



# FCC PART 15C TEST REPORT No.I21Z70555-IOT03

for

**Samsung Electronics Co., Ltd**

**Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN**

**SM-A032F/DS, SM-A032F**

**FCC ID : ZCASMA032F**

with

**Hardware Version: REV1.0**

**Software Version: A032F.001**

**Issued Date: 2021-11-26**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I21Z70555-IOT03	Rev.0	1st edition	2021-11-26

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## 1. Test Laboratory

### 1.1.Introduction & Accreditation

**Telecommunication Technology Labs, CAICT** is an ISO/IEC 17025:2017 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (ISED#: 24849). The detail accreditation scope can be found on NVLAP website.

### 1.2. Testing Location

Location 1:CTTL(Huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,  
P. R. China100191

Location 2:CTTL(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology  
Development Area, Beijing, 100176, P.R. China

### 1.3. Testing Environment

Normal Temperature: 15-35°C

Relative Humidity: 20-75%

### 1.4. Project date

Testing Start Date: 2021-08-13

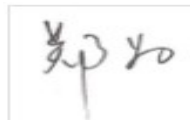
Testing End Date: 2021-11-26

### 1.5. Signature



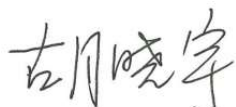
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**Feng Aiyu**  
(Prepared this test report)



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**Zheng Wei**  
(Reviewed this test report)



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**Hu Xiaoyu**  
(Approved this test report)

## **2. Client Information**

### **2.1.Applicant Information**

Company Name: Samsung Electronics Co., Ltd  
Address: 19 Chapin Rd.,Building D Pine Brook, NJ 07058  
City: /  
Postal Code: /  
Country: /  
Contact: Jenni Chun  
Telephone: +1-201-937-4203  
E-mail: j1.chun@samsung.com

### **2.2.Manufacturer Information**

Company Name: Samsung Electronics Co., Ltd  
Address: Samsung R5, Maetan dong 129, Samsung ro  
Youngtong gu, Suwon city 443 742, Korea  
City: /  
Postal Code: /  
Country: /  
Contact: 조성훈 (Sunghoon Cho)  
Telephone: +82-10-2722-4159  
E-mail: ggobi.cho@samsung.com

### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN
Model name	SM-A032F/DS, SM-A032F
FCC ID	ZCASMA032F
With WLAN Function	Yes
Frequency Range	ISM 2400MHz~2483.5MHz
Type of Modulation	DSSS/CCK/OFDM
Number of Channels	11
Antenna	Integral Antenna
MAX Conducted Power	24.26dBm
Power Supply	3.85V

#### **3.2. Internal Identification of EUT**

<b>EUT ID*</b>	<b>SN or IMEI</b>	<b>HW Version</b>	<b>SW Version</b>
UT08a	/	REV1.0	A032M.001
UT17a	2170411UT17a	REV1.0	A032F.001

\*EUT ID: is used to identify the test sample in the lab internally.

#### **3.3. Internal Identification of AE**

<b>AE ID*</b>	<b>Description</b>	<b>Remark</b>
AE1-1	Adapter1	/
AE1-2	Adapter2	/
AE1-3	Adapter3	/
AE2-1	Adapter4	/
AE2-2	Adapter5	/
AE2-3	Adapter6	/
AE2-4	Adapter7	/
AE2-5	Adapter8	/
AE3-1	Adapter9	/
AE3-2	Adapter10	/
AE3-3	Adapter11	/
AE3-4	Adapter12	/
AE3-11	Adapter13	/
AE4-1	Adapter14	/
AE4-4	Adapter15	/
AE5-1	USB Cable1	/



AE5-2	USB Cable2	/
AE5-3	USB Cable3	/
AE6	Headset1	/
AE7	Headset2	/
AE8	Battery	/
AE1-1		
Model	EP-TA50EWE	
Manufacturer	RFTECH Co., Ltd.	
Length of cable	/	
AE1-2		
Model	EP-TA50JWS	
Manufacturer	RFTECH Co., Ltd.	
Length of cable	/	
AE1-3		
Model	EP-TA50JWE	
Manufacturer	RFTECH Co., Ltd.	
Length of cable	/	
AE2-1		
Model	EP-TA50EWE	
Manufacturer	DONGYANG E&P Inc.	
Length of cable	/	
AE2-2		
Model	EP-TA50JWS	
Manufacturer	DONGYANG E&P Inc.	
Length of cable	/	
AE2-3		
Model	EP-TA50JWE	
Manufacturer	DONGYANG E&P Inc.	
Length of cable	/	
AE2-4		
Model	EP-TA50UWE	
Manufacturer	DONGYANG E&P Inc.	
Length of cable	/	
AE2-5		
Model	EP-TA50RWS	
Manufacturer	DONGYANG E&P Inc.	
Length of cable	/	
AE3-1		
Model	EP-TA50EWE	
Manufacturer	HAEM Co.,Ltd	
Length of cable	/	
AE3-2		
Model	EP-TA50JWS	





Manufacturer	HAEM Co.,Ltd	
Length of cable	/	
AE3-3		
Model	EP-TA50JWE	
Manufacturer	HAEM Co.,Ltd	
Length of cable	/	
AE3-4		
Model	EP-TA50UWE	
Manufacturer	HAEM Co.,Ltd	
Length of cable	/	
AE3-11		
Model	EP-TA50EWE	
Manufacturer	HAEM Co.,Ltd	
Length of cable	/	
AE4-1		
Model	EP-TA50EWE	
Manufacturer	Salcomp (Shenzhen) Co., Ltd.	
Length of cable	/	
AE4-4		
Model	EP-TA50UWE	
Manufacturer	Salcomp (Shenzhen) Co., Ltd.	
Length of cable	/	
AE5-1		
Model	ECB-DU68WE(GH39-02004A)	
Manufacturer	CRESYN HANOI Co., Ltd	
Length	/	/
AE5-2		
Model	ECB-DU68WE(GH39-02004A)/ ECB-DU68WZ(GH39-02005A) / ECB-DU68WE(GH39-02004B)	
Manufacturer	DONGGUAN KSD CO.,LTD	
Length	/	/
AE5-3		
Model	ECB-DU68WE(GH39-02004A)/ ECB-DU68WZ(GH39-02005A) / ECB-DU68WE(GH39-02004B)	
Manufacturer	RFTECH Co., Ltd.	
Length	/	/
AE6		
Model	GH59-15054A/ GH59-15071A	
Manufacturer	DONGGUAN YOUNGBO ELECTRONICS CO.,LTD	
Length	/	
AE7		

Model	GH59-15054A/ GH59-15071A
Manufacturer	CRESYN HANOI Co., Ltd
Length	/
AE8	
TYPE	Secondary Li-ion Battery
SN	SLC-50
Manufacturer	Ningde Amperex Technology Limited

\*AE ID: is used to identify the test sample in the lab internally.

### 3.4. General Description

The Equipment under Test (EUT) is a model of Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN with integrated antenna and inbuilt battery.

It consists of normal options: travel charger, USB cable.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

### 3.5. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor k=2.

#### Measurement Uncertainty

Parameter	Uncertainty
temperature	0.48°C
humidity	2 %
DC voltages	0.003V

## 4. Reference Documents

### 4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

### 4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
	FCC CFR 47, Part 15, Subpart C:	
	15.205 Restricted bands of operation;	
FCC Part15	15.209 Radiated emission limits, general requirements;	2018
	15.247 Operation within the bands 902-928MHz, 2400-2483.5 MHz, and 5725-5850 MHz.	
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB 558074 D01	Federal Communications Commission Office of	2019



Engineering and Technology Laboratory Division  
GUIDANCE FOR COMPLIANCE MEASUREMENTS ON  
DIGITAL TRANSMISSION SYSTEM, FREQUENCY  
HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID  
SYSTEM DEVICES OPERATING UNDER SECTION  
15.247 OF THE FCC RULES

## 5. Test Results

### 5.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.247 (b)	/	BR
Peak Power Spectral Density	15.247 (e)	/	BR
Occupied 6dB Bandwidth	15.247 (a)	/	BR
Band Edges Compliance	15.247 (d)	/	BR
Transmitter Spurious Emission - Conducted	15.247 (d)	/	BR
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	/	BR
AC Powerline Conducted Emission	15.107, 15.207	/	BR

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, The test was not performed by CTTL
BR	Re-use test data from basic model report.
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

### 5.2. Statements

The test cases as listed in section 5.1 of this report for the EUT specified in section 3 was performed by CTTL and according to the standards or reference documents listed in section 4.2

The EUT met all requirements of the standards or reference documents, and only the WLAN function was tested in this report.

### 5.3. Explanation of re-use of test data

T nom	Normal Temperature
T min	Low Temperature
T max	High Temperature
V nom	Normal Voltage

For this report, if the test cases listed above are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	T nom	26°C
Voltage	V nom	3.85V
Humidity	H nom	20-75%

The Equipment Under Test (EUT) model SM-A032F/DS, SM-A032F, (FCC ID: ZCASMA032F) is a variant product of SM-A032M/DS, SM-A032M, (FCC ID: ZCASMA032M), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements were performed average power of this device, all the test results are derived from test report No.I21Z70411-IOT05.

For detail differences between two models please refer the Declaration of Changes document.

## 6. Test Facilities Utilized

### Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	1 year	2022-05-24
2	LISN	ENV216	101459	R&S	1 year	2022-04-10
3	Test Receiver	ESCI7	100948	R&S	1 year	2022-07-17
4	Shielding Room	S81	/	ETS-Lindgren	/	/

### Radiated emission test system

No	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100235	R&S	1 year	2022-02-23
2	EMI Antenna	VULB9163	9163-482	Schwarzbeck	1 year	2021-11-04
3	EMI Antenna	LB-180-NF	203001300 041	A-INFO	1 year	2022-02-28
4	EMI Antenna	LB- 180400-25- C-KF	2110084000 06	A-INFO	1 year	2022-02-28
5	Analytical Spectrometer	FSV40	101047	R&S	1 year	2022-06-02

## 7. Measurement Uncertainty

### 7.1. Maximum Output Power

Measurement Uncertainty: 0.387dB,k=1.96

### 7.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

### 7.3. DTS 6-dB Signal Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

### 7.4. Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

### 7.5. Transmitter Spurious Emission

#### Conducted (k=1.96)

Frequency Range	Uncertainty(dB)
$30\text{MHz} \leq f \leq 2\text{GHz}$	1.22
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	1.22
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.22
$8\text{GHz} \leq f \leq 12.75\text{GHz}$	1.51
$12.75\text{GHz} \leq f \leq 26\text{GHz}$	1.51
$26\text{GHz} \leq f \leq 40\text{GHz}$	1.59

#### Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.40
$1\text{GHz} \leq f \leq 18\text{GHz}$	4.32
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.26

### 7.6. AC Power-line Conducted Emission

Measurement Uncertainty: 3.10dB, k=2

## **ANNEX A: Detailed Test Results**

### **A.1. Measurement Method**

#### **A.1.1. Conducted Measurements**

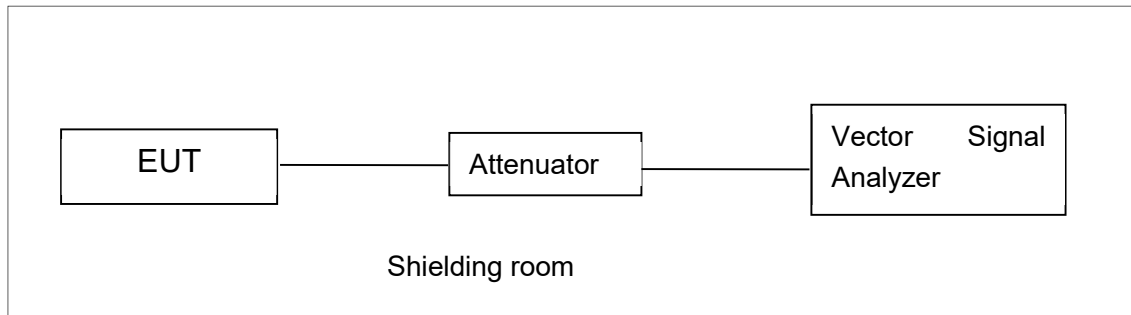
Connect the EUT to the test system as Fig.A.1.1.1 shows.

Set the EUT to the required work mode.

Set the EUT to the required channel.

Set the Vector Signal Analyzer and start measurement.

Record the values. Vector Signal Analyzer



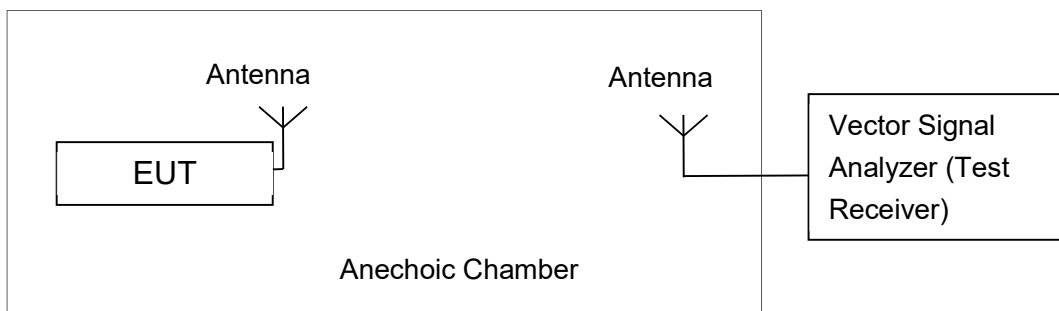
**Fig.A.1.1.1: Test Setup Diagram for Conducted Measurements**

#### **A.1.2. Radiated Emission Measurements**

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 3MHz;



**Fig.A.1.2.1: Test Setup Diagram for Radiated Measurements**

## **A.2. Maximum Output Power**

**Method of Measurement: See ANSI C63.10-2013-clause 11.9.1.1**

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq$  [3  $\times$  RBW].
- c) Set span  $\geq$  [3  $\times$  RBW].
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

**Measurement Limit:**

Standard	Limit (dBm)
FCC CRF Part 15.247(b)	< 30

**EUT ID:** UT17a

### **A.2.1. Peak Output Power-conducted**

**Measurement Results:**

#### **802.11b/g mode**

Mode	Data Rate (Mbps)	Test Result (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11b	1	20.45	/	/
	2	20.84	/	/
	5.5	22.37	/	/
	11	23.97	23.29	23.59
802.11g	6	22.91	/	/
	9	23.07	/	/
	12	22.54	/	/
	18	22.51	/	/
	24	23.04	/	/
	36	23.38	24.23	19.87
	48	21.97	/	/
54	21.98	/	/	

#### **802.11n-HT20 mode**

Mode	Data Rate (Index)	Test Result (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11n (20MHz)	MCS0	22.71	/	/
	MCS1	22.85	/	/



	MCS2	23.85	/	/
	MCS3	24.06	/	/
	MCS4	24.26	23.89	19.64
	MCS5	23.98	/	/
	MCS6	23.42	/	/
	MCS7	21.99	/	/

The data rate MCS4 are selected as worse condition, and the following cases are performed with this condition.

The spot check result of average output power is 17.88dBm (802.11b 1Mbps ch1 prototype result: 18.48dBm).

Note: The duty cycle of the EUT is 100%.

**Conclusion: Pass**

### **A.3. Peak Power Spectral Density**

**Method of Measurement: See ANSI C63.10-2013-clause 11.10.2**

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to RBW = 3 kHz.
- d) Set the VBW = 10 kHz.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

**Measurement Limit:**

Standard	Limit
FCC CRF Part 15.247(e)	< 8 dBm/3 kHz

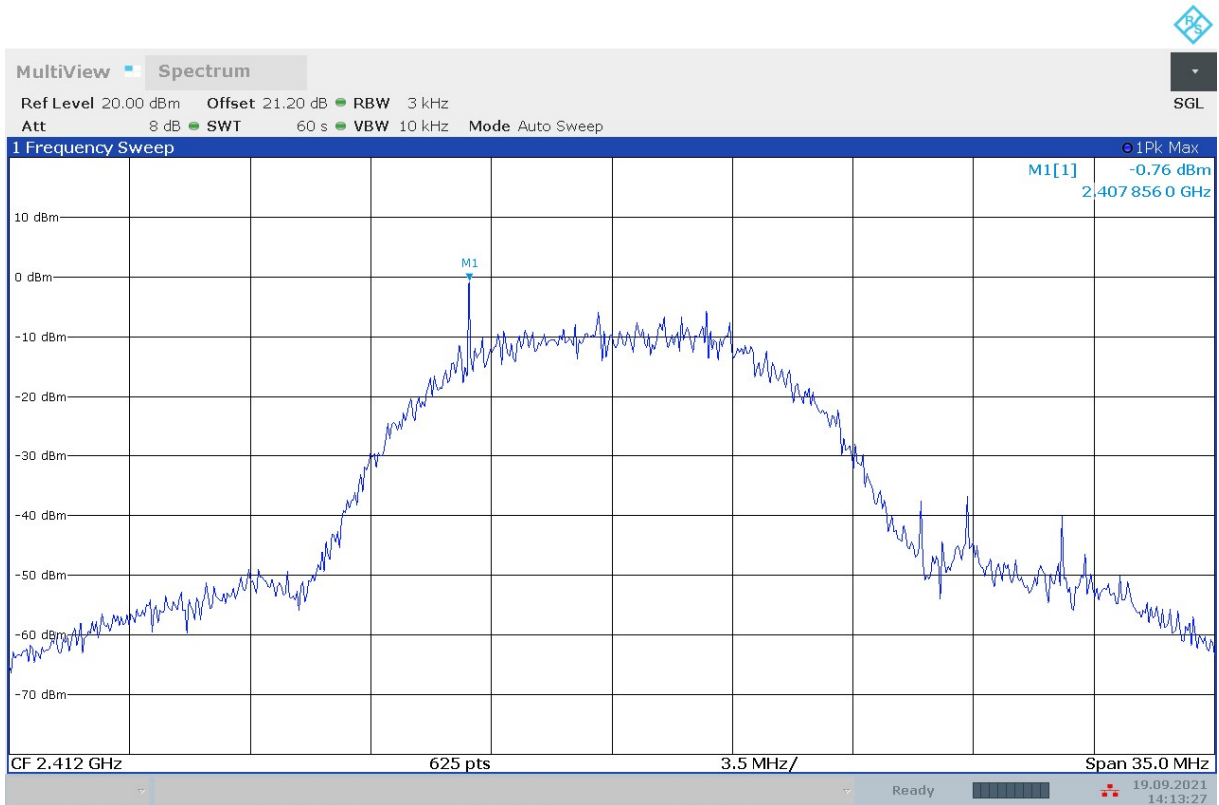
**Measurement Results:**

UT17a

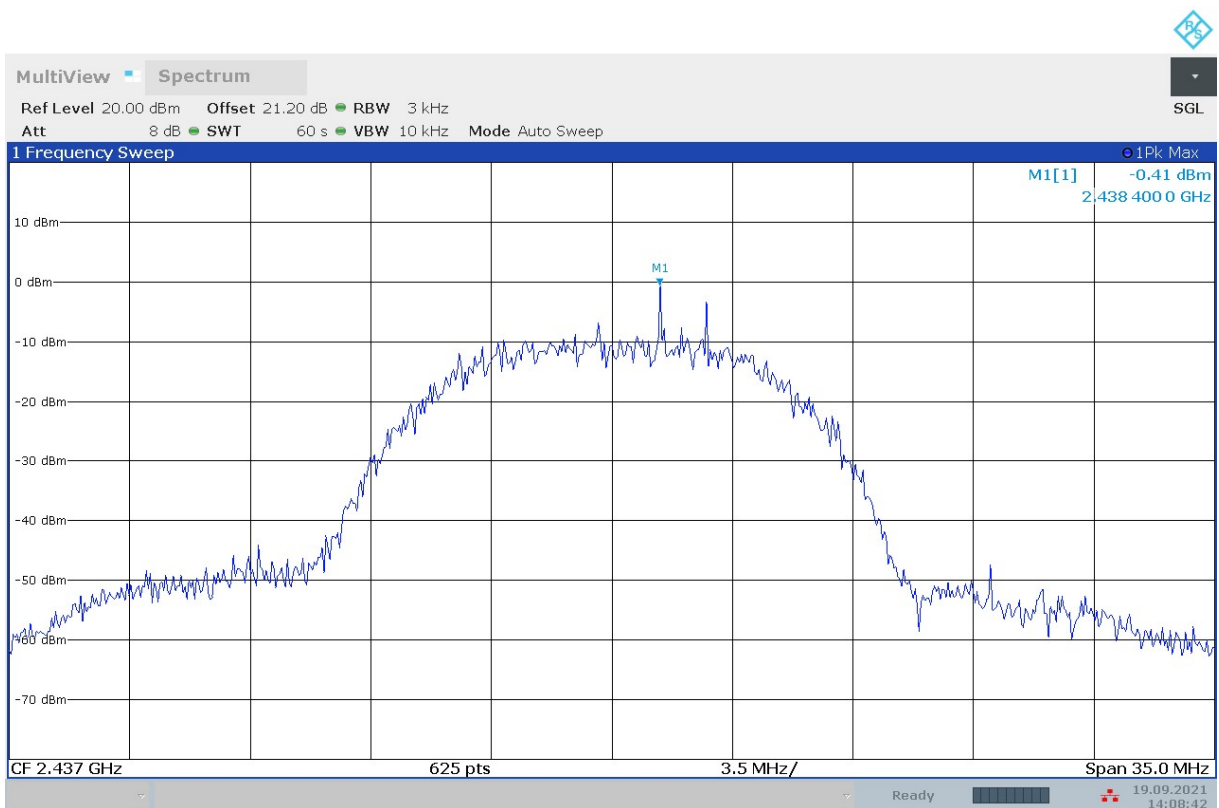
Mode	Channel	Power Spectral Density ( dBm/3 kHz )
		ANT0
802.11b	1	-0.76
	6	-0.41
	11	-5.49
802.11g	1	-10.9
	6	-11.6
	11	-14.41
802.11n (HT20)	1	-10.39
	6	-11.53
	11	-13.71

**Conclusion: Pass**

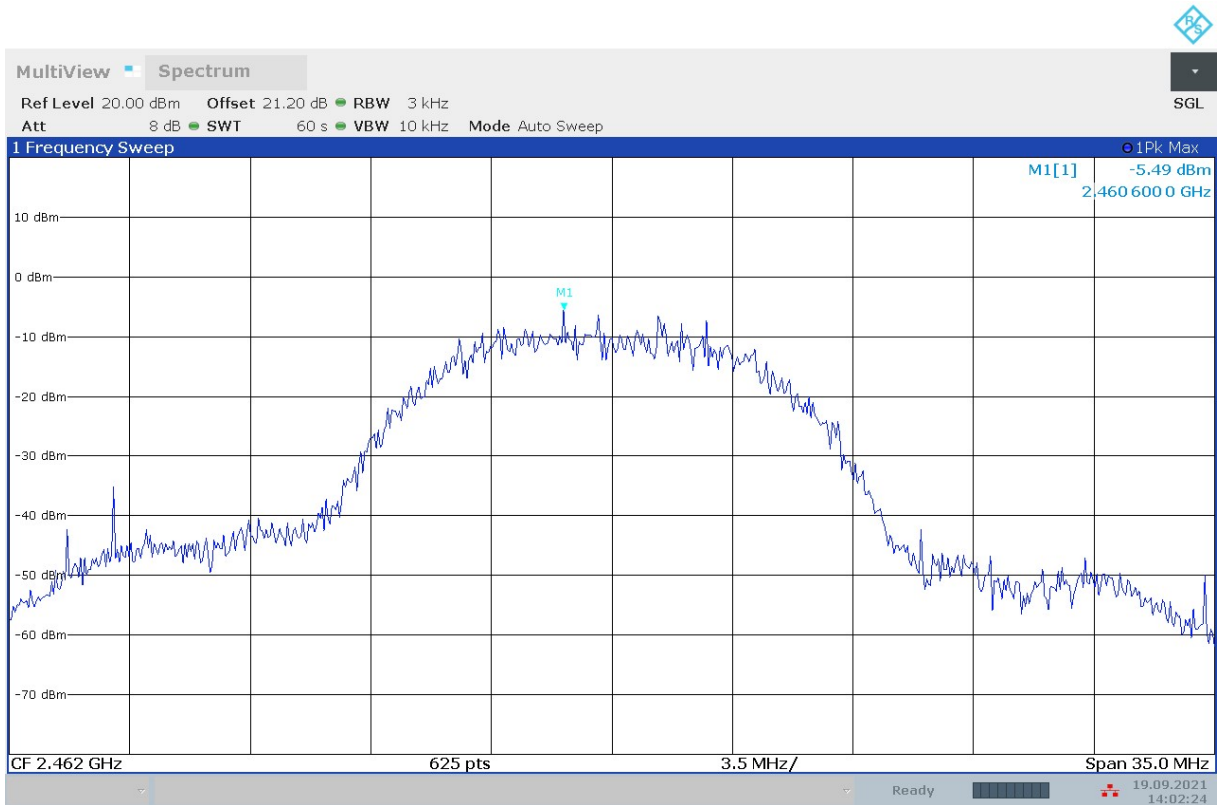
**Test graphs as below:**



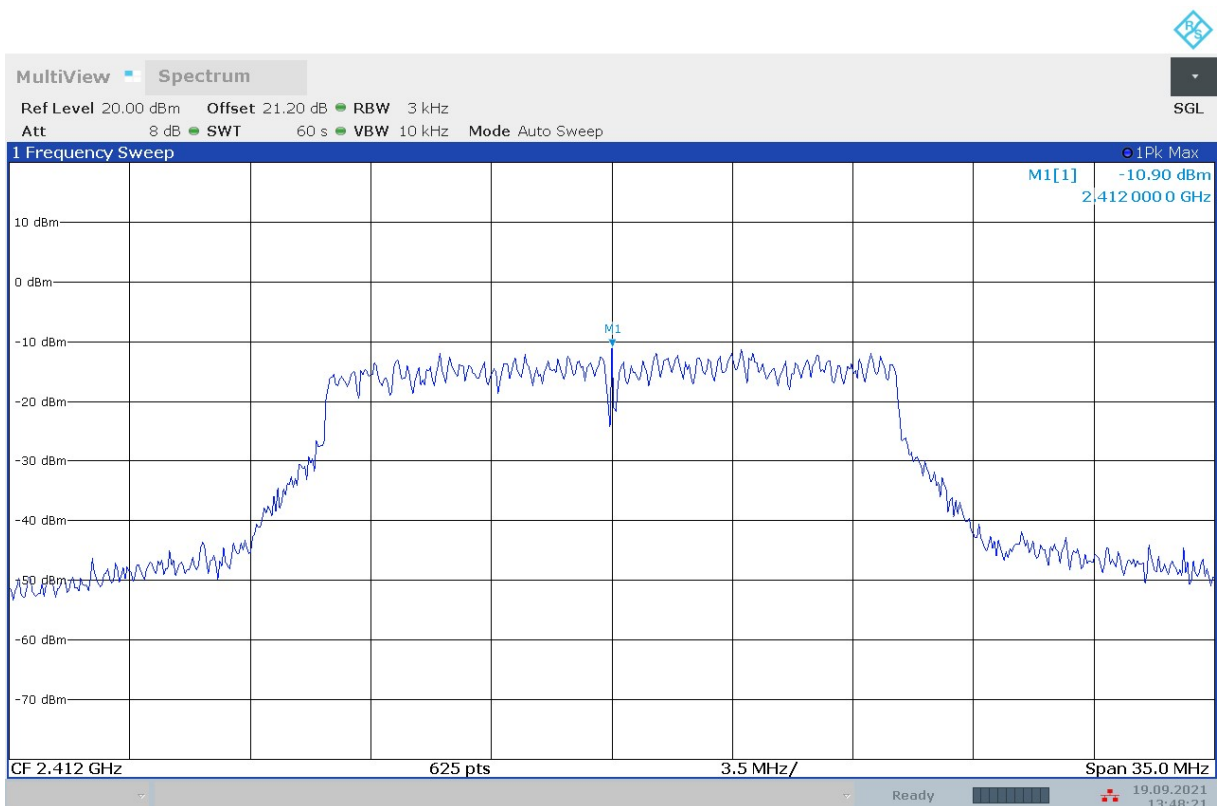
**Fig.A.3.1 Power Spectral Density(802.11b,Ch1)**



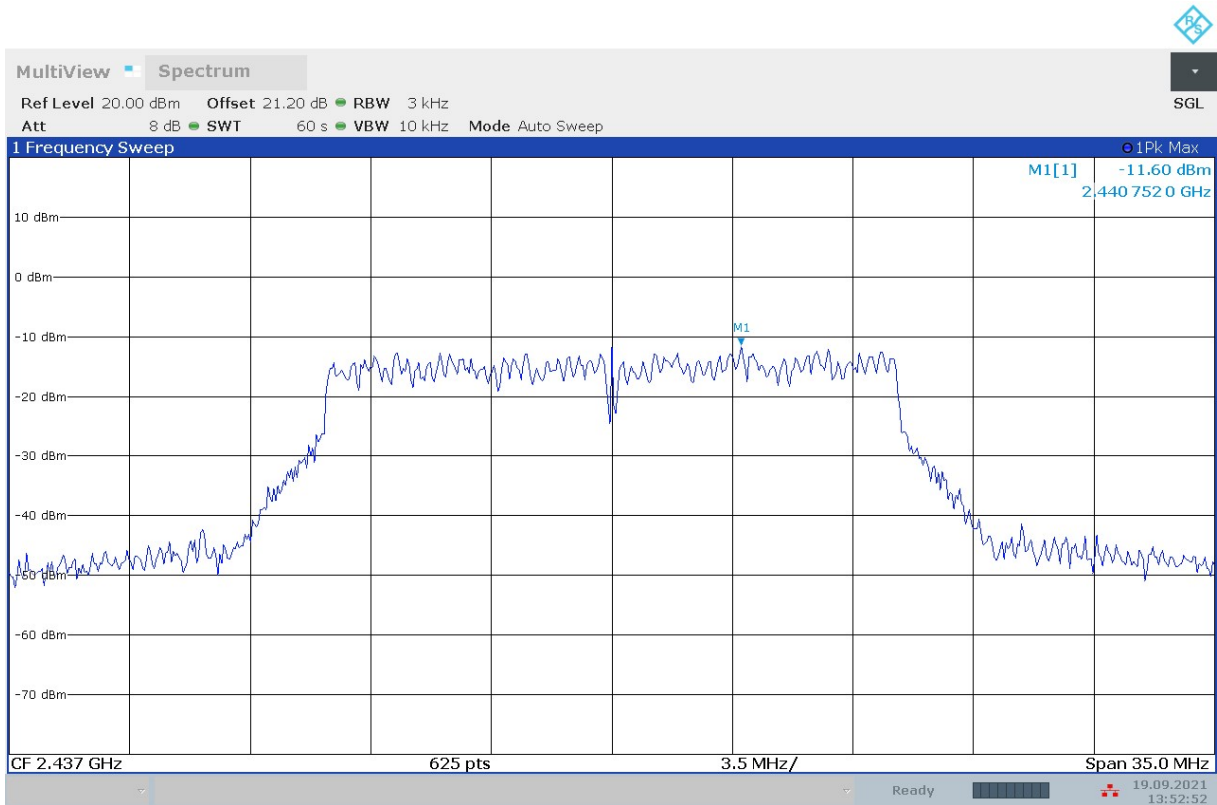
**Fig.A.3.2 Power Spectral Density (802.11b, Ch 6)**



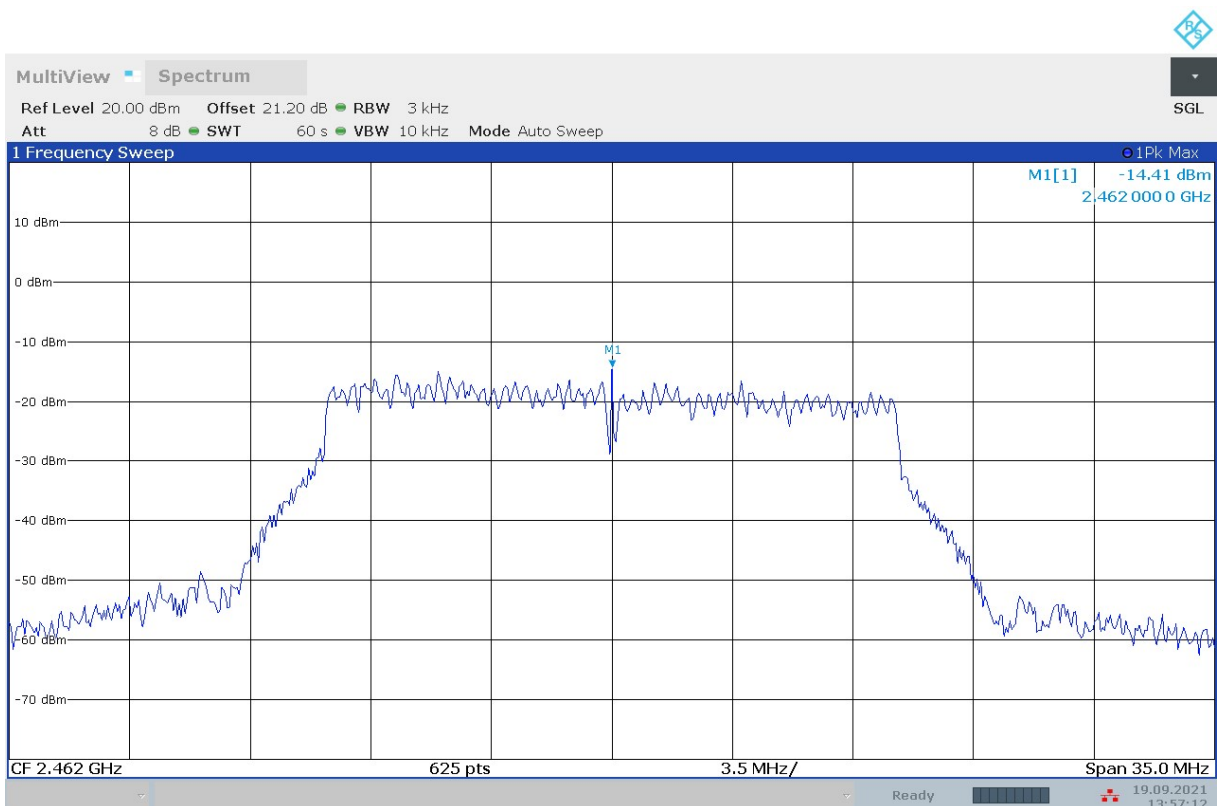
**Fig.A.3.3 Power Spectral Density (802.11b, Ch 11)**



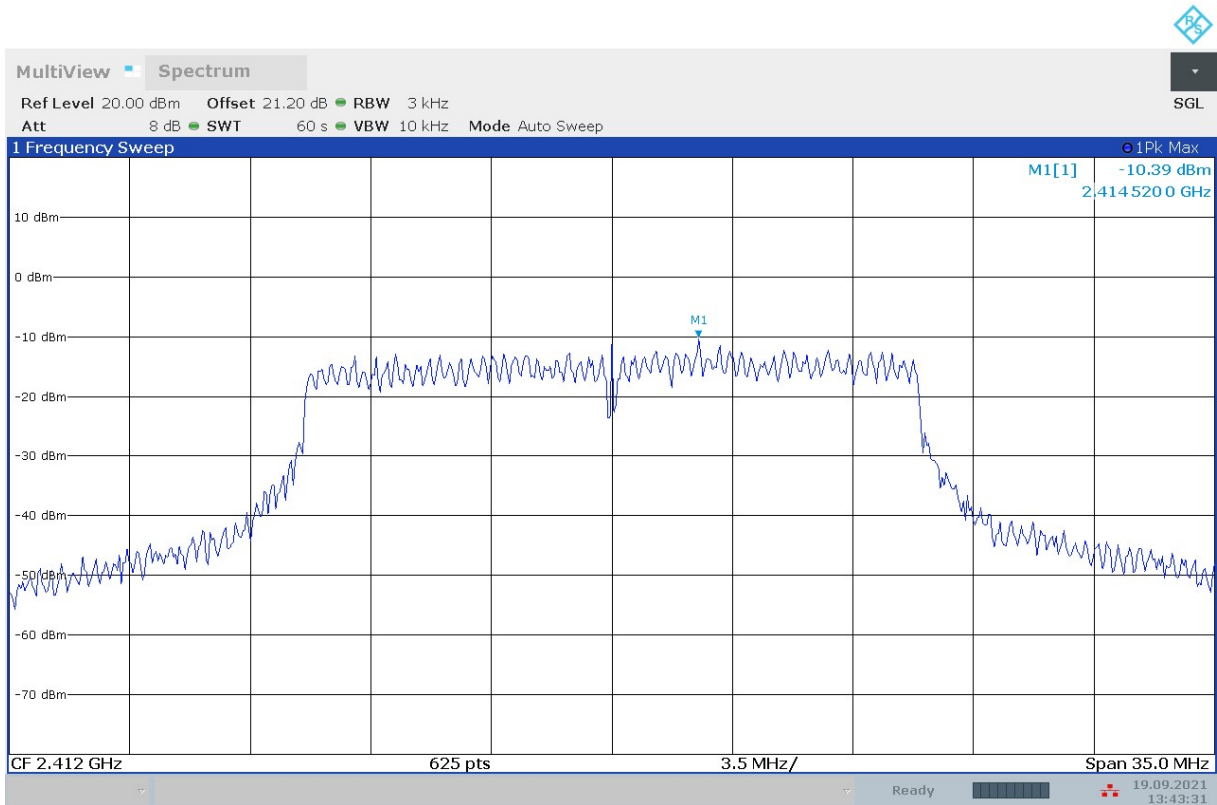
**Fig.A.3.4 Power Spectral Density (802.11g, Ch 1)**



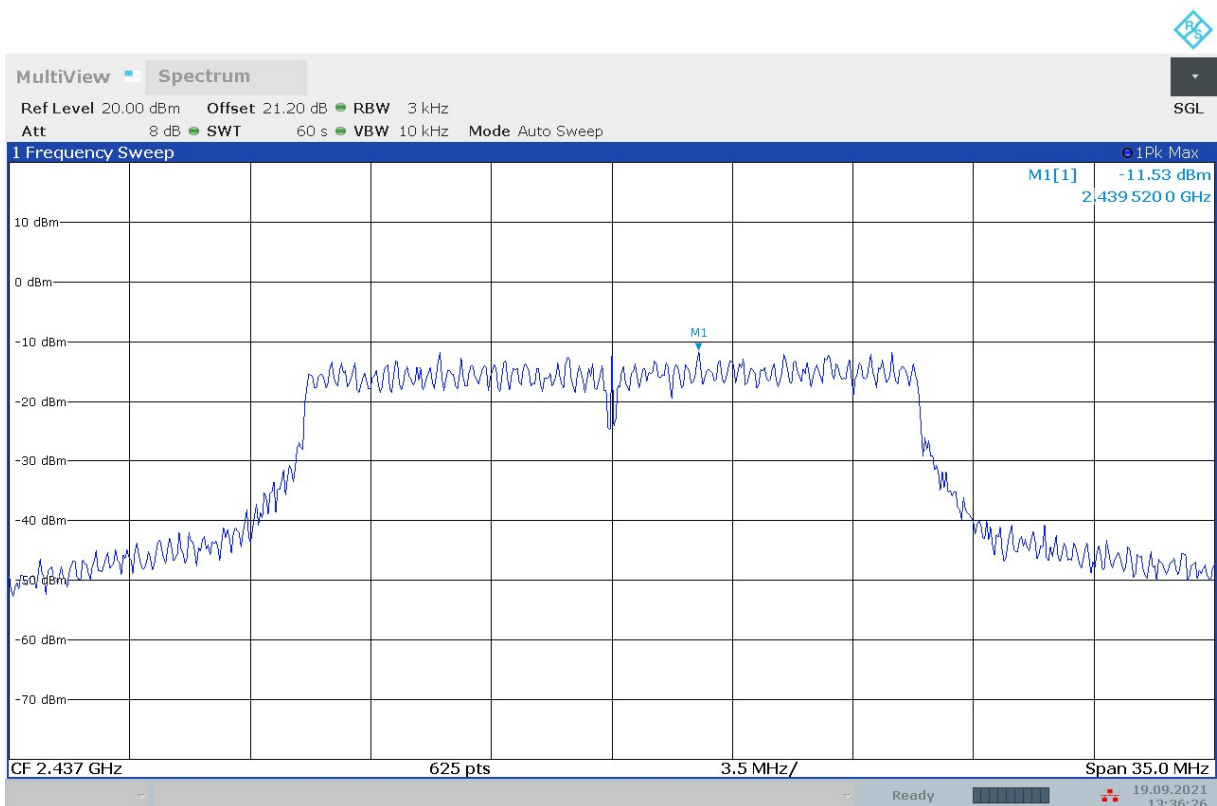
**Fig.A.3.5 Power Spectral Density (802.11g, Ch 6)**



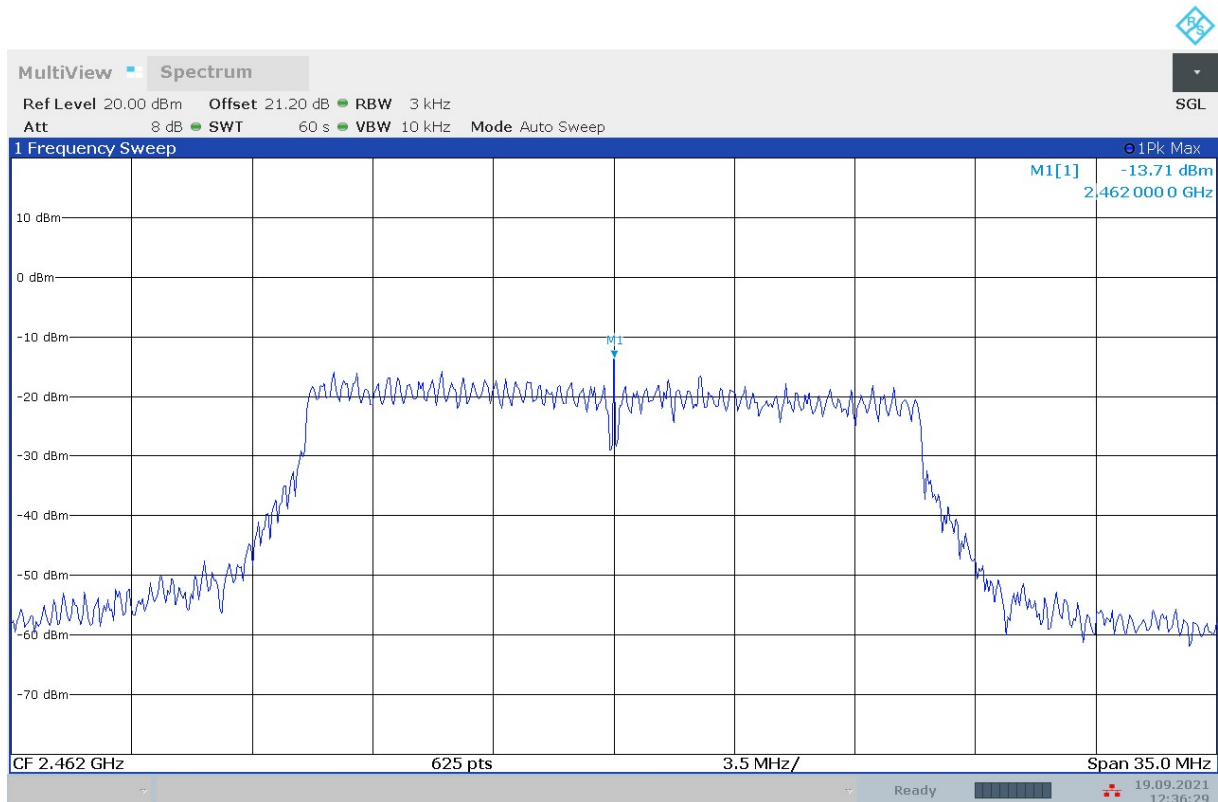
**Fig.A.3.6 Power Spectral Density (802.11g, Ch 11)**



**Fig.A.3.7 Power Spectral Density (802.11n-HT20, Ch 1)**



**Fig.A.3.8 Power Spectral Density (802.11n-HT20, Ch 6)**



**Fig.A.3.9 Power Spectral Density (802.11n-HT20, Ch 11)**

#### **A.4. DTS 6-dB Signal Bandwidth**

**Method of Measurement: See ANSI C63.10-2013 section 11.8.1.**

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) = 300 kHz.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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.

**Measurement Limit:**

Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a)	≥ 500

**EUT ID:** UT17a

**Measurement Result:**

**SISO ANT0:**

### 802.11b/g mode

Mode	Channel	Occupied 6dB Bandwidth ( kHz)		conclusion
802.11b	1	Fig.A.4.1	8581	<b>P</b>
	6	Fig.A.4.2	8617	<b>P</b>
	11	Fig.A.4.3	8601	<b>P</b>
802.11g	1	Fig.A.4.4	16460	<b>P</b>
	6	Fig.A.4.5	16487	<b>P</b>
	11	Fig.A.4.6	16104	<b>P</b>

### 802.11n-HT20 mode

Mode	Channel	Occupied 6dB Bandwidth ( kHz)		conclusion
802.11n (HT20)	1	Fig.A.4.7	17608	<b>P</b>
	6	Fig.A.4.8	17689	<b>P</b>
	11	Fig.A.4.9	17021	<b>P</b>

Test graphs as below:

SISO ANT0:

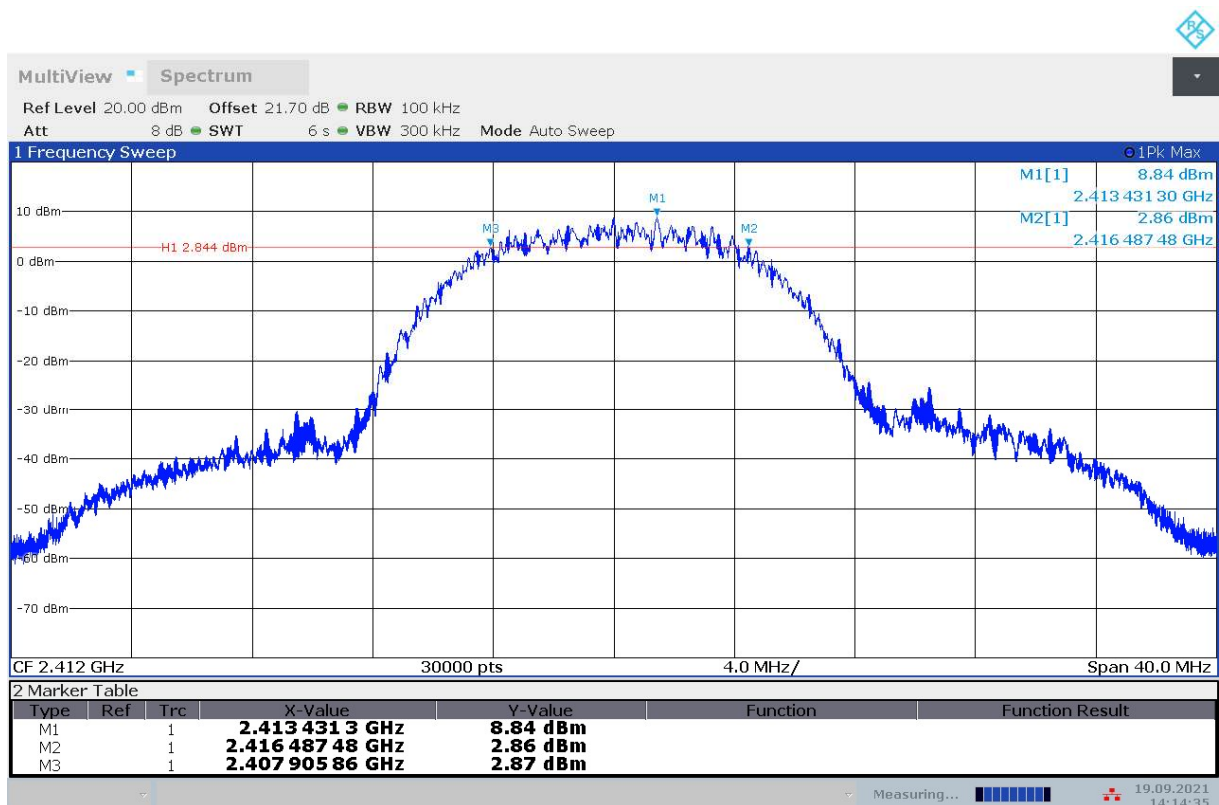


Fig.A.4.1 Occupied 6dB Bandwidth(802.11b,Ch 1)



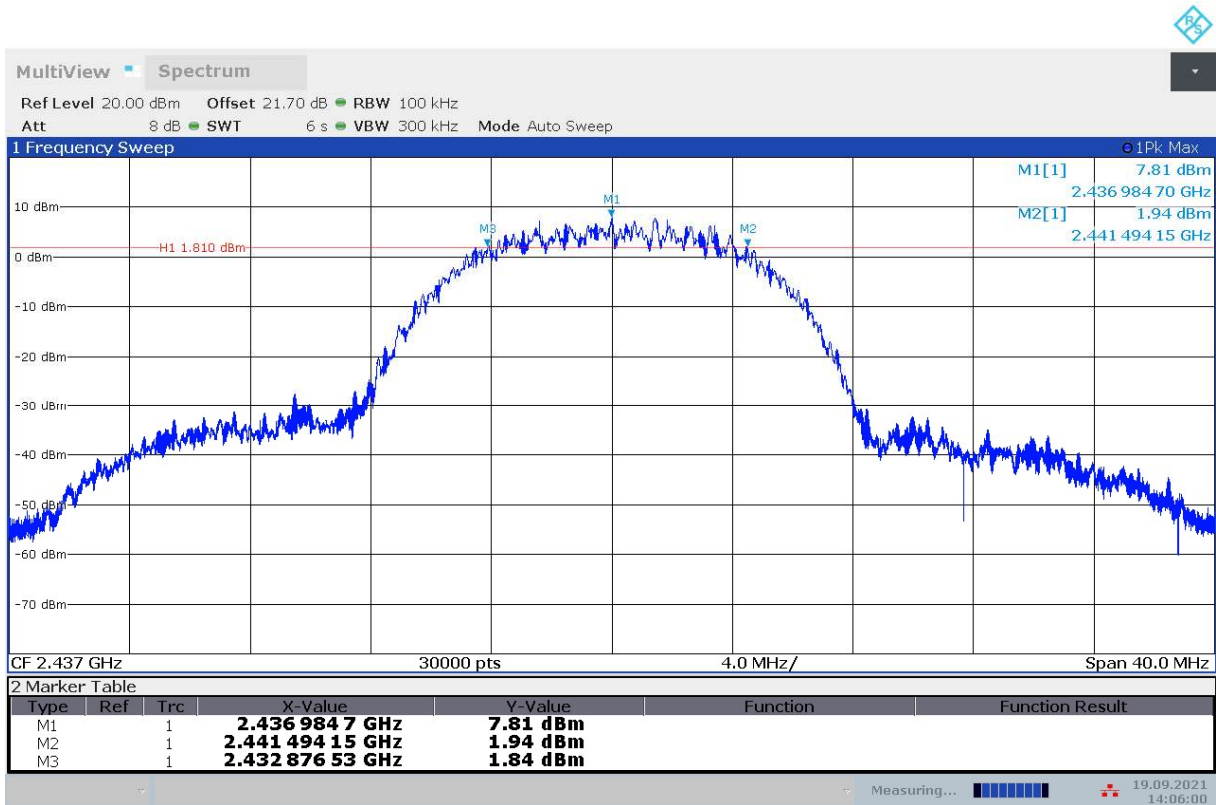


Fig.A.4.2 Occupied 6dB Bandwidth (802.11b, Ch 6)

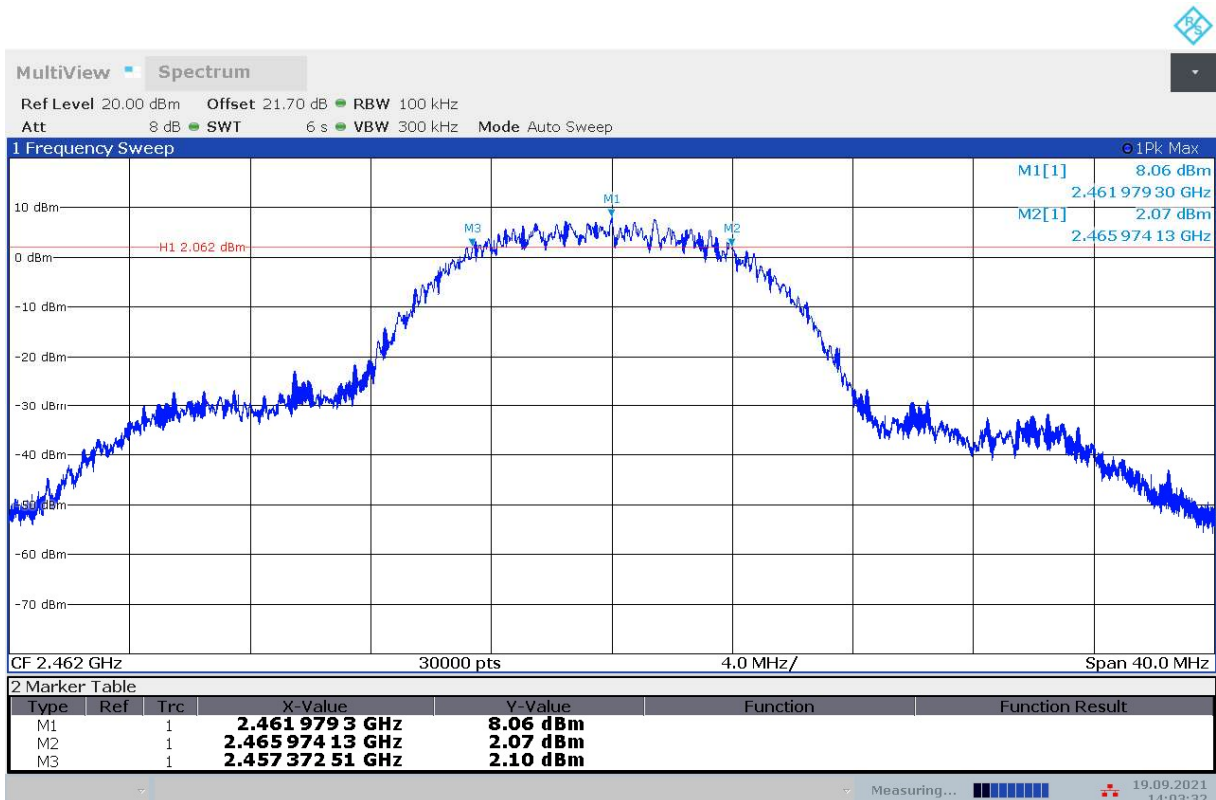
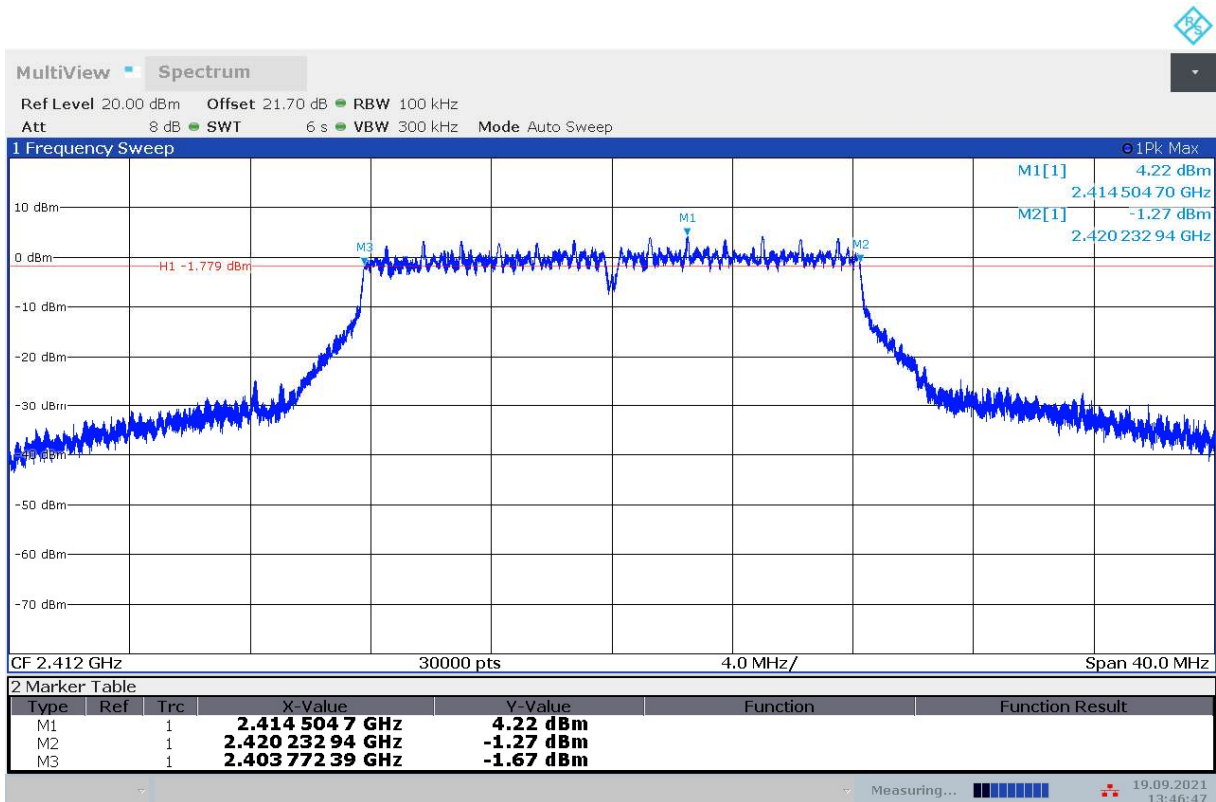
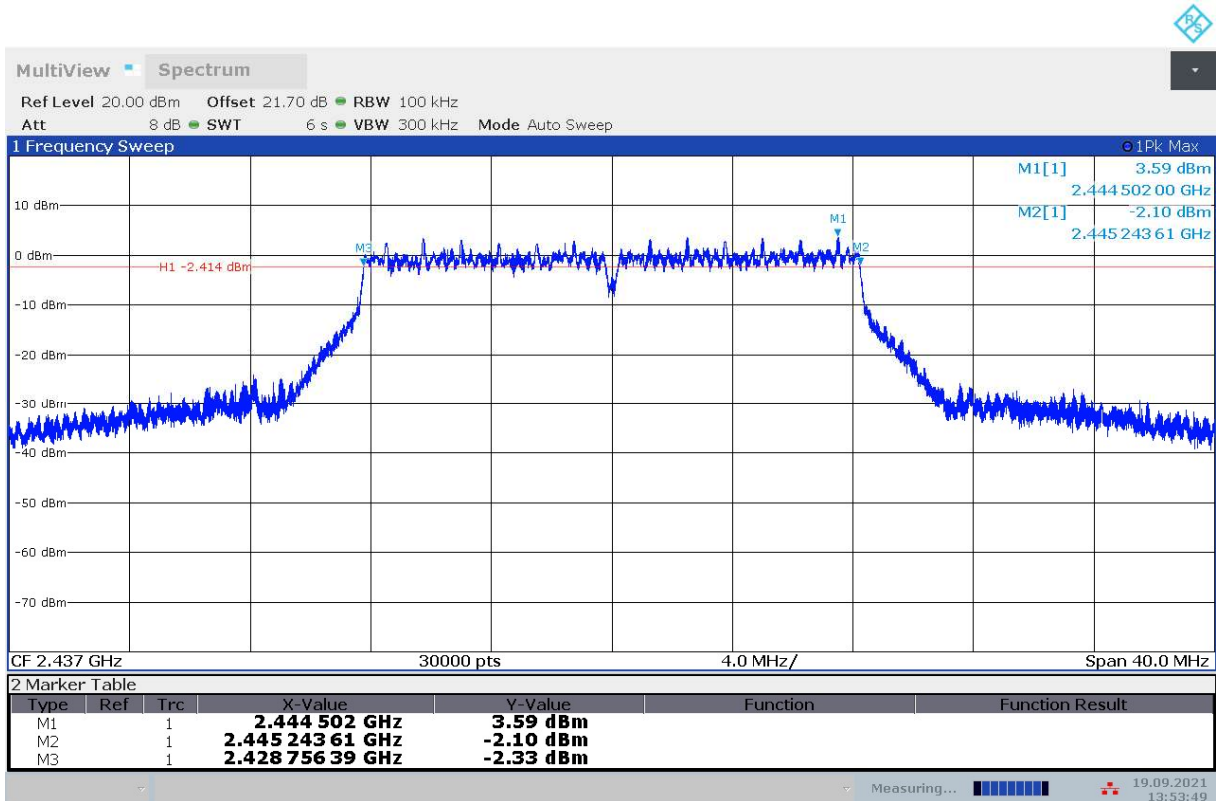


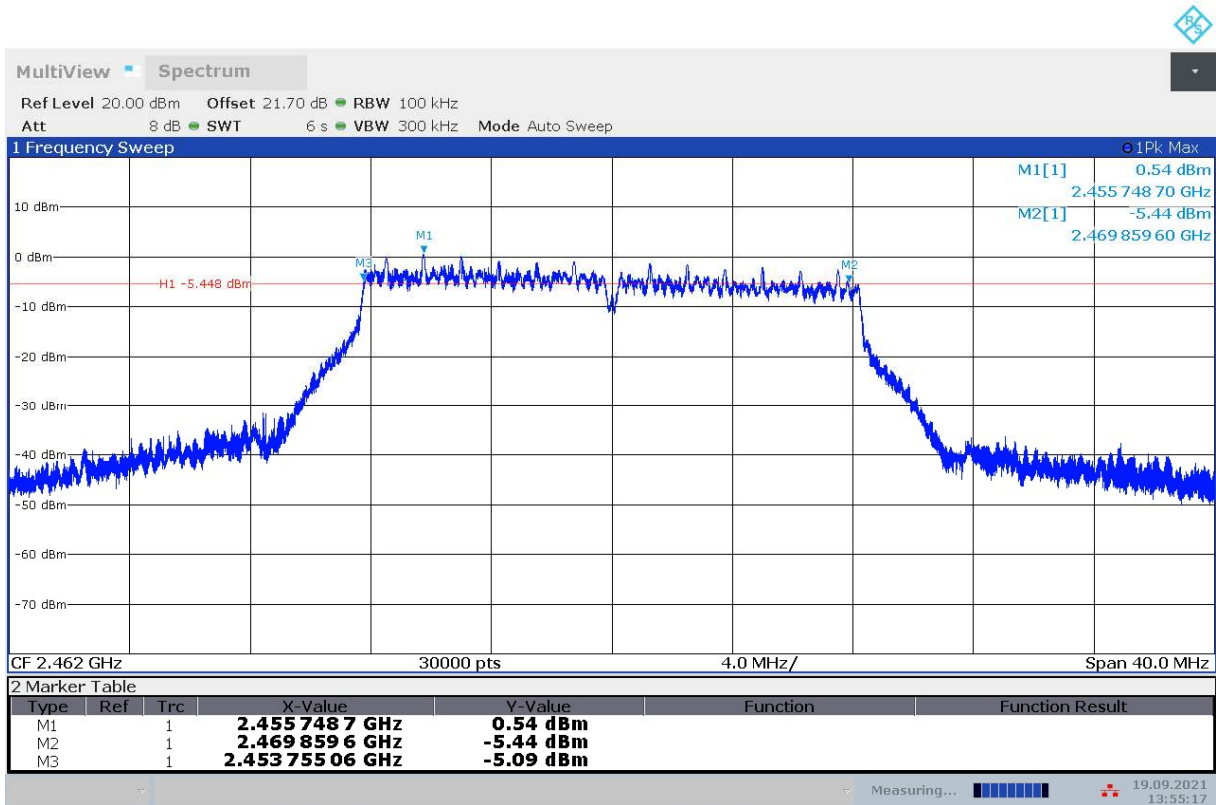
Fig.A.4.3 Occupied 6dB Bandwidth (802.11b, Ch 11)



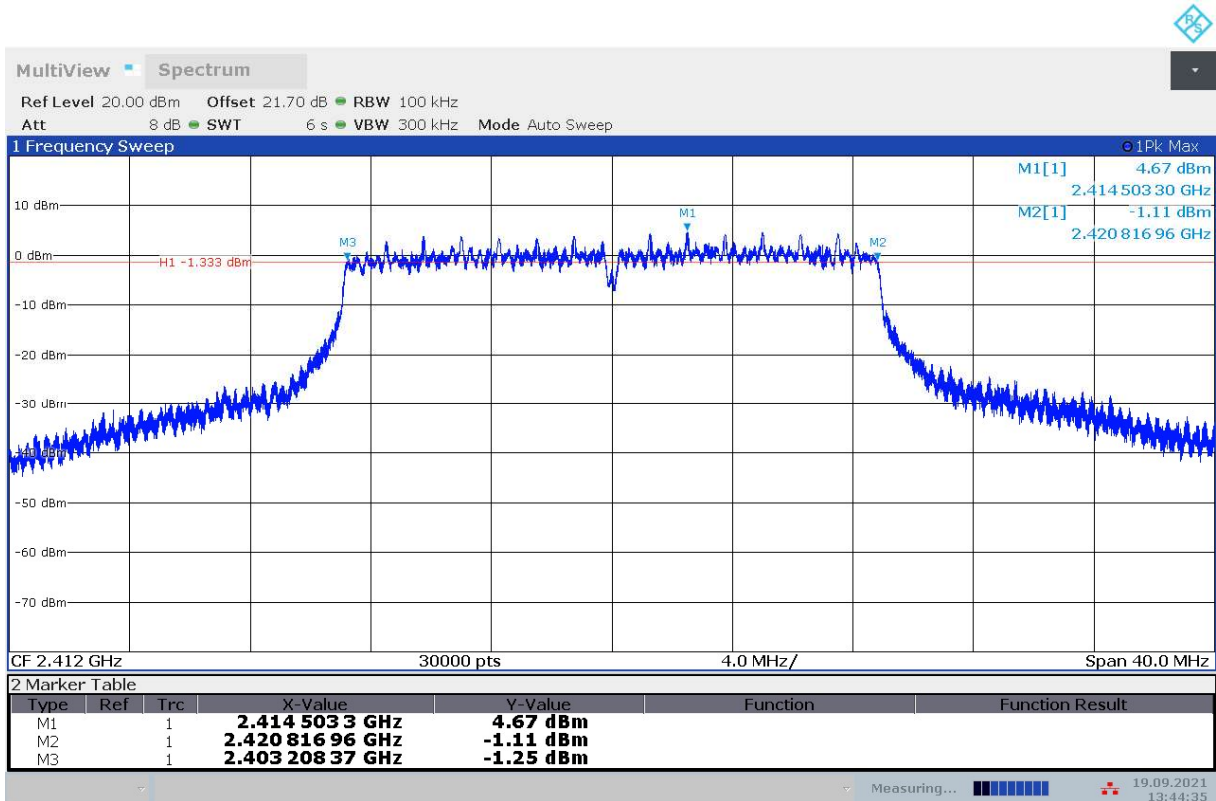
**Fig.A.4.4 Occupied 6dB Bandwidth (802.11g, Ch 1)**



**Fig.A.4.5 Occupied 6dB Bandwidth (802.11g, Ch 6)**



**Fig.A.4.6 Occupied 6dB Bandwidth (802.11g, Ch 11)**



**Fig.A.4.7 Occupied 6dB Bandwidth (802.11n-20MHz, Ch 1)**

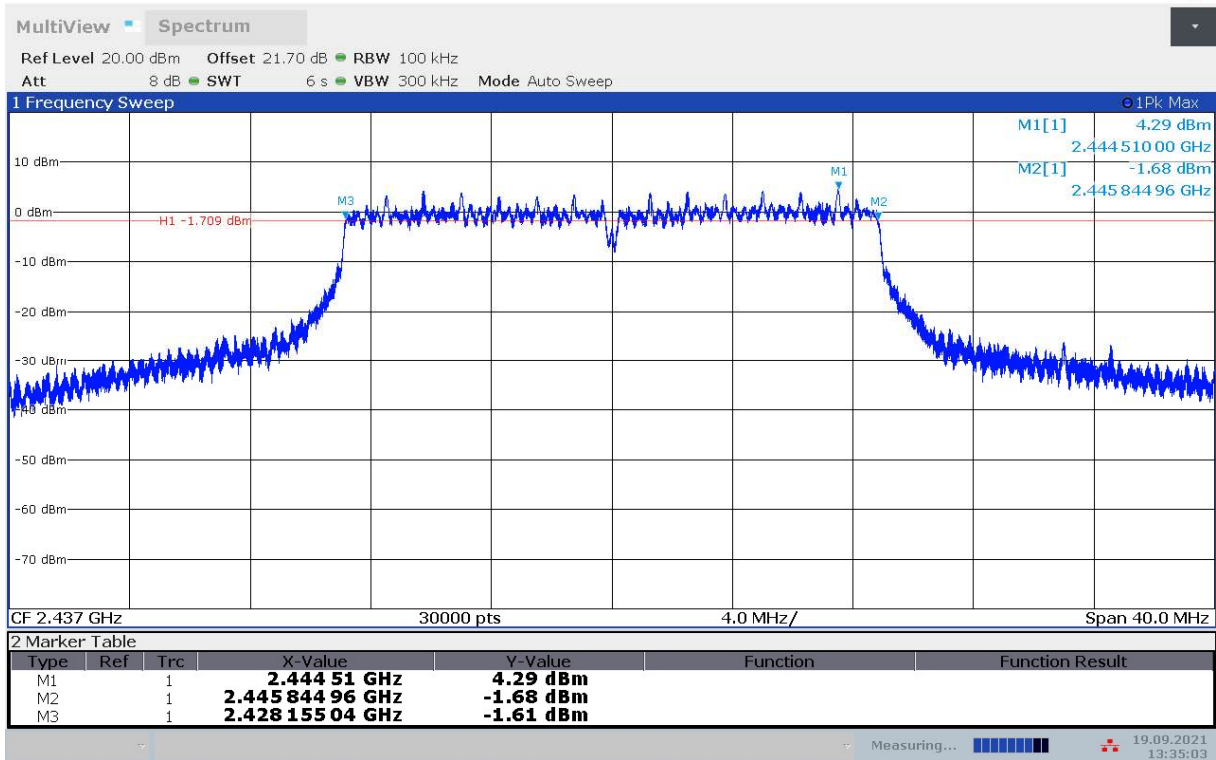


Fig.A.4.8 Occupied 6dB Bandwidth (802.11n-HT20, Ch 6)

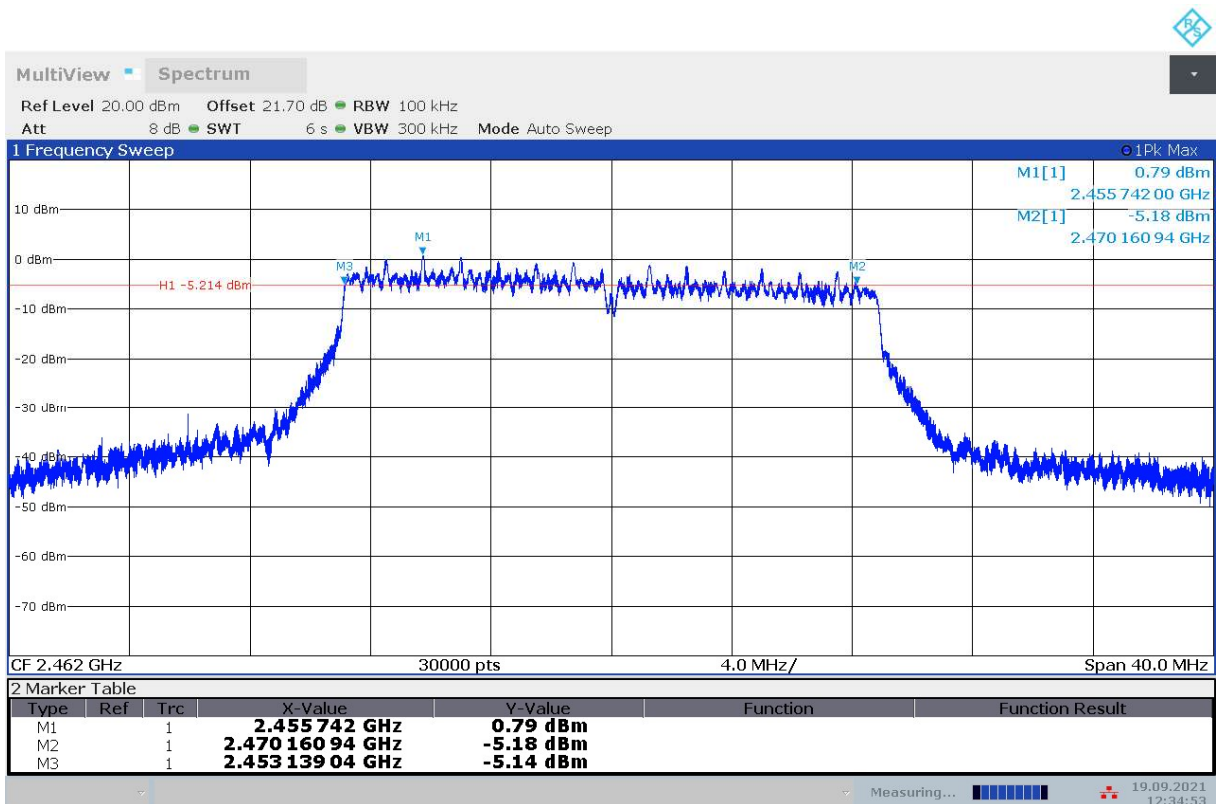


Fig.A.4.9 Occupied 6dB Bandwidth (802.11n-HT20, Ch 11)

## **A.5. Band Edges Compliance**

### **Method of Measurement: See ANSI C63.10-2013-clause 6.10.4**

Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output. Configure the spectrum analyzer settings as described below.

- a) Set Span = 100MHz
- b) Sweep Time: coupled
- c) Set the RBW= 100 kHz
- c) Set the VBW= 300 kHz
- d) Detector: Peak
- e) Trace: Max hold

### **Measurement Limit:**

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 20

**EUT ID:** UT17a

### **Measurement Result:**

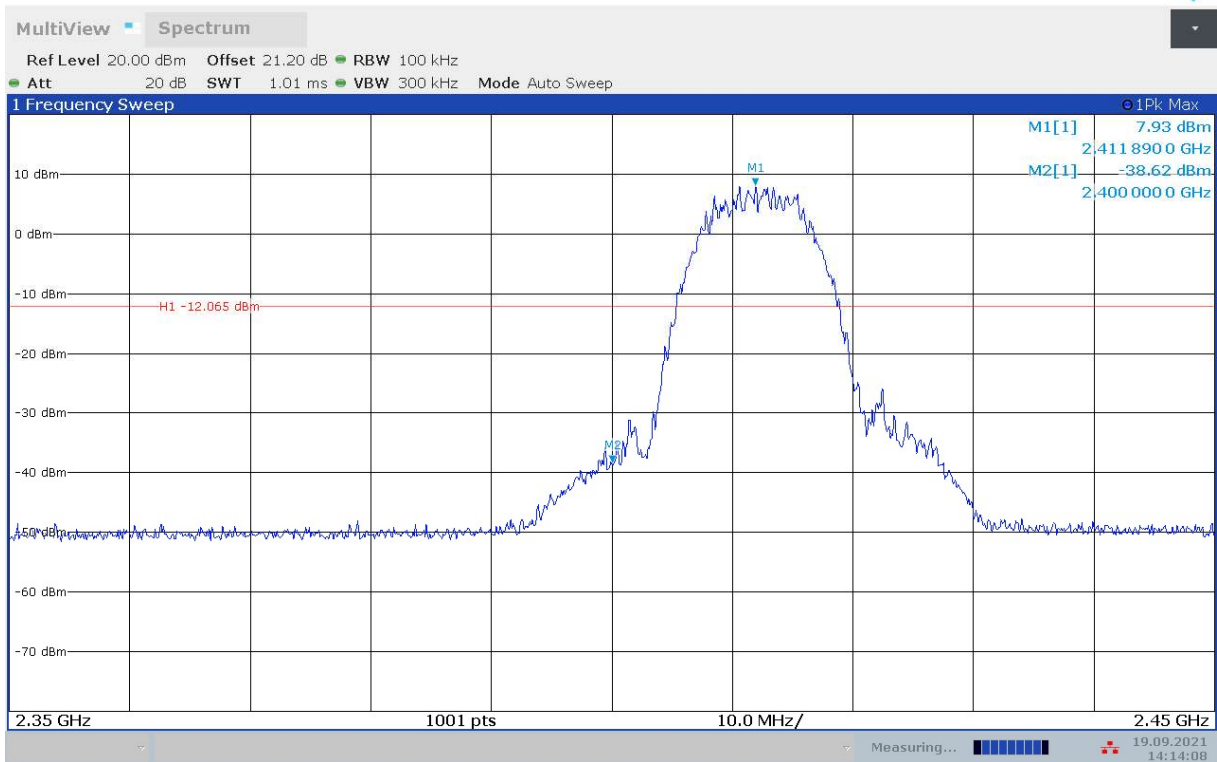
#### **802.11b/g mode**

Mode	Channel	Test Results	Conclusion
802.11b	1	Fig.A.5.1	<b>P</b>
	11	Fig.A.5.2	<b>P</b>
802.11g	1	Fig.A.5.3	<b>P</b>
	11	Fig.A.5.4	<b>P</b>

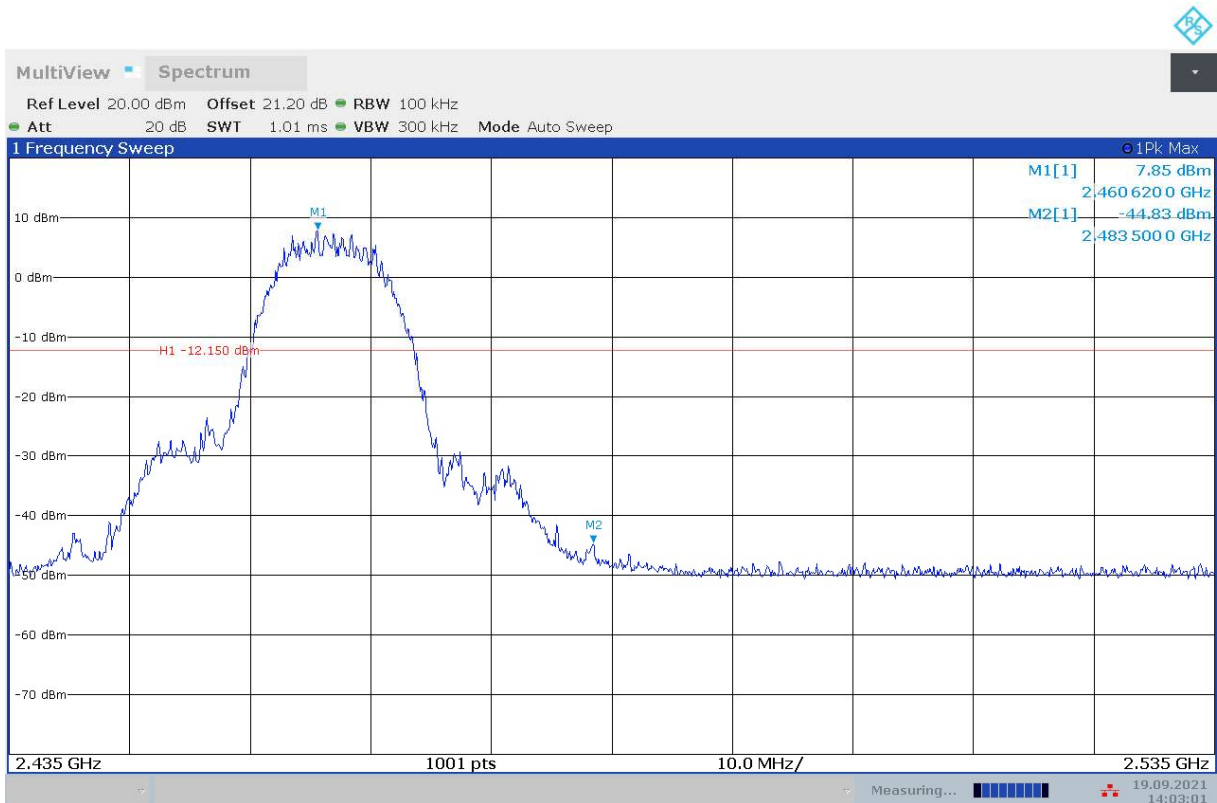
#### **802.11n-HT20 mode**

Mode	Channel	Test Results	Conclusion
802.11n (HT20)	1	Fig.A.5.5	<b>P</b>
	11	Fig.A.5.6	<b>P</b>

**Test graphs as below:**



**Fig.A.5.1 Band Edges (802.11b, Ch 1)**



**Fig.A.5.2 Band Edges (802.11b, Ch 11)**