

# TEST REPORT

of

FCC Part 15 Subpart E §15.407

FCC ID: A3LWIDT20R

Equipment Under Test : Wi-Fi Module  
Model Name : WIDT20R  
Applicant : Samsung Electronics Co., Ltd.  
Manufacturer : Samsung Electronics Co., Ltd.  
Date of Test(s) : 2016.05.13 ~ 2016.05.18  
Date of Issue : 2016.05.24

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

Tested By:



Youngmin Park

Date:

2016.05.24

Approved By:



Alvin Kim

Date:

2016.05.24

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

---

## Table of contents

1. General information -----	3
2. Transmitter radiated spurious emissions -----	47
3. 26 dB Bandwidth -----	58
4. 6 dB Bandwidth -----	64
5. Maximum Conducted Output Power -----	70
6. Peak Power Spectral Density -----	75
7. AC Power Line Conducted Emission -----	86
8. Antenna Requirement -----	90

---

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 1. General information

### 1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Telephone : +82 31 688 0901

FAX : +82 31 688 0921

### 1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea

Contact Person : Cho, Min-Hyeong

Phone No. : +82 31 277 2688

### 1.3. Description of EUT

<b>Kind of Product</b>	Wi-Fi Module	
<b>Model Name</b>	WIDT20R	
<b>Power Supply</b>	DC 5.0 V	
<b>Frequency Range</b>	5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20), 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40)	
<b>Modulation Technique</b>	OFDM	
<b>Number of Channels</b>	5 channels (Band 3: 11a/n_HT20), 2 channels (Band 3: 11n_HT40)	
<b>Antenna Type</b>	Fixed type (MIMO - 2 Tx / 2 Rx)	
<b>Antenna Gain</b>	<b>Port#1</b>	5 745 MHz ~ 5 825 MHz (MIMO): 2.48 dB i
	<b>Port#2</b>	5 745 MHz ~ 5 825 MHz (MIMO): 1.21 dB i

### 1.4. Declaration by the manufacturer

- The device supports 2.4 GHz WLAN and 5 GHz WLAN(Band 1, Band 2A, Band 2C and Band 3).
- There is no increase in authorized power for UNII bands(Band 1, 2A, 2C, and 3) compared to original output power.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

## 1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	Agilent	E8257D	MY51501169	Jul. 13, 2015	Annual	Jul. 13, 2016
Signal Generator	R&S	SMBV100A	255834	Jun. 22, 2015	Annual	Jun. 22, 2016
Spectrum Analyzer	R&S	FSV30	103100	Jun. 22, 2015	Annual	Jun. 22, 2016
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 24, 2015	Annual	Sep. 24, 2016
Power Meter	Anritsu	ML2495A	1223004	Jun. 08, 2015	Annual	Jun. 08, 2016
Power Sensor	Anritsu	MA2411B	1207272	Jun. 08, 2015	Annual	Jun. 08, 2016
Attenuator	MCLI	FAS-23-20	23834	Jun. 08, 2015	Annual	Jun. 08, 2016
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 29, 2016	Annual	Feb. 28, 2017
High Pass Filter	Wainwright Instrument GmbH	WHKX6.0/18G-10SS	51	Jun. 23, 2015	Annual	Jun. 23, 2016
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	15	Jun. 23, 2015	Annual	Jun. 23, 2016
Preamplifier	H.P.	8447F	2944A03909	Aug. 27, 2015	Annual	Aug. 27, 2016
Preamplifier	R&S	SCU-18	10117	Apr. 07, 2016	Annual	Apr. 07, 2017
Preamplifier	TESTEK	TK-PA1840H	130016	Sep. 29, 2015	Annual	Sep. 29, 2016
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 19, 2015	Biennial	Aug. 19, 2017
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	396	Jun. 18, 2015	Biennial	Jun. 18, 2017
Horn Antenna	R&S	HF906	100326	Feb. 01, 2016	Biennial	Feb. 01, 2018
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	BBHA9170223	Sep. 01, 2014	Biennial	Sep. 01, 2016
Antenna Master	INN-CO GmbH	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INN-CO GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Test Receiver	R&S	ESU26	100109	Mar. 07, 2016	Annual	Mar. 07, 2017
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Test Receiver	R&S	ESCI 7	100911	Dec. 22, 2015	Annual	Dec. 22, 2016
Two-Line V-Network	R&S	ENV216	100190	Dec. 21, 2015	Annual	Dec. 21, 2016
Shield Room	SY Corporation	L x W x H (6.5 m x 3.5 m x 3.5 m)	N/A	N.C.R.	N/A	N.C.R.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

## 1.6. Summary of test result

The EUT has been tested according to the following specifications:

APPLIED STANDARD : FCC Part 15 Subpart E		
Standard section	Test Item	Result
15.205(a) 15.209(a) 15.407(b)(4)	Transmitter radiated spurious emissions	Complied
15.407(a)	26 dB Bandwidth	Complied
15.407(e)	6 dB Bandwidth	Complied
15.407(a)(3)	Maximum Conducted Output Power	Complied
15.407(a)(3)	Peak Power Spectral Density	Complied
15.207	AC Power Line Conducted Emission	Complied

## 1.7. Test Procedure(s)

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and the guidance provided in KDB 789033 D02 v01r02 were used in the measurement of the DUT.

## 1.8. Sample calculation

Where relevant, the following sample calculation is provided:

### 1.8.1. Conducted test

Offset value (dB) = Attenuator (dB) + Cable loss (dB)

### 1.8.2. Radiation test

Field strength level (dB $\mu$ V/m) = Measured level (dB $\mu$ V) + Antenna factor (dB) + Cable loss (dB) - Amplifier gain (dB)

## 1.9. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL009826	2016.05.18	Initial
1	F690501/RF-RTL009826-1	2016.05.24	Added duty cycle plots

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

## 1.10 Duty Cycle of EUT

Regarding to KDB 558074 D01\_v03r05, 6.0, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

Set RBW  $\geq$  OBW if possible; otherwise, set RBW to the largest available value. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are  $> 50/T$  and the number of sweep points across duration T exceeds 100.

Mode	Data Rate (Mbps)							
	6	9	12	18	24	36	48	54
<b>11a</b>								
Duty Cycle (%)	100	100	100	100	100	100	100	100
Correction factor (dB)	0	0	0	0	0	0	0	0
<b>11a_HT20</b>	<b>MCS0</b>	<b>MCS1</b>	<b>MCS2</b>	<b>MCS3</b>	<b>MCS4</b>	<b>MCS5</b>	<b>MCS6</b>	<b>MCS7</b>
Duty Cycle (%)	100	100	100	100	100	100	100	100
Correction factor (dB)	0	0	0	0	0	0	0	0
<b>11a_HT20</b>	<b>MCS8</b>	<b>MCS9</b>	<b>MCS10</b>	<b>MCS11</b>	<b>MCS12</b>	<b>MCS13</b>	<b>MCS14</b>	<b>MCS15</b>
Duty Cycle (%)	100	100	100	100	100	100	100	100
Correction factor (dB)	0	0	0	0	0	0	0	0
<b>11n_HT40</b>	<b>MCS0</b>	<b>MCS1</b>	<b>MCS2</b>	<b>MCS3</b>	<b>MCS4</b>	<b>MCS5</b>	<b>MCS6</b>	<b>MCS7</b>
Duty Cycle (%)	100	100	100	100	100	100	100	100
Correction factor (dB)	0	0	0	0	0	0	0	0
<b>11n_HT40</b>	<b>MCS8</b>	<b>MCS9</b>	<b>MCS10</b>	<b>MCS11</b>	<b>MCS12</b>	<b>MCS13</b>	<b>MCS14</b>	<b>MCS15</b>
Duty Cycle (%)	100	100	100	100	100	100	100	100
Correction factor (dB)	0	0	0	0	0	0	0	0

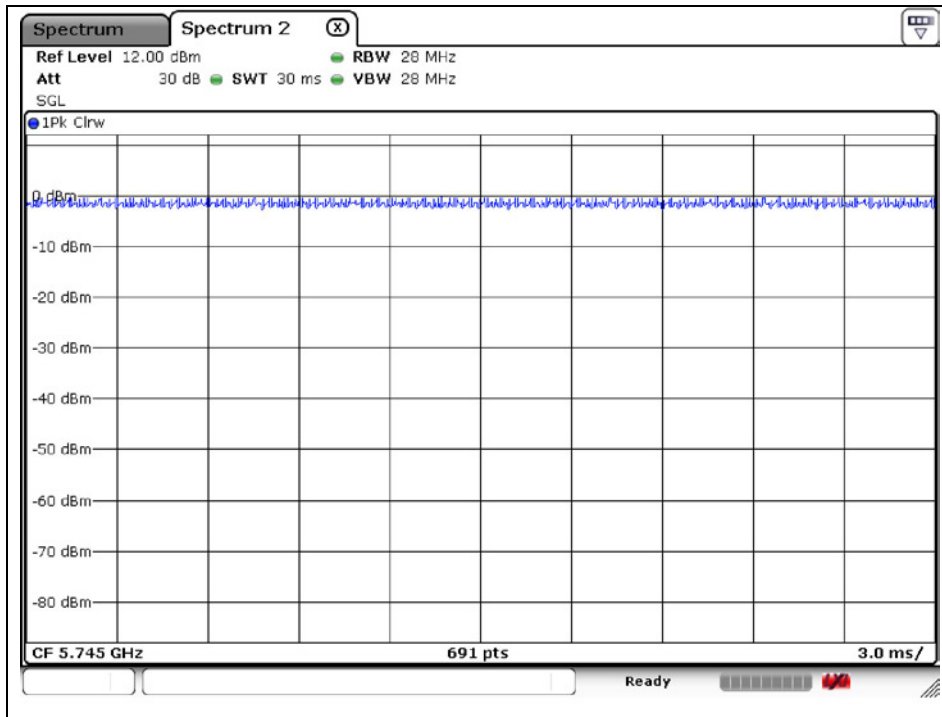
Remark:

1. As measured duty cycles of EUT, all of mode and data rate keep constant period and are converted to log scale (power averaging) to compensate correction factor to result of average test items.
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = 10 log (1 / Duty cycle)

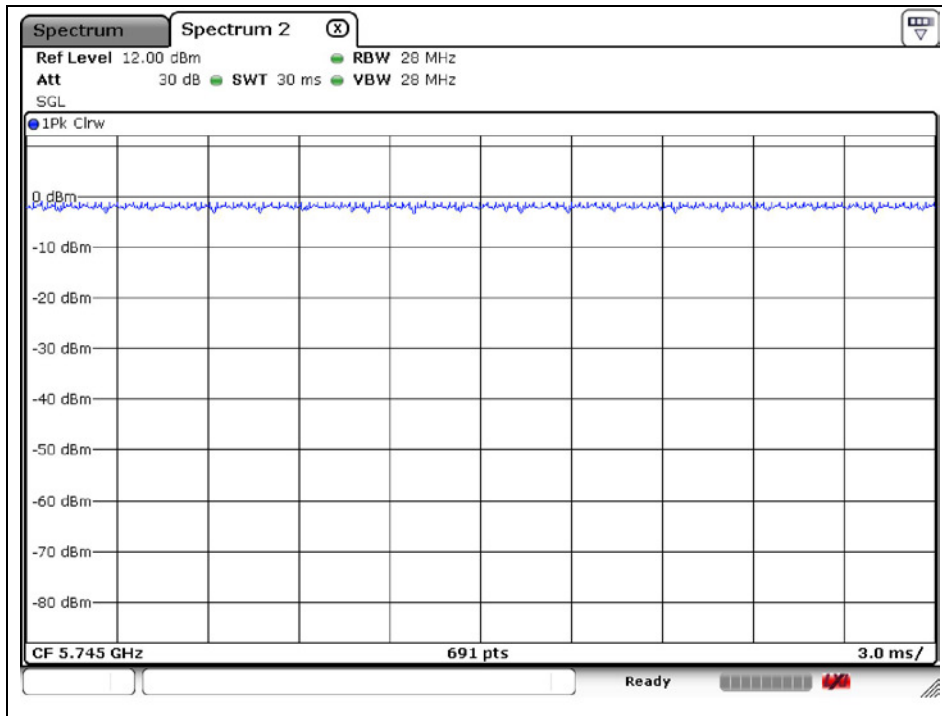
*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**OFDM : 802.11a - ANT1**

6 Mbps

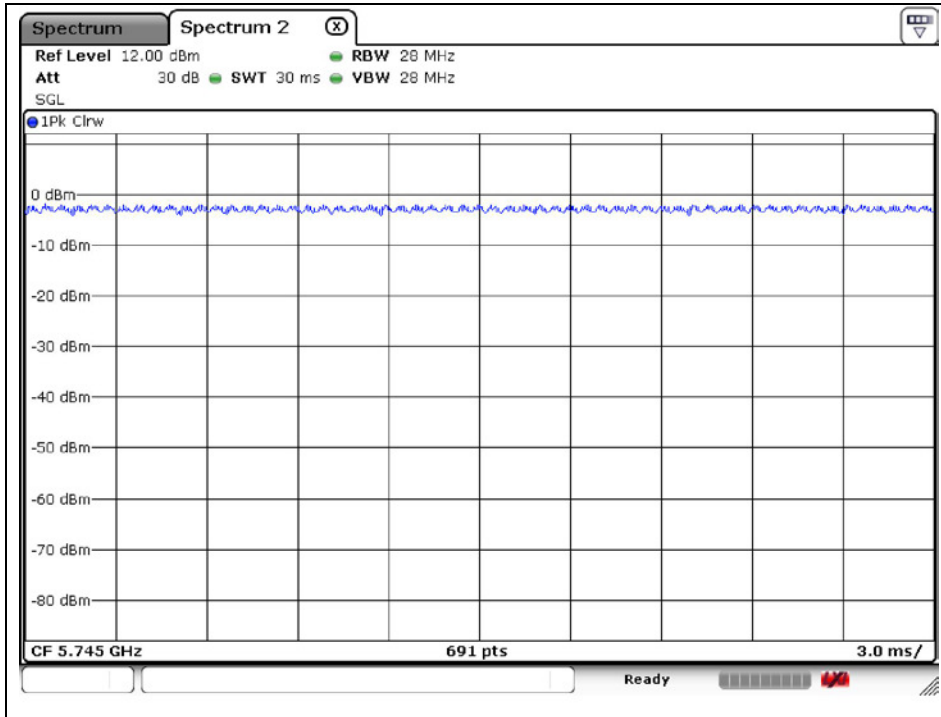


9 Mbps

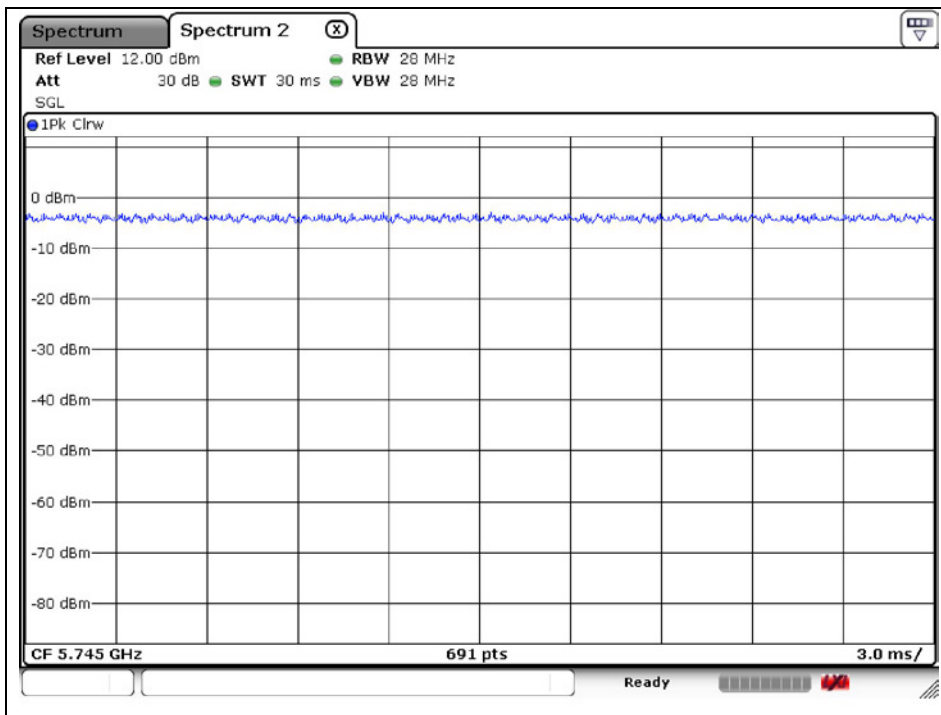


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

12 Mbps



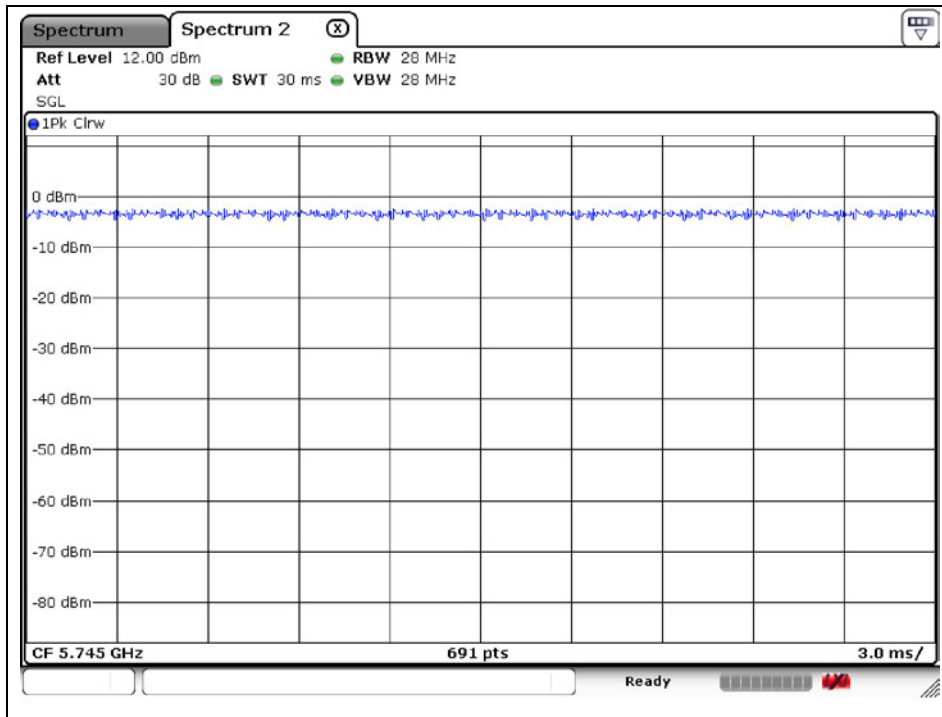
18 Mbps



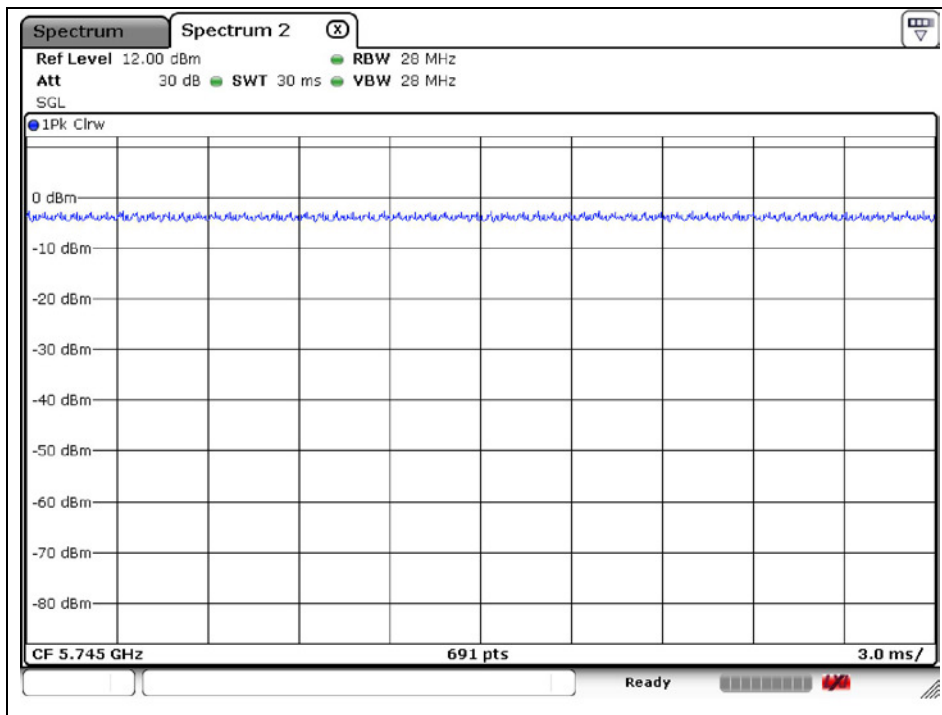
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.



24 Mbps

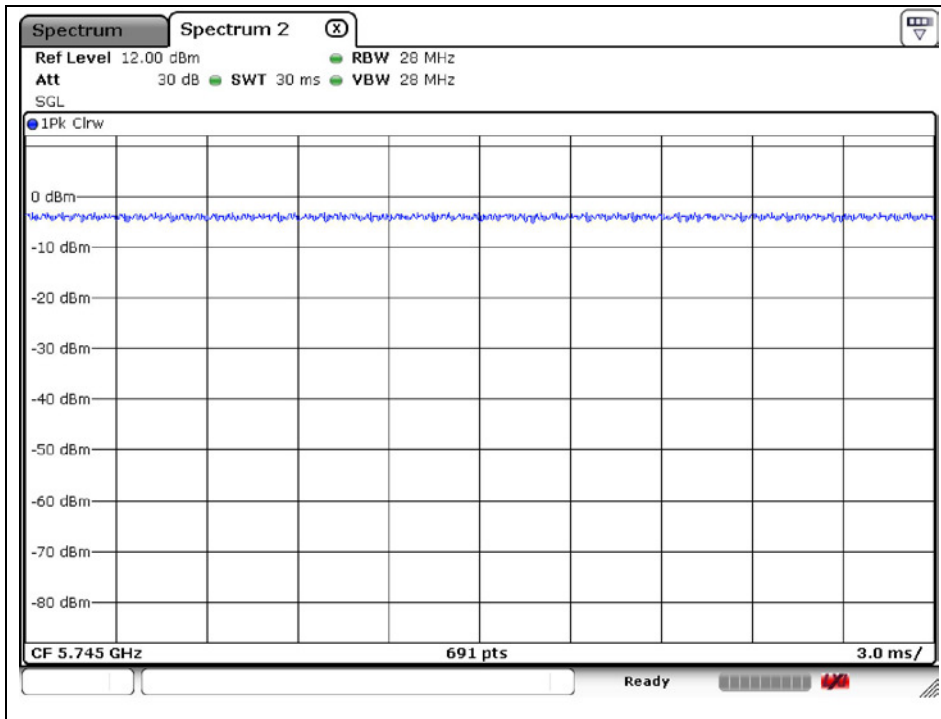


36 Mbps

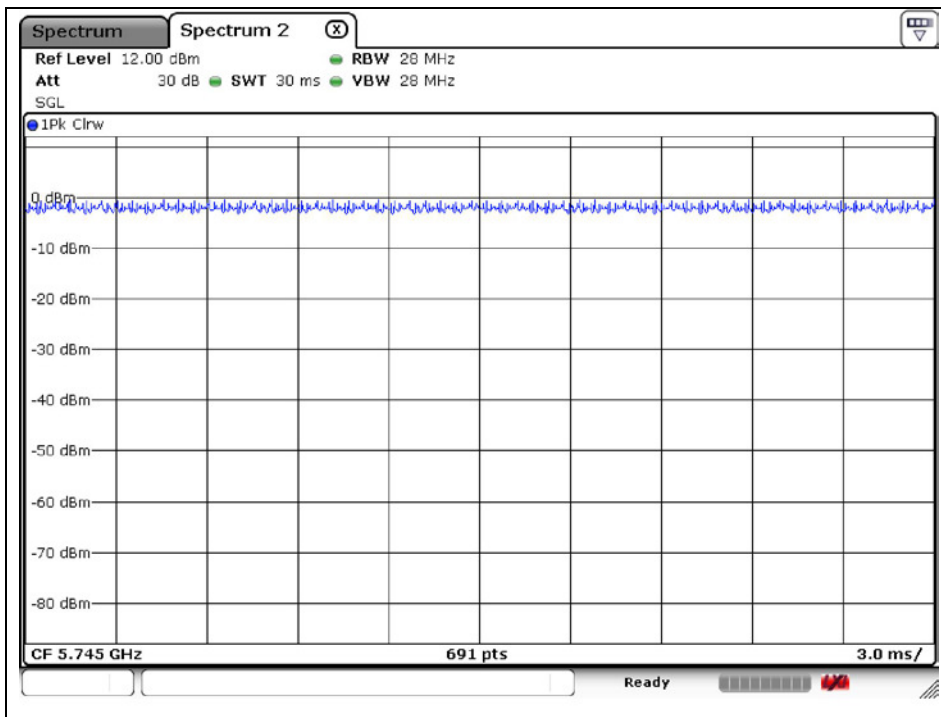


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

48 Mbps



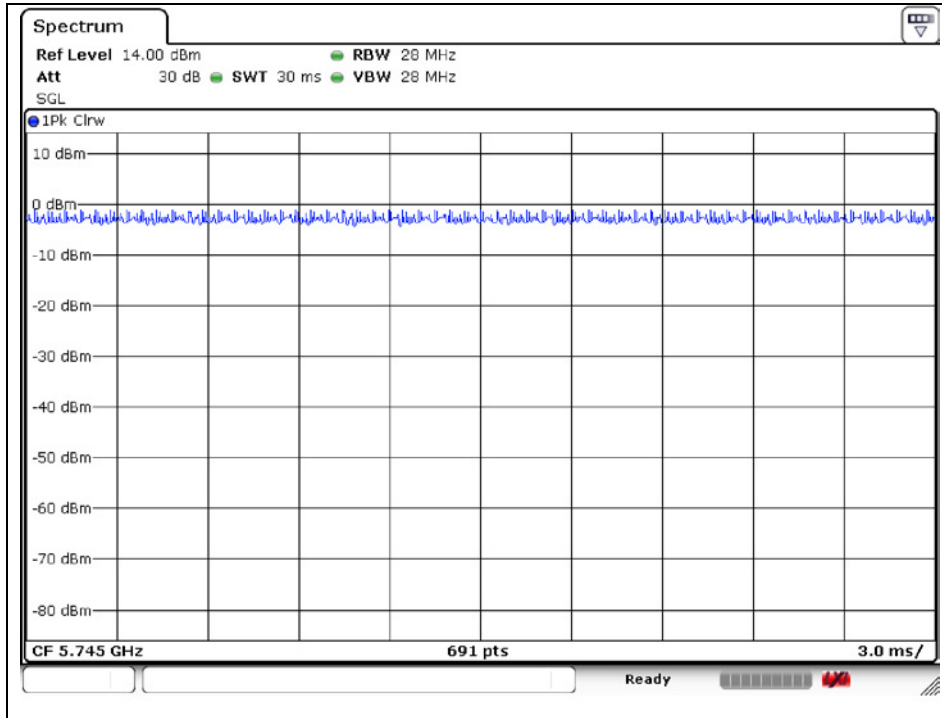
54 Mbps



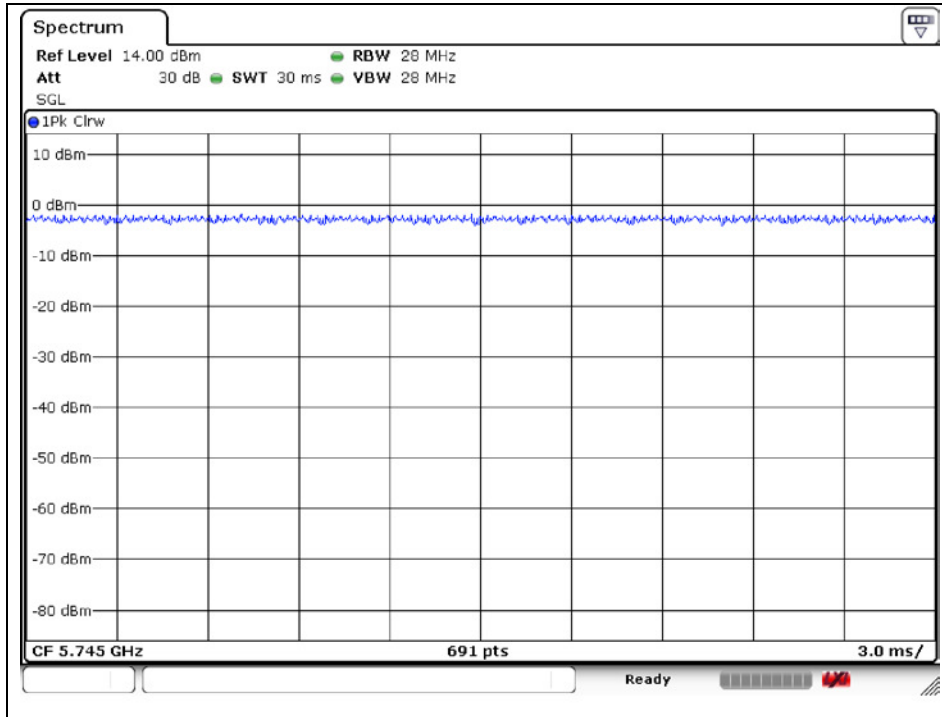
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

**OFDM : 802.11a - ANT2**

6 Mbps

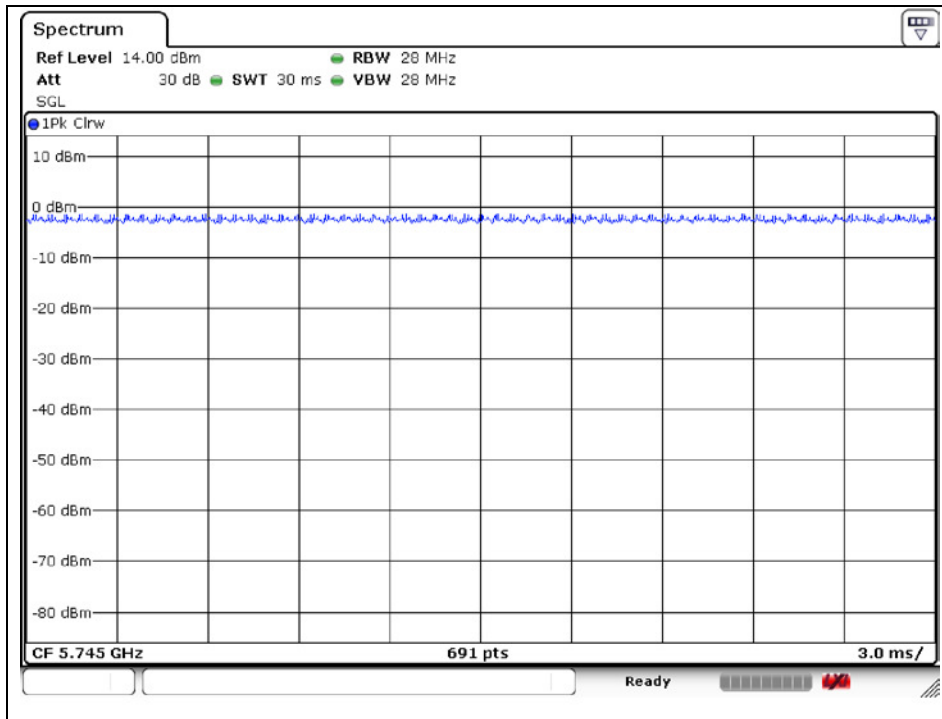


9 Mbps

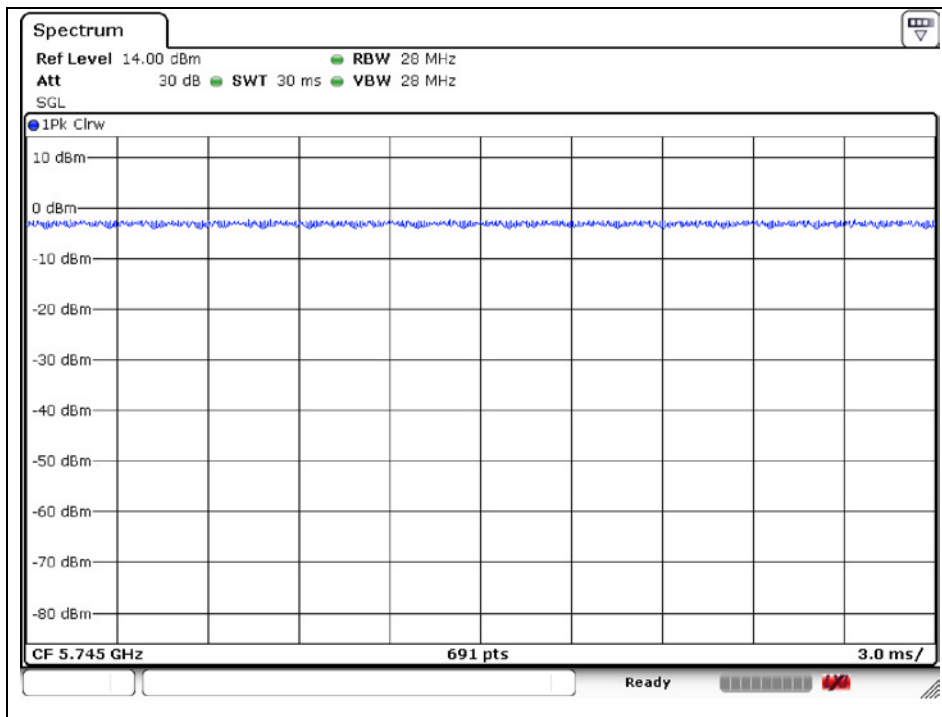


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

12 Mbps

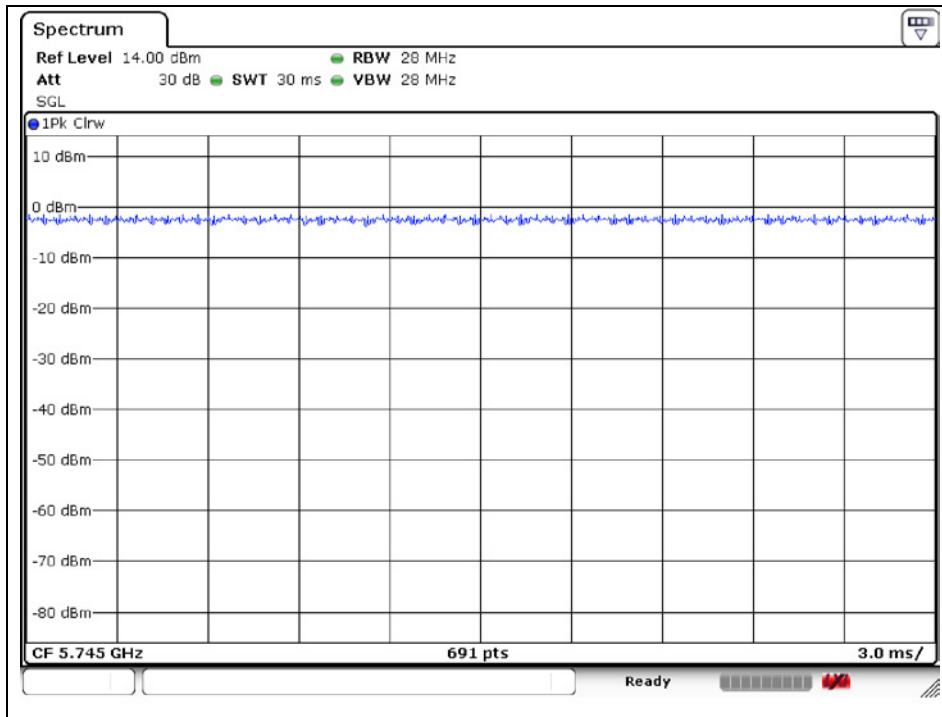


18 Mbps

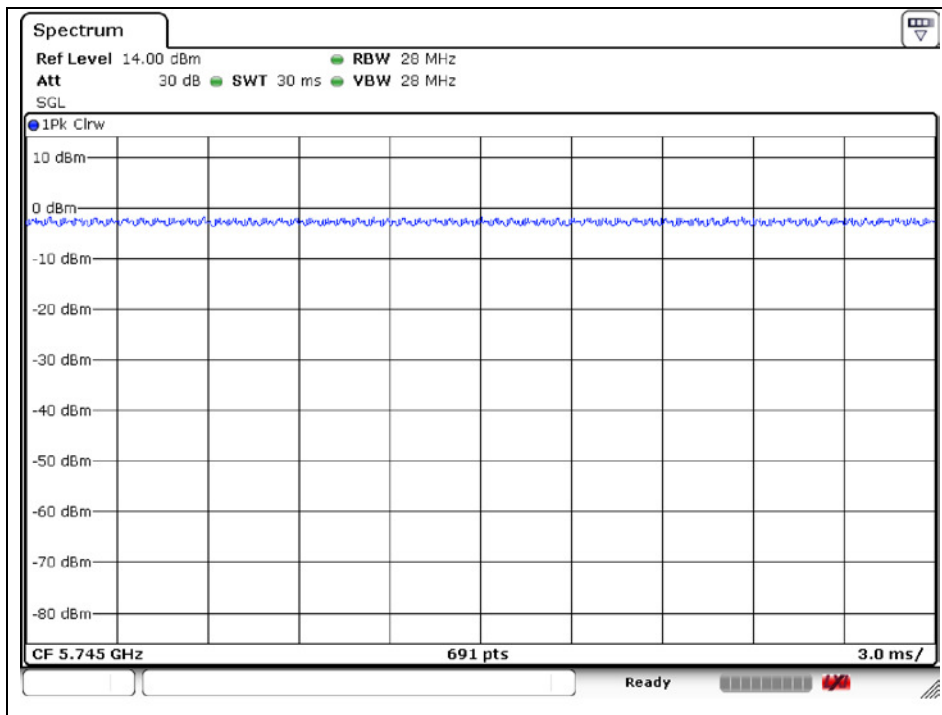


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

24 Mbps

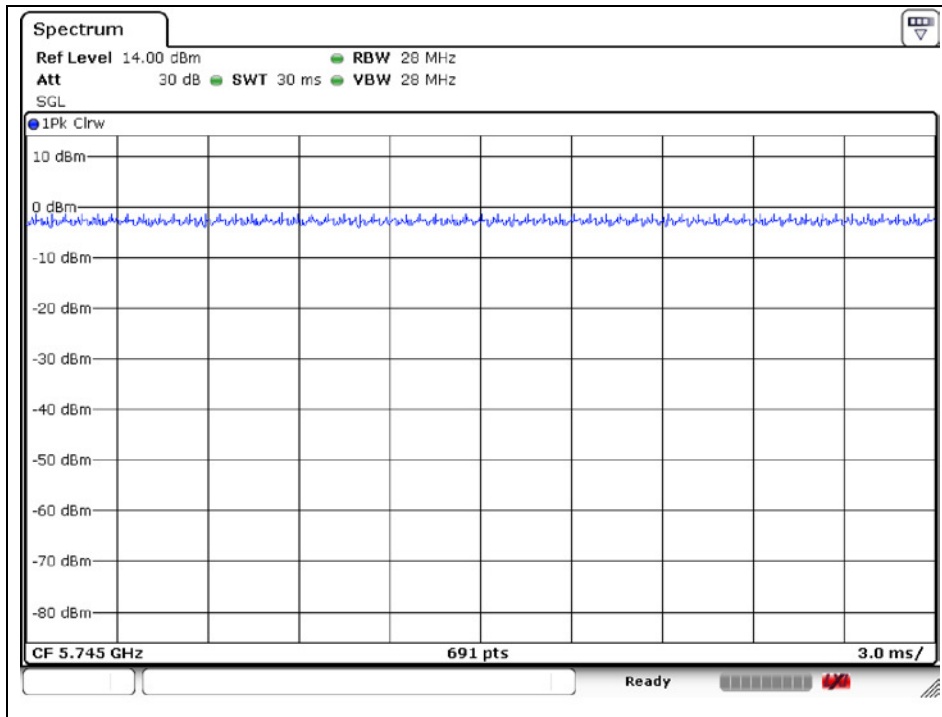


36 Mbps

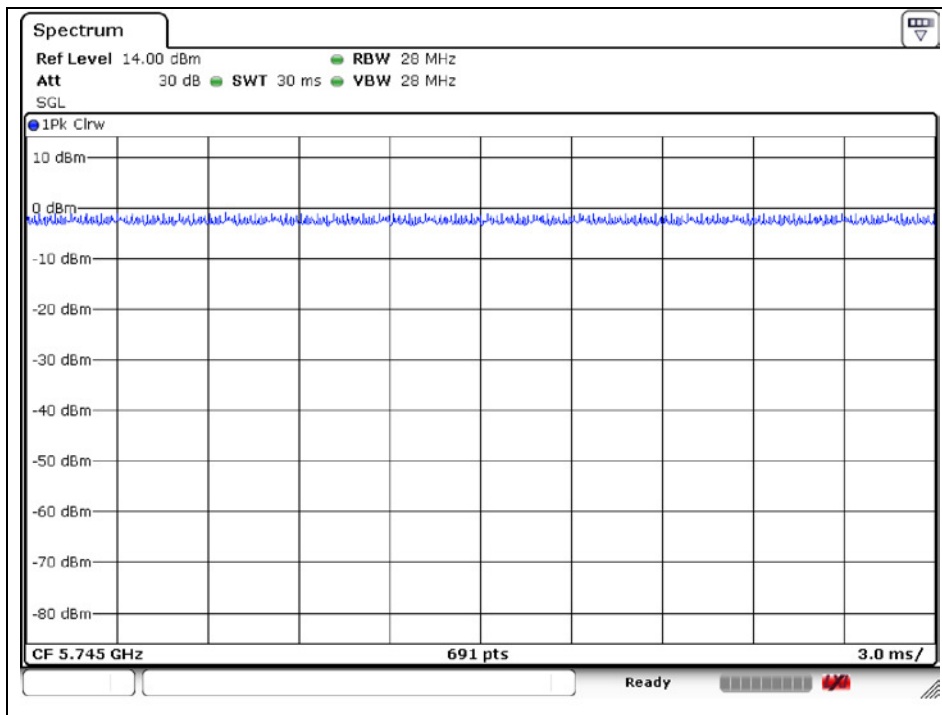


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

48 Mbps

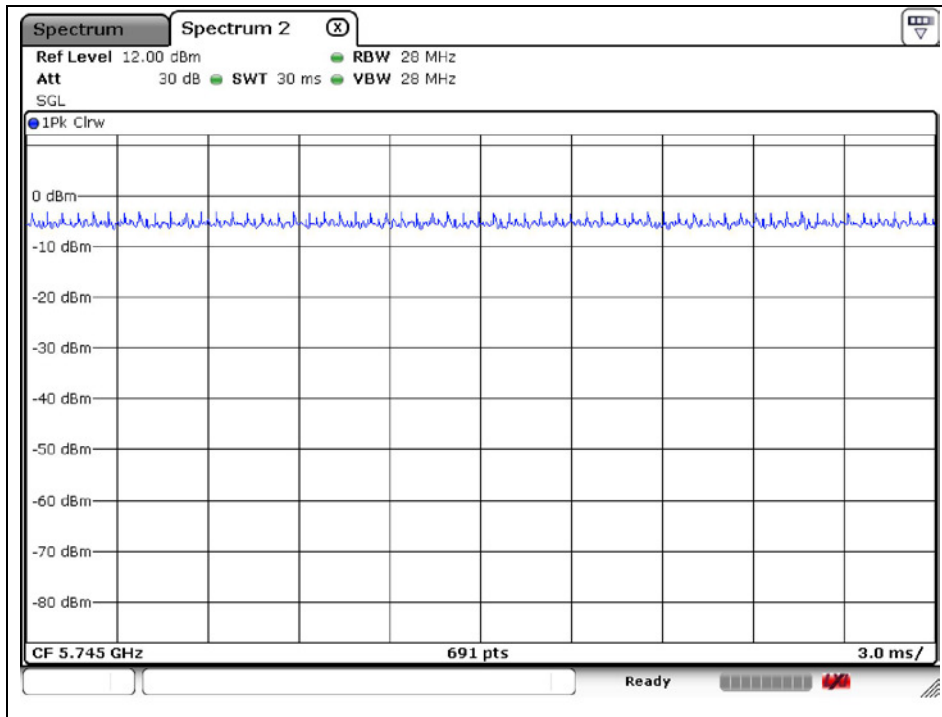


54 Mbps

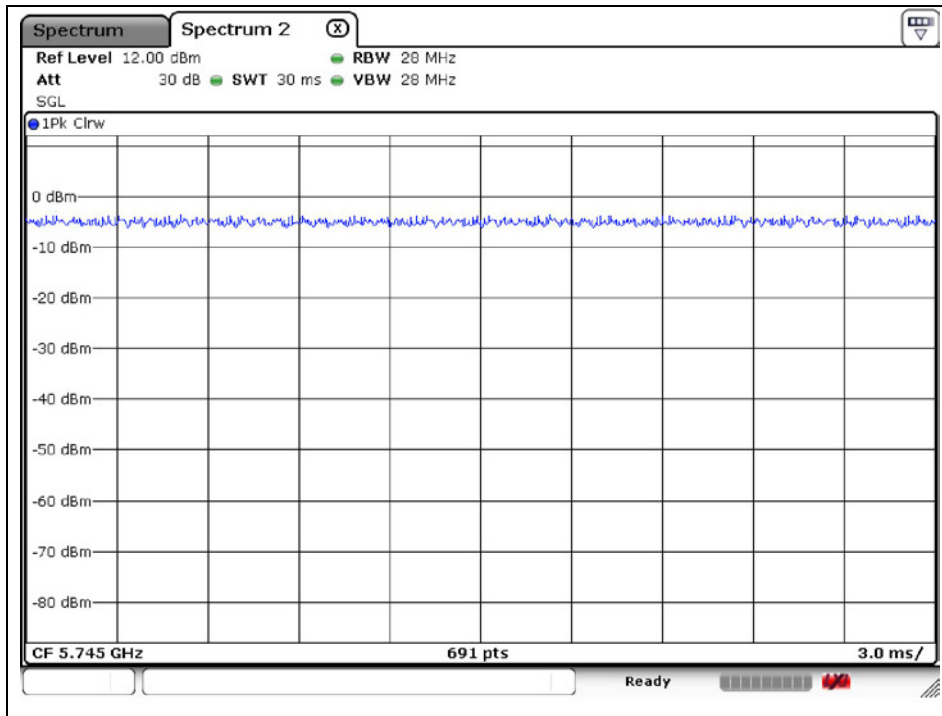


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

**OFDM: 802.11n\_HT20 – ANT1**  
MCS0

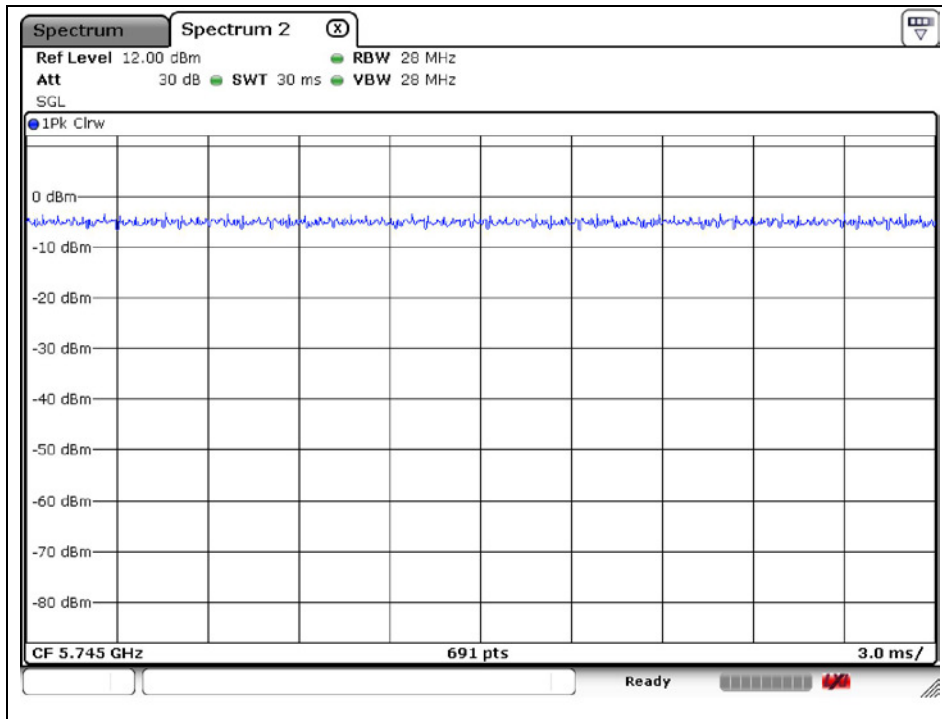


MCS1

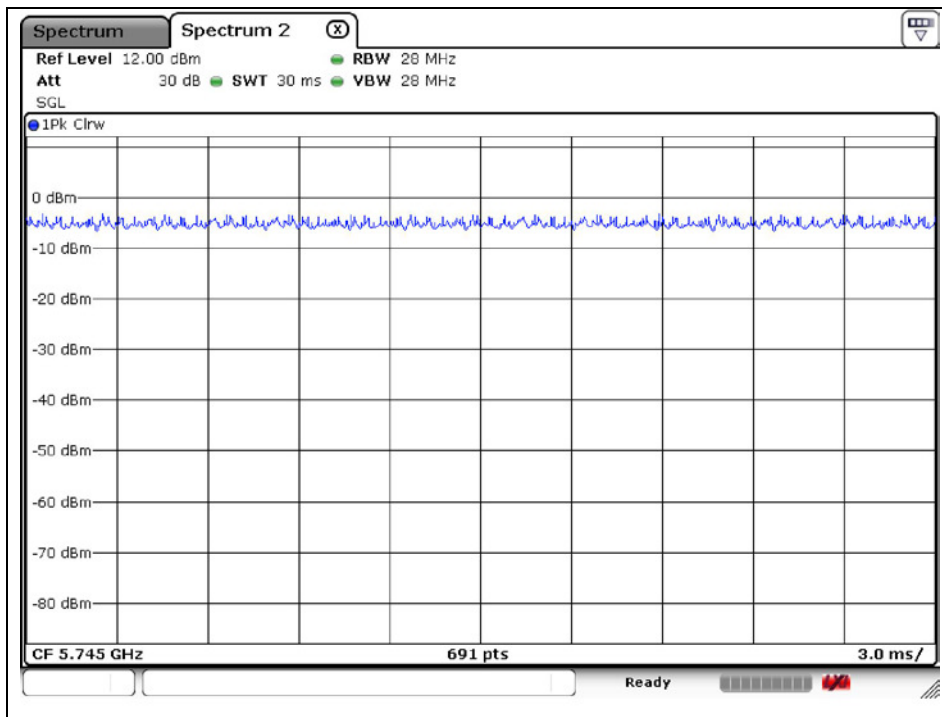


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS2



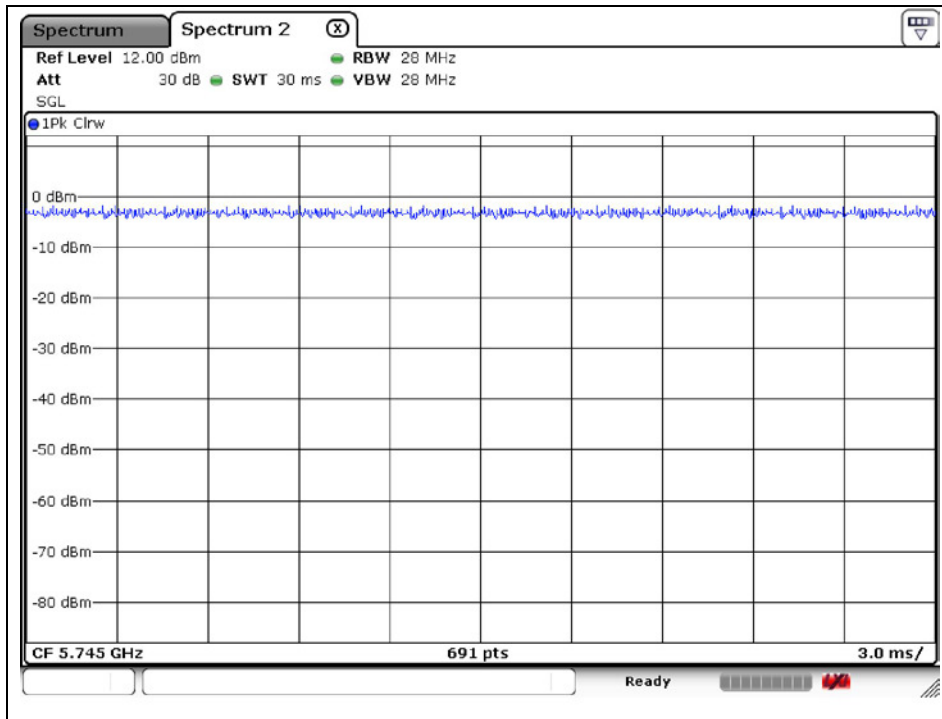
MCS3



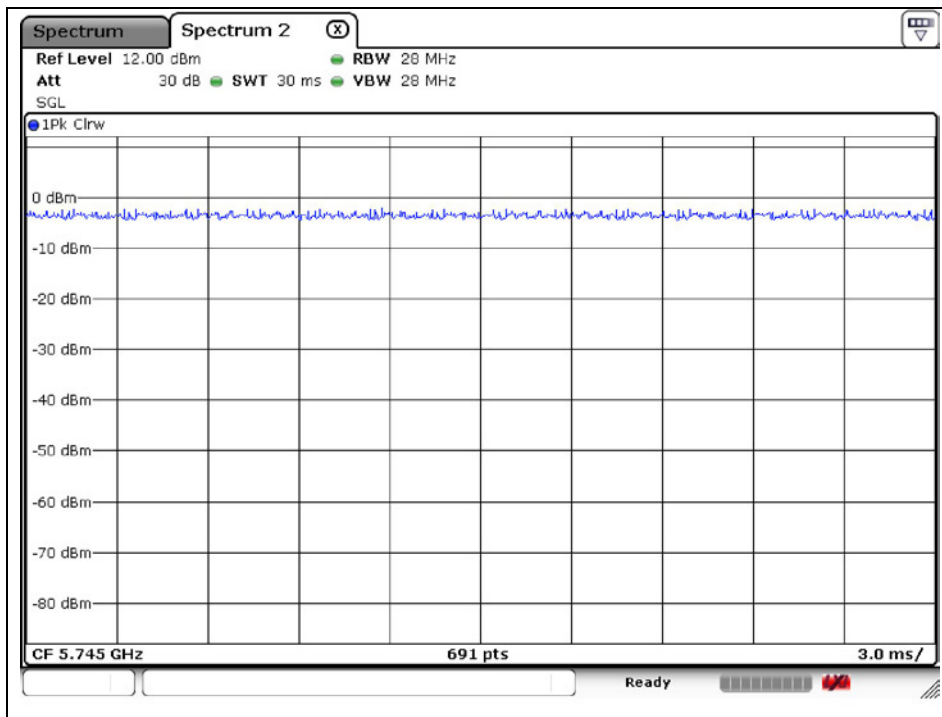
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.



MCS4

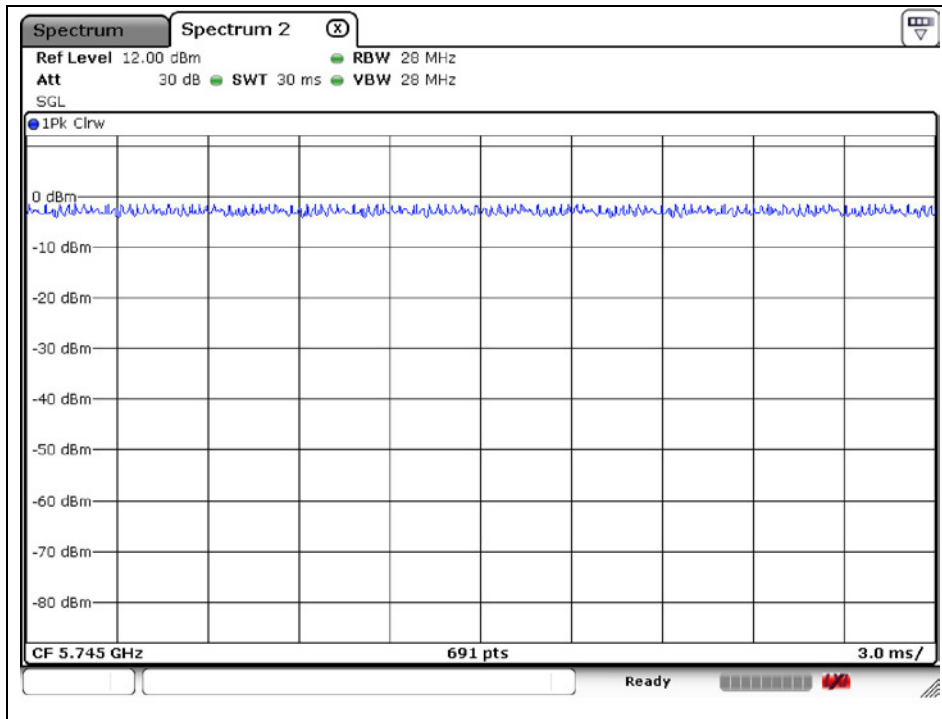


MCS5

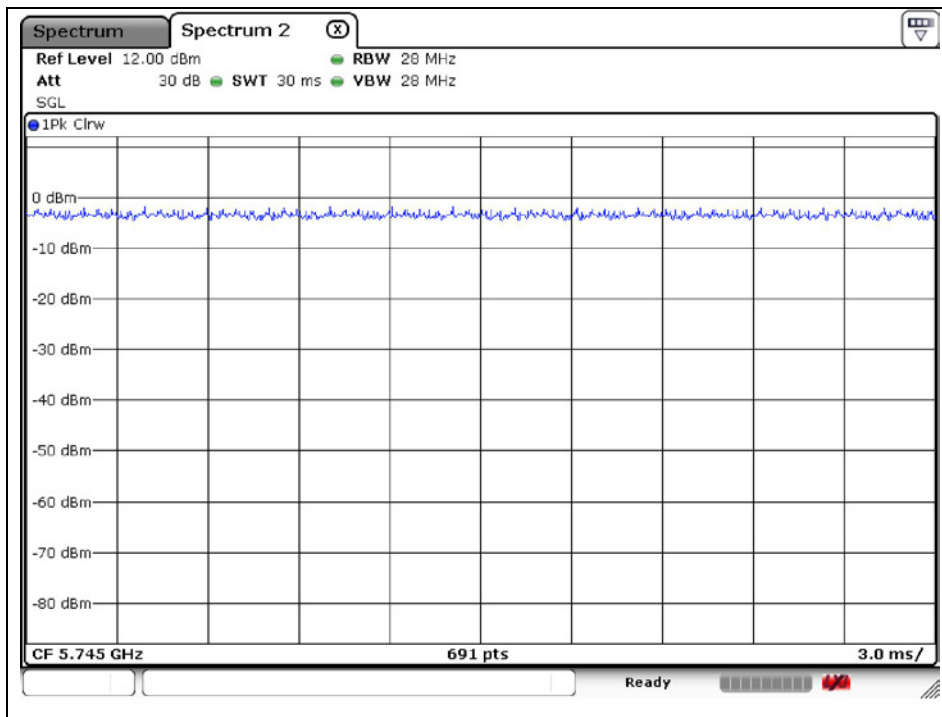


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS6

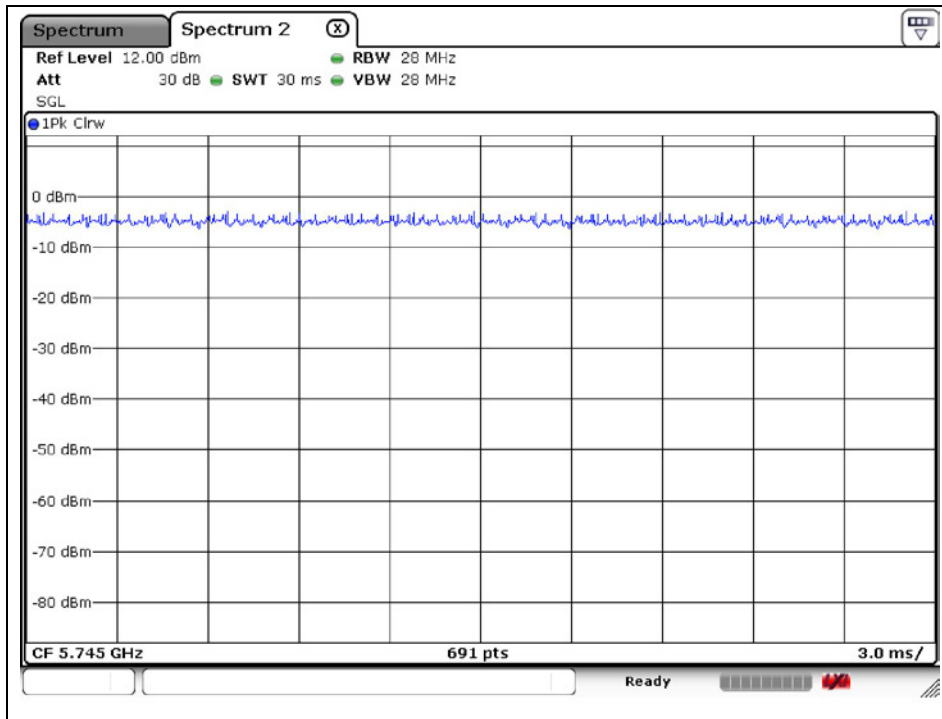


MCS7

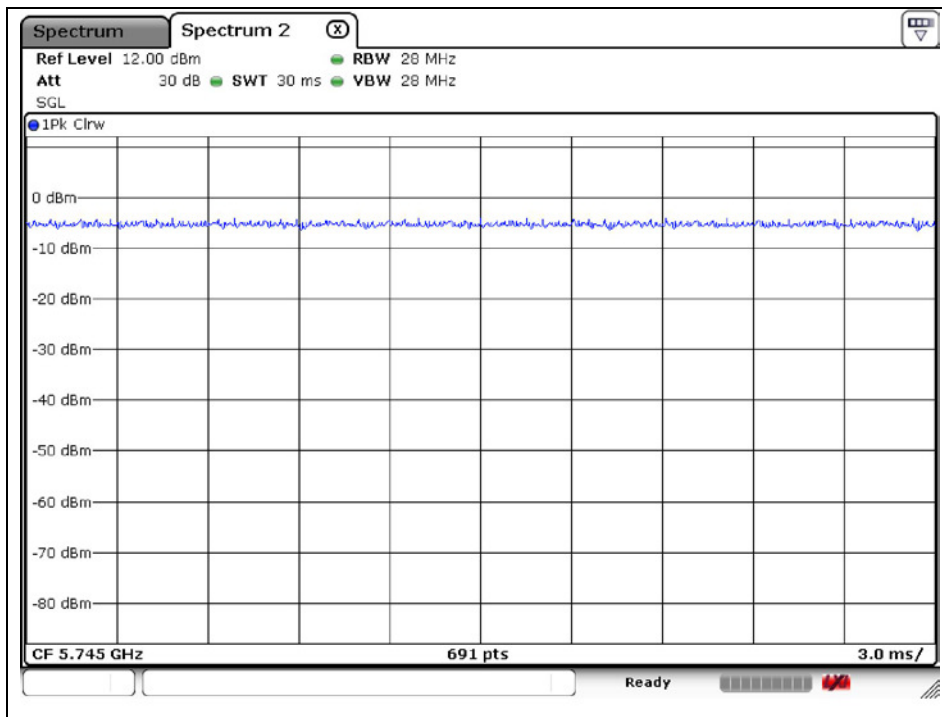


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS8

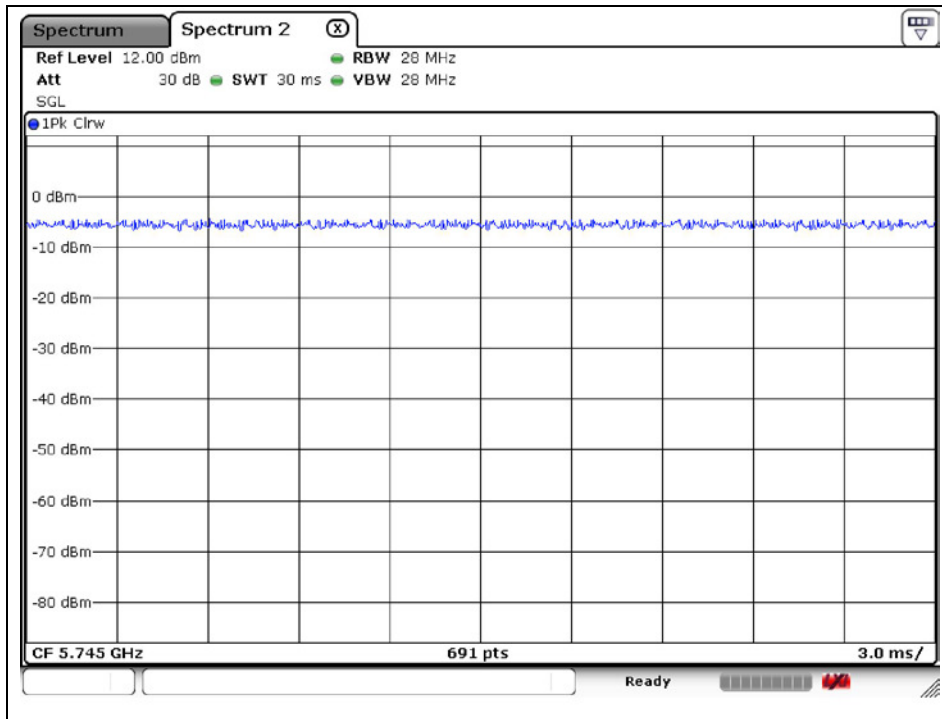


MCS9

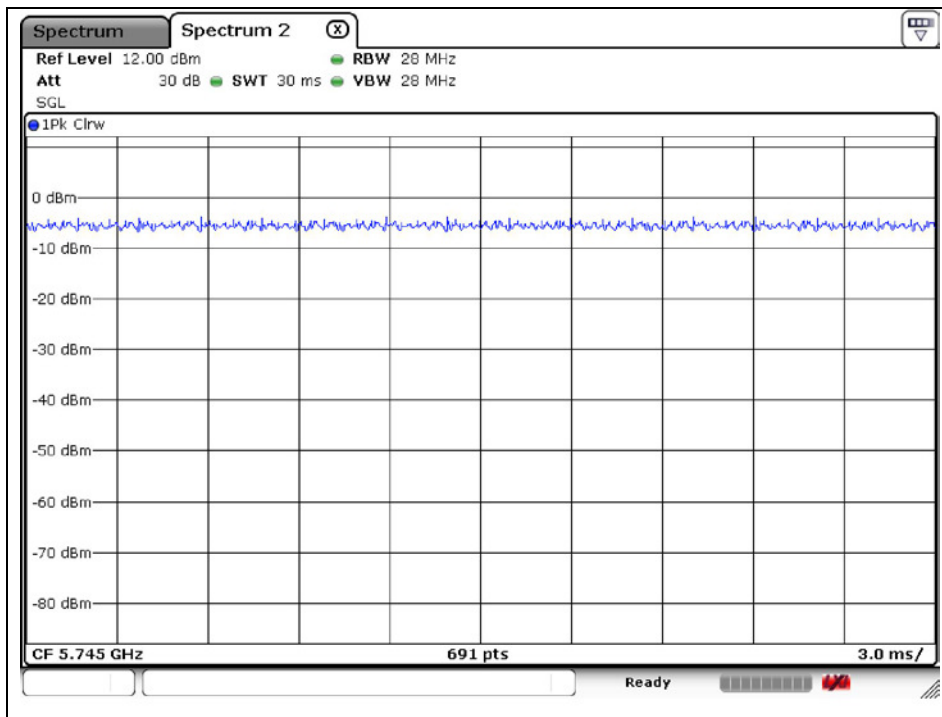


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS10

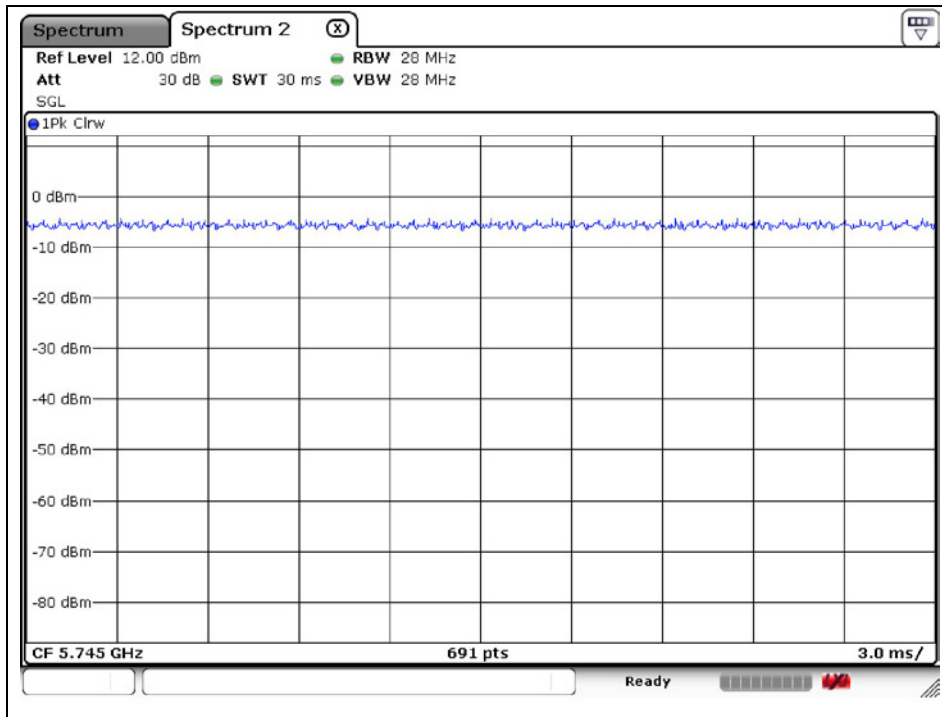


MCS11

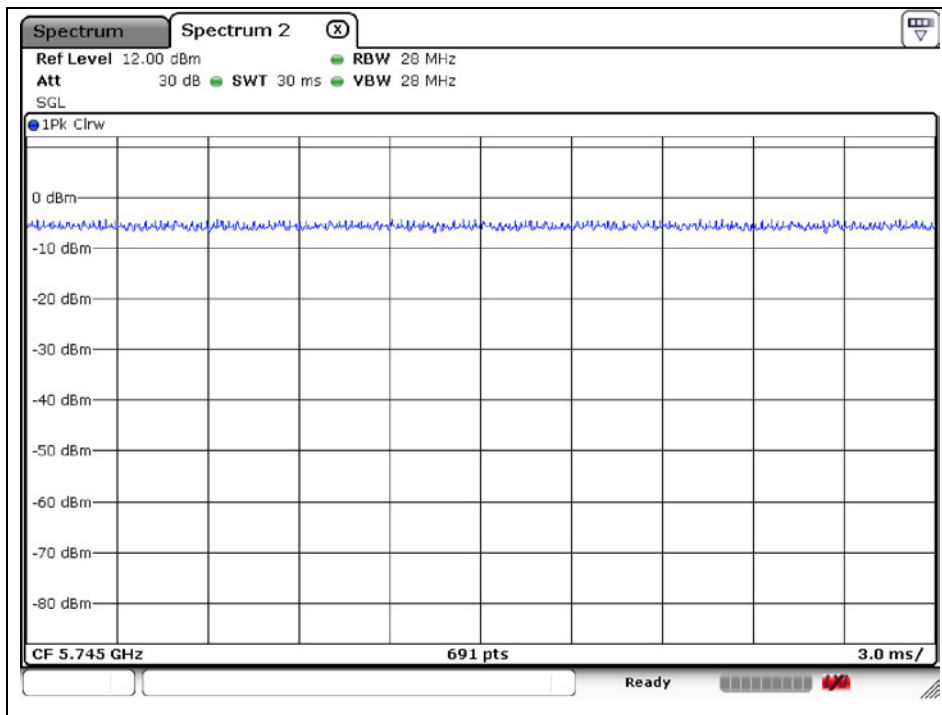


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS12

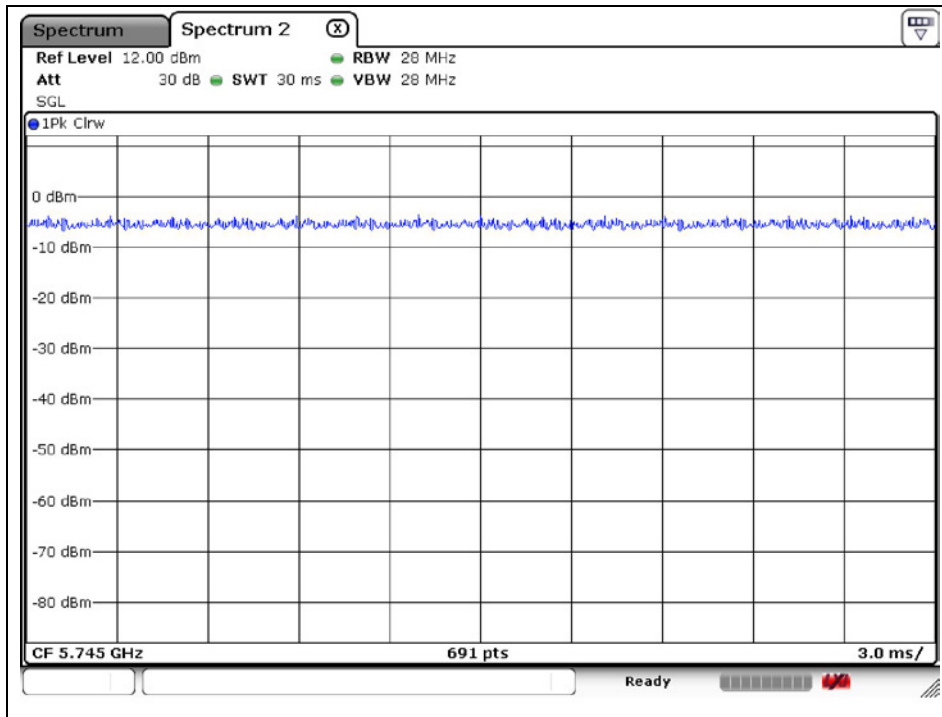


MCS13

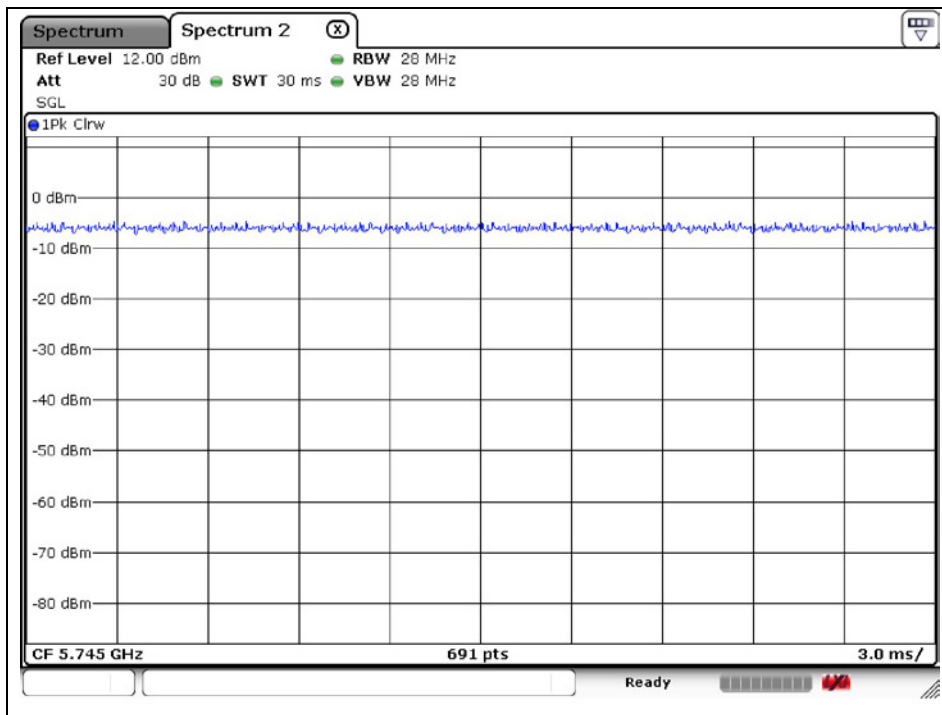


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS14

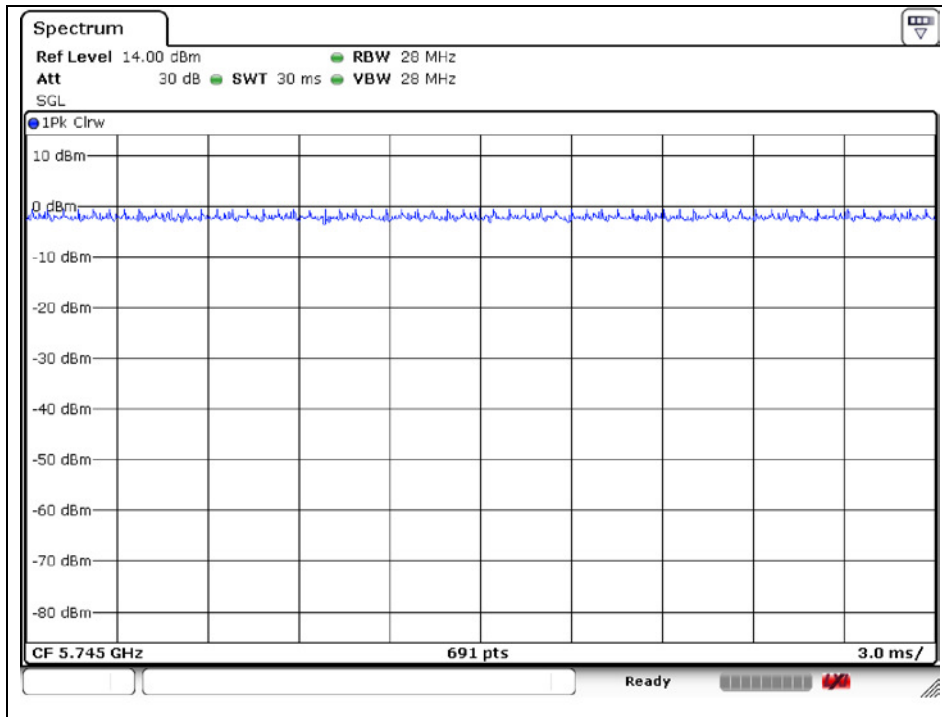


MCS15

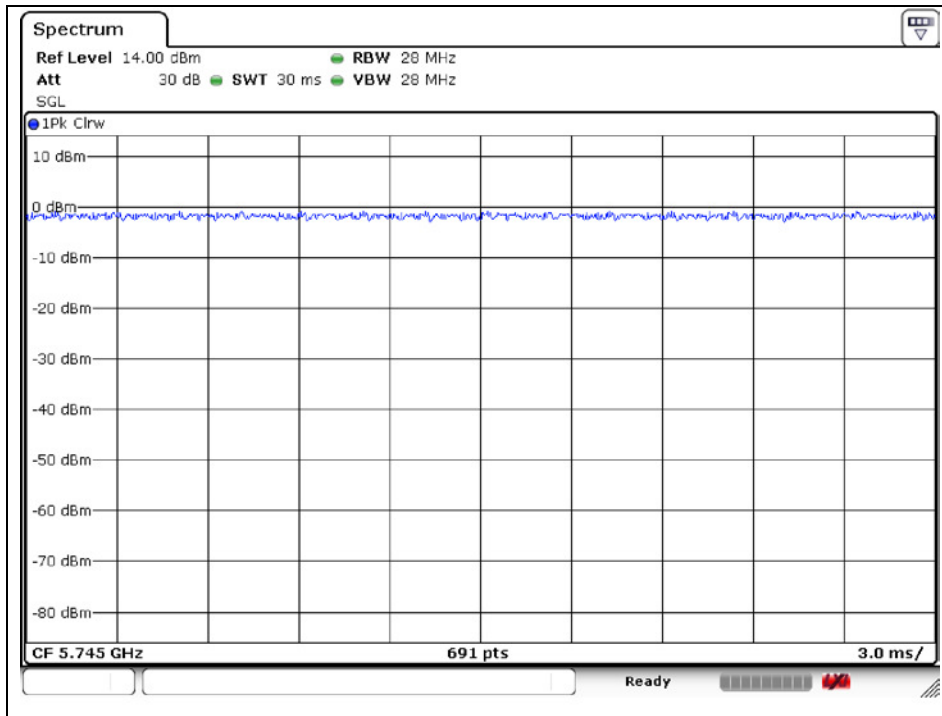


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

**OFDM: 802.11n\_HT20 – ANT2**  
MCS0

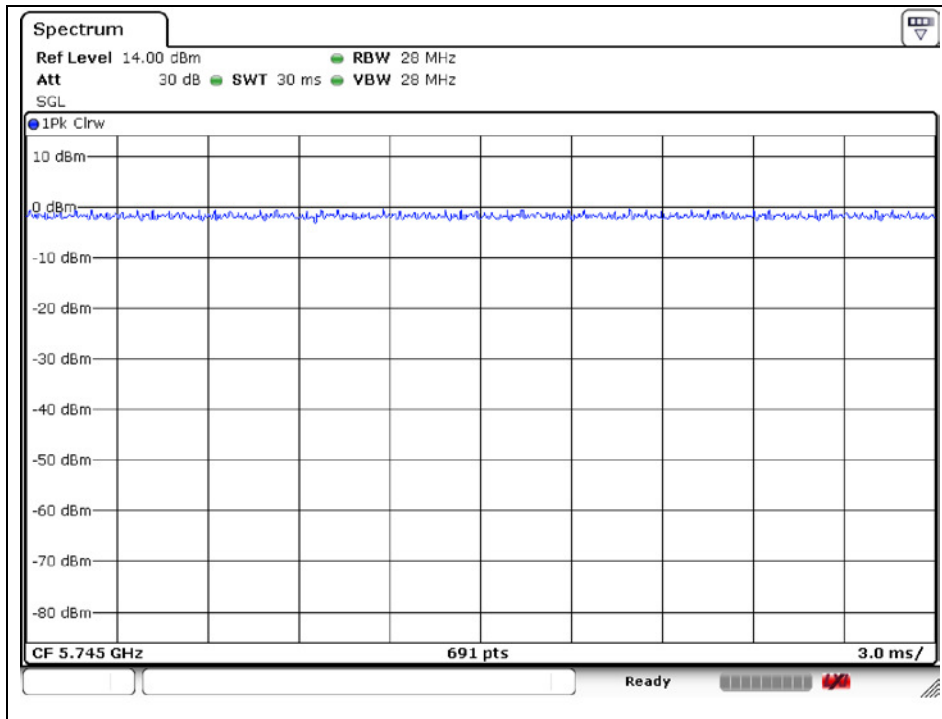


MCS1

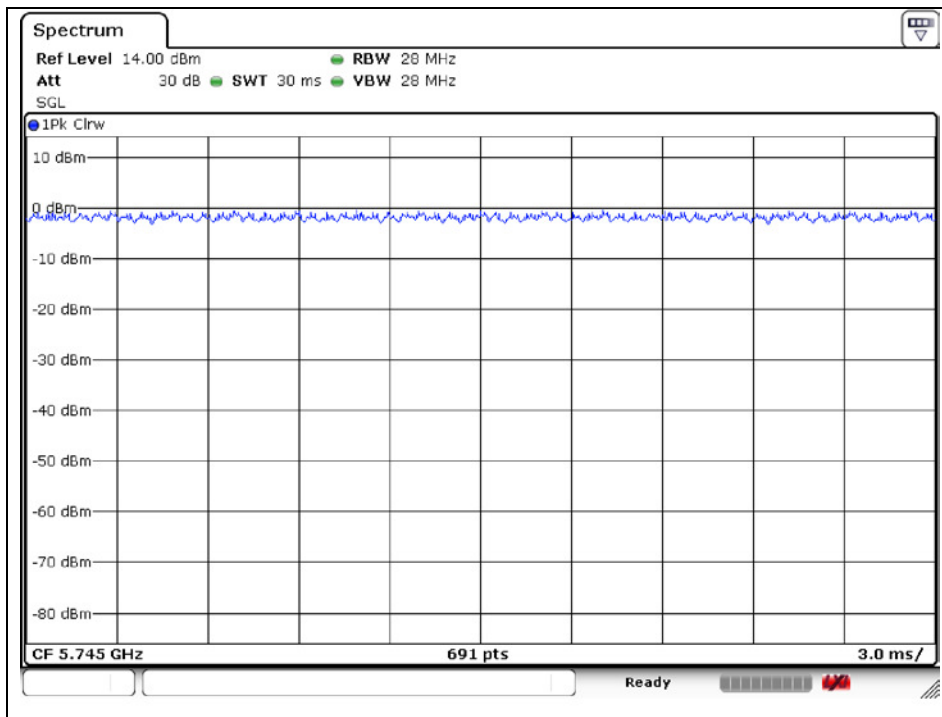


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS2



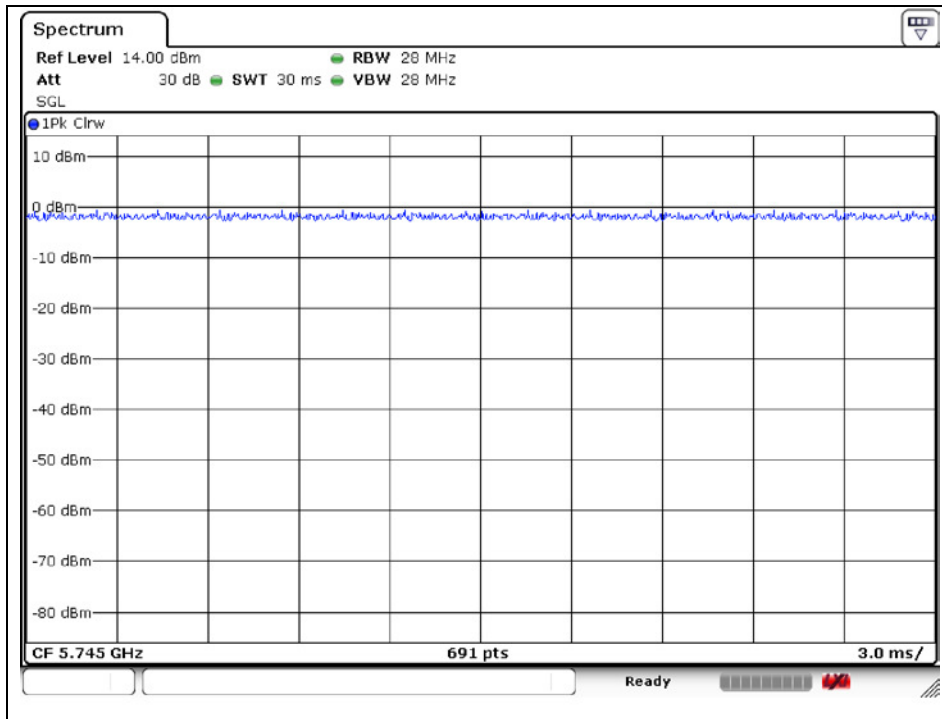
MCS3



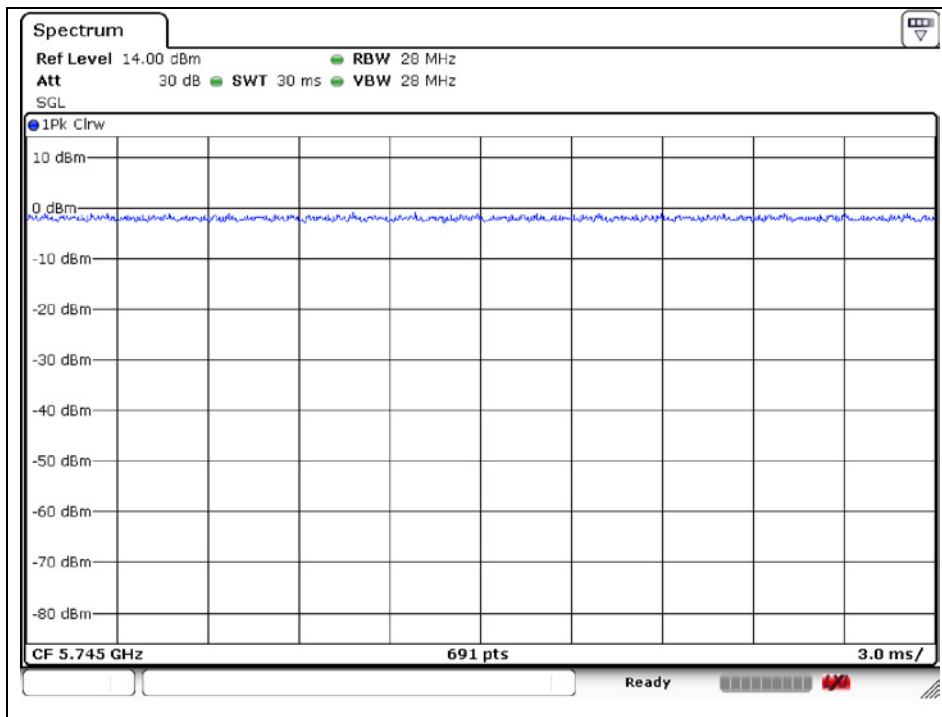
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.



MCS4

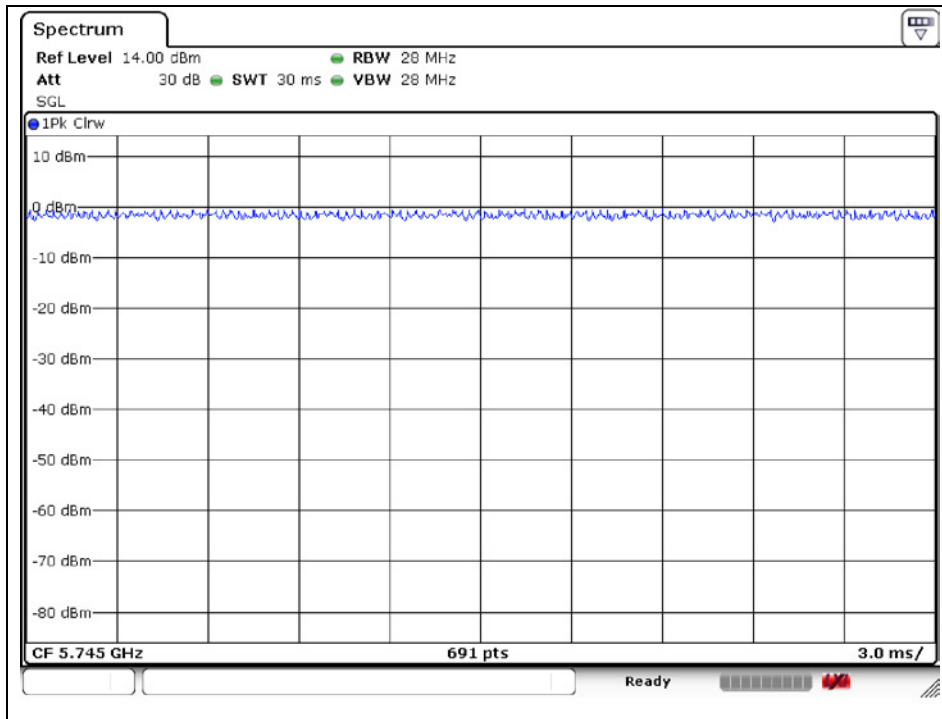


MCS5

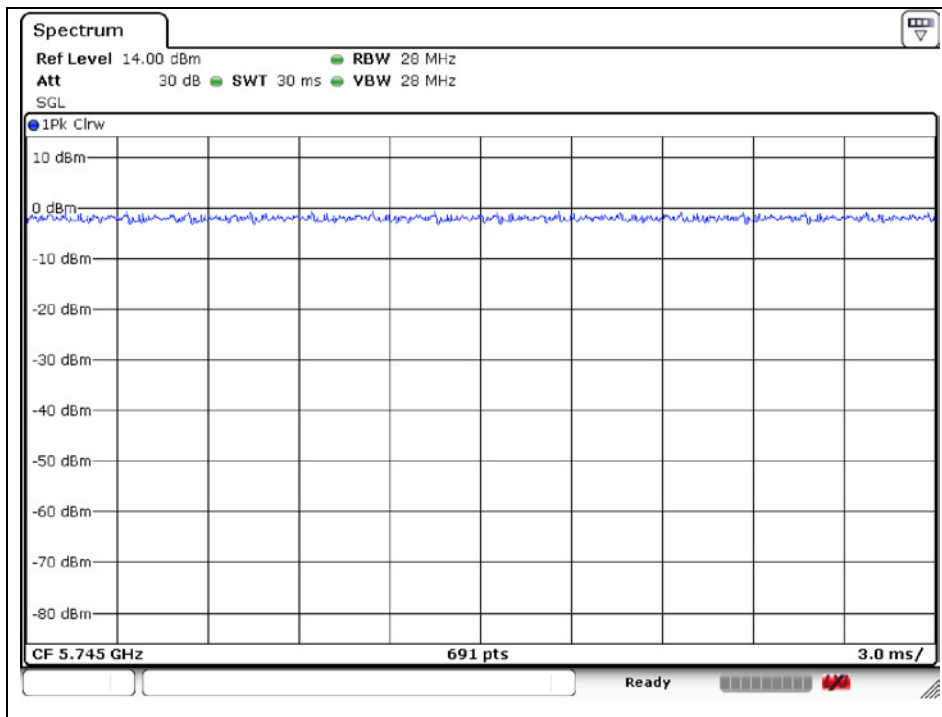


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS6

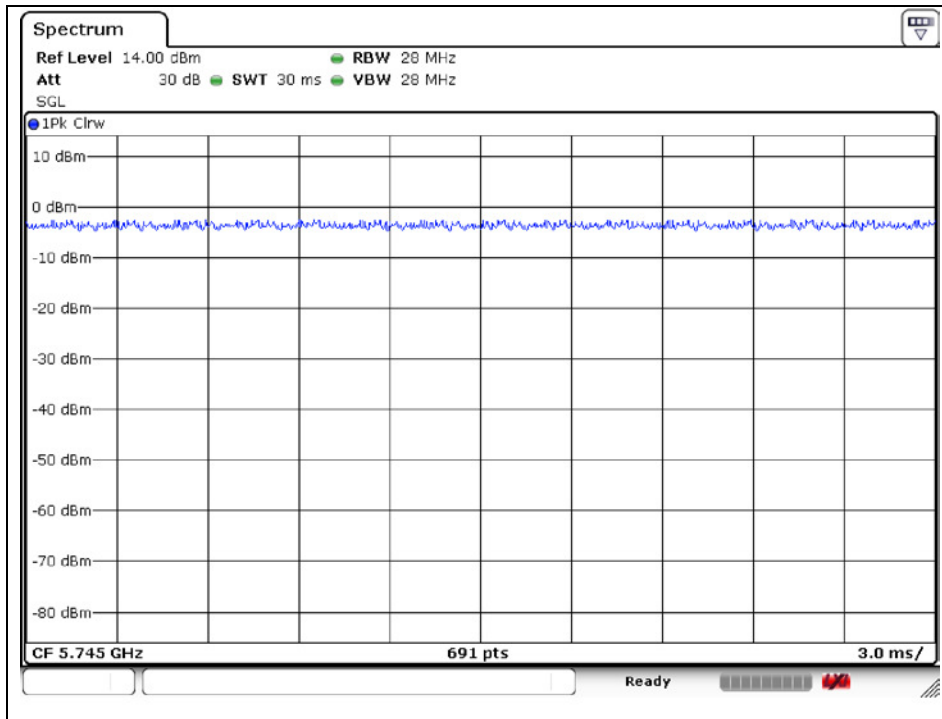


MCS7

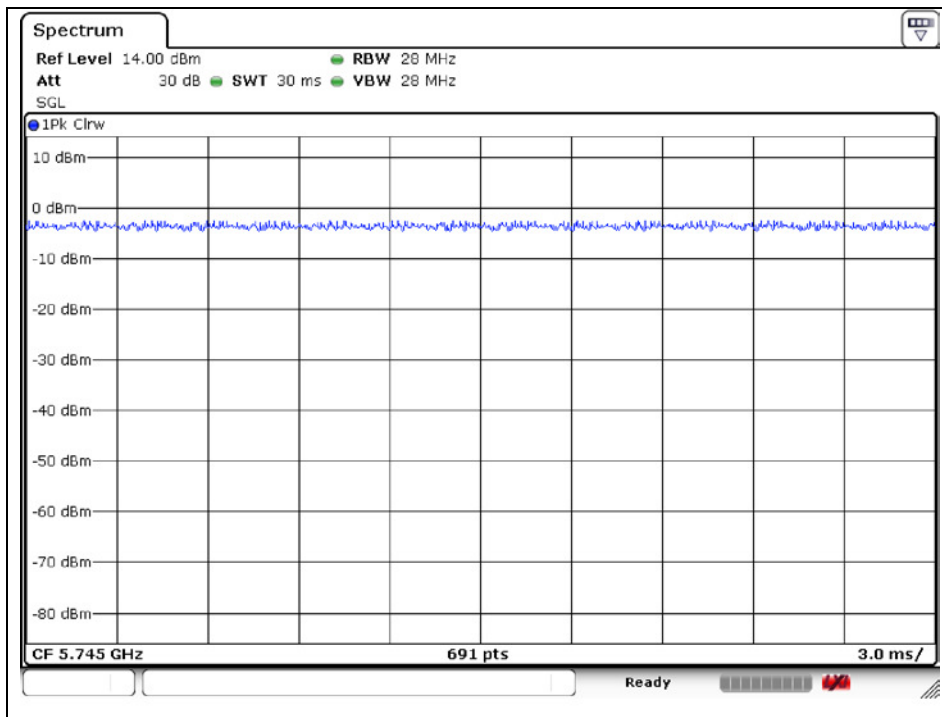


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS8

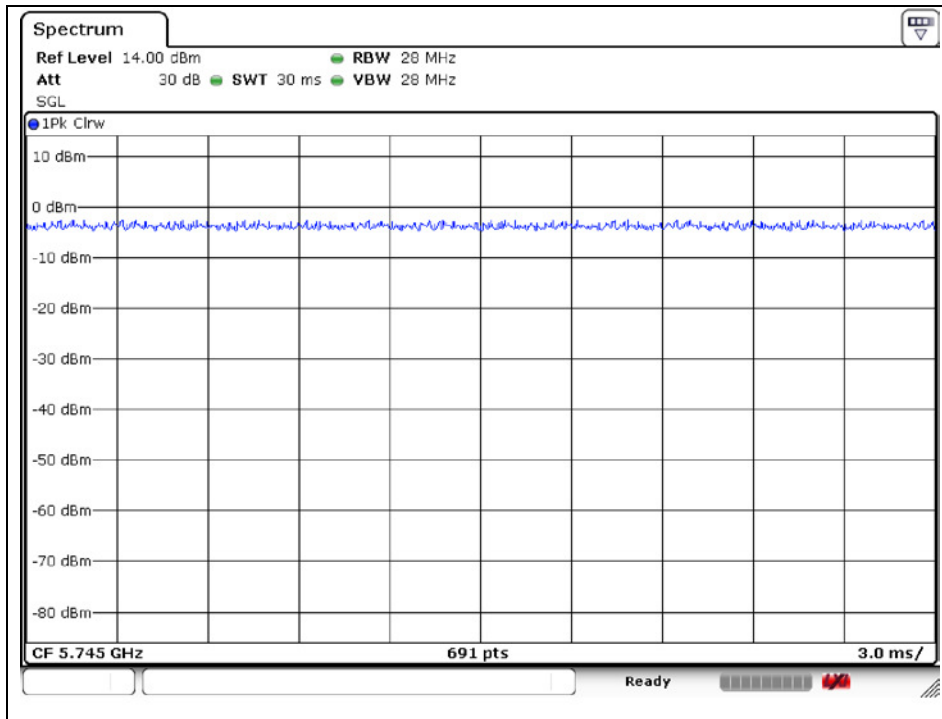


MCS9

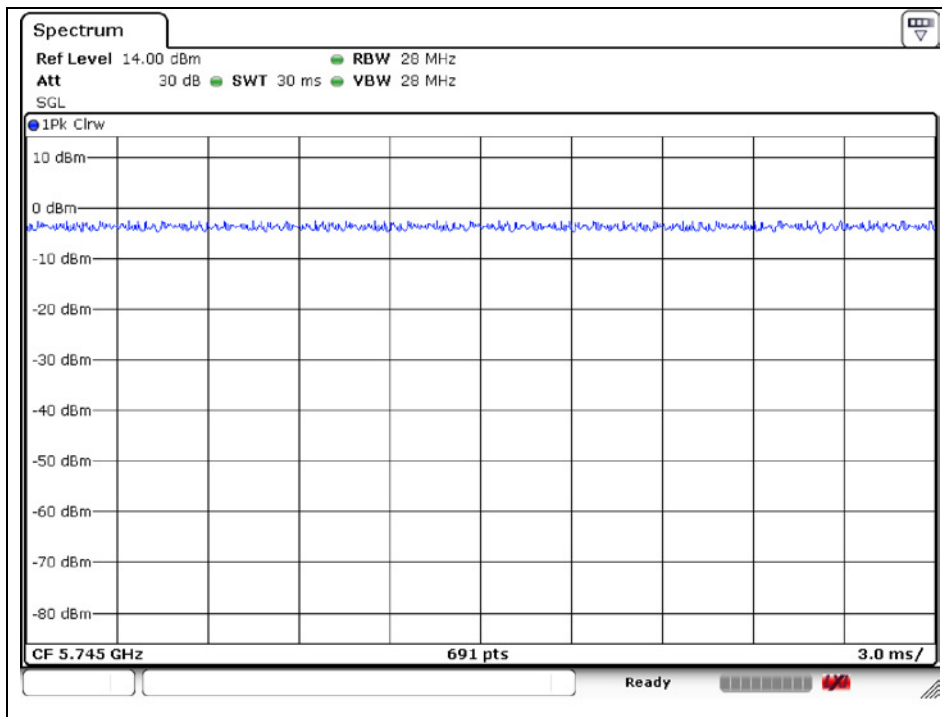


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS10

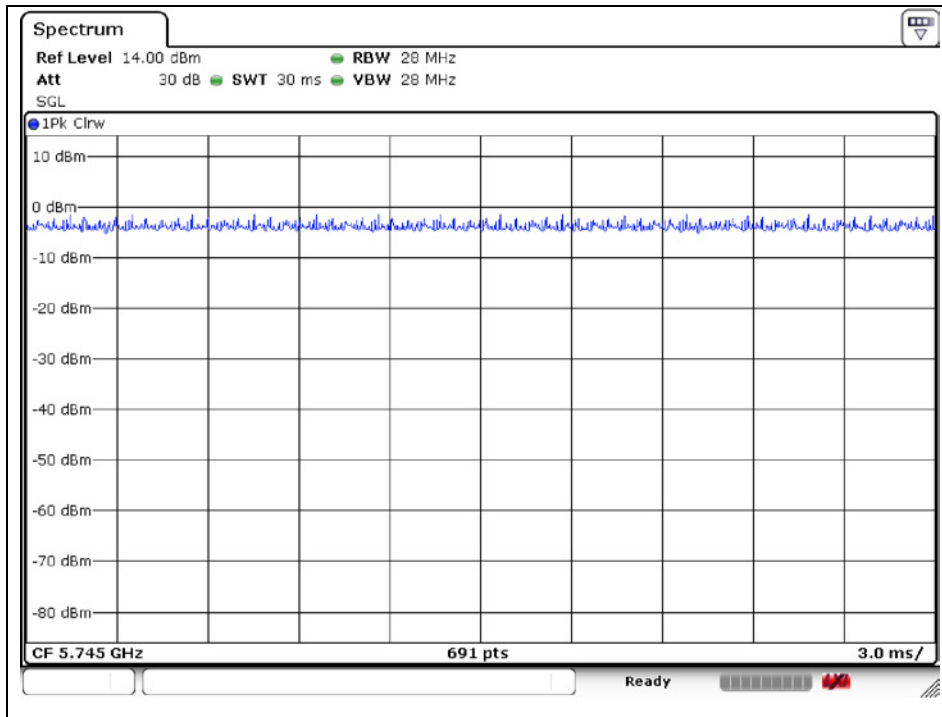


MCS11

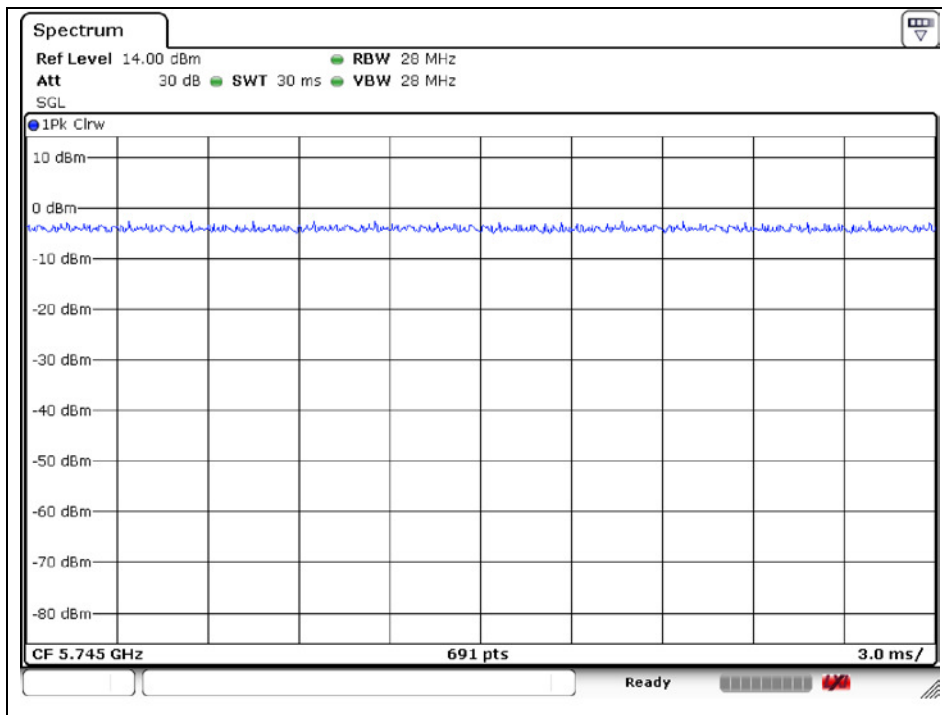


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS12

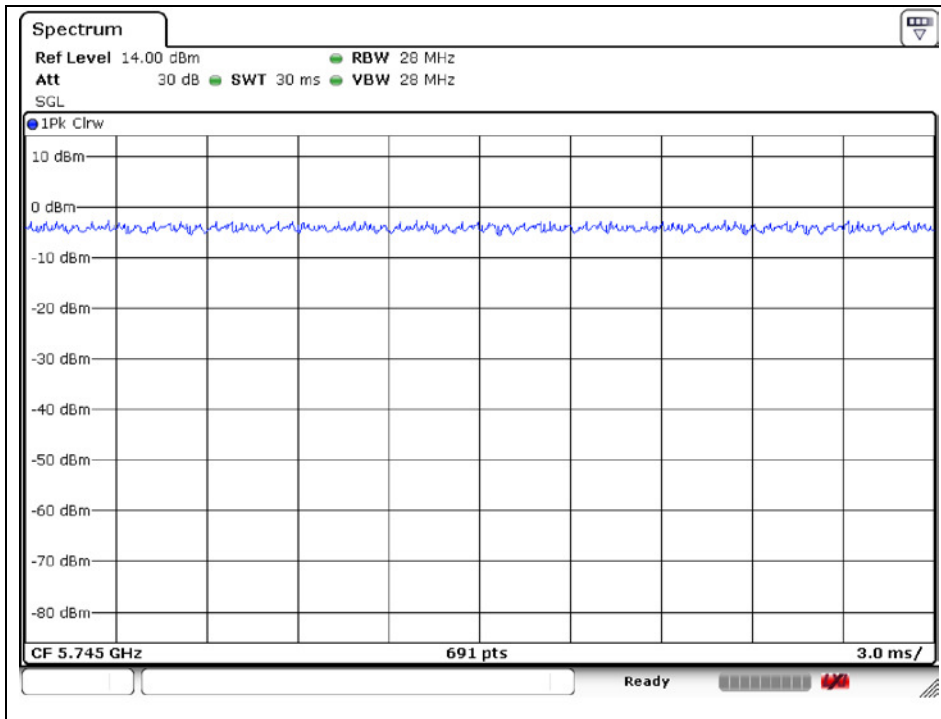


MCS13

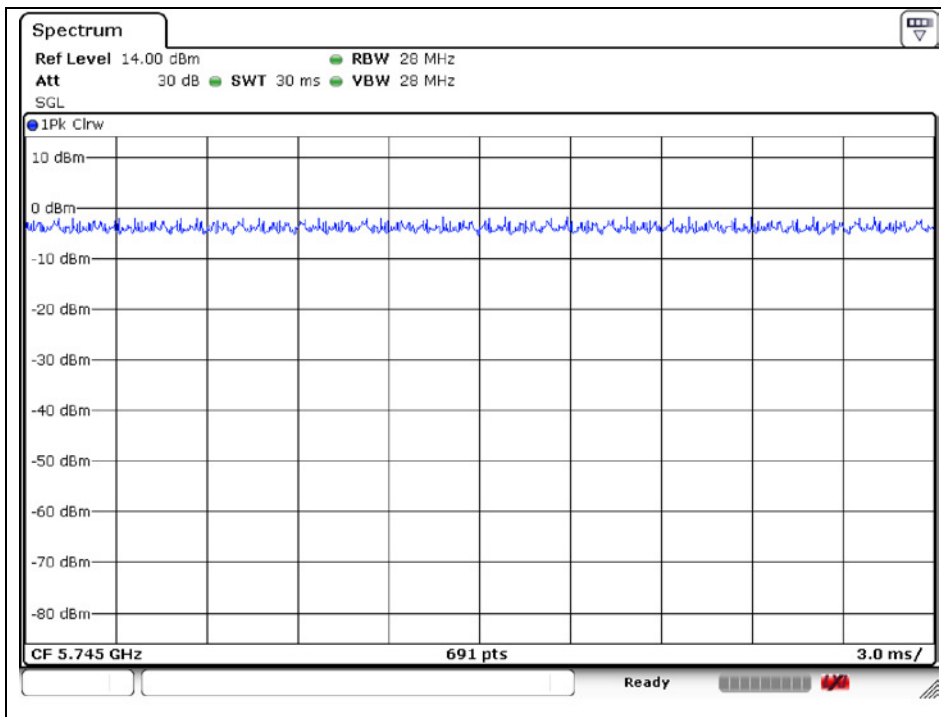


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS14



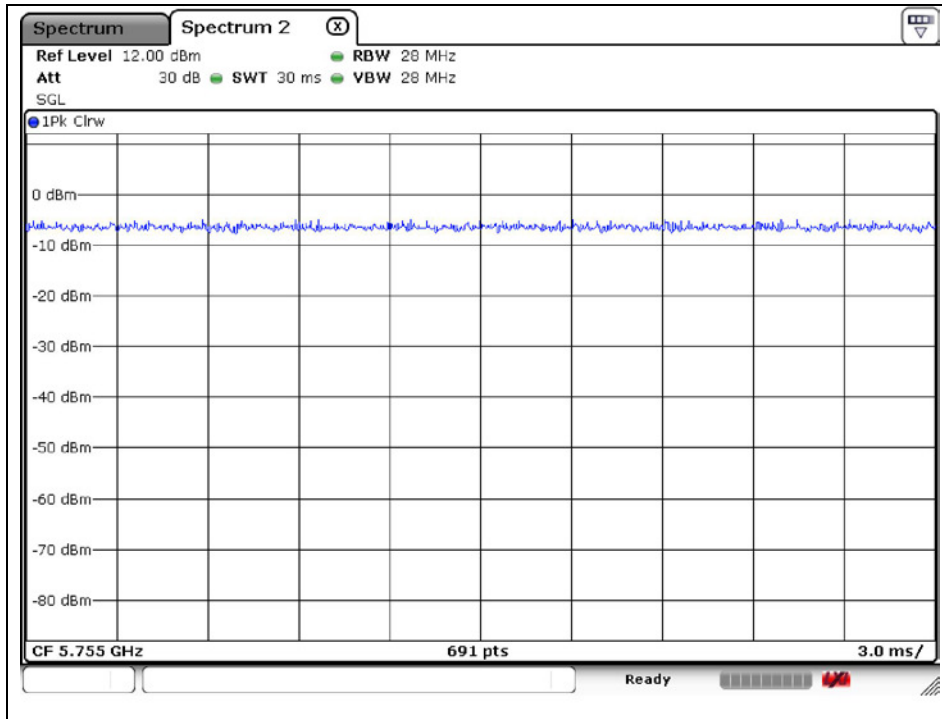
MCS15



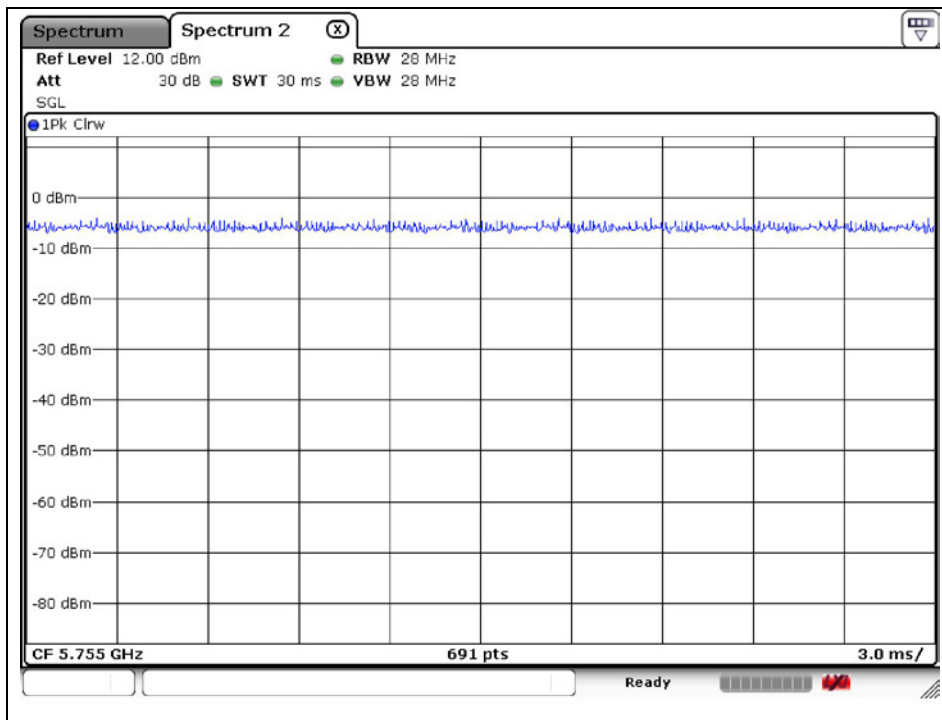
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

**OFDM: 802.11n\_HT40 – ANT1**

MCS0

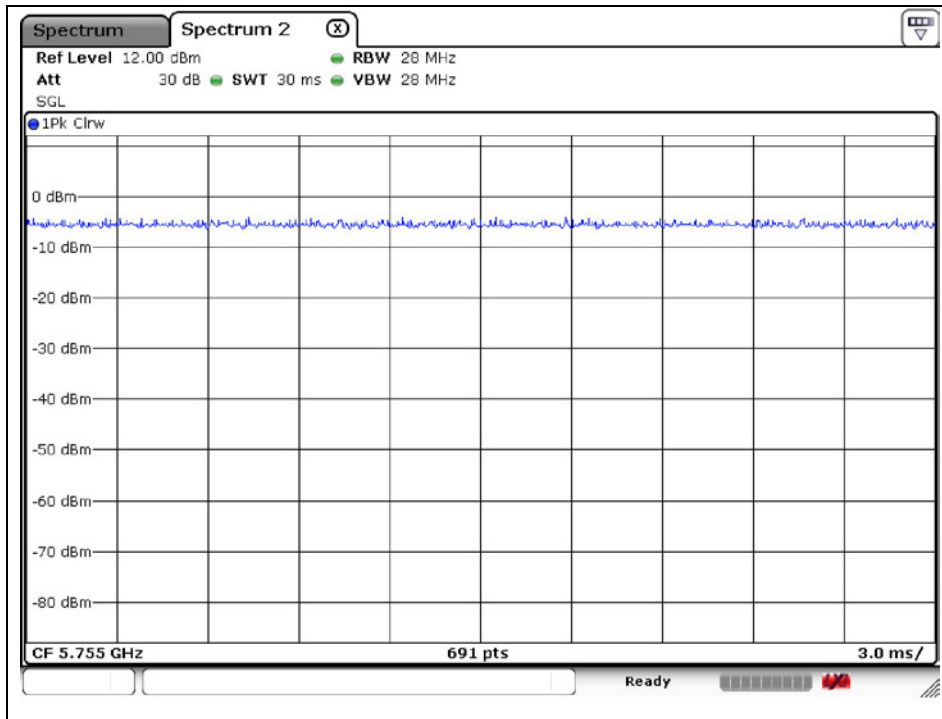


MCS1

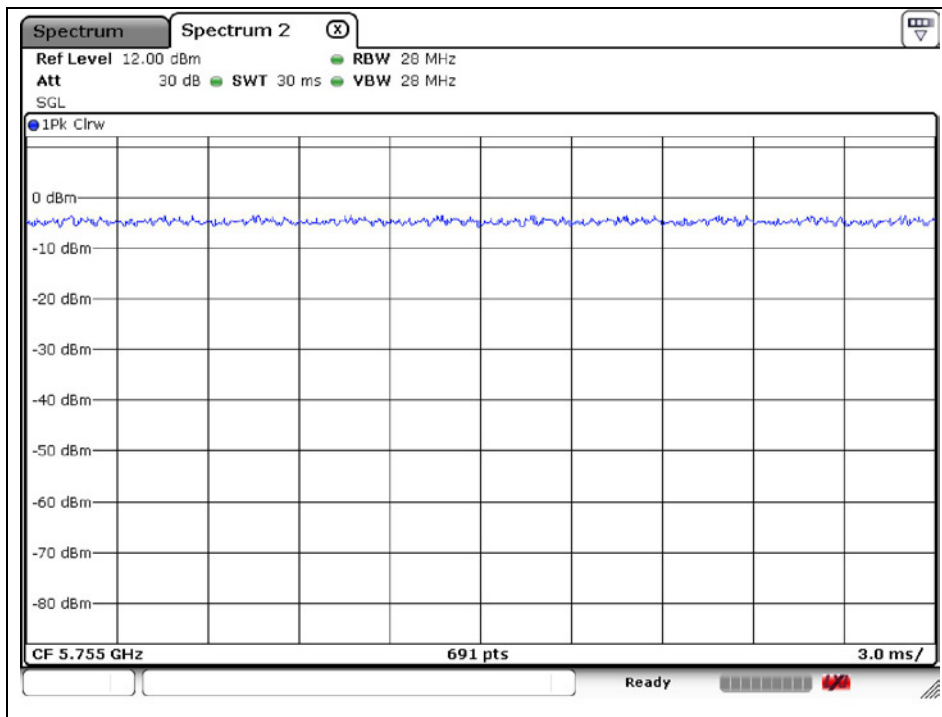


*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

MCS2



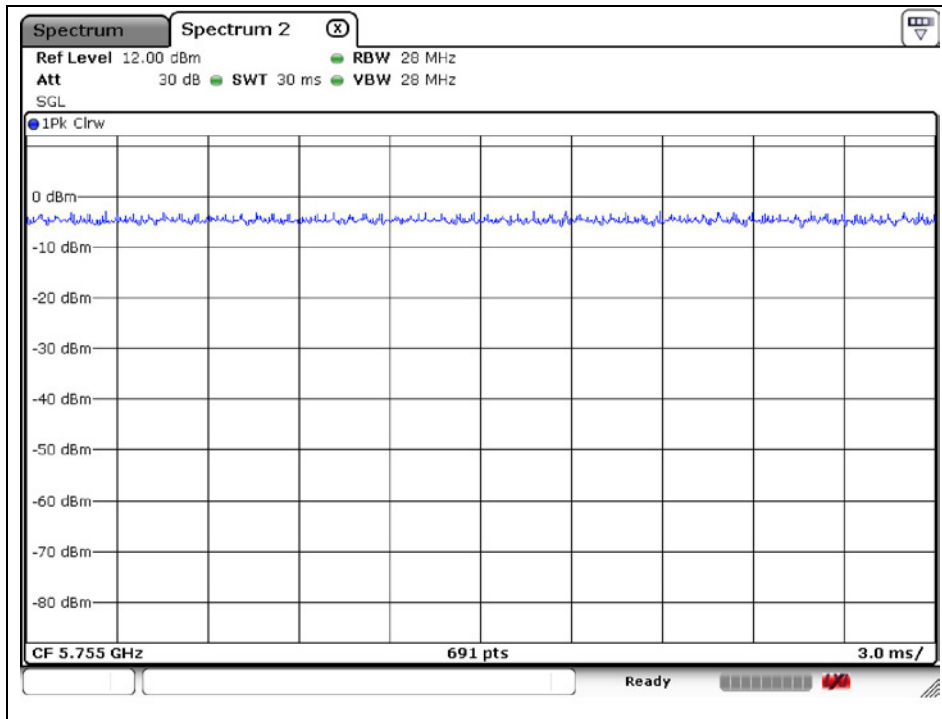
MCS3



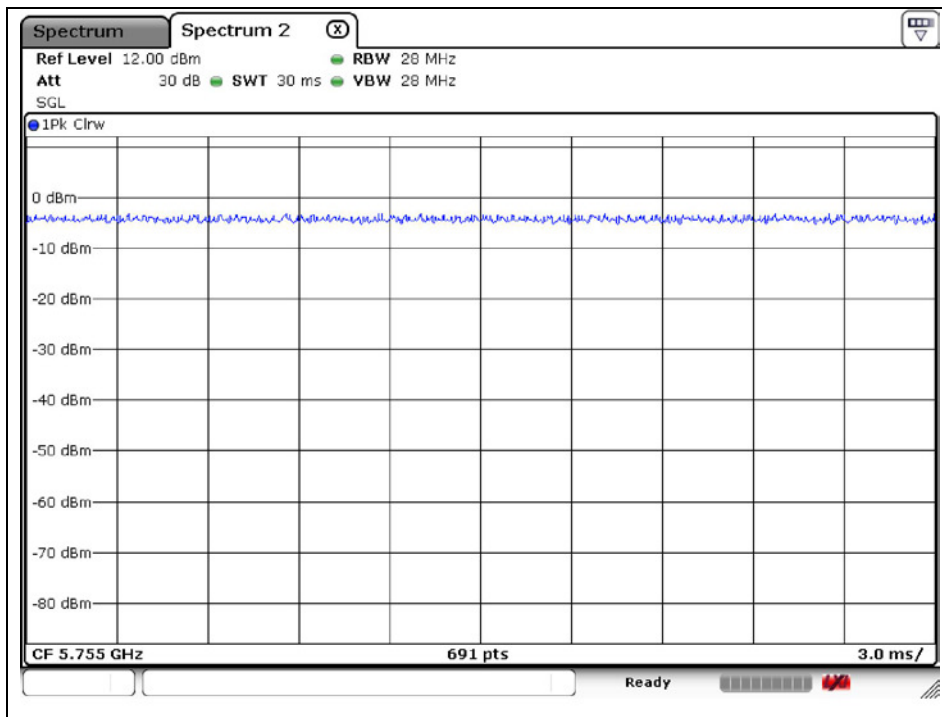
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.



MCS4

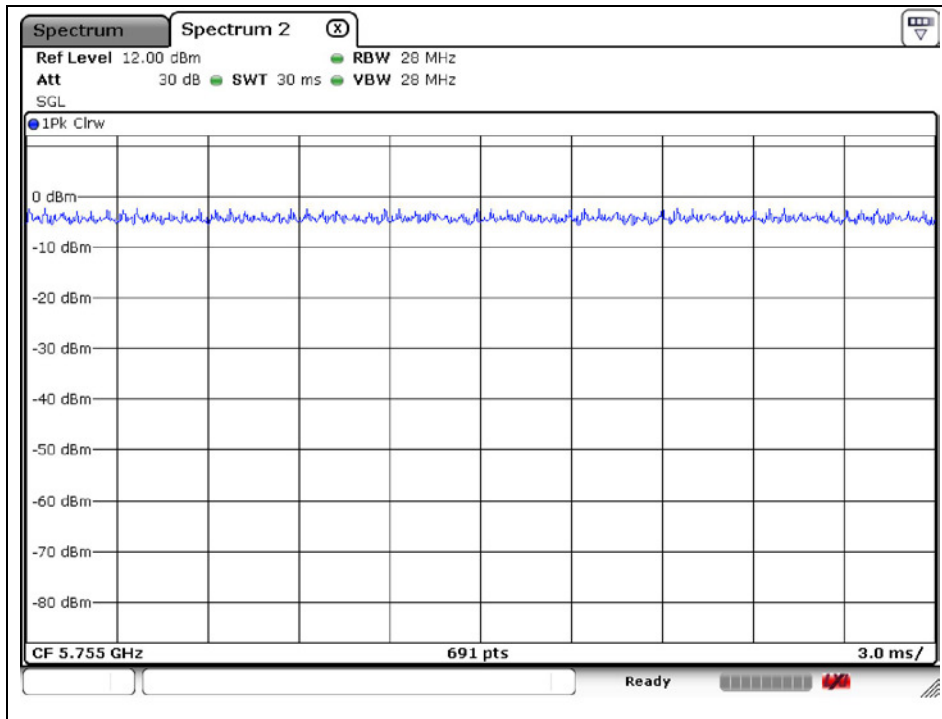


MCS5

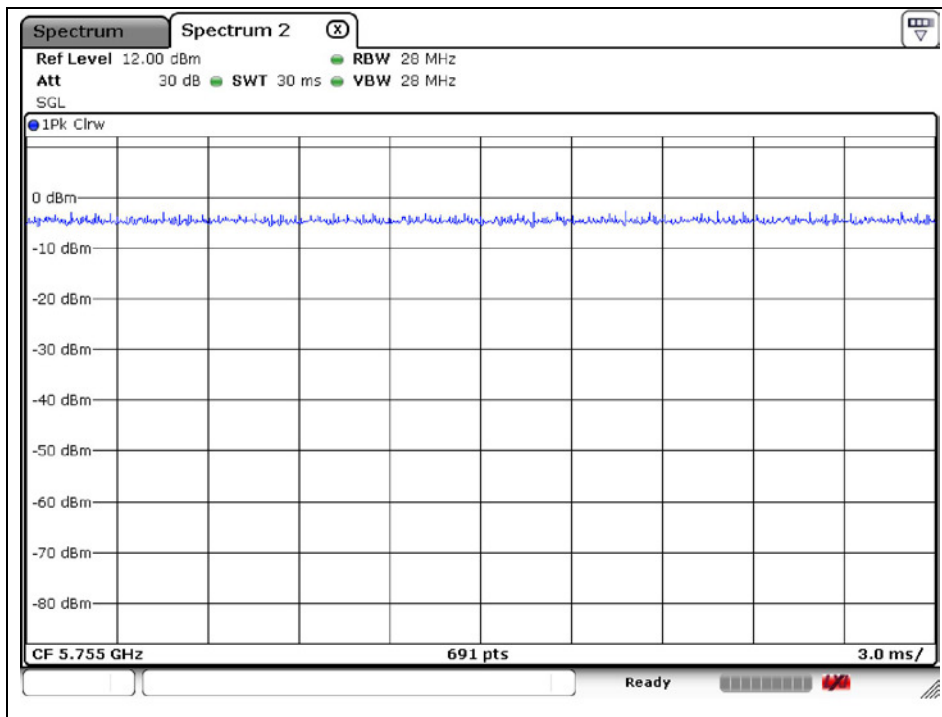


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS6

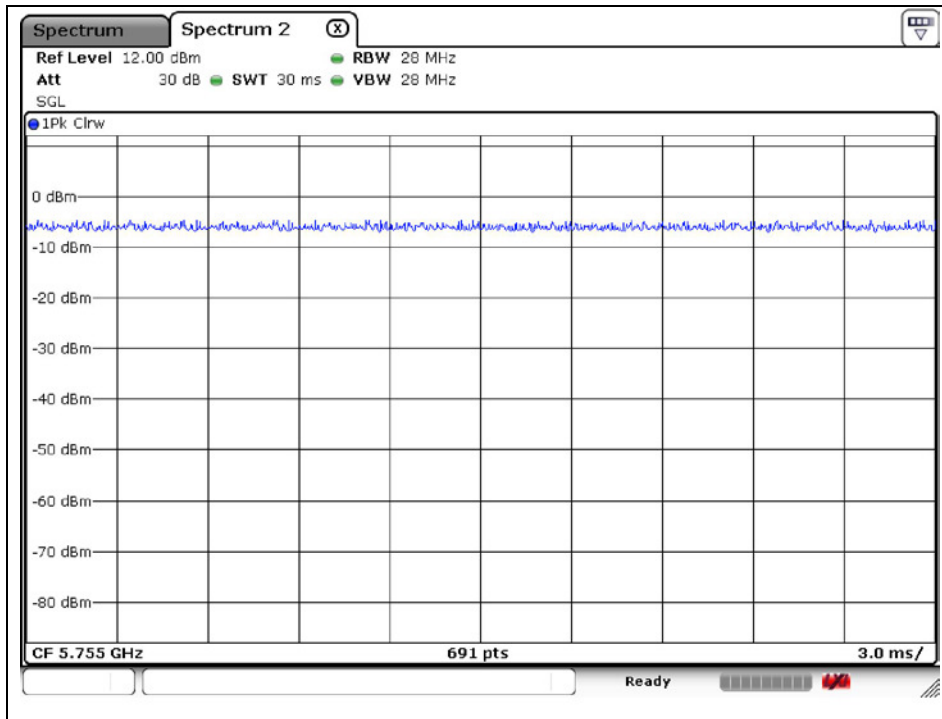


MCS7

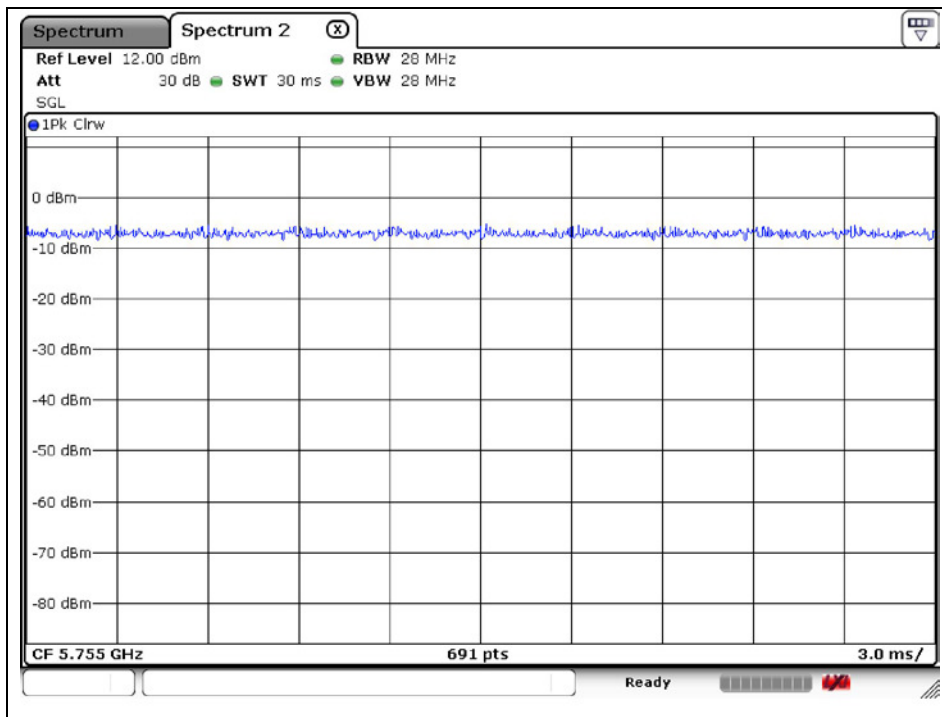


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS8

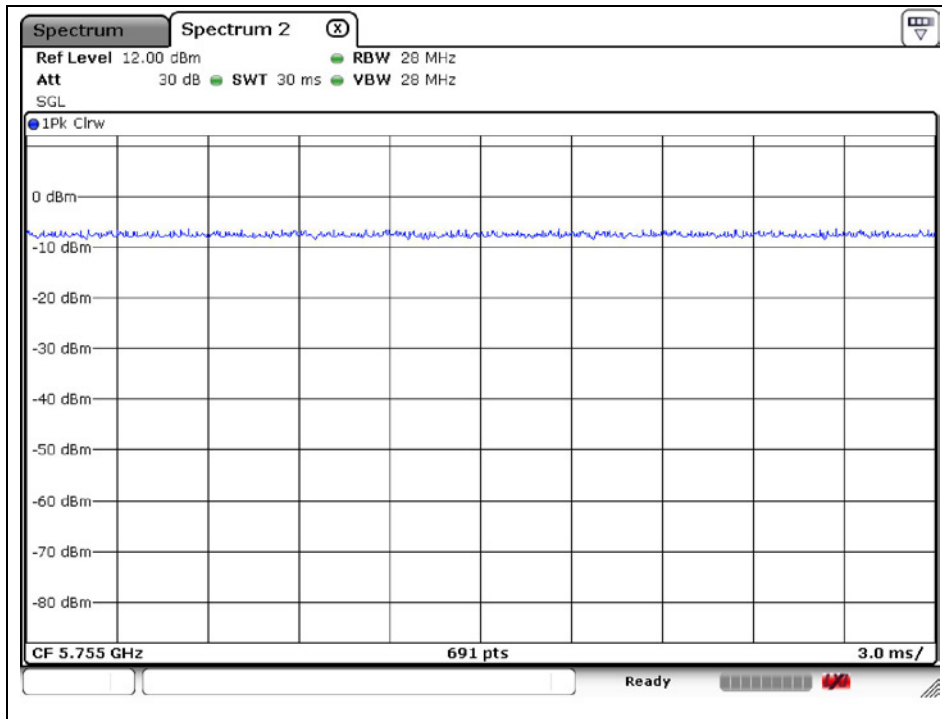


MCS9

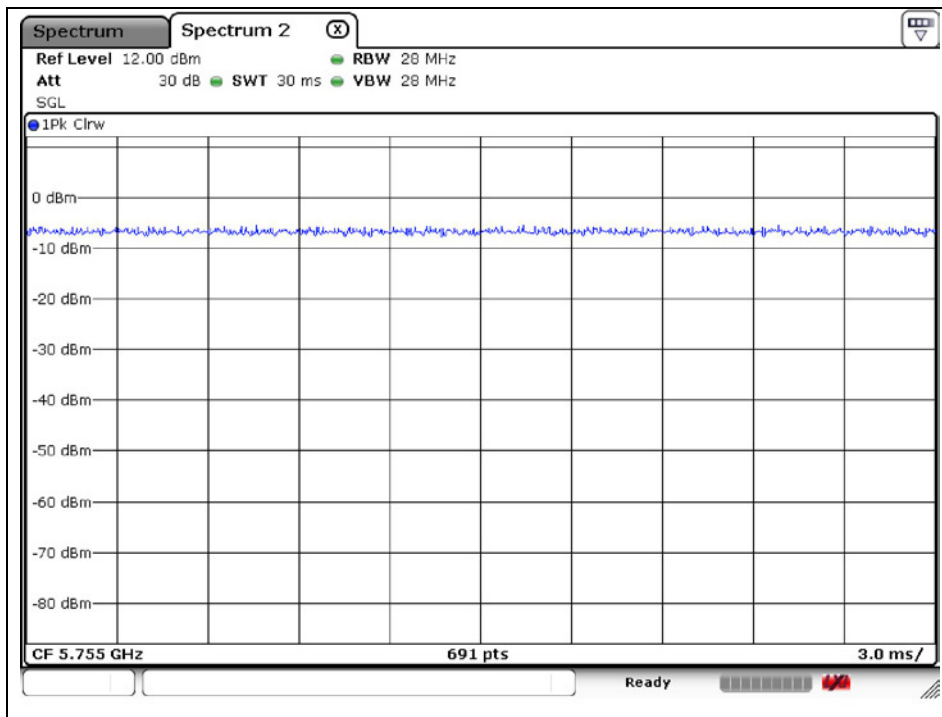


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS10

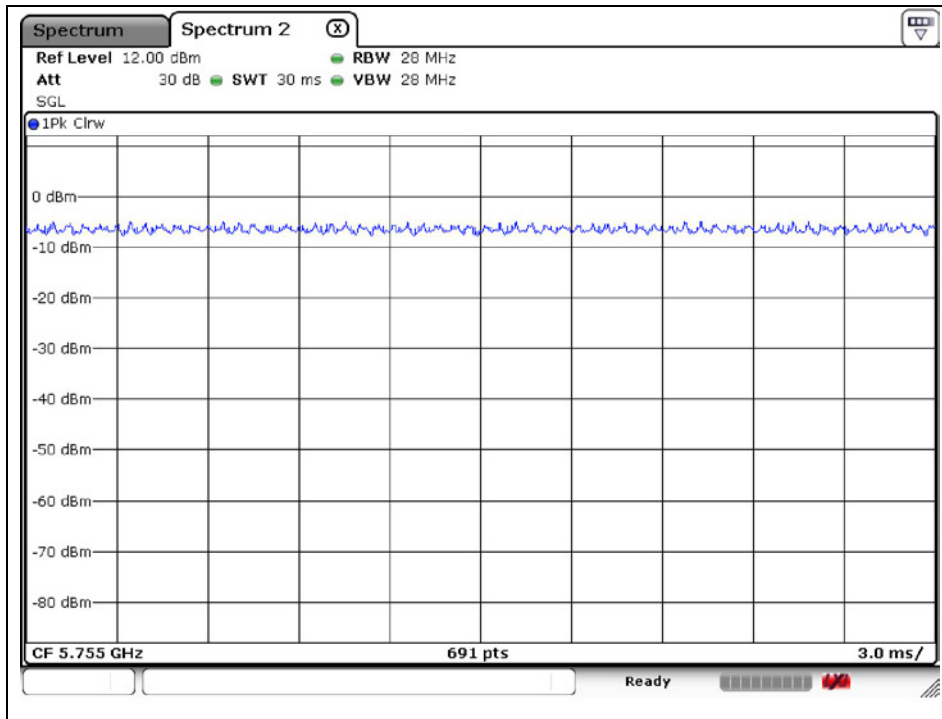


MCS11

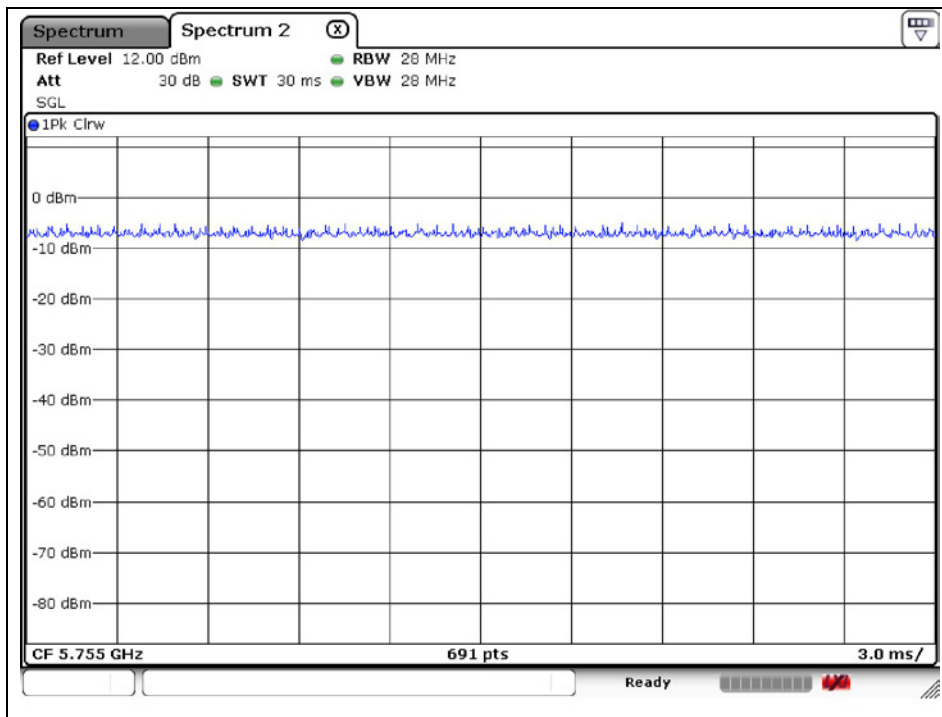


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS12

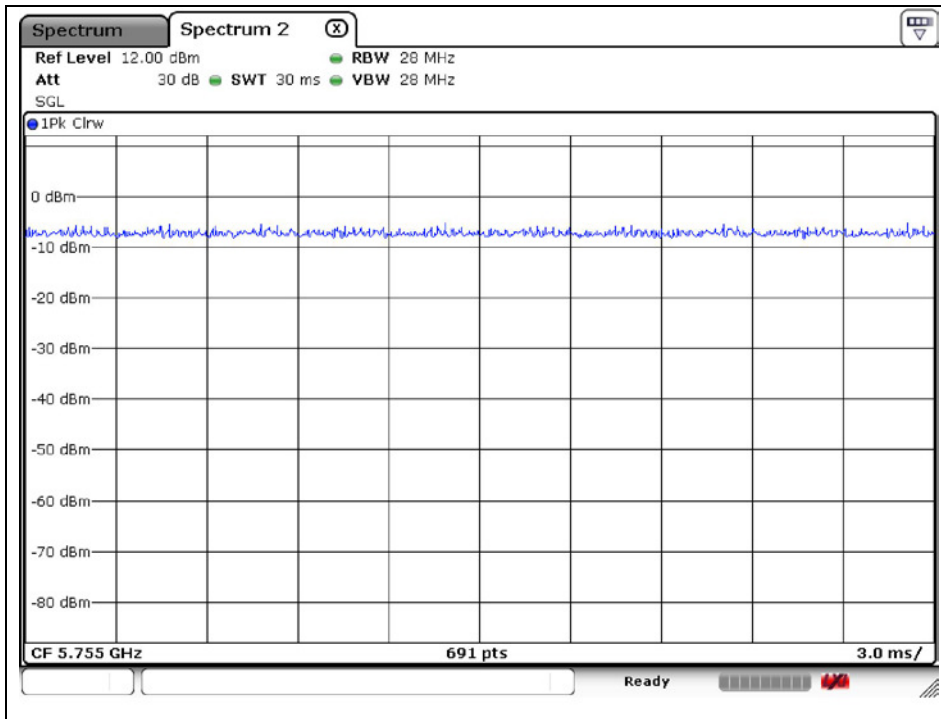


MCS13

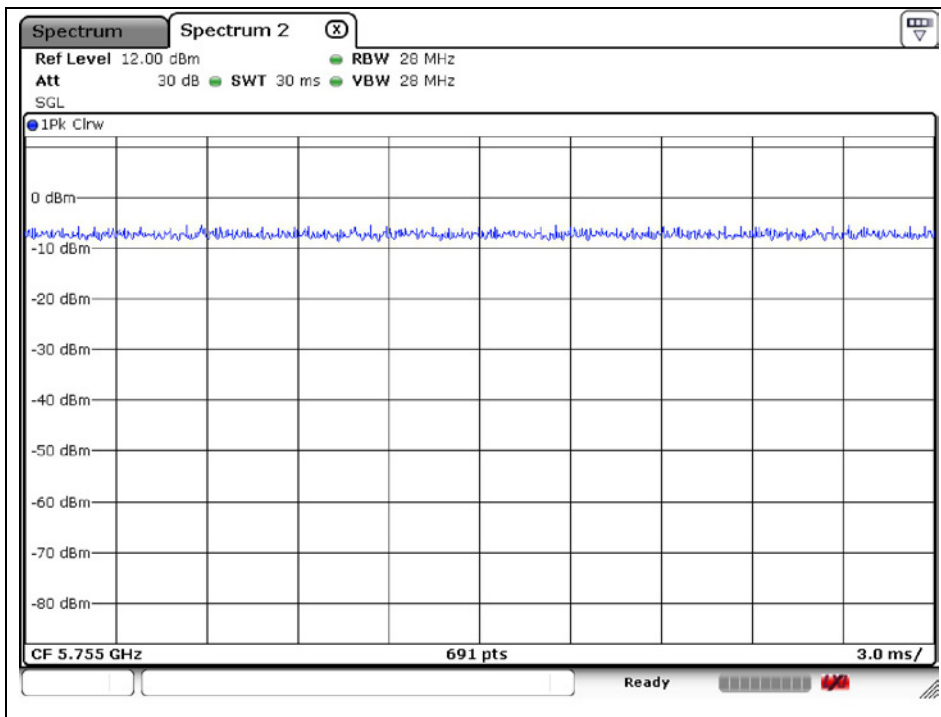


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS14

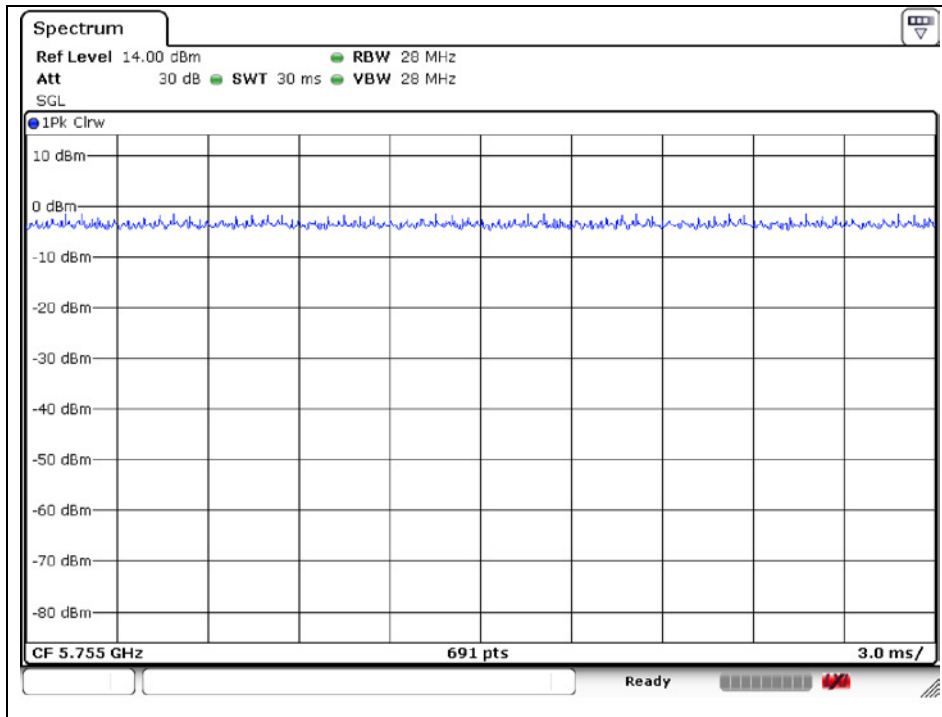


MCS15

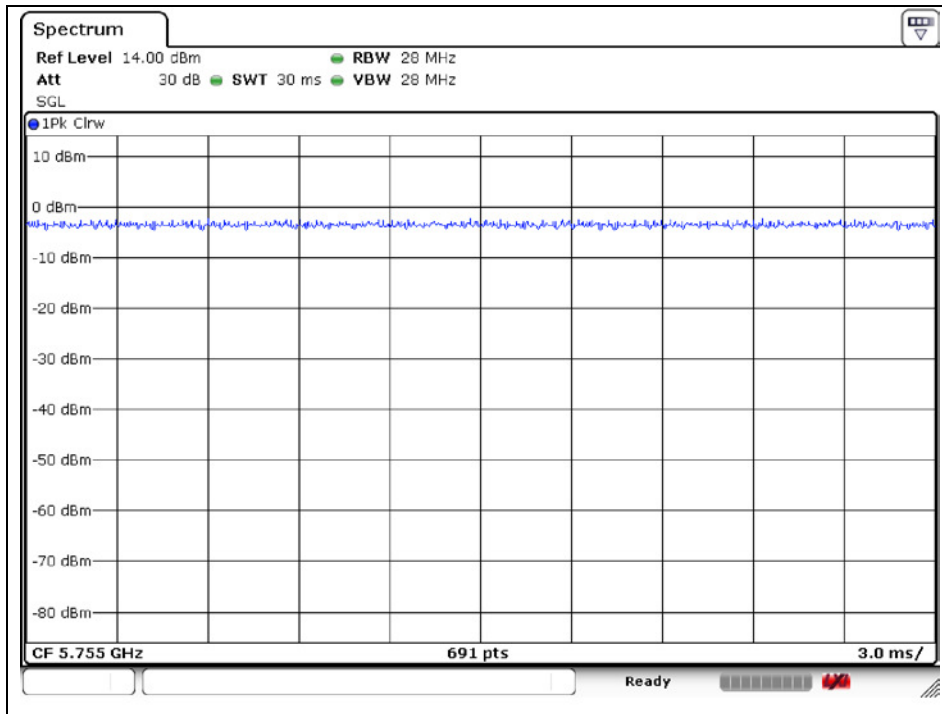


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

**OFDM: 802.11n\_HT40 – ANT2**  
MCS0

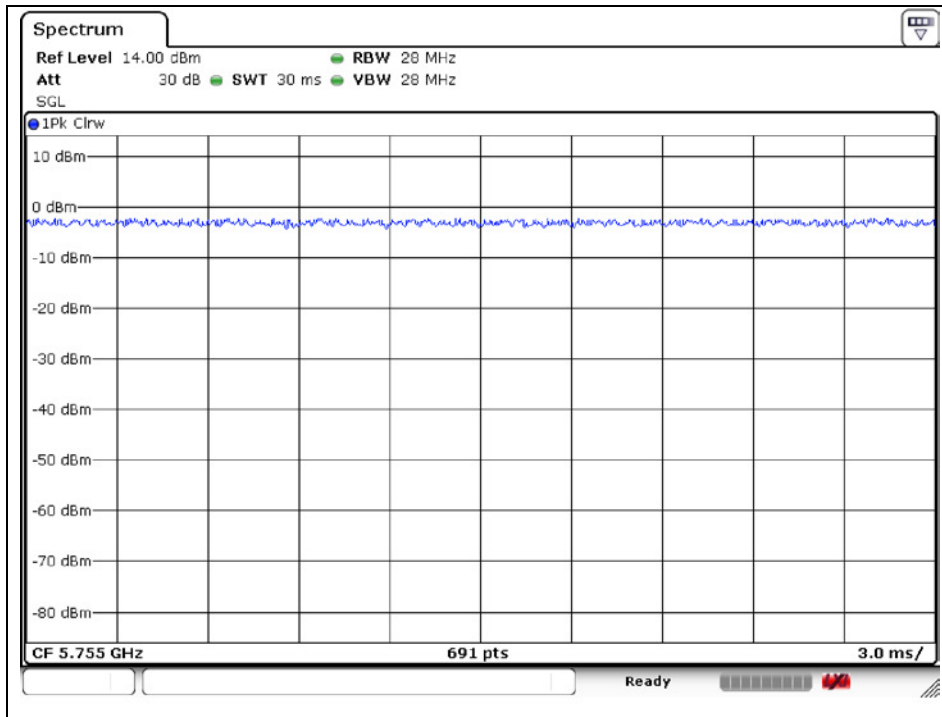


MCS1

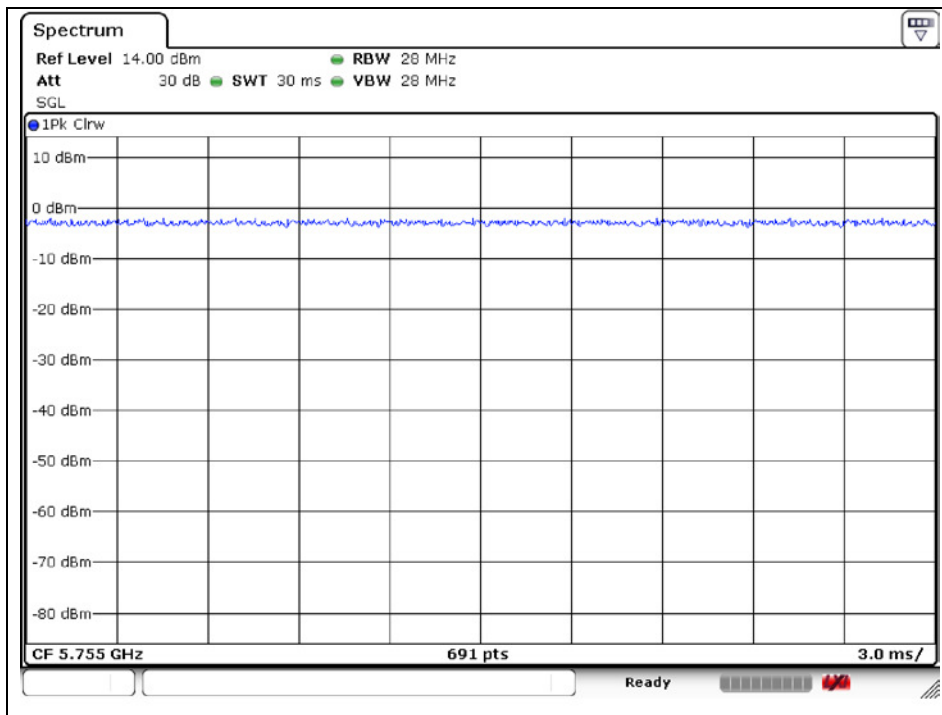


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS2



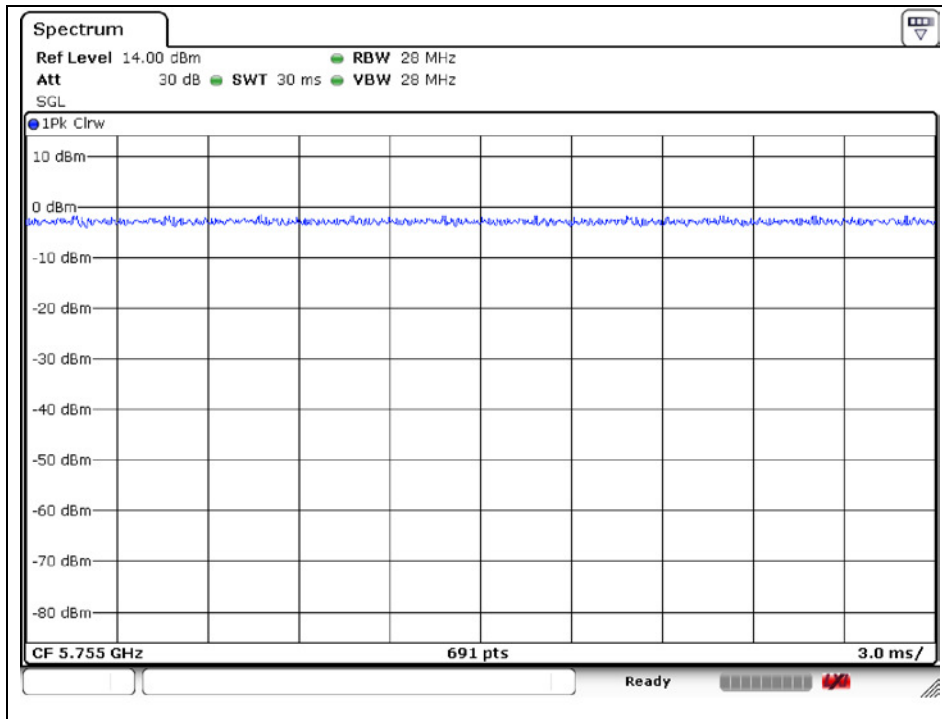
MCS3



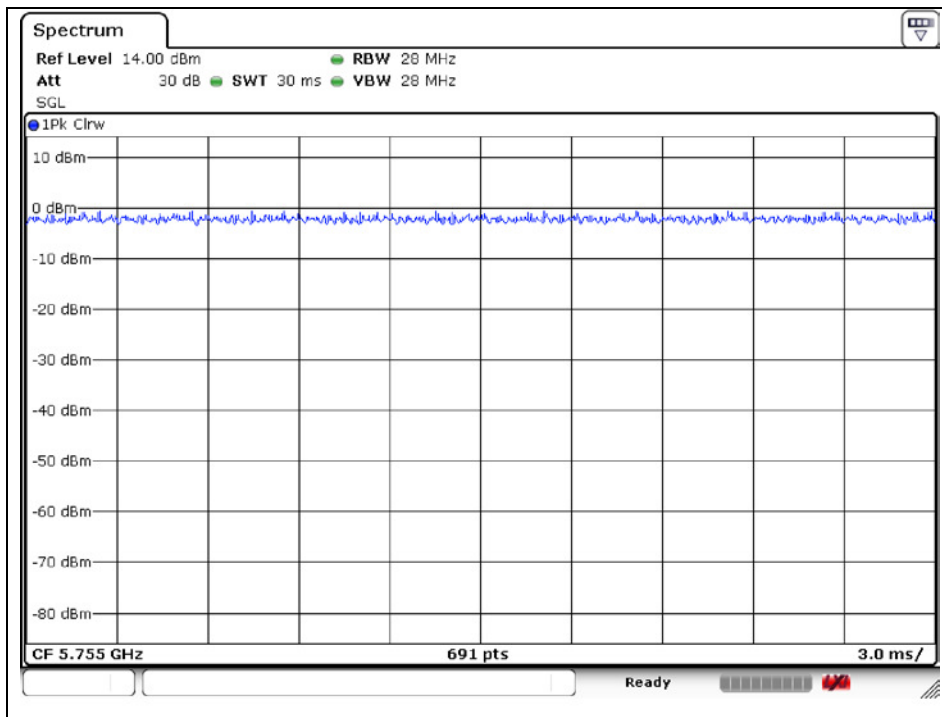
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.



MCS4

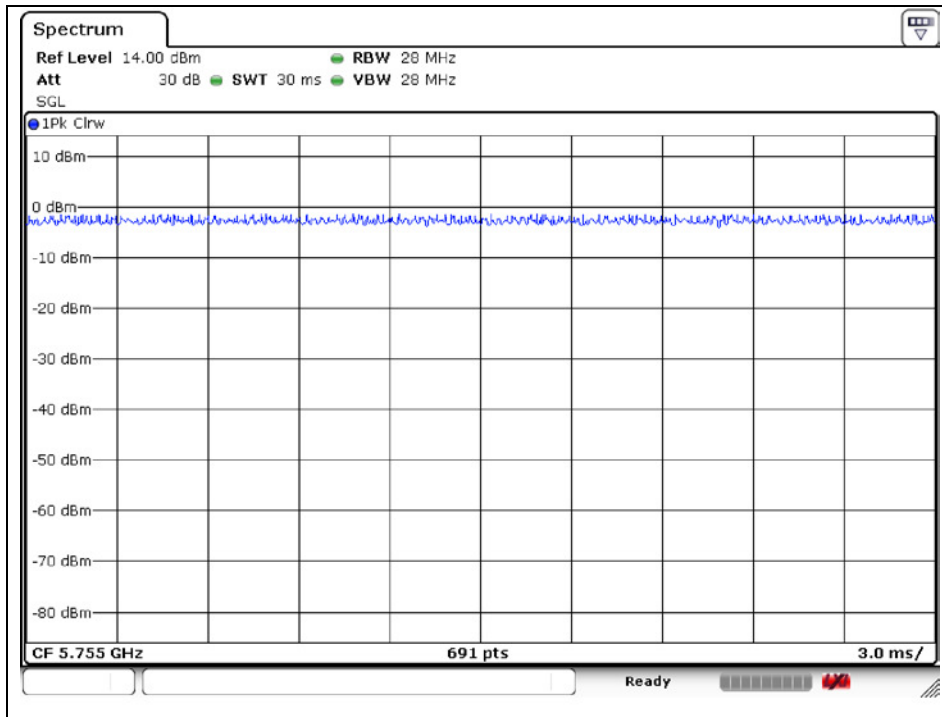


MCS5

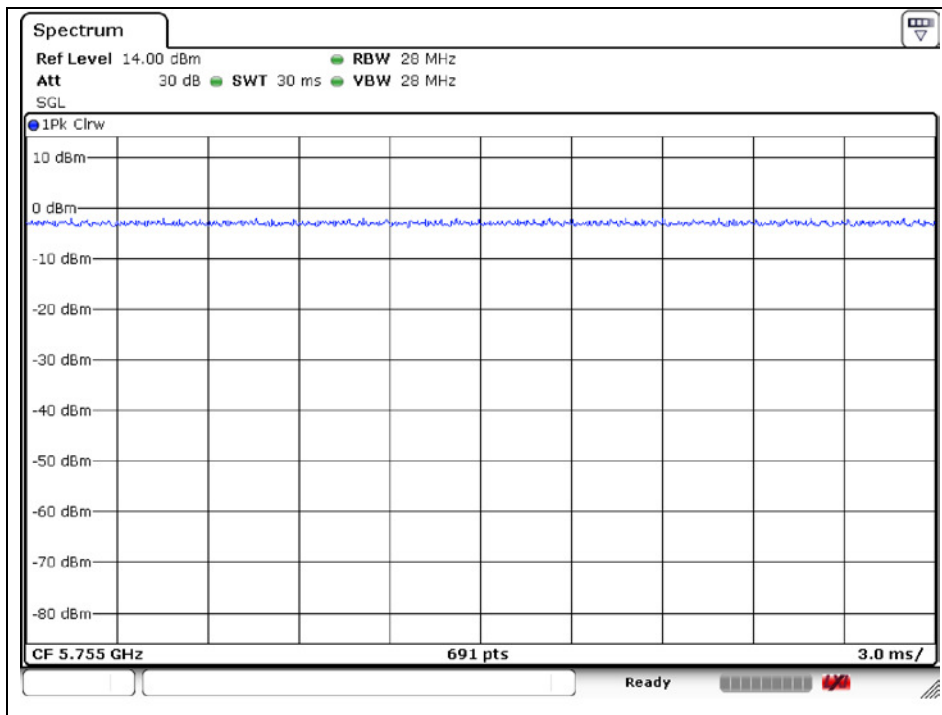


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS6

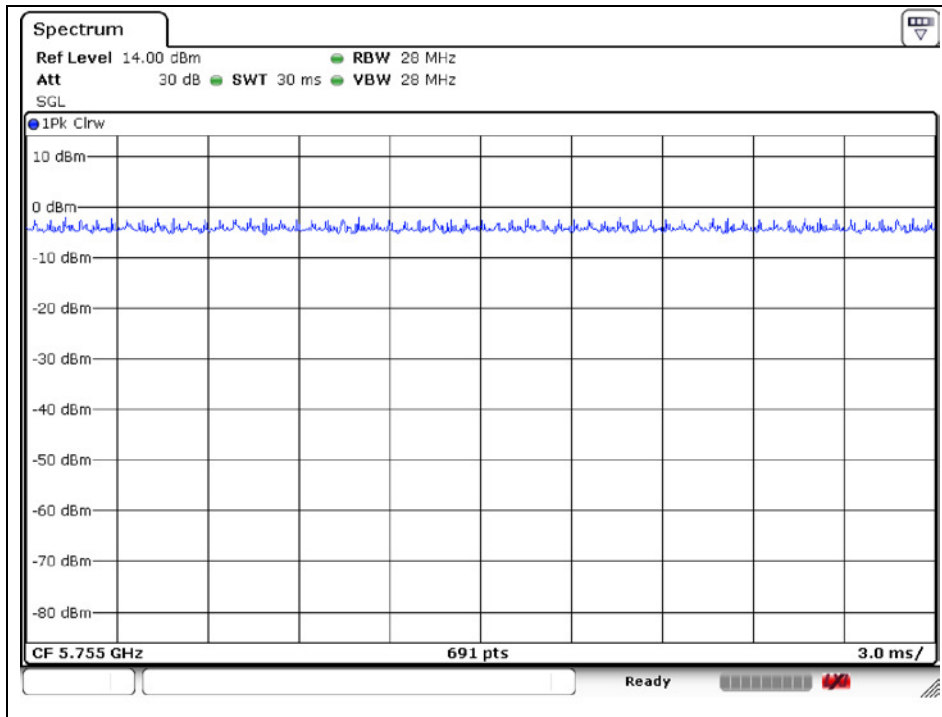


MCS7

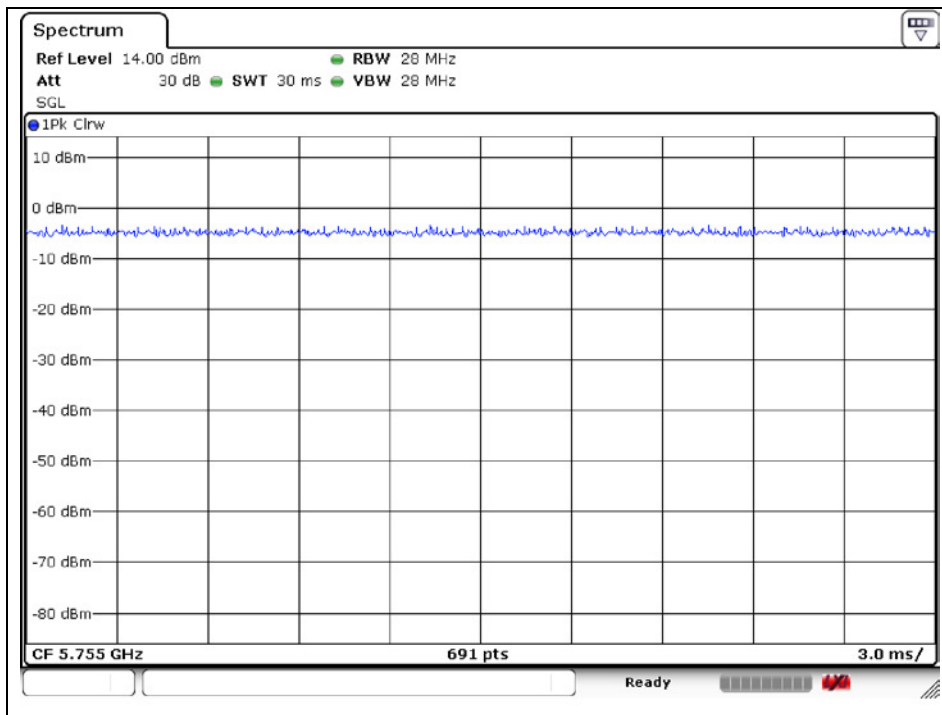


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS8

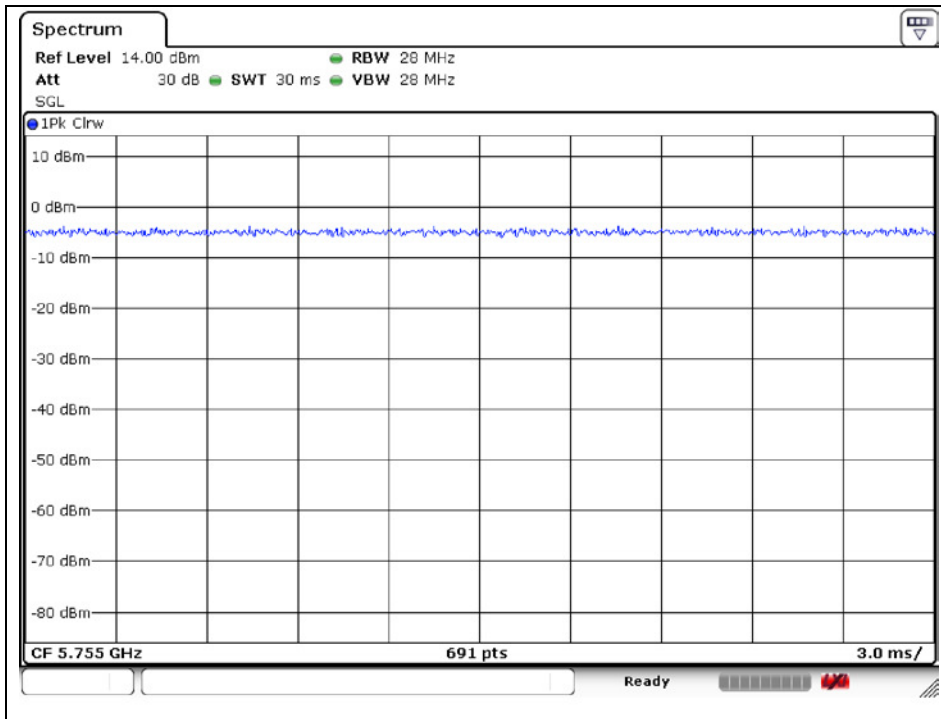


MCS9

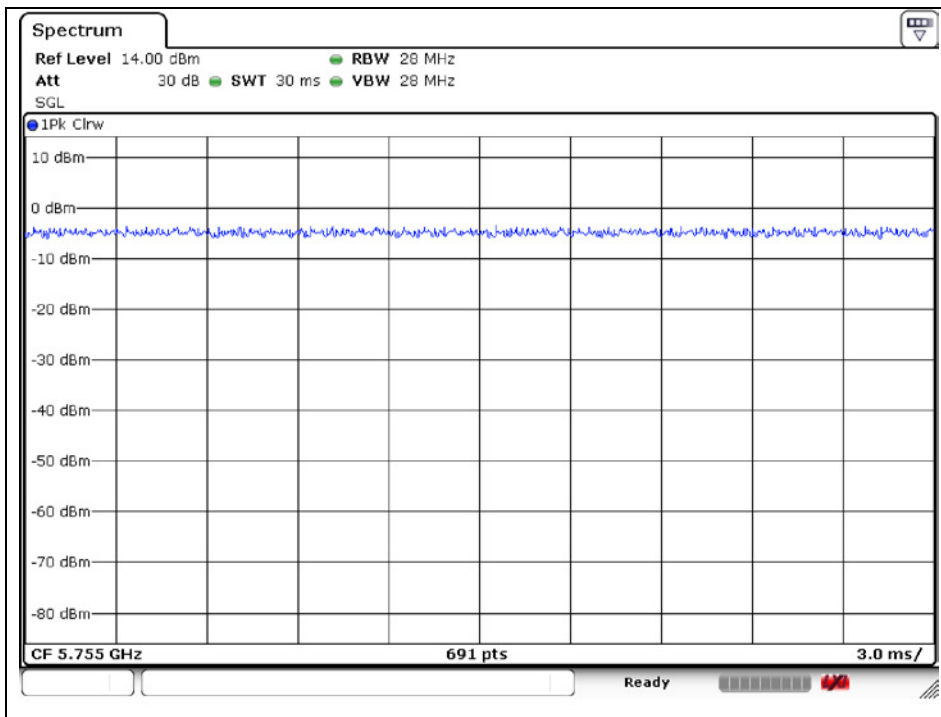


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS10

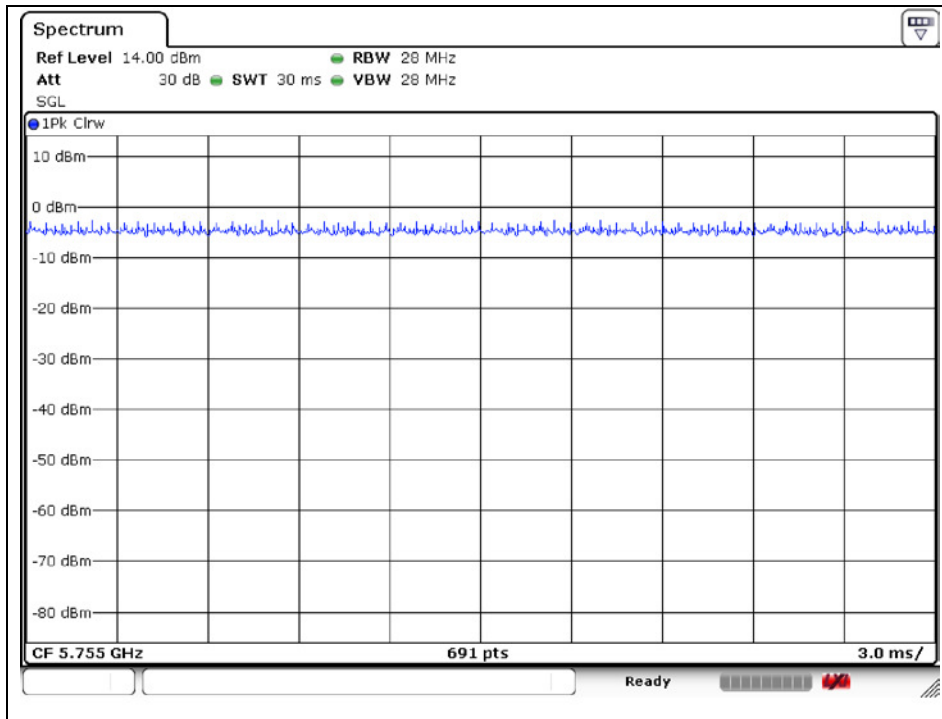


MCS11

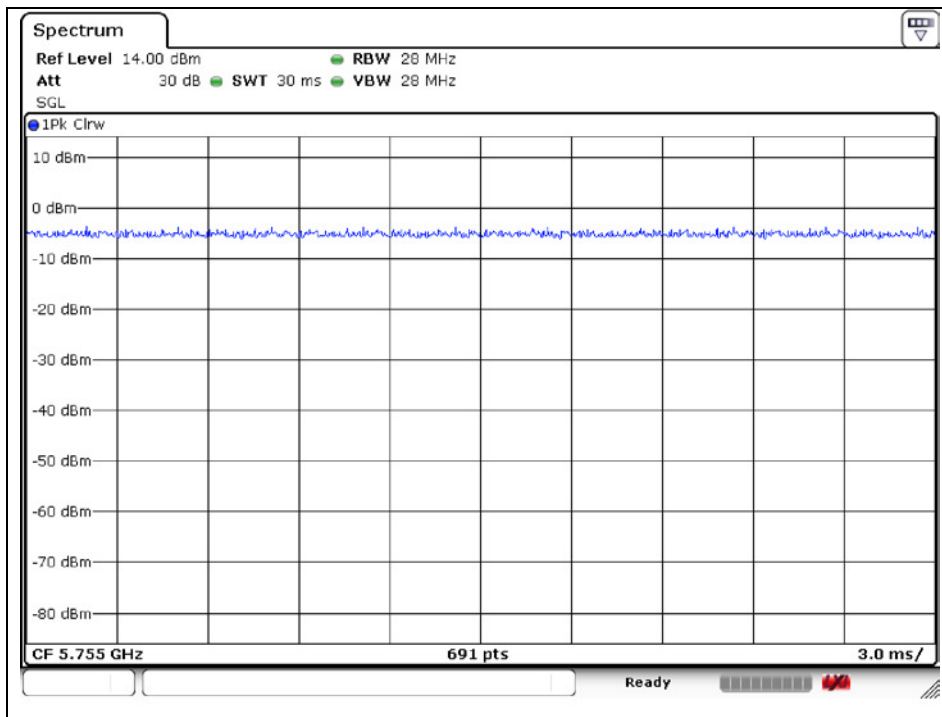


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS12

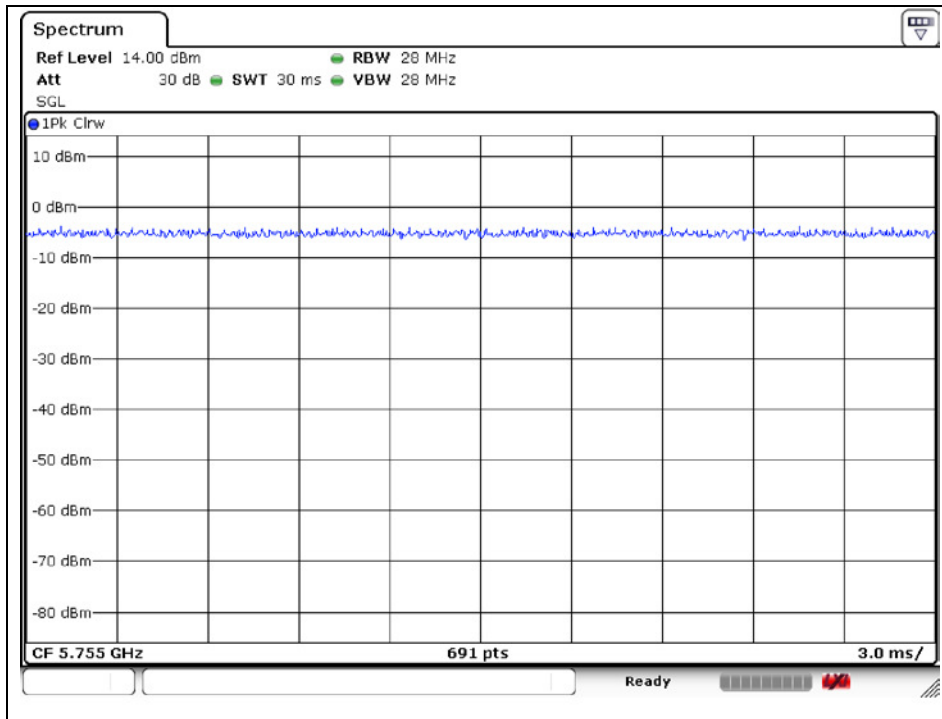


MCS13

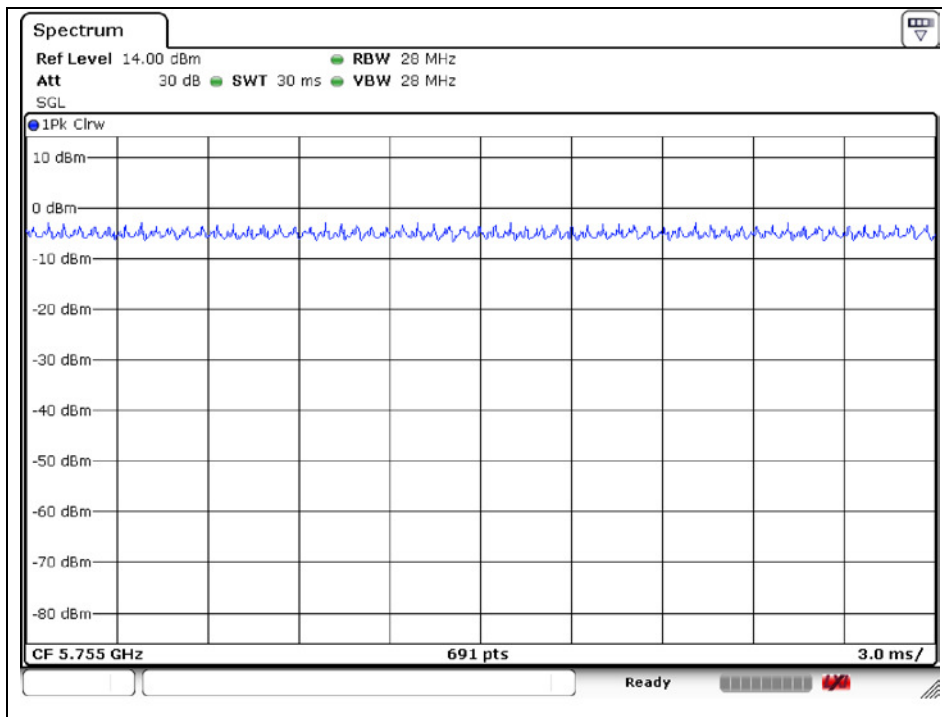


The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

MCS14



MCS15



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.