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TEST REPORT

CE Sigfox Test for SFM20R1

APPLICANT
SJI Co.,Ltd

REPORT NO.
HCT-RF-1907-CE011-R1

DATE OF ISSUE
August 9, 2022

Tested by
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Additional Model
-

Applicant	**SJI Co.,Ltd** 54-33, Dongtanhana 1-gil, Gyeonggi-do Hwaseong-si South Korea
Eut Type Model Name	Sigfox Quad-mode module SFM20R1
Date of Test	April 21, 2017 ~ October 13, 2017
Test Standard Used	ETSI EN 300 220-1 V3.1.1 (2017-02) ETSI EN 300 220-2 V3.1.1 (2017-02)
Test Results	Approval for CE Temperature : (24.3 ± 3.0) °C, Relative Humidity : (37.0 ± 3.0) % R.H. Results, Measurement uncertainty : Refer to the attachment
Manufacturer Frequency alignment range	SJI Co.,Ltd Tx : 868.055 MHz ~ 868.205 MHz, Rx : 869.525 MHz

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	July 02, 2019	Initial Release
1	August 09, 2022	We modified the applicant name.

Test Report Statement:

The above Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme) / A2LA(American Association for Laboratory Accreditation), which signed the ILAC-MRA.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	**SJI Co.,Ltd** 54-33, Dongtanhana 1-gil, Gyeonggi-do Hwaseong-si South Korea

2. EQUIPMENT UNDER TEST (EUT)

Equipment	Sigfox Quad-mode module
Model	SFM20R1
Serial number	-
Manufacturer	SJI Co.,Ltd
Rating	DC 3.3 V

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

3.1 Manufacturers declarations

No. of units:	One (Transceiver)	
Receiver category:	2	
Application:	Sigfox Quad-mode module	
Equipment category:	Short Range Device	
Model No.:	SFM20R1	
Serial No.:	-	
Type of modulation:	DBPSK	
Specification(s):	ETSI EN 300 220-1 V3.1.1 (2017-02) ETSI EN 300 220-2 V3.1.1 (2017-02)	
Tx frequency(MHz):	868.055 MHz ~ 868.205 MHz	
Rx frequency(MHz):	869.525 MHz	
Voice Application:	Not applicable	
Duty cycle(%):	≤ 1.0 %	
System:	Narrowband system	
Listen Before Talk (LBT):	applicable	
Adaptive Frequency Agility:	applicable	
H/W version :	1.0	
S/W version :	SFM20R_V204	
Power source:	Normal voltage :	DC 3.3 V
	Extreme lower voltage :	DC 3.2 V
	Extreme upper voltage :	DC 5.0 V
Temperature range:	Normal Temperature :	+24.3°C
	Extreme lower Temperature :	-30.0°C
	Extreme upper Temperature :	+85.0°C
Antenna type:	External antenna (Dipole Antenna)	
Peak. antenna gain:	2.05 dBi	

4. TEST SUMMARY

The list of measured parameters called for in ETSI EN 300 220-1 V3.1.1 is given below:

Clause	Transmitter Parameter	Test method	Result
5.1	Operating frequency	N/A	(See note1)
5.2	Effective Radiated Power	Conducted	Pass
5.3	Maximum Effective Radiated Power spectral density	N/A	(See note5)
5.4	Duty Cycle	N/A	(See note2)
5.5	Duty Cycle Template	N/A	(See note2)
5.6	Occupied Bandwidth	Conducted	Pass
5.7	Frequency error	Conducted	Pass
5.8	Tx Out Of Band Emissions	Conducted	Pass
5.9	Unwanted emissions in the spurious domain	Radiated	Pass
5.10	Transient power	Conducted	Pass
5.11	Adjacent Channel Power	N/A	(See note3)
5.12	TX behaviour under Low Voltage Conditions	N/A	(See note6)
5.13	Adaptive Power Control	N/A	(See note4)

Note:

1. Operational Frequency band : 868.034 MHz ~ 868.226 MHz,
   Norminal Operating frequencies : 868.055 MHz ~ 868.205 MHz,
   Operating Channel width(s) : 600 kHz
2. Manufacturers declaration : Duty cycle ≤ 1.0 %
3. The operating channel width is not less than or equal to 25 kHz.
4. Not annex C band AA.
5. Not annex B bands I, L.
   Maximum e.r.p. spectral density applies to transmitters using DSSS or wideband techniques other than FHSS modulation, in annex C band X.
6. TX behaviour under low voltage condition applies to battery powered EUT.

Clause	Receiver Parameter	Test method	Result
5.14	RX sensitivity level	N/A	(See note1)
5.15	Adjacent channel selectivity	N/A	(See note1,2)
5.16	Receiver saturation at Adjacent Channel	N/A	(See note1,2)
5.17	Spurious response rejection	N/A	(See note1,2)
5.18	Blocking	Pass	(See note1)
5.19	Behaviour at high wanted signal level	N/A	(See note1)
5.21.2	Clear Channel Assessment threshold	N/A	(See note3)
5.21.3	Polite spectrum access timing parameters	N/A	(See note3)
5.21.4	Adaptive Frequency Agility	N/A	(See note4)

Note:

1. Operational Frequency band : 869.525 MHz
2. No Receiver category 1
3. Manufacturers declaration : Duty cycle ≤ 1.0 %
4. The Adaptive Frequency Agility is not supported.

5. TEST EQUIPMENT

No.	Instrument	Model No.	Due to Calibration	Manufacture	Serial No.
☒	Signal Analyzer (20 Hz ~ 40.0 GHz)	FSV40-N	2018-09-27	ROHDE & SCHWARZ	101068-SZ
☒	Signal Analyzer (100Hz ~ 30.0 GHz)	FSP	2018-09-21	ROHDE & SCHWARZ	836650/016
☒	Signal Analyzer (20 Hz ~ 26.5 GHz)	N9020A	2018-05-04	AGILENT	My51110063
☒	SIGNAL GENERATOR (100kHz~40GHz)	SMB100A	2018-07-18	Rohde&Schwarz	177633
☒	SIGNAL GENERATOR (9kHz~6GHz)	N5182A	2018-01-23	AGILENT	MY47070406
☒	Power Sensor	N1921A	2018-04-17	AGILENT	MY52260025
☒	Power Meter	N1911A	2018-04-17	AGILENT	MY45100523
☒	High Pass Filter (1.0GHz ~ 15.0 GHz)	WHKX10-900-1000-15000-40SS	2018-07-21	WAINWRIGHT INSTRUMET	5
☒	BI-LOG Antenna (30 MHz ~ 1 GHz)	VULB9160	2018-10-14	Schwarzbeck	3368
☒	Horn Antenna (1 GHz ~ 18 GHz)	BBHA9120D	2018-10-14	Schwarzbeck	9120D-1298
☒	Horn Antenna (1 GHz ~ 18 GHz)	BBHA9120D	2019-05-16	Schwarzbeck	9120D-1299
☒	Power Divider-2way (DC ~ 26.5 GHz)	11636B	2017-11-10	HP	11377
☒	POWER DIVIDER-4WAY (0.5 ~ 18 GHz)	Narda 4426-4	2018-02-22	Narda	11927
☒	STEP	8494B	2018-09-05	Agilent	MY41110293

	ATTENUATOR (1 W, DC ~ 18 GHz)				
☒	Fixed Attenuator (10 dB, DC ~ 26.5 GHz)	56-10	2017-11-03	WEINSCHEL	72324
☒	Fixed Attenuator (20 dB, DC ~ 26.5 GHz)	8493C	2018-06-22	HP	17280
☒	DC power supply	E3632A	2018-03-14	HP	KR75303962
☒	Temp & Humidity Chamber	SU-642	2018-03-31	ESPEC	93008124
☒	POWER AMP (0.1 GHz ~ 18 GHz)	CBLU1183540B-01	2018-06-12	CERNEX	26822

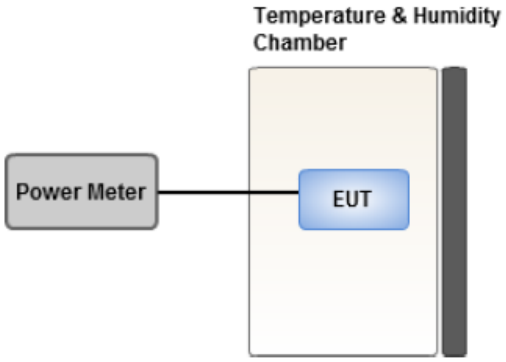
Note:

1. All equipment is calibrated with traceable calibrations.
2. Each calibration is traceable to the national or international standards.

6. TRANSMITTER MEASUREMENTS

6.1 Effective Radiated Power (conducted measurement)

6.1.1 Test Setup



6.1.2 Test Procedure

Refer to ETSI EN 300 220-1 V3.1.1 (2017-02) Clause 5.2.2.1.2

The transmitter shall be connected to a dummy load as described in clause 4.3.7 and the conducted power delivered shall be measured with a measurement receiver according to clause 4.3.10.

In the case of non-constant envelope modulation, a peak detector shall be used.

The maximum gain of the antenna to be used together with the equipment shall be declared by the manufacturer and this shall be recorded in the test report.

Perp, the radiated power (e.r.p.) limit applies to the maximum measured conducted power (Pconducted) value adjusted by the antenna gain (relative to a dipole) (Perp=Pconducted+antenna gain).

6.1.3 Limit

Frequency Bands/frequencies	Maximum effective radiated power, e.r.p.	Channel access and occupation rules (e.g. Duty cycle or LBT + AFA)	Maximum occupied bandwidth
865,000MHz to 868,000 MHz	25 mW e.r.p.	≤ 1 % duty cycle or polite spectrum access	The whole band except for audio & video applications limited to 300 kHz

6.1.4 Test Result

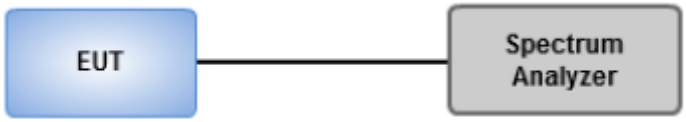
TEST CONDITIONS		Effective Radiated Power (dBm)		
		868.055 MHz	868.130 MHz	868.205 MHz
T nom	V normal	12.759	12.757	12.750
T low	V max	13.492	13.480	13.478
	V min	13.498	13.499	13.496
T high	V max	11.957	11.951	11.951
	V min	11.962	11.957	11.957
Measurement Uncertainty : 0.54 dB (about 95 % , k = 2)				

Note:

1. unmodulated carrier
2. P= A + G
   (P : Effective Radiated Power, A: Measured conducted power, G: Antenna gain)
3. Peak. Ant gain(dBd) : 2.05 dBi - 2.15 = -0.1 dBd

6.2 Occupied Bandwidth

6.2.1 Test Setup



6.2.2 Test Procedure

Refer to ETSI EN 300 220-1 V3.1.1 (2017-02) Clause 5.6.3.4

Step 1:

Operation of the EUT shall be started, on the highest operating frequency as declared by the manufacturer, with the appropriate test signal.

The signal attenuation shall be adjusted to ensure that the signal power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals on either side of the power envelope being included in the measurement.

Step 2:

When the trace is completed the peak value of the trace shall be located and the analyser marker placed on this peak.

Step 3:

The 99 % occupied bandwidth function of the spectrum analyser shall be used to measure the occupied bandwidth of the signal.

6.2.3 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 Flow and Fhigh.

6.2.4 Test Result

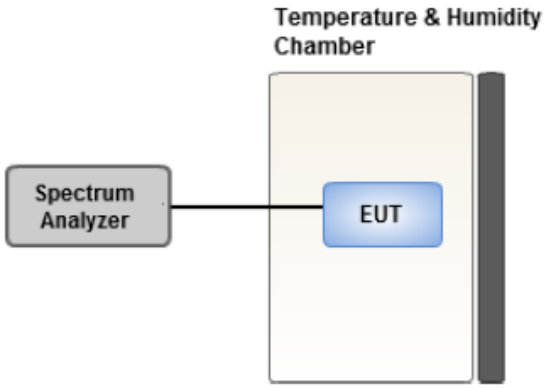
TEST CONDITIONS	Occupied Bandwidth (kHz)		
	868.055 MHz	868.130 MHz	868.205 MHz
T nom	125.98	124.98	152.16
T low	165.78	165.42	165.00
T high	165.95	163.27	165.50
Measurement Uncertainty : 3.35 kHz (about 95 % , k = 2)			

Note:

1. Normal conditions
2. Test signal : D-M3

6.3 Frequency error

6.3.1 Test Setup



6.3.2 Test Procedure

Refer to ETSI EN 300 220-1 V3.1.1 (2017-02) Clause 5.7.2.4

Step 1:

Operation of the EUT shall be started on the nominal frequency as declared by the manufacturer under extreme high temperature and extreme voltage conditions.

Step 2:

Operation of the EUT shall be started on the nominal frequency as declared by the manufacturer under extreme low temperature and extreme voltage conditions.

The frequency of the unmodulated carrier shall be measured and noted.

6.3.3 Test Result

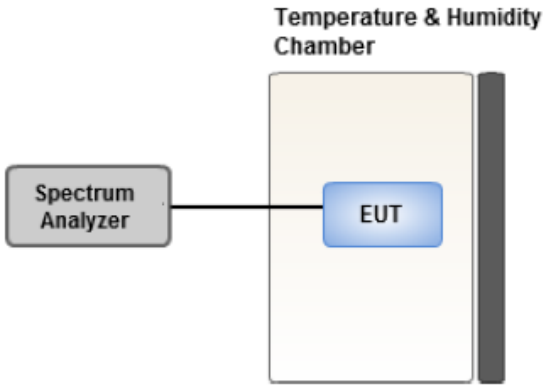
TEST CONDITIONS		Frequency error	
		868.055 MHz	**868.205 MHz**
T nom	V nom	868.054270	868.204263
T low	V max	0.000858	0.000868
	V min	0.000858	0.000878
T high	V max	-0.000525	-0.000503
	V min	-0.000508	-0.000487
Measurement Uncertainty : 23.1 kHz (about 95 %, k = 2)			

Note:

1. Un-modulation test

6.4 Tx Out Of Band Emissions

6.4.1 Test Setup



6.4.2 Test Procedure

Refer to ETSI EN 300 220-1 V3.1.1 (2017-02) Clause 5.8.3.4

Step 1:

Operation of the EUT shall be started, on the highest operating frequency as declared by the manufacturer, with the appropriate test signal.

The signal shape is recorded when stable and shall be below the spectrum mask Out Of Band for operating channel.

Step 2:

The test equipment shall be reconfigured as appropriate for the parameter shown in Table 17.

Table 17: Test Parameter Setting for Lower Out Of Band Measurement

Spectrum Analyser Setting	Value	Notes
Centre frequency	fclow	The lowest Operating Frequency in the band
Span	2 x (500 kHz + fclow - flow_OFB)	Ensures that the left most mask specification remains within the span
NOTE: flow_OFB is the lower edge of the Operational Frequency Band.		

Operation of the EUT is restarted, with the appropriate test signal, on the lowest operating frequency as declared by the manufacturer. If the equipment is using only one operating Frequency in the operational Frequency Band, measurement shall be performed the nominal operating frequency. The signal shape is recorded when stable; and shall be below the spectrum mask for operating channel and the spectrum mask for operational frequency band.

Step 3:

The test equipment shall be reconfigured as appropriate for the parameter shown in Table 18.

Table 18: Test Parameter Setting for upper Out Of Band Measurement

Spectrum Analyser Setting	Value	Notes
Centre frequency	fchigh	the highest Operating Frequency in the band
Span	2 x (500 kHz + fhigh_OFB - fchigh)	Ensures that the rightmost mask specification remains within the span
NOTE: fhigh_OFB is the higher edge of the operational frequency Band.		

Operation of the EUT is restarted, with the appropriate test signal, on the highest Operating Frequency as declared by the manufacturer.

If the equipment is using only one Operating Frequency in the Operational Frequency Band, measurement shall be performed at the nominal Operating Frequency

The signal shape is recorded when stable and shall be below the spectrum mask for Out Of Band emissions for operating channel and for operational Frequency Band.

Step 4:

For frequency agile devices, the measurement shall be repeated in each Operational Frequency Band.

Step 5:

Where required (see clause 5.8.3.1 condition 1), the measurements in step 1 to step 5 shall be repeated under extreme test conditions.

6.4.3 Limit

The EUT emissions level in OOB domains for the Operating Channel and the Operational Frequency Band shall be less or equal to Table 15 spectrum mask.

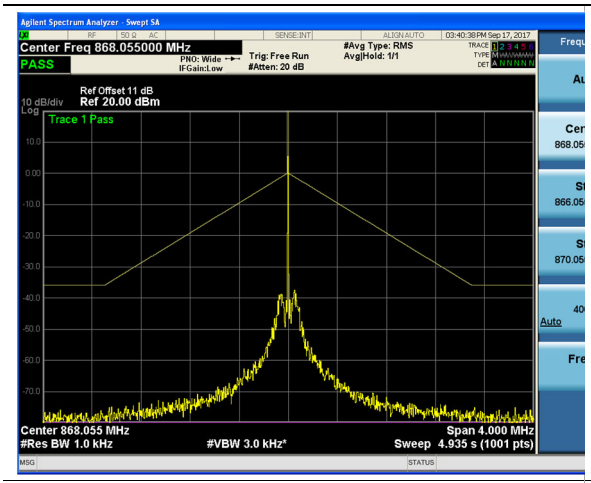
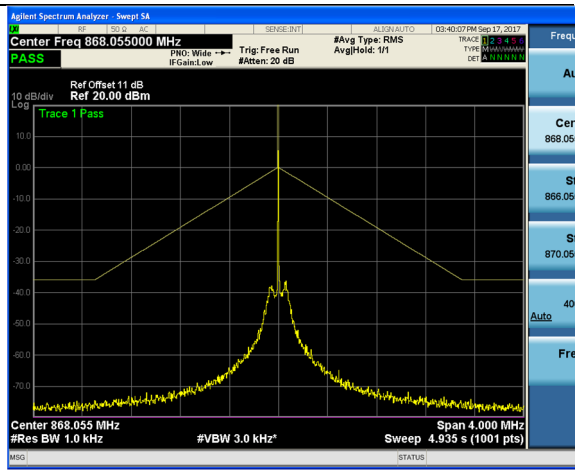
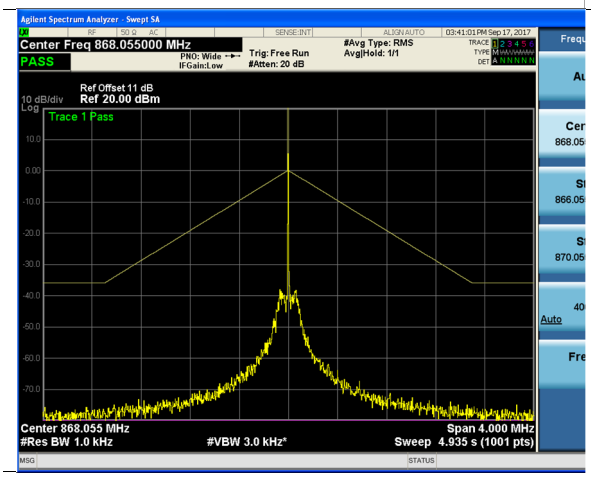
Domain	Frequency Range	RBWREF	Max power limit
OOB limits applicable to Operational Frequency Band (See Figure 6)	f ≤ flow_OFB - 400 kHz	10 kHz	-36 dBm
	Flow_OFB - 400 kHz ≤ f ≤ flow_OFB - 200 kHz	1 kHz	-36 dBm
	flow - 200 kHz ≤ f < flow_OFB	1 kHz	See Figure 6
	f = flow_OFB	1 kHz	0 dBm
	f = fhigh_OFB	1 kHz	0 dBm
	Fhigh_OFB < f ≤ fhigh_OFB + 200 kHz	1 kHz	See Figure 6
	Fhigh_OFB + 200 kHz ≤ f ≤ fhigh_OFB + 400 kHz	1 kHz	-36 dBm
	Fhigh_OFB + 400 kHz ≤ f	10 kHz	-36 dBm
OOB limits applicable to Operating Channel (See Figure 5)	f = fc- 2.5 x OCW	1 kHz	-36 dBm
	fc - 2,5 x OCW ≤ f ≤ fc - 0,5 x OCW	1 kHz	See Figure 5
	f = fc - 0,5 x OCW	1 kHz	0 dBm
	f = fc + 0,5 x OCW	1 kHz	0 dBm
	fc + 0,5 x OCW ≤ f ≤ fc + 2,5 x OCW	1 kHz	See Figure 5
	f = fc+ 2,5 x OCW	1 kHz	-36 dBm

NOTE: f is the measurement frequency.
fc is the Operating Frequency.
Flow_OFB is the lower edge of the Operational Frequency Band.
Fhigh_OFB is the upper edge of the Operational Frequency Band.
OCW is the operating channel bandwidth.

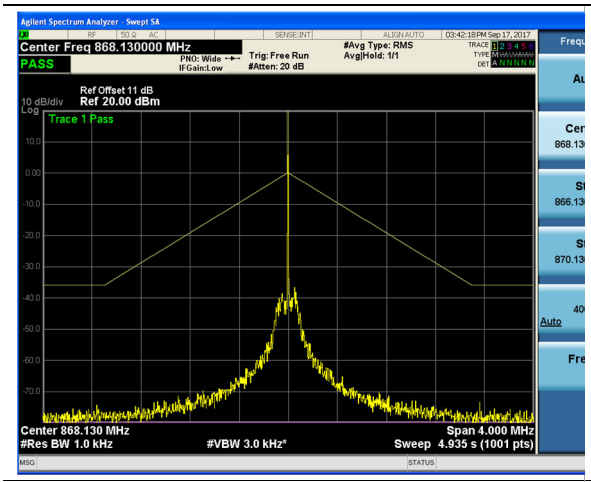
6.4.4 Test Result

Operating Channel

Normal Temperature

Frequency: 868.055 MHz	
	
3.2 V	3.3 V
	
5.0 V	

Frequency: 868.13 MHz



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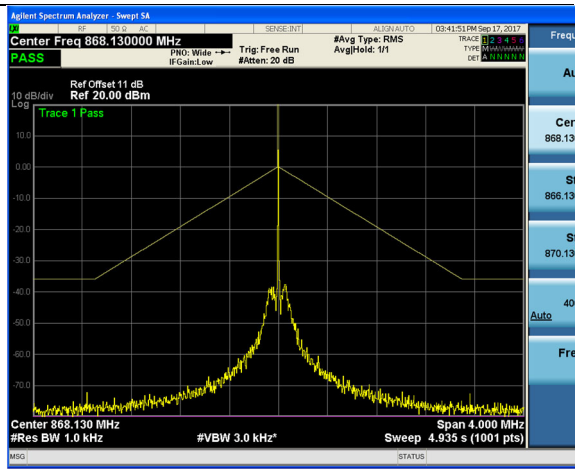

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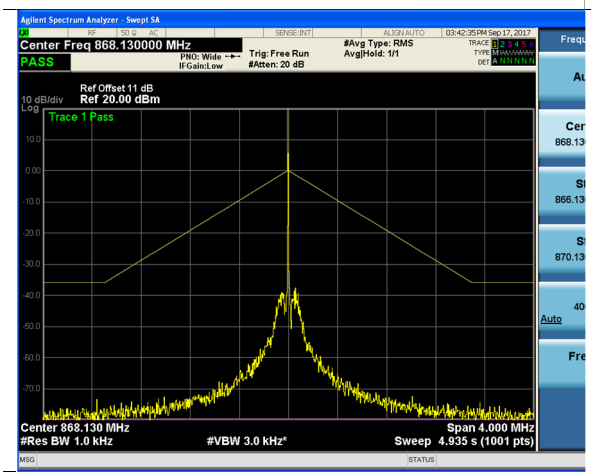
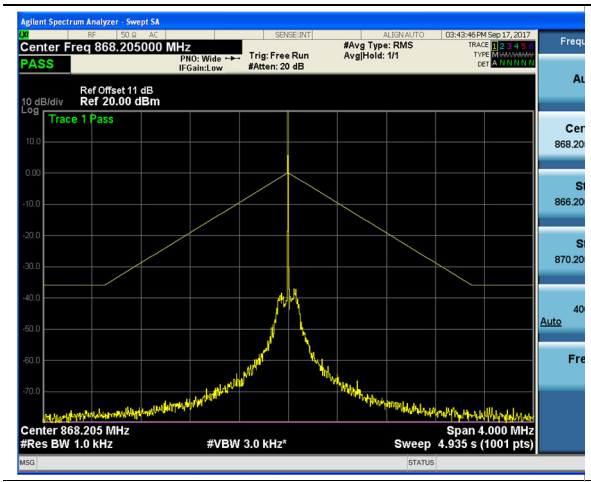


5.0 V

Frequency: 868.205 MHz



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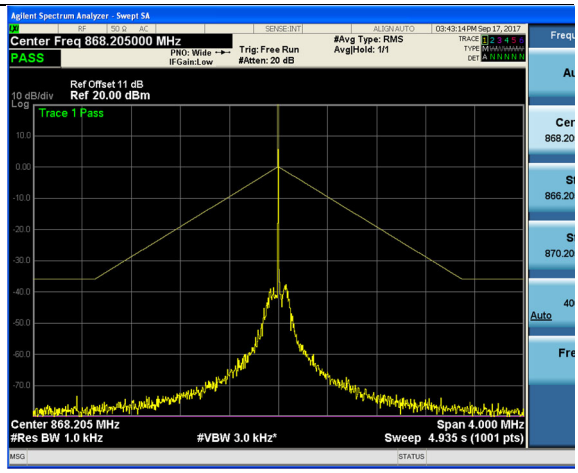

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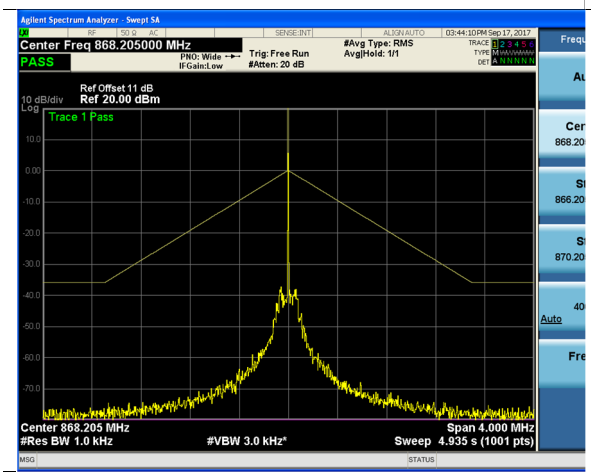
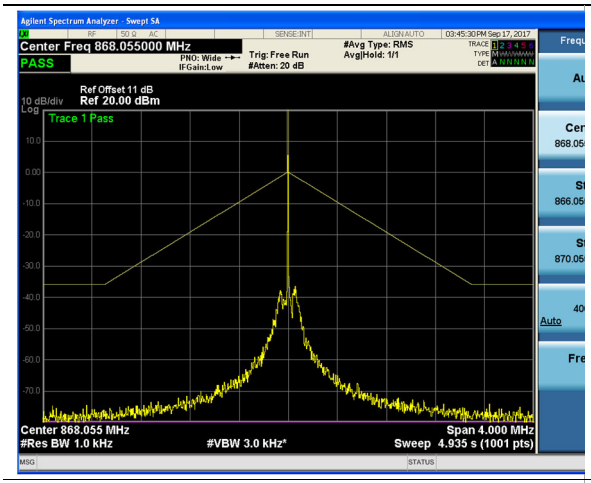
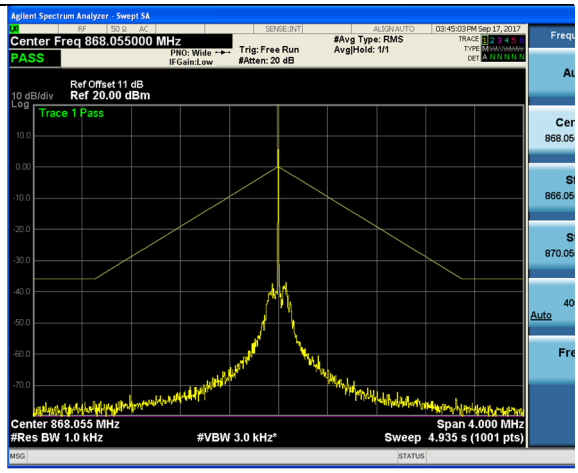
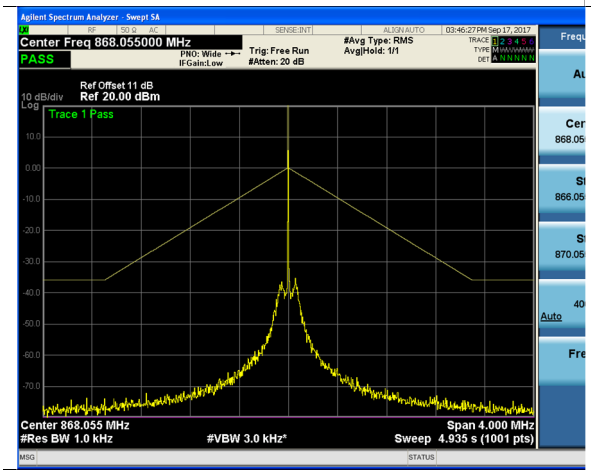
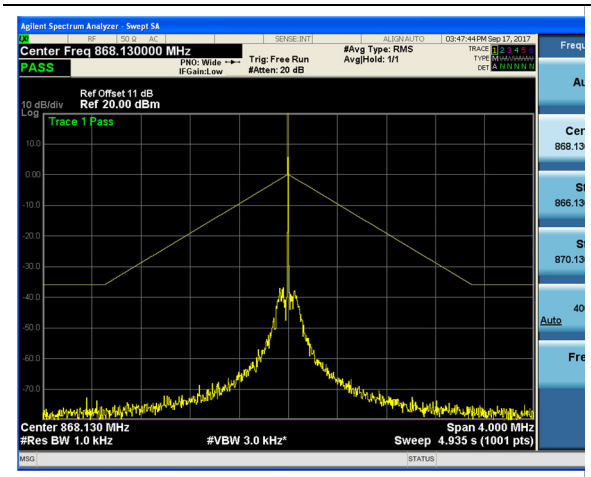


5.0 V

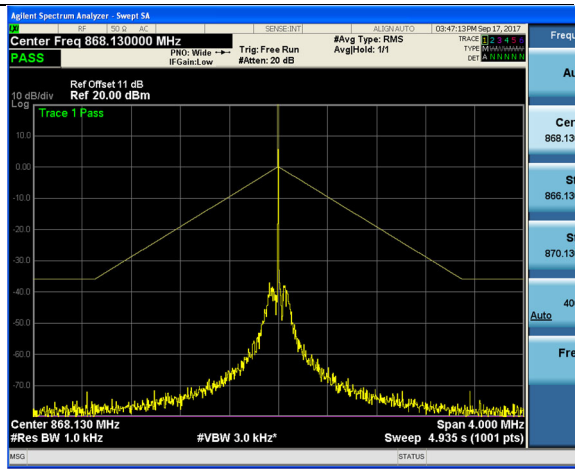
- Temperature : Low

Frequency: 868.055 MHz	
	
3.2 V	3.3 V
	
5.0 V	

Frequency: 868.13 MHz



3.2 V



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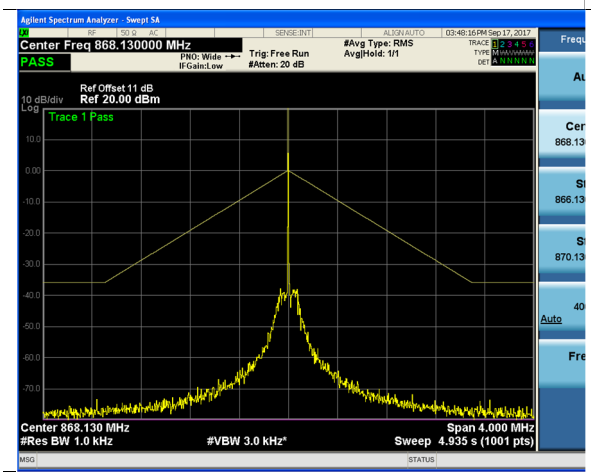
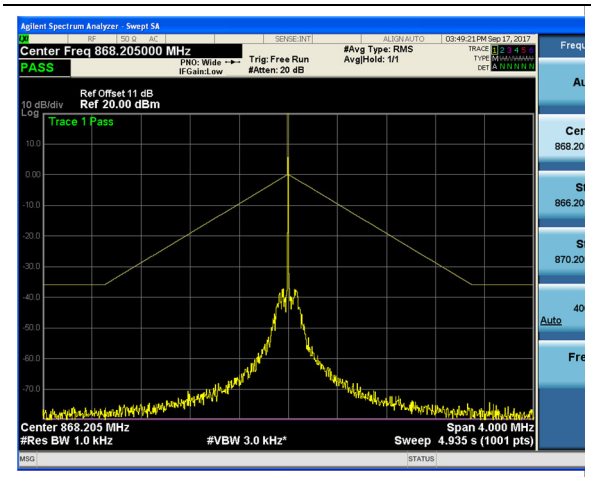
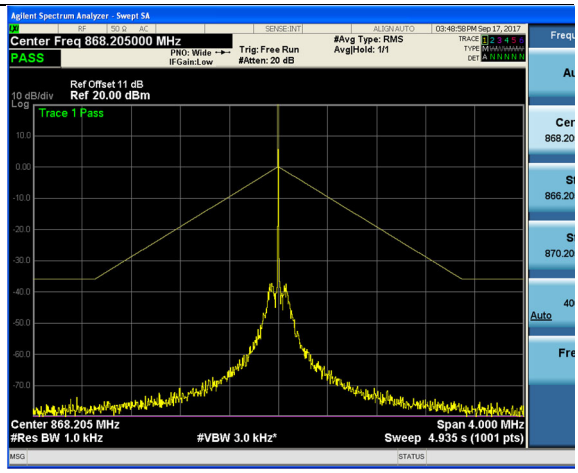


5.0 V

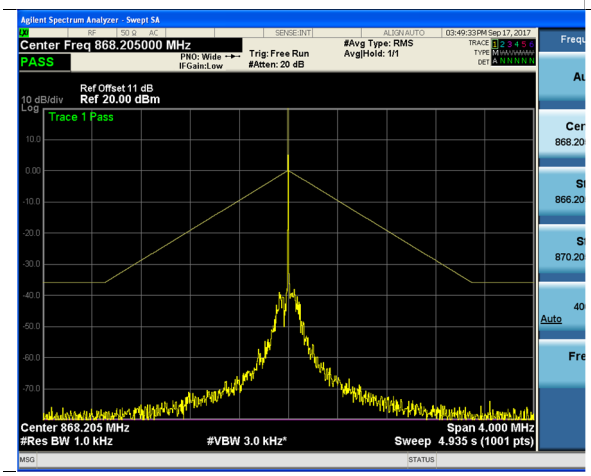
Frequency: 868.205 MHz



3.2 V

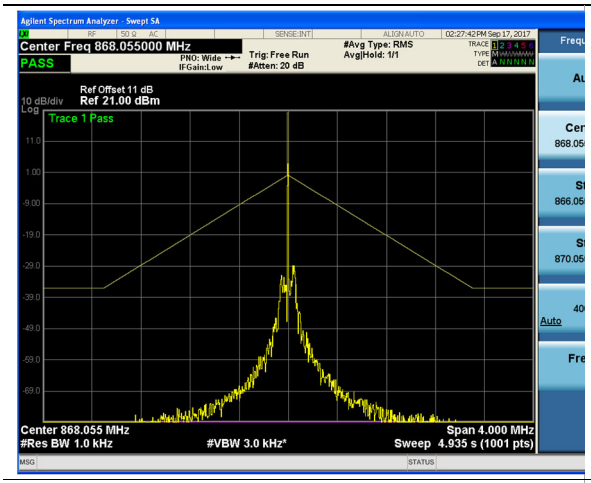
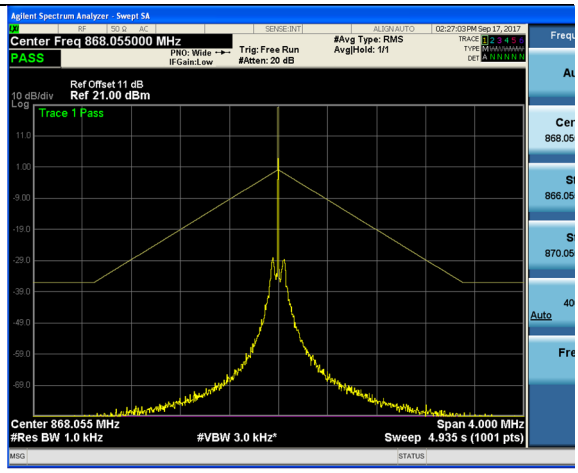
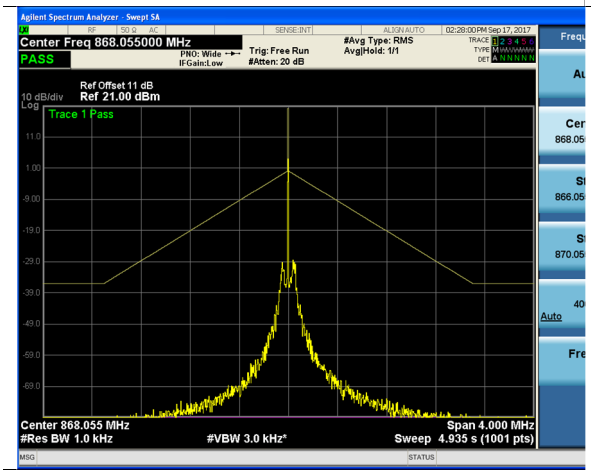


3.3 V

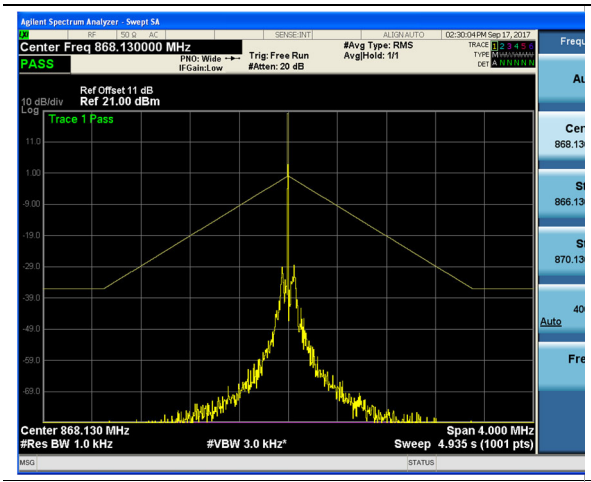


5.0 V

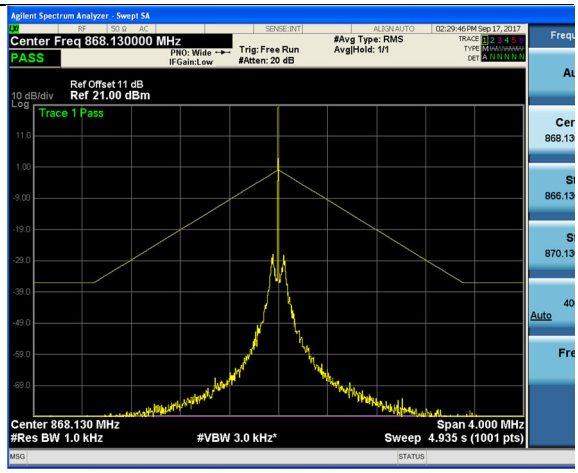
- Temperature : High

Frequency: 868.055 MHz	
	
3.2 V	3.3 V
	
5.0 V	

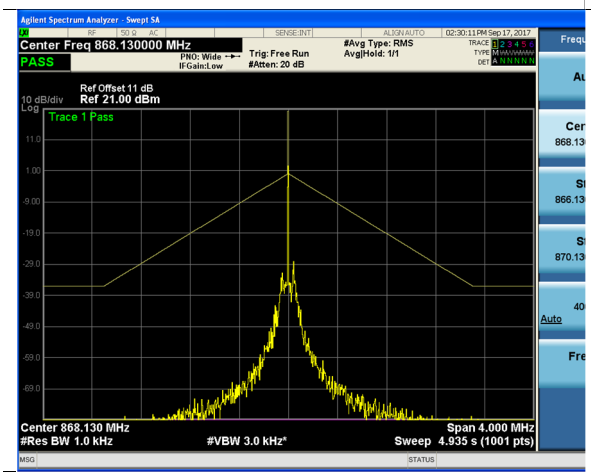
Frequency: 868.13 MHz



3.2 V

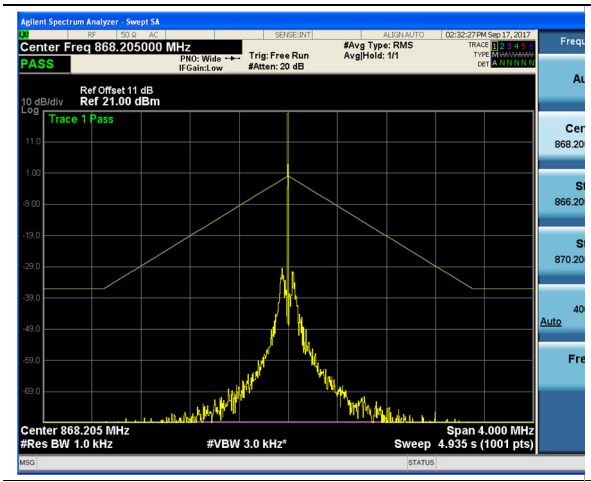


3.3 V

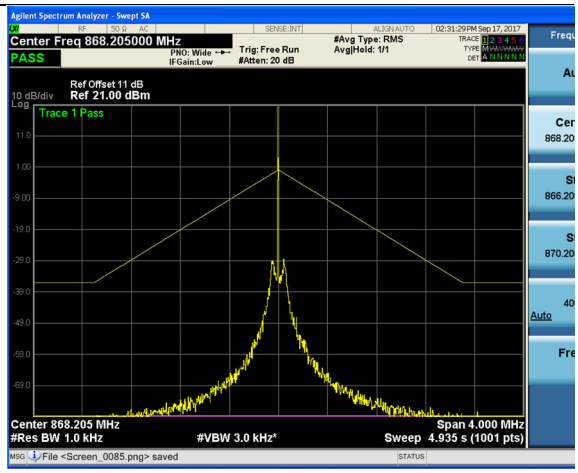


5.0 V

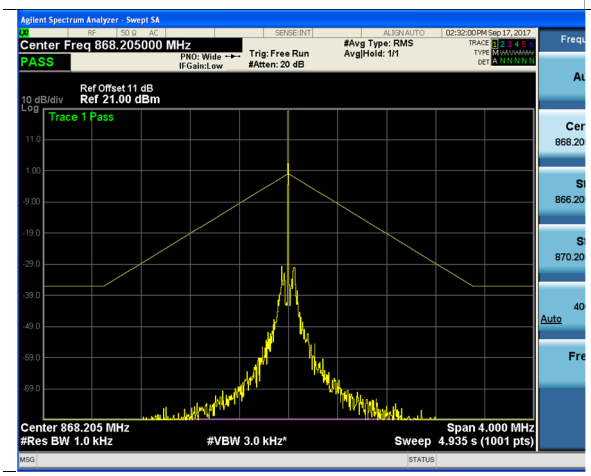
Frequency: 868.205 MHz



3.2 V



3.3 V

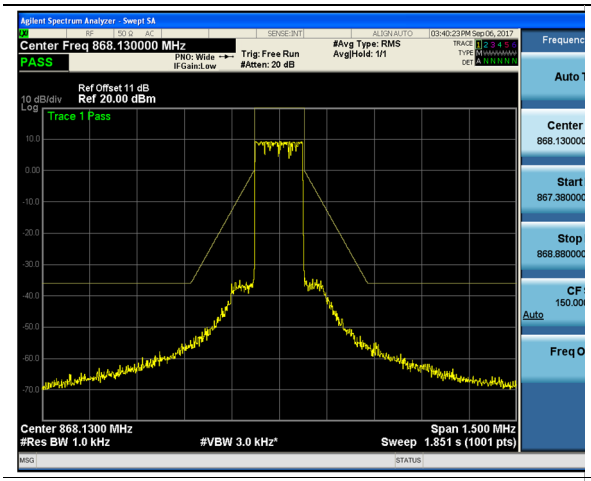


5.0 V

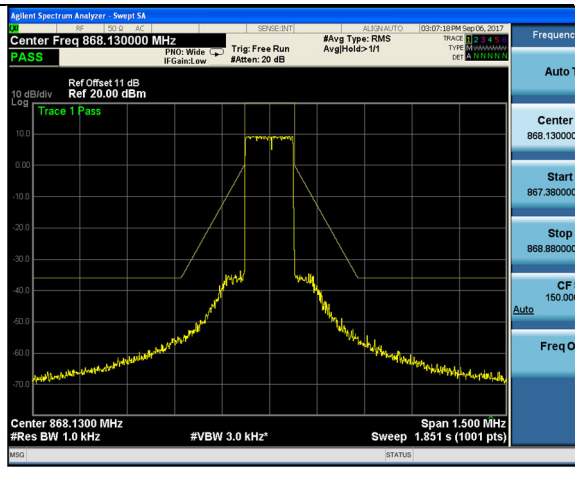
Operating Frequency Band

Normal Temperature

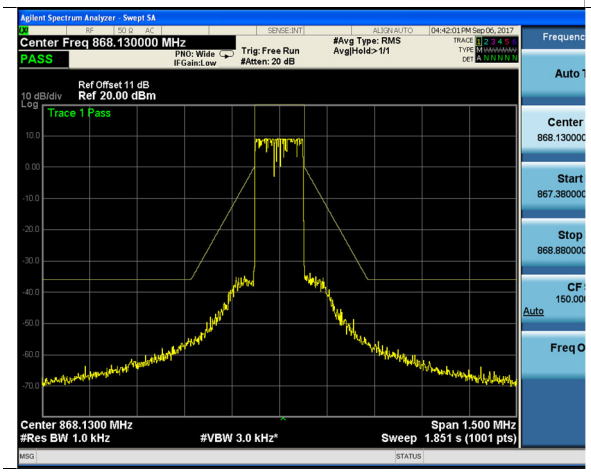
Frequency: 868.13 MHz



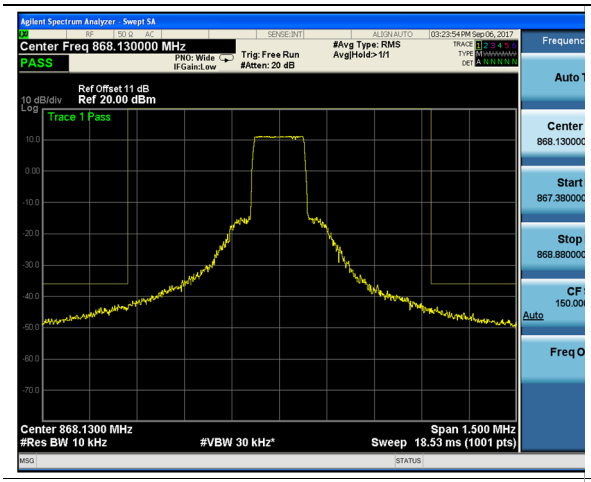
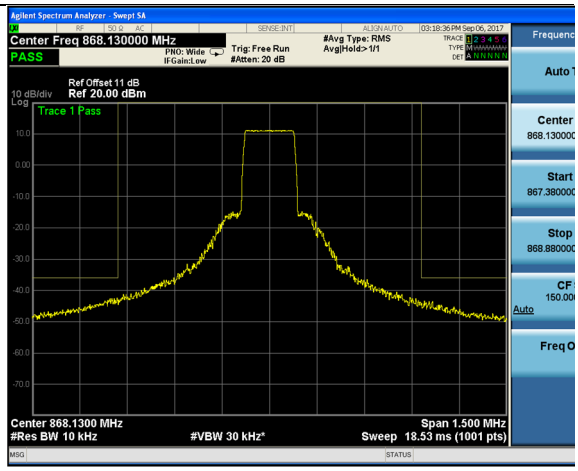
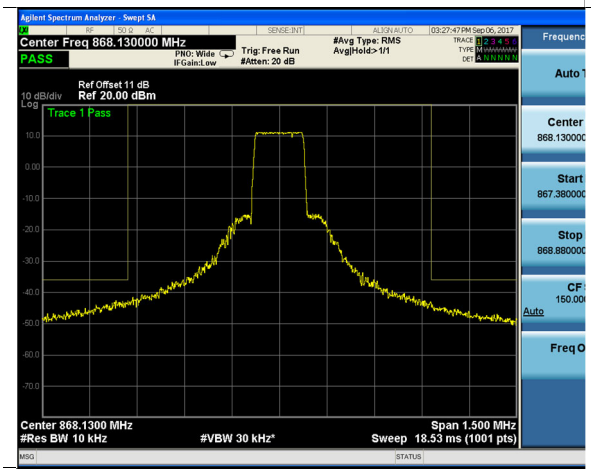
3.2 V



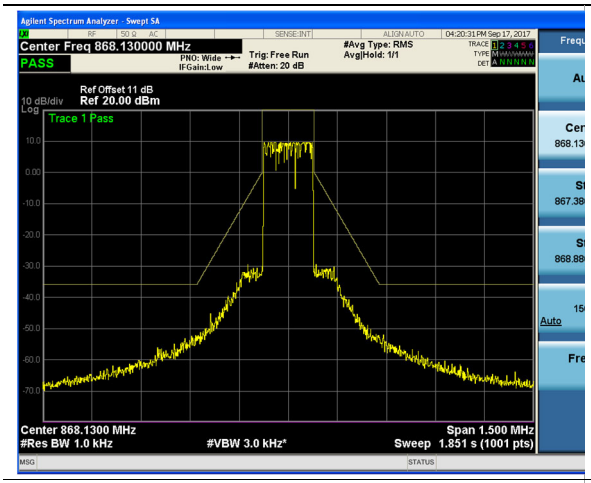
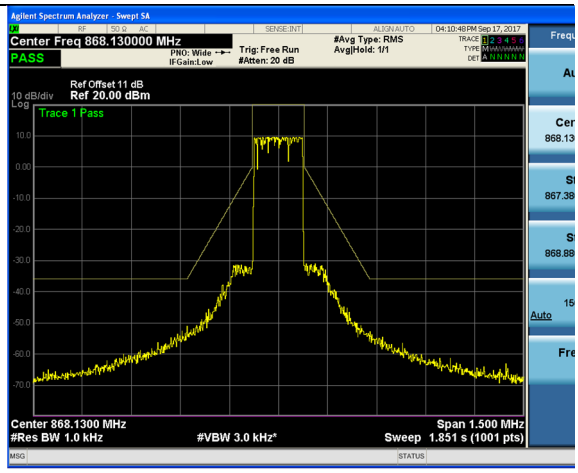
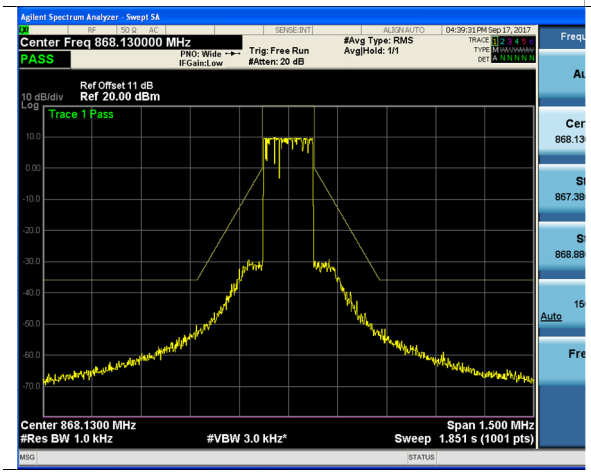
3.3 V



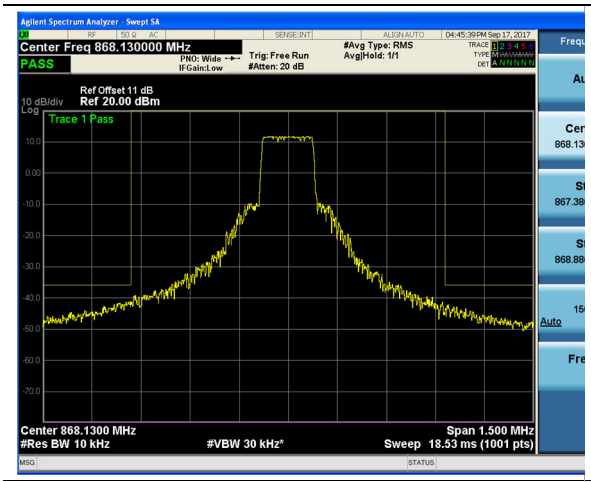
5.0 V

Frequency: 868.13 MHz	
	
3.2 V	3.3 V
	
5.0 V	

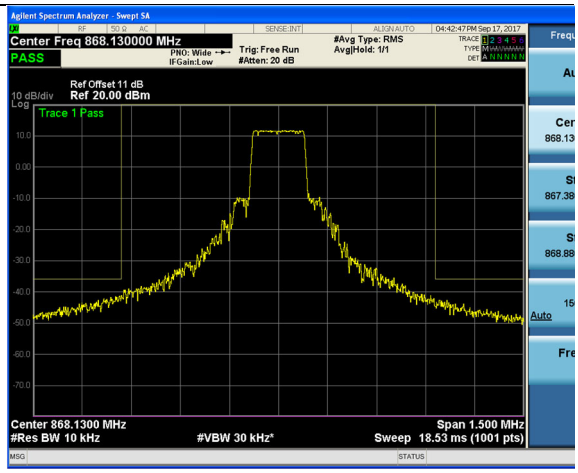
- Temperature : Low

Frequency: 868.13 MHz	
	
3.2 V	3.3 V
	
5.0 V	

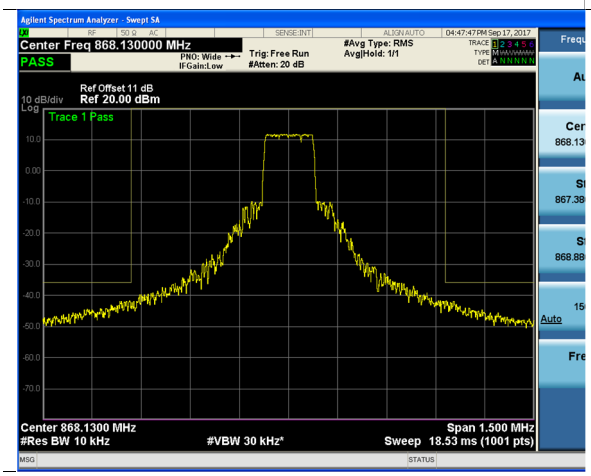
Frequency: 868.13 MHz



3.2 V

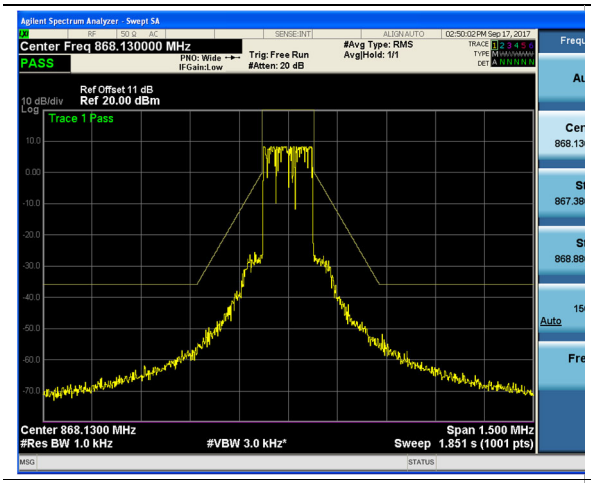
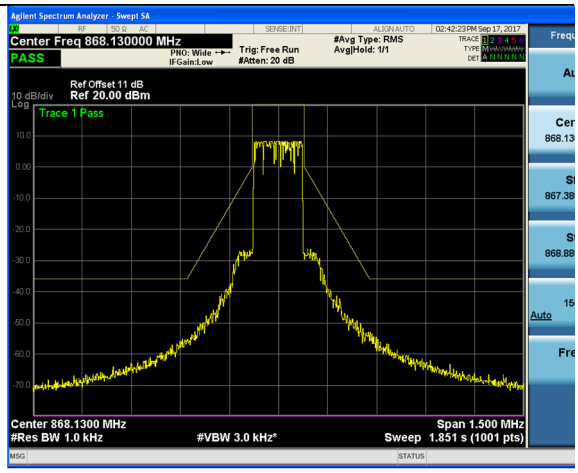
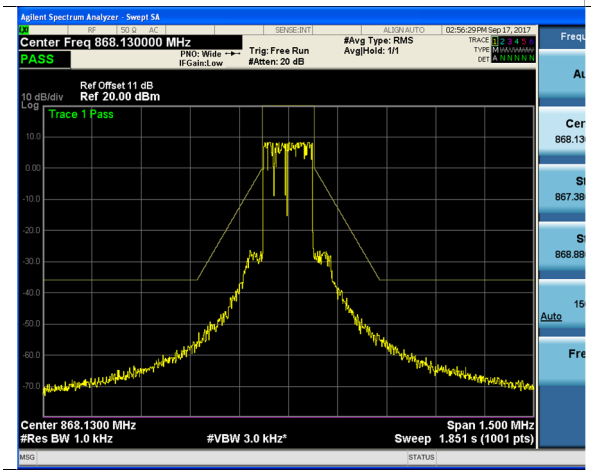


3.3 V

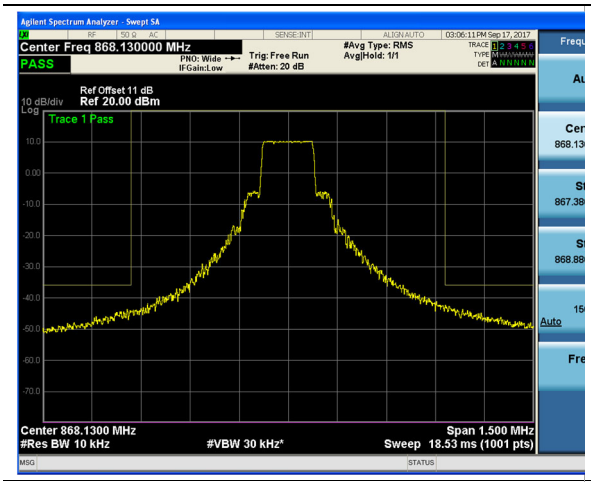


5.0 V

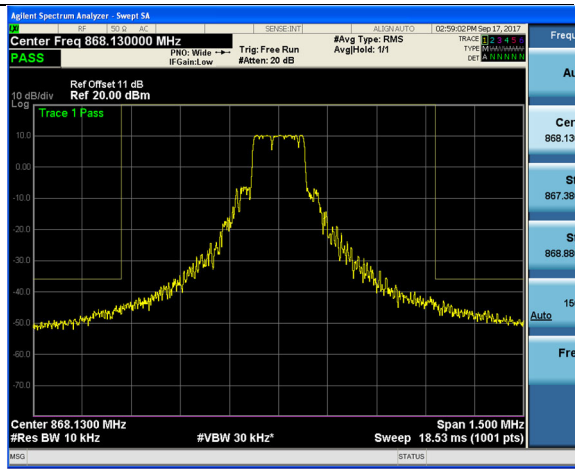
- Temperature : High

Frequency: 868.13 MHz	
	
3.2 V	3.3 V
	
5.0 V	

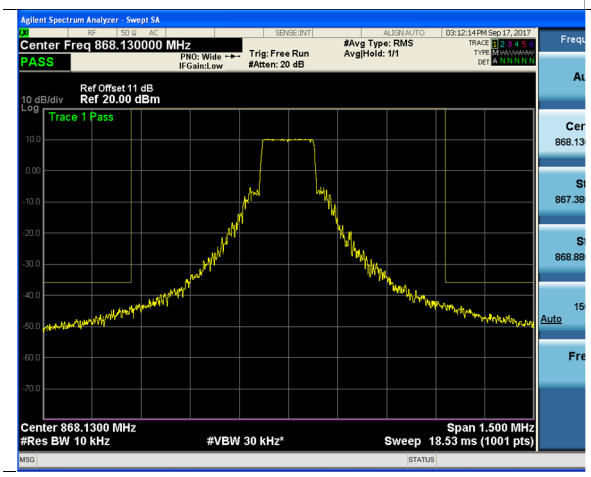
Frequency: 868.13 MHz



3.2 V



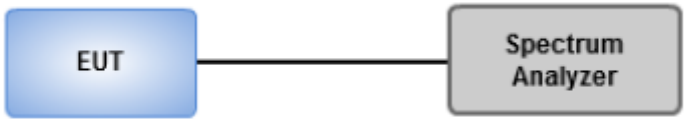
3.3 V



5.0 V

6.5 Unwanted emissions in the spurious domain

6.5.1 Test Setup



6.5.2 Test Procedure

- Refer to ETSI EN 300 220-1 V3.1.1 (2017-02) Clause 5.9.3.3.1

The antenna port of the EUT shall be connected to the dummy load and the output of the dummy load connected to the measuring receiver.
The operation of the EUT shall be started.
For TX mode clause 5.9.3.1 applies.
The measuring receiver shall be tuned over the frequency range shown in Table 21.

Table 21: Spurious Radiations conducted Measurement Frequency Range

Frequency Range
9 kHz to 6 GHz
NOTE: The measurements need only to be performed over the frequency range 4 GHz to 6 GHz if emissions are detected within 10 dB of the specified limit between 1,5 GHz and 4 GHz.

6.5.3 Limit

The power of any unwanted emission in the spurious domain shall not exceed the values given in Table 19.

Table 19: Spurious domain emission limits

Frequency ranges / State	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies ≤1 000 MHz	Frequencies > 1 000 MHz
TX mode	-54 dBm	-36 dBm	-30 dBm
RX and all other modes	-57 dBm	-57 dBm	-47 dBm

6.5.4 Test Result

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
249.98	V	-75.27	-54	21.27	Peak
1595.25	V	-46.90	-30	16.90	Peak
2392.58	V	-47.59	-30	17.59	Peak
3742.92	V	-46.11	-30	16.11	Peak
4340.42	V	-45.48	-30	15.48	Peak
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

Note:

1. Test Frequency : 868.055 MHz
2. Spurious emissions were measured from 9 kHz to 6 GHz
3. State : DUT is supported only TX mode.

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
250.01	V	-74.29	-54	20.29	Peak
1598.92	V	-48.39	-30	18.39	Peak
2391.75	V	-47.77	-30	17.77	Peak
3745.92	V	-46.56	-30	16.56	Peak
5078.92	V	-44.75	-30	14.75	Peak
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

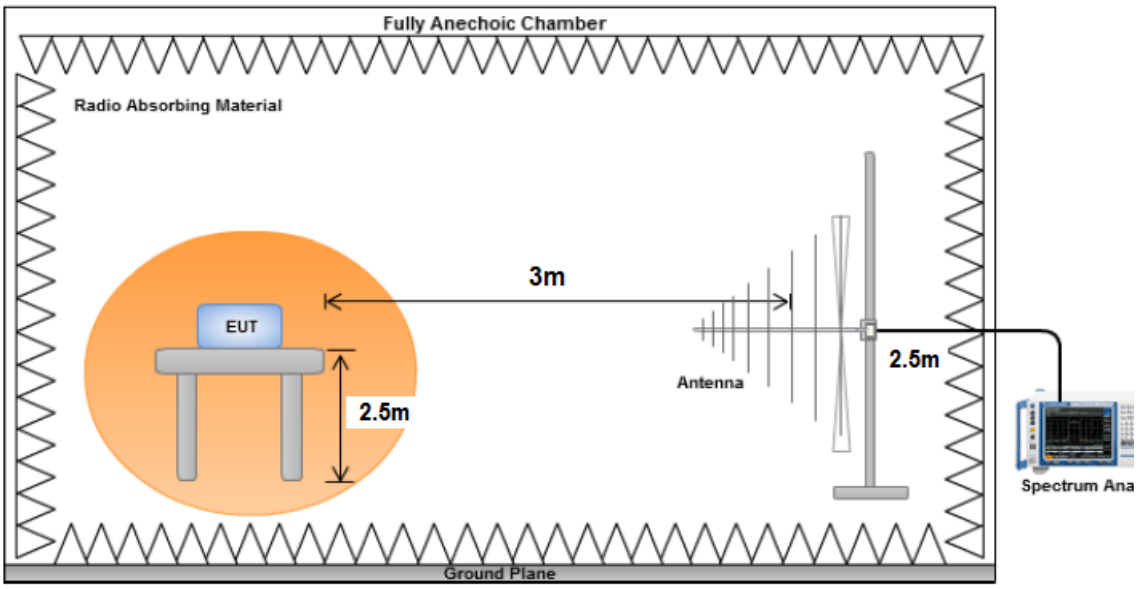
Note:

1. Test Frequency : 868.205 MHz
2. Spurious emissions were measured from 9 kHz to 6 GHz
3. State : DUT is supported only TX mode.

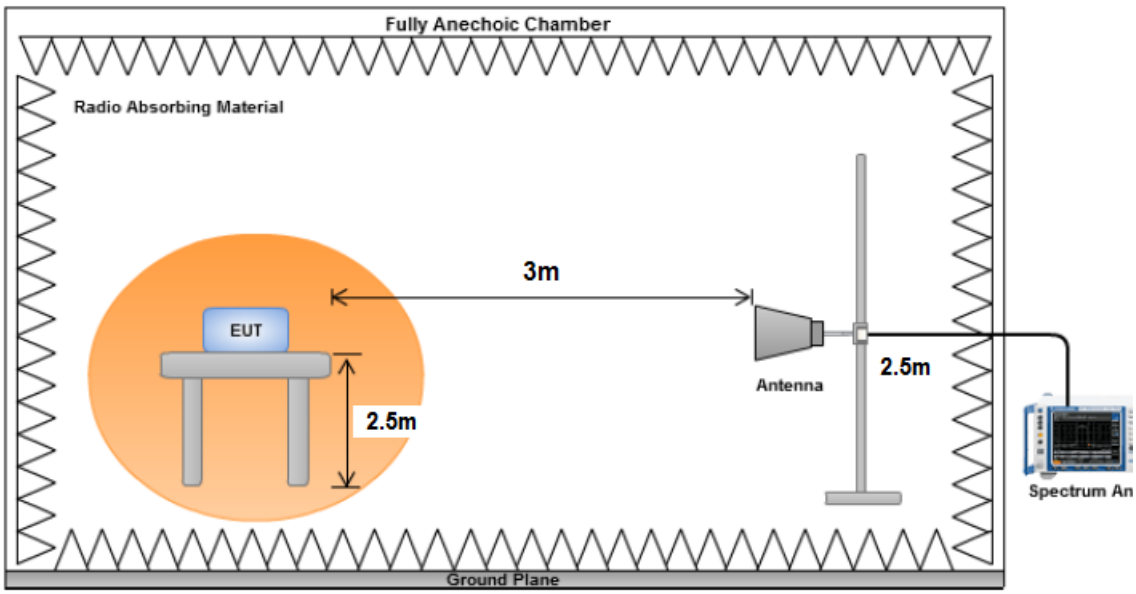
6.6 Unwanted emissions in the spurious domain(Radiated)

6.6.1 Test Setup

Below 1GHz



Above 1GHz



6.6.2 Test Procedure

- Refer to ETSI EN 300 220-1 V3.1.1 (2017-02) Clause 5.9.3.3.2

A suitable test site shall be selected from those described in clause C.1. The EUT shall be connected to its normal operating antenna.
The output of the test antenna shall be connected to a measuring receiver. The measurements described shall be performed using appropriate radiated measurement methods described in clause C.5.1 (or clause C.5.2) depending on the test site, followed by clause C.5.3. The operation of the EUT shall be started.

For TX mode clause 5.9.3.1 applies.

The measuring receiver shall be tuned over the frequency range shown in Table 22.

Table 22: Spurious Radiations radiated Measurement Frequency Range

Frequency Range
25 MHz to 6 GHz
NOTE: The measurements need only to be performed over the frequency range 4 GHz to 6 GHz if emissions are detected within 10 dB of the specified limit between 1,5 GHz and 4 GHz.

6.6.3 Limit

The power of any unwanted emission in the spurious domain shall not exceed the values given in Table 20.

Table 20: Parameters for TX Spurious Radiations Measurement

Operating Mode	Frequency Range	RBW_{REF} (see note 2)
Transmit mode	9 kHz ≤ f < 150 kHz	1 kHz
	150 kHz ≤ f < 30 MHz	10 kHz
	30 MHz ≤ f < f_C - m	100 kHz
	f_C - m ≤ f < f_C - n	10 kHz
	f_C - n ≤ f < f_C - p	1 kHz
	f_C + p < f ≤ f_C + n	1 kHz
	f_C + n < f ≤ f_C + m	10 kHz
	f_C + m < f ≤ 1 GHz	100 kHz
	1 GHz < f ≤ 6 GHz	1 MHz
NOTE 1:	f is the measurement frequency. f_C is the Operating Frequency. m is 10 x OCW or 500 kHz, whichever is the greater. n is 4 x OCW or 100 kHz, whichever is the greater. p is 2,5 x OCW.	
NOTE 2:	If the value of RBW used for measurement is different from RBW_{REF}, use bandwidth correction from clause 4.3.10.1.	

6.6.4 Test Result

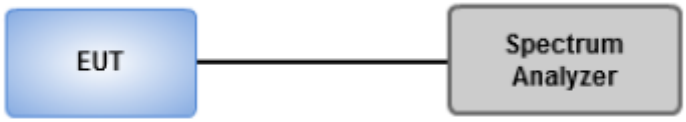
Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1180.25	V	-58.72	-47	11.72	RMS
1283.92	H	-58.45	-47	11.45	RMS
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k= 2) Above 1 GHz : 5.57 dB (about 95 %, k= 2)			

Note:

1. Test Frequency : 869.525 MHz
2. Spurious emissions were measured from 9 kHz to 6 GHz
3. State : DUT is supported only RX mode.

6.7 Transient power

6.7.1 Test Setup



6.7.2 Test Procedure

- Refer to ETSI EN 300 220-1 V3.1.1 (2017-02) Clause 5.10.3.2

The output of the EUT shall be connected to a spectrum analyser or equivalent measuring equipment. The measurement shall be undertaken in **zero span** mode. The analyser's centre frequency shall be set to an offset from the operating centre frequency. These offset values and their corresponding RBW configurations are listed in Table 24.

Table 24: RBW for Transient Measurement

Measurement points: offset from centre frequency	Analyser RBW	RBWREF
-0,5 x OCW - 3 kHz 0,5 x OCW + 3 kHz Not applicable for OCW < 25 kHz	1 kHz	1kHz
±12,5 kHz or ±OCW whichever is the greater	Max (RBW pattern 1, 3, 10 kHz) ≤ Offset frequency/6 (see note)	1kHz
-0,5 x OCW - 400 kHz 0,5 x OCW + 400 kHz	100 kHz	1kHz
-0,5 x OCW -1 200 kHz 0,5 x OCW + 1 200 kHz	300 kHz	1kHz

NOTE: Max (RBW pattern 1, 3, 10 kHz) means the maximum bandwidth that falls into the commonly implemented 1, 3, 10 kHz RBW filter bandwidth incremental pattern of spectrum analysers.

EXAMPLE: If OCW is 25 kHz then the RBW value corresponding to one OCW offset frequency is 3 kHz. The rest of the analyser settings are listed in Table 25, and if OCW is 250 kHz then the RBW value corresponding to one OCW offset frequency is 30 kHz.

Table 25: Parameters for Transient Measurement

Spectrum Analyser Setting	Value	Notes
VBW/RBW	10	At higher RBW values VBW may be clipped to its maximum value
Sweep time	500 ms	
RBW filter	Gaussian	
Trace Detector Function	RMS	
Trace Mode	Max hold	
Sweep points	501	
Measurement mode	Continuous sweep	

NOTE: The ratio between the number of sweep points and the sweep time shall be the same ratio as above if
different number of sweep points is used.

The used modulation shall be D-M3. The analyser shall be set to the settings of Table 25 and a measurement shall be started for each offset frequency. The EUT shall transmit at least five D-M3 test signal. The peak value shall be recorded and the measurement shall be repeated at each offset frequency mentioned in Table 24. The recorded power values shall be converted to power values measured in RBWREF by the formula in clause 4.3.10.1.

6.7.3 Limit

The transient power shall not exceed the values given in Table 23.

Table 23: Spurious domain emission limits

Absolute offset from centre frequency	RBWREF	Peak power limit applicable at measurement points
≤ 400 kHz	1 kHz	0 dBm
> 400 kHz	1 kHz	-27 dBm

6.7.4 Test Result

Measurement points: offset from centre frequency	Transient power (dBm)	Limit (dBm)	Margin (dB)
-0,5 x OCW - 3 kHz	-55.985	0	55.985
0,5 x OCW + 3 kHz	-54.800	0	54.800
±12,5 kHz or ±OCW whichever is the greater	-48.186	-27	21.186
±12,5 kHz or ±OCW whichever is the greater	-48.805	-27	21.805
-0,5 x OCW - 400 kHz	-49.795	-27	22.795
0,5 x OCW + 400 kHz	-50.112	-27	23.112
-0,5 x OCW -1 200 kHz	-51.004	-27	24.004
0,5 x OCW + 1 200 kHz	-51.177	-27	24.177

Note:

1. Test Frequency : 868.055 MHz

2. Measurement Uncertainty : 0.70 dB (about 95 %, $k = 2$)

Measurement points: offset from centre frequency	Transient power (dBm)	Limit (dBm)	Margin (dB)
-0,5 x OCW - 3 kHz	-55.749	0	55.749
0,5 x OCW + 3 kHz	-56.484	0	56.484
±12,5 kHz or ±OCW whichever is the greater	-47.924	-27	20.924
±12,5 kHz or ±OCW whichever is the greater	-48.874	-27	21.874
-0,5 x OCW - 400 kHz	-49.739	-27	22.739
0,5 x OCW + 400 kHz	-49.958	-27	22.958
-0,5 x OCW -1 200 kHz	-51.104	-27	24.104
0,5 x OCW + 1 200 kHz	-51.329	-27	24.329

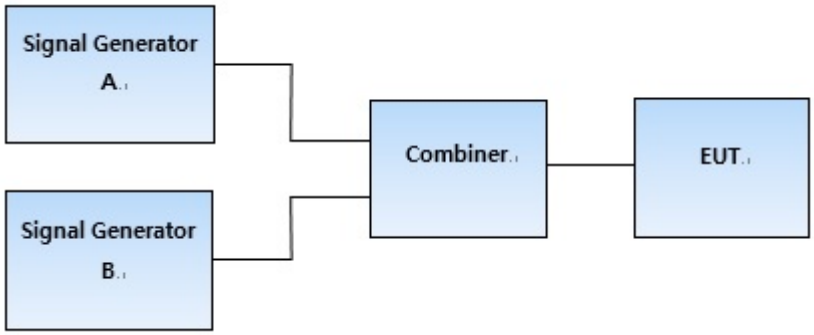
Note:

1. Test Frequency : 868.205 MHz
2. Measurement Uncertainty : 0.70 dB (about 95 %, $k = 2$)

7. RECEIVER MEASUREMENTS

7.1 Blocking

7.1.1 Test Setup



7.1.2 Test Procedure

Signal generator A shall be set to an appropriate modulated test signal at the operating frequency of the EUT receiver.
Signal generator B shall be unmodulated.
Measurements shall be carried out at frequencies of the unwanted signal at approximately the frequency(ies) offset(s) defined in technical requirement avoiding those frequencies at which spurious responses occur. Additional measurement points may be requested by technical requirements clause.
If several operational frequency bands are used by the equipment, at least one blocking measurement by bands has to be performed.

Step 1:

Signal generator B shall be powered off. Signal generator A shall be set to the minimum level which gives the wanted performance criterion of EUT or the reference level in Table 32, whichever is the higher The output level of generator A shall then be increased by 3 dB unless otherwise specified in technical requirement.

Step 2:

Signal generator B is powered on and set to operate at the nominal operating frequency - offset frequency.

Signal generator B is then switched on and the signal amplitude is adjusted to the minimum level at which the wanted performance criterion is not achieved.

With signal generator B settings unchanged, the receiver shall be replaced with a suitable RF power measuring equipment. The power into the measuring equipment shall be measured and noted.

The blocking level is then the conducted power received from generator B at the EUT antenna connector.

This can either be measured on the antenna connector for conducted test or be calculated for radiated test (see clause C.5.4).

The blocking level shall be higher or equal to the blocking power level requested in the technical requirement clause.

Step 3:

The measurement in steps 1 to 3 shall be repeated with signal offsets at required frequencies.

Step 4:

The information shown in Table 44 shall be recorded in the test report for each measured signal level and unwanted signal offset.

7.1.3 Limit

The blocking levels at the specified frequency offsets shall be equal to or greater than the limits Table 41, except at frequencies where spurious responses are found.

Table 41: Blocking level parameters for RX category 2

Requirement	Limits
	Receiver category 2
Blocking at ±2 MHz from OC edge fhigh and flow	≥ -69 dBm
Blocking at ±10 MHz from OC edge fhigh and flow	≥ -44 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -44 dBm

7.1.4 Test Result

Frequency offset from OC edge	Blocking signal frequency (MHz)	Signal generator A (dBm)	Blocking signal level (dBm)
±2 MHz	871.225	-123.58	-40
	867.225		-40
	871.825		-40
	867.825		-40
±10 MHz	879.225		-40
	859.225		-40
	879.825		-40
	859.825		-40
Frequency offset from Center frequency	**Blocking signal frequency (MHz)**	**Signal generator A (dBm)**	**Blocking signal level (dBm)**
±5 % or ±15 MHz (whichever is the greater)	884.225	-123.58	-40
	854.225		-40

Note:

1. Type of blocking signal : CW
2. Nominal centre frequency of receiver : 869.525 MHz

8. PHOTOGRAPHS OF THE EUT

Photographs is described in Appendix A. Please refer to Appendix A.

9. SETUP PHOTO

Setup photo is described in Appendix B. Please refer to Appendix B.