



TEST REPORT

Report Number: R14093304-E1

Applicant : SmartSky Microwave LLC
430 Davis Drive, Suite 350
Morrisville, NC 27560 USA

Model : 3243299-302

Brand : SmartSky Microwave LLC

FCC ID : TBD2APND-ATGRR0002

EUT Description : 2.4GHz Ground-Based Transceiver

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
February 17, 2022

Prepared by:
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REPORT REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
V1	2022-02-17	Initial Release	Mike Antola
V2	2022-03-11	Misc. editorial updates	Mike Antola

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END OF REPORT660

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SmartSky Microwave LLC
430 David Drive, Suite 350
Morrisville, NC 27560 USA

EUT DESCRIPTION: 2.4GHz Ground-Based Transceiver

MODEL: 3243299-302

SERIAL NUMBER: 2140K0403

SAMPLE RECEIPT DATE: 2020-12-09

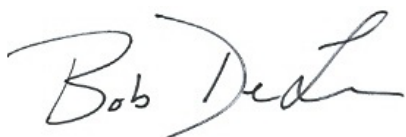
DATE TESTED: 2020-12-15 to 2022-02-07

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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 a2La, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released
For UL LLC By:



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UL LLC

2. TEST RESULTS SUMMARY

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.247 (a) (2)	6dB BW	Compliant	None.
15.247 (b) (3)	Output Power	Compliant	None.
See Comment	Average power	Compliant	None.
15.247 (e)	PSD	Compliant	None.
15.247 (d)	Conducted Spurious Emissions	Compliant	None.
15.209, 15.205	Radiated Emissions	Compliant	None.
15.207	AC Mains Conducted Emissions	Compliant	None.

This report contains data provided by the applicant which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by a2La, certification # 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss}$$

$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

CONDUCTED MEASUREMENTS IN RESTRICTED BAND (ANTENNA PORT)

Where relevant, the following sample calculation is provided:

Summing Chains:

$$\text{Total EIRP (dBm)} = [10 * \text{LOG} (P_{\text{CHAIN } 0} (W) + P_{\text{CHAIN } 1} (W) + \dots + P_{\text{CHAIN } N} (W))] + \text{Array Gain (dBi)}$$

$$\text{Total EIRP (dBm)} = [10 * \text{LOG}$$

$$(23.4\mu\text{W} + 22.7\mu\text{W} + 19.36\mu\text{W} + 7.52\mu\text{W} + 8.09\mu\text{W} + 10.47\mu\text{W} + 24.95\mu\text{W} + 19.5\mu\text{W})] + 26.8 \text{ dBi}$$

$$\text{Total EIRP (dBm)} = -41.865 \text{ dBm}$$

$$\text{Equivalent Electric Field Strength (dBuV)} = \text{EIRP (dBm)} - 20 * \text{LOG}(d) + 104.8, \text{ where 'd' is the specified measurement distance in meter}$$

$$-53.43 \text{ dBm} - 20 * \text{LOG}(3) + 104.8 = 41.83 \text{ dBuV/m}$$

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a ground-based 2.4 GHz transceiver intended to communicate with airborne stations.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2448.2 - 2473.2	4.5 MHz	23.8	239.88
2450.7 - 2470.7	9 MHz	23.9	245.47

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The Ground Station antenna consists of eight columns of elements with individual feeds forming a phased array antenna system. The system has a maximum array gain of 26.8 dBi. By applying different phases and amplitudes to the inputs, a beam may be steered in azimuth over a 30 degree range. Control channel information is sent over a 30 degree wide beam.

6.4. SOFTWARE AND FIRMWARE

The software/firmware is as follows:

Version: 0.3.0
Revision: 6002
Build ID: c968905
Package ID: 2

6.5. WORST-CASE CONFIGURATION AND MODE

The EUT supports 3 modulations (QPSK, 16-QAM and 64-QAM) and 2 bandwidths (4.5 MHz and 9 MHz). Testing was performed in both Single RB (i.e. 3RB) and Full RB (i.e. FRB) configurations. Output Power & PSD testing was performed in all modulations and bandwidth configurations. For QAM modulation, it was determined that 16-QAM was worst case. Therefore all testing ,other than output power and PSD, were tested in both QPSK and 16-QAM.

All testing was performed conducted, followed by cabinet radiated emissions.

Radiated spurious emissions and Bandedge testing from 1-18GHz was performed at low/mid/high channels, where applicable, only at the modes that yielded the highest Output Power & PSD as described here:

- 3RB, 9MHz, QPSK
- 3RB, 9MHz, 16QAM
- Full RB, 4.5MHz, QPSK
- Full RB, 4.5MHz, 16QAM

Radiated testing below 1GHz and above 18GHz, along with AC line conducted testing, were performed only at the worse-case mode/channel as described here:

- Full RB, 4.5MHz, QPSK, Low Channel

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	T580	R90RGXGW	NA
Signal Generator	Keysight	83640B	3844A00978	NA
Test Box	Tektelic	T0003914	2049K0005	NA
DC Power Supply	Emerson	NetSure 5100	ENES 60	NA

I/O CABLES

I/O Cable List					
Cable No.	Port	Type*	Cable Max Length > 3M [Y/N]	Cable Shielded [Y/N]	Remarks
1	N Female	I/O	Y	N	8x Type N RF connector to antenna
2	SFP+	I/O	Y	N	data between Radio(RRH) and ground unit(BBU)
3	RJ45	I/O	Y	Y	Diagnostic and external control port
4	2-conductor bulkhead connector	DC	Y	N	Power supplied by ground unit (BBU) to Radio (RRH)
5	SMA Female	I/O	N/A	N/A	Calibration port

TEST SETUP

Conducted and Restricted Band Spurious Emissions Test Setup

The Ground system was setup to emulate the installed system in the field. The Baseband Unit (BBU) was connected to the EUT (Remote Radio Head, RRH) and an internet connection (EPC). A GPS antenna was connected to the BBU chassis (SCM). A PC was connected to the RRH and the BBU to enable system testing. The RRH was connected to the Spectrum Analyzer to enable FCC required measurements. The RRH was tested at each of the 8 staves.

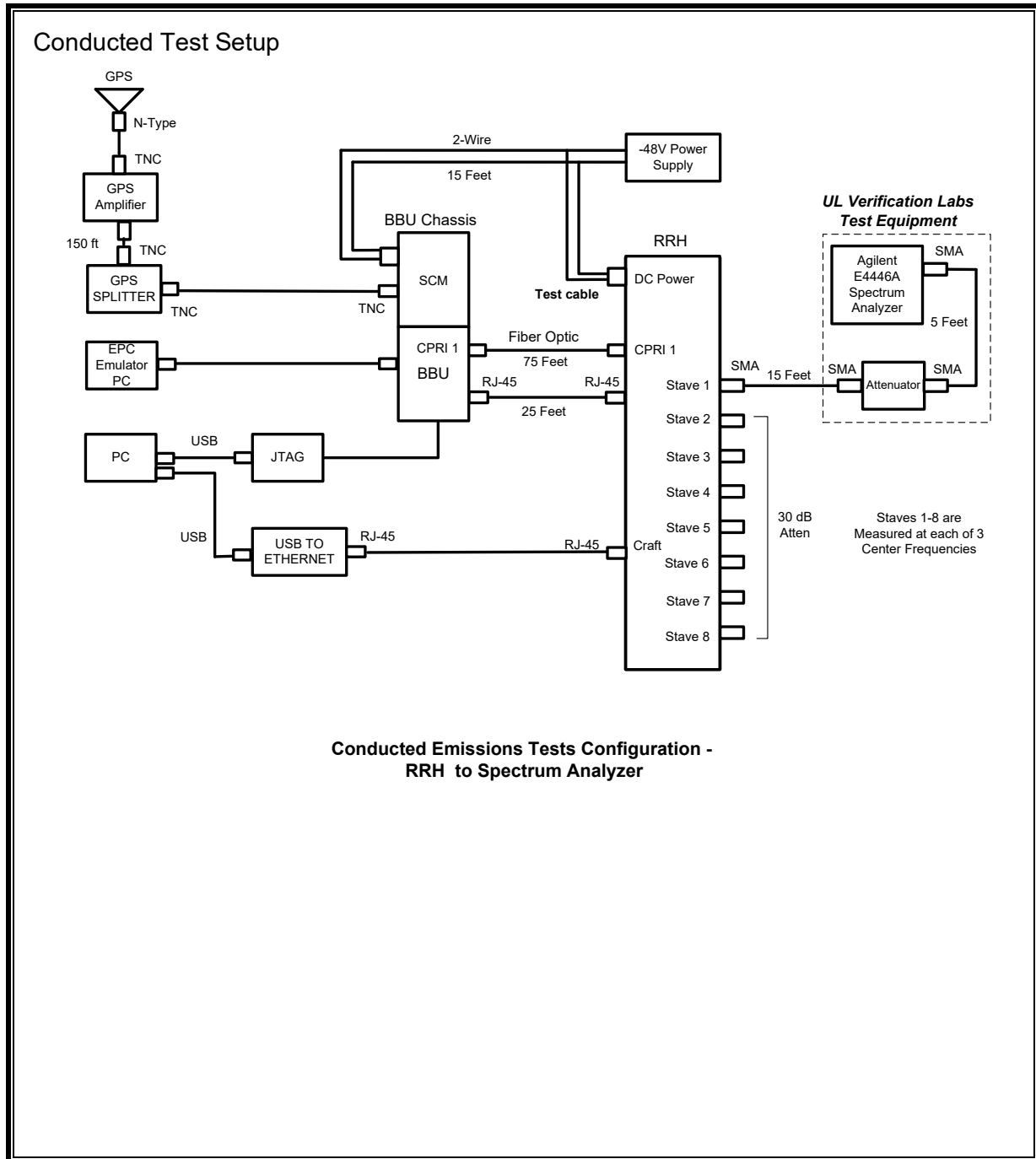
Radiated Test Setup

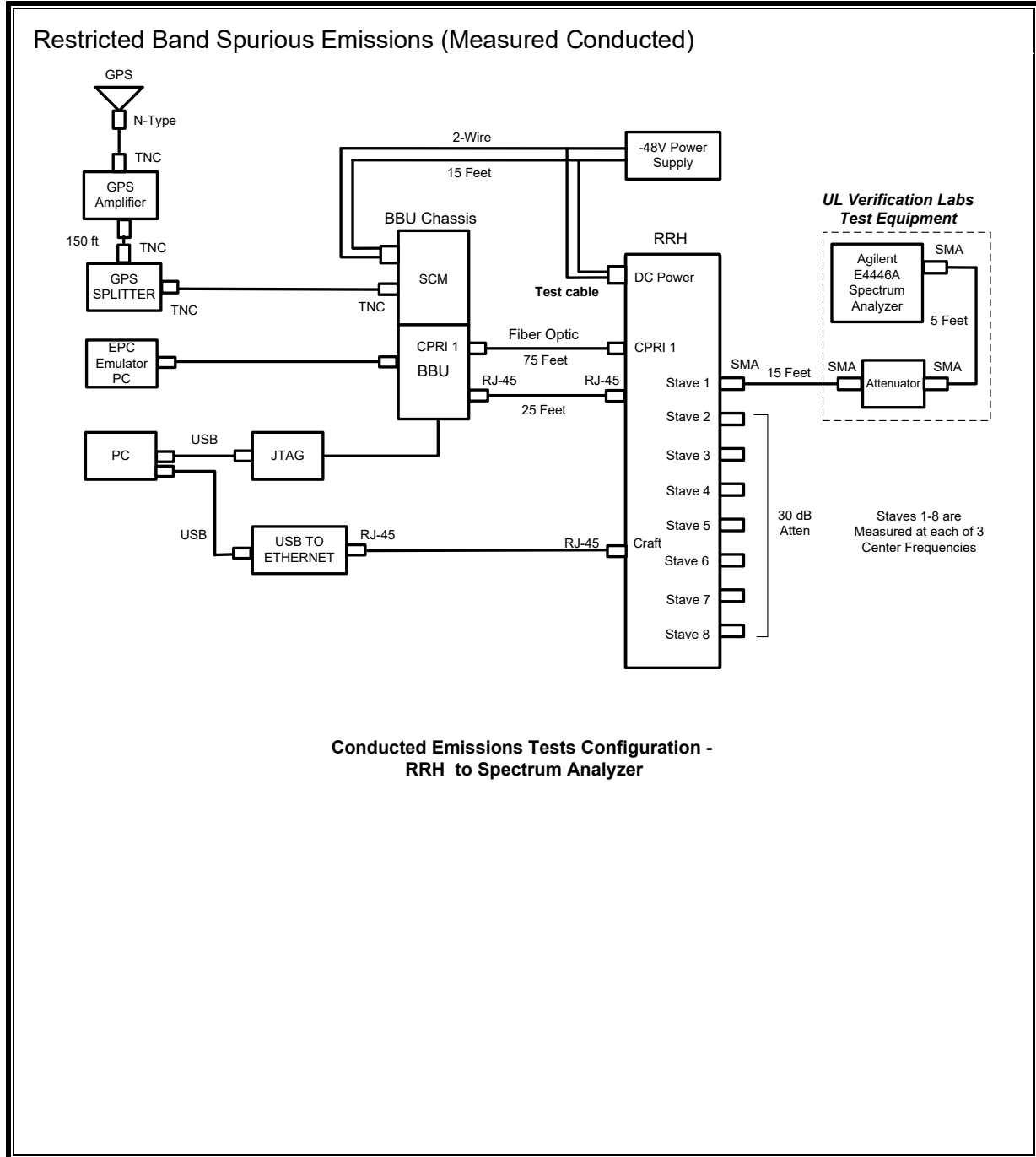
The Ground system was setup to emulate the installed system in the field. The BBU was connected to the RRH and an internet connection (EPC). A GPS antenna was connected to the BBU chassis (SCM). A PC was connected to the RRH and the BBU to enable system testing. The RRH was located in the EMI chamber, and the SCM and BBU were located outside the chamber.

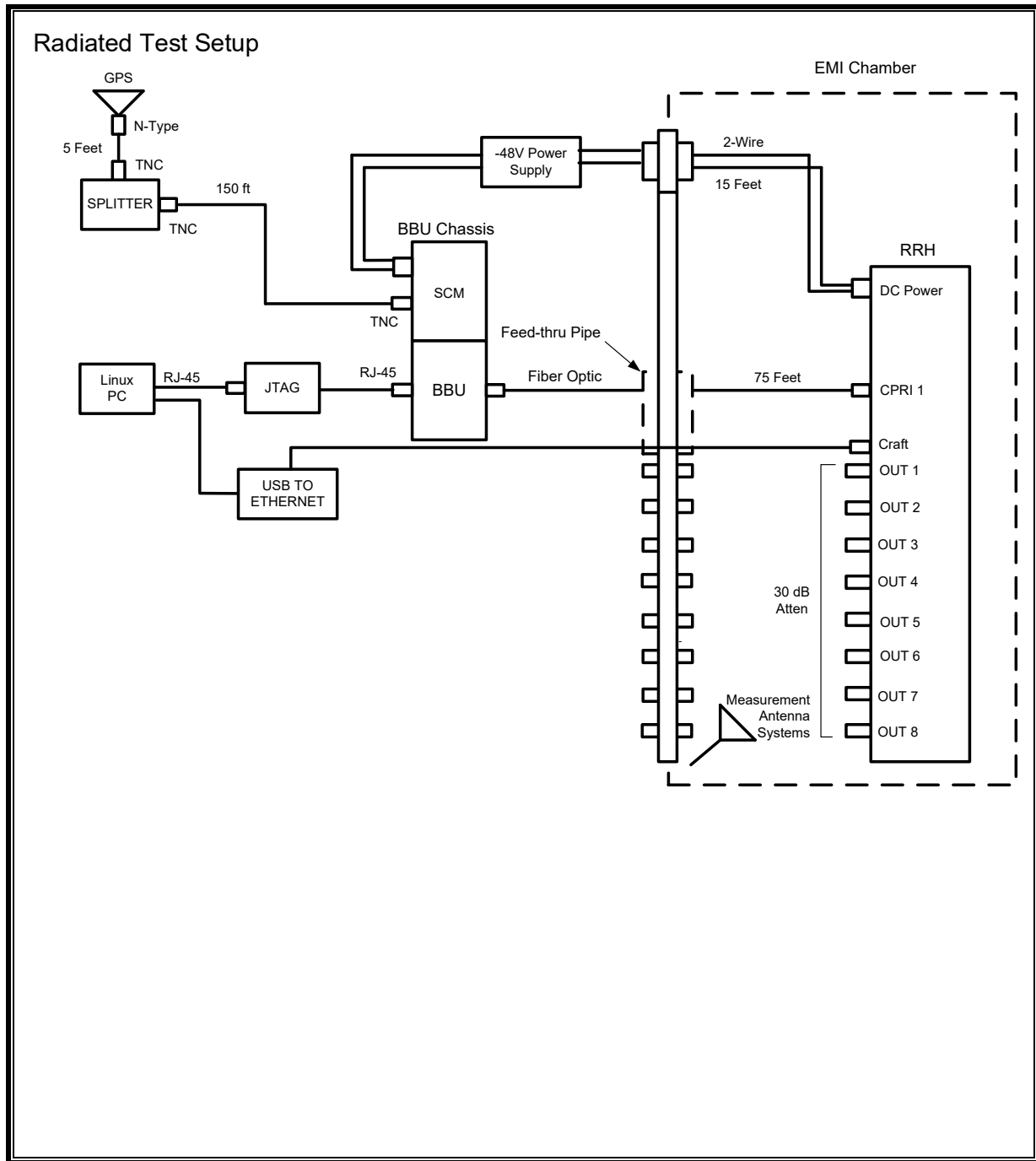
Line Conducted Emissions Test Setup

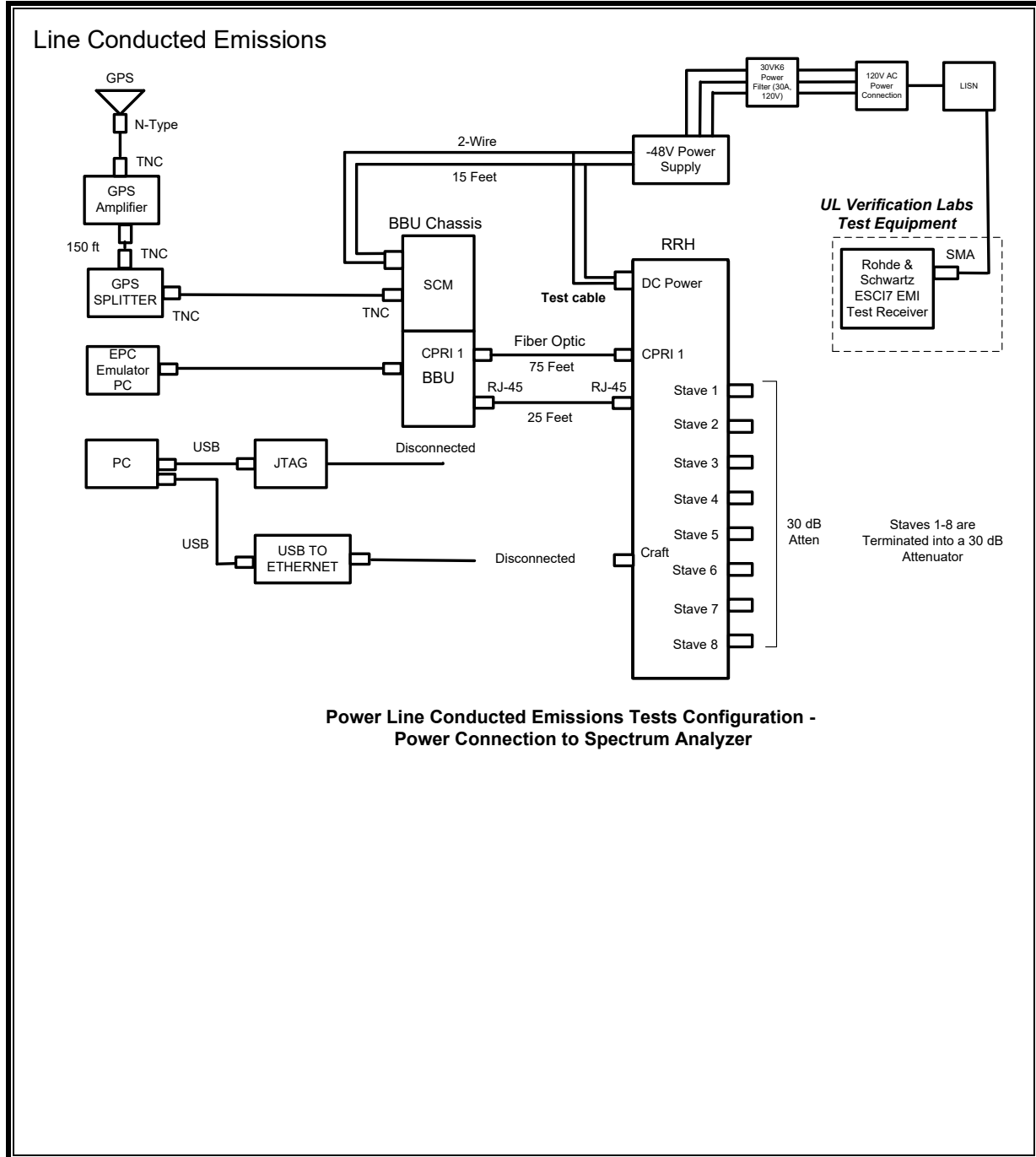
The Ground system was setup to emulate the installed system in the field. The BBU was connected to the RRH and an internet connection (EPC). A GPS antenna was connected to the BBU chassis (SCM). The line conducted emissions were tested on the power lines that fed the Ground system.

SETUP DIAGRAM FOR TESTS









6.7. MODIFICATIONS REQUIRED FOR COMPLIANCE

None

7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
SA0027	Spectrum Analyzer	Keysight Technologies	N9030A	2021-06-25	2022-06-25
206459	Spectrum Analyzer	Rohde & Schwarz	FSW50	2021-03-15	2022-03-15
PWM005	RF Power Meter	Keysight Technologies	N1912A	2021-07-27	2022-07-27
PWS008 (PRE0126444)	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2021-05-27	2022-05-27
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
SIG005	Swept Signal Generator, 10MHz – 40GHz	Keysight	83640B	2021-08-18	2022-08-18
BRF003	2.4GHz notch filter, 2W, F _{high} =18GHz	Micro-Tronics	BRM50702	2021-02-15	2022-02-15
HPF016	18GHz high-pass filter, 2W, F _{high} =40GHz	Micro-Tronics	HPS19367	2021-02-16	2022-02-16
LPF008	DC-1000MHz low-pass filter	Pasternack	PE8720	2021-07-31	2022-07-31
215269	Duplexor/Circulator	Multiple	Multiple	2022-01-27	2023-01-27
SOFTEMI	Antenna Port Software	UL	Version 2021.11.3	NA	NA

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2021-08-19	2022-08-19
	30-1000 MHz				
AT0066	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB1	2021-02-18	2022-02-18
	1-18 GHz				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2021-05-13	2022-05-13
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2021-11-04	2022-11-04
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2021-07-20	2022-07-20
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2021-07-20	2022-07-20
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2021-07-20	2022-07-20
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2021-07-20	2022-07-20
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-30	2022-03-30
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2021-09-27	2022-09-27

8. MEASUREMENT METHODS

Duty Cycle: ANSI C63.10 Subclause -11.6

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW \geq DTS BW

Output Power: ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

PSD: ANSI C63.10 Subclause -11.10.5 Method AVGPSD-2

Out-of-band emissions in non-restricted bands: ANSI C63.10 Section 11.11.

Out-of-band emissions in restricted bands: ANSI C63.10 Section 11.12.

General Radiated Emissions – ANSI C63.10 Sections 6.3-6.6

Line Conducted Emissions – ANSI C63.10 Section 6.2

9. ANTENNA PORT TEST RESULTS – AUTHORIZED BAND, 3RB

9.1. ON TIME AND DUTY CYCLE

LIMITS

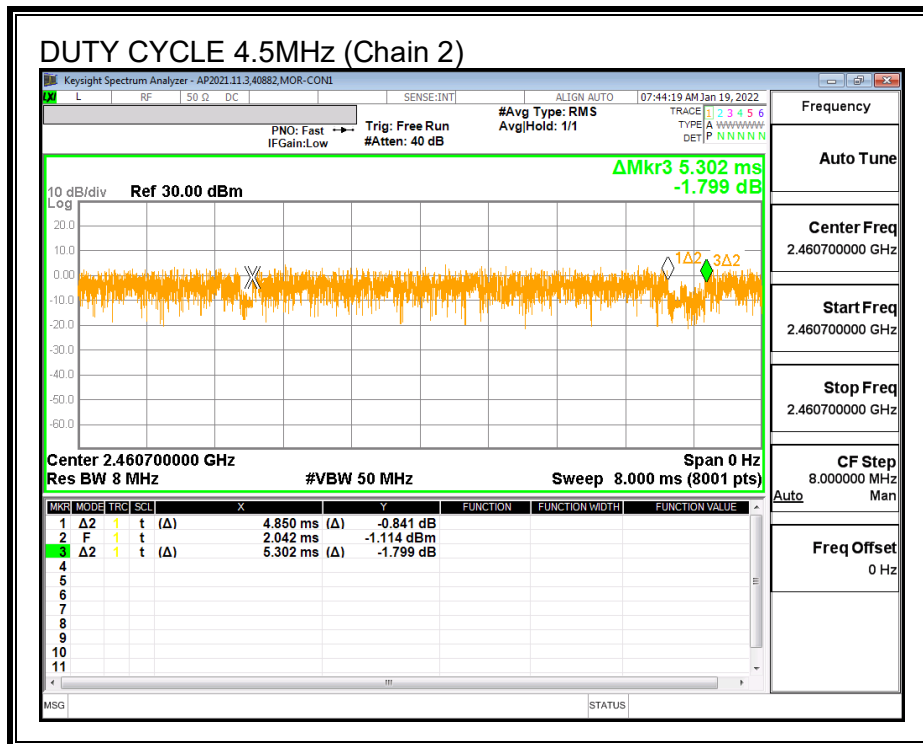
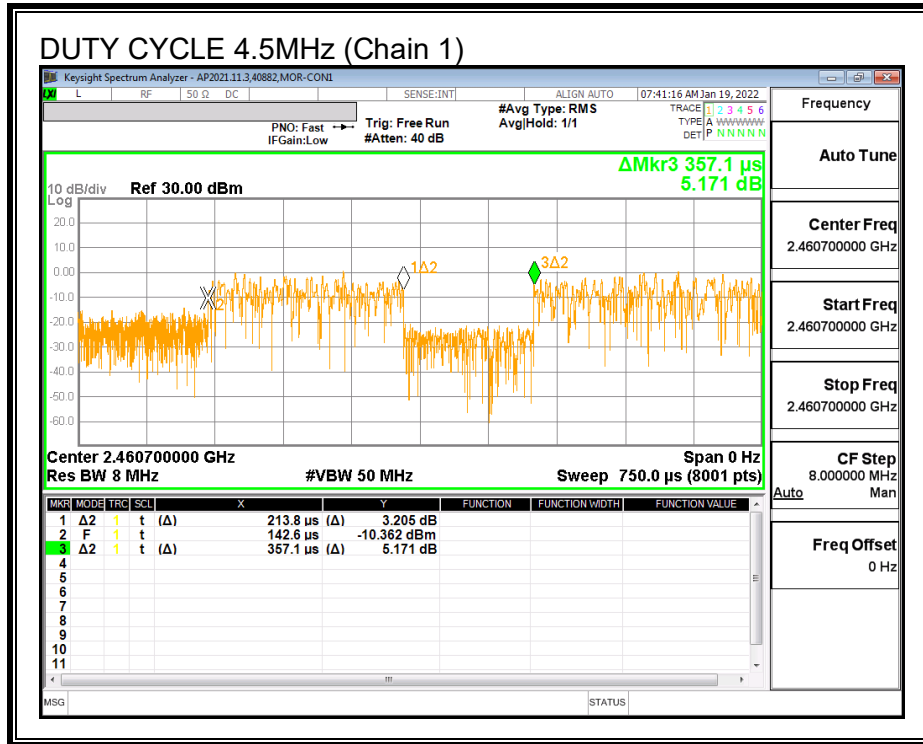
None; for reporting purposes only.

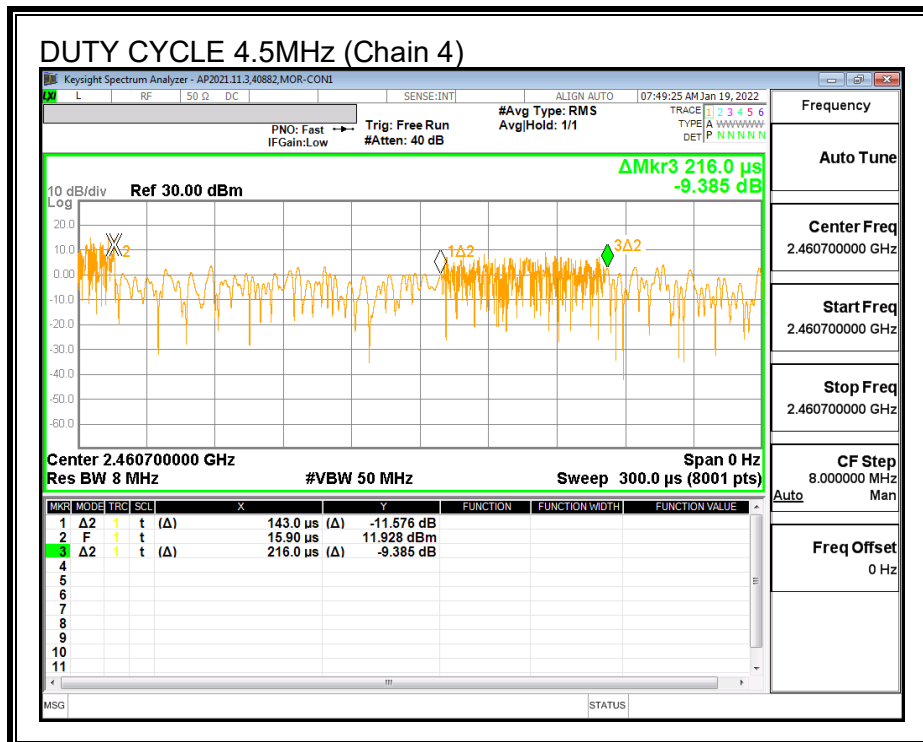
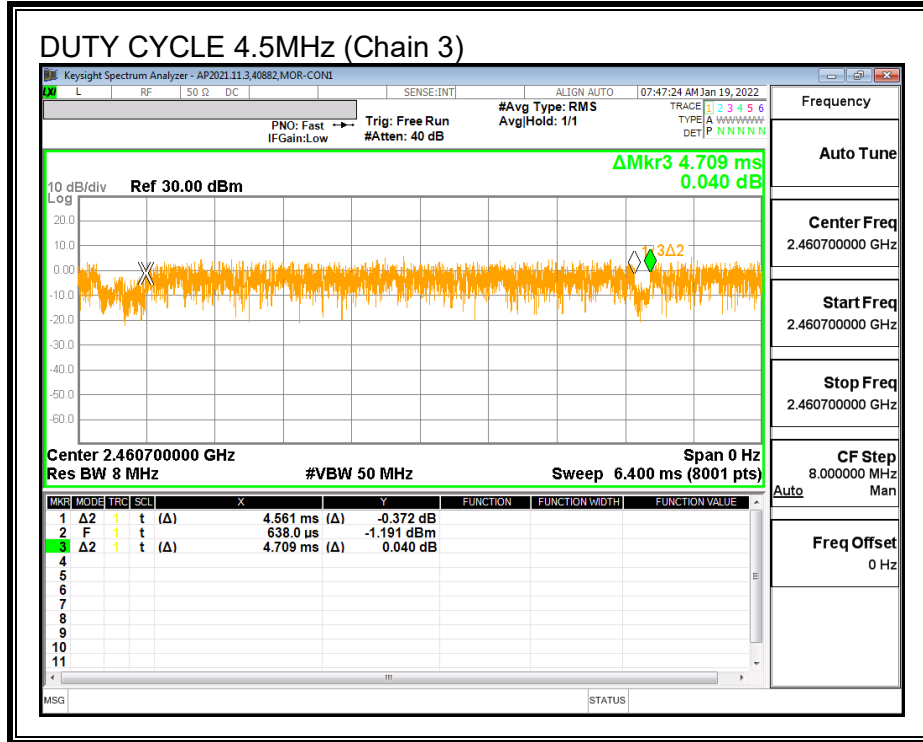
PROCEDURE

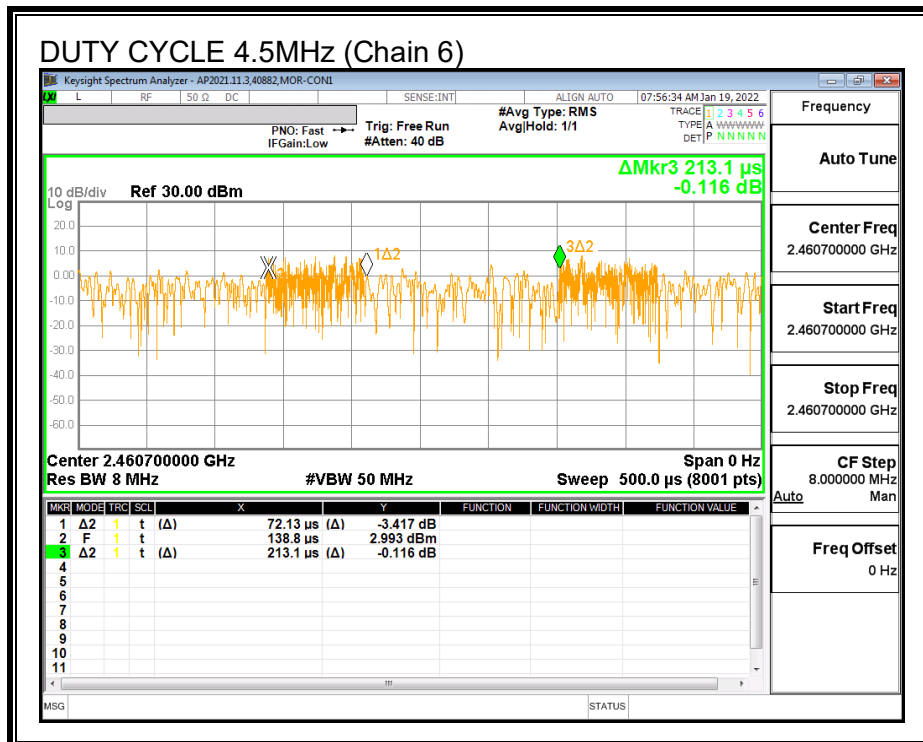
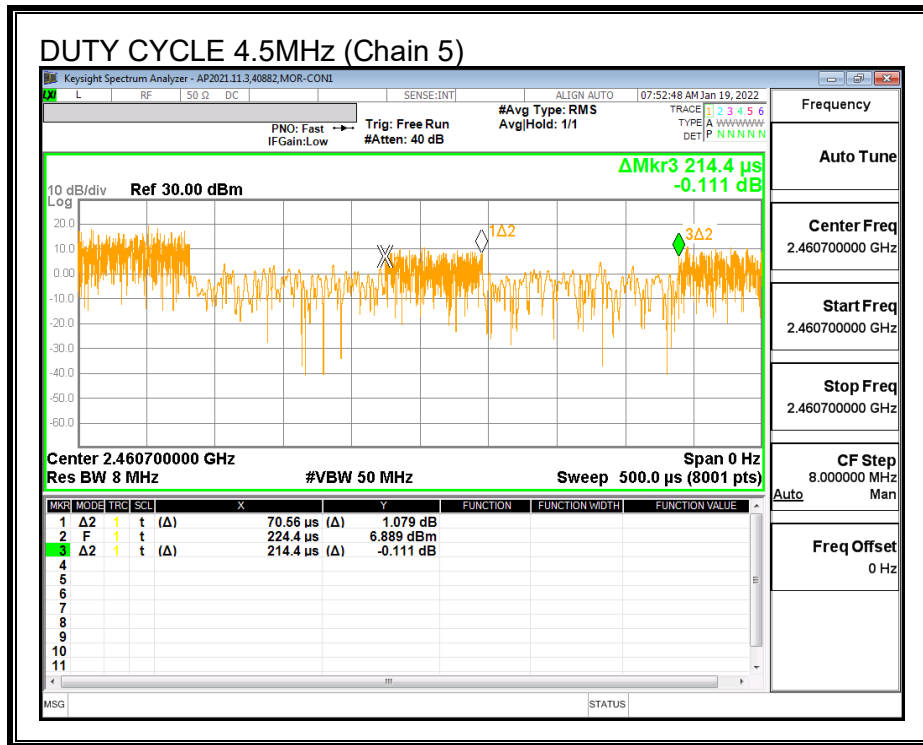
ANSI C63.10 Section 11.6 Zero-Span Spectrum Analyzer Method.

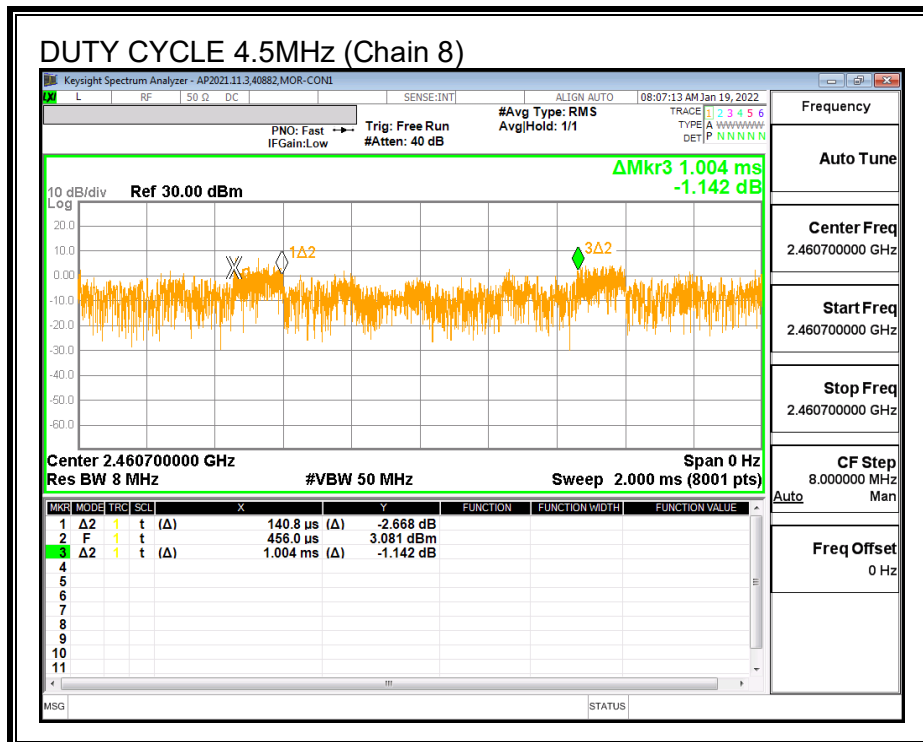
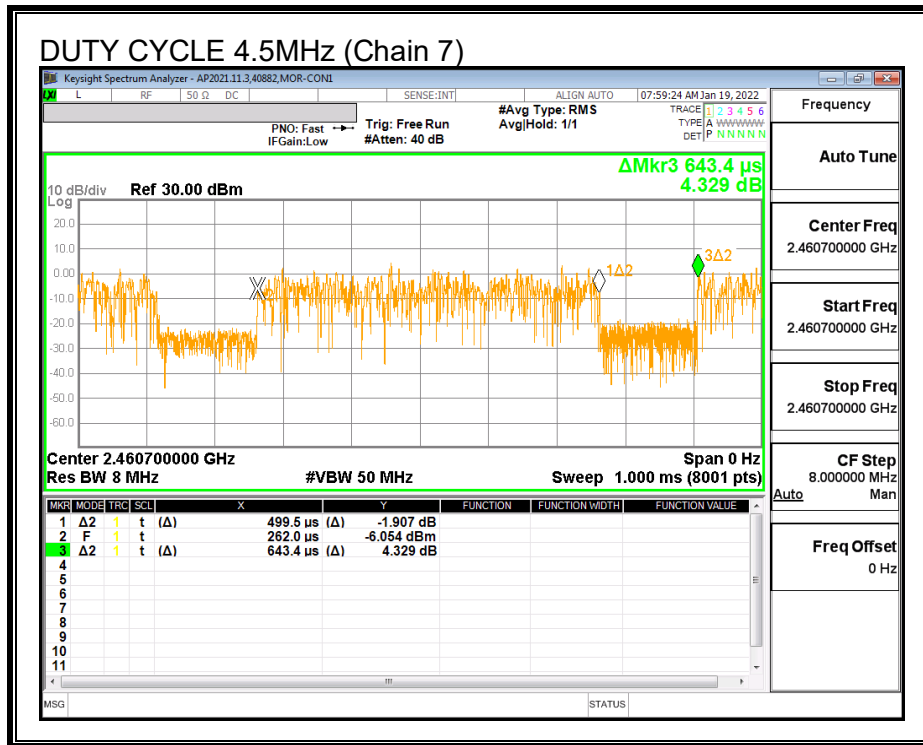
ON TIME AND DUTY CYCLE RESULTS – QPSK

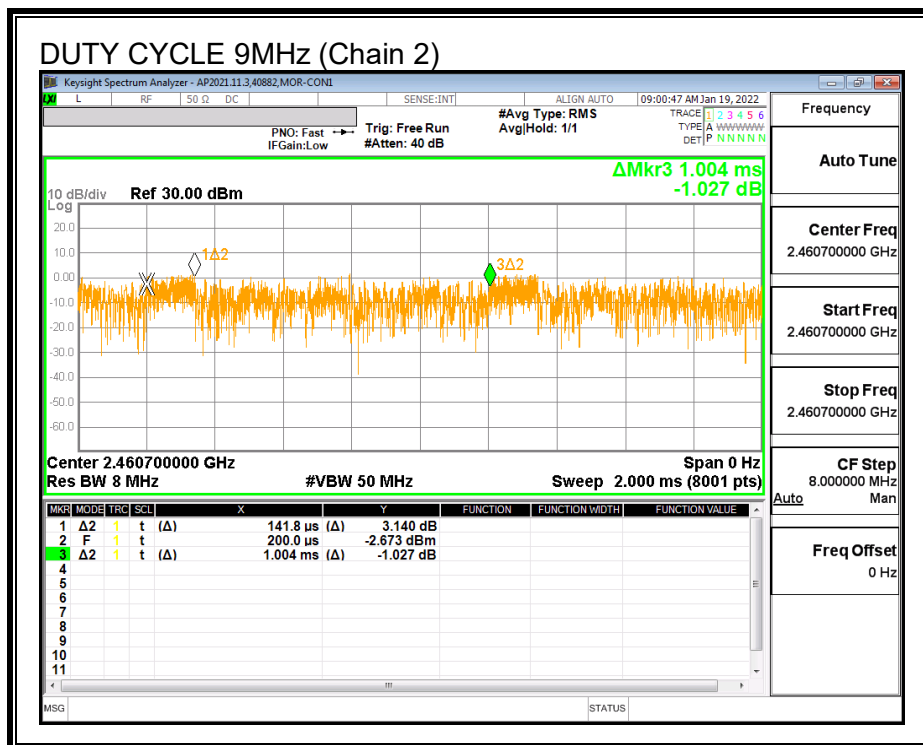
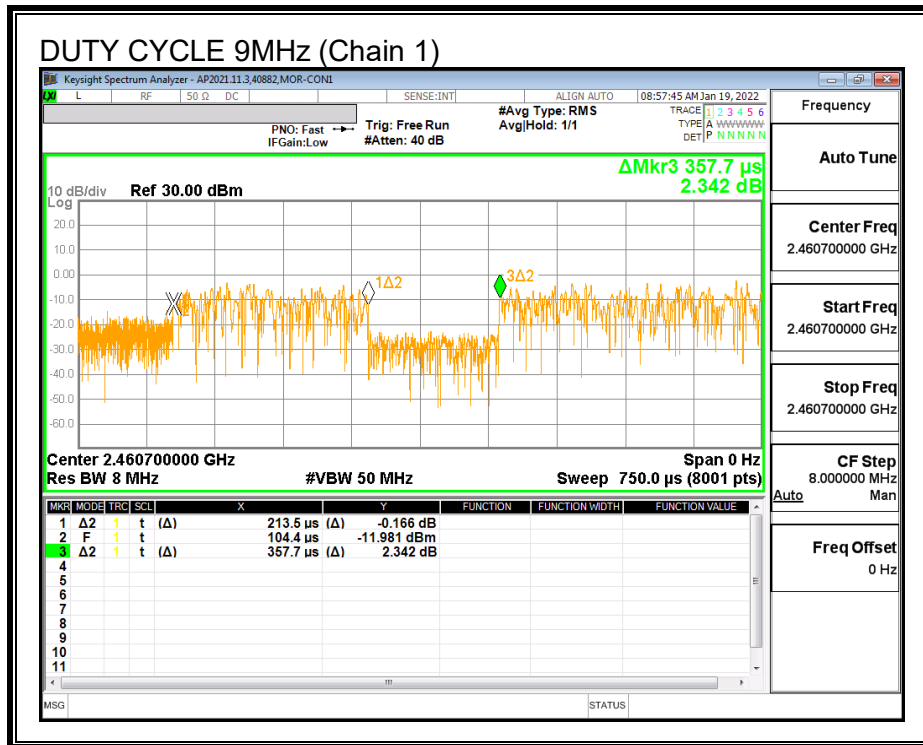
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band (4.5MHz)						
Chain 1	0.214	0.357	0.599	59.87%	4.46	4.677
Chain 2	4.850	5.302	0.915	91.47%	0.77	0.206
Chain 3	4.561	4.709	0.969	96.86%	0.28	0.219
Chain 4	0.143	0.216	0.662	66.20%	3.58	6.993
Chain 5	0.071	0.214	0.329	32.91%	9.65	14.172
Chain 6	0.072	0.213	0.338	33.85%	9.41	13.864
Chain 7	0.500	0.643	0.776	77.63%	2.20	2.002
Chain 8	0.141	1.004	0.140	14.02%	17.06	7.102
2.4GHz Band (9MHz)						
Chain 1	0.214	0.358	0.597	59.69%	4.48	4.684
Chain 2	0.142	1.004	0.141	14.12%	17.00	7.052
Chain 3	0.190	1.000	0.190	19.03%	14.41	5.255
Chain 4	0.071	0.214	0.332	33.19%	9.58	14.086
Chain 5	0.071	0.215	0.330	32.96%	9.64	14.096
Chain 6	0.071	0.287	0.248	24.83%	12.10	14.035
Chain 7	0.212	0.357	0.594	59.43%	4.52	4.715
Chain 8	0.074	0.216	0.343	34.26%	9.30	13.543

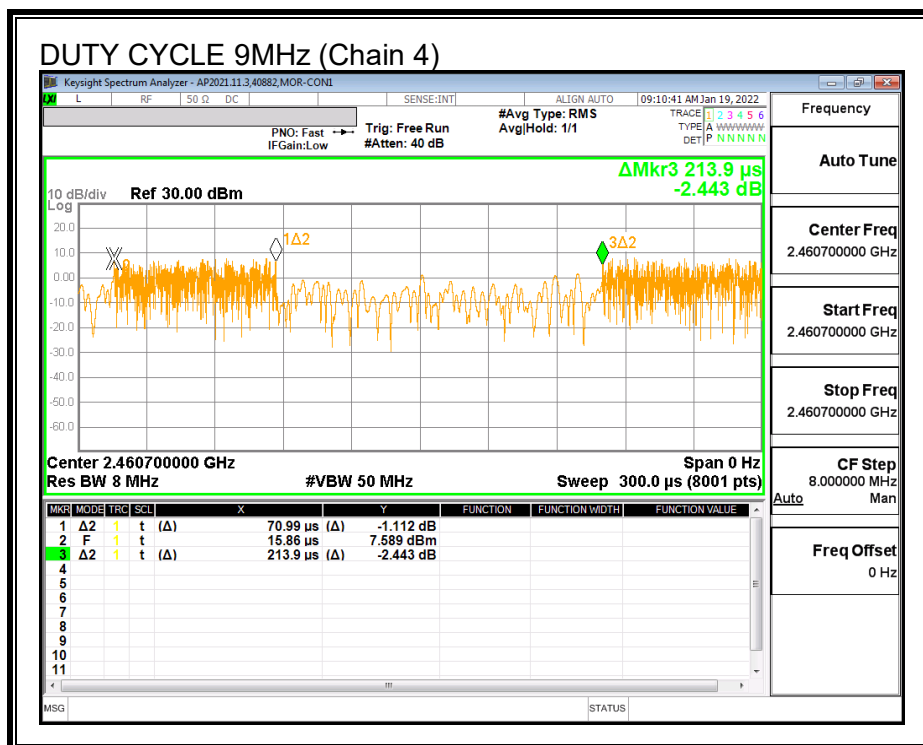
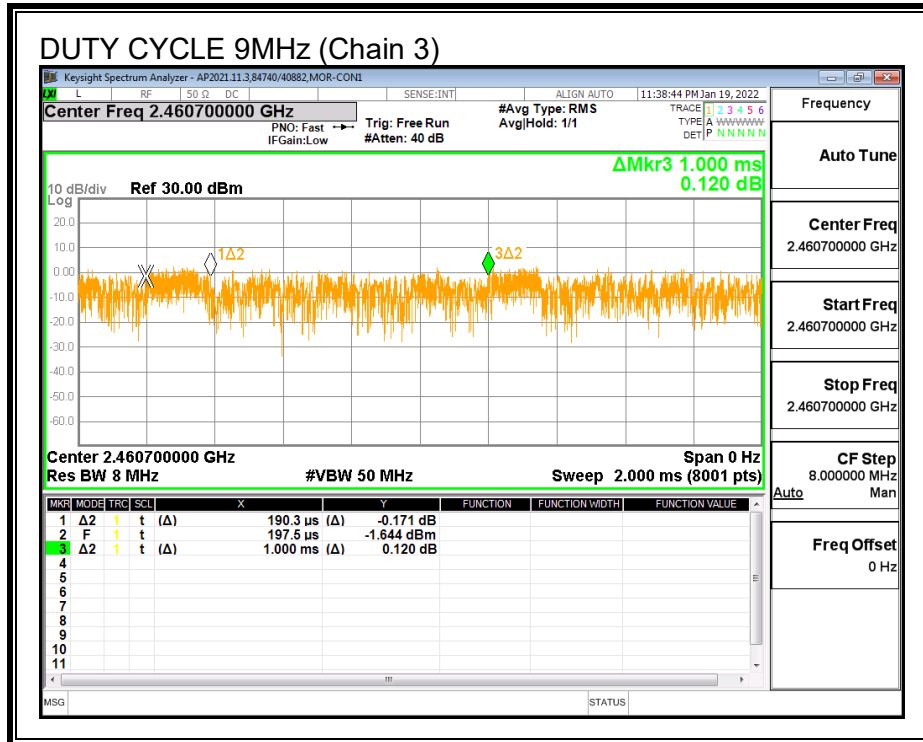


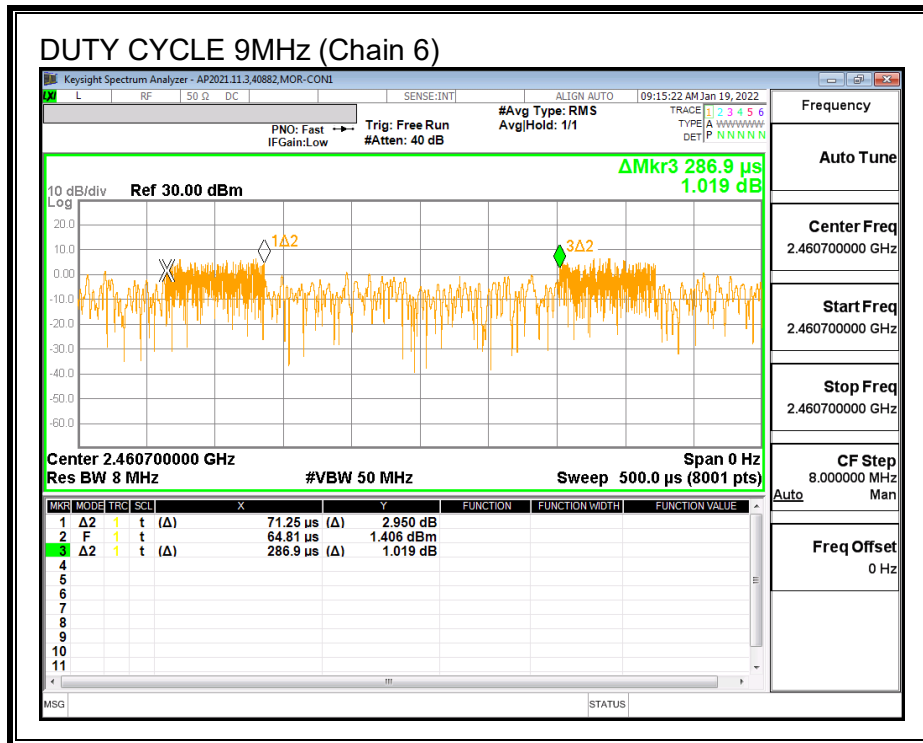
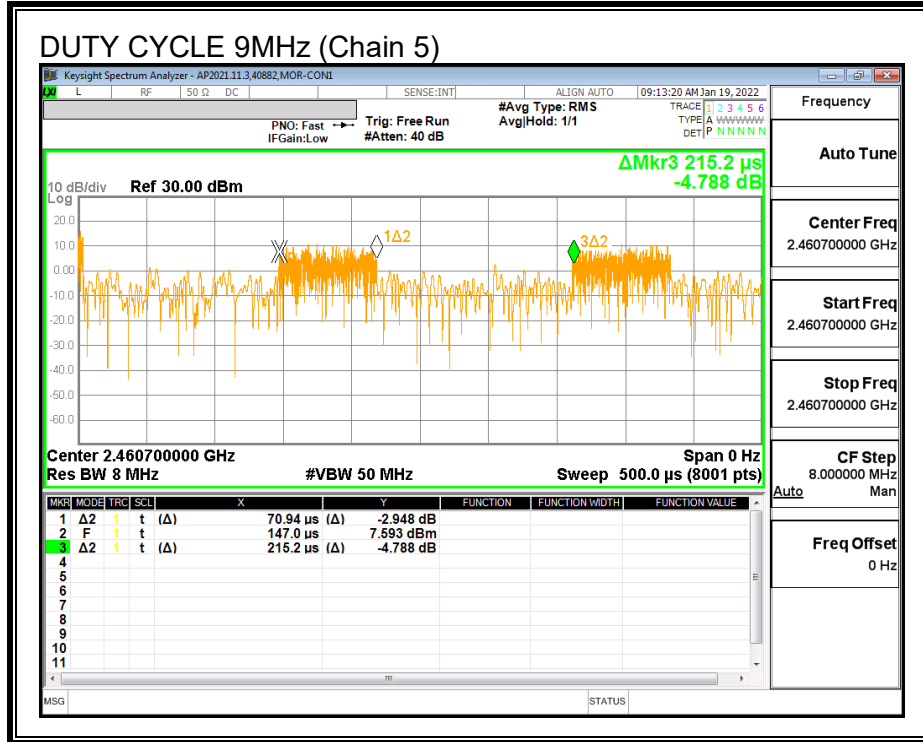


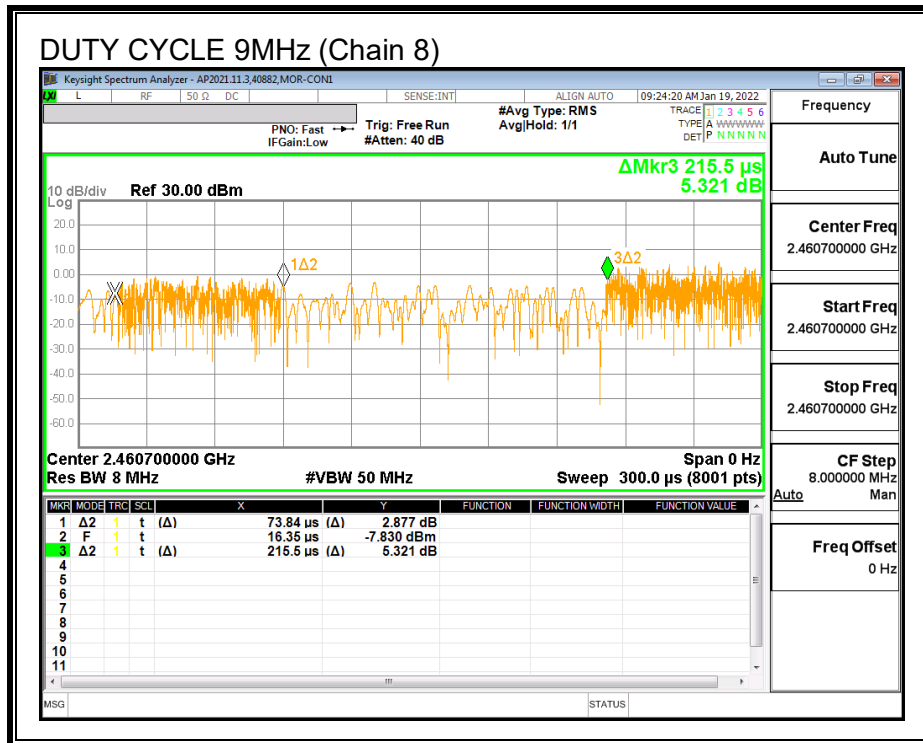
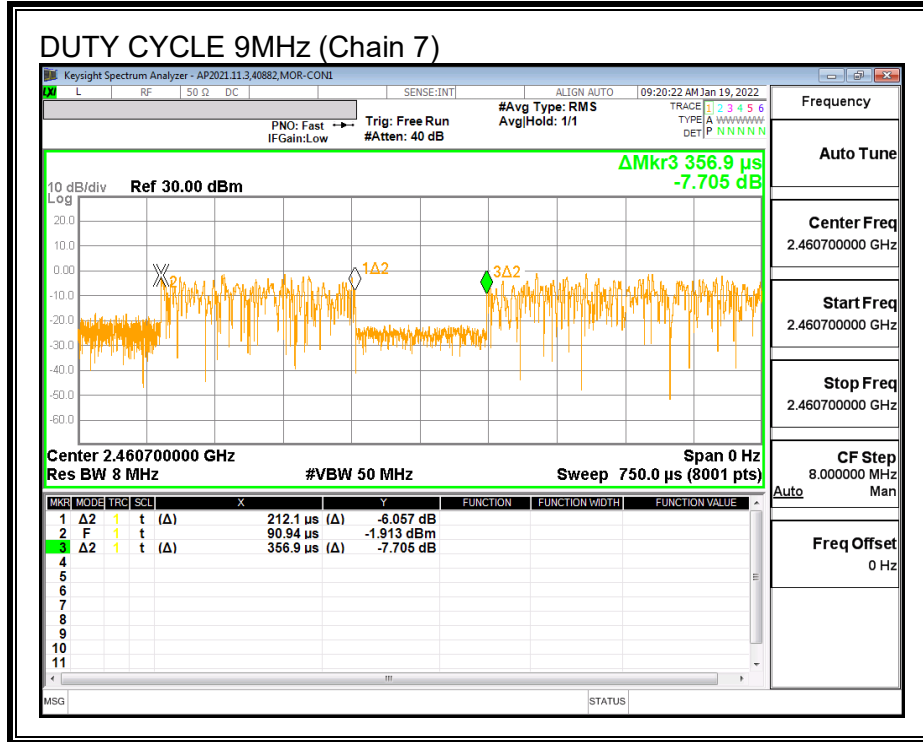






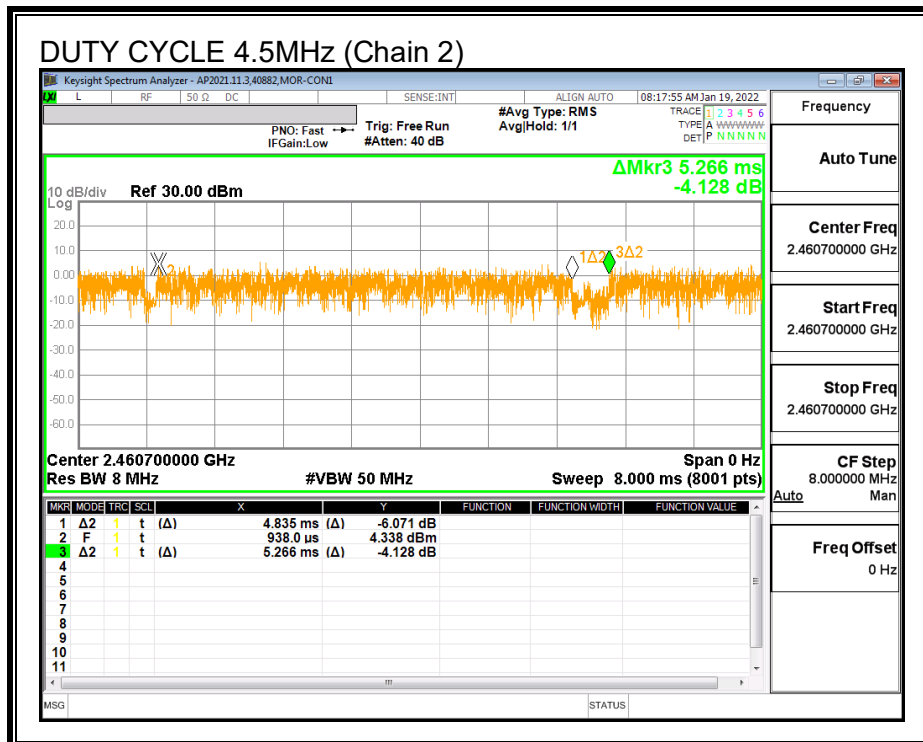
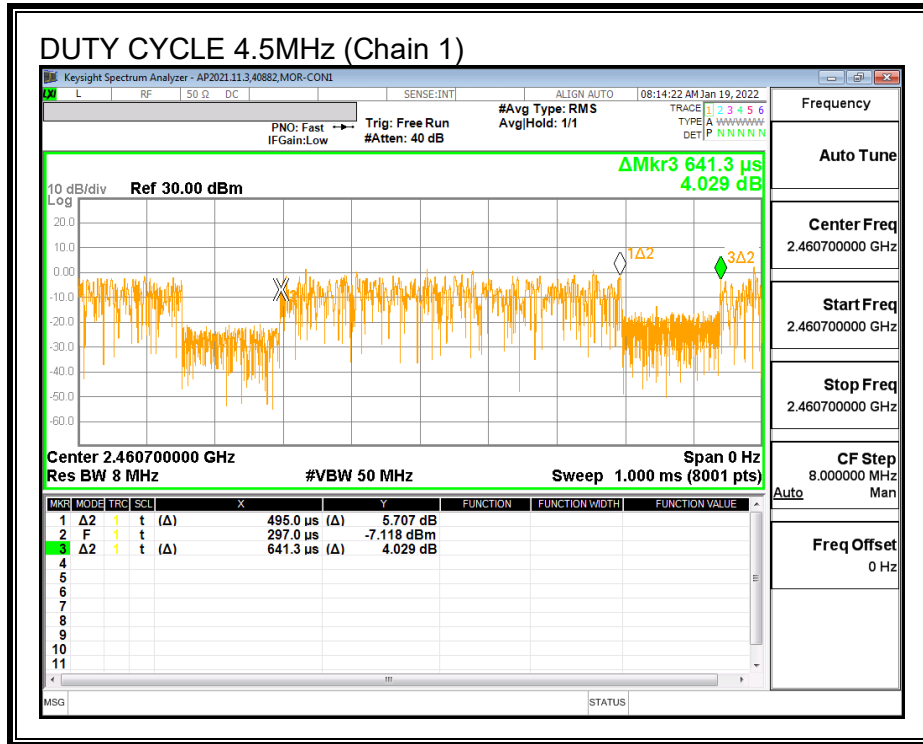


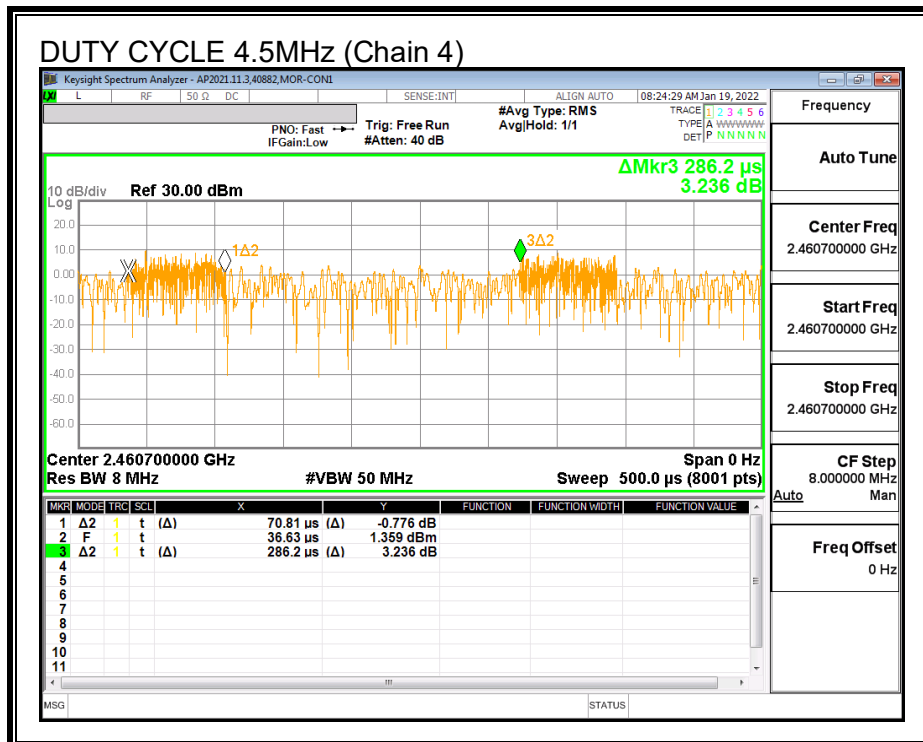
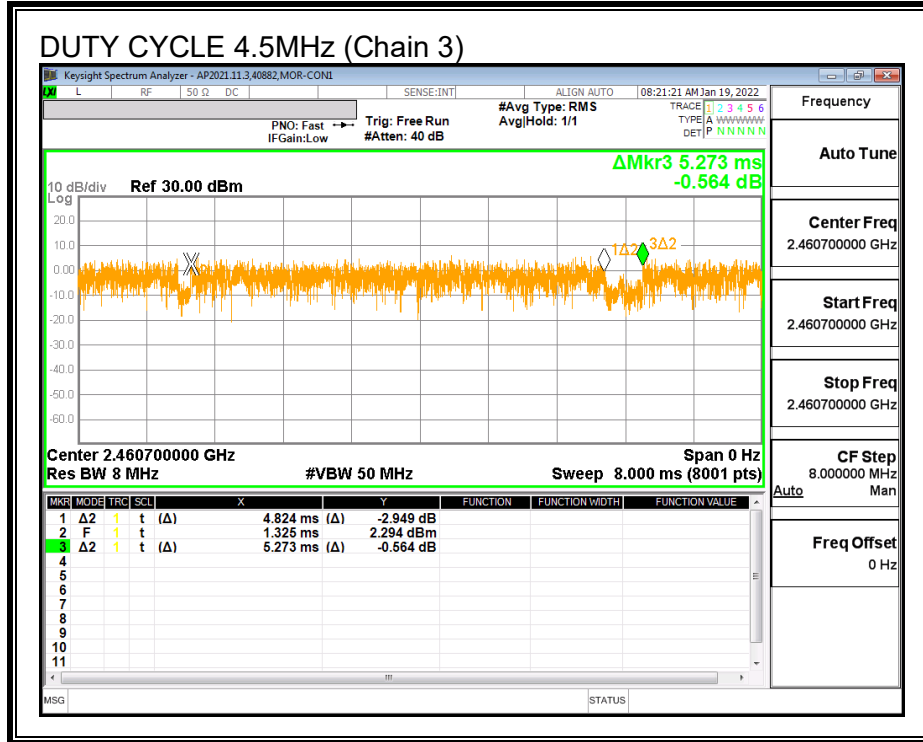


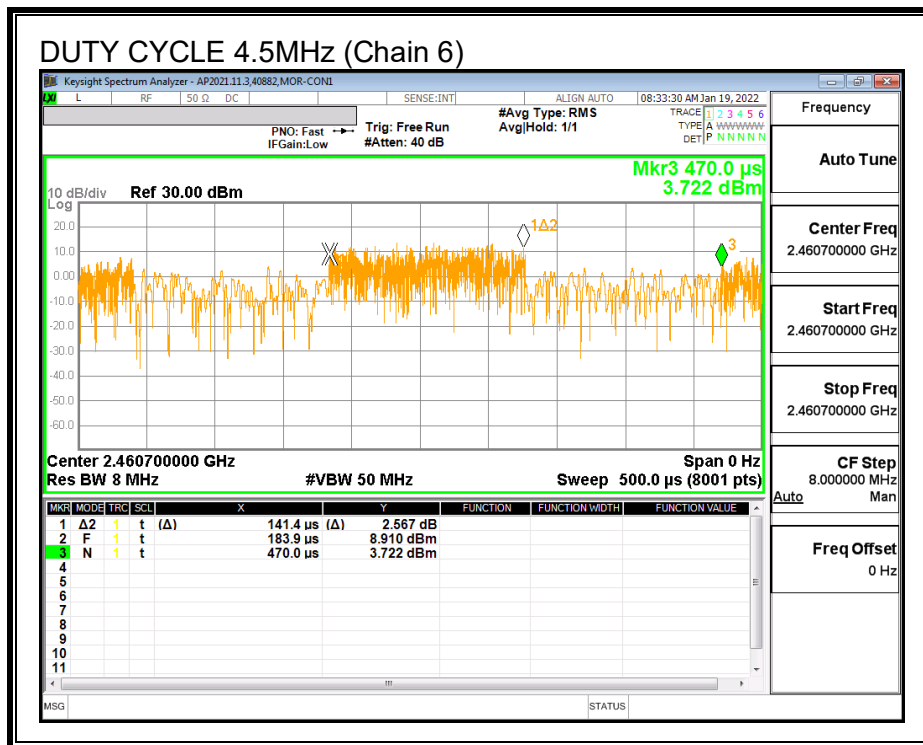
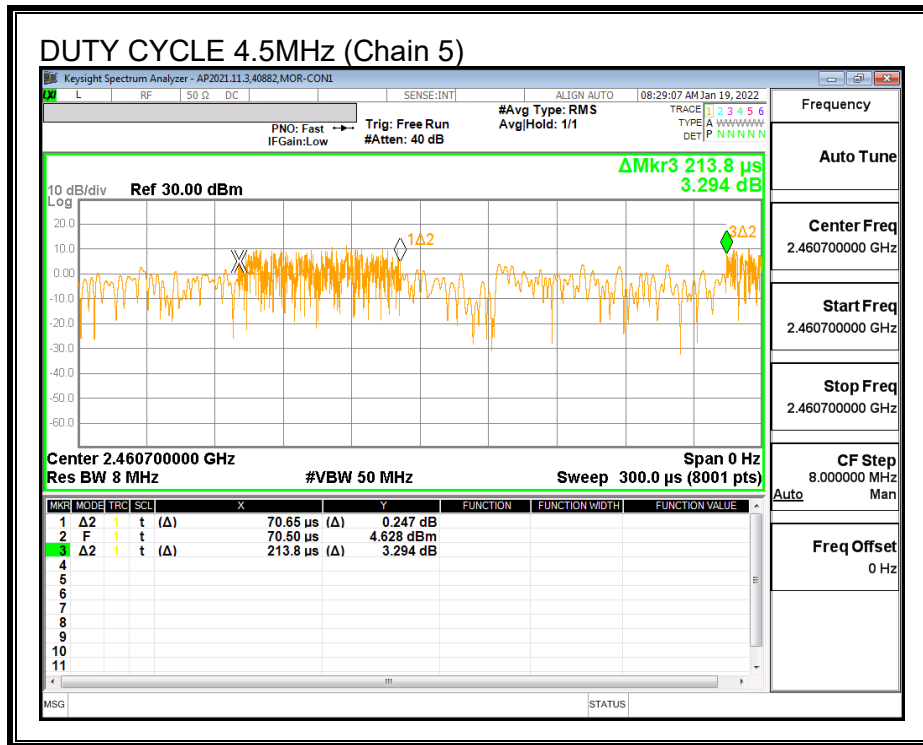


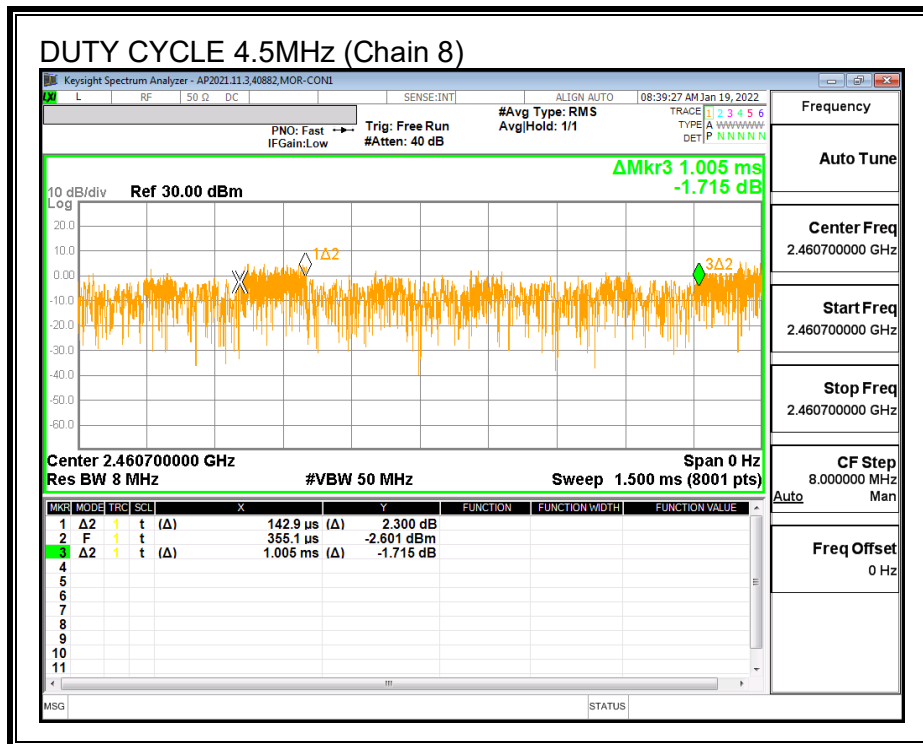
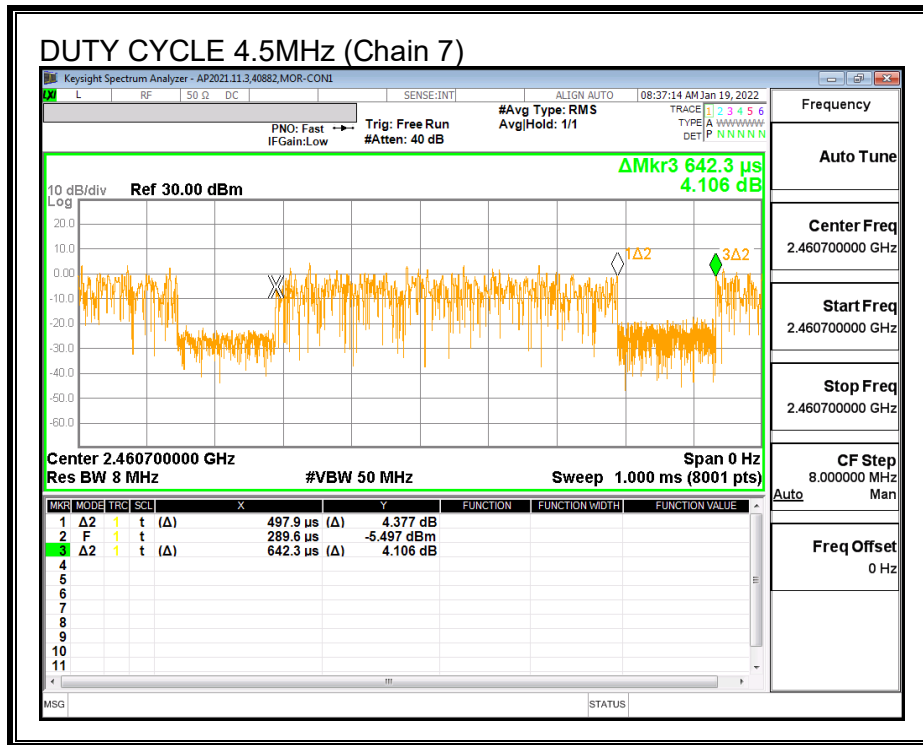
ON TIME AND DUTY CYCLE RESULTS – 16-QAM

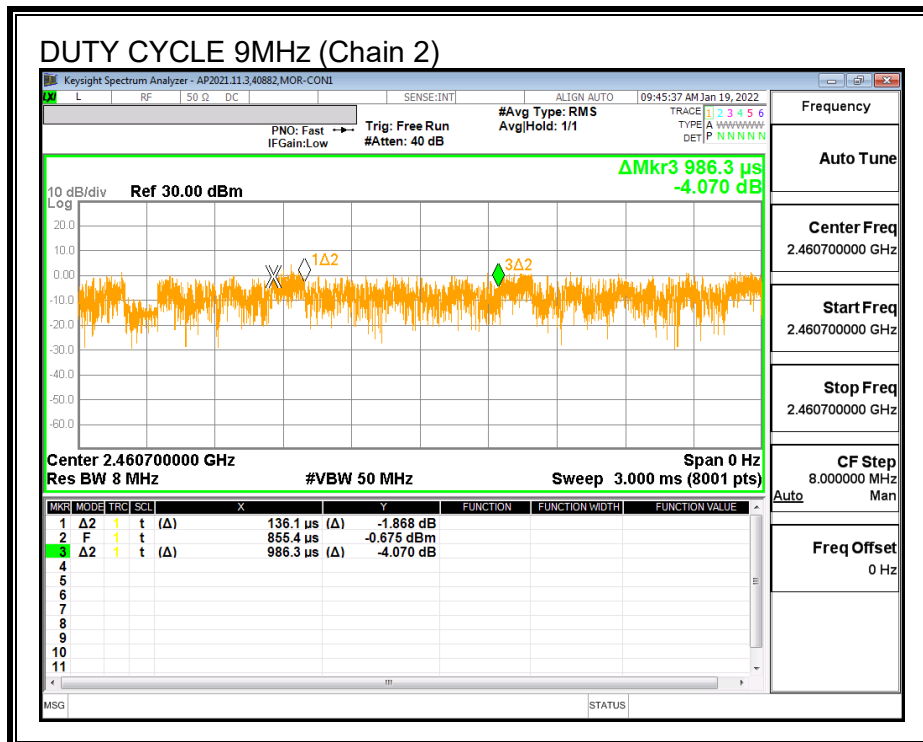
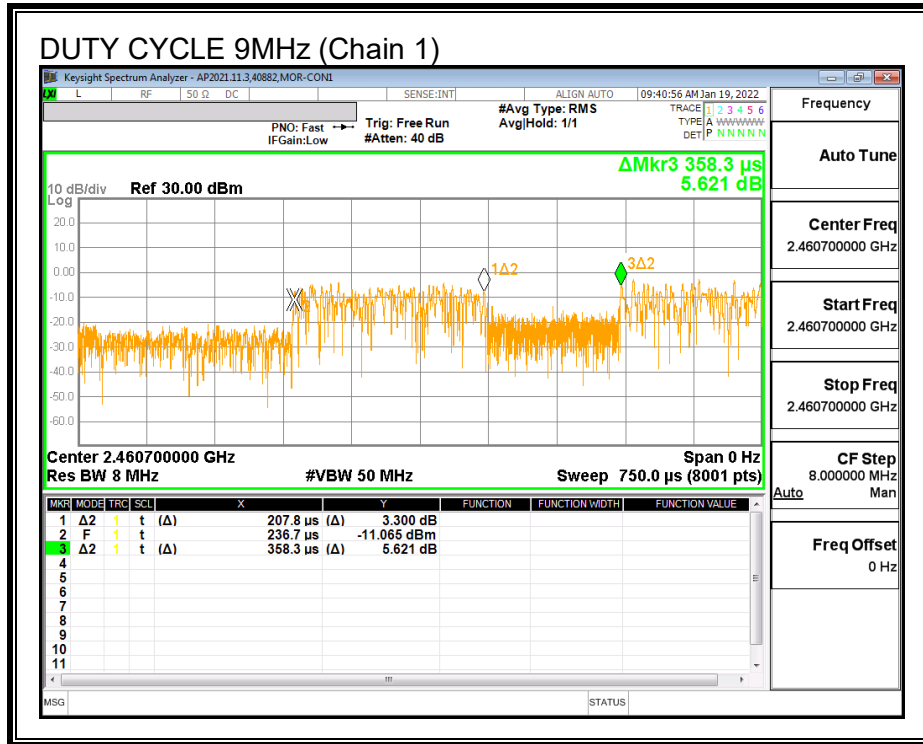
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band (4.5MHz)						
Chain 1	0.495	0.641	0.772	77.19%	2.25	2.020
Chain 2	4.835	5.266	0.918	91.82%	0.74	0.207
Chain 3	4.824	5.273	0.915	91.48%	0.77	0.207
Chain 4	0.071	0.286	0.247	24.74%	12.13	14.122
Chain 5	0.071	0.214	0.330	33.04%	9.62	14.154
Chain 6	0.141	0.470	0.301	30.09%	10.43	7.072
Chain 7	0.498	0.642	0.775	77.52%	2.21	2.008
Chain 8	0.143	1.005	0.142	14.22%	16.94	6.998
2.4GHz Band (9MHz)						
Chain 1	0.208	0.358	0.580	58.00%	4.73	4.812
Chain 2	0.136	0.986	0.138	13.80%	17.20	7.348
Chain 3	4.831	5.279	0.915	91.51%	0.77	0.207
Chain 4	0.070	0.215	0.328	32.80%	9.68	14.192
Chain 5	0.071	0.214	0.329	32.93%	9.65	14.184
Chain 6	0.069	0.216	0.320	32.02%	9.89	14.453
Chain 7	0.848	0.994	0.854	85.39%	1.37	1.179
Chain 8	0.071	0.285	0.249	24.95%	12.06	14.045

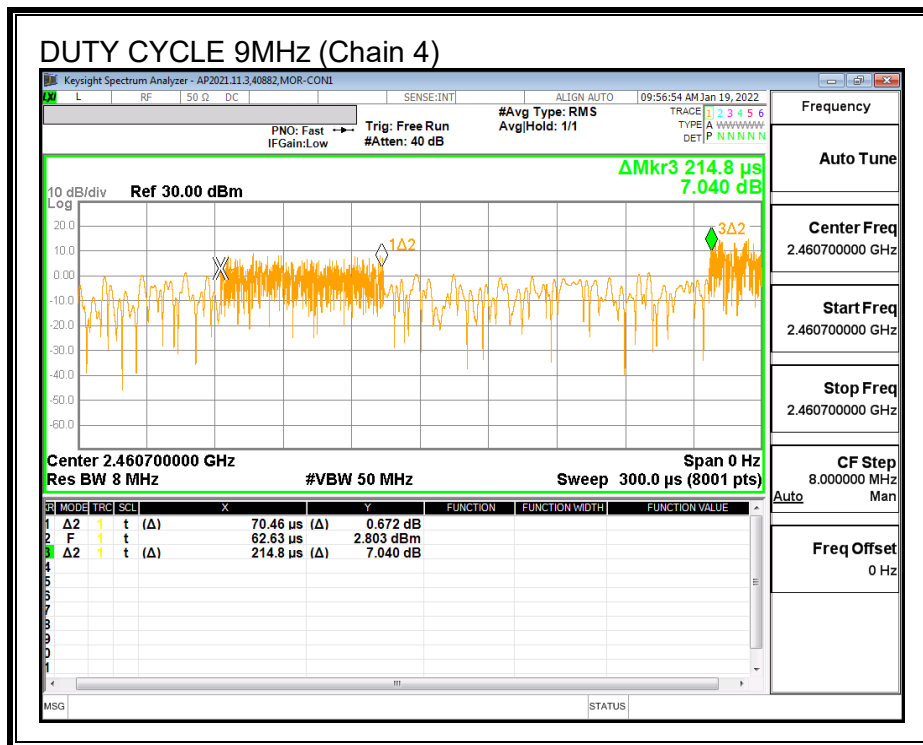
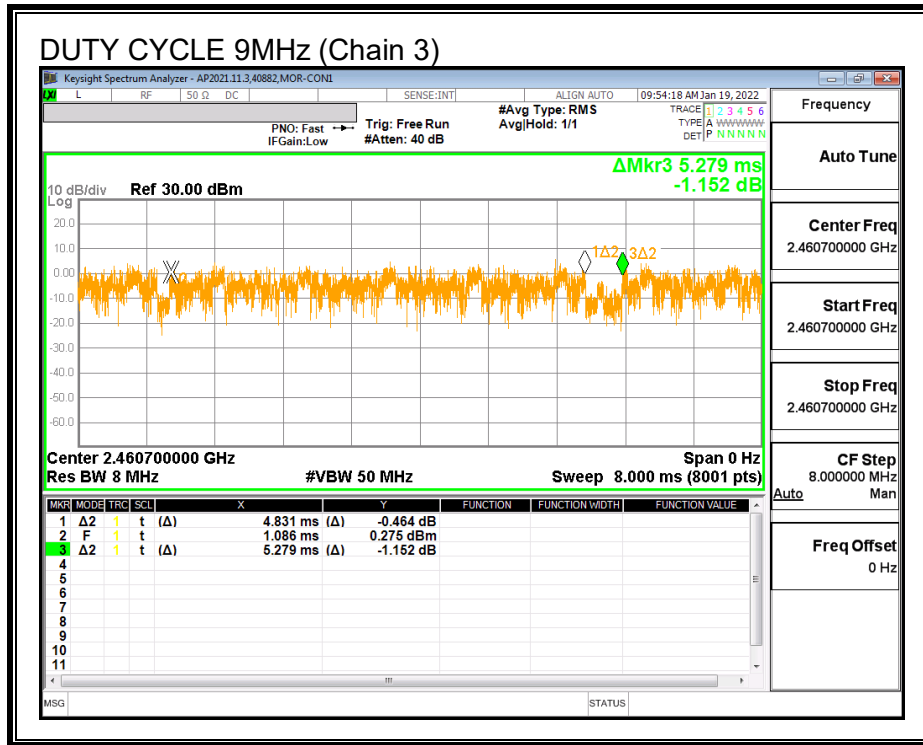


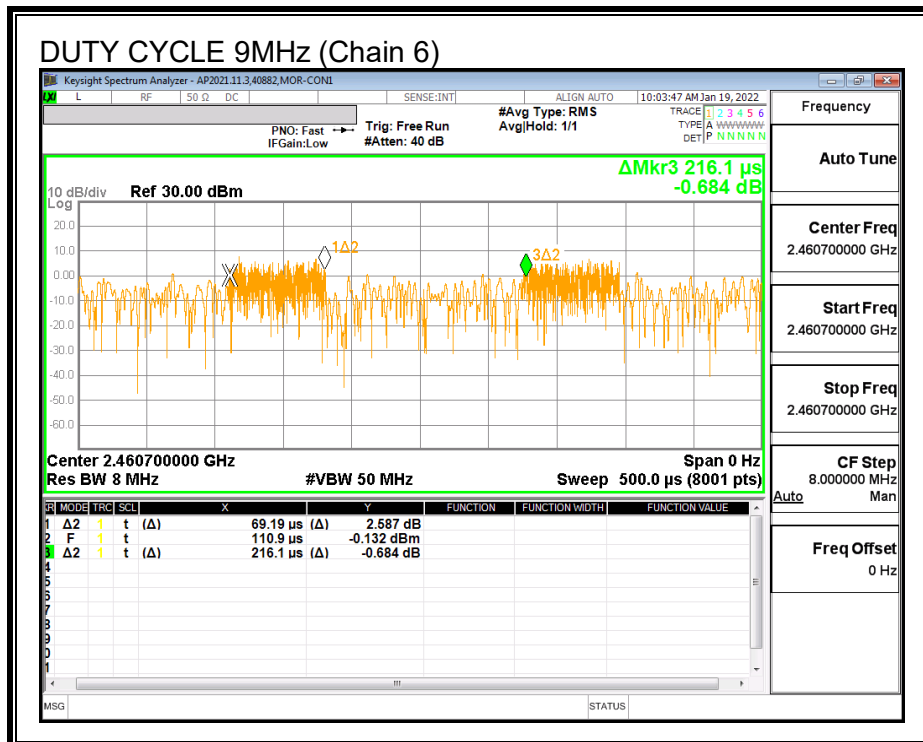
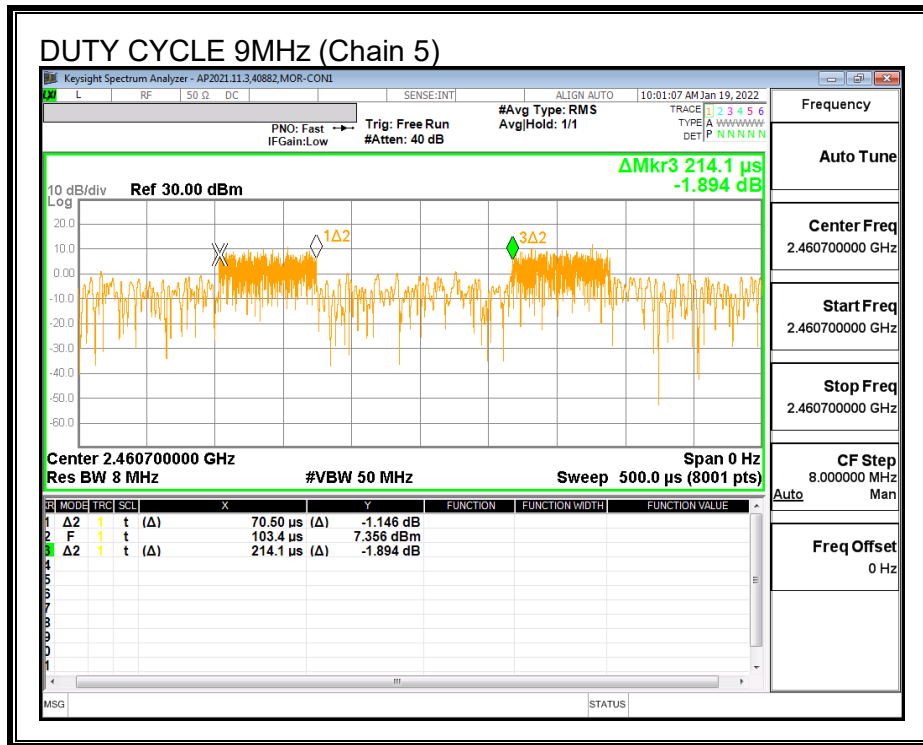


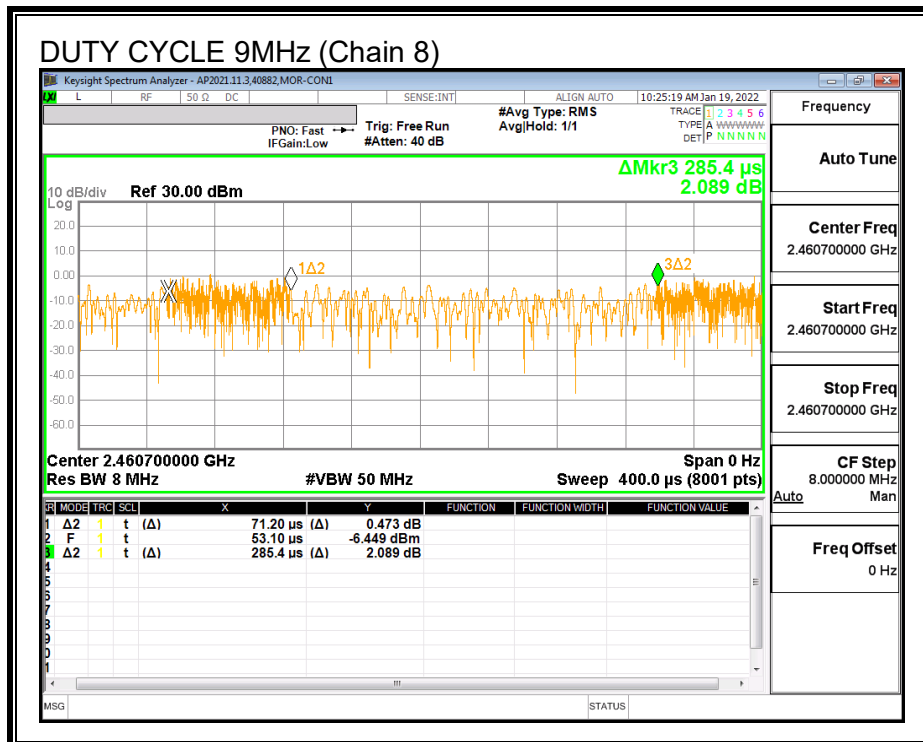
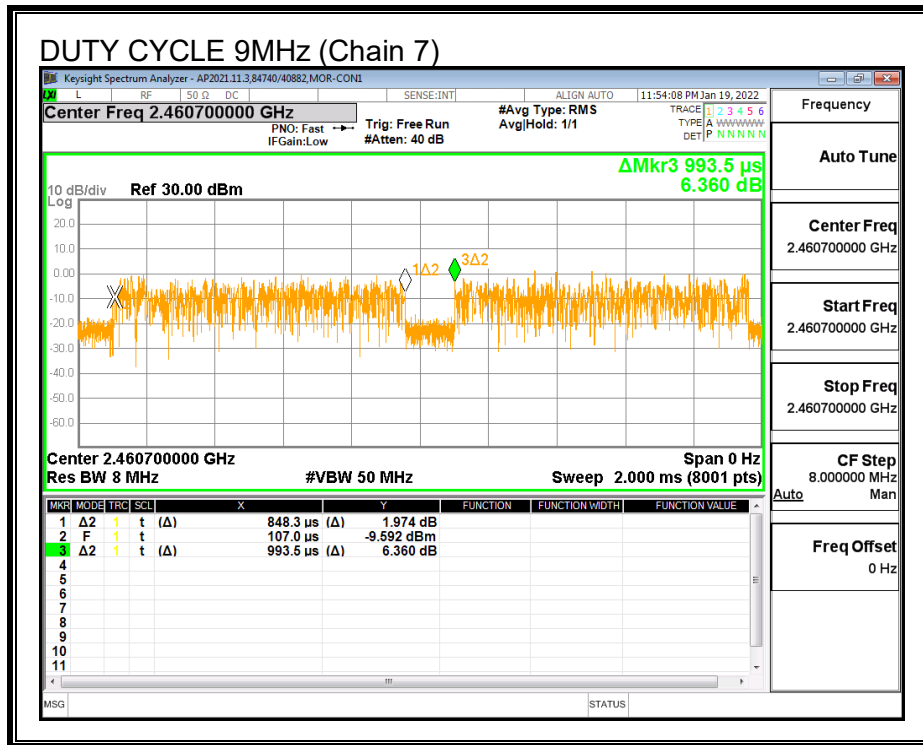






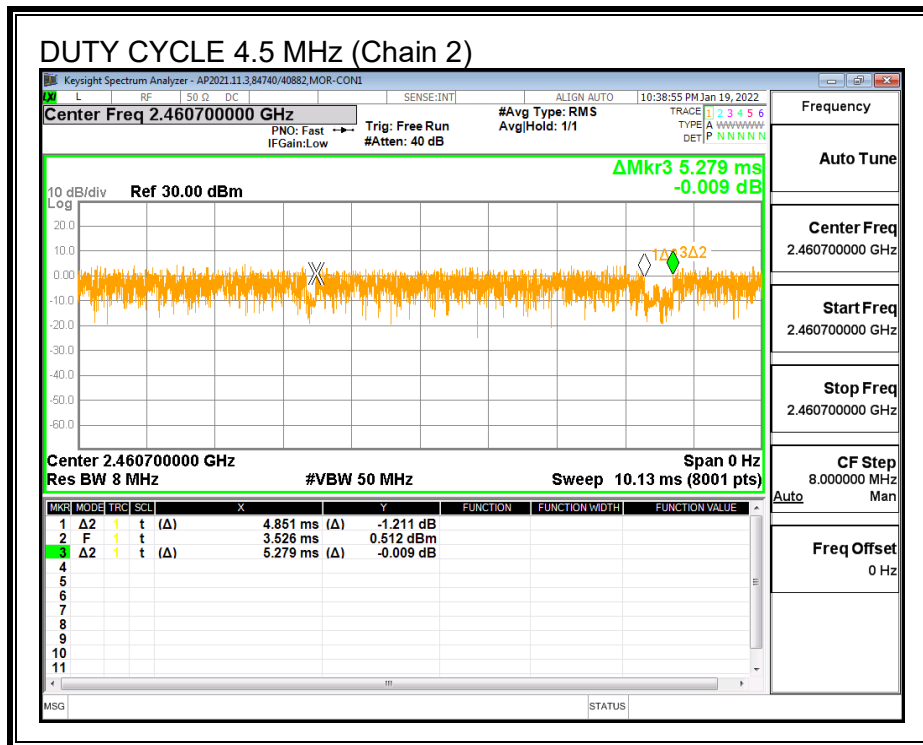
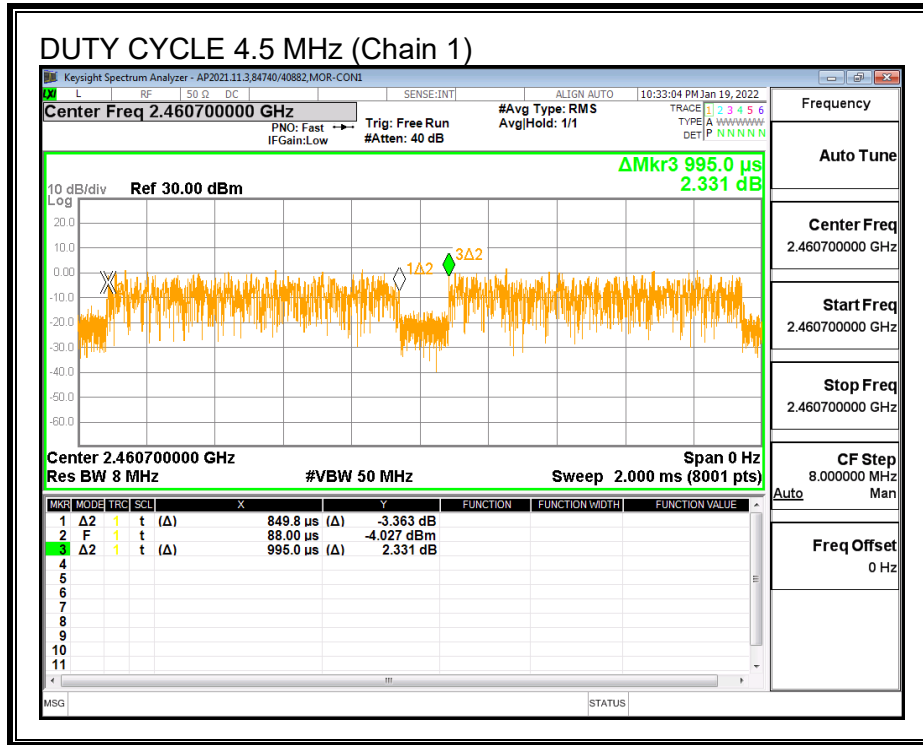


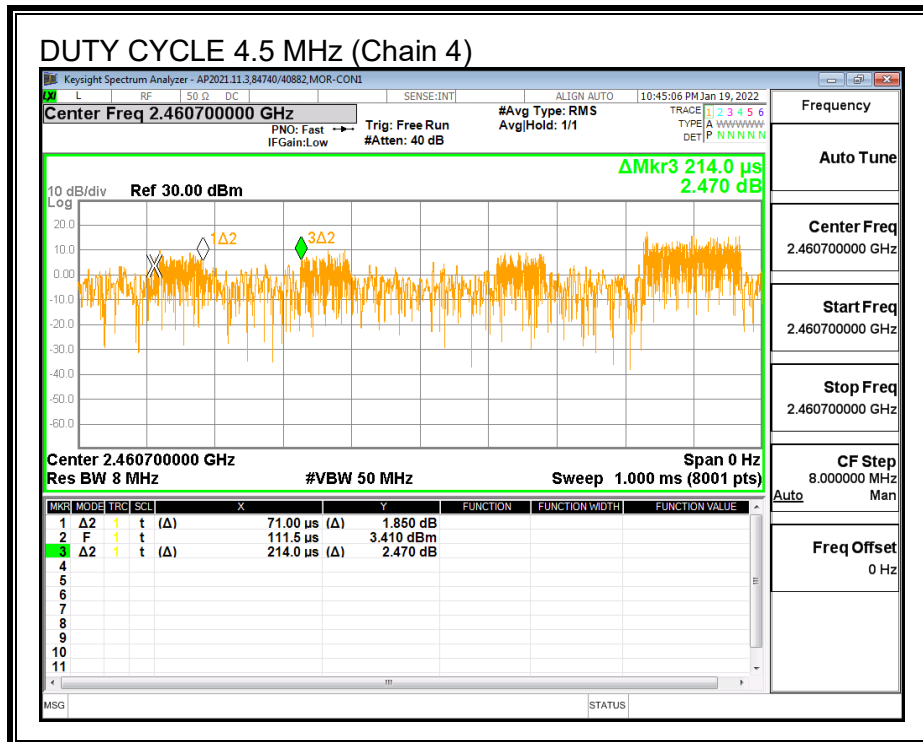
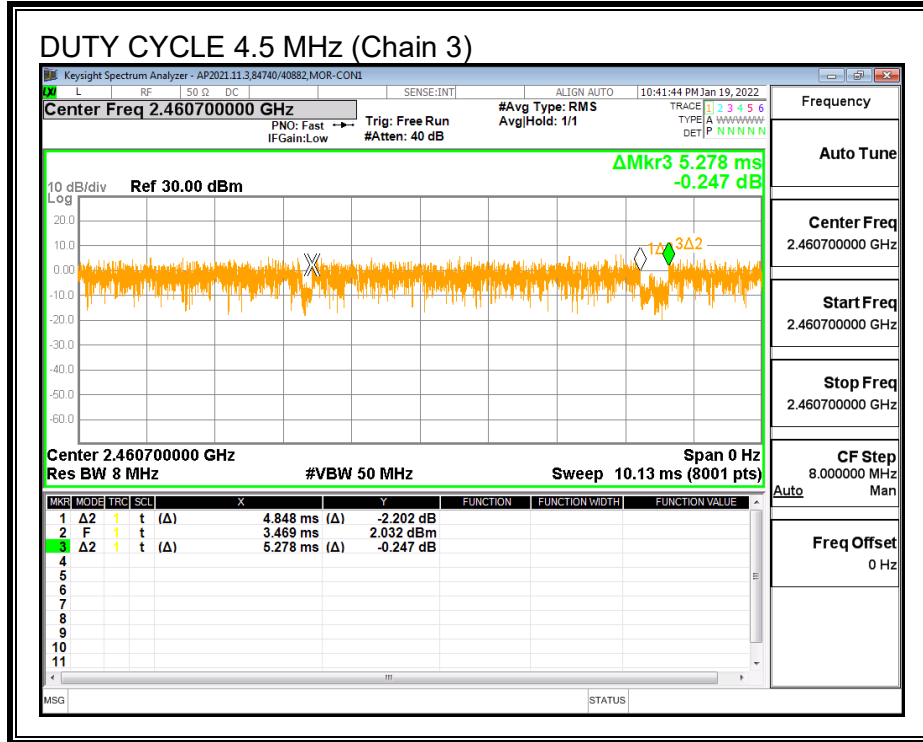


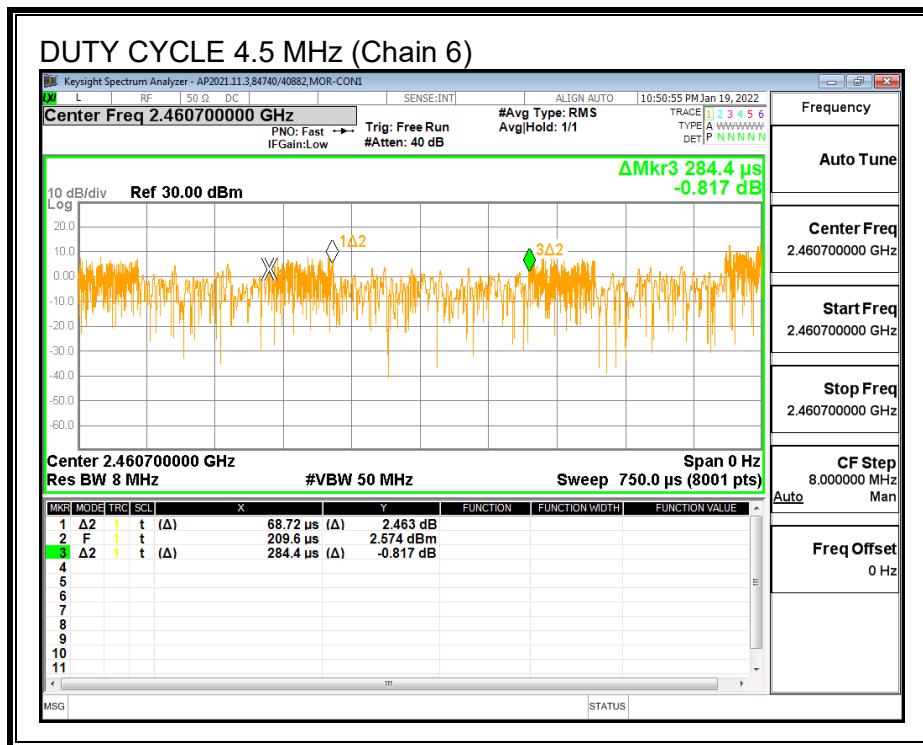
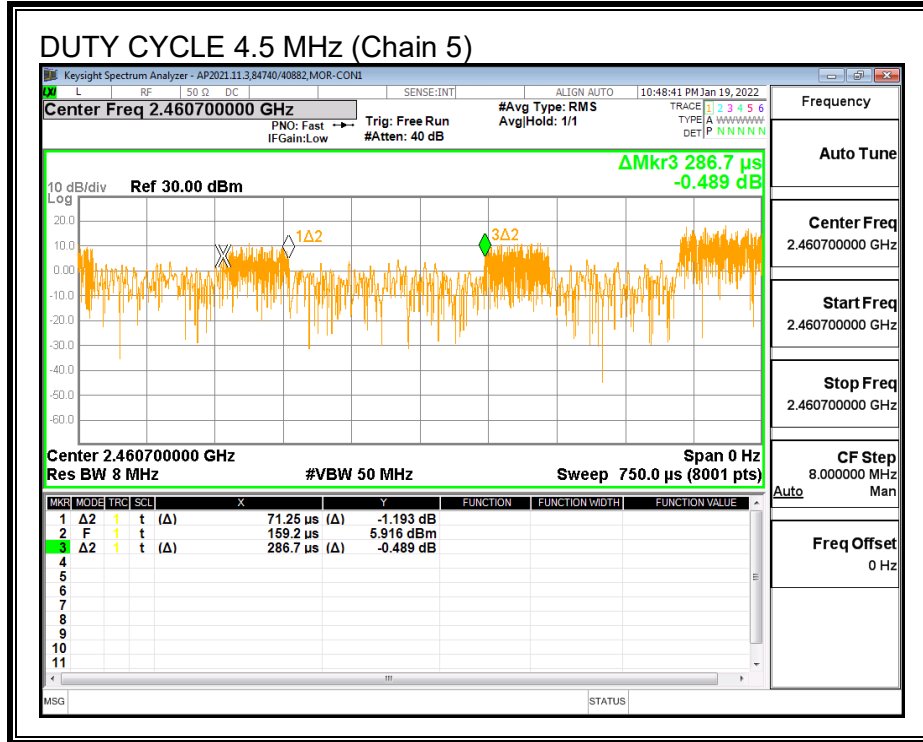


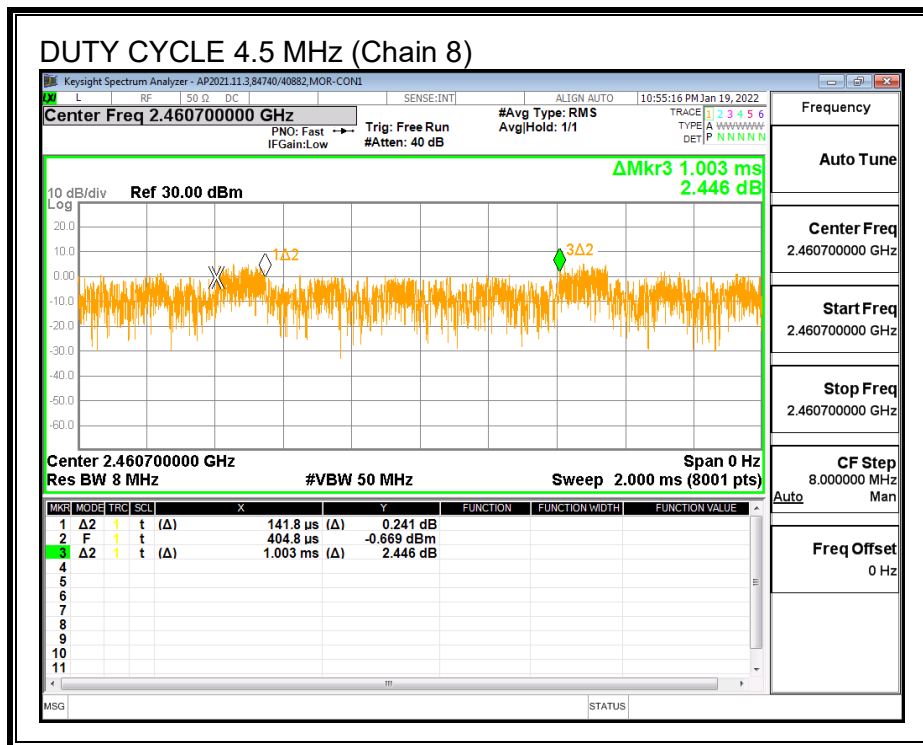
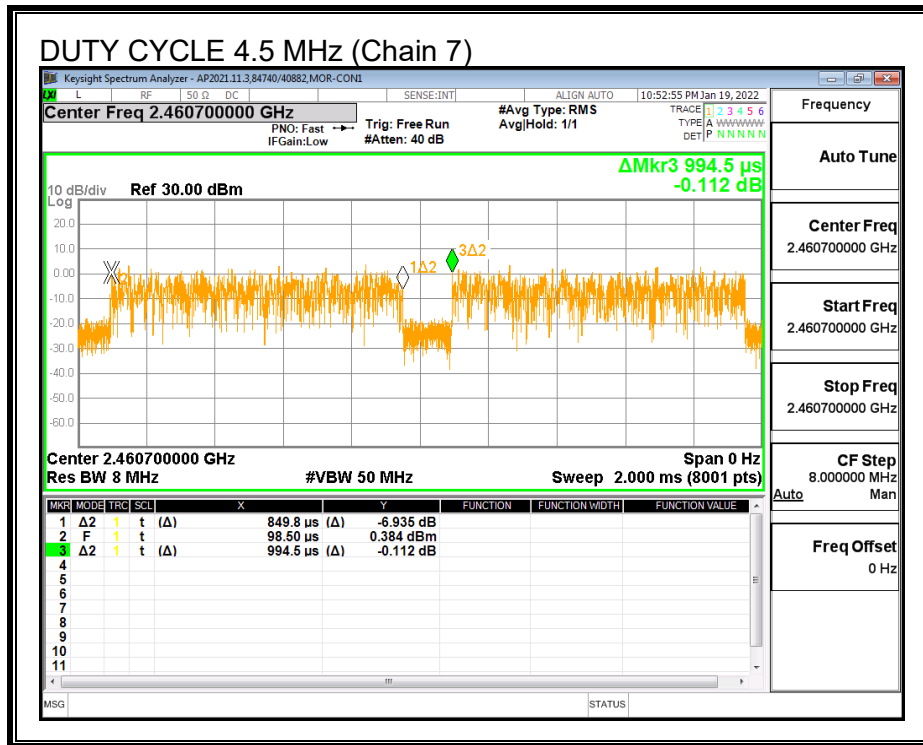
ON TIME AND DUTY CYCLE RESULTS – 64-QAM

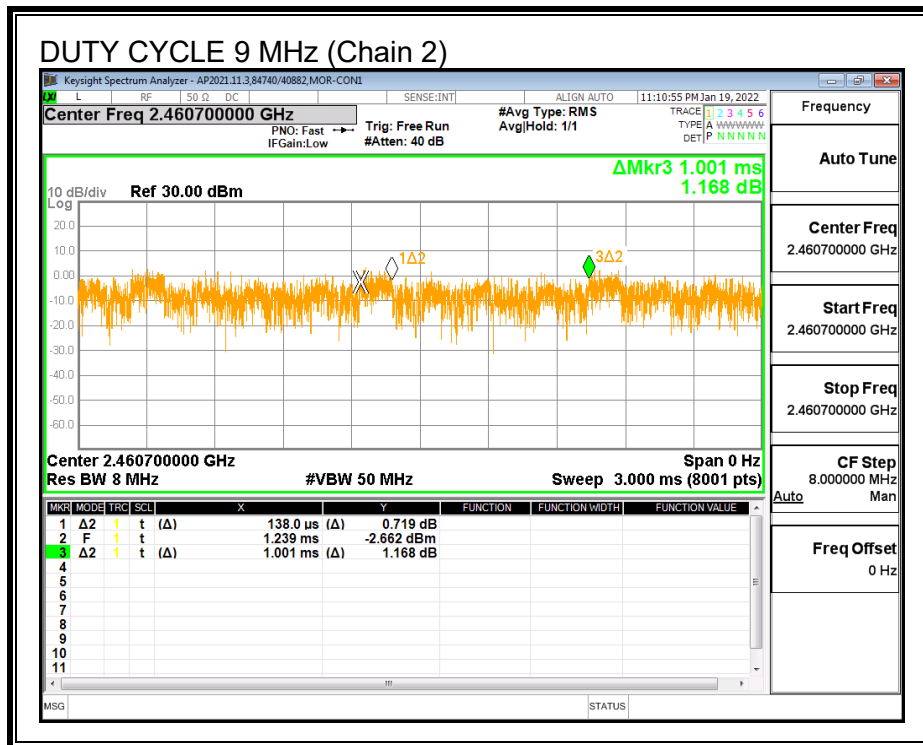
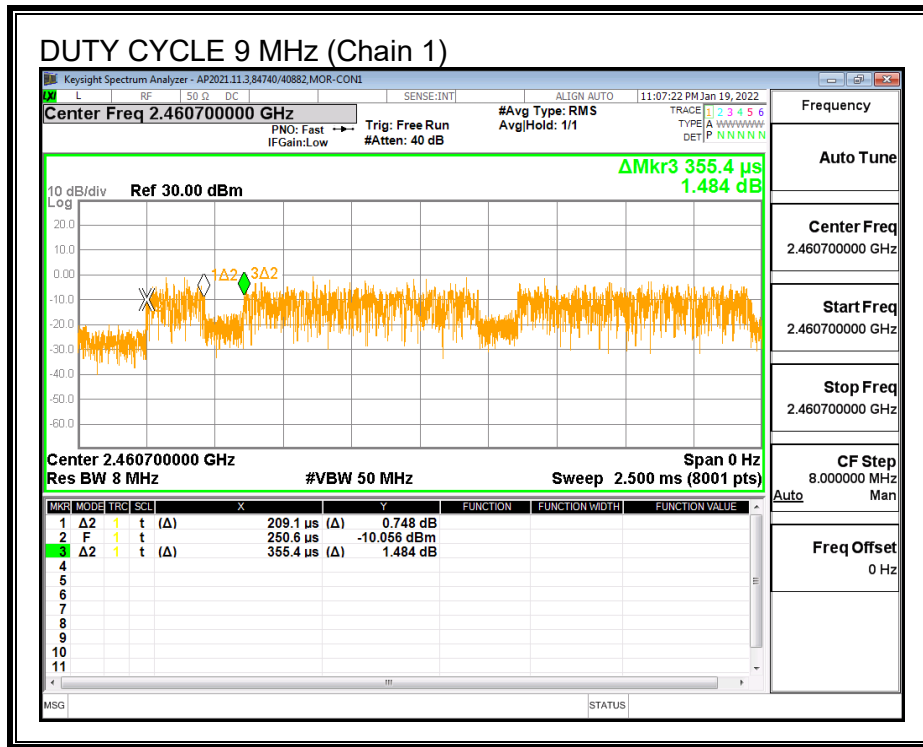
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band (4.5MHz)						
Chain 1	0.850	0.995	0.854	85.41%	1.37	1.177
Chain 2	4.851	5.279	0.919	91.89%	0.73	0.206
Chain 3	4.848	5.278	0.919	91.85%	0.74	0.206
Chain 4	0.071	0.214	0.332	33.18%	9.58	14.085
Chain 5	0.071	0.287	0.248	24.83%	12.10	14.035
Chain 6	0.069	0.284	0.242	24.16%	12.34	14.552
Chain 7	0.850	0.995	0.854	85.45%	1.37	1.177
Chain 8	0.142	1.003	0.141	14.14%	16.99	7.052
2.4GHz Band (9MHz)						
Chain 1	0.209	0.355	0.588	58.84%	4.61	4.782
Chain 2	0.138	1.001	0.138	13.79%	17.21	7.246
Chain 3	4.568	4.723	0.967	96.72%	0.29	0.219
Chain 4	0.071	0.215	0.331	33.10%	9.60	14.085
Chain 5	0.069	0.285	0.241	24.05%	12.38	14.599
Chain 6	0.070	0.287	0.243	24.31%	12.28	14.337
Chain 7	0.851	1.003	0.849	84.87%	1.43	1.175
Chain 8	0.140	1.003	0.139	13.94%	17.12	7.153

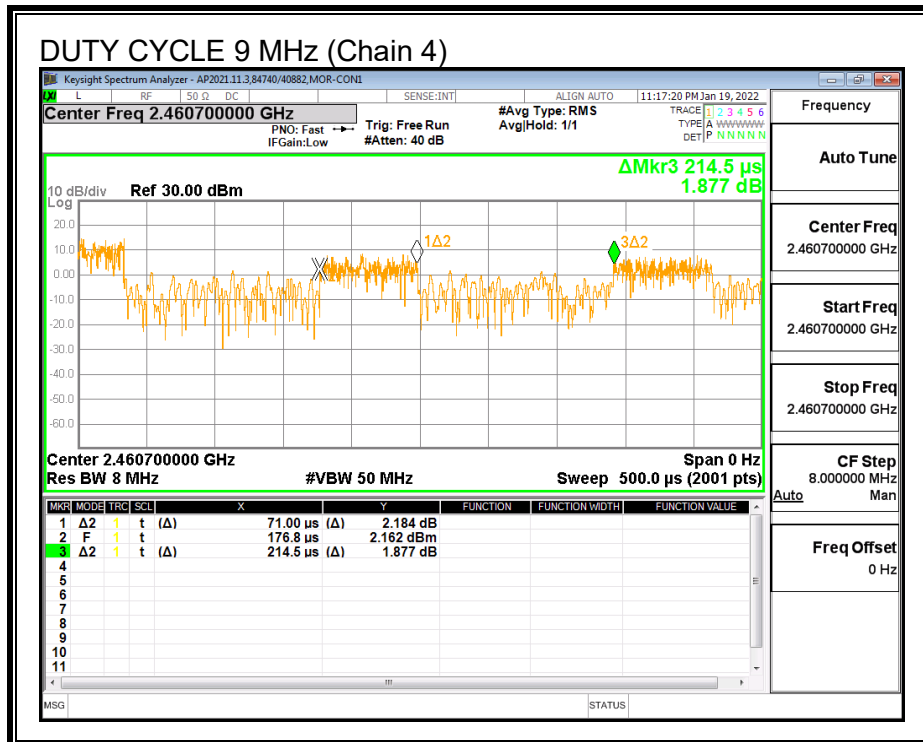
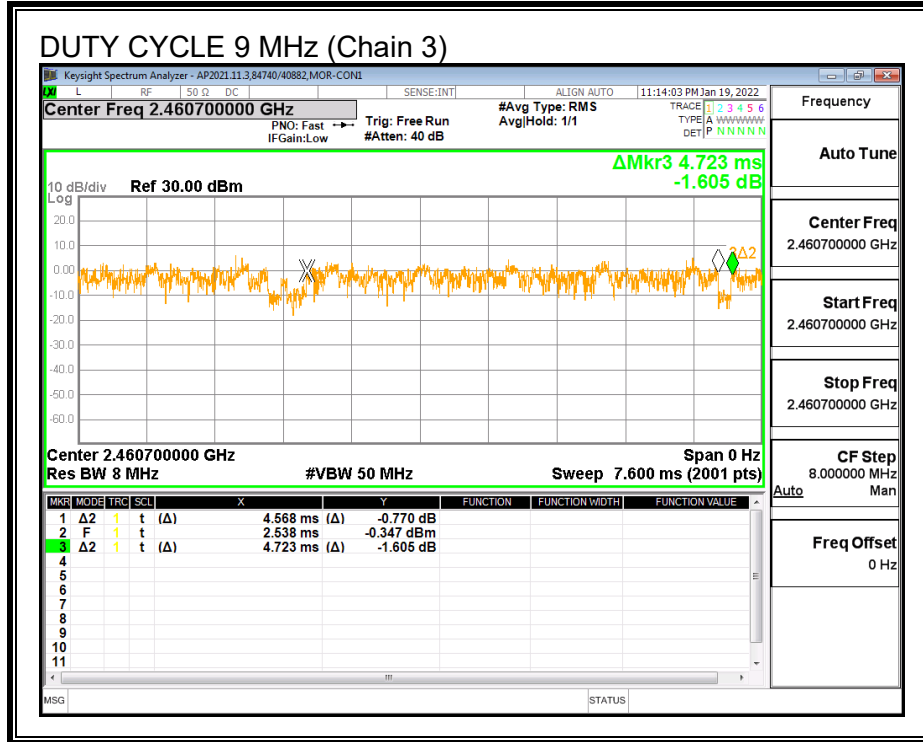


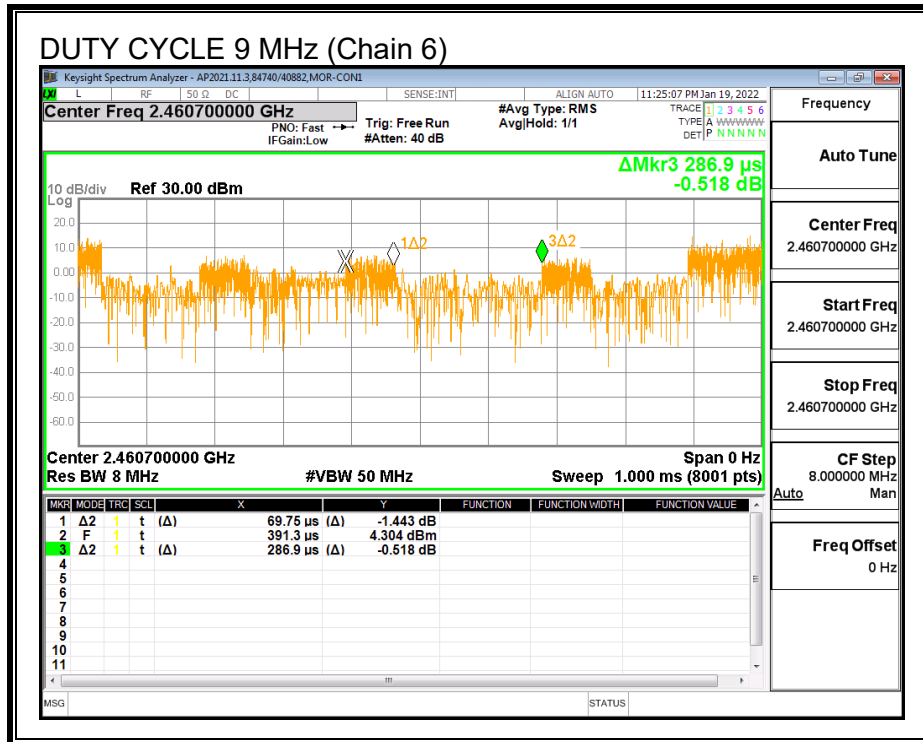
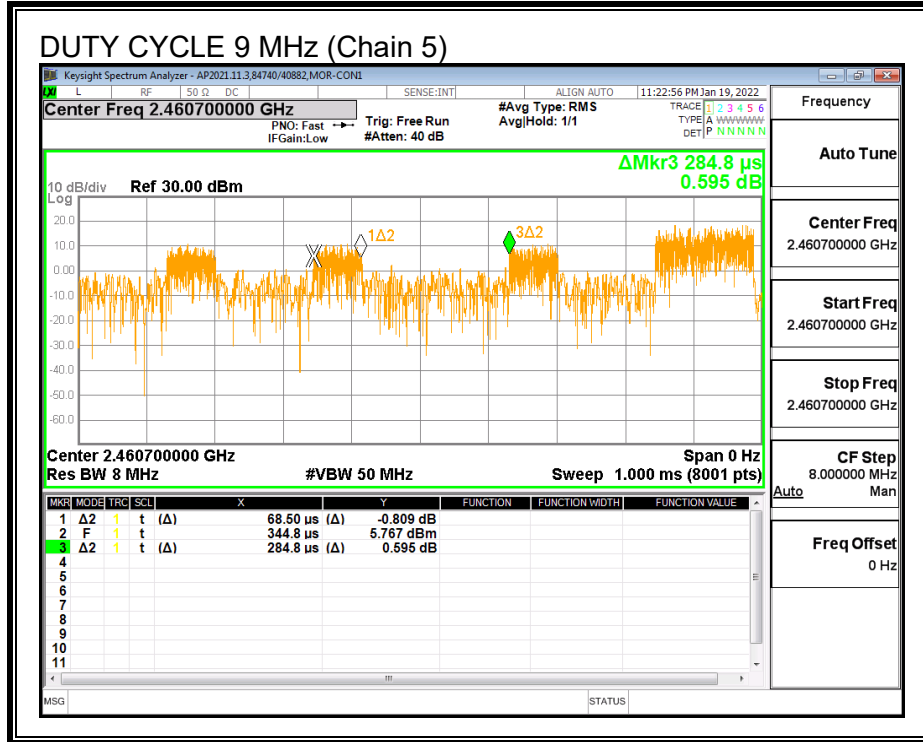


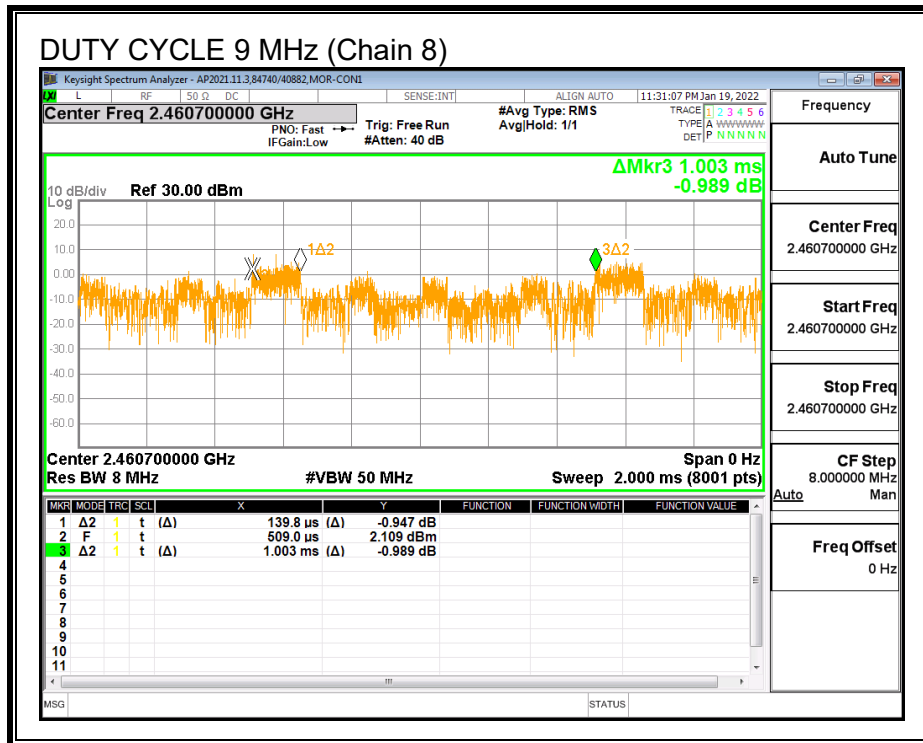
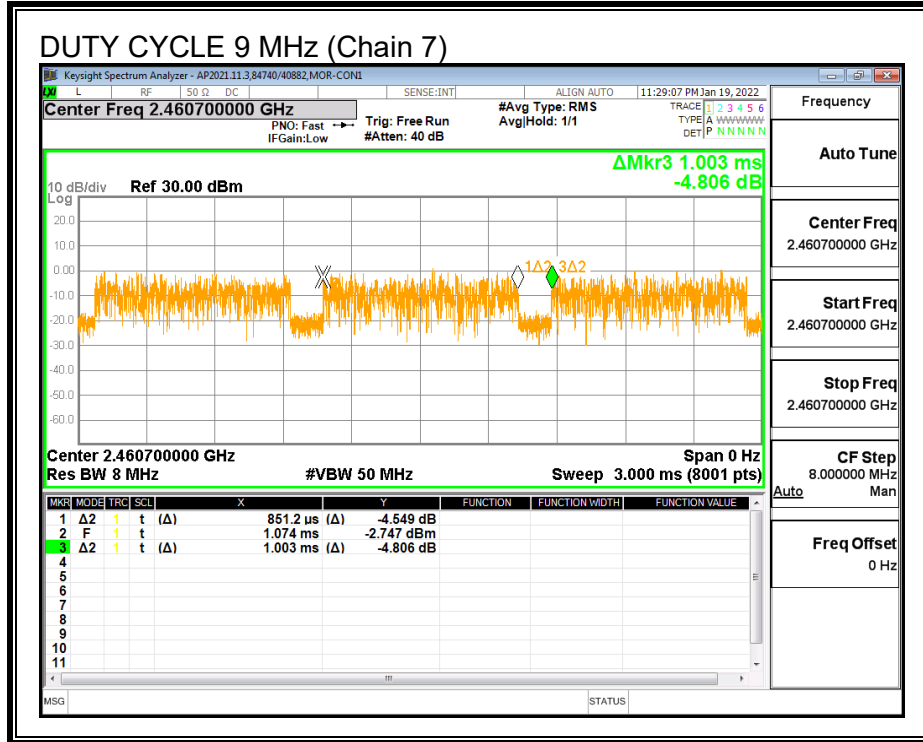












9.2. 4.5 MHz MODE IN THE 2.4 GHz AUTHORIZED BAND

9.2.1. 6 dB BANDWIDTH

LIMITS

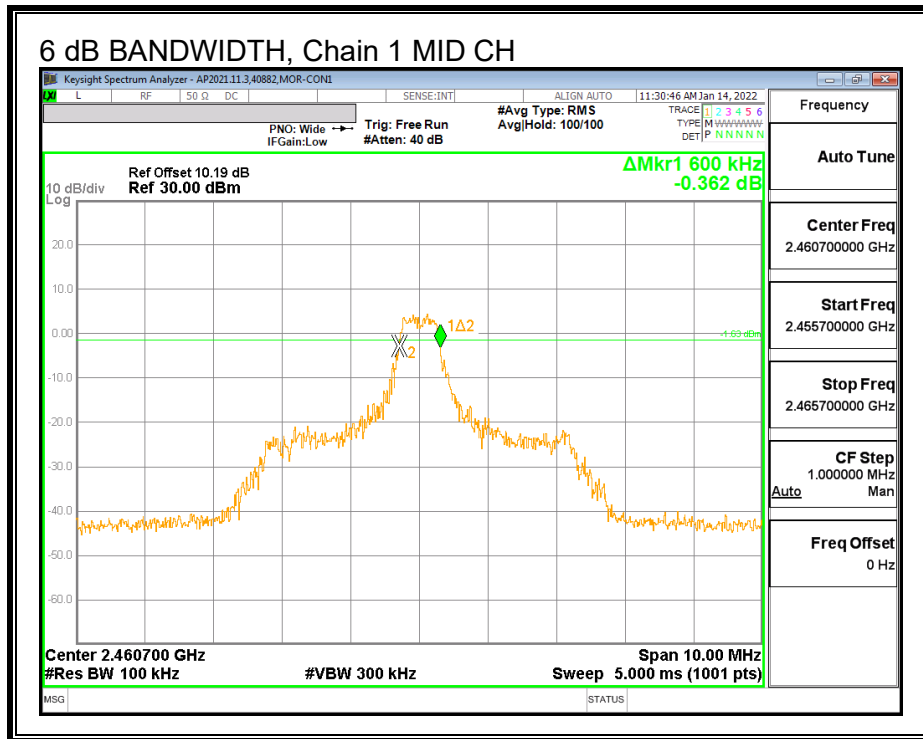
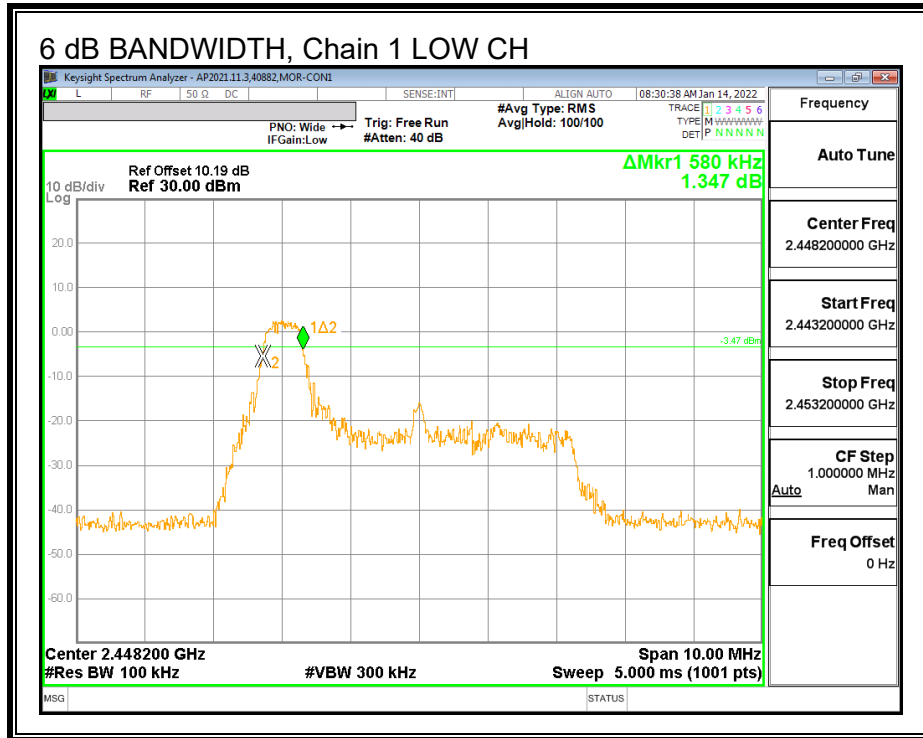
FCC §15.247 (a) (2)

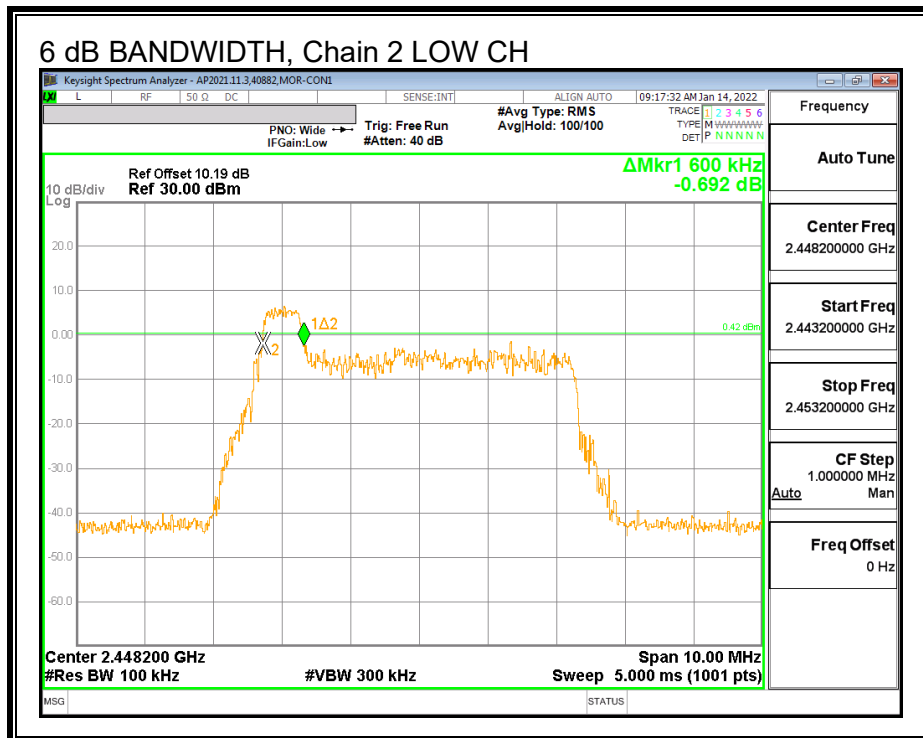
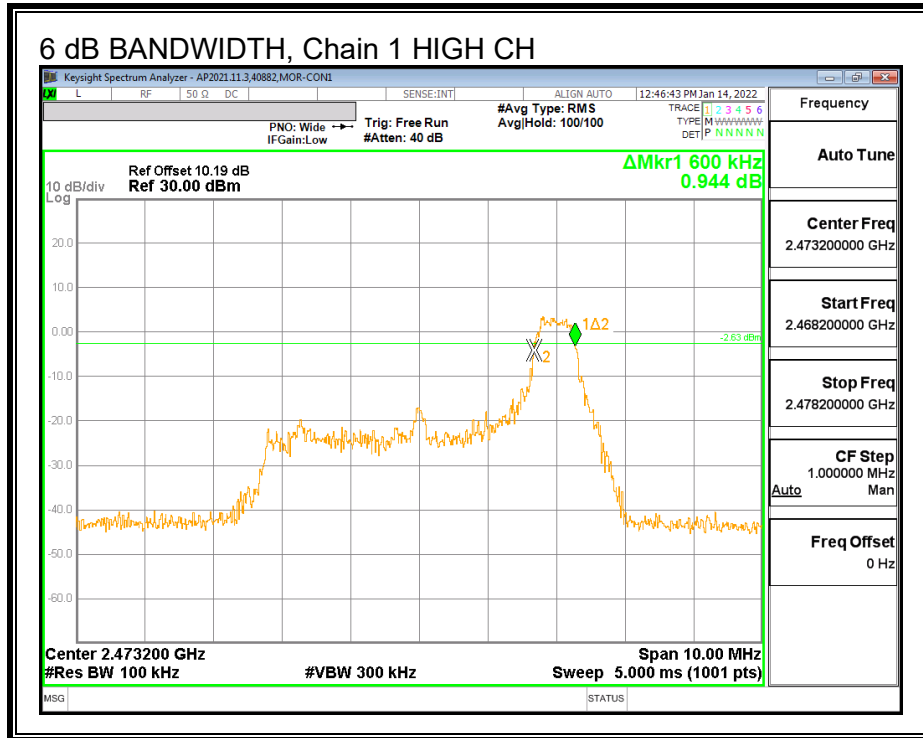
The minimum 6 dB bandwidth shall be at least 500 kHz.

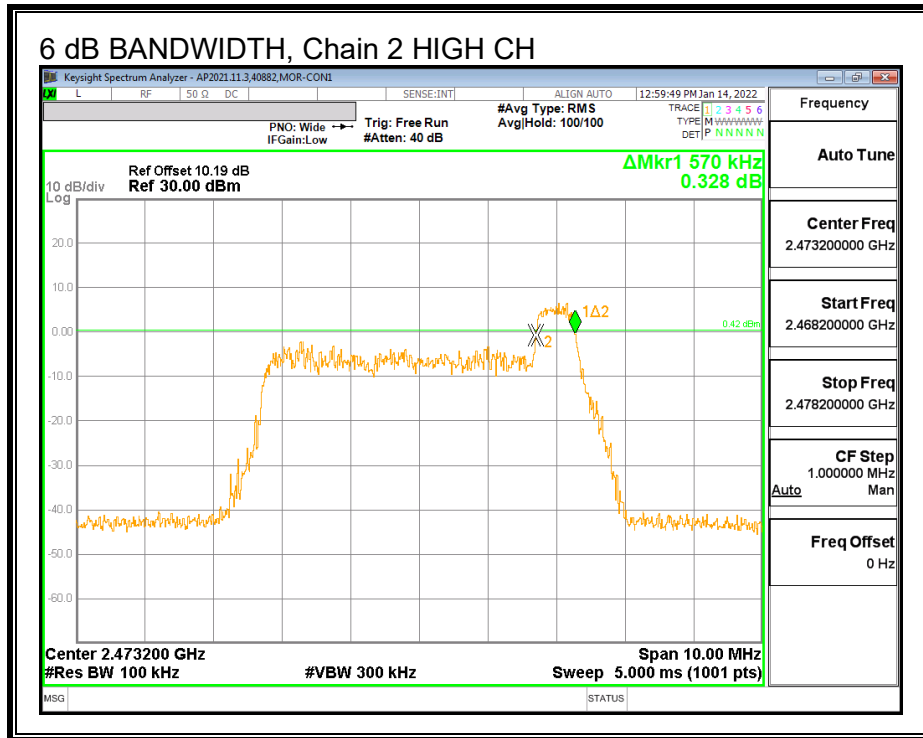
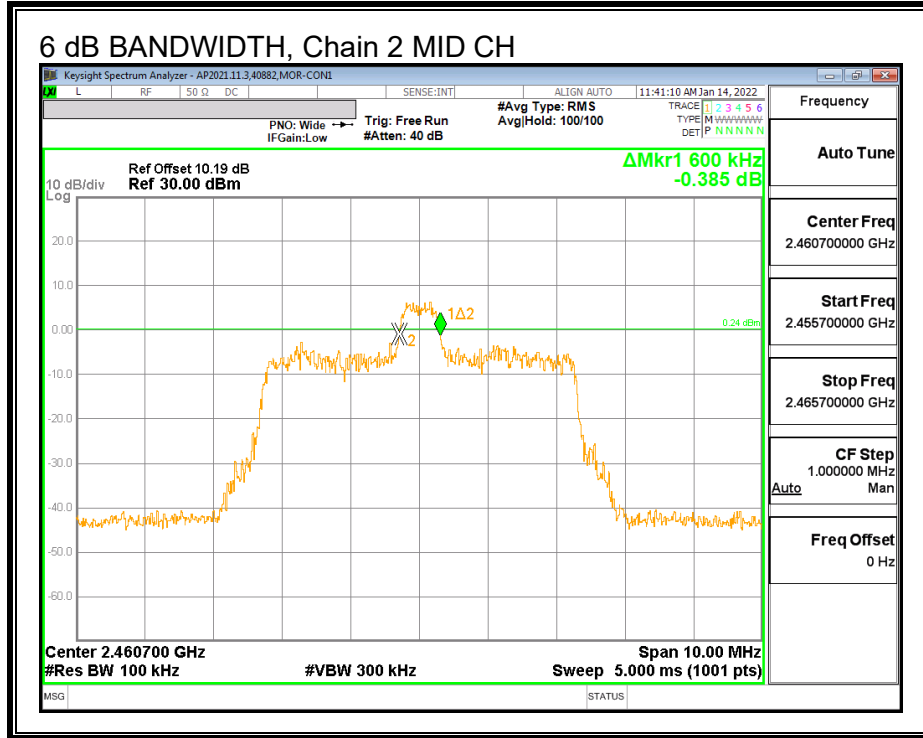
RESULTS - QPSK

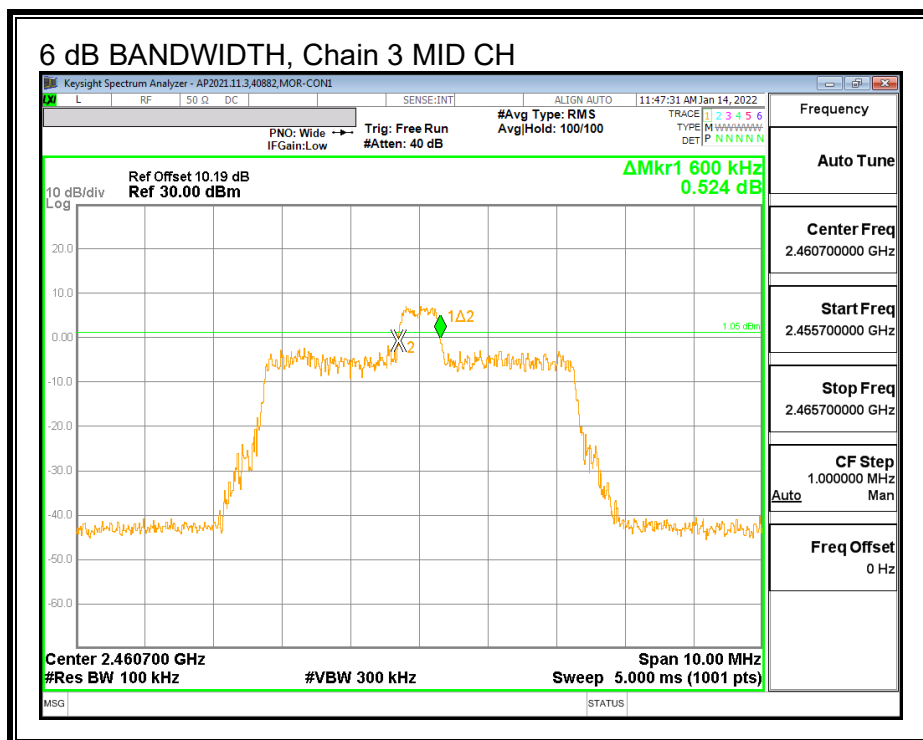
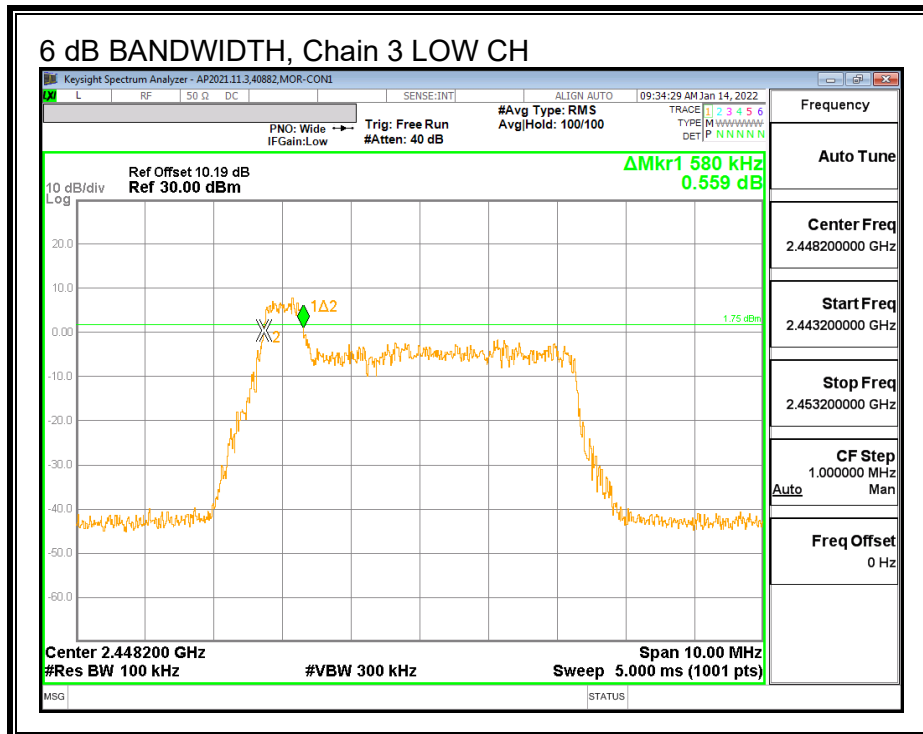
Channel	Frequency (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	6 dB BW Chain 3 (MHz)	6 dB BW Chain 4 (MHz)	Minimum Limit (MHz)
Low	2448.2	0.580	0.600	0.580	4.460	0.5
Mid	2460.7	0.600	0.600	0.600	4.530	0.5
High	2473.2	0.600	0.570	0.580	4.450	0.5

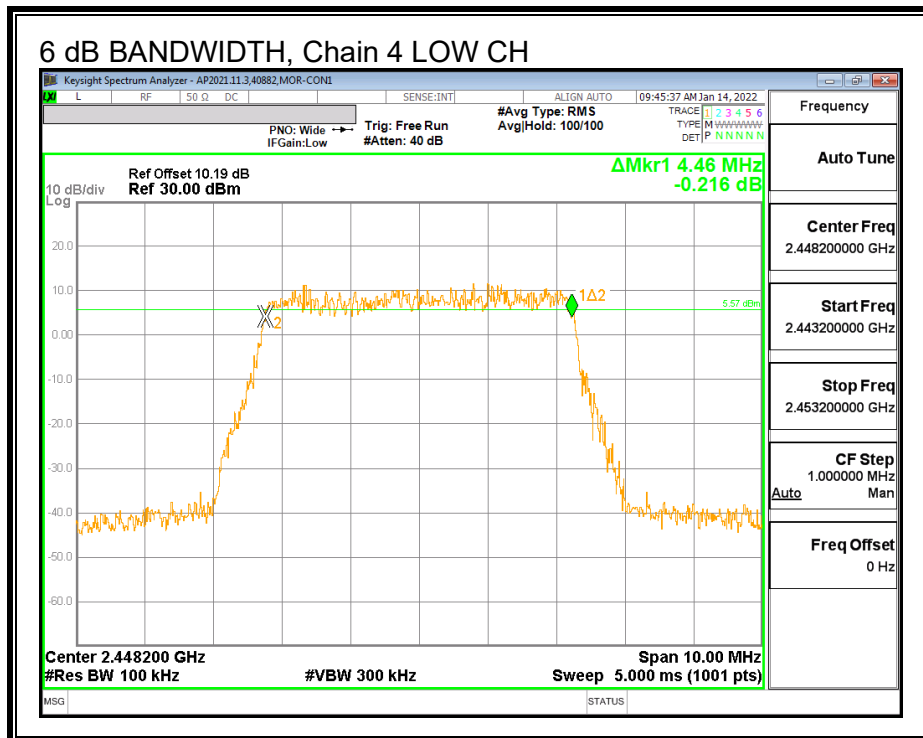
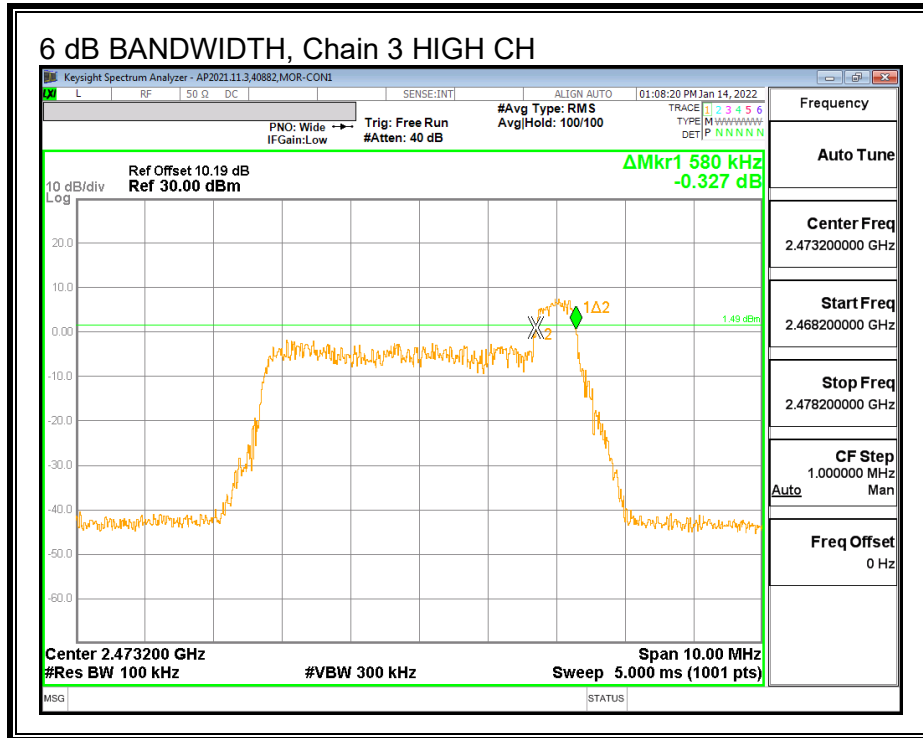
Channel	Frequency (MHz)	6 dB BW Chain 5 (MHz)	6 dB BW Chain 6 (MHz)	6 dB BW Chain 7 (MHz)	6 dB BW Chain 8 (MHz)	Minimum Limit (MHz)
Low	2448.2	4.450	4.540	0.590	4.380	0.5
Mid	2460.7	4.480	4.470	0.580	4.160	0.5
High	2473.2	4.460	4.460	0.560	4.470	0.5

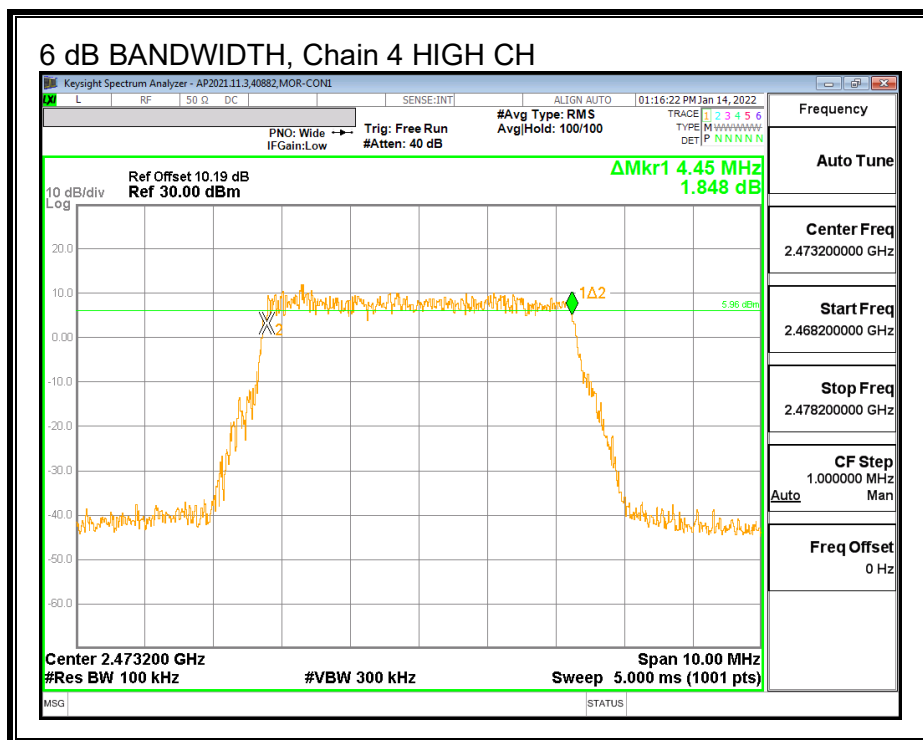
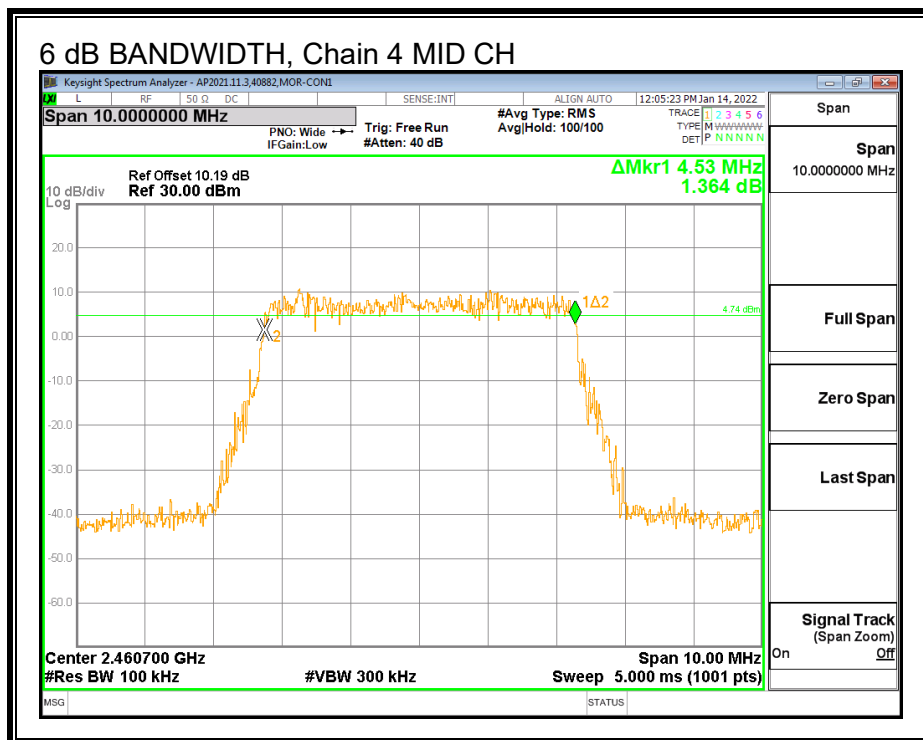


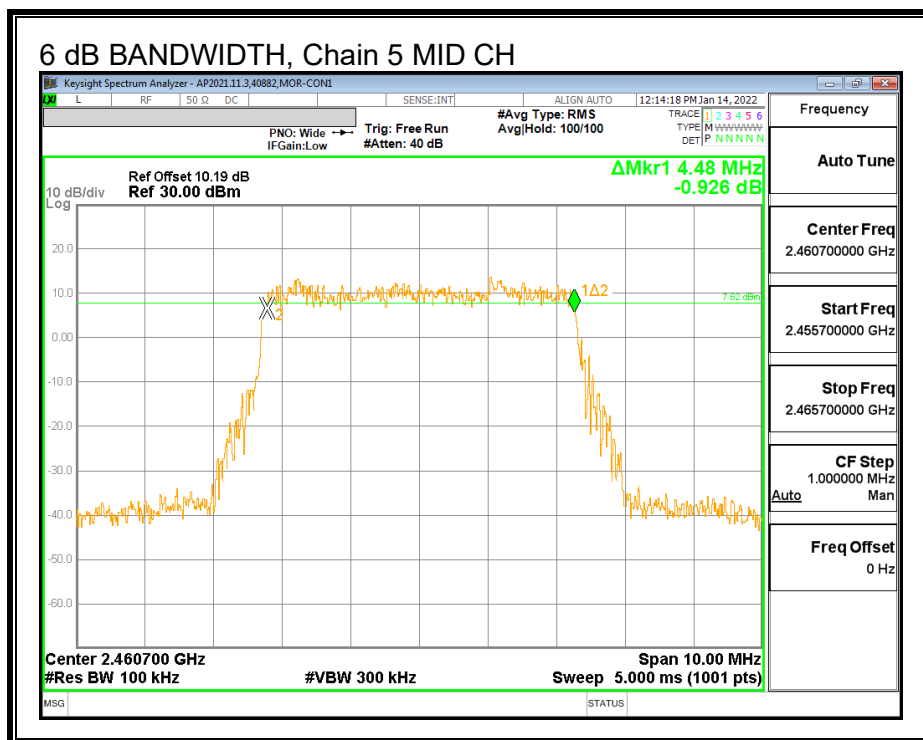
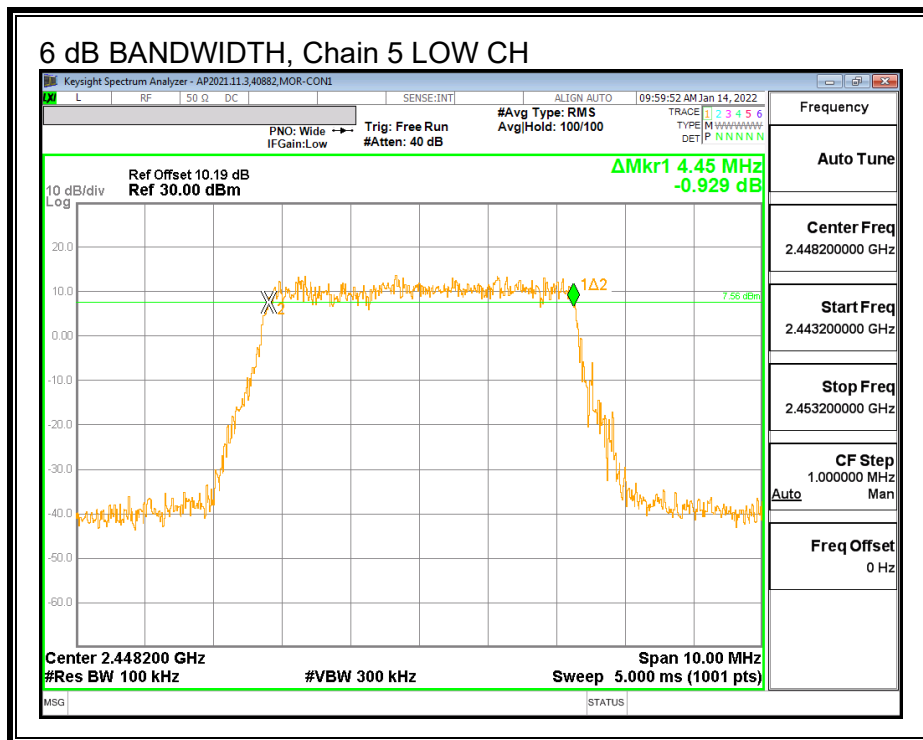


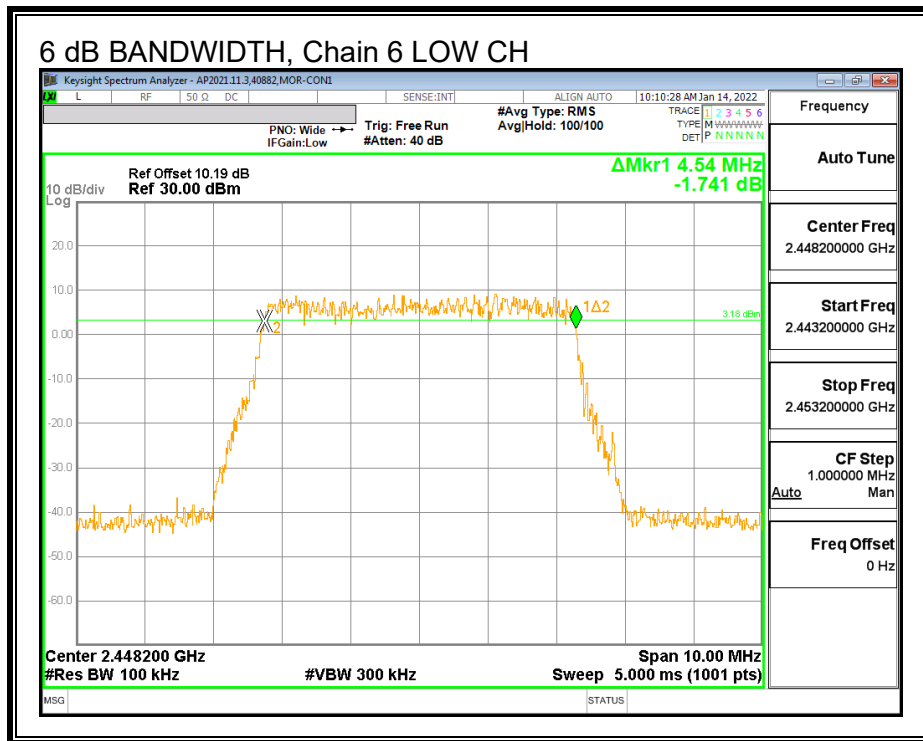
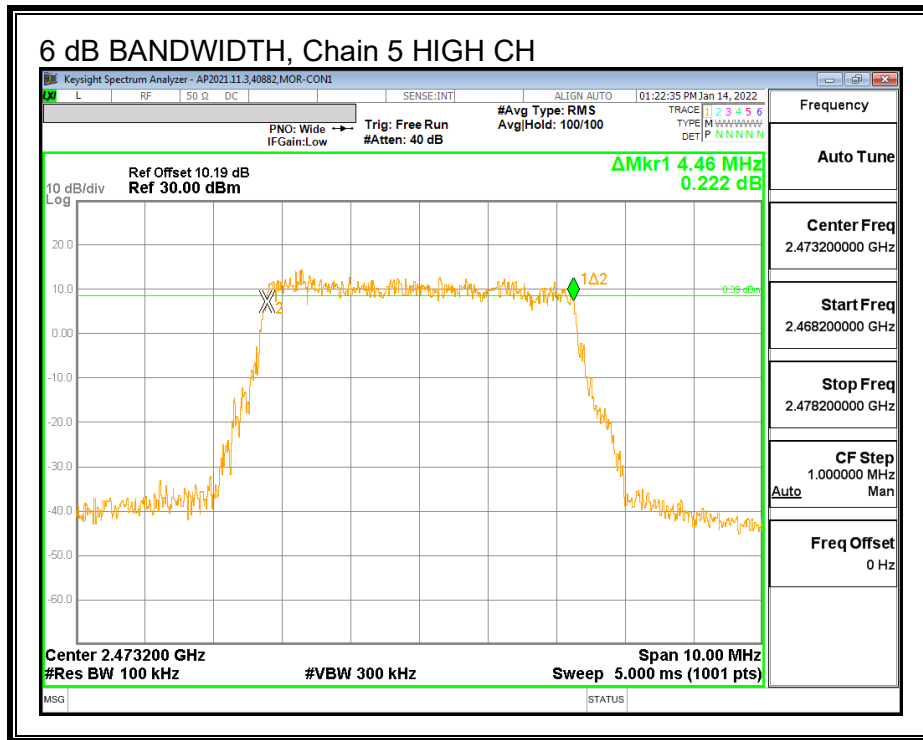


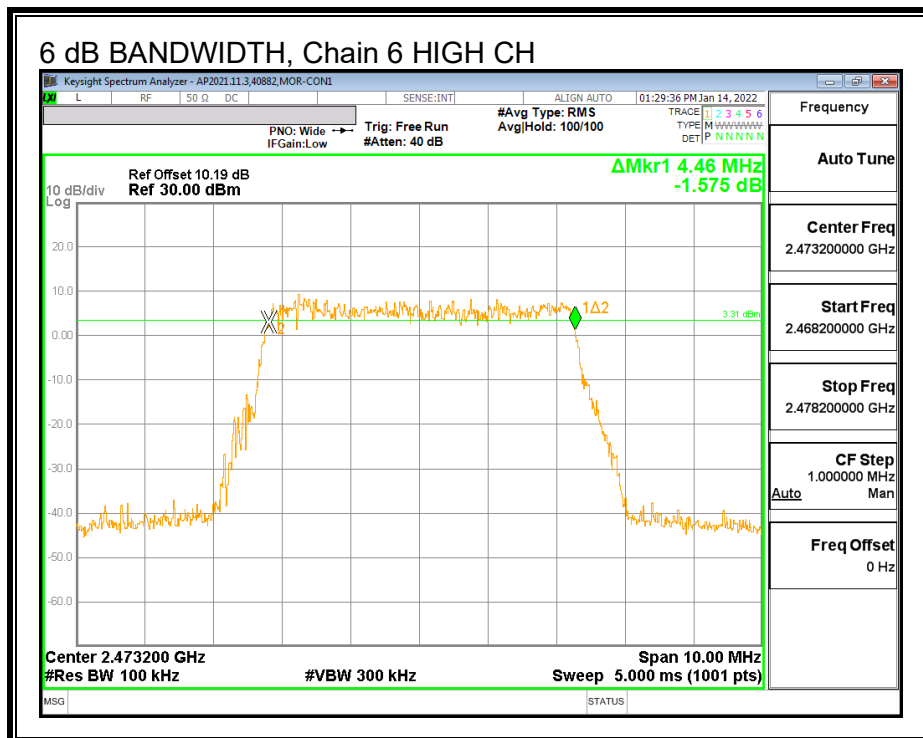
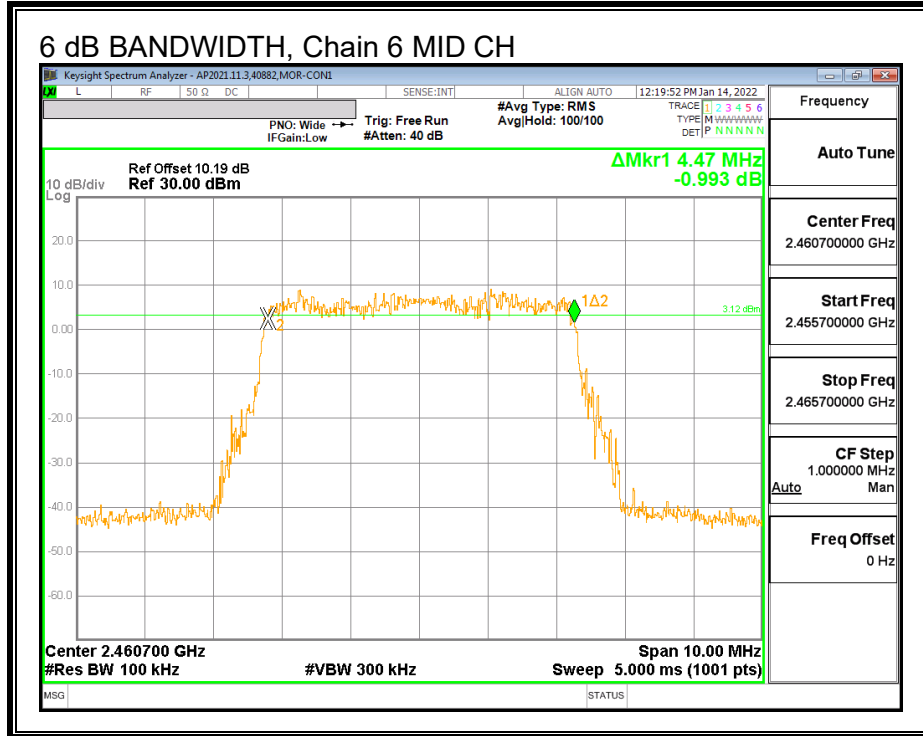


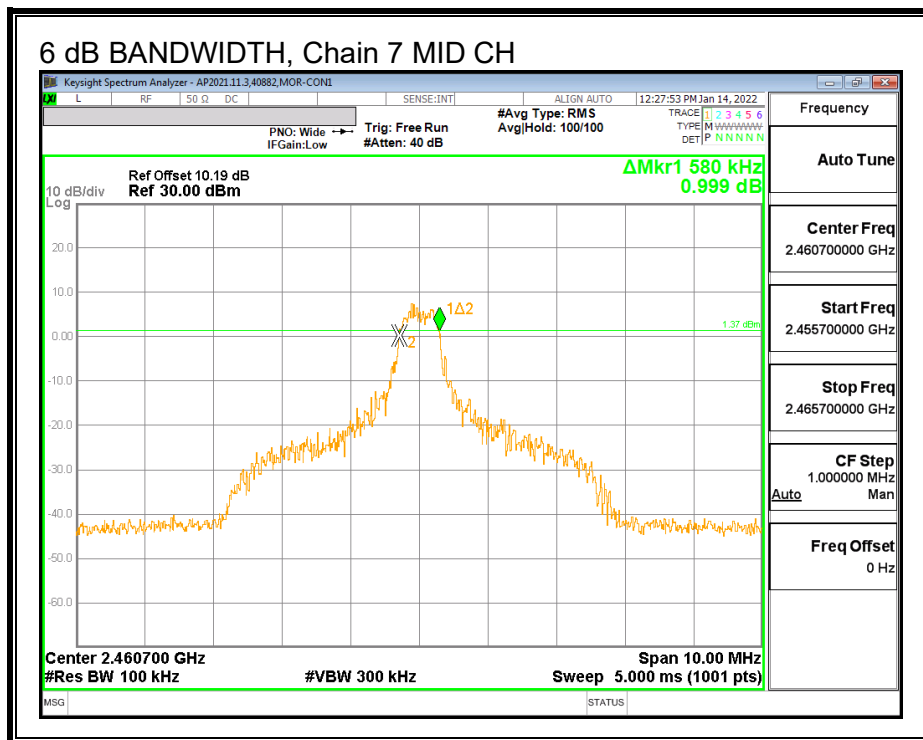
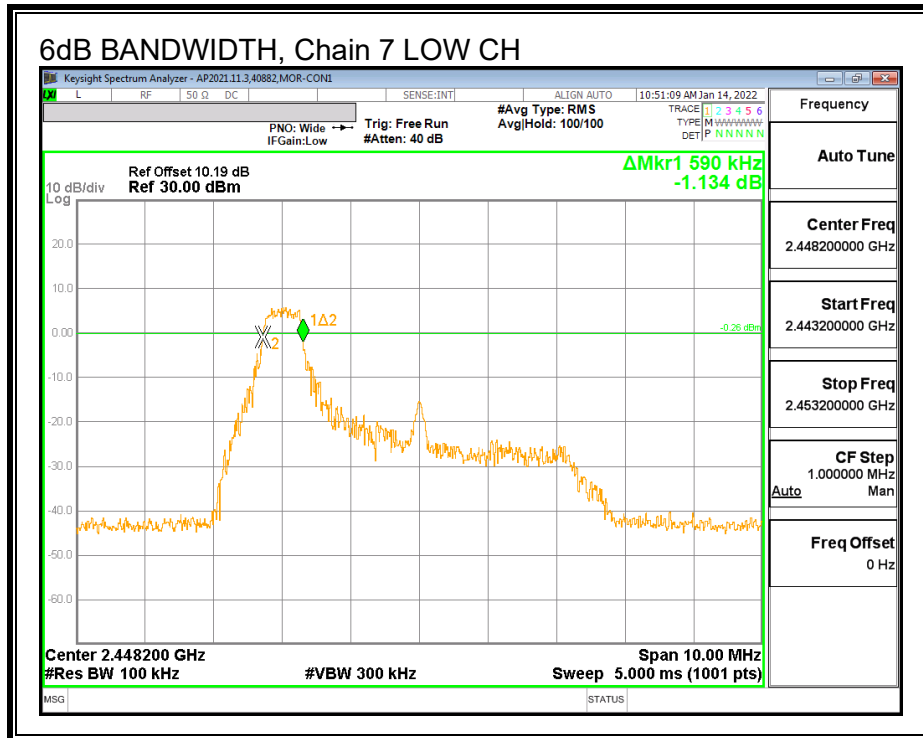


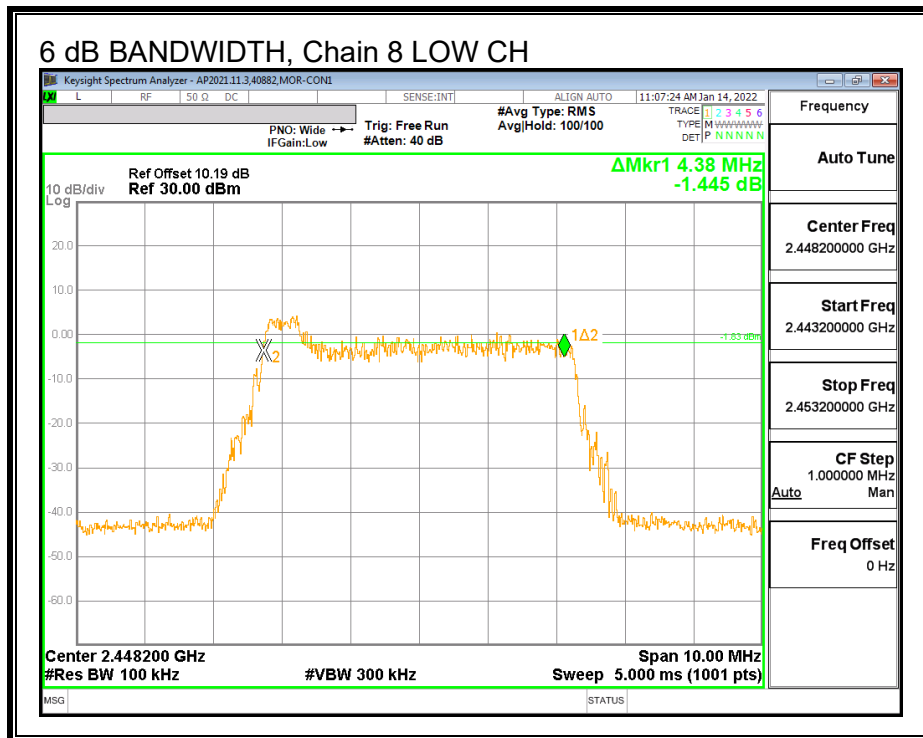
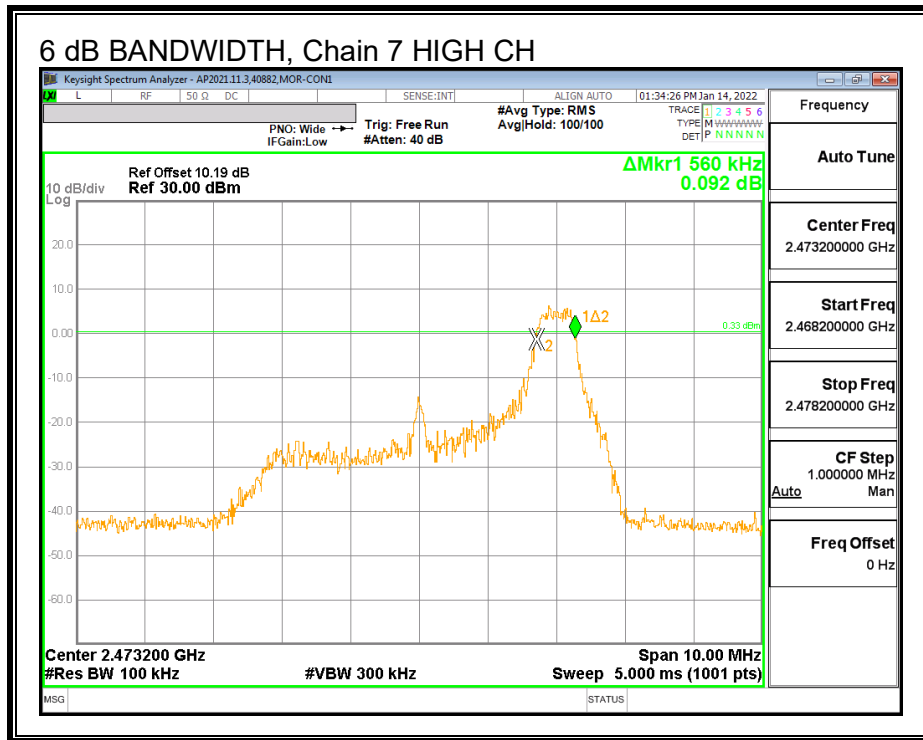


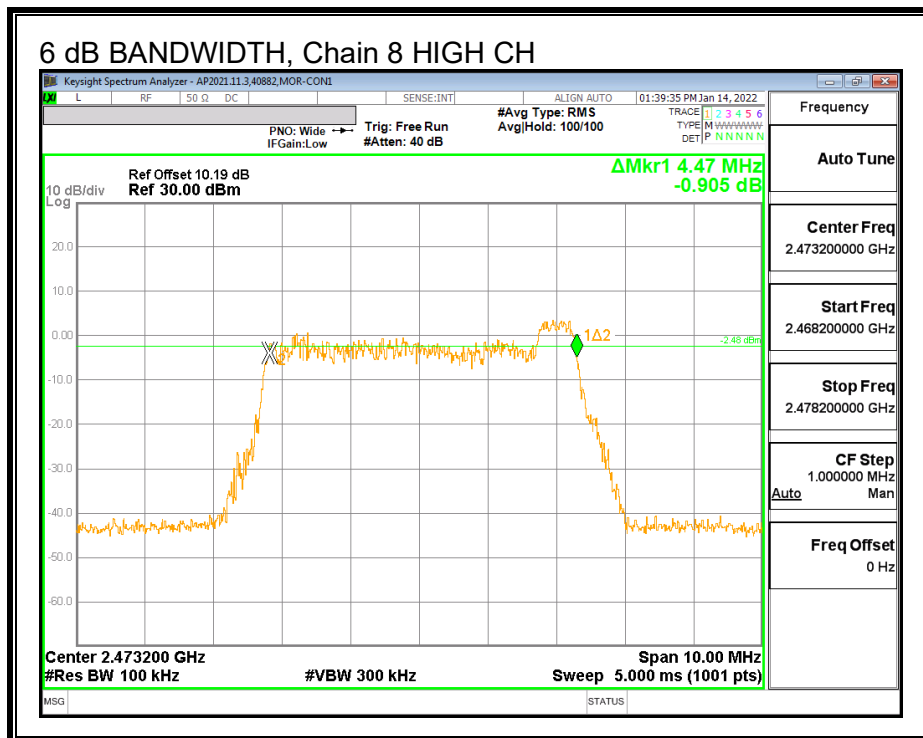
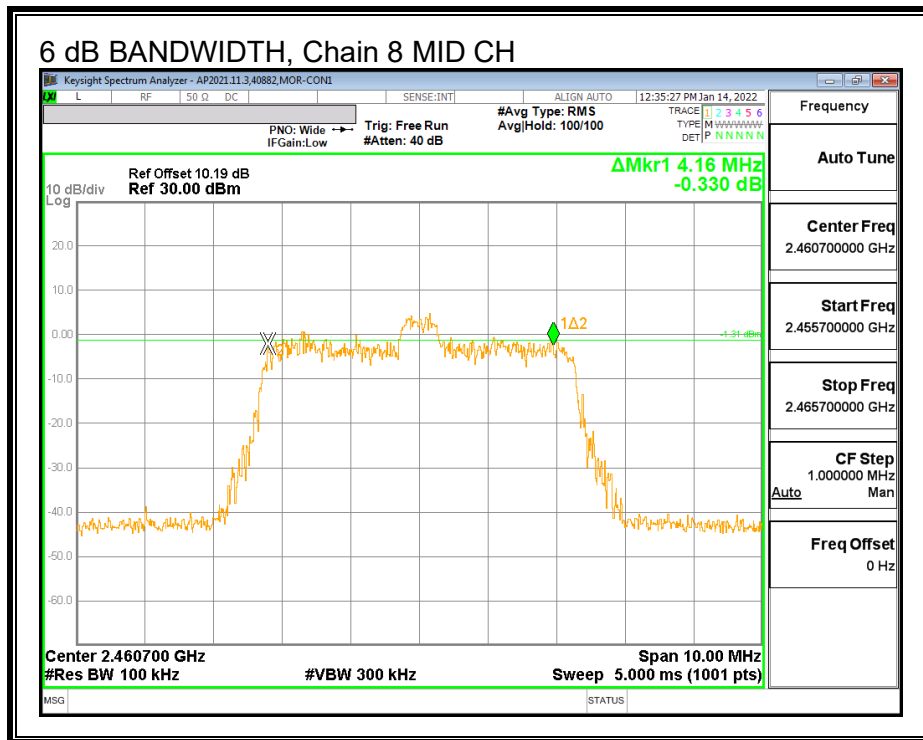












RESULTS – 16-QAM

Channel	Frequency (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	6 dB BW Chain 3 (MHz)	6 dB BW Chain 4 (MHz)	Minimum Limit (MHz)
Low	2448.2	0.580	0.570	0.570	4.490	0.5
Mid	2460.7	0.610	0.580	0.600	4.470	0.5
High	2473.2	0.580	0.560	0.570	4.460	0.5

Channel	Frequency (MHz)	6 dB BW Chain 5 (MHz)	6 dB BW Chain 6 (MHz)	6 dB BW Chain 7 (MHz)	6 dB BW Chain 8 (MHz)	Minimum Limit (MHz)
Low	2448.2	4.520	4.470	0.580	4.460	0.5
Mid	2460.7	4.490	4.500	0.590	4.180	0.5
High	2473.2	4.450	4.490	0.560	4.460	0.5

