

# **Snap Inc.**

# RF TEST REPORT

### **Report Type:**

FCC Part 15.247 RF report

### Model:

5

#### **REPORT NUMBER:**

240200104SHA-001

#### **ISSUE DATE:**

September 2, 2024

### **DOCUMENT CONTROL NUMBER:**

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Report no.: 240200104SHA-001

**Applicant:** Snap Inc.

2772 Donald Douglas Loop North, Santa Monica, CA 90405, USA

Manufacturer: Snap Inc.

2772 Donald Douglas Loop North, Santa Monica, CA 90405, USA

**Manufacturing Site 1:** Quanta Computer Inc

220, Wen Hwa 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan

Manufacturing Site 2: Quanta Computer Inc

No. 178, Wen Hwa 2nd Rd., Guishan Dist., Taoyuan City 33377,

Taiwan

**Product Name:** Spectacles

Type/Model: 5

FCC ID: 2AIRN-005

#### **SUMMARY:**

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2023): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2020): American National Standard of Procedures for Compliance Testing of

**Unlicensed Wireless Devices** 

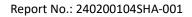
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Project Engineer	Reviewer	
Dylan Tang	Wakeyou Wang	

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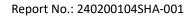
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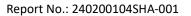
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### **Revision History**

Report No.	Version	Description	Issued Date	
240200104SHA-001	Rev. 01	Initial issue of report	September 2, 2024	

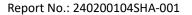




## **Measurement result summary**

TEST ITEM	FCC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	Pass
Power spectrum density	15.247(e)	Pass
Emission outside the frequency band	15.247(d)	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	Pass
Occupied bandwidth	-	Tested
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable





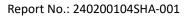
### **1 GENERAL INFORMATION**

### 1.1 Description of Equipment Under Test (EUT)

Product name:	Spectacles
Type/Model:	5
Description of EUT:	The EUT is a Spectacles which supports WIFI and Bluetooth function, it has only one model.
Rating:	DC 9V
Category of EUT:	Class B
Software Version:	v5.0043.0157-PERF
Hardware Version:	EVT-1
Sample received date:	March 1, 2024
Date of test:	March 1, 2024 ~ June 5, 2024

### 1.2 Technical Specification

Frequency Range:	2402-2480MHz
Support Standards:	IEEE 802.15.1
Type of Modulation:	GFSK
Channel Number:	3
Data Rate:	1Mbps,2Mbps
Antenna Information:	3.2dBi, PCB antenna

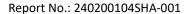




### 1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
	<u> </u>
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized,	CNAS Accreditation Lab Registration No. CNAS L0139
certified, or accredited by these organizations:	FCC Accredited Lab Designation Number: CN0175
organizations.	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0
	A2LA Accreditation Lab Certificate Number: 3309.02





### 2 TEST SPECIFICATIONS

### 2.1 Standards or specification

47CFR Part 15 (2023) ANSI C63.10 (2020)

### 2.2 Mode of operation during the test

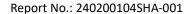
The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)			2402 ~ 2480				
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

### **Data rate VS Power:**

The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter				
Test Software	CMD			
Working Mode	BLE			
Test Channel	2402MHz 2426MHz 2480MHz			
Power Setting	default	default	default	





While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Radiated test mode: EUT transmitted signal with BLE antenna;

Conducted test mode: EUT transmitted signal from BLE RF port connected to SPA directly;

### 2.3 Test software list

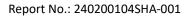
Test Items	Software Manufacturer		Version	
Conducted emission	ESxS-K1	R&S	V2.1.0	
Radiated emission	ES-K1	R&S	V1.71	

### 2.4 Test peripherals list

Item No.	Name	Band and Model	Description
-	-	-	-

### 2.5 Test environment condition:

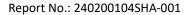
Test items	Temperature	Humidity	
Minimum 6dB Bandwidth			
Maximum conducted output power and e.i.r.p.			
Power spectrum density	23°C	52% RH	
Emission outside the frequency band			
Occupied bandwidth			
Radiated Emissions in restricted frequency bands	22°C	55% RH	
Power line conducted emission	21°C	52% RH	





### 2.6 Instrument list

	ucted Emission				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
V V	Test Receiver	R&S	ESR7	EC 6194	2025-02-27
<b>V</b>	A.M.N.	R&S	ESH2-Z5	EC 3119	2024-11-19
	A.M.N.	R&S	ENV4200	EC 3558	2025-06-04
<u></u>	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2024-12-07
~	Shielded room	Zhongyu	-	EC 2838	2025-01-11
Radia	ted Emission				,
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<b>~</b>	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-22
~	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-09-12
	Pre-amplifier	R&S	AFS42- 00101800-25-S- 42	EC 5262	2025-06-15
~	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2024-12-07
~	Horn antenna	Tonscend	bha9120d	EC 6432-2	2025-02-15
~	Horn antenna	ETS	3116c	EC 5955	2024-07-22
~	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
RF tes	st				
Used	Equipment	Manufacturer	Type	Internal no.	Due date
~	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2025-03-07
<b>\</b>	PXA Signal Analyzer	Keysight	N9030B	EC 6078	2025-06-14
~	Vector Signal Generator	Agilent	N5182B	EC 5175	2025-03-07
>	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2025-03-07
<b>\</b>	Test Receiver	R&S	ESCI 7	EC 4501	2025-03-09
	Universal Radio Communication Tester	R&S	CMW500	EC 6209	2025-01-30
	Universal Radio Communication Tester	R&S	CMW500	EC5944	2025-03-07
<	Signal generator	Agilent	N5182A	EC 6172	2025-08-07
<b>~</b>	Signal generator	Agilent	N5181A	EC 6171	2025-08-07
~	Climate chamber	GWS	MT3065	EC 6021	2025-03-06
Addit	ional instrument				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
>	Therom-Hygrograph	Testo	175h1	EC 6640	2024-08-28
•	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

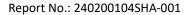




### 2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	$\pm0.74$ dB
Radiated Emissions in restricted frequency bands below 1GHz	$\pm$ 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	$\pm$ 5.02dB
Emission outside the frequency band	± 2.89dB





### 3 Minimum 6dB bandwidth

Test result: Pass

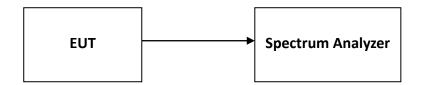
### **3.1 Limit**

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

### 3.2 Measurement Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq$  3 × RBW.
- 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.

### 3.3 Test Configuration



### 3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A



### 4 Maximum conducted output power and e.i.r.p.

Test result: Pass

#### 4.1 Limit

**TEST REPORT** 

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

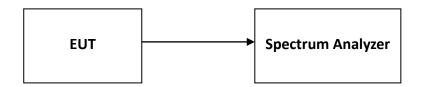
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

### 4.2 Measurement Procedure

- a) Set the RBW ≥ DTS bandwidth.
- b) Set VBW  $\geq 3 \times RBW$ .
- c) Set span ≥ 3 x 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.



### 4.3 Test Configuration



### 4.4 Test Results of Maximum conducted output power

Please refer to Appendix A



### 5 Power spectrum density

Test result: Pass

### 5.1 Limit

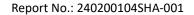
**TEST REPORT** 

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

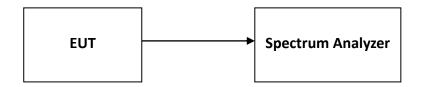
### 5.2 Measurement Procedure

- 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:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq$  3 × RBW.
- 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.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.





### 5.3 Test Configuration



### 5.4 Test Results of Power spectrum density

Please refer to Appendix A



### 6 Emission outside the frequency band

Test result: Pass

### 6.1 Limit

**TEST REPORT** 

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

#### 6.2 Measurement Procedure

#### Reference level measurement

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to  $\geq$  1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW  $\geq$  3 x RBW.
- 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 PSD level.

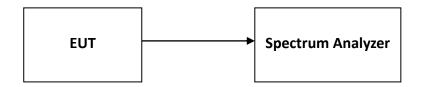
#### **Emission level measurement**

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq$  3 x RBW.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.



### 6.3 Test Configuration



### 6.4 The results of Emission outside the frequency band

Please refer to Appendix A



### 7 Radiated Emissions in restricted frequency bands

Test result: Pass

### **7.1** Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

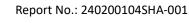
#### 7.2 Measurement Procedure

#### For Radiated emission below 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) Both X and Y axes of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

### NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.



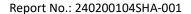


#### For Radiated emission above 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

#### Note:

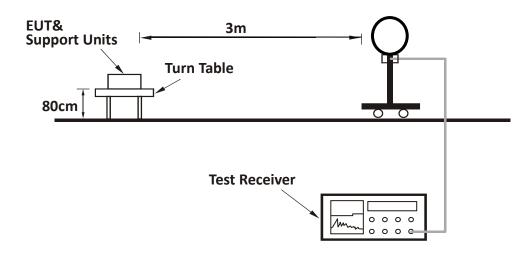
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported



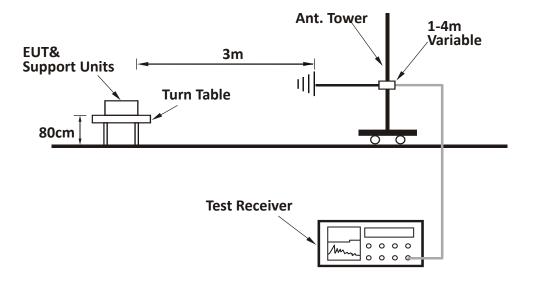


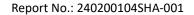
### 7.3 Test Configuration

For Radiated emission below 30MHz:



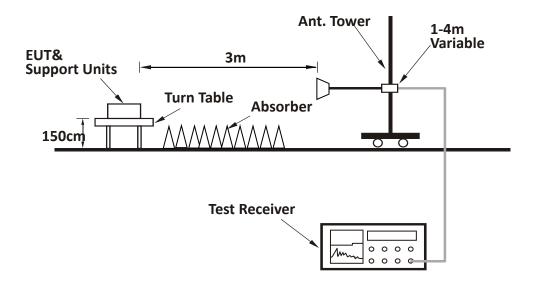
### For Radiated emission 30MHz to 1GHz:

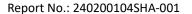






### For Radiated emission above 1GHz:



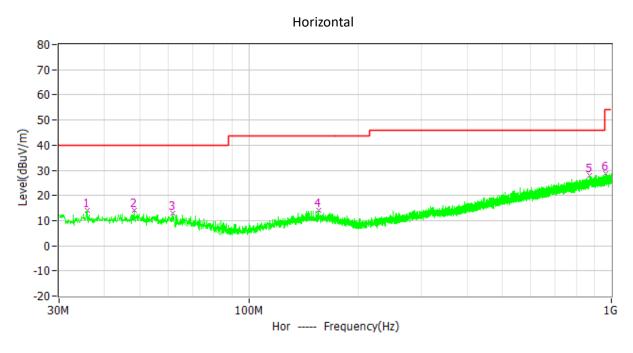


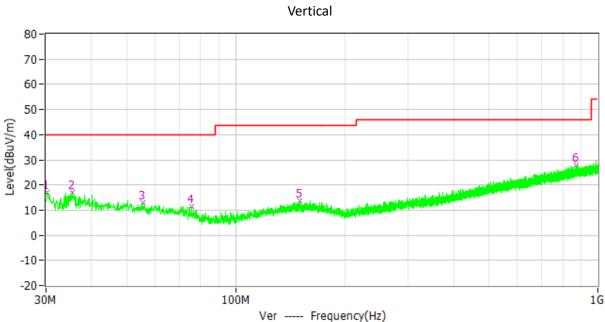


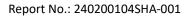
### 7.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:









### Test data below 1GHz

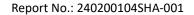
Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
Н	35.820	14.1	13.2	40.0	25.9	QP
Н	48.333	13.9	14.5	40.0	26.1	QP
Н	61.719	12.9	13.6	40.0	27.1	QP
Н	156.197	14.2	14.7	43.5	29.3	QP
Н	872.930	28.0	26.8	46.0	18.0	QP
Н	963.334	28.8	27.6	54.0	25.2	QP
V	30.194	17.1	12.2	40.0	22.9	QP
V	35.432	16.9	13.1	40.0	23.1	QP
V	55.511	13.0	14.2	40.0	27.0	QP
V	75.687	11.4	11.2	40.0	28.6	QP
V	150.862	13.6	14.5	43.5	29.9	QP
V	869.535	28.0	26.7	46.0	18.0	QP

### Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz

1M

TIVI				1			
СН	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
	Н	2402.00	102.5	37.2	Fundamental	/	PK
	V	2402.00	101.4	37.2	Fundamental	/	PK
	Н	2390.00	51.9	37.2	74.00	22.1	PK
	V	2390.00	52.3	37.2	74.00	21.7	PK
L	Н	4804.00	31.4	-15.1	74.00	42.6	PK
	Н	7206.00	35.8	-9.0	74.00	38.2	PK
	V	4804.00	30.9	-15.1	74.00	43.1	PK
	V	7206.00	35.5	-9.0	74.00	38.5	PK
	Н	4852.00	32.7	-15.0	74.00	41.3	PK
M	Н	7278.00	36.7	-8.8	74.00	37.3	PK
	V	4852.00	32.3	-15.0	74.00	41.7	PK
	V	7278.00	37.1	-8.8	74.00	36.9	PK





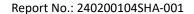
	Н	2480.00	100.6	37.5	Fundamental	/	PK
	V	2480.00	102.6	37.5	Fundamental	/	PK
	Н	2483.50	51.6	37.5	74.00	22.4	PK
Н	V	2483.50	52.3	37.5	74.00	21.7	PK
	Н	4960.00	32.9	-14.9	74.00	41.1	PK
	Н	7440.00	34.8	-8.5	74.00	39.2	PK
	V	4960.00	33.3	-14.9	74.00	40.7	PK
	V	7440.00	35.3	-8.5	74.00	38.7	PK

### 2M

СН	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
	Н	2402.00	102.3	37.2	Fundamental	/	PK
	V	2402.00	101.3	37.2	Fundamental	/	PK
	Н	2390.00	51.5	37.2	74.00	22.5	PK
	V	2390.00	51.2	37.2	74.00	22.8	PK
L	Н	4804.00	31.0	-15.1	74.00	43.0	PK
	Н	7206.00	35.8	-9.0	74.00	38.2	PK
	V	4804.00	31.1	-15.1	74.00	42.9	PK
	V	7206.00	35.8	-9.0	74.00	38.2	PK
	Н	4852.00	33.0	-15.0	74.00	41.0	PK
	Н	7278.00	36.3	-8.8	74.00	37.7	PK
M	V	4852.00	33.6	-15.0	74.00	40.4	PK
	V	7278.00	36.5	-8.8	74.00	37.5	PK
	Н	2480.00	94.7	37.5	Fundamental	/	PK
	V	2480.00	96.9	37.5	Fundamental	/	PK
	Н	2483.50	51.8	37.5	74.00	22.2	PK
	V	2483.50	52.2	37.5	74.00	21.8	PK
Н	Н	4960.00	32.8	-14.9	74.00	41.2	PK
	Н	7440.00	34.6	-8.5	74.00	39.4	PK
	V	4960.00	34.4	-14.9	74.00	39.6	PK
	V	7440.00	35.5	-8.5	74.00	38.5	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (- Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.

- 2. Corrected Reading = Original Receiver Reading + Correct Factor
- 3. Margin = Limit Corrected Reading

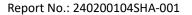




4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB, Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV, Limit = 40.00dBuV/m.

Then Correct Factor = 30.20 + 2.00 - 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m; Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.





### 8 Occupied Bandwidth

Test result: Tested

### 8.1 Limit

None

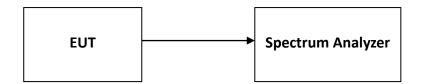
### 8.2 Measurement Procedure

The occupied bandwidth per RSS-Gen was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

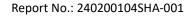
The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

### 8.3 Test Configuration



### 8.4 The results of Occupied Bandwidth

Please refer to Appendix A





### 9 Antenna requirement

### Requirement:

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.

### **Result:**

EUT uses permanently	/ attached antenna 1	to the intentional	radiator, so it	can comply wit	h the provisions
of this section.					