

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

**Test Report No.** : OT-180-RWD-079  
**AGR No.** : A188A-336  
**Applicant** : Samsung Electronics Co Ltd  
**Address** : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States  
**Manufacturer** : Samsung Electronics Co Ltd  
**Address** : Maetan dong 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea  
**Type of Equipment** : Wi-Fi/BT Transceiver  
**FCC ID.** : A3LWCP730M  
**Model Name** : WCP730M  
**Serial number** : N/A  
**Total page of Report** : 268 pages (including this page)  
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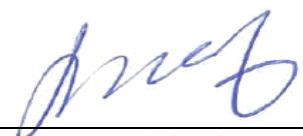
## SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART E Section 15.407*

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:   
Ki-Hong, Nam / Chief Engineer  
ONETECH Corp.

Approved by:   
Keun-Young, Choi / Vice President  
ONETECH Corp.

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**Revision History**

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-18O-RWD-079	2018.10.31	Initial Release	All



## 1. VERIFICATION OF COMPLIANCE

Applicant : Samsung Electronics Co Ltd

Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States

Manufacturer : Samsung Electronics Co Ltd

Address : Maetan dong 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea

Factory 1 : WISOL HA NOI COMPANY LIMITED

Address : No. 26, Street 05, Vsip Bac Ninh Industrial Park, Phu Chan Communt, Tu Son Town, Bac Ninh Province, Viet Nam.

Factory 2 : Shenzhen Zowee Technology Co., Ltd.

Address : Floor5 & 6, Block 5, Science & Technology Park of Privately Owned Enterprises, Pingshan, Xili, Nanshan District, Shenzhen, Guangdong Province, P.R. China

Contact Person : Minhyung cho / Senior Engineer

Telephone No. : +82-31-277-2688

FCC ID : A3LWCP730M

Model Name : WCP730M

Brand Name : 

Serial Number : N/A

Date : October 31, 2018

EQUIPMENT CLASS	Unlicensed National Information infrastructure(UNII)
E.U.T. DESCRIPTION	Modular Transmitter, Wi-Fi/BT Transceiver
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART E Section 15.407 KDB 789033 D02 General UNII Test Procedures New Rules V02r01
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. TEST SUMMARY

### 2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.407(a)	26 dB Bandwidth	PASS
15.407(a)	Maximum Conducted Output Power	Met the Limit / PASS
15.407(a)	Peak Power Spectral Density	Met the Limit / PASS
15.407(a)	Peak Excursion	Met the Limit / PASS
15.407(g)	Frequency Stability	Met the Limit / PASS
15.407(b)	Undesirable Emissions	Met the Limit / PASS
15.205, 15.407(b)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Met the Limit / PASS
15.207	AC Conducted Emissions 150 kHz-30 MHz	Met the Limit / PASS
15.407(h)	Dynamic frequency Selection	Met the Limit / PASS

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

### 2.3 Related Submittal(s) / Grant(s)

Original submittal only

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART E Section 15.407

### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The Samsung Electronics Co Ltd, Model WCP730M (referred to as the EUT in this report) is a Wi-Fi/BT Transceiver. The product specification described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Wi-Fi/BT Transceiver		
Temperature Range	-20 °C ~ 50 °C		
OPERATING FREQUENCY	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	Bluetooth	2 402 MHz ~ 2 480 MHz	
	WLAN 2.4 GHz	2 412 MHz ~ 2 472 MHz (802.11b/g/n(HT20))	
		2 422 MHz ~ 2 462 MHz (802.11n(HT40))	
	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11a/n(HT20)/ac(VHT20))	
		5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac(VHT40))	
		5 210 MHz (802.11ac(VHT80))	
	5 250 MHz ~ 5 350 MHz Band	5 260 MHz ~ 5 320 MHz (802.11a/n(HT20)/ac(VHT20))	
		5 270 MHz ~ 5 310 MHz (802.11n(HT40)/ac(VHT40))	
		5 290 MHz (802.11ac(VHT80))	
	5 470 MHz ~ 5 725 MHz Band	5 500 MHz ~ 5 700 MHz (802.11a/n(HT20)/ac(VHT20))	
		5 510 MHz ~ 5 670 MHz (802.11n(HT40)/ac(VHT40))	
		5 530 MHz (802.11ac(VHT80))	
	5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11a/n(HT20)/ac(VHT20))	
5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac(VHT40))			
5 775 MHz (802.11ac(VHT80))			
MODULATION TYPE	Bluetooth LE	GFSK	
	Bluetooth	GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps	
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK)	
		802.11g/n(HT20)/n(HT40): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
WLAN 5 GHz	802.11a/n(HT20)/n(HT40)/ac(VHT80): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)		

RF OUTPUT POWER'	Bluetooth LE	1 Mbps	10.50 dBm	
		2 Mbps	10.33 dBm	
	Bluetooth	1 Mbps	10.43 dBm	
		2 Mbps	10.09 dBm	
		3 Mbps	10.47 dBm	
	WLAN 2.4 GHz	Antenna 0	19.96 dBm(802.11b)	
			16.85 dBm(802.11g)	
			15.62 dBm(802.11n_HT20)	
			13.50 dBm(802.11n_HT40)	
		Antenna 1	20.46 dBm(802.11b)	
			17.04 dBm(802.11g)	
Multiple Antenna	15.98 dBm(802.11n_HT20)			
	13.94 dBm(802.11n_HT40)			
	19.96 dBm(802.11g)			
		18.80 dBm(802.11n_HT20)		
		16.74 dBm(802.11n_HT40)		

RF OUTPUT POWER	5 150 MHz ~ 5 250 MHz Band	Antenna 0	15.82 dBm(802.11a) 14.61 dBm(802.11n_HT20) 13.23 dBm(802.11n_HT40) 10.86 dBm(802.11ac_VHT80)
		Antenna 1	16.06 dBm(802.11a) 15.02 dBm(802.11n_HT20) 13.42 dBm(802.11n_HT40) 10.89 dBm(802.11ac_VHT80)
		Multiple Antenna	18.95 dBm(802.11a) 17.79 dBm(802.11n_HT20) 16.34 dBm(802.11n_HT40) 13.89 dBm(802.11ac_VHT80)
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	16.01 dBm(802.11a) 14.93 dBm(802.11n_HT20) 13.31 dBm(802.11n_HT40) 11.24 dBm(802.11ac_VHT80)
		Antenna 1	15.89 dBm(802.11a) 14.88 dBm(802.11n_HT20) 13.08 dBm(802.11n_HT40) 10.58 dBm(802.11ac_VHT80)
		Multiple Antenna	18.96 dBm(802.11a) 17.92 dBm(802.11n_HT20) 16.21 dBm(802.11n_HT40) 13.93 dBm(802.11ac_VHT80)

RF OUTPUT POWER	5 470 MHz ~ 5 725 MHz Band	Antenna 0	16.35 dBm(802.11a) 15.41 dBm(802.11n_HT20) 13.81 dBm(802.11n_HT40) 11.57 dBm(802.11ac_VHT80)
		Antenna 1	16.02 dBm(802.11a) 15.08 dBm(802.11n_HT20) 13.06 dBm(802.11n_HT40) 10.82 dBm(802.11ac_VHT80)
		Multiple Antenna	18.97 dBm(802.11a) 18.07 dBm(802.11n_HT20) 16.46 dBm(802.11n_HT40) 14.22 dBm(802.11ac_VHT80)
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	16.73 dBm(802.11a) 15.41 dBm(802.11n_HT20) 13.58 dBm(802.11n_HT40) 11.53 dBm(802.11ac_VHT80)
		Antenna 1	16.23 dBm(802.11a) 15.15 dBm(802.11n_HT20) 13.41 dBm(802.11n_HT40) 11.63 dBm(802.11ac_VHT80)
		Multiple Antenna	19.28 dBm(802.11a) 18.25 dBm(802.11n_HT20) 16.47 dBm(802.11n_HT40) 14.59 dBm(802.11ac_VHT80)
MODULATION TYPE	Bluetooth LE	GFSK	
	Bluetooth	GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps	
	WLAN 2.4 G	DSSS Modulation(DBPSK/DQPSK/CCK) OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
	WLAN 5 G	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	

ANTENNA TYPE	Metal Antenna			
ANTENNA GAIN	Bluetooth LE	-4.60 dBi		
	Bluetooth	-4.60 dBi		
	WLAN 2.4 GHz	Antenna 0	0.71 dBi	
		Antenna 1	2.56 dBi	
		Multiple Antenna	4.74 dBi	
	5 150 MHz ~ 5 250 MHz Band	Antenna 0	3.47 dBi	
		Antenna 1	2.98 dBi	
		Multiple Antenna	6.24 dBi	
	5 250 MHz ~ 5 350 MHz Band	Antenna 0	1.64 dBi	
		Antenna 1	-0.67 dBi	
		Multiple Antenna	3.65 dBi	
	5 470 MHz ~ 5 725 MHz Band	Antenna 0	1.95 dBi	
		Antenna 1	-0.49 dBi	
		Multiple Antenna	3.91 dBi	
	5 725 MHz ~ 5 850 MHz Band	Antenna 0	0.14 dBi	
		Antenna 1	-0.92 dBi	
		Multiple Antenna	2.65 dBi	
	List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		40 MHz	

**3.2 Alternative type(s)/model(s); also covered by this test report.**

-. None

**4. EUT MODIFICATIONS**

-. None



## 5. SYSTEM TEST CONFIGURATION

### 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	Samsung Electronics Co Ltd	WCP730M	N/A

### 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
WCP730M	Samsung Electronics Co Ltd	Wi-Fi/BT Transceiver	
HP Pavilion g series	HP	Notebook PC	EUT
PPP009C	LIE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	AC Adapter	

### 5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting mode is programmed.

#### UNII 1

Modulation	DATA RATE	OUTPUT POWER[dBm]	
		Antenna 0	Antenna 1
802.11 a (Middle Channel)	6 Mbps	15.82	16.06
	9 Mbps	15.76	16.01
	12 Mbps	15.73	15.96
	18 Mbps	15.75	15.90
	24 Mbps	15.70	15.86
	36 Mbps	15.64	15.81
	48 Mbps	15.66	15.85
	54 Mbps	15.61	15.77
HT 20 (Middle Channel)	6.5 Mbps	14.53	15.02
	13 Mbps	14.48	14.97
	19.5 Mbps	14.42	14.91
	26 Mbps	14.36	14.85
	39 Mbps	14.43	14.73
	52 Mbps	14.41	14.70
	58.5 Mbps	14.36	14.66
	65 Mbps	14.28	14.62
HT 40 (Low Channel)	13.5 Mbps	12.78	13.23
	27 Mbps	12.72	13.18
	40.5 Mbps	12.67	13.11
	54 Mbps	12.63	13.07
	81 Mbps	12.57	13.01
	108 Mbps	12.61	12.96
	121.5 Mbps	12.68	13.07
	135 Mbps	12.63	13.04

VHT80 (Middle Channel)	29.3 Mbps	10.86	10.89
	58.5 Mbps	10.77	10.81
	87.8 Mbps	10.71	10.74
	117 Mbps	10.68	10.69
	175.5 Mbps	10.72	10.73
	234 Mbps	10.77	10.79
	263.3 Mbps	10.68	10.71
	292.5 Mbps	10.61	10.66
	351 Mbps	10.55	10.58
	390 Mbps	10.58	10.62

- The worse case data rate for each modulation is determined 6 Mbps(Ant.0/Ant.1) for IEEE 802.11a, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40, 29.3 Mbps(Ant.0/Ant.1) for VHT80.
- To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

**UNII 2A**

Modulation	DATA RATE	OUTPUT POWER[dBm]	
		Antenna 0	Antenna 1
802.11 a (Middle Channel)	6 Mbps	15.79	15.53
	9 Mbps	15.71	15.46
	12 Mbps	15.76	15.49
	18 Mbps	15.69	15.43
	24 Mbps	15.62	15.34
	36 Mbps	15.57	15.28
	48 Mbps	15.51	15.22
	54 Mbps	15.47	15.18
HT 20 (Middle Channel)	6.5 Mbps	14.93	14.88
	13 Mbps	14.86	14.81
	19.5 Mbps	14.81	14.77
	26 Mbps	14.74	14.73
	39 Mbps	14.82	14.79
	52 Mbps	14.83	14.81
	58.5 Mbps	14.76	14.77
	65 Mbps	14.71	14.73
HT 40 (Low Channel)	13.5 Mbps	13.05	13.08
	27 Mbps	12.97	13.01
	40.5 Mbps	12.92	12.94
	54 Mbps	12.86	12.86
	81 Mbps	12.88	12.89
	108 Mbps	12.81	12.80
	121.5 Mbps	12.76	12.73
	135 Mbps	12.68	12.71

VHT80 (Middle Channel)	29.3 Mbps	11.24	10.58
	58.5 Mbps	11.19	10.52
	87.8 Mbps	11.12	10.46
	117 Mbps	11.07	10.41
	175.5 Mbps	11.00	10.35
	234 Mbps	10.96	10.27
	263.3 Mbps	10.86	10.16
	292.5 Mbps	10.88	10.20
	351 Mbps	10.81	10.12
	390 Mbps	10.77	10.08

- The worse case data rate for each modulation is determined 6 Mbps(Ant.0/Ant.1) for IEEE 802.11a, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40, 29.3 Mbps(Ant.0/Ant.1) for VHT80.
- To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

**UNII 2C**

Modulation	DATA RATE	OUTPUT POWER[dBm]	
		Antenna 0	Antenna 1
802.11 a (Middle Channel)	6 Mbps	16.35	15.53
	9 Mbps	16.31	15.48
	12 Mbps	16.26	15.42
	18 Mbps	16.21	15.38
	24 Mbps	16.18	15.32
	36 Mbps	16.12	15.26
	48 Mbps	16.08	15.21
	54 Mbps	16.17	15.29
HT 20 (Middle Channel)	6.5 Mbps	15.41	14.64
	13 Mbps	15.37	14.60
	19.5 Mbps	15.31	14.54
	26 Mbps	15.35	14.59
	39 Mbps	15.33	14.55
	52 Mbps	15.27	14.45
	58.5 Mbps	15.21	14.40
	65 Mbps	15.13	14.32
HT 40 (Low Channel)	13.5 Mbps	13.42	12.61
	27 Mbps	13.37	12.55
	40.5 Mbps	13.31	12.50
	54 Mbps	13.26	12.46
	81 Mbps	13.20	12.42
	108 Mbps	13.28	12.48
	121.5 Mbps	13.32	12.53
	135 Mbps	13.26	12.47

VHT80 (Middle Channel)	29.3 Mbps	11.57	10.82
	58.5 Mbps	11.51	10.74
	87.8 Mbps	11.48	10.66
	117 Mbps	11.40	10.59
	175.5 Mbps	11.37	10.55
	234 Mbps	11.42	10.61
	263.3 Mbps	11.47	10.68
	292.5 Mbps	11.41	10.62
	351 Mbps	11.36	10.57
	390 Mbps	11.33	10.51

- The worse case data rate for each modulation is determined 6 Mbps(Ant.0/Ant.1) for IEEE 802.11a, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40, 29.3 Mbps(Ant.0/Ant.1) for VHT80.
- To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

**UNII 3**

Modulation	DATA RATE	OUTPUT POWER[dBm]	
		Antenna 0	Antenna 1
802.11 a (Middle Channel)	6 Mbps	16.11	16.23
	9 Mbps	16.07	16.18
	12 Mbps	16.02	16.12
	18 Mbps	15.95	16.06
	24 Mbps	15.99	16.10
	36 Mbps	16.08	16.14
	48 Mbps	16.02	16.08
	54 Mbps	15.96	16.01
HT 20 (Middle Channel)	6.5 Mbps	15.41	14.85
	13 Mbps	15.36	14.80
	19.5 Mbps	15.27	14.76
	26 Mbps	15.33	14.83
	39 Mbps	15.28	14.76
	52 Mbps	15.21	14.70
	58.5 Mbps	15.15	14.65
	65 Mbps	15.11	14.60
HT 40 (Low Channel)	13.5 Mbps	13.51	13.41
	27 Mbps	13.45	13.36
	40.5 Mbps	13.41	13.30
	54 Mbps	13.36	13.24
	81 Mbps	13.30	13.18
	108 Mbps	13.38	13.26
	121.5 Mbps	13.42	13.33
	135 Mbps	13.36	13.28



VHT80 (Middle Channel)	29.3 Mbps	11.53	11.63
	58.5 Mbps	11.48	11.58
	87.8 Mbps	11.41	11.50
	117 Mbps	11.36	11.45
	175.5 Mbps	11.30	11.39
	234 Mbps	11.27	11.32
	263.3 Mbps	11.32	11.43
	292.5 Mbps	11.38	11.49
	351 Mbps	11.32	11.42
	390 Mbps	11.26	11.38

- The worse case data rate for each modulation is determined 6 Mbps(Ant.0/Ant.1) for IEEE 802.11a, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40, 29.3 Mbps(Ant.0/Ant.1) for VHT80.
- To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis.

## 5.4 Configuration of Test System

**Line Conducted Test:** The EUT was connected to USB and the power of USB was connected to Notebook PC. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

## 5.5 Antenna Requirement

For intentional device, according to section 15.203, 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.

### **Antenna Construction:**

The antenna of the EUT is a Metal Antenna on the main board in the EUT, so no consideration of replacement by the user.

## 6. PRELIMINARY TEST

### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

### 6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

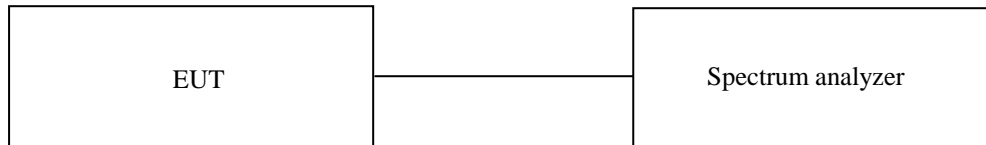
## 7. MIMIMUM 26 dB BANDWIDTH

### 7.1 Operating environment

Temperature : 25 °C  
 Relative humidity : 46 % R.H.

### 7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 26 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 26 dB.



### 7.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 14, 2018 (1Y)

All test equipment used is calibrated on a regular basis.

**7.4 Test data for 802.11a RLAN Mode**

**7.4.1 Test data for Antenna 0**

-. Test Date : September 28, 2018 ~ October 24, 2018

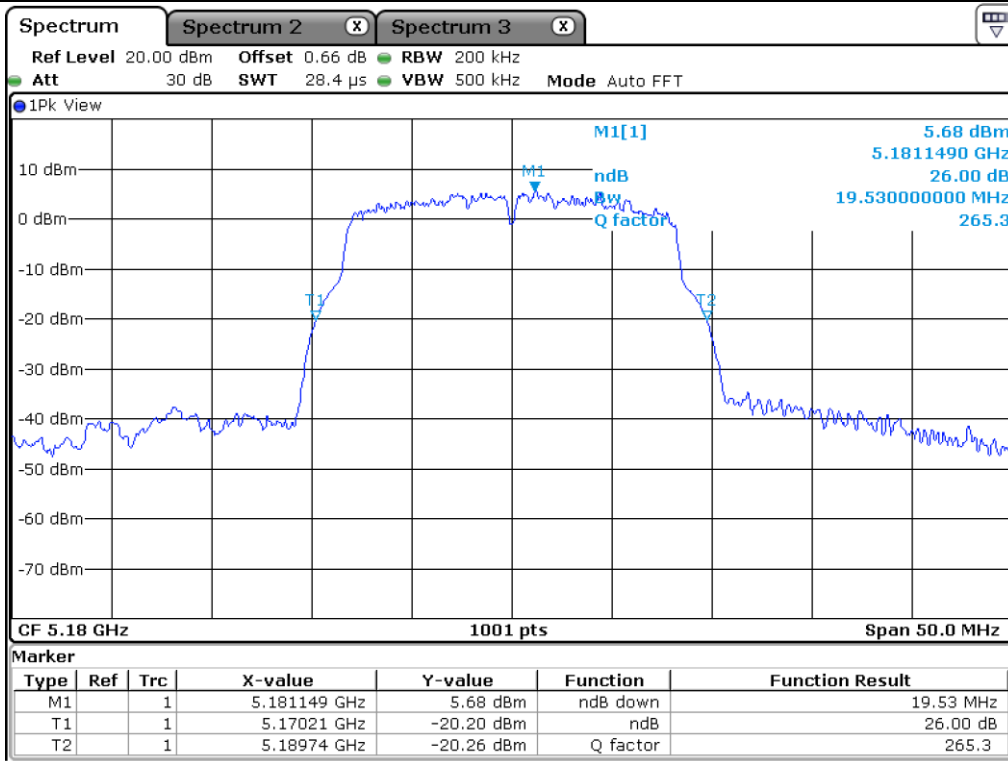
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	19.53
	Middle	5 220.00	19.58
	High	5 240.00	19.53
5 250 ~ 5 350	Low	5 260.00	19.83
	Middle	5 300.00	19.83
	High	5 320.00	20.03
5 470 ~ 5 725	Low	5 500.00	19.88
	Middle	5 580.00	20.28
	High	5 700.00	19.98
5 725 ~ 5 850	Low	5 745.00	19.93
	Middle	5 785.00	19.88
	High	5 825.00	20.23

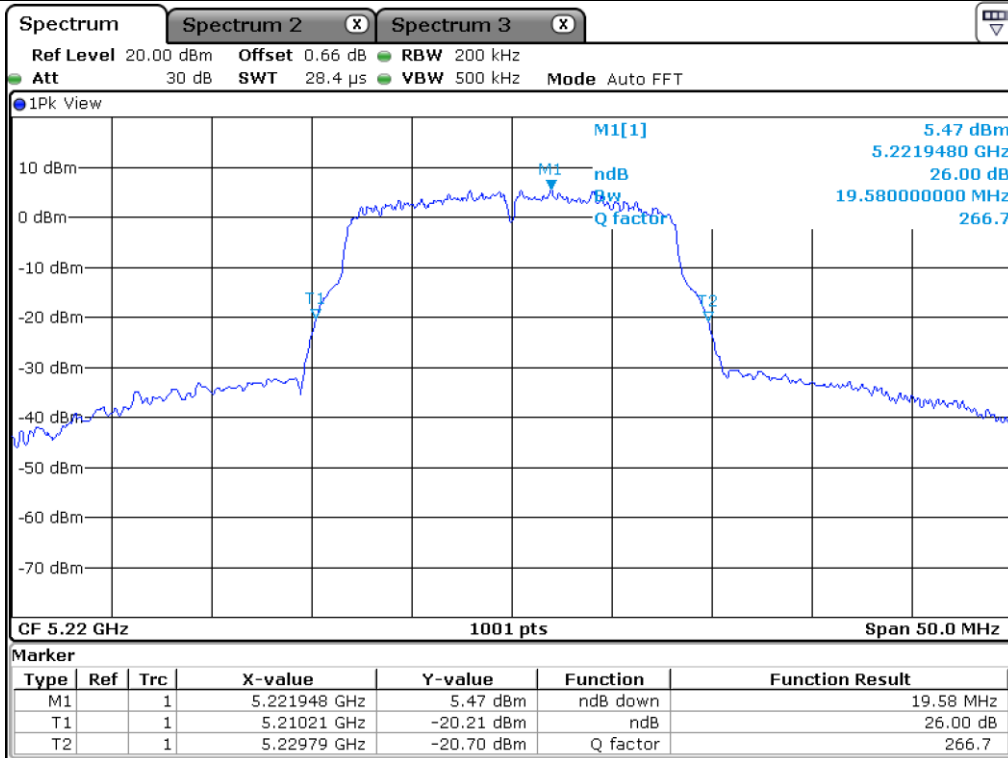
Remark: See next page for measurement data.



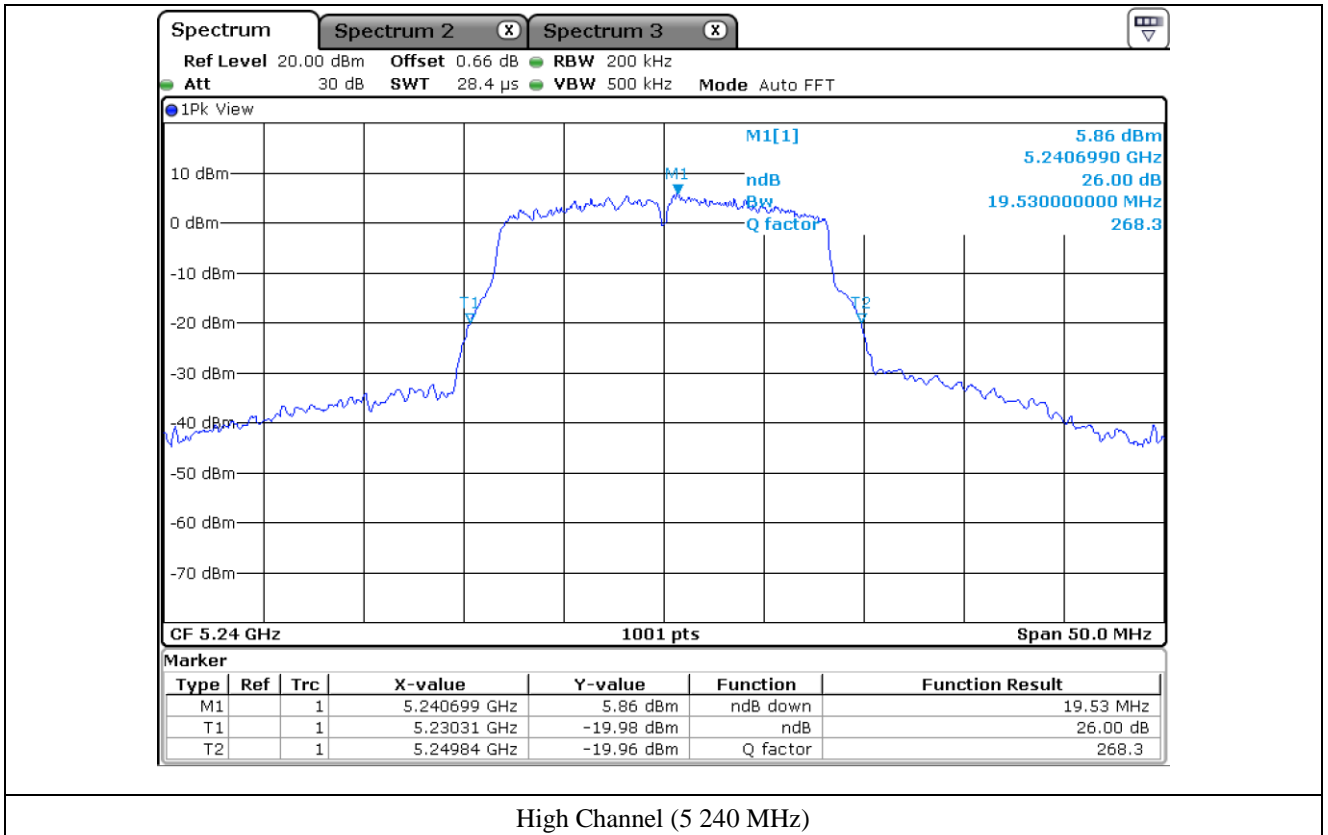
**Tested by: Tae-Ho, Kim / Senior Manager**

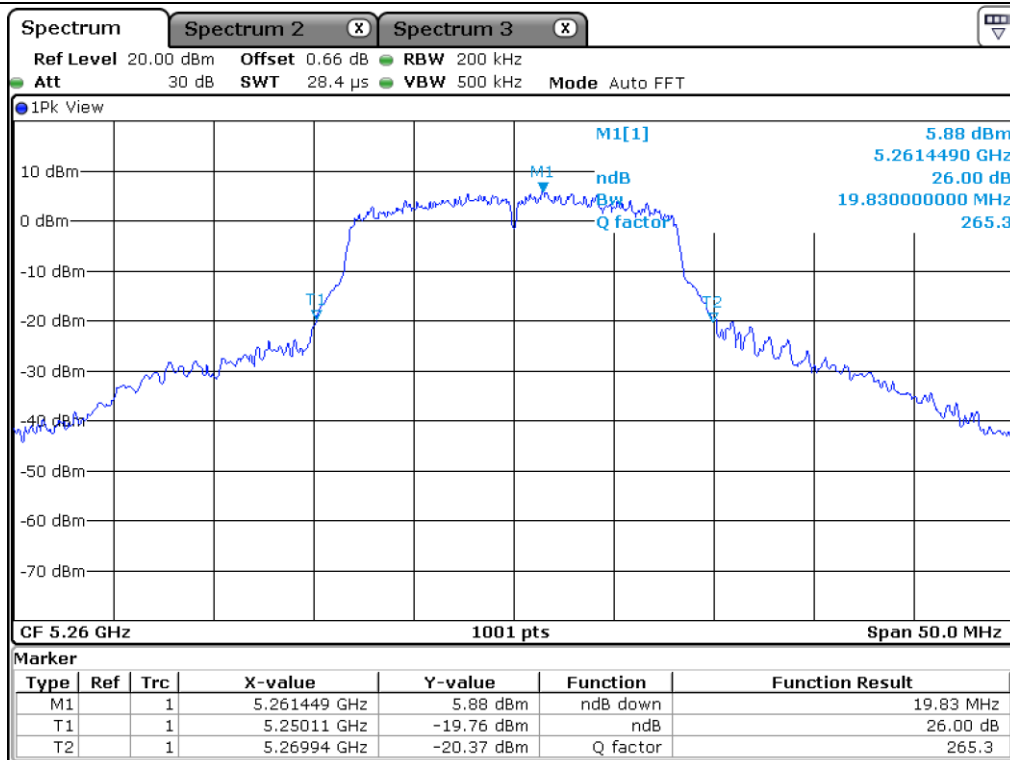


Low Channel (5 180 MHz)

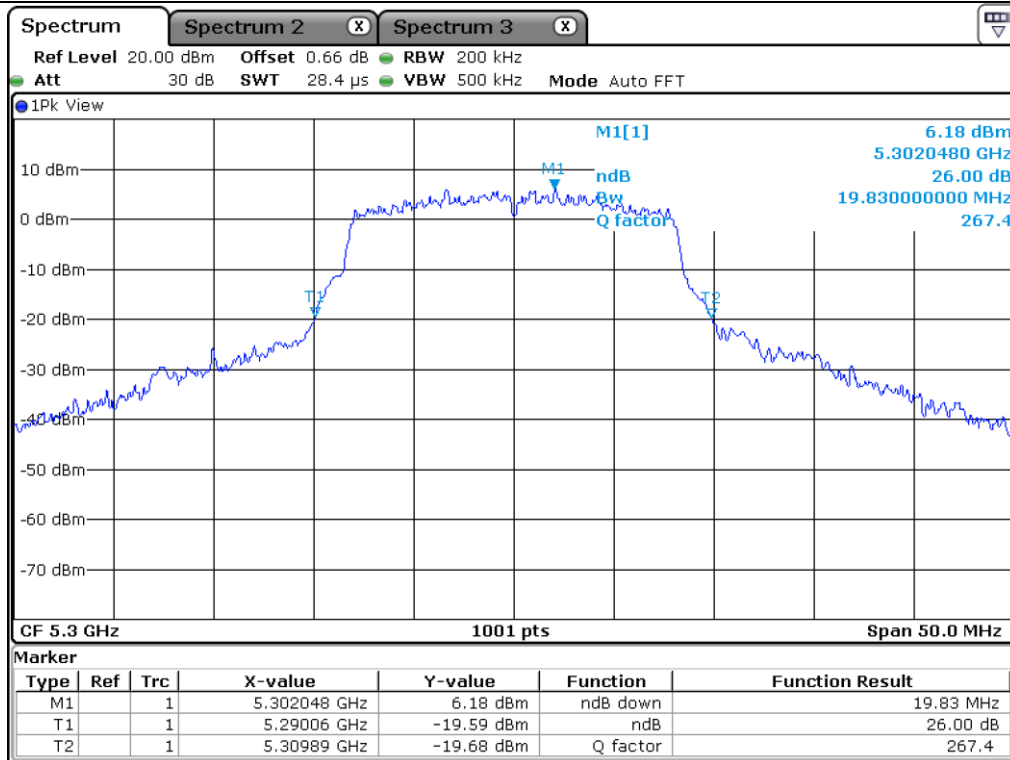


Middle Channel (5 220 MHz)



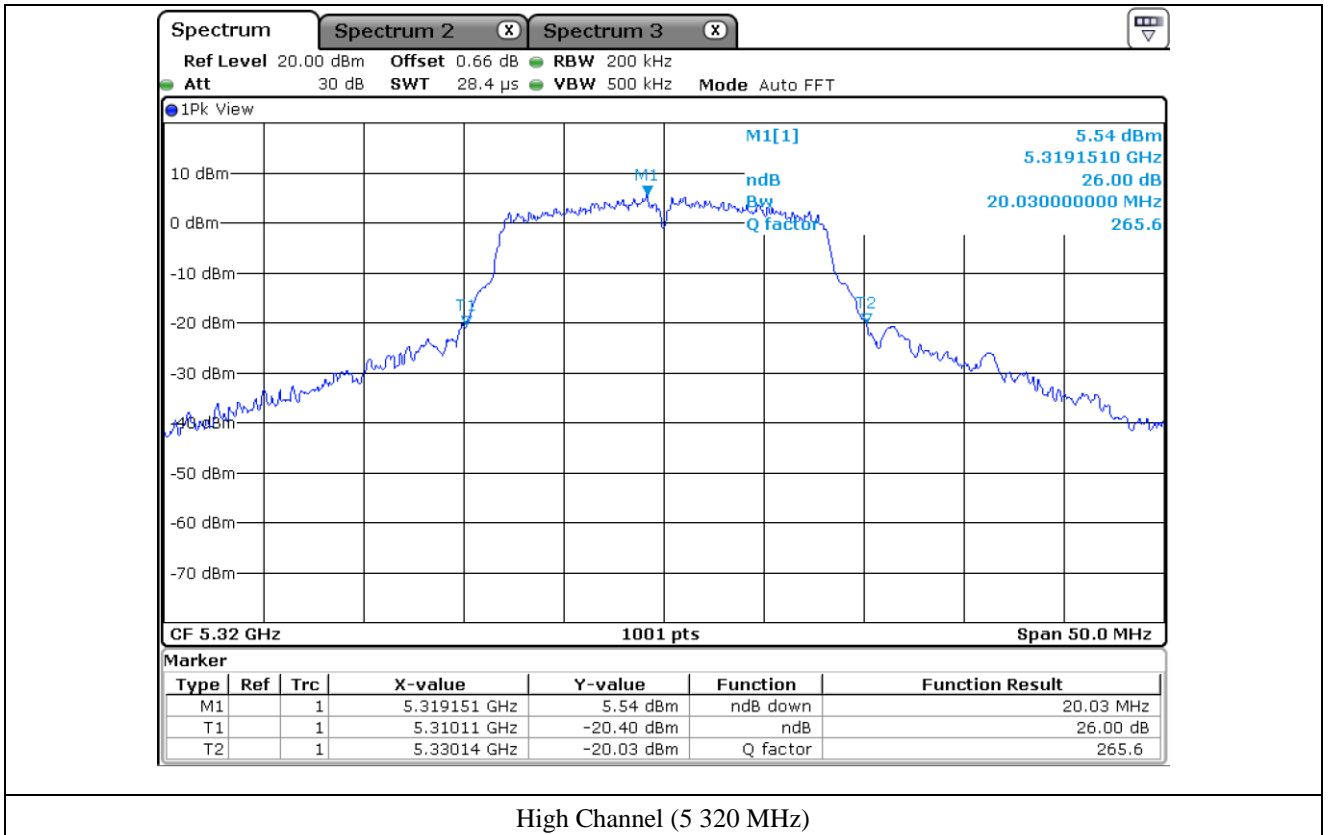


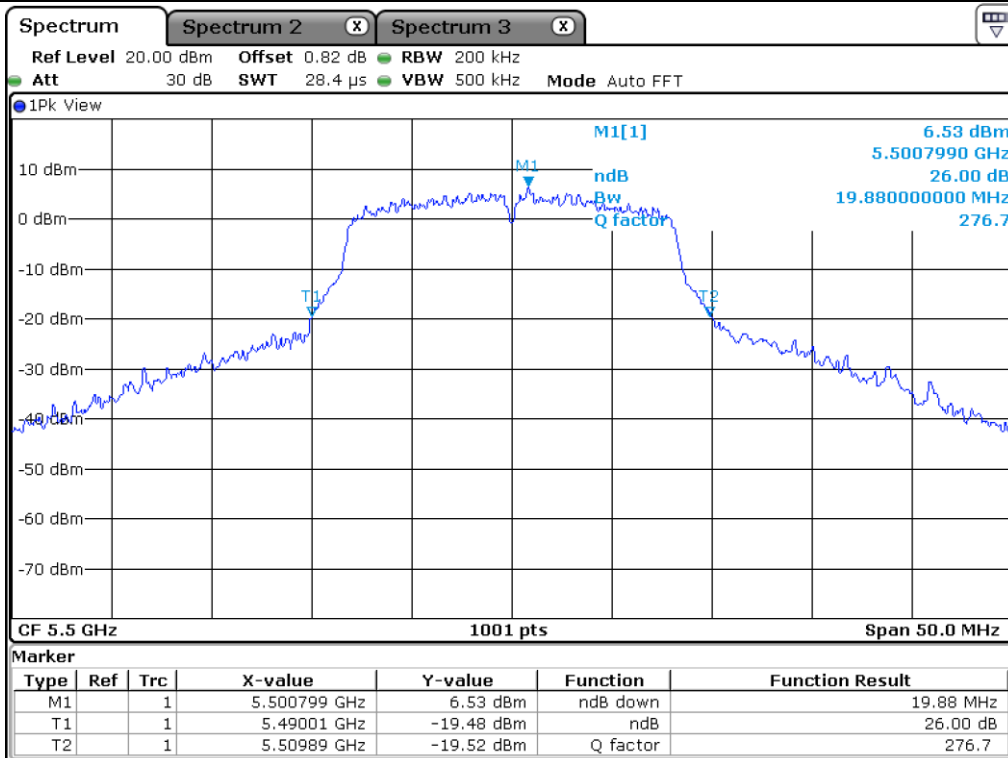
Low Channel (5 260 MHz)



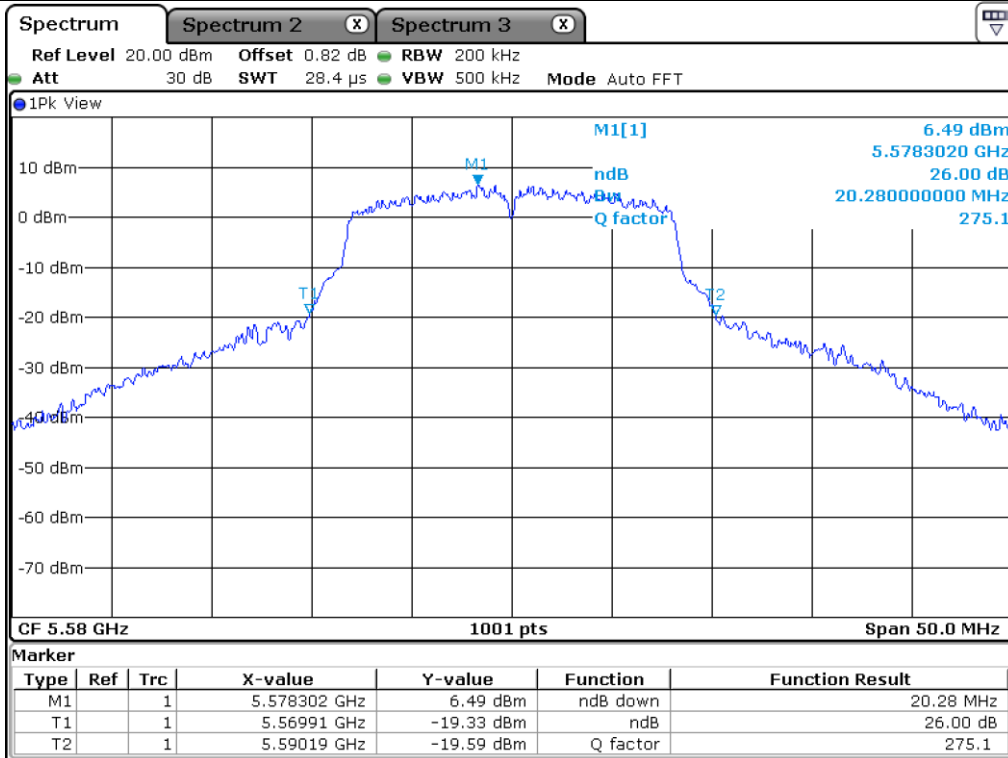
Middle Channel (5 300 MHz)



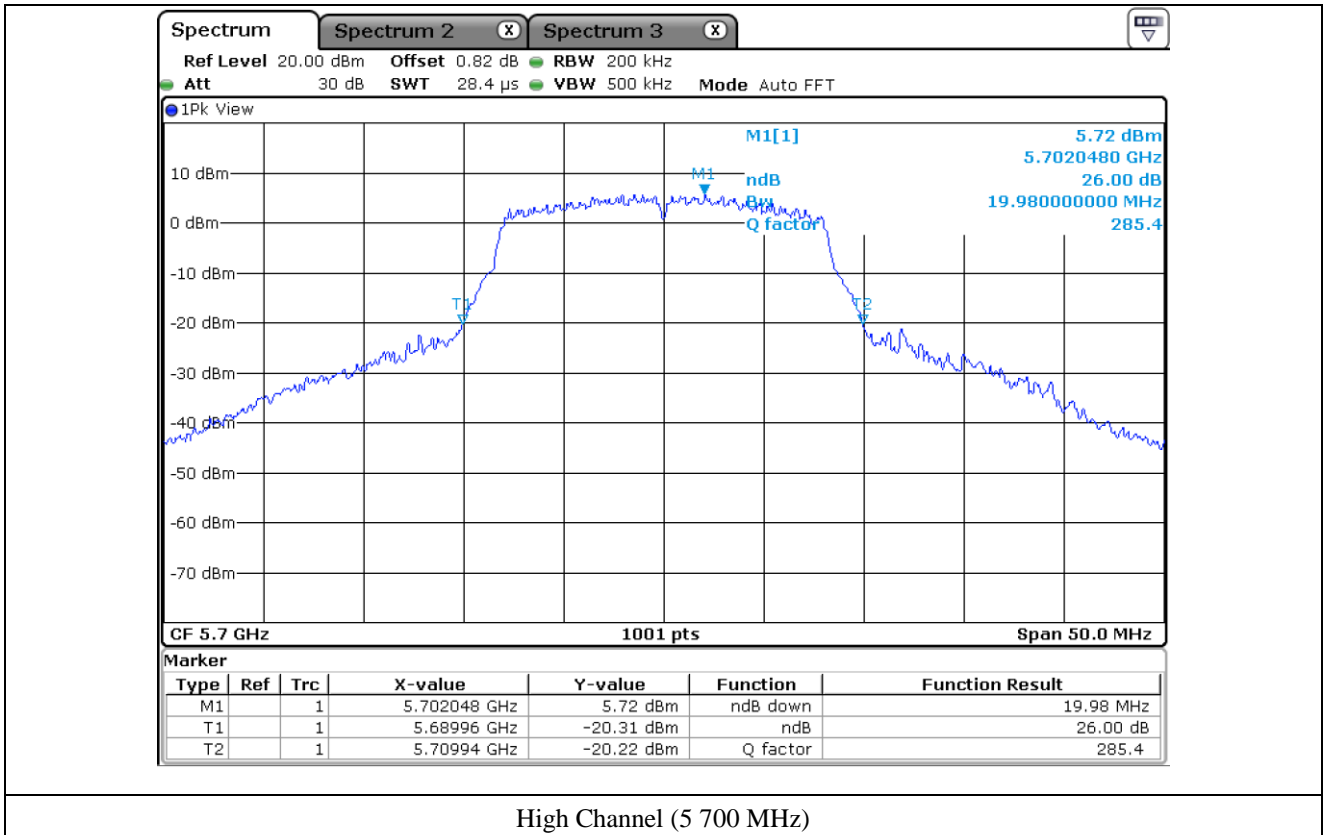


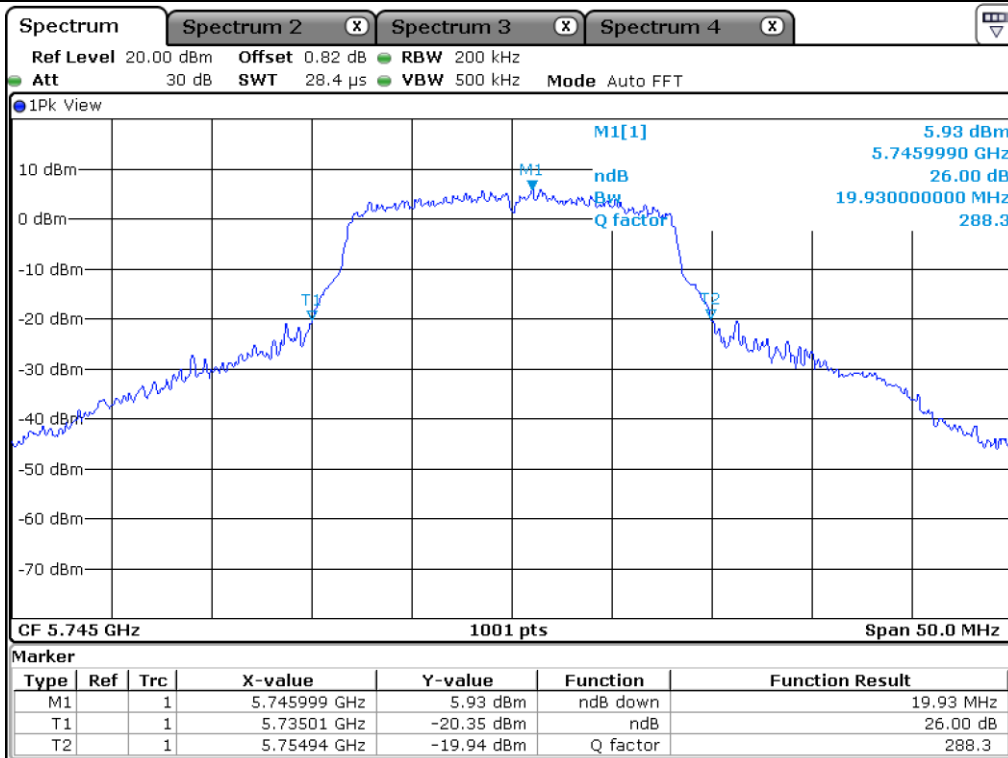


Low Channel (5 500 MHz)

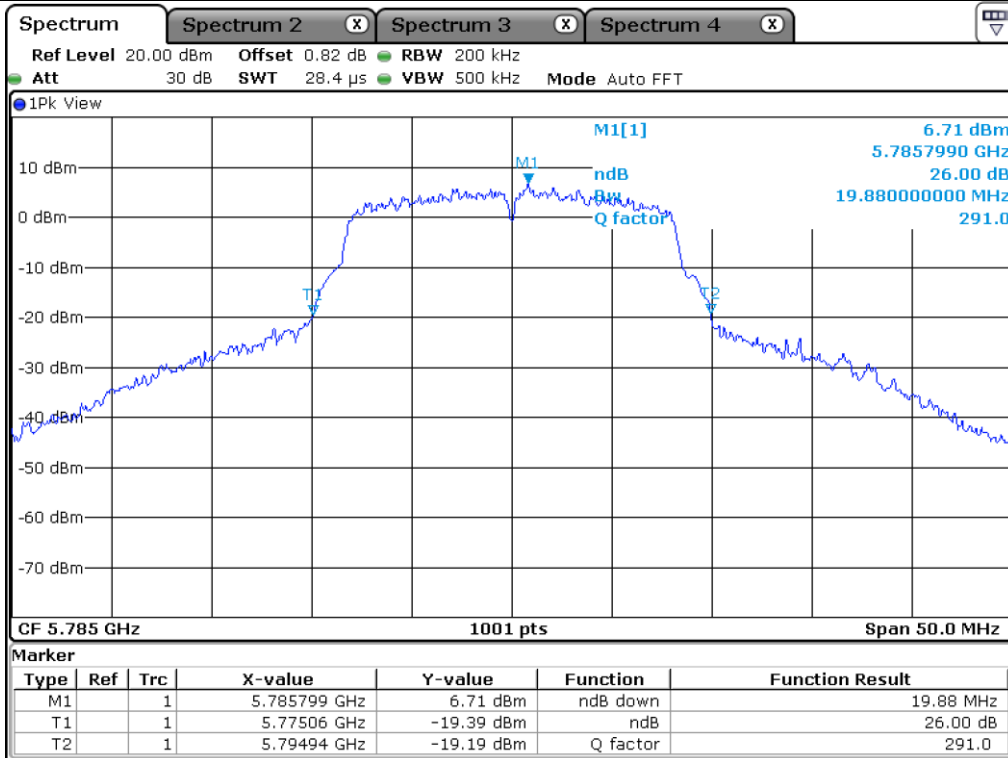


Middle Channel (5 580 MHz)

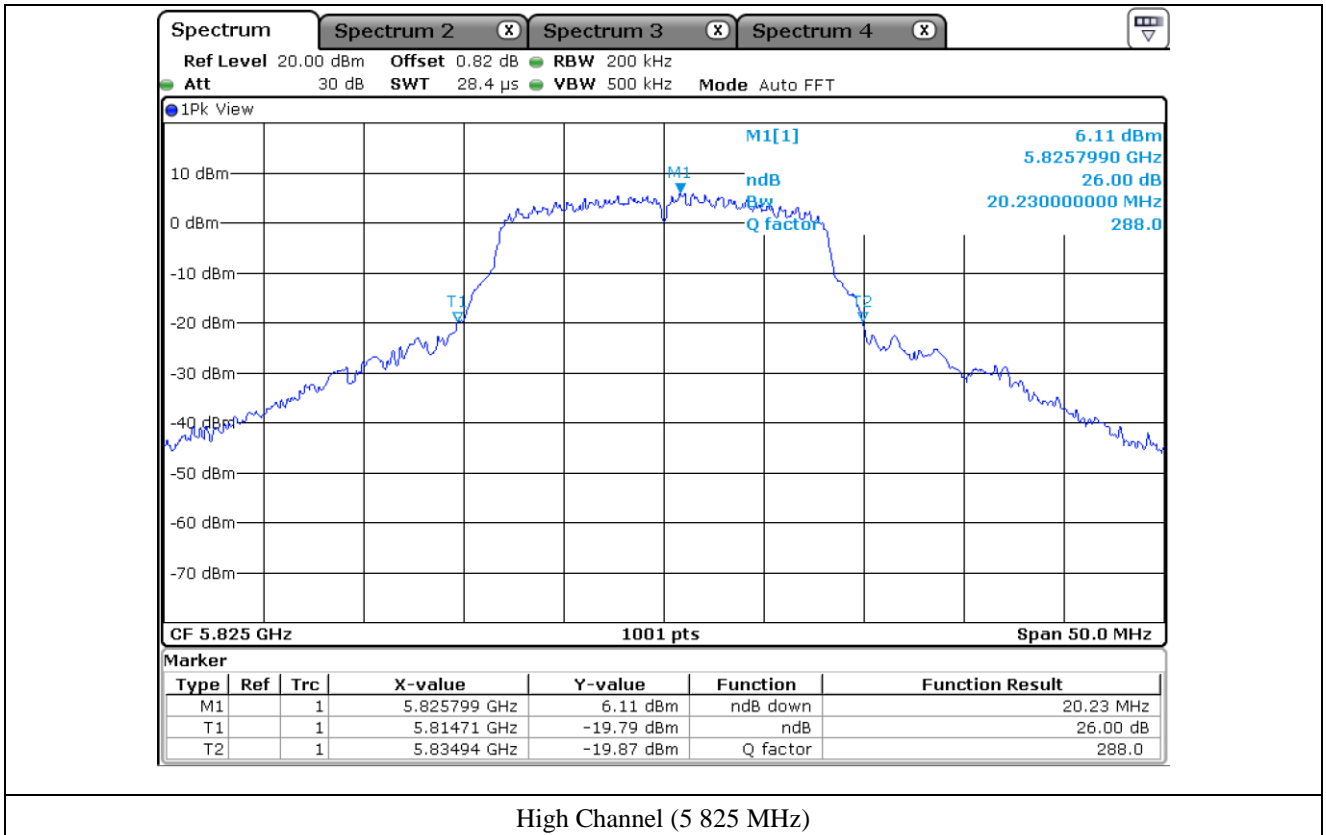




Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)



**7.4.2 Test data for Antenna 1**

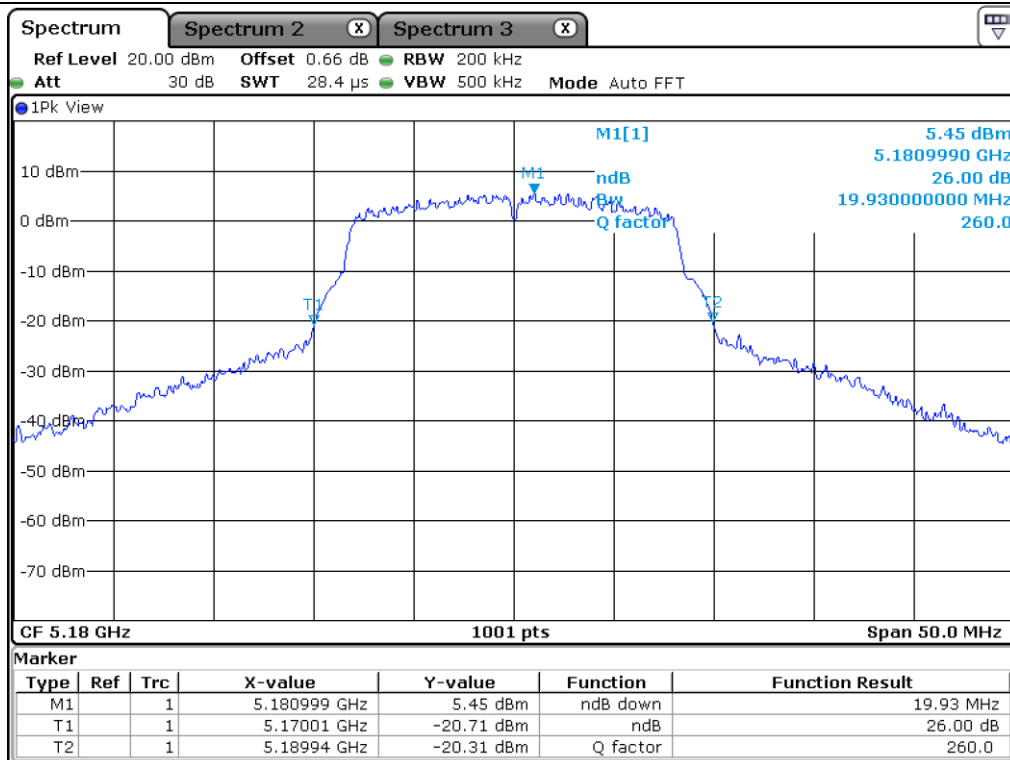
- Test Date : September 28, 2018 ~ October 24, 2018  
 - Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	19.93
	Middle	5 220.00	19.98
	High	5 240.00	19.98
5 250 ~ 5 350	Low	5 260.00	19.78
	Middle	5 300.00	20.03
	High	5 320.00	19.93
5 470 ~ 5 725	Low	5 500.00	19.98
	Middle	5 580.00	19.83
	High	5 700.00	19.98
5 725 ~ 5 850	Low	5 745.00	20.13
	Middle	5 785.00	20.08
	High	5 825.00	19.98

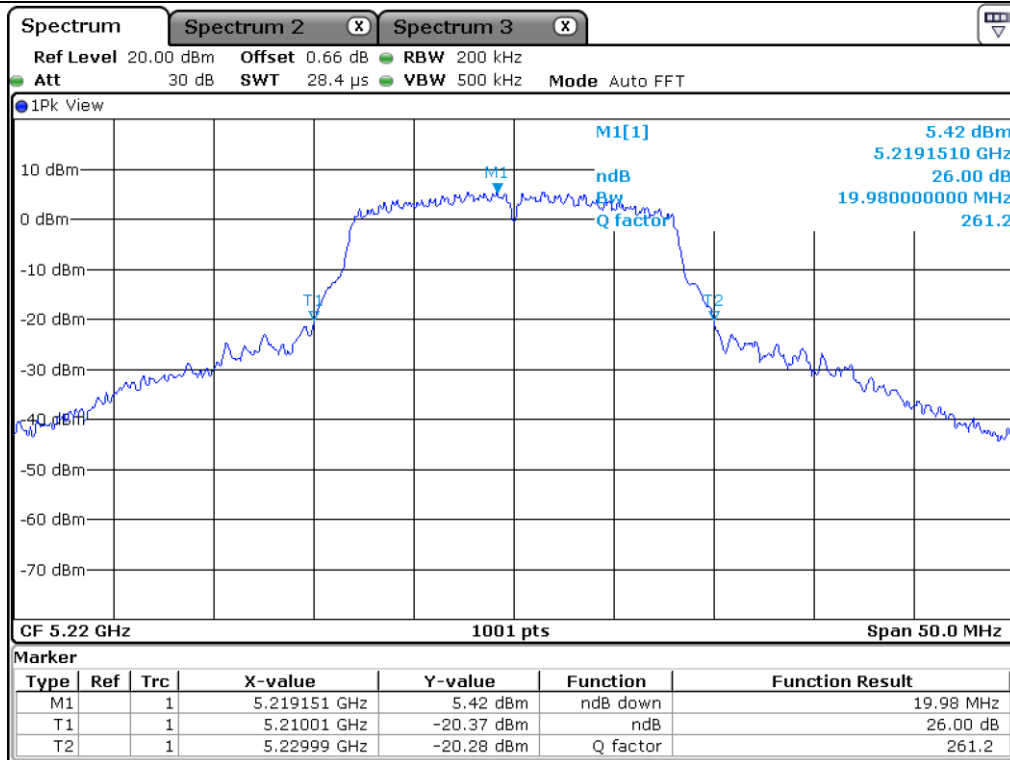
Remark: See next page for measurement data.



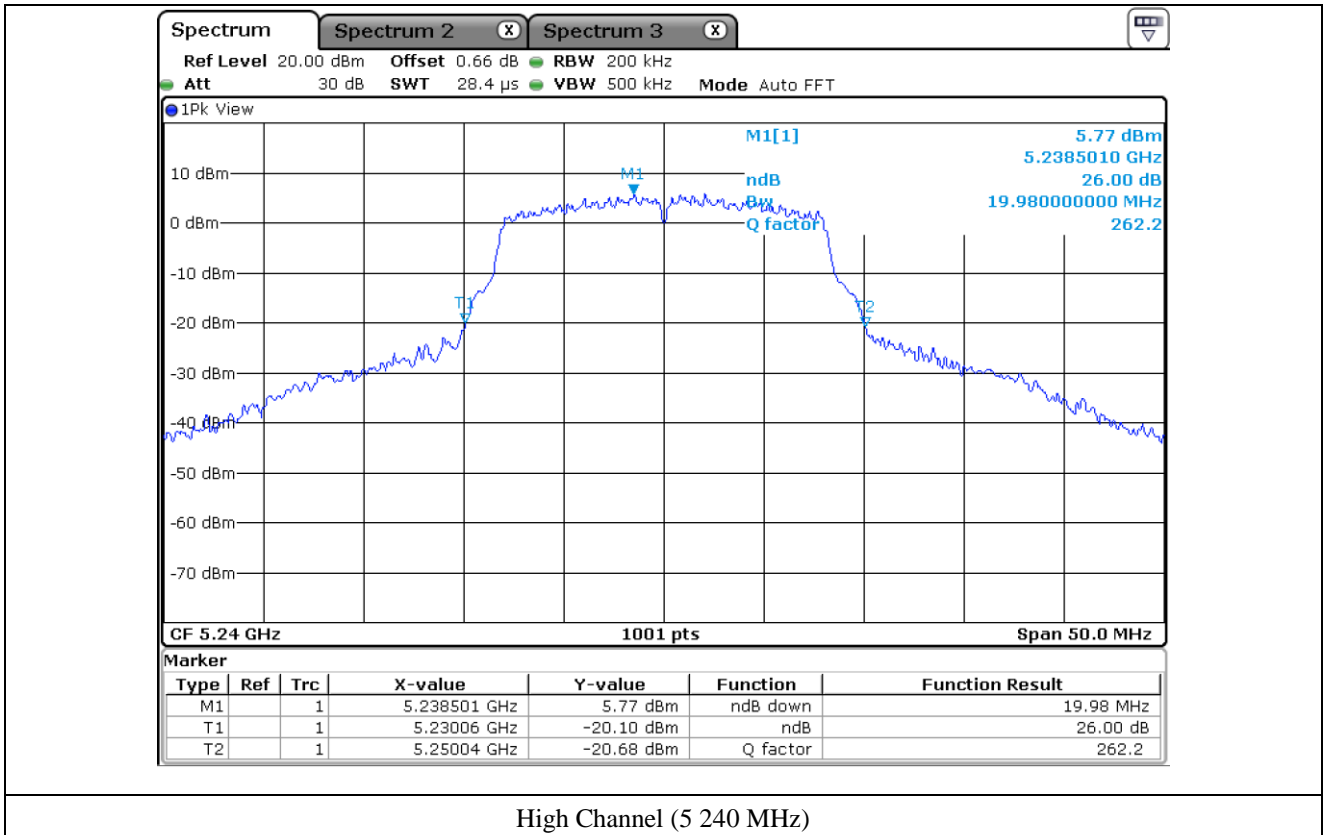
**Tested by: Tae-Ho, Kim / Senior Manager**



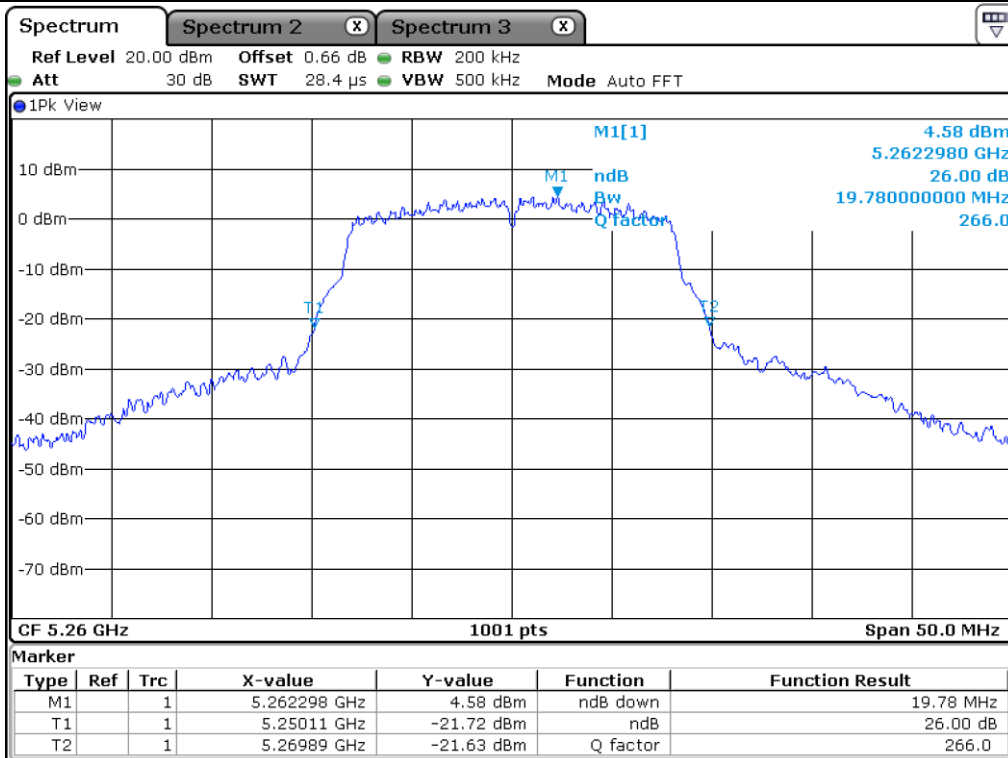
Low Channel (5 180 MHz)



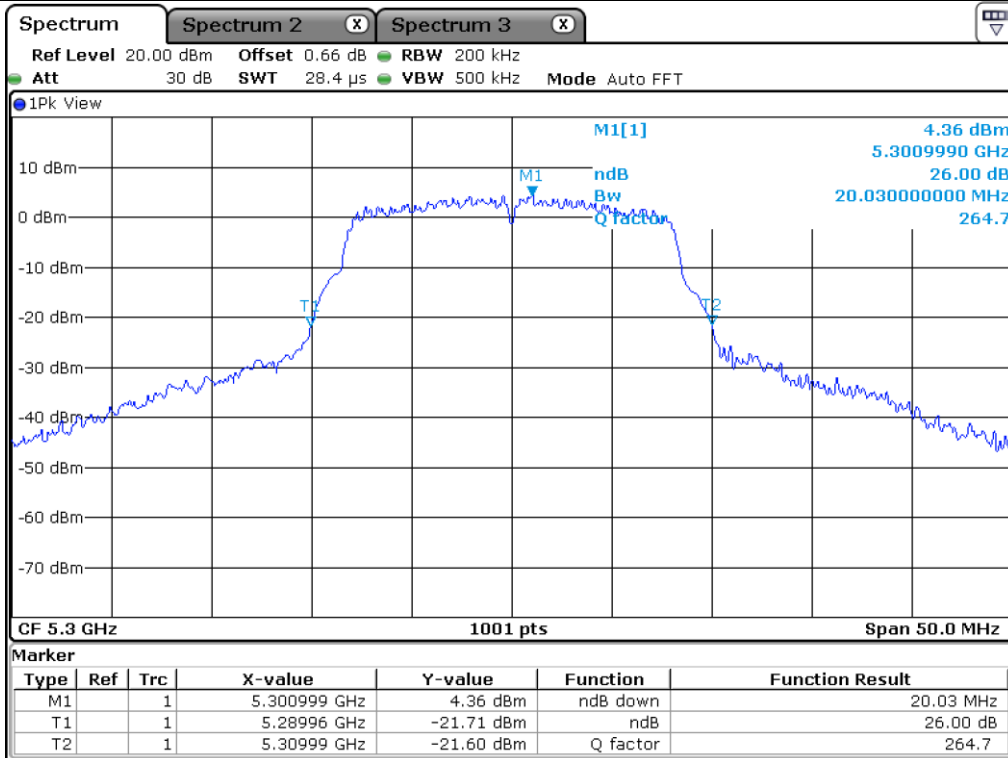
Middle Channel (5 220 MHz)



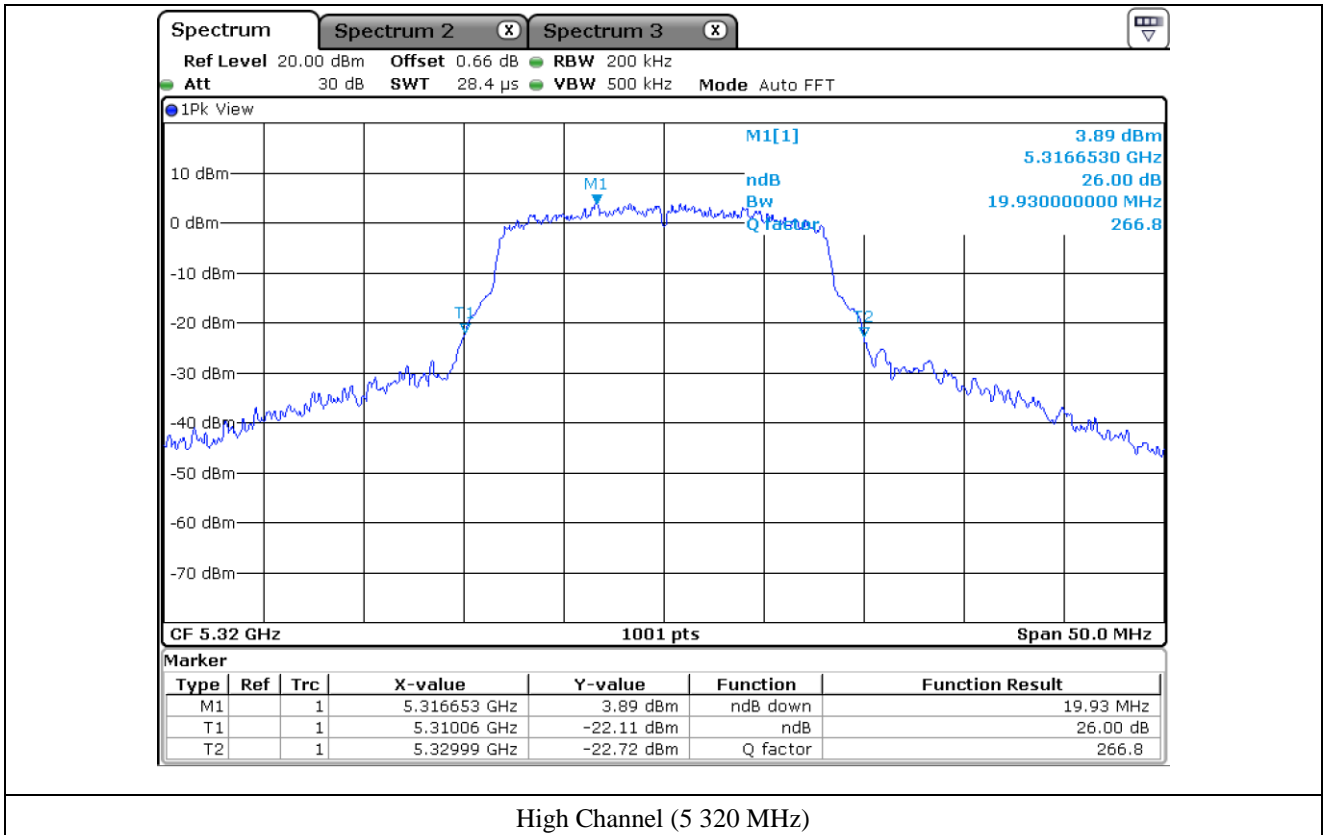




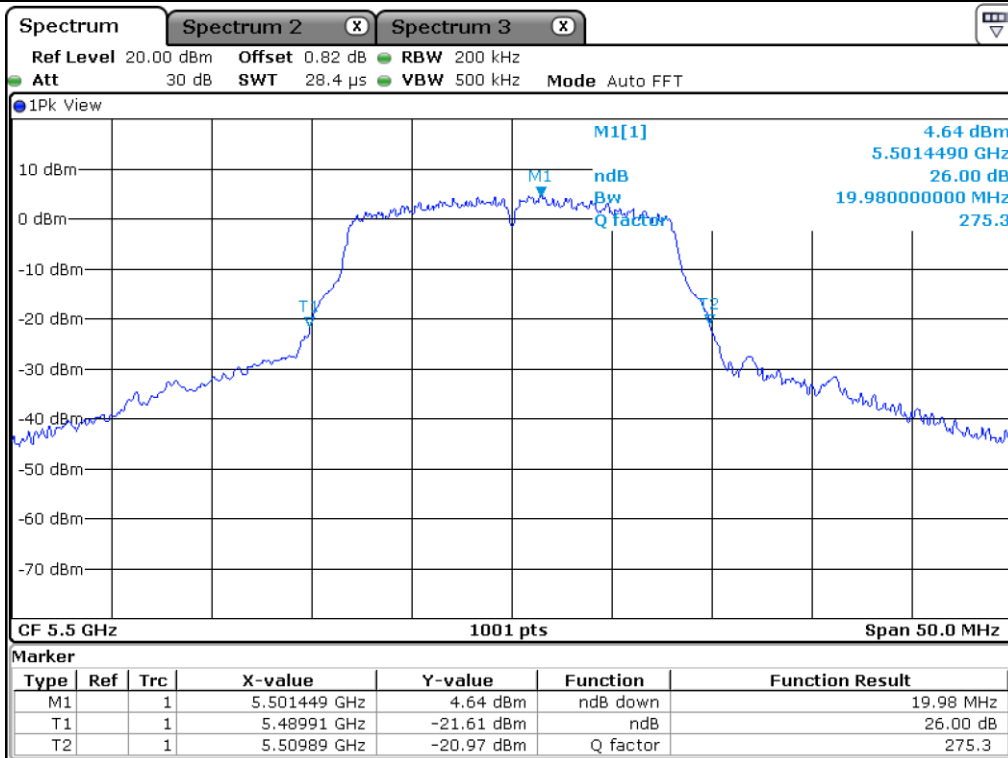
Low Channel (5 260 MHz)



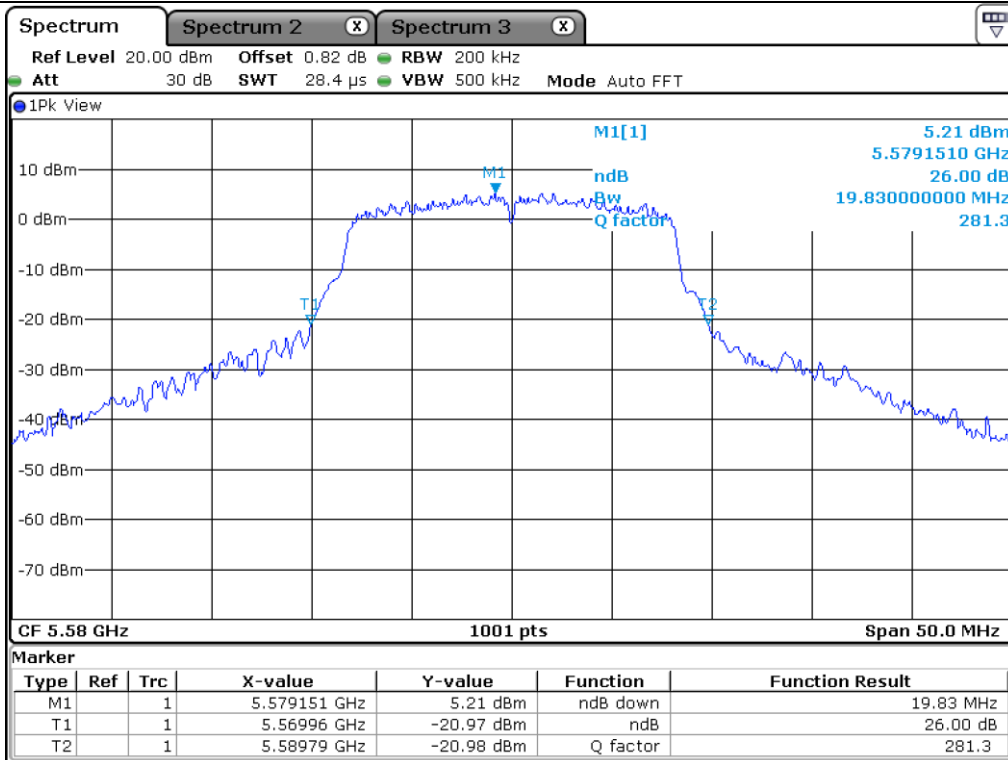
Middle Channel (5 300 MHz)



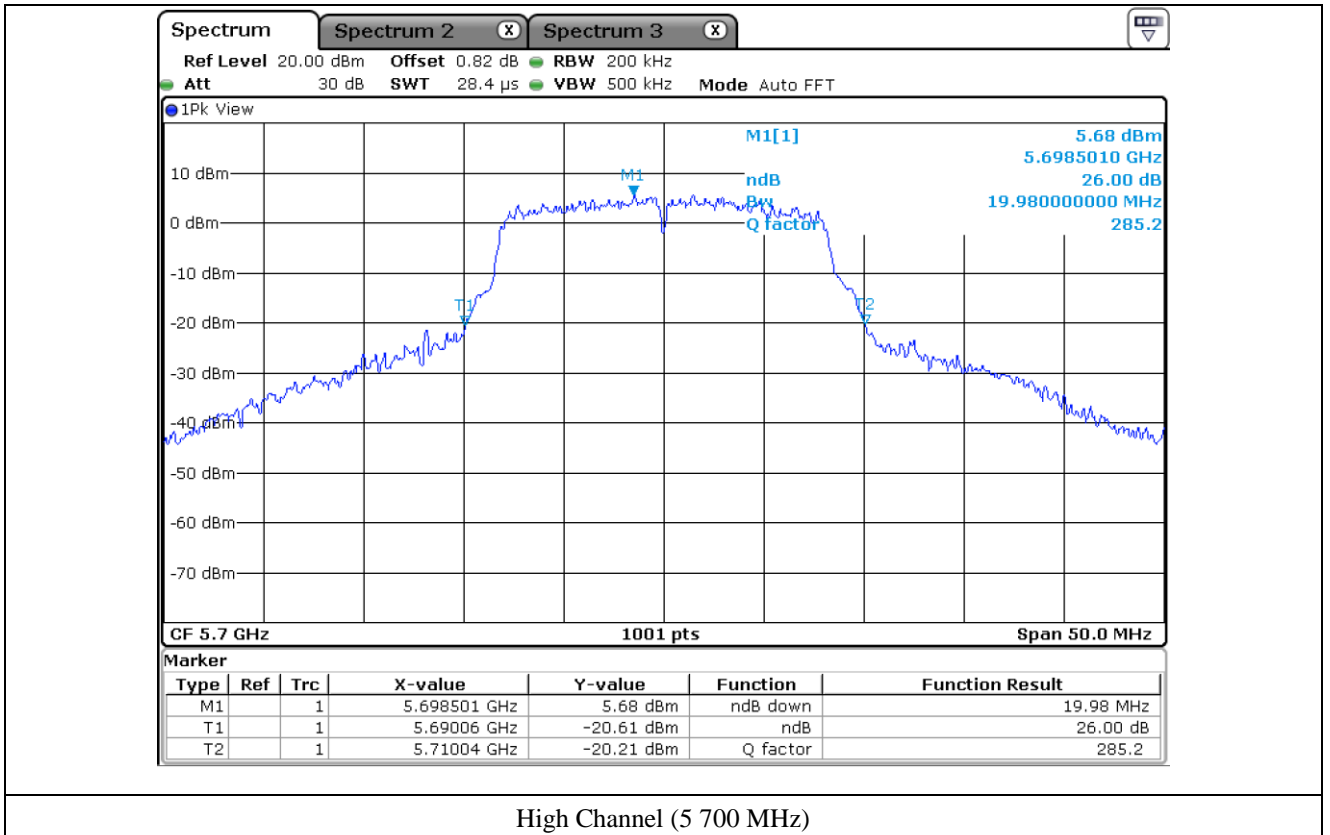
High Channel (5 320 MHz)

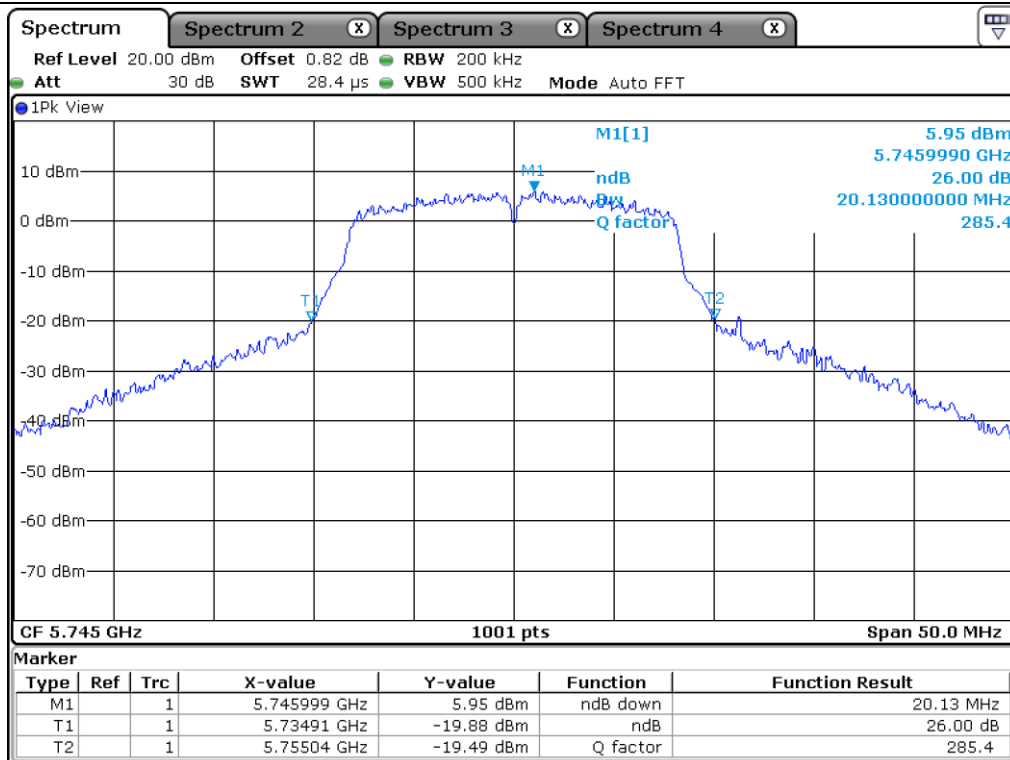


Low Channel (5 500 MHz)

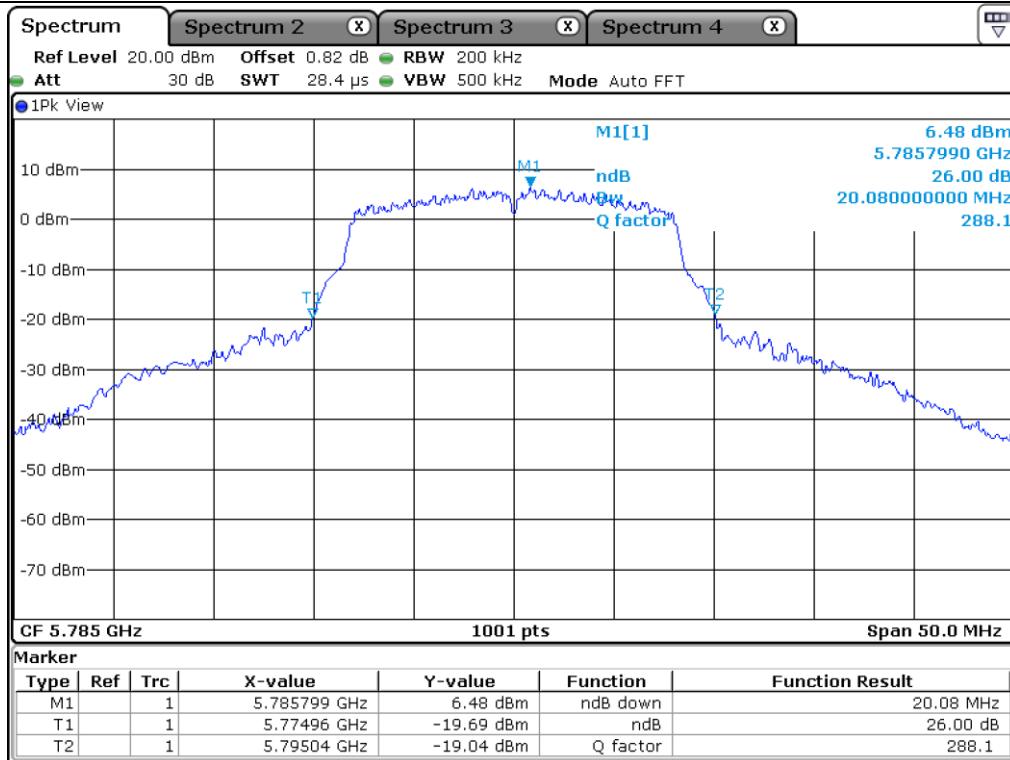


Middle Channel (5 580 MHz)

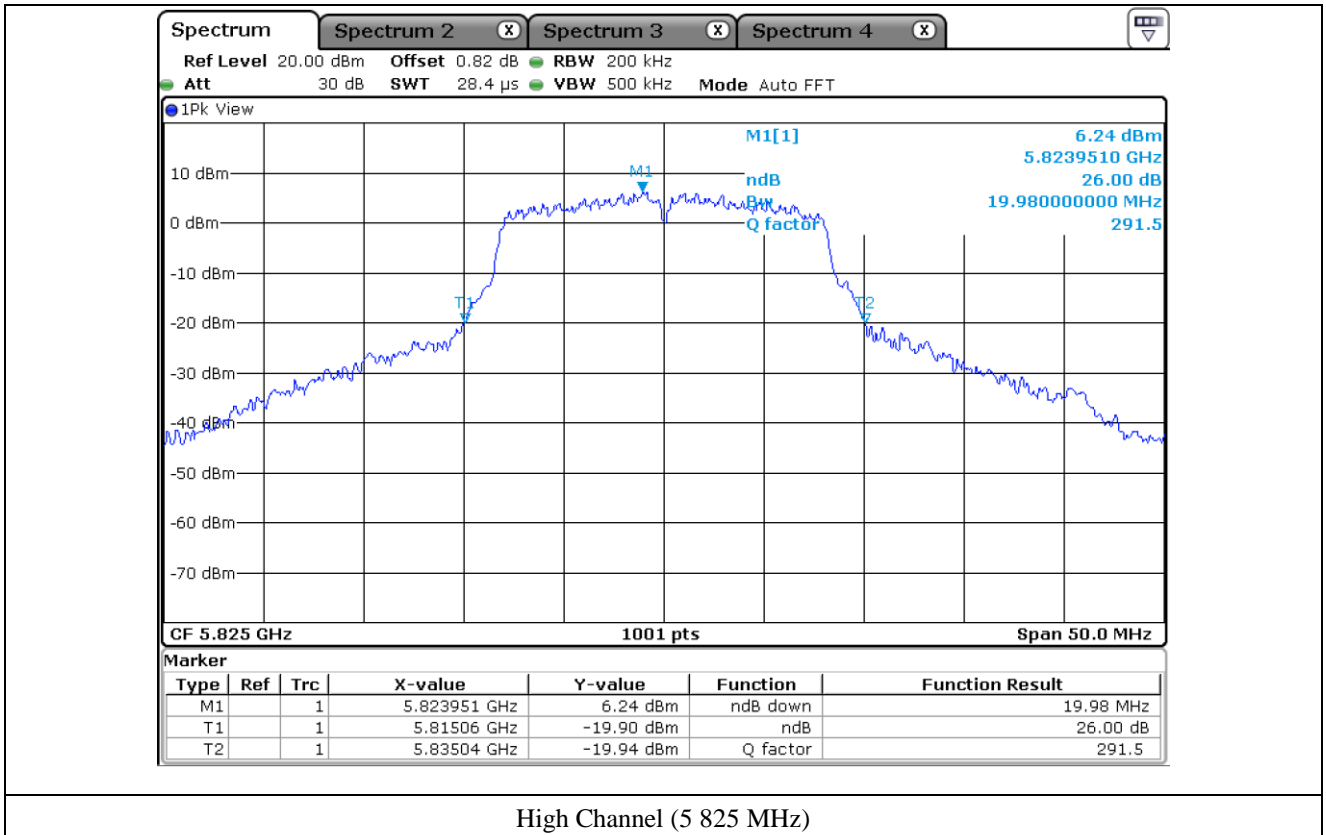




Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)

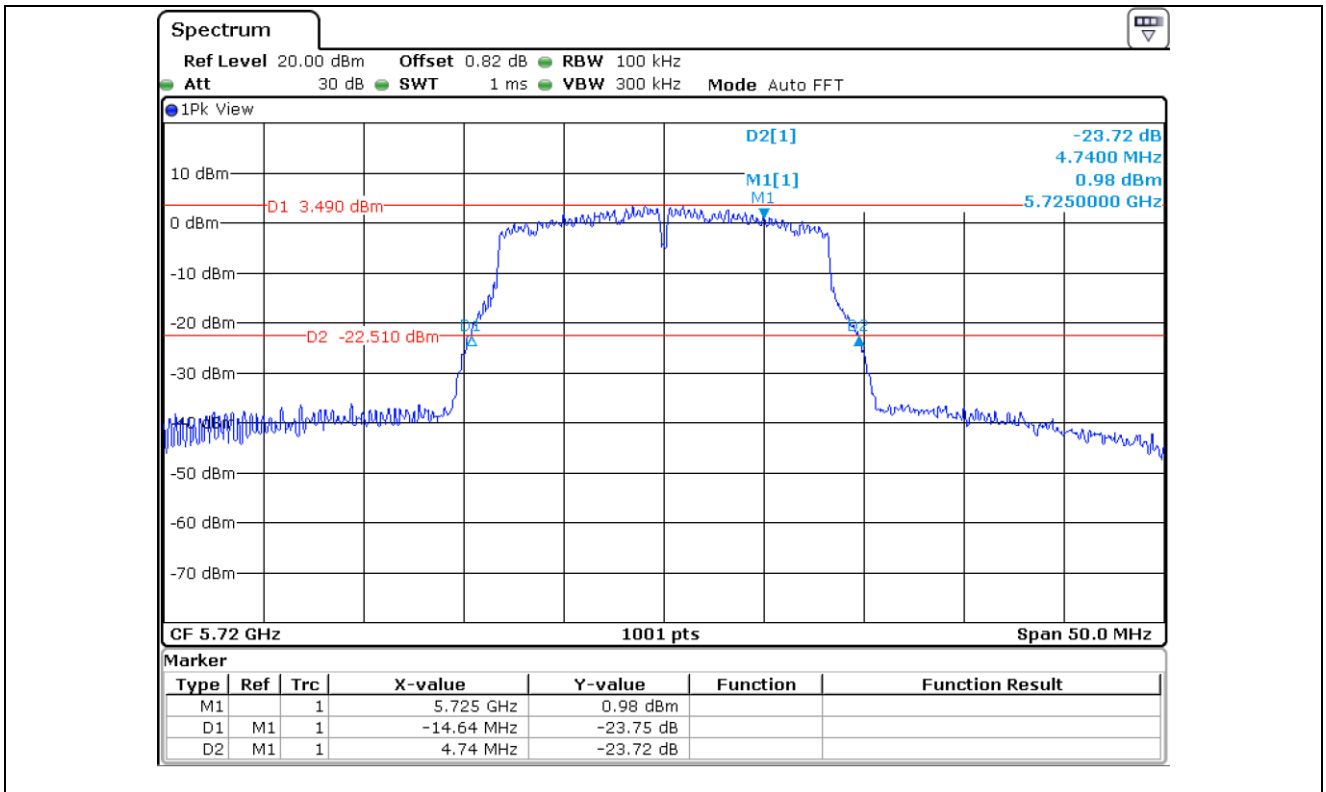


**7.4.3 Test data for Staddle Channel\_Antenna 0**

- Test Date : September 28, 2018 ~ October 24, 2018
- Test Result : Pass

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 470 ~ 5 725	5 720.00	14.64
5 725 ~ 5 850	5 720.00	4.74

*(Signature)*  
 Tested by: Tae-Ho, Kim / Senior Manager



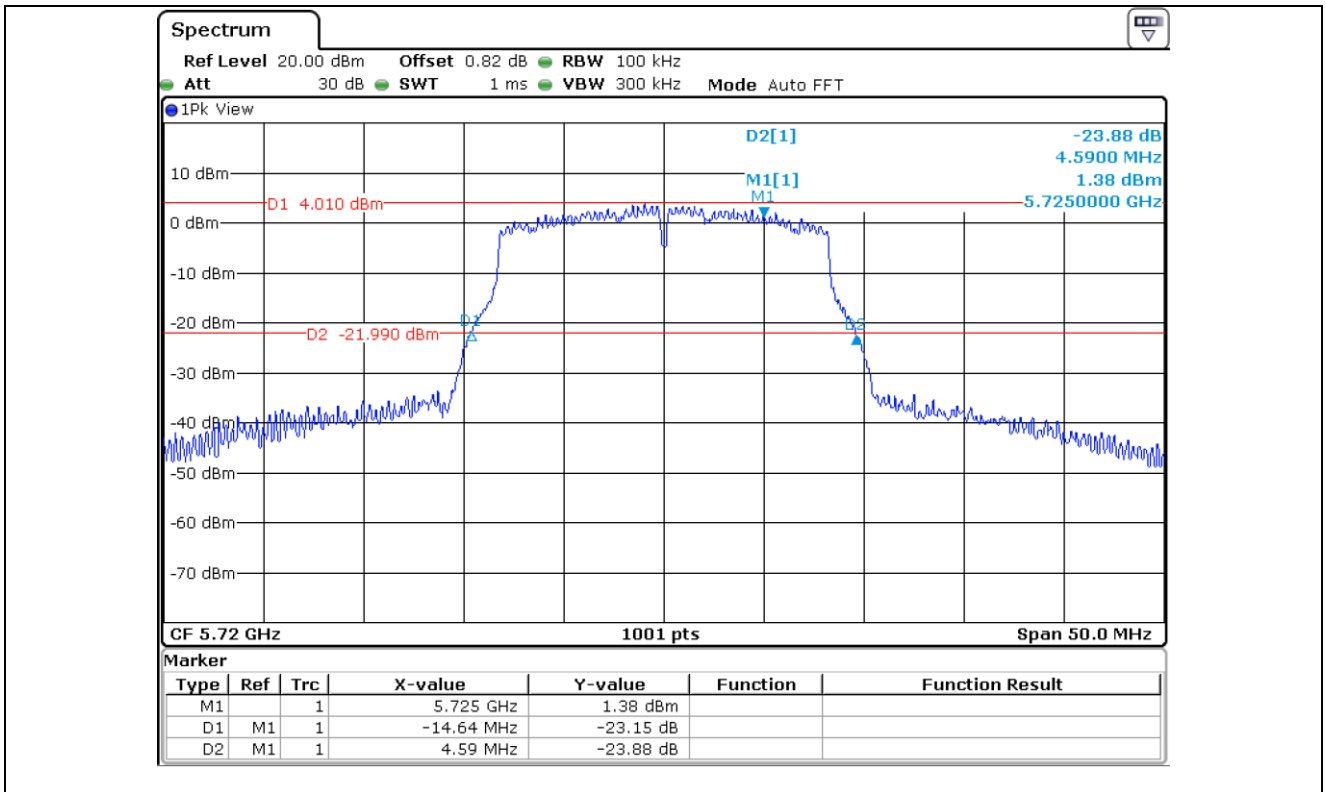
7.4.4 Test data for Staddle Channel\_Antenna 1

- Test Date : September 28, 2018 ~ October 24, 2018
- Test Result : Pass

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 470 ~ 5 725	5 720.00	14.64
5 725 ~ 5 850	5 720.00	4.59



Tested by: Tae-Ho, Kim / Senior Manager





### 7.5 Test data for 802.11n\_HT20 RLAN Mode

#### 7.5.1 Test data for Antenna 0

-. Test Date : September 28, 2018 ~ October 24, 2018

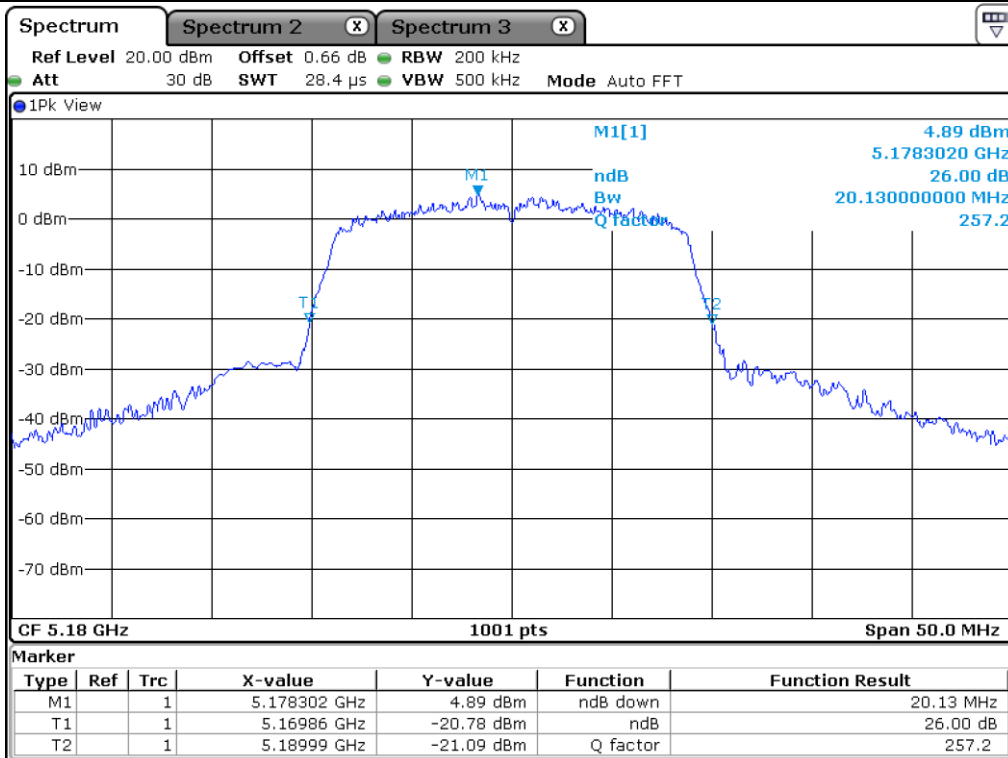
-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	20.13
	Middle	5 220.00	20.38
	High	5 240.00	20.23
5 250 ~ 5 350	Low	5 260.00	20.28
	Middle	5 300.00	20.28
	High	5 320.00	20.43
5 470 ~ 5 725	Low	5 500.00	20.53
	Middle	5 580.00	20.38
	High	5 700.00	20.43
5 725 ~ 5 850	Low	5 745.00	20.18
	Middle	5 785.00	20.28
	High	5 825.00	20.03

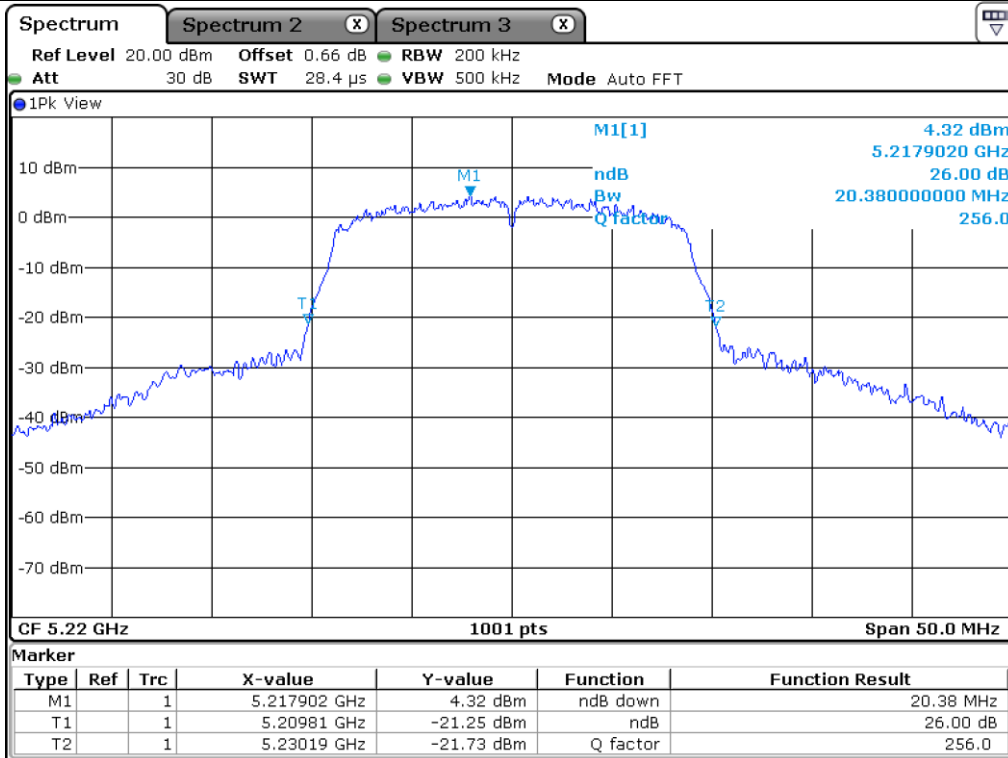
Remark: See next page for measurement data.



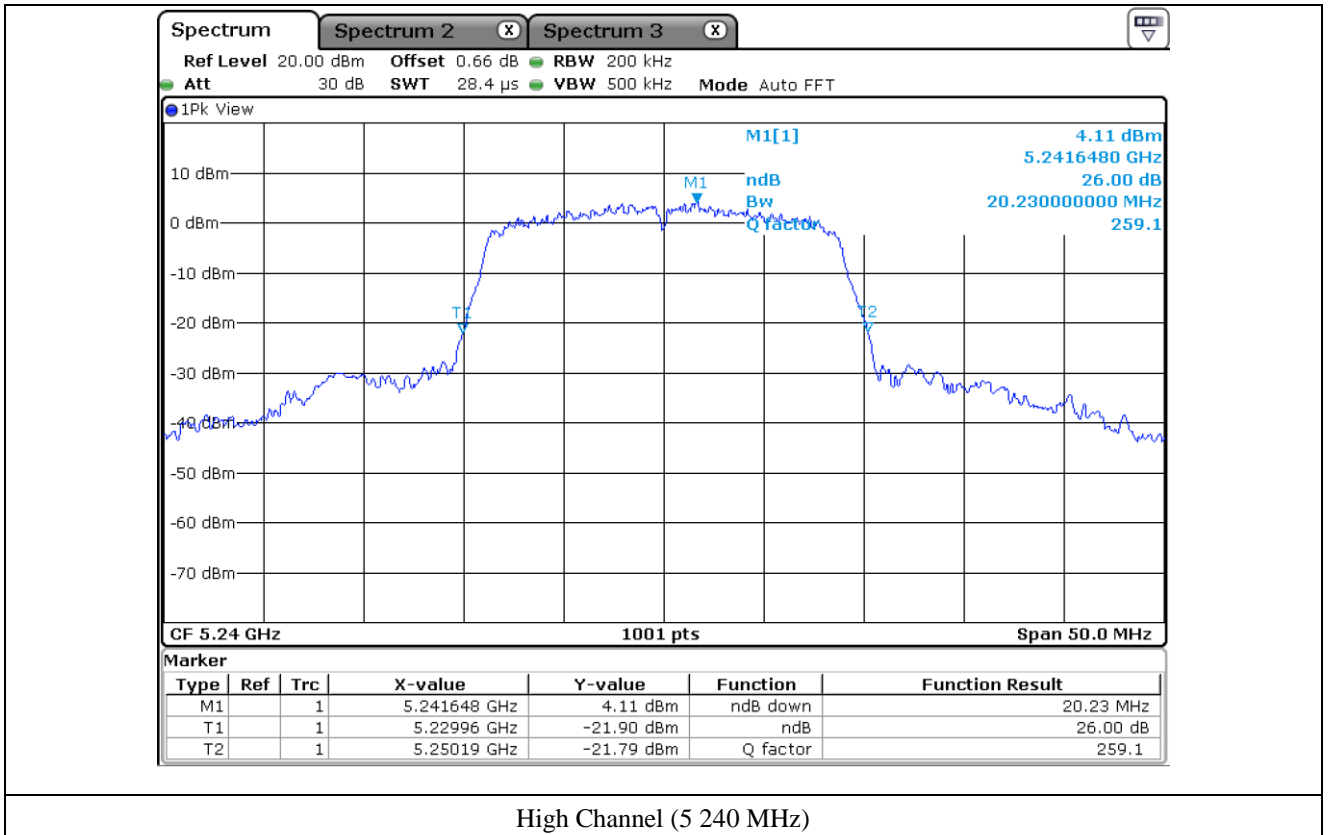
Tested by: Tae-Ho, Kim / Senior Manager

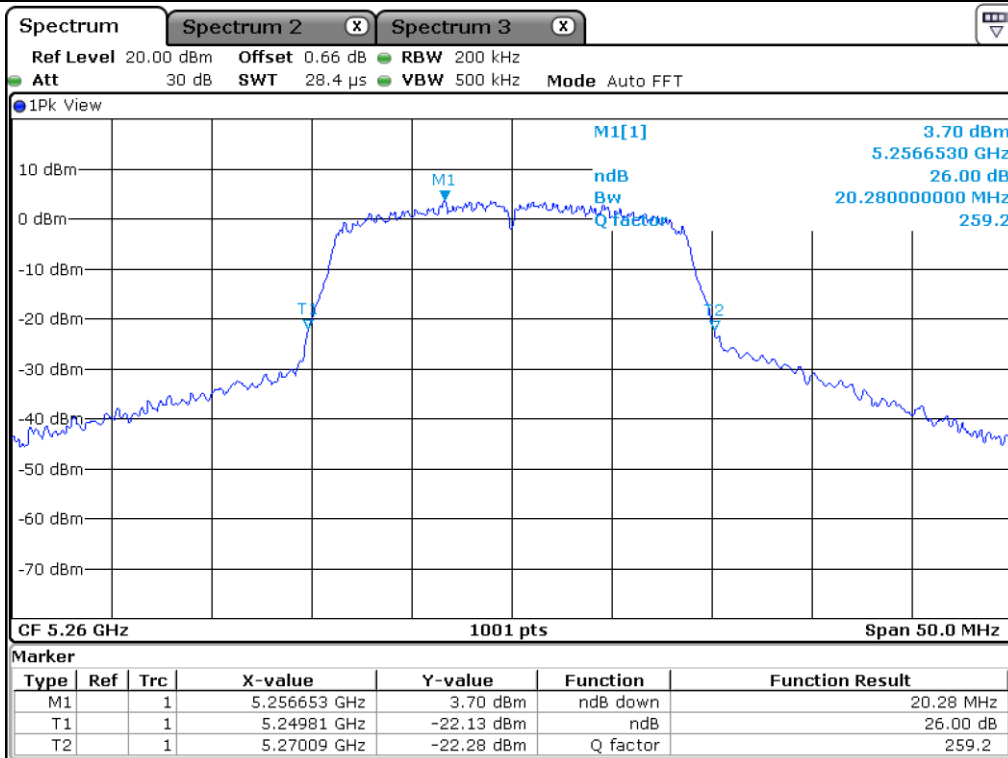


Low Channel (5 180 MHz)

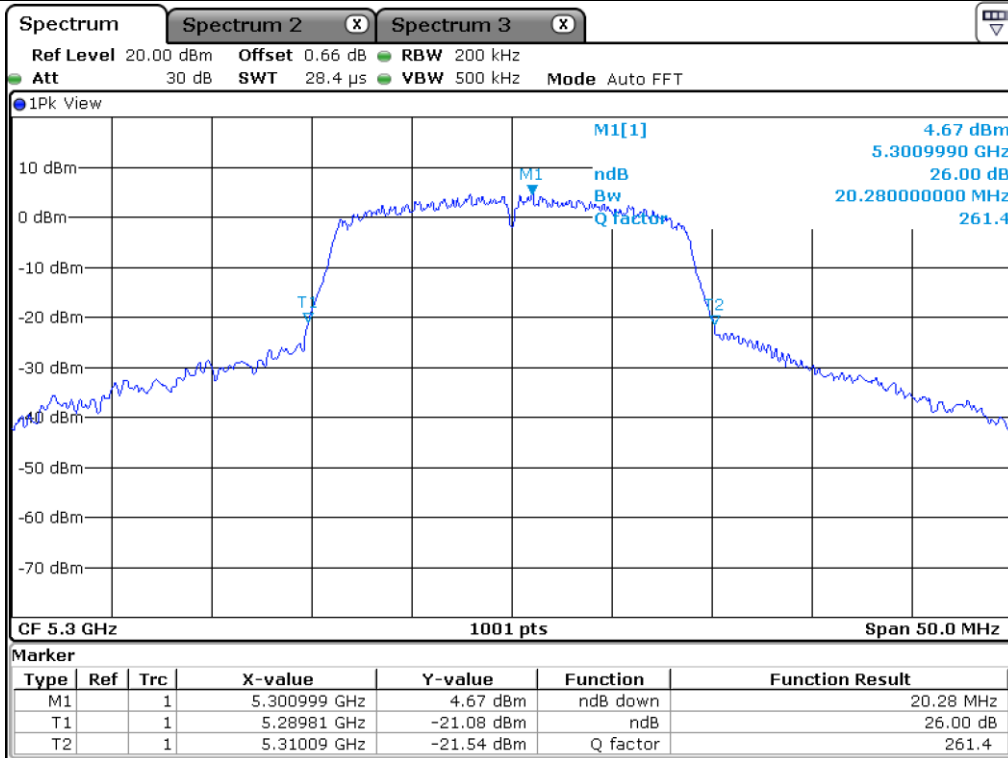


Middle Channel (5 220 MHz)

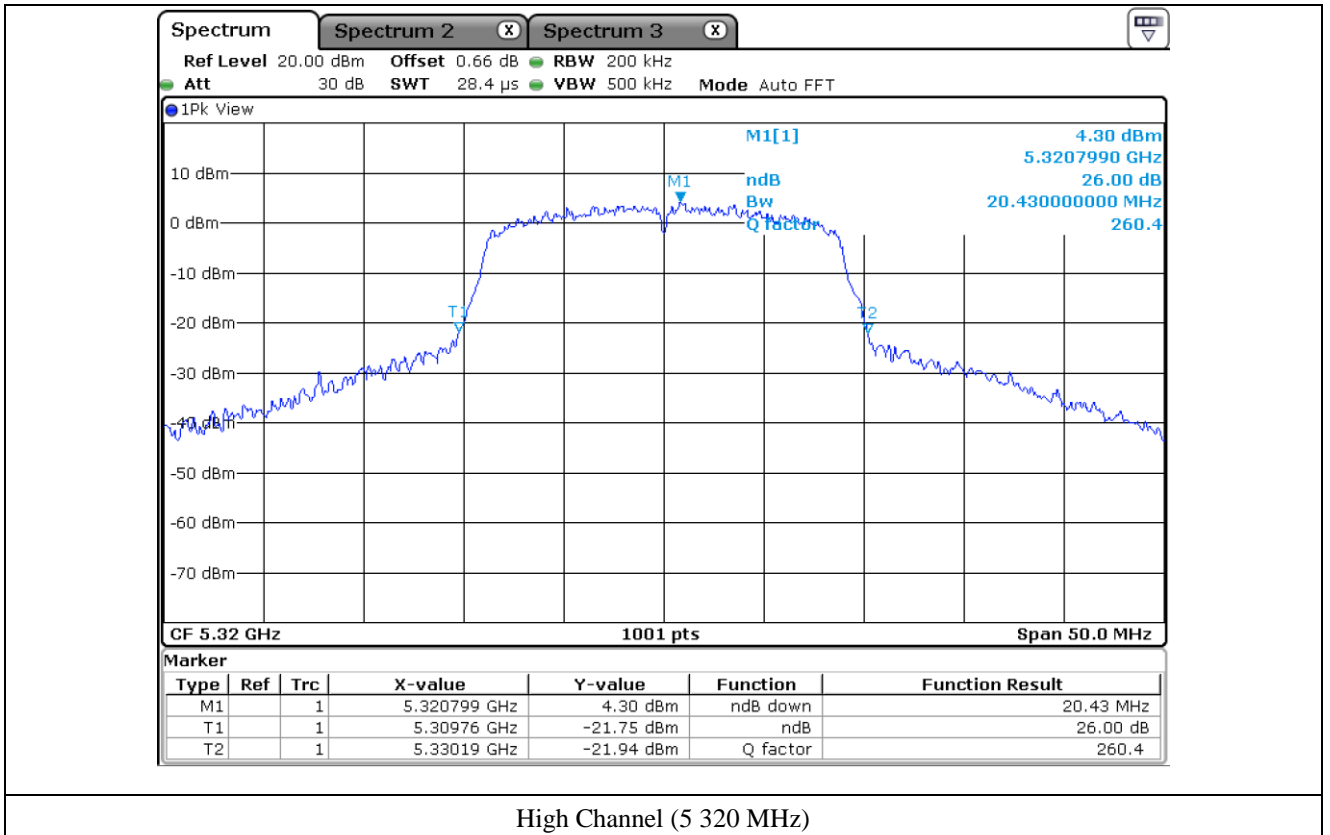


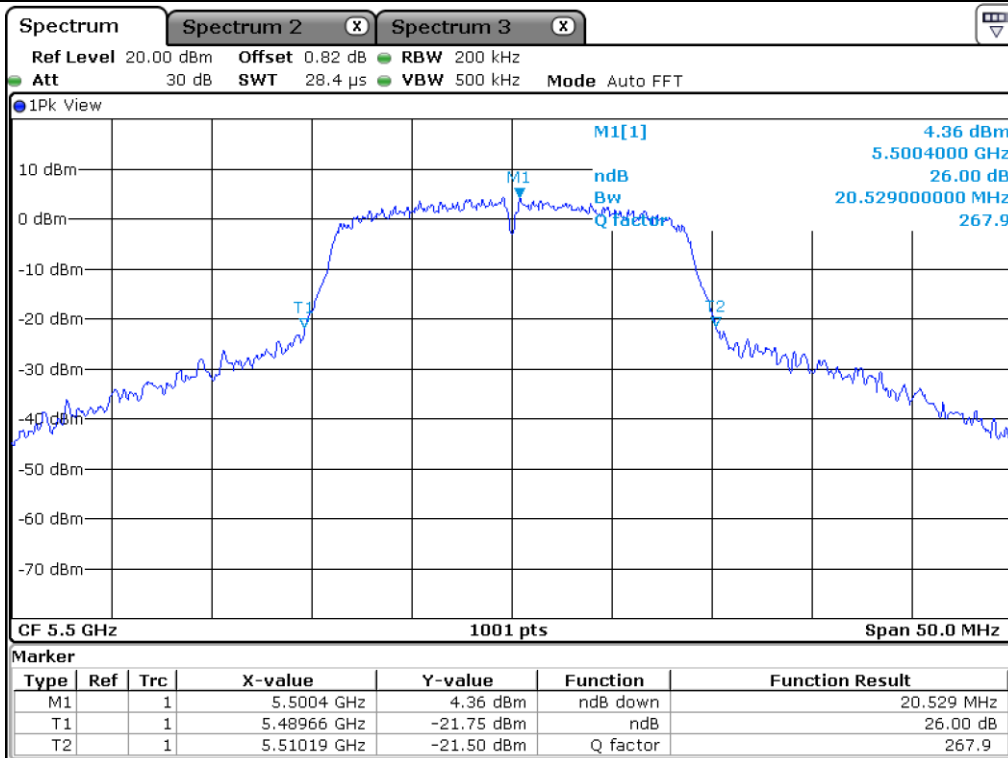


Low Channel (5 260 MHz)

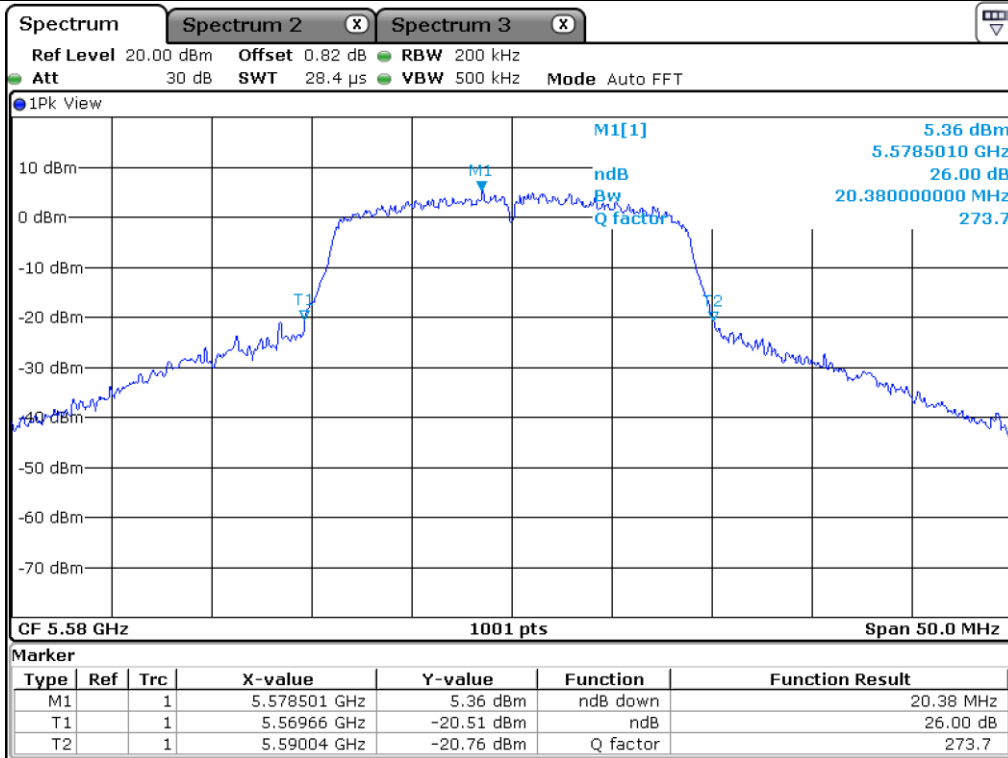


Middle Channel (5 300 MHz)

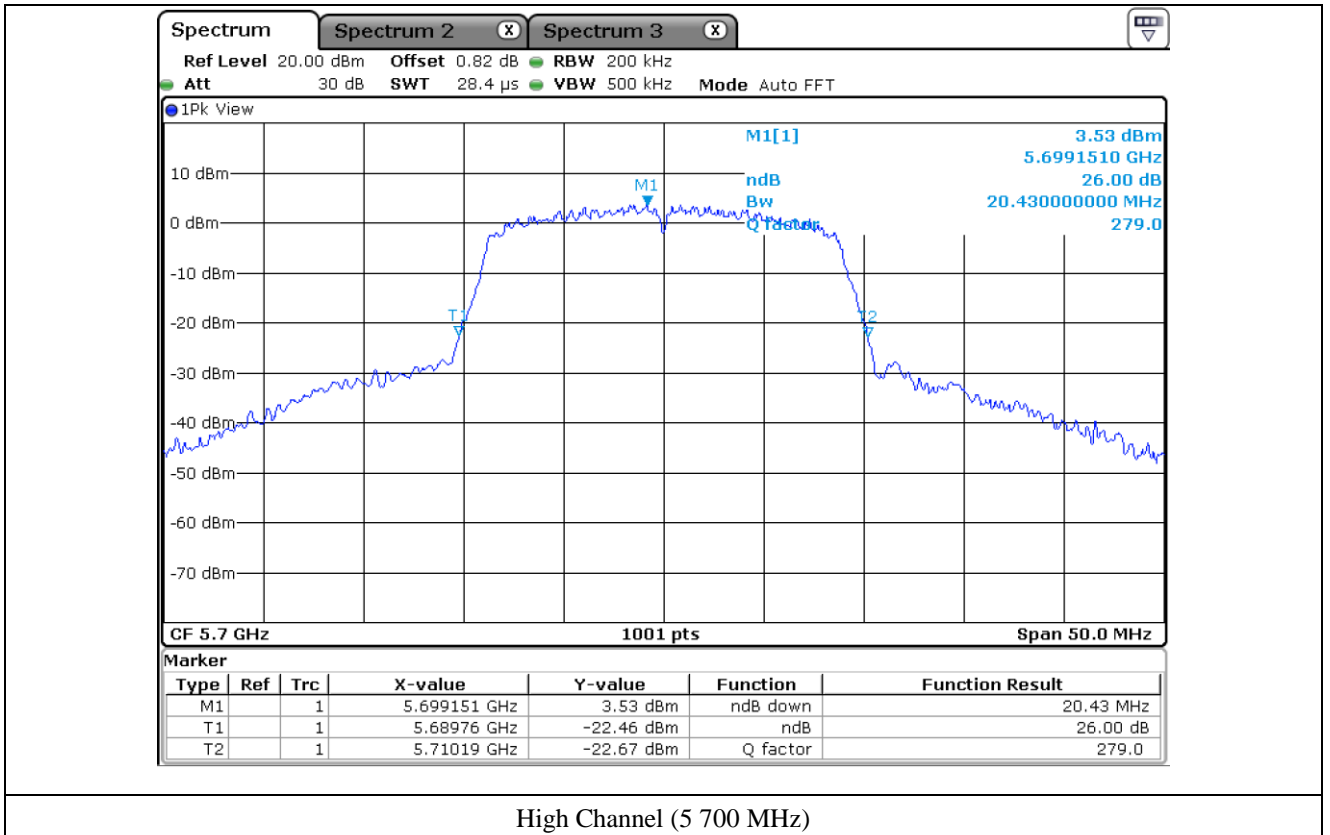


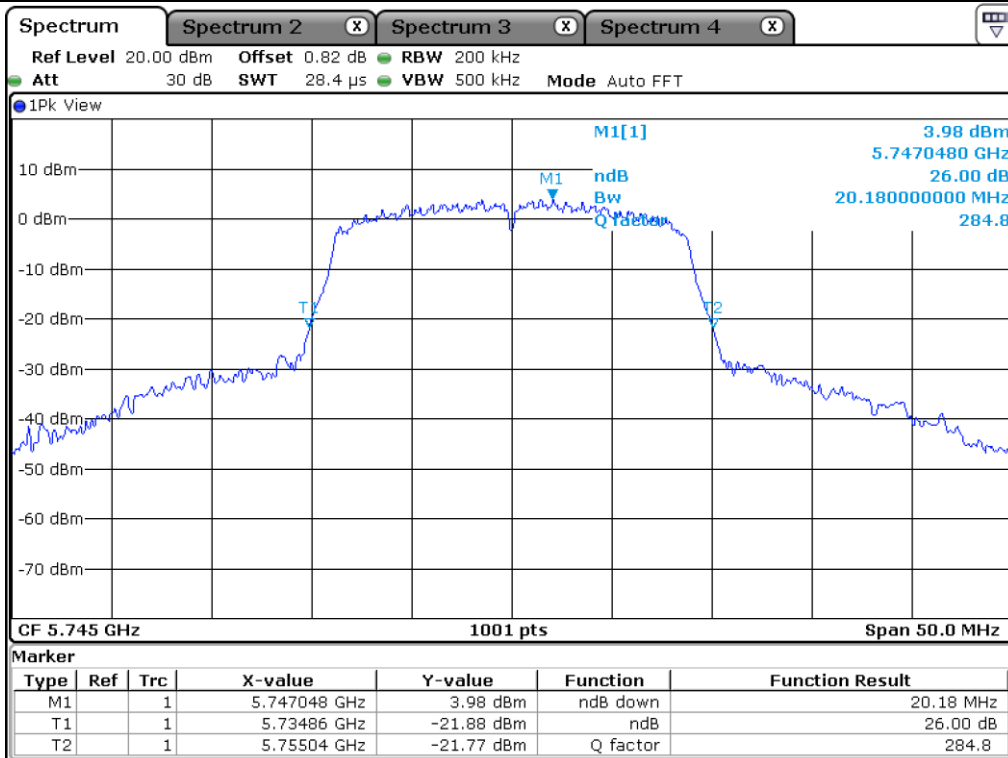


Low Channel (5 500 MHz)

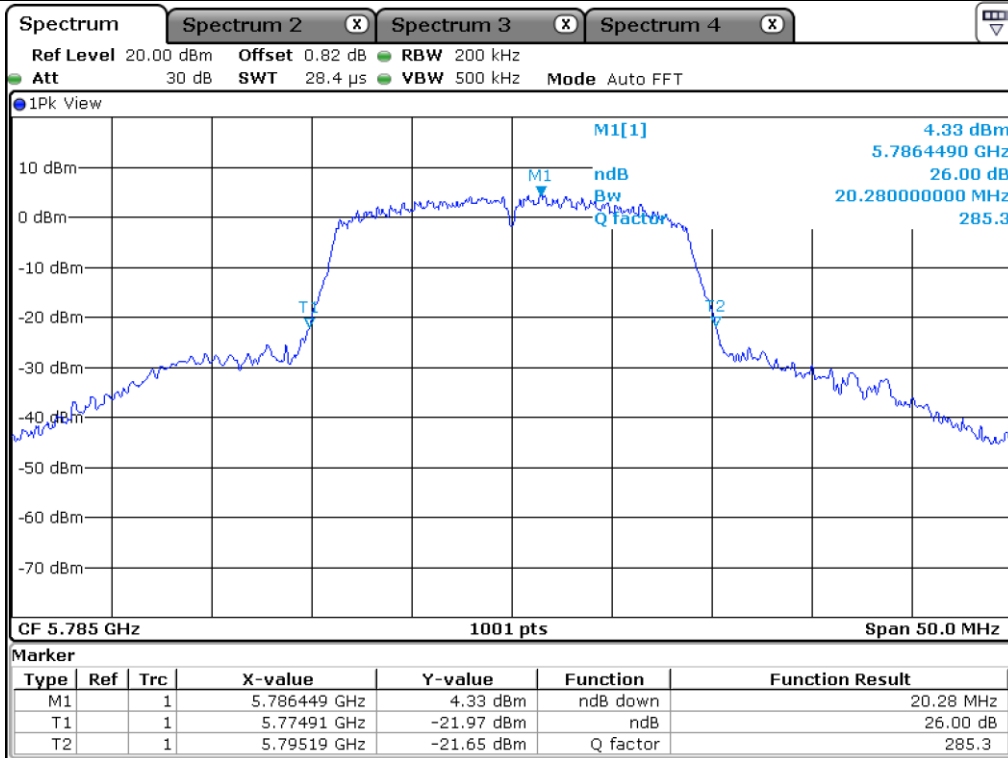


Middle Channel (5 580 MHz)



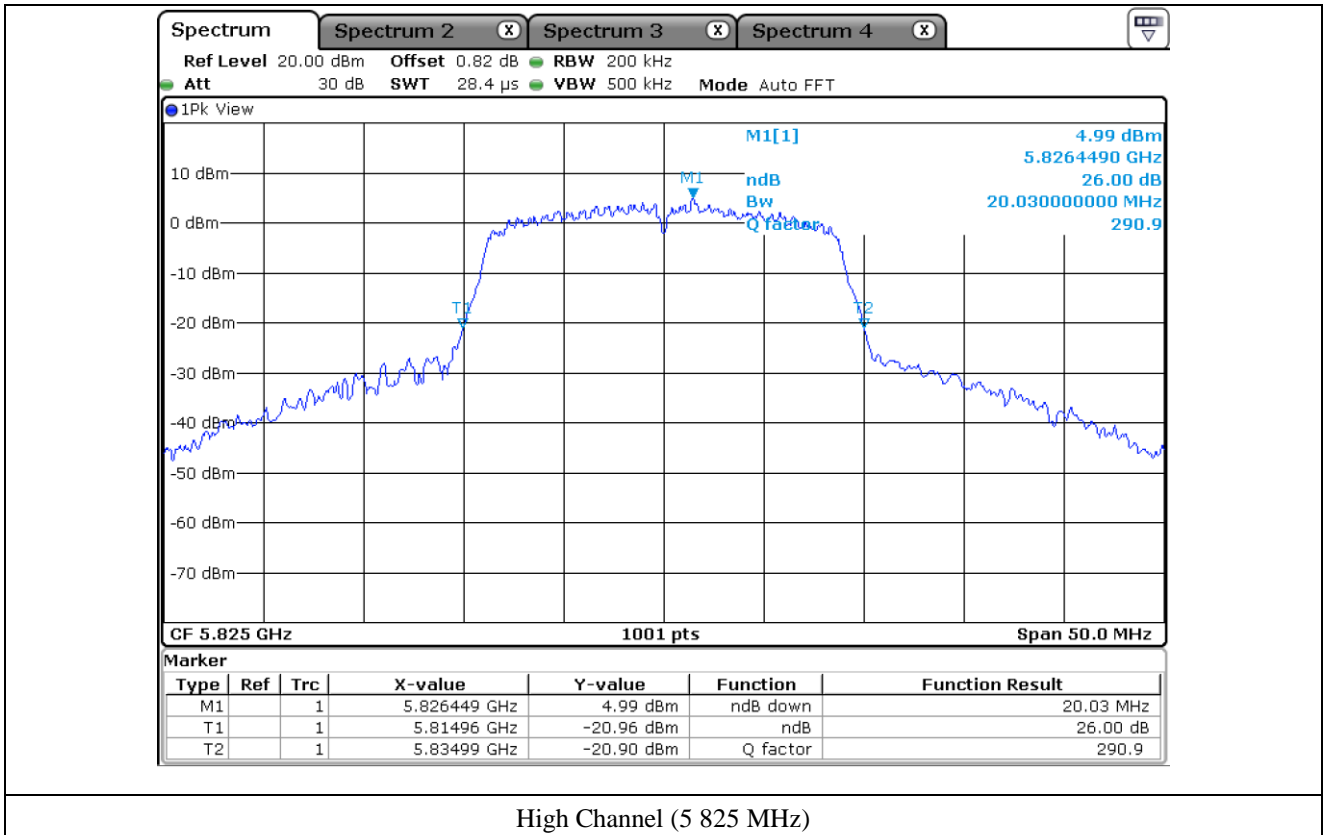


Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)





**7.5.2 Test data for Antenna 1**

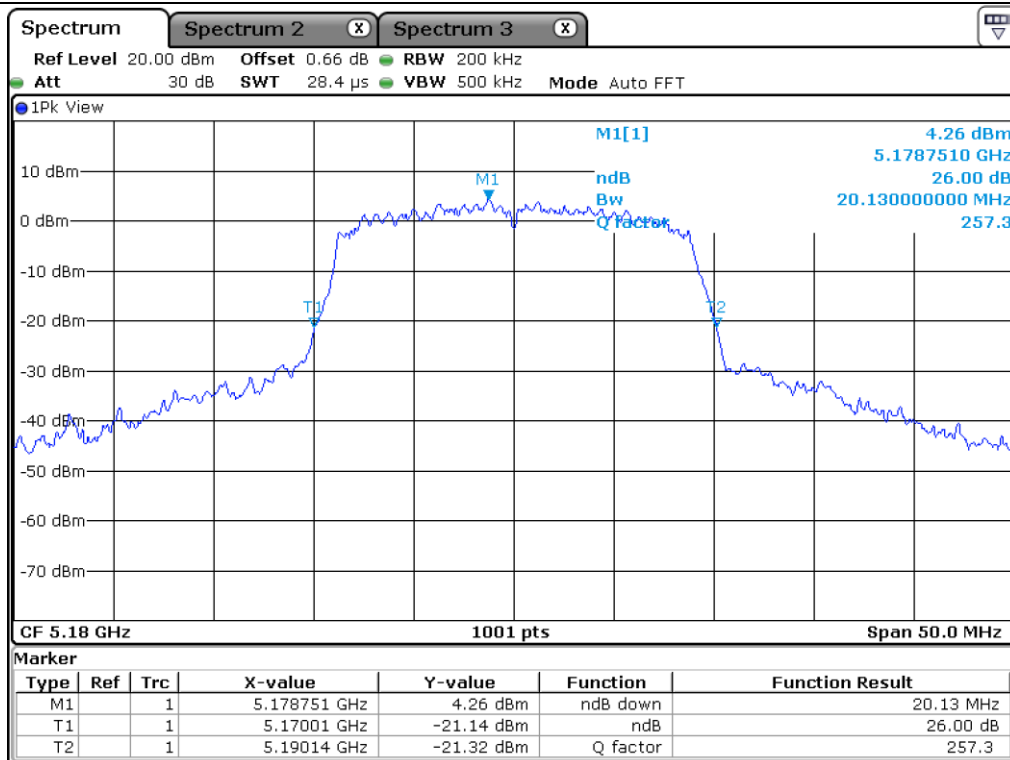
- Test Date : September 28, 2018 ~ October 24, 2018  
 - Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	20.13
	Middle	5 220.00	20.13
	High	5 240.00	20.08
5 250 ~ 5 350	Low	5 260.00	20.08
	Middle	5 300.00	20.28
	High	5 320.00	20.13
5 470 ~ 5 725	Low	5 500.00	20.08
	Middle	5 580.00	20.03
	High	5 700.00	20.28
5 725 ~ 5 850	Low	5 745.00	20.13
	Middle	5 785.00	20.23
	High	5 825.00	20.23

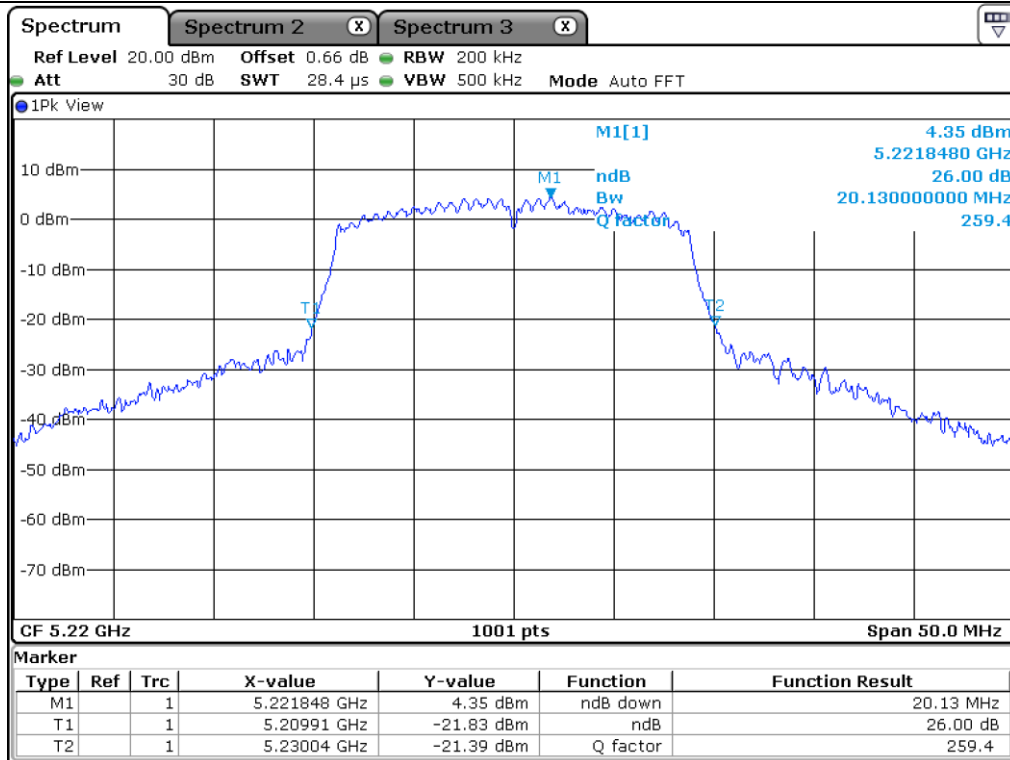
Remark: See next page for measurement data.



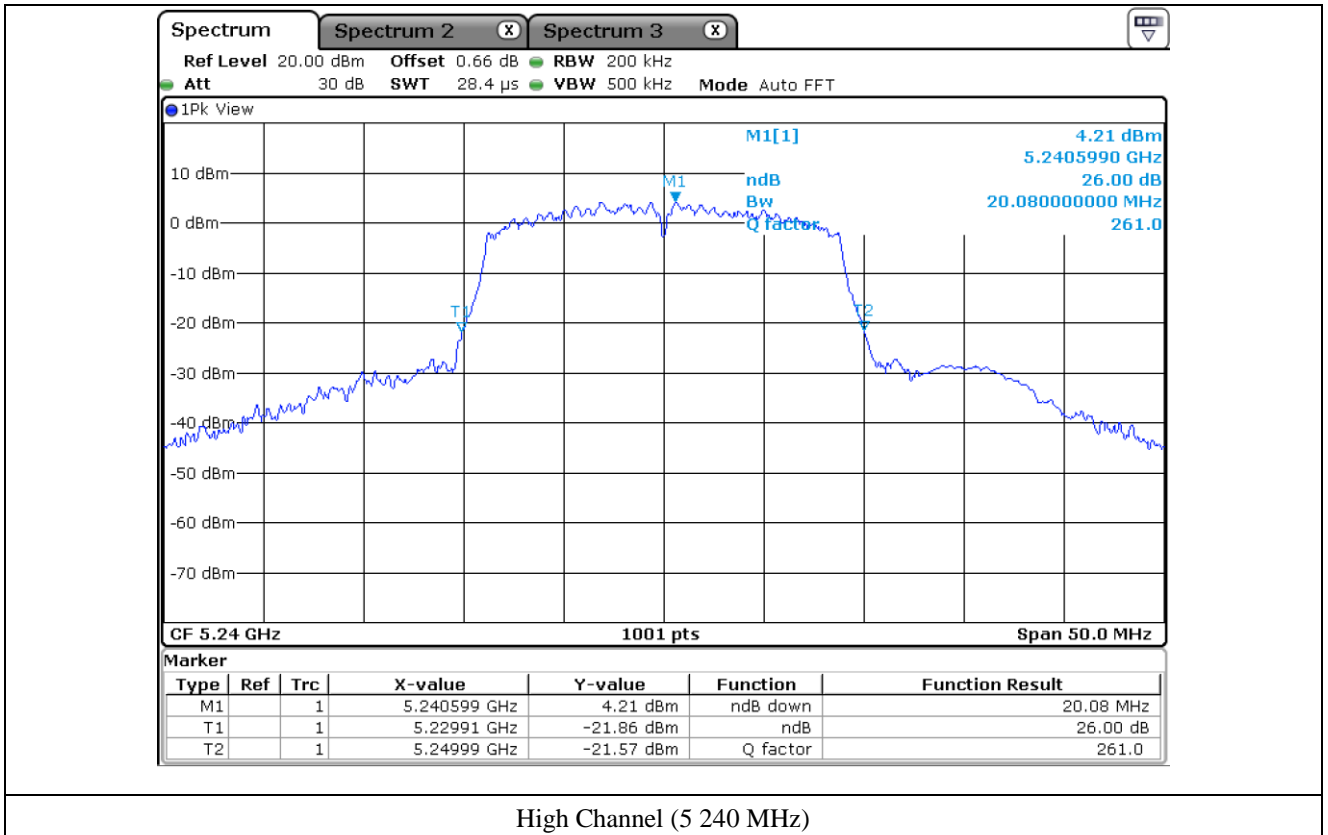
**Tested by: Tae-Ho, Kim / Senior Manager**

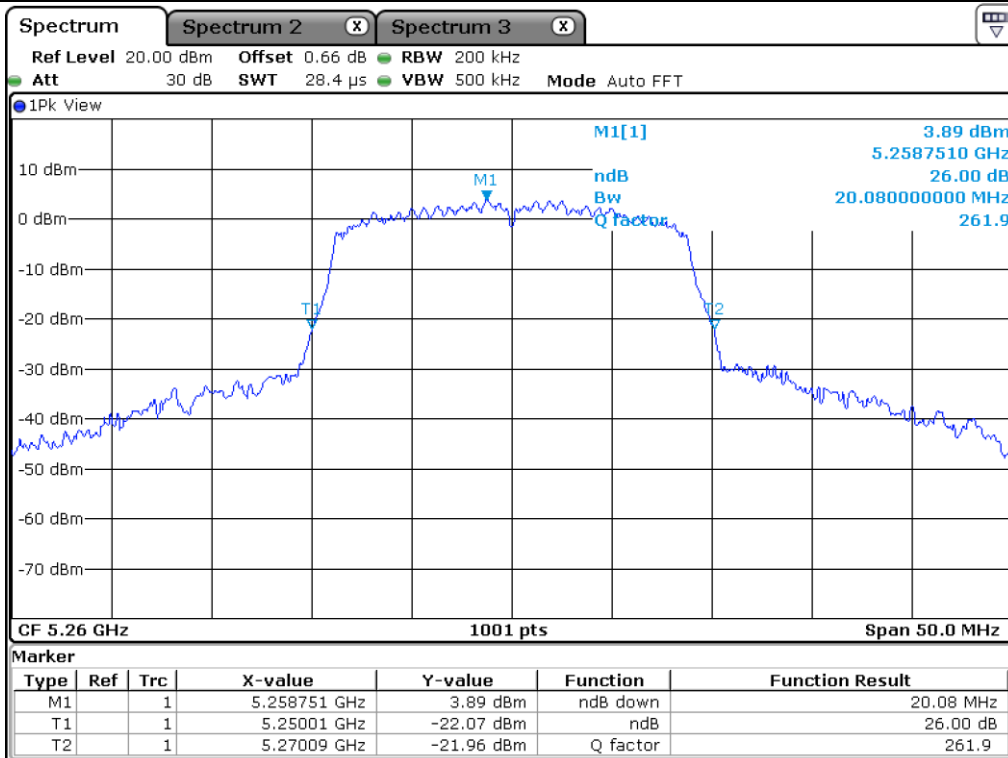


Low Channel (5 180 MHz)

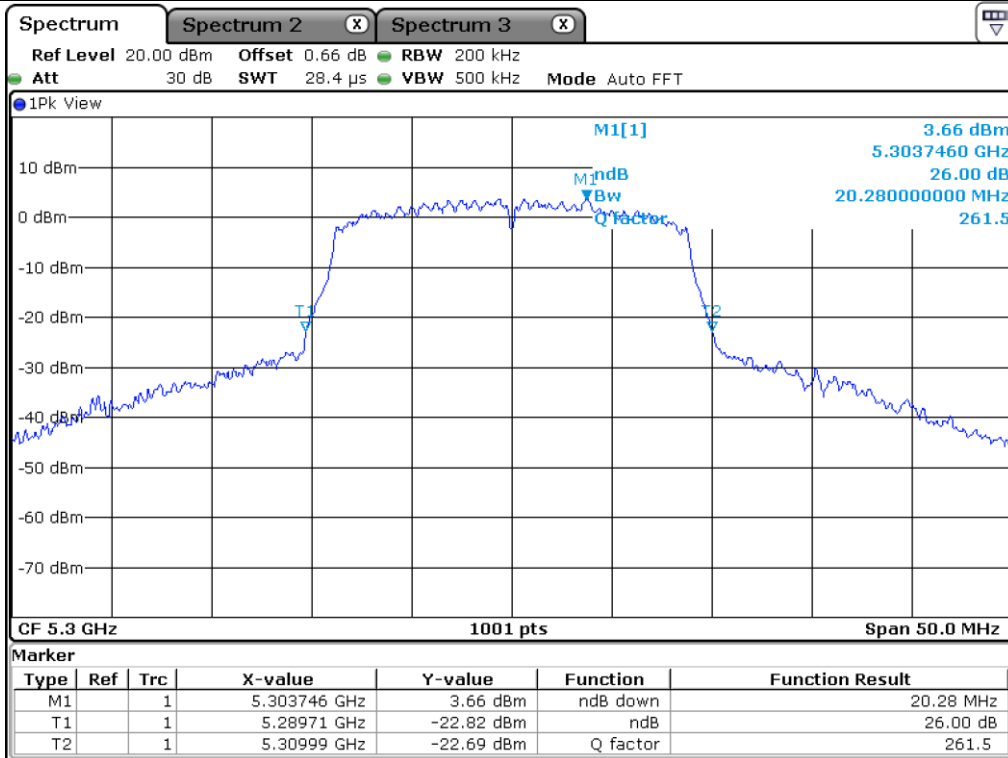


Middle Channel (5 220 MHz)

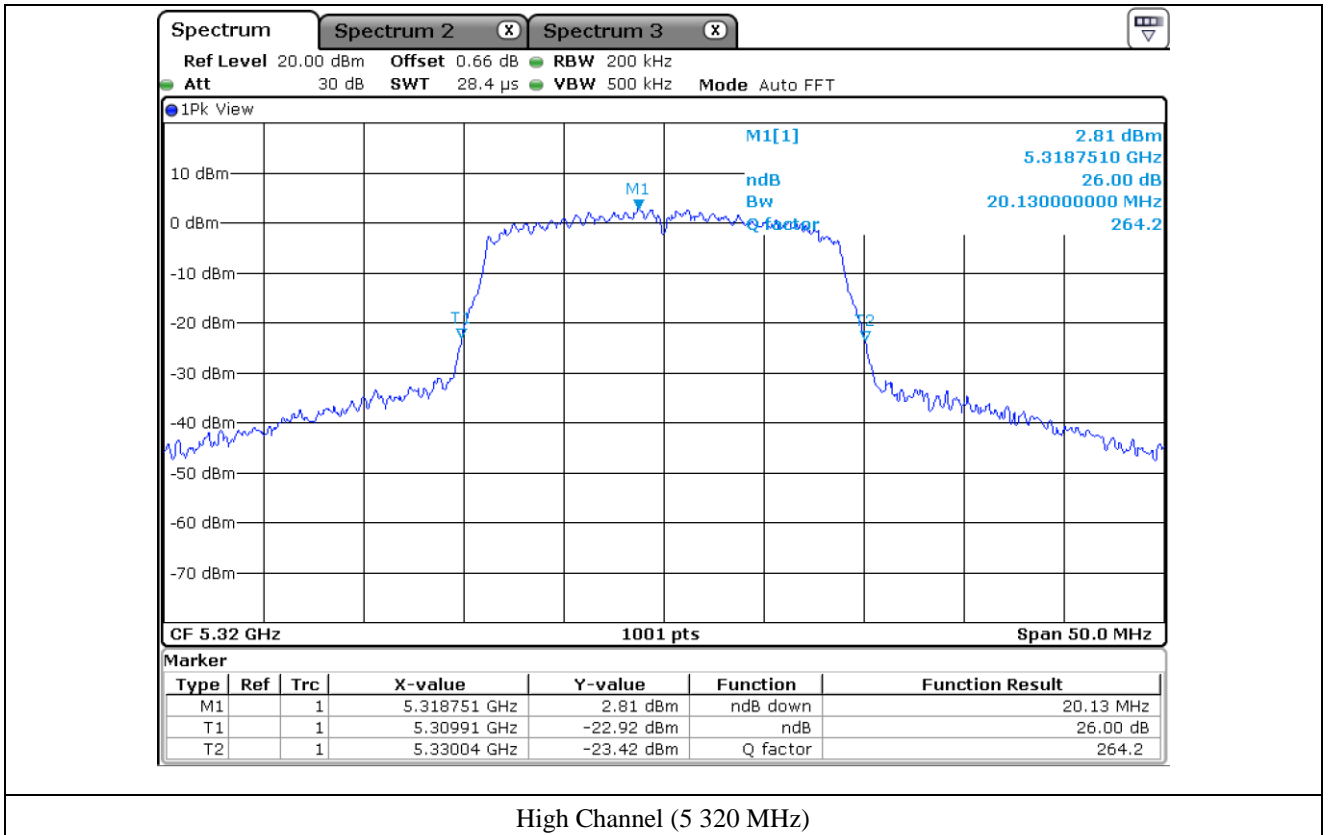


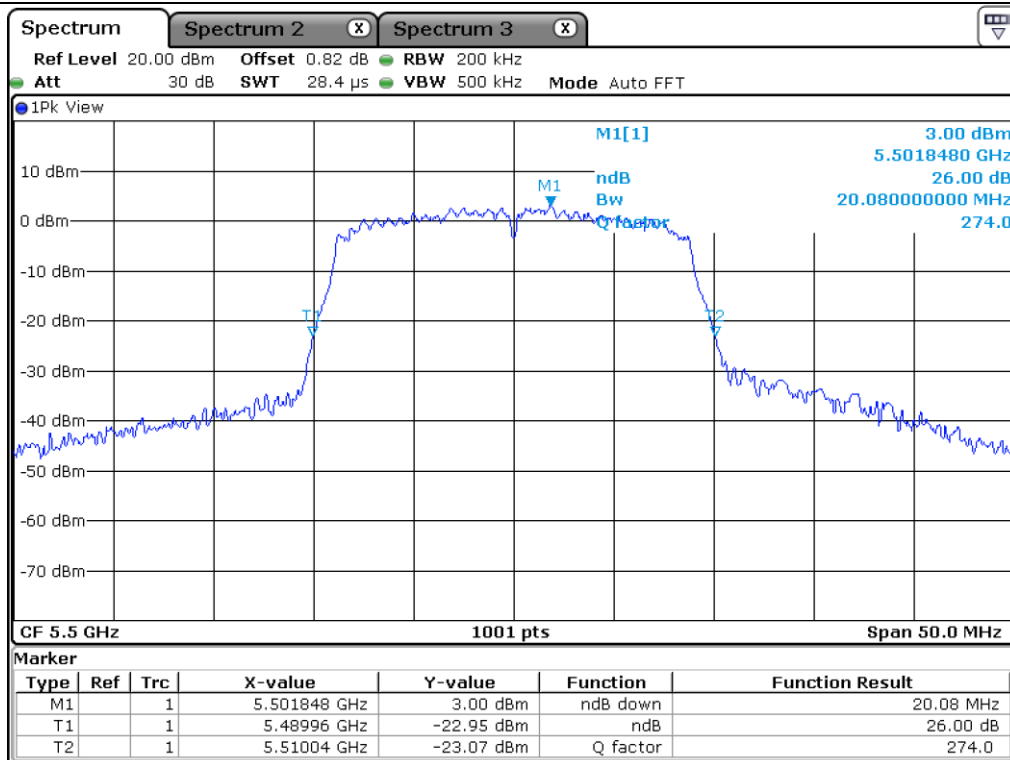


Low Channel (5 260 MHz)

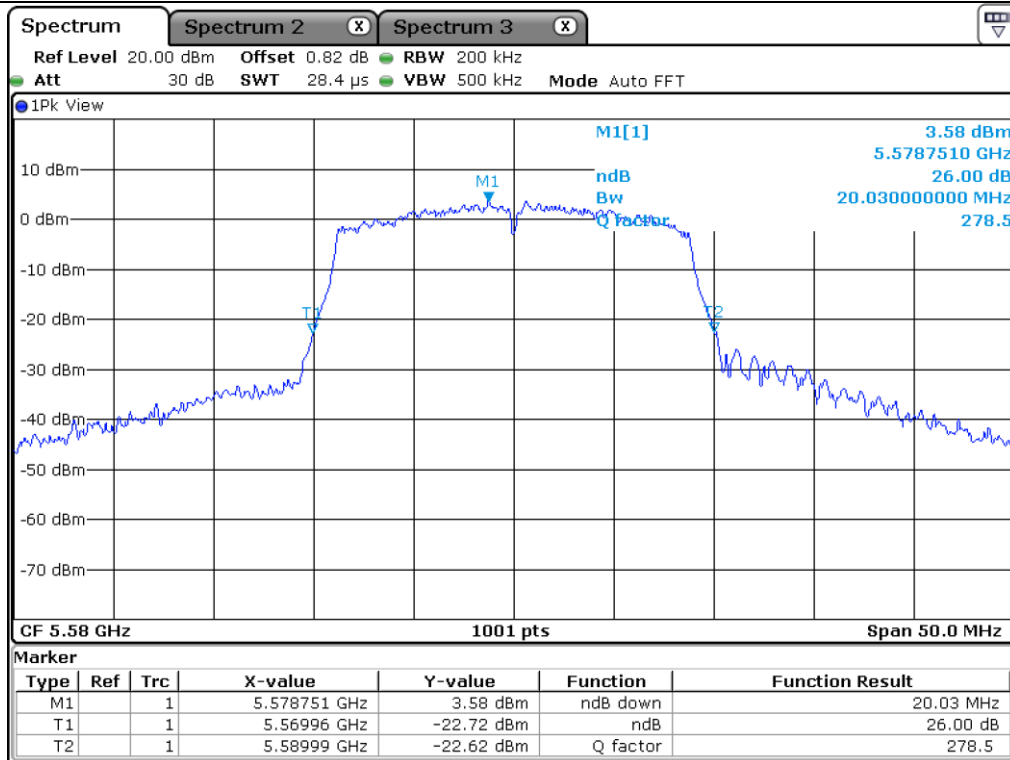


Middle Channel (5 300 MHz)

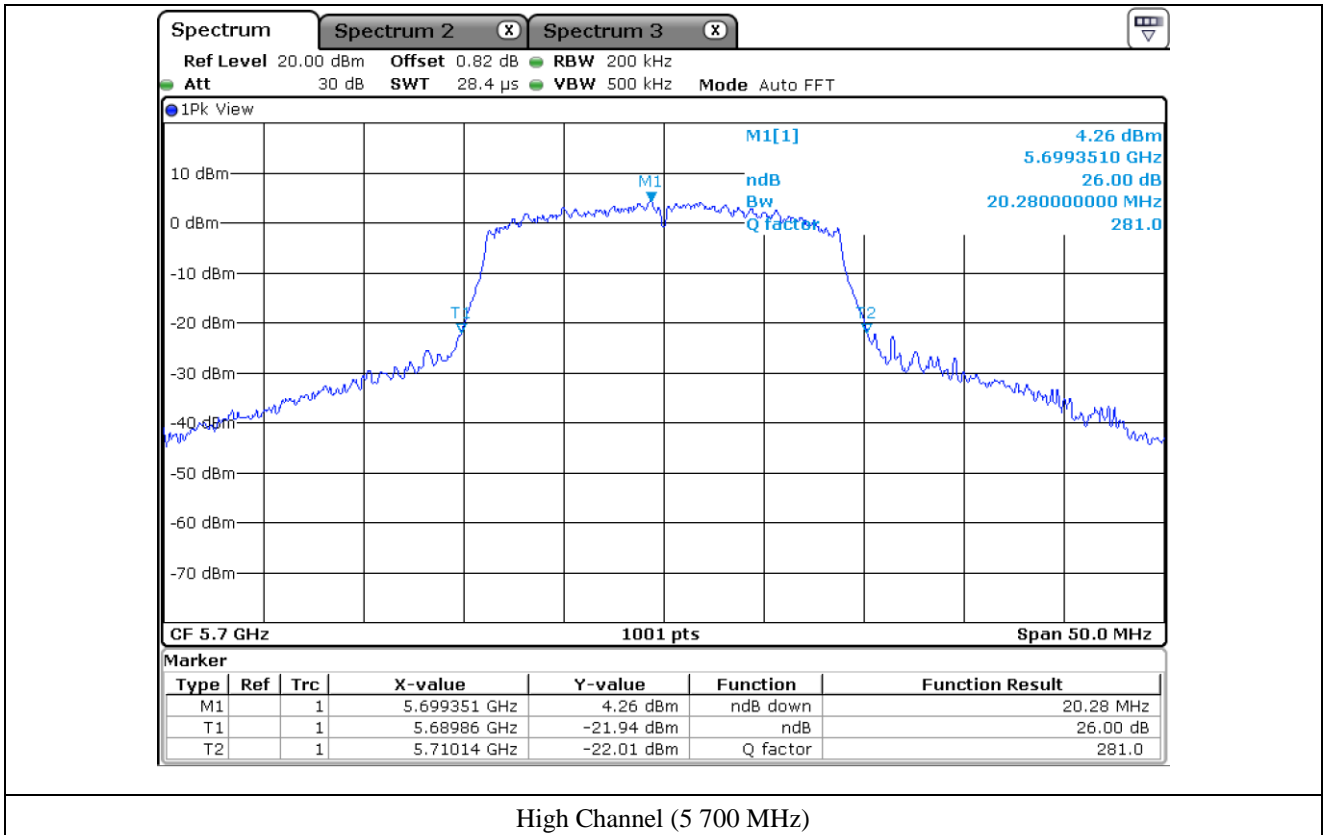




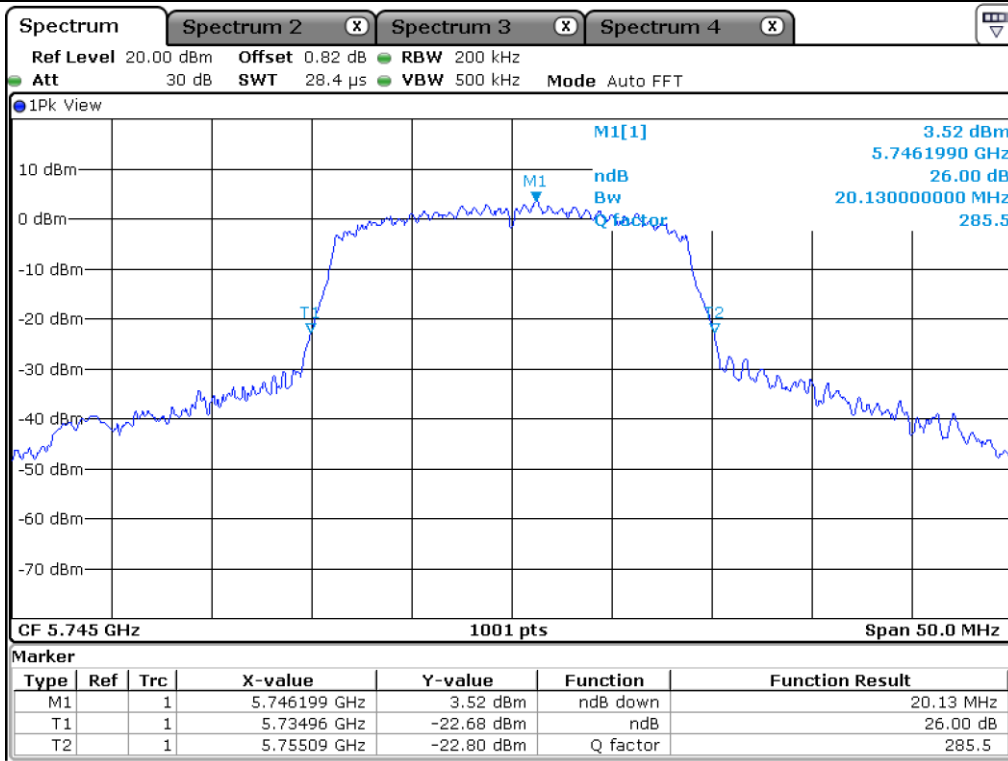
Low Channel (5 500 MHz)



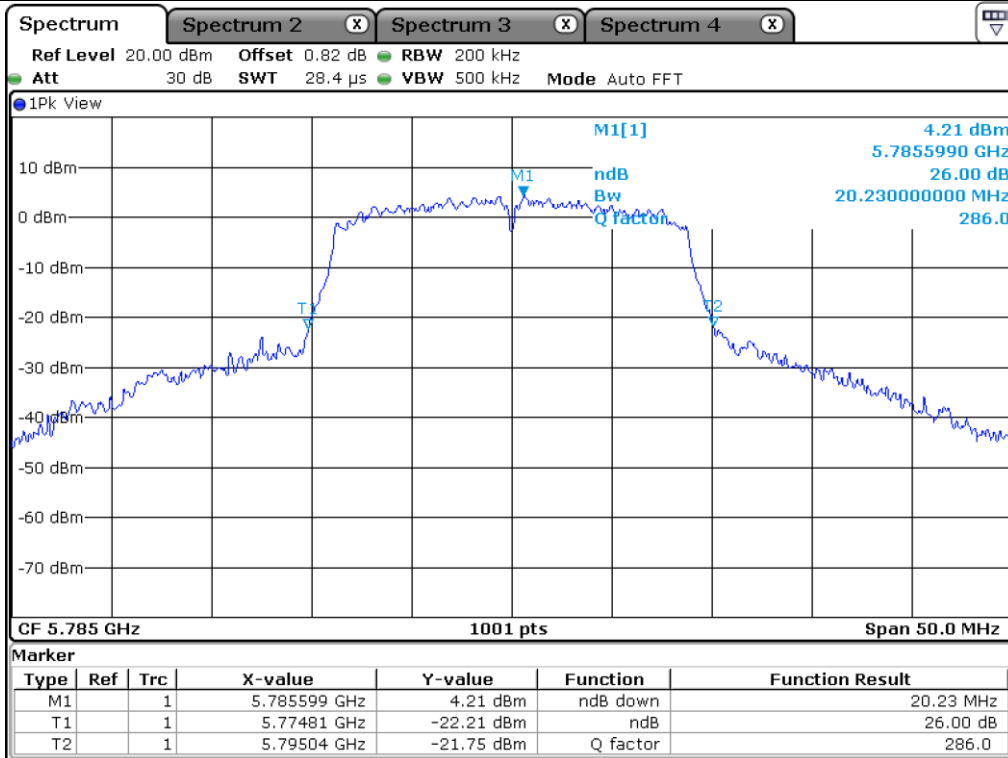
Middle Channel (5 580 MHz)



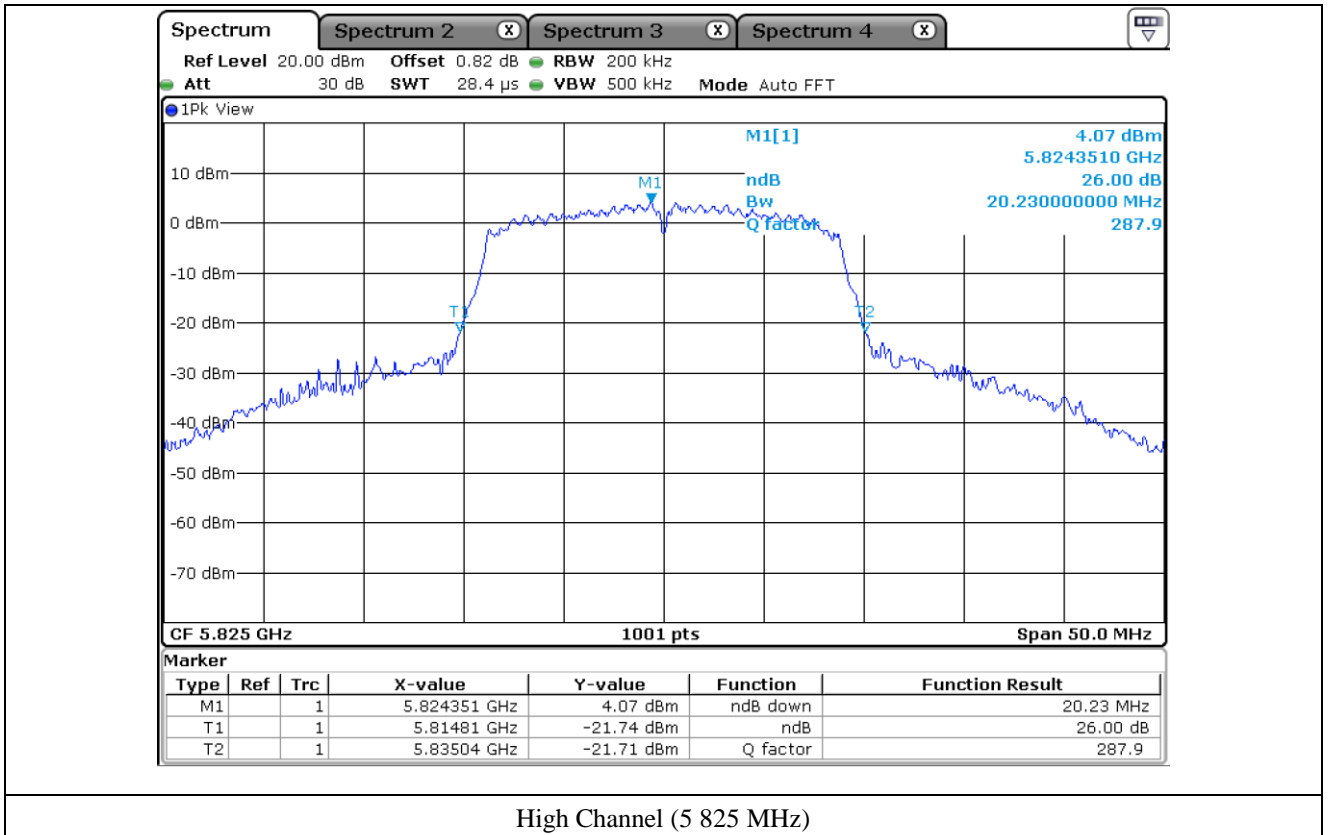




Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)



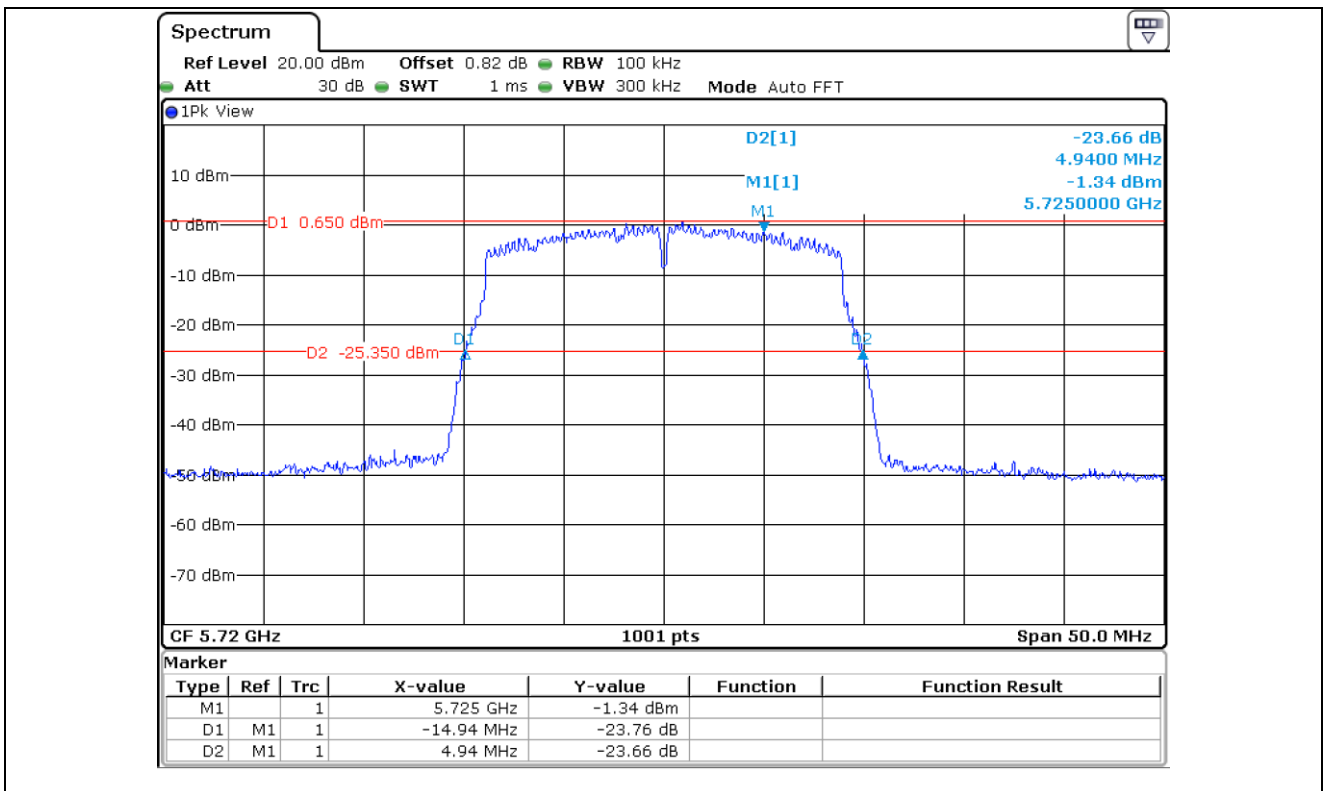
7.4.3 Test data for Staddle Channel\_Antenna 0

- Test Date : September 28, 2018 ~ October 24, 2018
- Test Result : Pass

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 470 ~ 5 725	5 720.00	14.94
5 725 ~ 5 850	5 720.00	4.94



Tested by: Tae-Ho, Kim / Senior Manager



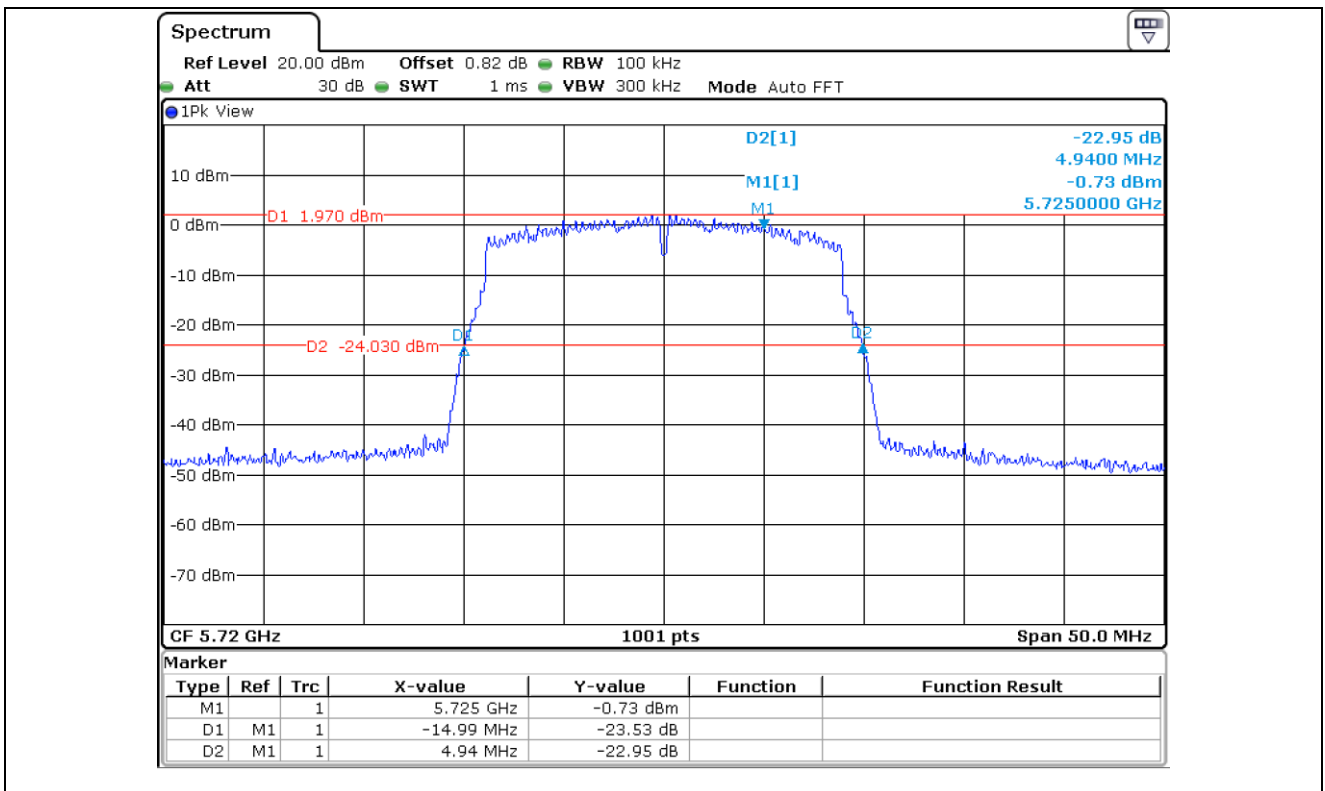
7.4.4 Test data for Staddle Channel\_Antenna 1

- Test Date : September 28, 2018 ~ October 24, 2018
- Test Result : Pass

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 470 ~ 5 725	5 720.00	14.99
5 725 ~ 5 850	5 720.00	4.94



Tested by: Tae-Ho, Kim / Senior Manager



**7.6 Test data for 802.11n\_HT40 RLAN Mode**


**7.6.1 Test data for Antenna 0**

-. Test Date : September 28, 2018 ~ October 24, 2018

-. Test Result : Pass

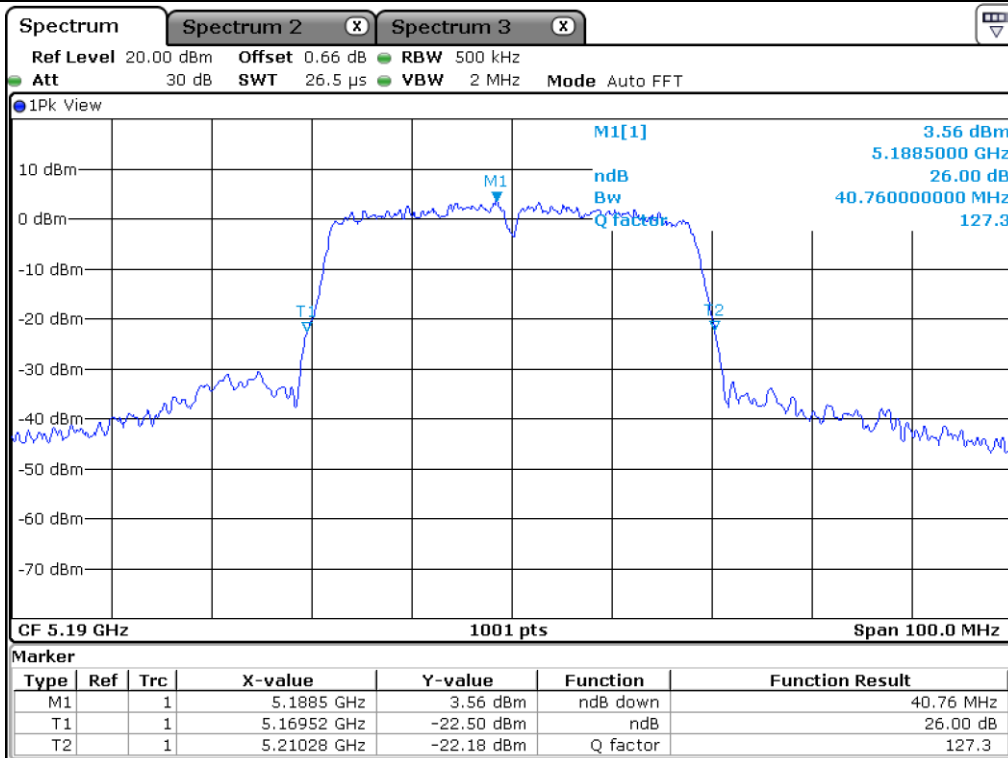
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 190.00	40.76
	High	5 230.00	40.86
5 250 ~ 5 350	Low	5 270.00	40.66
	High	5 310.00	40.16
5 470 ~ 5 725	Low	5 510.00	40.86
	Middle	5 550.00	40.56
	High	5 670.00	40.56
5 725 ~ 5 850	Low	5 755.00	40.56
	High	5 795.00	40.76

Remark: See next page for measurement data.

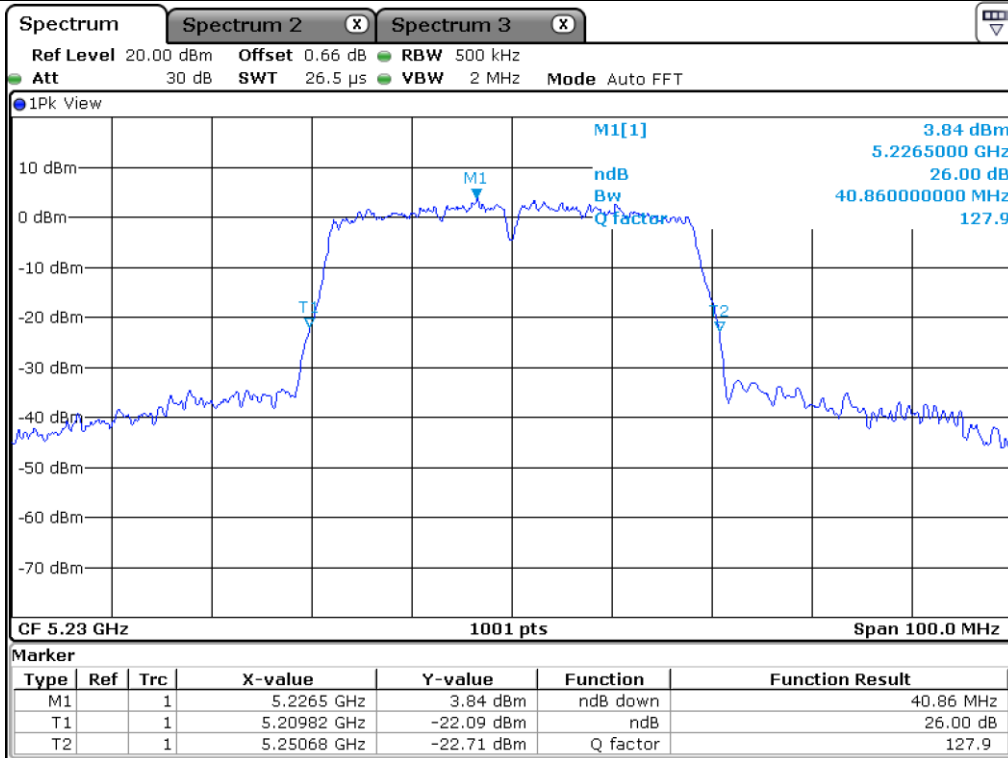



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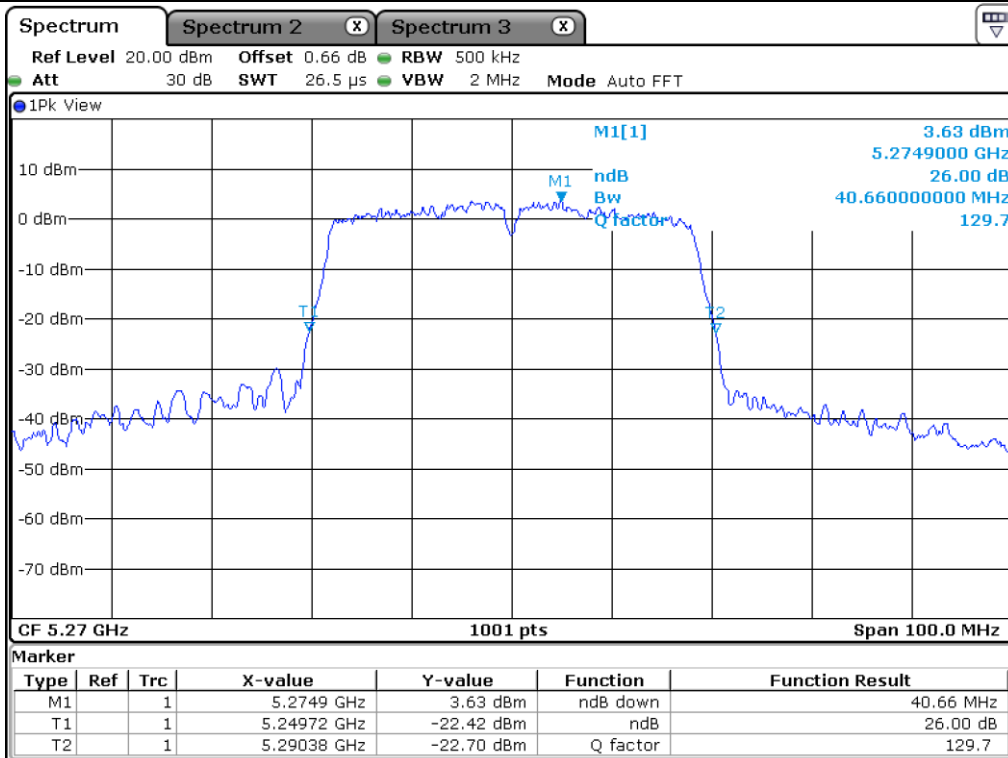
**Tested by: Tae-Ho, Kim / Senior Manager**



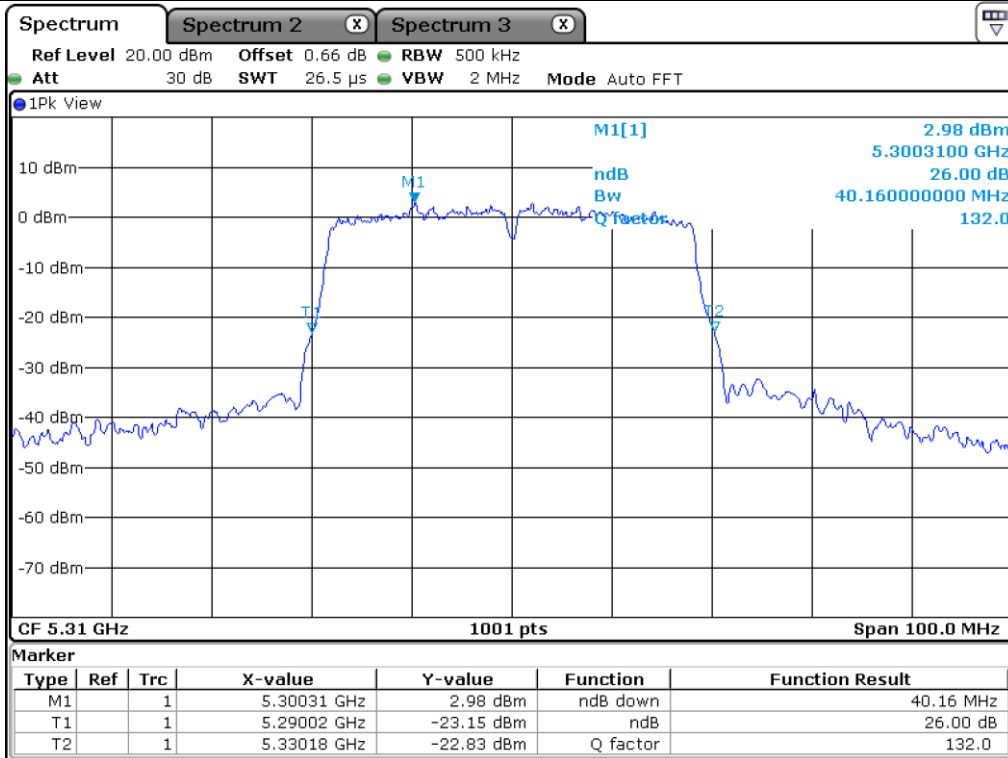
Low Channel (5 190 MHz)



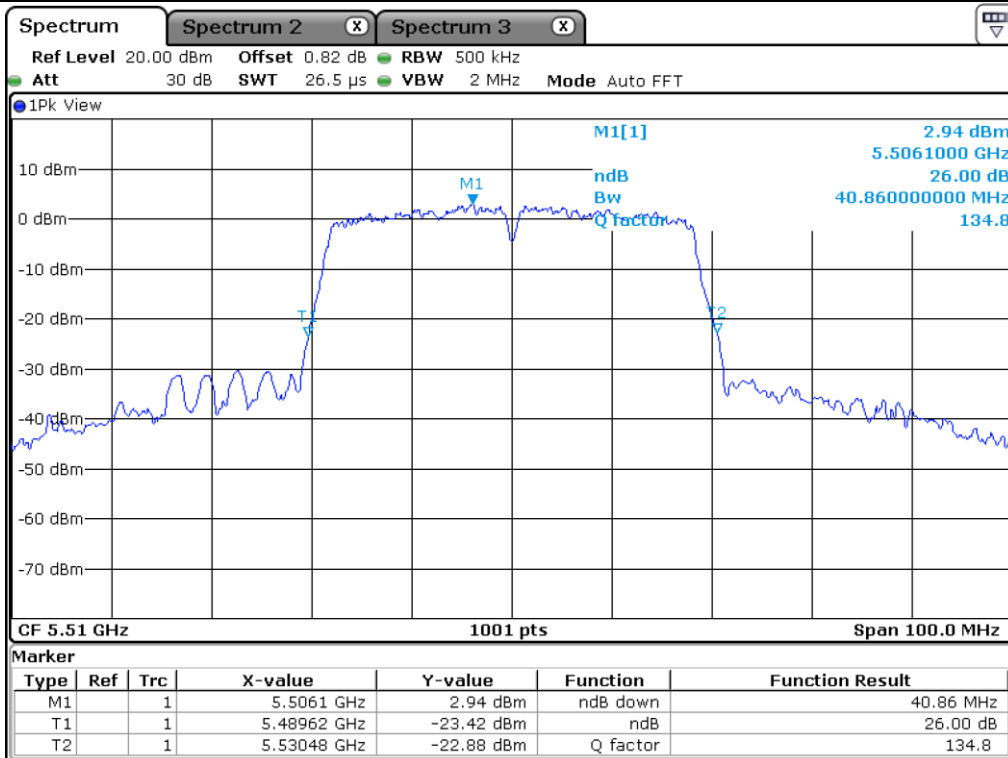
High Channel (5 230 MHz)



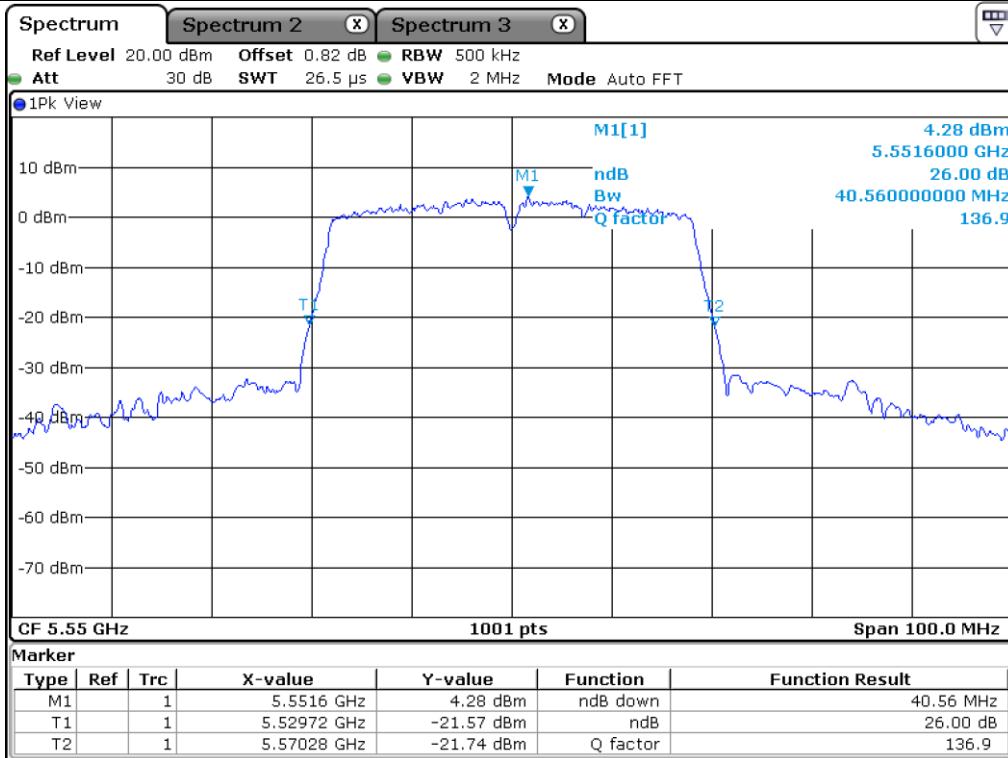
Low Channel (5 270 MHz)



High Channel (5 310 MHz)

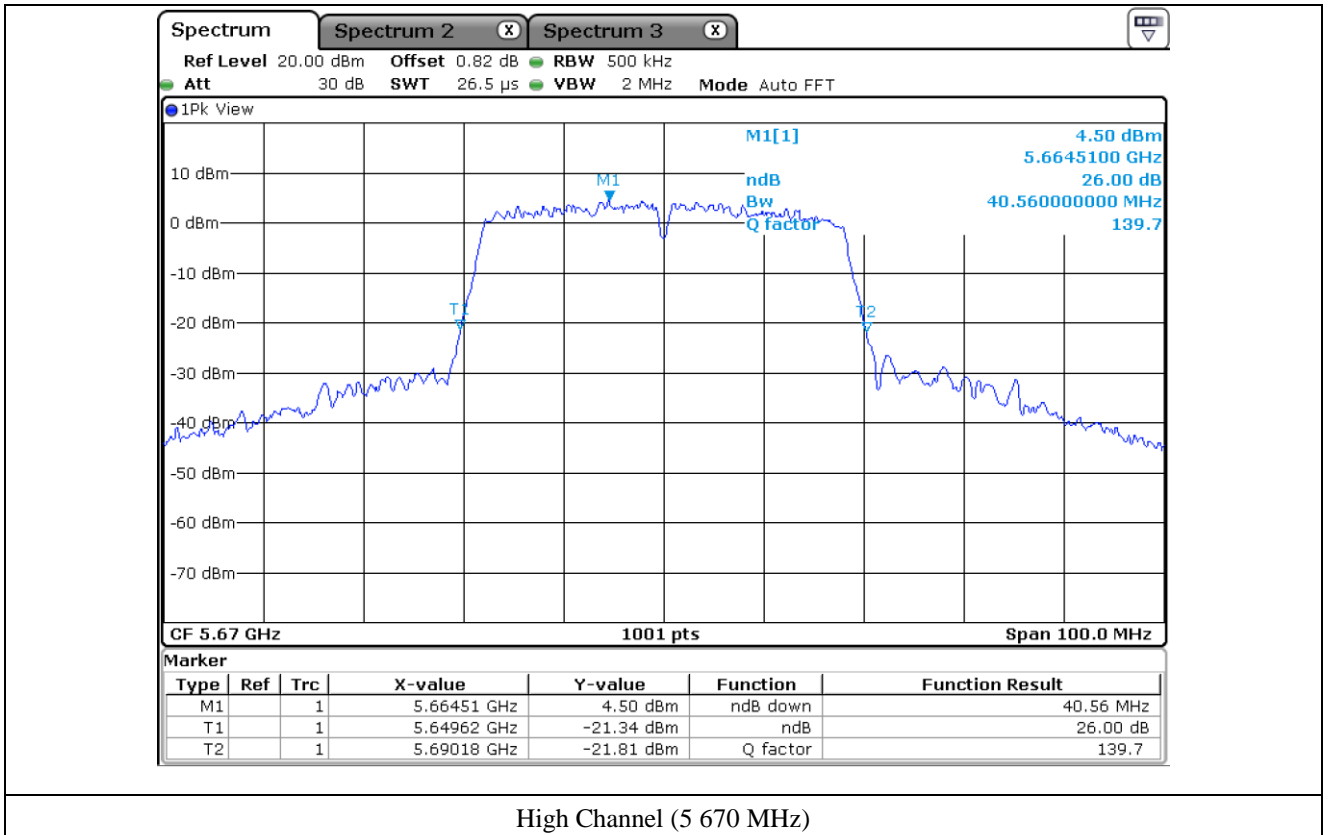


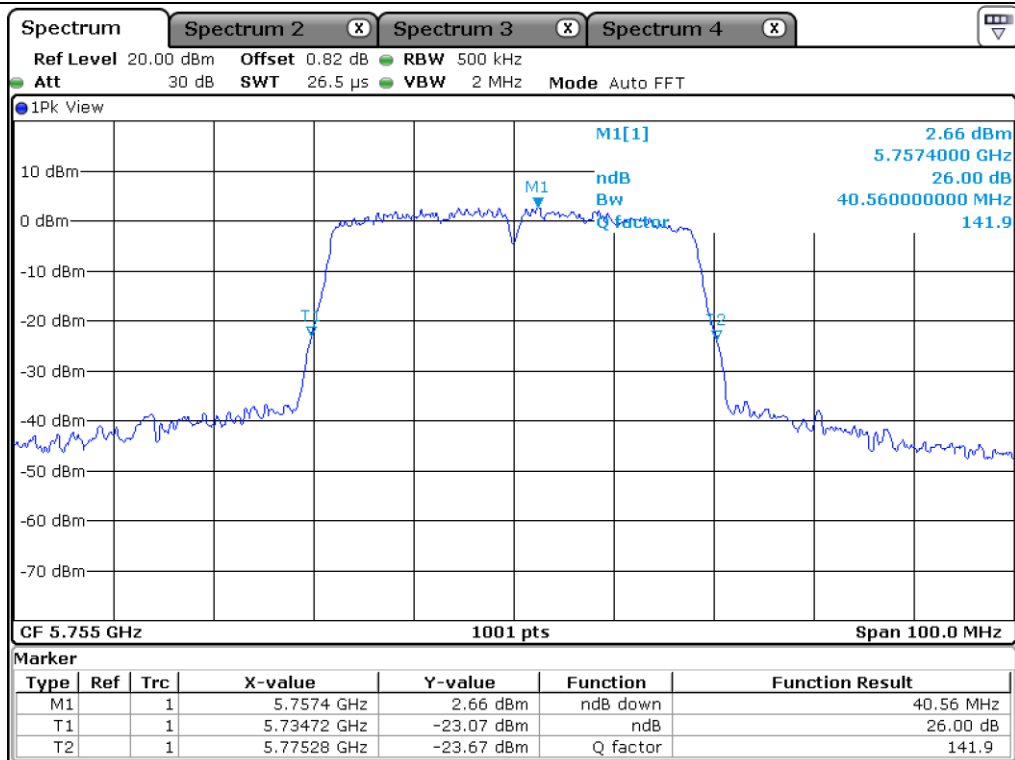
Low Channel (5 510 MHz)



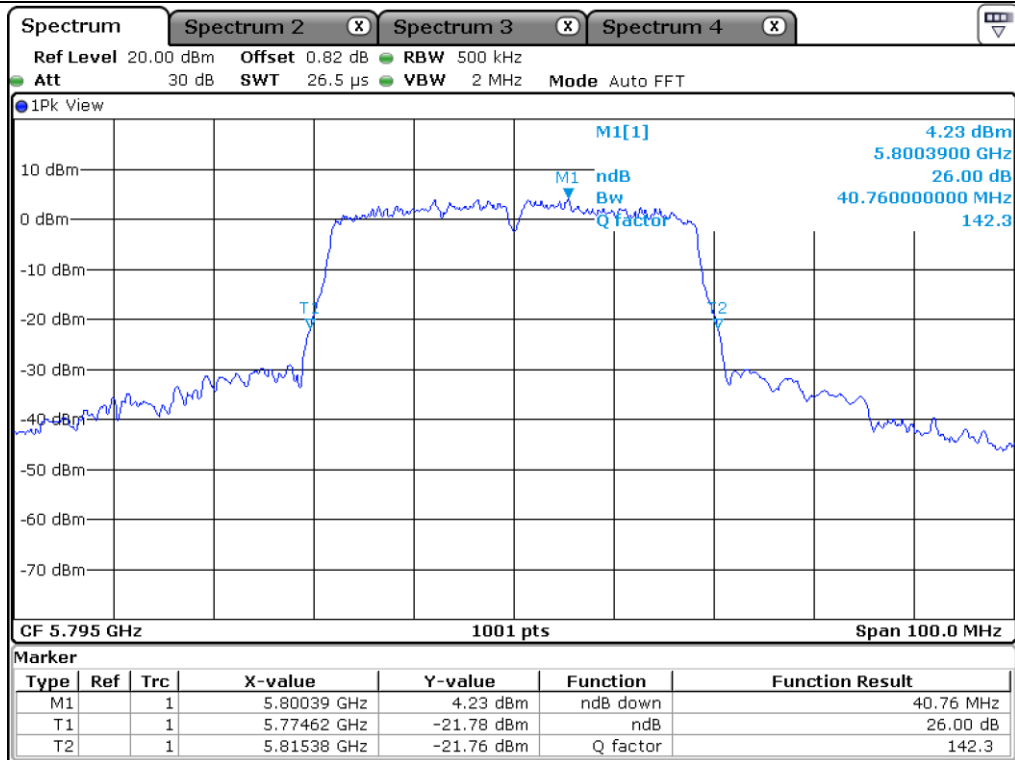
Middle Channel (5 550 MHz)







Low Channel (5 755 MHz)



High Channel (5 795 MHz)