



849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
PH: 888.472.2424 OR
352.472.5500
FAX: 352.472.2030
EMAIL: INFO@TIMCOENGR.COM
[HTTP://WWW.TIMCOENGR.COM](http://WWW.TIMCOENGR.COM)

FCC PART 90 RADAR TEST REPORT

APPLICANT	Enterprise Electronics Corporation
	128 South Industrial Blvd. Enterprise Alabama 36330 USA
FCC ID	BUV-SK1000H
MODEL NUMBER	SK1000H
PRODUCT DESCRIPTION	RADAR
DATE SAMPLE RECEIVED	4/07/2017
FINAL TEST DATE	4/14/2017
TESTED BY	Cory Leverett
APPROVED BY	Sid Sanders
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Version Number	Description	Issue Date
568AUT17TestReport_	Rev1	Initial Issue	4/17/2017
568AUT17TestReport_	Rev2	Added name of testing technician	5/31/2017

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THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.

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GENERAL REMARKS



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Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- ☐ Not fulfill the general approval requirements as identified in this test report

Attestations

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

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

**Enterprise Electronics Corporation
128 South Industrial Blvd.
Enterprise Alabama 36330 USA**

A handwritten signature in blue ink, appearing to read 'Cory Leverett', is written over a circular red stamp. The stamp contains the text 'ENTERPRISE ELECTRONICS CORPORATION' and 'ALABAMA'.

Tested by:

Name and Title: Cory Leverett, Project Manager/Testing Technician

Date: 04/17/2017

Reviewed and approved by:

A handwritten signature in blue ink, appearing to read 'Sid Sanders', is written over a circular blue stamp. The stamp contains the text 'ENTERPRISE ELECTRONICS CORPORATION' and 'ALABAMA'.

Name and Title: Sid Sanders, Engineer

Date: 4/18/2017

Applicant: Enterprise Electronics Corporation
FCC ID: BUV-SK1000H
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EUT SPECIFICATION



EUT Description	RADAR
FCC ID	BUV-SK1000H
Model Number	SK1000H
Operating Frequency	3500 – 3550 MHz
Type of Emission	8M91P0N
Modulation	Unmodulated FM carrier pulse
EUT Power Source	☒ 112/208 Vac 60Hz 3-Phase
	☐ DC Power (48 VDC)
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☐ Pre-Production
	☒ Production
Type of Equipment	☒ Fixed
	☐ Mobile
	☐ Portable
Antenna	20' prime fed parabolic antenna 44 dBi gain

TEST SETUP INFORMATION

Test Condition	The EUT was tested under normal temperature and humidity. The temperature was 20-26°C with a relative humidity of 35 - 55%.
Modifications	None
Test Exercise	The EUT was transmitting a modulated pulse with a 2 us pulse at a 500 Hz rep rate, with the exception of frequency stability testing in which CW signal was used.
Regulatory Standards	FCC CFR 47 Part 2, 90
Measurement Standards	TIA_603-D:2010, ITU-R M.1177-4 (04/2011), CISPR 16-2-3 ED 3.1

TEST REPORT SUMMARY



Rule Part No.	Test Item	Status Pass/Fail/NA
2.1046, 90.205	RF Power Output	Pass
2.1047, 90.207, 90.209	Modulation Characteristics	Pass
2.1049,	Occupied Bandwidth	Pass
2.1051, 90.210 (b)(3)	Antenna Conducted Emissions	Pass
2.1053, 90.210(b)(3)	Field Strength Spurious Emissions	Pass
2.1055, 90.213	Frequency Stability	Pass

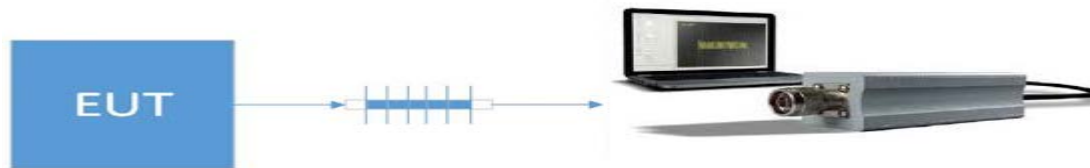
RF POWER OUTPUT

Rule Part No.: 2.1046, 90.205

Requirements: Manufacturers specifications

Procedure: RF power is measured by connecting a 50-ohm, Peak Power Watt meter to the RF output connector. The EUT was supplied with a nominal voltage, and the transmitter properly adjusted for the target output power.

Setup Diagram:



Notes: The EUT has 2 transmitters; all conducted measurement results are summed and compared to the limit following the procedures listed above

The mean power was calculated based on formula:

$$P_a = P_m * DC$$

P_a is Mean linear power in watts

P_m is Peak linear power in watts

DC is duty cycle in %

Example: $404.79 \text{ (W)} * (91.6/833) = 44.51 \text{ (w)}$

Test Data: Measurement Table

Pulse Type	Tuned Freq (MHz)	T_d (uSec)	Period (uSec)	DC (%)	Peak Power (dBm)	Peak Power (W)	Mean Power (W)
0.5 uS	3525	0.58	1005.51	0.06%	89.75	944060.88	541.88
0.8 uS	3525	0.89	1299.02	0.07%	89.92	981747.94	672.46
1 uS	3525	1.02	1663.25	0.06%	89.74	941889.60	575.36
2 uS	3525	2.08	1999.92	0.10%	89.78	950604.79	990.65

Part 2.1033 (C) (8) DC Input into the final amplifier

PEAK INPUT POWER: $P(W) = E(V) * I(A) = 67 \text{ kVDC} * 35 \text{ A} = 2345 \text{ kW}$

MODULATION CHARACTERISTICS

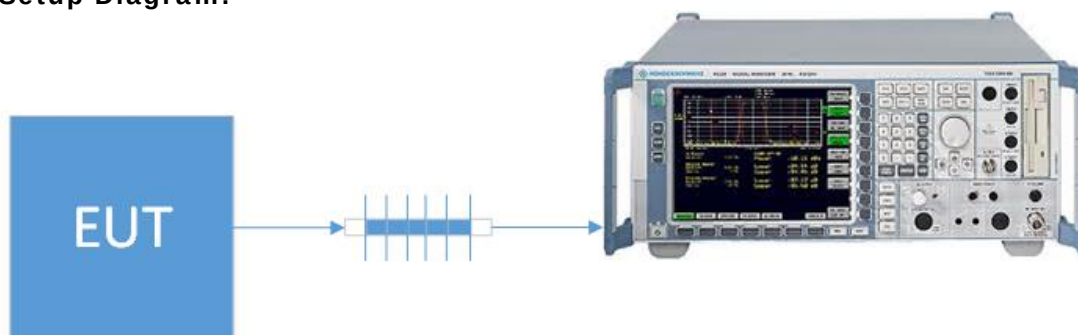


Rule Part No.: 2.1047, 90.207, 90.209

Requirements: Manufacturers specification, authorization reviewed on a case-by case-basis

Procedure: As detailed in the procedures listed above

Setup Diagram:



Notes: The manufacturer specifications declare that the EUT is normally operated with a pulse compression modulation scheme with a pulse durations of 100 μ S.

Further detailed specifications are contained in "product specifications" manual.

Test Data: Measurement Table

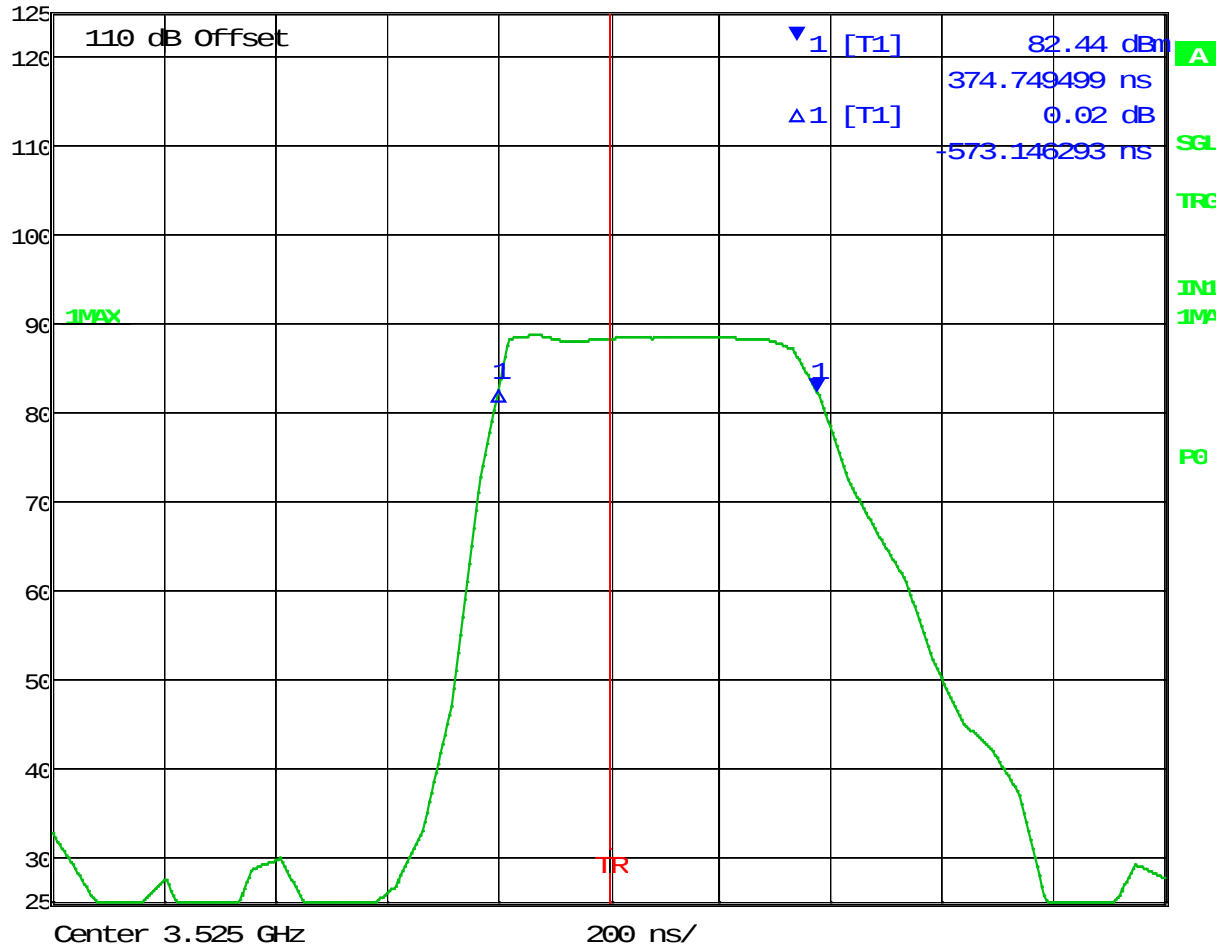
Pulse Type	Pulse widths (μ S)	Pulse rep. rate (Hz)
0.5 μ S	0.57	950
0.8 μ S	0.89	750
1.0 μ S	1.02	750
2.0 μ S	2.08	500

MODULATION CHARACTERISTICS



Test Data: 0.5 μ s Pulse width Plot

	Max/Ref Lvl	Marker 1 [T1]	RBW	10 MHz	RF Att	0 dB
	125 dBm	82.44 dBm	VBW	10 MHz		
	95 dBm	374.749499 ns	SWT	2 μ s	Unit	dBm



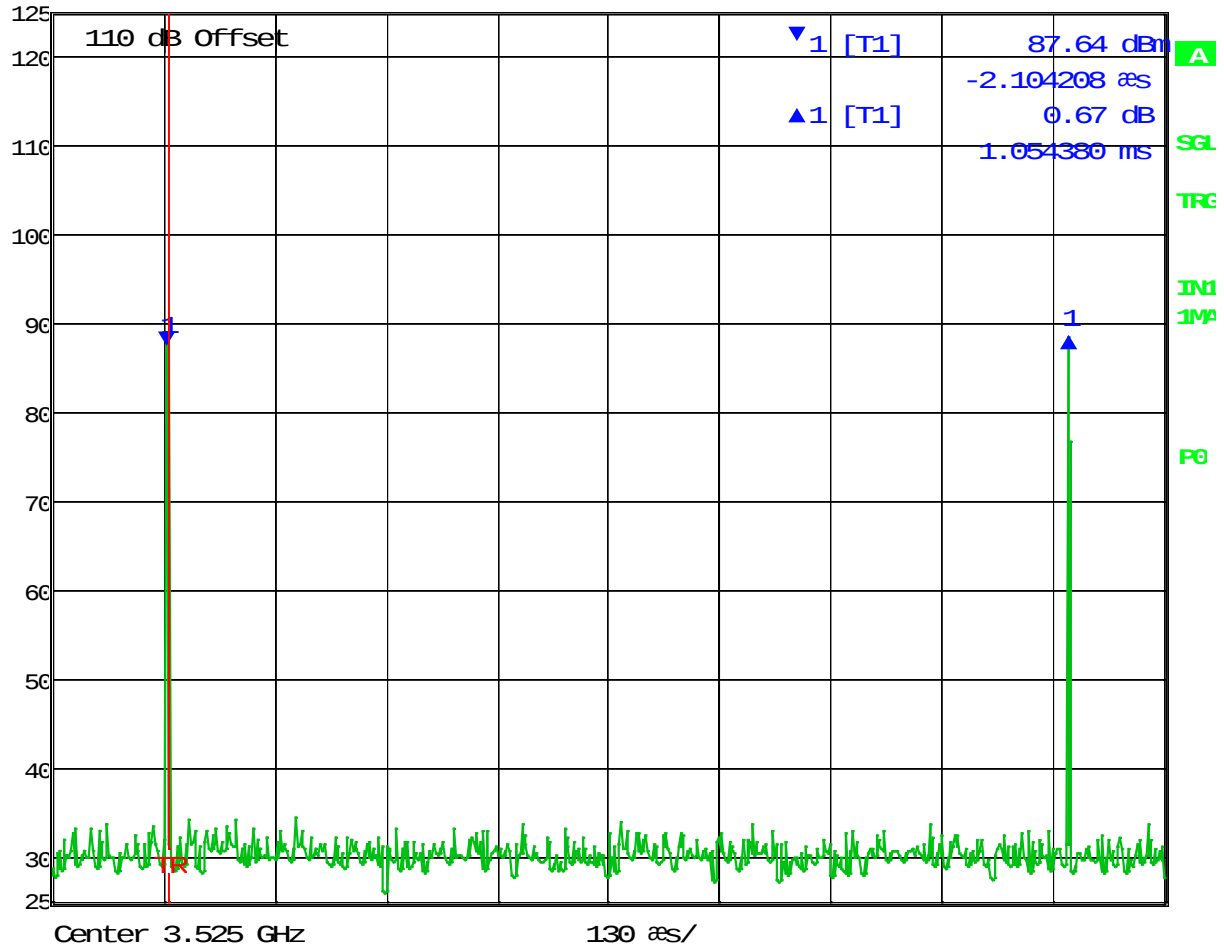
Date: 11.APR.2017 13:59:39

MODULATION CHARACTERISTICS



Test Data: 0.5 uS Rep Rate Plot

	Max/Ref Lvl	Delta 1 [T1]	RBW	10 MHz	RF Att	0 dB
	125 dBm	0.67 dB	VBW	3 MHz		
	95 dBm	1.054380 ms	SWT	1.3 ms	Unit	dBm



Date: 11.APR.2017 13:51:46

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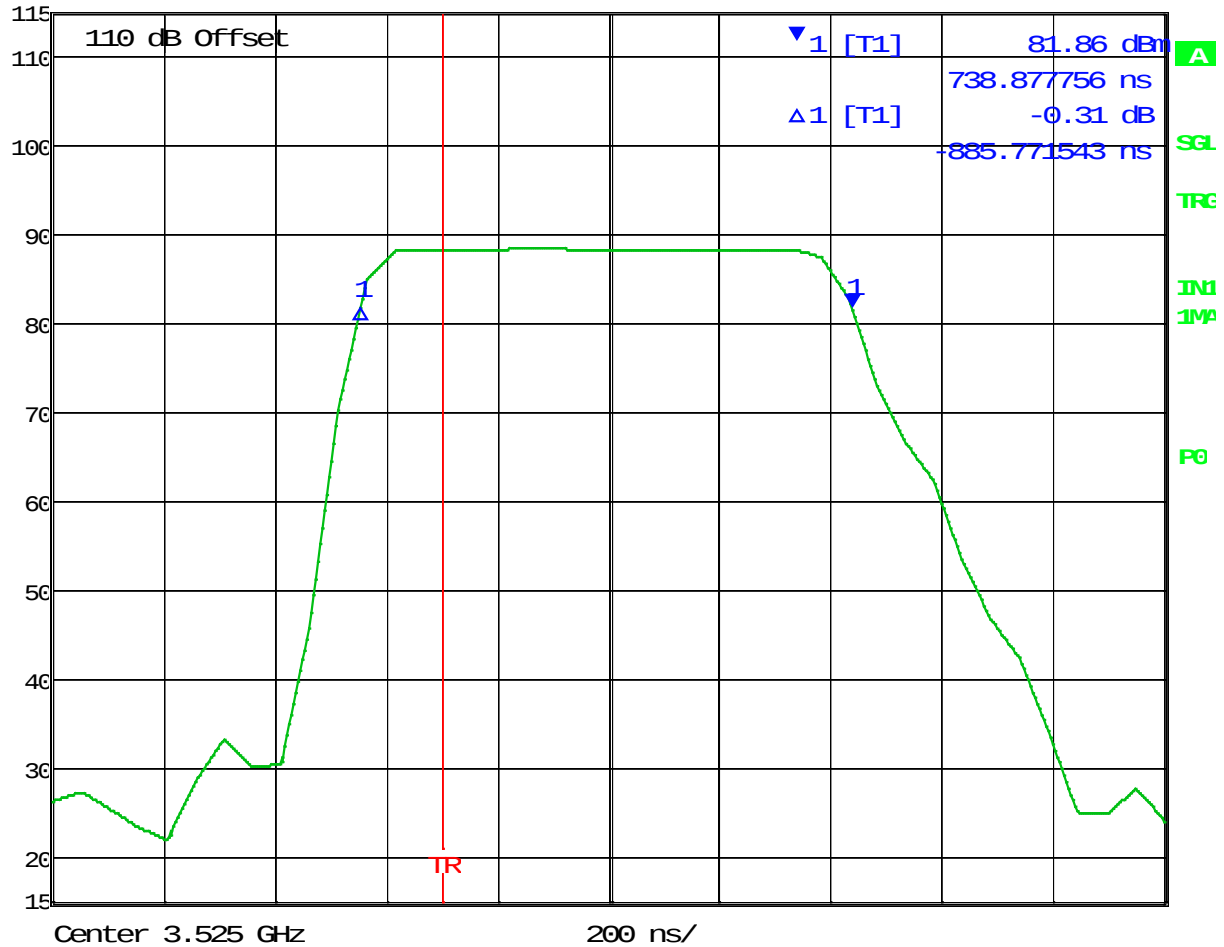
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MODULATION CHARACTERISTICS



Test Data: 0.8 μ s Pulse width Plot

	Max/Ref Lvl	Marker 1 [T1]	RBW	10 MHz	RF Att	0 dB
	115 dBm	81.86 dBm	VBW	10 MHz		
	95 dBm	738.877756 ns	SWT	2 μ s	Unit	dBm



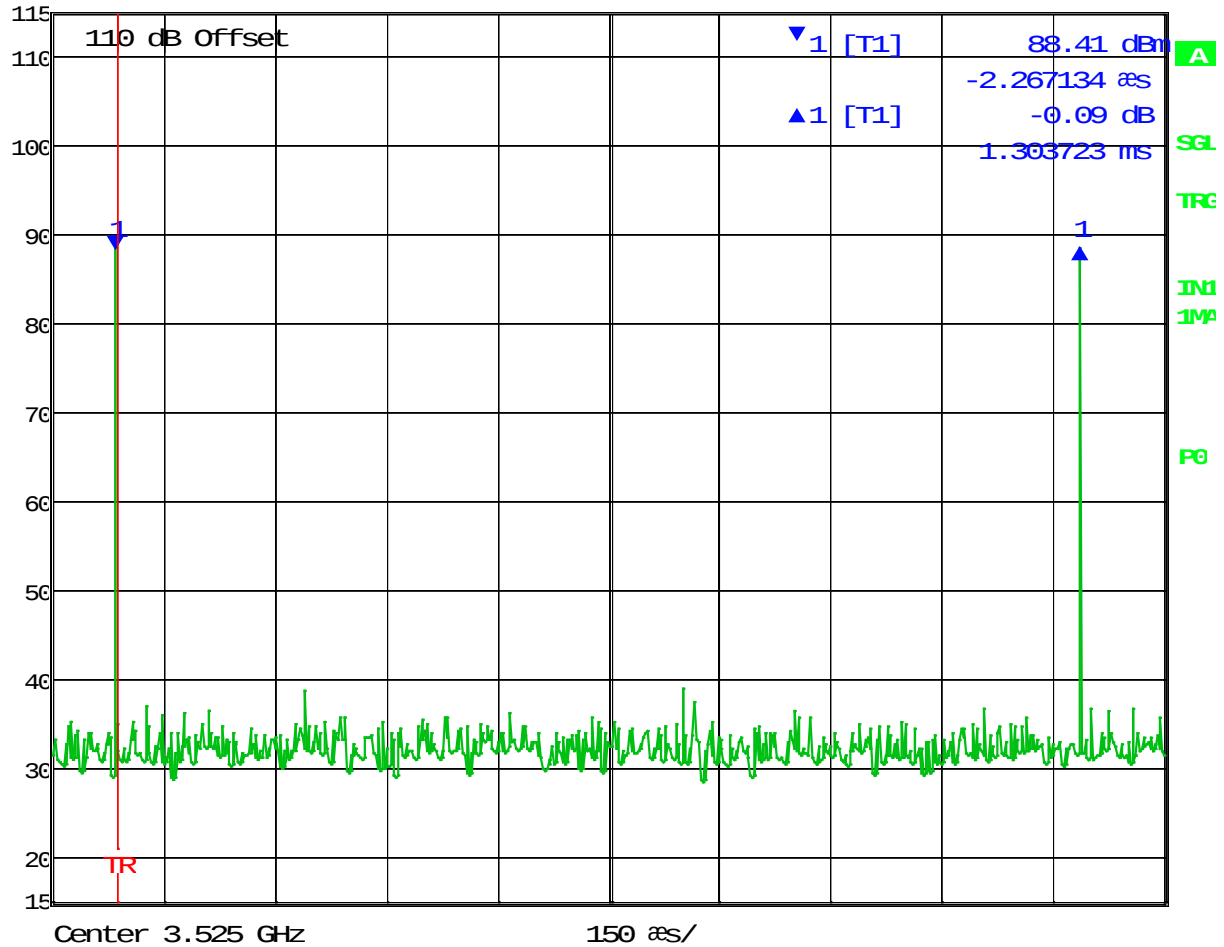
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MODULATION CHARACTERISTICS



Test Data: 0.8 μ s Rep Rate Plot

	Max/Ref Lvl	Delta 1 [T1]	RBW	10 MHz	RF Att	0 dB
	115 dBm	-0.09 dB	VBW	10 MHz		
	95 dBm	1.303723 ms	SWT	1.5 ms	Unit	dBm



Date: 11.APR.2017 14:16:24

MODULATION CHARACTERISTICS



Test Data: 1 uS Pulse width Plot

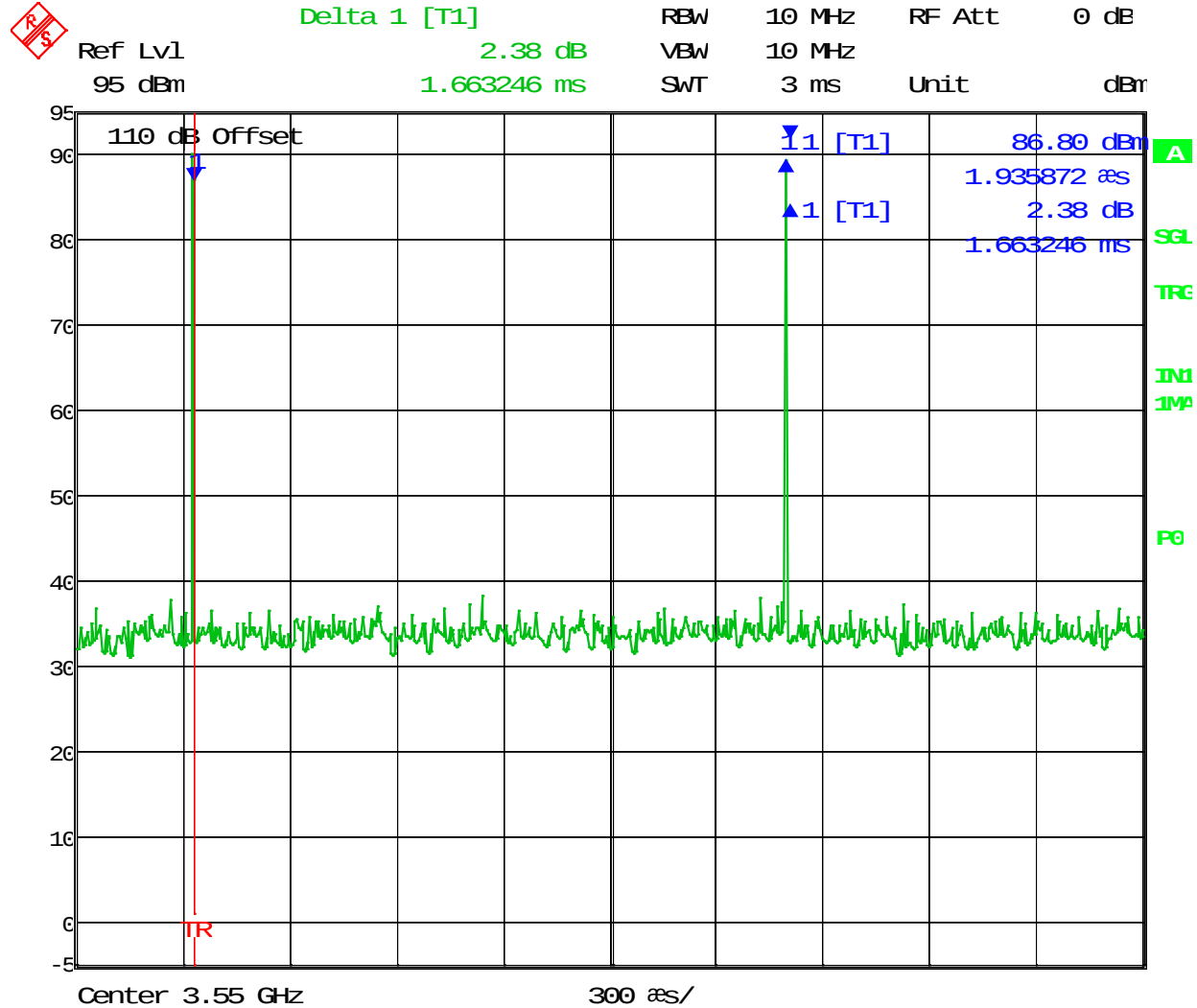


Date: 11.APR.2017 15:43:38

MODULATION CHARACTERISTICS



Test Data: 1 uS Rep Rate Plot

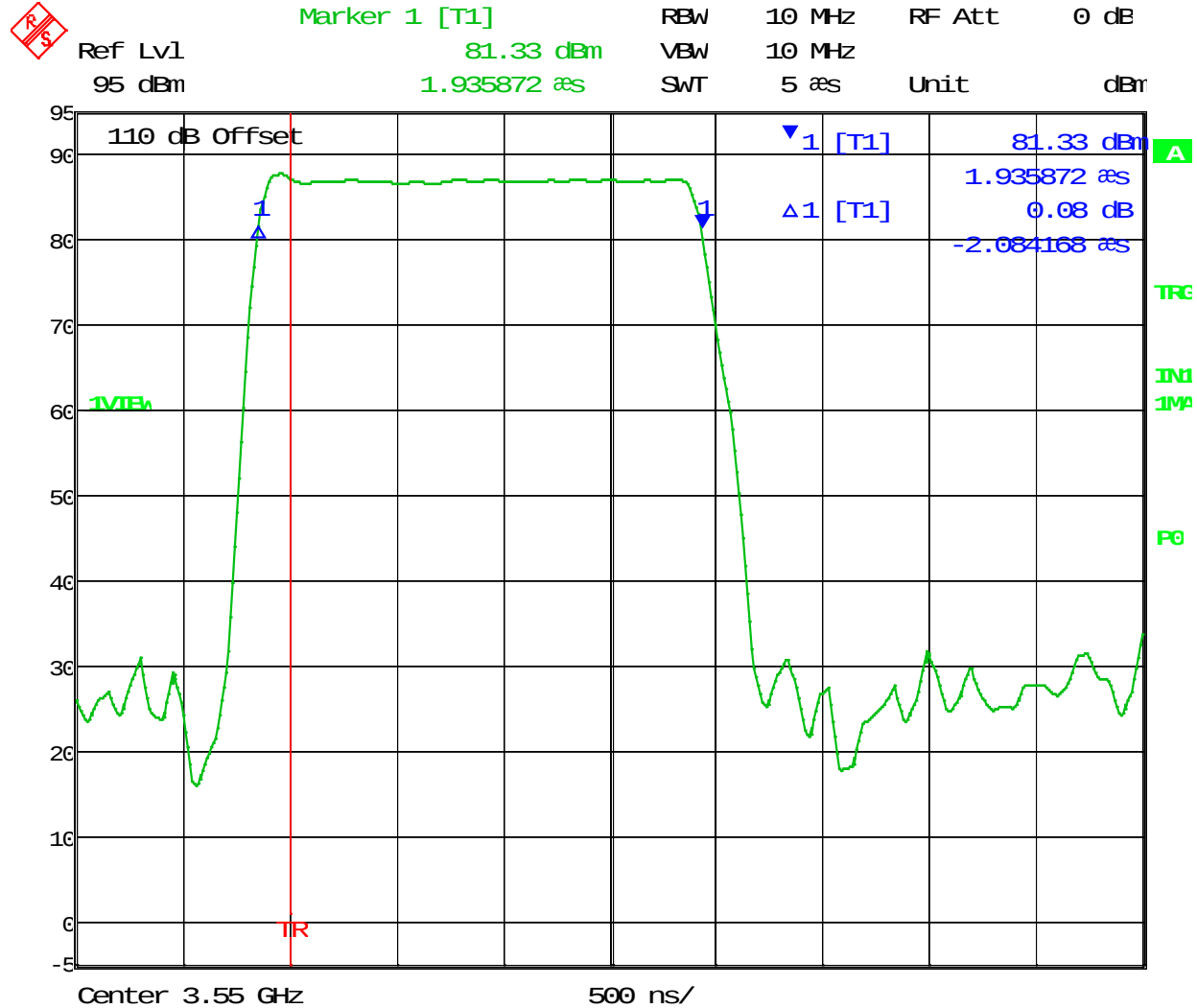


Date: 11.APR.2017 15:35:41

MODULATION CHARACTERISTICS



Test Data: 2 uS Pulse width Plot

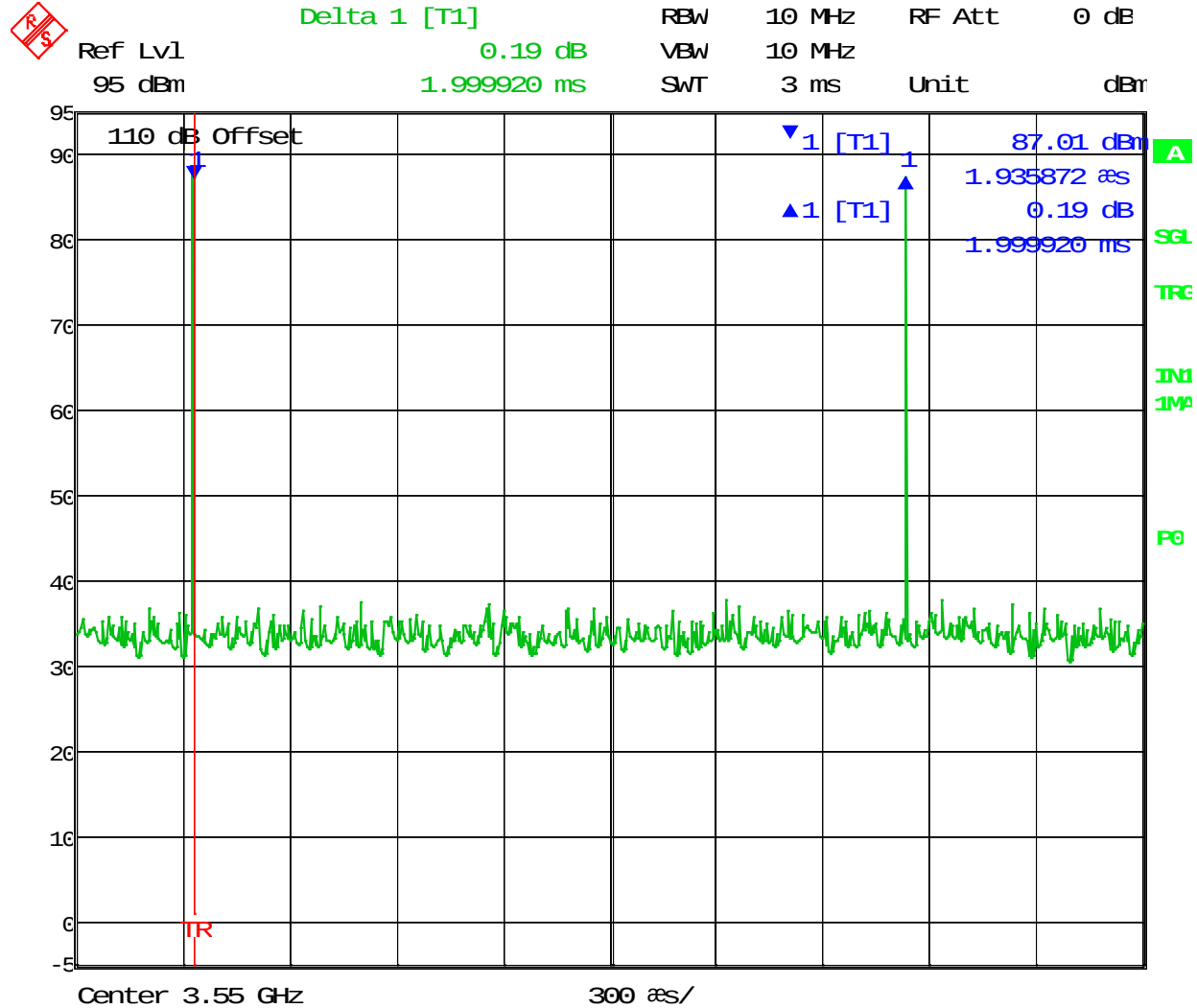


Date: 11.APR.2017 15:31:44

MODULATION CHARACTERISTICS



Test Data: 2 uS Rep Rate Plot



Date: 11.APR.2017 15:33:00

MODULATION CHARACTERISTICS

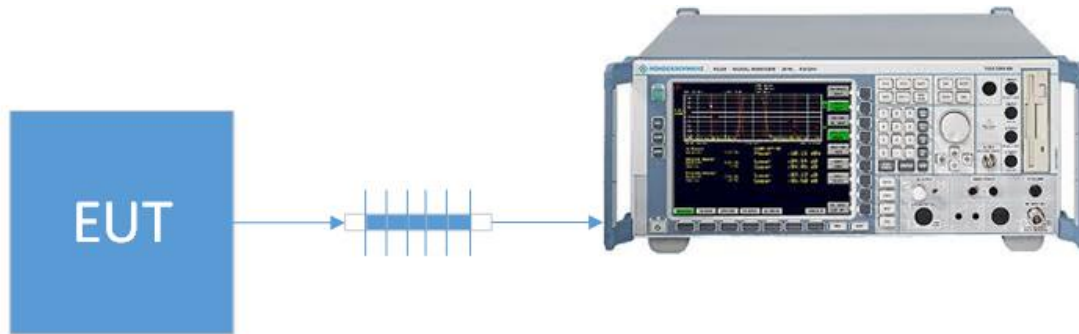
OCCUPIED BANDWIDTH

Rule Part No.: 2.1049,

Requirements: 99% OBW Reporting Only

Procedure: In accordance with standards listed above

Setup Diagram:



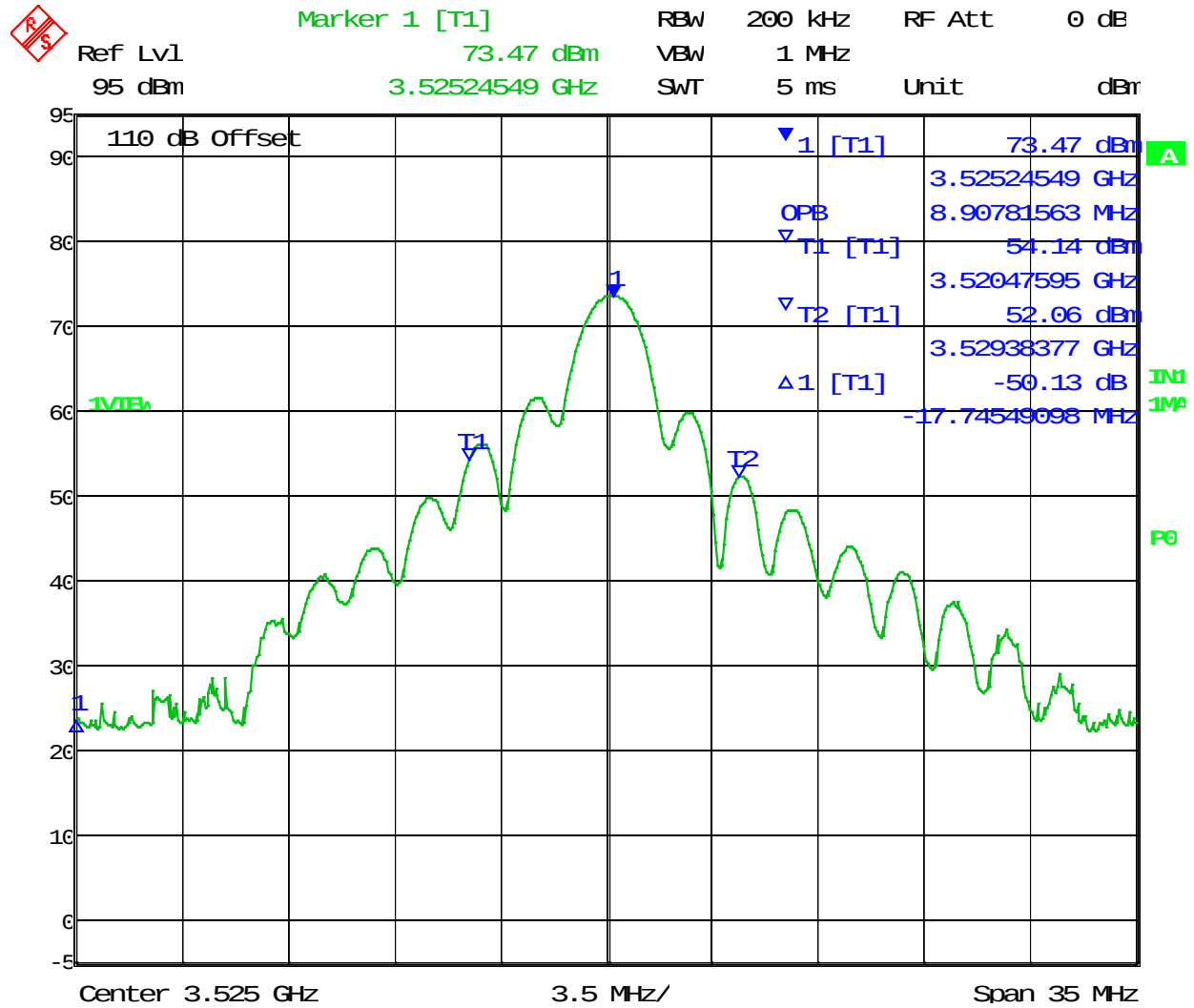
Test Data: Measurement Table

Pulse Type	99% OBW (MHz)
0.5 uS	8.91
0.8 uS	7.57
1 uS	7.97
2uS	5.33

OCCUPIED BANDWIDTH



Test Data: 0.5 uS 99 % OBW Plot

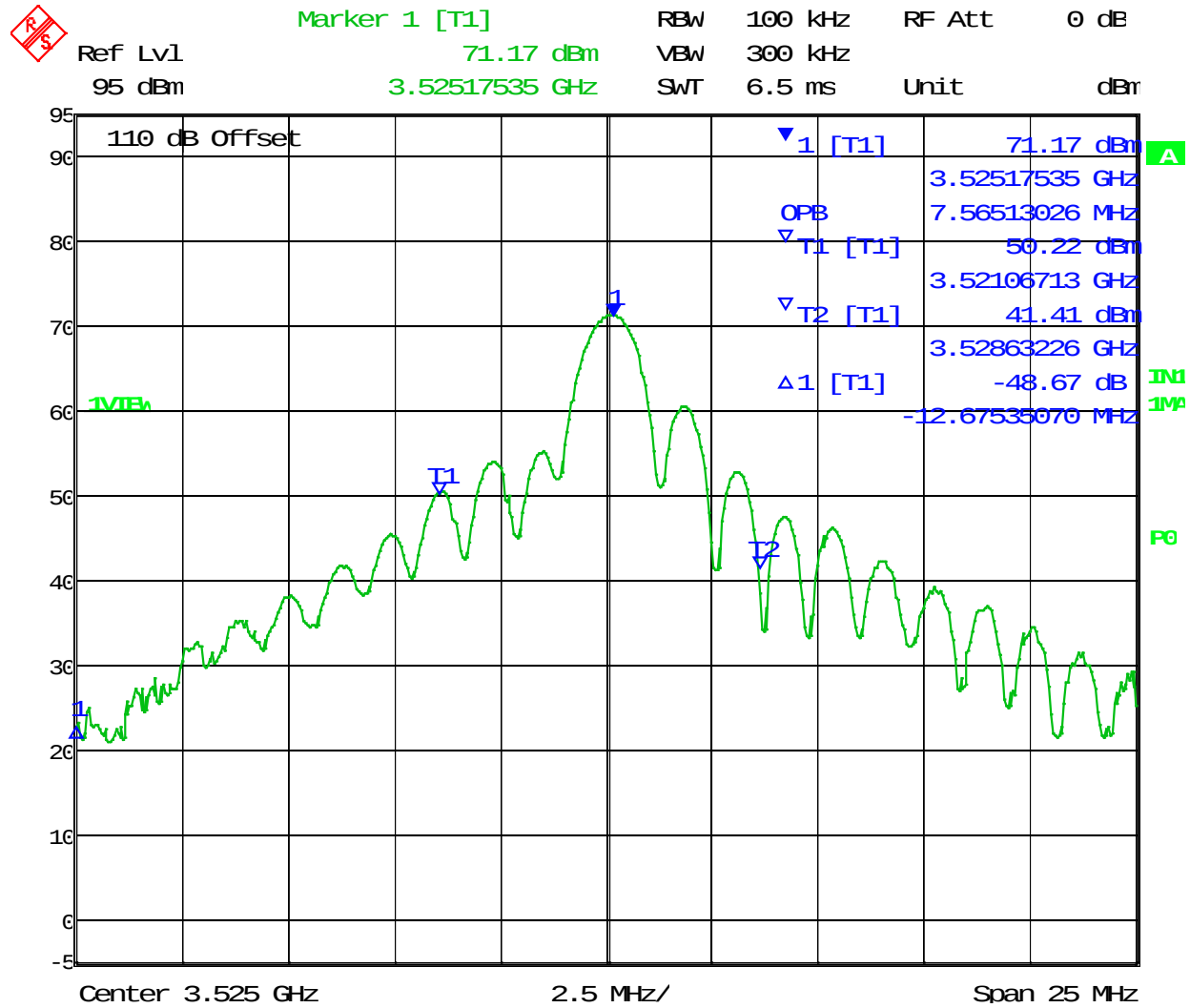


Date: 11.APR.2017 14:03:47

OCCUPIED BANDWIDTH



Test Data: 0.8 uS 99 % OBW Plot



Date: 11.APR.2017 14:11:18

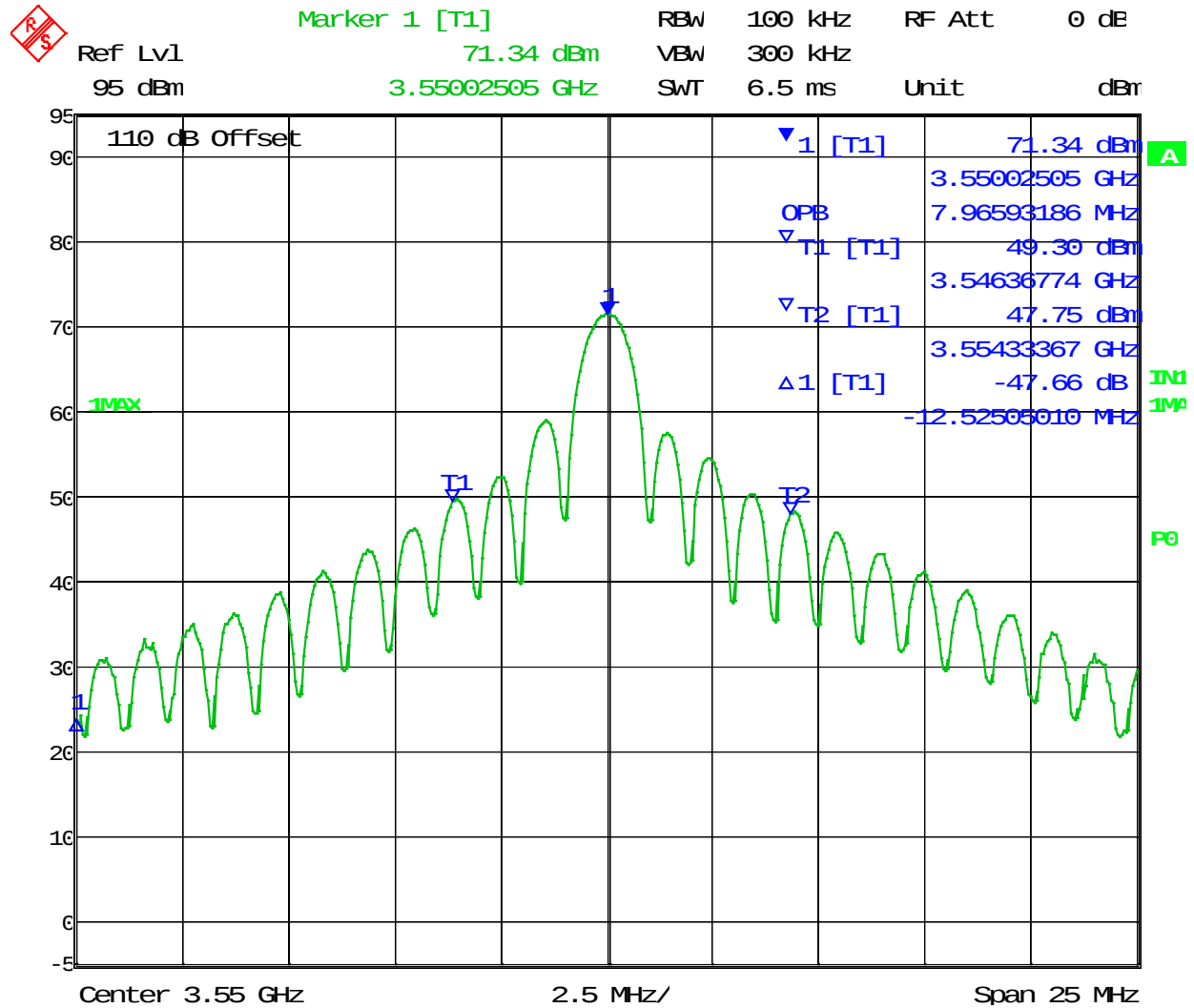
Applicant: Enterprise Electronics Corporation
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OCCUPIED BANDWIDTH



Test Data: 1 uS 99 % OBW Plot



Date: 11.APR.2017 15:26:20

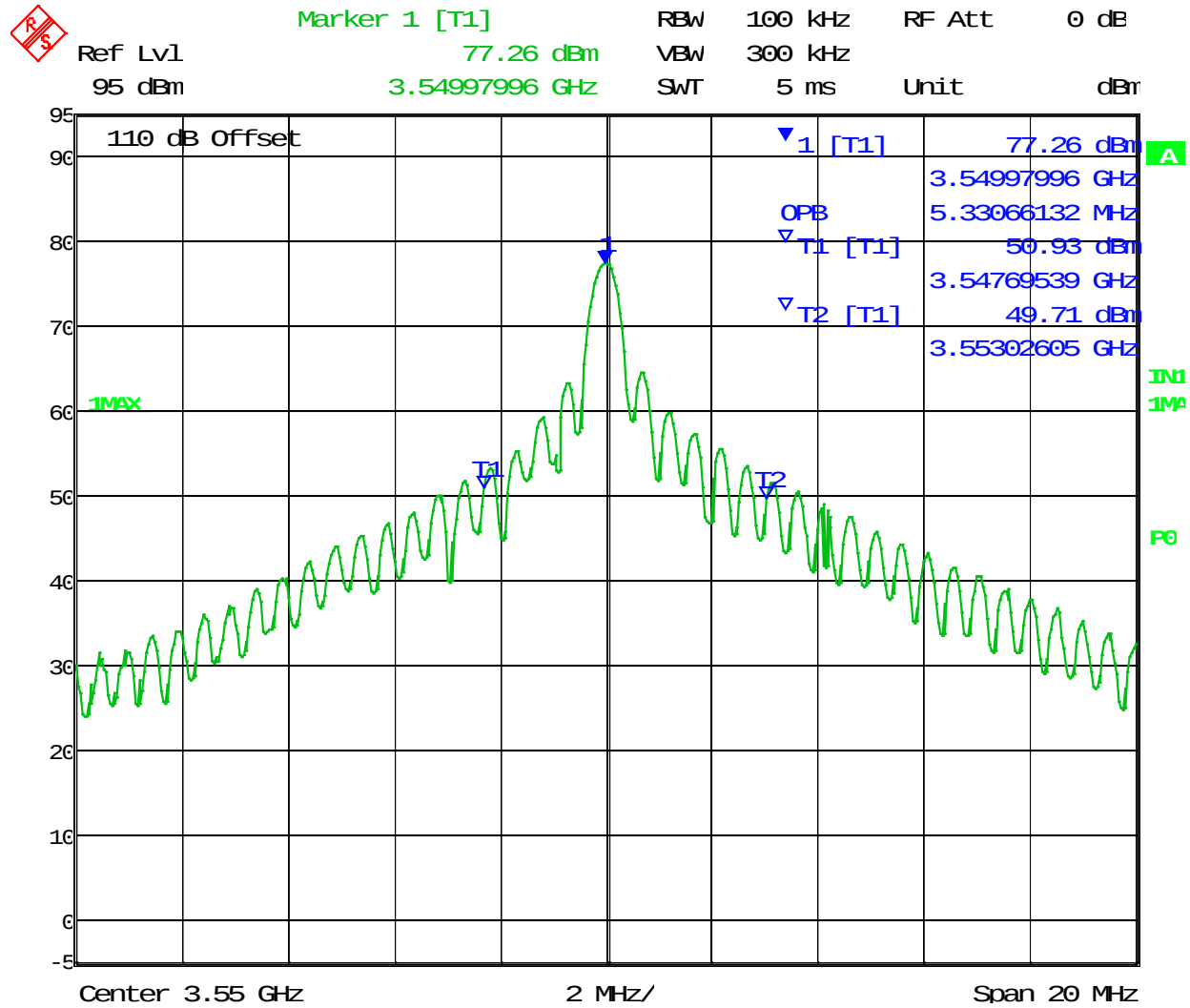
Applicant: Enterprise Electronics Corporation
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OCCUPIED BANDWIDTH



Test Data: 2 uS 99 % OBW Plot

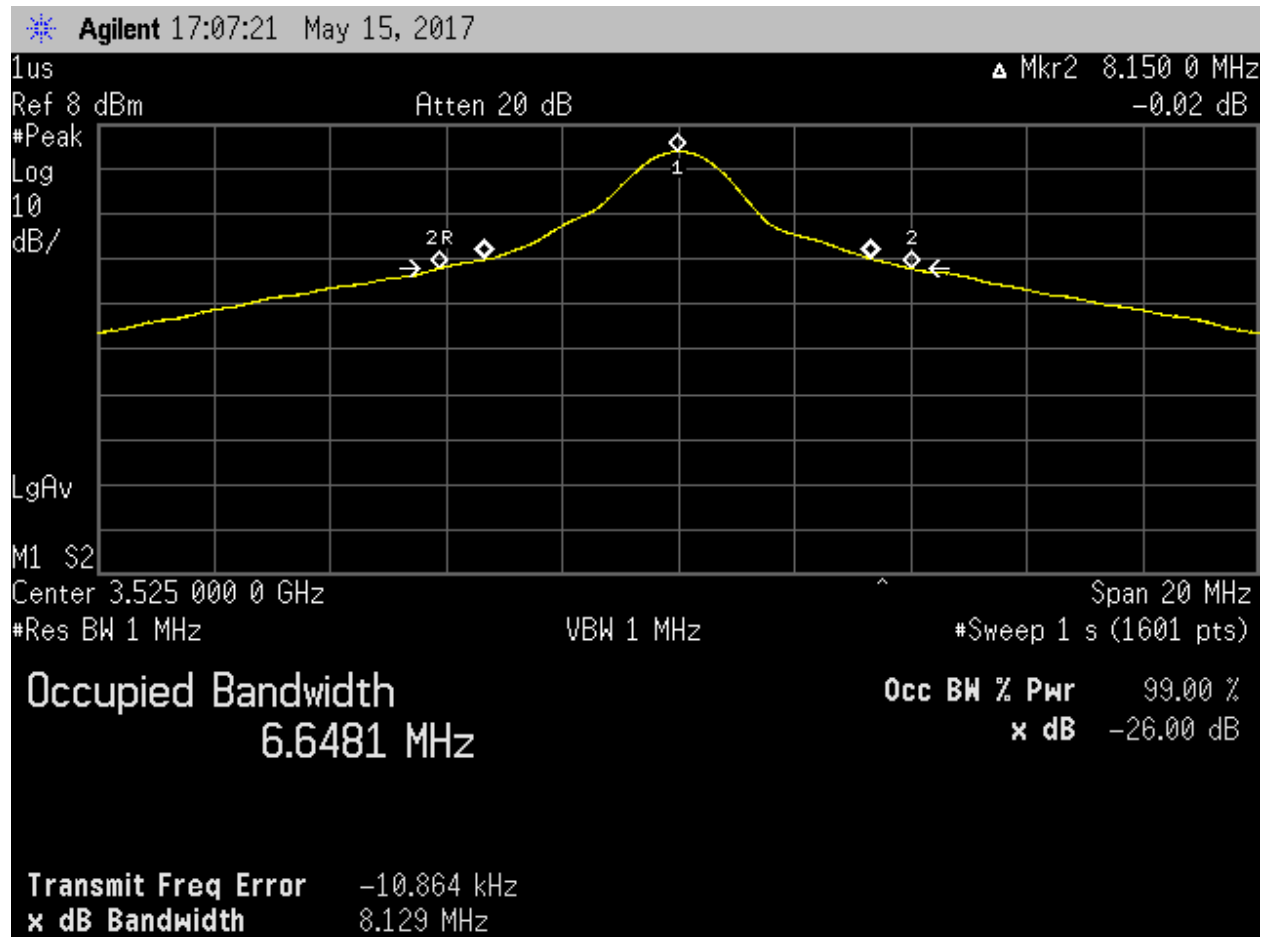


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OCCUPIED BANDWIDTH



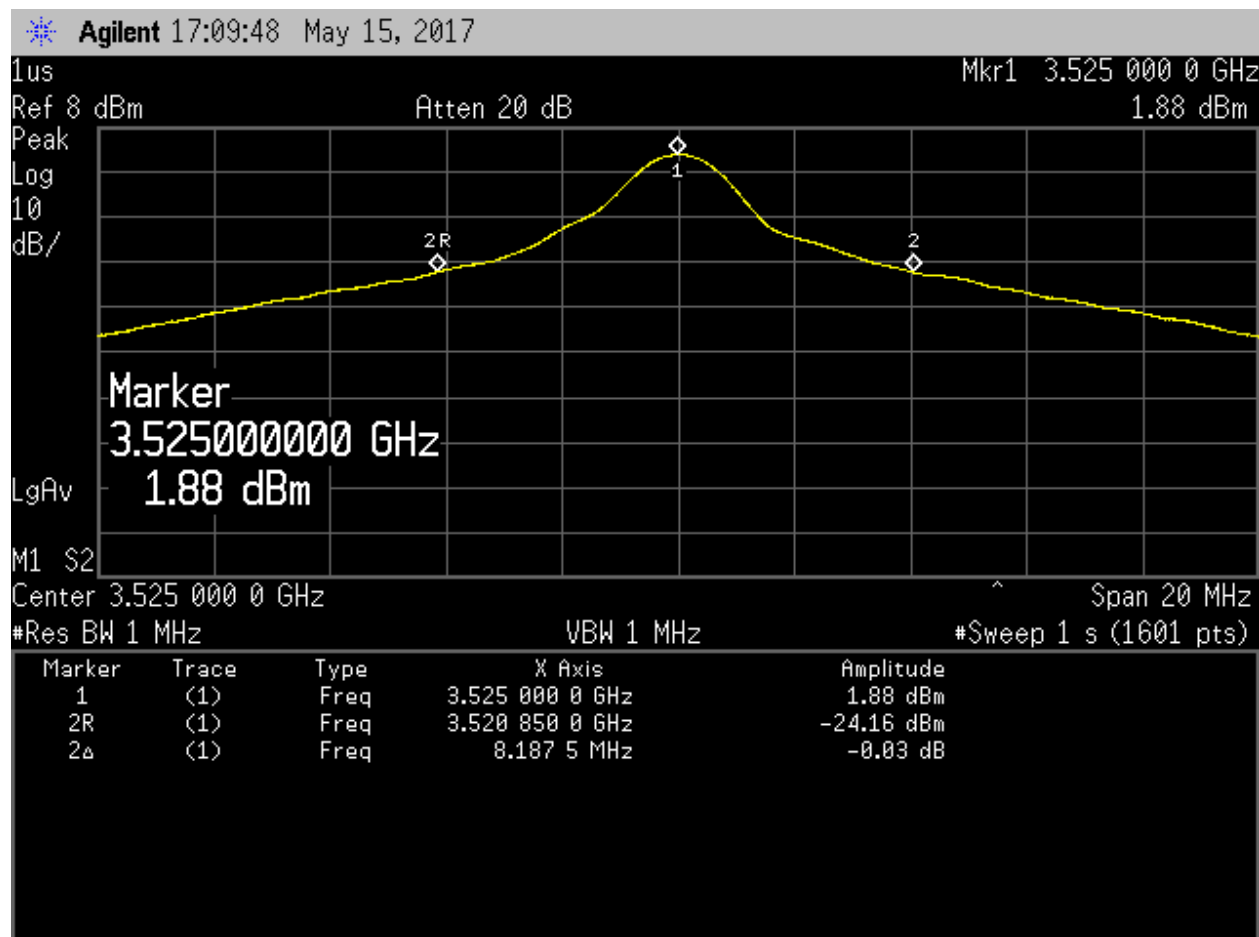
Test Data: 1.0us 99 % OBW Plot



OCCUPIED BANDWIDTH



Test Data: 1.0us 99 % OBW SA Plot



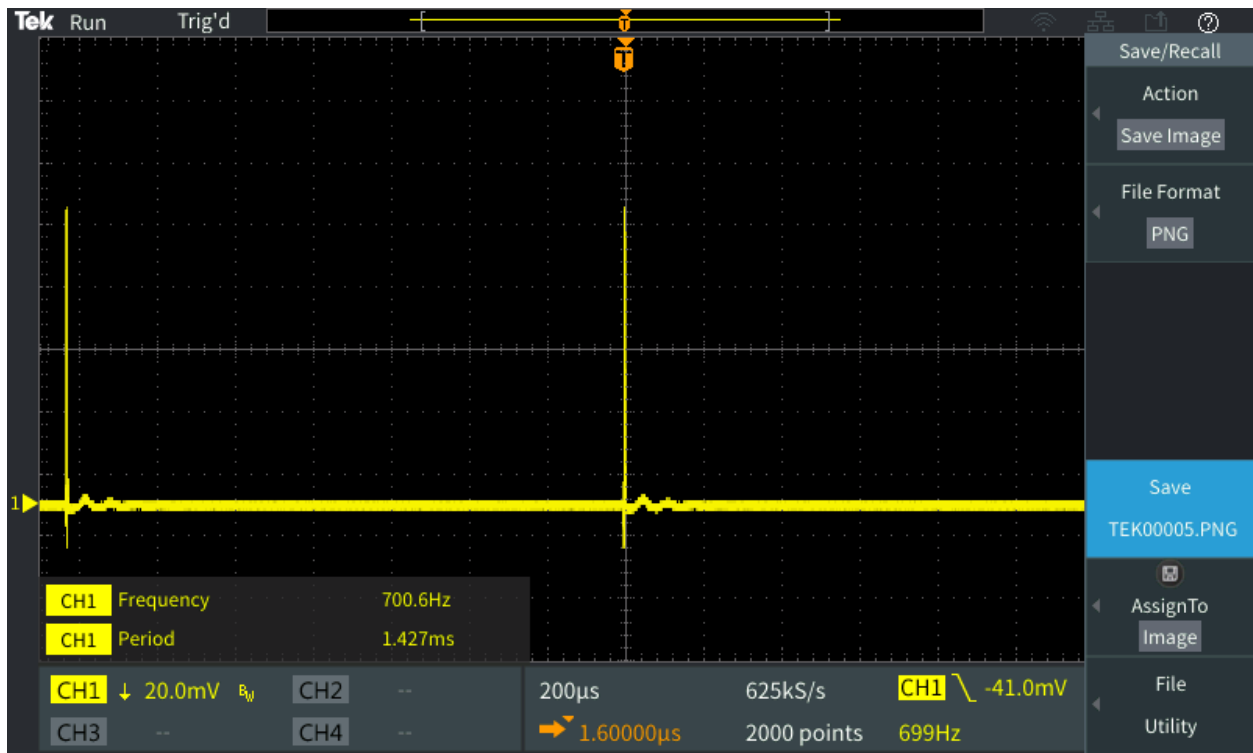
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OCCUPIED BANDWIDTH



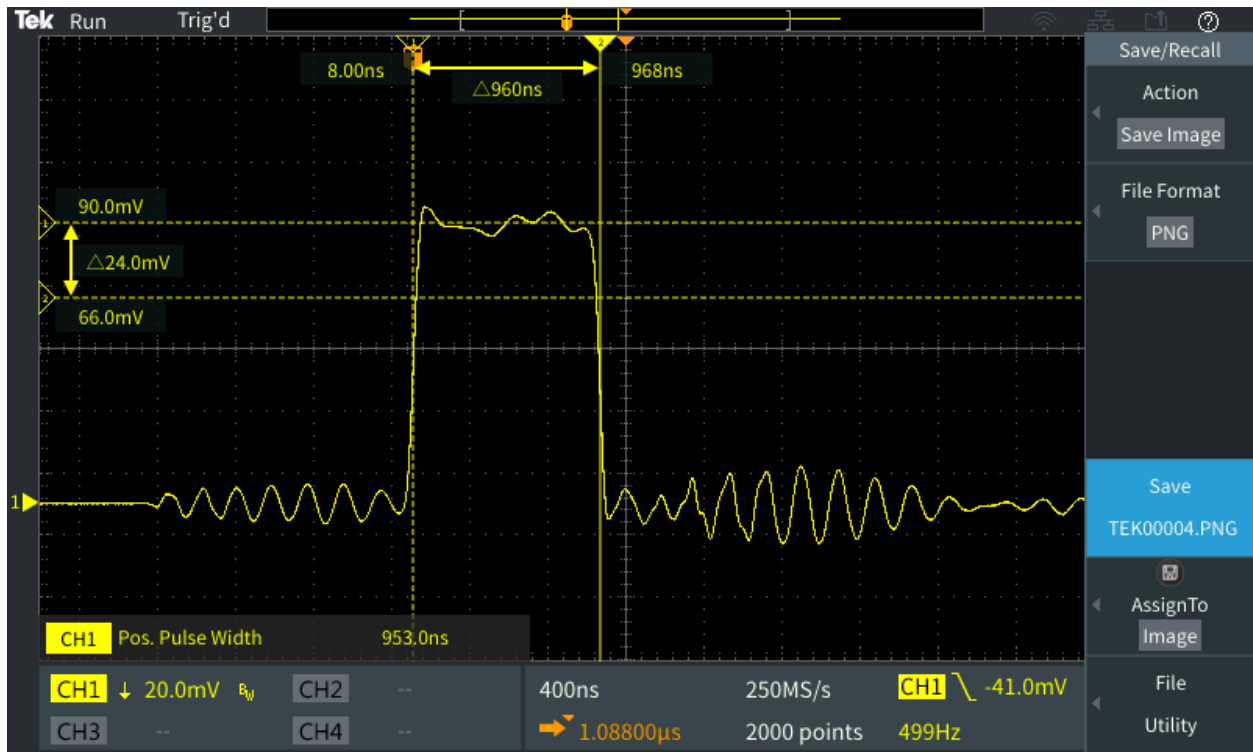
Test Data: 1.0us PRF Plot



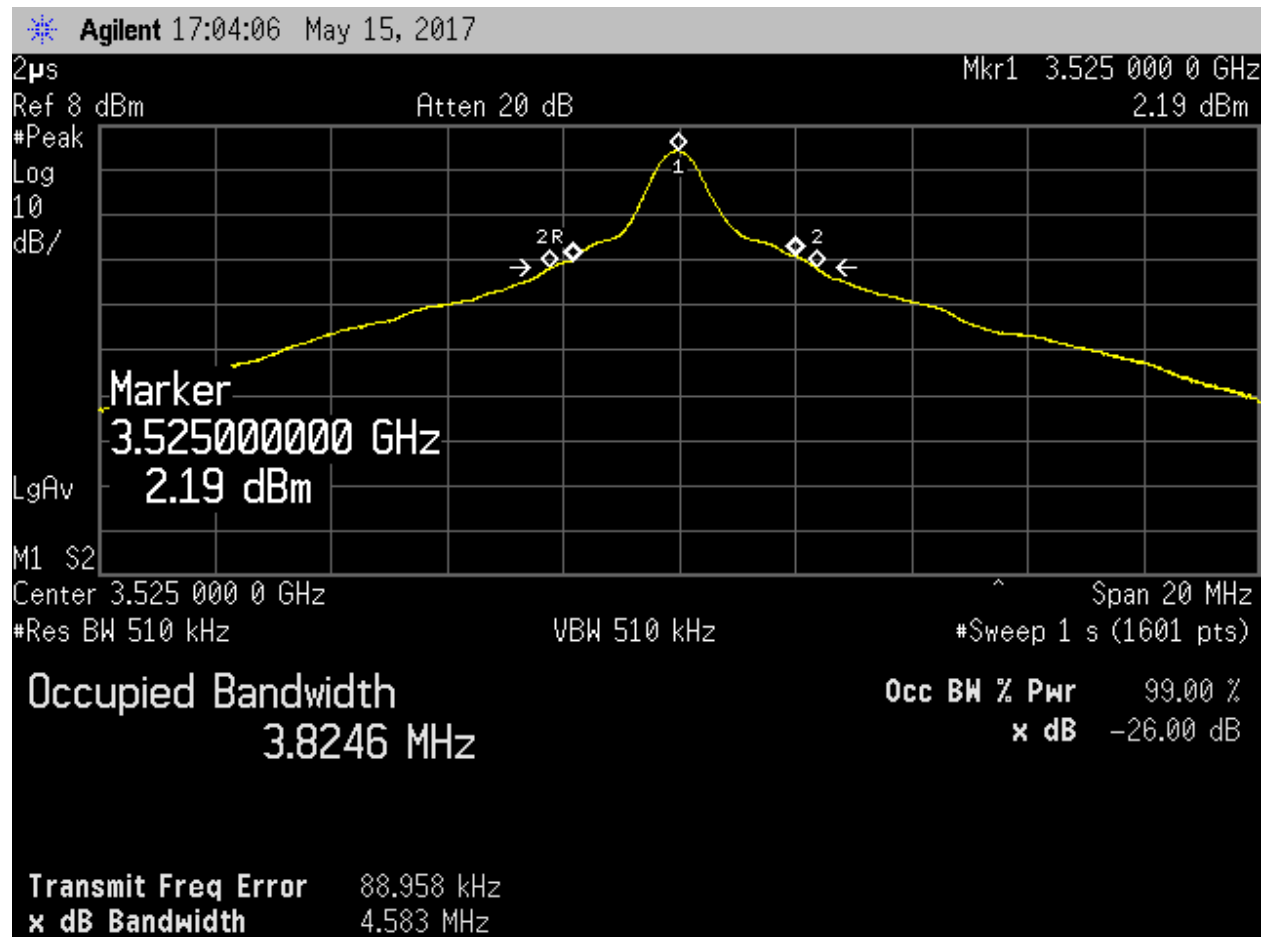
OCCUPIED BANDWIDTH



Test Data: 1.0us PW Plot



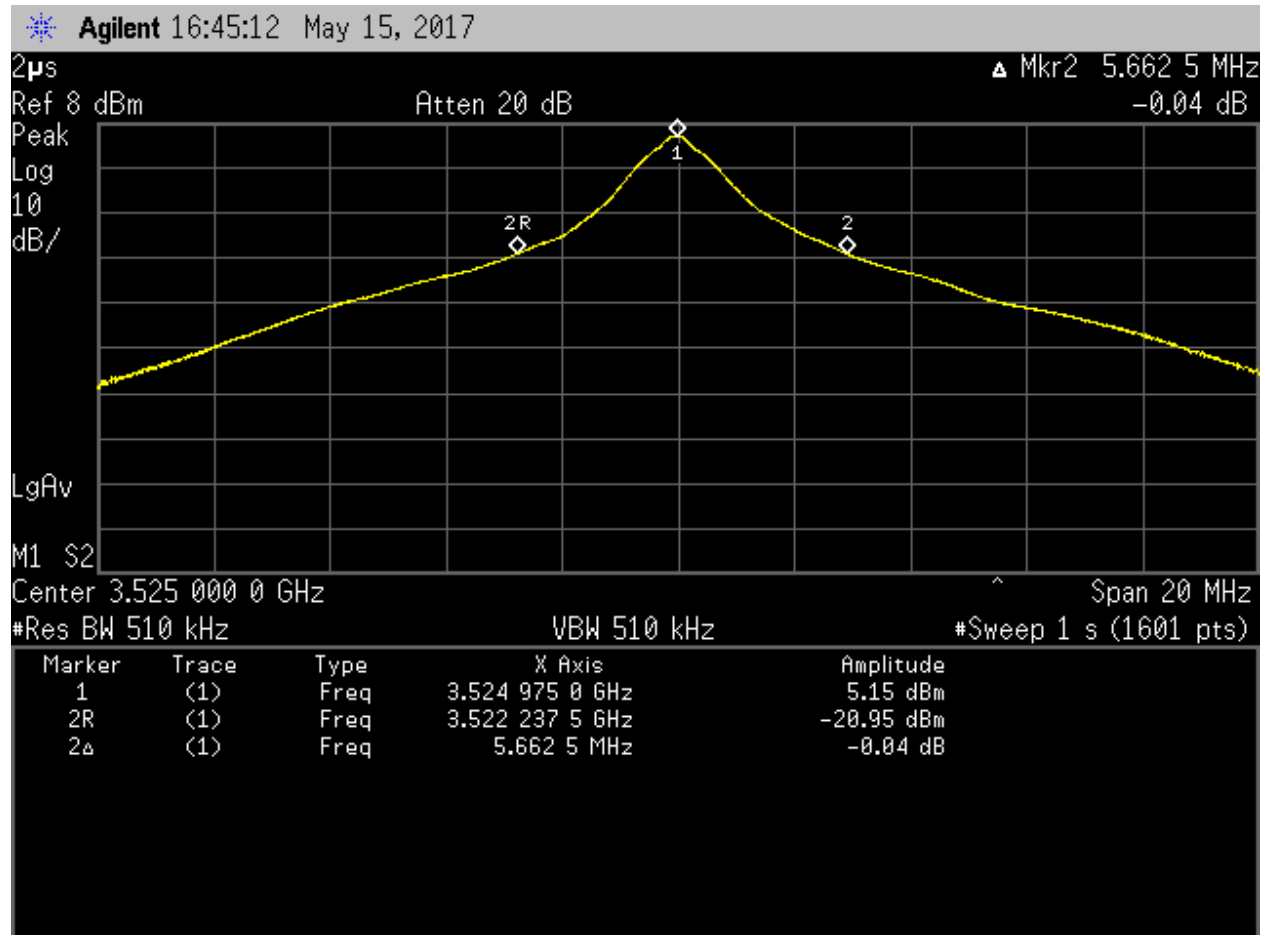
Test Data: 2.0us OBW Plot



OCCUPIED BANDWIDTH



Test Data: 2.0us OBW SA Plot



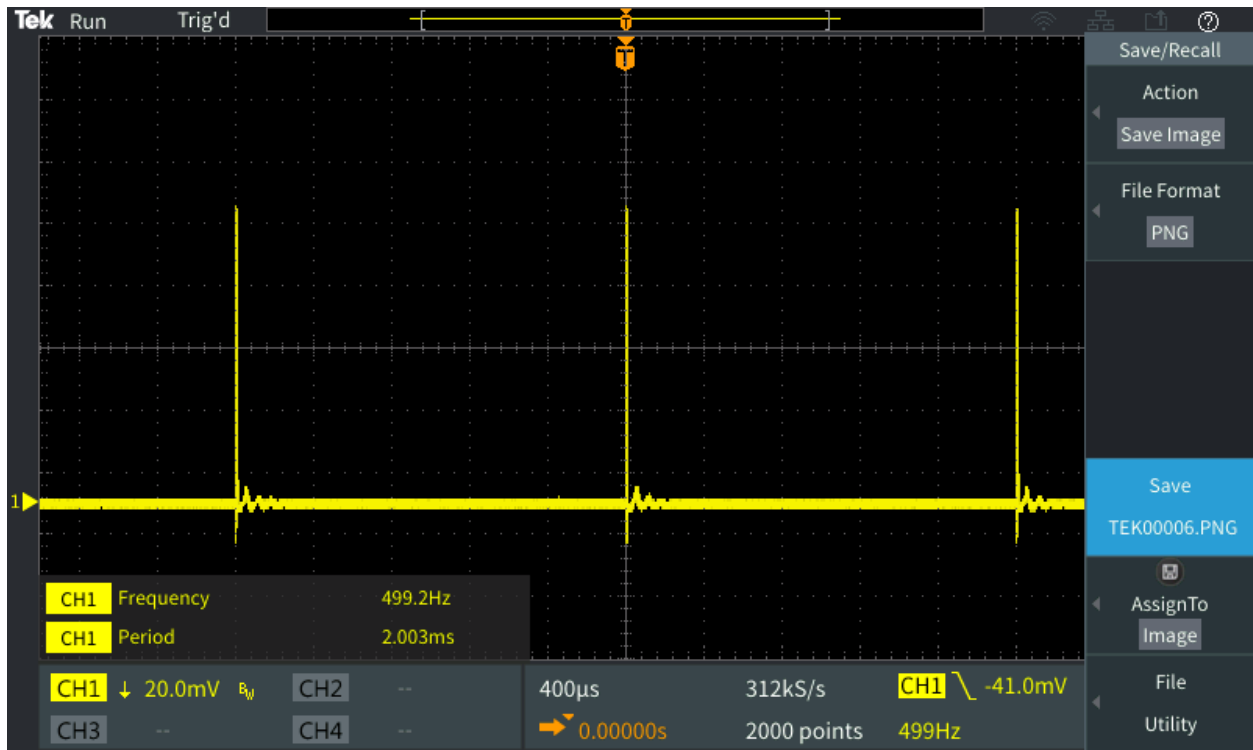
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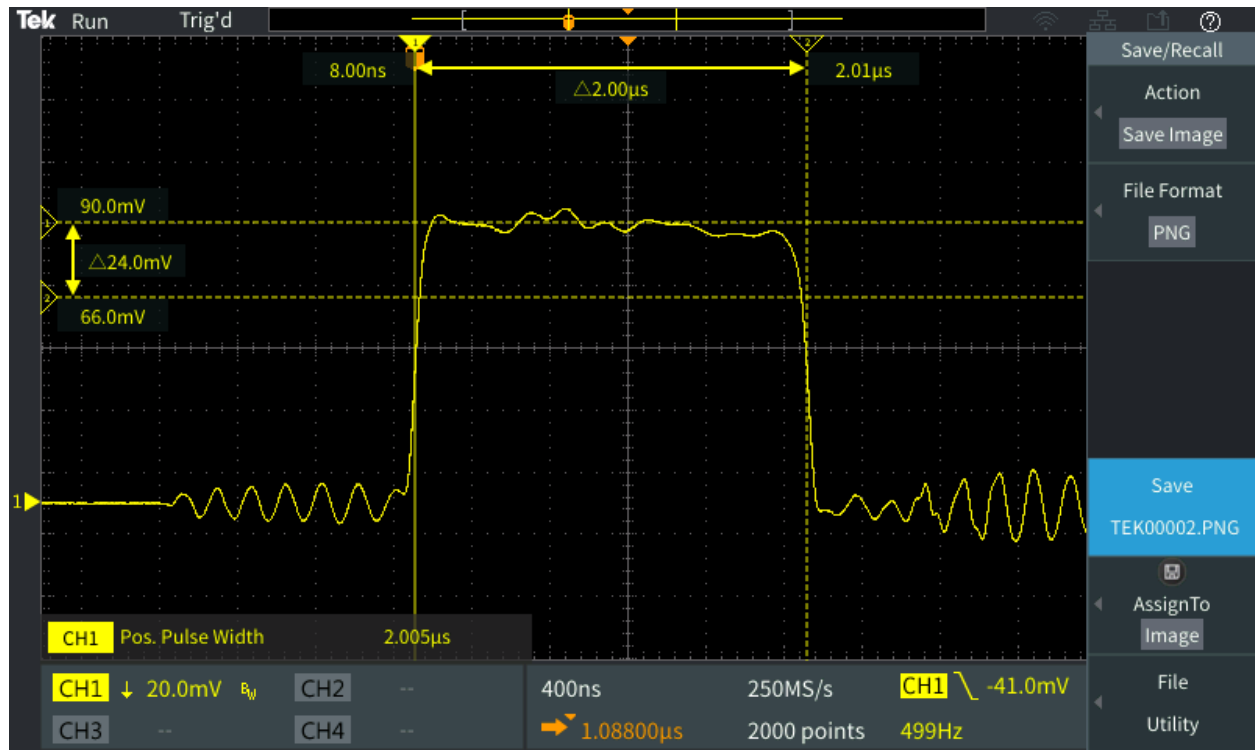
OCCUPIED BANDWIDTH



Test Data: 2.0us PRF Plot



Test Data: 2.0us PW Plot



SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

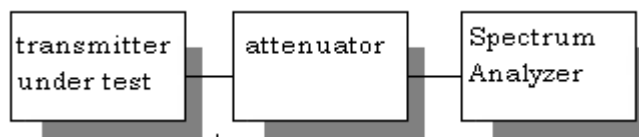
Rule Part No.: 2.1051, 90.210 (b)(3)

Requirements: 43+10log (P)

Procedure: The spectrum was scanned from 9 KHz - 40 GHz. The measurements were made in accordance with standard that is listed above.

The mean power was calculated based on the standard formula for radar systems:
 $P_a = P_m * T_d * f_r$. Where T_d is pulse duration, P_m is peak power, and f_r is pulse rep rate.

Setup Diagram:



Test Data: Measurement Table

Tuned Frequency (MHz)	Peak Power (dBm)	Peak Power (W)	Limit (dBc)
3525	89.92	981747.94	102.92
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	Margin (dB)
7050	-27.93	117.85	14.93
10575	-46.35	136.27	33.35
14100	-45.16	135.08	32.16
17625	-46.51	136.43	33.51
21150	-38.43	128.35	25.43
24675	-35.86	125.78	22.86
28200	-27.16	117.08	14.16
35250	-38.61	128.53	25.61
31725	-32.56	122.48	19.56

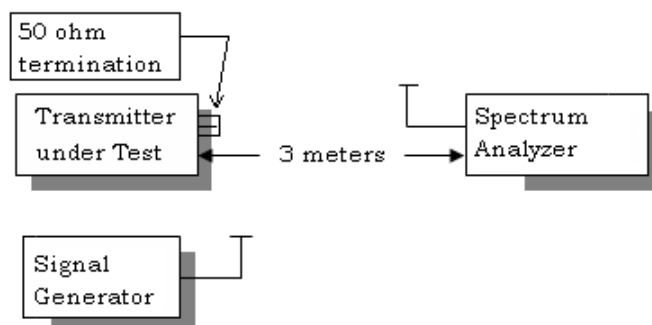
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: 2.1053, 90.210(b)(3)

Requirements: $43 + 10 \log(P)$

Procedure: The tabulated data shows the results of the substitution measurement of radiated field strength emissions test. The spectrum was scanned from 9 KHz - 40 GHz.

Setup Diagram:



Test Data: Measurement Table

Tuned Frequency (MHz)	Power Mode (Hi/Lo)	Peak Power(dBm)	Peak Power (Watts)	FCC Requirement (dB)	Measured BW (MHz)
3525	Hi	89.92	981747.94	102.92	8.91
Emission Frequency (MHz)	Ant. Polarity	ERP (dBm)	Below Carrier (dBc)		Margin
7,050.00	V	-48.3	138.22		35.30
10,575.00	V	-55.7	145.62		42.70
14,100.00	V	-36.1	126.02		23.10
17,625.00	H	-65.5	155.42		52.50
21,150.00	V	-66.5	156.42		53.50
24,675.00	H	-69.5	159.42		56.50
28,200.00	H	-60.5	150.42		47.50
31,725.00	H	-60.3	150.22		47.30
35,250.00	H	-58.9	148.82		45.90

FREQUENCY STABILITY

Rule Parts. No.: 2.1055, 90.213

Requirements: Manufacturers specification, authorization reviewed on a case-by-case basis.

Procedure: The test procedures used are detailed in the standard that is listed above.

Notes: The EUT was too large to fit inside Thermal chamber; the frequency generating components only were placed inside the thermal chamber for this test as shown in the test setup photo

Test Data Measurement Table

Temperature	Frequency MHz	Cycles	PPM
25°C (reference)	3464.971172		
-30°C	3464.971827	655	0.189
-20°C	3464.971708	536	0.155
-10°C	3464.971559	387	0.112
0°C	3464.971405	233	0.067
10°C	3464.971223	51	0.015
20°C	3464.971150	-22	-0.006
30°C	3464.970864	-308	-0.089
40°C	3464.970801	-371	-0.107
50°C	3464.970314	-858	-0.248
Input Voltage	Frequency	Cycles	PPM
-15%	3464.971166	-6	-0.002
15%	3464.971173	1	0.000

EQUIPMENT LIST



Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Attenuator K 6dB W DC-	Narda	476-6	044-3	06/25/15	06/25/17
Antenna: Biconical 1096 Chamber	Eaton	94455-1	1096	07//15	07/14/17
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/14/15	07/14/17
Antenna: Dipole Kit 153	Electro-Metrics	TDA-30/1-4	153	NA	NA
Digital Multimeter	Fluke	77	35053830	10/21/15	10/21/17
Antenna: Standard Gain Horn 1.0-2.4 GHz	Polarad	CA-L	5	NA	NA
Antenna: Standard Gain Horn 2.14-4.34 GHz	Polarad	CA-S	203	NA	NA
Antenna: Standard Gain Horn 3.95-5.85 GHz	Scientific-Atlanta Inc.	12-3.9	8105CF	NA	NA
Antenna: Standard Gain Horn 8.2-12.5 GHz	Systron Donner	DBG-520-20	Not Serialized	NA	NA
Antenna: Standard Gain Horn 18.0-26.3 GHz	Systron Donner	DBE-520-20	Not Serialized	NA	NA
Antenna: Standard Gain Horn 26.5-40.2 GHz	Systron Donner	DBD-520-20	Not Serialized	NA	NA
Antenna: Standard Gain Horn 5.85-8.2 GHz	ATM	137-442-2	D261908-01	NA	NA
Coaxial Cable - Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMKM-0244-02 ; KMKM-0670-01; KFKF-0197-00	NA	NA
Sweep/Signal Generator	Anritsu	68369B	985112	10/28/15	10/28/17
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren Chamber	3117	00041534	02/25/15	02/25/17
Software: Field Strength Program	Timco	N/A	Version 4.0	NA	NA
Antenna: Active Loop	ETS-Lindgren	6502	00062529	11/18/15	11/18/17
USB Peak Power Sensor 50 MHz to 18 GHz	Boonton	55318	9224	09/13/16	09/13/18
Coaxial Cable #103 - KMKM-0180-01 Aqua	Micro-Coax	UFB142A-0-0720-200200	225363-002 (#103)	08/05/15	08/05/17
Type K J	Martel	303	080504494	10/26/15	10/26/17

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Thermometer					
EMI Test Receiver R & S ESIB 40	Rohde & Schwarz	ESIB 40	100274	08/16/16	08/16/18
High Pass Filter 18GHz	Micro-Tronics	HPS18771	-002	05/13/16	05/13/18
High Pass Filter 6.2 GHz	Micro-Tronics	HPS17647	-002	04/12/17	04/12/19
Attenuator N 30dB 20W DC-4G	CLASS III	34078	M3933/10-5	05/19/15	05/19/17
Adapter Waveguide WR-284 to Coax SMA	Advanced Microwave Corp	WR284/SMAF	NA	NA	NA
High Pass Filter 980MHz	Microlab	HA-20N	NA	NA	06/17/17
Antenna: Double-Ridged Horn 18-40 GHz	EMCO	3116	9011-2145	11/18/15	11/18/17
Spectrum Analyzer	Agilent	E4445A	US42220301	12/18/16	12/18/18
Oscilloscope	Tektronik	DPO 3054	C0101411	04/04/17	04/04/19

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

END OF REPORT