TEST REPORT

Report Number: R13513666-E1

Applicant	:	SmartSky Microwave LLC 430 Davis Drive, Suite 350 Morrisville, NC 27560 USA
Model	:	3243299-302
Brand	:	SmartSky Microwave LLC
FCC ID	:	2APND-ATGRR0001
EUT Description	:	2.4GHz Ground-Based Transceiver
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
June 16, 2021

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
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NVLAP TESTING

NVLAP Lab code: 200246-0

REPORT REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
V1	2021-05-14	Initial Release	M. Antola
V2	2021-05-19	Updated power section; misc. editorial updates	M. Antola
V3	2021-06-14	Editorial update to Section 8	M. Antola
V4	2021-06-16	Misc. editorial updates	M. Antola

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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: 1811P0703

SAMPLE RECEIPT DATE: 2021-02-04

DATE TESTED: 2021-02-08 to 2021-05-10

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

Approved & Released For
UL LLC By:

Bob DeLisi
Principal Engineer
UL LLC

Prepared By:

Mike Antola
Staff Engineer
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

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, NC 27560, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

12 Laboratory Dr.	2800 Perimeter Park Dr.
Site Code: 2180C	
☐ Chamber A RTP	☐ North Chamber
☐ Chamber C RTP	☒ South Chamber

The above test sites and facilities are covered under FCC Test Firm Registration # 703469. Chambers above are covered under Industry Canada company address and respective code.

UL LLC (RTP), CABID: 0067, is accredited by NVLAP, Laboratory Code 200246-0

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
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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

5.1. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

CONDUCTED MEASUREMENTS IN RESTRICTED BAND (ANTENNA PORT)

Where relevant, the following sample calculation is provided:
Summing Chains:
Total EIRP (dBm) = [10* LOG ($P_{CHAIN\ 0}$ (W) + $P_{CHAIN\ 1}$ (W) + … + $P_{CHAIN\ N}$ (W))] + Array Gain (dBi)
Total EIRP (dBm) = [10 * LOG (23.4uW+22.7uW+19.36uW+7.52uW+8.09uW+10.47uW+24.95uW+19.5uW)] + 26.8 dBi
Total EIRP (dBm) = -41.865 dBm
Equivalent Electric Field Strength (dBuV) = EIRP (dBm) – 20*LOG(d) + 104.8, where ‘d’ is the specified measurement distance in meter
-53.43 dBm – 20*LOG(3) + 104.8 = 41.83 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	23.46	221.82
2450.7 - 2470.7	9 MHz	23.6	229.09

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). All testing was performed in both Single RB (i.e. 3RB) and Full RB (i.e. FRB) configurations. Power testing was performed in all modulations and bandwidth configurations. It was determined that 16-QAM was the worse-case of 16-QAM / 64-QAM, thus all additional testing was performed only in this modulation. All additional testing also performed in QPSK modulation. Radiated testing below 1GHz and above 18GHz, along with AC line conducted testing, were performed only at the worse-case channel. All other testing was performed at low/mid/high channels.

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	Agilent	83640B	3844A00978	NA
Test Box	Tektelic	T0003914	2049K0005	NA
DC Power Supply	Agilent Technologies	N5747A	US 09A0988H	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.

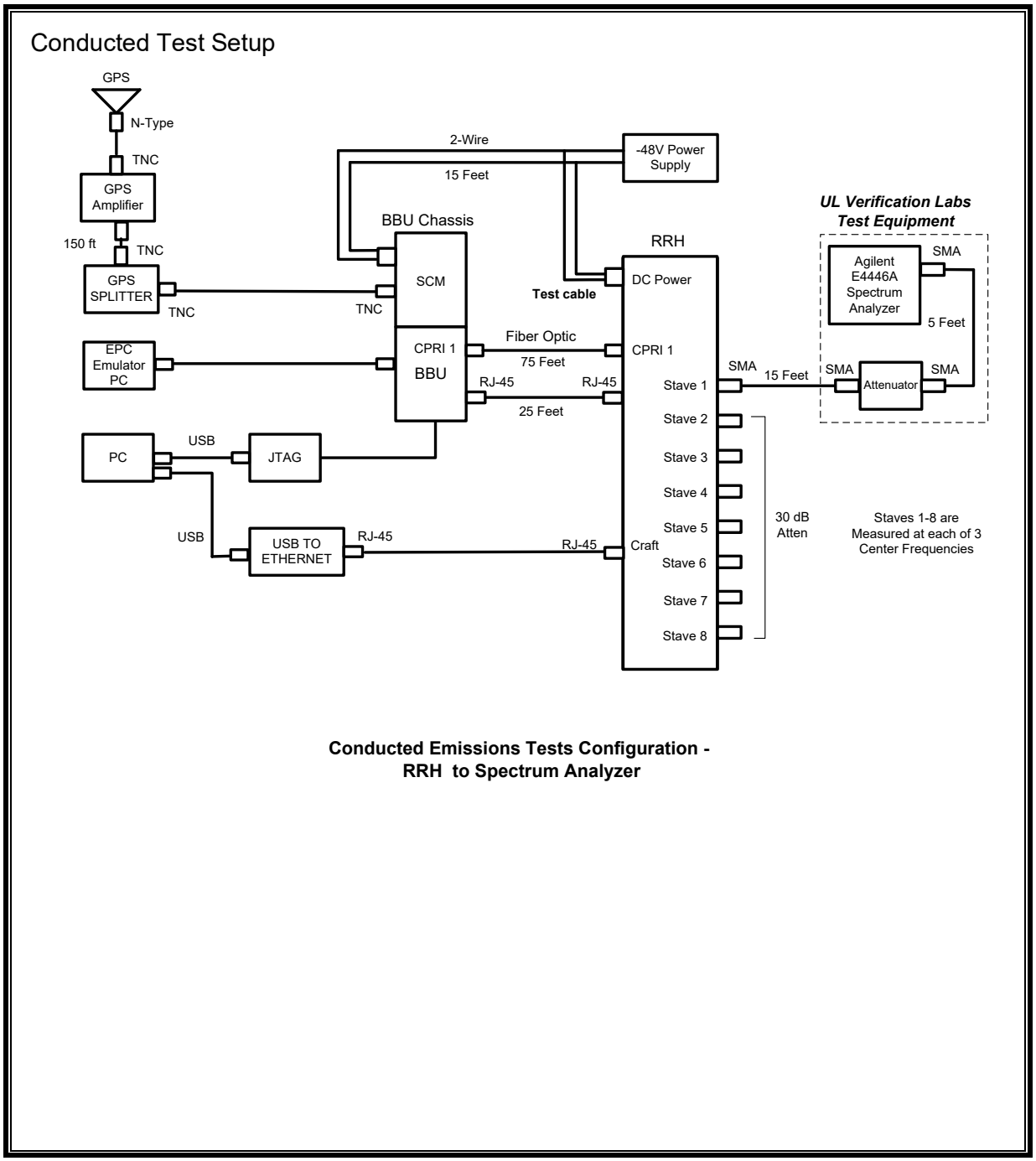
Radiated Test Setup

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

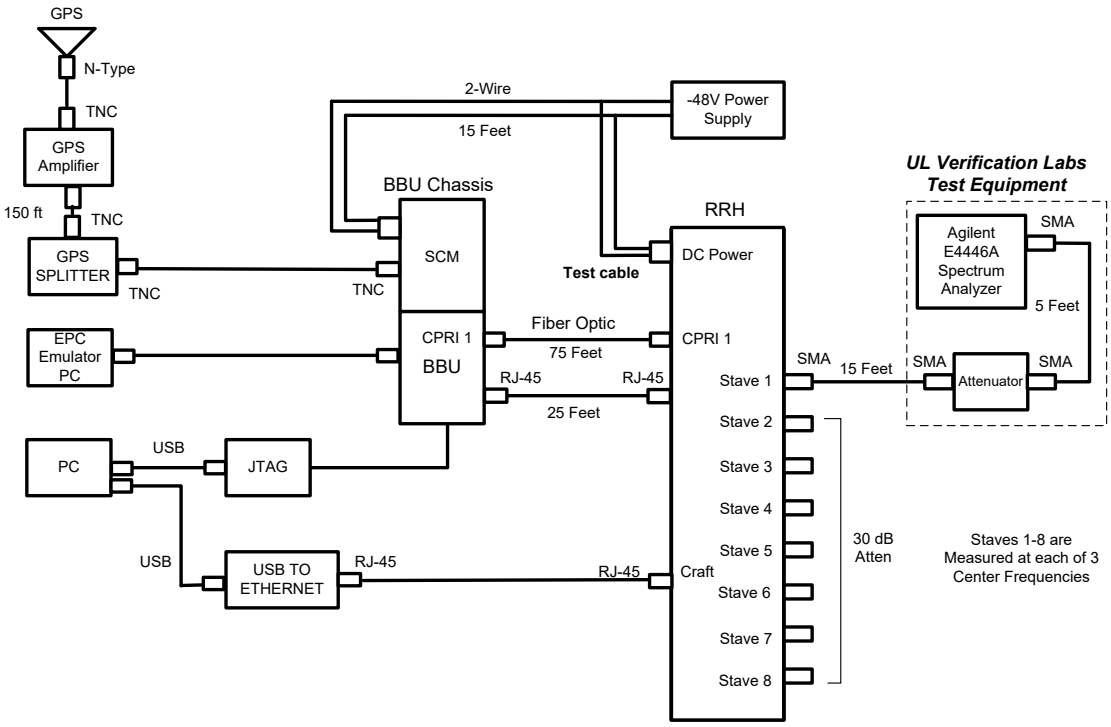
The Ground system was setup to emulate the installed system in the field. The BBU was connected to the RRH and an internet connection (EPC). A GPS antenna was connected to the BBU chassis (SCM). The line conducted emissions were tested on the power lines that fed the Ground system.

SETUP DIAGRAM FOR TESTS

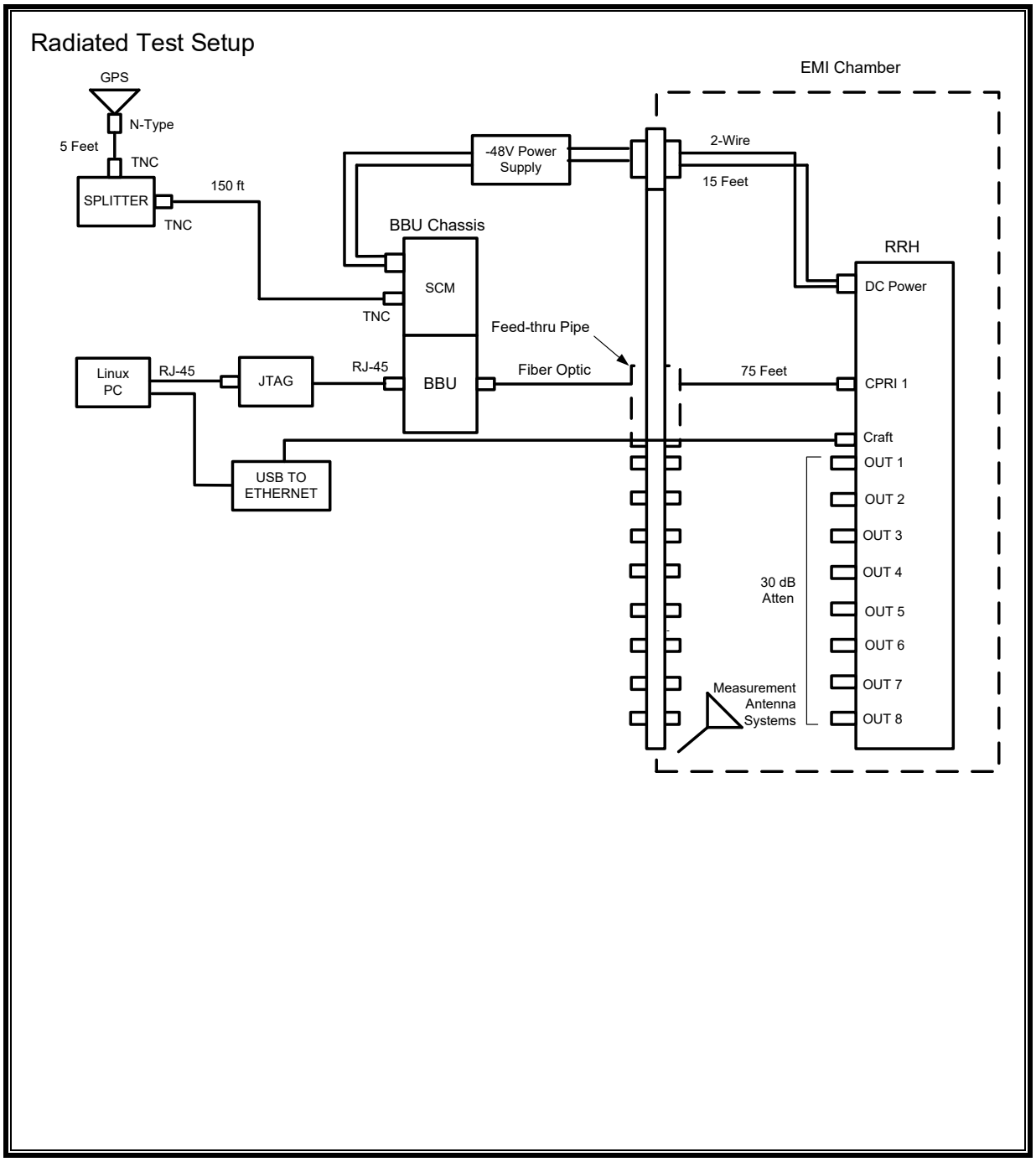


Conducted Emissions Tests Configuration - RRH to Spectrum Analyzer

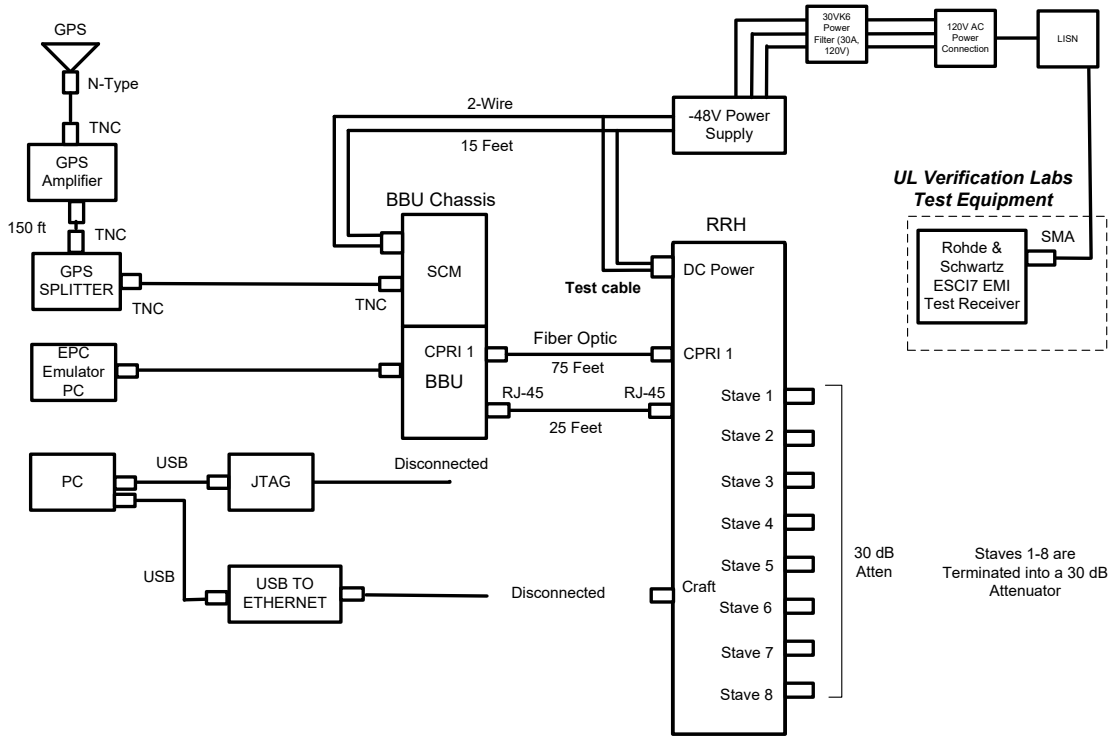
Restricted Band Spurious Emissions (Measured Conducted)



Conducted Emissions Tests Configuration - RRH to Spectrum Analyzer



Line Conducted Emissions



Power Line Conducted Emissions Tests Configuration - Power Connection to Spectrum Analyzer

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 – Antenna Port – RF Conducted (Morrisville – Conducted 1/2)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0027	Spectrum Analyzer	Keysight	N9030A	2020-06-10	2021-06-10
206459	Spectrum Analyzer	Rohde & Schwarz	FSW 50	2021-03-15	2022-03-15
75141	EMI Test Receiver	Rohde & Schwarz	ESCI 7	2020-08-18	2021-08-18
PWM001	Power Meter	Keysight	N1912A	2020-07-17	2021-07-17
PWM005	Power Meter	Keysight	N1912A	2020-07-14	2021-07-14
PWS001	Power Sensor	Keysight	N1921A	2020-05-27	2021-05-27
PWS006	Power Sensor	Keysight	N1921A	2020-11-25	2021-11-25
PWS005	Power Sensor	Keysight	N1921A	2020-05-26	2021-05-26
PWS002	Power Sensor	Keysight	N1921A	2020-09-10	2021-09-10
BRF015	2.4GHz Band-Reject Filter	Micro-Tronics	G043	2021-04-23	2022-04-23
HPF010	3GHz High Pass Filter	Micro-Tronics	HPM17543	2021-02-16	2022-02-16
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
SOFTEMI	EMI Software	UL	Version 9.5 2021.03.04		
EMISoftware	Antenna Port Software	UL LLC	AP Version 2021.02.02		
EMISoftware	Antenna Port Software	UL LLC	AP Version 2021.02.16		

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2020-03-26	2021-03-26
HI0091	Environmental Meter	Fisher Scientific	14-650-118	2020-06-26	2021-06-26
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2020-08-18	2021-08-18
75141	EMI Test Receiver	Rohde & Schwarz	ESCI 7	2020-08-18	2021-08-18
ATA222	Transient Limiter	Electro-Metrics	EM-7600	2020-03-26	2021-03-26
PS214	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 2021.03.04		
LISN008	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	2020-08-08	2021-08-08

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2020-08-20	2021-08-20
	30-1000 MHz				
AT0075	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-10-27	2021-10-27
	1-18 GHz				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-28	2021-04-28
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-10	2021-07-10
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-10	2021-07-10
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-06	2021-07-06
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-07	2021-07-07
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2020-03-27	2021-03-27
SA0025	Spectrum Analyzer	Agilent	N9030A	2020-03-17	2021-03-17
SOFTEMI	EMI Software	UL	Version 9.5 2020.08.18		
	Additional Equipment used				
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2020-08-06	2021-08-06

8. MEASUREMENT METHODS

Duty Cycle: ANSI C63.10 Subclause -11.6

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW ≥ 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.

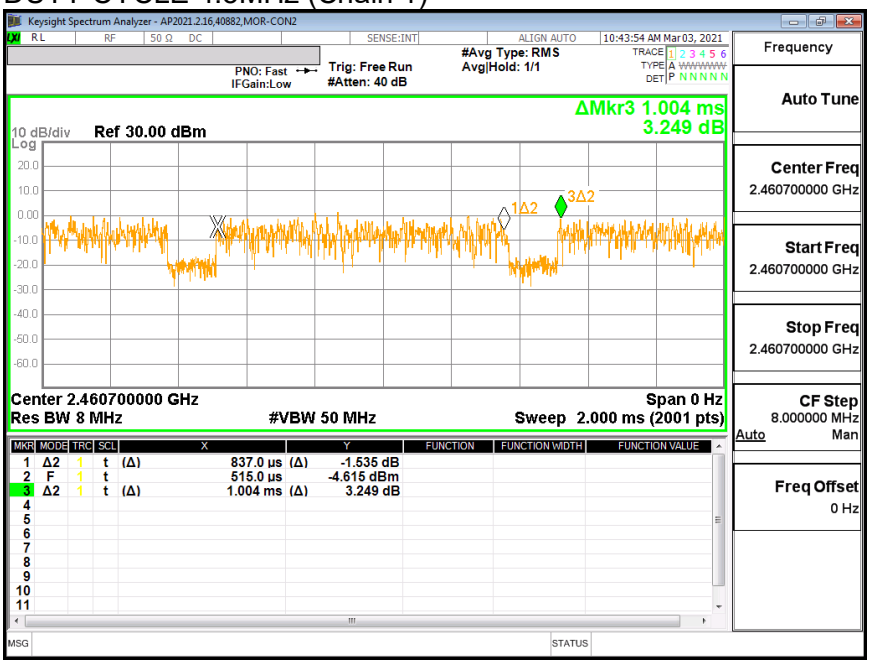
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS – QPSK

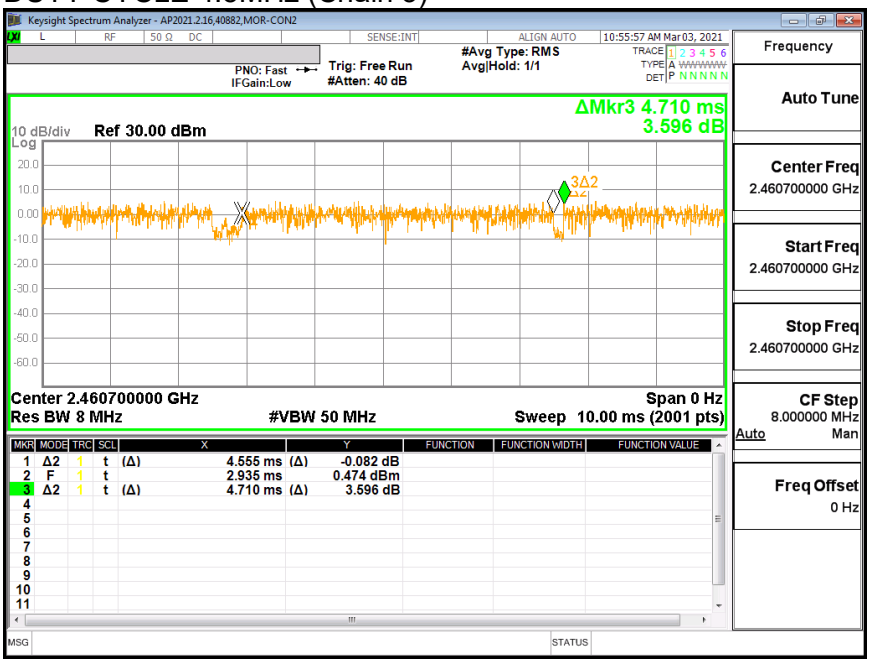
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band (4.5MHz)						
Chain 1	0.837	1.004	0.834	83.37%	1.58	1.195
Chain 2	4.790	5.245	0.913	91.33%	0.79	0.209
Chain 3	4.555	4.710	0.967	96.71%	0.29	0.220
Chain 4	0.068	0.215	0.315	31.47%	10.04	14.815
Chain 5	0.069	0.215	0.324	32.38%	9.80	14.393
Chain 6	0.070	0.212	0.331	33.05%	9.62	14.286
Chain 7	0.854	1.000	0.854	85.40%	1.37	1.171
Chain 8	0.141	1.004	0.141	14.05%	17.04	7.087
2.4GHz Band (9MHz)						
Chain 1	0.856	1.003	0.853	85.34%	1.38	1.168
Chain 2	0.173	0.995	0.174	17.42%	15.18	5.770
Chain 3	0.121	0.988	0.123	12.26%	18.23	8.258
Chain 4	0.068	0.285	0.239	23.91%	12.43	14.652
Chain 5	0.068	0.214	0.319	31.85%	9.94	14.684
Chain 6	0.069	0.230	0.300	29.97%	10.47	14.524
Chain 7	0.843	0.997	0.846	84.59%	1.45	1.186
Chain 8	0.140	1.002	0.140	13.97%	17.09	7.143

DUTY CYCLE 4.5MHz (Chain 1)

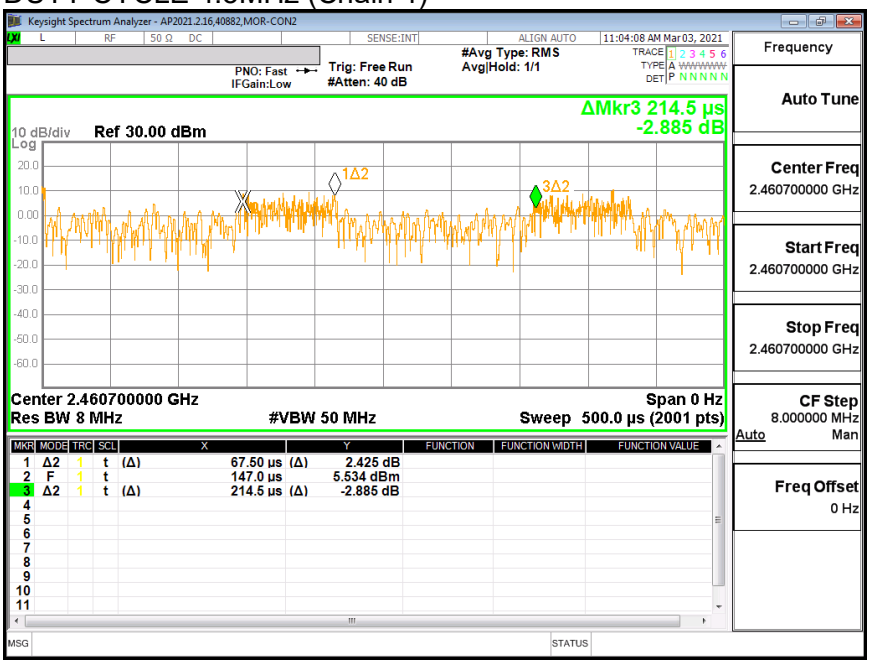


DUTY CYCLE 4.5MHz (Chain 2)

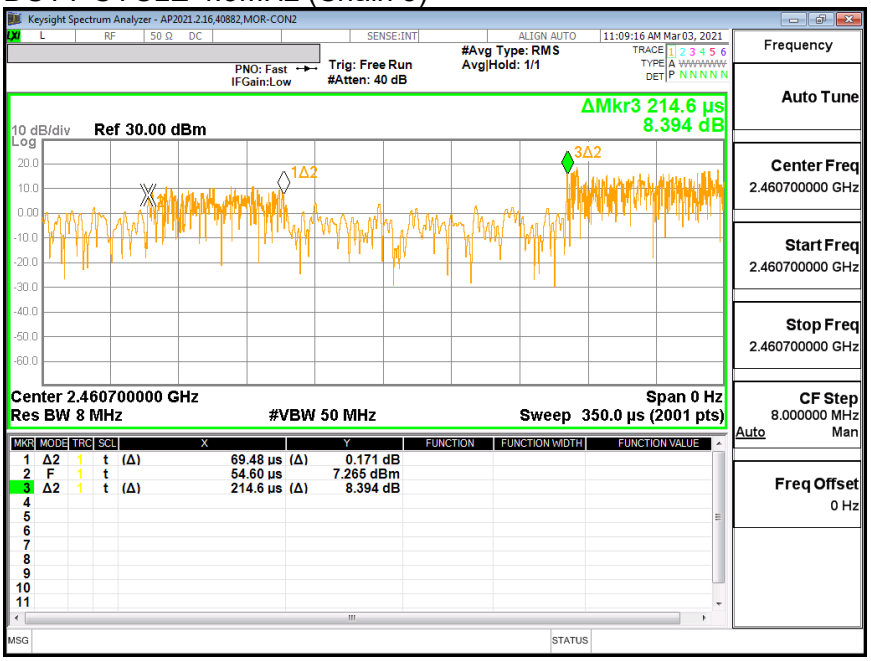
DUTY CYCLE 4.5MHz (Chain 3)



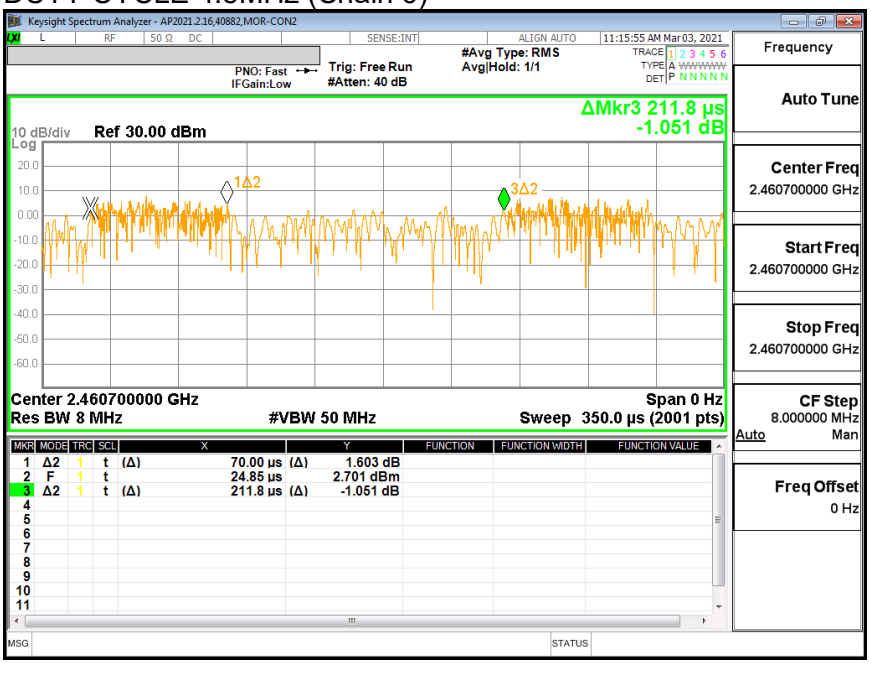
DUTY CYCLE 4.5MHz (Chain 4)



DUTY CYCLE 4.5MHz (Chain 5)

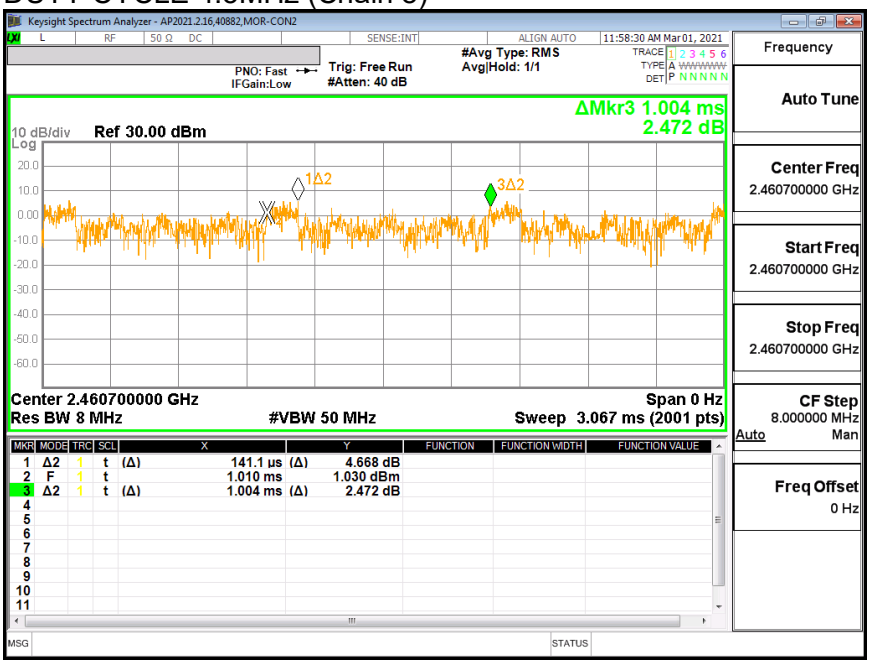


DUTY CYCLE 4.5MHz (Chain 6)



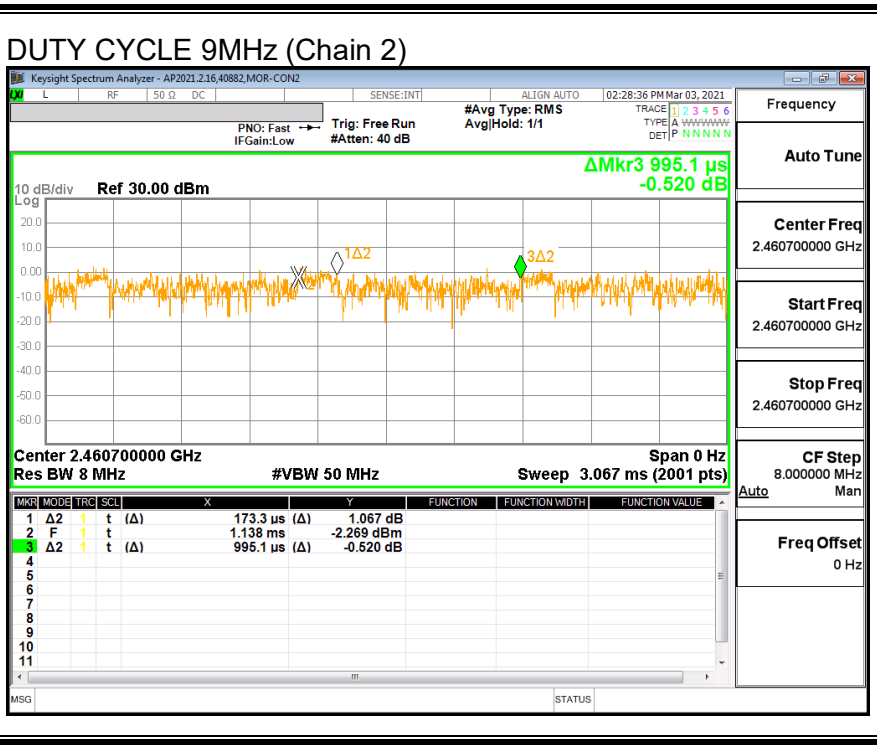
DUTY CYCLE 4.5MHz (Chain 7)

DUTY CYCLE 4.5MHz (Chain 8)

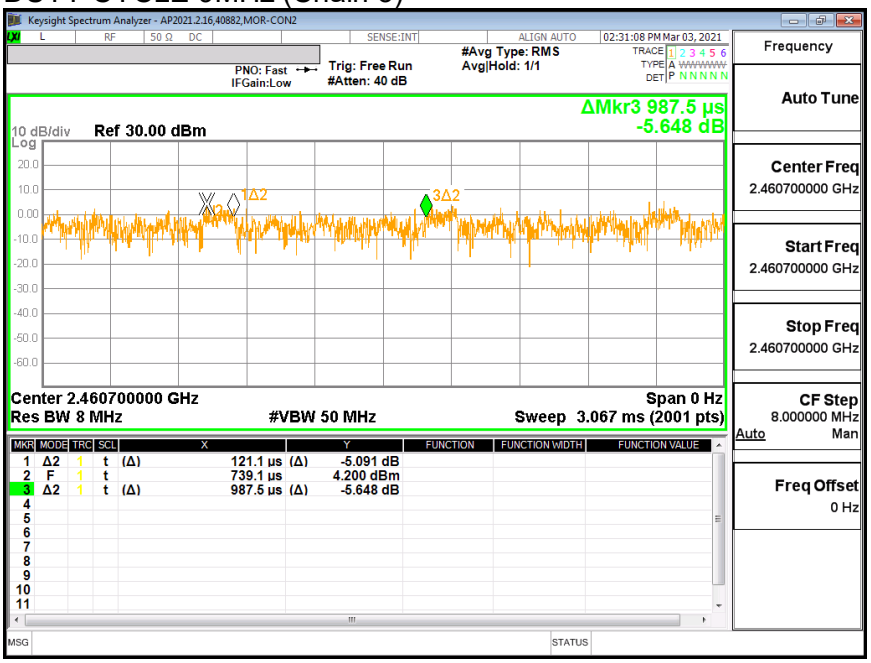


DUTY CYCLE 9MHz (Chain 1)

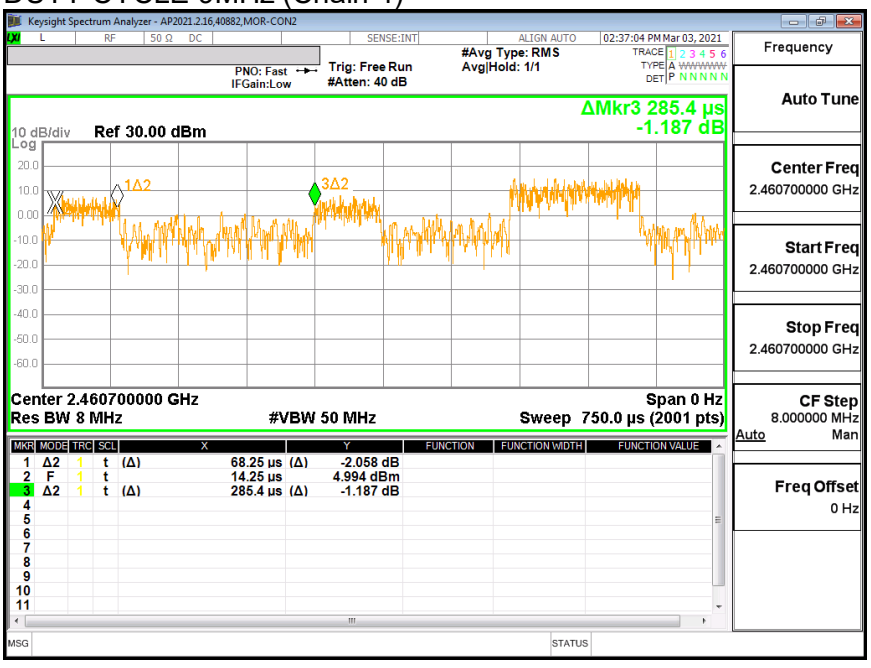
DUTY CYCLE 9MHz (Chain 2)



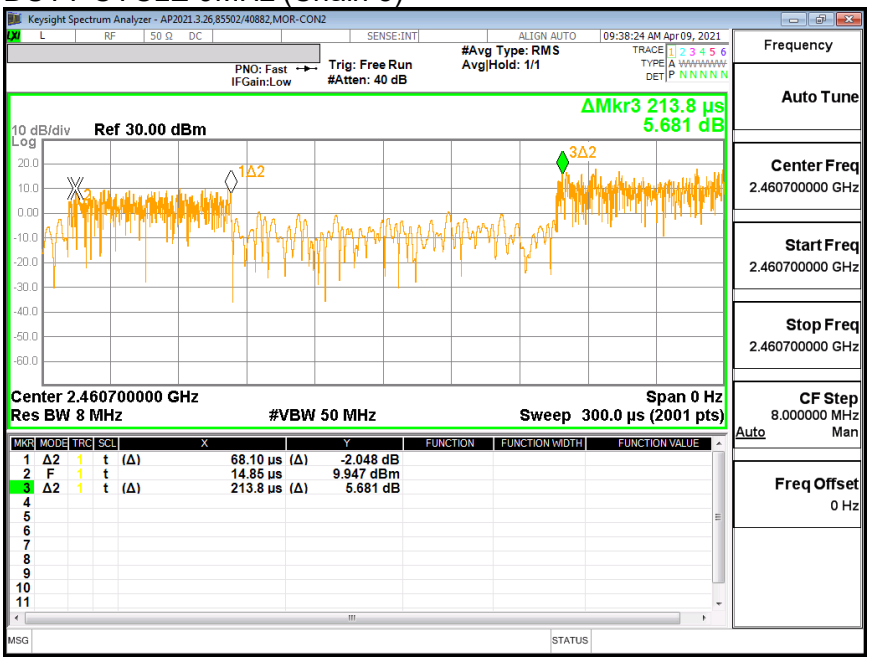
DUTY CYCLE 9MHz (Chain 3)



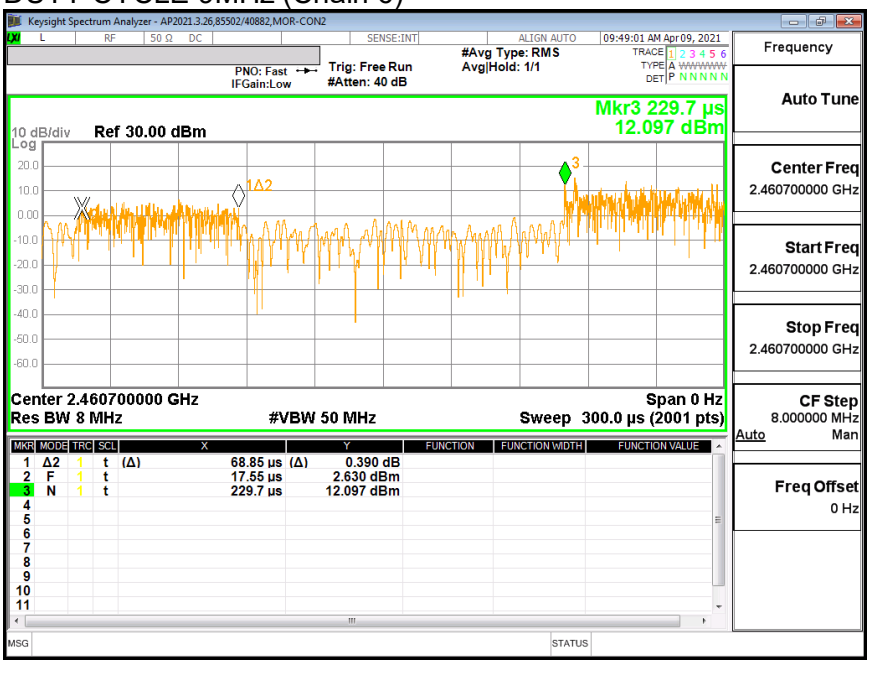
DUTY CYCLE 9MHz (Chain 4)



DUTY CYCLE 9MHz (Chain 5)

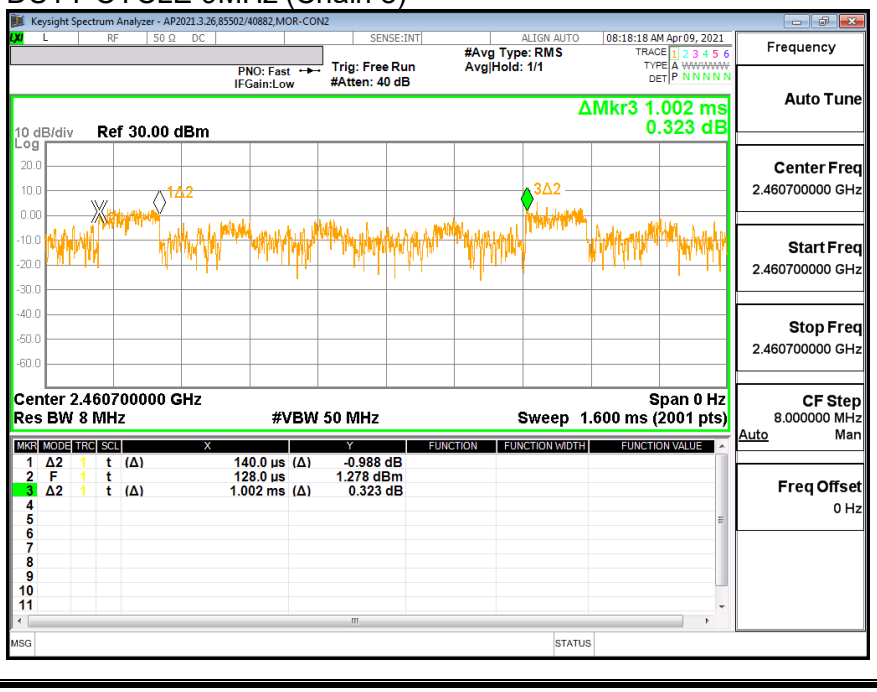


DUTY CYCLE 9MHz (Chain 6)



DUTY CYCLE 9MHz (Chain 7)

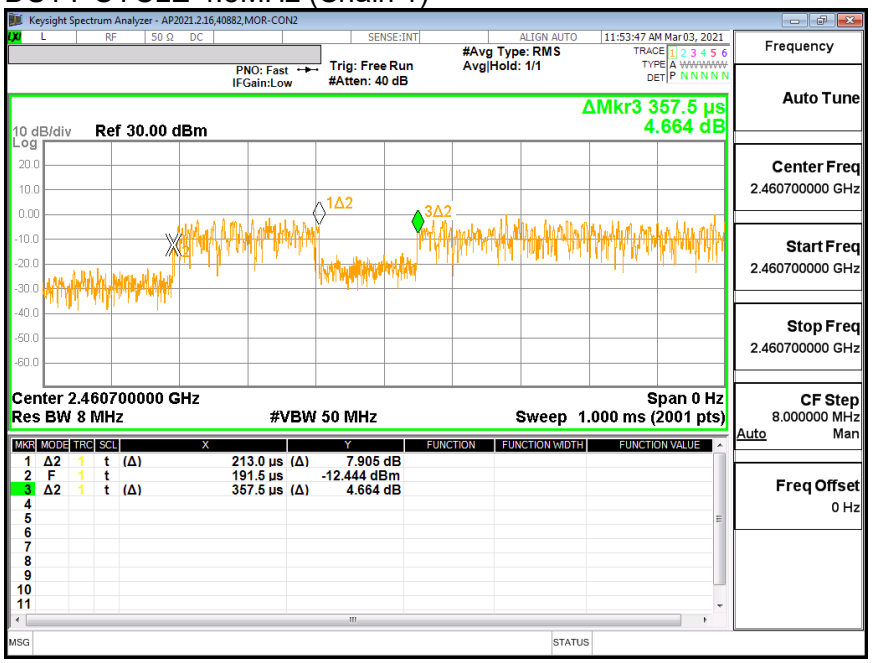
DUTY CYCLE 9MHz (Chain 8)



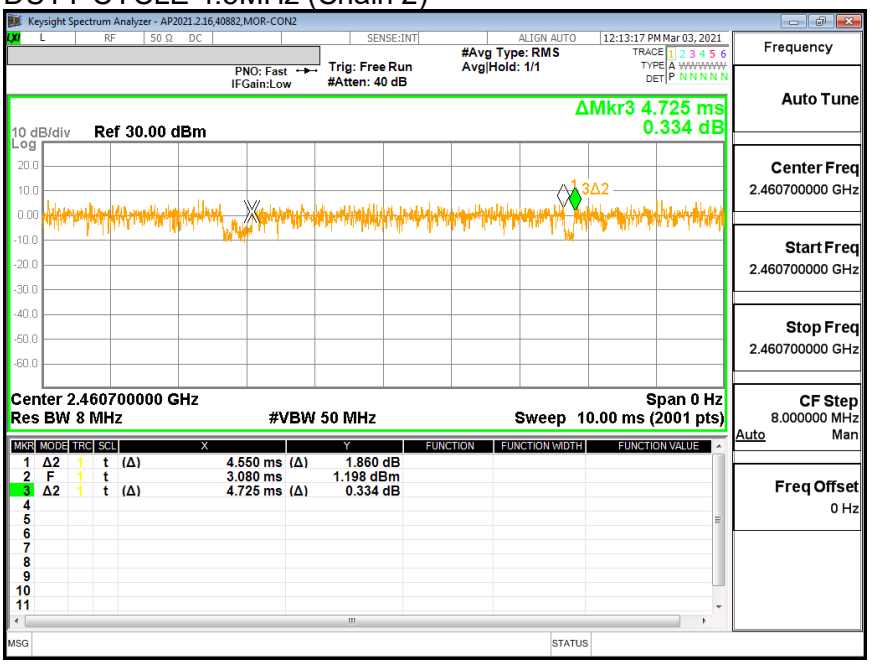
ON TIME AND DUTY CYCLE RESULTS – 16-QAM

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	0.213	0.358	0.595	59.50%	4.51	4.695
Chain 2	4.550	4.725	0.963	96.30%	0.33	0.220
Chain 3	4.540	4.720	0.962	96.19%	0.34	0.220
Chain 4	0.072	0.214	0.336	33.64%	9.46	13.889
Chain 5	0.067	0.287	0.233	23.34%	12.64	14.925
Chain 6	0.076	0.219	0.347	34.70%	9.19	13.158
Chain 7	0.214	0.359	0.596	59.61%	4.49	4.673
Chain 8	0.130	0.998	0.130	13.03%	17.70	7.692
2.4GHz Band (9MHz)						
Chain 1	0.851	1.000	0.851	85.10%	1.40	1.175
Chain 2	0.143	0.510	0.280	28.04%	11.04	6.993
Chain 3	4.825	5.310	0.909	90.87%	0.83	0.207
Chain 4	0.068	0.213	0.319	31.90%	9.92	14.717
Chain 5	0.071	0.218	0.326	32.57%	9.74	14.085
Chain 6	0.067	0.214	0.313	31.31%	10.09	14.925
Chain 7	0.847	1.001	0.846	84.62%	1.45	1.181
Chain 8	0.074	0.220	0.336	33.64%	9.46	13.514

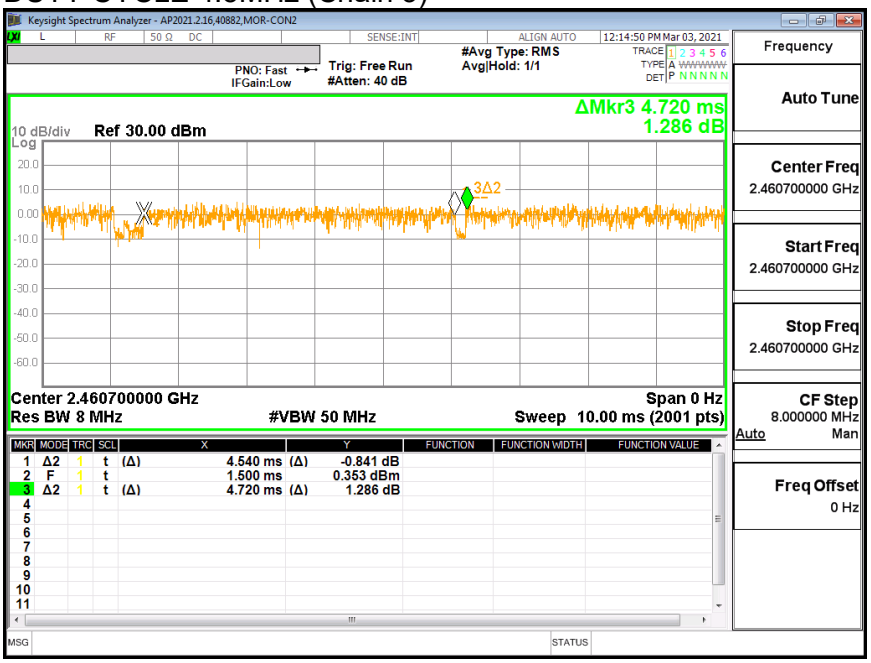
DUTY CYCLE 4.5MHz (Chain 1)



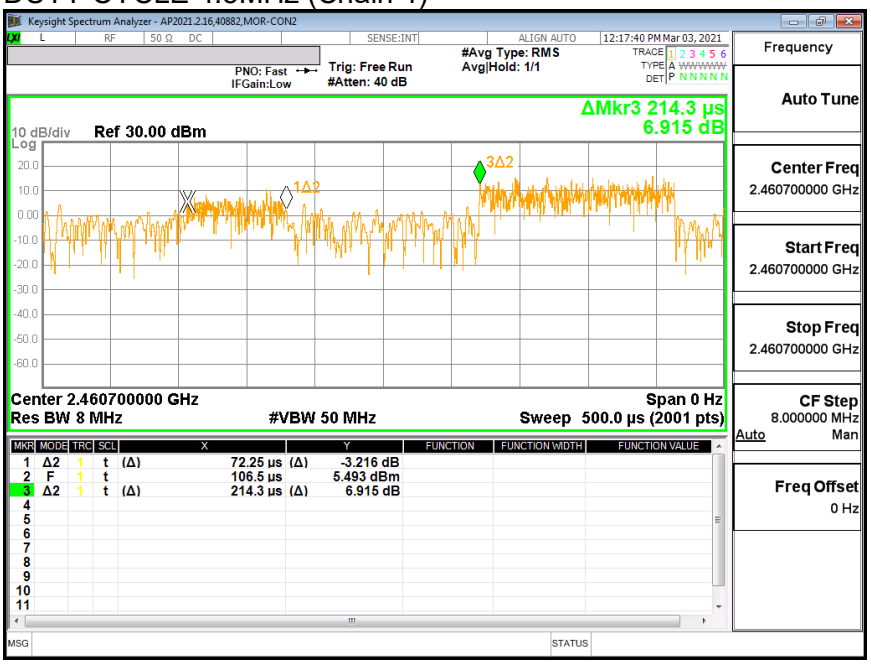
DUTY CYCLE 4.5MHz (Chain 2)



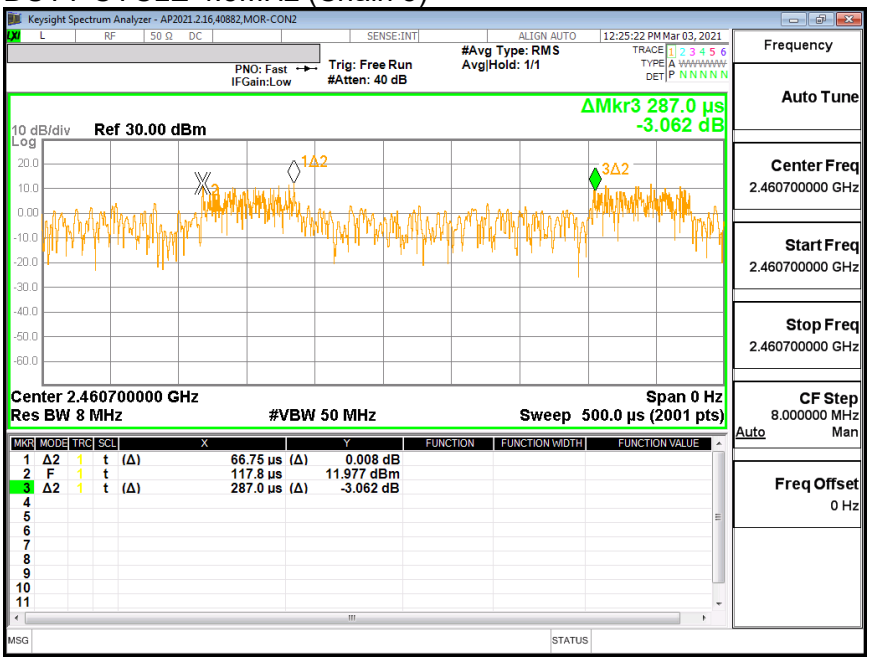
DUTY CYCLE 4.5MHz (Chain 3)



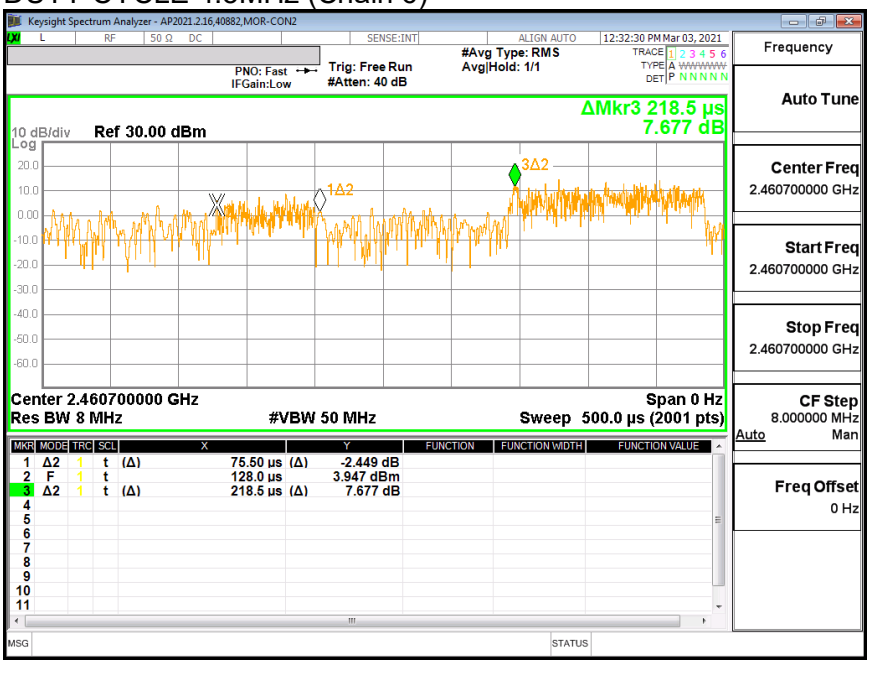
DUTY CYCLE 4.5MHz (Chain 4)



DUTY CYCLE 4.5MHz (Chain 5)



DUTY CYCLE 4.5MHz (Chain 6)

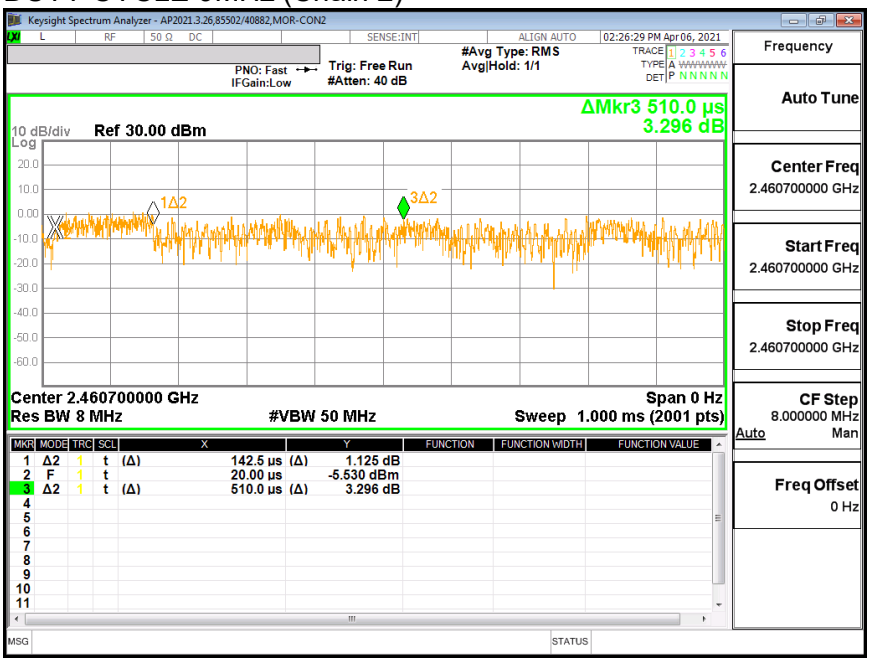


DUTY CYCLE 4.5MHz (Chain 7)

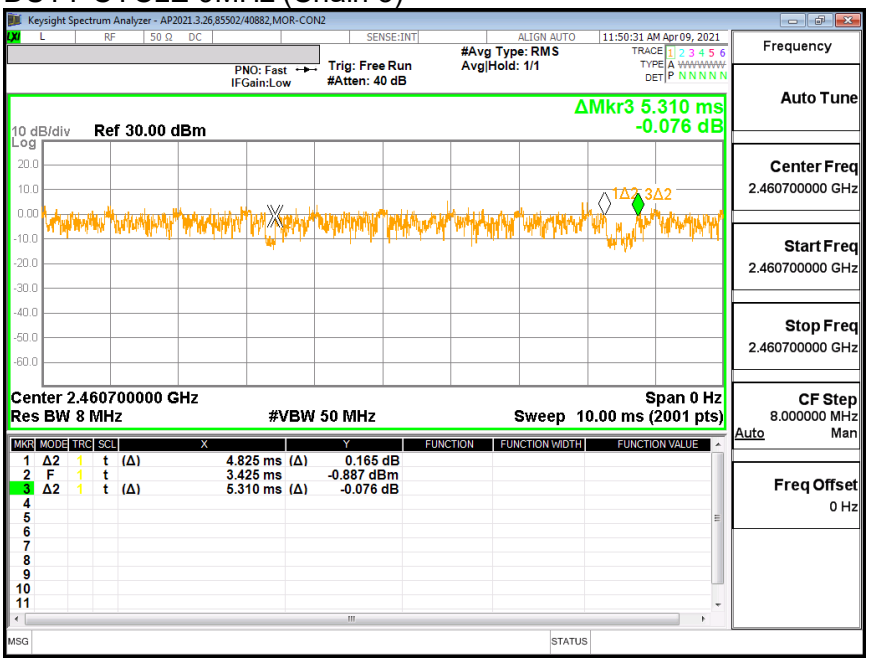
DUTY CYCLE 4.5MHz (Chain 8)

DUTY CYCLE 9MHz (Chain 1)

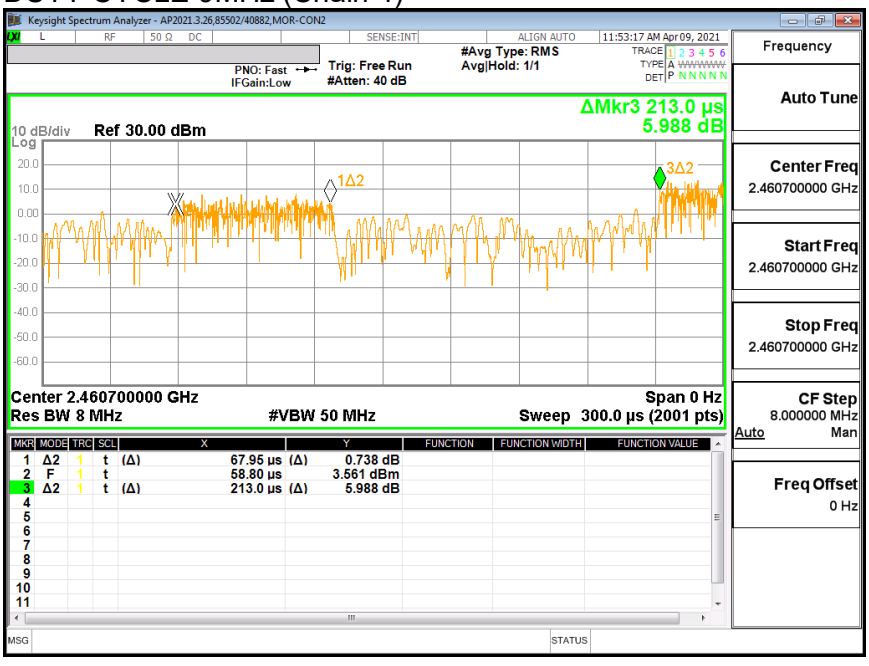
DUTY CYCLE 9MHz (Chain 2)



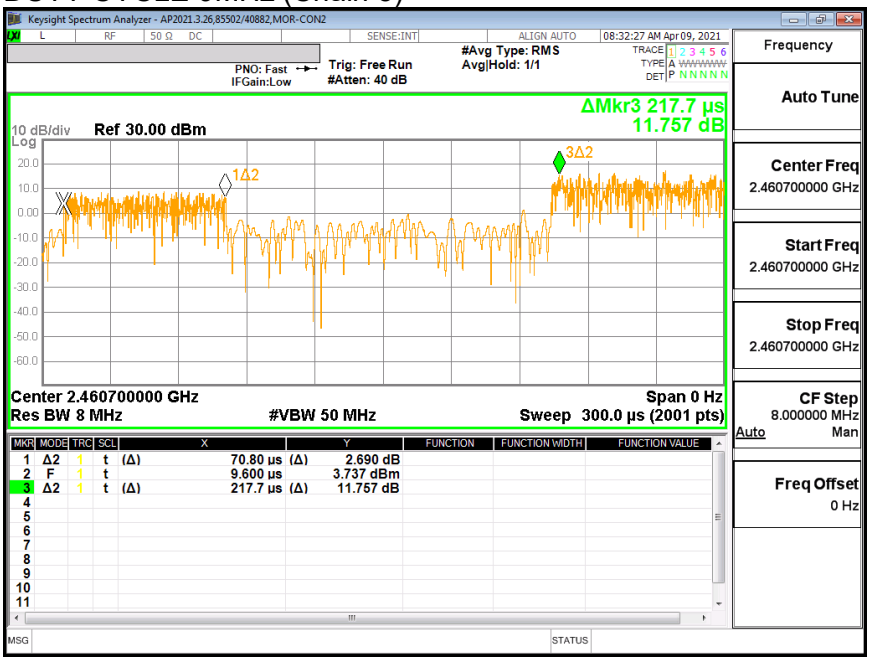
DUTY CYCLE 9MHz (Chain 3)



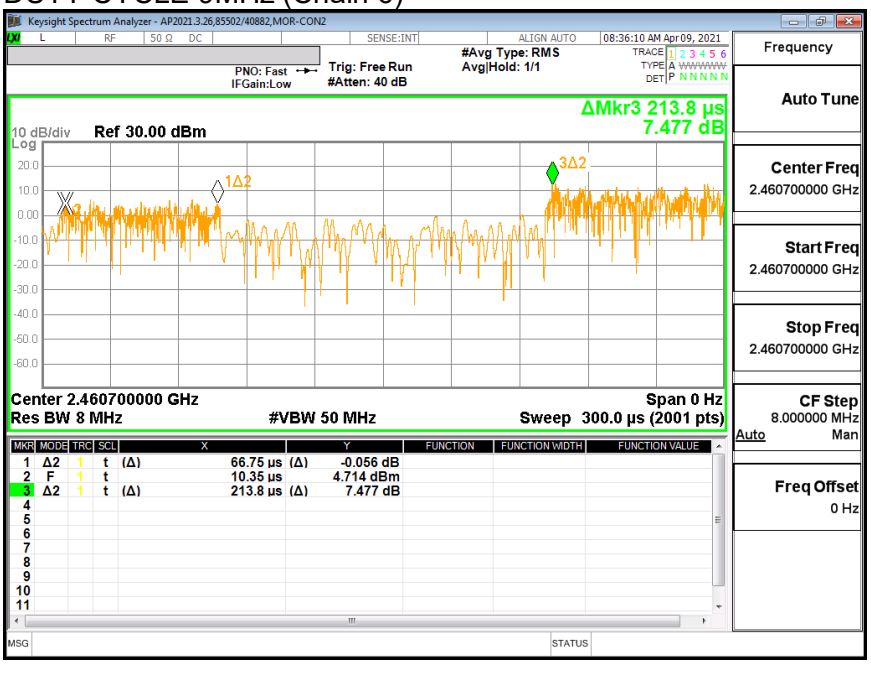
DUTY CYCLE 9MHz (Chain 4)



DUTY CYCLE 9MHz (Chain 5)

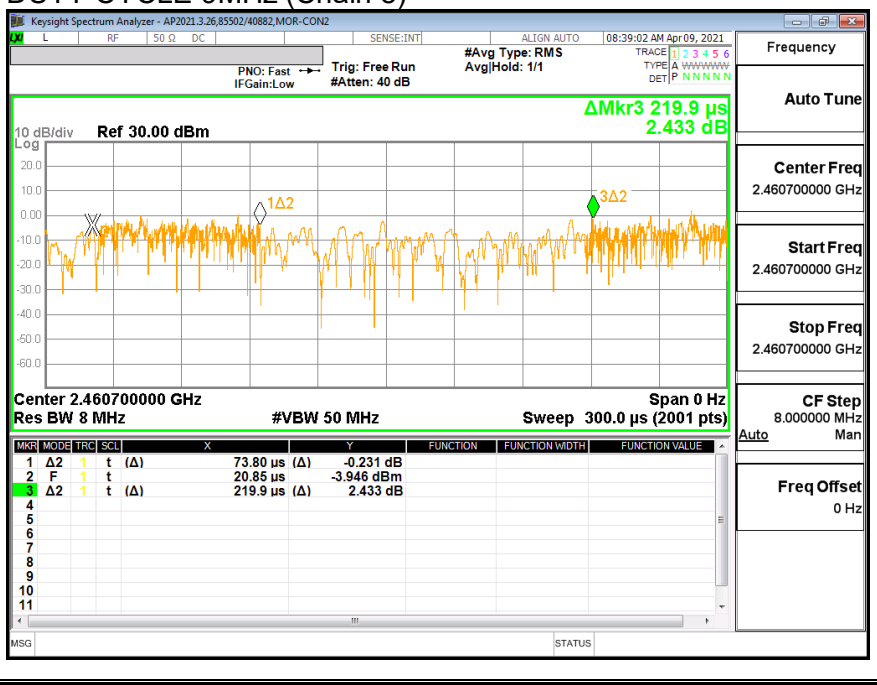


DUTY CYCLE 9MHz (Chain 6)



DUTY CYCLE 9MHz (Chain 7)

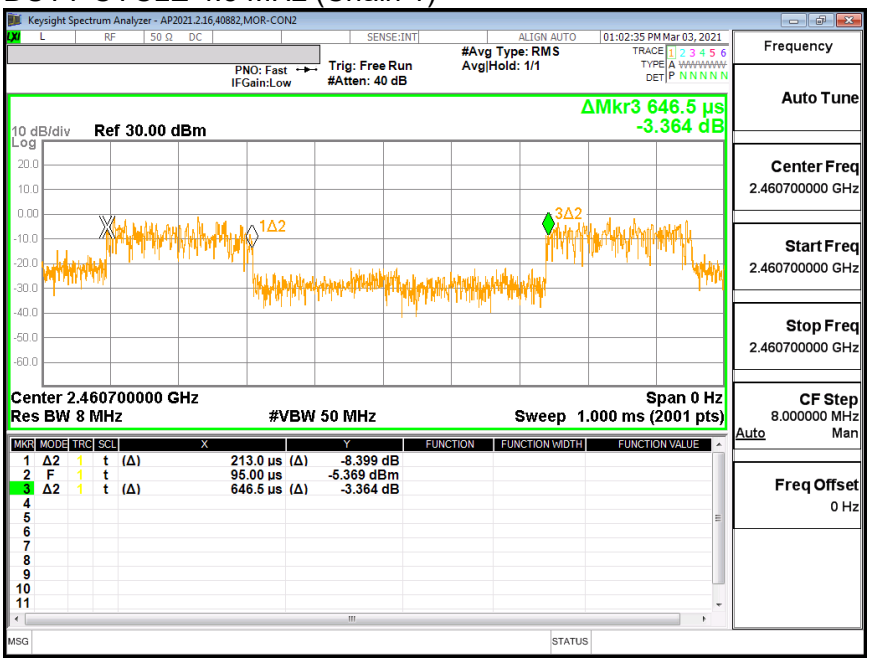
DUTY CYCLE 9MHz (Chain 8)



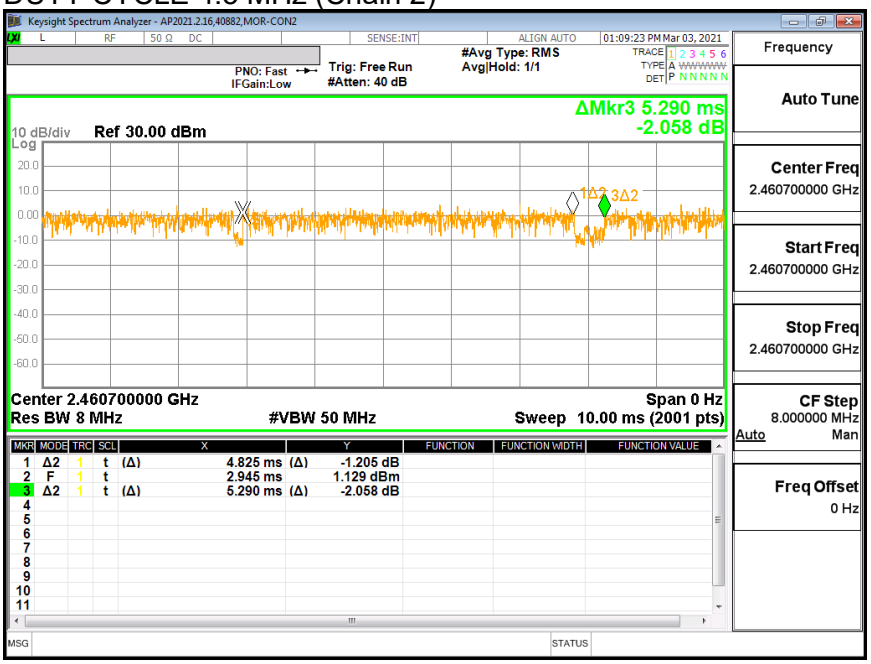
ON TIME AND DUTY CYCLE RESULTS – 64-QAM

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	0.213	0.647	0.329	32.95%	9.64	4.695
Chain 2	4.825	5.290	0.912	91.21%	0.80	0.207
Chain 3	4.565	4.730	0.965	96.51%	0.31	0.219
Chain 4	0.071	0.215	0.331	33.10%	9.60	14.085
Chain 5	0.070	0.215	0.326	32.57%	9.74	14.259
Chain 6	0.068	0.287	0.237	23.69%	12.51	14.732
Chain 7	0.845	0.989	0.854	85.43%	1.37	1.184
Chain 8	0.137	1.004	0.136	13.65%	17.30	7.299
2.4GHz Band (9MHz)						
Chain 1	0.214	0.360	0.595	59.45%	4.52	4.677
Chain 2	0.070	0.288	0.242	24.17%	12.33	14.388
Chain 3	4.552	4.731	0.962	96.22%	0.34	0.220
Chain 4	0.070	0.288	0.243	24.28%	12.29	14.286
Chain 5	0.070	0.214	0.326	32.58%	9.74	14.337
Chain 6	0.070	0.408	0.172	17.16%	15.31	14.286
Chain 7	0.848	0.997	0.851	85.07%	1.40	1.179
Chain 8	0.851	1.001	0.850	85.01%	1.41	1.175

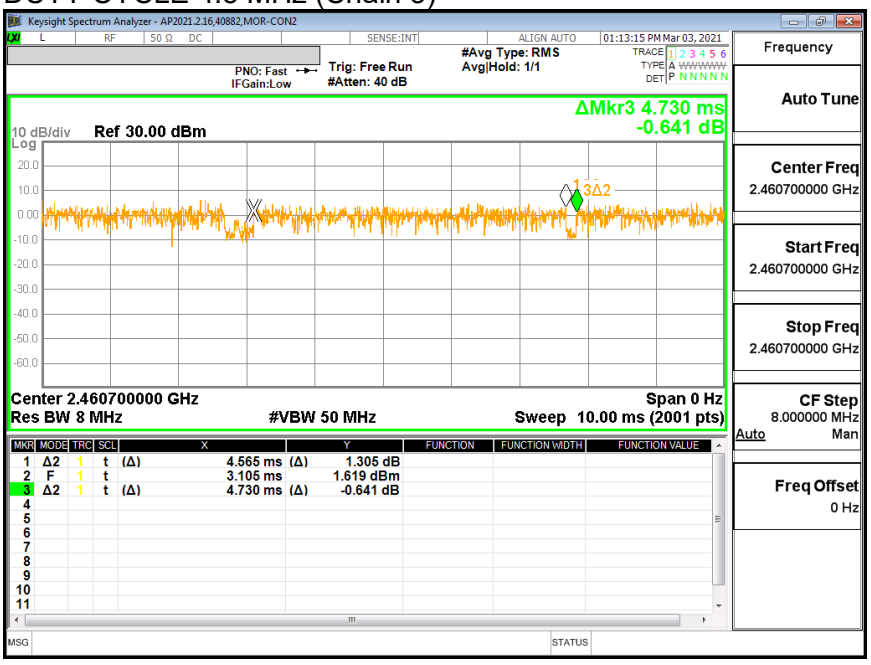
DUTY CYCLE 4.5 MHz (Chain 1)



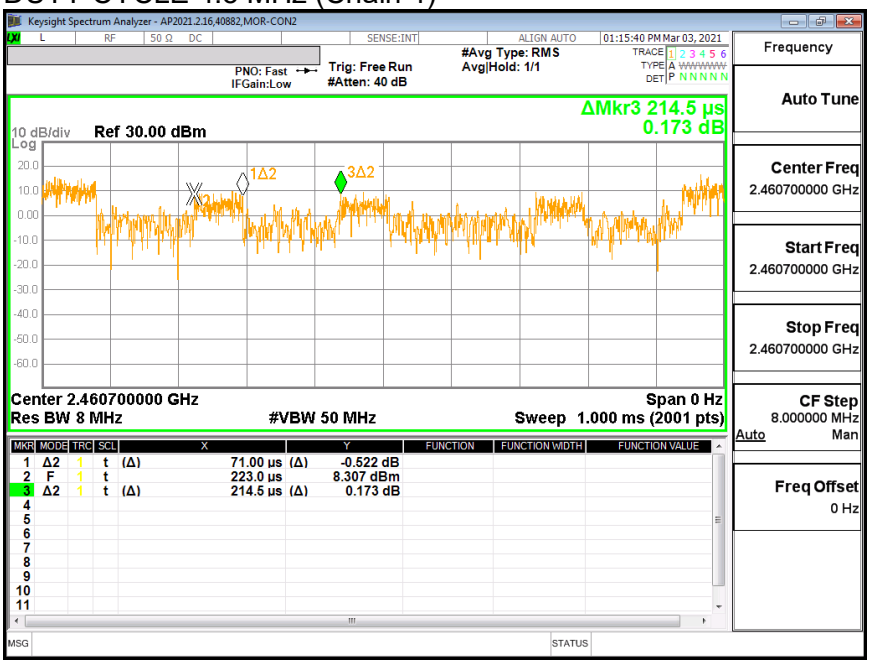
DUTY CYCLE 4.5 MHz (Chain 2)



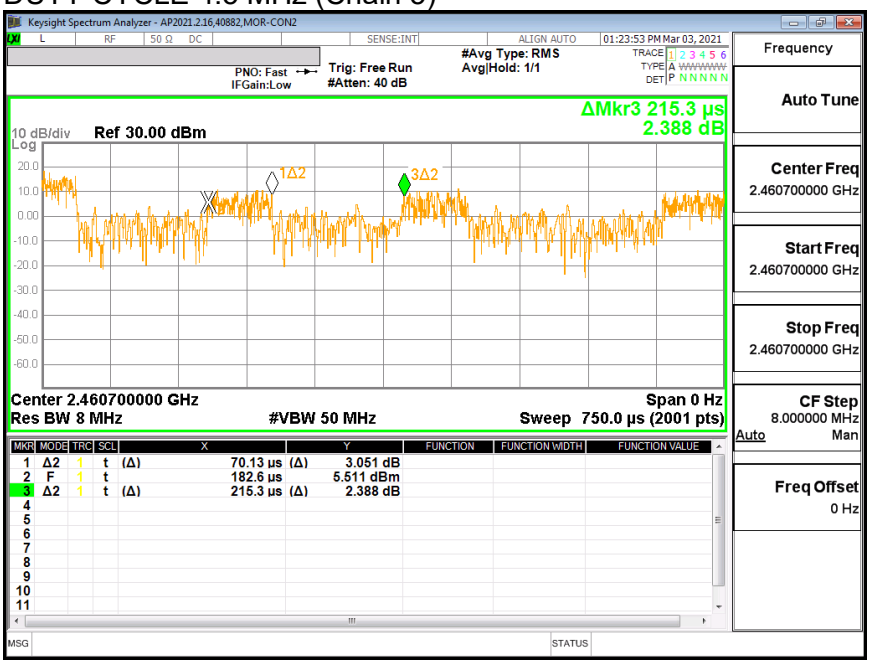
DUTY CYCLE 4.5 MHz (Chain 3)



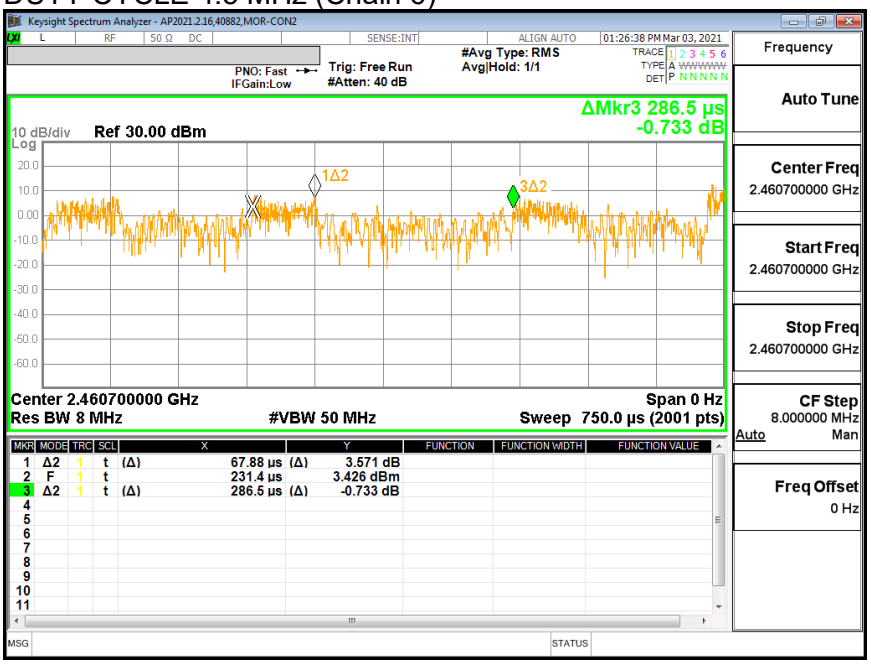
DUTY CYCLE 4.5 MHz (Chain 4)



DUTY CYCLE 4.5 MHz (Chain 5)

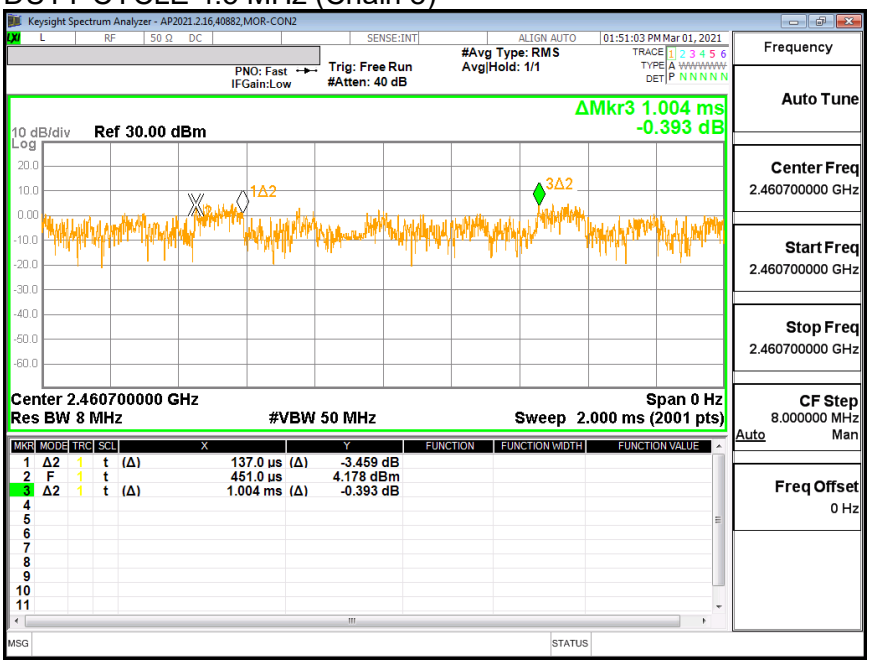


DUTY CYCLE 4.5 MHz (Chain 6)

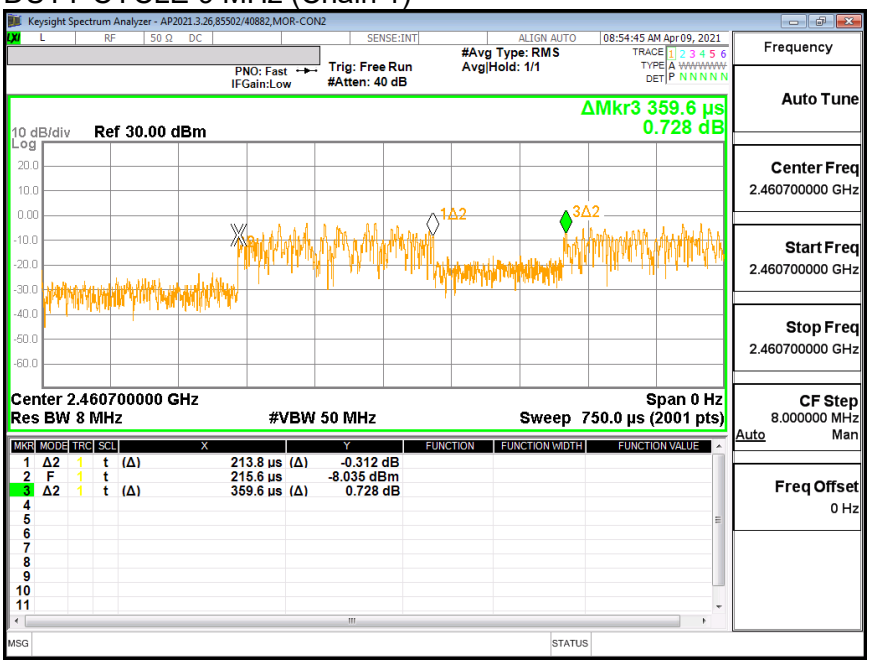


DUTY CYCLE 4.5 MHz (Chain 7)

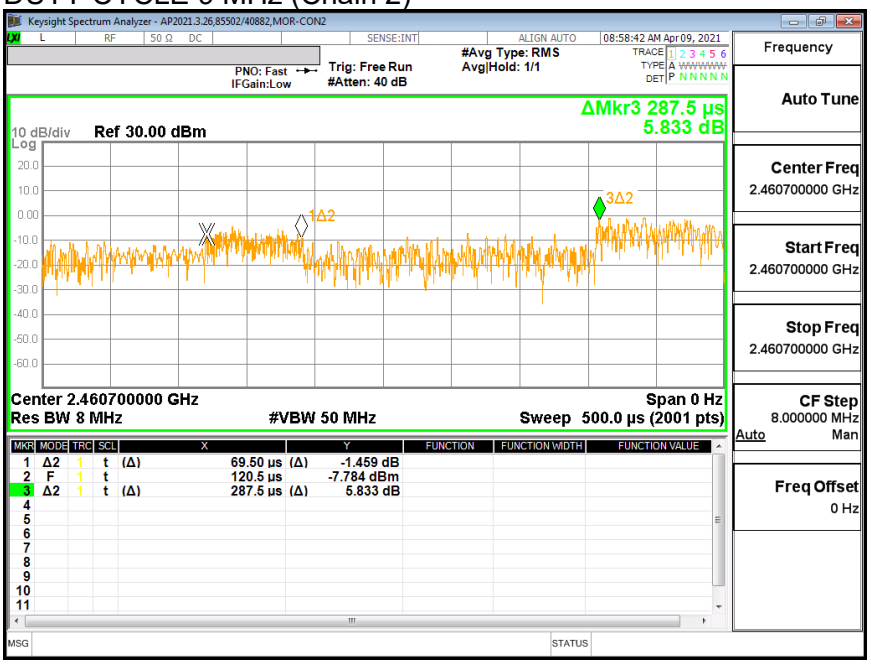
DUTY CYCLE 4.5 MHz (Chain 8)



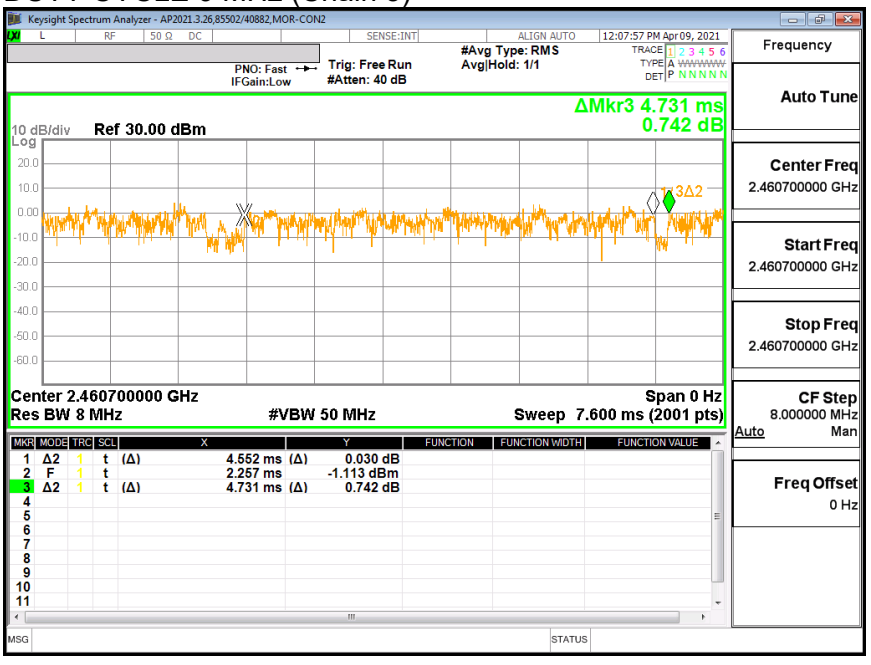
DUTY CYCLE 9 MHz (Chain 1)



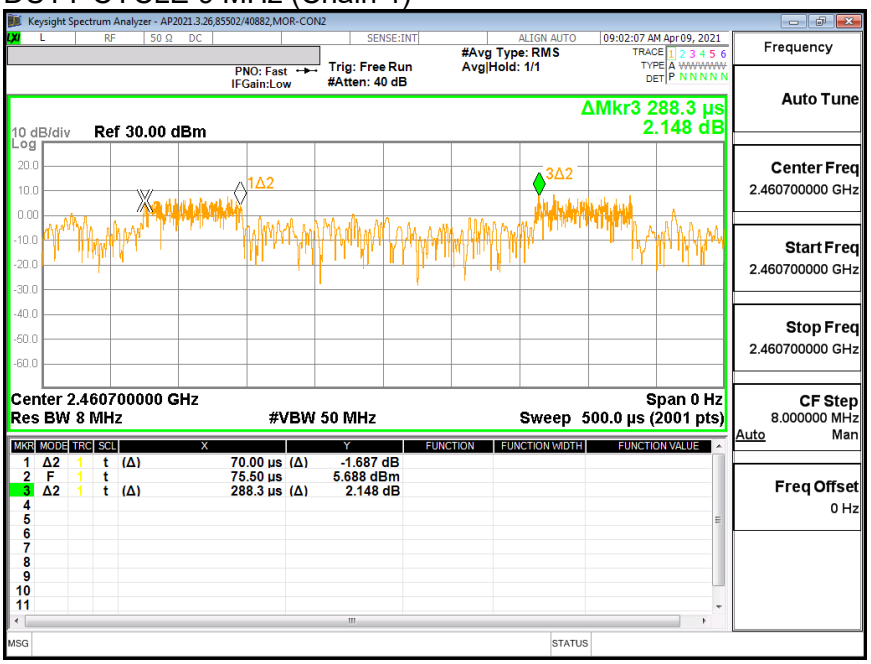
DUTY CYCLE 9 MHz (Chain 2)



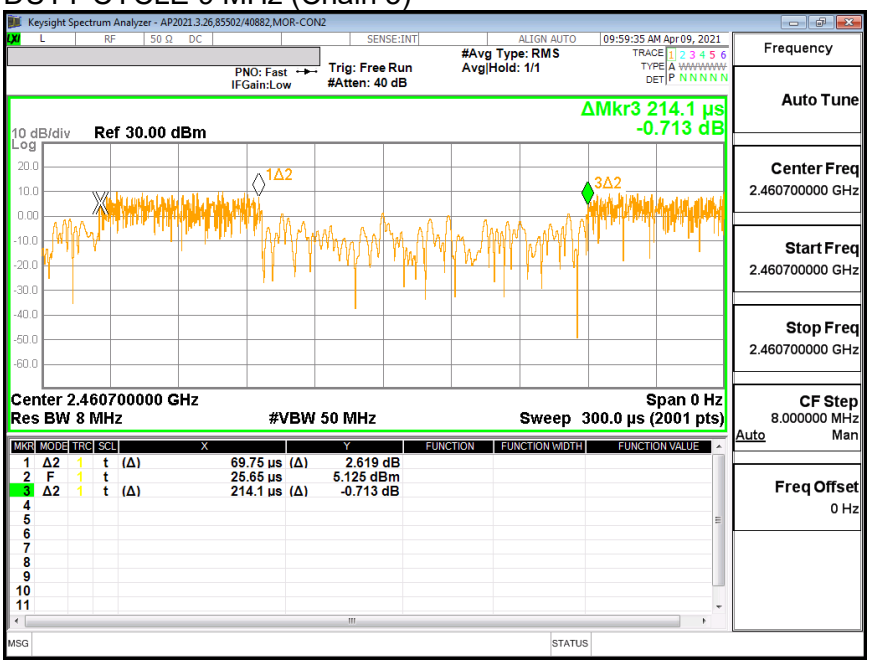
DUTY CYCLE 9 MHz (Chain 3)



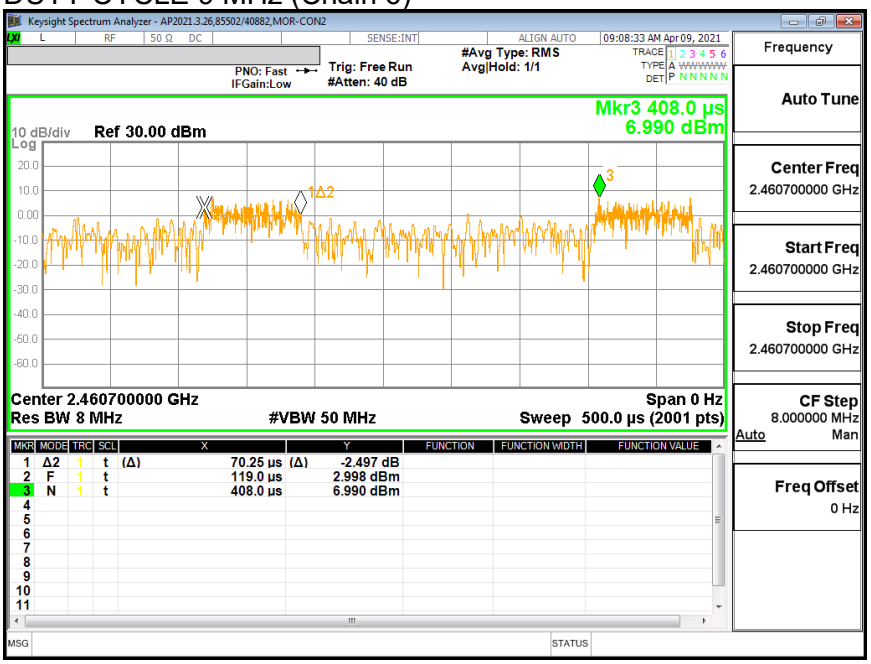
DUTY CYCLE 9 MHz (Chain 4)



DUTY CYCLE 9 MHz (Chain 5)

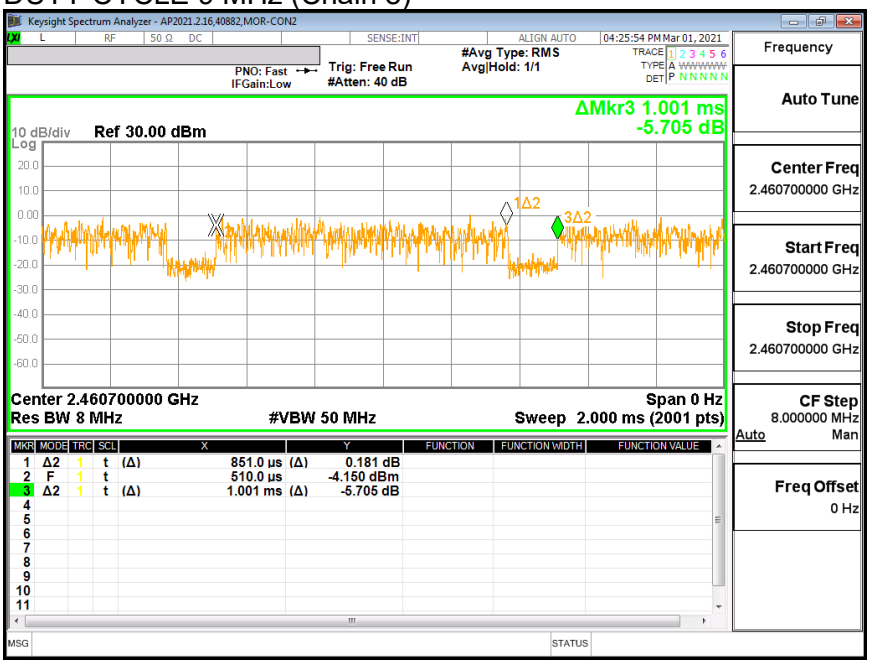


DUTY CYCLE 9 MHz (Chain 6)



DUTY CYCLE 9 MHz (Chain 7)

DUTY CYCLE 9 MHz (Chain 8)



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)

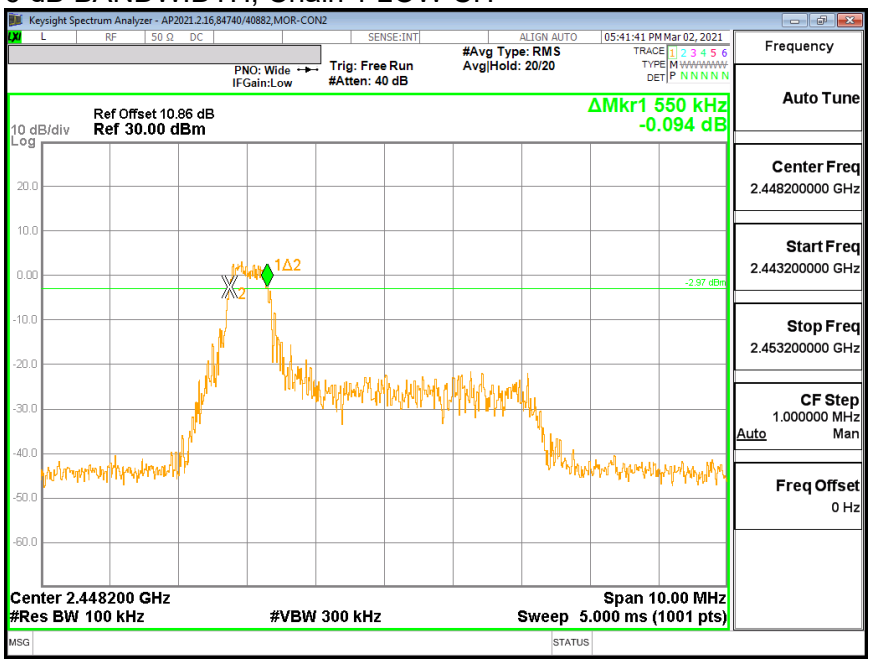
The minimum 6 dB bandwidth shall be at least 500 kHz.

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	0.550	0.540	0.560	4.500	0.5
Mid	2460.7	0.590	0.560	0.600	4.500	0.5
High	2473.2	0.510	0.540	0.570	4.490	0.5

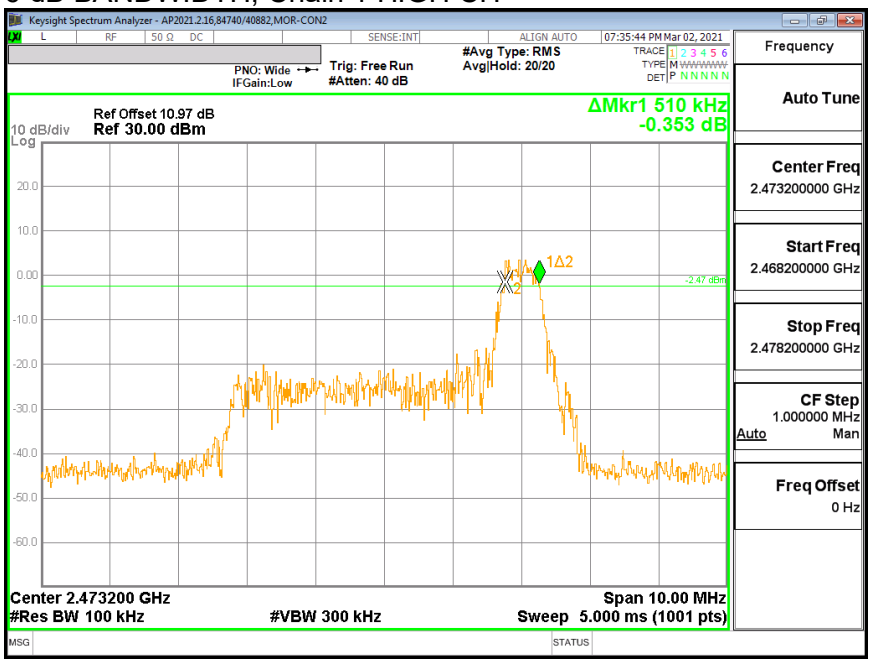
Channel	Frequency (MHz)	6 dB BW Chain 5 (MHz)	6 dB BW Chain 6 (MHz)	6 dB BW Chain 7 (MHz)	6 dB BW Chain 8 (MHz)	Minimum Limit (MHz)
Low	2448.2	4.320	4.510	0.540	4.400	0.5
Mid	2460.7	4.280	4.410	0.570	3.340	0.5
High	2473.2	4.450	4.510	0.570	4.110	0.5

6 dB BANDWIDTH, Chain 1 LOW CH



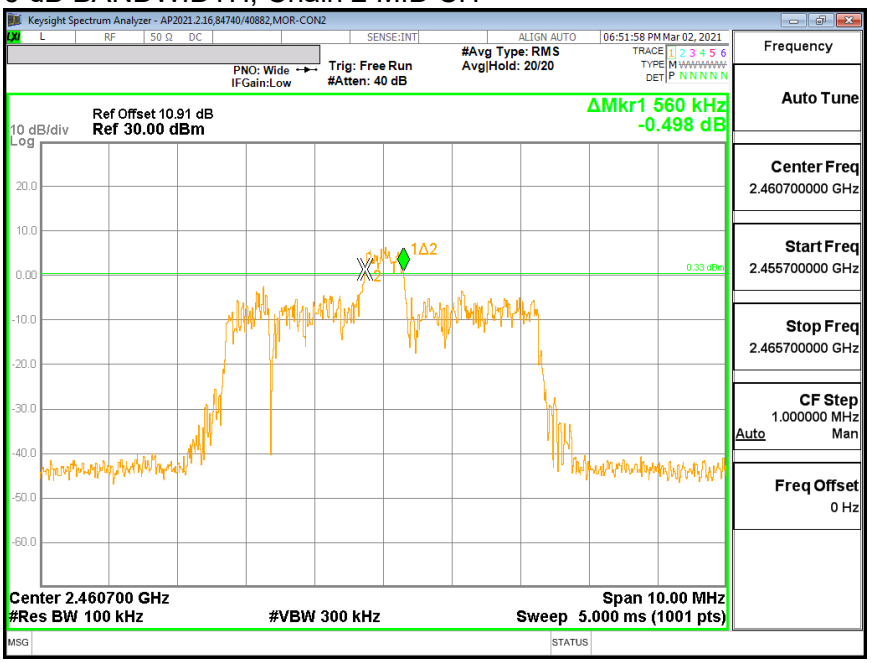
6 dB BANDWIDTH, Chain 1 MID CH

6 dB BANDWIDTH, Chain 1 HIGH CH

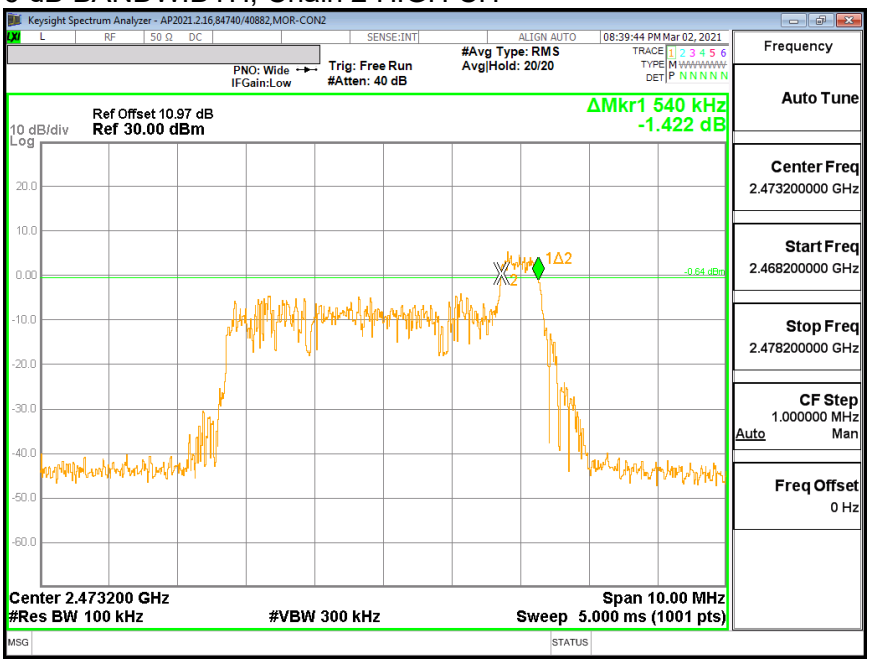


6 dB BANDWIDTH, Chain 2 LOW CH

6 dB BANDWIDTH, Chain 2 MID CH



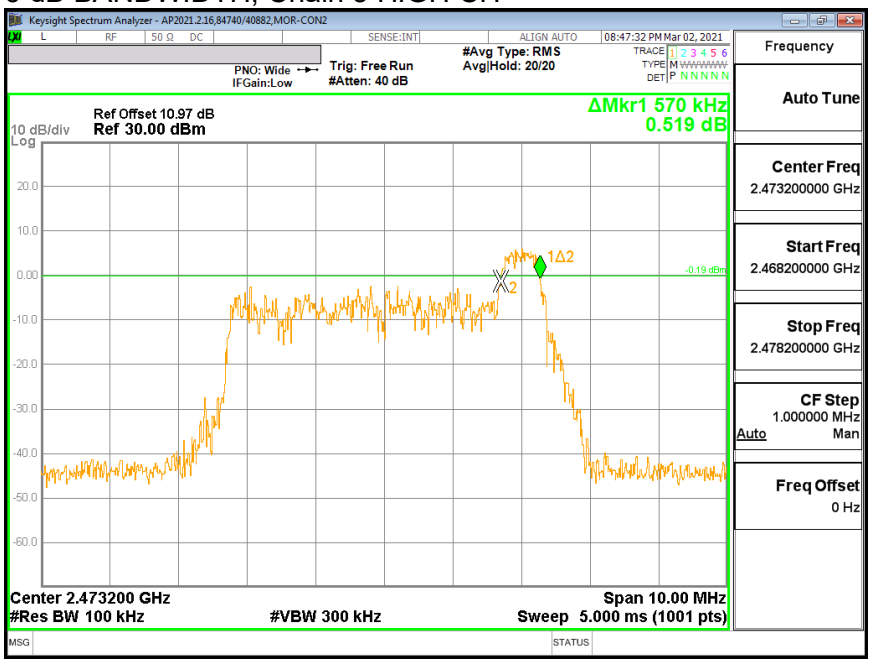
6 dB BANDWIDTH, Chain 2 HIGH CH



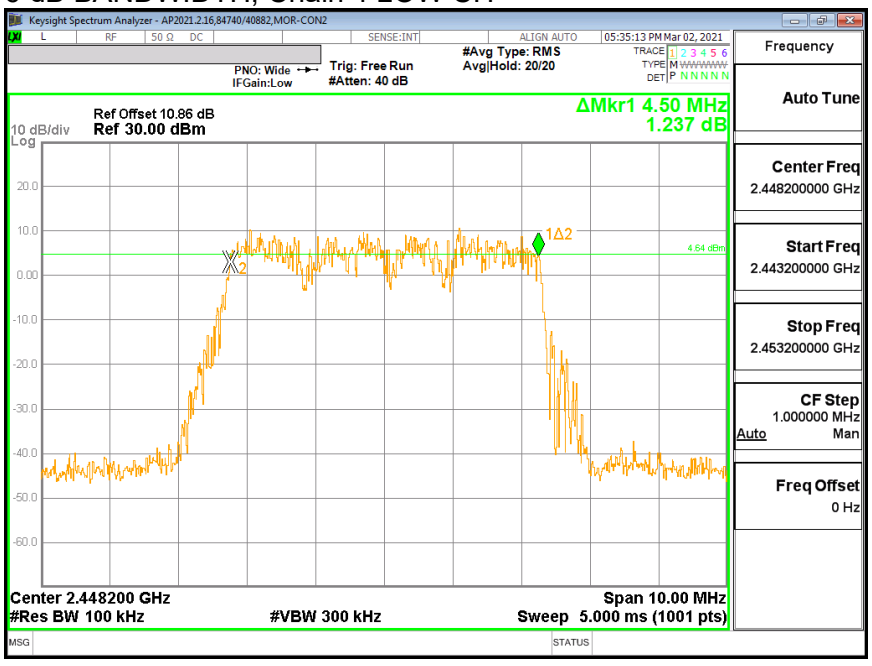
6 dB BANDWIDTH, Chain 3 LOW CH

6 dB BANDWIDTH, Chain 3 MID CH

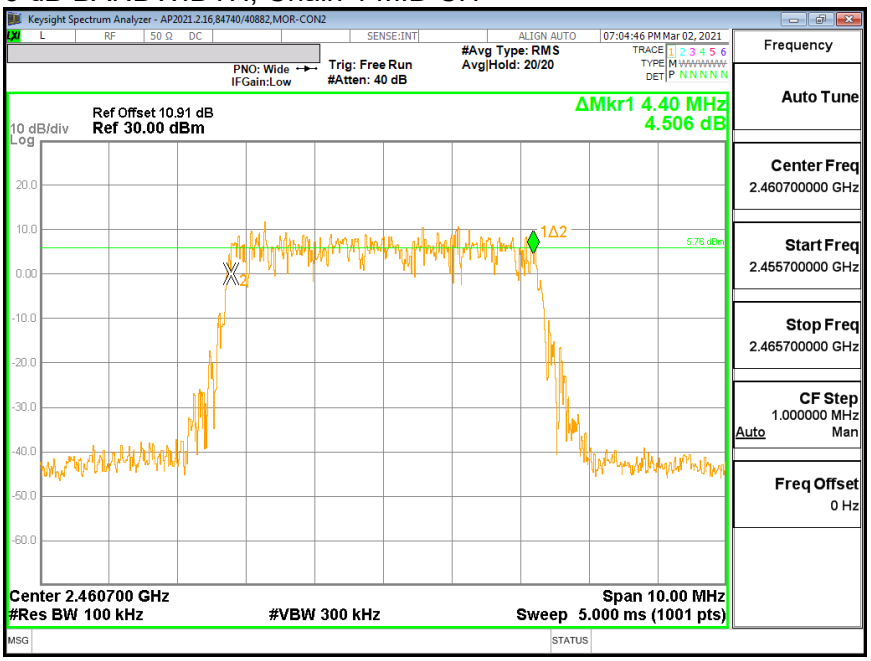
6 dB BANDWIDTH, Chain 3 HIGH CH



6 dB BANDWIDTH, Chain 4 LOW CH

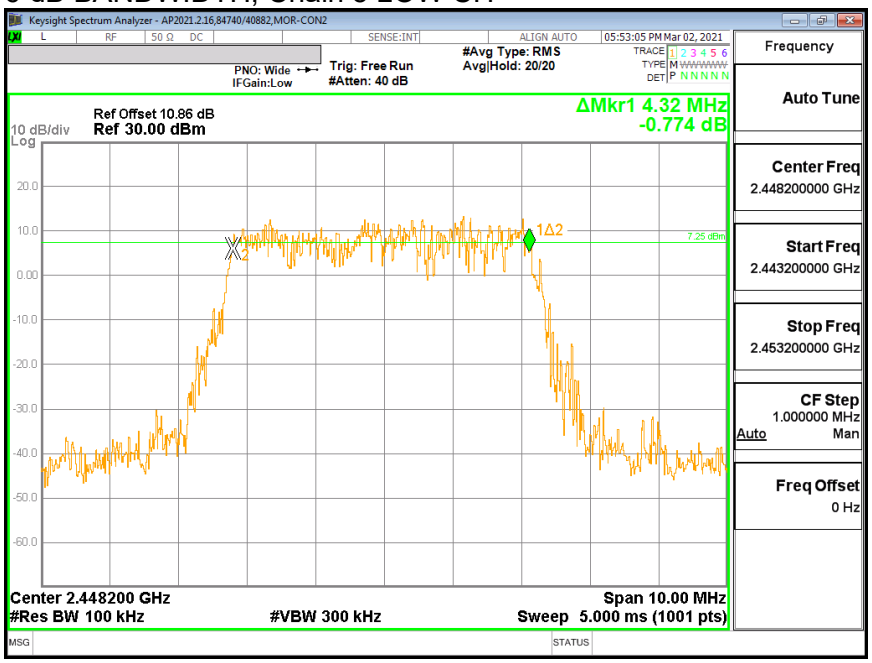


6 dB BANDWIDTH, Chain 4 MID CH

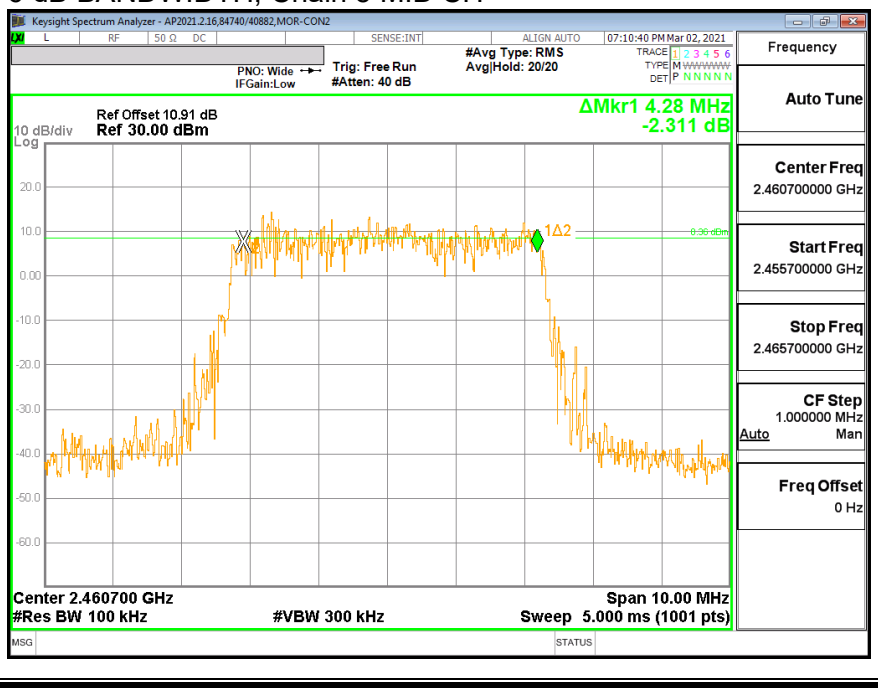


6 dB BANDWIDTH, Chain 4 HIGH CH

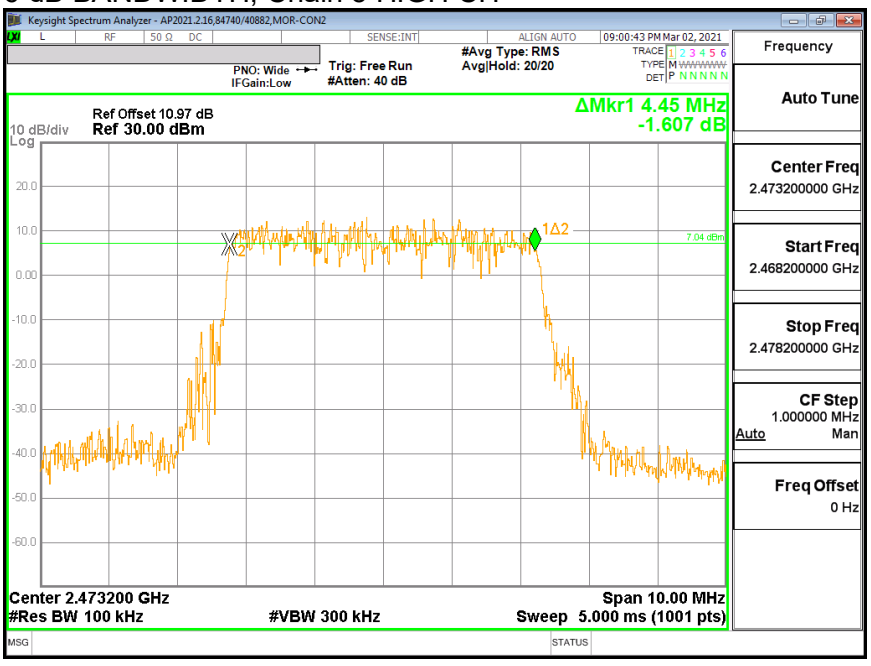
6 dB BANDWIDTH, Chain 5 LOW CH



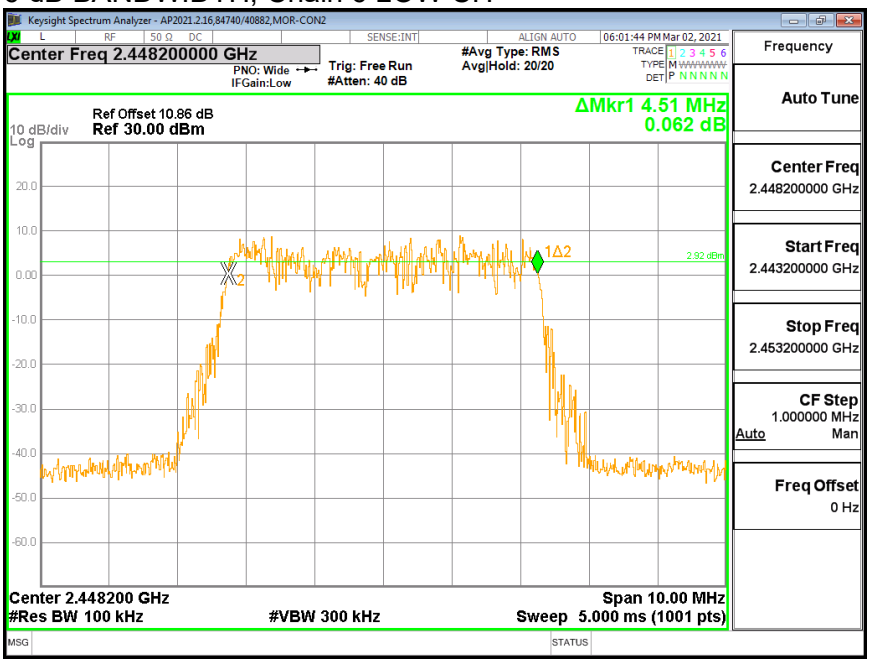
6 dB BANDWIDTH, Chain 5 MID CH



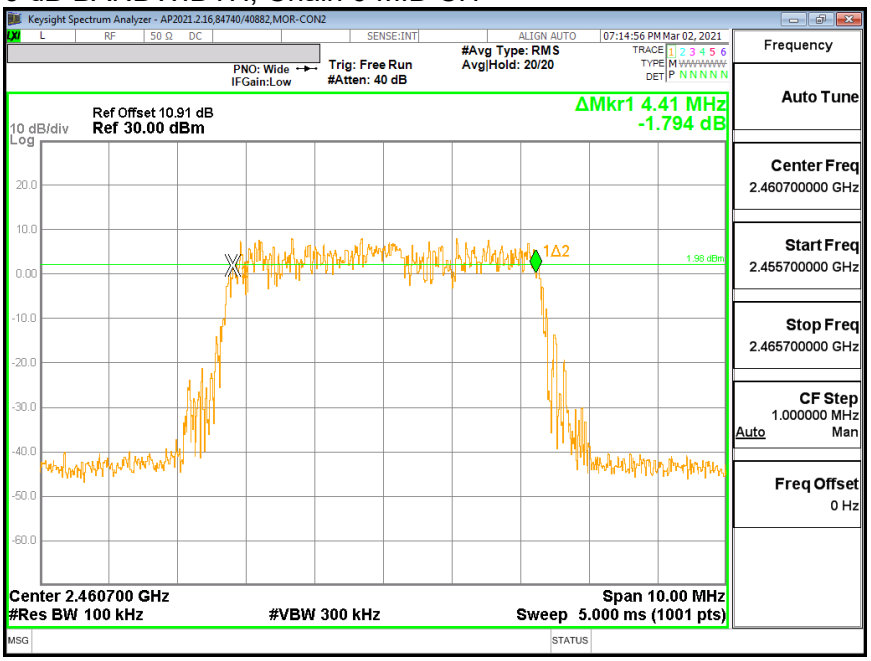
6 dB BANDWIDTH, Chain 5 HIGH CH



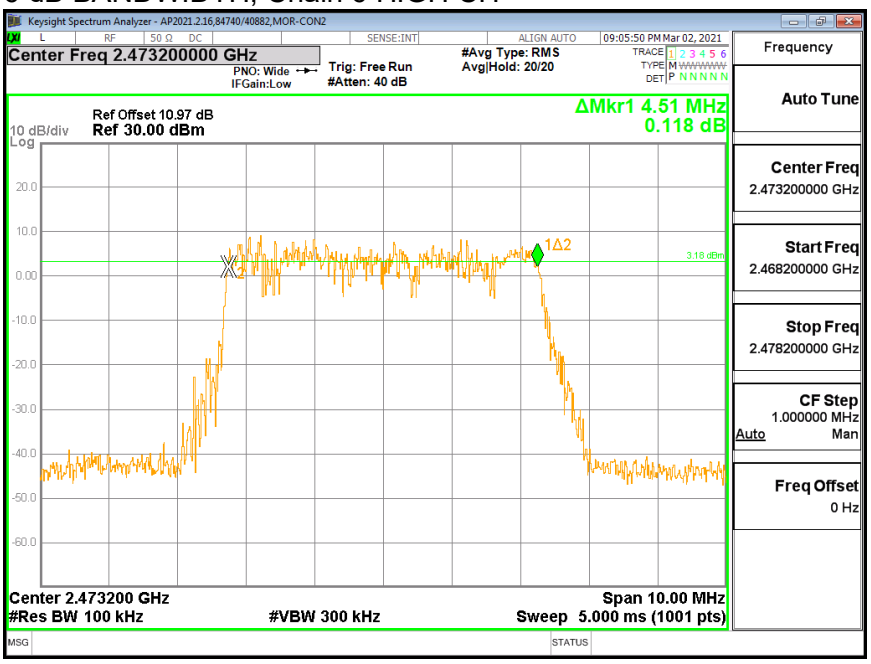
6 dB BANDWIDTH, Chain 6 LOW CH



6 dB BANDWIDTH, Chain 6 MID CH

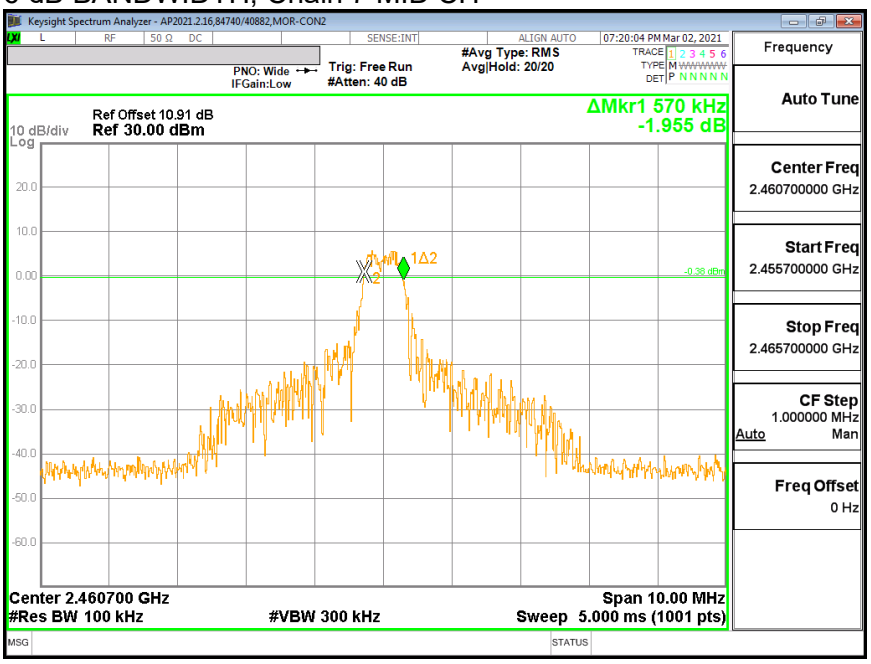


6 dB BANDWIDTH, Chain 6 HIGH CH

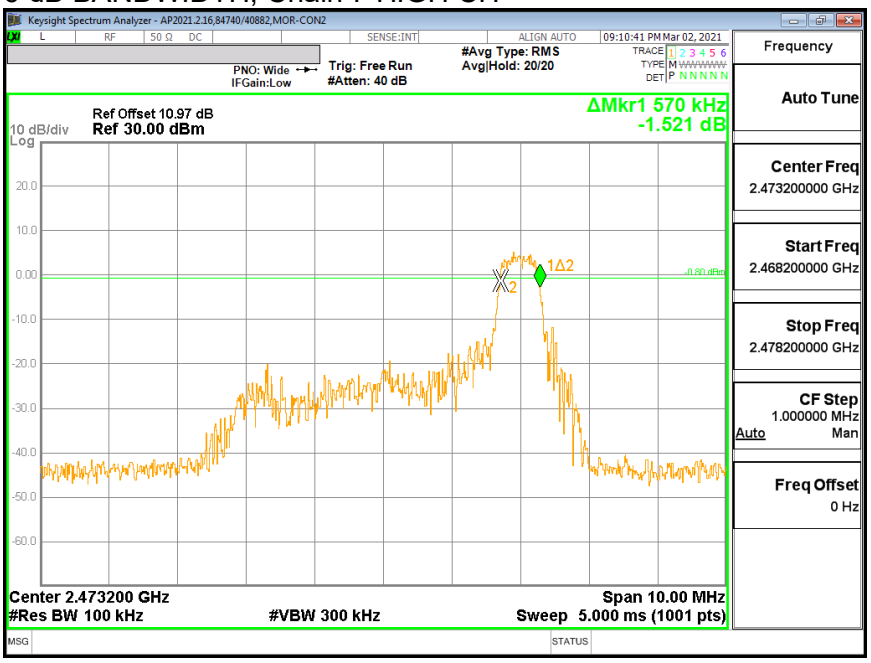


6dB BANDWIDTH, Chain 7 LOW CH

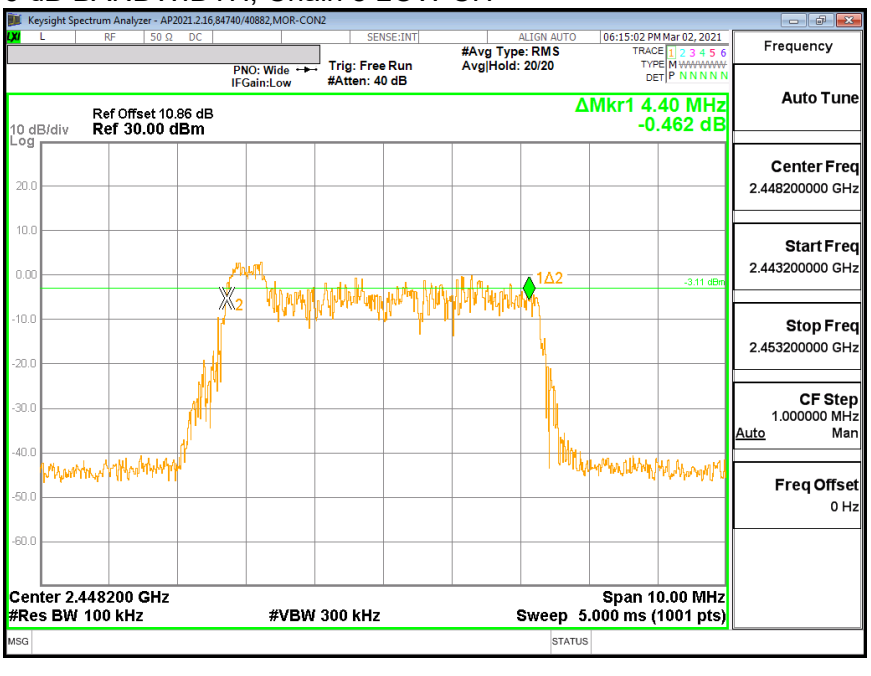
6 dB BANDWIDTH, Chain 7 MID CH



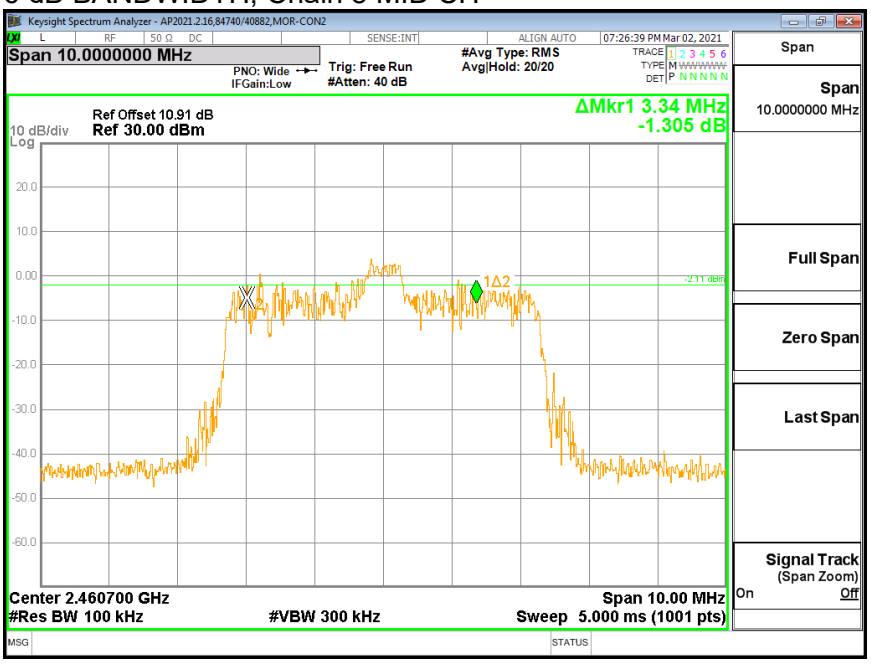
6 dB BANDWIDTH, Chain 7 HIGH CH



6 dB BANDWIDTH, Chain 8 LOW CH



6 dB BANDWIDTH, Chain 8 MID CH



6 dB BANDWIDTH, Chain 8 HIGH CH

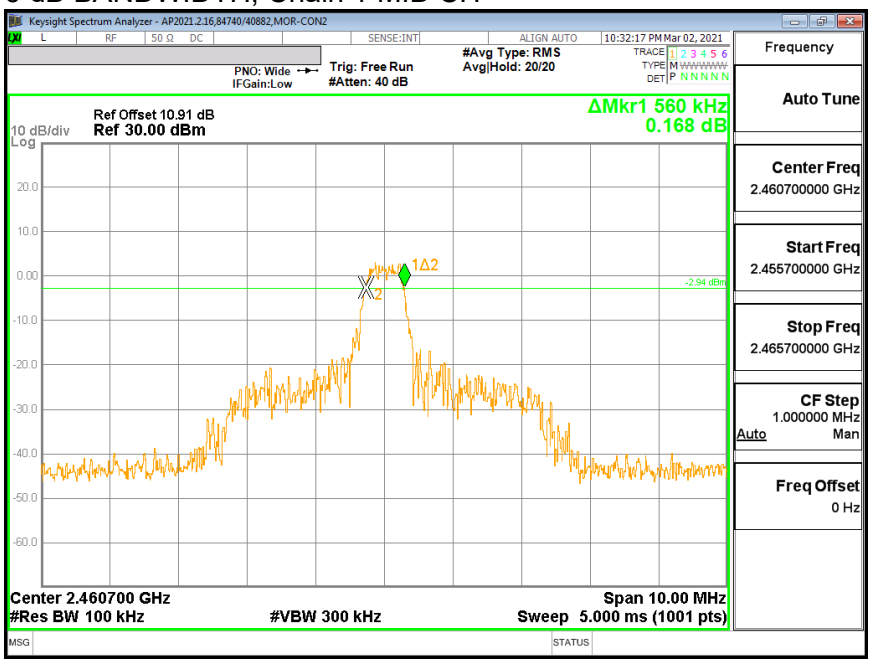
RESULTS – 16-QAM

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	0.570	0.540	0.560	4.470	0.5
Mid	2460.7	0.560	0.570	0.600	4.480	0.5
High	2473.2	0.560	0.550	0.560	4.430	0.5

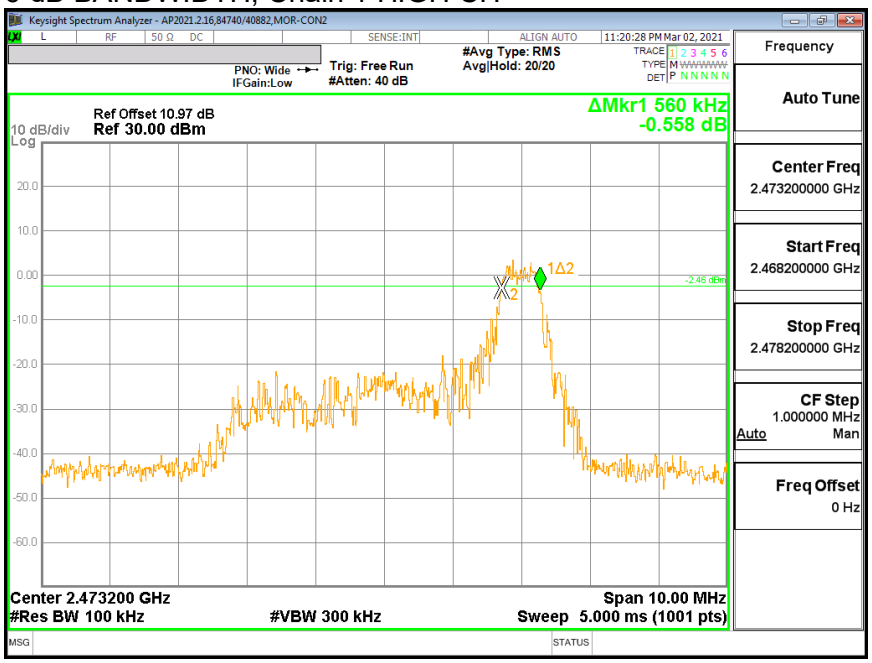
Channel	Frequency (MHz)	6 dB BW Chain 5 (MHz)	6 dB BW Chain 6 (MHz)	6 dB BW Chain 7 (MHz)	6 dB BW Chain 8 (MHz)	Minimum Limit (MHz)
Low	2448.2	4.490	4.440	0.550	4.510	0.5
Mid	2460.7	4.480	4.450	0.570	4.130	0.5
High	2473.2	4.420	4.510	0.580	4.260	0.5

6 dB BANDWIDTH, Chain 1 LOW CH

6 dB BANDWIDTH, Chain 1 MID CH



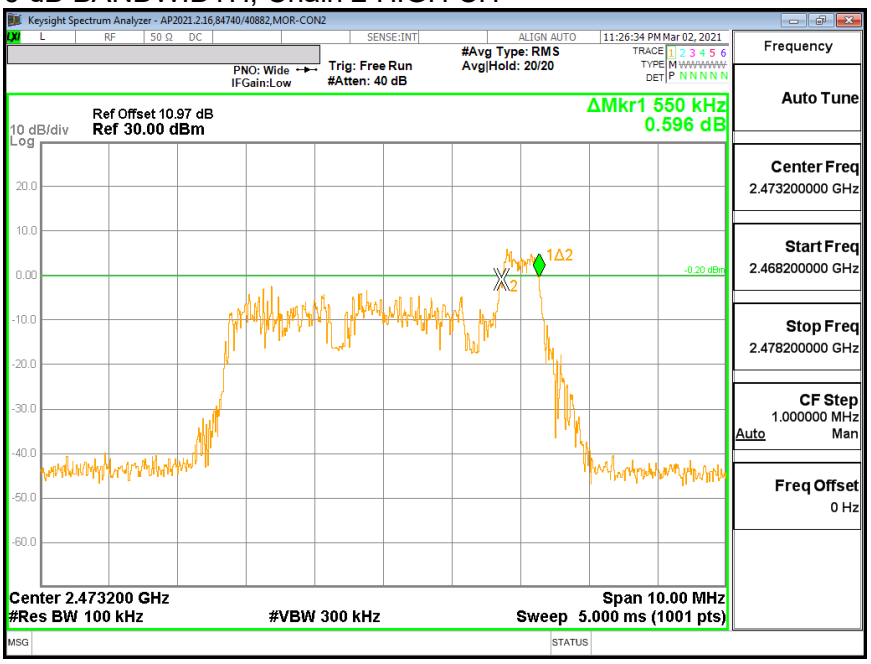
6 dB BANDWIDTH, Chain 1 HIGH CH



6 dB BANDWIDTH, Chain 2 LOW CH

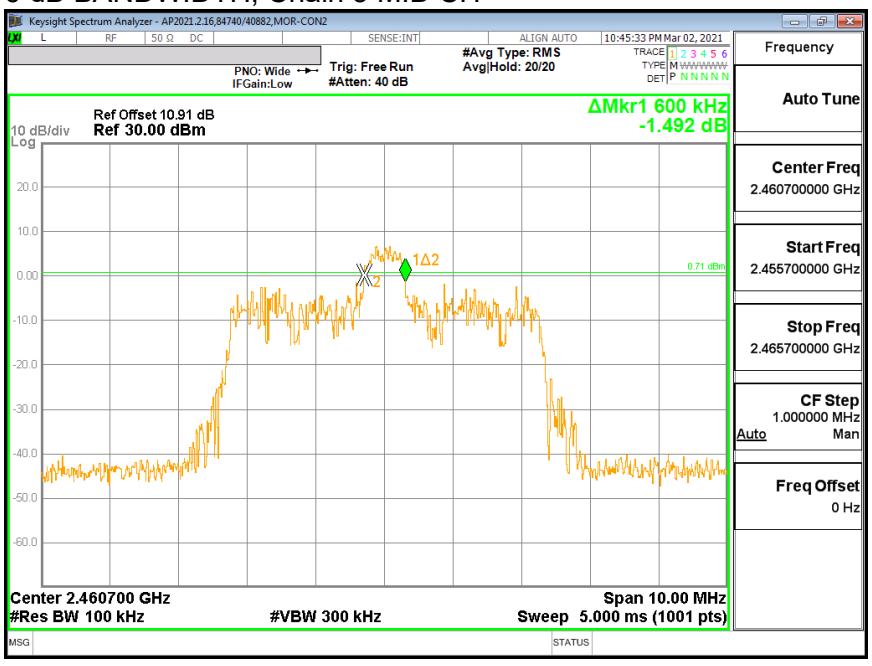
6 dB BANDWIDTH, Chain 2 MID CH

6 dB BANDWIDTH, Chain 2 HIGH CH

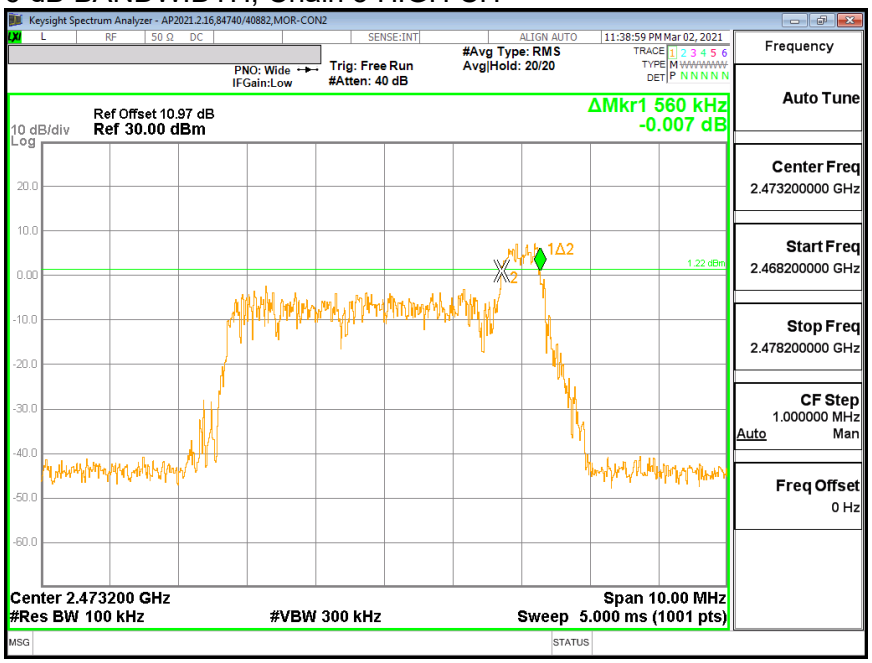


6 dB BANDWIDTH, Chain 3 LOW CH

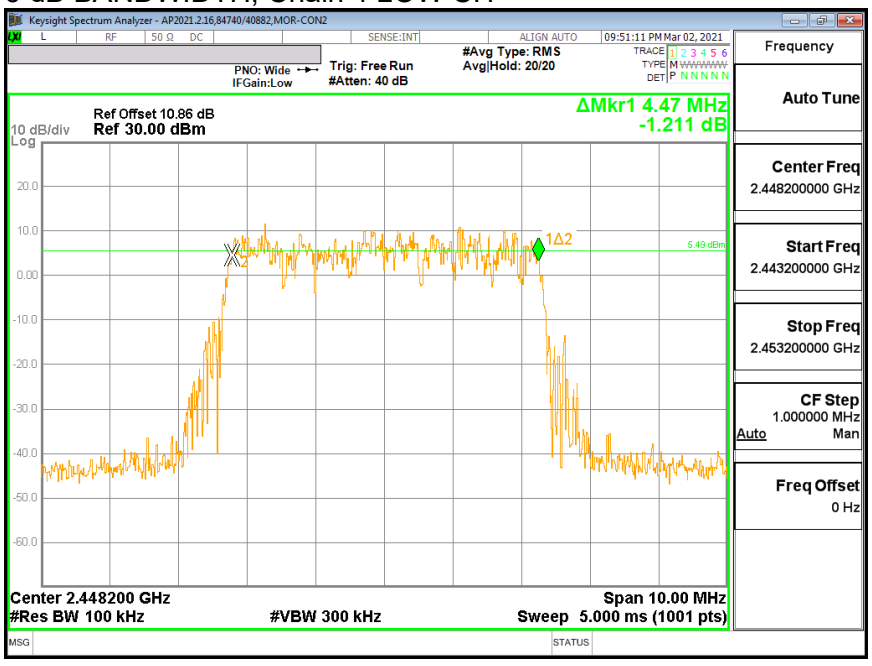
6 dB BANDWIDTH, Chain 3 MID CH



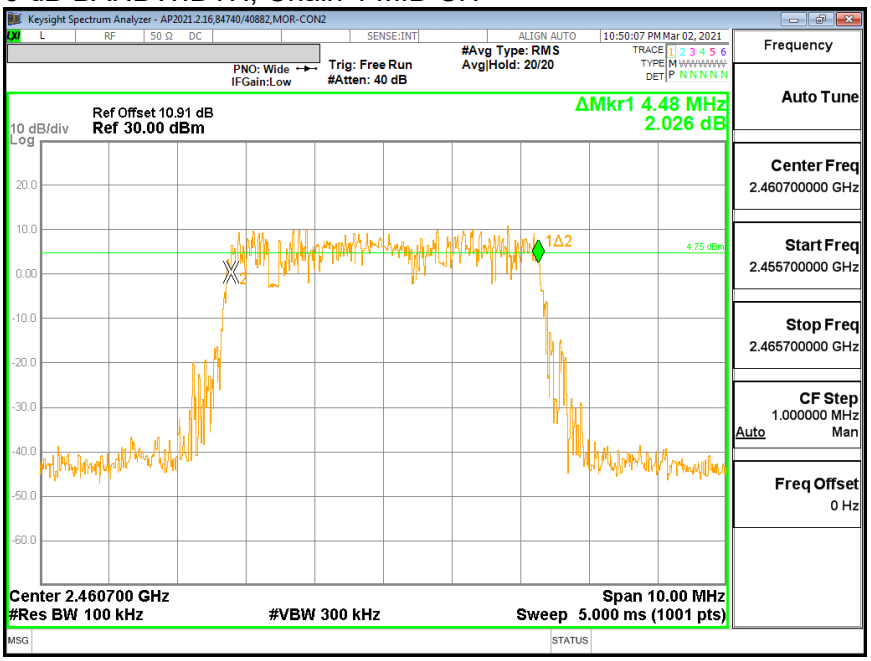
6 dB BANDWIDTH, Chain 3 HIGH CH



6 dB BANDWIDTH, Chain 4 LOW CH

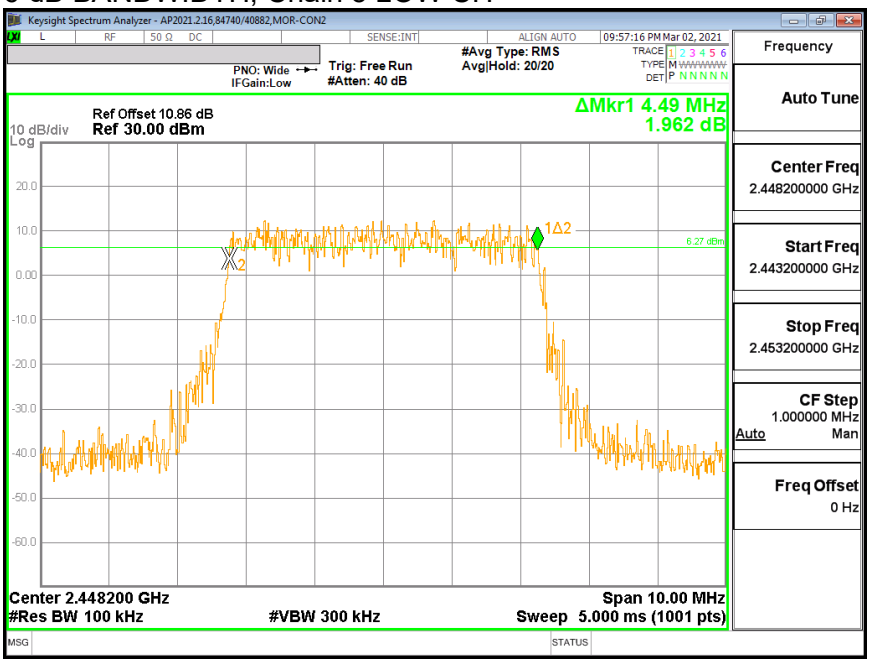


6 dB BANDWIDTH, Chain 4 MID CH

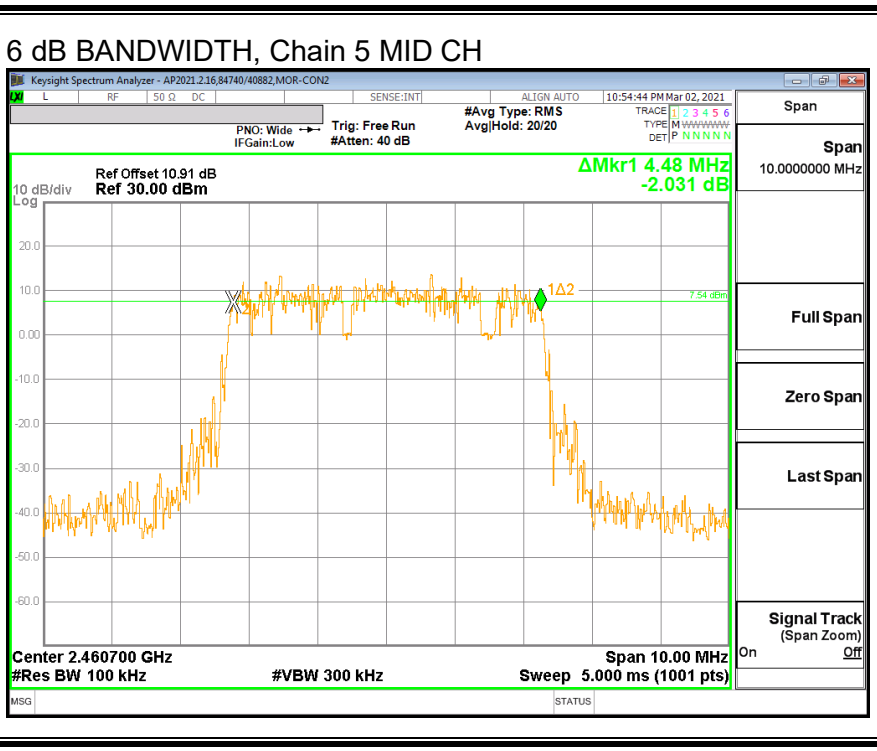


6 dB BANDWIDTH, Chain 4 HIGH CH

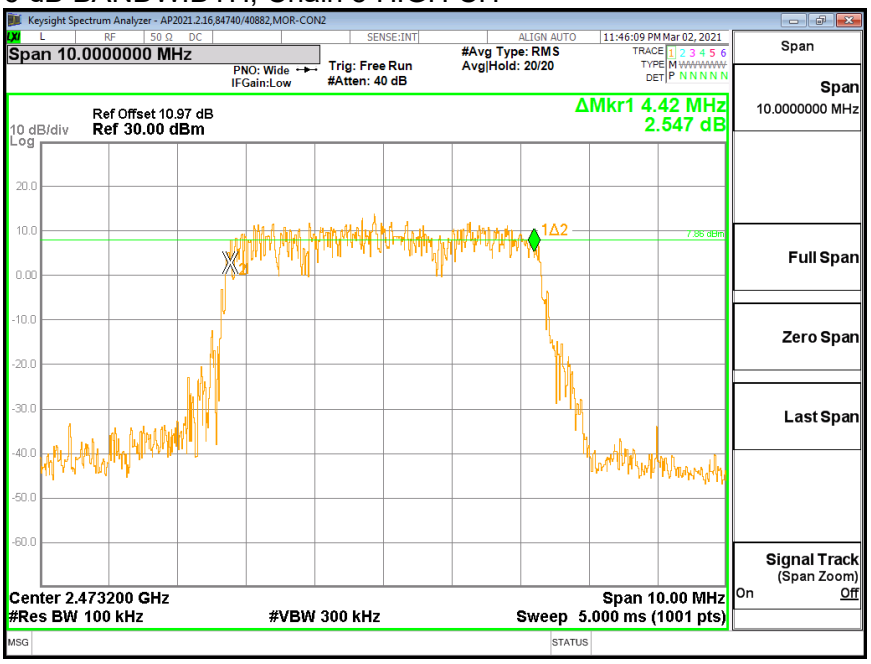
6 dB BANDWIDTH, Chain 5 LOW CH



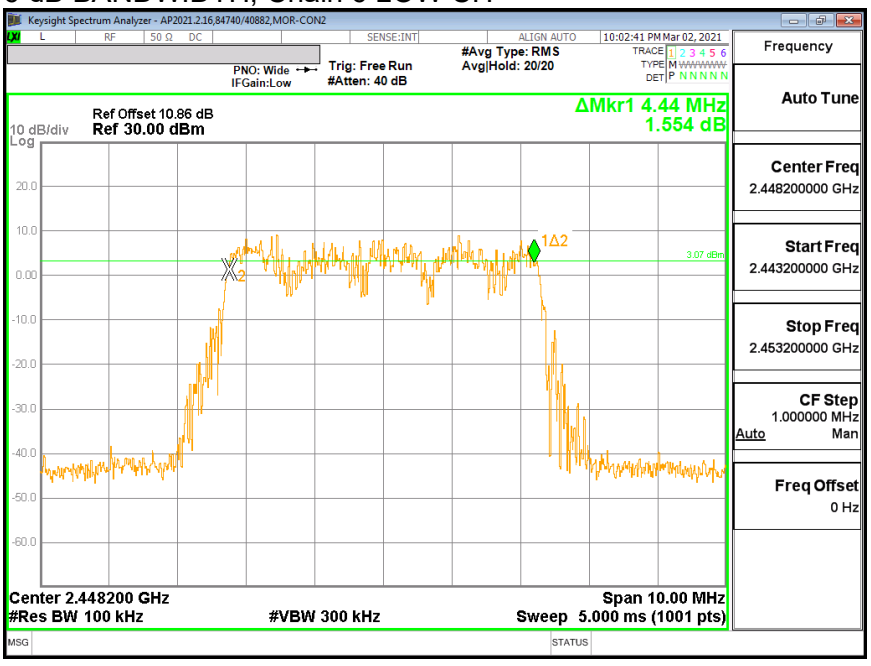
6 dB BANDWIDTH, Chain 5 MID CH



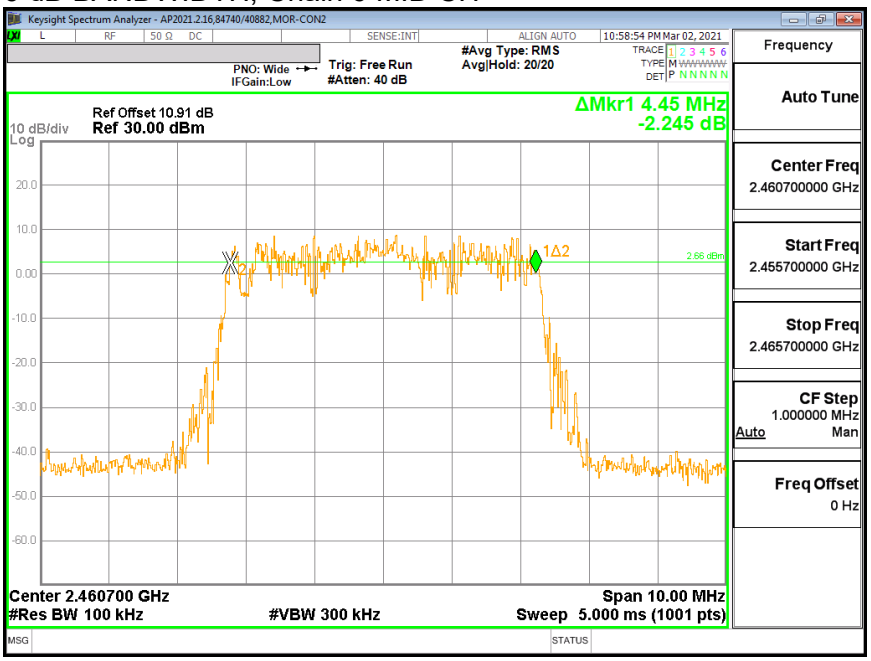
6 dB BANDWIDTH, Chain 5 HIGH CH



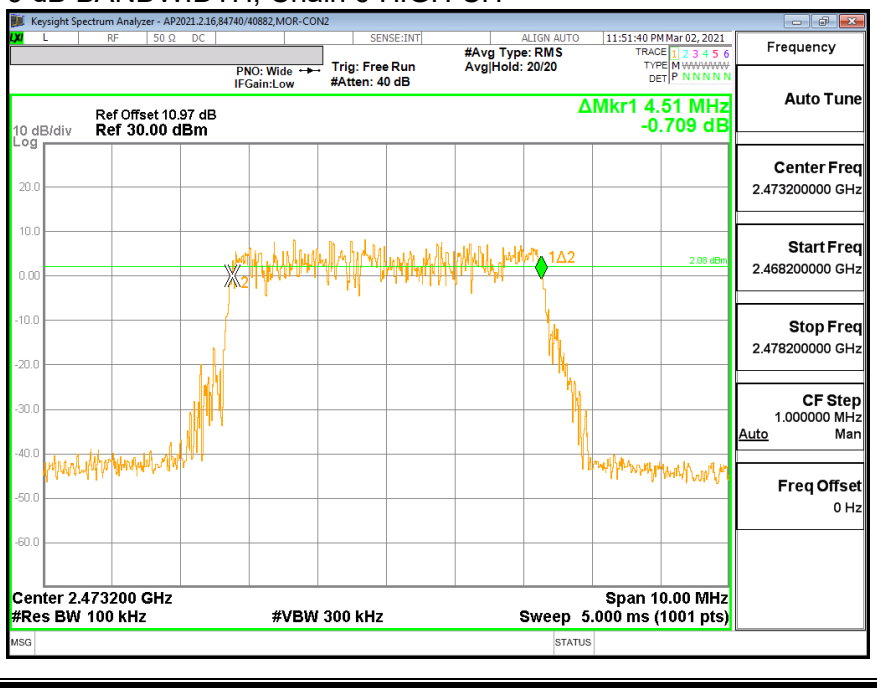
6 dB BANDWIDTH, Chain 6 LOW CH



6 dB BANDWIDTH, Chain 6 MID CH



6 dB BANDWIDTH, Chain 6 HIGH CH



6 dB BANDWIDTH, Chain 7 LOW CH

6 dB BANDWIDTH, Chain 7 MID CH