



# TEST REPORT

## KCTL Inc.

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Report No.:  
KR20-SRF0112-A

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# KCTL

### 1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2020-03-26

2. Use of Report : Certification

3. Name of Product and Model : Mobile Phone / SC-41A, SCV48

4. Manufacturer and Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LSMA415JPN

6. Date of Test : 2020-03-27 to 2020-04-22

7. Test Standards : FCC Part 15 Subpart E, 15.407

8. Test Results : Refer to the test result in the test report

Affirmation	Tested by	Technical Manager
	Name : Kwonse Kim (Signature)	Name : Seungyong Kim (Signature)

2020-05-04

## KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

**Report revision history**

Date	Revision	Page No
2020-04-29	Initial report	-
2020-05-04	Index update	3

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Note. The report No. KR20-SRF0112 is superseded by the report No. KR20-SRF0112-A.



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## 1. General information

Client : Samsung Electronics Co., Ltd.  
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677,  
Rep. of Korea  
Manufacturer : Samsung Electronics Co., Ltd.  
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677,  
Rep. of Korea  
Factory : Samsung Electronics Vietnam Thai Nguyen Co., Ltd  
Address : YEN BINH 1 INDUSTRIAL PARK, PHO YEN DISTRICT, THAI NGUYEN  
PROVINCE THAI NGUYEN 23000  
Laboratory : KCTL Inc.  
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea  
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132  
VCCI Registration No. : R-20080, G-20078, C-20059, T-20056  
Industry Canada Registration No. : 8035A  
KOLAS No.: KT231

## 2. Device information

Equipment under test : Mobile Phone  
Model : SC-41A, SCV48  
Difference in model name : Model SCV48 is electrically identical to model SC-41A. Two model numbers are allocated for marketing and logistic purposes only.  
Modulation technique : Bluetooth(BDR/EDR)\_GFSK,  $\pi/4$ DQPSK, 8DPSK  
Bluetooth(BLE)\_GFSK  
WIFI(802.11b/g/n20/n40/ac20/ac40/ac80)\_DSSS, OFDM  
NFC\_ASK  
LTE\_QPSK, 16QAM, 64QAM  
WCDMA\_QPSK  
GSM\_GMSK, 8-PSK  
Number of channels : Bluetooth(BDR/EDR)\_79 ch / Bluetooth(BLE)\_40 ch  
802.11b/g/n\_HT20 : 13 ch  
UNII-1: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)  
UNII-2A: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)  
UNII-2C: 12 ch (20 MHz), 6 ch (40 MHz), 3 ch (80 MHz)  
UNII-3: 5 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)  
Power source : DC 3.85 V  
Antenna specification : LTE/GSM/WCDMA\_LDS+METAL Antenna  
WIFI/Bluetooth(BDR/EDR/BLE)\_LDS+METAL Antenna  
NFC\_FPCB Antenna

Antenna gain : WIFI/Bluetooth(BDR/EDR/BLE) : -5.74 dBi  
 UNII-1 -5.41 dBi  
 UNII-2A -5.78 dBi  
 UNII-2C -6.86 dBi  
 UNII-3 -5.61 dBi

Frequency range : Bluetooth(BDR/EDR/BLE)\_2 402 MHz ~ 2 480 MHz  
 2 412 MHz ~ 2 472 MHz (802.11b/g/n\_HT20)  
 UNII-1: 5 180 MHz ~ 5 240 MHz (802.11a/n\_HT20/ac\_VHT20)  
 UNII-1: 5 190 MHz ~ 5 230 MHz (802.11n\_HT40/ac\_VHT40)  
 UNII-1: 5 210 MHz (802.11ac\_VHT80)  
 UNII-2A: 5 260 MHz ~ 5 320 MHz (802.11a/n\_HT20/ac\_VHT20)  
 UNII-2A: 5 270 MHz ~ 5 310 MHz (802.11n\_HT40/ac\_VHT40)  
 UNII-2A: 5 290 MHz (802.11ac\_VHT80)  
 UNII-2C: 5 500 MHz ~ 5 720 MHz (802.11a/n\_HT20/ac\_VHT20)  
 UNII-2C: 5 510 MHz ~ 5 710 MHz (802.11n\_HT40/ac\_VHT40)  
 UNII-2C: 5 530 MHz ~ 5 690 MHz (802.11ac\_VHT80)  
 UNII-3: 5 745 MHz ~ 5 825 MHz (802.11a/n\_HT20/ac\_VHT20)  
 UNII-3: 5 755 MHz ~ 5 795 MHz (802.11n\_HT40/ac\_VHT40)  
 UNII-3: 5 775 MHz (802.11ac\_VHT80)  
 LTE Band 5\_824.7 MHz ~ 848.3 MHz  
 LTE Band 12\_699.7 MHz ~ 715.3 MHz  
 LTE Band 41\_2 498.5 MHz ~ 2 687.5 MHz  
 GSM 850\_824.2 MHz ~ 848.8 MHz  
 GSM 1900\_1 850.2 MHz ~ 1 909.8 MHz  
 WCDMA 850\_826.4 MHz ~ 846.6 MHz

Software version : SC-41A\_A415D.001, SCV48\_A415J.001

Hardware version : REV0.1

Test device serial No. : Conducted(R38N301XM3J, R38N301XM2M)  
 Radiated(R38N301XMFK, R38N301XMBP, R38N301XMCA)

Operation temperature : -30 °C ~ 50 °C

**2.1. Accessory information**

Equipment	Manufacturer	Model	Serial No.	Power source
Earphone	Samsung Electronics Co., Ltd.	EHS61ASFBE	-	-

## 2.2. Model Information

The only difference between the SCV48 and SC-41A is:

1. H/W  
-All part is same.
2. S/W  
- Supported WCDMA, LTE FDD/TDD bands are different by Software.
  - \* SC-41A  
: 3G(B1,B5,B6,B19), 4G FDD(B1,B3,B5,B12,B19,B21), 4G TDD(B38,B39,B41)
  - \* SCV48  
: 3G(B1,B5), 4G FDD(B1,B3,B12,B18), 4G TDD(B41)
- Other part is same.

## 2.3. Frequency/channel operations

This device contains the following capabilities:

2.4GHz WIFI(802.11b/g/n(HT20)), 5GHz WIFI(802.11a/n(HT20/HT40)/ac(VHT20/VHT40/VHT80))

Bluetooth(BDR/EDR/BLE), NFC,

LTE Band 5, LTE Band 12, LTE Band 41, GSM 850, GSM 1900, WCDMA 850

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5 180	52	5 260	100	5 500	149	5 745
40	5 200	56	5 280	120	5 600	157	5 785
48	5 240	64	5 320	140	5 700	165	5 825
				144	5 720		

Table 2.3-1. 802.11a/n/ac\_HT20/VHT20 mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
38	5 190	54	5 270	102	5 510	151	5 755
46	5 230	62	5 310	118	5 590	159	5 795
				134	5 670		
				142	5 710		

Table 2.3-2. 802.11n/ac\_HT40/VHT40 mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
42	5 210	58	5 290	106	5 530	155	5 775
				122	5 610		
				138	5 690		

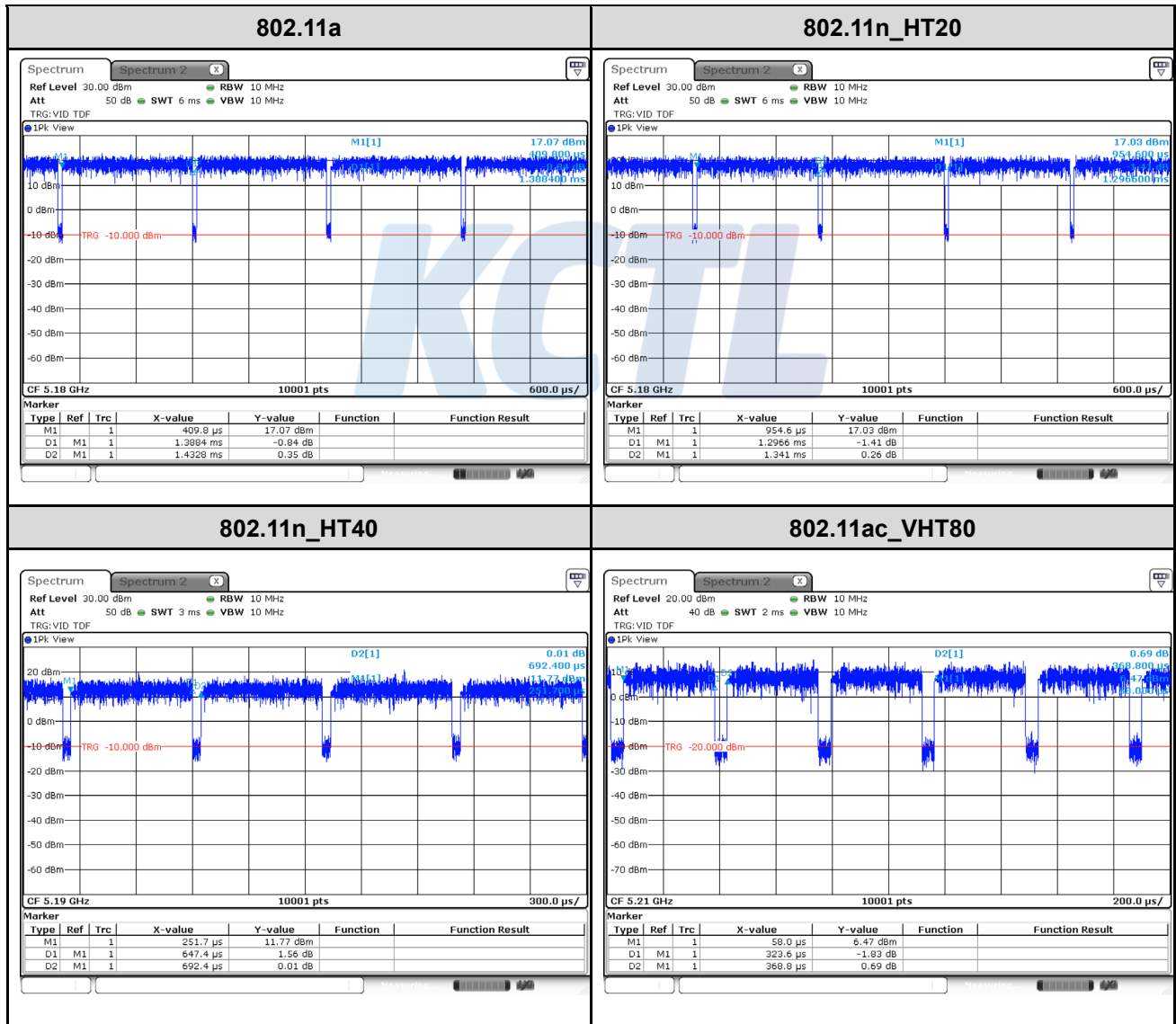
Table 2.3-3. 802.11ac\_VHT80 mode

## 2.4. Duty Cycle Factor

Test mode	T <sub>on</sub> time (ms)	Period (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.388 4	1.432 8	0.969 0	96.90	0.14
802.11n_HT20	1.296 6	1.341 0	0.966 9	96.69	0.15
802.11n_HT40	0.647 4	0.692 4	0.935 0	93.50	0.29
802.11ac_VHT80	0.323 6	0.368 8	0.877 4	87.74	0.57

**Notes.**

1. Duty cycle (Linear) = T<sub>on</sub> time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)



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**KCTL****3. Antenna requirement**

Requirement of FCC part section 15.203, 15.407:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- The transmitter has permanently attached LDS+METAL Antenna (internal antenna) on board.

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#### 4. Summary of tests

FCC Part section(s)	Parameter	Test results
15.407(a)	Maximum conducted output power	Pass
15.407(a)	Maximum power spectral density	Pass
15.407(a)	26 dB Channel Bandwidth	Pass
15.407(e)	6 dB Channel Bandwidth	Pass
15.407(g)	Frequency stability	Pass
15.407(b), 15.205(a), 15.209(a)	Spurious emission	Pass
	Band-edge, restricted band	Pass
15.207(a)	Conducted Emissions	Pass

**Notes:**

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
3. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation
4. The test procedure(s) in this report were performed in accordance as following.
  - ANSI C63.10-2013
  - KDB 662911 D01 v02r01
  - KDB 789033 D02 v02r01
5. Based on the baseline scan, the worst-case data rates were:
  - SISO Antenna: 802.11b mode : 1Mbps
  - 802.11g mode : 6Mbps
  - 802.11n HT20 mode : MCS0
  - 802.11n HT40 mode : MCS0
  - 802.11n VHT80 mode : MCS0
6. Depending on spot-check result for n HT20 & HT40 mode is worst case than ac VHT20 & VHT40.

**5. Measurement uncertainty**

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{CISPR}$  measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty ( $\pm$ )	
Conducted RF power	1.76 dB	
Conducted spurious emissions	4.03 dB	
Radiated spurious emissions	9 kHz ~ 30 MHz:	2.28 dB
	30 MHz ~ 300 MHz	4.98 dB
	300 MHz ~ 1 000 MHz	5.14 dB
	1 GHz ~ 6 GHz	6.70 dB
	Above 6 GHz	6.60 dB
Conducted emissions	9 kHz ~ 150 kHz	3.66 dB
	150 kHz ~ 30 MHz	3.26 dB

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**6. Measurement results explanation example**

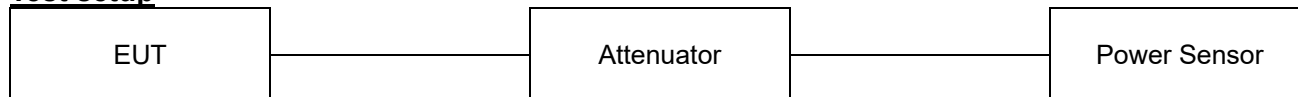
The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.

With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Frequency (MHz)	Factor(dB)	Frequency (MHz)	Factor(dB)
30	10.03	9 000	12.13
50	10.07	10 000	12.35
100	10.14	11 000	12.43
200	10.24	12 000	12.45
300	10.31	13 000	12.60
400	10.38	14 000	12.71
500	10.42	15 000	12.82
600	10.48	16 000	12.93
700	10.53	17 000	12.67
800	10.57	18 000	13.00
900	10.62	19 000	13.18
1 000	10.67	20 000	13.13
2 000	10.81	21 000	13.27
3 000	11.10	22 000	13.42
4 000	11.42	23 000	13.46
5 000	11.42	24 000	13.43
6 000	11.67	25 000	13.93
7 000	11.66	26 000	13.53
8 000	11.88	26 500	13.74

**Notes:**

Offset(dB) = RF cable loss(dB) + Attenuator(dB)

**7. Test results****7.1. Maximum conducted output power****Test setup****Limit**

According to §15.407(a),

Band	EUT category		Conducted output power limit
UNII-1		Outdoor access point	1 W (30 dBm)
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	250 mW (23.98 dBm)
UNII-2A		√	250 mW or 11 dBm + 10logB <sup>1)</sup>
UNII-2C		√	250 mW or 11 dBm + 10logB <sup>1)</sup>
UNII-3		√	1 W (30 dBm)

**Note:**

1) Conducted output power limit B is the 26 dB emission bandwidth.

**Test procedure**ANSI C63.10-2013-Section 12.3.3.2 and 14.2  
KDB 789033 D02 v02r01 - Section E.2.d) or e)  
KDB 662911 D01 v02r01 - Section E).1)

**Test settings****Used test method is Section E.2.d)****◆ KDB 789033 D02 v02r01****Section E.2.d)****Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction):**

- (i) Measure the duty cycle,  $x$ , of the transmitter output signal as described in II.B..
- (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (iii) Set RBW = 1 MHz
- (iv) Set RBW  $\geq$  3 MHz
- (v) Number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ . (This ensures that bin-to-bin spacing is  $\leq \text{RBW} / 2$ , so that narrowband signals are not lost between frequency bins.)
- (vi) Sweep time = auto.
- (vii) Detector = power averaging (rms), if available. Otherwise use sample detector mode.
- (viii) Do not use sweep triggering. Allow the sweep to "free run."
- (ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
- (x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (xi) Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \log(1/0,25) = 6$  dB if the duty cycle is 25%.

**Section E.2.e)****Method SA-2 Alternative (power averaging(rms) detection with slow sweep with each spectrum bin averaging across on and off times of the EUT transmissions, followed by duty cycle correction):**

- (i) Measure the duty cycle,  $x$ , of the transmitter output signal as described in II.B..
- (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (iii) Set RBW = 1 MHz
- (iv) Set RBW  $\geq$  3 MHz
- (v) Number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ . (This ensures that bin-to-bin spacing is  $\leq \text{RBW} / 2$ , so that narrowband signals are not lost between frequency bins.)
- (vi) Manually set sweep time  $\geq 10 \times (\text{number of points in sweep}) \times (\text{total on/off period of the transmitted signal})$ .
- (vii) Set detector = power averaging (rms)
- (viii) Perform a single sweep.
- (ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement

function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

- (x) Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \log(1/0.25) = 6$  dB if the duty cycle is 25%.

**Section E.3.a)****Method PM (Measurement using an RF average power meter):**

- (xi) 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 constant 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
- (xii) If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in II
- (xiii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- (xiv) 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%).

**Section E.3.b)****Method PM-G (Measurement using a gated RF average power meter):**

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

**Test results**

Test mode	Band	Freq (MHz)	Measured power (dBm)	DCF (dB)	Conducted output power (dBm)	Conducted Power Limit (dBm)
					Average	
802.11a	UNII-1	5 180	14.43	0.14	14.57	23.98
		5 200	15.41	0.14	15.55	
		5 240	15.64	0.14	15.78	
	UNII-2A	5 260	15.38	0.14	15.52	23.98
		5 280	15.40	0.14	15.54	
		5 320	15.62	0.14	15.76	
	UNII-2C	5 500	16.00	0.14	16.14	23.98
		5 600	16.02	0.14	16.16	
		5 700	13.93	0.14	14.07	
	UNII-3	5 745	14.00	0.14	14.14	30.00
		5 785	14.96	0.14	15.10	
		5 825	15.65	0.14	15.79	
802.11n HT20	UNII-1	5 180	14.27	0.15	14.42	23.98
		5 200	14.27	0.15	14.42	
		5 240	14.48	0.15	14.63	
	UNII-2A	5 260	14.38	0.15	14.53	23.98
		5 280	14.39	0.15	14.54	
		5 320	14.60	0.15	14.75	
	UNII-2C	5 500	14.88	0.15	15.03	23.98
		5 600	14.91	0.15	15.06	
		5 700	14.78	0.15	14.93	
	UNII-3	5 745	13.66	0.15	13.81	30.00
		5 785	14.61	0.15	14.76	
		5 825	14.67	0.15	14.82	
802.11n HT40	UNII-1	5 190	12.12	0.29	12.41	23.98
		5 230	13.33	0.29	13.62	
	UNII-2A	5 270	13.05	0.29	13.34	23.98
		5 310	12.29	0.29	12.58	
	UNII-2C	5 510	13.68	0.29	13.97	23.98
		5 590	13.78	0.29	14.07	
	UNII-3	5 670	13.56	0.29	13.85	30.00
		5 755	13.76	0.29	14.05	
			5 795	13.56	0.29	13.85

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Test mode	Band	Freq (MHz)	Measured power (dBm)	DCF (dB)	Conducted output power (dBm)	Conducted Power Limit (dBm)
					Average	
802.11ac VHT80	UNII-1	5 210	11.02	0.57	11.59	23.98
	UNII-2A	5 290	11.07	0.57	11.64	23.98
	UNII-2C	5 530	12.21	0.57	12.78	23.98
		5 610	12.41	0.57	12.98	
	UNII-3	5 775	12.56	0.57	13.13	30.00

**Note:**

1. Conducted Output power Calculation:

Conducted Output power = Measured power(dB m) + DCF (dB)





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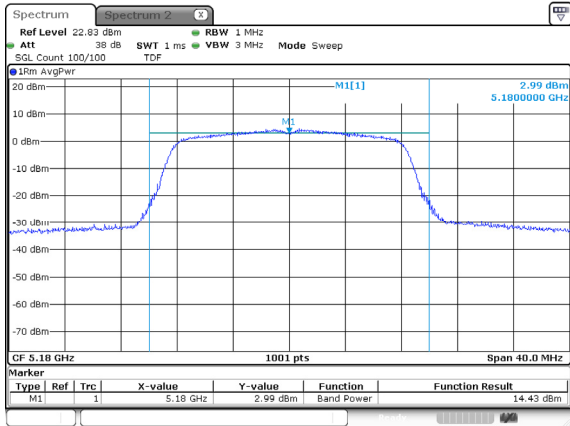
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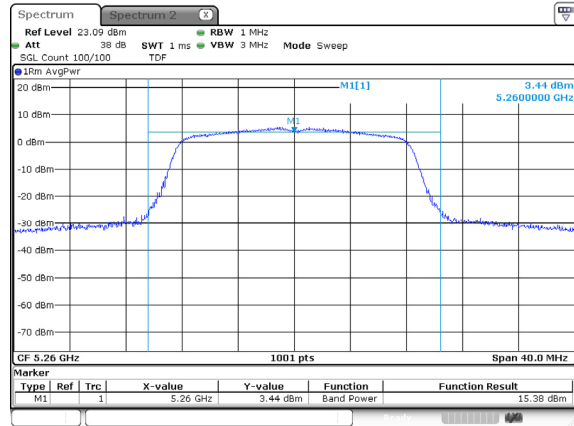
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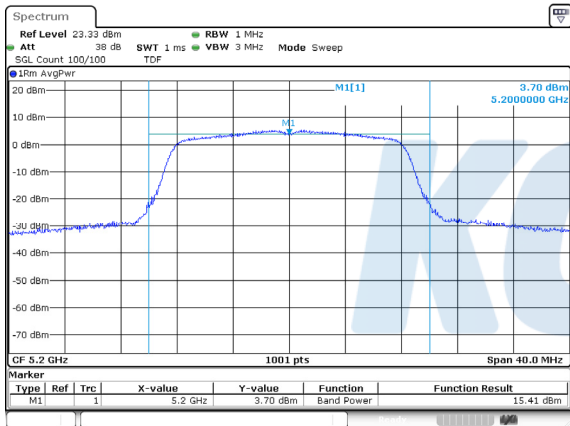
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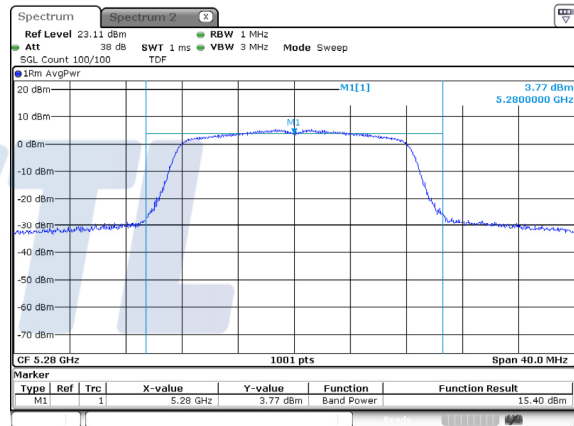
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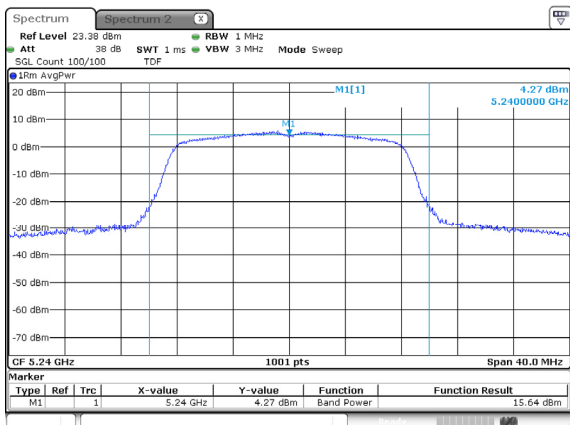
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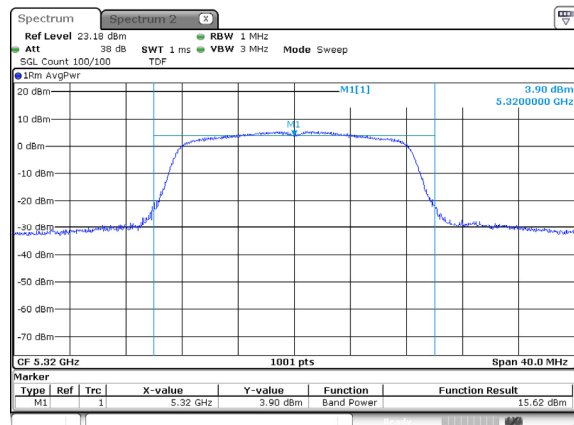
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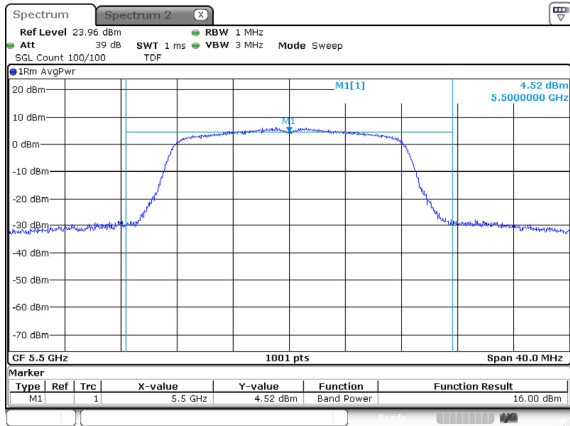
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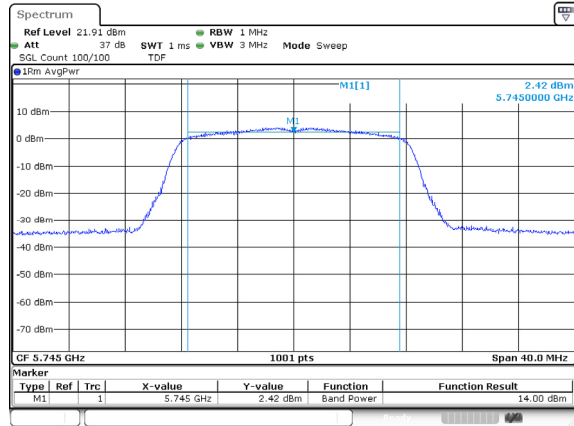
## UNII-2A / 802.11a / High ch.



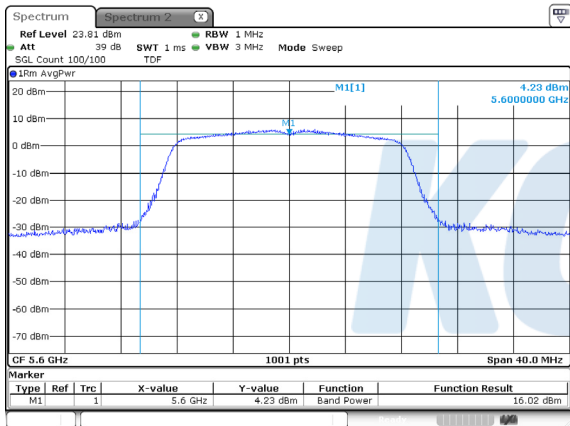
**UNII-2C / 802.11a / Low ch.**



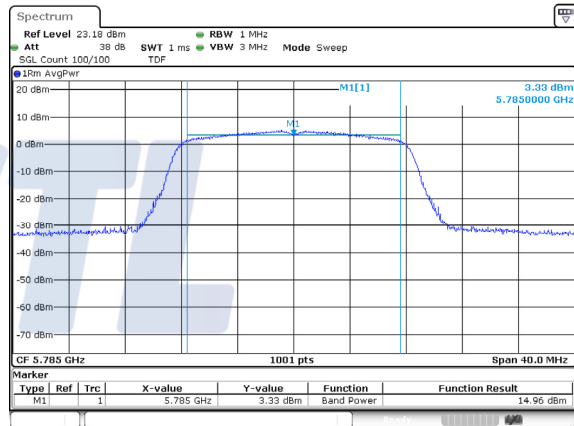
**UNII-3 / 802.11a / Low ch.**



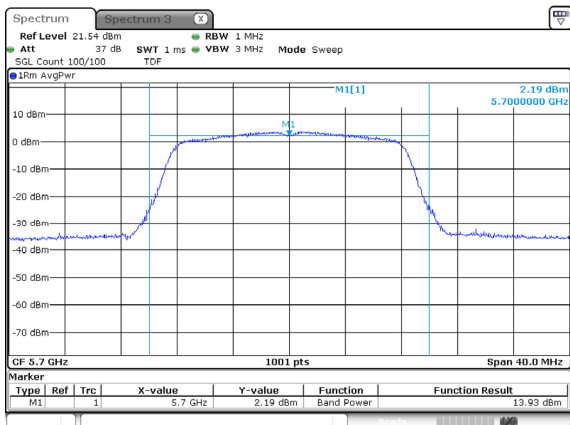
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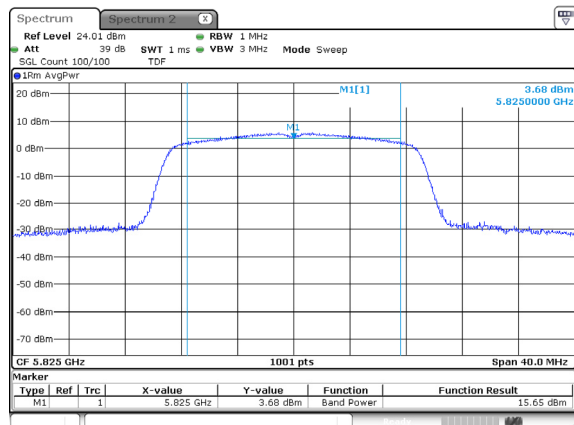
**UNII-3 / 802.11a / Mid ch.**



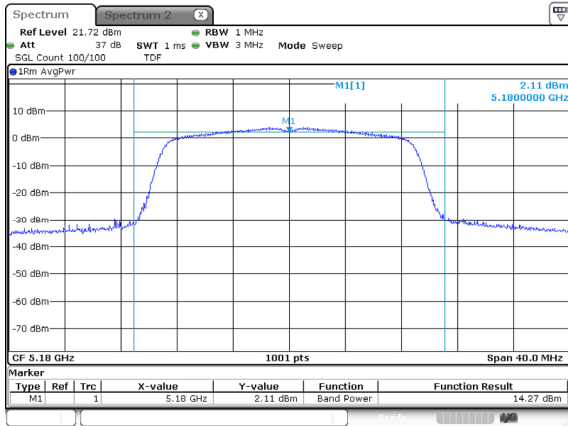
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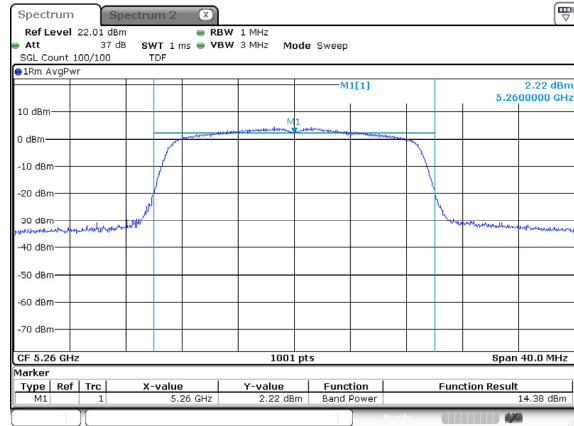
**UNII-3 / 802.11a / High ch.**



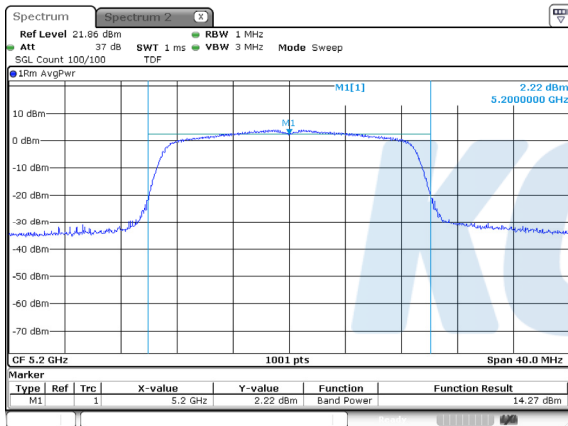
**UNII-1 / 802.11n HT20 / Low ch.**



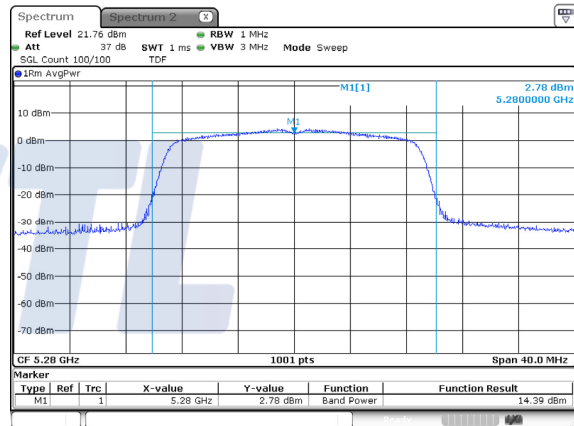
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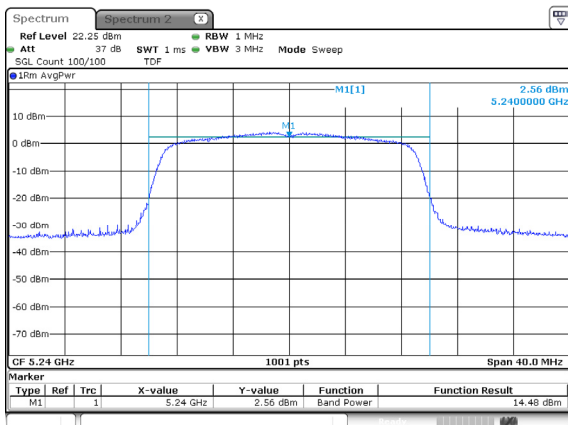
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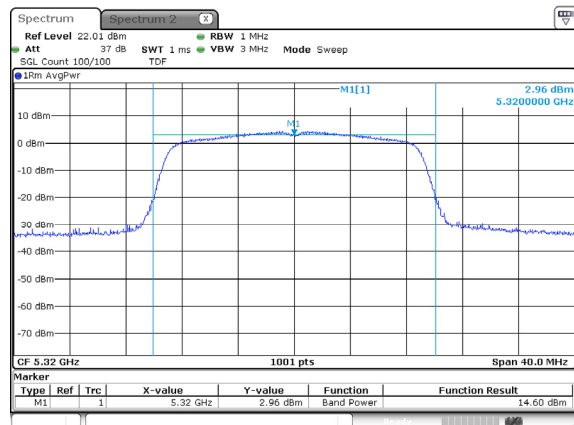
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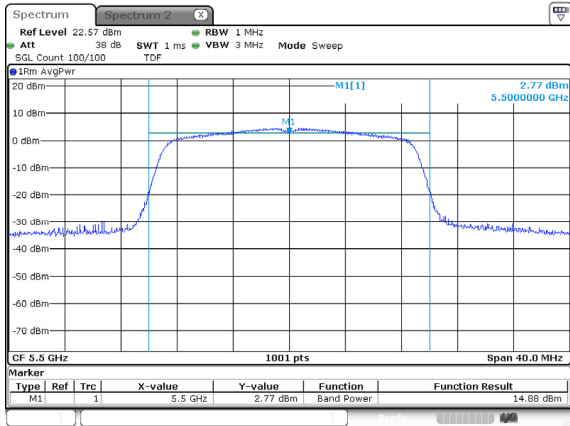
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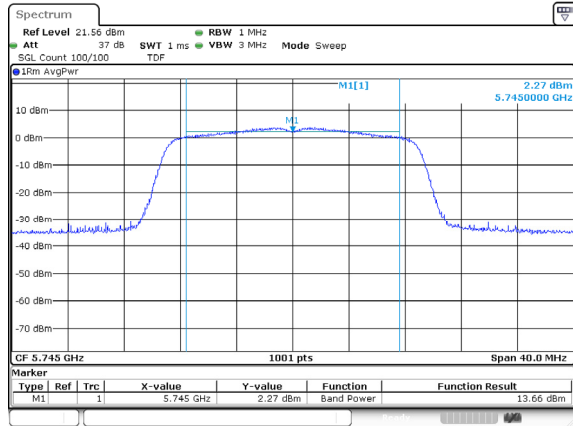
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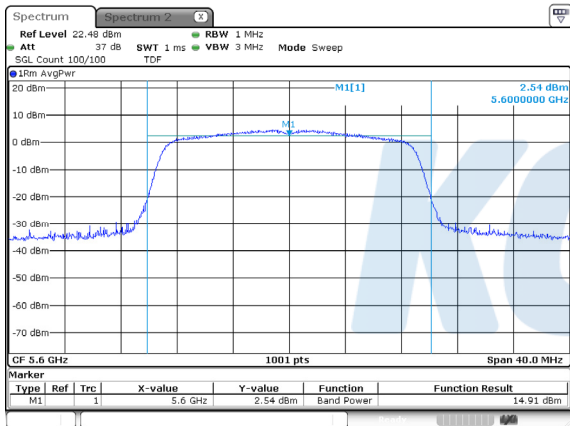
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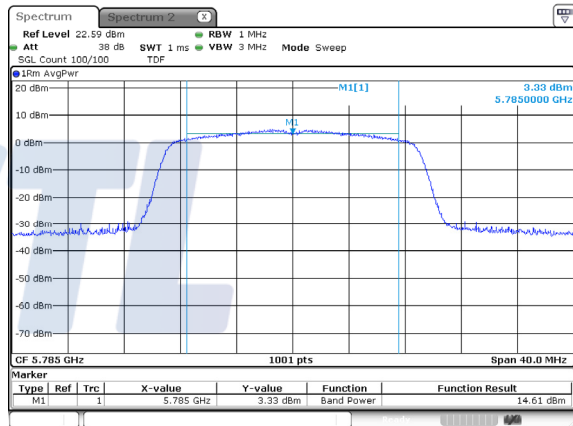
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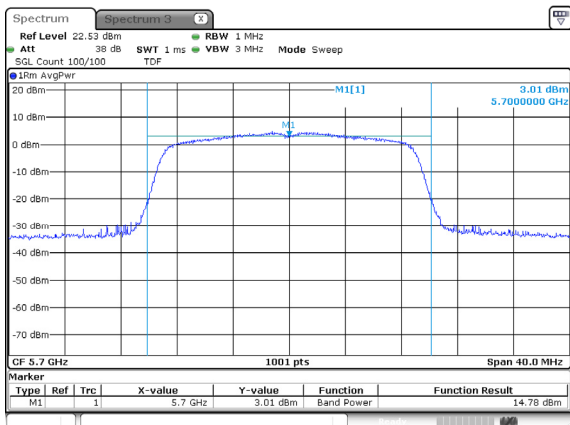
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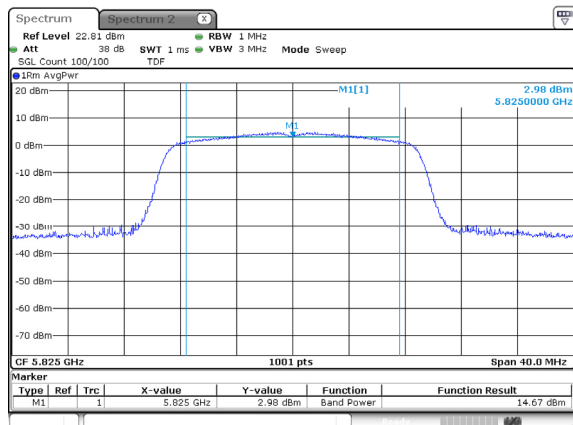
**UNII-3 / 802.11n HT20 / Mid ch.**



**UNII-2C / 802.11n HT20 / High ch.**



**UNII-3 / 802.11n HT20 / High ch.**



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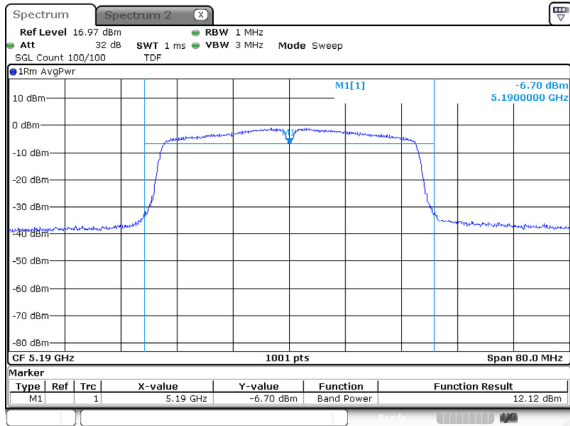
65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

Report No.:  
KR20-SRF0112-A

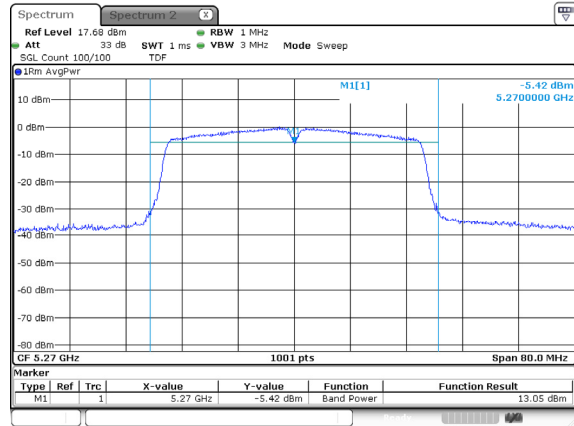
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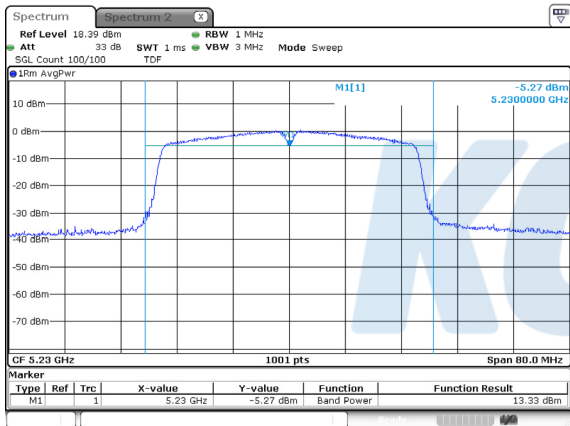
## UNII-1 / 802.11n HT40 / Low ch.



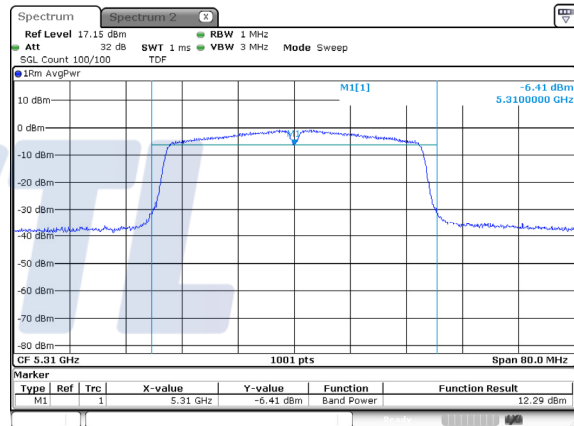
## UNII-2A / 802.11n HT40 / Low ch.



## UNII-1 / 802.11n HT40 / High ch.



## UNII-2A / 802.11n HT40 / High ch.



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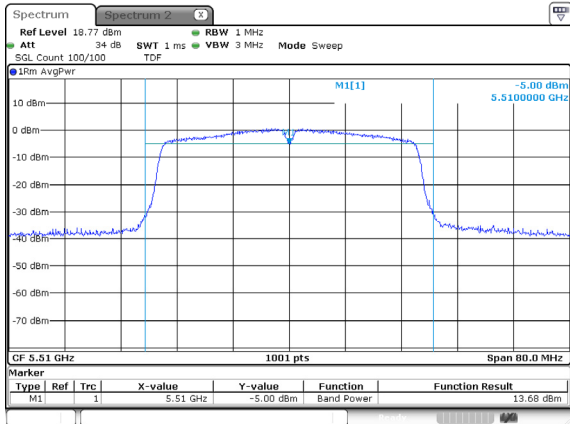
65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

Report No.:  
KR20-SRF0112-A

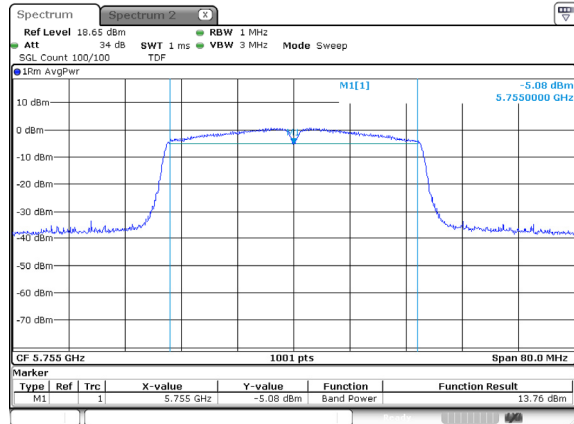
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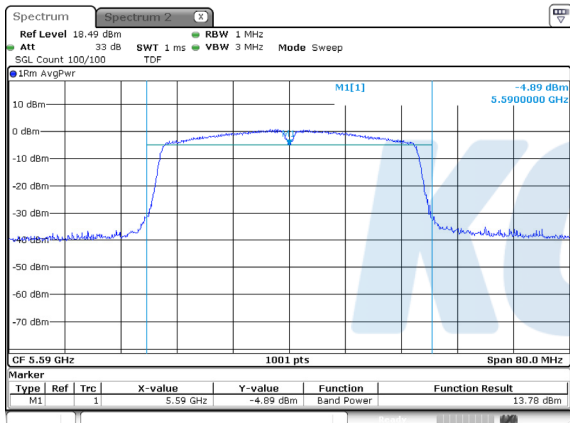
## UNII-2C / 802.11n HT40 / Low ch.



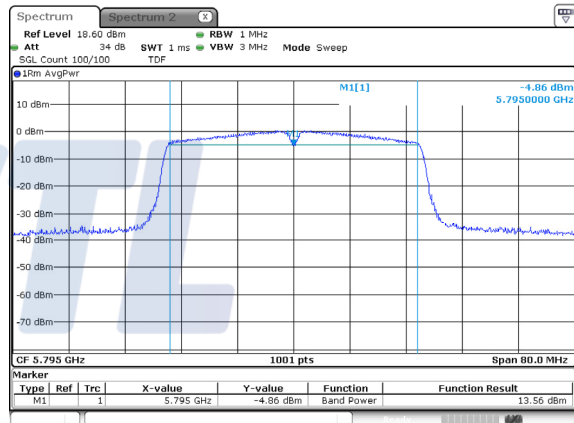
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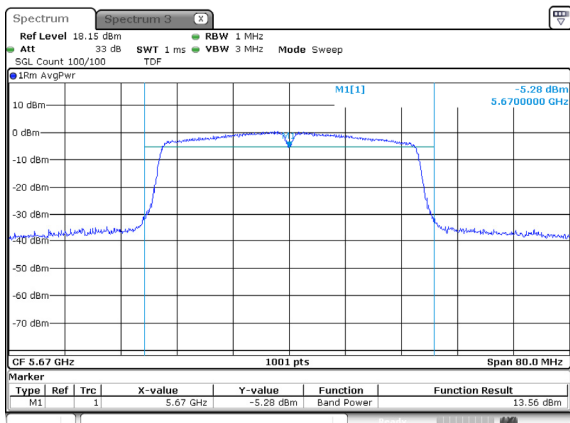
## UNII-2C / 802.11n HT40 / Mid ch.



## UNII-3 / 802.11n HT40 / High ch.

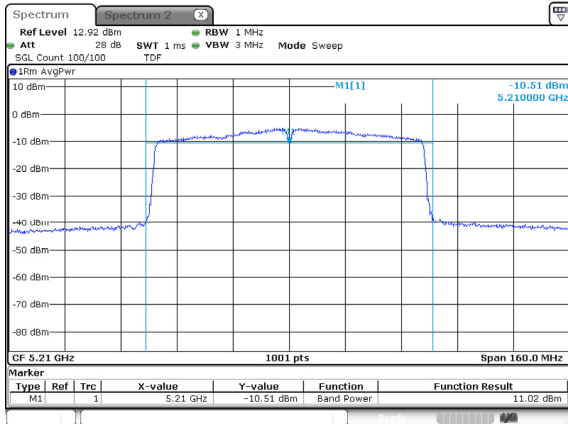


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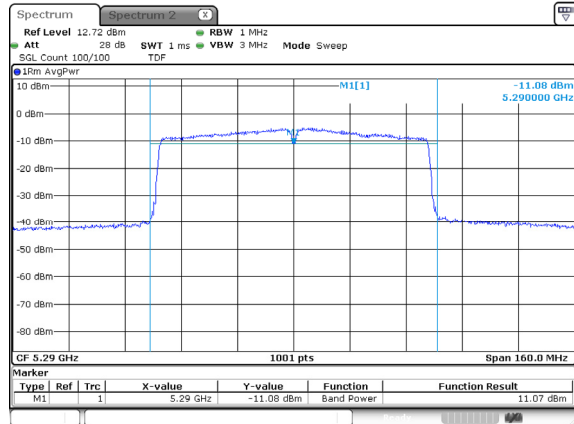


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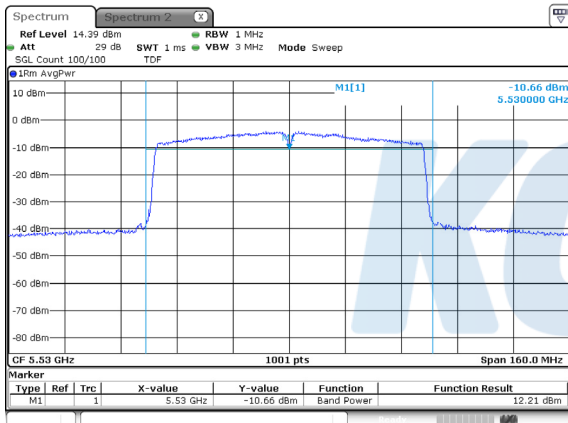
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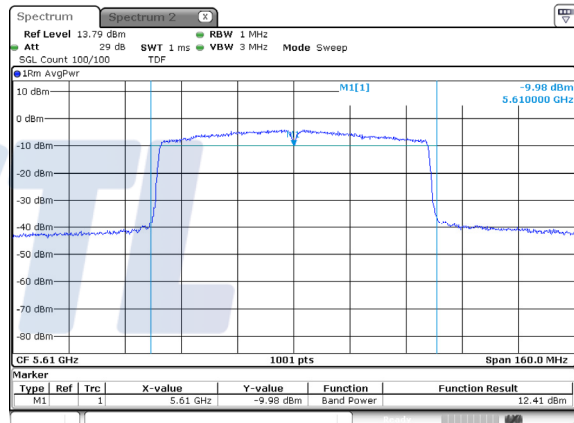
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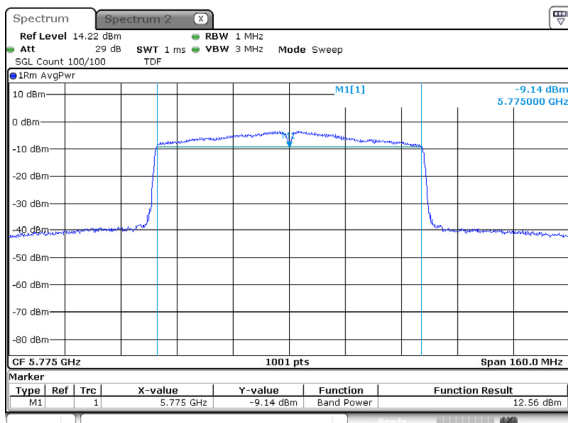
**UNII-2C / 802.11ac VHT80 / Low ch.**



**UNII-3 / 802.11ac VHT80 / High ch.**



**UNII-3 / 802.11ac VHT80 / Low ch.**



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