

TEST REPORT

REPORT NUMBER: 11981280-E10V1

COMPANY NAME: Fitbit Inc.

EUT DESCRIPTION: Smart Watch

MODEL: FB505

SERIAL NUMBER: B2-A1-1238P

ISSUE DATE: 29-Jan-18

DATE TESTED: 10-Jan-18 and 29-Jan-18

APPLICABLE STANDARDS: JAPAN RADIO LAW RADIO EQUIPMENT REGULATIONS

TEST METHOD: Notice 88 of Ordinance Concerning Technical Regulations Conformity Certification of Specified Radio Equipment

Place of Testing: UL Verification Services Inc.
47173 BENICIA ST, FREMONT, CA 94538, USA

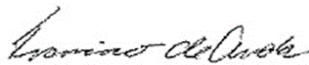
Test Result: Complies

Classification of Specified Radio Equipment: Article 2 Clause 1 Item 19

Type of radio wave, Frequency and antenna power: F1D 2402-2480MHz (Interval of 2MHz 40ch) 0.009237W

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For UL Verification Services Inc. By:



FRANCISCO DE ANDA
OPERATIONS LEAD
UL Verification Services Inc.

Tested By:



ROY ZHENG
LAB ENGINEER
UL Verification Services Inc.

Reviewed By:



TINA CHU
SENIOR PROJECT ENGINEER
UL Verification Services Inc.



1. EUT Information

Report No. : 11981280-E10V1	
Applicant : Fitbit Inc.	
Equipment	Description: Smart Watch
Model No. : FB505	
SerialNo. : B2-A1-1238P	
The number of Tx Antenna : 1	
Max Antenna Gain : -11.30dBi	
Mode : BLE	
Type of Radio wave : F1D	

Supply Voltage	Modulation
☒ DC ☐ AC 4.40V	☐ DS (e.g. WLAN 11b)
	☐ OFDM & OBW≤ 26MHz (e.g. WLAN 11g, 11n HT20)
Voltage Condition	☐ OFDM & OBW 26~38MHz (e.g. WLAN 11n HT40)
☒ Non-Extreme ☐ Extreme	☒ Other Modulation (e.g. GFSK, Not BT)
Normal DC4.4V	EUT has
Normal-10% -	☒ ANT Connector
Normal+10% -	☐ No ANT Connector distance -

The worst-case data rate for each mode is determined to be as follows, based on preliminary test of the chipset utilized in this radio.
All final tests were made at the Lowest Rate (1Mbps)

Factors

	[MHz]	Other than for Power		For Power	
		Cable Loss [dB]	ATT/[dB]	Cable Loss [dB]	ATT/[dB]
Low Channel (Tx1)	2402	0.30	10.00	0.30	10.00
Middle Channel (Tx2)	2440	0.30	10.00	0.30	10.00
High Channel (Tx3)	2480	0.30	10.00	0.30	10.00

2.TEST Result

2.1. Frequency Tolerance

Job No. 11981280-E10V1

Remark1

Remark2

[DATA]

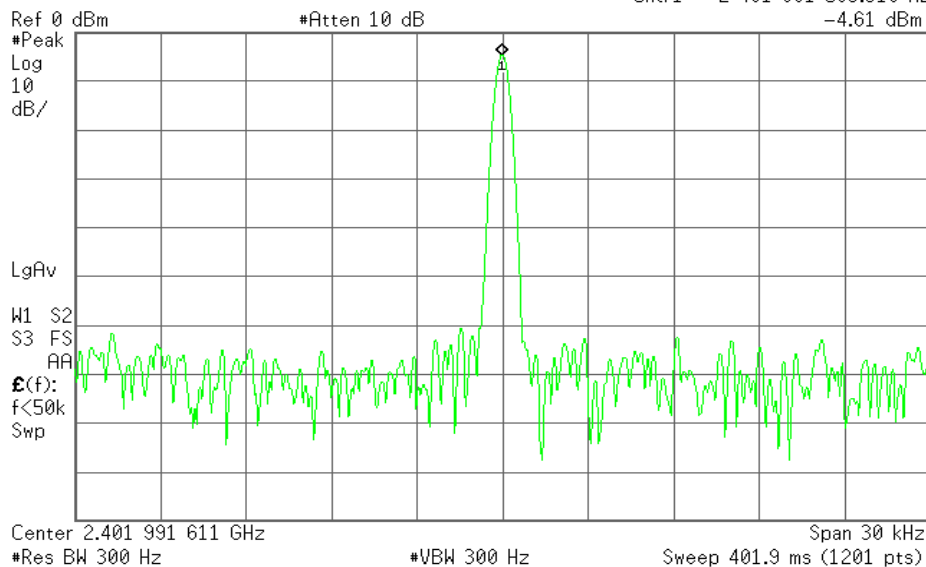
Voltage	Freq. [MHz]	Result [MHz]	Tolerance [kHz]	Tolerance [ppm]	Limit [ppm]
DC4.4V	2402	2401.9916	-8.4067	-3.50	±50.0
	2440	2439.9956	-4.4278	-1.81	±50.0
	2480	2480.0002	0.2320	0.09	±50.0

Tx1_Freq_Nom

Agilent 13:52:40 Jan 10, 2018

R L

Cntr1 2 401 991 593.310 Hz

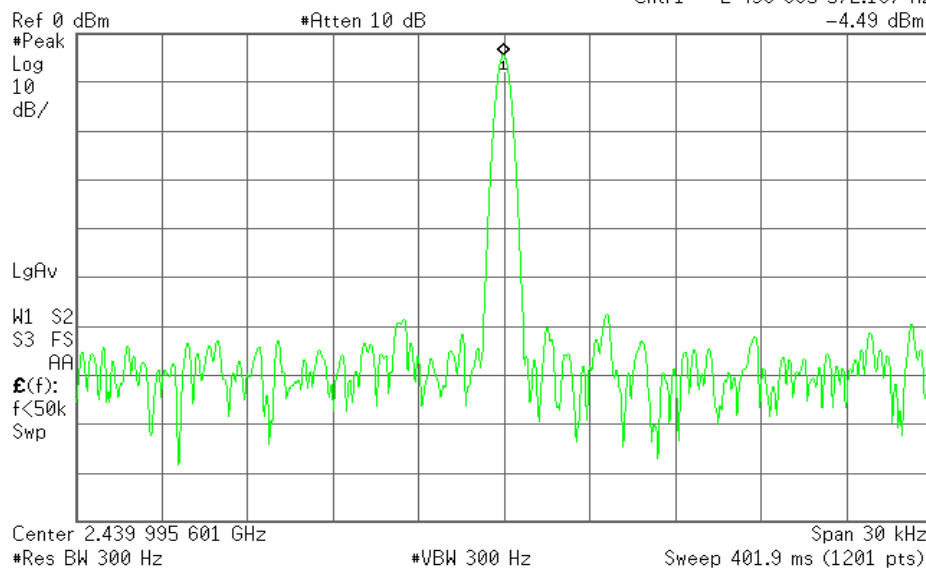


Tx2_Freq_Nom

Agilent 13:57:16 Jan 10, 2018

R L

Cntr1 2 439 995 572.187 Hz



Tx3_Freq_Nom

Tx3_Freq_Nom

Agilent 13:58:22 Jan 10, 2018

R L

Cntr1 2 480 000 231.951 Hz

-5.33 dBm

Ref 0 dBm

#Atten 10 dB

#Peak
Log
10
dB/

LgAv

W1 S2
S3 FS
AA

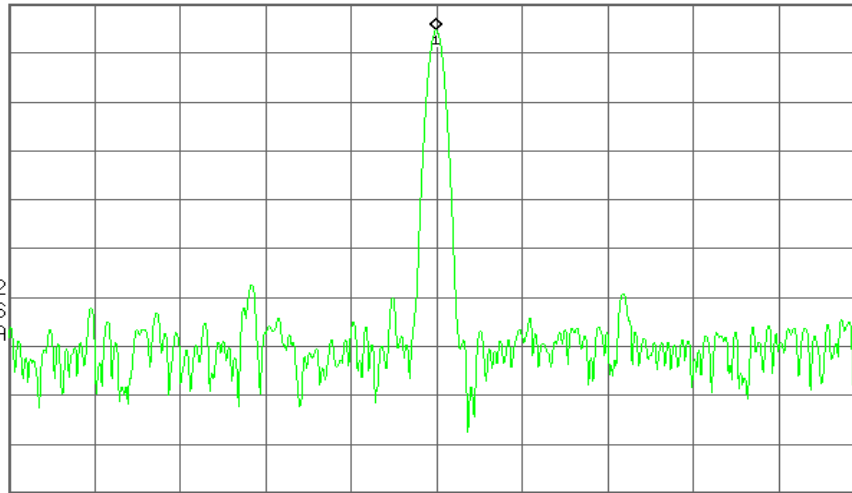
E(f):
f<50k
Swp

Center 2.480 000 250 GHz

#Res BW 300 Hz

#VBW 300 Hz

Span 30 kHz
Sweep 401.9 ms (1201 pts)



2.2. Occupied Bandwidth / Spreading Bandwidth

Job No. 11981280-E10V1

Remark1

Remark2 The Span was set suitably instead of 2 - 3.5 times the limit of OBW.

[DATA]

99% Occupied Frequency Bandwidth

Voltage	Freq. [MHz]	Result [MHz]	Limit [MHz]
DC4.4V	2402	1.2904	26
	2440	1.2909	26
	2480	1.2925	26

(Reference data)

Spreading Bandwidth

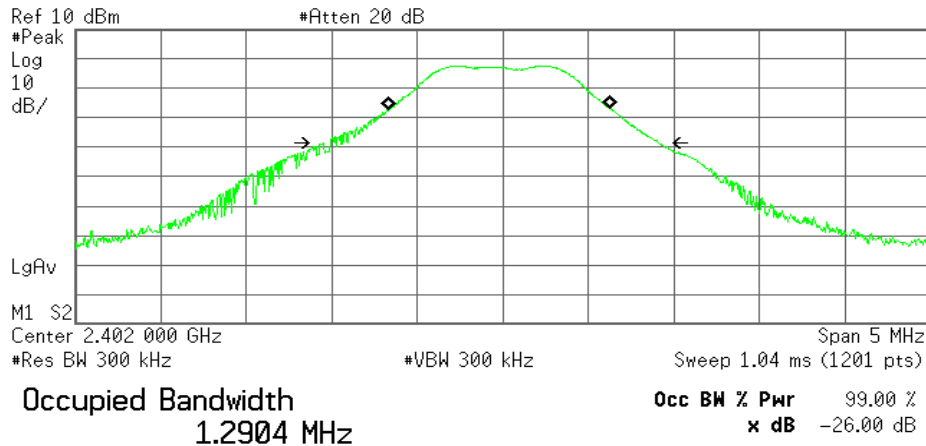
Voltage	Freq. [MHz]	Result [MHz]	Result [kHz]	Limit [kHz]
DC4.4V	2402	0.8372	-	-
	2440	0.8392	-	-
	2480	0.8394	-	-

99% Occupied Frequency Bandwidth

Tx1_99OBW_Nom

* Agilent 14:00:45 Jan 10, 2018

R L

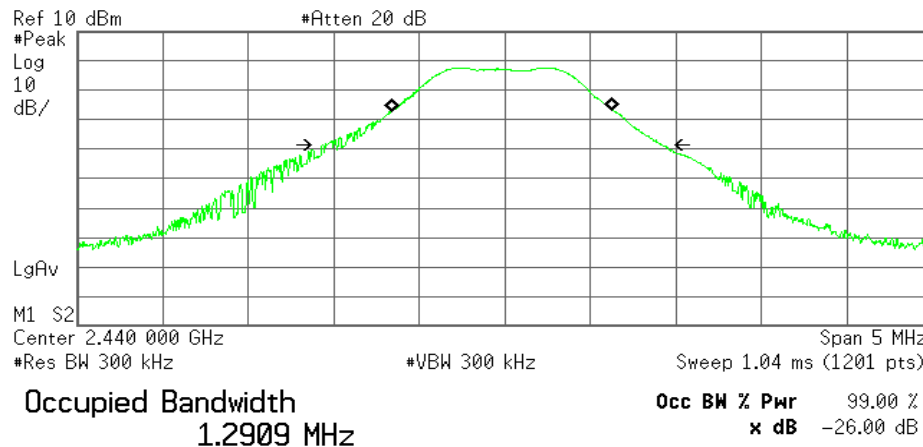


Transmit Freq Error -20.783 kHz
x dB Bandwidth 1.959 MHz

Tx2_99OBW_Nom

Agilent 14:04:18 Jan 10, 2018

R L

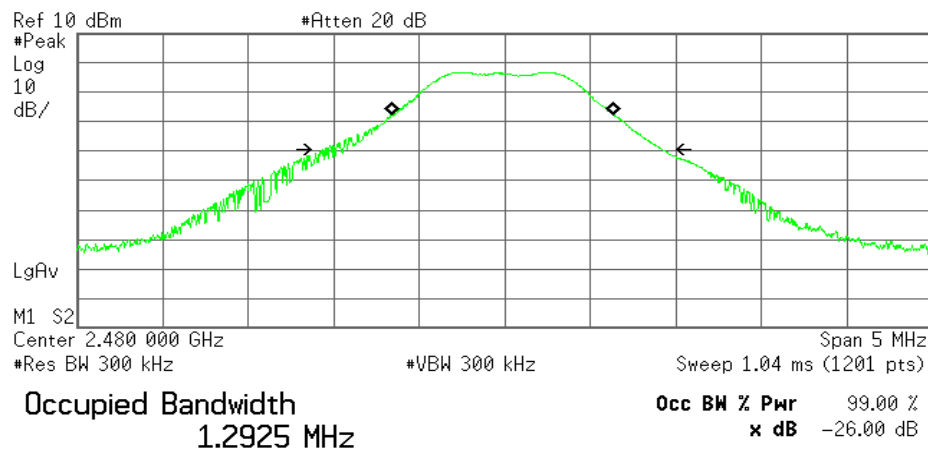


Transmit Freq Error -15.115 kHz
x dB Bandwidth 1.963 MHz

Tx3_99OBW_Nom

Agilent 14:16:47 Jan 10, 2018

R L



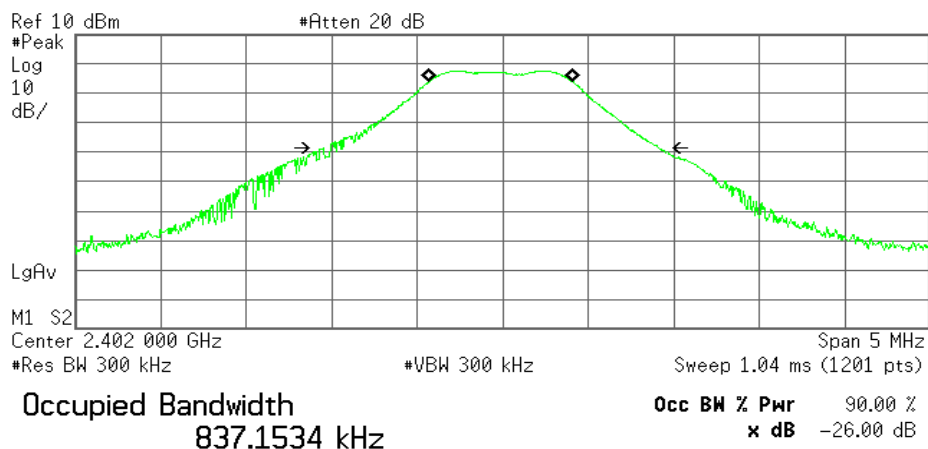
Transmit Freq Error -12.550 kHz
x dB Bandwidth 1.962 MHz

(Reference data)
Spreading Bandwidth

Tx1_900BW_Nom

Agilent 14:00:51 Jan 10, 2018

R L

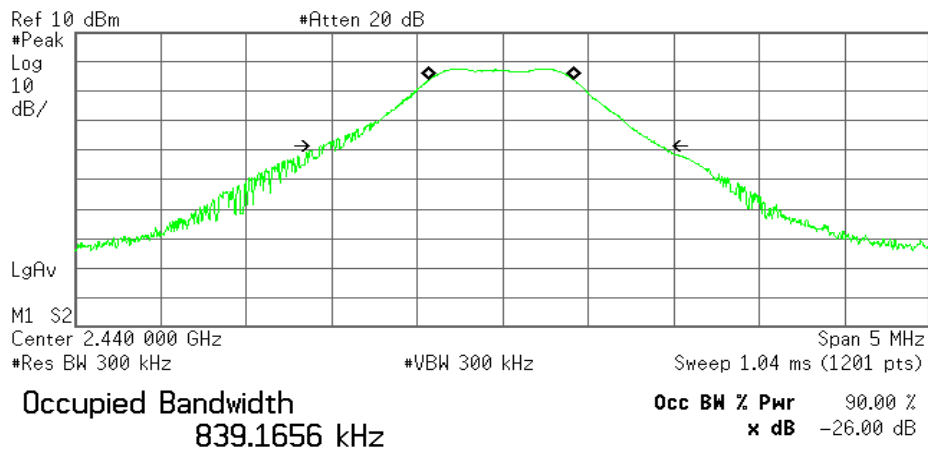


Transmit Freq Error -12.312 kHz
Occupied Bandwidth 1.960 MHz

Tx2_900BW_Nom

Agilent 14:04:24 Jan 10, 2018

R L

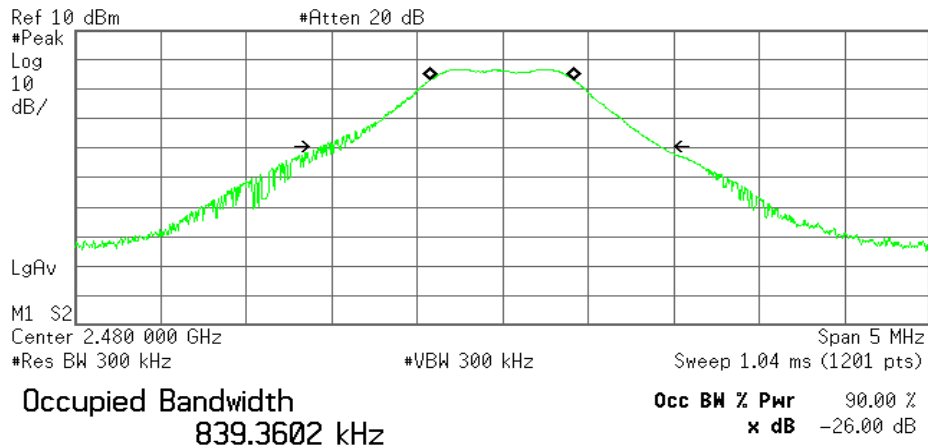


Transmit Freq Error -9.099 kHz
Occupied Bandwidth 1.963 MHz

Tx3_900BW_Nom

Agilent 14:16:53 Jan 10, 2018

R L



Transmit Freq Error -4.593 kHz
Occupied Bandwidth 1.962 MHz

2.3. Unwanted Emission Strength (Normal Voltage)

Job No. 11981280-E10V1

Remark1

Remark2

[DATA]

Voltage	Freq.	Freq.	S/A Reading	Cable Loss	Atten. Loss	Result	Result	Limit	Remark
	[MHz]	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[uW]	[uW]	
DC4.4V	2402	717.90	-61.14	0.30	10.00	-50.84	0.008	2.500	♣1
		2322.00	-61.61	0.30	10.00	-51.31	0.007	2.500	♣1
		2377.75	-52.38	0.30	10.00	-42.08	0.062	2.500	♣1
		2399.99	-61.12	0.30	10.00	-50.82	0.008	25.000	♣2
		2399.99	-33.71	0.30	10.00	-23.41	4.566	25.000	♣2
		3281.00	-58.78	0.30	10.00	-48.48	0.014	2.500	♣4
		12490.00	-57.27	0.30	10.00	-46.97	0.020	2.500	♣4
	2440	818.90	-61.04	0.30	10.00	-50.74	0.008	2.500	♣1
		2399.00	-61.39	0.30	10.00	-51.09	0.008	25.000	♣2
		3453.00	-58.66	0.30	10.00	-48.36	0.015	2.500	♣4
		7670.00	-57.24	0.30	10.00	-46.94	0.020	2.500	♣4
	2480	191.70	-61.40	0.30	10.00	-51.10	0.008	2.500	♣1
		1489.00	-61.39	0.30	10.00	-51.09	0.008	2.500	♣1
		2483.51	-58.80	0.30	10.00	-48.50	0.014	25.000	♣3
		2483.58	-72.90	0.30	10.00	-62.60	0.001	25.000	♣3
		2504.00	-57.64	0.30	10.00	-47.34	0.018	2.500	♣4
		3271.00	-58.95	0.30	10.00	-48.65	0.014	2.500	♣4
		7143.00	-56.45	0.30	10.00	-46.15	0.024	2.500	♣4

Sample Calculation :

Result = Reading + Cable Loss + Attenuator

♣1:Freq Range1 (≥ 30MHz, < 2,387MHz)

♣2:Freq Range2 (2,387MHz以上, < 2,400MHz)

♣3:Freq Range3 (> 2,483.5MHz, ≤ 2,496.5MHz)

♣4:Freq Range4 (> 2,496.5MHz, ≤ 12.5GHz)

Tx1_SpuriousM_Nom

Agilent 14:01:25 Jan 10, 2018

R L

Mkr1 717.9 MHz

-61.14 dBm

Ref 10 dBm

#Atten 20 dB

#Peak

Log

10

dB/

LgAv

V1 S2

Start 30.0 MHz

Stop 1.000 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 1.68 ms (1201 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	717.9 MHz	-61.14 dBm

Tx1_SpuriousG_Nom

Agilent 14:01:13 Jan 10, 2018

R L

Mkr4 12.490 GHz

-57.27 dBm

Ref 10 dBm

#Atten 20 dB

#Peak

Log

10

dB/

V

LgAv

V1 S2

Start 1.000 GHz

Stop 12.500 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 19.2 ms (1201 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.402 GHz	-2.42 dBm
2	(1)	Freq	2.322 GHz	-61.61 dBm
3	(1)	Freq	3.281 GHz	-58.78 dBm
4	(1)	Freq	12.490 GHz	-57.27 dBm

Tx1_BandEdgeLow_Nom

Agilent 14:01:44 Jan 10, 2018

R L

Mkr4 2.399 99 GHz

-33.71 dBm

Ref 10 dBm

#Atten 20 dB

#Peak

Log

10

dB/

LgAv

V1 S2

Start 2.320 00 GHz

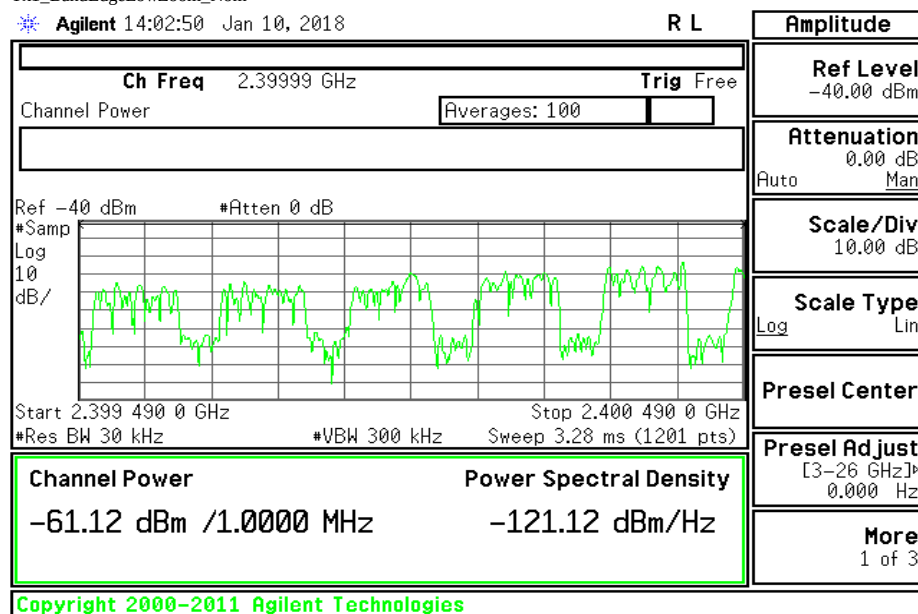
Stop 2.420 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 1.04 ms (1201 pts)

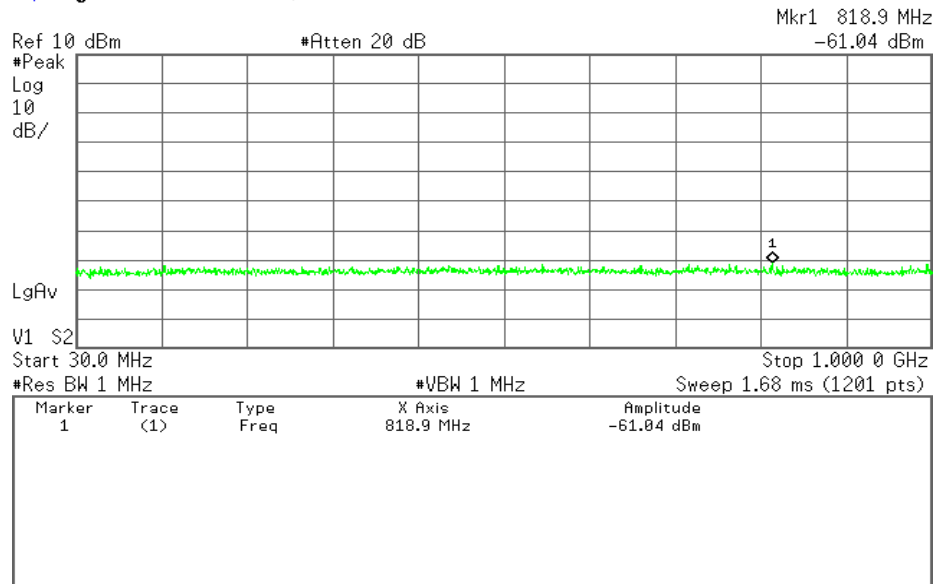
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.401 75 GHz	-2.45 dBm
2	(1)	Freq	2.399 99 GHz	-33.71 dBm
3	(1)	Freq	2.377 75 GHz	-52.38 dBm
4	(1)	Freq	2.399 99 GHz	-33.71 dBm



Tx2_SpuriousM_Nom

Agilent 14:12:35 Jan 10, 2018

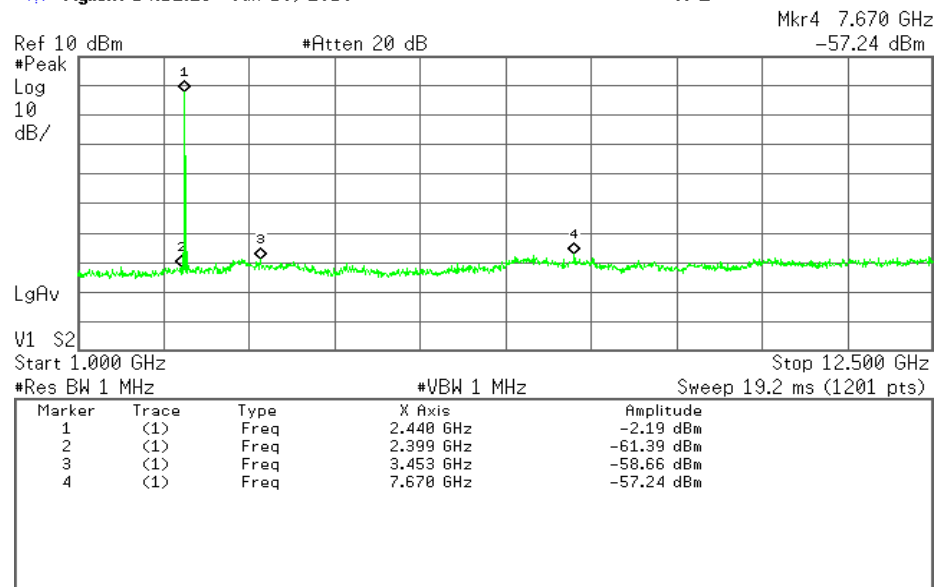
R L



Tx2_SpuriousG_Nom

Agilent 14:12:23 Jan 10, 2018

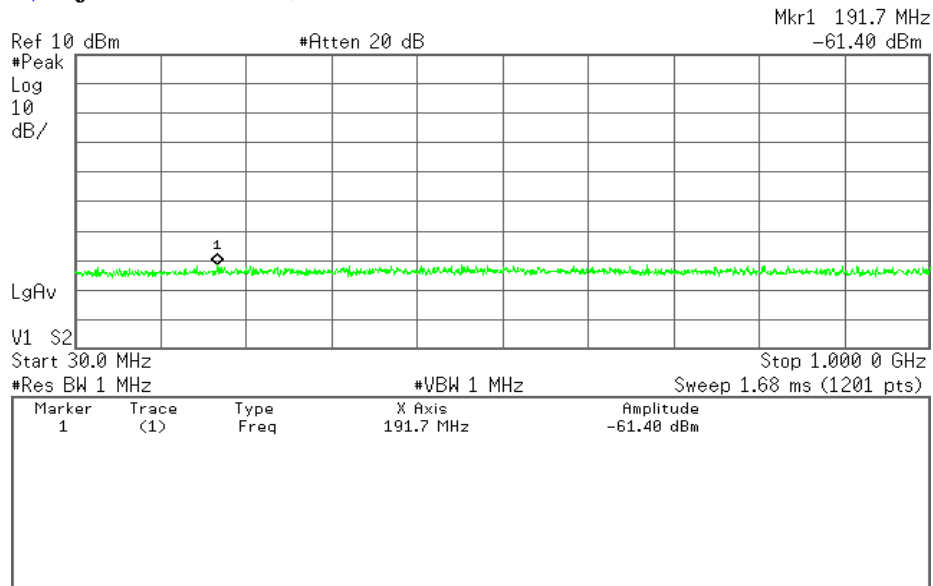
R L



Tx3_SpuriousM_Nom

Agilent 14:17:27 Jan 10, 2018

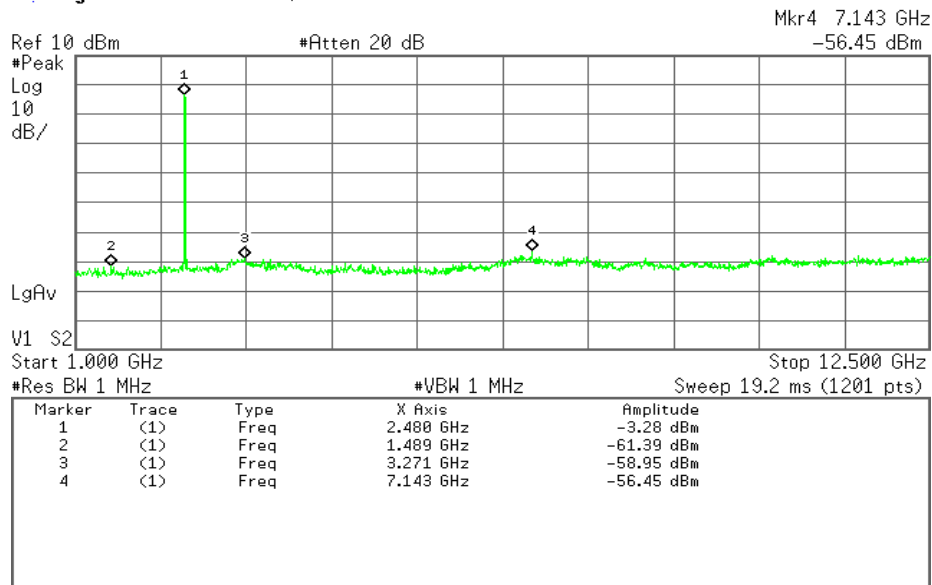
R L



Tx3_SpuriousG_Nom

Agilent 14:17:14 Jan 10, 2018

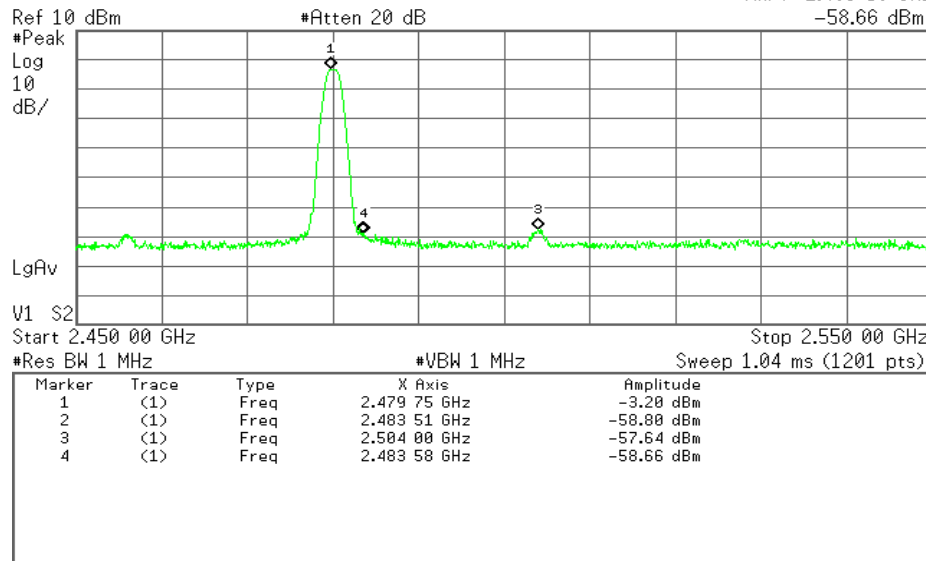
R L



Tx3_BandEdgeHigh_Nom

* Agilent 14:17:46 Jan 10, 2018

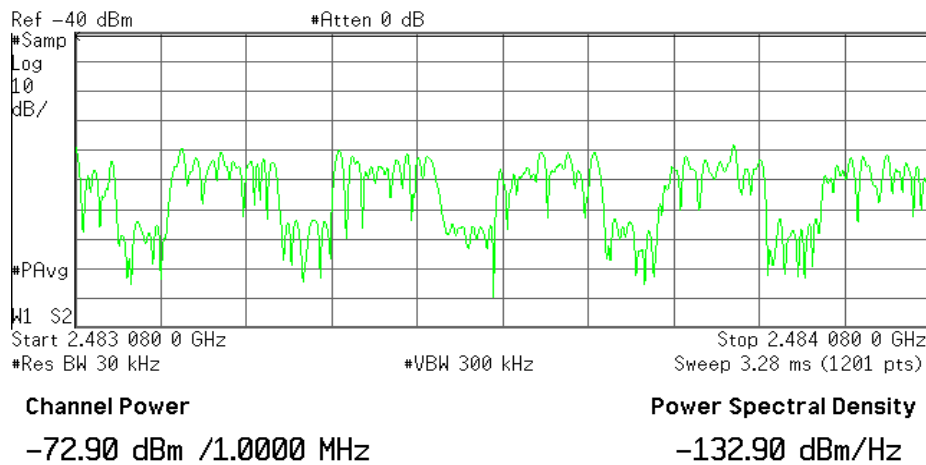
R L

Mkr4 2.483 58 GHz
-58.66 dBm

Tx3_BandEdgeHighZoom_Nom

* Agilent 14:18:39 Jan 10, 2018

R L



2.4. Output Power

Job No. 11981280-E10V1

Remark1

Remark2

[DATA]

Voltage	Chain	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [W]	Burst Rate	Output Power (A) [W]	Antenna Gain [dBi]	E.I.R.P. (A) [W]
DC4.4V	0	2402	-2.73	0.30	10.00	0.005715	1.63	0.009310	-11.30	0.000690
		2440	-2.59	0.30	10.00	0.005902	1.63	0.009615	-11.30	0.000713
		2480	-3.38	0.30	10.00	0.004920	1.63	0.008016	-11.30	0.000594
DC4.4V	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
DC4.4V	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
DC4.4V	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-

Sample Calculation :

Output Power (A) = $10^{\left(\left(\text{Reading [dBm]} + \text{Cable Loss} + \text{Atten. Loss} \right) / 10 \right)}$ * Burst Rate

E.I.R.P. (A) = Output Power (A) * $10^{\left(\text{Antenna Gain[dBi]}/10 \right)}$

[Total Power / Result and Limit]

Voltage	Freq. [MHz]	Output Power				E.I.R.P.		
		Result (B) [W]	Tolerance Result [%]	Limit [W]	Tolerance Limit [%]	Result (B) [W]	Result [dBm]	Limit [dBm]
DC4.4V	2402	0.009310	0.8	0.010000	+20 ~ -80	0.000690	-1.61	12.14
	2440	0.009615	4.1	0.010000	+20 ~ -80	0.000713	-1.47	12.14
	2480	0.008016	-13.2	0.010000	+20 ~ -80	0.000594	-2.26	12.14

Sample Calculation :

Tolerance = Output Power Result (B) / Declared Output Power * 100 - 100.

Output Power Result (B) : Sum of all "Output Power (A)" at same Freq.

E.I.R.P. Result (B): Sum of all "E.I.R.P. (A)" at same Freq.

[Declared Output Power]

Average of Output Power Result (B)	0.008980	[W]	Average of E.I.R.P. Result(B)	0.000666	[W]
Declared Output Power	0.009237	[W]	E.I.R.P. for Declared Output Power	-1.64	[dBm]
+20	0.011084	[W]			
Middle (Declared Output Power -30%)	0.006466	[W]			
-80	0.001847	[W]			

Sample Calculation :

E.I.R.P. for Declared Output Power

= $10 * \log \left(\text{Average of E.I.R.P. Result (B)} * \left(\text{Declared Output Power} / \text{Average of Output Power Result (B)} \right) * 1000 \right)$

2.5. Secondary Radiated Emission Strength

Job No. 11981280-E10V1

Remark1

Remark2

[DATA]

Voltage [V]	Freq. [MHz]	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [nW]	Limit [nW]	Remark
DC4.4V	2402	542.5	-90.96	0.30	10.00	-80.66	0.009	4.000	♦5
		12011.0	-77.26	0.30	10.00	-66.96	0.201	20.000	♦6
DC4.4V	2440	992.7	-90.14	0.30	10.00	-79.84	0.010	4.000	♦5
		7066.0	-77.23	0.30	10.00	-66.93	0.203	20.000	♦6
DC4.4V	2480	437.4	-91.52	0.30	10.00	-81.22	0.008	4.000	♦5
		12414.0	-77.66	0.30	10.00	-67.36	0.184	20.000	♦6

Sample Calculation :

Result = Reading + Cable Loss

♦5:Freq Range5 (≥ 30MHz, <1GHz)

♦6:Freq Range6 (≥ 1GHz, ≤ 12.5GHz)

Rx1_SpuriousL_Nom

Agilent 10:41:38 Jan 29, 2018

L

APv7.9.1(012518),38596,

Mkr1 542.5 MHz

Ref -10 dBm

#Atten 0 dB

-90.96 dBm

#Peak

Log

10

dB/

LgAv

M1 S2

S3 FC

AA

E(f):

FTun

Swp

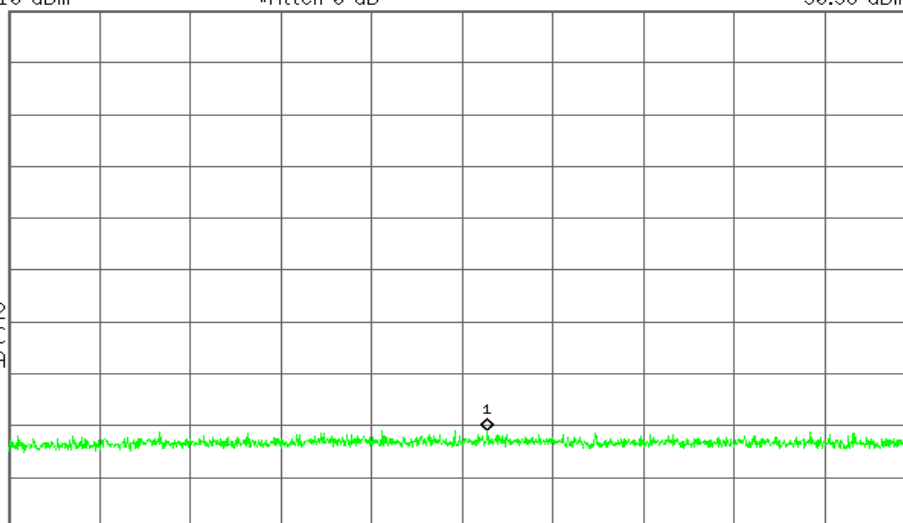
Start 30.0 MHz

#Res BW 100 kHz

#VBW 100 kHz

Stop 1.000 0 GHz

Sweep 117 ms (1201 pts)



Rx1_SpuriousL G_Nom

Agilent 10:43:09 Jan 29, 2018

L

APv7.9.1(012518),38596,

Mkr1 12.011 GHz

Ref -10 dBm

#Atten 0 dB

-77.26 dBm

#Peak

Log

10

dB/

LgAv

M1 S2

S3 FC

AA

E(f):

FTun

Swp

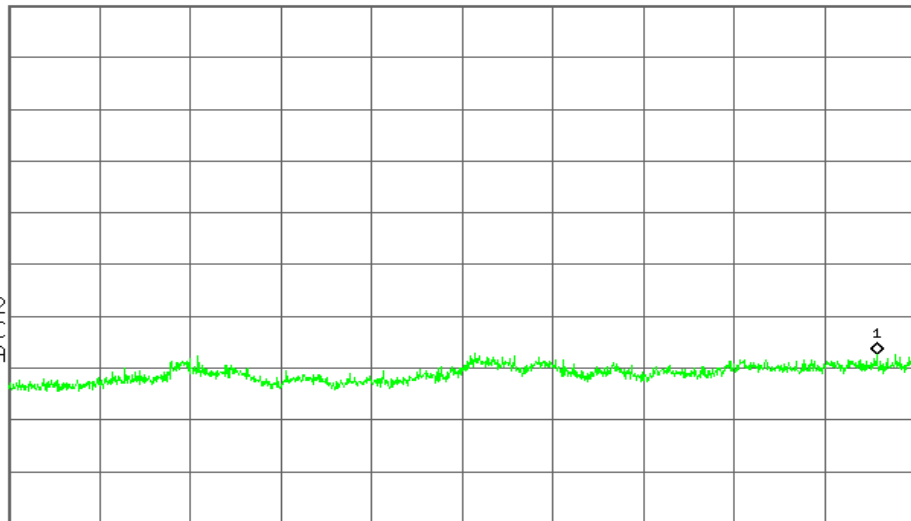
Start 1.000 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 12.500 GHz

Sweep 19.2 ms (1201 pts)



Rx2_SpuriousM_Nom

Agilent 14:20:01 Jan 10, 2018

R L

Mkr1 992.7 MHz

-90.14 dBm

Ref -10 dBm

#Atten 0 dB

#Peak
Log
10
dB/

LgAv

V1 S2
S3 FC
AA

E(f):
FTun
Swp

Start 30.0 MHz

Stop 1.000 0 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 117 ms (1201 pts)

Rx2_SpuriousG_Nom

Agilent 14:19:49 Jan 10, 2018

R L

Mkr1 7.066 GHz

-77.22 dBm

Ref -10 dBm

#Atten 0 dB

#Peak
Log
10
dB/

LgAv

V1 S2
S3 FC
AA

E(f):
FTun
Swp

Start 1.000 GHz

Stop 12.500 GHz

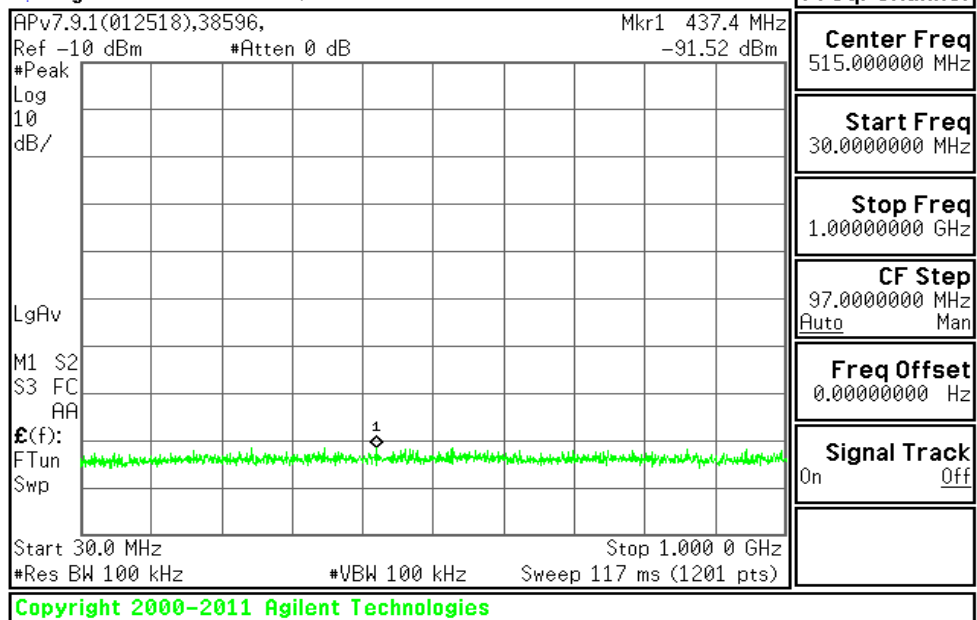
#Res BW 1 MHz

#VBW 1 MHz

Sweep 19.2 ms (1201 pts)

Agilent 10:41:55 Jan 29, 2018

L



Rx3_SpuriousH G_Nom

Agilent 10:42:40 Jan 29, 2018

L

APv7.9.1(012518),38596,

Mkr1 12.414 GHz

Ref -10 dBm

#Atten 0 dB

-77.66 dBm

#Peak

Log

10

dB/

LgAv

M1 S2

S3	FC
----	----

AA

 $\mathbb{E}(f):$

FTun

Swp

comp

Start 1.000 GHz

```
#Res BW 1 MHz
```

```
#VBW 1 MHz
```

Stop 12.500 GHz

Sweep 19.2 ms (1201 pts)

2.6. Duty / Burst Rate

Job No. 11981280-E10V1

Remark1

Remark2

[DATA]

Voltage	Freq.	On Time	Period	Result (Duty)	Result (Burst Rate)
[V]	[MHz]	[msec]	[msec]	[%]	
DC4.4V	2440	0.389	0.633	61.4	1.629

Sample Calculation :

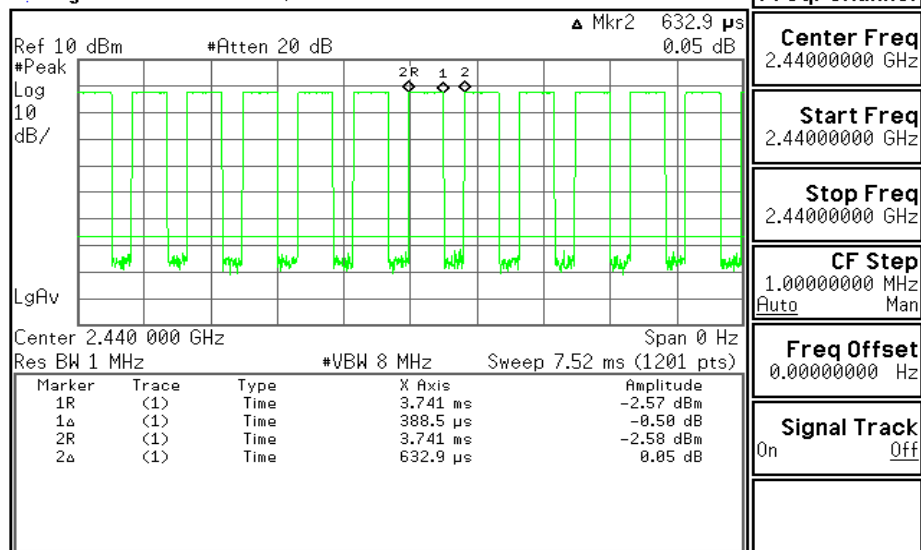
Result(Duty) = On Time / Period * 100

Result(Burst Rate) = Period / On Time

Tx2_Duty_Nom

Agilent 14:30:38 Jan 10, 2018

R L



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3. Measurement Equipment

Use	Int. No.	Kind of Equipment	Model No.	Manufacturer	Serial No.	Calibration Authority	Calibration Date
X	T146	Spectrum Analyzer (PSA)	E4446A	Agilent	MY45300064	Keysight	7/18/2017
X	T1268	Power Meter	N1911A	Keysight	MY55196017	Keysight	7/15/2017
X	T413	Power Sensor	N1921A	Keysight	MY52020011	Keysight	7/22/2017

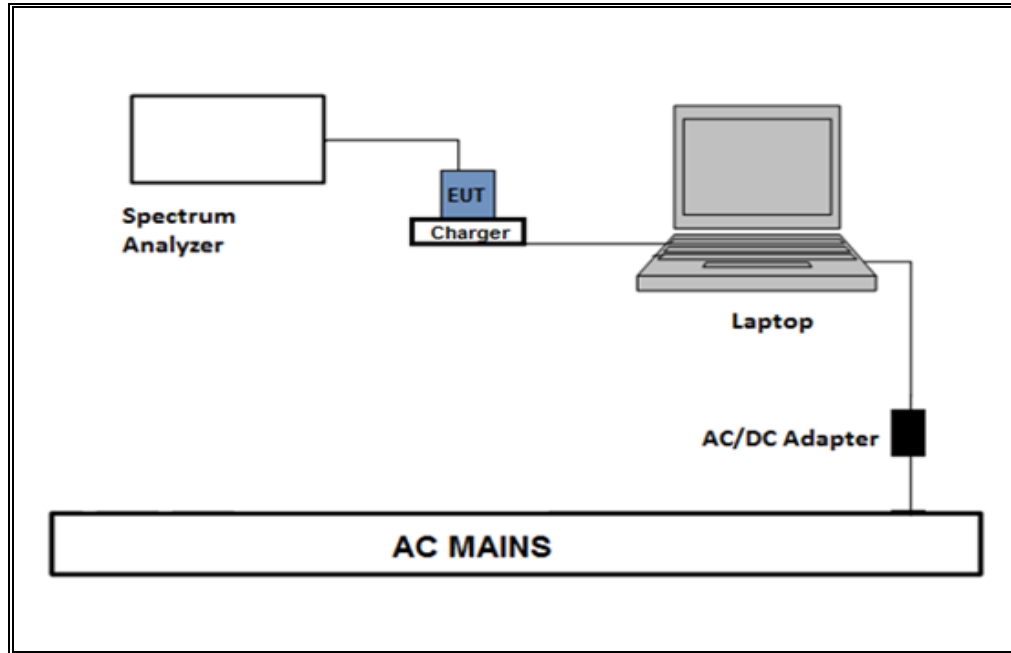
- Note :
1. The calibration of measurement equipment is valid for a one year period.
 2. "X" used equipment.
 3. All equipment is calibrated and traceable to ISO17025

4. Test Condition

Test Item	Date	Temp (5-35°C)	Humidity (45-85%RH)	Engineer	Test Room
Frequency Tolerance	1/10/2018	26.3 deg C	48%	Roy Zheng	Conducted B
Occupied Bandwidth	1/10/2018	26.3 deg C	48%	Roy Zheng	Conducted B
Unwanted Emission Strength	1/10/2018	26.3 deg C	48%	Roy Zheng	Conducted B
Output Power/ E.I.R.P	1/10/2018	26.3 deg C	48%	Roy Zheng	Conducted B
Secondary Radiated Emission Strength	1/10/2018 & 1-29-2018	26.3 deg C	48%	Roy Zheng	Conducted B
Burst Length / Duty	1/10/2018	26.3 deg C	48%	Roy Zheng	Conducted B

5. TEST CONFIGURATION

TEST CirCuit



PHOTO

