TIMCO ENGINEERING, Inc.

849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
PH: 888.472.2424 OR 352.472.5500
FAX: 352.472.2030
EMAIL: TEI@TIMCOENGR.COM
HTTP://WWW.TIMCOENGR.COM

FCC PART 15.247 FHSS

TEST REPORT

APPLICANT	SYN-TECH SYSTEMS, INC.
ADDRESS	100 FOUR POINTS WAY TALLAHASSEE FLORIDA 32305
FCC ID	NR3-032B0100
PRODUCT DESCRIPTION	PDA WITH BLUETOOTH
DATE SAMPLE RECEIVED	June 21, 2006
DATE TESTED	June 23, 2006
TESTED BY	Nam Nguyen
APPROVED BY	Mario de Aranzeta C.E.T.
TIMCO REPORT NO.	209ZUT6TestReport
TEST RESULTS	☒ PASS ☐ FAIL

ACCREDITED
Certificate # 0955-01

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STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 NW State Road 45, Newberry, Florida 32669 USA.

Authorized by: Mario de Aranzeta

Function: Engineer

Date: August 16 , 2006

GENERAL INFORMATION AND EQUIPMENT UNDER TEST

Applicable Standards:	FCC Part 15.247		
Test Result:	The test results relate only to the items tested.		
Manufacturer:	SYN-TECH SYSTEMS, INC. 100 FOUR POINTS WAY TALLAHASSEE FLORIDA 32305		
FCC ID:	NR3-032B0100		
Product Description:	PDA WITH BLUETOOTH DEVICE		
Operating Frequency:	2402 - 2480 MHz		
Max. Output Power (conducted):	☐ Conducted - dBm	☐ ERP -	☐ EIRP
Type of Modulation:	FHSS- Bluetooth		
Power Supply:	*Primary Power*	3.6 Vdc	
	Secondary Power	110VAC/50-60Hz	
Test Item:	Pre-Production		
Antenna Type:	Antenna spec attached		
Antenna Connector:	None-permanently attached		
Modification to the EUT:	None		
Test Facilities	Timco Engineering Inc. 849 N.W. State Road 45, Newberry, FL 32669.		
Test Exercise (e.g. software description, test signal, etc.)	The test article was set in a continuous transmit mode of operation		
Test Conditions	Temperature: 78°F Humidity: 55%		

TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Biconnical Antenna	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Biconnical Antenna	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303a01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Spectrum Analyzer	HP	8566B OPT 462	3188A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/05	4/28/07
Log-Periodic Antenna	Eaton	96005	1243	CAL 12/14/05	12/14/07

TEST PROCEDURE

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-2003 using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.
BANDWIDTH 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth and the span set as shown on plot.

POWER OUTPUT: The RF power output was measured radiated EIRP.

ANTENNA CONDUCTED EMISSIONS: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: 15.207(a)

Requirements:

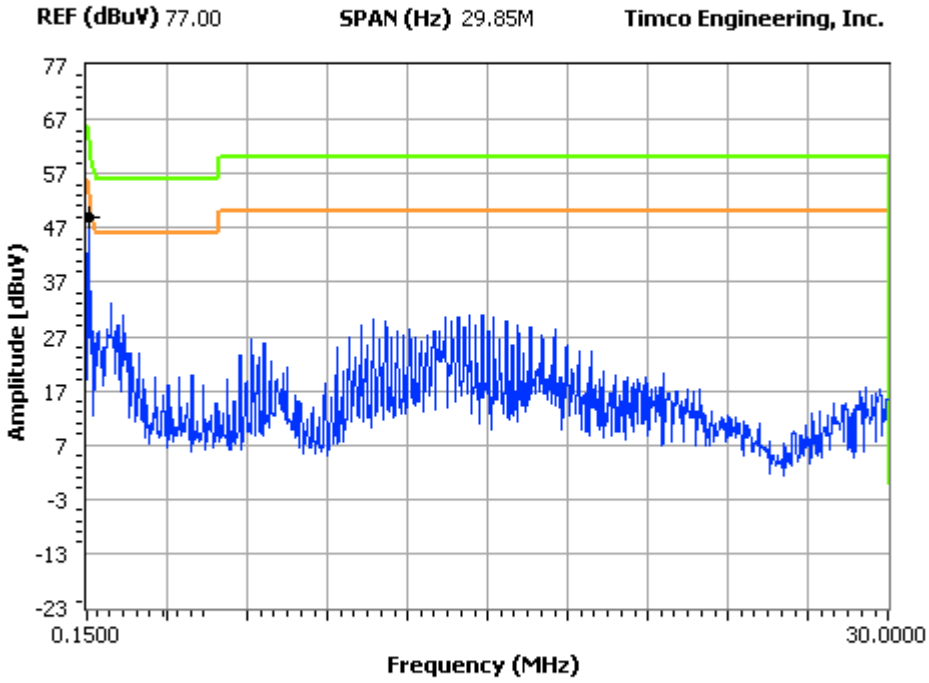
Emission Frequency (MHz)	FCC Conducted Limit (dBμV)	
	Quasi-peak (QP)	Average (AV)
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50
* Decreases with the logarithm of the frequency.		

Test Data:

NOTES:

SYN-TECH SYSTEMS, INC. -
POWERLINE CONDUCTED PLOT - LINE 1

FCC 15.107 Mask Class B



RBW	VBW	ST (sec)
10 kHz	30 kHz	2

Center Frequency (Hz) 15.075M

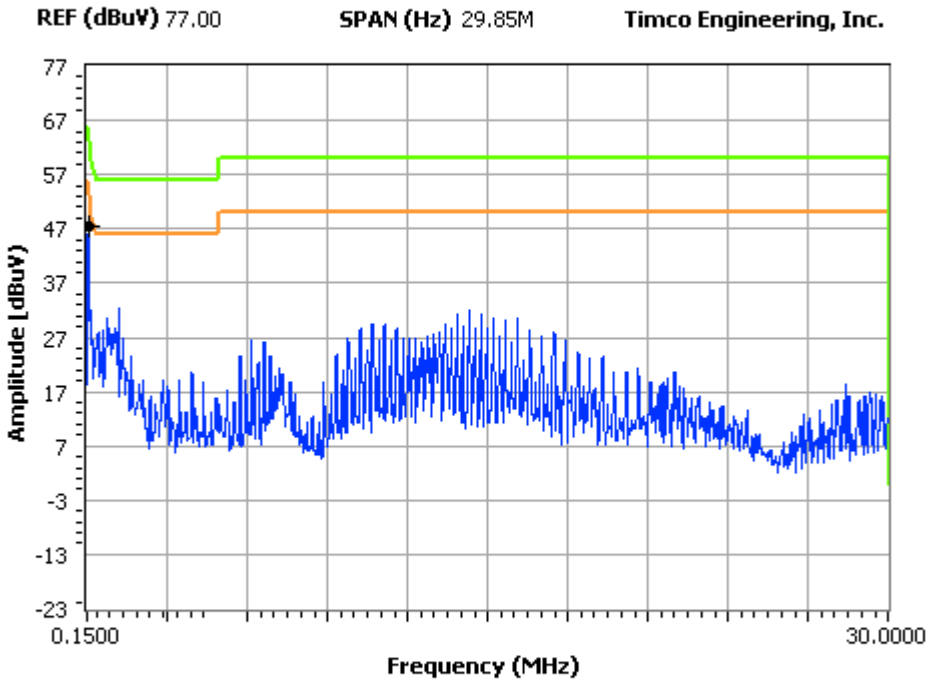
Marker Delta (Hz) 0.00

Peak	0.210	48.80
MKR2	0.000	0.00
MKR3	0.000	0.00
HWMK	23.076	6.27

NOTES:

SYN-TECH SYSTEMS, INC. -
POWERLINE CONDUCTED PLOT - LINE 2

FCC 15.107 Mask Class B



RBW	VBW	ST (sec)
10 kHz	30 kHz	2

Center Frequency (Hz) 15.075M

Marker Delta (Hz) 0.00

Peak	0.210	47.50
MKR2	0.000	0.00
MKR3	0.000	0.00
HWMK	23.076	6.27

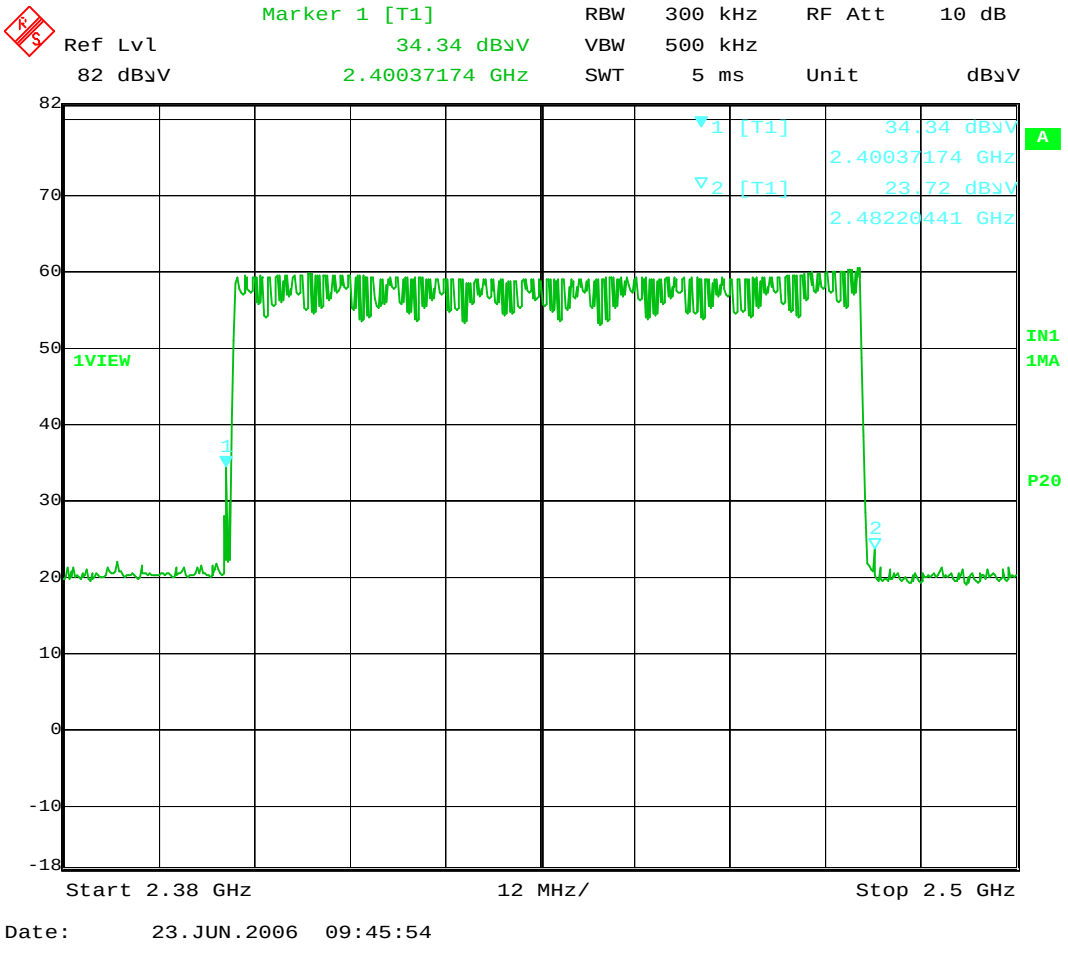
NUMBER OF HOPPING CHANNELS

Rules Part No.: 15.247(a)(1)

Requirements:

902-928 MHz	If the 20 dB bandwidth is less than 250 kHz, the system shall use at least 50 hopping frequencies.
	If the 20 dB bandwidth is 250 kHz or greater, the system shall use at least 25 hopping frequencies.
2400-2483.5 MHz	At least 15 channels
5725-5850 MHz	At least 75 channels

Test Data: There are 79 hopping channels



DWELL TIME OF A HOPPING CHANNEL

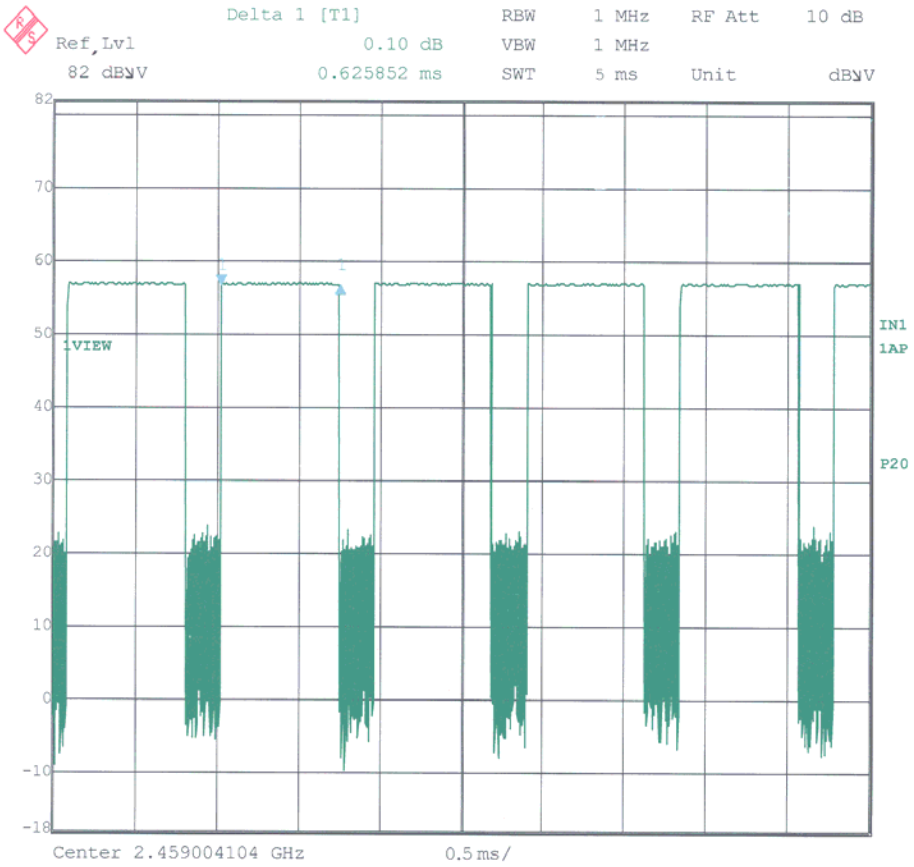
Rules Part No.: 15.247(a)(1)(i)

Requirements:

902-928 MHz	If 20 dB bandwidth is less than 250 kHz, Dwell time < = 0.4 seconds in a 20 second period.
	If 20 dB bandwidth is 250 kHz or greater, Dwell time < = 0.4 seconds n a 10 second period.
2400-2483.5 MHz	< = 0.4 seconds in a 0.4 seconds multiplied the number of hopping channels employed.
5725-5850 MHz	< = 0.4 seconds in a 30 second period.

Test Data:

The dwell time is 0.625 msec/hop or 400msec for 640 hops/.4 seconds.
30(1600*79)* 625 msec = 380 msec.

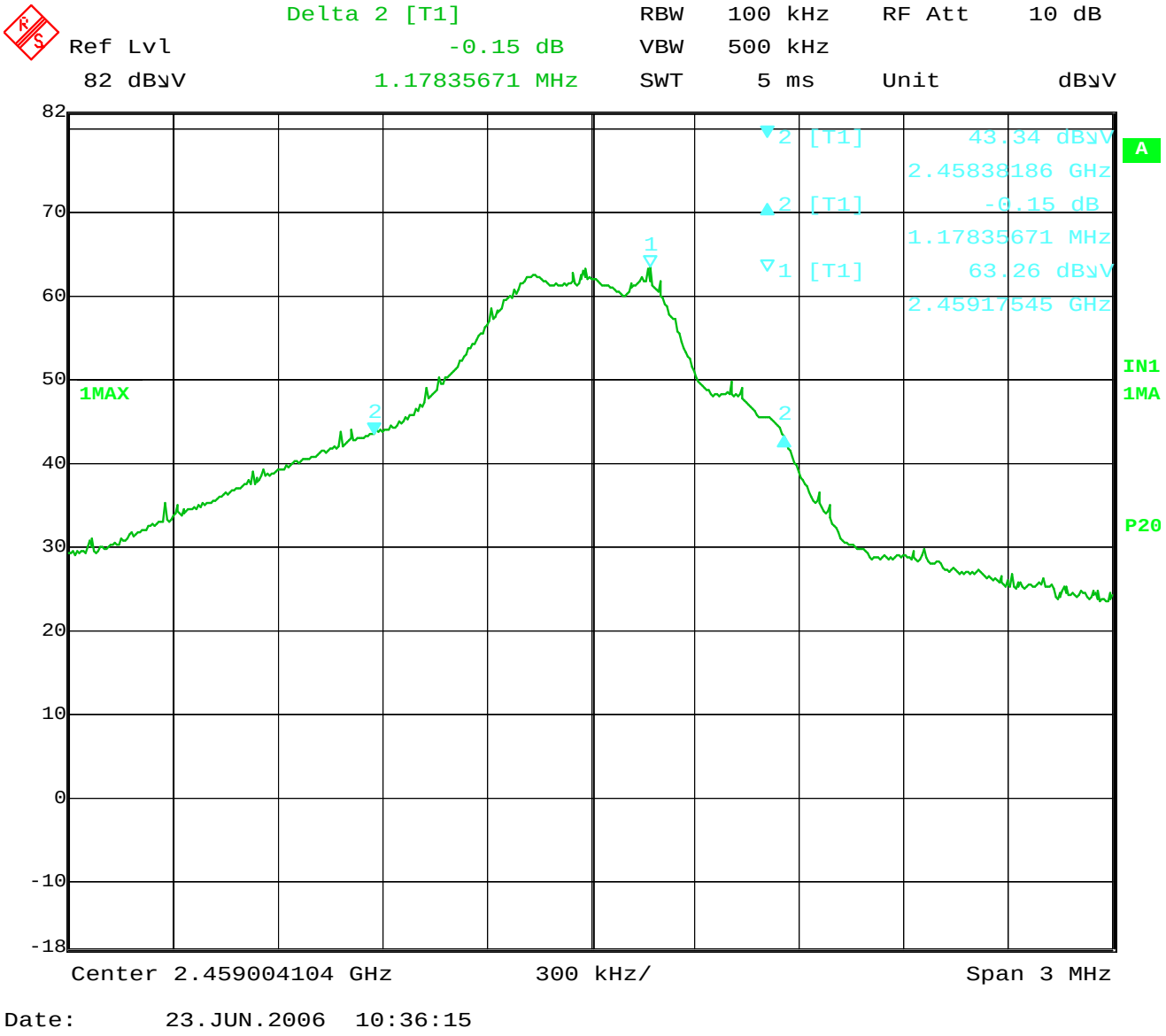


20 dB BANDWIDTH

Rules Part No.: 15.247(a)(2)

Requirements: 20 dB bandwidth

Test Data: See the following plot



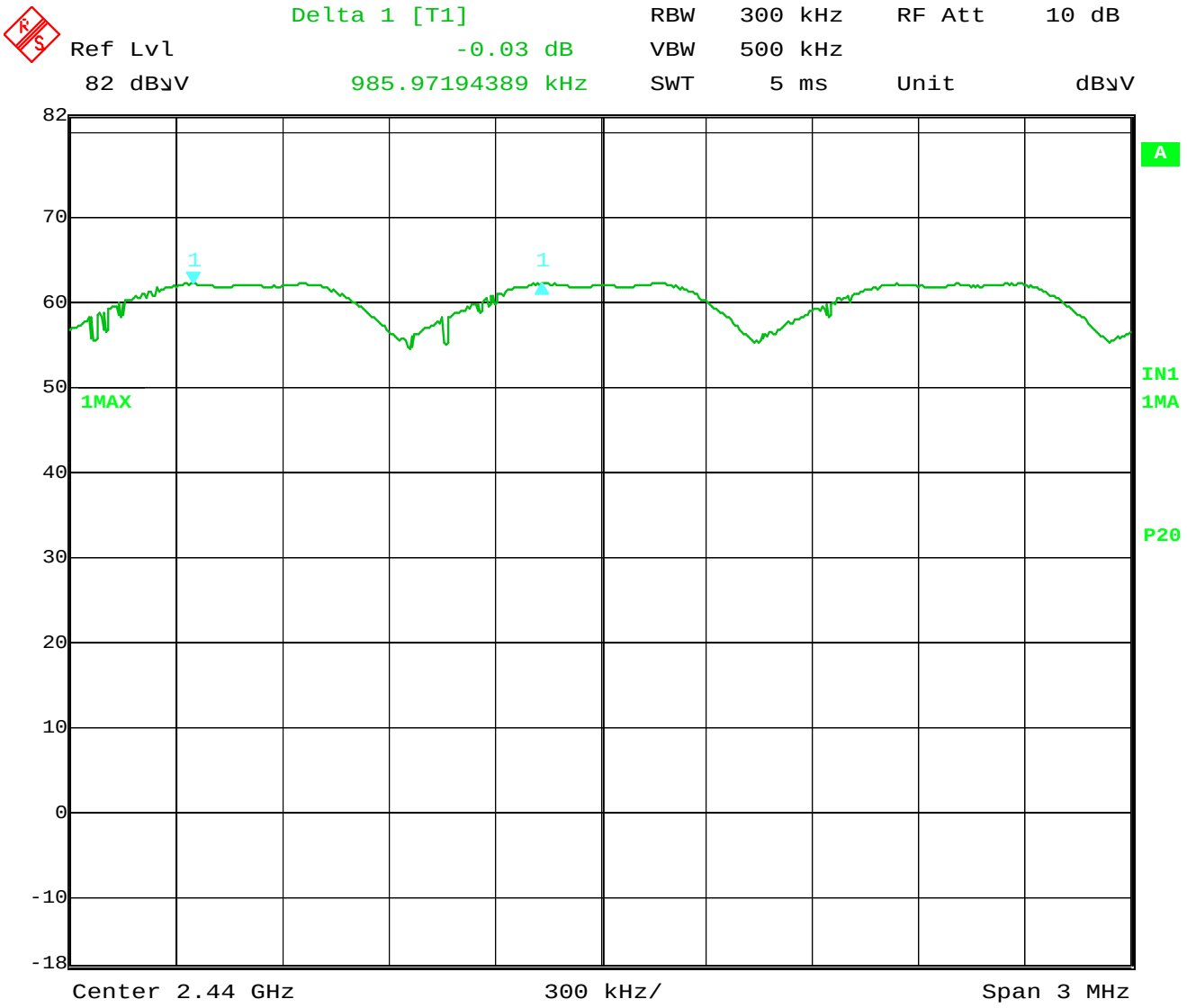
This device was tested at the low , middle, and high channels. The worst case is reported.

CARRIER FREQUENCY SEPARATION

Rules Part No.: 15.247(a)(2)

Requirements: The hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Data: See the following plot

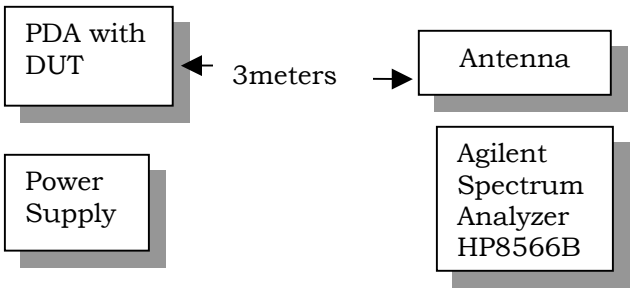


POWER OUTPUT

Rules Part No.: 15.247(b)

Requirements: The maximum peak output power shall not exceed 1 watt (30 dBm). If directional transmitting antennas with a gain of more than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Method: The antenna was permanently attached and the power output was measured radiated.



Test Data: 2 mWatts EIRP

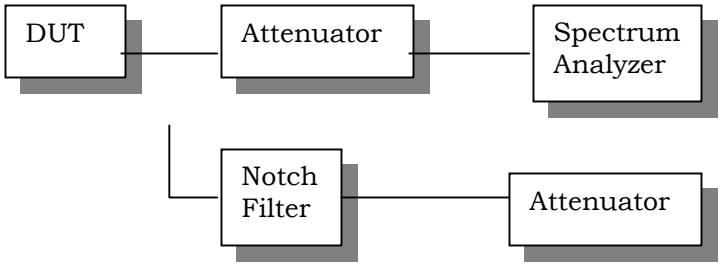
Three places in the band were measured and the highest power presented above.

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Rules Part No.: 15.247(c)

Requirements: Emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

Method of Measuring:



Note: The spectrum was scanned to the tenth harmonic.

Test Data:

Not Applicable

FIELD STRENGTH OF SPURIOUS EMISSIONS

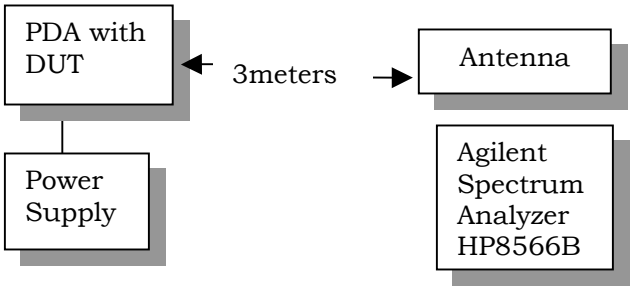
Rules Part No.: 15.247(c), 15.205 &15.209(b)

Requirements:

(Fundamental) Frequency	(Field Strength) Limits
902 – 928MHz	127.37dBuV/m
2.4 – 2.4835GHz	54 dBuV/m @3m
30 - 88 MHz	40 dBuV/m @3M
88 -216 MHz	43.5 dBuV/m @3M
216 -960 MHz	46 dBuV/m @3M
ABOVE 960 MHz	54dBuV/m

Emissions that fall in the restricted bands (15.205) must be less than or equal to 500 uV/m (54 dBuV/m). Spurious not in a restricted band must be 20 dBc.

Test Setup



Equipment placed 80cm above ground on a rotatable platform.

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB	Field Strength dBuV/m	Margin dB
2,402.00	2,402.00	55.1	V	3.18	32.33	90.61	36.77
2,402.00	2,402.00	62	H	3.18	32.33	97.51	29.87
2,402.00	4,804.00r	11.4	V	4.9	34.34	50.64	3.36
2,402.00	4,804.00r	10.1	H	4.9	34.34	49.34	4.66
2,402.00	7,206.00	9.6	H	5.72	36.15	51.47	28.24
2,402.00	7,206.00	12.7	V	5.72	36.15	54.57	25.14
2,459.00	2,459.00	54.3	V	3.22	32.49	90.01	37.37
2,459.00	2,459.00	61.9	H	3.22	32.49	97.61	29.77
2,459.00	4,918.00r	13.9	V	4.96	34.43	53.29	0.71
2,459.00	4,918.00r	12.4	H	4.96	34.43	51.79	2.21
2,459.00	7,377.00r	9.5	H	5.83	36.35	51.68	2.32
2,459.00	7,377.00r	10.5	V	5.83	36.35	52.68	1.32
2,480.00	2,480.00	54.1	V	3.24	32.54	89.88	37.5
2,480.00	2,480.00	58.8	H	3.24	32.54	94.58	32.8
2,480.00	4,960.00r	12.4	V	4.98	34.47	51.85	2.15
2,480.00	4,960.00r	13.8	H	4.98	34.47	53.25	0.75
2,480.00	7,440.00r	10.8	H	5.86	36.43	53.09	0.91
2,480.00	7,440.00r	11.6	V	5.86	36.43	53.89	0.11

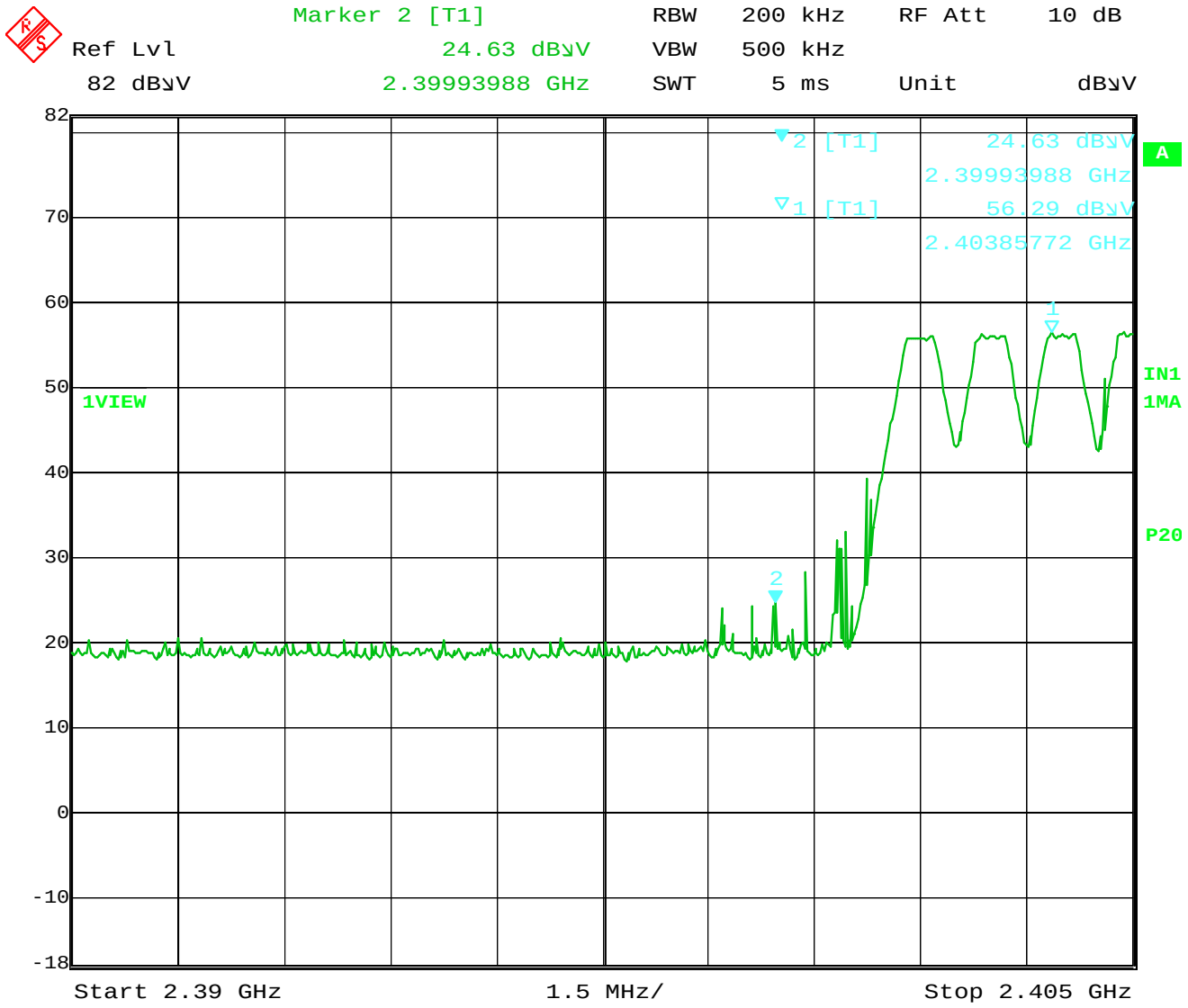
Harmonics were measured to the 10th harmonic

RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

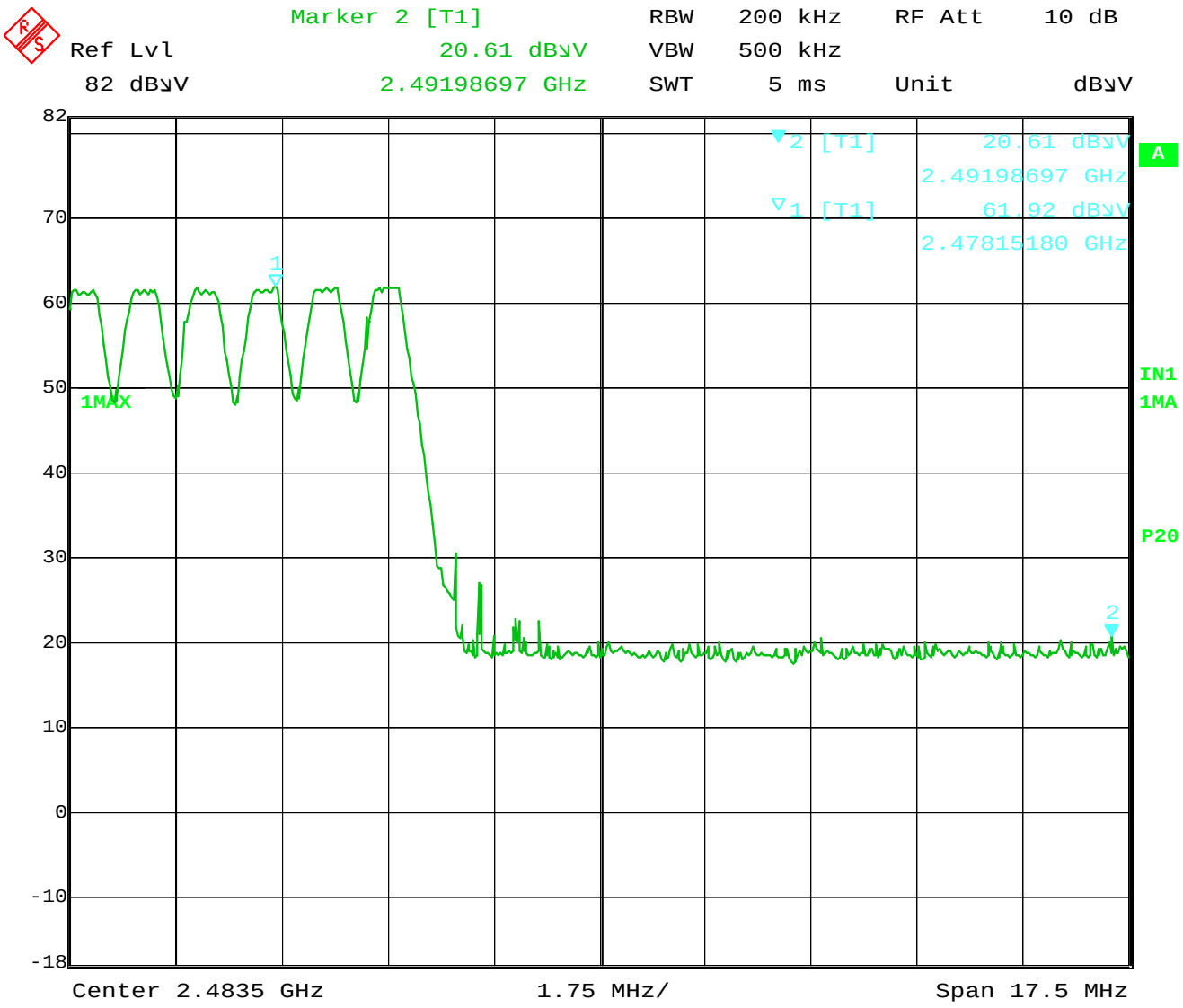
Rule Parts No.: **Part 15.205**

Requirements: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 uV/m (54dBuV/m). Emissions not in the restricted band must be 20 dBc.

BAND EDGE – HIGH



BAND EDGE – HIGH



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RF EXPOSURE REQUIREMENT

§15.247 (e), §1.1307 (b)(2), §1.1310, & §2.1093	
Frequency Range (MHz)	Power Density (mW/cm^2)
Limits for Occupational/Controlled Exposures	
0.3 – 3.0	*(100)
3.0 – 30	*($900/f^2$)
30 - 300	1.0
300 - 1500	f/300
1500 – 100,000	5.0
Limits for General Population/Uncontrolled Exposure	
0.3 – 3.0	*(100)
3.0 – 30	*($180/f^2$)
30 - 300	0.2
300 - 1500	f/1500
1500 – 100,000	1.0
f = frequency in MHz * = Place-wave equivalent power density	

MPE Calculation
The calculations on the next page are based on the following:
An output power of 2 mW
A gain of 0 dBi
A value for the general population expose limit of 1 mW/cm^2 which in the formula is designated as S=1 or as calculated from 1500/1500=1

$Po := 2$ mWatts $dBd := 0$ antenna gain $f := 1500$ Frequency in MHz

$G := dBd + 2.15$ gain in dBi $G = 2.15$

$Gn := 10^{\frac{G}{10}}$ gain numeric $S := \frac{f}{1500}$ 300 for controlled

1500 for uncontrolled

$Gn = 1.641$ $S = 1$

$$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}} \qquad Rinches := \frac{R}{2.54}$$

$R = 0.511$ distance in centimeters required for compliance $Rinches = 0.201$