RED-Radio Test Report

For

MAXIIOT LTD

LoRaWAN

Model No.: DL7612-EX

Prepared For	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102 Tel: (86) 755-26066440 Fax: (86) 755-26014772
Report Number	:	SZAWW180622001-04W
Date of Receipt	:	Jun. 22, 2018
Date of Test	:	Jun. 22~Nov. 06, 2018
Date of Report	:	Nov. 06, 2018

Contents

TEST REPORT

Applicant	:	MAXIIOT LTD
Manufacturer	:	MAXIIOT LTD
Product Name	:	LoRaWAN
Model No.	:	DL7612-EX
Trade Mark	:	MAXIIOT
Rating(s)	:	Input: DC 3.3V, 1A

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: Jun. 22~Nov. 06, 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.	:	DL7612-EX	
Trade Mark	:	MAXIIOT	
Test Power Supply	:	TX & RX: DC 3.3V	
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)	
Product Description	:	Operation Frequency:	868-868.6MHz
		Number of Channel:	6 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

Notebook	:	Manufacturer: FUJITSU LIMITED M/N: LH531 S/N: 518127-01R2300775 DC Rating: DC 19V, 4.22A CE , FCC DOC, CCC
		Adapter: M/N: ADP-602HA Input: 100V-240V~ 50/60Hz, 1.5A Output: DC 19V, 3.16A

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)
00	868.0
01	868.1
02	868.2
03	868.3
04	868.4
05	868.5
06	868.6

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 3.3V	TX & RX: DC 2.97V~ DC 3.63V
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. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 17, 2017	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Nov. 17, 2017	1 Year
10.	Horn Antenna	Schewarzbeck	BBHA9170	9170-375	Nov. 17, 2017	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	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. 18, 2017	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 17, 2017	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 17, 2017	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 18, 2017	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 18, 2017	1 Year
19.	DC Power Supply	LW	TPR-6410D	349315	Nov. 01, 2018	1 Year
20.	Constant Temperature Humidity Chamber	Sertep	ZJ-HWHS80B	ZJ-17042804	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

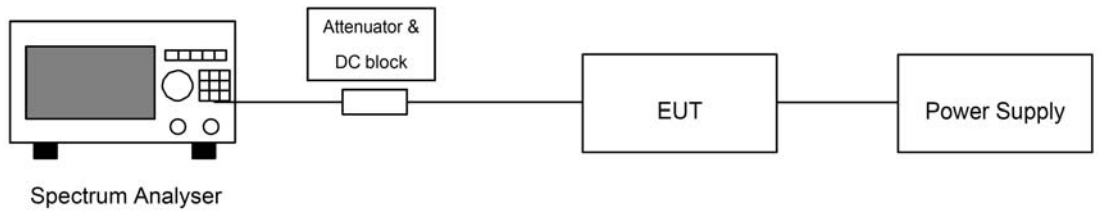
Harmonised Standard ETSI EN 300 220-2			
No.	Test Items	Clause No.	Results
1	Operating frequency	4.2.1	PASS
2	Unwanted emissions in the spurious domain	4.2.2	PASS
3	Effective radiated power	4.3.1	PASS
4	Maximum e.r.p. spectral density	4.3.2	N/A
5	Duty cycle	4.3.3	PASS
6	Occupied bandwidth	4.3.4	PASS
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



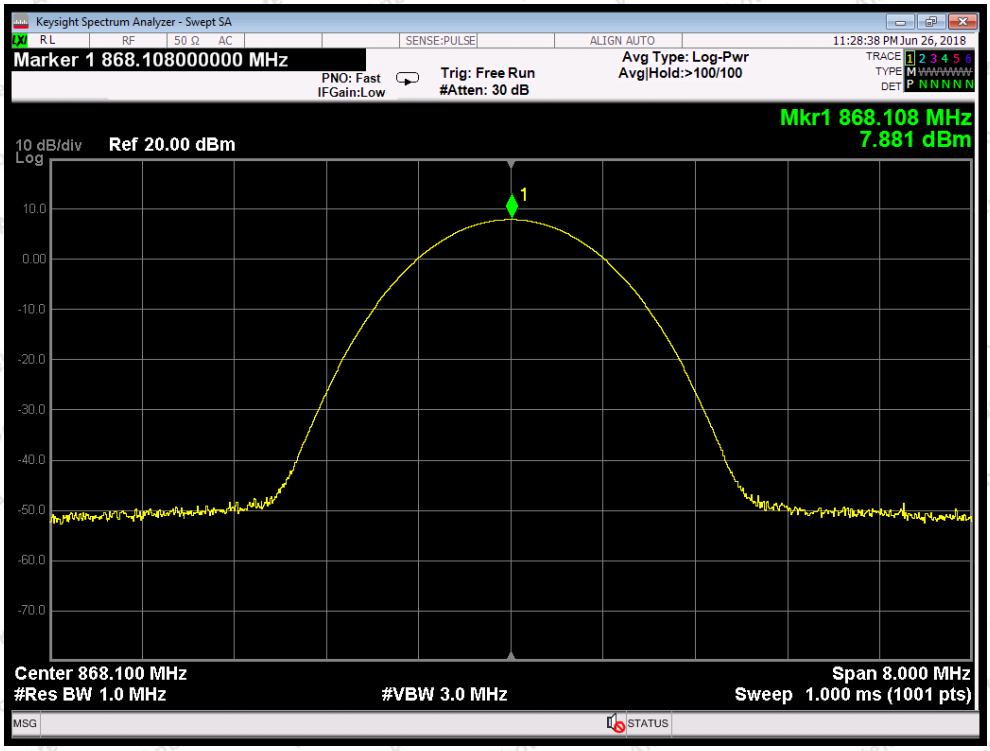
3.3. Test Procedure

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.

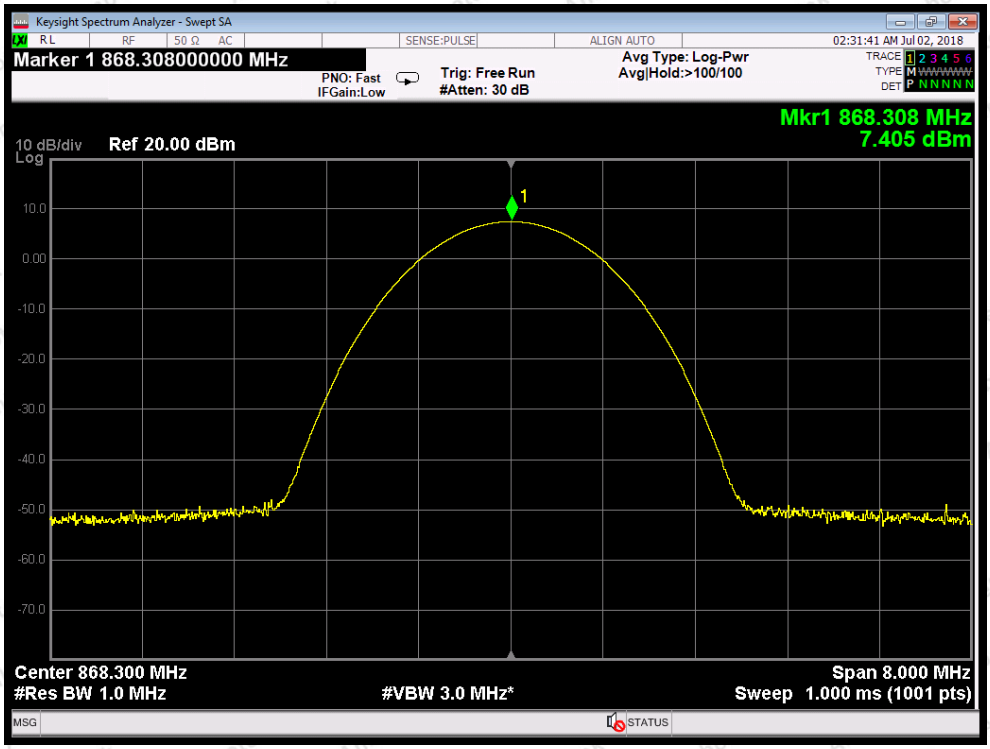
3.4. Test Data

Pass

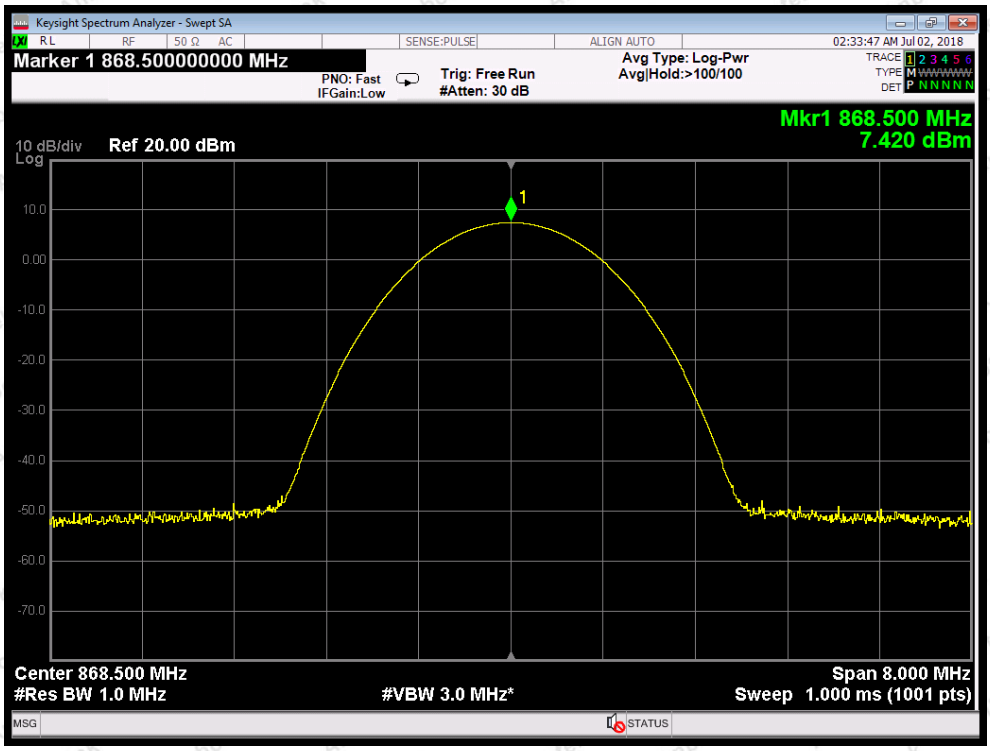
Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	TX: DC 3.3V



Test Mode: CH01



Test Mode: CH03



Test Mode: CH05

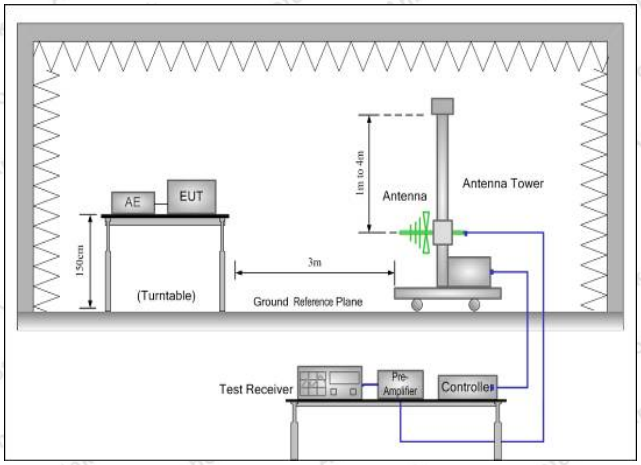
3. Unwanted Emissions In The Spurious Domain

3.1. Test Standard and Limit

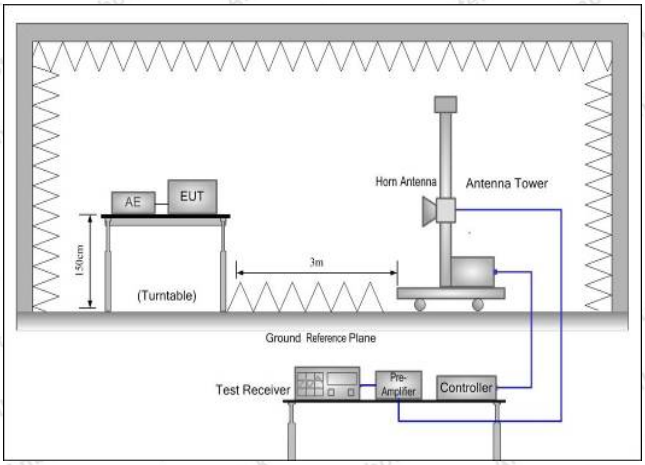
Test Standard	ETSI EN 300 220-2 V3.1.1 Clause 4.2.2			
Test Limit	Frequency / State	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1 000 MHz	Frequencies above 1 000 MHz
	TX mode	-54 dBm	-36 dBm	-30 dBm
	RX and all other modes	-57 dBm	-57 dBm	-47 dBm

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 3.3V

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
63.39	-67.24	-54.00	-13.24	H	PASS
119.37	-52.38	-36.00	-16.38	H	
226.99	-73.89	-54.00	-19.89	H	
868.10	-40.49	-36.00	-4.49	H	
954.00	-65.79	-54.00	-11.79	H	
966.00	-58.39	-54.00	-4.39	H	
52.09	-74.92	-54.00	-20.92	V	
131.33	-60.33	-36.00	-24.33	V	
223.72	-66.18	-54.00	-12.18	V	
868.10	-46.53	-36.00	-10.53	V	
963.07	-63.66	-54.00	-9.66	V	
966.00	-59.46	-54.00	-5.46	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
2604.30	-46.98	-30.00	-16.98	H	PASS
2786.60	-47.01	-30.00	-17.01	H	
3472.40	-46.80	-30.00	-16.80	H	
2786.60	-47.27	-30.00	-17.27	V	
2604.30	-50.60	-30.00	-20.60	V	
3472.40	-44.59	-30.00	-14.59	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	RX: DC 3.3V

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
63.41	-64.24	-57.00	-7.24	H	PASS
98.25	-65.55	-57.00	-8.55	H	
112.49	-70.52	-57.00	-13.52	H	
203.40	-72.63	-57.00	-15.63	H	
332.14	-61.49	-57.00	-4.49	H	
841.32	-70.01	-57.00	-13.01	H	
60.24	-69.54	-57.00	-12.54	V	
87.98	-65.80	-57.00	-8.80	V	
138.92	-68.08	-57.00	-11.08	V	
185.96	-74.33	-57.00	-17.33	V	
311.69	-76.37	-57.00	-19.37	V	
848.25	-67.42	-57.00	-10.42	V	

Test Result: above 1000MHz

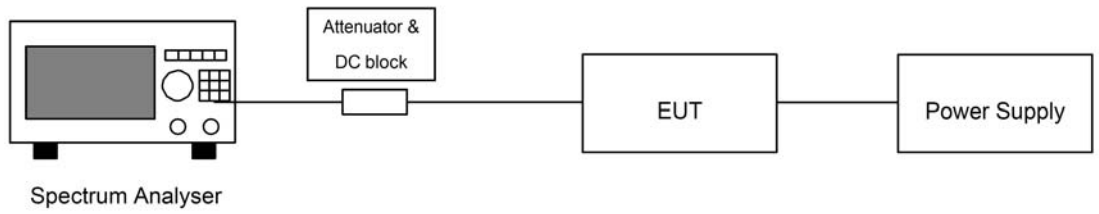
Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
2586.94	-48.38	-30.00	-18.38	H	PASS
2621.66	-45.37	-30.00	-15.37	H	
3489.76	-45.16	-30.00	-15.16	H	
2786.60	-48.60	-30.00	-18.60	V	
2612.98	-47.28	-30.00	-17.28	V	
3481.08	-40.79	-30.00	-10.79	V	

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 3.3V	12.866
T min (°C)	-10.00	V nom (V)	TX: DC 2.97V	12.722
T max (°C)	45.00	V nom (V)	TX: DC 3.63V	11.677
Max RF Power				12.866
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 3.3V	12.734
T min (°C)	-10.00	V nom (V)	TX: DC 2.97V	12.698
T max (°C)	45.00	V nom (V)	TX: DC 3.63V	11.567
Max RF Power				12.734
Limits				13.98
Result				PASS

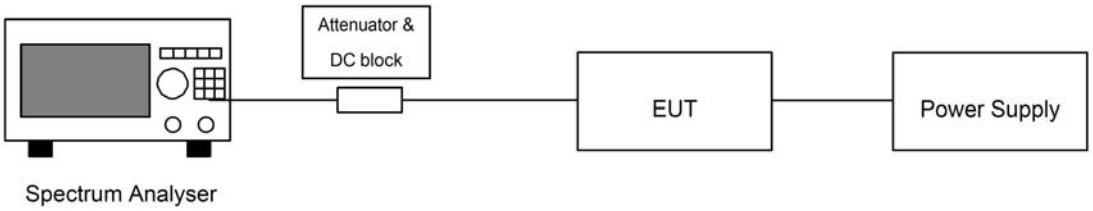
Test Mode:		TX CH05		
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	TX: DC 3.3V	12.848
T min (°C)	-10.00	V nom (V)	TX: DC 2.97V	12.715
T max (°C)	45.00	V nom (V)	TX: DC 3.63V	11.599
Max RF Power				12.848
Limits				13.98
Result				PASS

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

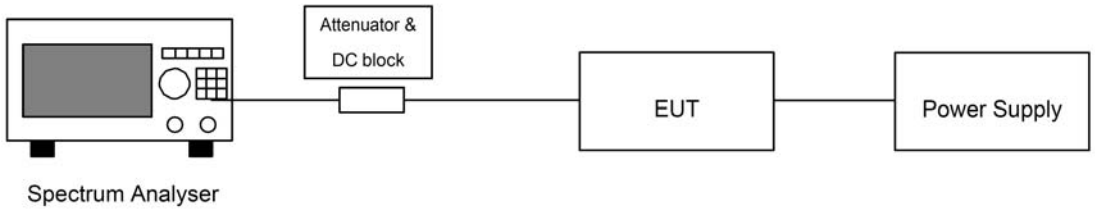
The duty cycle is < 1%

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

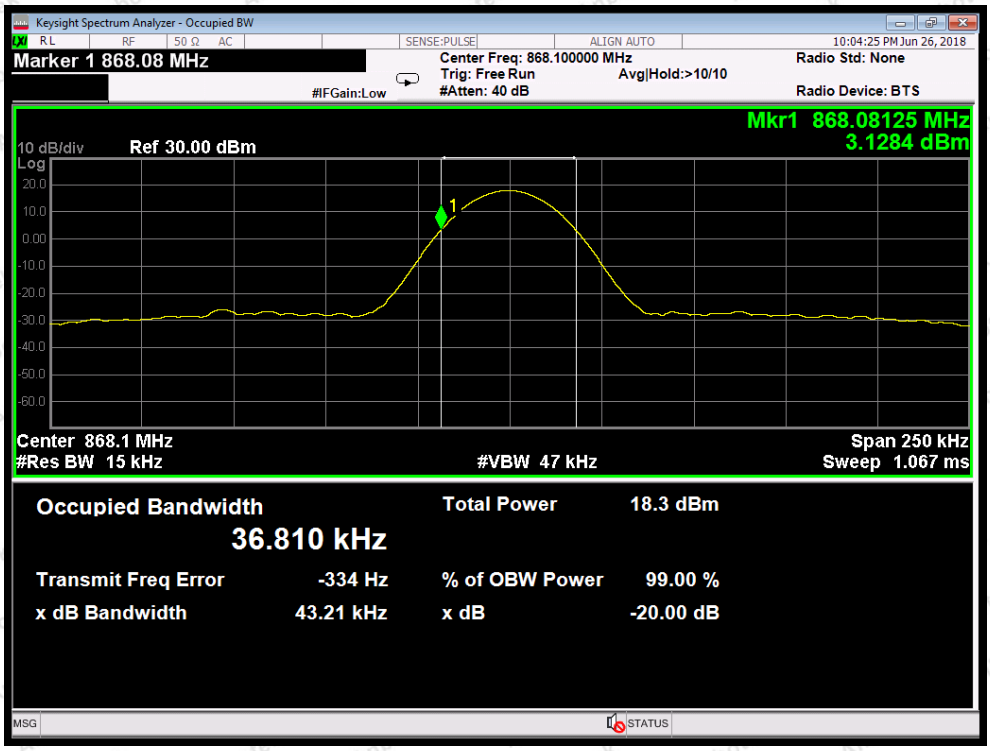
Test Mode:			TX CH01				
Test Channel	Test Temperature	Test Voltage (V dc)	F(Low) MHz	F(High) MHz	OBW (KHz)	Maximum OBW(KHz)	Results
CH01	-10	TX: DC 2.97V	868.0813	868.1180	36.686	36.798	Pass
		TX: DC 3.63V	868.0813	868.1180	36.744		
	25	TX: DC 3.3V	868.0813	868.1180	36.750		
	45	TX: DC 2.97V	868.0813	868.1180	36.797		
		TX: DC 3.63V	868.0813	868.1180	36.798		

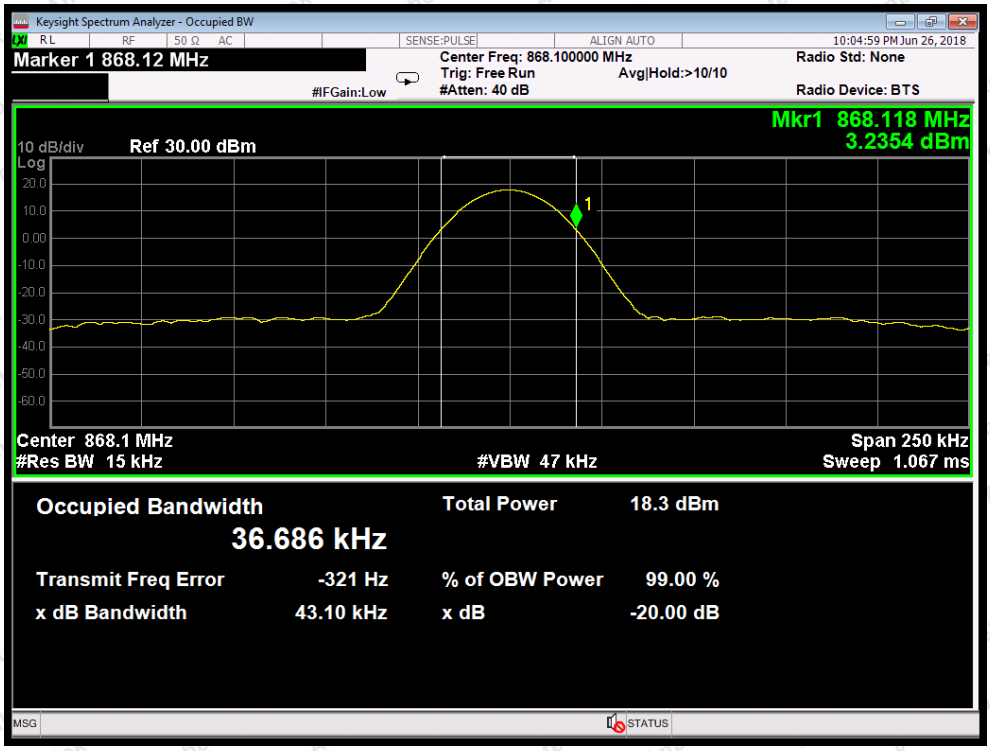
Test Mode:			TX CH03				
Test Channel	Test Temperature	Test Voltage (V dc)	F(Low) MHz	F(High) MHz	OBW (KHz)	Maximum OBW(KHz)	Results
CH01	-10	TX: DC 2.97V	868.2808	868.3175	36.691	36.727	Pass
		TX: DC 3.63V	868.2805	868.3178	36.727		
	25	TX: DC 3.3V	868.2808	868.3175	36.589		
	45	TX: DC 2.97V	868.2808	868.3175	36.649		
		TX: DC 3.63V	868.2808	868.3175	36.614		

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 2.97V	868.4805	868.5178	36.706	36.708	Pass
		TX: DC 3.63V	868.4805	868.5178	36.708		
	25	TX: DC 3.3V	868.4808	868.5178	36.654		
	45	TX: DC 2.97V	868.4805	868.5178	36.677		
		TX: DC 3.63V	868.4805	868.5178	36.694		

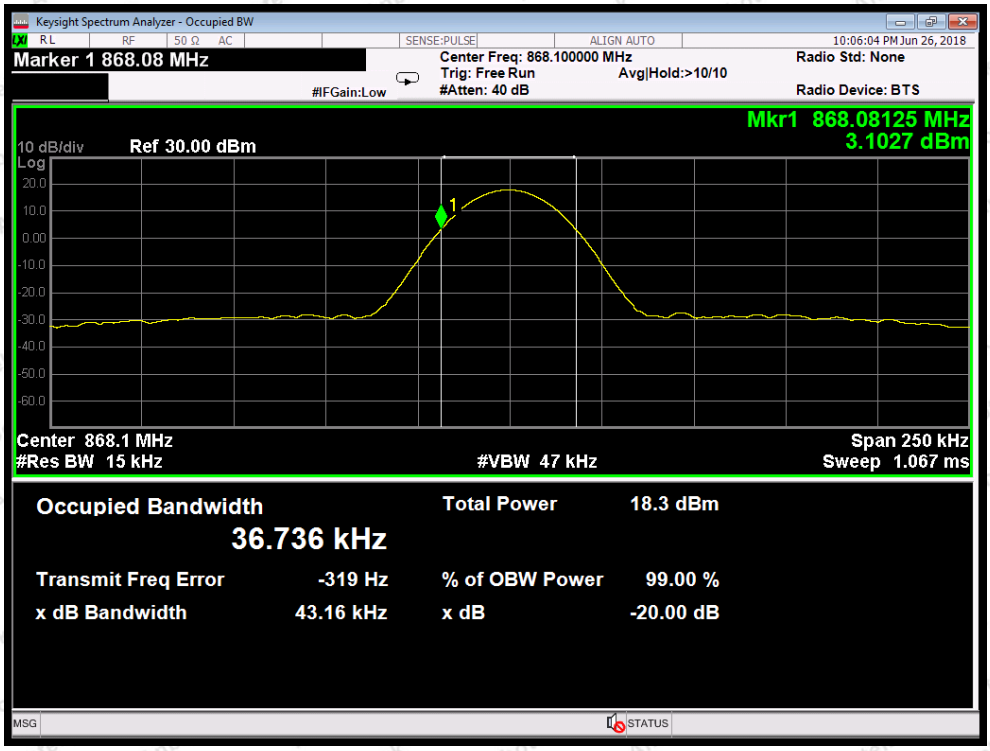
868.1MHz:

LTLV





LTHV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
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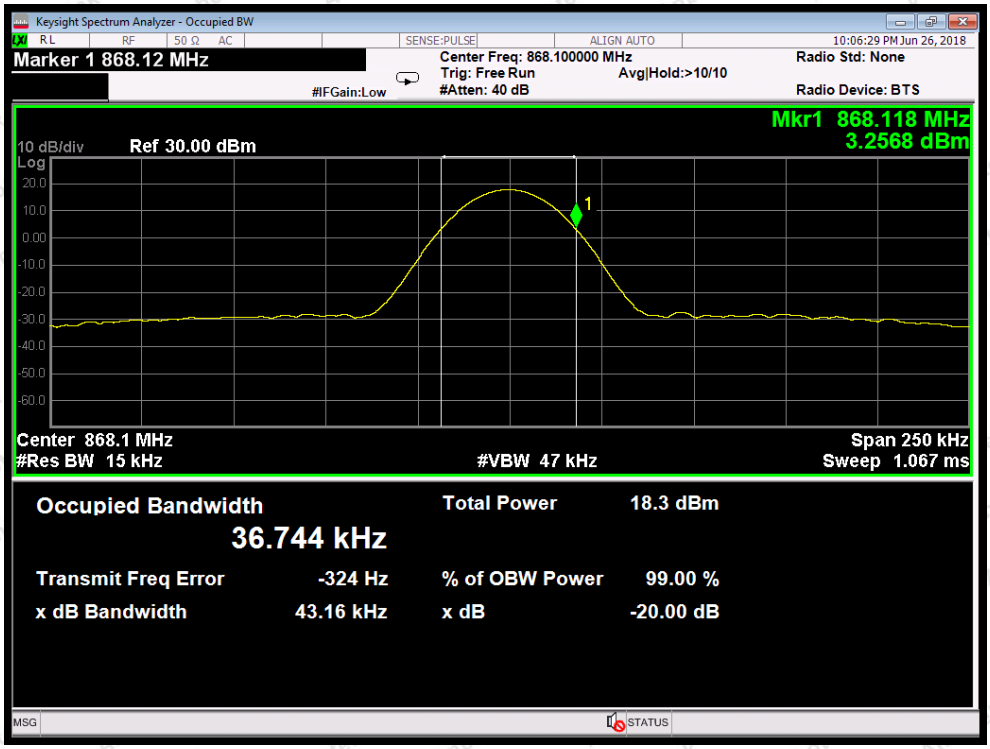
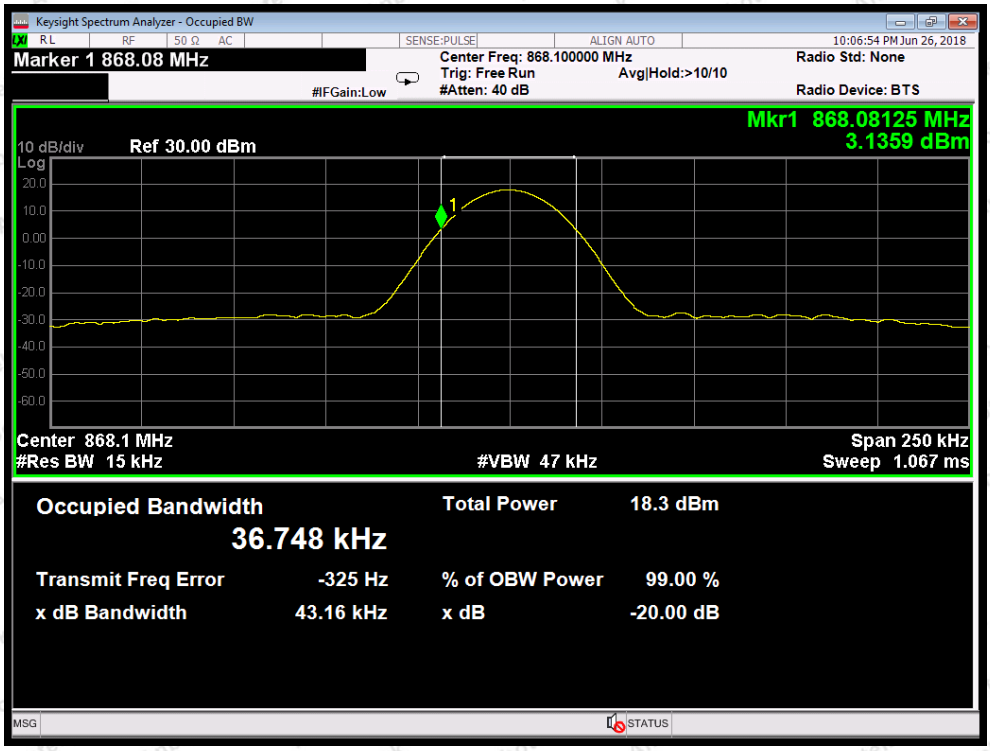
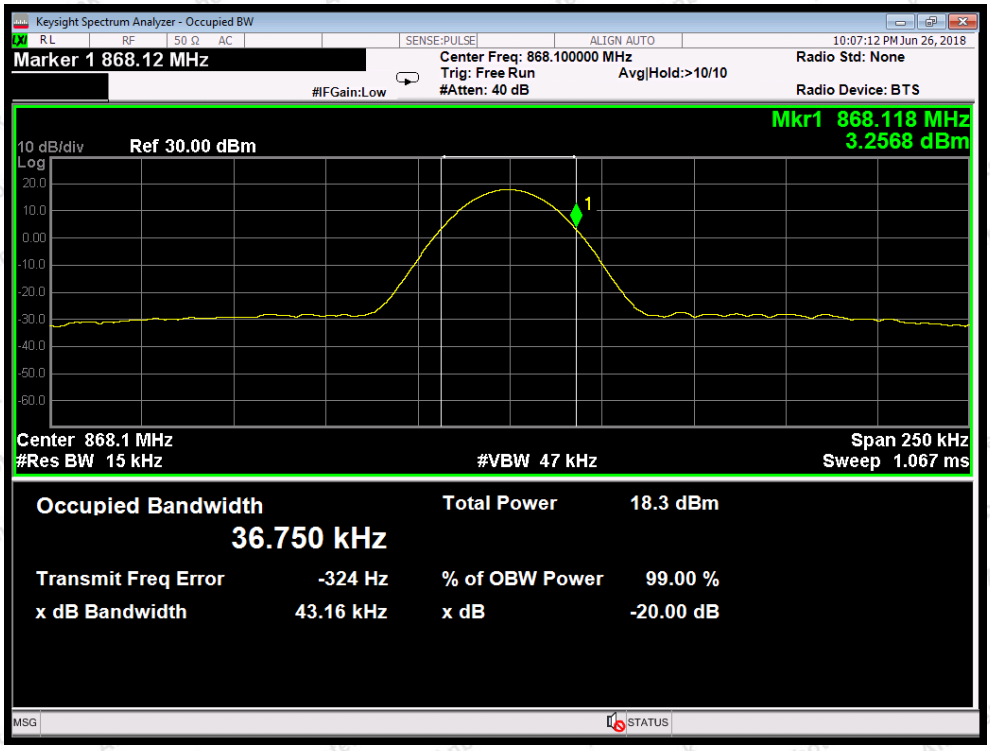
ALIGN AUTO
10:06:04 PM Jun 26, 2018
Marker 1 868.08 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.08125 MHz
3.1027 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.736 kHz
Total Power 18.3 dBm
Transmit Freq Error -319 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.16 kHz
x dB -20.00 dB
MSG
STATUS

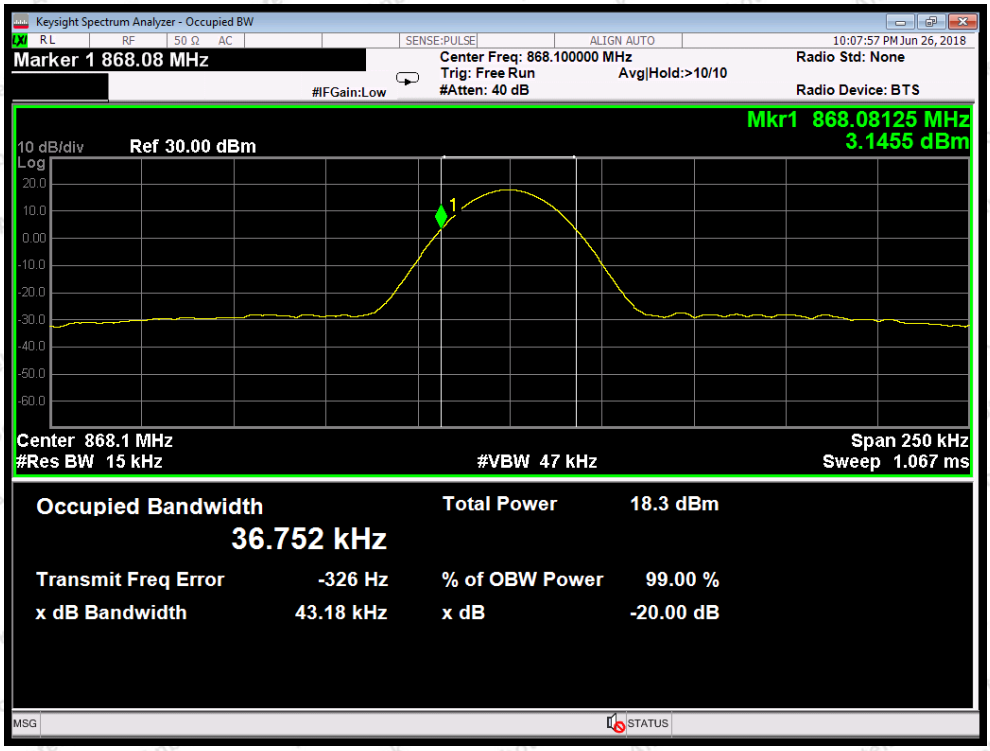

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
10:06:29 PM Jun 26, 2018
Marker 1 868.12 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.118 MHz
3.2568 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.744 kHz
Total Power 18.3 dBm
Transmit Freq Error -324 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.16 kHz
x dB -20.00 dB
MSG
STATUS

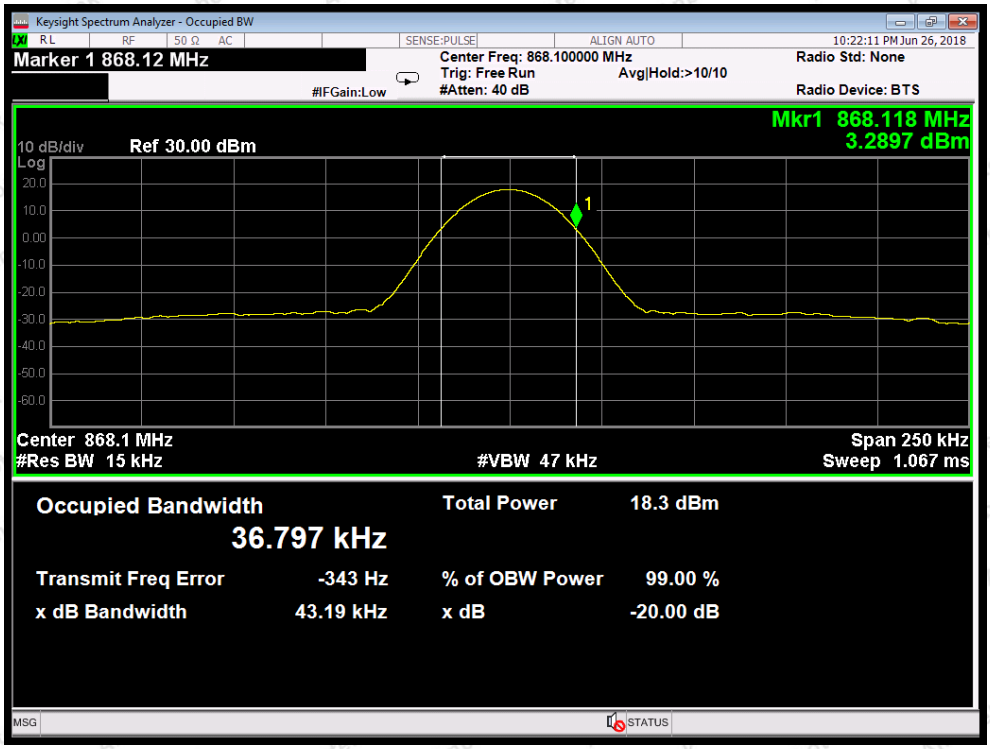
NTNV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
10:06:54 PM Jun 26, 2018
Marker 1 868.08 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.08125 MHz
3.1359 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.748 kHz
Total Power
18.3 dBm
Transmit Freq Error
-325 Hz
% of OBW Power
99.00 %
x dB Bandwidth
43.16 kHz
x dB
-20.00 dB
MSG
STATUS

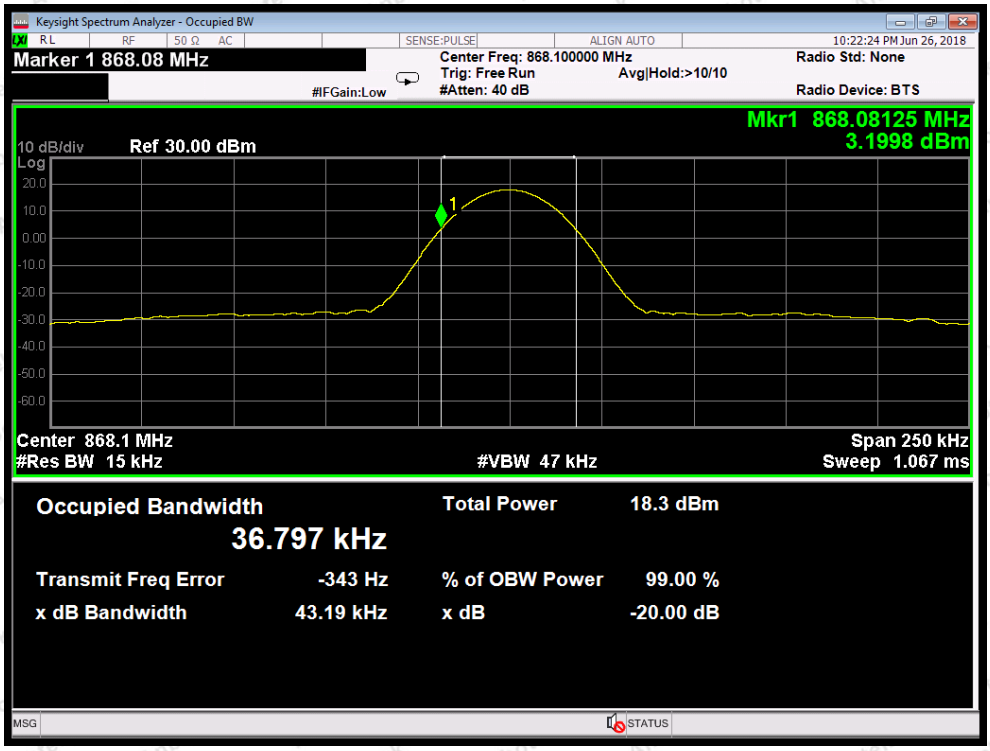

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
10:07:12 PM Jun 26, 2018
Marker 1 868.12 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.118 MHz
3.2568 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.750 kHz
Total Power
18.3 dBm
Transmit Freq Error
-324 Hz
% of OBW Power
99.00 %
x dB Bandwidth
43.16 kHz
x dB
-20.00 dB
MSG
STATUS

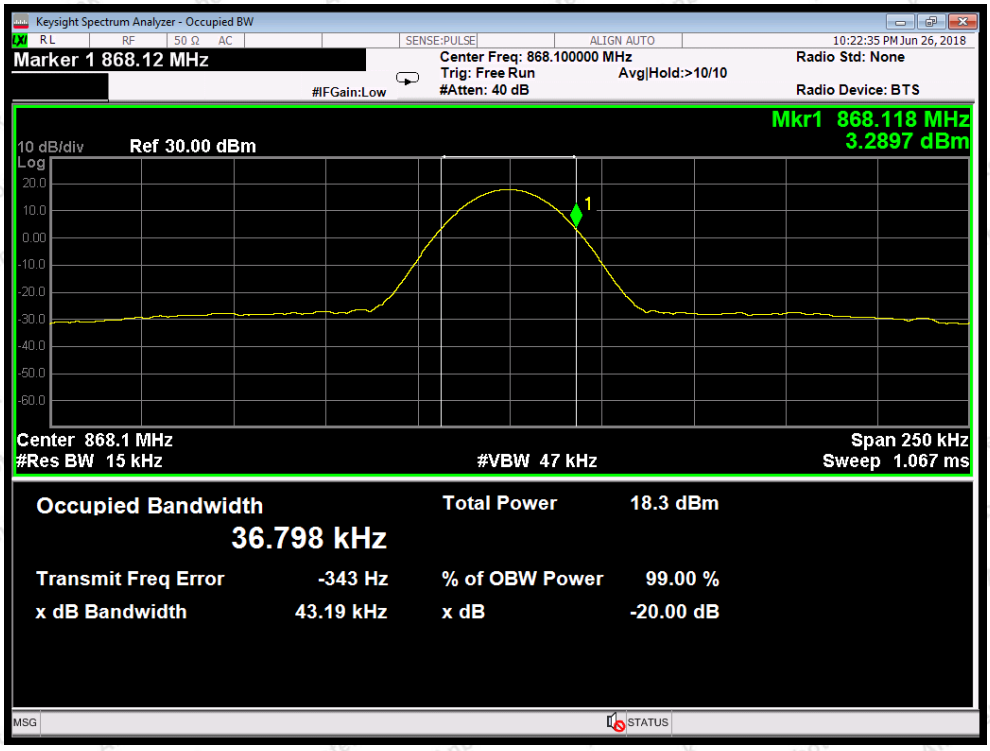
HTLV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
10:07:57 PM Jun 26, 2018
Marker 1 868.08 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.08125 MHz
3.1455 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.752 kHz
Total Power 18.3 dBm
Transmit Freq Error -326 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.18 kHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
10:22:11 PM Jun 26, 2018
Marker 1 868.12 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.118 MHz
3.2897 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.797 kHz
Total Power 18.3 dBm
Transmit Freq Error -343 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.19 kHz
x dB -20.00 dB
MSG
STATUS

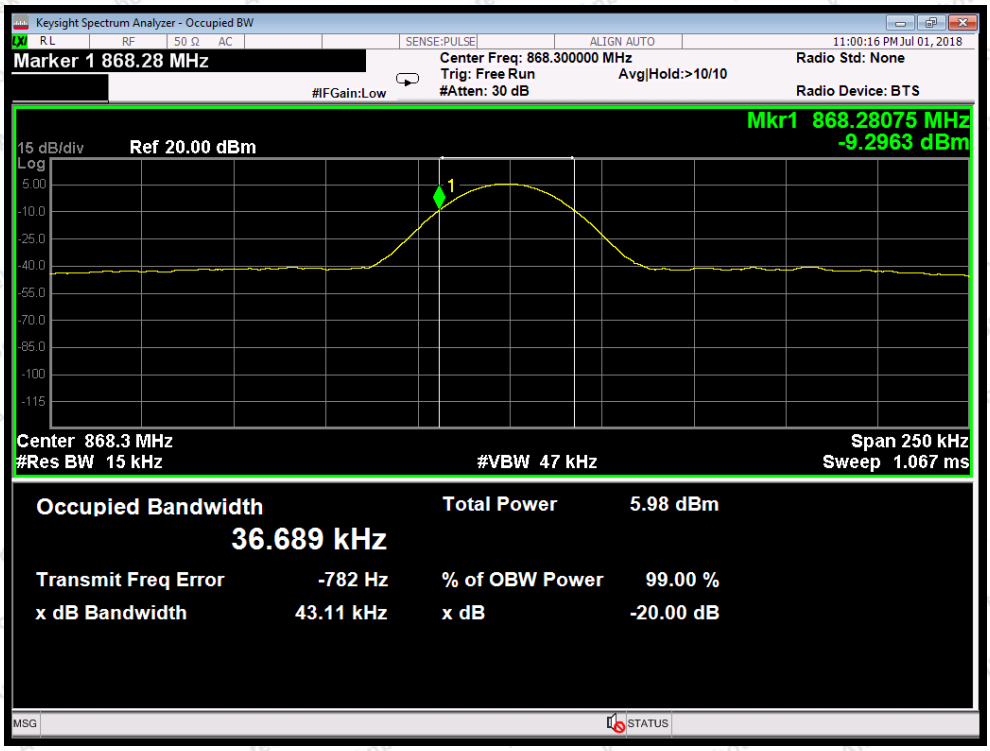
HTHV

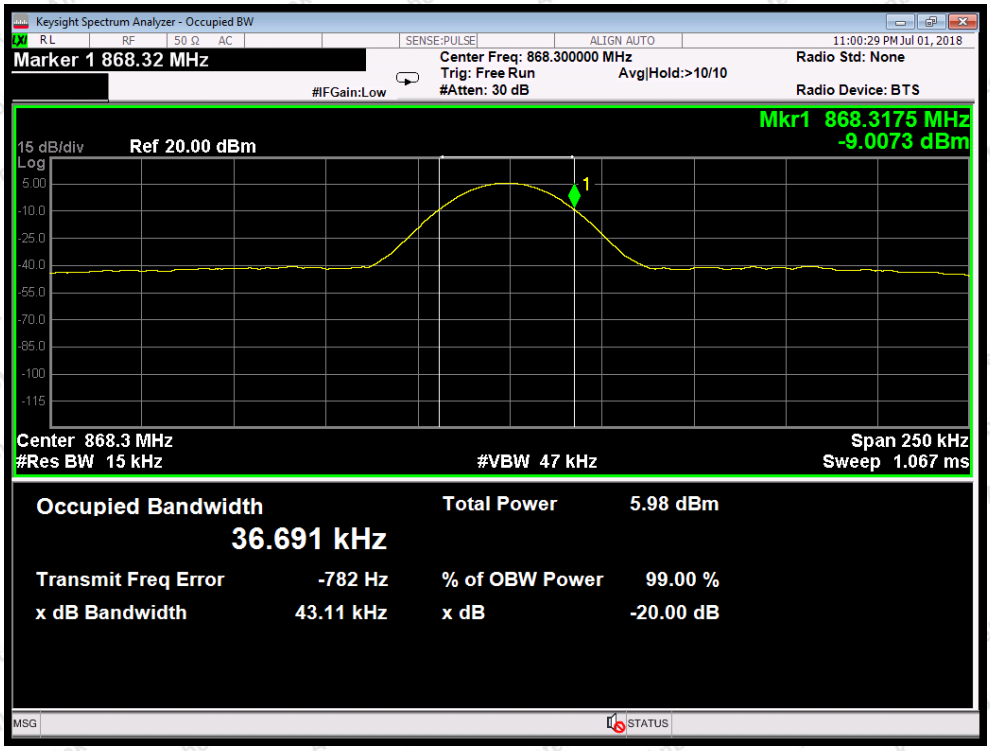

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
10:22:24 PM Jun 26, 2018
Marker 1 868.08 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.08125 MHz
3.1998 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.797 kHz
Total Power
18.3 dBm
Transmit Freq Error
-343 Hz
% of OBW Power
99.00 %
x dB Bandwidth
43.19 kHz
x dB
-20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
10:22:35 PM Jun 26, 2018
Marker 1 868.12 MHz
Center Freq: 868.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.118 MHz
3.2897 dBm
10 dB/div
Ref 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 868.1 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.798 kHz
Total Power
18.3 dBm
Transmit Freq Error
-343 Hz
% of OBW Power
99.00 %
x dB Bandwidth
43.19 kHz
x dB
-20.00 dB
MSG
STATUS

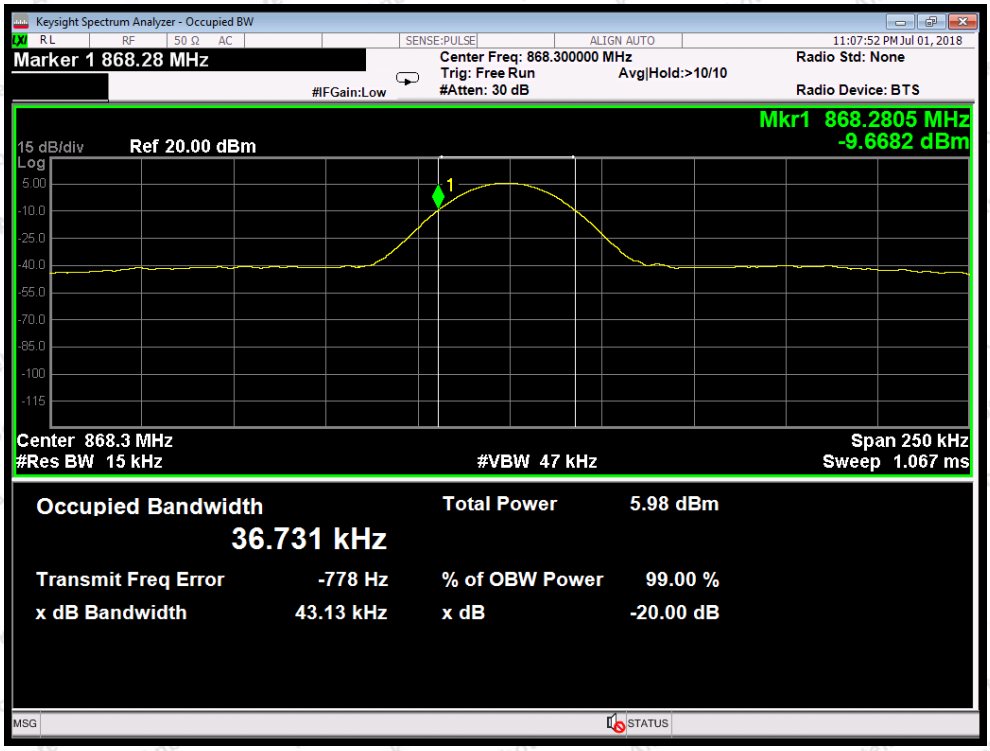
868.3MHz:

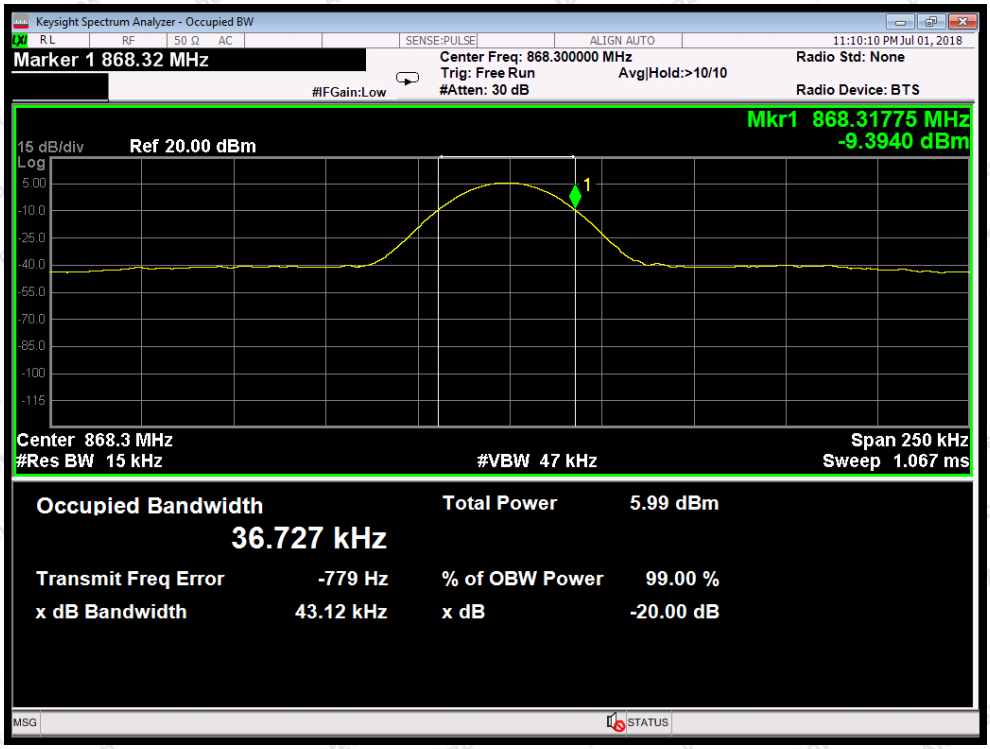
LTLV



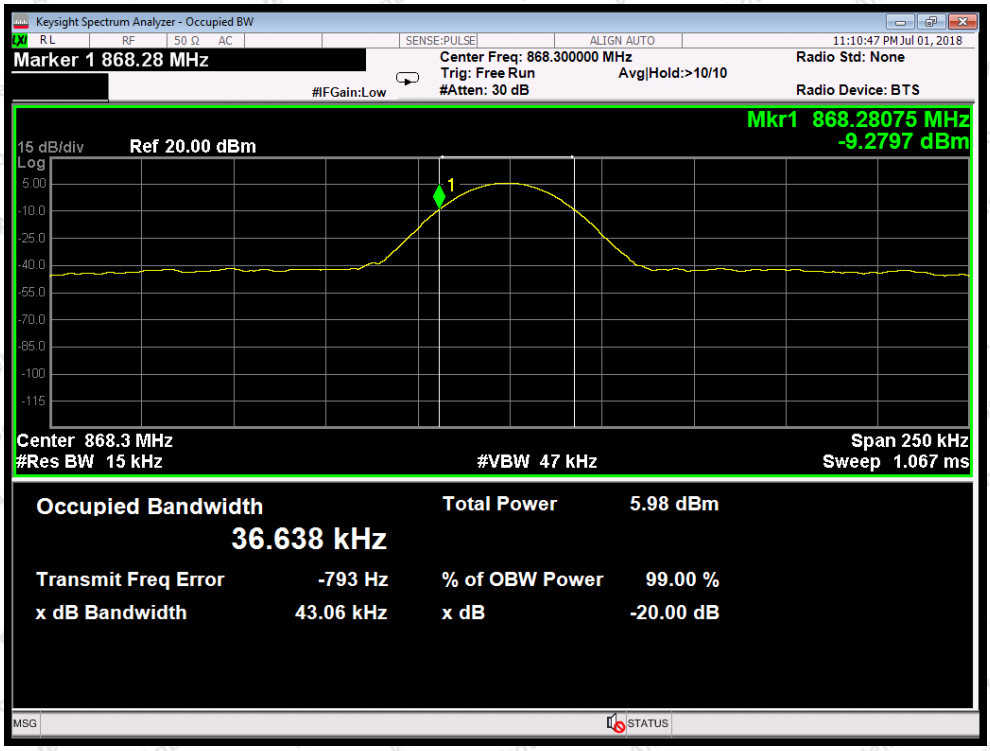


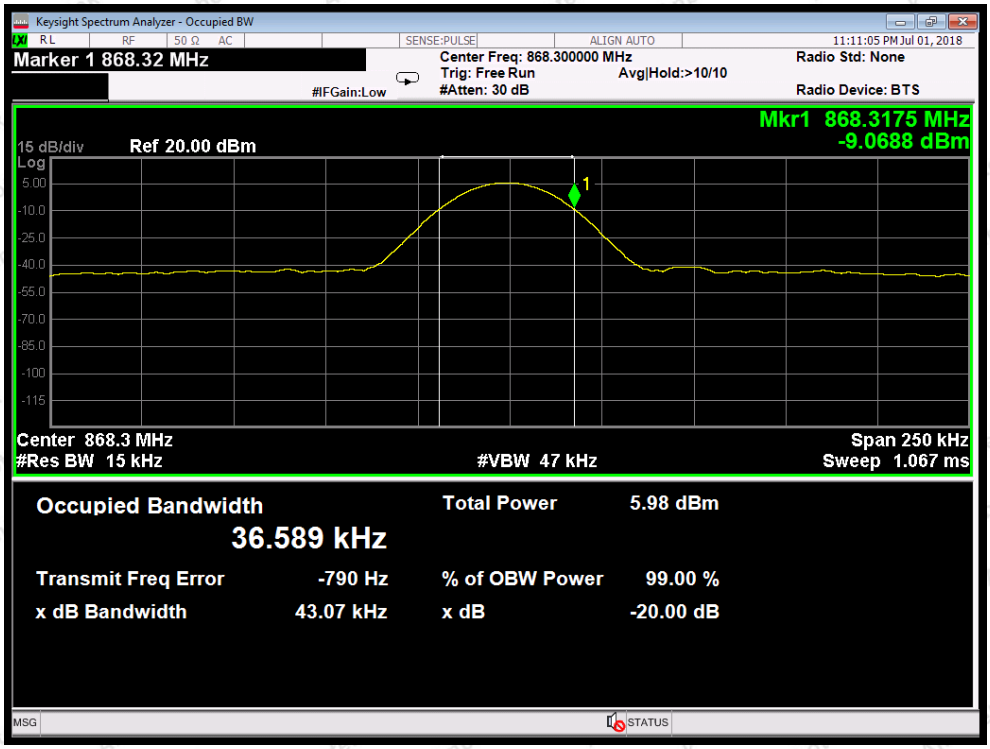
LTHV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:07:52 PM Jul 01, 2018
Marker 1 868.28 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 868.2805 MHz
-9.6682 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.731 kHz
Total Power 5.98 dBm
Transmit Freq Error -778 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.13 kHz
x dB -20.00 dB
MSG
STATUS

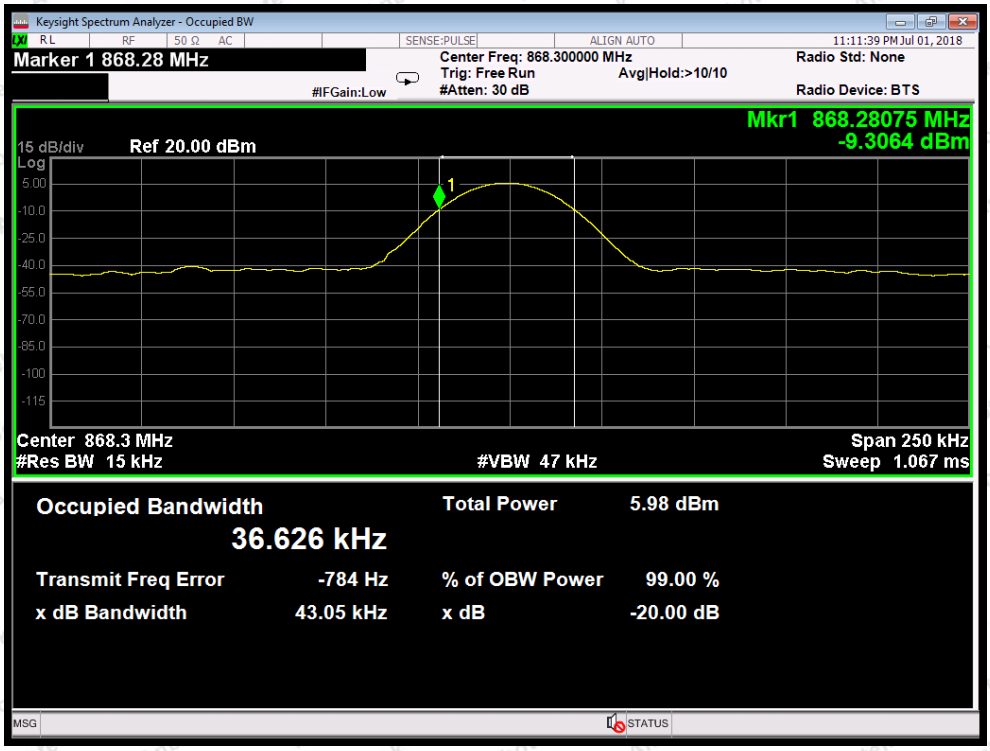

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:10:10 PM Jul 01, 2018
Marker 1 868.32 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.31775 MHz
-9.3940 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.727 kHz
Total Power 5.99 dBm
Transmit Freq Error -779 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.12 kHz
x dB -20.00 dB
MSG
STATUS

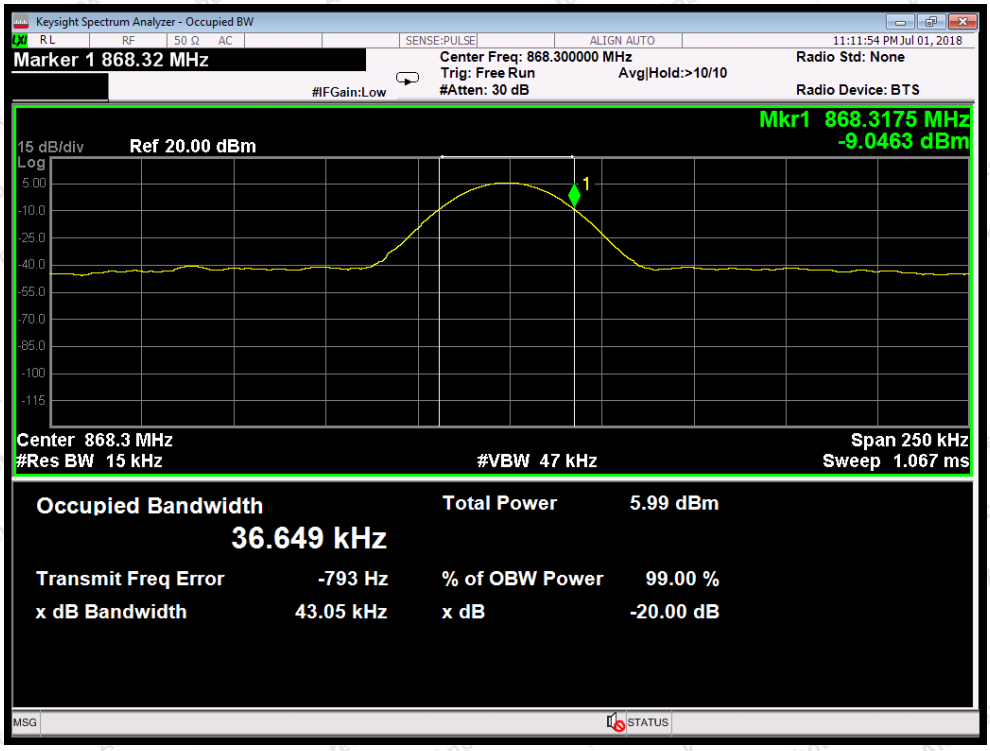
NTNV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:10:47 PM Jul 01, 2018
Marker 1 868.28 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 868.28075 MHz
-9.2797 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.638 kHz
Total Power 5.98 dBm
Transmit Freq Error -793 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.06 kHz
x dB -20.00 dB
MSG
STATUS

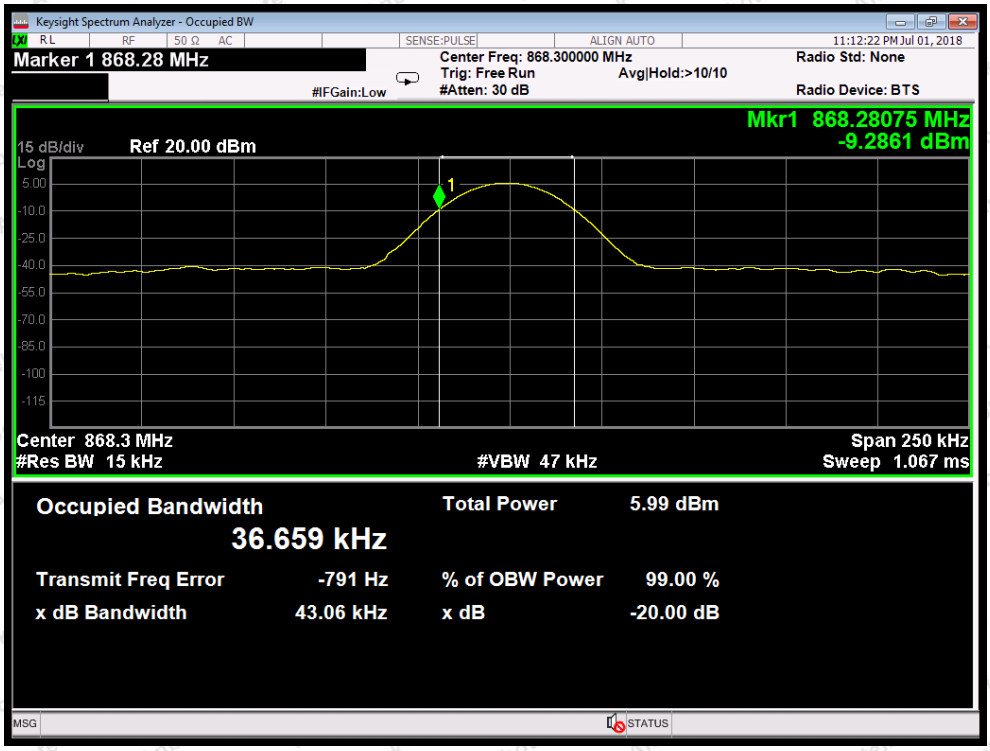

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:11:05 PM Jul 01, 2018
Marker 1 868.32 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.3175 MHz
-9.0688 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.589 kHz
Total Power 5.98 dBm
Transmit Freq Error -790 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.07 kHz
x dB -20.00 dB
MSG
STATUS

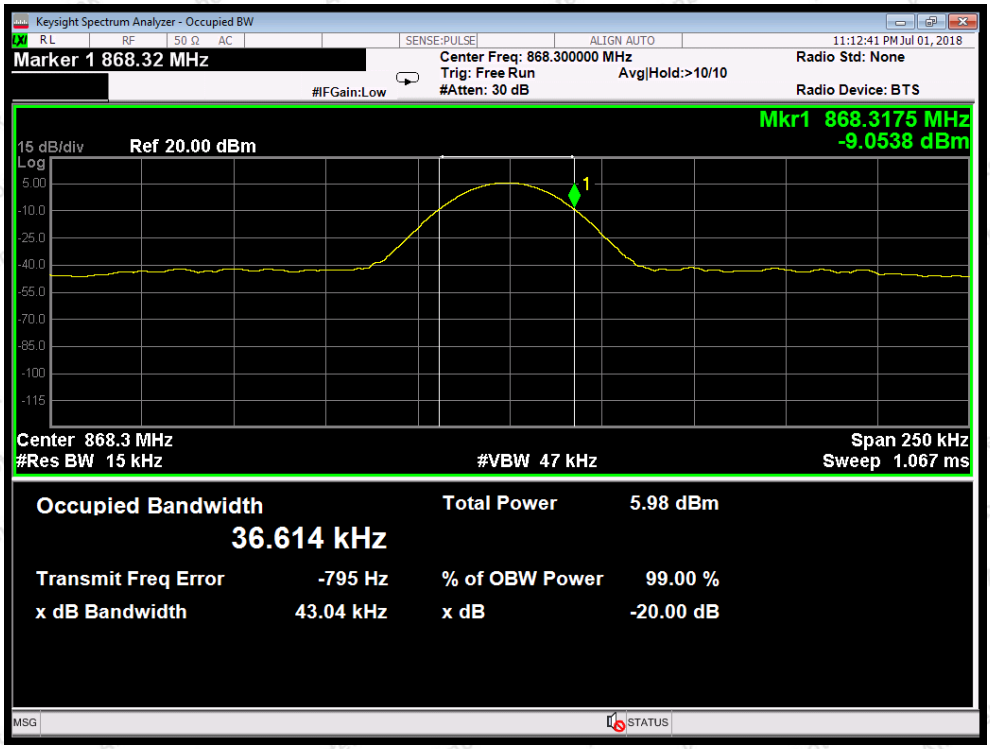
HTLV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:11:39 PM Jul 01, 2018
Marker 1 868.28 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 868.28075 MHz
-9.3064 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.626 kHz
Total Power 5.98 dBm
Transmit Freq Error -784 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.05 kHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:11:54 PM Jul 01, 2018
Marker 1 868.32 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 868.3175 MHz
-9.0463 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.649 kHz
Total Power 5.99 dBm
Transmit Freq Error -793 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.05 kHz
x dB -20.00 dB
MSG
STATUS

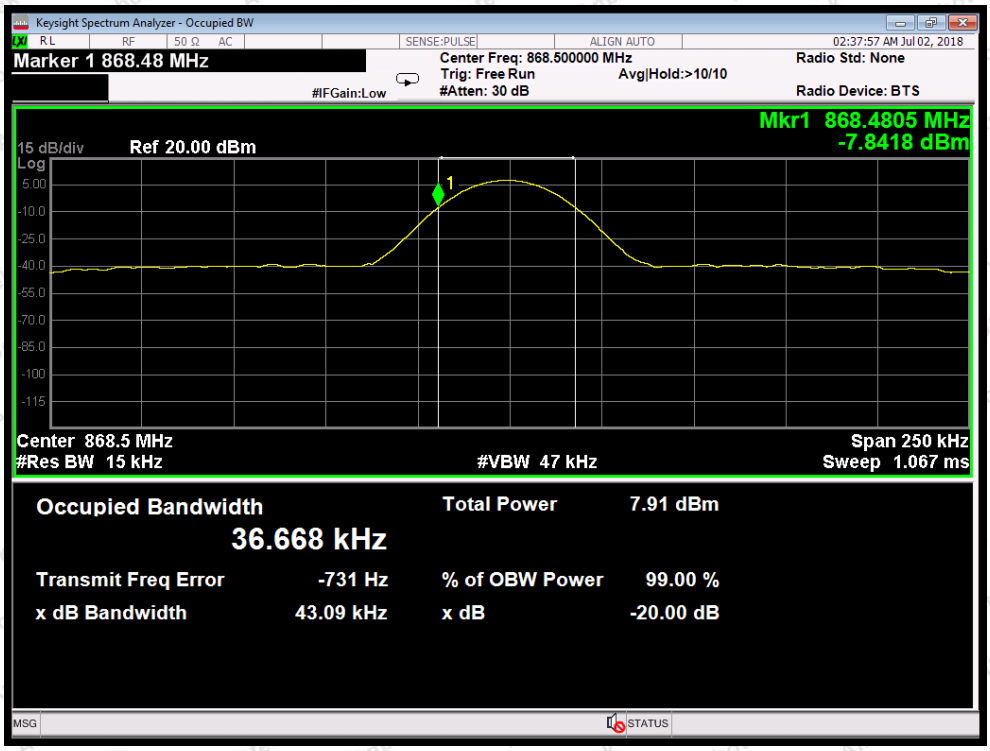
HTHV

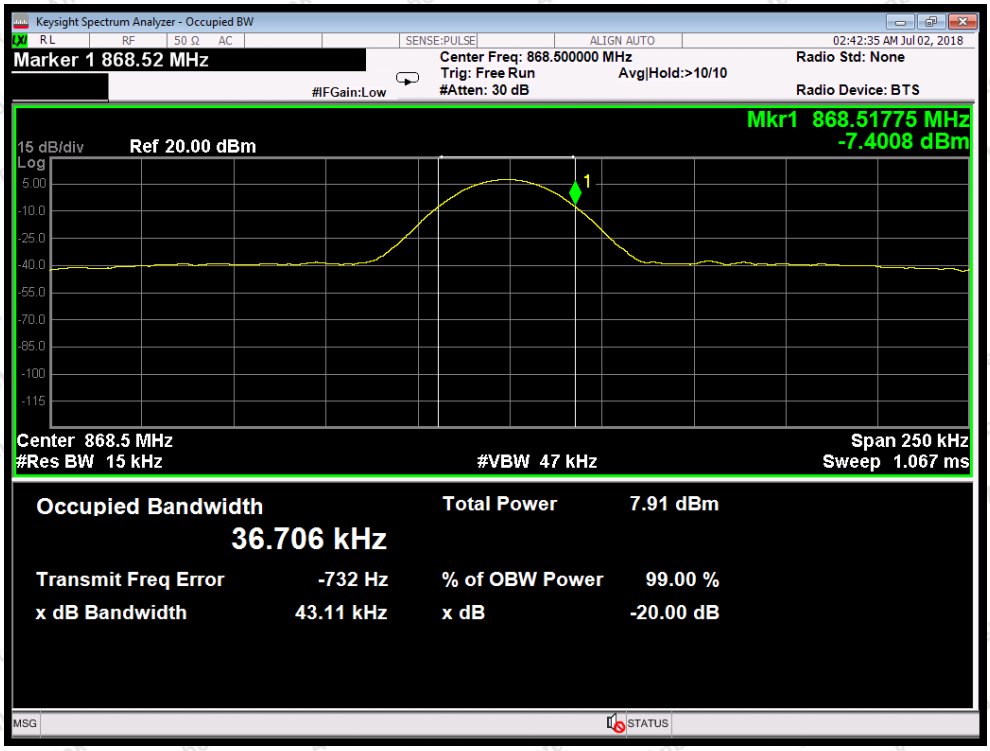

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:12:22 PM Jul 01, 2018
Marker 1 868.28 MHz
Center Freq: 868.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.28075 MHz
-9.2861 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.659 kHz
Total Power 5.99 dBm
Transmit Freq Error -791 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.06 kHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:12:41 PM Jul 01, 2018
Marker 1 868.32 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 868.3175 MHz
-9.0538 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.3 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.614 kHz
Total Power 5.98 dBm
Transmit Freq Error -795 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.04 kHz
x dB -20.00 dB
MSG
STATUS

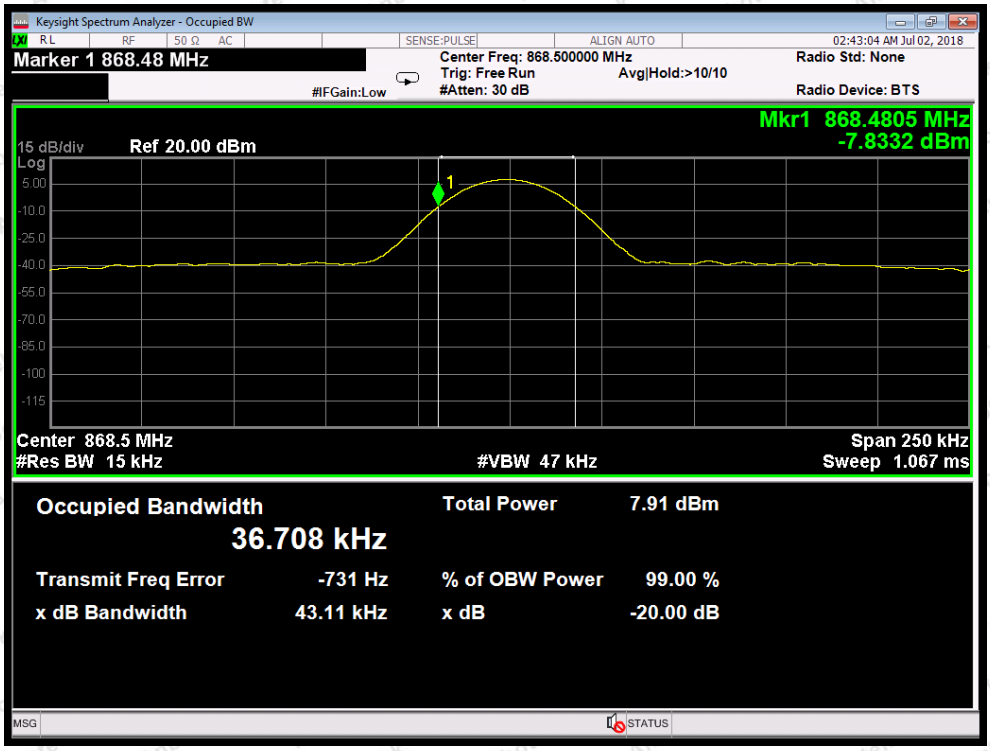
868.5MHz:

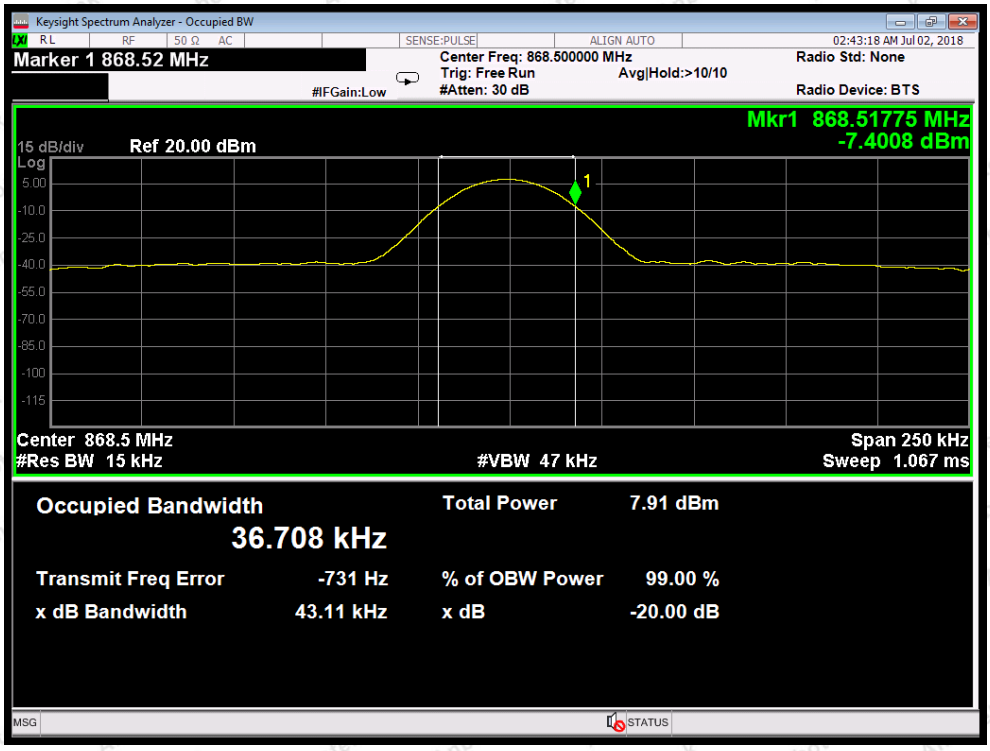
LTLV



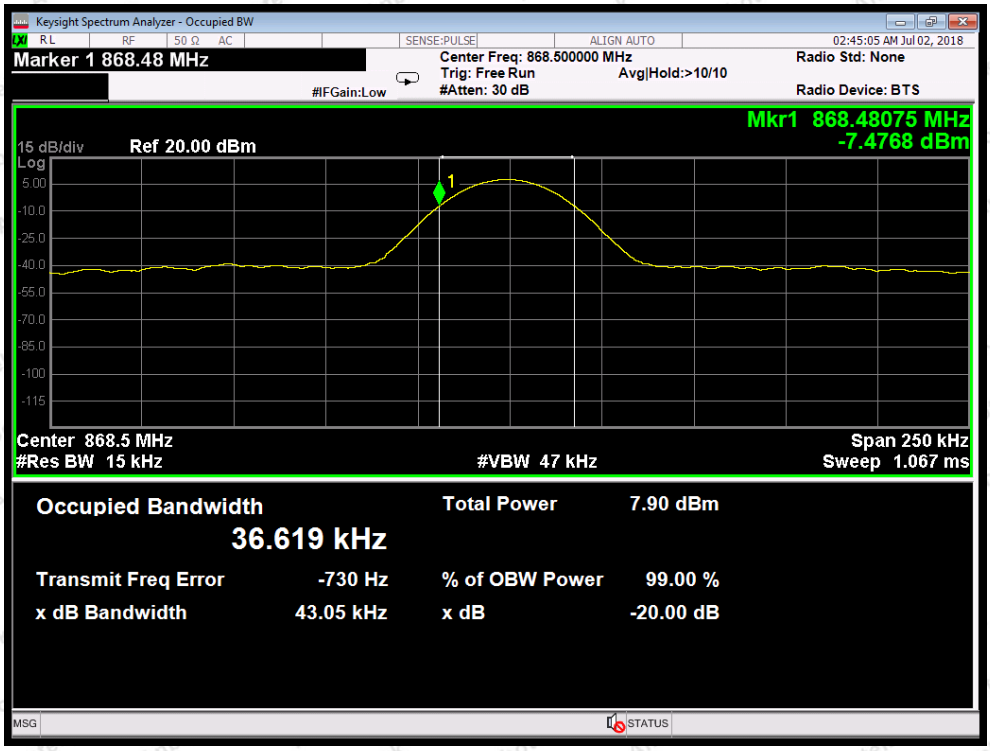


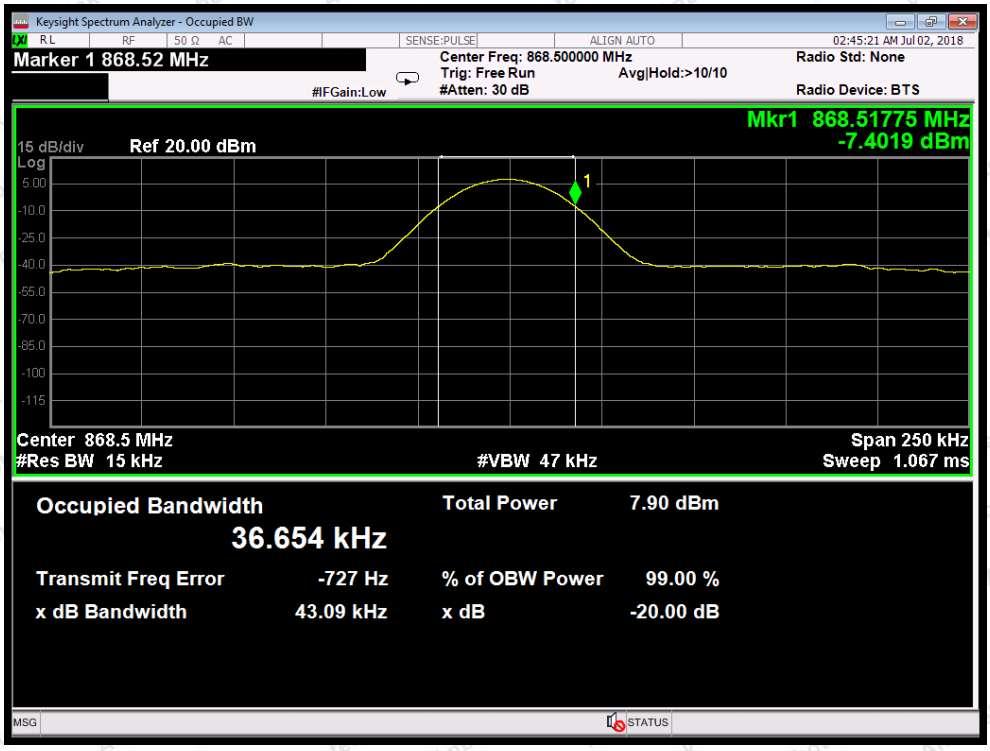
LTHV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:43:04 AM Jul 02, 2018
Marker 1 868.48 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 868.4805 MHz
-7.8332 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.708 kHz
Total Power 7.91 dBm
Transmit Freq Error -731 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.11 kHz
x dB -20.00 dB
MSG
STATUS

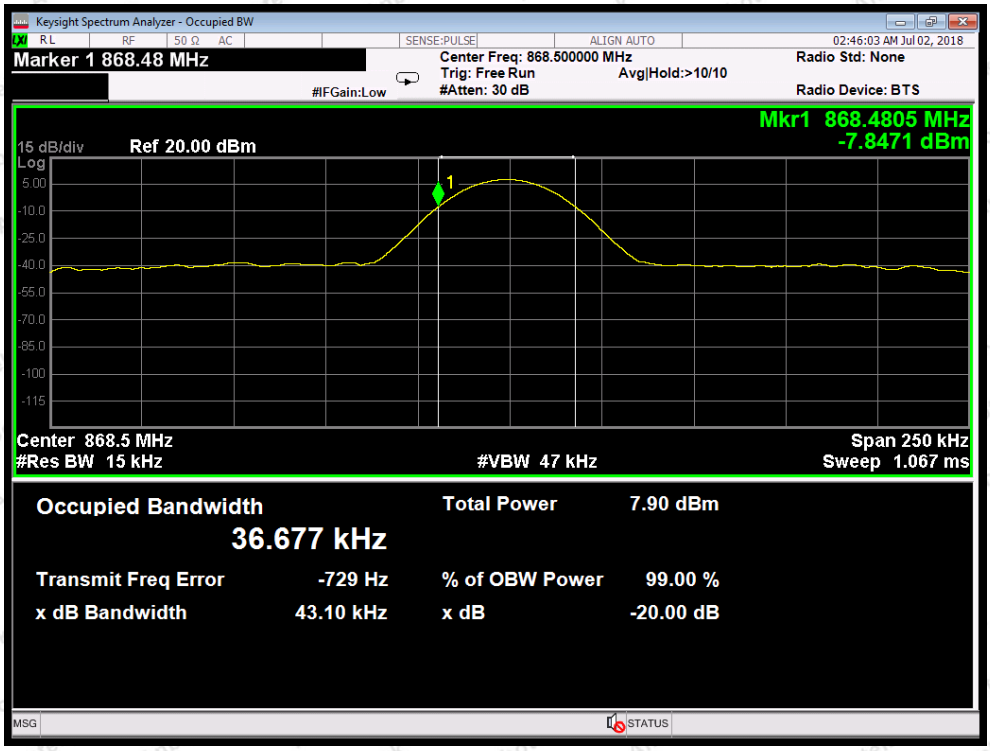

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:43:18 AM Jul 02, 2018
Marker 1 868.52 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.51775 MHz
-7.4008 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.708 kHz
Total Power 7.91 dBm
Transmit Freq Error -731 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.11 kHz
x dB -20.00 dB
MSG
STATUS

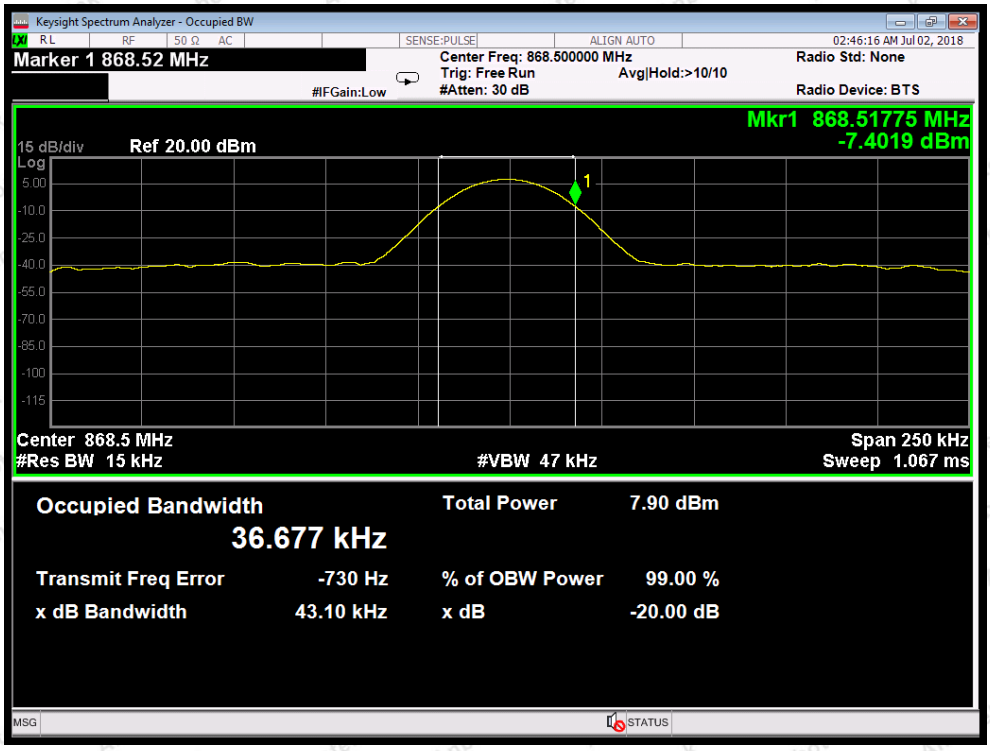
NTNV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:45:05 AM Jul 02, 2018
Marker 1 868.48 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 868.48075 MHz
-7.4768 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.619 kHz
Total Power 7.90 dBm
Transmit Freq Error -730 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.05 kHz
x dB -20.00 dB
MSG
STATUS

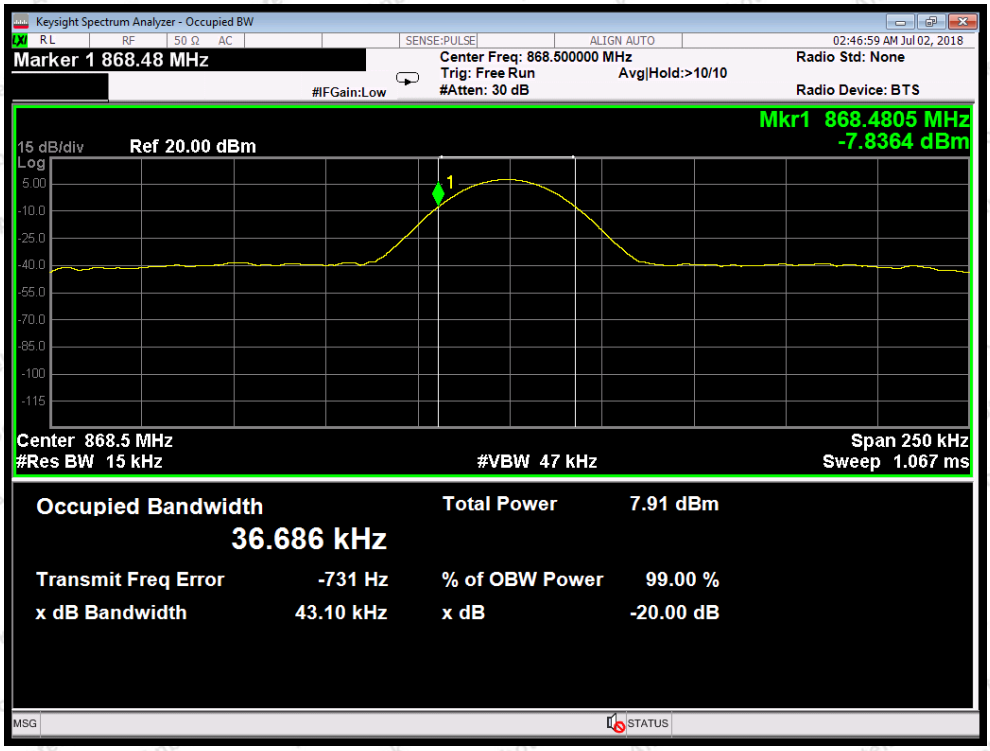

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:45:21 AM Jul 02, 2018
Marker 1 868.52 MHz
Center Freq: 868.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Mkr1 868.51775 MHz
-7.4019 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.654 kHz
Total Power 7.90 dBm
Transmit Freq Error -727 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.09 kHz
x dB -20.00 dB
MSG
STATUS

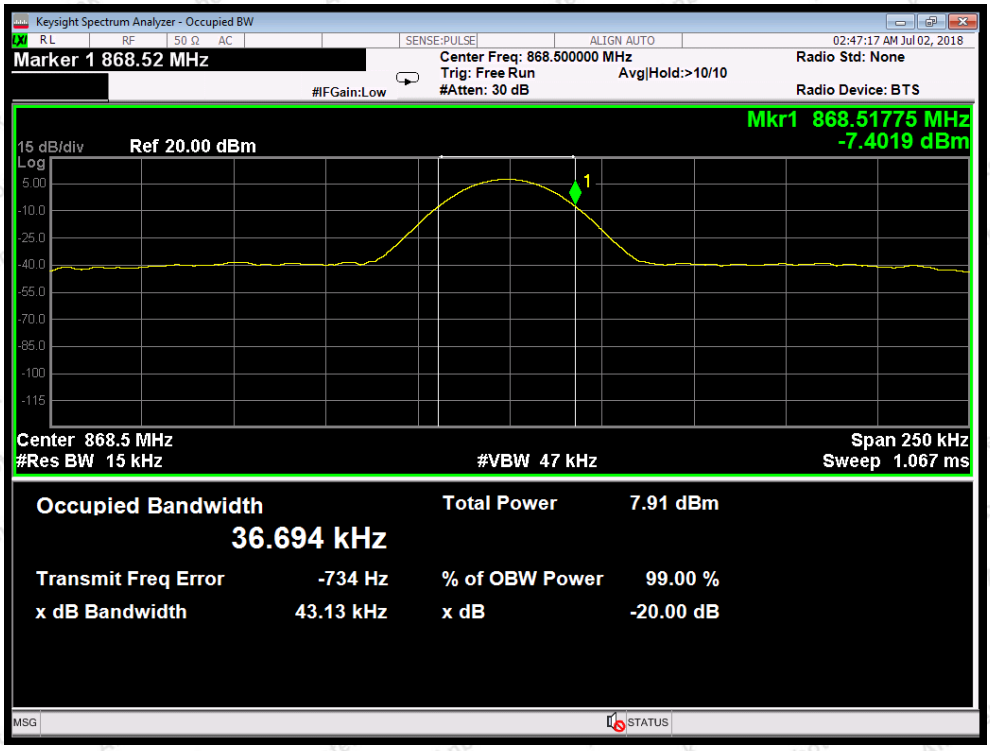
HTLV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:46:03 AM Jul 02, 2018
Marker 1 868.48 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 868.4805 MHz
-7.8471 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.677 kHz
Total Power 7.90 dBm
Transmit Freq Error -729 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.10 kHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:46:16 AM Jul 02, 2018
Marker 1 868.52 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 868.51775 MHz
-7.4019 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.677 kHz
Total Power 7.90 dBm
Transmit Freq Error -730 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.10 kHz
x dB -20.00 dB
MSG
STATUS

HTHV


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:46:59 AM Jul 02, 2018
Marker 1 868.48 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 868.4805 MHz
-7.8364 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.686 kHz
Total Power 7.91 dBm
Transmit Freq Error -731 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.10 kHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:47:17 AM Jul 02, 2018
Marker 1 868.52 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 868.51775 MHz
-7.4019 dBm
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 868.5 MHz
#Res BW 15 kHz
#VBW 47 kHz
Span 250 kHz
Sweep 1.067 ms
Occupied Bandwidth
36.694 kHz
Total Power 7.91 dBm
Transmit Freq Error -734 Hz
% of OBW Power 99.00 %
x dB Bandwidth 43.13 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.			

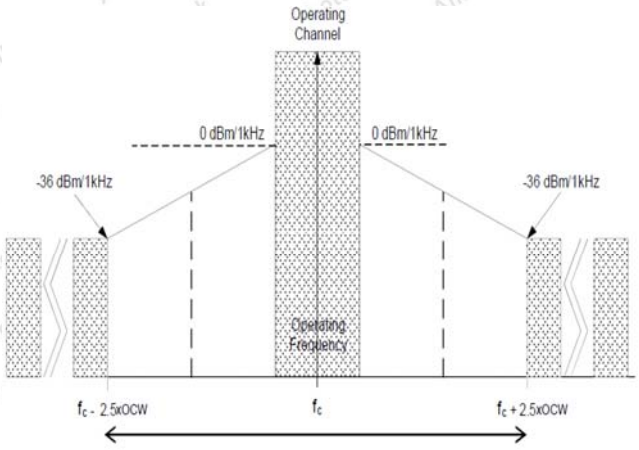


Figure 5: Out Of Band Domain for Operating Channel with reference BW

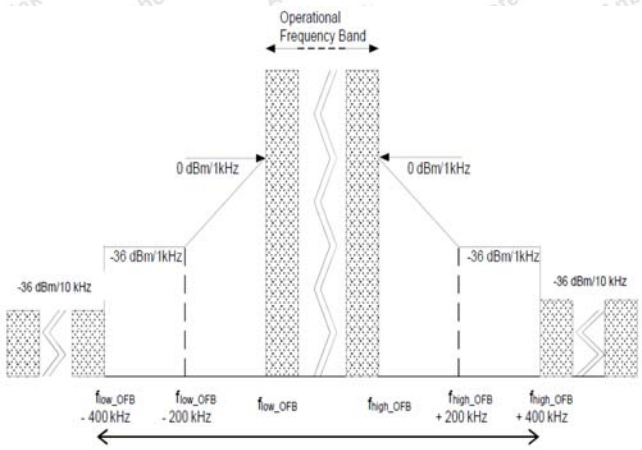
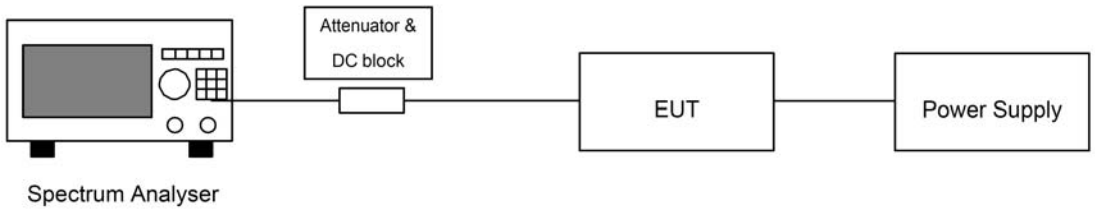


Figure 6: Out Of Band Domain for Operational Frequency Band with reference BW

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.

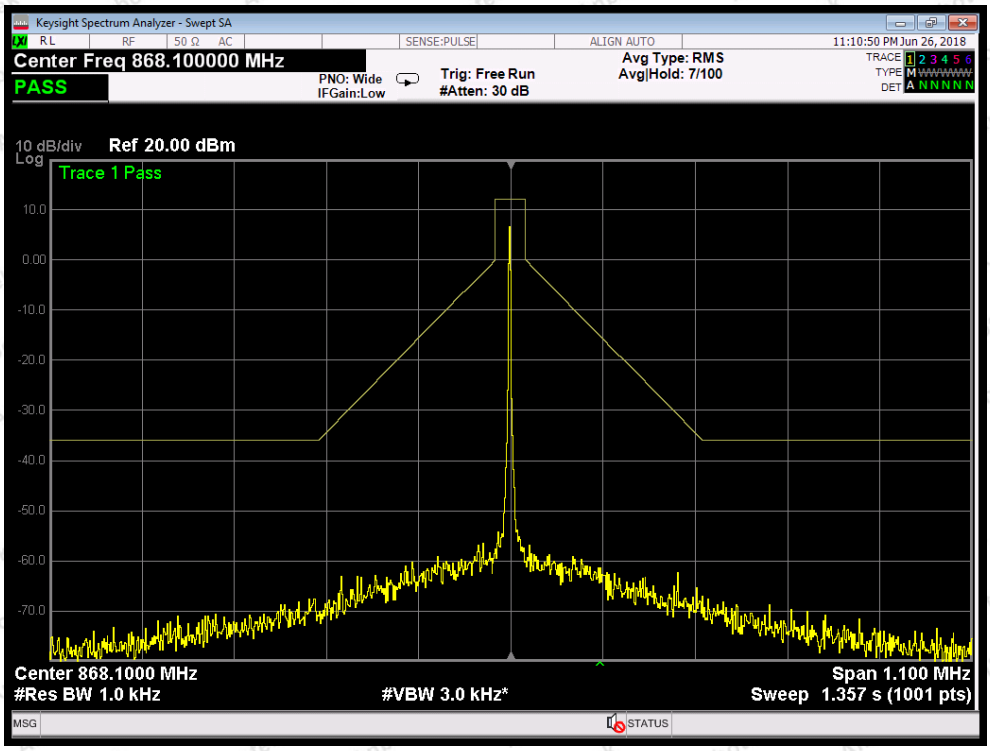
7.4. Test Data

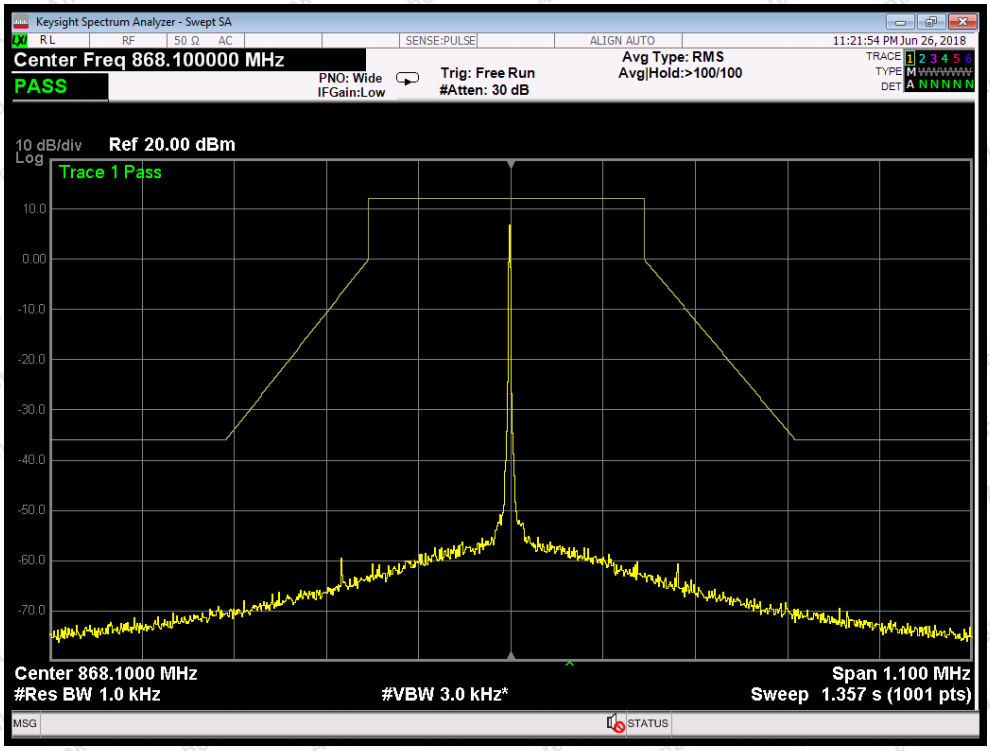
Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	See below

PASS

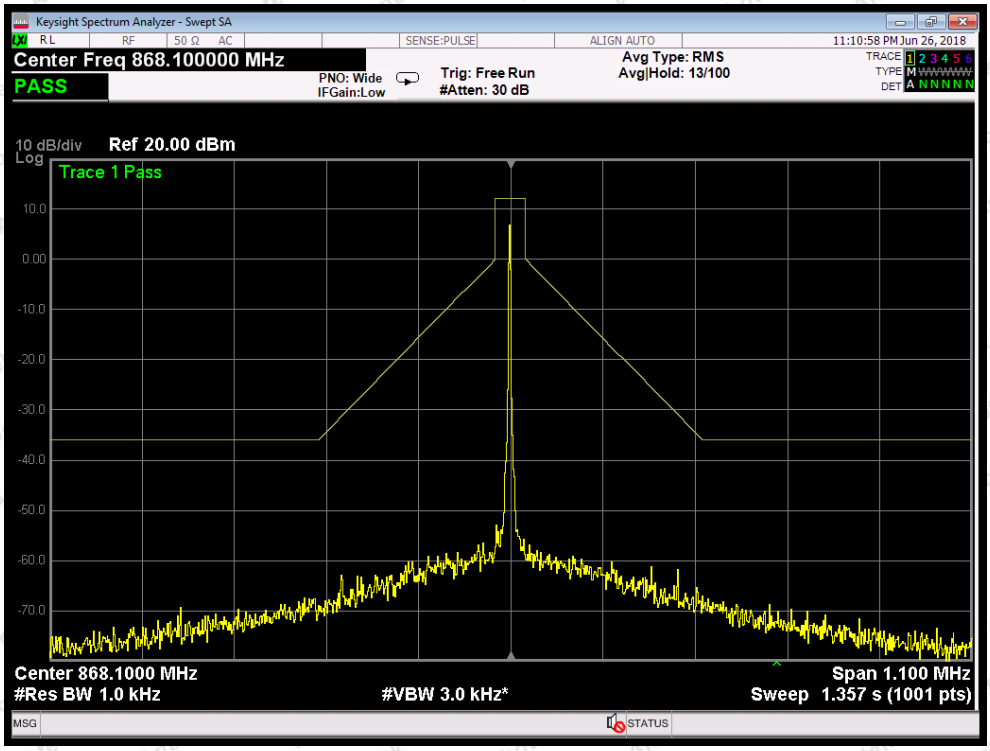
868.1MHz:

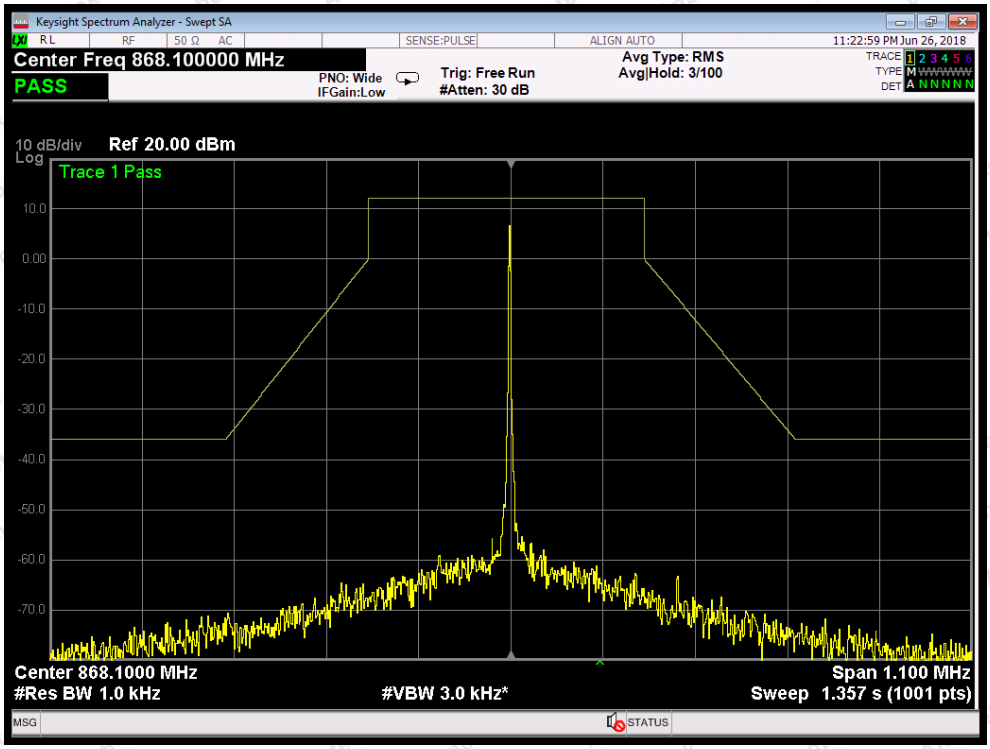
LTLV



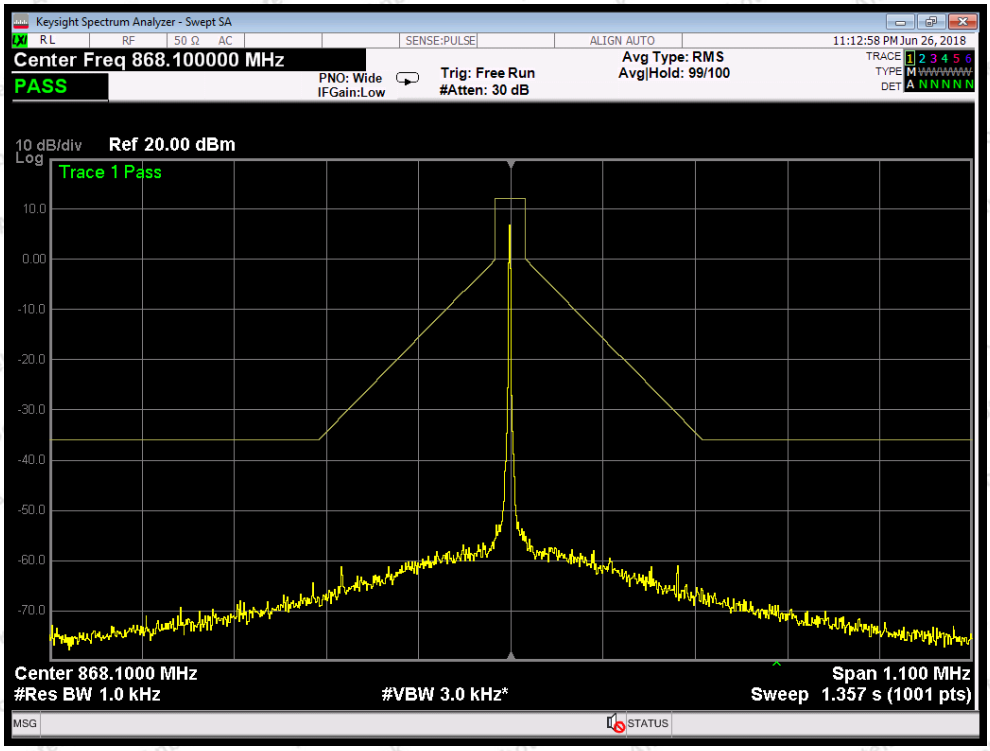


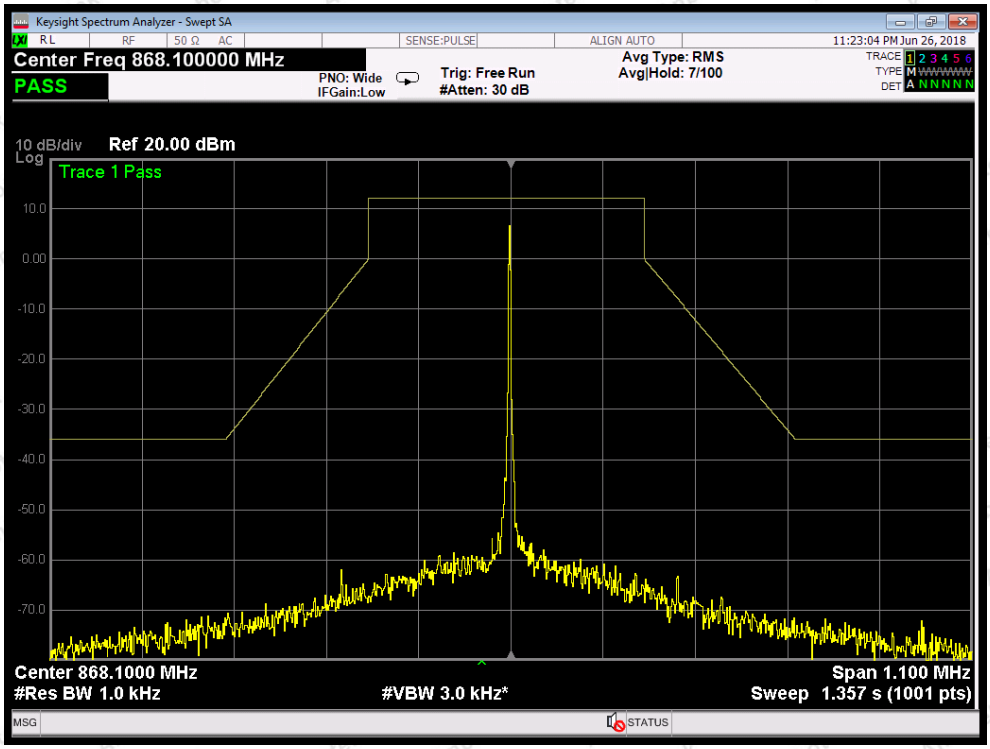
LTHV


Keysight 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: 13/100
11:10:58 PM Jun 26, 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 1.357 s (1001 pts)

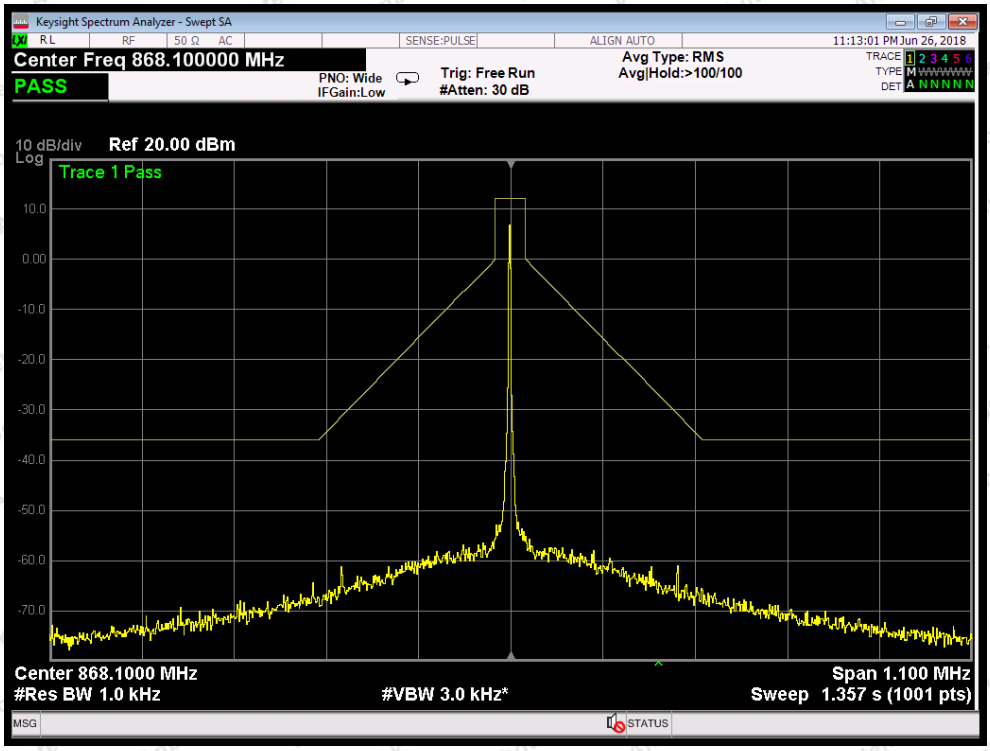

Keysight Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 3/100
11:22:59 PM Jun 26, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)

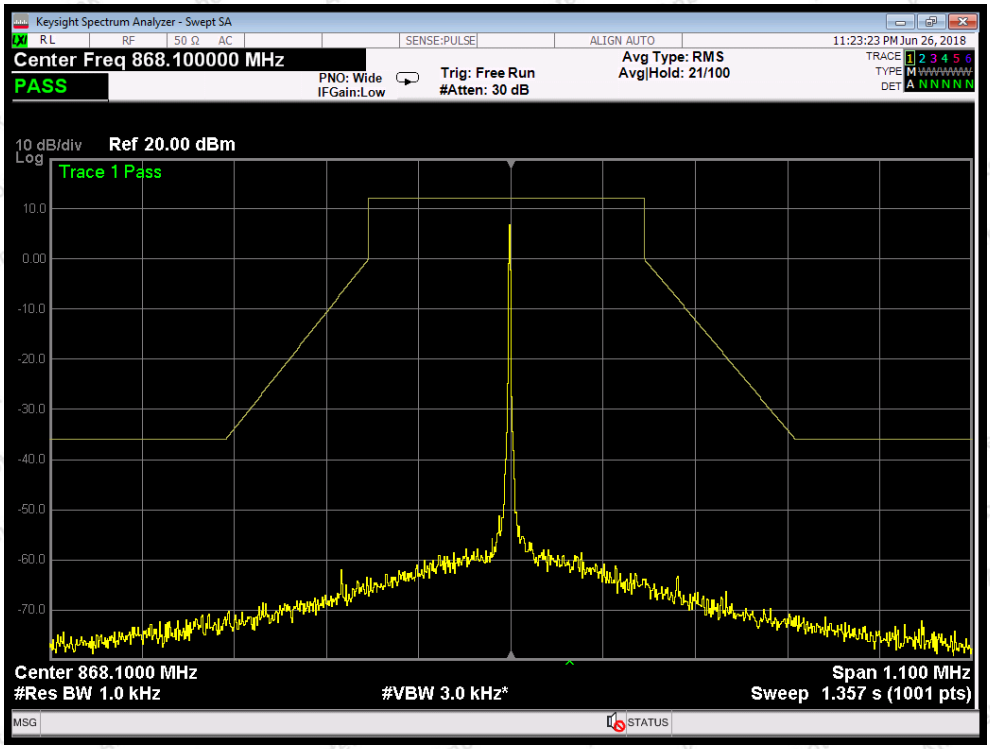
NTNV


Keysight 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: 99/100
11:12:58 PM Jun 26, 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 1.357 s (1001 pts)

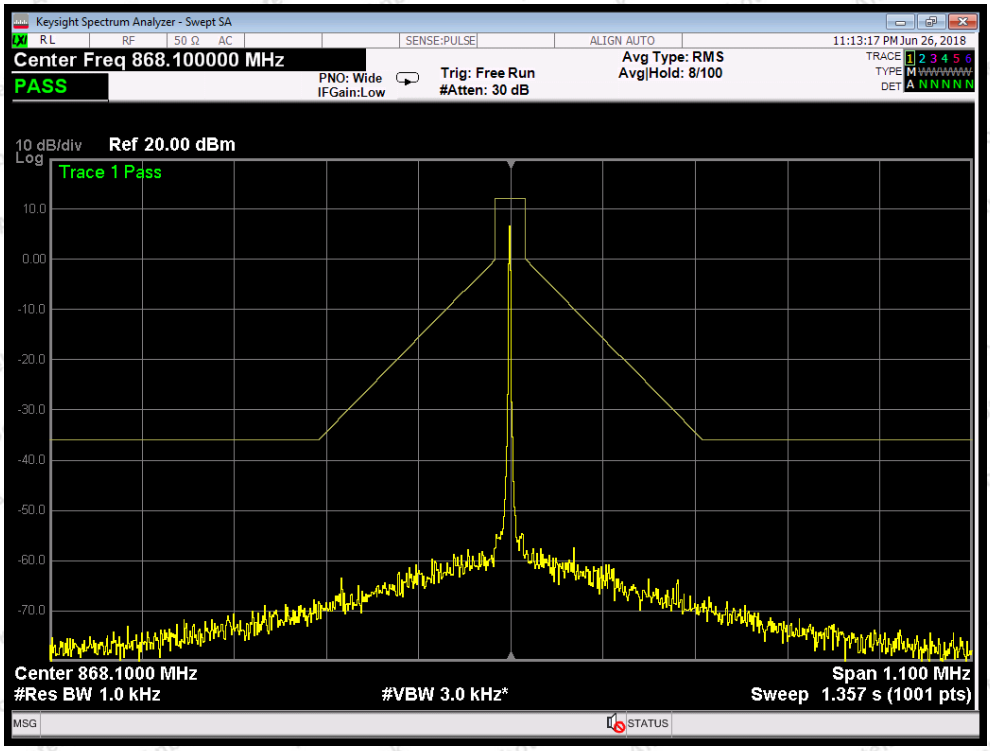

Keysight Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 7/100
11:23:04 PM Jun 26, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)

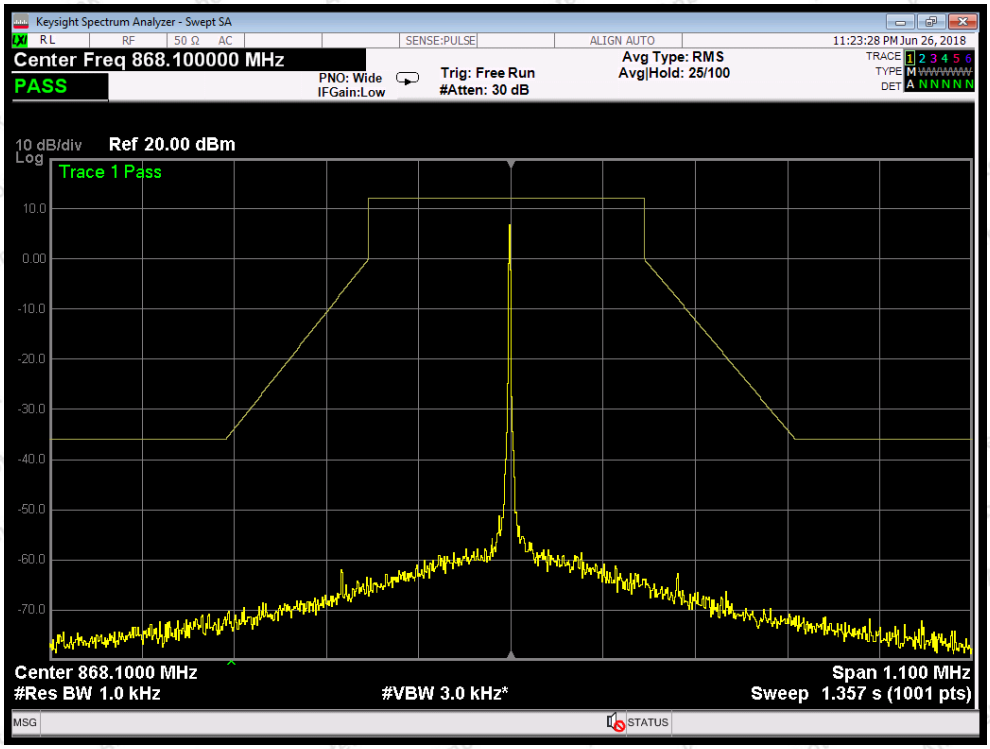
HTLV


Keysight 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
11:13:01 PM Jun 26, 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 1.357 s (1001 pts)


Keysight 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: 21/100
11:23:23 PM Jun 26, 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 1.357 s (1001 pts)

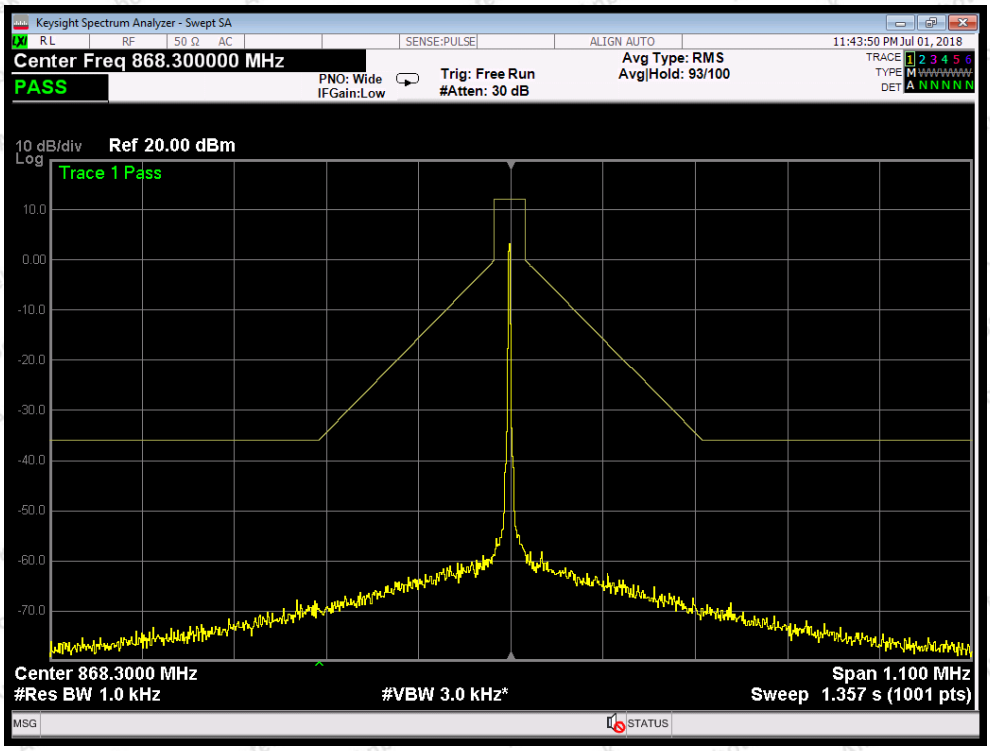
HTHV

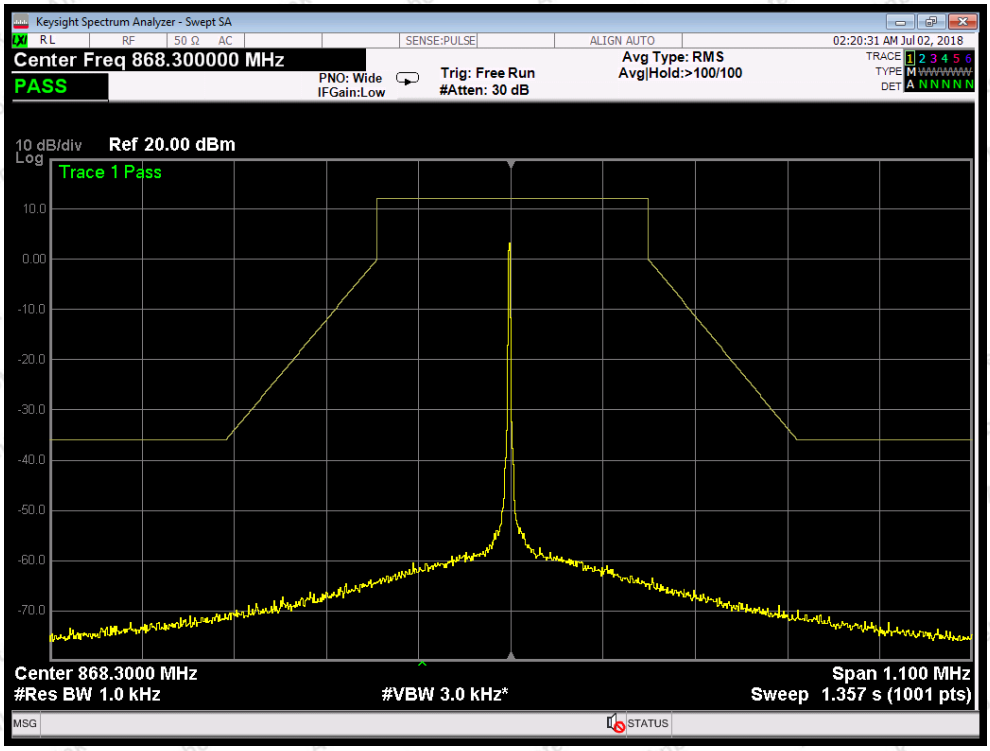

Keysight Spectrum Analyzer - Swept SA
Center Freq 868.100000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 8/100
11:13:17 PM Jun 26, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.1000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)


Keysight 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: 25/100
11:23:28 PM Jun 26, 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 1.357 s (1001 pts)

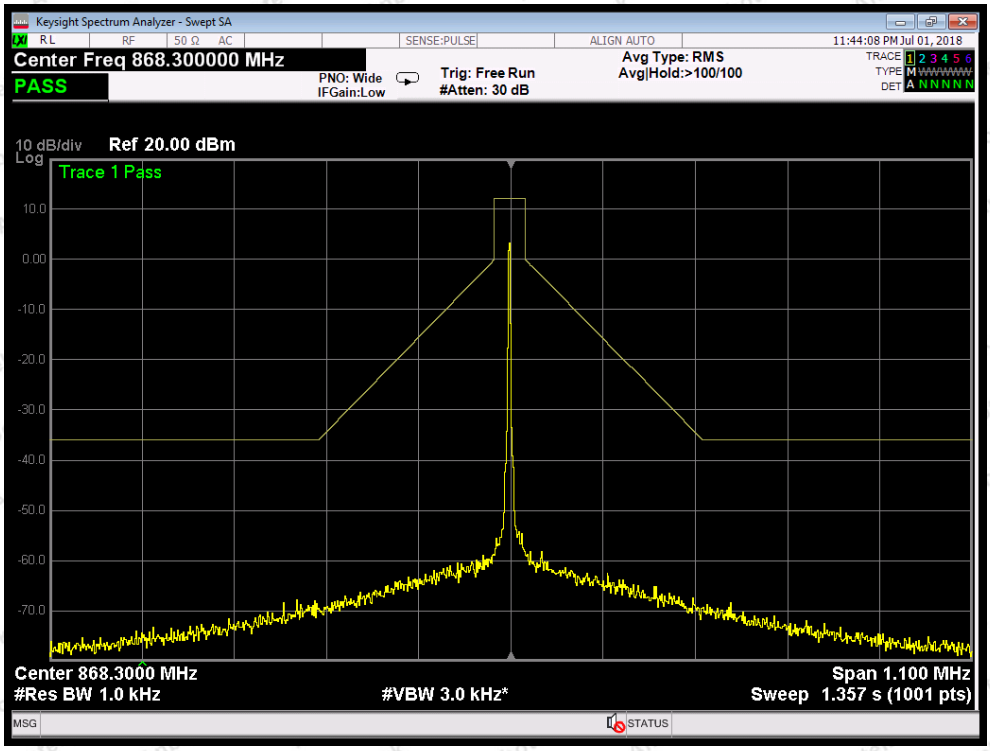
868.3MHz:

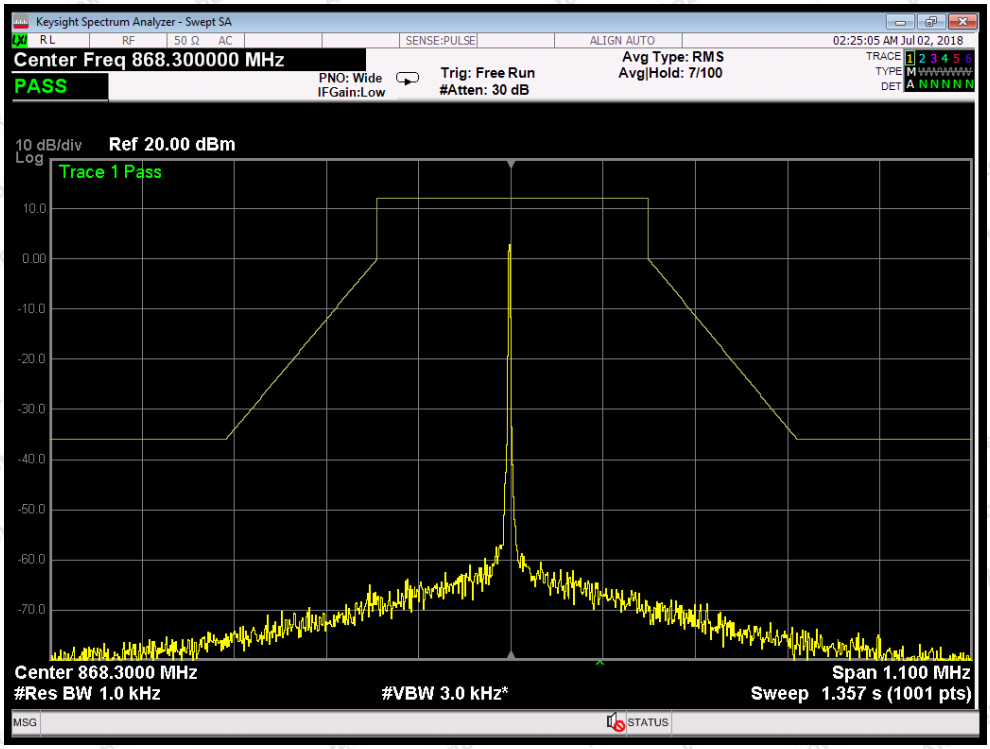
LTLV



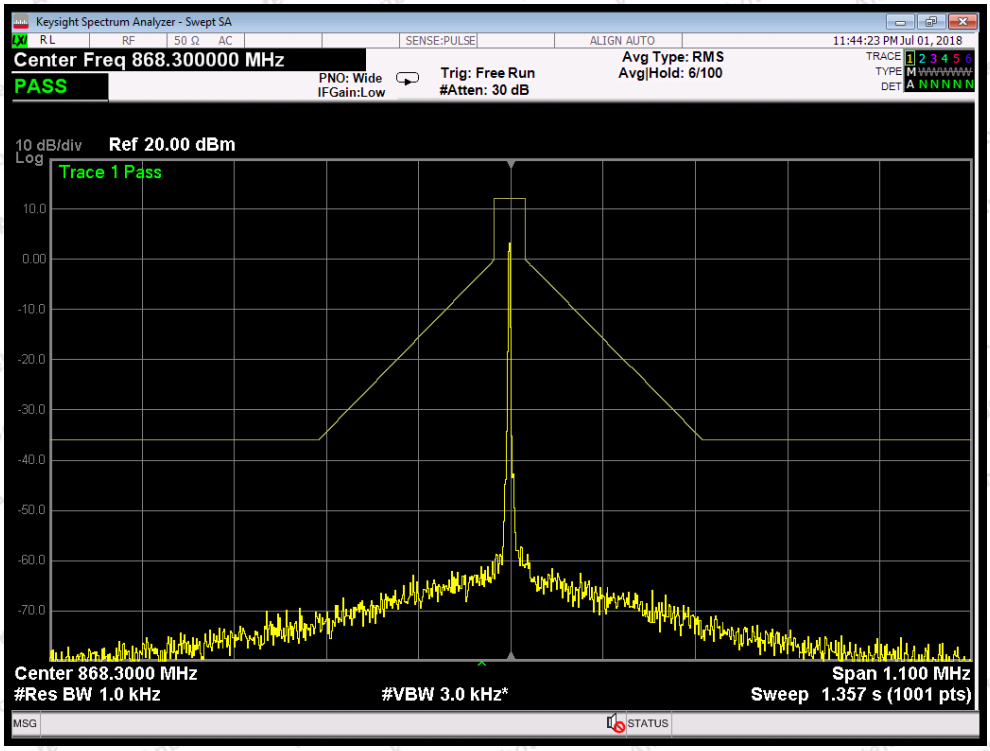


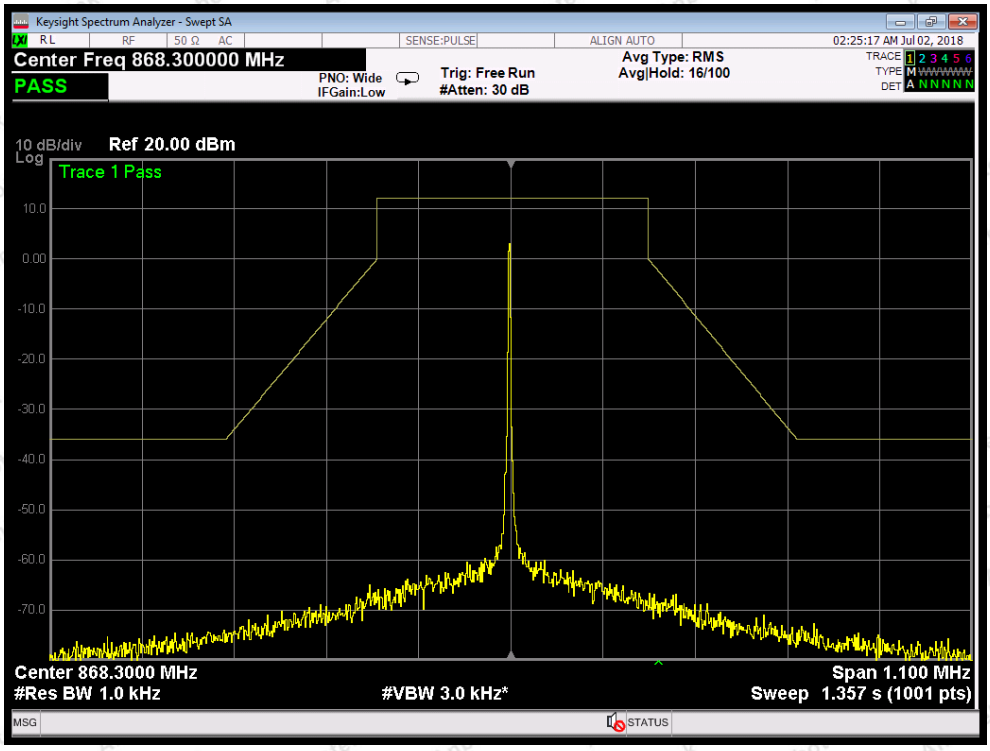
LTHV


Keysight 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
11:44:08 PM Jul 01, 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 1.357 s (1001 pts)

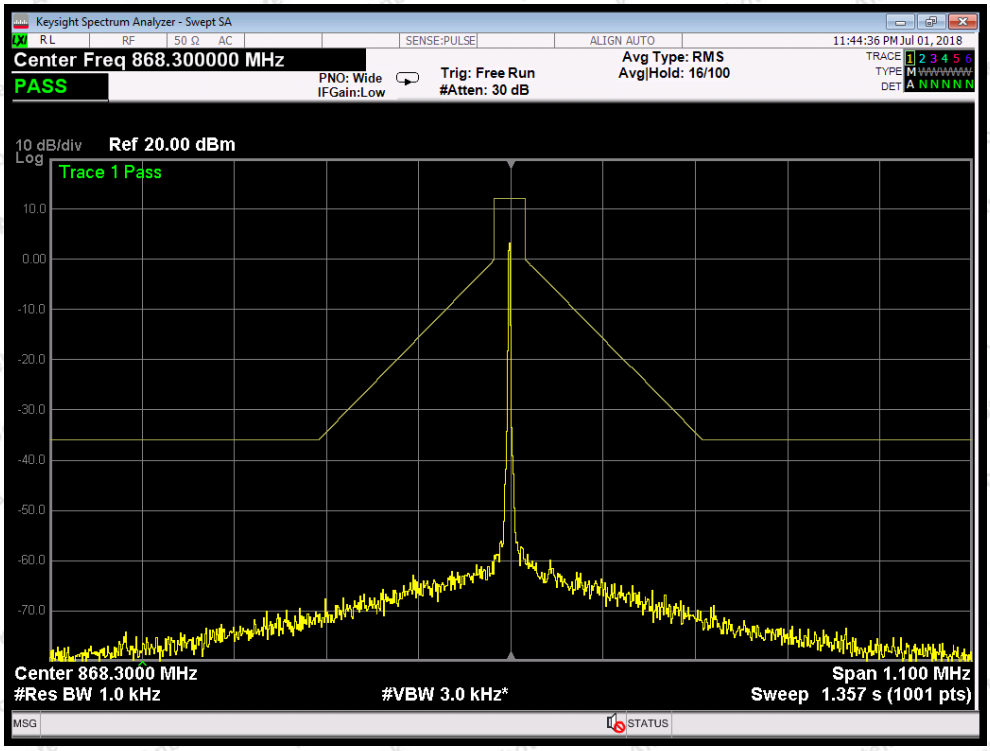

Keysight Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 7/100
02:25:05 AM Jul 02, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)

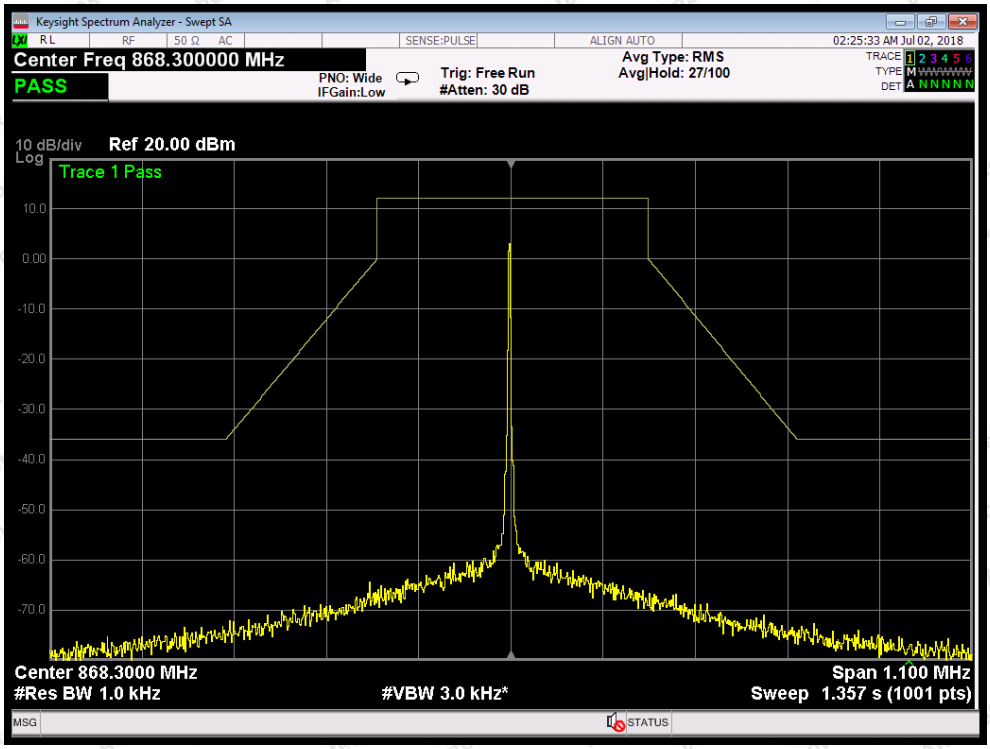
NTNV


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:44:23 PM Jul 01, 2018
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 6/100
TRACE 1 2 3 4 5 6
TYPE M
DET A N N N N N
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)
MSG
STATUS

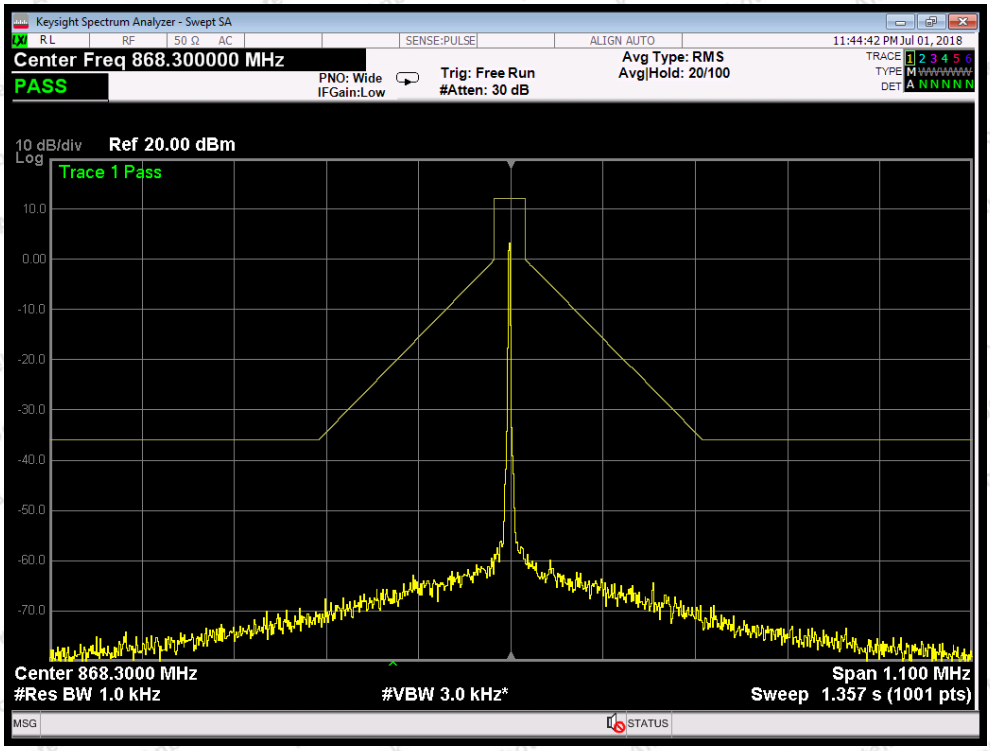

Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
02:25:17 AM Jul 02, 2018
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 16/100
TRACE 1 2 3 4 5 6
TYPE M
DET A N N N N N
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)
MSG
STATUS

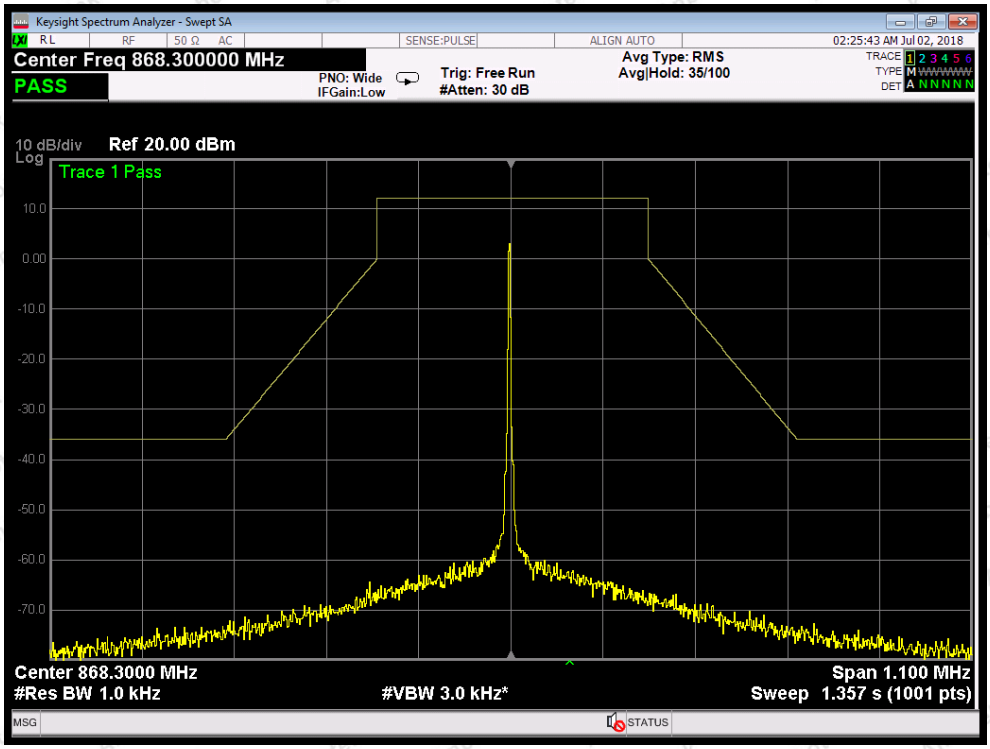
HTLV


Keysight 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: 16/100
11:44:36 PM Jul 01, 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 1.357 s (1001 pts)


Keysight 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: 27/100
02:25:33 AM Jul 02, 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 1.357 s (1001 pts)

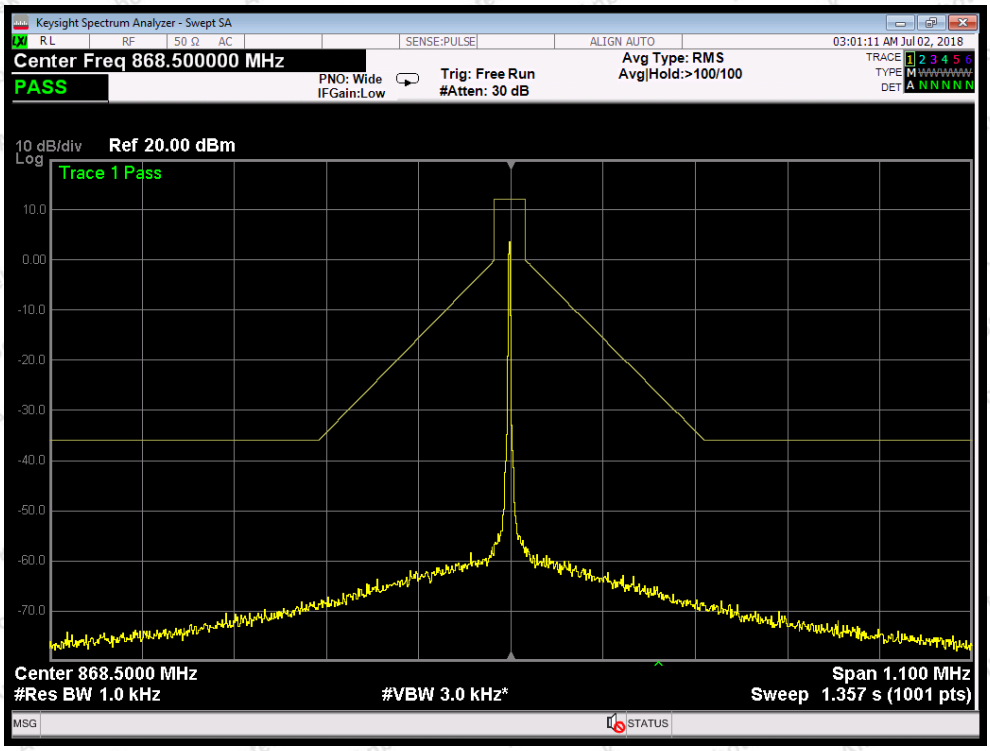
HTHV

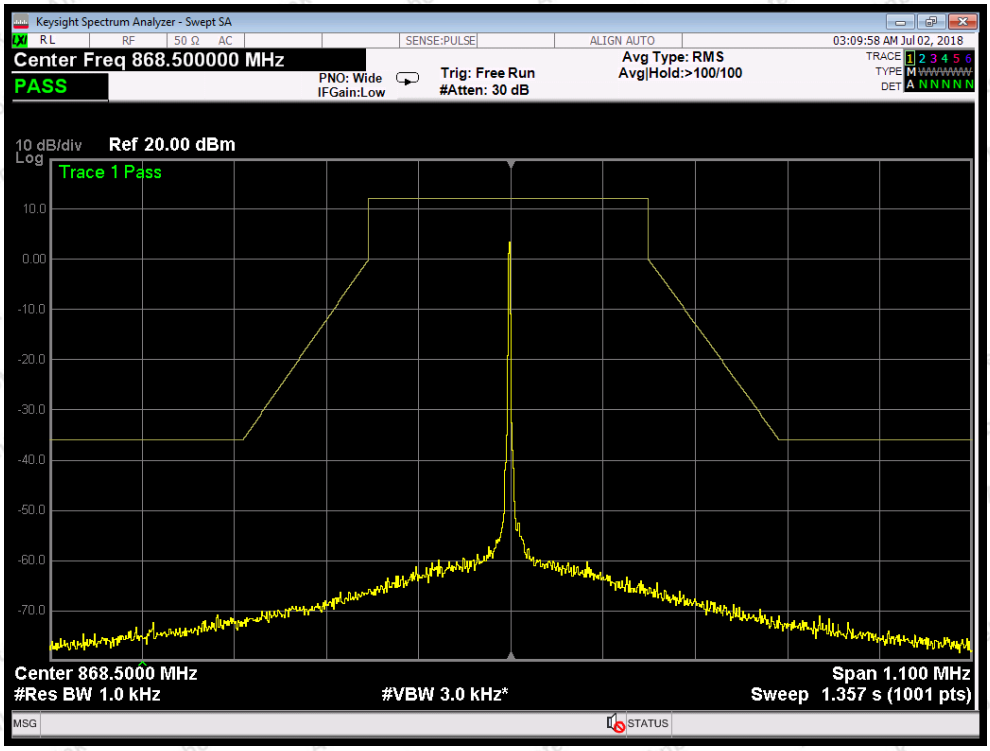

Keysight Spectrum Analyzer - Swept SA
Center Freq 868.300000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 20/100
11:44:42 PM Jul 01, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.3000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)


Keysight 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: 35/100
02:25:43 AM Jul 02, 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 1.357 s (1001 pts)

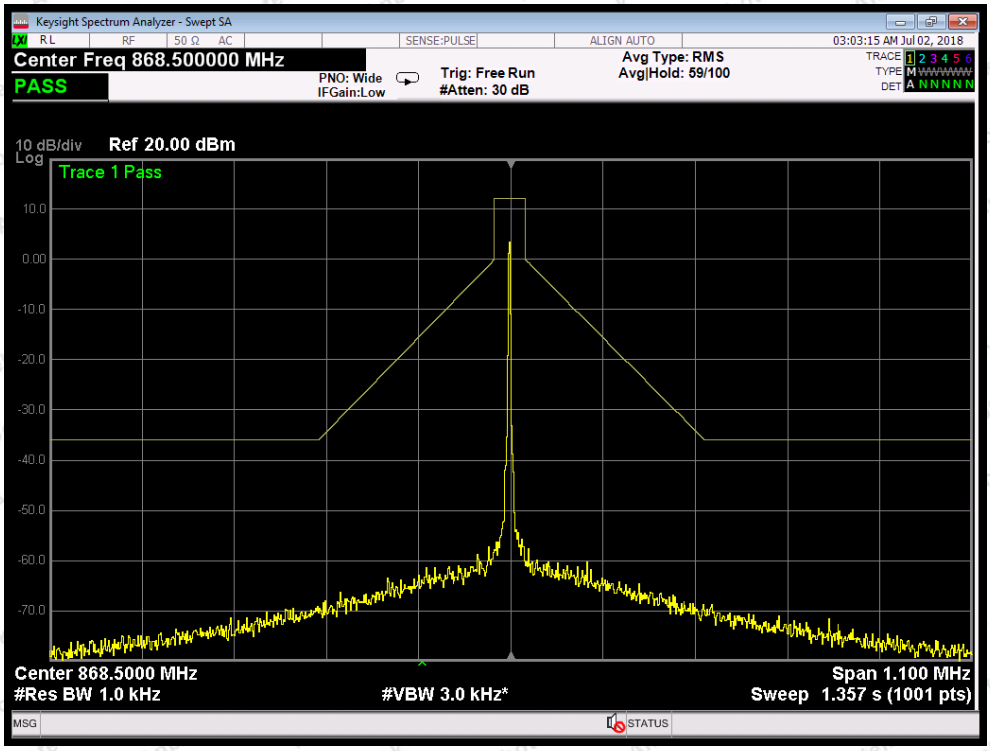
868.5MHz:

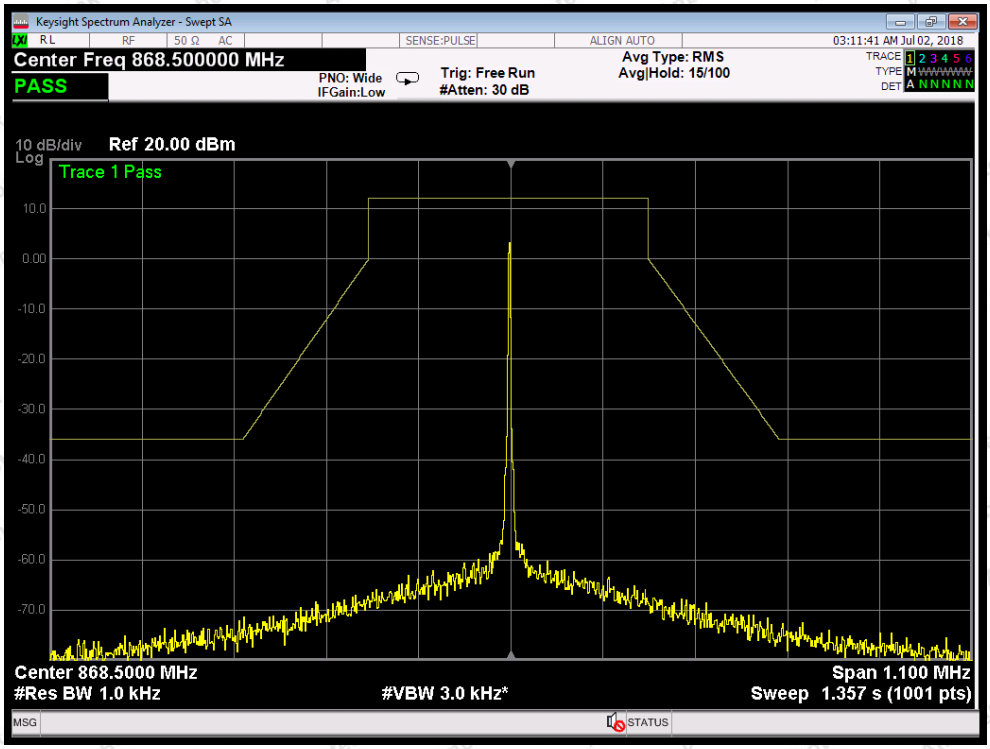
LTLV



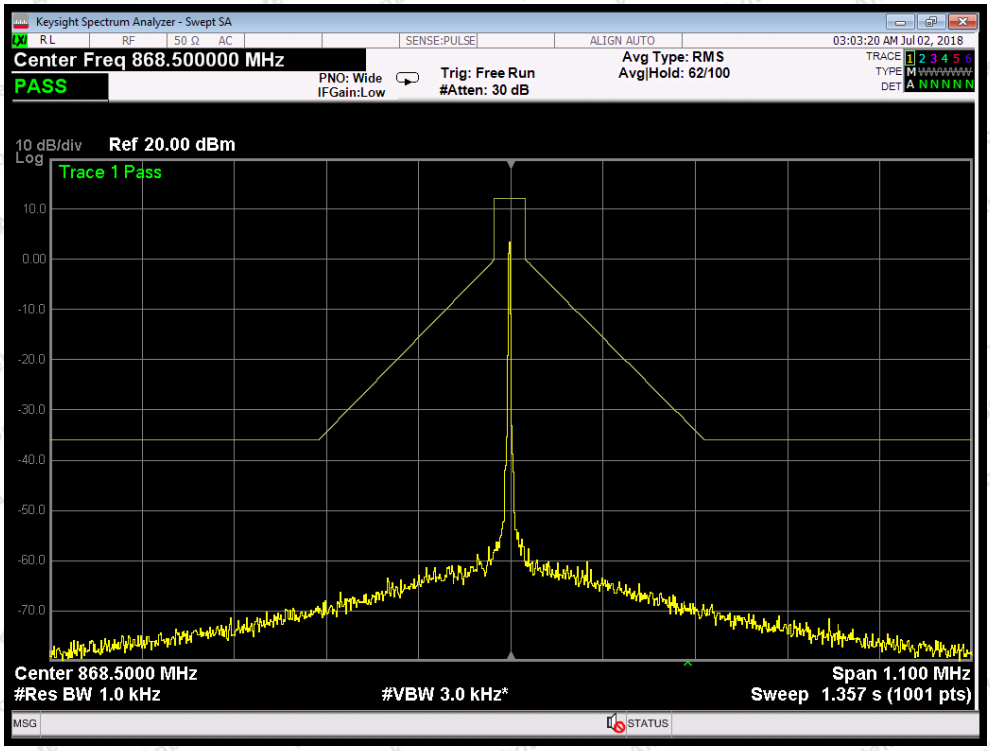


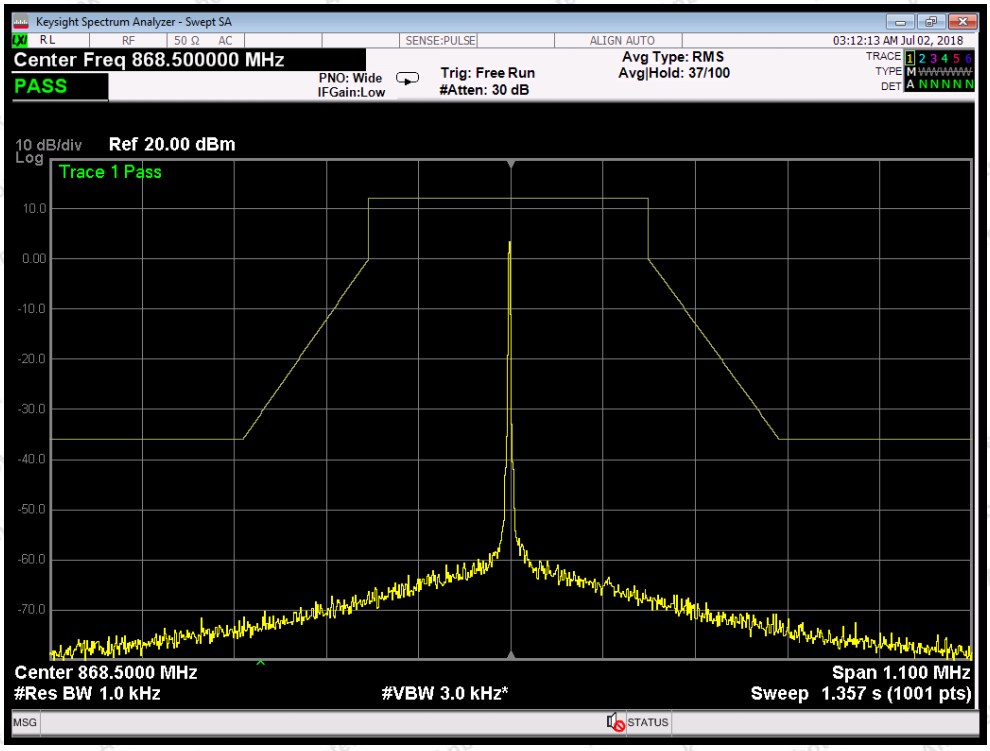
LTHV


Keysight 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: 59/100
03:03:15 AM Jul 02, 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 1.357 s (1001 pts)

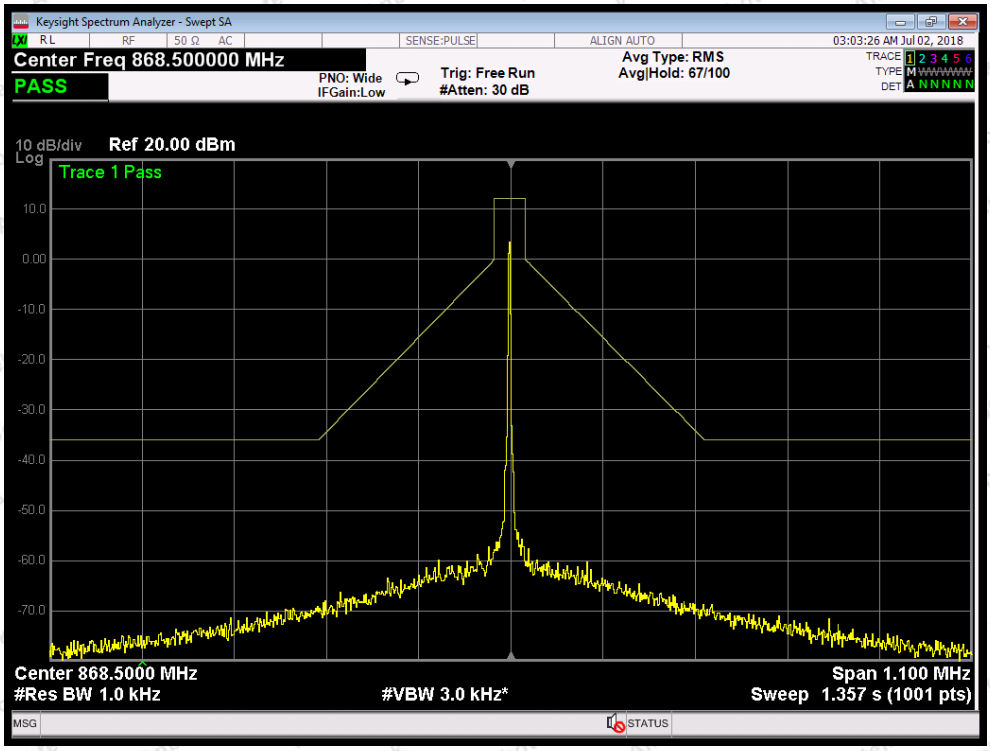

Keysight Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 15/100
03:11:41 AM Jul 02, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)

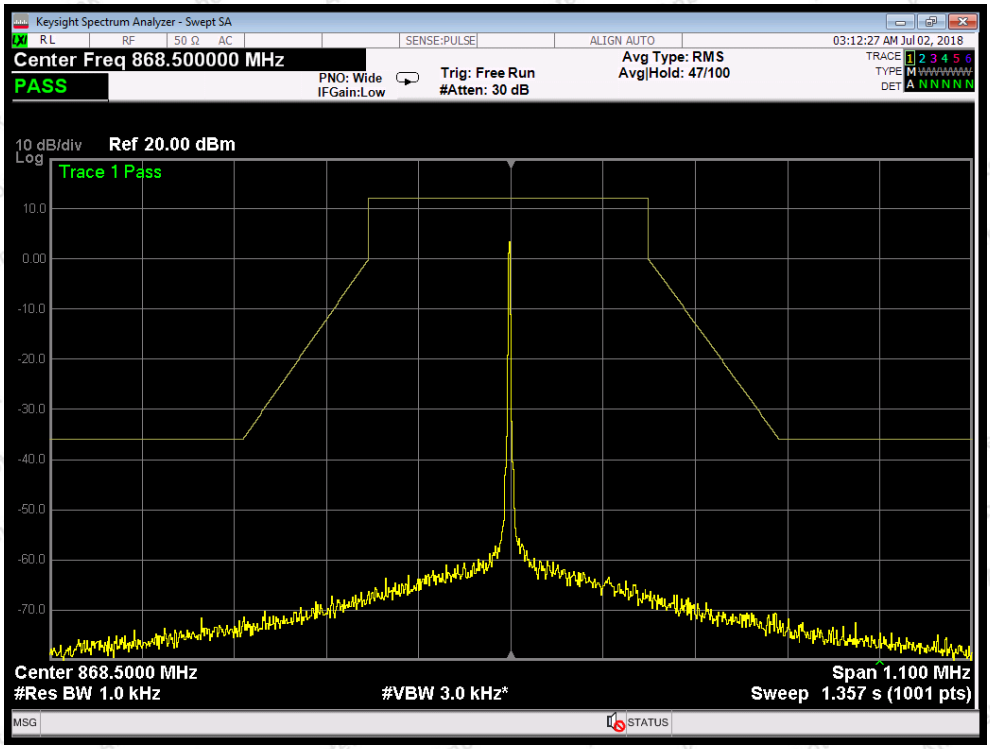
NTNV


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
03:03:20 AM Jul 02, 2018
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 62/100
TRACE 1 2 3 4 5 6
TYPE M
DET A N N N N N
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)
MSG
STATUS

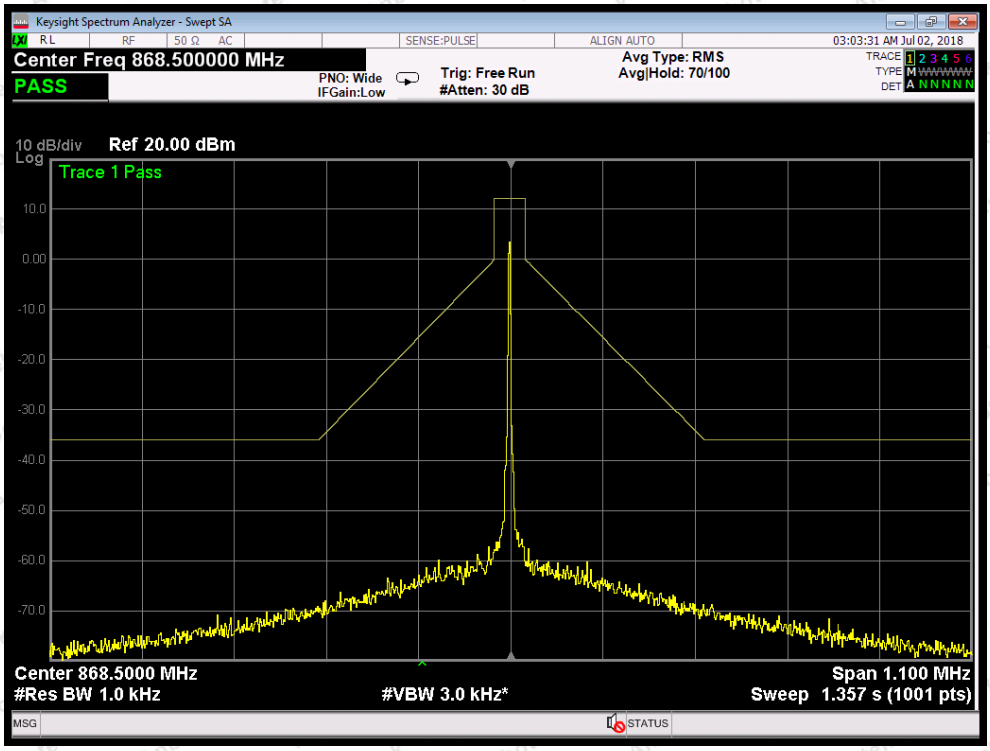

Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
03:12:13 AM Jul 02, 2018
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 37/100
TRACE 1 2 3 4 5 6
TYPE M
DET A N N N N N
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 pts)
MSG
STATUS

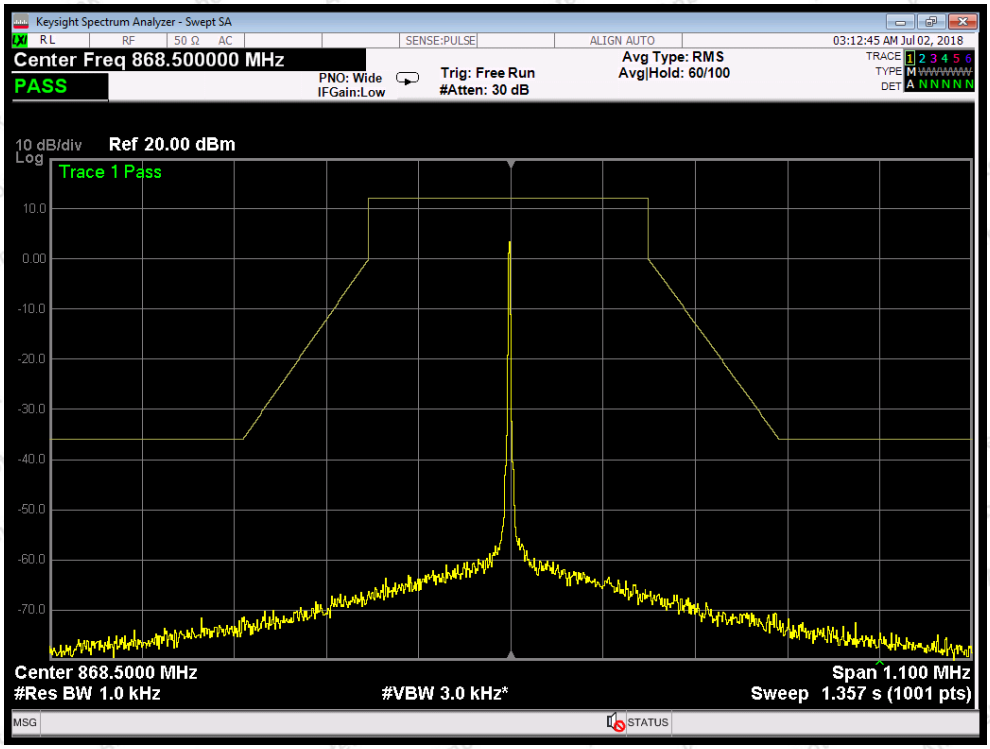
HTLV


Keysight 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: 67/100
03:03:26 AM Jul 02, 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 1.357 s (1001 pts)


Keysight 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: 47/100
03:12:27 AM Jul 02, 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 1.357 s (1001 pts)

HTHV


Keysight 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: 70/100
03:03:31 AM Jul 02, 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 1.357 s (1001 pts)

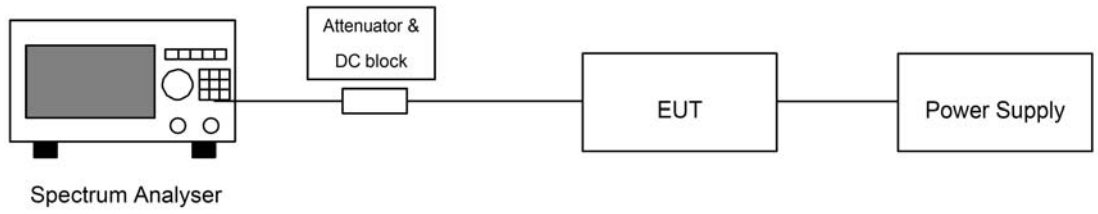

Keysight Spectrum Analyzer - Swept SA
Center Freq 868.500000 MHz
PASS
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 60/100
03:12:45 AM Jul 02, 2018
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 868.5000 MHz
#Res BW 1.0 kHz
#VBW 3.0 kHz*
Span 1.100 MHz
Sweep 1.357 s (1001 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 3.3V

Test Mode:	CH01	
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-OCW	0	-9.34
+OCW	0	-10.32
-0,5 x OCW - 400 kHz	-27	-36.63
0,5 x OCW + 400 kHz	-27	-35.34
-0,5 x OCW -1 200 kHz	-27	-34.44
0,5 x OCW + 1 200 kHz	-27	-34.74

Test Mode:	CH03	
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-OCW	0	-9.21
+OCW	0	-10.36
-0,5 x OCW - 400 kHz	-27	-36.73
0,5 x OCW + 400 kHz	-27	-35.32
-0,5 x OCW -1 200 kHz	-27	-34.40
0,5 x OCW + 1 200 kHz	-27	-34.14

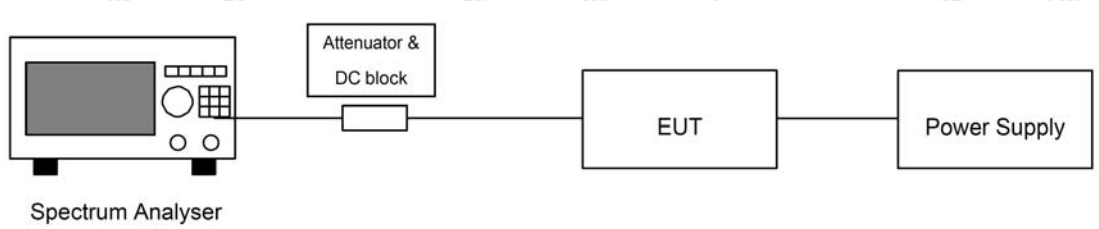
Test Mode:	CH05	
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-OCW	0	-9.09
+OCW	0	-10.35
-0,5 x OCW - 400 kHz	-27	-36.33
0,5 x OCW + 400 kHz	-27	-35.31
-0,5 x OCW -1 200 kHz	-27	-34.45
0,5 x OCW + 1 200 kHz	-27	-34.17

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

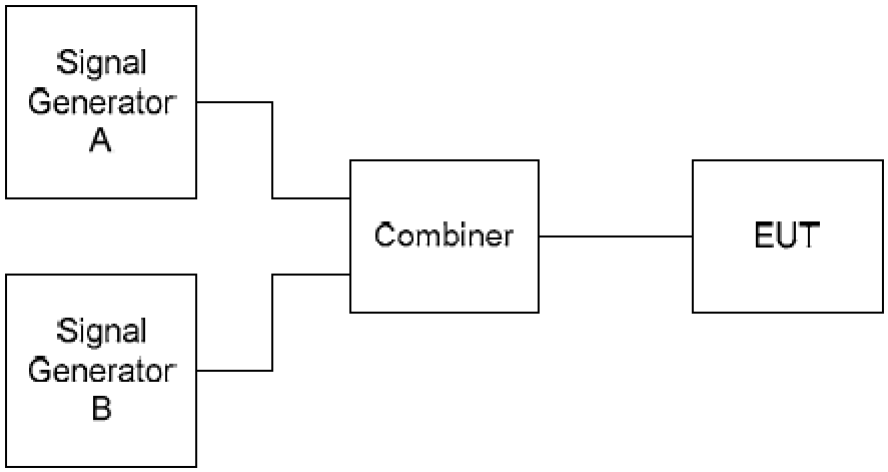
When the voltage slowly reduced lower than 70% of the manufacturer declared, the EUT will shut down, and during this period, the TX behaviour is always comply with limit.

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.

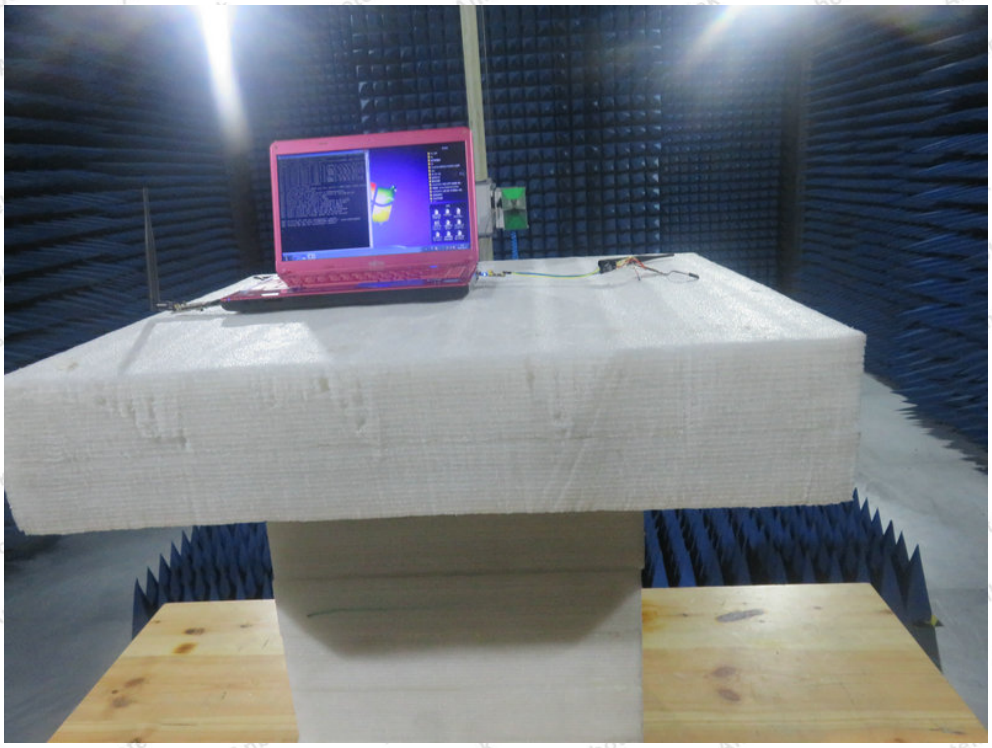
10.4. Test Data

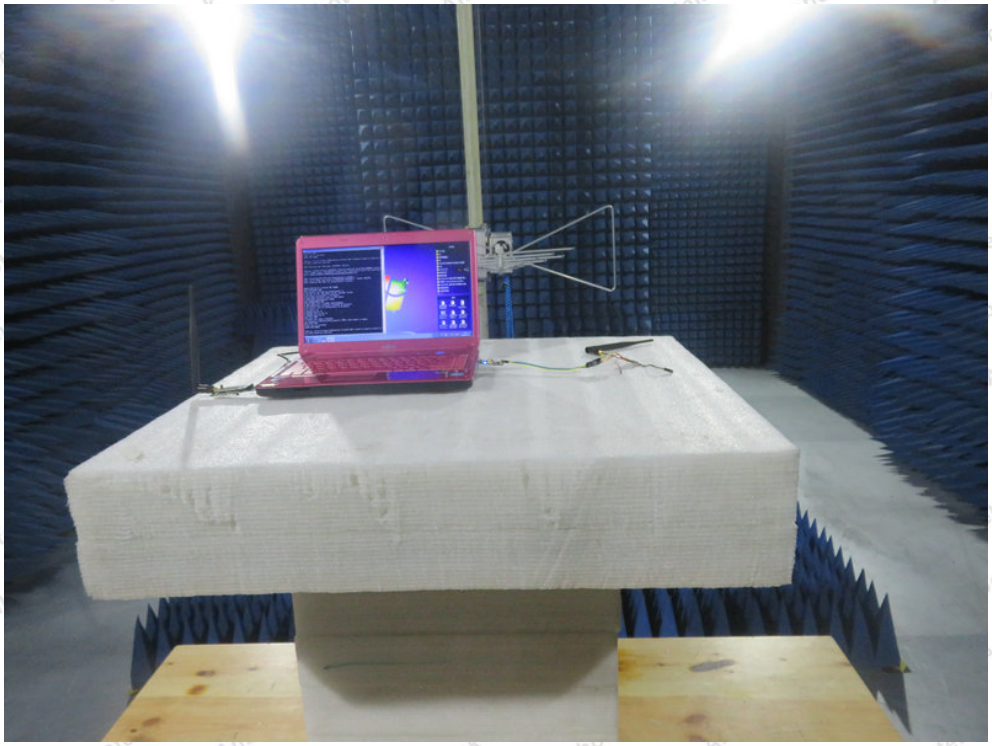
Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	RX: DC 3.3V

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 ----------