

TEST REPORT

FCC Certification

Applicant Name:

TJ Media Co., Ltd.

Address:640-8, Deungchon-Dong, Gangseo-Gu, Seoul,
157-030 South Korea**Date of Issue:**

March 08, 2018

Location:

HCT CO., LTD.,

74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA**Report No.:** HCT-RF-1802-FC013-R1**FCC ID:****TO8-TKR-373MU****APPLICANT:****TJ Media Co., LTd.****Model:**

TKR-373MU

Derivation Model:

TKR-373MP

EUT Type:

MIC Karaoke(Portable)

FCC Rule Part(s):

§15.236

Modulation	Type of Emission	Frequency (MHz)	E.I.R.P	
			(W)	(dBm)
FM	94K7F3E	494.0	0.010	9.88
		499.4	0.012	10.69
		505.2	0.013	11.18

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S.C. 853(a)



Report prepared by : Kwon Jeong
Engineer of Telecommunication Testing Center



Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1802-FC013	February 28, 2018	- First Approval Report
HCT-RF-1802-FC013-R1	March 08, 2018	- Removed the Internal Photo on page 5. - Added the channel list on page 6. - Added the standby mode on page 20. - Added the Radiated Spurious Emission Plot on page 30 – 34.

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	TJ Media Co., Ltd.
Address:	640-8, Deungchon-Dong, Gangseo-Gu, Seoul, 157-030 South Korea
FCC ID:	TO8-TKR-373MU
FCC Rule Part(s):	§15.236
EUT Type:	MIC Karaoke(Portable)
Modulation:	FM
Model:	TKR-373MU
Derivation Model:	TKR-373MP
Frequency Range:	493.0 MHz ~ 505.3 MHz
Test Frequency:	494.0 MHz, 499.4MHz, 505.2 MHz
Number of Channels:	16
Power source:	DC 3.0 V (Battery 1.5 VDC*2)
Antenna specification:	UHF Antenna type: Helical, Peak gain: -0.52 dBi
Date(s) of Tests:	February 05, 2018 ~ February 26, 2018

2. INTRODUCTION

2.1. INFORMATION ABOUT DERIVATIVE MODEL

Derivative model use the same software of basic model. In case of derivative model, the IR socket is removed in basic model and added button key.

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Equivalent Isotropic Radiated Power	- KDB 206256 D01 v02 – Clause IV - ANSI/TIA-603-E Section 2.2.17
Occupied Bandwidth	- KDB 206256 D01 v02 – Clause IV - ANSI 63.10-2013 Section 6.9
Radiated Spurious Emission	- KDB 206256 D01 v02 – Clause IV - ETSI EN 300 422-1 V1.4.2 (2011-08)
Emission mask	- KDB 206256 D01 v02 – Clause IV - ETSI EN 300 422-1 V1.4.2 (2011-08)
Frequency Stability	- KDB 206256 D01 v02 – Clause IV - ANSI 63.10-2013 Section 6.8

3.2 CHANNEL LIST

Channel	RF1 Frequency (MHz)	Channel	RF2 Frequency (MHz)
1	494.0	1	498.2
2	494.4	2	498.6
3	494.8	3	499.0
4	495.2	4	499.4
5	499.8	5	504.0
6	500.2	6	504.4
7	500.6	7	504.8
8	501.0	8	505.2

Note:

16 channels are allocated in one sample.

3.3 EQUIVALENT ISOTROPIC RADIATED POWER

Test Overview

Radiated tests are performed in the Semi-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

Test Settings

1. RBW = 1MHz
2. VBW = 3MHz
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High

Test Note

1. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
2. The worst case emissions are reported with the EUT positioning, modulations and axis configurations shown in the test data.

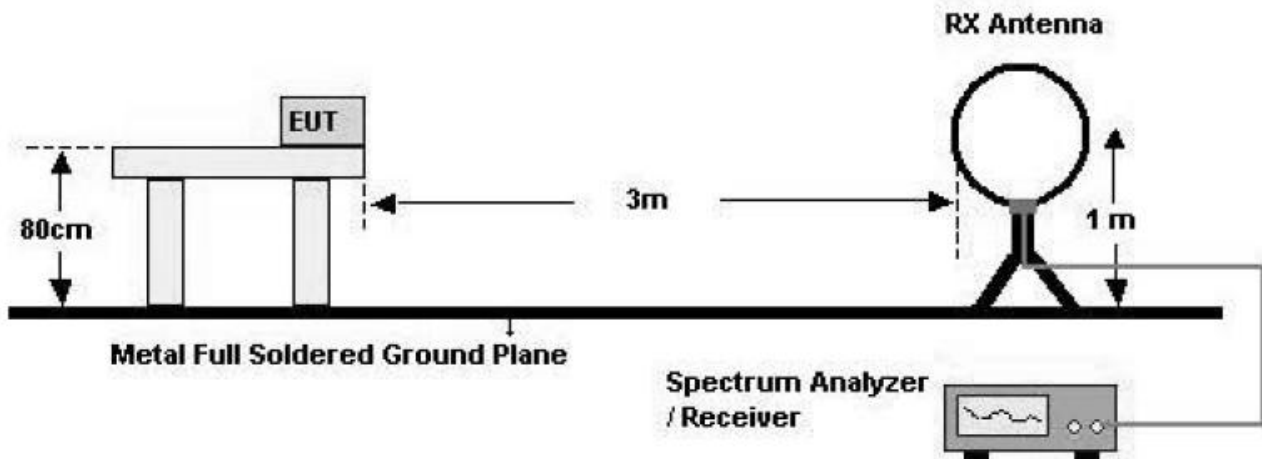
3.4 RADIATED SPURIOUS EMISSION

Test Overview

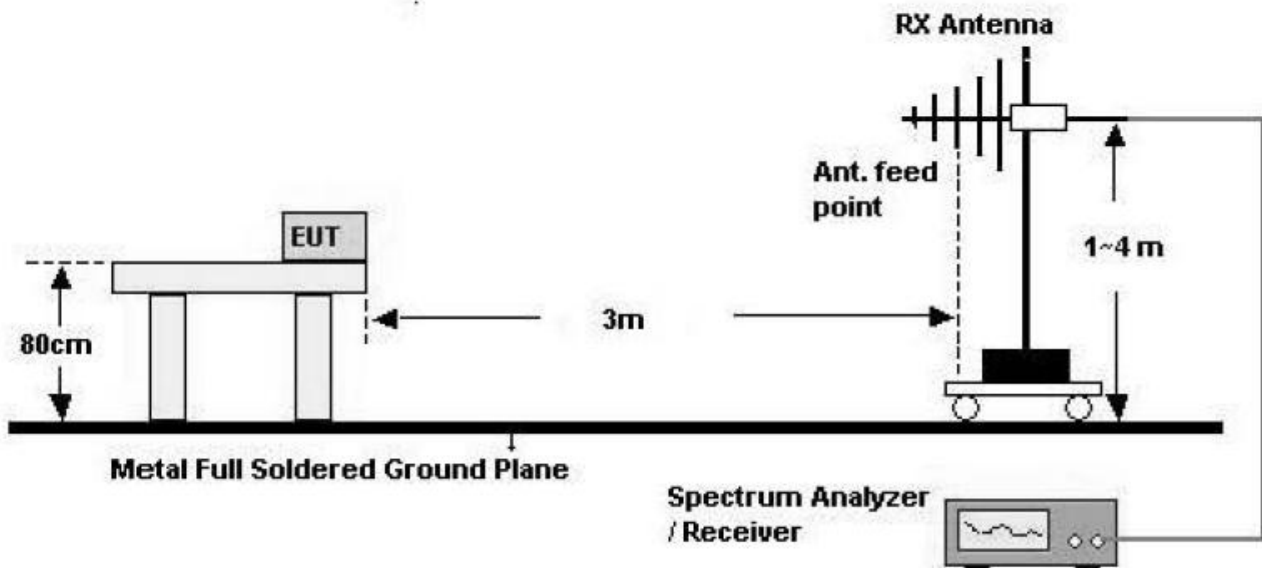
Radiated tests are performed in the Semi-anechoic chamber.

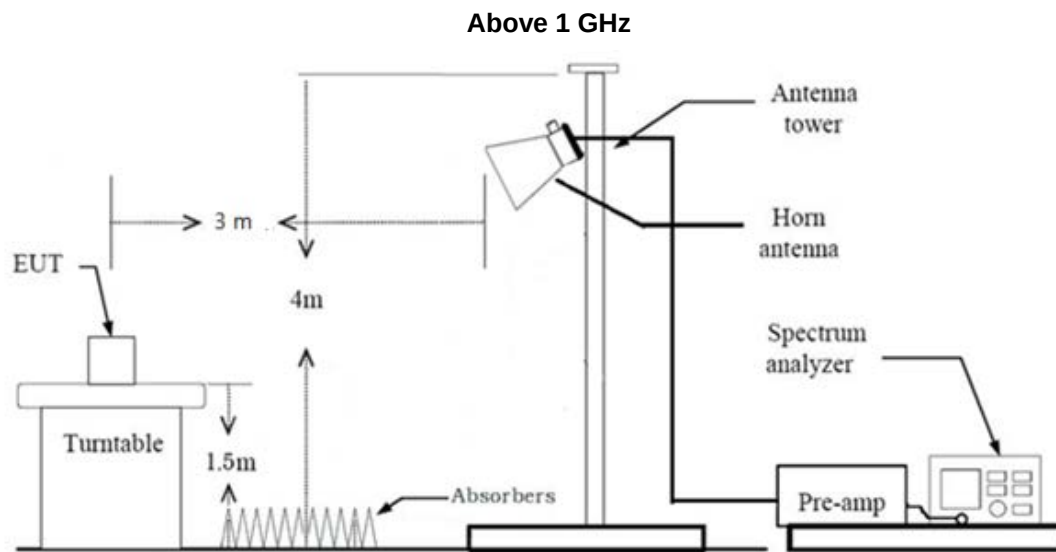
The EUT was demonstrated using the applicable measurement procedures of ETSI EN 300 422-1.

Below 30 MHz



30 MHz - 1 GHz



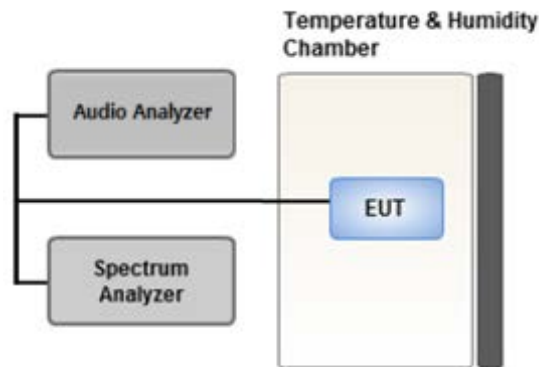
**Test Settings**

1. RBW = 9kHz to 30MHz : 10kHz
30 MHz to 1GHz : 100kHz
1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. No. of sweep points $> 2 \times$ span / RBW
4. Detector = Peak detector below 1 GHz and a RMS Average detector above 1 GHz
5. Trace mode = Max Hold
6. The trace was allowed to stabilize
7. Test channel : Low/ Middle/ High

Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
The worst case emissions are reported with the EUT positioning, modulations and axis configurations shown in the test data.
3. The EUT was demonstrated using a Peak detector below 1 GHz and a RMS Average detector above 1 GHz.
4. The EUT was investigated up to the 10th harmonic of the fundamental.

3.5 OCCUPIED BANDWIDTH



Test setup

According to ANSI C63.10-2013 section 6.9 for additional Test Set-Up procedures, the occupied bandwidth of emission was measured with a Spectrum Analyzer connected to the antenna terminal while EUT was operating in 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. Then mark the –26dB Bandwidth and record it.

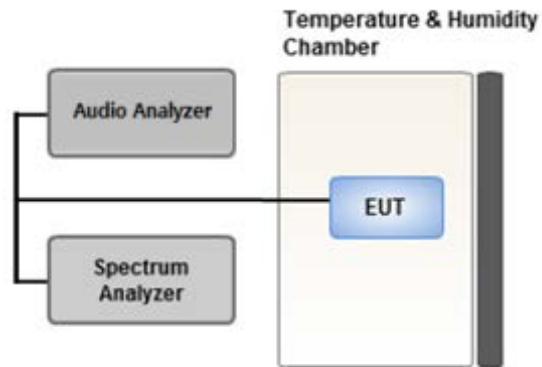
Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize

3.6 EMISSION MASK

Test Overview

The EUT was demonstrated using the applicable measurement procedures of ETSI EN 300 422-1.



Test setup

Test Settings

1. Centre frequency: f_c : Transmitter (Tx) nominal frequency
2. Dispersion (Span): $f_c - 1\text{ MHz}$ to $f_c + 1\text{ MHz}$
3. Resolution BandWidth (RBW): 1 kHz
4. Video BandWidth (VBW): 1 kHz
5. Detector: Peak
6. Trace mode = max hold

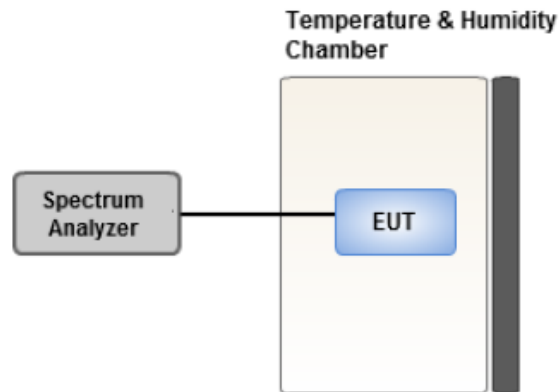
Test Note

1. Audio limiting threshold: 50mV(Declared by the manufacturer)

3.7 FREQUENCY STABILITY

Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.10-2013.



Test setup

Test Settings

1. Temperature:

The temperature is varied from -20°C to +50°C in 10°C increments using an environmental chamber.

2. Primary Supply Voltage:

85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

3. Set frequency counter center frequency to the right frequency needs to be measured.

Test Note

1. Battery operated equipment shall be tested using a new battery.

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
REOHDE & SCHWARZ	SCU 18 / AMPLIFIER	10094	04/24/2017	Annual	04/24/2018
Wainwright	WHK1.2/15G-10EF/H.P.F	4	04/10/2017	Annual	04/10/2018
Agilent	E3632A/DC Power Supply	KR75303243	07/18/2017	Annual	07/18/2018
ESPEC	SU-642 / Chamber	0093008124	03/31/2017	Annual	03/31/2018
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	09/09/2016	Biennial	09/09/2018
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	10/14/2016	Biennial	10/14/2018
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY52090906	06/01/2017	Annual	06/01/2018
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/22/2017	Annual	06/22/2018
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/30/2017	Annual	10/30/2018
REOHDE & SCHWARZ	FSV30/Spectrum Analyzer	100854	05/18/2017	Annual	05/18/2018
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	04/19/2017	Biennial	04/19/2019
Schwarzbeck	VULB9160/ Bilog Antenna	3150	09/30/2016	Biennial	09/30/2018
Schwarzbeck	VULB9160/ Bilog Antenna	9360-3368	10/14/2016	Biennial	10/14/2018
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/18/2017	Annual	07/18/2018
REOHDE & SCHWARZ	ESU / EMI TEST RECEIVER	100346	08/11/2017	Annual	08/11/2018
Hewlett Packard	8903B/Audio Analyzer	3413A13913	10/27/2017	Annual	10/27/2018
Hewlett Packard	8901B/Modulation Analyzer	3438A05231	10/17/2017	Annual	10/17/2018

5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

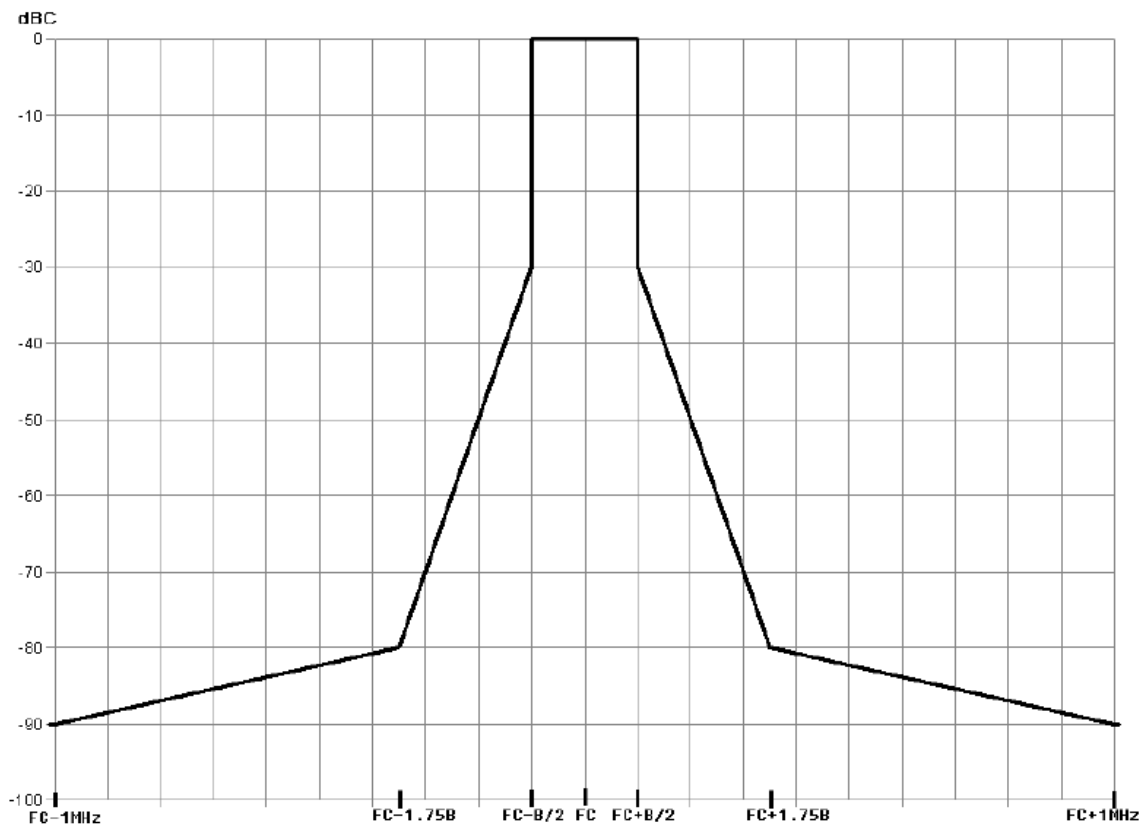
Parameter	Expanded Uncertainty ($\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	6.07

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§15.236(d)(1)	50 mW	PASS
Occupied Bandwidth	§15.236(f)(2)	<200kHz	PASS
Emission mask	§15.236(g)	<u>See note1</u>	PASS
Frequency Stability	§15.236(f)(3)	Within $\pm 0.005\%$ of the operating frequency	PASS

Note1:



B = 26dB bandwidth

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§15.236(d)(1)	50 mW	PASS
Radiated Spurious Emission	§15.236(g)	<u>See note1</u>	PASS

Note1:

State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW	250 nW	1 µW
Standby	2 nW	2 nW	20 nW

7. TEST DATA

7.1 Equivalent Isotropic Radiated Power(Radiated Test)

Freq. (MHz)	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol.	E.R.P		E.I.R.P		Limit (W)
						(W)	(dBm)	(W)	(dBm)	
494.00	-19.13	4.39	4.36	1.02	V	0.006	7.73	0.010	9.88	< 0.05
499.40	-18.32	5.20	4.36	1.02	V	0.007	8.54	0.012	10.69	
505.20	-18.05	5.76	4.30	1.03	V	0.008	9.03	0.013	11.18	

Note:

1. E.R.P = Substitute Level(dBm) + Ant. Gain(dBd) – C.L(Cable Loss)
2. E.I.R.P = E.R.P + 2.15
3. We performed TKR-373MU and TKR-373MP. And worst case is TKR-373MU.
This report is attached only TKR-373MU.

7.2 Equivalent Isotropic Radiated Power(Conducted Test)

Freq. (MHz)	Measured Level (dBm)	Peak. Gain (dBi)	E.I.R.P		Limit (W)
			(W)	(dBm)	
494.00	9.635	-0.520	0.008	9.115	< 0.05
499.40	10.637	-0.520	0.010	10.117	
505.20	10.587	-0.520	0.010	10.067	

Note:

1. E.I.R.P = Measured Level(dBm) + Peak. Gain(dBi)

7.3 Radiated Spurious Emission(Mode : Operation)

Model : TKR-373MU

Freq. (MHz)	Freq (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
494.0	988.0	-77.71	3.69	-46.16	1.44	H	-43.91	-36.00	7.91
	1,482.0	-49.81	8.46	-50.11	1.79	H	-43.44	-30.00	13.44
	2,470.0	-51.72	10.92	-49.86	2.33	H	-41.27	-30.00	11.27
	433.9	-74.63	4.40	-51.84	0.95	V	-48.39	-36.00	12.39
499.4	998.8	-77.92	3.81	-46.42	1.45	V	-44.06	-36.00	8.06
	1,498.2	-49.11	8.58	-50.08	1.80	H	-43.30	-30.00	13.30
	2,497.0	-51.74	10.94	-49.70	2.35	H	-41.11	-30.00	11.11
	433.9	-75.70	4.40	-52.91	0.95	V	-49.46	-36.00	13.46
505.2	1,515.6	-48.22	8.66	-49.65	1.81	H	-42.80	-30.00	12.80
	2,526.0	-52.00	10.98	-50.25	2.38	H	-41.65	-30.00	11.65
	433.9	-76.25	4.40	-53.46	0.95	V	-50.01	-36.00	14.01

Model : TKR-373MP

Freq. (MHz)	Freq (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
494.0	988.0	-77.00	3.69	-45.45	1.44	V	-43.20	-36.00	7.20
	2,470.0	-51.87	10.92	-50.01	2.33	H	-41.42	-30.00	11.42
	433.9	-71.88	4.40	-49.09	0.95	H	-45.64	-36.00	9.64
499.4	998.8	-76.00	3.81	-44.50	1.45	V	-42.14	-36.00	6.14
	1,498.2	-51.61	8.58	-52.58	1.80	H	-45.80	-30.00	15.80
	2,497.0	-52.34	10.94	-50.30	2.35	H	-41.71	-30.00	11.71
	433.9	-73.90	4.40	-51.11	0.95	V	-47.66	-36.00	11.66
505.2	1,515.6	-52.00	8.66	-53.43	1.81	H	-46.58	-30.00	16.58
	2,526.0	-51.80	10.98	-50.05	2.38	H	-41.45	-30.00	11.45
	433.9	-74.16	4.40	-51.37	0.95	V	-47.92	-36.00	11.92

7.4 Radiated Spurious Emission(Mode : Standby)

Model : TKR-373MU

Freq. (MHz)	Freq (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
No Peak Found									

Model : TKR-373MP

Freq. (MHz)	Freq (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
No Peak Found									

7.5 Occupied Bandwidth

Freq.(MHz)	-26dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)
494.0	164.6	94.741	<200kHz
499.4	105.8	83.713	
505.2	146.3	91.263	

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 26 ~ 27.

7.6 Emission mask

- Plots of the EUT's Emission mask are shown Page 28 ~ 29.

7.7 Frequency Stability

- OPERATING FREQUENCY: 494.0 MHz
- REFERENCE VOLTAGE: 3.00 VDC
- LIMIT: Within $\pm 0.005\%$ of the operating frequency

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (kHz)	Limit (kHz)
100%	3.00	+20(Ref)	493998085.808	-1.91	± 24.70
100%		-20	494002091.685	2.09	± 24.70
100%		-10	494001993.334	1.99	± 24.70
100%		0	494000825.873	0.83	± 24.70
100%		+10	493999016.732	-0.98	± 24.70
100%		+30	493997882.245	-2.12	± 24.70
100%		+40	493996285.287	-3.71	± 24.70
100%		+50	493994464.778	-5.54	± 24.70
85%	2.55	+20	493998086.583	-1.91	± 24.70
115%	3.45	+20	493998075.710	-1.92	± 24.70

- ☒ OPERATING FREQUENCY: 499.4 MHz
☒ REFERENCE VOLTAGE: 3.00 VDC
☒ LIMIT: Within $\pm 0.005\%$ of the operating frequency

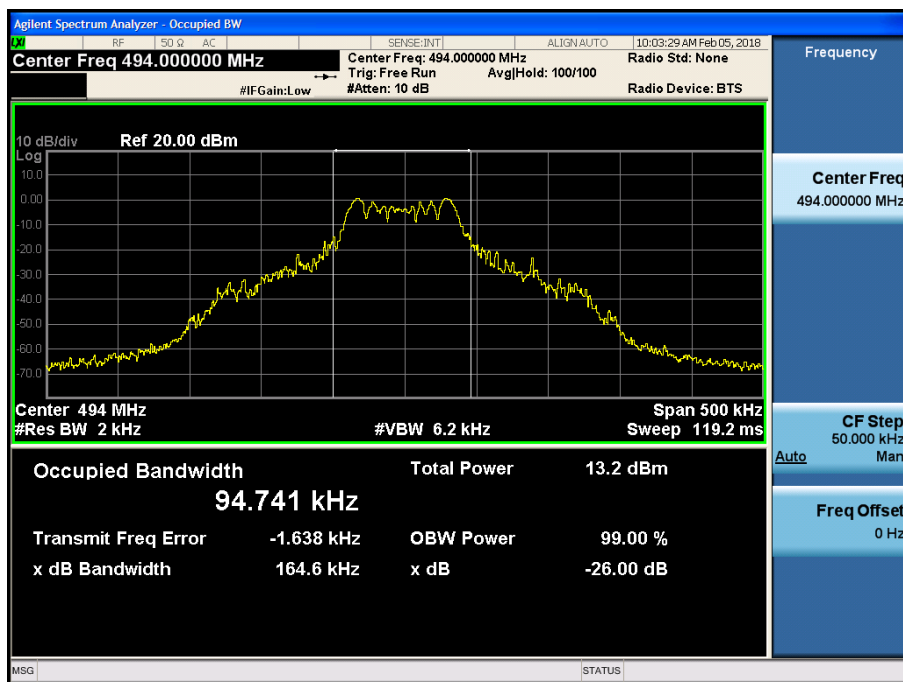
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (kHz)	Limit (kHz)
100%	3.00	+20(Ref)	499398049.724	-1.95	± 24.97
100%		-20	499402199.377	2.20	± 24.97
100%		-10	499401987.237	1.99	± 24.97
100%		0	499400826.188	0.83	± 24.97
100%		+10	499399043.253	-0.96	± 24.97
100%		+30	499397852.673	-2.15	± 24.97
100%		+40	499396273.425	-3.73	± 24.97
100%		+50	499394424.191	-5.58	± 24.97
85%	2.55	+20	499398051.751	-1.95	± 24.97
115%	3.45	+20	499398043.009	-1.96	± 24.97

- ☒ OPERATING FREQUENCY: 505.2 MHz
☒ REFERENCE VOLTAGE: 3.00 VDC
☒ LIMIT: Within $\pm 0.005\%$ of the operating frequency

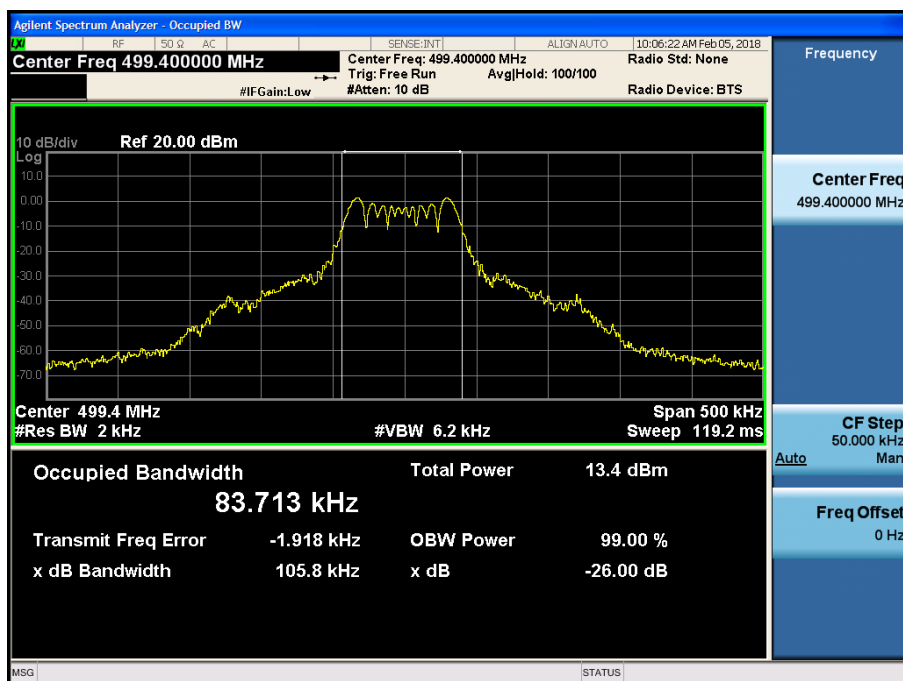
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (kHz)	Limit (kHz)
100%	3.00	+20(Ref)	505198107.553	-1.89	± 25.26
100%		-20	505202043.819	2.04	± 25.26
100%		-10	505201940.711	1.94	± 25.26
100%		0	505200825.567	0.83	± 25.26
100%		+10	505199046.452	-0.95	± 25.26
100%		+30	505197889.423	-2.11	± 25.26
100%		+40	505196265.185	-3.73	± 25.26
100%		+50	505194375.594	-5.62	± 25.26
85%	2.55	+20	505198088.679	-1.91	± 25.26
115%	3.45	+20	505198082.369	-1.92	± 25.26

8. TEST PLOTS

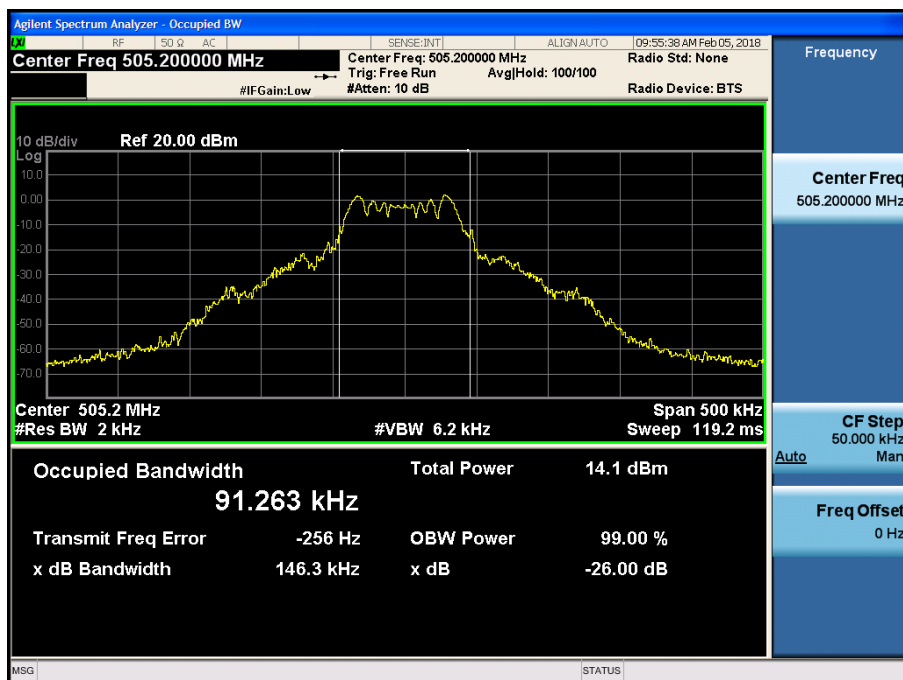
Occupied Bandwidth Plot (494.00 MHz)



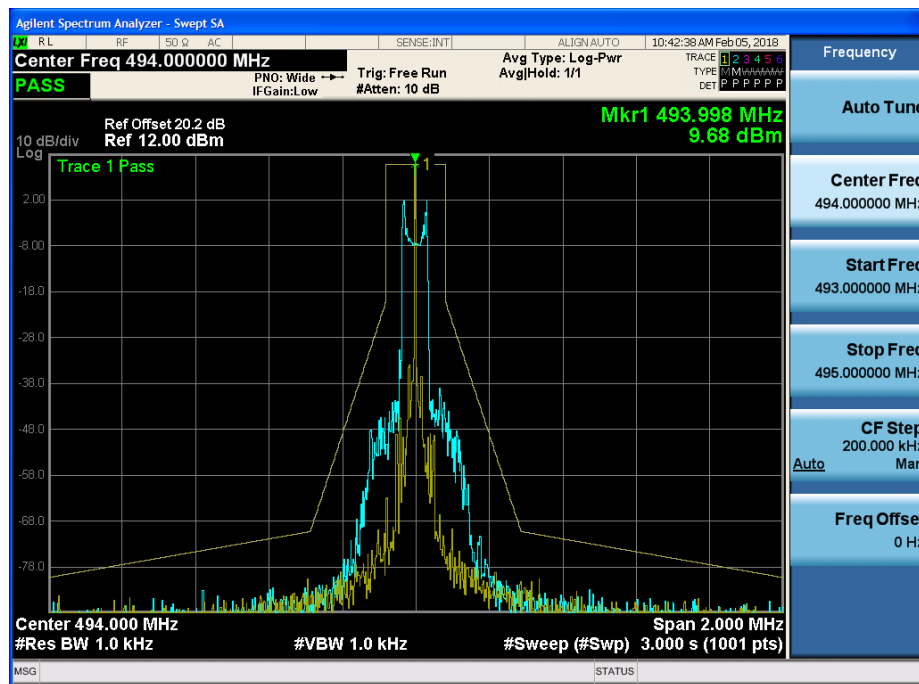
Occupied Bandwidth Plot (499.40 MHz)



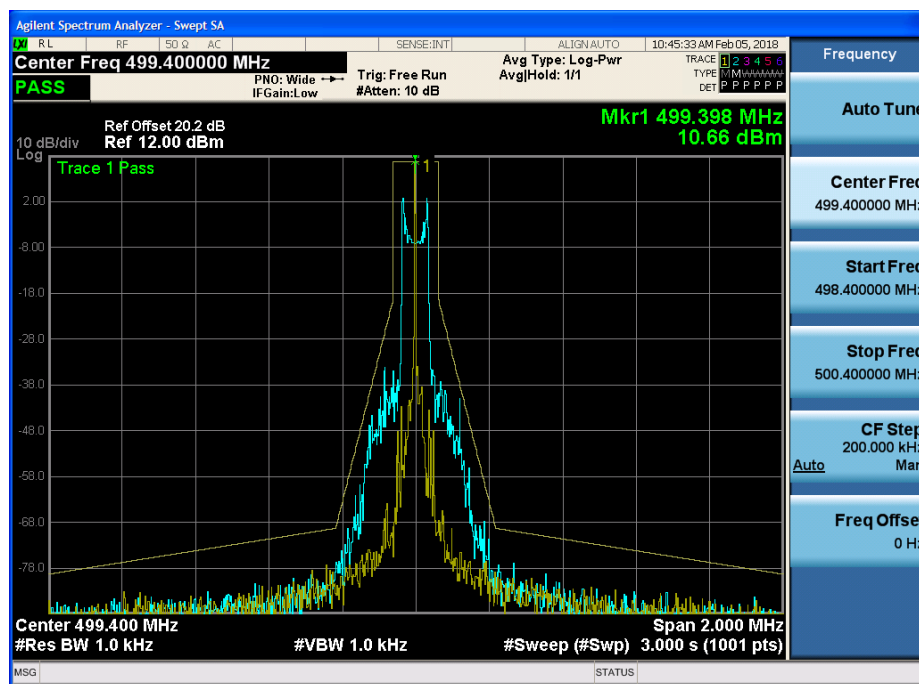
Occupied Bandwidth Plot (505.20 MHz)



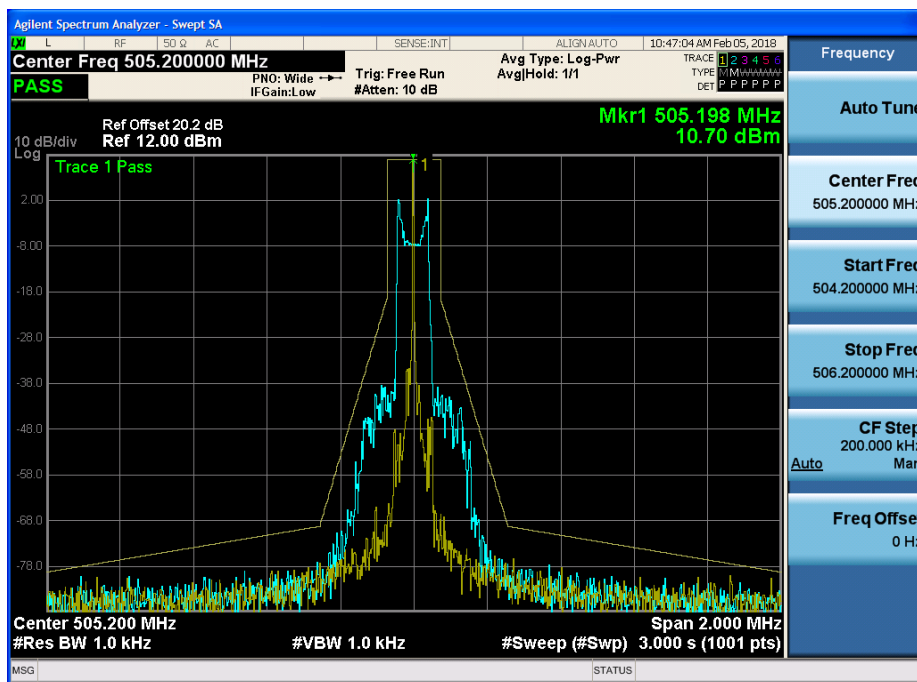
Emission mask Plot (494.00 MHz)



Emission mask Plot (499.40 MHz)

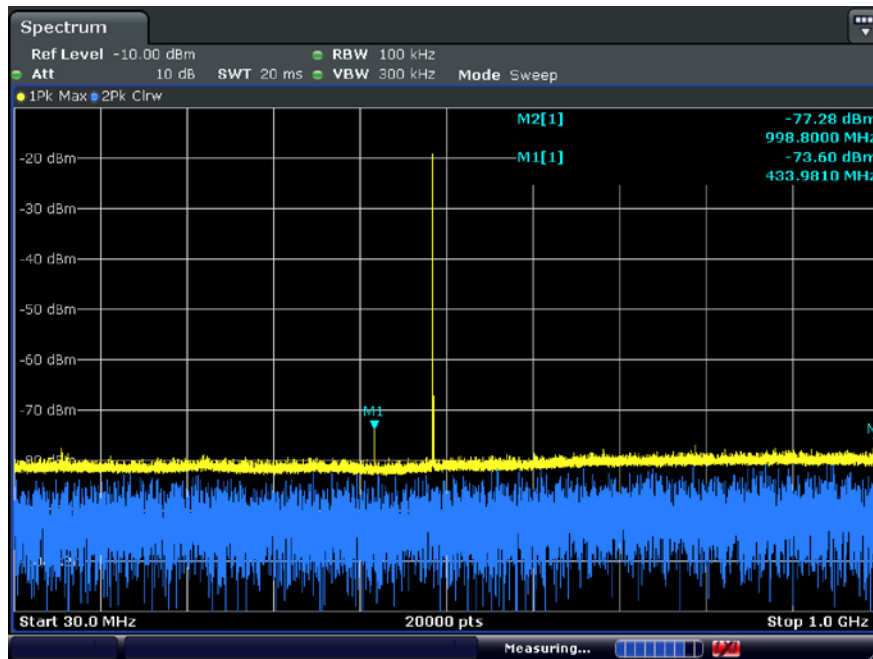


Emission mask Plot (505.20 MHz)

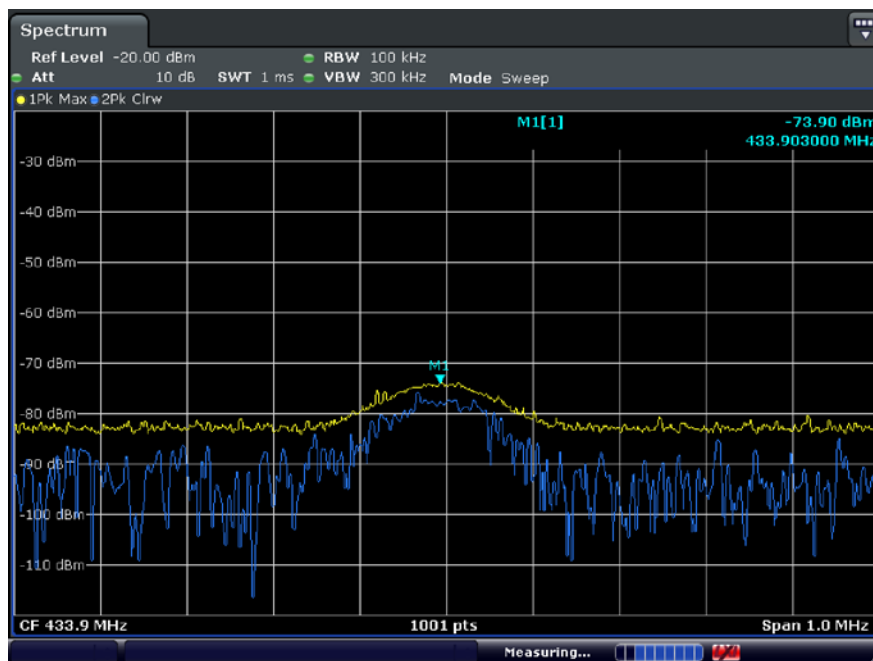


Radiated Spurious Emission Plot (Mode : Operation)

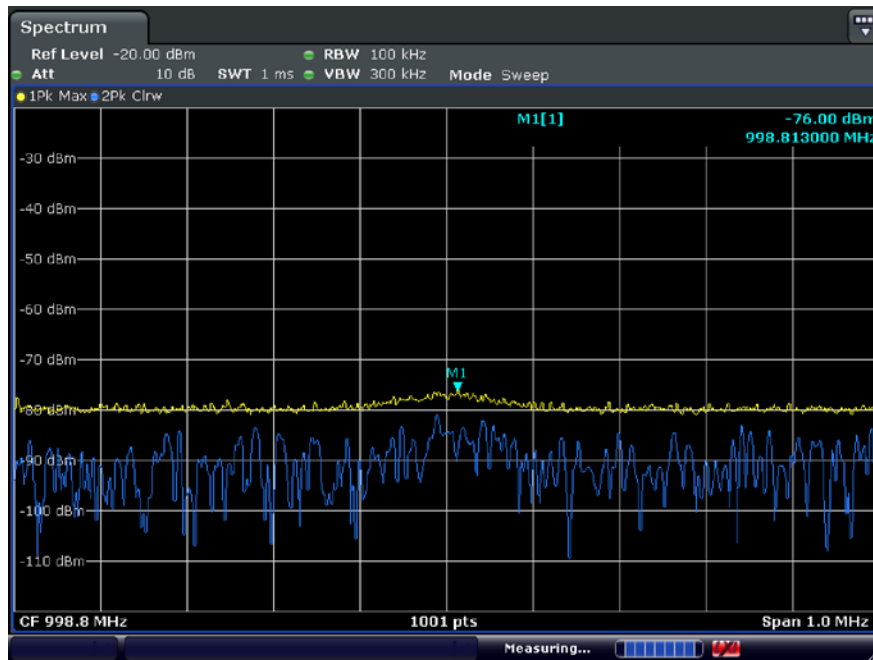
Frequency : 30MHz – 1GHz



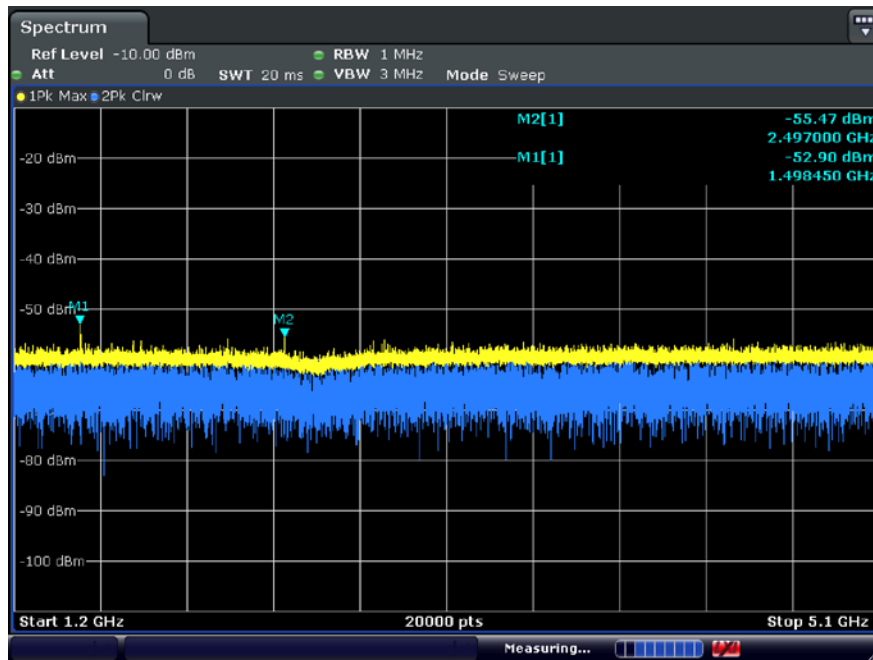
Frequency : 433.9MHz



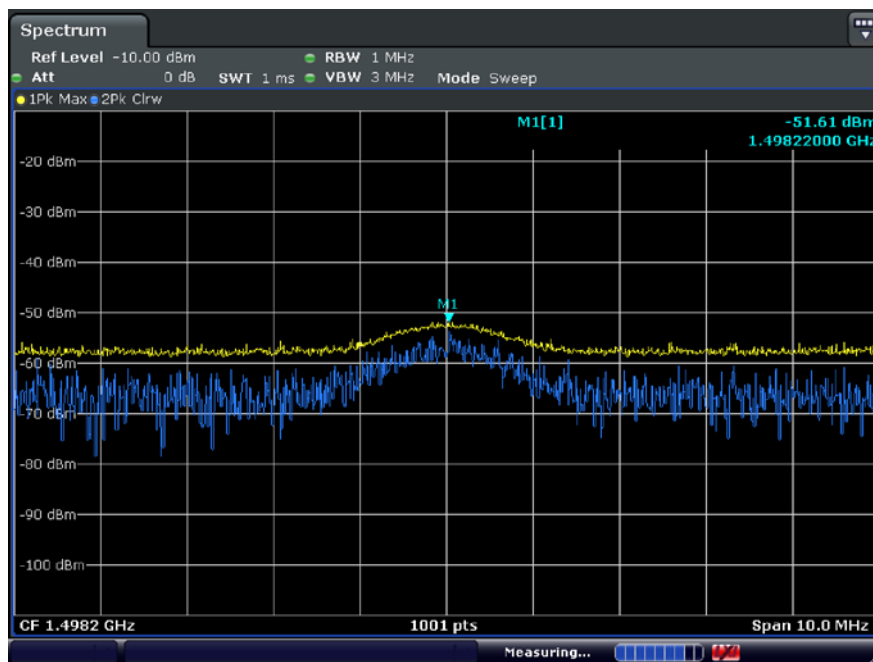
Frequency : 998.8MHz



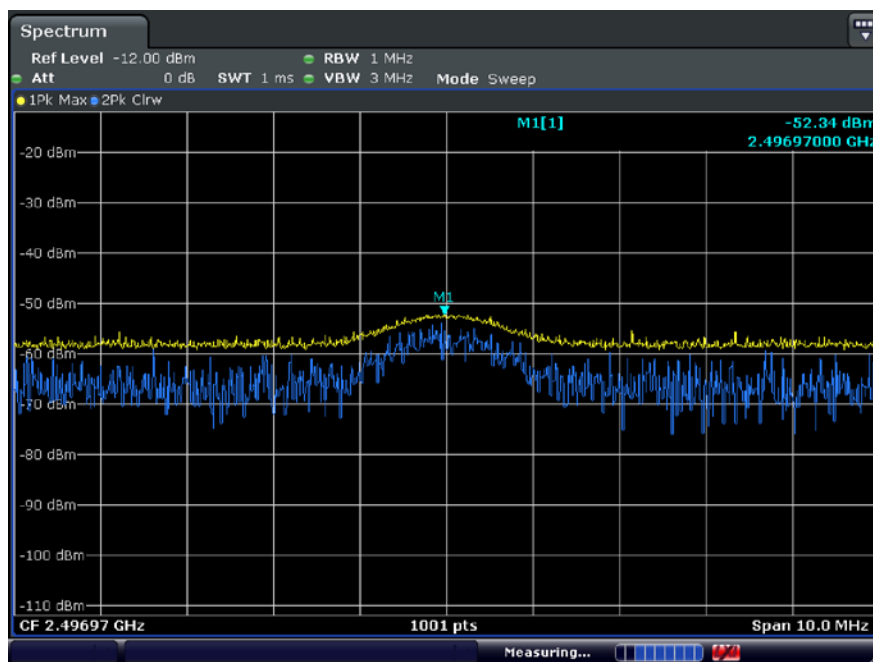
Frequency : 1GHz – 5.1GHz



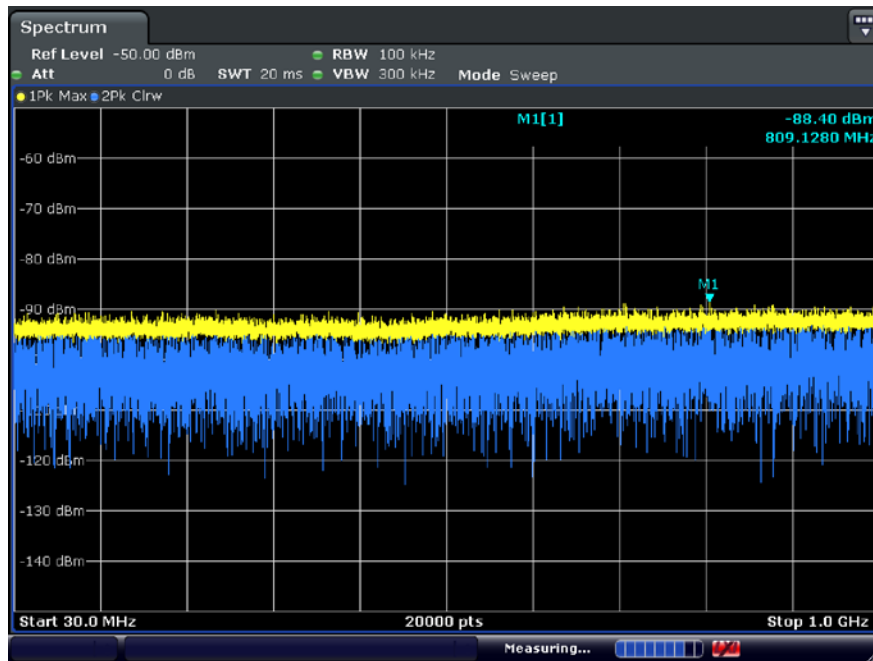
Frequency : 1498.2MHz



Frequency : 2497.0MHz



Radiated Spurious Emission Plot (Mode : Standby)
Frequency : 30MHz – 1GHz



Frequency : 1GHz – 5.1GHz

