



Test Report - FCC PART 90 (TNB)

Prepared For: BARON WEATHER INC.

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager

Date of Signature
(YYYY-MM-DD): 2021-04-30

This test report shall not be reproduced except in full without the written and signed permission of Timco Engineering Inc. (IIA). This test report relates only to the items tested as identified and is not valid for any subsequent changes or modifications made to the equipment under test.

Table of Contents

1.	CUSTOMER INFORMATION.....	5
1.1	PART 2 TEST RESULT SUMMARY.....	5
1.2	PART 90 TEST RESULT SUMMARY	5
2.	LOCATION OF TESTING	6
2.1	TEST LABORATORY	6
2.2	TESTING WAS PERFORMED, REVIEWED BY	6
3.	TEST SAMPLE(S) (EUT/DUT).....	7
3.1	DESCRIPTION OF THE EUT.....	7
3.2	CONFIGURATION OF EUT	8
3.3	TEST SETUP OF EUT	8
4.	TEST METHODS & APPLICABLE REGULATORY LIMITS.....	9
4.1	TEST METHODS/STANDARDS/GUIDANCE:	9
4.2	APPLIED LIMITS AND REGULATORY LIMITS:.....	9
5.	MEASUREMENT UNCERTAINTY.....	9
6.	ENVIRONMENTAL CONDITIONS	9
6.1	TEMPERATURE & HUMIDITY.....	9
7.	LIST OF TEST EQUIPMENT AND TEST FACILITY.....	10
7.1	LIST OF TEST EQUIPMENT	10
8.	TEST RESULTS	11
8.1	POWER AT THE FINAL AMPLIFIER.....	12
8.2	RF OUTPUT POWER	13
8.3	BANDWIDTH & EMISSION	14
8.3.1	<i>Bandwidth Plot, 99%, 2900 MHz, 0.8us.....</i>	<i>16</i>
8.3.2	<i>Bandwidth Plot, 99%, 2900 MHz, 1us</i>	<i>17</i>
8.3.3	<i>Bandwidth Plot, 99%, 2900 MHz, 2us</i>	<i>18</i>
8.3.4	<i>Bandwidth Plot, 99%, 2900 MHz, 4.5us.....</i>	<i>19</i>
8.3.5	<i>Bandwidth Plot, 40 dB BW, 2900 MHz, 0.8us</i>	<i>20</i>
8.3.1	<i>Bandwidth Plot, 40 dB BW, 2900 MHz, 1us</i>	<i>21</i>
8.3.2	<i>Bandwidth Plot, 40 dB BW, 2900 MHz, 2us.....</i>	<i>22</i>
8.3.3	<i>Bandwidth Plot, 40 dB BW, 2900 MHz, 4.5us.....</i>	<i>23</i>
8.3.4	<i>Bandwidth Plot, 99%, 2950 MHz, 0.8us.....</i>	<i>24</i>
8.3.5	<i>Bandwidth Plot, 99%, 2950 MHz, 1us.....</i>	<i>25</i>
8.3.6	<i>Bandwidth Plot, 99%, 2950 MHz, 2us</i>	<i>26</i>
8.3.7	<i>Bandwidth Plot, 99%, 2950 MHz, 4.5us.....</i>	<i>27</i>
8.3.8	<i>Bandwidth Plot, 40 dB BW, 2950 MHz, 0.8us.....</i>	<i>28</i>
8.3.9	<i>Bandwidth Plot, 40 dB BW, 2950 MHz, 1us</i>	<i>29</i>
8.3.10	<i>Bandwidth Plot, 40 dB BW, 2950 MHz, 2us</i>	<i>30</i>

8.3.11	Bandwidth Plot, 40 dB BW, 2950 MHz, 4.5us.....	31
8.3.12	Bandwidth Plot, 99%, 3000 MHz, 0.8us	32
8.3.13	Bandwidth Plot, 99%, 3000 MHz, 1us	33
8.3.14	Bandwidth Plot, 99%, 3000 MHz, 2us	34
8.3.15	Bandwidth Plot, 99%, 3000 MHz, 4.5us.....	35
8.3.16	Bandwidth Plot, 40 dB BW, 3000 MHz, 0.8us	36
8.3.17	Bandwidth Plot, 40 dB BW, 3000 MHz, 1us.....	37
8.3.18	Bandwidth Plot, 40 dB BW, 3000 MHz, 2us.....	38
8.3.19	Bandwidth Plot, 40 dB BW, 3000 MHz, 4.5us	39
8.4	EMISSION LIMITATIONS, IN-BAND.....	40
8.4.1	Emission Mask, 2900 MHz, 0.8us	41
8.4.2	Emission Mask, 2900 MHz, 1us	42
8.4.3	Emission Mask, 2900 MHz, 2us.....	43
8.4.1	Emission Mask, 2900 MHz, 4.5us	44
8.4.2	Emission Mask, 2950 MHz, 0.8us	45
8.4.3	Emission Mask, 2950 MHz, 1us	46
8.4.4	Emission Mask, 2950 MHz, 2us	47
8.4.5	Emission Mask, 2950 MHz, 4.5us.....	48
8.4.6	Emission Mask, 3000 MHz, 0.8us.....	49
8.4.7	Emission Mask, 3000 MHz, 1us.....	50
8.4.8	Emission Mask, 3000 MHz, 2us.....	51
8.4.9	Emission Mask, 3000 MHz, 4.5us	52
8.5	EMISSION LIMITATIONS, OUT-OF-BAND.....	53
8.5.1	Conducted Emissions 30 MHz to 1 GHz, 2900 MHz.....	54
8.5.2	Conducted Emissions 1 to 40 GHz , 2900 MHz	55
8.5.1	Conducted Emissions 30 MHz to 1 GHz, 2950 MHz	56
8.5.2	Conducted Emissions 1 to 40 GHz , 2950 MHz	57
8.5.1	Conducted Emissions 30 MHz to 1 GHz, 3000 MHz.....	58
8.5.1	Conducted Emissions 1 to 40 GHz, 3000 MHz	59
8.6	RADIATED EMISSIONS.....	60
8.6.1	Radiated Emissions, 2900 MHz	61
8.6.2	Radiated Emissions, 2950 MHz	62
8.6.3	Radiated Emissions, 3000 MHz.....	62
8.7	MODULATION CHARACTERISTICS.....	63
8.7.1	Test Data: 0.8 uS Pulse width Plot.....	64
8.7.2	Test Data: 0.8 uS Rep Rate Plot	65
8.7.3	Test Data: 1 uS Pulse width Plot	66
8.7.4	Test Data: 1 uS Rep Rate Plot	67
8.7.5	Test Data: 2 uS Pulse width Plot	68
8.7.6	Test Data: 2 uS Rep Rate Plot.....	69
8.7.7	Test Data: 4.5 uS Pulse width Plot.....	70
8.7.8	Test Data: 4.5 uS Rep Rate Plot.....	71
8.7.1	Audio Frequency Response.....	72
8.7.2	Low Pass Filter Response.....	72
8.7.3	Modulation Limiting	72
8.8	FREQUENCY STABILITY.....	73



8.8.1 Frequency Stability Data74

8.8.2 Frequency Stability Plot75

8.9 TRANSIENT FREQUENCY BEHAVIOR.....76

8.10 ADJACENT CHANNEL POWER LIMITS.....77

9. ANNEX-A - PHOTOGRAPHS OF THE EUT.....78

10. ANNEX-B – TEST SETUP PHOTOGRAPHS.....78

11. HISTORY OF TEST REPORT CHANGES.....78

1. Customer Information

Applicant: BARON WEATHER INC.
Address: 4930 Research Dr.
 Huntsville, Alabama 35805

1.1 Part 2 Test Result Summary

The following test procedure and guidance were used for measuring FCC PART 90 known as Licensed Maritime Radiotelephone; ANSI C63.26-2015. Full test results are available in this report.

Applicable Clauses from Part 2		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
2.202	Bandwidth & Emission	Pass
2.1033 (c)(8)	Power at the Final Amplifier	Reported
2.1046 (a)	RF Output Power	Pass
2.1047	Modulation characteristics	Pass
2.1049	Occupied Bandwidth	Pass
2.1051	Spurious emissions at antenna terminals	Pass
2.1053	Field strength of spurious radiation	Pass
2.1055	Frequency stability	Pass

1.2 Part 90 Test Result Summary

The following test procedure and guidance were used for measuring FCC PART 90 (PRIVATE LAND MOBILE RADIO SERVICES) known as Licensed Land Mobile; ANSI C63.26-2015. Full test results are available in this report.

Applicable Clauses from Part 90		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
90.205 (r)	Transmitter Power	Pass
90.207 (n)	Emission designator	Reported
90.209 (b) (5) footnote 2	Bandwidth limitations	Pass
90.210 (n)	Emission masks, In-band	Pass
90.210 (n)	Emission masks, Out-of-band	Pass
90.213 (a) footnote 10	Frequency stability	Pass
90.214	Transient Frequency Behavior	n/a
90.221	Adjacent channel power limits	n/a

No additions to the test methods were needed. There were no deviations, or exclusions from the test methods. No test results are from external providers or from the customer. The test results relate only to the items tested. Timco does not offer opinions and interpretations, only a pass/fail statement.

2. Location of Testing

2.1 Test Laboratory

Timco Engineering Inc. is a subsidiary of Industrial Inspection & Analysis, Inc. ("IIA"). Testing was performed at Timco's permanent laboratory located at 849 NW State Road 45, Newberry, Florida 32669

FCC test firm # 578780
FCC Designation # US1070
FCC site registration is under A2LA certificate # 0955.01
ISED Canada test site registration # 2056A
EU Notified Body # 1177
For all designations see A2LA scope # 0955.01

2.2 Testing was performed, reviewed by

Dates of Testing: 2/27/2023 – 2/28/2023



Sr. EMC Engineer
EMC-003838-NE



Signature: _____

Name & Title: _____
Tim Royer, EMC Engineer

Date of Signature 6/23/2023

3. Test Sample(s) (EUT/DUT)

The test sample was received: 2/27/2023

3.1 Description of the EUT

A description as well as unambiguous identification of the EUT(s) tested. Where more than one sample is required for technical reasons (such as the use of connected units for the purpose of conducted output power testing where the product units will have integral antennas), each specific test shall identify which unit was tested.

Identification	
FCC ID:	NX5-GEN3-1000SK
Brief Description	Baron GEN3 1MW S-Band Klystron
Type of Modular	n/a
Model(s) #	GEN3-1000SK
Trade name	n/a
Firmware version	n/a
Software version	n/a
Serial Number	n/a

Technical Characteristics	
Technology	Licensed Non-Broadcast Station Transmitter
Frequency Range	2900 - 3000 MHz
RF O/P Power (Max.)	1000 kW
Modulation	Pulse w/ no modulation.
Bandwidth & Emission Class	13M7P0N
Number of Channels	n/a
Antenna Connector	WR284 Waveguide
Voltage Rating (AC or Batt.)	120/208V 3PH

Antenna Characteristics		
Antenna Name	Frequency Range	Dimensions
BS300774	2900-3000 MHz	6M Parabolic Prime Focus

3.2 Configuration of EUT

Test Modes			
Band	Mode (#)	Test Frequencies	Modulation
2.9 – 3 GHz	0.8 us	2.9, 2.95, 3 GHz	Pulse
2.9 – 3 GHz	1 us	2.9, 2.95, 3 GHz	Pulse
2.9 – 3 GHz	2 us	2.9, 2.95, 3 GHz	Pulse
2.9 – 3 GHz	4.5 us	2.9, 2.95, 3 GHz	Pulse

Operating conditions during Testing:

The device was operated without the provided antenna(s).

No other modifications of the device under test (including firmware, specific software settings, and input/output signal levels to the EUT) were made.

Peripherals used during Testing:

A laptop provided by the manufacturer was used to control the EUT.

3.3 Test Setup of EUT

Equipment, antenna, and cable arrangement. The setup of the equipment and cable or wire placement on the test site that produces the highest radiated and the highest ac power line conducted emissions shall be shown clearly and described. Information on the orientation of portable equipment during testing shall be included. Drawings or photographs may be used for this purpose.

Test Setups are included in the test report.

4. Test methods & Applicable Regulatory Limits

4.1 Test methods/Standards/Guidance:

Test procedures and guidance for measuring Licensed Part 90 Licensed device:

- 1) ANSI C63.26-2015
- 2) ITU-R M.1177-3

4.2 Applied Limits and Regulatory Limits:

- 1) FCC CFR 47 Part 90

5. Measurement Uncertainty

Parameter	Uncertainty (dB)
Conducted Emissions	± 3.14 dB
Radiated Emissions (9kHz – 30 MHz)	± 3.08 dB
Radiated Emissions (30 – 200 MHz)	± 2.16 dB
Radiated Emissions (200 – 1000 MHz)	± 2.15 dB
Radiated Emissions (1 GHz – 18 GHz)	± 2.14 dB
Radiated Emissions (18 GHz – 40 GHz)	± 2.31 dB
Note: The uncertainties provided in this table represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of K=2.	

6. Environmental Conditions

6.1 Temperature & Humidity

Measurements performed at the test site did not exceed the following:

Temperature	23 C +/- 5%
Humidity	55% +/- 5%
Note: Specific environmental conditions that are applicable to a specific test are available in the test result section.	

7. List of Test Equipment and Test Facility

The test equipment used identified by type, manufacturer, serial number, or other identification and the date on which the next calibration or service check is due.

Description of the firmware or software used to operate EUT for testing purposes.

A complete list of all test equipment used shall be included with the test report. The manufacturer's model and serial numbers, and date of last calibration, and calibration interval shall be included. Measurement cable loss, measuring instrument bandwidth and detector function, video bandwidth, if appropriate, and antenna factors shall also be included where applicable.

7.1 List of Test Equipment

Test Equipment						
Type	Device	Manufacturer	Model	SN#	Current Cal	Cal Due
Thermometer	Type K J Thermometer	Martel	303	080504494	1/16/23	1/16/2024
Receiver	EMI Test Receiver R&S ESU 40	Rohde & Schwarz	ESU 40	100320	5/27/21	5/26/2024
Antenna	Biconical 1096	Eaton	94455-1	1096	5/4/21	5/3/2024
Antenna, NSA	Log-Periodic 409	Electro-Metrics	LPA-30	409	5/4/21	5/3/2024
Antenna	Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	10/14/20	10/14/2023
Power Sensor	R&S 18 GHz USB Peak Power Sensor	Rohde & Schwarz	NRP-Z85	1411.7501.02-102085-VV	8/3/22	8/3/2023

8. Test Results

The results of the test are usually indicated in the form of tables, spectrum analyzer plots, charts, sample calculations, as appropriate for each test procedure.

A description and/or a block diagram of the test setup is usually provided.

The measurement results, along with the appropriate limits for comparison, may be presented in tabular or graphical form. In addition, any variation in the measurement environment may be reported if applicable (e.g., a significant change of temperature that could affect the cable loss and amplifier response).

Unless noted otherwise in the referenced standard, the measurements of **ac power-line conducted emissions and conducted power output** will be reported in units of dB μ V. Unless noted otherwise in the referenced standard, the measurements of **radiated emissions** will be reported in units of decibels, referenced to one microvolt per meter (dB μ V/m) for electric fields, or to one ampere per meter (dBA/m) for magnetic fields, at the distance specified in the appropriate standards or requirements. The measurements of antenna-conducted power for receivers may be reported in units of dB μ V if the impedance of the measuring instrument is also reported. Otherwise, antenna-conducted power will be reported in units of decibels referenced to one milliwatt (dBm). All formulas for data conversions and conversion factors, if used, will be included in this measurement report.

8.1 Power at the Final Amplifier

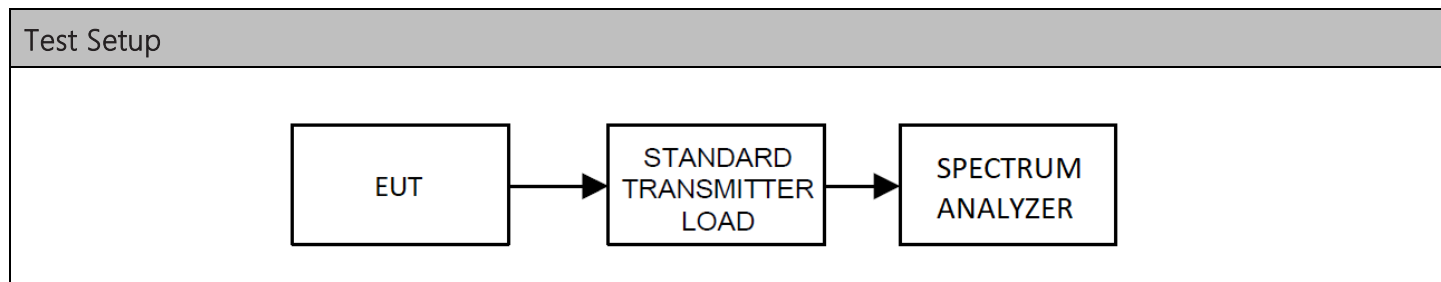
Limits from FCC Part 2.1033 (c)(8).

No method of measurement is specified. The result has been calculated based on all available information.

Test Results		
EUT Operating Voltage (V)	EUT Current (A)	Power at the Final Amplifier
240 V AC	8 A	1920 W

8.2 RF Output Power

Limits from FCC Parts 2.1046(a) and 90.205 (r); and test procedure from ANSI C63.26-2015.



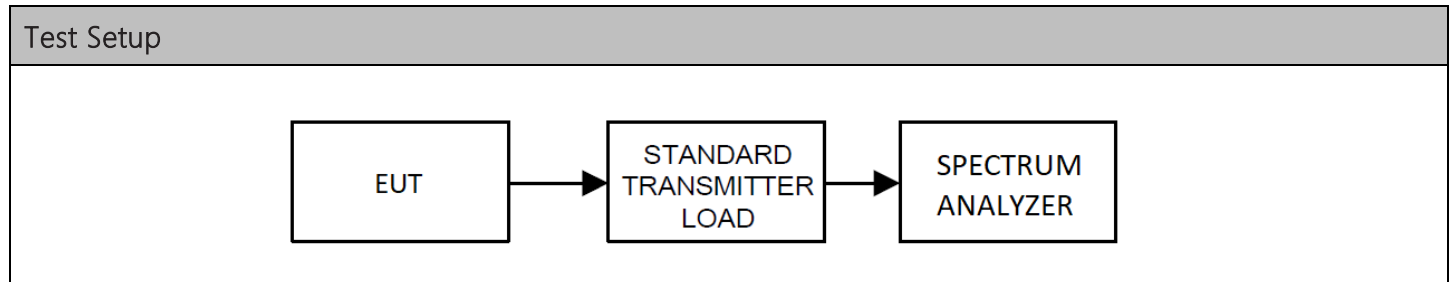
Pulse Type	Tuned Freq (MHz)	T _d (uSec)	Period (uSec)	DC (%)	Ant 1 Peak Power (dBm)	Ant Peak Power (W)	Ant Mean Power (W)
0.8 us	2900	0.78	833	0.09%	90.110	1025651.93	0.08
1 us	2900	0.95	1000	0.10%	90.120	1028016.30	0.09
2us	2900	1.98	2000	0.10%	90.250	1059253.73	0.09
4.5 us	2900	4.48	4000	0.11%	90.270	1064143.02	0.10
0.8 us	2950	0.78	833	0.09%	90.190	1044720.22	0.08
1 us	2950	0.95	1000	0.10%	90.210	1049542.43	0.09
2us	2950	1.98	2000	0.10%	90.200	1047128.55	0.09
4.5 us	2950	4.48	4000	0.11%	90.150	1035142.17	0.10
0.8 us	3000	0.78	833	0.09%	90.160	1037528.42	0.08
1 us	3000	0.95	1000	0.10%	90.170	1039920.17	0.09
2us	3000	1.98	2000	0.10%	90.220	1051961.87	0.09
4.5 us	3000	4.48	4000	0.11%	90.150	1035142.17	0.10

Note: The mean power was calculated based on formula:

$$P_a = P_m \cdot DC$$

8.3 Bandwidth & Emission

Limits from FCC Parts 2.1049 and 90.207 (n) & 90.209 (b) (5) footnote 2, and test procedure from ANSI C63.26-2015.



Test Results, Authorized Bandwidth		
Rule Part	Operating Range	Authorized Bandwidth
Part 90	2.9 – 3 GHz	2050 MHz

Test Results, Occupied Bandwidth		
Tuned Frequency (MHz)	Occupied Bandwidth (MHz)	Bandwidth Type
2900.0 (0.8us)	13.42	99% Power
2900.0 (1us)	11.5	99% Power
2900.0 (2us)	5.9	99% Power
2900.0 (4.5us)	2.53	99% Power
2900.0 (0.8us)	31.325	40 dB
2900.0 (1us)	29.09	40 dB
2900.0 (2us)	9.34	40 dB
2900.0 (4.5us)	6.44	40 dB

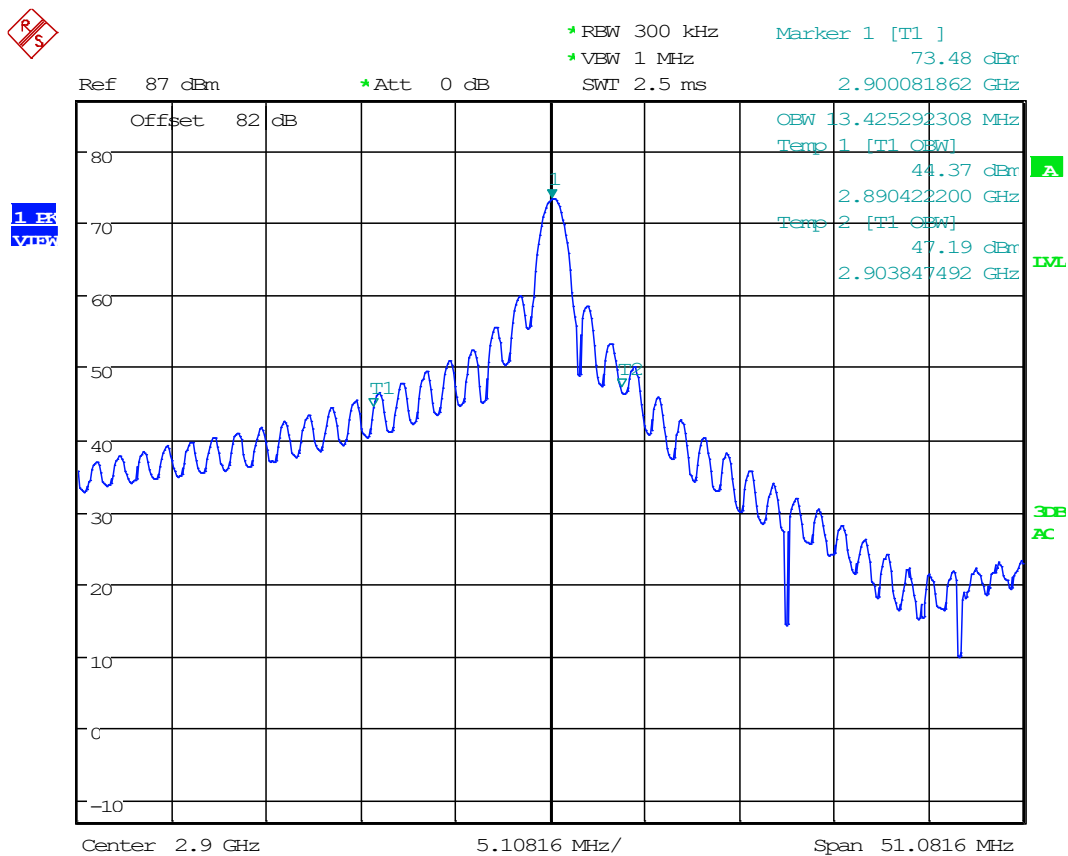
Test Results, Occupied Bandwidth		
Tuned Frequency (MHz)	Occupied Bandwidth (MHz)	Bandwidth Type
2950.0 (0.8us)	13.79	99% Power
2950.0 (1us)	11.04	99% Power
2950.0 (2us)	5.38	99% Power
2950.0 (4.5us)	2.93	99% Power
2950.0 (0.8us)	28.84	40 dB
2950.0 (1us)	27.04	40 dB
2950.0 (2us)	7.9	40 dB
2950.0 (4.5us)	6.64	40 dB

Test Results, Occupied Bandwidth		
Tuned Frequency (MHz)	Occupied Bandwidth (MHz)	Bandwidth Type
3000.0 (0.8us)	12.85	99% Power
3000.0 (1us)	10.83	99% Power
3000.0 (2us)	5.3	99% Power
3000.0 (4.5us)	2.68	99% Power
3000.0 (0.8us)	27.69	40 dB
3000.0 (1us)	27	40 dB
3000.0 (2us)	14.66	40 dB
3000.0 (4.5us)	6.87	40 dB

Test Results, Necessary Bandwidth			
Tuned Frequency (MHz)	Necessary Bandwidth (MHz)	Emission Designator	Bandwidth Type
2900.0	31.325	PON	40 dB Down

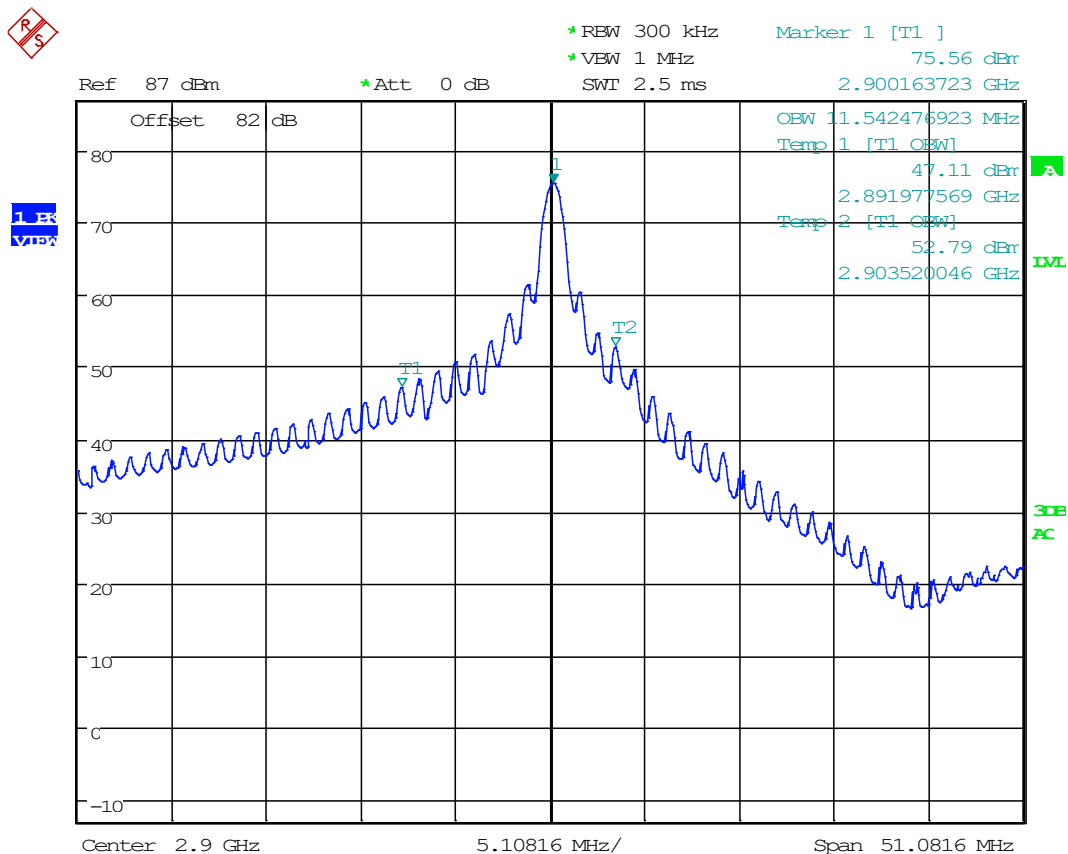
Occupied Bandwidth, Spectrum Plots

8.3.1 Bandwidth Plot, 99%, 2900 MHz, 0.8us



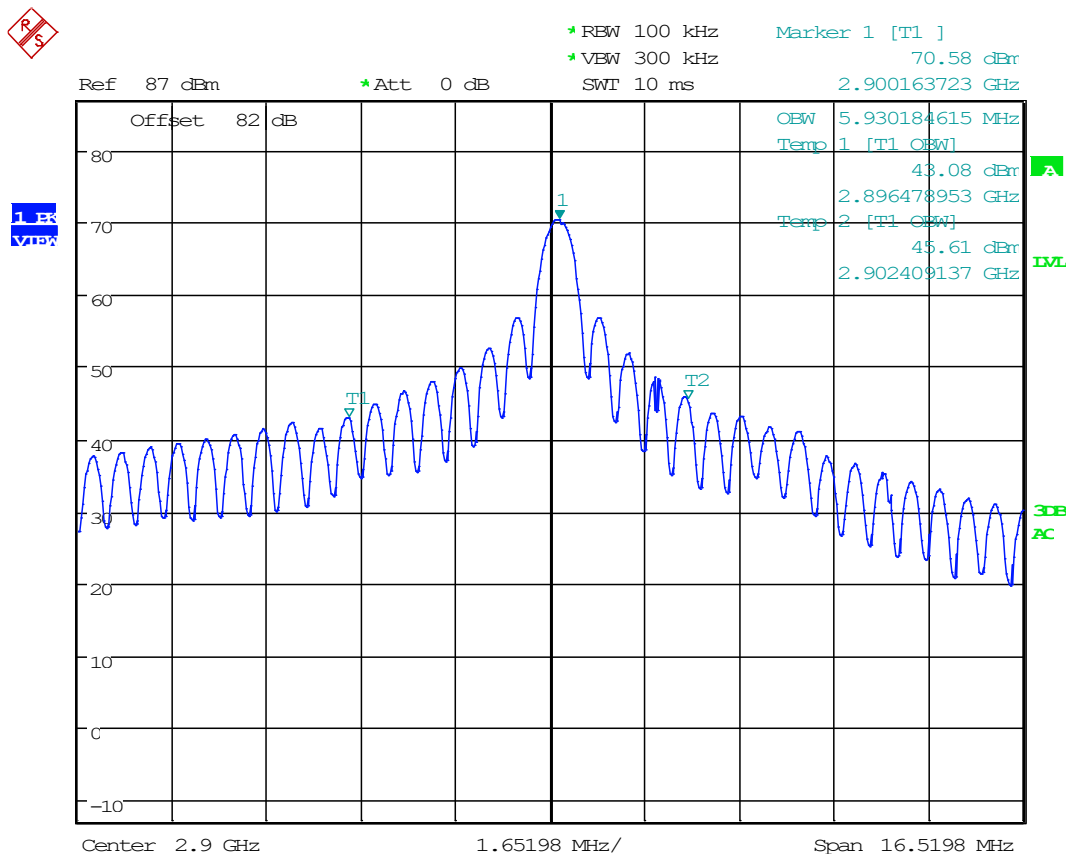
Date: 27.FEB.2023 18:24:02

8.3.2 Bandwidth Plot, 99%, 2900 MHz, 1us



Date: 27.FEB.2023 18:26:50

8.3.3 Bandwidth Plot, 99%, 2900 MHz, 2us



Date: 27.FEB.2023 18:29:43



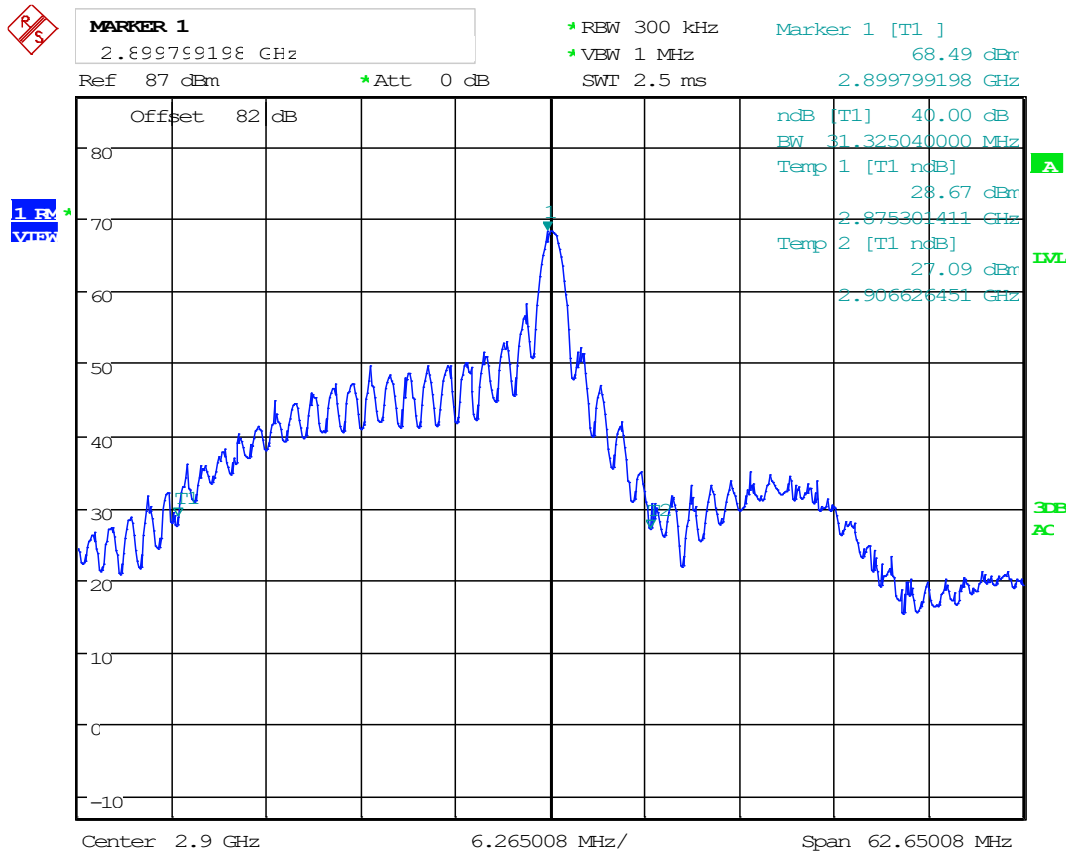
A

IM

3DE

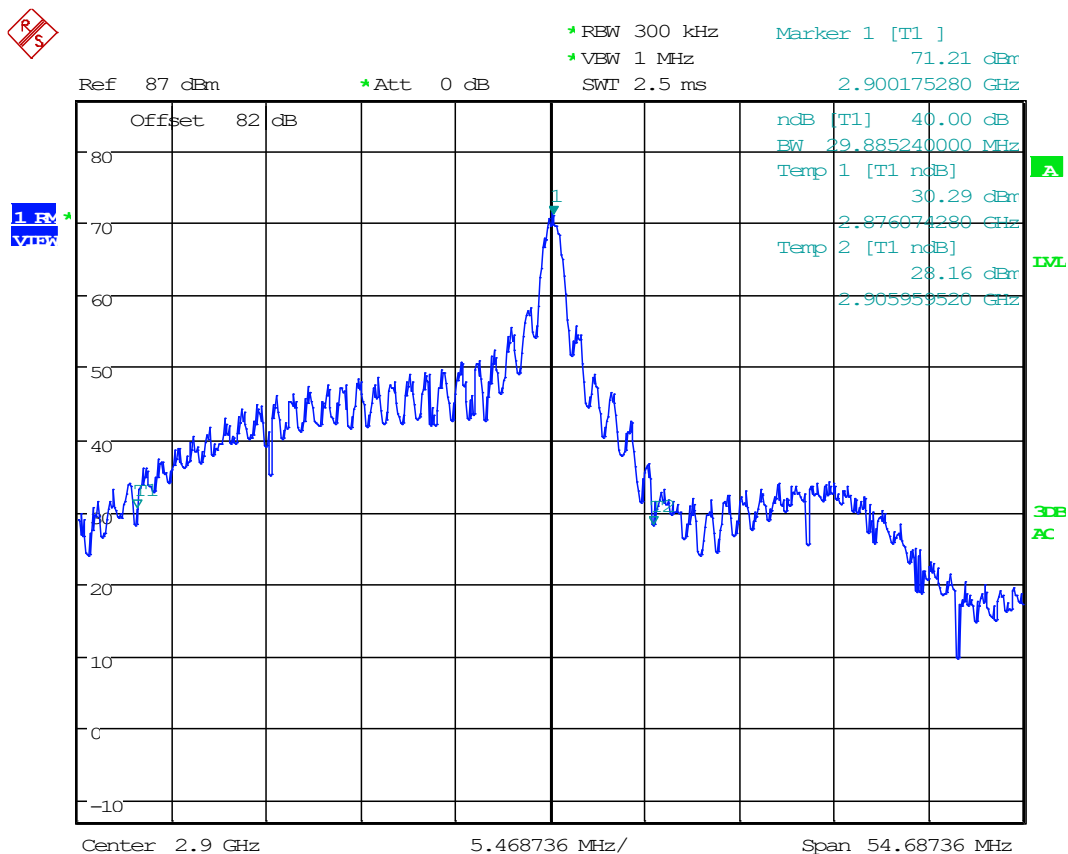
AC

8.3.5 Bandwidth Plot, 40 dB BW, 2900 MHz, 0.8us



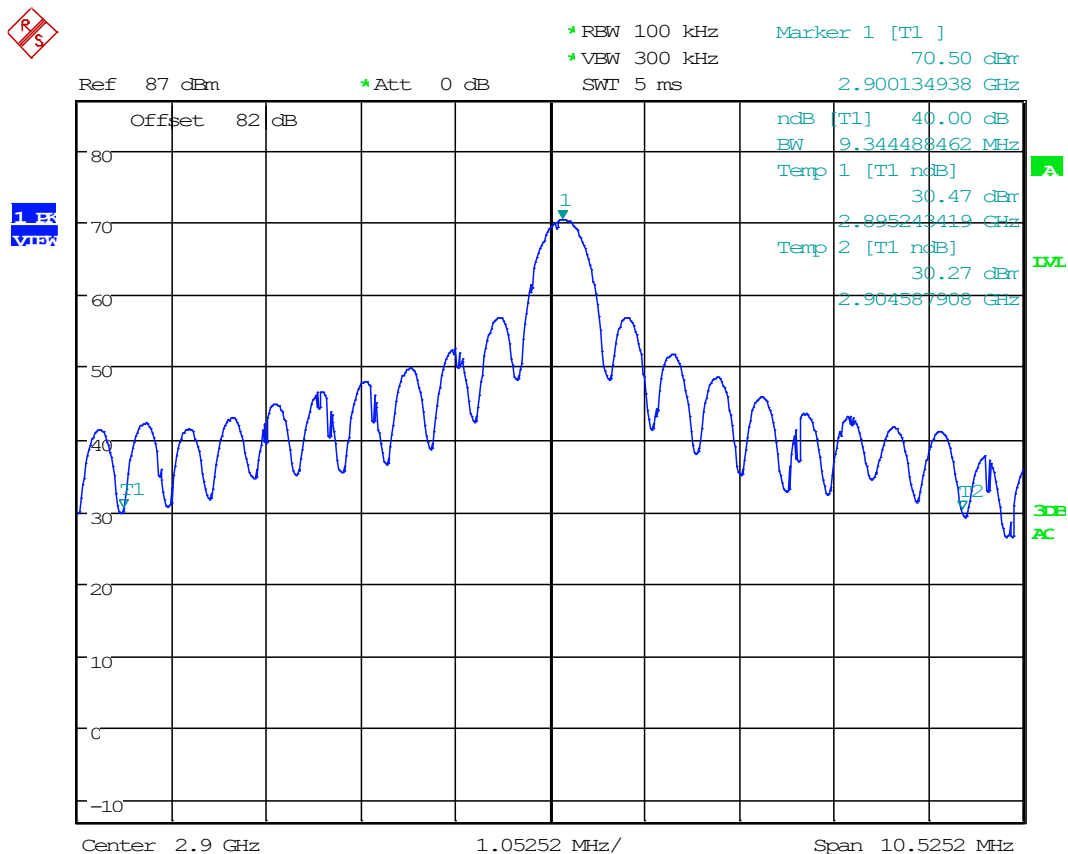
Date: 27.FEB.2023 15:33:31

8.3.1 Bandwidth Plot, 40 dB BW, 2900 MHz, 1us



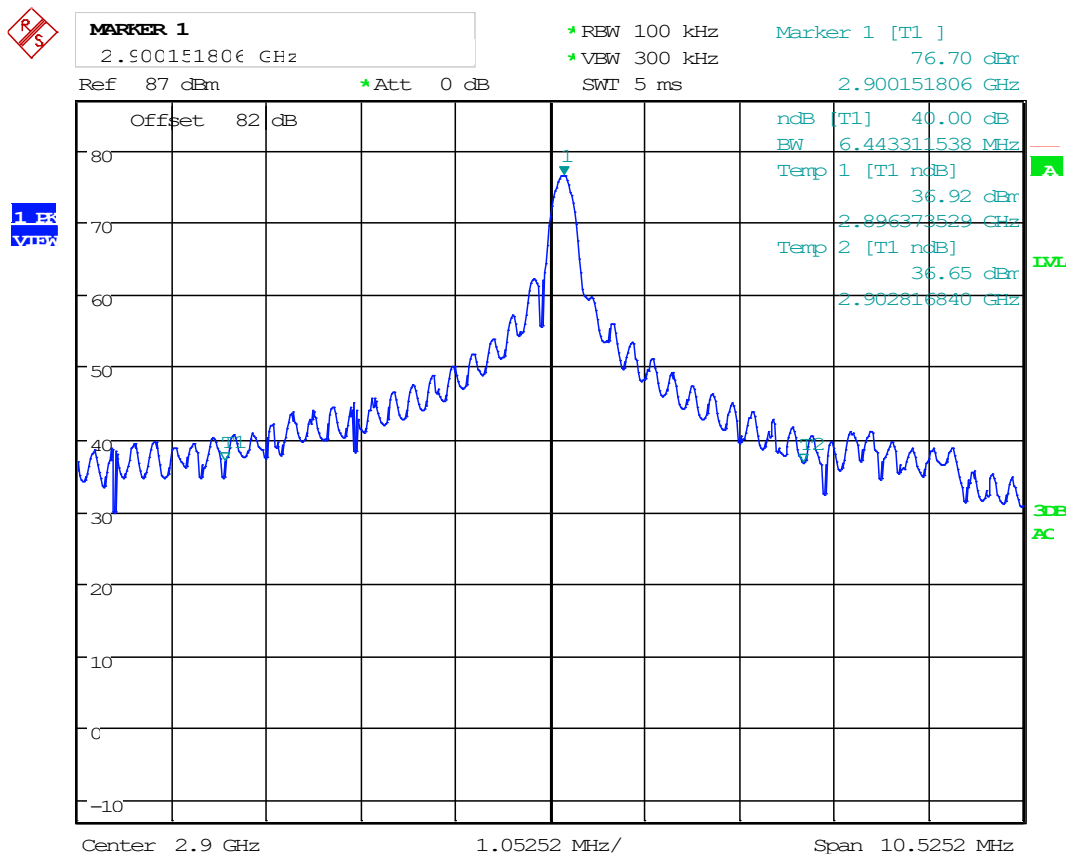
Date: 27.FEB.2023 15:23:41

8.3.2 Bandwidth Plot, 40 dB BW, 2900 MHz, 2us



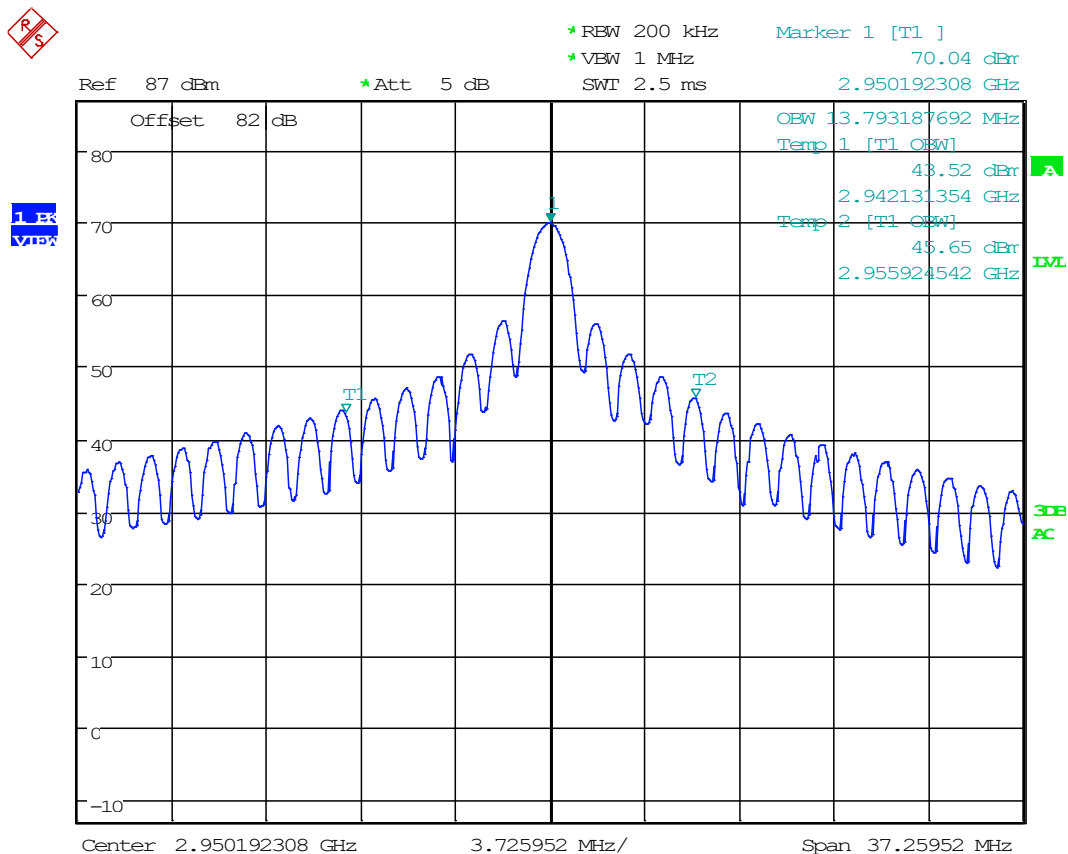
Date: 27.FEB.2023 18:34:34

8.3.3 Bandwidth Plot, 40 dB BW, 2900 MHz, 4.5us



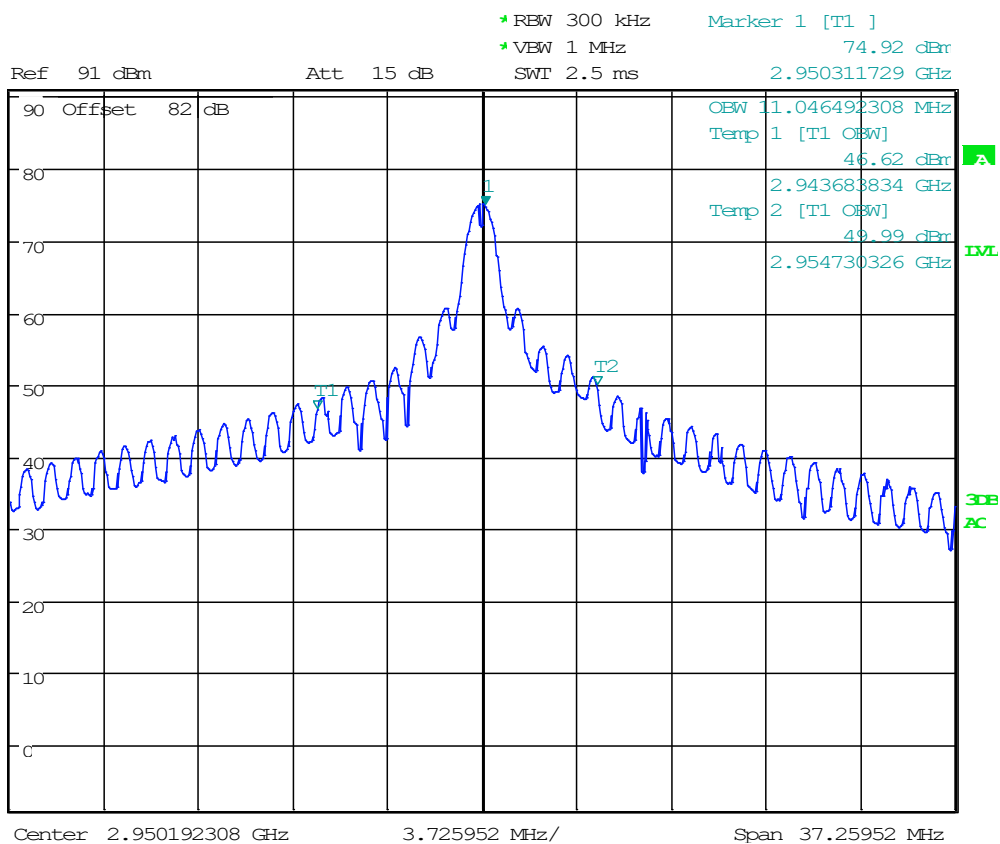
Date: 27.FEB.2023 18:32:20

8.3.4 Bandwidth Plot, 99%, 2950 MHz, 0.8us



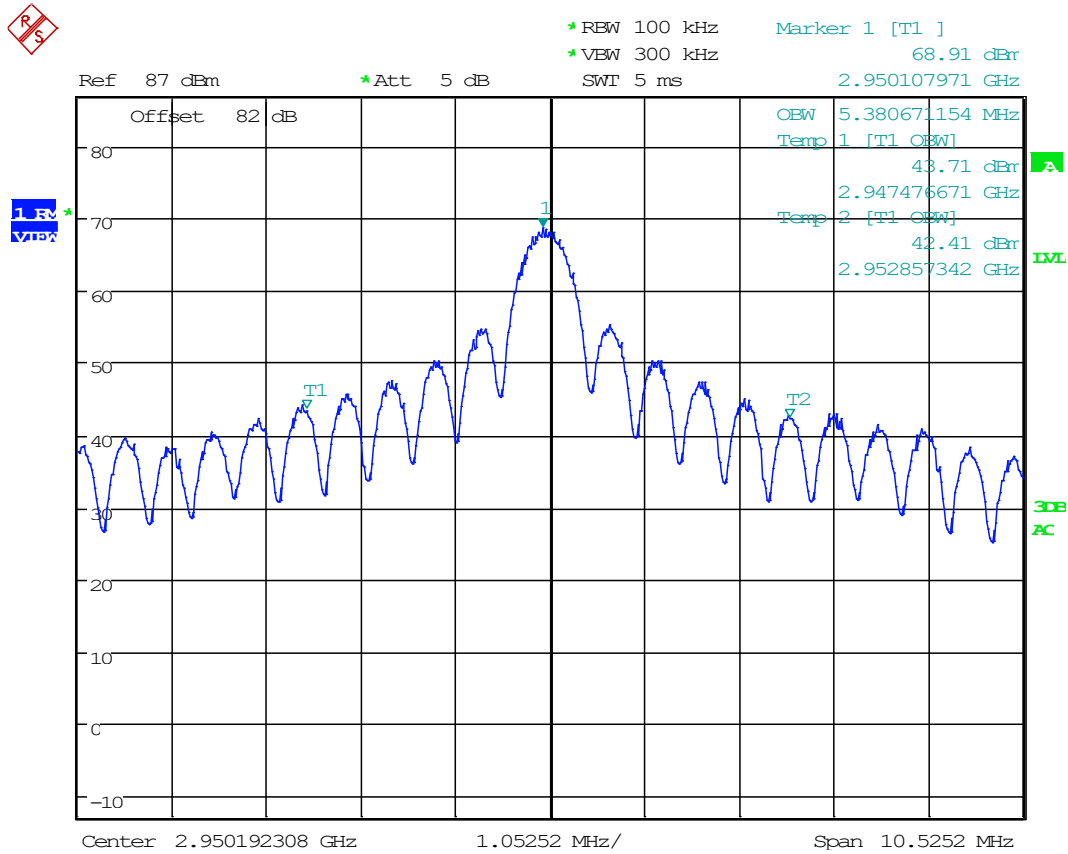
Date: 27.FEB.2023 11:58:42

8.3.5 Bandwidth Plot, 99%, 2950 MHz, 1us



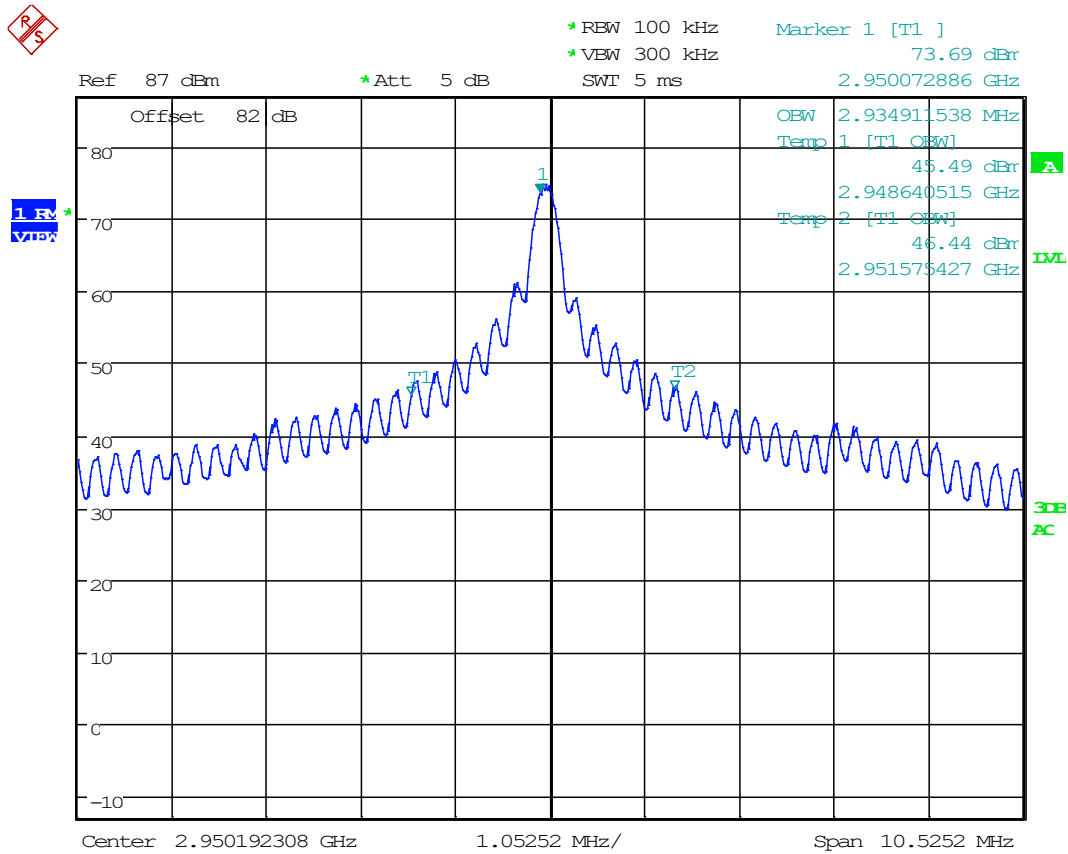
Date: 27.FEB.2023 11:46:42

8.3.6 Bandwidth Plot, 99%, 2950 MHz, 2us



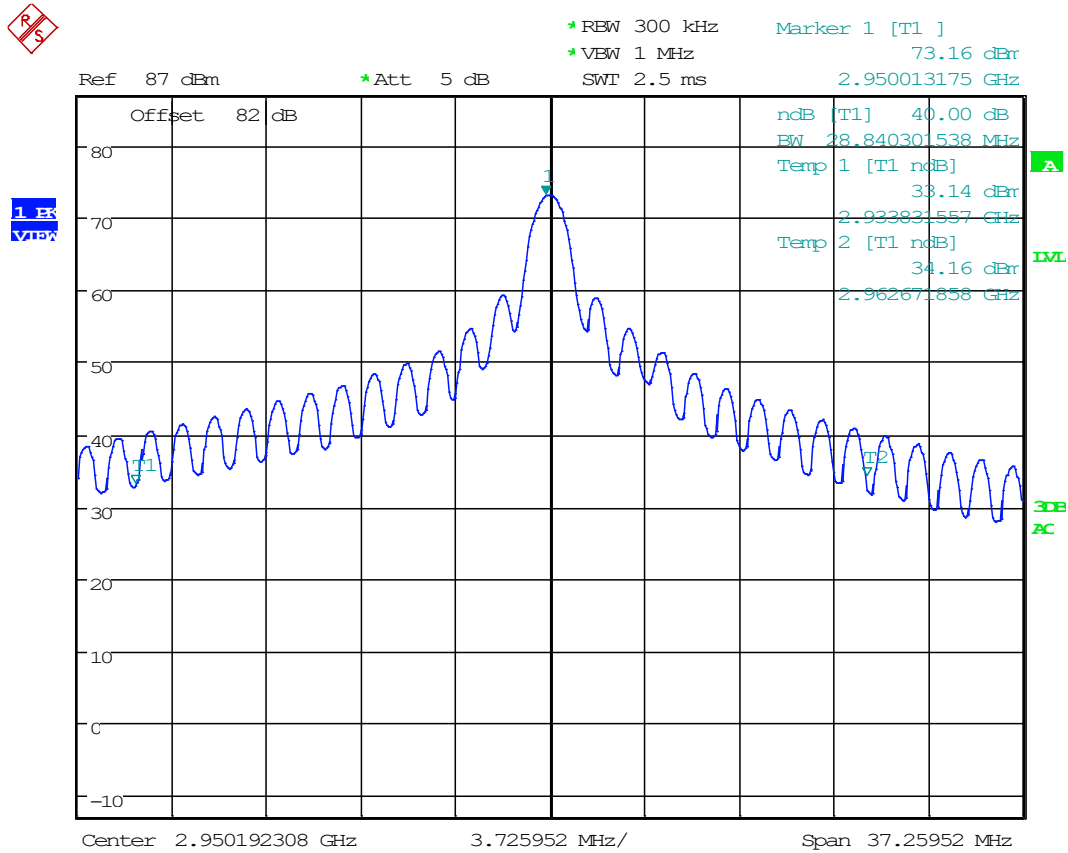
Date: 27.FEB.2023 12:11:16

8.3.7 Bandwidth Plot, 99%, 2950 MHz, 4.5us



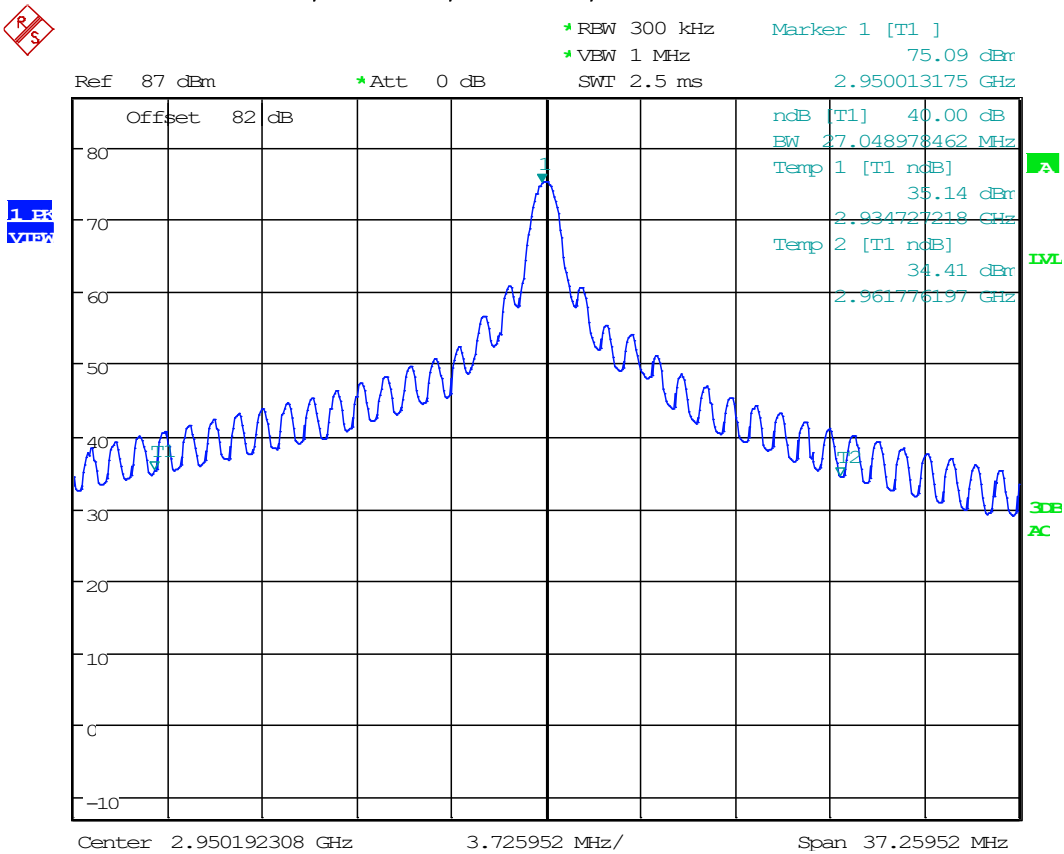
Date: 27.FEB.2023 12:06:12

8.3.8 Bandwidth Plot, 40 dB BW, 2950 MHz, 0.8us



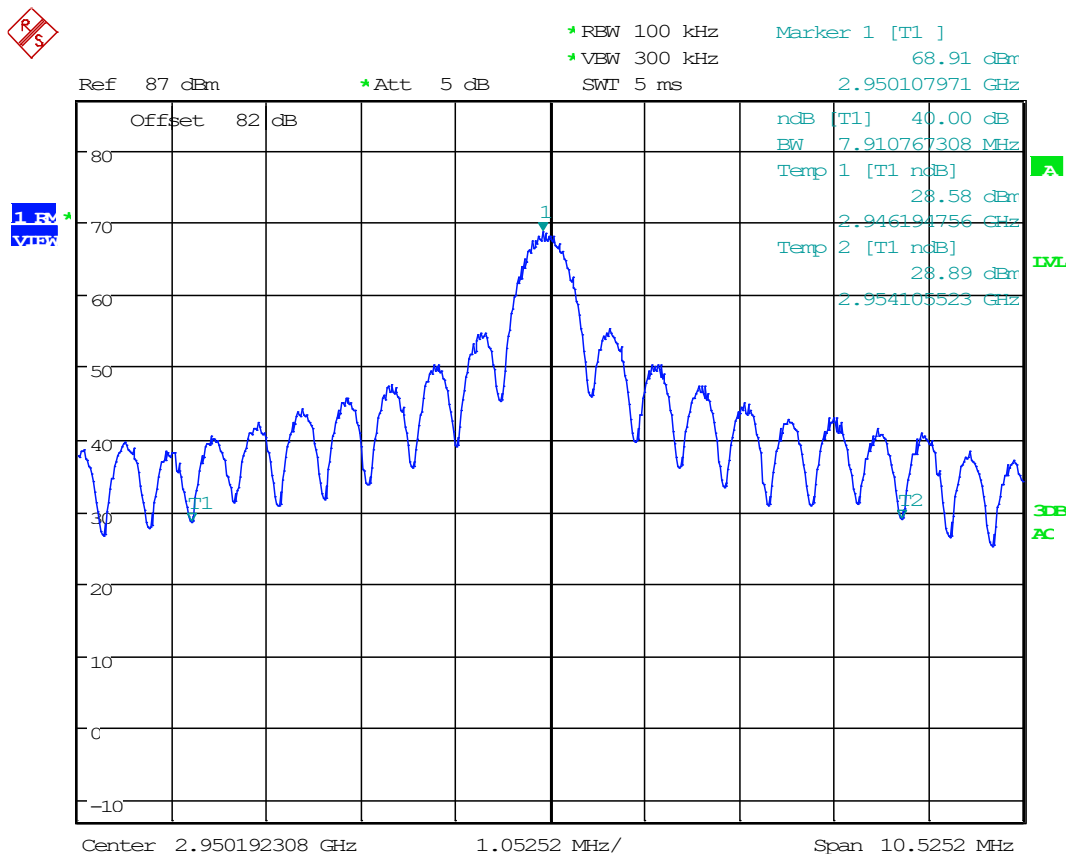
Date: 27.FEB.2023 11:56:12

8.3.9 Bandwidth Plot, 40 dB BW, 2950 MHz, 1us



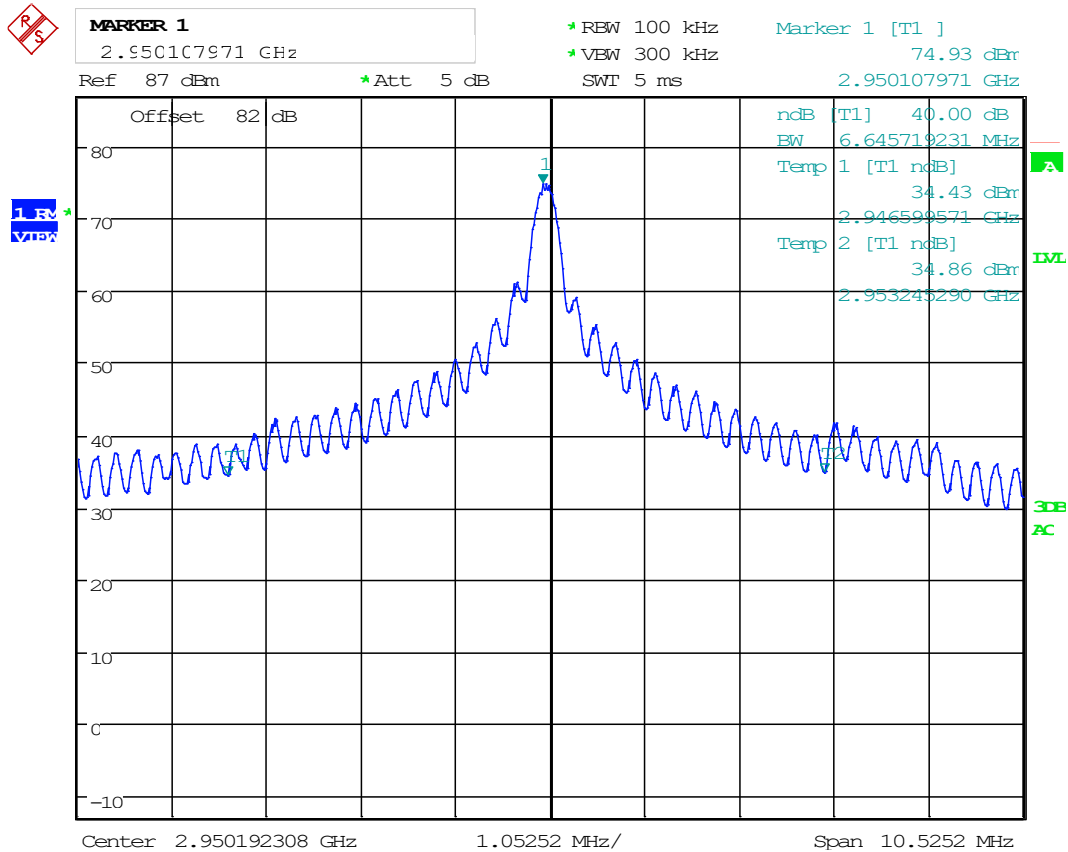
Date: 27.FEB.2023 11:48:57

8.3.10 Bandwidth Plot, 40 dB BW, 2950 MHz, 2us



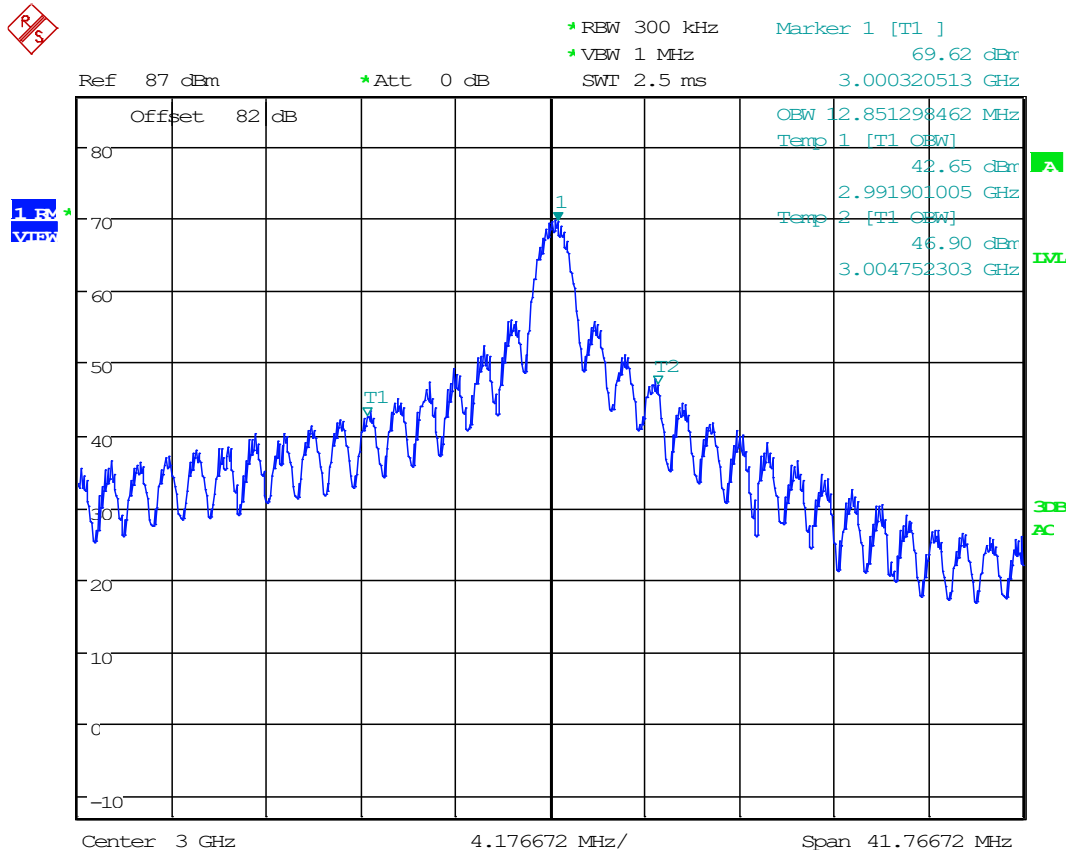
Date: 27.FEB.2023 12:10:45

8.3.11 Bandwidth Plot, 40 dB BW, 2950 MHz, 4.5us



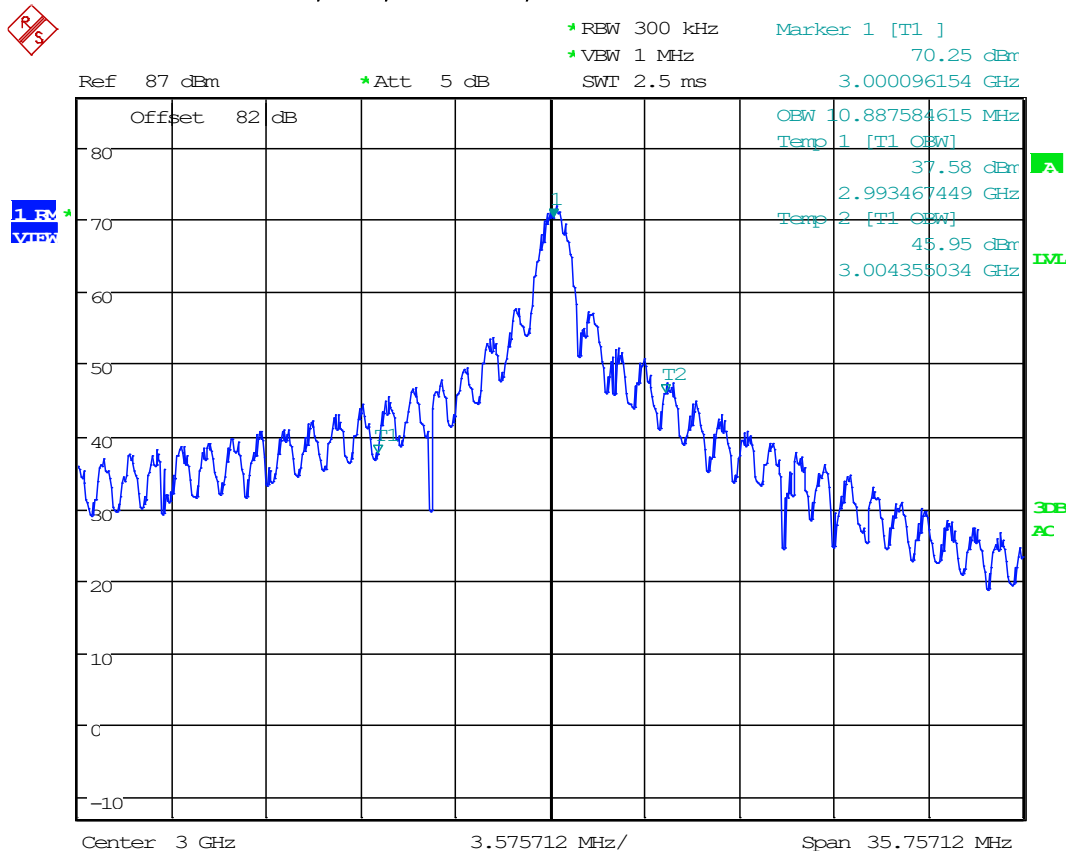
Date: 27.FEB.2023 12:06:38

8.3.12 Bandwidth Plot, 99%, 3000 MHz, 0.8us



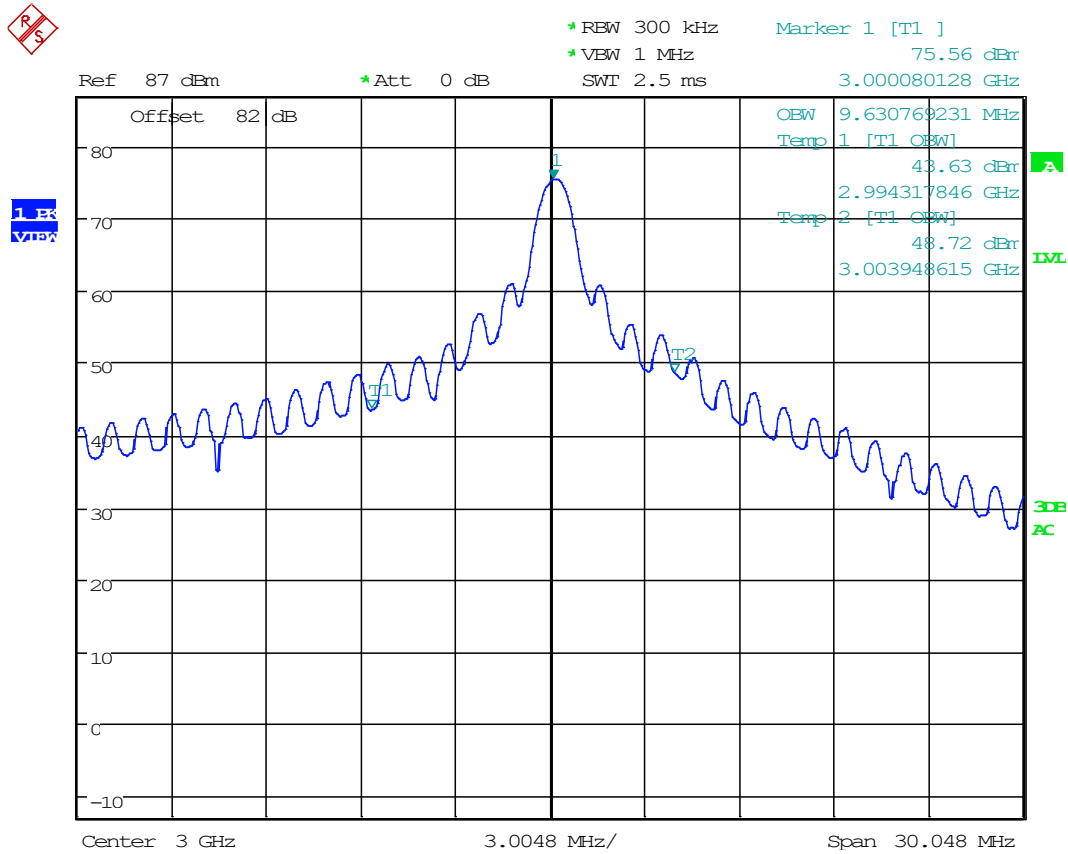
Date: 27.FEB.2023 16:21:42

8.3.13 Bandwidth Plot, 99%, 3000 MHz, 1us



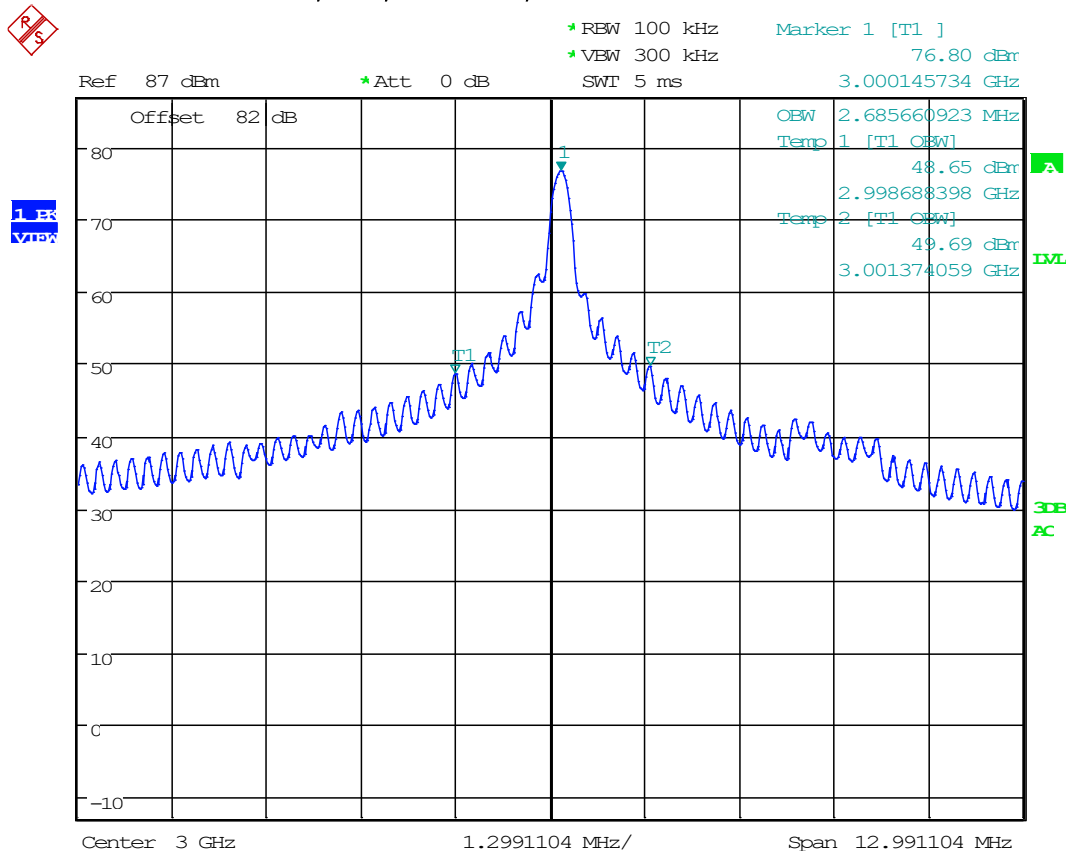
Date: 27.FEB.2023 16:32:50

8.3.14 Bandwidth Plot, 99%, 3000 MHz, 2us



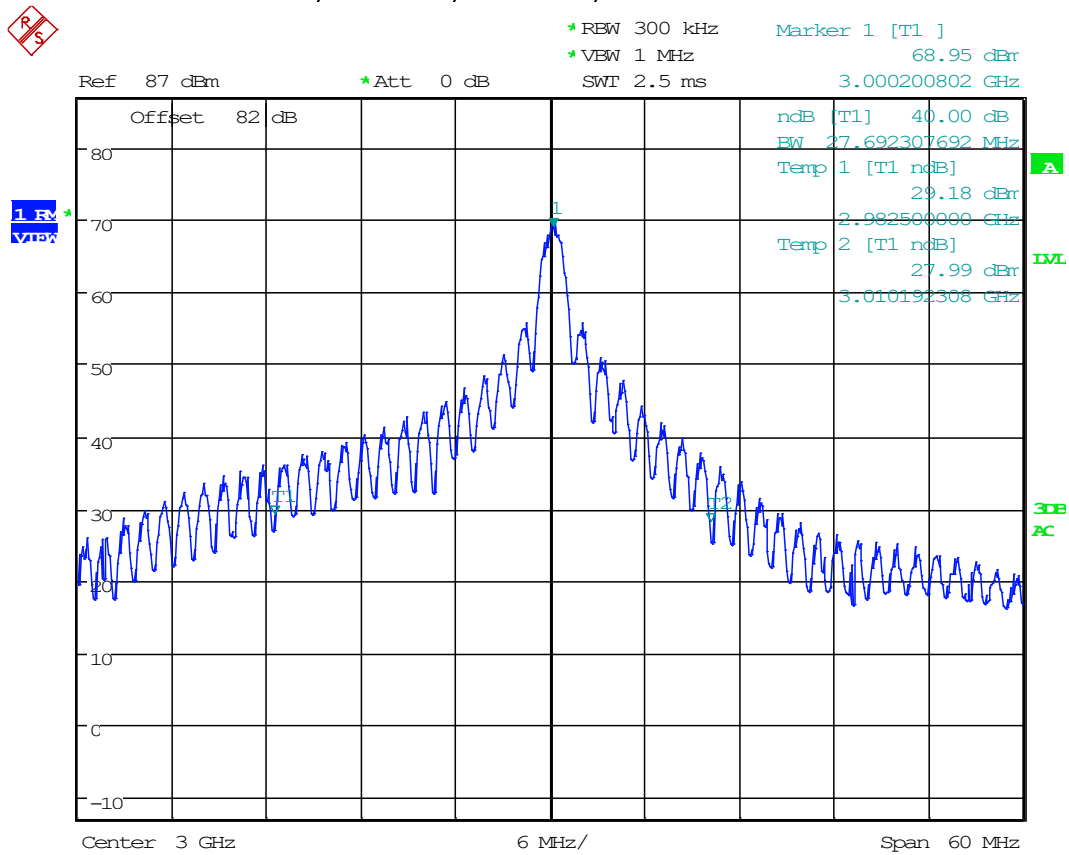
Date: 27.FEB.2023 16:41:58

8.3.15 Bandwidth Plot, 99%, 3000 MHz, 4.5us



Date: 27.FEB.2023 16:52:47

8.3.16 Bandwidth Plot, 40 dB BW, 3000 MHz, 0.8us

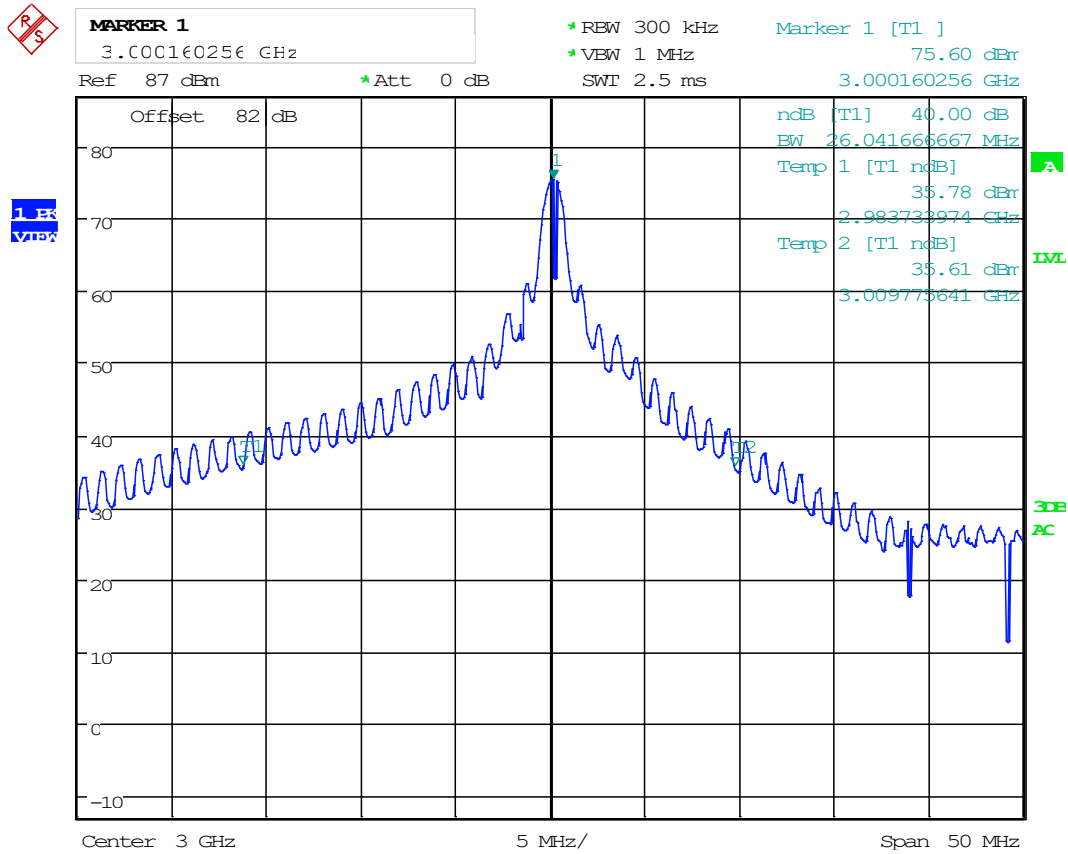


Date: 27.FEB.2023 16:23:49



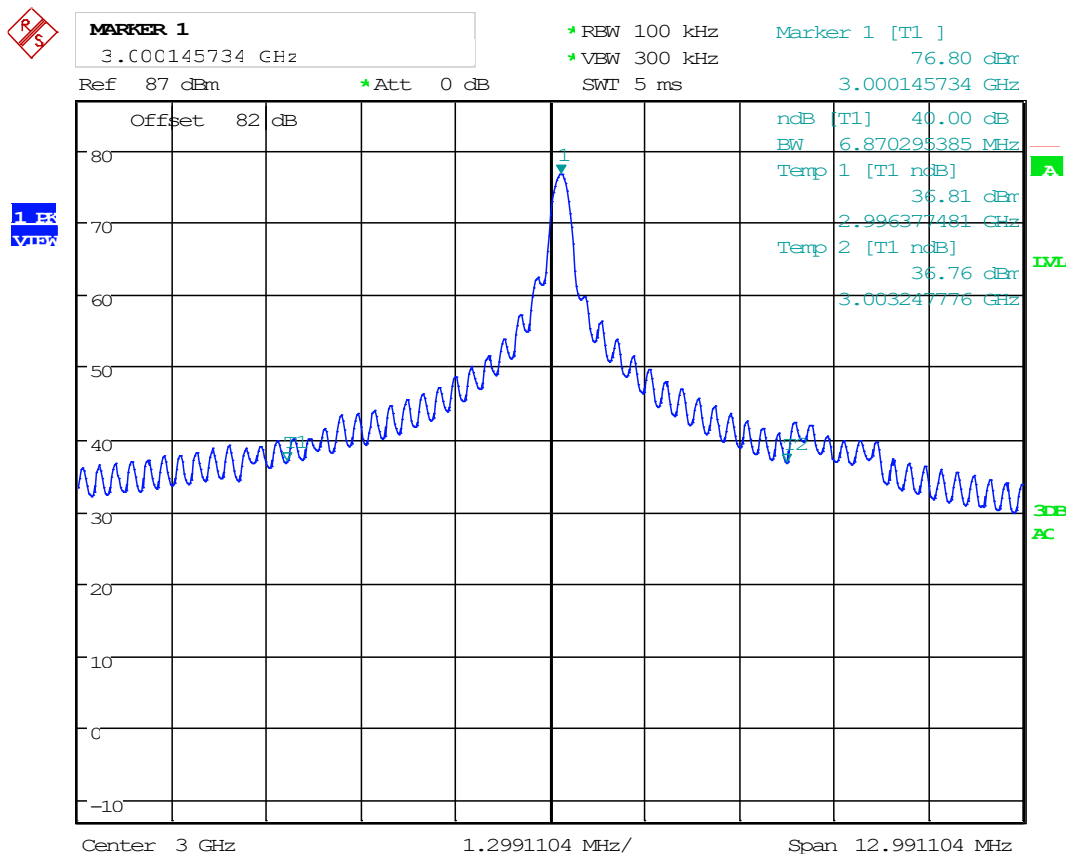
Page 37 of 79

8.3.18 Bandwidth Plot, 40 dB BW, 3000 MHz, 2us



Date: 27.FEB.2023 16:43:55

8.3.19 Bandwidth Plot, 40 dB BW, 3000 MHz, 4.5us

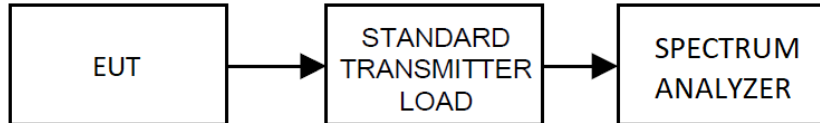


Date: 27.FEB.2023 16:53:52

8.4 Emission Limitations, In-Band

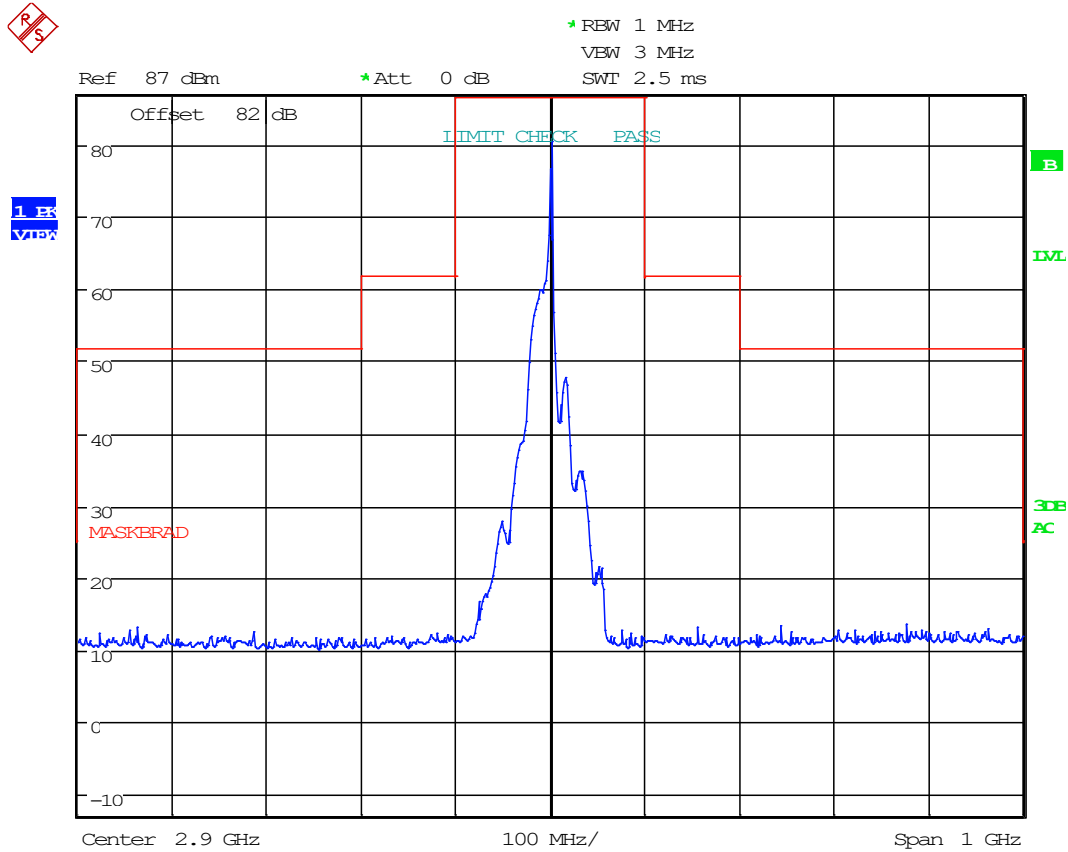
Limits from FCC Part 90.210 (n); and test procedure from ANSI C63.26-2015.

Conducted Test Setup



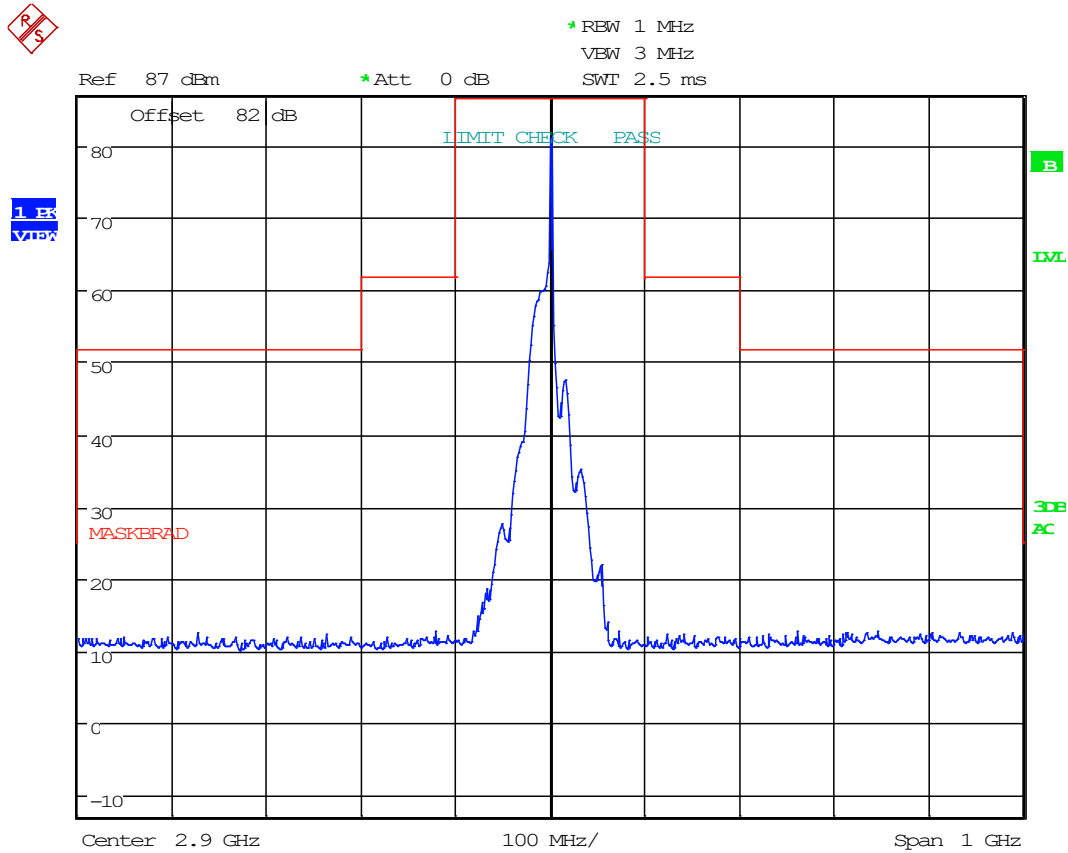
Conducted Emissions Mask, Spectrum Plots

8.4.1 Emission Mask, 2900 MHz, 0.8us



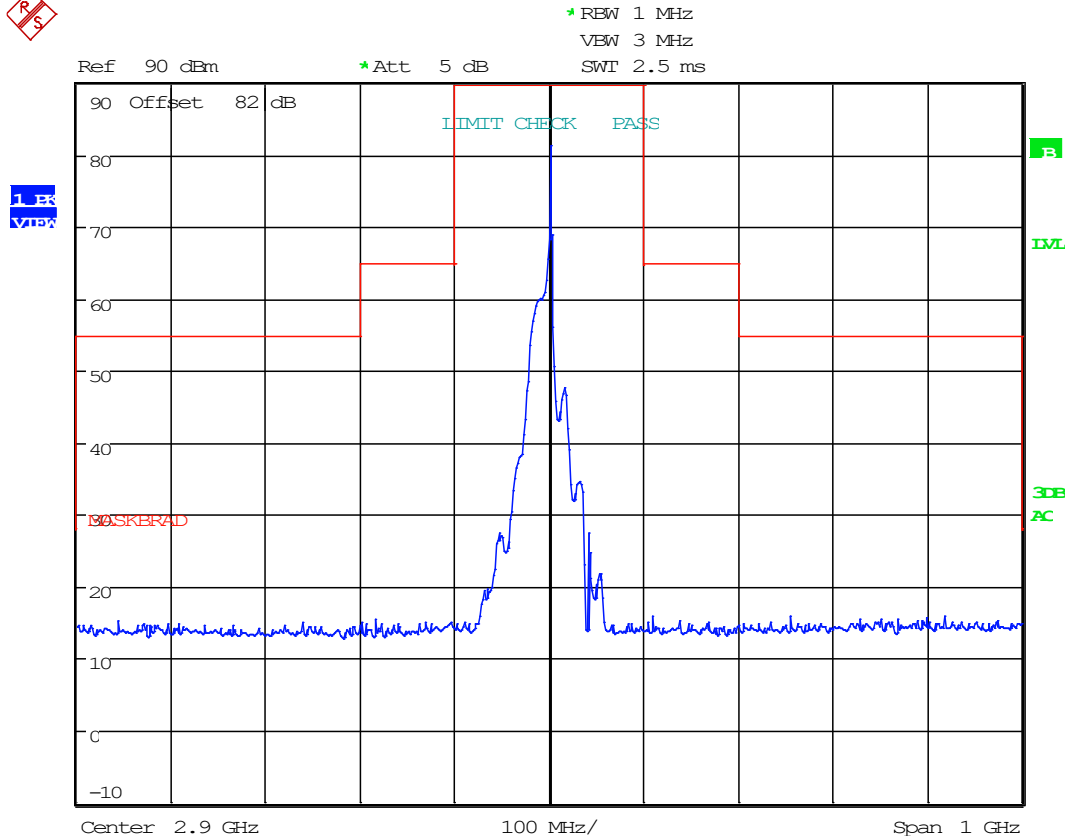
Date: 27.FEB.2023 15:27:38

8.4.2 Emission Mask, 2900 MHz, 1us



Date: 27.FEB.2023 15:25:17

8.4.3 Emission Mask, 2900 MHz, 2us

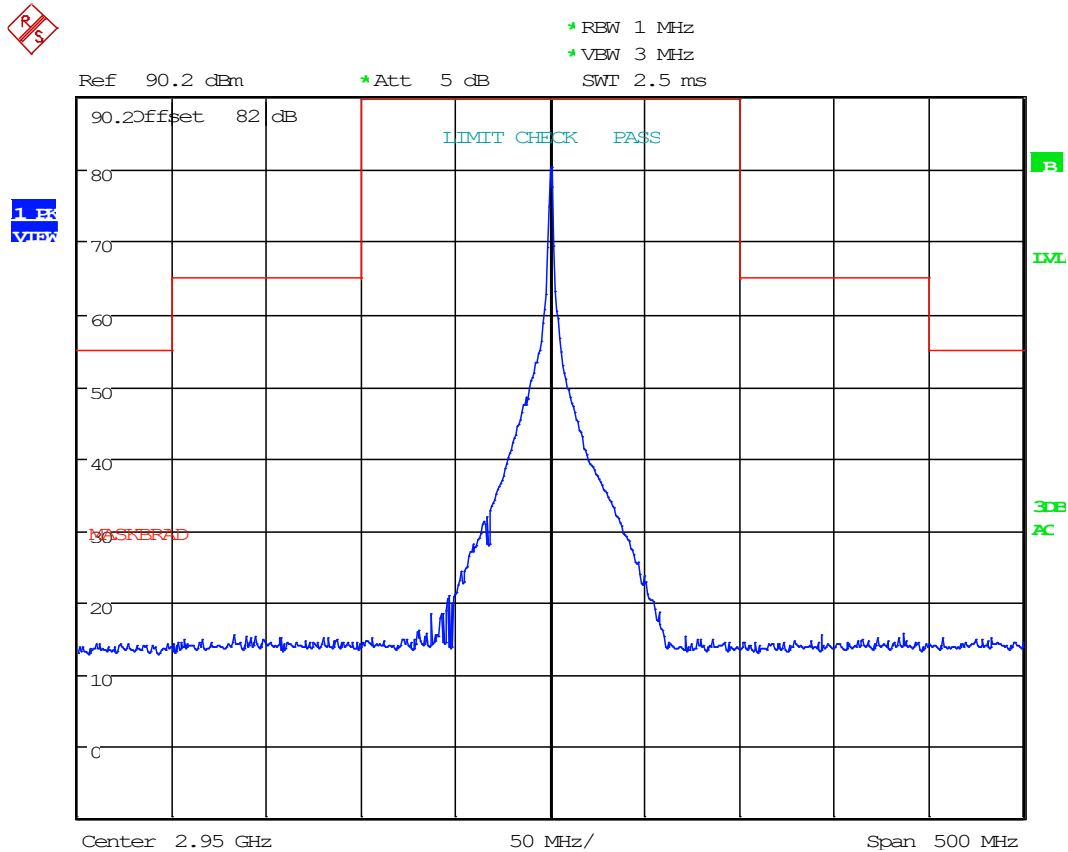


Date: 27.FEB.2023 15:10:37



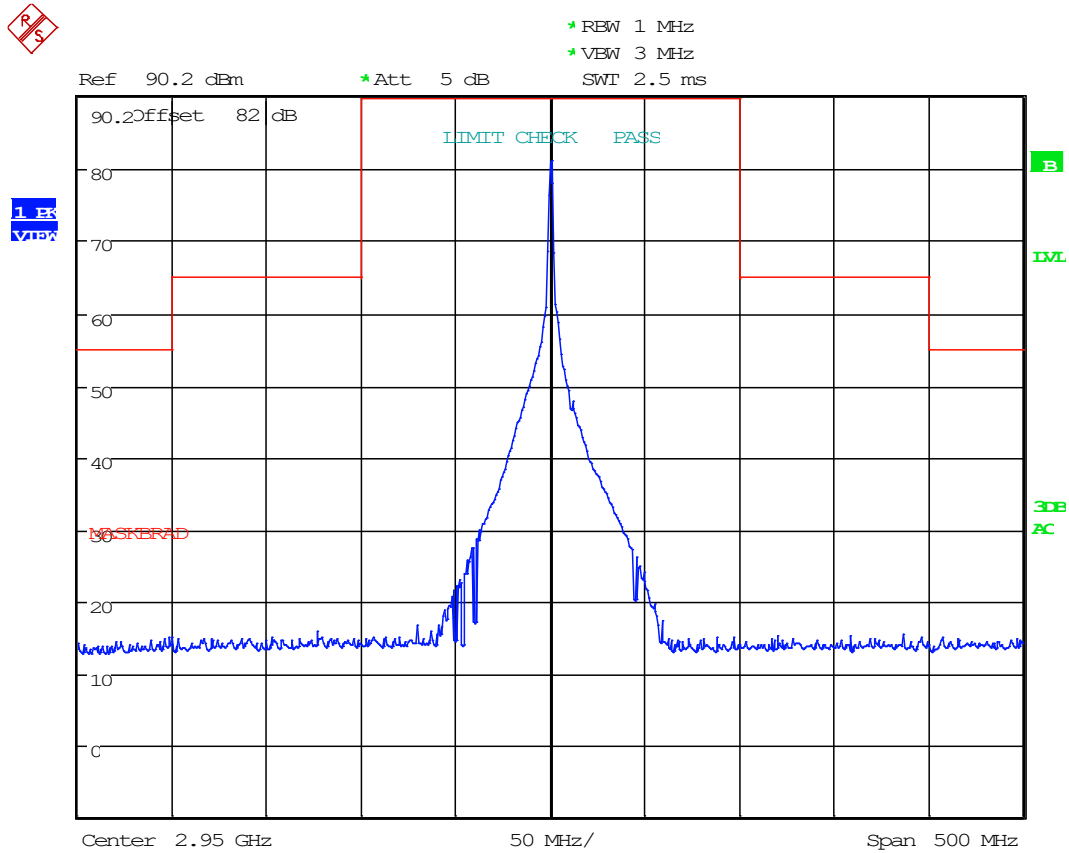
Page 44 of 79

8.4.2 Emission Mask, 2950 MHz, 0.8us



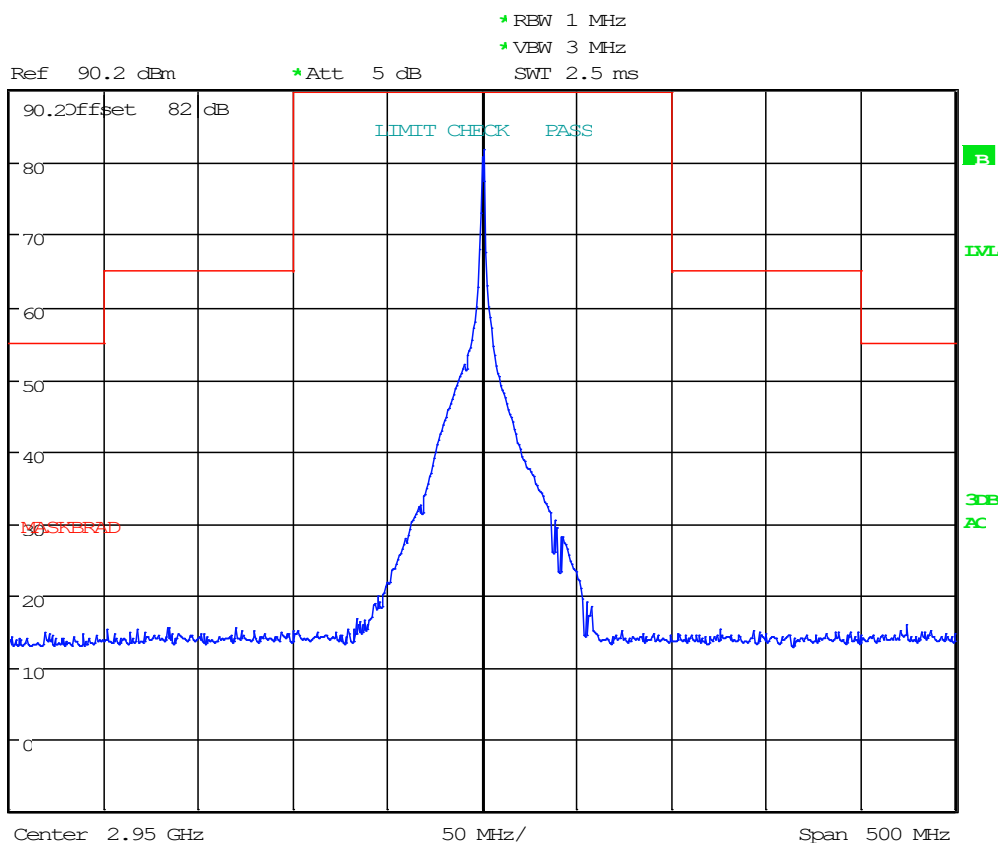
Date: 27.FEB.2023 11:54:09

8.4.3 Emission Mask, 2950 MHz, 1us



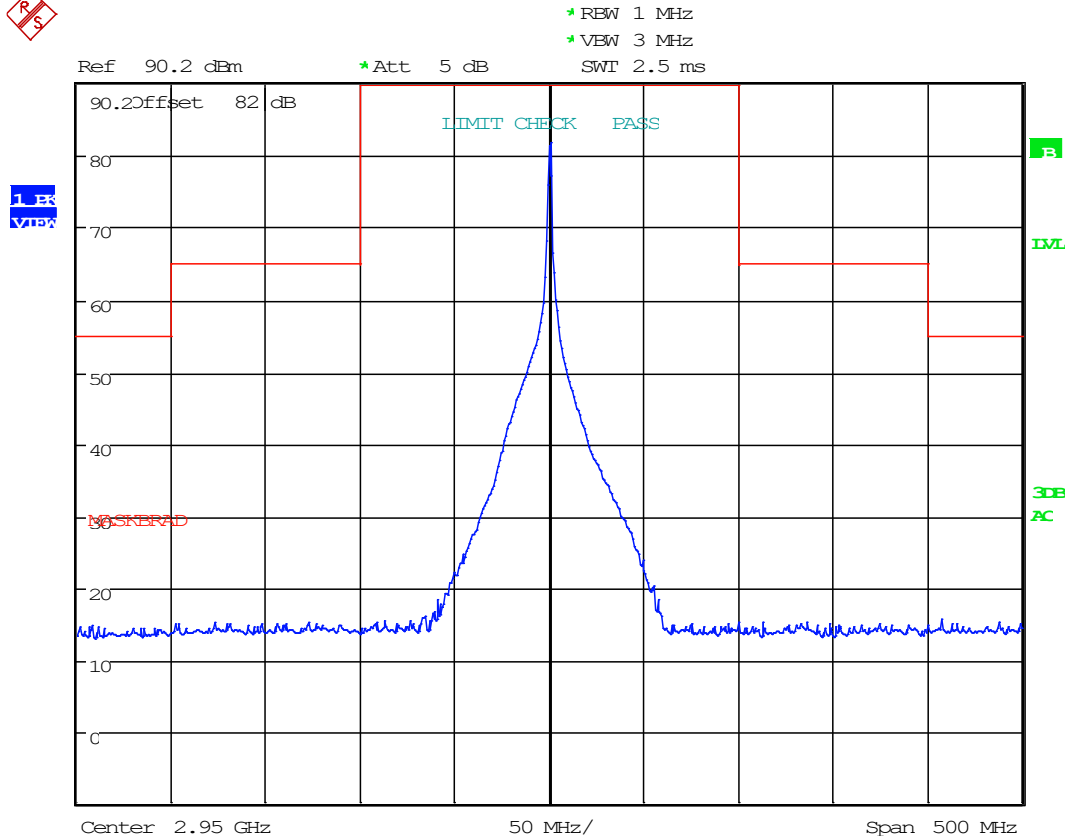
Date: 27.FEB.2023 11:51:34

8.4.4 Emission Mask, 2950 MHz, 2us



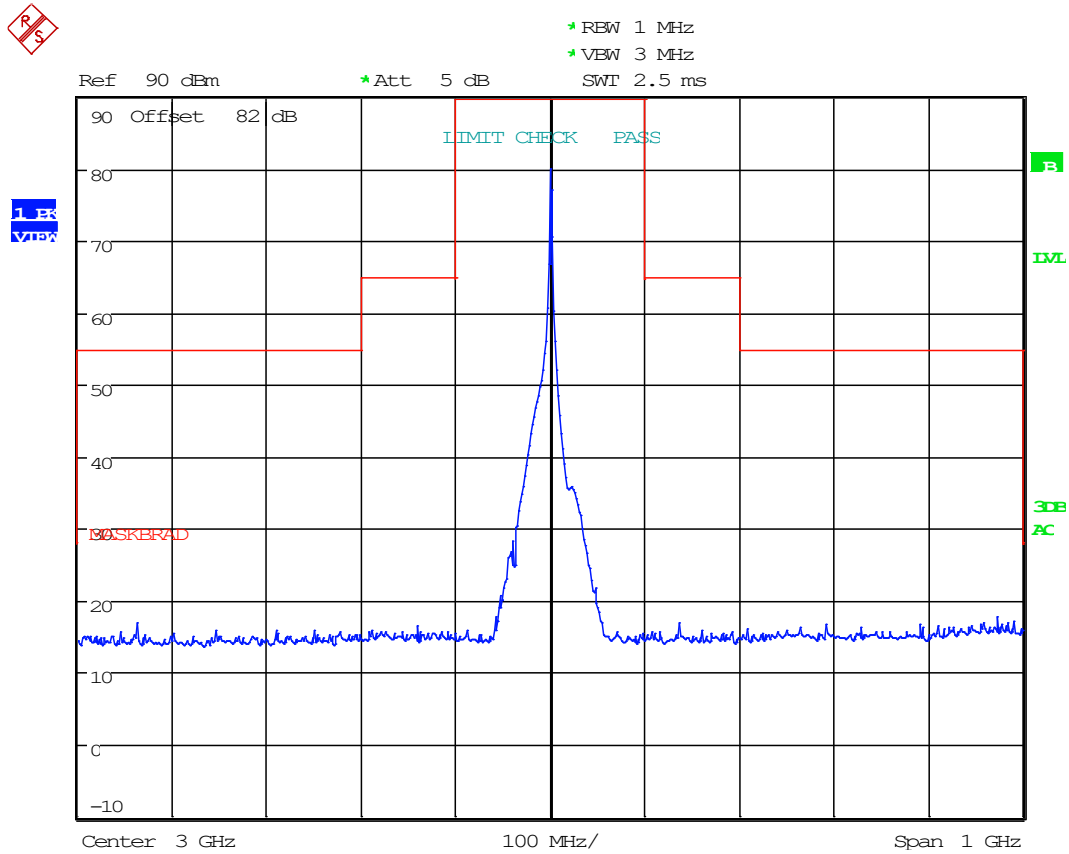
Date: 27.FEB.2023 12:12:27

8.4.5 Emission Mask, 2950 MHz, 4.5us



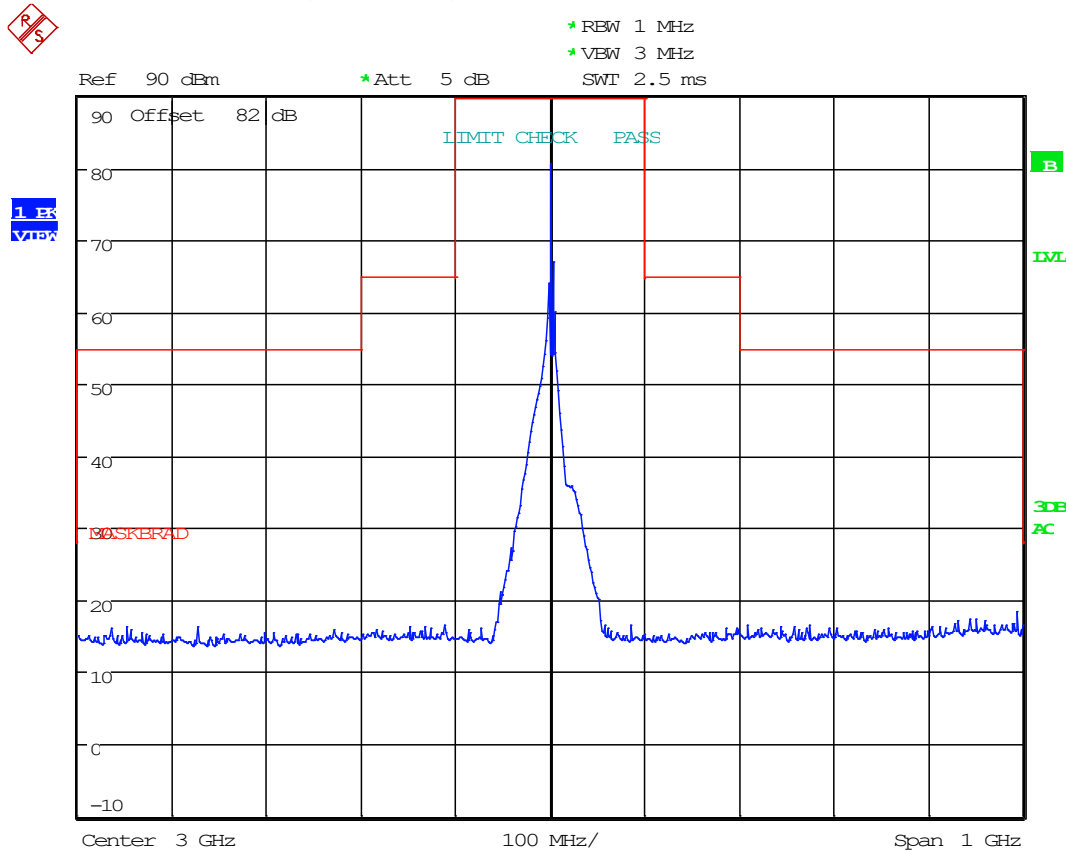
Date: 27.FEB.2023 12:08:15

8.4.6 Emission Mask, 3000 MHz, 0.8us



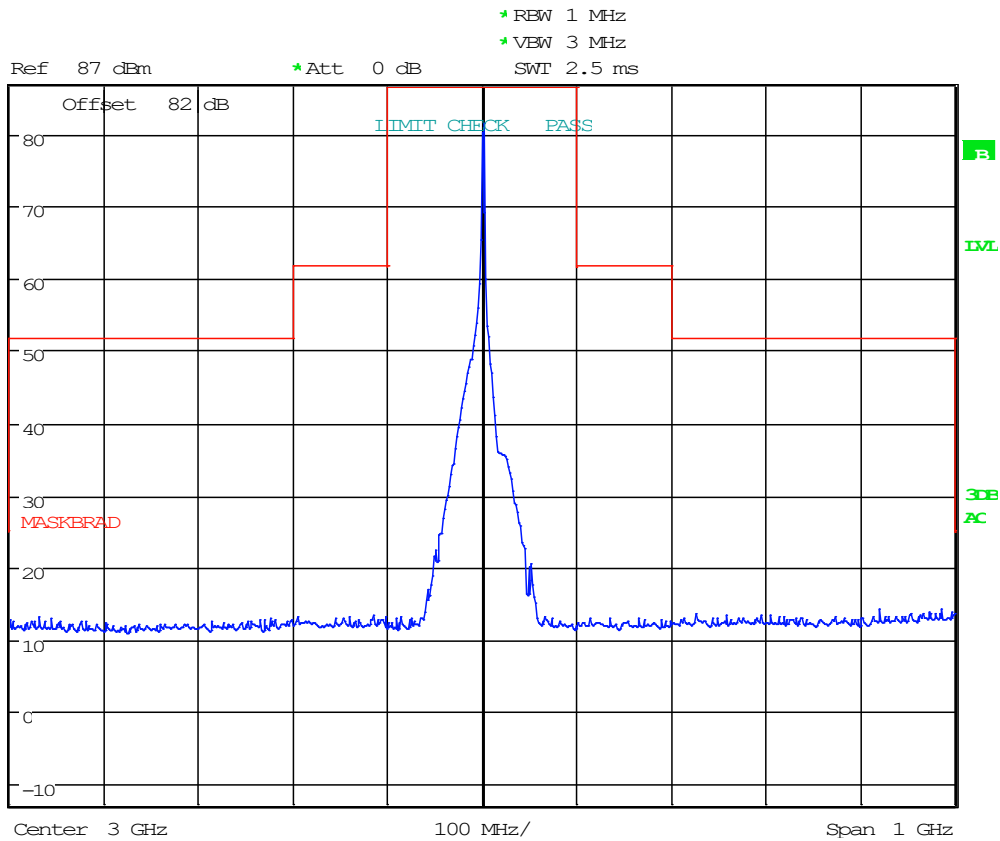
Date: 27.FEB.2023 16:27:00

8.4.7 Emission Mask, 3000 MHz, 1us



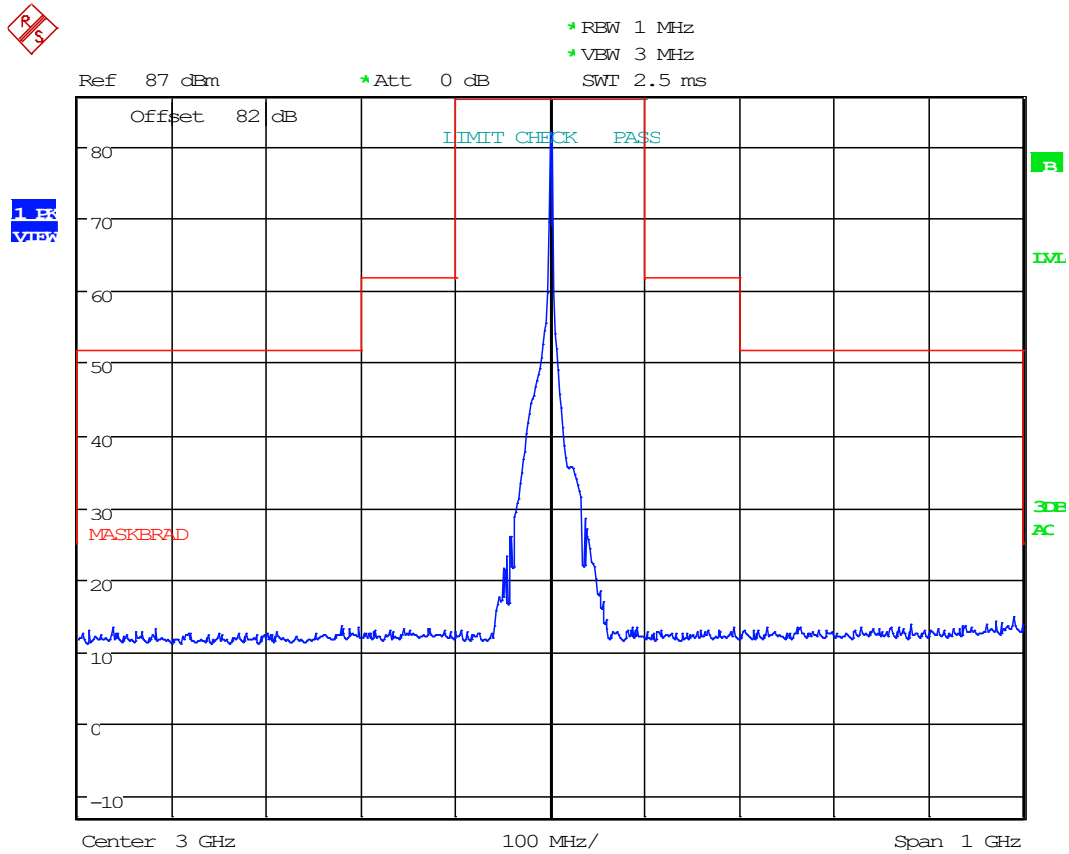
Date: 27.FEB.2023 16:30:01

8.4.8 Emission Mask, 3000 MHz, 2us



Date: 27.FEB.2023 16:45:51

8.4.9 Emission Mask, 3000 MHz, 4.5us

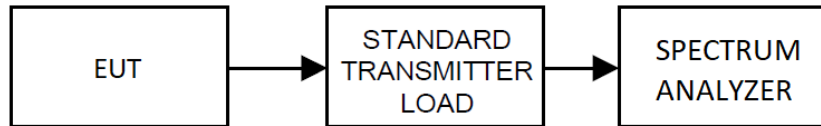


Date: 27.FEB.2023 16:48:39

8.5 Emission Limitations, Out-of-Band

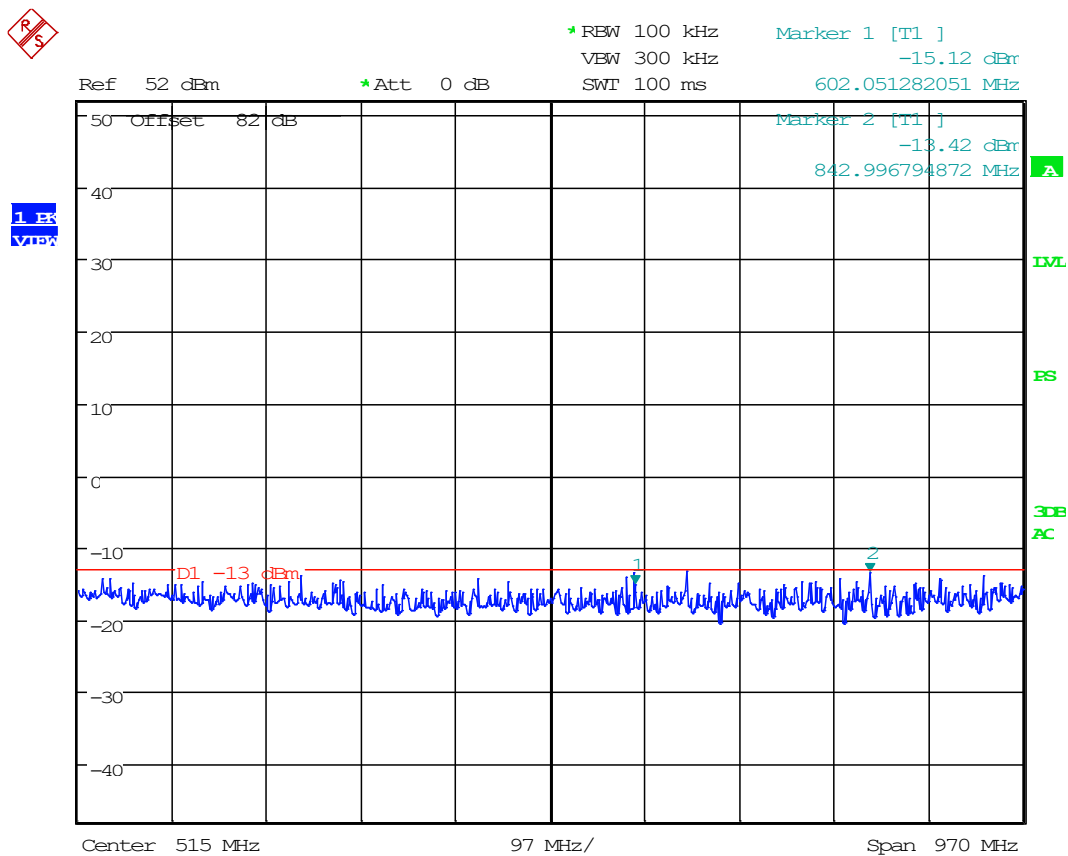
Limits from FCC Parts 2.1051 and 90.210 (n); and test procedure from ANSI C63.26-2015.

Conducted Test Setup



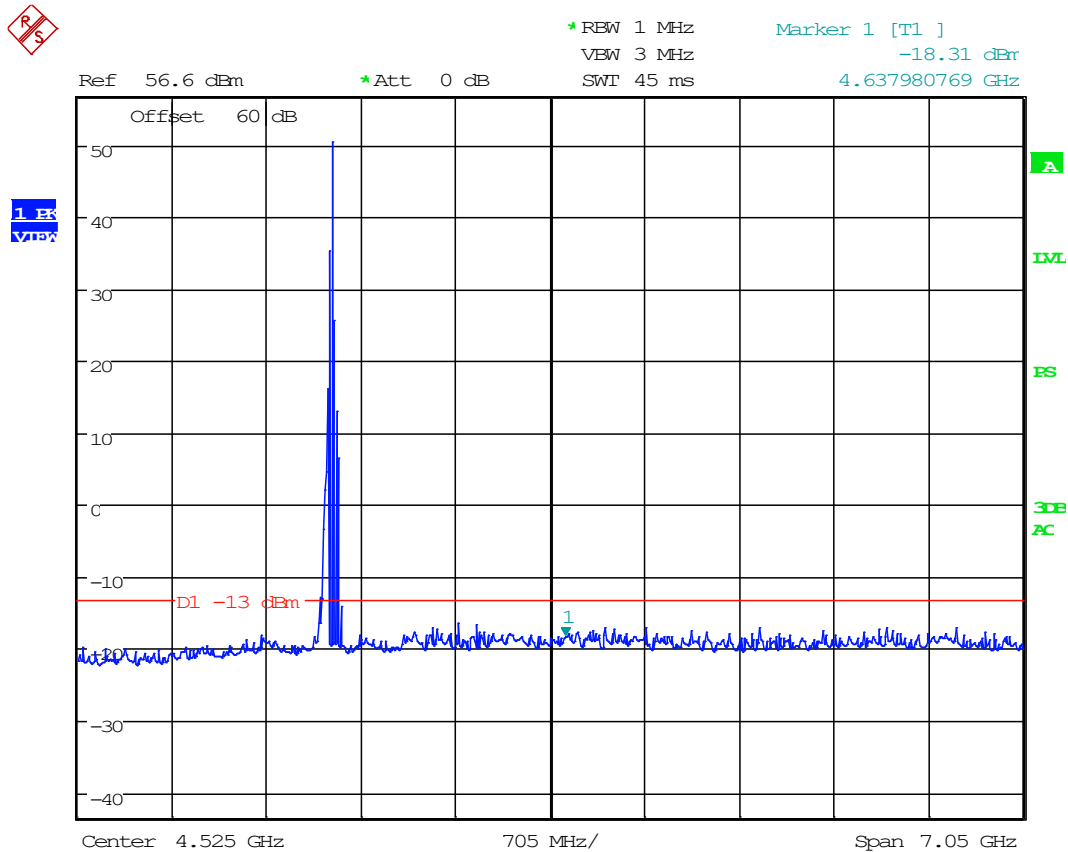
Conducted Emissions Spectrum Plots

8.5.1 Conducted Emissions 30 MHz to 1 GHz, 2900 MHz



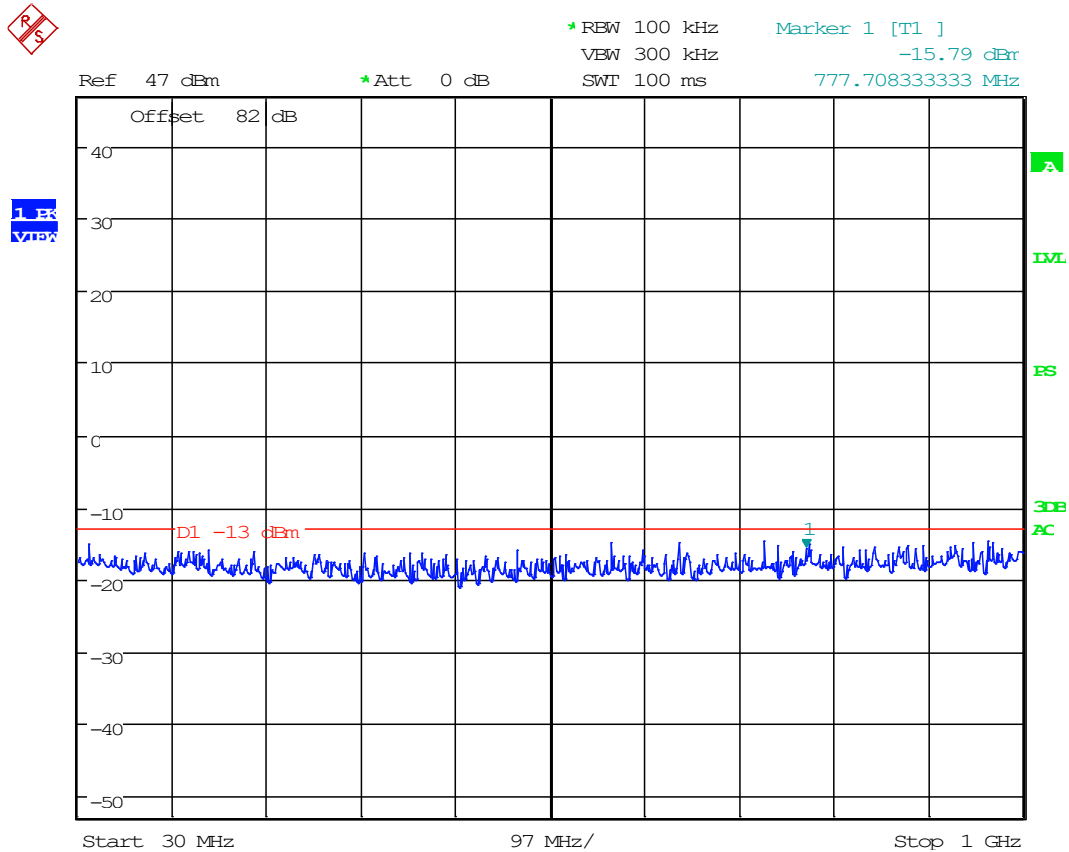
Date: 27.FEB.2023 15:40:11

8.5.2 Conducted Emissions 1 to 40 GHz , 2900 MHz



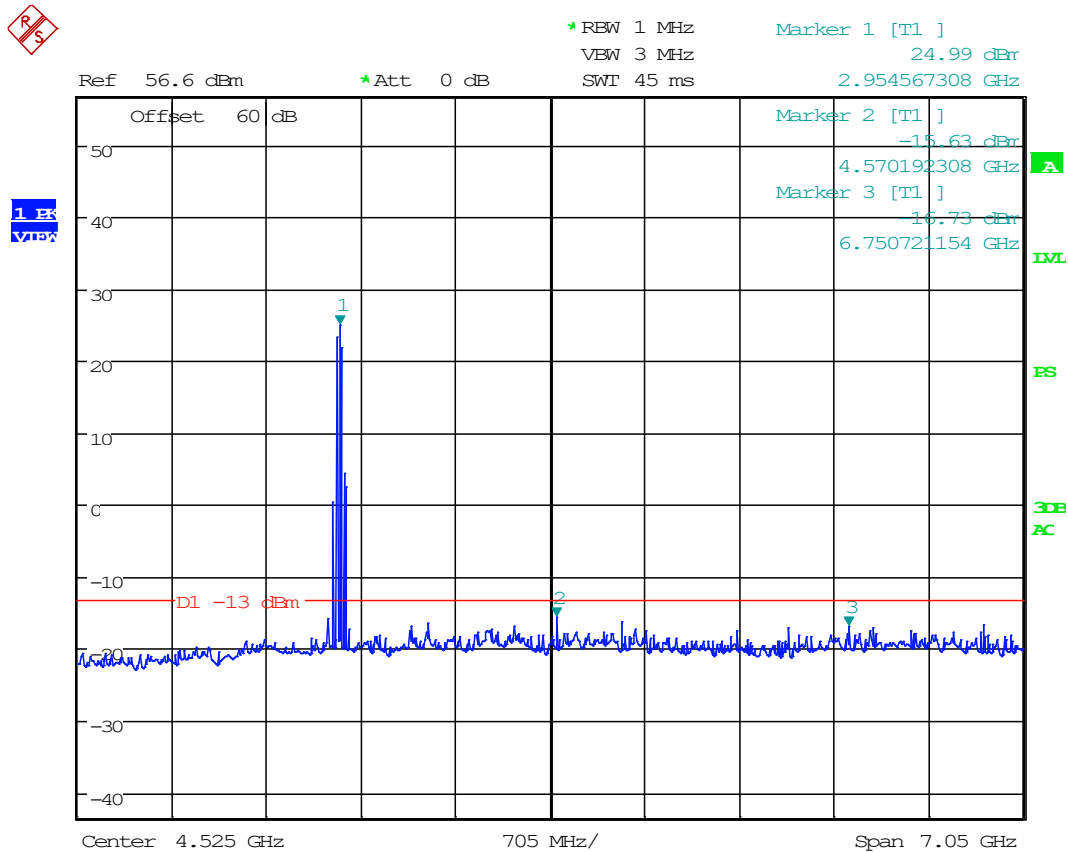
Date: 27.FEB.2023 15:38:32

8.5.1 Conducted Emissions 30 MHz to 1 GHz, 2950 MHz



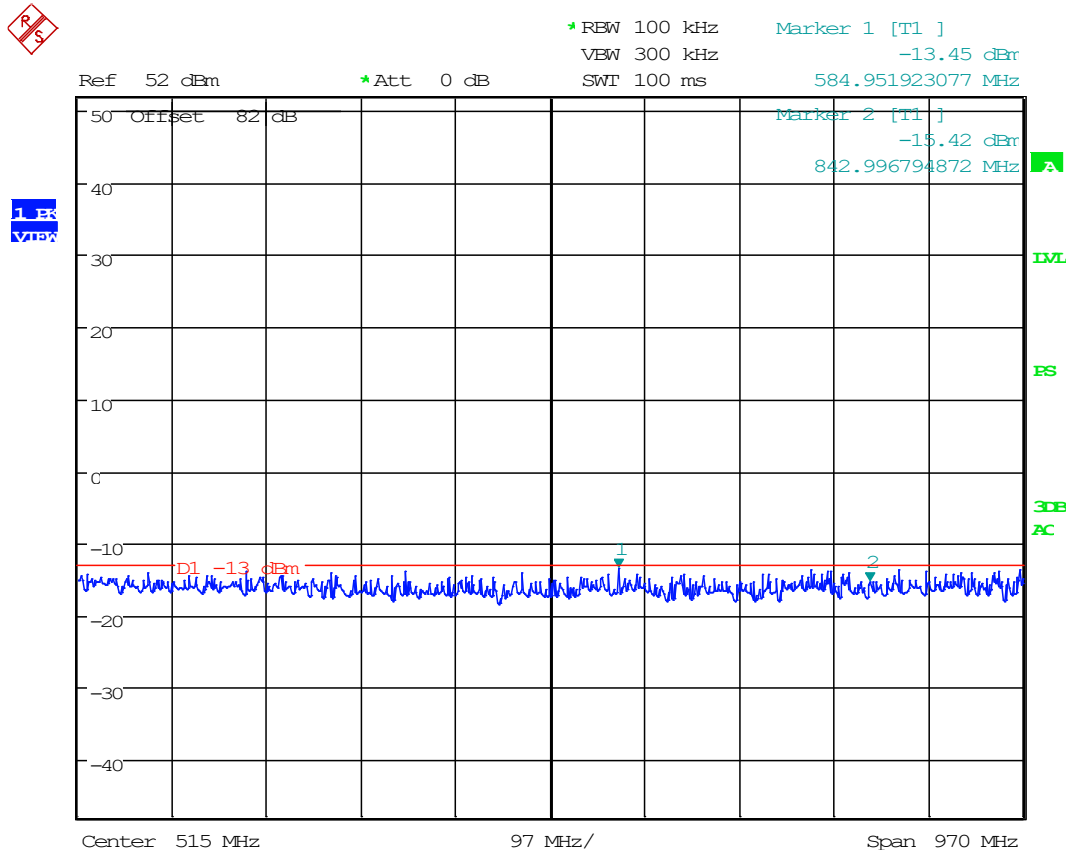
Date: 27.FEB.2023 12:35:23

8.5.2 Conducted Emissions 1 to 40 GHz , 2950 MHz



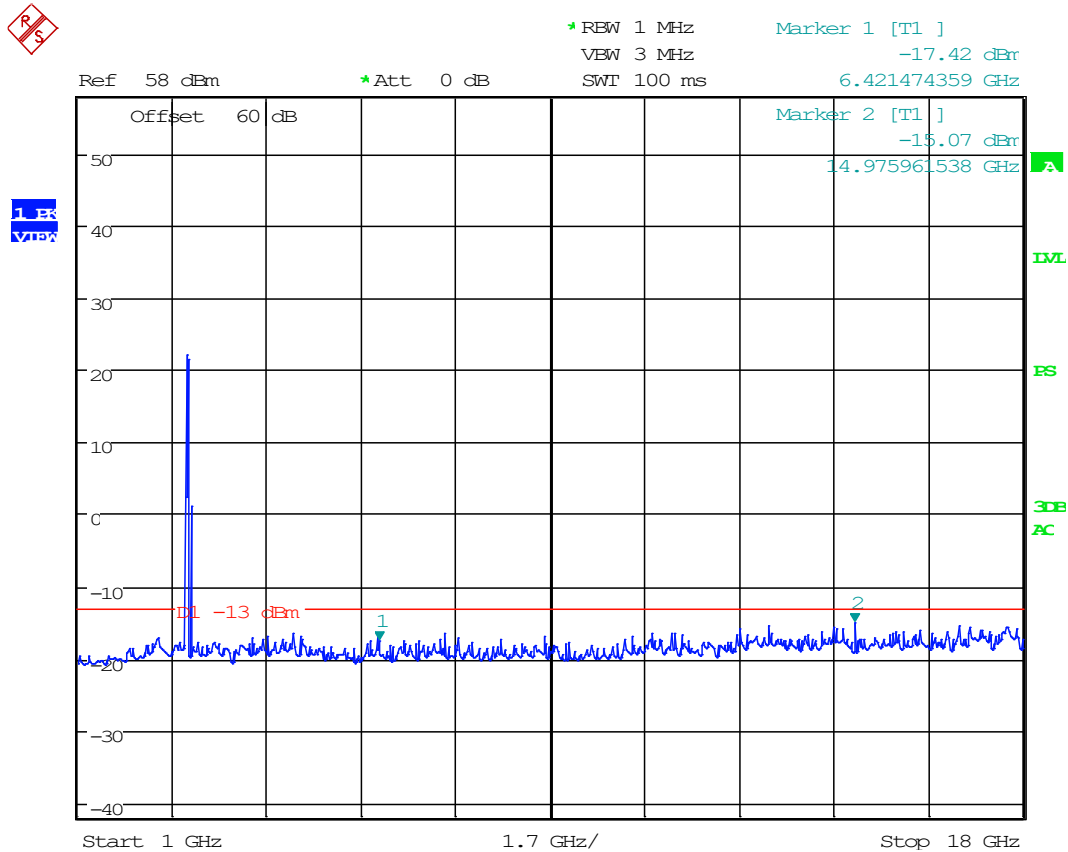
Date: 27.FEB.2023 12:39:59

8.5.1 Conducted Emissions 30 MHz to 1 GHz, 3000 MHz



Date: 27.FEB.2023 16:12:21

8.5.1 Conducted Emissions 1 to 40 GHz, 3000 MHz

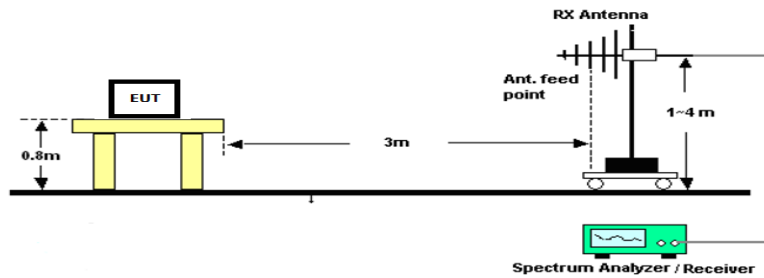


Date: 27.FEB.2023 16:13:33

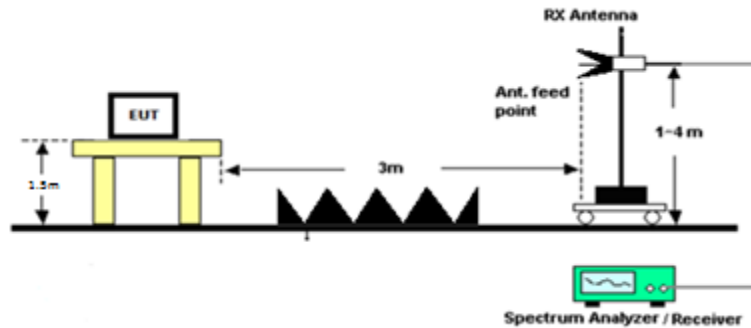
8.6 Radiated Emissions

Limits from FCC Parts 2.1053 and 90.210 (n); and test procedure from ANSI C63.26-2015.

Radiated Test Setup, 30 – 1000 MHz



Radiated Test Setup, Above 1000 MHz



Radiated Emissions, Tabular Data

8.6.1 Radiated Emissions, 2900 MHz

Tuned Freq MHz	Emission Frequency MHz	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Distance (m)	FS (dBuV/m)	erp (dBm)	Margin
2900.0	5800.0	32.0	V	0.76	30.00	62.73	3	62.73	-34.6475	21.65
2900.0	5800.0	17.5	H	1.12	30.00	48.62	3	48.62	-48.7559	35.76
2900.0	8700.0	32.8	V	1.12	30.00	63.88	3	63.88	-33.4959	20.50
2900.0	8700.0	28.1	H	1.37	30.00	59.47	3	59.47	-37.9063	24.91
2900.0	11600.0	17.8	V	2.03	30.00	49.82	3	49.82	-47.5561	34.56
2900.0	11600.0	16.9	H	2.84	30.00	49.73	3	49.73	-47.6472	34.65
2900.0	14500.0	20.4	V	3.58	30.00	54.02	3	54.02	-43.3572	30.36
2900.0	14500.0	18.4	H	7.40	30.00	55.78	3	55.78	-41.5930	28.59
2900.0	17400.0	21.0	V	9.57	30.00	60.60	3	60.60	-36.7767	23.78
2900.0	17400.0	19.7	H	8.35	30.00	58.07	3	58.07	-39.3063	26.31
2900.0	20300.0	19.6	V	9.36	30.00	58.91	3	58.91	-38.4684	25.47
2900.0	20300.0	20.3	H	10.37	30.00	60.62	3	60.62	-36.7604	23.76
2900.0	23200.0	21.0	V	11.37	30.00	62.35	3	62.35	-35.0224	22.02
2900.0	23200.0	21.4	H	12.38	30.00	63.80	3	63.80	-33.5744	20.57
2900.0	26100.0	22.4	V	13.39	30.00	65.75	3	65.75	-31.6265	18.63
2900.0	26100.0	22.7	H	14.40	30.00	67.10	3	67.10	-30.2785	17.28
2900.0	29000.0	26.1	V	15.41	30.00	71.54	3	71.54	-25.8405	12.84
2900.0	29000.0	26.3	H	16.41	30.00	72.72	3	72.72	-24.6526	11.65

8.6.2 Radiated Emissions, 2950 MHz

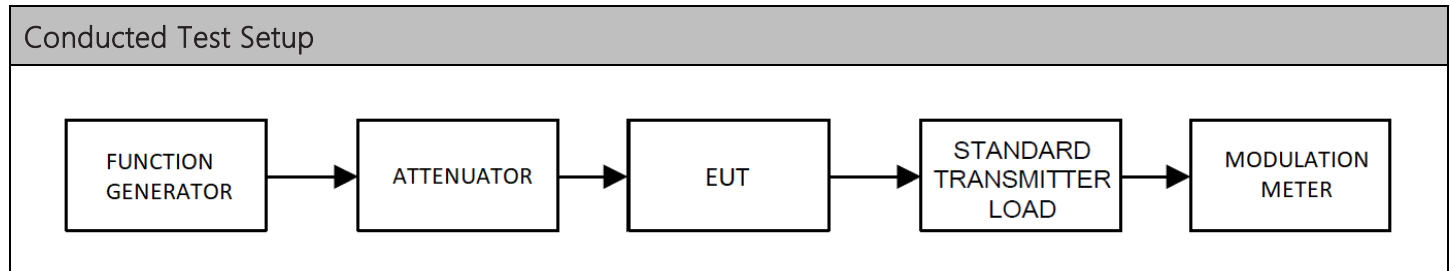
Tuned Freq MHz	Emission Frequency MHz	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Distance (m)	FS (dBuV/m)	erp (dBm)	Margin
2950.0	5900.0	45.3	V	0.76	30.00	76.02	3	76.02	-21.3575	8.36
2950.0	5900.0	39.2	H	1.12	30.00	70.31	3	70.31	-27.0659	14.07
2950.0	8850.0	46.2	V	1.12	30.00	77.31	3	77.31	-20.0659	7.07
2950.0	8850.0	46.7	H	1.37	30.00	78.03	3	78.03	-19.3463	6.35
2950.0	11800.0	11.3	V	2.03	30.00	43.34	3	43.34	-54.0361	41.04
2950.0	11800.0	10.4	H	2.84	30.00	43.23	3	43.23	-54.1472	41.15
2950.0	14750.0	10.9	V	3.58	30.00	44.46	3	44.46	-52.9172	39.92
2950.0	14750.0	10.8	H	7.40	30.00	48.18	3	48.18	-49.2000	36.20
2950.0	17700.0	13.6	V	9.57	30.00	53.14	3	53.14	-44.2367	31.24
2951.0	17706.0	11.6	H	8.35	30.00	49.95	3	49.95	-47.4263	34.43
2952.0	20664.0	17.9	V	9.36	30.00	57.25	3	57.25	-40.1284	27.13
2953.0	20671.0	13.5	H	10.37	30.00	53.90	3	53.90	-43.4804	30.48
2954.0	23632.0	13.3	V	11.37	30.00	54.68	3	54.68	-42.6924	29.69
2955.0	23640.0	13.0	H	12.38	30.00	55.39	3	55.39	-41.9844	28.98
2956.0	26604.0	18.8	V	13.39	30.00	62.17	3	62.17	-35.2065	22.21
2957.0	26613.0	18.6	H	14.40	30.00	62.97	3	62.97	-34.4085	21.41
2958.0	29580.0	16.4	V	15.41	30.00	61.84	3	61.84	-35.5405	22.54
2959.0	29590.0	17.2	H	16.41	30.00	63.62	3	63.62	-33.7526	20.75

8.6.3 Radiated Emissions, 3000 MHz

Tuned Freq MHz	Emission Frequency MHz	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Distance (m)	FS (dBuV/m)	erp (dBm)	Margin
3.0	6.0	50.7	V	0.76	30.00	81.49	3	81.49	-15.8875	2.89
3.0	6.0	48.7	H	1.12	30.00	79.86	3	79.86	-17.5159	4.52
3.0	9.0	47.1	V	1.12	30.00	78.23	3	78.23	-19.1459	6.15
3.0	9.0	37.5	H	1.37	30.00	68.87	3	68.87	-28.5063	15.51
3.0	12.0	17.8	V	2.03	30.00	49.82	3	49.82	-47.5561	34.56
3.0	12.0	16.9	H	2.84	30.00	49.73	3	49.73	-47.6472	34.65
3.0	15.0	20.4	V	3.58	30.00	54.02	3	54.02	-43.3572	30.36
3.0	15.0	18.4	H	7.40	30.00	55.78	3	55.78	-41.5930	28.59
3.0	18.0	21.0	V	9.57	30.00	60.60	3	60.60	-36.7767	23.78
3.0	18.0	19.7	H	8.35	30.00	58.07	3	58.07	-39.3063	26.31
3.0	21.0	19.6	V	9.36	30.00	58.91	3	58.91	-38.4684	25.47
3.0	21.0	20.3	H	10.37	30.00	60.62	3	60.62	-36.7604	23.76
3.0	24.0	21.0	V	11.37	30.00	62.35	3	62.35	-35.0224	22.02
3.0	24.0	21.4	H	12.38	30.00	63.80	3	63.80	-33.5744	20.57
3.0	27.0	22.4	V	13.39	30.00	65.75	3	65.75	-31.6265	18.63
3.0	27.0	22.7	H	14.40	30.00	67.10	3	67.10	-30.2785	17.28
3.0	30.0	26.1	V	15.41	30.00	71.54	3	71.54	-25.8405	12.84
3.0	30.0	26.3	H	16.41	30.00	72.72	3	72.72	-24.6526	11.65

8.7 Modulation Characteristics

Limits from FCC Parts 2.1047 and test procedure from ANSI C63.26-2015

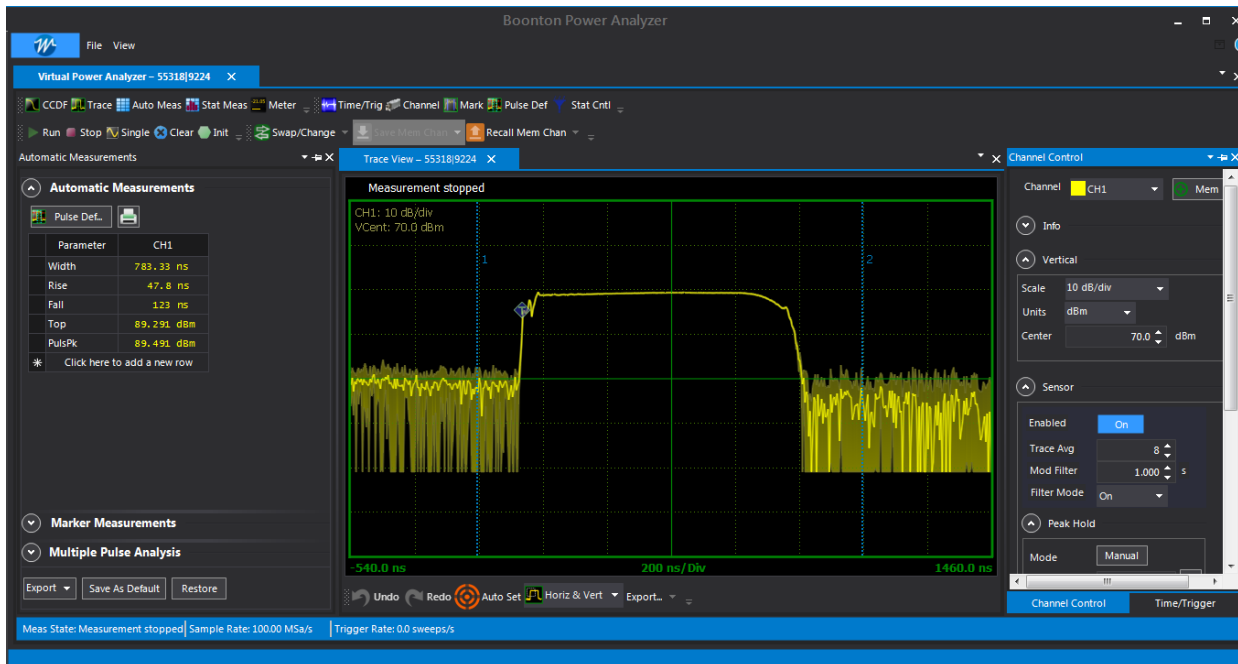


FCC 90.207, 90.209 – Pulse Characteristics.

Pulse Type	Pulse widths (μ s)	Pulse rep. rate (Hz)
0.8 μ s	0.78	500
1 μ s	0.95	500
2 μ s	1.98	500
4.5 μ s	4.48	250

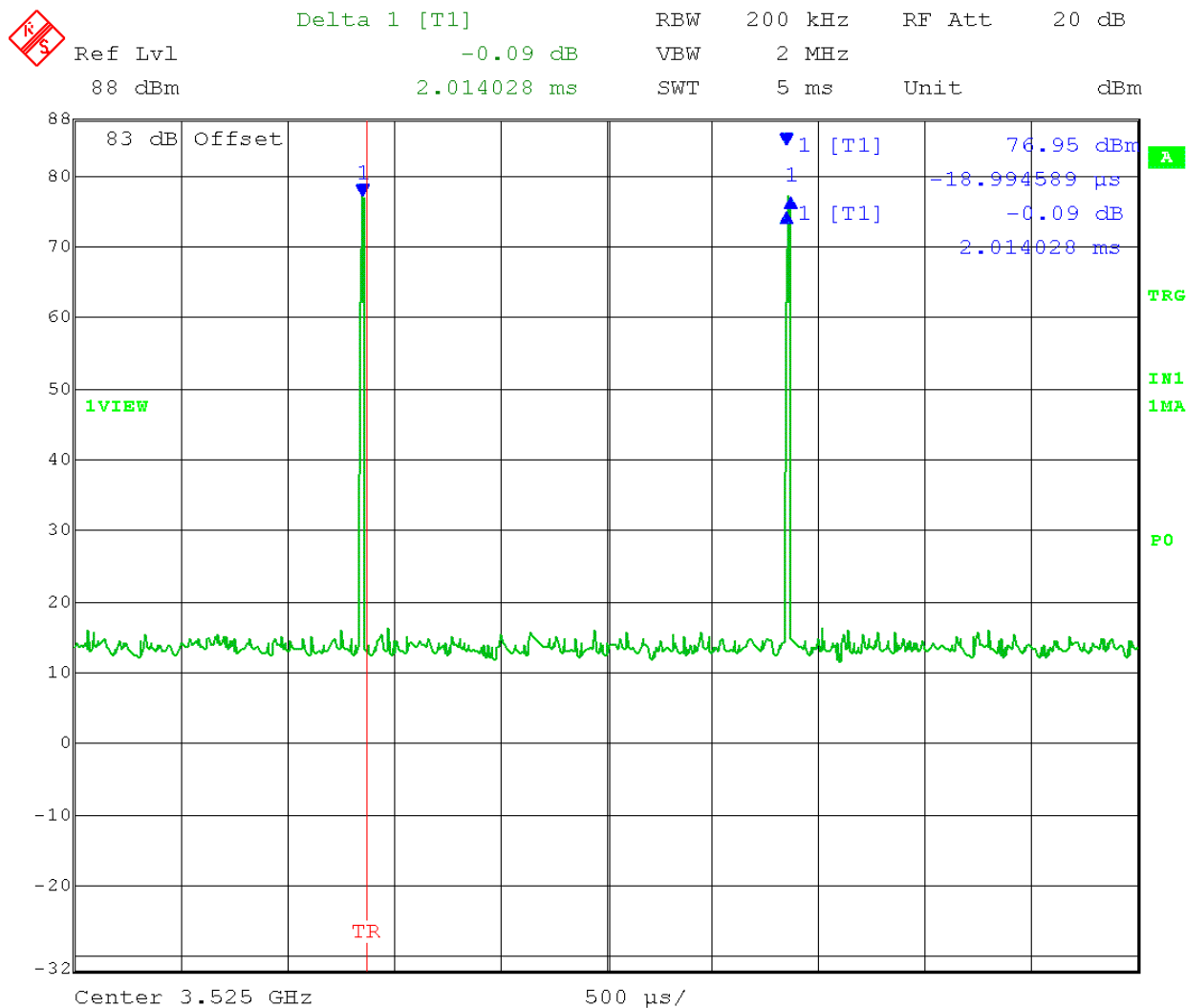
MODULATION CHARACTERISTICS

8.7.1 Test Data: 0.8 uS Pulse width Plot



MODULATION CHARACTERISTICS

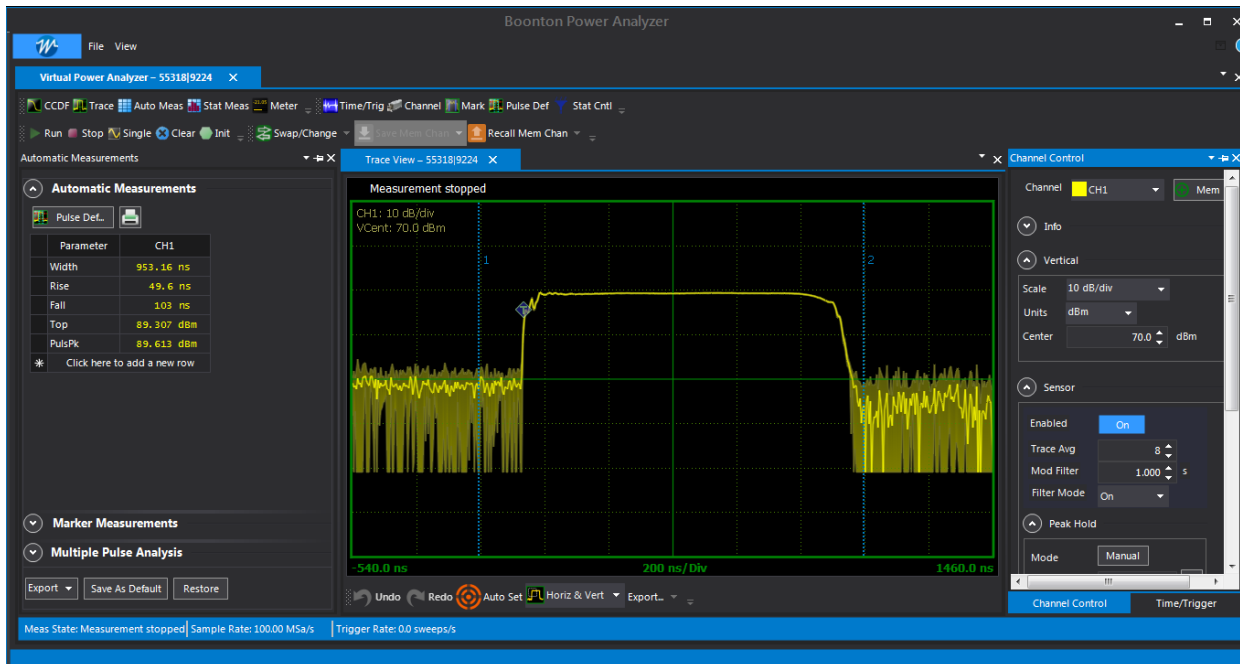
8.7.2 Test Data: 0.8 uS Rep Rate Plot



Date: 20.SEP.2017 15:03:12

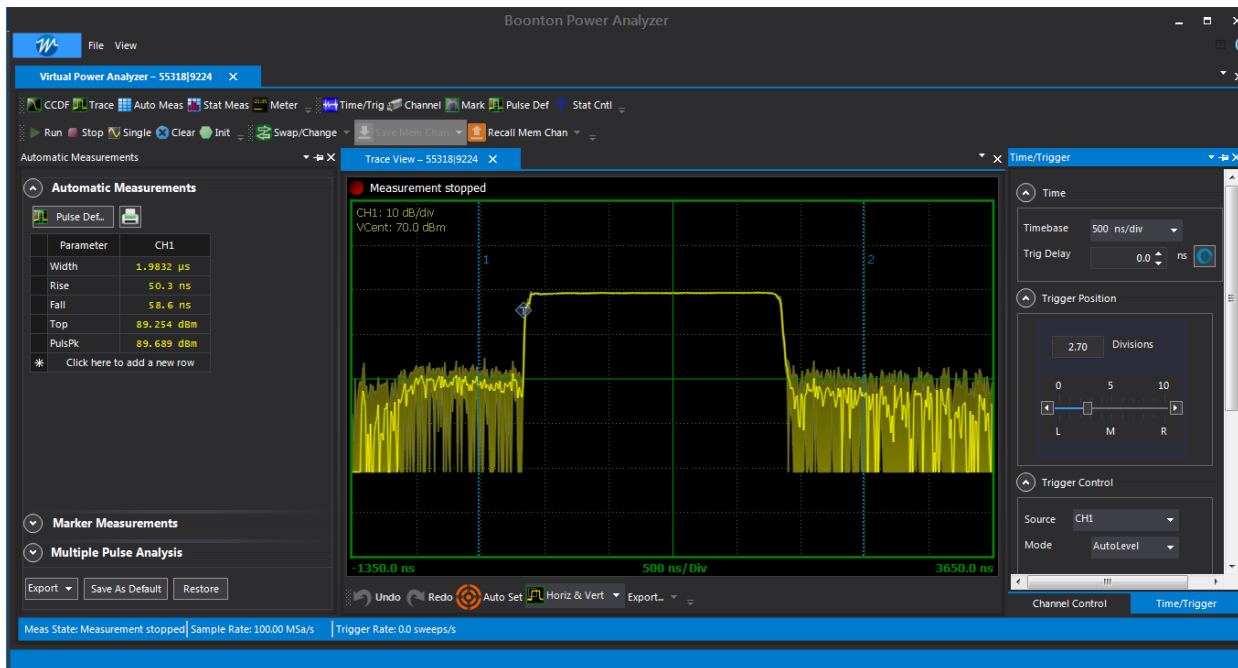
MODULATION CHARACTERISTICS

8.7.3 Test Data: 1 uS Pulse width Plot

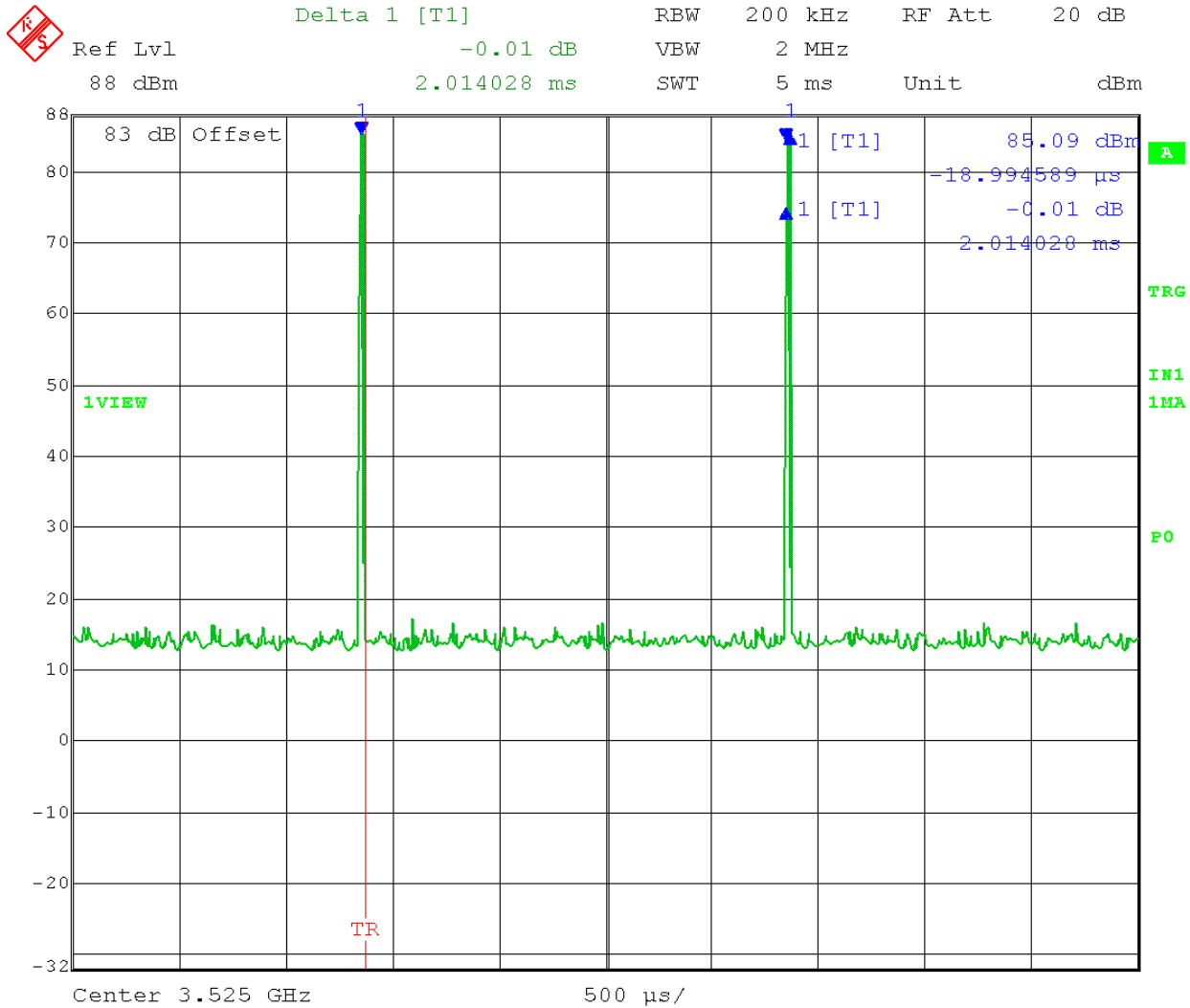


MODULATION CHARACTERISTICS

8.7.5 Test Data: 2 μ s Pulse width Plot



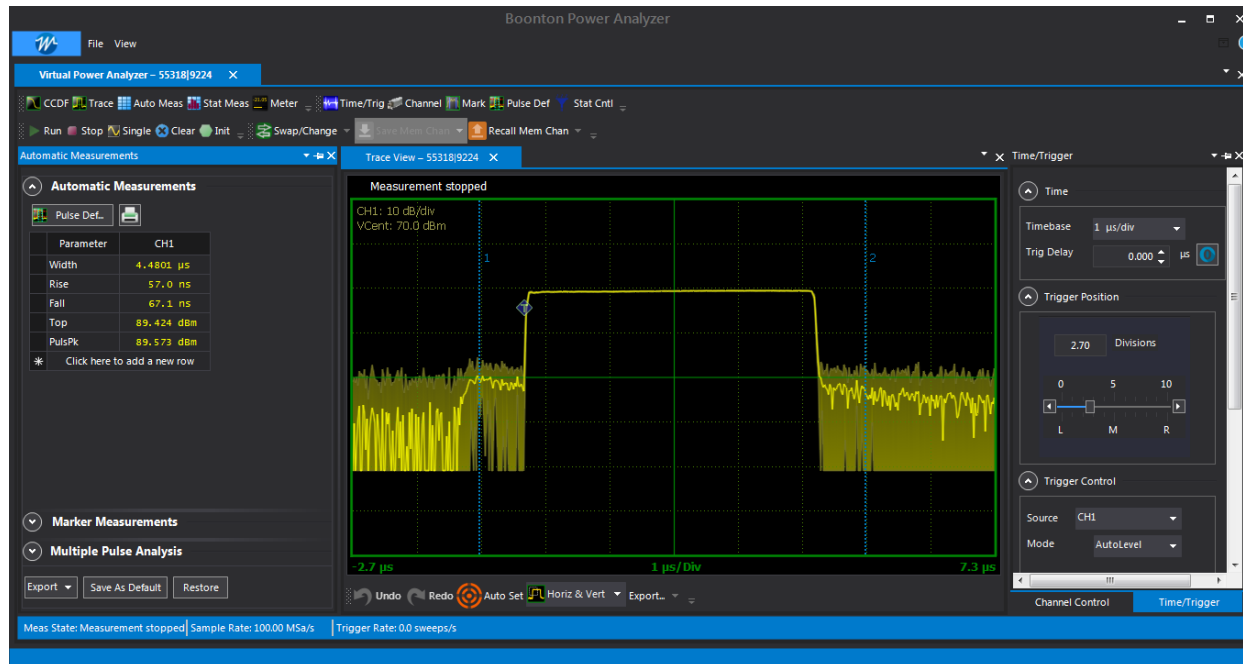
8.7.6 Test Data: 2 uS Rep Rate Plot



Date: 20.SEP.2017 15:04:16

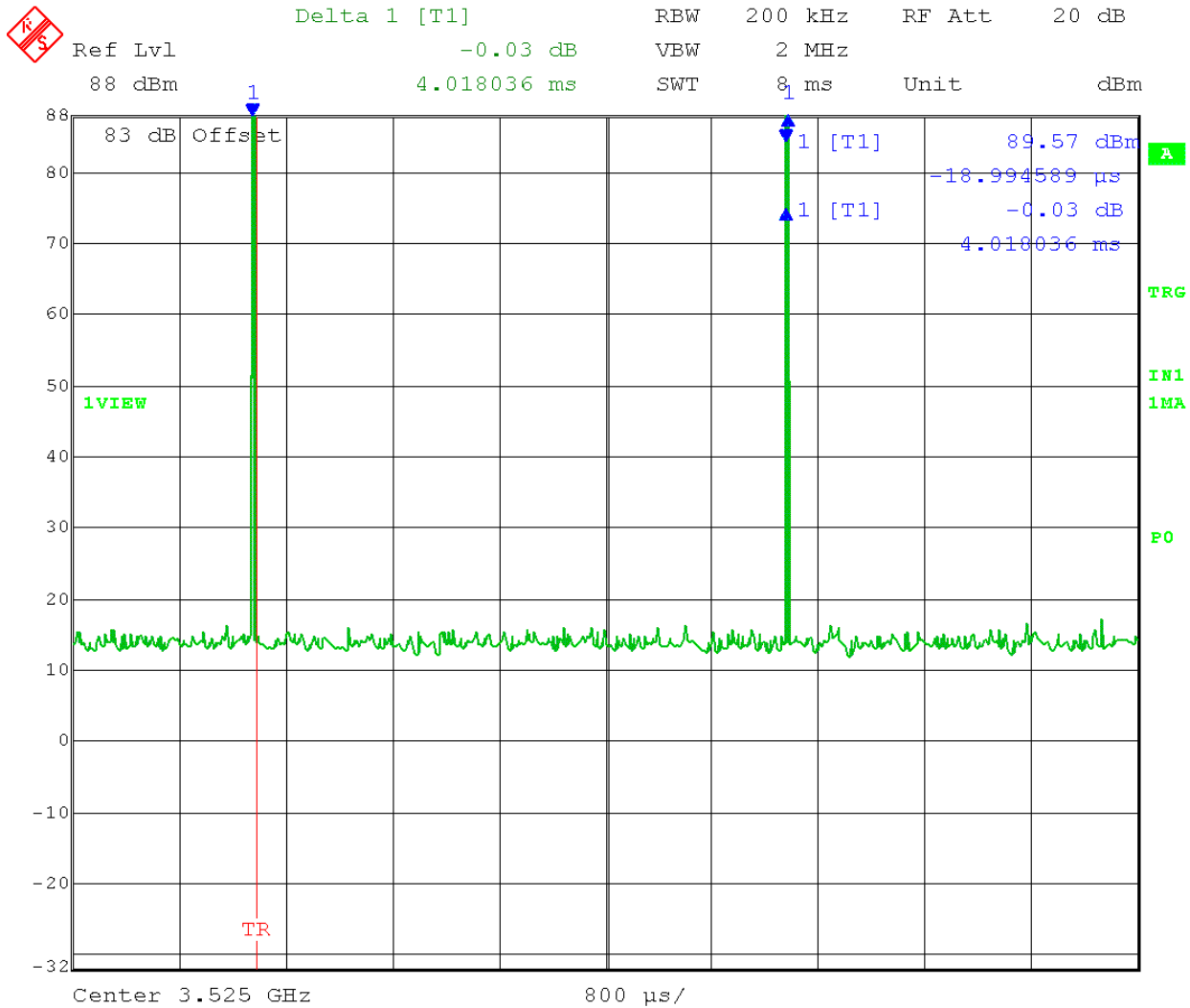
MODULATION CHARACTERISTICS

8.7.7 Test Data: 4.5 uS Pulse width Plot



MODULATION CHARACTERISTICS

8.7.8 Test Data: 4.5 uS Rep Rate Plot



Date: 20.SEP.2017 15:05:19

8.7.1 Audio Frequency Response

N/A. Device does not carry Audio.

8.7.2 Low Pass Filter Response

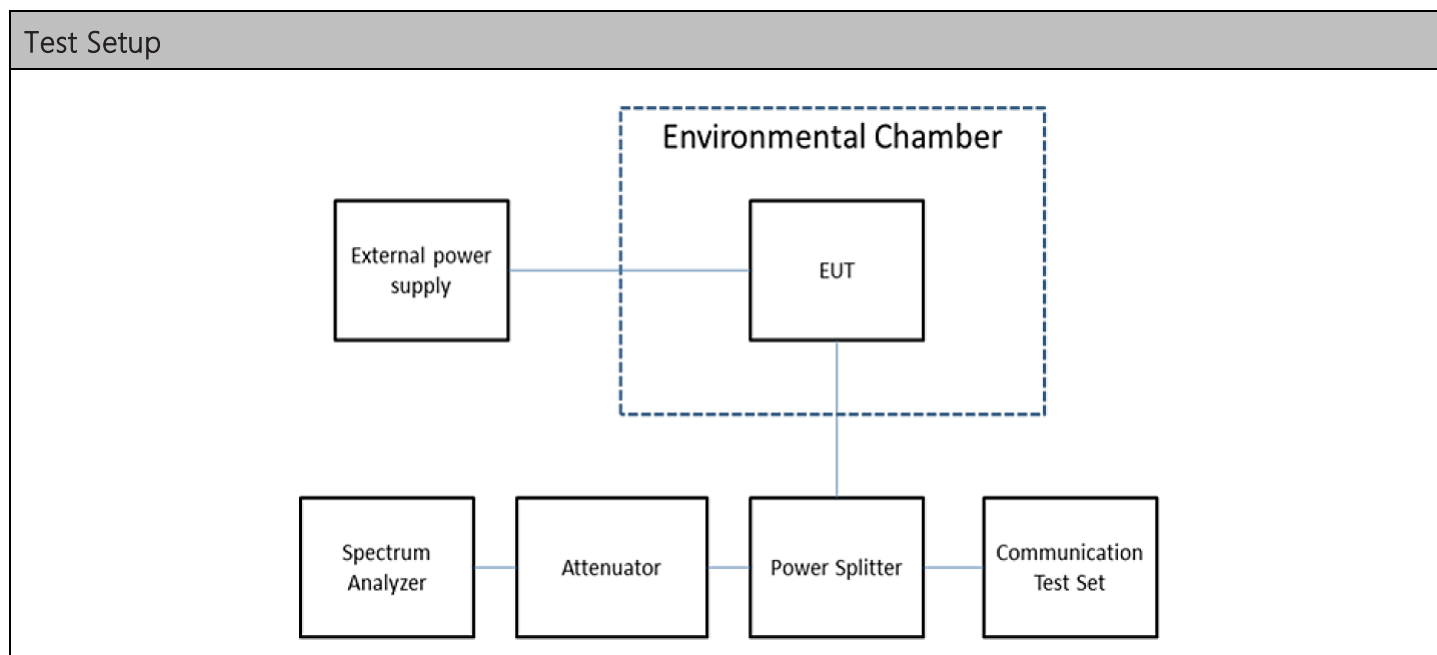
N/A. Device does not carry Audio.

8.7.3 Modulation Limiting

N/A. Device does not need to limit modulation.

8.8 Frequency Stability

Limits from FCC Parts 2.1055 and 90.213 (a) footnote 10; and test procedure from ANSI C63.26-2015.



Test Results, Mode 1		
Tuned Frequency (MHz)	Max Deviation (ppm)	Limit (ppm)
2950.0	0.00000051	1250

Note: This EUT is designed to operate within FCC Parts 90, and in accordance with ISSED RSS-238. Therefore, in lieu of FCC Part 90 unspecified stability limit, the EUT shall meet Frequency Stability limits from the appropriate standards (1250 ppm).

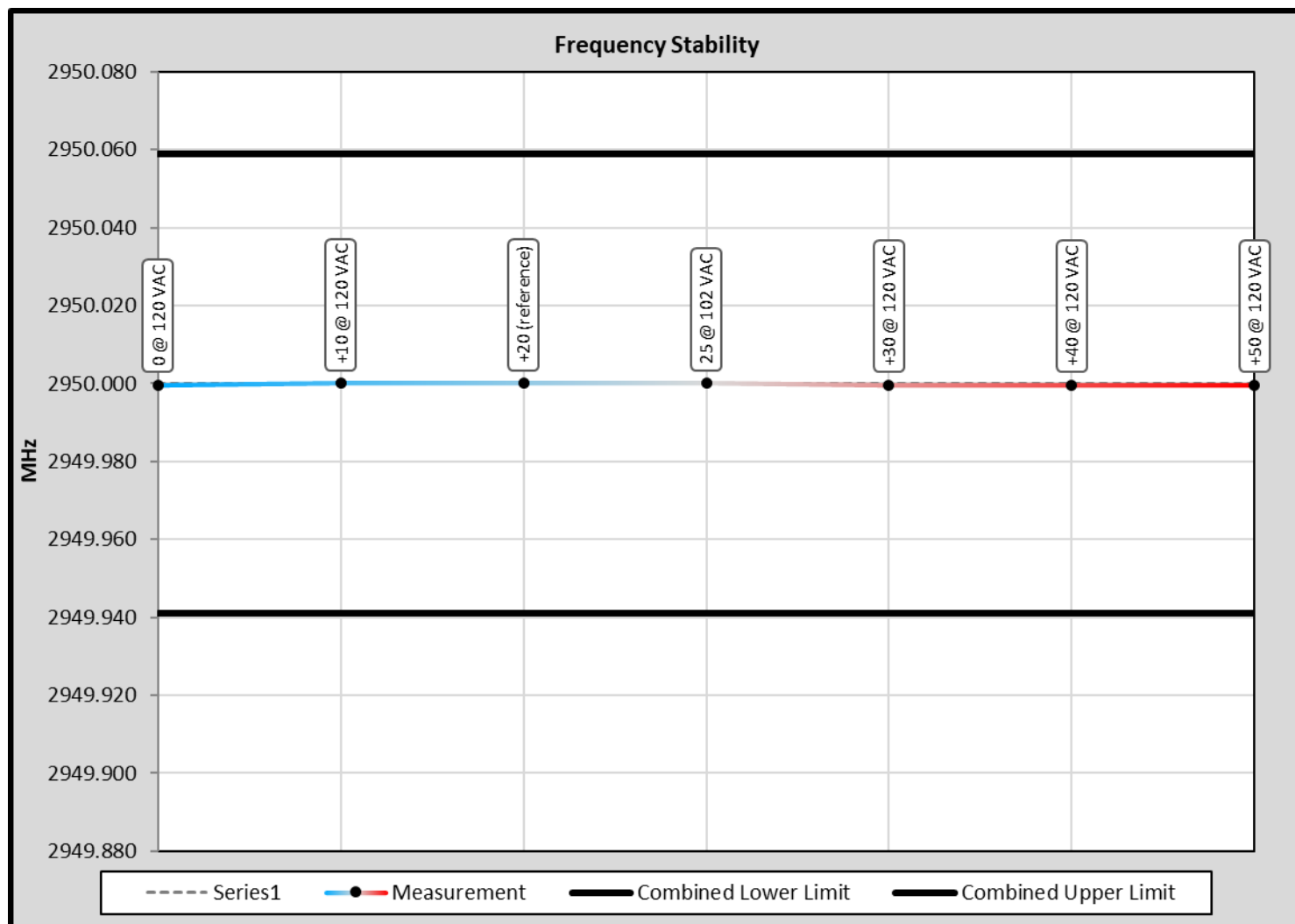
Note: EUT voltage was not varied because it will always be connected to a UPS battery back up system. EUT was operated in only the temperature range it will be exposed to due to it being installed inside a building.

Frequency Stability, Tabular Data

8.8.1 Frequency Stability Data

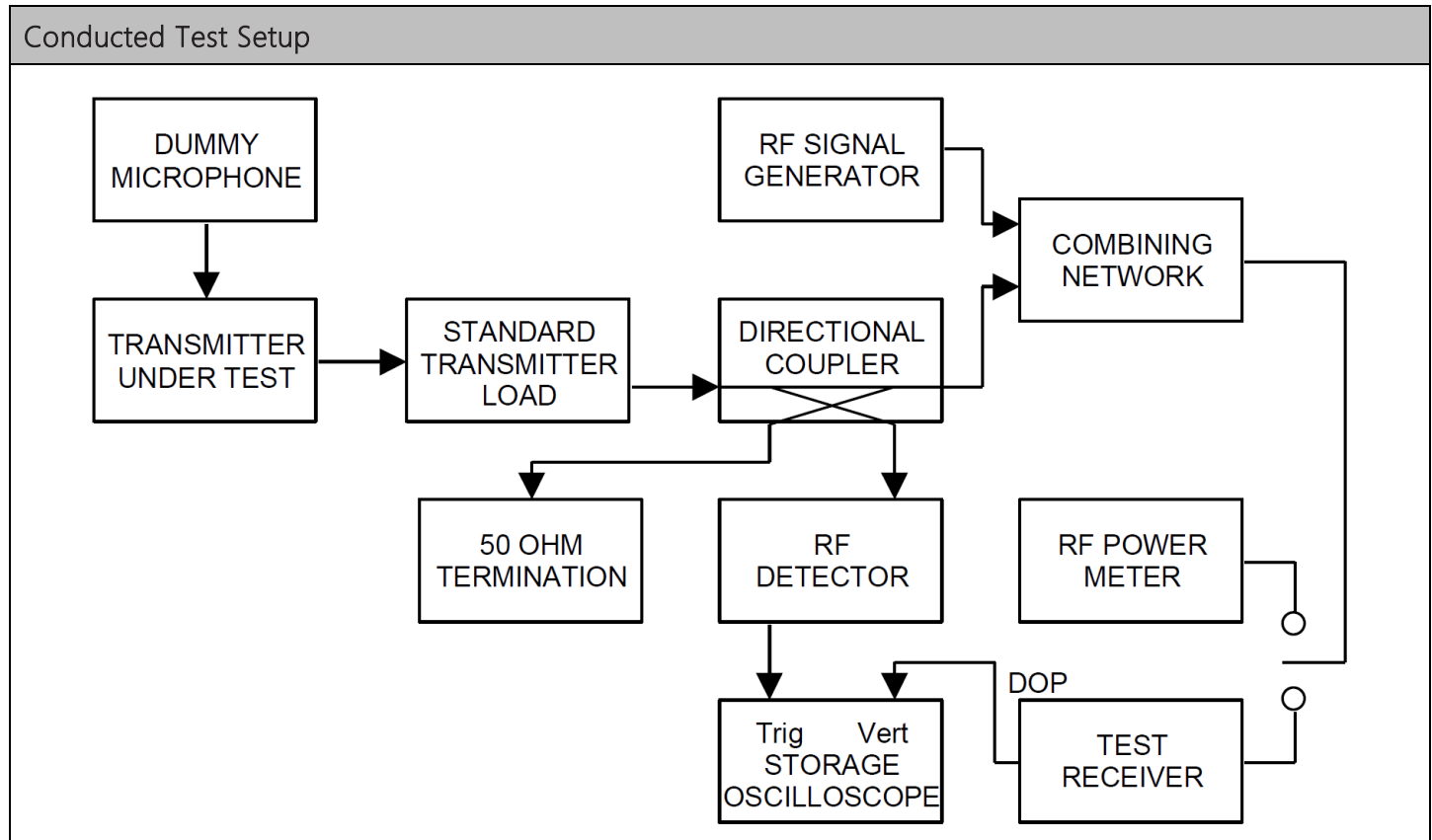
FCC Part 90 Limit	20.0	ppm	
FCC Part 90 Limit, as ppb	20000	ppb (Parts per Billion)	
FCC Part 90 Limit, as %	0.00200	%	
Strictest Combined Limit, as Hz	59000.000	Hz	
Combined Lower Limit	2949.941000	MHz	
Combined Upper Limit	2950.059000	MHz	
Rated Supply Voltage	120.0	☒ AC ☐ DC	
Temperature / Voltage Variation			
Temperature (°C)	Supplied Voltage (V)	Frequency (MHz)	Deviation (kHz)
-30	120.0	2950.000000	0.000
-20	120.0	2950.000000	0.000
-10	120.0	2950.000000	0.000
0	120.0	2949.999599	0.401
+10	120.0	2950.000000	0.001
+20 (reference)	120.0	2950.000000	0.000
25	102.0	2950.000000	0.001
+30	120.0	2950.001500	-1.499
+40	120.0	2949.999599	0.401
+50	120.0	2949.999599	0.401

8.8.2 Frequency Stability Plot



8.9 Transient Frequency Behavior

Limits from FCC Part 90.214; and test procedure from ANSI C63.26-2015.

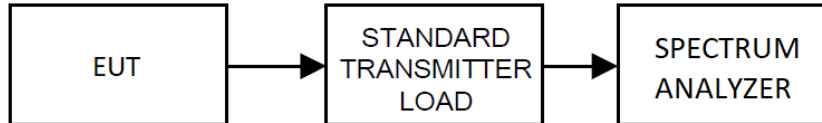


N/A. Device does not operate in a band requiring TFR measurement.

8.10 Adjacent channel power limits

Limits from FCC Part 90.221, and test procedure from ANSI C63.26-2015.

Conducted Test Setup



N/A. Device does not operate in a band requiring ACP measurement.

9. ANNEX-A - Photographs of the EUT

Photographs of the EUT and any manufacturer supplied accessories to be used with the EUT are in separate supplementary documents labelled EXTERNAL PHOTOS and INTERNAL PHOTOS.

10. ANNEX-B – Test Setup Photographs

Test setup photographs are located in a separate supplementary ANNEX-B document.

11. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_6489-23_FCC_PT90_1	1	Initial release	3/7/2023

END OF TEST REPORT
