

**FCC PART 15 SUBPART C SECTION 15.247
&
RSS 247
TEST REPORT**

for

**MODULAR TRANSMITTER
Model: ATWILC3000-MR110CA**

Prepared for
**ATMEL CORPORATION
1 SPECTRUM POINTE DR., SUITE 225
LAKE FOREST, CA 92630**

Prepared by: _____

TOREY OLIVER

Approved by: _____

MATT HARRISON

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

DATE: JANUARY 4, 2016

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
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114 Olinda Drive
Brea, CA 92823
(714) 579-0500**

**Agoura Division
2337 Troutdale Drive
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19121 El Toro Road
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(949) 589-0700**

**Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400**

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2	Plot Map And Layout of Test Site Above 1GHz
3	Conducted Emissions Test Setup



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: ATWILC3000-MR110CA
S/N: None

Product Description: The EUT is a BLE and Wifi Wireless Shielded Module with a chip antenna.

Modifications: The EUT was not modified in order to comply with specifications.

Manufacturer: Atmel Corporation
1 Spectrum Pointe Dr., Suite 225
Lake Forest, CA 92630

Test Dates: December 22, 23, 2015 & January 4, 2016

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart C Sections 15.205, 15.207, 15.209, & 15.247.
RSS 247 & RSS GEN

Test Procedure: ANSI C63.4 & C63.10, and KDB 558074 D01 v03r05.



SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz - 30 MHz	Complies with the limits of CFR Title 47 Part 15 Subpart C Section 15.207 and RSS GEN
2	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, and RSS GEN
3	DTS Bandwidth	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
4	Maximum Peak Conducted Output Power	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
5	Maximum Peak Power Spectral Density Level In The Fundamental Emission	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
6	Emissions in Non-Restricted Frequency Bands (in 100kHz Bandwidth)	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247
7	Emissions in the Restricted Bands	Complies with CFR Title 47 Part 15 Subpart C Section 15.247 and RSS 247



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Modular Transmitter Model: ATWILC3000-MR110CA. 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 15 Subpart C sections 15.207, 15.205, 15.209, 15.247, RSS GEN, and RSS 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

Atmel Corporation

Hassan Hashemi

Senior Director

Compatible Electronics Inc.

Torey Oliver

Test Technician

Matt Harrison

Lab Manager

2.4 Date Test Sample was Received

The test sample was received on September 17, 2015.

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.
RSS 247	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS GEN	General Requirements for Compliance of Radio Apparatus
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

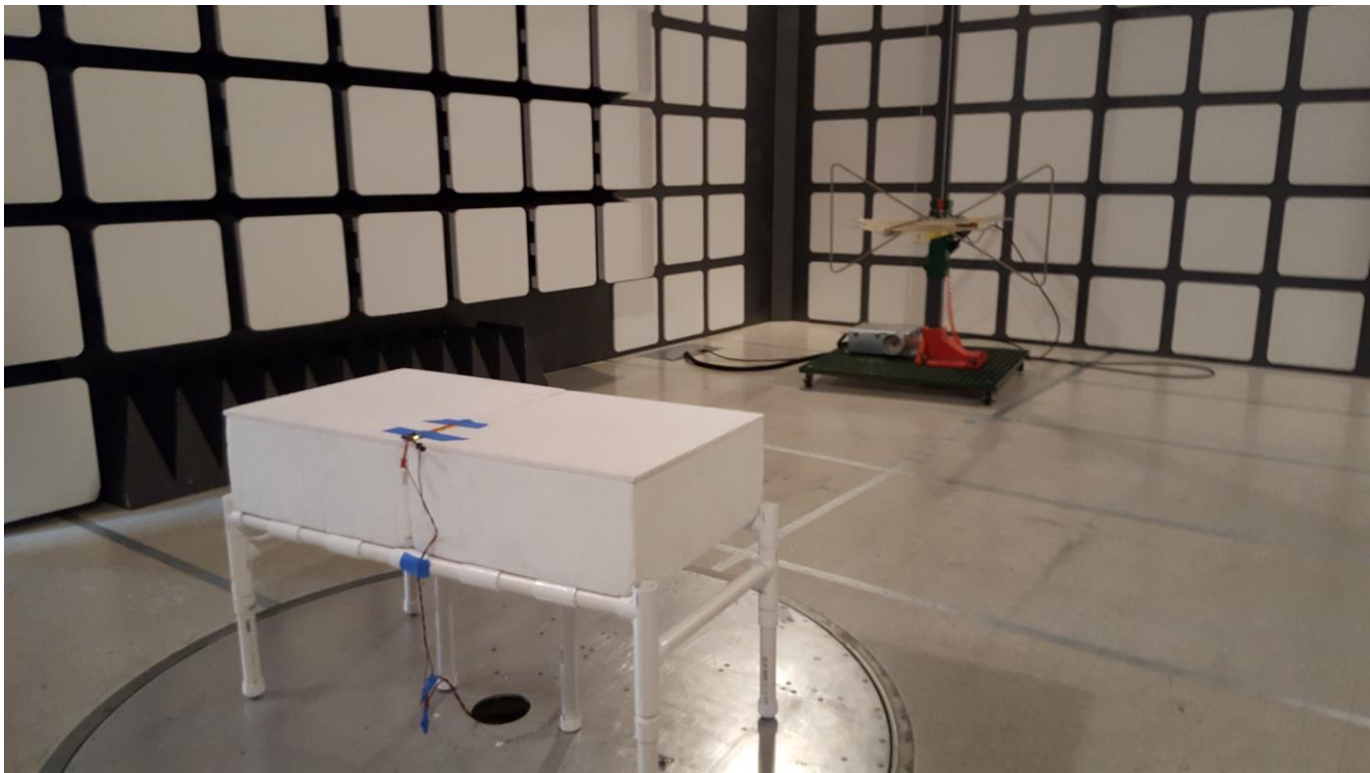
4.1 Description of Test Configuration

The Modular Transmitter Model: ATWILC3000-MR110CA (EUT) was setup in a tabletop configuration. The EUT was powered by a DC Supply (for Conducted Emissions the EUT was connected to a USB Power Adapter). The EUT was continuously transmitting a data stream during transmit tests and continuously receiving during receiver tests. The EUT was checked in all axes and the X-Axis was found to be the worst case. All modulation modes were checked and the worst case data is provided.

The voltage was varied $\pm 15\%$ 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



4.1.2 Cable Construction and Termination

Cable 1-2

These are 2 meter, un-shielded, round cables that connect 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 connect 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 1 meter, foil shielded, USB cable that connect the EUT to the USB Power Adapter. The cable is hardwired into both ends of the cable. The cable was not bundled. The shield of the cable was terminated at the connectors.



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)	ATMEL CORPORATION	ATWILC3000-MR110CA	N/A
2	DC SUPPLY	MPJA	0-30V / 0-5A	017687
3	EUT CONTROL BOARD	ATMEL CORPORATION	NONE	NONE
4	USB POWER ADAPTER (CONDUCTED EMISSIONS)	BELKIN	F8J052	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	551034	2/6/2015	2/6/2016
Pre-Amp, 18-40GHz	Com Power	PA-840	181289	6/16/2014	6/16/2016
LISN	Com Power	LI-215	191937	4/16/2015	4/16/2016
RF Peak Power Meter/Analyzer	Boonton	4500A	1282	12/2/2014	12/2/2016
Peak Power Sensor	Boonton	57318	3723	12/2/2014	12/2/2016
High Pass Filter	AMTI Microwave Circuits	H3G020G4	481230	6/4/2015	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

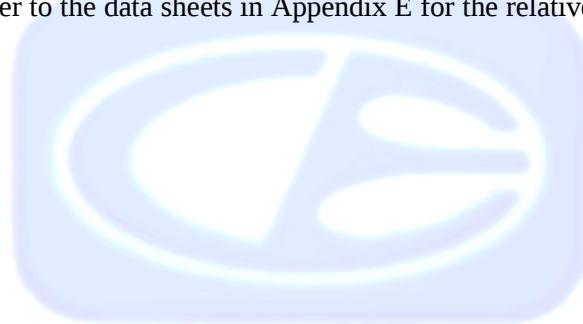
The EUT was mounted on a 1.0 by 1.5 by 0.8 meter high non-conductive table, which was placed on the ground plane.

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

The EUT was not grounded.

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

For BLE there are a total of 40 channels. The low channel is at 2402.0 MHz and the high channel is at 2480.0 MHz. There is approximately 2 MHz separation between channels and the EUT uses GFSK modulation. Below are the channels and power settings:

BLE Settings

Channels	Frequency	DG=	Gain Settings	
0-39 ==	2402-2480 MHz	-8	PPA 6	PA 6

7.2 Antenna

The antenna is a chip antenna.



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 Conducted Emissions Test

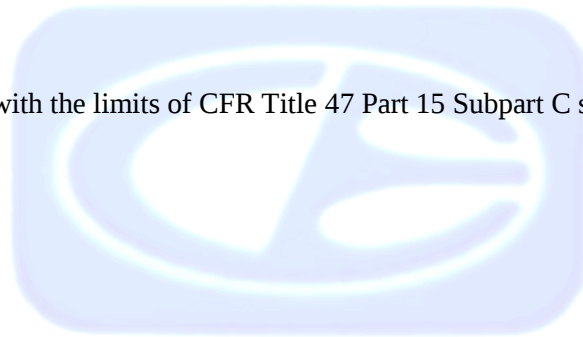
The EMI receiver was used as a measuring meter. A quasi-peak and/or average reading was taken only where indicated in the data sheets. The LISN output was measured using the EMI receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT received its power through the LISN, which was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI 63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the computer software. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart C section 15.207 & RSS GEN.



8.1.2 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	120 kHz
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, and RSS GEN.



8.1.3 DTS Bandwidth

The DTS Bandwidth was measured directly connected to the EMI Receiver using a RBW of 100 kHz and a VBW of 300 kHz. A peak detector and a max hold trace were used with auto sweep time. The trace was allowed to fully maximize. We measured the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. The automatic bandwidth measurement capability of the EMI Receiver was employed using the n dB bandwidth mode with n set to 6 dB. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.

8.1.4 Maximum Peak Conducted Output Power

The maximum peak conducted output power was measured using a Peak Power Meter. The Peak Power Meter used a resolution bandwidth that is greater than the DTS bandwidth and a video bandwidth greater than 3 x RBW. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.

8.1.5 Maximum Peak Power Spectral Density Level In The Fundamental Emission

The Maximum Peak Power Spectral Density Level in the Fundamental Emission was measured directly connected to the EMI Receiver. Tuned to the center frequency of the DTS channel and set the span to 1.5 times the DTS bandwidth. RBW was set to minimum 3 kHz but not > 100kHz and VBW 3 * RBW. A peak detector was used with the sweep time set to auto. A max hold trace was used and allowed to fully stabilize. The peak marker function was used to determine the maximum amplitude level within the RBW. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.



8.1.6 Emissions in Non-Restricted Frequency Bands (in 100kHz Bandwidth)

The Emissions in Non-Restricted Frequency Bands (in 100kHz Bandwidth) measurements were performed using the EMI Receiver directly connected to the EUT. A reference level was established by setting the instrument center frequency to DTS channel center frequency. The span was set to ≥ 1.5 times the DTS bandwidth. The RBW was 100 kHz and VBW 300 kHz. A peak detector was used with a sweep time set to auto. A max hold trace was used and allowed to fully stabilize. The peak marker function was used to determine the level and 20dB below that was the reference level. For Emission Level Measurement the center frequency and span were set to encompass the frequency range to be measured. RBW was set to 100 kHz and VBW to 300 kHz. A peak detector was used with a sweep time set to auto. The number of measurement points were greater than span/RBW. A max hold trace was used and allowed to fully stabilize. The peak marker function was used to determine the maximum amplitude level. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15, Subpart C, Section 15.247 and RSS 247.

8.1.7 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 and RSS GEN.

8.1.8 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 and RSS 247.



9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from throughout all tests.

10. CONCLUSIONS

The Modular Transmitter Model: ATWILC3000-MR110CA meets all of the relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart C sections 15.205, 15.207, 15.209, 15.247, RSS GEN & RSS 247.



APPENDIX A***LABORATORY ACCREDITATIONS AND
RECOGNITIONS***

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

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:



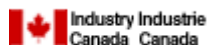
VCCI Listing, from VCCI site

[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>



Compatible Electronics IC listing can be found at:

<http://www.ic.gc.ca/eic/site/ic1.nsf/eng/home>



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX B

MODIFICATIONS TO THE EUT



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

MODIFICATIONS TO THE EUT

There were no modifications made during testing.



APPENDIX C***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Modular Transmitter
Model: ATWILC3000-MR110CA
S/N: None

No additional models were tested.



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX D***DIAGRAMS, FACTORS, CHARTS, AND PHOTOS***

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

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

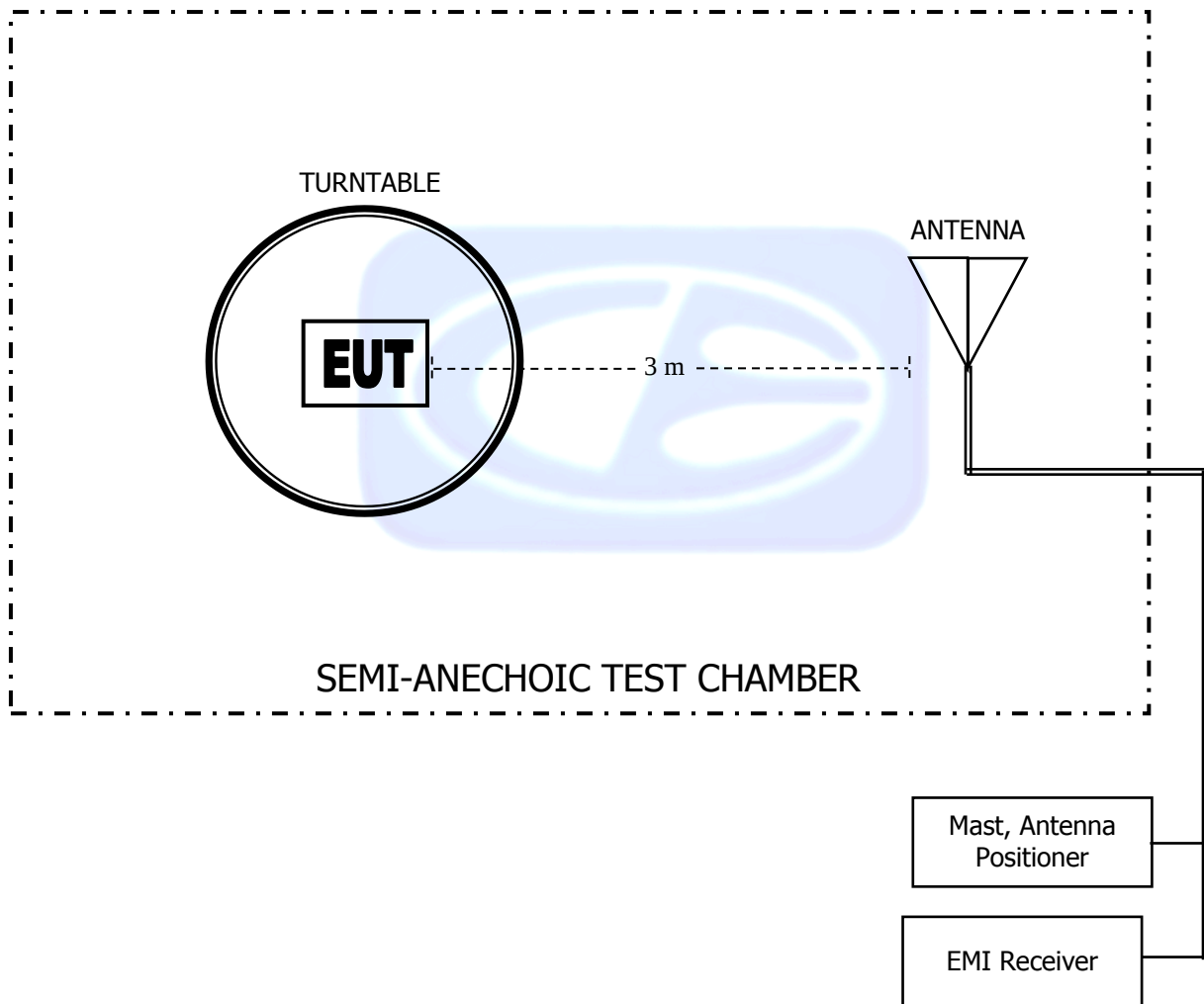


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ

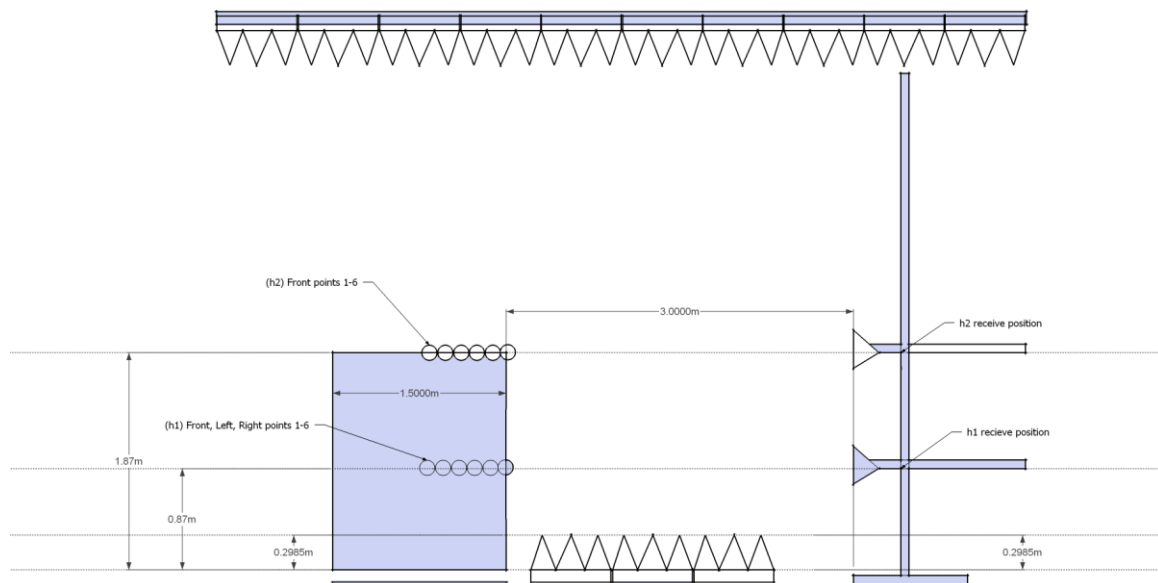
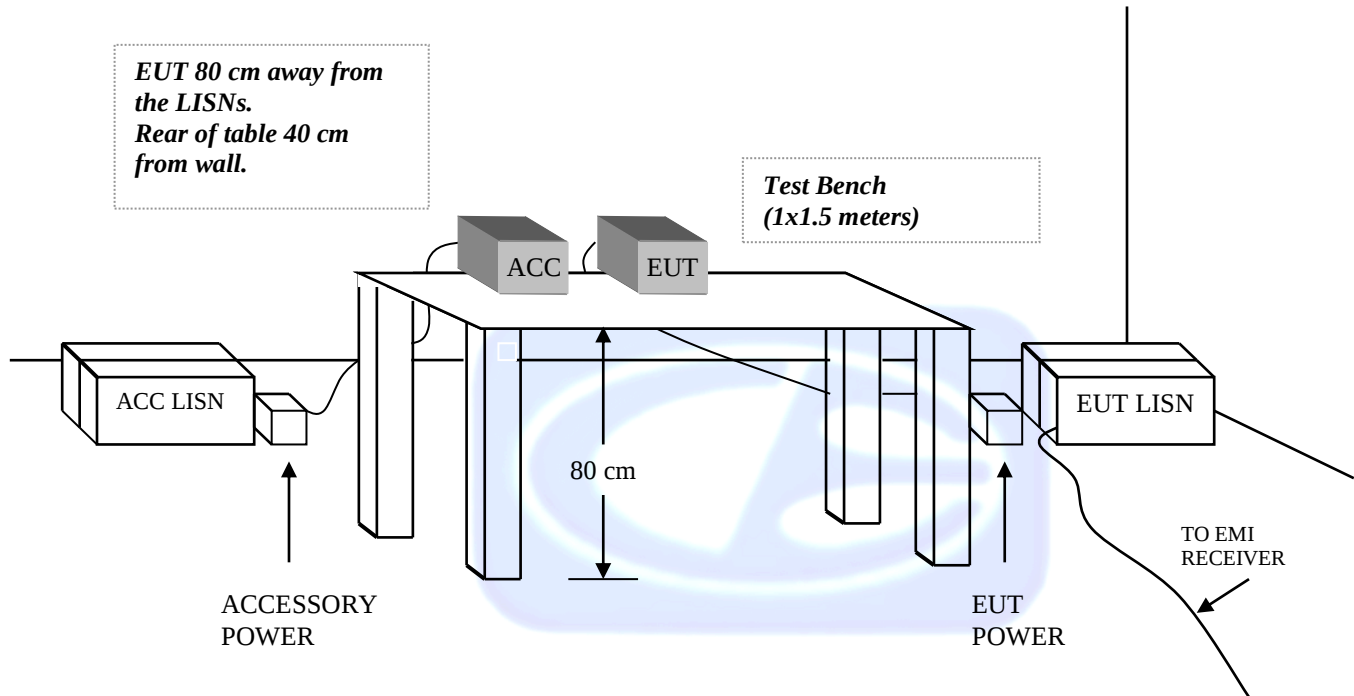


FIGURE 3: CONDUCTED EMISSIONS TEST SETUP

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-118A**1-18GHz - PREAMPLIFIER****S/N: 551034****CALIBRATION DUE: FEBRUARY 6, 2016**

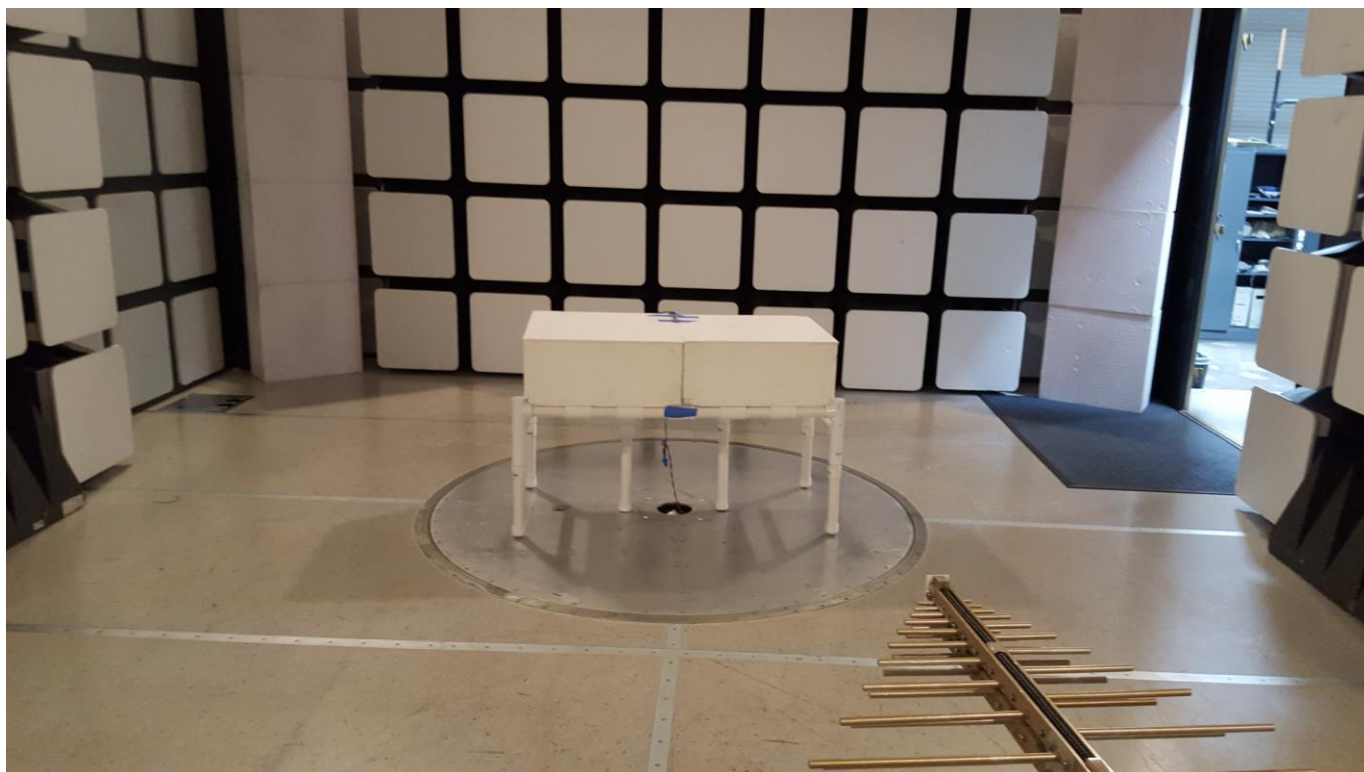
FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
500	36.77	5500	39.82
1000	38.63	6000	38.74
1100	38.72	6500	39.60
1200	38.97	7000	35.52
1300	38.59	7500	36.61
1400	39.18	8000	36.92
1500	38.71	8500	37.13
1600	39.28	9000	36.50
1700	39.25	9500	38.92
1800	39.06	10000	38.74
1900	40.34	11000	35.23
2000	40.07	12000	35.64
2500	39.69	13000	36.73
3000	40.94	14000	36.48
3500	40.41	15000	37.57
4000	40.44	16000	38.10
4500	41.20	17000	37.34
5000	39.35	18000	36.80



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**

ATMEL CORPORATION
MODULAR TRANSMITTER
Model: ATWILC3000-MR110CA
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

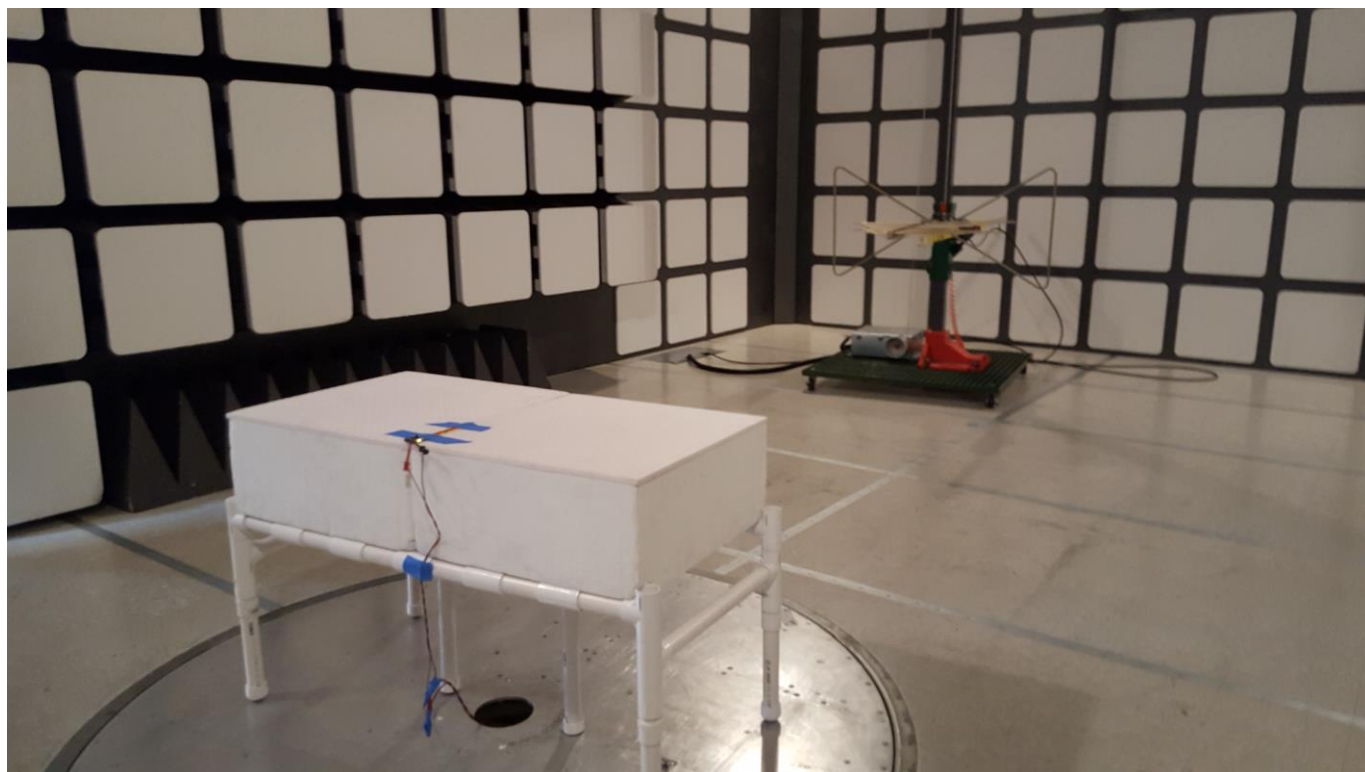
**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

**REAR VIEW**

ATMEL CORPORATION
MODULAR TRANSMITTER
Model: ATWILC3000-MR110CA
FCC SUBPART C - RADIATED EMISSIONS < 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

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(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

**FRONT VIEW**

ATMEL CORPORATION
MODULAR TRANSMITTER
Model: ATWILC3000-MR110CA
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

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19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

**REAR VIEW**

ATMEL CORPORATION
MODULAR TRANSMITTER
Model: ATWILC3000-MR110CA
FCC SUBPART C - RADIATED EMISSIONS > 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

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114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
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(949) 589-0700

Lake Forest Division
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Lake Forest, CA 92630
(949) 587-0400



FRONT VIEW

ATMEL CORPORATION
MODULAR TRANSMITTER
Model: ATWILC3000-MR110CA
FCC SUBPART C - CONDUCTED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
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(818) 597-0600

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Lake Forest Division
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Lake Forest, CA 92630
(949) 587-0400



REAR VIEW

ATMEL CORPORATION
MODULAR TRANSMITTER
Model: ATWILC3000-MR110CA
FCC SUBPART C - CONDUCTED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
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(818) 597-0600

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19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX E***RADIATED EMISSIONS DATA SHEETS***

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

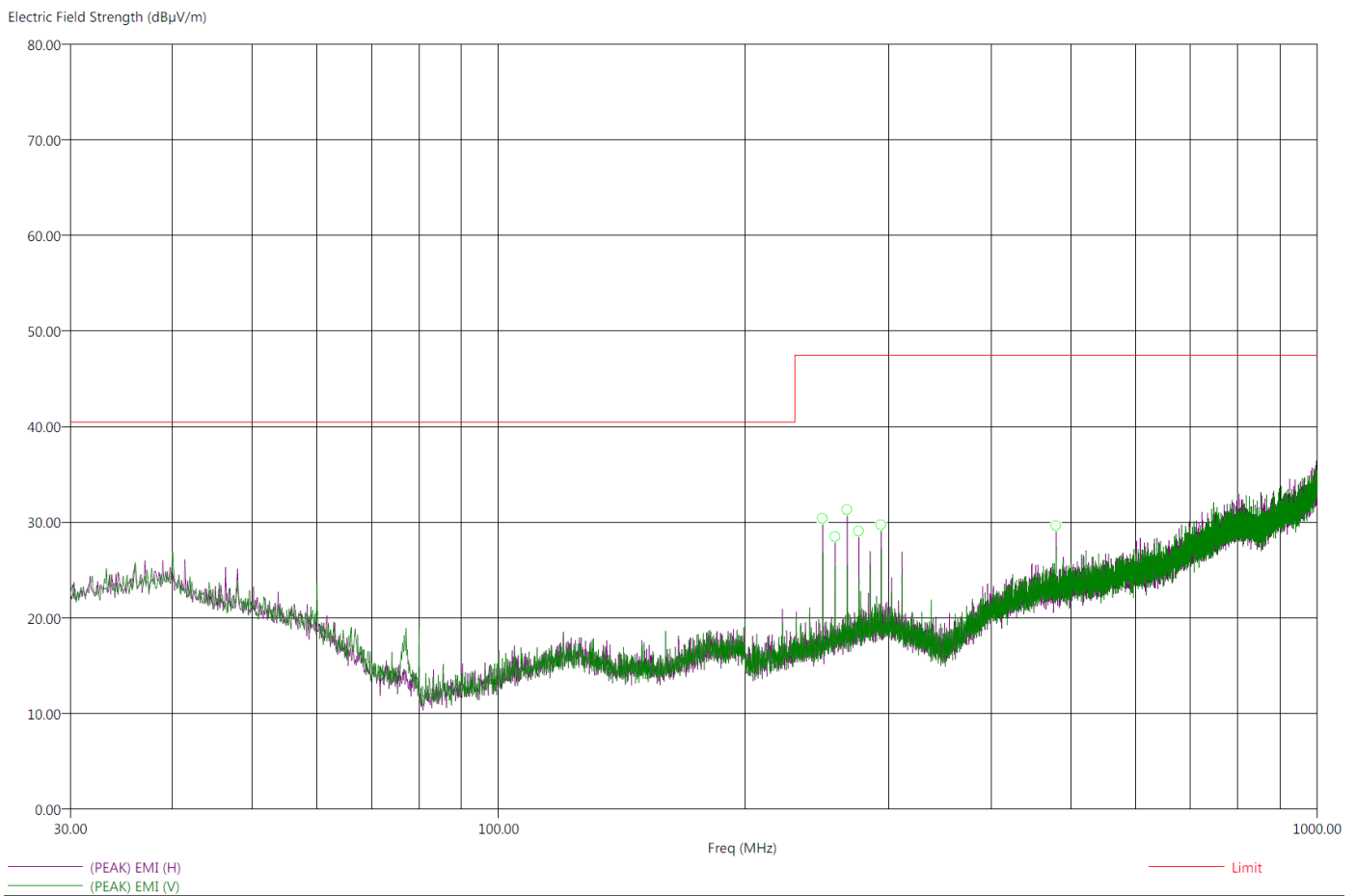
Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.209
File: Radiated Pre-Scan 30-1000Mhz.set
Operator: Torey Oliver
EUT Type: ATWINC3000.
EUT Condition: Transmitting @ BLE, 2440 MHz.
Comments: DigGain: -8 PPA 6 PA 6
Temp: 72f
Hum: 46%
3.3VDC

12/22/2015 4:03:47 PM
Sequence: Preliminary Scan

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.



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
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(818) 597-0600

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(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.209
File: Radiated Final 30-1000Mhz.set
Operator: Torey Oliver
EUT Type: ATWINC3000.
EUT Condition: Transmitting @ BLE, 2440 MHz.
Comments: DigGain: -8 PPA 6 PA 6
Temp: 72f
Hum: 46%
3.3VDC

12/22/2015 4:43:06 PM
Sequence: Final Measurements

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)
248.90	-16.41	31.04	32.48	47.45	H	256.00	164.41	16.46	1.60
257.80	-17.15	30.30	31.68	47.45	H	259.00	114.74	16.77	1.76
266.70	-15.42	32.03	33.42	47.45	H	259.00	117.73	17.07	1.94
275.60	-16.49	30.96	32.96	47.45	H	275.25	111.64	17.35	2.10
293.40	-18.44	29.01	31.01	47.45	H	0.00	114.50	17.90	2.03
480.00	-16.57	30.88	33.34	47.45	H	360.00	112.17	21.09	2.26

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



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
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19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

APPENDIX E
CONDUCTED EMISSIONS DATA SHEETS

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

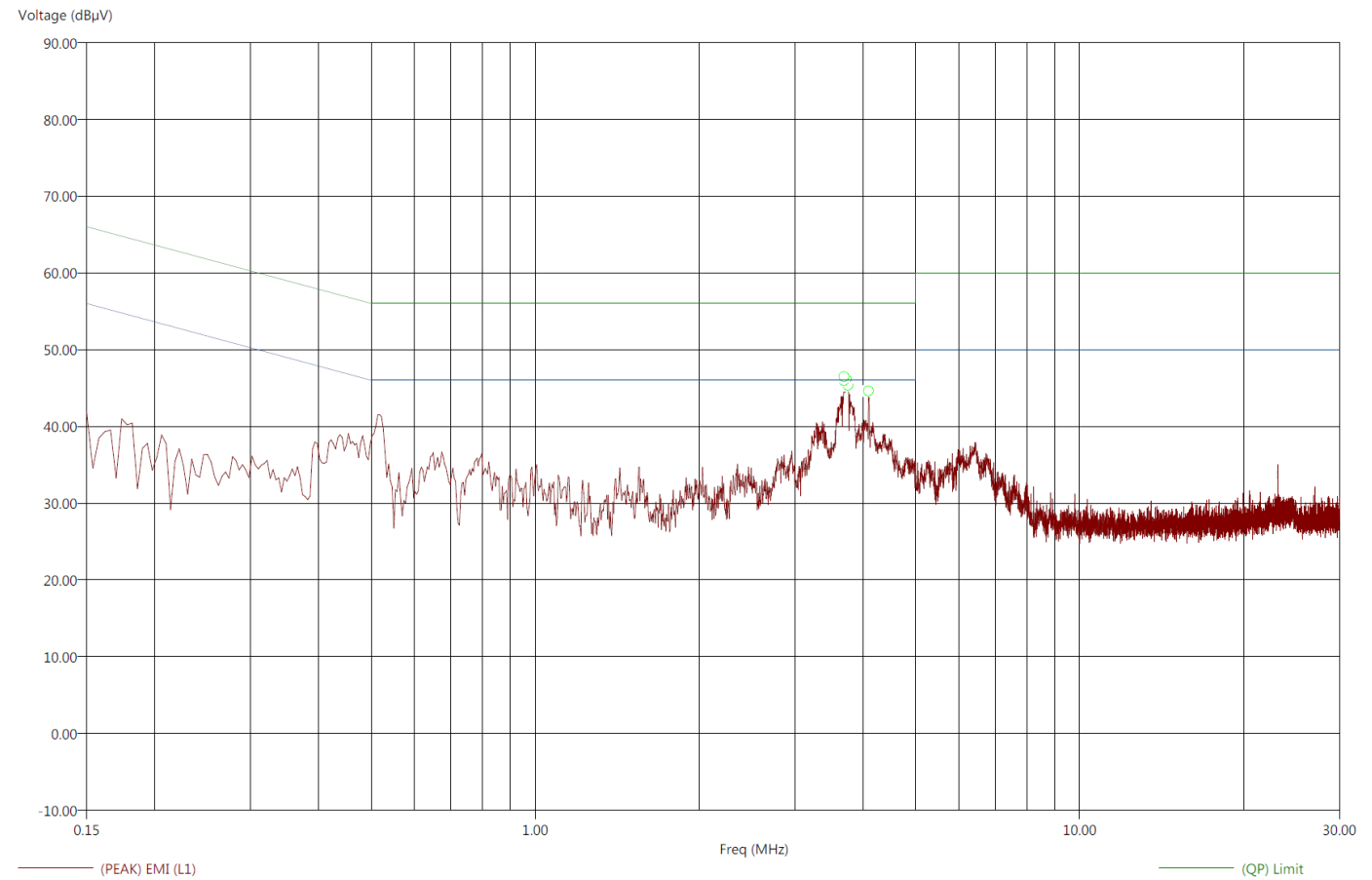
Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.207
File: Conducted Pre-Line.set
Operator: Matt Harrison
EUT Type: Wireless Module, ATWINC3000.
EUT Condition: Transmitting @ BLE, 2440 MHz.
Comments: Connected to Control Board Powered By USB Adapter.
Temp: 74f
Hum: 48%
USB Adapter: 120V 60Hz

12/23/2015 9:31:38 AM
Sequence: Preliminary Scan

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

This was worst case for all modes and channels



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114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

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19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.207
File: Conducted Final-Line.set
Operator: Matt Harrison
EUT Type: Wireless Module, ATWINC3000.
EUT Condition: Transmitting @ BLE, 2440 MHz.
Comments: Connected to Control Board Powered By USB Adapter.
Temp: 74f
Hum: 48%
USB Adapter: 120V 60Hz

12/23/2015 9:34:24 AM
Sequence: Final Measurements

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

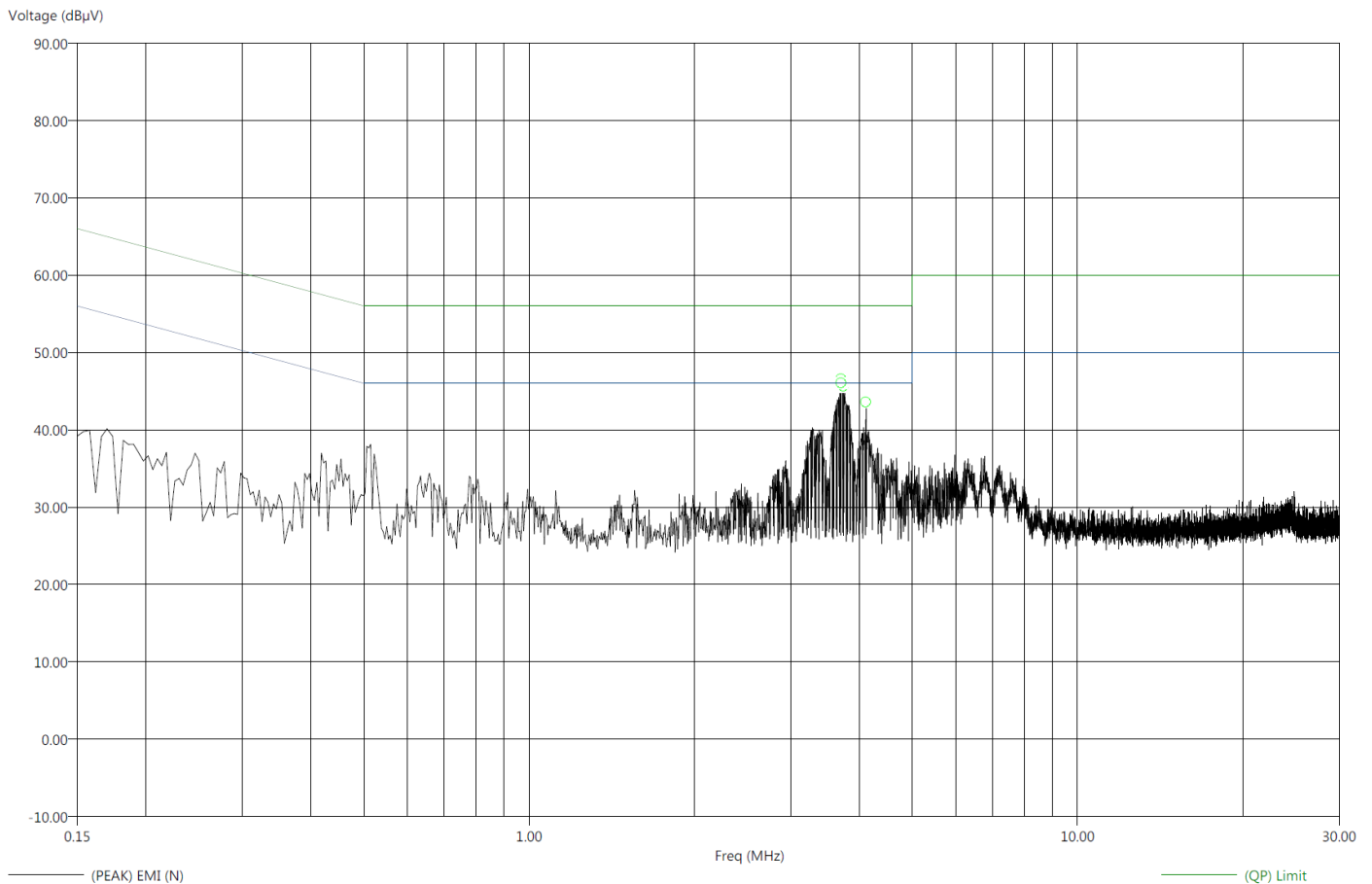
Freq (MHz)	(AVG) Margin AVL (dB)	(QP) Margin QPL (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer (dB)	Cable (dB)
3.69	-18.08	-15.83	27.92	40.17	45.72	46.00	56.00	0.03	0.23
3.70	-17.83	-15.28	28.17	40.72	46.24	46.00	56.00	0.03	0.23
3.73	-16.65	-14.22	29.35	41.78	46.62	46.00	56.00	0.03	0.23
3.74	-16.77	-14.50	29.23	41.50	46.67	46.00	56.00	0.03	0.23
3.76	-17.74	-15.98	28.26	40.02	46.32	46.00	56.00	0.03	0.23
4.09	-19.58	-20.71	26.42	35.29	40.64	46.00	56.00	0.03	0.22

This was worst case for all modes and channels



Title: FCC 15.207
File: Conducted Pre-Neutral.set
Operator: Matt Harrison
EUT Type: Wireless Module, ATWINC3000.
EUT Condition: Transmitting @ BLE, 2440 MHz.
Comments: Connected to Control Board Powered By USB Adapter.
Temp: 74f
Hum: 48%
USB Adapter: 120V 60Hz

12/23/2015 9:40:22 AM
Sequence: Preliminary Scan

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

This was worst case for all modes and channels



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Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.207

12/23/2015 9:34:24 AM

File: Conducted Final-Line.set

Sequence: Final Measurements

Operator: Matt Harrison

EUT Type: Wireless Module, ATWINC3000.

EUT Condition: Transmitting @ BLE, 2440 MHz.

Comments: Connected to Control Board Powered By USB Adapter.

Temp: 74f

Hum: 48%

USB Adapter: 120V 60Hz

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

Freq (MHz)	(AVG) Margin AVL (dB)	(QP) Margin QPL (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer (dB)	Cable (dB)
3.69	-18.08	-15.83	27.92	40.17	45.72	46.00	56.00	0.03	0.23
3.70	-17.83	-15.28	28.17	40.72	46.24	46.00	56.00	0.03	0.23
3.73	-16.65	-14.22	29.35	41.78	46.62	46.00	56.00	0.03	0.23
3.74	-16.77	-14.50	29.23	41.50	46.67	46.00	56.00	0.03	0.23
3.76	-17.74	-15.98	28.26	40.02	46.32	46.00	56.00	0.03	0.23
4.09	-19.58	-20.71	26.42	35.29	40.64	46.00	56.00	0.03	0.22

This was worst case for all modes and channels**Brea Division**
114 Olinda Drive
Brea, CA 92823
(714) 579-0500**Agoura Division**
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600**Silverado Division**
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Silverado, CA 92676
(949) 589-0700**Lake Forest Division**
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

DTS BANDWIDTH



DTS BANDWIDTH

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

Date: 1/4/2016
Lab: R
Test ENG: Torey Oliver

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

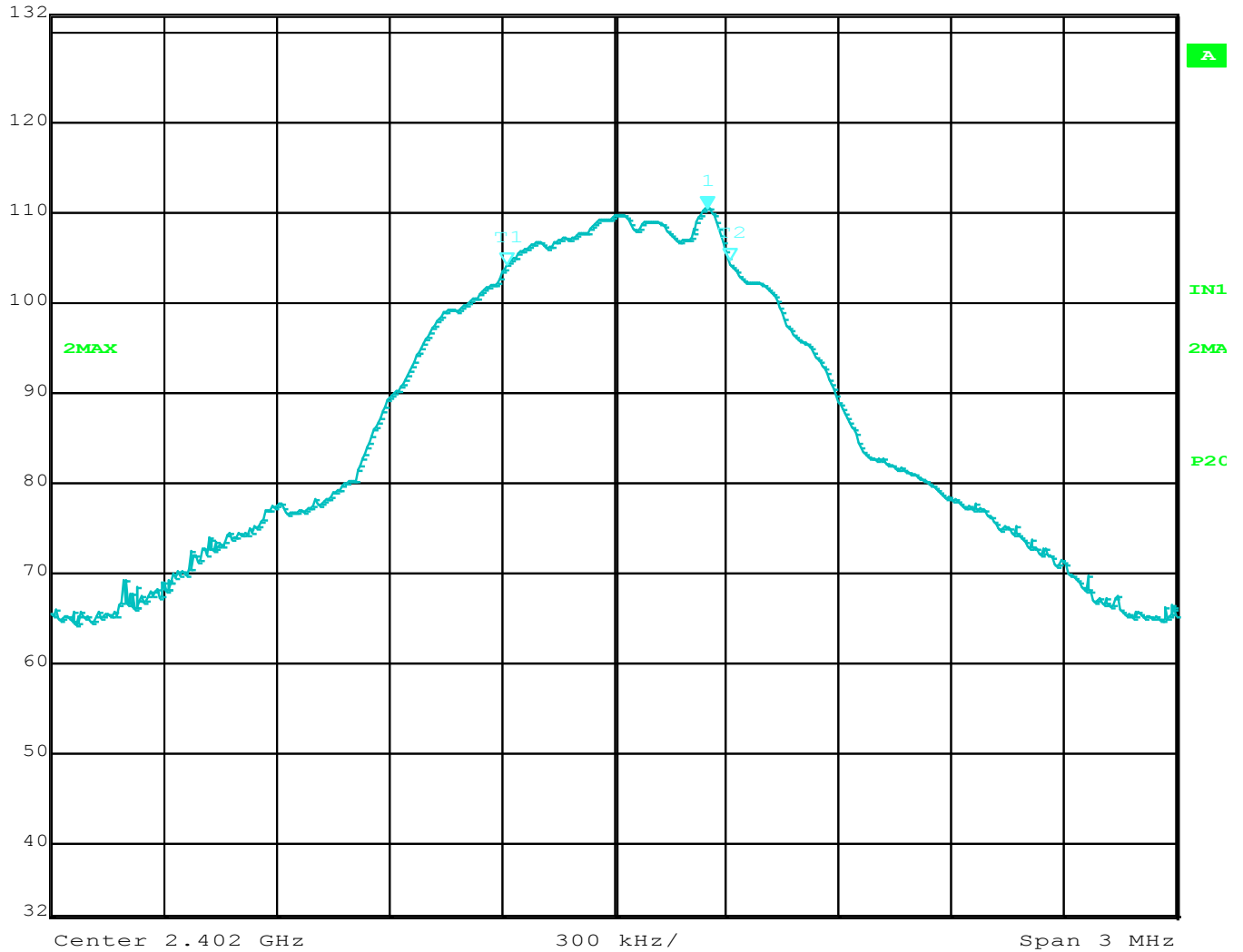
DTS Bandwidth

Freq. (MHz)	Measured BW (kHz)	Limit (Min) (kHz)	Margin (kHz)	Peak / QP / Avg	Comments
2402	595.19	500.00	95.19	Peak	
2440	595.19	500.00	95.19	Peak	
2480	595.19	500.00	95.19	Peak	





Ref Lvl 132 dBμV
Marker 1 [T2 ndB] 6.00 dB
BW 595.19038076 kHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 60 dB
Unit dBμV



Comment A: 1th
Date: 4.JAN.2016 12:59:32



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114 Olinda Drive
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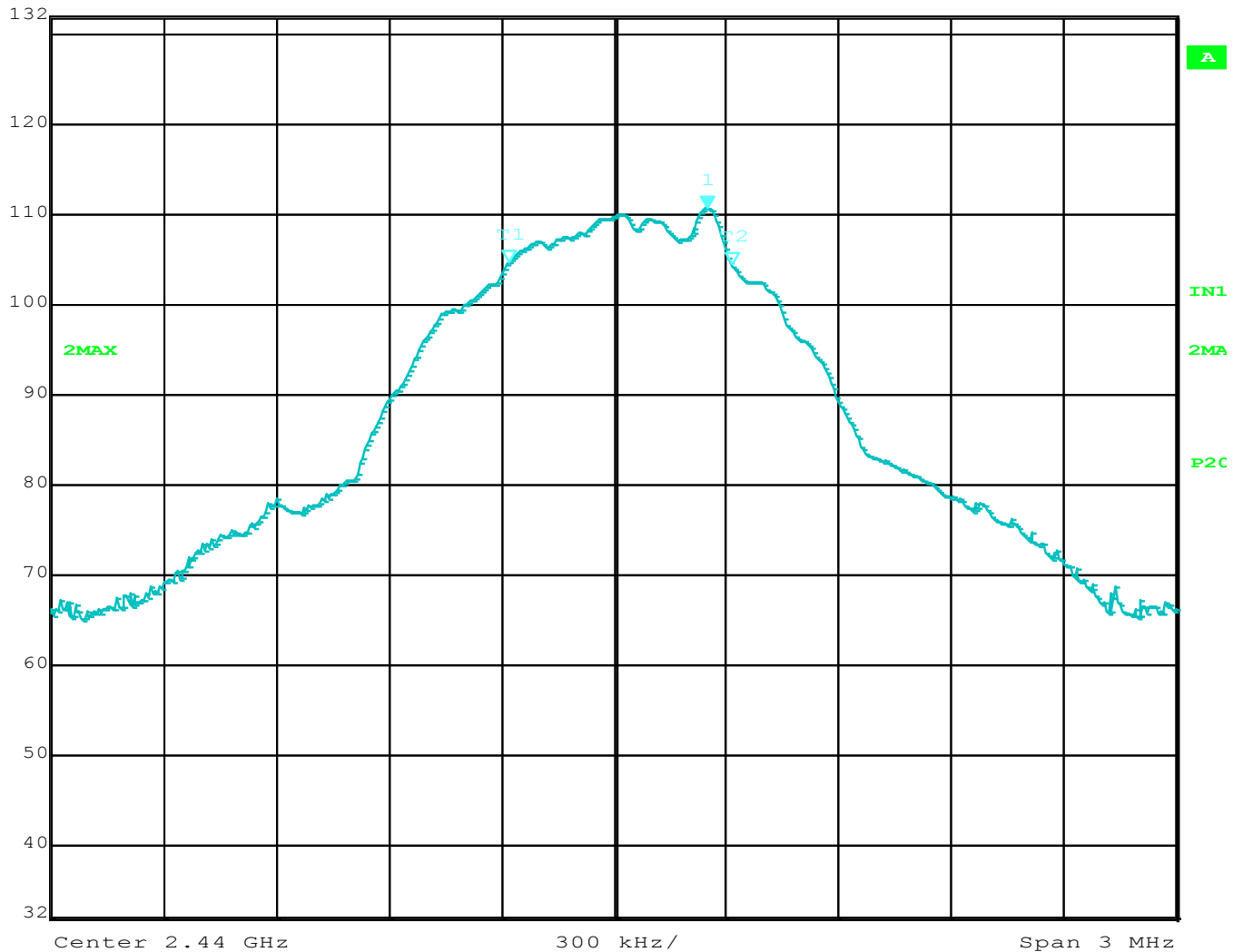
Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

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(949) 587-0400



Marker 1 [T2 ndB] RBW 100 kHz RF Att 60 dB
Ref Lvl ndB 6.00 dB VBW 300 kHz
132 dBμV BW 595.19038076 kHz SWT 5 ms Unit dBμV



Comment A: 1th
Date: 4.JAN.2016 13:01:59

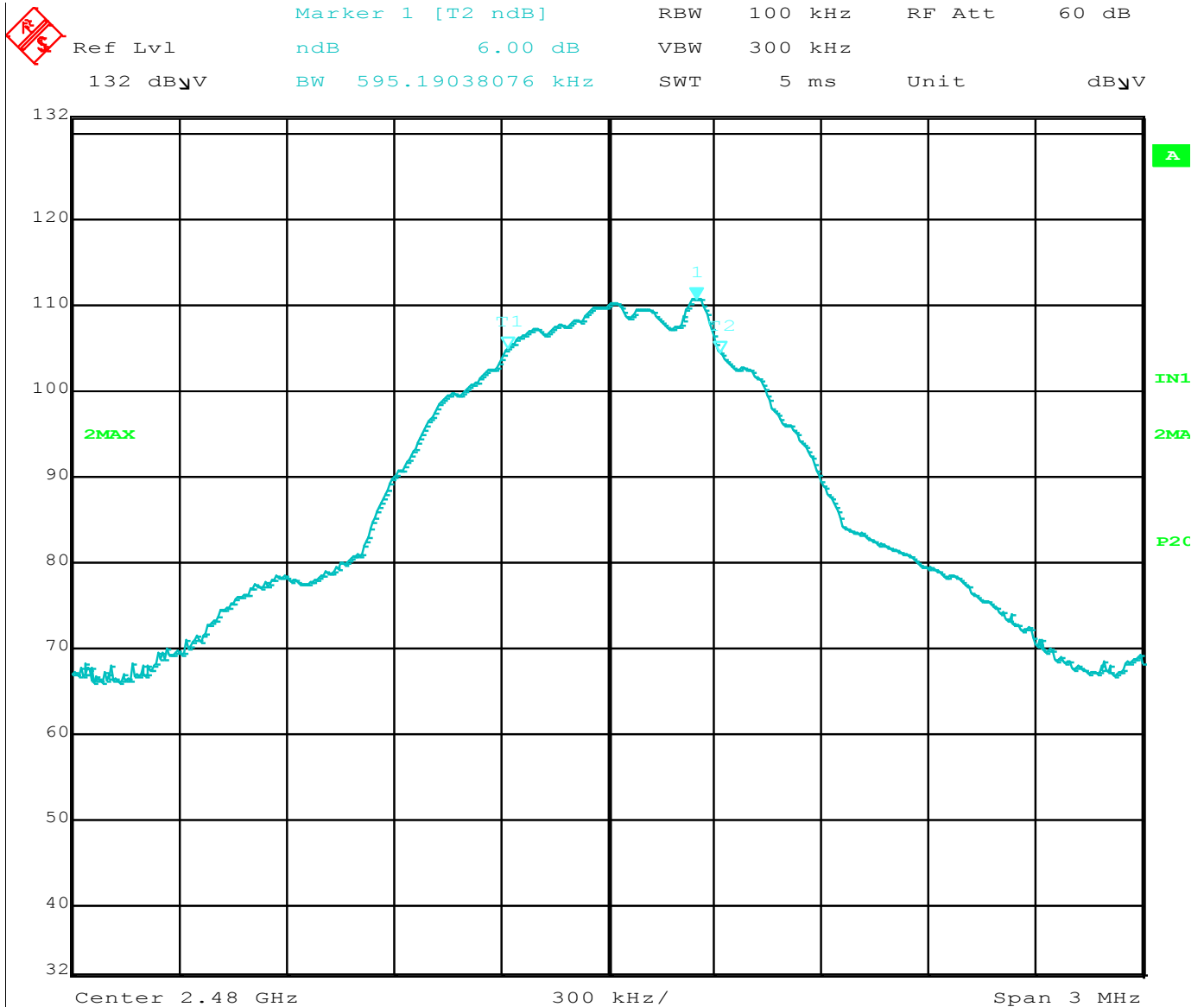


Brea Division
114 Olinda Drive
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2337 Troutdale Drive
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(949) 589-0700

Lake Forest Division
20621 Pascal Way
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Comment A: DTS Bandwidth

Date: 4.JAN.2016 13:22:49



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114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

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MAXIMUM PEAK CONDUCTED OUTPUT POWER
DATA SHEETS

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

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(949) 587-0400

MAXIMUM PEAK CONDUCTED OUTPUT POWER

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

Date: 12/22/2015
Lab: R
Test ENG: Torey Oliver

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

Freq. (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Peak / QP / Avg	Comments
2402	4.53	30.00	-25.47	Peak	
2440	5.33	30.00	-24.67	Peak	
2480	6.04	30.00	-23.96	Peak	



MAXIMUM PEAK POWER SPECTRAL DENSITY LEVEL IN THE FUNDAMENTAL EMISSION

DATA SHEETS



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
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PEAK POWER SPECTRAL DENSITY

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

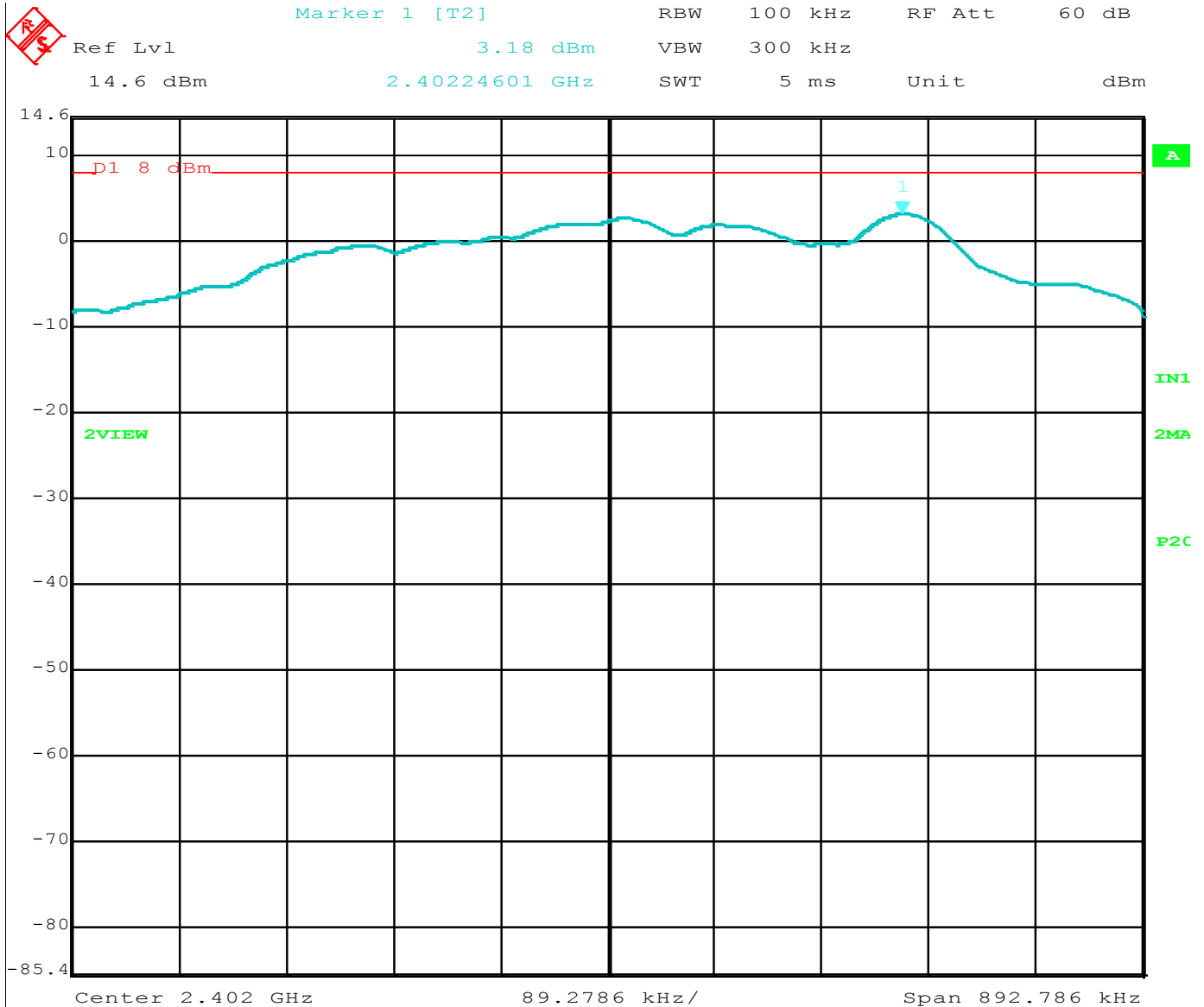
Date: 1/4/2016
Lab: R
Test ENG: Torey Oliver

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

PSD

Freq. (MHz)	Peak (dBm)	Limit (dBm)	Margin (dB)	Peak / QP / Avg	Comments
2402	3.18	8.00	-4.82	Peak	
2440	3.50	8.00	-4.50	Peak	
2480	3.68	8.00	-4.32	Peak	





Comment A: Power Spectral Density
Date: 4.JAN.2016 14:06:09

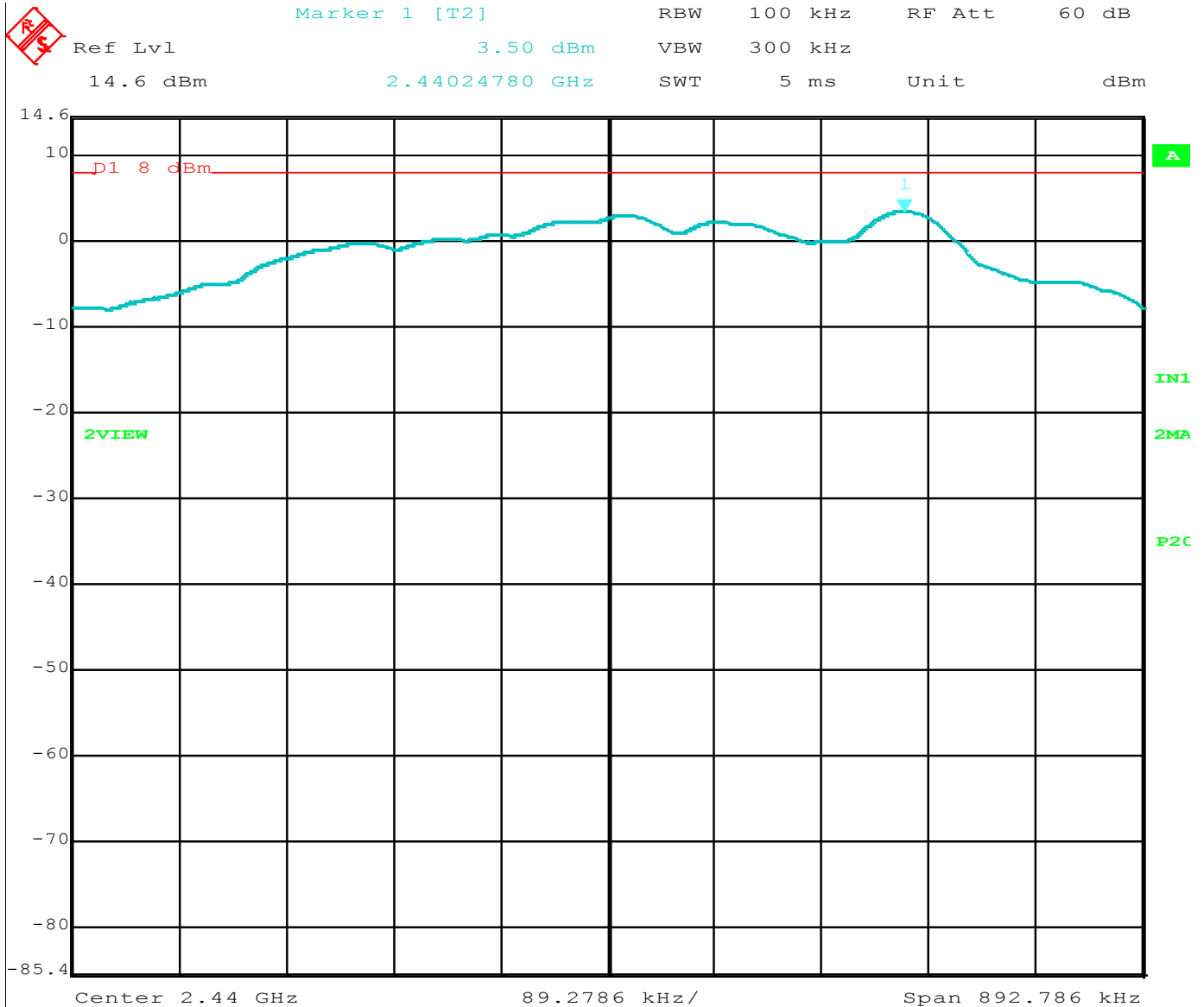


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Brea, CA 92823
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Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



Comment A: Power Spectral Density

Date: 4.JAN.2016 14:05:40

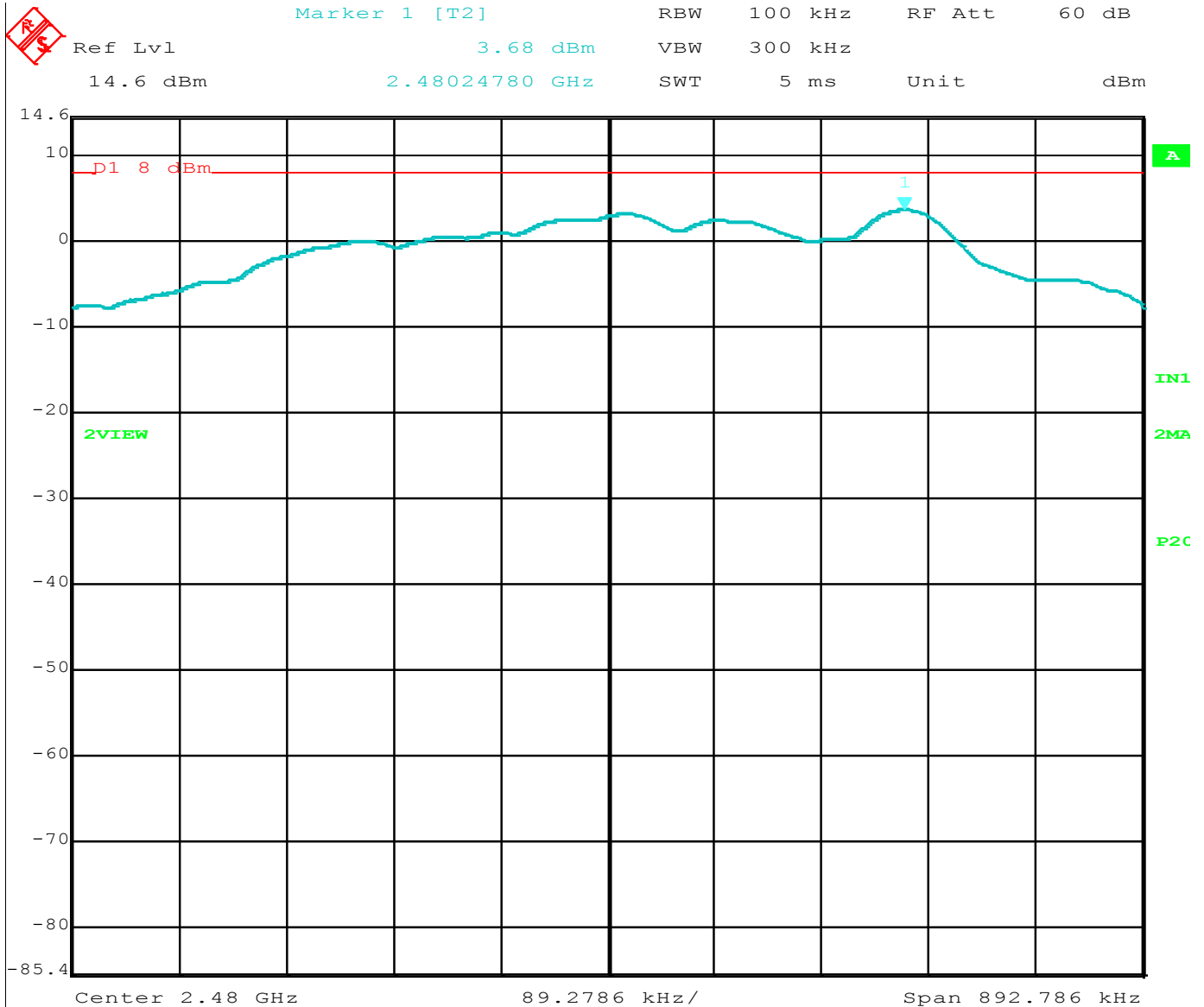


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Brea, CA 92823
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Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



HARMONIC EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS (IN 100KHZ BANDWIDTH) / CONDUCTED

DATA SHEETS



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

HARMONIC EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

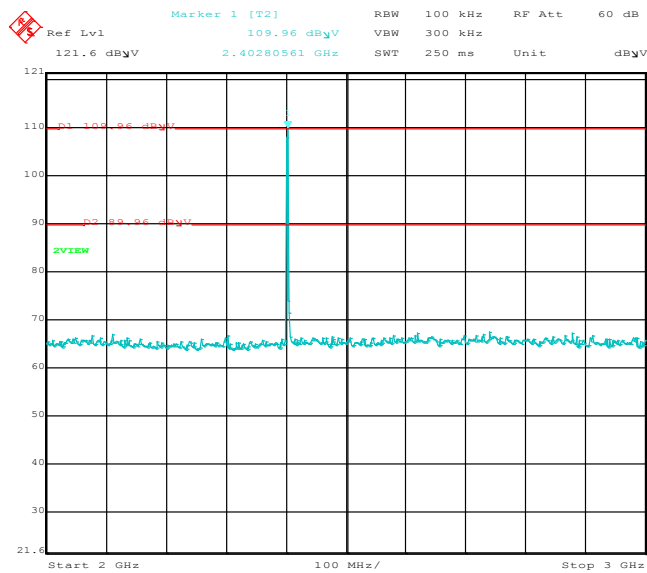
Date: 1/4/2016
Lab: R
Test ENG: Torey Oliver

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

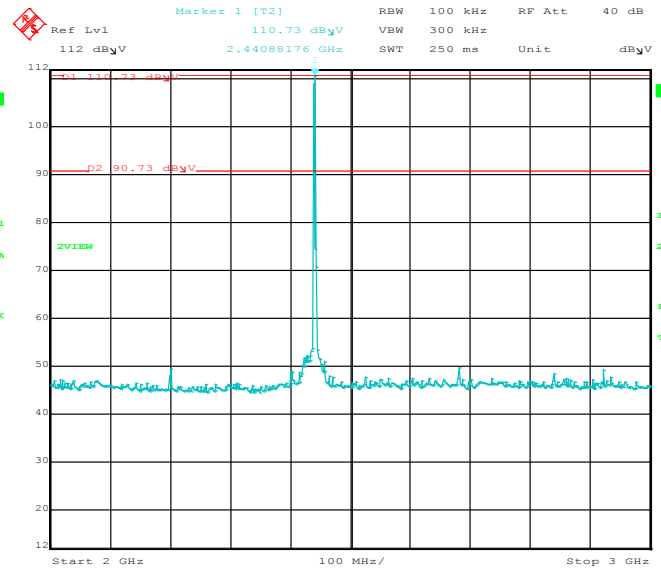
Freq. (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Peak / QP / Avg	Comments
7993.988	68.03	89.96	-21.93	Peak	Low Channel
7965.9319	68.43	90.73	-22.30	Peak	Mid Channel
8022.0441	68.27	90.35	-22.08	Peak	High Channel



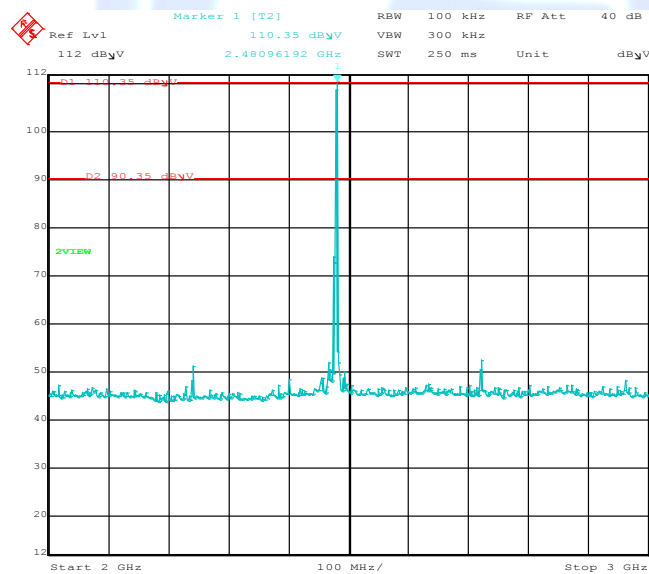
Reference Level Measurements



Comment A: Conducted Spurious
Date: 4.JAN.2016 14:09:20



Comment A: Conducted Spurious
Date: 4.JAN.2016 14:16:47



Comment A: Conducted Spurious
Date: 4.JAN.2016 14:21:48



***EMISSIONS IN RESTRICTED FREQUENCY BANDS (RADIATED
FIELD STRENGTH)
DATA SHEETS***



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
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HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS

Low Channel, Horizontal & Vertical

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

Date: 12/22/2015
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
4804.00	51.03	H	73.98	-22.95	Peak	1.58	62	In Restricted Band
4804.00	40.11	H	53.98	-13.87	Avg	1.58	62	
12010.00		H	73.98		Peak			In Restricted Band
12010.00		H	53.98		Avg			No emissions found
14412.00	66.03	H	73.98	-7.95	Peak	2.49	7	In Restricted Band
14412.00	52.89	H	53.98	-1.09	Avg	2.49	7	
19216.00		H	73.98		Peak			In Restricted Band
19216.00		H	53.98		Avg			No Emissions Found
4804.00	46.92	V	73.98	-27.06	Peak	2.61	192	In Restricted Band
4804.00	34.03	V	53.98	-19.95	Avg	2.61	192	
12010.00		V	73.98		Peak			In Restricted Band
12010.00		V	53.98		Avg			No emissions found
14412.00	65.40	V	73.98	-8.58	Peak	2.82	321	In Restricted Band
14412.00	52.70	V	53.98	-1.28	Avg	2.82	321	
19216.00		V	73.98		Peak			In Restricted Band
19216.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter



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114 Olinda Drive
Brea, CA 92823
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Lake Forest Division
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Lake Forest, CA 92630
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HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS

Mid Channel, Horizontal & Vertical

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

Date: 12/22/2015
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
4880.00	51.05	H	73.98	-22.93	Peak	1.27	138	In Restricted Band
4880.00	39.01	H	53.98	-14.97	Avg	1.27	138	
7320.00		H	73.98		Peak			In Restricted Band
7320.00		H	53.98		Avg			No Emissions Found
12200.00		H	73.98		Peak			In Restricted Band
12200.00		H	53.98		Avg			No Emissions Found
19520.00		H	73.98		Peak			In Restricted Band
19520.00		H	53.98		Avg			No Emissions Found
4880.00	50.79	V	73.98	-23.19	Peak	1.13	63	In Restricted Band
4880.00	39.76	V	53.98	-14.22	Avg	1.13	63	
7320.00		V	73.98		Peak			In Restricted Band
7320.00		V	53.98		Avg			No emission found
12200.00		V	73.98		Peak			In Restricted Band
12200.00		V	53.98		Avg			No emission found
19520.00		V	73.98		Peak			In Restricted Band
19520.00		V	53.98		Avg			No emission found

Test distance
3 meter



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

HARMONIC EMISSIONS IN RESTRICTED FREQUENCY BANDS

High Channel, Horizontal & Vertical

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

Date: 12/22/2015
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
4960.00	53.65	H	73.98	-20.33	Peak	1.08	64	In Restricted Band
4960.00	42.04	H	53.98	-11.94	Avg	1.08	64	
7440.00		H	73.98		Peak			In Restricted Band
7440.00		H	53.98		Avg			No emission found
12400.00		H	73.98		Peak			In Restricted Band
12400.00		H	53.98		Avg			No Emissions Found
19840.00		H	73.98		Peak			In Restricted Band
19840.00		H	53.98		Avg			No Emissions Found
22320.00		H	73.98		Peak			In Restricted Band
22320.00		H	53.98		Avg			No Emissions Found
4960.00	55.12	V	73.98	-18.86	Peak	1.01	201	In Restricted Band
4960.00	44.61	V	53.98	-9.37	Avg	1.01	201	
7440.00		V	73.98		Peak			In Restricted Band
7440.00		V	53.98		Avg			No emission found
12400.00		V	73.98		Peak			In Restricted Band
12400.00		V	53.98		Avg			No Emissions Found
19840.00		V	73.98		Peak			In Restricted Band
19840.00		V	53.98		Avg			No Emissions Found
22320.00		V	73.98		Peak			In Restricted Band
22320.00		V	53.98		Avg			No Emissions Found

Test distance
3 meter



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

EMISSIONS RADIATED OUTSIDE OF THE FUNDAMENTAL FREQUENCY BAND AT BAND EDGES

DATA SHEETS



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
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BAND EDGES- VERTICAL

BLE Mode

FCC 15.247

Company: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

Date: 12/22/2015
Lab: R
Test ENG: Torey Oliver

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
2402.00	95.51	V	--	--	Peak	1.02	208	Fundamental of Low Channel
2400.00	71.41	V	75.51	-4.10	Delta	1.02	208	From Peak
2386.88	53.50	V	73.98	-20.48	Peak	1.02	208	No Marker Delta Method Used
2386.88	47.85	V	53.98	-6.13	Avg	1.02	208	
2480.00	96.04	V	--	--	Peak	1	209	Fundamental of High Channel
2483.50	54.49	V	73.98	-19.49	Peak	1	209	No Marker Delta Method Used
2483.50	48.10	V	53.98	-5.88	Avg	1	209	

Test distance
3 meter



BAND EDGES- HORIZONTAL

BLE Mode

FCC 15.247

Company

: Atmel Corporation
EUT: Modular Transmitter
Model: ATWILC3000-MR110CA
Mode: BLE

Date: 12/22/2015
Lab: R
Test ENG: Torey Oliver

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
2402.00	100.18	H	--	--	Peak	1.41	202	Fundamental of Low Channel
2400.00	75.91	H	80.18	-4.27	Delta	1.41	202	
2377.98	52.84	H	73.98	-21.14	Peak	1.41	202	No Marker Delta Method Used
2377.98	47.70	H	53.98	-6.28	Avg	1.41	202	
2480.00	102.43	H	--	--	Peak	1.31	205	Fundamental of High Channel
2483.50	57.93	H	73.98	-16.05	Peak	1.31	205	No Marker Delta Method Used
2483.50	48.20	H	53.98	-5.78	Avg	1.31	205	

Test distance
3 meter



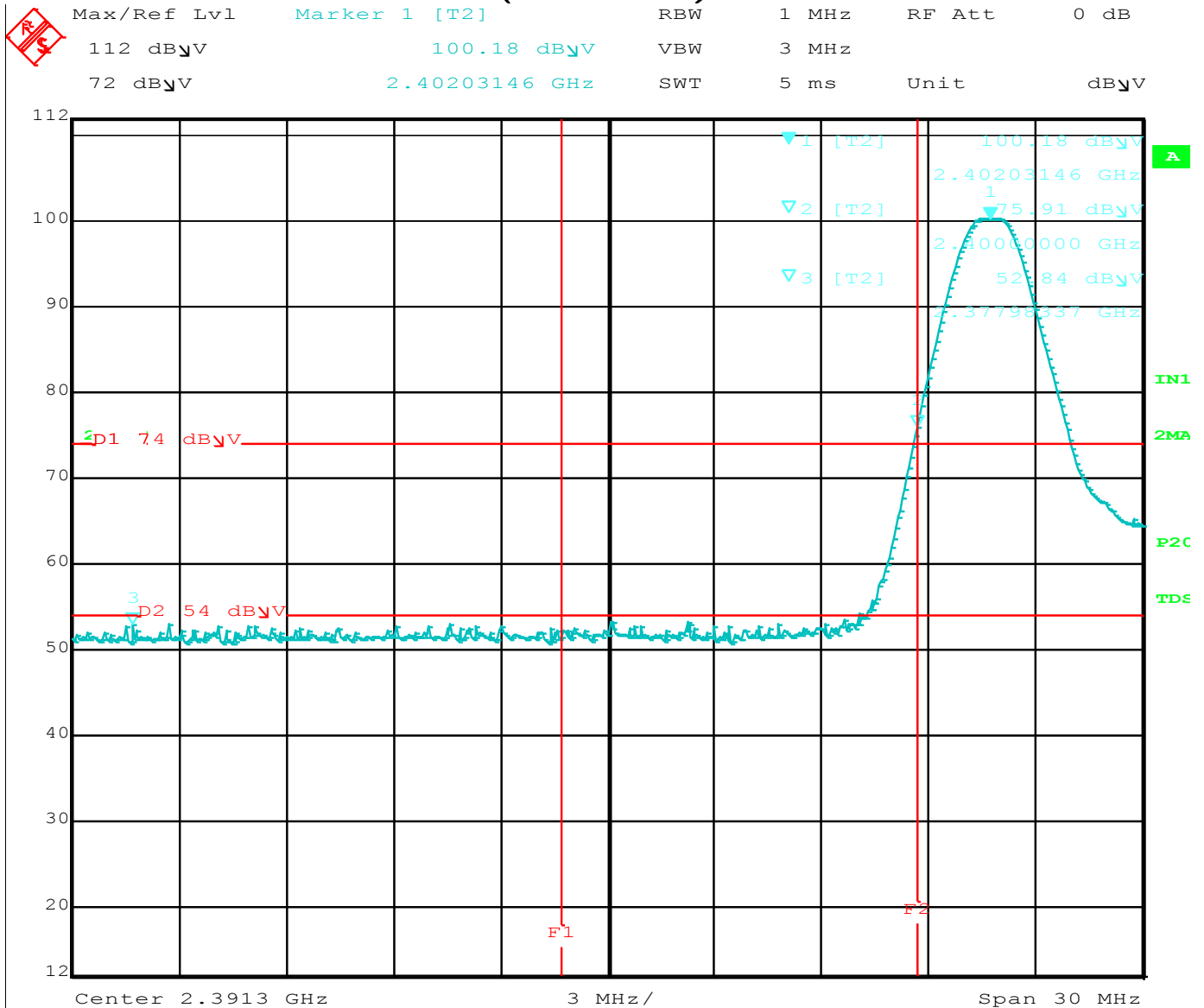
Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

LOWER BAND EDGE (Horizontal)

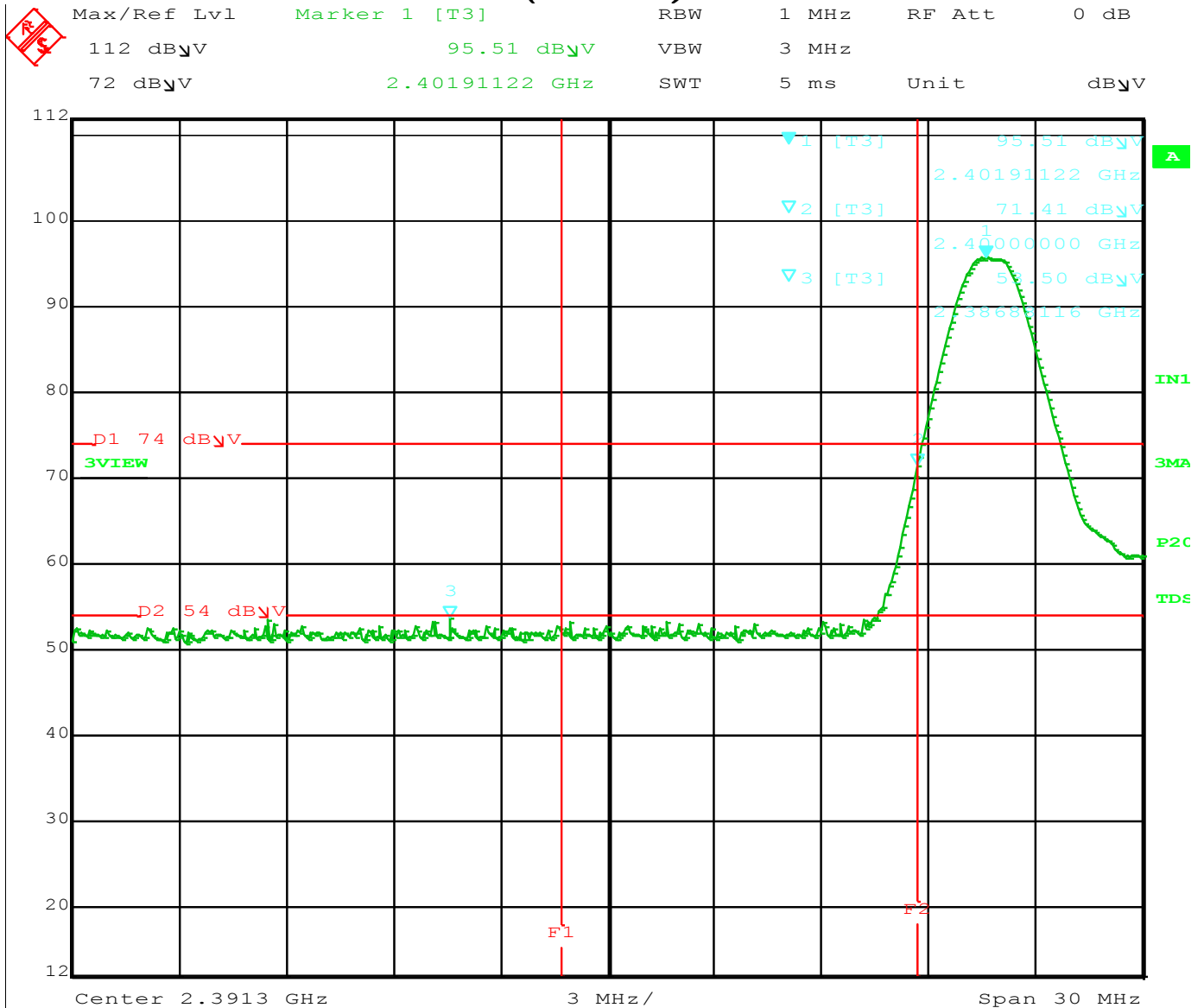


Comment A: Edge Horizontal

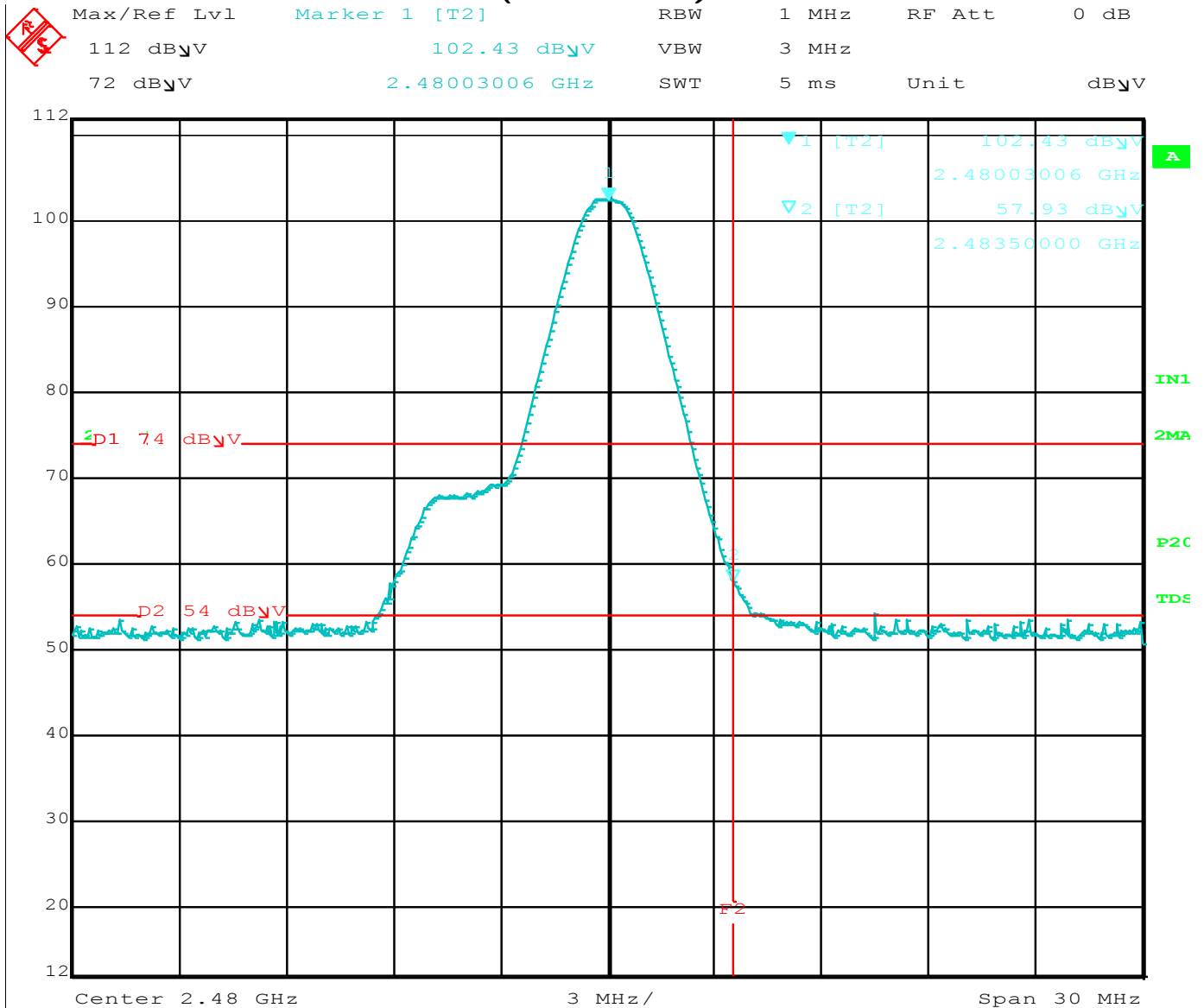
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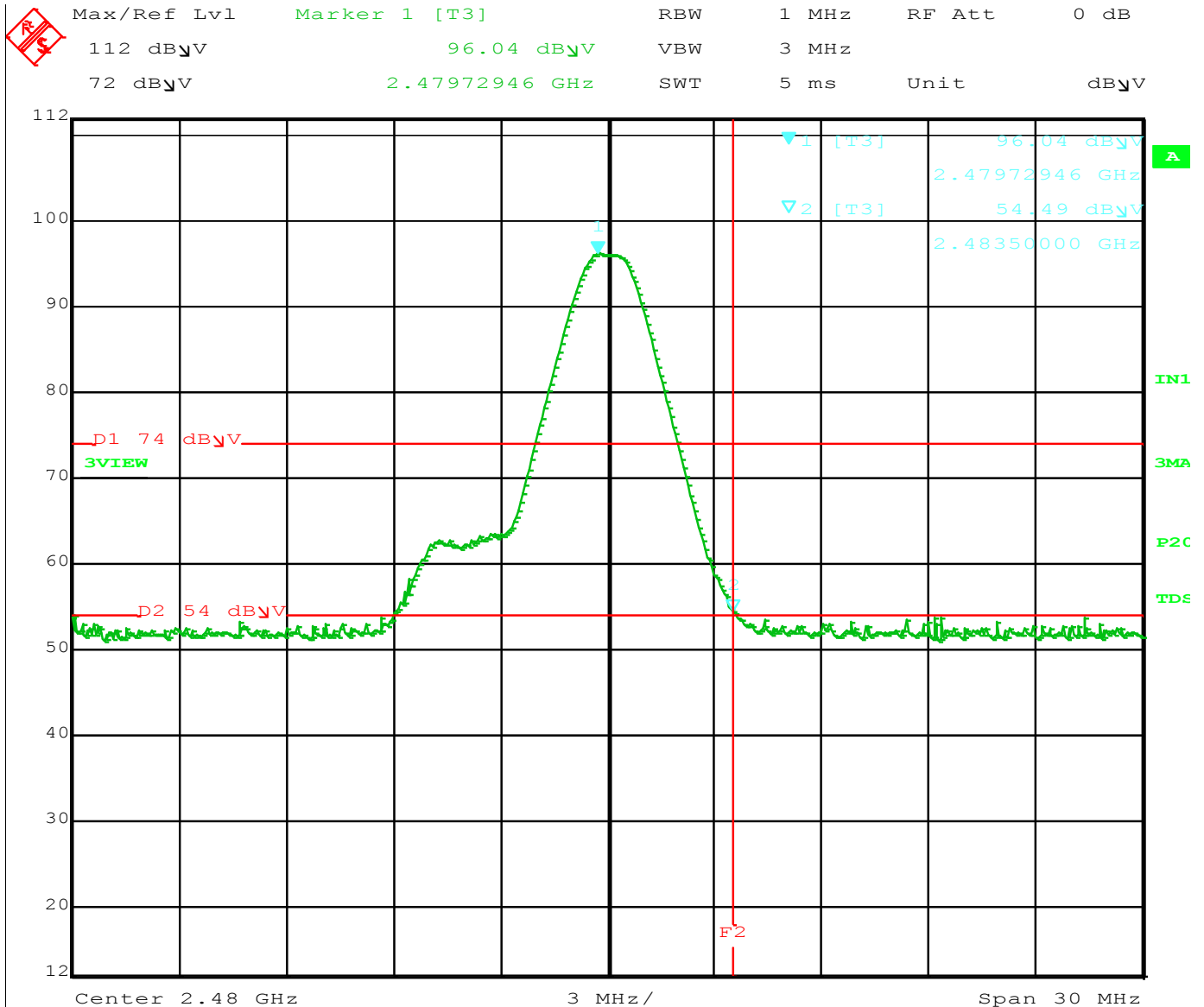
LOWER BAND EDGE (Vertical)



UPPER BAND EDGE (Horizontal)



UPPER BAND EDGE (Vertical)



Comment A: Edge Vertical

Date: 22.DEC.2015 14:05:36



OCCUPIED BANDWIDTH

DATA SHEETS



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
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20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

RSS 247

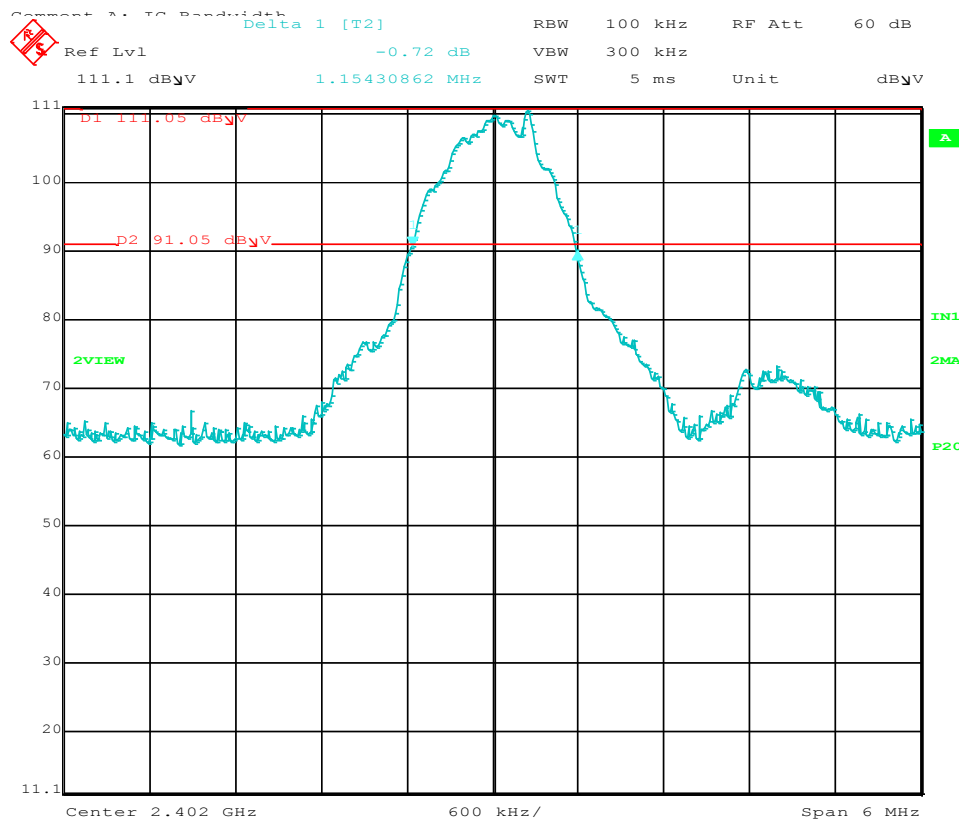
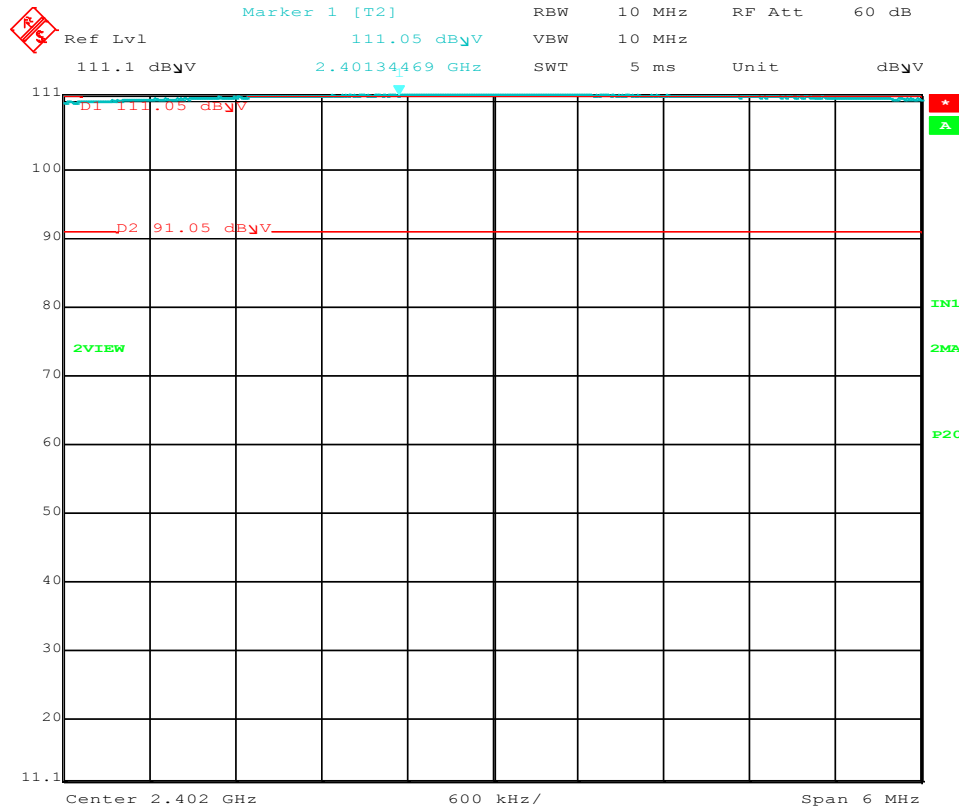
Company: Atmel Corporation Date: 1/4/2016
EUT: Modular Transmitter Lab: R
Model: ATWINC3000 Test ENG: T. Oliver
Mode: BLE

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

Occupied Bandwidth

Freq. (MHz)	Measured BW (kHz)	Peak / QP / Avg	Comments
2412	1154.30	Peak	
2442	1154.30	Peak	
2462	1154.30	Peak	





Comment A: IC Bandwidth

Date: 4.JAN.2016 13:33:37

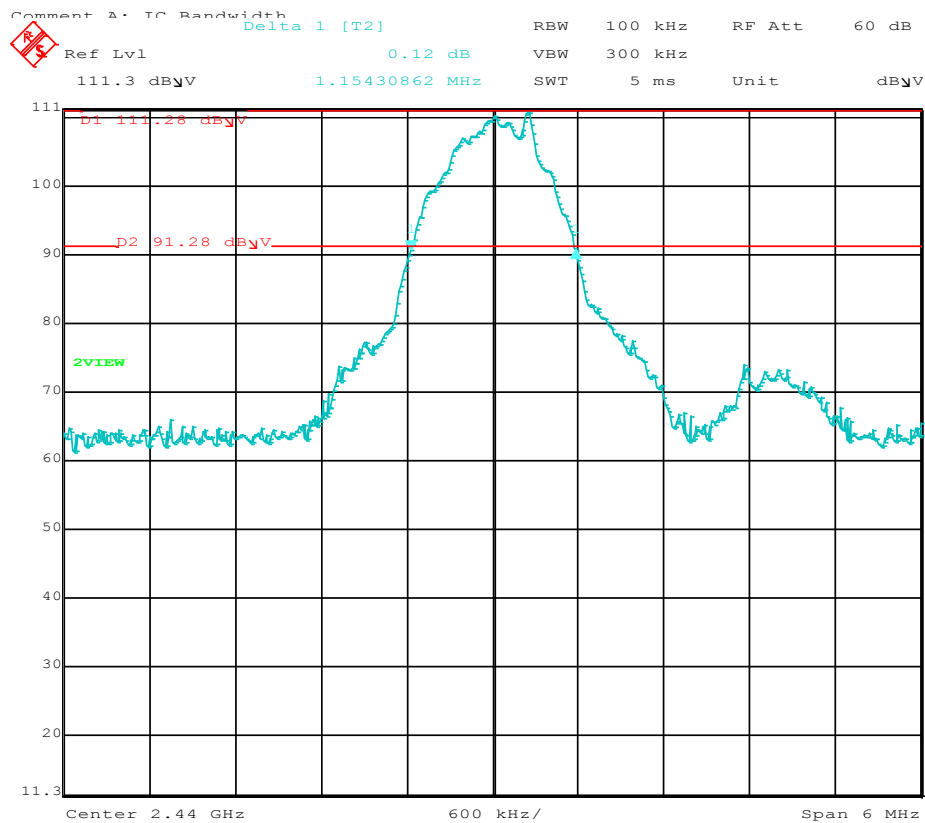
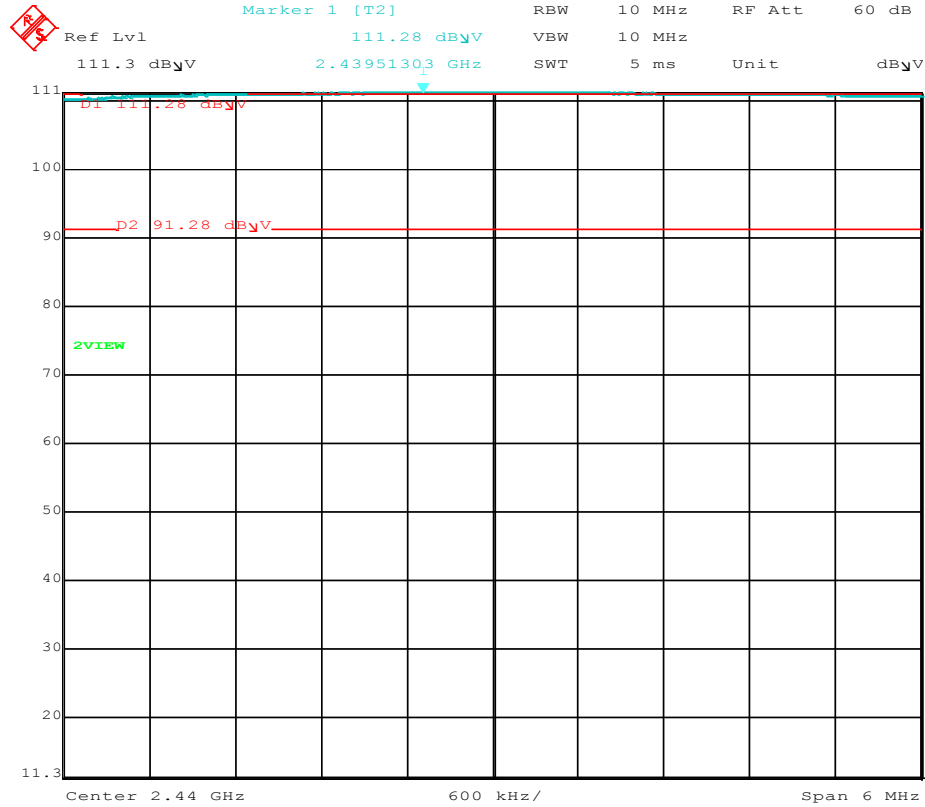


Brea Division
114 Olinda Drive
Brea, CA 92823
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Agoura Division
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19121 El Toro Road
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Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



Comment A: IC Bandwidth

Date: 4.JAN.2016 13:31:42

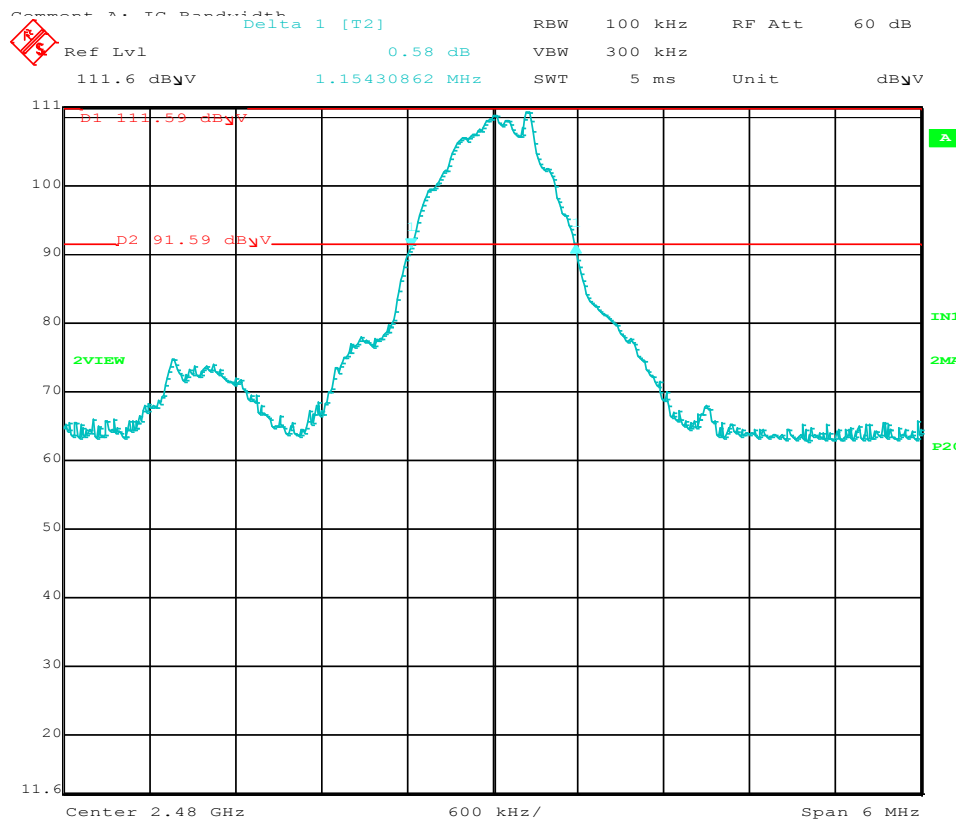
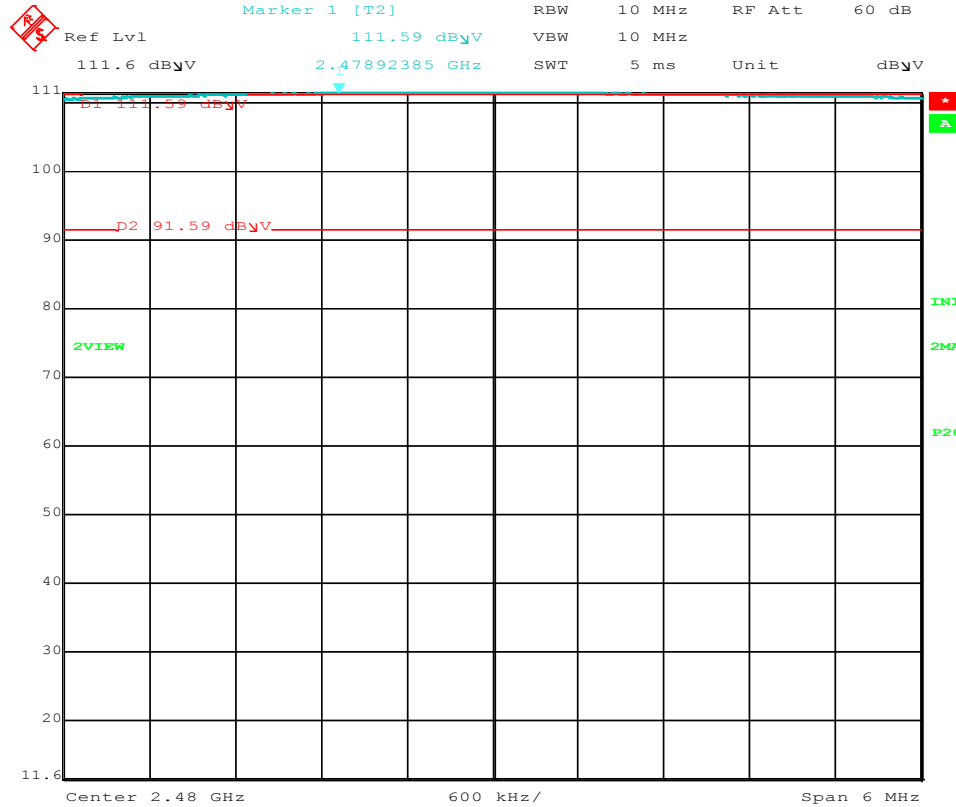


Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

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Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



Comment A: IC Bandwidth

Date: 4.JAN.2016 13:51:46



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

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19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
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Lake Forest, CA 92630
(949) 587-0400