FCC PART 2.1043 CLASS II PERMISSIVE CHANGE
&
FCC PART 15 SUBPART C SECTION 15.247

TEST REPORT

for

MODULAR TRANSMITTER

Model: ATWINC1500-MR210UB

Prepared for

HARMAN INTERNATIONAL
1718 W. MISHAWAKA RD
ELKHART, IN 46517

Prepared by:_____

TOREY OLIVER

Approved by:_____

MATT HARRISON

COMPATIBLE ELECTRONICS INC.
20621 PASCAL WAY
LAKE FOREST, CALIFORNIA 92630
(949) 587-0400

DATE: MAY 12, 2016

	REPORT BODY	APPENDICES					TOTAL
		A	*B*	*C*	*D*	*E*	
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1	Plot Map And Layout of Test Site Below 1GHz
2	Plot Map And Layout of Test Site Above 1GHz

GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.

Device Tested:	Modular Transmitter Model: ATWINC1500-MR210UB S/N: None
Product Description:	The EUT is an 802.11b, g, and n Wireless Shielded Module with one whip antenna.
Modifications:	The EUT was not modified in order to comply with specifications.
Manufacturer:	Harman International 1718 W. Mishawaka Rd Elkhart, IN 46517
Test Dates:	May 10th-12th, 2016
Test Specifications:	EMI requirements CFR Title 47, Part 15 Subpart C Sections 15.205, 15.209, & 15.247.
Test Procedure:	ANSI C63.4 & C63.10, and KDB 558074 D01 v03r04.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Radiated RF Emissions & Harmonics, 9 kHz – 25,000 MHz	Complies with the limits of CFR Title 47 Part 15 Subpart C Sections 15.205 & 15.209
2	Emissions in the Restricted Bands	Complies with CFR Title 47 Part 15 Subpart C Section 15.247

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Modular Transmitter Model: ATWINC1500-MR210UB. The EMI measurements were performed according to the measurement procedure described in ANSI C63.10 & C63.4. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT (equipment under test) hereafter, are within the specification limits defined by the Code of Federal Regulations Title 47, Part 2.1043, & Part 15 Subpart C sections, 15.205, 15.209, & 15.247.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The tests described herein were performed at the test facility of Compatible Electronics, 20621 Pascal Way Lake Forest, California 92630.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Harman International

Susan Whitfield

Compatible Electronics Inc.

Torey Oliver	Test Technician
Matt Harrison	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on May 10th, 2016.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics as of the date of this test report.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
NVLAP	National Voluntary Laboratory Accreditation Program
CFR	Code of Federal Regulations
PCB	Printed Circuit Board
TX	Transmit
RX	Receive

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this Test Report.

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2014	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	American National Standard for Testing Unlicensed Wireless Devices
KDB 558074 D01 v03r05	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

4. DESCRIPTION OF TEST CONFIGURATION

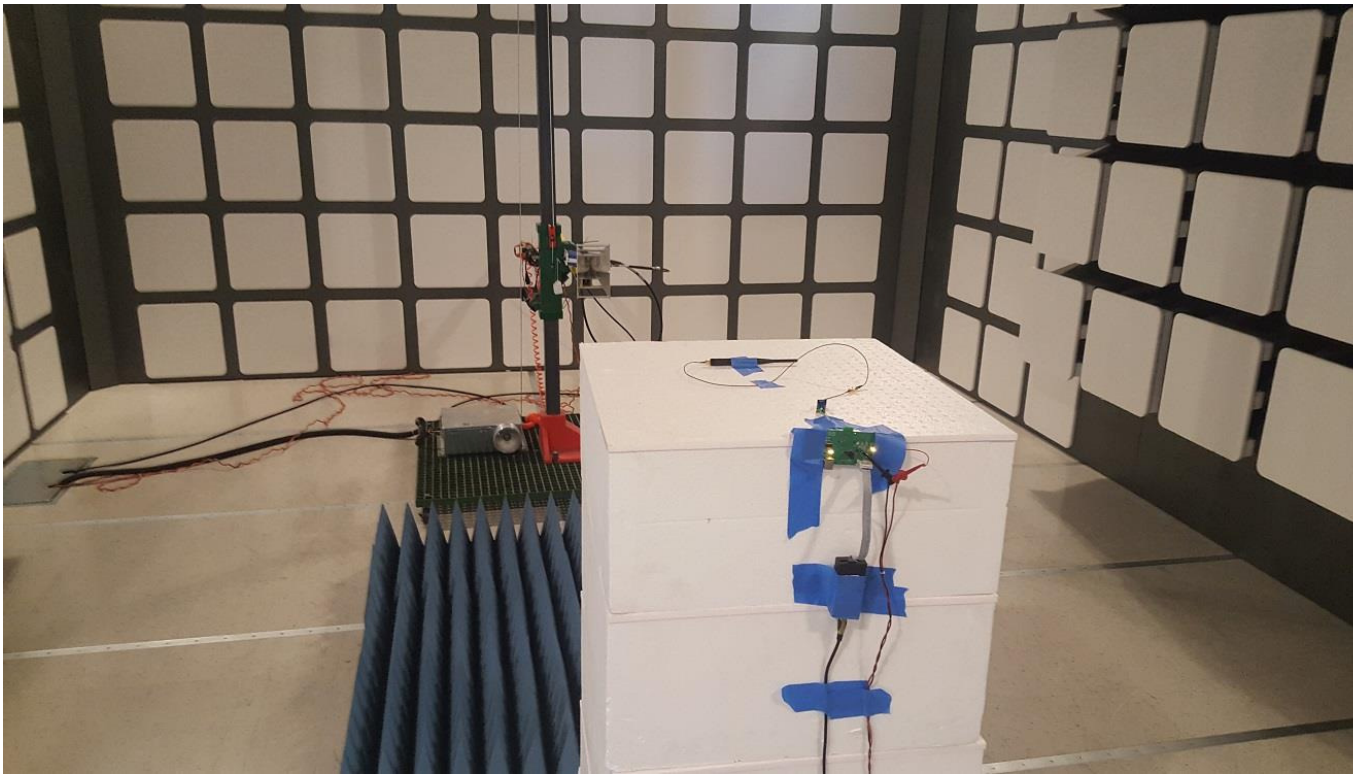
4.1 Description of Test Configuration

The Modular Transmitter Model: ATWINC1500-MR210UB (EUT) was setup in a tabletop configuration. The EUT was powered by a DC Supply. The EUT was continuously transmitting a data stream. The EUT and antenna were checked in all axes and the EUT in the Y-Axis with the antenna in the X-Axis was found to be the worst case.

The voltage was varied ± 15% and the transmitting signal amplitude and frequency did not vary.

It was determined that the emissions were at their highest level when the EUT was transmitting in the configuration described above for Radiated Emissions. The final radiated data was taken in the above configuration. Please see Appendix E for the test data.

4.1.1 Photograph Test Configuration (Y-Axis for EUT and X-Axis for Antenna)



4.1.2 Cable Construction and Termination

Cable 1-2

These are 2 meter, un-shielded, round cables that connects the EUT to the DC Power Supply. The cables were hardwired into the EUT and have banana connectors at the DC Supply end. The cables were not bundled.

Cable 3

This is a 10 centimeter, un-shielded, round cables that connects the EUT to the EUT Control Board. The cable is hardwired into both ends of the cable. The cable was not bundled.

Cable 4

This is a 50 centimeter, braid shielded, round cable that connects the EUT to the whip antenna. The cable has a U.FL connector at the EUT end and a RPSMA connector at the antenna end of the cable. The cable was not bundled.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANU-FACTURER	MODEL	SERIAL NUMBER
1	MODULAR TRANSMITTER(EUT)	HARMAN INTERNATIONAL	ATWINC1500-MR210UB	NONE
2	DC SUPPLY	MPJA	0-30V / 0-5A	017687
3	EUT CONTROL BOARD	ATMEL CORPORATION	NONE	NONE
4	ANTENNA	INPAQ TECHNOLOGY CO., LTD.	DAM-C5-B-M2-600-10-00	NONE

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Computer	Compatible Electronics	NONE	NONE	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100219	9/3/2015	9/3/2016
Antenna, Loop	Com Power	AL-130	121049	12/06/2013	12/06/2016
Antenna, CombiLog	Com Power	AC-220	25857	5/21/2014	5/21/2016
Antenna, Horn 1-18GHz	Com Power	AH-118	071250	7/1/2014	7/1/2016
Antenna, Horn 18-26 GHz	Com Power	AH-826	081033	NCR	NCR
Pre-Amp, 1-18GHz	Com Power	PAM-118A	443011	4/18/2016	4/18/2017
Pre-Amp, 18-40GHz	Com Power	PA-840	181289	6/16/2014	6/16/2016
High Pass Filter	AMTI Microwave Circuits	H3G020G4	481230	6/4/2014	6/4/2016
Mast, Antenna Positioner	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Antenna Mast	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Turntable	Sunol Science Corporation	FM 2001	N/A	N/A	N/A
Mast and Turntable Controller	Sunol Science Corporation	SC104V	020808-1	N/A	N/A

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and the figures in Appendix D of this report for test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 by 0.8 meter high non-conductive table, which was placed on the ground plane.

For testing above 1 GHz the EUT was mounted 1.5 meter above the ground plane.

The EUT was grounded through the USB Cable.

6.3 Facility Environmental Characteristics

When applicable refer to the data sheets in Appendix E for the relative humidity, air temperature, and barometric pressure.

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

There are a total of 11 channels. The low channel is at 2412.0 MHz and the high channel is at 2462.0 MHz. There is approximately 5 MHz separation between channels and the EUT uses DSSS modulation. Below are the channels and power settings:

	b Mode	g Mode	n Mode
1 == 2412 MHz DigGain=	DG= -6	DG= -8	DG= -8
2 == 2417 MHz DigGain=	DG= -6	DG= -5	DG= -5
3 == 2422 MHz DigGain=	DG= -6	DG= -4	DG= -4
4 == 2427 MHz DigGain=	DG= -6	DG= -3	DG= -3
5 == 2432 MHz DigGain=	DG= -6	DG= -3	DG= -3
6 == 2437 MHz DigGain=	DG= -6	DG= -3	DG= -3
7 == 2442 MHz DigGain=	DG= -6	DG= -3	DG= -3
8 == 2447 MHz DigGain=	DG= -6	DG= -3	DG= -3
9 == 2452 MHz DigGain=	DG= -6	DG= -4	DG= -4
10 == 2457 MHz DigGain=	DG= -6	DG= -6	DG= -6
11 == 2462 MHz DigGain=	DG= -6	DG= -9	DG= -9

7.2 Antenna

The antenna is an external whip antenna, it was connected by a U.FL connector at the EUT end and a cable that connects a reverse polarity SMA connector that is connected to the whip antenna. The antenna has a foam gasket around it as well as an adjustable elbow that can turn it 90 degrees and a gain of 2.0 ± 0.5 dBi.

8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

8.1.1 Radiated Emissions (Spurious and Harmonics) Test

The R&S receiver was used as a measuring meter. The receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps. Amplifiers were used to increase the sensitivity of the instrument. There were two Microwave Preamplifier used for frequencies above 1 GHz.

For spurious emissions the quasi-peak detector was used for frequencies below 1GHz and the average detector was used for frequencies above 1 GHz.

For the radiated Harmonic emissions and Band Edges a linear average detector was used.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE (MHz)	TRANSDUCER	EFFECTIVE MEASUREMENT BANDWIDTH
.009 to .150	Active Loop Antenna	200 Hz
.150 to 30	Active Loop Antenna	9 kHz
30 to 1000	Combilog Antenna	100 kHz (120kHz for QP Measurements)
1000 to 25000	Horn Antenna	1 MHz

The TDK FAC-3 shielded test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4, EN 50147-2, and CISPR 22. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters in both vertical and horizontal polarizations (for E field radiated field strength).

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart C sections 15.205, 15.209, & 15.247.

8.1.2 Emissions in the Restricted Bands (Radiated)

The Emissions in the Restricted Bands measurement was performed using the EMI Receiver at a 3-meter test distance to obtain the final test data. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15 Subpart C, Section 15.205.

8.1.3 Emissions Radiated Outside of the Fundamental Frequency Band

The Band Edge measurement was performed using the EMI Receiver at a 3-meter test distance to obtain the final test data. The low and high channels were tuned to during the low and high band edge tests. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247.

9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from throughout all tests.

10. CONCLUSIONS

The Modular Transmitter Model: ATWINC1500-MR210UB meets all of the relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart C sections 15.205, 15.209, & 15.247.

APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS

NVLAP LAB CODES 200063-0, 200528-0, 200527-0

For US, Canada, Australia/New Zealand, Taiwan and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025 an ISO 9002 equivalent. Please follow the link to the NIST site for each of our facilities NVLAP certificate and scope of accreditation.

NVLAP listing links
Agoura Division - http://ts.nist.gov/Standards/scopes/2000630.htm
Brea Division - http://ts.nist.gov/Standards/scopes/2005280.htm
Silverado/Lake Forest Division - http://ts.nist.gov/Standards/scopes/2005270.htm

ANSI listing
CETCB
https://www.ansica.org/wwwversion2/outside/ALLdirectoryDetails.asp?menuID=1&prgID=3&orgID=123&status=4

Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for EMC under the US/EU Mutual Recognition Agreement (MRA).

Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for Taiwan/BSMI under the US/APEC (Asia-Pacific Economic Cooperation) Mutual Recognition Agreement (MRA).

We are also certified/listed for IT products by the following country/agency:

VCCI Listing, from VCCI site
Enter "Compatible" in search form http://www.vcci.or.jp/vcci_e/activity/registration/setsubi.html

FCC Listing, from FCC OET site
FCC test lab search https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm

Industry Canada Industrie Canada

Compatible Electronics IC listing can be found at:
http://www.ic.gc.ca/eic/site/ic1.nsf/eng/home

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

There were no modifications made during testing.

APPENDIX C

ADDITIONAL MODELS COVERED UNDER THIS REPORT

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST	Modular Transmitter Model: ATWINC1500-MR210UB S/N: None

No additional models were tested.

APPENDIX D

DIAGRAMS, FACTORS, CHARTS, AND PHOTOS

FIGURE 1: PLOT MAP AND LAYOUT OF TEST SITE BELOW 1GHZ

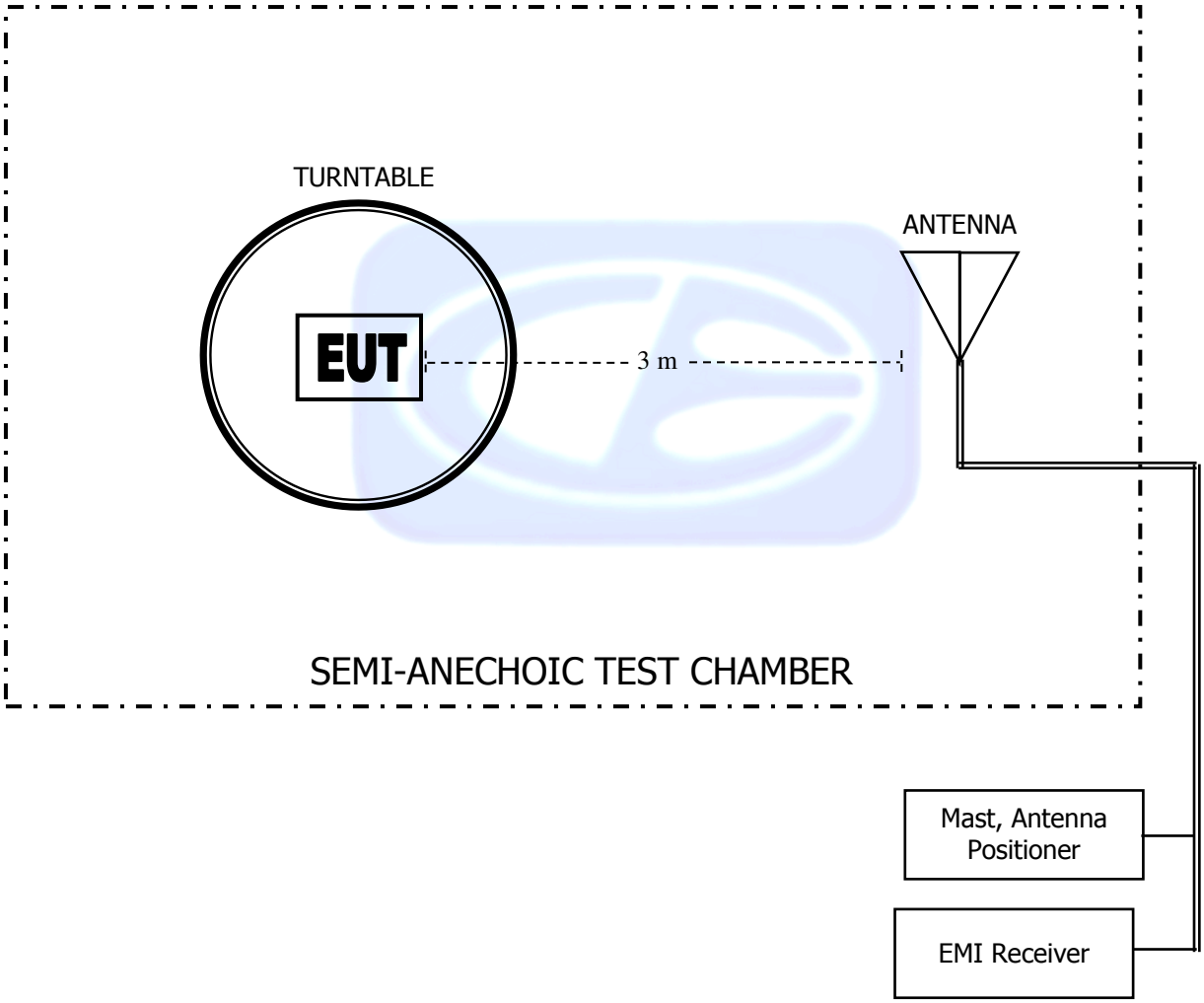
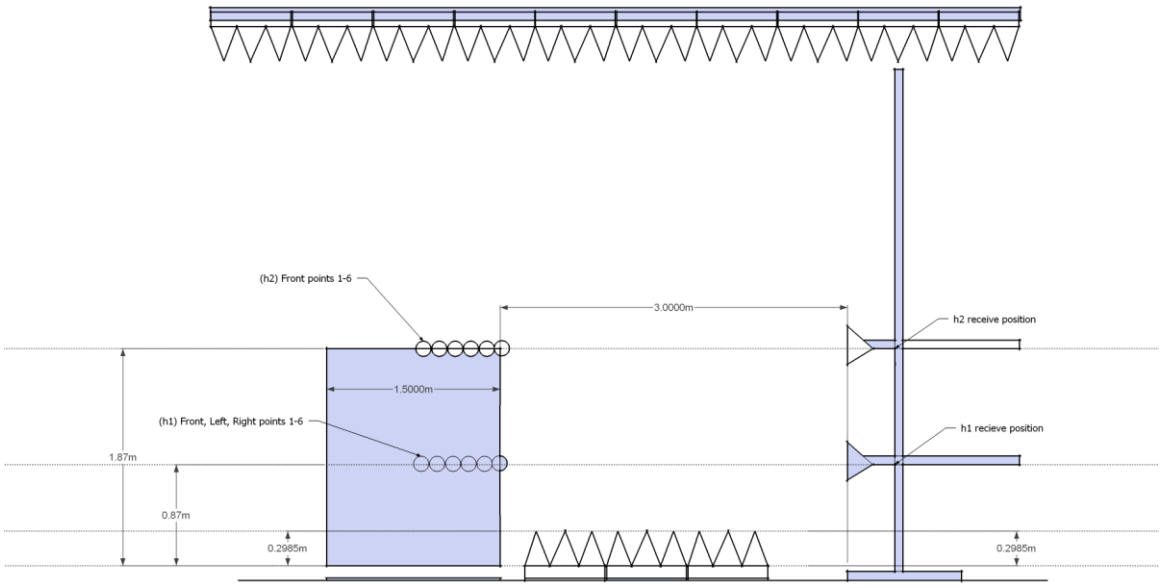


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ



COM-POWER AL-130

LOOP ANTENNA

S/N: 121049

CALIBRATION DUE: DECEMBER 6, 2016

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)	FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-34.64	16.86	**0.8**	-36.32	15.18
0.01	-34.78	16.72	**0.9**	-36.22	15.28
0.02	-35.91	15.59	**1.0**	-36.22	15.28
0.03	-35.48	16.02	**2.0**	-35.91	15.59
0.04	-35.82	15.68	**3.0**	-35.91	15.59
0.05	-36.49	15.01	**4.0**	-36.01	15.49
0.06	-36.30	15.20	**5.0**	-35.80	15.70
0.07	-36.43	15.07	**6.0**	-36.00	15.50
0.08	-36.30	15.20	**7.0**	-35.90	15.60
0.09	-36.39	15.11	**8.0**	-35.70	15.80
0.1	-36.41	15.09	**9.0**	-35.70	15.80
0.2	-36.61	14.89	**10.0**	-35.60	15.90
0.3	-36.63	14.87	**15.0**	-36.52	14.98
0.4	-36.52	14.99	**20.0**	-35.75	15.75
0.5	-36.63	14.87	**25.0**	-37.78	13.72
0.6	-36.62	14.88	**30.0**	-38.62	12.88
0.7	-36.53	14.97			

COM-POWER AC-220

LAB R - COMBILOG ANTENNA

S/N: 25857

CALIBRATION DUE: MAY 21, 2016

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.5	**160**	13.3
35	22.5	**180**	15.0
40	23.0	**200**	14.6
45	21.5	**250**	16.5
50	21.3	**300**	18.1
60	18.2	**400**	19.4
70	13.2	**500**	21.4
80	11.6	**600**	21.6
90	11.9	**700**	23.7
100	12.6	**800**	26.0
120	15.1	**900**	26.6
140	13.6	**1000**	28.5

COM-POWER AH-118

HORN ANTENNA

S/N: 071250

CALIBRATION DUE: JULY 1, 2016

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
1000	30.1	**9500**	44.2
1500	29.2	**10000**	43.4
2000	31.6	**10500**	44.6
2500	35.5	**11000**	45.1
3000	33.7	**11500**	45.7
3500	36.0	**12000**	46.2
4000	35.4	**12500**	45.4
4500	35.5	**13000**	44.8
5000	40.1	**13500**	46.7
5500	37.8	**14000**	47.8
6000	39.0	**14500**	46.4
6500	39.9	**15000**	47.2
7000	40.4	**15500**	45.5
7500	44.4	**16000**	45.0
8000	44.1	**16500**	44.5
8500	43.1	**17000**	47.0
9000	43.0	**17500**	47.8
		18000	44.2

COM-POWER PAM-118

1-18GHz - PREAMPLIFIER

S/N: 443011

CALIBRATION DUE: April 18, 2017

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
0.500	39.74	**7.000**	35.31
1.000	40.74	**7.500**	35.9
1.500	38.4	**8.000**	34.08
2.000	40.64	**8.500**	34.37
2.500	39.71	**9.500**	34.45
3.000	39.39	**10.000**	34.23
3.500	41.05	**11.000**	35.23
4.000	38.74	**12.000**	33.36
4.500	39.95	**13.000**	33.27
5.000	39.88	**14.000**	34.84
5.500	39.32	**15.000**	33.19
6.000	40.83	**16.000**	36.25
6.500	41.14	**17.000**	32.33
		18.000	34.1

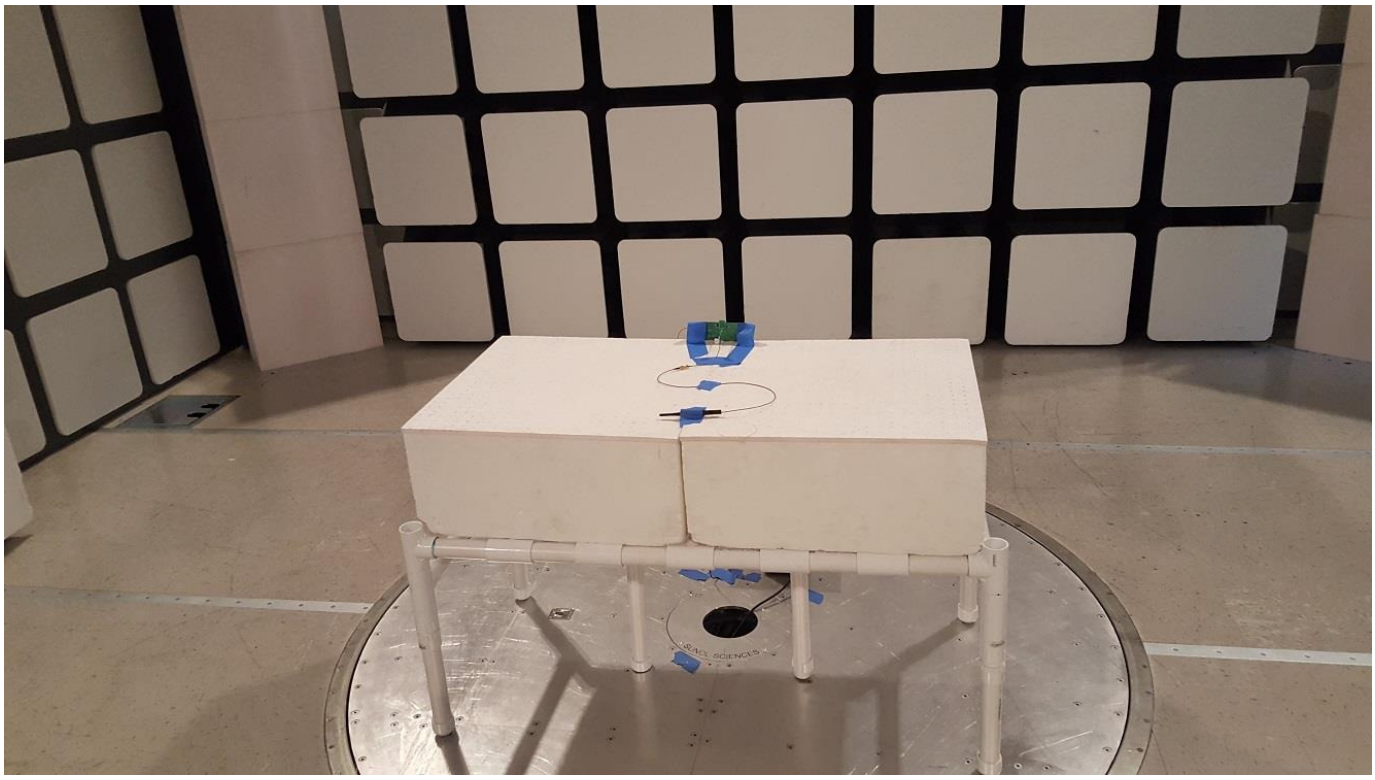
COM-POWER PA-840

18-40 GHz PREAMPLIFIER

S/N: 181289

CALIBRATION DUE: JUNE 16, 2016

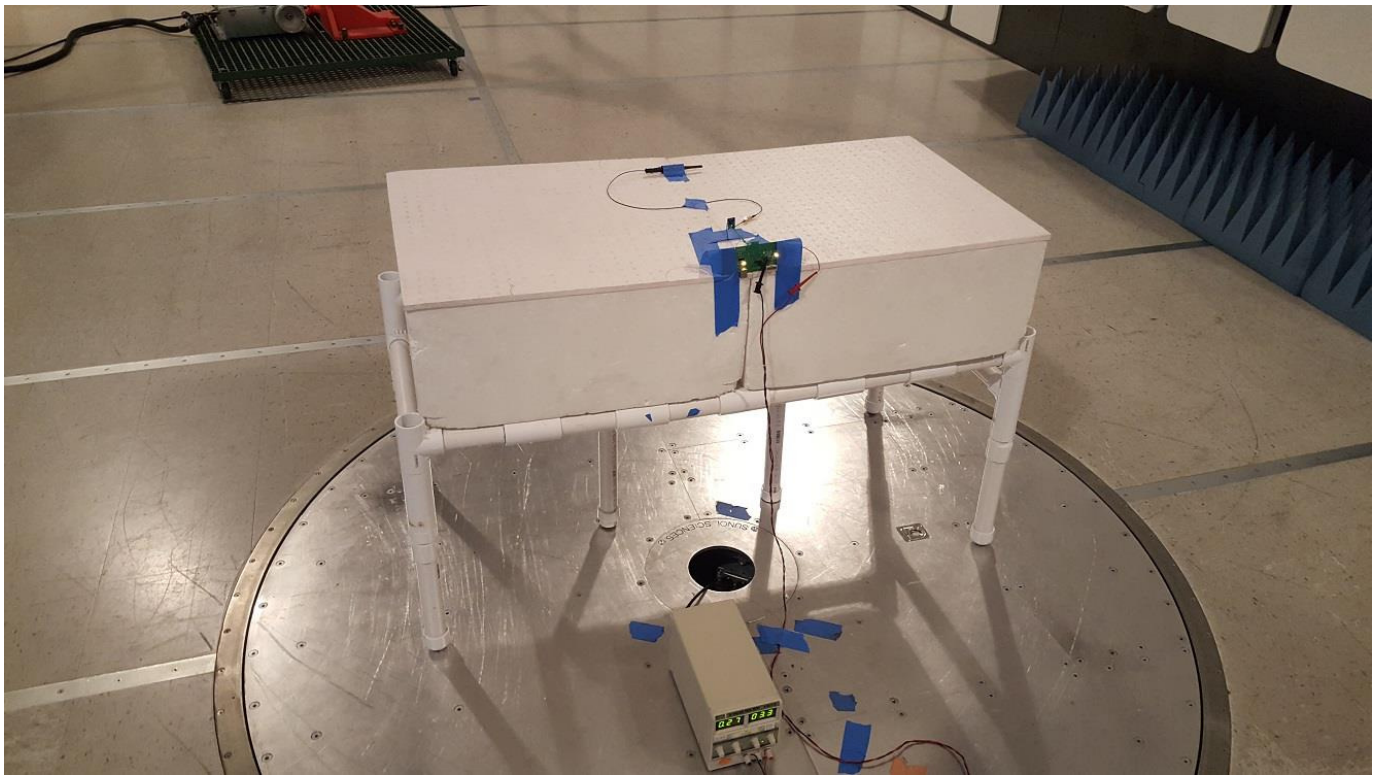
FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
18000	29.4	**31500**	28.2
19000	28.8	**32000**	28.6
20000	30.5	**32500**	28.8
21000	31.4	**33000**	28.2
22000	31.2	**33500**	27.7
23000	30.1	**34000**	27.2
24000	30.3	**34500**	28.2
25000	29.8	**35000**	27.3
26000	30.5	**35500**	27.2
26500	30.7	**36000**	27.2
27000	30.8	**36500**	27.5
27500	30.2	**37000**	27.0
28000	30.1	**37500**	26.7
28500	30.2	**38000**	26.2
29000	30.1	**38500**	26.5
29500	29.8	**39000**	26.3
30000	29.2	**39500**	26.9
30500	28.4	**40000**	27.6
31000	29.8		



FRONT VIEW

HARMAN INTERNATIONAL
MODULAR TRANSMITTER
Model: ATWINC1500-MR210UB
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

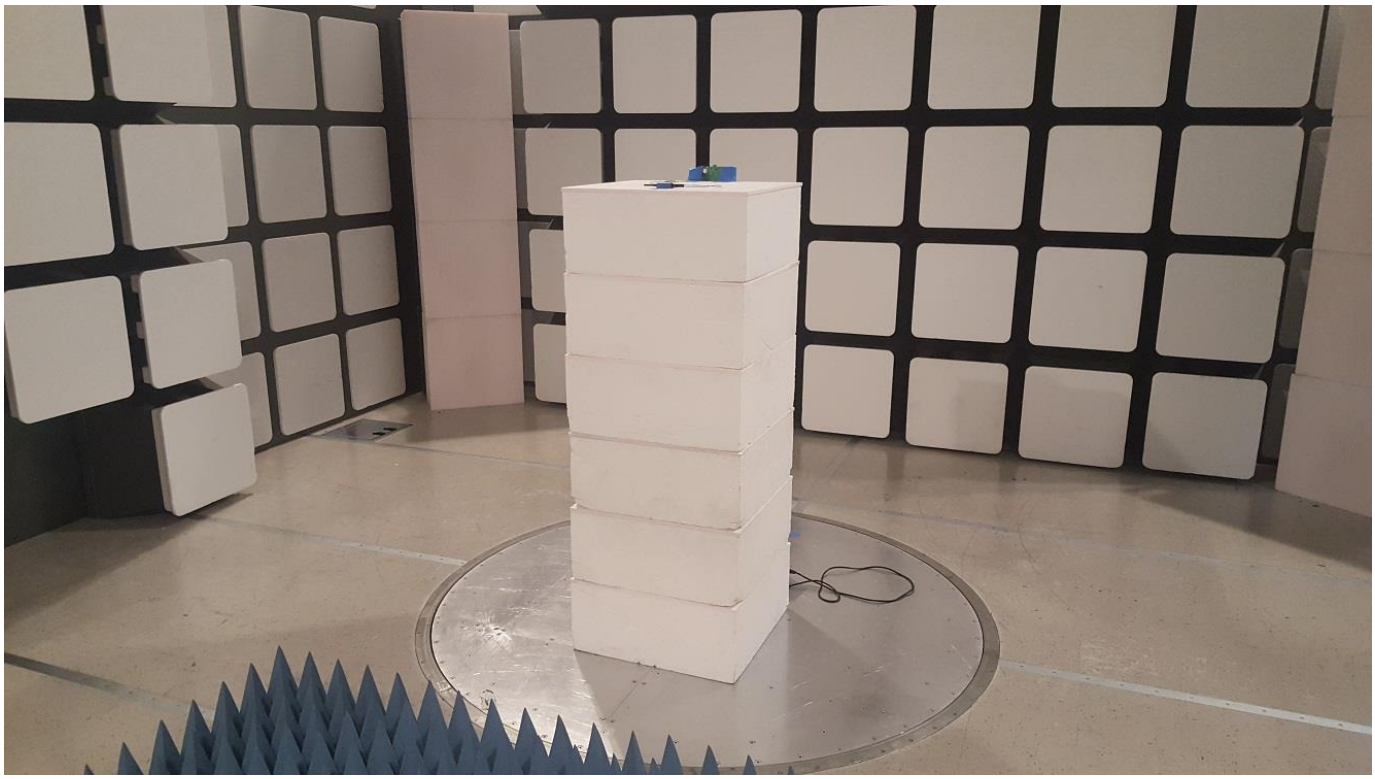
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

HARMAN INTERNATIONAL
MODULAR TRANSMITTER
Model: ATWINC1500-MR210UB
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

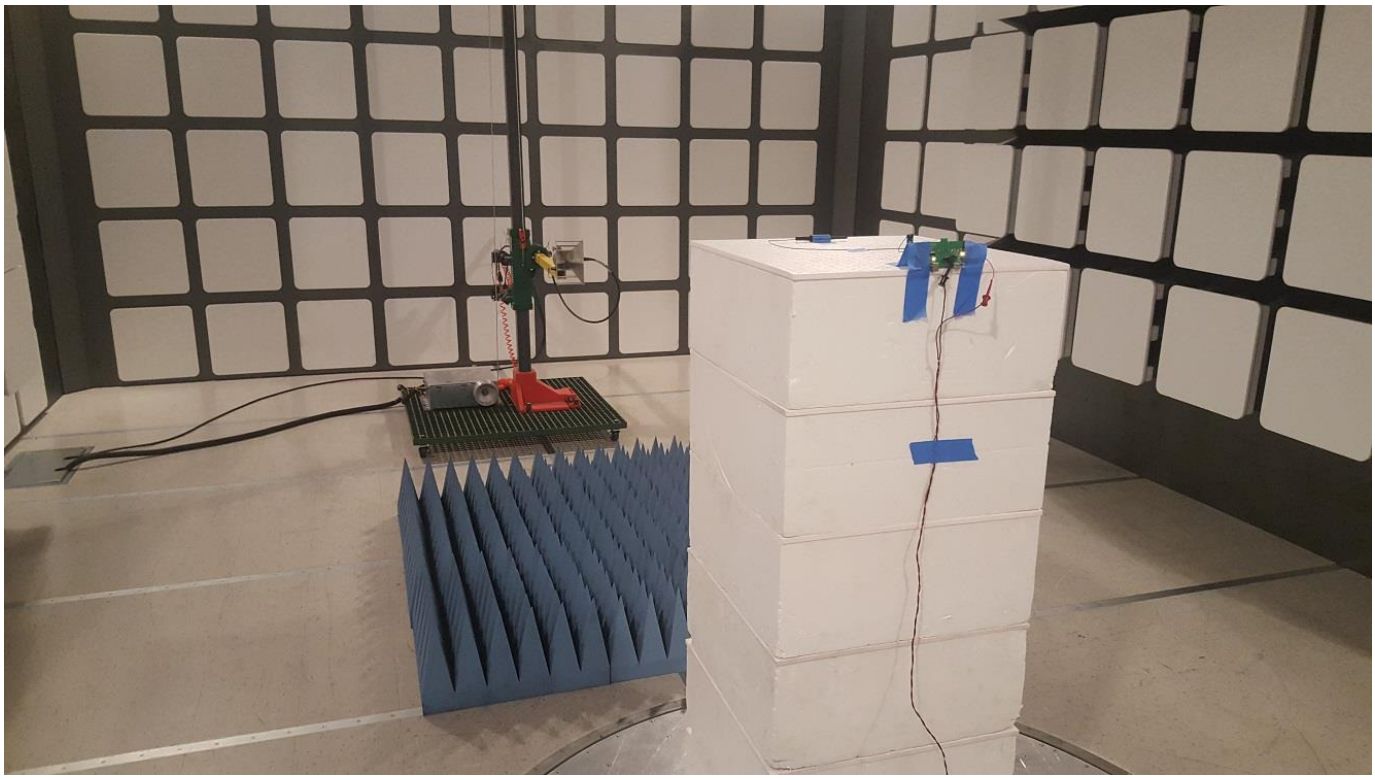
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



FRONT VIEW

HARMAN INTERNATIONAL
MODULAR TRANSMITTER
Model: ATWINC1500-MR210UB
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

HARMAN INTERNATIONAL
MODULAR TRANSMITTER
Model: ATWINC1500-MR210UB
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

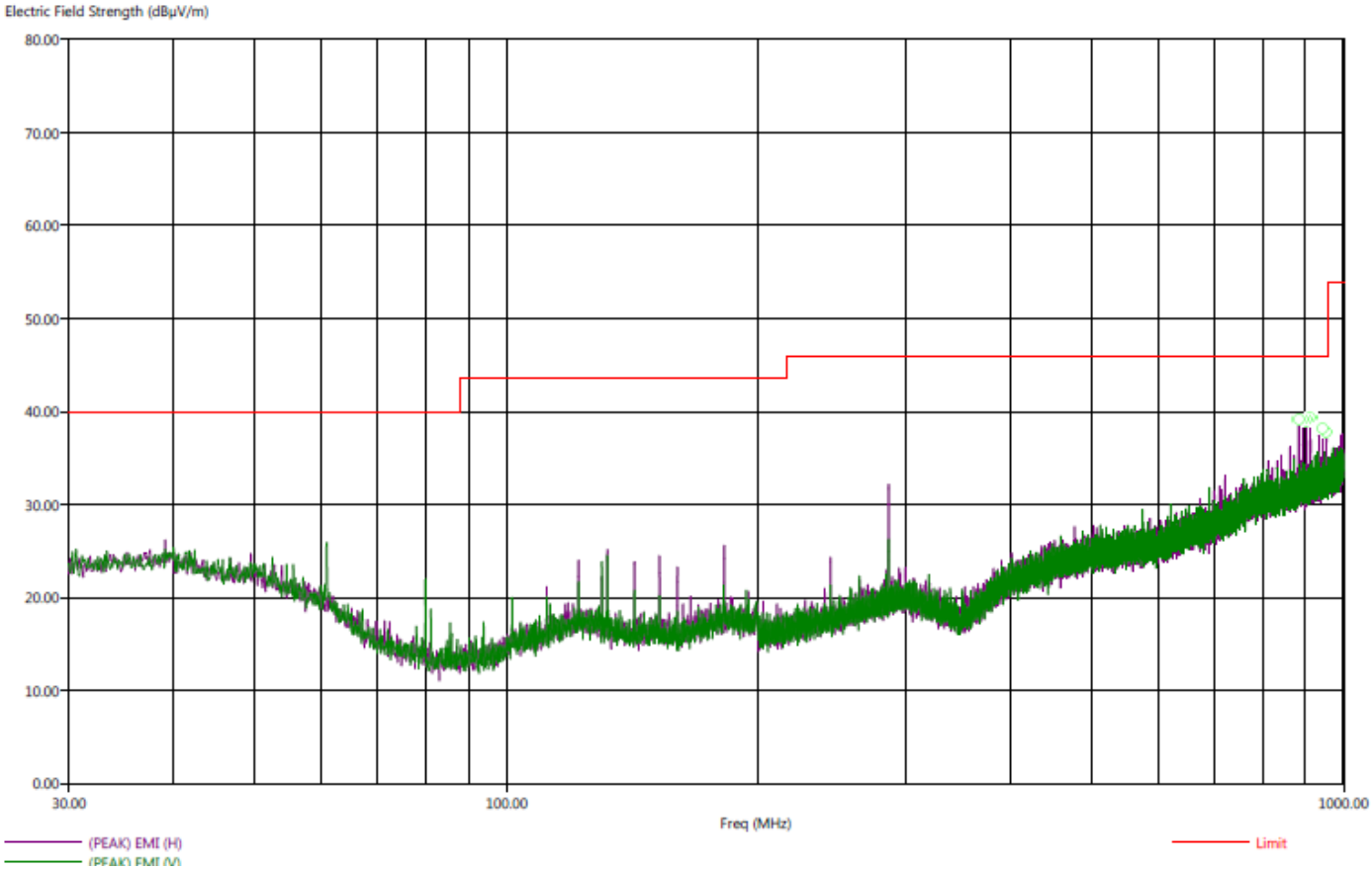
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

RADIATED EMISSIONS DATA SHEETS

Title: FCC 15.209 5/12/2016 5:34:54 PM
File: Radiated Pre-Scan 30-1000Mhz.set Sequence: Preliminary Scan
Operator: Torey Oliver
EUT Type: Wifi Module / ATWINC1500-MR210UB
EUT Condition: The EUT is constantly transmitting.
Comments: B mode Mid Channel: 2437 MHz
Connected to a DC power supply
Antenna 2
Temp: 72f
Hum: 42%
3.3VDC

Compatible Electronics, Inc. FAC-3 (Lab R)



This was worst case for all modes and channels
There were no radiated emissions besides harmonics found between 9kHz-30 MHz or 1GHz-25GHz.

Title: FCC 15.209 5/12/2016 5:47:38 PM
File: Radiated Final 30-1000Mhz.set Sequence: Final Measurements
Operator: Torey Oliver
EUT Type: Wifi Module / ATWINC1500-MR210UB
EUT Condition: The EUT is constantly transmitting.
Comments: B mode Mid Channel: 2437 MHz
Connected to a DC power supply
Antenna 2
Temp: 72f
Hum: 42%
3.3VDC

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq (MHz)	(QP) Margin (dB)	(QP) EMI (dBµV/m)	(PEAK) EMI (dBµV/m)	Limit (dBµV/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)	Transducer(dB)	Cable(dB)
883.40	-5.66	40.34	42.59	46.00	H	22.25	183.43	26.40	3.67
893.60	-6.10	39.90	42.50	46.00	H	268.00	102.05	26.52	3.69
903.70	-5.64	40.36	42.87	46.00	H	262.50	107.19	26.62	3.71
913.90	-7.24	38.76	41.77	46.00	H	262.75	185.40	26.68	3.73
944.40	-8.83	37.17	41.55	46.00	H	258.75	169.88	26.87	3.79
954.50	-8.36	37.64	41.24	46.00	H	262.50	178.89	27.05	3.82

This was worst case for all modes and channels
There were no radiated emissions besides harmonics found between 9kHz-30 MHz or 1GHz-25GHz.

EMISSIONS IN RESTRICTED FREQUENCY BANDS (RADIATED FIELD STRENGTH)

DATA SHEETS

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11b Mode, Low Channel, Horizontal & Vertical

FCC 15.247

Company:	Harman International	Date:	5/11/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210PUB	Test ENG:	Torey Oliver
Mode:	802.11b		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4824.00		H	73.98		Peak			In Restricted Band
4824.00		H	53.98		Avg			No Emissions Found
12060.00	63.60	H	73.98	-10.38	Peak	1.96	351	In Restricted Band
12060.00	51.78	H	53.98	-2.20	Avg	1.96	351	
14472.00		H	73.98		Peak			In Restricted Band
14472.00		H	53.98		Avg			No Emissions Found
19296.00		H	73.98		Peak			In Restricted Band
19296.00		H	53.98		Avg			No Emissions Found
4824.00		V	73.98		Peak			In Restricted Band
4824.00		V	53.98		Avg			No emissions found
12060.00	63.59	V	73.98	-10.39	Peak	1.07	346	In Restricted Band
12060.00	51.53	V	53.98	-2.45	Avg	1.07	346	
14472.00		V	73.98		Peak			In Restricted Band
14472.00		V	53.98		Avg			No Emissions Found
19296.00		V	73.98		Peak			In Restricted Band
19296.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11b Mode, Mid Channel, Horizontal & Vertical

FCC 15.247

Company:	Harman International	Date:	6/11/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210PUB	Test ENG:	Torey Oliver
Mode:	802.11b		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4874.00		H	73.98		Peak			In Restricted Band
4874.00		H	53.98		Avg			No Emissions Found
7311.00		H	73.98		Peak			In Restricted Band
7311.00		H	53.98		Avg			No Emissions Found
12185.00	61.17	H	73.98	-12.81	Peak	1.24	343	In Restricted Band
12185.00	48.88	H	53.98	-5.10	Avg	1.24	343	
19496.00		H	73.98		Peak			In Restricted Band
19496.00		H	53.98		Avg			No Emissions Found
4874.00		V	73.98		Peak			In Restricted Band
4874.00		V	53.98		Avg			No Emissions Found
7311.00		V	73.98		Peak			In Restricted Band
7311.00		V	53.98		Avg			No Emissions Found
12185.00	61.32	V	73.98	-12.66	Peak	2.64	354	In Restricted Band
12185.00	48.34	V	53.98	-5.64	Avg	2.64	354	
19496.00		V	73.98		Peak			In Restricted Band
19496.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11b Mode, High Channel, Horizontal & Vertical

FCC 15.247

Company:	Harman International	Date:	5/11/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210PUB	Test ENG:	Torey Oliver
Mode:	802.11b		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4924.00		H	73.98		Peak			In Restricted Band
4924.00		H	53.98		Avg			No Emissions Found
7386.00		H	73.98		Peak			In Restricted Band
7386.00		H	53.98		Avg			No Emissions Found
12310.00	63.75	H	73.98	-10.23	Peak	2.11	0	In Restricted Band
12310.00	51.71	H	53.98	-2.27	Avg	2.11	0	
19696.00		H	73.98		Peak			In Restricted Band
19696.00		H	53.98		Avg			No Emissions Found
22158.00		H	73.98		Peak			In Restricted Band
22158.00		H	53.98		Avg			No Emissions Found
4924.00		V	73.98		Peak			In Restricted Band
4924.00		V	53.98		Avg			No emissions found
7386.00		V	73.98	--	Peak			In Restricted Band
7386.00		V	53.98	--	Avg			No emissions found
12310.00	61.65	V	73.98	-12.33	Peak	1.2	345	In Restricted Band
12310.00	49.55	V	53.98	-4.43	Avg	1.2	345	
19696.00		V	73.98		Peak			In Restricted Band
19696.00		V	53.98		Avg			No Emissions Found
22158.00		V	73.98		Peak			In Restricted Band
22158.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11g Mode, Low Channel, Horizontal & Vertical

FCC 15.247

Company:	Harman International	Date:	5/13/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11g		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4824.00		H	73.98		Peak			In Restricted Band
4824.00		H	53.98		Avg			No emissions found
12060.00		H	73.98		Peak			In Restricted Band
12060.00		H	53.98		Avg			No emissions found
14472.00		H	73.98		Peak			In Restricted Band
14472.00		H	53.98		Avg			No emissions found
19296.00		H	73.98		Peak			In Restricted Band
19296.00		H	53.98		Avg			No Emissions Found
4824.00		V	73.98		Peak			In Restricted Band
4824.00		V	53.98		Avg			No emissions found
12060.00		V	73.98		Peak			In Restricted Band
12060.00		V	53.98		Avg			No emissions found
14472.00		V	73.98		Peak			In Restricted Band
14472.00		V	53.98		Avg			No emissions found
19296.00		V	73.98		Peak			In Restricted Band
19296.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11g Mode, Mid Channel, Horizontal & Vertical

FCC 15.247

Company: Harman International
EUT: Modular Transmitter
Model: ATWINC1500-MR210UB
Mode: 802.11g

Date: 5/13/2016
Lab: R
Test ENG: Torey Oliver

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4874.00		H	73.98		Peak			In Restricted Band
4874.00		H	53.98		Avg			No Emissions Found
7311.00		H	73.98		Peak			In Restricted Band
7311.00		H	53.98		Avg			No Emissions Found
12185.00	67.64	H	73.98	-6.34	Peak	1.04	317	In Restricted Band
12185.00	51.79	H	53.98	-2.19	Avg	1.04	317	
19496.00		H	73.98		Peak			In Restricted Band
19496.00		H	53.98		Avg			No Emissions Found
4874.00		V	73.98		Peak			In Restricted Band
4874.00		V	53.98		Avg			No Emissions Found
7311.00		V	73.98		Peak			In Restricted Band
7311.00		V	53.98		Avg			No Emissions Found
12185.00	64.47	V	73.98	-9.51	Peak	1.17	0	In Restricted Band
12185.00	49.22	V	53.98	-4.76	Avg	1.17	0	
19496.00		V	73.98		Peak			In Restricted Band
19496.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11g Mode, High Channel, Horizontal & Vertical

FCC 15.247

Company:	Harman International	Date:	5/13/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11g		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4924.00		H	73.98		Peak			In Restricted Band
4924.00		H	53.98		Avg			No emissions found
7386.00		H	73.98		Peak			In Restricted Band
7386.00		H	53.98		Avg			No Emissions Found
12310.00		H	73.98		Peak			In Restricted Band
12310.00		H	53.98		Avg			No emissions found
19696.00		H	73.98		Peak			In Restricted Band
19696.00		H	53.98		Avg			No Emissions Found
22158.00		H	73.98		Peak			In Restricted Band
22158.00		H	53.98		Avg			No Emissions Found
4924.00		V	73.98		Peak			In Restricted Band
4924.00		V	53.98		Avg			No Emissions Found
7386.00		V	73.98		Peak			In Restricted Band
7386.00		V	53.98		Avg			No Emissions Found
12310.00		V	73.98		Peak			In Restricted Band
12310.00		V	53.98		Avg			No emissions found
19696.00		V	73.98		Peak			In Restricted Band
19696.00		V	53.98		Avg			No Emissions Found
22158.00		V	73.98		Peak			In Restricted Band
22158.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11n Mode, Low Channel, Horizontal & Vertical

FCC 15.247

Company:	Harman International	Date:	5/13/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500B-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11n		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4824.00		H	73.98		Peak			In Restricted Band
4824.00		H	53.98		Avg			No Emissions Found
12060.00		H	73.98		Peak			In Restricted Band
12060.00		H	53.98		Avg			No Emissions Found
14472.00		H	73.98		Peak			In Restricted Band
14472.00		H	53.98		Avg			No Emissions Found
19296.00		H	73.98		Peak			In Restricted Band
19296.00		H	53.98		Avg			No Emissions Found
4824.00		V	73.98		Peak			In Restricted Band
4824.00		V	53.98		Avg			No Emissions Found
12060.00		V	73.98		Peak			In Restricted Band
12060.00		V	53.98		Avg			No Emissions Found
14472.00		V	73.98		Peak			In Restricted Band
14472.00		V	53.98		Avg			No Emissions Found
19296.00		V	73.98		Peak			In Restricted Band
19296.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11n Mode, Mid Channel, Horizontal & Vertical

FCC 15.247

Company: Harman International
EUT: Modular Transmitter
Model: ATWINC1500B-MR210UB
Mode: 802.11n

Date: 5/13/2016
Lab: R
Test ENG: Torey Oliver

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4874.00		H	73.98		Peak			In Restricted Band
4874.00		H	53.98		Avg			No emissions found
7311.00		H	73.98		Peak			In Restricted Band
7311.00		H	53.98		Avg			No emissions found
12185.00	63.92	H	73.98	-10.06	Peak	1.95	321	In Restricted Band
12185.00	48.97	H	53.98	-5.01	Avg	1.95	321	
19496.00		H	73.98		Peak			In Restricted Band
19496.00		H	53.98		Avg			No Emissions Found
4874.00		V	73.98		Peak			In Restricted Band
4874.00		V	53.98		Avg			No emissions found
7311.00		V	73.98		Peak			In Restricted Band
7311.00		V	53.98		Avg			No emissions found
12185.00	64.94	V	73.98	-9.04	Peak	1.33	338	In Restricted Band
12185.00	49.65	V	53.98	-4.33	Avg	1.33	338	
19496.00		V	73.98		Peak			In Restricted Band
19496.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS
802.11n Mode, High Channel, Horizontal & Vertical

FCC 15.247

Company:	Harman International	Date:	5/13/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500B-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11n		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4924.00		H	73.98		Peak			In Restricted Band
4924.00		H	53.98		Avg			No emissions found
7386.00		H	73.98		Peak			In Restricted Band
7386.00		H	53.98		Avg			No Emissions Found
								No Emissions Found
12310.00		H	73.98		Peak			In Restricted Band
12310.00		H	53.98		Avg			No emissions found
19696.00		H	73.98		Peak			In Restricted Band
19696.00		H	53.98		Avg			No Emissions Found
22158.00		H	73.98		Peak			In Restricted Band
22158.00		H	53.98		Avg			No Emissions Found
4924.00		V	73.98		Peak			In Restricted Band
4924.00		V	53.98		Avg			No emissions found
7386.00		V	73.98		Peak			In Restricted Band
7386.00		V	53.98		Avg			No Emissions Found
12310.00		V	73.98		Peak			In Restricted Band
12310.00		V	53.98		Avg			No emissions found
19696.00		V	73.98		Peak			In Restricted Band
19696.00		V	53.98		Avg			No Emissions Found
22158.00		V	73.98		Peak			In Restricted Band
22158.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter

EMISSIONS RADIATED OUTSIDE OF THE FUNDAMENTAL FREQUENCY BAND AT BAND EDGES

DATA SHEETS

802.11b Mode

BAND EDGES- VERTICAL

FCC 15.247

Company:	Harman International	Date:	5/16/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210PUB	Test ENG:	Torey Oliver
Mode:	802.11b		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2412.00	105.37	V	--	--	Peak	2.95	237	Fundamental of Low Channel
2397.80	77.78	V	85.37	-7.59	Delta	2.95	237	From Peak
2385.79	60.77	V	73.98	-13.21	Peak	2.95	237	**No** Marker Delta Method Used
2385.79	48.42	V	53.98	-5.56	Avg	2.95	237	
2462.00	104.31	V	--	--	Peak	2.06	241	Fundamental of High Channel
2491.79	61.67	V	73.98	-12.31	Peak	2.06	241	**No** Marker Delta Method Used
2491.79	48.58	V	53.98	-5.40	Avg	2.06	241	

Test distance
3 meter

802.11b Mode

BAND EDGES- HORIZONTAL

FCC 15.247

Company:	Harman International	Date:	5/16/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210PUB	Test ENG:	Torey Oliver
Mode:	802.11b		

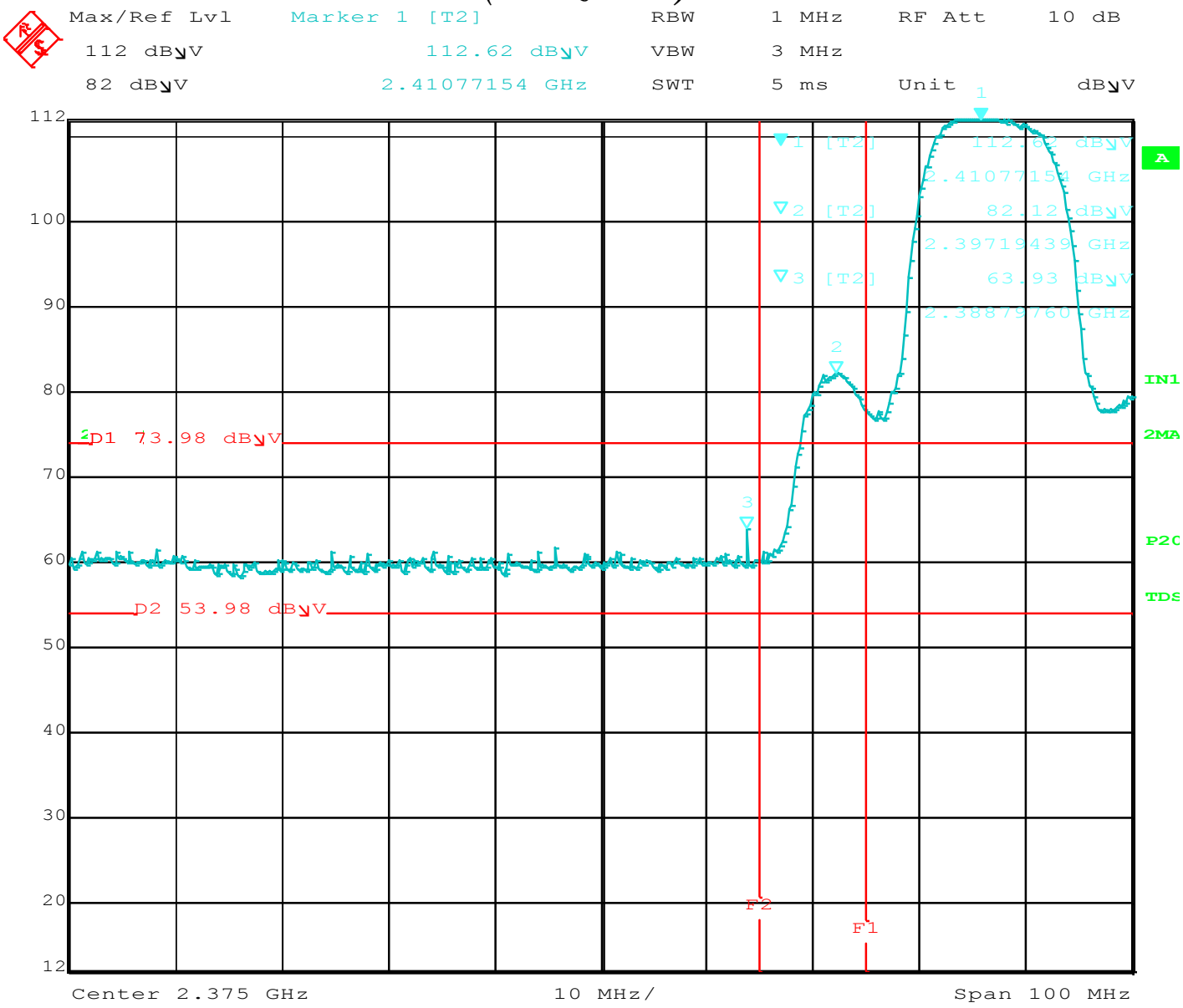
Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2412.00	112.62	H	--	--	Peak	1.62	191	Fundamental of Low Channel
2397.19	82.12	H	92.62	-10.50	Delta	1.62	191	From Peak
2388.80	63.93	H	73.98	-10.05	Peak	1.62	191	**No** Marker Delta Method Used
2388.80	48.81	H	53.98	-5.17	Avg	1.62	191	
2462.00	113.26	H	--	--	Peak	1	10	Fundamental of High Channel
2501.81	62.08	H	73.98	-11.90	Peak	1	10	**No** Marker Delta Method Used
2501.81	48.90	H	53.98	-5.08	Avg	1	10	

Test distance
3 meter

LOWER BAND EDGE

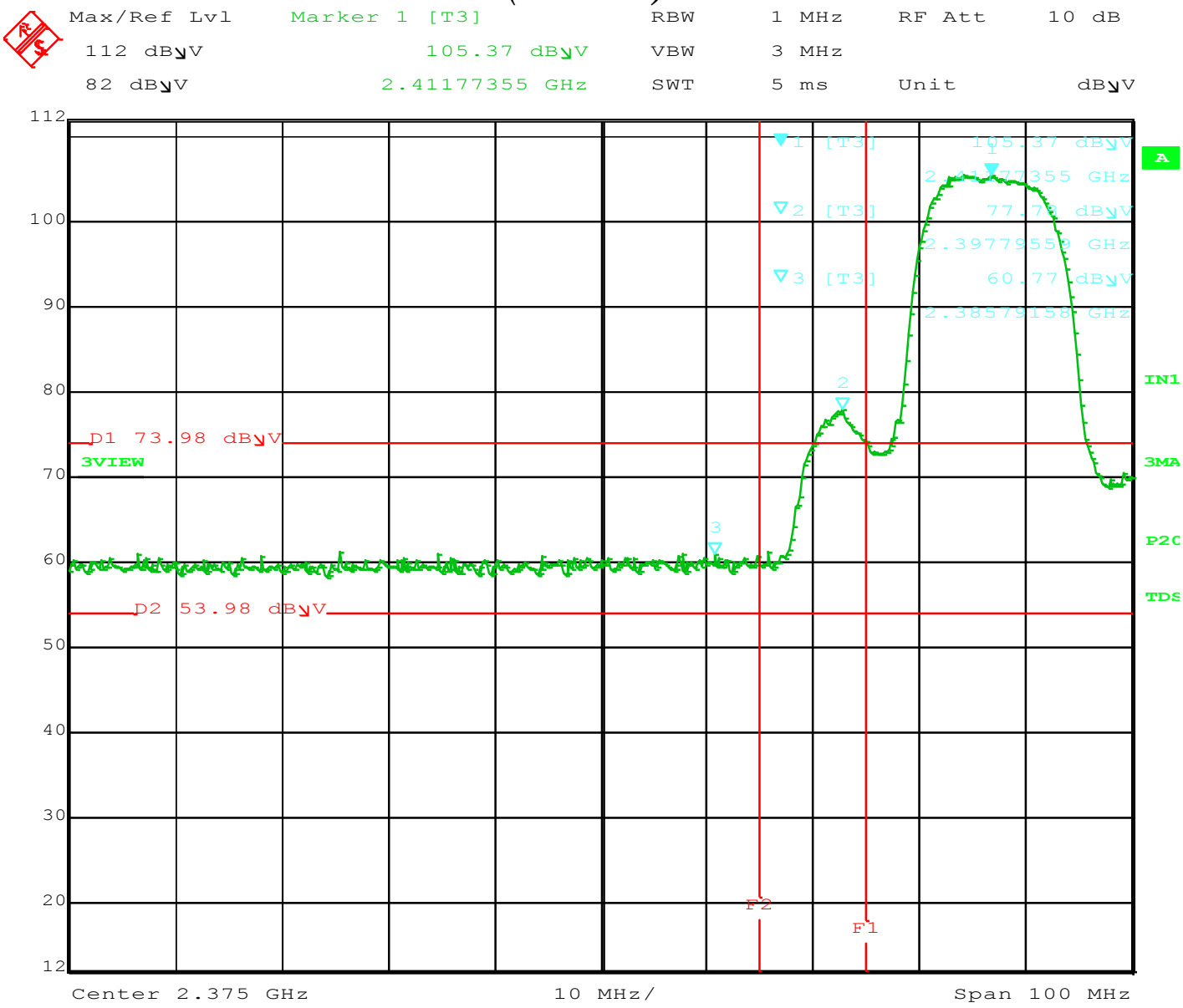
(Horizontal)



Comment A: Lower Band Edge 802.11b Horizontal
Date: 16.MAY.2016 16:43:50

LOWER BAND EDGE

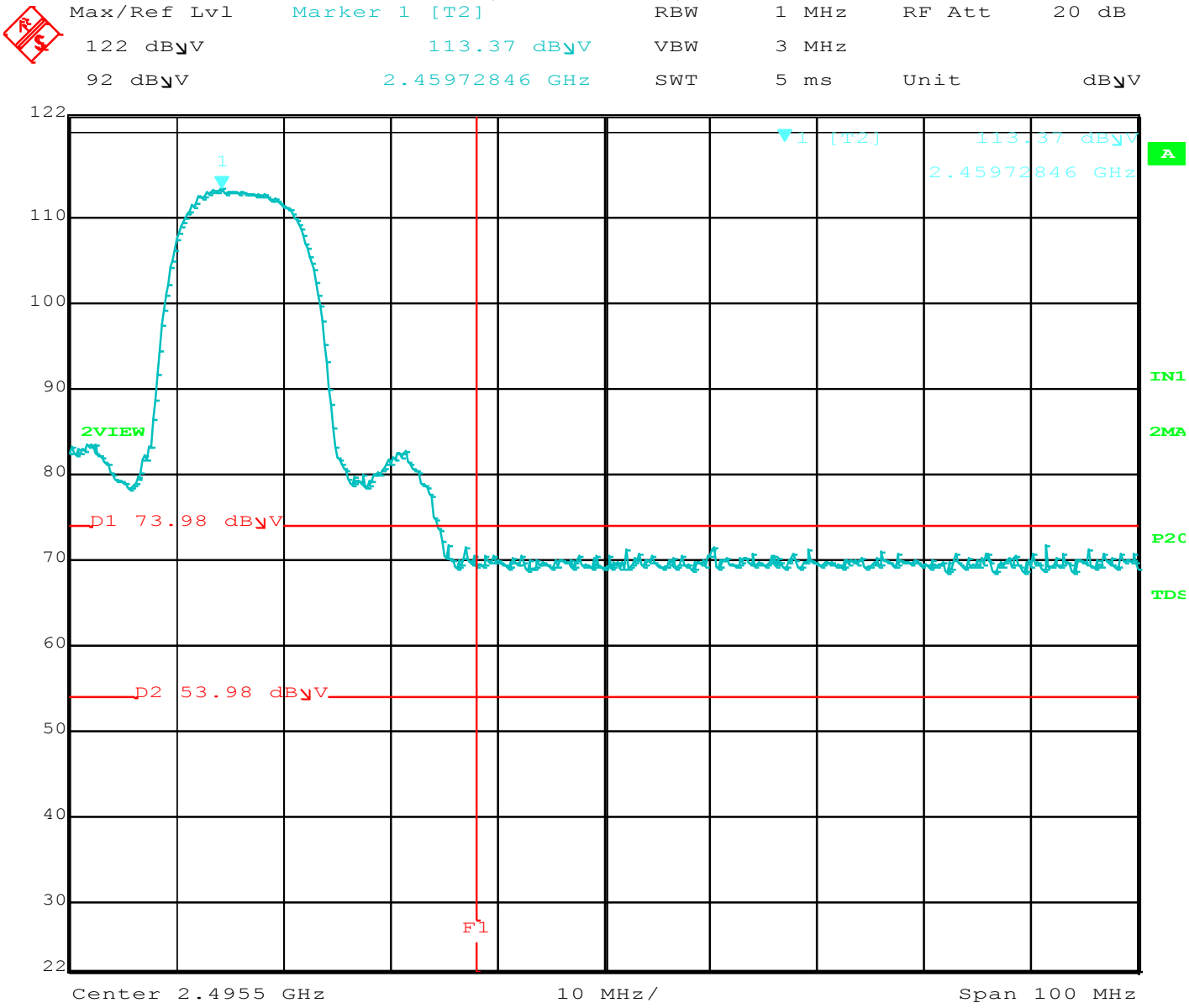
(Vertical)



Comment A: Lower Band Edge 802.11b Vertical
Date: 16.MAY.2016 16:39:07

UPPER BAND EDGE

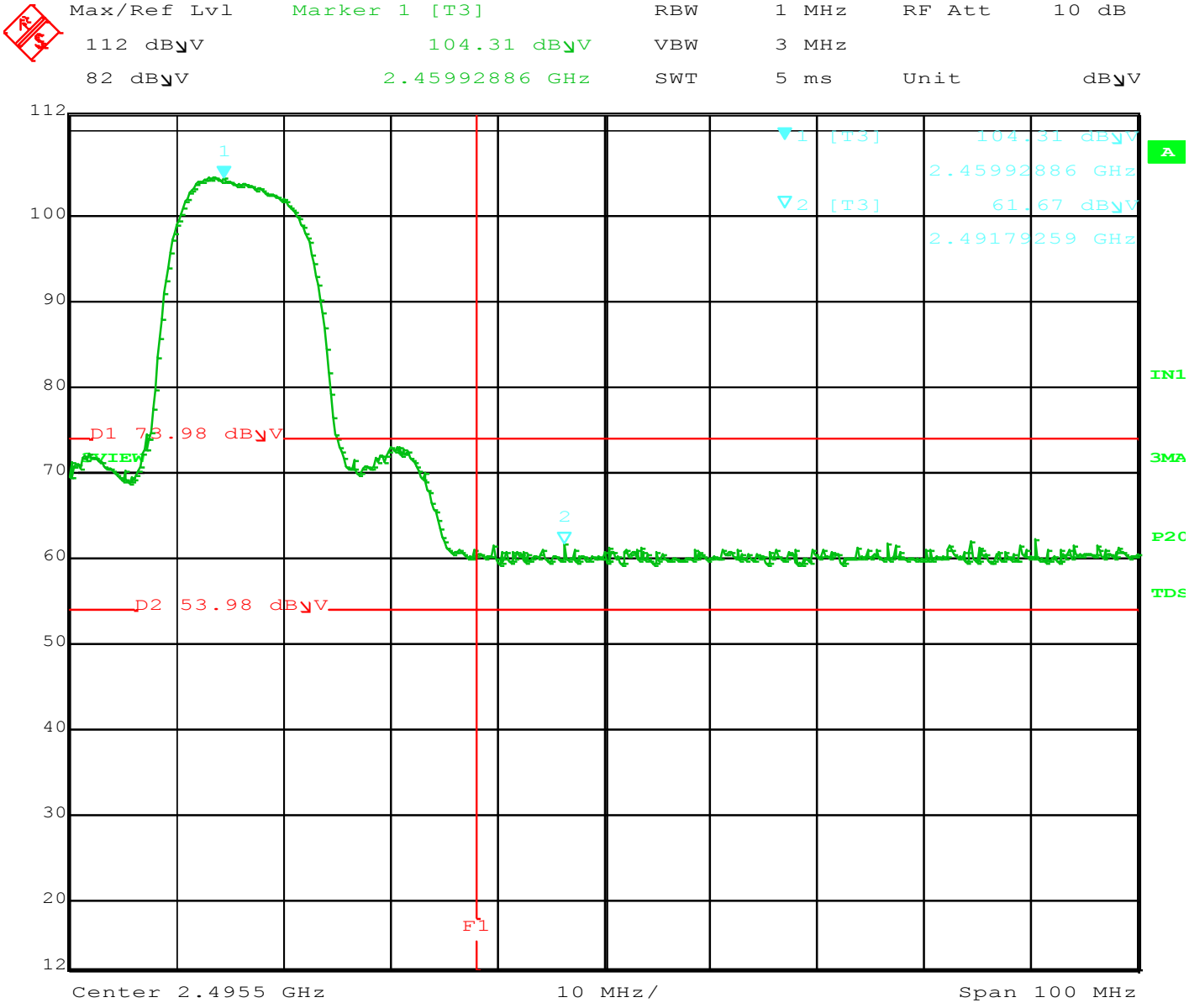
(Horizontal)



Comment A: Upper Band Edge 802.11b Horizontal
Date: 16.MAY.2016 16:29:00

UPPER BAND EDGE

(Vertical)



Comment A: Upper Band Edge 802.11b Vertical
Date: 16.MAY.2016 16:33:32

802.11g Mode

BAND EDGES- VERTICAL

FCC 15.247

Company:	Harman International	Date:	5/16/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11g		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2412.00	101.71	V	--	--	Peak	2.94	237	Fundamental of Low Channel
2399.80	75.07	V	81.71	-6.64	Delta	2.94	237	From Peak
2384.19	68.10	V	73.98	-5.88	Peak	2.94	237	**No** Marker Delta Method Used
2384.19	39.89	V	53.98	-14.09	Avg	2.94	237	
2462.00	98.86	V	--	--	Peak	243	3.44	Fundamental of High Channel
2484.30	61.46	V	73.98	-12.52	Peak	243	3.44	**No** Marker Delta Method Used
2484.30	39.44	V	53.98	-14.54	Avg	243	3.44	

Test distance
3 meter

802.11g Mode

BAND EDGES- HORIZONTAL

FCC 15.247

Company:	Harman International	Date:	5/16/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11g		

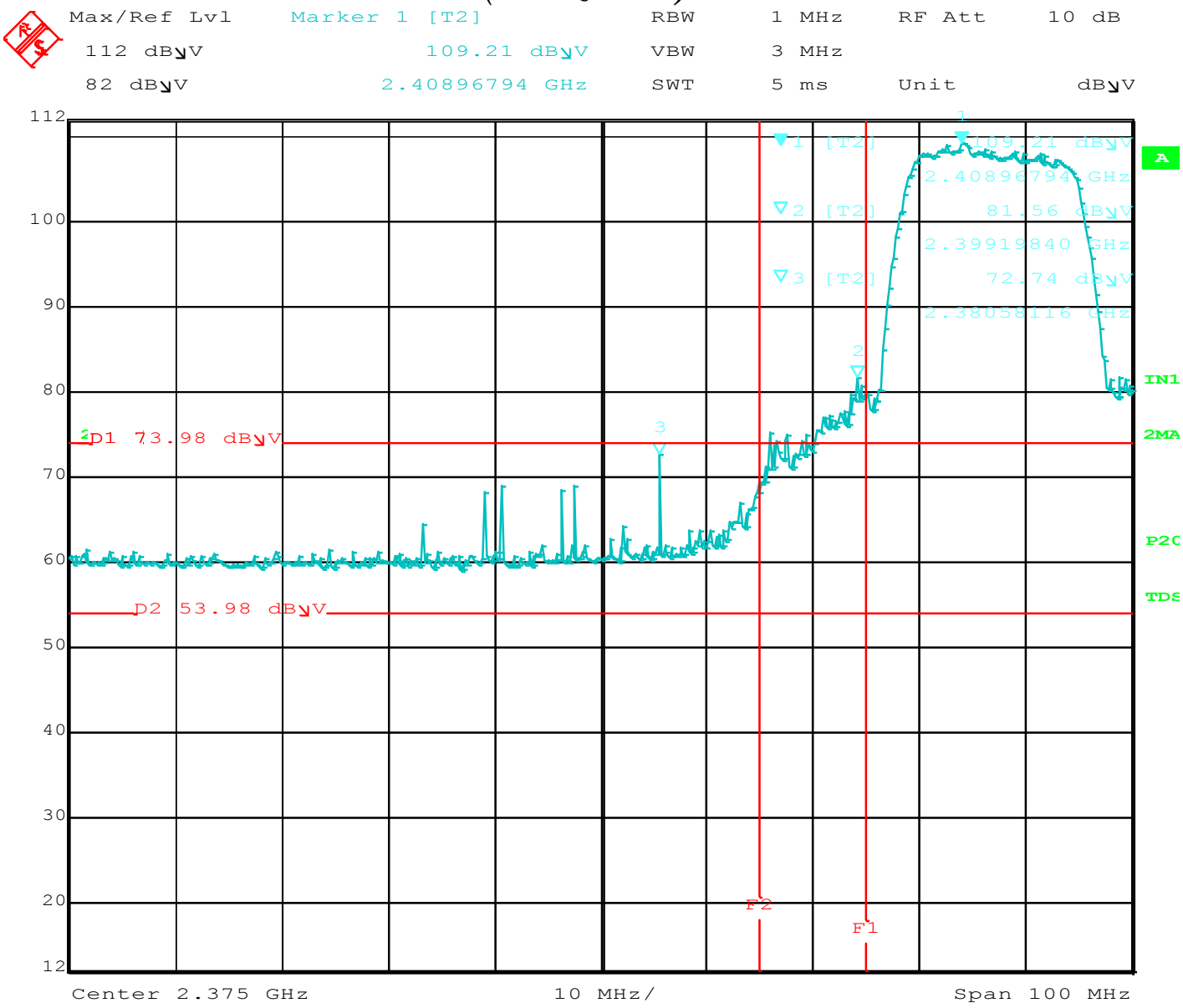
Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2412.00	109.21	H	--	--	Peak	1.17	4	Fundamental of Low Channel
2399.20	81.56	H	89.21	-7.65	Delta	1.17	4	From Peak
2380.58	72.74	H	73.98	-1.24	Peak	1.17	4	**No** Marker Delta Method Used
2380.58	48.76	H	53.98	-5.22	Avg	1.17	4	
2462.00	107.06	H	--	--	Peak	1	360	Fundamental of High Channel
2484.50	70.07	H	73.98	-3.91	Peak	1	360	**No** Marker Delta Method Used
2484.50	50.02	H	53.98	-3.96	Avg	1	360	

Test distance
3 meter

LOWER BAND EDGE

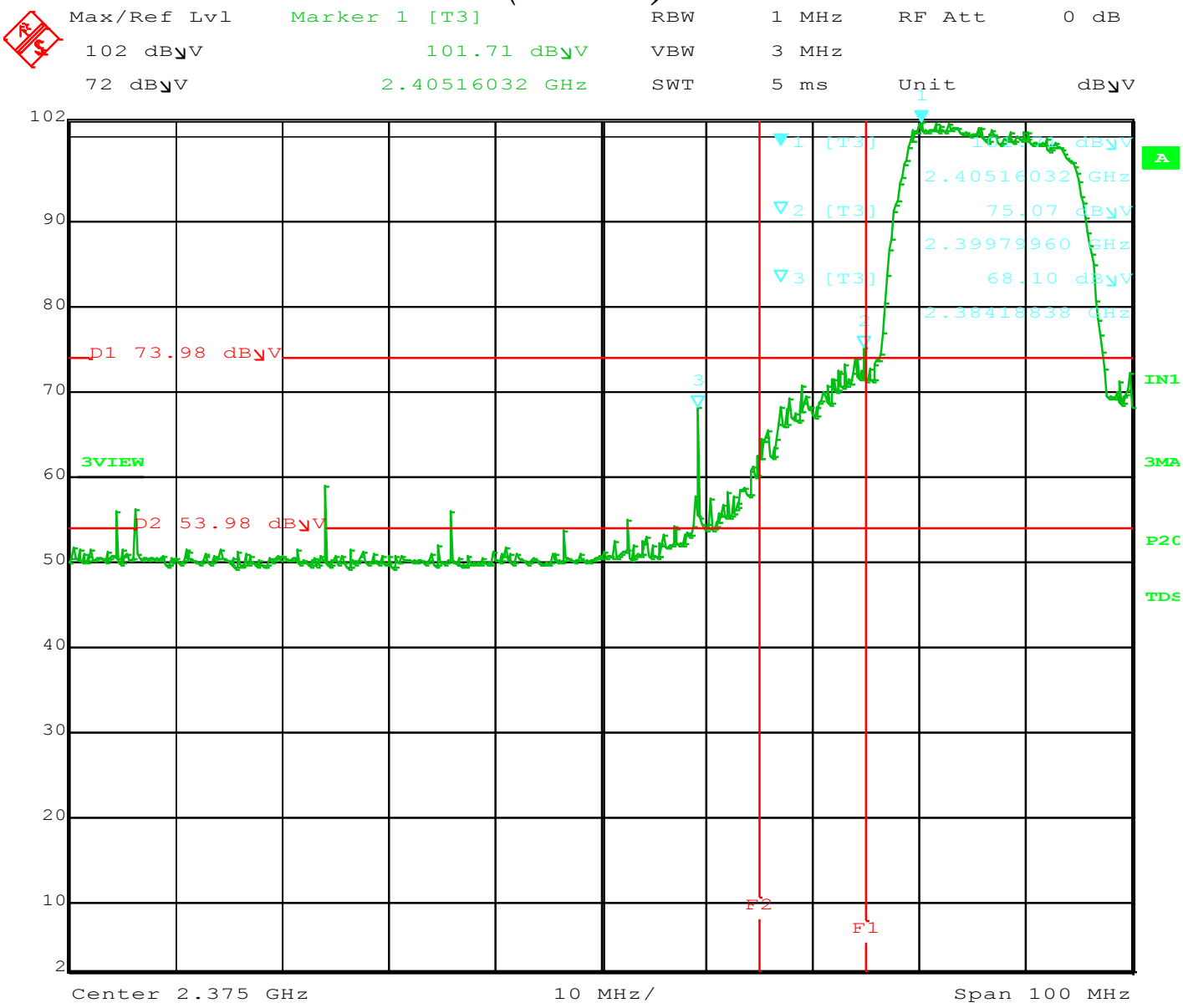
(Horizontal)



Comment A: Lower Band Edge 802.11n Horizontal
Date: 16.MAY.2016 15:30:28

LOWER BAND EDGE

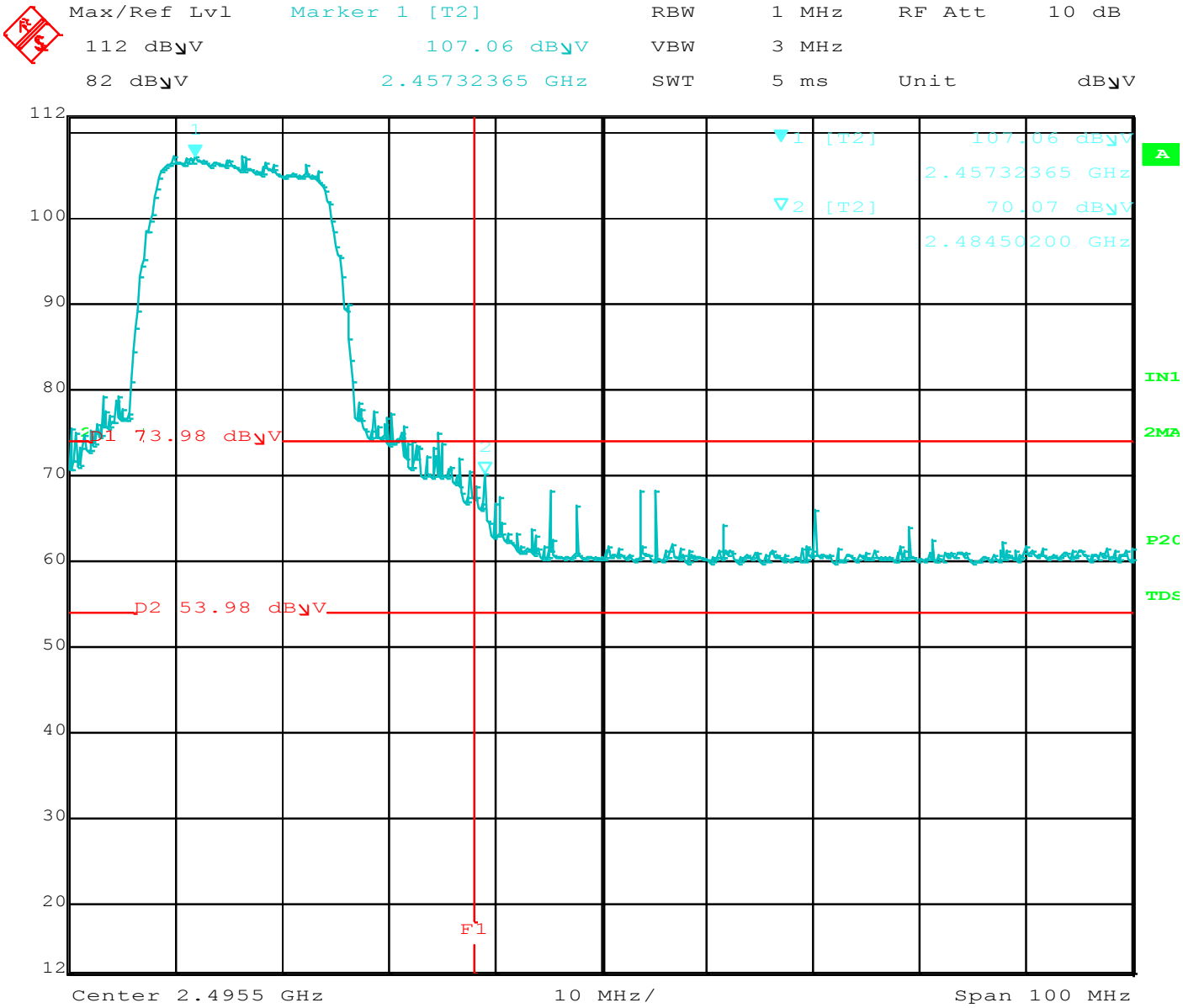
(Vertical)



Comment A: Lower Band Edge 802.11g Vertical
Date: 16.MAY.2016 15:34:23

UPPER BAND EDGE

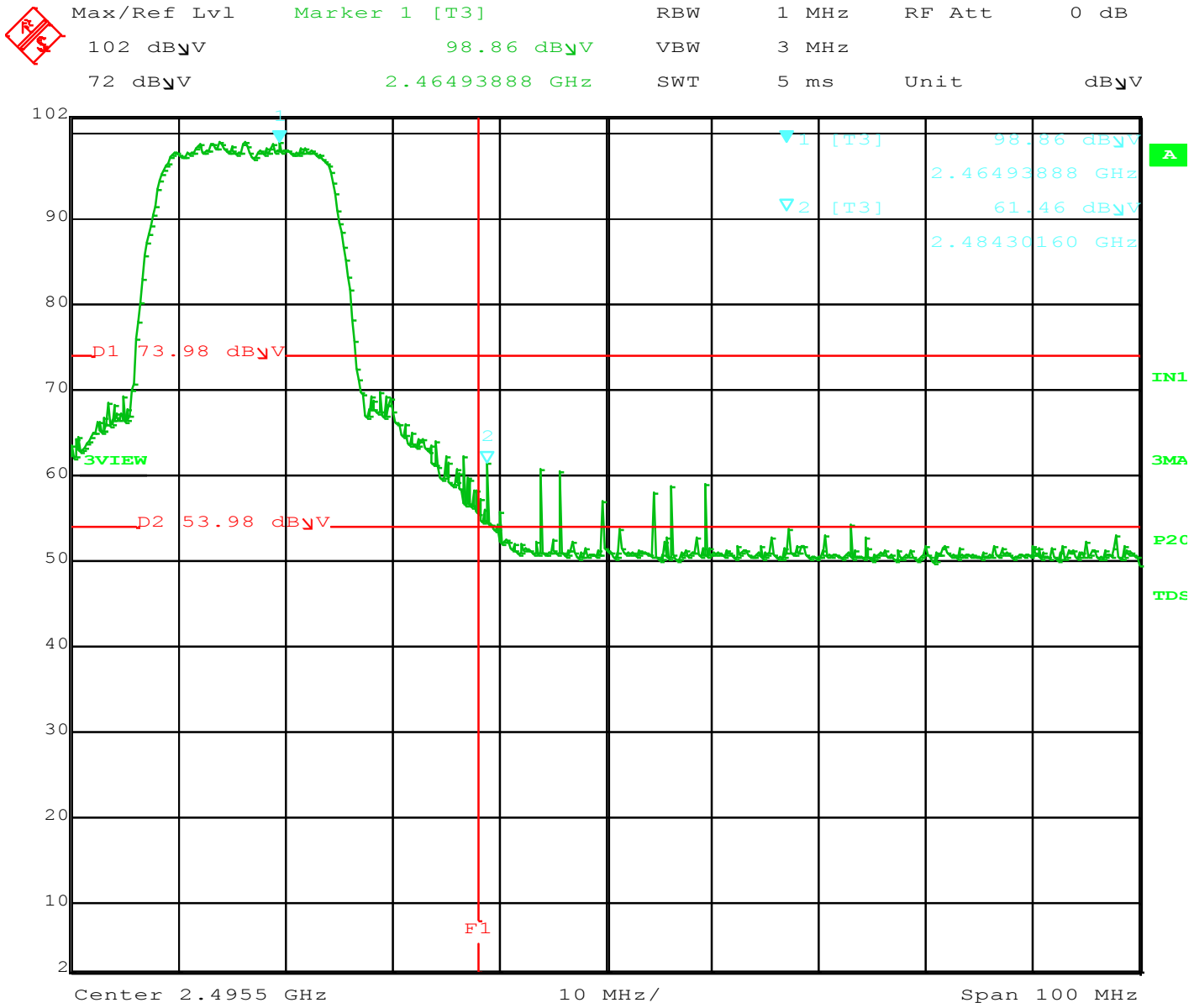
(Horizontal)



Comment A: Upper Band Edge 802.11g Horizontal
Date: 16.MAY.2016 15:49:21

UPPER BAND EDGE

(Vertical)



Comment A: Upper Band Edge 802.11g Vertical
Date: 16.MAY.2016 15:44:23

802.11n Mode

BAND EDGES- VERTICAL

FCC 15.247

Company:	Harman International	Date:	5/16/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500B-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11n		

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2412.00	102.27	V	--	--	Peak	2.34	238	Fundamental of Low Channel
2400.00	74.24	V	82.27	-8.03	Delta	2.34	238	From Peak
2390.00	64.85	V	73.98	-9.13	Peak	2.34	238	**No** Marker Delta Method Used
2390.00	43.37	V	53.98	-10.61	Avg	2.34	238	
2462.00	98.31	V	--	--	Peak	2.79	242	Fundamental of High Channel
2484.30	65.85	V	73.98	-8.13	Peak	2.79	242	**No** Marker Delta Method Used
2484.30	41.13	V	53.98	-12.85	Avg	2.79	242	

Test distance
3 meter

802.11n Mode

BAND EDGES- HORIZONTAL

FCC 15.247

Company:	Harman International	Date:	5/16/2016
EUT:	Modular Transmitter	Lab:	R
Model:	ATWINC1500B-MR210UB	Test ENG:	Torey Oliver
Mode:	802.11n		

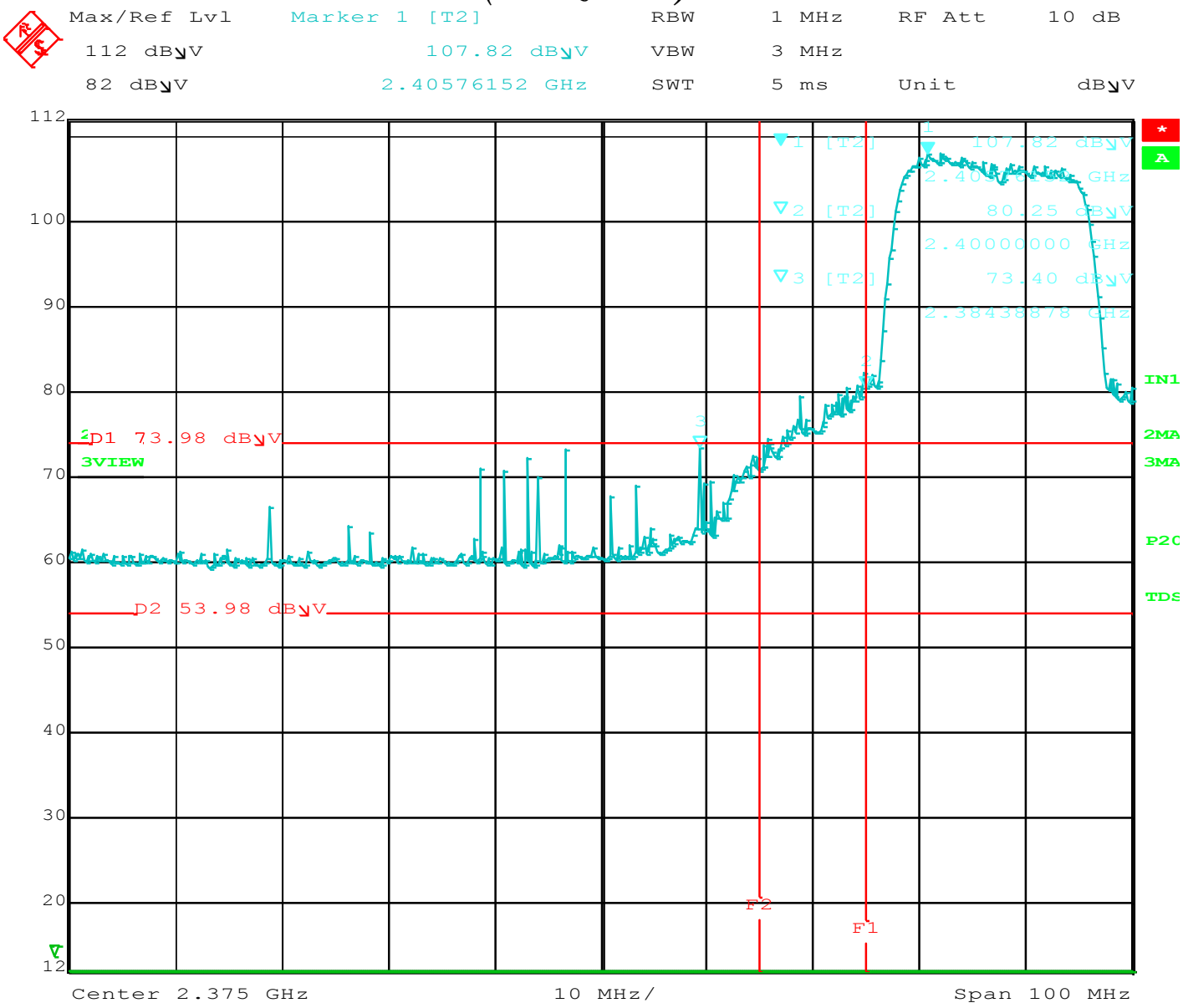
Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2412.00	107.82	H	--	--	Peak	1	341	Fundamental of High Channel
2400.00	80.25	H	87.82	-7.57	Delta	1	341	From Peak
2384.39	73.40	H	73.98	-0.58	Peak	1	341	**No** Marker Delta Method Used
2384.39	49.53	H	53.98	-4.45	Avg	1	341	
2462.00	107.18	H	--	--	Peak	1.85	360	Fundamental of High Channel
2487.78	71.15	H	73.98	-2.83	Peak	1.85	360	**No** Marker Delta Method Used
2487.78	49.05	H	53.98	-4.93	Avg	1.85	360	

Test distance
3 meter

LOWER BAND EDGE

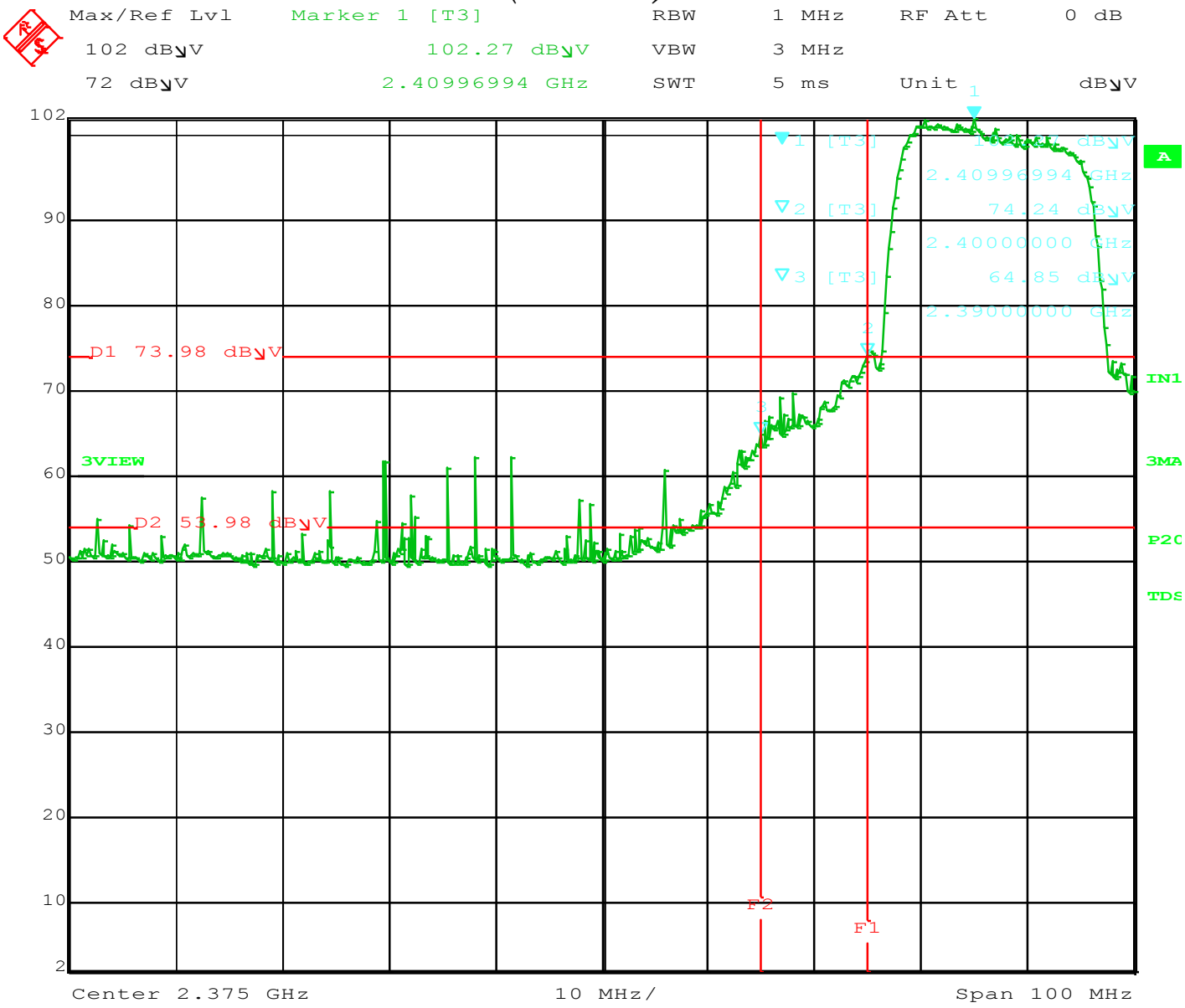
(Horizontal)



Comment A: Lower Band Edge 802.11n Vertical
Date: 16.MAY.2016 14:59:08

LOWER BAND EDGE

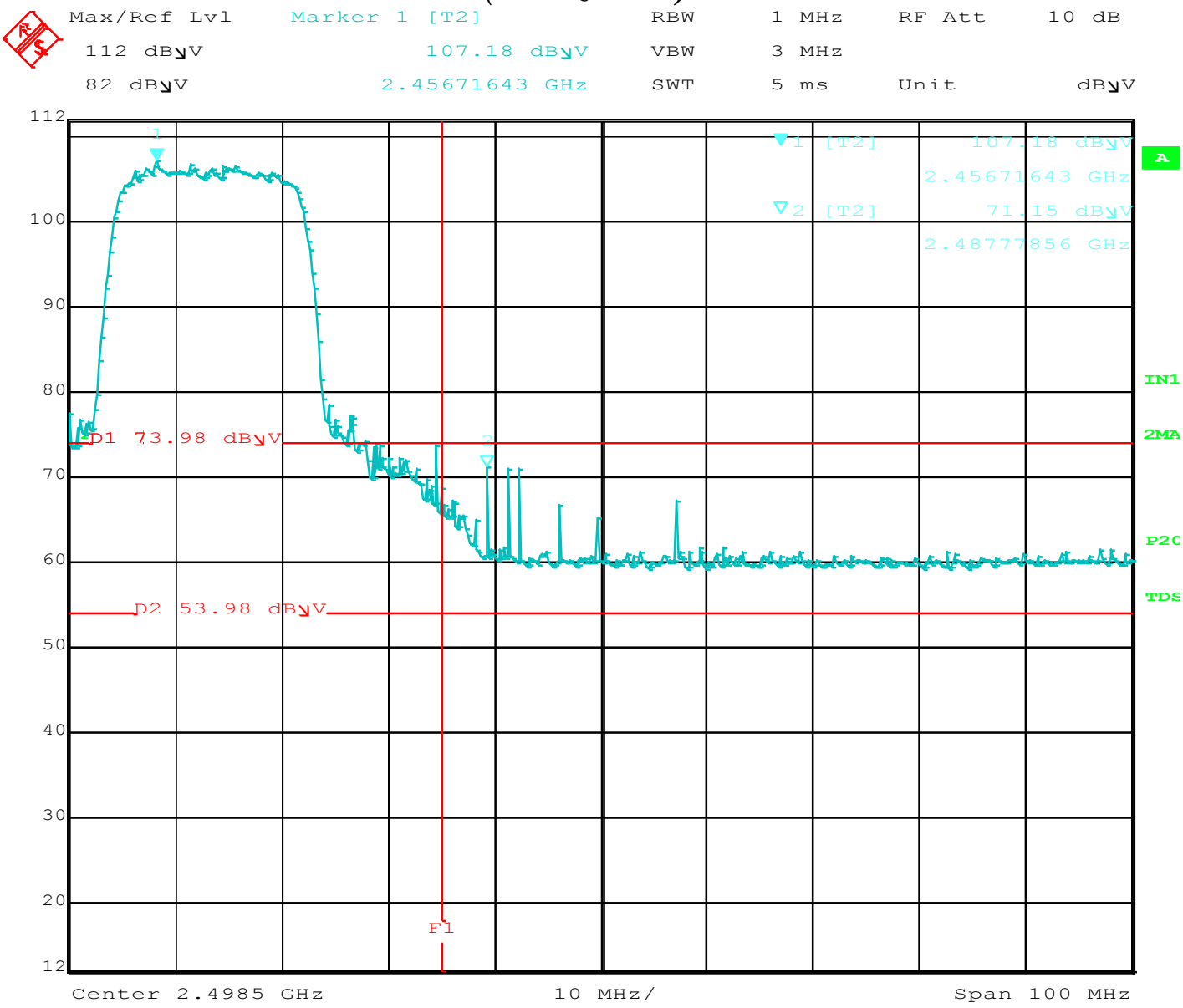
(Vertical)



Comment A: Lower Band Edge 802.11n Vertical
Date: 16.MAY.2016 14:53:52

UPPER BAND EDGE

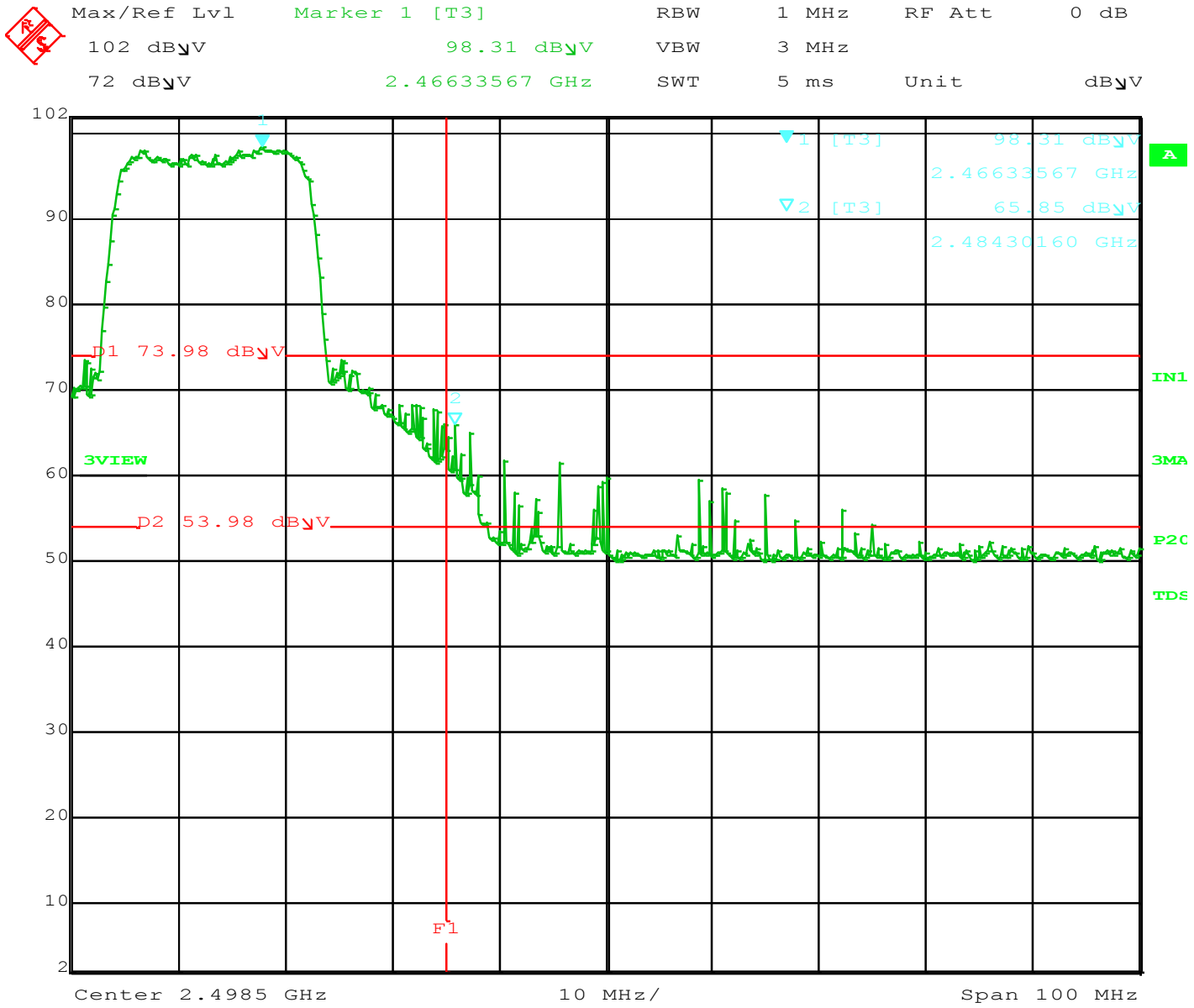
(Horizontal)



Comment A: Upper Band Edge 802.11n Horizontal
Date: 16.MAY.2016 14:32:16

UPPER BAND EDGE

(Vertical)



Comment A: Upper Band Edge 802.11n Vertical
Date: 16.MAY.2016 14:42:35