

## 4. 6 dB Bandwidth

### 4.1. Test Setup



### 4.2. Limit

According to §15.407(e), within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 4.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section C.2 of KDB 789033 D02 v02r01.
2. Set RBW = 100 kHz.
3. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### Remark;

In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 v02r01.

*The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.*

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

### 4.4. Test result

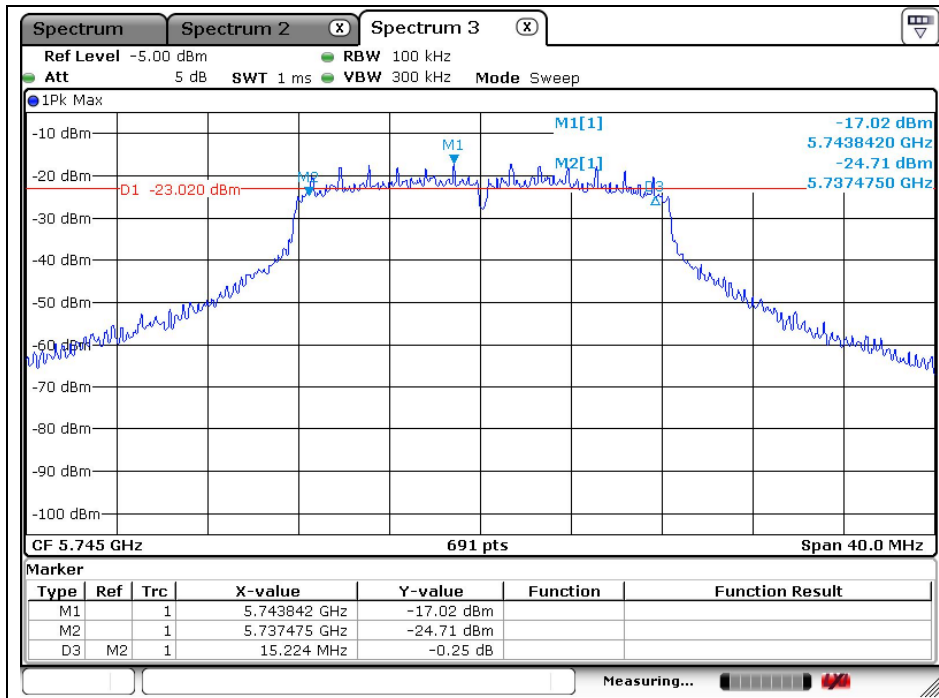
Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	Ch.	Data Rate(Mbps)	6 dB Bandwidth (MHz)		Minimum Bandwidth (MHz)
					ANT 1	ANT 2	
U-NII 3	11a	5 745	149	6	15.224	15.282	500
		5 785	157		15.224	15.166	
		5 825	165		15.224	15.282	
	11n_HT20	5 745	149	MCS0	15.166	15.109	
		5 785	157		15.166	15.166	
		5 825	165		15.166	15.282	
	11n_HT40	5 755	151	MCS0	35.080	35.311	
		5 795	159		35.030	35.311	
	11ac_VHT80	5 775	155	MCS0	75.080	75.250	
U-NII 3 (Band-Crossing channels)	11a	5 720	144	6	2.685	2.525	
	11n_HT20	5 720	144	MCS0	2.742	2.583	
	11n_HT40	5 710	142	MCS0	2.740	2.630	
	11ac_VHT80	5 690	138	MCS0	2.510	2.742	

### - Test plots

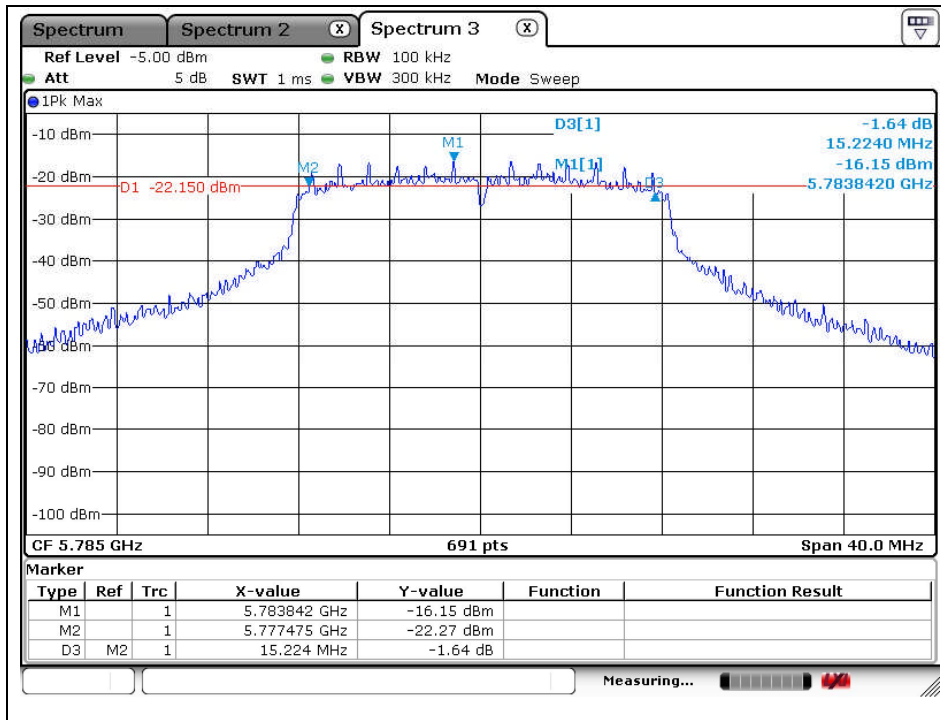
#### 802.11a (Band 3)\_ANT 1

Low Channel (5 745 MHz)

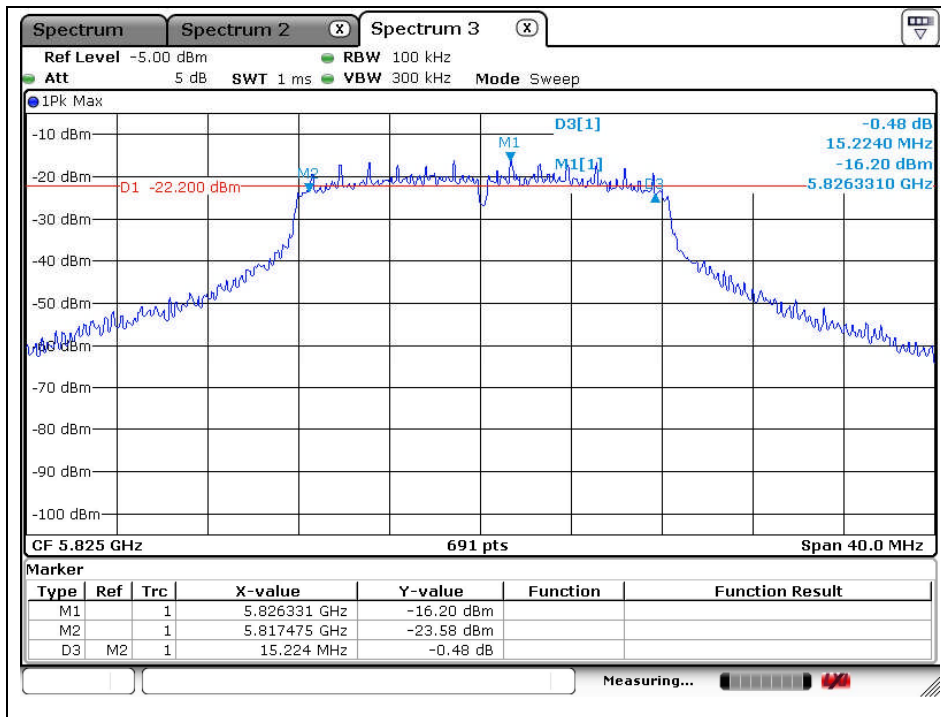


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

Middle Channel (5 785 MHz)



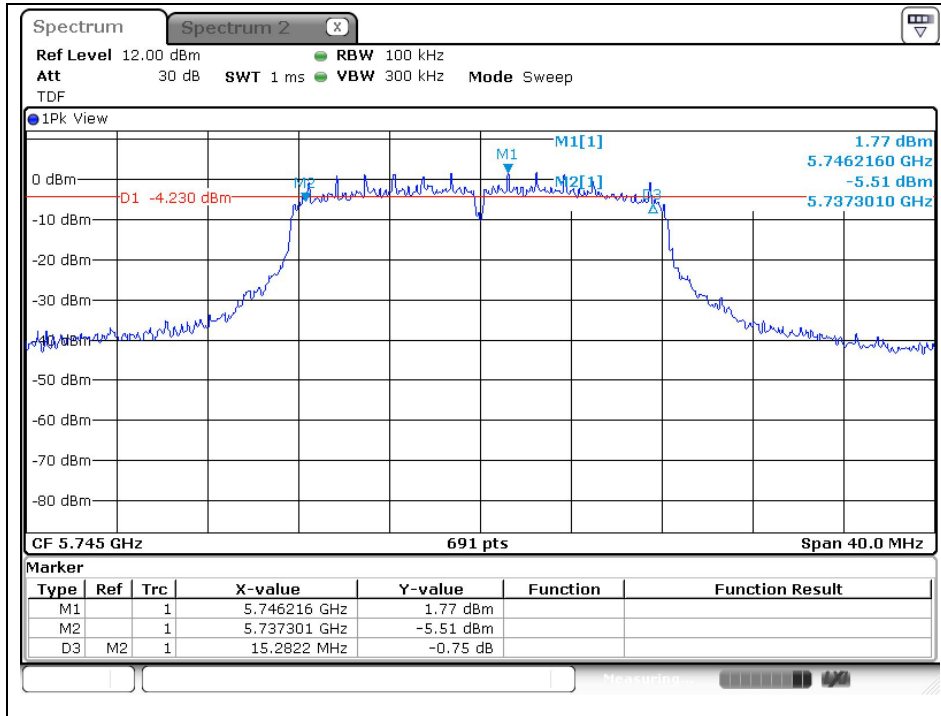
High Channel (5 825 MHz)



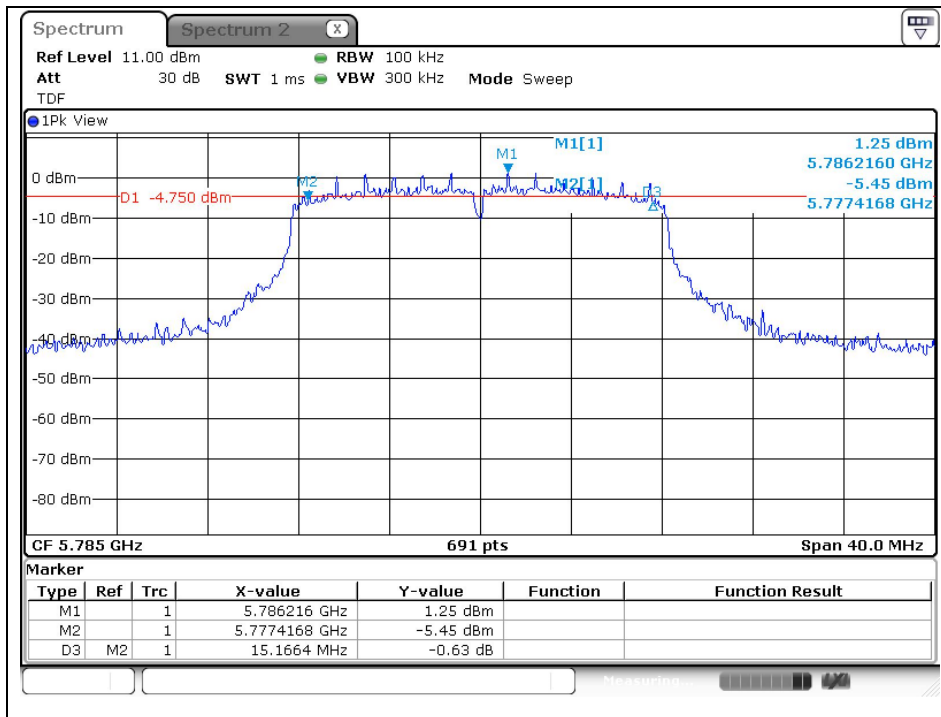
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## 802.11a (Band 3)\_ANT 2

Low Channel (5 745 MHz)

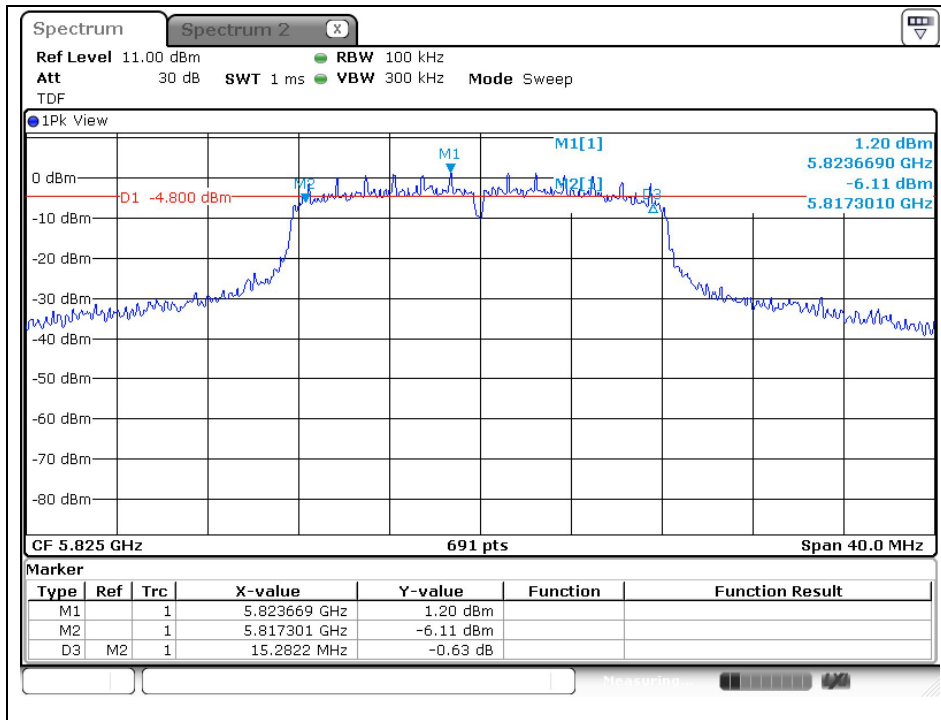


Middle Channel (5 785 MHz)



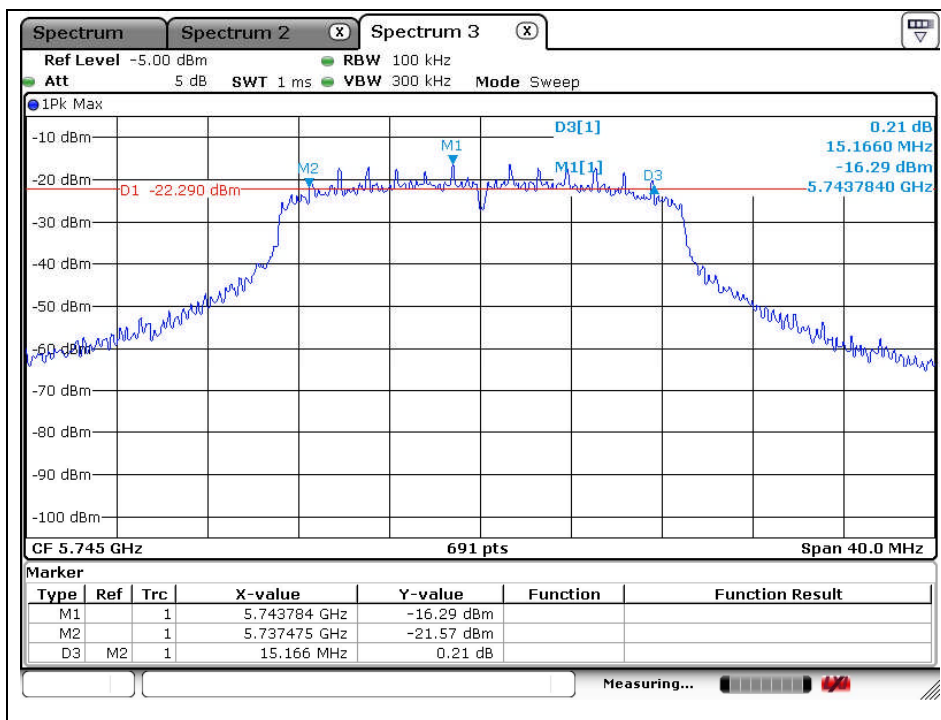
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

High Channel (5 825 MHz)



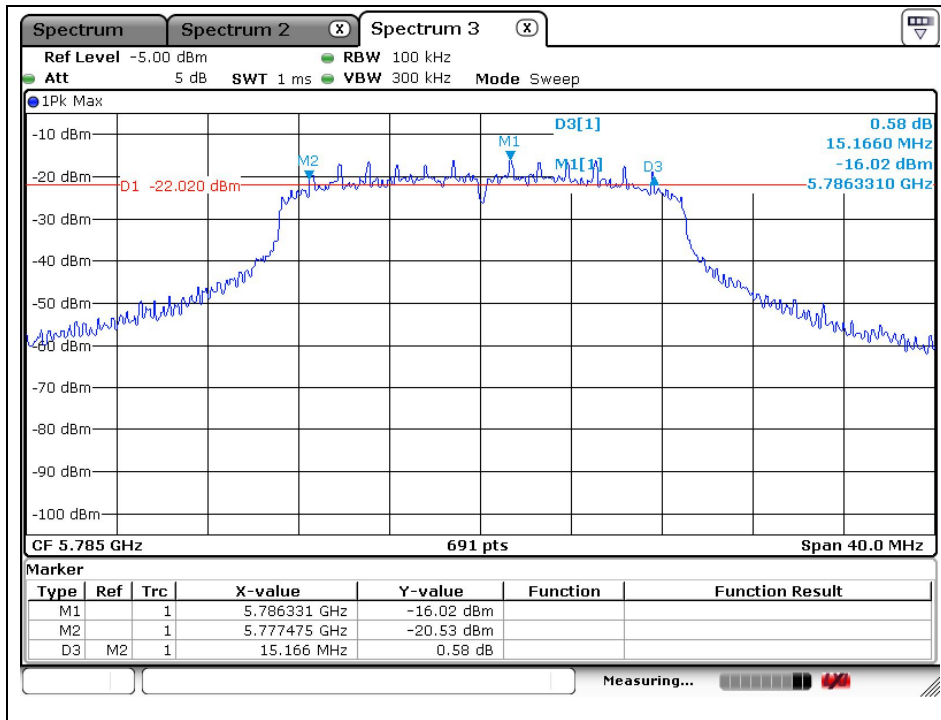
802.11n\_HT20 (Band 3)\_ANT 1

Low Channel (5 745 MHz)

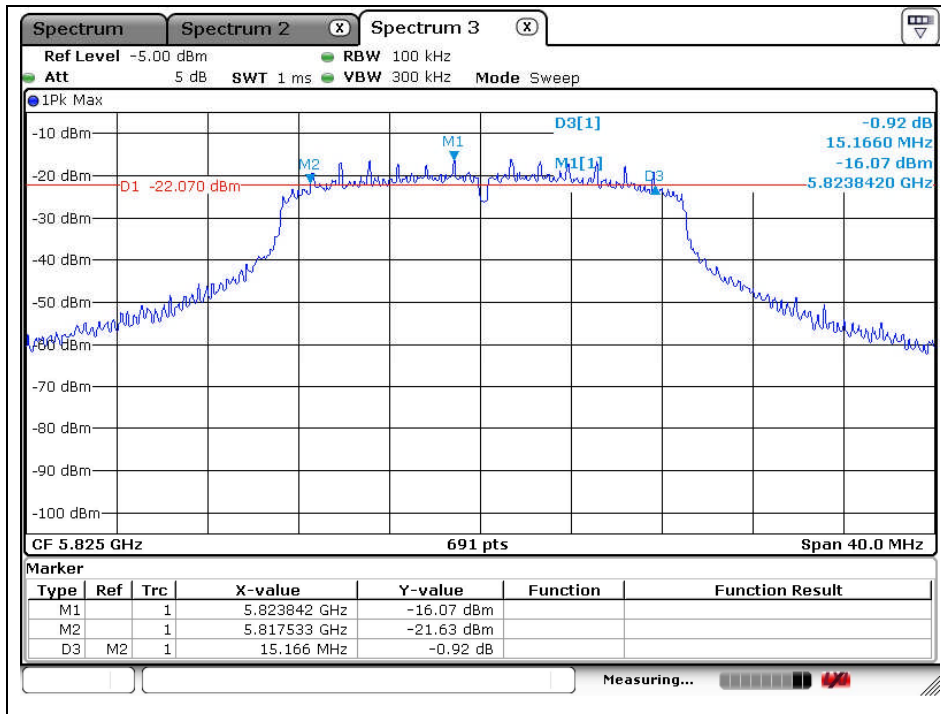


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

Middle Channel (5 785 MHz)



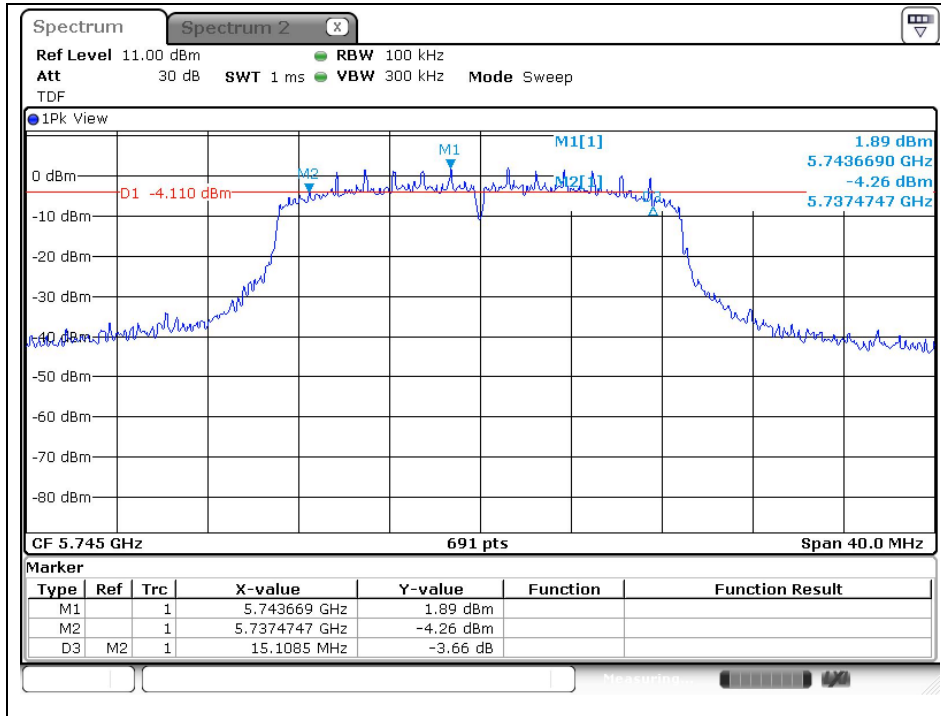
High Channel (5 825 MHz)



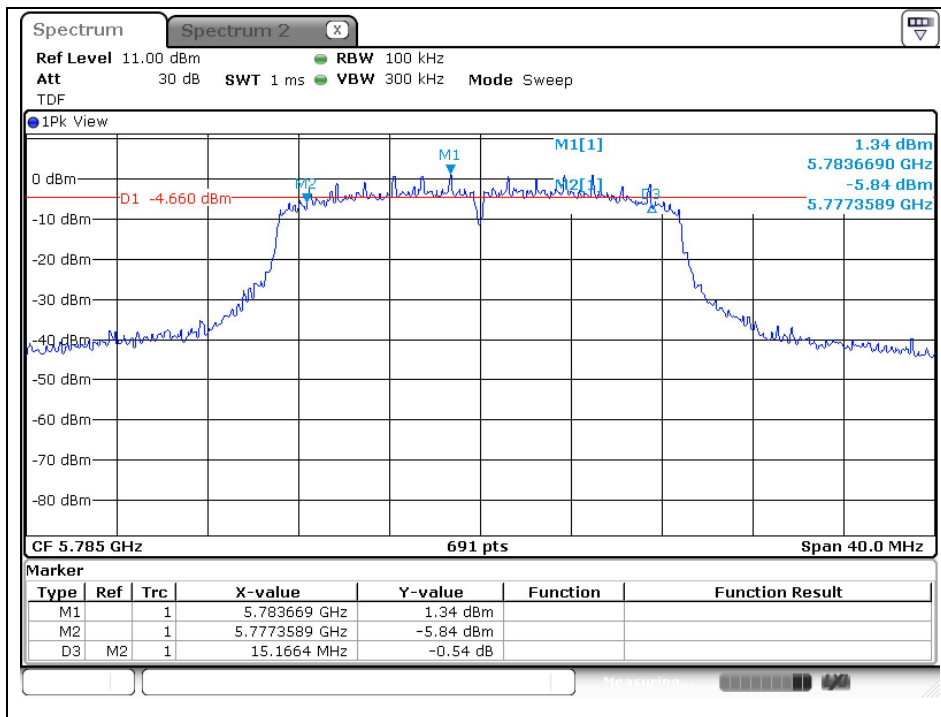
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## 802.11n\_HT20 (Band 3)\_ANT 2

Low Channel (5 745 MHz)

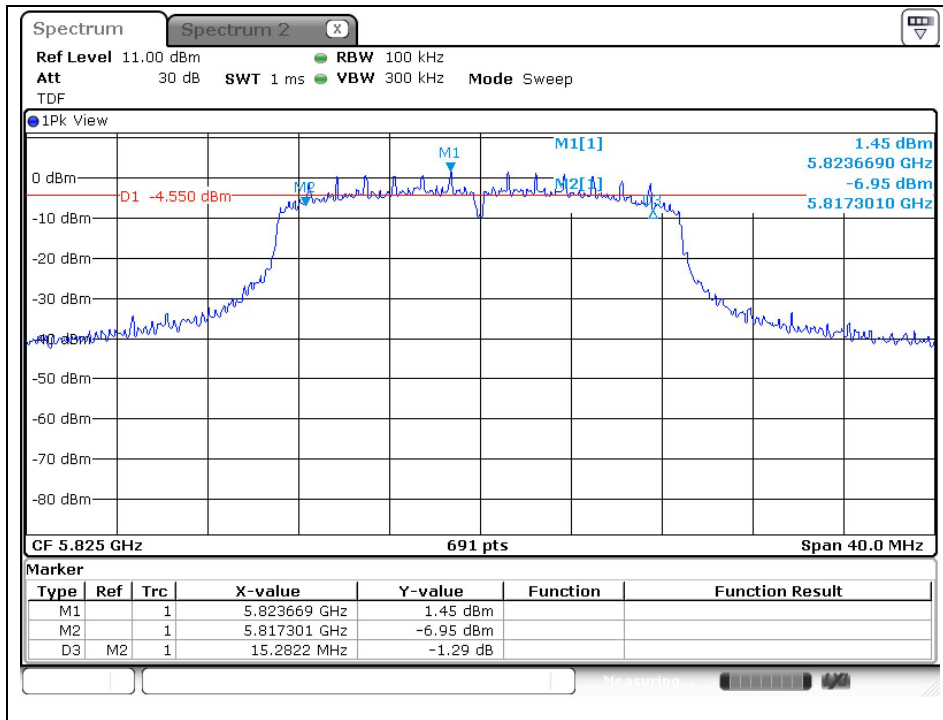


Middle Channel (5 785 MHz)



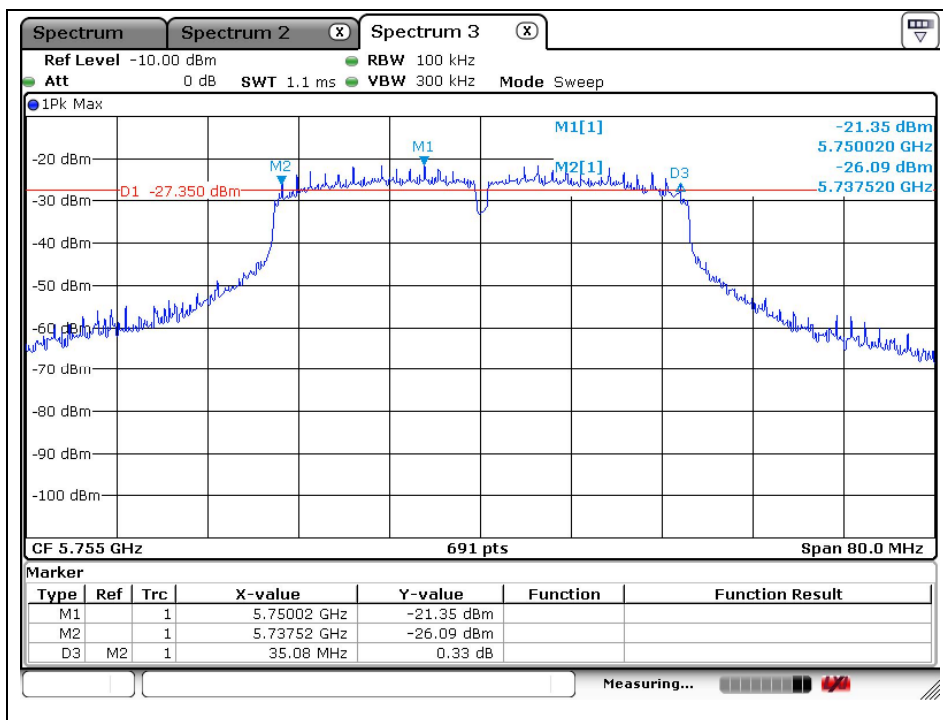
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

High Channel (5 825 MHz)



802.11n\_HT40 (Band 3)\_ANT 1

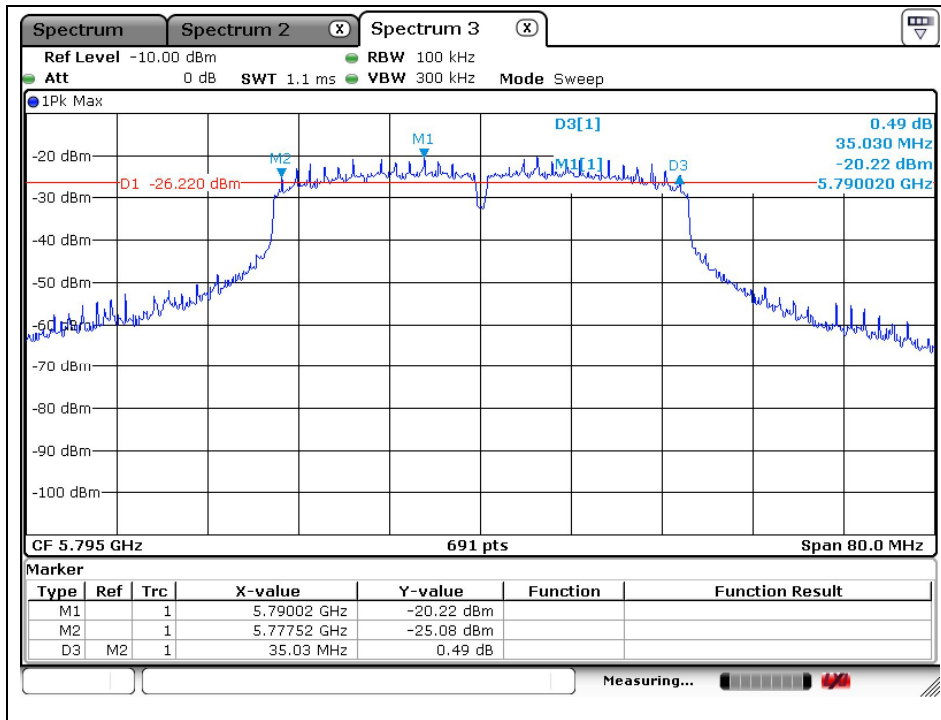
Low Channel (5 755 MHz)



The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

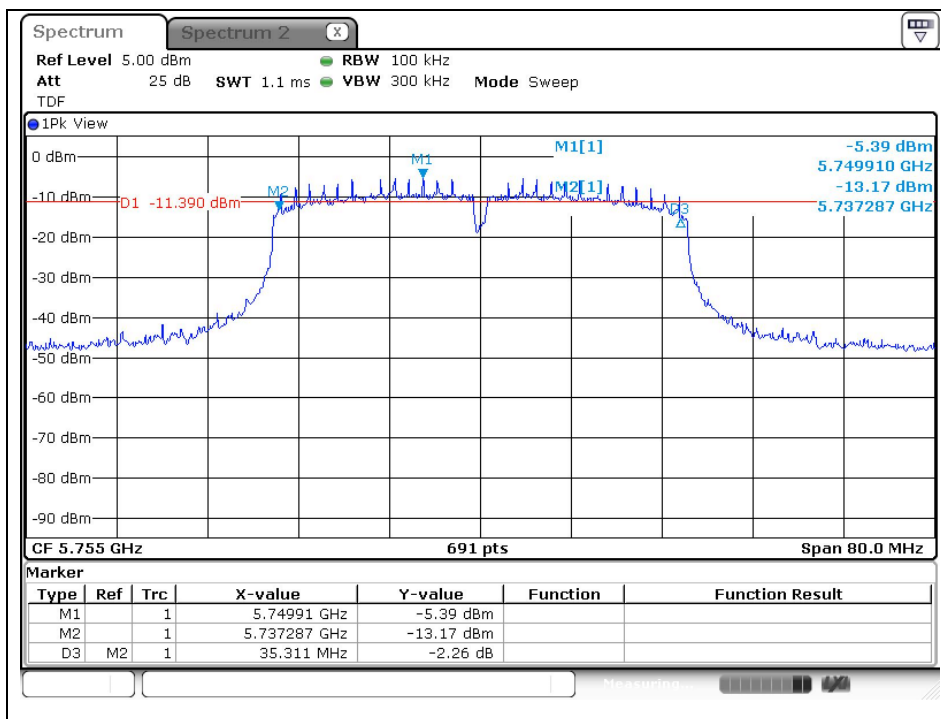


High Channel (5 795 MHz)



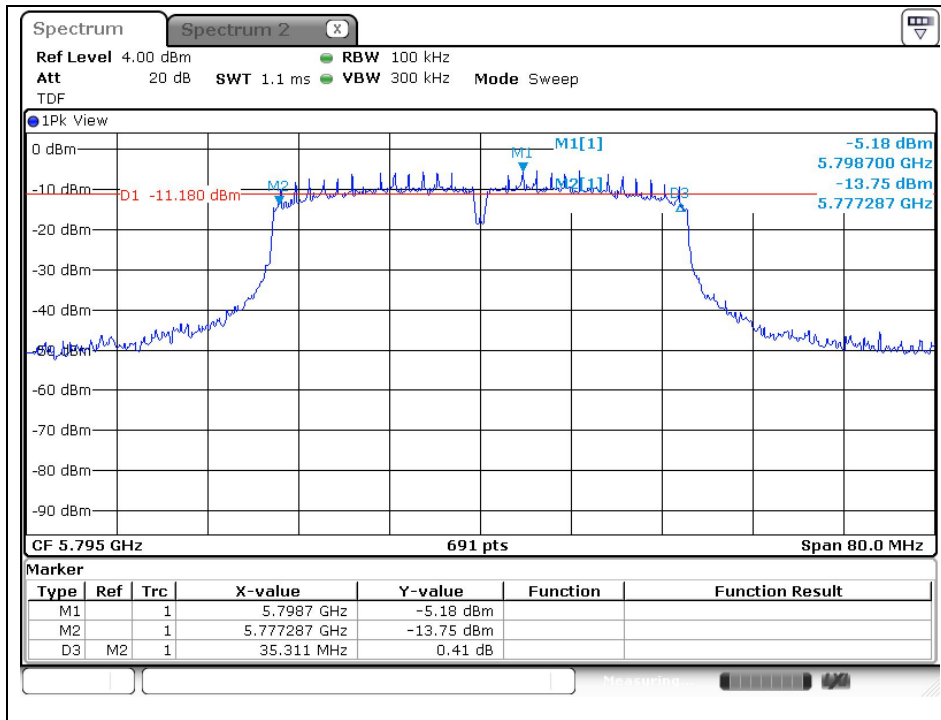
802.11n\_HT40 (Band 3)\_ANT 2

Low Channel (5 755 MHz)



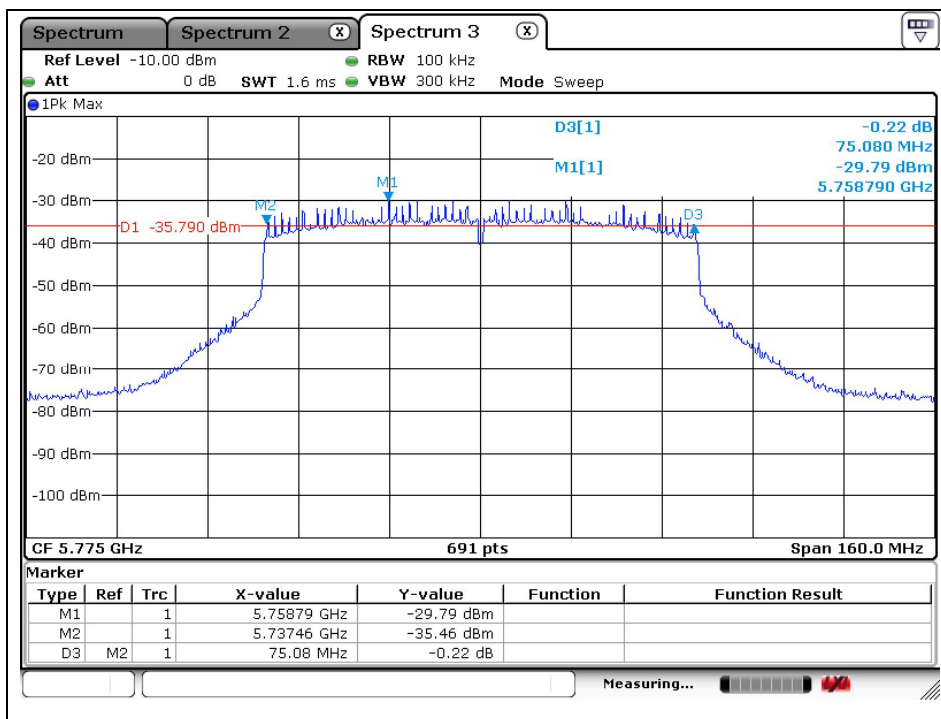
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

High Channel (5 795 MHz)



802.11ac\_VHT80 (Band 3)\_ANT 1

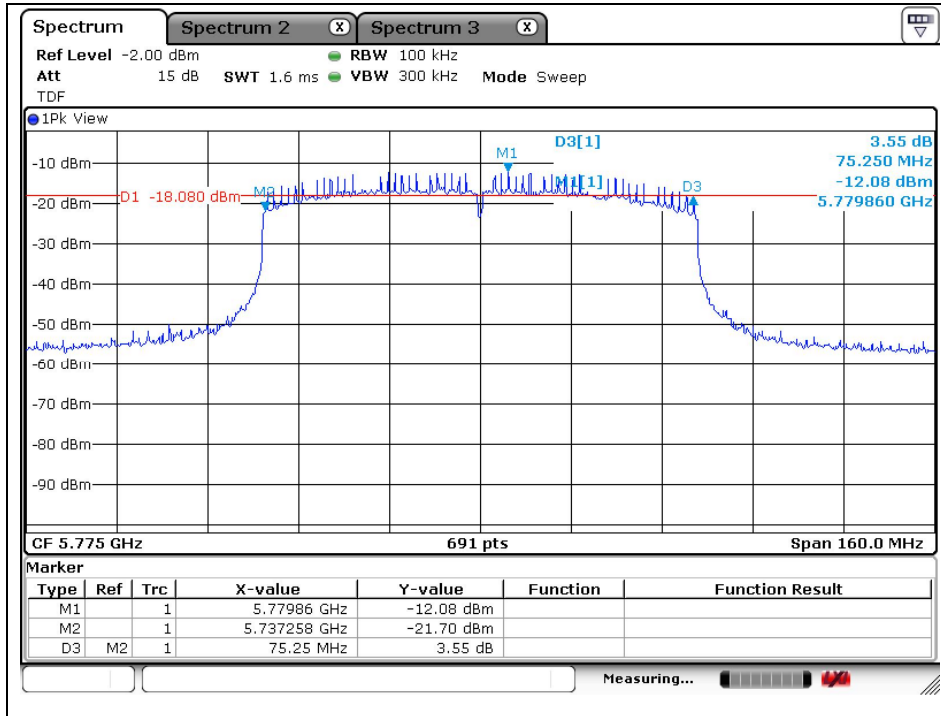
Middle Channel (5 775 MHz)



The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## 802.11ac\_VHT80 (Band 3)\_ANT 2

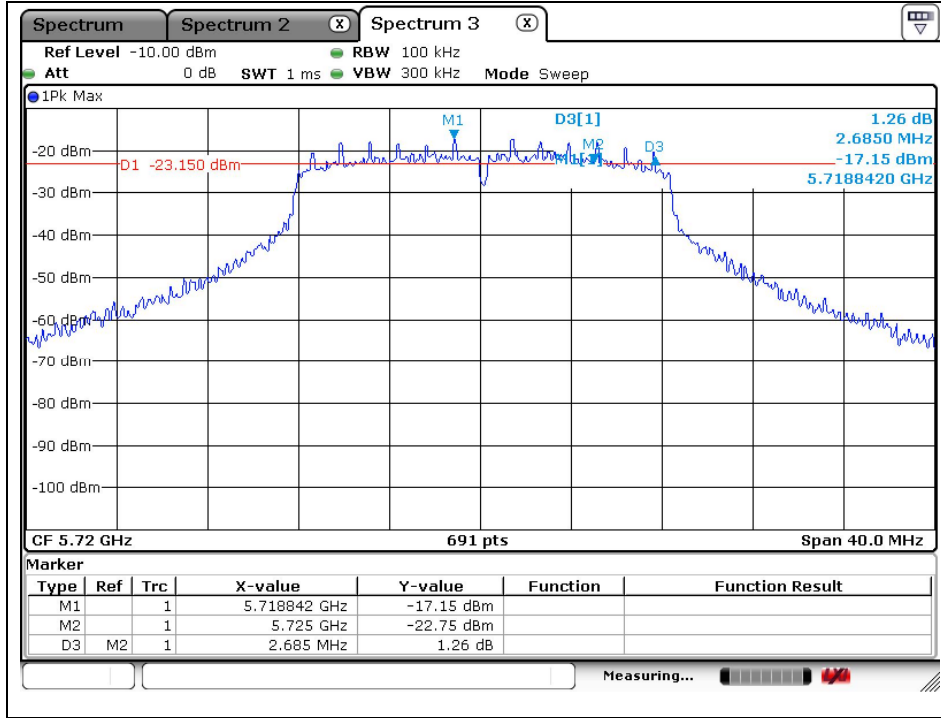
Middle Channel (5 775 MHz)



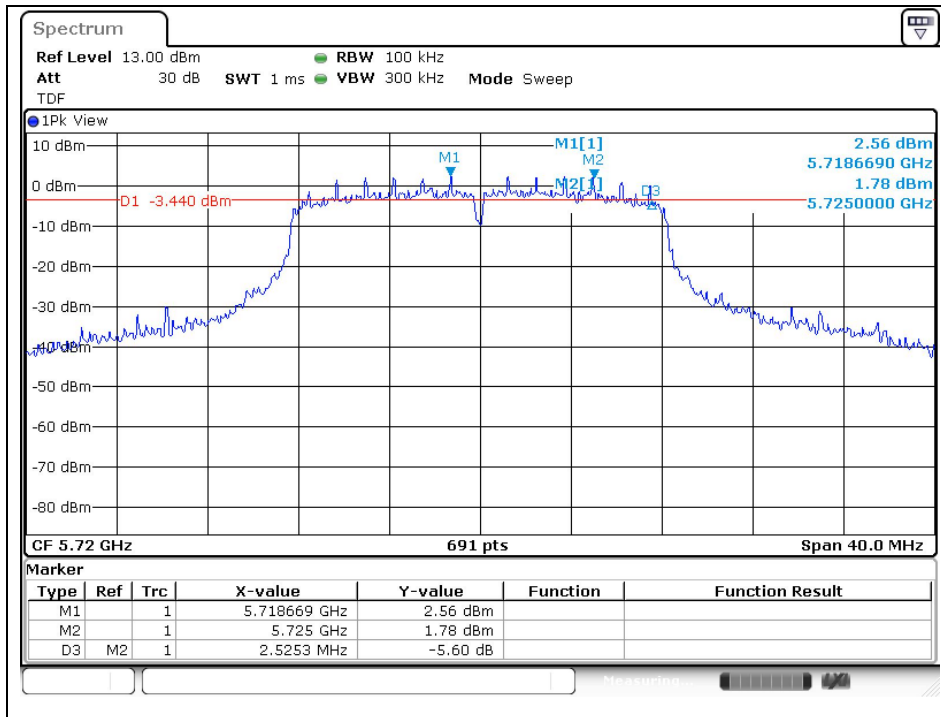
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## Band-crossing channels

802.11a (5 720 MHz)\_ANT 1

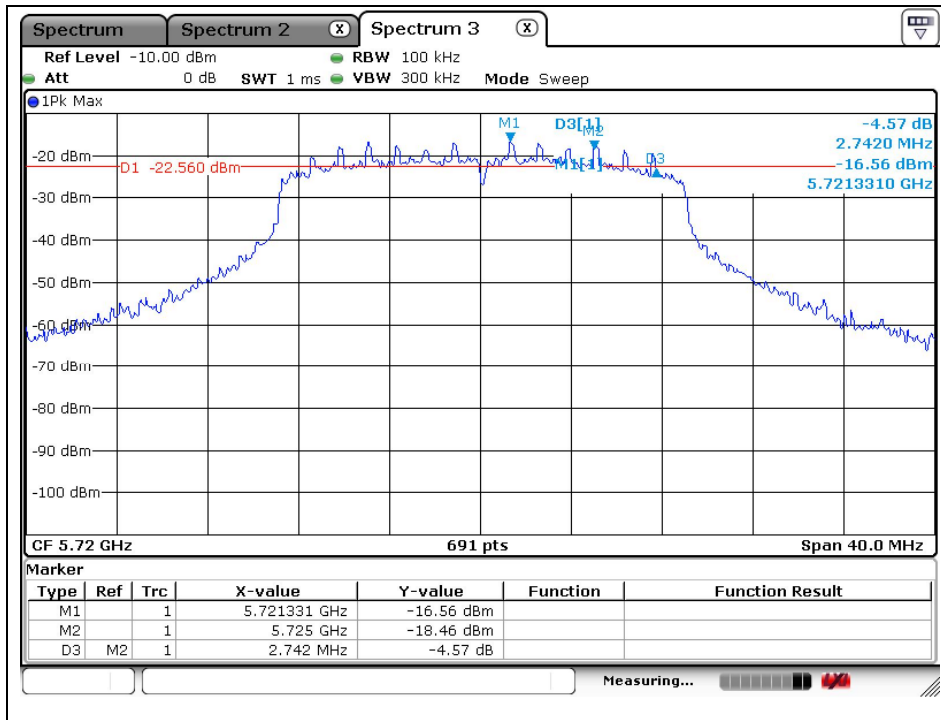


802.11a (5 720 MHz)\_ANT 2

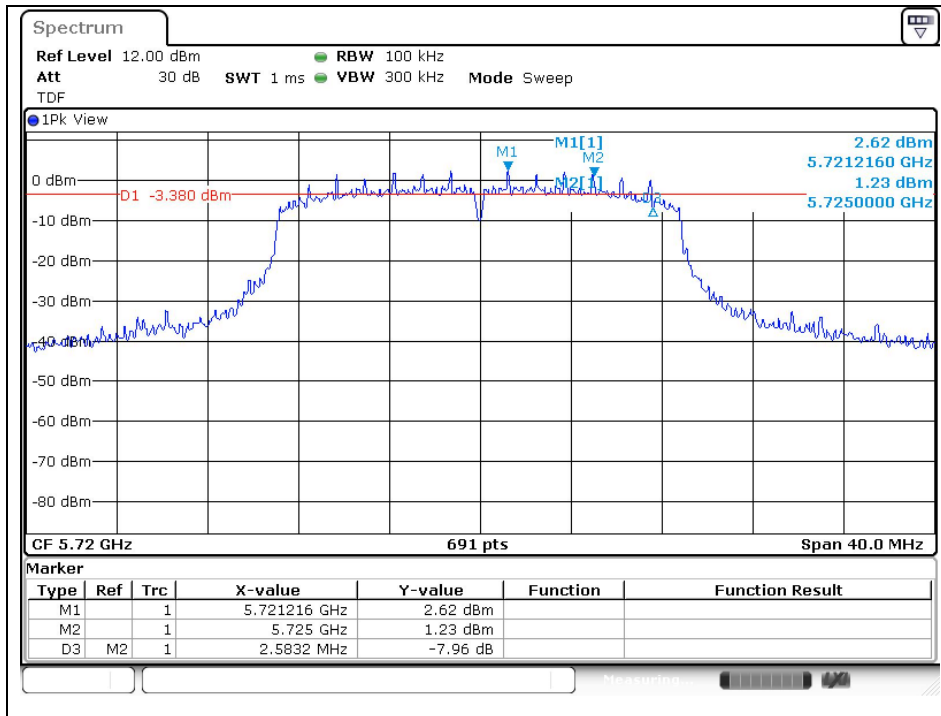


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

802.11n\_HT20 (5 720 MHz)\_ANT 1

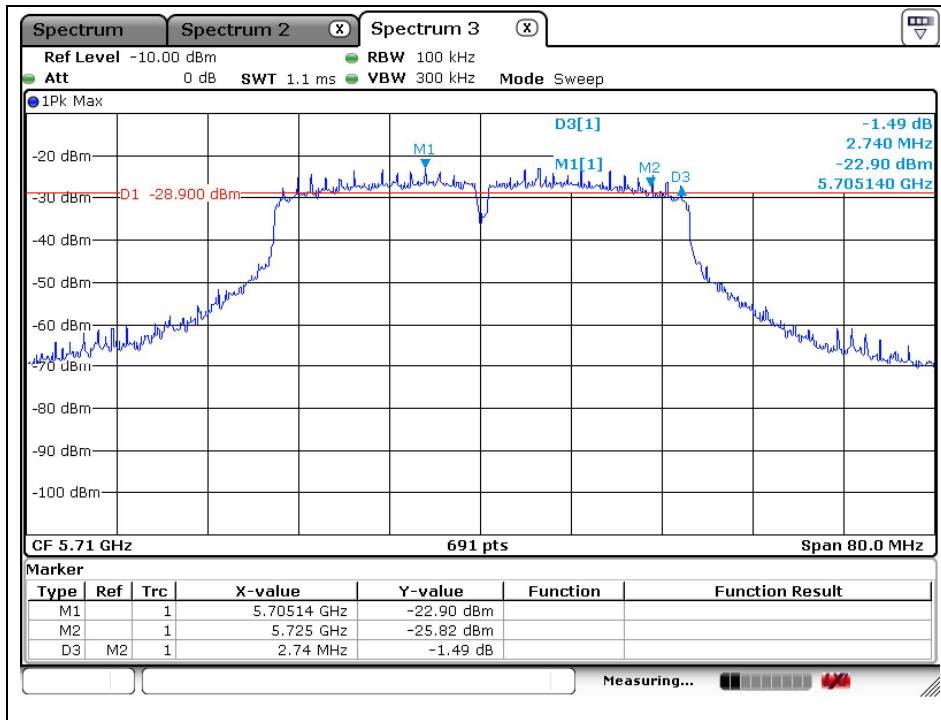


802.11n\_HT20 (5 720 MHz)\_ANT 2

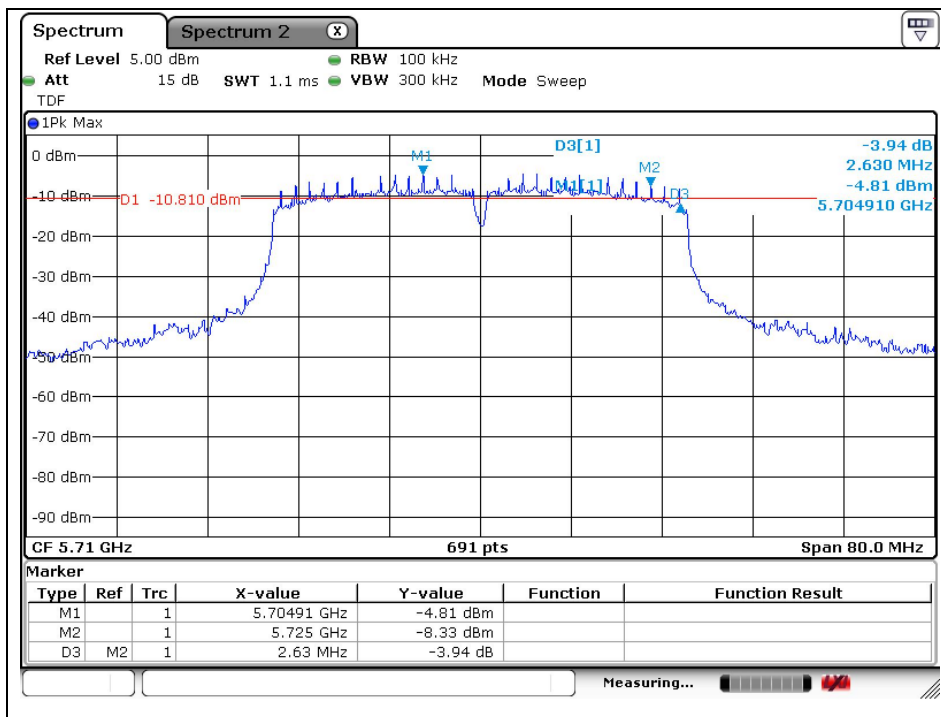


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

802.11n\_HT40 (5 710 MHz)\_ANT 1

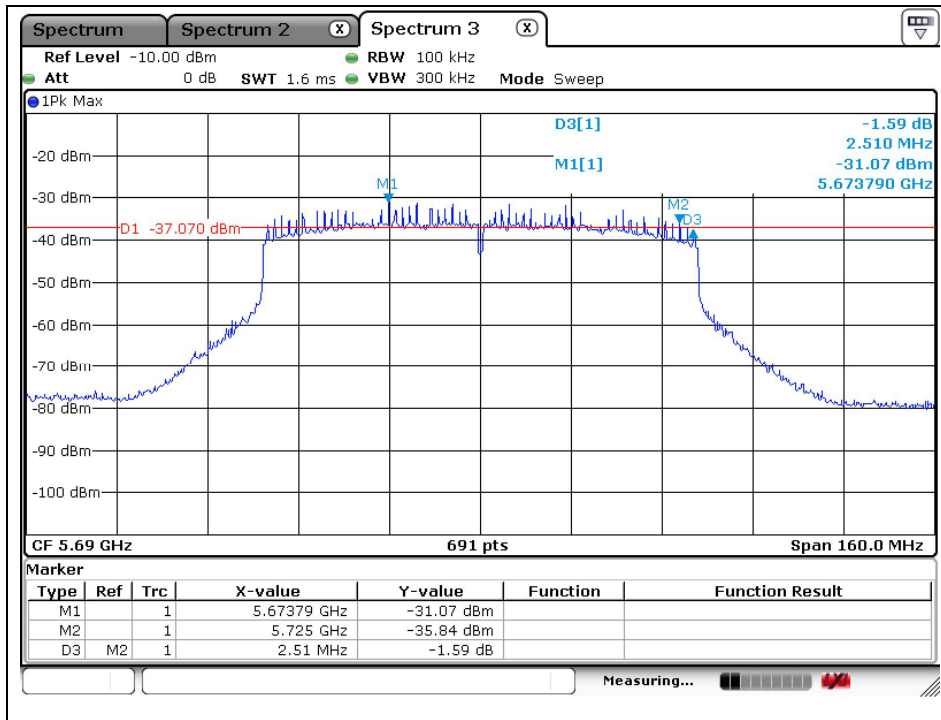


802.11n\_HT40 (5 710 MHz)\_ANT 2

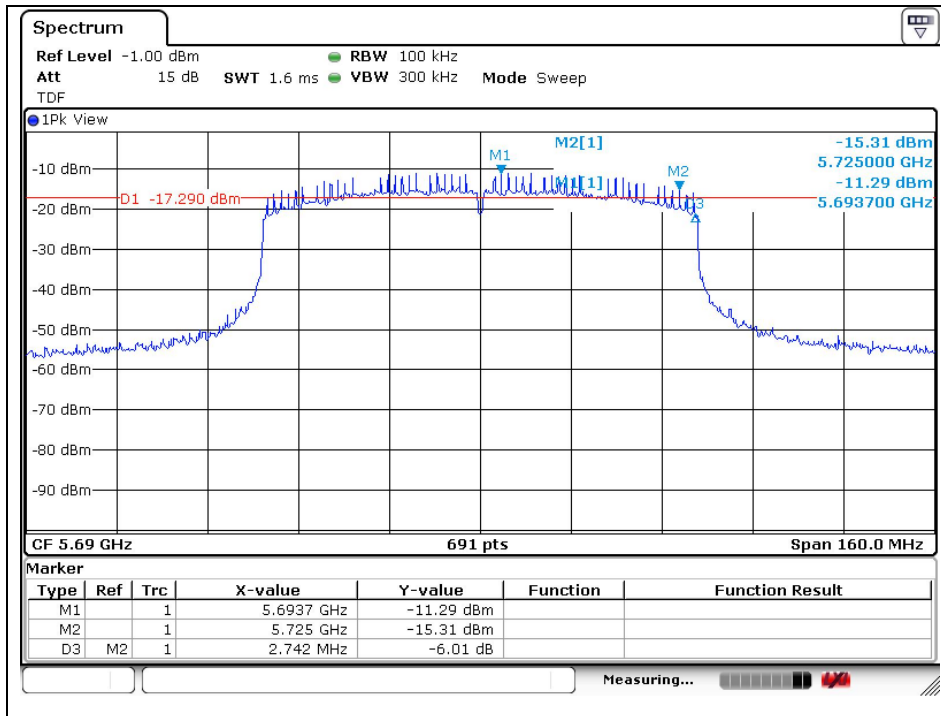


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

802.11ac\_VHT80 (5 690 MHz)\_ANT 1



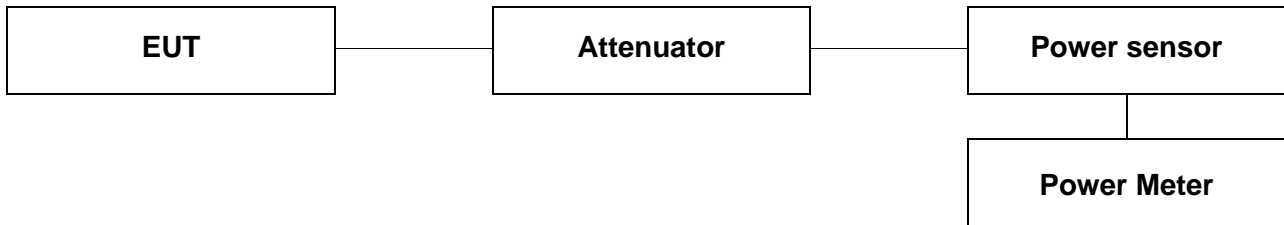
802.11ac\_VHT80 (5 690 MHz)\_ANT 2



The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## 5. Maximum Conducted Output Power

### 5.1. Test Setup



### 5.2. Limit

#### According to 15.407 (a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

#### According to 15.407 (a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dB m + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

#### According to 15.407 (a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

*The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.*

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

RTT5041-19(2019.04.24)(1)

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

A4(210 mm x 297 mm)



---

### 5.3. Test Procedure

1. All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.
2. This measurement settings are specified in section E.3.a of KDB 789033 D02 v02r01.
3. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
  - The EUT is configured to transmit continuously or to transmit with a consistent duty cycle.
  - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
  - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
4. If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in section II.B.
5. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
6. Adjust the measurement in dBm by adding  $10 \log(1/x)$  where  $x$  is the duty cycle (e.g.,  $10 \log(1/0.25)$  if the duty cycle is 25 %).
7. In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 v02r01.

---

*The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.*

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

RTT5041-19(2019.04.24)(1)

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

A4(210 mm x 297 mm)

## 5.4. Test result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

### Test mode: 11a

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11a	U-NII 1	5 180	6	13.20	13.04	16.13
		5 220		12.70	13.57	16.17
		5 240		12.69	13.54	16.15
	U-NII 2A	5 260		12.45	13.82	16.20
		5 300		12.84	13.76	16.33
		5 320		12.39	14.46	16.56
	U-NII 2C	5 500		12.97	15.09	17.17
		5 580		12.48	13.84	16.22
		5 700		13.47	12.61	16.07
	U-NII 3	5 745		14.11	12.45	16.37
		5 785		14.68	11.57	16.41
		5 825		14.76	11.15	16.33

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1+ANT 2 (dB m)	Duty Factor (dB)	Average Power Result (dB m)
11a	U-NII 1	5 180	6	16.13	0.21	16.34
		5 220		16.17		16.38
		5 240		16.15		16.36
	U-NII 2A	5 260		16.20		16.41
		5 300		16.33		16.54
		5 320		16.56		16.77
	U-NII 2C	5 500		17.17		17.38
		5 580		16.22		16.43
		5 700		16.07		16.28
	U-NII 3	5 745		16.37		16.58
		5 785		16.41		16.62
		5 825		16.33		16.54

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB m)
U-NII 1	5 180	23.98			3.53	23.98
	5 220					
	5 240					
U-NII 2A	5 260	23.98	21.592	24.34	4.76	23.98
	5 300		21.129	24.25		
	5 320		21.041	24.23		
U-NII 2C	5 500	23.98	21.129	24.25	4.78	23.98
	5 580		20.839	24.19		
	5 700		20.637	24.15		
U-NII 3	5 745	30			4.89	30.00
	5 785					
	5 825					

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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

**Test mode: 11n\_HT20**

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11n_HT20	U-NII 1	5 180	MCS0	12.64	13.11	15.89
		5 220		12.41	13.67	16.10
		5 240		12.39	13.82	16.17
	U-NII 2A	5 260		12.31	13.55	15.98
		5 300		12.70	13.81	16.30
		5 320		12.30	14.43	16.50
	U-NII 2C	5 500		12.50	14.89	16.87
		5 580		12.09	13.54	15.89
		5 700		13.24	11.84	15.61
	U-NII 3	5 745		14.06	11.65	16.03
		5 785		14.43	11.43	16.19
		5 825		14.47	10.92	16.06

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1+ANT 2 (dB m)	Duty Factor (dB)	Average Power Result (dB m)
11n_HT20	U-NII 1	5 180	MCS0	15.89	0.22	16.11
		5 220		16.10		16.32
		5 240		16.17		16.39
	U-NII 2A	5 260		15.98		16.20
		5 300		16.30		16.52
		5 320		16.50		16.72
	U-NII 2C	5 500		16.87		17.09
		5 580		15.89		16.11
		5 700		15.61		15.83
	U-NII 3	5 745		16.03		16.25
		5 785		16.19		16.41
		5 825		16.06		16.28

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB m)
U-NII 1	5 180	23.98			3.53	23.98
	5 220					
	5 240					
U-NII 2A	5 260	23.98	20.781	24.18	4.76	23.98
	5 300		21.071	24.24		
	5 320		21.099	24.24		
U-NII 2C	5 500	23.98	21.071	24.24	4.78	23.98
	5 580		20.839	24.19		
	5 700		20.839	24.19		
U-NII 3	5 745	30			4.89	30.00
	5 785					
	5 825					

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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

**Test mode: 11n\_HT40**

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11n_HT40	U-NII 1	5 190	MCS0	4.01	5.94	8.09
		5 230		4.13	6.22	8.31
	U-NII 2A	5 270		8.09	9.64	11.94
		5 310		8.05	10.07	12.19
	U-NII 2C	5 510		10.97	13.27	15.28
		5 550		10.92	12.79	14.97
		5 670		11.53	11.02	14.29
	U-NII 3	5 755		12.41	10.46	14.55
5 795		13.01	9.64	14.65		

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1+ANT 2 (dB m)	Duty Factor (dB)	Average Power Result (dB m)
11n_HT40	U-NII 1	5 190	MCS0	8.09	0.44	8.53
		5 230		8.31		8.75
	U-NII 2A	5 270		11.94		12.38
		5 310		12.19		12.63
	U-NII 2C	5 510		15.28		15.72
		5 550		14.97		15.41
		5 670		14.29		14.73
	U-NII 3	5 755		14.55		14.99
5 795		14.65	15.09			

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)		Antenna gain (dB i)	Limit (dB m)
U-NII 1	5 190	23.98			3.53	23.98
	5 230					
U-NII 2A	5 270	23.98	42.020	27.23	4.76	23.98
	5 310		42.550	27.29		
U-NII 2C	5 510	23.98	43.880	27.42	4.78	23.98
	5 550		44.060	27.44		
	5 670		43.180	27.35		
U-NII 3	5 755	30			4.89	30
	5 795					

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

**Test mode: 11ac\_VHT80**

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11ac_VHT80	U-NII 1	5 210	MCS0	4.09	6.35	8.38
	U-NII 2A	5 290		3.82	5.78	7.92
	U-NII 2C	5 530		3.96	4.75	7.38
	U-NII 3	5 775		5.19	3.79	7.56

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1+ANT 2 (dB m)	Duty Factor (dB)	Average Power Result (dB m)
11ac_VHT80	U-NII 1	5 210	MCS0	8.38	0.86	9.24
	U-NII 2A	5 290		7.92		8.78
	U-NII 2C	5 530		7.38		8.24
	U-NII 3	5 775		7.56		8.42

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB m)
U-NII 1	5 210	23.98			3.53	23.98
U-NII 2A	5 290	23.98	85.500	30.32	4.76	23.98
U-NII 2C	5 530	23.98	85.670	30.33	4.78	23.98
U-NII 3	5 775	30			4.89	30

**Remark;**

Attenuator and cable offset was compensated in test program (R&S Power Viewer) before measuring.

According to KDB 662911 D01 v02r01, average power of each port (ANT 1+ANT 2) and antenna gain was combined by using below calculation.

Average Power:  $10\log\{10^{(ANT\ 1\ power / 10)} + 10^{(ANT\ 2\ power / 10)}\}$

Antenna Gain:  $10\log\{[10^{(ANT\ 1\ gain / 20)} + 10^{(ANT\ 2\ gain / 20)}]^{2 / 2}\}$

Average Power Result(dB m) = Average Power (dB m) + Duty Factor (dB i)

*The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.*

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

**- Band-crossing channels**

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11a	U-NII 2C	5 720	6	12.73	11.04	14.98
	U-NII 3	5 720		5.28	3.56	7.51
11n_HT20	U-NII 2C	5 720	MCS0	12.09	10.77	14.49
	U-NII 3	5 720		5.16	3.93	7.60
11n_HT40	U-NII 2C	5 710	MCS0	10.42	9.31	12.91
	U-NII 3	5 710		-2.05	-2.98	0.52
11ac_VHT80	U-NII 2C	5 690	MCS0	4.31	3.13	6.77
	U-NII 3	5 690		-12.26	-12.59	-9.41

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	ANT 1+ANT 2 (dB m)	Duty Factor (dB)	Average Power Result (dB m)
11a	U-NII 2C	5 720	6	14.98	0.21	15.19
	U-NII 3	5 720		7.51		7.72
11n_HT20	U-NII 2C	5 720	MCS0	14.49	0.22	14.71
	U-NII 3	5 720		7.60		7.82
11n_HT40	U-NII 2C	5 710	MCS0	12.91	0.44	13.35
	U-NII 3	5 710		0.52		0.96
11ac_VHT80	U-NII 2C	5 690	MCS0	6.77	0.86	7.63
	U-NII 3	5 690		-9.41		-8.55

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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



Mode	Band	Limit					
		Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB m)
11a	U-NII 2C	5 720	23.98	15.420	22.88	4.78	22.88
	U-NII 3					4.89	30
11n_HT20	U-NII 2C	5 720	23.98	15.420	22.88	4.78	22.88
	U-NII 3					4.89	30
11n_HT40	U-NII 2C	5 710	23.98	36.260	26.59	4.78	23.98
	U-NII 3					4.89	30
11ac_VHT80	U-NII 2C	5 690	23.98	78.070	29.92	4.78	23.98
	U-NII 3					4.89	30

**Remark;**

Attenuator and cable offset was compensated in test program (R&S Power Viewer) before measuring.

According to KDB 662911 D01 v02r01, average power of each port (ANT 1+ANT 2) and antenna gain was combined by using below calculation.

Average Power:  $10\log\{10^{(ANT\ 1\ power / 10)} + 10^{(ANT\ 2\ power / 10)}\}$

Antenna Gain:  $10\log\{[10^{(ANT\ 1\ gain / 20)} + 10^{(ANT\ 2\ gain / 20)}]^{2 / 2}\}$

Average Power Result(dB m) = Average Power (dB m) + Duty Factor (dB i)

*The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.*

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

RTT5041-19(2019.04.24)(1)

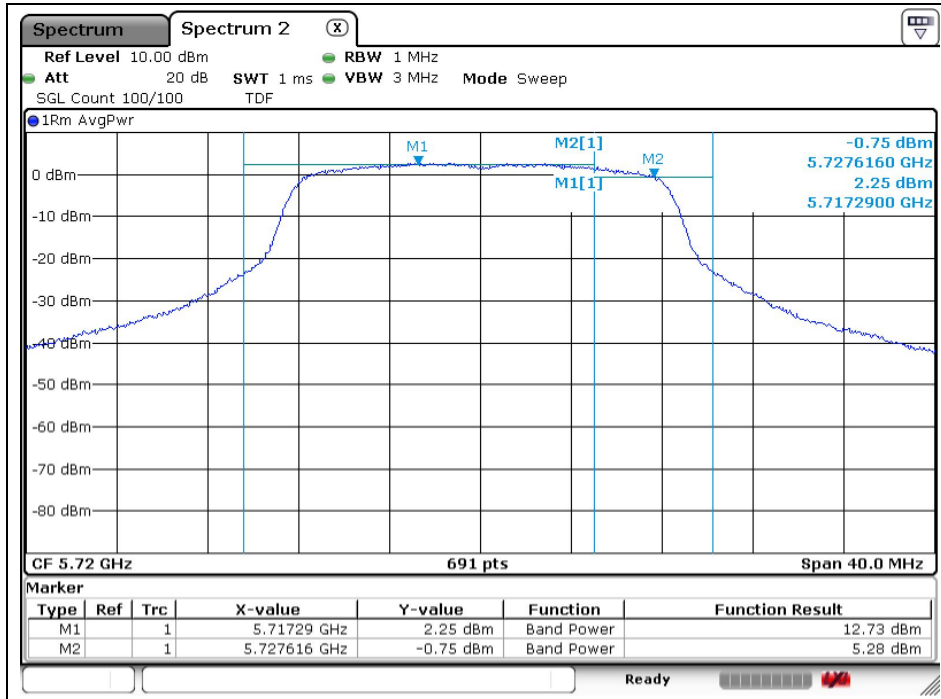
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

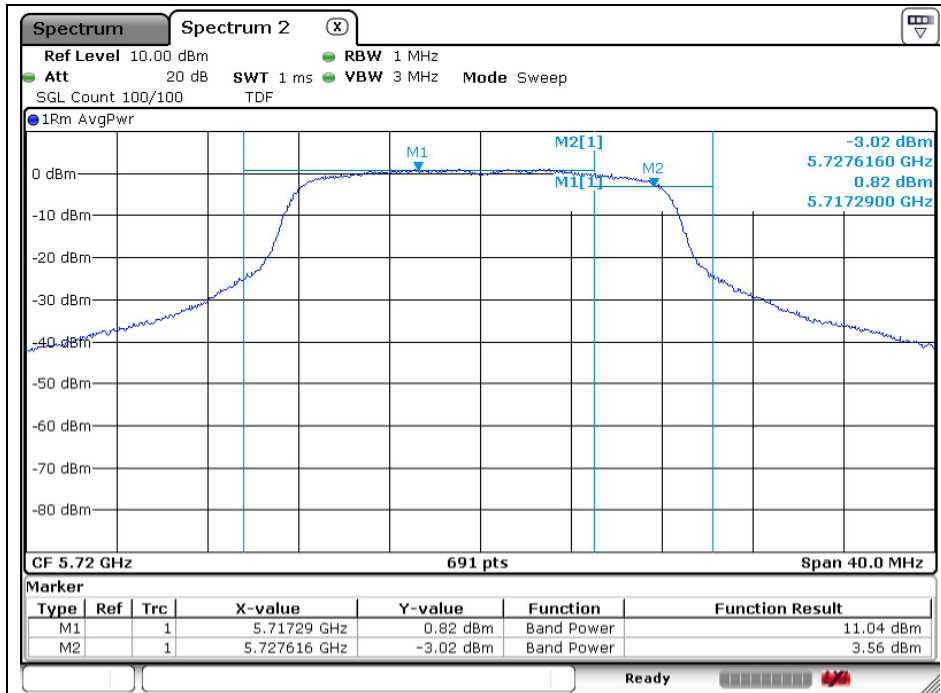
**- Test plots**

**Band-crossing channels**

802.11a (5 720 MHz)\_ANT1

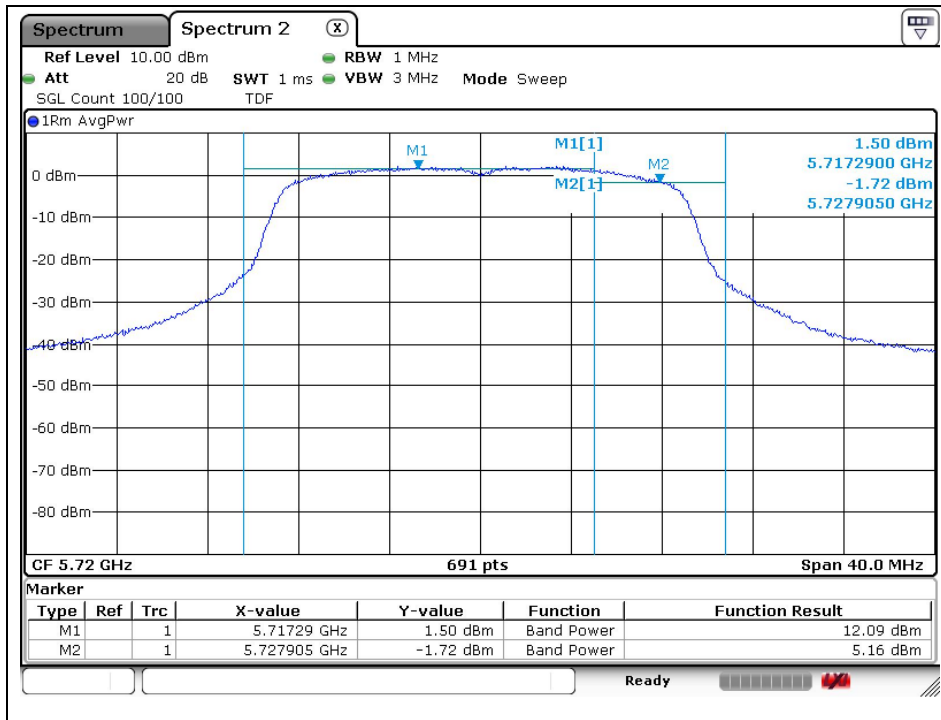


802.11a (5 720 MHz)\_ANT2

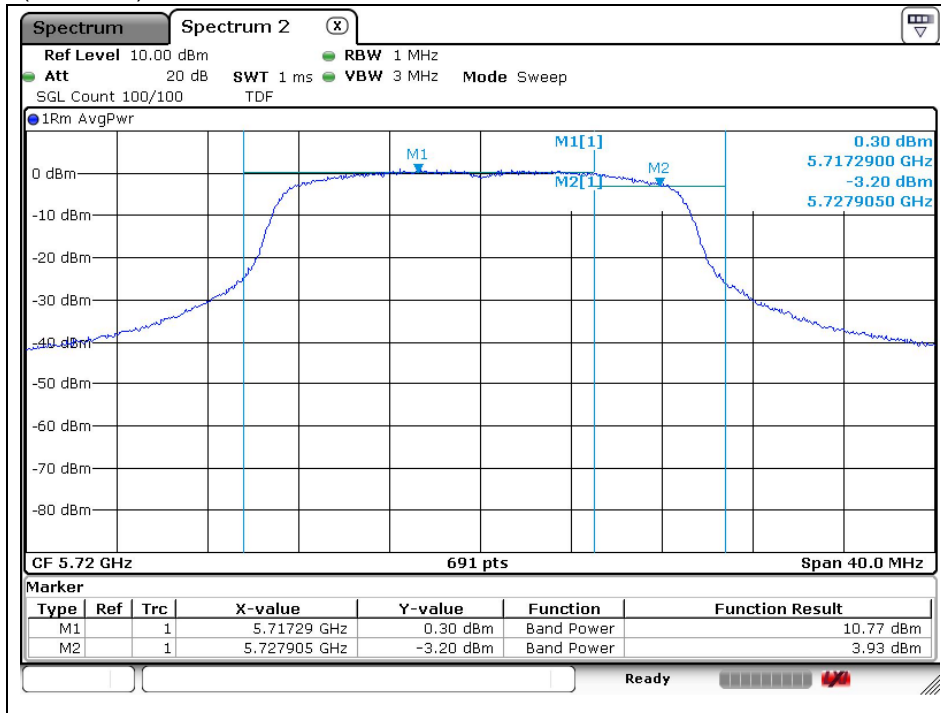


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

802.11n\_HT20 (5 720 MHz)\_ANT1

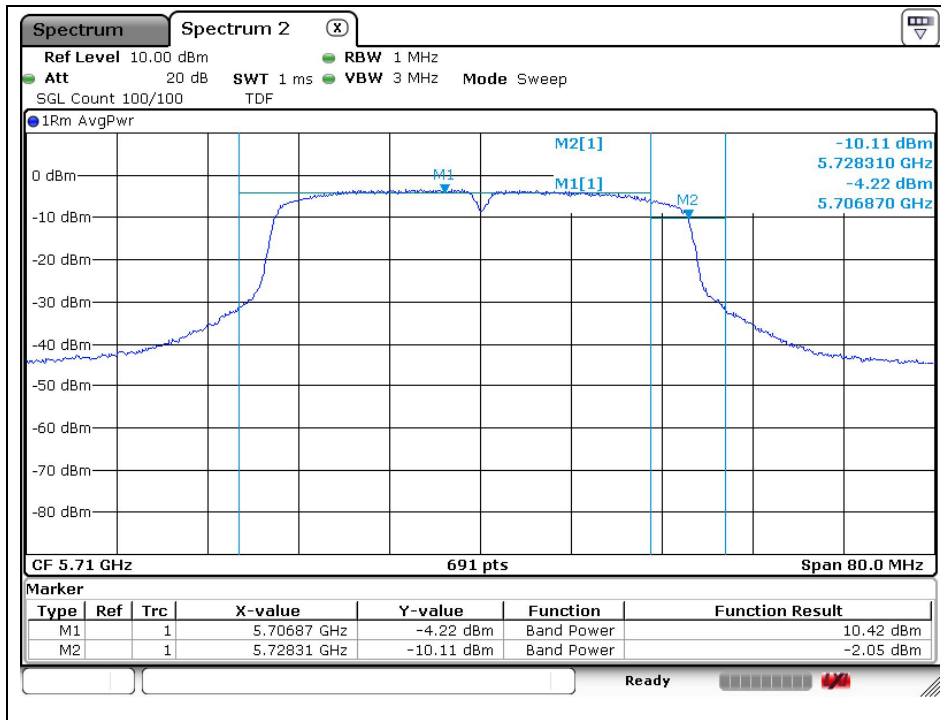


802.11n\_HT20 (5 720 MHz)\_ANT2

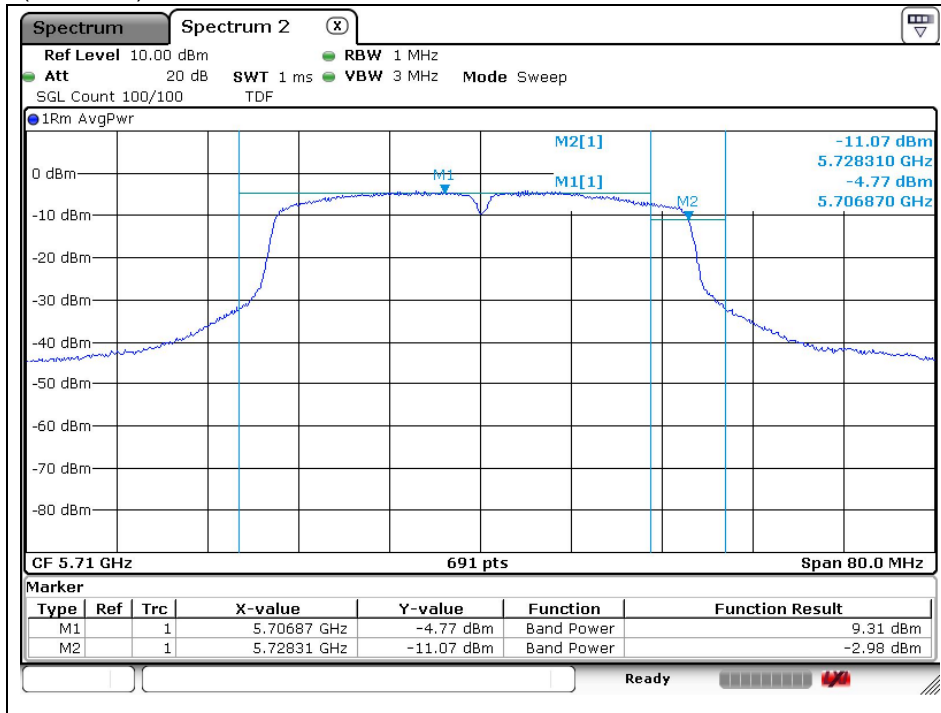


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

802.11n\_HT40 (5 710 MHz)\_ANT1

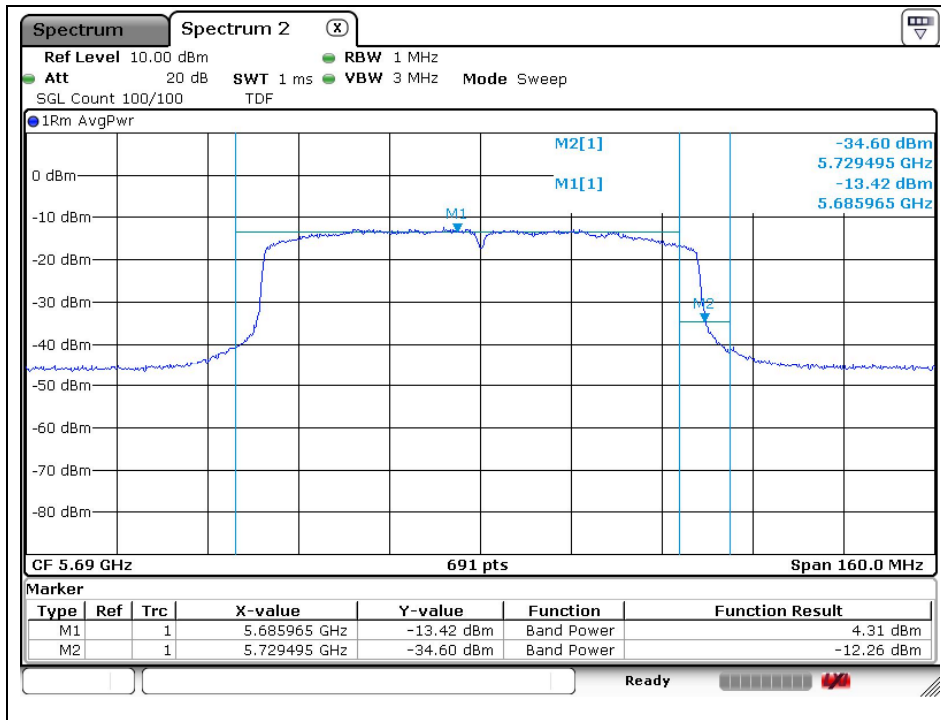


802.11n\_HT40 (5 710 MHz)\_ANT2

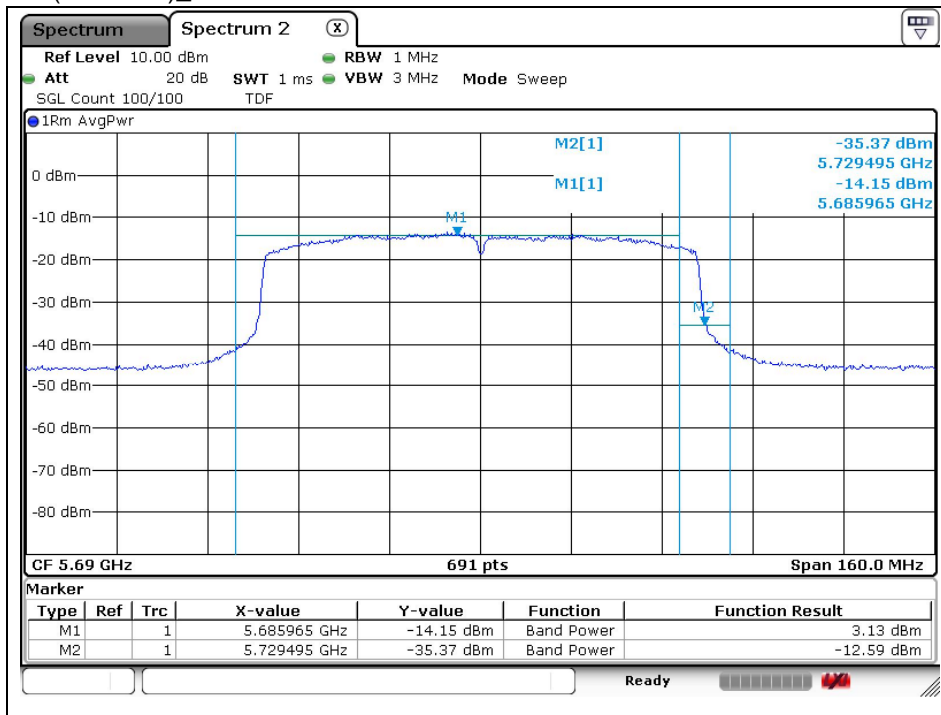


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

802.11ac\_VHT80 (5 690 MHz)\_ANT1



802.11ac\_VHT80 (5 690 MHz)\_ANT2



The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## 6. Peak Power Spectral Density

### 6.1. Test Setup



### 6.2. Limit

#### According to 15.407 (a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

#### According to 15.407 (a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dB m + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

#### According to 15.407 (a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

*The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.*

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

RTT5041-19(2019.04.24)(1)

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

A4(210 mm x 297 mm)

### 6.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section F of KDB 789033 D02 v02r01.
2. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. Make the following adjustments to the peak value of the spectrum, if applicable:
  - a) **If Method SA-2 or SA-2 Alternative was used, add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the peak of the spectrum.**
  - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
  - a) Set  $RBW \geq 1/T$ , where  $T$  is defined in section II.B.1.a).
  - b) Set  $VBW \geq 3 RBW$ .
  - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500 \text{ kHz}/RBW)$  to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
  - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10\log(1 \text{ MHz}/RBW)$  to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
  - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
7. In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 v02r01.

*The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.*

## 6.4. Test result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

### Test mode: 11a

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11a	U-NII 1	5 180	36	6	0.73	3.78	5.53
		5 220	44		1.28	3.85	5.76
		5 240	48		1.17	3.54	5.53
	U-NII 2A	5 260	52		1.06	2.79	5.02
		5 300	60		1.79	2.82	5.35
		5 320	64		1.46	3.53	5.63
	U-NII 2C	5 500	100		1.68	4.00	6.00
		5 580	116		1.60	3.48	5.65
		5 700	140		2.39	2.35	5.38
	U-NII 3	5 745	149		0.58	-1.80	2.56
		5 785	157		1.15	-2.04	2.85
		5 825	165		1.07	-1.88	2.85

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)				
11a	U-NII 1	5 180	36	6	5.53	0.21	5.74	11				
		5 220	44		5.76		5.97					
		5 240	48		5.53		5.74					
	U-NII 2A	5 260	52		5.02		5.23					
		5 300	60		5.35		5.56					
		5 320	64		5.63		5.84					
	U-NII 2C	5 500	100		6.00		6.21					
		5 580	116		5.65		5.86					
		5 700	140		5.38		5.59					
		Band	Frequency (MHz)		Ch.		Data Rate (Mbps)		Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
	U-NII 3		5 745		149		6		2.56	0.21	2.77	30
			5 785		157				2.85		3.06	
5 825			165	2.85	3.06							

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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



**Test mode: 11n\_HT20**

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11n_HT20	U-NII 1	5 180	36	MCS0	1.68	2.24	4.98
		5 220	44		1.78	2.73	5.29
		5 240	48		1.76	2.90	5.38
	U-NII 2A	5 260	52		1.41	2.90	5.23
		5 300	60		1.64	2.87	5.31
		5 320	64		1.09	3.49	5.46
	U-NII 2C	5 500	100		1.46	2.97	5.29
		5 580	116		1.05	2.73	4.98
		5 700	140		2.49	1.96	5.24
	U-NII 3	5 745	149		0.08	-1.72	2.28
		5 785	157		0.94	-1.62	2.86
		5 825	165		1.01	-2.42	2.64

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)				
11n_HT20	U-NII 1	5 180	36	MCS0	4.98	0.22	5.20	11				
		5 220	44		5.29		5.51					
		5 240	48		5.38		5.60					
	U-NII 2A	5 260	52		5.23		5.45					
		5 300	60		5.31		5.53					
		5 320	64		5.46		5.68					
	U-NII 2C	5 500	100		5.29		5.51					
		5 580	116		4.98		5.20					
		5 700	140		5.24		5.46					
		Band	Frequency (MHz)		Ch.		Data Rate (Mbps)		Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
	U-NII 3		5 745		149		MCS0		2.28	0.22	2.50	30
			5 785		157				2.86		3.08	
5 825			165	2.64	2.86							

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

**Test mode: 11n\_HT40**

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11n_HT40	U-NII 1	5 190	38	MCS0	-9.34	-8.32	-5.79
		5 230	40		-9.68	-7.44	-5.41
	U-NII 2A	5 270	54		-4.86	-3.99	-1.39
		5 310	62		-4.86	-3.65	-1.20
	U-NII 2C	5 510	102		-2.16	-0.31	1.87
		5 550	110		-2.46	-0.41	1.70
		5 670	134		-2.41	-1.82	0.91
	U-NII 3	5 755	151		-4.31	-5.54	-1.87
		5 795	159		-3.61	-6.48	-1.80

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)				
11n_HT40	U-NII 1	5 190	38	MCS0	-5.79	0.44	-5.35	11				
		5 230	40		-5.41		-4.97					
	U-NII 2A	5 270	54		-1.39		-0.95					
		5 310	62		-1.20		-0.76					
	U-NII 2C	5 510	102		1.87		2.31					
		5 550	110		1.70		2.14					
		5 670	134		0.91		1.35					
		<b>Band</b>	<b>Frequency (MHz)</b>		<b>Ch.</b>		<b>Data Rate (Mbps)</b>		<b>Measured PPSD (dB m)</b>	<b>Duty Correction Factor (dB)</b>	<b>Final PPSD (dB m)</b>	<b>Limit (dB m/500 kHz)</b>
	U-NII 3	5 755	151		MCS0		-1.87		0.44	-1.43	30	
		5 795	159				-1.80			-1.36		

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

**Test mode: 11ac\_VHT80**

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11ac_VHT80	U-NII 1	5 210	42	MCS0	-11.92	-10.75	-8.29
	U-NII 2A	5 290	58		-12.98	-10.88	-8.79
	U-NII 2C	5 530	106		-12.81	-11.45	-9.07
	U-NII 3	5 775	155		-14.56	-14.80	-11.67

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
11ac_VHT80	U-NII 1	5 210	42	MCS0	-8.29	0.86	-7.43	11
	U-NII 2A	5 290	58		-8.79		-7.93	
	U-NII 2C	5 530	106		-9.07		-8.21	
		<b>Band</b>	<b>Frequency (MHz)</b>	<b>Ch.</b>	<b>Data Rate (Mbps)</b>	<b>Measured PPSD (dB m)</b>	<b>Duty Correction Factor (dB)</b>	<b>Final PPSD (dB m)</b>
	U-NII 3	5 775	155	MCS0	-11.67	0.86	-10.81	30

**Remark;**

According to KDB 662911 D01 v02r01, power spectral density of each port (ANT 1+ANT 2) was combined by using below calculation.

$$\text{PPSD: } 10\log\{10^{(\text{ANT 1 PSD} / 10)} + 10^{(\text{ANT 2 PSD} / 10)}\}$$

$$\text{Final PPSD (dB m)} = \text{Measured PPSD (dB m)} + \text{Duty Correction Factor (dB)}$$

$$\text{EIRP (dB m)} = \text{Final PPSD (dB m)} + \text{Antenna gain (dB i)}$$

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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

**Band-crossing channels**

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	ANT 1 (dB m)	ANT 2 (dB m)	ANT 1+ANT 2 (dB m)
11a	U-NII 2C	5 720	144	6	2.96	2.02	5.53
	U-NII 3	5 720	144		-1.08	-1.88	1.55
11n_HT20	U-NII 2C	5 720	144	MCS0	2.77	2.09	5.45
	U-NII 3	5 720	144		-1.58	-2.55	0.97
11n_HT40	U-NII 2C	5 710	142	MCS0	-2.35	-3.08	0.31
	U-NII 3	5 710	142		-7.79	-8.19	-4.98
11ac_VHT80	U-NII 2C	5 690	138	MCS0	-12.91	-13.69	-10.27
	U-NII 3	5 690	138		-19.86	-18.92	-16.35

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
11a	U-NII 2C	5 720	144	6	5.53	0.21	5.74	11
11n_HT20		5 720	144	MCS0	5.45	0.22	5.67	
11n_HT40		5 710	142		3.44	0.44	3.88	
11ac_VHT80		5 690	138	-10.27	0.86	-9.41		
Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
11a	U-NII 3	5 720	144	6	1.55	0.21	1.76	30
11n_HT20		5 720	144	MCS0	0.97	0.22	1.19	
11n_HT40		5 710	142		-4.98	0.44	-4.54	
11ac_VHT80		5 690	138	-16.35	0.86	-15.49		

**Remark;**

According to KDB 662911 D01 v02r01, power spectral density of each port (ANT 1+ANT 2) was combined by using below calculation.

$$\text{PPSD: } 10\log\{10^{(\text{ANT 1 PSD} / 10)} + 10^{(\text{ANT 2 PSD} / 10)}\}$$

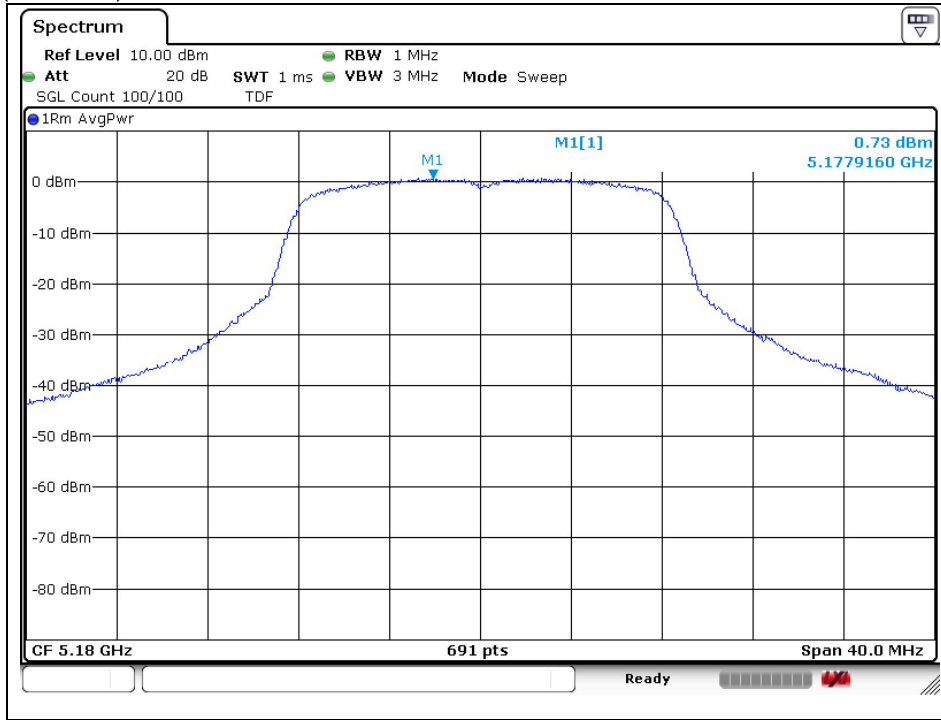
$$\text{Final PPSD (dB m)} = \text{Measured PPSD (dB m)} + \text{Duty Correction Factor (dB)}$$

$$\text{EIRP (dB m)} = \text{Final PPSD (dB m)} + \text{Antenna gain (dB i)}$$

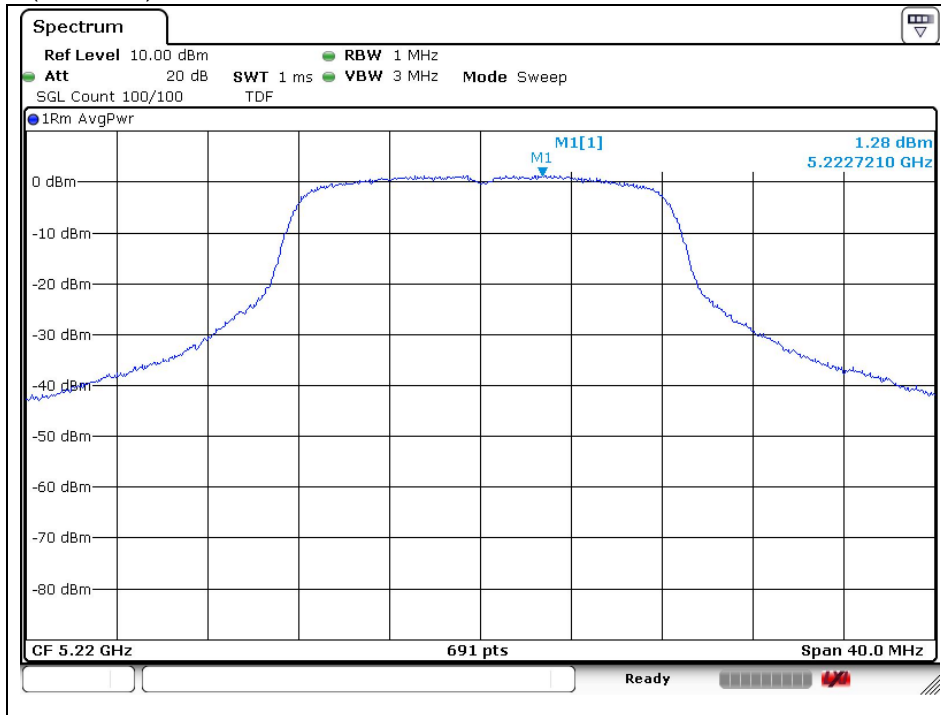
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

**- Test plots**

**OFDM: 802.11a (Band 1) \_ANT 1**  
 Low Channel (5 180 MHz)

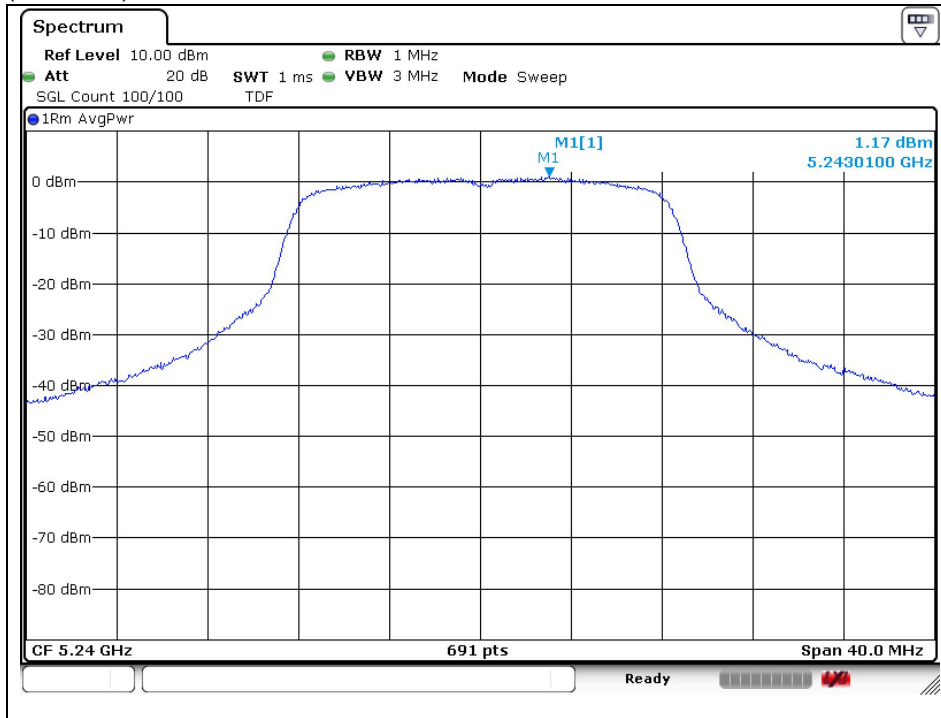


Middle Channel (5 220 MHz)



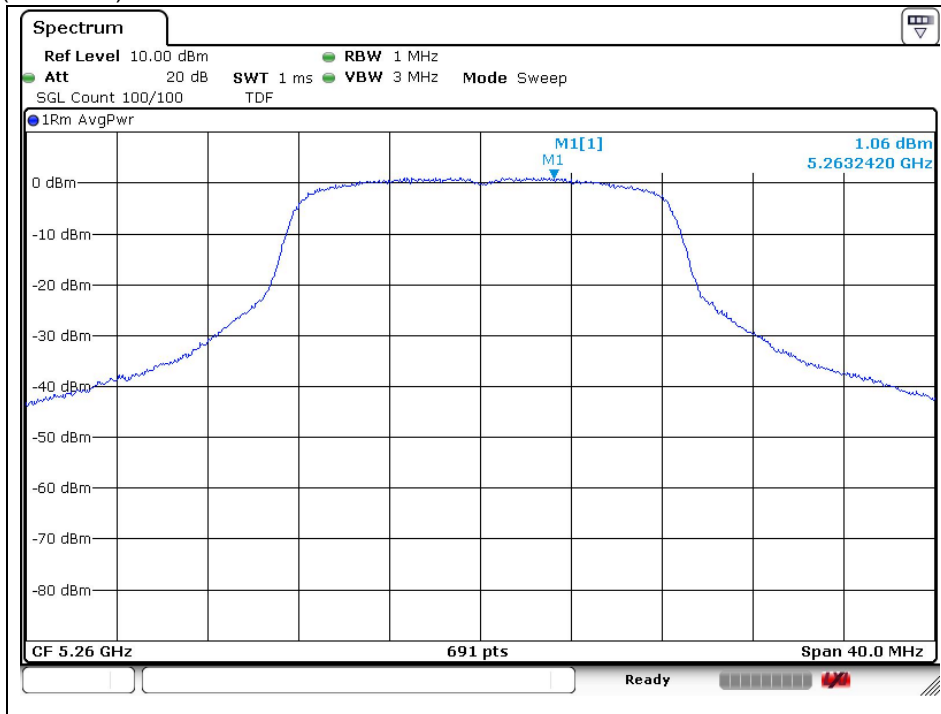
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

High Channel (5 240 MHz)



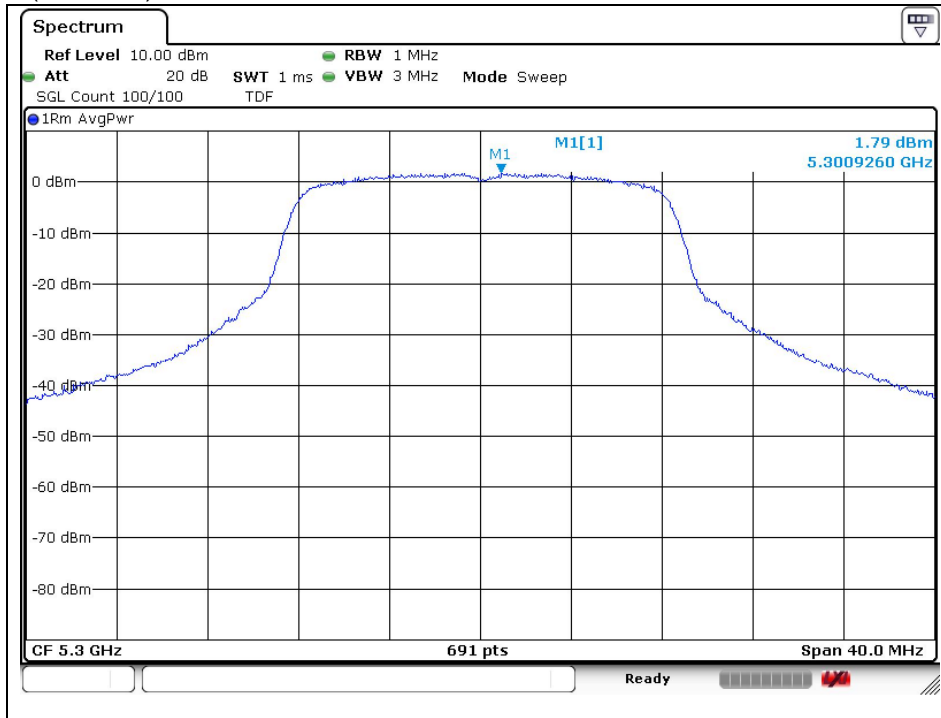
OFDM: 802.11a (Band 2A) \_ANT 1

Low Channel (5 260 MHz)

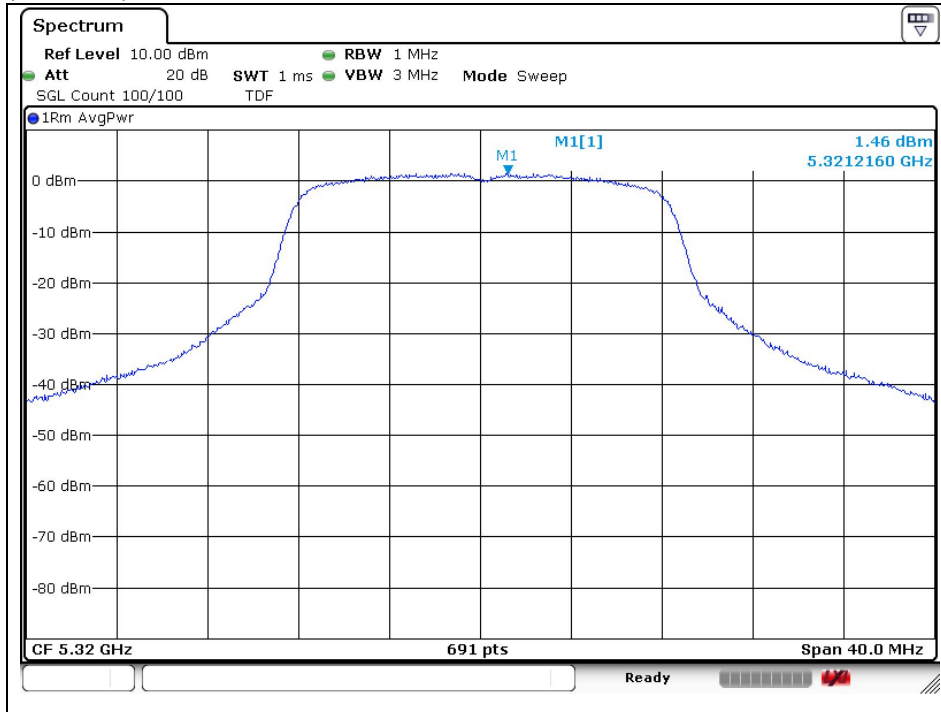


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

Middle Channel (5 300 MHz)



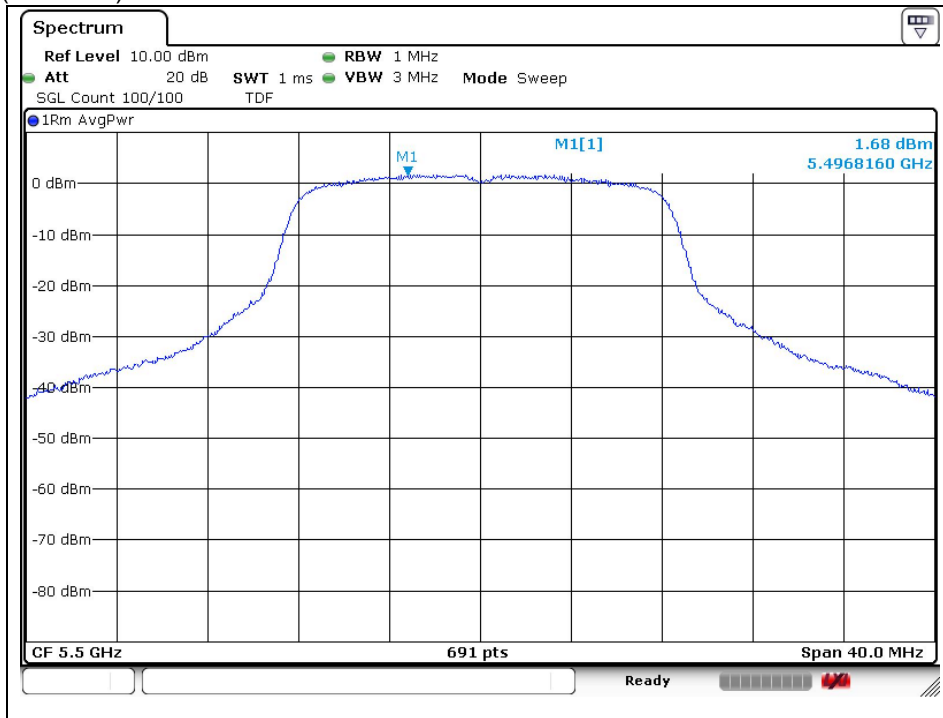
High Channel (5 320 MHz)



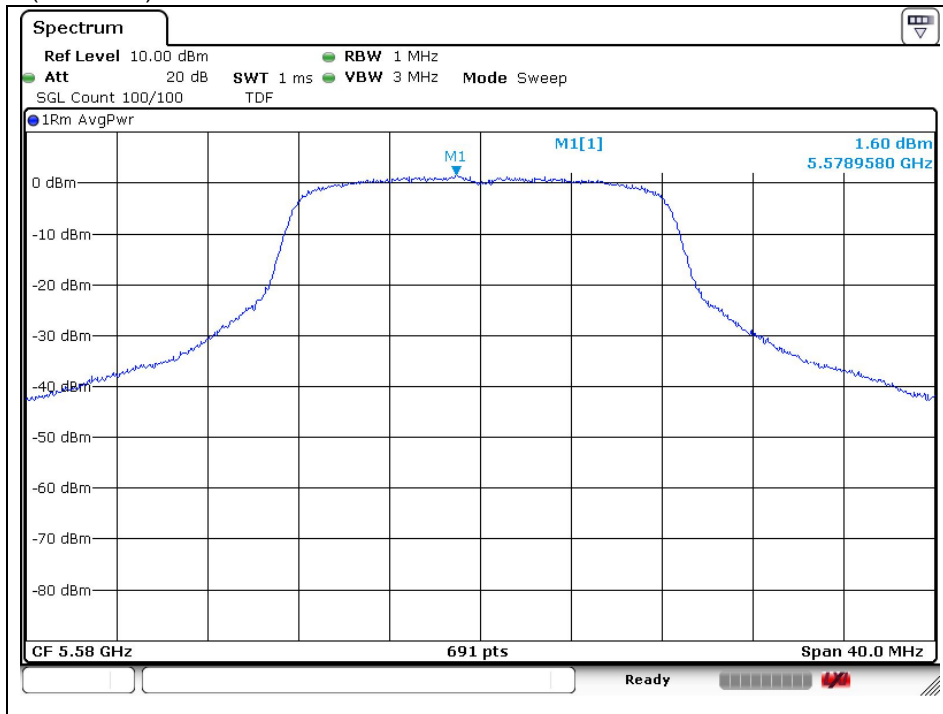
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## OFDM: 802.11a (Band 2C) \_ANT 1

Low Channel (5 500 MHz)



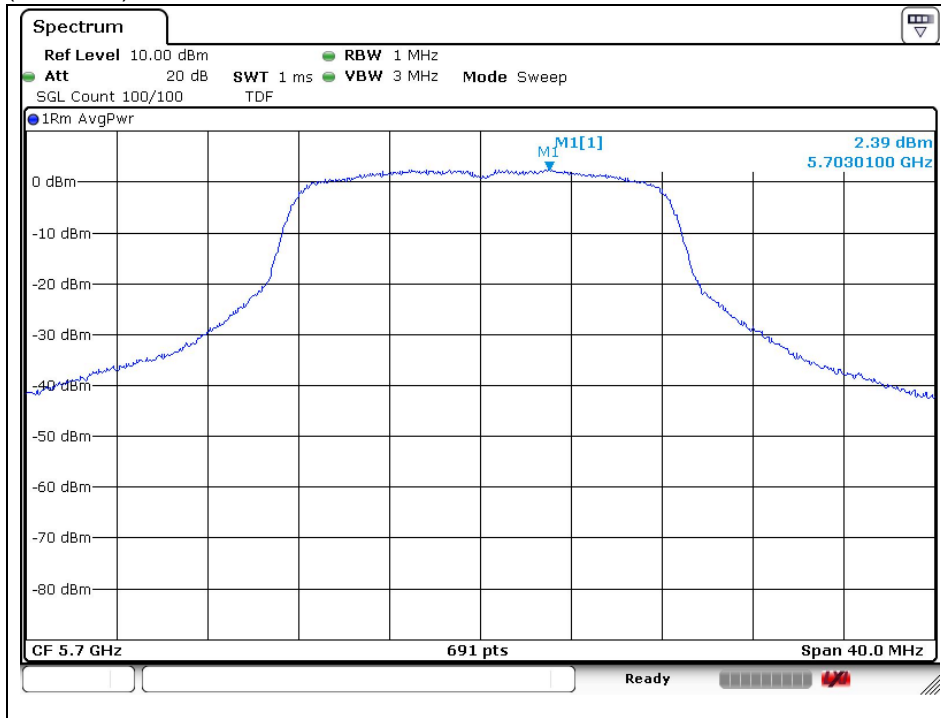
Middle Channel (5 580 MHz)



The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

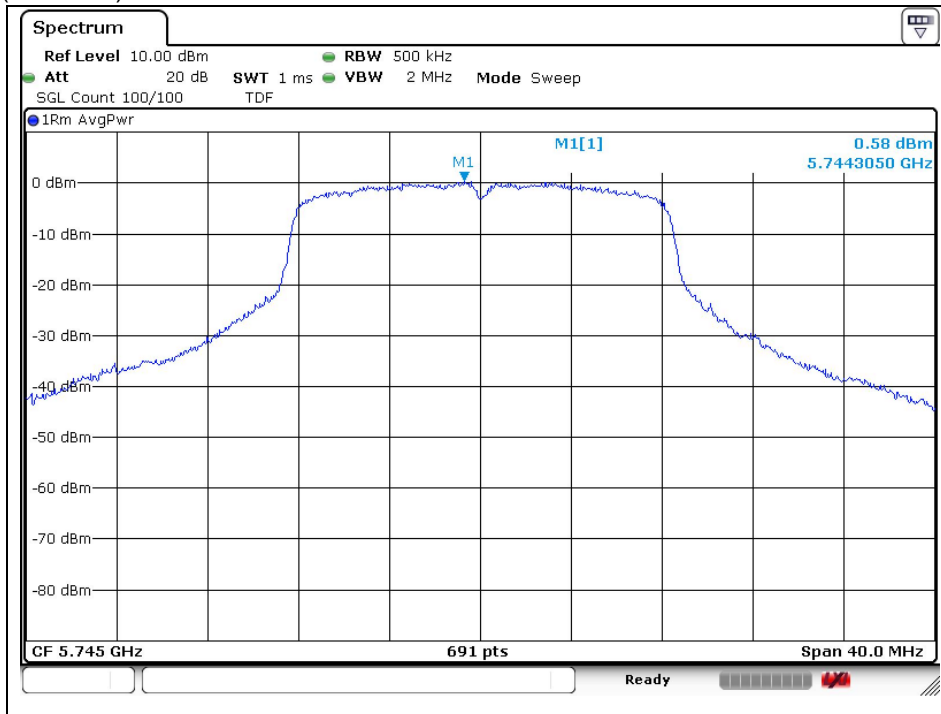


High Channel (5 700 MHz)



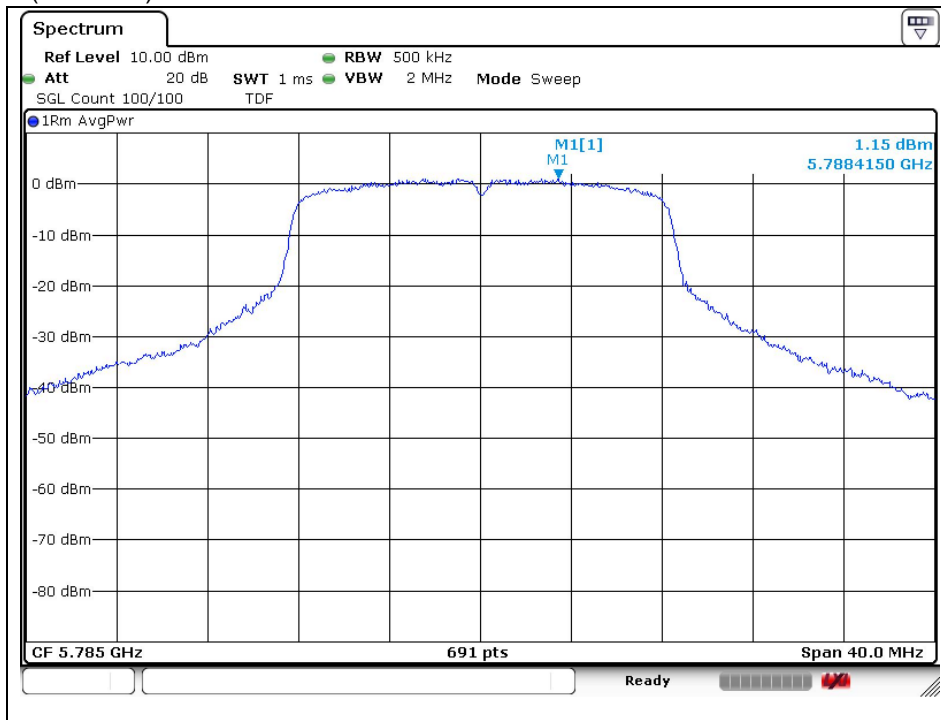
OFDM: 802.11a (Band 3) \_ANT 1

Low Channel (5 745 MHz)

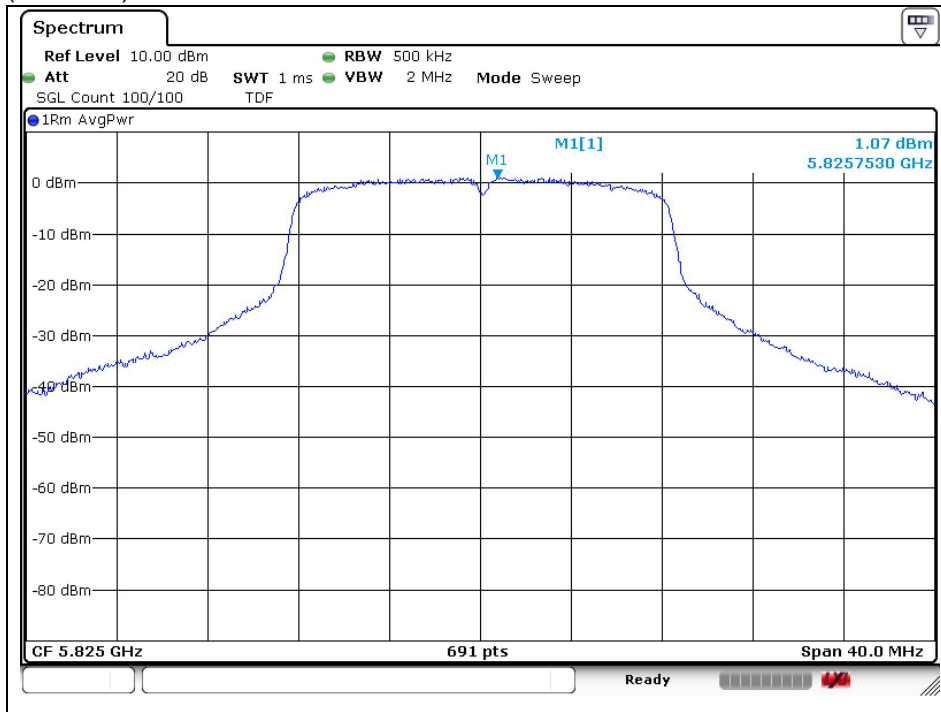


The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

Middle Channel (5 785 MHz)



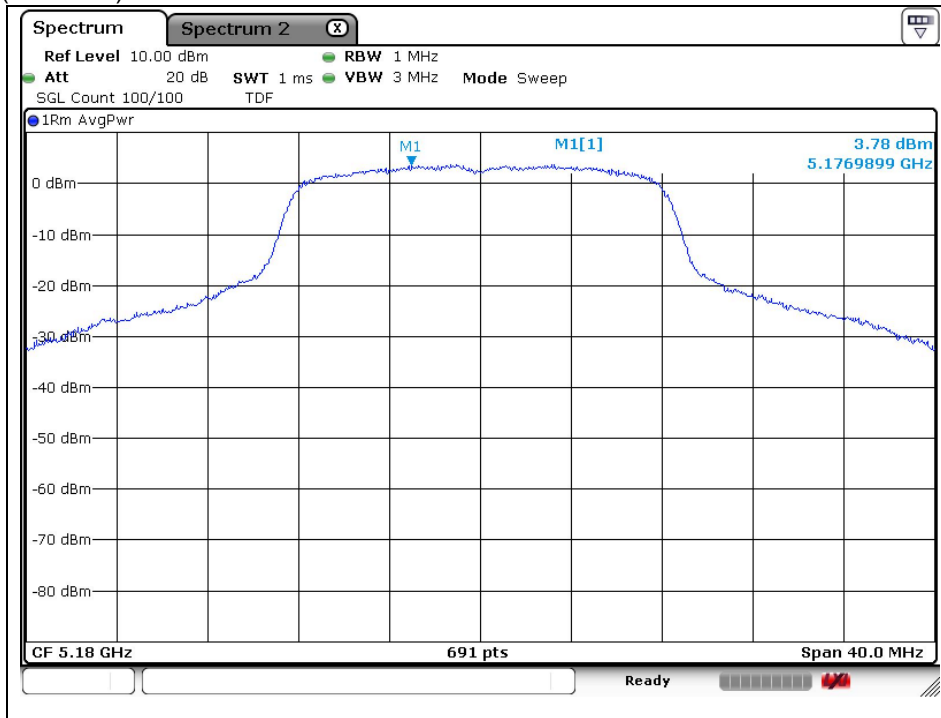
High Channel (5 825 MHz)



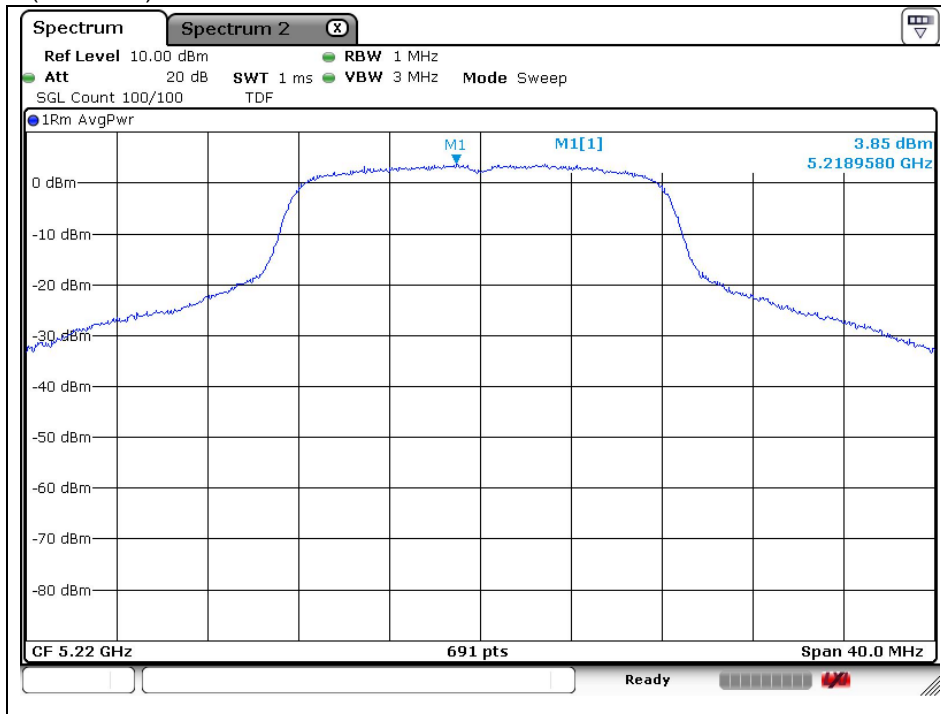
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

## OFDM: 802.11a (Band 1) \_ANT 2

Low Channel (5 180 MHz)

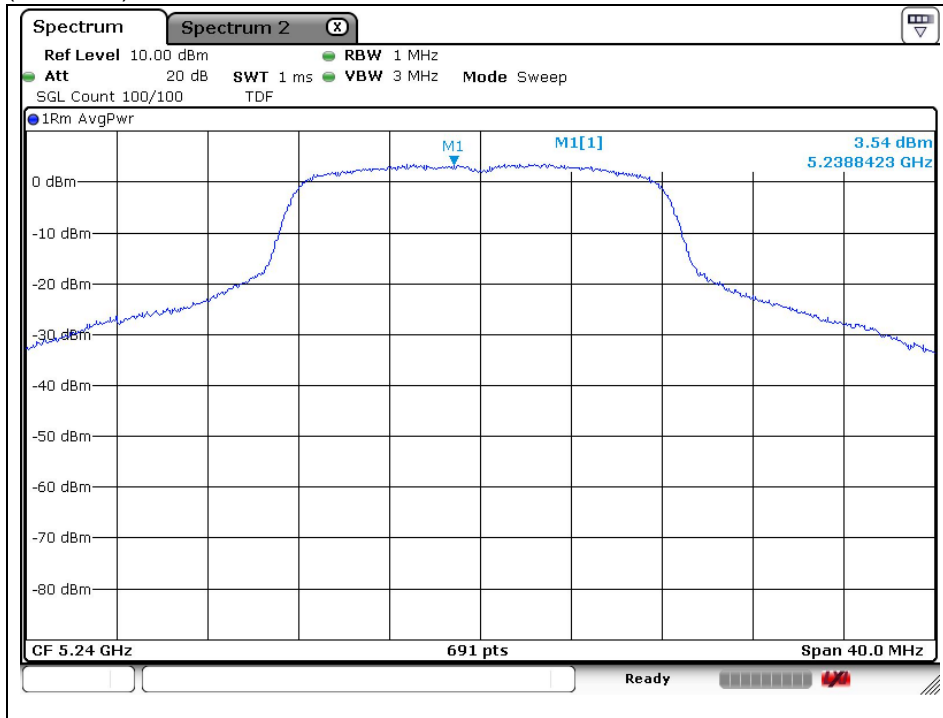


Middle Channel (5 220 MHz)



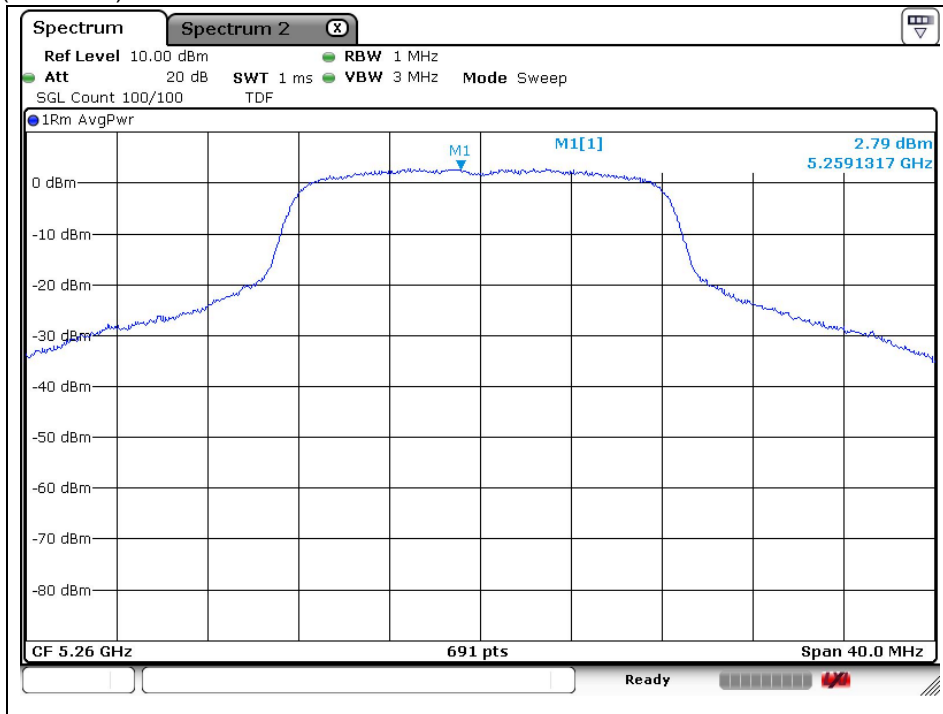
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

High Channel (5 240 MHz)



OFDM: 802.11a (Band 2A) \_ANT 2

Low Channel (5 260 MHz)



The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.