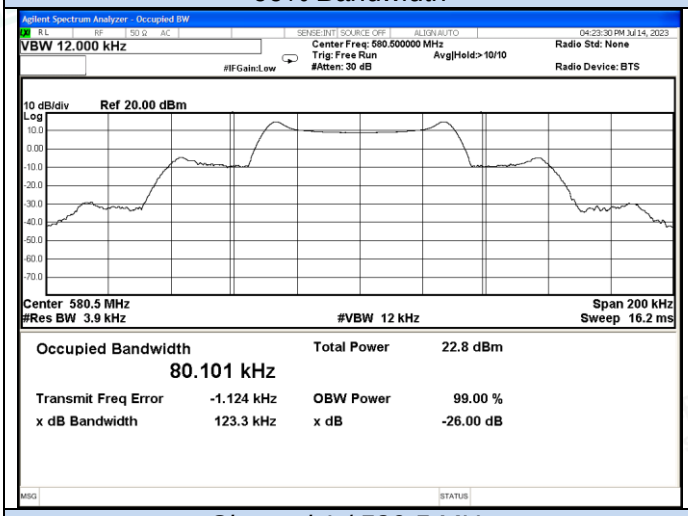
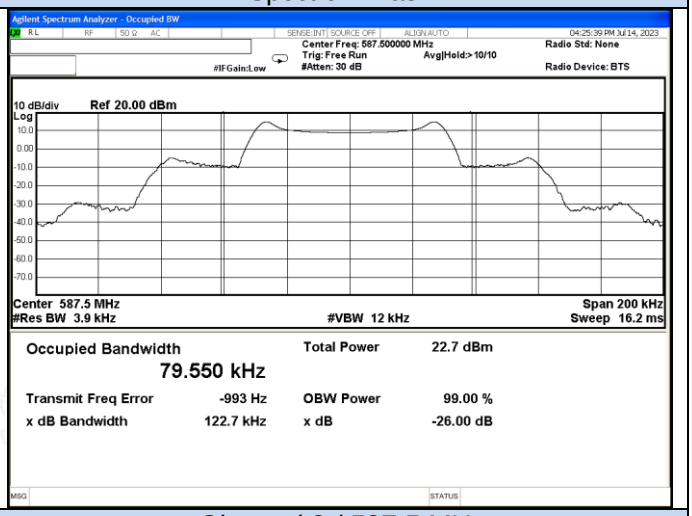
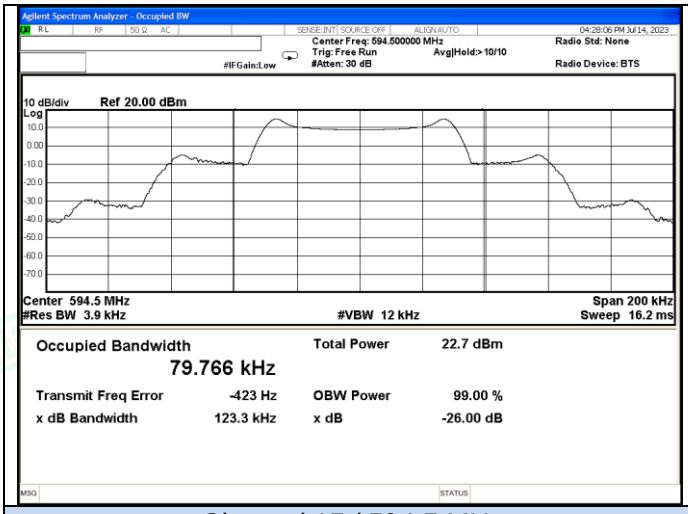
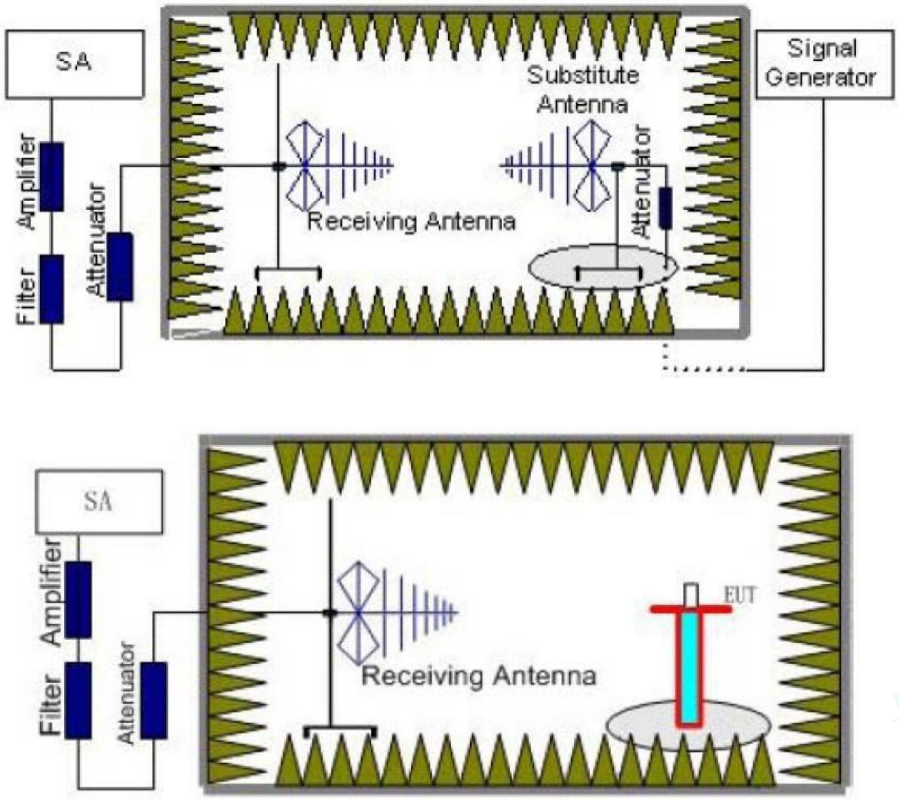
99% *Bandwidth*	Spectrum mask
	
Channel 1 / 580.5 MHz	*Channel 8 / 587.5 MHz*
	
Channel 15 / 594.5 MHz	

5.3. Transmitter unwanted emissions(radiated or conducted)

5.3.1. Measurement description:

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).

4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
The measurement results are obtained as described below:
Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl} + G_a
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.
8. In order to make sure test results more clearly,we set frequency range and sweep time for difference frequency range as follows table:

TEST LIMITS

FCC & IC (according to ETSI EN 300 422-1 V2.1.2 (2017-01))			
State	**Max. spurious level**		
	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz	Other frequencies ≤ 1000 MHz	All frequencies > 1000 MHz
Operating	4.0 nW	250 nW	1.00 µW
Standby	2.0 nW	2.0 nW	20.0 nW

FCC & IC	
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:	
On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the	25 dB
On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of	35 dB
On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least	43 + 10log10 (mean output power in watts) dB

5.3.2. Results for Radiated Emissions

Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
580.5MHz					
150.00	H	-44.49	-36.00	-8.49	PK
65.50	V	-58.51	-54.00	-4.51	PK
324.99	H	-41.76	-36.00	-5.76	PK
706.27	V	-61.02	-54.00	-7.02	PK
4925.05	H	-41.17	-30.00	-11.17	PK
4928.21	V	-33.96	-30.00	-3.96	PK
7387.83	H	-35.57	-30.00	-5.57	PK
7386.96	V	-42.23	-30.00	-12.23	PK

Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
587.5MHz					
147.03	H	-46.88	-36.00	-10.88	PK
64.81	V	-58.84	-54.00	-4.84	PK
324.49	H	-39.54	-36.00	-3.54	PK
703.71	V	-60.18	-54.00	-6.18	PK
4924.26	H	-42.61	-30.00	-12.61	PK
4928.45	V	-34.07	-30.00	-4.07	PK
7388.86	H	-37.09	-30.00	-7.09	PK
7386.35	V	-42.41	-30.00	-12.41	PK

Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
594.5MHz					
150.02	H	-44.30	-36.00	-8.30	PK
64.40	V	-58.26	-54.00	-4.26	PK
325.47	H	-39.65	-36.00	-3.65	PK
705.45	V	-61.10	-54.00	-7.10	PK
4927.04	H	-41.12	-30.00	-11.12	PK
4926.63	V	-34.35	-30.00	-4.35	PK
7389.58	H	-36.11	-30.00	-6.11	PK
7387.78	V	-42.73	-30.00	-12.73	PK

Note: 1, All detected emissions are more than 20 dB below the limit,In addition to main frequency.

5.4. Conducted spurious emission

5.4.1. Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is repeated for DSSS and OFDM modulation. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

5.4.2. Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max Hold

5.4.3. Limits:

FCC		
Frequency (MHz)	Quasi-Peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

5.4.4. Results:

Not Applicable.

5.5.Frequency Stability

Test Requirement:FCC CFR 47 Part 74.e) 4)

Test Method:FCC CFR 47 Part 2.1055

Requirements:+/-50 ppm

(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

(4) The frequency tolerance of the transmitter shall be 0.005 percent.

Test Procedure:

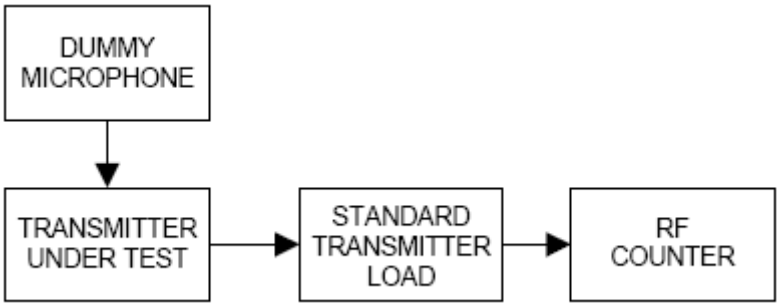
Frequency stability versus Environmental Temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators.

The EUT was placed inside the temperature chamber. After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

Frequency Stability versus Input Voltage

At room temperature (25 ± 5°C), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage. For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Result:

Assigned Frequency: 580.5 MHz		
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within +/- 28.025 kHz
50	3.0	+2.77
40	3.0	+2.32
30	3.0	+2.00
20	3.0	+1.72
10	3.0	-1.04
0	3.0	-1.57
-10	3.0	-1.92
-20	3.0	-2.23
-30	3.0	-2.40
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within Max +/- 28.025 kHz
25	3.3	+2.01
25	3.0	-1.84
25	2.7	-2.16

Assigned Frequency: 587.5 MHz		
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within +/- 28.025 kHz
50	3.0	+2.63
40	3.0	+2.31
30	3.0	+2.05
20	3.0	+1.71
10	3.0	-1.02
0	3.0	-1.50
-10	3.0	-1.84
-20	3.0	-2.21
-30	3.0	-2.46
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within Max +/- 28.025 kHz
25	3.3	+2.13
25	3.0	-1.84
25	2.7	-2.13

Assigned Frequency: 594.5 MHz		
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within +/- 28.025 kHz
50	3.0	+2.51
40	3.0	+2.30
30	3.0	+2.01
20	3.0	+1.62
10	3.0	-1.01
0	3.0	-1.60
-10	3.0	-1.81
-20	3.0	-2.25
-30	3.0	-2.40
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within Max +/- 28.025 kHz
25	3.3	+2.01
25	3.0	-1.72
25	2.7	-2.10

Battery end point: 3.0Vdc

The results: The unit does meet the FCC requirements.

5.6.Modulation Characteristics

Test Requirement:FCC CFR 47 Part 74.e) 3)

Test Method:FCC CFR 47 Part 2.1047 & TIA/EIA 603 E 2016:Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

Requirements:

(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply:

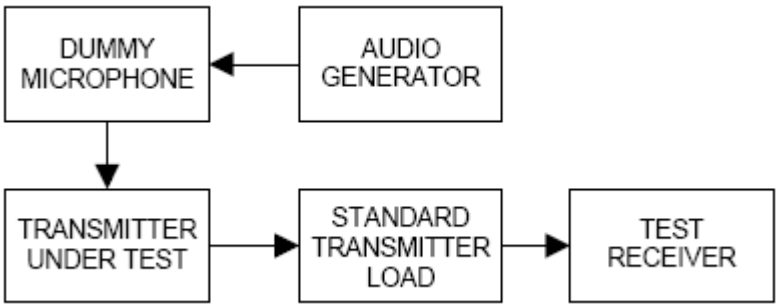
(3) Any form of modulation may be used. A maximum deviation of ±75 kHz is permitted when frequency modulation is employed.

Test Procedure:

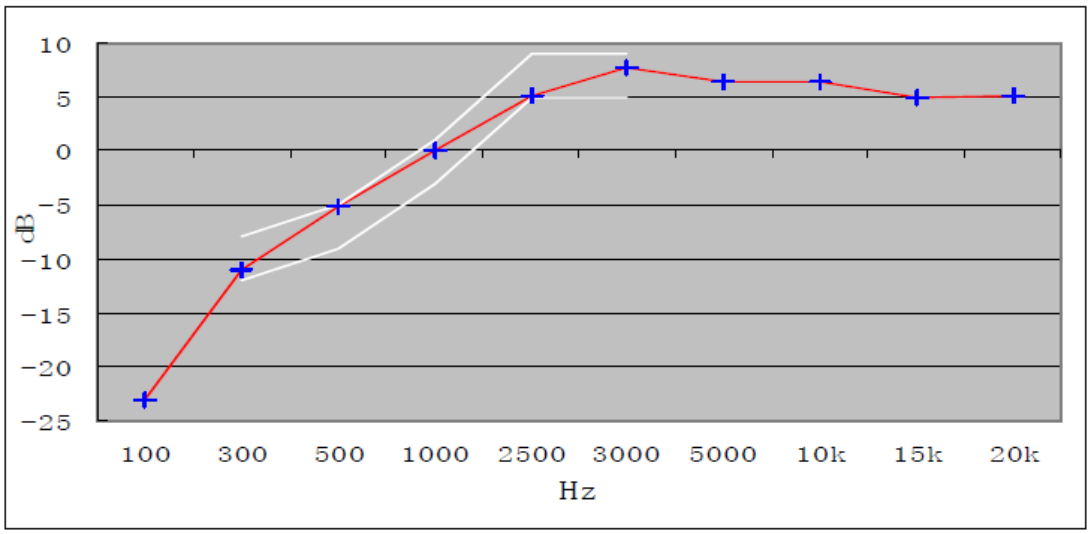
Audio Frequency Response

The RF output of the transceiver was connected to the input of FSP 30 with FM deviation module through sufficient attenuation so as not to overload the meter or distort the reading. An audio signal generator was connected to the audio input of microphone.

The audio signal input level was adjusted to obtain 20% of the maximum rated system deviation at 1 kHz, and recorded as DEV REF . With the audio signal generator level unchanged, set the generator frequency between 100 to 5000 Hz. The transmitter deviations (DEV FREQ) were measured and the audio frequency response was calculated as 20log10 [DEV FREQ / DEV REF]



The plot(s) of Audio Frequency Response is presented hereinafter as reference.

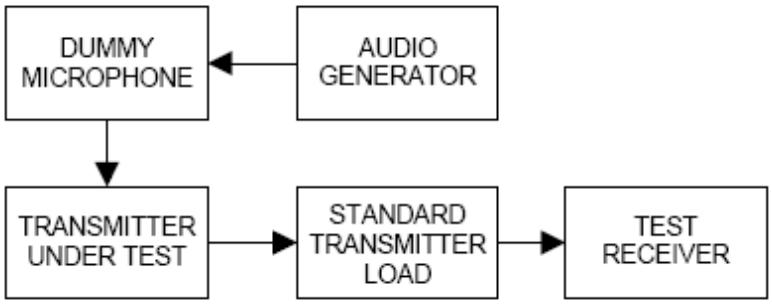


0dB=10mV at 1kHz (20% of the maximum rated system deviation).

Modulation Limiting

a) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz. Turn the de-emphasis function off.
c) Apply a **1000 Hz** modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain **60% of full rated system deviation**.
d) Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum).
e) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.

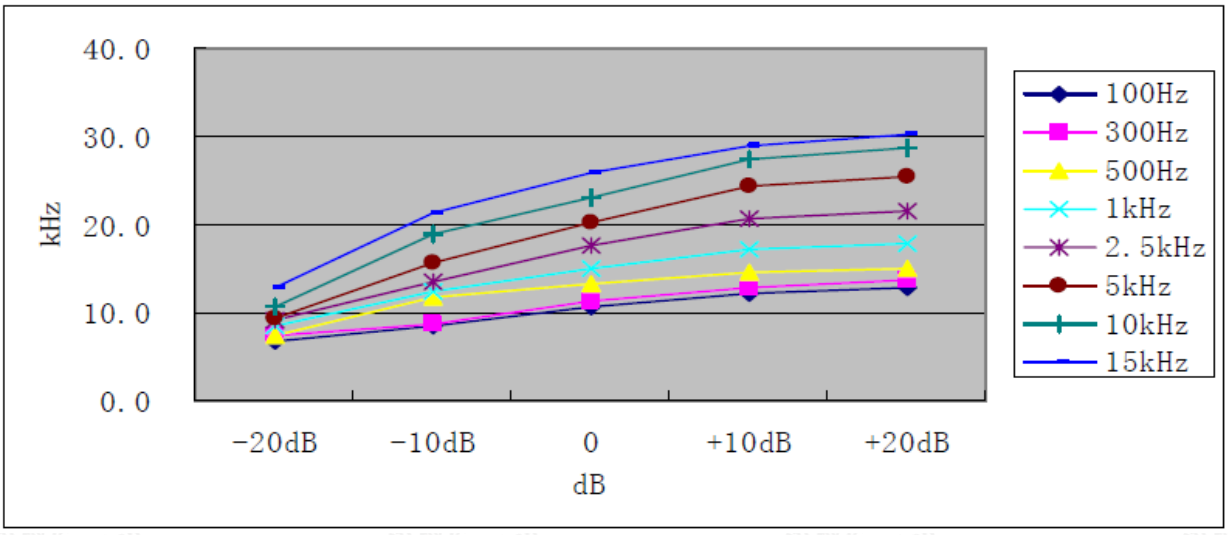
With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 100 to 15k Hz and observe the steady-state deviation. Record the maximum deviation.



Test at five different modulating frequencies (100Hz ,300Hz, 500Hz, 1KHz, 2.5kHz, 5kHz, 10kHz，15kHz), the output level of the audio generator was varied up to 1V and the FM deviation level was recorded.

Positive peak deviation

Test Frequency	560.5MHz



5.7.Necessary bandwidth (BN) for analogue systems

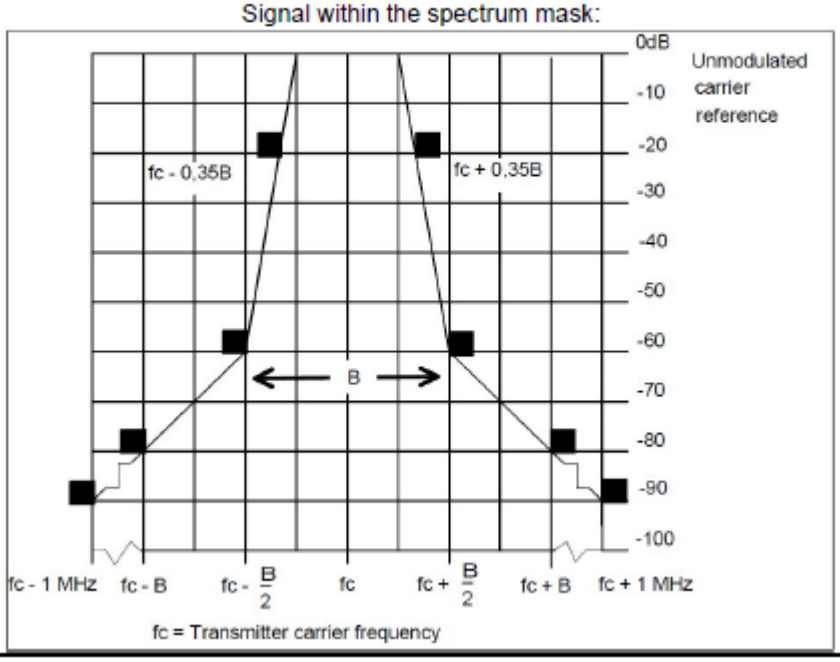
5.7.1.Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Resolution bandwidth:	1 kHz
Video bandwidth:	1 kHz
Span:	Fc-1MHz to fc+1MHz(2MHz)
Trace mode:	Max Hold

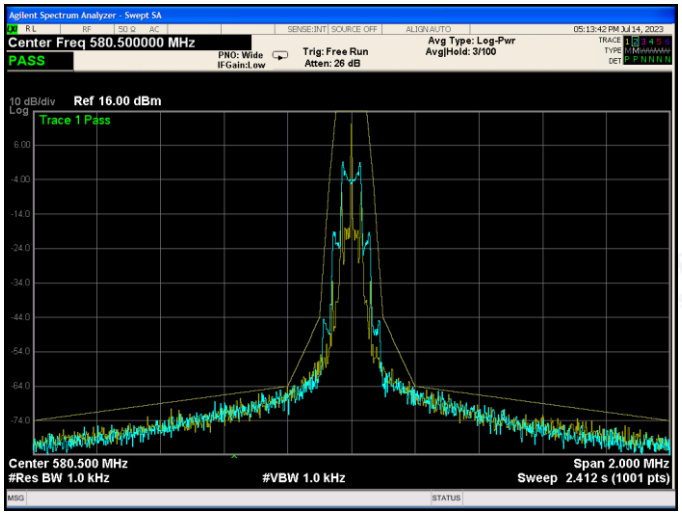
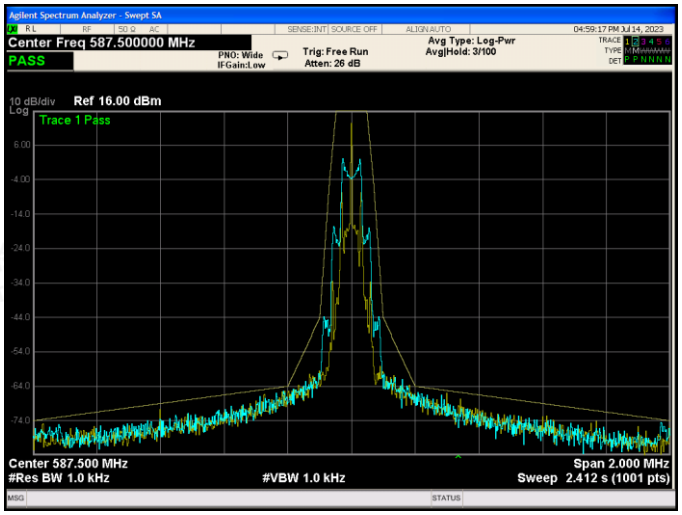
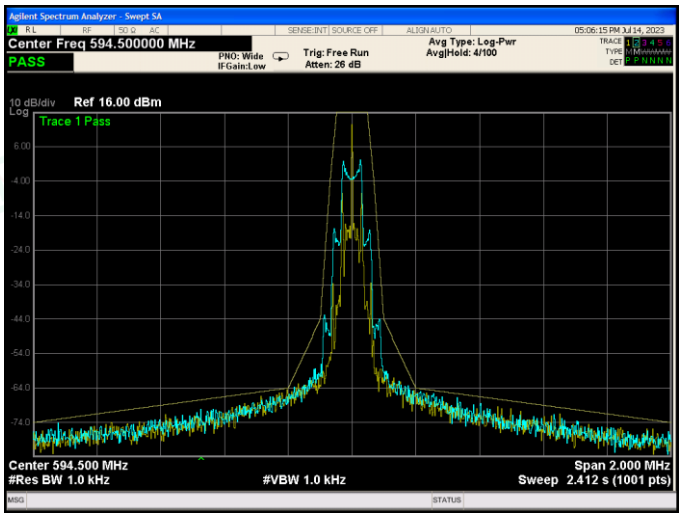
5.7.2.Limits:

FCC & IC

Signal within the spectrum mask:



5.7.3. Results:

Necessary bandwidth	
	
Channel 1 / 580.5 *MHz*	*Channel 8* / 587.5 *MHz*
	
Channel 15 / 594.5 *MHz*	

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2022-10-29	2023-10-28
2	DC Power Supply	Agilent	E3642A	N/A	2022-10-29	2023-10-28
3	Temperature & Humidity Chamber	GUANGZHOU GOGNWEN	GDS-100	70932	2022-10-06	2023-10-05
4	EMI Test Software	AUDIX	E3	/	N/A	N/A
5	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2023-06-15	2024-06-14
6	Positioning Controller	Max-Full	MF7802BS	MF780208586	N/A	N/A
7	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2021-08-29	2024-08-28
8	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2021-09-12	2024-09-11
9	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2021-09-05	2024-09-04
10	EMI Test Receiver	R&S	ESR 7	101181	2023-06-15	2024-06-14
11	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2022-10-29	2023-10-28
12	Broadband Preamplifier	/	BP-01M18G	P190501	2023-06-15	2024-06-14
13	EMI Test Receiver	R&S	ESPI	101940	2022-08-18	2023-08-17
14	Artificial Mains	R&S	ENV216	101288	2023-06-15	2024-06-14
15	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2023-06-15	2024-06-14
16	EMI Test Software	Farad	EZ	/	N/A	N/A

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------