



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 15.247

TEST REPORT

For

Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, 518057
China

FCC ID: YAMHP6XXUMS

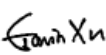
Report Type: Original Report	Product Name: Digital Portable Radio
Report Number: DG2210607-21603E-00A	
Report Date: 2021-06-30	
Reviewed By:	Gavin Xu RF Engineer 
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name:		Digital Portable Radio
Test Model:		HP682 Um
Multiple Models:		HP685 Um, HP686 Um, HP688 Um, HP602 Um, HP605 Um, HP606 Um, HP608 Um, HDP682 Um, HDP685 Um, HDP686 Um, HDP688 Um, HDP602 Um, HDP605 Um, HDP606 Um, HDP608 Um
Model Difference:		Refer to the DOS letter
Rated Input Voltage:		DC 7.7V from battery or DC 12V charging from Charger Base
Adapter Information	Model:	HKA01212010-XQ
	Input:	AC 100-240V 50/60Hz 0.5A
	Output:	DC 12.0V 1.0A
Serial Number:		HP682Um: DG2210607-21603E-RF -S1 HP602Um: DG2210607-21603E-RF -S2
EUT Received Date:		2021.06.08
EUT Received Status:		Good

Technical Specification

Operation Frequency Range (MHz):	2402-2480
Max. RF Output Power (Conducted)(dBm):	3.29
Antenna Gain (dBi)[▲]:	0
Modulation Type:	GFSK

Objective

This report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the EUT compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: YAMHP6XXUMS

FCC Part 22&74&80&90 TNF submissions with FCC ID: YAMHP6XXUMS

Test Methodology

All measurements detailed in this test report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices" and KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB, 1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404
...
...
..	...	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

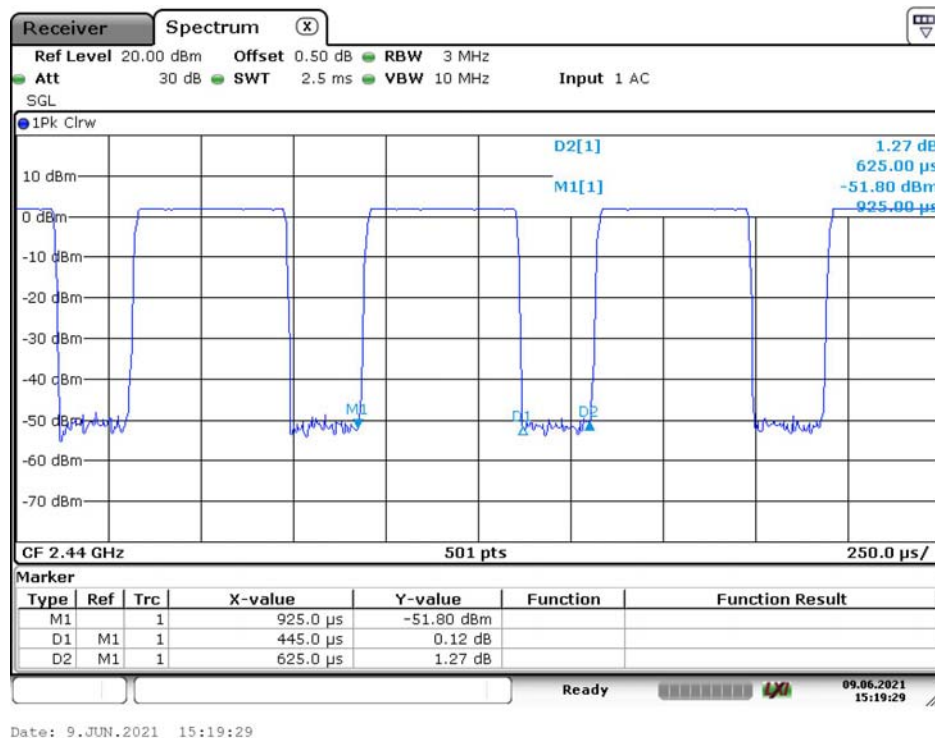
The software: "blue test3.exe" was used during test, which was provided by manufacturer.

The maximum power level was configured by the software as below table:

Channel	Frequency (MHz)	Power Level Setting
Low	2402	6
Middle	2440	6
High	2480	6

The duty cycle as below:

T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)
0.445	0.625	71.2

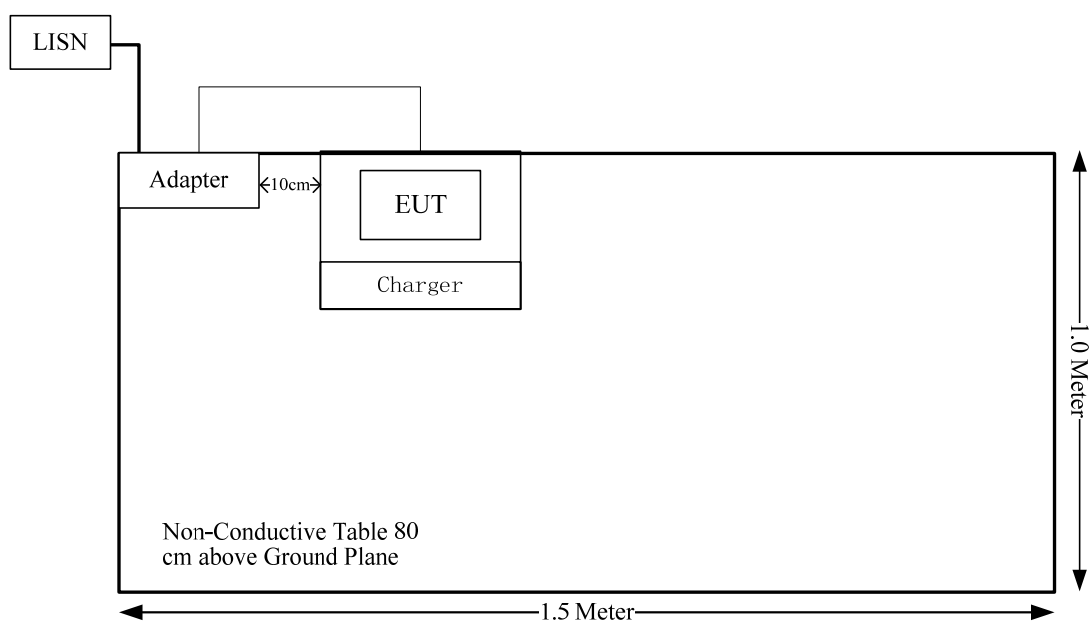


Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length(m)	From	To
Adapter cable	No	No	1.8	Adapter	EUT

Block Diagram of Test Setup

Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted emission					
R&S	LISN	ENV 216	101614	2020-09-12	2021-09-12
R&S	EMI Test Receiver	ESCI	101121	2020-07-07	2021-07-07
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2020-09-05	2021-09-05
R&S	Test Software	EMC32	Version 9.10.00	N/A	N/A
Radiation Below 1GHz Test					
Sunol Sciences	Antenna	JB3	A060611-1	2020-11-10	2023-11-10
R&S	EMI Test Receiver	ESR3	102453	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2021-05-06	2022-05-05
HP	Amplifier	8447D	2727A05902	2020-09-05	2021-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiation Above 1GHz Test					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2020-12-05	2023-12-04
Agilent	Spectrum Analyzer	E4440A	SG43360054	2020-07-07	2021-07-07
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2020-09-05	2021-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2020-09-05	2021-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2020-06-27	2021-06-27
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2021-06-16	2022-06-16
Mini Circuits	High Pass Filter	VHF-6010+	31118	2021-06-16	2022-06-16
RF Conducted					
R&S	EMI Test Receiver	ESR3	102724	2020-06-22	2021-06-21
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2020-09-06	2021-09-06
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2020-09-12	2021-09-12

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Test Items	Conducted Emissions	Radiated Emissions (Below 1GHz)	Radiated Emissions (Above 1GHz)	RF Conducted
Temperature:	26.7℃	28.5 °C	27.8 °C	26.9 °C
Relative Humidity:	69%	52%	50 %	46 %
ATM Pressure:	100kPa	100.2kPa	100.2kPa	100.4 Pa
Tester:	Walker Chen	Alex Hu	Lee Li	Wayne Wei
Test Date:	2021-06-20	2021.06.22	2021.06.24	2021-06-09

SUMMARY OF TEST RESULTS

S/N	FCC Rules	Description of Test	Result
1	§15.247 (i) §1.1310 §2.1093	RF Exposure	Compliance
2	§15.203	Antenna Requirement	Compliance
3	§15.207 (a)	AC Line Conducted Emissions	Compliance
4	§15.205 §15.209 §15.247(d)	Spurious Emissions	Compliance
5	§15.247 (a)(2)	6 dB Bandwidth	Compliance
6	§15.247(b)(3)	Maximum Conducted Output Power	Compliance
7	§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
8	§15.247(e)	Power Spectral Density	Compliance

1 - RF EXPOSURE

Applicable Standard

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Evaluate Result

The max conducted power including tune-up tolerance is 4 dBm (2.51 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$
 $= 2.51/5 \cdot (\sqrt{2.480}) = 0.8 < 3.0$

So the stand-alone SAR evaluation is not necessary.

2 - ANTENNA REQUIREMENT

Applicable Standard

According to § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Information And Connector Construction

The EUT has one internal antenna arrangement for BT, fulfill the requirement of this section. Please refer to below information and the EUT photos:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
FPC	50	0dBi/2.4~2.5GHz

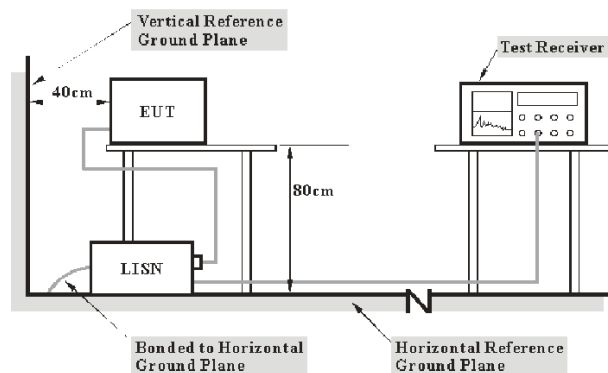
Result: Compliance.

3 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main lisen with a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase (“hot”) line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

Corrected Amplitude & Margin Calculation

The basic equation is as follows: $V_C = V_R + A_C + VDF$; $C_f = A_C + VDF$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_c : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit.

For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows: $\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$

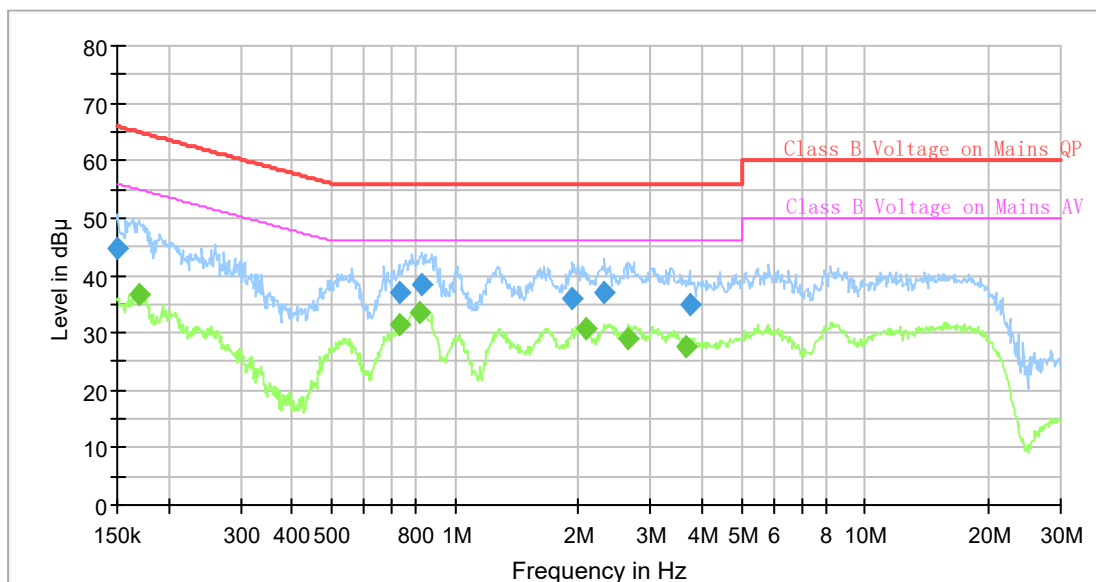
Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

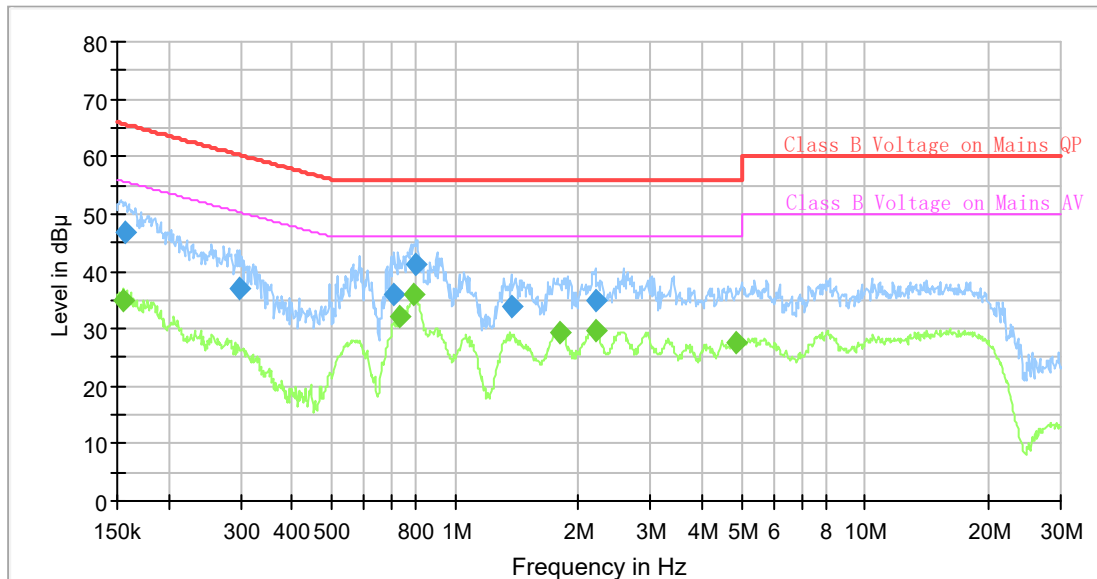
Model: HP682 Um

AC120 V, 60 Hz, Line:



Final Result

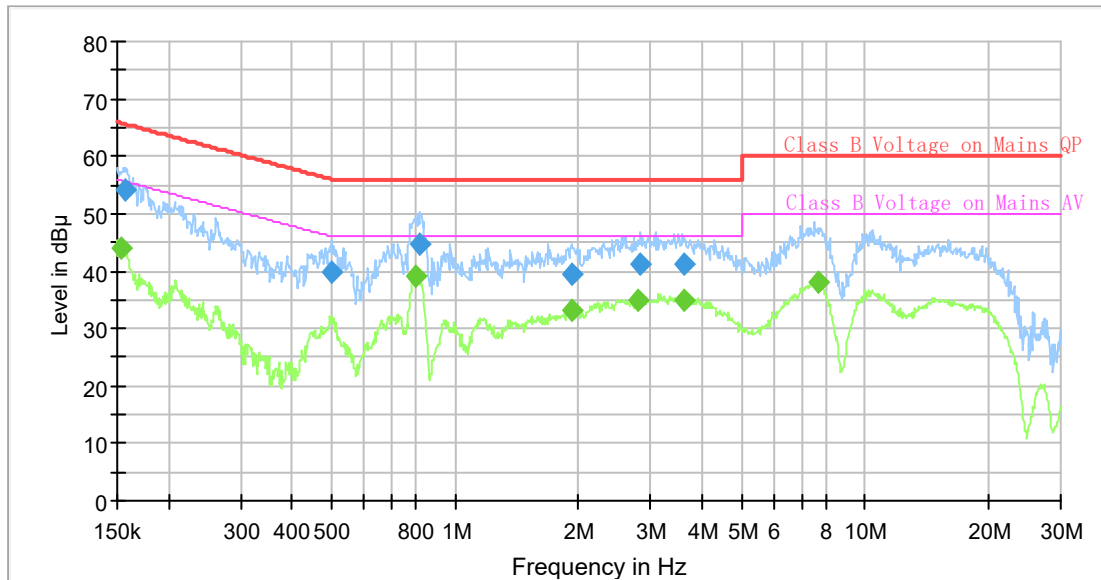
Frequency (MHz)	QuasiPeak (dB μV)	Average (dB μV)	Limit (dB μV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.150750	44.77	---	65.96	21.19	9.000	L1	9.6
0.169919	---	36.72	54.96	18.24	9.000	L1	9.6
0.729009	37.12	---	56.00	18.88	9.000	L1	9.7
0.732654	---	31.33	46.00	14.67	9.000	L1	9.7
0.817621	---	33.53	46.00	12.47	9.000	L1	9.7
0.829947	38.27	---	56.00	17.73	9.000	L1	9.7
1.928035	35.86	---	56.00	20.14	9.000	L1	9.7
2.077810	---	30.67	46.00	15.33	9.000	L1	9.7
2.318778	37.05	---	56.00	18.95	9.000	L1	9.7
2.653034	---	29.10	46.00	16.90	9.000	L1	9.7
3.668908	---	27.63	46.00	18.37	9.000	L1	9.7
3.724217	35.01	---	56.00	20.99	9.000	L1	9.7

AC120 V, 60 Hz, Neutral:**Final Result**

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.155329	---	35.02	55.71	20.69	9.000	N	9.6
0.157671	46.69	---	65.59	18.90	9.000	N	9.6
0.298544	37.13	---	60.28	23.15	9.000	N	9.6
0.711054	35.87	---	56.00	20.13	9.000	N	9.6
0.732654	---	32.05	46.00	13.95	9.000	N	9.6
0.793516	---	35.97	46.00	10.03	9.000	N	9.6
0.805479	41.07	---	56.00	14.93	9.000	N	9.6
1.373481	33.89	---	56.00	22.11	9.000	N	9.6
1.798001	---	29.46	46.00	16.54	9.000	N	9.6
2.194990	34.92	---	56.00	21.08	9.000	N	9.6
2.205965	---	29.85	46.00	16.15	9.000	N	9.6
4.875311	---	27.65	46.00	18.35	9.000	N	9.6

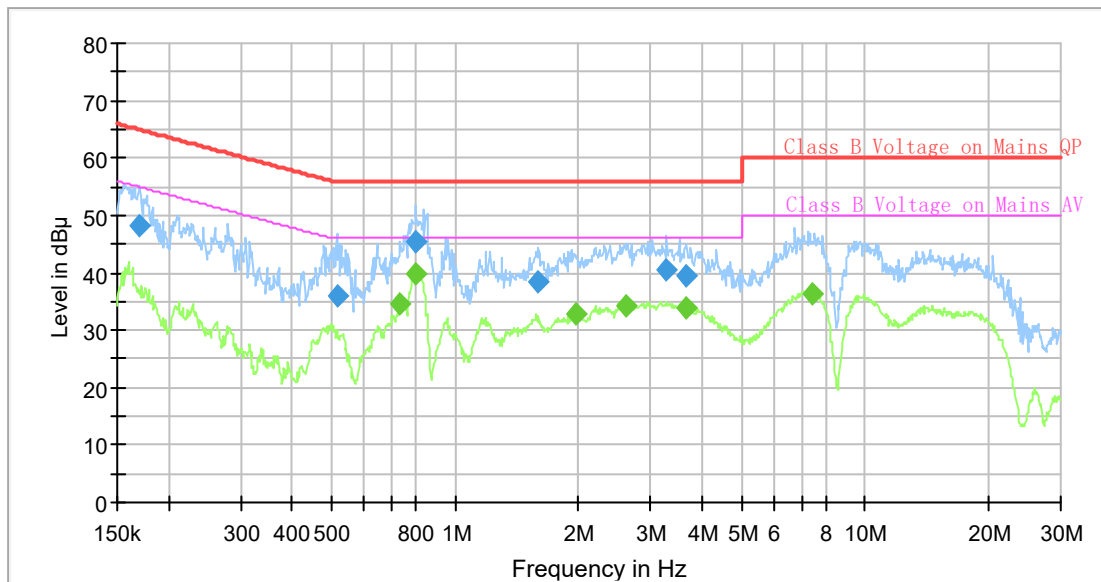
Model: HP602 Um

AC120 V, 60 Hz, Line:



Final Result

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.153788	---	43.93	55.79	11.86	9.000	L1	9.6
0.157671	54.00	---	65.59	11.59	9.000	L1	9.6
0.501508	39.95	---	56.00	16.05	9.000	L1	9.6
0.801471	---	39.23	46.00	6.77	9.000	L1	9.7
0.821710	44.73	---	56.00	11.27	9.000	L1	9.7
1.918443	39.34	---	56.00	16.66	9.000	L1	9.7
1.928035	---	33.02	46.00	12.98	9.000	L1	9.7
2.802654	---	34.82	46.00	11.18	9.000	L1	9.7
2.830751	41.16	---	56.00	14.84	9.000	L1	9.7
3.632492	---	34.87	46.00	11.13	9.000	L1	9.7
3.632492	41.19	---	56.00	14.81	9.000	L1	9.7
7.675629	---	37.94	50.00	12.06	9.000	L1	9.8

AC120 V, 60 Hz, Neutral:**Final Result**

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Limit (dB µ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.169919	48.29	---	64.96	16.67	9.000	N	9.6
0.514172	36.08	---	56.00	19.92	9.000	N	9.6
0.732654	---	34.74	46.00	11.26	9.000	N	9.6
0.801471	45.53	---	56.00	10.47	9.000	N	9.6
0.805479	---	39.99	46.00	6.01	9.000	N	9.6
1.595161	38.35	---	56.00	17.65	9.000	N	9.6
1.966886	---	32.81	46.00	13.19	9.000	N	9.6
2.613633	---	34.38	46.00	11.62	9.000	N	9.6
3.287634	40.40	---	56.00	15.60	9.000	N	9.6
3.650655	---	33.73	46.00	12.27	9.000	N	9.6
3.668908	39.59	---	56.00	16.41	9.000	N	9.6
7.449337	---	36.23	50.00	13.77	9.000	N	9.6

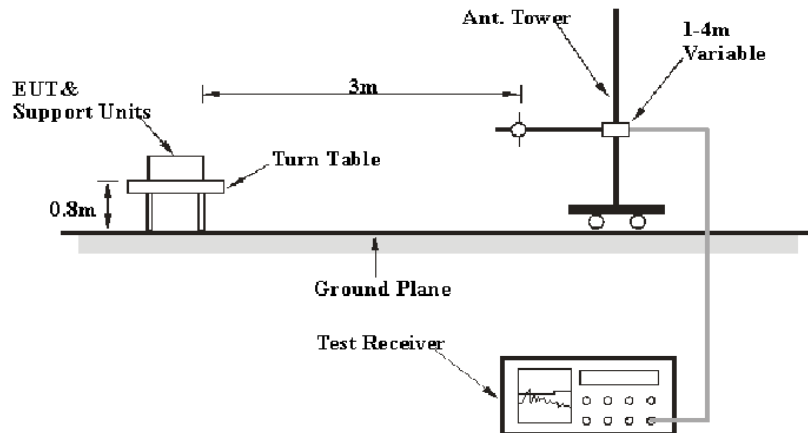
4 - SPURIOUS EMISSIONS

Applicable Standard

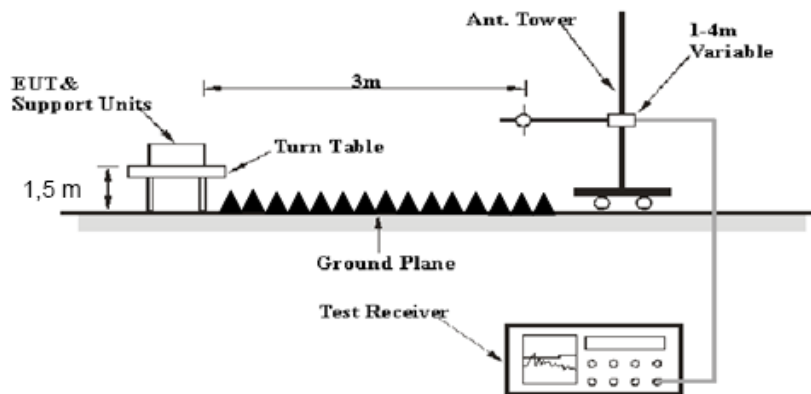
FCC §15.247 (d); §15.209; §15.205

Test System Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 3meters chamber, above 1GHz tests were performed in the 3 meters chamber B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

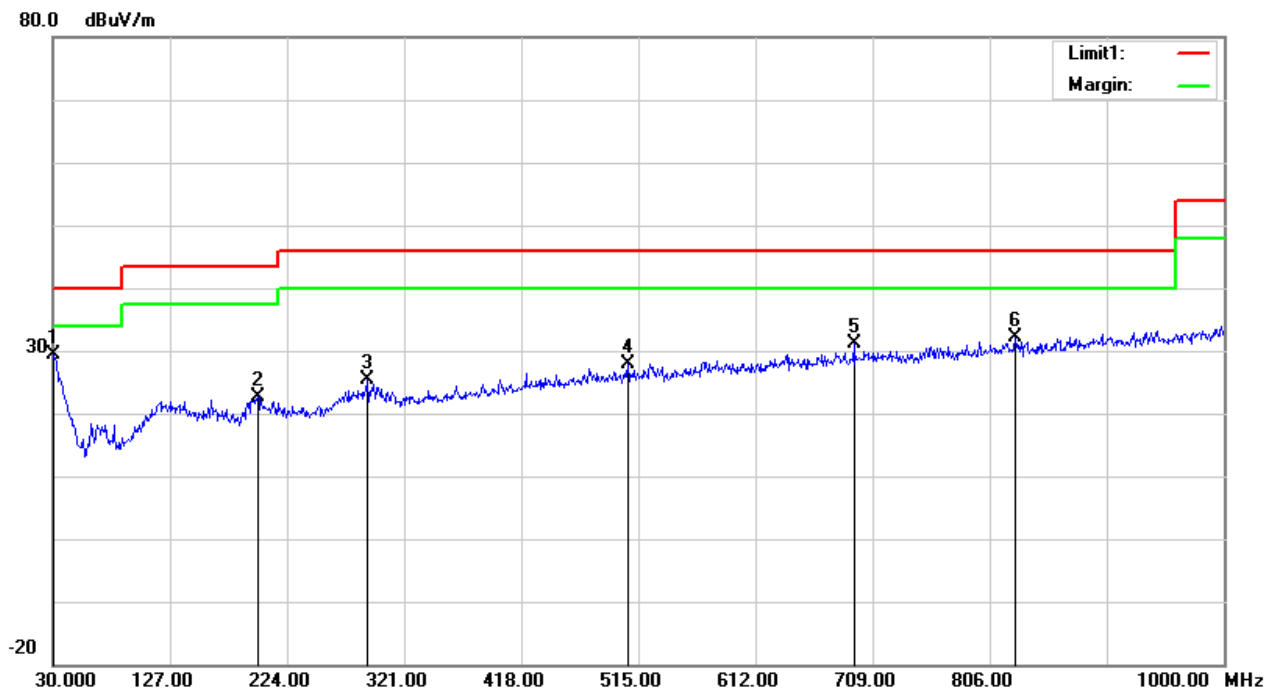
$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

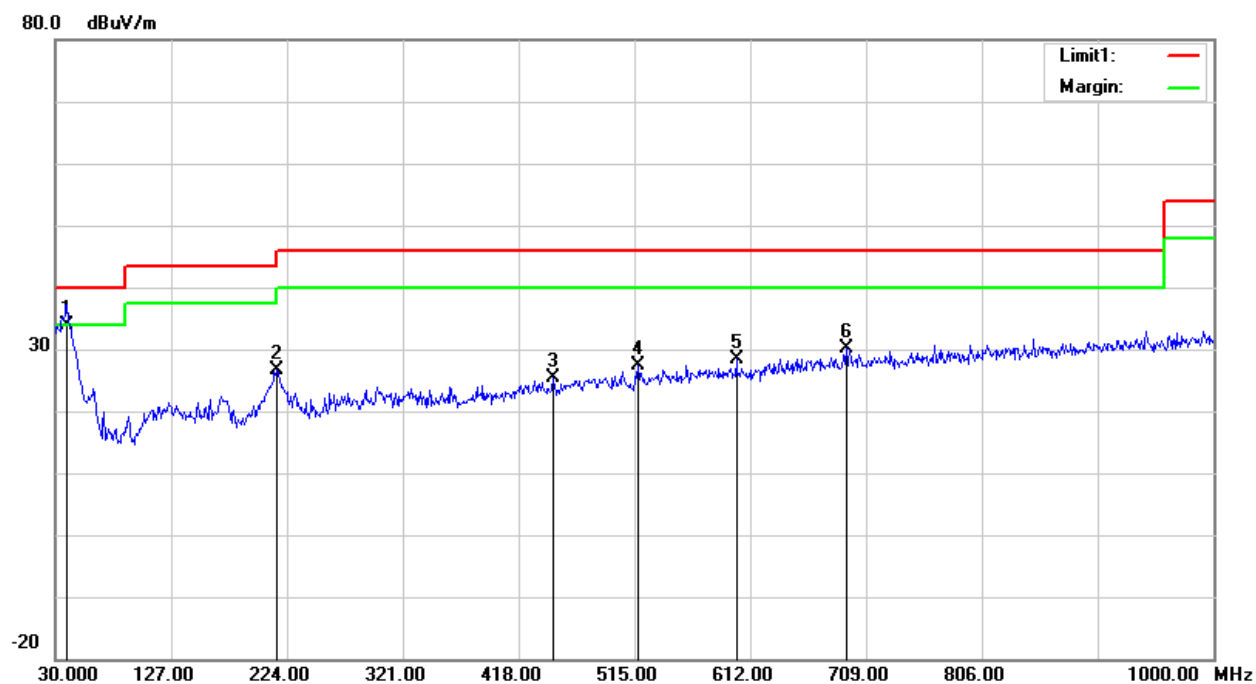
$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data*Test Mode: Transmitting***Test Result:** Compliance*Please Refer to the following data.***1) 30MHz-1GHz (High channel was the worst)**

Model: HP682 Um

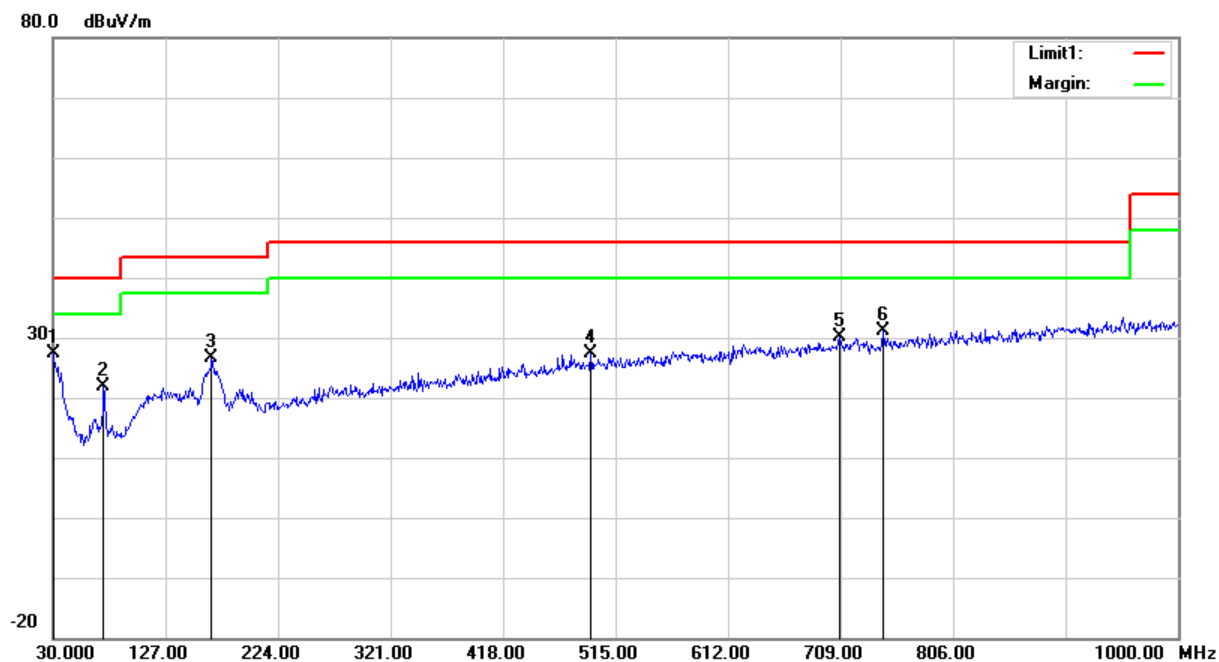
Horizontal:

Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	28.04	peak	1.46	29.50	40.00	10.50
199.7500	28.57	peak	-5.83	22.74	43.50	20.76
290.9300	29.28	peak	-3.84	25.44	46.00	20.56
506.2700	28.27	peak	-0.39	27.88	46.00	18.12
693.4800	28.70	peak	2.36	31.06	46.00	14.94
827.3400	27.83	peak	4.38	32.21	46.00	13.79

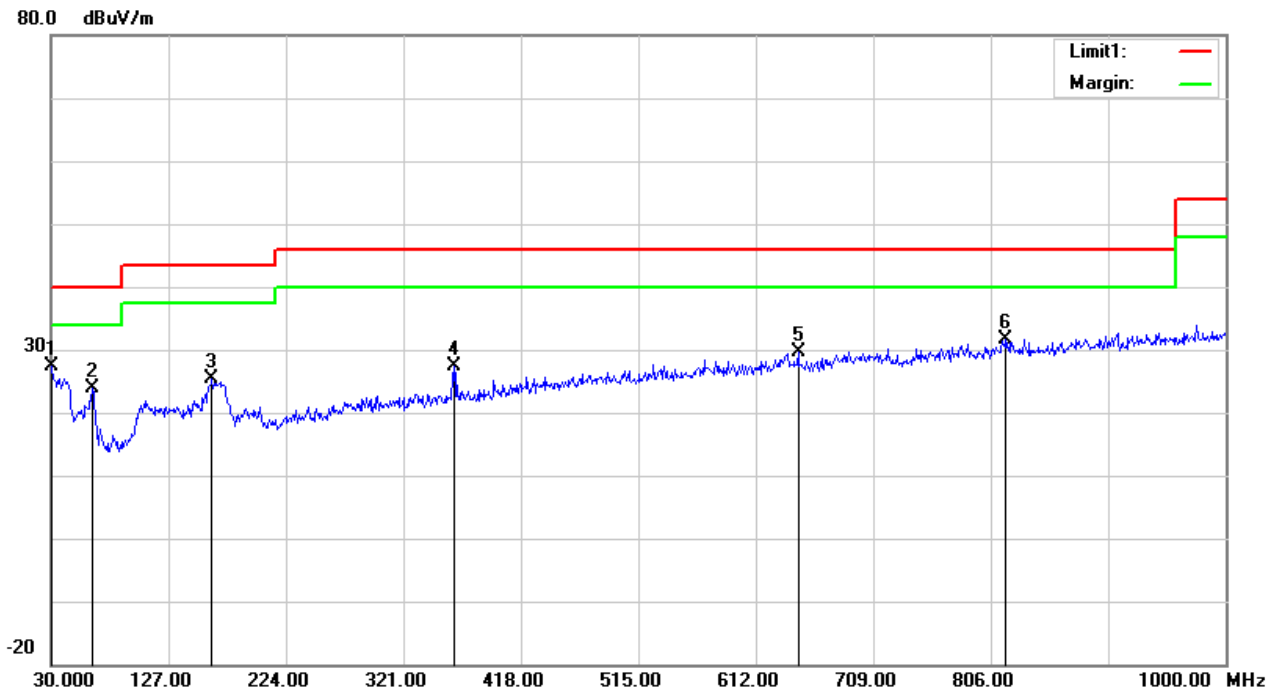
Vertical:

Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
39.7000	39.68	QP	-5.84	33.84	40.00	6.16
215.2700	33.71	peak	-7.15	26.56	43.50	16.94
447.1000	26.58	peak	-1.23	25.35	46.00	20.65
517.9100	27.64	peak	-0.26	27.38	46.00	18.62
600.3600	27.61	peak	0.76	28.37	46.00	17.63
692.5100	27.75	peak	2.34	30.09	46.00	15.91

Model: HP602 Um

Horizontal:

Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	25.88	peak	1.46	27.34	40.00	12.66
73.6500	33.06	peak	-11.23	21.83	40.00	18.17
166.7700	33.22	peak	-6.51	26.71	43.50	16.79
493.6600	27.76	peak	-0.44	27.32	46.00	18.68
708.0300	27.29	peak	2.77	30.06	46.00	15.94
745.8600	28.01	peak	3.04	31.05	46.00	14.95

Vertical:

Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	25.98	peak	1.46	27.44	40.00	12.56
63.9500	35.82	peak	-11.87	23.95	40.00	16.05
162.8900	31.76	peak	-6.30	25.46	43.50	18.04
362.7100	30.06	peak	-2.75	27.31	46.00	18.69
646.9200	27.88	peak	1.71	29.59	46.00	16.41
818.6100	27.39	peak	4.30	31.69	46.00	14.31

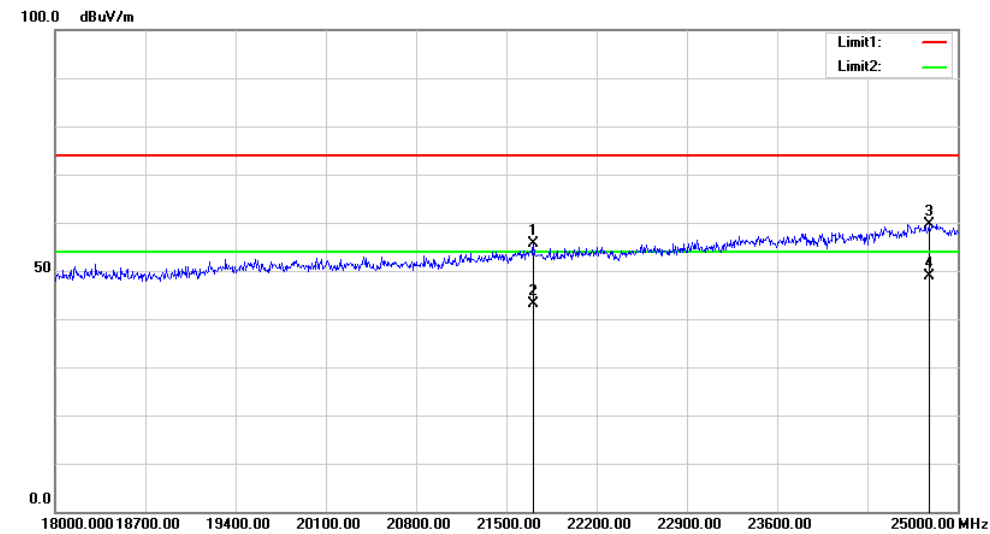
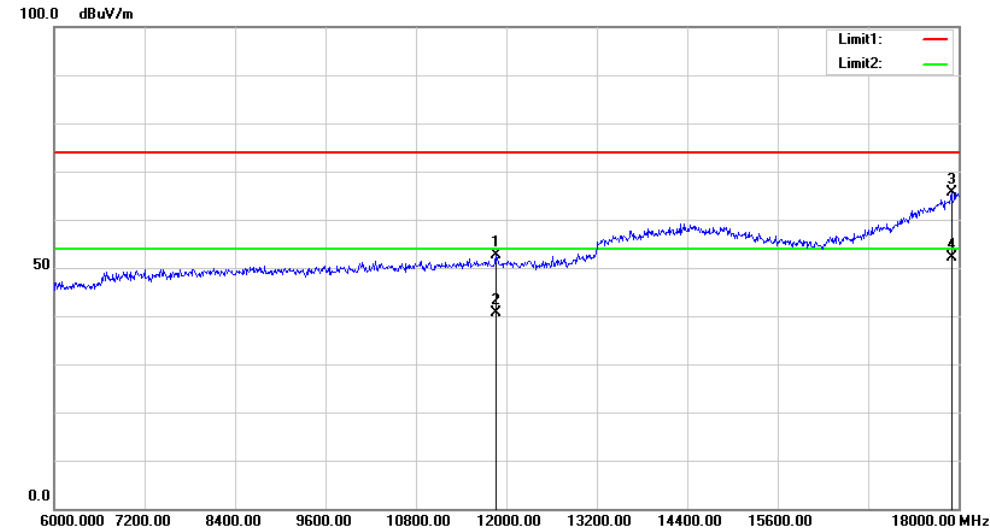
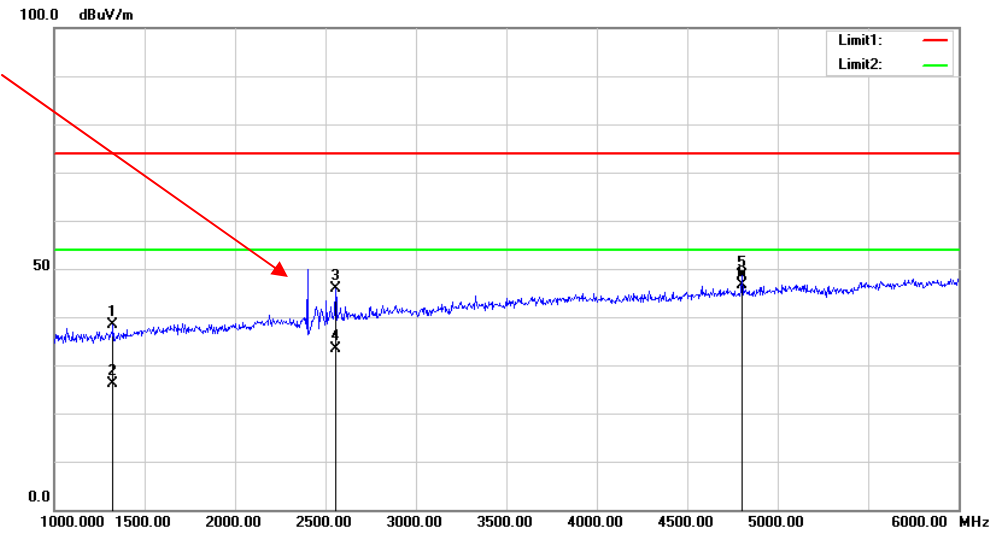
2) 1-25GHz

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	61.36	PK	H	28.10	1.80	0.00	91.26	N/A	N/A
2402.00	60.46	AV	H	28.10	1.80	0.00	90.36	N/A	N/A
2402.00	63.47	PK	V	28.10	1.80	0.00	93.37	N/A	N/A
2402.00	62.50	AV	V	28.10	1.80	0.00	92.40	N/A	N/A
2390.00	25.73	PK	V	28.08	1.80	0.00	55.61	74.00	18.39
2390.00	14.71	AV	V	28.08	1.80	0.00	44.59	54.00	9.41
4804.00	40.42	PK	V	32.91	3.17	25.60	50.90	74.00	23.10
4804.00	35.47	AV	V	32.91	3.17	25.60	45.95	54.00	8.05
7206.00	35.96	PK	V	35.74	4.82	25.60	50.92	74.00	23.08
7206.00	24.71	AV	V	35.74	4.82	25.60	39.67	54.00	14.33
2557.50	41.29	PK	H	28.51	1.87	26.22	45.45	74.00	28.55
2557.50	41.61	PK	V	28.51	1.87	26.22	45.77	74.00	28.23
Middle Channel: 2440 MHz									
2440.00	61.99	PK	H	28.18	1.82	0.00	91.99	N/A	N/A
2440.00	61.23	AV	H	28.18	1.82	0.00	91.23	N/A	N/A
2440.00	64.13	PK	V	28.18	1.82	0.00	94.13	N/A	N/A
2440.00	62.61	AV	V	28.18	1.82	0.00	92.61	N/A	N/A
4880.00	39.36	PK	V	33.06	3.27	25.66	50.03	74.00	23.97
4880.00	34.41	AV	V	33.06	3.27	25.66	45.08	54.00	8.92
7320.00	35.90	PK	V	36.03	4.62	25.72	50.83	74.00	23.17
7320.00	23.65	AV	V	36.03	4.62	25.72	38.58	54.00	15.42
High Channel: 2480 MHz									
2480.00	62.03	PK	H	28.26	1.84	0.00	92.13	N/A	N/A
2480.00	61.26	AV	H	28.26	1.84	0.00	91.36	N/A	N/A
2480.00	64.21	PK	V	28.26	1.84	0.00	94.31	N/A	N/A
2480.00	62.64	AV	V	28.26	1.84	0.00	92.74	N/A	N/A
2483.50	27.33	PK	V	28.27	1.84	0.00	57.44	74.00	16.56
2483.50	15.62	AV	V	28.27	1.84	0.00	45.73	54.00	8.27
4960.00	40.83	PK	V	33.22	3.23	25.63	51.65	74.00	22.35
4960.00	34.73	AV	V	33.22	3.23	25.63	45.55	54.00	8.45
7440.00	35.11	PK	V	36.34	4.41	25.85	50.01	74.00	23.99
7440.00	25.44	AV	V	36.34	4.41	25.85	40.34	54.00	13.66

3) Worst Test Plots (Low channel)

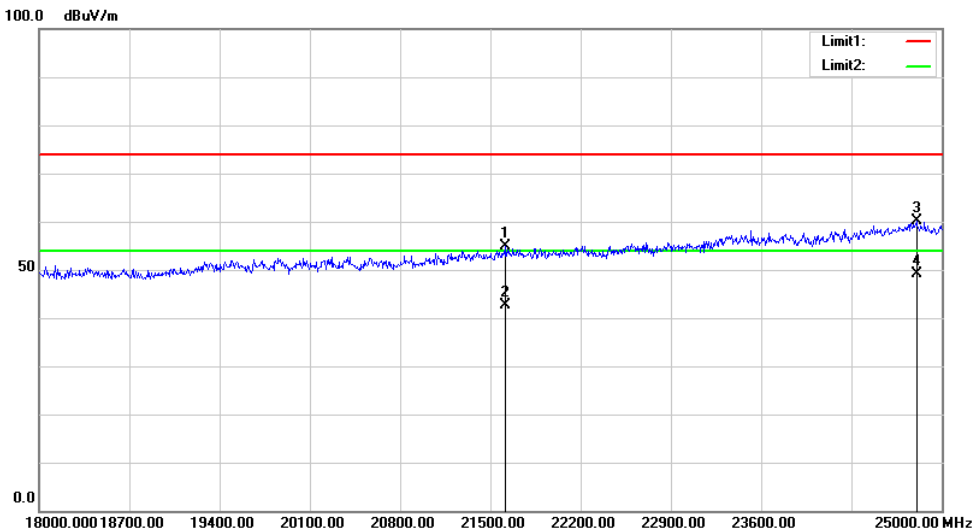
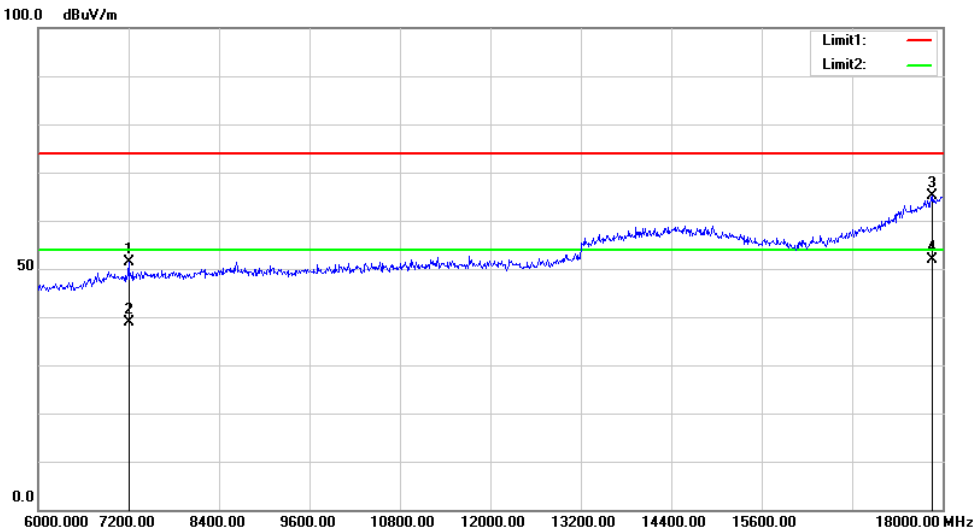
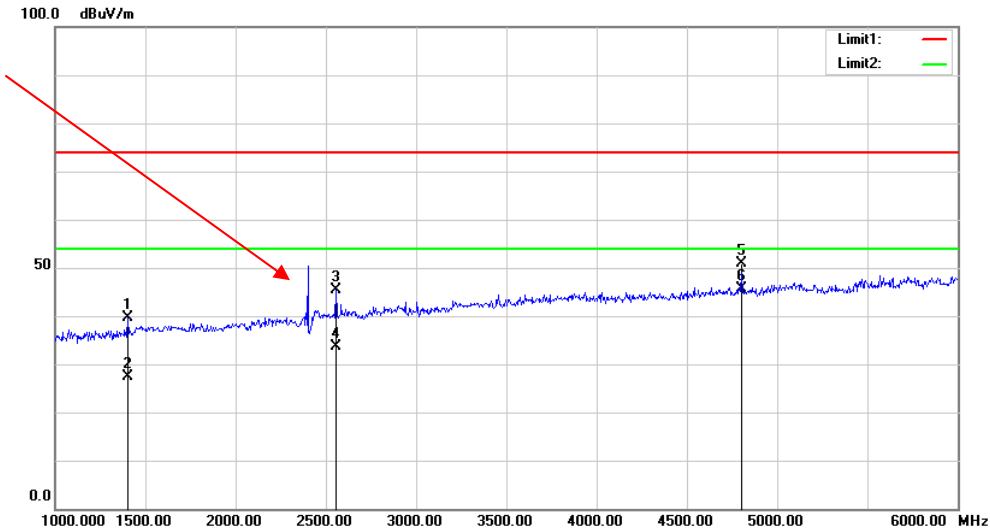
Horizontal:

Fundamental
Test with Band
Rejection Filter



Vertical:

Fundamental
Test with Band
Rejection Filter



5 – 6 dB EMISSION BANDWIDTH

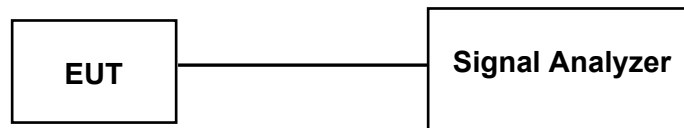
Applicable Standard

According to FCC §15.247(a) (2)

Systems using digital modulation techniques 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.

Test Procedure

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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.



Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

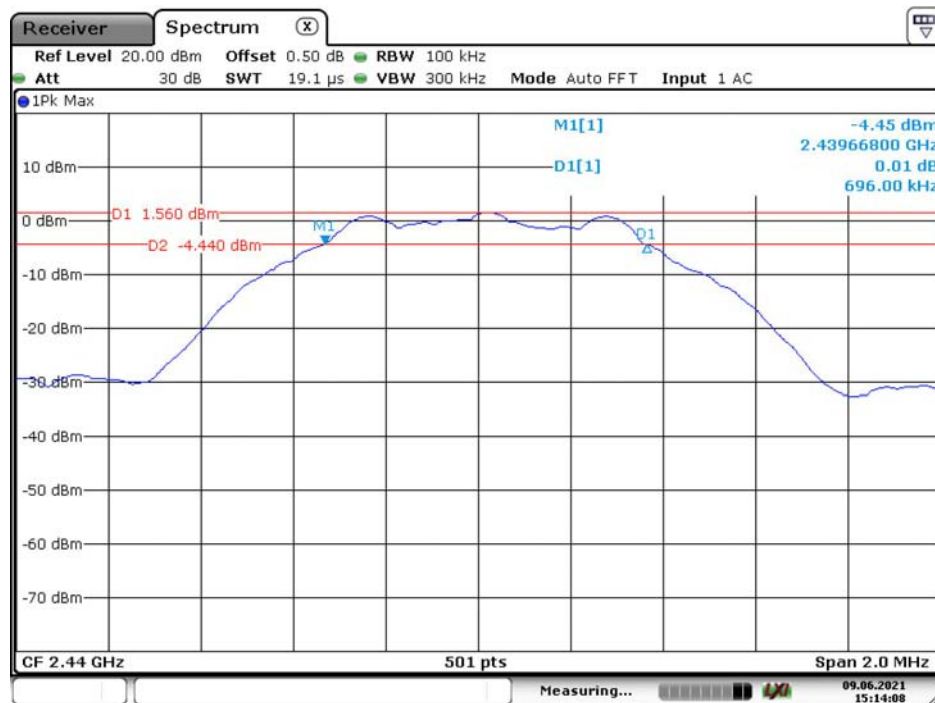
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
Low	2402	0.704	≥ 0.5
Middle	2440	0.696	≥ 0.5
High	2480	0.700	≥ 0.5

Low Channel



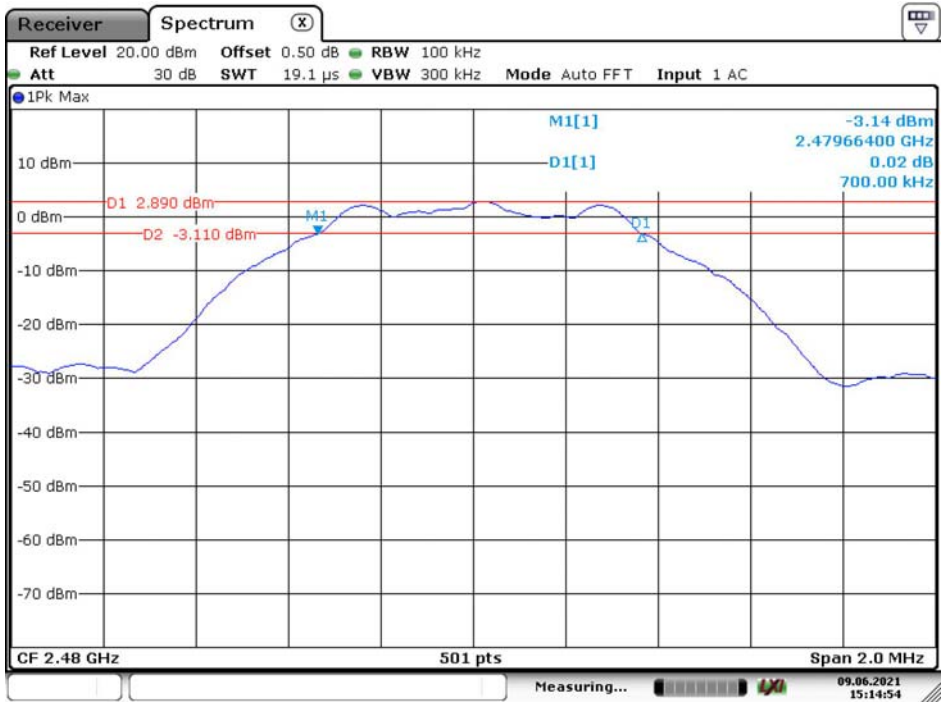
Date: 9.JUN.2021 15:13:12

Middle Channel



Date: 9.JUN.2021 15:14:08

High Channel



Date: 9.JUN.2021 15:14:54

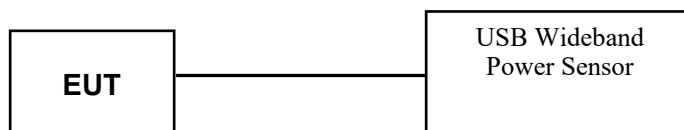
6 - MAXIMUM PEAK CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.



Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
Low	2402	-0.44	≤30
Middle	2440	2.00	≤30
High	2480	3.29	≤30

Note: The data above was tested in conducted mode, the antenna gain is 0 dBi.

7 – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

According to FCC§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

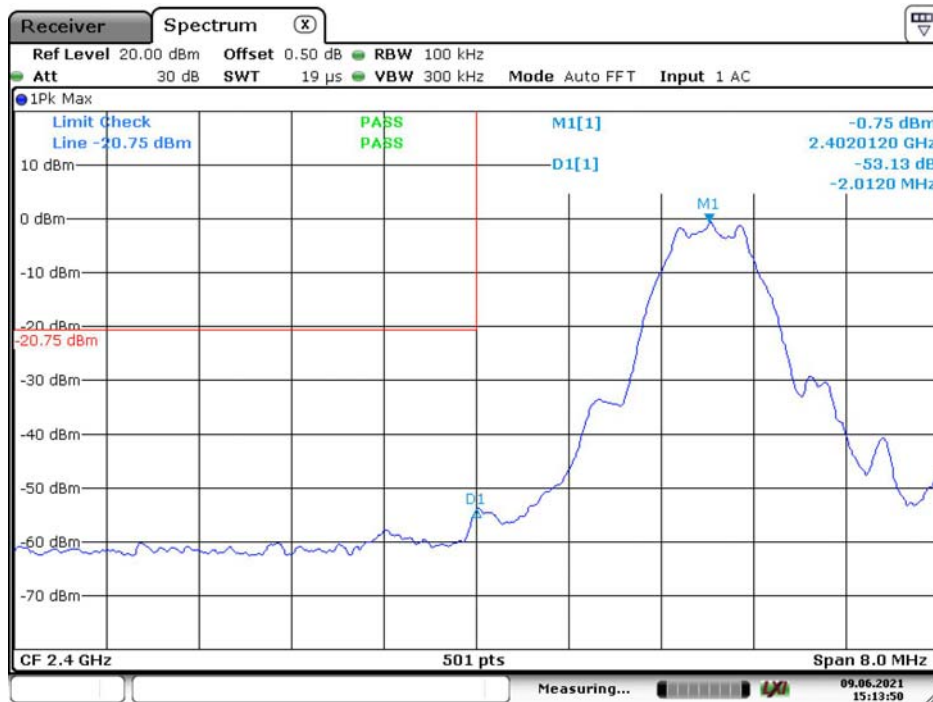
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Test Mode: Transmitting

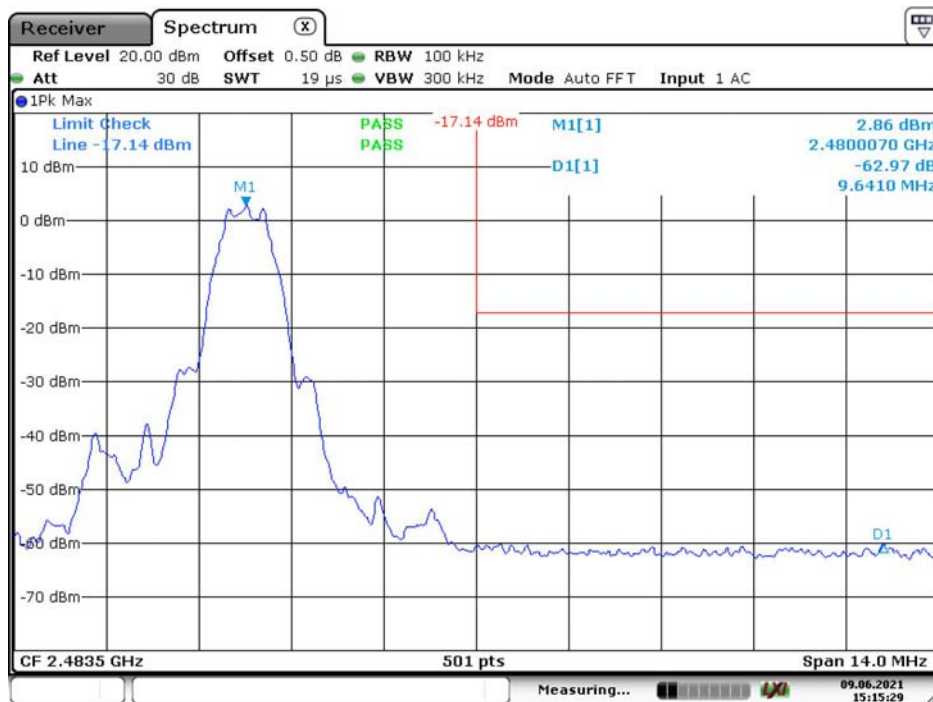
Test Result: Compliance. Please refer to following tables and plots.

Band Edge, Left Side



Date: 9.JUN.2021 15:13:50

Band Edge, Right Side



Date: 9.JUN.2021 15:15:29

8 - POWER SPECTRAL DENSITY

Applicable Standard

According to FCC§15.247(e):For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

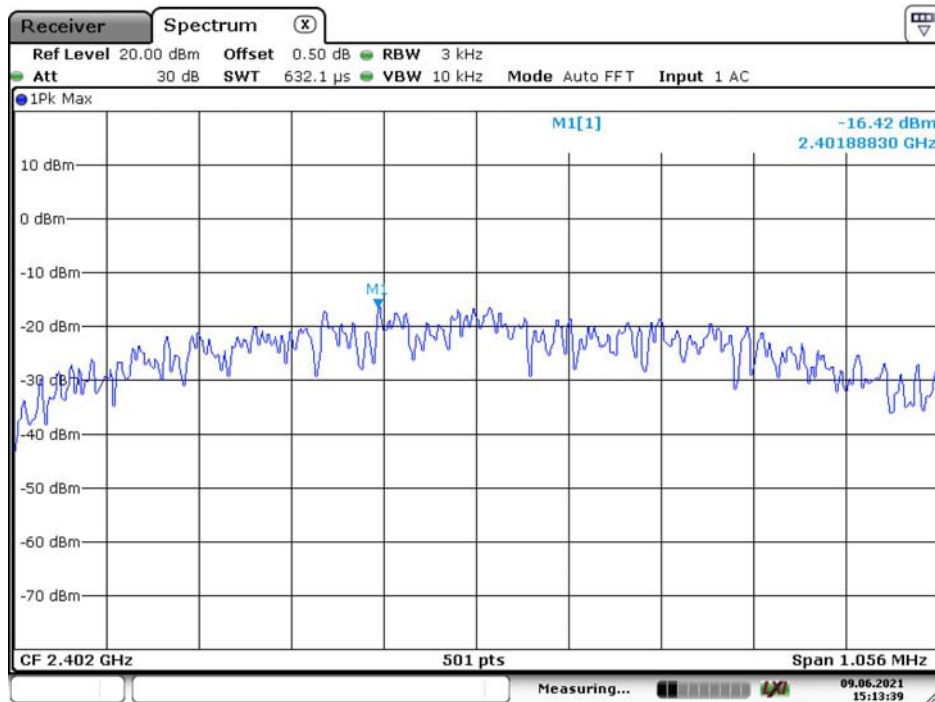
Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

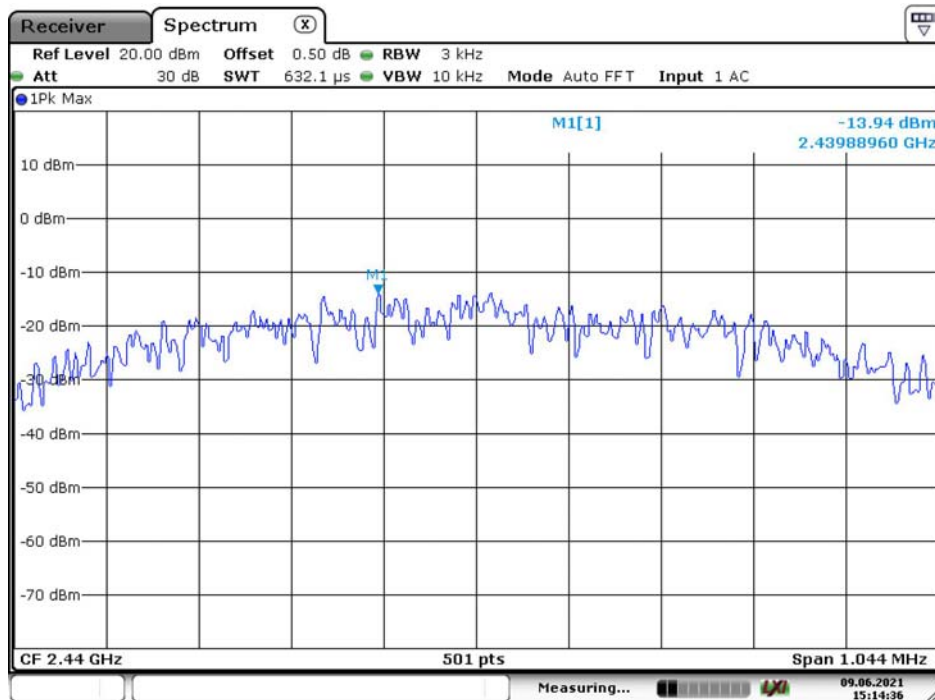
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-16.42	≤8
Middle	2440	-13.94	≤8
High	2480	-12.73	≤8

Power Spectral Density, Low Channel



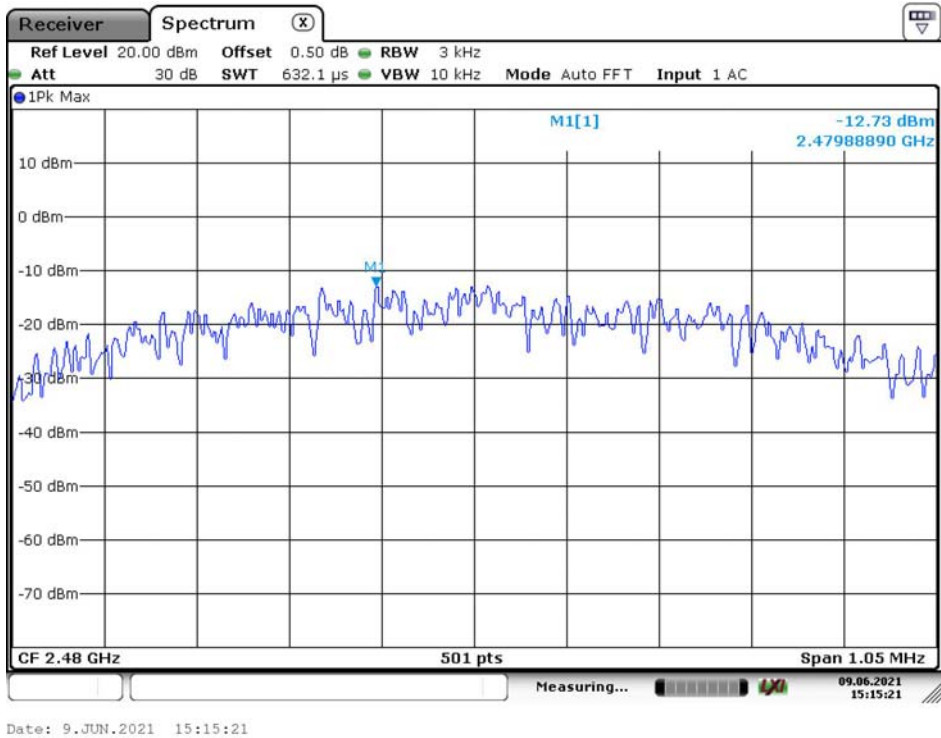
Date: 9.JUN.2021 15:13:39

Power Spectral Density, Middle Channel



Date: 9.JUN.2021 15:14:36

Power Spectral Density, High Channel



***** END OF REPORT *****