



Nemko USA, Inc.
2210 Faraday Avenue, Suite 150
Carlsbad, CA 92008
Phone (760) 444-3500 Fax (760) 444-3005

CERTIFICATION TEST REPORT

Report Number: 2012 12225093 FCC

Project Number: 10221250

Nex Number: 225093

Applicant: TRANGO SYSTEMS, INC.
14188 STOWE DRIVE, SUITE B
Poway, CA 92064

Equipment Under Test (EUT): OUTDOOR POINT-TO-POINT WIRELESS
MICROWAVE SYSTEM

Model: SL-24

FCC ID: NCY-SL24
IC: 2945A-SL24

In Accordance With: FCC Part 15 Subpart C, 15.249
IC RSS-210 Issue 8 December 2010
IC RSS-Gen Issue 3 December 2010

Tested By: Nemko USA Inc.
2210 Faraday Avenue, Suite 150
Carlsbad, CA 92008

Authorized By: 
Alan Laudani, EMC/RF Test Engineer

Date: JANUARY 29, 2013

Total Number of Pages: 107

1 Applicant Affirmation

Christopher Gustaf representing Trango Systems, Inc. hereby affirms:

- a) That he/she has reviewed and concurs that the test shown in this report are reflective of the operational characteristics of the device for which certification is sought;
- b) That the device in this test report will be representative of production units;
- c) That all changes (in hardware and software/firmware) to the subject device will be reviewed.
- d) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving (certifying) the subject equipment.

Christopher Gustaf



Printed name of official

Signature of official

14188 Stowe Drive, Suite B
Address

January 29, 2013
Date

858-353-1773
Telephone number

chris@trangosys.com
Email address of official

NOTE—This affirmation must be signed by the responsible party before it is submitted to a regulatory body for approval.

Section1: Summary of Test Results

General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15; Subpart C and IC RSS-210. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made in a 10m semi-anechoic chamber. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

Apparatus Assessed:	Outdoor Point-To-Point Wireless Microwave System
Model:	SL-24
Specification:	FCC Part 15 Subpart C, 15.249 IC RSS-210 Issue 8 December 2010
Date Received in Laboratory:	November 15, 2012
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None

1.1 Report Release History

REVISION	DATE	COMMENTS
-	January 29, 2013	Prepared By: Andreas Gillmeier
-	January 29, 2013	Initial Release: Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

Nemko USA Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko USA Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TESTED BY:  Date: JANUARY 29, 2013
Andreas Gillmeier, EMC Test Engineer

TABLE OF CONTENTS

1	Applicant Affirmation	2
	Section1: Summary of Test Results	3
1.1	Report Release History	4
	Section 2: Equipment Under Test	6
2.1	Samples Submitted for Assessment	6
2.2	Theory of Operation	7
2.3	Technical Specifications of the EUT	7
	Section 3: Test Conditions	8
3.1	Specifications	8
3.2	Deviations From Laboratory Test Procedures	8
3.3	Test Environment	8
3.4	Test Equipment	9
	Section 4: Observations	10
4.1	Modifications Performed During Assessment	10
4.2	Record Of Technical Judgements	10
4.3	EUT Parameters Affecting Compliance	10
4.4	Test Deleted	10
4.5	Additional Observations	11
	Section 5: Results Summary	12
5.1	Test Results	12
	Appendix A: Test Results	13
	Power Line Conducted Emissions	13
	Section 15.215(c) – Occupied Bandwidth	18
	RSS-Gen Section 4.6.1 – Occupied Bandwidth	18
	Section 15.249 (b) (1) – Field Strength of Emissions – Radiated Power	44
	RSS-210 Annex 12 – Fixed Point-to-Point Systems in the Band 24.05–24.25 GHz	44
	Section 15.249 (a) and (d) – Spurious Emissions Outside of the band	68
	Section 15.249 (d) – Frequency stability	106
	Annex 12 – Frequency stability	106
	RSS-Gen 4.10 – Receiver Spurious Emissions	107

Section 2: Equipment Under Test

2.1 Samples Submitted for Assessment

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Outdoor Point-To-Point Wireless Microwave System	Trango Systems, Inc. Model: SL-24 Serial #: 8493464 SW version: 1p0r0d111412	Power-over-Ethernet or AC/DC Power Adapter
EUT – AD24G-1-T2 1 Ft/0.3m Diameter 24 GHz Antenna	Trango Systems, Inc. Part number: AD24G-1-T2 Serial #: NA	N/A
EUT – AD24G-2-T2 2 Ft/0.6m Diameter 24 GHz Antenna	Trango Systems, Inc. Part number: AD24G-2-T2 Serial #: NA	N/A
EUT – AD24G-3-T2 3 Ft/0.9m Diameter 24 GHz Antenna	Trango Systems, Inc. Part number: AD24G-3-T2 Serial #: TG12129001	N/A
Support –AC-DC Power Adapter	CINCON Electronics Co., Ltd. Model: TR70A48-02 S/N: 70-48-0007140	AC: 3 wire, IEC connector, unshielded, 6 feet, 18AWG DC: 2 wire unshielded, 3 feet, special connector w/ ferrite Steward 28A0807-0A2
Support –AC-DC Power Adapter for POE junction box	Trango Systems, Inc. Part number: P-Supply-WM-48-L Rev B Serial #: N/A	AC: 3 wire, IEC connector, unshielded, 7 feet, 18AWG DC: 2 wire unshielded, 3 feet, special connector
Support – Power-over-Ethernet junction box	Trango Systems, Inc. Part number: 310-9291 R1 Serial #: 00000003	N/A
Support – Laptop	Samsung Model: NP700Z5B Serial: HK2L93NE907049W	N/A
Support – Power Supply for Laptop	Delta Electronics Inc. Model: SADP-90FH D Serial: CNBA4400215ABZ0418P0996 Rev2	AC: 3 wire, IEC connector, unshielded, 3 feet, 18AWG DC: 2 wire unshielded, 4 feet, barrel connector

CONNECTION	I/O CABLE
IF RX to IF TX	SMA cable, shielded, 2 feet
3 x Ethernet cable	4 pair x 26 AWG, shielded, Cat 5e, 32 feet



2.2 Theory of Operation

The SL-24 is an Outdoor Point-To-Point Wireless Microwave System. Its function is to transfer large amounts of data between two locations via a point-to-point link on 24 GHz.

2.3 Technical Specifications of the EUT

Manufacturer:	Trango Systems, Inc.
Operating Frequency:	24.05 to 24.25 GHz in the 24000-24250 MHz Band
Operating Frequencies (MHz): 10 MHz Channels Low Center 24055, 24065, 24075, 24085, 24095, 24105, 24115, 24125, 24135, 24145 High Center 24155, 24165, 24175, 24185, 24195, 24205, 24215, 24225, 24235, 24245 14 MHz Channels Low Center 24058, 24072, 24086, 24100, 24114, 24128, 24142 High Center 24157, 24171, 24185, 24199, 24213, 24227, 24241 20 MHz Channels Low Center 24060, 24080, 24100, 24120, 24140 High Center 24160, 24180, 24200, 24220, 24240 25 MHz Channels Low Center 24064, 24089, 24114, 24139 High Center 24162, 24187, 24212, 24237 30 MHz Channels Low Center 24066, 24096, 24126 High Center 24164, 24194, 24234 40 MHz Channels Low Center 24071, 24129 High Center 24171, 24229 50 MHz Channels Low Center 24075, 24125 High Center 24125, 24225 60 MHz Channels Low Center 24081 High Center 24215	
Rated Field Strength:	127.69 dBµV/m Peak @ 3 meters or 2424 mV/m
Modulation:	QPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM
Antenna Type:	AD24G-1-T2 1 Ft/0.3m Diameter 24 GHz Antenna, max. 36.2 dBi gain AD24G-2-T2 2 Ft/0.6m Diameter 24 GHz Antenna, max. 41.1 dBi gain AD24G-3-T2 3 Ft/0.9m Diameter 24 GHz Antenna, 44.5 dBi gain
Antenna Connector:	Custom Dual Polarization circular waveguide and latching mechanism Diameter 10.06 mm
Power Source:	-48 V DC

Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.249

Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz bands.

IC RSS-210 Issue 8 December 2010

Low-power Licence-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment. Annex 12 - Fixed Point-to-Point Systems in the Band 24.05-24.25 GHz

IC RSS-Gen Issue 3 December 2010

General Requirements and Information for the Certification of Radio-communication Equipment

3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	20-23 °C
Humidity range	29-54%

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
901	pre amp	Sonoma	310 N	130607	10/15/2012	10/15/2013
911	911	Spectrum Analyzer	Agilent	E4440A	US41421266	10/15/2012
752	Antenna, DRWG	EMCO	3115	4943	12/2/2010	12/2/2012
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	9/6/2012	9/6/2013
317	Preamplifier	HP	8449A	2749A00167	6/11/2012	6/11/2013
877	Antenna, DRG Horn, .7-18GHz	AH Systems	SAS-571	688	9/13/2012	9/13/2014
128	Antenna, Bicon	EMCO	3104	2882	3/21/2011	3/21/2013
110	Antenna, LPA	Electrometrics	LPA-25	1217	4/1/2011	4/1/2013
E1013	DRG Horn (Small)	EMCO	3116	00119488	1/10/2012	1/10/2014
836	Signal Generator	Agilent	E8254A	US41140229	3/7/2012	3/7/2013
S1031	5m/16' Measuring Tape	Stanley	33-158	N/A	NCR	NCR
711	Spectrum Analyzer	HP	8566B	2747A04729	12/28/2011	12/28/2012
404	Spectrum Analyzer Display	HP	85662A	2648A15448	12/28/2011	12/28/2012
E1018	9kHz to 7GHz Spectrum Analyzer	Rohde & Schwarz	FSP7	835363/0003	2/23/2012	2/23/2013
E1020	Two Line V-Network	Rohde & Schwarz	ENV216	101044	4/6/2012	4/6/2013
E1032	CISPR 22: Balanced Telecom ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02-09, Including T8ALCL-1	112254	12/19/2011	12/19/2012
N157	DC Power Supply	Kikusui	PAD 110-10L		NCR	NCR
814	Multimeter	Fluke	111	78130063	10/15/2012	10/15/2013
N149	Environmental Chamber	Cincinnati Sub-Zero	ZPHS-32-2-2-H/AC	ZP0552665	4/16/2012	4/16/2013

From Dallas:

Nemko Dallas ID	Device	Manufacturer	Model	Serial Number	Last Cal	Next Cal
983	Preamplifier, 18-40 GHz	Nemko USA, Inc.	BB1	1	10/26/2012	10/26/2013
984	Antenna, Horn	Millitech	SGH-19-RP000	-	-	-
985	Antenna, Horn	Millitech	SGH-15-RP000	-	-	-
987	Harmonic Mixer	Hewlett Packard	5356D	2521A00583	-	-
989	Harmonic Mixer	Hewlett Packard	11970U	2332A00116	-	-
990	Antenna, Horn	Millitech	SGH-10-RP000	-	-	-

Registration of the 10m Semi-anechoic chamber is on file with the Federal Communications Commission and with Industry Canada under Site Number 2040B-3.



Section 4: Observations

4.1 Modifications Performed During Assessment

The following design modifications were made to the EUT during testing.

To pass conducted emissions, the power cord for the POE adapter was shortened.

To pass radiated emissions a ferrite (Steward 28A0807-0A2) was added close to the DC connector on the EUT side with one turn.

To pass frequency error the TX frequencies were redefined.

To pass bandedge measurement the highest and lowest TX frequencies were adjusted. Frequencies in red are offset 1MHz from original channel plan to meet Band Edge requirements.

Channel Width	Low Channel	High Channel
10	24.055	24.245
14	24.058	24.241
20	24.060	24.240
25	24.0635	24.2375
30	24.066	24.234
40	24.071	24.229
50	24.075	24.225
60	24.081	24.215

4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

4.4 Test Deleted

No Tests were deleted from this assessment.

4.5 Additional Observations

There were no additional observations made during this assessment.



Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C: §15.249
IC RSS-210 Issue 8 December 2010
IC RSS-Gen Issue 3 December 2010

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant

Y Yes: Mandatory i.e. the apparatus shall conform to these tests.

N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

5.1 Test Results

Part 15C	Industry Canada	Test Description	Required	Result
15.207	RSS-210 2.5	Conducted Emission Limit	Y***	Pass
15.215(c)	RSS-Gen 4.6.3	20 dB Bandwidth	Y	Pass
15.249(b) (1)	RSS-210 Annex 12(a)	Field Strength of Emissions	Y	Pass
15.249(a)	A12(d)	Spurious Emissions Outside of the band	Y	Pass
15.249(b) (2)	A12(b)	Frequency Tolerance	Y	Pass
15.109 (a)	RSS-Gen 4.10 & RSS-Gen 6.1	Receiver Spurious Emissions	N/T*	

N* = EUT only employ battery power for operation and doesn't operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

N/T* = EUT does not have a separate receive mode. Configured to transmit/receive only.

*** Device is professionally installed in non-residential areas.

Appendix A: Test Results

Power Line Conducted Emissions

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Test Conditions:

Sample Number:	SL-24	Temperature:	20°C
Date:	December 19, 2012	Humidity:	54 %
Modification State:		Tester:	Andreas Gillmeir
		Laboratory:	Nemko Ground Plane 3

Test Results: EUT complies

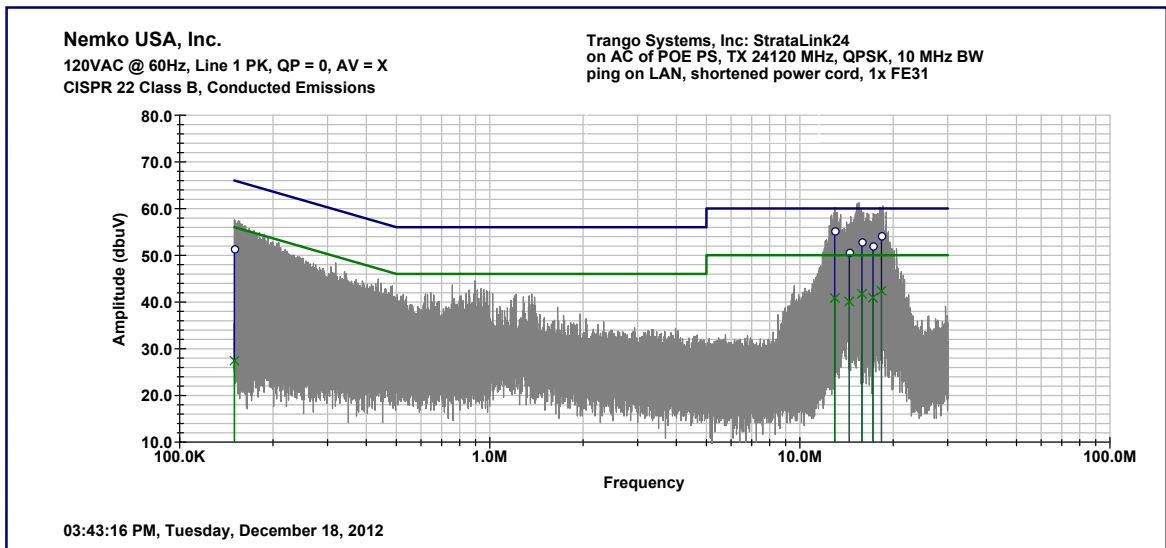
See attached plots

Additional Observations:

- EUT was tested using the following modes: Transmit and Receive Test Mode.
- Green limit line is Average limit and blue limit line is Quasi-peak limit.
- 0 represents final quasi peak measurements while x represent final average measurements.
- Instrumentation settings are 9kHz RBW/30kHz VBW for Average measurements and 100kHz RBW/100kHz VBW for Peak measurements.

Transmit and Receive

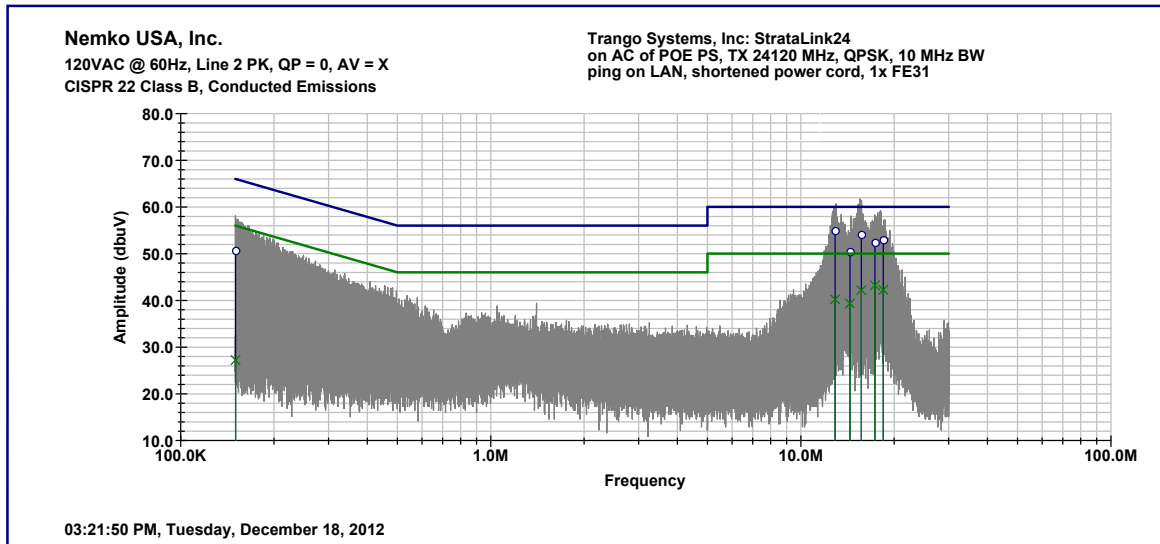
Graphical Data



Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
150.171	51.4	27.4	66.0	56.0	-14.6	-28.6
12960.100	55.2	40.8	60.0	50.0	-4.8	-9.2
14432.500	50.6	40.1	60.0	50.0	-9.4	-9.9
15860.800	52.8	41.8	60.0	50.0	-7.2	-8.2
17221.100	52.0	40.9	60.0	50.0	-8.0	-9.1
18329.900	54.2	42.4	60.0	50.0	-5.8	-7.6

Graphical Data



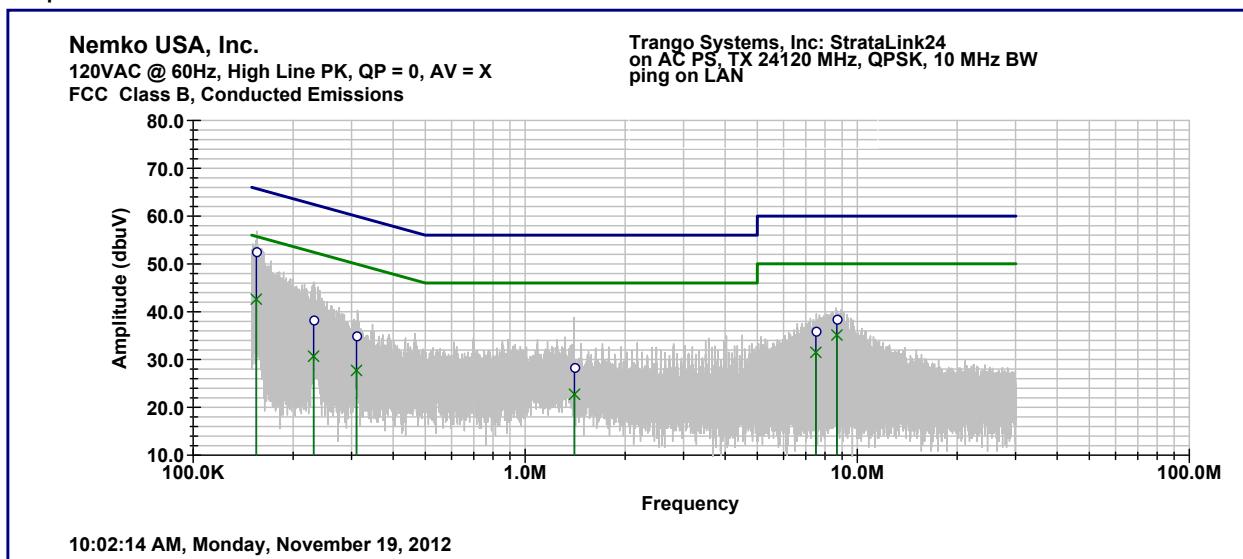
Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
150.3	50.7	27.2	66.0	56.0	-15.3	-28.8
12890.4	54.9	40.2	60.0	50.0	-5.1	-9.8
14396.5	50.5	39.3	60.0	50.0	-9.5	-10.7
15669.3	54.1	42.2	60.0	50.0	-5.9	-7.8
17342.6	52.4	43.2	60.0	50.0	-7.6	-6.8
18450.2	53.0	42.2	60.0	50.0	-7.0	-7.8

Transmit and Receive with AC supplied directly to the DC power port

Limits FCC15C.207

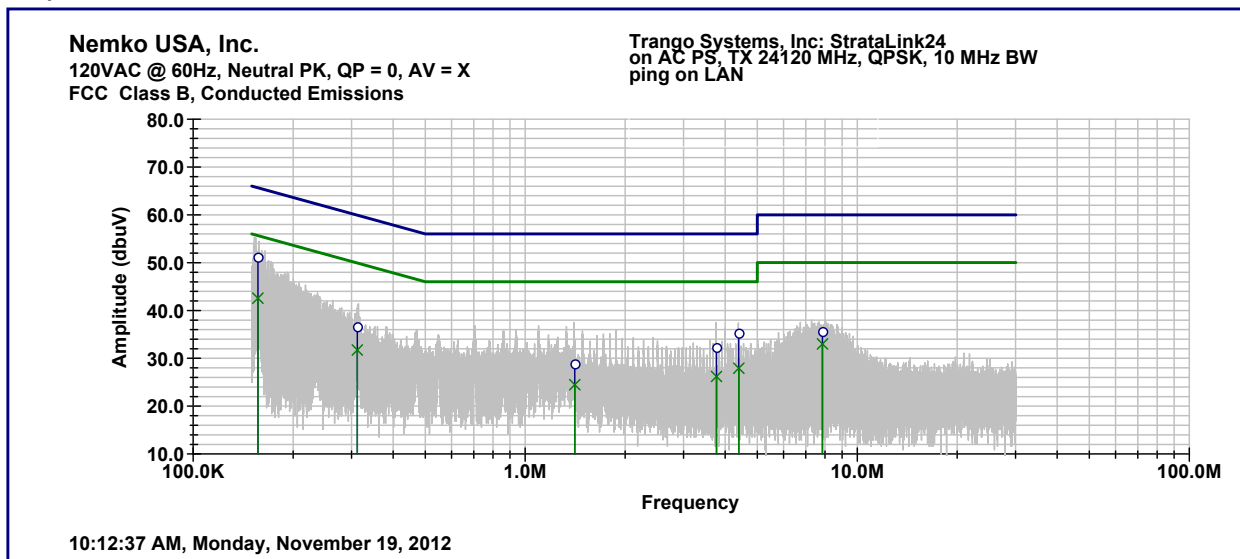
Graphical Data line 1



Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
154.948	52.6	42.6	65.7	55.7	-13.1	-13.1
230.531	38.3	30.7	62.4	52.4	-24.1	-21.7
310.346	35.0	27.7	60.0	50.0	-25.0	-22.3
1406.870	28.4	22.7	56.0	46.0	-27.6	-23.3
7496.530	35.9	31.5	60.0	50.0	-24.1	-18.5
8672.750	38.5	35.1	60.0	50.0	-21.5	-14.9

Graphical Data line 2



Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
156.675	51.2	42.6	65.6	55.6	-14.4	-13.0
312.160	36.6	31.7	59.9	49.9	-23.3	-18.2
1410.110	28.8	24.5	56.0	46.0	-27.2	-21.5
3767.570	32.3	26.2	56.0	46.0	-23.7	-19.8
4395.300	35.3	27.9	56.0	46.0	-20.7	-18.1
7851.110	35.6	33.0	60.0	50.0	-24.4	-17.0

Section 15.215(c) – Occupied Bandwidth

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

RSS-Gen Section 4.6.1 – Occupied Bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

Test Conditions:

Sample Number:	SL-24	Temperature:	20 °C
Date:	January 26, 2013	Humidity:	65 %
Modification State:	Low, Mid and High Channel	Tester:	MARK PHILIPS
		Laboratory:	Nemko

Test Results:

See attached plots

Additional Observations:

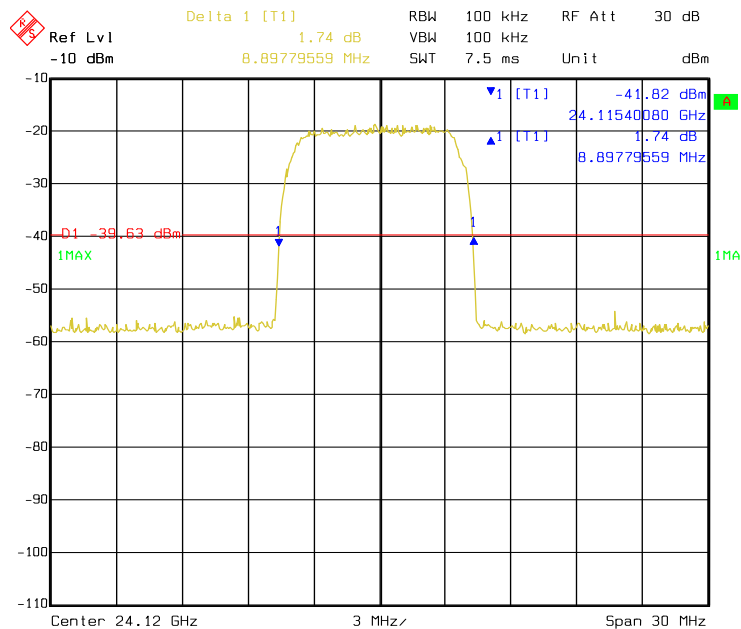
- Span is wide enough to capture the channel transmission
- RBW is 1% of the span or worst case
- Sweep is auto

- Detector is Peak
- Trace is Max Hold
- A peak output max hold reading was taken. The 20 dB bandwidth was determined with the spectrum analyser's 20 dB down function.
- Per Industry Canada requirement, another measurement was made using the built-in OBW measuring feature of the spectrum analyser with power BW of 99%.

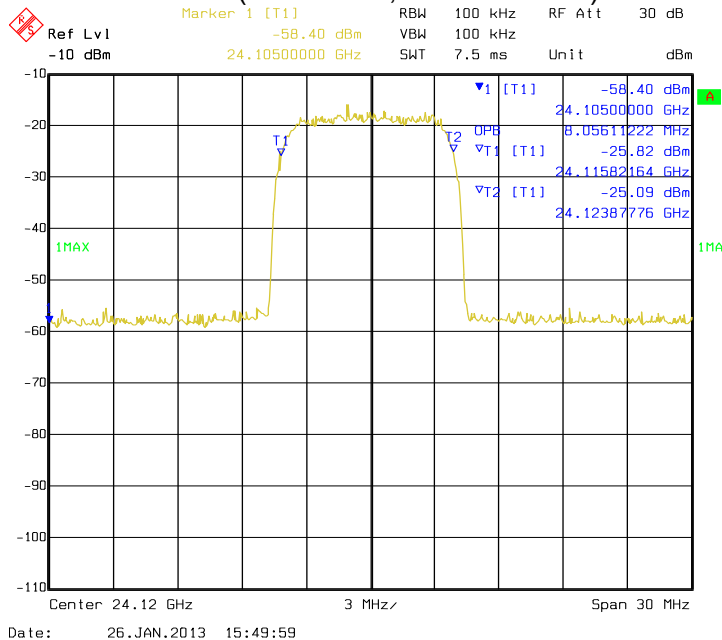
Mode:	20 dB Bandwidth	99% Bandwidth
24120MHz, 10 MHz 8PSK	8.898 MHz	8.056 MHz
24120MHz, 14 MHz 8PSK	14.309 MHz	13.166 MHz
24120MHz, 20 MHz 8PSK	18.877 MHz	17.194 MHz
24120MHz, 25 MHz 8PSK	24.449 MHz	22.545 MHz
24120MHz, 30 MHz 8PSK	30.721 MHz	28.196 MHz
24120MHz, 40 MHz 8PSK	41.102 MHz	37.875 MHz
24120MHz, 50 MHz 8PSK	49.900 MHz	46.292 MHz
24120MHz, 60 MHz 8PSK	61.522 MHz	57.114 MHz
24120MHz, 10 MHz QPSK	8.778 MHz	8.079 MHz
24120MHz, 10 MHz QAM64	8.778 MHz	8.079 MHz
24120MHz, 14 MHz QPSK	14.309MHz	13.214 MHz
24120MHz, 14 MHz QAM128	14.309 MHz	13.151 MHz
24120MHz, 20 MHz QPSK	18.818 MHz	17.347 MHz
24120MHz, 20 MHz QAM1024	18.818 MHz	17.325 MHz
24120MHz, 25 MHz QPSK	24.349 MHz	22.725 MHz
24120MHz, 25 MHz QAM1024	24.449 MHz	22.585 MHz
24120MHz, 30 MHz QPSK	30.721 MHz	28.267 MHz
24120MHz, 30 MHz QAM1024	30.581 MHz	28.196 MHz
24120MHz, 40 MHz QPSK	40.962 MHz	38.156 MHz
24120MHz, 40 MHz QAM1024	40.962 MHz	38.156 MHz
24120MHz, 50 MHz QPSK	50.000 MHz	46.152 MHz
24120MHz, 50 MHz QAM1024	50.000 MHz	46.152 MHz
24120MHz, 60 MHz QPSK	61.122 MHz	56.914 MHz
24120MHz, 60 MHz QAM1024	61.323 MHz	56.914 MHz

FCC ID: NCY-SL24
IC: 2945A-SL24

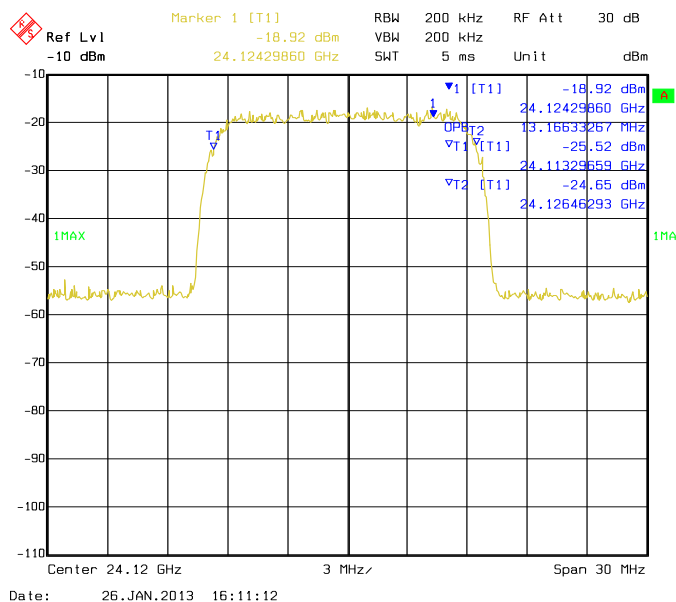
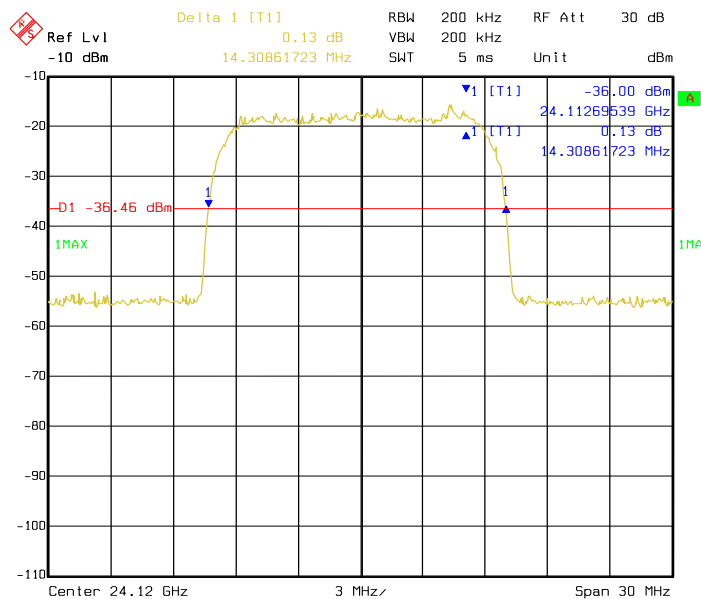
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Mid Channel (24120MHz, 10 MHz 8PSK) 20dB

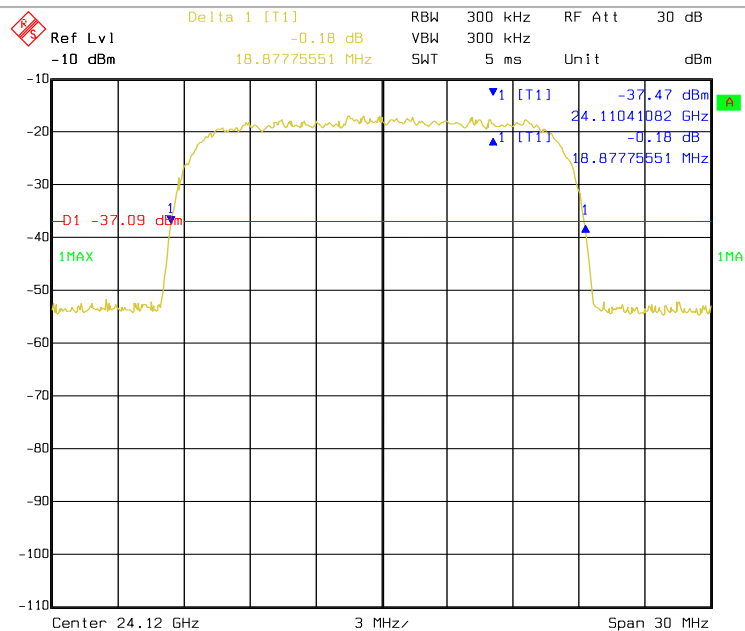


Mid Channel (24120MHz, 10 MHz 8PSK) 99% Occupied Bandwidth



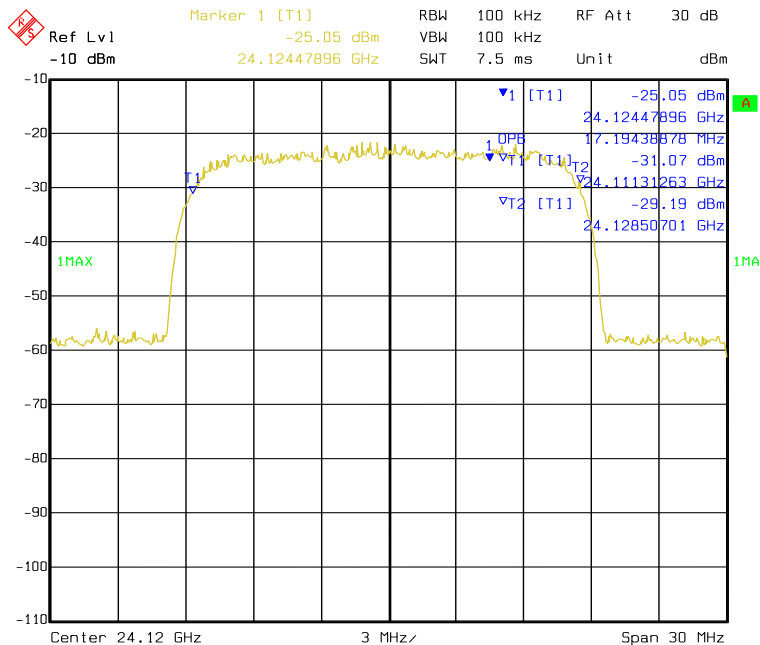
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 26.JAN.2013 16:07:11

Mid Channel (24120MHz, 20 MHz 8PSK) 20dB

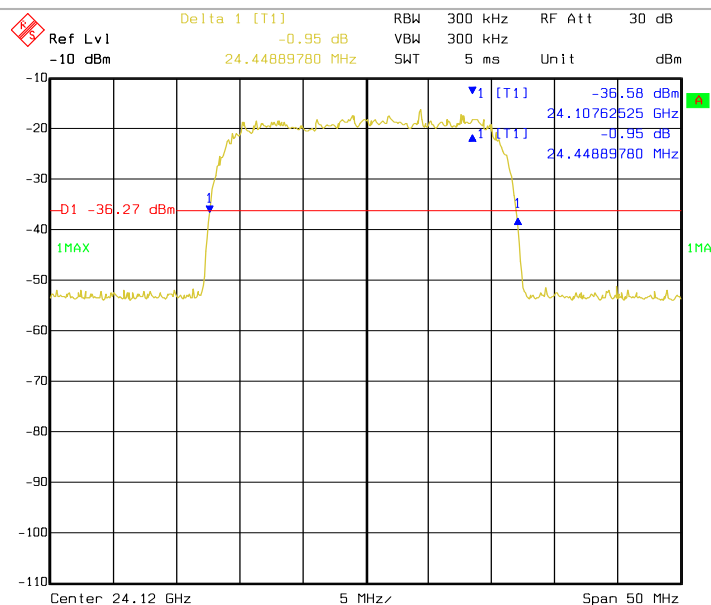


Date: 26.JAN.2013 16:03:37

Mid Channel (24120MHz, 20 MHz 8PSK) 99% Occupied Bandwidth

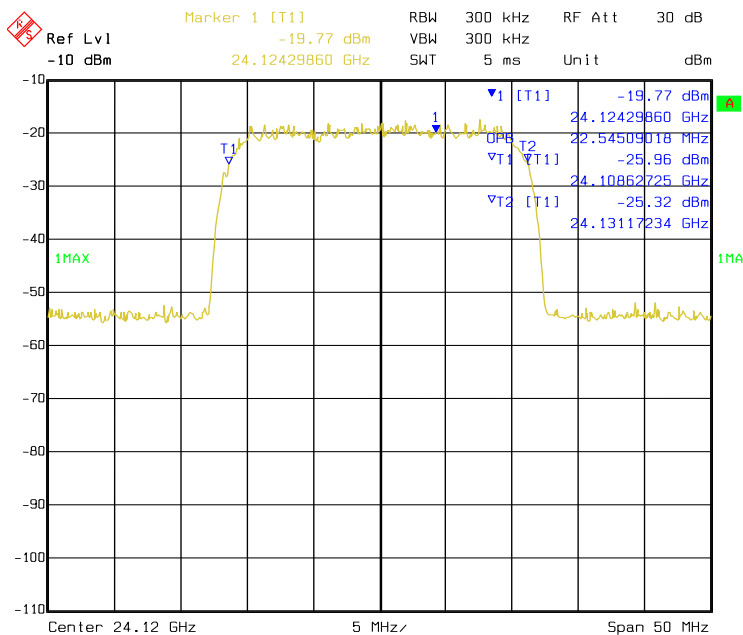
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 26.JAN.2013 16:35:57

Mid Channel (24120MHz, 25 MHz 8PSK) 20dB

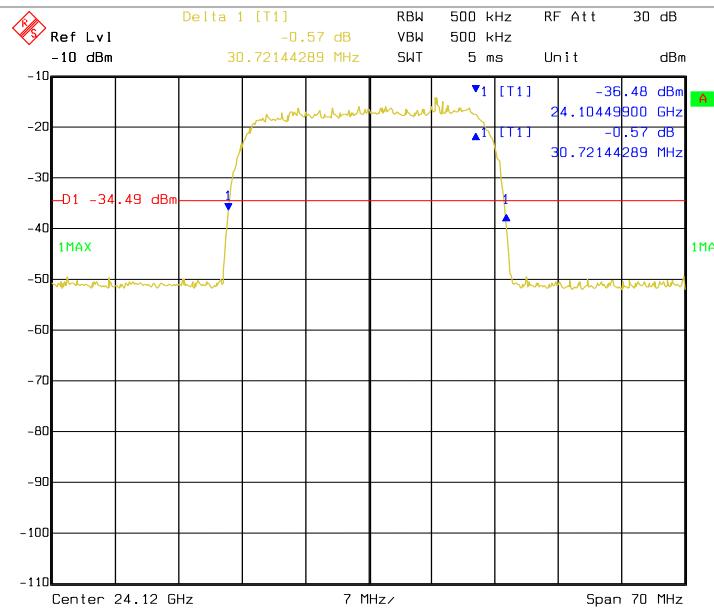


Date: 26.JAN.2013 16:31:59

Mid Channel (24120MHz, 25 MHz 8PSK) 99% Occupied Bandwidth

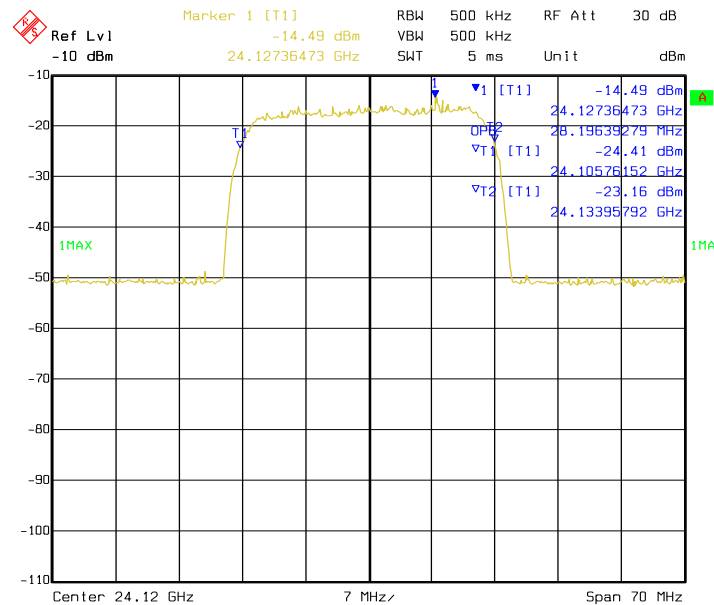
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 26.JAN.2013 16:38:40

Mid Channel (24120MHz, 30 MHz 8PSK) 20dB

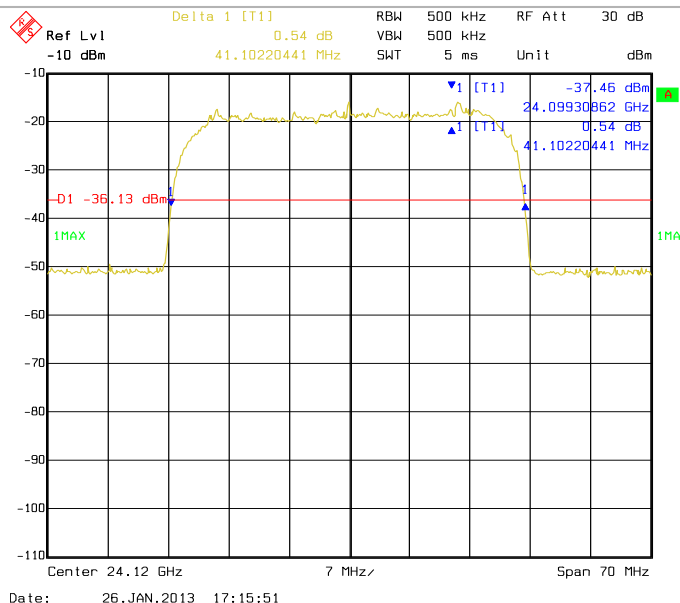


Date: 26.JAN.2013 16:41:04

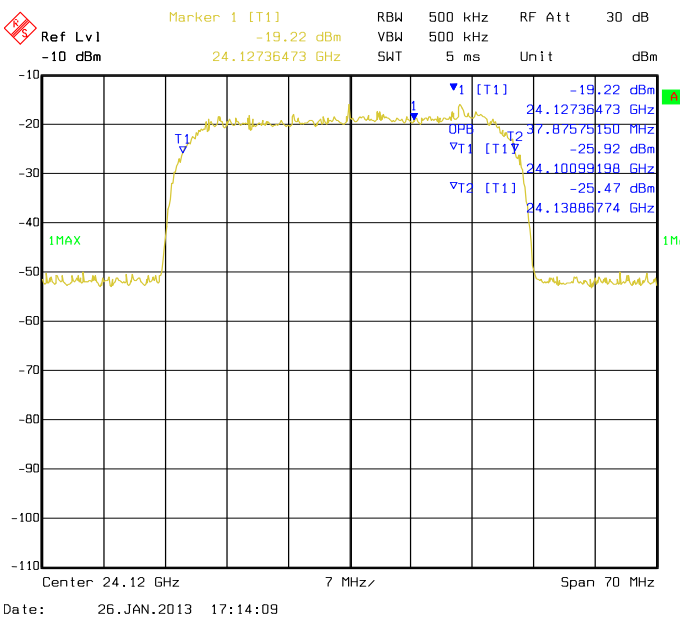
Mid Channel (24120MHz, 30 MHz 8PSK) 99% Occupied Bandwidth

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



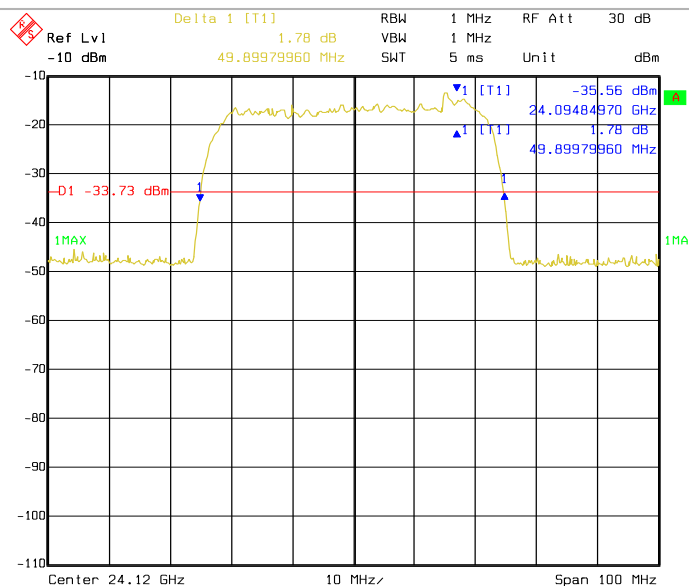
Mid Channel (24120MHz, 40 MHz 8PSK) 20dB



Mid Channel (24120MHz, 40 MHz 8PSK) 99% Occupied Bandwidth

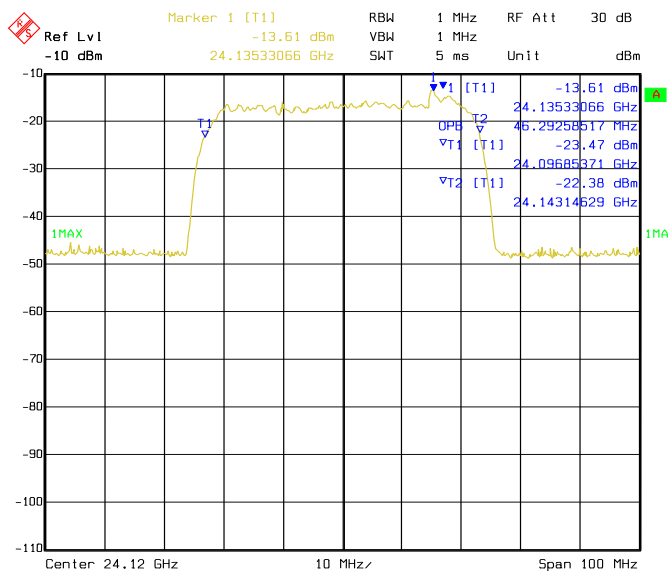
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 26.JAN.2013 17:19:14

Mid Channel (24120MHz, 50 MHz 8PSK) 20dB



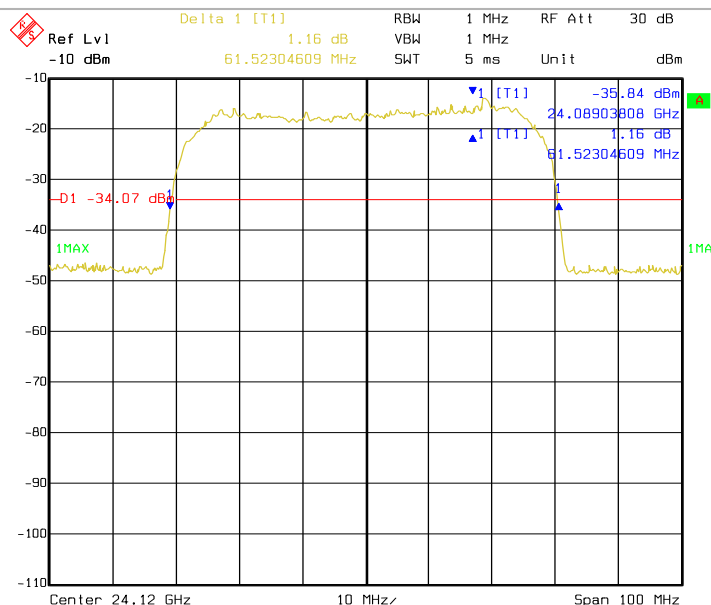
Date: 26.JAN.2013 17:20:55

Mid Channel (24120MHz, 50 MHz 8PSK) 99% Occupied Bandwidth

www.nemko.com

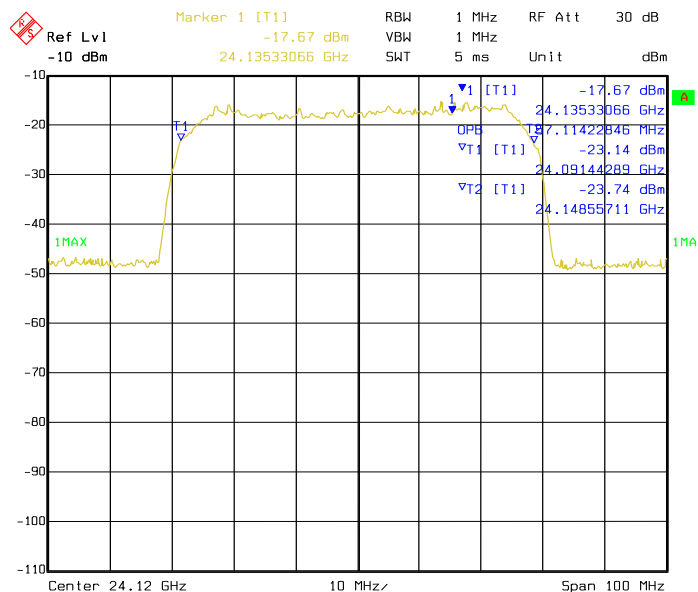
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 26.JAN.2013 17:25:38

Mid Channel (24120MHz, 60 MHz 8PSK) 20dB

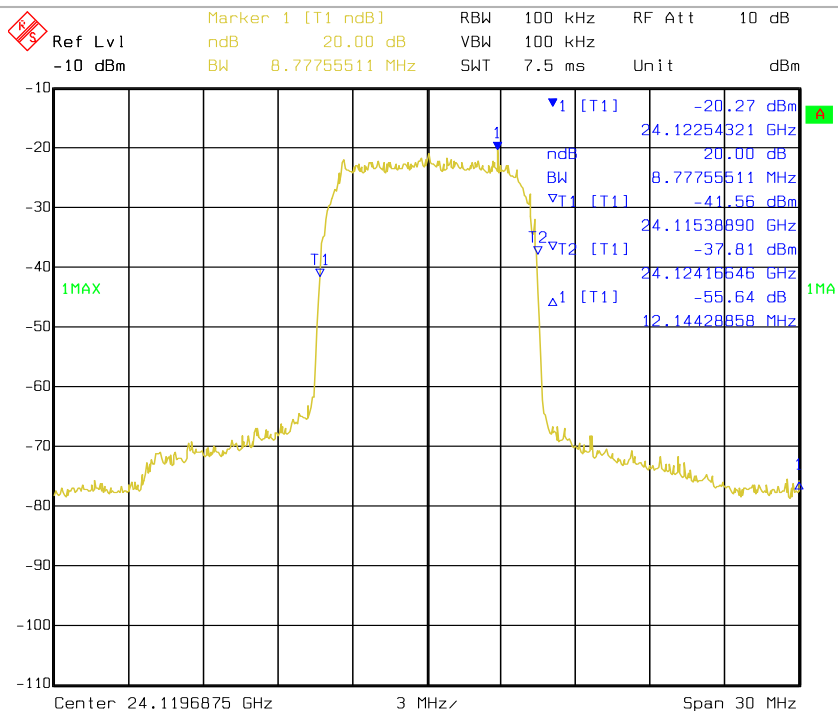


Date: 26.JAN.2013 17:24:06

Mid Channel (24120MHz, 60 MHz 8PSK) 99% Occupied Bandwidth

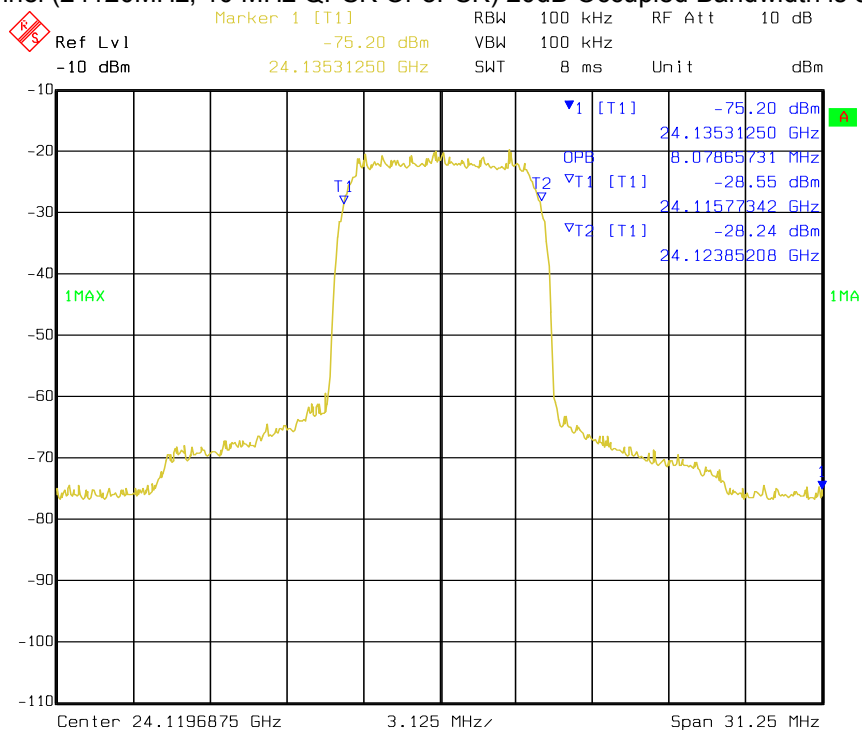
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:24:13

Mid Channel (24120MHz, 10 MHz QPSK Or 8PSK) 20dB Occupied Bandwidth is 8.778 MHz

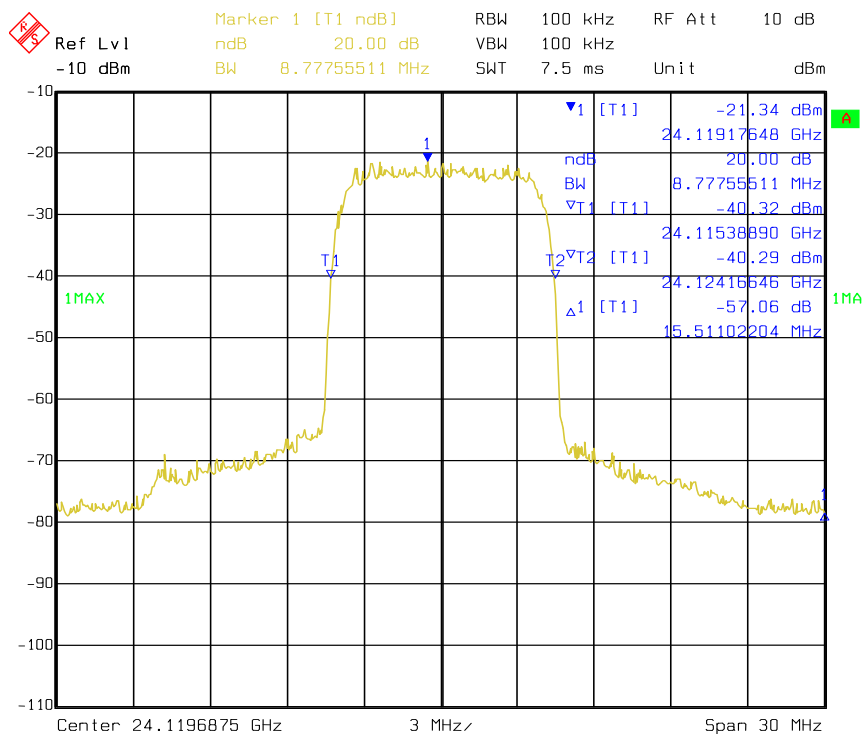


Date: 15.NOV.2012 15:23:03

Mid Channel (24120MHz, 10 MHz QPSK Or 8PSK)) 99% Occupied Bandwidth is 8.079 MHz

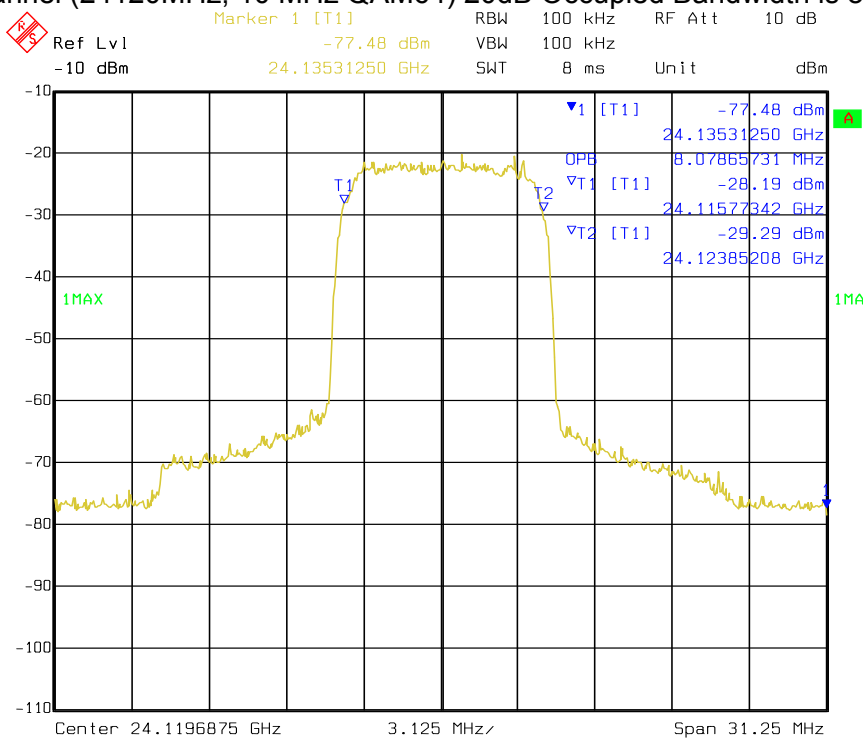
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:23:36

Low Channel (24120MHz, 10 MHz QAM64) 20dB Occupied Bandwidth is 8.778 MHz

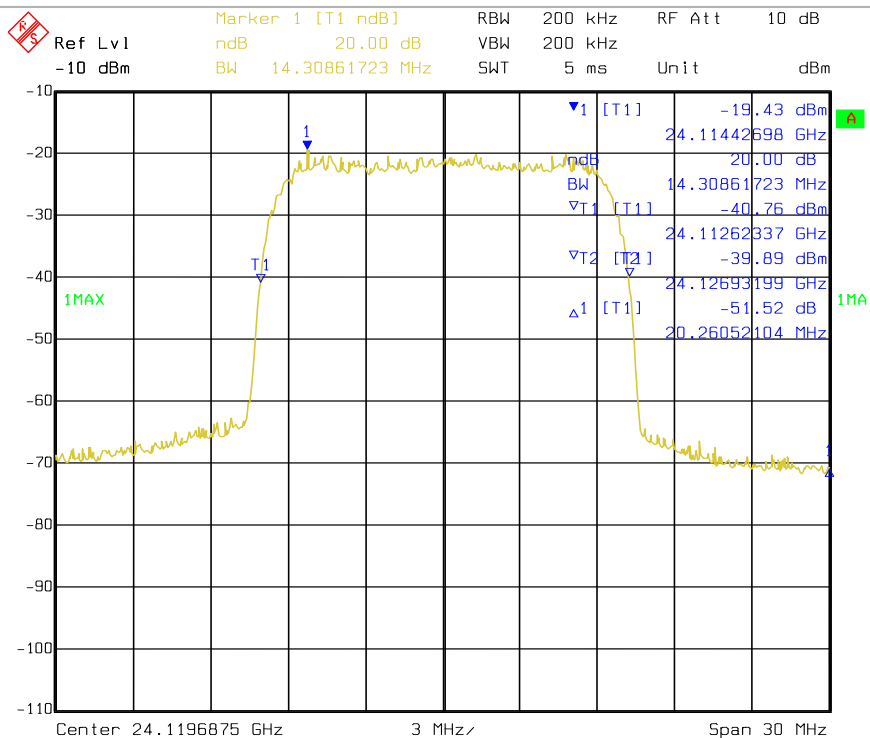


Date: 15.NOV.2012 15:25:49

Low Channel (24120MHz, 10 MHz QAM64) 99% Occupied Bandwidth is 8.079 MHz

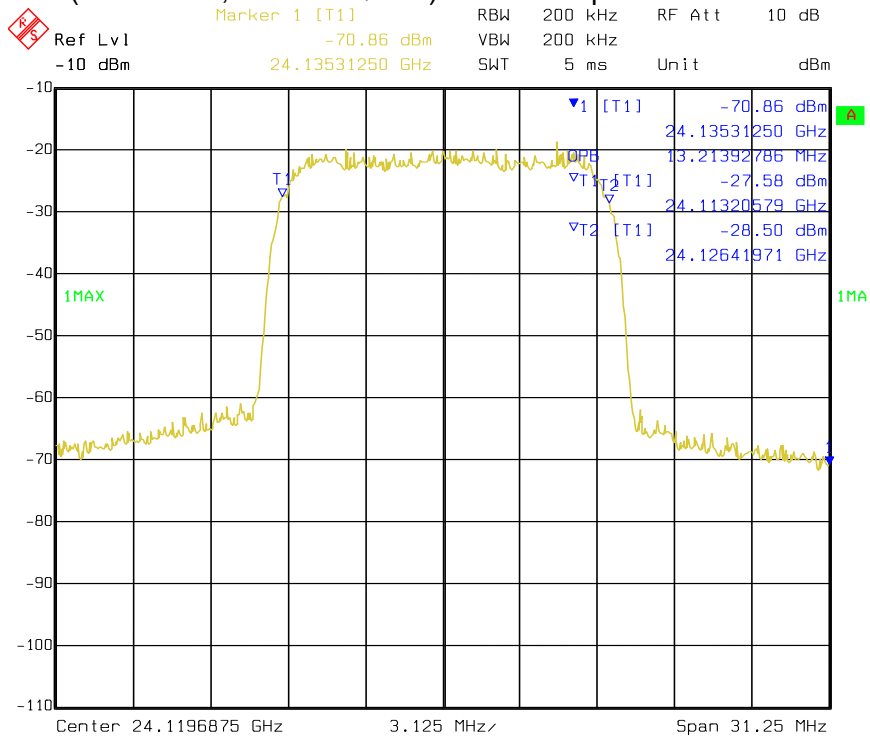
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:22:30

Mid Channel (24120MHz, 14 MHz QPSK) 20dB Occupied Bandwidth is 14.309 MHz

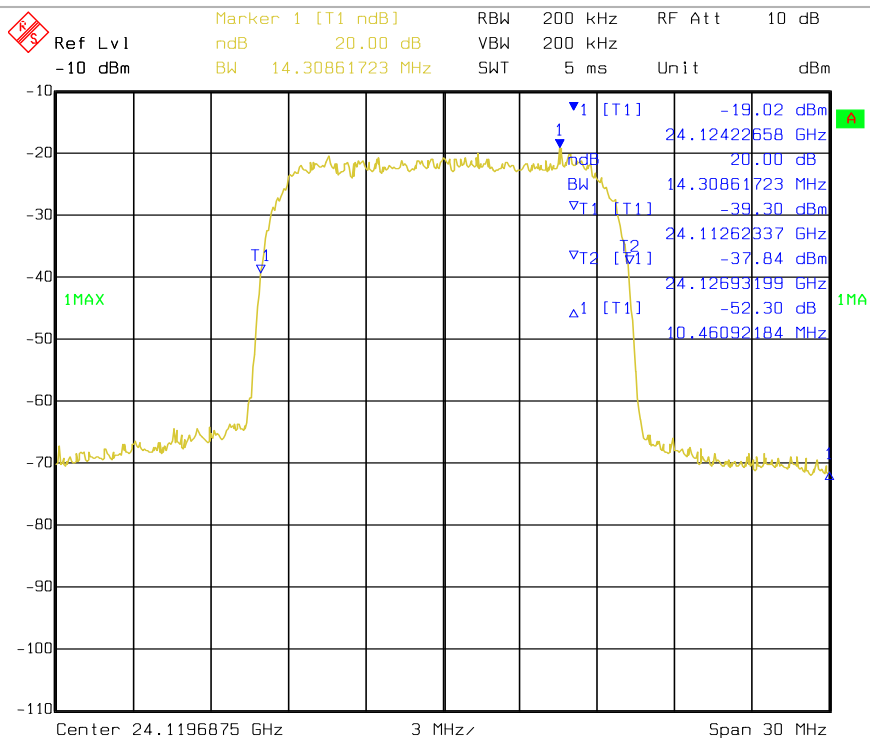


Date: 15.NOV.2012 15:30:55

Mid Channel (24120MHz, 14 MHz QPSK) 99% Occupied Bandwidth is 13.214 MHz

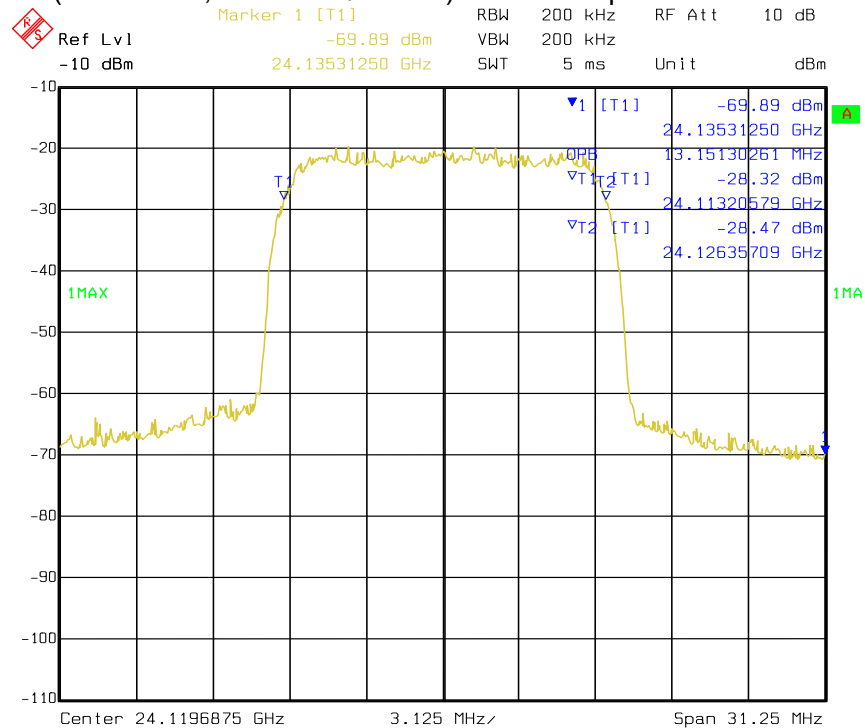
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:21:38

Mid Channel (24120MHz, 14 MHz QAM128) 20dB Occupied Bandwidth is 14.309 MHz

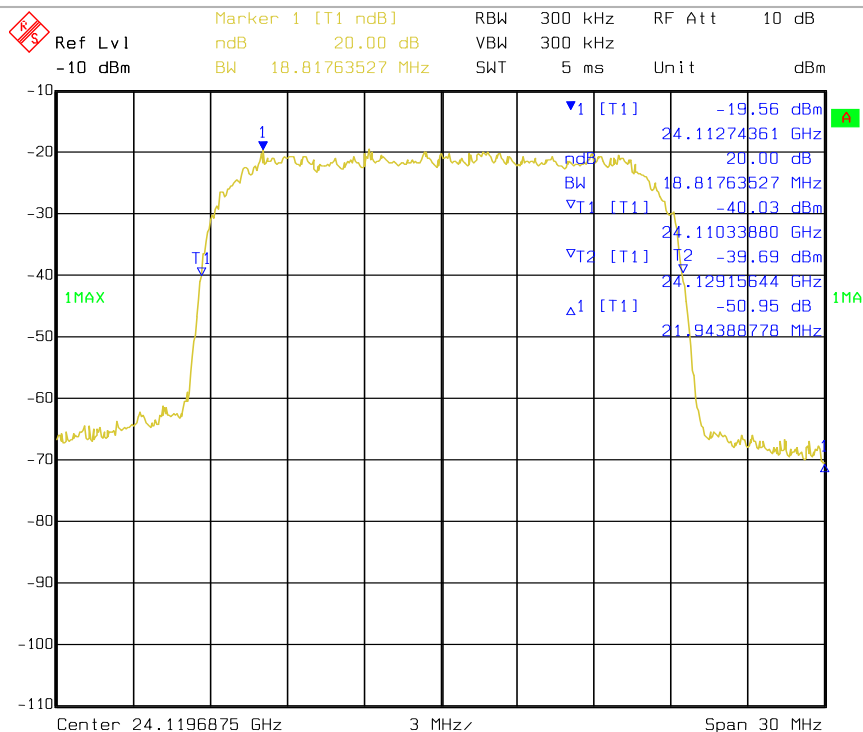


Date: 15.NOV.2012 15:29:50

Mid Channel (24120MHz, 14 MHz QAM128) 99% Occupied Bandwidth is 13.151 MHz

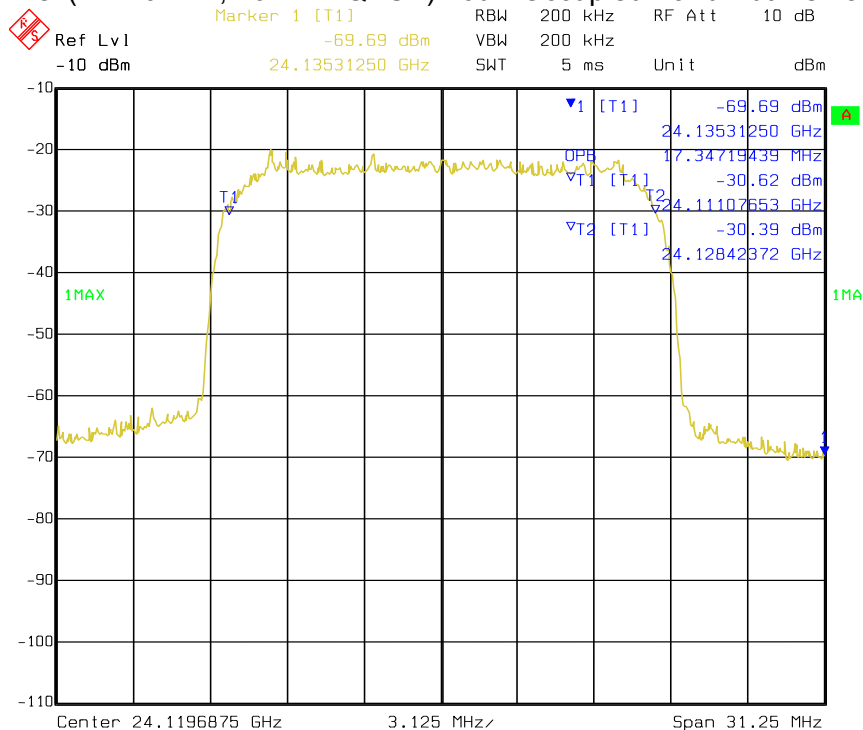
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:20:32

Mid Channel (24120MHz, 20 MHz QPSK) 20dB Occupied Bandwidth is 18.818 MHz

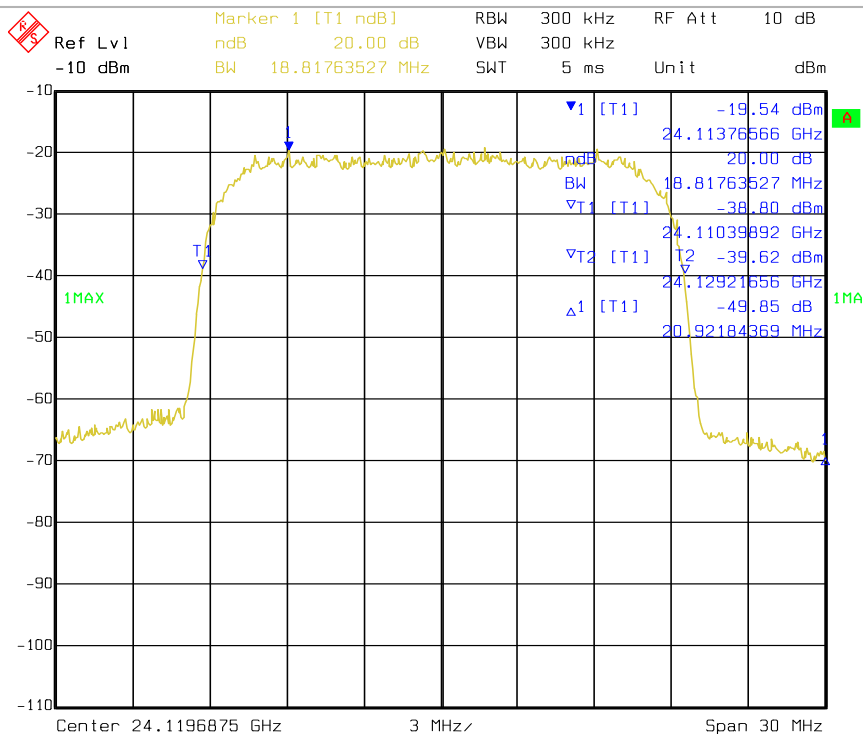


Date: 15.NOV.2012 15:31:41

Mid Channel (24120MHz, 20 MHz QPSK) 99% Occupied Bandwidth is 17.347 MHz

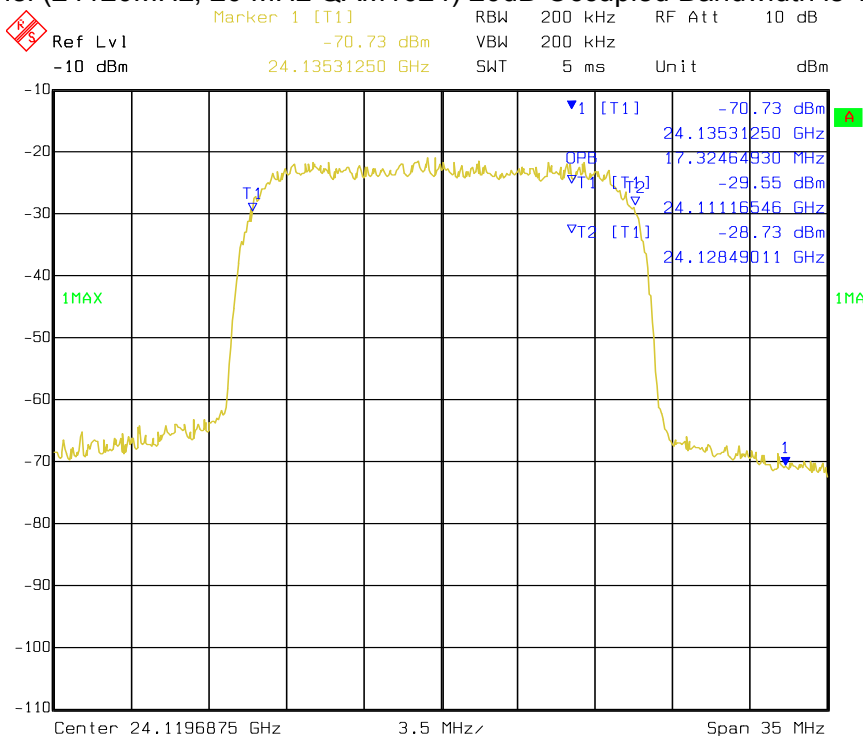
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:19:51

Mid Channel (24120MHz, 20 MHz QAM1024) 20dB Occupied Bandwidth is 18.818 MHz

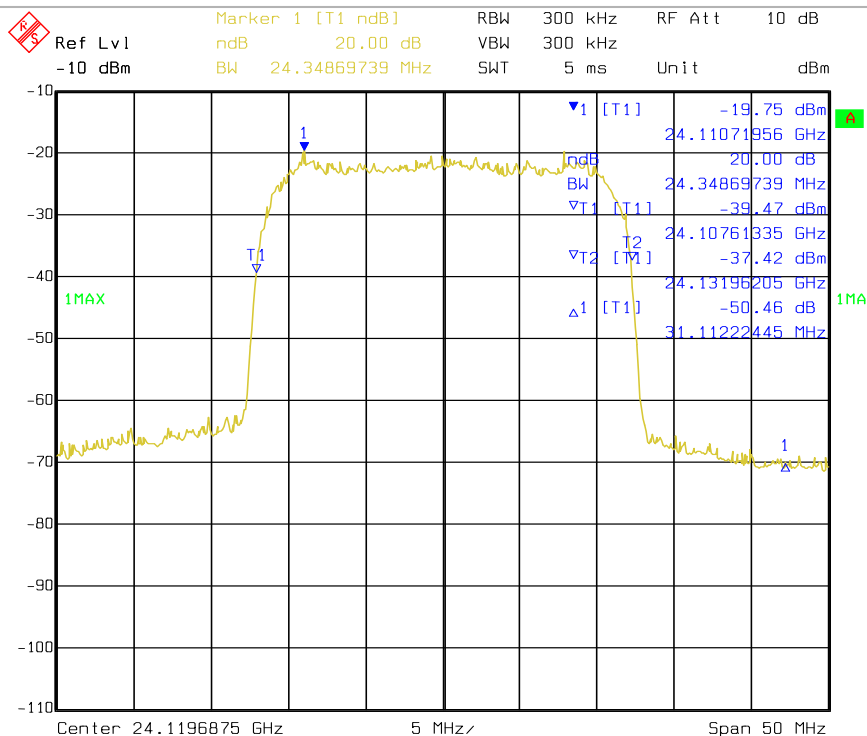


Date: 15.NOV.2012 15:38:46

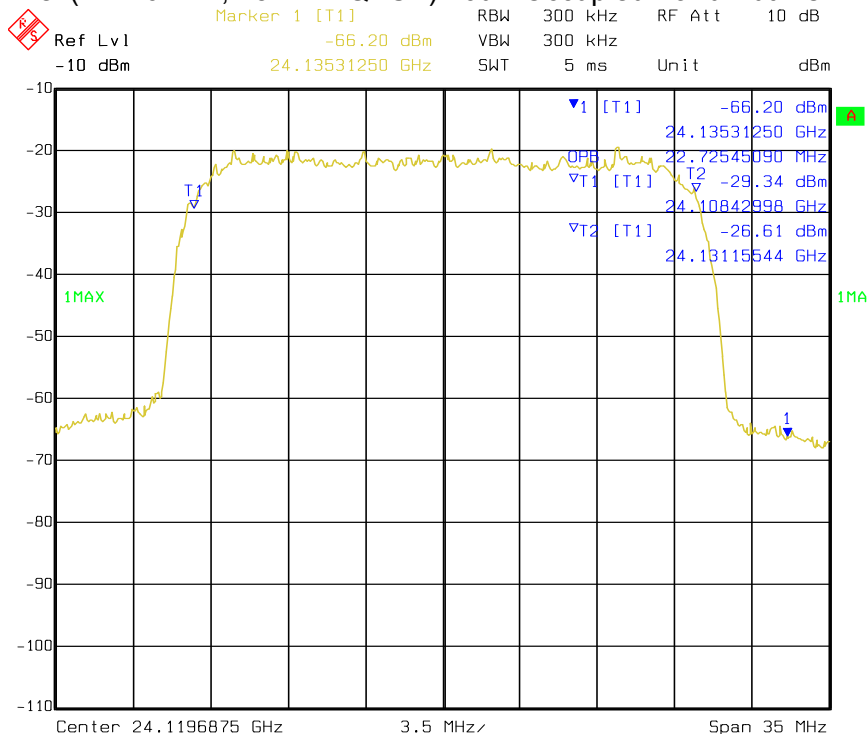
Mid Channel (24120MHz, 20 MHz QAM1024) 99% Occupied Bandwidth is 17.325 MHz

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



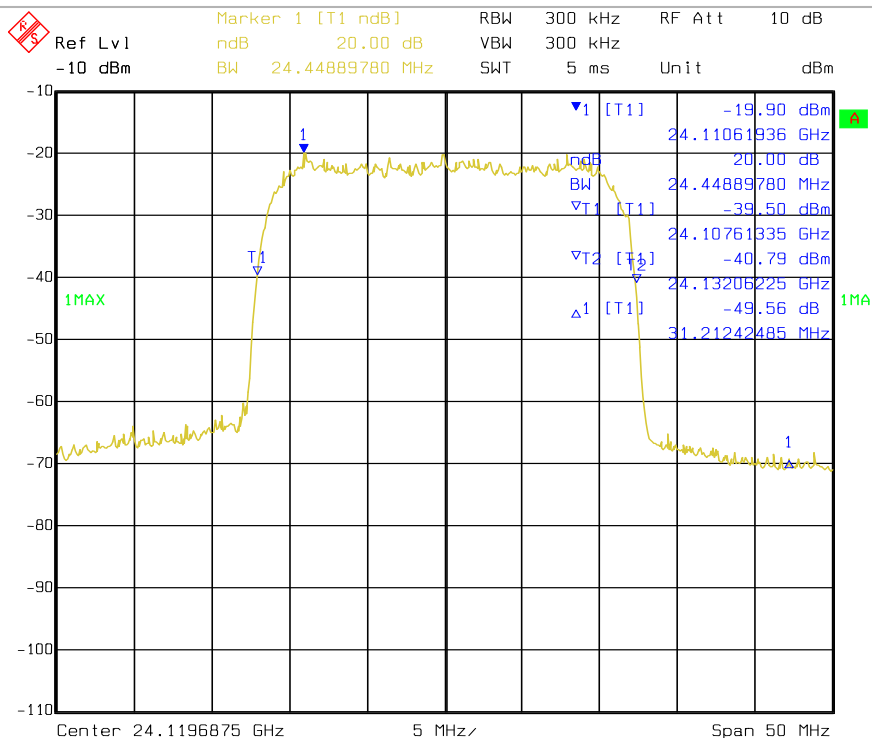
Mid Channel (24120MHz, 25 MHz QPSK) 20dB Occupied Bandwidth is 24.349 MHz



Mid Channel (24120MHz, 25 MHz QPSK) 99% Occupied Bandwidth is 22.725 MHz

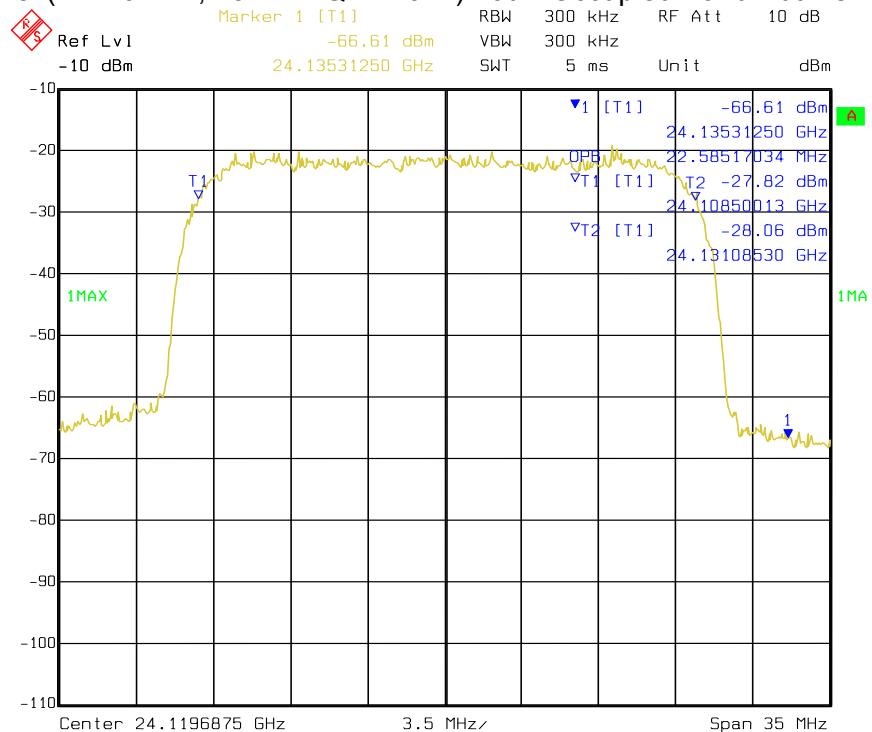
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:18:22

Mid Channel (24120MHz, 25 MHz QAM1024) 20dB Occupied Bandwidth is 24.449 MHz

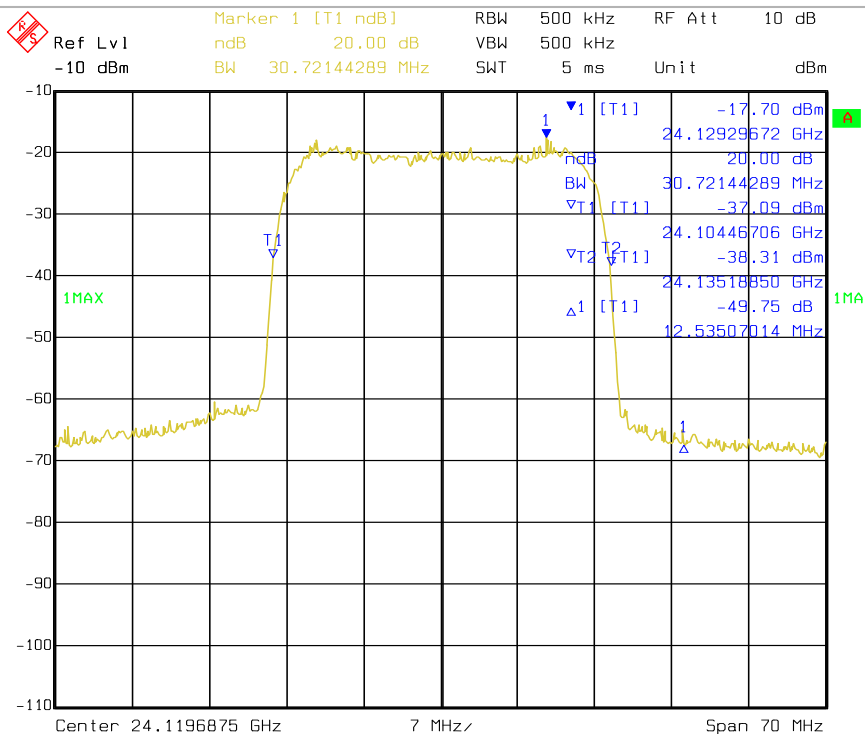


Date: 15.NOV.2012 15:36:44

Mid Channel (24120MHz, 15 MHz QAM1024) 99% Occupied Bandwidth is 22.585 MHz

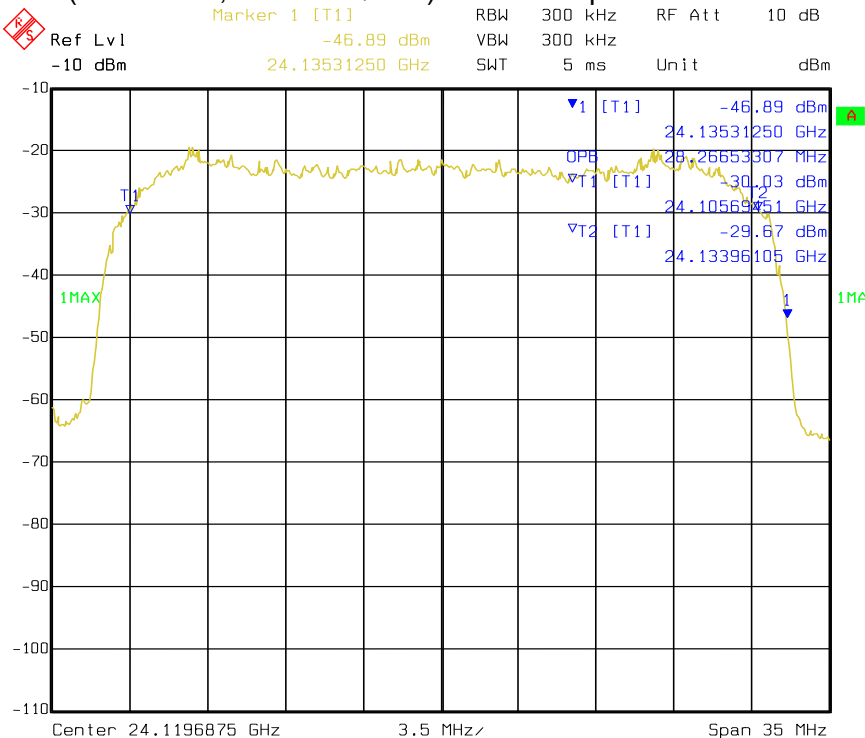
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:17:16

Mid Channel (24120MHz, 30 MHz QPSK) 20dB Occupied Bandwidth is 30.721 MHz

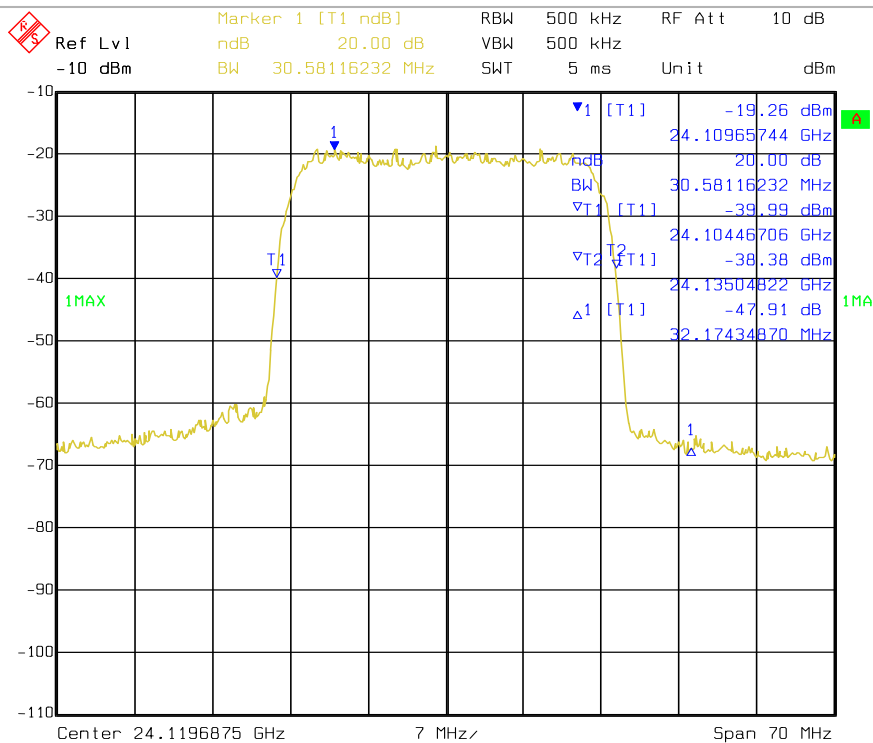


Date: 15.NOV.2012 15:34:36

Mid Channel (24120MHz, 30 MHz QPSK) 99% Occupied Bandwidth is 28.267 MHz

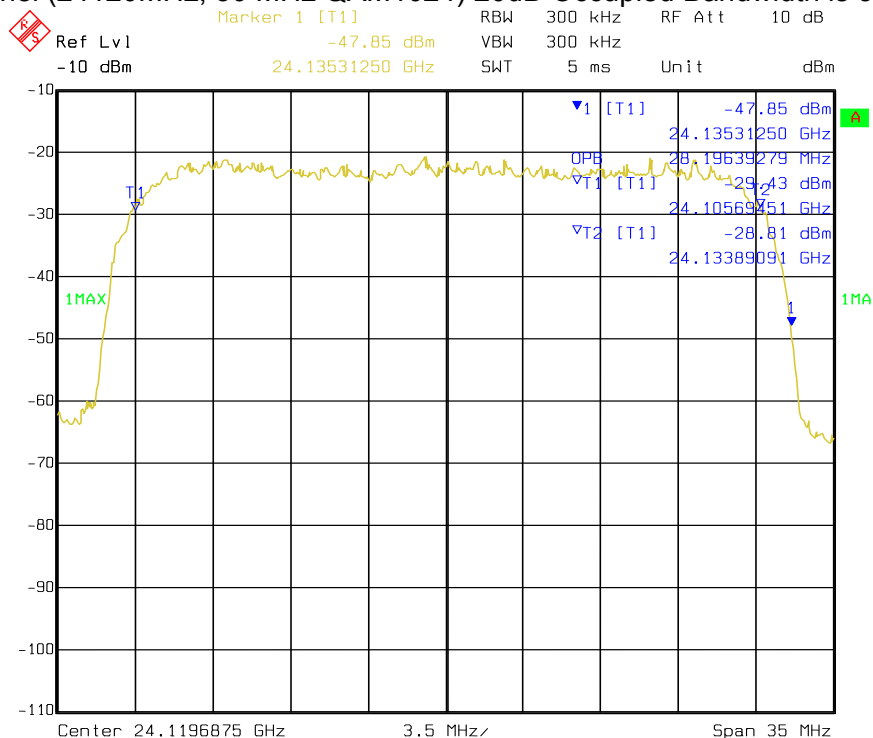
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:16:32

Mid Channel (24120MHz, 30 MHz QAM1024) 20dB Occupied Bandwidth is 30.581 MHz

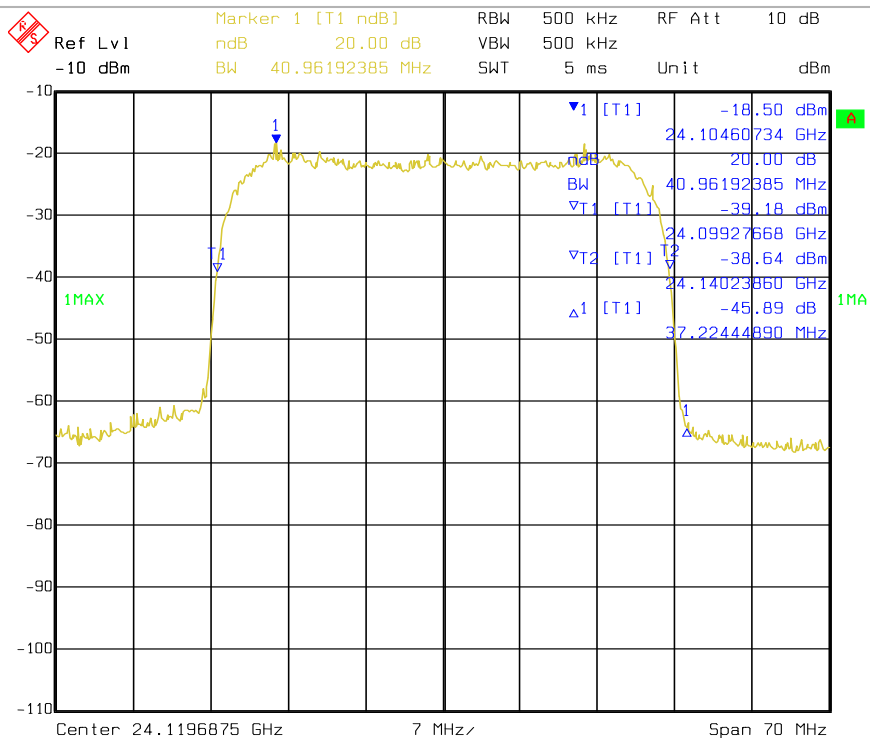


Date: 15.NOV.2012 15:35:43

Mid Channel (24120MHz, 30 MHz QAM1024) 99% Occupied Bandwidth is 28.196 MHz

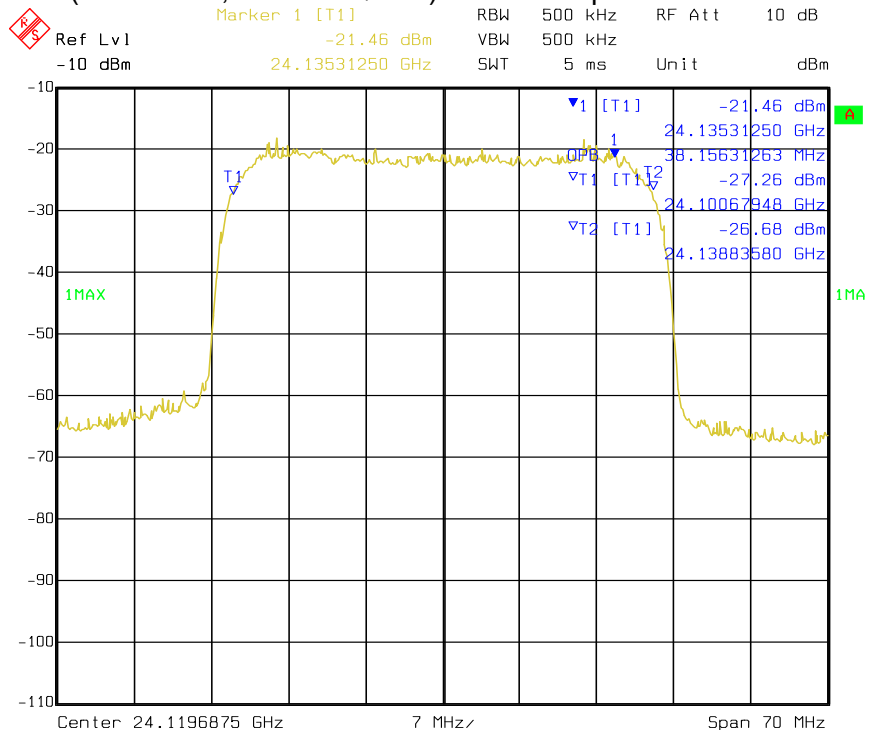
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:15:37

Mid Channel (24120MHz, 40 MHz QPSK) 20dB Occupied Bandwidth is 40.962 MHz

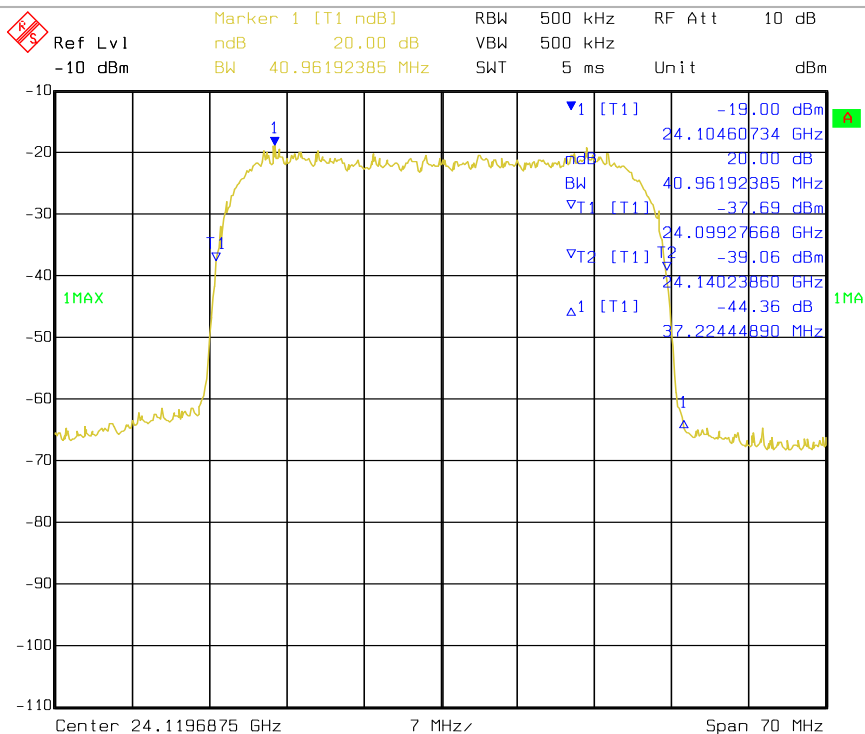


Date: 15.NOV.2012 15:40:45

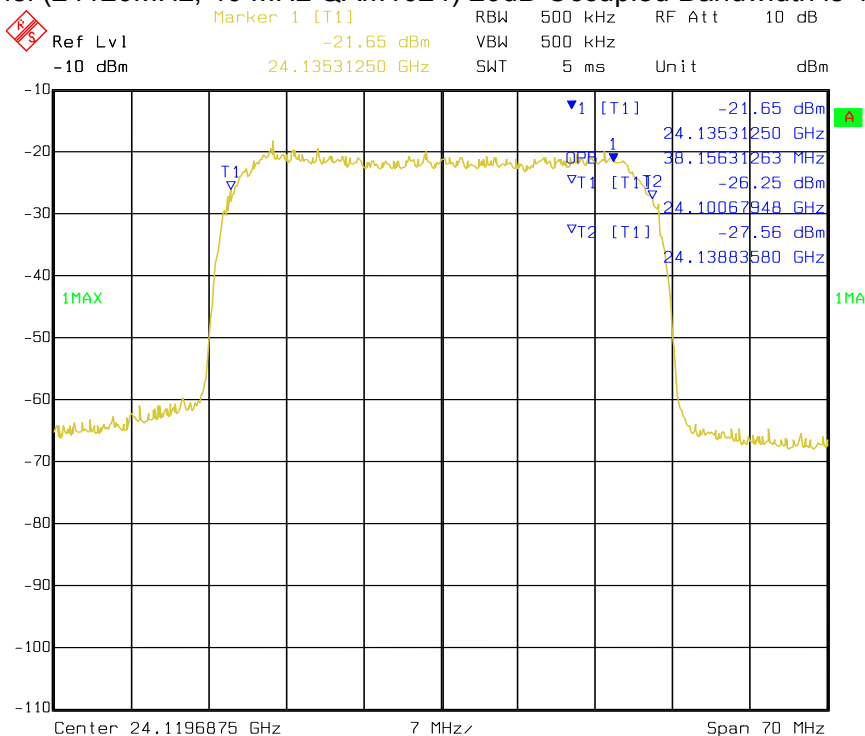
Mid Channel (24120MHz, 40 MHz QPSK) 99% Occupied Bandwidth is 38.156 MHz

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



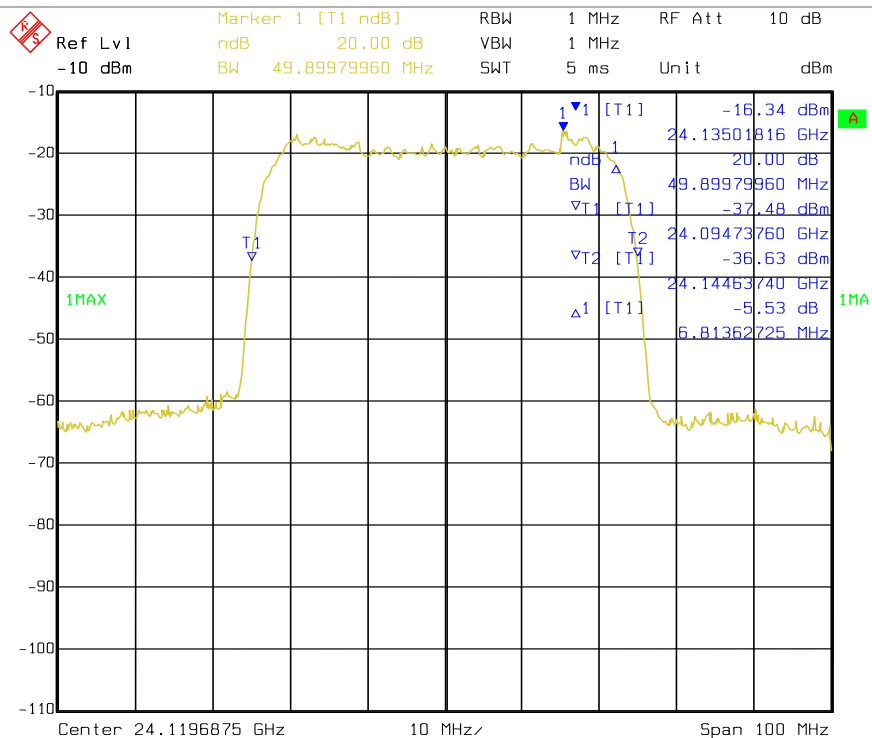
Mid Channel (24120MHz, 40 MHz QAM1024) 20dB Occupied Bandwidth is 40.962 MHz



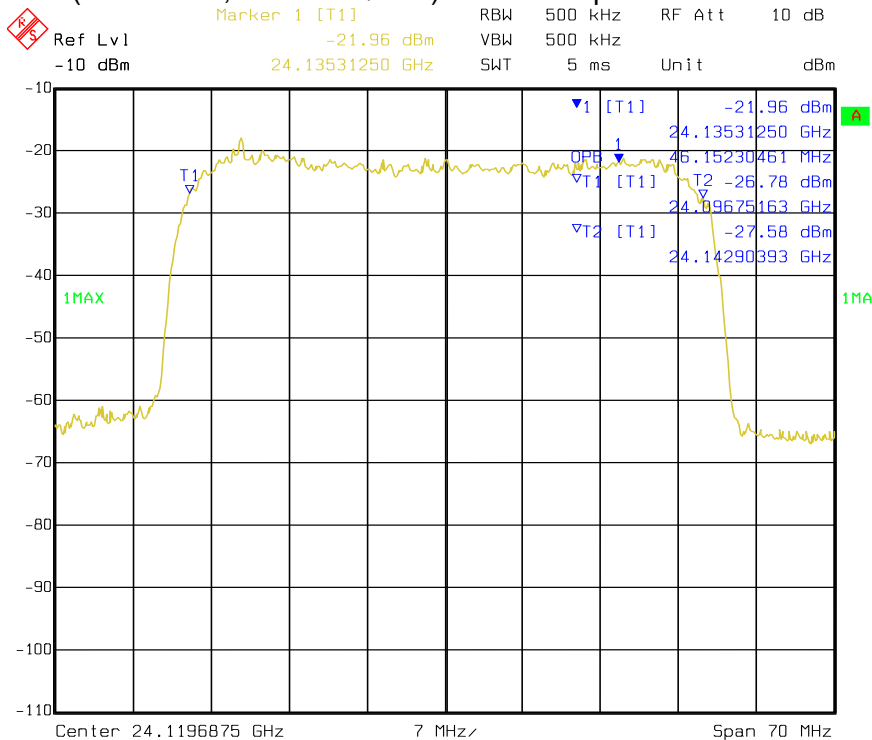
Mid Channel (24120MHz, 40 MHz QAM1024) 99% Occupied Bandwidth is 38.156 MHz

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



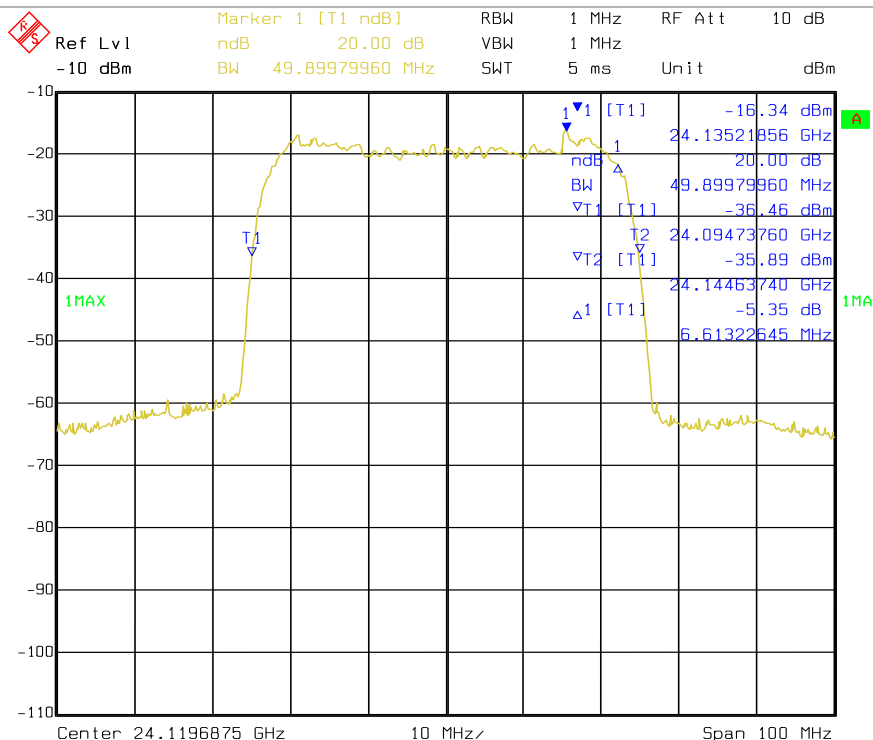
Mid Channel (24120MHz, 50 MHz QPSK) 20dB Occupied Bandwidth is 50.000 MHz



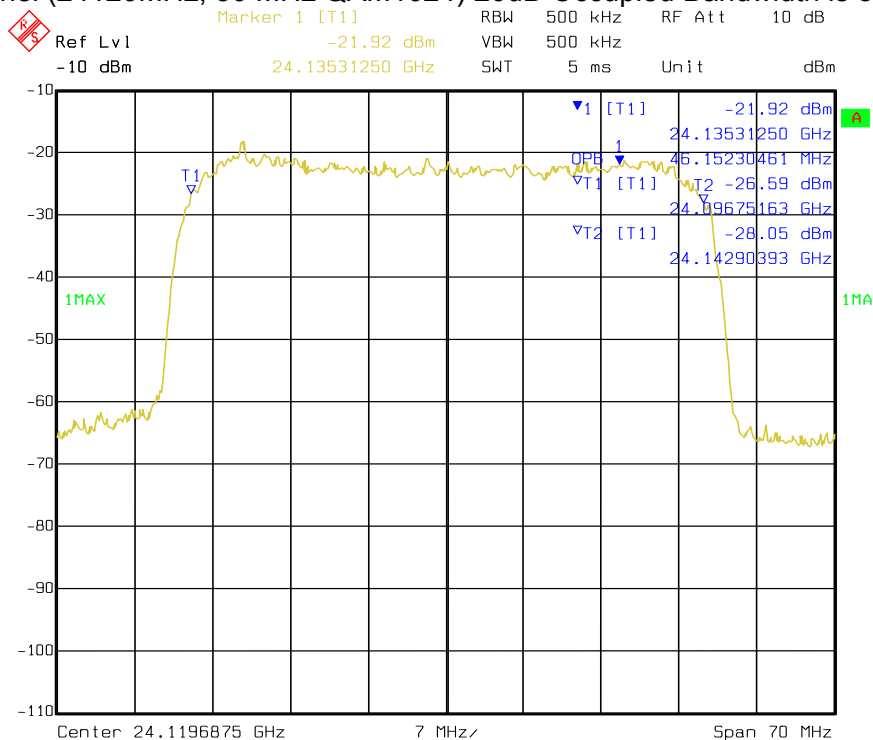
Mid Channel (24120MHz, 50 MHz QPSK) 99% Occupied Bandwidth is 46.152 MHz

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



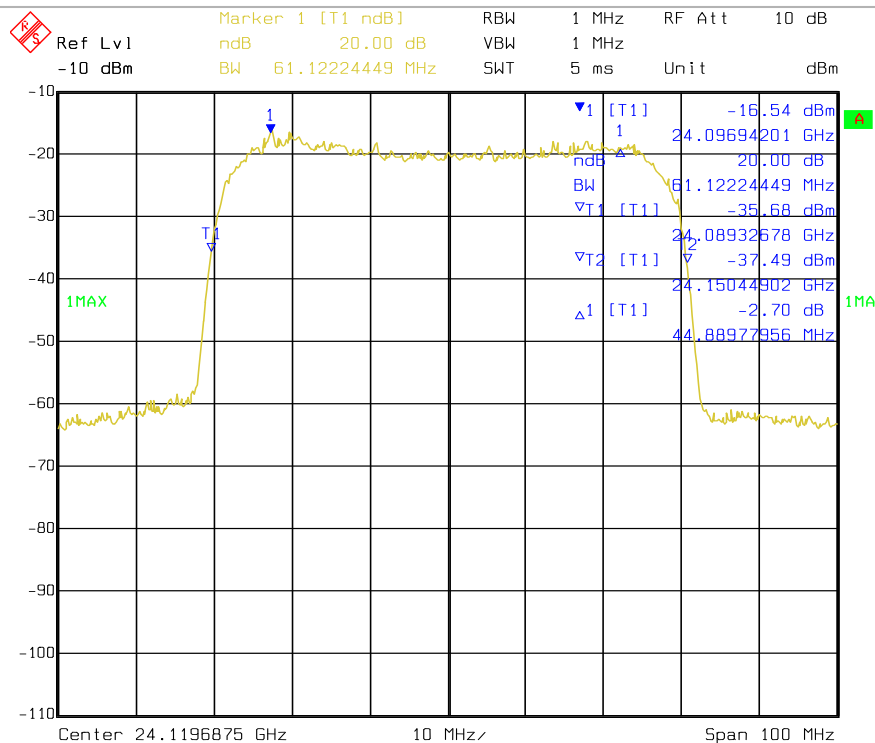
Mid Channel (24120MHz, 50 MHz QAM1024) 20dB Occupied Bandwidth is 50.000 MHz



Mid Channel (24120MHz, 50 MHz QAM1024) 99% Occupied Bandwidth is 46.152 MHz

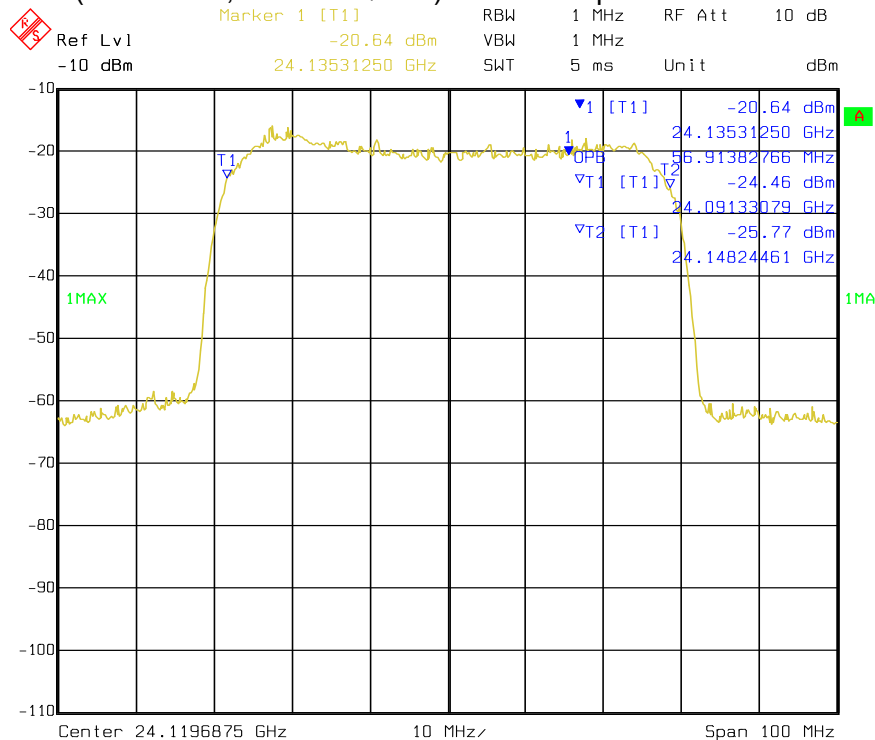
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:12:33

Mid Channel (24120MHz, 60 MHz QPSK) 20dB Occupied Bandwidth is 61.122 MHz

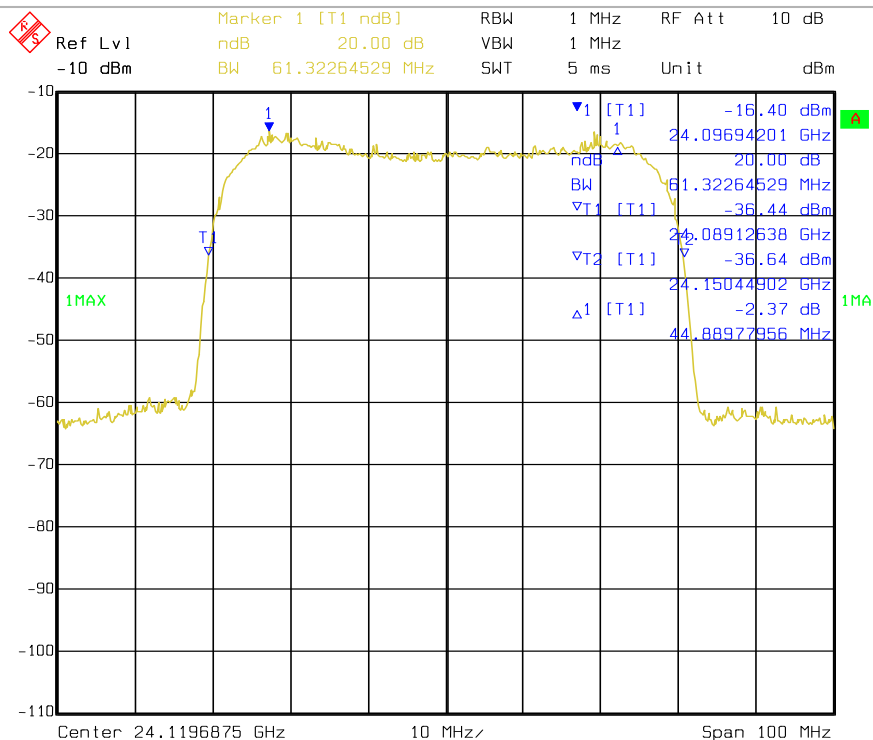


Date: 15.NOV.2012 15:44:55

Mid Channel (24120MHz, 60 MHz QPSK) 99% Occupied Bandwidth is 56.914 MHz

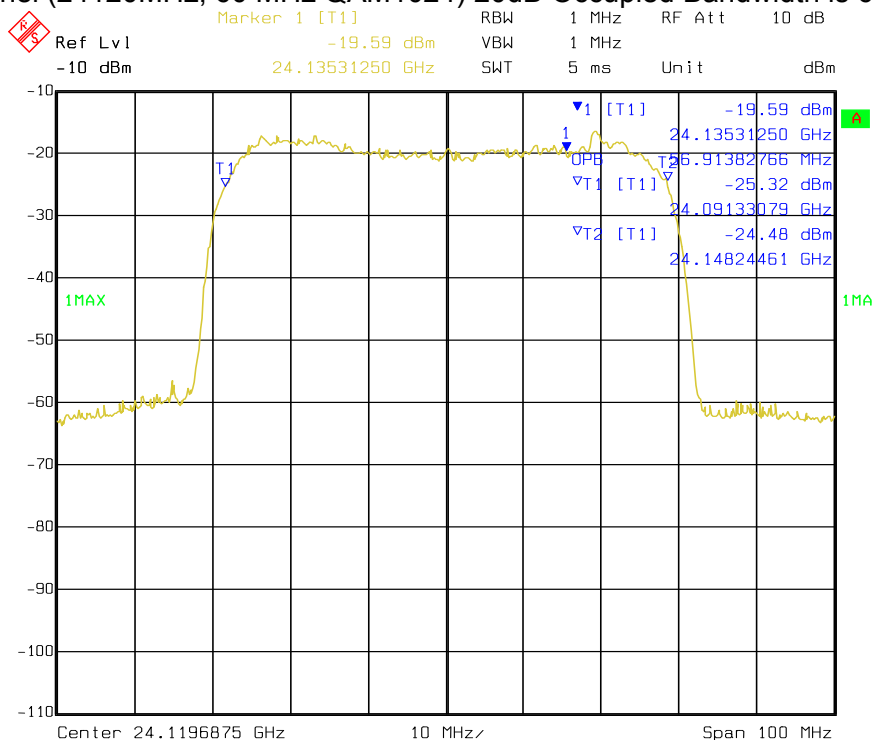
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 15.NOV.2012 16:11:53

Mid Channel (24120MHz, 60 MHz QAM1024) 20dB Occupied Bandwidth is 61.323 MHz



Date: 15.NOV.2012 15:45:54

Mid Channel (24120MHz, 60 MHz QAM1024) 99% Occupied Bandwidth is 56.914 MHz

Section 15.249 (b) (1) – Field Strength of Emissions – Radiated Power

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(b) Fixed, point-to-point operation as referred to in this paragraph shall be limited to systems employing a fixed transmitter transmitting to a fixed remote location. Point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information are not allowed. Fixed, point-to-point operation is permitted in the 24.05–24.25 GHz band subject to the following conditions:

(1) The field strength of emissions in this band shall not exceed 2500 millivolts/meter.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

RSS-210 Annex 12 – Fixed Point-to-Point Systems in the Band 24.05–24.25 GHz

The band 24.05–24.25 GHz may be used for fixed point-to-point systems that comply with the standards set out in this annex. Fixed point-to-point operation is limited to systems employing a fixed transmitter that transmits to a fixed remote location. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited.

Note: Devices operating in band 24.0–24.25 GHz at a field strength not exceeding 250 mV/m at 3 metres are classified as Category II, the requirements of which are found in RSS-310.

Fixed, point-to-point operation is permitted in the band 24.05–24.25 GHz under the following conditions:

- The field strength of emissions in this band shall not exceed 25 V/m measured at a distance of 3 metres. The power delivered to the antenna shall not exceed 1 mW.
- Except for harmonics, out-of-band emissions shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent. Harmonics shall be limited to a maximum level of 2.5 mV/m measured at 3 metres.
- The field strength limit in (a) of this section is based on average limit. However, the peak field strength shall not exceed 25 V/m measured at 3 metres along the antenna boresight.

Test Conditions:

Sample Number:	SL-24	Temperature:	21°C
Date:	January 25, 2013	Humidity:	64%
Modification State:	Low, Mid and High Channel	Tester:	Mark Philips
		Laboratory:	Nemko San Diego

Test Results: See attached plots and table below.

Additional Observations:

- EUT was supplied via Power Over Ethernet -48 V.
- All measurements were performed using a peak detector and in vertical polarization.
- RBW and VBW is 10MHz for fundamental and harmonics (if not noted otherwise). When measuring the fundamental and the signal bandwidth was larger than the RBW and channel integration measurement was done.
- The duty cycle is 100%.
- Max hold, Peak detector.
- Peak limit = Average limit: 2500 mV/m = 128.0 dB μ V/m
- Horizontal and Vertical antenna polarities were measured, Vertical polarity was consistently worst case.
- All modes were investigated and 8PSK at 10 MHz did not differ from QPSK at 10 MHz.
- The mode QPSK at 10 MHz Bandwidth was found to be worst case, and mid frequency of the other modes presented to show representative field strength below worst case.

Sample Computation @ 24120MHz

Correction factor = Antenna factor + Cable loss = 46.2 + 6.0 = 52.2 dB μ V/m

Corrected reading = Max. Reading + Correction factor = 63.6 + 52.2 = 115.5 dB μ V/m

Also, @ 24140 MHz QPSK, 24.120 GHz: -52.4 dBm + 107 +52.2 = 106.8 dBuV/m

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

Radiated Power:

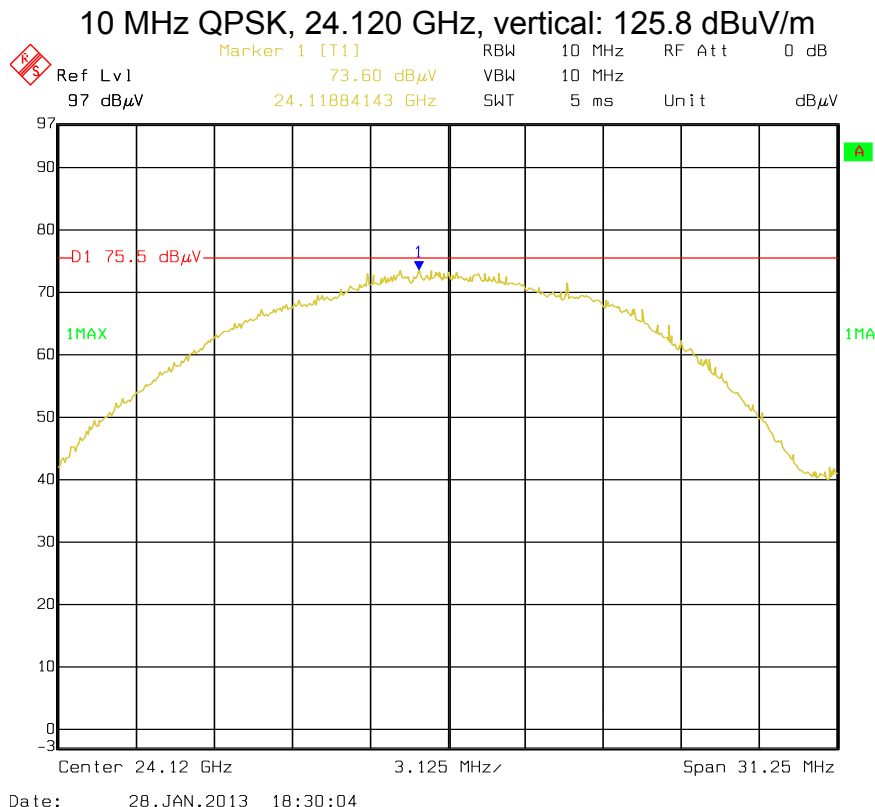
Limit Peak 128 dBμV/m	Peak Field Strength -Vertical. units: dBμV/m					
	AD24G-1-T2 1 Ft/0.3m Diameter 24 GHz Antenna		AD24G-2-T2 2 Ft/0.6m Diameter 24 GHz Antenna		AD24G-3-T2 3 Ft/0.9m Diameter 24 GHz Antenna	
Frequency, mode	Result	Margin	Result	Margin	Result	Margin
24055MHz, 10 MHz QPSK	125.80	-2.20	125.60	-2.40	115.50	-12.50
24120MHz, 10 MHz QPSK	119.75	-8.25	124.30	-3.70	112.80	-15.20
24245MHz, 10 MHz QPSK	121.70	-6.30	122.10	-5.90	114.10	-13.90
24120MHz, 10 MHz QAM64	124.50	-3.50	125.60	-2.40	108.30	-19.70
24120MHz, 10 MHz QAM128	121.50	-6.50	124.40	-3.60	108.40	-19.60
24120MHz, 10 MHz QAM1024	117.50	-10.50	125.30	-2.70	111.50	-16.50
24120MHz, 14 MHz QPSK	126.30	-1.70	120.40	-7.60	106.82	-21.18
24120MHz, 20 MHz QPSK	127.69	-0.31	122.84	-5.16	108.37	-19.63
24120MHz, 25 MHz QPSK	127.55	-0.45	124.60	-3.40	108.77	-19.23
24120MHz, 30 MHz QPSK	122.15	-5.85	124.70	-3.30	110.05	-17.95
24120MHz, 40 MHz QPSK	123.64	-4.36	123.00	-5.00	111.00	-17.00
24120MHz, 50 MHz QPSK	124.97	-3.03	121.80	-6.20	112.57	-15.43
24120MHz, 60 MHz QPSK	125.93	-2.07	127.35	-0.65	110.47	-17.53

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

1 ft Antenna Data:

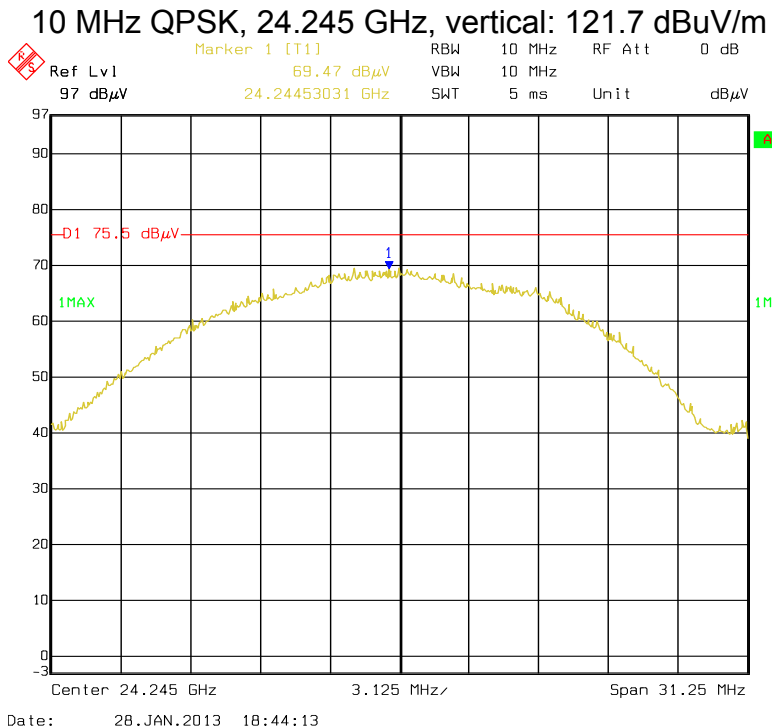
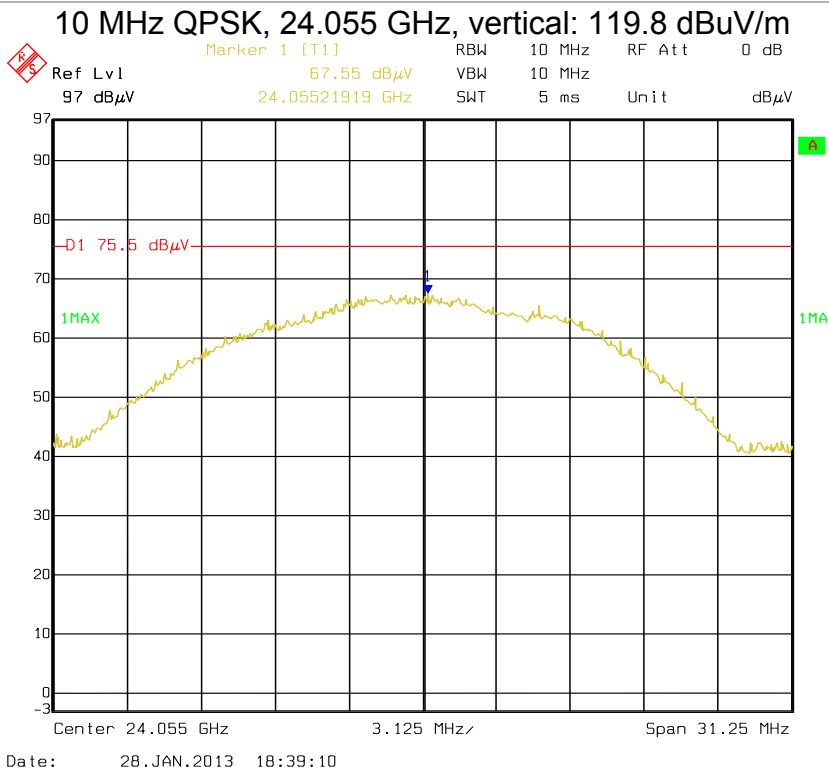
Radiated Power:



www.nemko.com

FCC ID: NCY-SL24
IC: 2945A-SL24

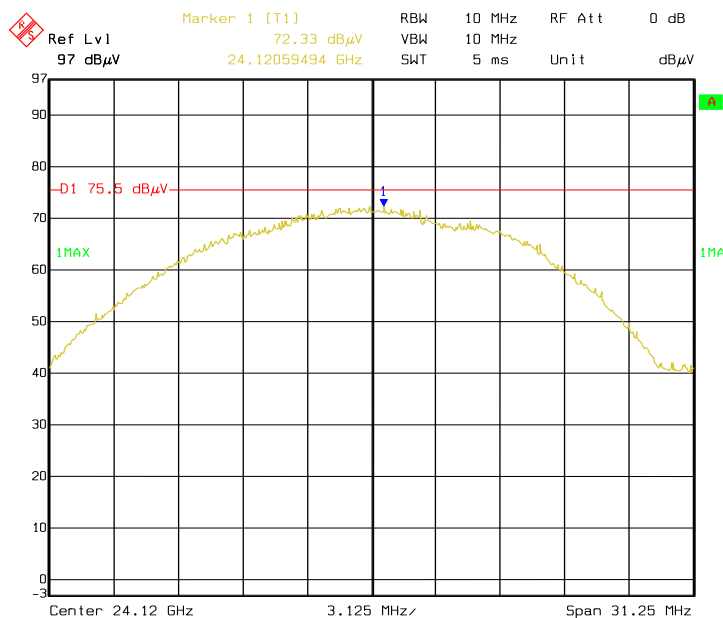
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



FCC ID: NCY-SL24
IC: 2945A-SL24

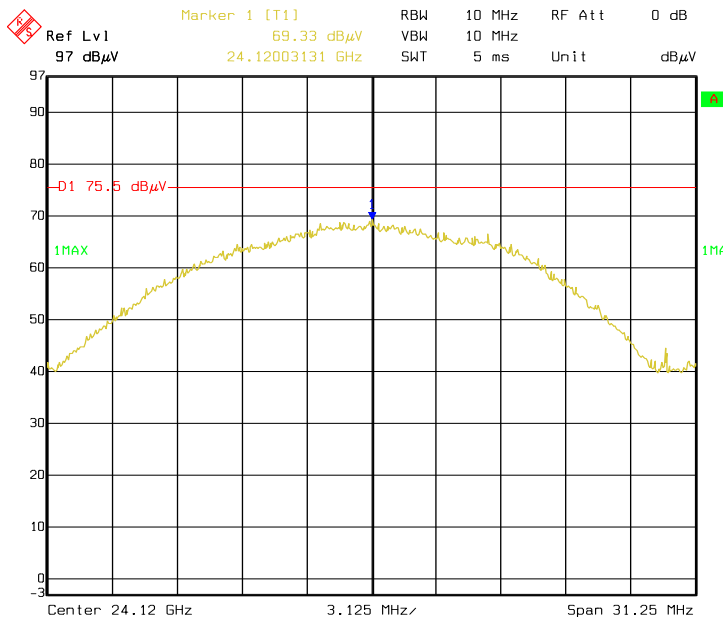
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

10 MHz QAM64, 24.120 GHz, vertical: 124.5 dBuV/m



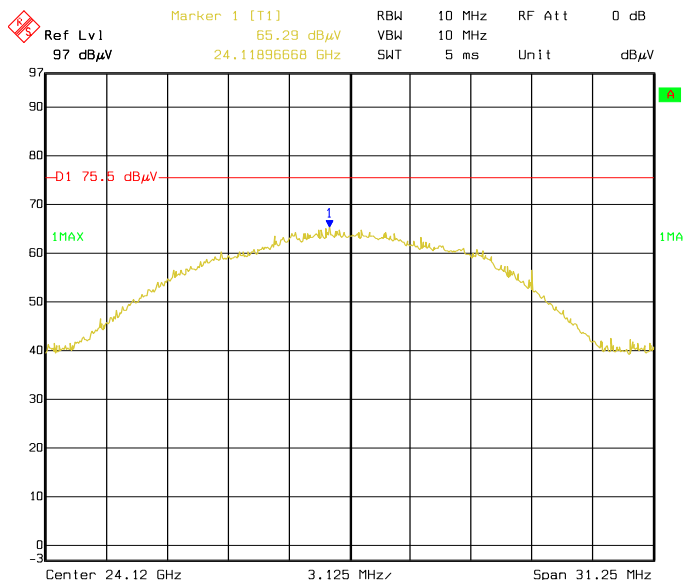
Date: 28.JAN.2013 18:49:19

10 MHz QAM128, 24.120 GHz, vertical: 121.5 dBuV/m



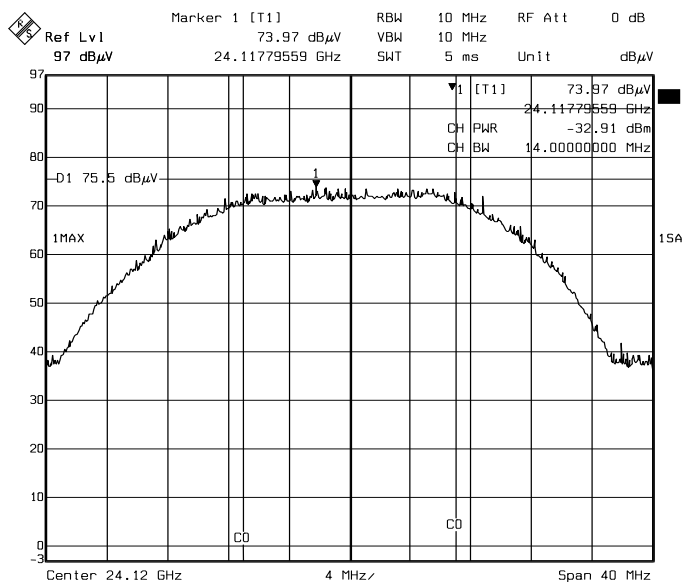
Date: 28.JAN.2013 18:55:59

10 MHz QAM1024, 24.120 GHz, vertical: 117.5 dBuV/m



Date: 28.JAN.2013 18:57:33

14 MHz QPSK, 24.120 GHz, vertical: 126.3 dBuV/m

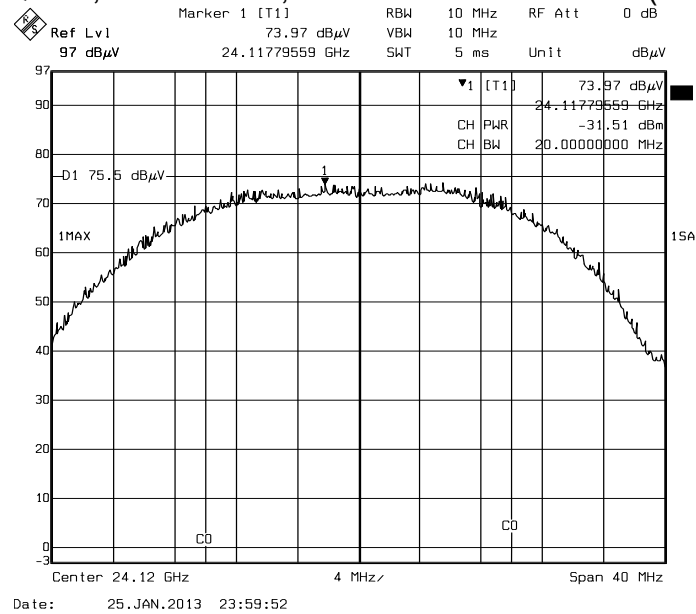


Date: 25.JAN.2013 23:58:00

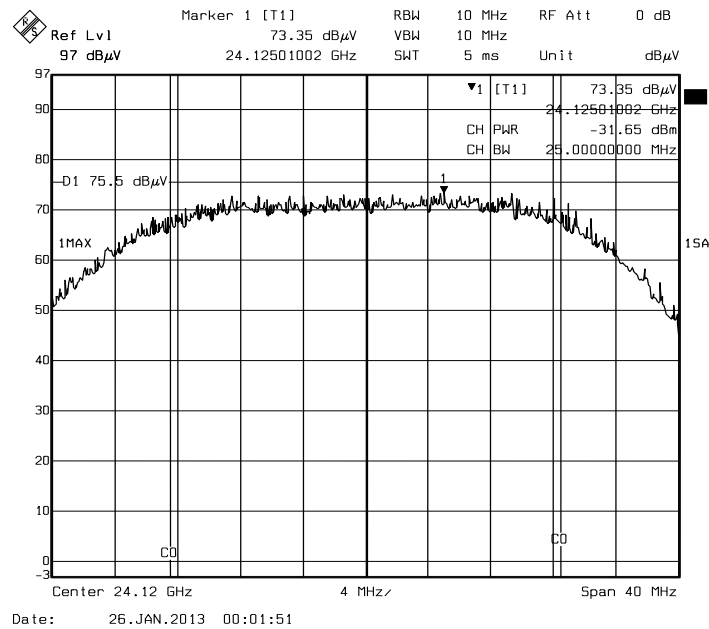
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

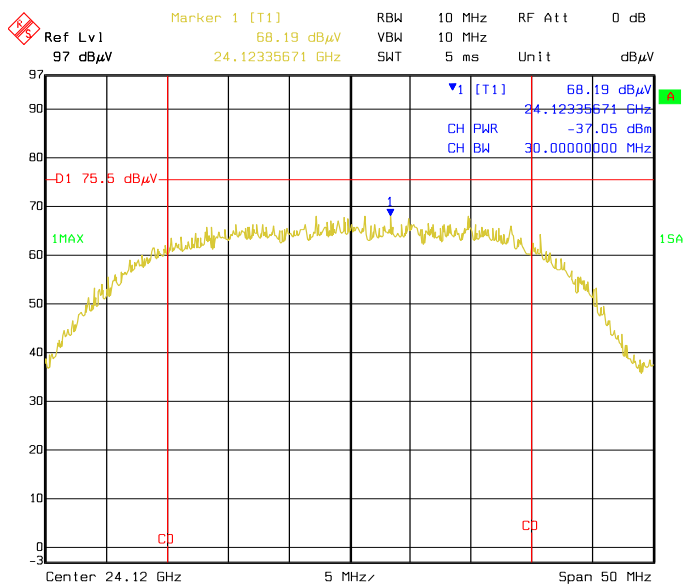
20 MHz QPSK, 24.120 GHz, vertical: 126.69 dBuV/m (2424 mV/m)



25 MHz QPSK, 24.120 GHz, vertical: 127.55 dBuV/m

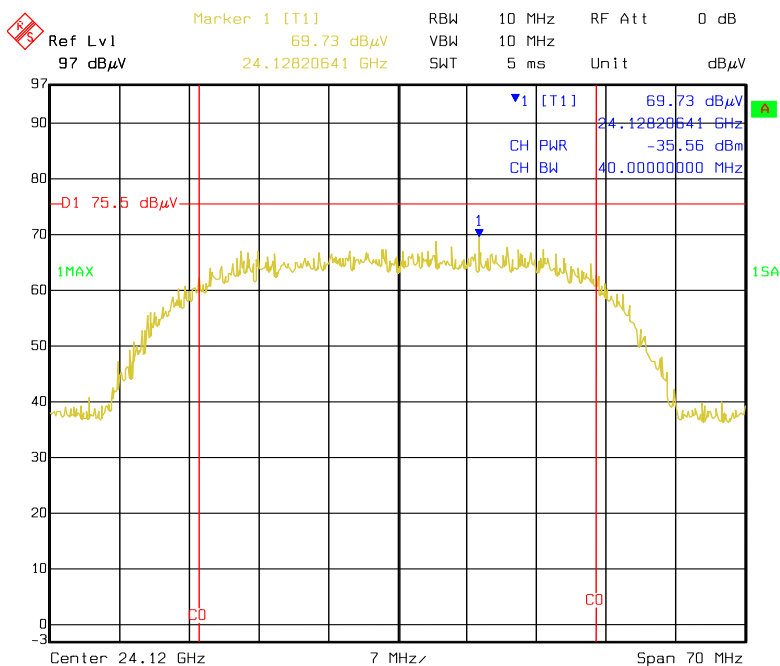


30 MHz QPSK, 24.120 GHz, vertical: 122.15 dBuV/m



Date: 28.JAN.2013 19:02:14

40 MHz QPSK, 24.120 GHz, vertical: 123.64 dBuV/m

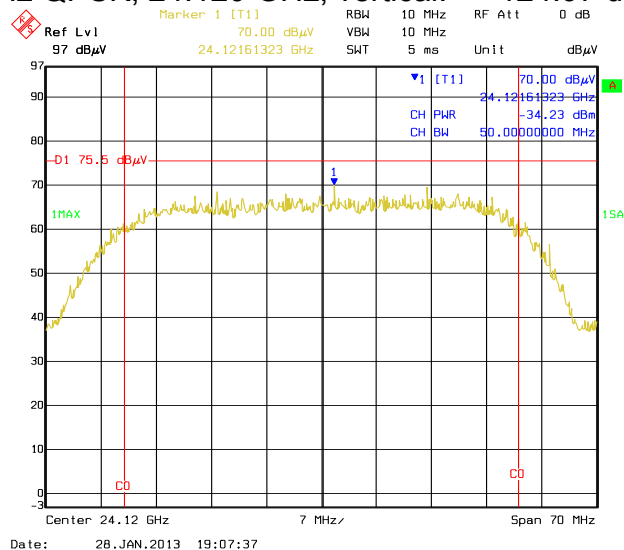


Date: 28.JAN.2013 19:04:46

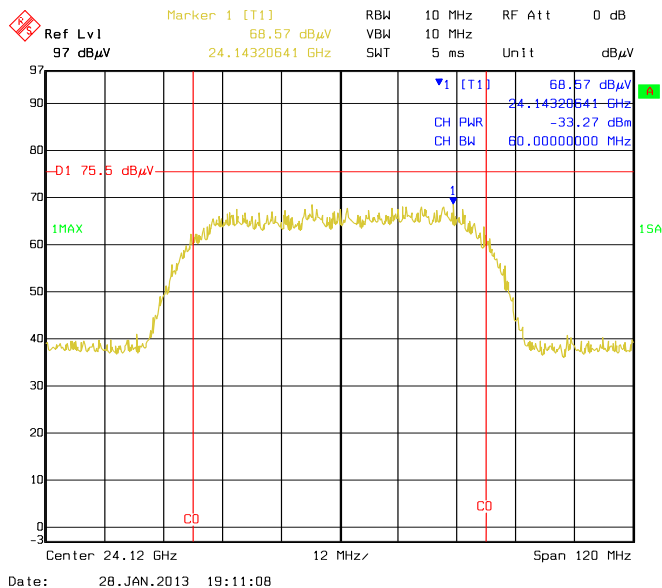
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

50 MHz QPSK, 24.120 GHz, vertical: 124.97 dBuV/m

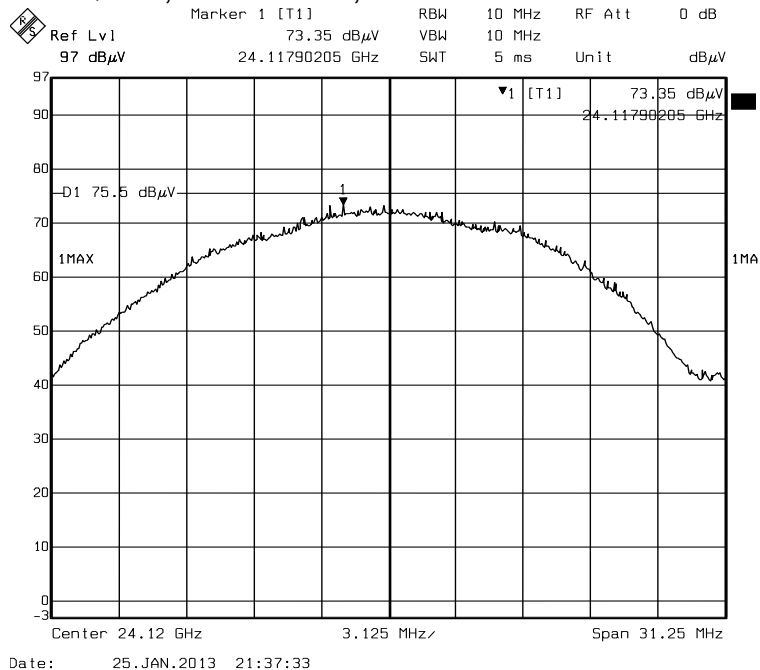


60 MHz QPSK, 24.120 GHz, vertical: 125.93 dBuV/m

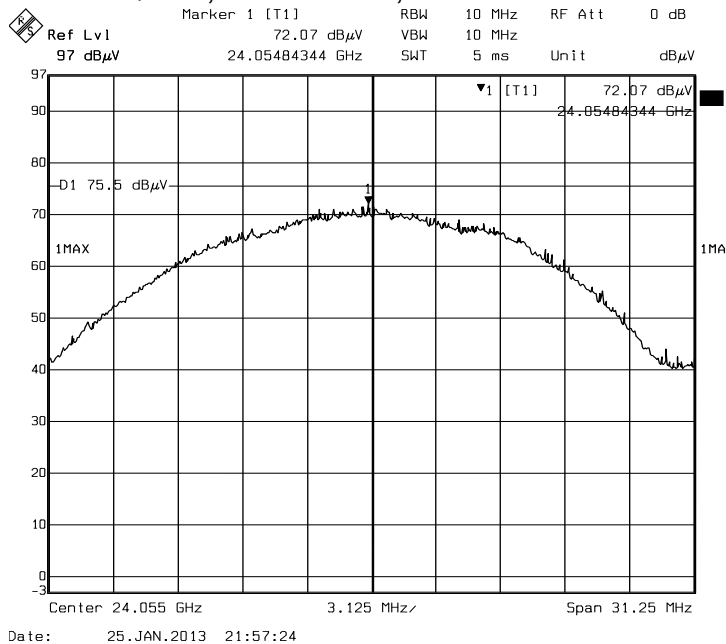


2 ft Antenna Data:

10 MHz QPSK, 24.120 GHz, vertical: 125.60 dBuV/m



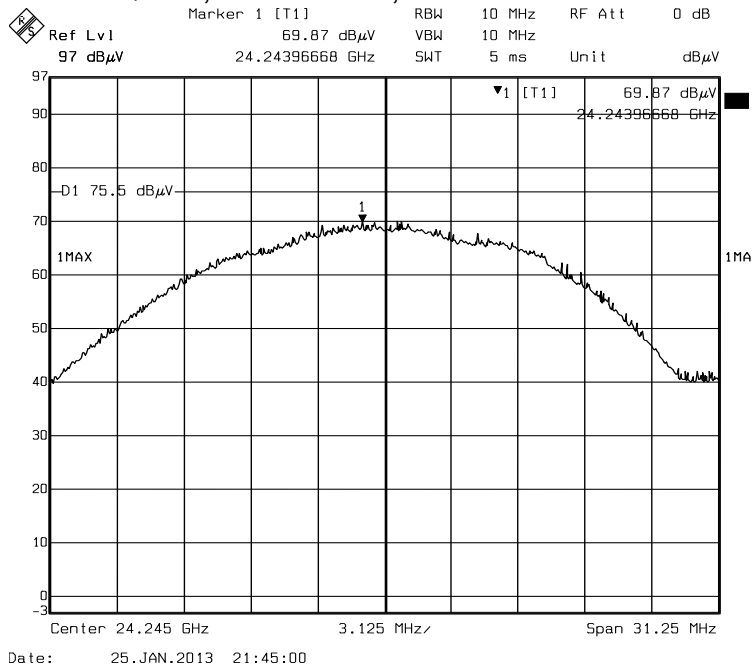
10 MHz QPSK, 24.055 GHz, vertical: 124.3 dBuV/m



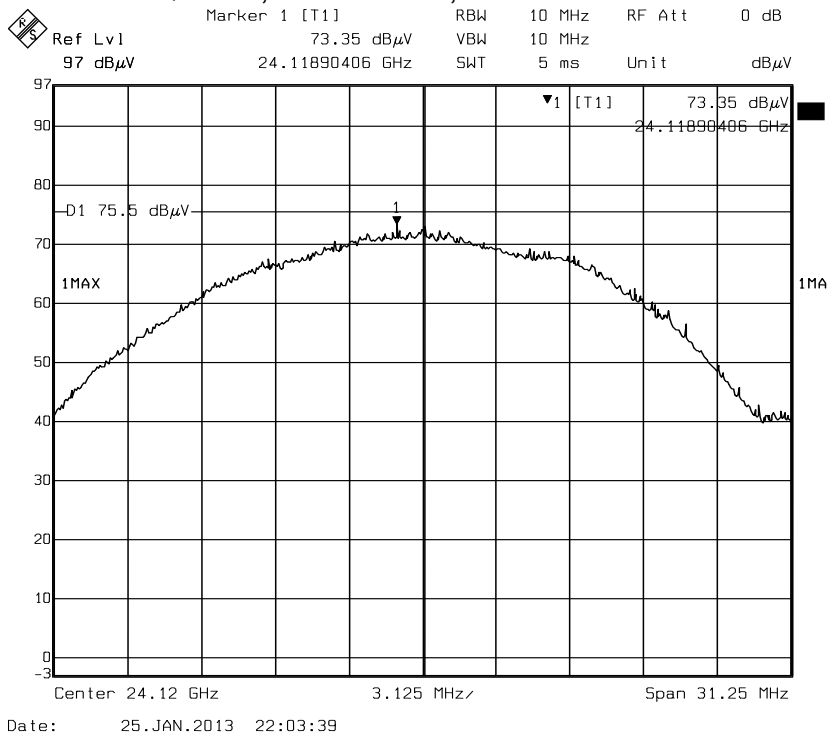
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

10 MHz QPSK, 24.245 GHz, vertical: 122.1 dBuV/m



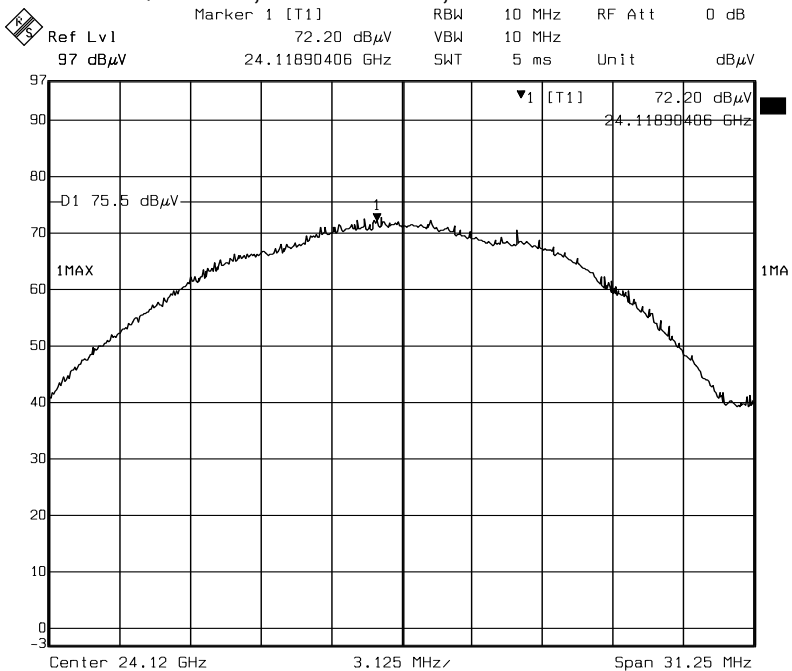
10 MHz QAM64, 24.120 GHz, vertical: 125.6 dBuV/m



FCC ID: NCY-SL24
IC: 2945A-SL24

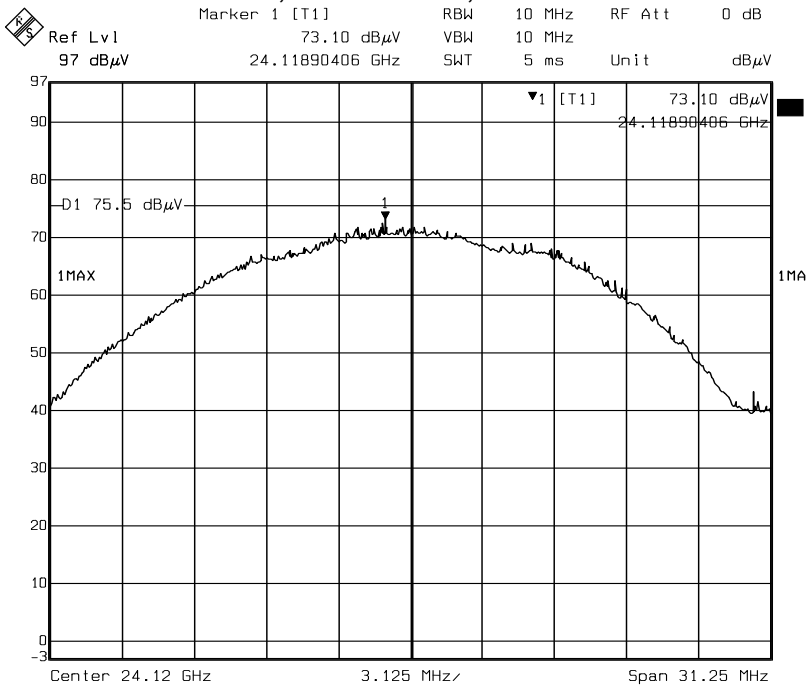
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

10 MHz QAM128, 24.120 GHz, vertical: 124.4 dBuV/m



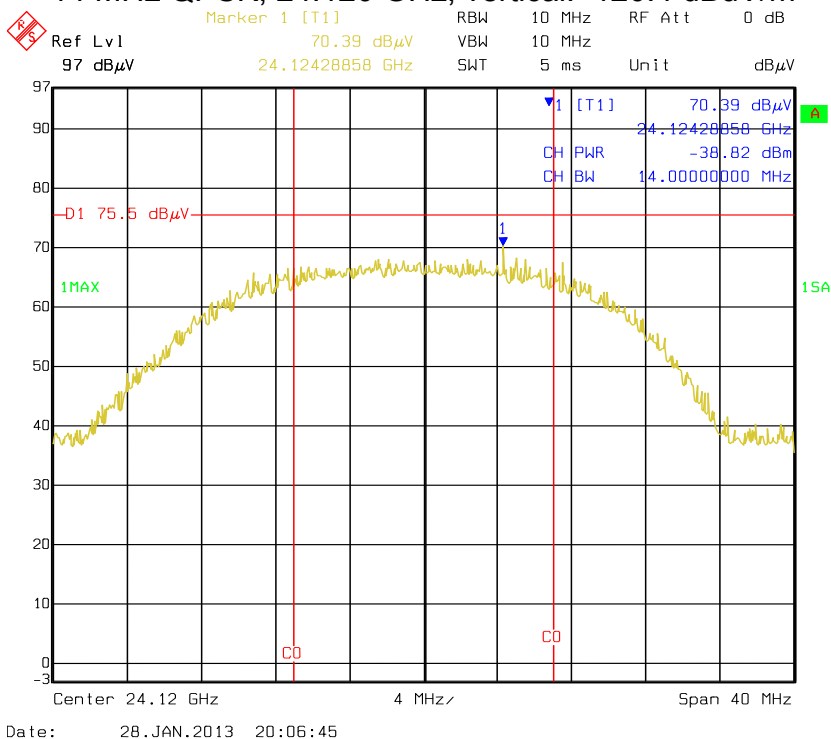
Date: 25.JAN.2013 22:05:42

10 MHz QAM1024, 24.120 GHz, vertical: 125.3 dBuV/m

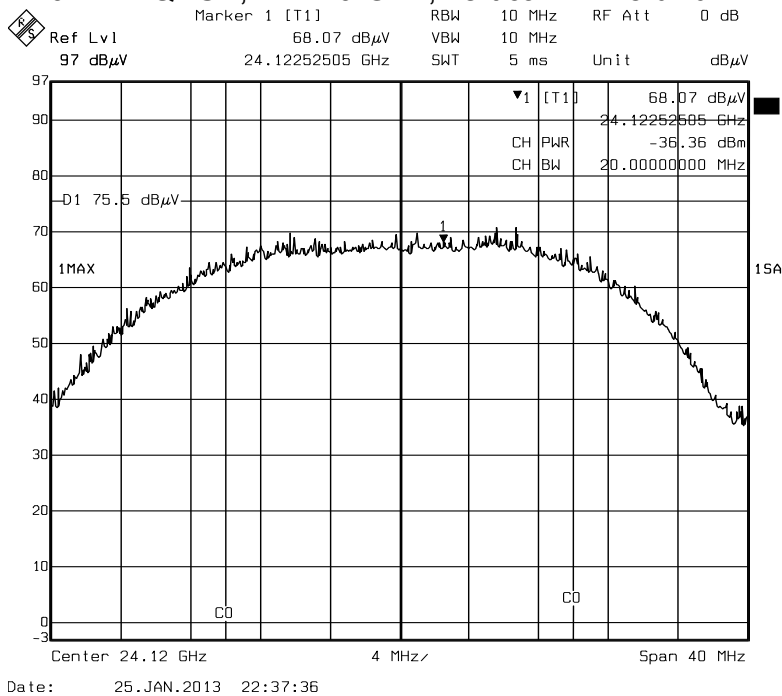


Date: 25.JAN.2013 22:07:00

14 MHz QPSK, 24.120 GHz, vertical: 120.4 dBuV/m



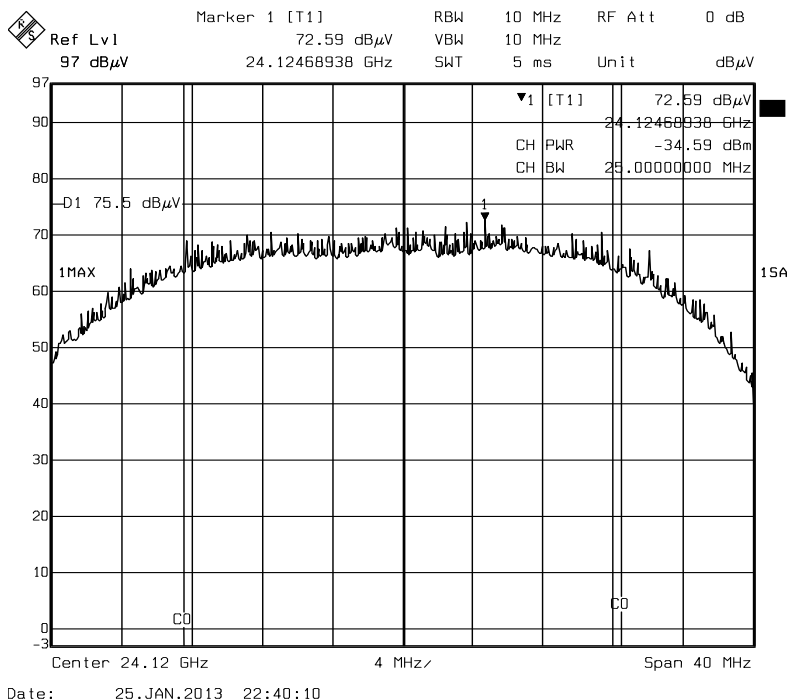
20 MHz QPSK, 24.120 GHz, vertical: 122.8 dBuV/m



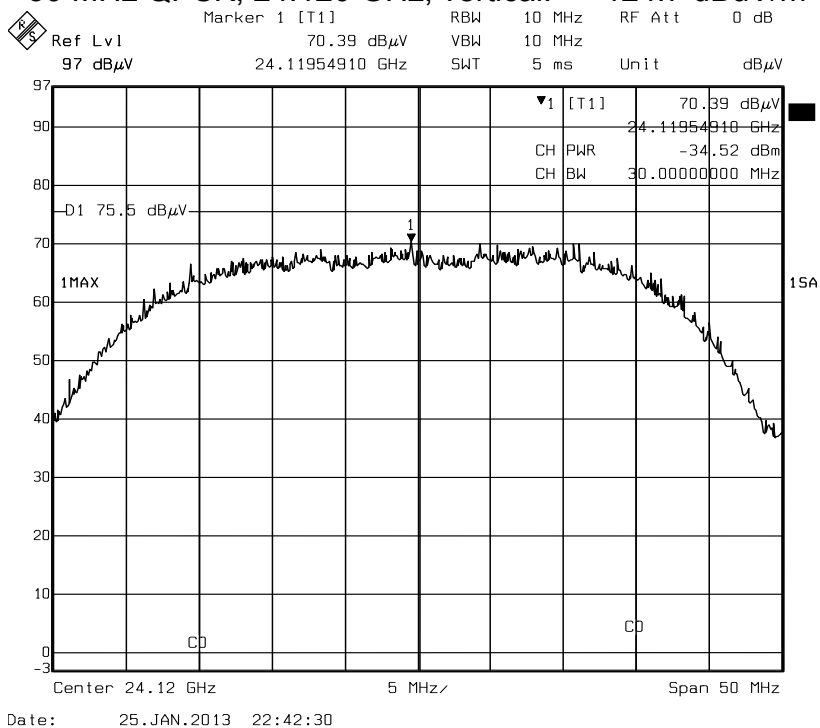
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

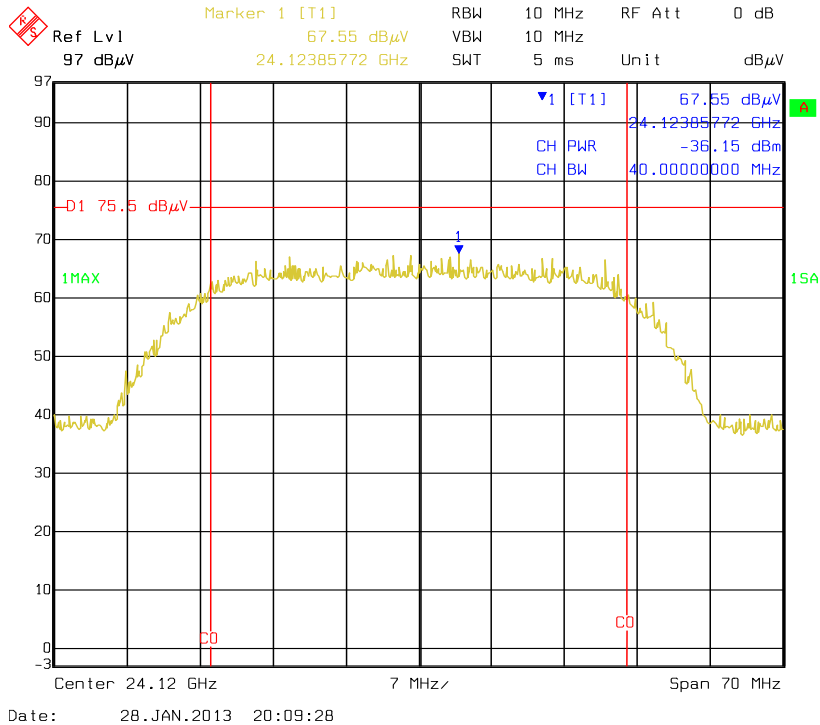
25 MHz QPSK, 24.120 GHz, vertical: 124.6 dBuV/m



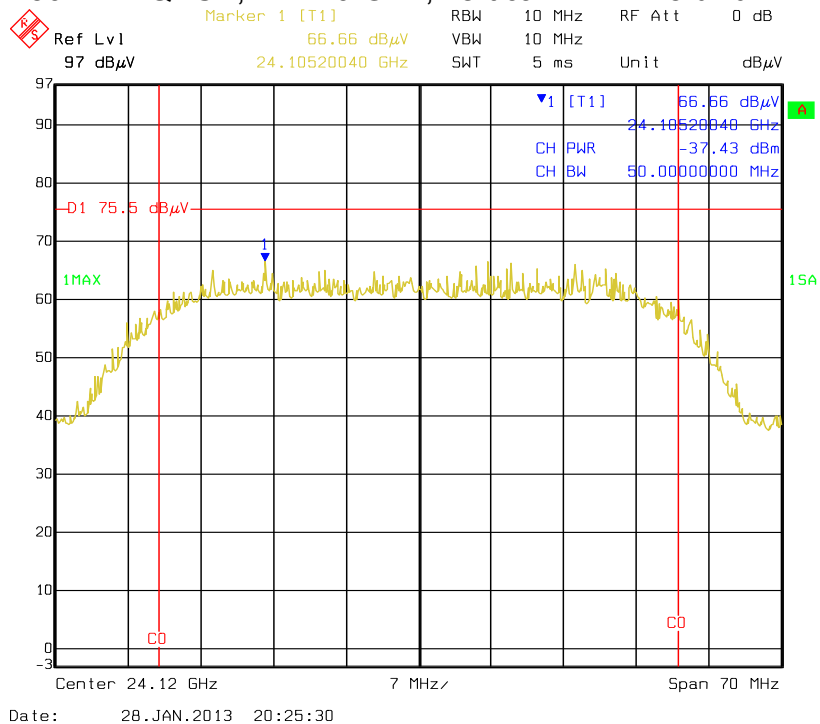
30 MHz QPSK, 24.120 GHz, vertical: 124.7 dBuV/m



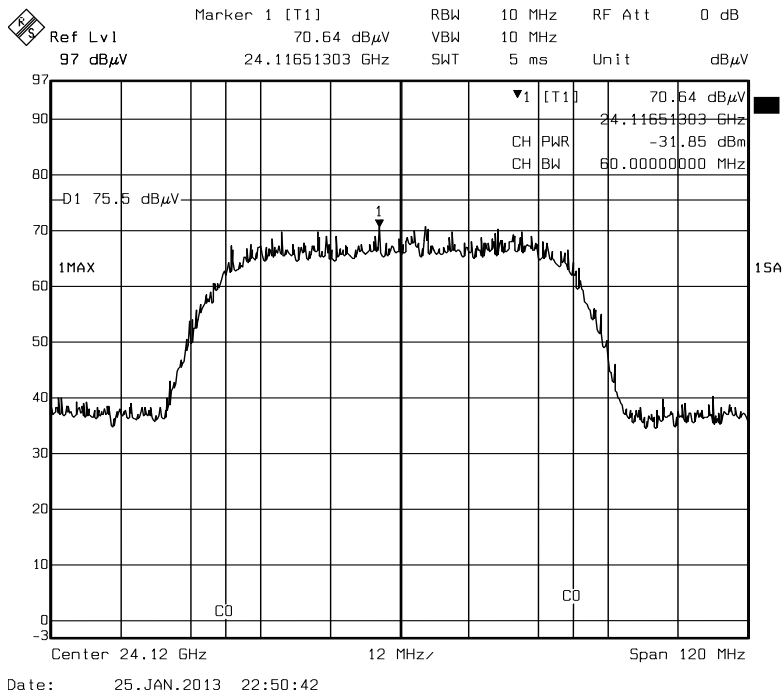
40 MHz QPSK, 24.120 GHz, vertical: 123.0 dBuV/m



50 MHz QPSK, 24.120 GHz, vertical: 121.8 dBuV/m

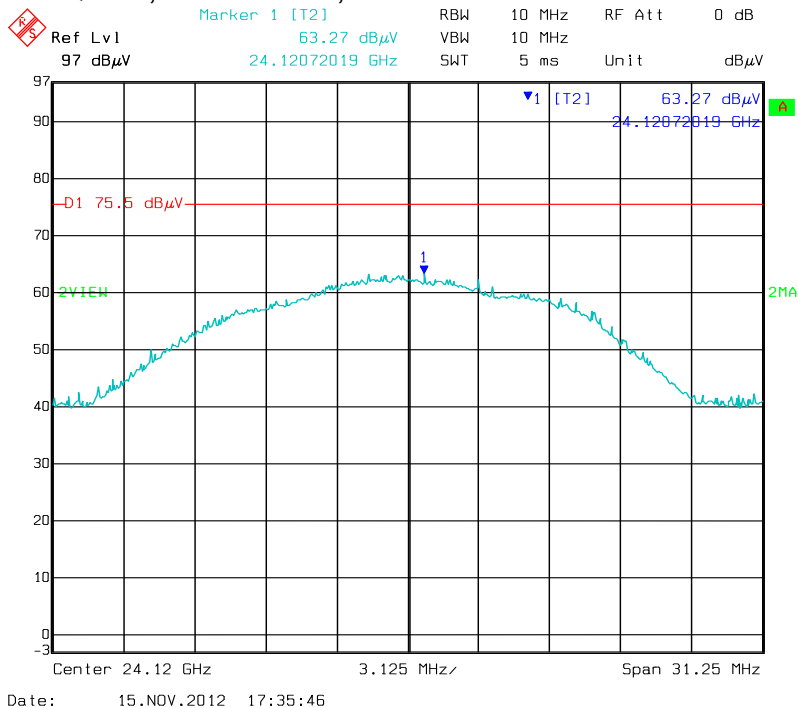


60 MHz QPSK, 24.120 GHz, vertical: 127.4 dBuV/m

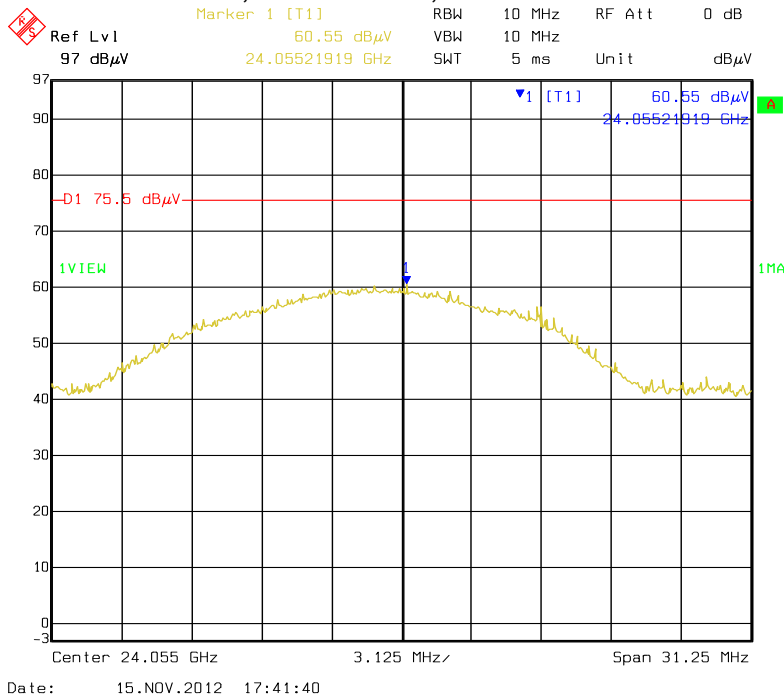


3 ft Antenna Data:

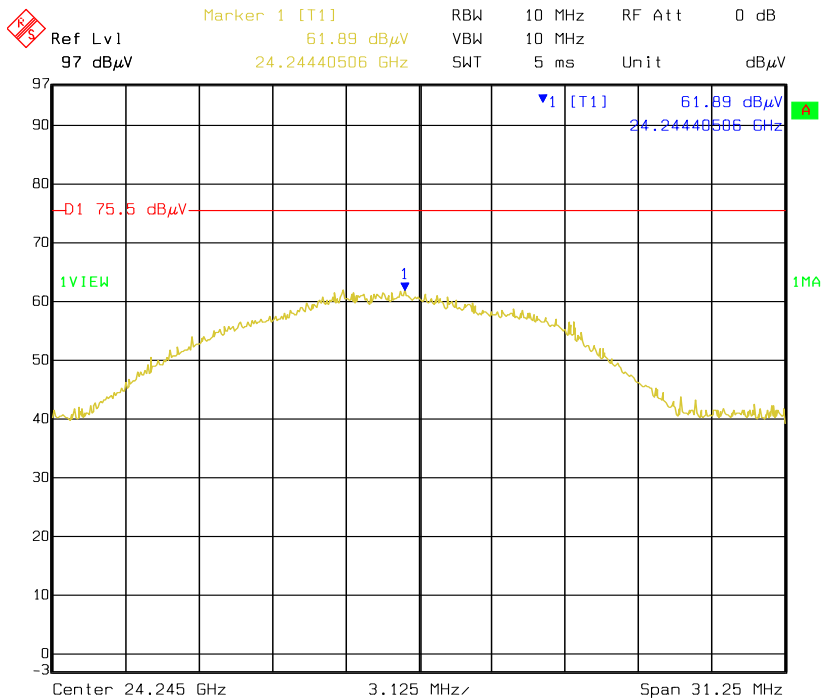
10 MHz QPSK, 24.120 GHz, vertical: $52.2 + 63.3 = 115.5$ dBuV/m



10 MHz QPSK, 24.055 GHz, vertical: 112.8 dBuV/m

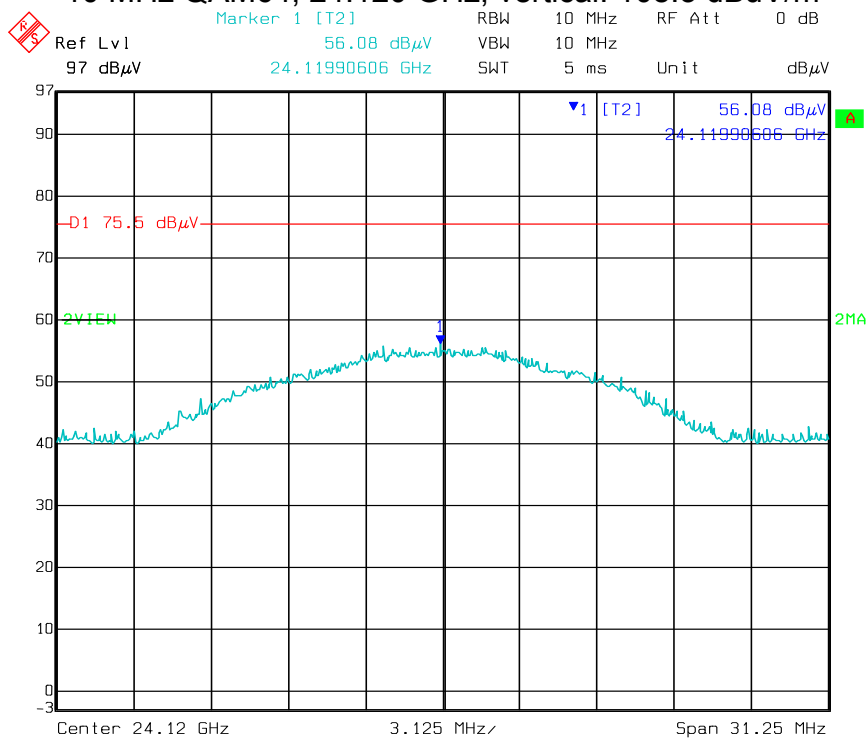


10 MHz QPSK, 24.245 GHz, vertical: 114.1 dBuV/m



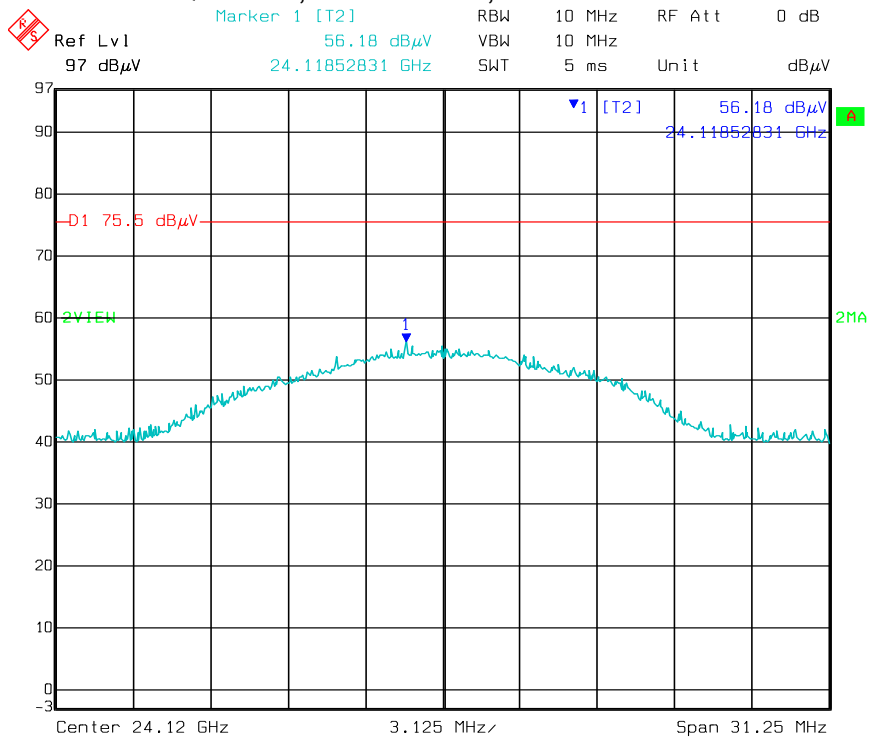
Date: 15.NOV.2012 17:45:33

10 MHz QAM64, 24.120 GHz, vertical: 108.3 dBuV/m



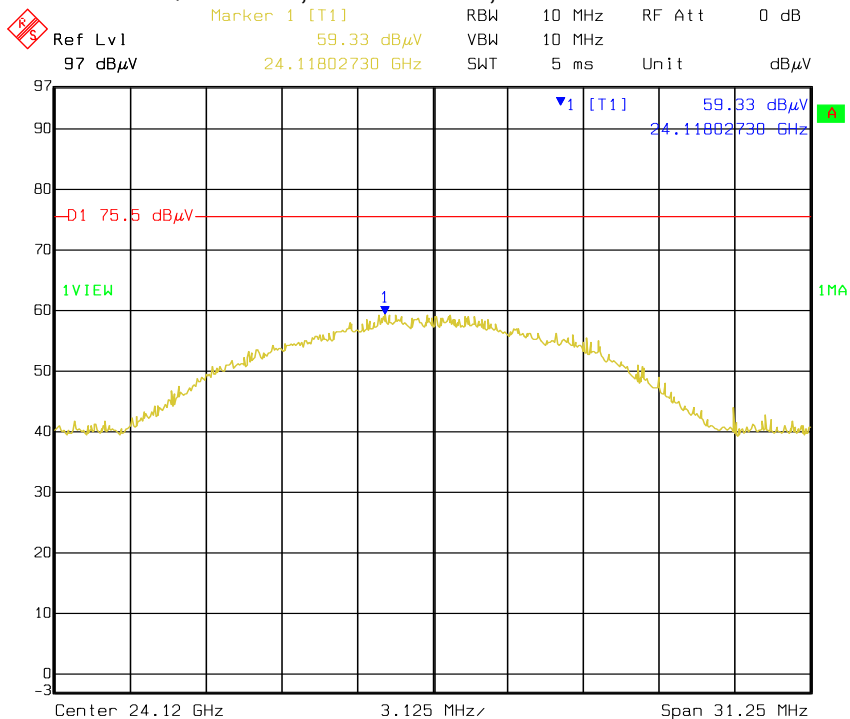
Date: 15.NOV.2012 17:59:46

10 MHz QAM128, 24.120 GHz, vertical: 108.4 dBuV/m

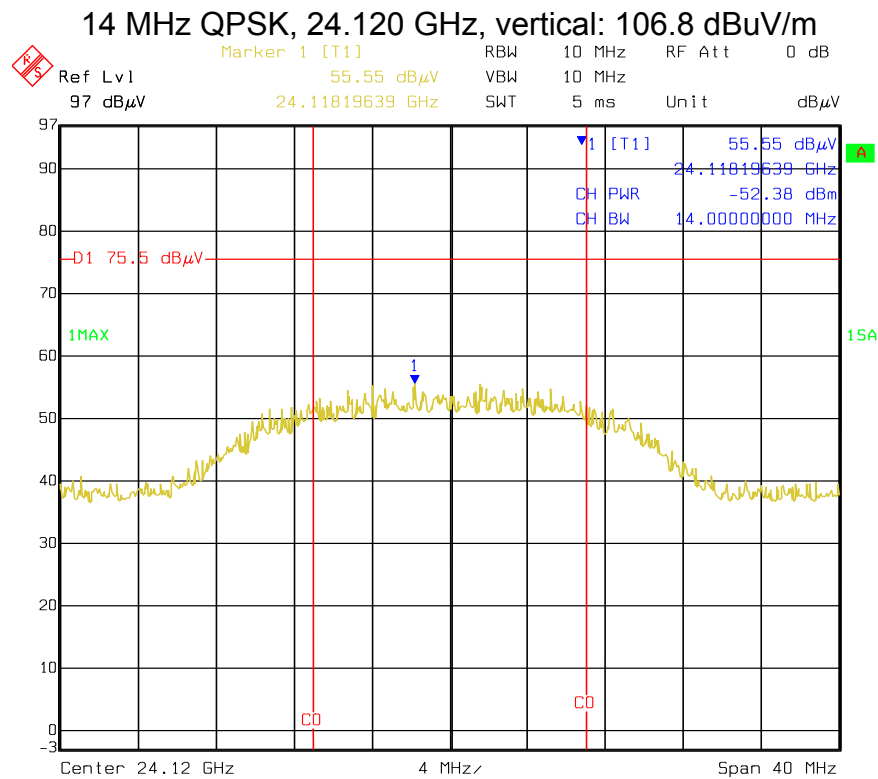


Date: 15.NOV.2012 17:54:56

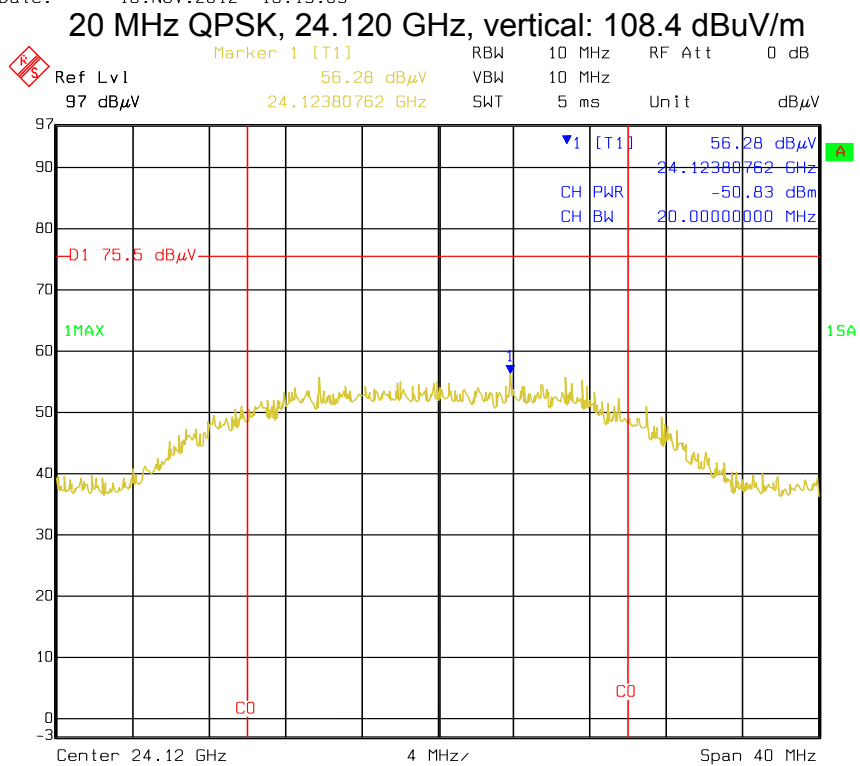
10 MHz QAM1024, 24.120 GHz, vertical: 111.5 dBuV/m



Date: 15.NOV.2012 17:51:31

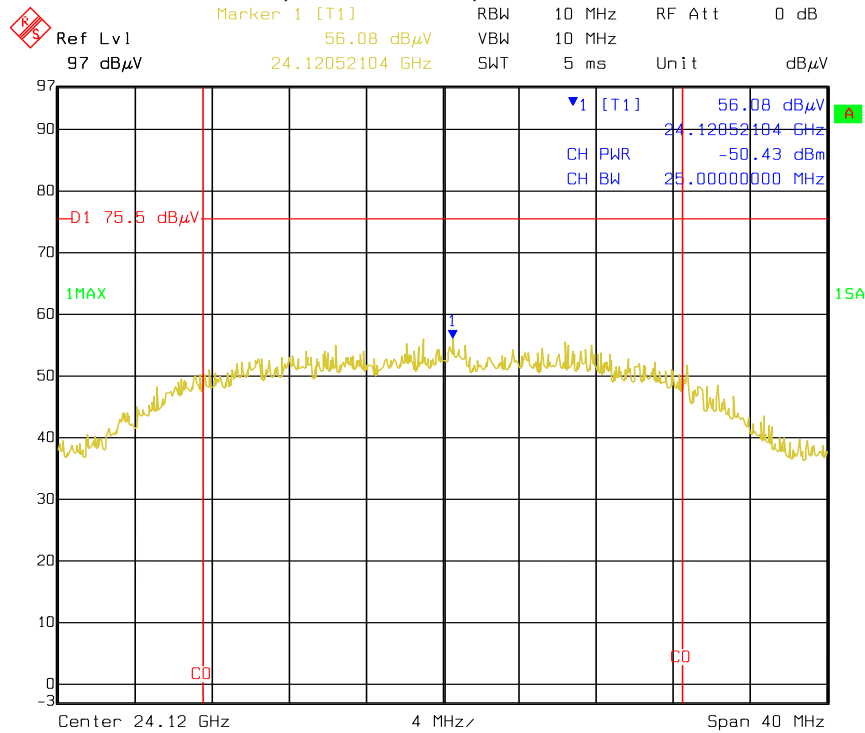


Date: 16.NOV.2012 15:19:09



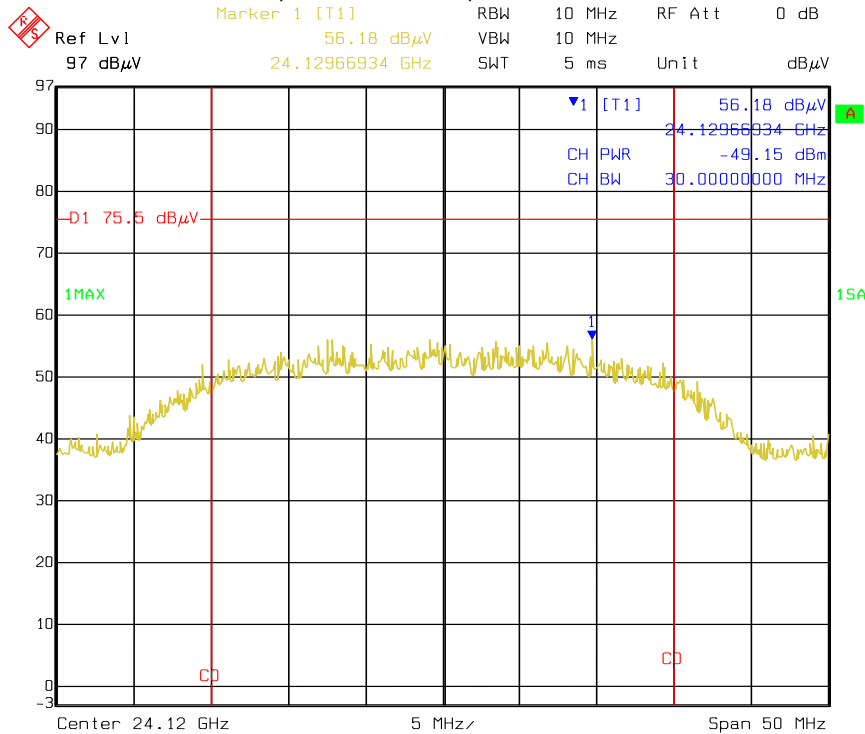
Date: 16.NOV.2012 15:23:44

25 MHz QPSK, 24.120 GHz, vertical: 108.8 dBuV/m

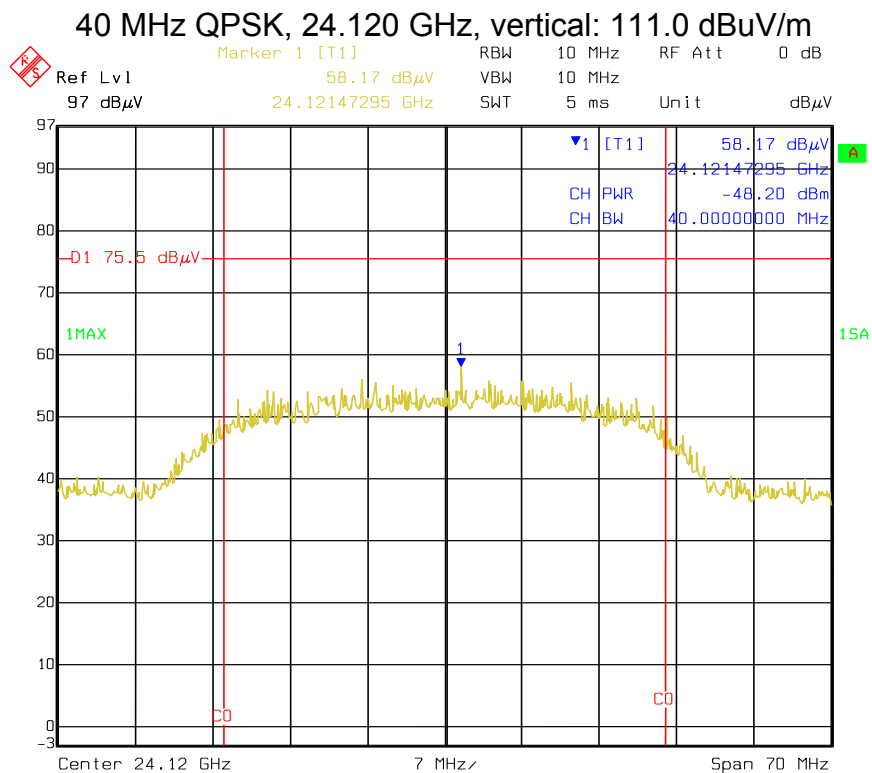


Date: 16.NOV.2012 15:27:05

30 MHz QPSK, 24.120 GHz, vertical: 110.1 dBuV/m

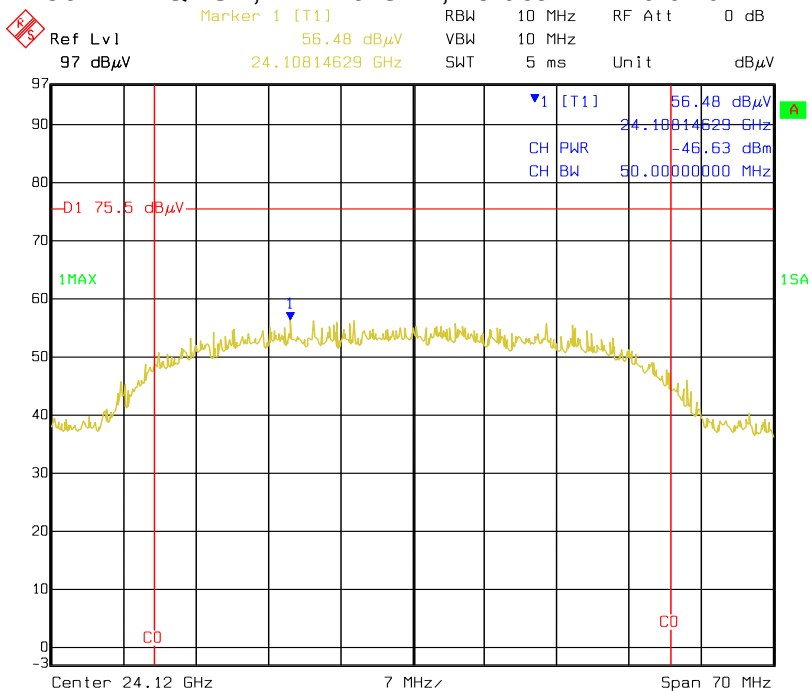


Date: 16.NOV.2012 15:31:27



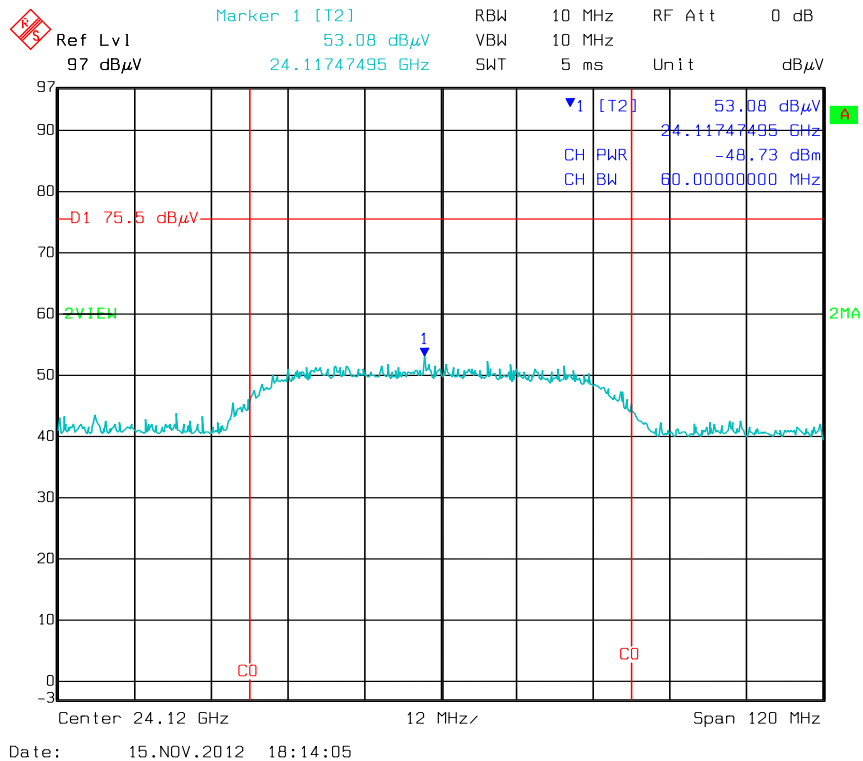
Date: 16.NOV.2012 15:39:31

50 MHz QPSK, 24.120 GHz, vertical: 112.6 dBuV/m



Date: 16.NOV.2012 15:46:54

60 MHz QPSK, 24.120 GHz, vertical: 110.5 dBuV/m



Section 15.249 (a) and (d) – Spurious Emissions Outside of the band

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

RSS-210 Annex 12 – Fixed Point-to-Point Systems in the Band 24.05–24.25 GHz

- d. Except for harmonics, out-of-band emissions shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent. Harmonics shall be limited to a maximum level of 2.5 mV/m measured at 3 metres.

Test Conditions:

Sample Number:	SL-24	Temperature:	21 °C
Date:	January 28, 2013	Humidity:	44 %
Modification State:	Low and High Channel	Tester:	MARK PHILIPS
		Laboratory:	Nemko San Diego

Test Results: Pass

Additional Observations:

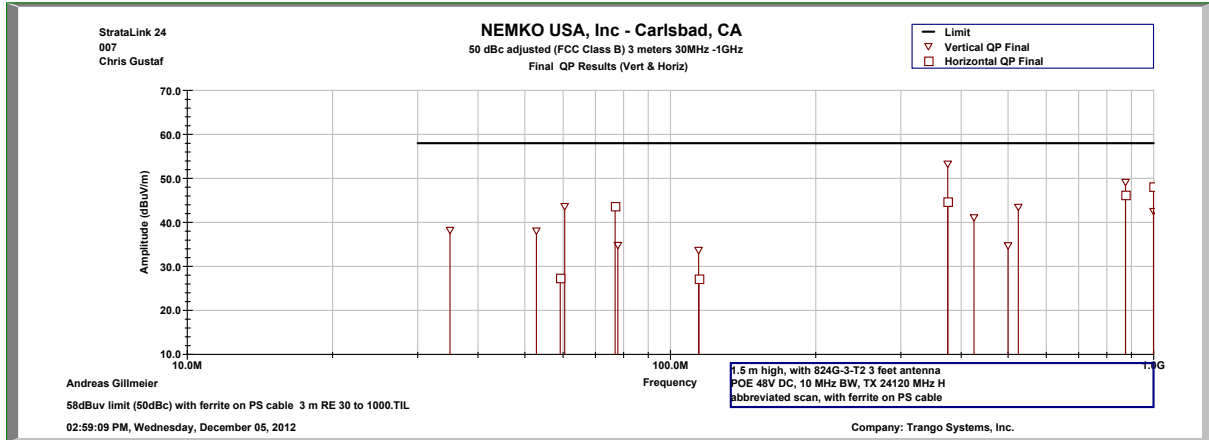
- EUT was supplied via Power Over Ethernet -48 V.
- All measurements were performed using a peak detector and in vertical polarization.
- All measurements below 1 GHz were performed at 3m employing a CISPR quasi-peak detector.
- RBW is 1 MHz and VBW is 3 MHz (if not noted otherwise) for Peak measurements above 1 GHz.
- Spectrum was investigated up to 100GHz
- There are no emissions found on frequencies above the fundamental
- The duty cycle is 100%.

Spurious emissions 30 -1000 MHz (TX on mid channel, 10 MHz QPSK):
No emissions due to the intentional radiator evident.

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

Spurious emissions 30 -1000 MHz (TX on mid channel, 10 MHz QPSK):
Limit line -50dBc (lessor compared with 15.209) based on 108.6 dBuV/m



Horizontal Table:

Horizontal RE Data									
Measurement Frequency (MHz)	QP Measured (dBuV)	Adjustments (dBm)	Tum Table (degrees)	Antenna Height (cm)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Pass	Comments
59.15	46.9	-19.6	3	111	27.4	58	-30.6	Pass	
76.85	68.1	-24.4	258	228	43.7	58	-14.3	Pass	
114.64	43.1	-15.9	350	376	27.2	58	-30.8	Pass	
374.99	58	-13.3	87	189	44.7	58	-13.3	Pass	
874.99	49.2	-2.9	180	143	46.2	58	-11.8	Pass	
999.98	47.8	0.3	275	111	48.1	58	-9.9	Pass	

Vertical Table:

Vertical RE Data									
Measurement Frequency (MHz)	QP Measured (dBuV)	Adjustments (dBm)	Tum Table (degrees)	Antenna Height (cm)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Pass	Comments
34.98	57.7	-19.4	-1	109	38.3	58	-19.7	Pass	
52.83	57.9	-19.7	-1	111	38.1	58	-19.9	Pass	
60.44	63.3	-19.7	-1	111	43.7	58	-14.3	Pass	
77.90	59.3	-24.4	159	111	34.8	58	-23.2	Pass	
114.40	49.7	-16	10	219	33.7	58	-24.3	Pass	
374.99	66.6	-13.3	193	117	53.3	58	-4.7	Pass	
425.00	53.2	-12.1	186	187	41.1	58	-16.9	Pass	
500.00	45	-10.3	350	139	34.7	58	-23.3	Pass	
524.99	52.9	-9.4	207	111	43.5	58	-14.5	Pass	
875.00	52.1	-2.9	239	181	49.2	58	-8.8	Pass	
1000.00	42.2	0.3	350	153	42.5	58	-15.5	Pass	

Spurious emissions 1 to 18 GHz (TX on mid channel, 10 MHz QPSK):

Frequency (MHz)	Average Measurement (dBμV)	Peak Measurement (dBμV)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)	Average Margin (dBμV/m)	Peak Margin (dBμV/m)	Pass Fail	Comments
1500.5	39.50	50.40	54	74	-14.5	-23.6	Pass	Horizontal Polarity
1500.0	46.90	51.80	54	74	-7.1	-22.2	Pass	Vertical Polarity

Spurious emissions 18 to 40 GHz (TX on mid channel, 10 MHz QPSK):

No spurious emissions detected.

Spurious emissions 40 to 60 GHz (TX on mid channel, 10 MHz QPSK):

No spurious emissions detected.

Noise floor at 48.240 GHz: 30 dBuV/m @ 10 cm

Corrected with antenna factor (40.5 dB/dBuV/m) and extrapolation (10cm -> 3m equals -30 dB): 40.5 dBuV/m

Spurious emissions 60 to 75 GHz (TX on mid channel, 10 MHz QPSK):

No spurious emissions detected.

Noise floor at 72.360 GHz: 30 dBuV/m @ 10 cm

Corrected with antenna factor (26.2 dB/dBuV/m) and extrapolation (10cm -> 3m equals -30 dB): 39.8 dBuV/m

Spurious emissions 75 to 100 GHz (TX on mid channel, 10 MHz QPSK):

No spurious emissions detected.

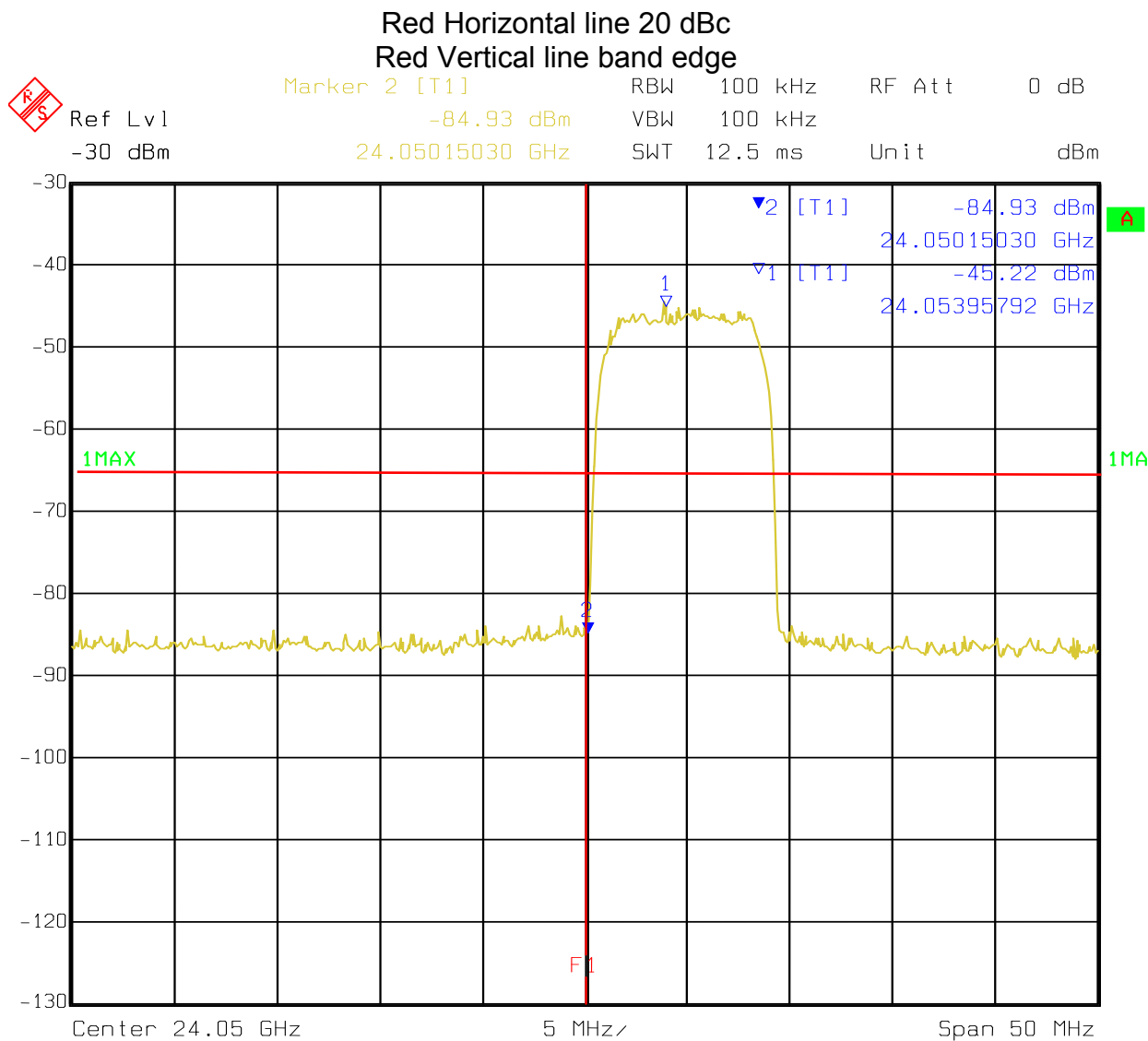
Noise floor at 96.480 GHz: 24 dBuV/m @ 10 cm

Corrected with antenna factor (46.6 dB/dBuV/m) and extrapolation (10cm -> 3m equals -30 dB): 40.4 dBuV/m

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

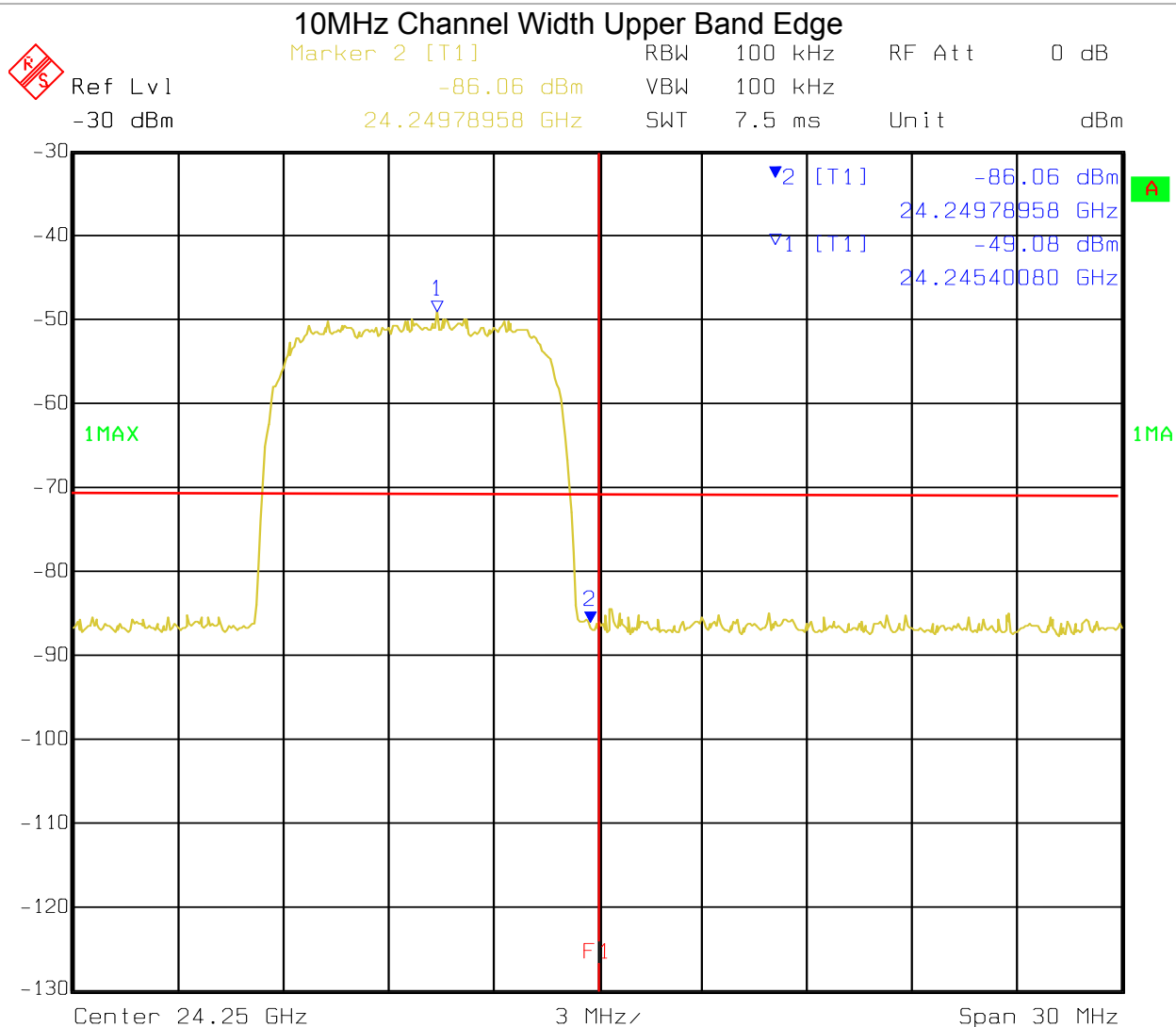
10 MHz Channel Width Lower Band Edge



Date: 28.JAN.2013 21:01:34

FCC ID: NCY-SL24
IC: 2945A-SL24

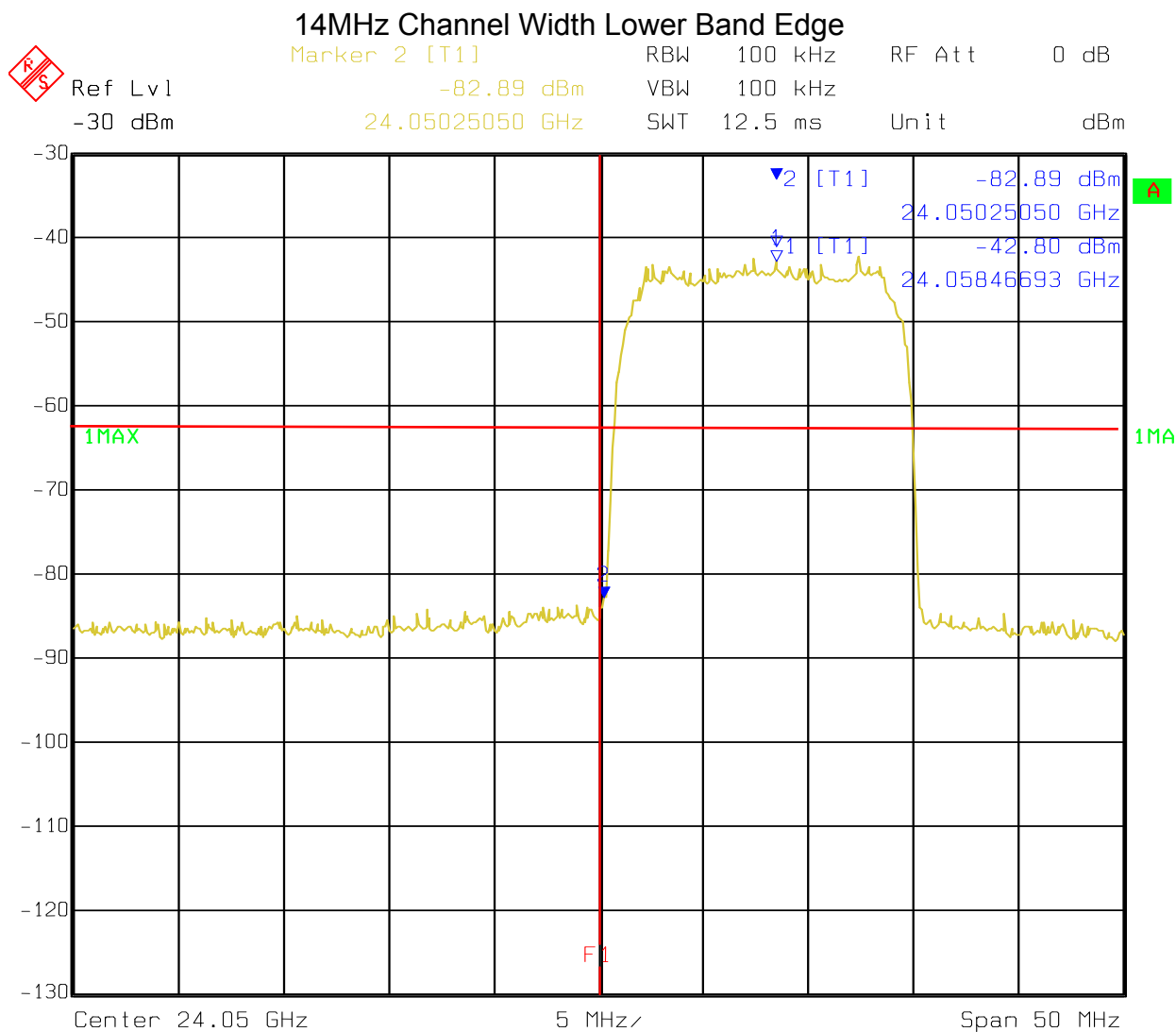
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 23:32:34

FCC ID: NCY-SL24
IC: 2945A-SL24

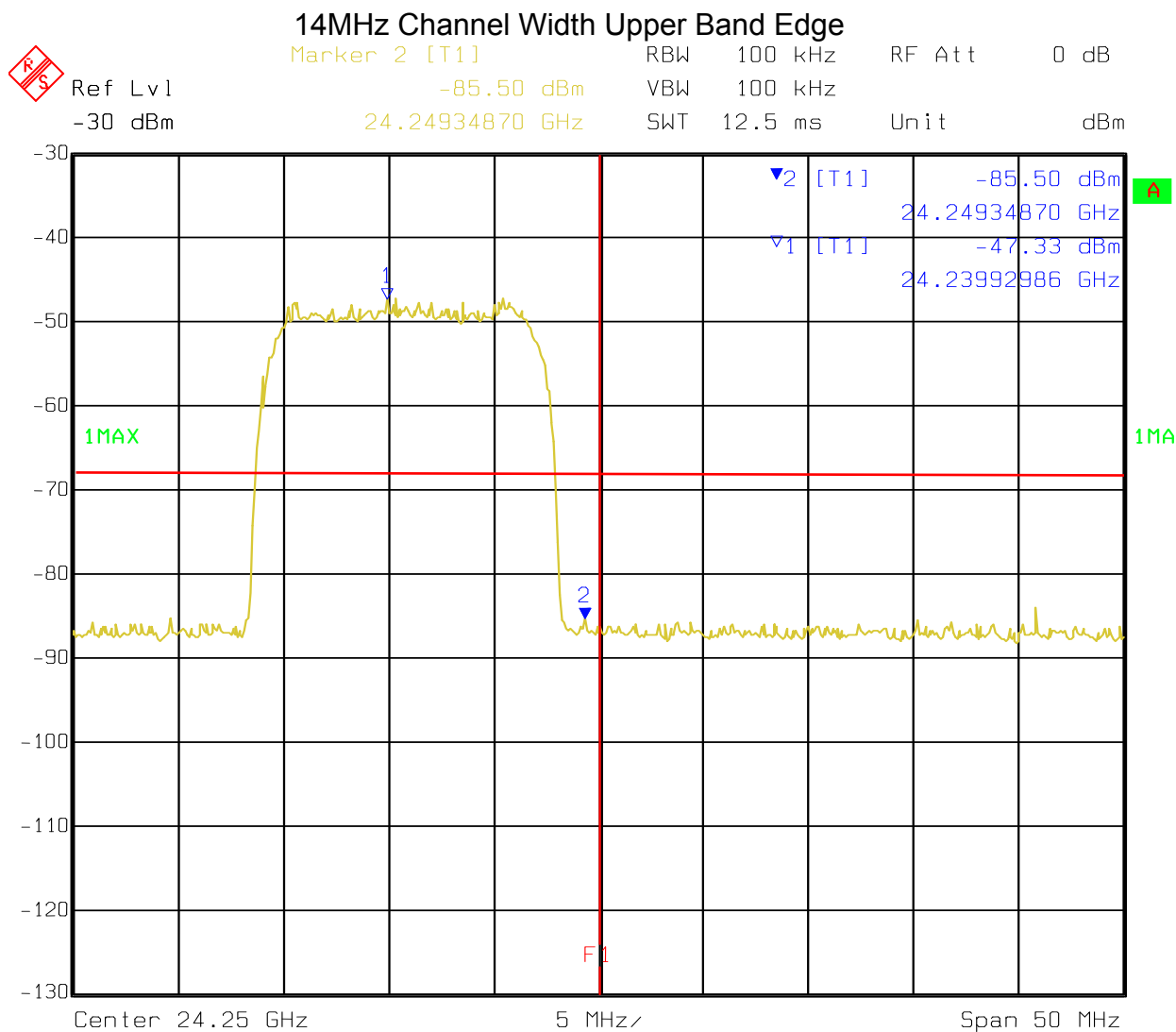
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 22:22:58

FCC ID: NCY-SL24
IC: 2945A-SL24

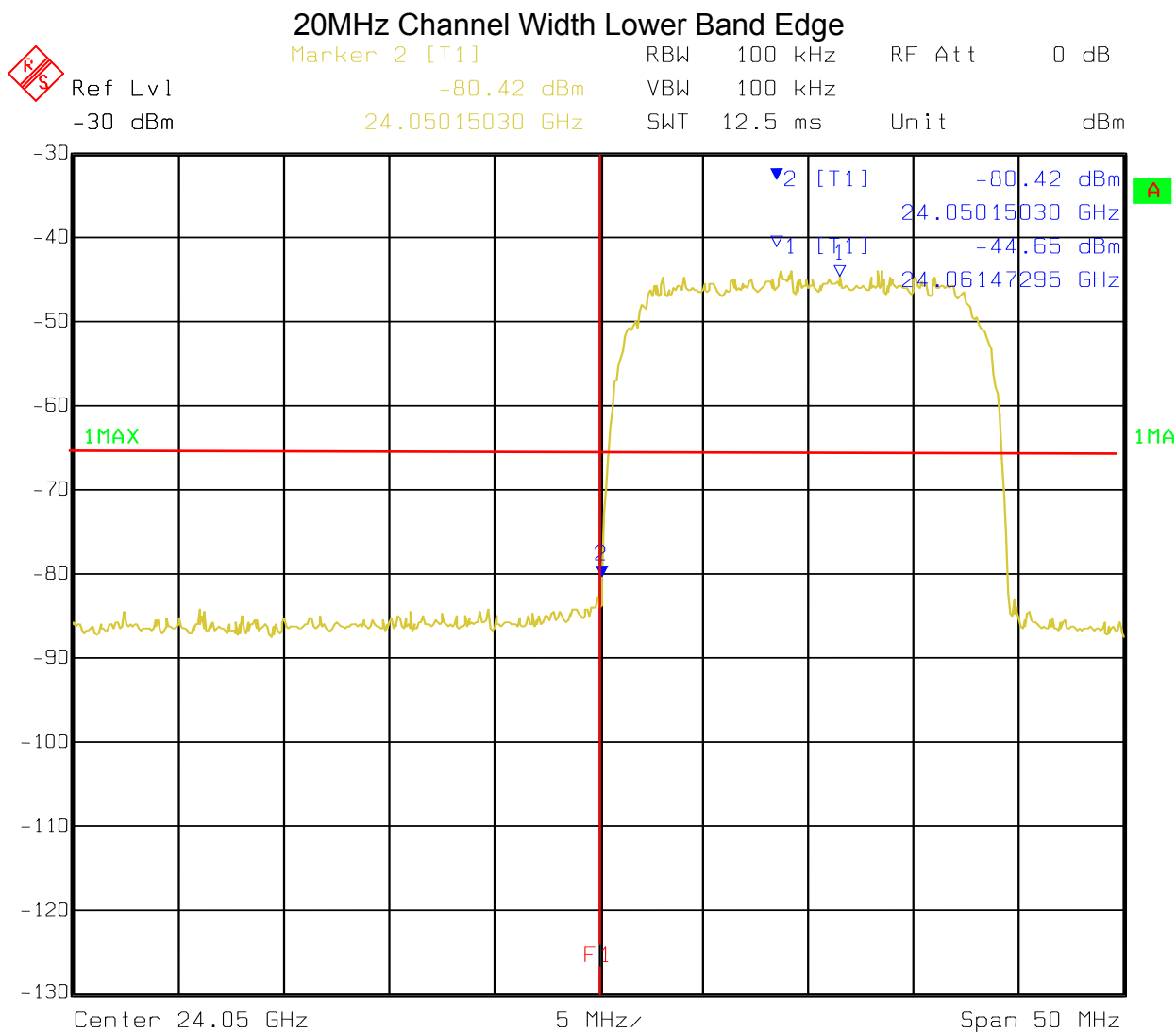
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 23:25:43

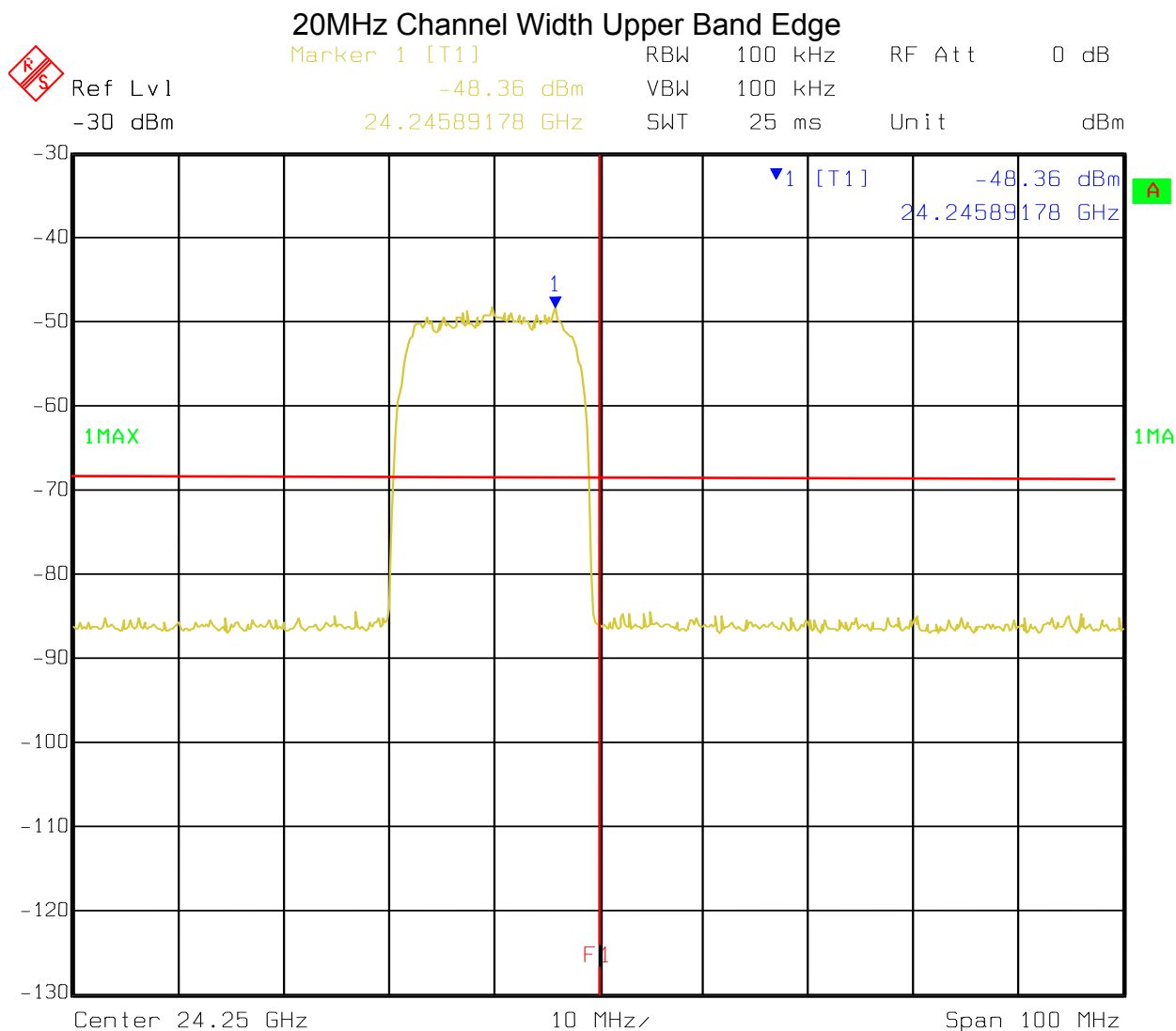
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 21:34:50

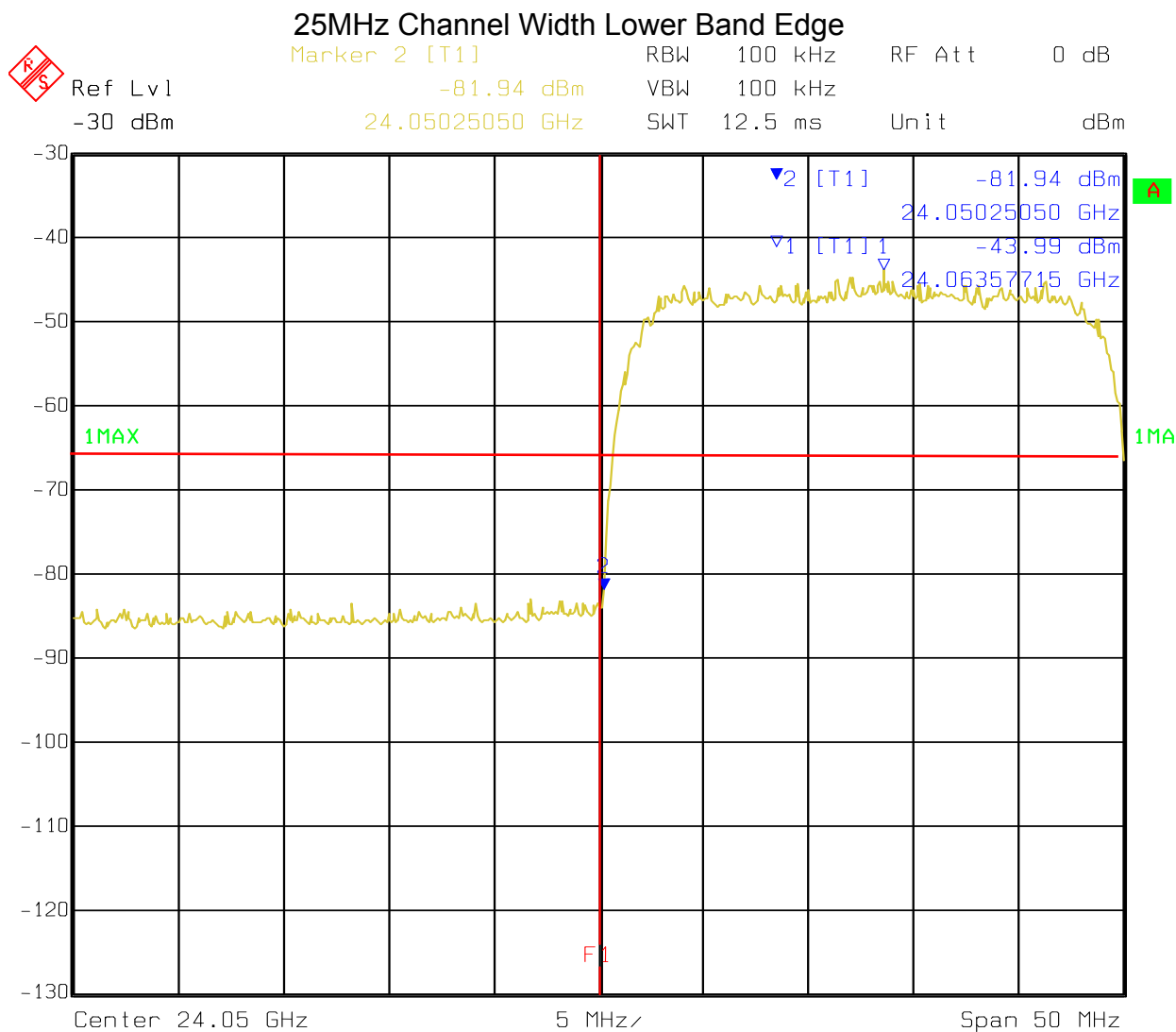
www.nemko.com



Date: 28.JAN.2013 23:22:50

FCC ID: NCY-SL24
IC: 2945A-SL24

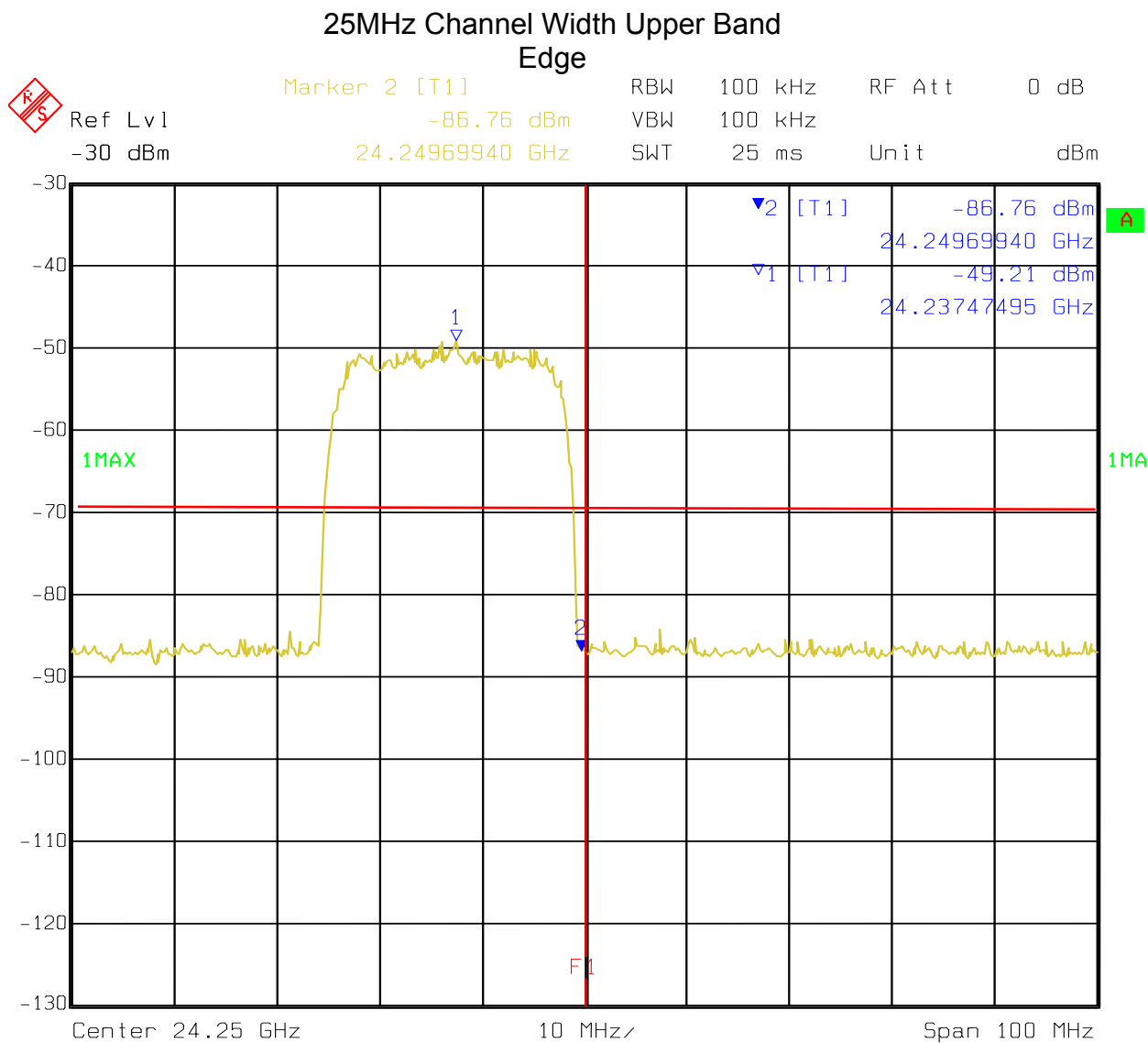
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 22:19:12

FCC ID: NCY-SL24
IC: 2945A-SL24

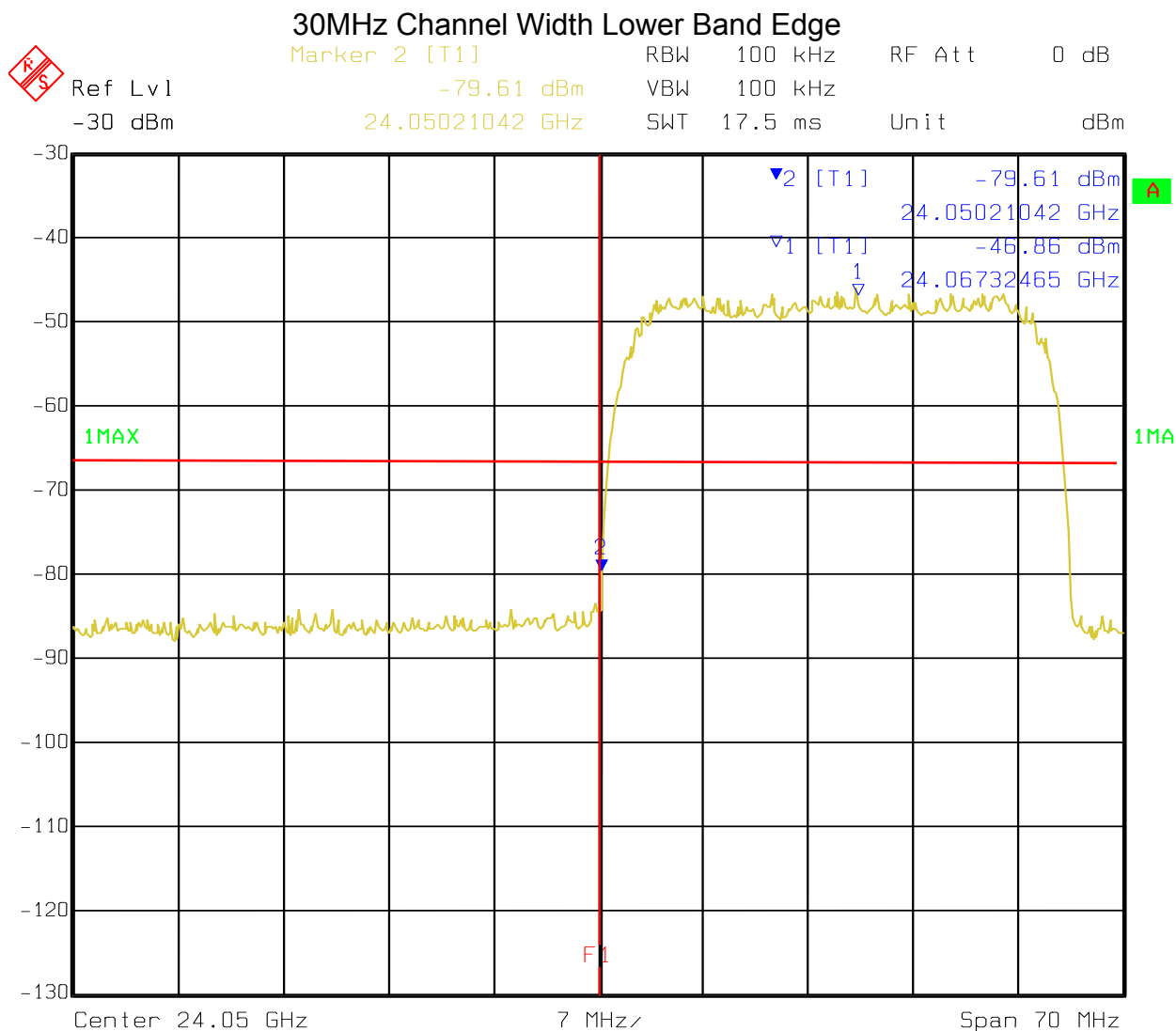
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 23:13:38

FCC ID: NCY-SL24
IC: 2945A-SL24

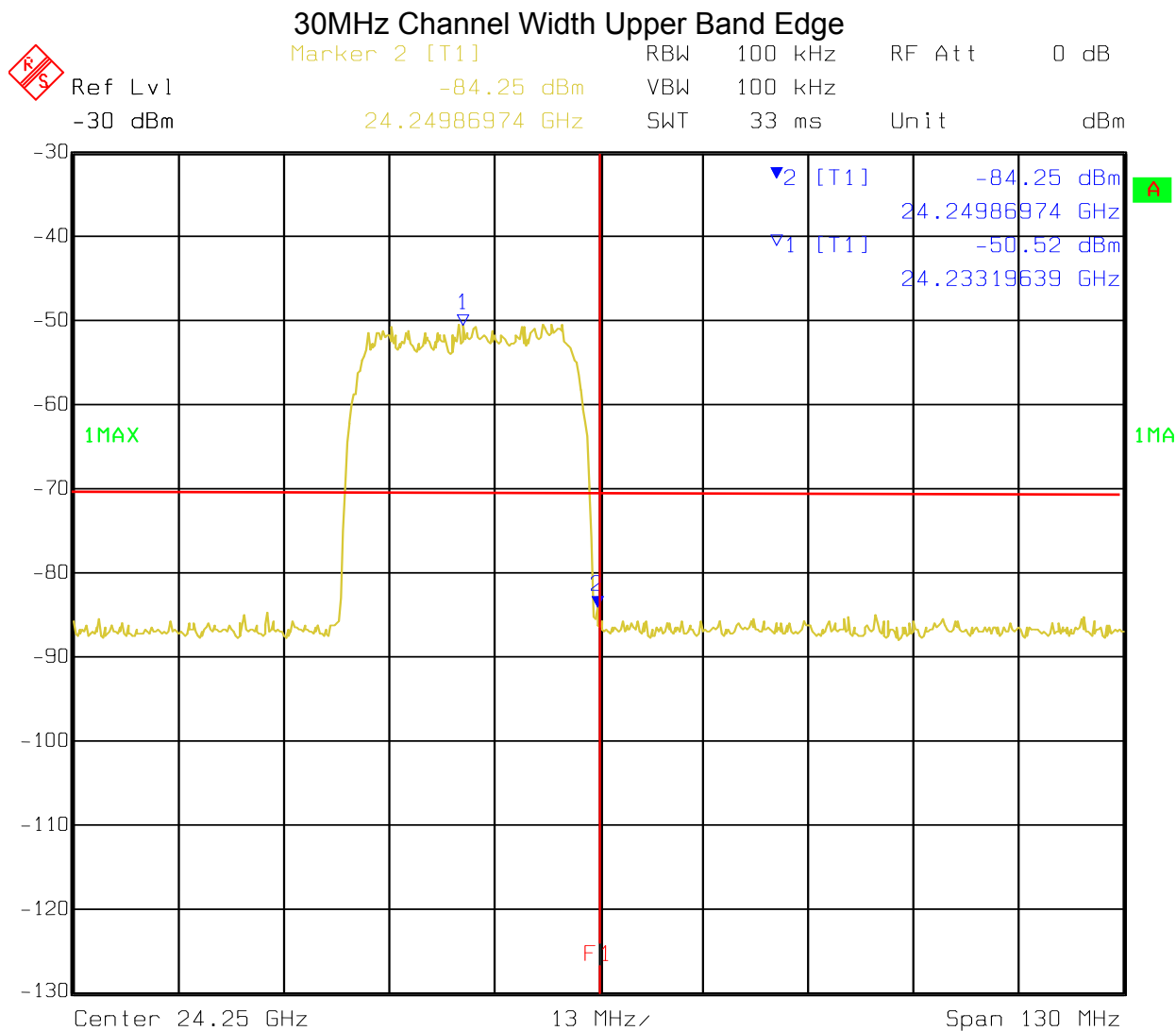
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 22:25:20

FCC ID: NCY-SL24
IC: 2945A-SL24

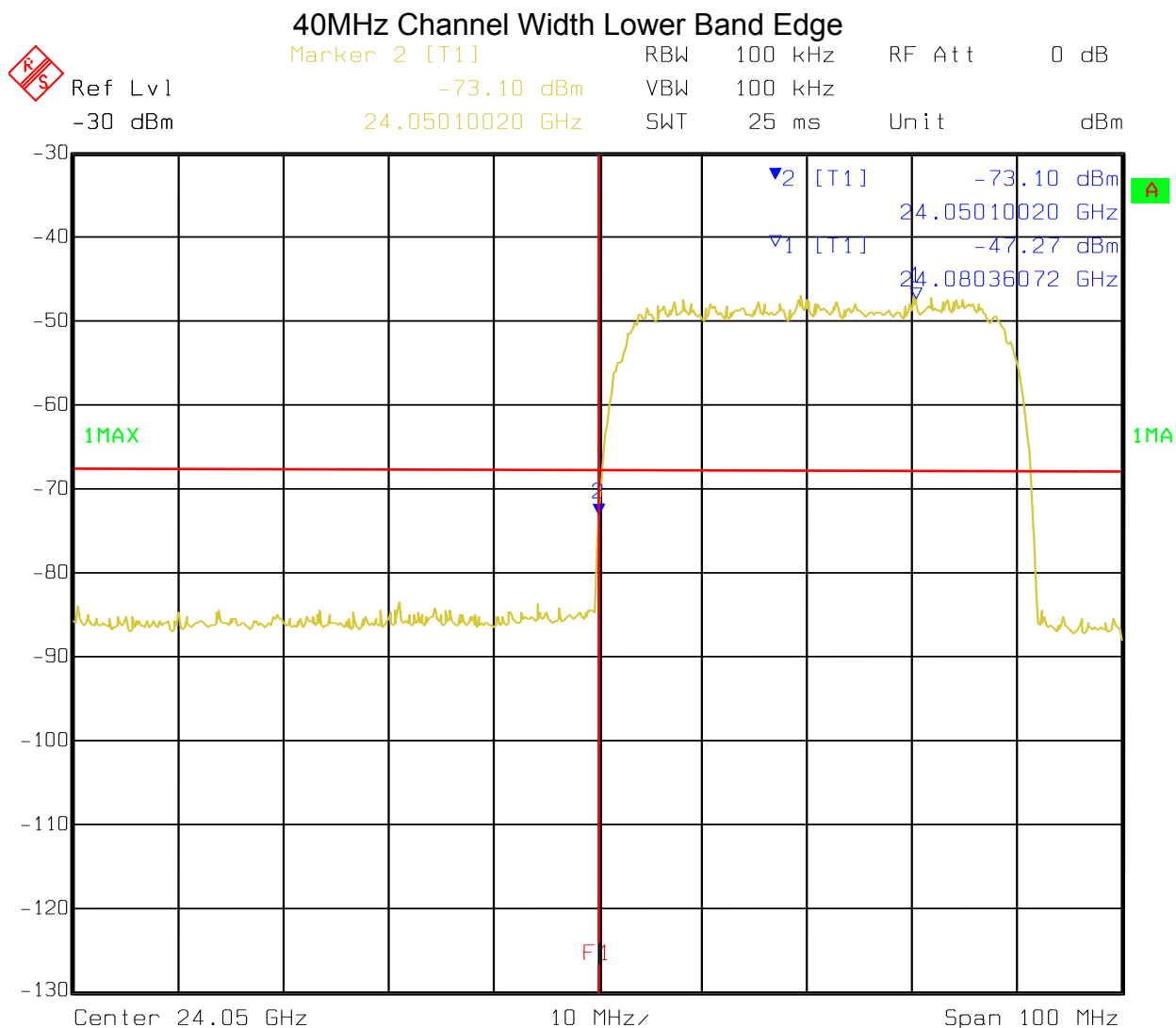
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 23:00:19

FCC ID: NCY-SL24
IC: 2945A-SL24

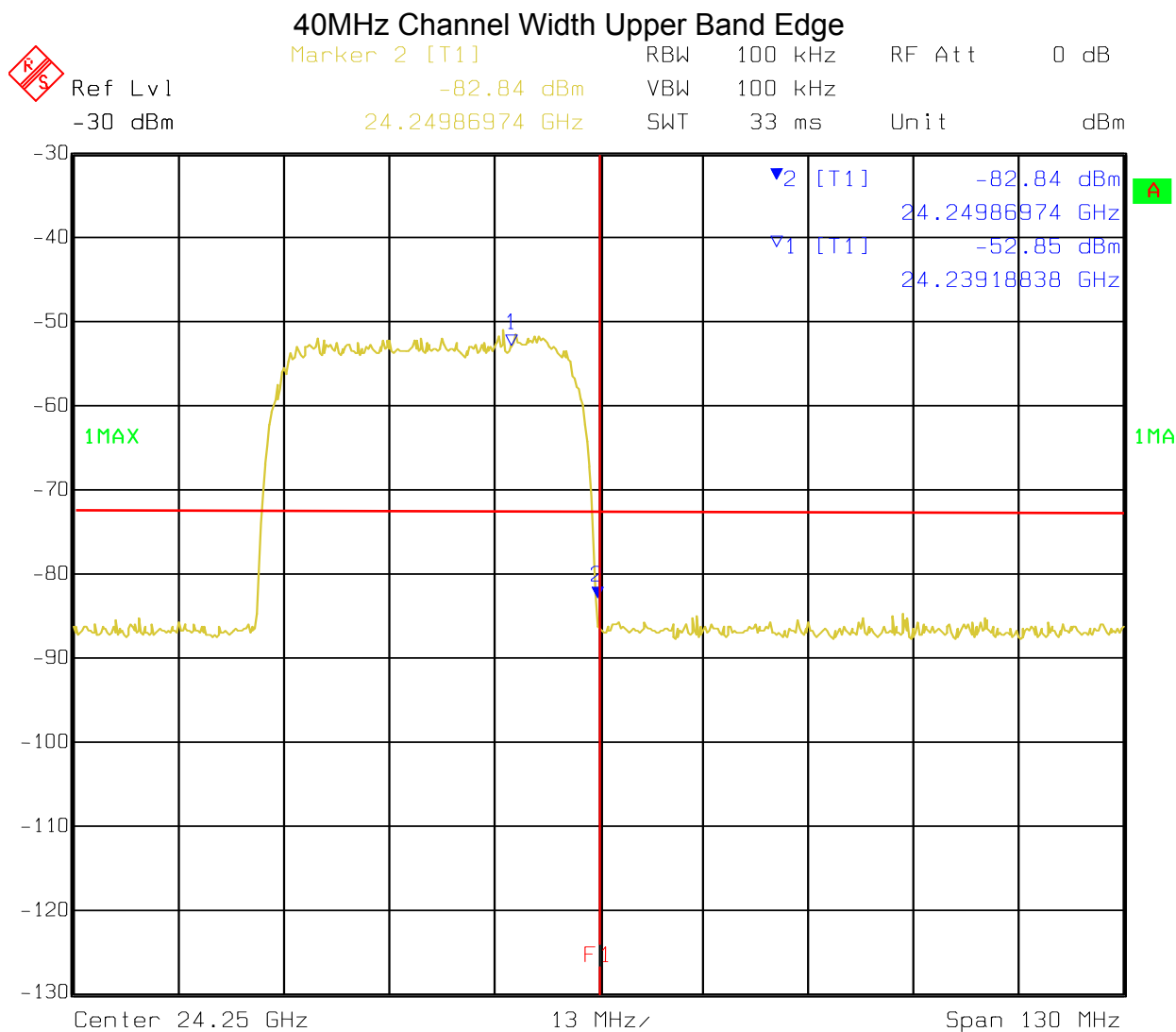
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 22:29:08

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

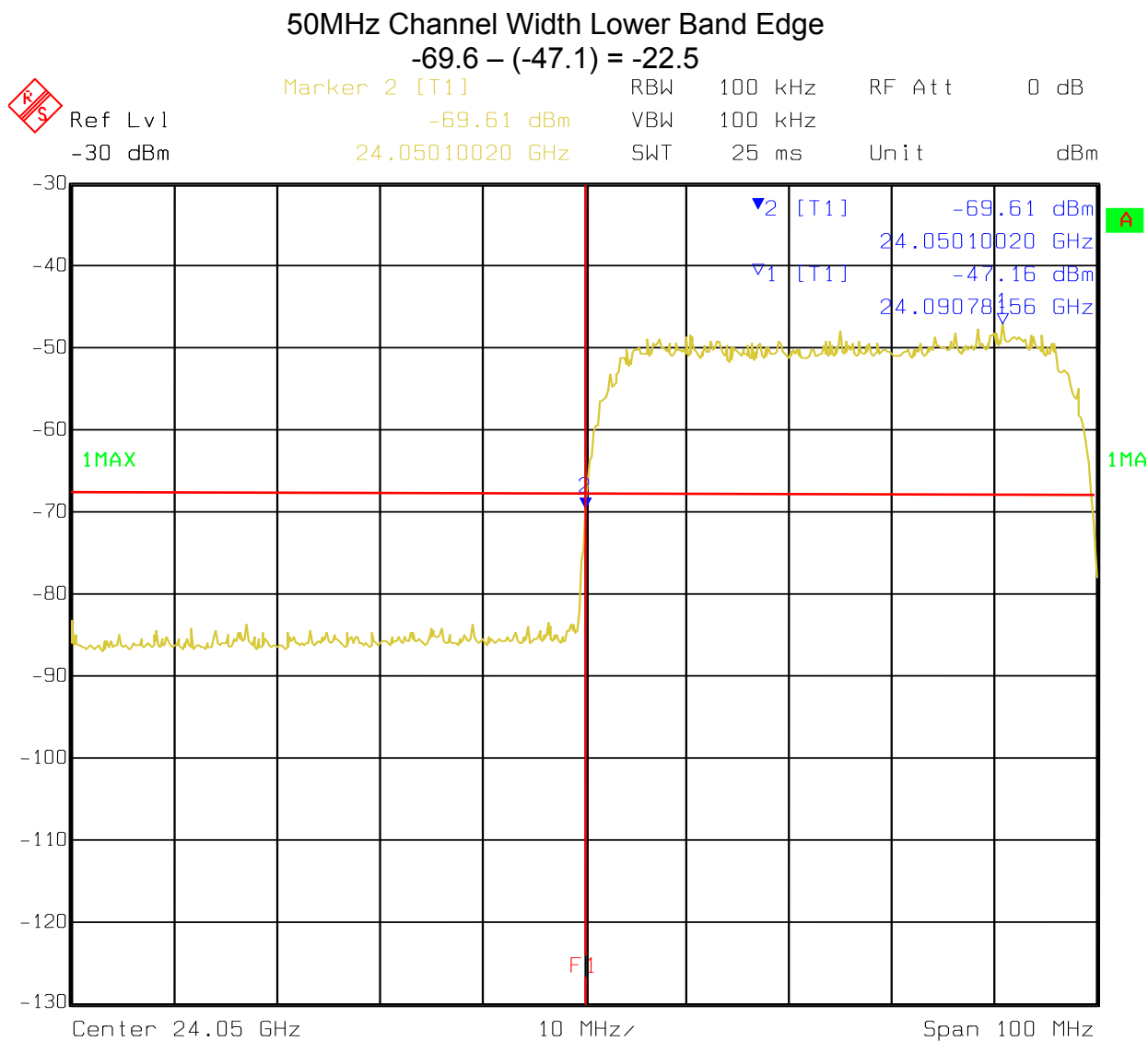


Date: 28.JAN.2013 22:57:14

www.nemko.com

FCC ID: NCY-SL24
IC: 2945A-SL24

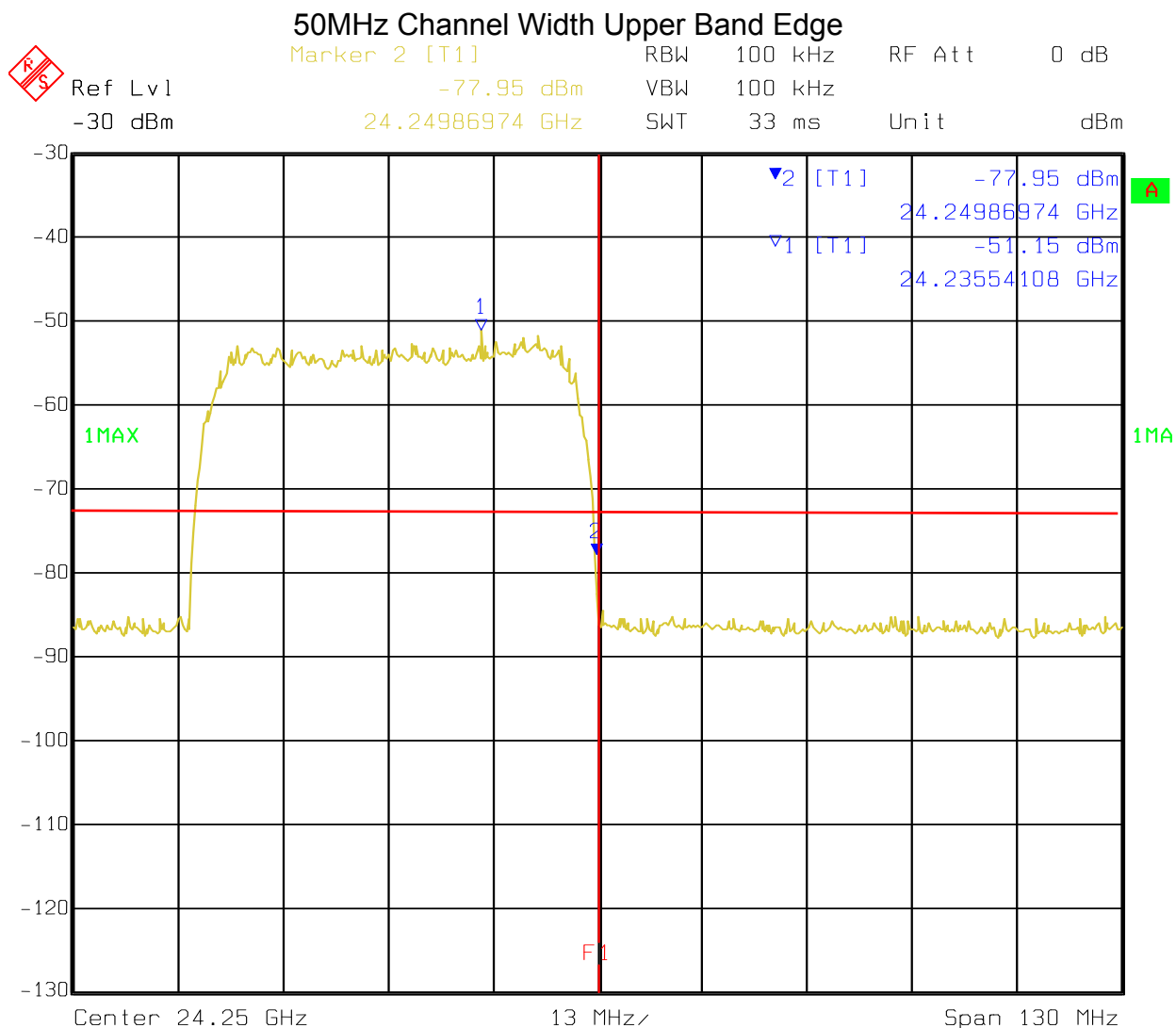
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 22:31:20

FCC ID: NCY-SL24
IC: 2945A-SL24

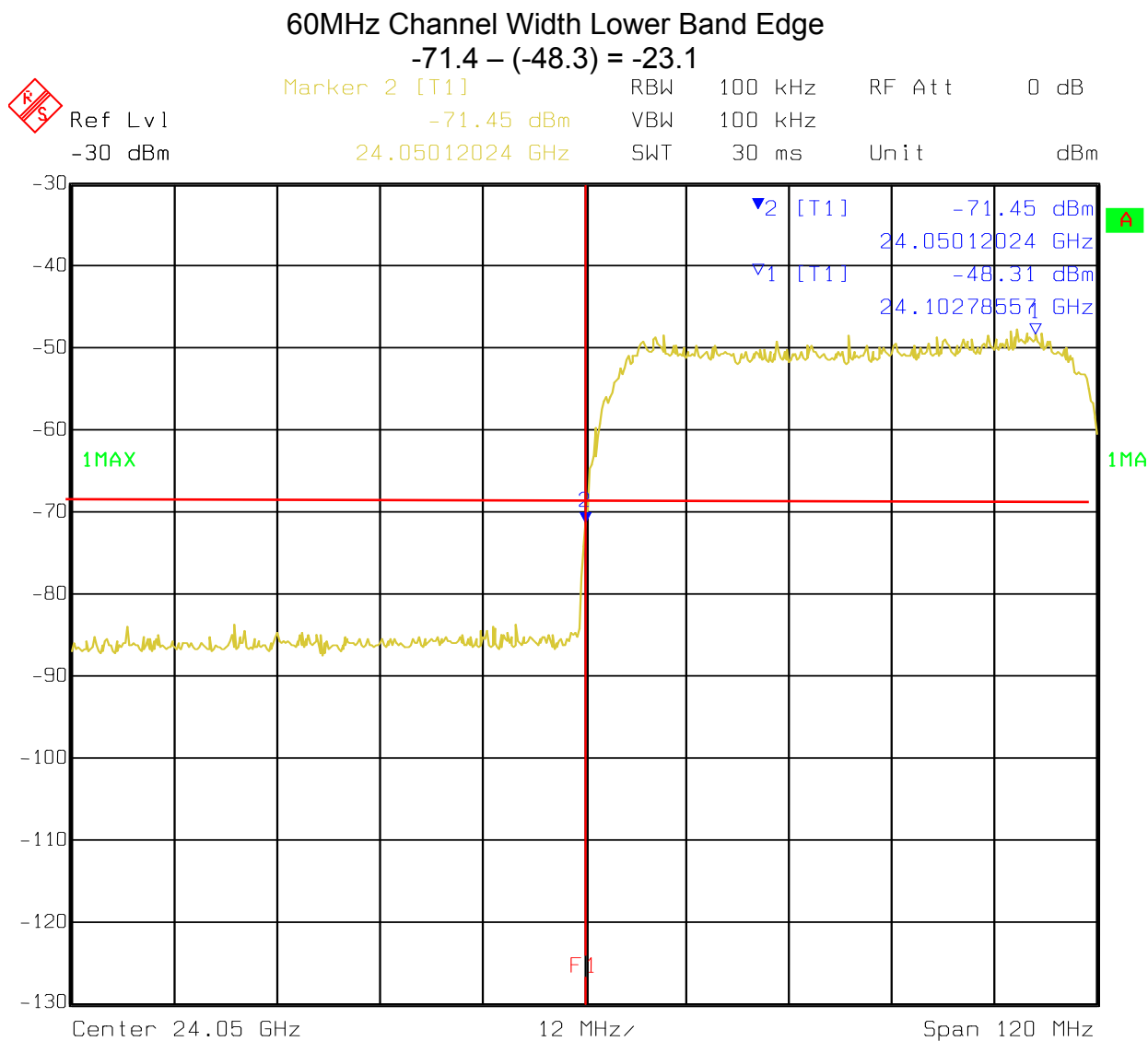
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 22:53:37

FCC ID: NCY-SL24
IC: 2945A-SL24

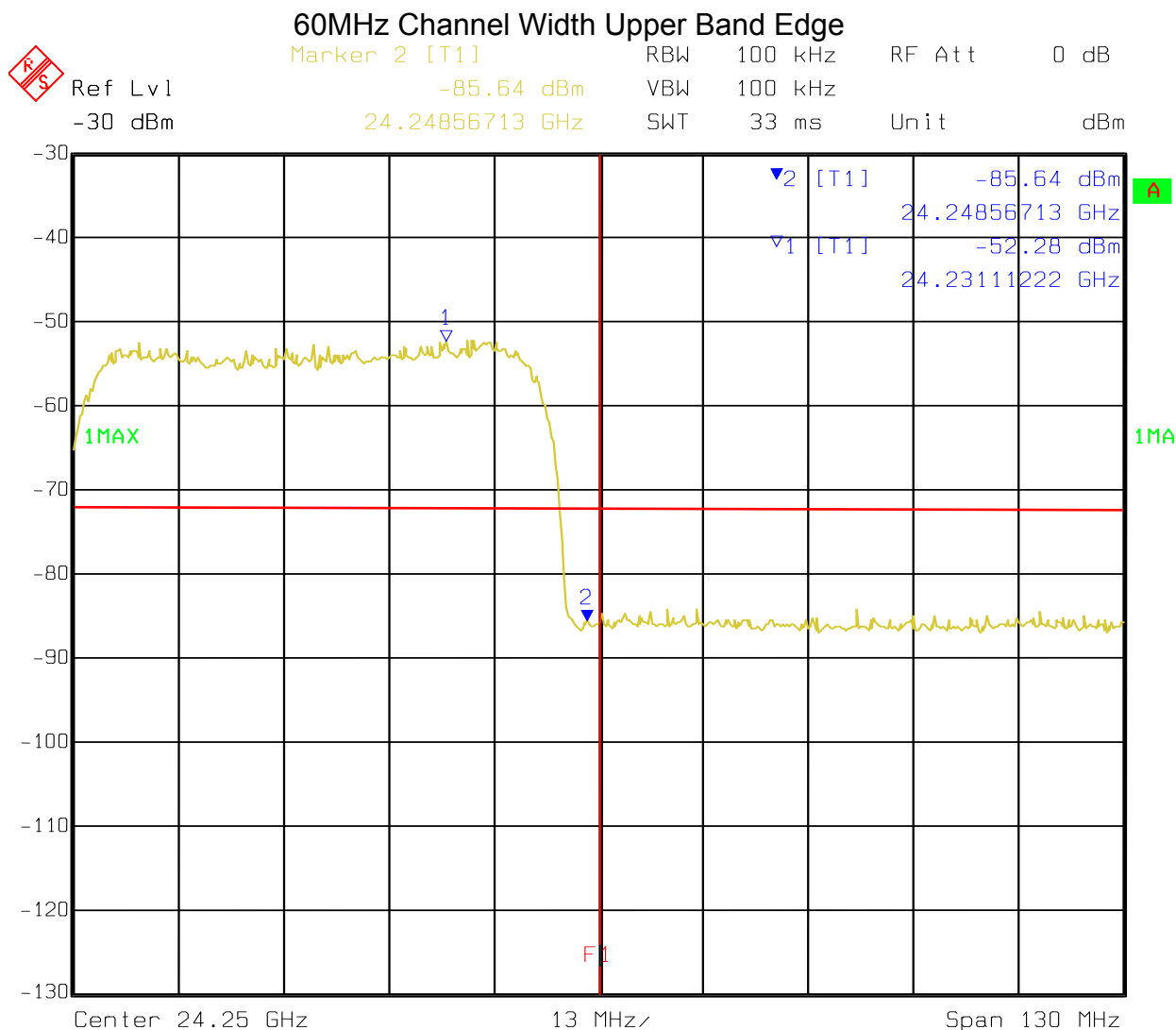
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 28.JAN.2013 22:36:15

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

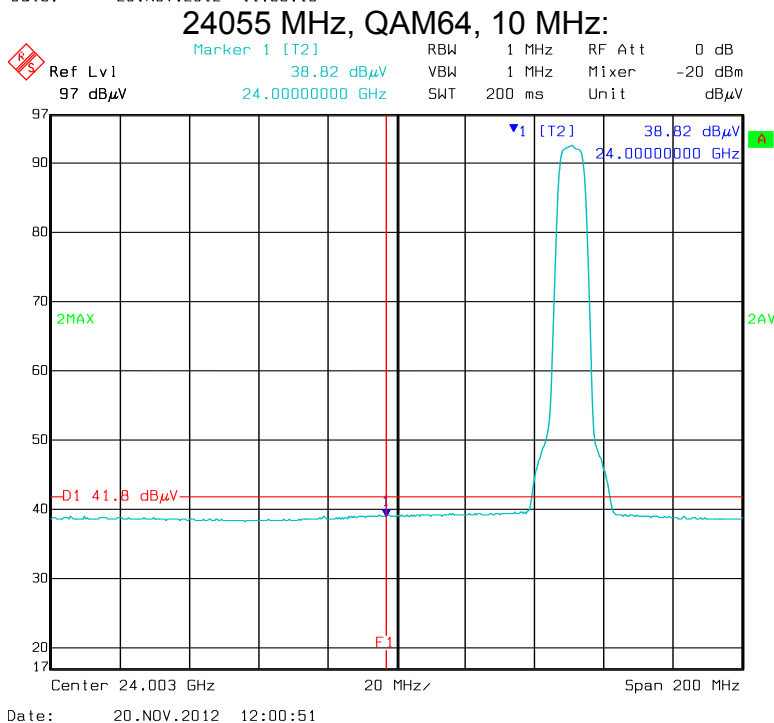
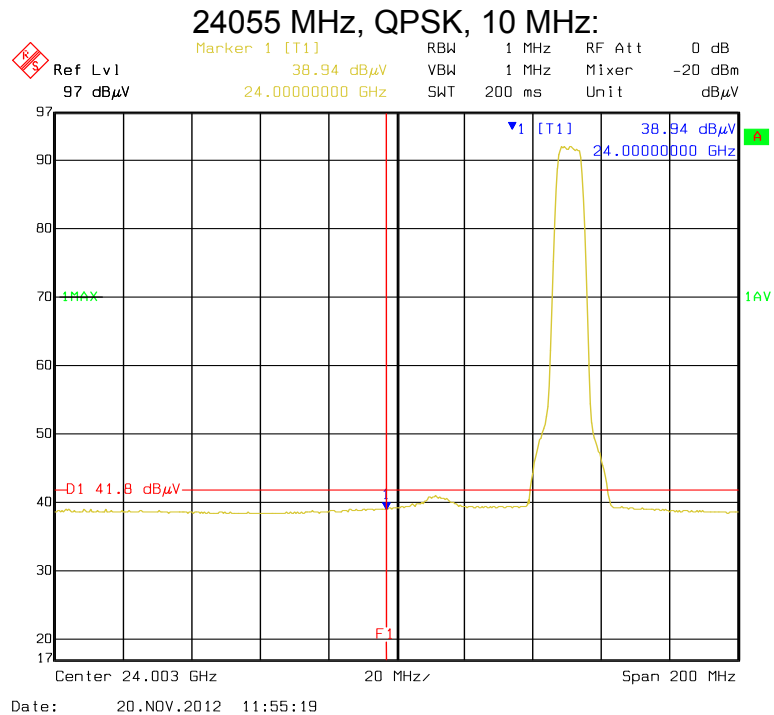


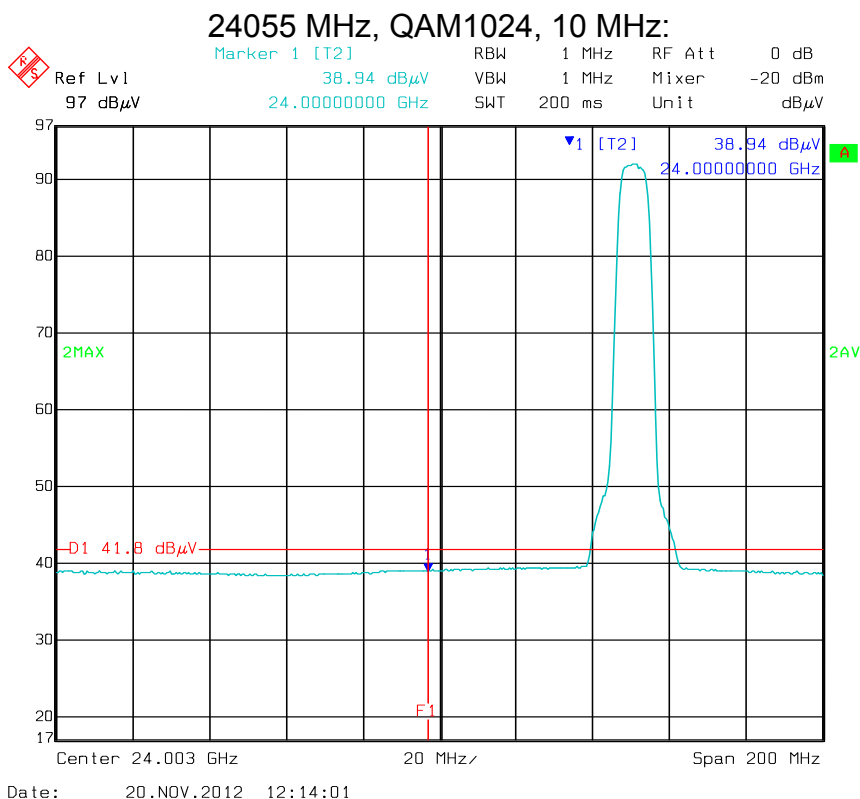
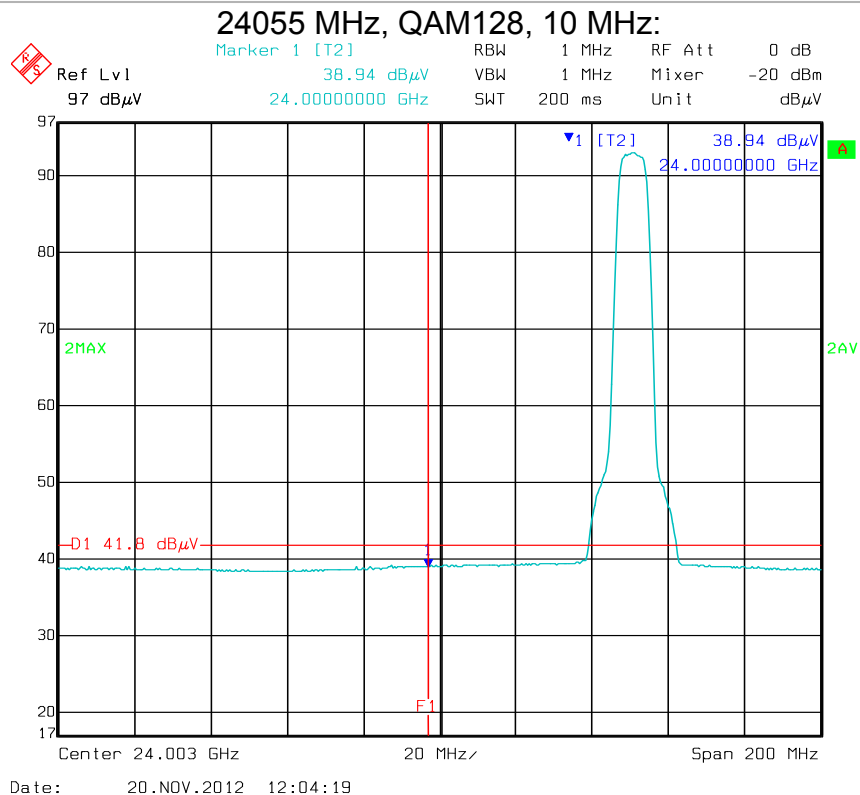
Date: 28.JAN.2013 22:50:01

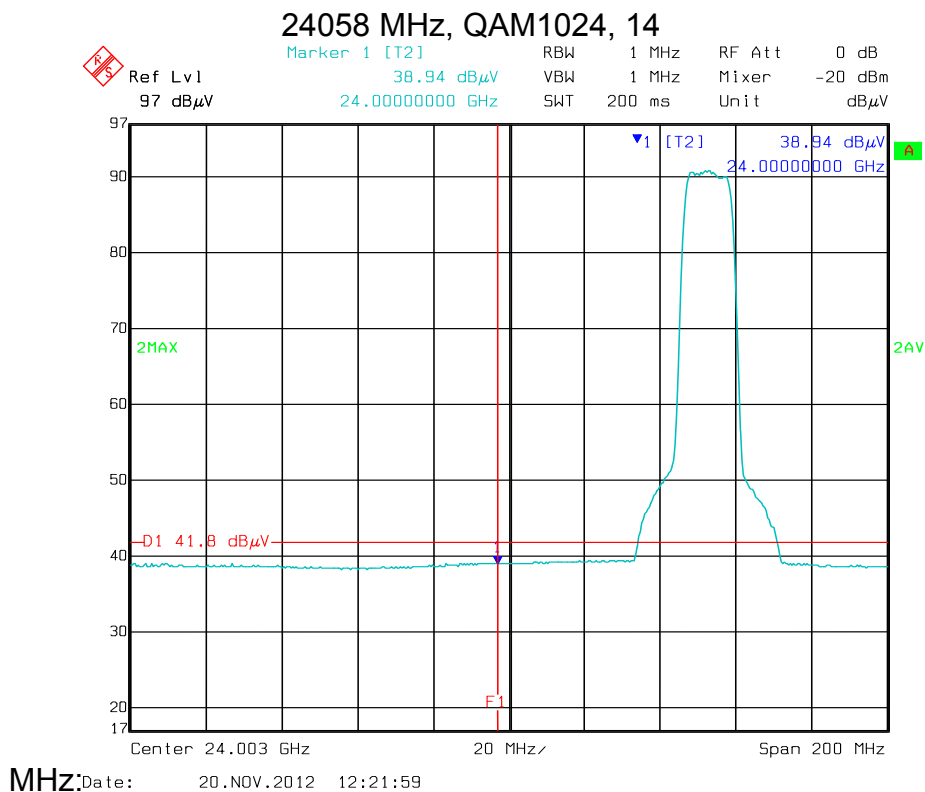
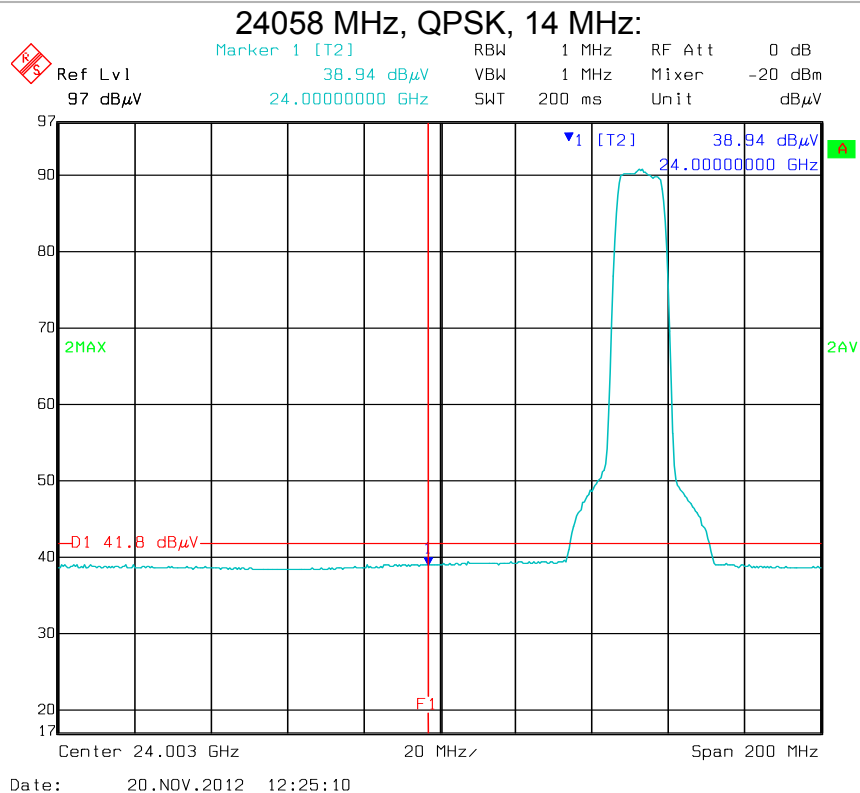
www.nemko.com

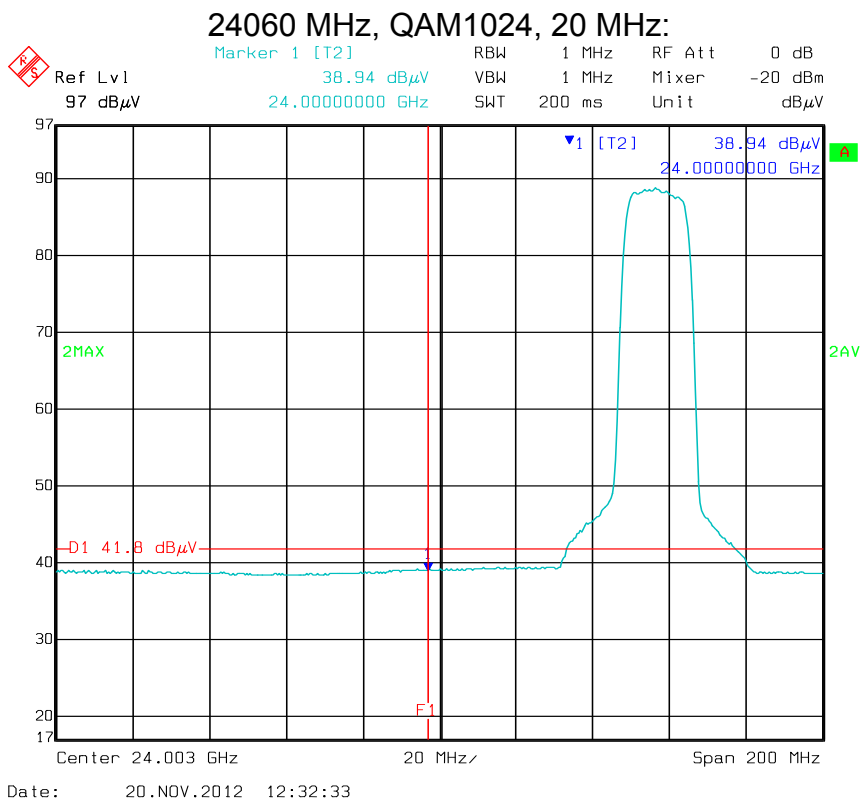
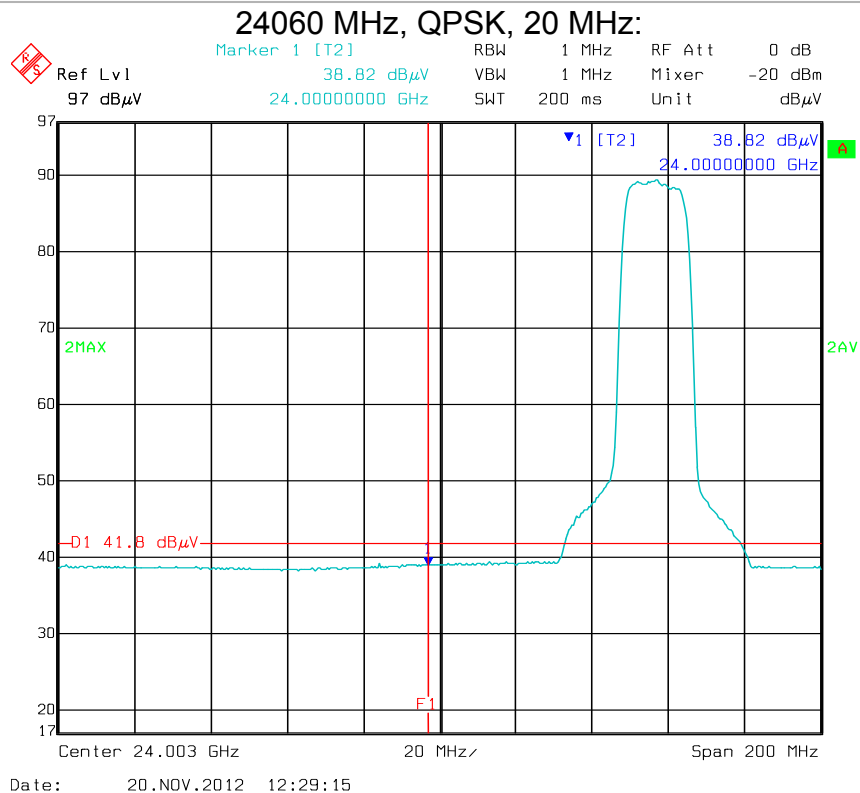
3 Ft, Antenna data

Bandedge low channel: (D1 @ 41.8dBuV represents the 54 dBuV/m (41.4 dBuV + 46.2 dBuV/m/dBuV (AF) – 33.6 dB (Preamp gain and cable loss);
F1 is @ 24 GHz)

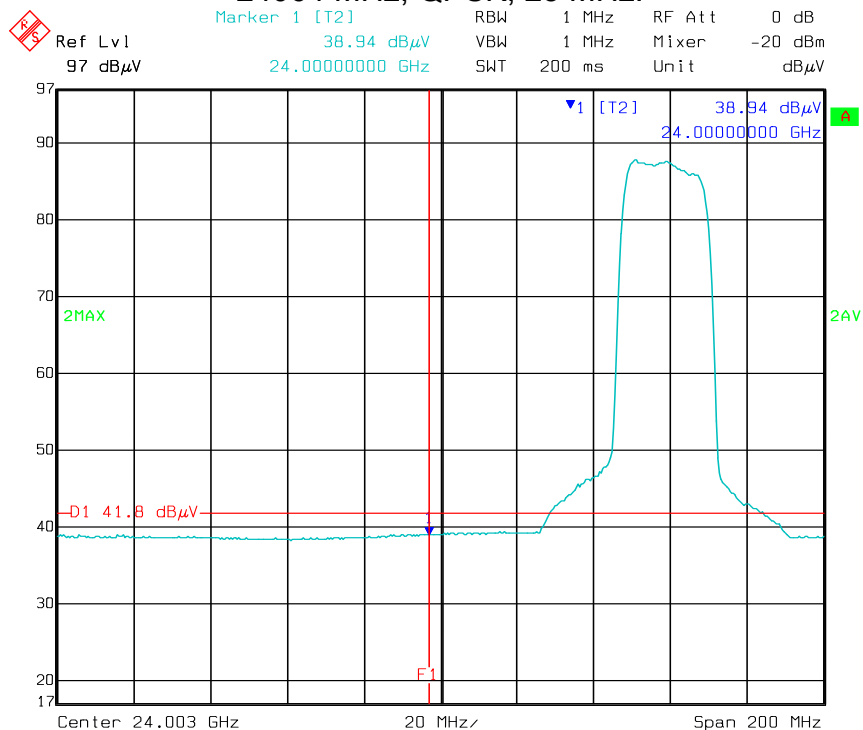






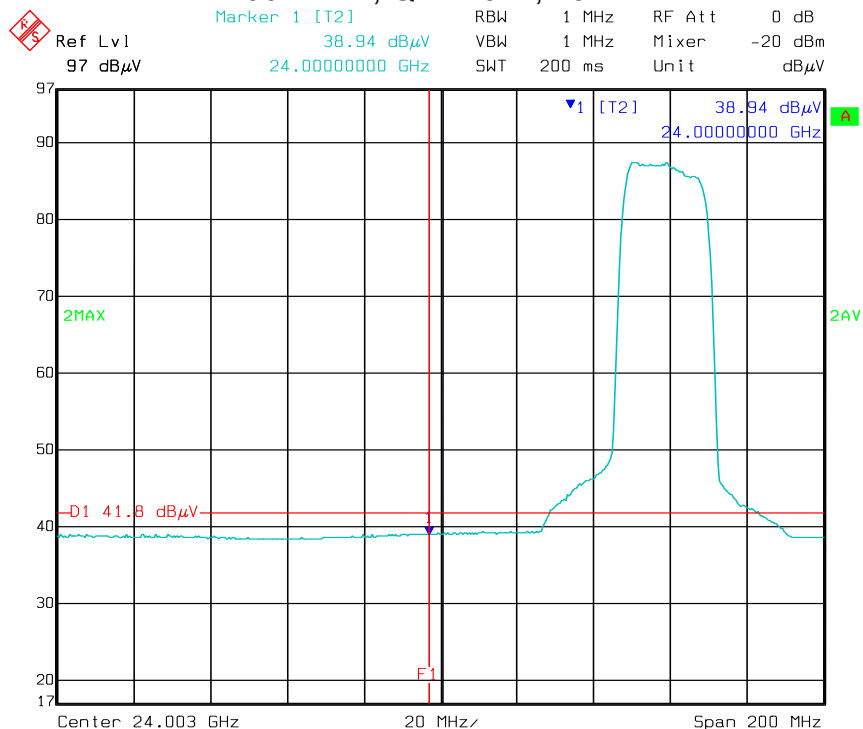


24064 MHz, QPSK, 25 MHz:



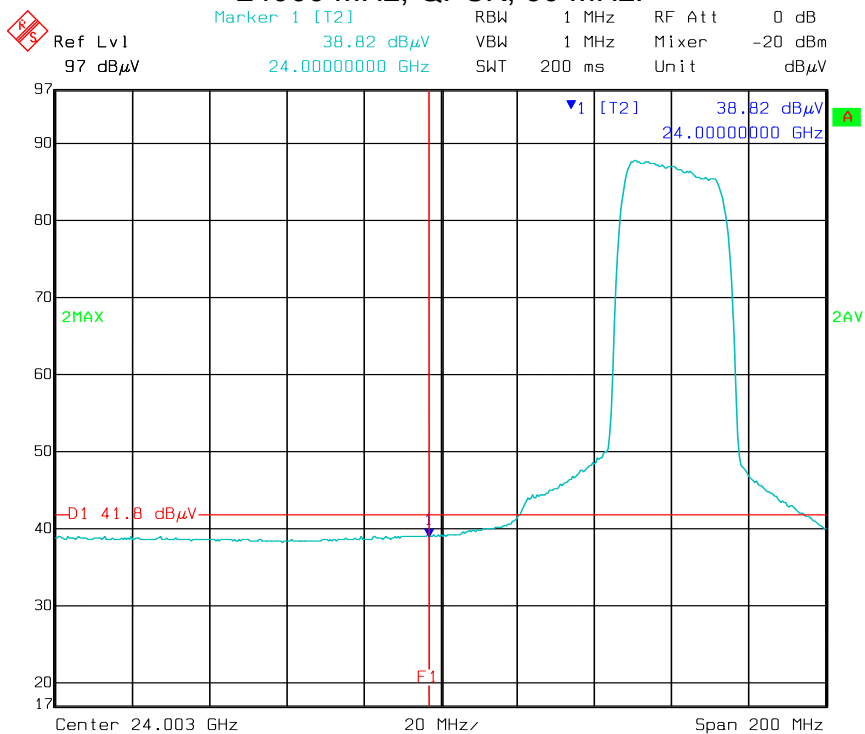
Date: 20.NOV.2012 12:38:18

24064 MHz, QAM1024, 25 MHz:



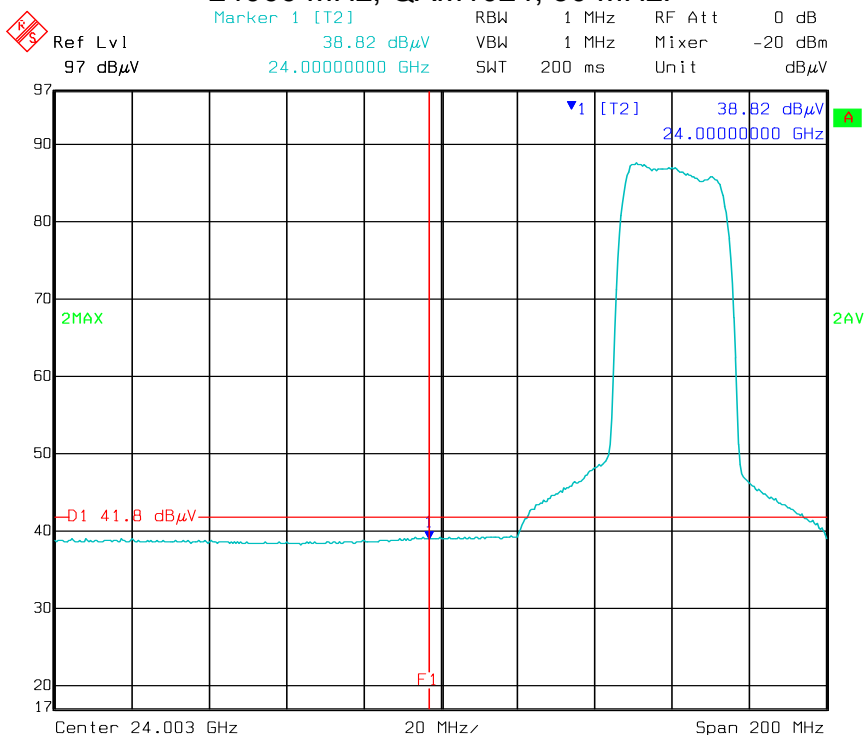
Date: 20.NOV.2012 12:35:54

24066 MHz, QPSK, 30 MHz:

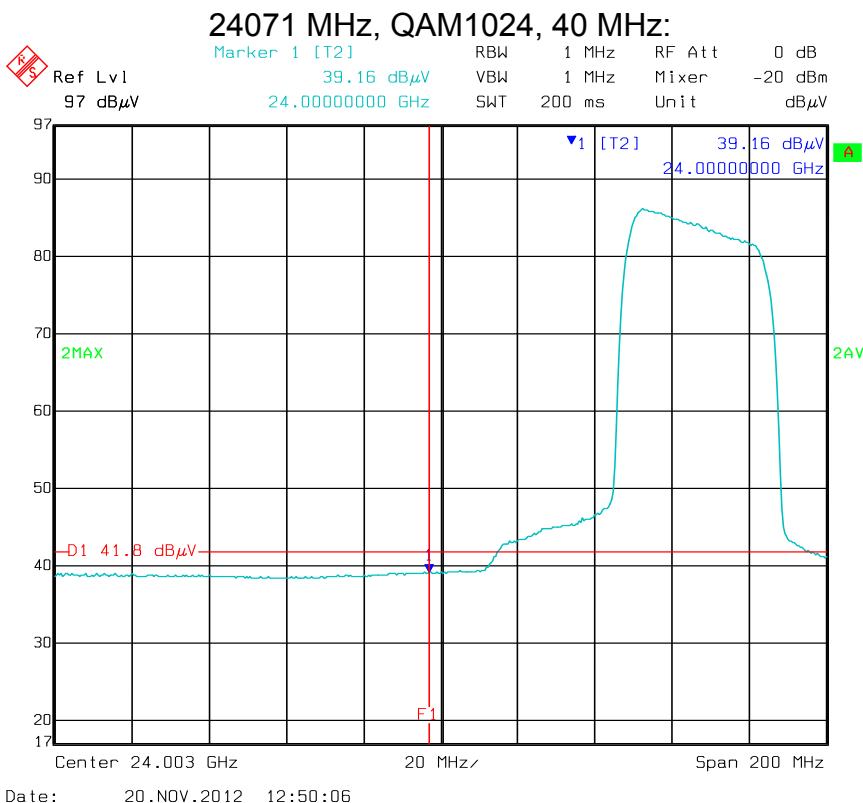
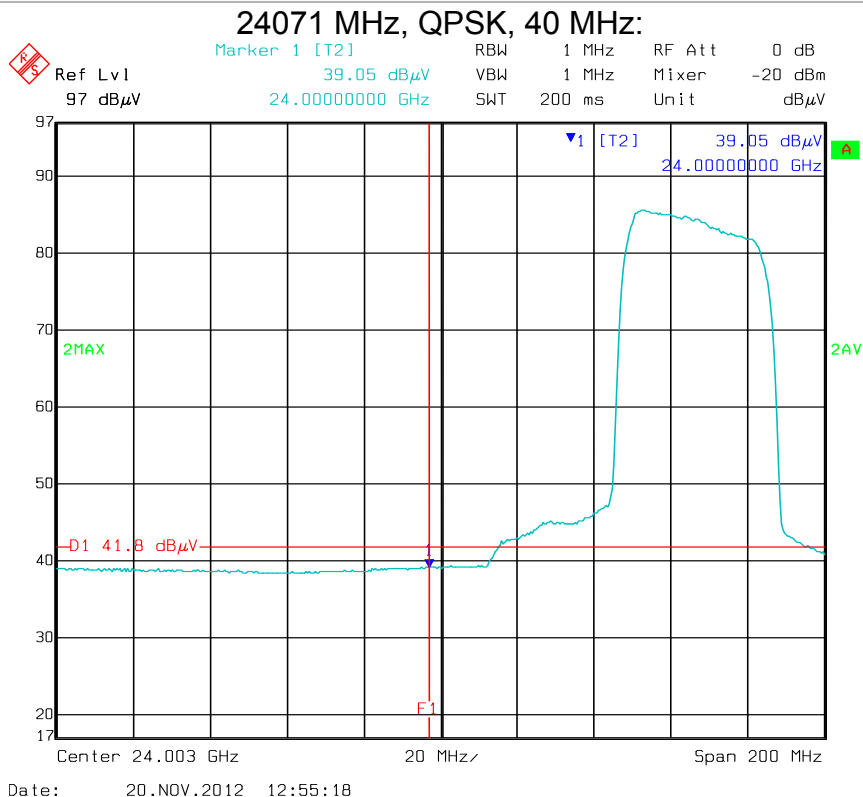


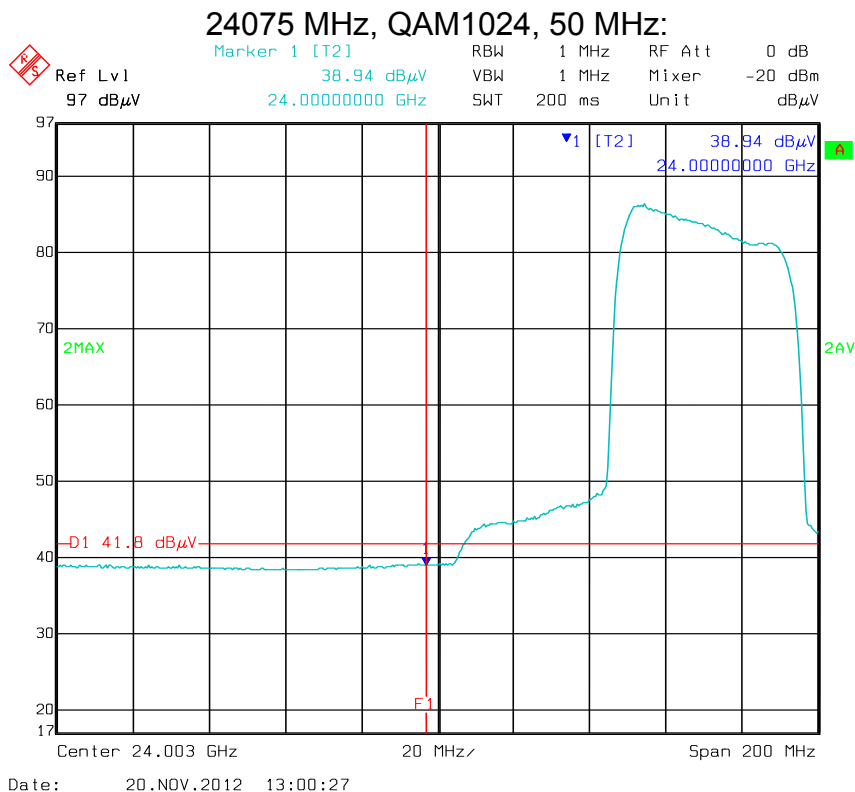
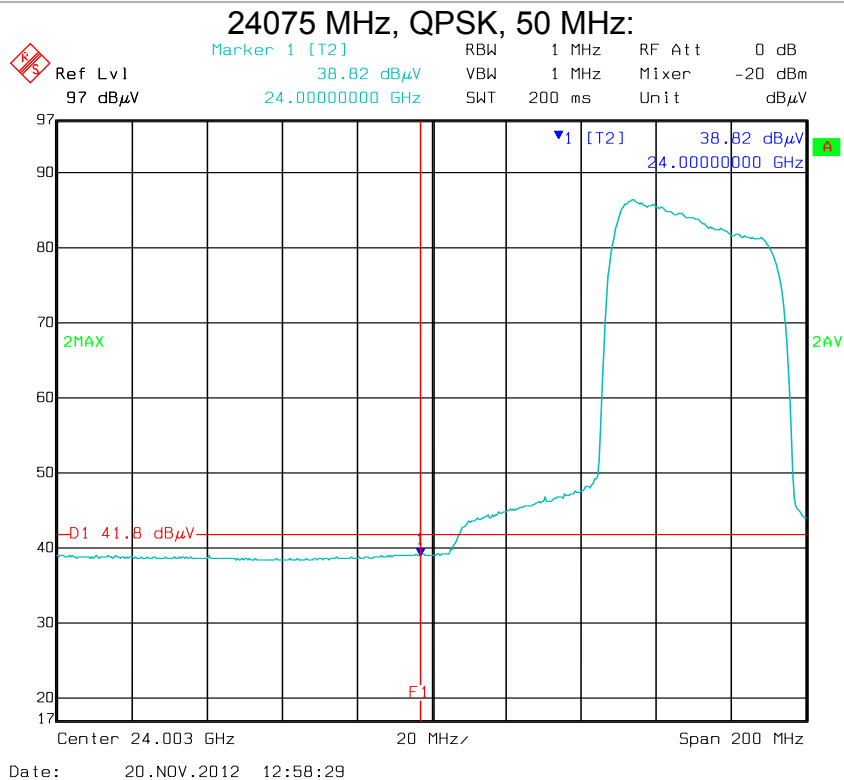
Date: 20.NOV.2012 12:42:09

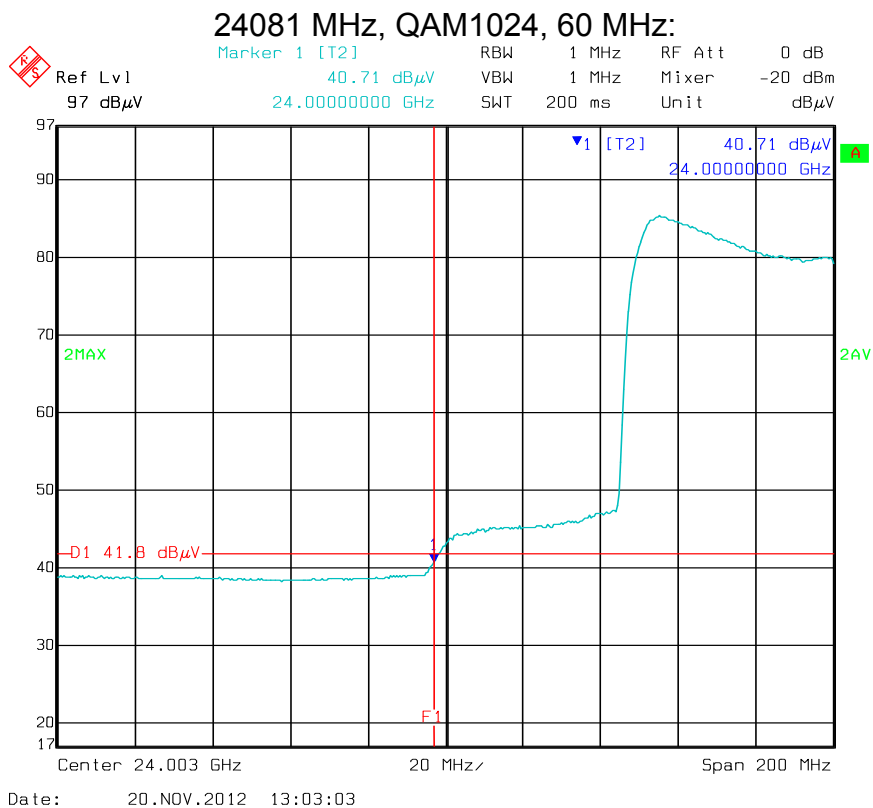
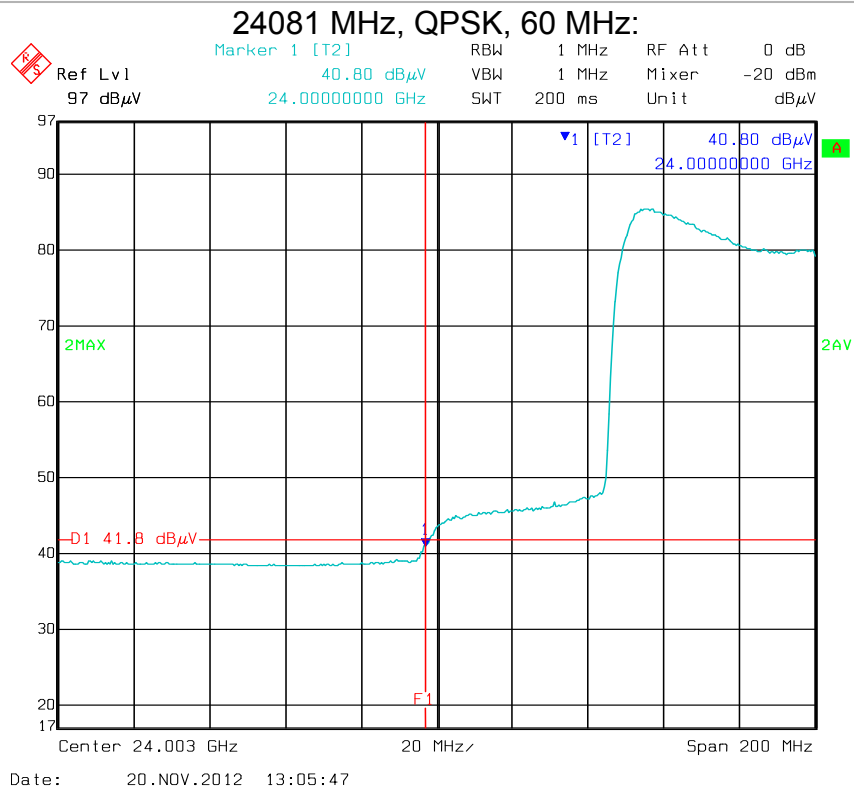
24066 MHz, QAM1024, 30 MHz:



Date: 20.NOV.2012 12:47:07



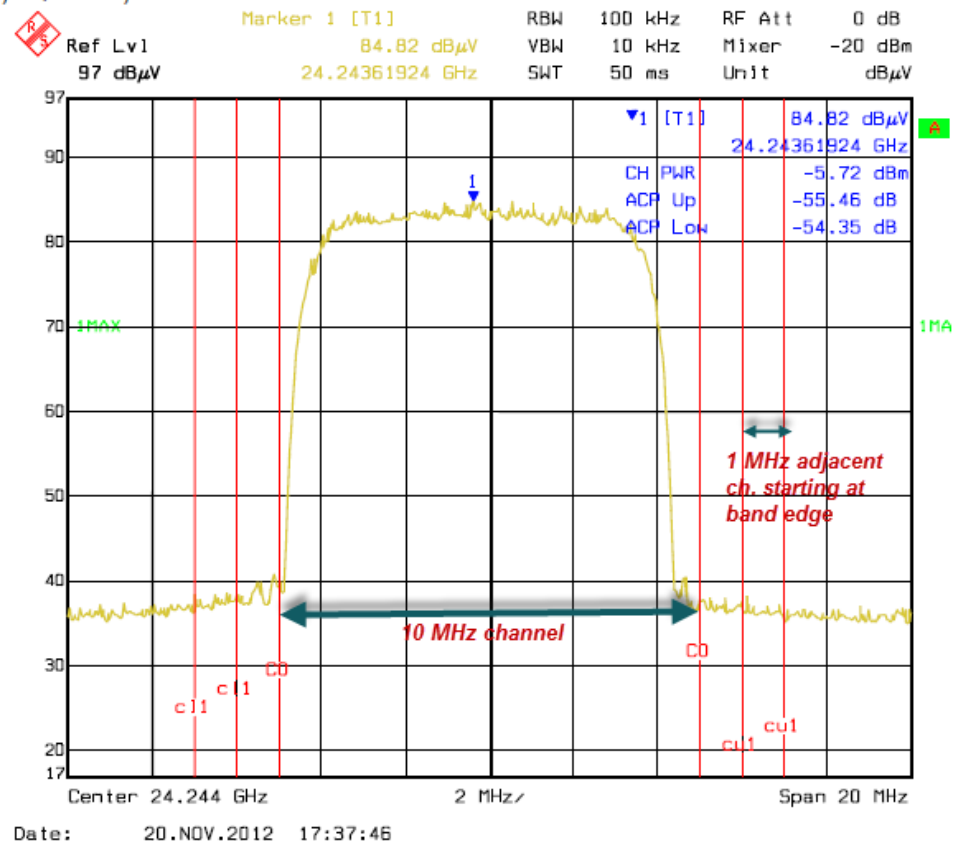




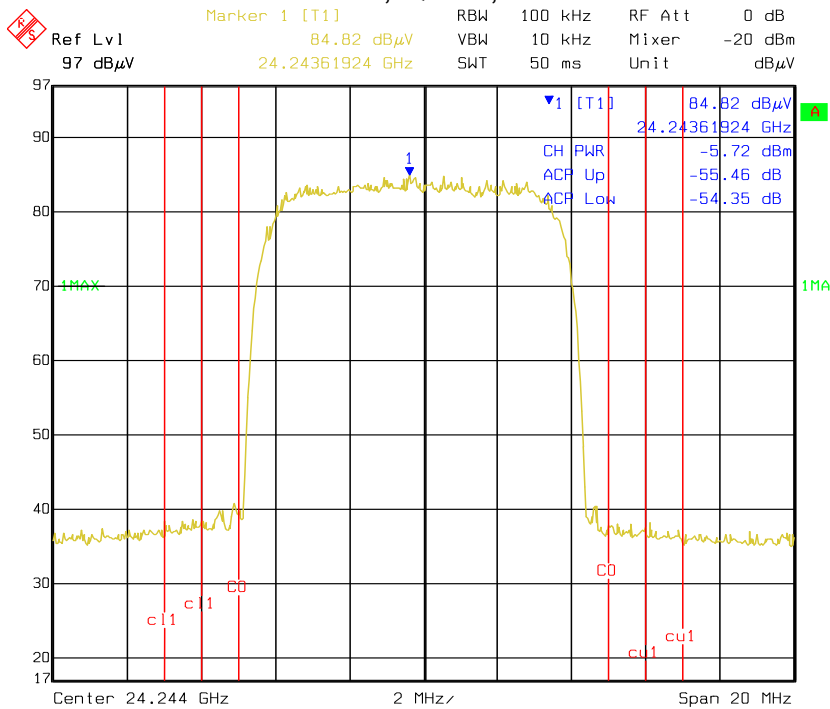
Bandedge high channel: (taken with the ACP method)

The band edge measurement was made by comparing power of the fundement signal, integrated over the 10 MHz channel, to the integrated power of the spectrum immediately adjacent to the band edge. This gives the power, measured in a 1 MHz band, relative to the fundamental power. The power in the 1 MHz adjacent to the band edge must be at least -50 dB relative to the power of the fundamental emission or must meet the limits of 15.209, *whichever is the lesser attenuation*. In this case -50 dBc is the lesser attenuation.

24244 MHz, QPSK, 10 MHz:

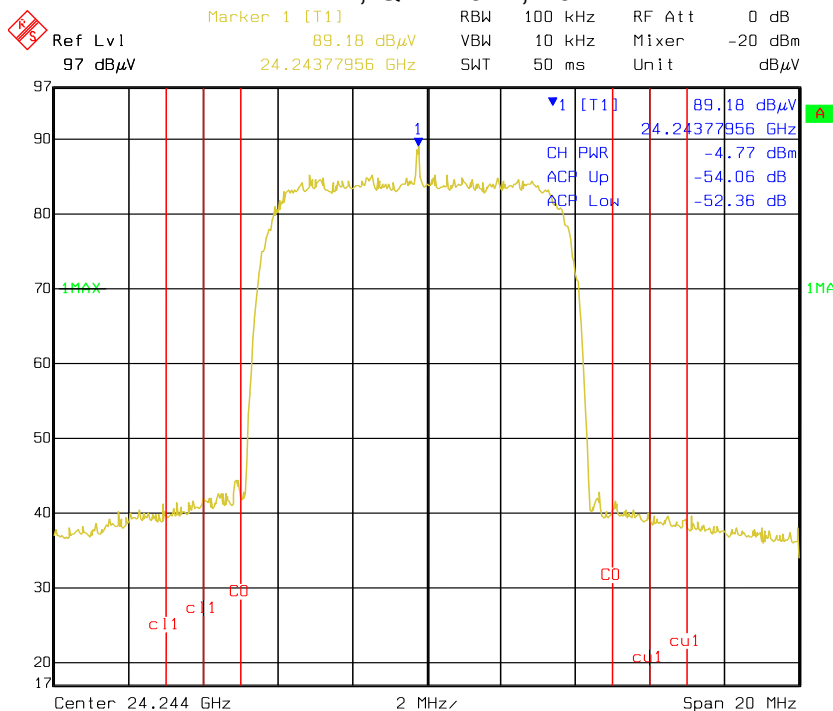


24244 MHz, QPSK, 10 MHz:



Date: 20.NOV.2012 17:37:46

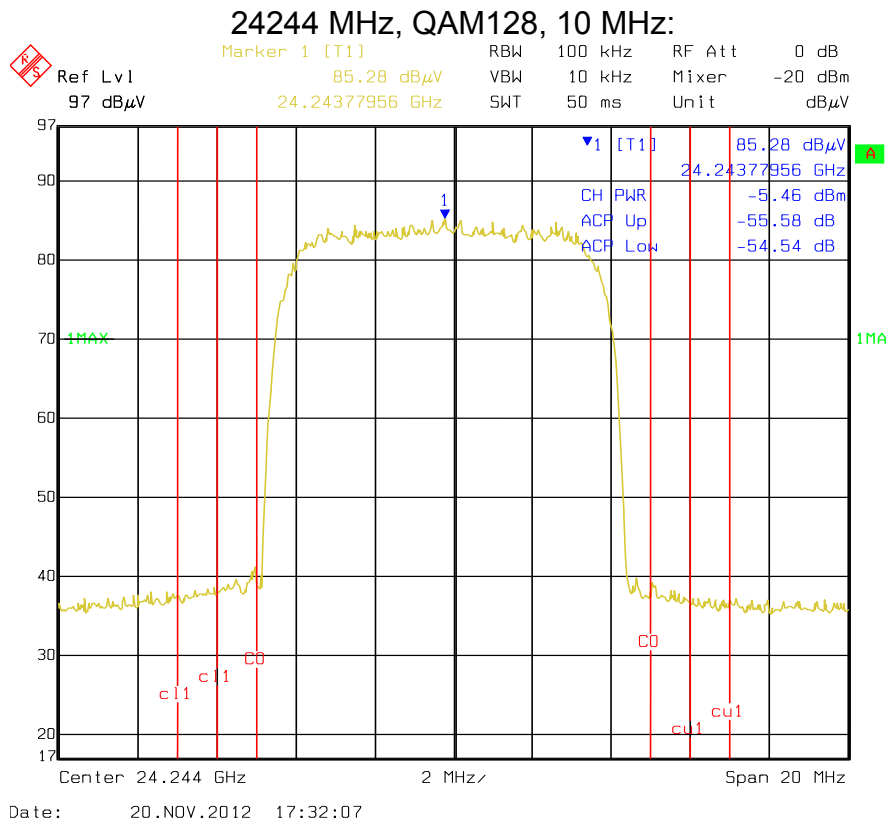
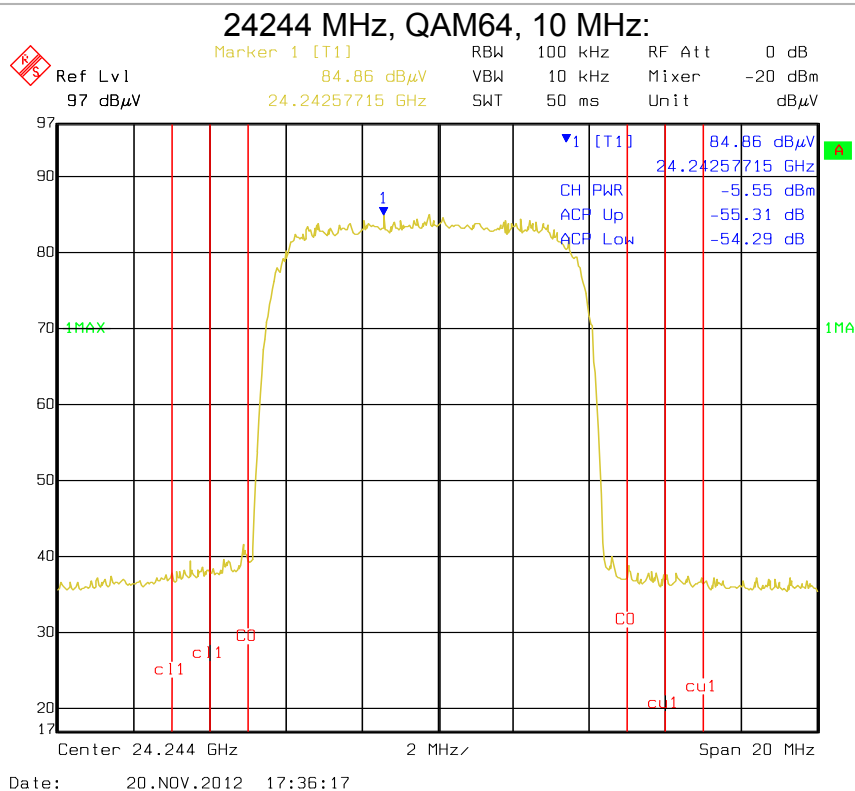
24244 MHz, QAM1024, 10 MHz:



Date: 20.NOV.2012 17:25:32

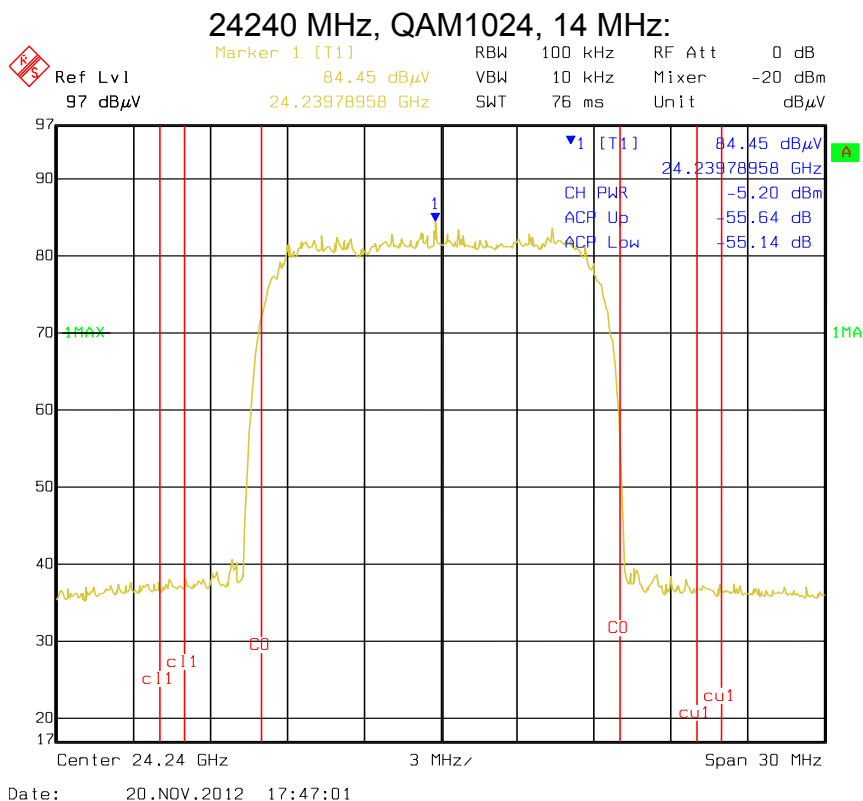
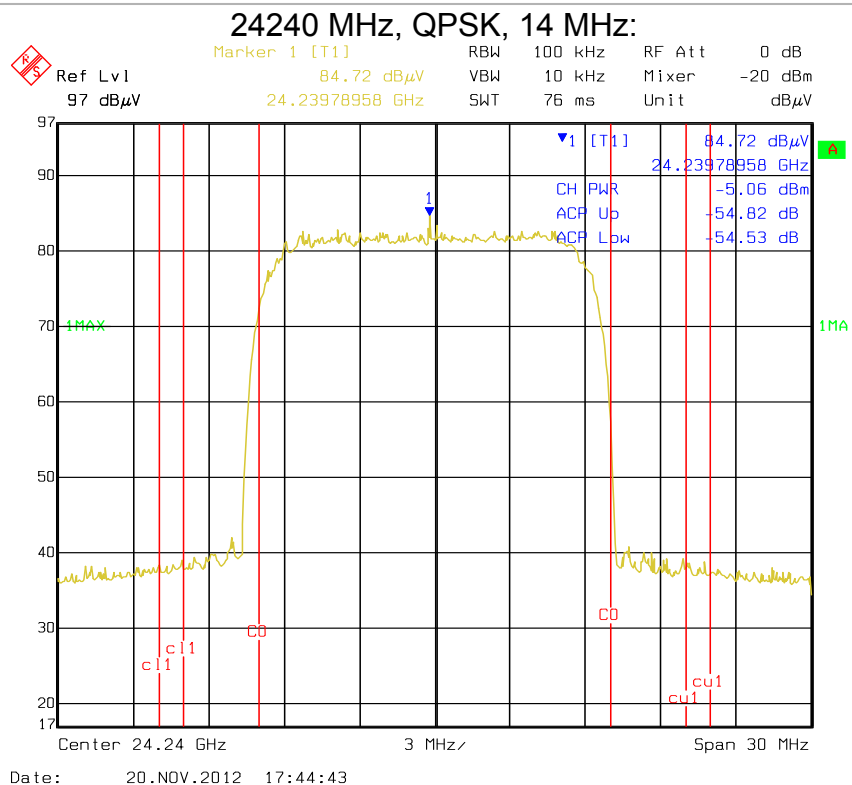
FCC ID: NCY-SL24
IC: 2945A-SL24

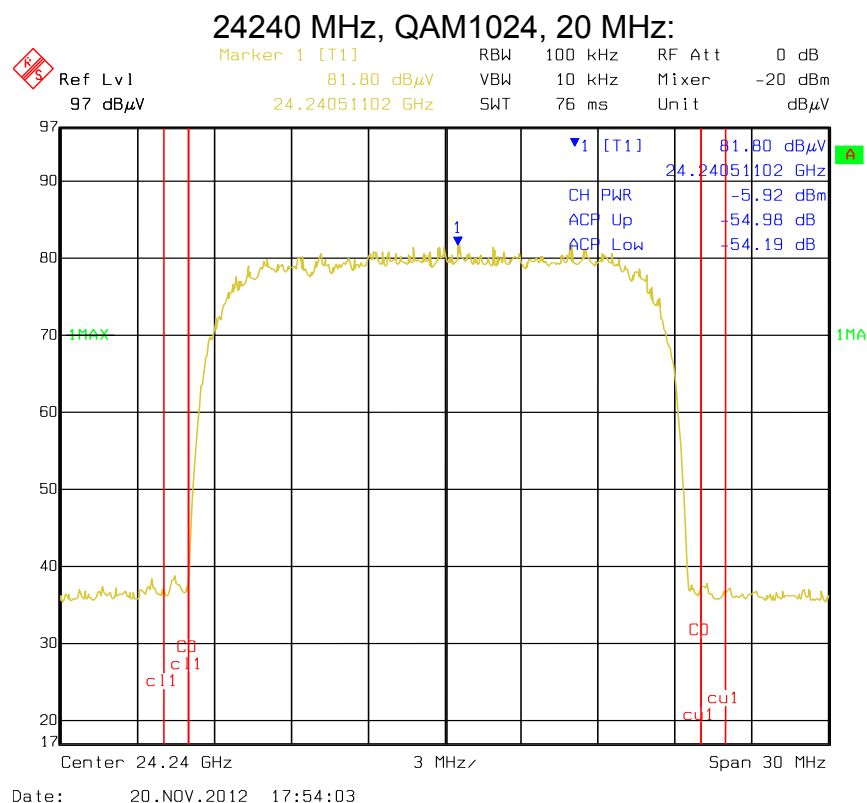
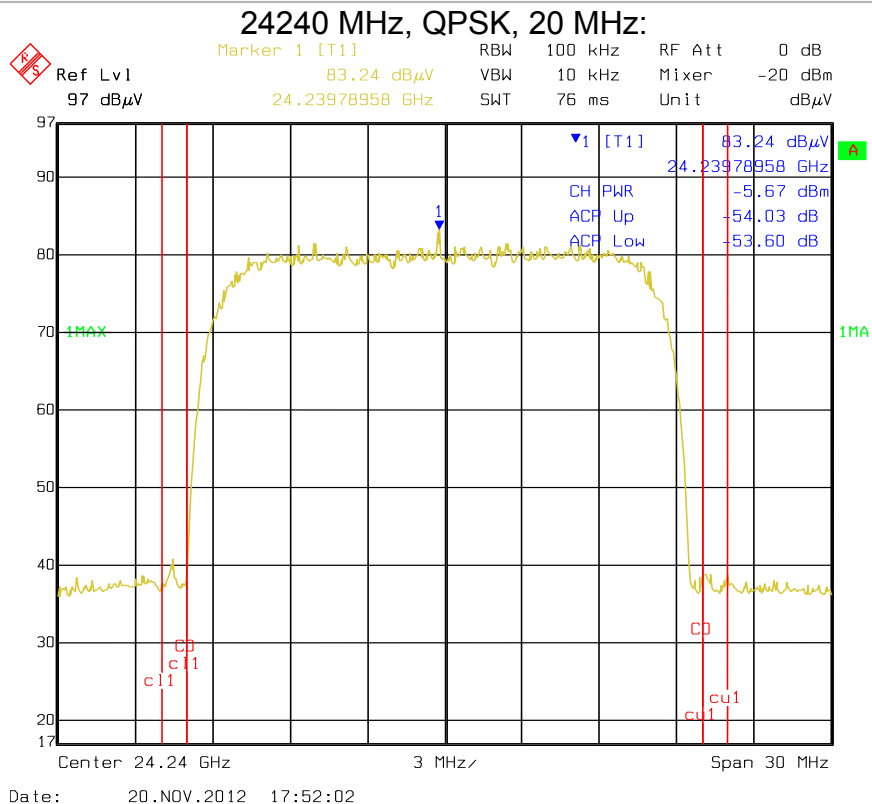
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



FCC ID: NCY-SL24
IC: 2945A-SL24

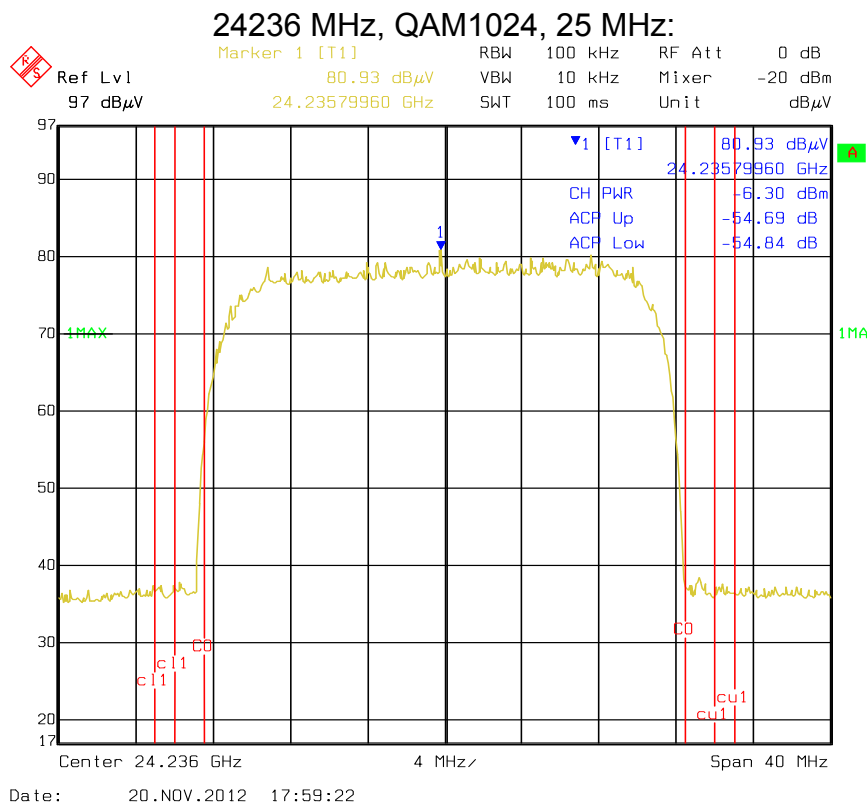
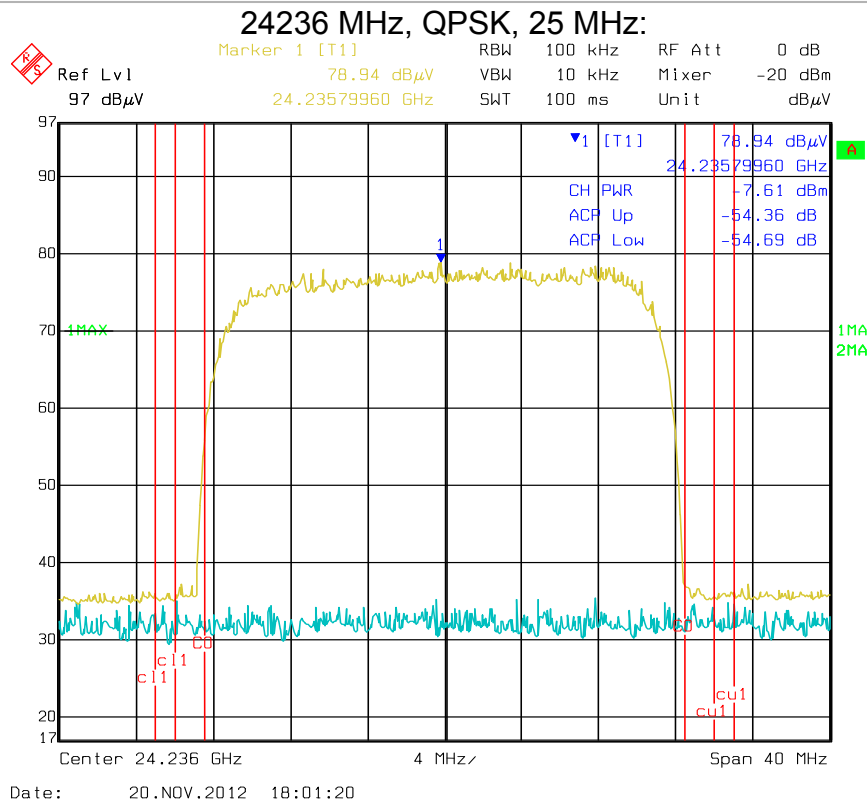
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249





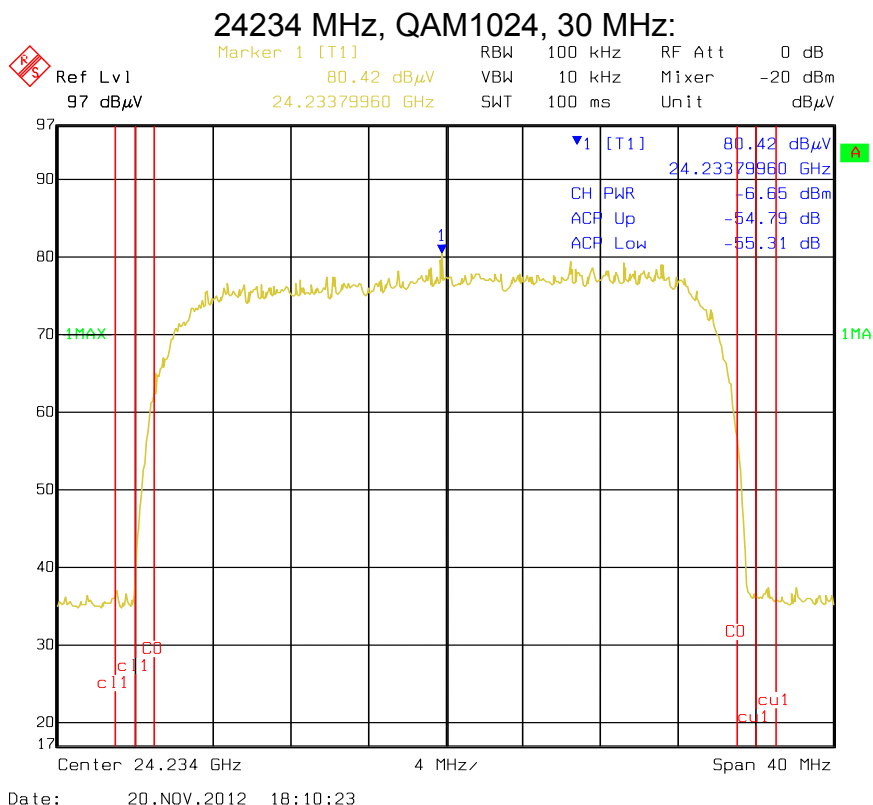
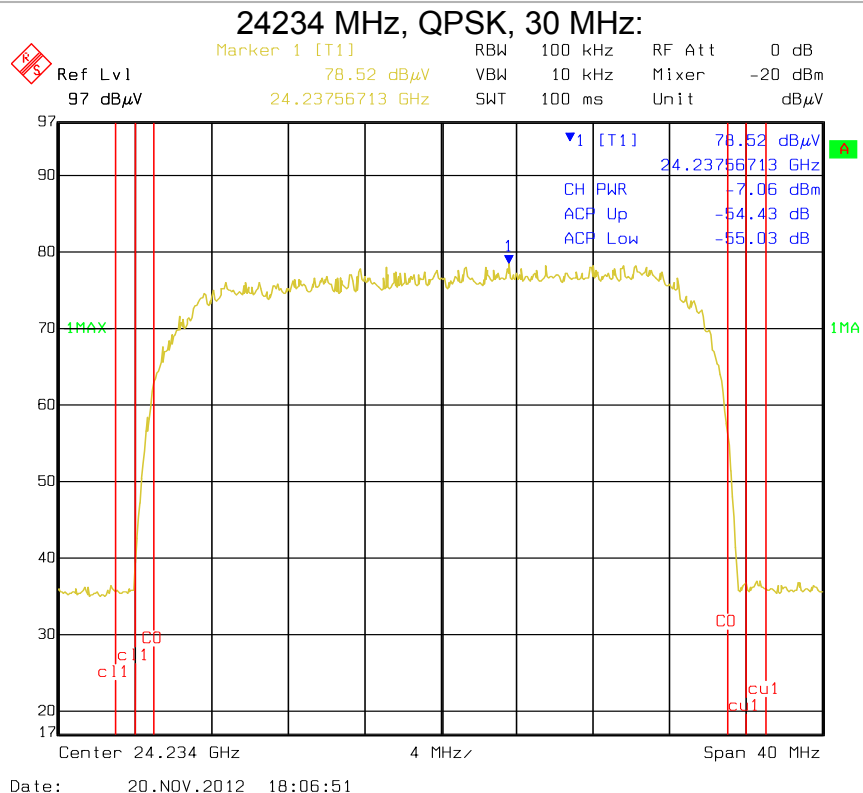
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



FCC ID: NCY-SL24
IC: 2945A-SL24

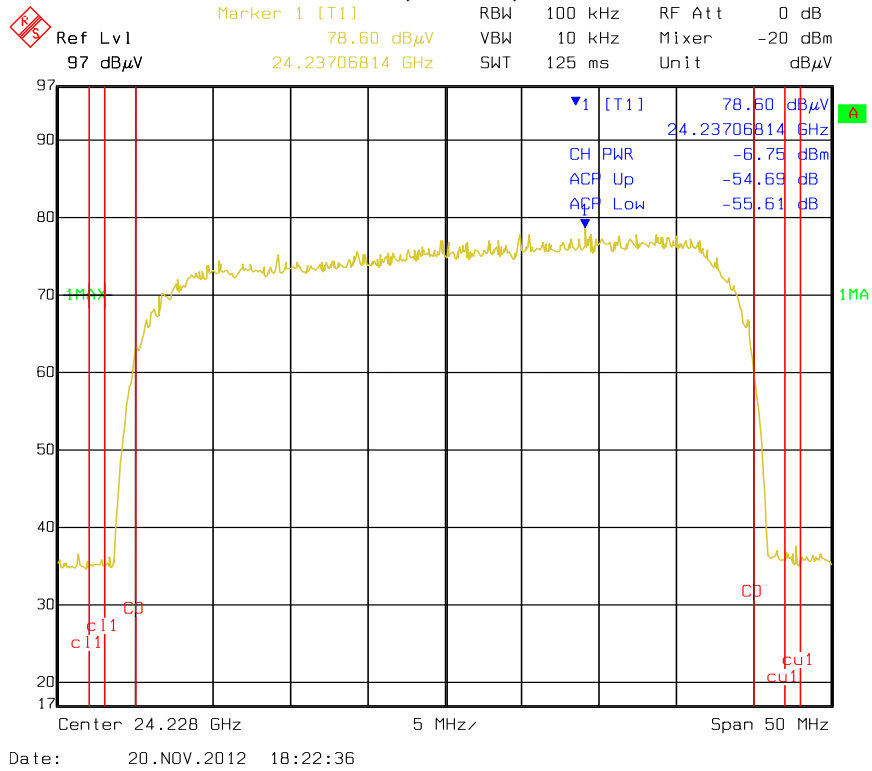
Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



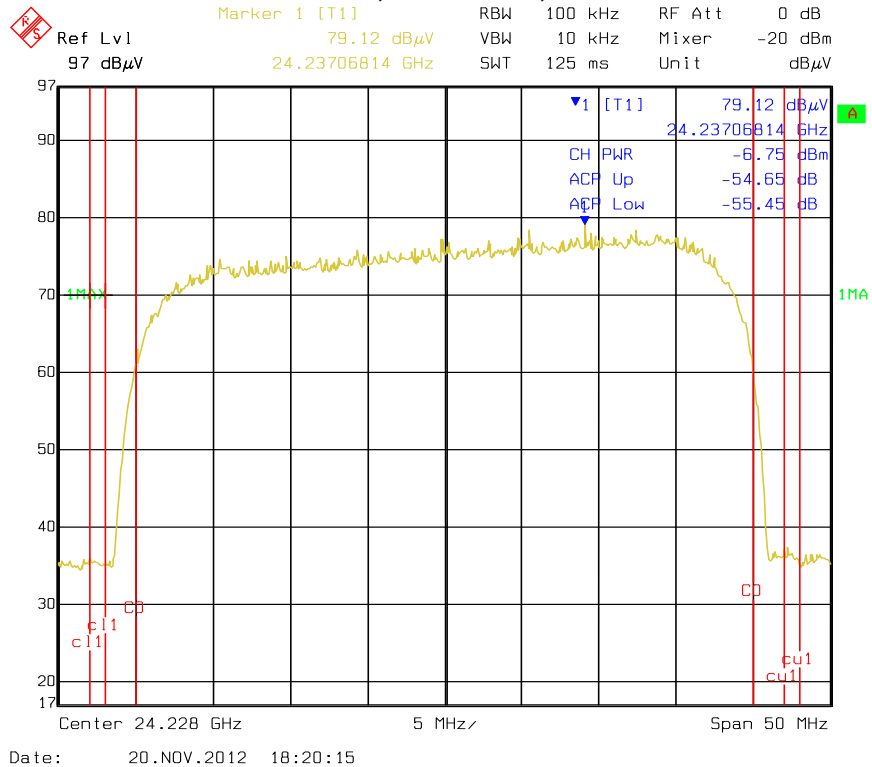
FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249

24228 MHz, QPSK, 40 MHz:

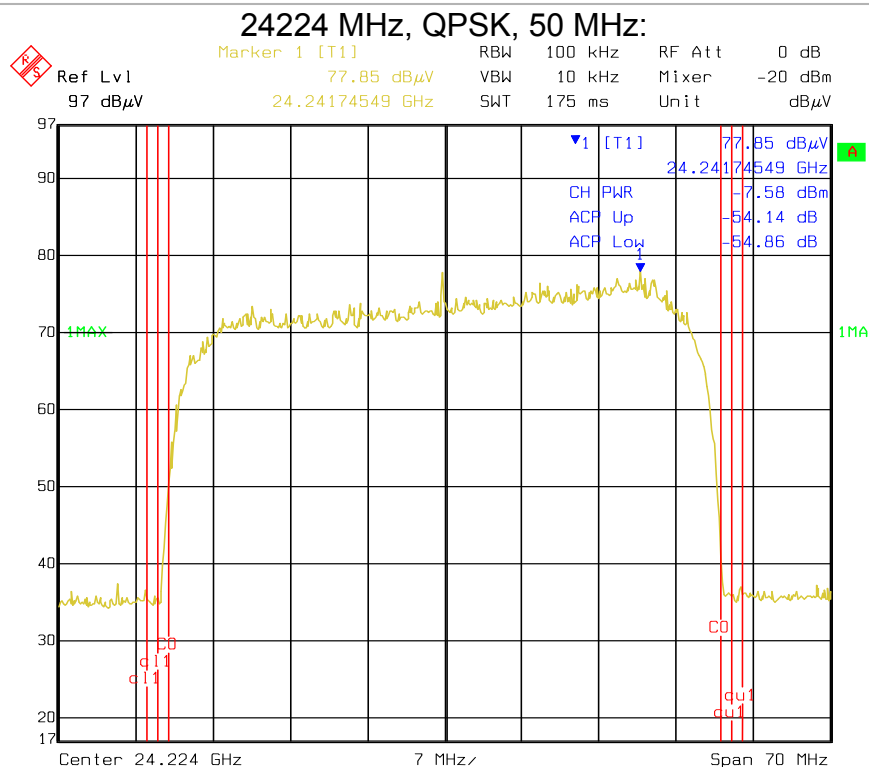


24228 MHz, QAM1024, 40 MHz:

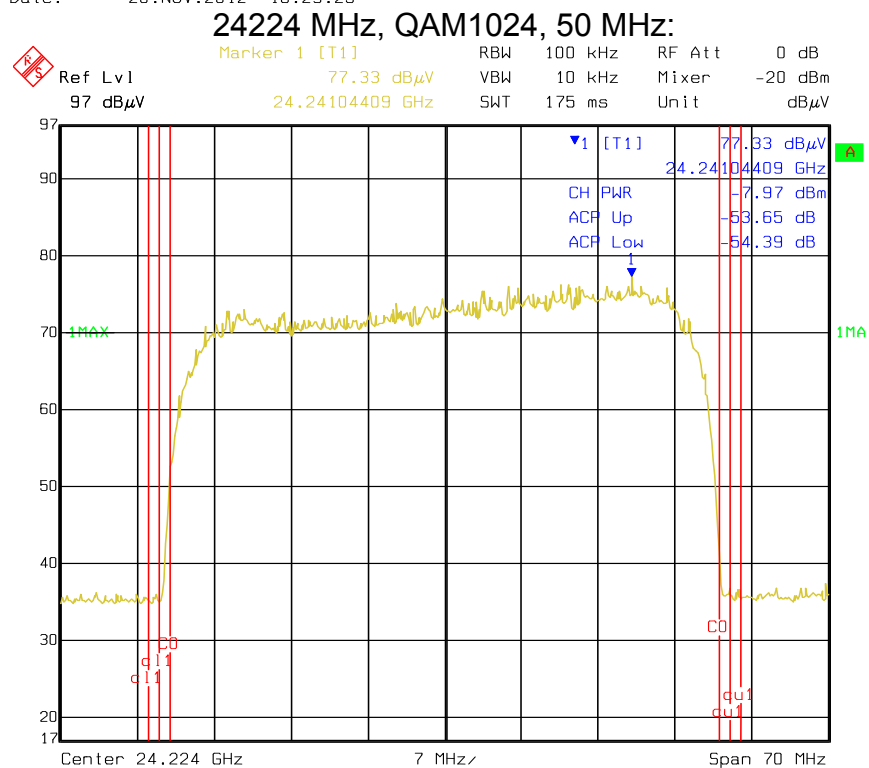


FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249



Date: 20.NOV.2012 18:29:25



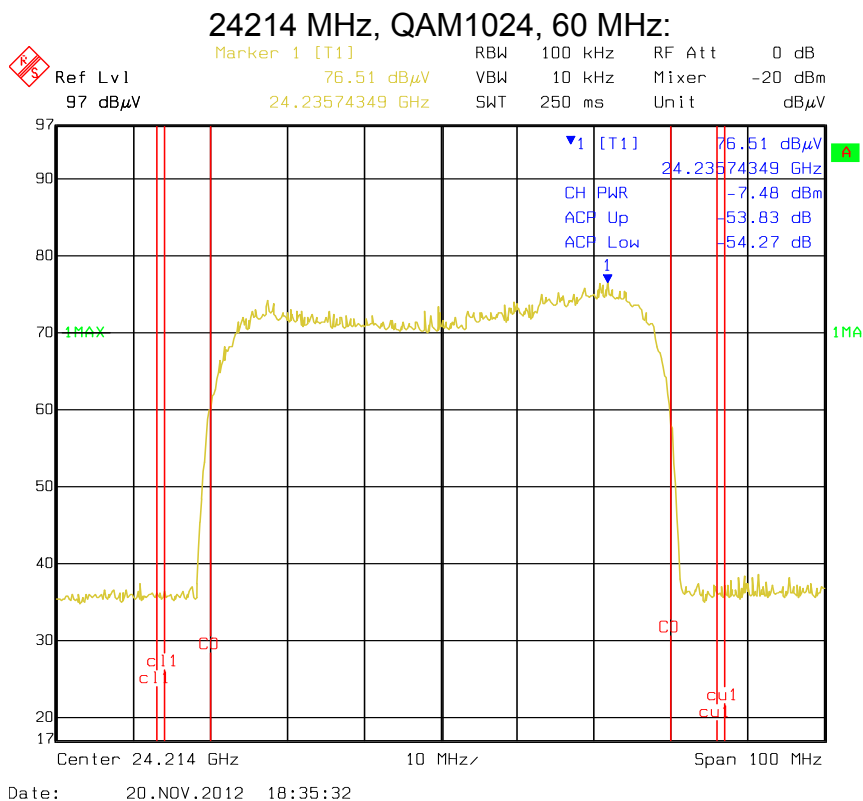
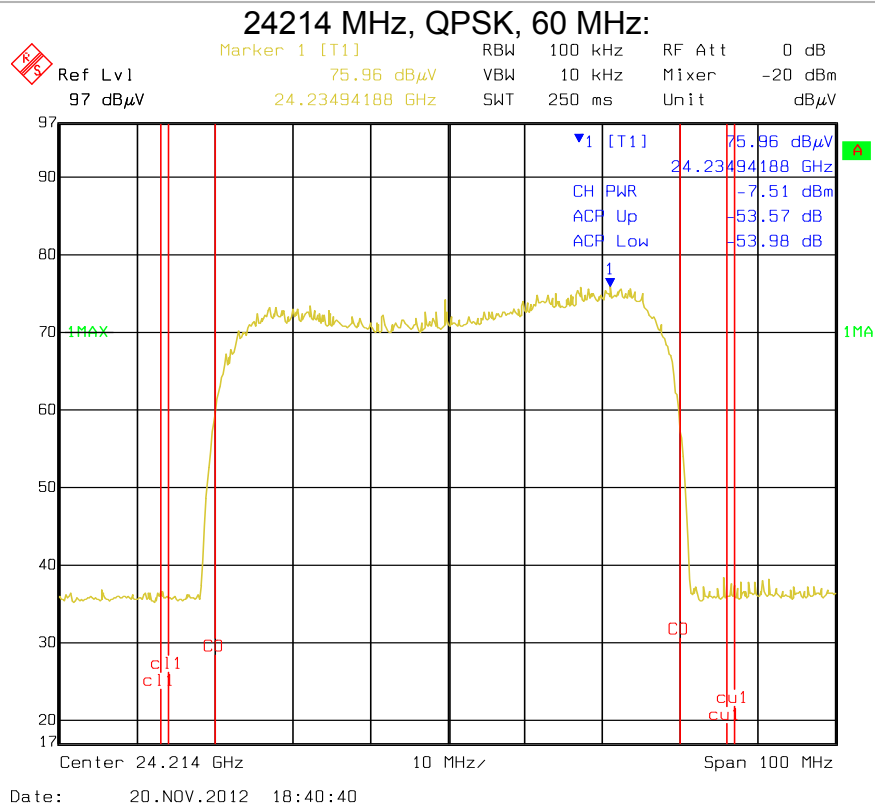
Date: 20.NOV.2012 18:30:58



www.nemko.com

FCC ID: NCY-SL24
IC: 2945A-SL24

Report Number: 2012 12225093 FCC
Specification: FCC Part 15 Subpart C, 15.249





Section 15.249 (d) – Frequency stability

(2) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.001\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Annex 12 – Frequency stability

(b) The frequency of the carrier is maintained within a tolerance of $\pm 0.001\%$.

Test Conditions:

Sample Number:	SL-24	Temperature:	23 °C
Date:	January 28, 2013	Humidity:	44 %
Modification State:	Low, Mid and High Channel	Tester:	ALEX CHANG
		Laboratory:	Nemko San Diego

Test Results: Pass. .

Additional Observations:

- The voltage was set to -40.8, -48 and -55.2 V DC at 20 °C.
- All measurements were done in CW mode, max hold, search peak.
- The temperature was set to -20, -10, 0, 10, 20, 30, 40 and 50 °C at -48 V DC

		24120 MHz				
Low limit in						
GHz:		24.1195989	-0.00024120			
High limit in						
GHz:		24.1200813	0.00024120			
Temperature	Voltage DC/V					
	-40.8	delta	-48	delta	-55.2	delta
-20	24.12000005	-0.00015995	24.12006117	-0.00022107	24.11999999	-0.00015989
-10	24.11999991	-0.00015981	24.11999500	-0.00015490	24.11999982	-0.00015972
0	24.12000160	-0.00016150	24.12000488	-0.00016478	24.11999982	-0.00015972
10	24.12000010	-0.00016000	24.12000392	-0.00016382	24.11999976	-0.00015966
20	24.11983958	0.00000052	24.11984010	0.00000000	24.11983938	0.00000072
30	24.12000005	-0.00015995	24.11999512	-0.00015502	24.12000004	-0.00015994
40	24.12000000	-0.00015990	24.11999841	-0.00015831	24.12000002	-0.00015992
50	24.11999999	-0.00015989	24.12000001	-0.00015991	24.11999998	-0.00015988

RSS-Gen 4.10 – Receiver Spurious Emissions**6.1 Radiated Limits**

Radiated spurious emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals.

Table 2: Radiated Limits of Receiver Spurious Emissions

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)*
30-88	100
88-216	150
216-960	200
Above 960	500

*Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7.

Test Conditions:

Sample Number:	SL-24	Temperature:	°C
Date:		Humidity:	%
Modification State:	Mid Channel	Tester:	ANDREAS GILLMEIER
		Laboratory:	Nemko

Additional Observations:**Test Results:**

No receiver spurious emissions test was performed as the EUT only operates with the transmitter and receiver on (full duplex) at the same time. See Section 15.249 (a) and (d) – Spurious Emissions Outside of the band.