TEST REPORT

REPORT NUMBER:	R12053557-E9d
COMPANY NAME:	Bose Corporation
EUT DESCRIPTION:	Wireless Module
MODEL:	424821
SERIAL NUMBER:	0122
ISSUE DATE:	2018-08-07
DATE TESTED:	4/19 to 7/10/2018
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 LLC 12 LABORATORY DRIVE, RESEARCH TRIANGLE PARK, NC 27709 USA
Test Result:	Complies
Classification of Specified Radio Equipment:	Article 2 Clause 1 Item 19-3

Type of radio wave, Frequency and antenna power:	G1D, D1D	5210MHz MIMO	0.000916W/MHz
	G1D, D1D	5290MHz MIMO	0.000485W/MHz
		5210MHz SISO (Max Chain)	0.000477W/MHz
		5290MHz SISO (Max Chain)	0.000299W/MHz

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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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, or any agency of the U.S. government.

Approved & Released For UL LLC. By:	Prepared By:
Jeffrey Moser Operations Leader UL LLC	Brian T. Kiewra Project Engineer UL LLC

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TESTING
ilac-MRA
NVLAP Lab code: 200246-0

1. EUT Information

Report No. :	R12053557-E9d
Applicant :	Bose Corporation
Equipment Description:	Wireless Module
Model No. :	424821
SerialNo. :	0122
The number of Tx Antenna :	2
Max Antenna Gain :	4.0dBi
Mode :	IEEE802.11ac
Type of Radio wave :	G1D, D1D

Supply Voltage

● DC ○ AC 4.00V

-

Modulation

● OFDM (OBW 38-78MHz)

○ OFDM (OBW 78-158MHz)

Voltage Condition

● Non-Extreme ○ Extreme

Normal DC4V

Normal-10% -

Normal+10% -

EUT has

● ANT Connector

○ No ANT Connector

distance -

EUT has

○ TPC Function

● No TPC Funciton

Band

● Single

○ Dual

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.

Factors

		Other than for Power and ACP		For Power	
	[MHz]	Cable Loss [dB]	ATT/ [dB]	Cable Loss [dB]	ATT/ [dB]
Low Channel (Tx1)	5210	16.26	0.00	16.26	0.00
Middle Channel (Tx2)	-				
High Channel (Tx3)	5290	16.26	0.00	16.26	0.00
Remarks					

* Cable loss and ATT are not taken into account for ACP.

Report Version Info

Ver.	Issue Date	Description	Revised By
1	2018-06-04	Initial Release.	Brian T. Kiewra
2	2018-06-27	Revised nominal input voltage	Brian T. Kiewra
3	2018-07-10	Revised cable loss information in Output power Section which required new measurements.	Brian T. Kiewra
4	2018-07-25	Revised output power to include MIMO and SISO measurements.	Brian T. Kiewra
5	2018-08-07	Declared MIMO and Worst-case SISO power.	Brian T. Kiewra

2.TEST Result

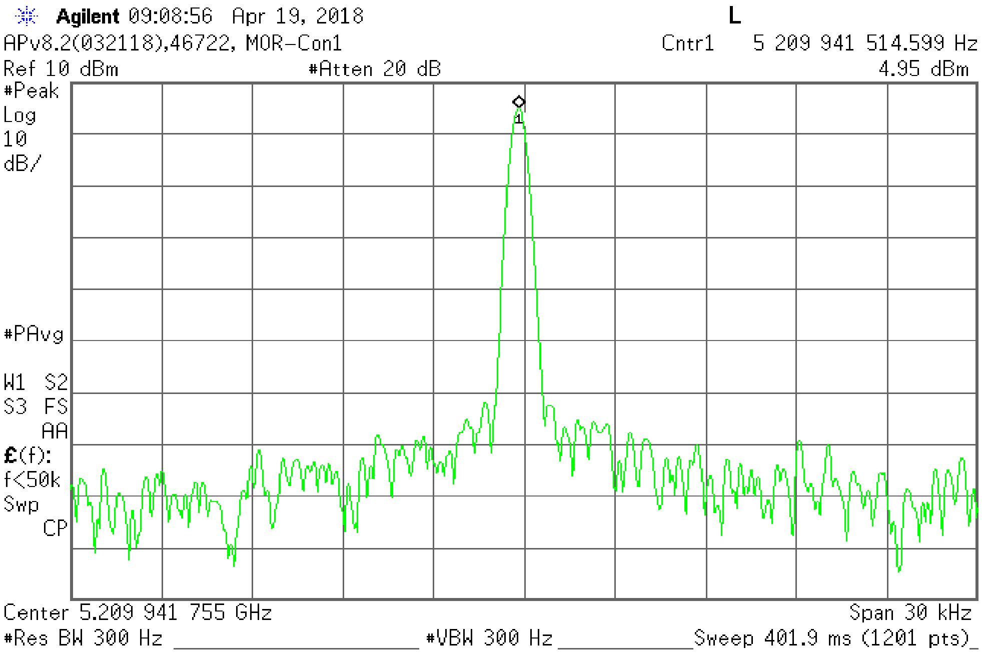
2.1. Frequency Tolerance

Job No.	R12053557-E9d
Remark1	
Remark2	

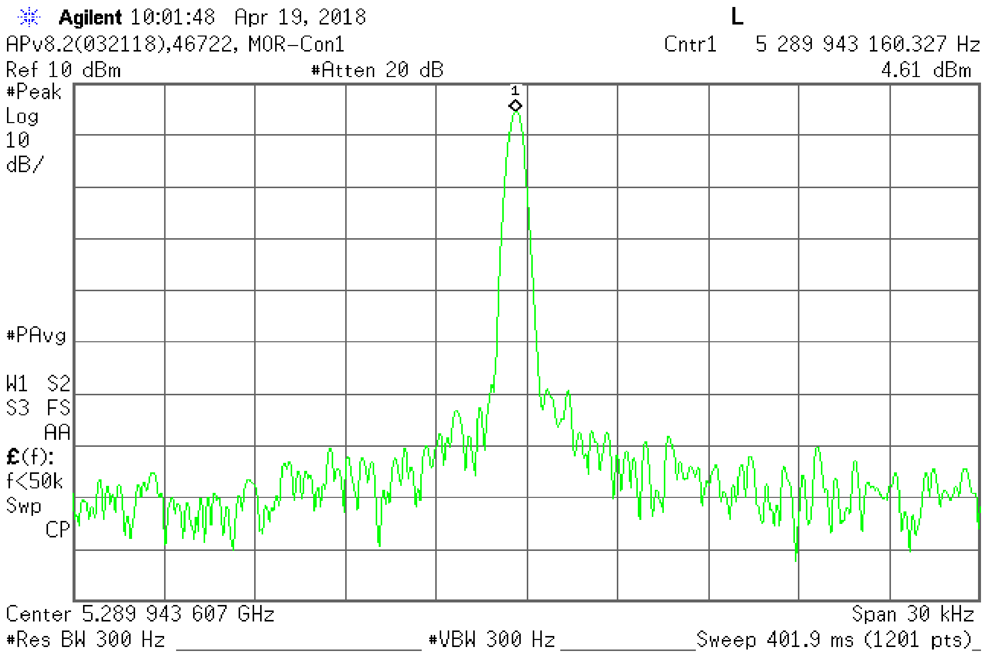
[DATA]

Voltage	Freq. [MHz]	Result [MHz]	Tolerance [kHz]	Tolerance [ppm]	Limit [ppm]
DC4V	5210	5209.9415	-58.5000	-11.23	±20.0
	-	-	-	-	±20.0
	5290	5289.9432	-56.8000	-10.74	±20.0

Tx1_Freq_Nom



Tx3_Freq_Nom



Agilent 10:01:48 Apr 19, 2018

APv8.2(032118),46722, MOR-Con1

Ref 10 dBm #Atten 20 dB

Cntr1 5 289 943 160.327 Hz

4.61 dBm

Center 5.289 943 607 GHz

Span 30 kHz

#Res BW 300 Hz

#VBW 300 Hz

Sweep 401.9 ms (1201 pts)

2.2. Occupied Bandwidth

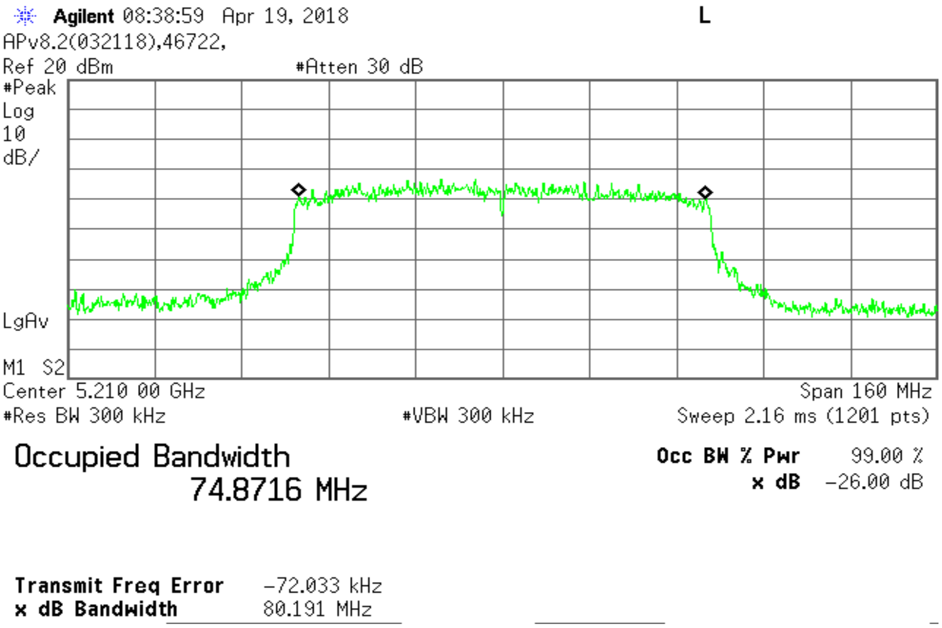
Job No.	R12053557-E9d
Remark1	
Remark2	

[DATA]

99% Occupied Frequency Bandwidth

Voltage	Freq. [MHz]	Result [MHz]	Limit [MHz]
DC4V	5210	74.8716	78
	-	-	-
	5290	74.6671	78

Tx1_99OBW_Nom



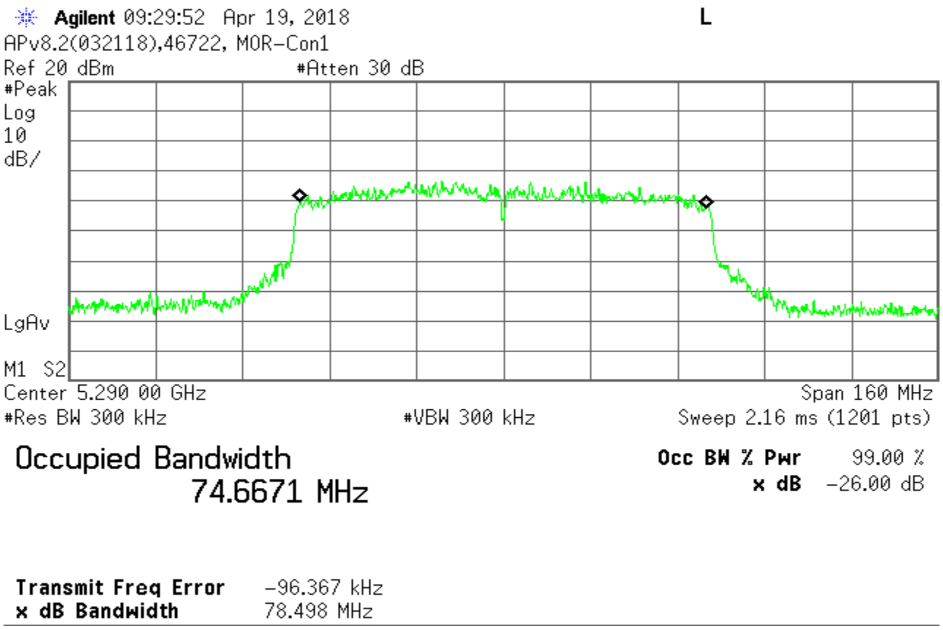
Agilent 08:38:59 Apr 19, 2018
L
APv8.2(032118),46722,
Ref 20 dBm
#Atten 30 dB
#Peak
Log
10
dB/
LgAv
M1 S2
Center 5.210 00 GHz
Span 160 MHz
#Res BW 300 kHz
#VBW 300 kHz
Sweep 2.16 ms (1201 pts)

Occupied Bandwidth
74.8716 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -72.033 kHz
x dB Bandwidth 80.191 MHz

Tx3_99OBW_Nom



Agilent 09:29:52 Apr 19, 2018

APv8.2(032118),46722, MOR-Con1

Ref 20 dBm #Atten 30 dB

Center 5.290 00 GHz Span 160 MHz

#Res BW 300 kHz #VBW 300 kHz Sweep 2.16 ms (1201 pts)

Occupied Bandwidth
74.6671 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

Transmit Freq Error -96.367 kHz

x dB Bandwidth 78.498 MHz

2.3.Unwanted Emission Strength (Normal Voltage)

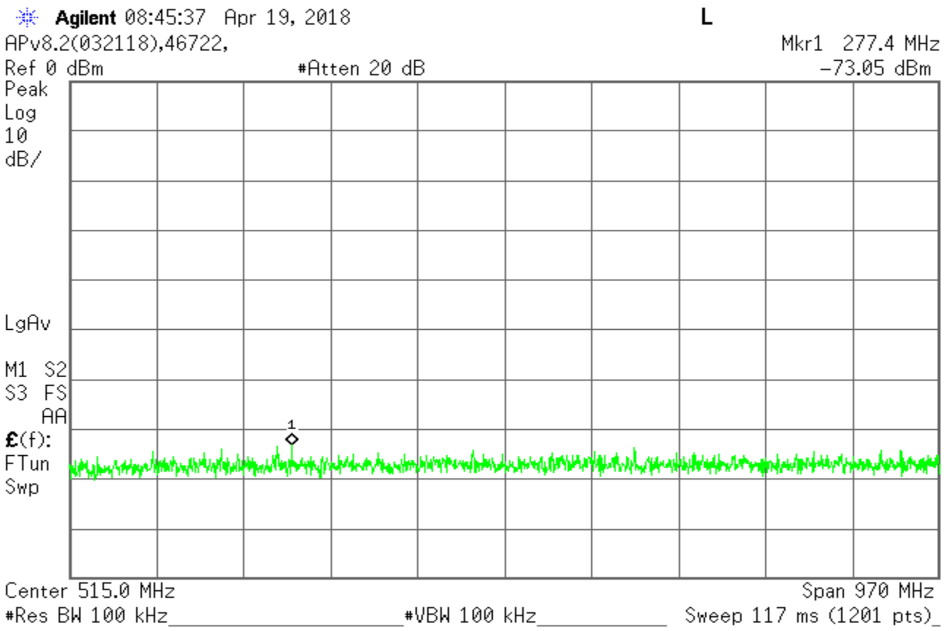
Job No. R12053557-E9d
Remark1
Remark2

[DATA]

Voltage	Freq. [MHz]	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [uW]	Limit [uW]	Remark
DC4V	5210	277.40	-73.05	16.26	0.00	-46.79	0.021	2.500	♦1
		4386.20	-67.45	16.26	0.00	-51.19	0.008	2.500	♦1
		4986.00	-59.47	16.26	0.00	-43.21	0.048	2.500	♦1
		6934.00	-55.59	16.26	0.00	-39.33	0.117	2.500	♦2
		13992.00	-54.35	16.26	0.00	-38.09	0.155	2.500	♦2
		15508.00	-53.16	16.26	0.00	-36.90	0.204	2.500	♦2
		24775.00	-50.99	16.26	0.00	-34.73	0.337	2.500	♦2
	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
	5290	930.50	-73.09	16.26	0.00	-46.83	0.021	2.500	♦1
		4438.80	-67.23	16.26	0.00	-50.97	0.008	2.500	♦1
		4940.00	-56.37	16.26	0.00	-40.11	0.097	2.500	♦1
		6897.00	-56.19	16.26	0.00	-39.93	0.102	2.500	♦2
		13988.00	-56.00	16.26	0.00	-39.74	0.106	2.500	♦2
		15538.00	-54.97	16.26	0.00	-38.71	0.135	2.500	♦2
		25585.00	-51.33	16.26	0.00	-35.07	0.311	2.500	♦2

Sample Calculation :
Result = Reading + Cable Loss + Attenuator + 1MHz RBW Correction (<1000MHz)
♦1:Freq Range (< 5020MHz)
♦2:Freq Range (> 5480MHz)

Tx1_SpuriousM_Nom



Agilent 08:45:37 Apr 19, 2018 L

APv8.2(032118),46722,

Mkr1 277.4 MHz

Ref 0 dBm #Atten 20 dB -73.05 dBm

Peak

Log

10

dB/

LgAv

M1 S2

S3 FS

AA

£(f):

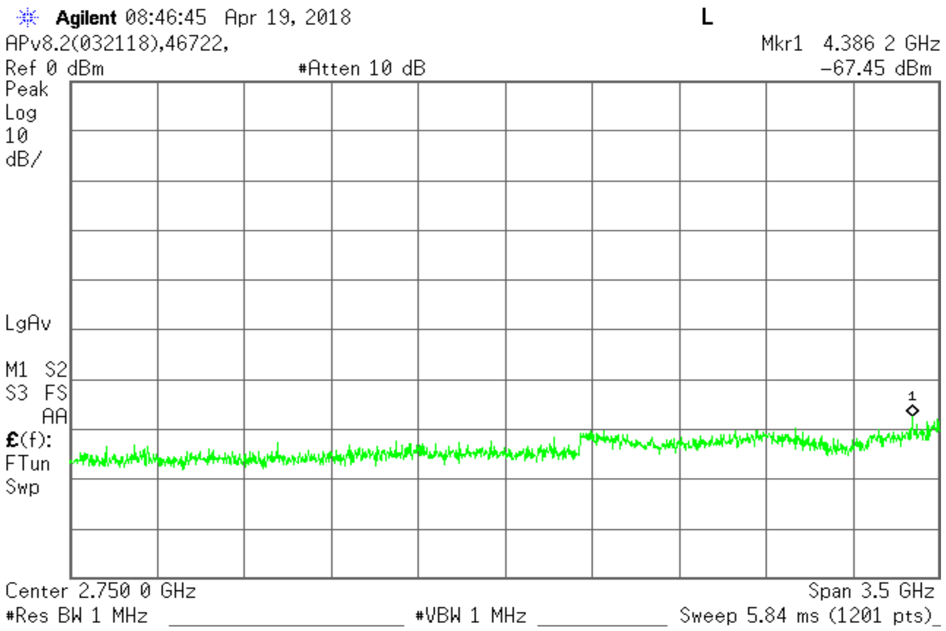
FTun

Swp

Center 515.0 MHz Span 970 MHz

#Res BW 100 kHz #VBW 100 kHz Sweep 117 ms (1201 pts)

Tx1_SpuriousG1_Nom



Agilent 08:46:45 Apr 19, 2018 L

APv8.2(032118),46722,

Mkr1 4.386 2 GHz

Ref 0 dBm #Atten 10 dB -67.45 dBm

Peak

Log

10

dB/

LgAv

M1 S2

S3 FS

AA

£(f):

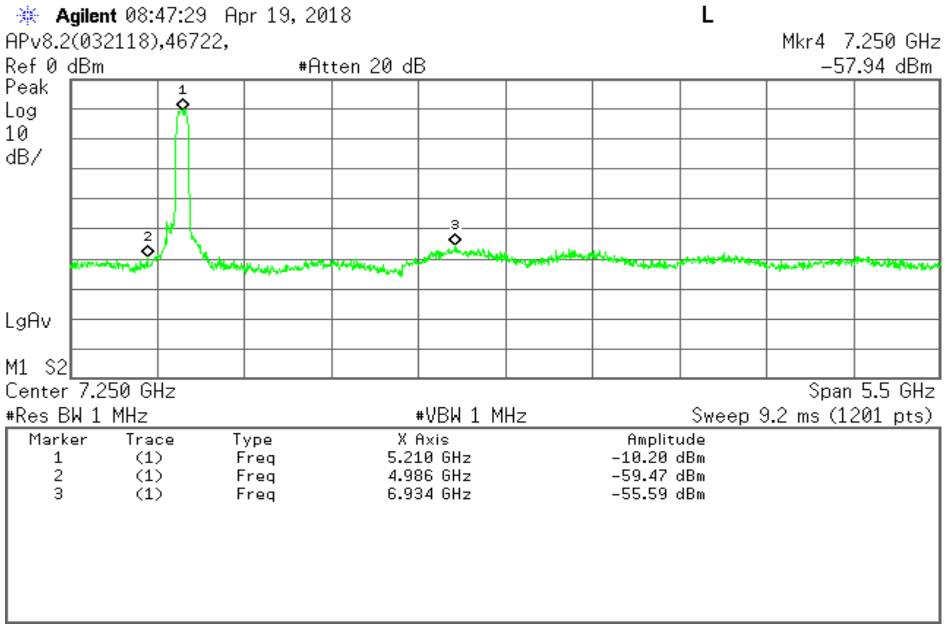
FTun

Swp

Center 2.750 0 GHz Span 3.5 GHz

#Res BW 1 MHz #VBW 1 MHz Sweep 5.84 ms (1201 pts)

Tx1_SpuriousG2_Nom



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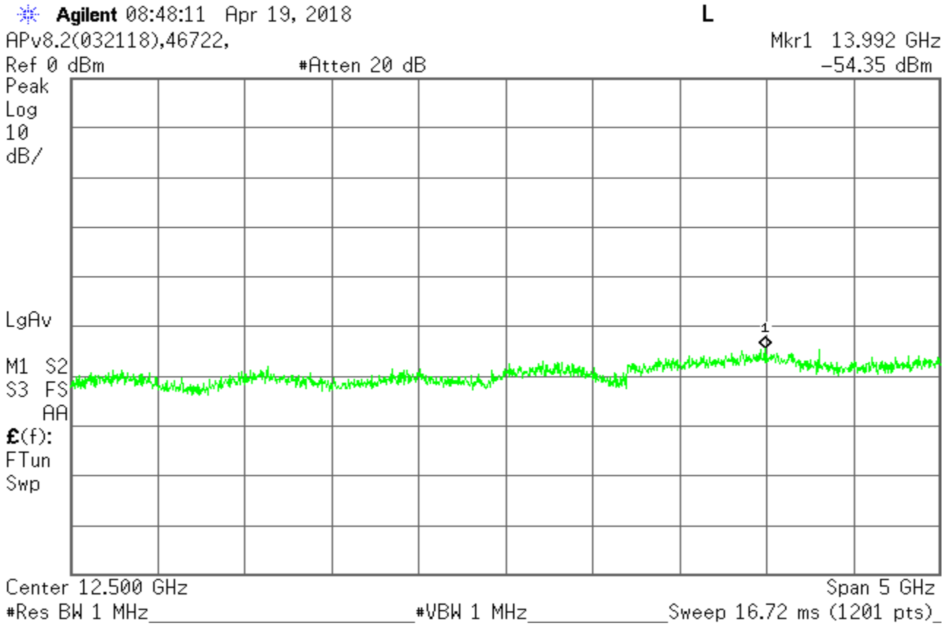
Agilent 08:47:29  Apr 19, 2018                          L
APv8.2(032118),46722,                                        Mkr4  7.250 GHz
Ref 0 dBm               #Atten 20 dB                              -57.94 dBm
Peak
Log
10
dB/

LgAv

M1  S2
Center 7.250 GHz                                                Span 5.5 GHz
#Res BW 1 MHz                       #VBW 1 MHz       Sweep 9.2 ms (1201 pts)
  Marker     Trace      Type            X Axis              Amplitude
    1         (1)       Freq           5.210 GHz           -10.20 dBm
    2         (1)       Freq           4.986 GHz           -59.47 dBm
    3         (1)       Freq           6.934 GHz           -55.59 dBm
```

Tx1_SpuriousG3_Nom

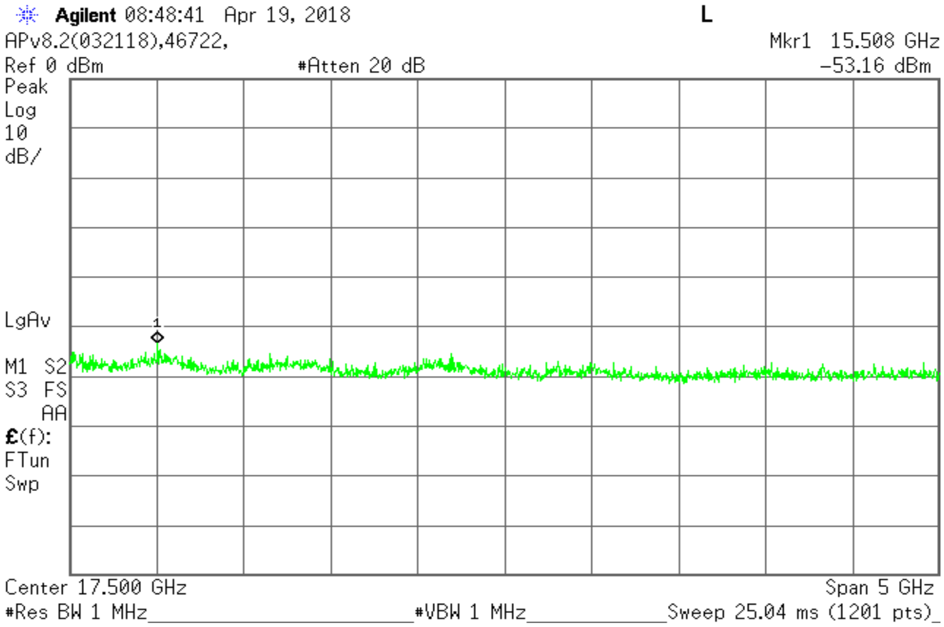


```
Agilent 08:48:11  Apr 19, 2018                          L
APv8.2(032118),46722,                                       Mkr1  13.992 GHz
Ref 0 dBm               #Atten 20 dB                              -54.35 dBm
Peak
Log
10
dB/

LgAv

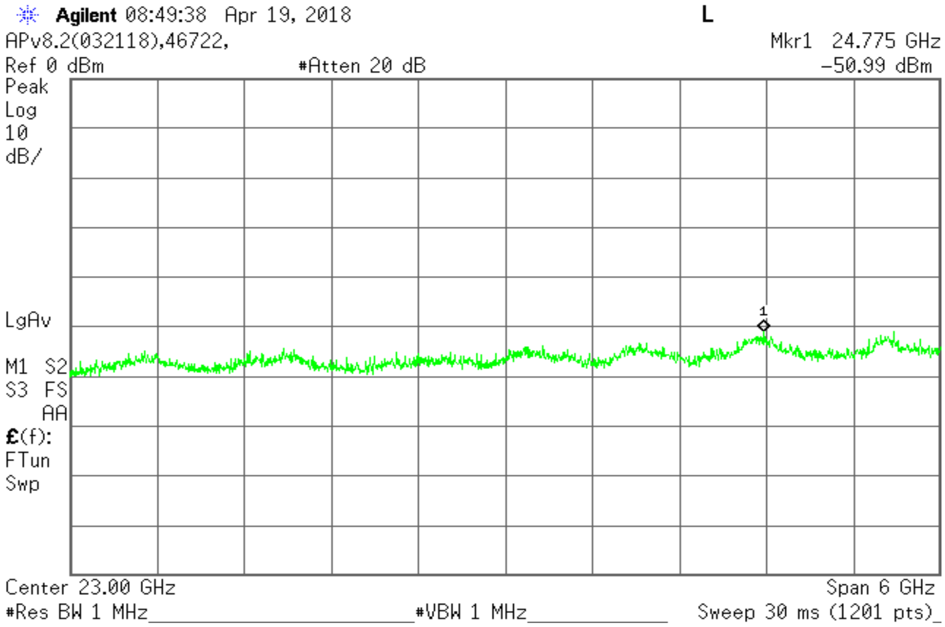
M1  S2
S3  FS
    AA
£(f):
FTun
Swp
Center 12.500 GHz                                                 Span 5 GHz
#Res BW 1 MHz_______________________#VBW 1 MHz____________Sweep 16.72 ms (1201 pts)_
```

Tx1_SpuriousG4_Nom



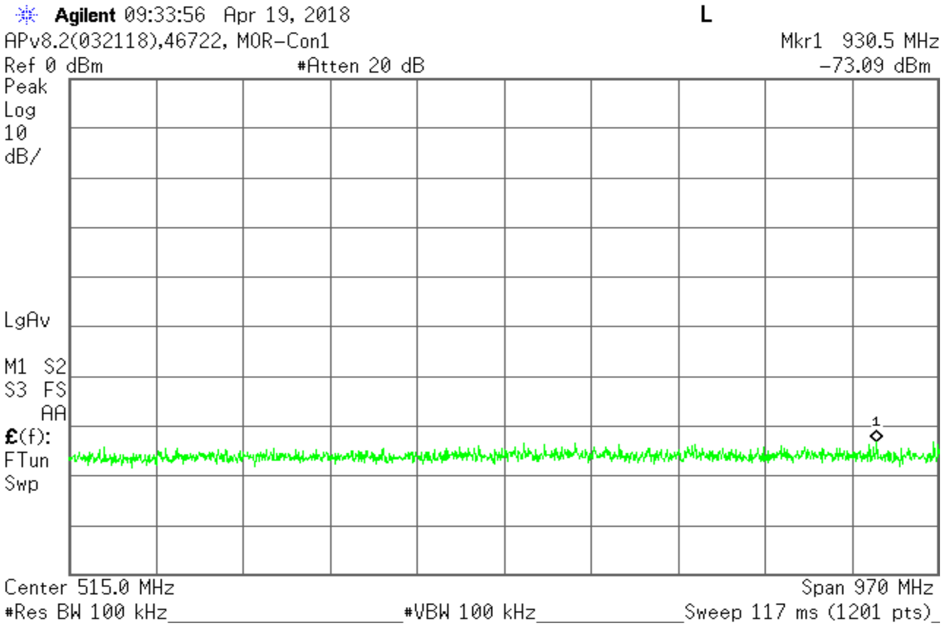
Agilent 08:48:41 Apr 19, 2018
APv8.2(032118),46722,
Mkr1 15.508 GHz
Ref 0 dBm #Atten 20 dB -53.16 dBm
Peak
Log
10
dB/
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Center 17.500 GHz Span 5 GHz
#Res BW 1 MHz #VBW 1 MHz Sweep 25.04 ms (1201 pts)

Tx1_SpuriousG5_Nom

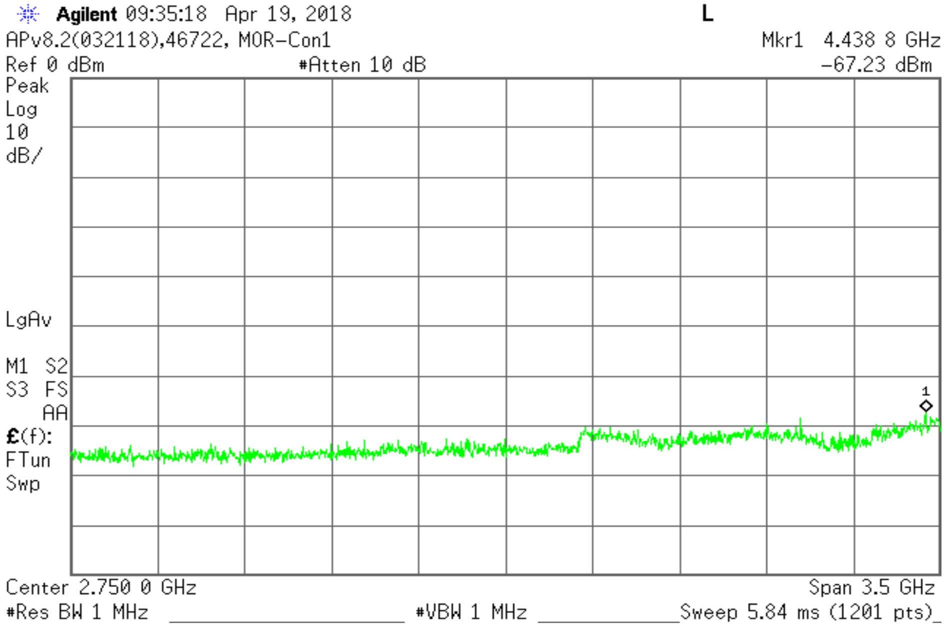


Agilent 08:49:38 Apr 19, 2018
APv8.2(032118),46722,
Mkr1 24.775 GHz
Ref 0 dBm #Atten 20 dB -50.99 dBm
Peak
Log
10
dB/
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Center 23.00 GHz Span 6 GHz
#Res BW 1 MHz #VBW 1 MHz Sweep 30 ms (1201 pts)

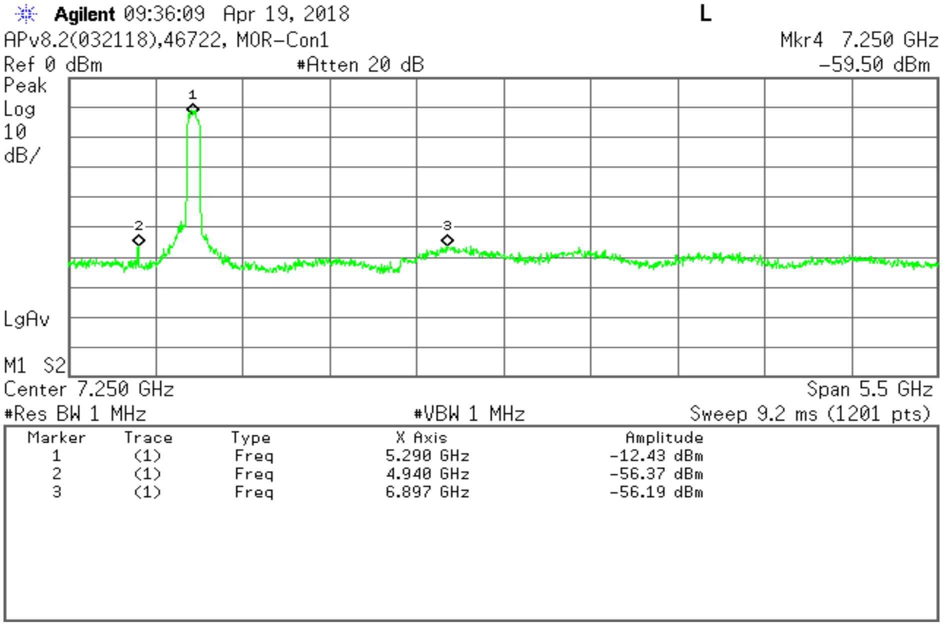
Tx3_SpuriousM_Nom


Agilent 09:33:56 Apr 19, 2018 L
APv8.2(032118),46722, MOR-Con1 Mkr1 930.5 MHz
Ref 0 dBm #Atten 20 dB -73.09 dBm
Center 515.0 MHz Span 970 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 117 ms (1201 pts)

Tx3_SpuriousG1_Nom


Agilent 09:35:18 Apr 19, 2018 L
APv8.2(032118),46722, MOR-Con1 Mkr1 4.438 8 GHz
Ref 0 dBm #Atten 10 dB -67.23 dBm
Center 2.750 0 GHz Span 3.5 GHz
#Res BW 1 MHz #VBW 1 MHz Sweep 5.84 ms (1201 pts)

Tx3_SpuriousG2_Nom



Agilent 09:36:09 Apr 19, 2018 L

APv8.2(032118),46722, MOR-Con1 Mkr4 7.250 GHz

Ref 0 dBm #Atten 20 dB -59.50 dBm

Peak

Log

10

dB/

LgAv

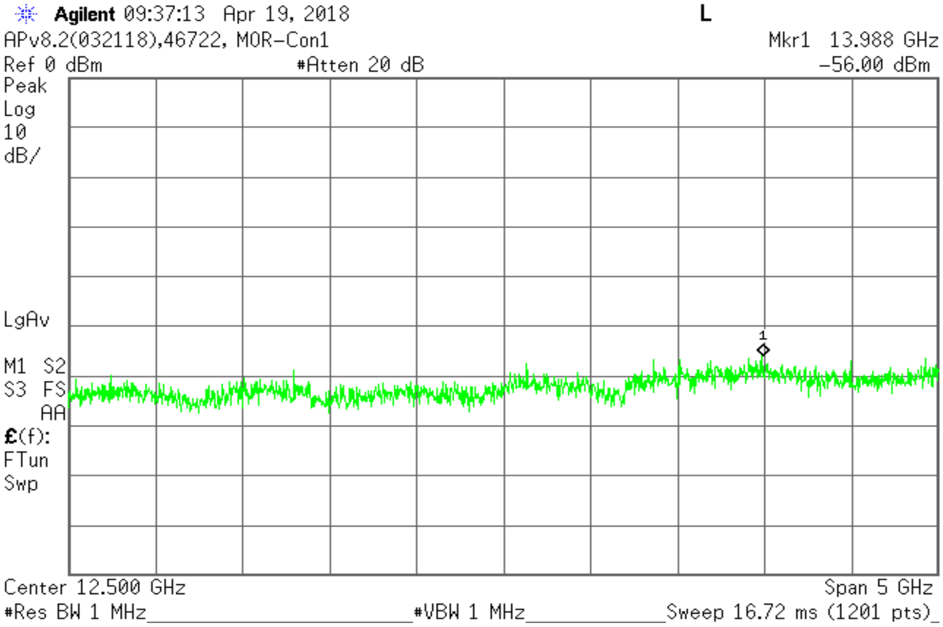
M1 S2

Center 7.250 GHz Span 5.5 GHz

#Res BW 1 MHz #VBW 1 MHz Sweep 9.2 ms (1201 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	5.290 GHz	-12.43 dBm
2	(1)	Freq	4.940 GHz	-56.37 dBm
3	(1)	Freq	6.897 GHz	-56.19 dBm

Tx3_SpuriousG3_Nom



Agilent 09:37:13 Apr 19, 2018 L

APv8.2(032118),46722, MOR-Con1 Mkr1 13.988 GHz

Ref 0 dBm #Atten 20 dB -56.00 dBm

Peak

Log

10

dB/

LgAv

M1 S2

S3 FS

AA

£(f):

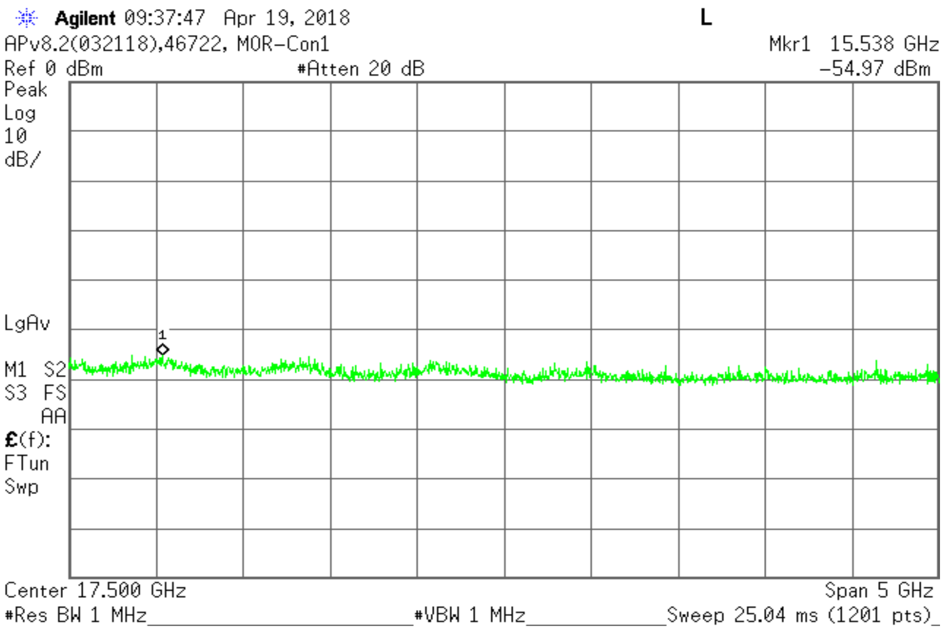
FTun

Swp

Center 12.500 GHz Span 5 GHz

#Res BW 1 MHz #VBW 1 MHz Sweep 16.72 ms (1201 pts)

Tx3_SpuriousG4_Nom



Agilent 09:37:47 Apr 19, 2018

APv8.2(032118),46722, MOR-Con1

Ref 0 dBm #Atten 20 dB

Mkr1 15.538 GHz

-54.97 dBm

Center 17.500 GHz

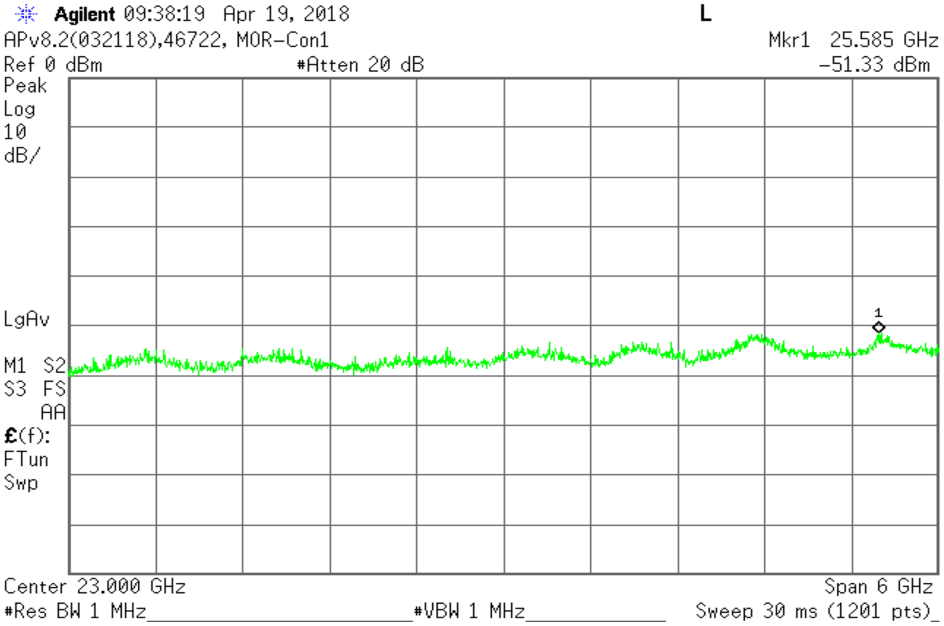
Span 5 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 25.04 ms (1201 pts)

Tx3_SpuriousG5_Nom



Agilent 09:38:19 Apr 19, 2018

APv8.2(032118),46722, MOR-Con1

Ref 0 dBm #Atten 20 dB

Mkr1 25.585 GHz

-51.33 dBm

Center 23.000 GHz

Span 6 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 30 ms (1201 pts)

2.4.1. Output Power/ E.I.R.P (MIMO)

Job No.	R12053557-E9d
Remark1	
Remark2	

[DATA]

Voltage	Port No.	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Burst Rate	Output Power (A) [W/MHz]	Antenna Gain [dBi]	E.I.R.P. (A) [W/MHz]
DC4V	0	5210	-24.81	16.26	0.00	2.39	0.000334	4.00	0.000839
		-	-	-	-	-	-	-	-
		5290	-26.84	16.26	0.00	2.39	0.000209	4.00	0.000525
DC4V	1	5210	-25.17	16.26	0.00	2.39	0.000307	4.00	0.000771
		-	-	-	-	-	-	-	-
		5290	-28.89	16.26	0.00	2.39	0.000130	4.00	0.000328
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-

Sample Calculation :

Output Power (A) = 10 ^ ((Reading [dBm] + Cable Loss + Atten. Loss) / 10) * Burst Rate
E.I.R.P. (A) = Output Power (A) * 10^(Antenna Gain[dBi]/10)

[Total Power / Result and Limit]

Voltage	Freq.	Output Power				E.I.R.P.	
	[MHz]	Result (B) [W/MHz]	Limit [W/MHz]	Tolerance Result [%]	Tolerance Limit [%]	Result (B) [W/MHz]	Limit [W/MHz]
DC4V	5210	0.000641	0.002500	-30.0	+20 ～ -80	0.001610	0.002500
	-	-	-	-	-	-	-
	5290	0.000340	0.002500	-30.0	+20 ～ -80	0.000853	0.001250

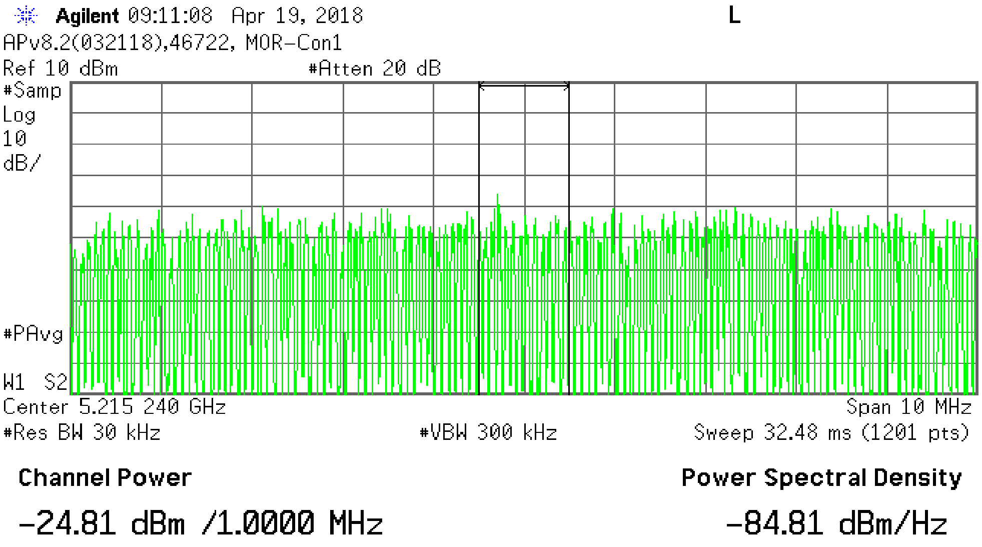
Sample Calculation :
Tolerance = Output Power Result (B) / Declared Output Power * 100 - 100.
Output Power Result (B) : Sum of all "Output Power (A)" at same Freq.
E.I.R.P. Result (B): Sum of all "E.I.R.P. (A)" at same Freq.

[Declared Output Power]

Voltage	Freq. [MHz]	Declared Output Power [W/MHz]	E.I.R.P. for Declared Output Power [W/MHz]
DC4V	5210	0.000916	0.002301
	-	-	-
	5290	0.000485	0.001219

Sample Calculation :
E.I.R.P. for Declared Output Power
= E.I.R.P. Result (B) * (Declared Output Power / Output Power Result (B))

Tx1_Power_Chain0_Nom



Agilent 09:11:08 Apr 19, 2018 L

APv8.2(032118),46722, MOR-Con1

Ref 10 dBm #Atten 20 dB

#Samp

Log

10

dB/

#PAvg

W1 S2

Center 5.215 240 GHz Span 10 MHz

#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

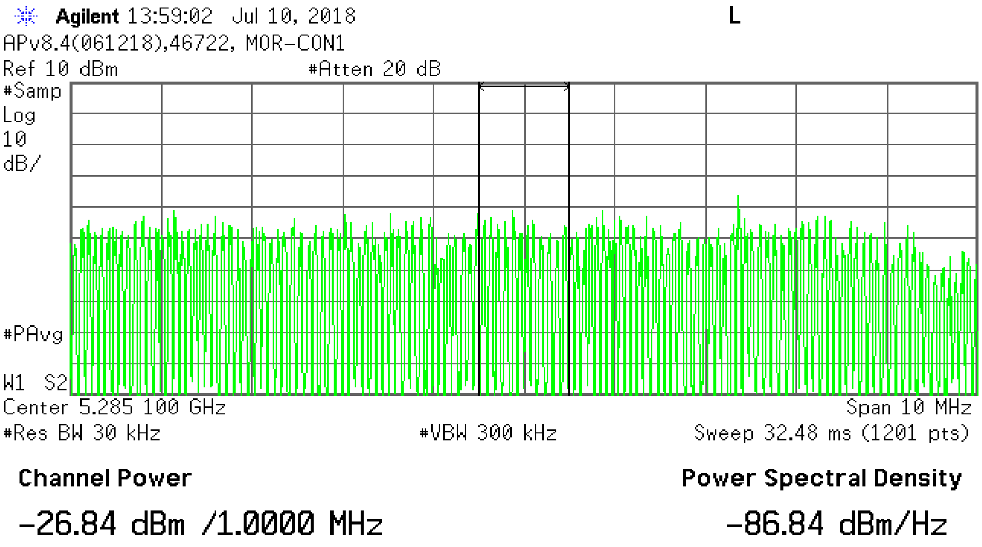
Channel Power

-24.81 dBm /1.0000 MHz

Power Spectral Density

-84.81 dBm/Hz

Tx3_Power_Chain0_Nom



Agilent 13:59:02 Jul 10, 2018 L

APv8.4(061218),46722, MOR-CON1

Ref 10 dBm #Atten 20 dB

#Samp

Log

10

dB/

#PAvg

W1 S2

Center 5.285 100 GHz Span 10 MHz

#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

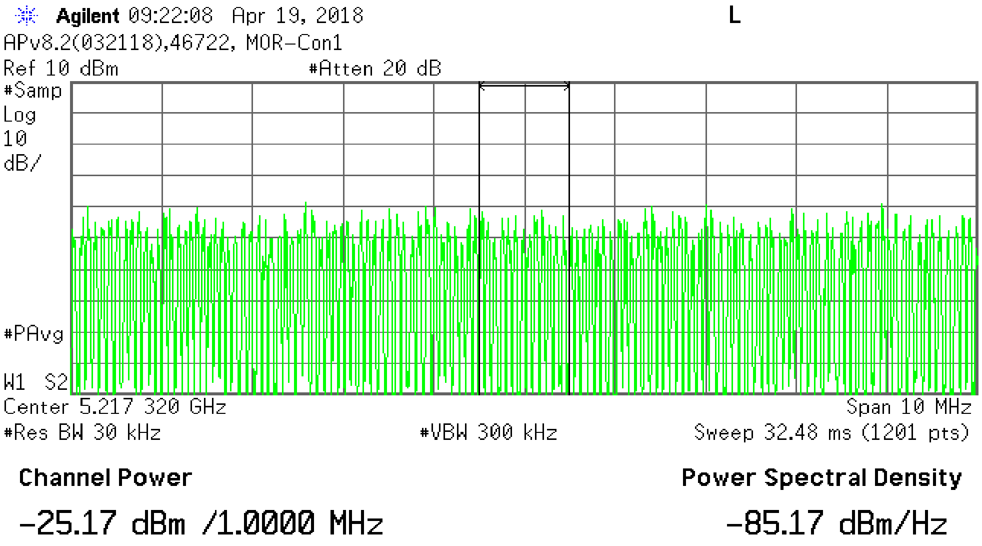
Channel Power

-26.84 dBm /1.0000 MHz

Power Spectral Density

-86.84 dBm/Hz

Tx1_Power_Chain1_Nom



Agilent 09:22:08 Apr 19, 2018 L

APv8.2(032118),46722, MOR-Con1

Ref 10 dBm #Atten 20 dB

#Samp
Log
10
dB/

#PAvg

W1 S2

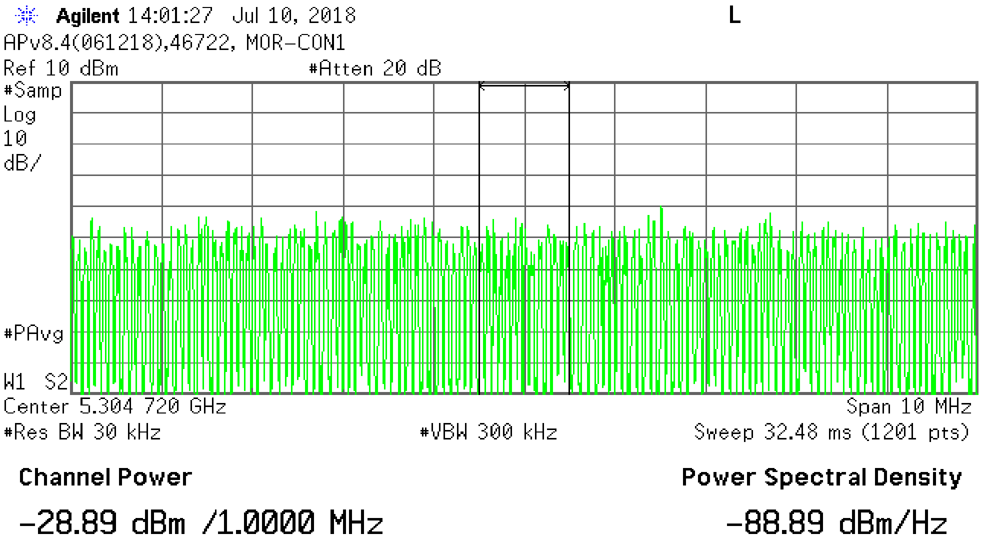
Center 5.217 320 GHz Span 10 MHz

#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

Channel Power **Power Spectral Density**

-25.17 dBm /1.0000 MHz -85.17 dBm/Hz

Tx3_Power_Chain1_Nom



Agilent 14:01:27 Jul 10, 2018 L

APv8.4(061218),46722, MOR-CON1

Ref 10 dBm #Atten 20 dB

#Samp
Log
10
dB/

#PAvg

W1 S2

Center 5.304 720 GHz Span 10 MHz

#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

Channel Power **Power Spectral Density**

-28.89 dBm /1.0000 MHz -88.89 dBm/Hz

2.4.2. Output Power/ E.I.R.P (SISO CH0)

Job No.	R12053557-E9d
Remark1	
Remark2	

[DATA]

Voltage	Port No.	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Burst Rate	Output Power (A) [W/MHz]	Antenna Gain [dBi]	E.I.R.P. (A) [W/MHz]
DC4V	0	5210	-24.81	16.26	0.00	2.39	0.000334	4.00	0.000839
		-	-	-	-	-	-	-	-
		5290	-26.84	16.26	0.00	2.39	0.000209	4.00	0.000525
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-

Sample Calculation :

Output Power (A) = 10 ^ ((Reading [dBm] + Cable Loss + Atten. Loss) / 10) * Burst Rate
E.I.R.P. (A) = Output Power (A) * 10^(Antenna Gain[dBi]/10)

[Total Power / Result and Limit]

Voltage	Freq.	Output Power				E.I.R.P.	
	[MHz]	Result (B) [W/MHz]	Limit [W/MHz]	Tolerance Result [%]	Tolerance Limit [%]	Result (B) [W/MHz]	Limit [W/MHz]
DC4V	5210	0.000334	0.002500	-30.0	+20 ～ -80	0.000839	0.002500
	-	-	-	-	-	-	-
	5290	0.000209	0.002500	-30.0	+20 ～ -80	0.000525	0.001250

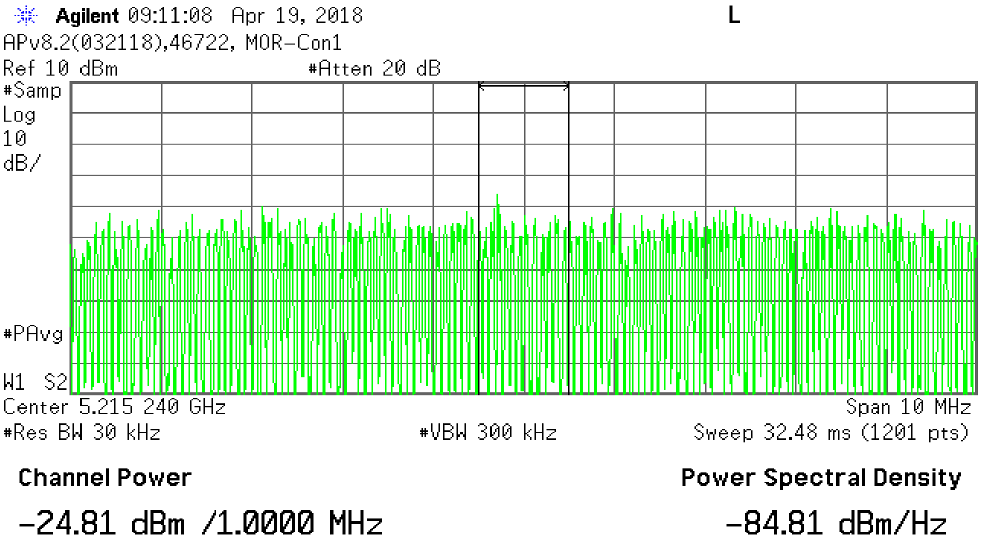
Sample Calculation :
Tolerance = Output Power Result (B) / Declared Output Power * 100 - 100.
Output Power Result (B) : Sum of all "Output Power (A)" at same Freq.
E.I.R.P. Result (B): Sum of all "E.I.R.P. (A)" at same Freq.

[Declared Output Power]

Voltage	Freq. [MHz]	Declared Output Power [W/MHz]	E.I.R.P. for Declared Output Power [W/MHz]
DC4V	5210	0.000477	0.001199
	-	-	-
	5290	0.000299	0.000751

Sample Calculation :
E.I.R.P. for Declared Output Power
= E.I.R.P. Result (B) * (Declared Output Power / Output Power Result (B))

Tx1_Power_Chain0_Nom

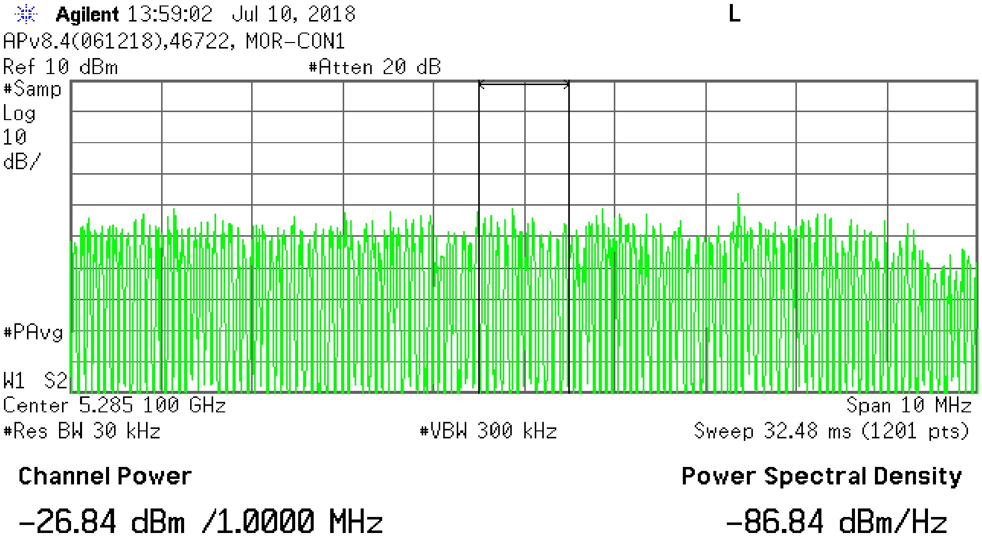


Agilent 09:11:08 Apr 19, 2018
APv8.2(032118),46722, MOR-Con1
Ref 10 dBm #Atten 20 dB
#Samp
Log
10
dB/
#PAvg
W1 S2
Center 5.215 240 GHz Span 10 MHz
#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

Channel Power
-24.81 dBm /1.0000 MHz

Power Spectral Density
-84.81 dBm/Hz

Tx3_Power_Chain0_Nom



Agilent 13:59:02 Jul 10, 2018
APv8.4(061218),46722, MOR-CON1
Ref 10 dBm #Atten 20 dB
#Samp
Log
10
dB/
#PAvg
W1 S2
Center 5.285 100 GHz Span 10 MHz
#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

Channel Power
-26.84 dBm /1.0000 MHz

Power Spectral Density
-86.84 dBm/Hz

2.4.3. Output Power/ E.I.R.P (SISO CH1)

Job No. R12053557-E9d
Remark1
Remark2

[DATA]

Voltage	Port No.	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Burst Rate	Output Power (A) [W/MHz]	Antenna Gain [dBi]	E.I.R.P. (A) [W/MHz]
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
DC4V	1	5210	-25.17	16.26	0.00	2.39	0.000307	4.00	0.000771
		-	-	-	-	-	-	-	-
		5290	-28.89	16.26	0.00	2.39	0.000130	4.00	0.000328
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-

Sample Calculation :

Output Power (A) = 10 ^ ((Reading [dBm] + Cable Loss + Atten. Loss) / 10) * Burst Rate
E.I.R.P. (A) = Output Power (A) * 10^(Antenna Gain[dBi]/10)

[Total Power / Result and Limit]

Voltage	Freq.	Output Power				E.I.R.P.	
	[MHz]	Result (B) [W/MHz]	Limit [W/MHz]	Tolerance Result [%]	Tolerance Limit [%]	Result (B) [W/MHz]	Limit [W/MHz]
DC4V	5210	0.000307	0.002500	-35.6	+20 ～ -80	0.000771	0.002500
	-	-	-	-	-	-	-
	5290	0.000130	0.002500	-56.3	+20 ～ -80	0.000328	0.001250

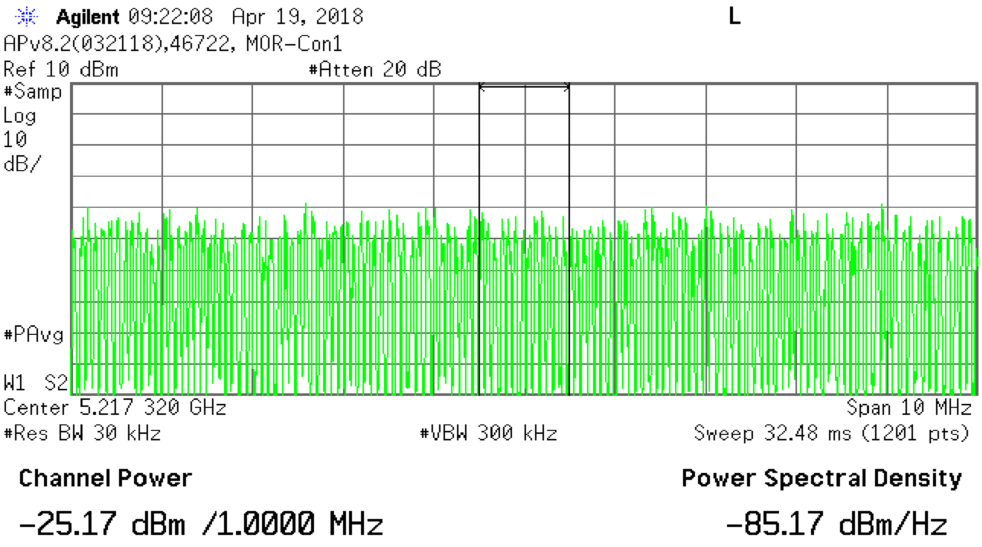
Sample Calculation :
Tolerance = Output Power Result (B) / Declared Output Power * 100 - 100.
Output Power Result (B) : Sum of all "Output Power (A)" at same Freq.
E.I.R.P. Result (B): Sum of all "E.I.R.P. (A)" at same Freq.

[Declared Output Power]

Voltage	Freq. [MHz]	Declared Output Power [W/MHz]	E.I.R.P. for Declared Output Power [W/MHz]
DC4V	5210	0.000477	0.001199
	-	-	-
	5290	0.000299	0.000751

Sample Calculation :
E.I.R.P. for Declared Output Power
= E.I.R.P. Result (B) * (Declared Output Power / Output Power Result (B))

Tx1_Power_Chain1_Nom



Agilent 09:22:08 Apr 19, 2018 L

APv8.2(032118),46722, MOR-Con1

Ref 10 dBm #Atten 20 dB

#Samp

Log

10

dB/

#PAvg

W1 S2

Center 5.217 320 GHz Span 10 MHz

#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

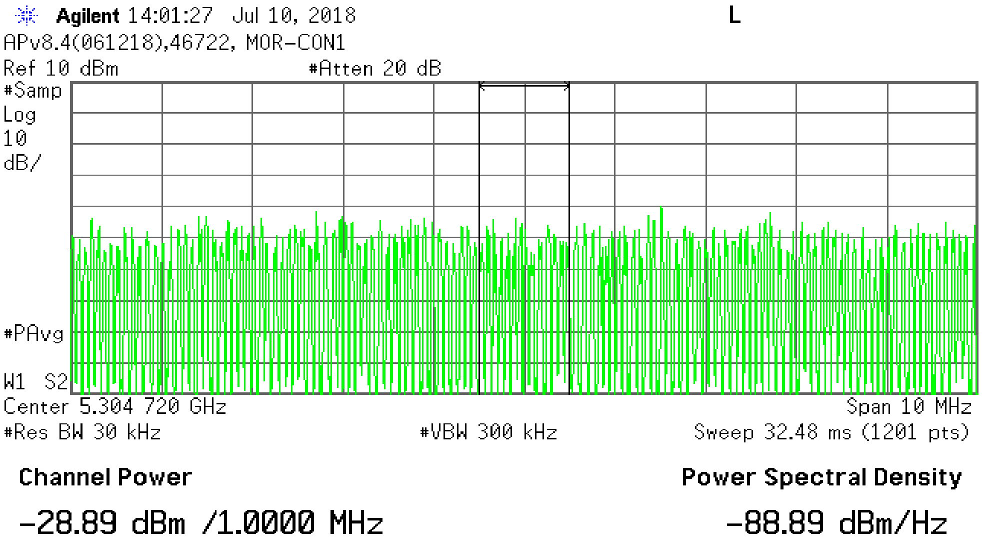
Channel Power

-25.17 dBm /1.0000 MHz

Power Spectral Density

-85.17 dBm/Hz

Tx3_Power_Chain1_Nom



Agilent 14:01:27 Jul 10, 2018 L

APv8.4(061218),46722, MOR-CON1

Ref 10 dBm #Atten 20 dB

#Samp

Log

10

dB/

#PAvg

W1 S2

Center 5.304 720 GHz Span 10 MHz

#Res BW 30 kHz #VBW 300 kHz Sweep 32.48 ms (1201 pts)

Channel Power

-28.89 dBm /1.0000 MHz

Power Spectral Density

-88.89 dBm/Hz

2.5.Secondary Radiated Emission Strength(Normal Voltage)

Job No.	R12053557-E9d
Remark1	
Remark2	

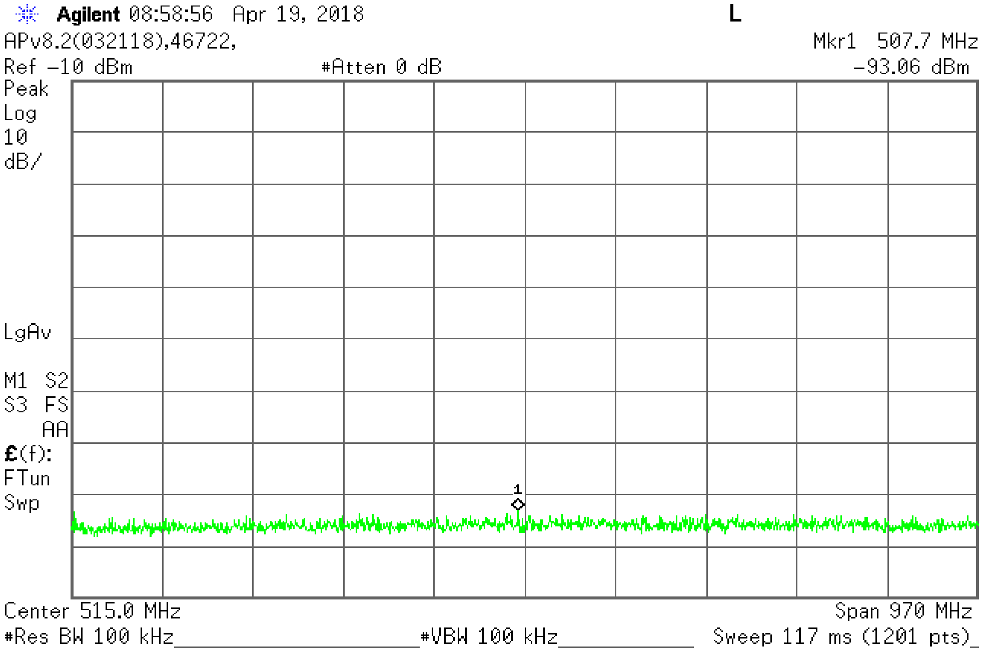
[DATA]

Voltage [V]	Freq. [MHz]	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [nW]	Limit [nW]	Remark
DC4V	5210	507.7	-93.06	16.26	0.00	-76.80	0.021	4.000	♦3
		3117.0	-79.32	16.26	0.00	-63.06	0.494	20.000	♦4
		6954.0	-75.83	16.26	0.00	-59.57	1.104	20.000	♦4
		14012.0	-74.22	16.26	0.00	-57.96	1.600	20.000	♦4
		15379.0	-75.30	16.26	0.00	-59.04	1.247	20.000	♦4
		24705.0	-71.06	16.26	0.00	-54.80	3.311	20.000	♦4

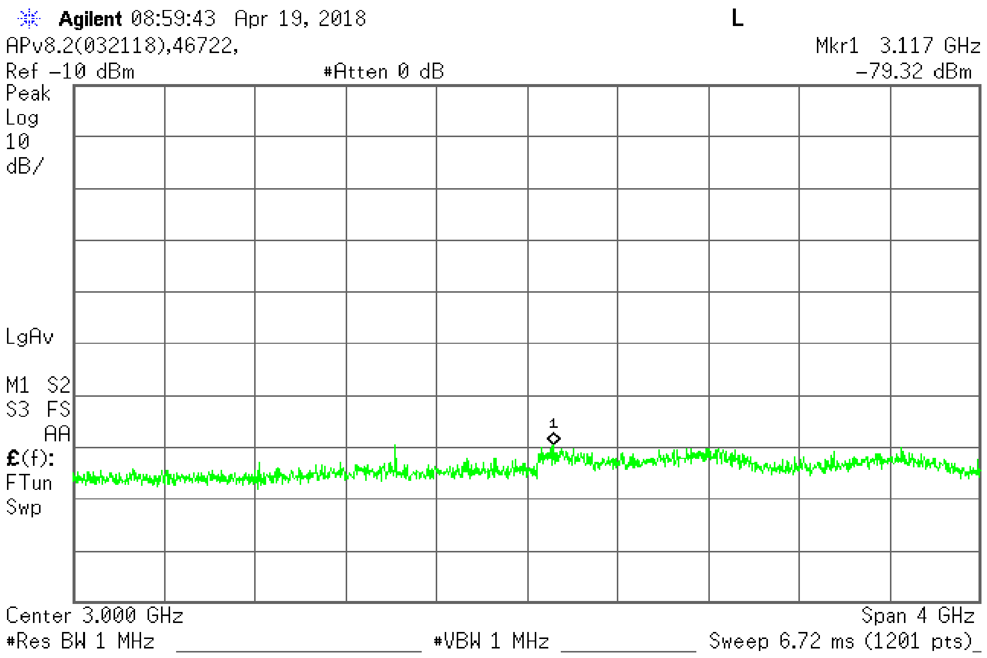
The sum of the results exceeding 1/10 of the Limit [nW] : 3.311

Sample Calculation :
Result = Reading + Cable Loss + Atten.
♦3:Freq Range (< 1GHz)
♦4:Freq Range (≥ 1GHz)

Rx1_SpuriousM_Nom



Rx1_SpuriousG1_Nom



Agilent 08:59:43 Apr 19, 2018 L

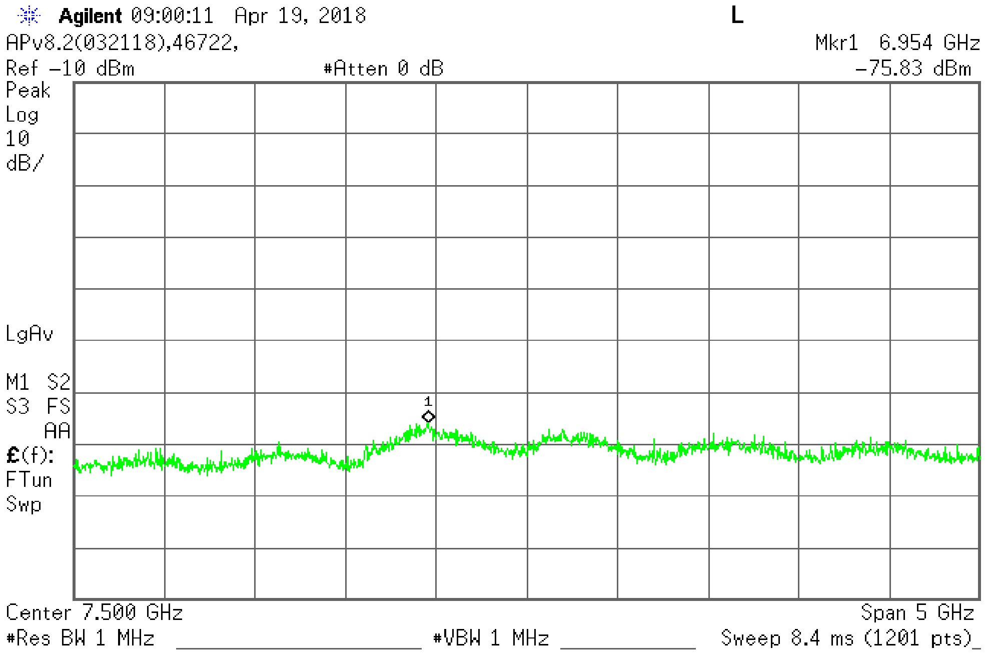
APv8.2(032118),46722, Mkr1 3.117 GHz

Ref -10 dBm #Atten 0 dB -79.32 dBm

Center 3.000 GHz Span 4 GHz

#Res BW 1 MHz #VBW 1 MHz Sweep 6.72 ms (1201 pts)

Rx1_SpuriousG2_Nom



Agilent 09:00:11 Apr 19, 2018 L

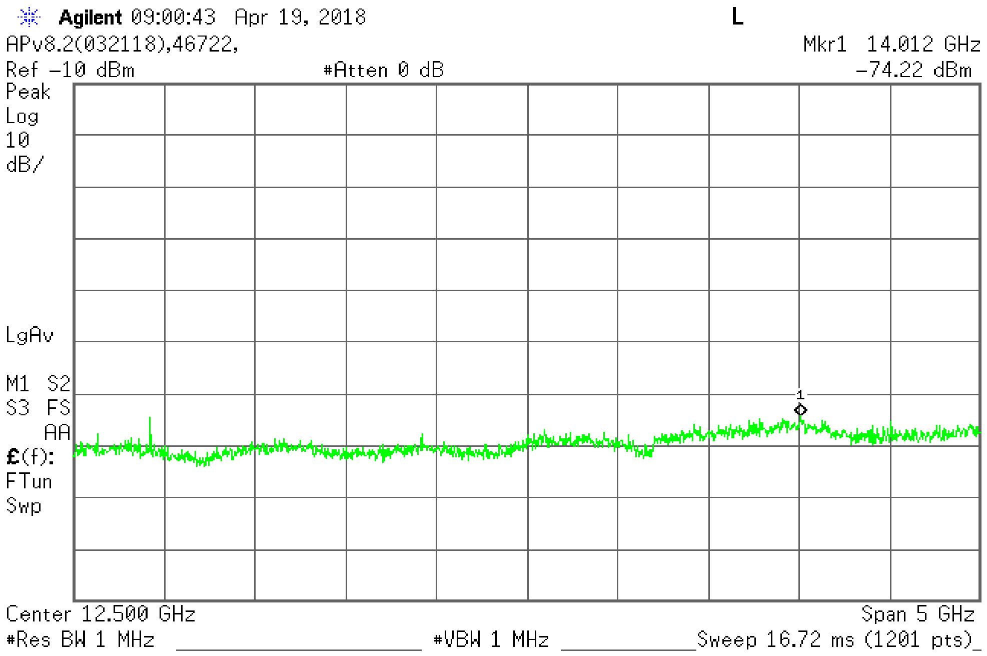
APv8.2(032118),46722, Mkr1 6.954 GHz

Ref -10 dBm #Atten 0 dB -75.83 dBm

Center 7.500 GHz Span 5 GHz

#Res BW 1 MHz #VBW 1 MHz Sweep 8.4 ms (1201 pts)

Rx1_SpuriousG3_Nom



Agilent 09:00:43 Apr 19, 2018

L

APv8.2(032118),46722,

Mkr1 14.012 GHz

Ref -10 dBm

#Atten 0 dB

-74.22 dBm

Peak

Log

10

dB/

LgAv

M1 S2

S3 FS

AA

£(f):

FTun

Swp

Center 12.500 GHz

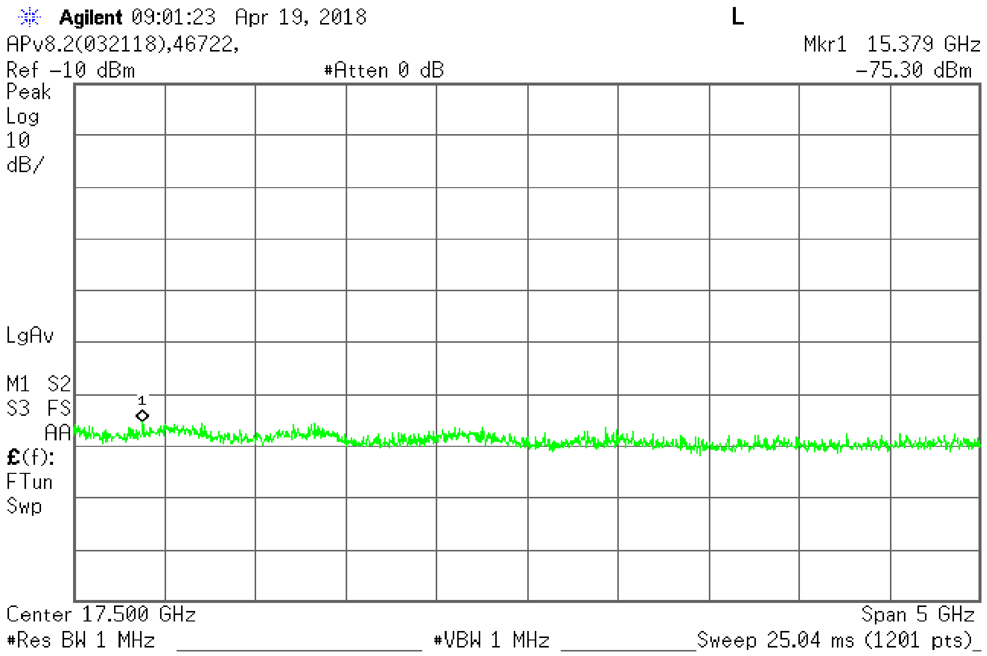
Span 5 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 16.72 ms (1201 pts)

Rx1_SpuriousG4_Nom



Agilent 09:01:23 Apr 19, 2018

L

APv8.2(032118),46722,

Mkr1 15.379 GHz

Ref -10 dBm

#Atten 0 dB

-75.30 dBm

Peak

Log

10

dB/

LgAv

M1 S2

S3 FS

AA

£(f):

FTun

Swp

Center 17.500 GHz

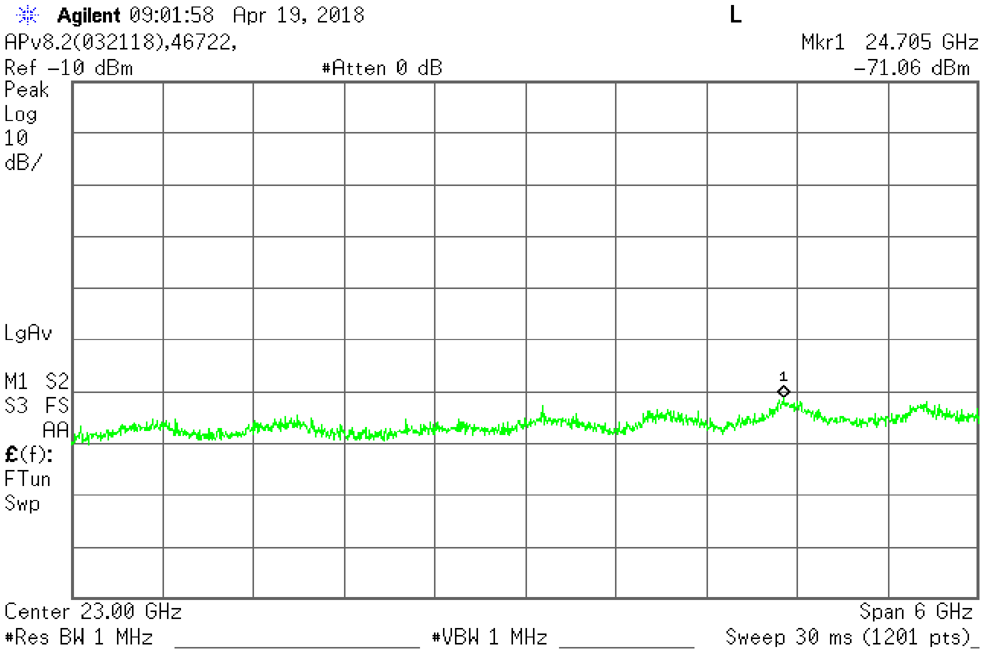
Span 5 GHz

#Res BW 1 MHz

#VBW 1 MHz

Sweep 25.04 ms (1201 pts)

Rx1_SpuriousG5_Nom



Agilent 09:01:58 Apr 19, 2018 L

APv8.2(032118),46722,

Mkr1 24.705 GHz

Ref -10 dBm #Atten 0 dB -71.06 dBm

Peak
Log
10
dB/

LgAv

M1 S2
S3 FS
AA
£(f):
FTun
Swp

Center 23.00 GHz Span 6 GHz

#Res BW 1 MHz #VBW 1 MHz Sweep 30 ms (1201 pts)

2.5.Secondary Radiated Emission Strength(Normal Voltage)

Job No.	R12053557-E9d
Remark1	
Remark2	

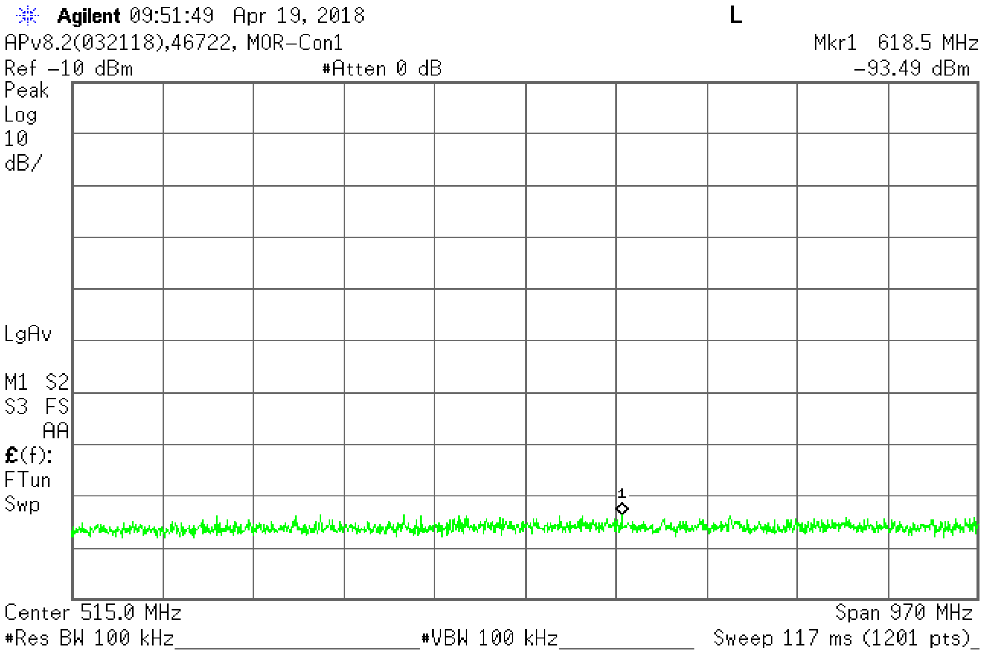
[DATA]

Voltage [V]	Freq. [MHz]	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [nW]	Limit [nW]	Remark
DC4V	5290	618.5	-93.49	16.26	0.00	-77.23	0.019	4.000	♦3
		3760.0	-78.89	16.26	0.00	-62.63	0.546	20.000	♦4
		6938.0	-75.04	16.26	0.00	-58.78	1.324	20.000	♦4
		13900.0	-74.60	16.26	0.00	-58.34	1.466	20.000	♦4
		15483.0	-74.11	16.26	0.00	-57.85	1.641	20.000	♦4
		24625.0	-71.38	16.26	0.00	-55.12	3.076	20.000	♦4

The sum of the results exceeding 1/10 of the Limit [nW] : 3.076

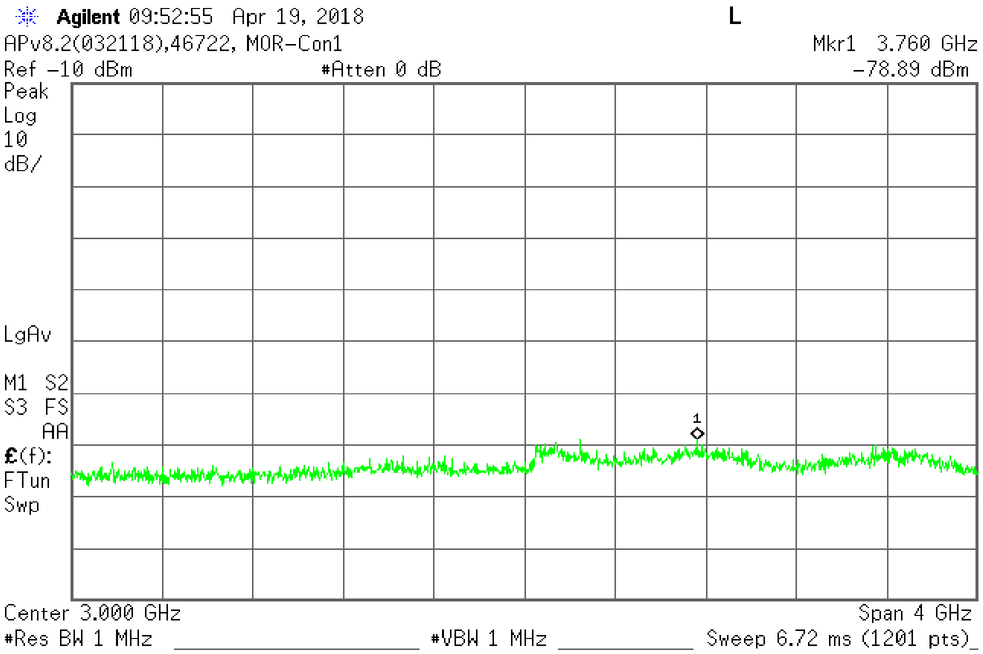
Sample Calculation :
Result = Reading + Cable Loss + Atten
♦3:Freq Range (< 1GHz)
♦4:Freq Range (≥ 1GHz)

Rx1_SpuriousM_Nom



Agilent 09:51:49 Apr 19, 2018
APv8.2(032118),46722, MOR-Con1
Mkr1 618.5 MHz
Ref -10 dBm #Atten 0 dB
-93.49 dBm
Center 515.0 MHz
Span 970 MHz
#Res BW 100 kHz #VBW 100 kHz Sweep 117 ms (1201 pts)

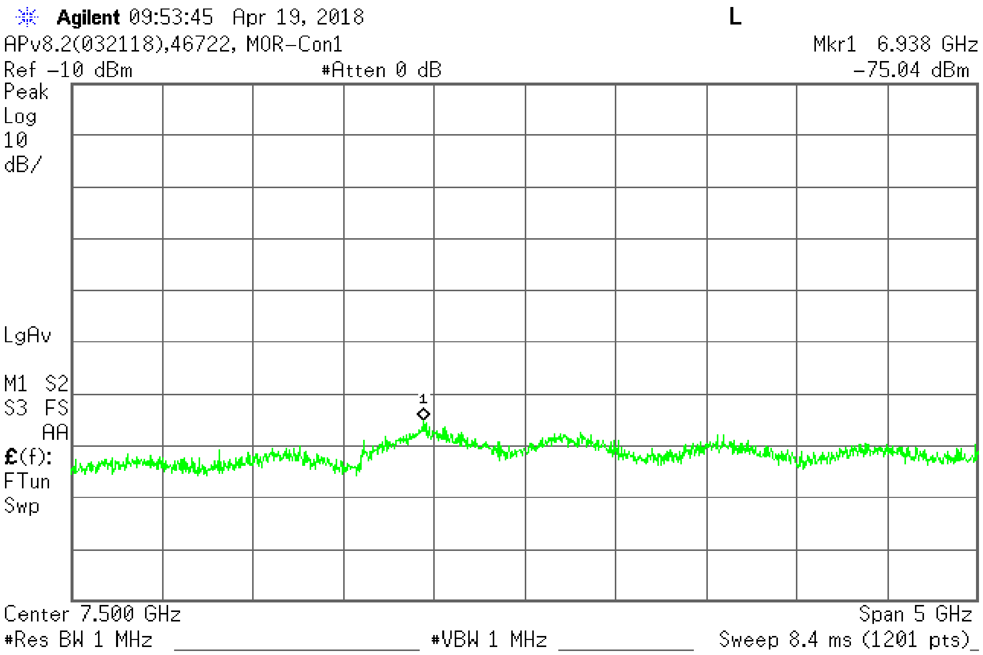
Rx1_SpuriousG1_Nom



Agilent 09:52:55 Apr 19, 2018 L
APv8.2(032118),46722, MOR-Con1 Mkr1 3.760 GHz
Ref -10 dBm #Atten 0 dB -78.89 dBm

Center 3.000 GHz Span 4 GHz
#Res BW 1 MHz #VBW 1 MHz Sweep 6.72 ms (1201 pts)

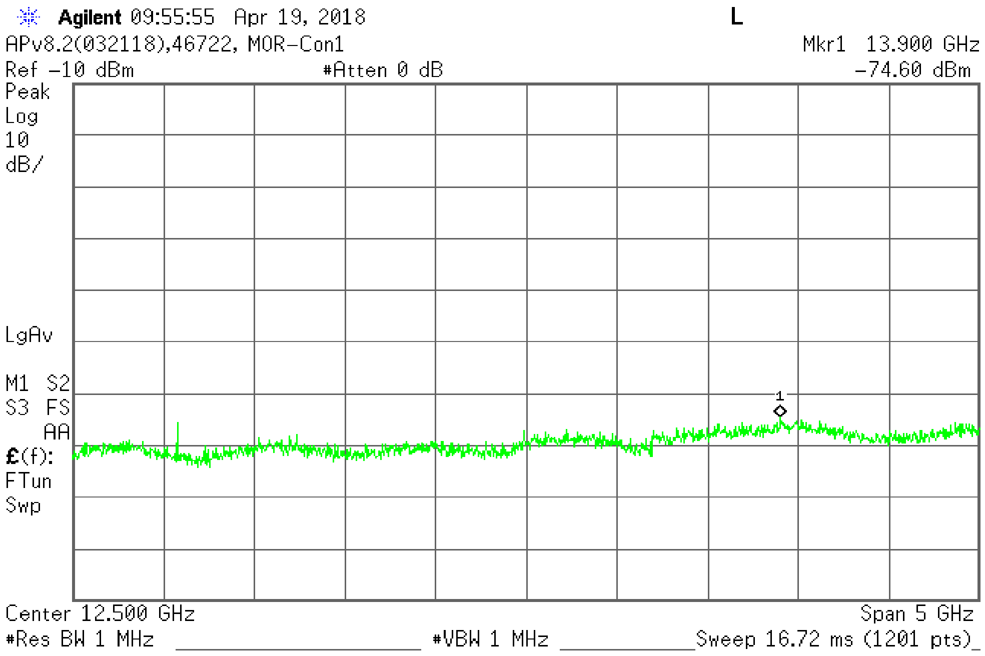
Rx1_SpuriousG2_Nom



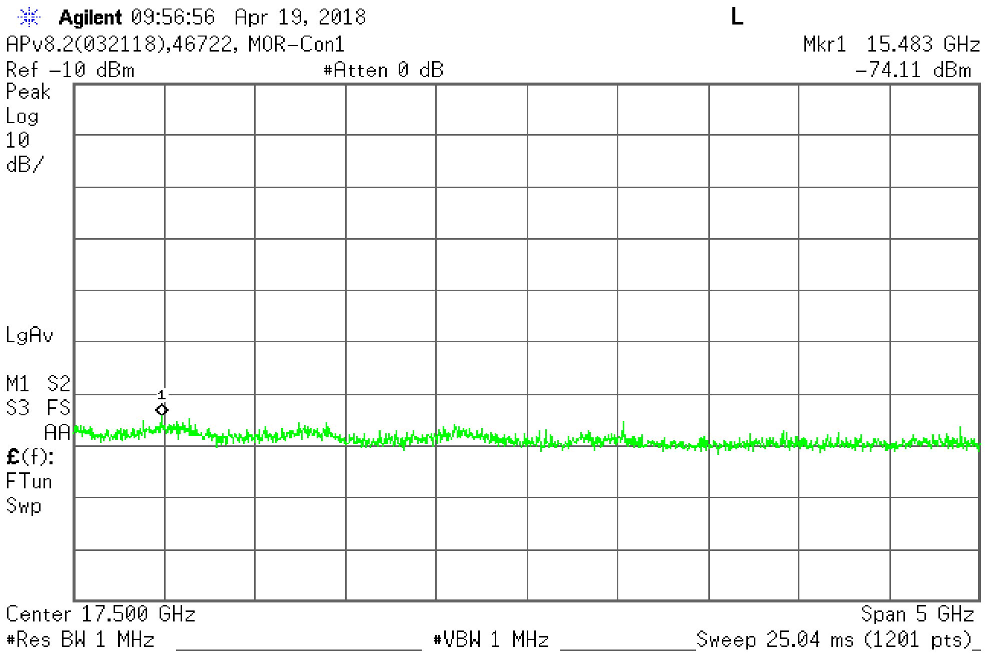
Agilent 09:53:45 Apr 19, 2018 L
APv8.2(032118),46722, MOR-Con1 Mkr1 6.938 GHz
Ref -10 dBm #Atten 0 dB -75.04 dBm

Center 7.500 GHz Span 5 GHz
#Res BW 1 MHz #VBW 1 MHz Sweep 8.4 ms (1201 pts)

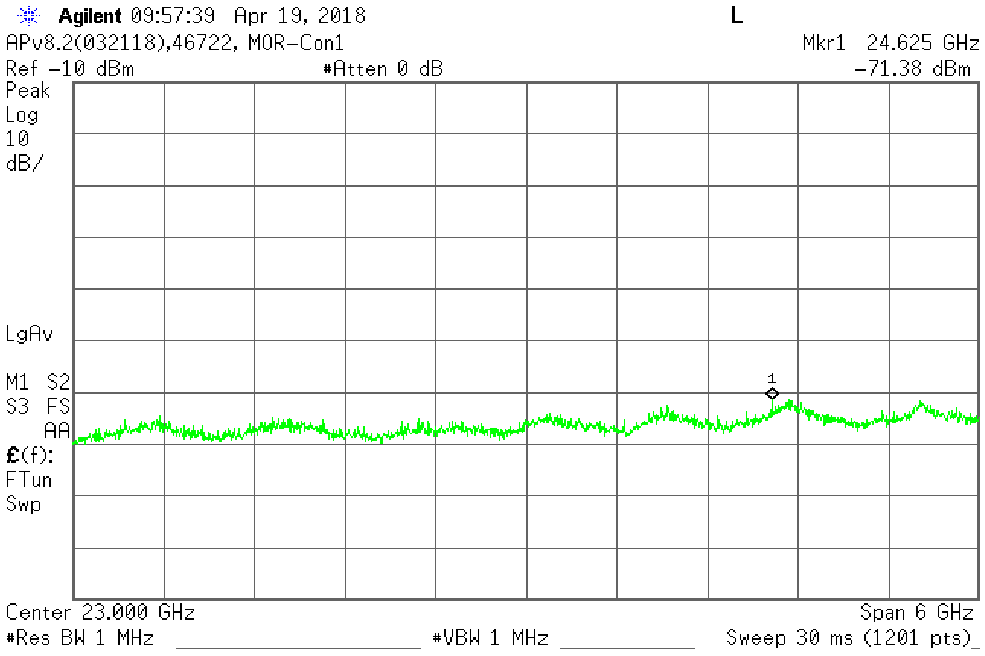
Rx1_SpuriousG3_Nom



Rx1_SpuriousG4_Nom



Rx1_SpuriousG5_Nom



2.6. Burst Length / Duty

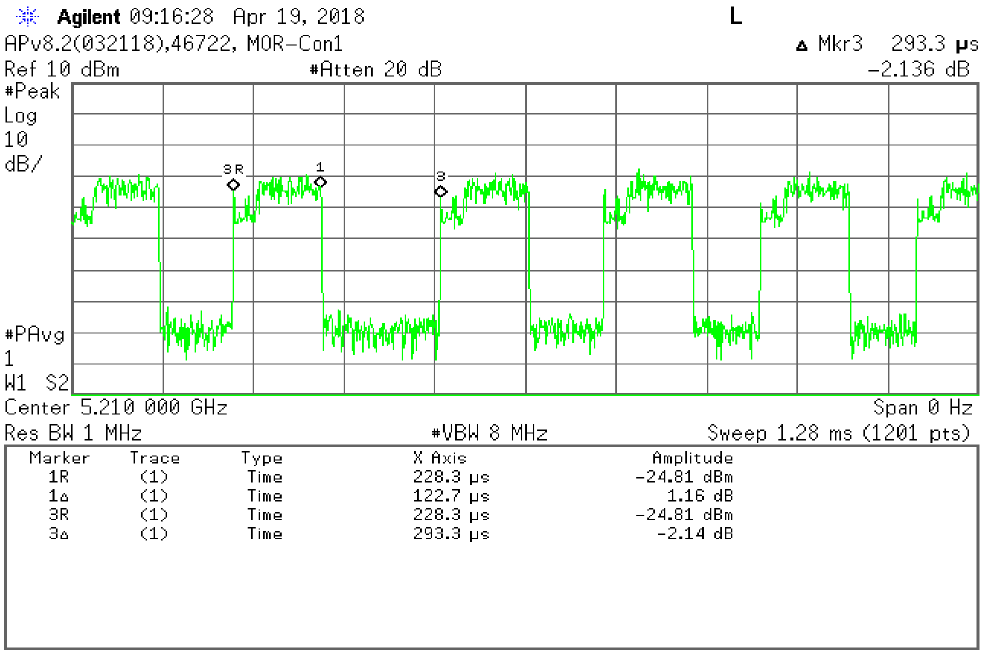
Job No.	R12053557-E9d
Remark1	
Remark2	

[DATA]

Voltage [V]	Freq. [MHz]	On Time [msec]	Period [msec]	Result (Duty) [%]	Result (Burst Rate)	Limit [msec]
DC4V	5210	0.123	0.293	41.8	2.390	4

Sample Calculation :
Result(Duty) = On Time / Period * 100
Result(Burst Rate) = Period / On Time

Tx1_Duty_Nom



```
Agilent 09:16:28  Apr 19, 2018                         L
APv8.2(032118),46722, MOR-Con1                    ▵ Mkr3   293.3 μs
Ref 10 dBm               #Atten 20 dB                     -2.136 dB
#Peak
Log
10
dB/

#PAvg
1
W1  S2
Center 5.210 000 GHz                                      Span 0 Hz
Res BW 1 MHz                 #VBW 8 MHz       Sweep 1.28 ms (1201 pts)
  Marker    Trace     Type          X Axis          Amplitude
    1R       (1)      Time        228.3 μs         -24.81 dBm
    1▵       (1)      Time        122.7 μs           1.16 dB
    3R       (1)      Time        228.3 μs         -24.81 dBm
    3▵       (1)      Time        293.3 μs          -2.14 dB
```

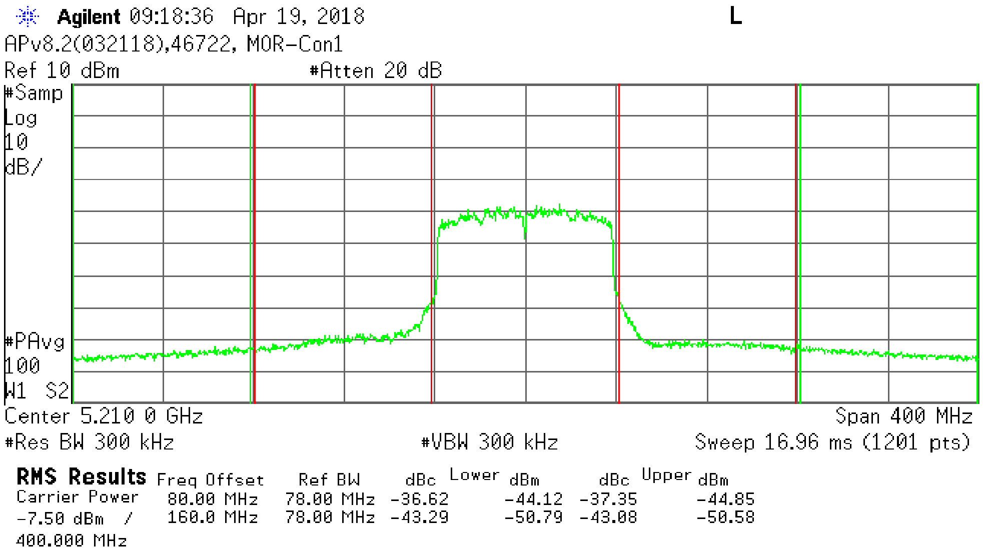
2.7.1. Adjacent Channel Power(Chain0)

Job No.	R12053557-E9d
Remark1	Chain 0
Remark2	

[DATA]

Voltage [V]	Freq. [MHz]	Separation [MHz]	Lower Side Result [dBc]	Upper Side Result [dBc]	Limit [dBc]	Remark
DC4V	5210	80	-36.62	-37.35	-25.00	
		-	-43.29	-43.08	-	
	-	-	-	-	-	
		-	-	-	-	
	5290	80	-36.13	-37.54	-25.00	
		-	-43.05	-43.43	-	

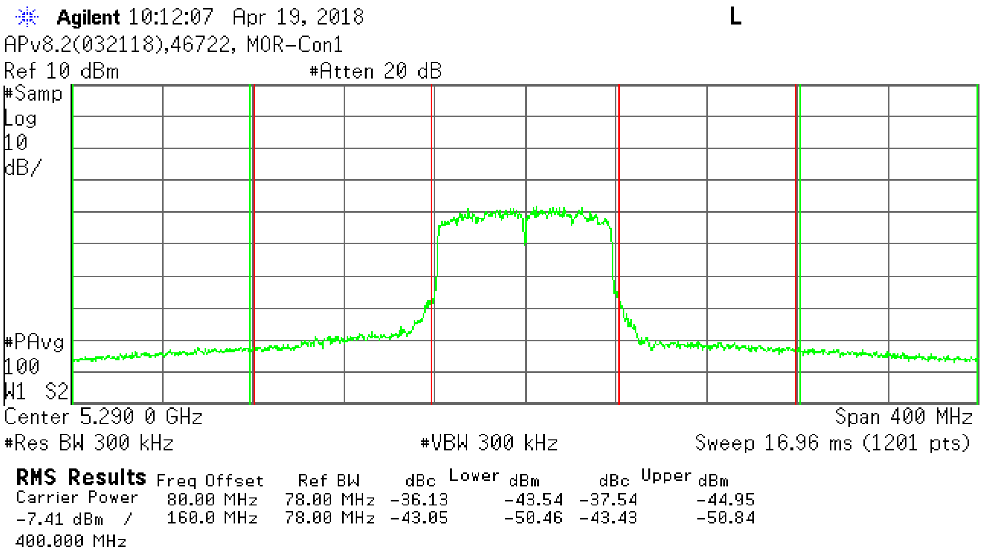
Tx1_ACP_Chain0_Nom



```
Agilent 09:18:36  Apr 19, 2018                            L
APv8.2(032118),46722, MOR-Con1
Ref 10 dBm                    #Atten 20 dB
#Samp
Log
10
dB/

#PAvg
100
W1  S2
Center 5.210 0 GHz                                        Span 400 MHz
#Res BW 300 kHz                #VBW 300 kHz         Sweep 16.96 ms (1201 pts)
RMS Results Freq Offset   Ref BW     dBc  Lower dBm     dBc  Upper dBm
Carrier Power  80.00 MHz  78.00 MHz  -36.62     -44.12  -37.35     -44.85
-7.50 dBm  /  160.0 MHz   78.00 MHz  -43.29     -50.79  -43.08     -50.58
400.000 MHz
```

Tx3_ACP_Chain0_Nom



```
Agilent 10:12:07  Apr 19, 2018
APv8.2(032118),46722, MOR-Con1
Ref 10 dBm                  #Atten 20 dB
Center 5.290 0 GHz                                        Span 400 MHz
#Res BW 300 kHz              #VBW 300 kHz      Sweep 16.96 ms (1201 pts)

RMS Results  Freq Offset   Ref BW     dBc   Lower dBm      dBc  Upper dBm
Carrier Power  80.00 MHz  78.00 MHz -36.13      -43.54  -37.54      -44.95
-7.41 dBm  /   160.0 MHz  78.00 MHz -43.05      -50.46  -43.43      -50.84
400.000 MHz
```

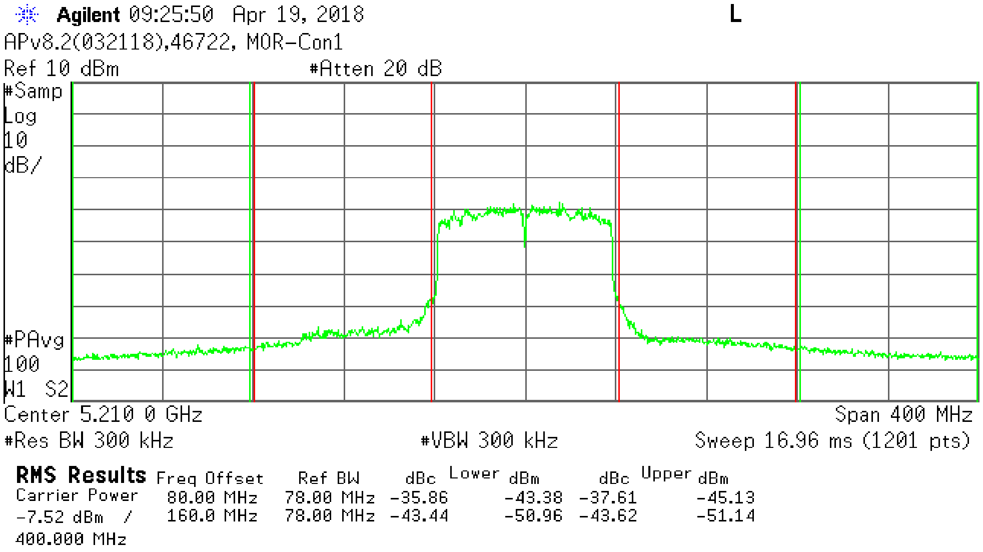
2.7.2. Adjacent Channel Power(Chain1)

Job No.	R12053557-E9d
Remark1	Chain 1
Remark2	

[DATA]

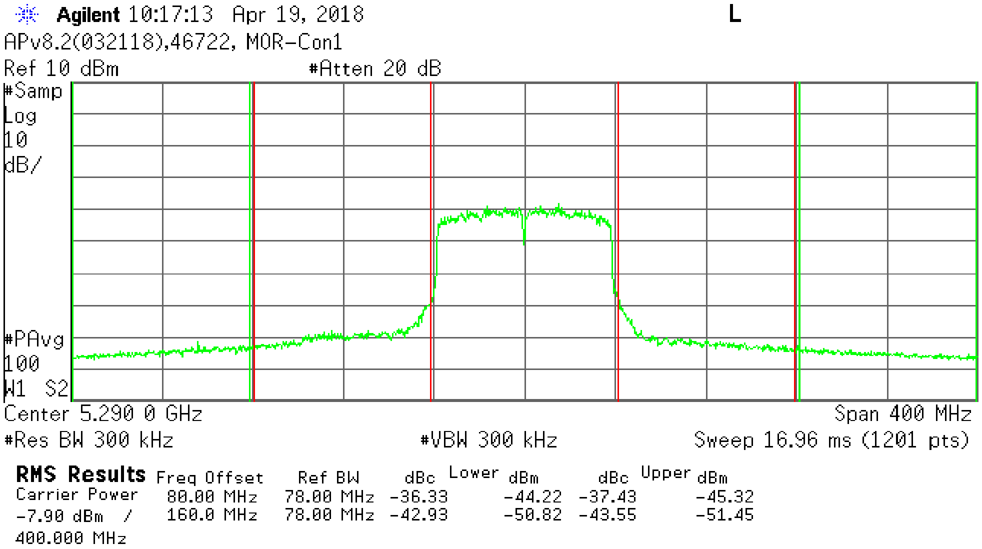
Voltage [V]	Freq. [MHz]	Separation [MHz]	Lower Side Result [dBc]	Upper Side Result [dBc]	Limit [dBc]	Remark
DC4V	5210	80	-35.86	-37.61	-25.00	
		-	-43.44	-43.62	-	
	-	-	-	-	-	
		-	-	-	-	
	5290	80	-36.33	-37.43	-25.00	
		-	-42.93	-43.55	-	

Tx1_ACP_Chain1_Nom



```
Agilent 09:25:50  Apr 19, 2018
APv8.2(032118),46722, MOR-Con1
Ref 10 dBm              #Atten 20 dB
Center 5.210 0 GHz                                   Span 400 MHz
#Res BW 300 kHz           #VBW 300 kHz     Sweep 16.96 ms (1201 pts)
RMS Results  Freq Offset  Ref BW    dBc Lower dBm    dBc Upper dBm
Carrier Power  80.00 MHz  78.00 MHz -35.86   -43.38 -37.61   -45.13
-7.52 dBm  /  160.0 MHz  78.00 MHz -43.44   -50.96 -43.62   -51.14
400.000 MHz
```

Tx3_ACP_Chain1_Nom



```
Agilent 10:17:13  Apr 19, 2018                          L
APv8.2(032118),46722, MOR-Con1
Ref 10 dBm                 #Atten 20 dB
#Samp
Log
10
dB/

#PAvg
100
W1  S2
Center 5.290 0 GHz                                        Span 400 MHz
#Res BW 300 kHz             #VBW 300 kHz          Sweep 16.96 ms (1201 pts)

RMS Results Freq Offset   Ref BW    dBc  Lower dBm     dBc  Upper dBm
Carrier Power   80.00 MHz  78.00 MHz  -36.33     -44.22  -37.43     -45.32
-7.90 dBm  /    160.0 MHz  78.00 MHz  -42.93     -50.82  -43.55     -51.45
400.000 MHz
```

2.8.Outband Leakage Power Strength (Normal Voltage)

Job No.	R12053557-E9d
Remark1	
Remark2	

[DATA]

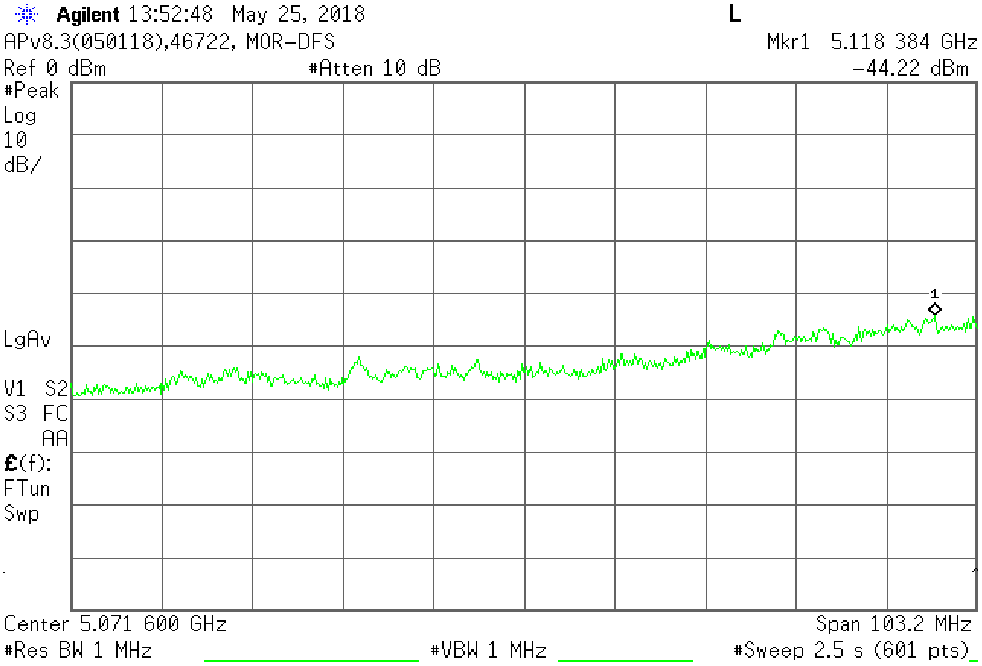
Voltage	Freq.	Freq.	S/A Reading	Cable Loss	Atten. Loss	Antenna Gain	Result	Result	Limit	Remark
[V]	[MHz]	[MHz]	[dBm]	[dB]	[dB]	[dBi]	[dBm]	[uW/MHz]	[uW/MHz]	
DC4V	5210	5118.38	-49.35	16.26	0.00	4.00	-29.09	1.233	2.500	♦5
		5149.96	-49.37	16.26	0.00	4.00	-29.11	1.227	15.000	♦6
		5250.03	-36.23	16.26	0.00	4.00	-15.97	25.293	233.314	♦7
		5251.07	-38.80	16.26	0.00	4.00	-18.54	13.996	24.923	♦8
		5293.02	-48.60	16.26	0.00	4.00	-28.34	1.466	3.216	♦9
		5297.90	-49.26	16.26	0.00	4.00	-29.00	1.259	2.500	♦10
	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
	5290	5198.10	-51.62	16.26	0.00	4.00	-31.36	0.731	2.500	♦11
		5203.37	-50.37	16.26	0.00	4.00	-30.11	0.975	2.506	♦12
		5249.00	-39.25	16.26	0.00	4.00	-18.99	12.618	25.000	♦13
		5249.99	-36.08	16.26	0.00	4.00	-15.82	26.182	243.355	♦14
		5352.50	-49.55	16.26	0.00	4.00	-29.29	1.178	15.000	♦15
		5377.76	-52.09	16.26	0.00	4.00	-31.83	0.656	2.500	♦16

Sample Calculation :

Result = Reading + Cable Loss + Attenuator+Antenna Gain

♦5: Freq Range (≥5,020MHz, ≤5,123.2MHz): ≤2.5μW/MHz
♦6: Freq Range (>5,123.2MHz, ≤5,150MHz): ≤15μW/MHz
♦7: Freq Range (≥5,250MHz, <5,251MHz): ≤10^(-(|5210-f|-40)+log(1/4))mW/MHz
♦8: Freq Range (≥5,251MHz, <5,290MHz): ≤10^(-(8/390)(|5210-f|-41)-1+log(1/4))mW/MHz
♦9: Freq Range (≥5,290MHz, <5,296.7MHz): ≤10^(-(3/100)(|5210-f|-80)-1.8+log(1/4))mW/MHz
♦10: Freq Range (≥5,296.7MHz, ≤5,480MHz): ≤2.5μW/MHz
♦11: Freq Range (≥5,020MHz, ≤5,203.3MHz): ≤2.5μW/MHz
♦12: Freq Range (>5,203.3MHz, ≤5,210MHz): ≤10^(-(3/100)(|5290-f|-80)-1.8+log(1/4))mW/MHz
♦13: Freq Range (>5,210MHz, ≤5,249MHz): ≤10^(-(8/390)(|5290-f|-41)-1+log(1/4))mW/MHz
♦14: Freq Range (>5,249MHz, ≤5,250MHz): ≤10^(-(|5290-f|-40)+log(1/4))mW/MHz
♦15: Freq Range (≥5,350MHz, <5,376.8MHz): ≤15μW/MHz
♦16: Freq Range (≥5,376.8MHz, ≤5,480MHz): ≤2.5μW/MHz

Tx1_Leak1_Nom



Agilent 13:52:48 May 25, 2018

APv8.3(050118),46722, MOR-DFS

Ref 0 dBm #Atten 10 dB

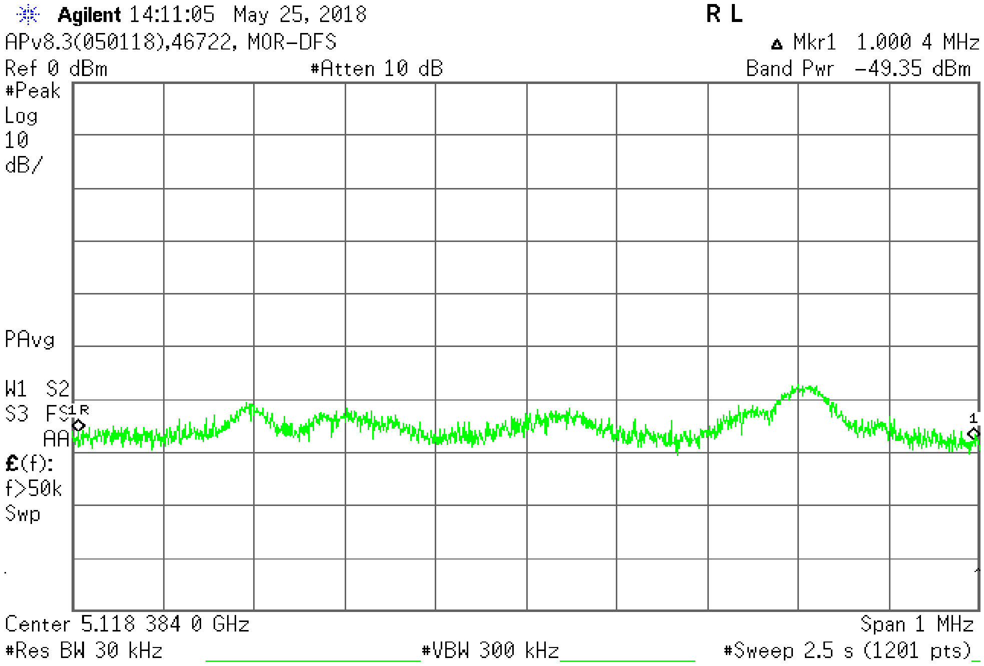
Mkr1 5.118 384 GHz

-44.22 dBm

Center 5.071 600 GHz Span 103.2 MHz

#Res BW 1 MHz #VBW 1 MHz #Sweep 2.5 s (601 pts)

Tx1_Leak1_ALT



Agilent 14:11:05 May 25, 2018

APv8.3(050118),46722, MOR-DFS

Ref 0 dBm #Atten 10 dB

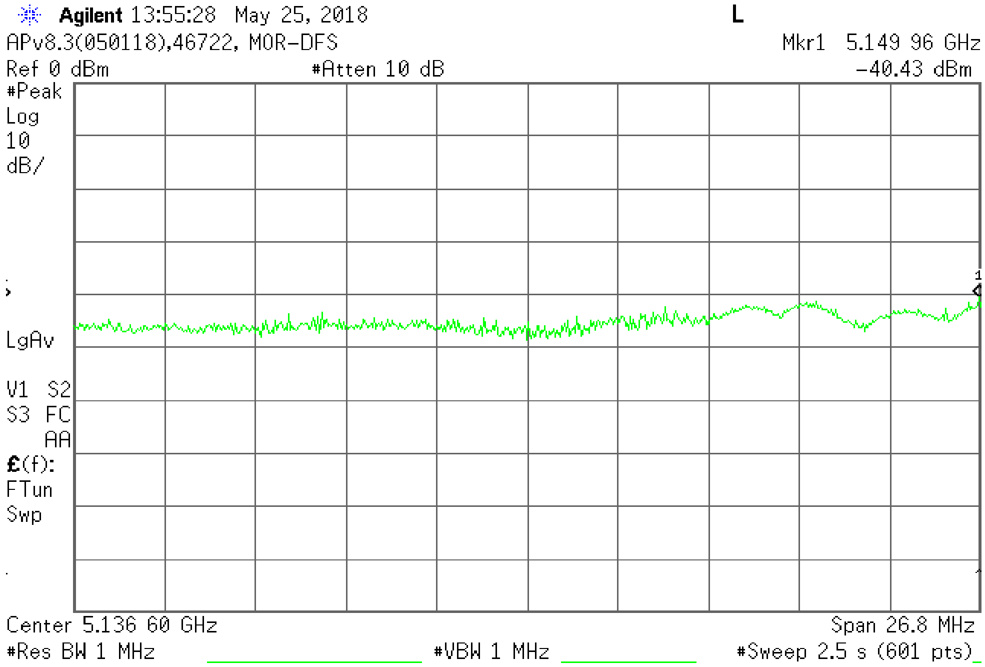
Δ Mkr1 1.000 4 MHz

Band Pwr -49.35 dBm

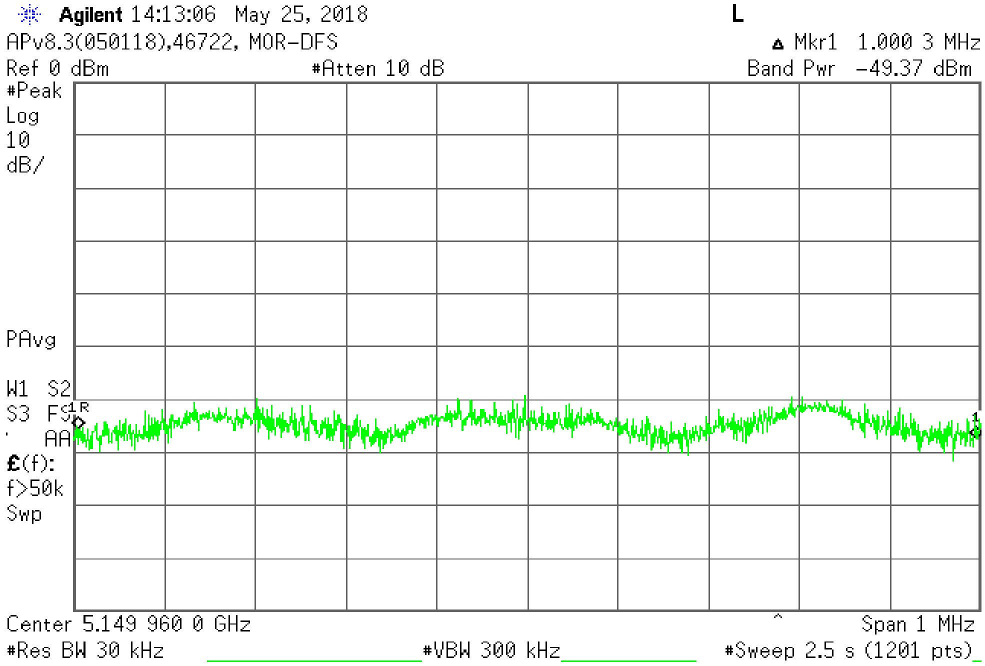
Center 5.118 384 0 GHz Span 1 MHz

#Res BW 30 kHz #VBW 300 kHz #Sweep 2.5 s (1201 pts)

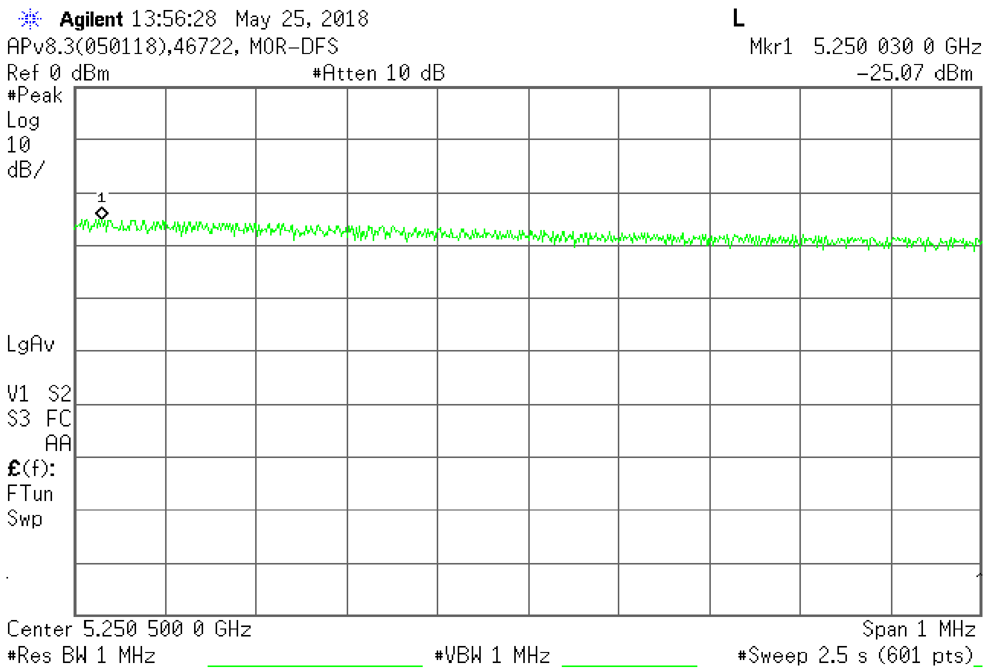
Tx1_Leak2_Nom



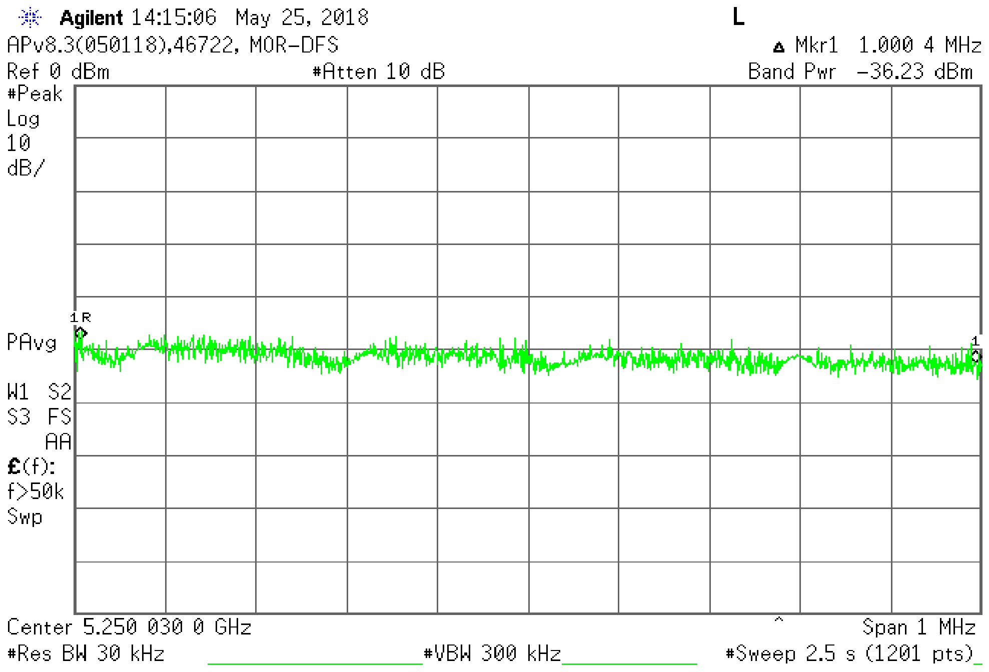
Tx1_Leak2_ALT



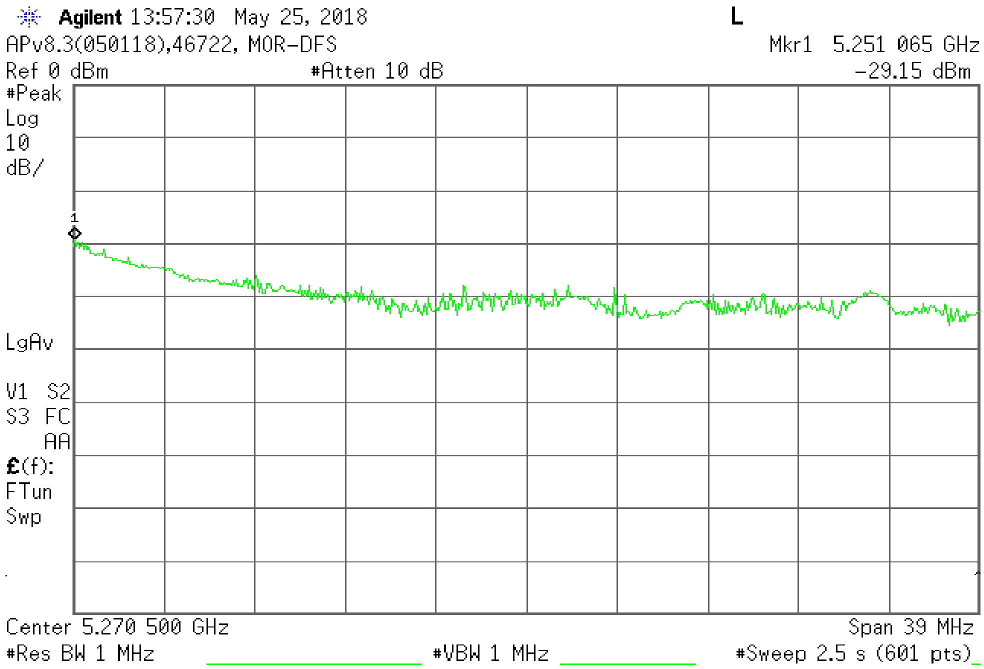
Tx1_Leak3_Nom



Tx1_Leak3_ALT



Tx1_Leak4_Nom



Agilent 13:57:30 May 25, 2018 L

APv8.3(050118),46722, MOR-DFS Mkr1 5.251 065 GHz

Ref 0 dBm #Atten 10 dB -29.15 dBm

#Peak
Log
10
dB/

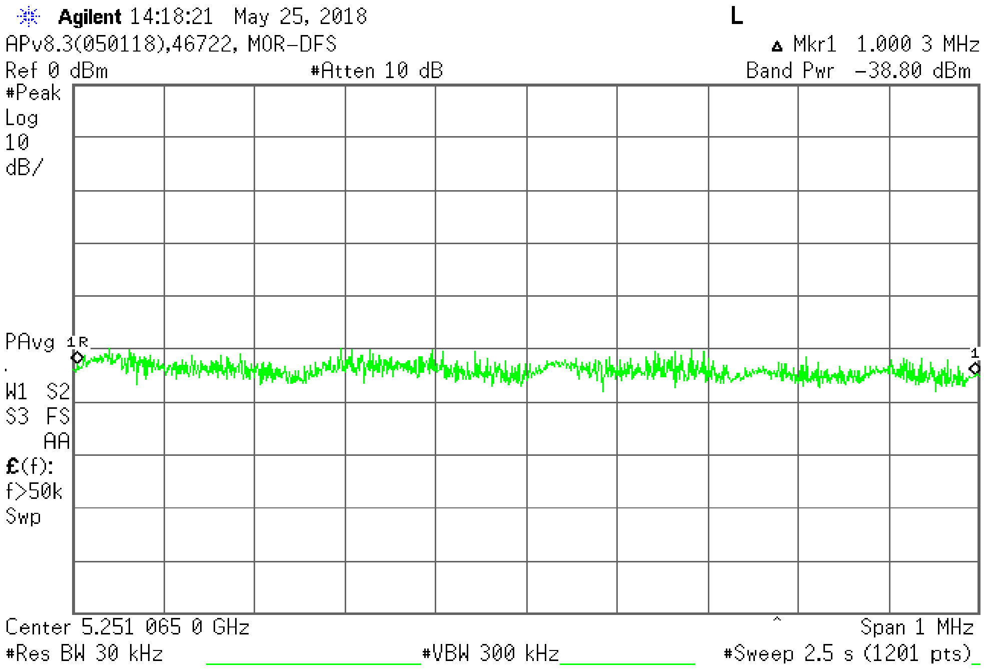
LgAv

V1 S2
S3 FC
AA
£(f):
FTun
Swp

Center 5.270 500 GHz Span 39 MHz

#Res BW 1 MHz #VBW 1 MHz #Sweep 2.5 s (601 pts)

Tx1_Leak4_ALT



Agilent 14:18:21 May 25, 2018 L

APv8.3(050118),46722, MOR-DFS Δ Mkr1 1.000 3 MHz

Ref 0 dBm #Atten 10 dB Band Pwr -38.80 dBm

#Peak
Log
10
dB/

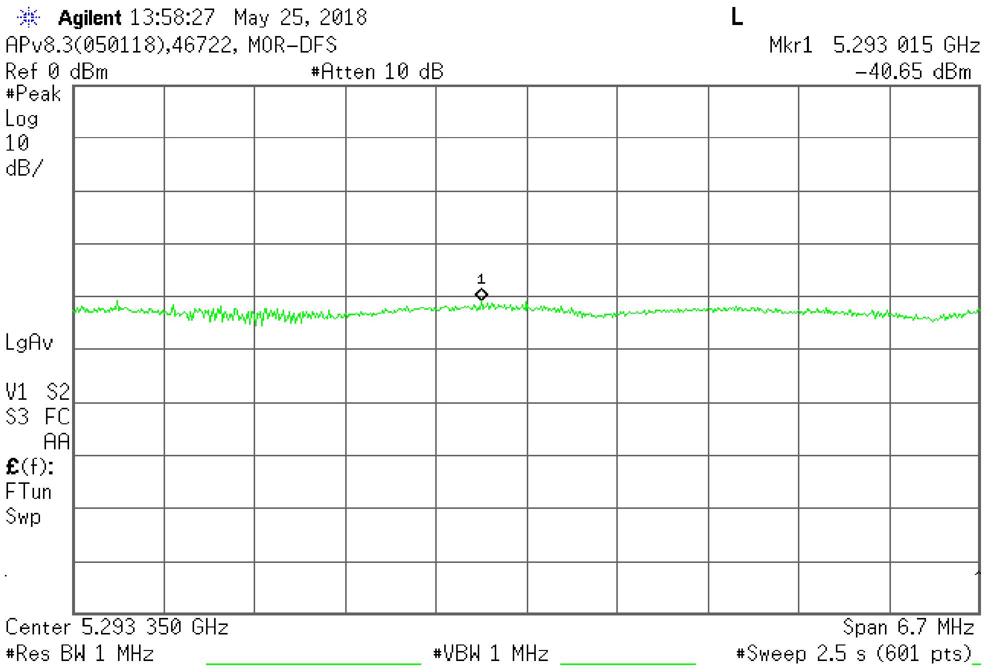
PAvg

W1 S2
S3 FS
AA
£(f):
f>50k
Swp

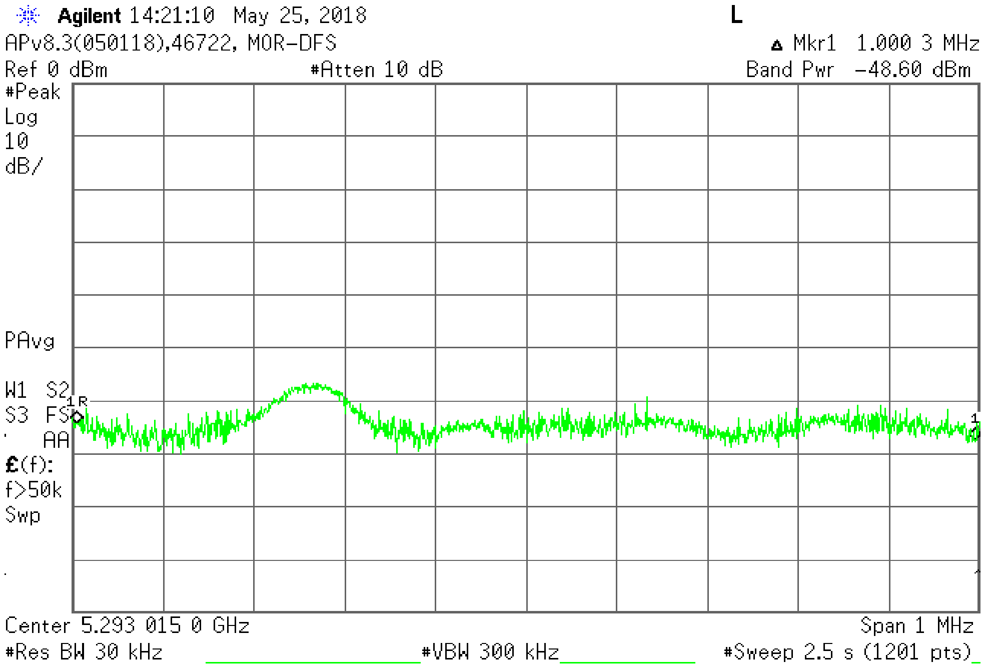
Center 5.251 065 0 GHz Span 1 MHz

#Res BW 30 kHz #VBW 300 kHz #Sweep 2.5 s (1201 pts)

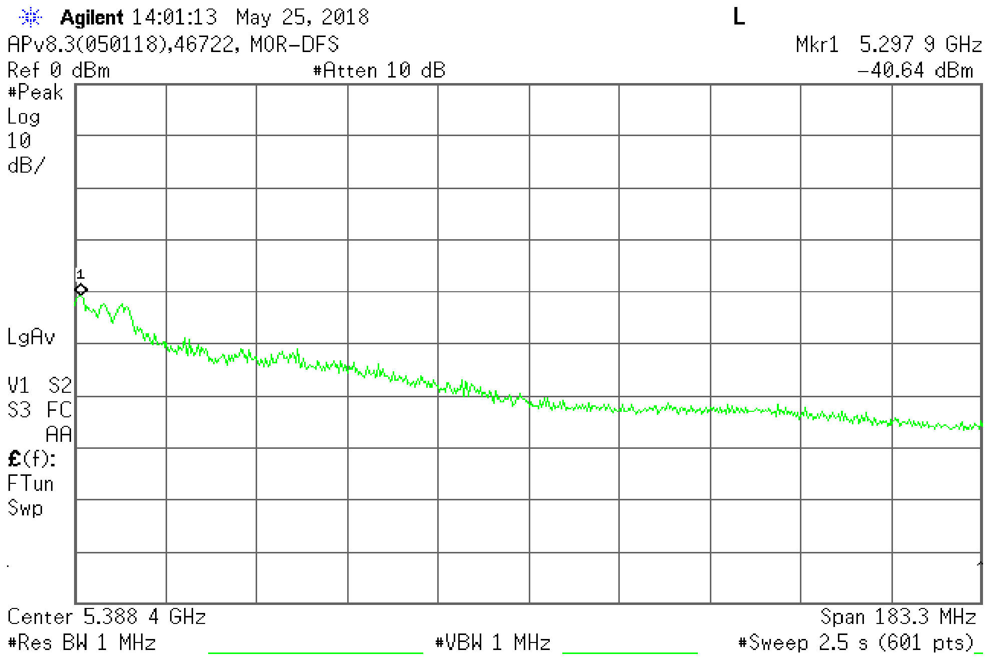
Tx1_Leak5_Nom



Tx1_Leak5_ALT



Tx1_Leak6_Nom


Agilent 14:01:13 May 25, 2018

APv8.3(050118),46722, MOR-DFS

Ref 0 dBm #Atten 10 dB

Mkr1 5.297 9 GHz

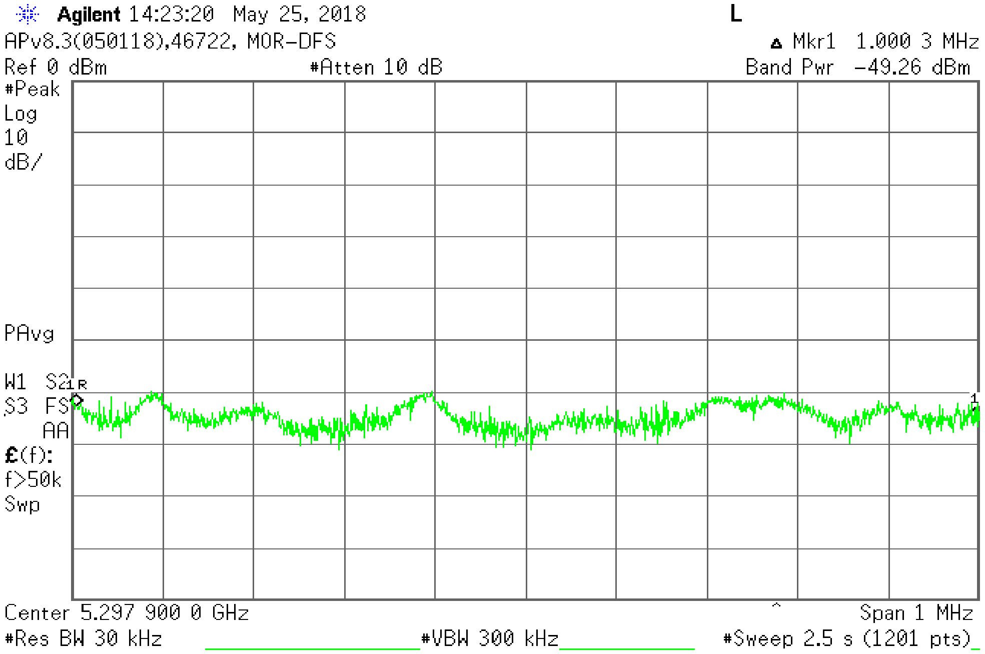
-40.64 dBm

Center 5.388 4 GHz Span 183.3 MHz

#Res BW 1 MHz #VBW 1 MHz #Sweep 2.5 s (601 pts)

L
#Peak
Log
10
dB/
1
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Swp

Tx1_Leak6_ALT


Agilent 14:23:20 May 25, 2018

APv8.3(050118),46722, MOR-DFS

Ref 0 dBm #Atten 10 dB

Δ Mkr1 1.000 3 MHz

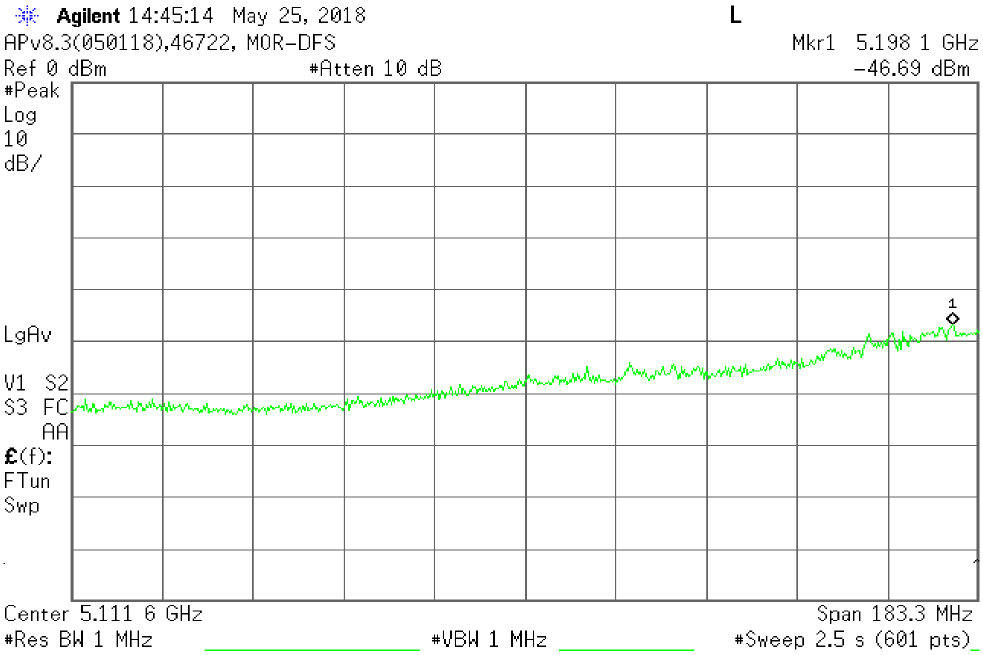
Band Pwr -49.26 dBm

Center 5.297 900 0 GHz Span 1 MHz

#Res BW 30 kHz #VBW 300 kHz #Sweep 2.5 s (1201 pts)

L
#Peak
Log
10
dB/
PAvg
W1 S2
S3 FS
AA
£(f):
f>50k
Swp
1R
1

Tx3_Leak1_Nom



Agilent 14:45:14 May 25, 2018 L

APv8.3(050118),46722, MOR-DFS Mkr1 5.198 1 GHz

Ref 0 dBm #Atten 10 dB -46.69 dBm

#Peak
Log
10
dB/

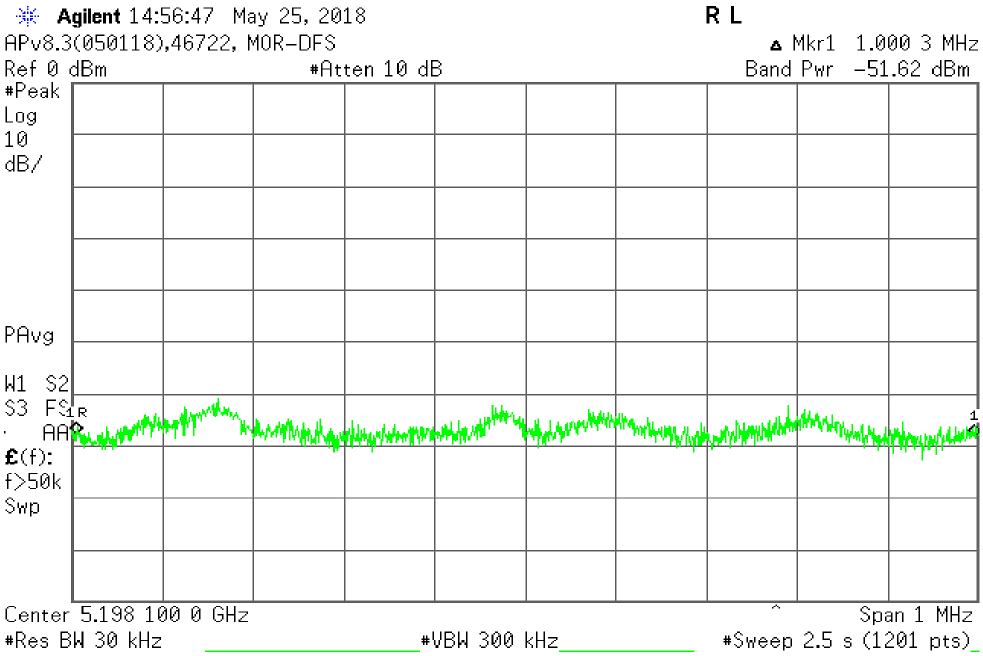
LgAv

V1 S2
S3 FC
AA
£(f):
FTun
Swp

Center 5.111 6 GHz Span 183.3 MHz

#Res BW 1 MHz #VBW 1 MHz #Sweep 2.5 s (601 pts)

Tx3_Leak1_ALT



Agilent 14:56:47 May 25, 2018 R L

APv8.3(050118),46722, MOR-DFS Δ Mkr1 1.000 3 MHz

Ref 0 dBm #Atten 10 dB Band Pwr -51.62 dBm

#Peak
Log
10
dB/

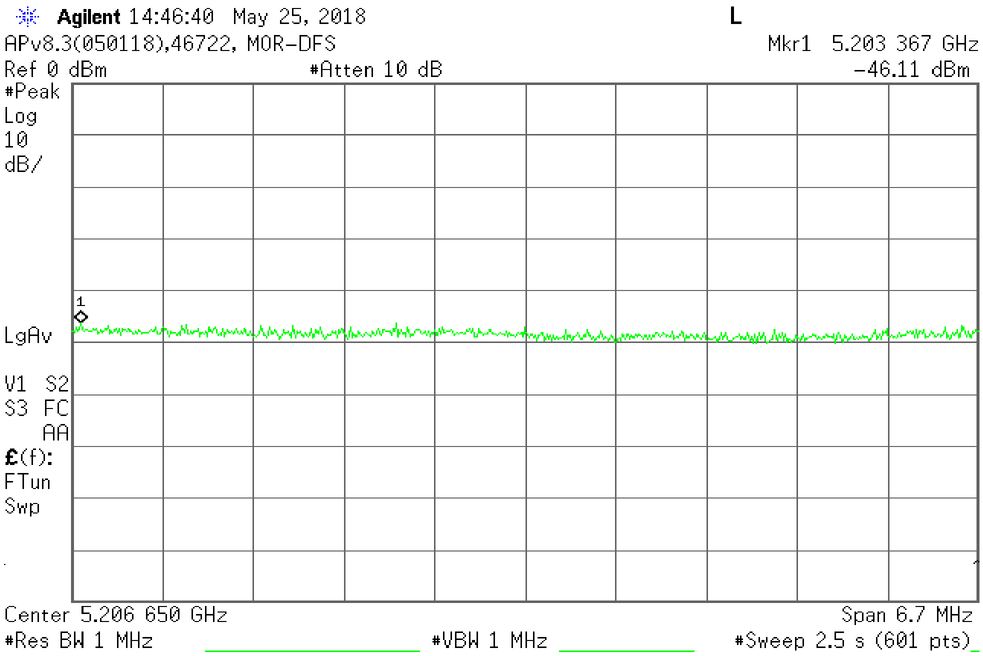
PAvg

W1 S2
S3 FS
AA
£(f):
f>50k
Swp

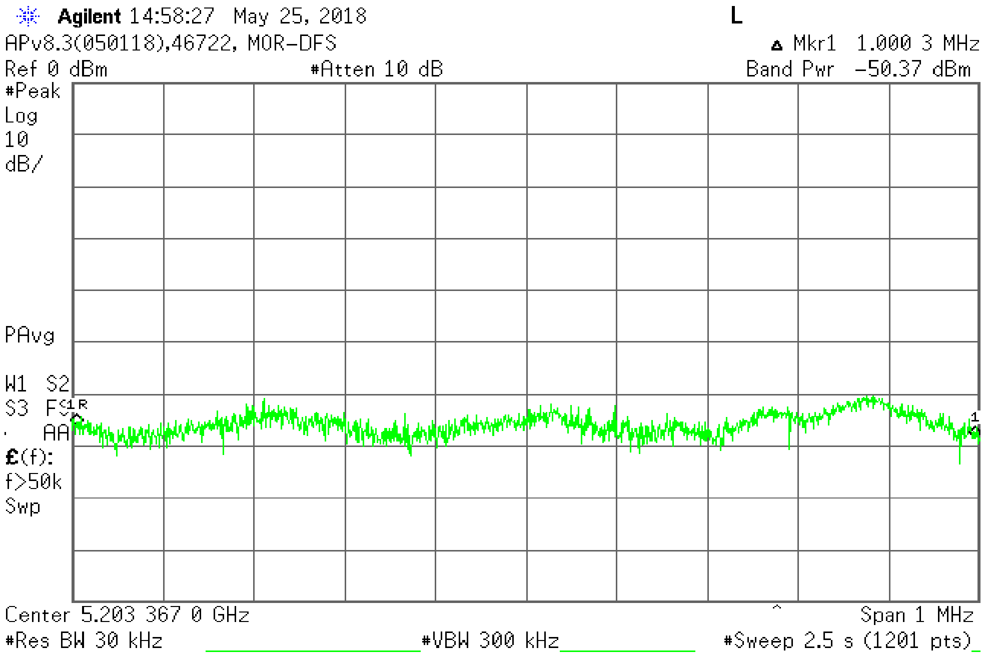
Center 5.198 100 0 GHz Span 1 MHz

#Res BW 30 kHz #VBW 300 kHz #Sweep 2.5 s (1201 pts)

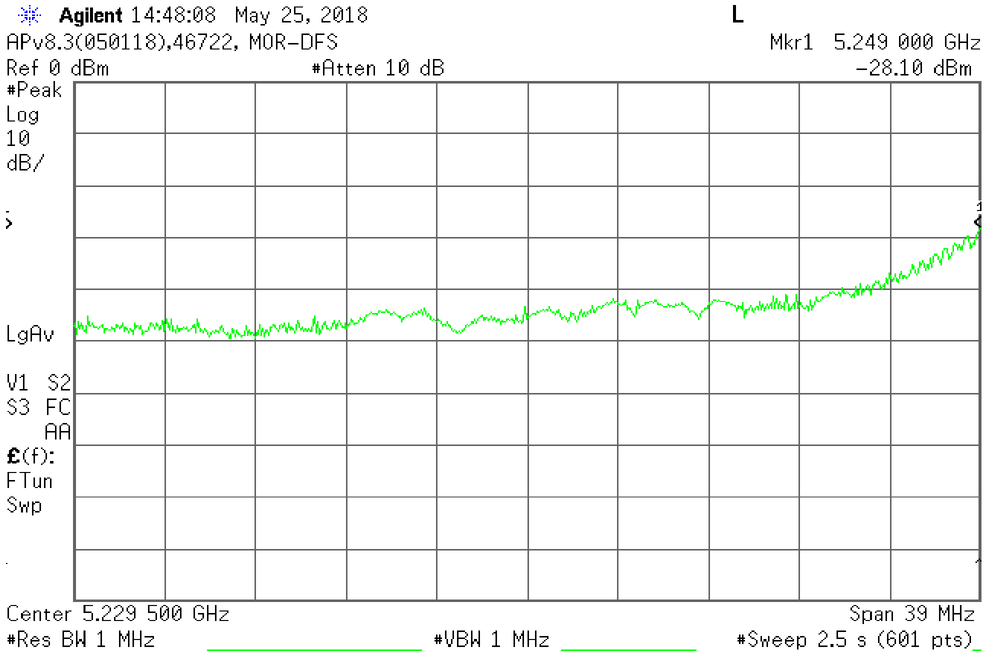
Tx3_Leak2_Nom



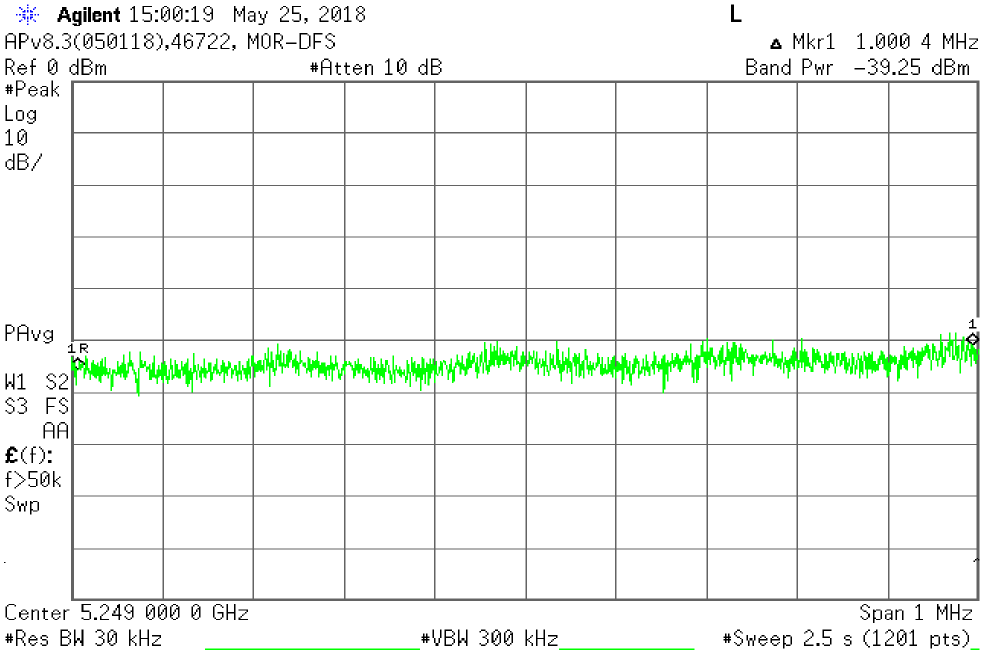
Tx3_Leak2_ALT



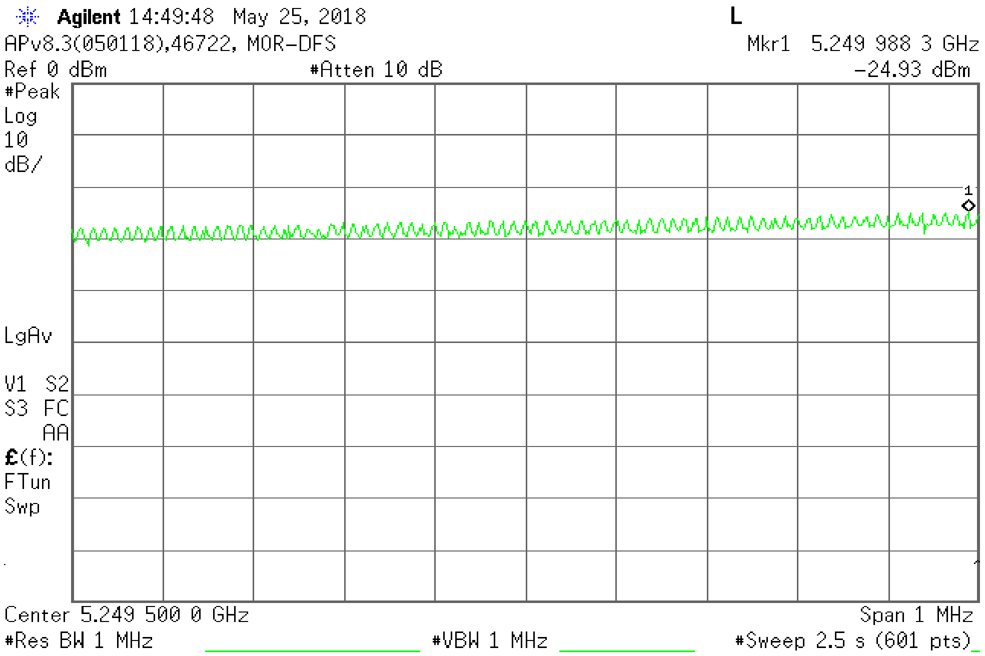
Tx3_Leak3_Nom



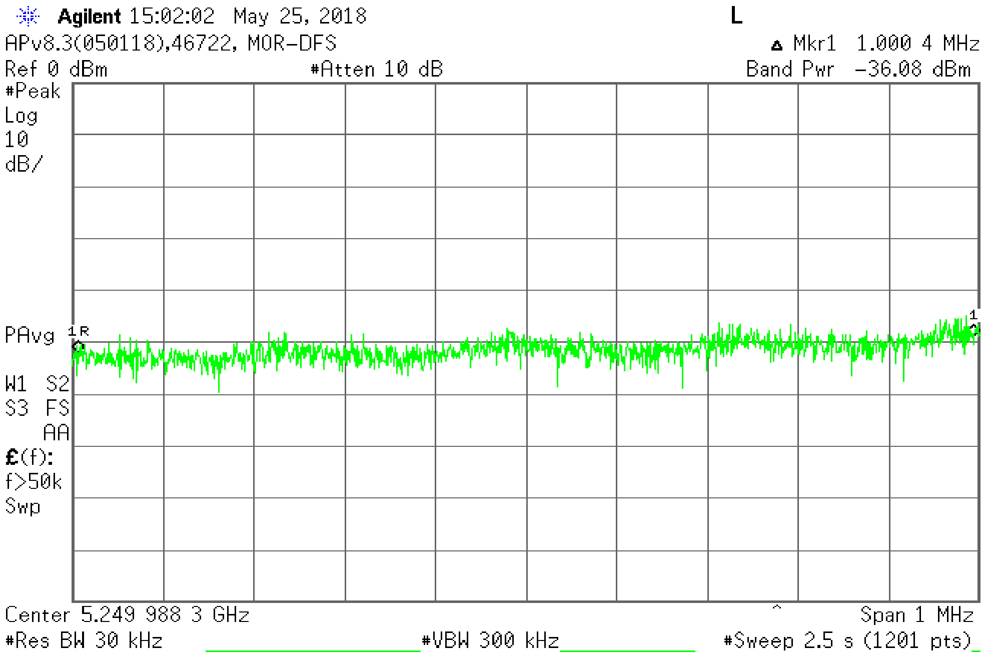
Tx3_Leak3_ALT



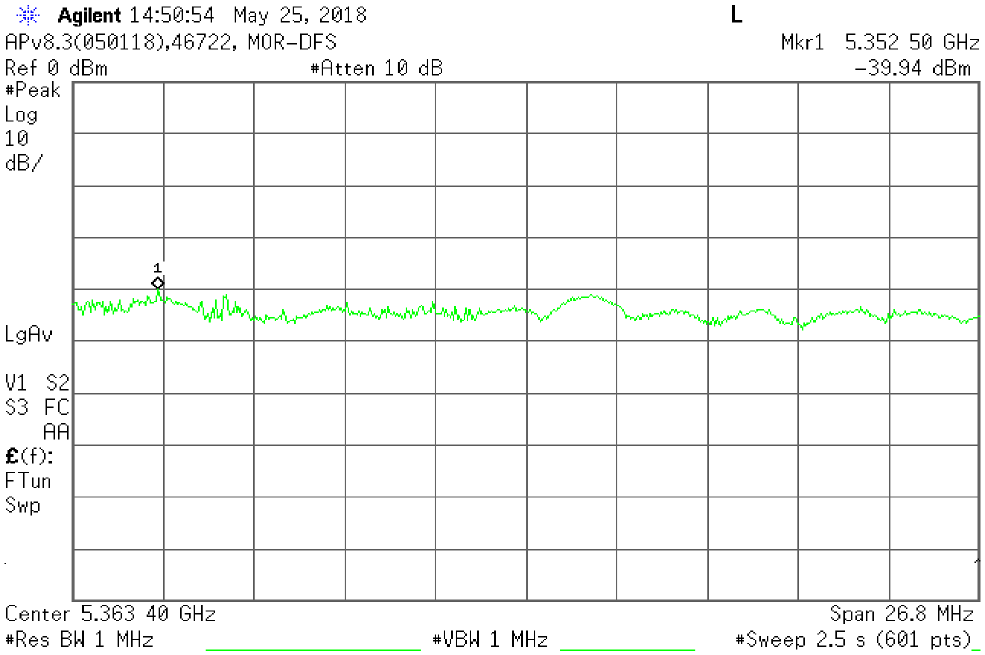
Tx3_Leak4_Nom



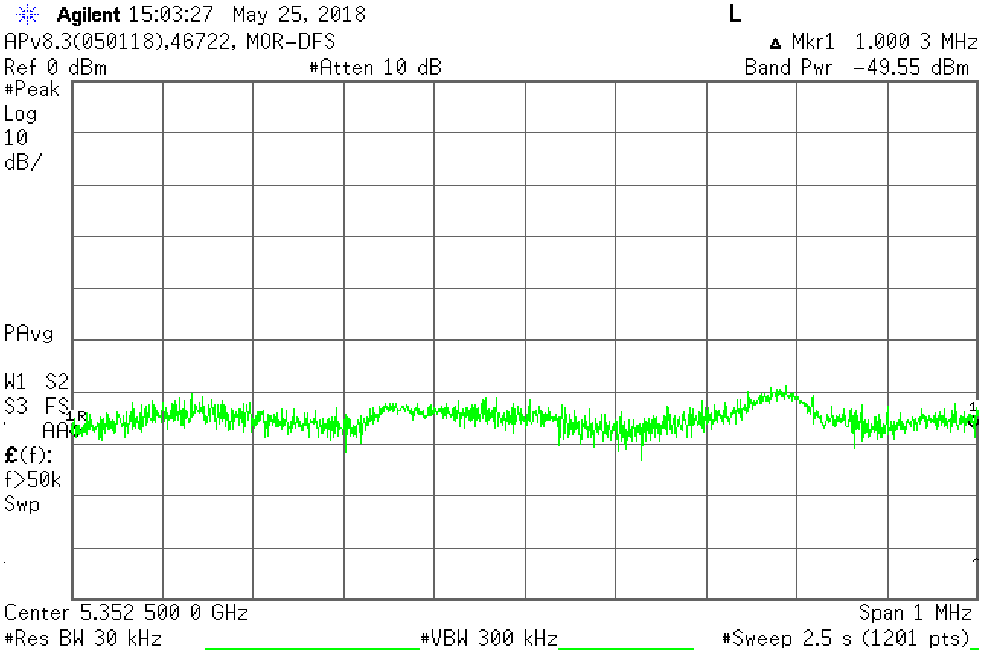
Tx3_Leak4_ALT



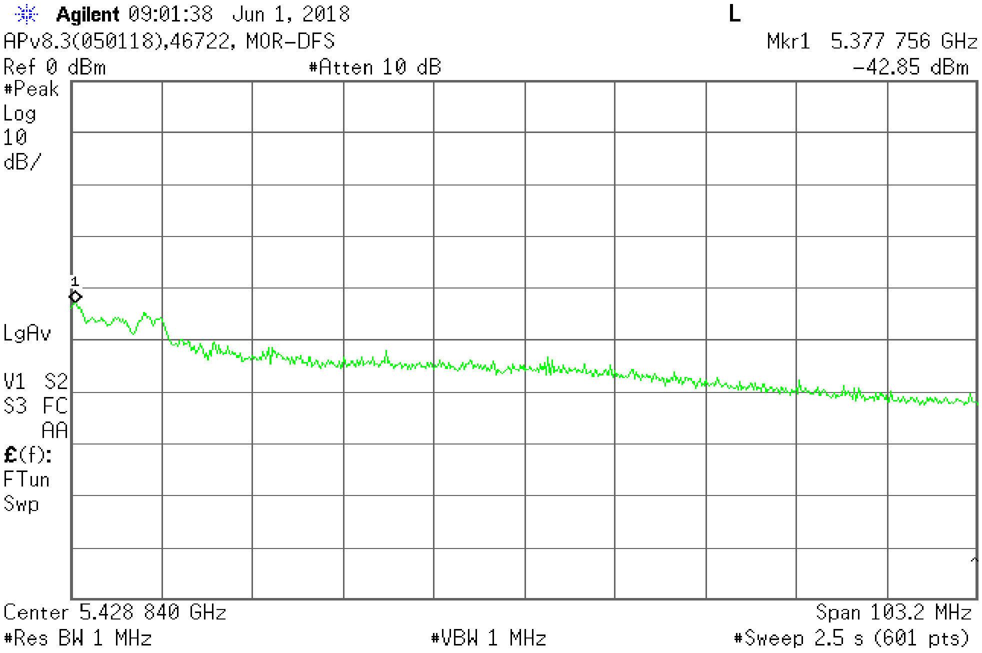
Tx3_Leak5_Nom



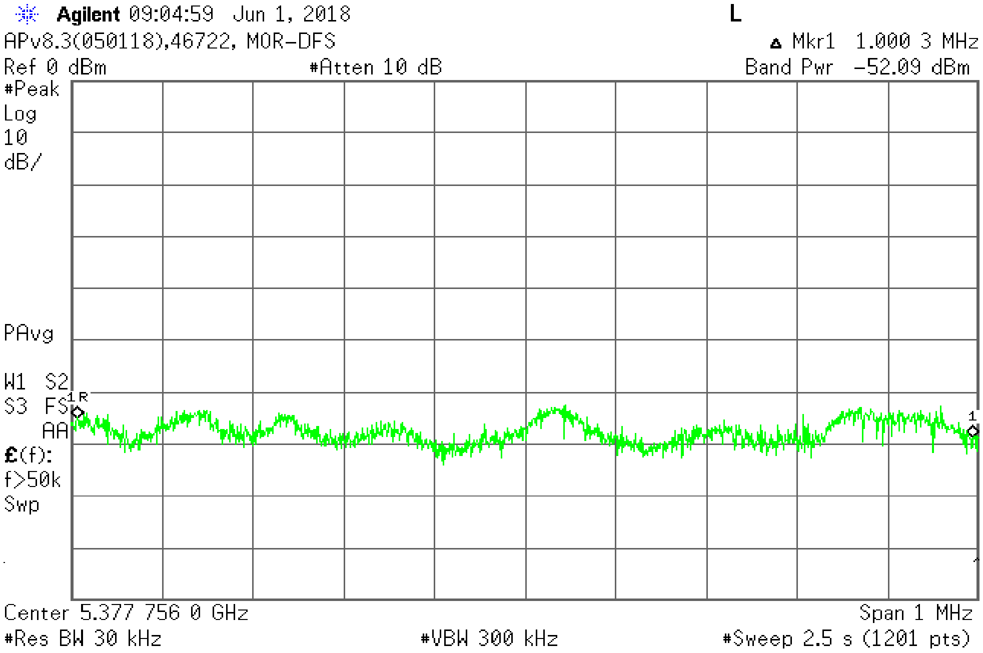
Tx3_Leak5_ALT



Tx3_Leak6_Nom



Tx3_Leak6_ALT



Average Power

Job No.	R12053557-E9d
Remark1	
Remark2	

[DATA]

Voltage	Port No.	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Burst Rate	Output Power Result [dBm]
DC4V	0	5210	-7.15	16.26	0.00	2.39	12.89
		-		-	-	-	-
		5290	-8.21	16.26	0.00	2.39	11.83
DC4V	1	5210	-7.19	16.26	0.00	2.39	12.85
		-		-	-	-	-
		5290	-8.54	16.26	0.00	2.39	11.50
DC4V	-	-		-	-	-	-
		-		-	-	-	-
		-		-	-	-	-
DC4V	-	-		-	-	-	-
		-		-	-	-	-
		-		-	-	-	-
DC4V	-	-		-	-	-	-
		-		-	-	-	-
		-		-	-	-	-
DC4V	-	-		-	-	-	-
		-		-	-	-	-
		-		-	-	-	-
DC4V	-	-		-	-	-	-
		-		-	-	-	-
		-		-	-	-	-
DC4V	-	-		-	-	-	-
		-		-	-	-	-
		-		-	-	-	-

Total Output Power

Voltage	Freq. [MHz]	Power [mW]
DC4V	5210	38.77
	-	-
	5290	29.40

3. Measurement Equipment

Use	Int. No.	Kind of Equipment	Model No.	Manufacturer	Serial No.	Calibration Authority	Calibration Date
X	72822	Spectrum Analyzer	E4446A	Agilent	MY51100032	World Cal	2017-08-21
X	81018	Spectrum Analyzer	E4446A	Agilent	MY46180491	World Cal	2018-04-12
X	PWM005	Power Meter	N1912A	Keysight	MY55116004	World Cal	2017-05-22
X	PWS005	Power Sensor	N1921A	Keysight	MY55090030	World Cal	2017-05-18

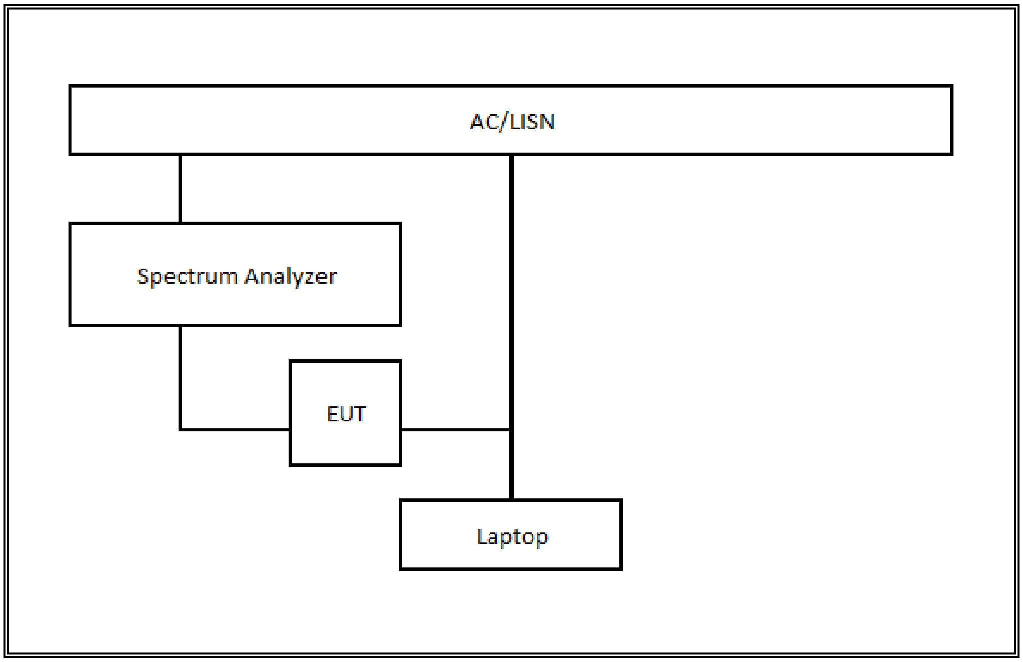
Note : 1. The calibration of measurement equipment is valid for a one year period.
2. "X" used equipment.

4. Test Condition

Test Item	Date	Temp	Hum	Engineer	Test Room
Frequency Tolerance	2018-04-19	22.7C	50%	46722	MOR-Con1
Occupied Bandwidth	2018-04-19	22.7C	50%	46722	MOR-Con1
Unwanted Emission Strength	2018-04-19	22.7C	50%	46722	MOR-Con1
Output Power/ E.I.R.P	4/19 to 7/10/2018	22.7C	50%	46722	MOR-Con1
Secondary Radiated Emission Strength	2018-04-19	22.7C	50%	46722	MOR-Con1
Burst Length / Duty	2018-04-19	22.7C	50%	46722	MOR-Con1
Adjacent Channel Power	2018-04-19	22.7C	50%	46722	MOR-Con1
Outband Leakage Power Strength	2018-05-25 2018-06-01	22.9C	50%	46722	MOR-DFS

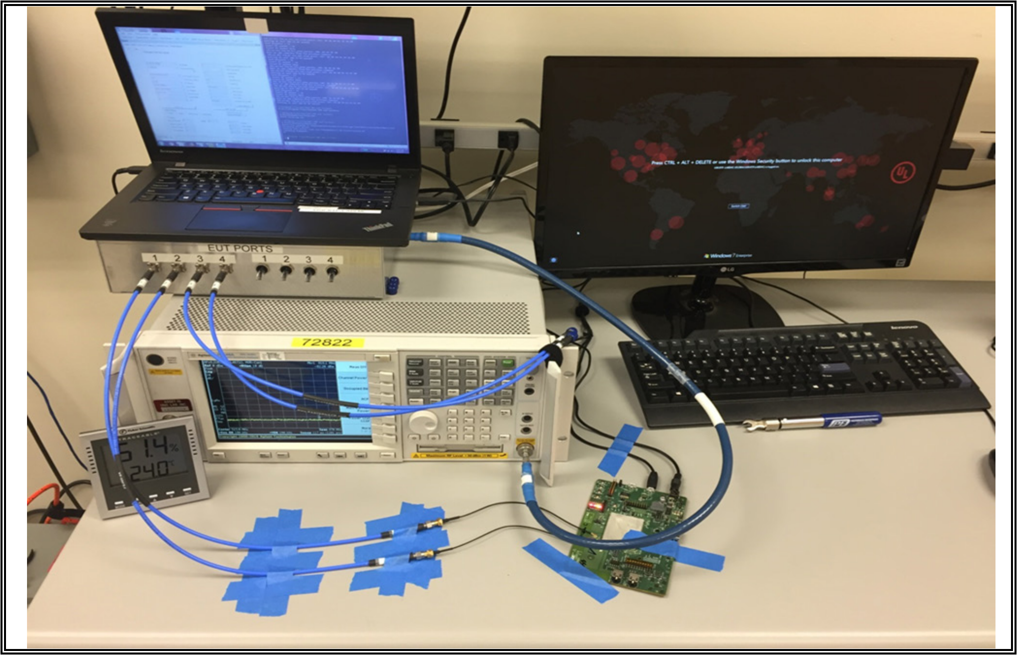
5. TEST CONFIGURATION

TEST CirCuit



AC/LISN
Spectrum Analyzer
EUT
Laptop

PHOTO



EUT PORTS
72822