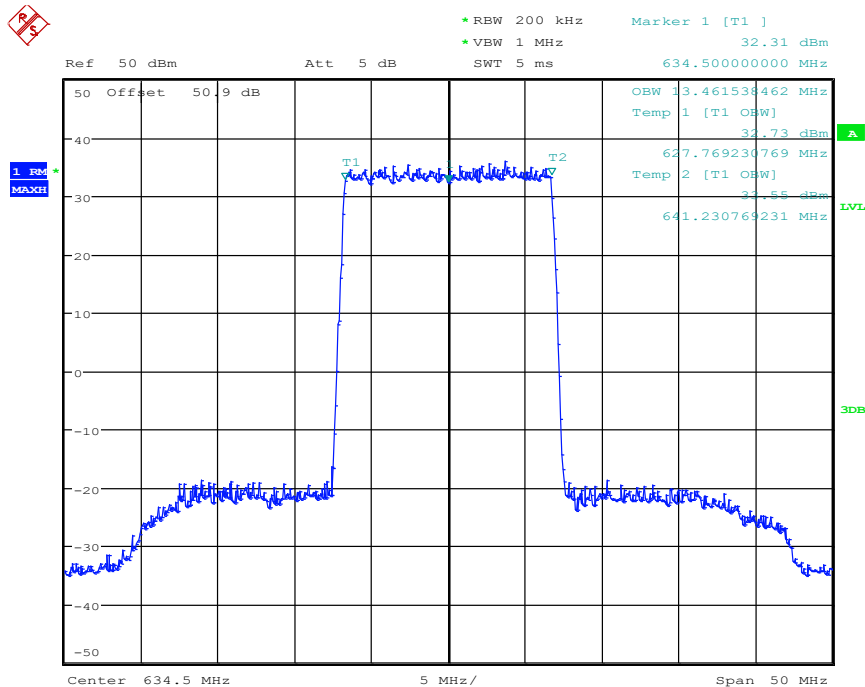
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2.1.7 Lowest frequency (15M Modulation)



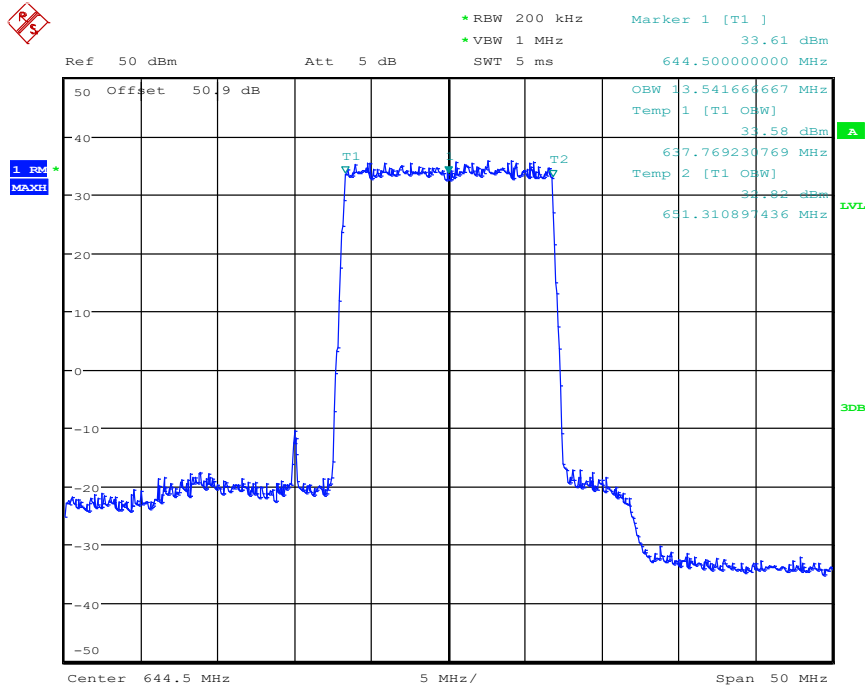
2.1.8 middle frequency



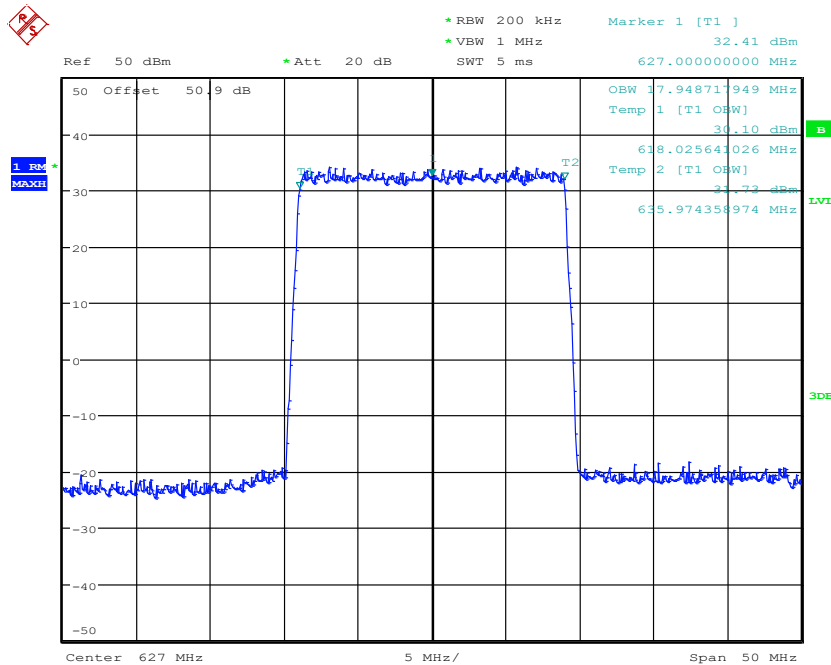
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## 2.1.9 highest frequency



## 2.1.10 Lowest frequency (20M)

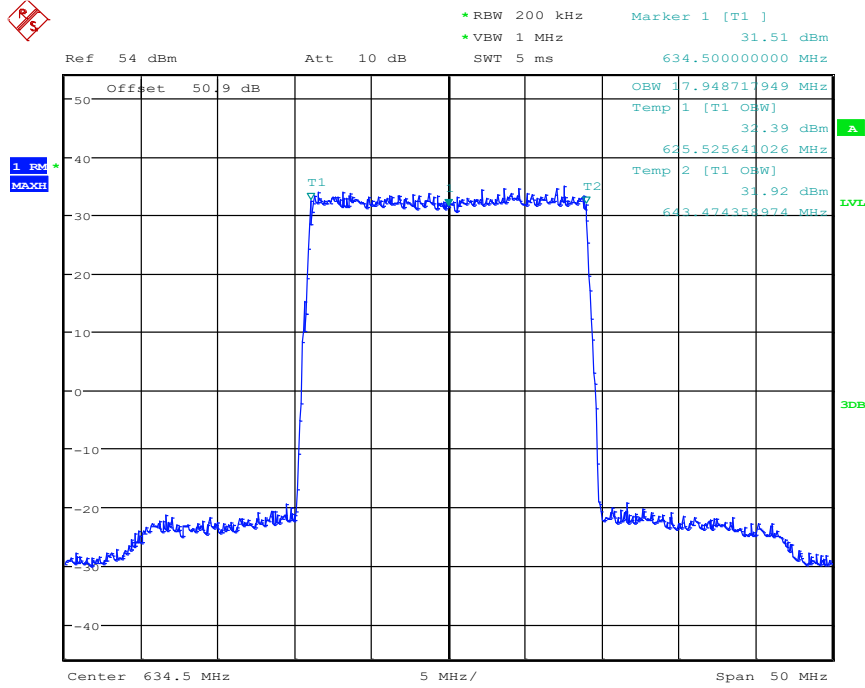


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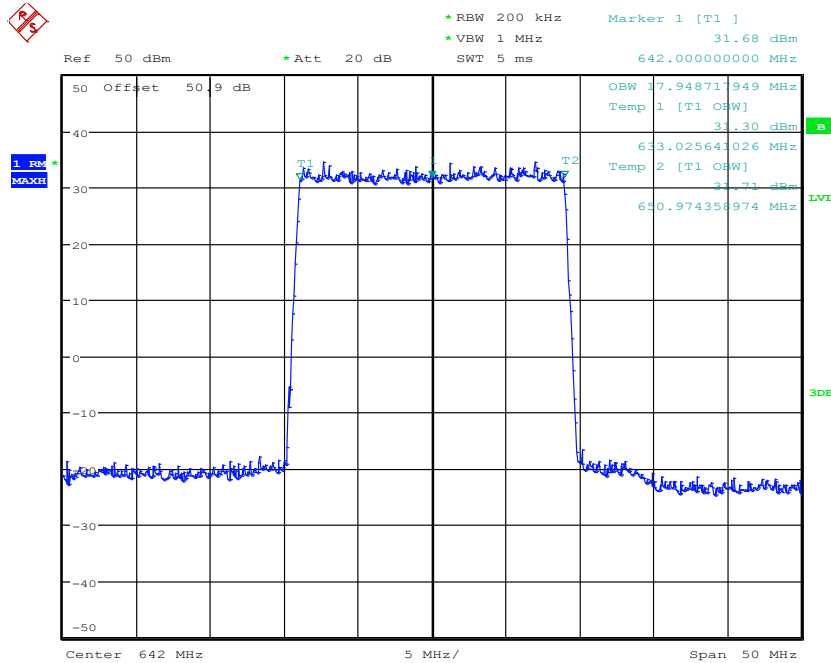
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2.1.11 middle frequency



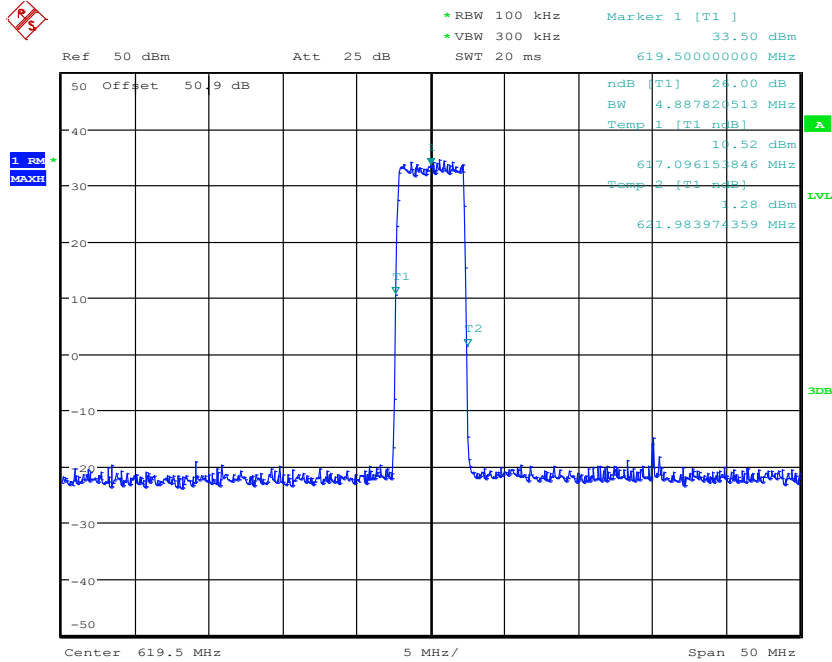
2.1.12 Highest frequency



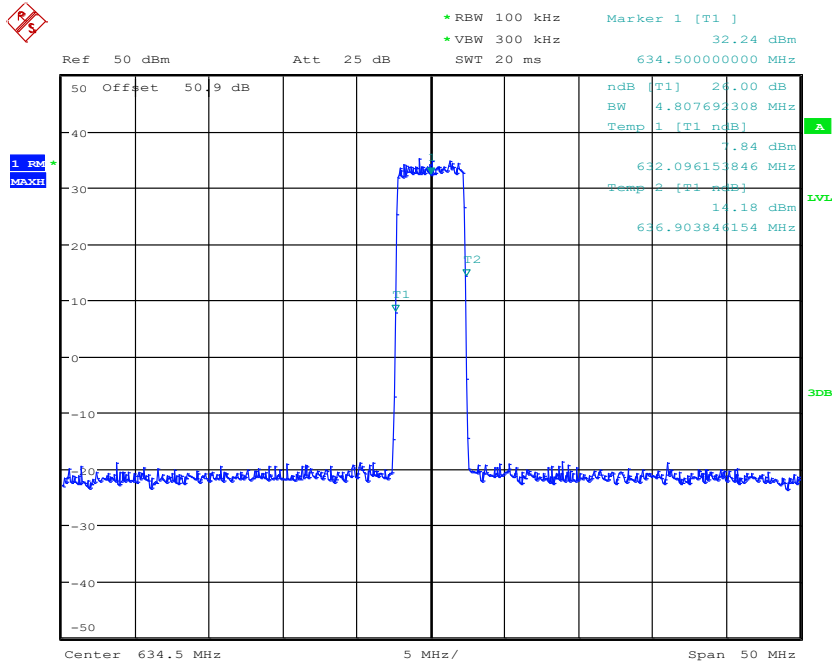
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**2.2 26dB Bandwidth**

**2.2.1 lowest frequency(5M Modulation)**



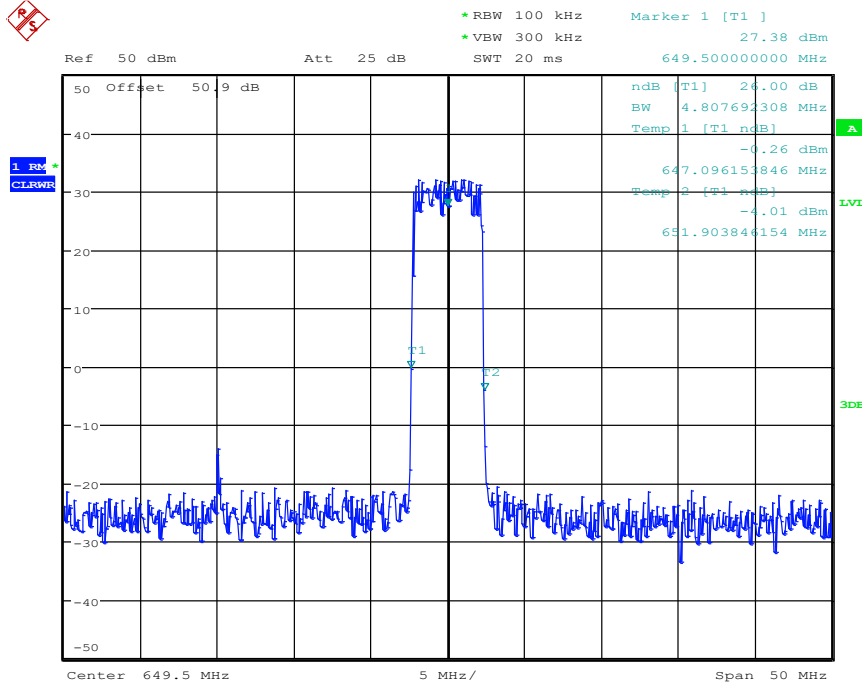
**2.2.2 middle frequency**



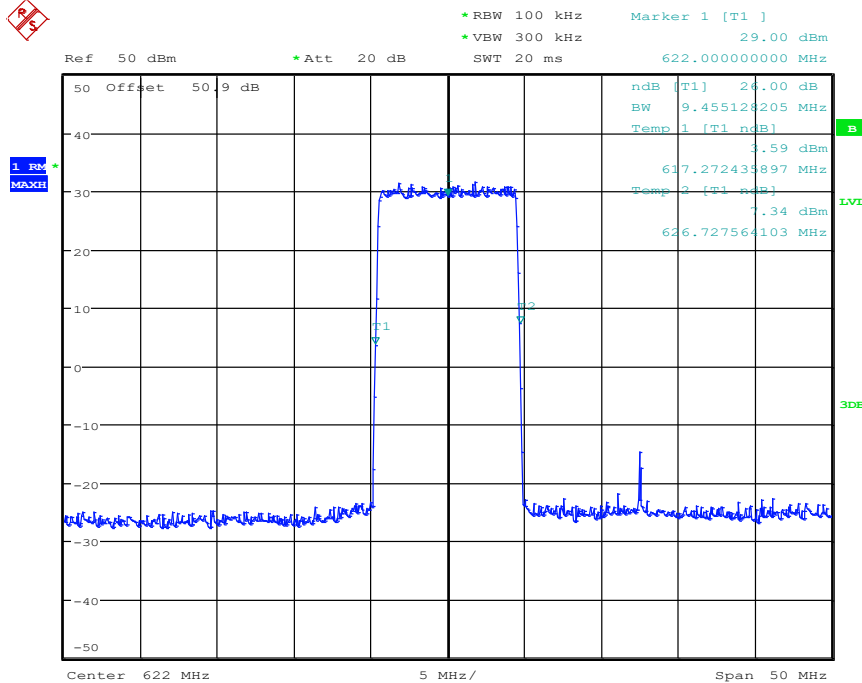
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2.2.3 Highest frequency

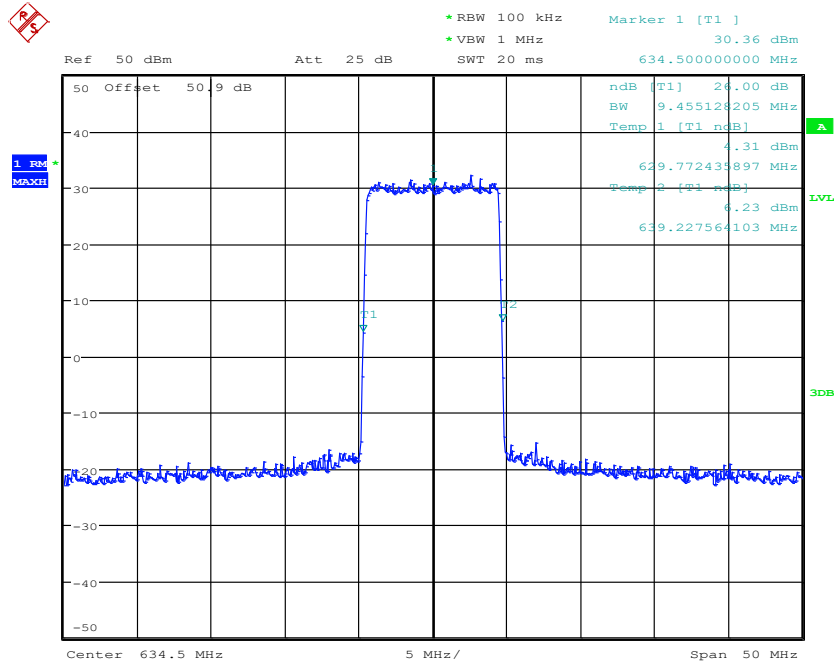


2.2.4 lowest frequency(10M Modulation)

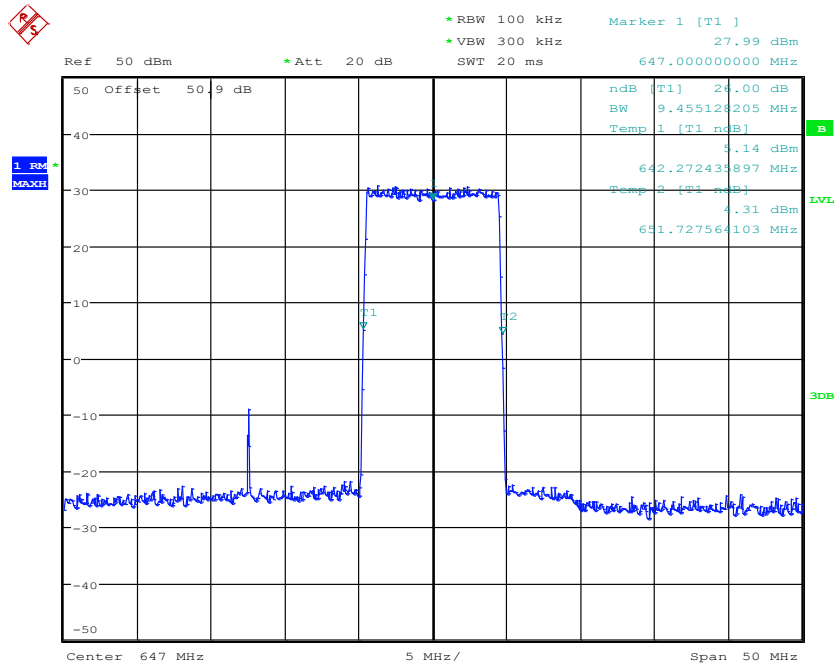


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2.2.5 middle frequency



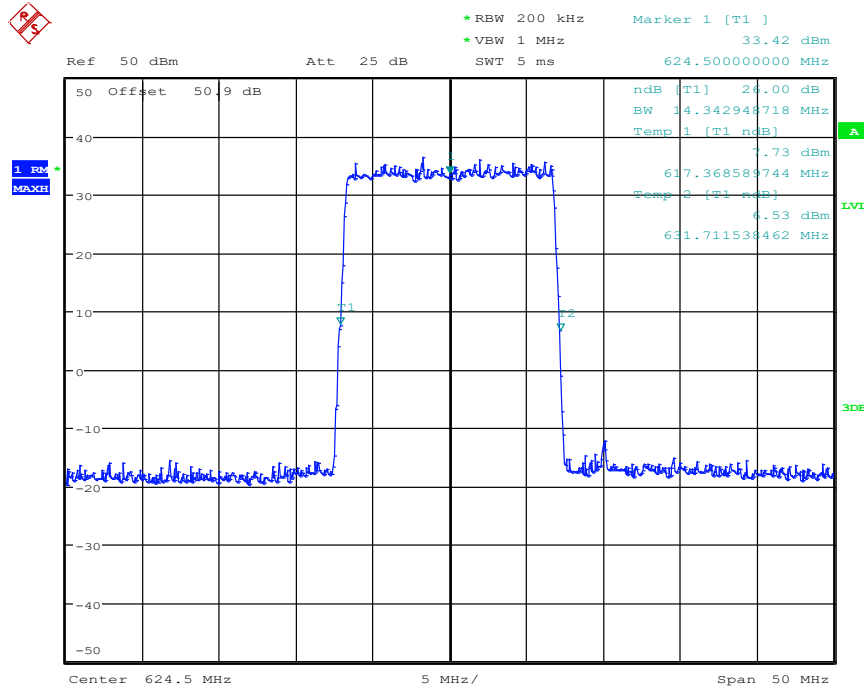
2.2.6 Highest frequency



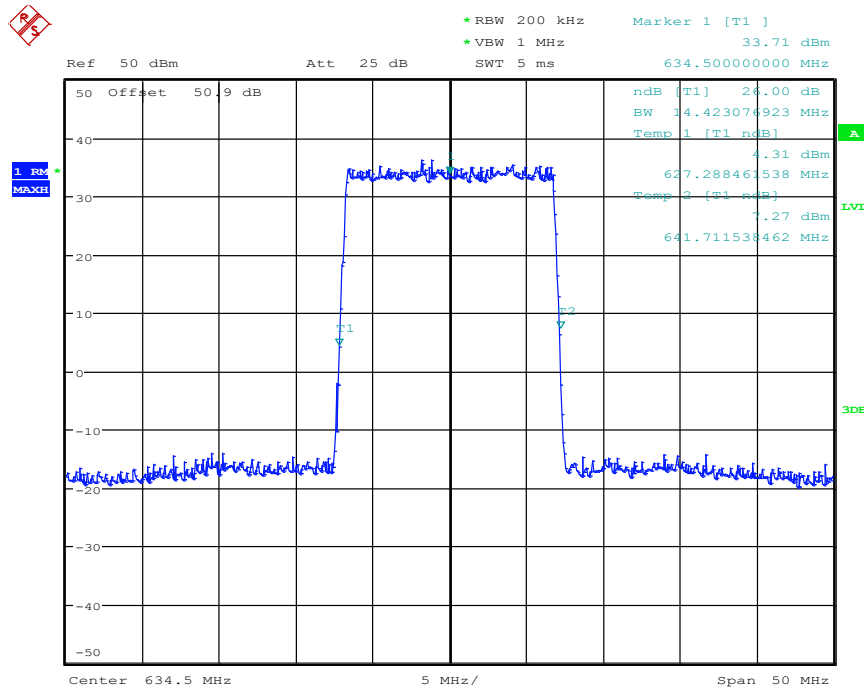
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2.2.7 lowest frequency(15M Modulation)



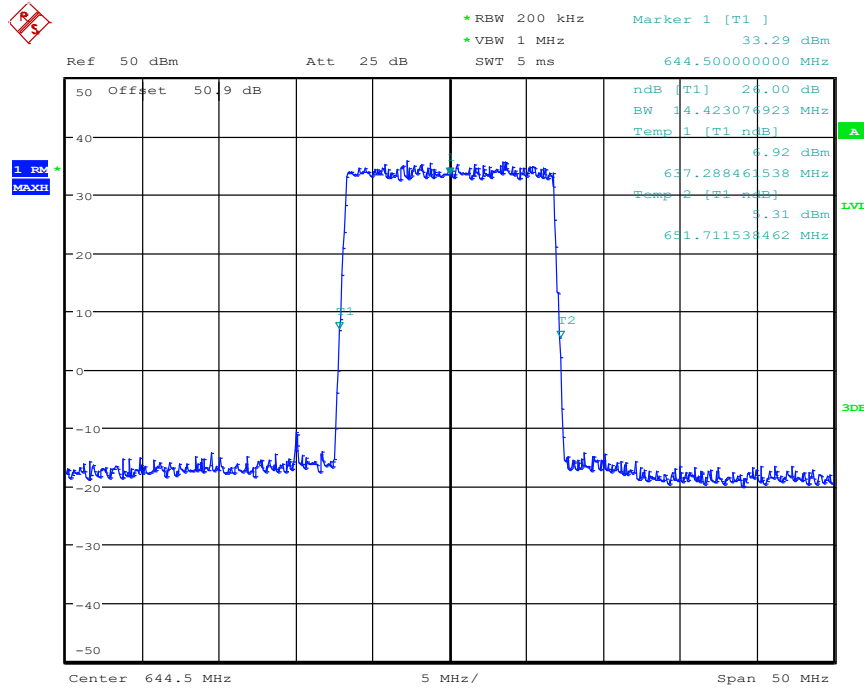
2.2.8 middle frequency



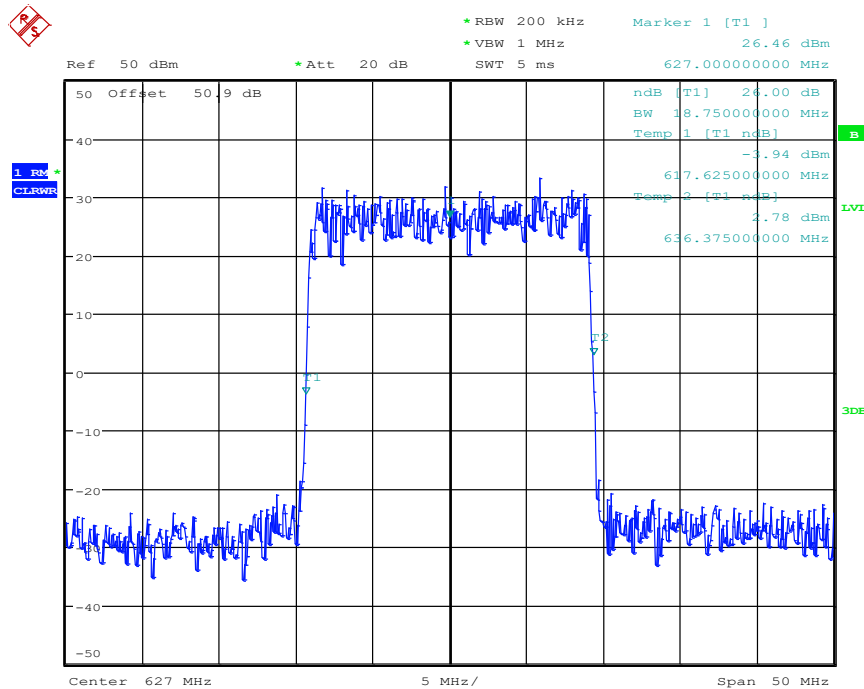
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## 2.2.9 Highest frequency

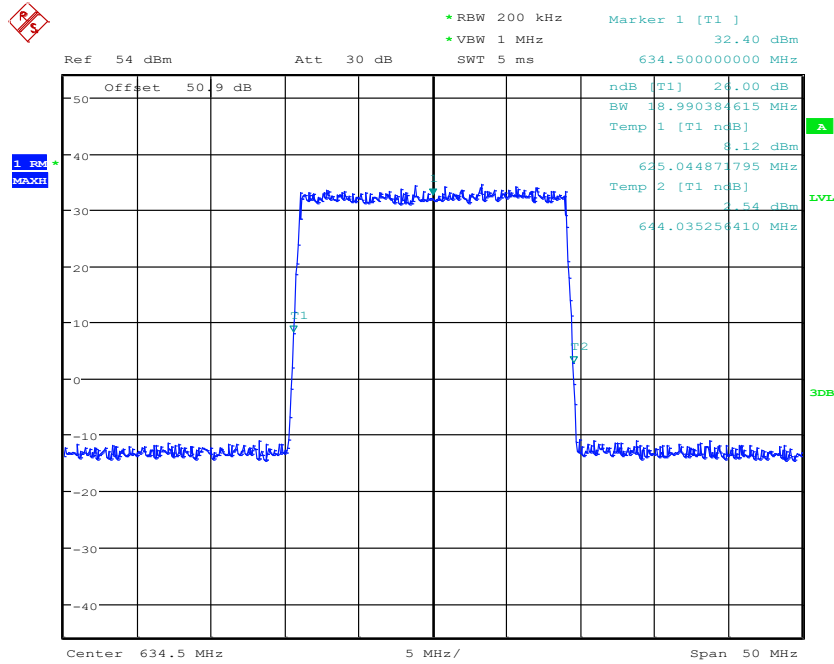


## 2.2.10 Lowest frequency(20M Modulation)

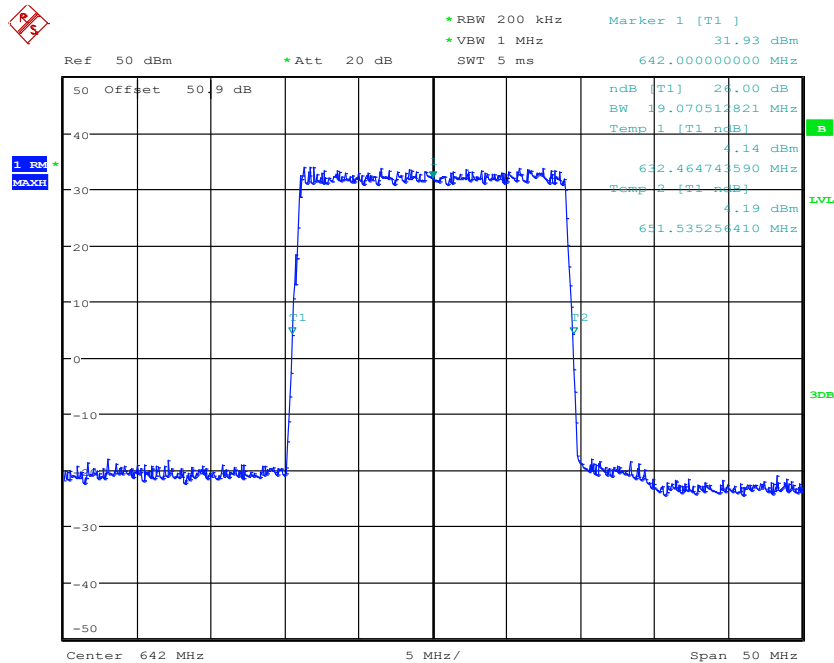


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## 2.2.11 middle frequency



## 2.1.12 Highest frequency



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 Guangzhou Branch    EEC Laboratory    中国·广州·经济技术开发区科学城科珠路198号    邮编: 510663    t (86-20) 82155555    f (86-20) 82075058    sgs.china@sgs.com

**6.2.2 RF Output Power & PAPR**

Test Requirement: FCC part 27.50(c)

Test Method: Clause 5 of KDB 971168 D01 V03r01 and ANSIC63.26-2015  
600MHz: 617-652MHz

(c) The following power and antenna height requirements apply to stations transmitting in the 600 MHz band and the 698-746 MHz band:

(3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;

Table 3 to §27.50—Permissible Power and Antenna Heights for Base and Fixed Stations in the 600 MHz, 698-757 MHz, 758-763 MHz, 776-787 MHz and 788-793 MHz Bands Transmitting a Signal With an Emission Bandwidth Greater than 1 MHz

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) per MHz (watts/MHz)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

(2) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section;

(3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;

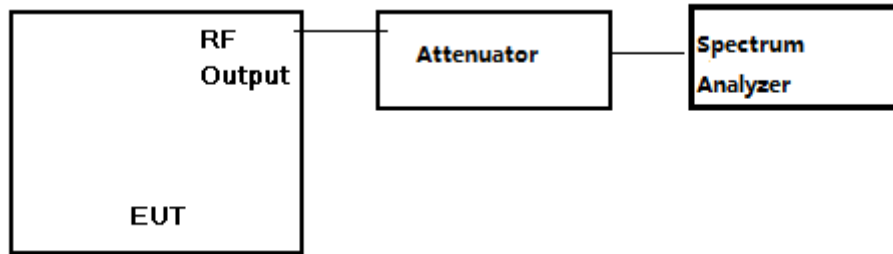
(4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section;



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Test Method: According to clause 5.2 of ANSI C63.26-2015  
 Status: Drive the EUT to maximum output power..  
 Conditions: Normal conditions  
 Application: Cellular Band RF output ports

Test Configuration:



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.



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**Measurement Record:**

Pretest has shown that the output power variation between modulation types is small. Antenna port 2 power output measurements for the LTE 5 bandwidth for all modulation types on the middle (center) channel are provided below:

/	Modulation		
	QPSK	16QAM	64QAM
Antenna Port 2 Middle Channel LTE 5Mhz	46.45dBm	46.43dBm	46.46dBm

The output power variation between modulation types is small in this measurement (and from past efforts on similar hardware as well). The variation of average power output versus modulation type is 0.03dB from the data provided. So, all power measurements in this report were performed with the EUT operating with 64QAM modulation.

**Single Carrier:**

**ANT1 Port:**

Transmitter: 617MHz ~652MHz(5M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power (W)	LTE	46.28dBm (42.462W)	46.46dBm (44.259W)	46.27dBm (42.364W)
PAPR((dB)	LTE	7.66	7.66	7.63

Transmitter: 617MHz ~652MHz(10M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.22dBm (41.879W)	46.06dBm (40.365W)	46.16dBm (41.305W)
PAPR(dB)	LTE	7.21	7.18	7.28

Transmitter: 617MHz ~652MHz(15M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.18dBm (41.495W)	46.14dBm (41.115W)	46.32dBm (42.855W)
PAPR(dB)	LTE	7.82	7.82	7.92



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Transmitter: 617MHz ~652MHz(20M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.19dBm (41.495W)	46.06dBm (40.365W)	46.08dBm (40.551W)
PAPR(dB)	LTE	7.34	7.24	7.50

**ANT2 Port:**

Transmitter: 617MHz ~652MHz(5M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.13dBm (41.020W)	46.39dBm (43.551W)	46.24 dBm (42.073W)
PAPR(dB)	LTE	7.63	7.66	7.66

Transmitter: 617MHz ~652MHz(10M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.14 dBm (41.115W)	46.13dBm (41.020W)	46.26 dBm (42.267W)
PAPR(dB)	LTE	7.24	7.18	7.31

Transmitter: 617MHz ~652MHz(15M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.23 dBm (41.978W)	46.31 dBm (42.756W)	46.40 dBm (43.652W)
PAPR(dB)	LTE	7.79	7.82	7.85

Transmitter: 617MHz ~652MHz(20M Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.10dBm (40.738W)	46.13dBm (41.020W)	46.24dBm (42.073W)
PAPR(dB)	LTE	7.31	7.28dB	7.53



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**Dual-Carrier (continuous):**

**ANT1 Port:**

Transmitter: 617MHz ~652MHz(5M and 5Mhz Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power (W)	LTE	46.13dBm (41.020W)	46.27dBm (42.364W)	46.19dBm (41.591W)
PAPR((dB)	LTE	7.43	7.57	7.61

Transmitter: 617MHz ~652MHz(10M and 10Mhz Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.31dBm (42.756W)	46.12dBm (40.926W)	46.27dBm (42.364W)
PAPR(dB)	LTE	7.35	7.29	7.42

Transmitter: 617MHz ~652MHz(15M and 15Mhz Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.23dBm (41.976W)	46.37dBm (43.351W)	46.25dBm (42.170W)
PAPR(dB)	LTE	7.53	7.48	7.62

**ANT2 Port:**

Transmitter: 617MHz ~652MHz(5M and 5Mhz Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.19dBm (41.591W)	46.27dBm (42.364W)	46.36 dBm (43.251W)
PAPR(dB)	LTE	7.63	7.66	7.66

Transmitter: 617MHz ~652MHz(10M and 10Mhz Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.21 dBm (41.783W)	46.32dBm (42.855W)	46.29dBm (42.560W)
PAPR(dB)	LTE	7.43	7.58	7.63



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Transmitter: 617MHz ~652MHz(15M and 15Mhz Modulation)

Test items	Modulation	Lowest frequency	Middle frequency	Highest frequency
Output Power	LTE	46.13 dBm (41.020W)	46.27 dBm (42.364W)	46.39dBm (43.551W)
PAPR(dB)	LTE	7.63	7.52	7.49

Remark:

1. According to the test plot the worst conducted PSD is  $30.06\text{dBm}+10\log(1\text{MHz}/100\text{kHz})=40.06\text{dBm}/\text{MHz}$ .

The test was performed with RBW 100Khz for PSD. The result was converted as RBW=1Mhz.

2.Both single carrier and dual carriers ware tested, only record the worse case max power graph (in single carrier).



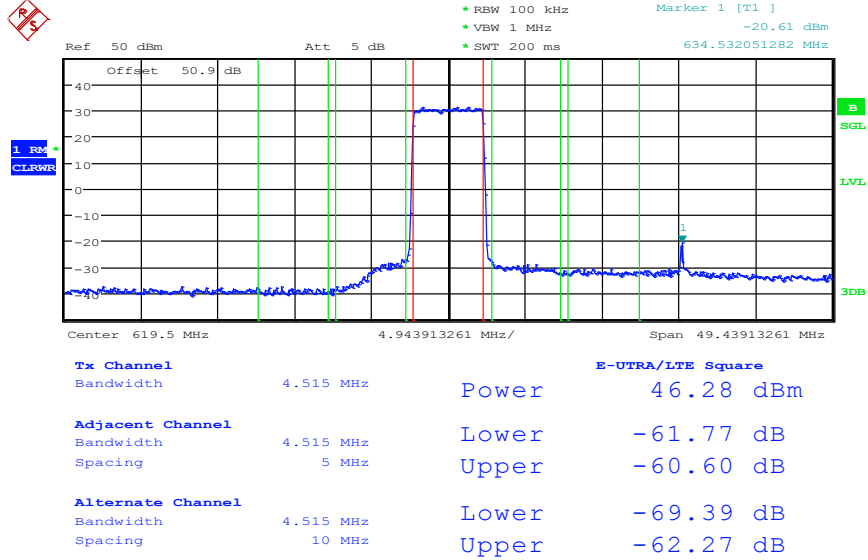
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**6.2.2.1 Measurement Record:**

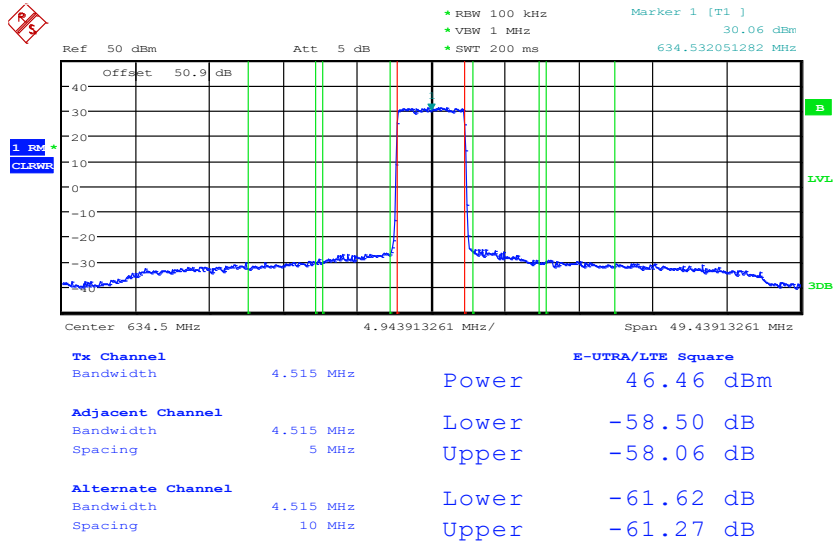
**1) Output power**

**1.1 ANT1 Port:**

**1.1 1 lowest frequency(5M Modulation)**



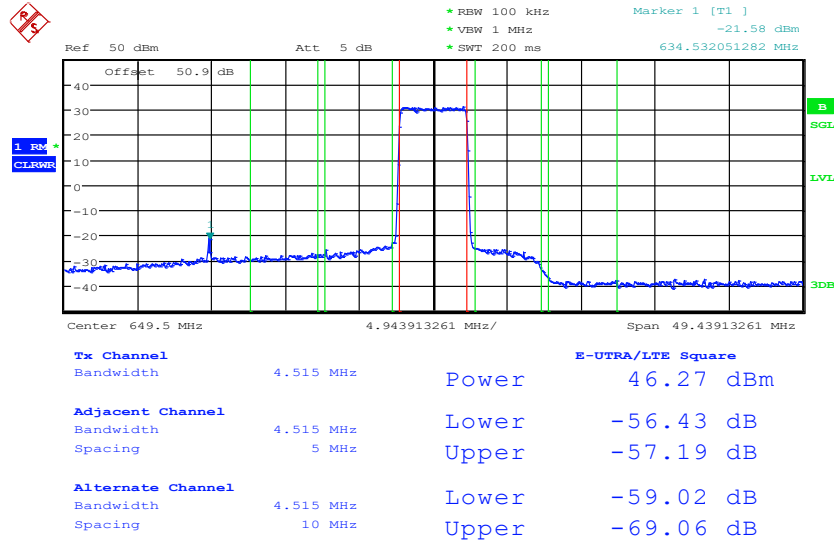
**1.1.2 middle frequency**



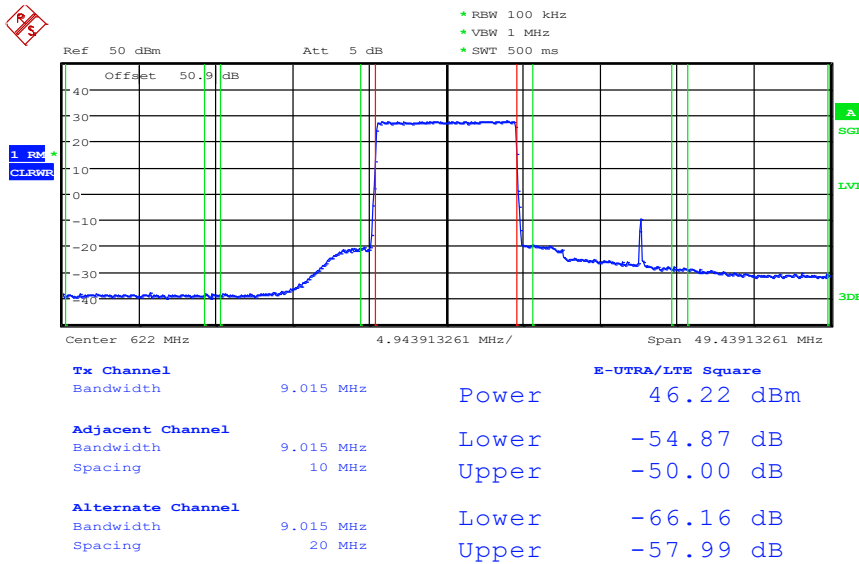
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### 1.1.3 highest frequency



### 1.1.4 Lowest frequency (10M Modulation)

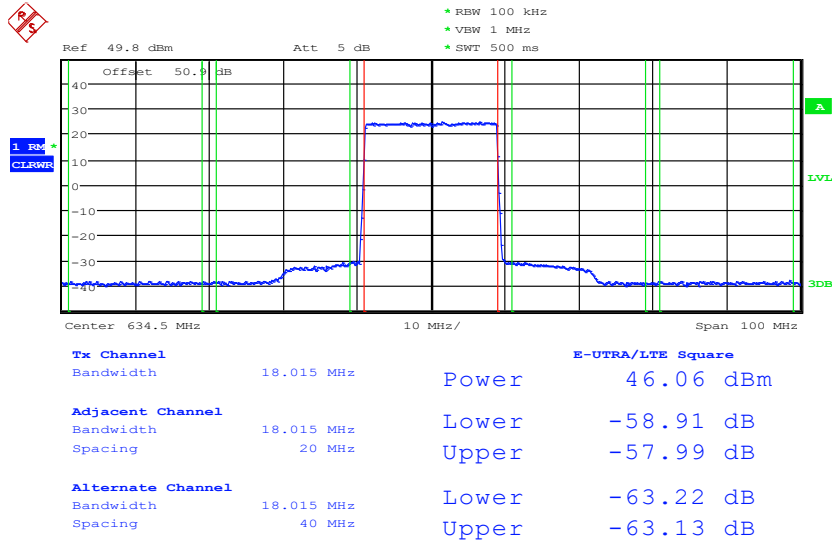


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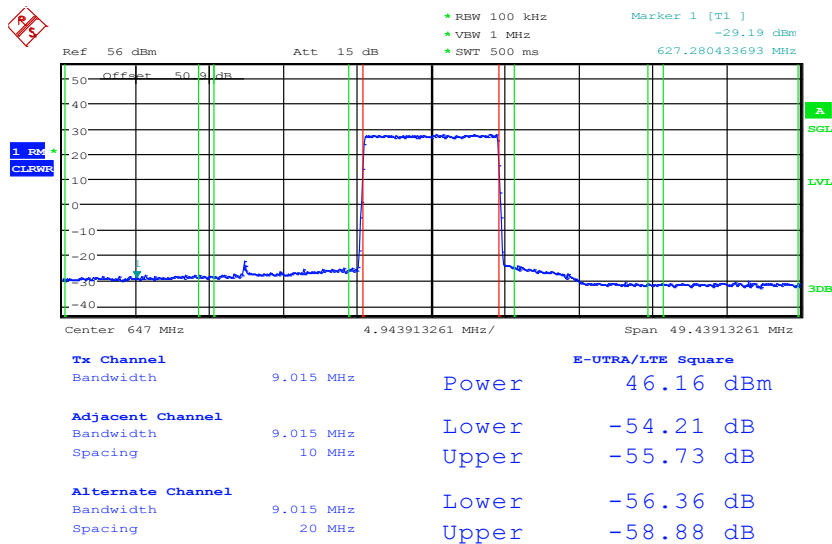
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### 1.1.5 Middle frequency:

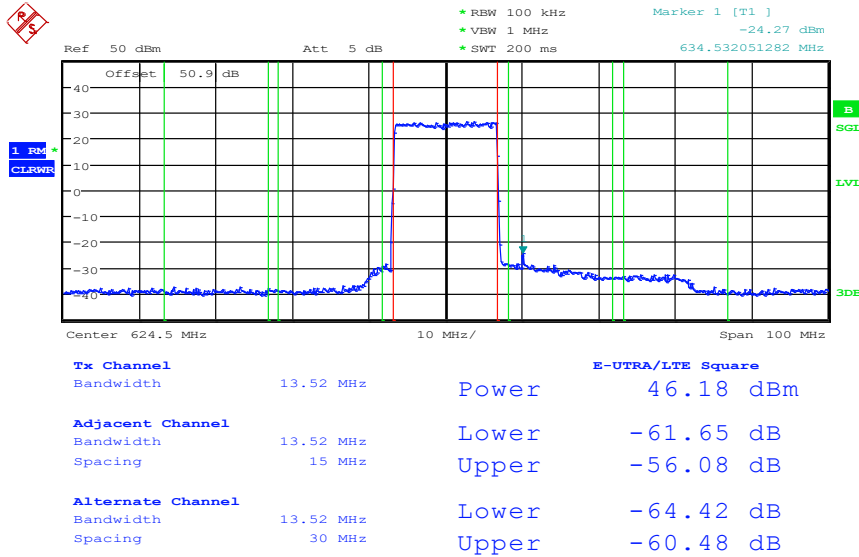


### 1.1.6 highest frequency

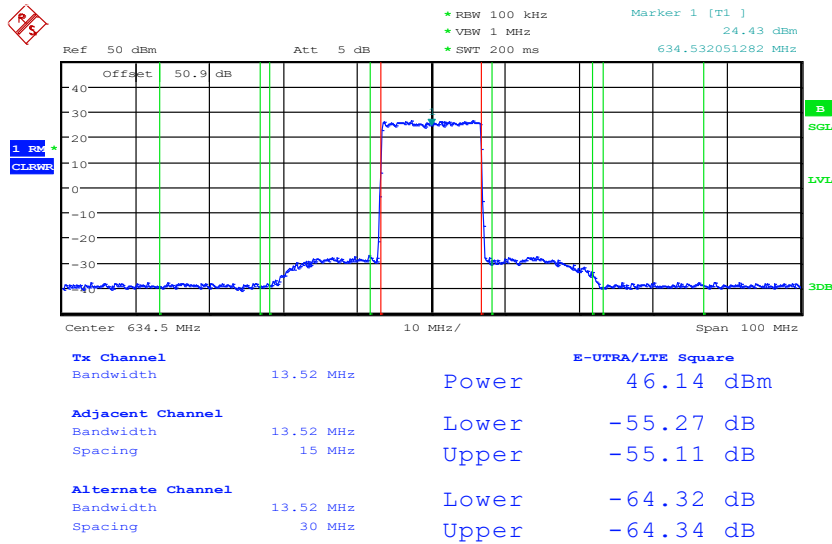


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1.1.7 lowest frequency(15M Modulation)



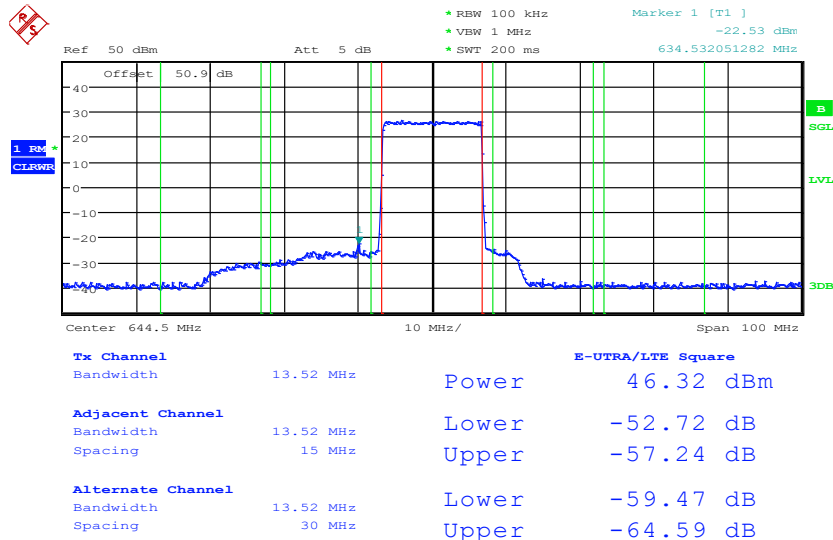
1.1.8 middle frequency



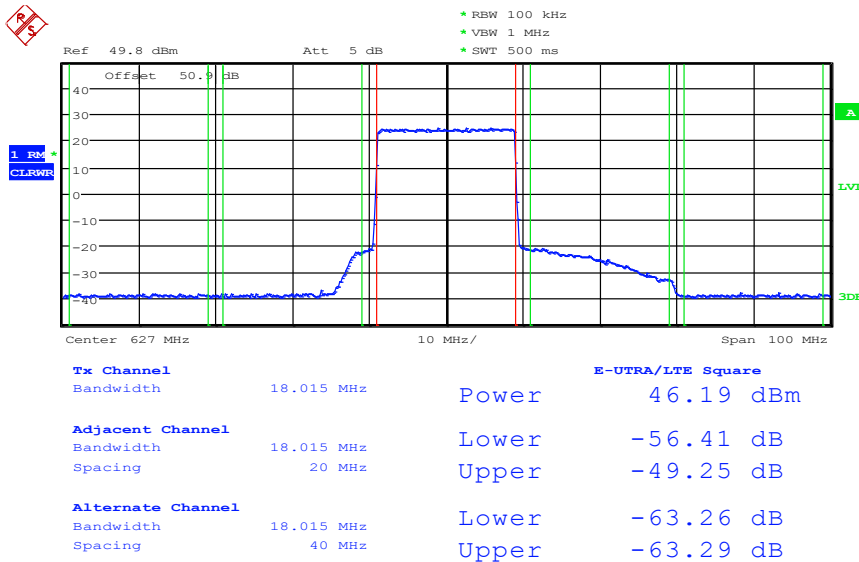
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### 1.1.9 highest frequency

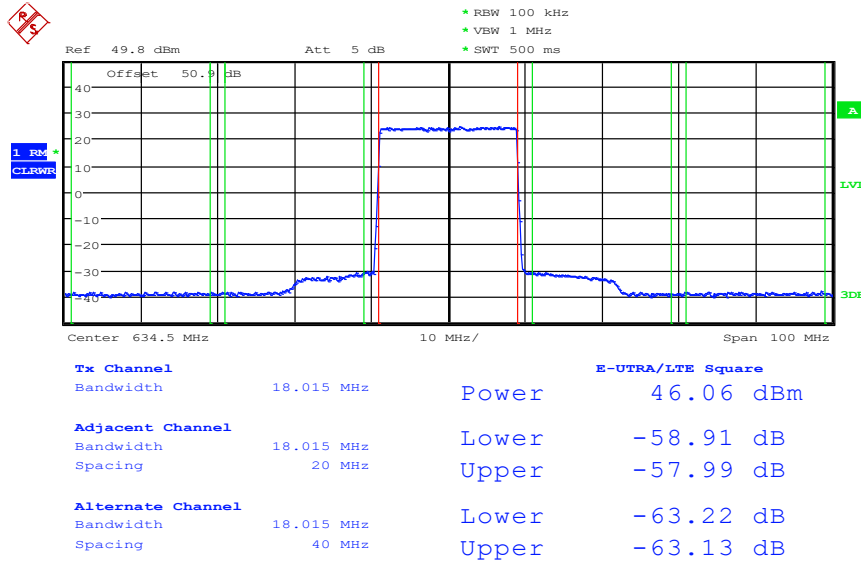


### 1.1.10 lowest frequency (20M Modulation)

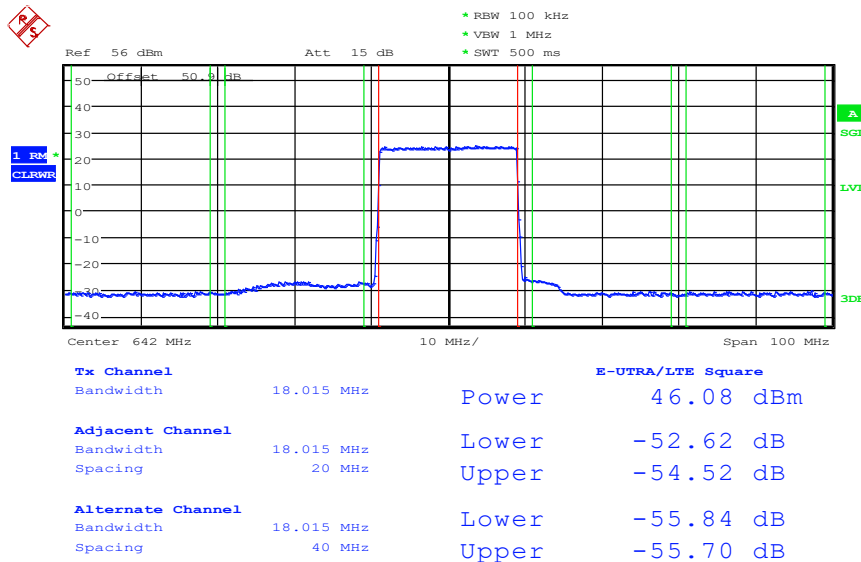


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### 1.1.11 middle frequency



### 1.1.12 highest frequency

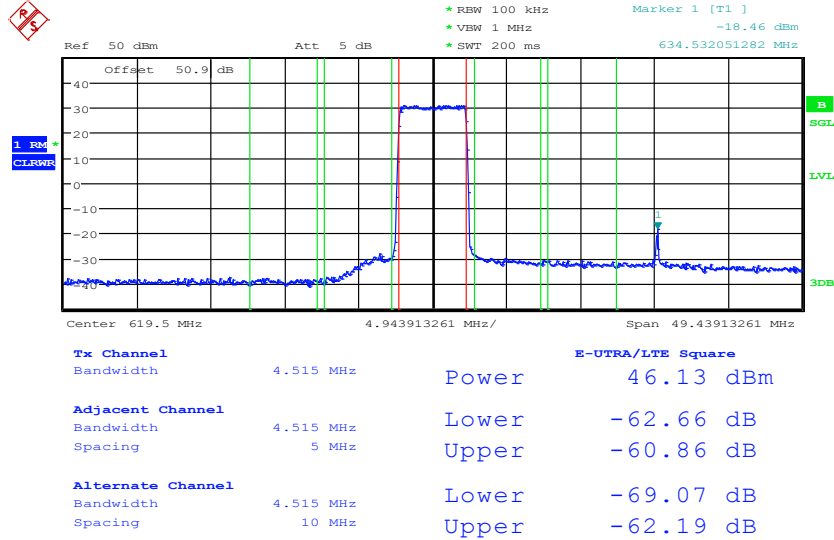


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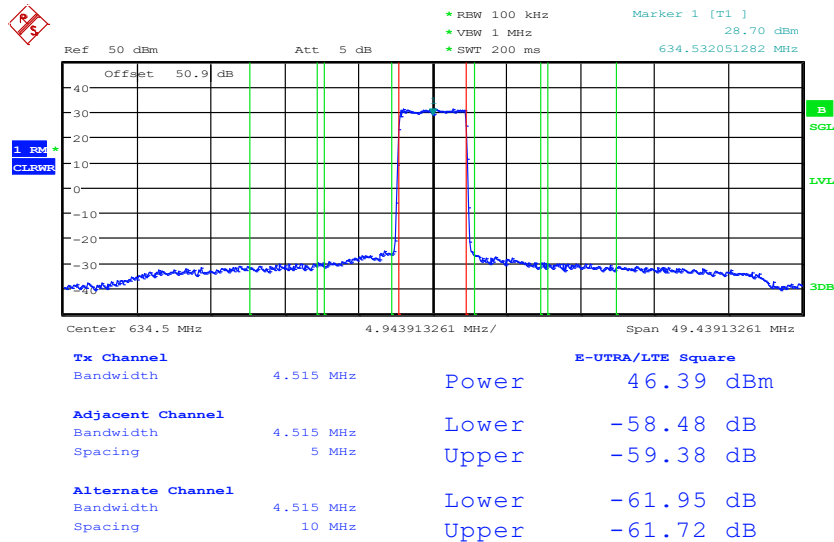
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## 1.2 ANT2 Port:

### 1.2.1 lowest frequency(5M Modulation)



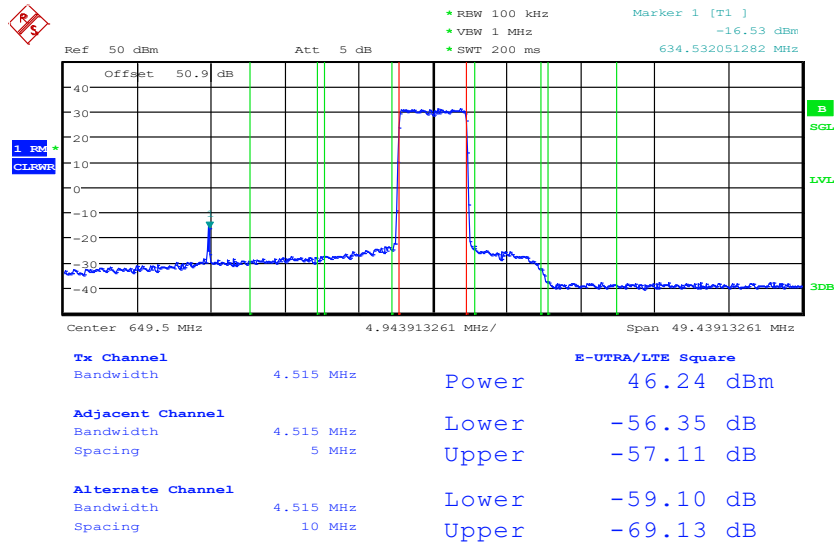
### 1.2.2 middle frequency



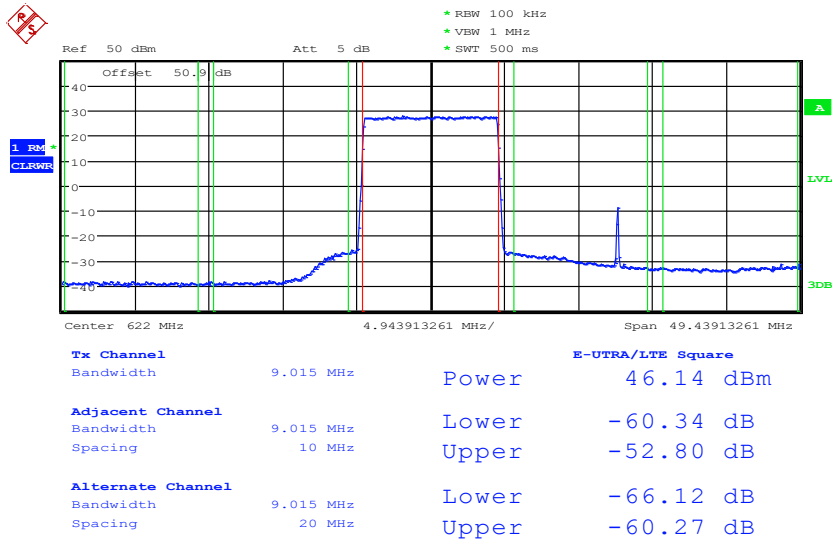
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### 1.2.3 highest frequency

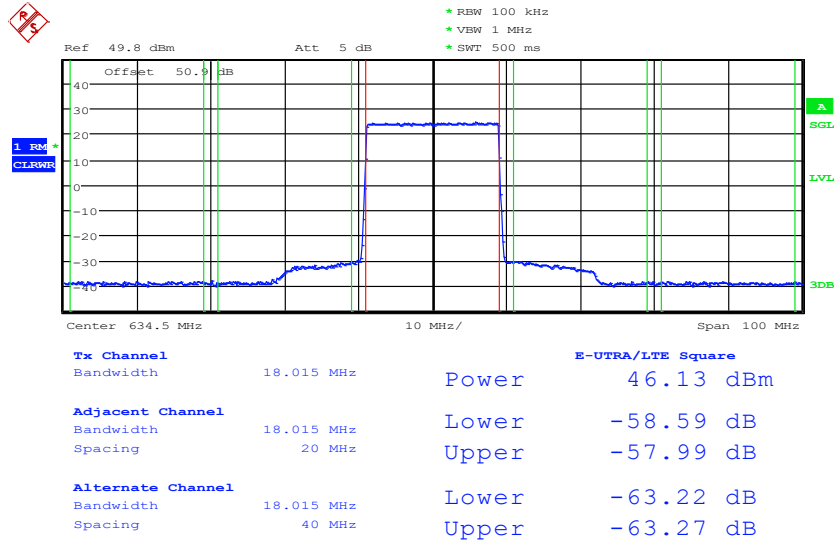


### 1.2.4 Lowest frequency (10M Modulation)

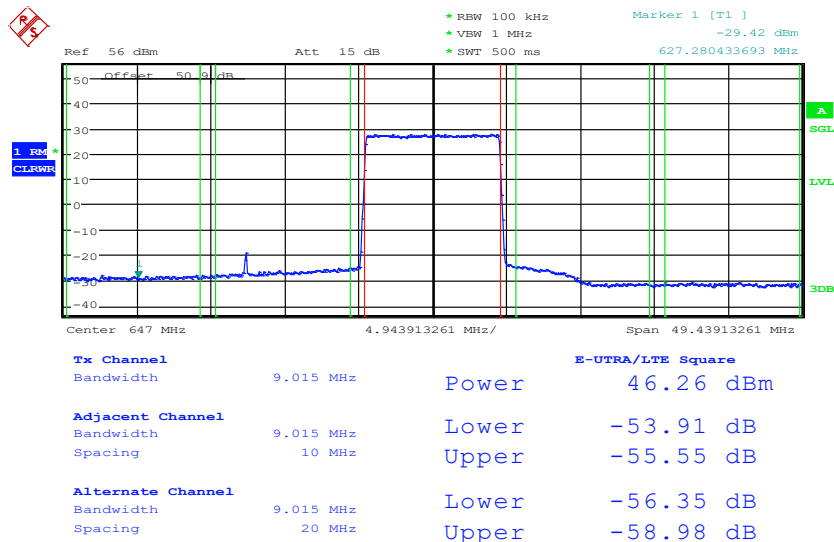


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1.2.5 Middle frequency:



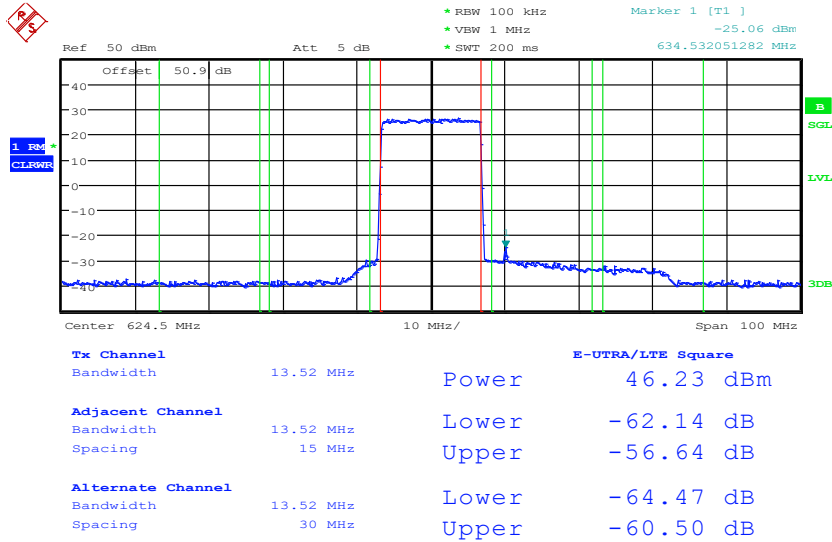
1.2.6 highest frequency



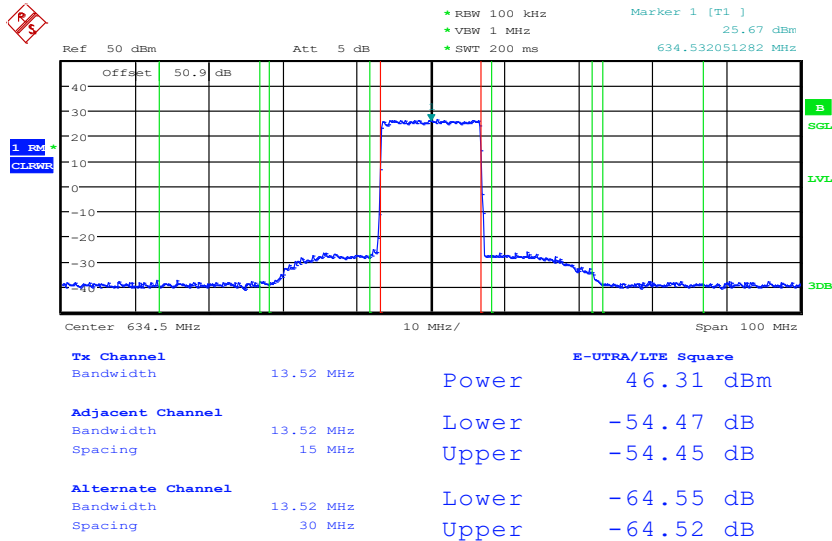
1.2.7 lowest frequency(15M Modulation)



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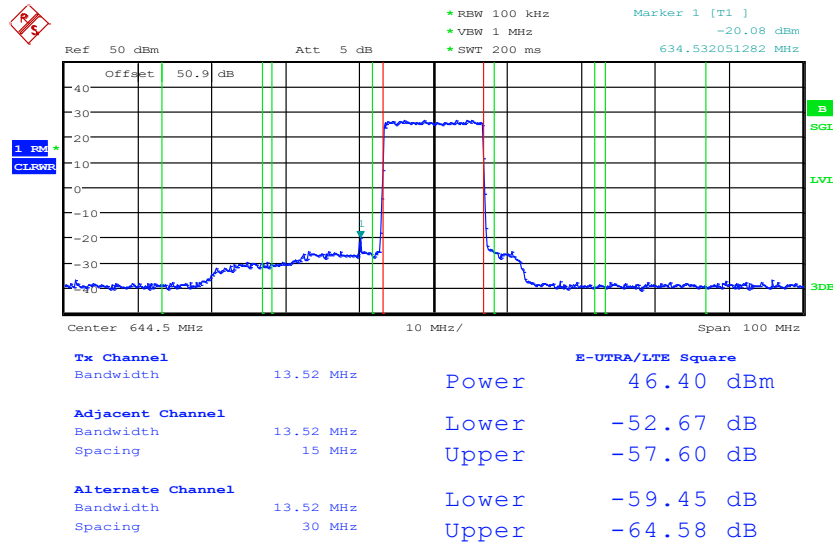
### 1.2.8 middle frequency



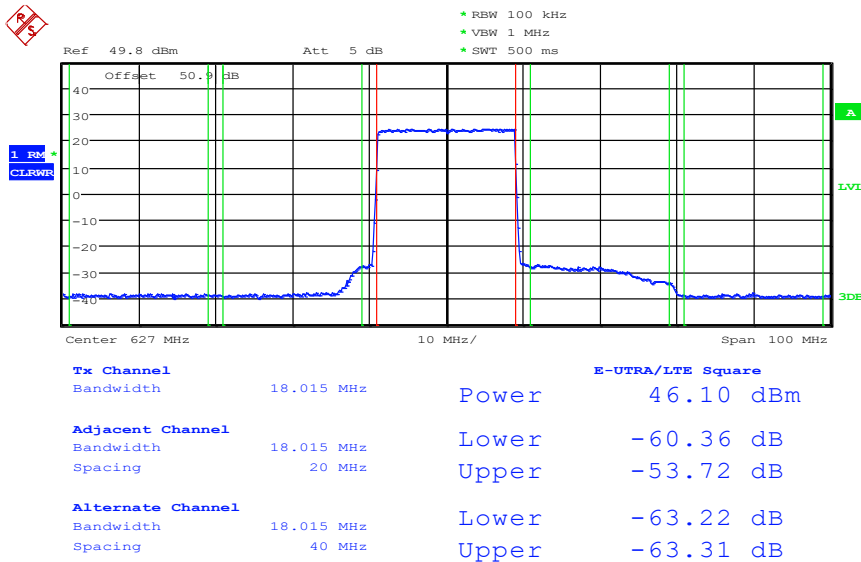
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### 1.2.9 highest frequency

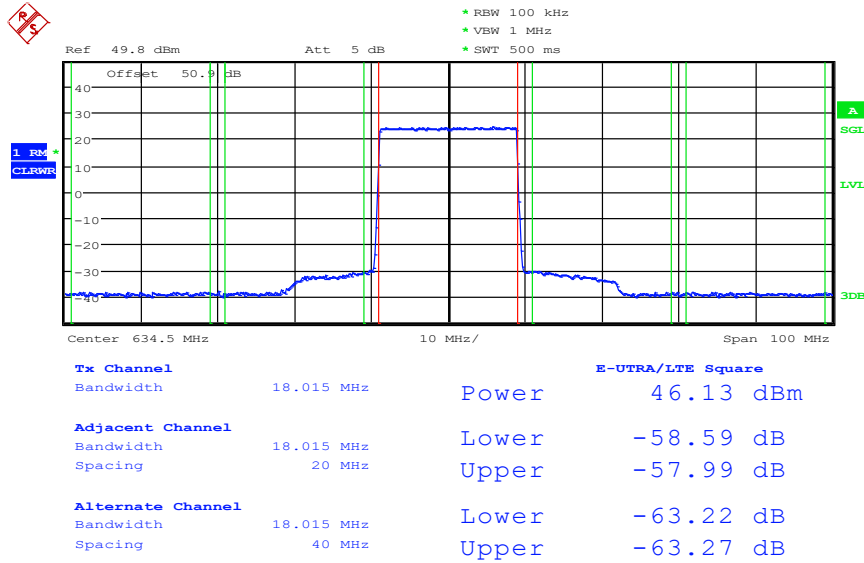


### 1.2.10 lowest frequency (20M Modulation)

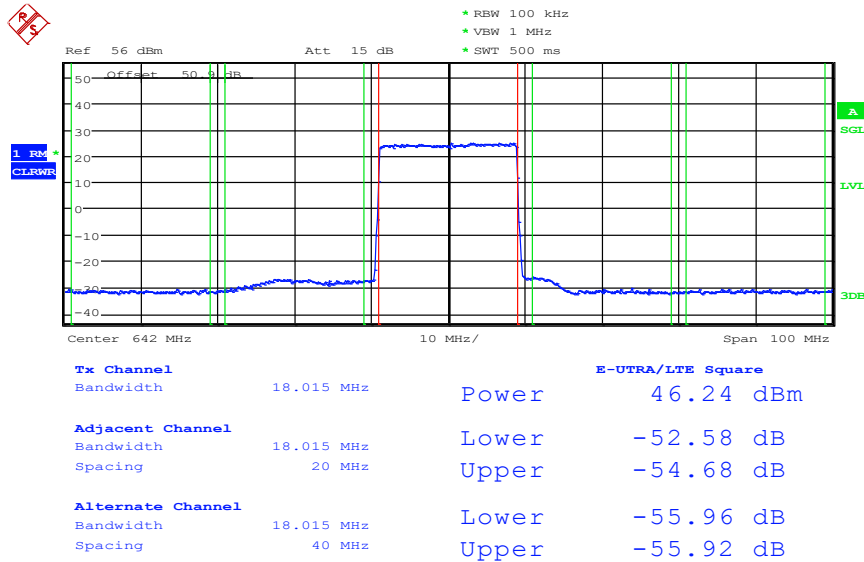


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## 1.2.11 middle frequency



## 1.2.12 highest frequency



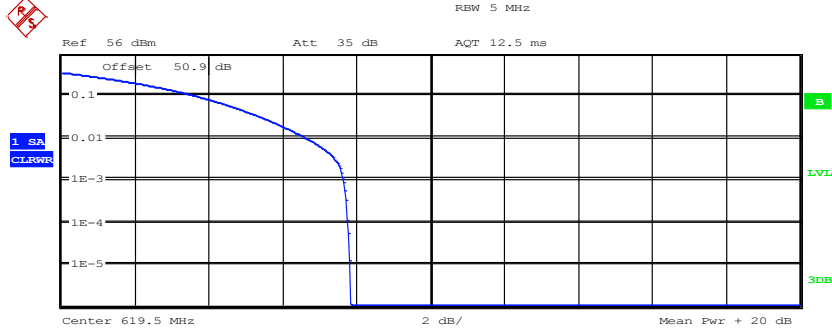
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**2)PAPR**

**2.1 ANT1 Port:**

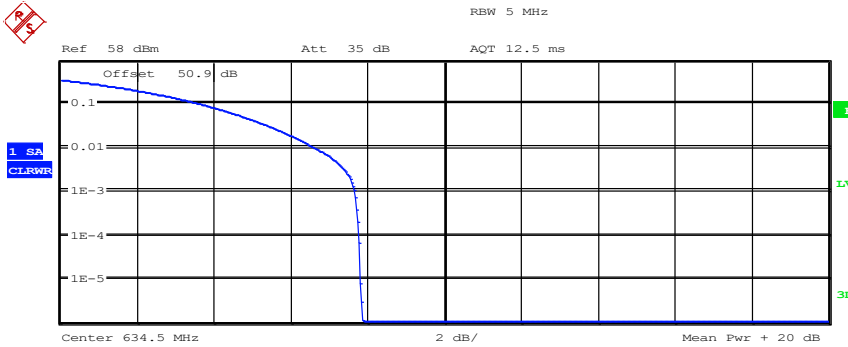
**2.1.1 lowest frequency(5M Modulation)**



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 7.1MHz

Trace 1	
Mean	46.15 dBm
Peak	53.97 dBm
Crest	7.82 dB
10 %	3.69 dB
1 %	6.63 dB
.1 %	7.66 dB
.01 %	7.76 dB

**2.1.2 middle frequency**



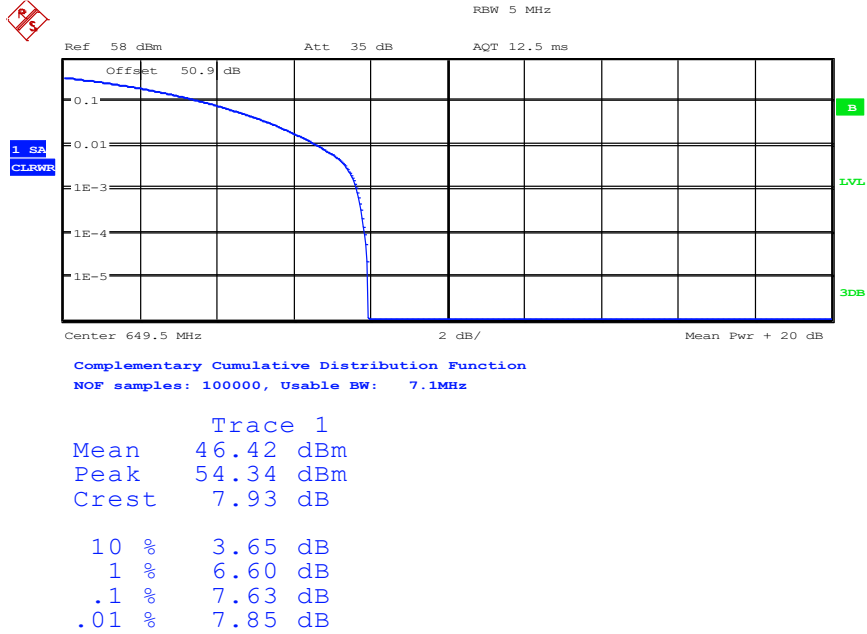
Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 7.1MHz

Trace 1	
Mean	46.48 dBm
Peak	54.34 dBm
Crest	7.86 dB
10 %	3.69 dB
1 %	6.63 dB
.1 %	7.66 dB
.01 %	7.79 dB

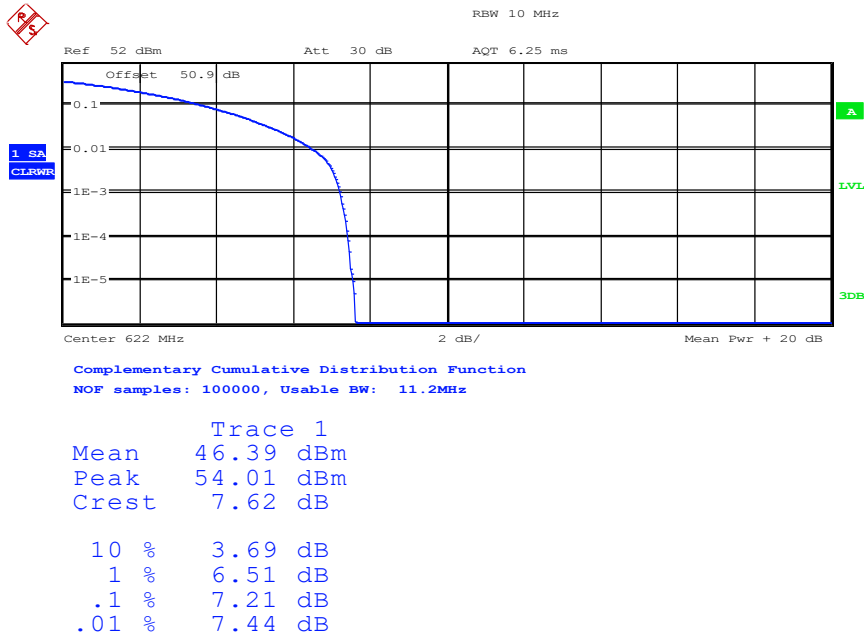


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2.1.3 Highest frequency



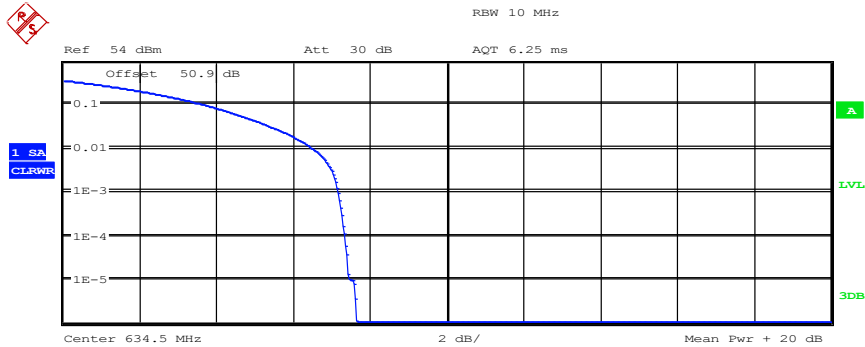
2.1.4 lowest frequency(10M Modulation)



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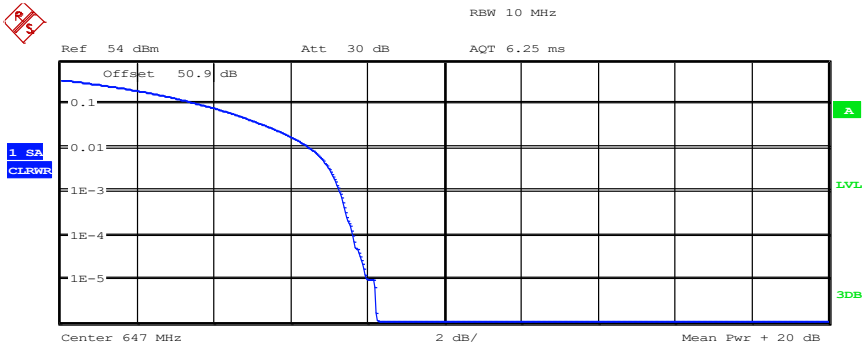
2.1.5 middle frequency



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

Trace 1	
Mean	46.28 dBm
Peak	53.92 dBm
Crest	7.64 dB
10 %	3.72 dB
1 %	6.47 dB
.1 %	7.18 dB
.01 %	7.34 dB

2.1.6 highest frequency



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

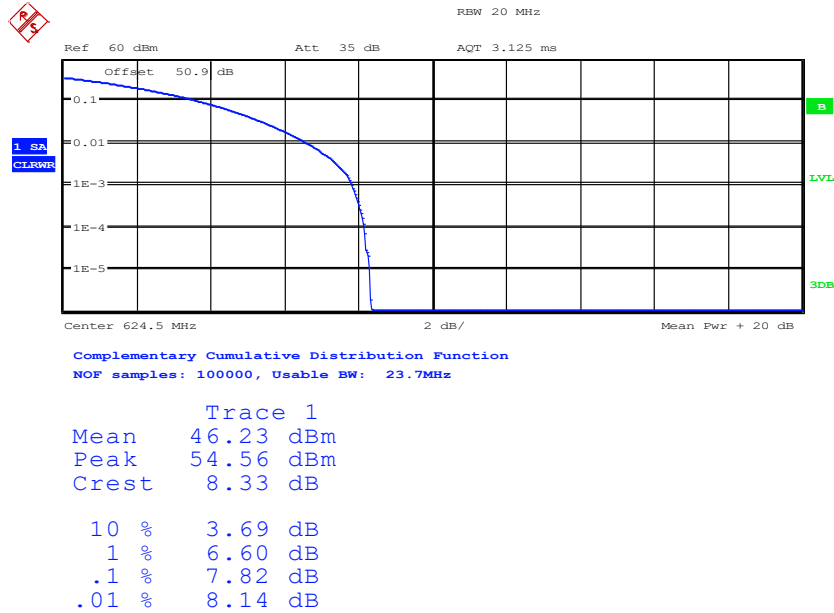
Trace 1	
Mean	46.23 dBm
Peak	54.47 dBm
Crest	8.24 dB
10 %	3.69 dB
1 %	6.47 dB
.1 %	7.28 dB
.01 %	7.63 dB



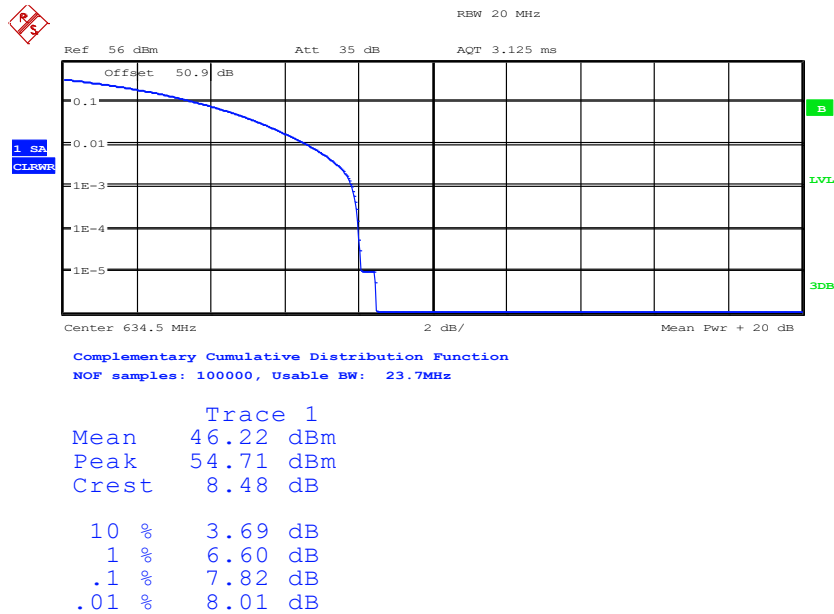
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2.1.7 lowest frequency(15M Modulation)

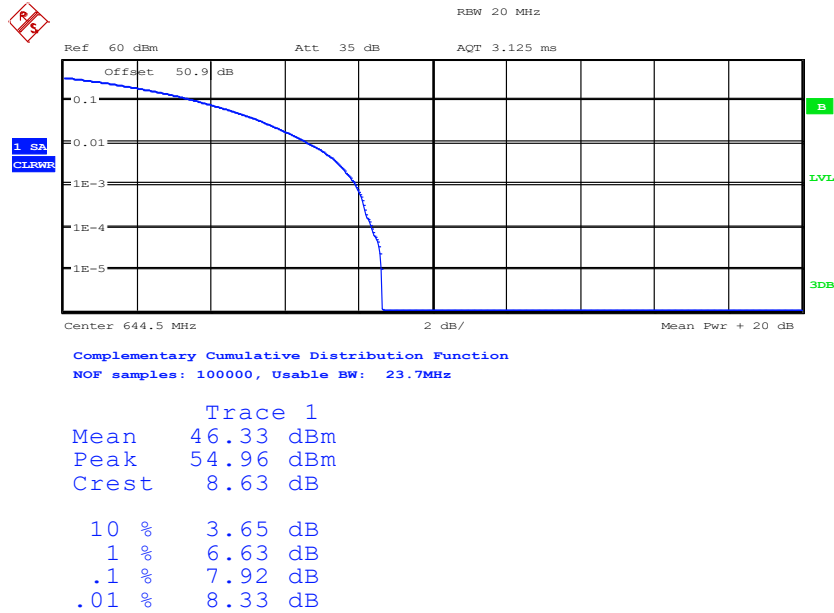


2.1.8 Middle frequency

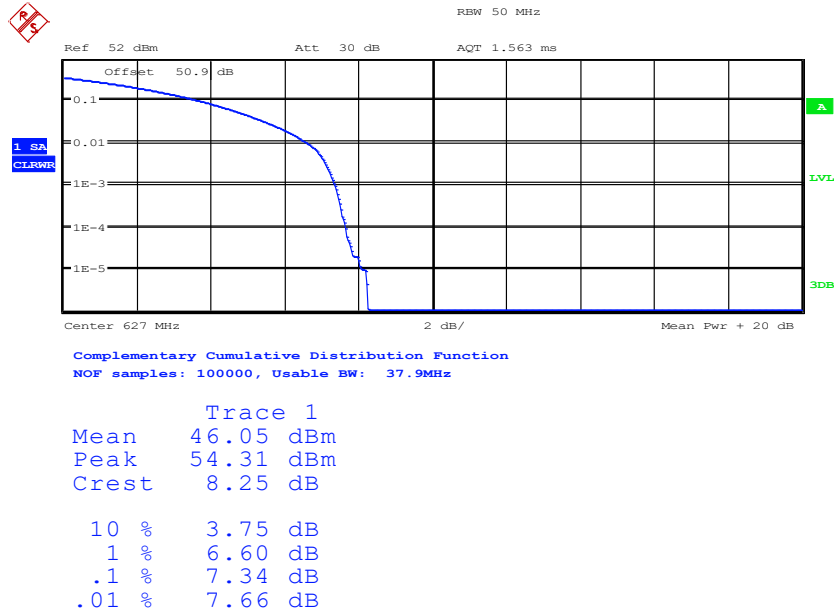


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2.1.9 Highest frequency



2.1.10 lowest frequency( 20M Modulation)

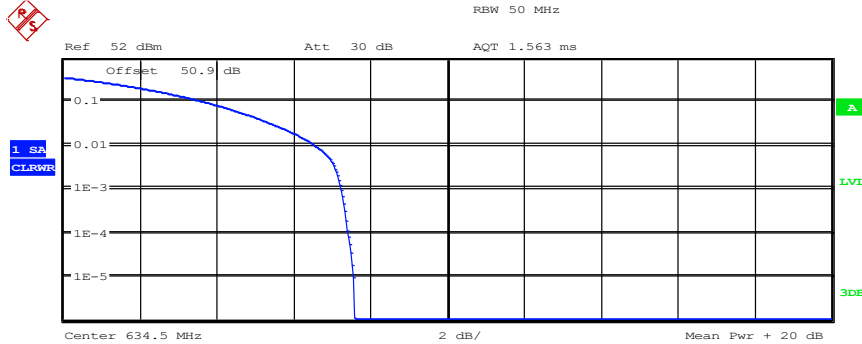


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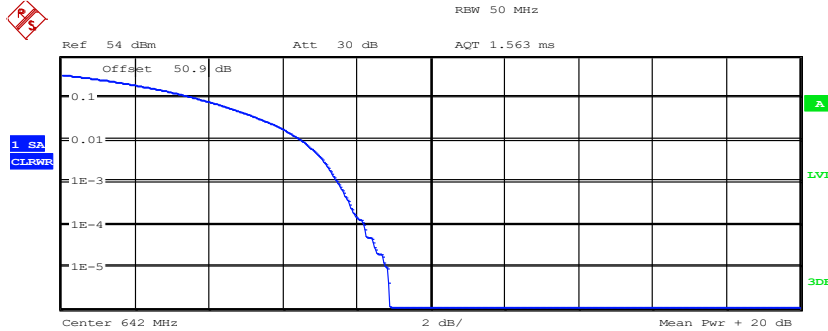
2.1.11 middle frequency



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 37.9MHz

Trace 1	
Mean	46.16 dBm
Peak	53.74 dBm
Crest	7.58 dB
10 %	3.72 dB
1 %	6.54 dB
.1 %	7.24 dB
.01 %	7.40 dB

2.1.12 highest frequency



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 37.9MHz

Trace 1	
Mean	46.17 dBm
Peak	55.06 dBm
Crest	8.89 dB
10 %	3.69 dB
1 %	6.51 dB
.1 %	7.50 dB
.01 %	8.21 dB

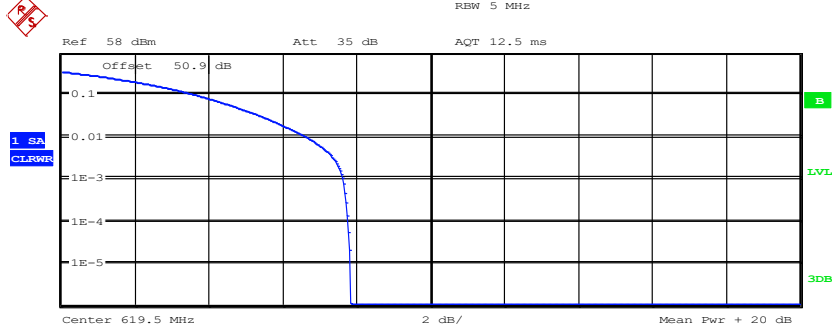


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**2.2 ANT2 Port:**

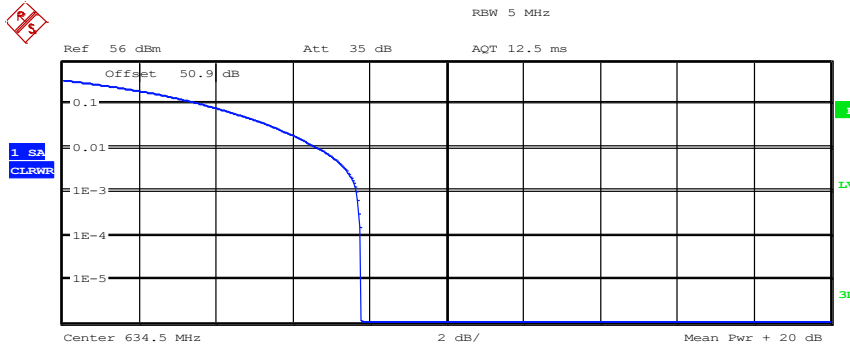
**2.2.1 lowest frequency(5M Modulation)**



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 7.1MHz

Trace 1	
Mean	46.23 dBm
Peak	54.06 dBm
Crest	7.83 dB
10 %	3.69 dB
1 %	6.63 dB
.1 %	7.63 dB
.01 %	7.76 dB

**2.2.2 middle frequency**



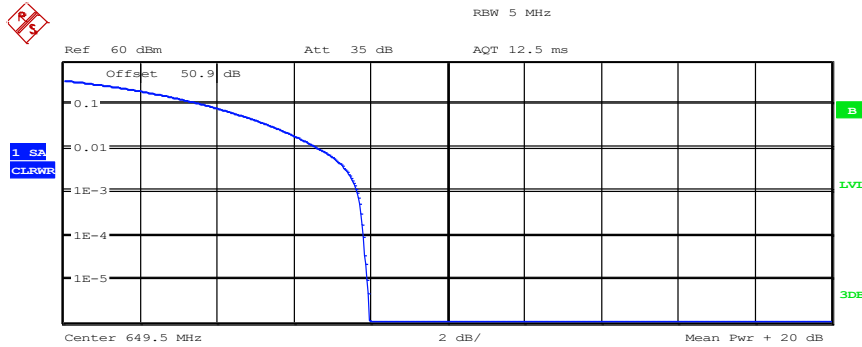
Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 7.1MHz

Trace 1	
Mean	46.40 dBm
Peak	54.18 dBm
Crest	7.77 dB
10 %	3.69 dB
1 %	6.67 dB
.1 %	7.66 dB
.01 %	7.76 dB



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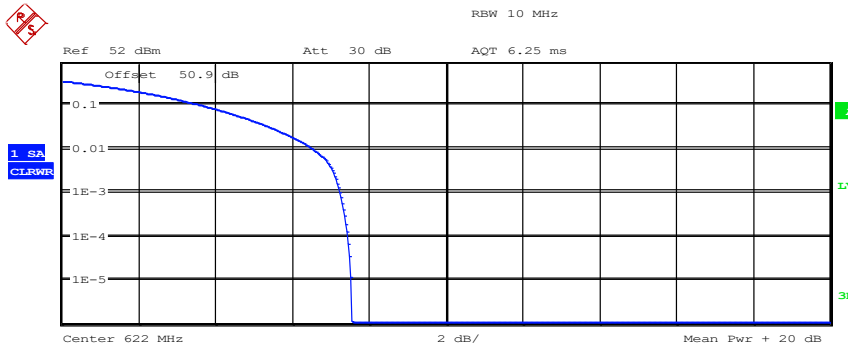
2.2.3 Highest frequency



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 7.1MHz

Trace 1	
Mean	46.40 dBm
Peak	54.37 dBm
Crest	7.97 dB
10 %	3.69 dB
1 %	6.63 dB
.1 %	7.66 dB
.01 %	7.82 dB

2.2.4 lowest frequency(10M Modulation)



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

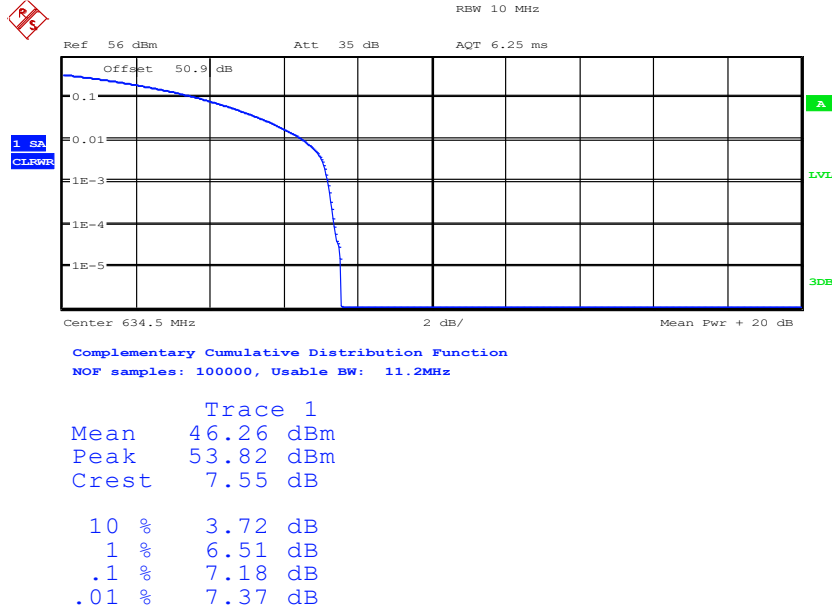
Trace 1	
Mean	46.12 dBm
Peak	53.66 dBm
Crest	7.54 dB
10 %	3.69 dB
1 %	6.51 dB
.1 %	7.24 dB
.01 %	7.44 dB



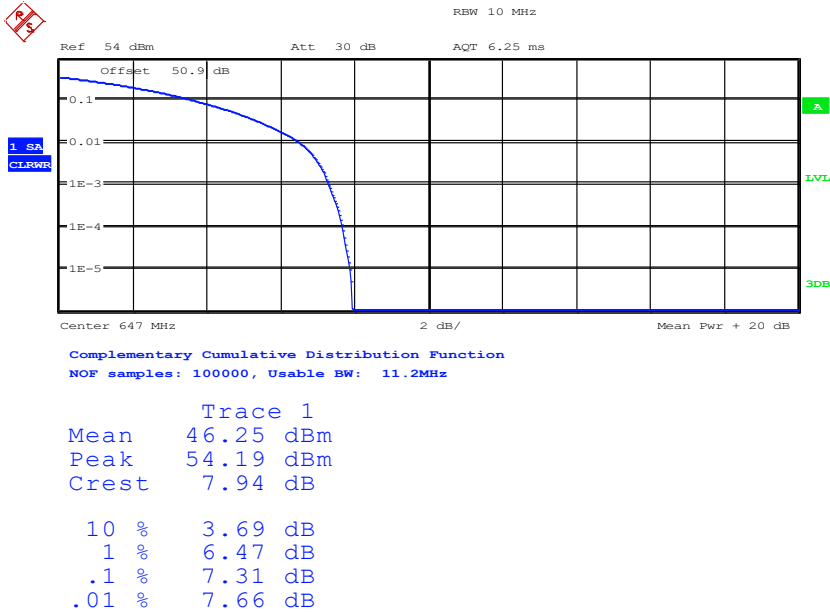
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2.2.5 middle frequency

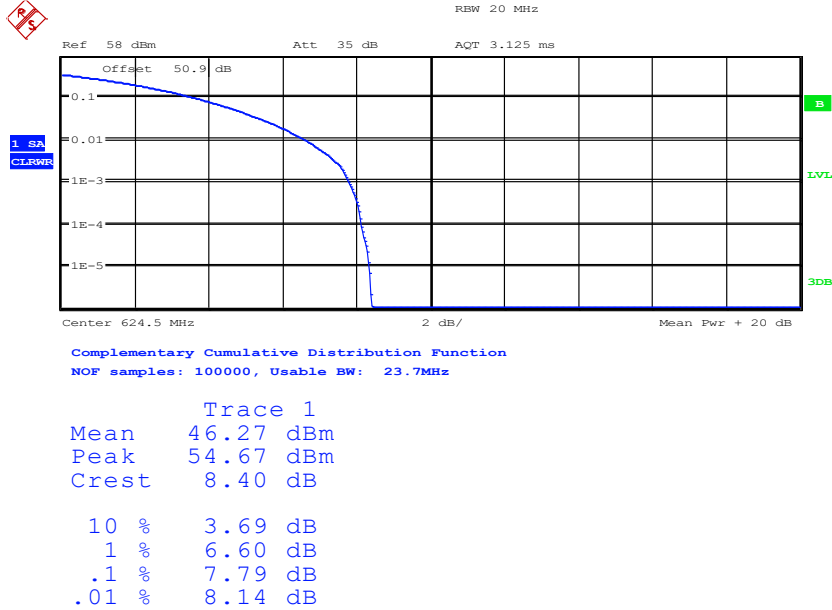


2.2.6 highest frequency

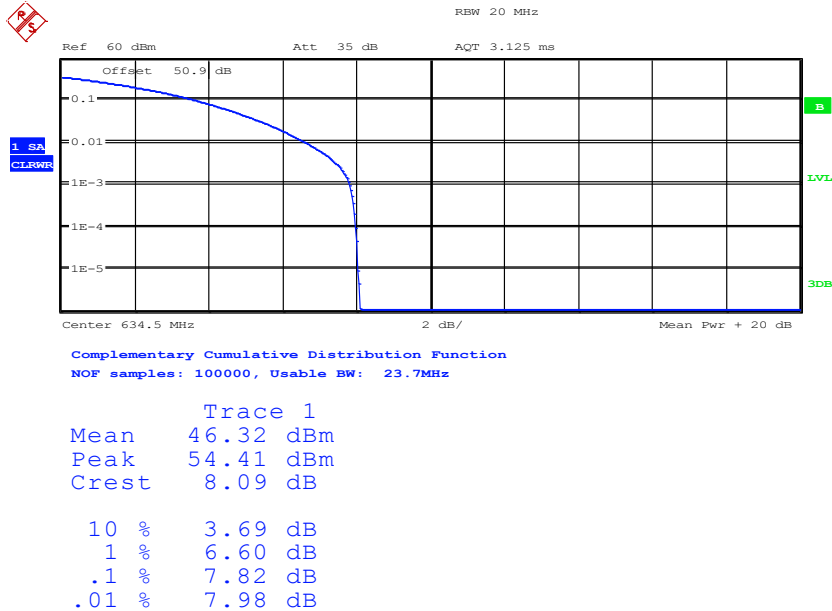


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2.2.7 lowest frequency(15M Modulation)



2.2.8 Middle frequency

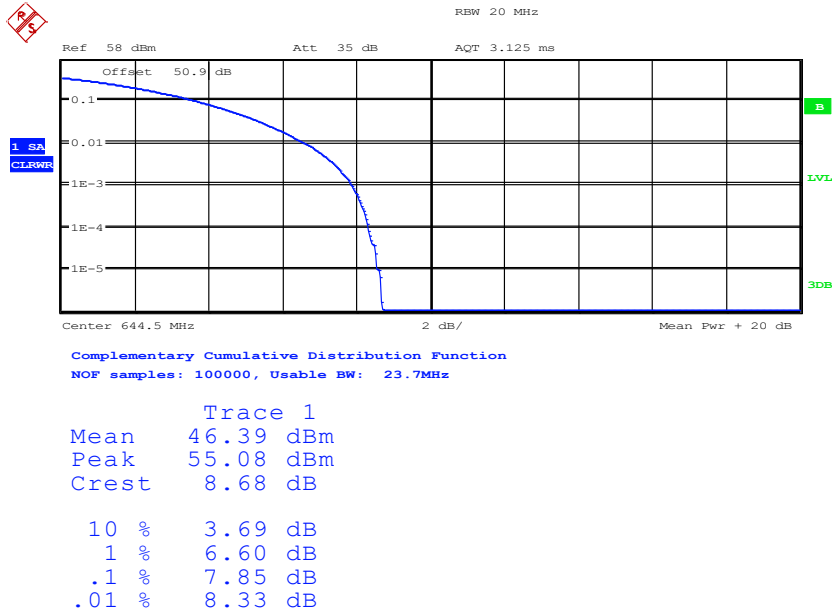


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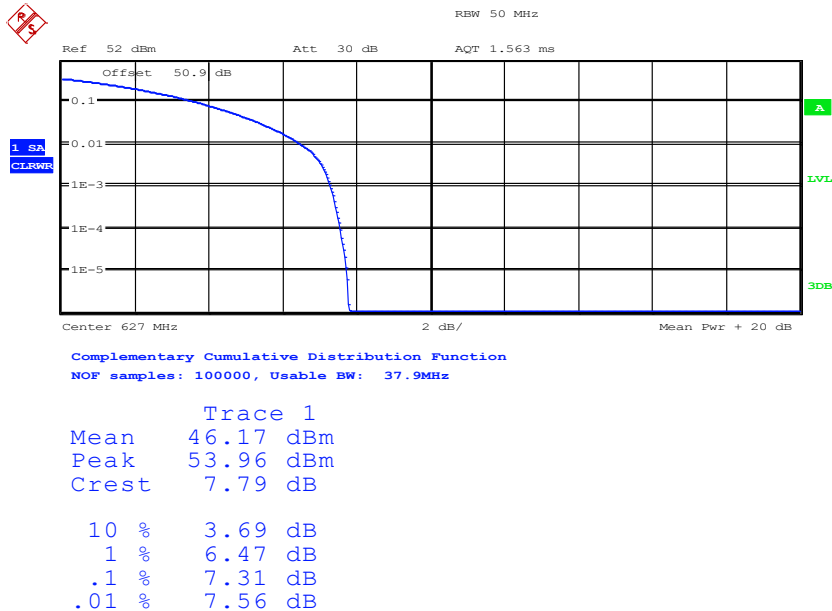
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2.2.9 Highest frequency

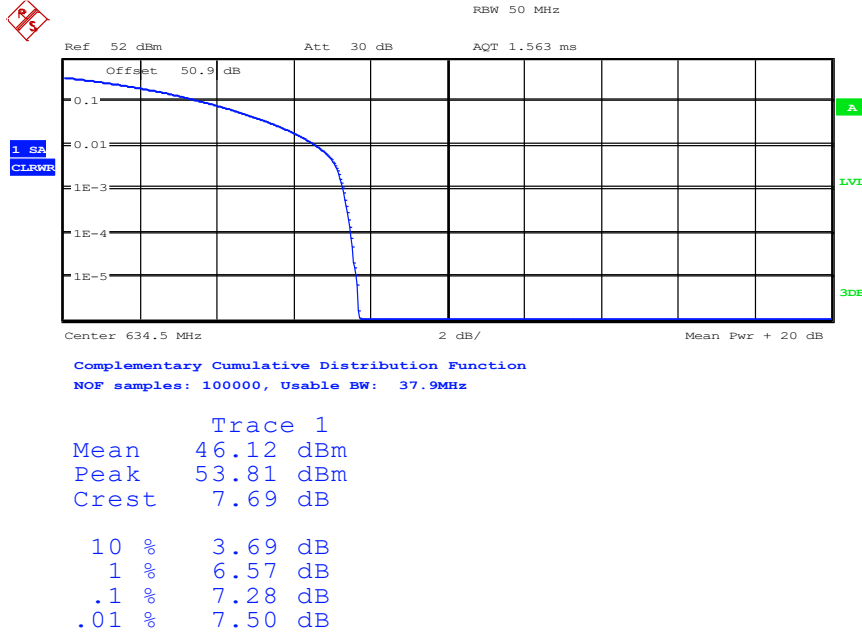


2.2.10 lowest frequency( 20M Modulation)

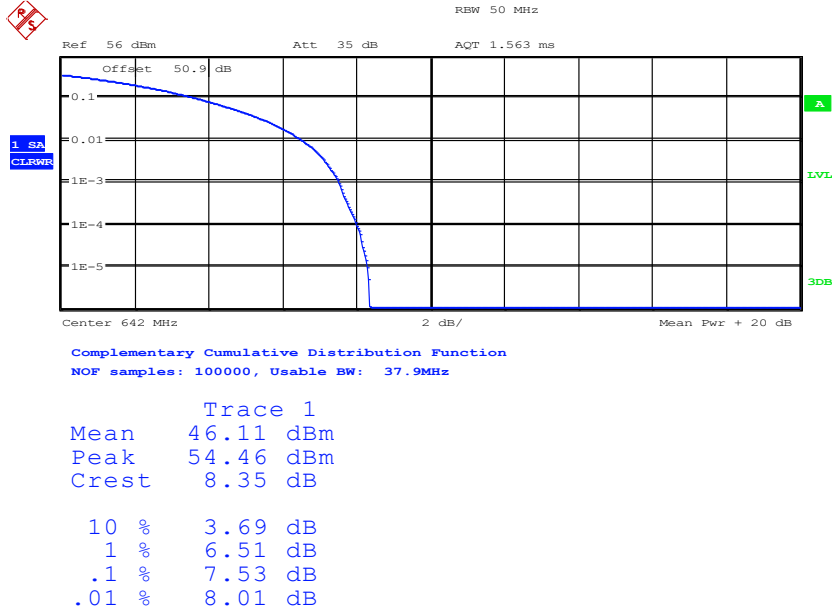


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2.2.11 middle frequency



2.2.12 highest frequency



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**6.2.3 Band Edge**

Test Requirement: FCC part 27.53 (g)  
 600MHz: 617-652MHz  
 §27.53 Emission limits.

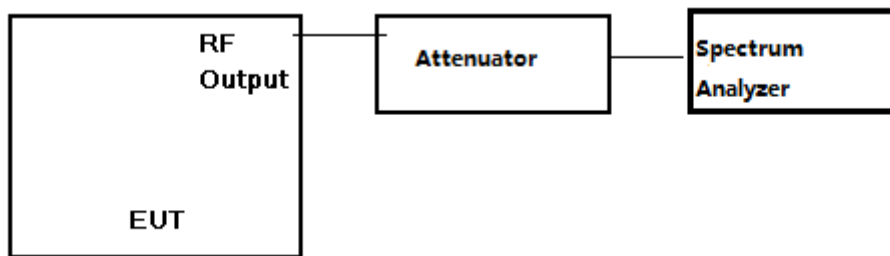
(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Test Method: According to clause 5.7 of ANSI C63.26-2015

Test Limit: The tested max PSD is 40.06dBm/Mhz, i.e. 10W. The emission shall be attenuation below the transmitter power at least  $43+10\log(10W)$  dB i.e. 53dB  
 $40.06dBm-(43+10\log(10W))= -13dBm$ .  
 The device with two RF output port MIMO, The emission limit was tightened:  
 $10\log(2)=3dB$ ,  
 The final limit for emission is :  
 $-13dBm-3=-16dBm$

EUT Operation:  
 Status: Drive the EUT to maximum output power.  
 Conditions: Normal conditions  
 Application: Cellular Band RF output ports

Test Configuration:



Band edge and Intermodulation test configuration



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**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),here 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.

**Intermodulation  
 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 destroyed;
5. Keep the EUT continuously transmitting in max power;
6. Keep two signals are same in modulation type and level;
7. Measure the 3 order intermodulated product by the EUT( the sum of the two unwanted signal should be rated power);
8. Correct for all losses in the RF path;
9. Read the conducted spurious emissioins of the EUT antenna port.



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**6.2.3.1 Measurement Record:**

ANT1 Port:

measure frequency		product Value (dBm)	Limit(dBm)	Magin (dB)
5M	Lowest frequency	-19.18	-16	-3.18
	Highest frequency	-17.72		-1.72
Dual 5M	Lowest frequency	-22.56	-16	-6.56
	Highest frequency	-22.90		-6.9
10M	Lowest frequency	-23.93	-16	-7.93
	Highest frequency	-19.11		-3.11
Dual 10M	Lowest frequency	-24.17	-16	-8.17
	Highest frequency	-22.10		-6.1
15M	Lowest frequency	-22.26	-16	-6.26
	Highest frequency	-22.19		-6.19
Dual 15M	Lowest frequency	-19.76	-16	-3.76
	Highest frequency	-19.31		-3.31
20M	Lowest frequency	-23.25	-16	-7.25
	Highest frequency	-20.04		-4.04

ANT2 Port:

measure frequency		product Value (dBm)	Limit(dBm)	Magin (dB)
5M	Lowest frequency	-18.84	-16	-2.84
	Highest frequency	-17.92		-1.92
Dual 5M	Lowest frequency	-22.72	-16	-6.72
	Highest frequency	-22.71		-6.71
10M	Lowest frequency	-24.56	-16	-8.56
	Highest frequency	-19.97		-3.97
Dual 10M	Lowest frequency	-24.45	-16	-8.45
	Highest frequency	-21.92		-5.92
15M	Lowest frequency	-24.07	-16	-8.07
	Highest frequency	-22.46		-6.46
Dual 15M	Lowest frequency	-19.66	-16	-3.66
	Highest frequency	-19.46		-3.46
20M	Lowest frequency	-23.93	-16	-7.93
	Highest frequency	-28.53		-12.53

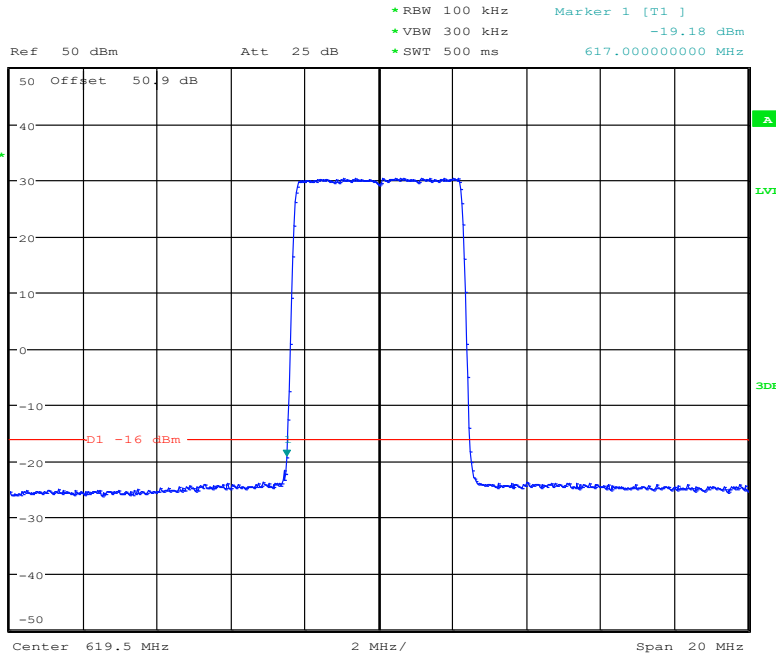


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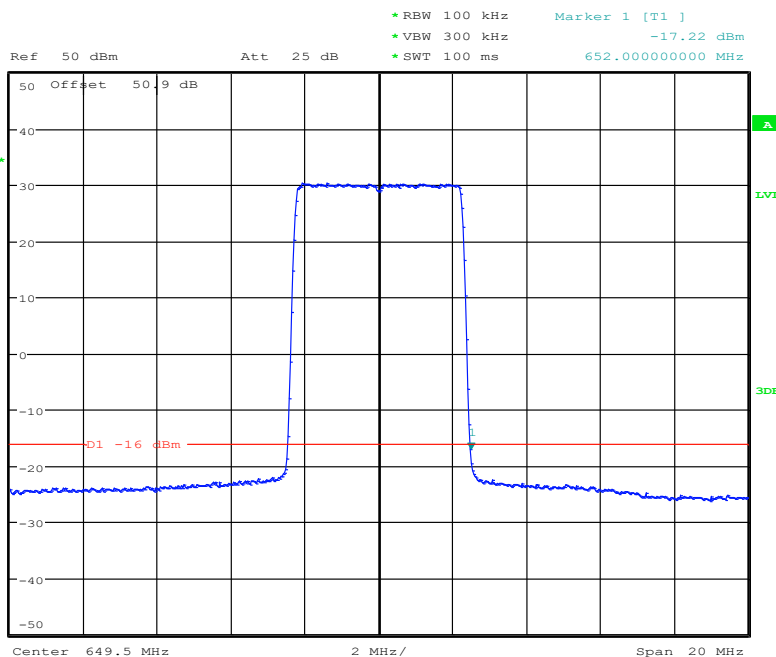
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**1) ANT1 Port:**  
**1.1 5M Modulation**  
 one signal input —Lower Edge



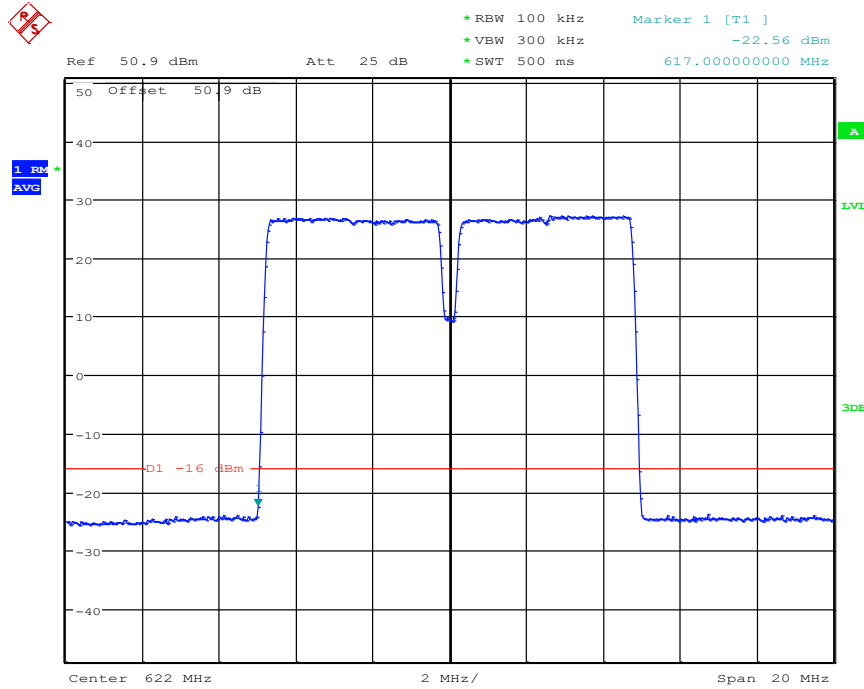
**1.2 one signal input —Upper Edge**



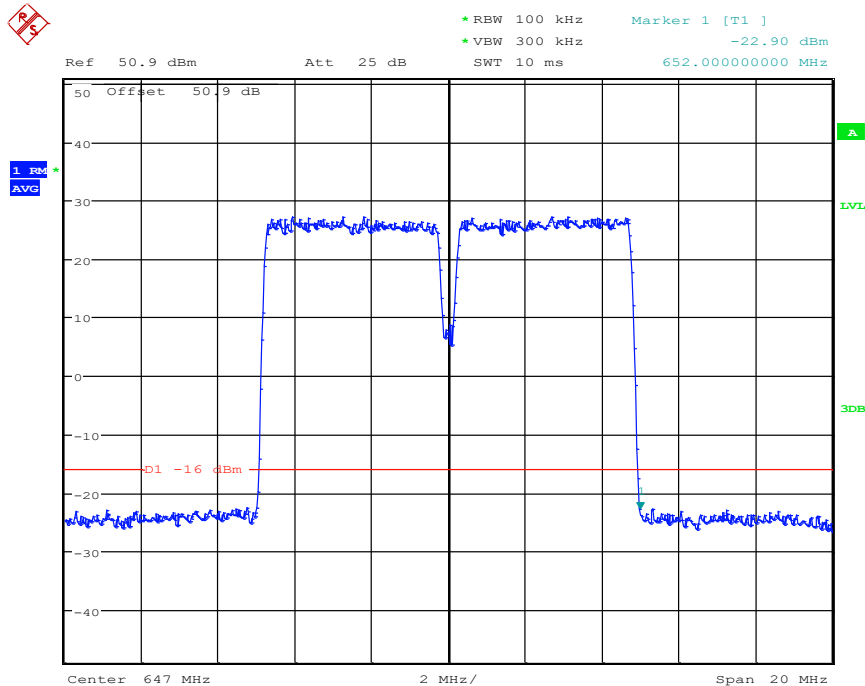
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1.3 two signal input —Lower Edge



1.4 two signal input —Upper Edge

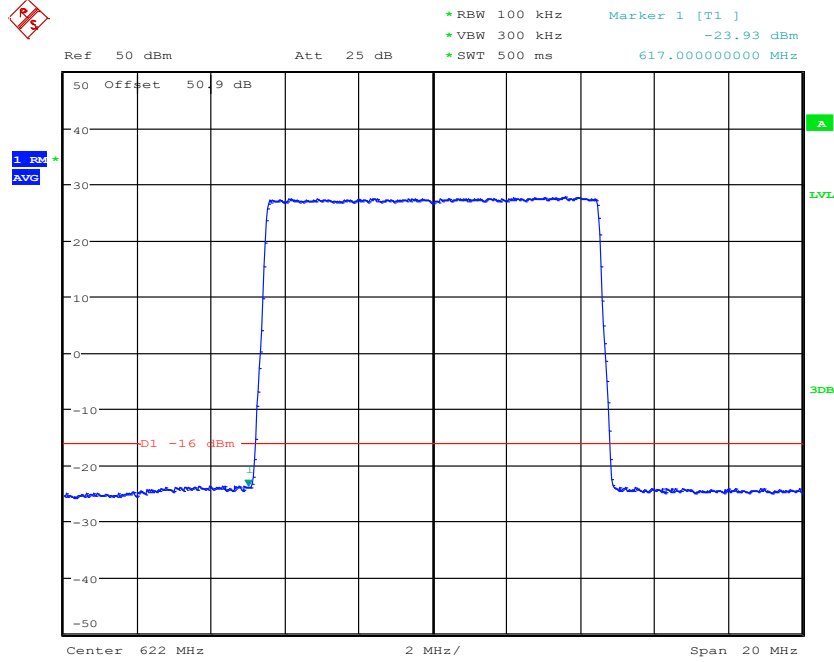


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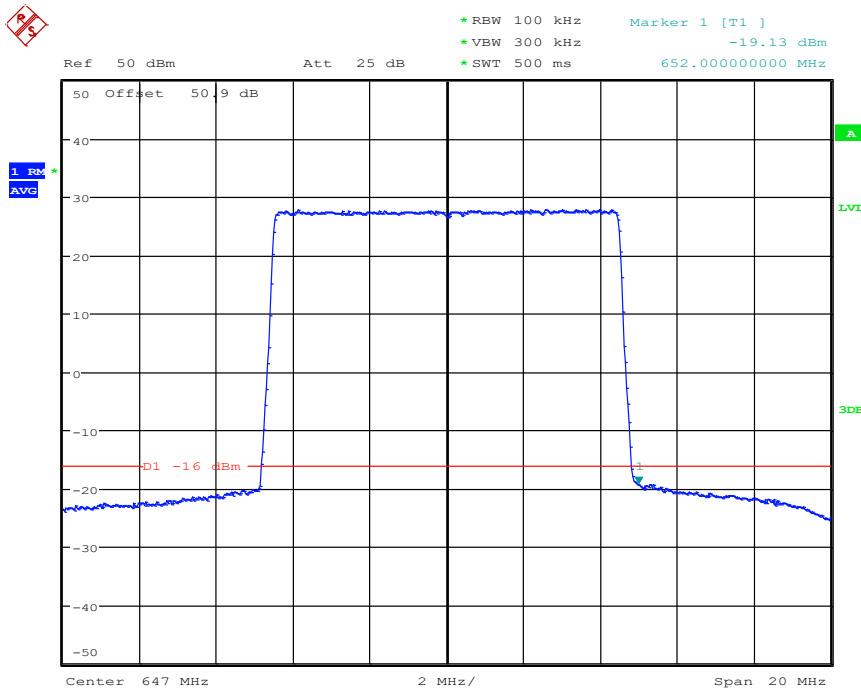
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**1.2 10M Modulation**

**1.2.1 one signal input —Lower Edge**

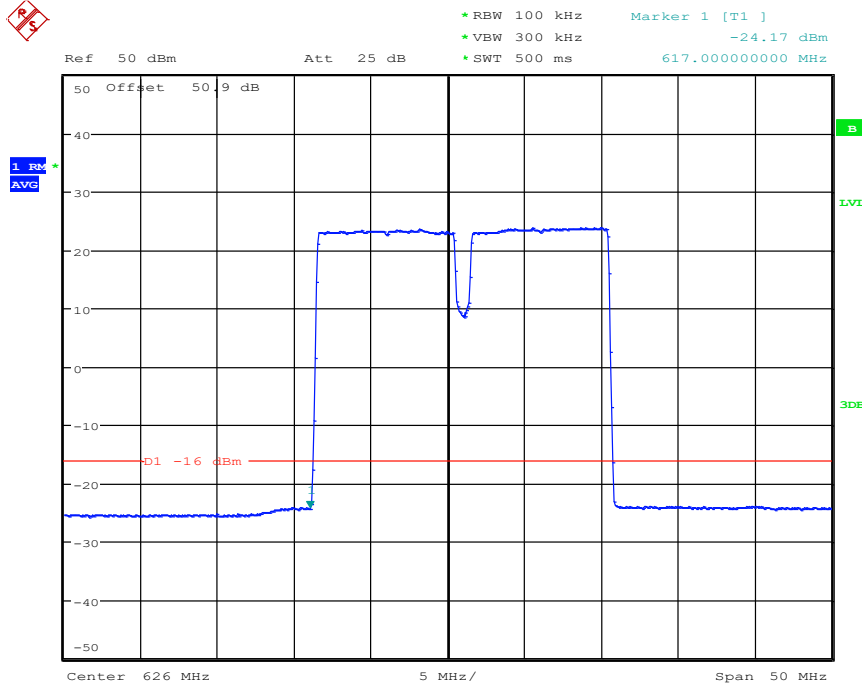


**1.2.2 one signal input —Upper Edge**

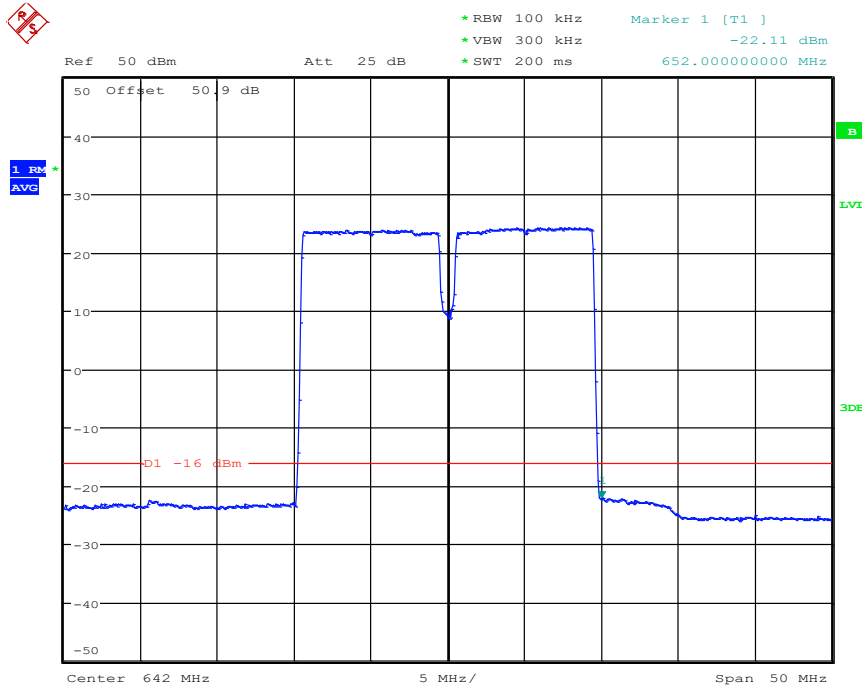


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1.2.3 two signal input —Lower Edge



1.2.4 two signal input —Upper Edge



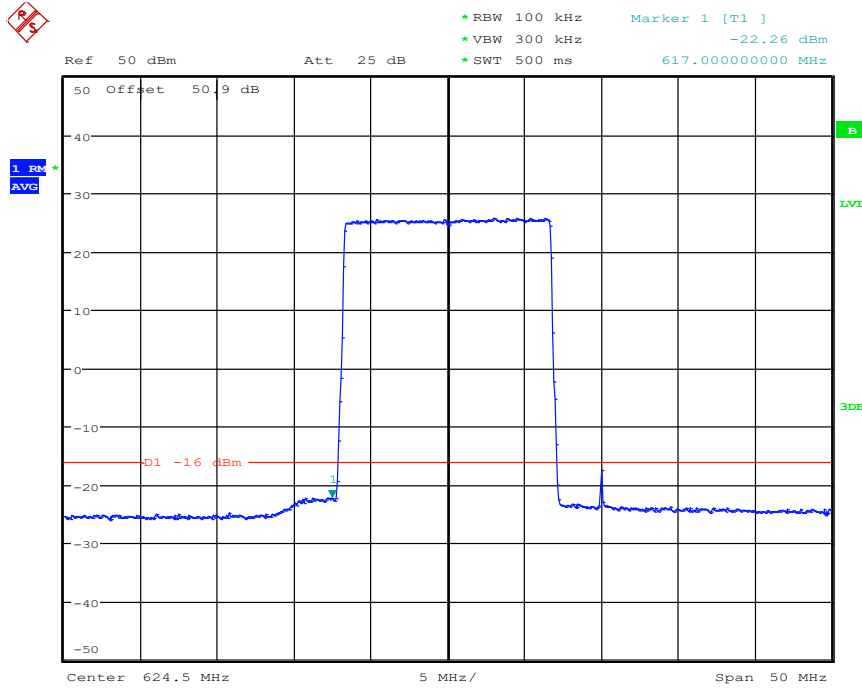
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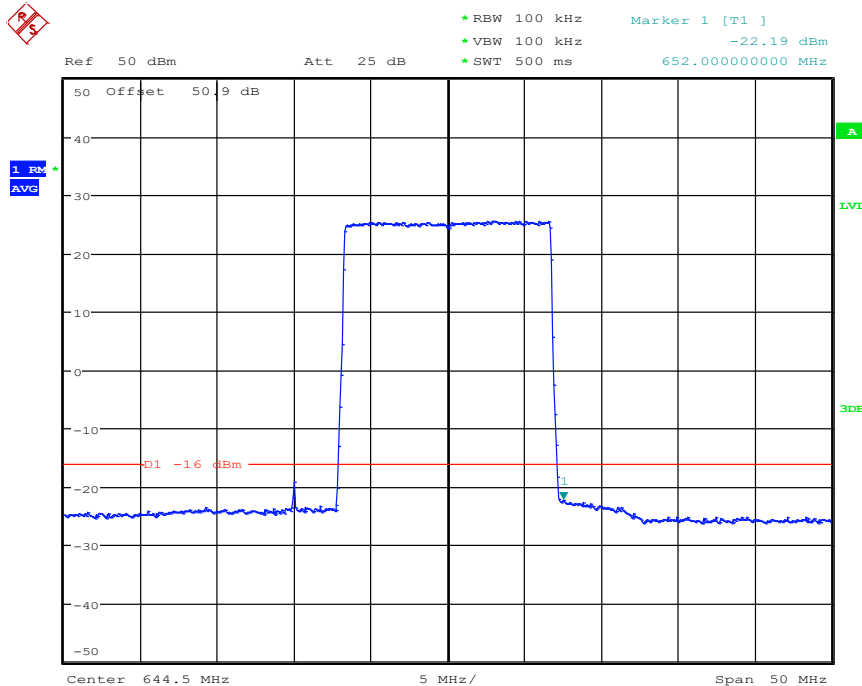
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**1.3 15M Modulation**

**1.3.1 one signal input —Lower Edge**



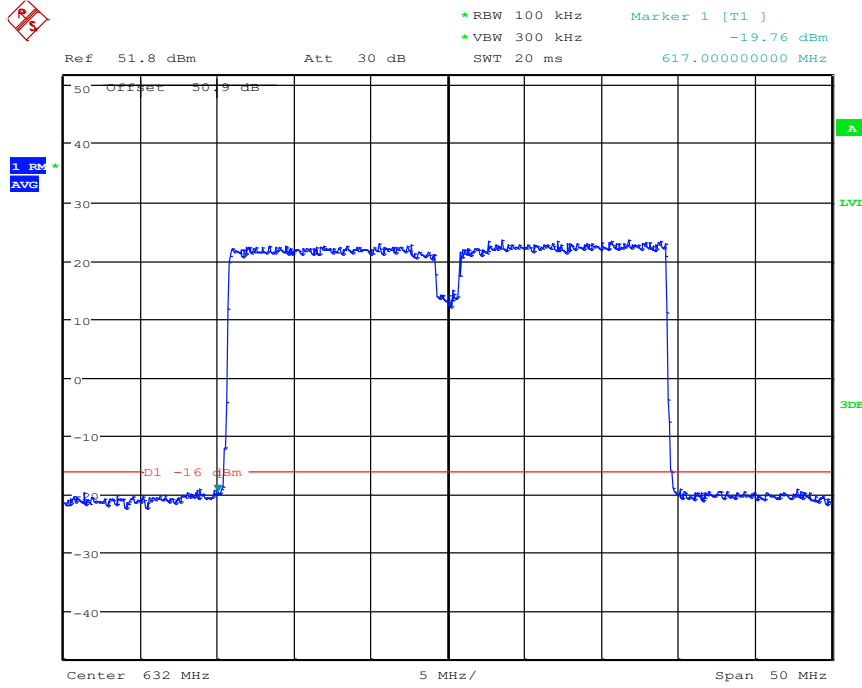
**1.3.2 one signal input —Upper Edge**



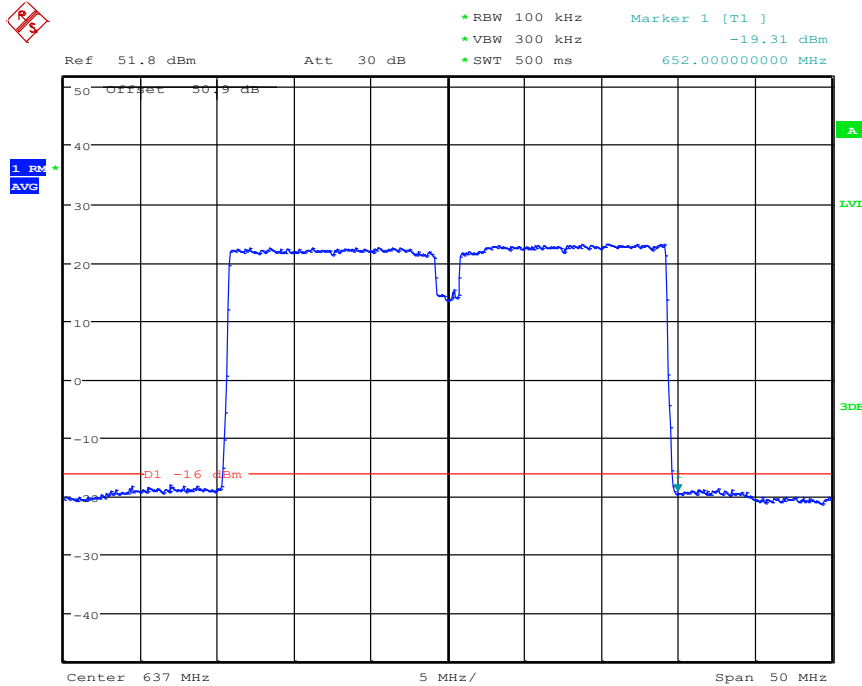
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1.3.3 two signal input —Lower Edge



1.3.4 two signal input —Upper Edge



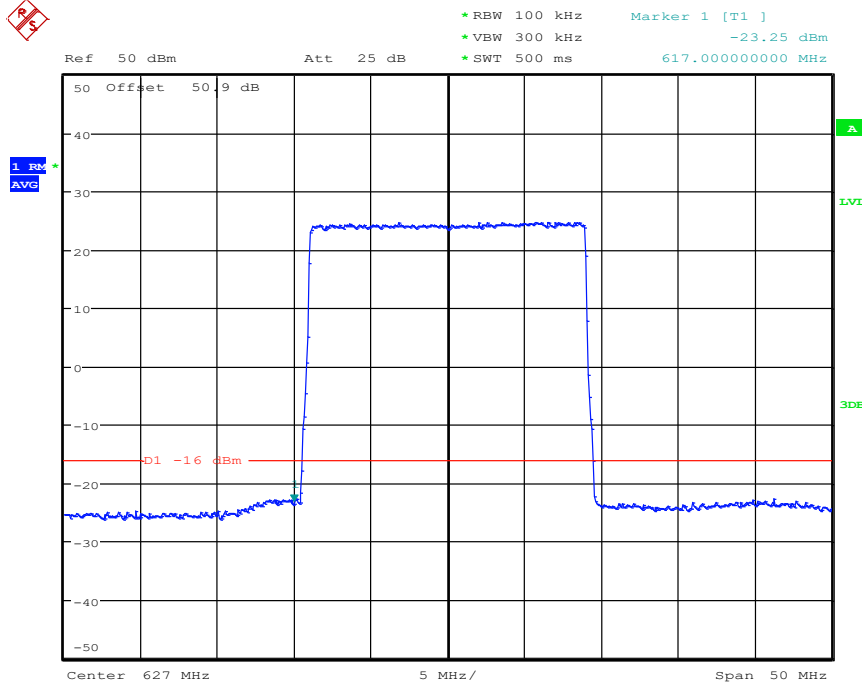
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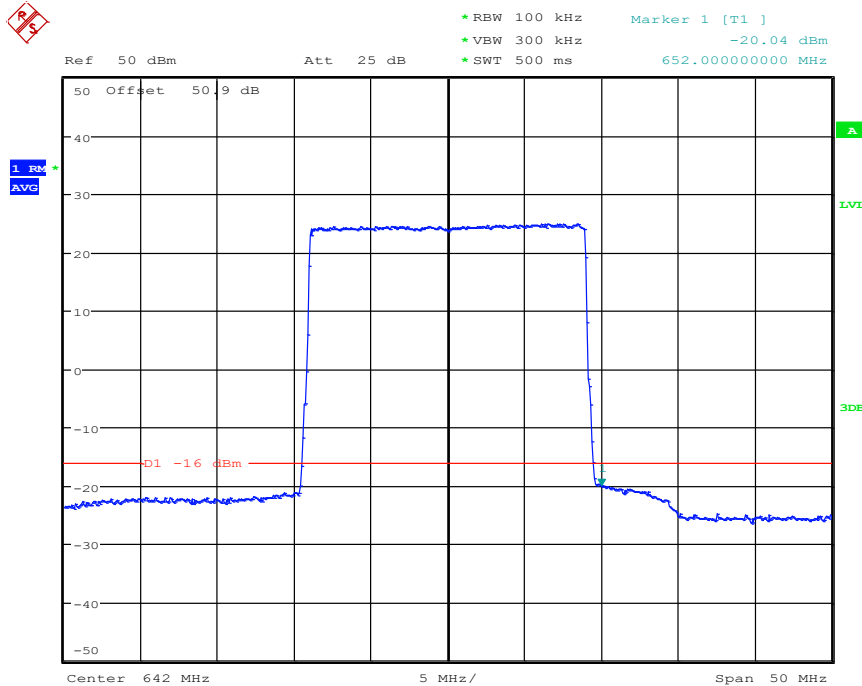
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**1.4 20M Modulation**

**1.4.1 one signal input —Lower Edge**



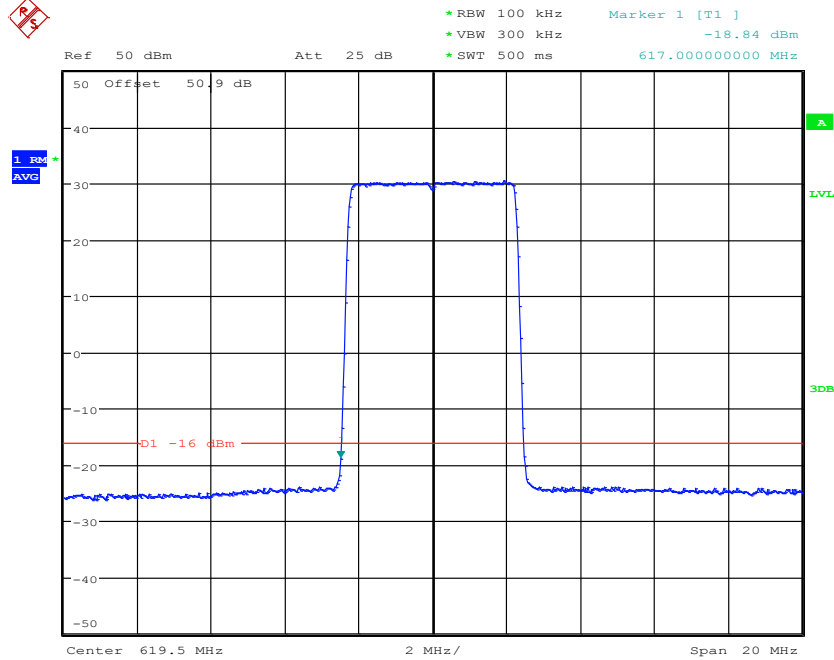
**1.4.2 one signal input —Upper Edge**



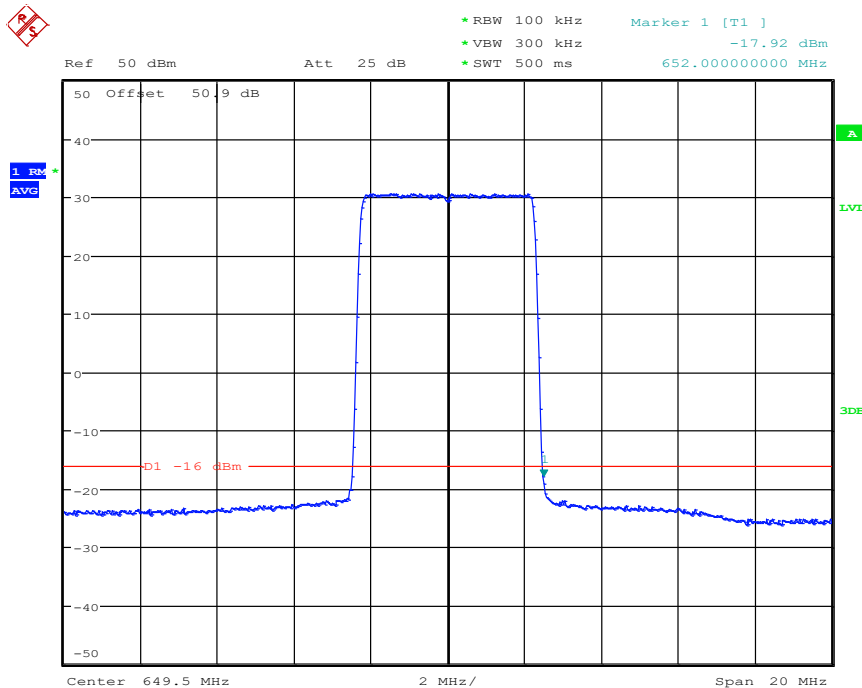
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**2)ANT2 Port:**  
**2.1 Transmitter: 5M Modulation**  
 2.1.1 one signal input —Lower Edge



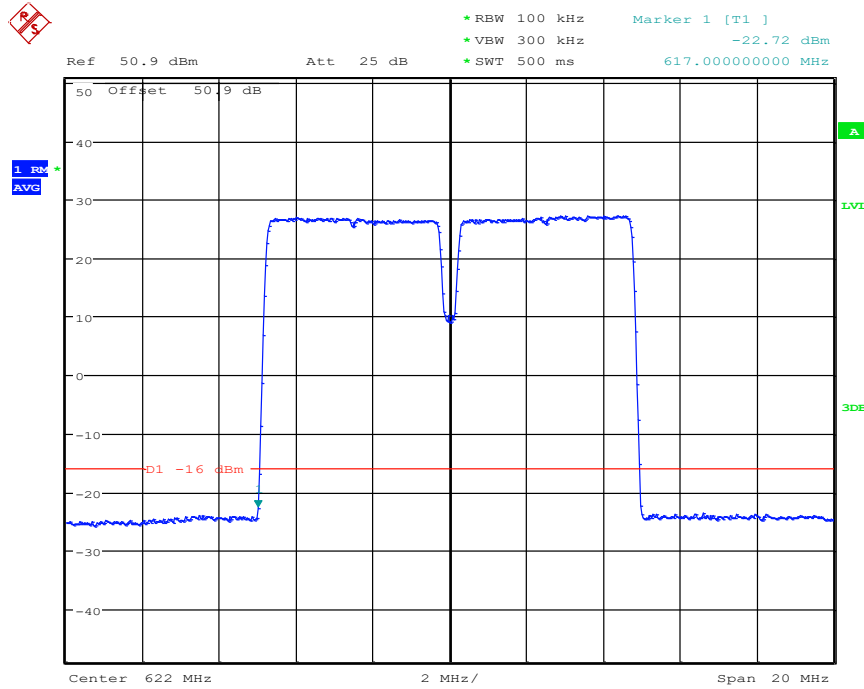
2.1.2 one signal input —Upper Edge



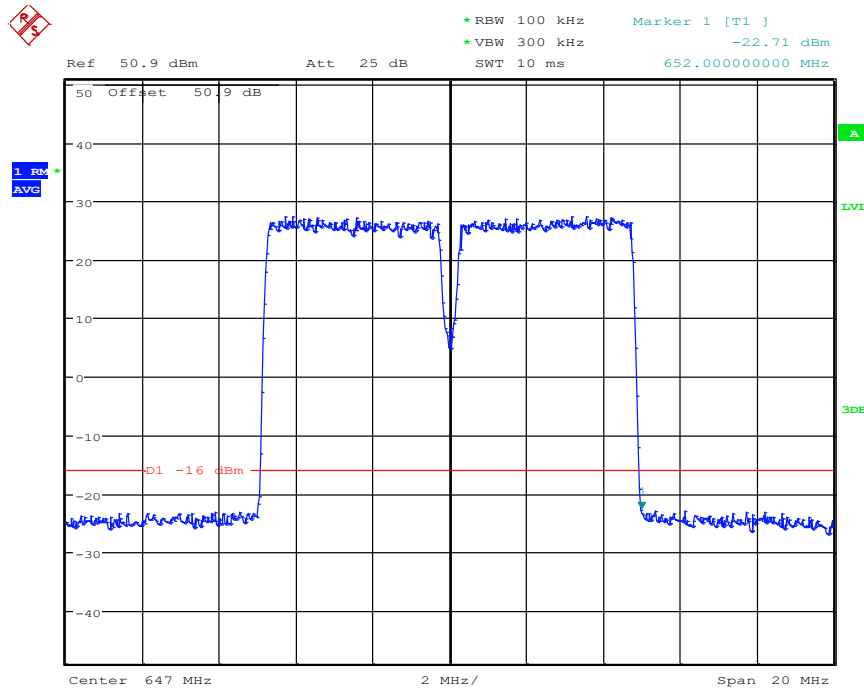
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2.1.3 two signal input —Upper Edge



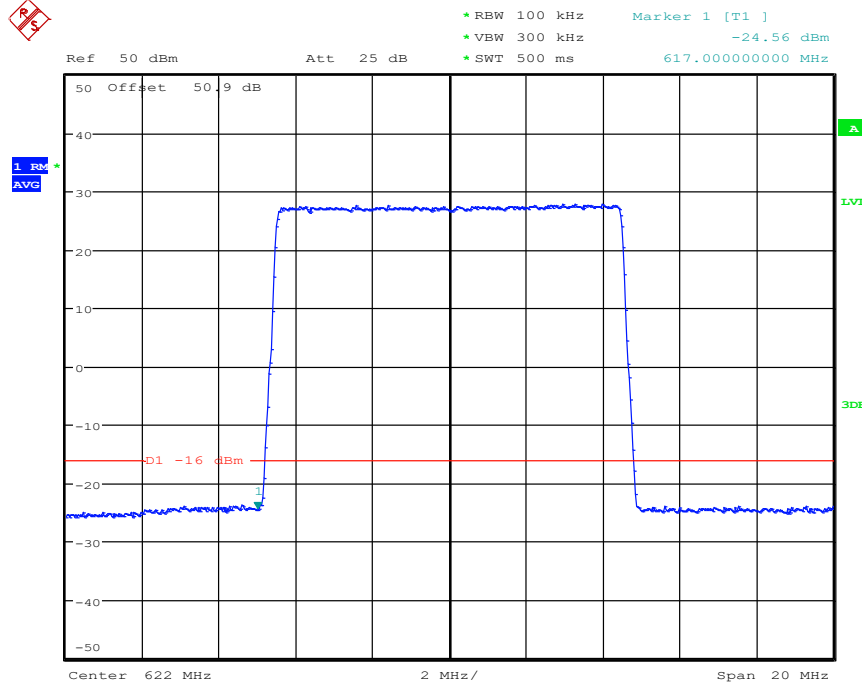
2.1.4 two signal input —Upper Edge



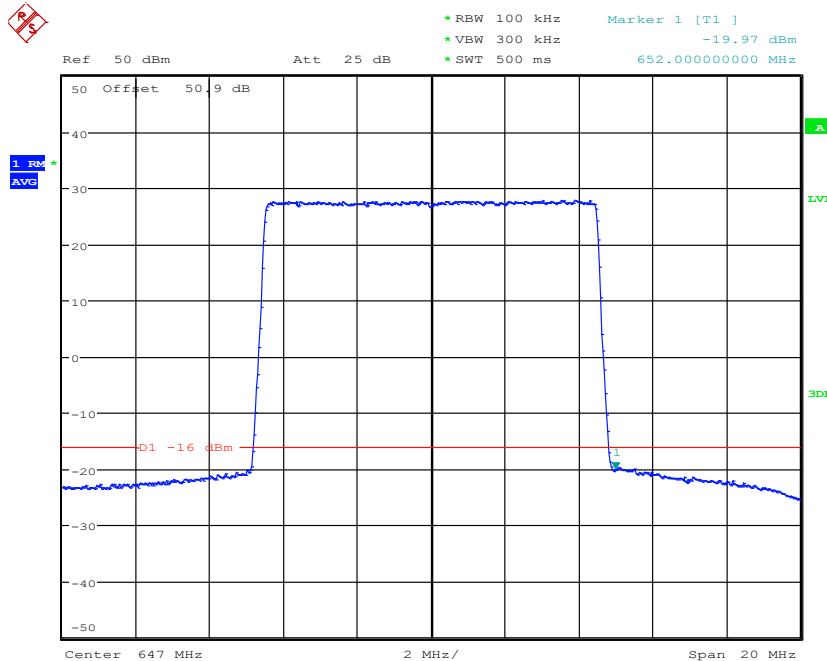
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**2.2 10M Modulation**

**2.2.1 one signal input —Lower Edge**



**2.2.2 one signal input —Upper Edge**

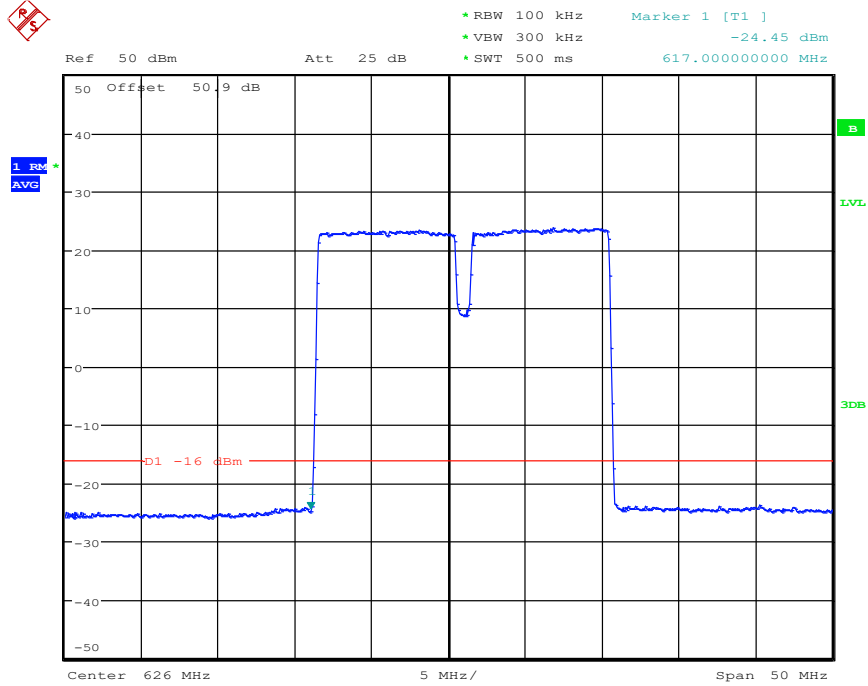


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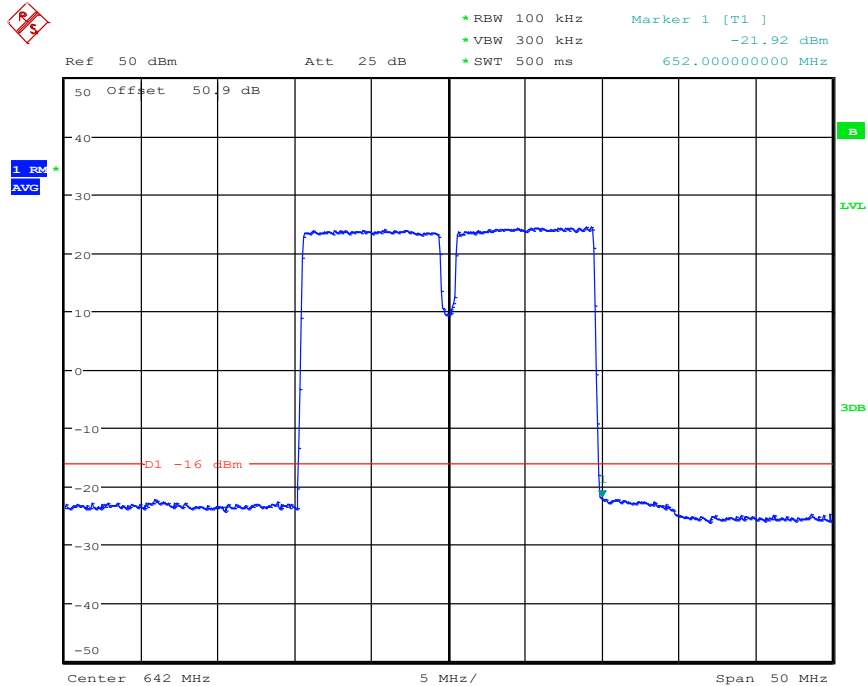
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2.2.3 two signal input —Lower Edge



2.2.4 two signal input —Upper Edge



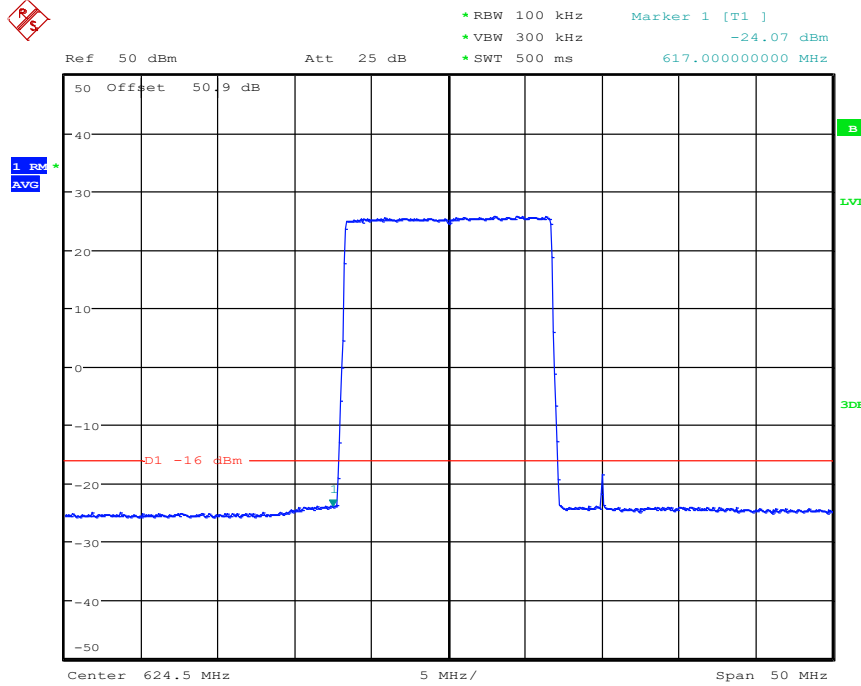
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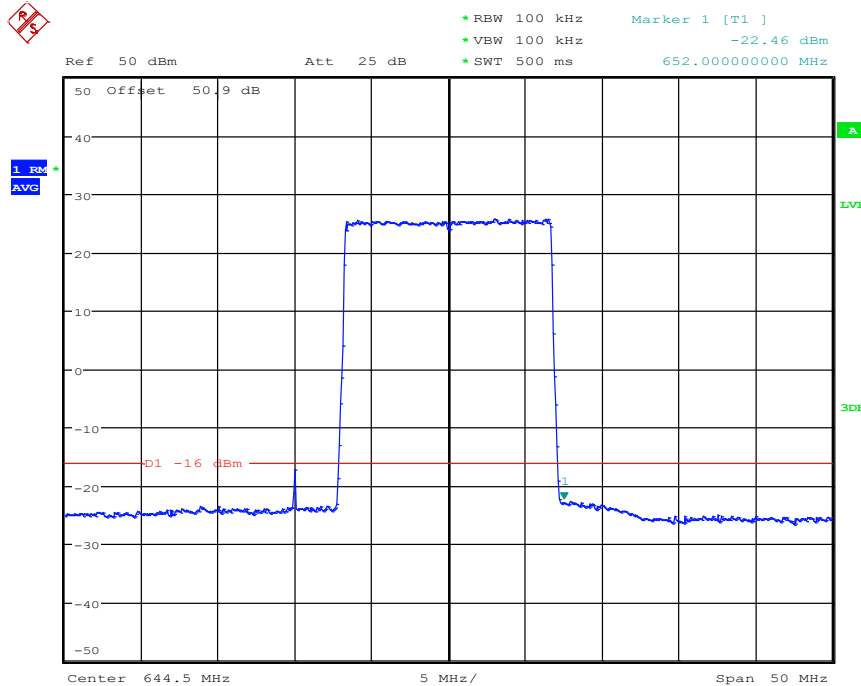
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**2.3 15M Modulation**

**2.3.1 one signal input —Lower Edge**



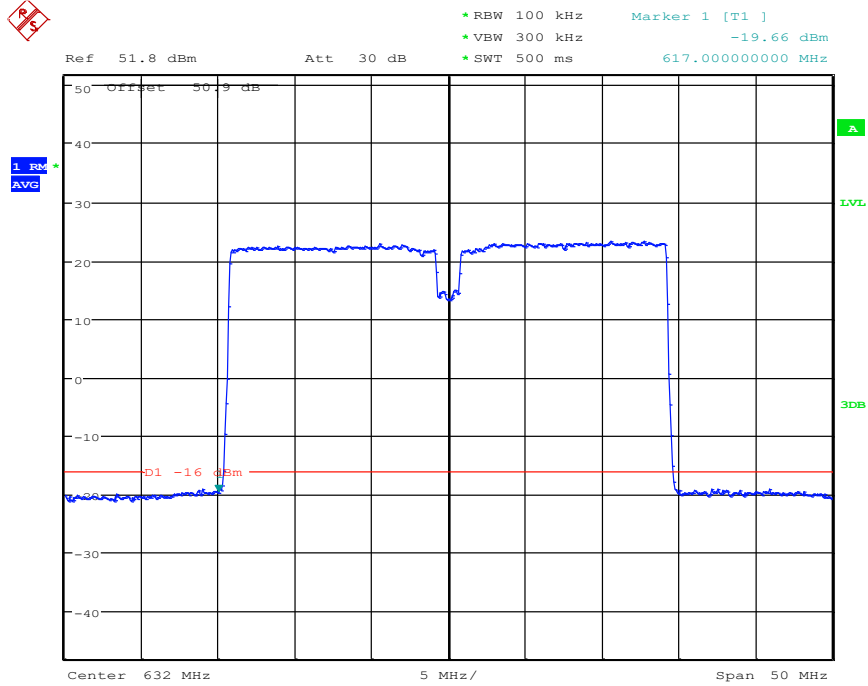
**2.3.2 one signal input —Upper Edge**



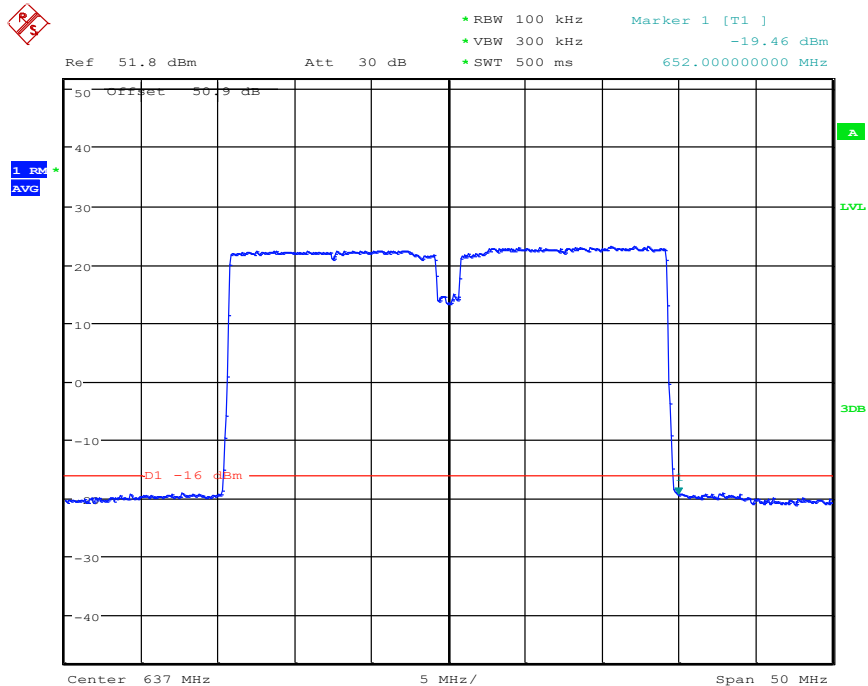
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2.3.3 two signal input —Lower Edge



2.3.4 two signal input —Upper Edge

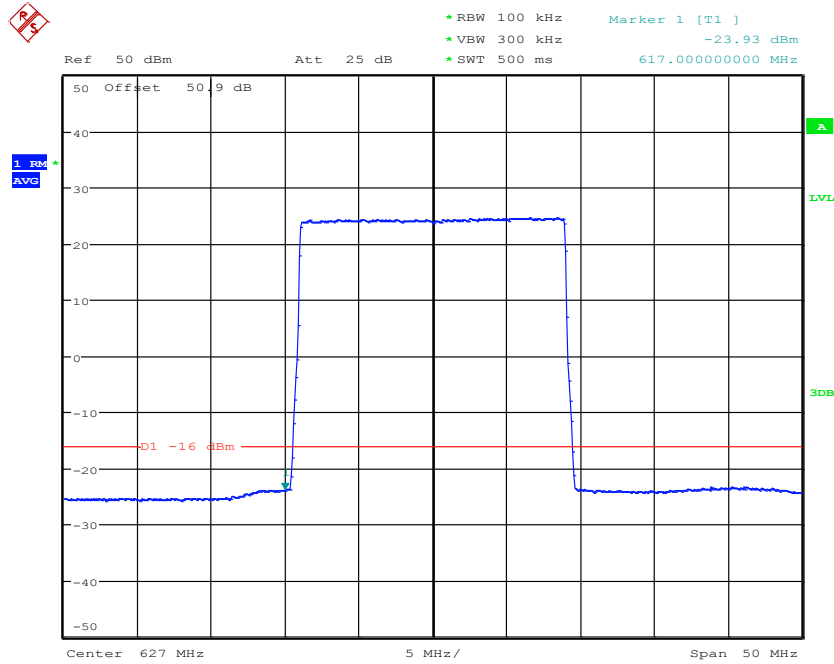


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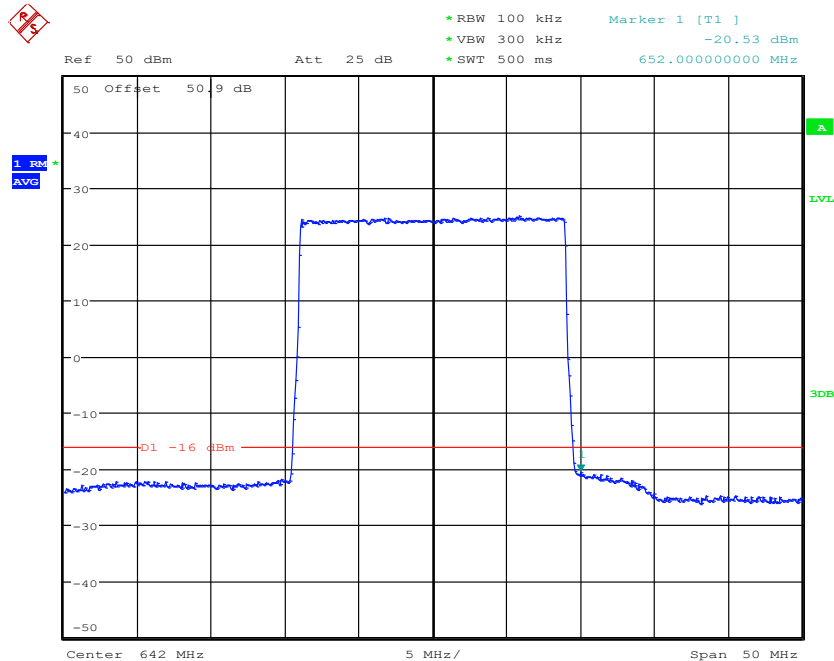
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**2.4 20M Modulation**

**2.4.1 one signal input —Lower Edge**



**2.4.2 one signal input —Upper Edge**



**Remark:**

Performed the band edge of the EUT operation on QPSK, 16QAM, 64QAM modulation separately, only the worst case 64QAM modulation was record in the report.



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### 6.2.4 Conducted Spurious Emissions

Test Requirement: FCC part 27.53(g)  
 600MHz: 617-652MHz

Test Method: According to clause 5.7 of ANSI C63.26-2015

Test Limit: §27.53 Emission limits.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Test Limit:  $40.06(\text{dBm}) - (43 + 10 \log(10\text{W})) - 3 = -16\text{dBm}$

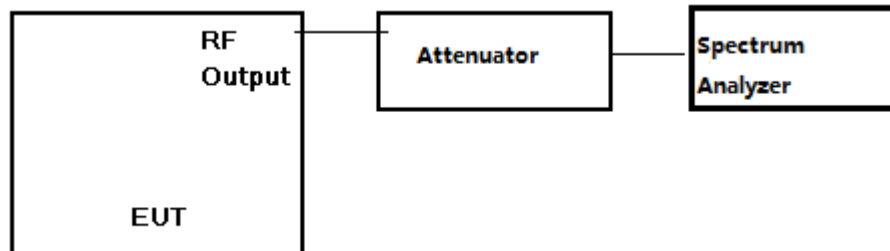
EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:



Conducted Spurious Emissions test configuration



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**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.

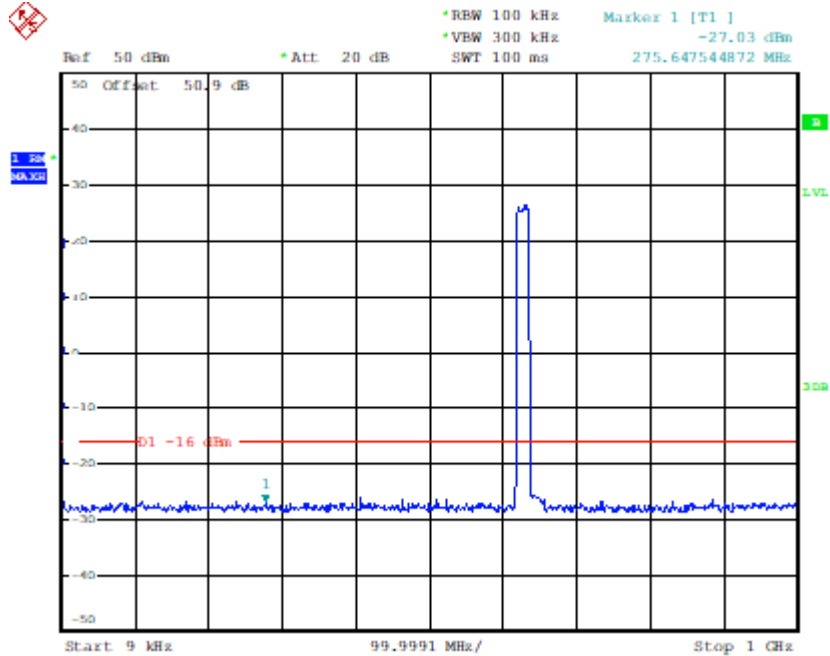


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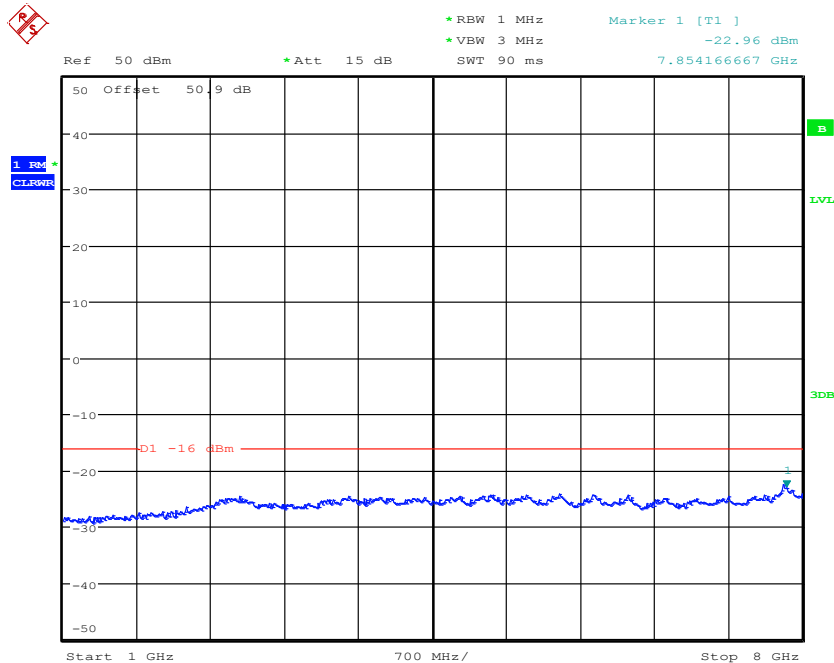
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**6.2.4.1 Measurement Record:**

**1) ANT1 Port:**  
**1.1 Lowest frequency**  
 9KHz to 1GHz

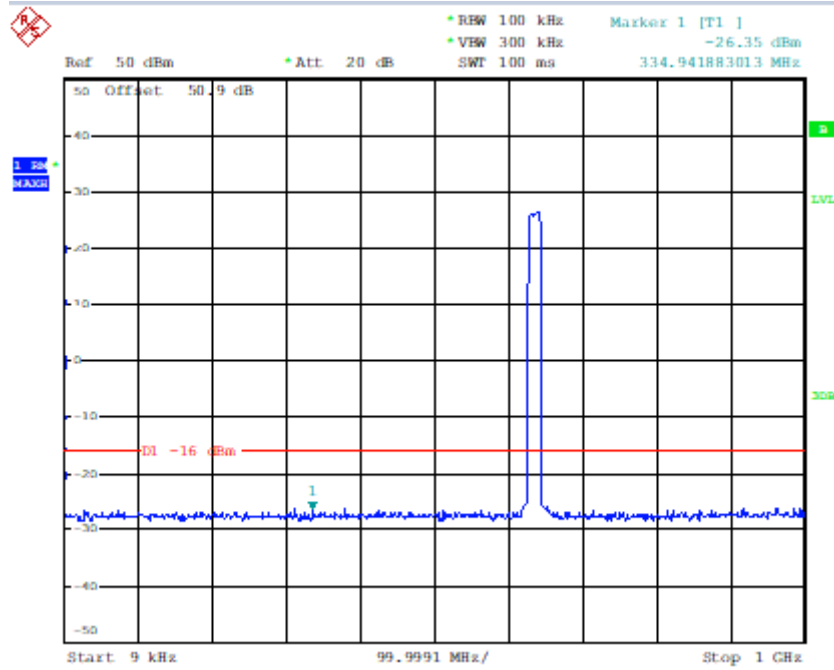


1GHz to 8GHz

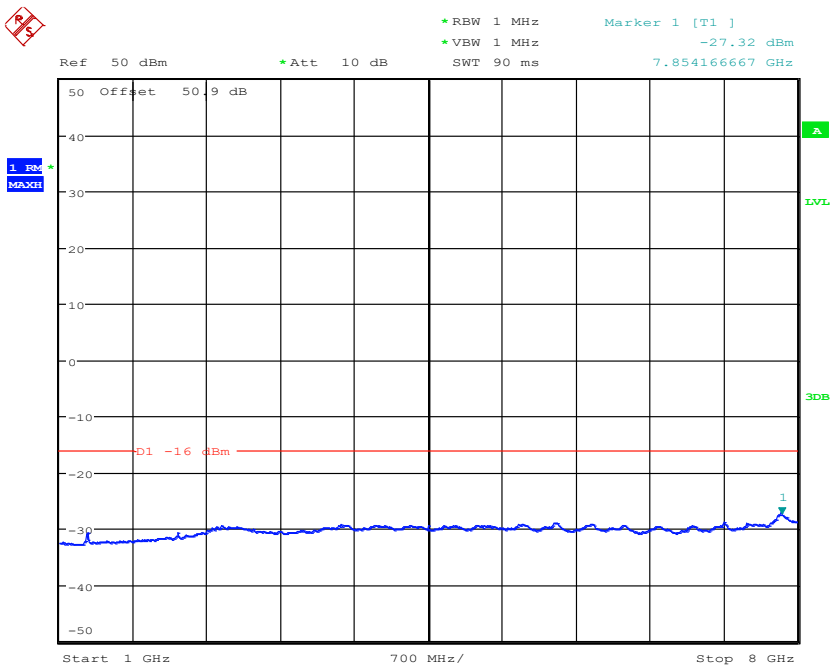


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**1.2 Middle frequency**  
**9KHz to 1GHz**



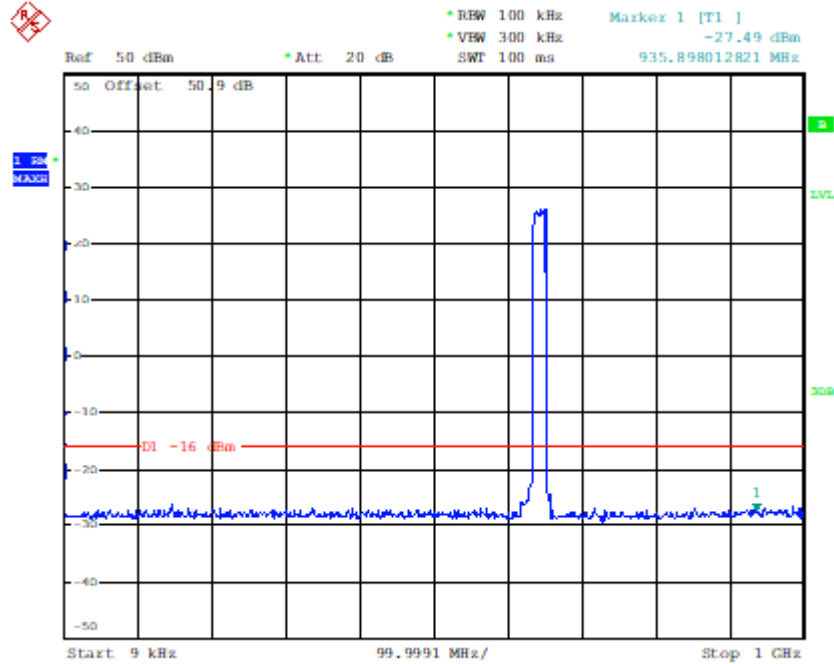
**1GHz to 8GHz**



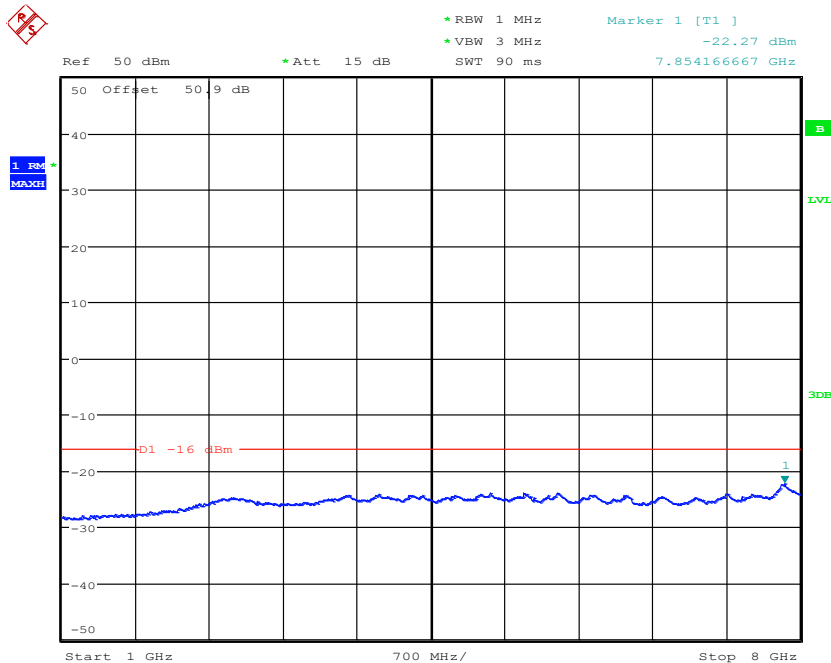
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**1.3 Highest frequency**

9KHz to 1GHz



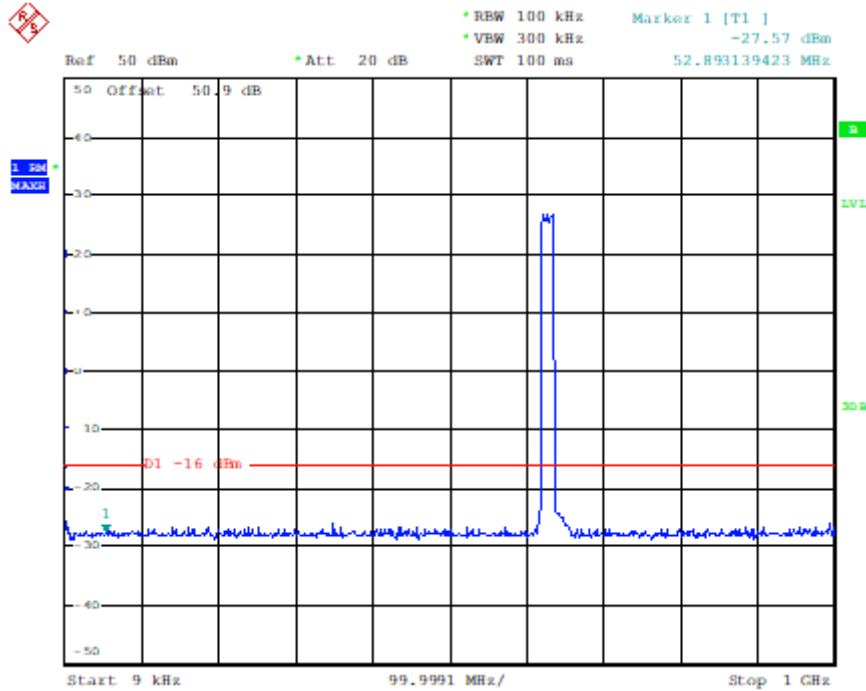
1GHz to 8GHz



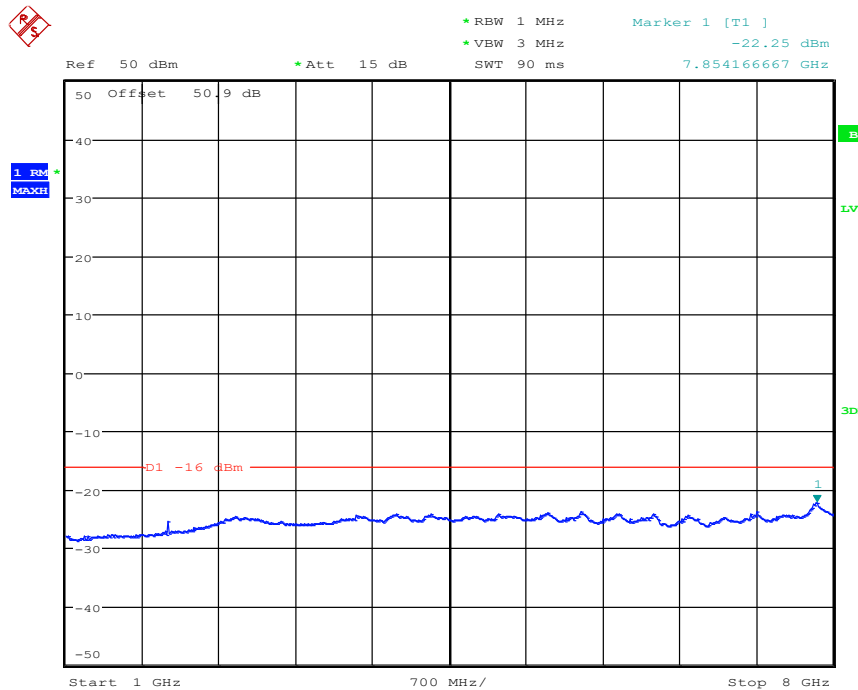
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**2)ANT2 Port:**  
**2.1 Lowest frequency**  
 9KHz to 1GHz



1GHz to 8GHz



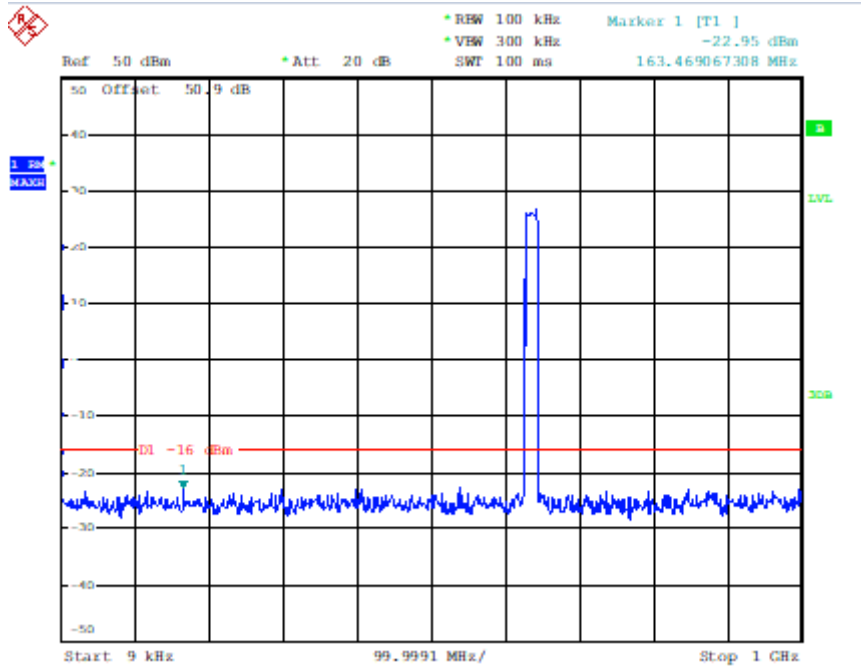
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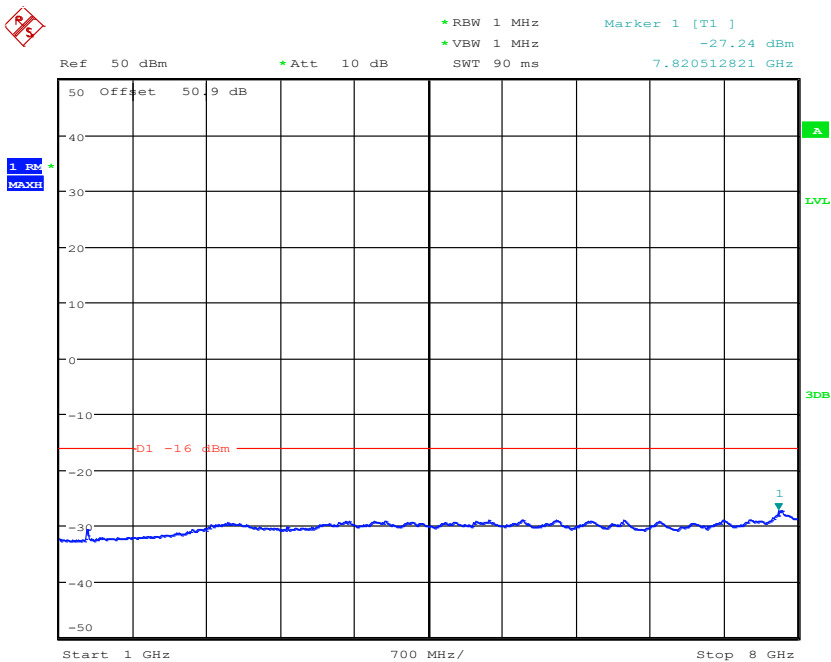


**2.2 Middle frequency**

9KHz to 1GHz



1GHz to 8GHz

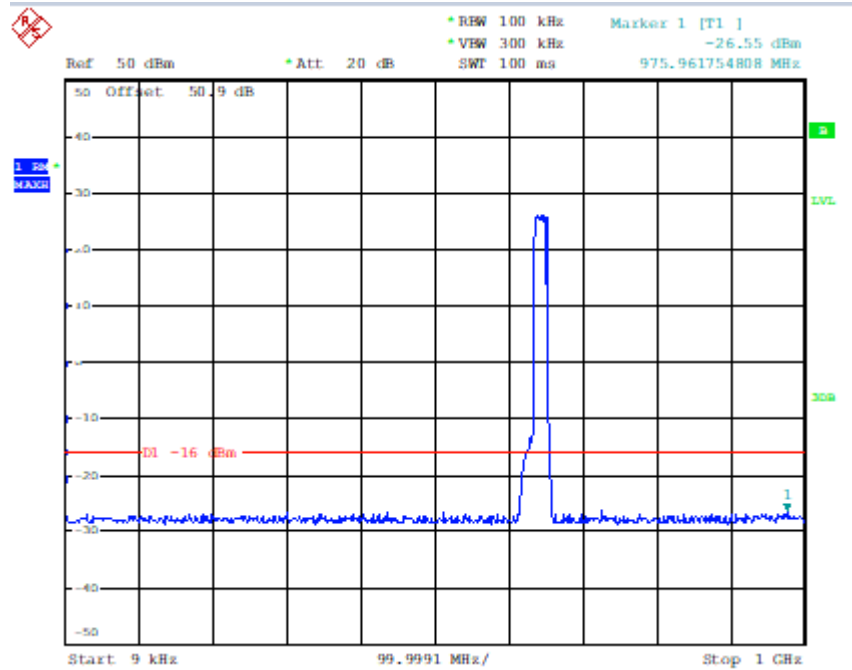


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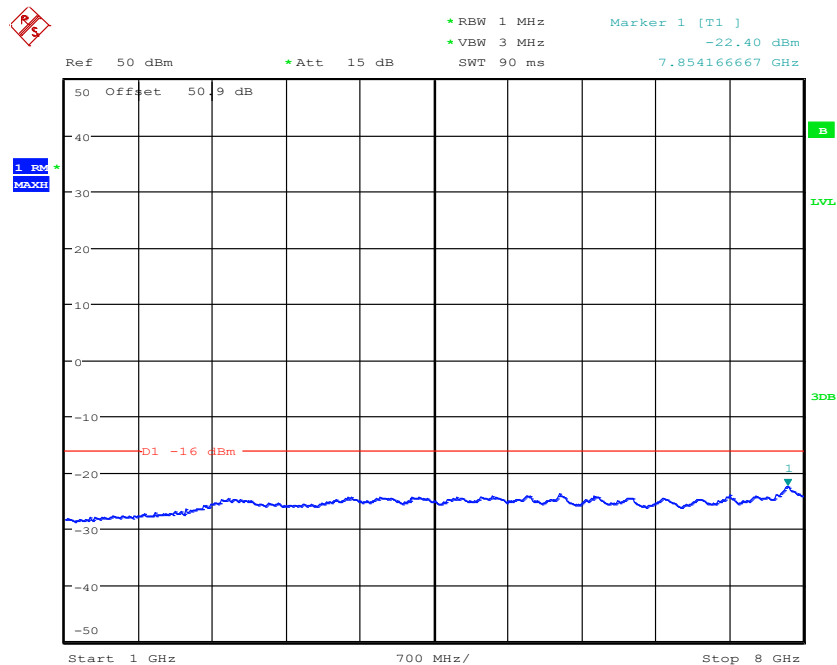
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**3) Highest frequency**

9kHz to 1GHz



1GHz to 8GHz



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**Remark:**

Performed the conducted emissions of the EUT operation on single Carrier with 5M,10M,15M,20M bandwidth and Dual carrier 5M,10M,15M bandwidth with QPSK, 16QAM,64QAM separately, only the worst case 20M bandwidth 64QAM modulation with single carrier was record in the report.

**6.2.5 Frequency Stability**

Test Requirement: FCC part 27.54

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 nominal voltage frequency value as reference point;
  - d) (1) From -30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
  - e) when reach a temperature point, keep the temperature balance 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 nominal voltage frequency value as reference point;
  - b) vary the voltage from -15% nominal voltage to +15% voltage;
  - c) read the frequency at the relative voltage.



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**1) Frequency Stability vs temperature:**

1.1) Test for Transmitter: 617~652MHz (middle channel 634.5MHz Modulation)

Temperature(°C)	Frequency(MHz)	Tolerance(ppm)
50	634.500009	-0.00078802
40	634.500013	-0.00015760
30	634.500012	-0.00031521
20	634.500014	Reference
10	634.500016	0.00031521
0	634.500007	-0.00110320
-10	634.500008	0.00094560
-20	634.500010	0.00063042
-30	634.500015	0.00015760

**2) Frequency Stability vs voltage:**

2.1) For AC supplied:

2.1.1) Test for Transmitter: 617~652MHz (middle channel 634.5MHz)

Voltage(V DC)	Frequency(MHz)	Tolerance(ppm)
-40.8 (-48*0.85)	634.500006	-0.00031521
-48	634.500008	Reference
-55.2 (-48*1.15)	634.500012	0.00063042

The device within the specified frequency range during test. Meet the Frequency Stability requirement.



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**6.2.6 Radiated Spurious Emissions**

Test Requirement: FCC part 27.53(g)  
 600MHz: 617-652MHz

§27.53 Emission limits.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Test limit:  $40.06(\text{dBm}) - (43 + 10 \log(10\text{W})) = -13\text{dBm}$

Test Method: According to clause 5.5 of ANSI C63.26-2015

EUT Operation:

Status: Drive the EUT to maximum output power of both channels and simultaneous emission.

Conditions: Normal conditions

Application: Enclosure

Test Configuration:

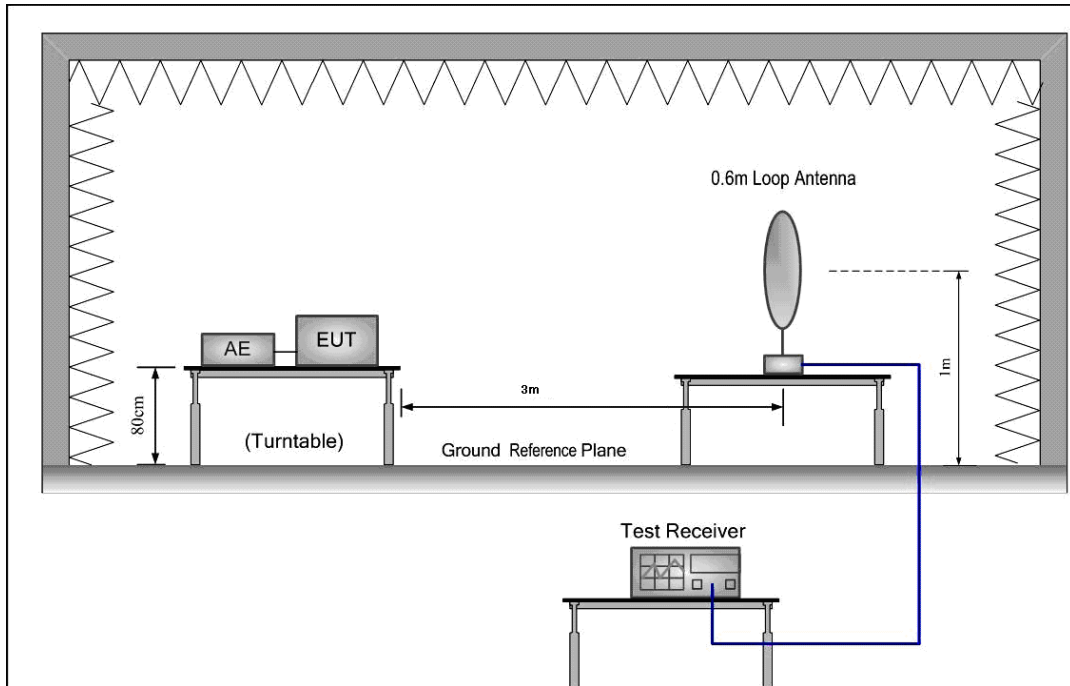


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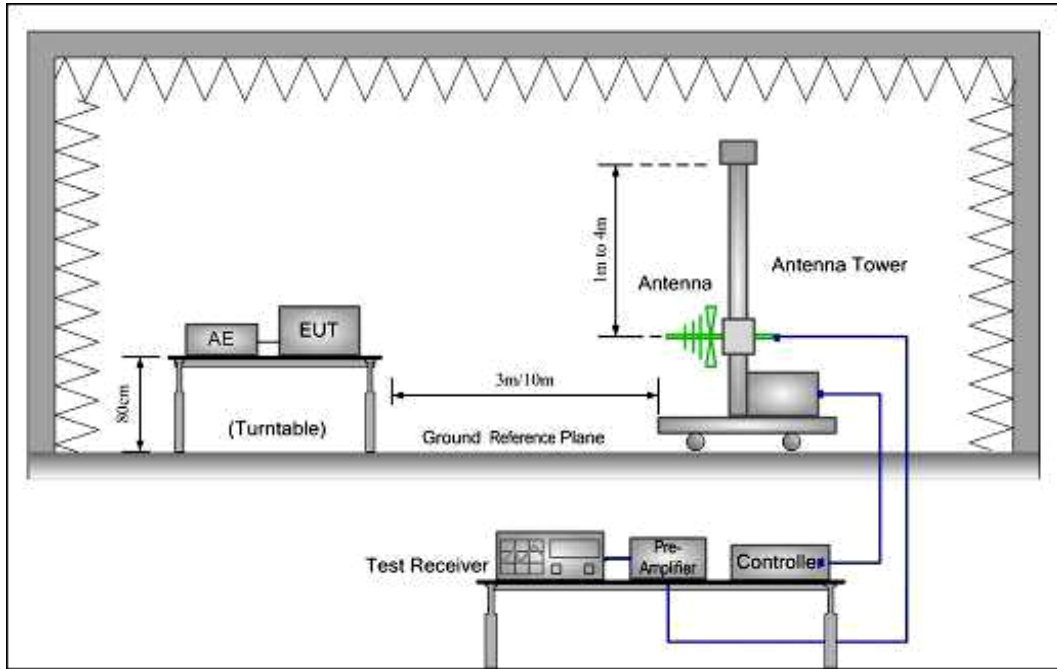
9 kHz to 30 MHz emissions:



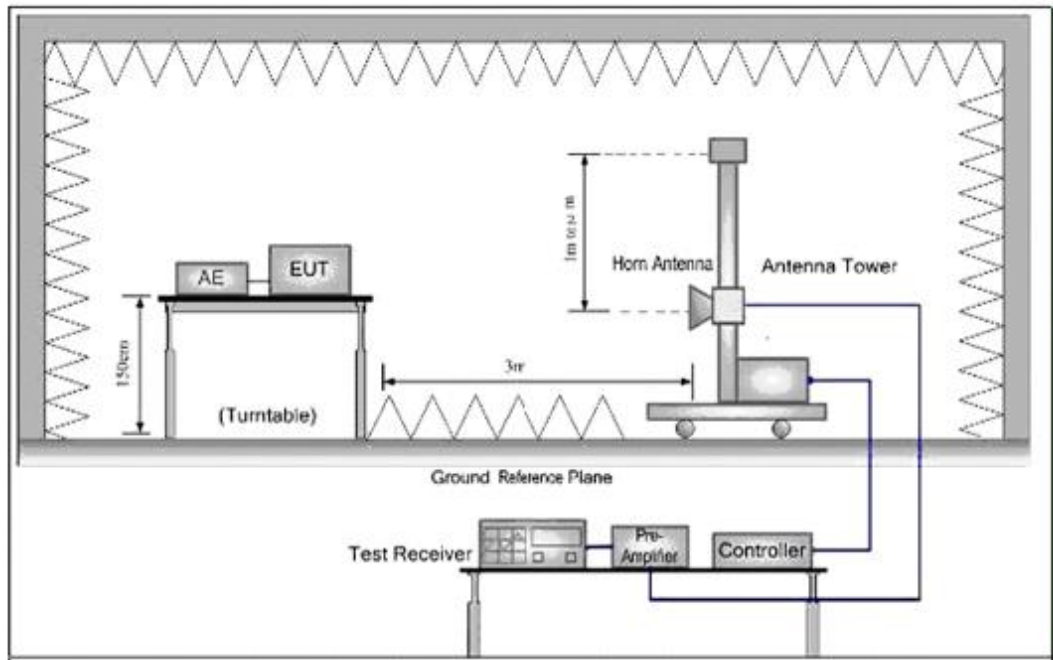
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30MHz to 1GHz emissions:



1GHz to 40GHz emissions:

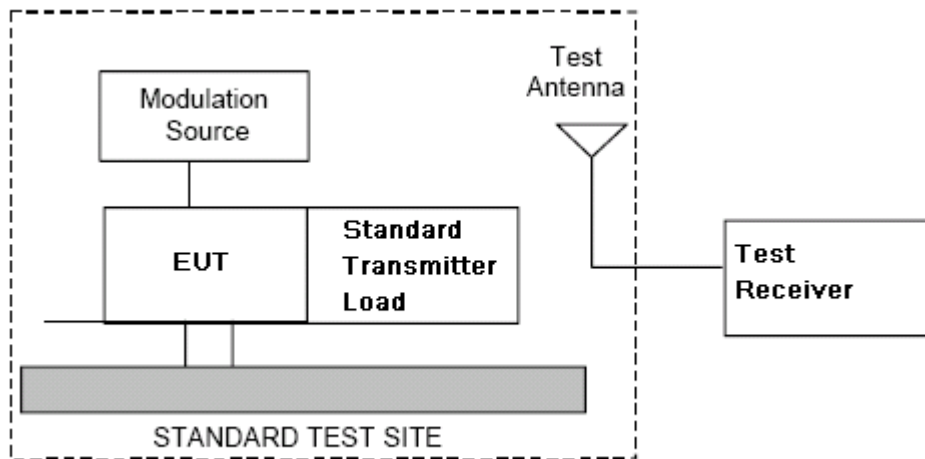


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- Test Procedure:
1. Test the background noise level with all the test facilities;
  2. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;
  3. Select the suitable RF notch filter to avoid the test receiver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

Radiated Emissions Test Procedure:

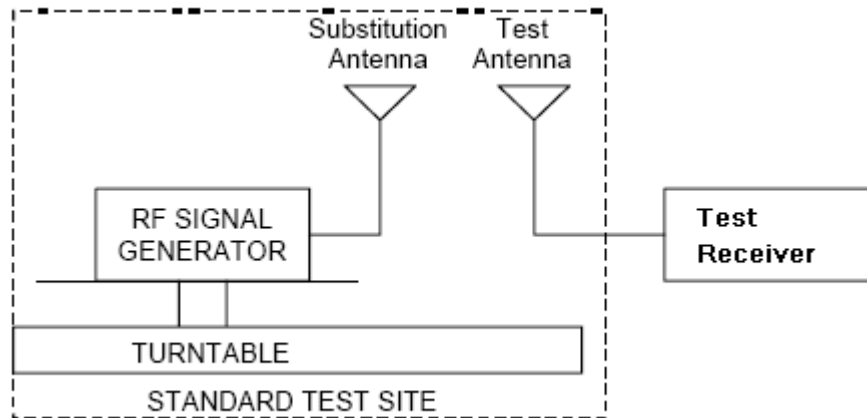


- a) Connect the equipment as illustrated.
- b) Adjust the spectrum analyzer for the following settings:
  - 1) Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.
  - 2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz 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 from 30MHz to 10 times of fundamental carrier, except for the region close to the carrier equal to  $\pm$  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.



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- 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:

$$Pd(\text{dBm}) = Pg(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

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.

$$\text{e.r.p (dBm)} = \text{e.i.r.p. (dBm)} - 2.15$$



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**6.2.6.1 Measurement Record:**

**9KHz~30 MHz Field Strength of Unwanted Emissions.**

The measurements with Loop and Log antennas were greater than 20dB below the limit, so the test data were not recorded in the test report.

**30 MHz~1 GHz Spurious Emissions .**

Pretest the device at lowest/ middle /highest frequency with different modulation bandwidth, and only recored the worst frequency (634.5MHz) with 5Mhz modulation bandwidth in the report.

**Vertical:**

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB/m	dB	dB	dBm	dBm	dB	
1	60.07	-32.55	-2.10	0.00	0.00	-34.65	-12.99	-21.66	VERTICAL
2	97.80	-31.21	-5.43	0.00	0.00	-36.64	-12.99	-23.65	VERTICAL
3	167.82	-34.97	-3.94	0.00	0.00	-38.91	-12.99	-25.92	VERTICAL
4	316.59	-29.95	-2.57	0.00	0.00	-32.52	-12.99	-19.53	VERTICAL
5	519.06	-48.21	1.16	0.00	0.00	-47.05	-12.99	-34.06	VERTICAL
6	737.07	-36.42	5.07	0.00	0.00	-31.35	-12.99	-18.36	VERTICAL

**Horizontal:**

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB/m	dB	dB	dBm	dBm	dB	
1	37.81	-34.84	2.25	0.00	0.00	-32.59	-12.99	-19.60	HORIZONTAL
2	69.84	-35.27	-6.41	0.00	0.00	-41.68	-12.99	-28.69	HORIZONTAL
3	113.71	-48.39	-8.73	0.00	0.00	-57.12	-12.99	-44.13	HORIZONTAL
4	372.00	-36.42	-1.23	0.00	0.00	-37.65	-12.99	-24.66	HORIZONTAL
5	716.68	-37.57	3.64	0.00	0.00	-33.93	-12.99	-20.94	HORIZONTAL
6	872.18	-43.07	7.85	0.00	0.00	-35.22	-12.99	-22.23	HORIZONTAL



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**Above 1G:  
 Vertical:**

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB/m	dB	dB	dBm	dBm	dB	
1	1071.03	-30.98	3.23	0.00	0.00	-27.75	-12.99	-14.76	VERTICAL
2	1284.85	-31.66	4.39	0.00	0.00	-27.27	-12.99	-14.28	VERTICAL
3	1674.81	-40.76	5.44	0.00	0.00	-35.32	-12.99	-22.33	VERTICAL
4	1913.22	-46.30	7.06	0.00	0.00	-39.24	-12.99	-26.25	VERTICAL
5	3210.29	-45.76	2.64	0.00	0.00	-43.12	-12.99	-30.13	VERTICAL
6	6873.29	-61.65	20.70	0.00	0.00	-40.95	-12.99	-27.96	VERTICAL

**Horizontal:**

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB/m	dB	dB	dBm	dBm	dB	
1	1284.49	-44.34	4.06	0.00	0.00	-40.28	-12.99	-27.29	HORIZONTAL
2	1531.56	-41.00	4.85	0.00	0.00	-36.15	-12.99	-23.16	HORIZONTAL
3	1926.22	-49.18	7.25	0.00	0.00	-41.93	-12.99	-28.94	HORIZONTAL
4	4313.92	-44.93	4.33	0.00	0.00	-40.60	-12.99	-27.61	HORIZONTAL
5	5147.96	-58.88	12.36	0.00	0.00	-46.52	-12.99	-33.53	HORIZONTAL
6	6816.35	-61.60	20.36	0.00	0.00	-41.24	-12.99	-28.25	HORIZONTAL



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**Remark:**

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

Measured were performed in the lowest, middle and highest frequency for the Transmitter of products  
 The spectrum was searched from 9KHz to 8GHz (10th Harmonic) for Transmitter and only record some worse cases(middle frequency).

Performed the pretest radiated emissions of the EUT operation on single Carrier 5M,10M,15M,20M modulation and Dual carrier 5M,10M,15M, with different modulation type QPSK, 16QAM,64QAM Separately, only the worst case 20M bandwidth 64QAM with single carrier was record in the report.

**--The End of Report--**



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