Palstar, Inc.

EMC TEST REPORT FOR

HF LDMOS Amplifier
Model: LA-1K

Tested To The Following Standard:

FCC Part 97 – Subpart D

Report No.: 100620-8

Date of issue: November 28, 2017

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Palstar, Inc.
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REPRESENTATIVE: Paul Hrivnak

REPORT PREPARED BY:

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CKC Laboratories, Inc.
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Mariposa, CA 95338

Project Number: 100620

DATE OF EQUIPMENT RECEIPT: November 13, 2017
DATE(S) OF TESTING: November 13-15, 2017

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.11
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

Location	NIST CB #	TAIWAN	CANADA	FCC	JAPAN
Fremont, CA	US0082	SL2-IN-E-1148R	3082B-1	US1023	A-0149

SUMMARY OF RESULTS

Standard / Specification: FCC Part(s) 97 Subpart D

Test Procedure	Description	Modifications	Results
2.1049 / 97.301	Occupied Bandwidth / Authorized Frequency Bands	NA	Pass
2.1046 / 97.313	RF Power Output / Transmitter Power Standards	NA	Pass
2.1051 / 97.307	Spurious Emissions at Antenna Terminals / Emission Standards	NA	Pass
2.1053 / 97.307	Field Strength of Spurious Radiation / Emission Standards	NA	Pass
97.317(a)(2)/(a)(3)	Standards for Certification of External RF Power Amplifiers	Mod. #1	Pass

NA = Not Applicable

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
Modification #1: Install the new firmware version 1.00J

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
HF LDMOS Amplifier	Palstar, Inc.	LA-1K	29040

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Maximum Duty Cycle:	50%
Antenna Connection Type:	External Connector
Nominal Input Voltage:	230-240 VAC

FCC PART 97 SUBPART D

2.1049 Occupied Bandwidth / 97.301 Authorized Frequency Bands

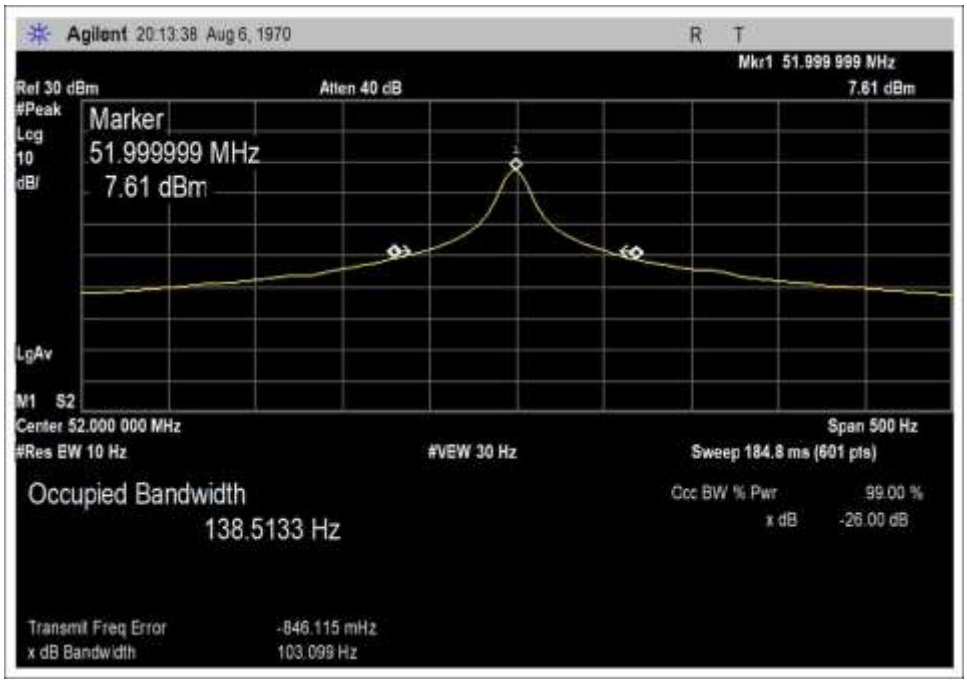
Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/13/2017
Configuration:	2		
Test Condition	The EUT is set up as intended. It is received an input signal from the amplifier. Two Spectrum Analyzers are connected to measure the input and output of the EUT		

Environmental Conditions			
Temperature (ºC)	21.5	Relative Humidity (%):	46

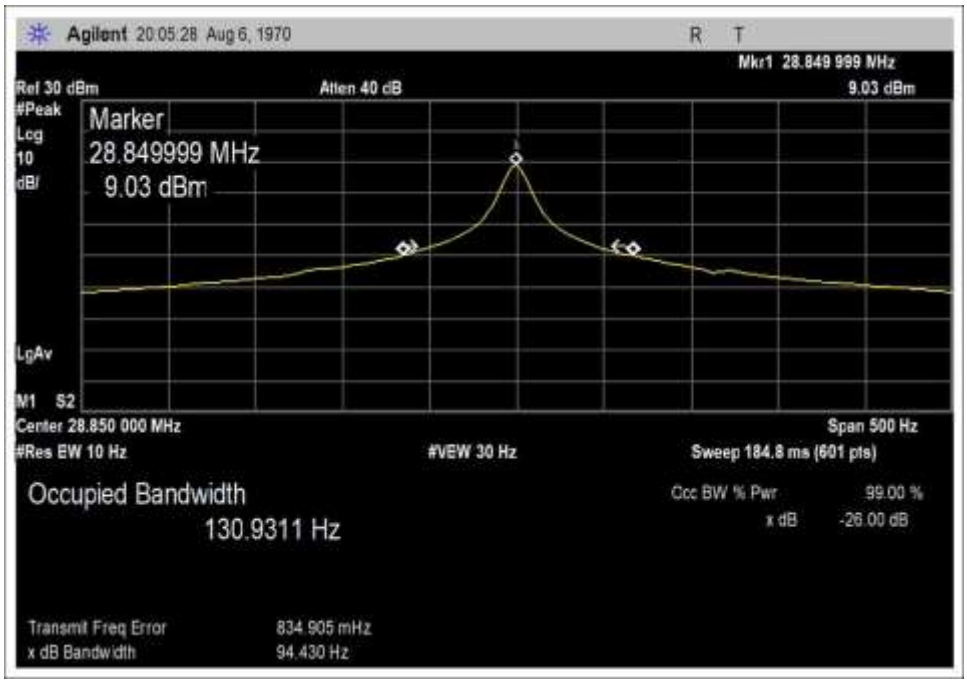
Test Equipment				
Asset#	**Description**	**Model**	**Cal Date**	**Cal Date**
AN00744	Directional Coupler	C2630	11/15/2016	11/15/2018
AN02902	Directional Coupler	C4080-20	11/3/2017	11/3/2019
ANP00914	Cable	ETS1-50A	11/3/2017	11/3/2019
ANP00915	Cable	ETS1-50A	11/3/2017	11/3/2019
ANP06560	Cable	LMR195-FR-6	1/29/2016	1/29/2018
ANP06561	Cable	LMR195-FR-4	1/29/2016	1/29/2018
ANP06690	Cable	PE3062-180	6/16/2016	6/16/2018
AN00783	Spectrum Analyzer	8596E	7/5/2016	7/5/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
AN02032	Resistor, Load	8890-300	6/27/2016	6/27/2018
ANC00032	Arbitrary Waveform Generator	E4433B	2/26/2016	2/26/2018

Test Data Summary					
Frequency (MHz)	**Band (m)**	**99% Occupied Bandwidth (Hz)**	**-26dBc Occupied Bandwidth (Hz)**	**Limit (kHz)**	**Results**
1.900	160	125.4940	92.439	None	Pass
3.550	80	129.8000	95.702	None	Pass
7.150	40	128.4520	93.979	None	Pass
14.175	20	131.9363	94.668	None	Pass
18.118	17	129.7515	94.335	None	Pass
21.225	15	133.2163	95.267	None	Pass
24.940	12	131.6562	94.661	None	Pass
28.850	10	130.9311	94.430	None	Pass
52.000	6	138.5133	103.099	None	Pass

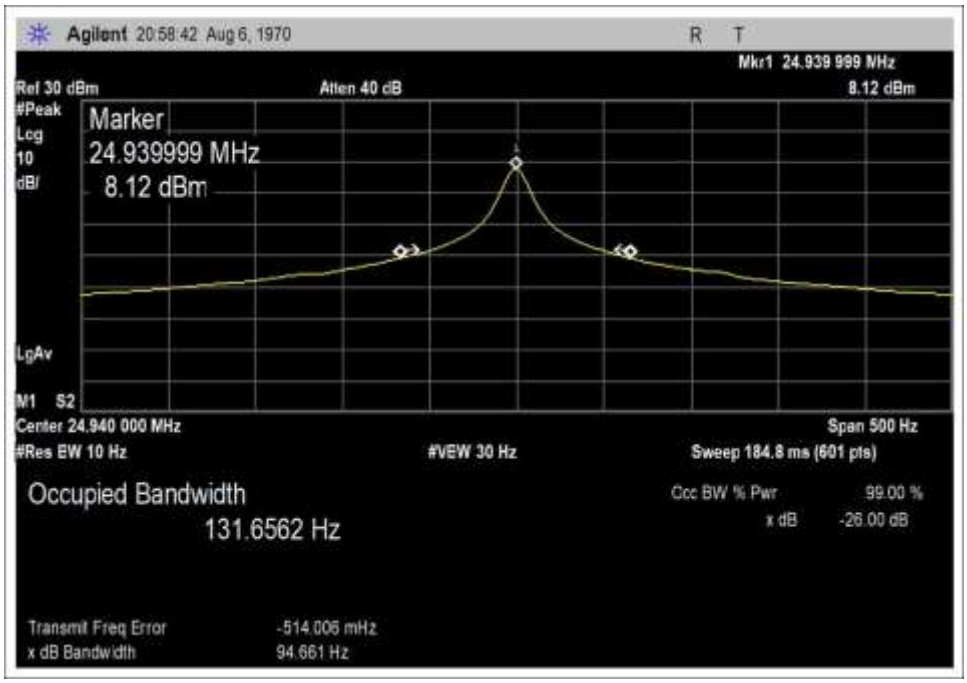
Plots



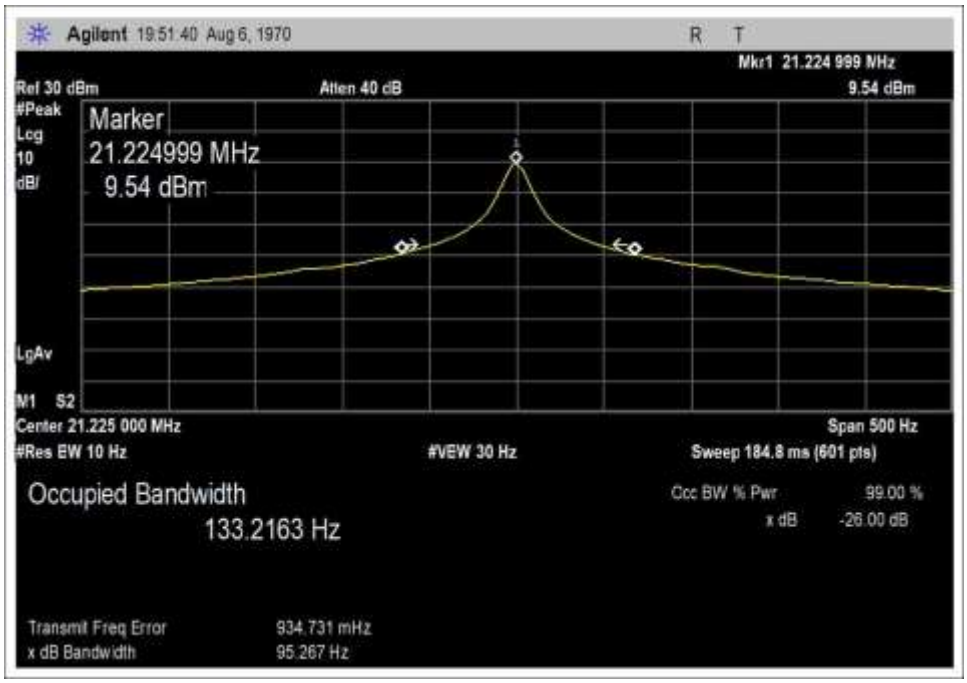
6M


Agilent 20:05:28 Aug 6, 1970
R T
Mkr1 28.849 999 MHz
Ref 30 dBm
Atten 40 dB
9.03 dBm
#Peak
Log
10
dB/
Marker
28.849999 MHz
9.03 dBm
LgAv
M1 S2
Center 28.850 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 Hz
Sweep 184.8 ms (601 pts)
Occupied Bandwidth
130.9311 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error 834.905 mHz
x dB Bandwidth 94.430 Hz

10M


Agilent 20:58:42 Aug 6, 1970
R T
Mkr1 24.939 999 MHz
Ref 30 dBm
Atten 40 dB
8.12 dBm
#Peak
Log
10
dB/
Marker
24.939999 MHz
8.12 dBm
LgAv
M1 S2
Center 24.940 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 Hz
Sweep 184.8 ms (601 pts)
Occupied Bandwidth
131.6562 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -514.006 mHz
x dB Bandwidth 94.661 Hz

12M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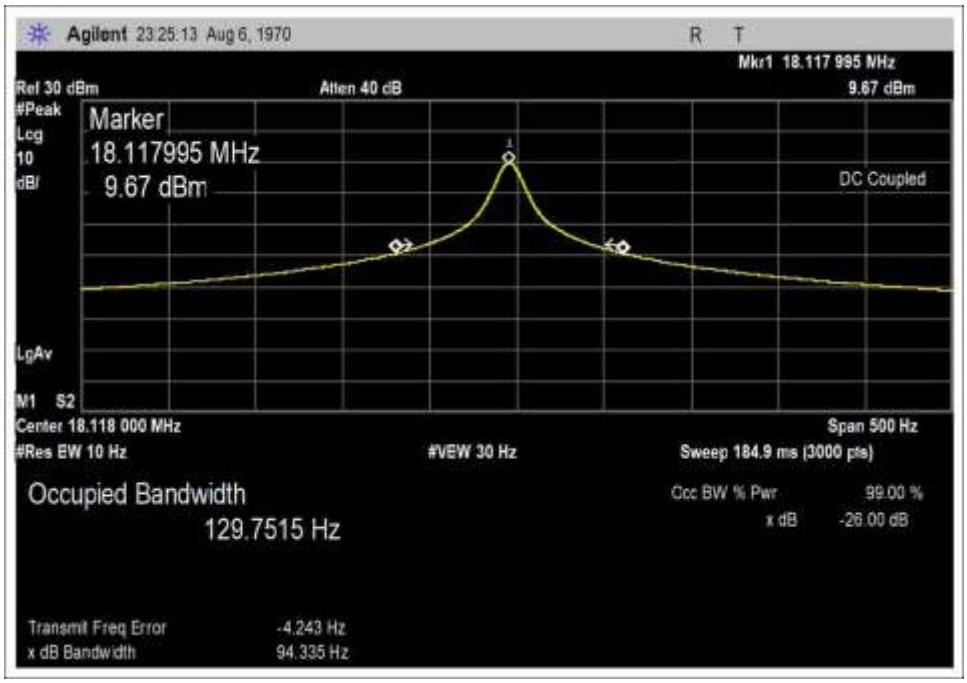
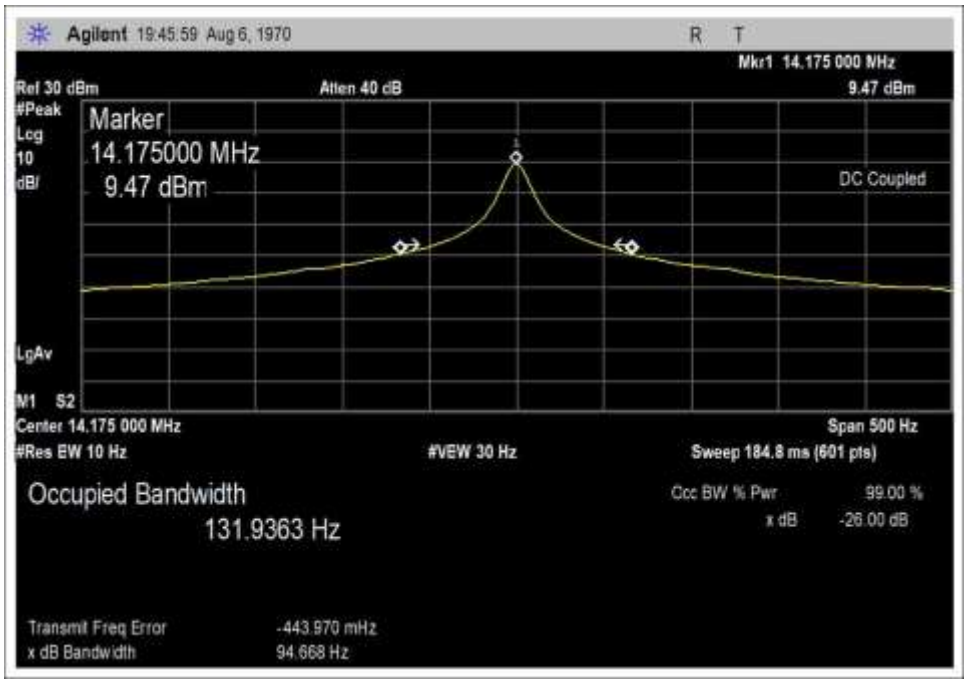
R T
Mkr1 21.224 999 MHz
Ref 30 dBm
Atten 40 dB
9.54 dBm
#Peak
Log
10
dB/
Marker
21.224999 MHz
9.54 dBm
LgAv
M1 S2
Center 21.225 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 Hz
Sweep 184.8 ms (601 pts)
Occupied Bandwidth
133.2163 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error 934.731 mHz
x dB Bandwidth 95.267 Hz

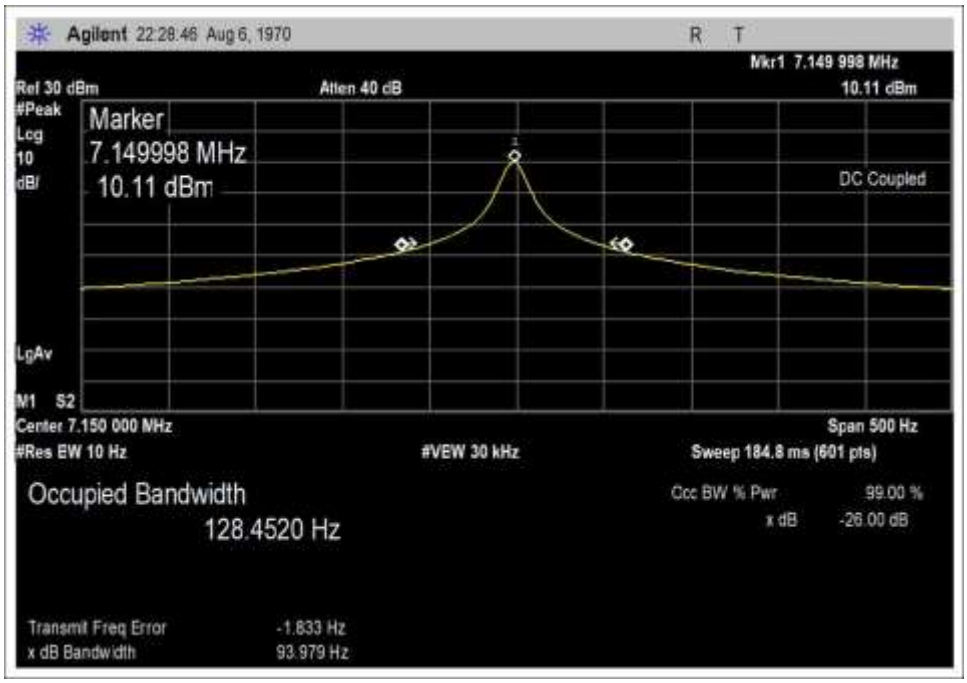
15M


Agilent 23:25:13 Aug 6, 1970
R T
Mkr1 18.117 995 MHz
Ref 30 dBm
Atten 40 dB
9.67 dBm
#Peak
Log
10
dB/
Marker
18.117995 MHz
9.67 dBm
DC Coupled
LgAv
M1 S2
Center 18.118 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 Hz
Sweep 184.9 ms (3000 pts)
Occupied Bandwidth
129.7515 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -4.243 Hz
x dB Bandwidth 94.335 Hz

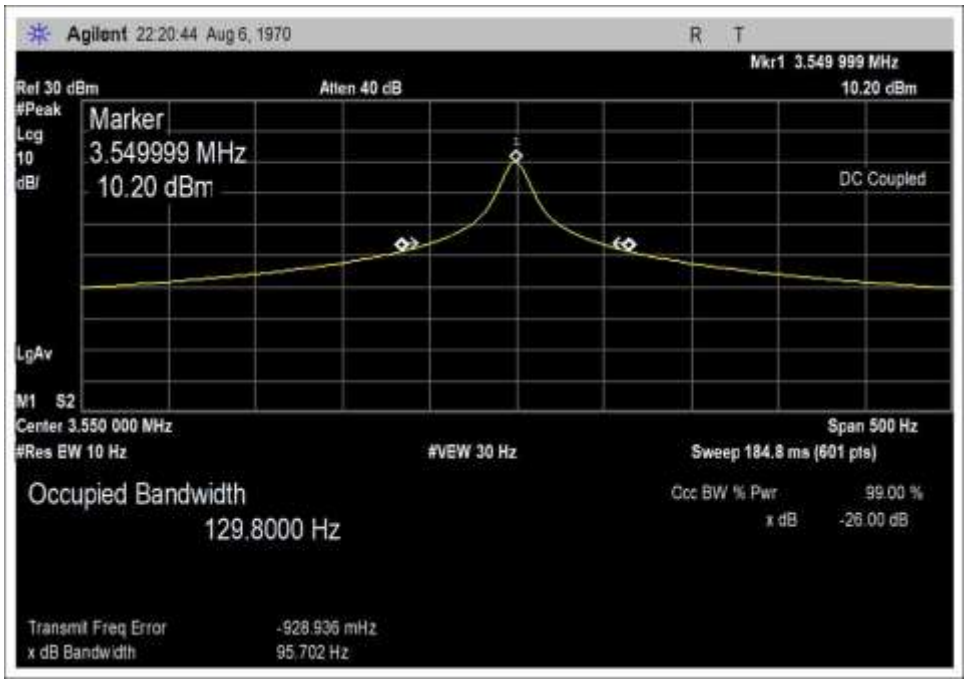
17M


Agilent 19:45:59 Aug 6, 1970
R T
Mkr1 14.175 000 MHz
Ref 30 dBm
Atten 40 dB
9.47 dBm
#Peak
Log
10
dB/
Marker
14.175000 MHz
9.47 dBm
DC Coupled
LgAv
M1 S2
Center 14.175 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 Hz
Sweep 184.8 ms (601 pts)
Occupied Bandwidth
131.9363 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -443.970 mHz
x dB Bandwidth 94.668 Hz

20M


Agilent 22:28:46 Aug 6, 1970
R T
Mkr1 7.149 998 MHz
Ref 30 dBm
Atten 40 dB
10.11 dBm
#Peak
Log
10
dB/
Marker
7.149998 MHz
10.11 dBm
DC Coupled
LgAv
M1 S2
Center 7.150 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 kHz
Sweep 184.8 ms (601 pts)
Occupied Bandwidth
128.4520 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -1.833 Hz
x dB Bandwidth 93.979 Hz

40M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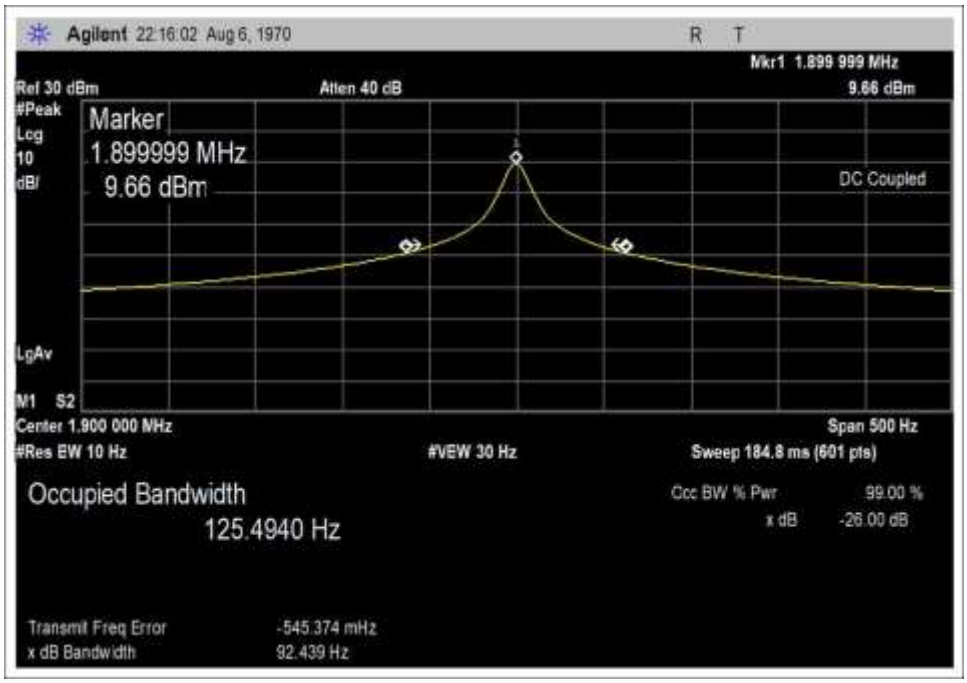
R T
Mkr1 3.549 999 MHz
Ref 30 dBm
Atten 40 dB
10.20 dBm
#Peak
Log
10
dB/
Marker
3.549999 MHz
10.20 dBm
DC Coupled
LgAv
M1 S2
Center 3.550 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 Hz
Sweep 184.8 ms (601 pts)
Occupied Bandwidth
129.8000 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -928.936 mHz
x dB Bandwidth 95.702 Hz

80M


Agilent 22:16:02 Aug 6, 1970
R T
Mkr1 1.899 999 MHz
Ref 30 dBm
Atten 40 dB
9.66 dBm
#Peak
Log
10
dB/
Marker
1.899999 MHz
9.66 dBm
DC Coupled
LgAv
M1 S2
Center 1.900 000 MHz
Span 500 Hz
#Res EW 10 Hz
#VEW 30 Hz
Sweep 184.8 ms (601 pts)
Occupied Bandwidth
125.4940 Hz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -545.374 mHz
x dB Bandwidth 92.439 Hz

160M

Test Setup Photo

2.1046 RF Power Output / 97.313 Transmitter Power Standards

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/13/2017
Configuration:	2		
Test Condition:	The EUT is set up as intended. It is received an input signal from the amplifier. Two Spectrum Analyzers are connected to measure the input and output of the EUT RBW=100kHz VBW=300kHz		

Environmental Conditions			
Temperature (ºC)	21.5	Relative Humidity (%):	46

Test Equipment				
Asset#	**Description**	**Model**	**Cal Date**	**Cal Date**
AN00744	Directional Coupler	C2630	11/15/2016	11/15/2018
AN02902	Directional Coupler	C4080-20	11/3/2017	11/3/2019
ANP00914	Cable	ETS1-50A	11/3/2017	11/3/2019
ANP00915	Cable	ETS1-50A	11/3/2017	11/3/2019
ANP06560	Cable	LMR195-FR-6	1/29/2016	1/29/2018
ANP06561	Cable	LMR195-FR-4	1/29/2016	1/29/2018
ANP06690	Cable	PE3062-180	6/16/2016	6/16/2018
AN00783	Spectrum Analyzer	8596E	7/5/2016	7/5/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
AN02032	Resistor, Load	8890-300	6/27/2016	6/27/2018
ANC00032	Arbitrary Waveform Generator	E4433B	2/26/2016	2/26/2018

Test Data Summary					
Frequency Range (MHz)	Band (m)	Measured Power Input (Watt)	Measured Power Output (Watt)	Limit (W)	Result
1.900	160	49.65	903.64	1500	Pass
3.550	80	49.65	986.27	1500	Pass
7.150	40	49.65	950.60	1500	Pass
14.175	20	49.65	864.96	1500	Pass
18.118	17	49.65	935.40	1500	Pass
21.225	15	49.65	891.25	1500	Pass
24.940	12	49.65	703.07	1500	Pass
28.850	10	49.65	831.76	1500	Pass
52.000	6	49.65	717.79	1500	Pass

Test Setup Photo

2.1051 Spurious Emissions at Antenna Terminals / 97.307 Emission Standard

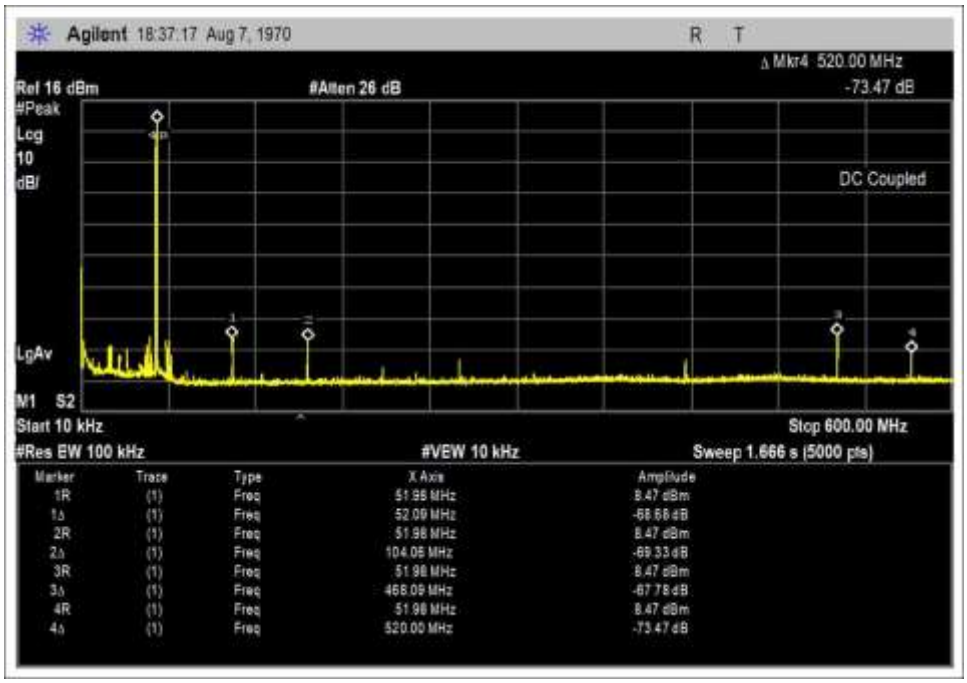
Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/14/2017
Configuration:	2		
Test Condition:	The EUT is set up as intended. It is received an input signal from the amplifier. Two Spectrum Analyzers are connected to measure the input and output of the EUT For frequencies <30 MHz 97.307(d) Limit: -43dbc below mean power of the fundamental. For frequencies >30 MHz 97.307(e) Limit: -60dbc below mean power of the fundamental.		

Environmental Conditions			
Temperature (ºC)	21	Relative Humidity (%):	46

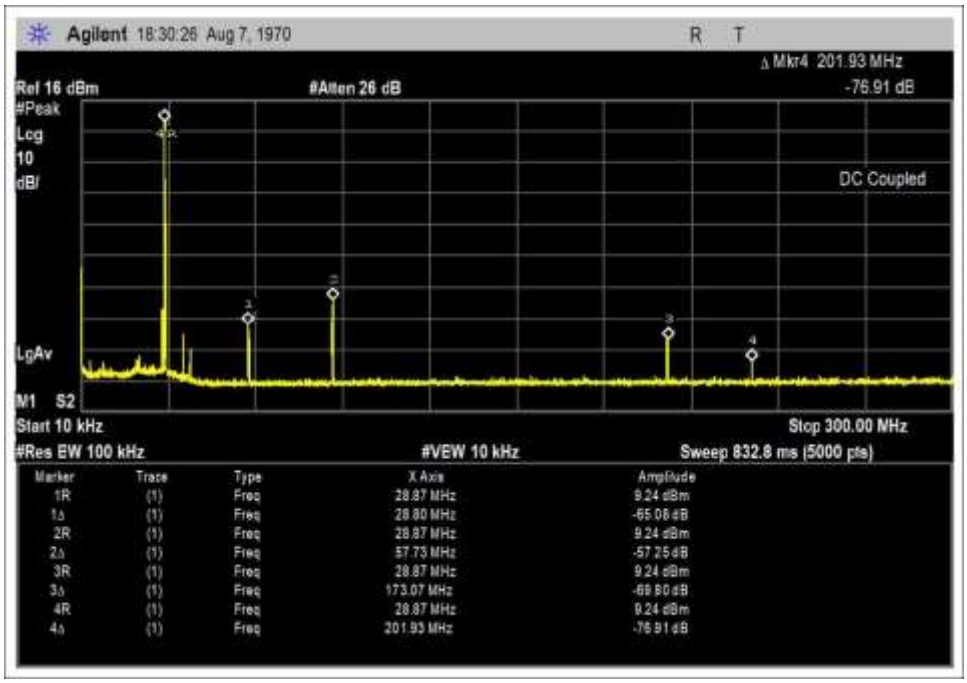
Test Equipment				
Asset# / Serial#	**Description**	**Model**	**Cal Date**	**Cal Date**
AN00744	Directional Coupler	C2630	11/15/2016	11/15/2018
AN02902	Directional Coupler	C4080-20	11/3/2017	11/3/2019
ANP00914	Cable	ETS1-50A	11/03/2017	11/3/2019
ANP00915	Cable	ETS1-50A	11/03/2017	11/3/2019
ANP06560	Cable	LMR195-FR-6	1/29/2016	1/29/2018
ANP06561	Cable	LMR195-FR-4	1/29/2016	1/29/2018
ANP06690	Cable	PE3062-180	6/16/2016	6/16/2018
AN00783	Spectrum Analyzer	8596E	7/5/2016	7/5/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
AN02032	Resistor, Load	8890-300	6/27/2016	6/27/2018
ANC00032	Arbitrary Waveform Generator	E4433B	2/26/2016	2/26/2018

Summary Table				
Frequency (MHz)	**Band (m)**	**Measured Worst Case Spurious (dBc)**	**Limit (dBc)**	**Result**
1.900	160	-49.69	-43	Pass
3.550	80	-54.55	-43	Pass
7.150	40	-61.49	-43	Pass
14.175	20	-49.17	-43	Pass
18.118	17	-58.19	-43	Pass
21.225	15	-46.92	-43	Pass
24.940	12	-65.72	-43	Pass
28.850	10	-65.08	-43	Pass
52.000	6	-67.78	-60	Pass

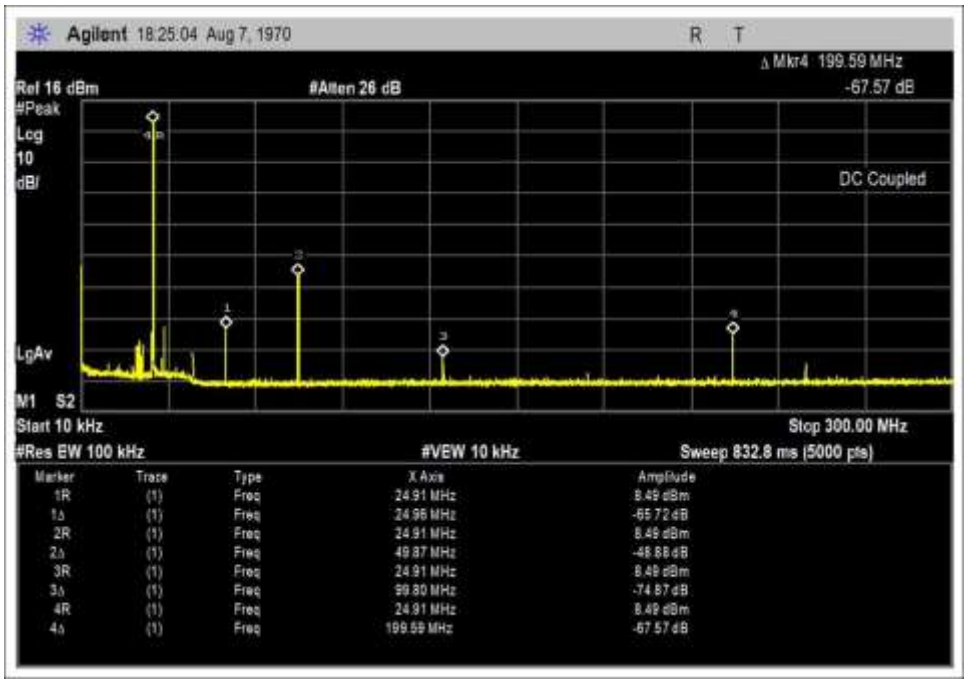
Plots



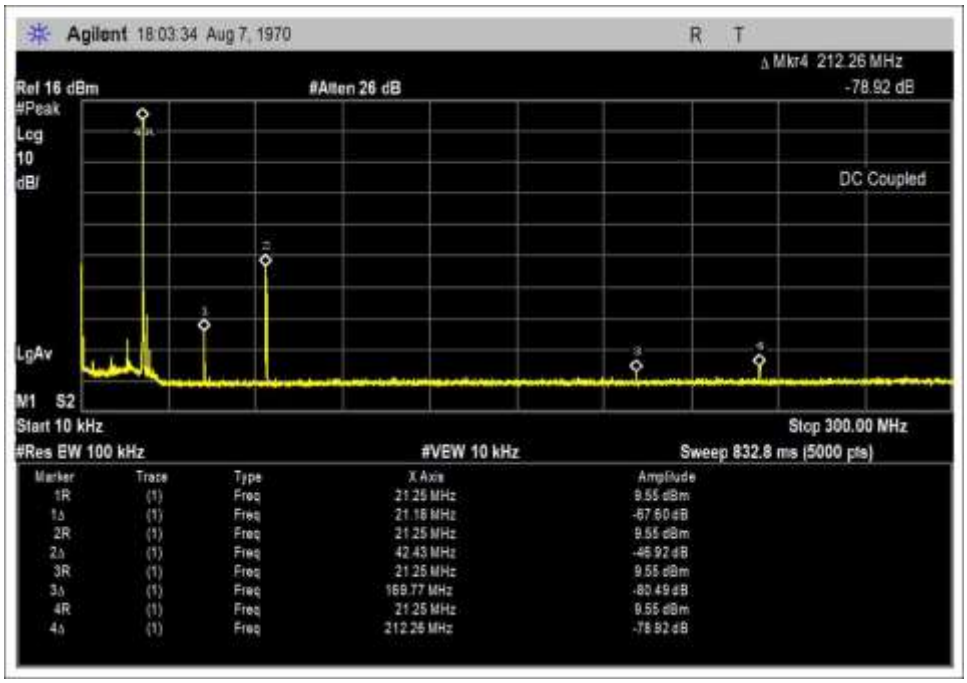
9kHz – 300MHz, 6M



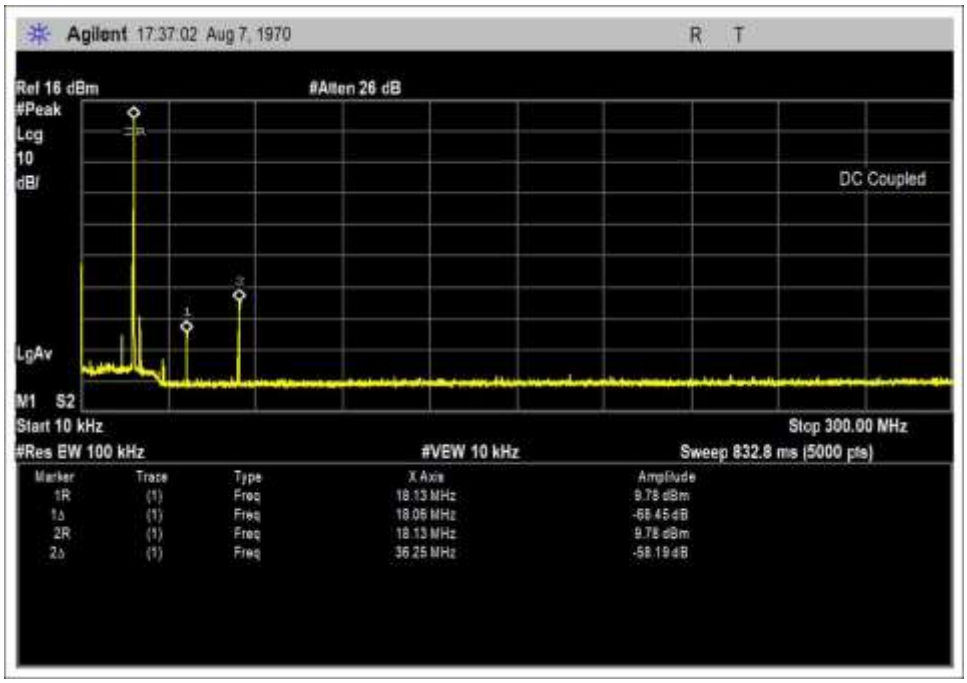
9kHz – 300MHz, 10M



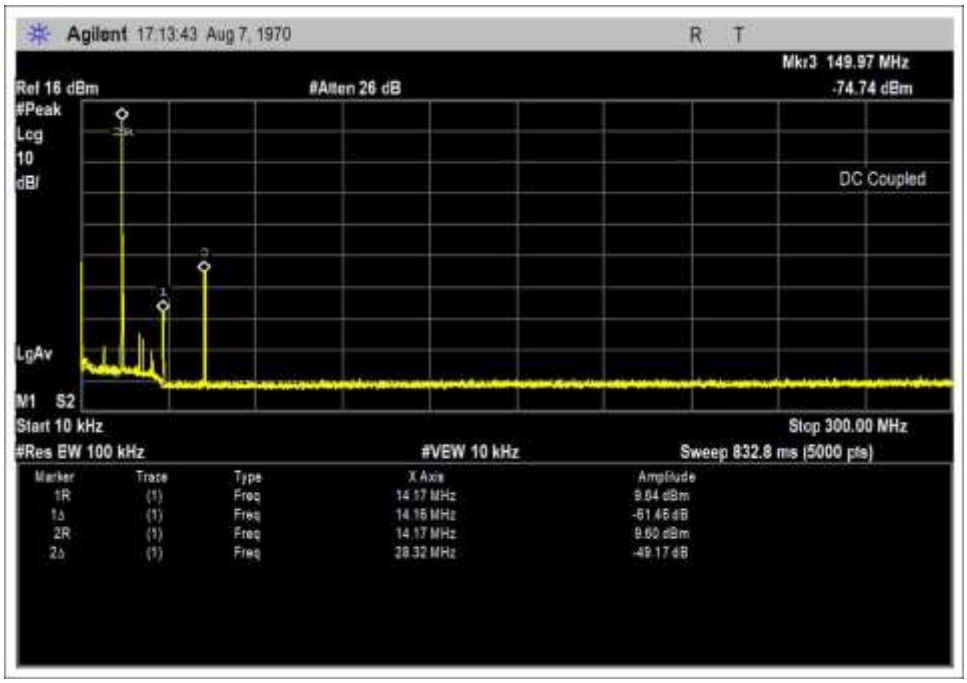
9kHz – 300MHz, 12M



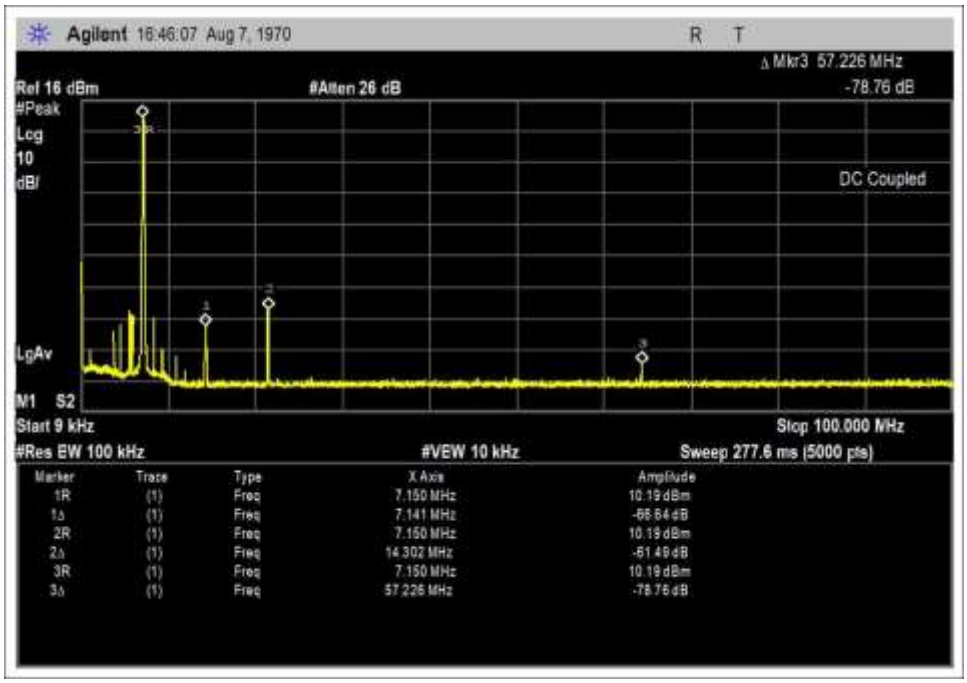
9kHz – 300MHz, 15M



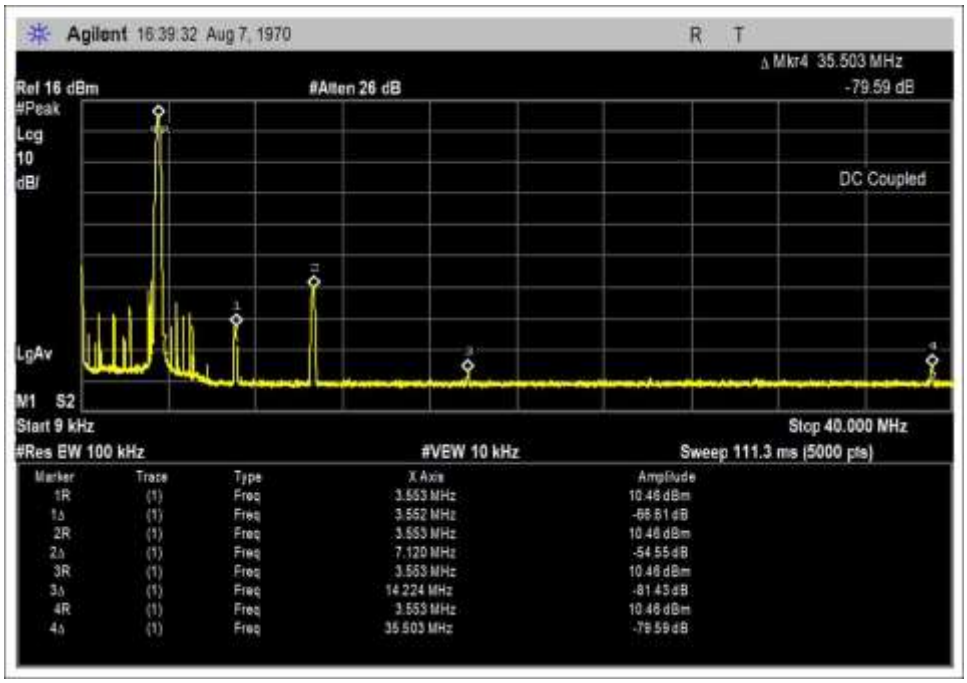
9kHz – 300MHz, 17M



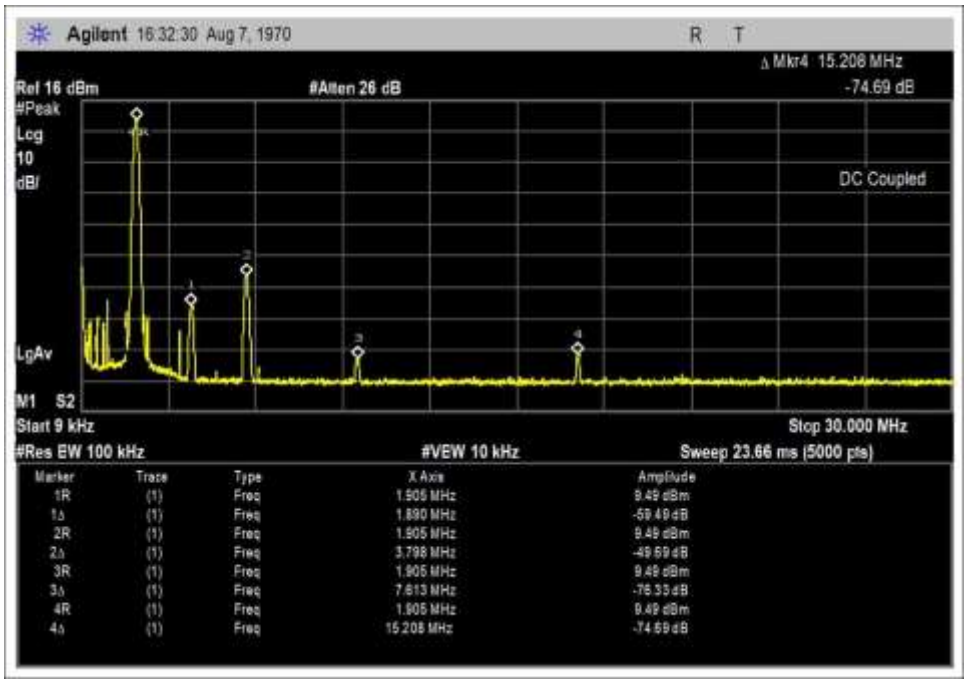
9kHz – 300MHz, 20M



9kHz – 300MHz, 40M



9kHz – 300MHz, 80M



9kHz – 300MHz, 160M

Test Setup Photo

2.1053 Field Strength of Spurious Radiation / 97.307 Emission Standard

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/15/2017
Configuration:	2		
Test Condition:	For frequencies <30 MHz 97.307(d) Limit: -43dbc below mean power of the fundamental. For frequencies >30 MHz 97.307(e) Limit: -60dbc below mean power of the fundamental A formula converts Conducted Method to Radiated Method Limit for Spurious Emission dBm (conducted power) = dBuV/m +20*LOG D -104.77 – Gain (dBi)		

Test Data

Test Location: CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170
Customer: Palstar, Inc
Specification: 97.307 (e) Radiated Emissions
Work Order #: 100620 Date: 11/15/2017
Test Type: Radiated Scan Time: 11:06:57
Tested By: Hieu Song Nguyenpham Sequence#: 8
Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

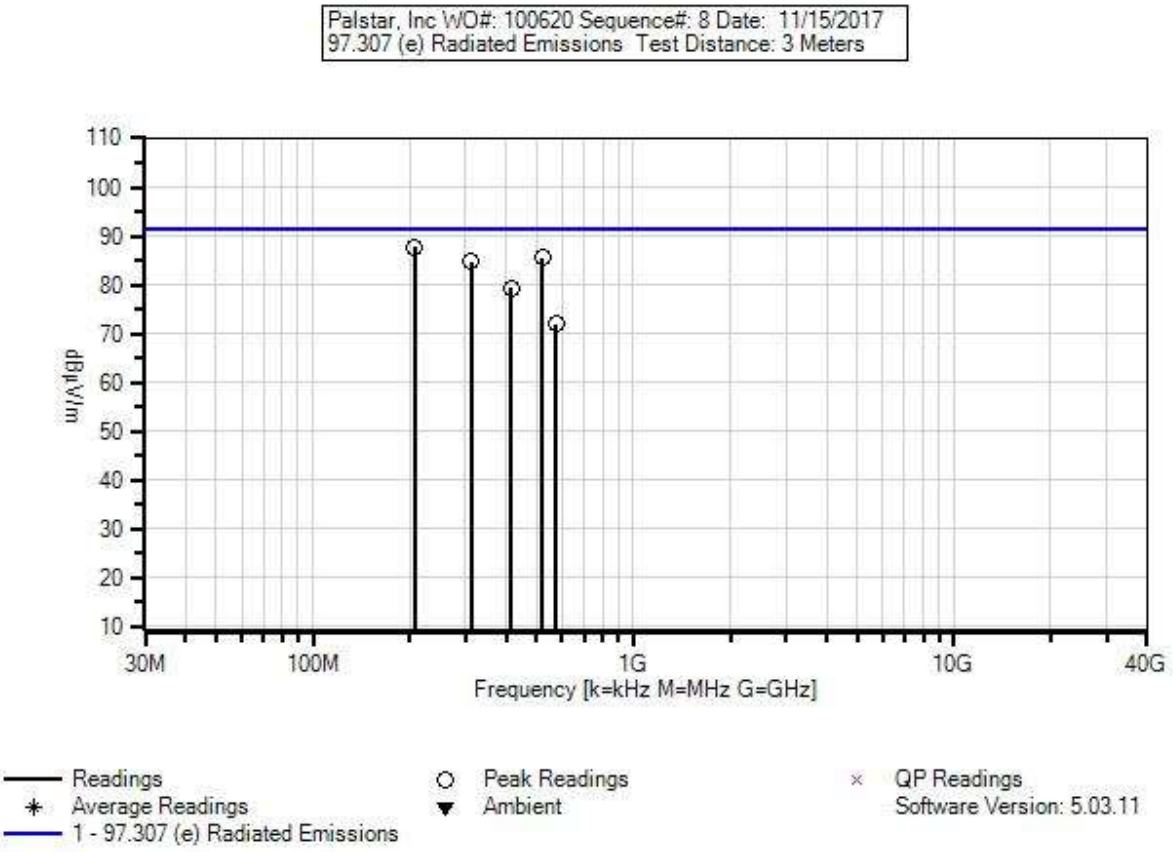
Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 600MHz

Temperature: 18.6°C
Atmospheric Pressure: 102.6kPa
Humidity 46% RH
Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)
RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intended signal to the EUT from the amplifier which is on the floor of the turning table
Band-6M


Palstar, Inc WO#: 100620 Sequence#: 8 Date: 11/15/2017
97.307 (e) Radiated Emissions Test Distance: 3 Meters
110
100
90
80
70
60
50
40
30
20
10
dBµV/m
30M
100M
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Average Readings
1 - 97.307 (e) Radiated Emissions
Peak Readings
Ambient
QP Readings
Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00971A	Preamp	8447D	2/5/2016	2/5/2018
T2	ANP06049	Attenuator	PE7002-6	5/9/2016	5/9/2018
T3	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
T4	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
T5	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
T6	AN01996	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	207.945M	97.2	-27.3 +0.5	+5.9 +9.7	+1.4	+0.3	+0.0	87.7	91.6	-3.9	Vert
2	519.972M	85.3	-28.3 +1.0	+5.9 +18.6	+2.4	+0.6	+0.0	85.5	91.6	-6.1	Horiz
3	312.044M	89.2	-27.1 +0.7	+5.9 +13.8	+1.8	+0.4	+0.0	84.7	91.6	-6.9	Horiz
4	415.948M	81.5	-27.9 +0.8	+5.9 +16.4	+2.1	+0.5	+0.0	79.3	91.6	-12.3	Horiz
5	571.965M	70.6	-28.4 +1.0	+5.9 +19.7	+2.5	+0.6	+0.0	71.9	91.6	-19.7	Vert

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Palstar, Inc.**		
Specification:	**97.307 (d) Radiated Emissions**		
Work Order #:	**100620**	Date:	11/15/2017
Test Type:	**Radiated Scan**	Time:	11:45:17
Tested By:	Hieu Song Nguyenpham	Sequence#:	16
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 300MHz

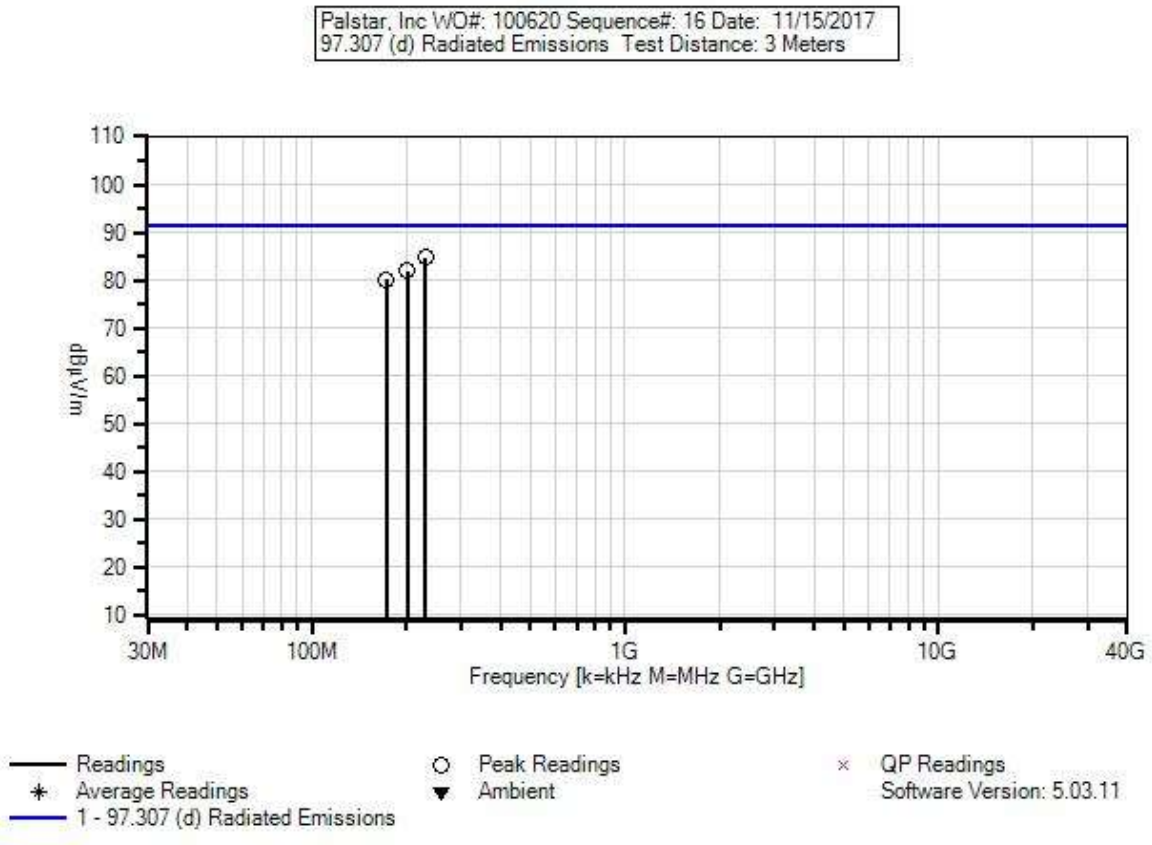
Temperature: 18.6°C
Atmospheric Pressure: 102.6kPa
Humidity 46% RH

Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)

RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intend signal to the EUT from the amplifier which is on the floor of the turning table

Band-10M



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00971A	Preamp	8447D	2/5/2016	2/5/2018
T2	ANP06049	Attenuator	PE7002-6	5/9/2016	5/9/2018
T3	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
T4	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
T5	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
T6	AN01996	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	230.779M	92.3	-27.1 +0.5	+5.9 +11.3	+1.5	+0.3	+0.0	84.7	91.6	-6.9	Horiz
2	201.950M	91.8	-27.3 +0.5	+5.9 +9.3	+1.4	+0.3	+0.0	81.9	91.6	-9.7	Vert
3	173.122M	90.4	-27.5 +0.4	+5.9 +9.4	+1.3	+0.2	+0.0	80.1	91.6	-11.5	Horiz

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Palstar, Inc.**		
Specification:	**97.307 (d) Radiated Emissions**		
Work Order #:	**100620**	Date:	11/15/2017
Test Type:	**Radiated Scan**	Time:	12:22:13
Tested By:	Hieu Song Nguyenpham	Sequence#:	22
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 300MHz

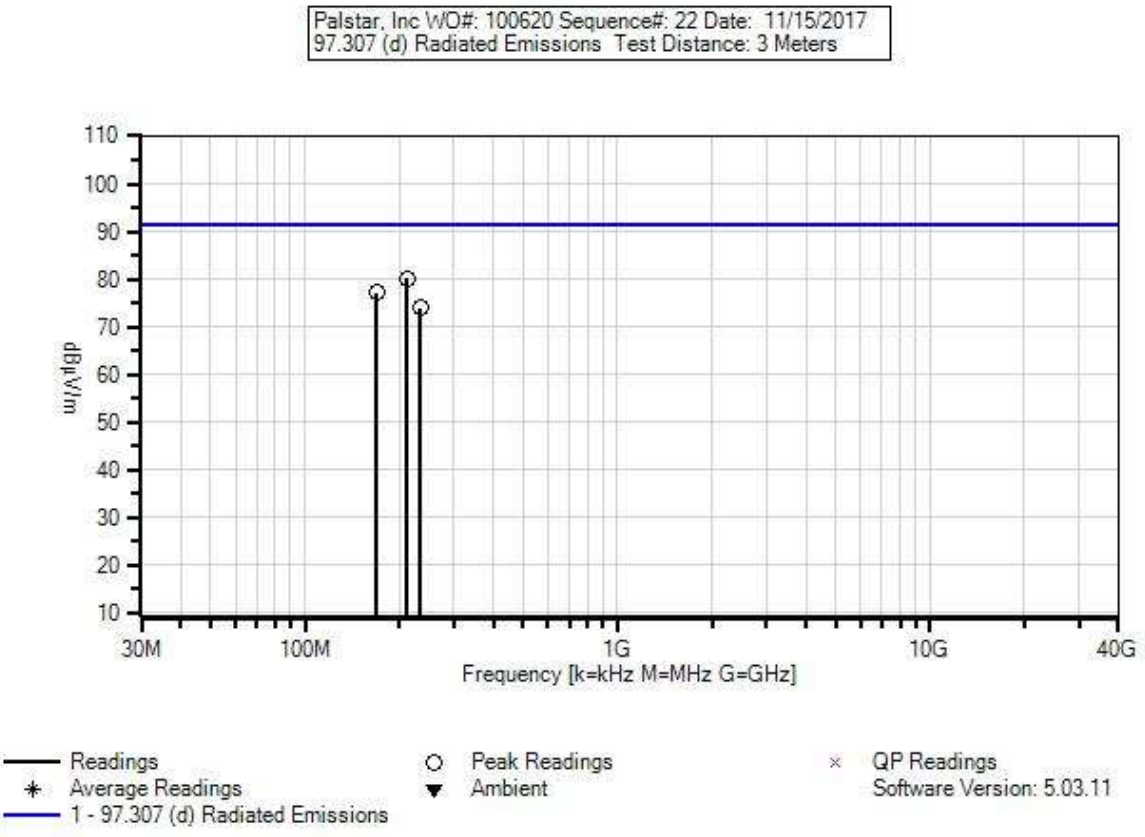
Temperature: 18.6°C
Atmospheric Pressure: 102.6kPa
Humidity 46% RH

Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)

RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intend signal to the EUT from the amplifier which is on the floor of the turning table

Band-15M



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00971A	Preamp	8447D	2/5/2016	2/5/2018
T2	ANP06049	Attenuator	PE7002-6	5/9/2016	5/9/2018
T3	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
T4	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
T5	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
T6	AN01996	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	212.229M	89.2	-27.2 +0.5	+5.9 +10.0	+1.4	+0.3	+0.0	80.1	91.6	-11.5	Vert
2	169.758M	87.3	-27.5 +0.4	+5.9 +9.7	+1.2	+0.2	+0.0	77.2	91.6	-14.4	Horiz
3	233.422M	81.2	-27.1 +0.6	+5.9 +11.5	+1.5	+0.3	+0.0	73.9	91.6	-17.7	Horiz

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Palstar, Inc.**		
Specification:	**97.307 (d) Radiated Emissions**		
Work Order #:	**100620**	Date:	11/15/2017
Test Type:	**Radiated Scan**	Time:	12:32:29
Tested By:	Hieu Song Nguyenpham	Sequence#:	25
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 300MHz

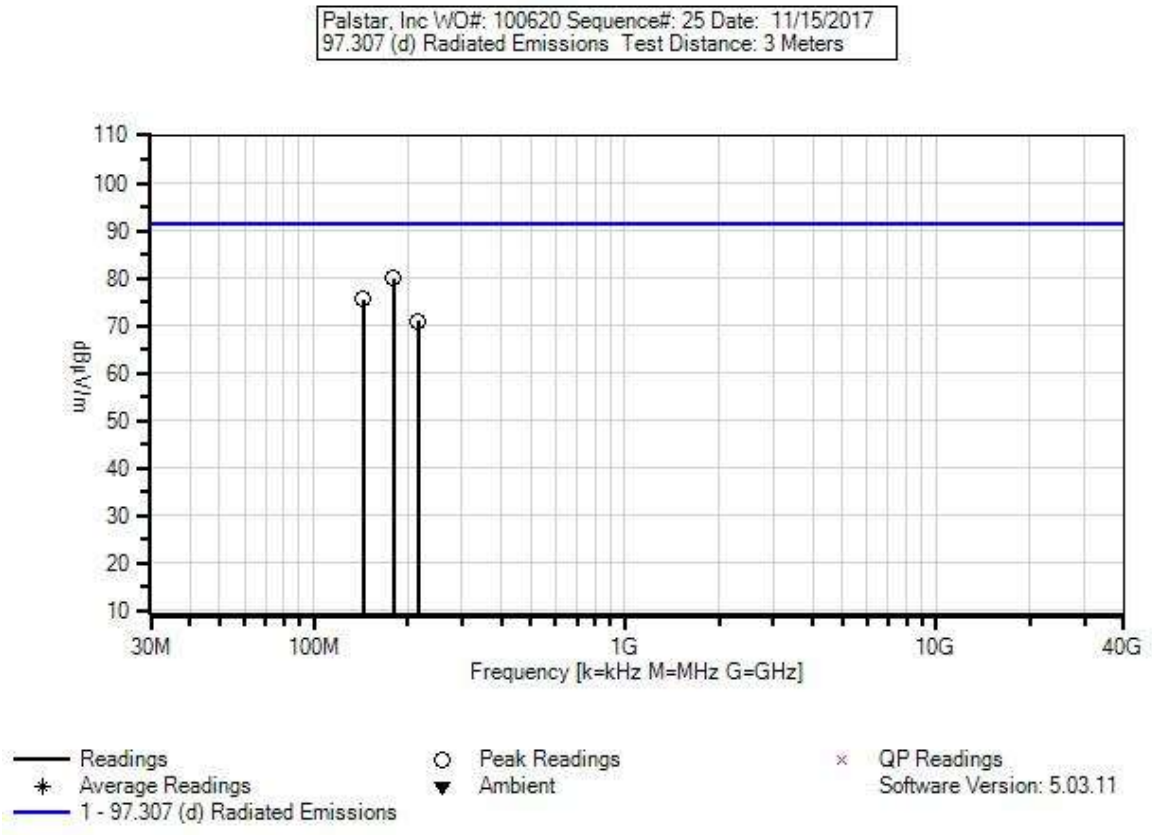
Temperature: 18.6DegC
Atmospheric Pressure: 102.6kPa
Humidity 46% RH

Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)

RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intend signal to the EUT from the amplifier which is on the floor of the turning table

Band-17M



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00971A	Preamp	8447D	2/5/2016	2/5/2018
T2	ANP06049	Attenuator	PE7002-6	5/9/2016	5/9/2018
T3	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
T4	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
T5	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
T6	AN01996	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	181.204M	90.4	-27.4 +0.5	+5.9 +9.0	+1.3	+0.3	+0.0	80.0	91.6	-11.6	Horiz
2	144.874M	84.2	-27.6 +0.4	+5.9 +11.3	+1.1	+0.2	+0.0	75.5	91.6	-16.1	Horiz
3	217.373M	79.6	-27.2 +0.5	+5.9 +10.4	+1.4	+0.3	+0.0	70.9	91.6	-20.7	Vert

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Palstar, Inc.**		
Specification:	**97.307 (d) Radiated Emissions**		
Work Order #:	**100620**	Date:	11/15/2017
Test Type:	**Radiated Scan**	Time:	12:45:52
Tested By:	Hieu Song Nguyenpham	Sequence#:	28
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 300MHz

Temperature: 18.6°C
Atmospheric Pressure: 102.6kPa
Humidity 46% RH

Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)

RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intend signal to the EUT from the amplifier which is on the floor of the turning table

Band-20M

All spurious emissions were better than 20dB below the applicable limits

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00971A	Preamp	8447D	2/5/2016	2/5/2018
	ANP06049	Attenuator	PE7002-6	5/9/2016	5/9/2018
	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
	AN01996	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Palstar, Inc.**		
Specification:	**97.307 (d) Radiated Emissions**		
Work Order #:	**100620**	Date:	11/15/2017
Test Type:	**Radiated Scan**	Time:	11:21:58
Tested By:	Hieu Song Nguyenpham	Sequence#:	11
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 100MHz

Temperature: 18.6°C
Atmospheric Pressure: 102.6kPa
Humidity 46% RH

Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)

RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intend signal to the EUT from the amplifier which is on the floor of the turning table

Band-40M

All spurious emissions were better than 20dB below the applicable limits

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00971A	Preamp	8447D	2/5/2016	2/5/2018
	ANP06049	Attenuator	PE7002-6	5/9/2016	5/9/2018
	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
	AN01996	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Palstar, Inc.**		
Specification:	**97.307 (d) Radiated Emissions**		
Work Order #:	**100620**	Date:	11/15/2017
Test Type:	**Radiated Scan**	Time:	11:24:14
Tested By:	Hieu Song Nguyenpham	Sequence#:	13
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 40MHz

Temperature: 18.6°C
Atmospheric Pressure: 102.6kPa
Humidity 46% RH

Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)

RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intend signal to the EUT from the amplifier which is on the floor of the turning table

Band-80M

All spurious emissions were better than 20dB below the applicable limits

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00971A	Preamp	8447D	2/5/2016	2/5/2018
	ANP06049	Attenuator	PE7002-6	5/9/2016	5/9/2018
	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
	AN01996	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Test Location:	CKC Laboratories Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249-1170		
Customer:	**Palstar, Inc.**		
Specification:	**97.307 (d) Radiated Emissions**		
Work Order #:	**100620**	Date:	11/15/2017
Test Type:	**Radiated Scan**	Time:	11:23:38
Tested By:	Hieu Song Nguyenpham	Sequence#:	12
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 30MHz

Temperature: 18.6°C
Atmospheric Pressure: 102.6kPa
Humidity 46% RH

Highest generated Frequency: 52MHz
Firmware Version: 1.00G
Test Method: ANSI C63.10 (2013)

RBW=VBW= 200Hz from 9kHz to 150kHz
RBW=VBW=9kHz from 150kHz to 30MHz
RBW=VBW= 120kHz from 30MHz to 600MHz

The EUT is set up at intended. All the ports are terminated by cables. Inject 50W an intend signal to the EUT from the amplifier which is on the floor of the turning table

Band-160M

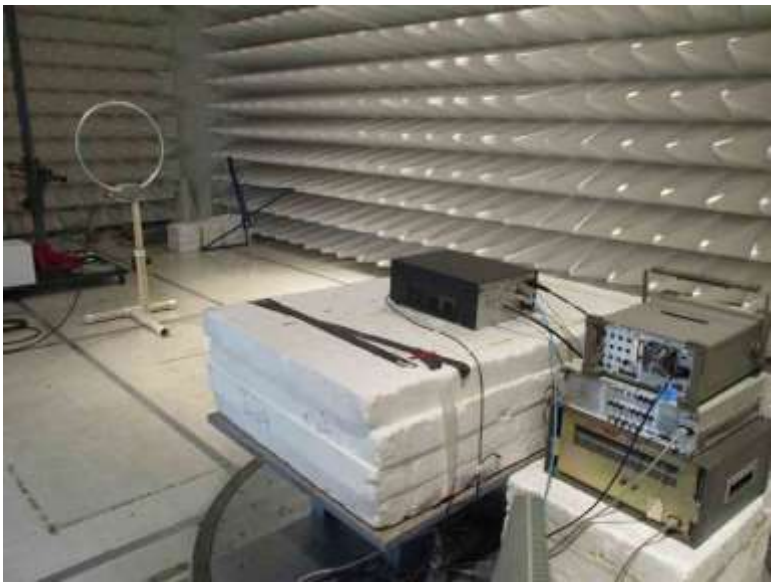
All spurious emissions were better than 20dB below the applicable limits

Test Equipment:

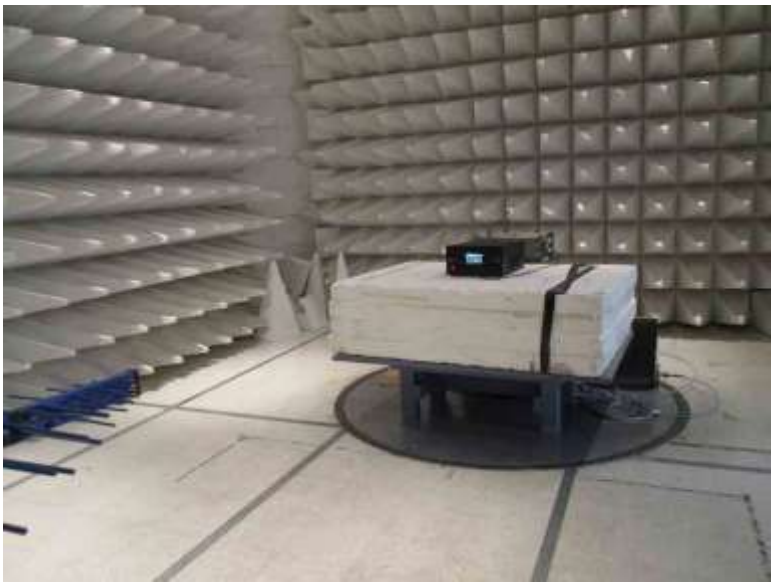
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	ANP00880	Cable	RG214U	5/10/2016	5/10/2018
	ANP01187	Cable	CNT-195	8/8/2016	8/8/2018
	ANP06691	Cable	PE3062-180	6/23/2016	6/23/2018
	AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
	AN00432	Loop Antenna	6502	5/30/2017	5/30/2019

Test Setup Photos

9kHz – 30MHz



9kHz – 30MHz



Above 30MHz

Above 30MHz

97.317(a)(1)(2)(3) Standards for Certification of External RF Power Amplifiers

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/13/2017
Configuration:	2		
Test Condition:	The EUT is set up as intended. It is received an input signal from the amplifier. Two Spectrum Analyzers are connected to measure the input and output of the EUT		
Declaration:	Modification #1 was in place during testing for 97.317(a)(3) only..		

Environmental Conditions			
Temperature (ºC)	21.5	Relative Humidity (%):	46

Test Equipment				
Asset# / Serial#	**Description**	**Model**	**Cal Date**	**Cal Date**
AN00744	Directional Coupler	C2630	11/15/2016	11/15/2018
AN02902	Directional Coupler	C4080-20	11/3/2017	11/3/2019
ANP00914	Cable	ETS1-50A	11/3/2017	11/3/2019
ANP00915	Cable	ETS1-50A	11/3/2017	11/3/2019
ANP06560	Cable	LMR195-FR-6	1/29/2016	1/29/2018
ANP06561	Cable	LMR195-FR-4	1/29/2016	1/29/2018
ANP06690	Cable	PE3062-180	6/16/2016	6/16/2018
AN00783	Spectrum Analyzer	8596E	7/5/2016	7/5/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018
AN02032	Resistor, Load	8890-300	6/27/2016	6/27/2018
ANC00032	Arbitrary Waveform Generator	E4433B	2/26/2016	2/26/2018

97.317(a)(1): When the amplifier is placed in the "standby" or "off" positions while connected to a signal generator, all spurious emissions were better than 20dB below the applicable limits for all bands.

97.317(a)(2)

Test Data Summary					
Frequency Range (MHz)	**Measured Power Input (dBm)**	**Measured Power Output (dBm)**	**Gain (dB)**	**Limit Gain (dB)**	**Result**
1.9	46.96	59.56	12.6	15	Pass
3.55	46.96	59.94	13.0	15	Pass
7.15	46.96	59.78	12.8	15	Pass
14.175	46.96	59.37	12.4	15	Pass
18.118	46.96	59.71	12.8	15	Pass
21.225	46.96	59.50	12.5	15	Pass
24.94	46.96	58.47	11.5	15	Pass
28.85	46.96	59.20	12.2	15	Pass
52	46.96	58.56	11.6	15	Pass

97.317(a)(3)

Test Data Summary					
Frequency Range (MHz)	**Measured Power Input (dBm)**	**Measured Power Output (dBm)**	**Gain (dB)**	**Limit Gain (dB)**	**Result**
26	46.96	46.87	-0.09	0	Pass
27	46.96	46.79	-0.17	0	Pass
28	46.96	46.82	-0.14	0	Pass

Test Setup Photo

SUPPLEMENTAL INFORMATION

Uncertainty Parameter	Actual	Limit	Unit of Measure
Occupied Channel Bandwidth	1	5	%
RF output power, Conducted	0.67	1.5	dB
Power Spectral Density, Conducted	0.67	3	dB
Unwanted Emissions, Conducted	0.67	3	dB
All Emissions, Radiated	3.73	6	dB
Temperature	1	3	ºC
Humidity	3.4	5	%
DC and Low Frequency Voltages	2	3	%
Time	1.1	5	%

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.