

**KTL Test Report:** 9L0114R

**Applicant:** Conifer Corporation

**Equipment Under Test:  
(E.U.T.)** TR2278 Signal Transverter

**FCC ID:** CI32278

**In Accordance With:** **FCC PART 21, Subpart K,  
FCC PART 74**  
Multipoint Distribution Service

**Tested By:** KTL Dallas Inc.  
802 N. Kealy  
Lewisville, Texas 75057-3136

**Authorized By:**  
  
Tom Tidwell, RF Group Manager

**Date:**

**Total Number of Pages:** 1

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

## Table of Contents

<a href="#">Table of Contents</a> .....	2
<a href="#">Section 1. Summary of Test Results</a> .....	3
<a href="#">Section 2. General Equipment Specification</a> .....	5
<a href="#">Section 3. RF Power Output</a> .....	10
<a href="#">Section 4. Occupied Bandwidth</a> .....	11
<a href="#">Section 5. Spurious Emissions at Antenna Terminals</a> .....	59
<a href="#">Section 6. Field Strength of Spurious</a> .....	78
<a href="#">Section 7. Frequency Stability</a> .....	80
<a href="#">Section 8. Test Equipment List</a> .....	81
<a href="#">Section 8. Test Equipment List</a> .....	82
<a href="#">Section 9. Test Setup Photos</a> .....	83
<a href="#">ANNEX A - TEST DETAILS</a> .....	A1
<a href="#">ANNEX B - TEST DIAGRAMS</a> .....	B1

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 1. Summary of Test Results**

Manufacturer: Conifer Corporation

Model No.: TR2278

Serial No.: NONE

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 21, Subpart K and Part 74.

New Submission

Production Unit

Class II Permissive Change

Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



**NVLAP LAB CODE: 100426-0**

TESTED BY: Tom Tidwell

DATE:

KTL Dallas Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. KTL Dallas Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report applies only to the items tested.

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Summary Of Test Data**

<b>NAME OF TEST</b>	<b>PARA. NO.</b>	<b>SPEC.</b>	<b>MEAS.</b>	<b>RESULT</b>
RF Power Output	2.1046	33dBW EIRP		Complies
Occupied Bandwidth	2.1049	21.908 (b) Mask		Complies
Spurious Emissions @ Antenna Terminals	2.1051	-60 dBc		Complies
Field Strength of Spurious Radiation	2.1053	-60 dBc		Complies
Frequency Stability	2.1055	± 1 kHz	N/A	N/A

**Footnotes:**

Frequency stability was not measured since the EUT uses a common oscillator for frequency conversion which oscillator is synchronized to the GPS timing signal.

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 2. General Equipment Specification**

<b>Max. Power Input:</b>	QPSK +10 dBm 16 QAM +7 dBm										
<b>Frequency Range:</b>	2150 – 2162 MHz MDS band										
<b>Type(s) of Modulation:</b>	<table border="0" style="margin-left: 40px;"> <tr> <td><b>F3E (Voice)</b></td> <td><b>F1D</b></td> <td><b>F2D</b></td> <td><b>D7W (QAM)</b></td> <td><b>G7W (QPSK)</b></td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	<b>F3E (Voice)</b>	<b>F1D</b>	<b>F2D</b>	<b>D7W (QAM)</b>	<b>G7W (QPSK)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>F3E (Voice)</b>	<b>F1D</b>	<b>F2D</b>	<b>D7W (QAM)</b>	<b>G7W (QPSK)</b>							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
<b>Emission Designator:</b>	<table border="0" style="margin-left: 40px;"> <tr> <td>QPSK</td> <td>100KG7W, 200KG7W, 400KG7W, 640KG7W, 800KG7W, 1M60G7W, 1M93G7W, 2M10G7W</td> </tr> <tr> <td>16QAM</td> <td>200KD7W, 400KD7W, 800KD7W, 1M60D7W, 3M20D7W</td> </tr> </table>	QPSK	100KG7W, 200KG7W, 400KG7W, 640KG7W, 800KG7W, 1M60G7W, 1M93G7W, 2M10G7W	16QAM	200KD7W, 400KD7W, 800KD7W, 1M60D7W, 3M20D7W						
QPSK	100KG7W, 200KG7W, 400KG7W, 640KG7W, 800KG7W, 1M60G7W, 1M93G7W, 2M10G7W										
16QAM	200KD7W, 400KD7W, 800KD7W, 1M60D7W, 3M20D7W										
<b>Output Impedance:</b>	50 ohms										
<b>Gain:</b>	20 dB (fixed)										
<b>RF Power Output Rated:</b>	<b>Per Carrier:</b> +27 dBm nominal (QPSK), +24 dBm nominal(16QAM) <b>Composite:</b> Not Applicable										
<b>Duty Cycle:</b>	Continuous										
<b>Channel Spacing:</b>	N/A										
<b>Operator Selection Of Operating Frequency:</b>	Not selectable by user										
<b>Power Output Adjustment Capability:</b>	Not adjustable by user.										
<b>Description of Modulation(s):</b>	<table border="0" style="margin-left: 40px;"> <tr> <td>QPSK</td> <td>Data Source: Pseudo-random bit source Symbol rate: Variable Filter: COS/0.25 Coding: None</td> </tr> <tr> <td>16QAM</td> <td>Data Source: Pseudo-random bit source Symbol rate: Variable Filter: COS/0.25 Coding: None</td> </tr> </table>	QPSK	Data Source: Pseudo-random bit source Symbol rate: Variable Filter: COS/0.25 Coding: None	16QAM	Data Source: Pseudo-random bit source Symbol rate: Variable Filter: COS/0.25 Coding: None						
QPSK	Data Source: Pseudo-random bit source Symbol rate: Variable Filter: COS/0.25 Coding: None										
16QAM	Data Source: Pseudo-random bit source Symbol rate: Variable Filter: COS/0.25 Coding: None										

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

<b>QPSK Modulation</b>			
Symbol Rate (ksps)	Useable Bandwidth (kHz)	Maximum Input Level (dBm)	RF Output (dBm)
128	100	+10	+27.0
160	200	+10	+27.0
320	400	+9	+26.4
512	640	+9	+27.0
640	800	+9	+27.0
1280	1600	+9	+27.0
1544	1930	+9	+27.0
2048	2100	+8	+26.0
2560	3200	+8	+26.0

<b>16QAM</b>			
Symbol Rate (ksps)	Useable Bandwidth (kHz)	Maximum Input Level (dBm)	RF Output (dBm)
160	200	+7	+24.0
320	400	+6	+23.5
640	800	+6	+23.5
1280	1600	+6	+23.5
2560	3200	+6	+23.5

**KTL Dallas**

FCC PART 21, SUBPART K  
MULTIPOINT DISTRIBUTION SERVICE  
PROJECT NO.: 9L0114R

*EQUIPMENT: TR2278 Transverter*

*FCC ID: C132278*

---

**Description of Modifications For Class II Permissive Change**

Not Applicable

**KTL Dallas**

FCC PART 21, SUBPART K  
MULTIPOINT DISTRIBUTION SERVICE  
PROJECT NO.: 9L0114R

*EQUIPMENT: TR2278 Transverter*

*FCC ID: CI32278*

---

**Modifications Made During Testing**

Not Applicable

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

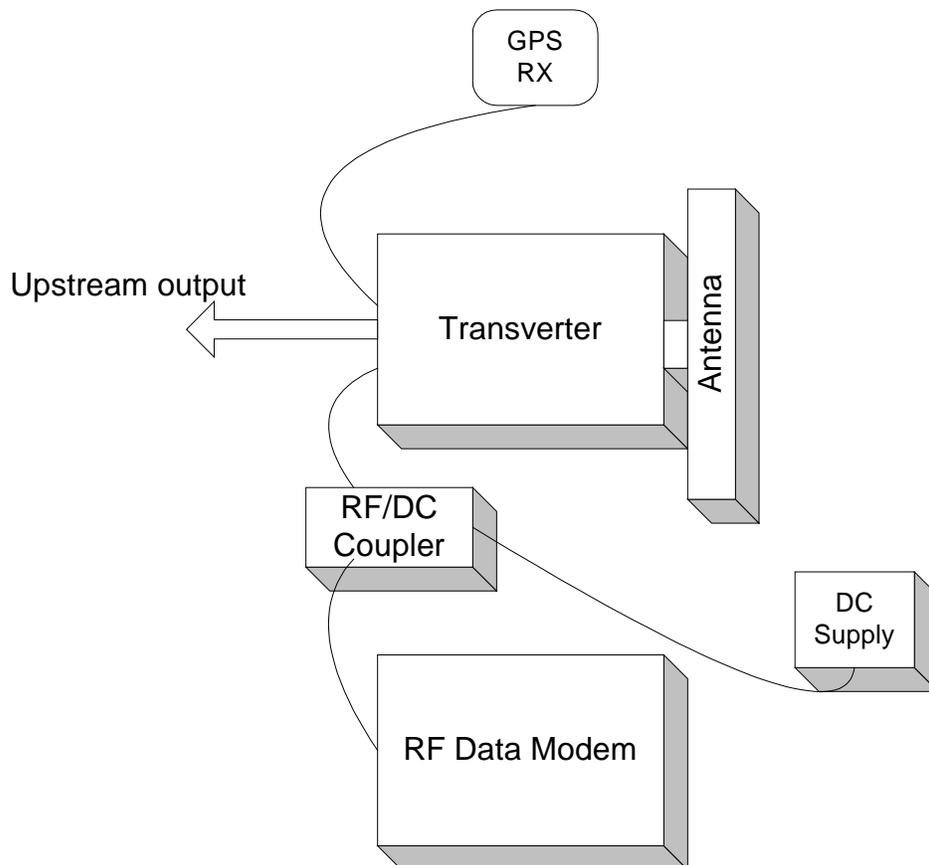
---

**Theory Of Operation**

The EUT is a frequency converter/amplifier that operates over the 2150 – 2162 MHz MDS band. The system uses one TR2278 for each transmitted channel. A 15 dBi gain panel antenna or a dBi gain sub reflector antenna is connected to the rf output. The upstream is directly connected to the head end equipment via 75 ohm coaxial cable.

The system uses a common oscillator, synchronized with the GPS timing signal, to convert the downstream signal from th 27 – 39 MHz band to the 2150 – 2162 MHz band. Since a common oscillator is used, the frequency drift is dependant upon the stability of the input signal.

**System Diagram**



*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: Tom Tidwell	DATE: 11,12 August 1999

**Test Results:** Complies.

**Measurement Data:**

Maximum Power Output @ Antenna (dBm)	Maximum Power Output @ Antenna (dBW)	Antenna Gain (dBi)	EIRP (dBW)
+27	-3	15	+12

**Test Equipment Used:** 1,4,5,7,,8,14,21,22

**Environmental Conditions:** 22 °Celsius  
42 % RH

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 4. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: Tom Tidwell	DATE: 11, 12 August 1999

**Test Results:** Complies.

**Measurement Data:** See attached plots.

NOTE: The equipment tested is intended for single channel operation. There are two modulation types: QPSK and 16 QAM. Within an assigned 6 MHz channel the user may use multiple transverter units to fill the 6 MHz channel assignment. The lowest and highest channels are centered at a frequency removed for the lower or upper 6 MHz channel edge by a displacement of  $f_d = \text{Useable BW}/2 + 20 \text{ kHz}$ . The useable BW is taken from the chart reproduced on page 6 of this report.

For Example:

Using QPSK modulation with a symbol rate of 128 ksps:

Useable BW = 100 kHz

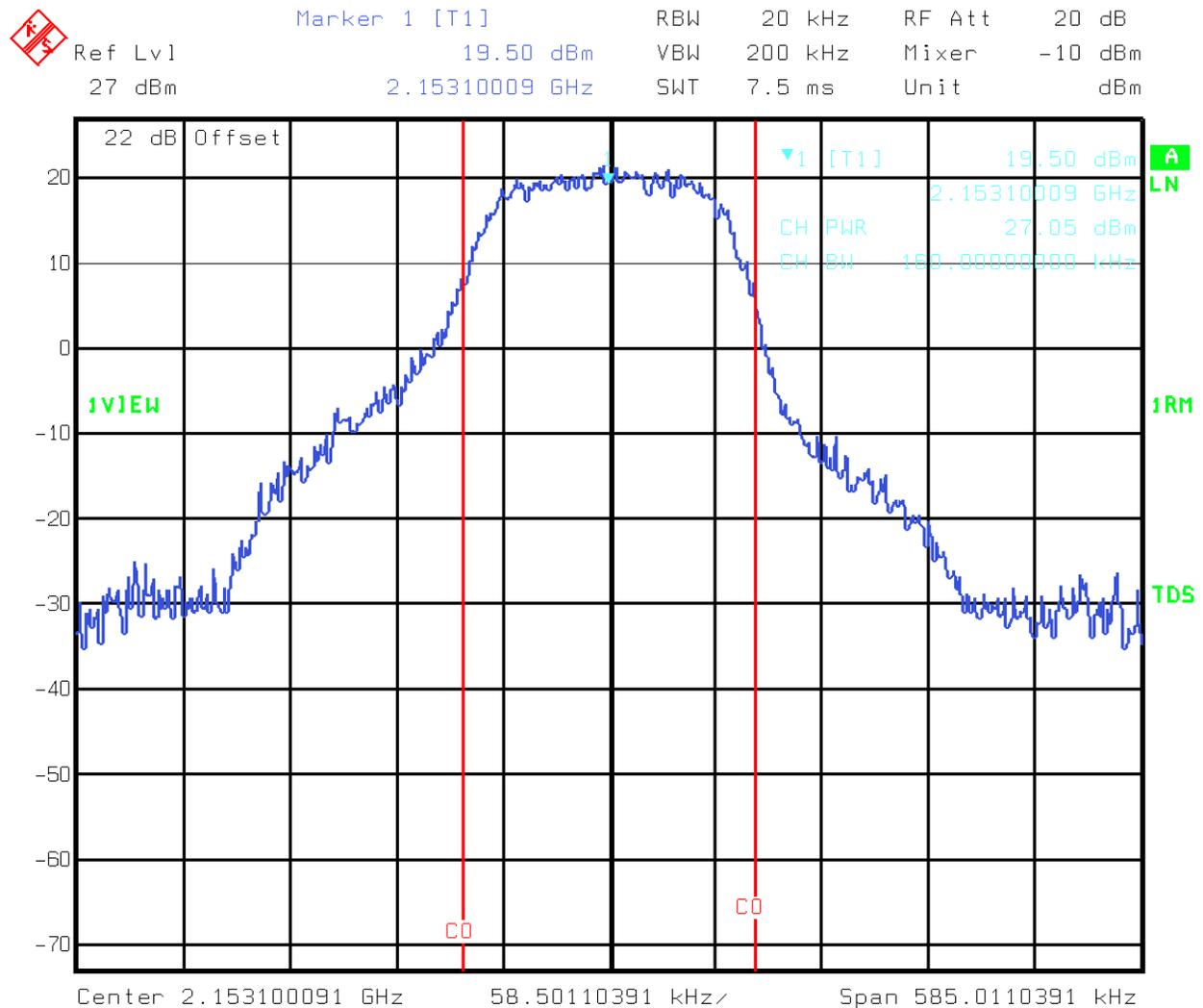
$f_d = 100\text{kHz}/2 + 20 \text{ kHz} = 70 \text{ kHz}$ .

Therefore in the 6 MHz channel centered on 2156 MHz, the lowest useable channel would be centered on  $2153 \text{ MHz} + 70 \text{ kHz} = 2153.07 \text{ MHz}$ . The highest useable channel would be centered on  $2159 \text{ MHz} - 70 \text{ kHz} = 2158.93 \text{ MHz}$ .

**Test Equipment Used:** 1,4,5,14,21,22

**Environmental Conditions:** 22 °Celsius  
42 % RH

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Average Channel Power  
Comment A: 35.9133 MHz Input, 2153.100 MHz Output  
Date: 11.AUG.1999 13:08:50

Plot 1 – QPSK modulation, 128 ksps

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278

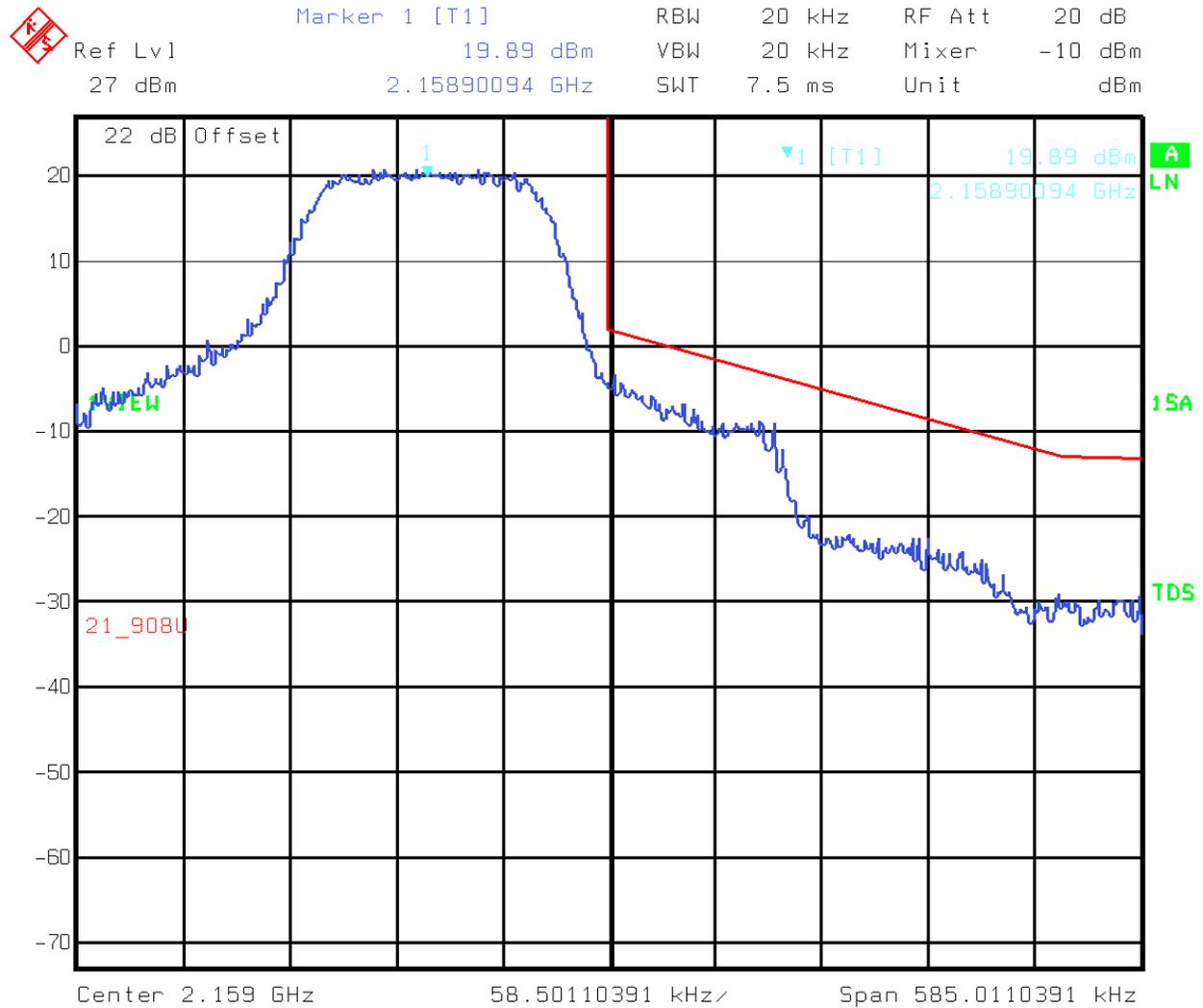


Title: Lower Edge of 6 MHz Channel

Date: 11.AUG.1999 13:13:38

Plot 2- QPSK modulation, 128 ksps

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278

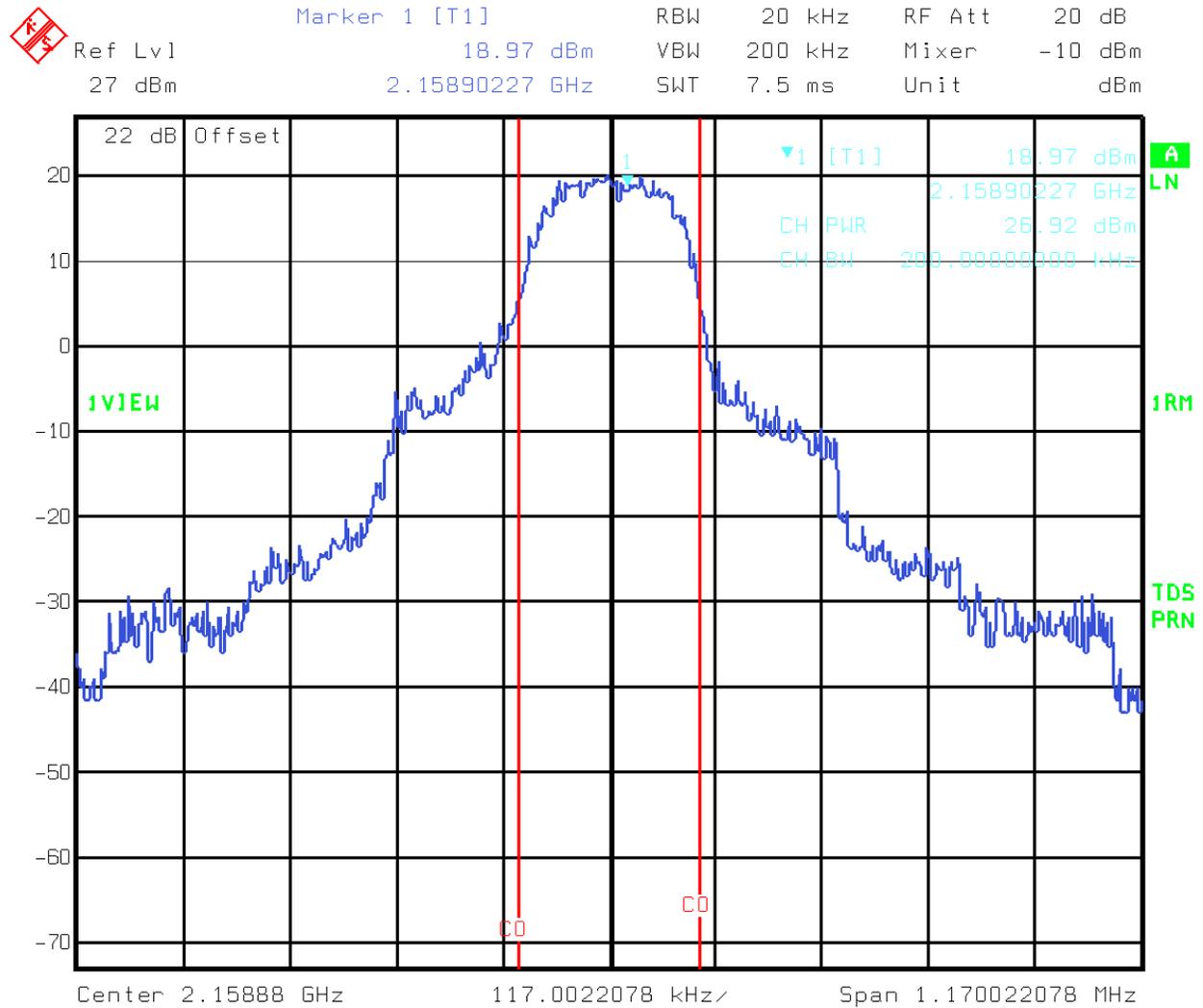


Title: Upper Edge of 6 MHz Channel

Date: 11.AUG.1999 14:42:23

Plot 3 – QPSK modulation, 128 ksps

EQUIPMENT: TR2278 Transverter  
 FCC ID: CI32278



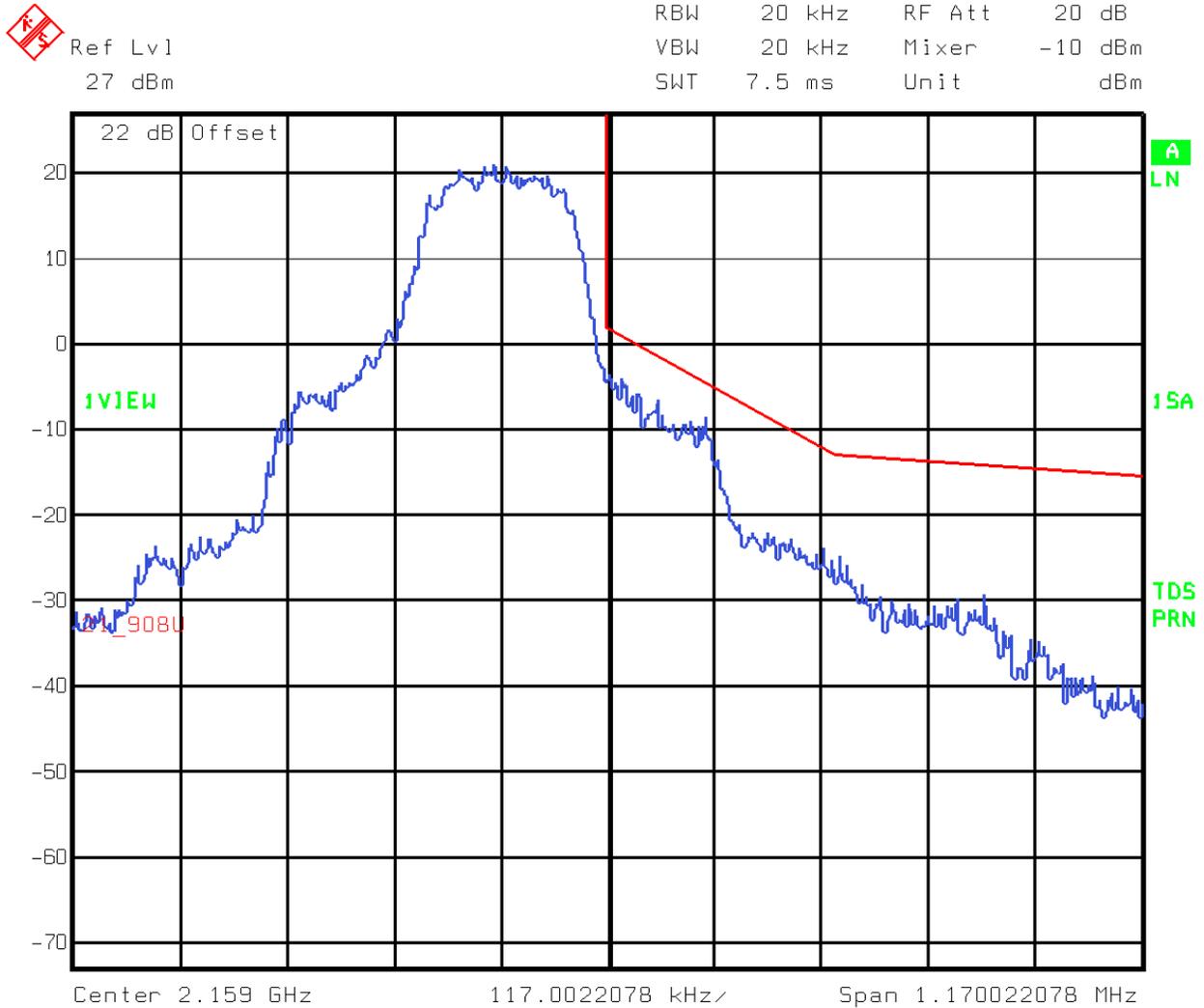
Title: Average Channel Power

Date: 11.AUG.1999 14:59:21

Plot 4 -- QPSK modulation, 160 ksps



EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278

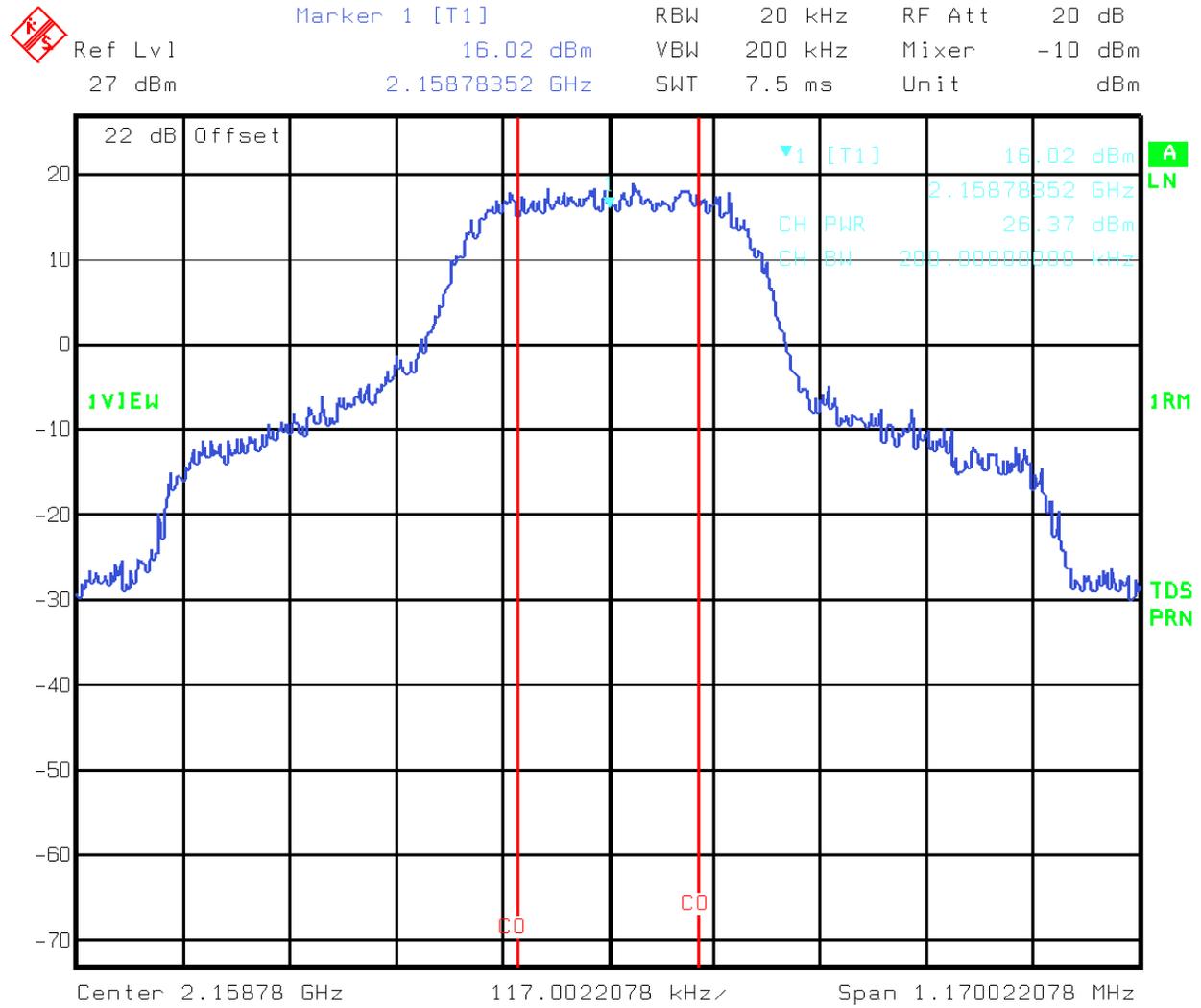


Title: Upper Edge of 6 MHz Channel

Date: 11.AUG.1999 15:00:38

Plot 6 -- QPSK modulation, 160 ksps

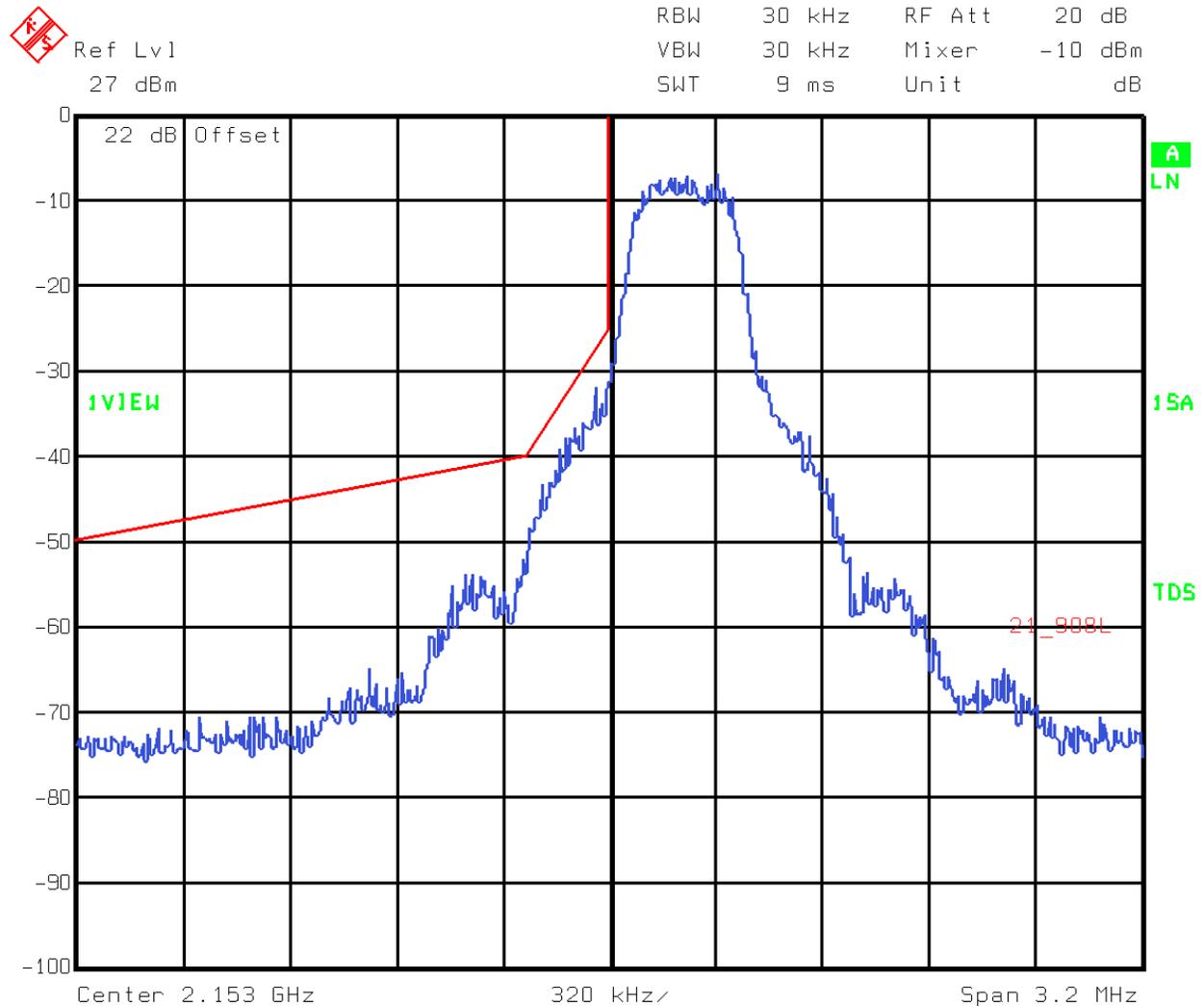
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Average Channel Power  
Date: 11.AUG.1999 15:37:56

Plot 7 - QPSK modulation, 320 ksps

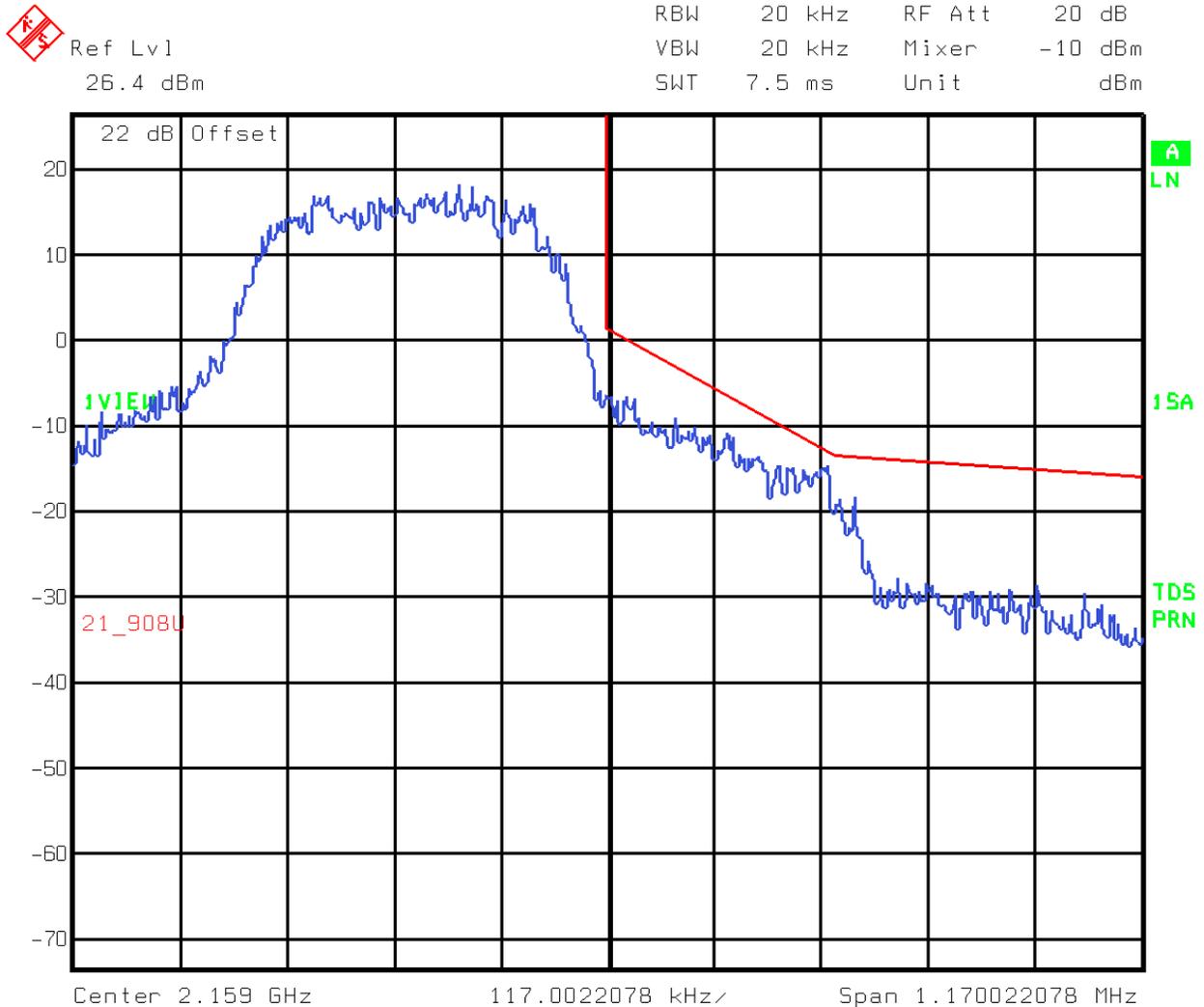
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 320 kbps  
Date: 12.AUG.1999 9:42:17

Plot 8 – QPSK Modulation, 320 kbps

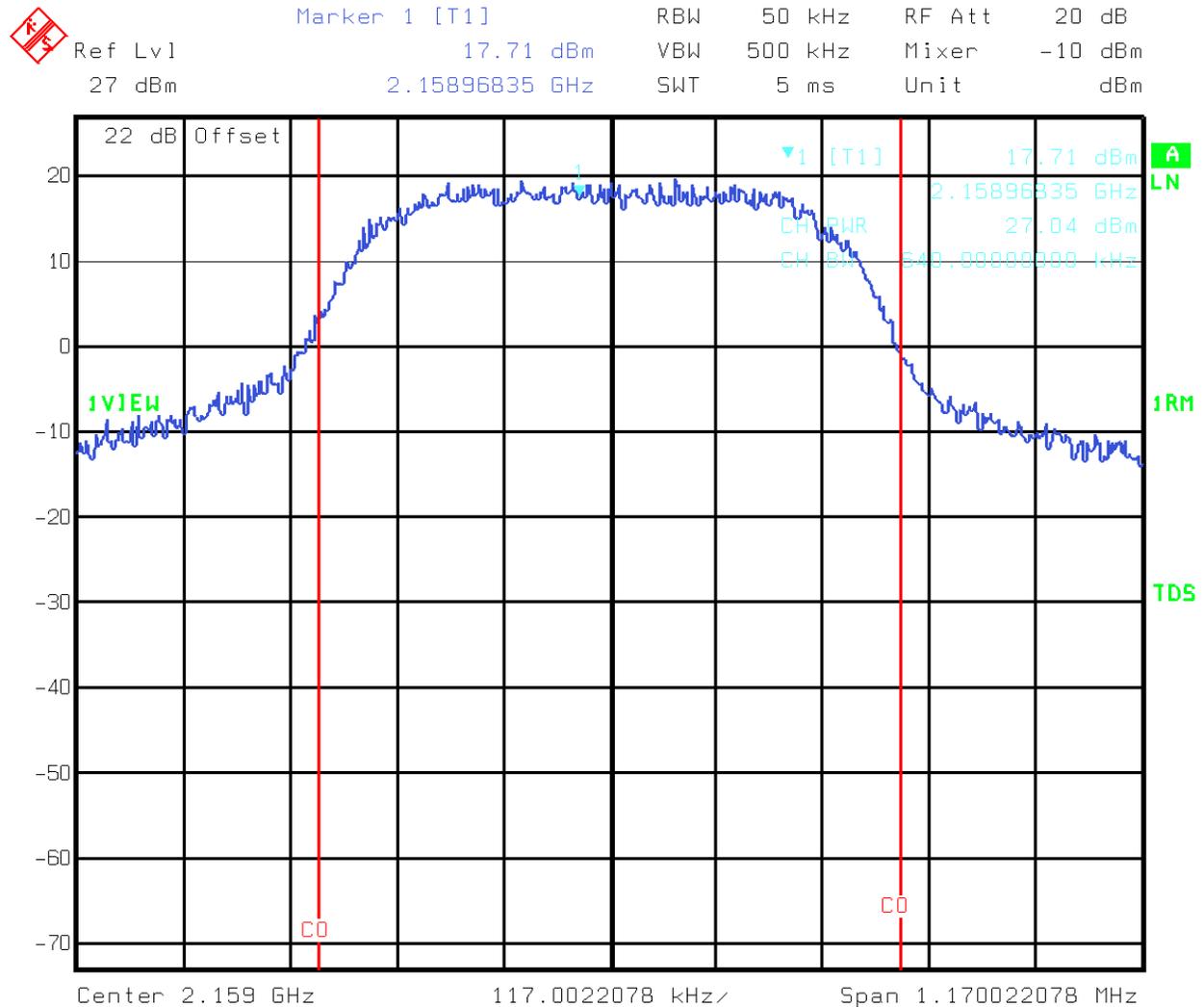
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Band Edge  
Comment A: 320 KSPS  
Date: 11.AUG.1999 15:44:20

Plot 9 – QPSK Modulation, 320 kbps

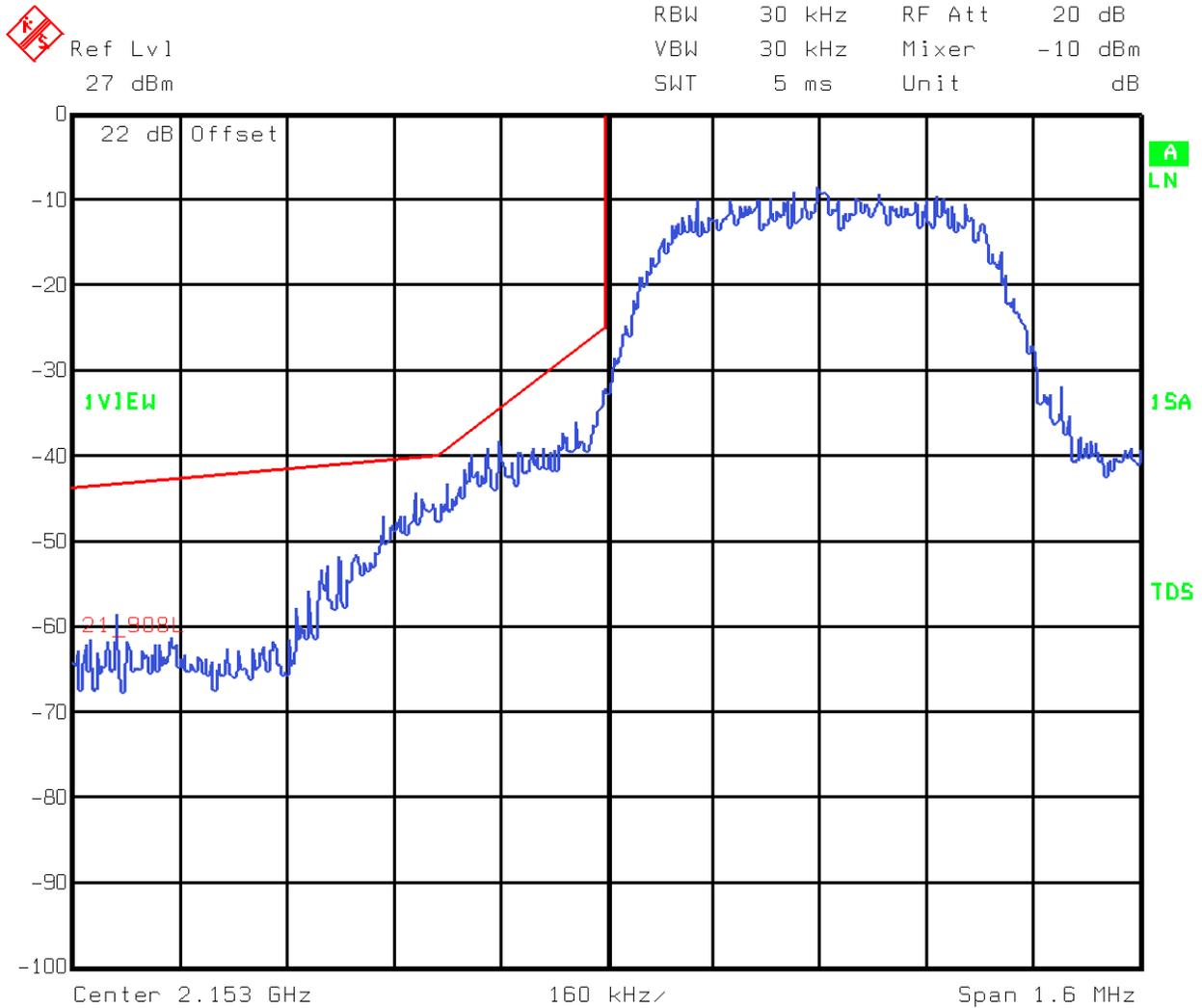
EQUIPMENT: TR2278 Transverter  
 FCC ID: CI32278



Title: Channel Power  
 Comment A: 512 KSPS  
 Date: 11.AUG.1999 15:57:34

Plot 10 – QPSK Modulation, 512 kbps

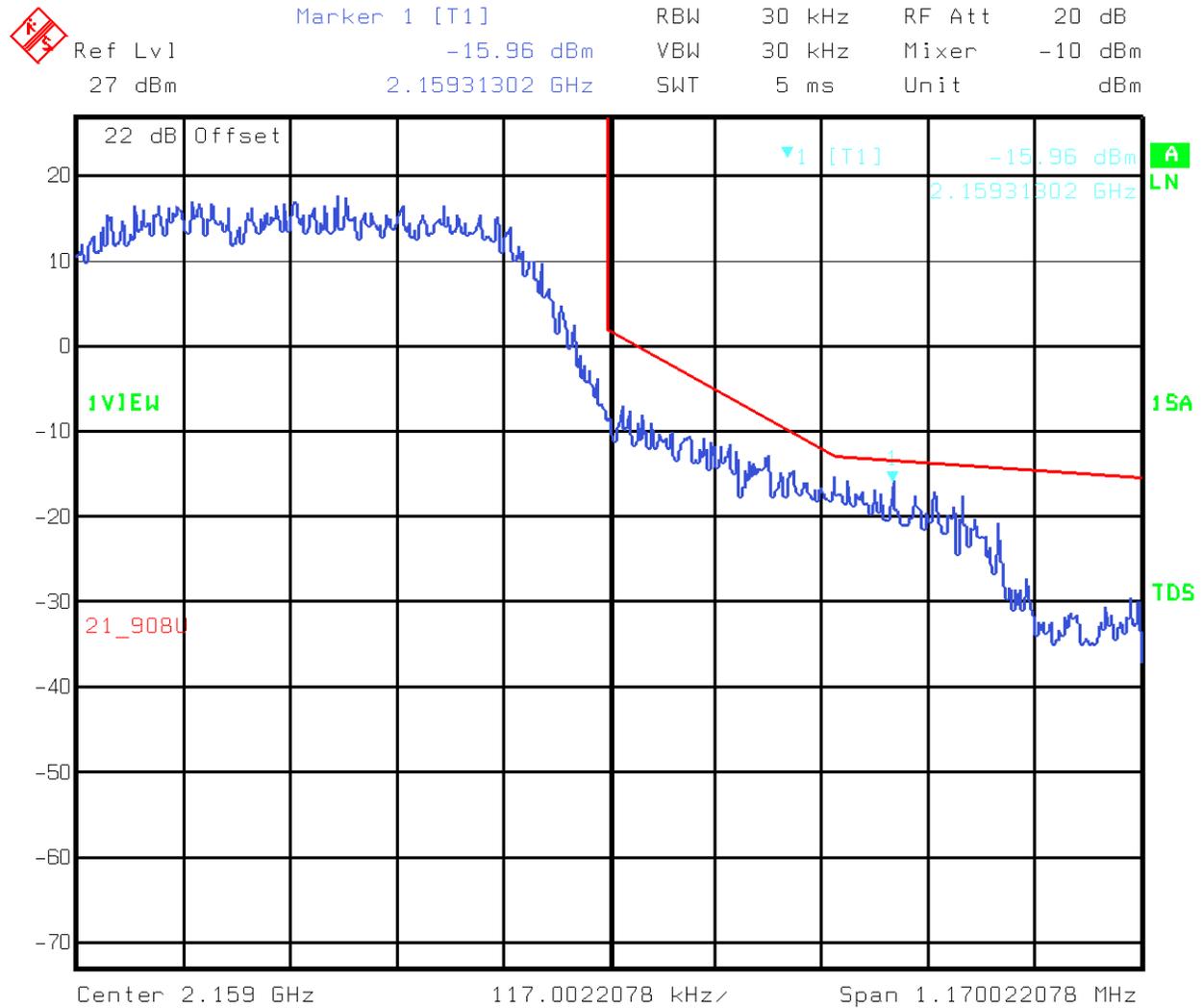
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 512 kbps  
Date: 12.AUG.1999 9:35:14

Plot 11 – QPSK Modulation, 512 kbps

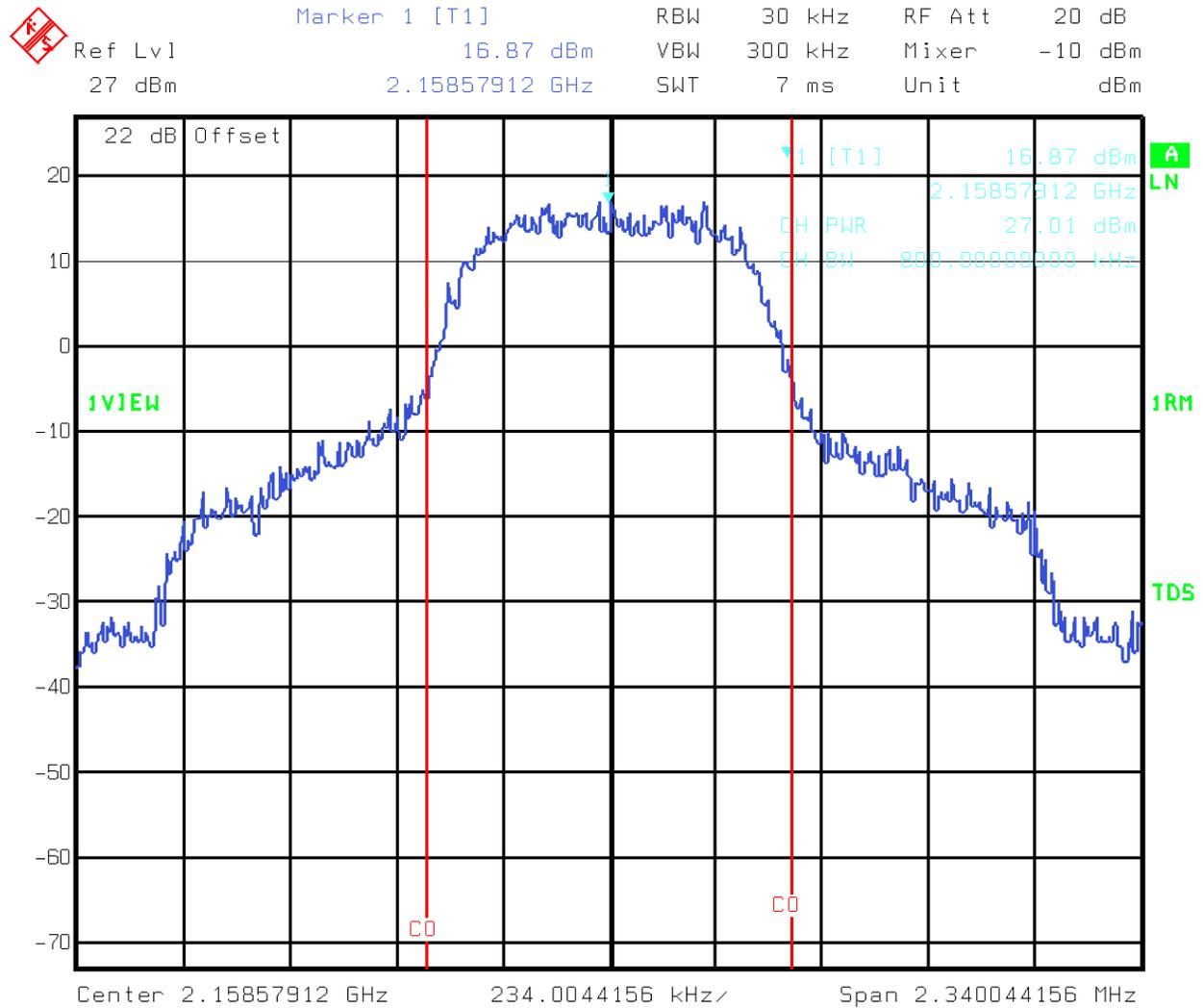
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
Comment A: 512 KSPS  
Date: 11.AUG.1999 16:04:25

Plot 12 – QPSK Modulation, 512 ksps

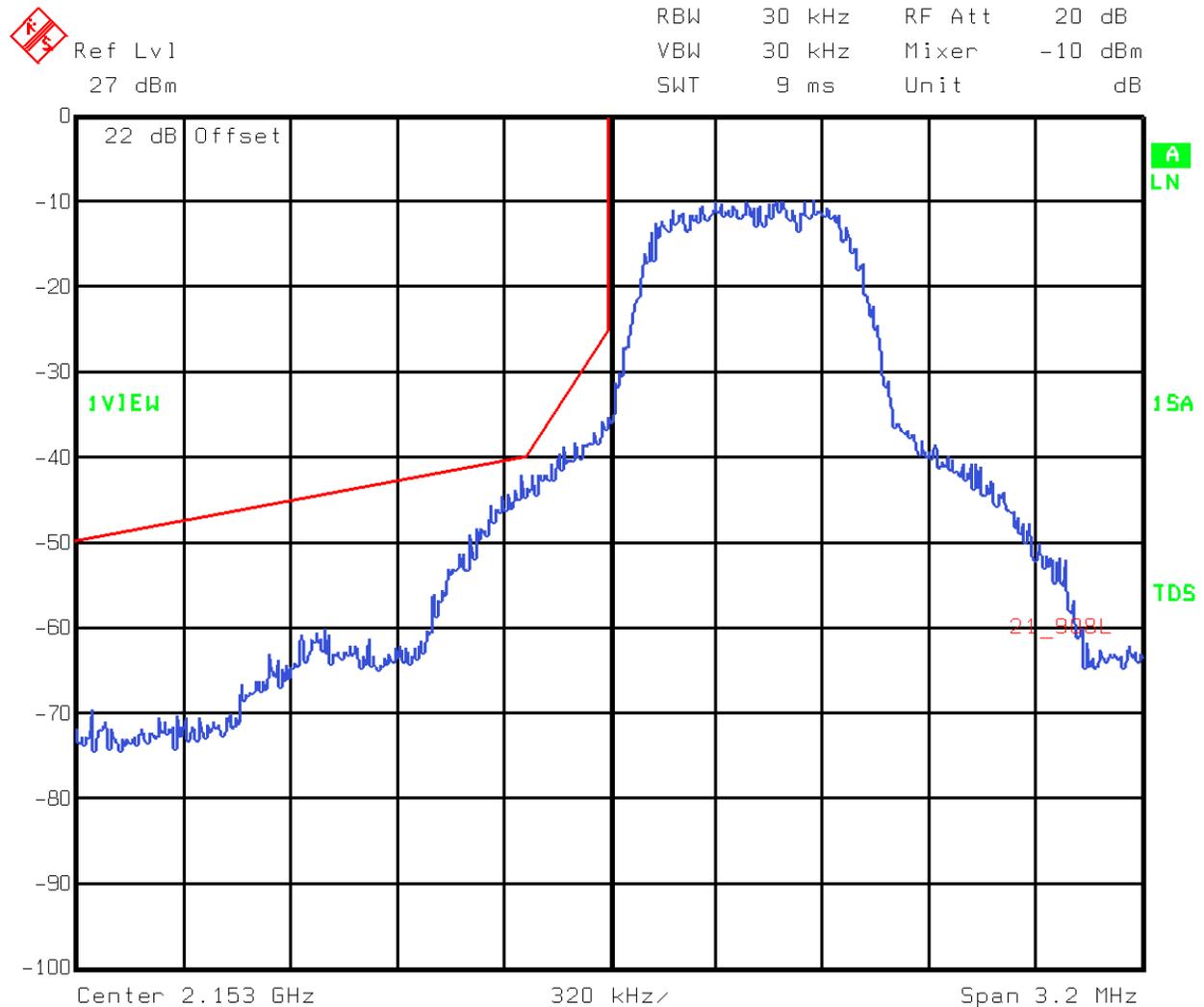
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Average Channel Power over 800 kHz BW  
Comment A: 640 ksps  
Date: 11.AUG.1999 16:12:49

Plot 13 – QPSK Modulation, 640 ksps

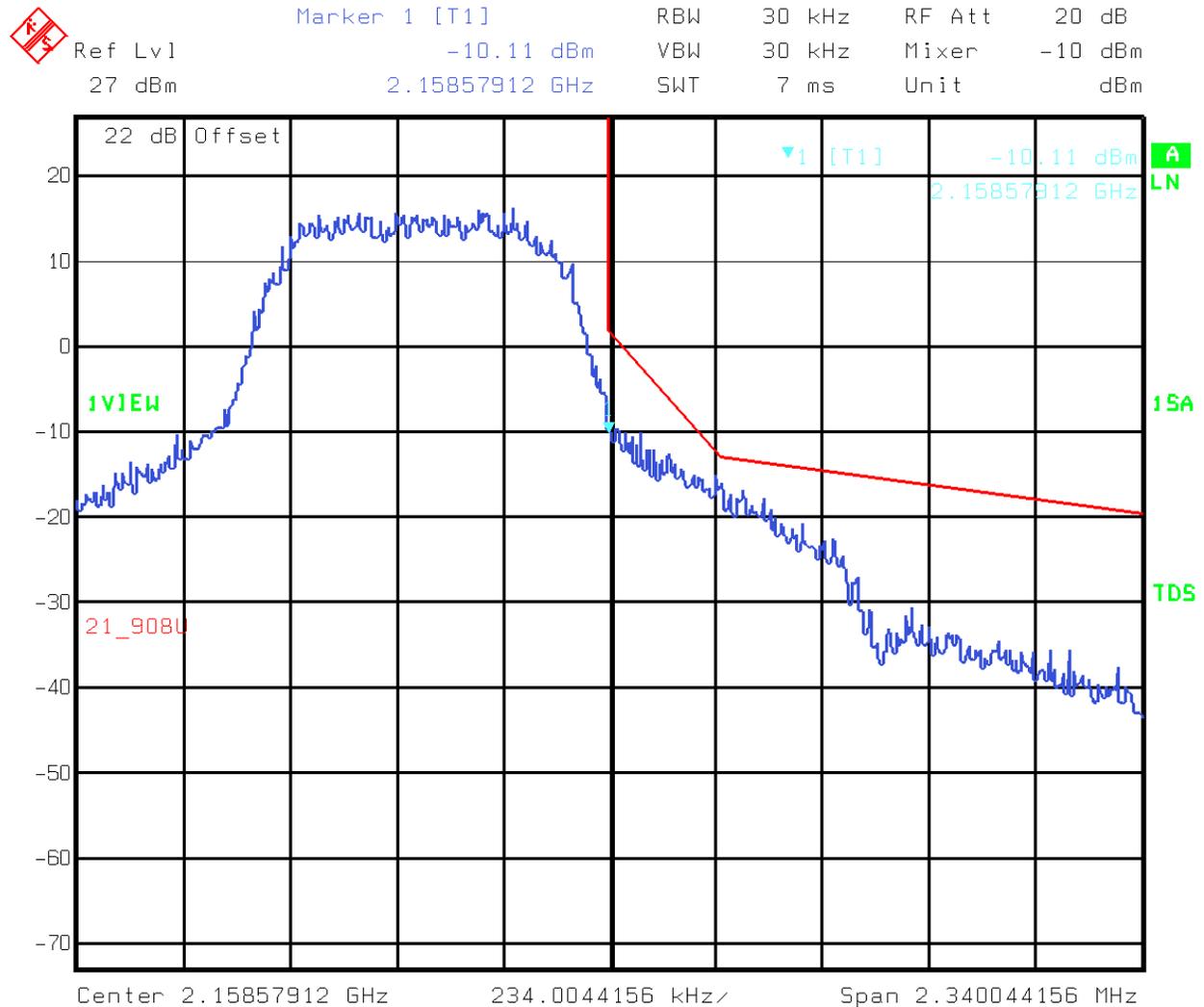
EQUIPMENT: TR2278 Transverter  
FCC ID: C132278



Title: Lower Edge of 6 MHz Channel  
Comment A: 640 kbps  
Date: 12.AUG.1999 9:19:42

Plot 14 – QPSK Modulation, 640 kbps

EQUIPMENT: TR2278 Transverter  
 FCC ID: CI32278

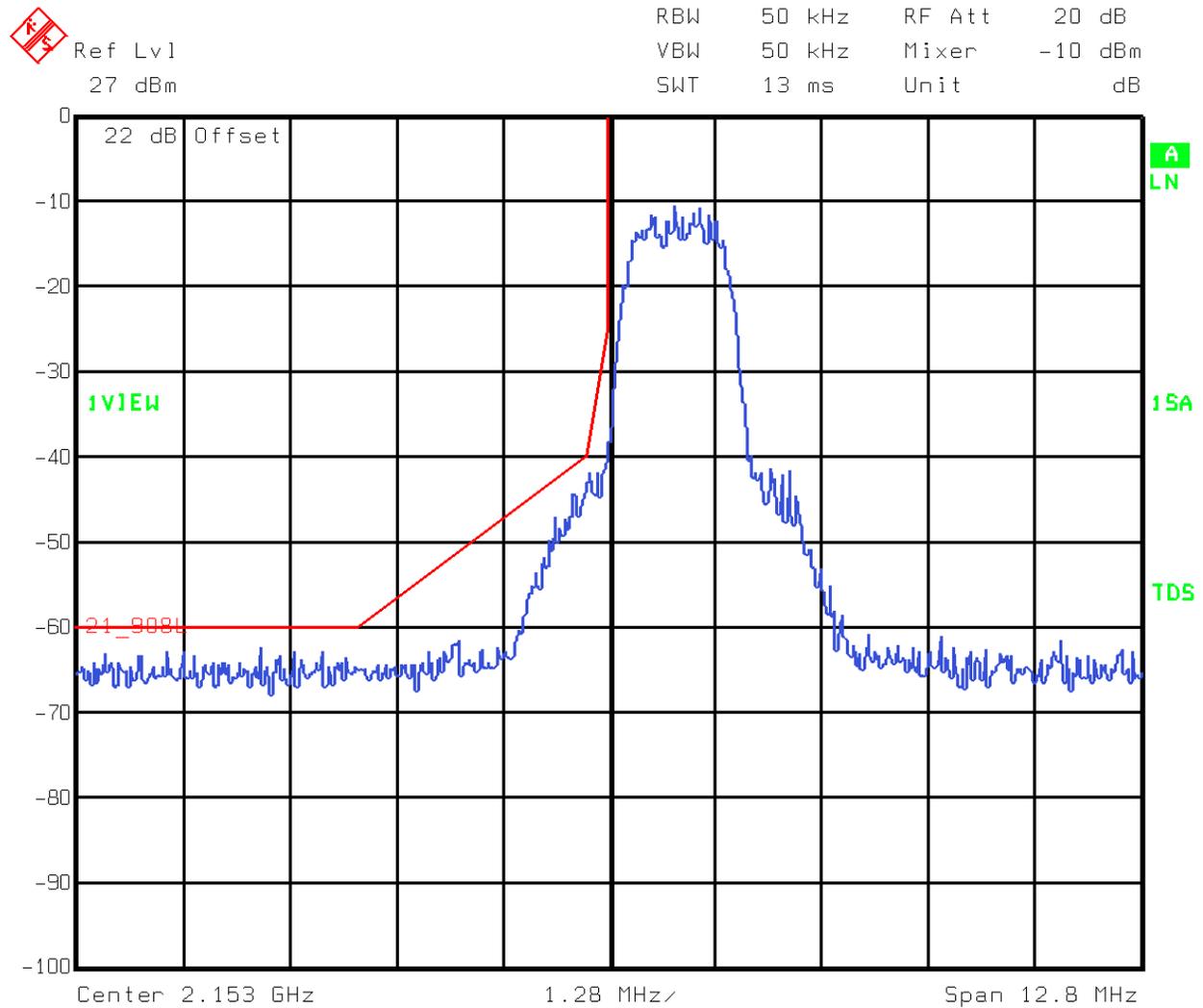


Title: Upper Edge of 6 MHz Channel  
 Comment A: 640 kbps  
 Date: 11.AUG.1999 16:17:47

Plot 15 – QPSK Modulation, 640 kbps



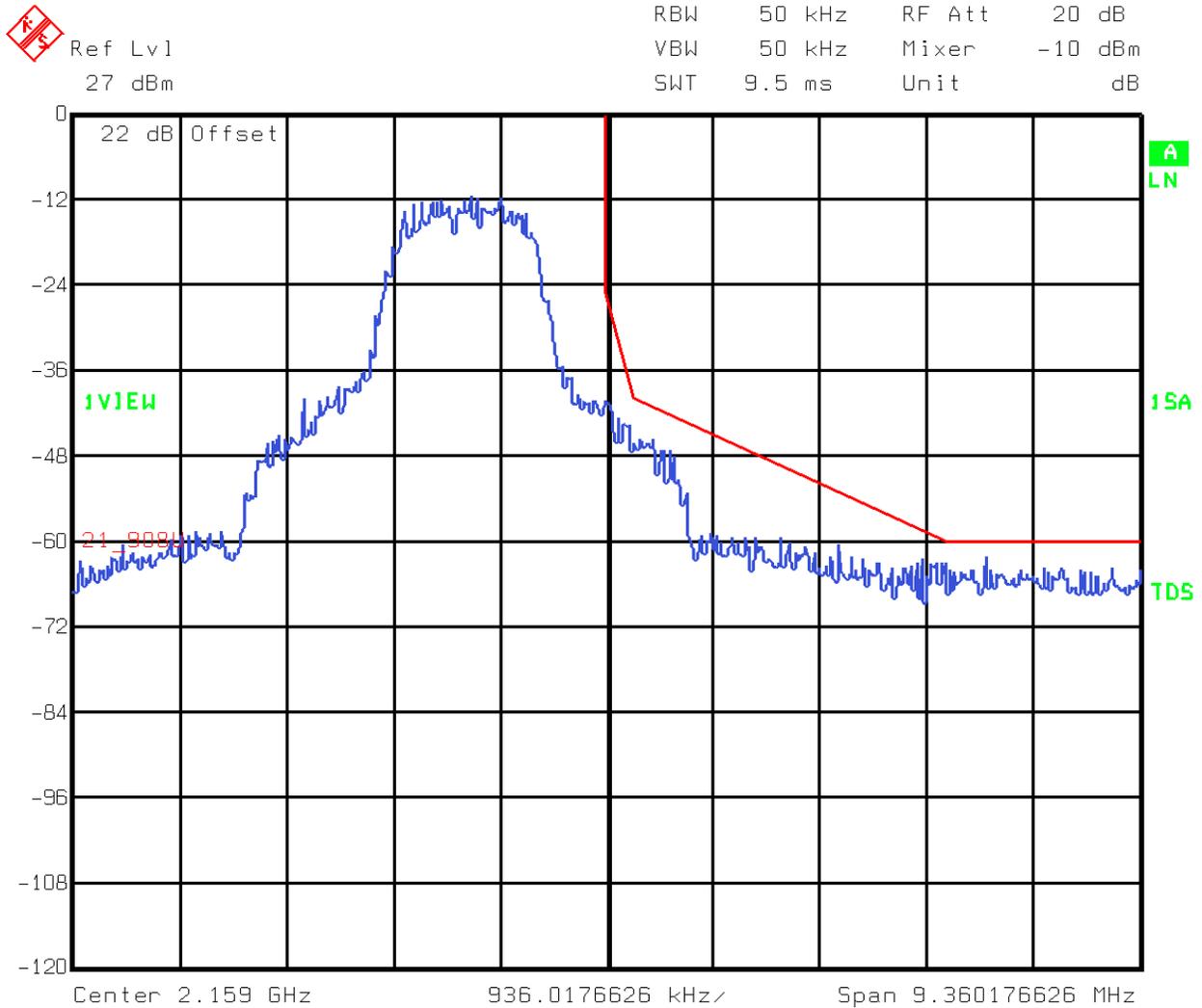
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 1280 kbps  
Date: 12.AUG.1999 9:15:03

Plot 17 – QPSK Modulation, 1280 kbps

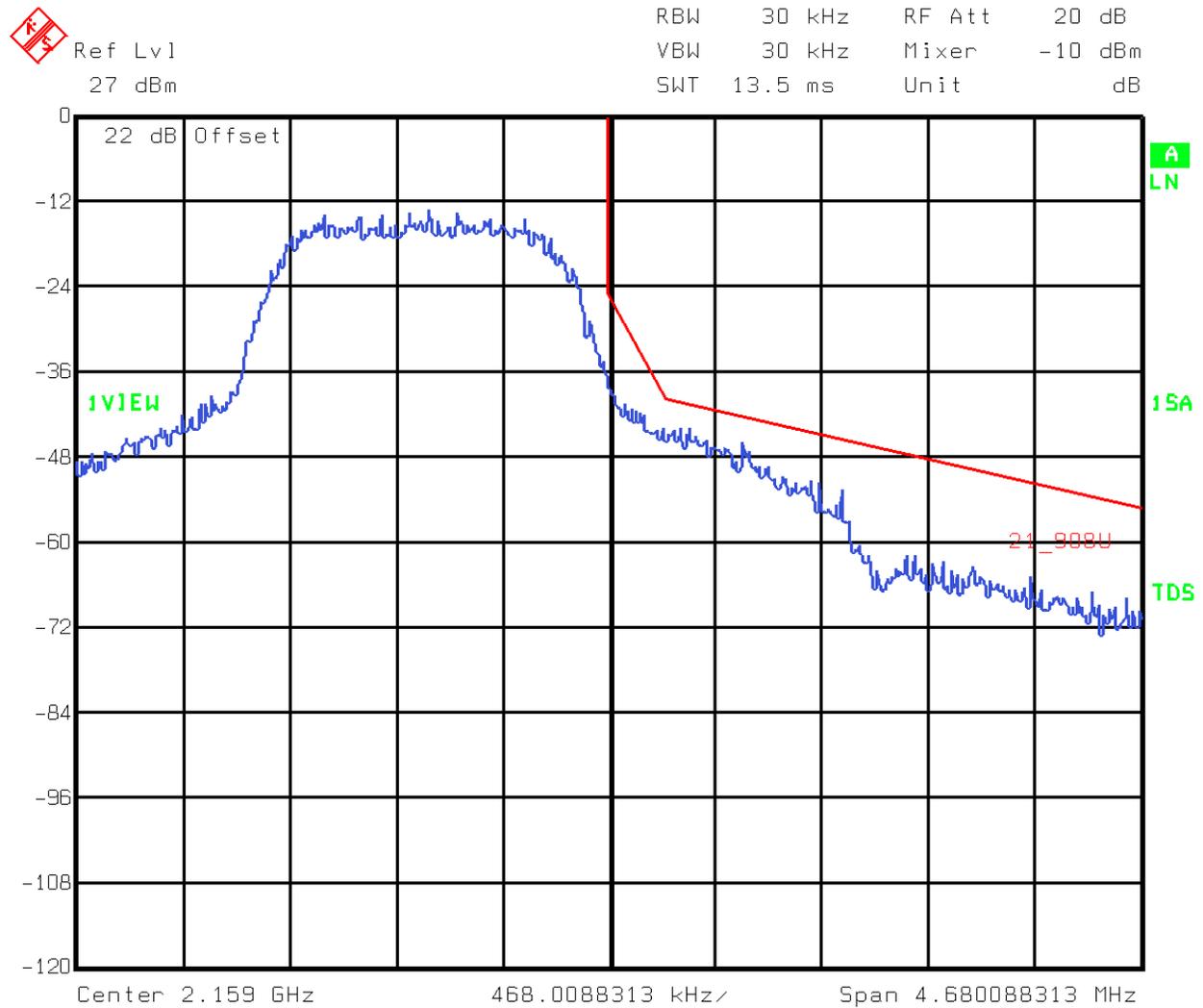
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
Comment A: 1280 kbps  
Date: 11.AUG.1999 16:28:24

Plot 18 – QPSK Modulation, 1280 kbps

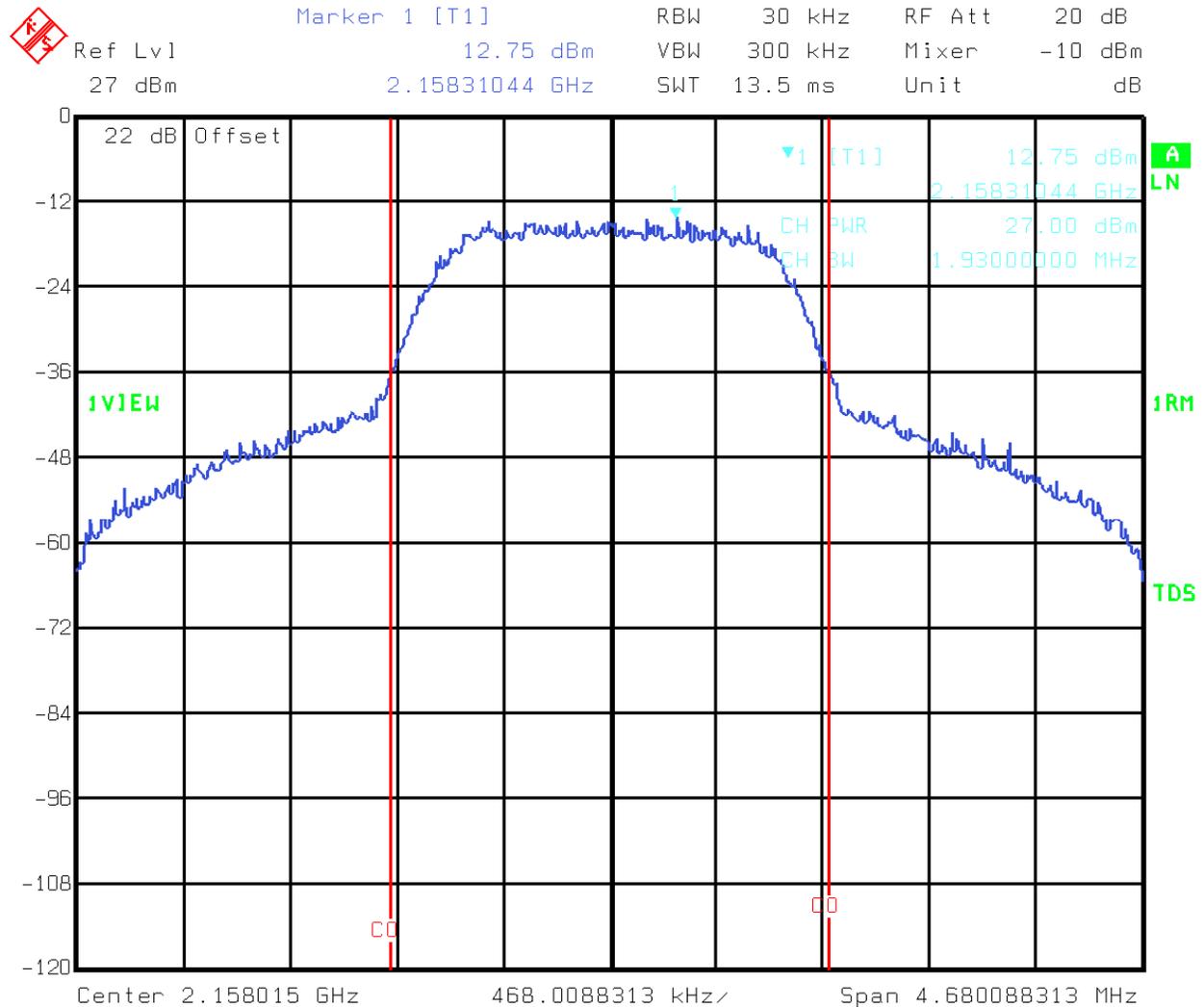
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz channel  
Comment A: 1280 kbps  
Date: 11.AUG.1999 16:37:51

Plot 19 – QPSK Modulation, 1280 kbps

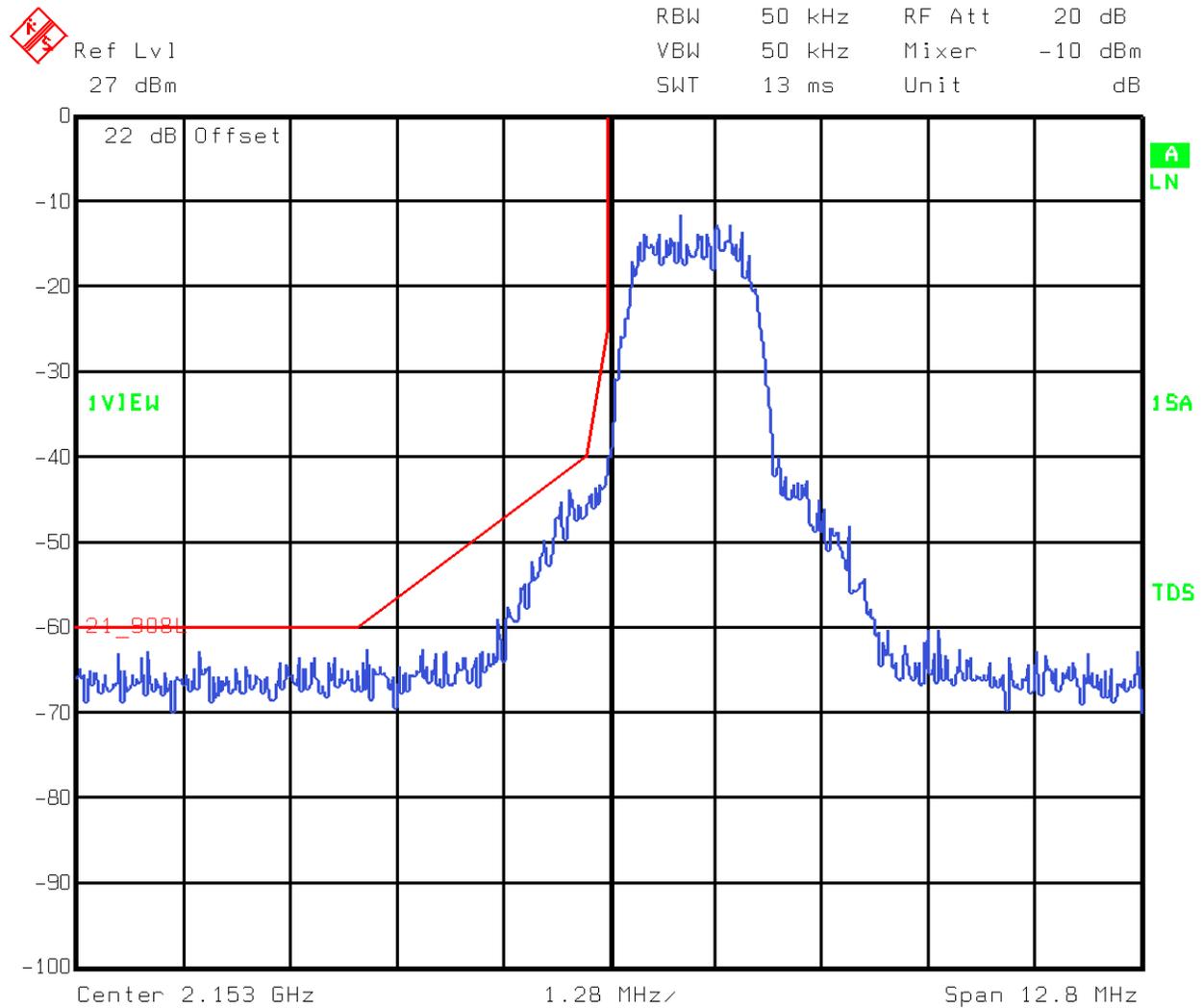
EQUIPMENT: TR2278 Transverter  
 FCC ID: CI32278



Title: Average Channel Power in 1.93 MHz band  
 Comment A: 1544 kbps  
 Date: 11.AUG.1999 16:58:26

**Plot 20 – QPSK Modulation, 1544 kbps**

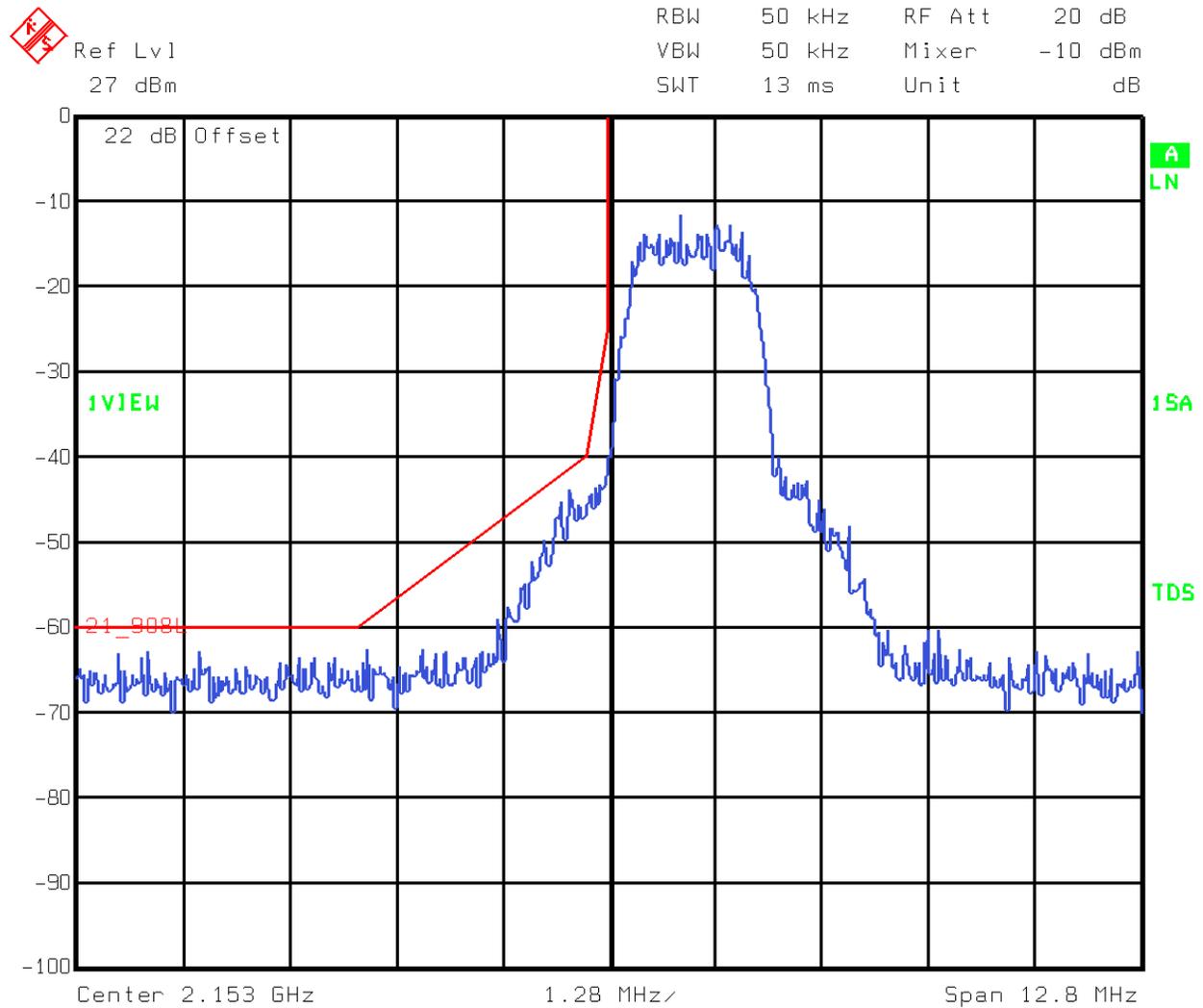
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 1544 kbps  
Date: 12.AUG.1999 9:09:25

Plot 21 – QPSK Modulation, 1544 kbps

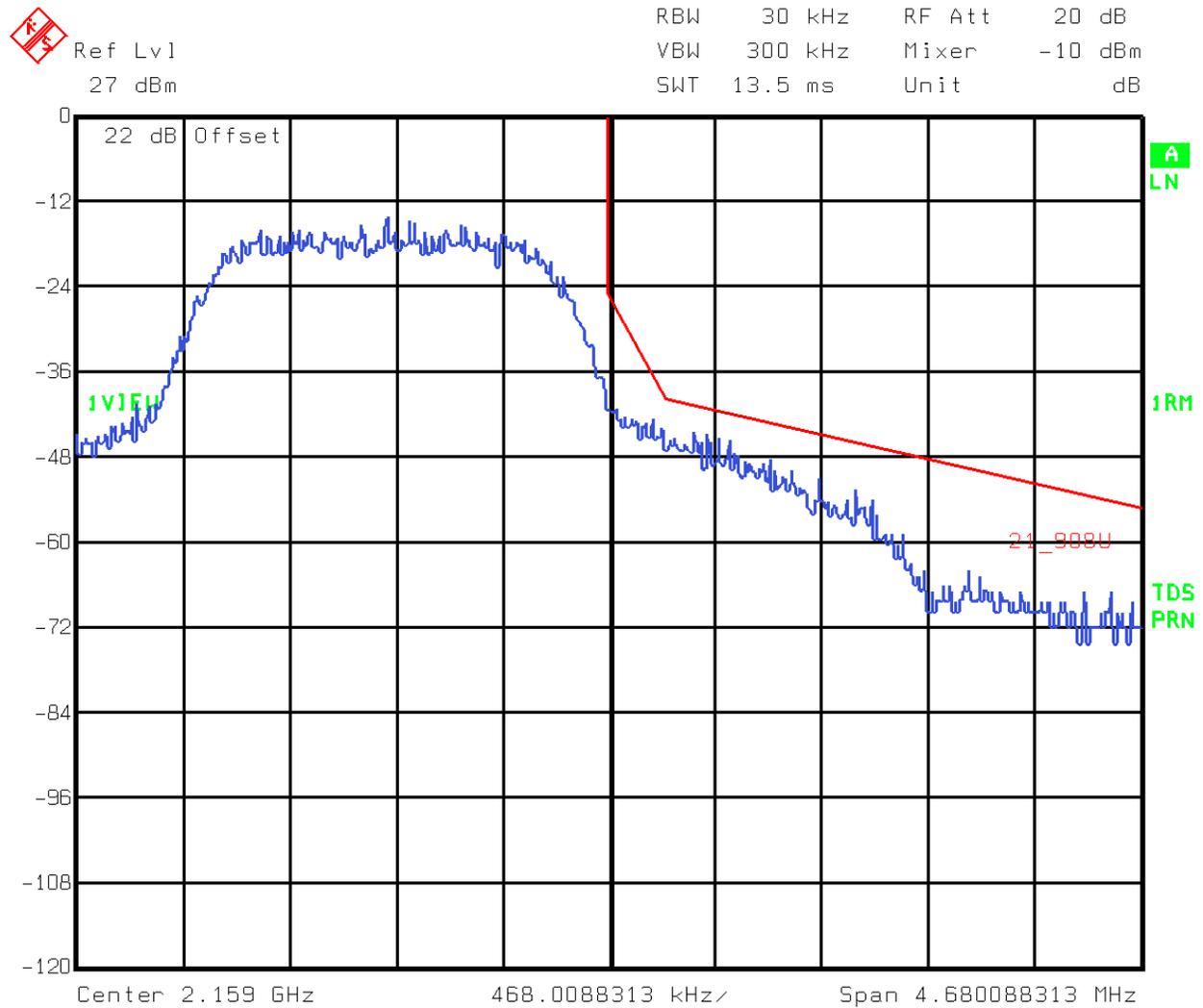
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 1544 kbps  
Date: 12.AUG.1999 9:09:25

Plot 22 – QPSK Modulation, 1544 kbps

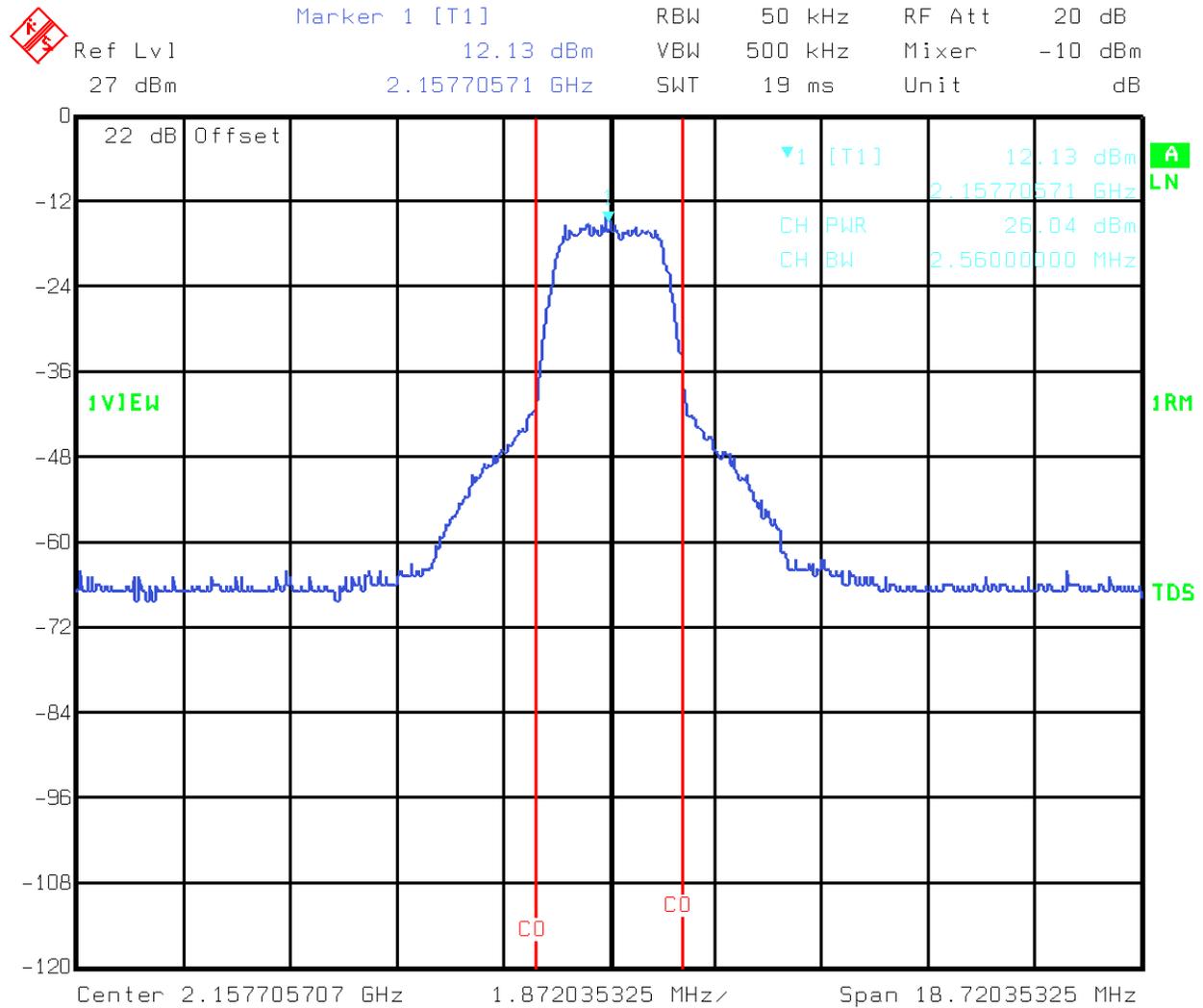
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz channel  
Comment A: 1544 kbps  
Date: 11.AUG.1999 16:59:59

Plot 23 – QPSK Modulation, 1544 kbps

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278

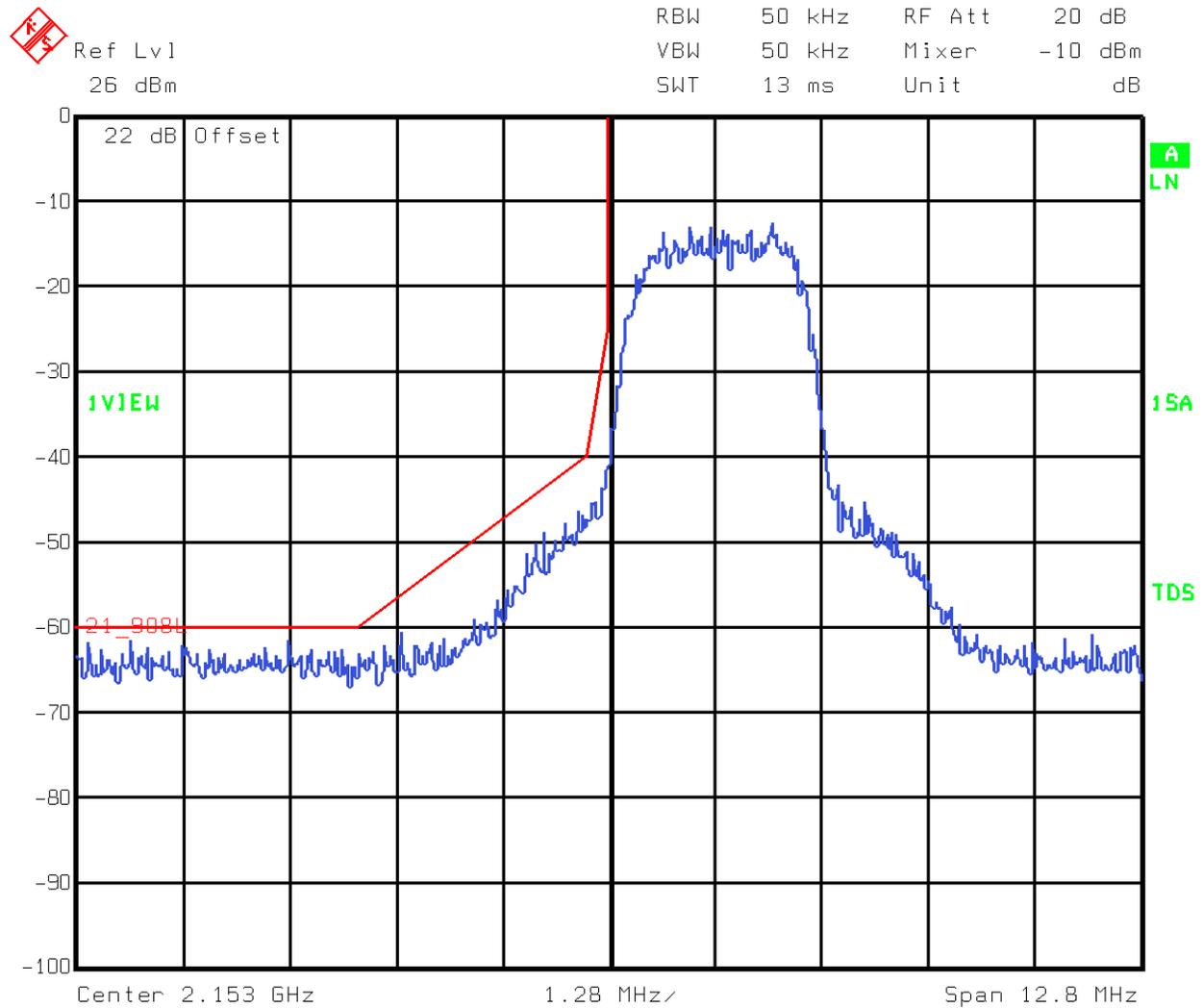


Title: Average Power over 2.56 MHz Band

Date: 12.AUG.1999 8:27:37

Plot 24 – QPSK Modulation 2048 ksps

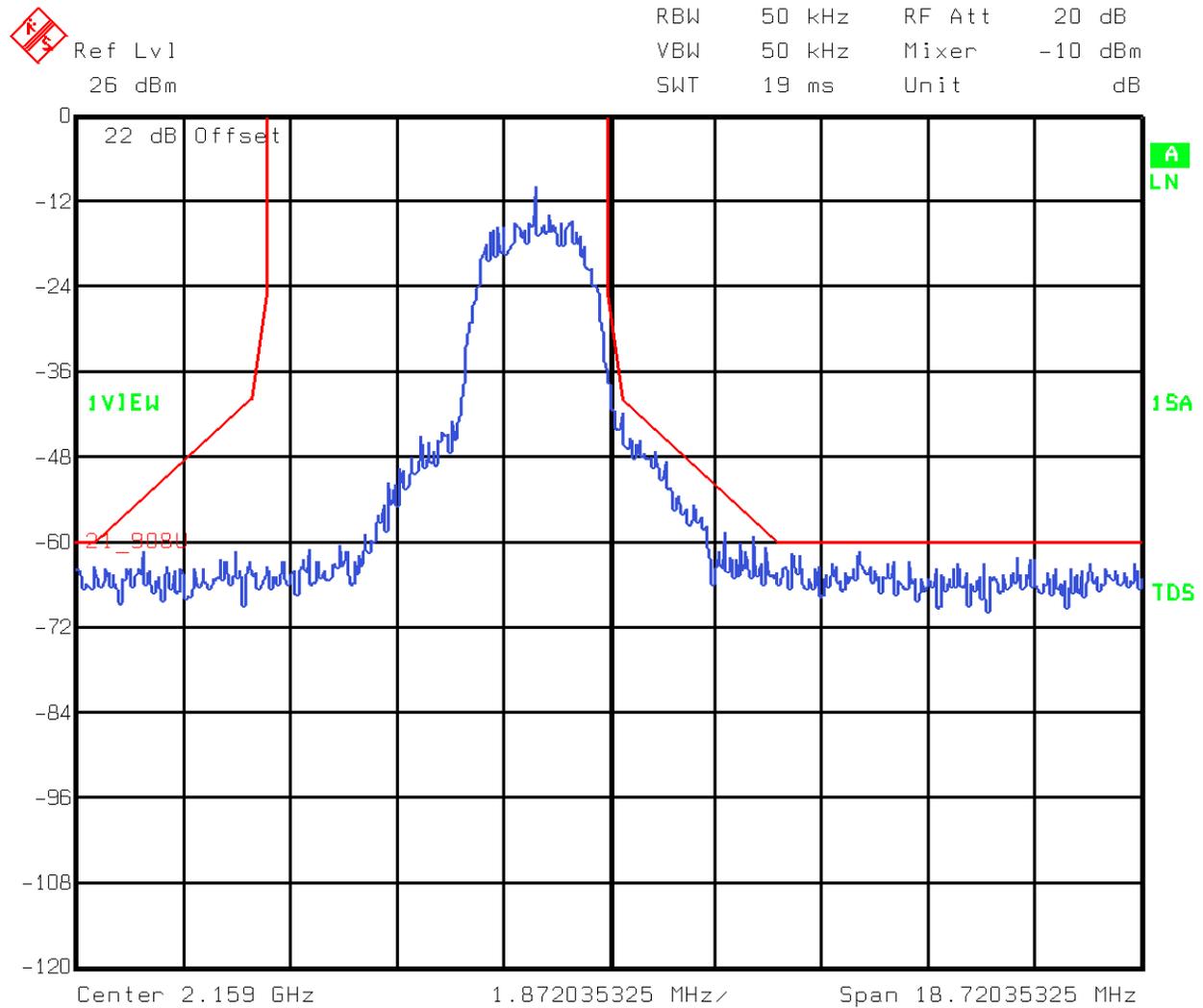
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 2048 kbps  
Date: 12.AUG.1999 9:01:35

Plot 25 – QPSK Modulation, 2048 kbps

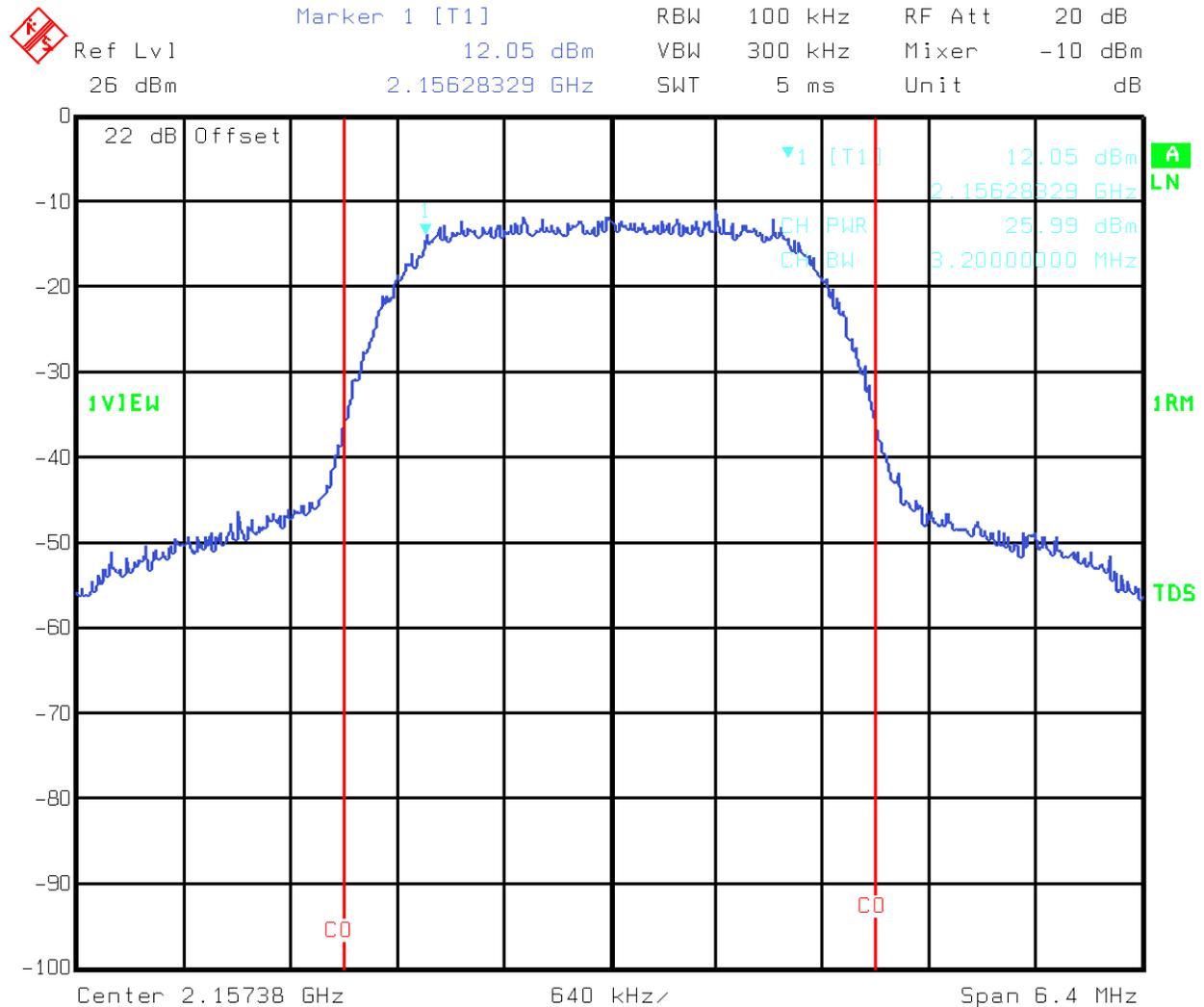
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
Comment A: 2560 kbps  
Date: 12.AUG.1999 8:29:23

Plot 26 – QPSK Modulation, 2048 kbps

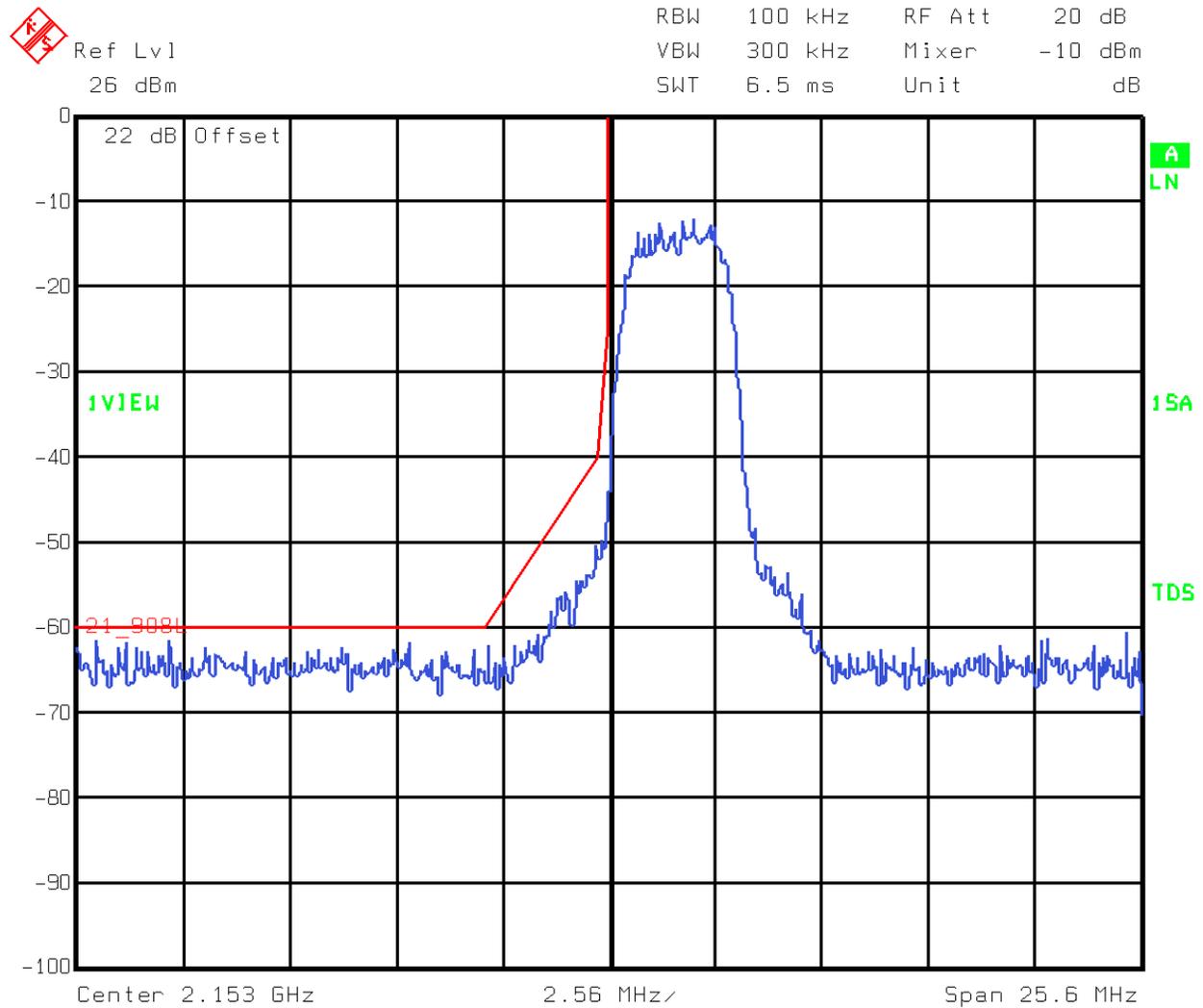
EQUIPMENT: TR2278 Transverter  
FCC ID: C132278



Title: Average Channel Power over 3.2 MHz BW  
Comment A: 2560 kbps  
Date: 12.AUG.1999 8:43:42

Plot 27 – QPSK Modulation, 2560 kbps

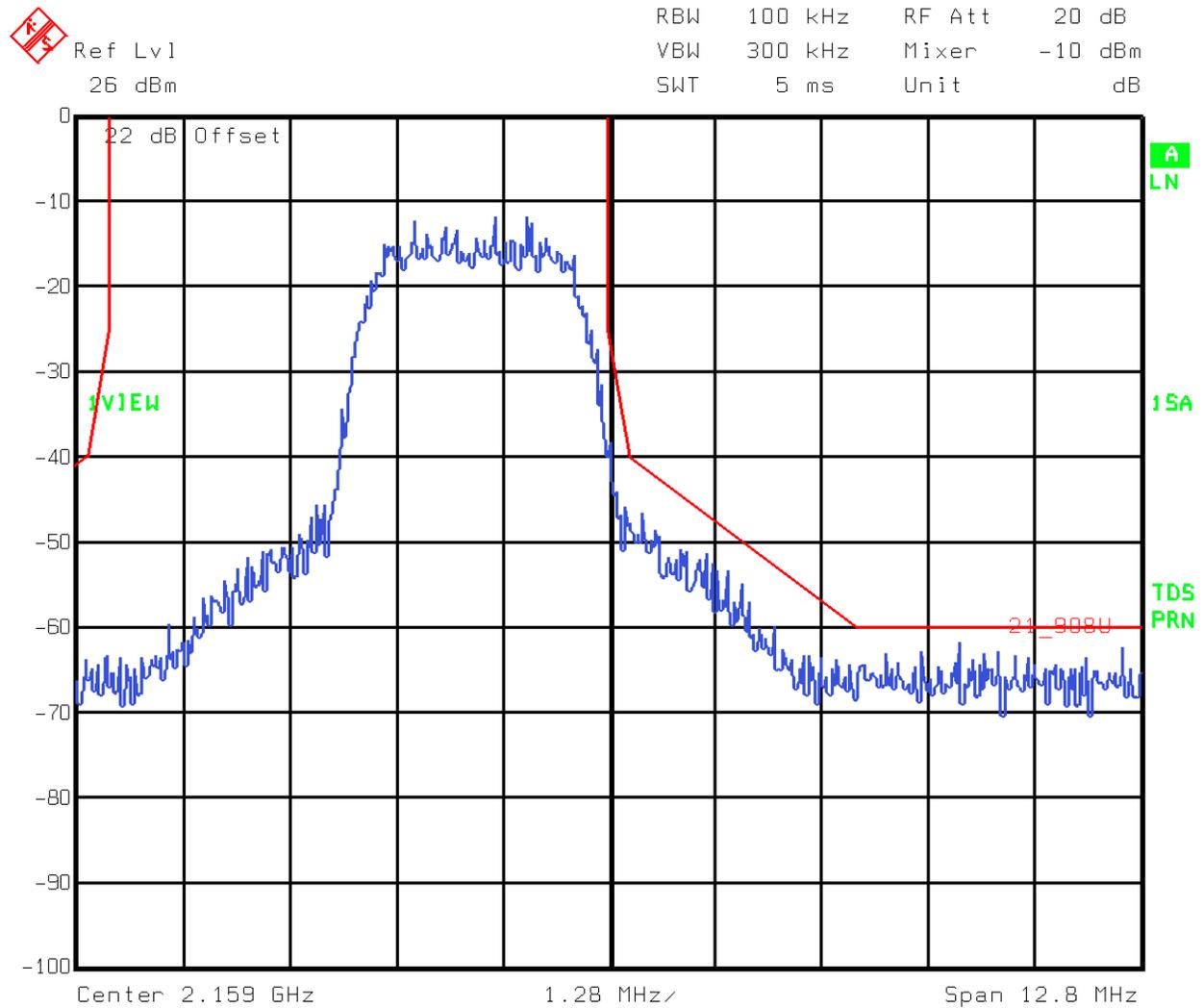
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 2560 kbps  
Date: 12.AUG.1999 8:53:25

Plot 28 – QPSK Modulation, 2560 kbps

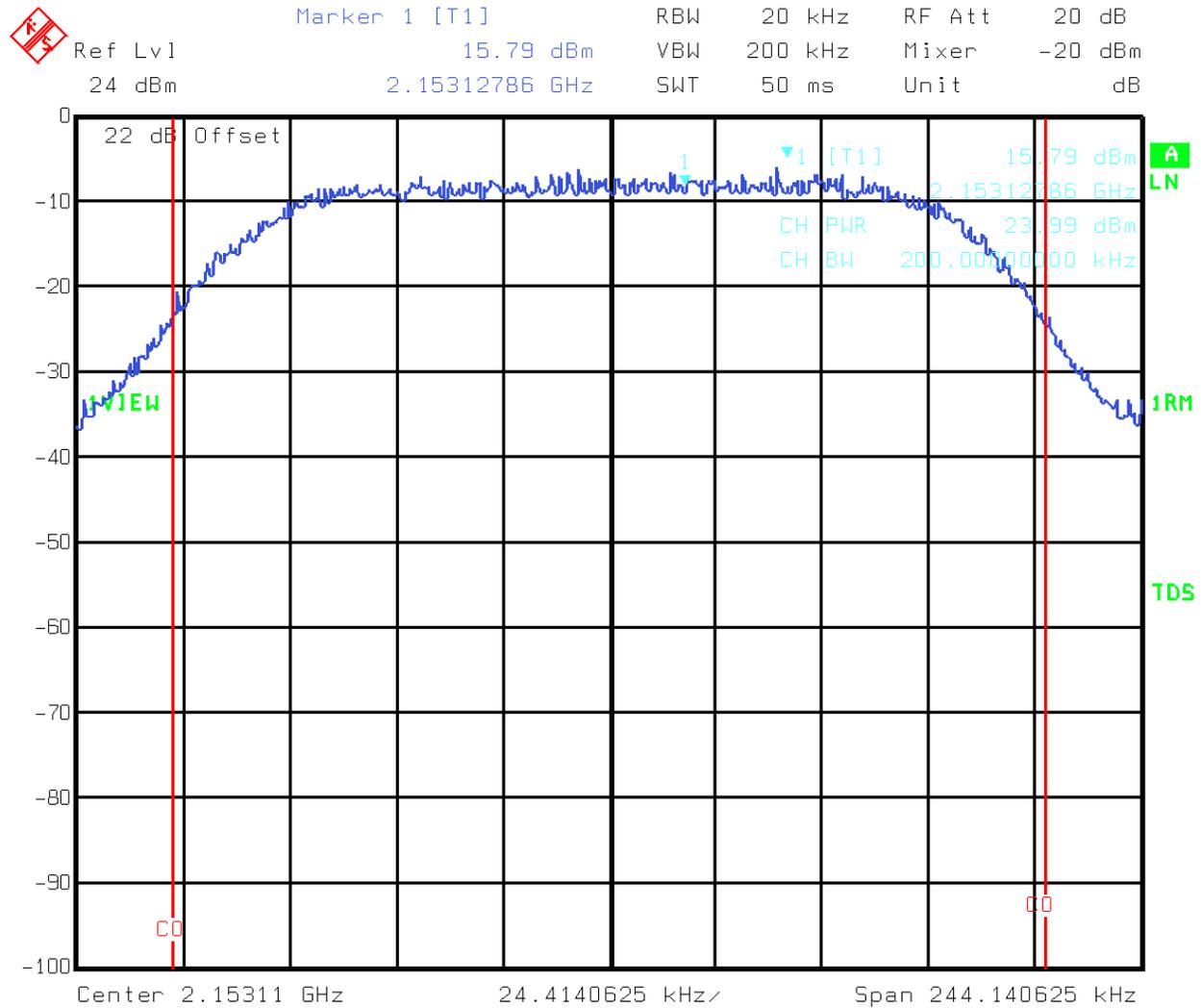
EQUIPMENT: TR2278 Transverter  
FCC ID: C132278



Title: Upper Edge of 6 MHz Channel  
Comment A: 2560 kbps  
Date: 12.AUG.1999 8:46:23

Plot 29 – QPSK Modulation, 2560 kbps

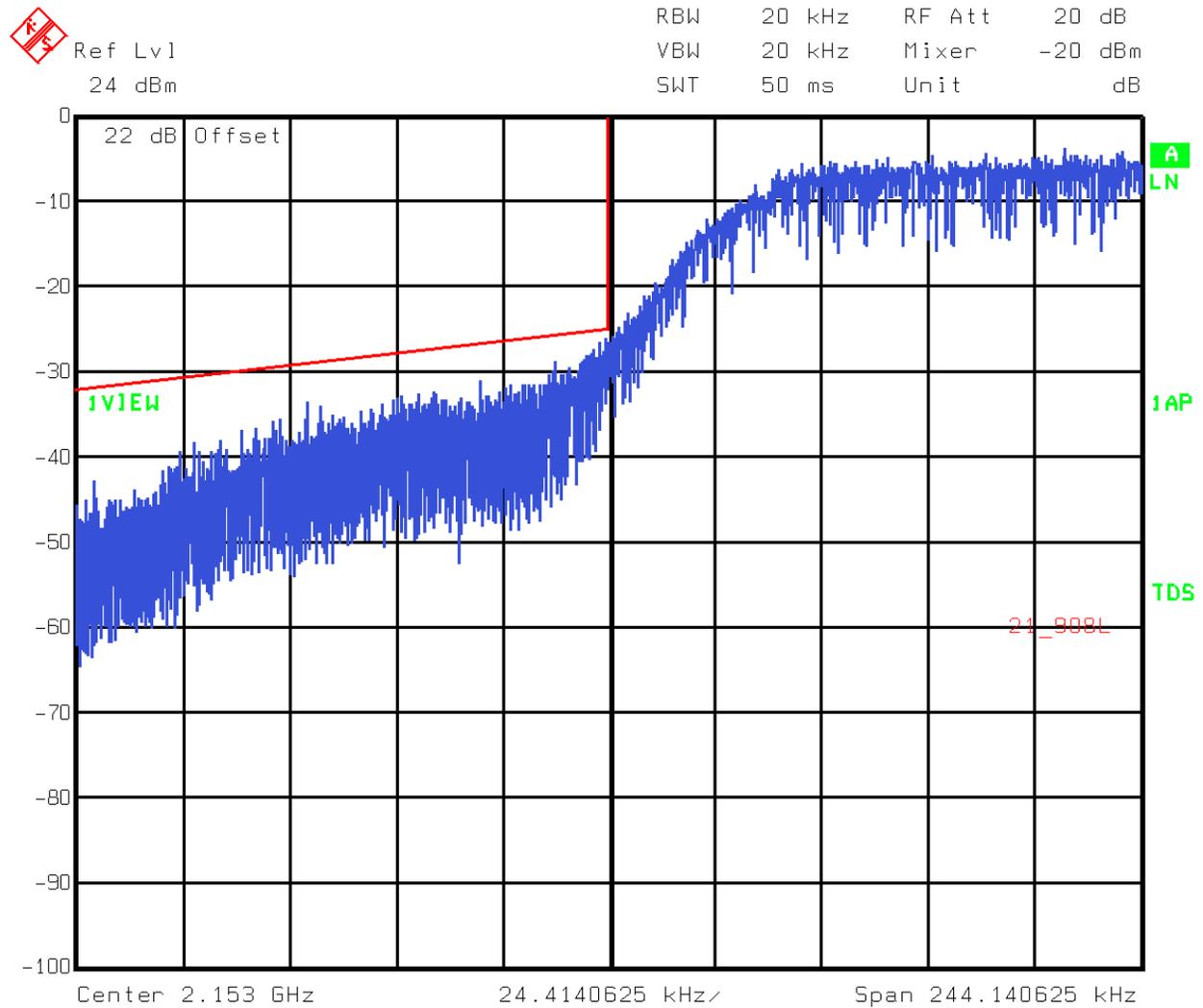
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Average Channel Power  
Comment A: 16 QAM Modulation 160 ks/sec.  
Date: 16.AUG.1999 10:47:57

Plot 30 – 16 QAM, 160 ksps

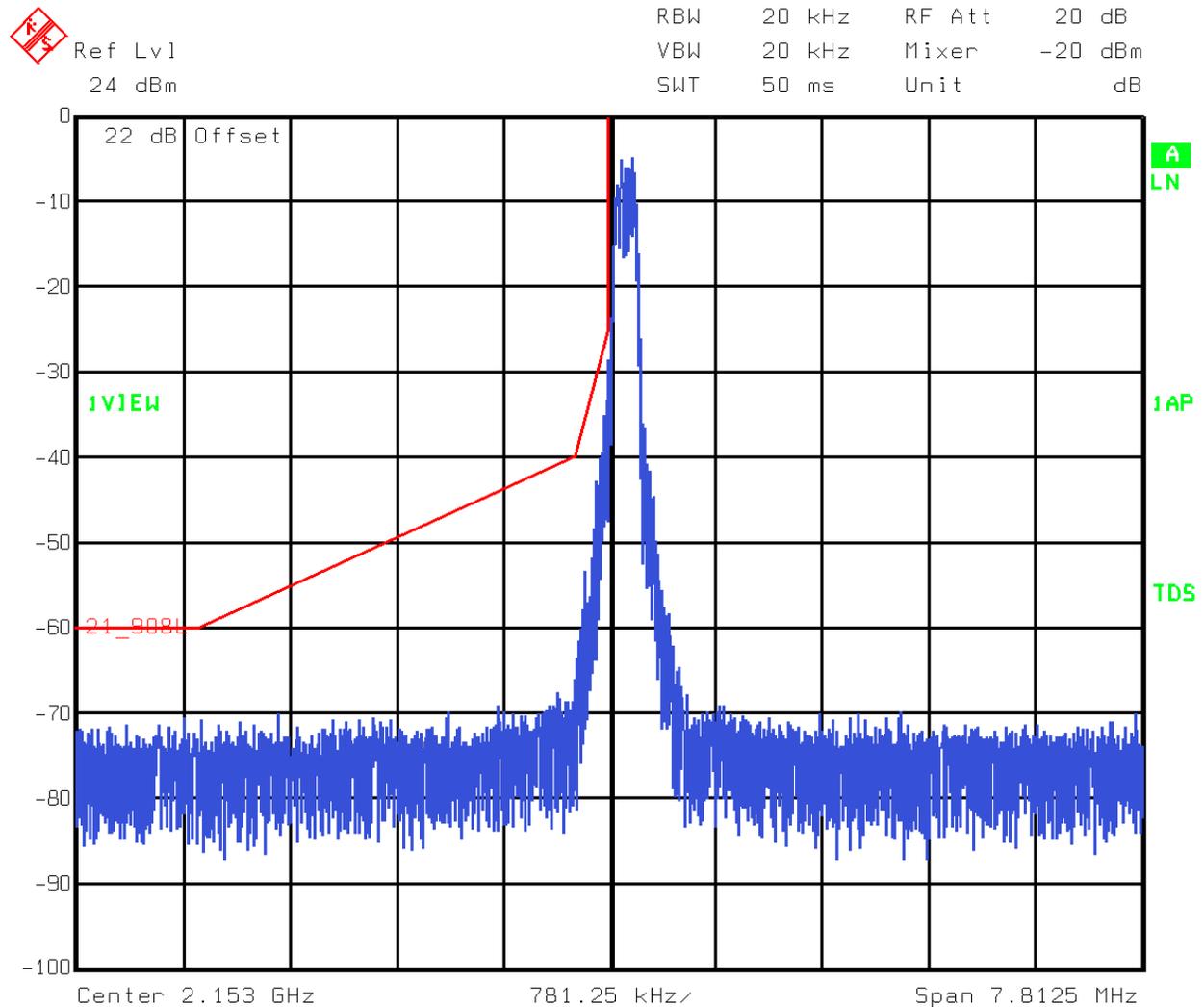
EQUIPMENT: TR2278 Transverter  
FCC ID: C132278



Title: Lower Edge of 6 MHz Channel  
Comment A: 16 QAM Modulation 160 ks/sec.  
Date: 16.AUG.1999 11:03:01

Plot 31 - 16 QAM, 160 ksps

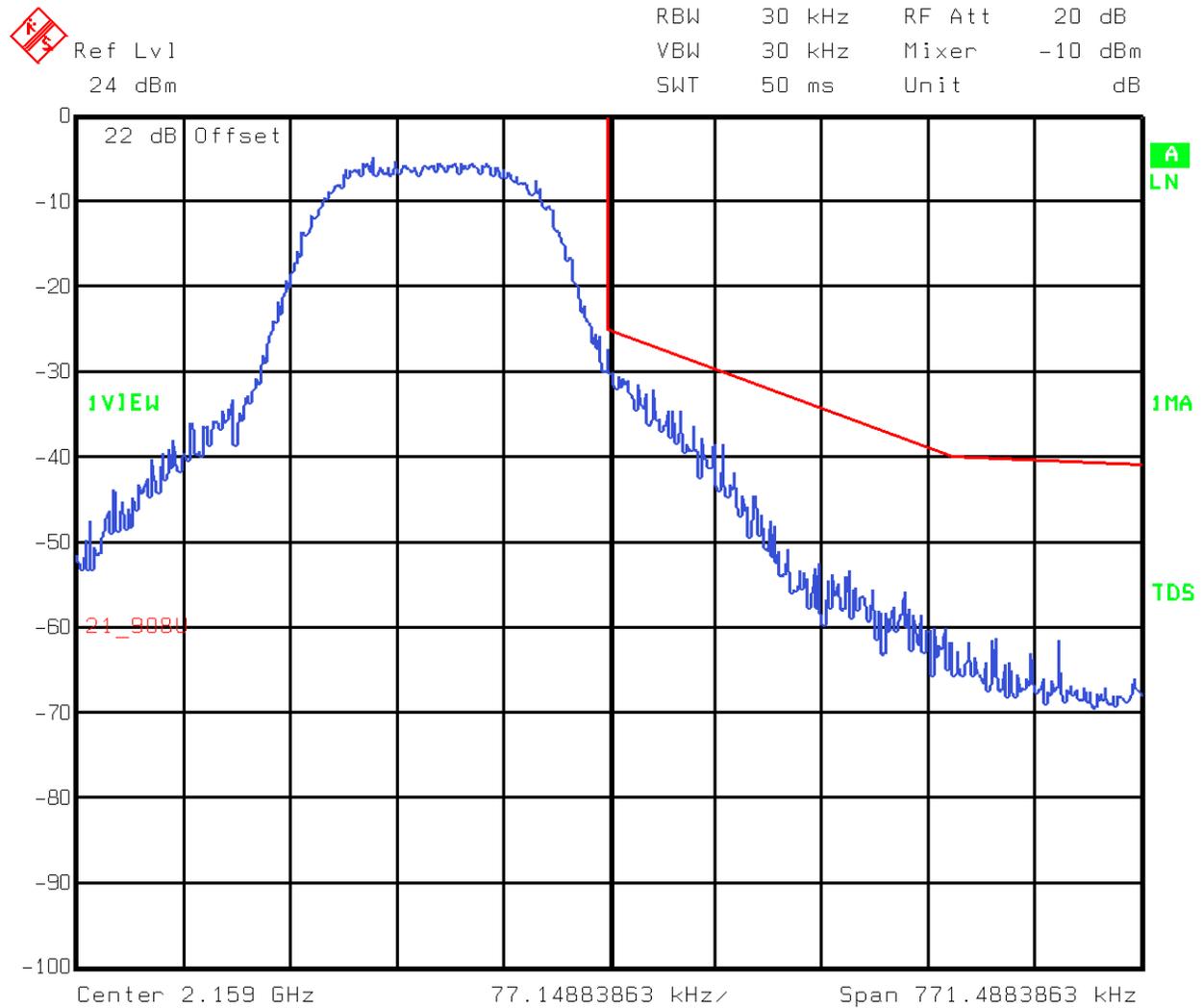
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 16 QAM Modulation 160 ks/sec.  
Date: 16.AUG.1999 11:31:10

Plot 32 - 16 QAM, 160 ksps

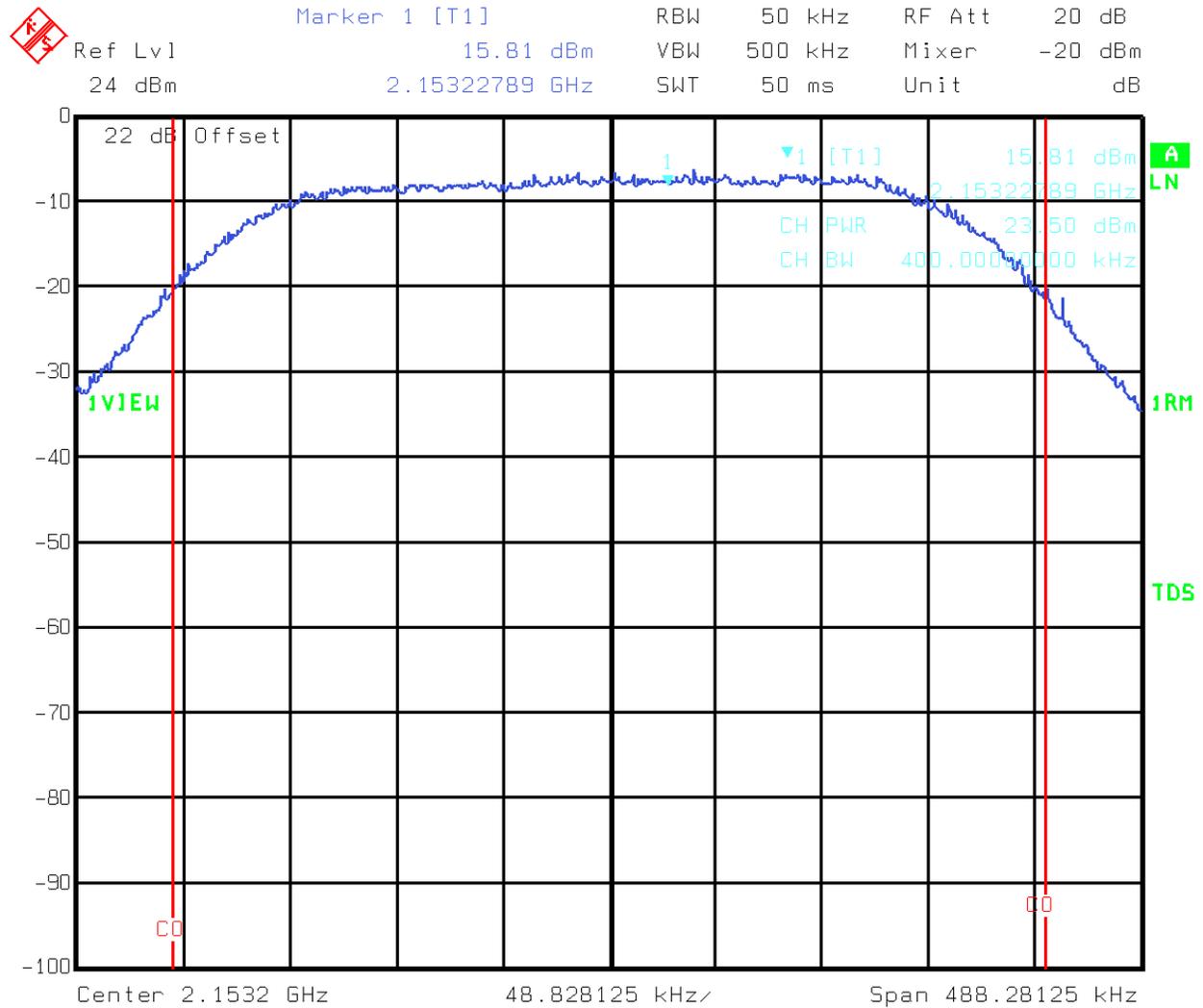
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
Comment A: 16 QAM, 160 ksps  
Date: 18.AUG.1999 14:40:37

Plot 33 - 16 QAM, 160 ksps

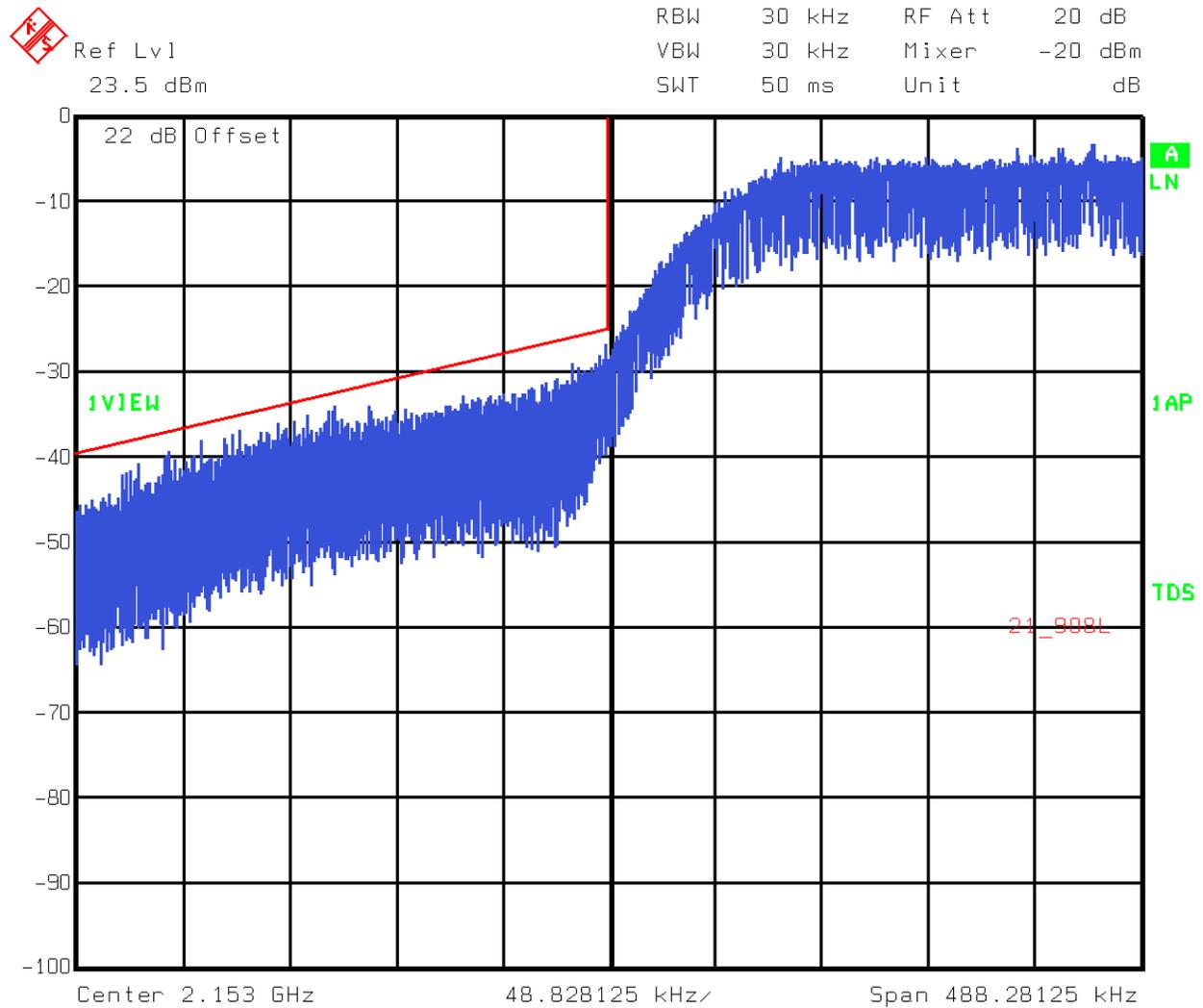
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Average Channel Power  
Comment A: 16 QAM Modulation 320 ks/sec.  
Date: 16.AUG.1999 12:05:54

Plot 34 – 16 QAM Modulation, 320 ksps

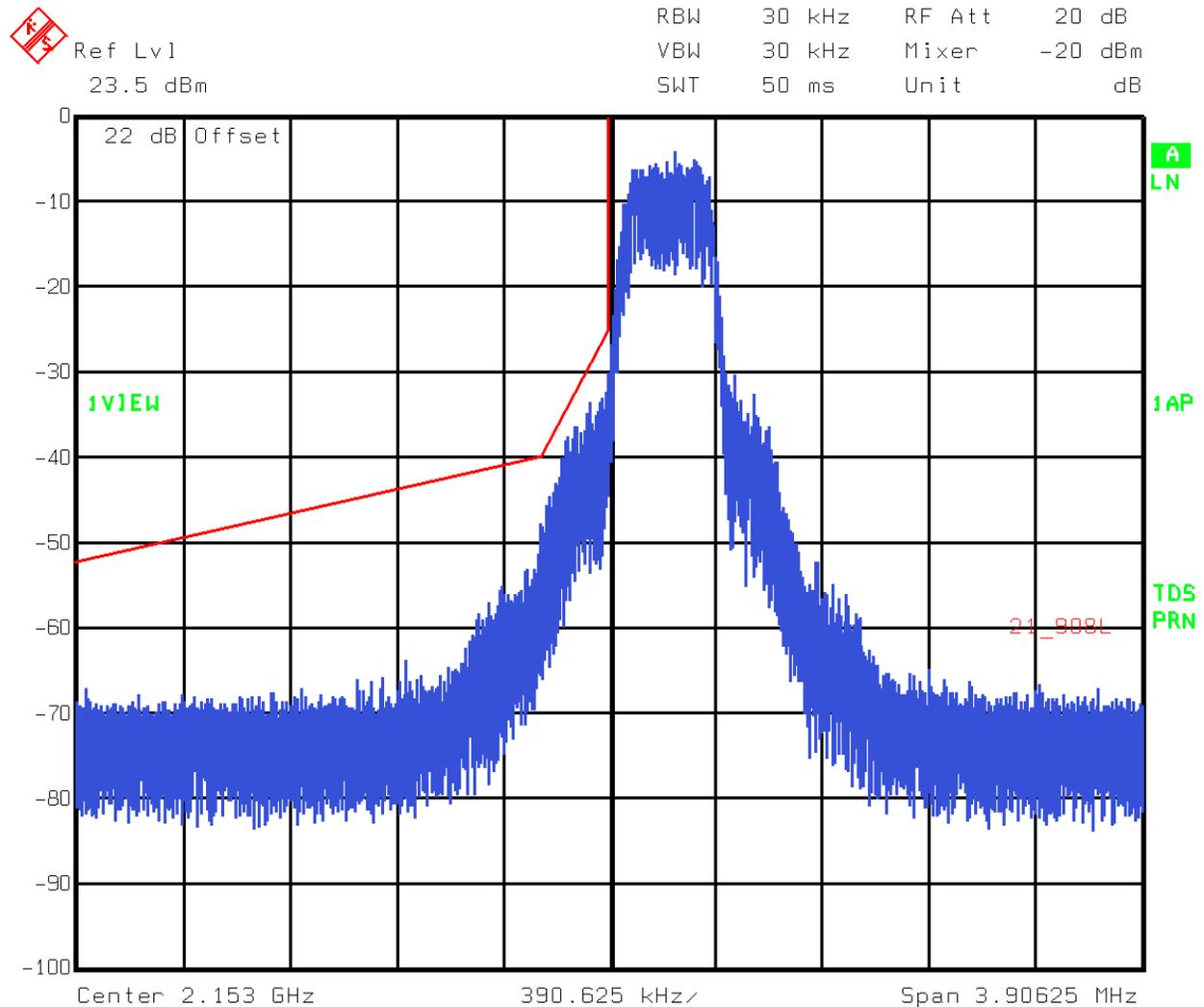
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 16 QAM Modulation 320 ks/sec.  
Date: 16.AUG.1999 14:00:46

Plot 35 – 16 QAM Modulation, 320 kbps

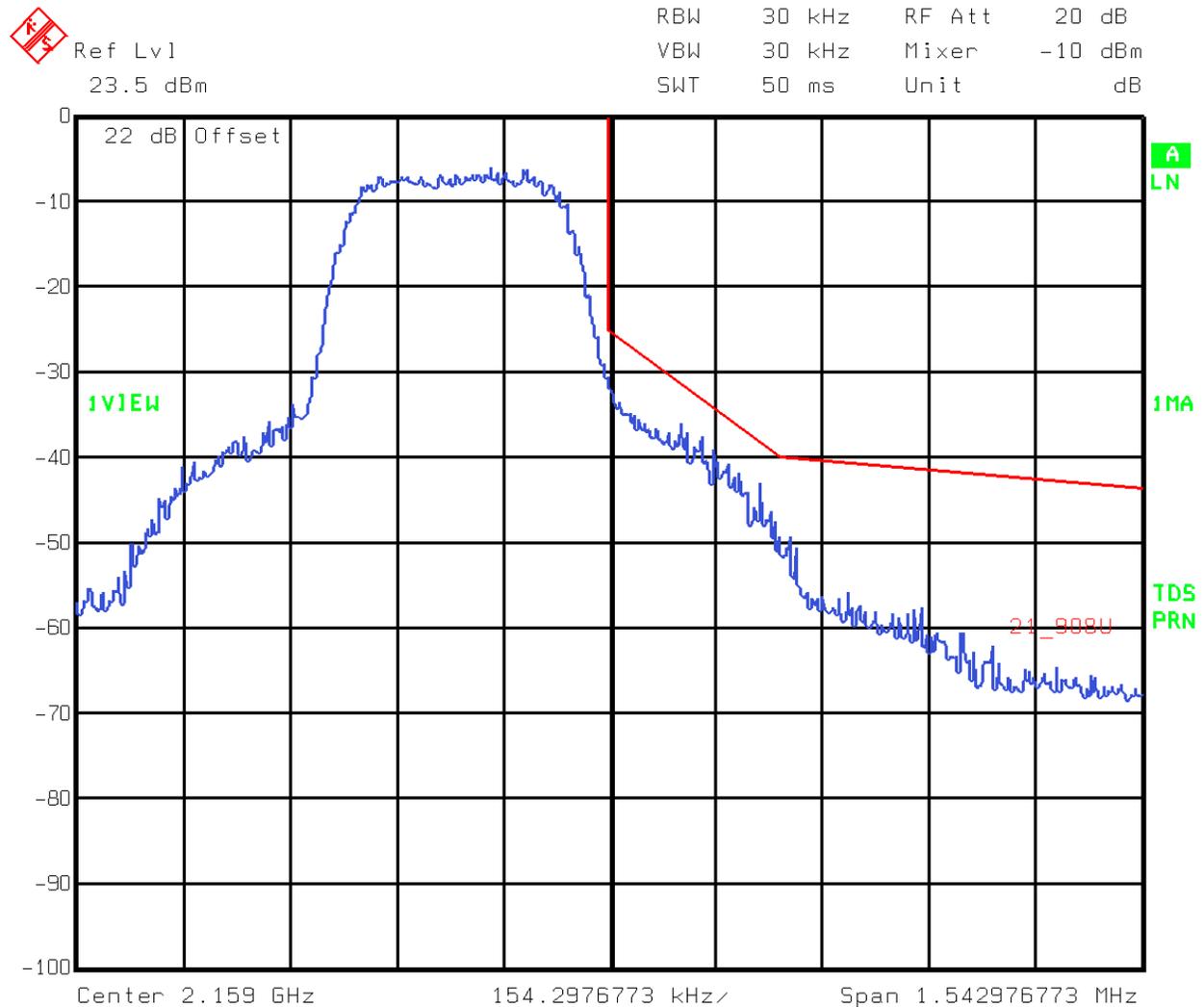
EQUIPMENT: TR2278 Transverter  
FCC ID: C132278



Title: Lower Edge of 6 MHz Channel  
Comment A: 16 QAM Modulation 320 ks/sec.  
Date: 16.AUG.1999 14:01:51

Plot 36 – 16 QAM Modulation, 320 kbps

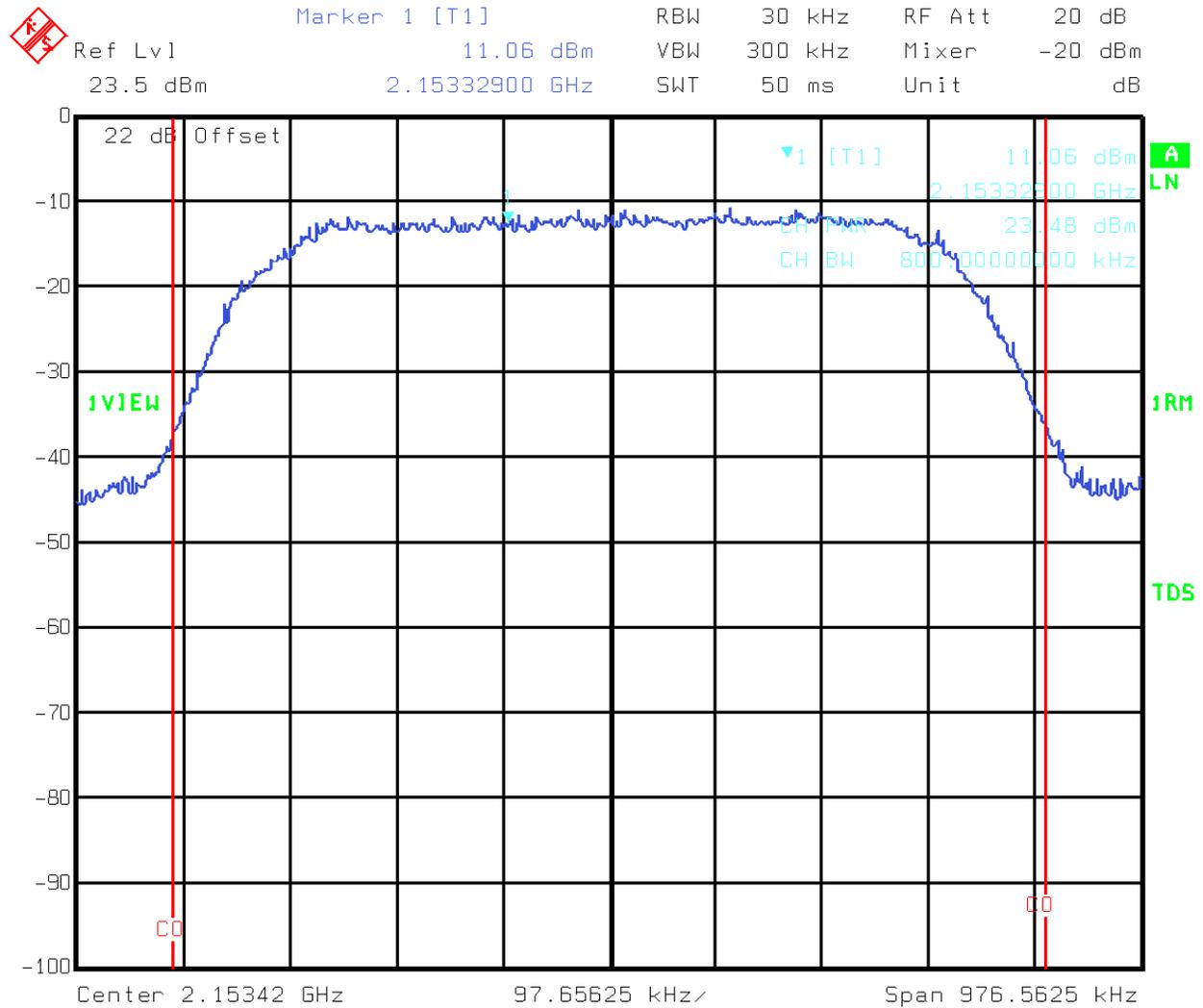
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
Comment A: 16 QAM, 320 ksps  
Date: 18.AUG.1999 14:11:26

Plot 37 – 16 QAM Modulation, 320 ksps

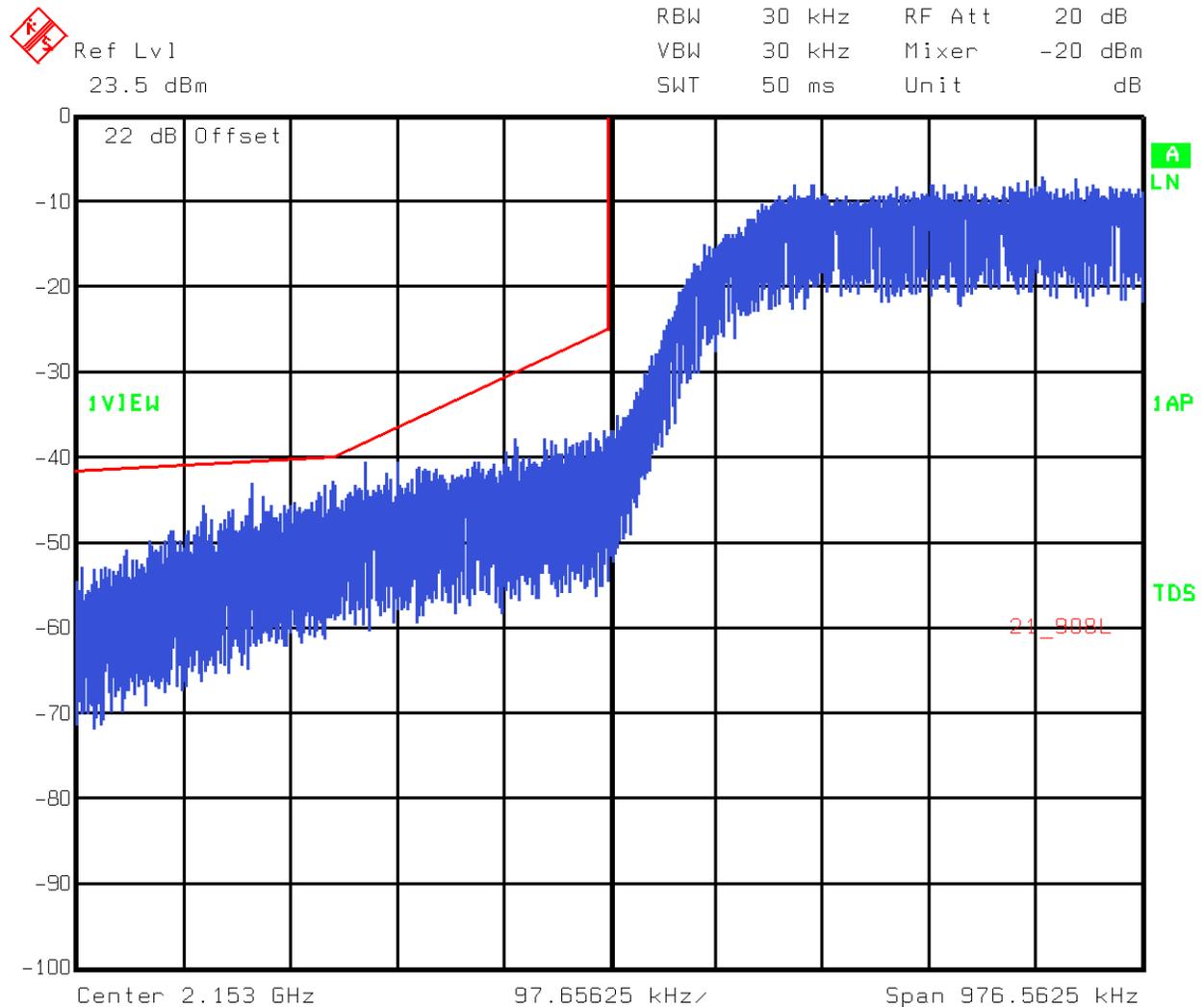
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Average Channel Bandwidth  
Comment A: 16 QAM Modulation 640 ks/sec.  
Date: 16.AUG.1999 15:33:49

Plot 38 – 16 QAM Modulation, 640 ksps

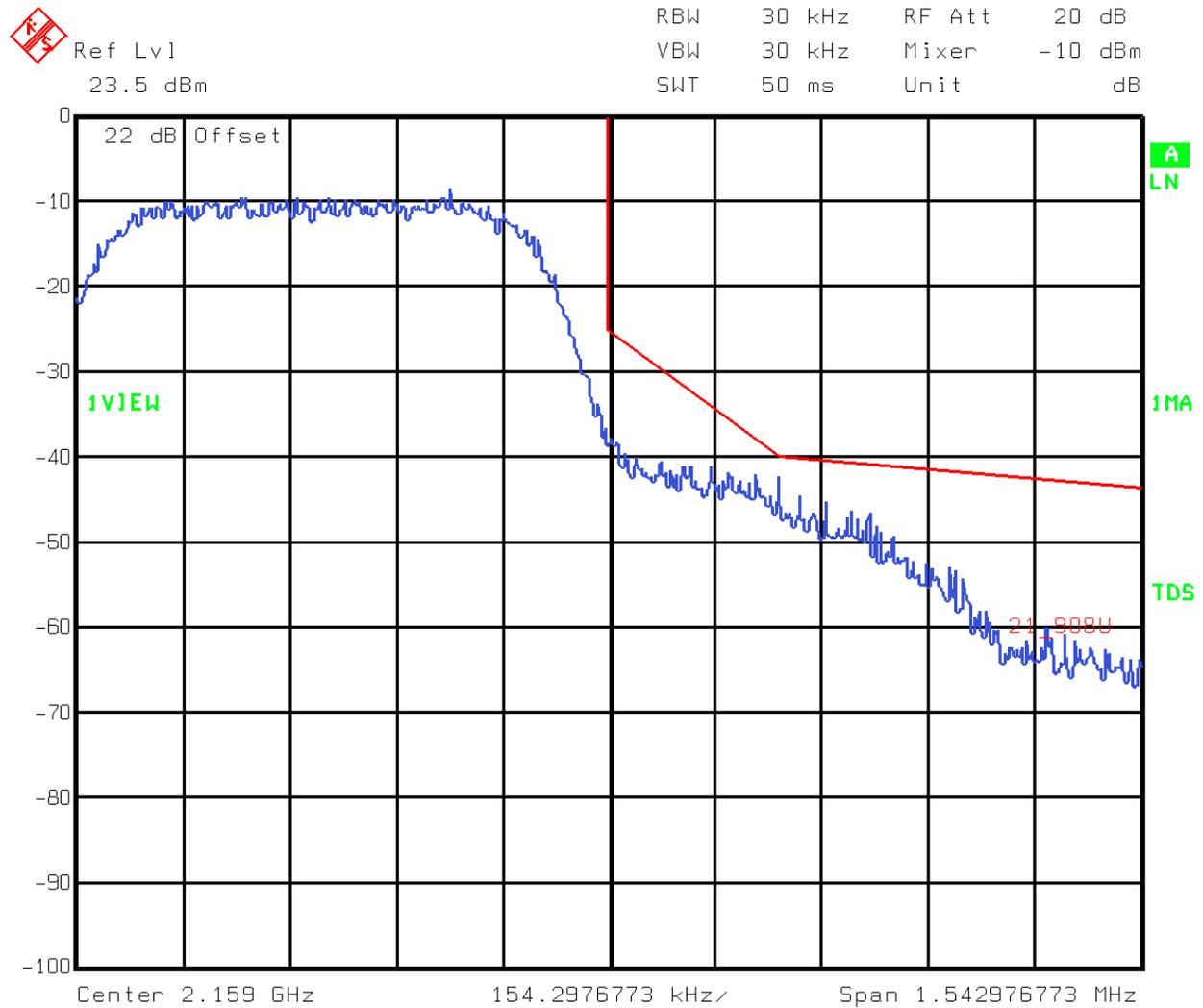
EQUIPMENT: TR2278 Transverter  
FCC ID: C132278



Title: Lower Edge of 6 MHz Channel  
Comment A: 16 QAM Modulation 640 ks/sec.  
Date: 16.AUG.1999 14:54:02

Plot 39 – 16 QAM Modulation, 640 kbps

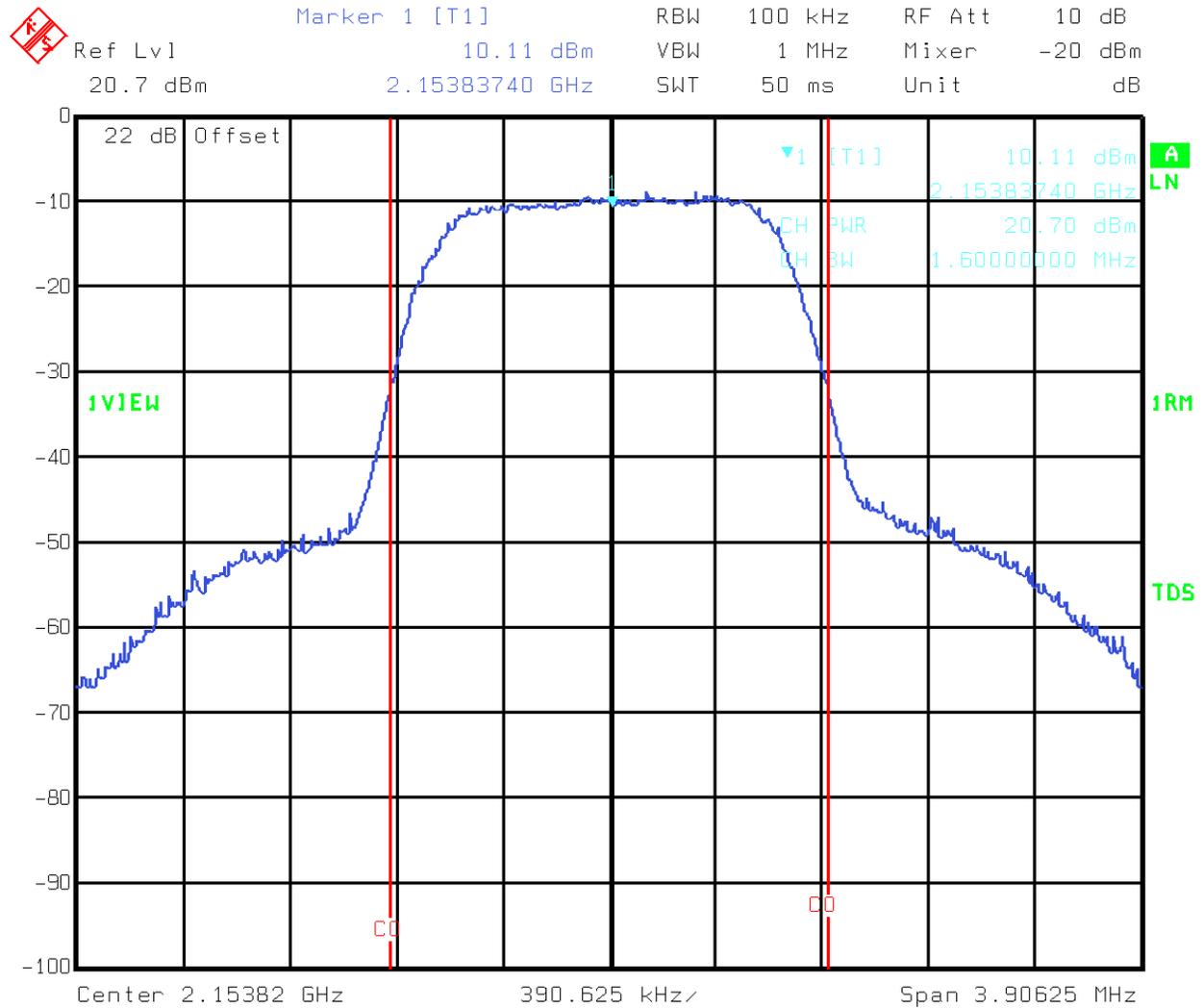
EQUIPMENT: TR2278 Transverter  
 FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
 Comment A: 16 QAM, 640 ksps  
 Date: 18.AUG.1999 14:08:27

**Plot 40 – 16 QAM Modulation, 640 ksps**

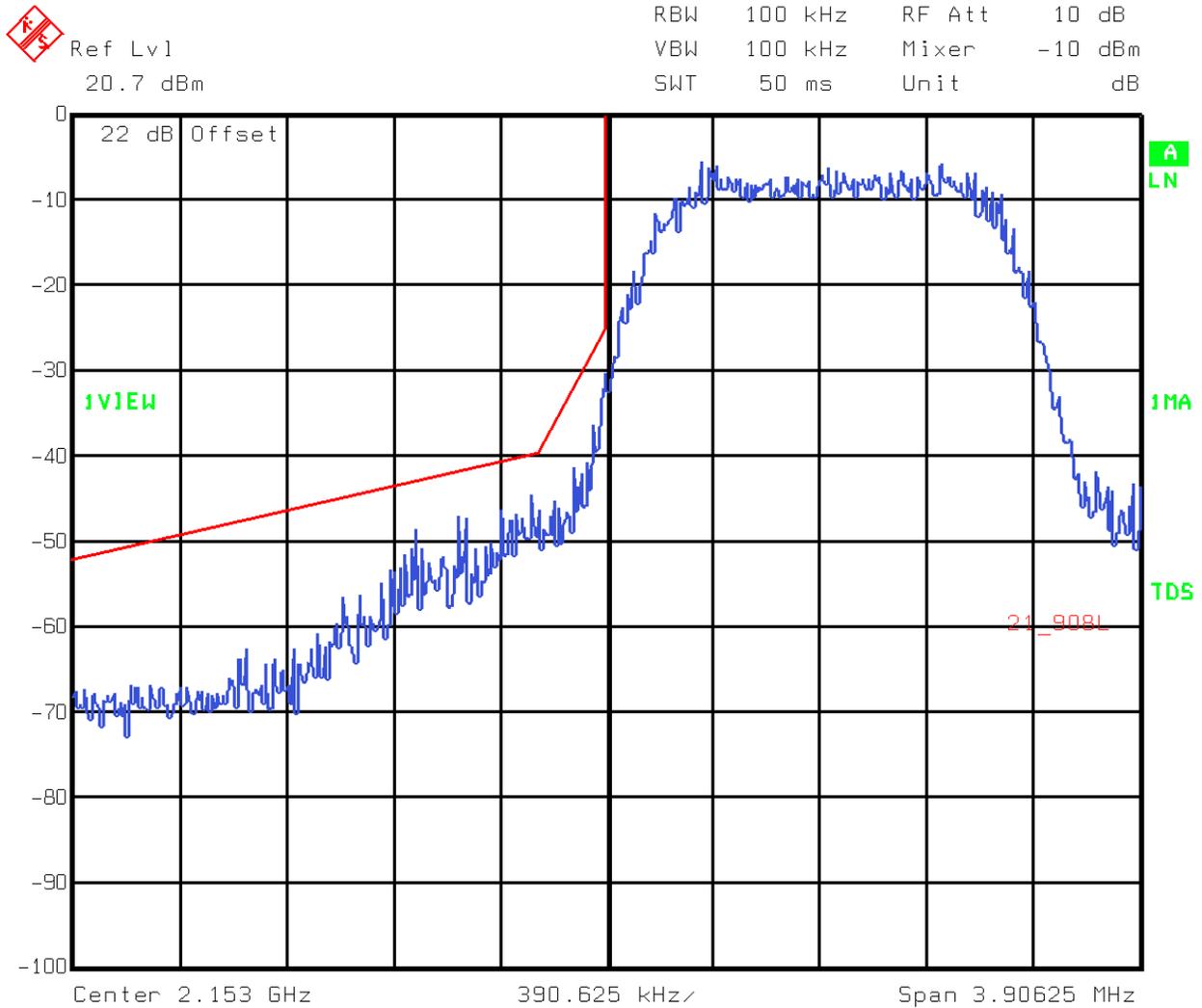
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Average Channel Power  
Comment A: 16 QAM, 1280 ksps  
Date: 18.AUG.1999 11:15:08

Plot 41 – 16 QAM Modulation, 1280 ksps

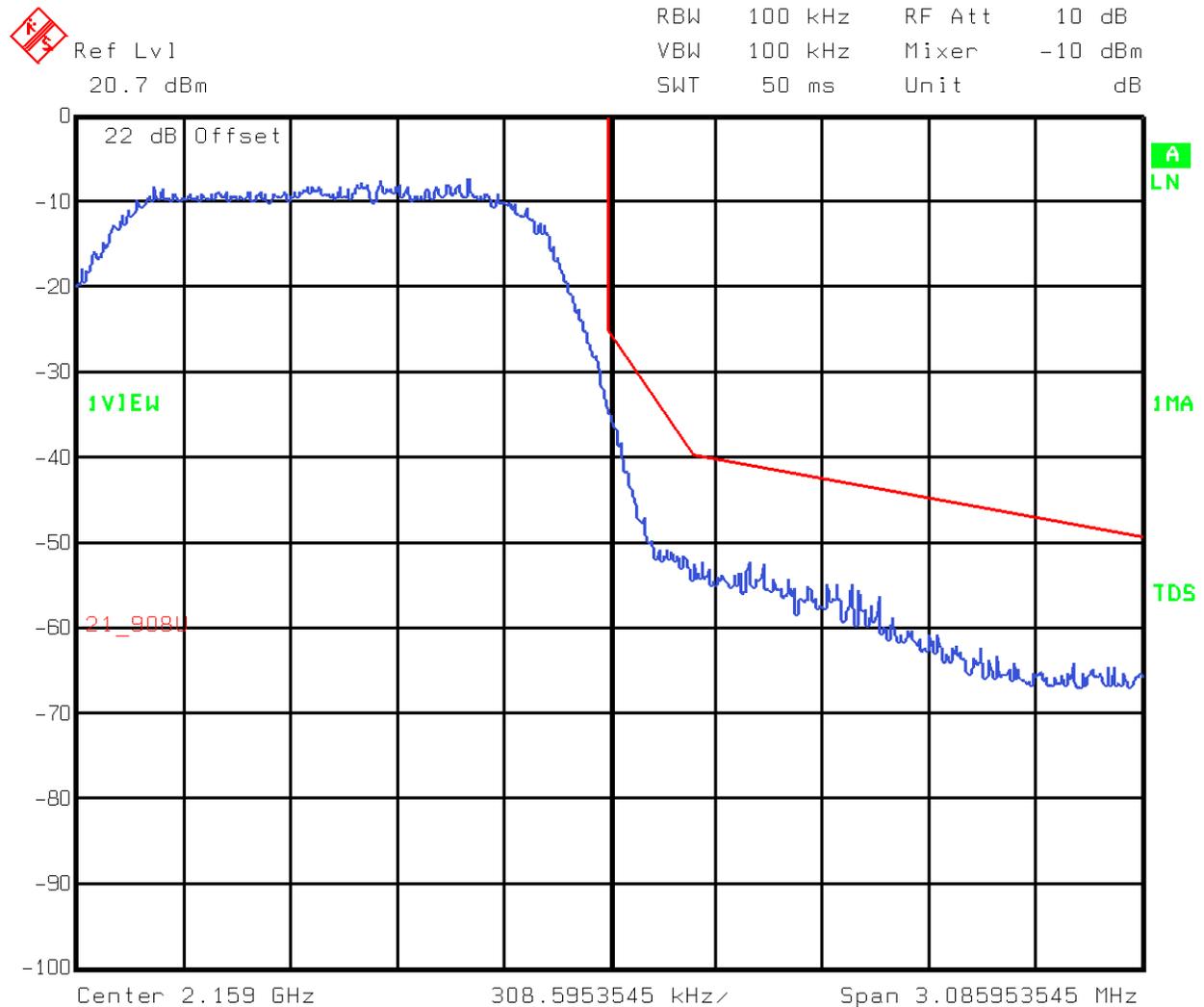
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Band  
Comment A: 16 QAM, 1280 ksps  
Date: 18.AUG.1999 11:18:11

Plot 42 – 16 QAM Modulation, 1280 ksps

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278

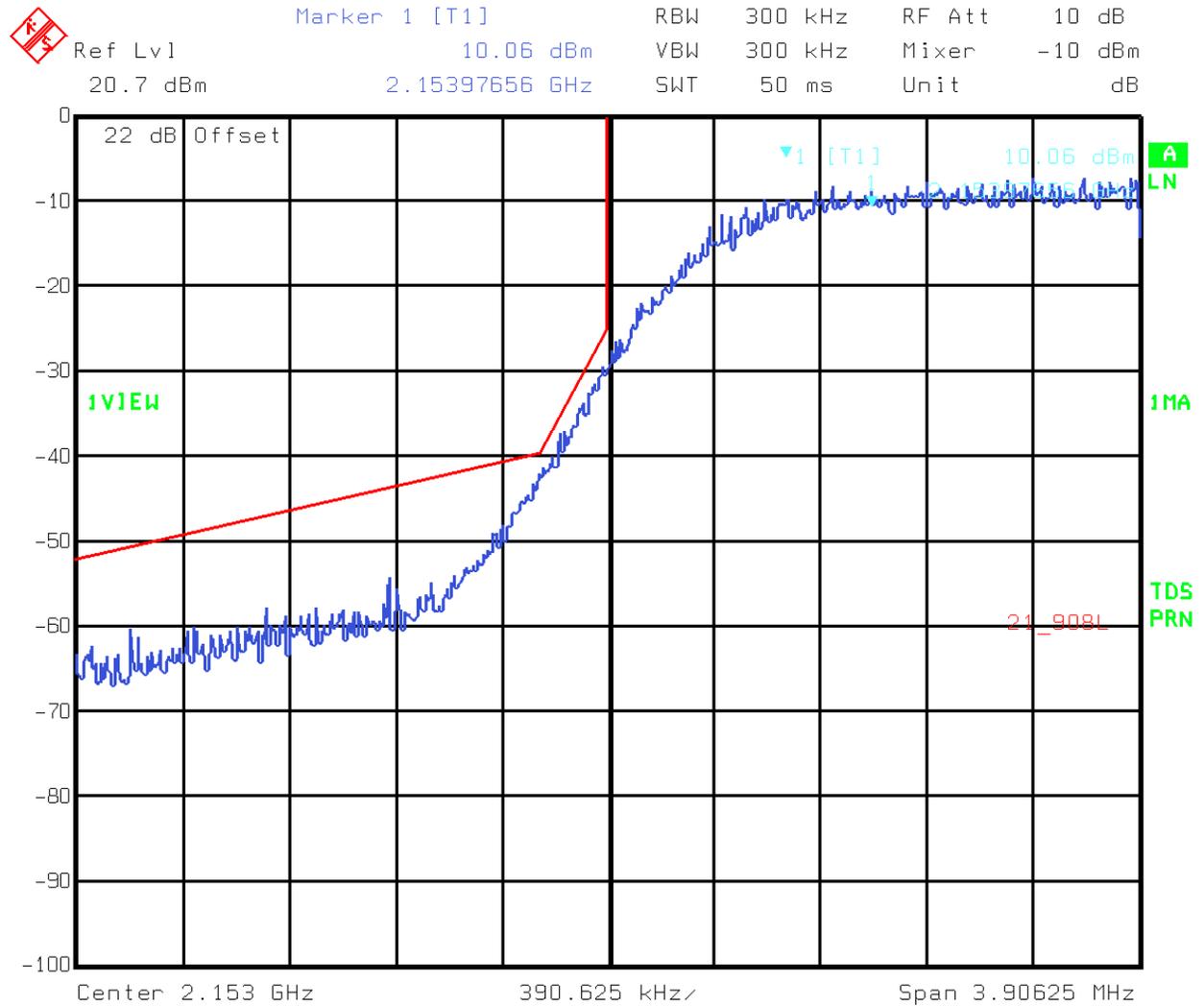


Title: Upper Edge of 6 MHz Channel  
Comment A: 16 QAM, 1280 ksps  
Date: 18.AUG.1999 13:07:58

Plot 43 – 16 QAM Modulation, 1280 ksps



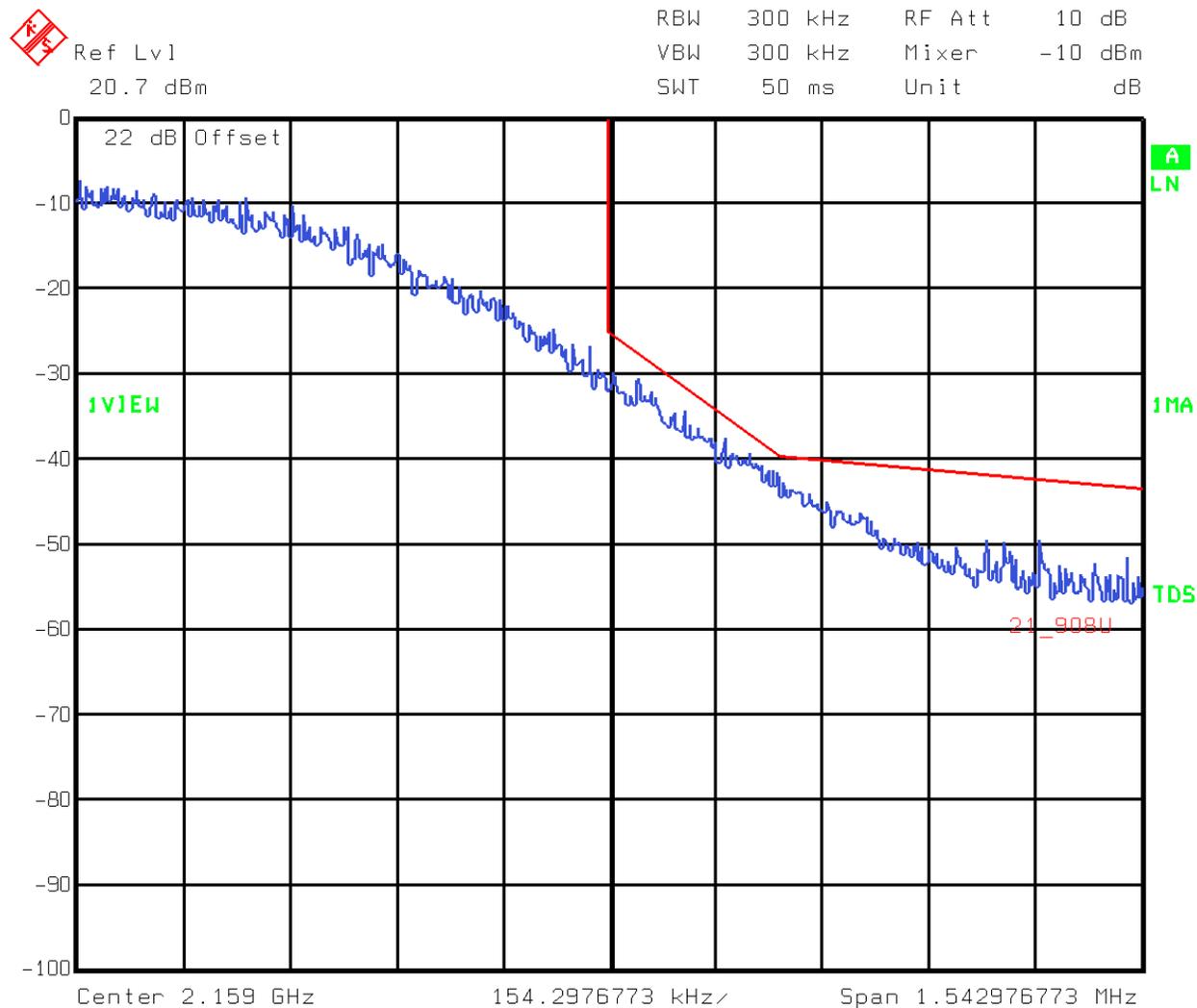
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Lower Edge of 6 MHz Channel  
Comment A: 16 QAM, 2560 ksps  
Date: 18.AUG.1999 11:37:37

Plot 45 – 16 QAM Modulation, 2560 ksps

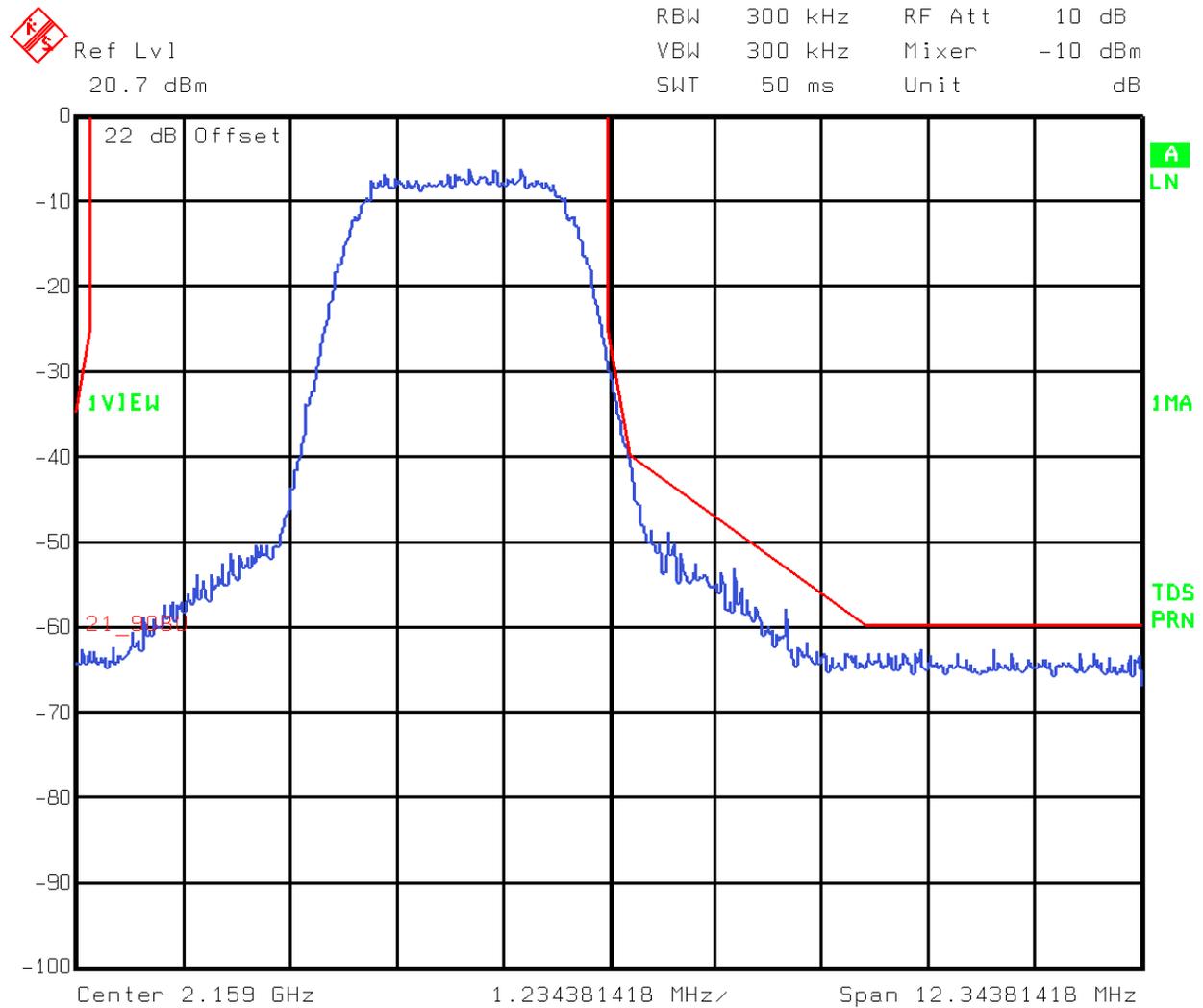
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
Comment A: 16 QAM, 2560 ksps  
Date: 18.AUG.1999 12:58:43

Plot 46 – 16 QAM Modulation, 2560 ksps

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Upper Edge of 6 MHz Channel  
Comment A: 16 QAM, 2560 ksps  
Date: 18.AUG.1999 12:59:57

Plot 47 – 16 QAM Modulation, 2560 ksps

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 5. Spurious Emissions at Antenna Terminals**

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: Tom Tidwell	DATE: 12 August, 1999

**Test Results:** Complies.

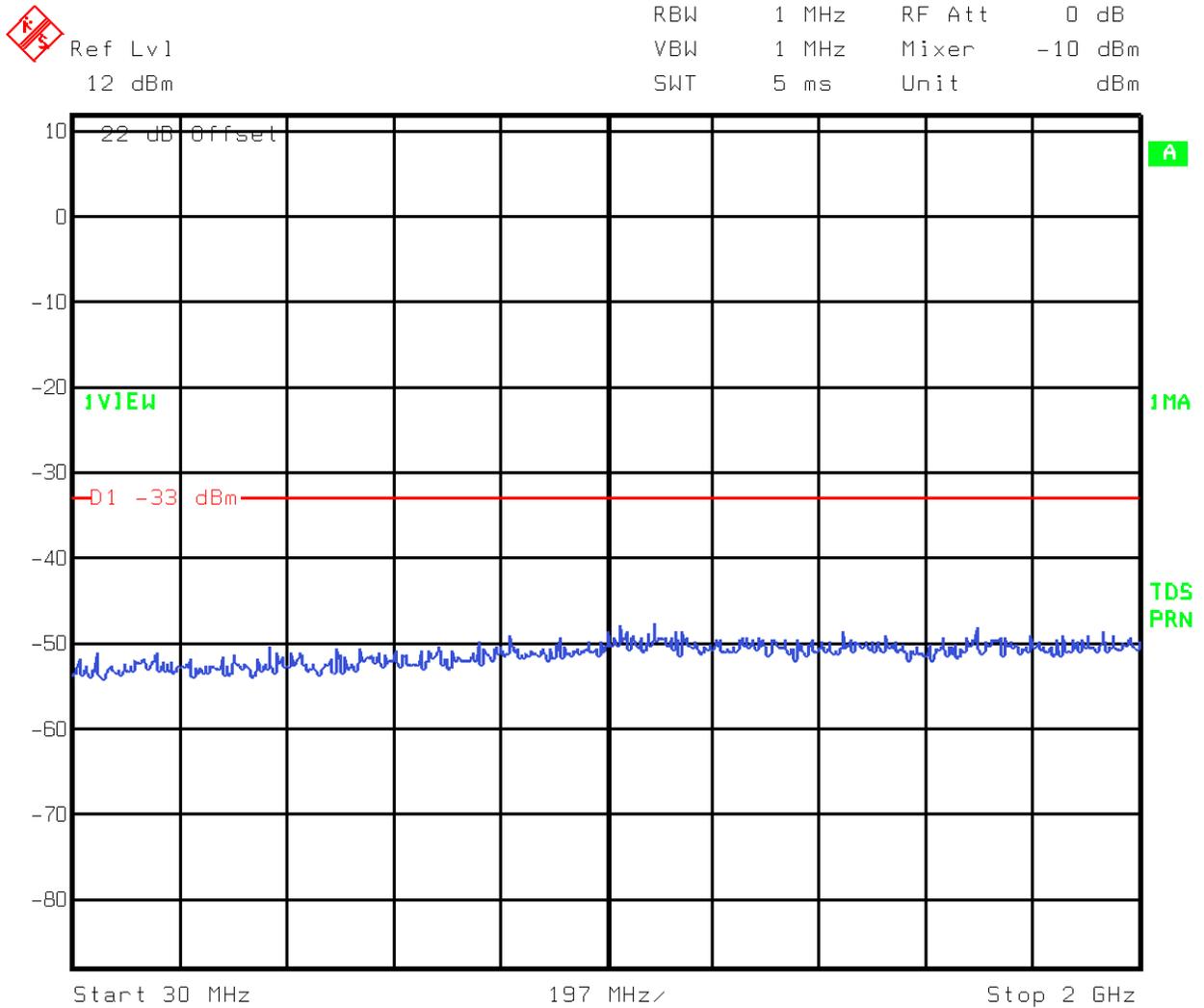
**Measurement Data:** See attached plots.

**Test Equipment Used:** 1,2,3,4,5,14,21,22

**Environmental Conditions:** 22 °Celsius  
42 % RH

<b>Worst-Case In-Band Spurious Emissions:</b>	<b>-35.97 dBm @ 6805.61 MHz</b>
---	---------------------------------

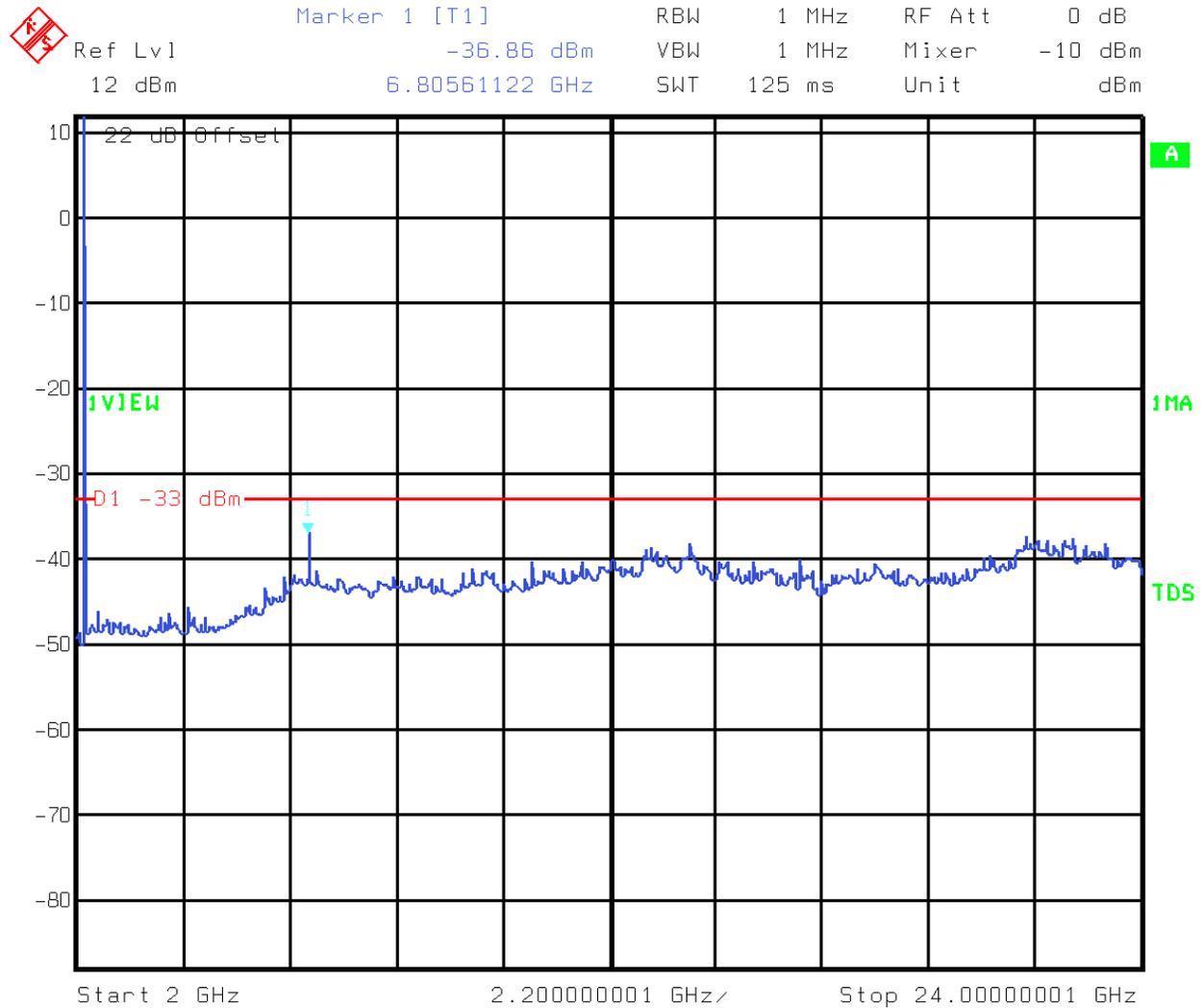
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 128 kps  
Date: 12.AUG.1999 11:53:05

Plot 48 – 128 kps

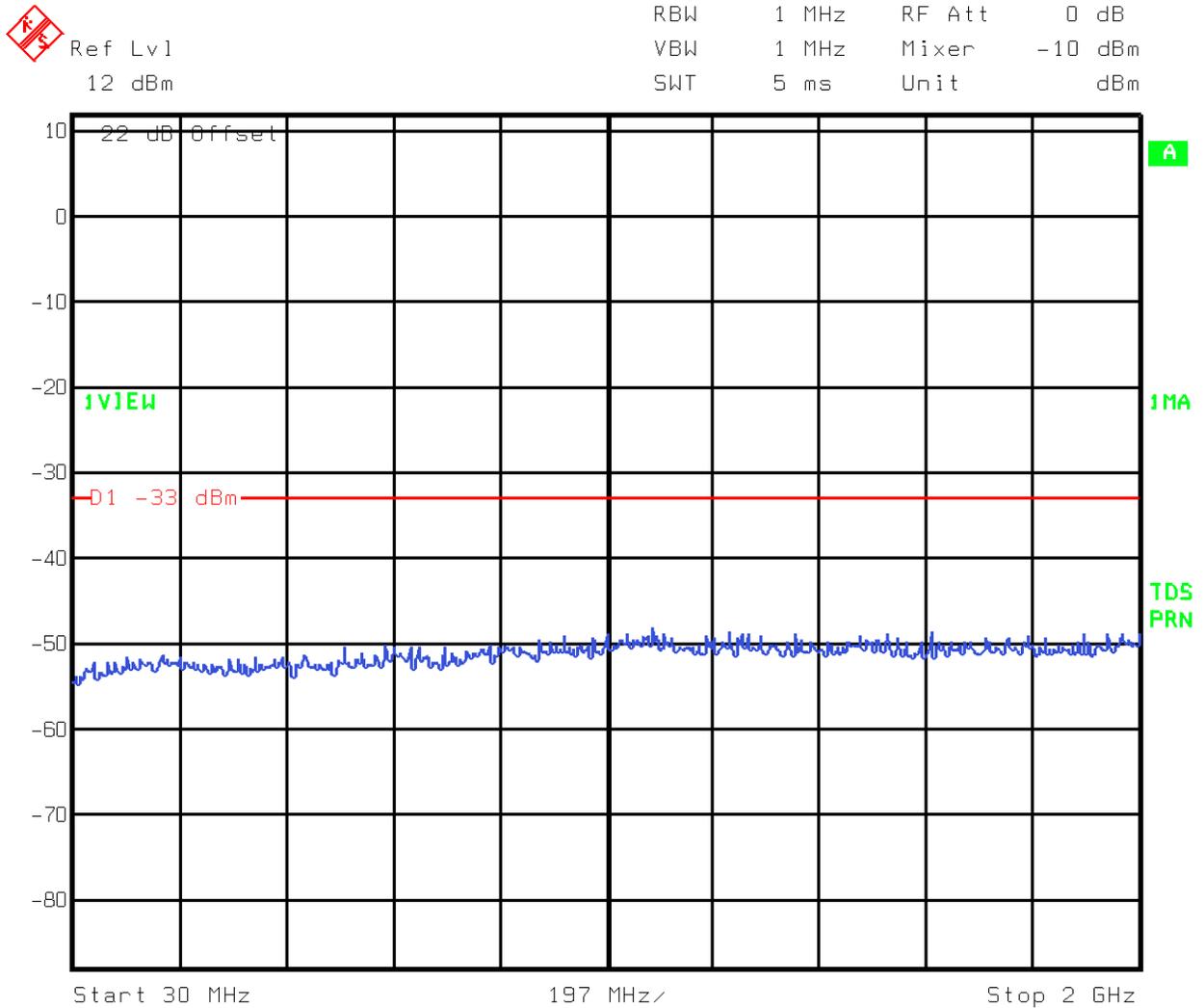
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 120 kbps  
Date: 12.AUG.1999 10:39:03

Plot 49 – 128 kbps

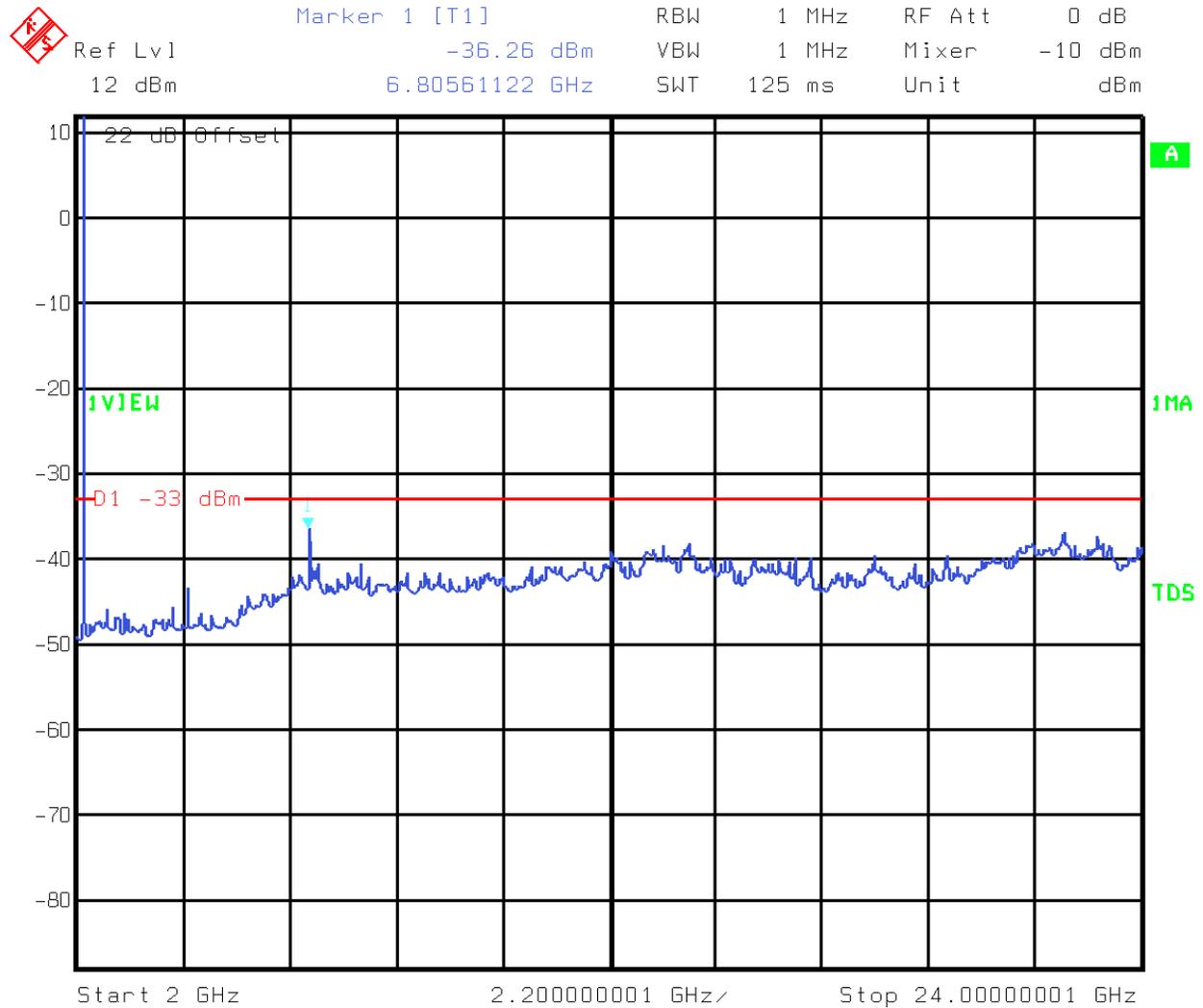
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 160 kps  
Date: 12.AUG.1999 11:50:55

Plot 50 – 160 kps

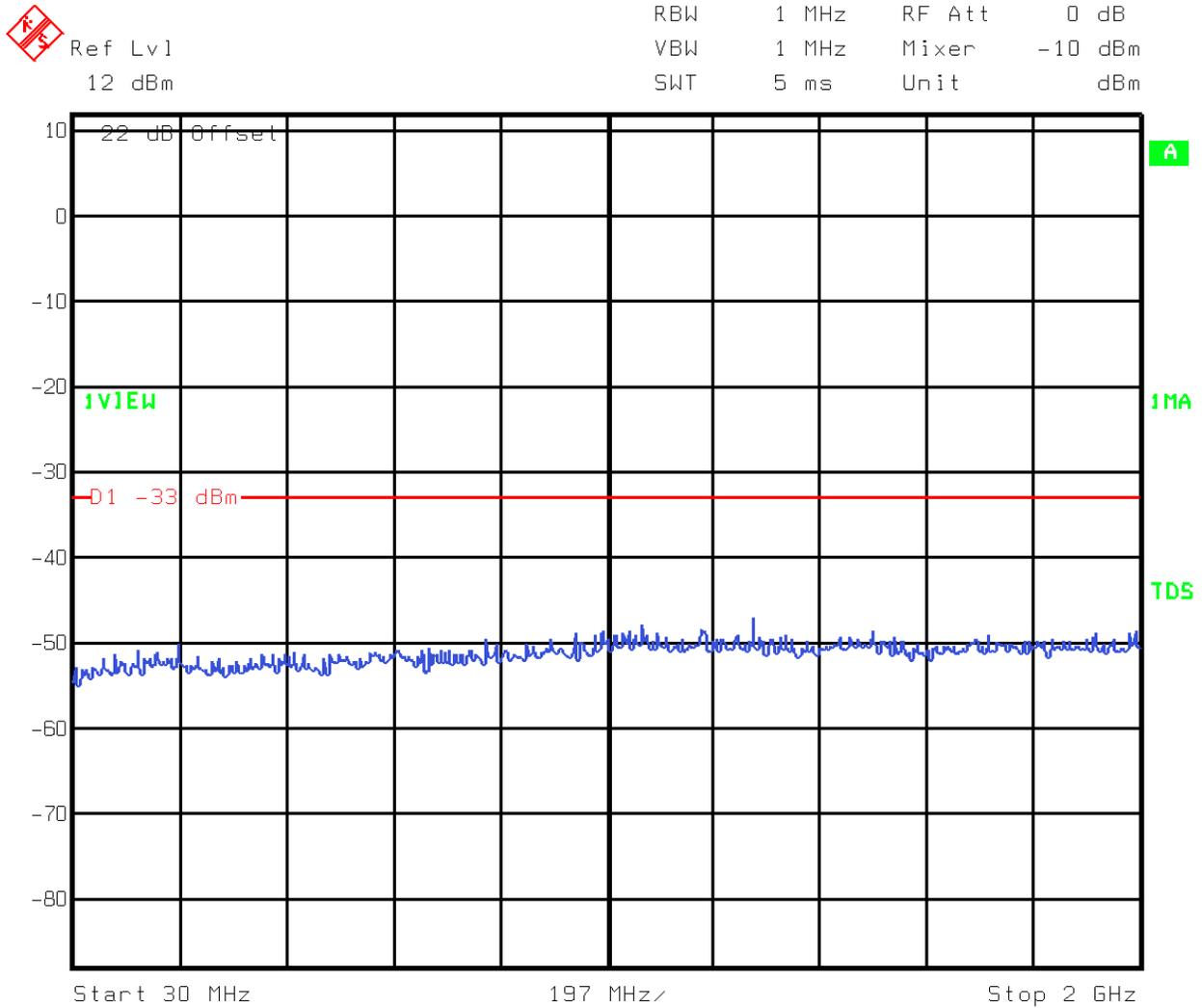
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 160 kps  
Date: 12.AUG.1999 10:26:43

**Plot 51 – 160 kps**

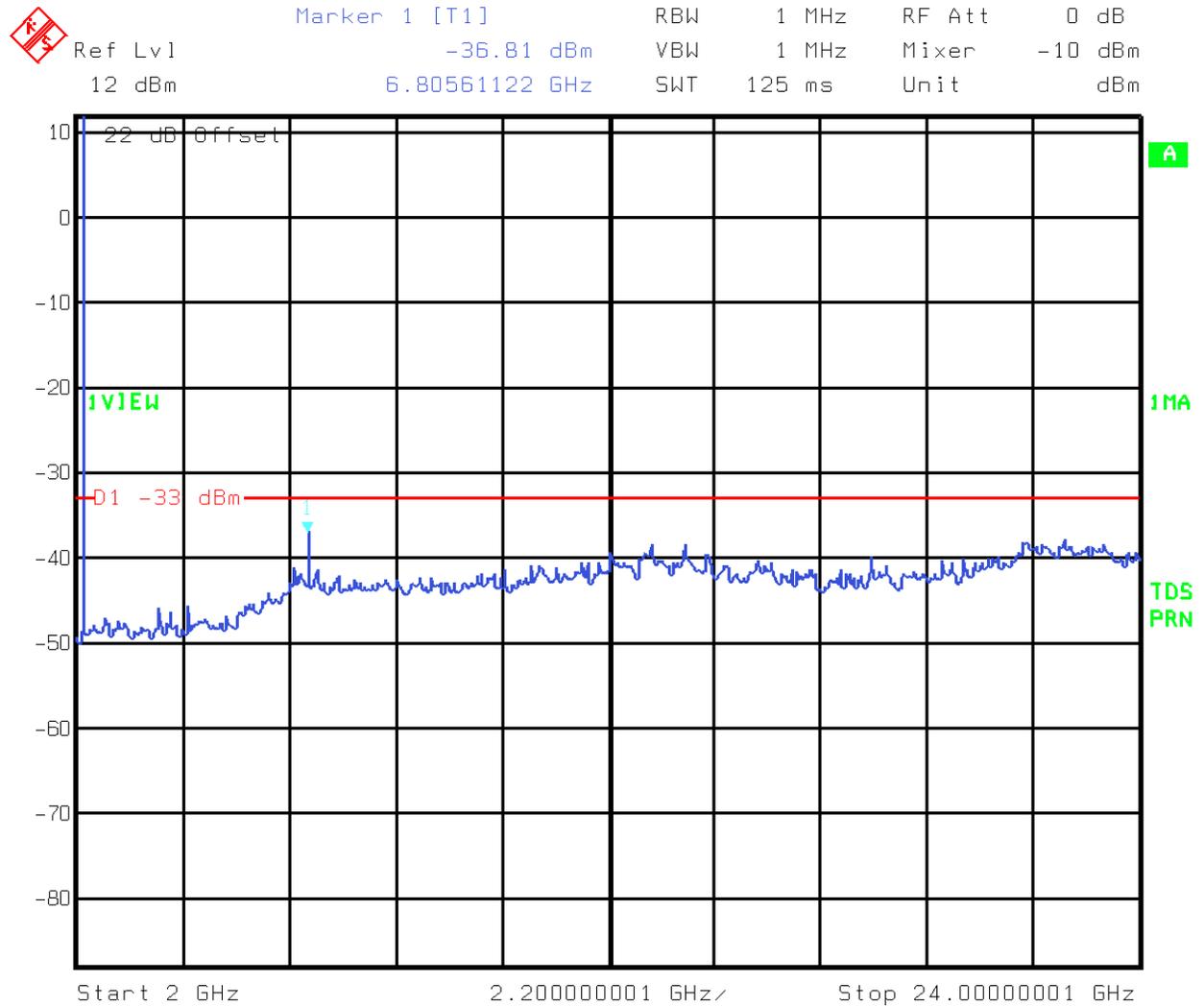
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 320 kps  
Date: 12.AUG.1999 11:49:38

Plot 52 – 320 kps

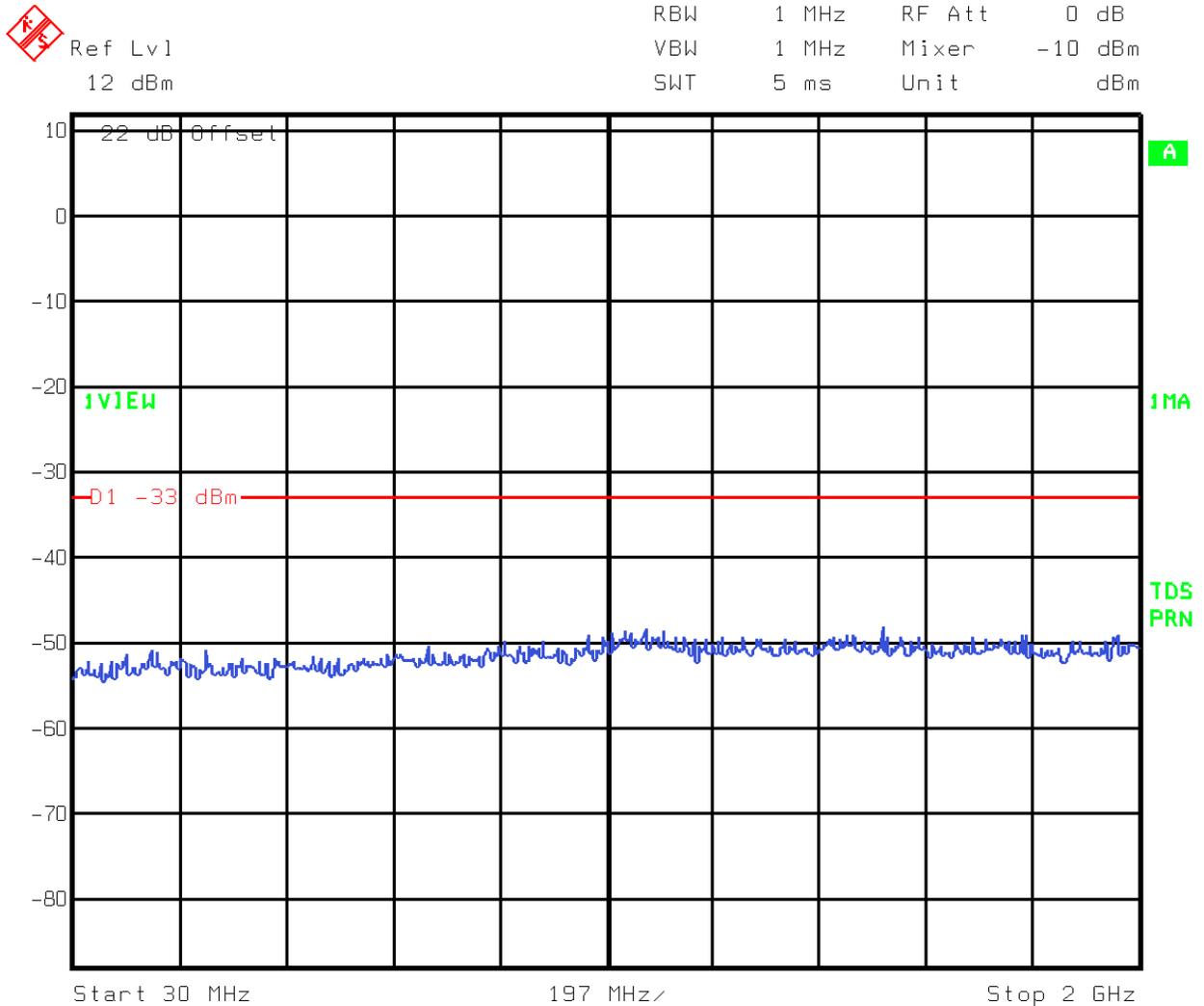
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 320 kps  
Date: 12.AUG.1999 10:40:08

Plot 53 – 320 kps

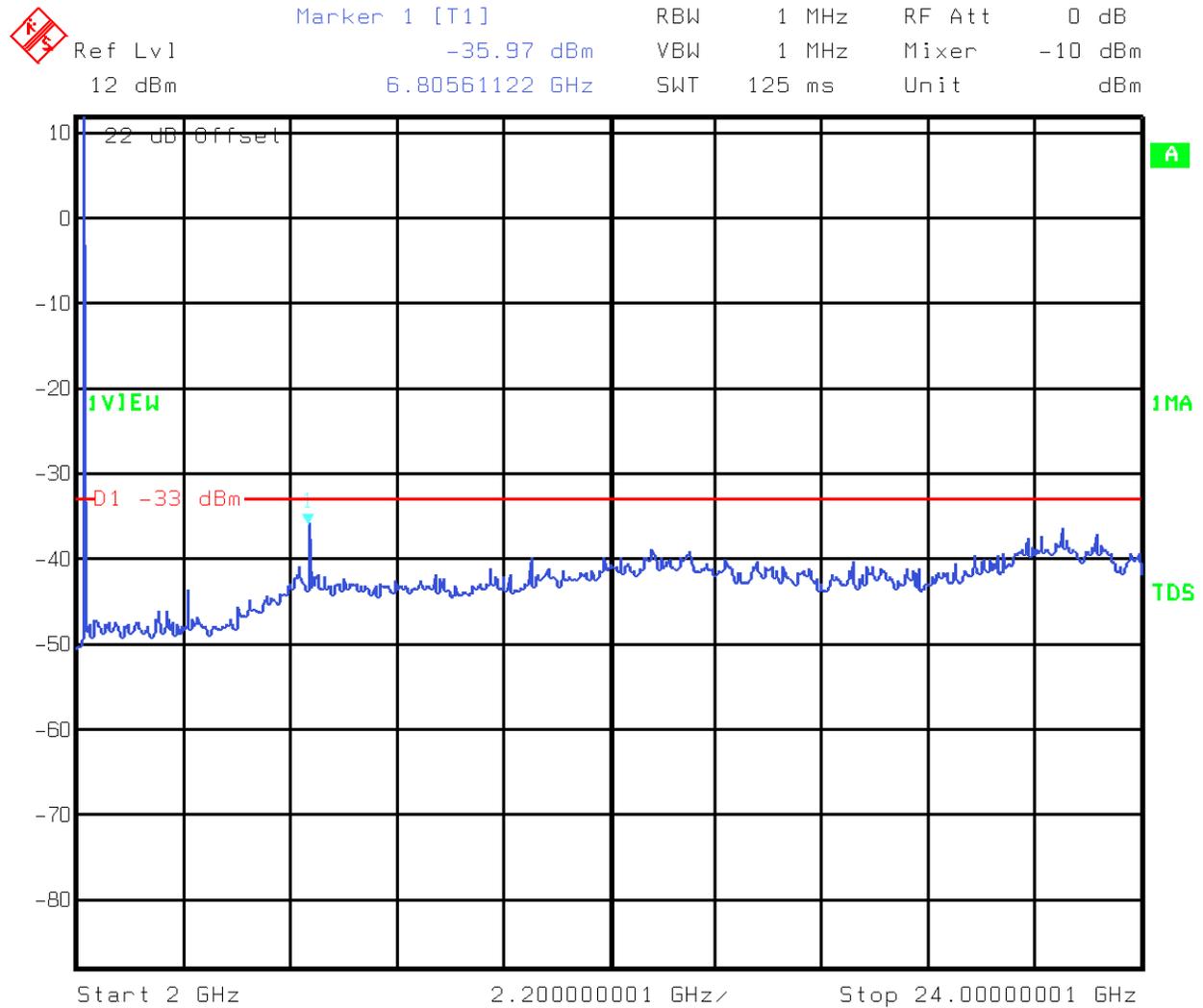
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 512 kps  
Date: 12.AUG.1999 11:45:48

Plot 54 – 512 kps

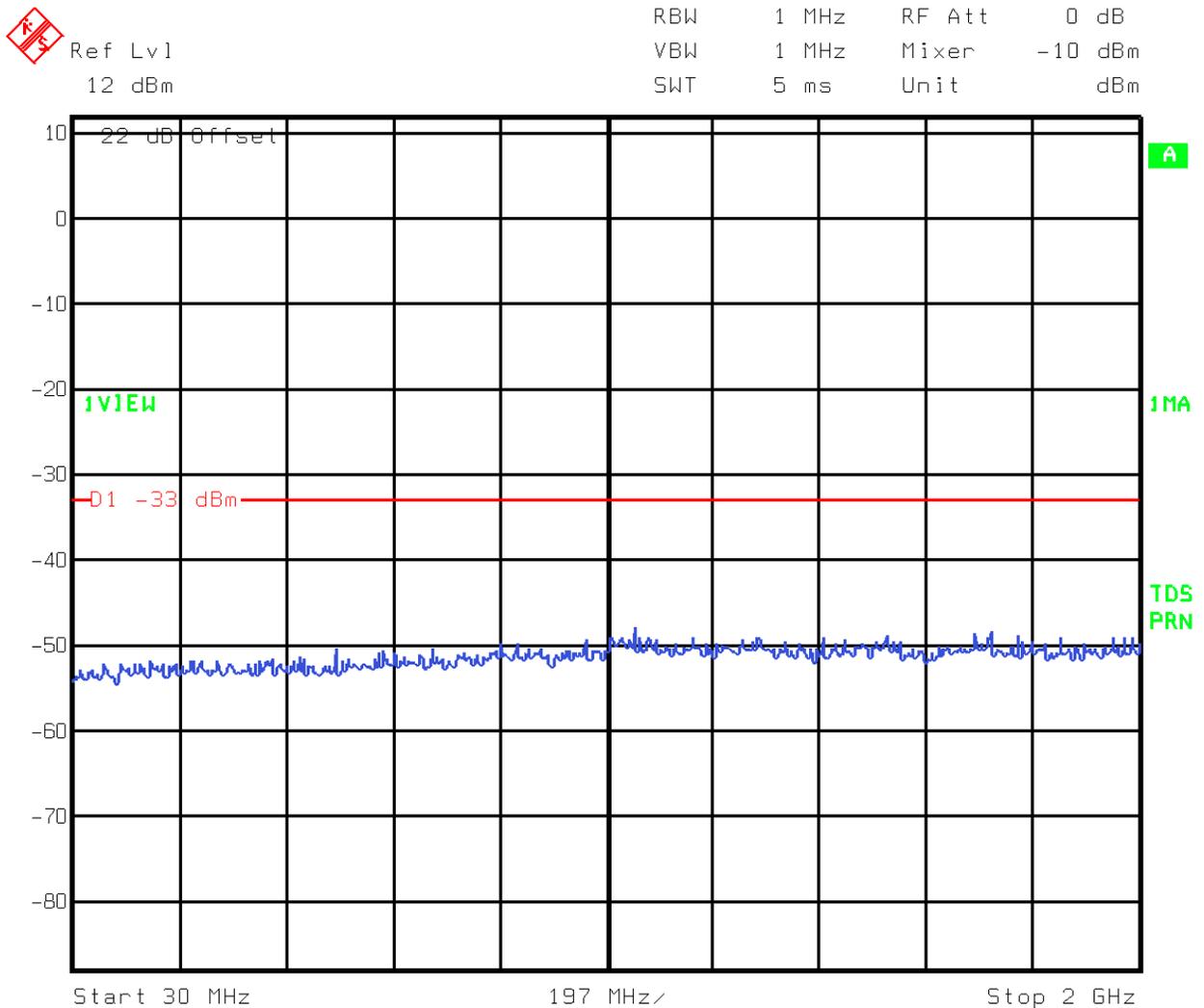
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 512 kbps  
Date: 12.AUG.1999 10:45:36

Plot 55 – 512 kbps

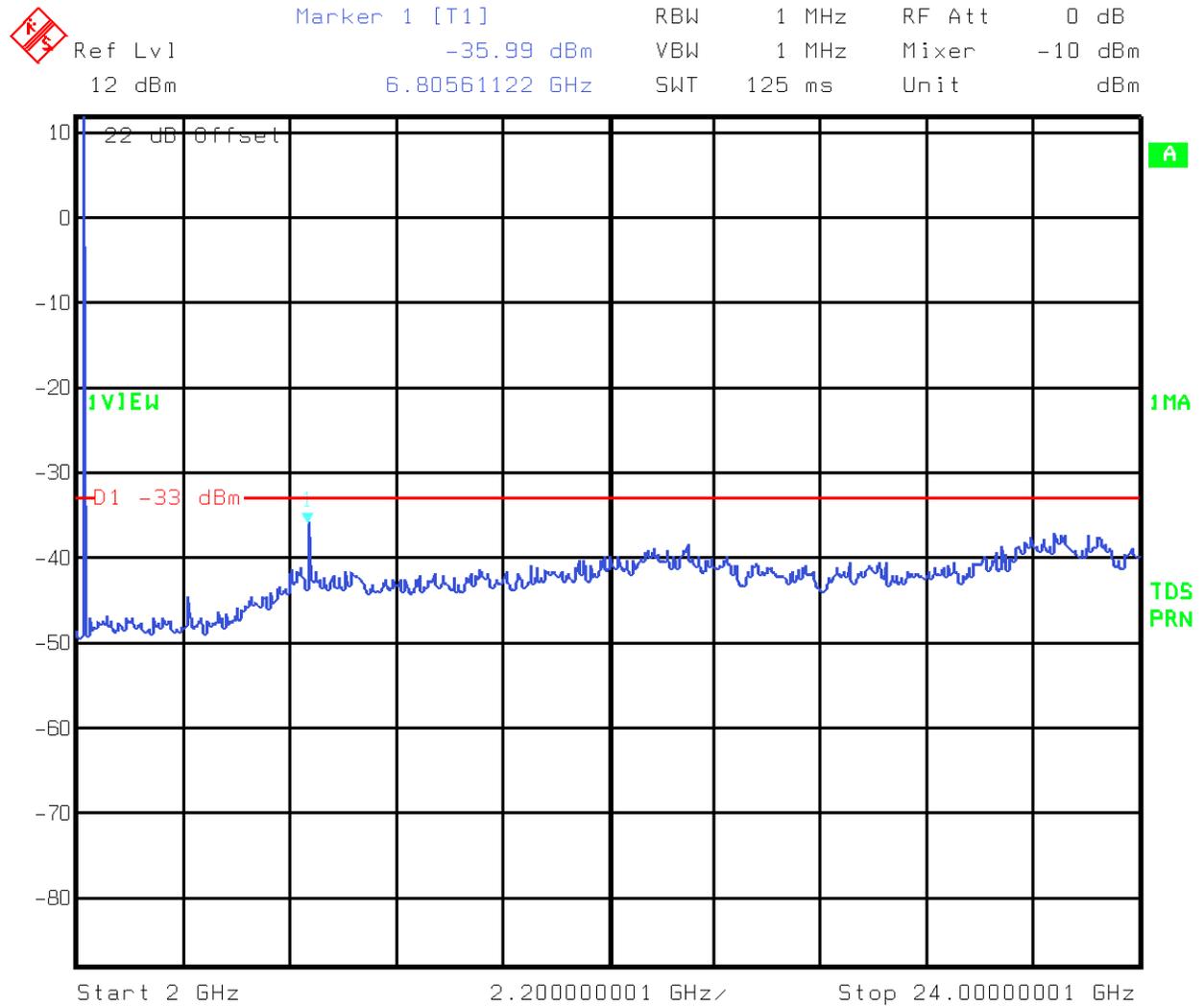
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Date: 12.AUG.1999 11:43:20

Plot 56 – 640 ksps

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278

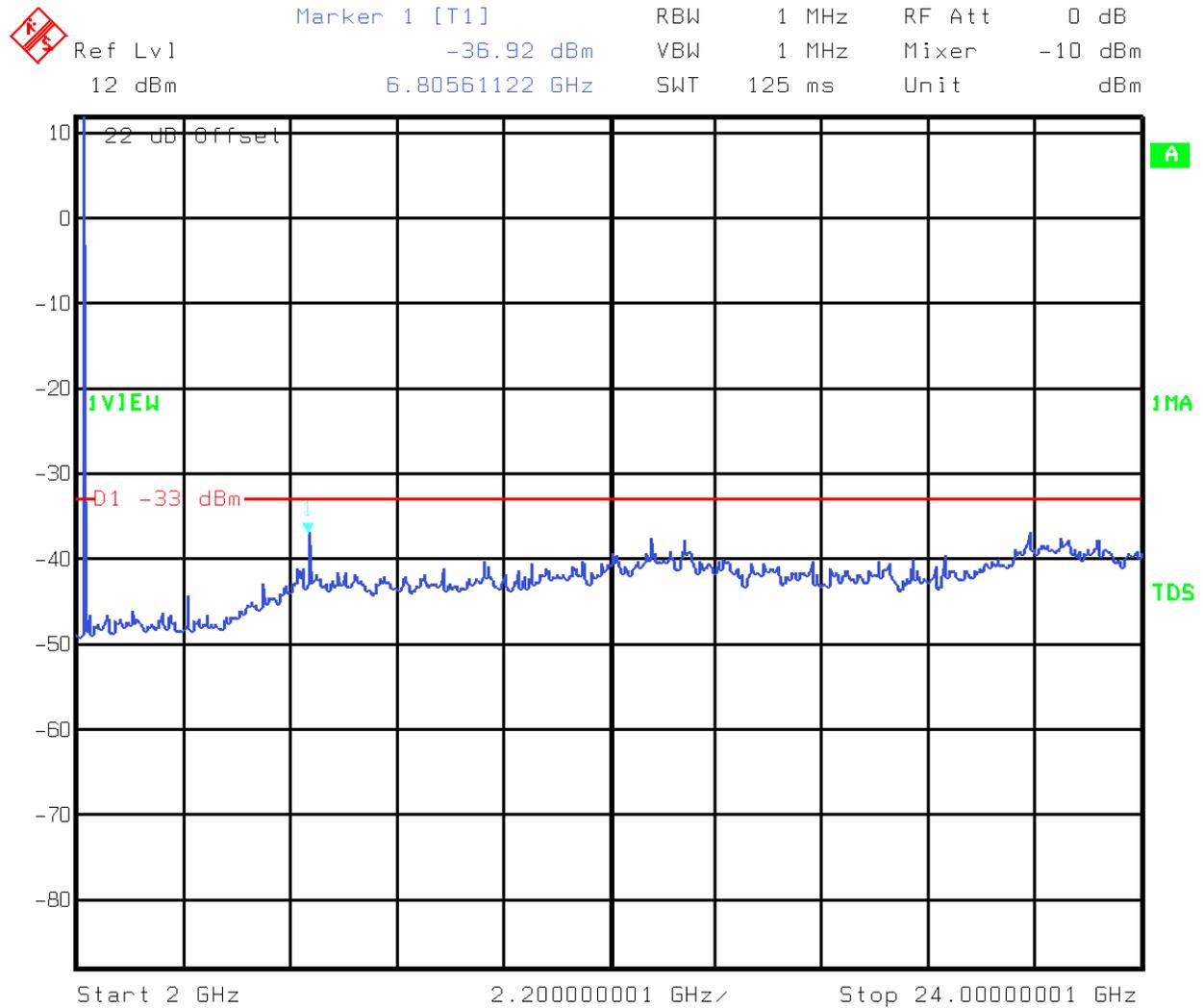


Title: Spurious Emissions  
Comment A: 640 kps  
Date: 12.AUG.1999 10:46:32

Plot 57 – 640 kps



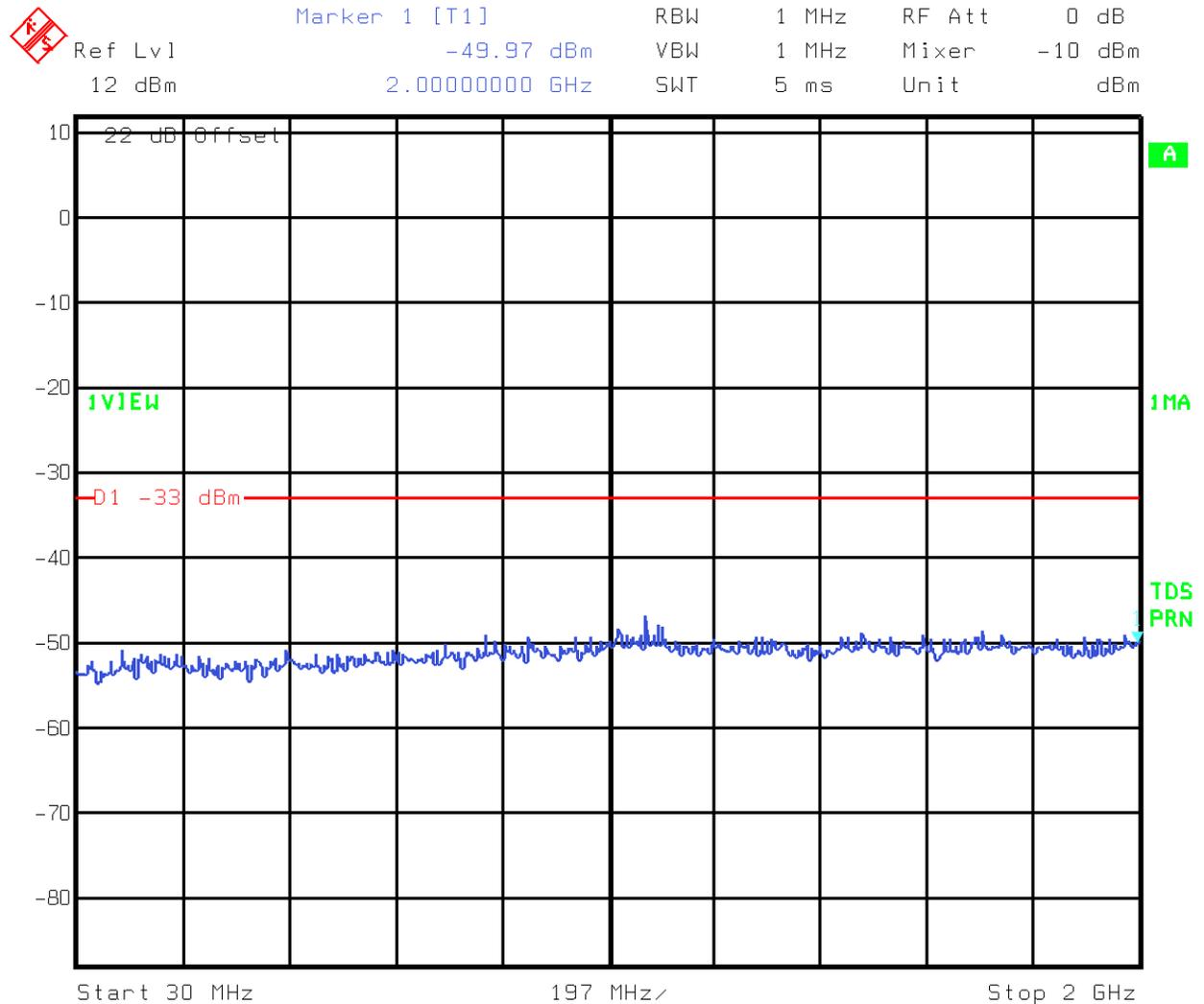
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 1280 kbps  
Date: 12.AUG.1999 11:13:58

Plot 59 – 1280 kbps

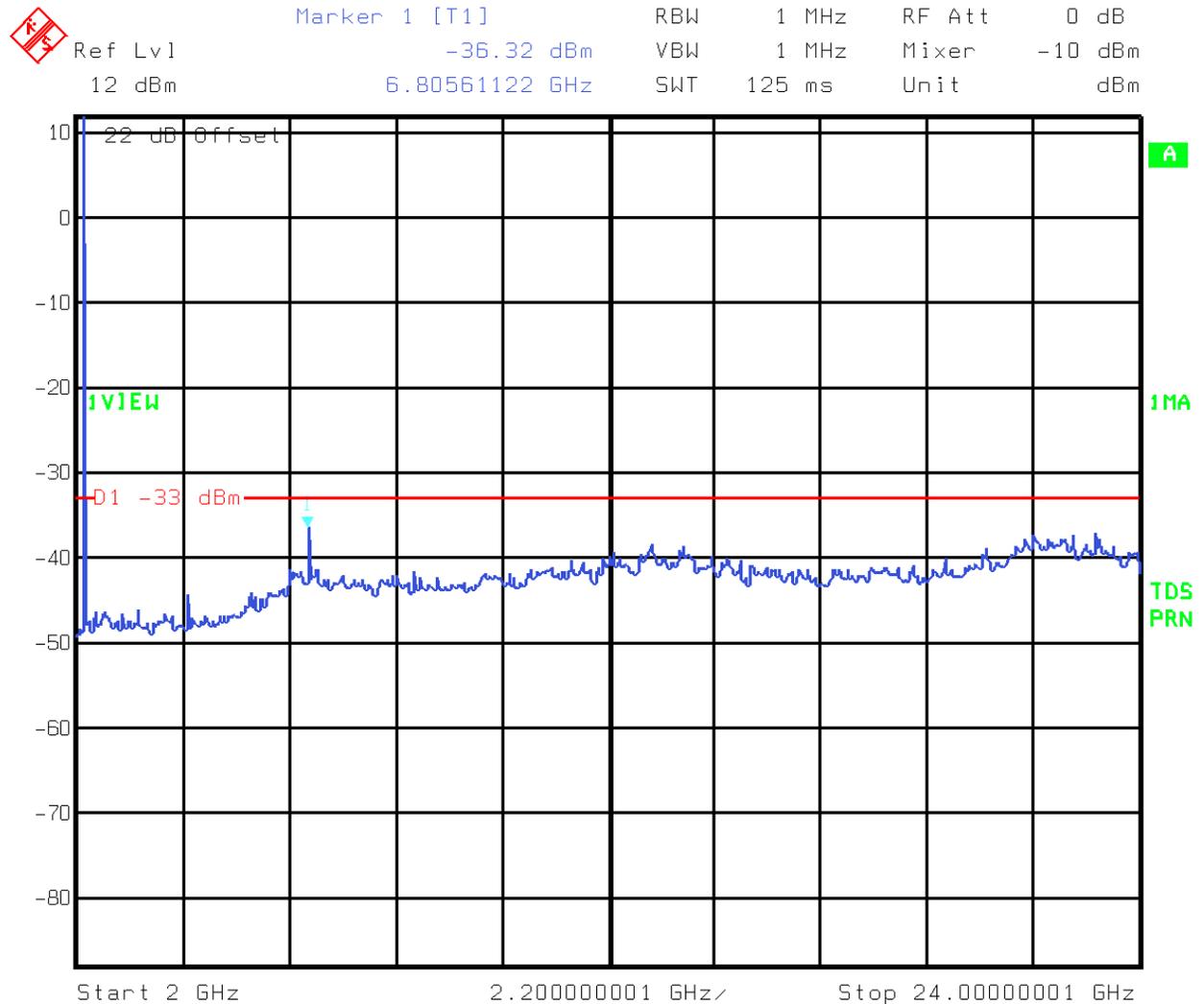
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 1544 kps  
Date: 12.AUG.1999 11:39:10

Plot 60 – 1544 kps

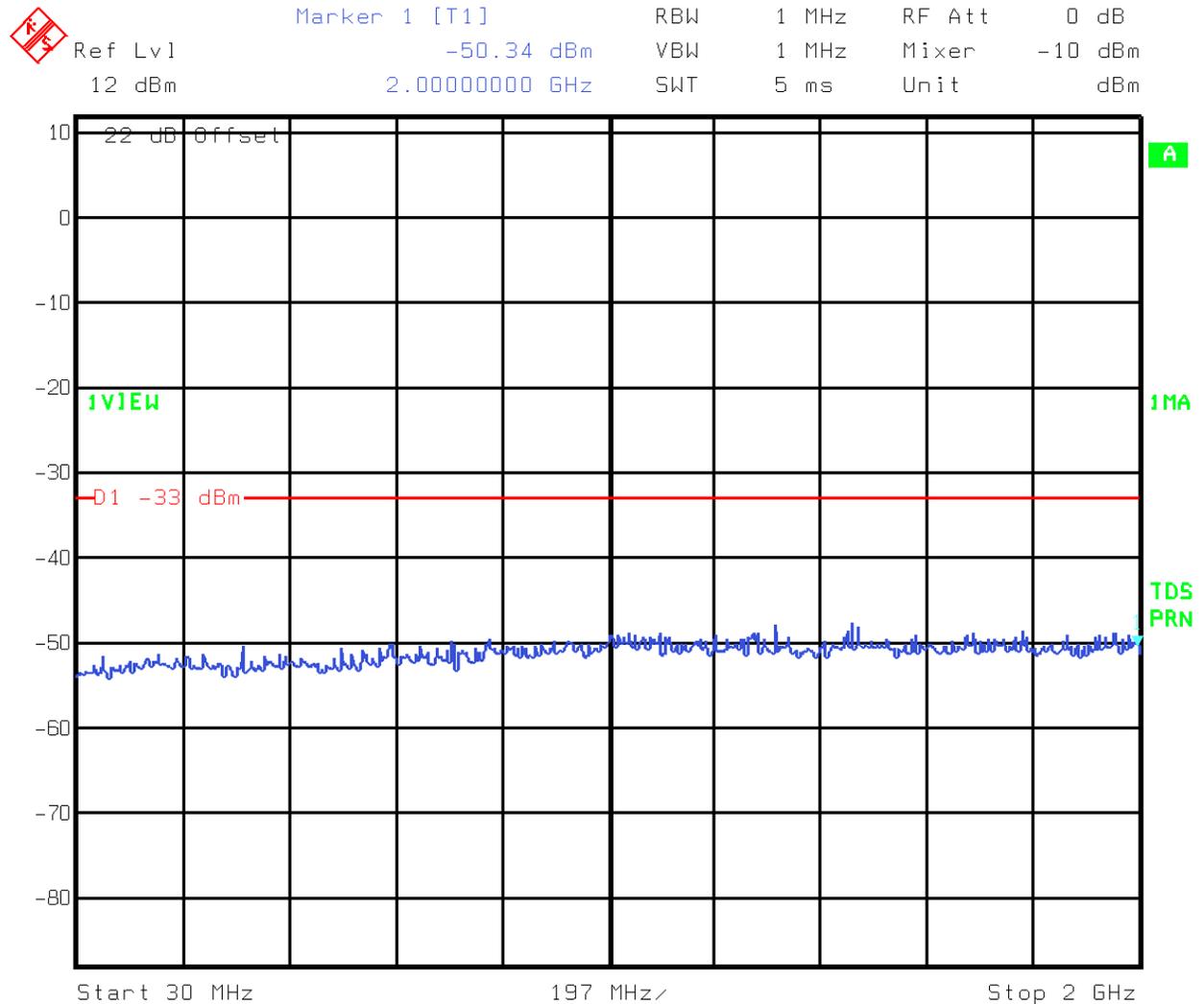
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 1544 kbps  
Date: 12.AUG.1999 11:15:02

Plot 61 – 1544 kbps

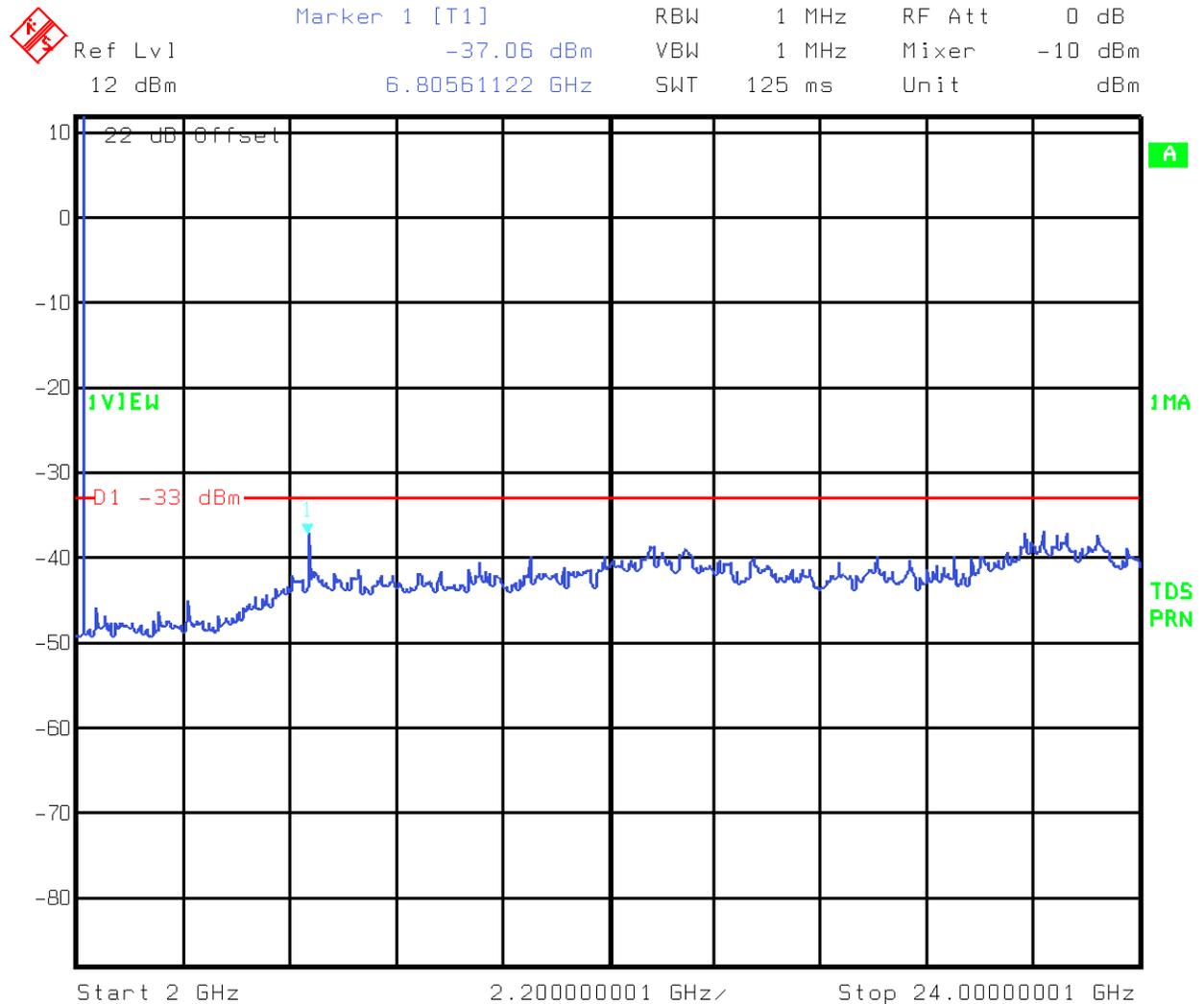
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 2048 kbps  
Date: 12.AUG.1999 11:36:44

Plot 62 – 2048 kbps

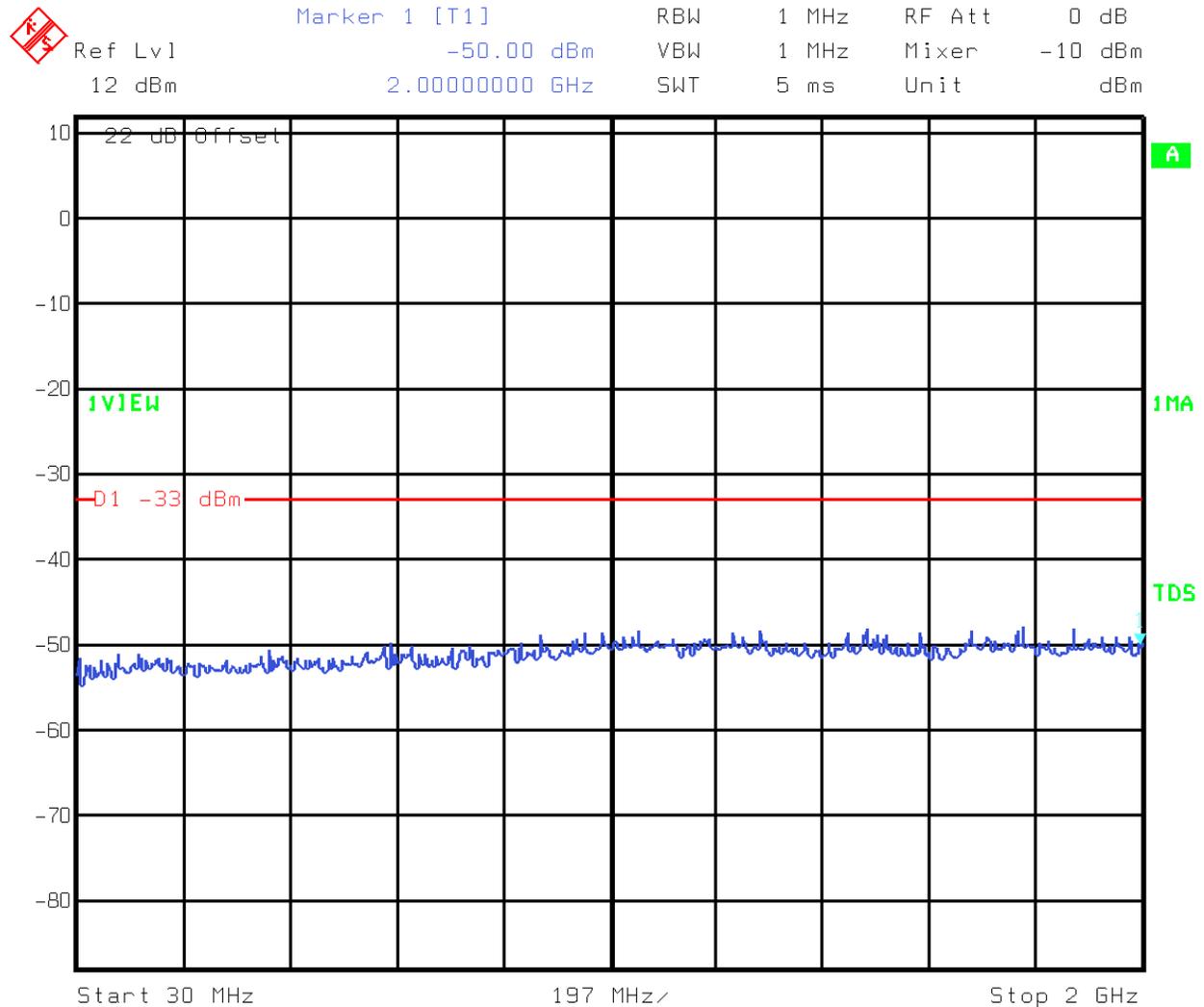
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 2048 kbps  
Date: 12.AUG.1999 11:18:51

Plot 63 – 2048 kbps

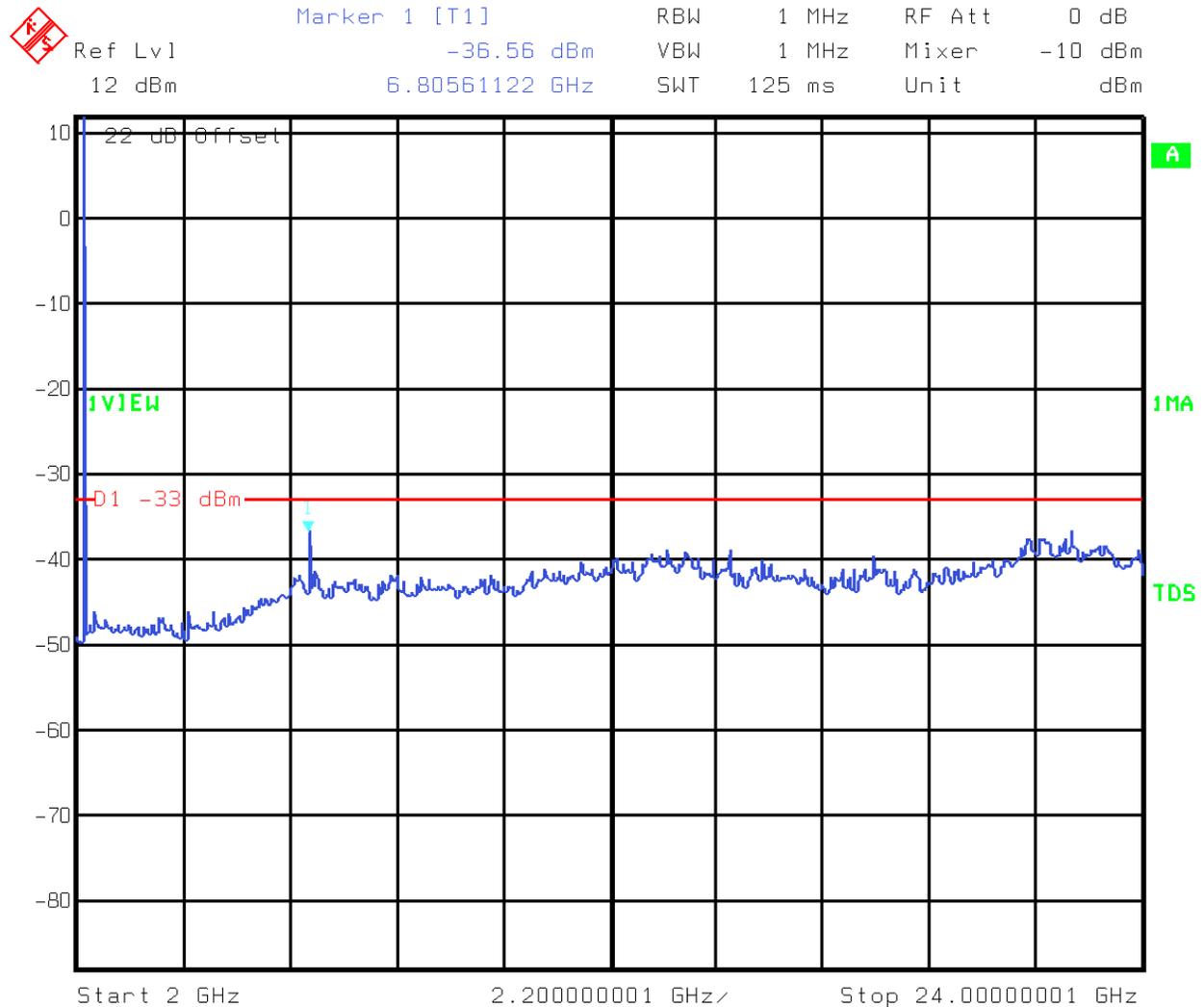
EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 2560 kps  
Date: 12.AUG.1999 11:35:33

Plot 64 – 2560 kps

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278



Title: Spurious Emissions  
Comment A: 2560 kbps  
Date: 12.AUG.1999 11:30:54

Plot 65 – 2560 kbps

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 6. Field Strength of Spurious**

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
TESTED BY: Tom Tidwell	DATE: 12 August, 1999

**Test Results:** Complies

**Measurement Data:** See attached table(s).

**Test Equipment Used:** 14, 33, 34, 35

**Environmental Conditions:** 22 °Celsius  
42 % RH

EQUIPMENT: TR2278 Transverter  
FCC ID: CI32278

Test Data - Radiated Emissions



KTL Dallas, Inc.

Dallas Headquarters:  
80221141  
Lewisville, TX 75057  
Tel: (972) 436-9600  
Fax: (972) 436-2667

Microwave Radiated Emissions Data

Complete  Preliminary  Page 1 of 1 of 1

Client: Conifer \_\_\_\_\_ Test #: MW-2 \_\_\_\_\_ W.O.#: 9L0114E \_\_\_\_\_  
 Client: Conifer \_\_\_\_\_ Test #: MW-3 \_\_\_\_\_ W.O.#: 9L0114E \_\_\_\_\_

EUT: TR2278 \_\_\_\_\_ S/N: NONE \_\_\_\_\_ Photo ID: 9L0069 RE-1 \_\_\_\_\_  
 EUT: TR2278 with Subreflector Antenna \_\_\_\_\_ S/N: NONE \_\_\_\_\_ Photo ID: 9L0069 RE-2 \_\_\_\_\_

Technician: Tom Tidwell \_\_\_\_\_ Specification: CFR 47, Part 21 \_\_\_\_\_ Lab: 1 \_\_\_\_\_ Date: 8/12/99 \_\_\_\_\_  
 Technician: Tom Tidwell \_\_\_\_\_ Specification: CFR 47, Part 21 \_\_\_\_\_ Lab: 1 \_\_\_\_\_ Date: 8/18/99 \_\_\_\_\_

Equipment Used: CF31, G2034, G2200, G2626 \_\_\_\_\_  
 Equipment Used: CF31, G2034, G2200, G2626 \_\_\_\_\_

Configuration: TX MAX POWER, ANTENNA REPLACED WITH 50 OHM LOAD \_\_\_\_\_  
 Configuration: TX MAX POWER \_\_\_\_\_

Bandwidth: 1 MHz \_\_\_\_\_ Video Bandwidth: 1 MHz \_\_\_\_\_ Antenna Distance 3 m \_\_\_\_\_ Detector: \_\_\_\_\_  
 Bandwidth: 1 MHz \_\_\_\_\_ Video Bandwidth: 1 MHz \_\_\_\_\_ Antenna Distance 3 m \_\_\_\_\_ Detector: \_\_\_\_\_

Climatic Conditions: \_\_\_\_\_ EUT Power:  115 V.A.C. \_\_\_\_\_  60 Hz \_\_\_\_\_  Peak \_\_\_\_\_  
 Climatic Conditions: 23 C \_\_\_\_\_ EUT Power:  115 V.A.C. \_\_\_\_\_  50 Hz \_\_\_\_\_  Average \_\_\_\_\_  
 Relative Humidity: 48% \_\_\_\_\_ 2300% A.C. \_\_\_\_\_ 50 Hz \_\_\_\_\_ Average \_\_\_\_\_  
 Atmospheric Pressure: 988 mbar \_\_\_\_\_ Other \_\_\_\_\_ 1 Phase \_\_\_\_\_ 3 Phase \_\_\_\_\_  
 Atmospheric Pressure: 985 mbar \_\_\_\_\_ Other \_\_\_\_\_ 1 Phase \_\_\_\_\_ 3 Phase \_\_\_\_\_

Freq. (MHz)	Meter Reading (dBμV/m)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Conver. Factor	Corrected Reading (dBμV/m)	EIRP (mW)	EIRP (dBm)	Pol.	Comments:
1159	102.6	28.3	3	0	0	132.9	7364.13	36.87	V	Measured w/ TX antenna installed
2130	81.4	28.3	3	0	0	112.2	5233.7	34.72	H	Measured w/ TX antenna installed
2159	110.9	28.3	3	0	0	142.2	4978.6	46.97	H	Measured w/ TX antenna installed
2278	59.9	28.3	3.1	32.0	0	59.3	0.00026	-35.93	V	Measured w/ 50 ohm load
2278	59.5	28.3	3.1	30	0	58.9	0.00023	-36.33	H	Measured w/ 50 ohm load
2278	59.5	28.3	3.1	30	0	60.9	0.00037	-34.33	V	Noise Floor
4318	35	32.1	4.4	31.6	0	39.9	2.9E-06	-55.33	H	Noise Floor
4318	35	32.1	4.4	30	0	41.5	4.2E-06	-53.73	V	Noise Floor
6477	35	34.5	5.5	32.0	0	43	6E-06	-52.23	H	Noise Floor
6477	35	34.5	5.5	30	0	45	9.5E-06	-50.23	V	Noise Floor
6477	35	34.5	5.5	33.0	0	50.3	3.2E-05	-41.93	H	Noise Floor
8636	40	37	6.3	33.0	0	53.3	6.4E-05	-41.93	V	Noise Floor
10795	40	38.6	7.3	33.3	0	52.6	5.5E-05	-42.63	H	Noise Floor
10795	40	38.6	7.3	30	0	55.9	0.00012	-39.33	V	Noise Floor
12952	40	39.9	8.2	32.2	0	55.9	0.00012	-39.33	H	Noise Floor
12952	40	39.9	8.2	30	0	58.1	0.00019	-37.13	V	Noise Floor
12952	40	39.9	8.2	30	0	58.1	0.00019	-37.13	H	Noise Floor

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 7. Frequency Stability**

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY:	DATE:

**Test Results:**

**Measurement Data:** See attached table.

**Test Equipment Used:**

**Standard Test Frequency:**

**Standard Supply Voltage:**

**Environmental Conditions:** °Celsius  
% RH

Not Applicable

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Test Data – Frequency Stability**

Not Applicable

EQUIPMENT: TR2278 Transverter

FCC ID: CI32278

**Section 8. Test Equipment List**

REF. NO.	EQUIPMENT	MANUFACTURE	MODEL	ASSET	LAST CAL.
1	50 ohm load(500W)	Narda	27470	G1366	2/25/99
2	Directional coupler(50 MHz – 1 GHz)	Narda	3020A	G3725	5/19/99
3	Directional coupler(1 GHz – 4 GHz)	Narda	3022	G3726	5/19/99
4	Directional coupler(2 GHz – 18 GHz)	Hewlett Packard	11692D	G3727	5/7/99
5	Spectrum analyzer	Rohde & Schwarz	FSEK 30	G2632	6/14/99
6	Spectrum analyzer	Hewlett Packard	8563E	G2624	5/29/99
7	Power Meter	Wavetek	8531	G3893	6/17/99
8	Power Sensor	Wavetek	85310	G3893	6/17/99
9	Tunable Notch Filter (200-400 MHz)	K & L	3TNF-200/400	G1713	COU
10	Tunable Notch Filter (250-500 MHz)	K & L	3TNF-250/500	G1714	COU
11	Tunable Notch Filter (500-1000 MHz)	K & L	3TNF-500/1000	G1712	COU
12	Tunable Notch Filter (1000-2000 MHz)	K & L	3TNF-1000/2000	G1711	COU
13	Blocking Capacitor	Hewlett Packard	11742		NCR
14	Coaxial Cable	Storm		CF31	4/29/99
15	Coaxial Cable	Suhner		C111	6/15/99
16	Coaxial Cable	AstroLab		CF38	9/1/99
17	Coaxial Cable	AstroLab		CF39	9/1/99
18	Coaxial Cable	AstroLab		CF40	9/1/99
19	Coaxial Cable	AstroLab		CF41	9/1/99
20	I/Q Modulation Generator	Rohde & Schwarz	AMIQ	G2735	5/26/99
21	RF signal generator	Rohde & Schwarz	SMIQ 03	G2736	5/3/99
22	SMA Attenuator (10 dB)	Mini-Circuits	BW-S10W2		8/14/99
23	SMA Attenuator (10 dB)	Mini-Circuits	BW-S10W3		8/15/99
24	SMA Attenuator (10 dB)	Mini-Circuits	BW-S10W4		8/16/99
25	SMA Attenuator (10 dB)	Mini-Circuits	BW-S10W5		8/17/99
26	SMA Attenuator (20 dB)	Mini-Circuits	BW-S20W2		8/14/99
27	SMA Attenuator (20 dB)	Mini-Circuits	BW-S20W3		8/15/99
28	SMA Attenuator (20 dB)	Mini-Circuits	BW-S20W4		8/16/99
29	SMA Attenuator (20 dB)	Mini-Circuits	BW-S20W5		8/17/99
30	Attenuator (10 dB)	Narda	776B-10	G1018	10/26/98
31	Attenuator (20 dB)	Narda	776B-20	G1017B	8/14/99
32	Radio test set	Rohde & Schwarz	CMTA 54	G2631	3/1/99
33	Horn Antenna	Electrometrics	RGA-60	G2034	6/28/99
34	Amplifier	Hewlett Packard	8449A	G2200	6/11/99
35	Spectrum analyzer	Hewlett Packard	8566B	G2626	4/21/99

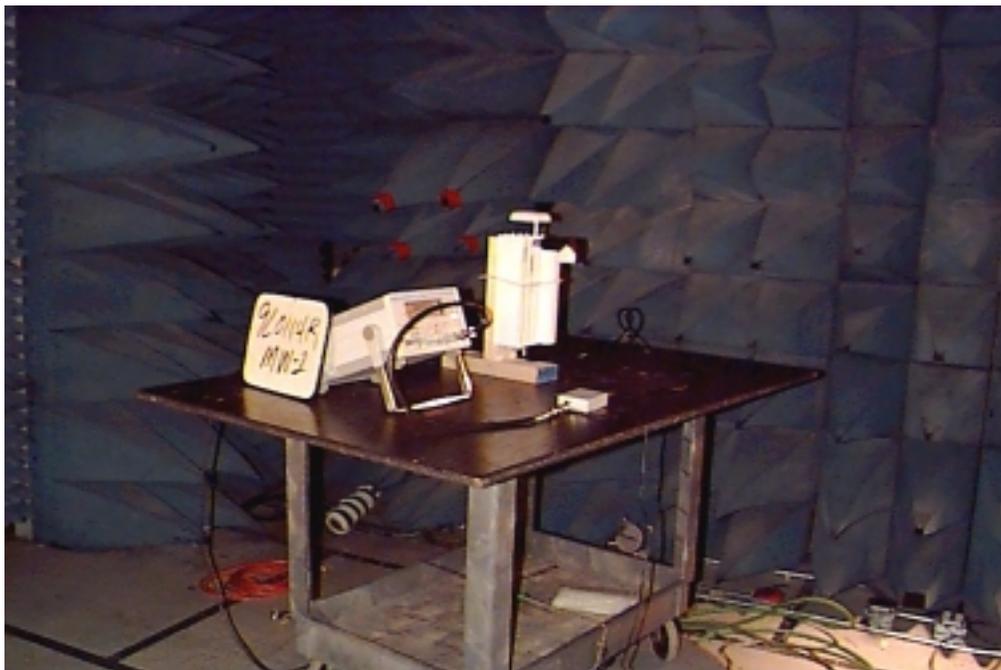
*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Section 9. Test Setup Photos**



**Photo 1 – Test #MW-2**



**Photo 2 – Test #MW-2**

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: C132278*

---



**Photo 3 – Test # MW-3**

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---



**Photo 4 – Test #MW-3**

**KTL Dallas**

FCC PART 21, SUBPART K  
MULTIPOINT DISTRIBUTION SERVICE  
PROJECT NO.: 9L0114R  
ANNEX A

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: C132278*

---

## **ANNEX A - TEST DETAILS**

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

<b>NAME OF TEST: RF Power Output</b>	<b>PARA. NO.: 2.1046</b>
--------------------------------------	--------------------------

**Method Of Measurement:**

**Antenna Conducted:**

The peak power at antenna terminals is measured using a Spectrum Analyzer or Power Meter. Power output is measured with the maximum rated input level.

**E.I.R.P.:**

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation  $GP/4\pi R^2 = E^2/120\pi$  and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: C132278*

---

<b>NAME OF TEST: Occupied Bandwidth</b>	<b>PARA. NO.: 2.1049</b>
---	--------------------------

**Method Of Measurement:**

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1% of the bandwidth of the transmitted signal. The resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform.

The appropriate bandwidth mask is applied to the output waveform to verify compliance.

**KTL Dallas**

FCC PART 21, SUBPART K  
MULTIPOINT DISTRIBUTION SERVICE  
PROJECT NO.: 9L0114R  
ANNEX A

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

<b>NAME OF TEST: Spurious Emission at Antenna Terminals</b>	<b>PARA. NO.: 2.1051</b>
---	--------------------------

**Antenna Conducted:**

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of 1 MHz for emissions above 1 GHz. Below 1 GHz the resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform.

The appropriate limit line is applied to the output waveform to verify compliance.

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

<b>NAME OF TEST: Field Strength of Spurious Radiation</b>	<b>PARA. NO.: 2.1053</b>
---	--------------------------

If the antenna is detachable from the transmitter, it is removed and replaced with a 50 ohm load. Emissions are measured up to the 10<sup>th</sup> harmonic of the highest transmit frequency that the transmitter is capable of producing.

If the antenna is not detachable from the transmitter, emissions are measured radiated only at a distance of 3 meters.

**Calculation of E.I.R.P.:**

Equivalent Isotropic Radiated Power is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation  $GP/4\pi R^2 = E^2/120\pi$  and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

<b>NAME OF TEST: Frequency Stability</b>	<b>2.1055</b>
--	---------------

**Method Of Measurement:**

**Frequency Stability With Voltage Variation:**

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

**Frequency Stability With Temperature Variation:**

The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

**KTL Dallas**

FCC PART 21, SUBPART K  
MULTIPOINT DISTRIBUTION SERVICE  
PROJECT NO.: 9L0114R  
ANNEX B

*EQUIPMENT: TR2278 Transverter*  
*FCC ID: C132278*

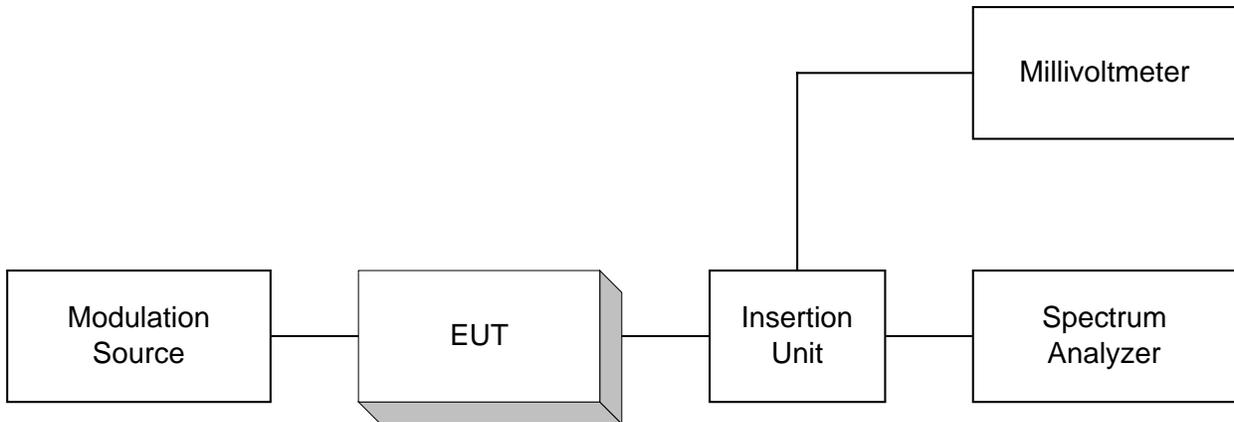
---

## **ANNEX B - TEST DIAGRAMS**

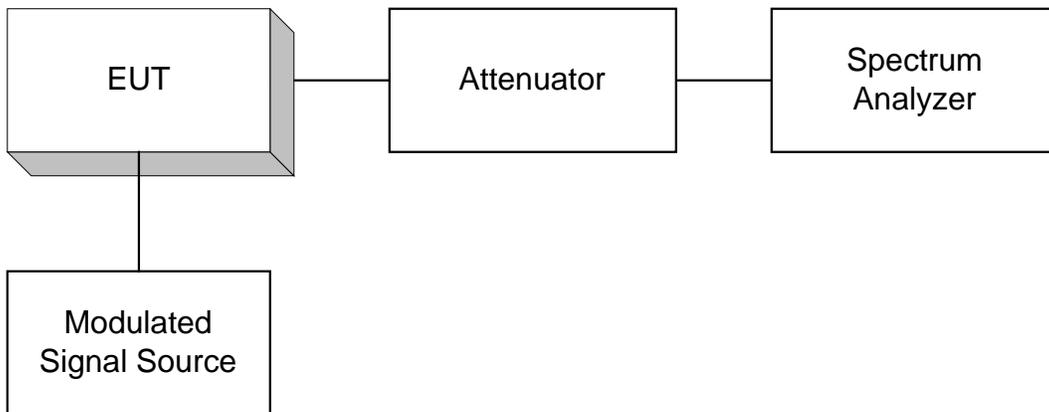
*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Para. No. 2.1046 - R.F. Power Output**



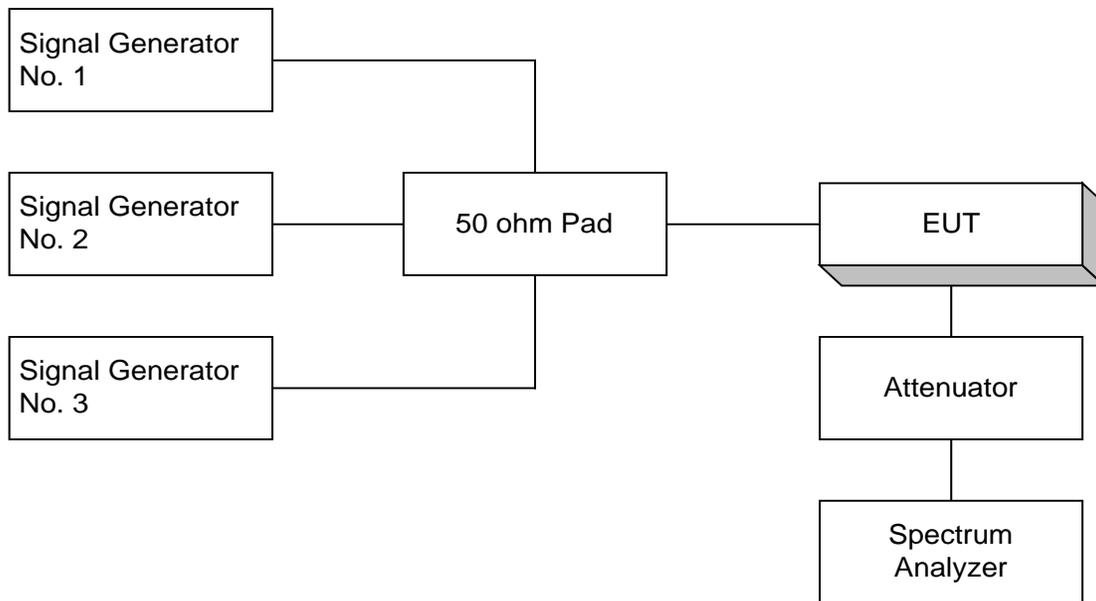
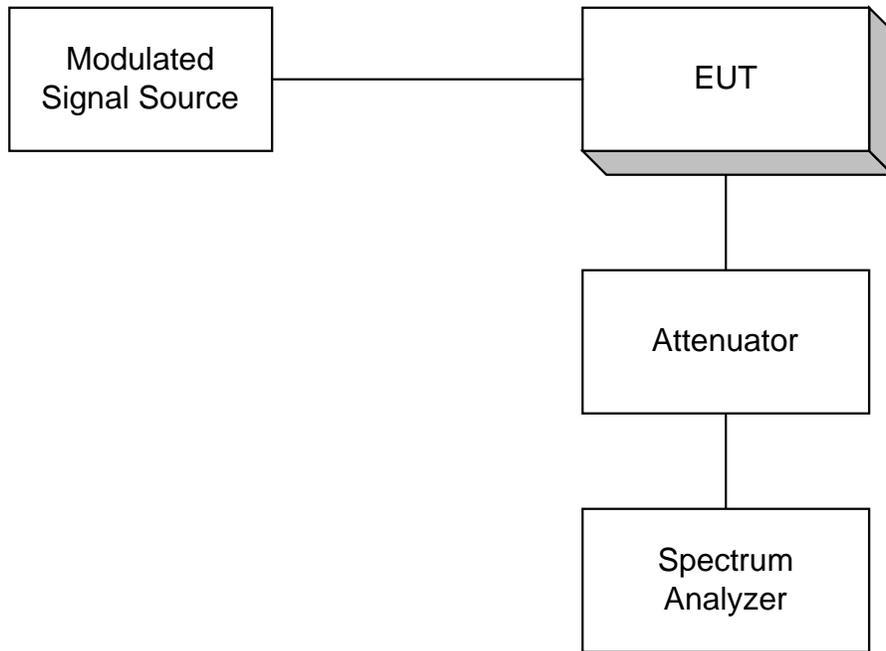
**Para. No. 2.1049 - Occupied Bandwidth**



*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

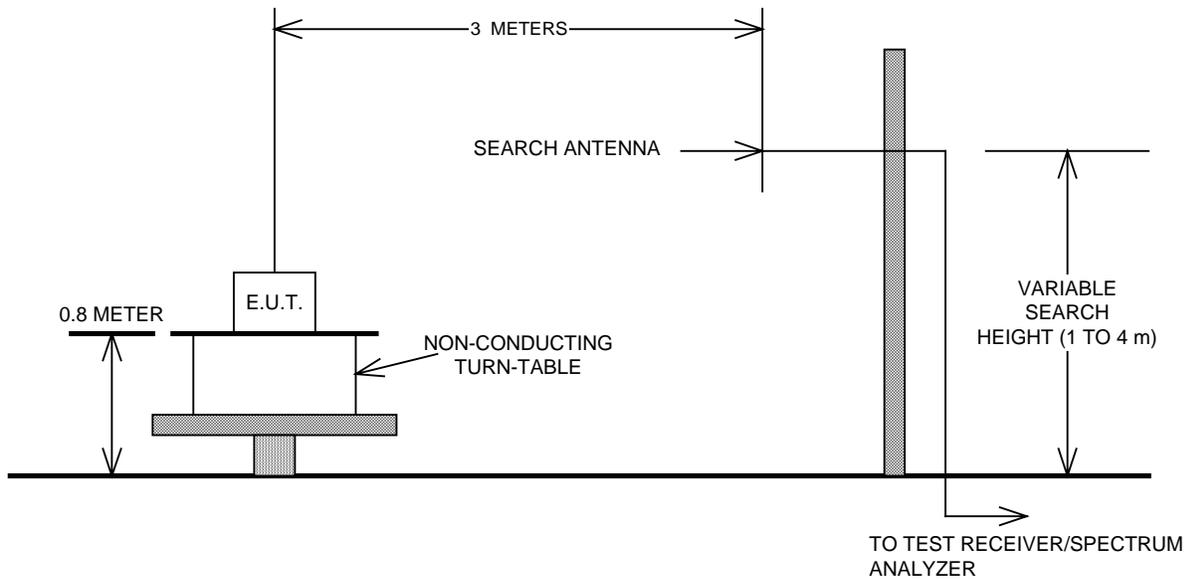
**Para. No. 2.1051 - Spurious Emissions at Antenna Terminals**



*EQUIPMENT: TR2278 Transverter*  
*FCC ID: CI32278*

---

**Para. No. 2.1053 - Field Strength of Radiation**



**Para. No. 2.1055 - Frequency Stability**

