RED-Radio Test Report

For

MAXIIOT LTD

LoRaWAN

Model No.: GL5712-EX, GL5712-EA

Prepared For	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
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Report Number	:	SZAWW180830005-04W
Date of Receipt	:	Aug. 30, 2018
Date of Test	:	Aug. 30~Nov. 13, 2018
Date of Report	:	Nov. 13, 2018

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TEST REPORT

Applicant	:	MAXIIOT LTD
Manufacturer	:	MAXIIOT LTD
Product Name	:	LoRaWAN
Model No.	:	GL5712-EX, GL5712-EA
Trade Mark	:	MAXIIOT
Rating(s)	:	Input: 3.3V⎓ 2A

Test Standard(s) : ETSI EN 300 220-1 V3.1.1 (2017-02)
ETSI EN 300 220-2 V3.1.1 (2017-02)

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 300 220-1 & EN 300220-2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test: Aug. 30~Nov. 13, 2018

Prepared By: (Engineer / Oliay Yang)

Reviewer: (Supervisor / Snowy Meng)

Approved & Authorized Signer: (Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Manufacturer	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Factory	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680

1.2. Description of Device (EUT)

Product Name	:	LoRaWAN	
Model No.	:	GL5712-EX, GL5712-EA (Note: All samples are the same except the different connectors, so we prepare "GL5712-EX" for test only.)	
Trade Mark	:	MAXIIOT	
Test Power Supply	:	TX & RX: DC 5V via USB Port	
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)	
Product Description	:	Operation Frequency:	868.1-868.5MHz
		Number of Channel:	5 Channels
		Modulation Type:	OOK
		Software Version:	V1.0
		Hardware Version:	V1.0
		Antenna Type:	Cylindrical Antenna
		Antenna Gain(Peak):	5 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

PC	:	Manufacturer: DELL
		M/N: Optiplex 3020 MT S/N: CN-079V51-70163-4AD-089K-A00 Input Rating: AC 100-240V, 50-60Hz 5.4A CE , FCC DOC, CCC
MONITOR	:	Manufacturer: DELL
		M/N: E1914Hf S/N: CN-034H2R-72872-419-AFJB Input:100V-240V, 1.5A, 50/60Hz TUV-GS, FCC, CE, KCC, VCCI
KEYBOARD	:	Manufacturer: DELL
		M/N: SK-8120 S/N: CN-0DJ365-71616-49J-0MVR-A00 Input Rating: DC 5V, 0.05A CE, FCC, VCCI, KCC, TUV-GS Cable: 1.8m, unshielded
MOUSE	:	Manufacturer: DELL M/N: MS111-T S/N: CN-0KW2YH-71616-488-1CBJ Input Rating: DC 5V, 0.1A Cable: 1.8m, unshielded CE, FCC, VCCI, KCC, TUV-GS

1.4. Description of Test Modes

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Mode	Description
Mode 1	CH01
Mode 2	CH03
Mode 3	CH05

1.5. List of Channels

Channel	Freq. (MHz)
01	868.1
02	868.2
03	868.3
04	868.4
05	868.5

1.6. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C ~ 35°C	-10°C ~ 45°C Note: (1)
Relative Humidity	20% ~ 75%	N/A
Supply Voltage	TX & RX: DC 5V via USB Port	TX & RX: DC 4.50V~ DC 5.50V
Note: (1) The HT 45°C and LT -10°C was declared by manufacturer.		

1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 05, 2018	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI3	101604	Nov. 05, 2018	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 05, 2018	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 05, 2018	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 05, 2018	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 19, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 20, 2018	1 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Nov. 20, 2018	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 05, 2018	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 05, 2018	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 05, 2018	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 05, 2018	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 05, 2018	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 05, 2018	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Apr. 02, 2018	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Nov. 01, 2018	1 Year

1.8. Measurement Uncertainty

For the test methods, according to ETSI EN 300 220-1&-2 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1 [4] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
All emissions, conducted	±6 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Duty Cycle	±5 %

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed 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 No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

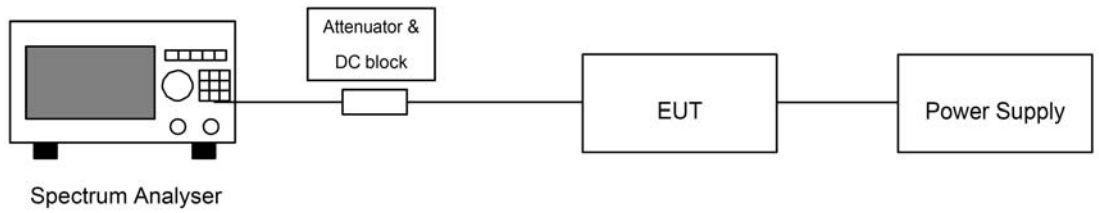
Harmonised Standard ETSI EN 300 220-2			
No.	Test Items	Clause No.	Results
1	Operating frequency	4.2.1	PASS
2	Unwanted emissions in the spurious domain	4.2.2	PASS
3	Effective radiated power	4.3.1	PASS
4	Maximum e.r.p. spectral density	4.3.2	N/A
5	Duty cycle	4.3.3	PASS
6	Occupied bandwidth	4.3.4	PASS
7	TX out of band emissions	4.3.5	PASS
8	Transient Power	4.3.6	PASS
9	Adjacent channel power	4.3.7	N/A
10	TX behaviour under low voltage conditions	4.3.8	PASS
11	Adaptive power control	4.3.9	N/A
12	FHSS	4.3.10	N/A
13	Short term behaviour	4.3.11	N/A
14	RX sensitivity	4.4.1	N/A
15	Receiver Blocking	4.4.2	PASS
16	Clear channel assessment threshold	4.5.2	N/A
17	Polite spectrum access timing parameters	4.5.3	N/A
18	Adaptive Frequency Agility	4.5.4	N/A
Note: 1. “N/A” is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device. 2. EUT Receiver categorie is Category 3.			

3. Operating Frequency

3.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.2.1
Test Limit	The manufacturer may declare either one or more operating frequencies and operating channels. Operating channel(s) shall be be entirely within operational frequency bands allowed by annexes B, C or any NRI.
	868MHz to 868.6MHz

3.2. Test Setup



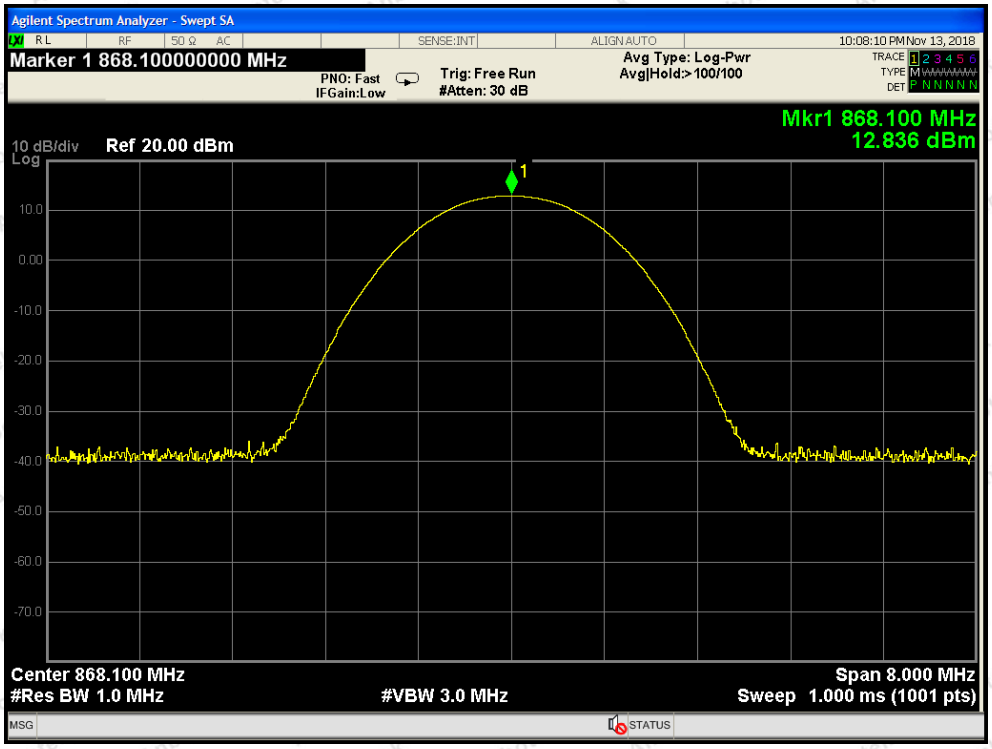
3.3. Test Procedure

The conducted measurement procedure in clause 5.1.2. of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

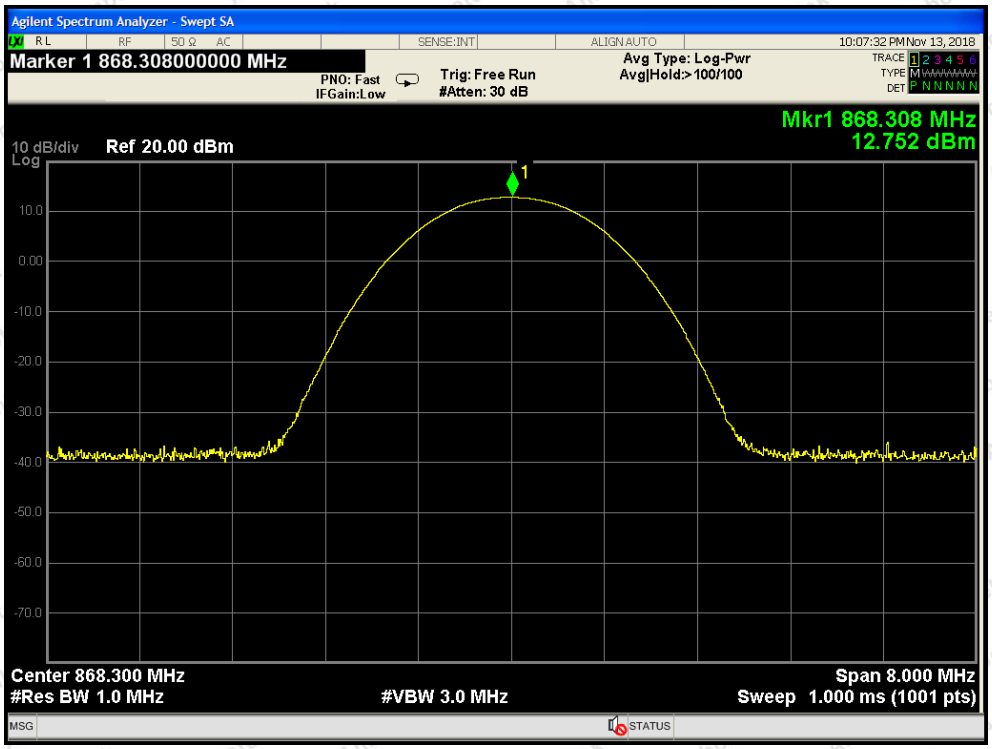
3.4. Test Data

Pass

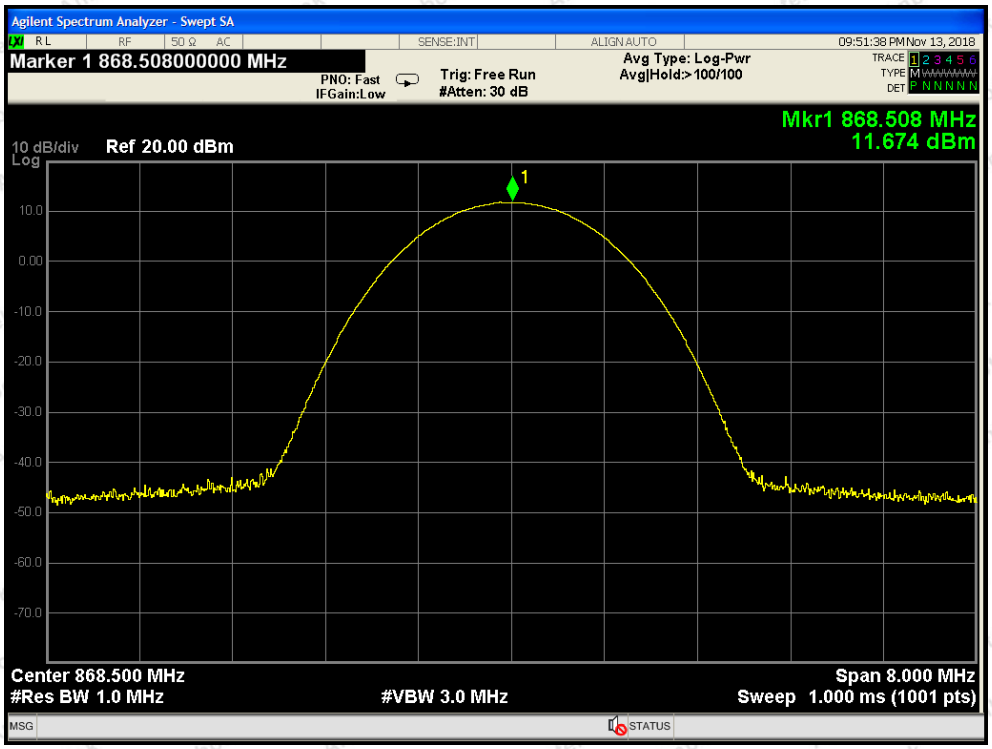
Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	TX: DC 5V via USB Port



Test Mode: CH01



Test Mode: CH03



Test Mode: CH05

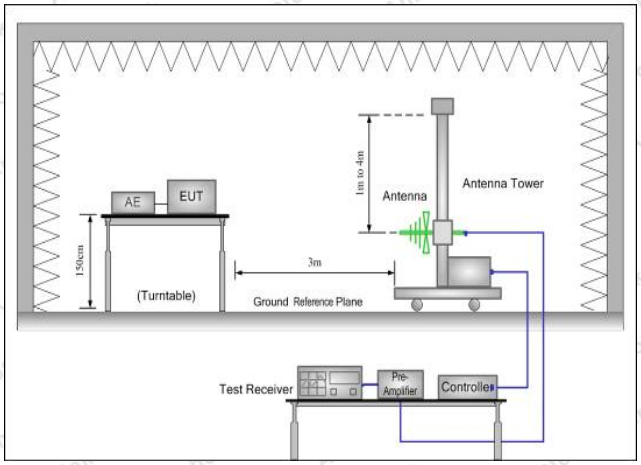
3. Unwanted Emissions In The Spurious Domain

3.1. Test Standard and Limit

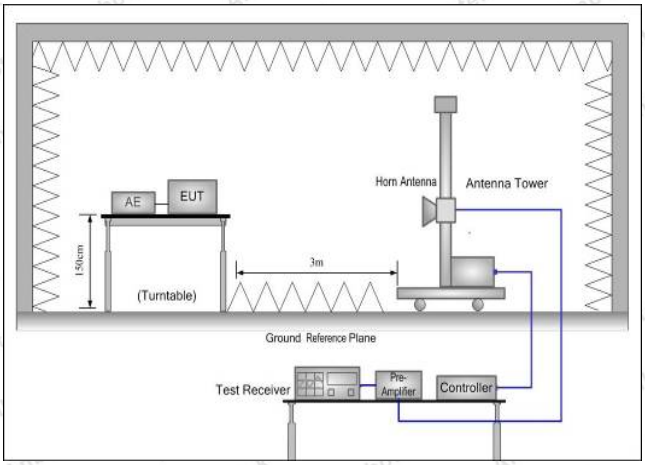
Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.2.2			
Test Limit	State \ Frequency	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1 000 MHz	Frequencies above 1 000 MHz
	TX mode	-54 dBm	-36 dBm	-30 dBm
	RX and all other modes	-57 dBm	-57 dBm	-47 dBm

3.2. Test Setup

(A) Radiated Emission Test Set-Up Frequency Bellow 1 GHz.



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



3.3. Test Procedure

The conducted measurement procedure in clause 5.9.3.3.1 of ETSI EN 300 220-1 V3.1.1.
The radiated measurement procedure in clause 5.9.3.3.2 of ETSI EN 300 220-1 V3.1.1, with the antenna port terminated in a dummy load.
The measurements shall be performed during continuously transmitting.

3.4. Test Data

PASS

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	TX: DC 5V via USB Port

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
70.38	-68.03	-54.00	-14.03	H	PASS
148.69	-53.27	-36.00	-17.27	H	
182.72	-74.02	-54.00	-20.02	H	
868.10	-46.02	-36.00	-10.02	H	
954.00	-68.43	-54.00	-14.43	H	
966.00	-66.12	-54.00	-12.12	H	
47.56	-70.87	-54.00	-16.87	V	
158.65	-58.56	-36.00	-22.56	V	
205.78	-66.06	-54.00	-12.06	V	
868.10	-38.26	-36.00	-2.26	V	
907.41	-65.63	-54.00	-11.63	V	
966.00	-66.76	-54.00	-12.76	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
2604.30	-47.39	-30.00	-17.39	H	PASS
2786.60	-48.07	-30.00	-18.07	H	
3472.40	-44.73	-30.00	-14.73	H	
2786.60	-46.75	-30.00	-16.75	V	
2604.30	-44.60	-30.00	-14.60	V	
3472.40	-46.87	-30.00	-16.87	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	RX: DC 5V via USB Port

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
64.06	-66.73	-57.00	-9.73	H	PASS
95.04	-68.50	-57.00	-11.50	H	
171.41	-63.62	-57.00	-6.62	H	
227.29	-68.18	-57.00	-11.18	H	
443.75	-67.40	-57.00	-10.40	H	
738.86	-68.50	-57.00	-11.50	H	
50.67	-67.01	-57.00	-10.01	V	
97.99	-66.99	-57.00	-9.99	V	
127.83	-69.18	-57.00	-12.18	V	
204.15	-73.90	-57.00	-16.90	V	
454.35	-66.64	-57.00	-9.64	V	
539.02	-70.73	-57.00	-13.73	V	

Test Result: above 1000MHz

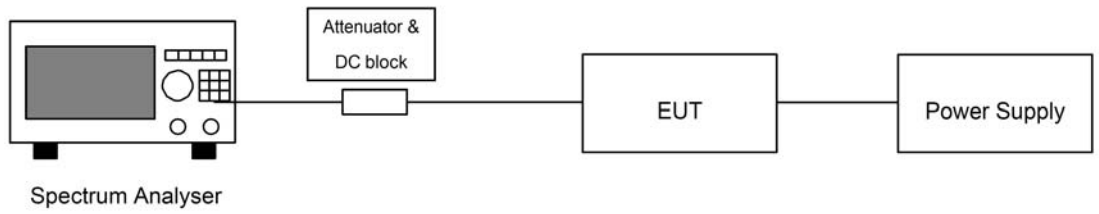
Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
2586.94	-44.51	-30.00	-14.51	H	PASS
2621.66	-46.75	-30.00	-16.75	H	
3489.76	-47.21	-30.00	-17.21	H	
2786.60	-47.11	-30.00	-17.11	V	
2612.98	-44.28	-30.00	-14.28	V	
3481.08	-42.78	-30.00	-12.78	V	

4. Effective Radiated Power

4.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.3.1	
Test Limit	The effective radiated power shall not be greater than the value allowed in annexes B or C (EN 300 220-2) for the chosen operational frequency band(s).	
	Frequency Band	Maximum effective radiated power
	433.04MHz to 434.79MHz	10mW
	868MHz to 868.6MHz	25mW
	915.20MHz to 920.8MHz	25mW

4.2. Test Setup



4.3. Test Procedure

The conducted measurement procedure in clause 5.2.2.1 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

4.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	See below

Test Mode:		TX CH01		
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	TX: DC 5V	12.84
T min (°C)	-10.00	V nom (V)	TX: DC 4.50V	12.35
T max (°C)	45.00	V nom (V)	TX: DC 5.50V	12.76
Max RF Power				12.84
Limits				13.98
Result				PASS

Test Mode:		TX CH03		
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	TX: DC 5V	12.75
T min (°C)	-10.00	V nom (V)	TX: DC 4.50V	12.32
T max (°C)	45.00	V nom (V)	TX: DC 5.50V	12.65
Max RF Power				12.75
Limits				13.98
Result				PASS

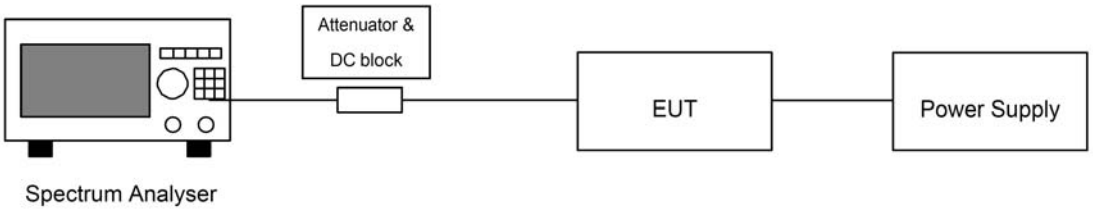
Test Mode:		TX CH05		
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	TX: DC 5Vt	11.67
T min (°C)	-10.00	V nom (V)	TX: DC 4.50V	11.43
T max (°C)	45.00	V nom (V)	TX: DC 5.50V	11.49
Max RF Power				11.67
Limits				13.98
Result				PASS

5. Duty Cycle

5.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.3.3	
Test Limit	The Duty Cycle shall not exceed the following values allowed in annexes B (EN 300 220-2) for the chosen operational frequency band(s).	
	Frequency Band	Channel access and occupation rules (e.g. Duty cycle or LBT + AFA)
	868MHz to 868.6MHz	≤ 1 % duty cycle or polite spectrum access

5.2. Test Setup



5.3. Test Procedure

The conducted measurement procedure in clause 5.4.2 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during uncontinuously transmitting.

5.4. Test Data

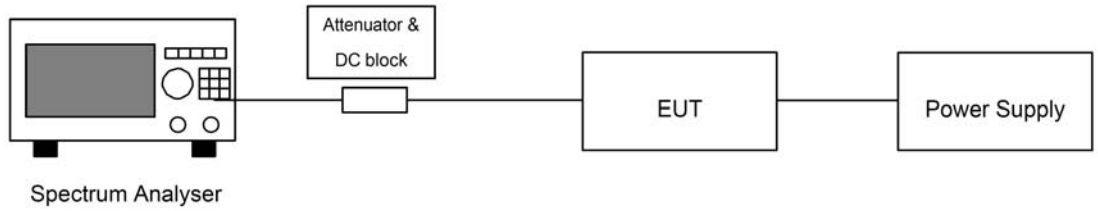
The duty cycle is < 1%

6. Occupied Bandwidth

6.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.3.4
Test Limit	The Operating Channel shall be declared and shall reside entirely within the Operational Frequency Band. The Maximum Occupied Bandwidth at 99 % shall reside entirely within the Operating Channel defined by F_{low} and F_{high}.

6.2. Test Setup



6.3. Test Procedure

The conducted measurement procedure in clause 5.6.3.4 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

6.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	See below

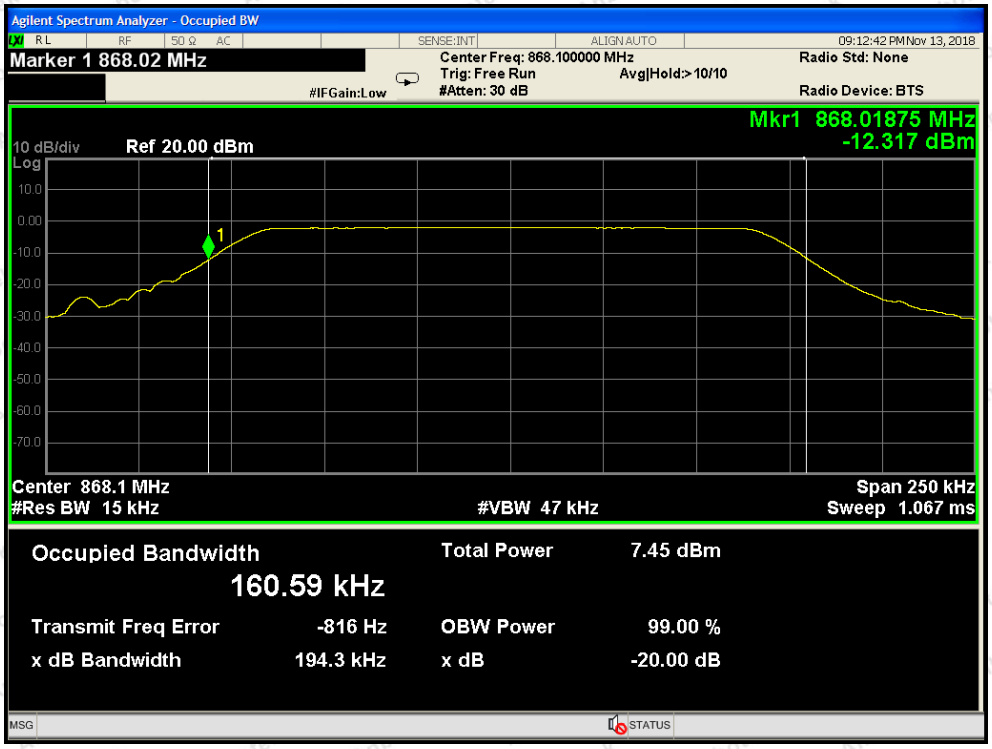
Test Mode:			TX CH01				
Test Channel	Test Temperature	Test Voltage (V dc)	F(Low) MHz	F(High) MHz	OBW (KHz)	Maximum OBW(KHz)	Results
CH01	-10	TX: DC 4.50V	868.0188	868.1795	160.61	160.94	Pass
		TX: DC 5.50V	868.0185	868.1798	160.70		
	25	TX: DC 5V	868.0185	868.1798	161.20		
	45	TX: DC 4.50V	868.0195	868.1805	160.94		
		TX: DC 5.50V	868.0193	868.1818	162.74		

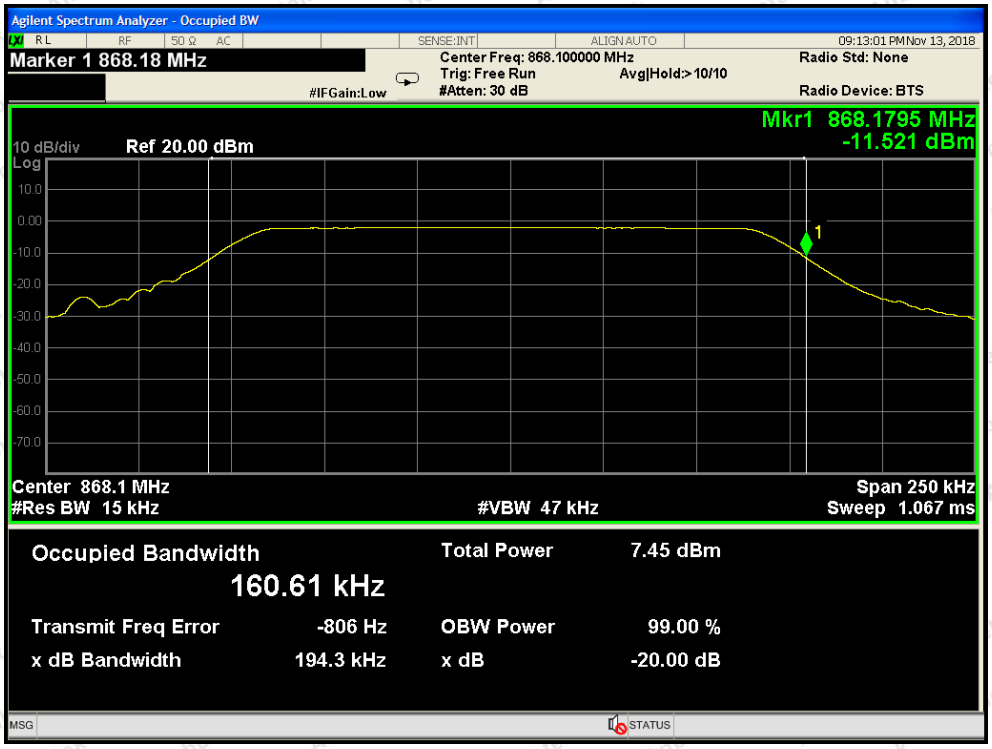
Test Mode:			TX CH03				
Test Channel	Test Temperature	Test Voltage (V dc)	F(Low) MHz	F(High) MHz	OBW (KHz)	Maximum OBW(KHz)	Results
CH01	-10	TX: DC 4.50V	868.2195	868.3798	159.95	162.75	Pass
		TX: DC 5.50V	868.2193	868.3805	161.05		
	25	TX: DC 5V	868.2178	868.3805	162.51		
	45	TX: DC 4.50V	868.2175	868.3808	162.71		
		TX: DC 5.50V	868.2175	868.3808	162.75		

Test Mode:			TX CH05				
Test Channel	Test Temperature	Test Voltage (V dc)	F(Low) MHz	F(High) MHz	OBW (KHz)	Maximum OBW(KHz)	Results
CH01	-10	TX: DC 4.50V	868.4193	868.5800	160.34	161.30	Pass
		TX: DC 5.50V	868.4193	868.5800	160.96		
	25	TX: DC 5V	868.4188	868.5803	161.06		
	45	TX: DC 4.50V	868.4185	868.5803	161.30		
		TX: DC 5.50V	868.4188	868.5795	159.76		

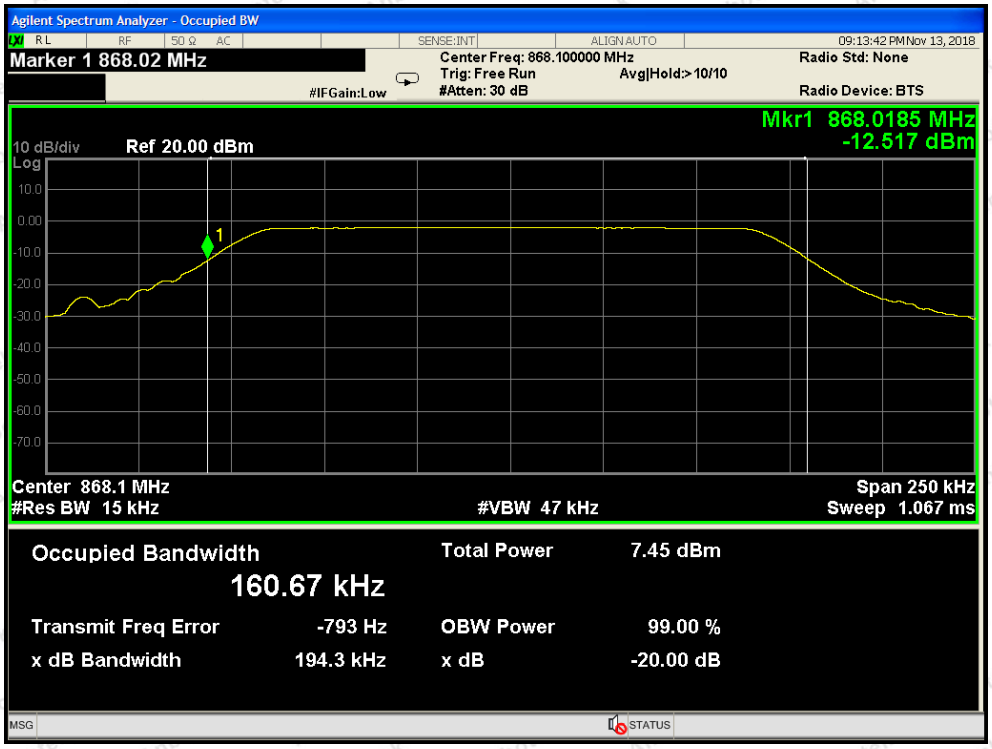
868.1MHz:

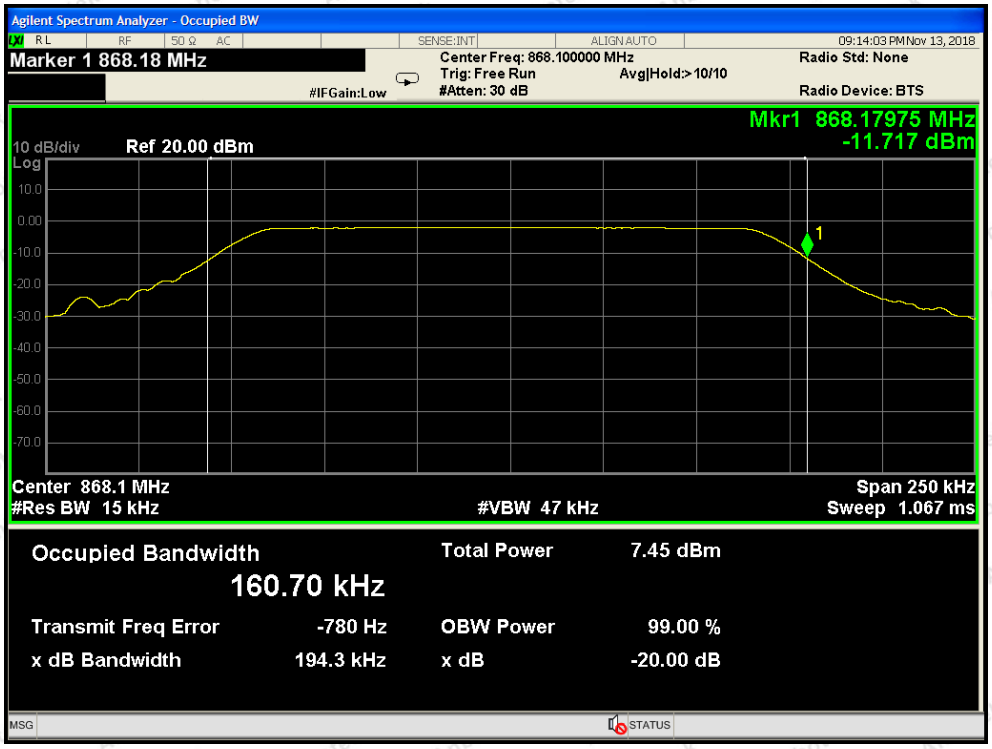
LTLV



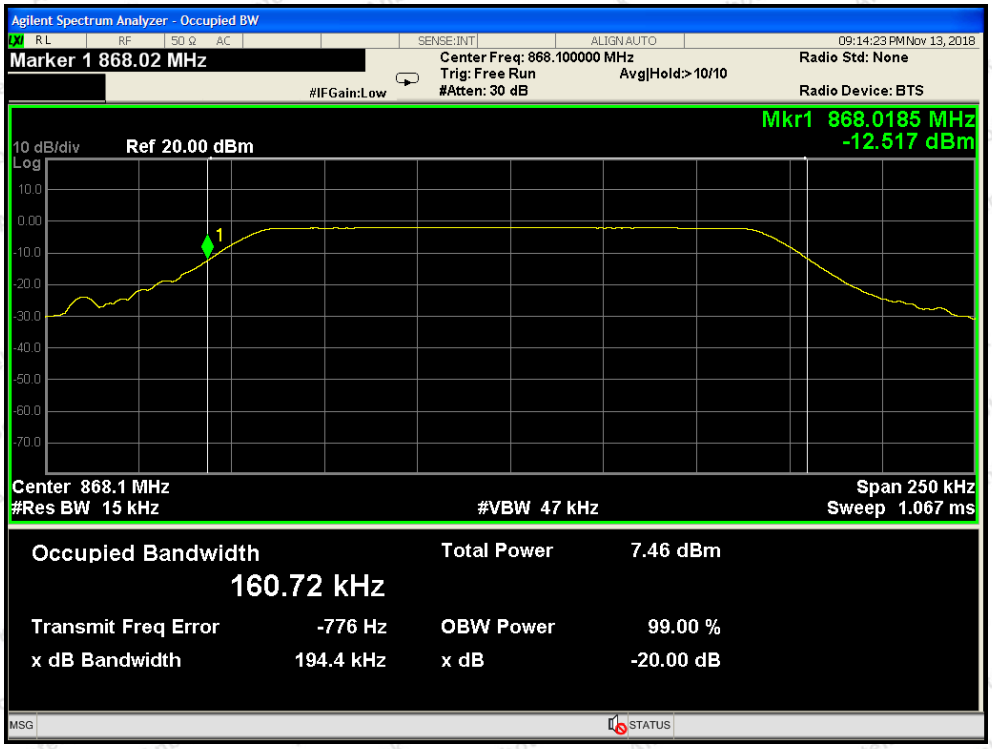


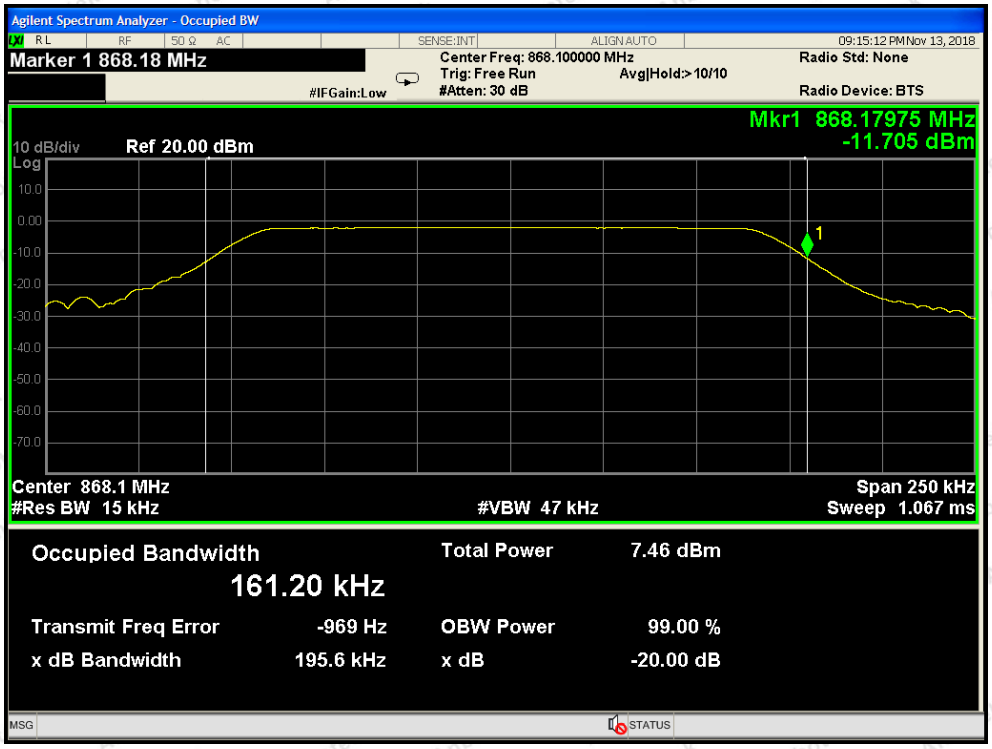
LTHV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:13:42 PM Nov 13, 2018
Marker 1 868.02 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.0185 MHz
-12.517 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.67 kHz
Total Power 7.45 dBm
Transmit Freq Error -793 Hz
OBW Power 99.00 %
x dB Bandwidth 194.3 kHz
x dB -20.00 dB
MSG
STATUS

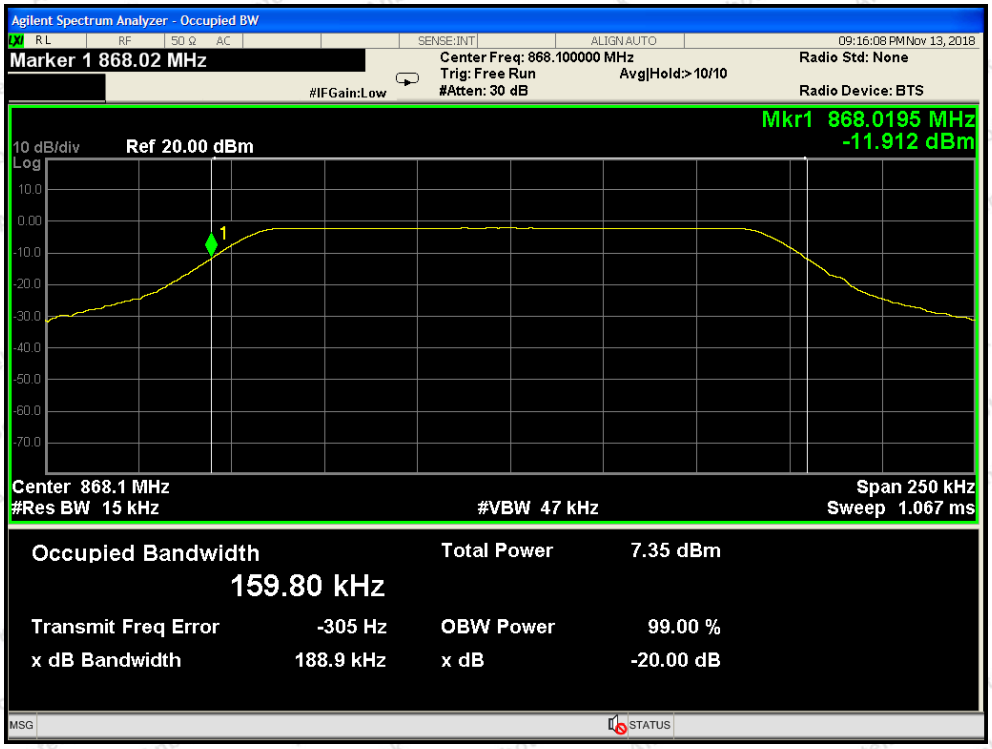

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:14:03 PM Nov 13, 2018
Marker 1 868.18 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.17975 MHz
-11.717 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.70 kHz
Total Power 7.45 dBm
Transmit Freq Error -780 Hz
OBW Power 99.00 %
x dB Bandwidth 194.3 kHz
x dB -20.00 dB
MSG
STATUS

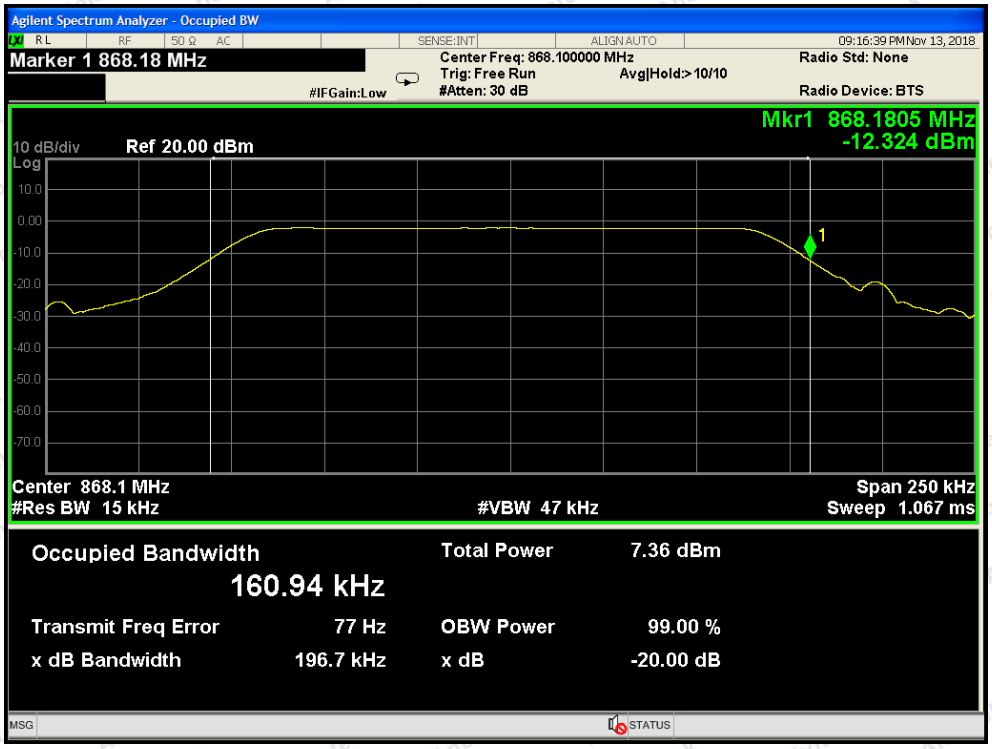
NTNV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:14:23 PM Nov 13, 2018
Marker 1 868.02 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.0185 MHz
-12.517 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.72 kHz
Total Power 7.46 dBm
Transmit Freq Error -776 Hz
OBW Power 99.00 %
x dB Bandwidth 194.4 kHz
x dB -20.00 dB
MSG
STATUS

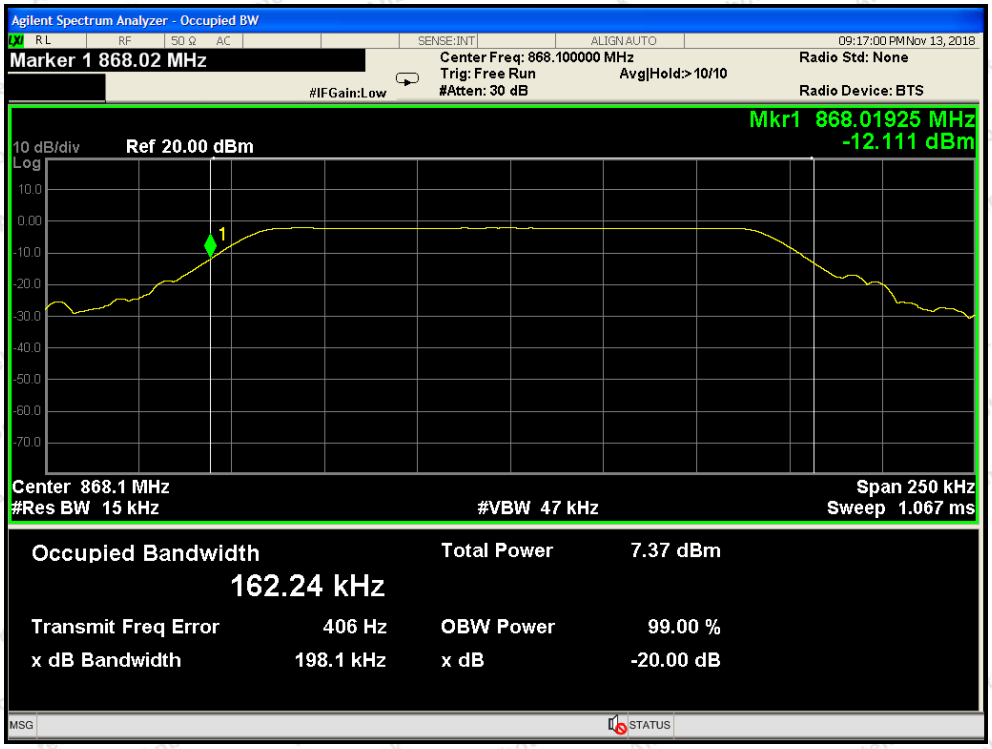

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:15:12 PM Nov 13, 2018
Marker 1 868.18 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.17975 MHz
-11.705 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
161.20 kHz
Total Power 7.46 dBm
Transmit Freq Error -969 Hz
OBW Power 99.00 %
x dB Bandwidth 195.6 kHz
x dB -20.00 dB
MSG
STATUS

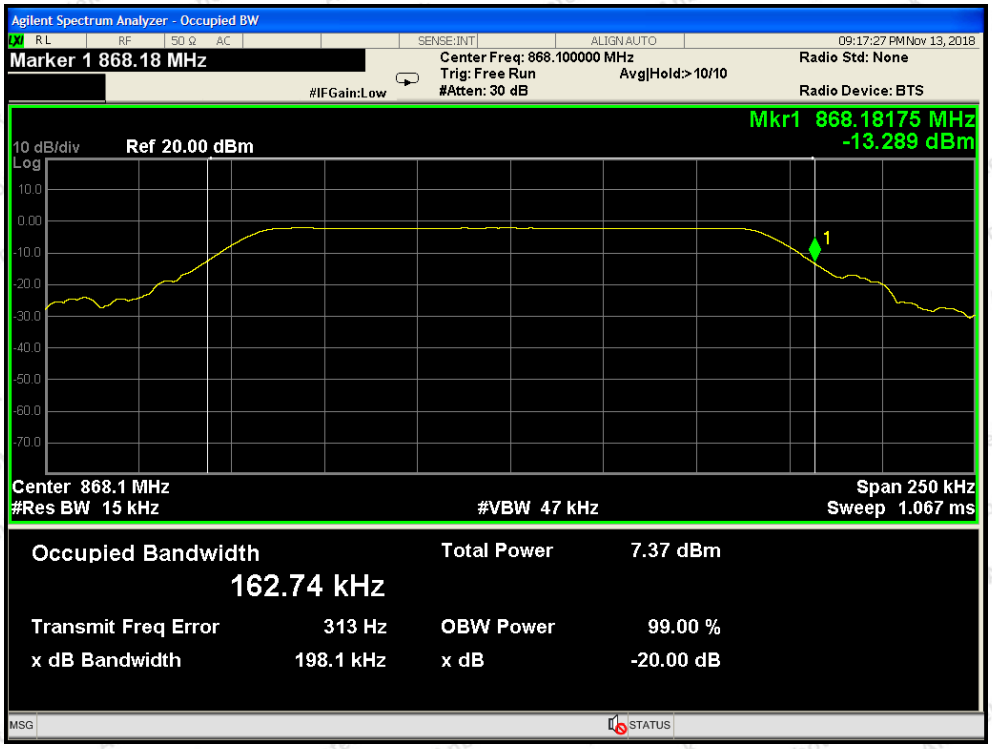
HTLV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:16:08 PM Nov 13, 2018
Marker 1 868.02 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.0195 MHz
-11.912 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
159.80 kHz
Total Power 7.35 dBm
Transmit Freq Error -305 Hz
OBW Power 99.00 %
x dB Bandwidth 188.9 kHz
x dB -20.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:16:39 PM Nov 13, 2018
Marker 1 868.18 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.1805 MHz
-12.324 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.94 kHz
Total Power 7.36 dBm
Transmit Freq Error 77 Hz
OBW Power 99.00 %
x dB Bandwidth 196.7 kHz
x dB -20.00 dB
MSG
STATUS

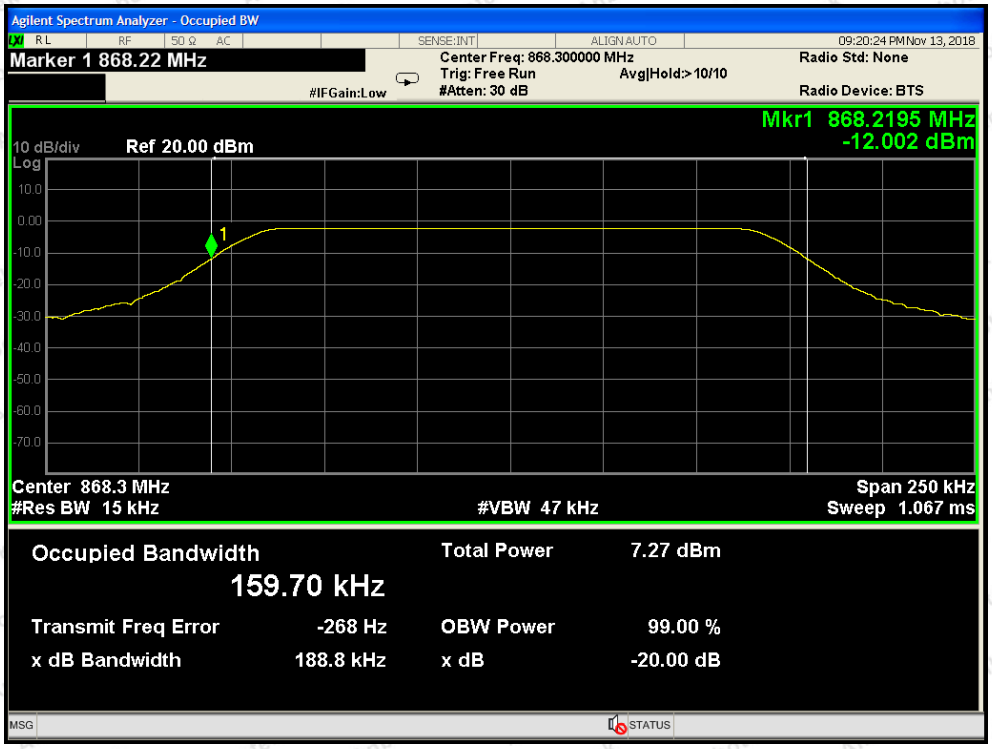
HTHV

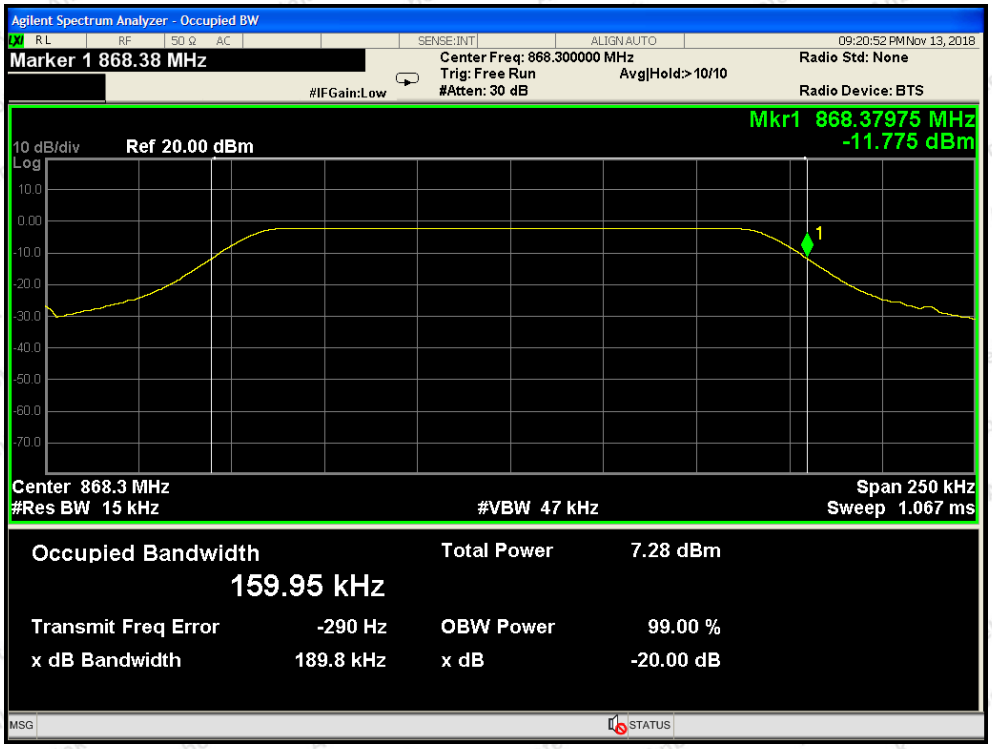

Agilent Spectrum Analyzer - Occupied BW
Marker 1 868.02 MHz
#IFGain:Low
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
09:17:00 PM Nov 13, 2018
Radio Std: None
Radio Device: BTS
Mkr1 868.01925 MHz
-12.111 dBm
10 dB/div
Ref 20.00 dBm
Log
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.24 kHz
Total Power 7.37 dBm
Transmit Freq Error 406 Hz
OBW Power 99.00 %
x dB Bandwidth 198.1 kHz
x dB -20.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
Marker 1 868.18 MHz
#IFGain:Low
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
09:17:27 PM Nov 13, 2018
Radio Std: None
Radio Device: BTS
Mkr1 868.18175 MHz
-13.289 dBm
10 dB/div
Ref 20.00 dBm
Log
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.74 kHz
Total Power 7.37 dBm
Transmit Freq Error 313 Hz
OBW Power 99.00 %
x dB Bandwidth 198.1 kHz
x dB -20.00 dB
MSG
STATUS

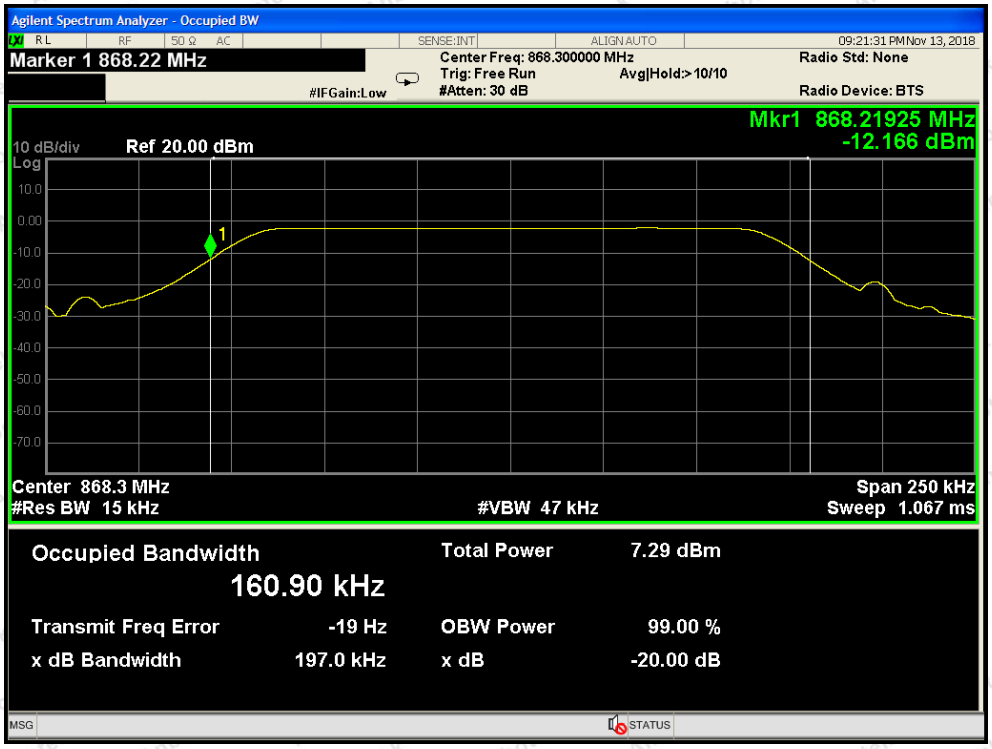
868.3MHz:

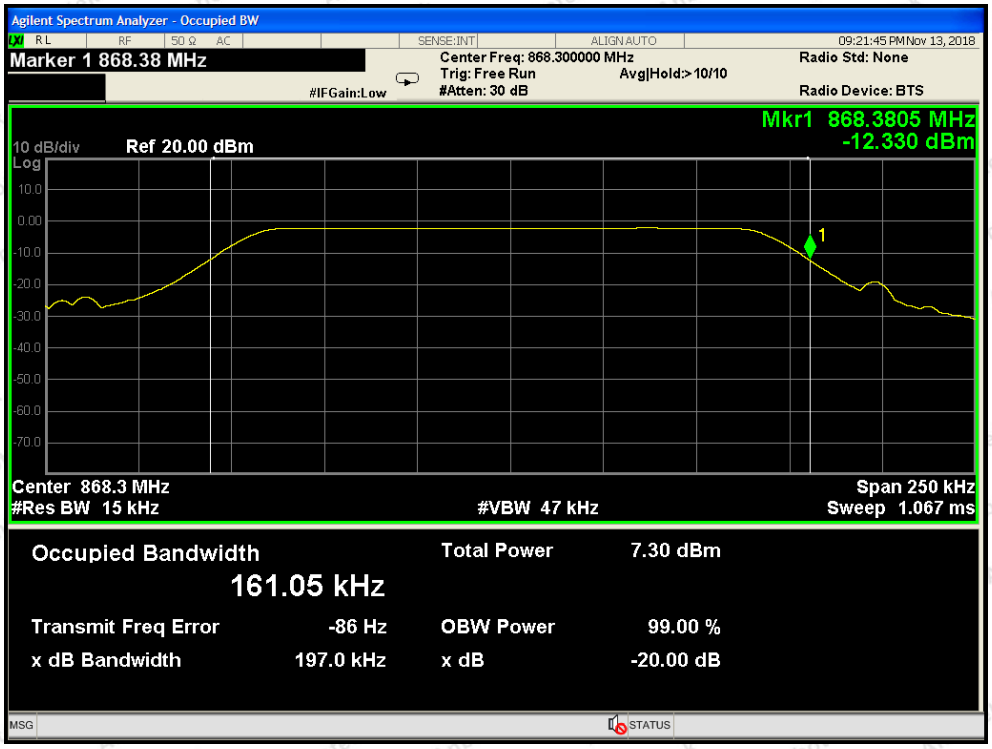
LTLV



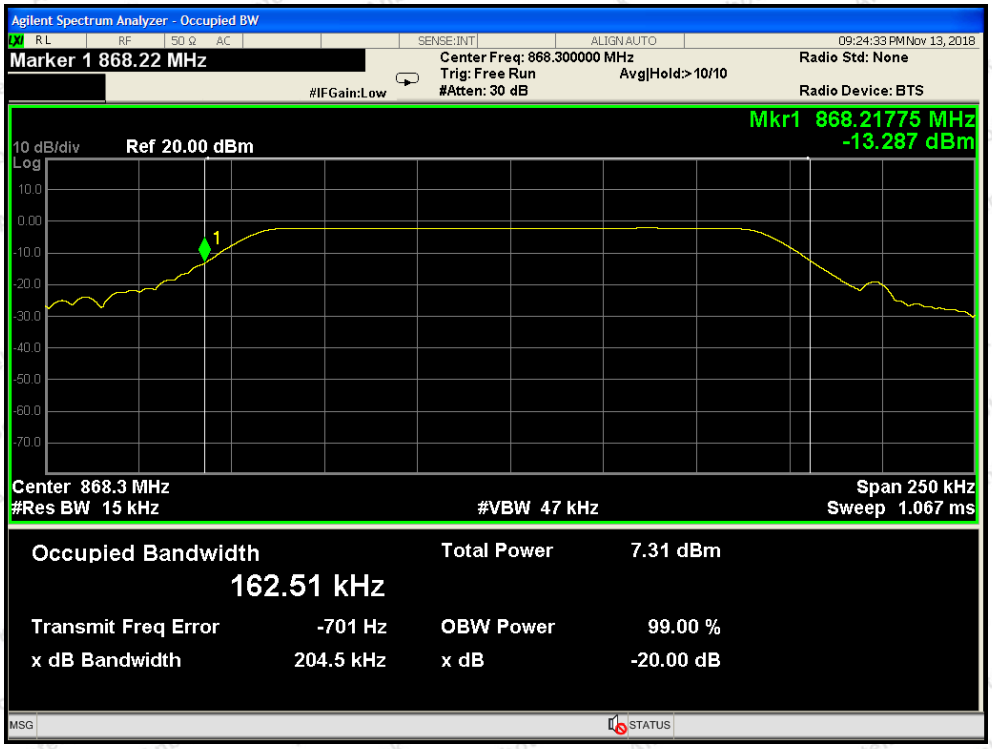


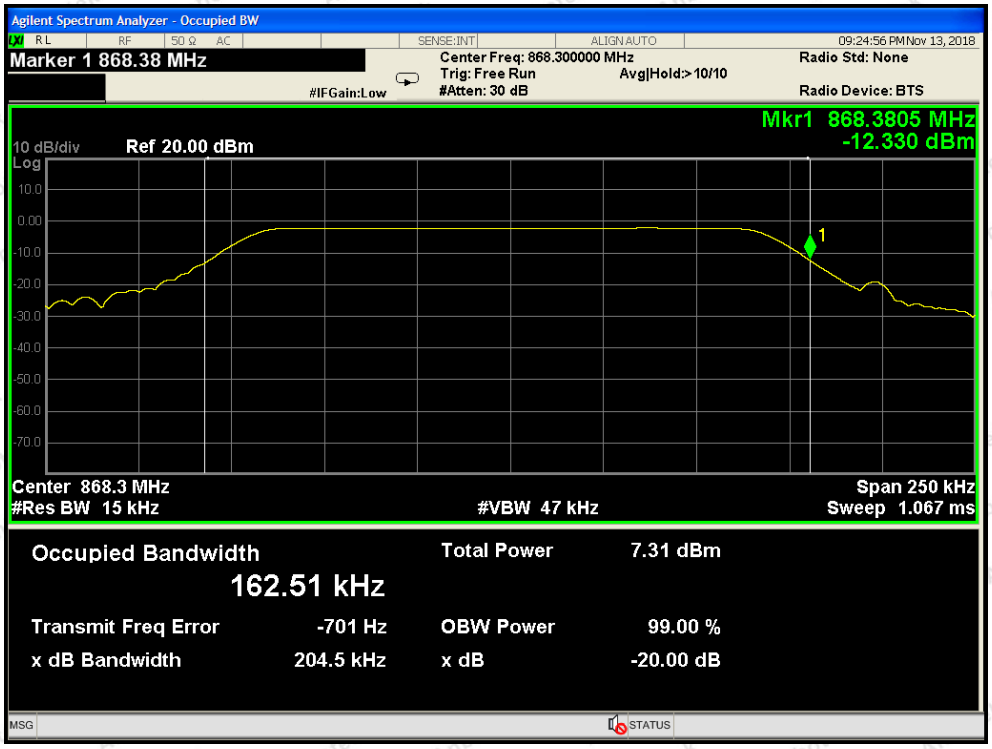
LTHV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:21:31 PM Nov 13, 2018
Marker 1 868.22 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.21925 MHz
-12.166 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.90 kHz
Total Power 7.29 dBm
Transmit Freq Error -19 Hz
OBW Power 99.00 %
x dB Bandwidth 197.0 kHz
x dB -20.00 dB
MSG
STATUS

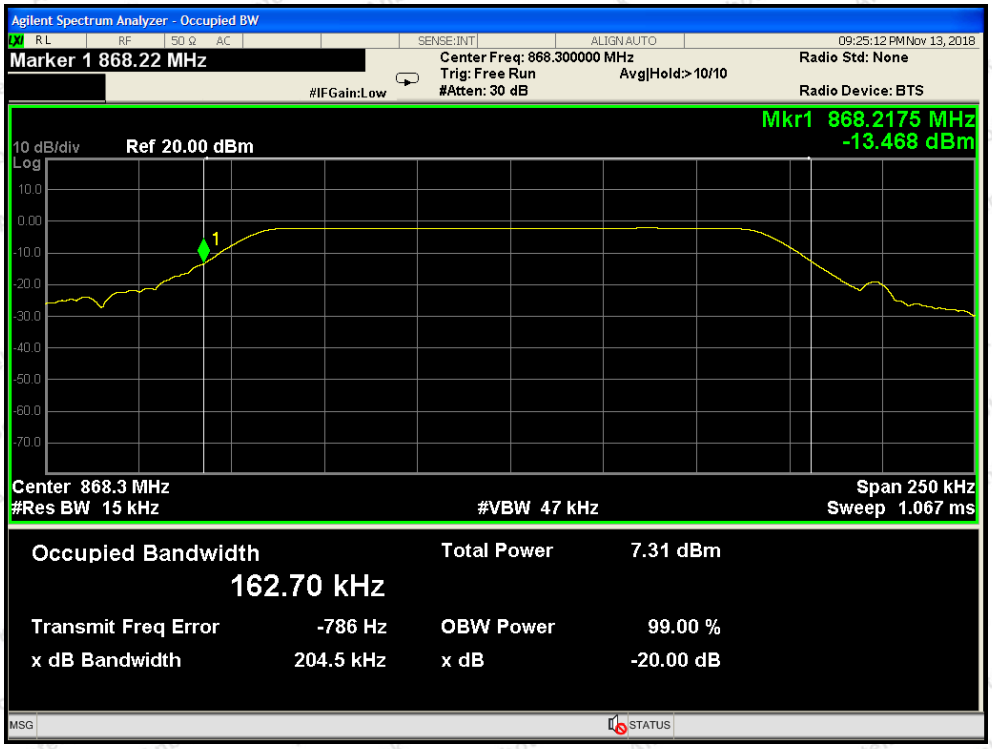

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:21:45 PM Nov 13, 2018
Marker 1 868.38 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.3805 MHz
-12.330 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
161.05 kHz
Total Power 7.30 dBm
Transmit Freq Error -86 Hz
OBW Power 99.00 %
x dB Bandwidth 197.0 kHz
x dB -20.00 dB
MSG
STATUS

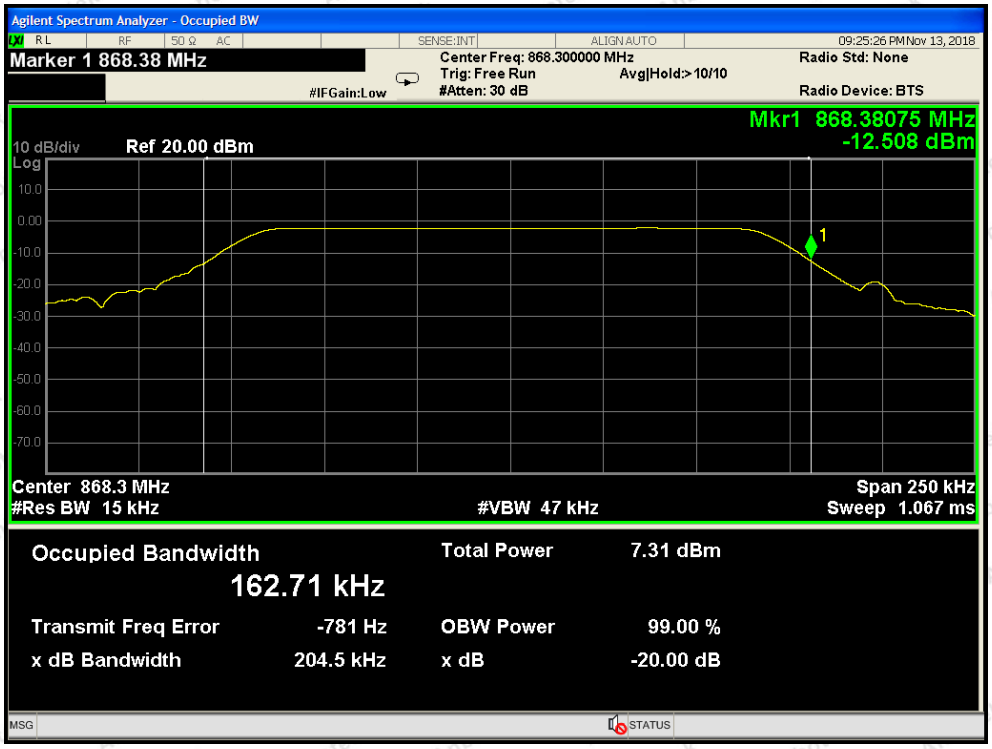
NTNV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:24:33 PM Nov 13, 2018
Marker 1 868.22 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.21775 MHz
-13.287 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.51 kHz
Total Power 7.31 dBm
Transmit Freq Error -701 Hz
OBW Power 99.00 %
x dB Bandwidth 204.5 kHz
x dB -20.00 dB
MSG
STATUS

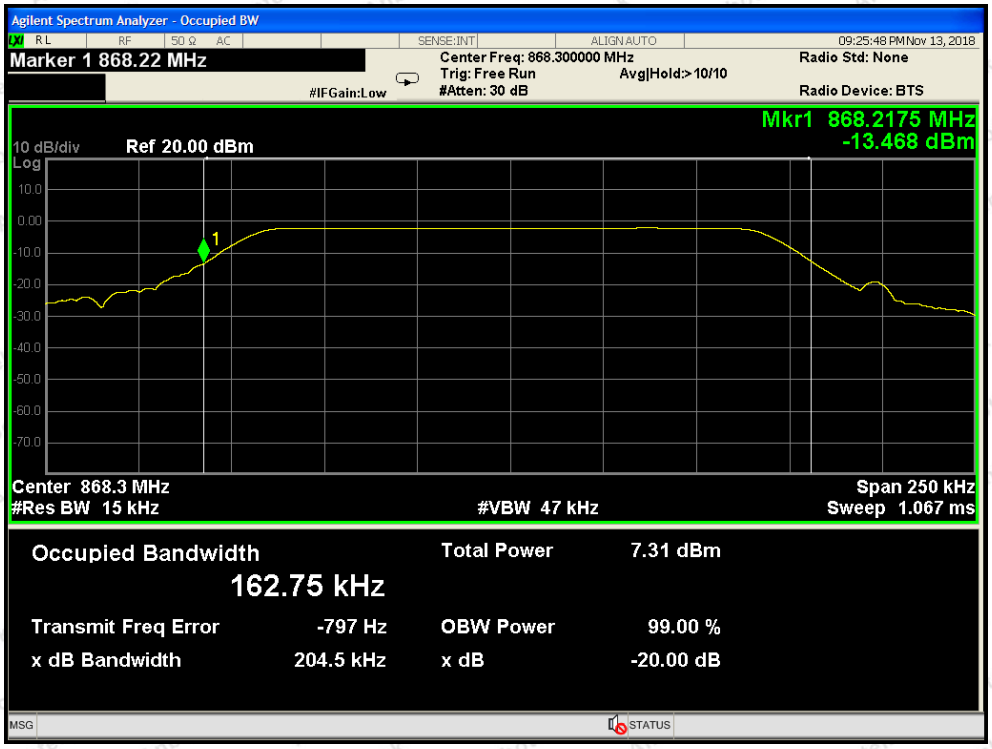

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:24:56 PM Nov 13, 2018
Marker 1 868.38 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.3805 MHz
-12.330 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.51 kHz
Total Power 7.31 dBm
Transmit Freq Error -701 Hz
OBW Power 99.00 %
x dB Bandwidth 204.5 kHz
x dB -20.00 dB
MSG
STATUS

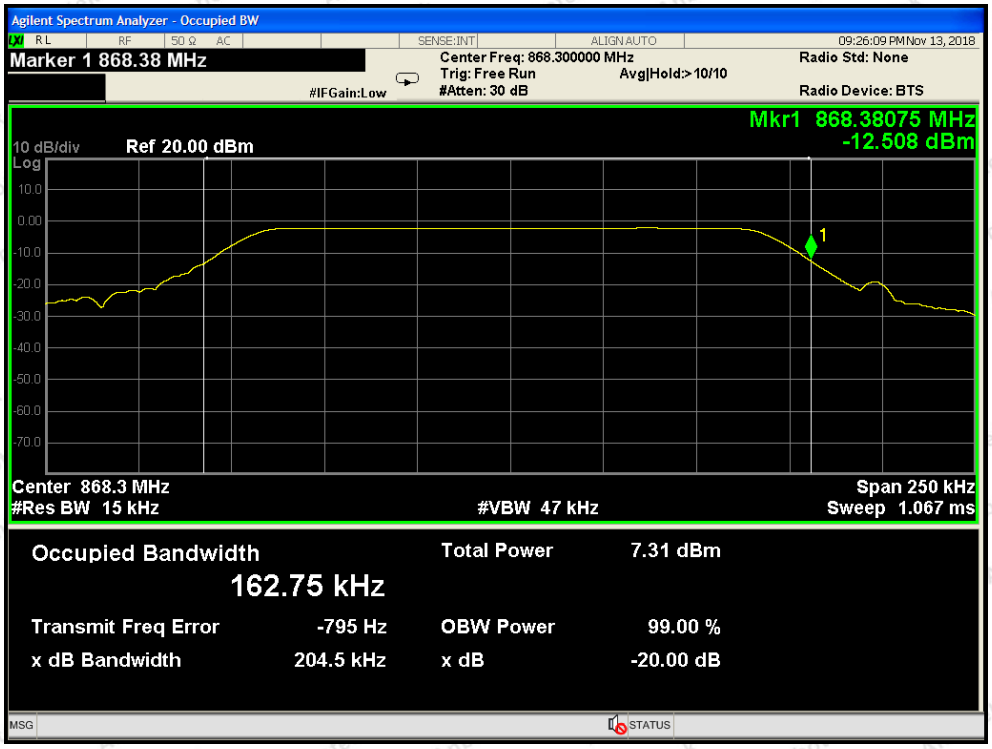
HTLV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:25:12 PM Nov 13, 2018
Marker 1 868.22 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.2175 MHz
-13.468 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.70 kHz
Total Power 7.31 dBm
Transmit Freq Error -786 Hz
OBW Power 99.00 %
x dB Bandwidth 204.5 kHz
x dB -20.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:25:26 PM Nov 13, 2018
Marker 1 868.38 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.38075 MHz
-12.508 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.71 kHz
Total Power 7.31 dBm
Transmit Freq Error -781 Hz
OBW Power 99.00 %
x dB Bandwidth 204.5 kHz
x dB -20.00 dB
MSG
STATUS

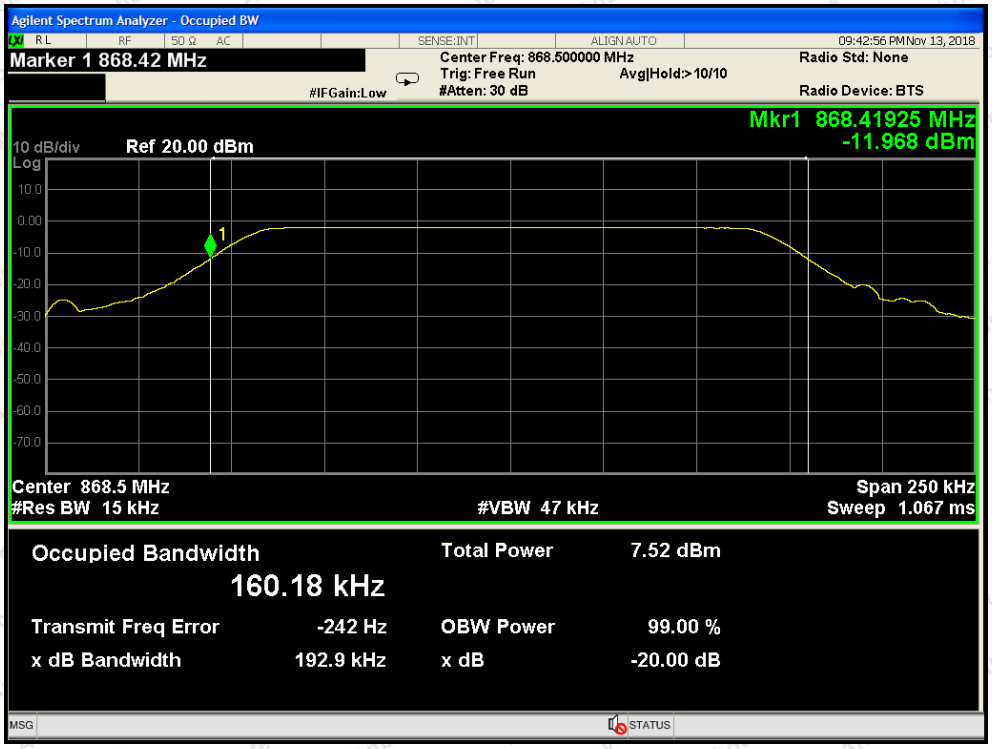
HTHV

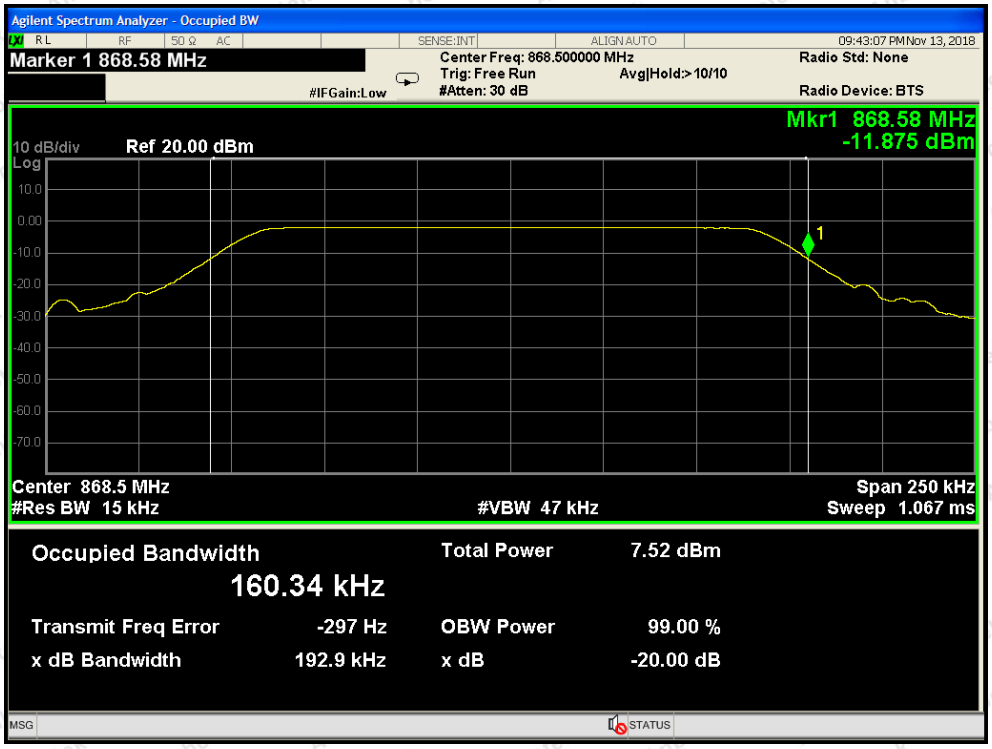

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:25:48 PM Nov 13, 2018
Marker 1 868.22 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.2175 MHz
-13.468 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.75 kHz
Total Power 7.31 dBm
Transmit Freq Error -797 Hz
OBW Power 99.00 %
x dB Bandwidth 204.5 kHz
x dB -20.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:26:09 PM Nov 13, 2018
Marker 1 868.38 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.38075 MHz
-12.508 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
162.75 kHz
Total Power 7.31 dBm
Transmit Freq Error -795 Hz
OBW Power 99.00 %
x dB Bandwidth 204.5 kHz
x dB -20.00 dB
MSG
STATUS

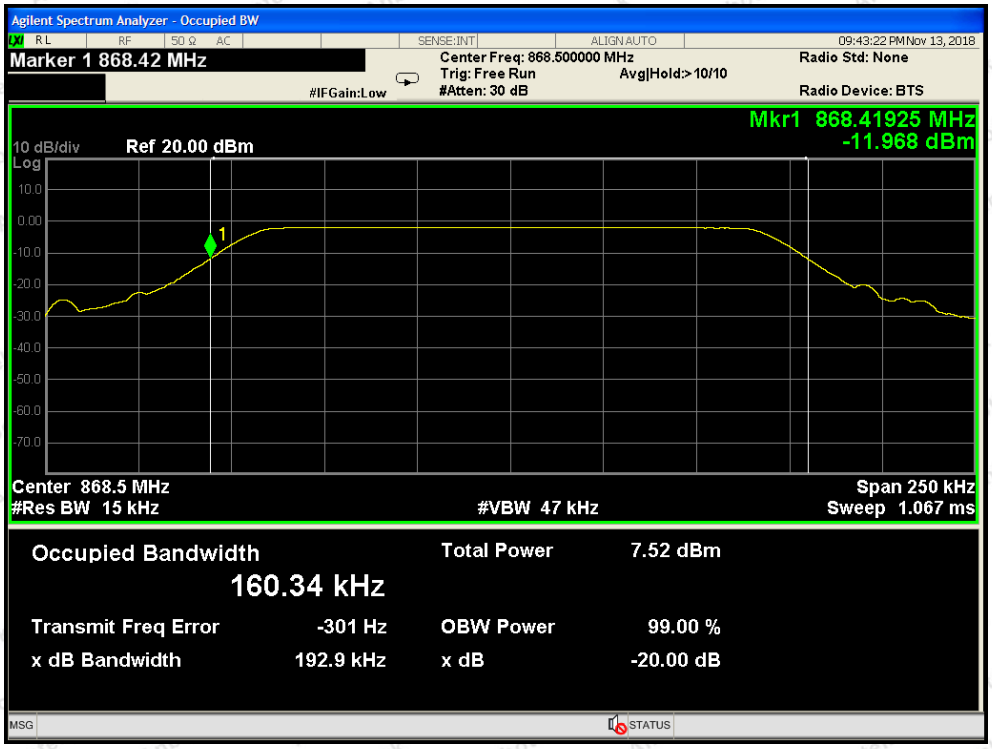
868.5MHz:

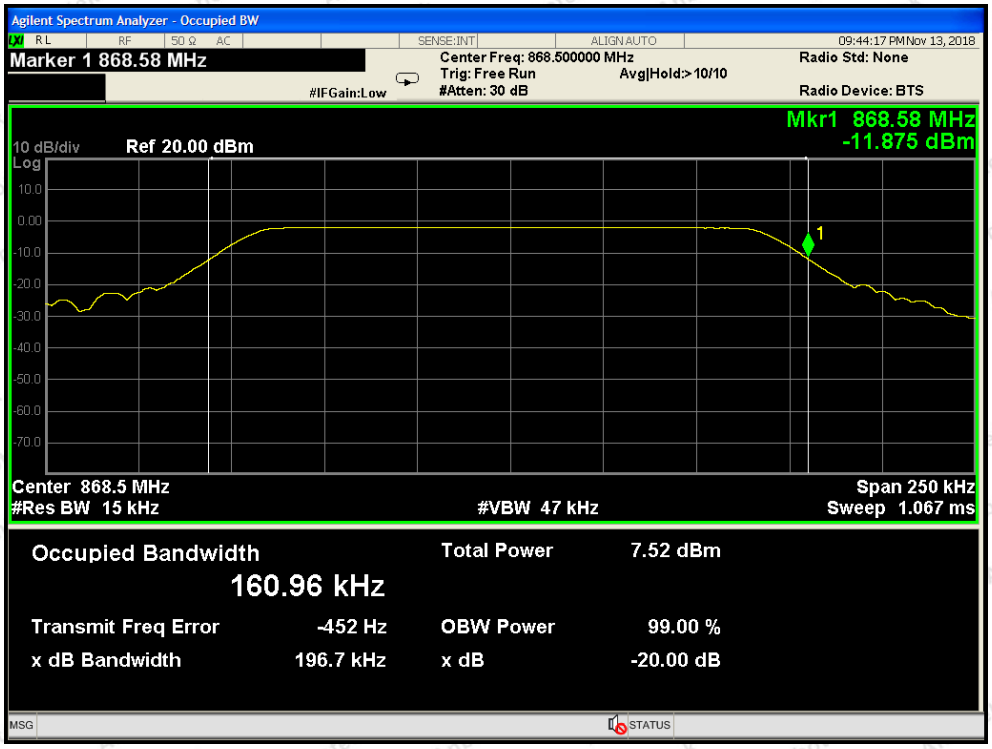
LTLV



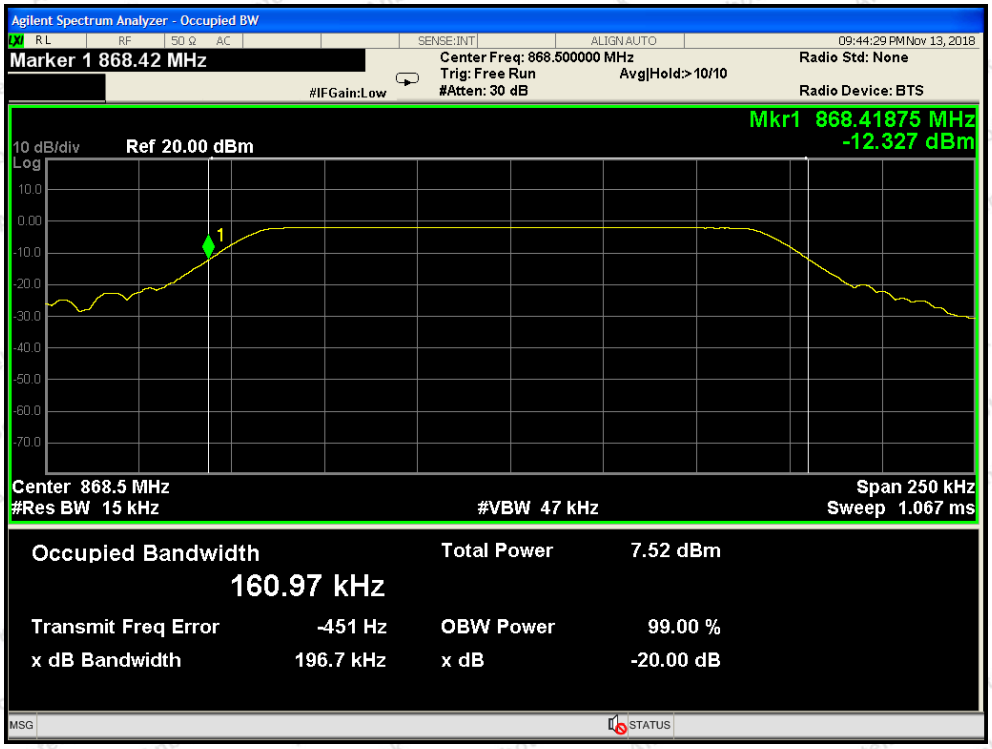


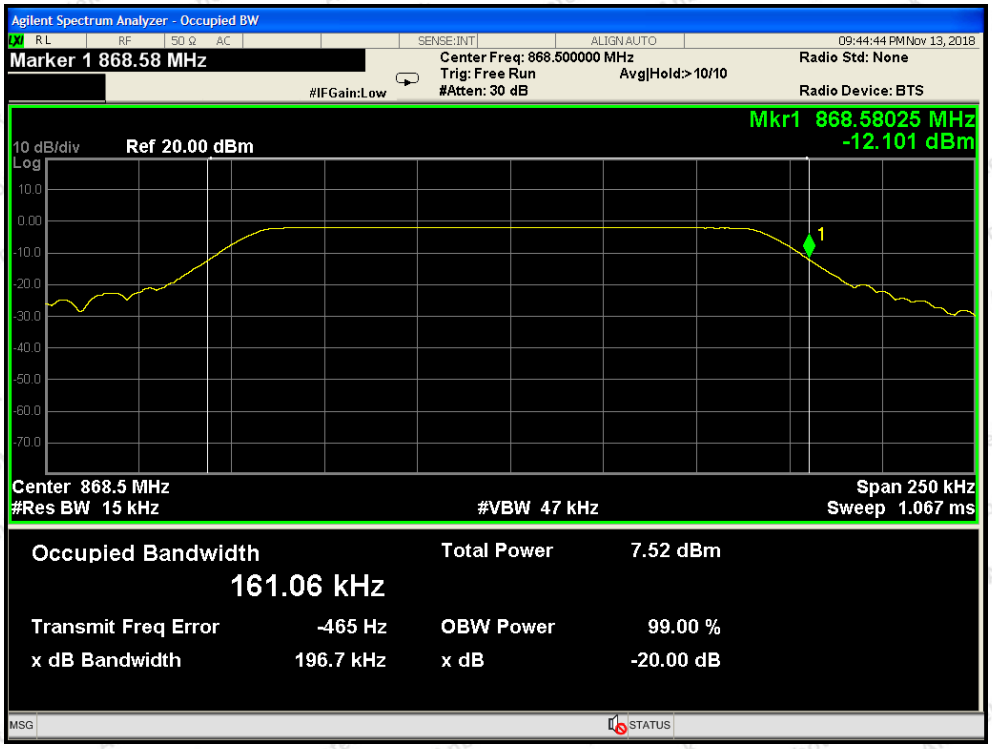
LTHV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:43:22 PM Nov 13, 2018
Marker 1 868.42 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.41925 MHz
-11.968 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.34 kHz
Total Power 7.52 dBm
Transmit Freq Error -301 Hz
OBW Power 99.00 %
x dB Bandwidth 192.9 kHz
x dB -20.00 dB
MSG
STATUS

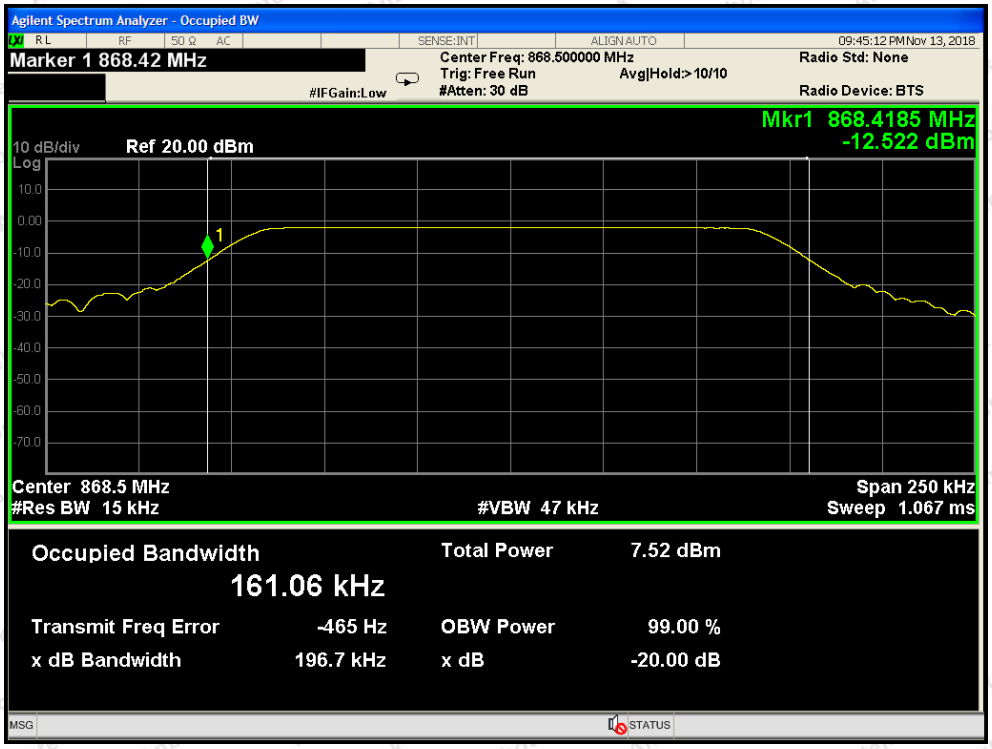

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:44:17 PM Nov 13, 2018
Marker 1 868.58 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.58 MHz
-11.875 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.96 kHz
Total Power 7.52 dBm
Transmit Freq Error -452 Hz
OBW Power 99.00 %
x dB Bandwidth 196.7 kHz
x dB -20.00 dB
MSG
STATUS

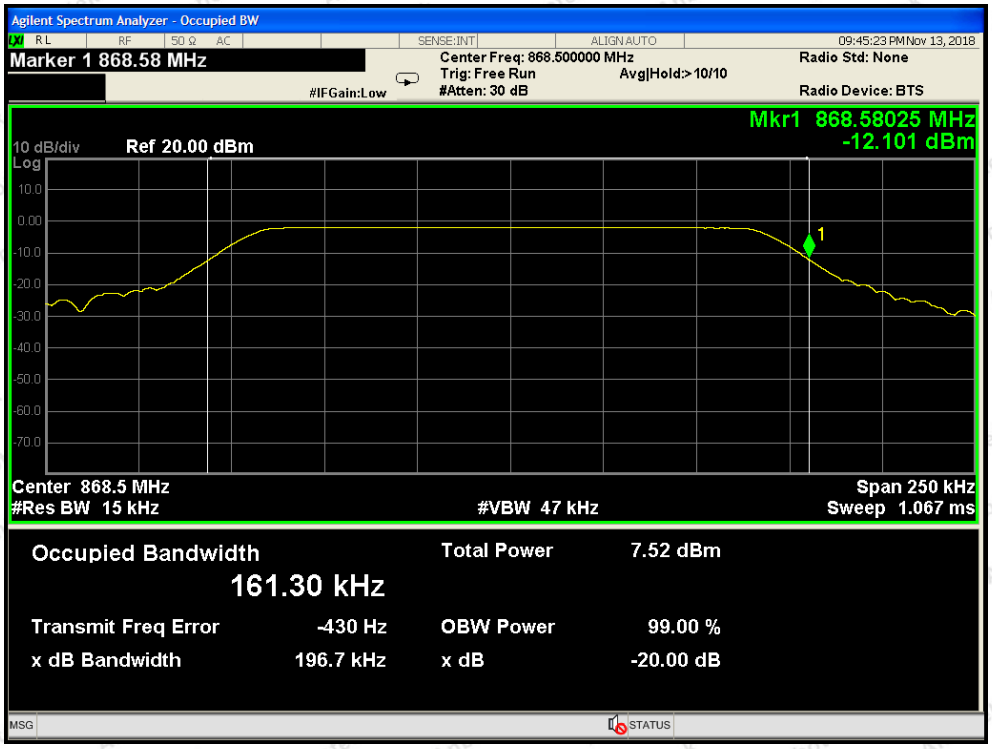
NTNV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:44:29 PM Nov 13, 2018
Marker 1 868.42 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.41875 MHz
-12.327 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
160.97 kHz
Total Power 7.52 dBm
Transmit Freq Error -451 Hz
OBW Power 99.00 %
x dB Bandwidth 196.7 kHz
x dB -20.00 dB
MSG
STATUS

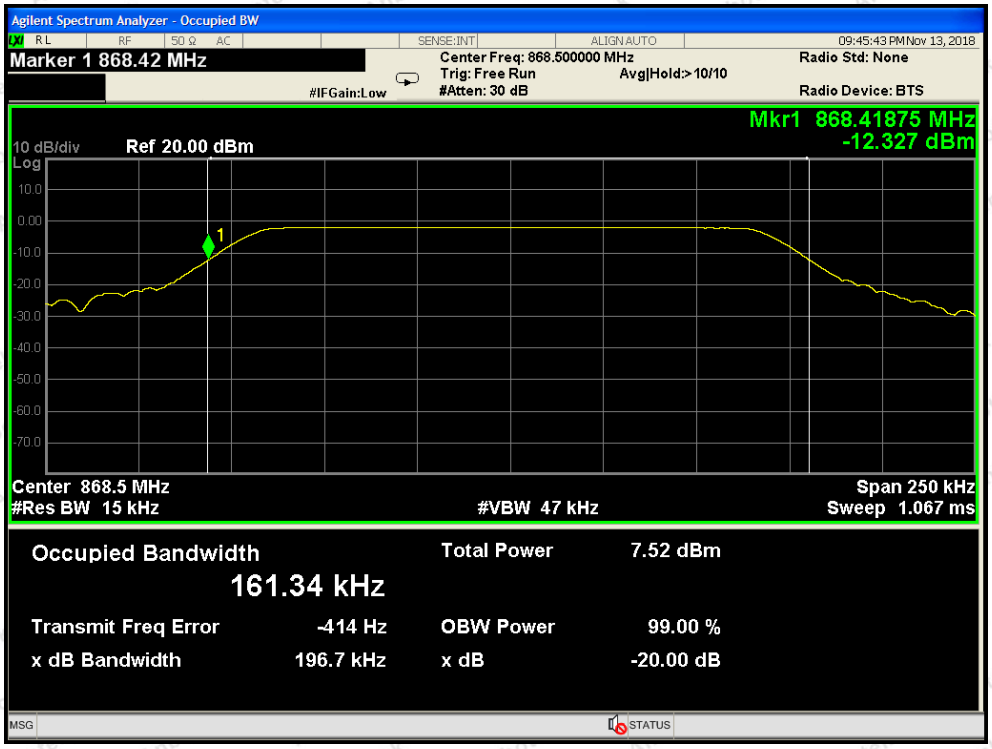

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:44:44 PM Nov 13, 2018
Marker 1 868.58 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.58025 MHz
-12.101 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
161.06 kHz
Total Power 7.52 dBm
Transmit Freq Error -465 Hz
OBW Power 99.00 %
x dB Bandwidth 196.7 kHz
x dB -20.00 dB
MSG
STATUS

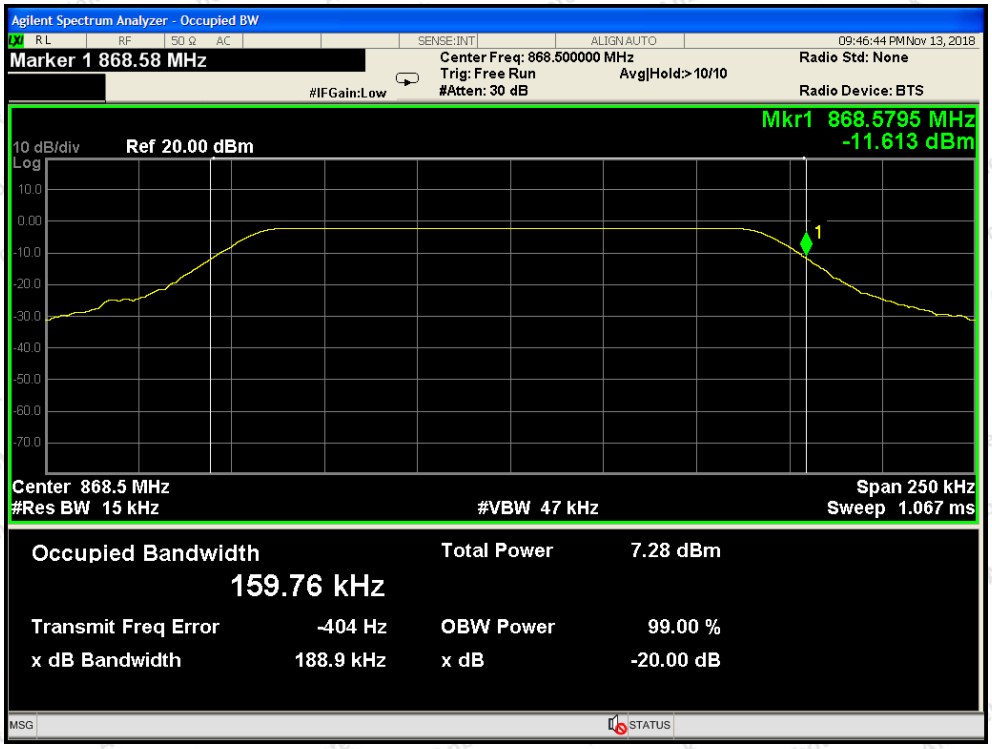
HTLV


Agilent Spectrum Analyzer - Occupied BW
RL RF 50 Ω AC SENSE:INT ALIGN AUTO 09:45:12 PM Nov 13, 2018
Marker 1 868.42 MHz
Center Freq: 868.500000 MHz
Trig: Free Run Avg|Hold:>10/10
#IFGain:Low #Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.4185 MHz
-12.522 dBm
10 dB/div Ref 20.00 dBm
Log
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
161.06 kHz
Total Power 7.52 dBm
Transmit Freq Error -465 Hz
OBW Power 99.00 %
x dB Bandwidth 196.7 kHz
x dB -20.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
RL RF 50 Ω AC SENSE:INT ALIGN AUTO 09:45:23 PM Nov 13, 2018
Marker 1 868.58 MHz
Center Freq: 868.500000 MHz
Trig: Free Run Avg|Hold:>10/10
#IFGain:Low #Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.58025 MHz
-12.101 dBm
10 dB/div Ref 20.00 dBm
Log
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
161.30 kHz
Total Power 7.52 dBm
Transmit Freq Error -430 Hz
OBW Power 99.00 %
x dB Bandwidth 196.7 kHz
x dB -20.00 dB
MSG
STATUS

HTHV


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:45:43 PM Nov 13, 2018
Marker 1 868.42 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Mkr1 868.41875 MHz
-12.327 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
161.34 kHz
Total Power 7.52 dBm
Transmit Freq Error -414 Hz
OBW Power 99.00 %
x dB Bandwidth 196.7 kHz
x dB -20.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:46:44 PM Nov 13, 2018
Marker 1 868.58 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Mkr1 868.5795 MHz
-11.613 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
159.76 kHz
Total Power 7.28 dBm
Transmit Freq Error -404 Hz
OBW Power 99.00 %
x dB Bandwidth 188.9 kHz
x dB -20.00 dB
MSG
STATUS

7. Out Of Band Emissions

7.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.3.5			
Test Limit	Domain	Frequency Range	RBW_{REF}	Max power limit
	OOB limits applicable to Operational Frequency Band (See Figure 6)	$f \le f_{low\_OFB}$ - 400 kHz	10 kHz	-36 dBm
		F_{low_OFB} - 400 kHz $\le f \le f_{low\_OFB}$ - 200 kHz	1 kHz	-36 dBm
		f_{low} - 200 kHz $\le f < f_{low\_OFB}$	1 kHz	See Figure 6
		$f = f_{low\_OFB}$	1 kHz	-36 dBm
		$f = f_{high\_OFB}$	1 kHz	-36 dBm
		$F_{high\_OFB} < f \le f_{high\_OFB}$ + 200 kHz	1 kHz	0 dBm
		F_{high_OFB} + 200 kHz $\le f \le f_{high\_OFB}$ + 400 kHz	1 kHz	-36 dBm
		F_{high_OFB} + 400 kHz $\le f$	10 kHz	-36 dBm
	OOB limits applicable to Operating Channel (See Figure 5)	$f = f_c$- 2.5 x OCW	1 kHz	-36 dBm
		f_c – 2.5 x OCW $\le f \le f_c$ – 0.5 x OCW	1 kHz	See Figure 5
		$f = f_c$ – 0.5 x OCW	1 kHz	0 dBm
		$f = f_c$ + 0.5 x OCW	1 kHz	0 dBm
		f_c + 0.5 x OCW $\le f \le f_c$ + 2.5 x OCW	1 kHz	See Figure 5
		$f = f_c$+ 2.5 x OCW	1 kHz	-36 dBm
	NOTE: f is the measurement frequency. f_c is the Operating Frequency. F_{low_OFB} is the lower edge of the Operational Frequency Band. F_{high_OFB} is the upper edge of the Operational Frequency Band. OCW is the operating channel bandwidth.			

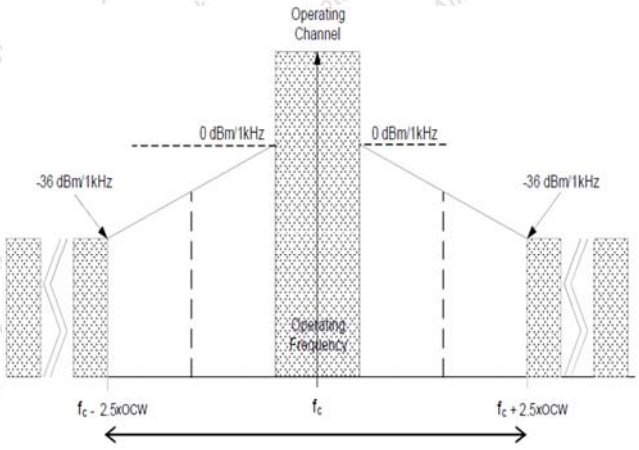


Figure 5: Out Of Band Domain for Operating Channel with reference BW

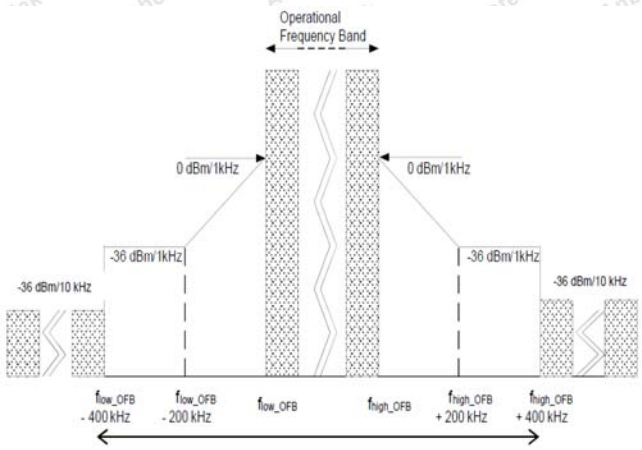
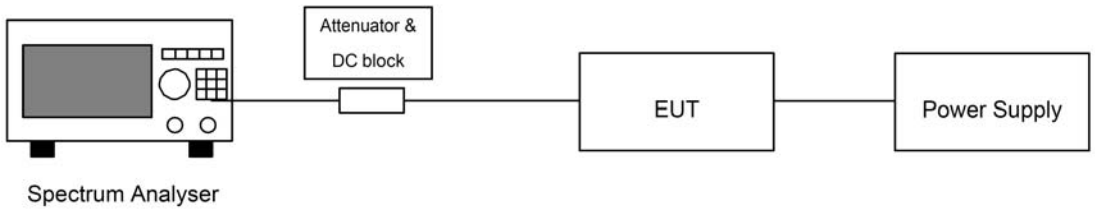


Figure 6: Out Of Band Domain for Operational Frequency Band with reference BW

7.2. Test Setup



7.3. Test Procedure

The conducted measurement procedure in clause 5.8.3.3 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

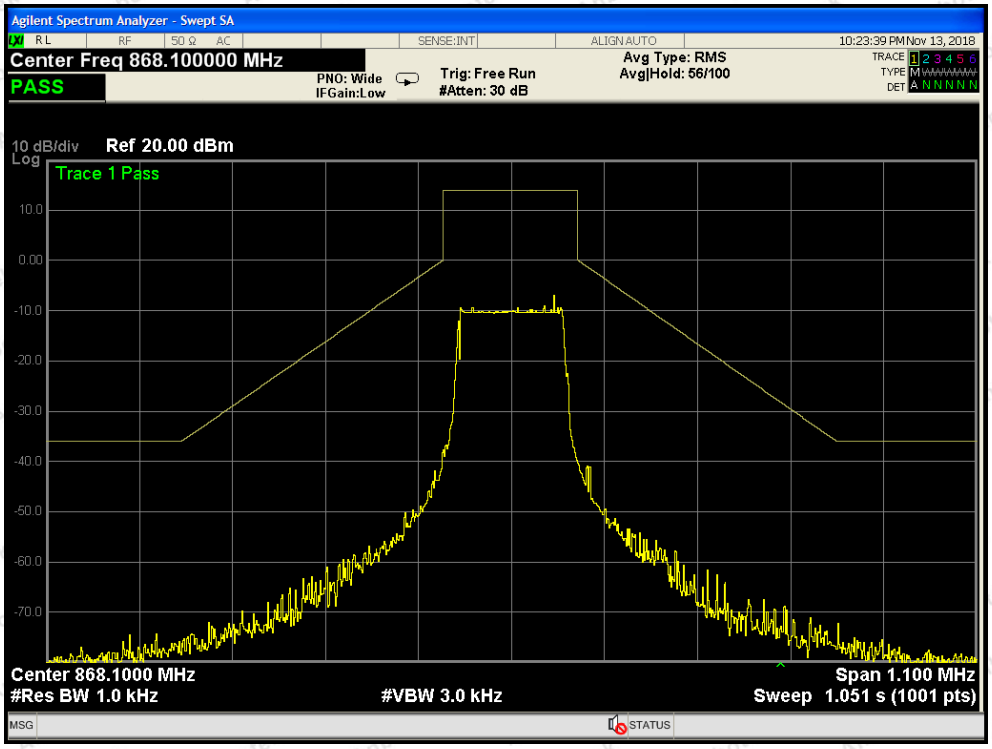
7.4. Test Data

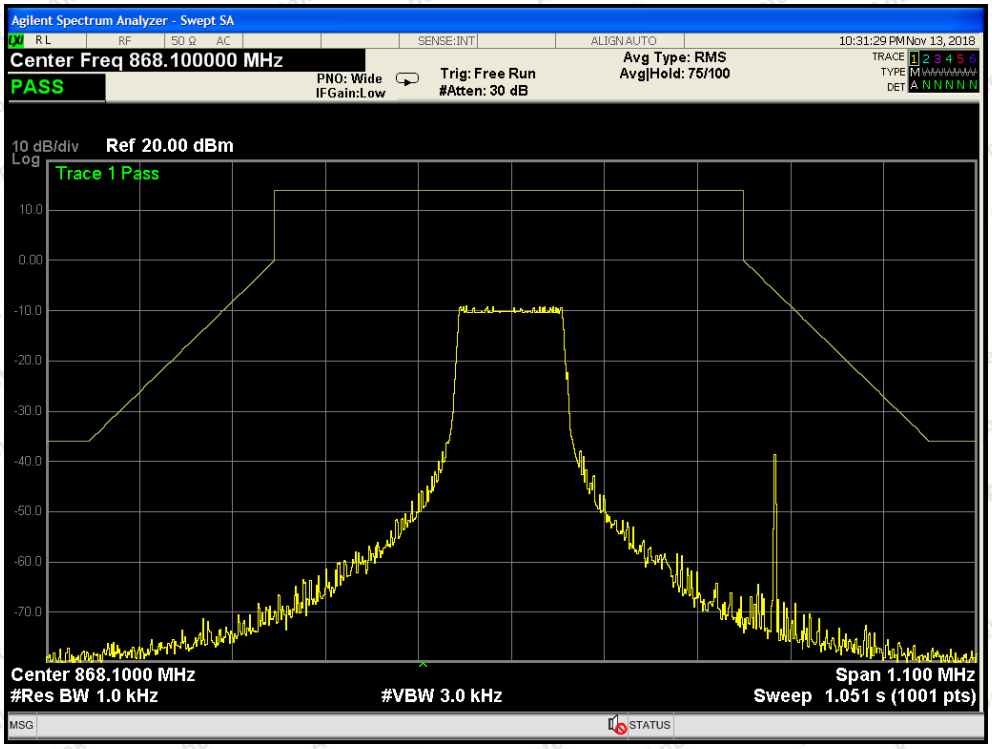
Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	See below

PASS

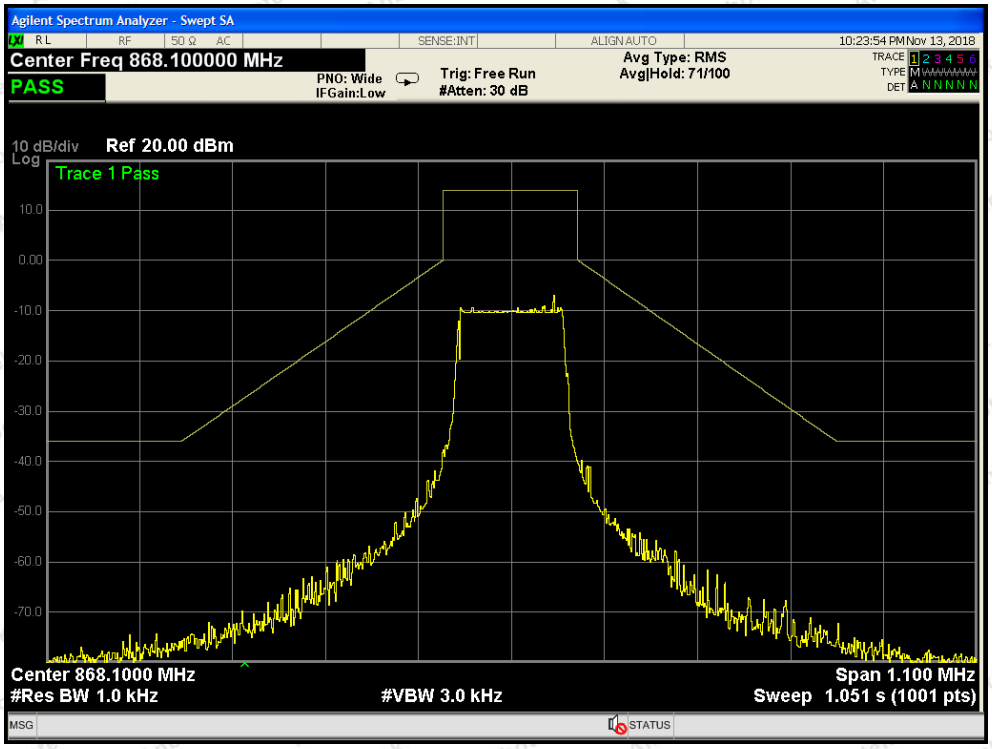
868.1MHz:

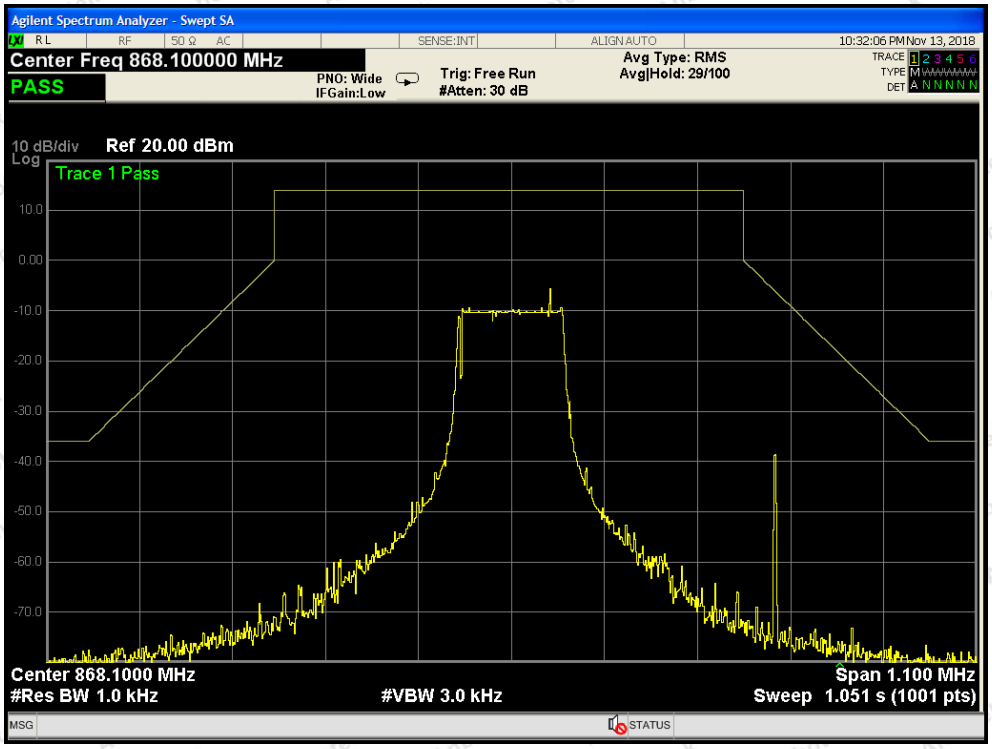
LTLV



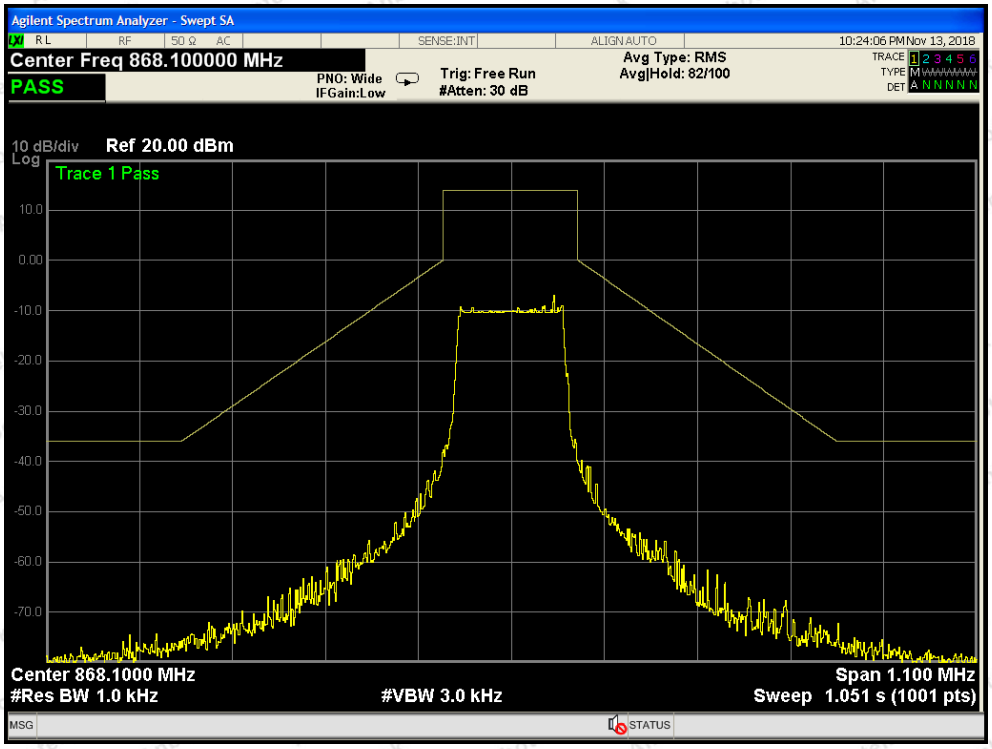


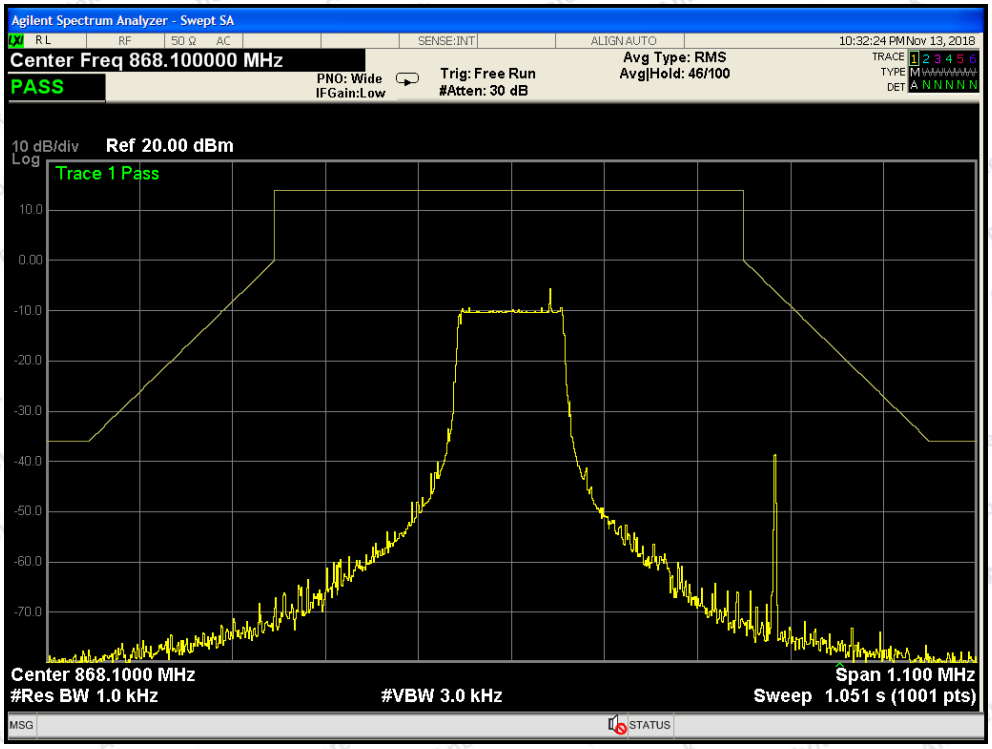
LTHV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 71/100
10:23:54 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

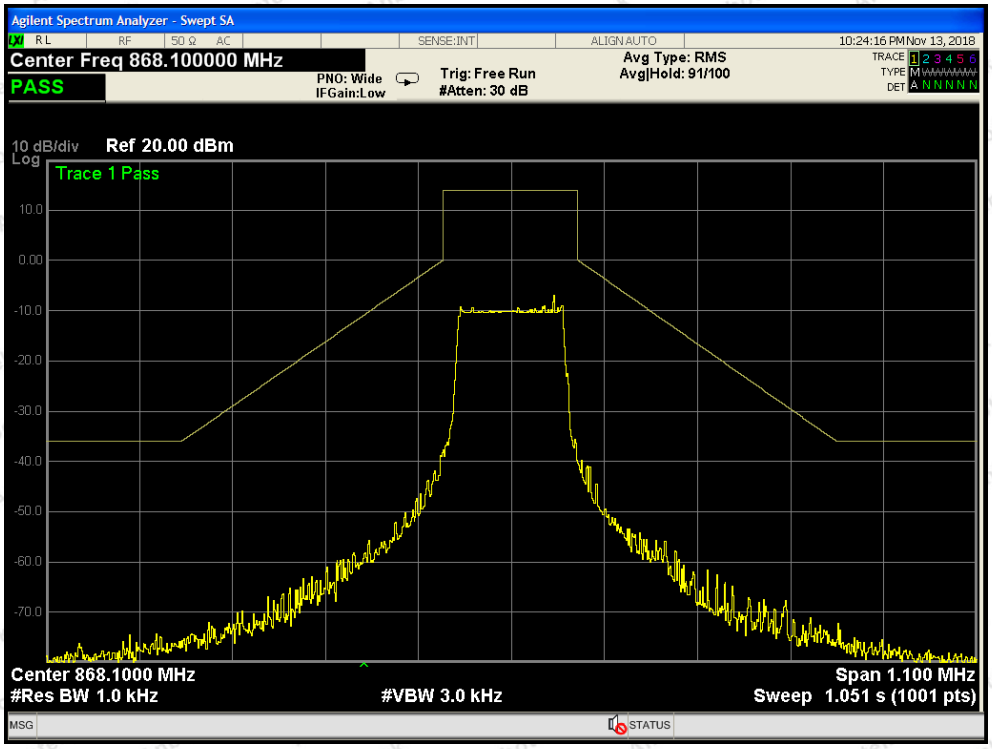

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 29/100
10:32:06 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

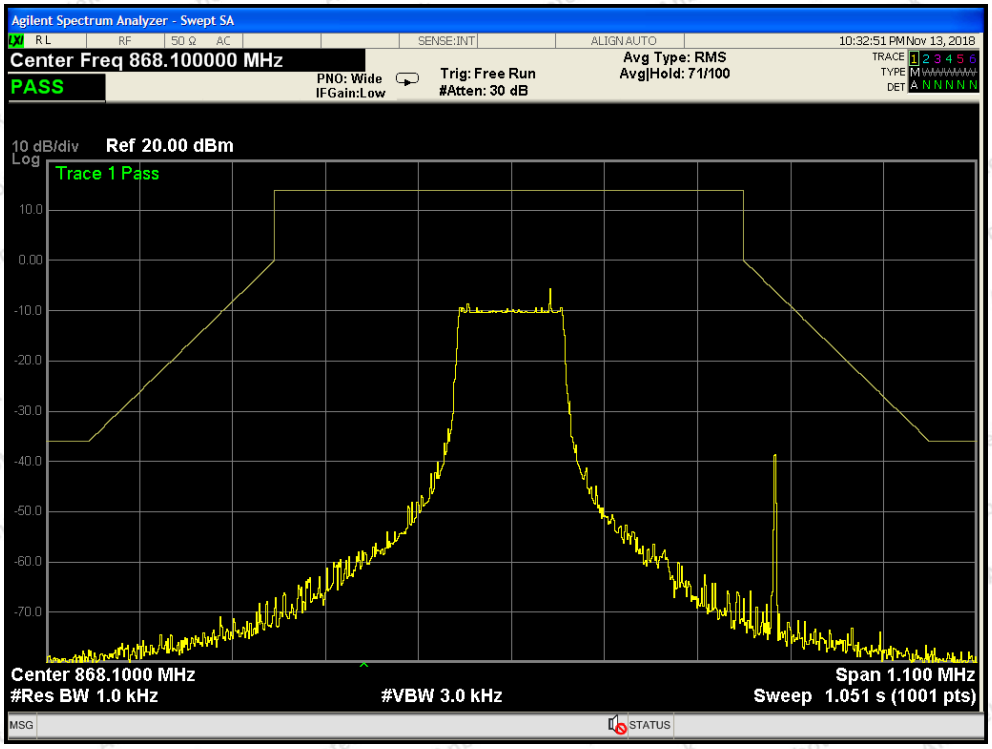
NTNV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 82/100
10:24:06 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

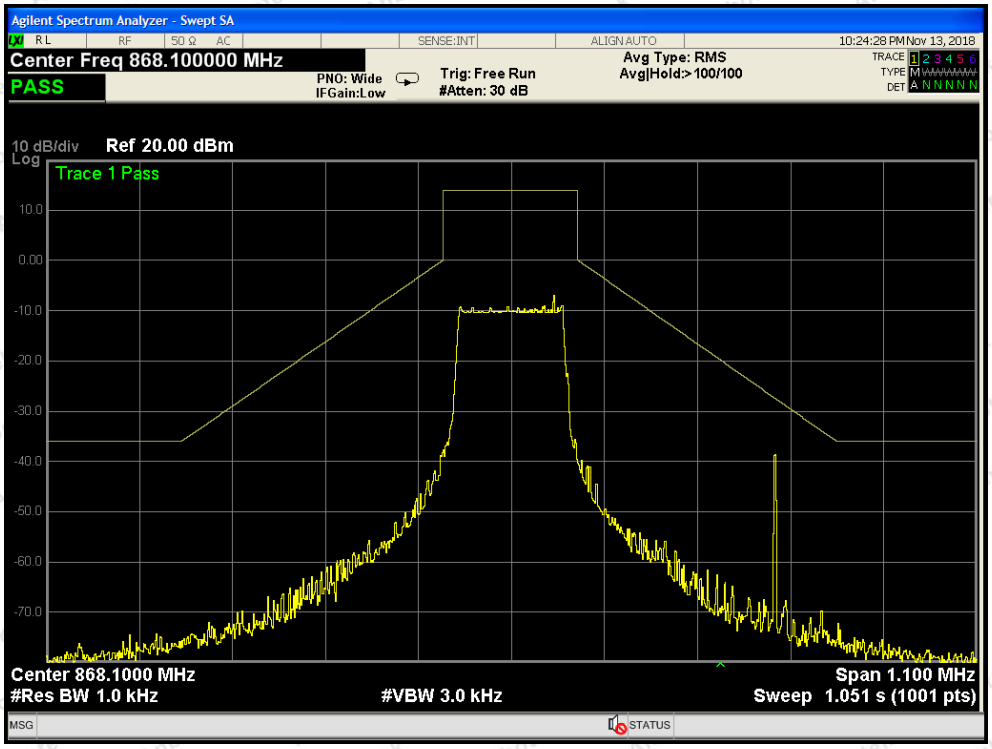

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 46/100
10:32:24 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

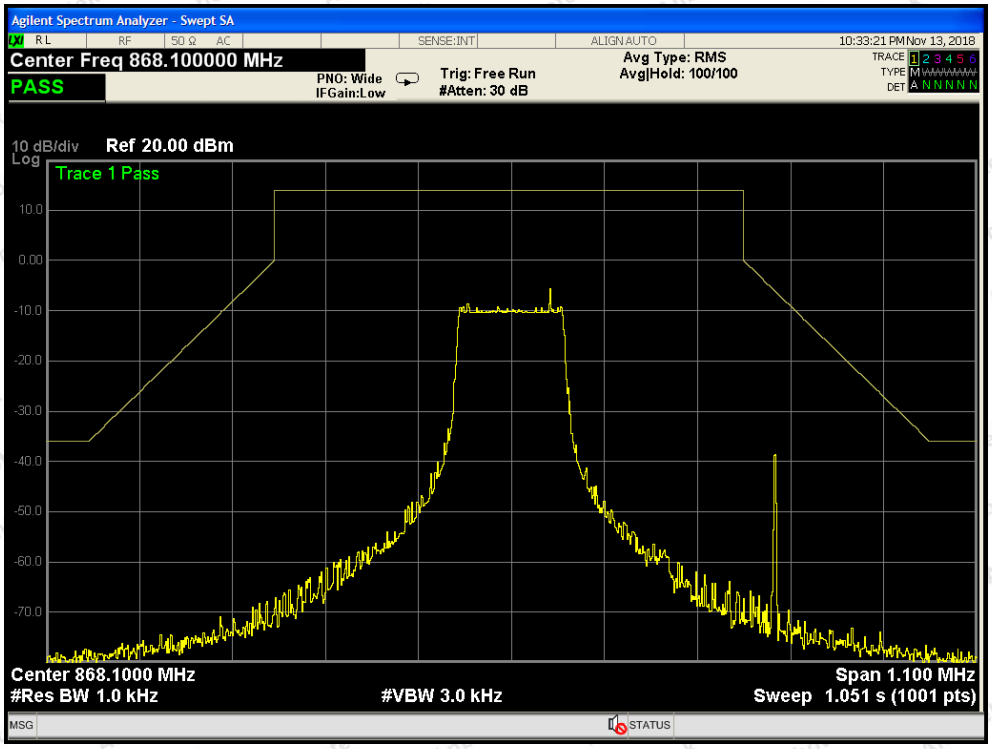
HTLV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 91/100
10:24:16 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 71/100
10:32:51 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

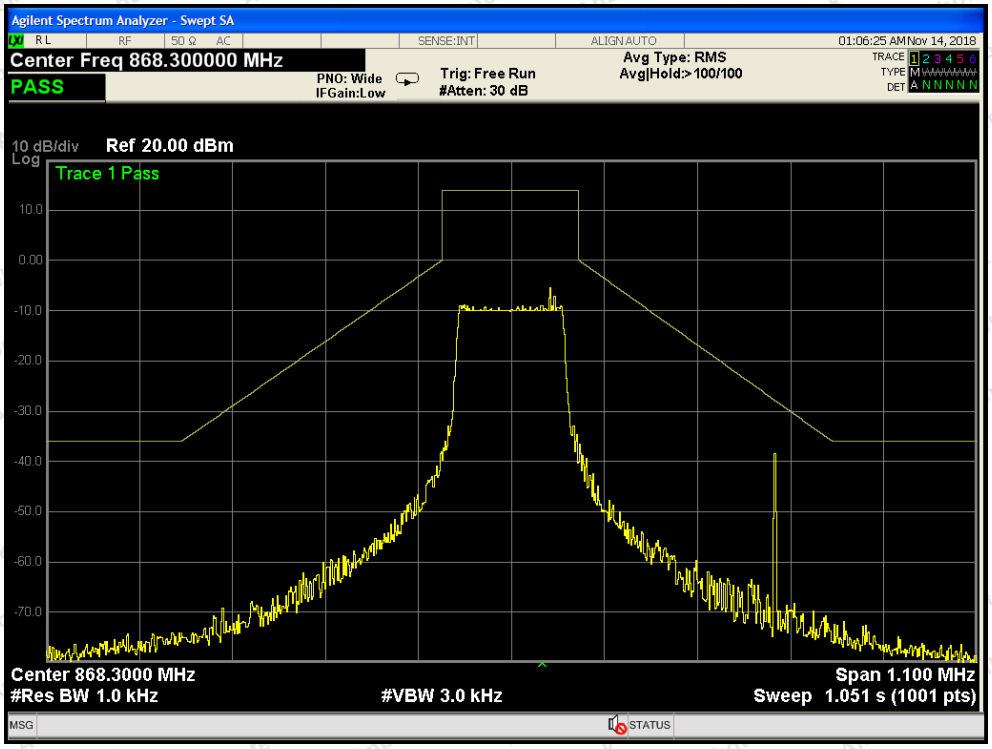
HTHV

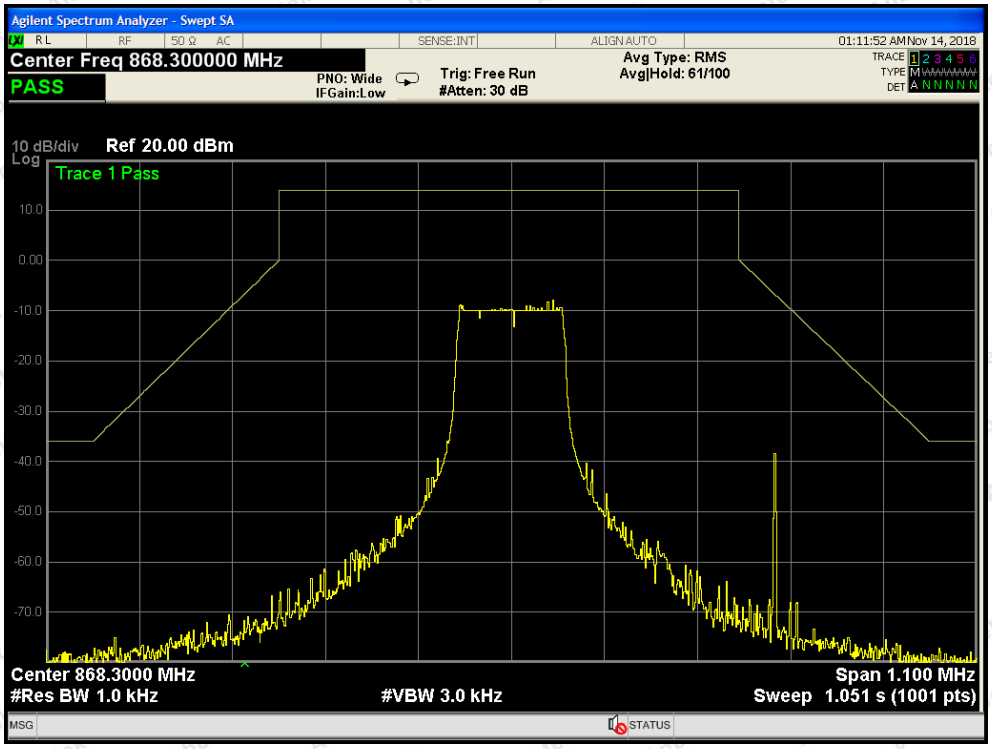

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold:>100/100
10:24:28 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
10:33:21 PM Nov 13, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

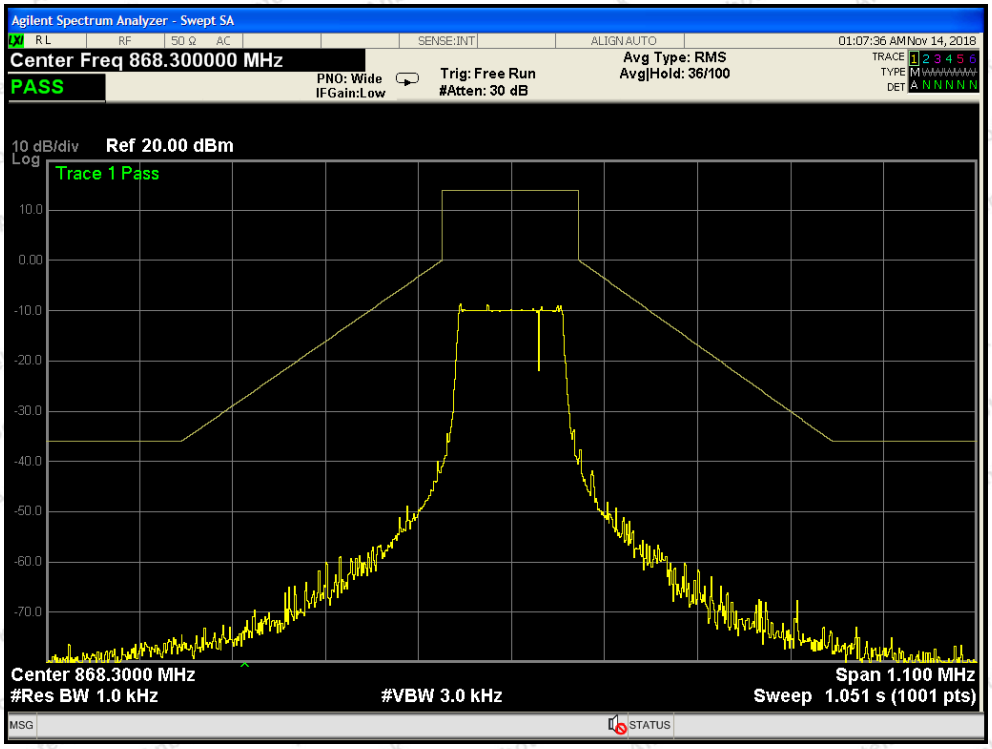
868.3MHz:

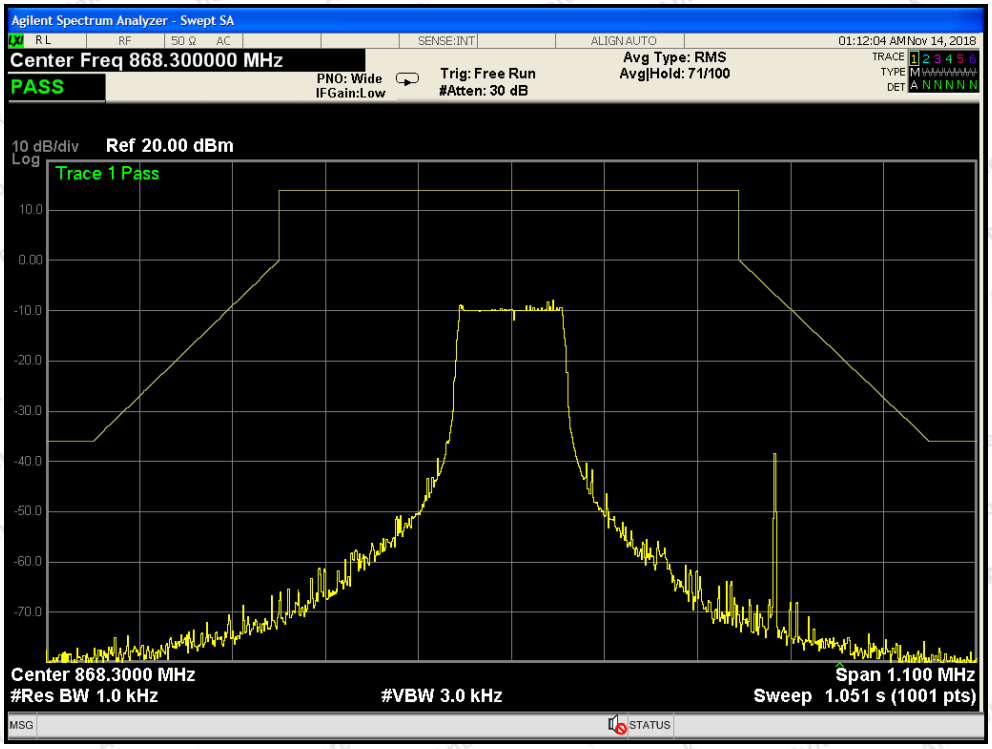
LTLV



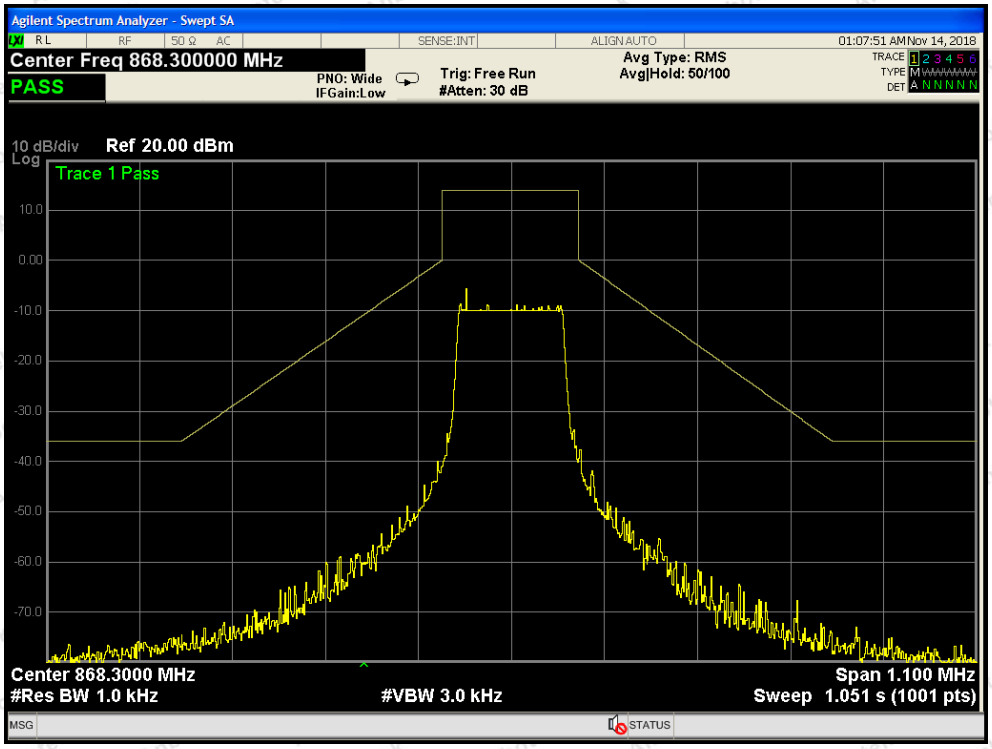


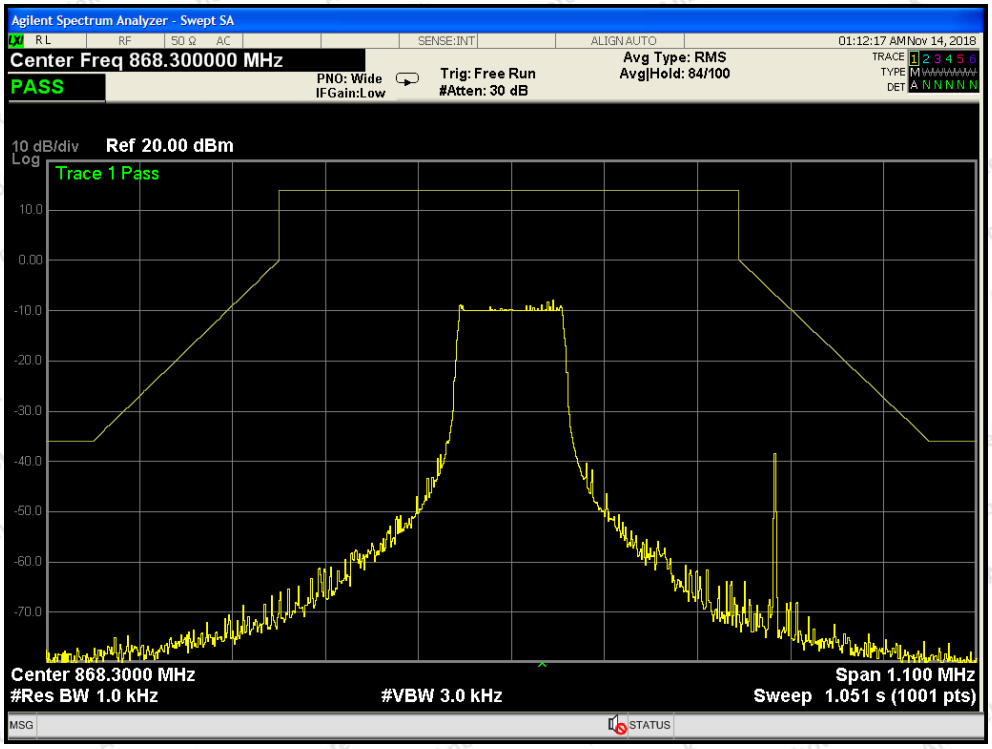
LTHV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 36/100
01:07:36 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

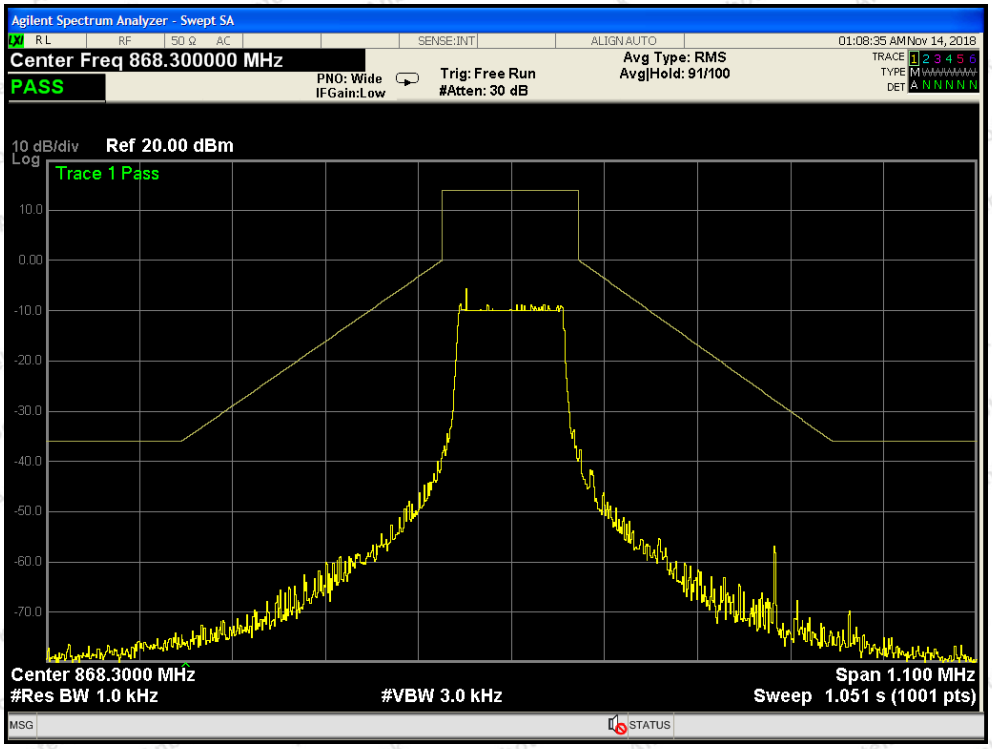

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 71/100
01:12:04 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

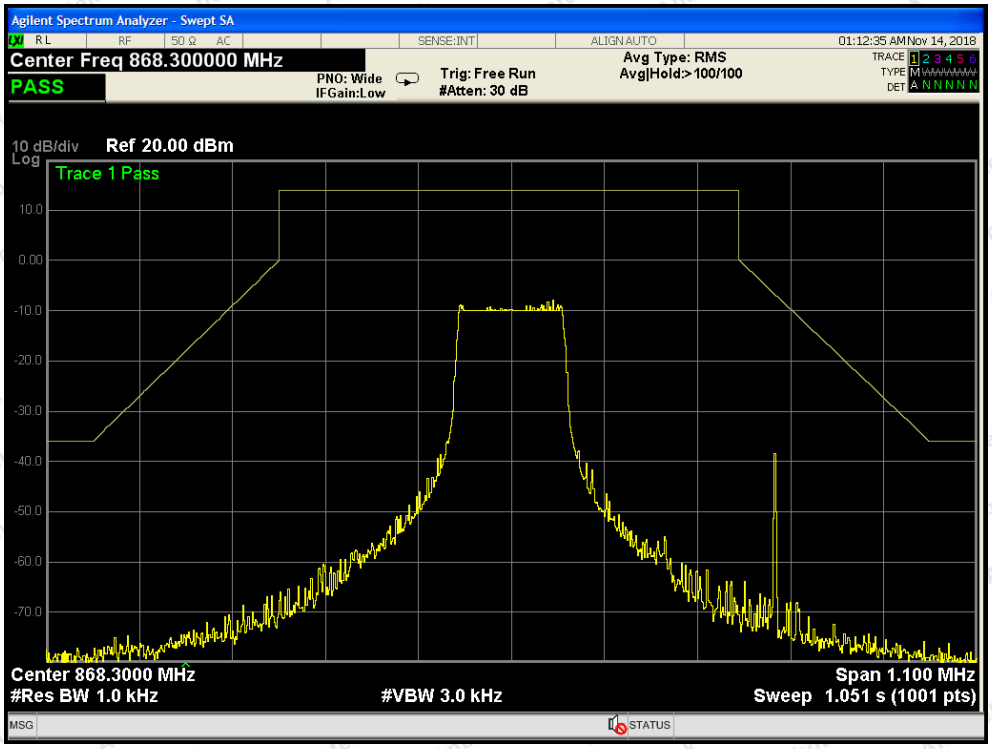
NTNV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 50/100
01:07:51 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

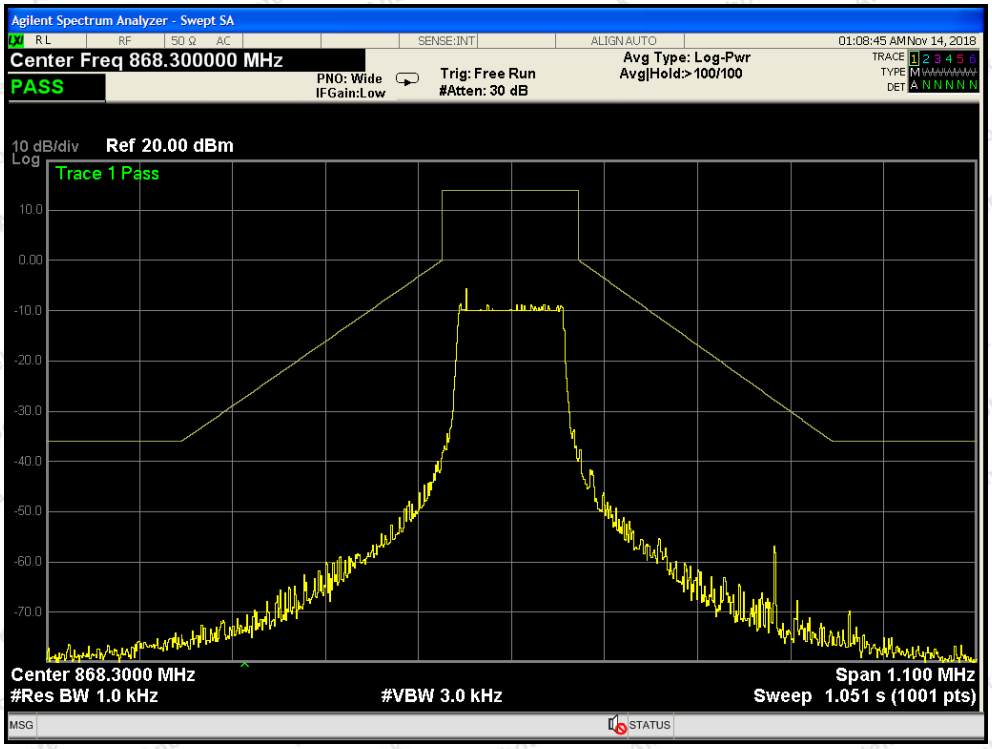

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 84/100
01:12:17 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

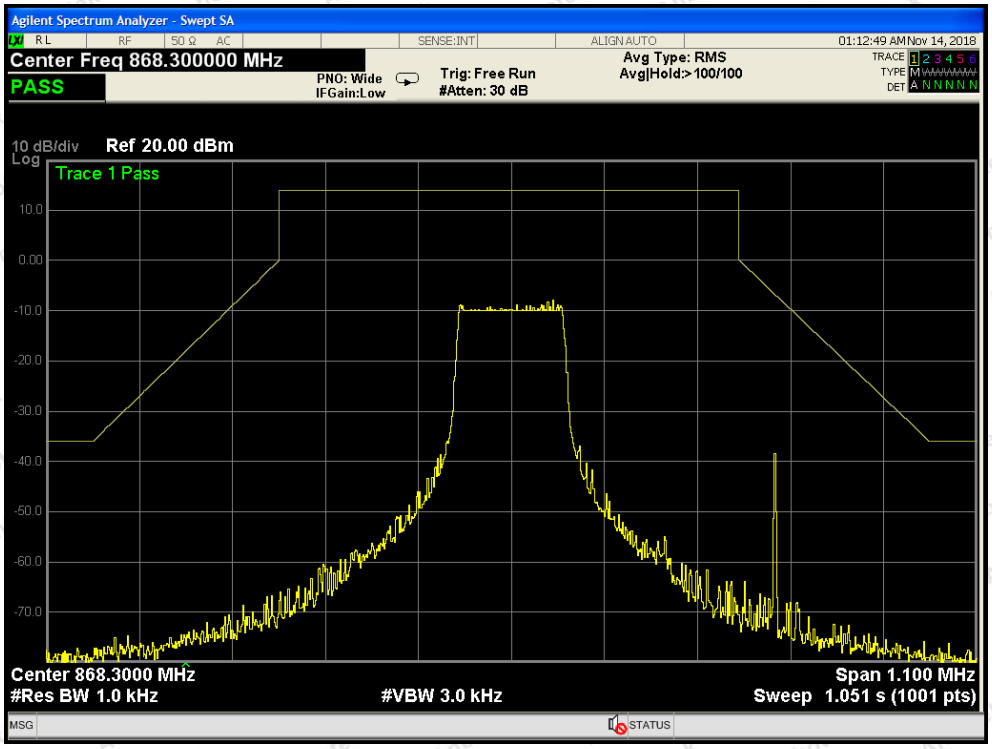
HTLV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 91/100
01:08:35 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold:>100/100
01:12:35 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

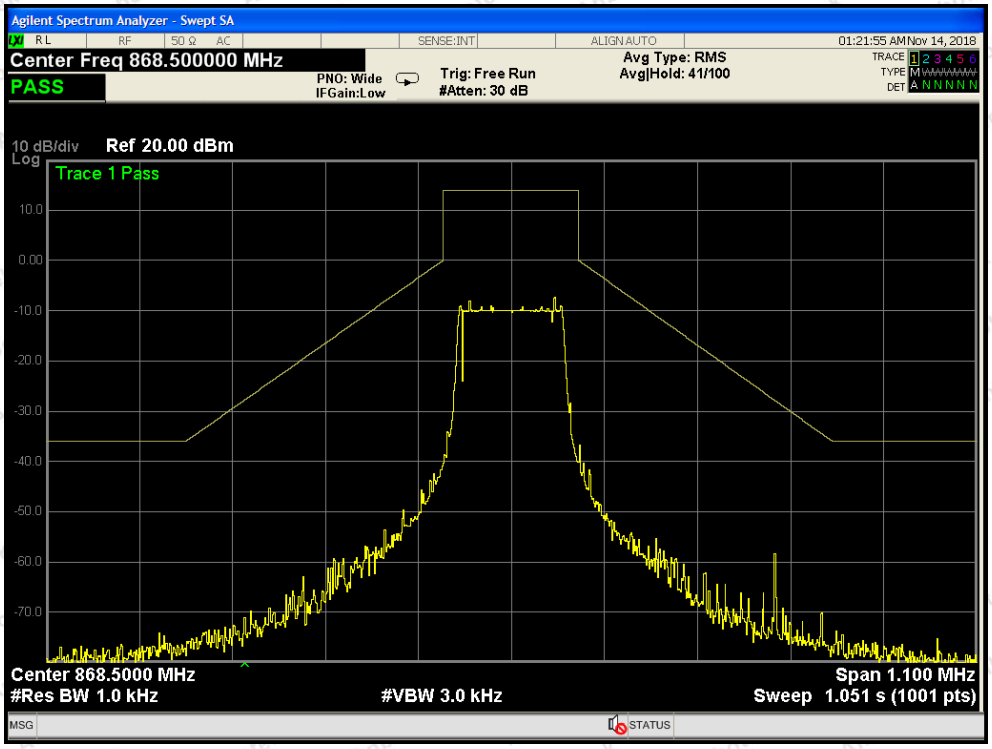
HTHV

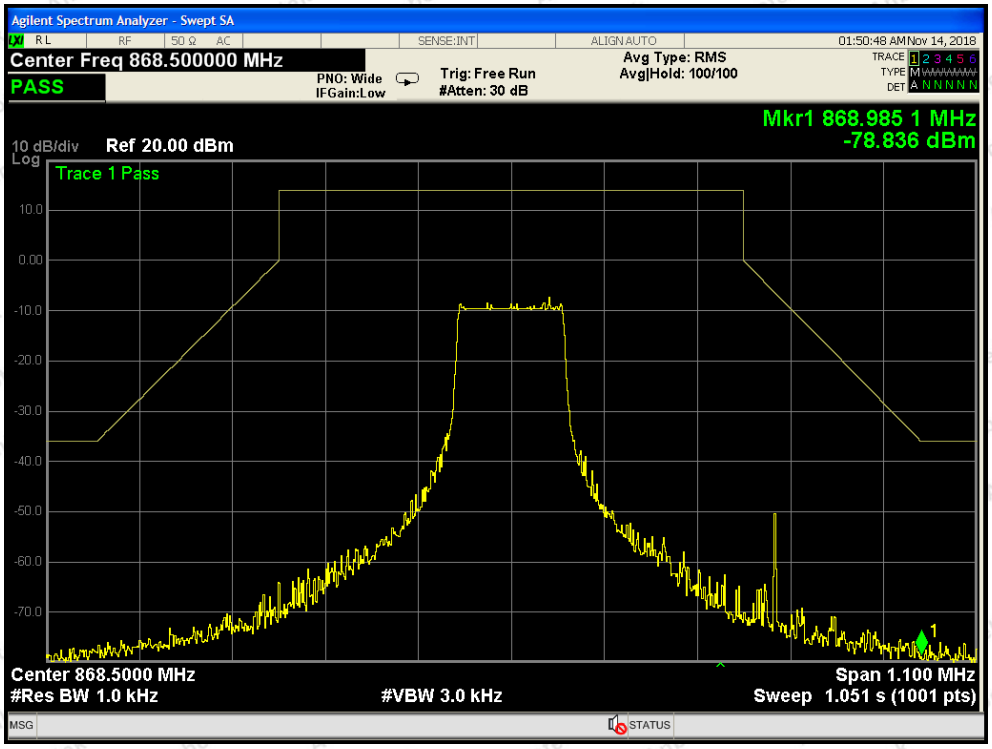

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
01:08:45 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold:>100/100
01:12:49 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

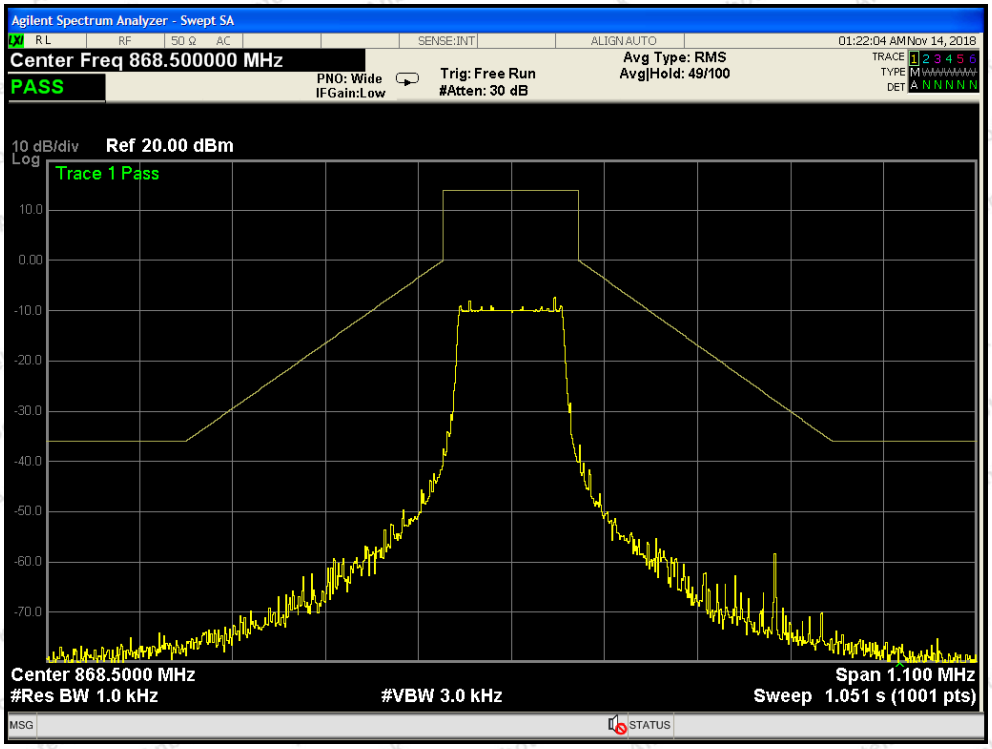
868.5MHz:

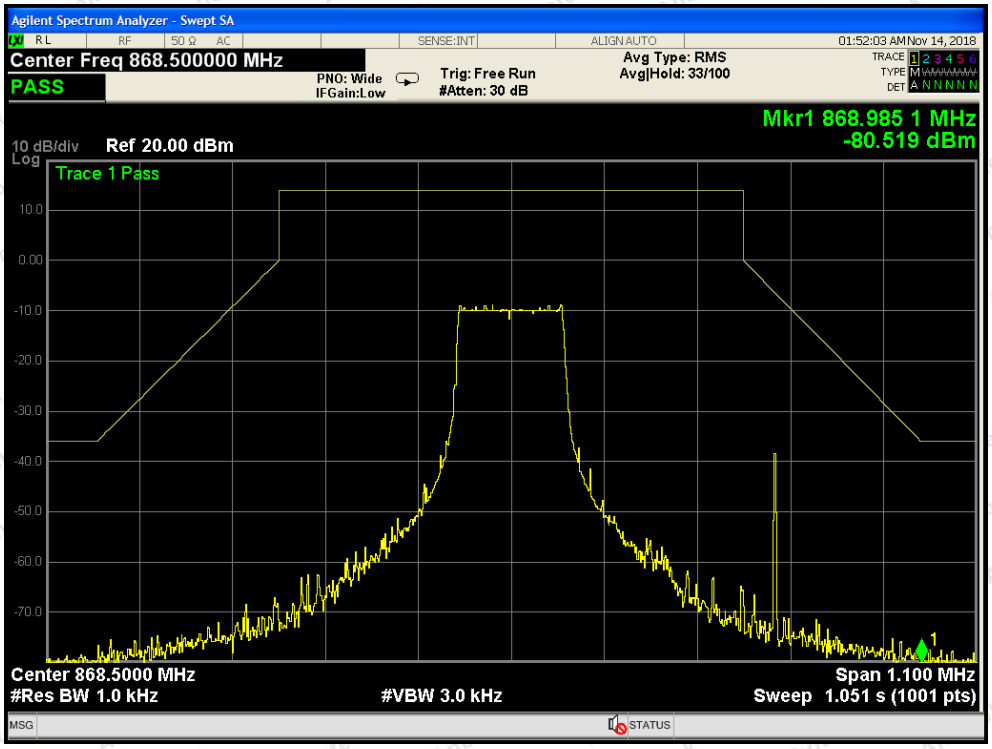
LTLV



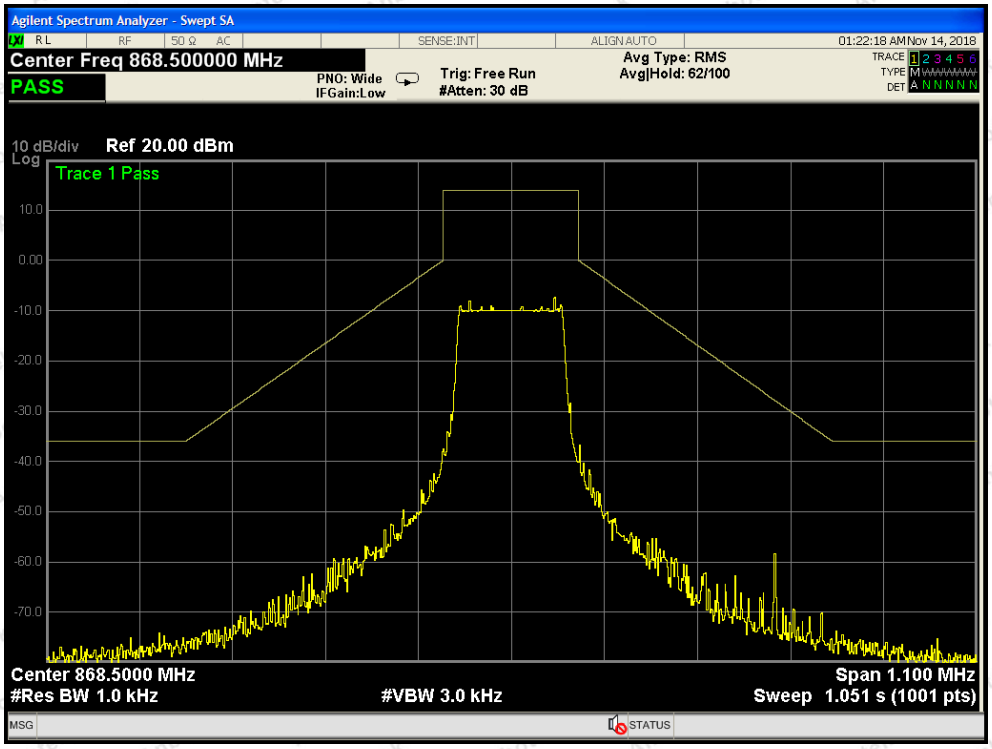


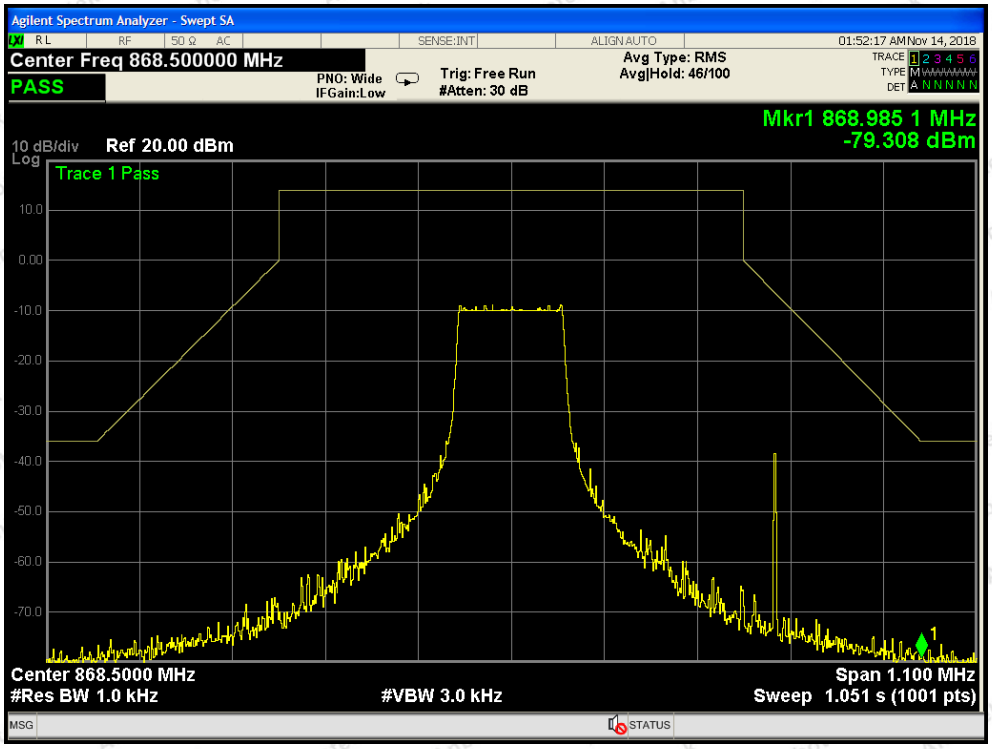
LTHV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 49/100
01:22:04 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

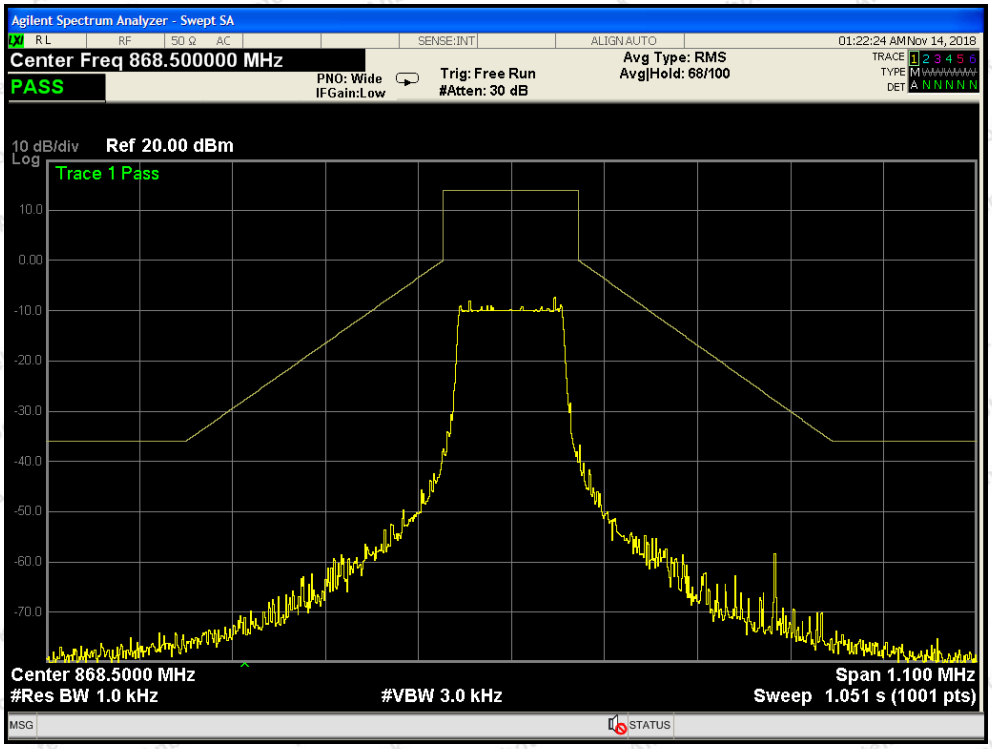

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 33/100
01:52:03 AM Nov 14, 2018
Mkr1 868.985 1 MHz
-80.519 dBm
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

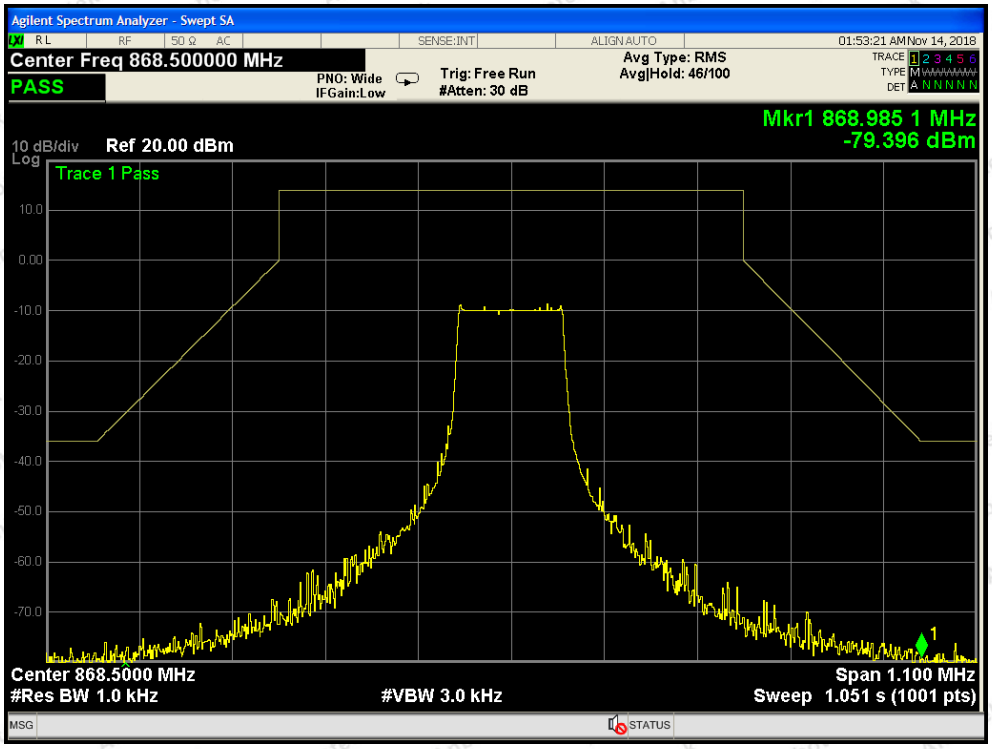
NTNV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 62/100
01:22:18 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

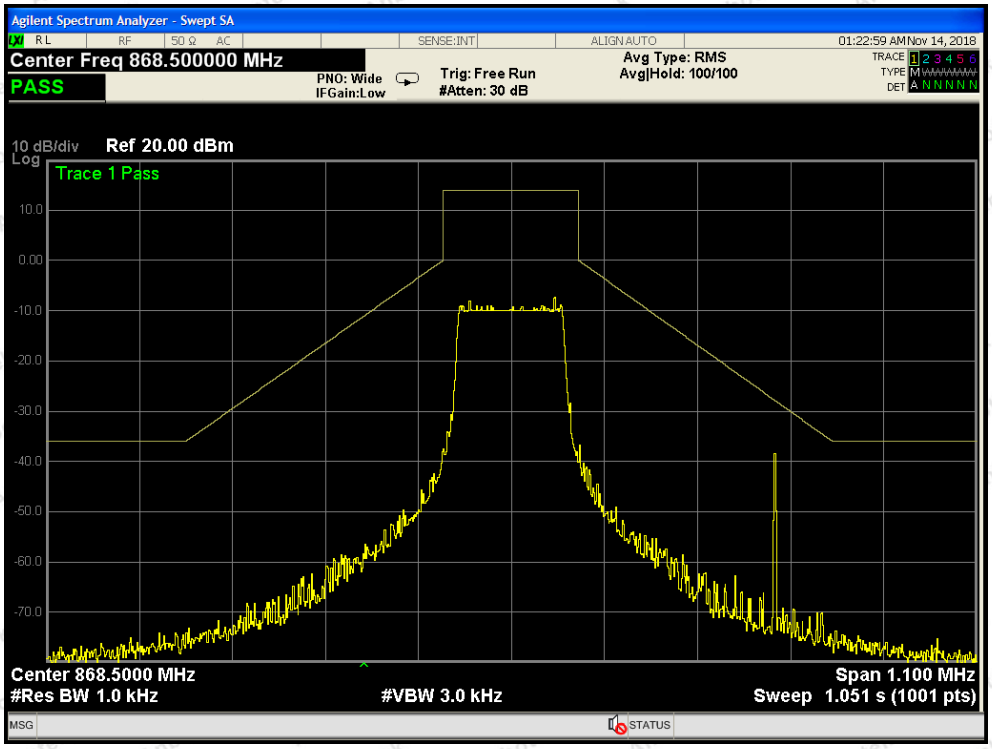

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 46/100
01:52:17 AM Nov 14, 2018
Mkr1 868.985 1 MHz
-79.308 dBm
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

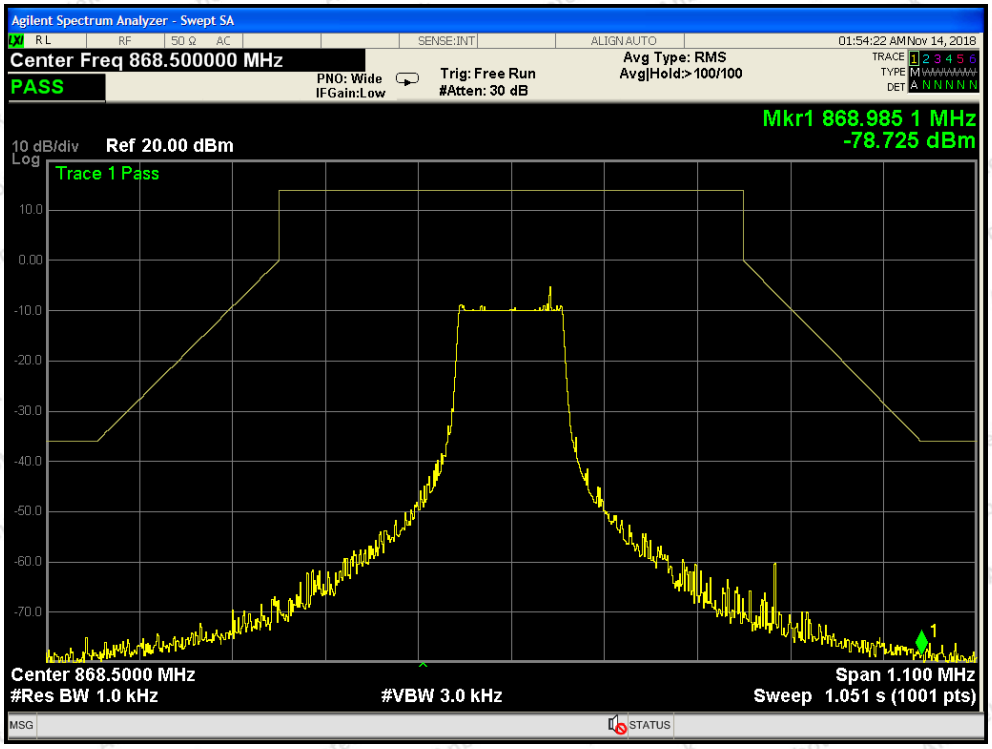
HTLV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 68/100
01:22:24 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 46/100
01:53:21 AM Nov 14, 2018
Mkr1 868.985 1 MHz
-79.396 dBm
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

HTHV


Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 100/100
01:22:59 AM Nov 14, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

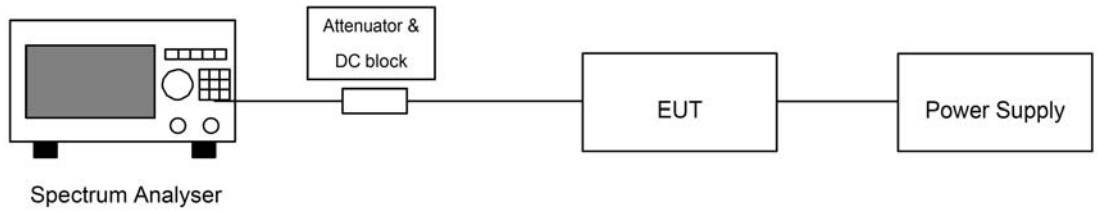

Agilent Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold:>100/100
01:54:22 AM Nov 14, 2018
Mkr1 868.985 1 MHz
-78.725 dBm
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Span 1.100 MHz
Sweep 1.051 s (1001 pts)

8. Transient Power

8.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.3.6		
Test Limit	Absolute offset from centre frequency	RBW_{REF}	Peak power limit applicable at measurement
	≤ 400 kHz	1 kHz	0 dBm
	> 400 kHz	1 kHz	-27 dBm

8.2. Test Setup



8.3. Test Procedure

The conducted measurement procedure in clause 5.10.3.2 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

8.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	TX: DC 5V via USB Port

Test Mode:	CH01	
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-OCW	0	-9.23
+OCW	0	-10.35
-0,5 x OCW - 400 kHz	-27	-36.63
0,5 x OCW + 400 kHz	-27	-35.36
-0,5 x OCW -1 200 kHz	-27	-34.48
0,5 x OCW + 1 200 kHz	-27	-34.04

Test Mode:	CH03	
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-OCW	0	-9.23
+OCW	0	-10.32
-0,5 x OCW - 400 kHz	-27	-36.71
0,5 x OCW + 400 kHz	-27	-35.31
-0,5 x OCW -1 200 kHz	-27	-34.45
0,5 x OCW + 1 200 kHz	-27	-34.18

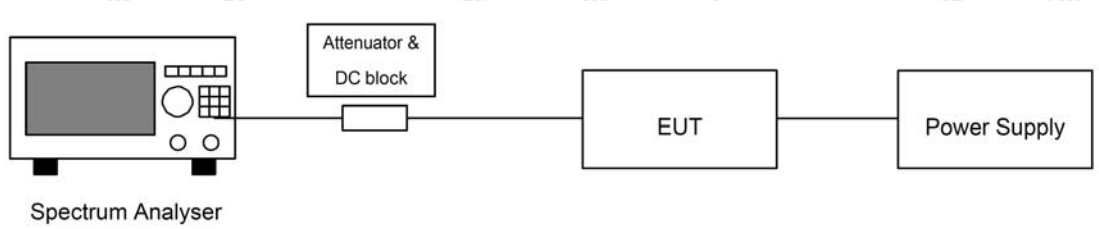
Test Mode:	CH05	
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-OCW	0	-9.29
+OCW	0	-10.36
-0,5 x OCW - 400 kHz	-27	-36.37
0,5 x OCW + 400 kHz	-27	-35.81
-0,5 x OCW -1 200 kHz	-27	-34.43
0,5 x OCW + 1 200 kHz	-27	-34.16

9. TX Behaviour Under Low Voltage Conditions

9.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.3.8
Test Limit	The equipment shall either: a) remain in the Operating Channel OC without exceeding any applicable limits (e.g. Duty Cycle); or b) reduce its effective radiated power below the Spurious Emission limits without exceeding any applicable limits (e.g. Duty Cycle); or c) shut down, (ceasing function); as the voltage falls below the manufacturers declared operating voltage.

9.2. Test Setup



9.3. Test Procedure

The conducted measurement procedure in clause 5.12.3.2 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

9.4. Test Data

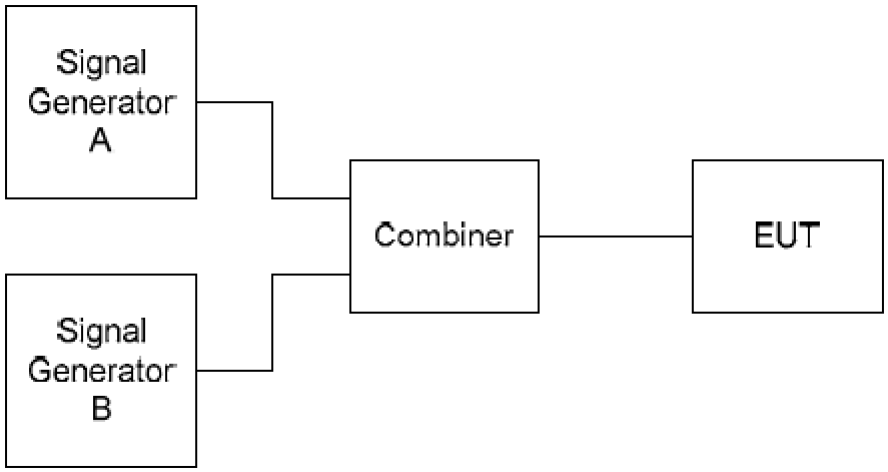
When the voltage slowly reduced lower than 70% of the manufacturer declared, the EUT will shut down, and during this period, the TX behaviour is always comply with limit.

10. Receiver Blocking

10.1. Test Standard and Limit

Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.4.2				
Test Limit	Requirement	Limits			
		Receiver category 3	Receiver category 2	Receiver category 1.5	Receiver category 1
	Blocking at ±2 MHz from OC edge f_{high} and f_{low}	⩾ -80 dBm	⩾ -69 dBm	⩾ -43 dBm	⩾ -20 dBm
	Blocking at ±10 MHz from OC edge f_{high} and f_{low}	⩾ -60 dBm	⩾ -44 dBm	⩾ -33 dBm	⩾ -20 dBm
	Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	⩾ -60 dBm	⩾ -44 dBm	⩾ -33 dBm	⩾ -20 dBm

10.2. Test Setup



10.3. Test Procedure

The conducted measurement procedure in clause 5.18.6.3 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously receiving.

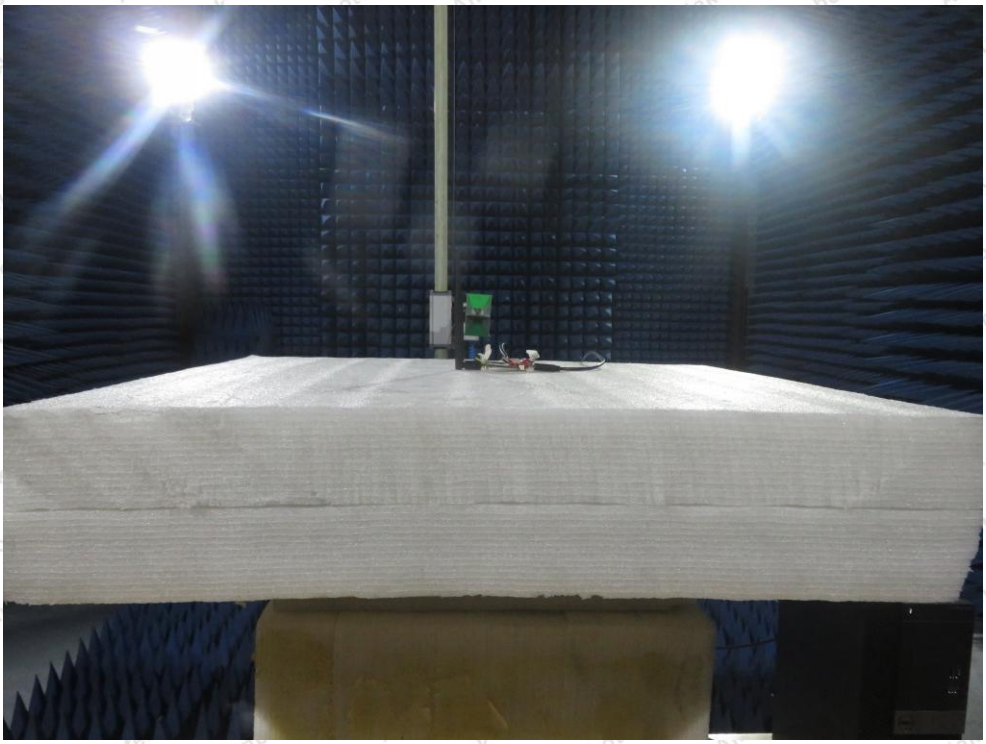
10.4. Test Data

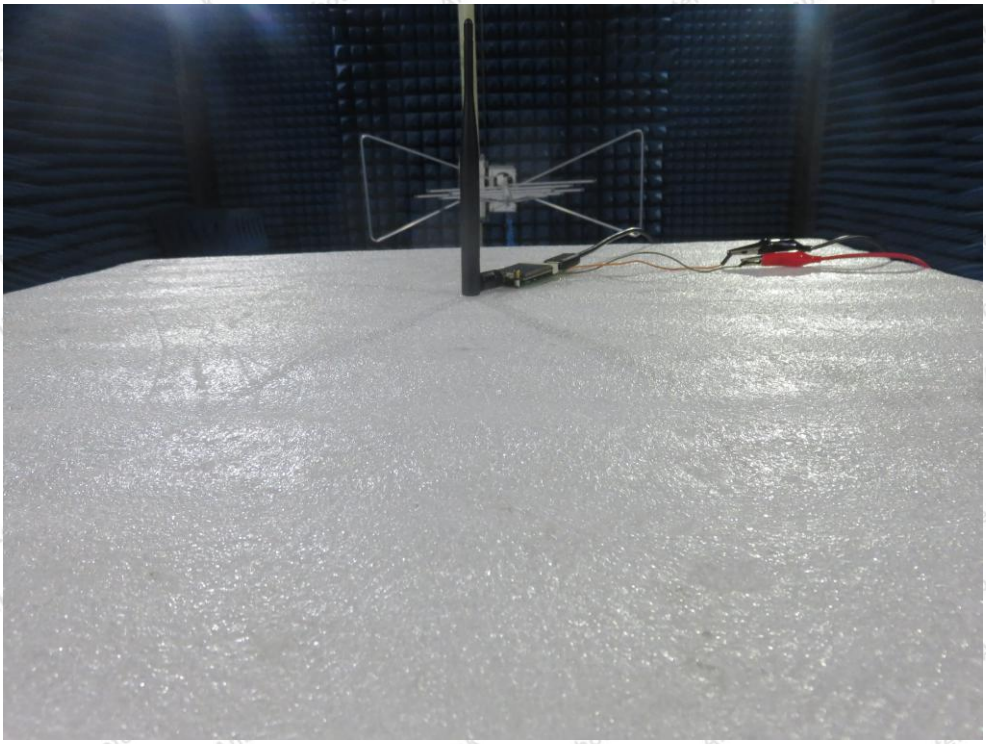
Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	RX: DC 5V via USB Port

EUT category: category 3	Operating Channel: CH01	
Requirement	Limit	Results
Blocking at -2 MHz from Operating Channel	≥ -80 dBm	PASS
Blocking at +2 MHz from Centre Frequency	≥ -80 dBm	PASS
Blocking at -10 MHz from Centre Frequency	≥ -60 dBm	PASS
Blocking at +10 MHz from Centre Frequency	≥ -60 dBm	PASS
Blocking at -5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -60 dBm	PASS
Blocking at +5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -60 dBm	PASS

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test





---------- End of Report ----------