Test Report # TR_0717-21_FCC_PT90_Booster Class A_2
Revision: 2
Issue Date: February 23, 2021
Final Test Date: February 23, 2021

ACCREDITED
CERT #0955.01

TIMCO ENGINEERING, Inc.
An IIA Company

Test Report - FCC PART 90 Booster Class A (B9A)
Prepared For: Fiplex Communications Inc.

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager
Date of Signature
(YYYY-MM-DD): 2021-02-23

Table of Contents

1. Customer Information

Applicant: Fiplex Communications Inc.
Address: 2101 NW 79th Ave.
MIAMI FL 33122

Technical Contact: Mr. Fernando Sommariva
Telephone: 305-884-8991
Email address: fernando.sommariva@fiplex.com

1.1 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 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters. Full test results are available in this report.

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.

The Following is for Test item FCC ID: P3TDH14-4A

Applicable Clauses from Part 2		
FCC Part 2 Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
2.202	Bandwidth & Emission	Pass
2.1033 (c)(8)	Power at the Final Amplifier	Pass
2.1046 (a)	RF Output Power	Pass
2.1047	Modulation characteristics	n/a
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	n/a

Applicable Clauses from Part 90 Subpart I		
FCC Part 90 Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
90.205	Transmitter Power	Pass
90.207	Types of Emissions	Pass
90.209	Bandwidth limitations	Pass
90.210	Emission masks, In-band	Pass
90.210	Emission masks, Out-of-band	Pass
90.213	Frequency stability	n/a
90.214	Transient Frequency Behavior	n/a
90.219 (d)(6)(i)	ERP of intermodulation products	n/a[1]
90.219 (d)(6)(ii)	ERP of noise within the passband	n/a[1]
90.219 (d)(6)(iii)	ERP of noise on spectrum < 1 MHz outside of the passband	n/a[1]
90.219 (d)(3)(i), (e)(1)	ERP of Radiated Power	n/a[1]
90.219 (e)(2)	Noise figure	Pass
90.219 (e)(3)	Spurious emissions	Pass
90.219 (e)(4)(i)(ii)(iii)	Retransmitted Signals	Pass
90.221	Adjacent channel power limits	n/a

Note 1: Requirements in Part 90.219 (d) apply at deployment of this EUT, therefore are not applicable at certification.

KDB 935210 D05 v01r04		
FCC KDB 935210 D05 Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
4.1	Test Signals for PLMRS (Input Signals)	Pass
4.2	AGC Threshold	Reported
4.3	Out-of-Band Rejection	Reported
4.4	Input-versus-Output Signal Comparison	Pass
4.5	Output Power	Pass
4.5	Amplifier/Booster Gain (optional)	Reported
4.6	Noise Figure	Pass
4.7.2	Out-of-band/Out-of-block Conducted Emissions (Intermodulation Products)	Pass
4.7.3	EUT Spurious Conducted Emissions	Pass
4.8	Frequency Stability	n/a
4.9	Spurious Radiated Emissions	Pass

KDB 484596 D01 v01		
FCC KDB 935210 D05 Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
3 a	Introduction	Reported
3 b	Explain the Differences	Reported
3 c	Spot-check Verification Data	Pass
3 d	Reference Section	Reported

Introduction

Equipment classes B9A and B9B are not allowed to be filed under the same FCC ID. However, FCC ID P3TDH14-4A is electrically identical to FCC ID P3TDH14-4B. The EUT uses software to limit the passband, converting the EUT from a Class B Industrial Signal Booster into a Class A Industrial Signal Booster. The test data is valid to be re-used due to the Class B operation of the EUT being worst-case in all aspects. The Class A operation represented in this filing was equal or more compliant with FCC Part 90 in all respects. Therefore all testing is to be considered identical, and has been re-used following the guidelines of KDB 484596.

Explain the Differences

FCC ID P3TDH14-4A is electrically identical to FCC ID P3TDH14-4B and has no difference in hardware. The EUT uses software to limit the passband from widths equal to or greater than 75 kHz to widths less than 75 kHz.

Spot-Check Verification Data

Please see sections Out-of-Band Rejection and Spurious Radiated Emissions in this report for Spot-Check data.

Reference Section

All original test data is from FCC ID P3TDH14-4B, test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

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: February 12, 2021 – February 23, 2021

Signature: 

Name & Title: Franklin Rose, EMC Specialist
Date of Signature
(YYYY-MM-DD): 2021-02-23

Signature: 

Sr. EMC Engineer
EMC-003838-NE

Name & Title: Tim Royer, EMC Engineer
Date of Signature
(YYYY-MM-DD): 2021-02-23

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

The test sample was received: February 12, 2021

3.1 Definitions

Signal booster: A device or system that automatically receives, amplifies, and retransmits signals from wireless stations into and out of building interiors, tunnels, shielded outdoor areas and other locations where these signals would otherwise be too weak for reliable communications. Signal booster systems may contain both Class A and Class B signal boosters as components.

Class A signal booster: A signal booster designed to retransmit signals on one or more specific channels. A signal booster is deemed to be a Class A signal booster if none of its passbands exceed 75 kHz.

Class B signal booster: A signal booster designed to retransmit any signals within a wide frequency band. A signal booster is deemed to be a Class B signal booster if it has a passband that exceeds 75 kHz.

3.2 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:	P3TDH14-4A
Brief Description	DAS Centric UV – Master (Cabinet Enclosure)
Type of Modular	n/a
Model(s) #	DH14EA-M-AVUT-NDND
Serial Number	20210041FU

Technical Characteristics	
Technology	DAS Industrial Signal Booster Master Unit
Frequency Range	150.8 – 173.4 MHz; and 450 - 512 MHz
RF O/P Power (Max.)	DL: 24 dBm (0.25 W)
Modulation	n/a
Bandwidth & Emission Class	11K3F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 9K80F1D, 9K80F1E
Number of Channels	Variable.
Duty Cycle	100%
Antenna Connector	N
Voltage Rating (AC or Batt.)	120 V AC or 28 V DC (internally)

Antenna Characteristics				
Antenna Name	Frequency Range	Antenna Type	Dimensions	Antenna Gain
n/a	n/a	n/a	n/a	n/a

Note: This EUT does not include antenna(s).

3.3 Configuration of EUT

Test Modes		
Band	Link Direction	Test Frequencies
150.8 – 173.4 MHz	Uplink	150.80625 MHz
		162.1 MHz
		173.39375 MHz
450 – 512 MHz	Uplink	450.0125 MHz
		460 MHz
		511.9875 MHz

Operating conditions during Testing:

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 was used to control the EUT.

3.4 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) FCC KDB 935210 D05 v01r04 Industrial Signal Boosters

4.2 Applied Limits and Regulatory Limits:

1) FCC CFR 47 Part 90 Subpart I, 90.219

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

Device	Manufacturer	Model	SN #	Current Cal	Cal Due
Signal Generator HP 8648C	HP	8648C	3847A04696	9/11/20	9/11/2023
Signal Generator R&S SMU-200A	Rohde & Schwarz	SMU200A	103195	4/23/18	4/22/2021
Digital Multimeter	Fluke	77	35053830	9/9/20	9/9/2023
Active Loop	ETS-Lindgren	6502	00062529	10/20/20	10/20/2023
Biconical 1057	Eaton	94455-1	1057	10/16/20	10/16/2023
Log-Periodic 1243	Eaton	96005	1243	4/20/18	4/19/2021
Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	2/25/20	2/24/2023
CHAMBER	Panashield	3M	N/A	3/12/19	3/11/2021
EMI Test Receiver R&S ESU 40	Rohde & Schwarz	ESU 40	100320	8/28/18	8/27/2021

Type	Device	Manufacturer	Model	SN #	Last Verified
Attenuator	N 20dB 20W DC-4G	Narda	766-20	0605	1/6/21
Attenuator	N 20dB 2W DC-13G	Narda	757C	30201	1/6/21
Coaxial Cable	BMBM-0061-01 RG400	Pasternack	PE3582LF-24	BMBM-0061-01	1/6/21
Coaxial Cable	BMBM-0061-02 RG400	Pasternack	PE3582LF-24	BMBM-0061-02	1/6/21
Coaxial Cable	BMBM-0061-03 RG400	Pasternack	PE3582LF-24	BMBM-0061-03	1/6/21
Coaxial Cable	BMBM-0061-04 RG400	Pasternack	PE3582LF-24	BMBM-0061-04	1/6/21
Coaxial Cable	BMBM-0122-01 RG400	Pasternack	PE3582LF-48	BMBM-0122-01	1/6/21
Coaxial Cable	BMBM-0122-02 RG400	Pasternack	PE3582LF-48	BMBM-0122-02	1/6/21
Coaxial Cable	BMBM-0122-03 RG400	Pasternack	PE3582LF-48	BMBM-0122-03	1/6/21
Coaxial Cable	BMBM-0122-04 RG400	Pasternack	PE3582LF-48	BMBM-0122-04	1/6/21
Coaxial Cable	Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMKM-0244-02 ; KMKM-0670-0	1/6/21
Combiner	Splitter/Combiner 1-1000MHz	Mini-Circuits	ZFSC-4-1-BNC+	U115700825	1/6/21
Combiner	Splitter/Combiner 1-1000MHz	Mini-Circuits	ZFSC-4-1-BNC+	U115700826	1/6/21
Noise Source	Noise Source 10MHz - 18GHz	Agilent	346B	MY44421884	1/6/21
Terminator	Terminator N 20W DC-18G	Narda	8205	#14	1/6/21
Test Equipment Adapter	Type R&S to NF			Test Equipment Adapter 04	1/6/21

Software	Author	Version
ESU Firmware	Rohde & Schwarz	4.43 SP3; BIOS v5.1-24-3
RSCommander	Rohde & Schwarz	1.6.4
Field Strength	Timco	v4.10.7.0

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 dBµV. 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 (dBµV/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 dBµV 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).

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

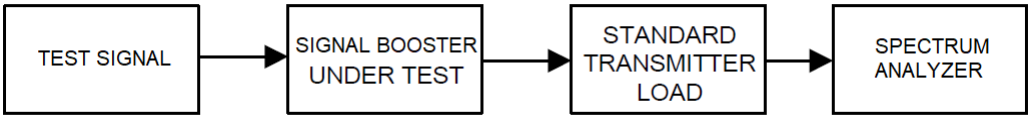
No method of measurement is specified. The result has been calculated based on all available information.

Test Results		
EUT Operating Voltage (V)	EUT Current (A)	Power at the Final Amplifier
28 V DC	2.86	80 W
120 V AC	0.67	80 W

8.2 RF Output Power & Gain

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

Limits from FCC Parts 2.1046(a), and 90.205 and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

Test Setup


Test Results, Power Output		
Link Direction	Max Power Output (dBm)	Max Power Output (W)
Uplink	24.0	0.25

VHF Band Gain

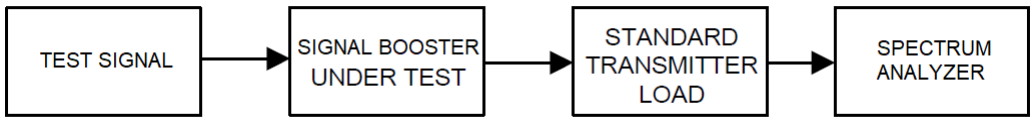
Test Results, Gain					
Link Direction	Tuned Frequency (MHz)	Input Level	Power Input (dBm)	Power Output (dBm)	Gain (dB)
Uplink	150.80625 MHz	AGC	-59.61	24.67	84.28
		AGC+3	-56.61	24.55	81.16
		Maximum	0	24.48	24.48
	162.1 MHz	AGC	-59.61	24.67	84.28
		AGC+3	-56.61	24.55	81.16
		Maximum	0	24.48	24.48
	173.39375 MHz	AGC	-59.61	24.67	84.28
		AGC+3	-56.61	24.55	81.16
		Maximum	0	24.48	24.48

UHF Band Gain

Test Results, Gain					
Link Direction	Tuned Frequency (MHz)	Input Level	Power Input (dBm)	Power Output (dBm)	Gain (dB)
Uplink	450.0125 MHz	AGC	-59.61	23.50	83.11
		AGC+3	-56.61	23.44	80.05
		Maximum	0	23.36	23.36
	460 MHz	AGC	-59.61	23.50	83.11
		AGC+3	-56.61	23.44	80.05
		Maximum	0	23.36	23.36
	511.9875 MHz	AGC	-59.61	23.50	83.11
		AGC+3	-56.61	23.44	80.05
		Maximum	0	23.36	23.36

8.3 Out-of-band Rejection

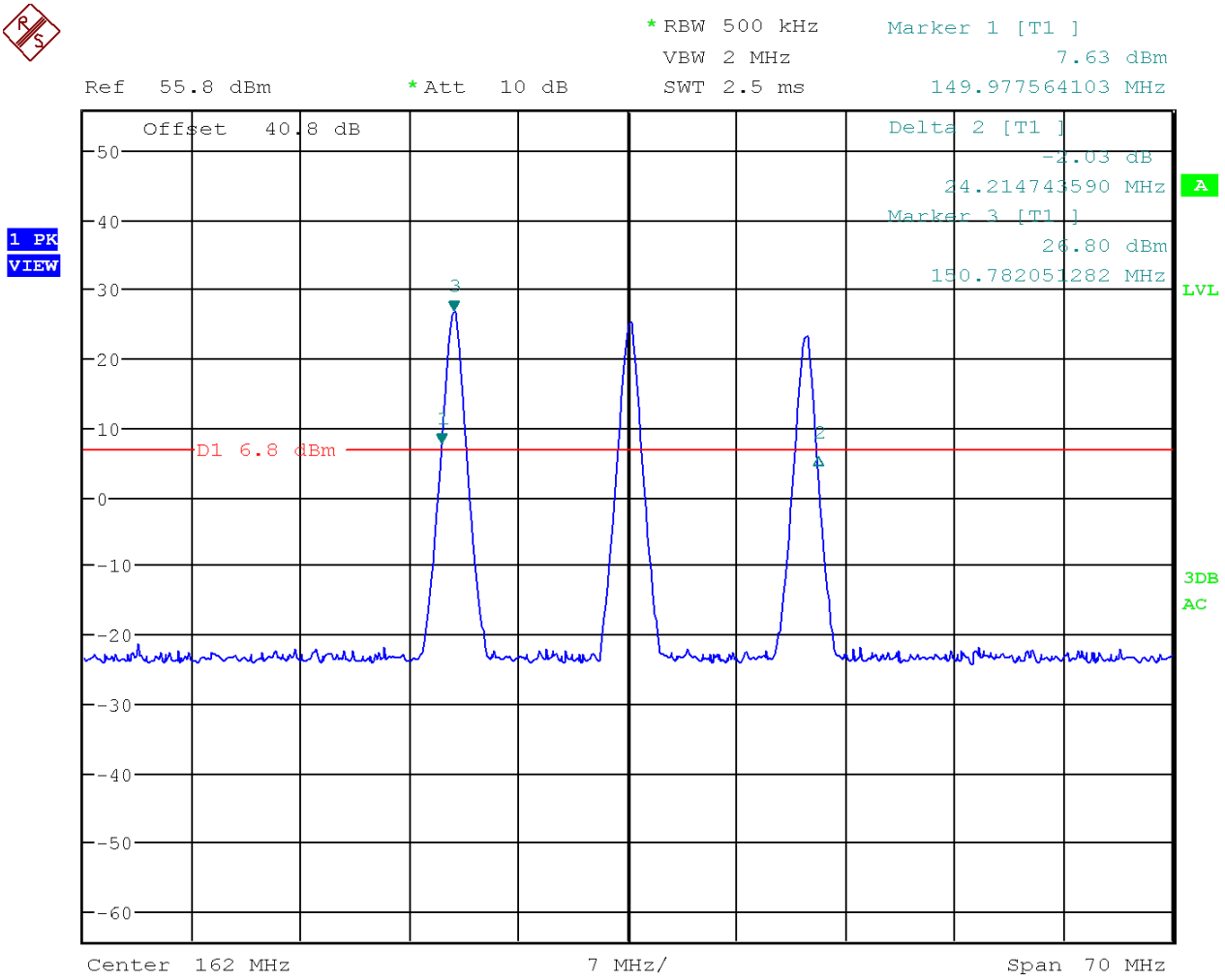
Limits and test method from FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

Test Setup


Test Results, Out-of-band Rejection and Class of Operation			
Operating Band	Link Direction	Passband (kHz)	Class of Operation
VHF 150.8-173.4 MHz	Uplink	< 75 kHz	Class A
UHF 450-512 MHz	Uplink	< 75 kHz	Class A

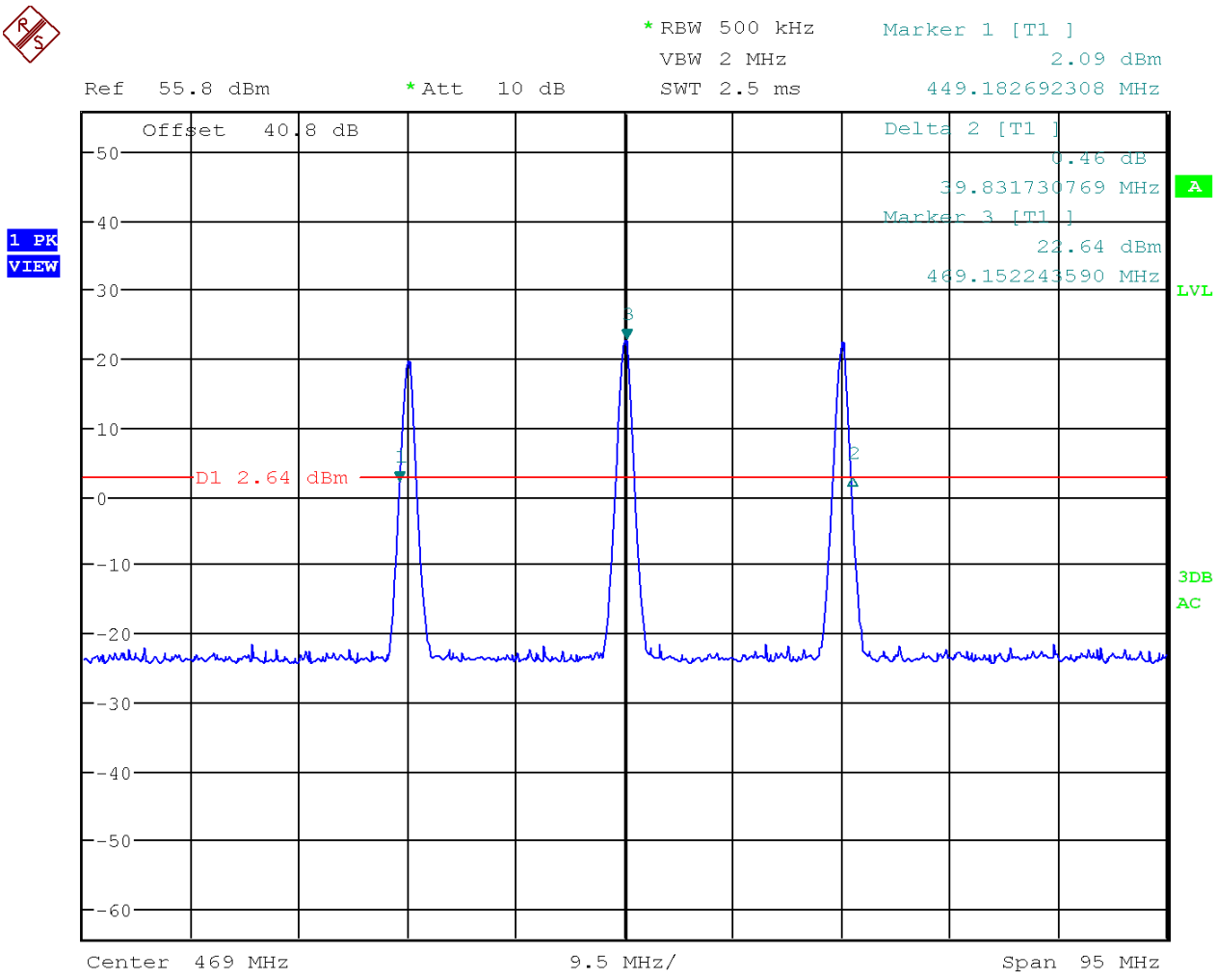
Out-of-band Rejection, Spectrum Plots

8.3.1 VHF Band, Uplink



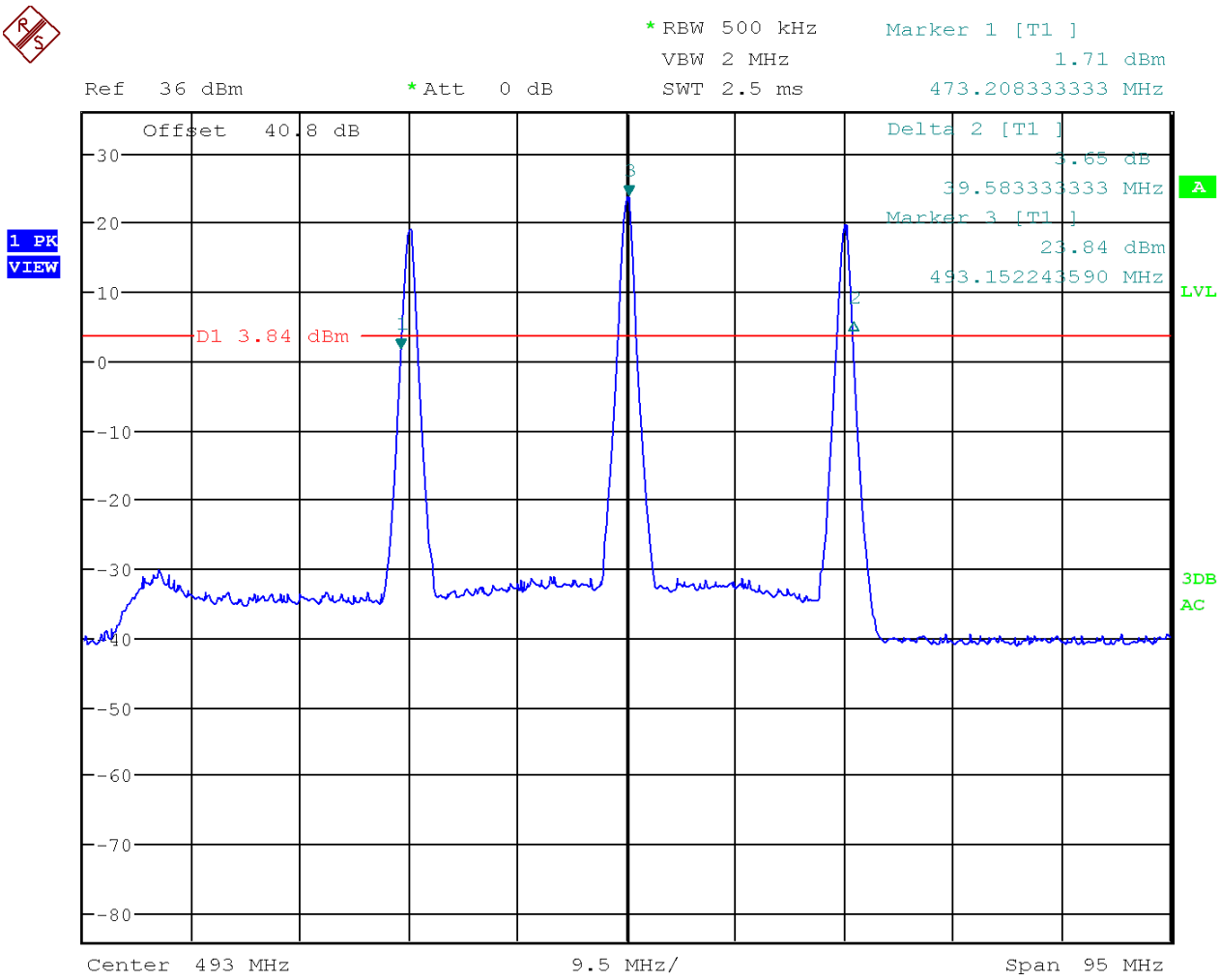
Date: 17.FEB.2021 14:55:51

8.3.1 UHF Low Band, Uplink



Date: 17.FEB.2021 15:11:58

1. UHF High Band, Uplink



Date: 24.FEB.2021 14:01:53

8.4 Bandwidth & Emission

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

Limits from FCC Parts 90.209 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

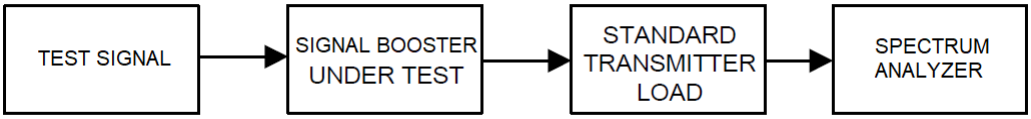
Authorized Bandwidth		
Rule Part	Operating Range	Authorized Bandwidth
Part 90	150-174 MHz	20 kHz, 11.25 kHz, 6.0 kHz
Part 90	406-512 MHz	20 kHz, 11.25 kHz, 6.0 kHz

Applicable Input Signals		
Signal	Occupied Bandwidth (kHz)	Representative Emission Designator(s)
CW	n/a	n/a
12.5 kHz FM	7.89	11K3F3E
25 kHz FM	12.5	16K0F3E
C4FM (P25 Phase I)	8.13	8K10F1D, 8K10F1E
HCPM (P25 Phase II SU)	8.01	8K10F1W
HDQPSK (P25 Phase II BS)	9.78	9K80F1D, 9K80F1E, 9K80D7W

8.5 Input VS Output Signal Comparison

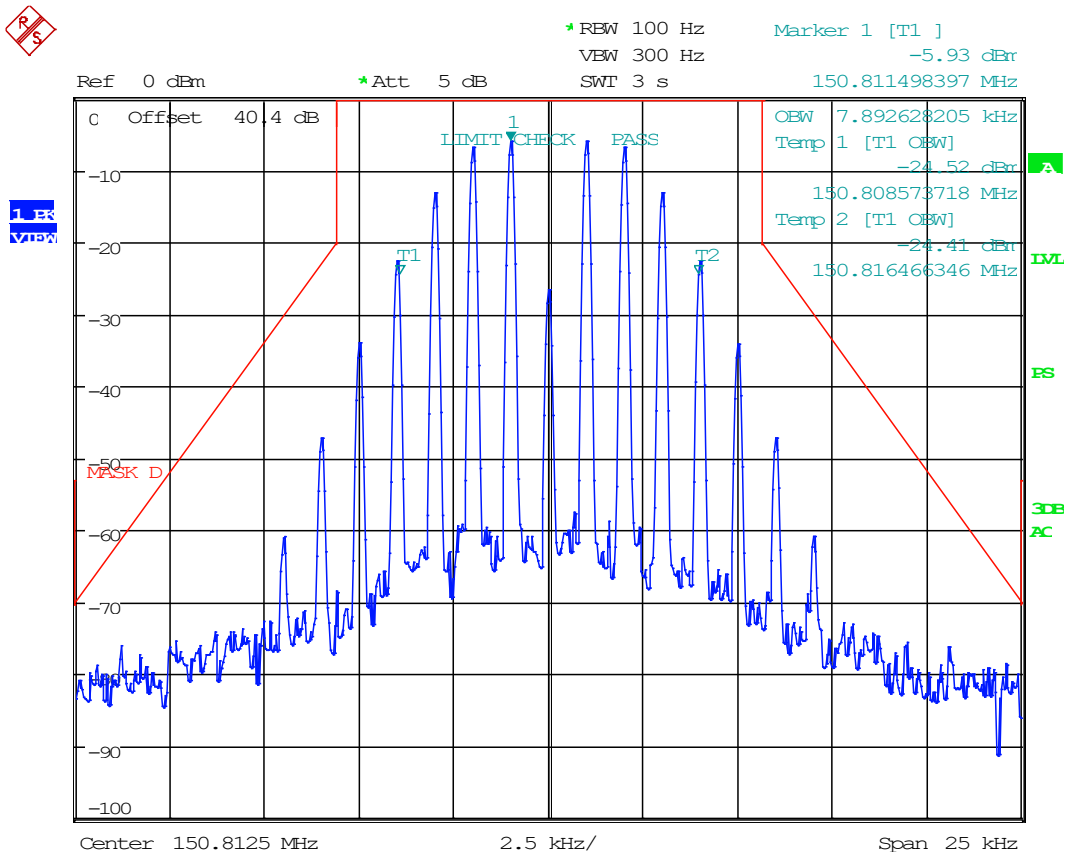
Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

Limits from FCC Parts 90.210 and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

Test Setup


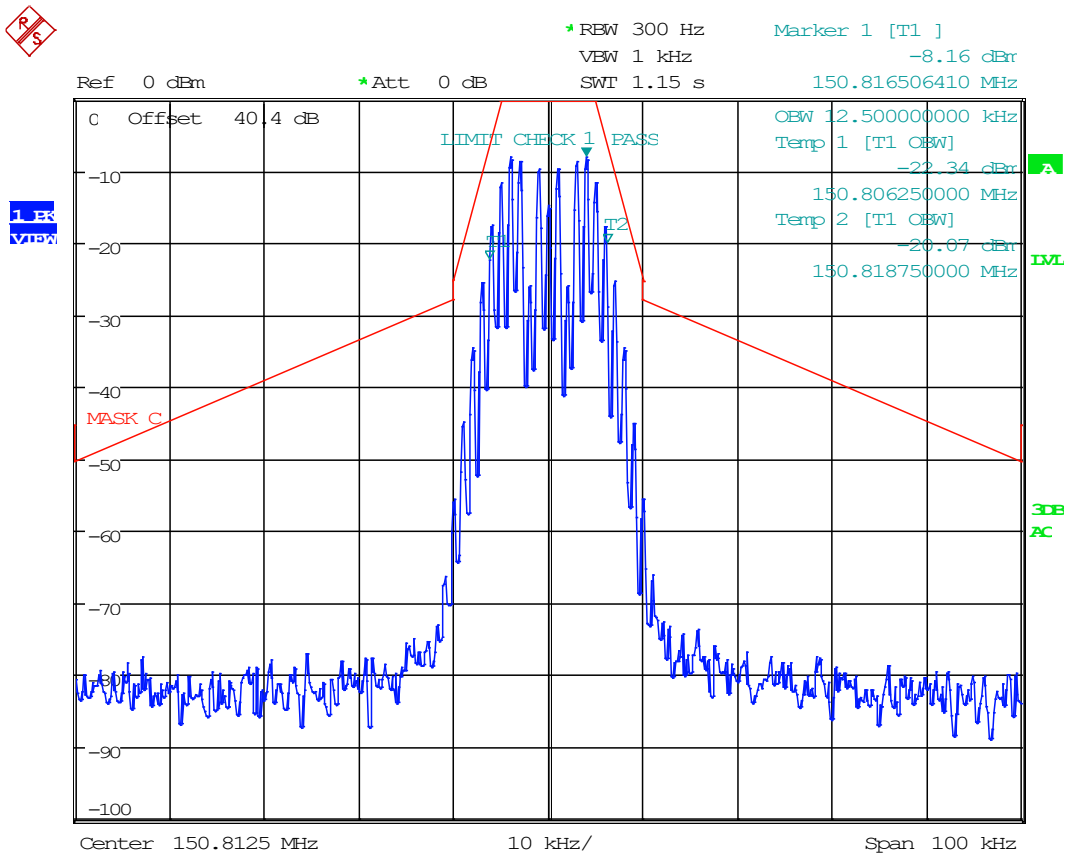
Input VS Output, Input Spectrum Plots

8.5.1 12.5 kHz FM



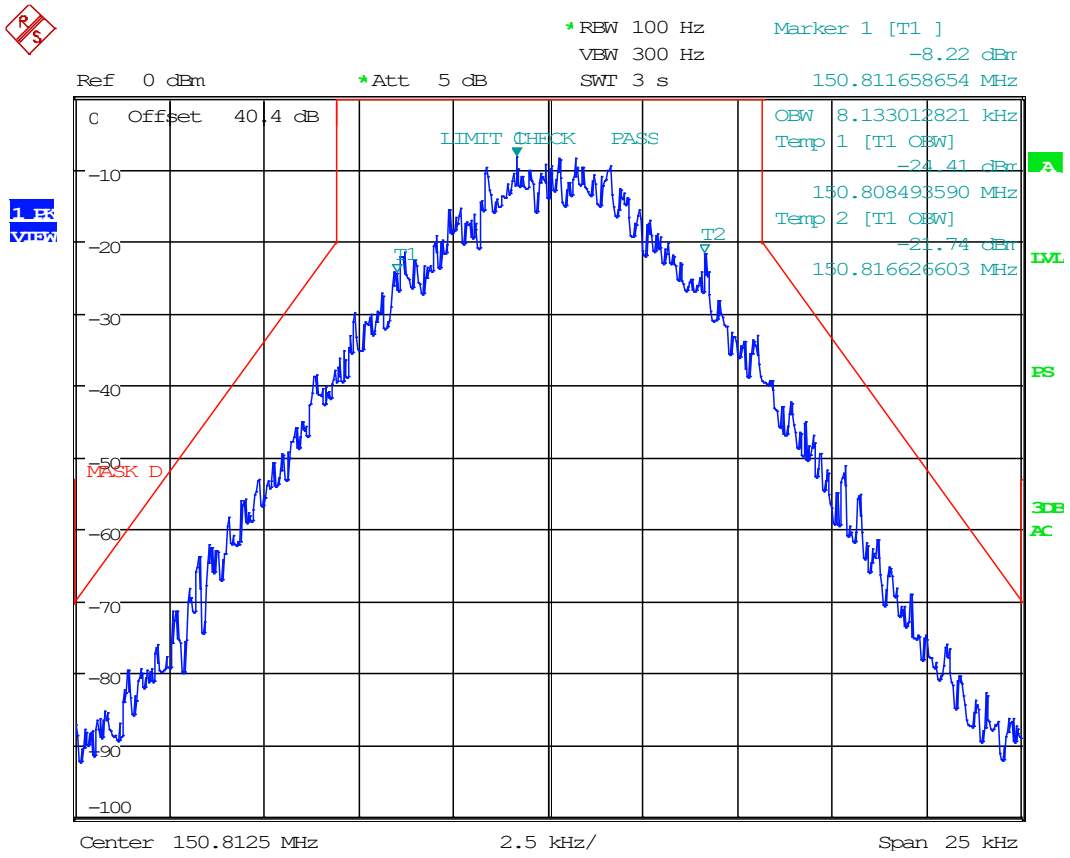
Date: 6.OCT.2020 20:08:30

1. 25 kHz FM



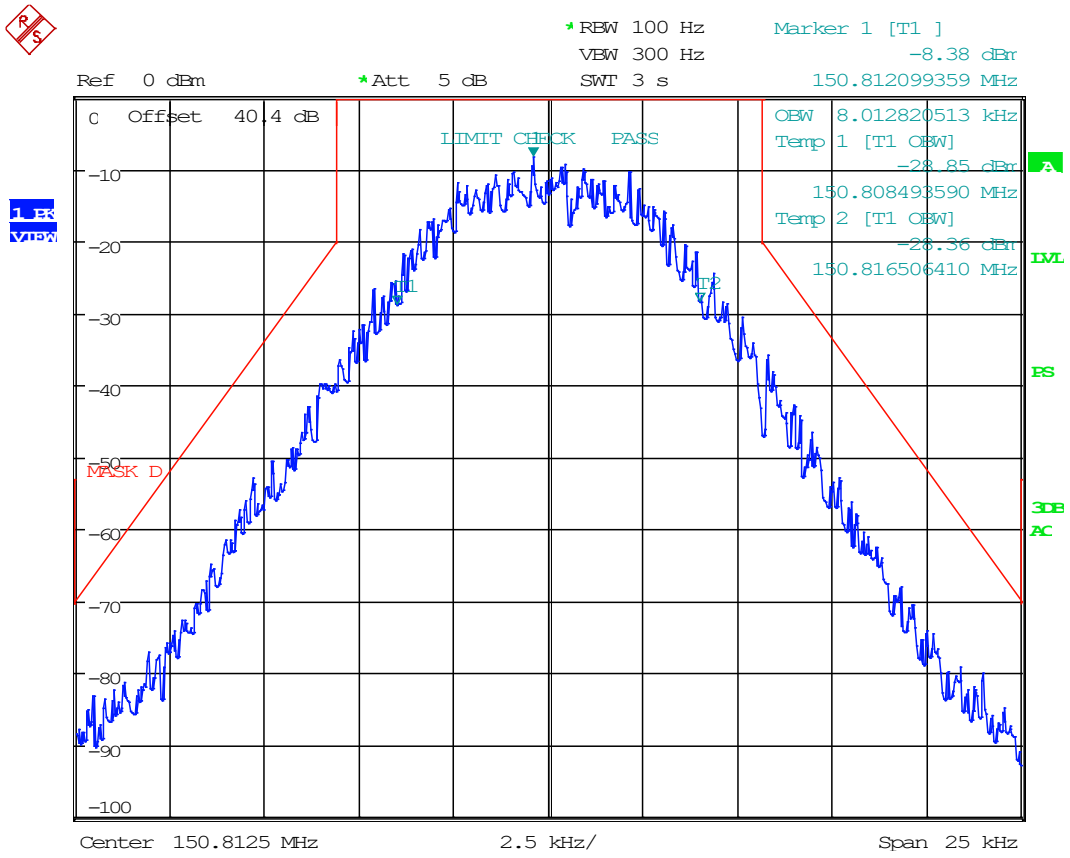
Date: 6.OCT.2020 20:01:25

8.5.2 C4FM



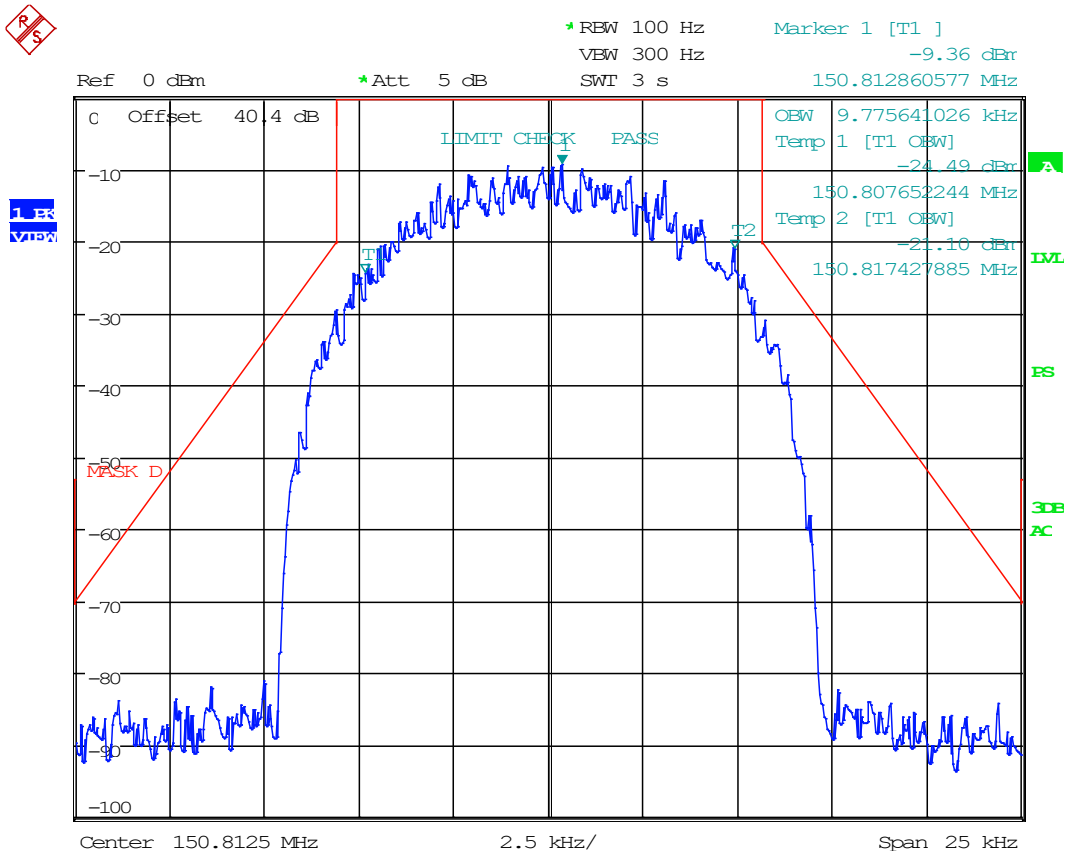
Date: 6.OCT.2020 20:10:17

8.5.3 H-CPM



Date: 6.OCT.2020 20:11:03

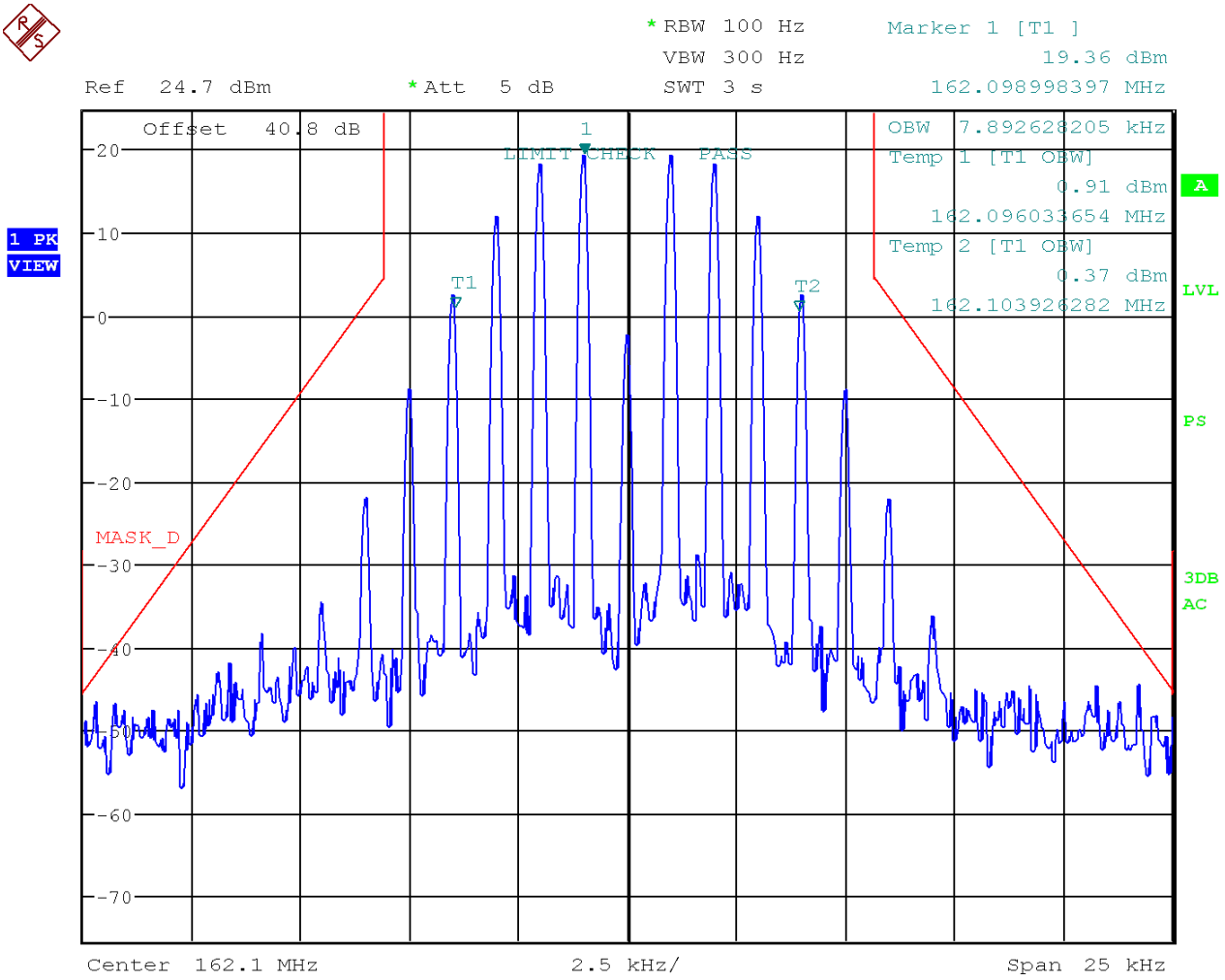
8.5.4 H-DQPSK



Date: 6.OCT.2020 20:12:07

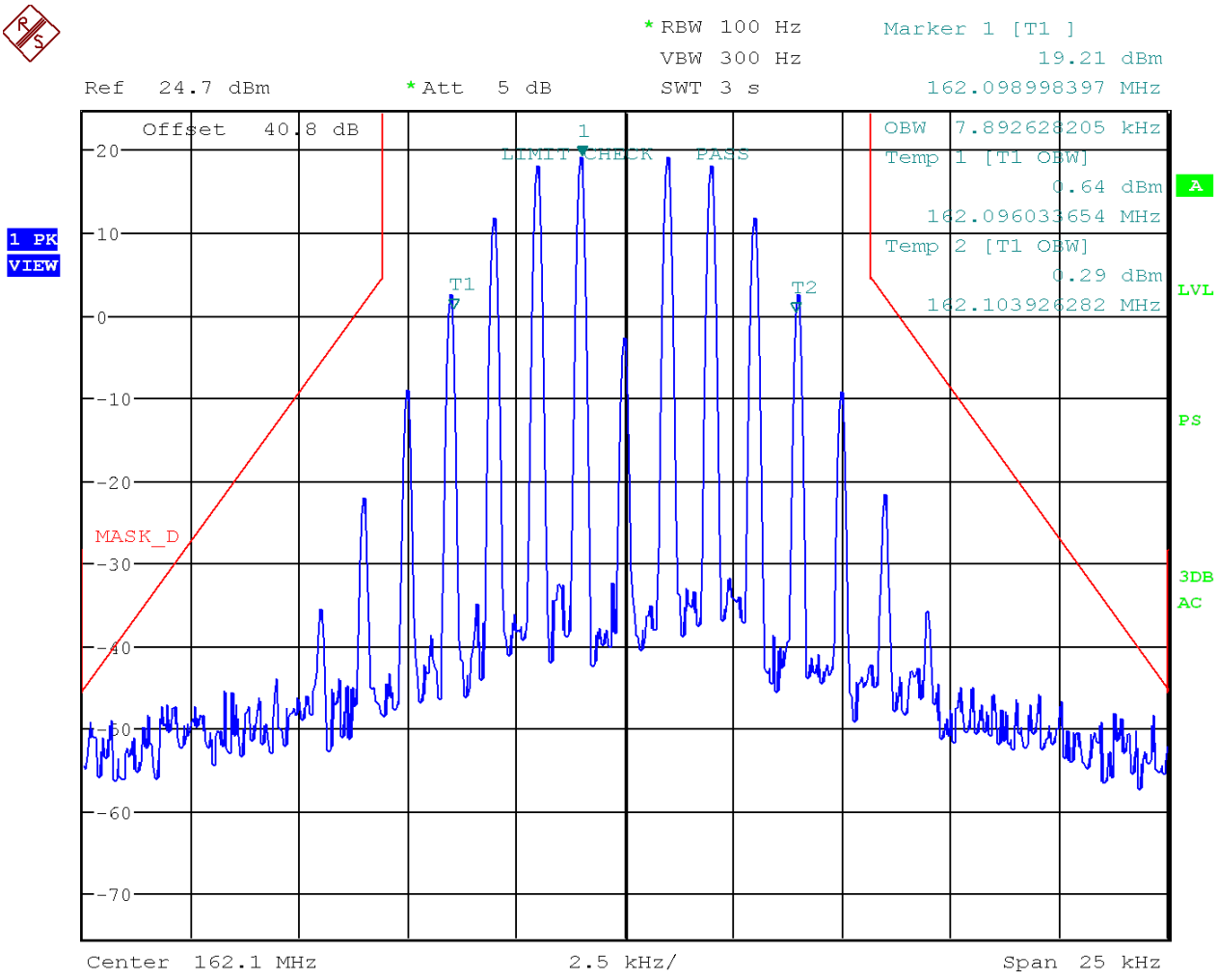
Input VS Output, Output Spectrum Plots, VHF Band

8.5.5 12.5 kHz FM, Uplink, AGC



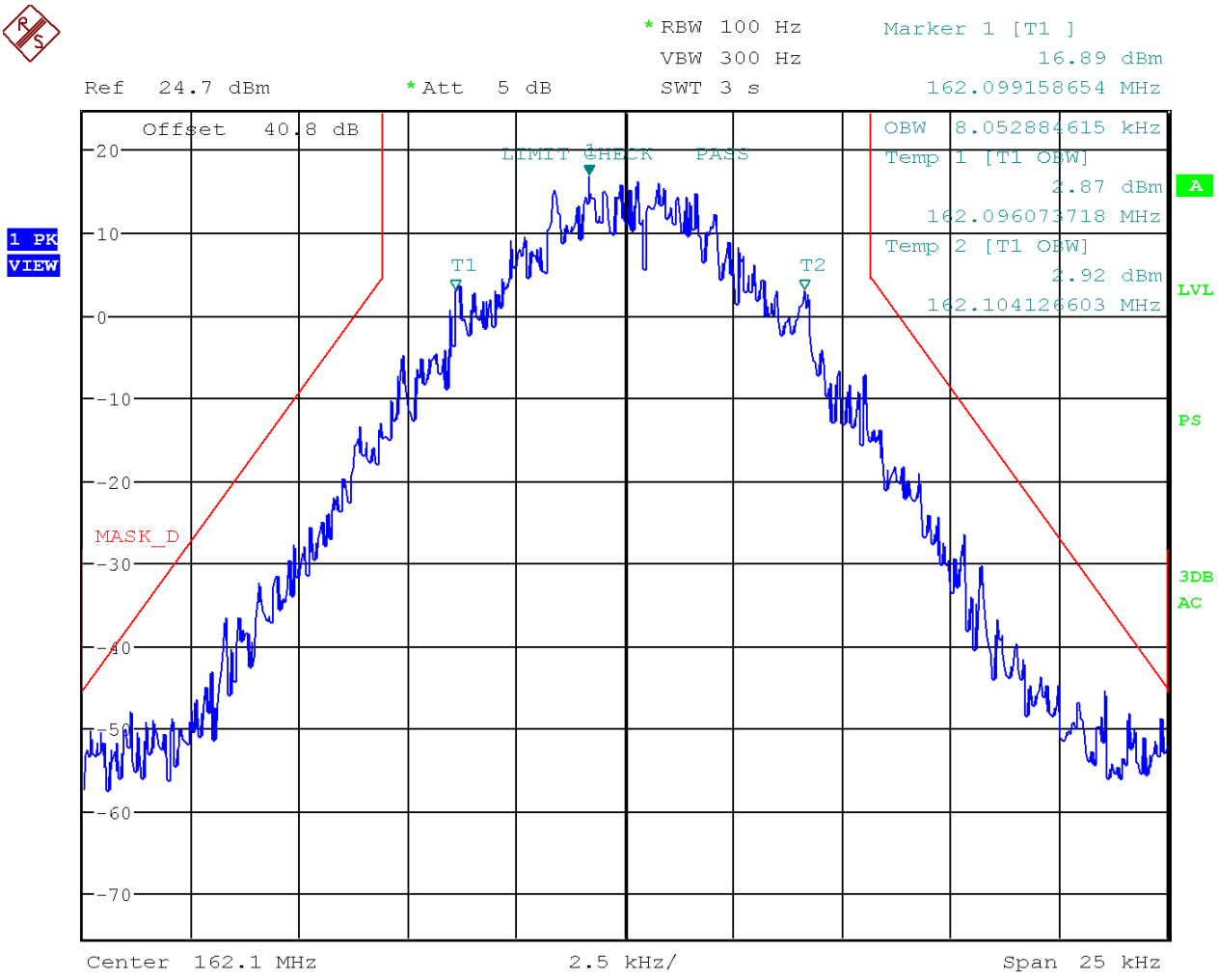
Date: 22.FEB.2021 12:54:26

8.5.6 12.5 kHz FM, Uplink, AGC +3dB



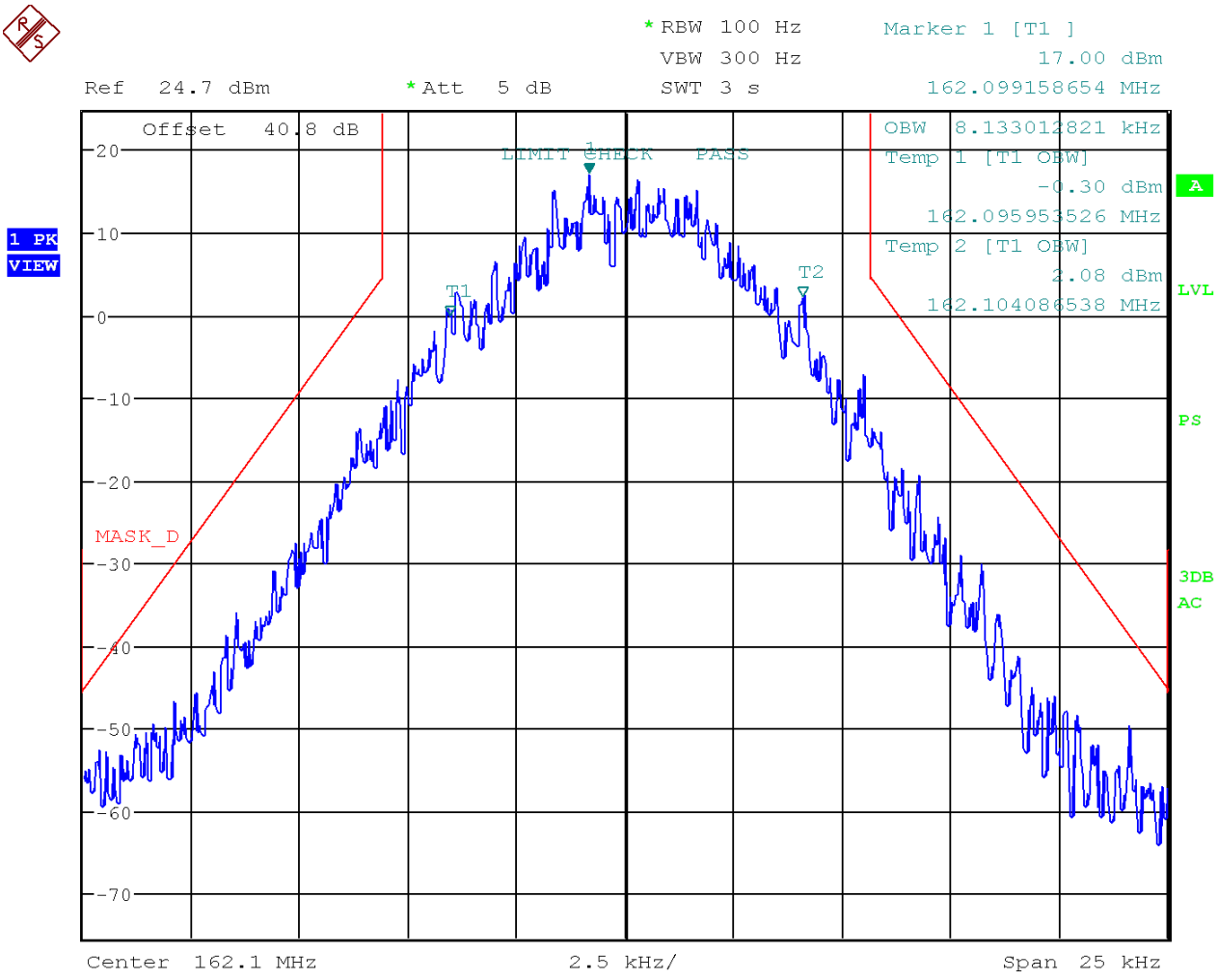
Date: 22.FEB.2021 12:55:06

8.5.7 C4FM, Uplink, AGC



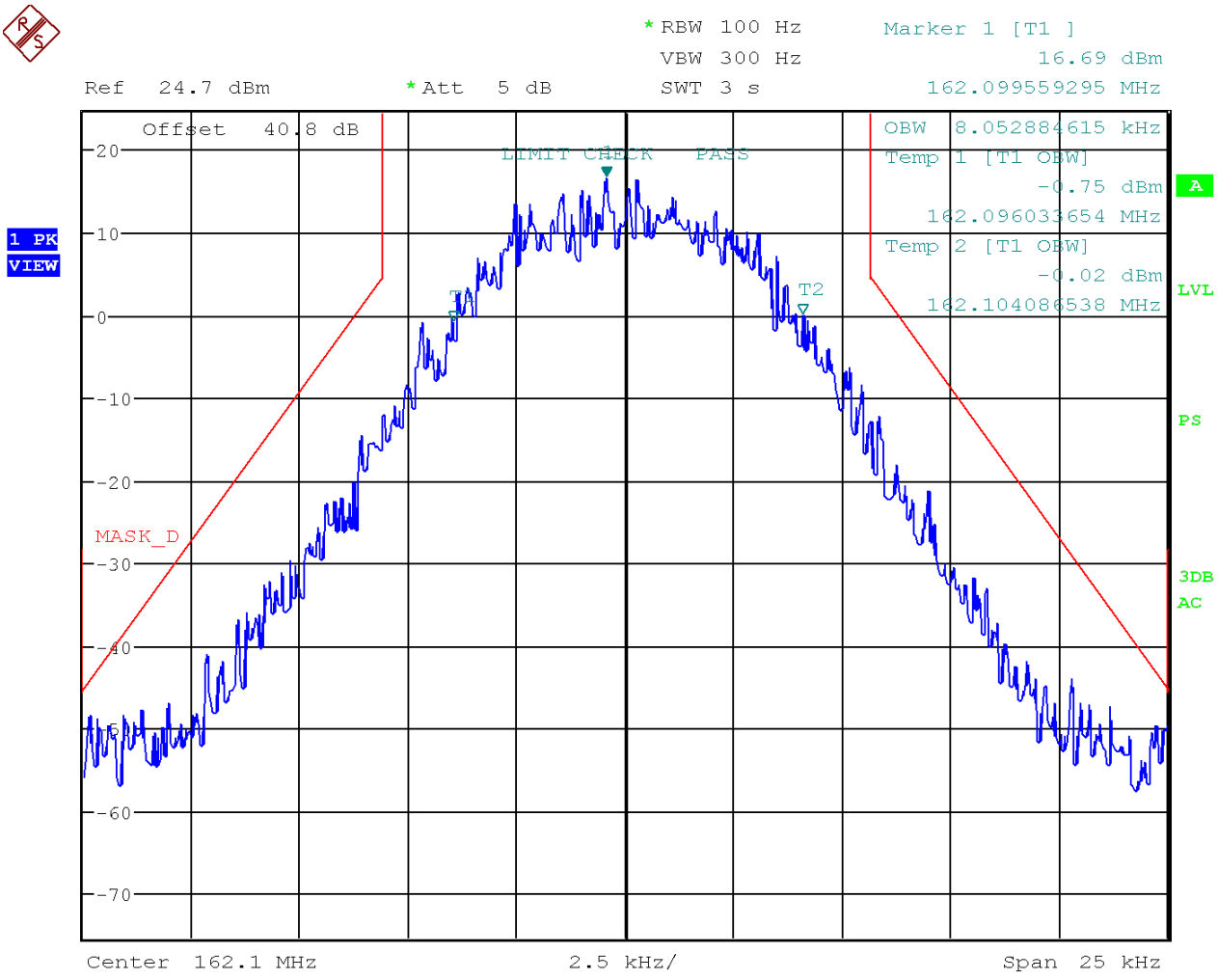
Date: 22.FEB.2021 12:56:08

8.5.8 C4FM, Uplink, AGC +3dB



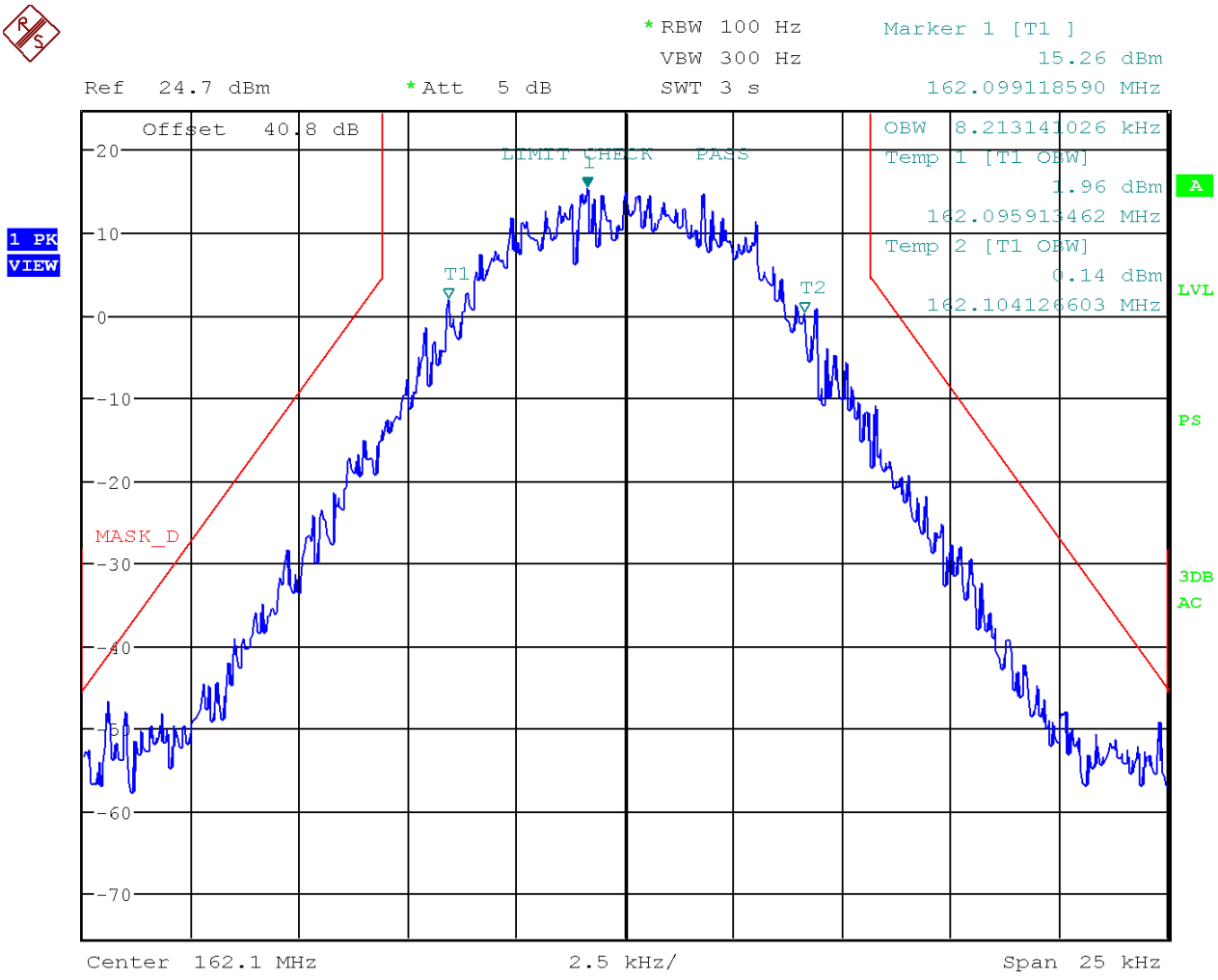
Date: 22.FEB.2021 12:56:31

8.5.9 H-CPM, Uplink, AGC



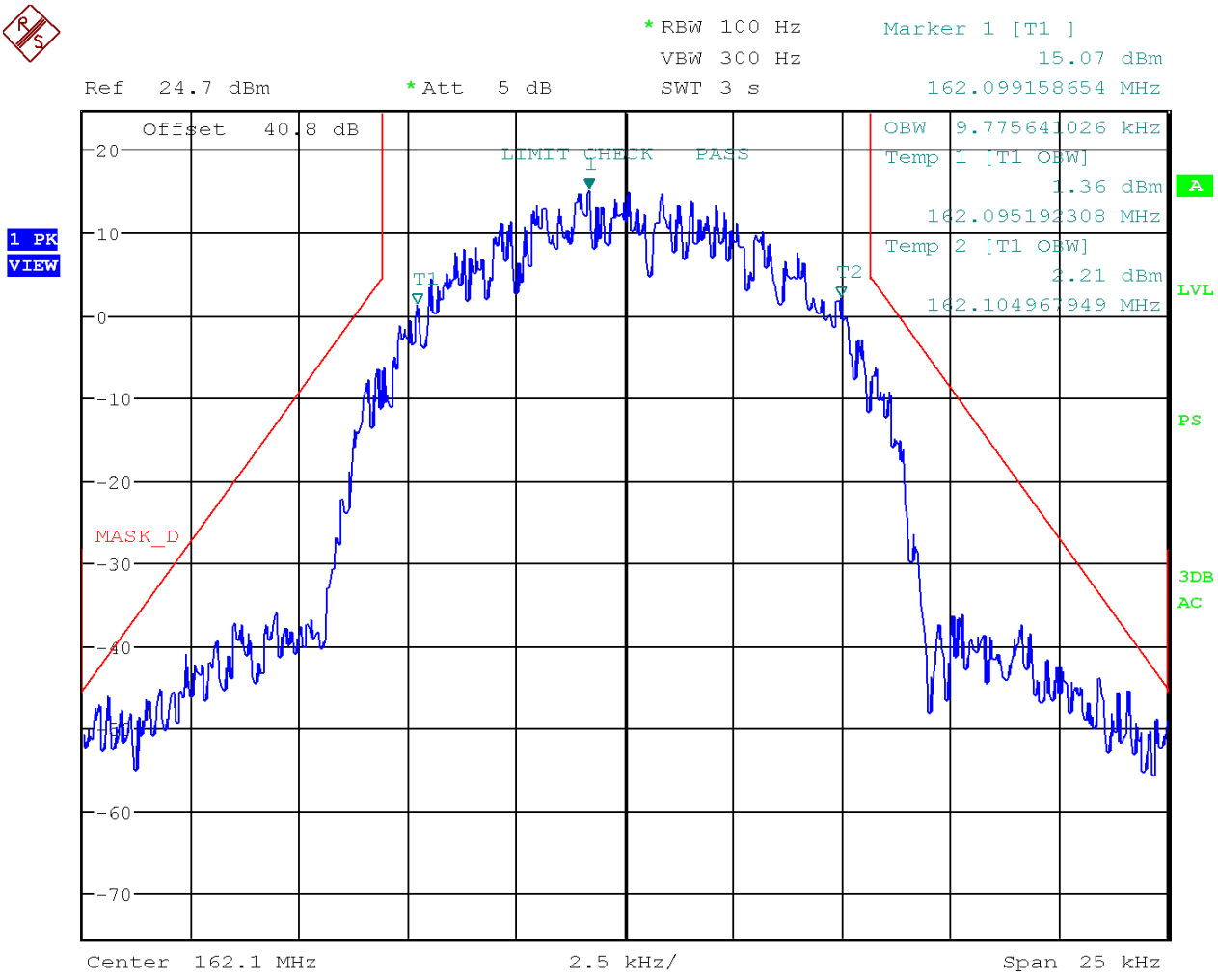
Date: 22.FEB.2021 12:57:02

8.5.10 H-CPM, Uplink, AGC +3dB



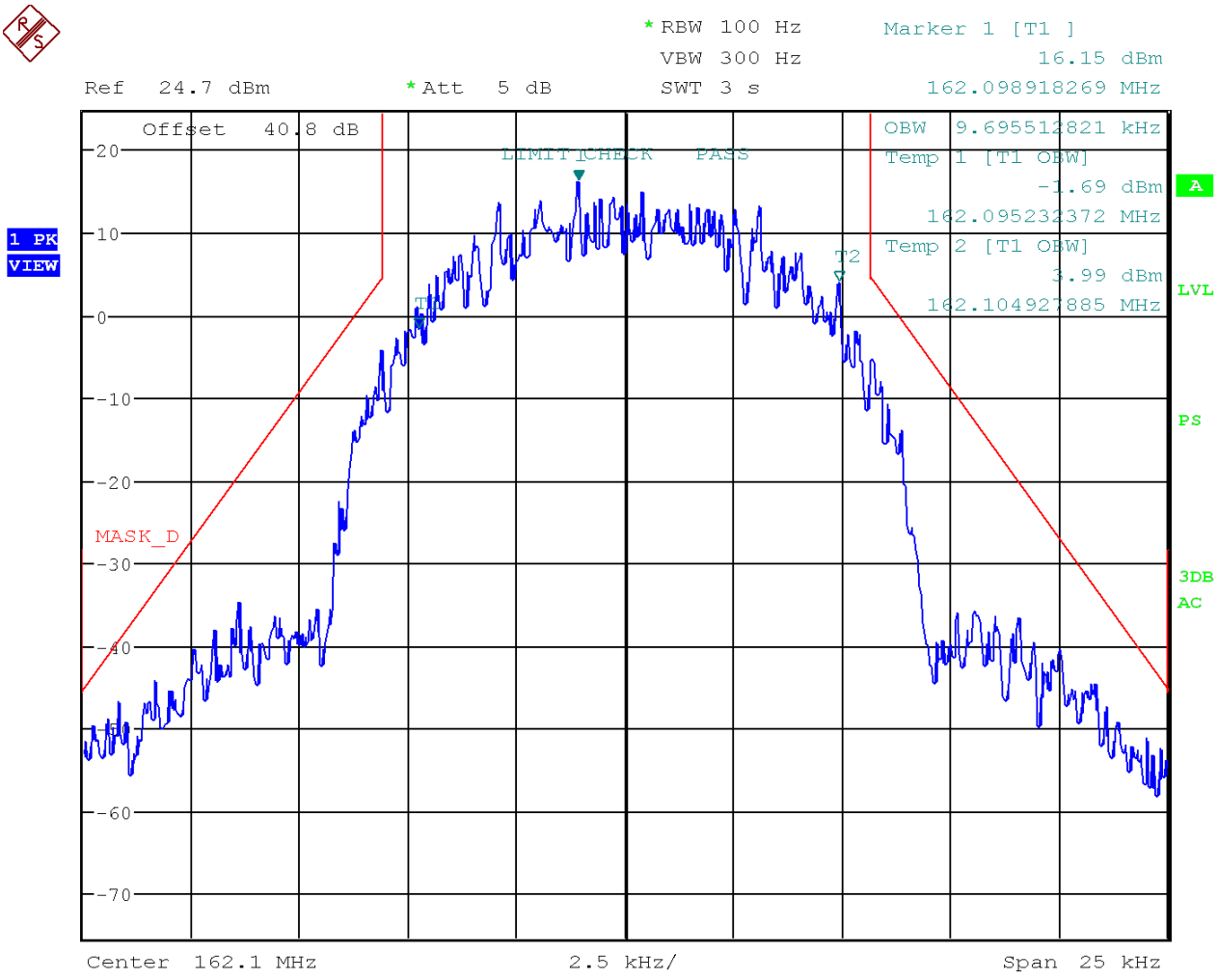
Date: 22.FEB.2021 12:57:35

8.5.11 H-DQPSK, Uplink, AGC



Date: 22.FEB.2021 12:58:42

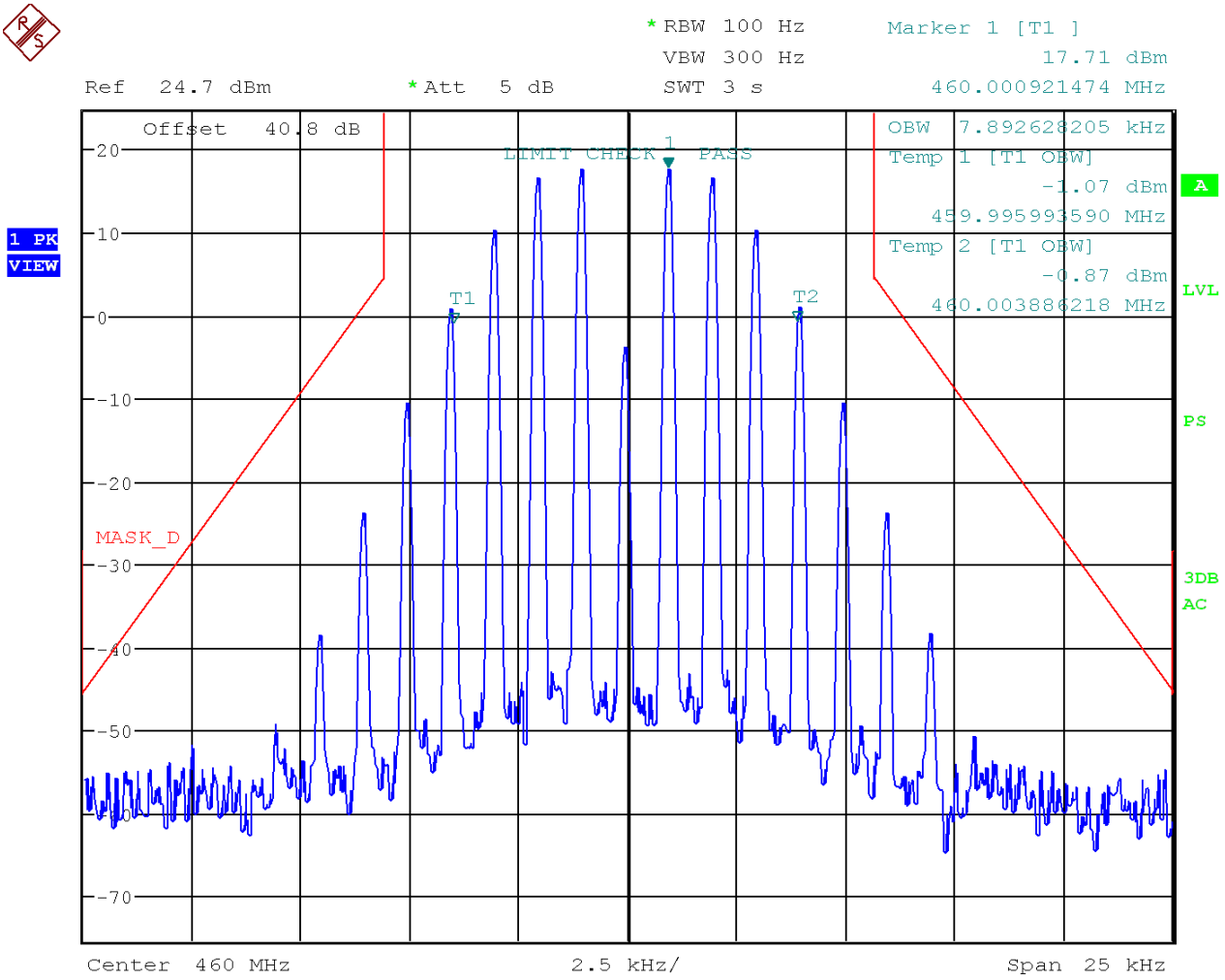
8.5.12 H-DQPSK, Uplink, AGC +3dB



Date: 22.FEB.2021 12:58:13

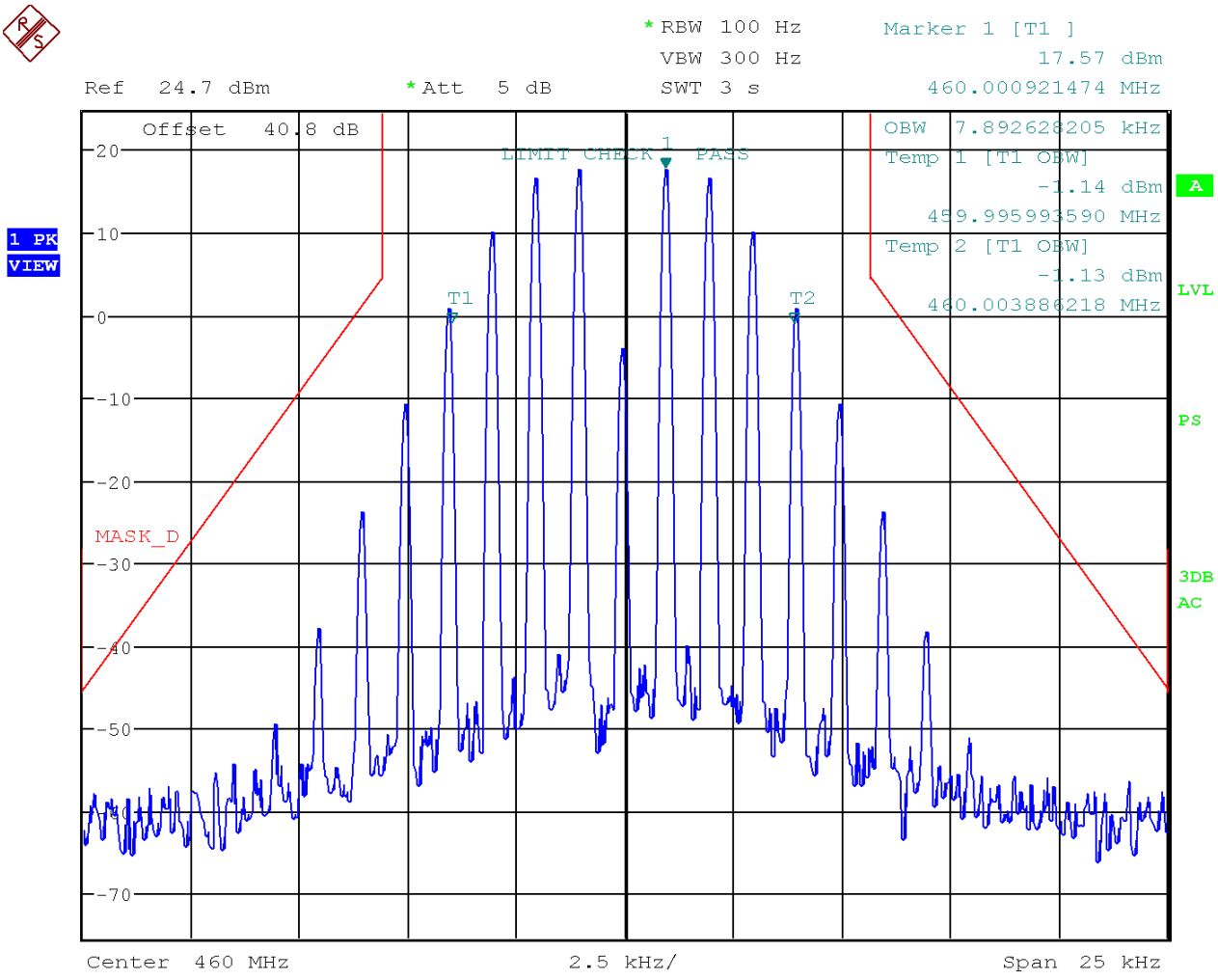
Input VS Output, Output Spectrum Plots, UHF Band

8.5.13 12.5 kHz FM, Uplink, AGC



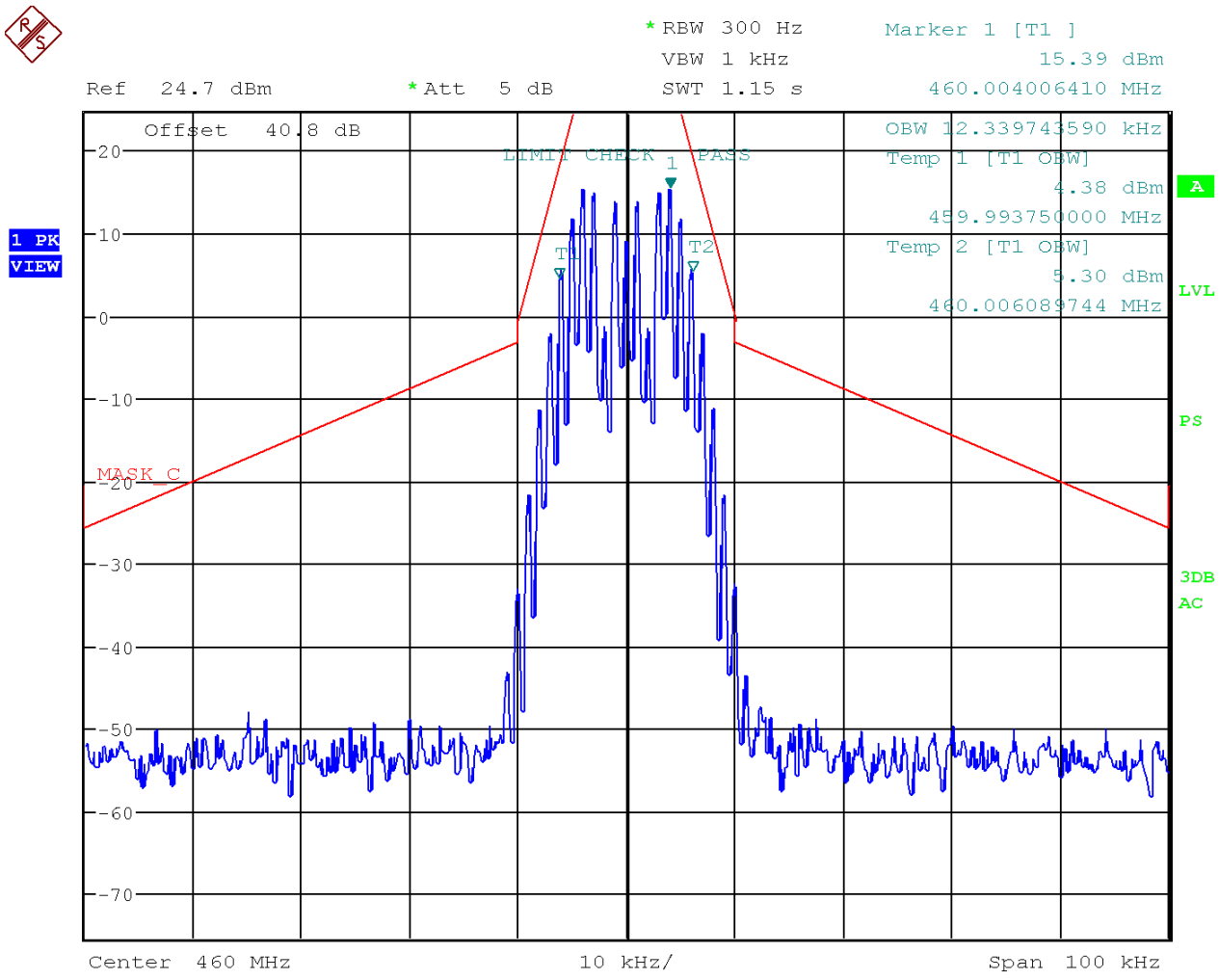
Date: 22.FEB.2021 13:20:00

8.5.14 12.5 kHz FM, Uplink, AGC +3dB



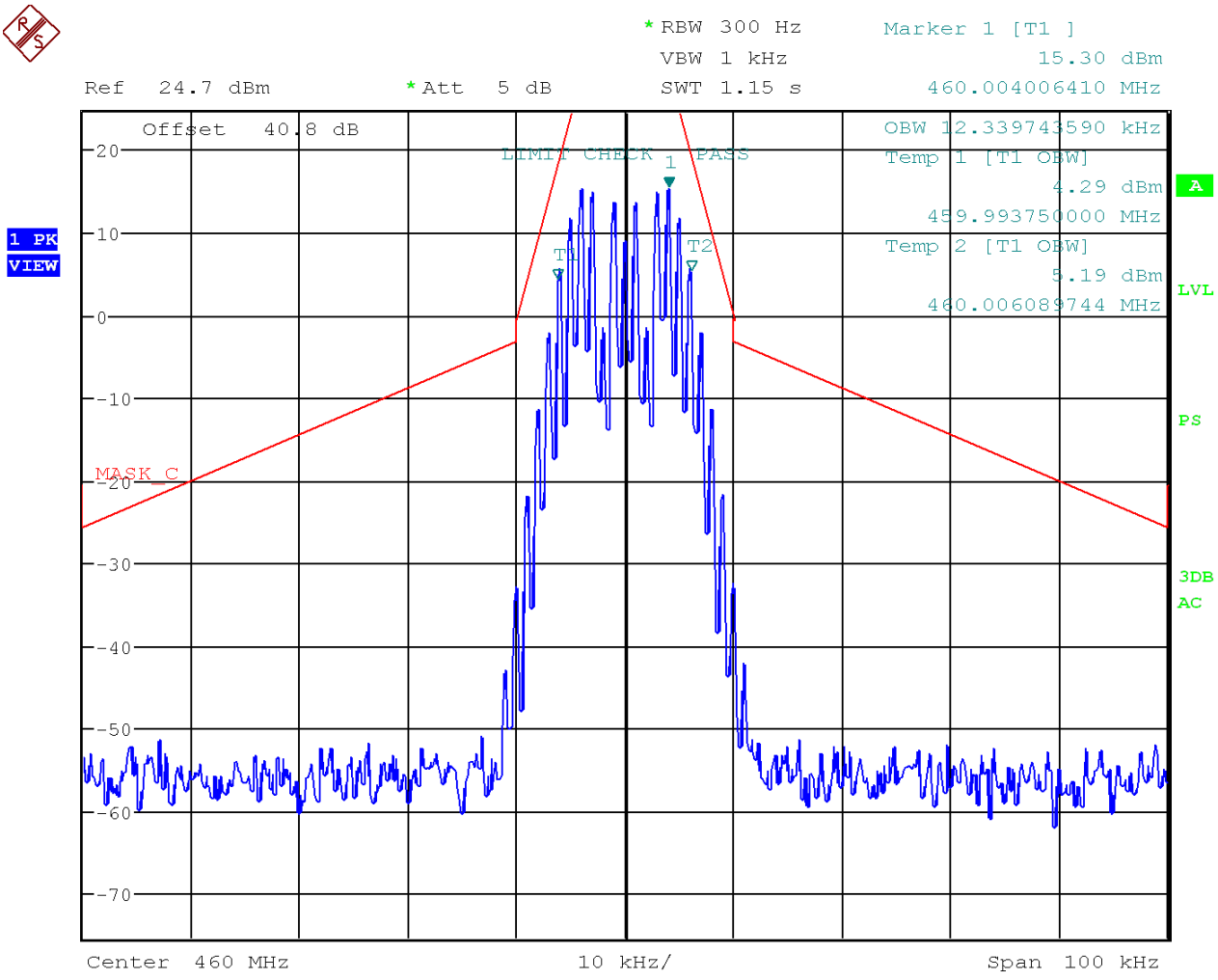
Date: 22.FEB.2021 13:20:26

1. 25 kHz FM, Uplink, AGC



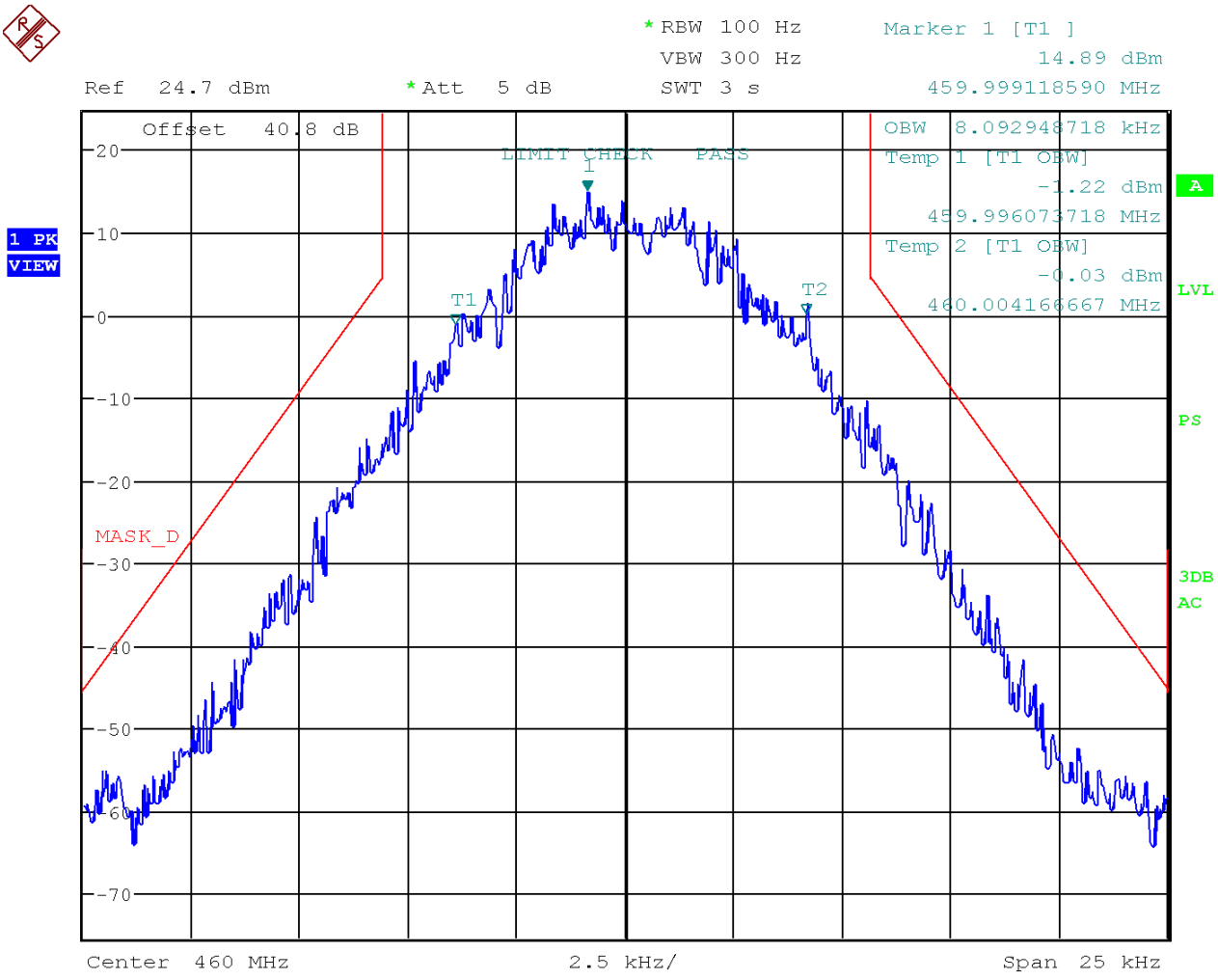
Date: 22.FEB.2021 13:26:19

8.5.15 25 kHz FM, Uplink, AGC +3dB



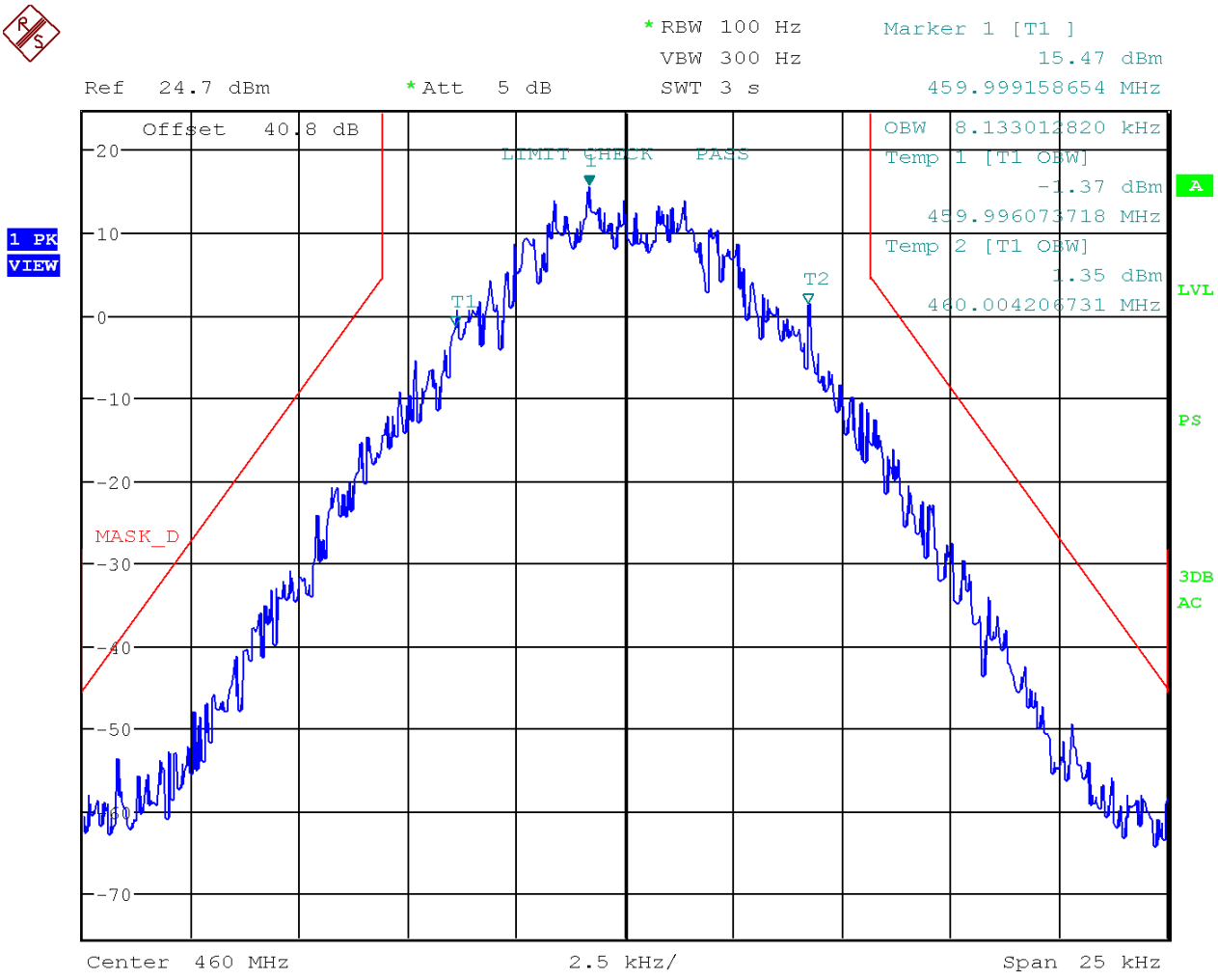
Date: 22.FEB.2021 13:26:40

8.5.16 C4FM, Uplink, AGC



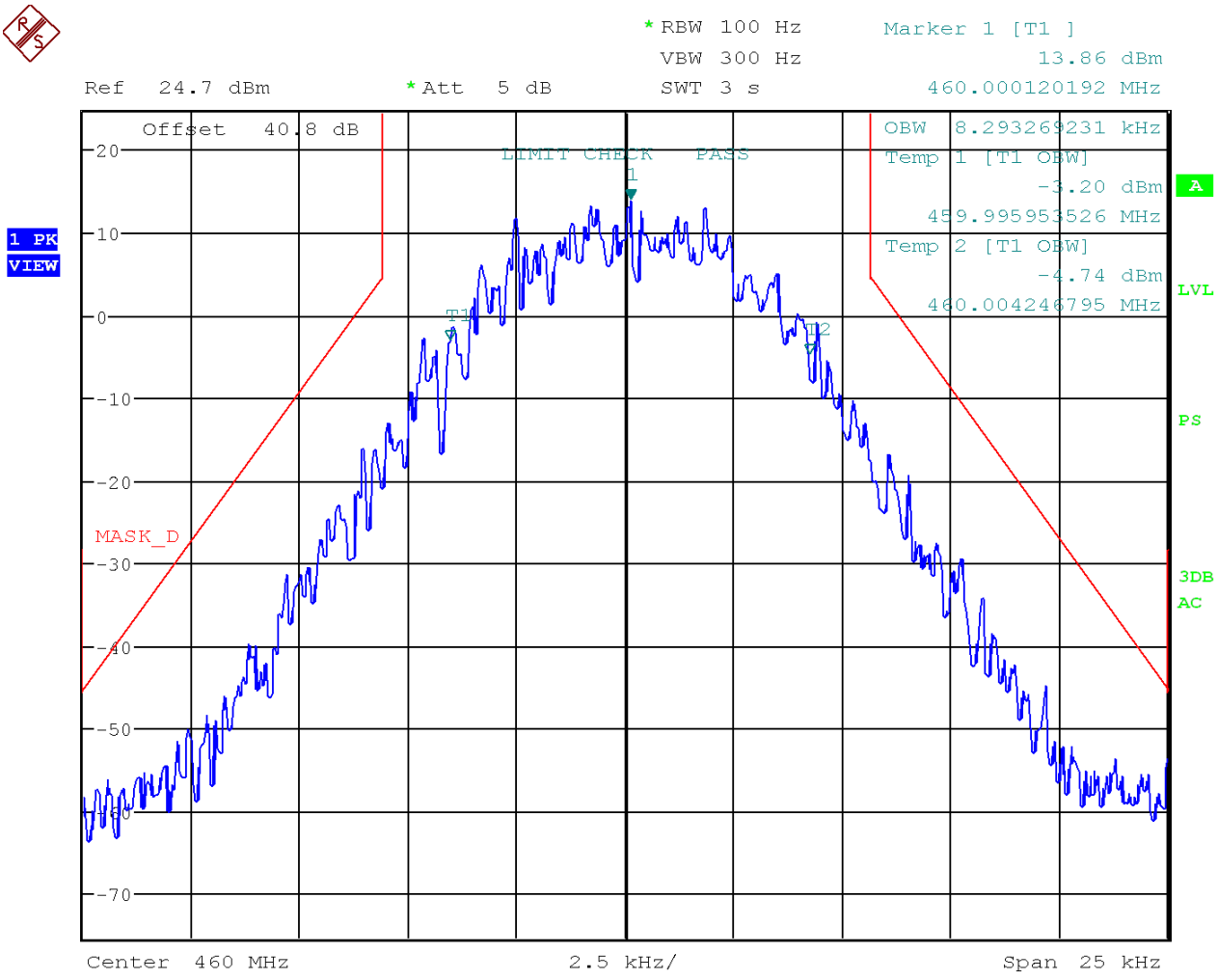
Date: 22.FEB.2021 13:23:50

8.5.17 C4FM, Uplink, AGC +3dB



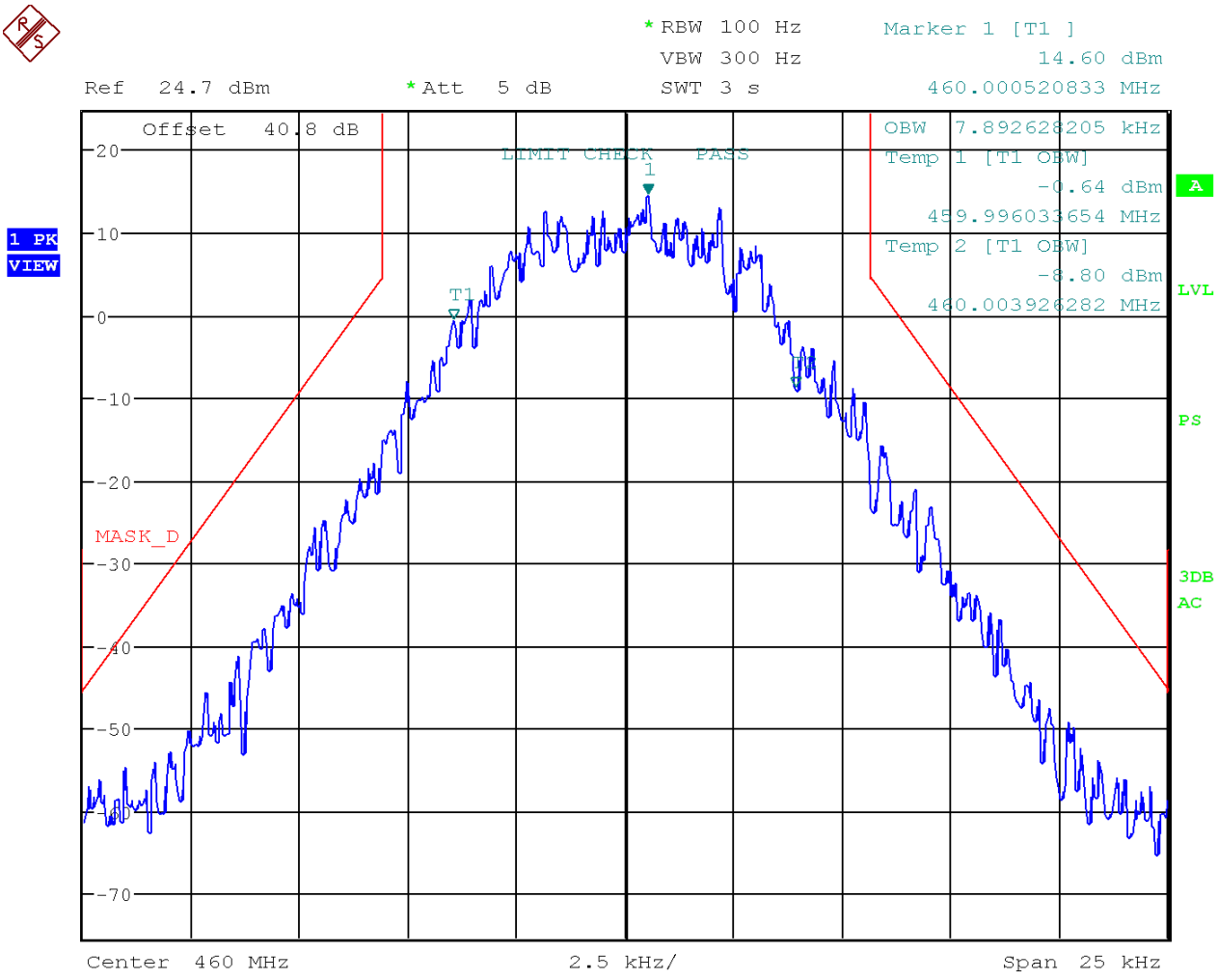
Date: 22.FEB.2021 13:23:24

8.5.18 H-CPM, Uplink, AGC



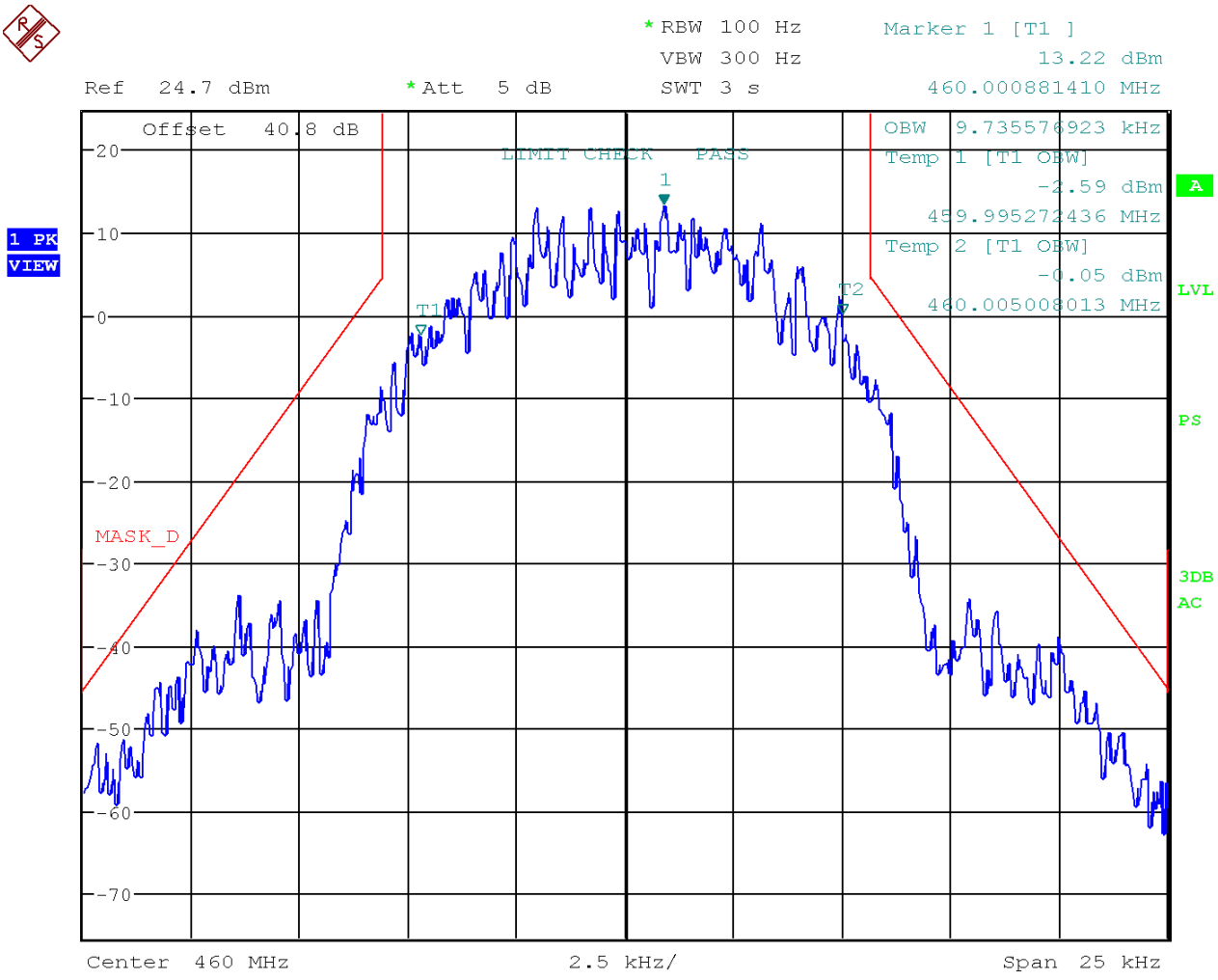
Date: 22.FEB.2021 13:22:12

8.5.19 H-CPM, Uplink, AGC +3dB



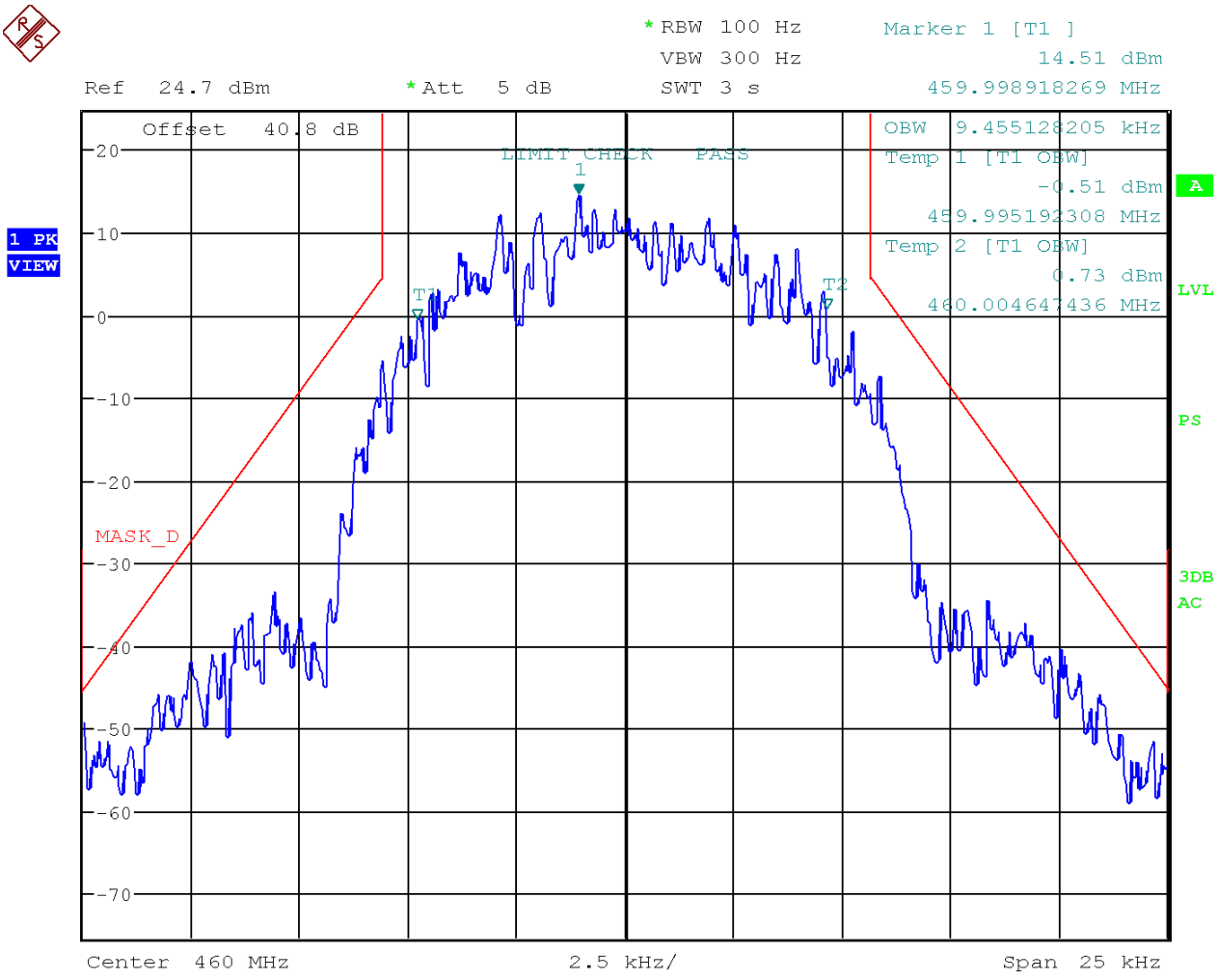
Date: 22.FEB.2021 13:22:42

8.5.20 H-DQPSK, Uplink, AGC



Date: 22.FEB.2021 13:21:10

8.5.21 H-DQPSK, Uplink, AGC +3dB

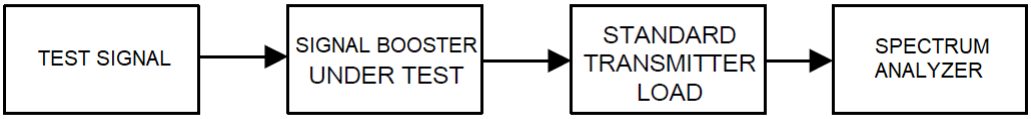


Date: 22.FEB.2021 13:21:36

8.6 Noise Figure

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

Limits from FCC KDB 935210 D05 v01r04 Industrial Signal Boosters. Test method from "Noise Figure Measurement Accuracy: The Y-Factor Method" by Keysight Technologies.

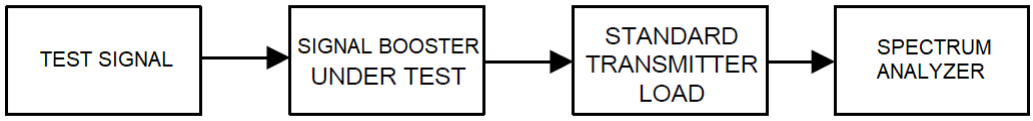
Test Setup


Test Results, Out-of-band Rejection and Class of Operation			
Operating Band	Link Direction	Noise Figure (dB)	Limit
150-174 MHz	Uplink	3.88	< 9 dB
406-512 MHz	Uplink	4.61	< 9 dB

8.7 Out-of-Band/Out-of-Block Emissions (Intermodulation Products)

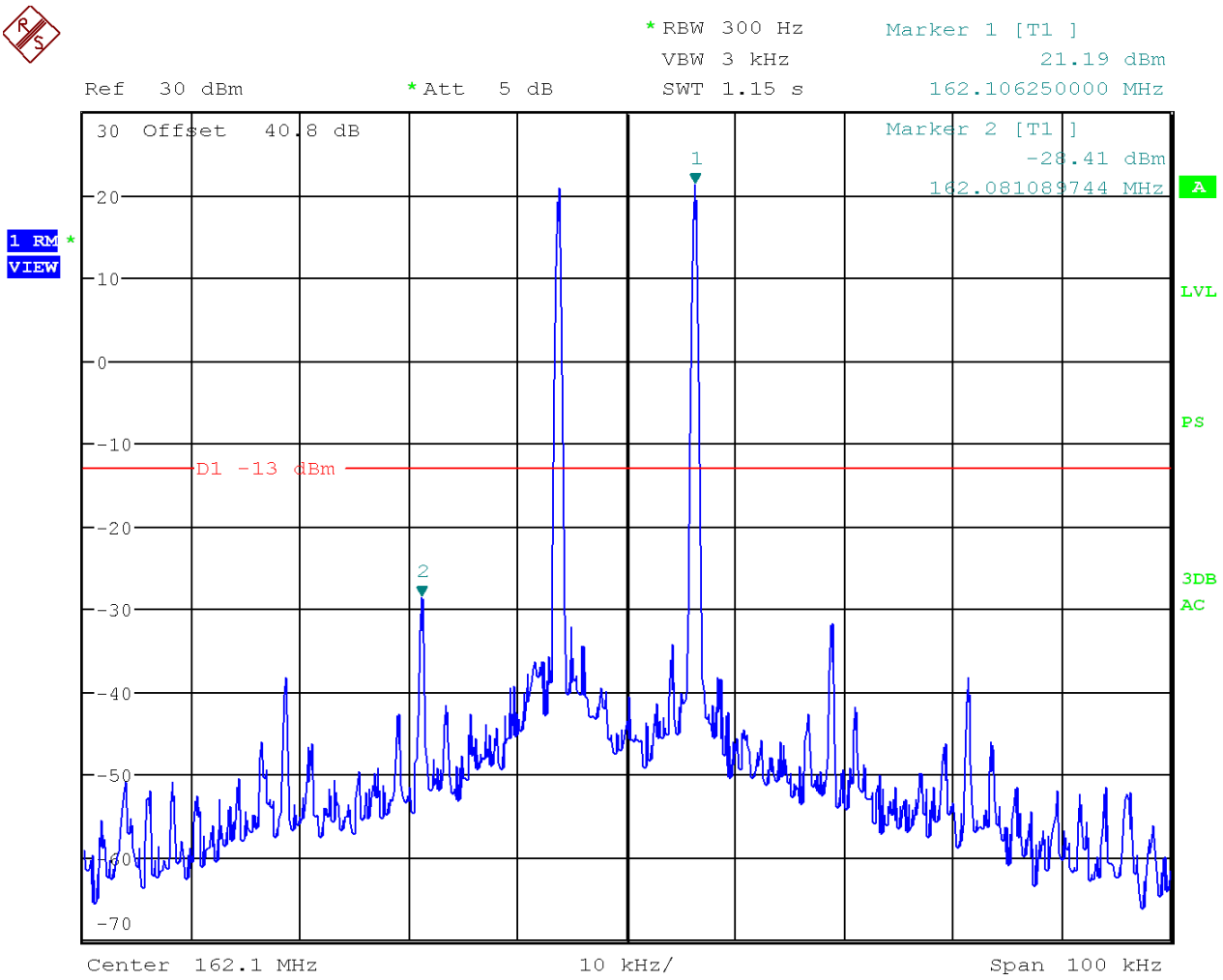
Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

Limits from FCC Parts 2.1051, 90.210 and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

Test Setup


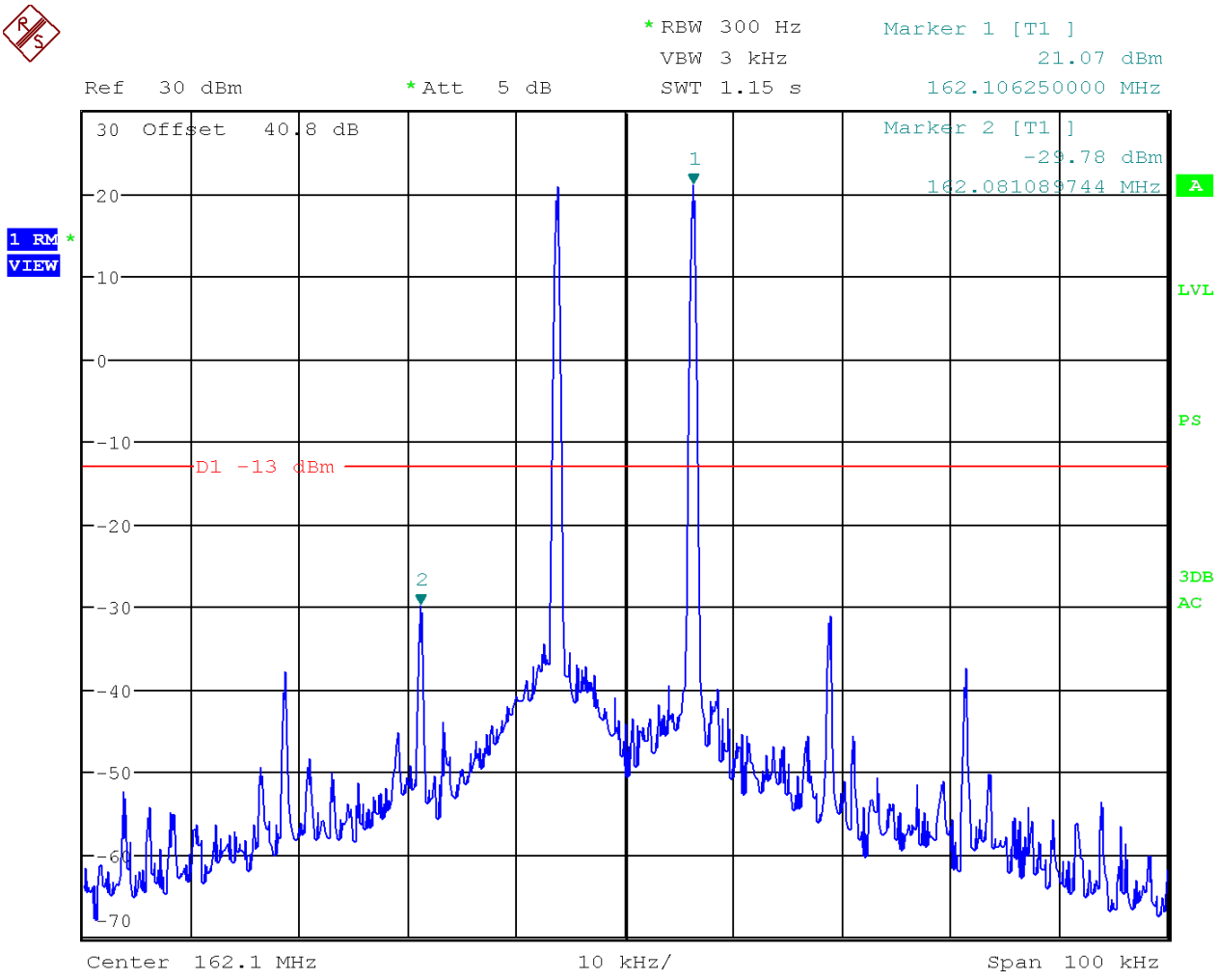
Intermodulation Products Spectrum Plots, VHF Band

8.7.1 12.5 kHz Signal, Uplink, AGC



Date: 22.FEB.2021 18:01:45

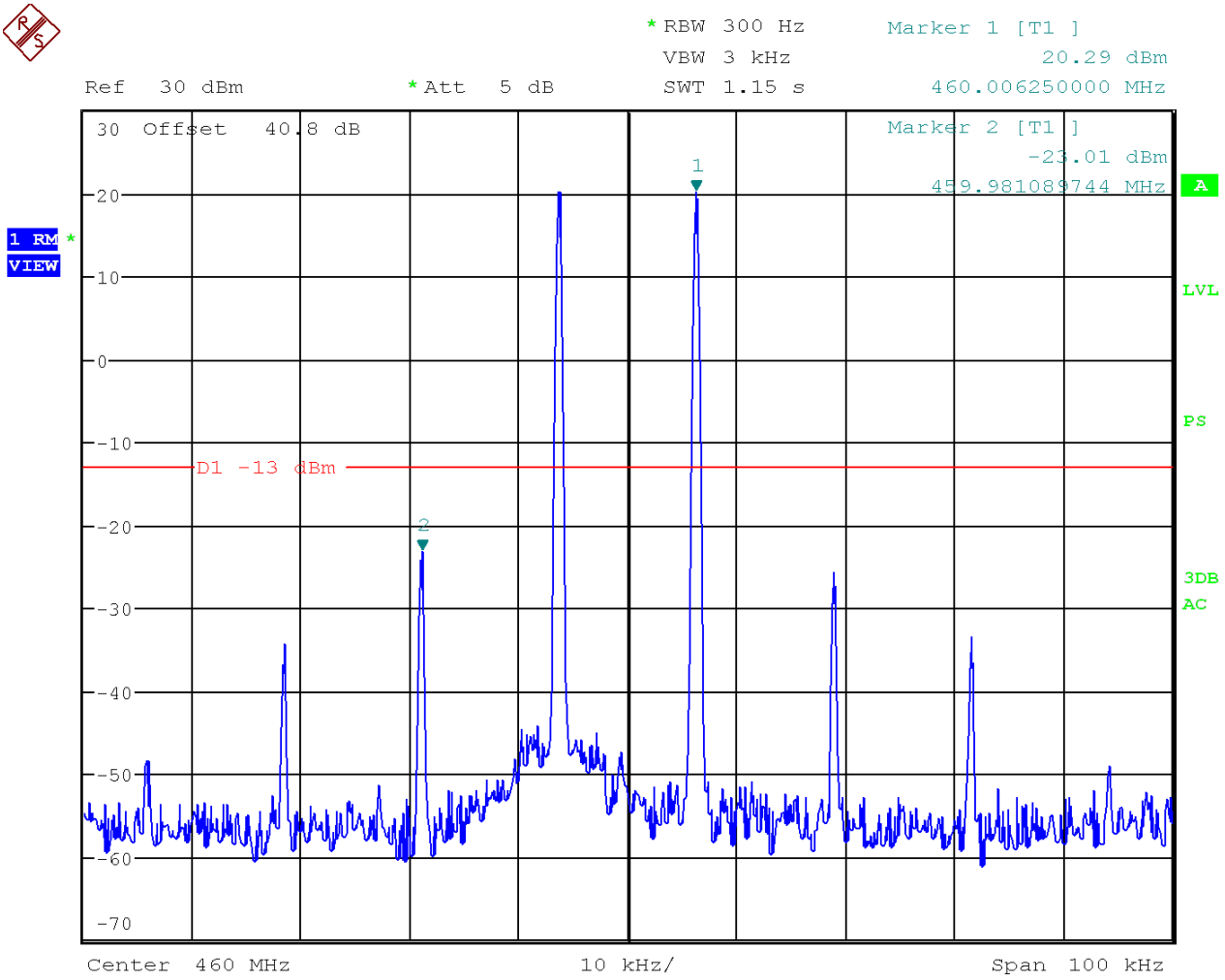
8.7.2 12.5 kHz Signal, Uplink, AGC +3dB



Date: 22.FEB.2021 18:02:22

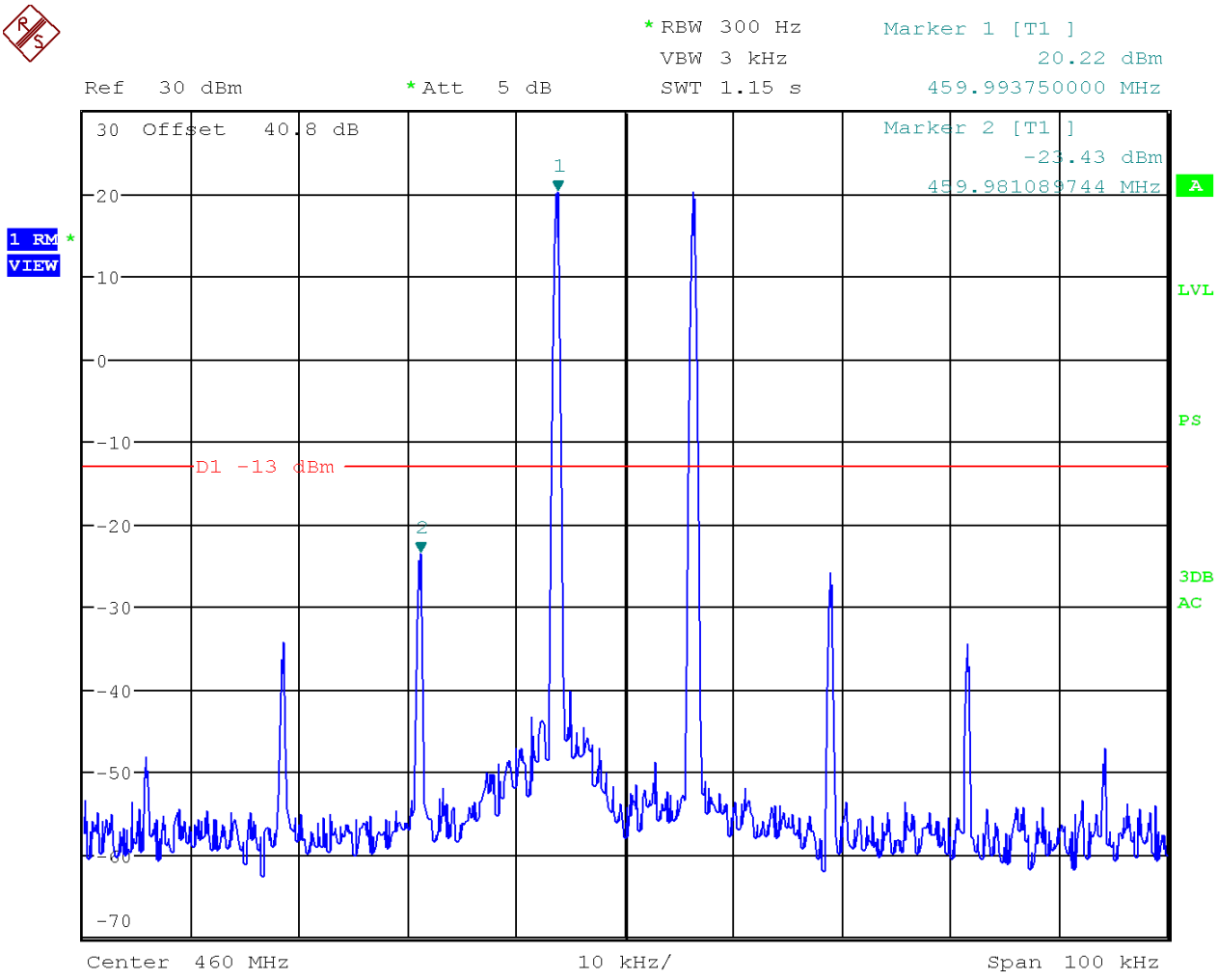
Intermodulation Products Spectrum Plots, UHF Band

8.7.3 12.5 kHz Signal, Uplink, AGC



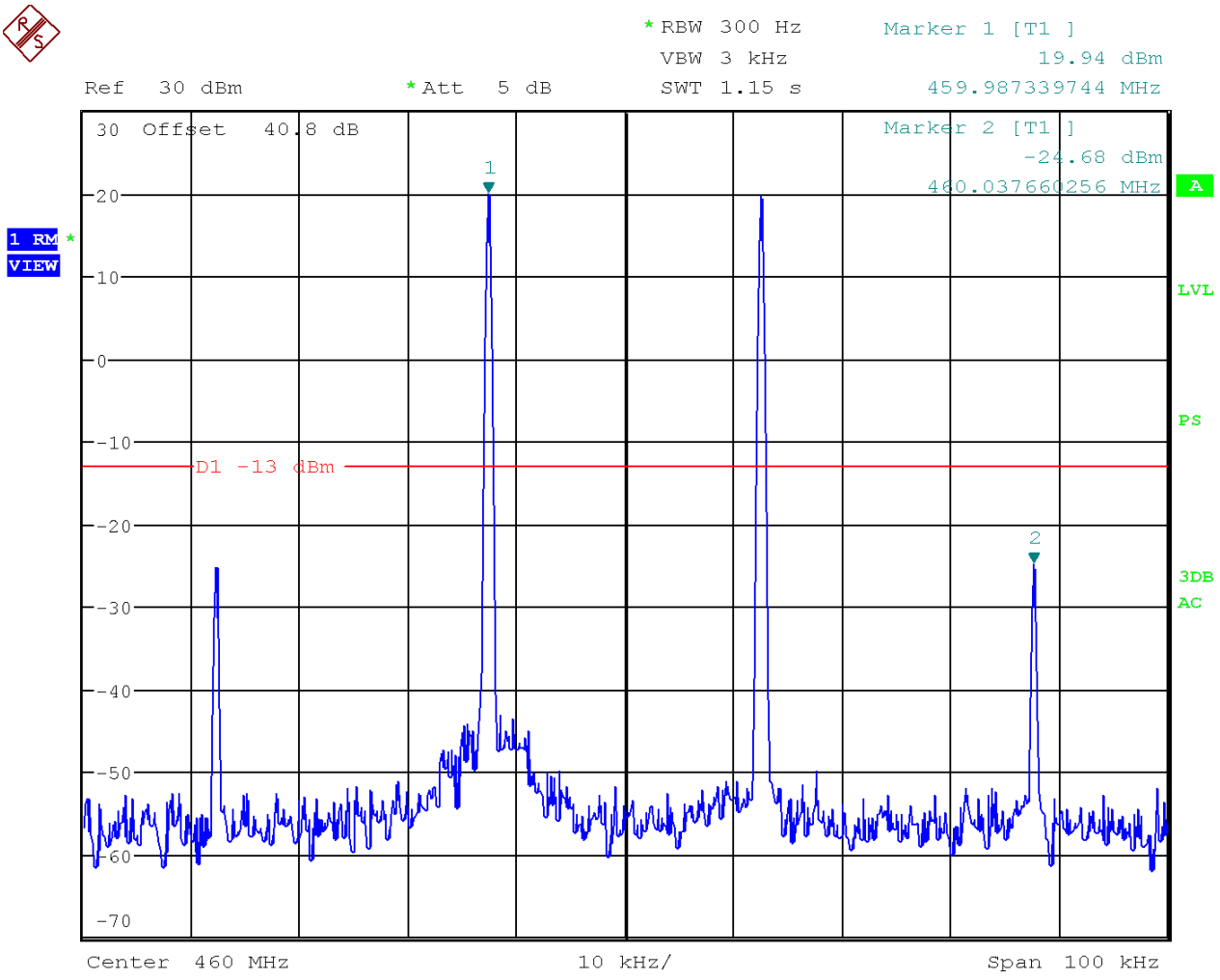
Date: 22.FEB.2021 13:34:42

8.7.4 12.5 kHz Signal, Uplink, AGC +3dB



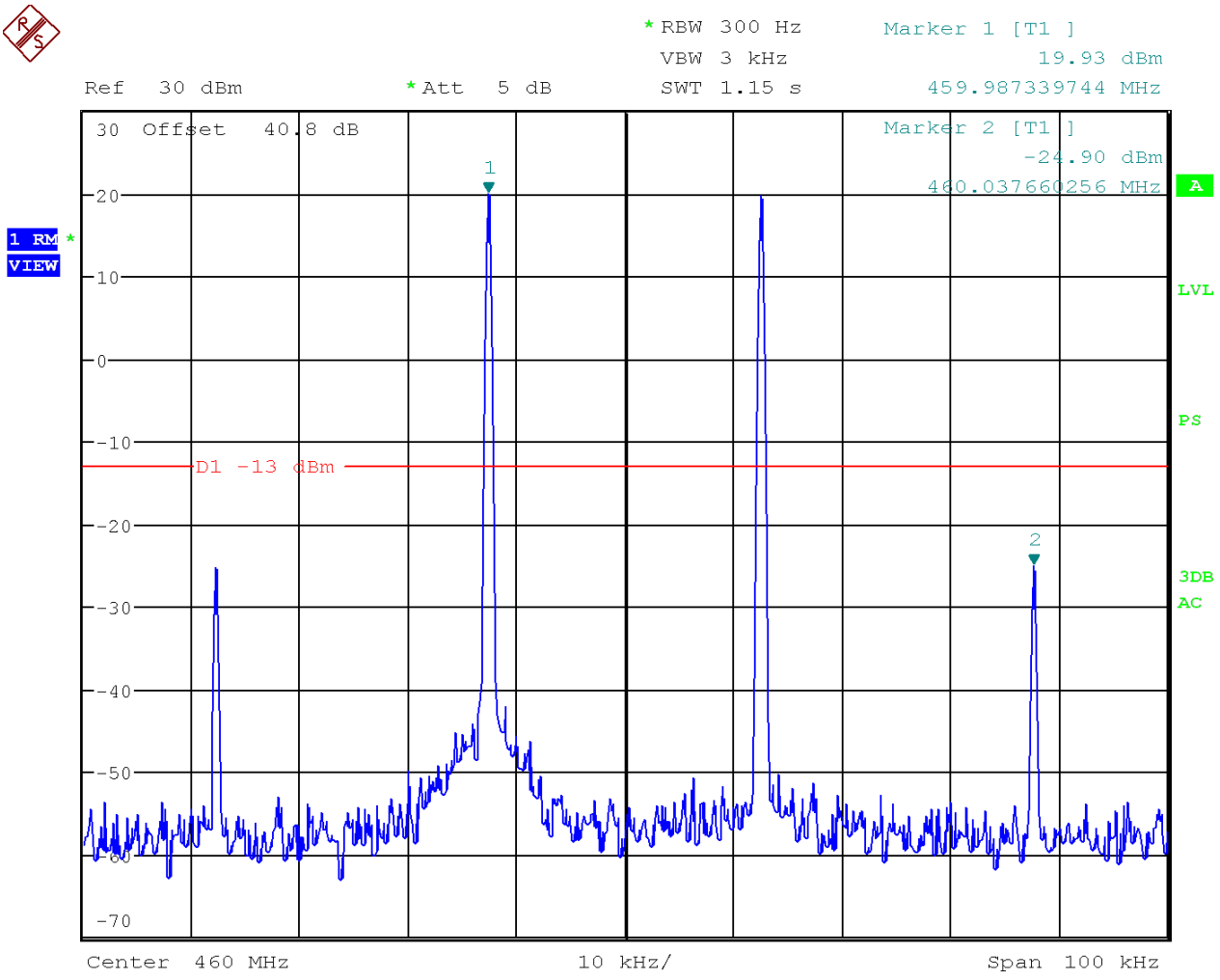
Date: 22.FEB.2021 13:35:20

8.7.5 25 kHz Signal, Uplink, AGC



Date: 22.FEB.2021 13:36:58

8.7.6 25 kHz Signal, Uplink, AGC +3dB

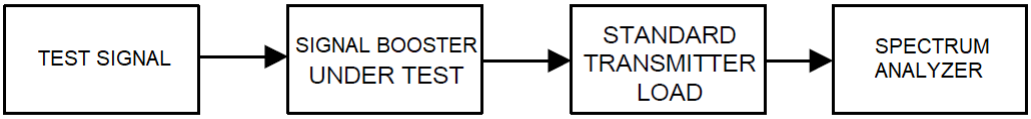


Date: 22.FEB.2021 13:36:27

8.8 Emission Mask, Out-of-Band

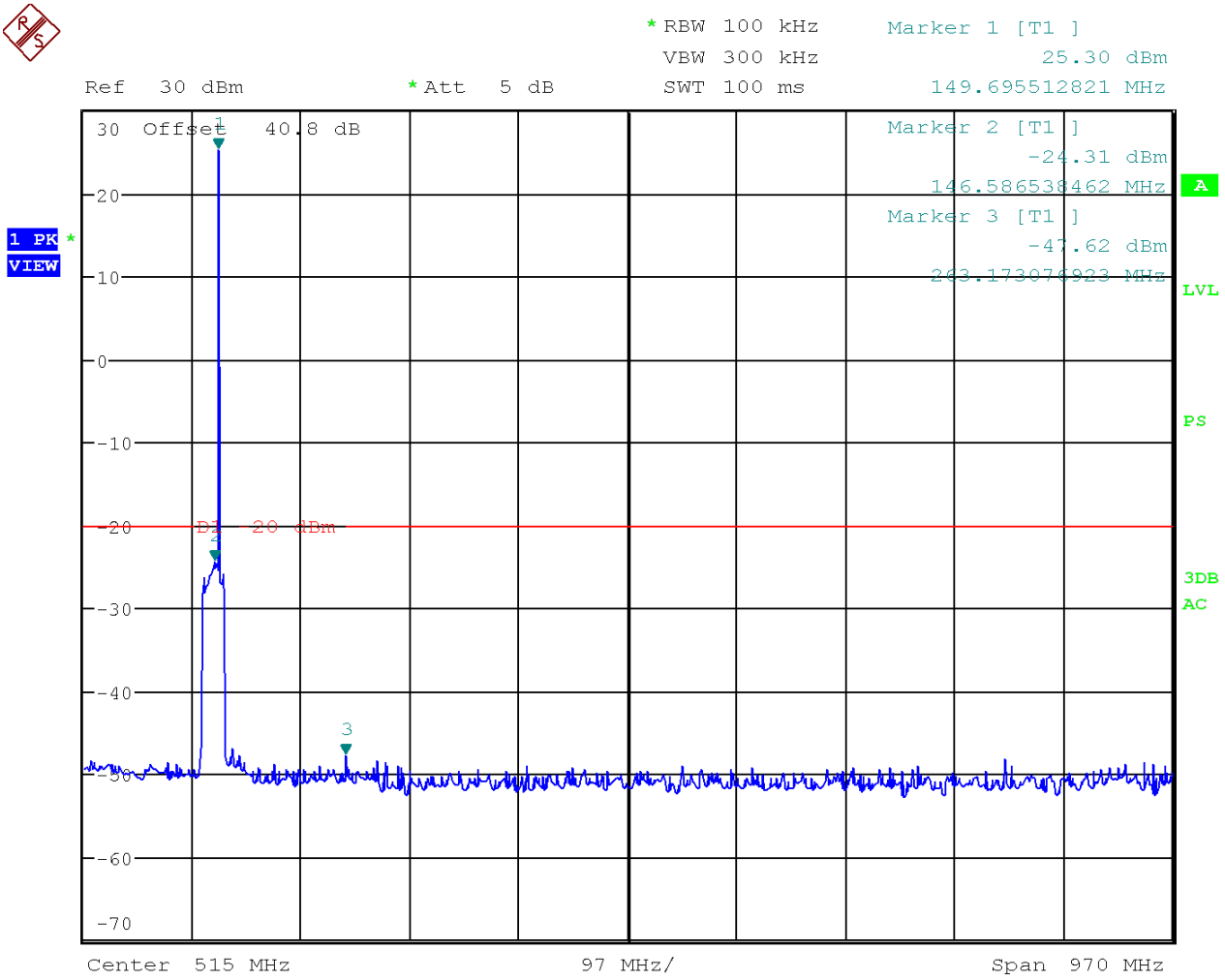
Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

Limits from FCC Parts 2.1051, 90.210 and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

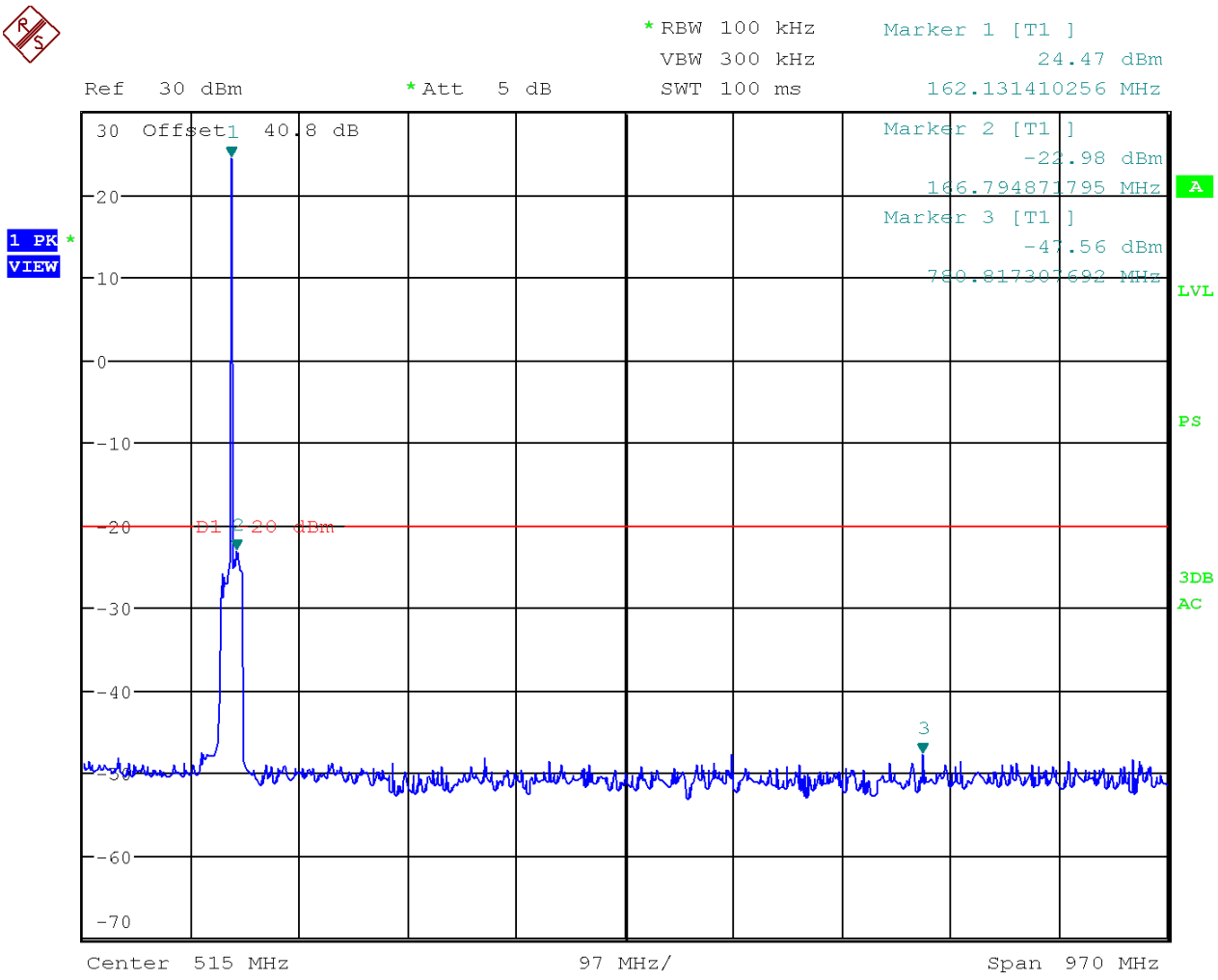
Test Setup


Conducted Emissions Spectrum Plots

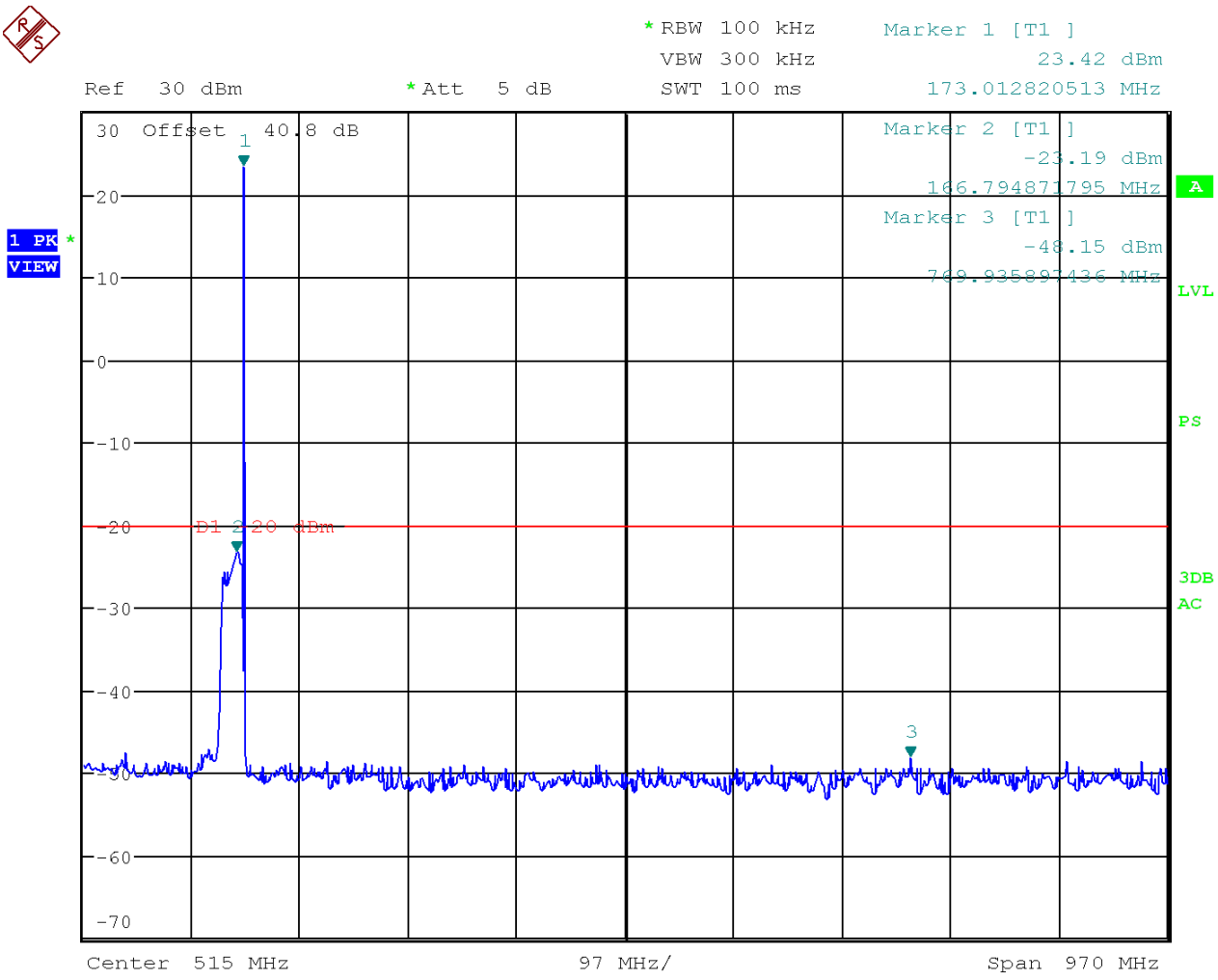
8.8.1 30 MHz to 1 GHz, VHF Band Uplink



Date: 22.FEB.2021 18:12:37

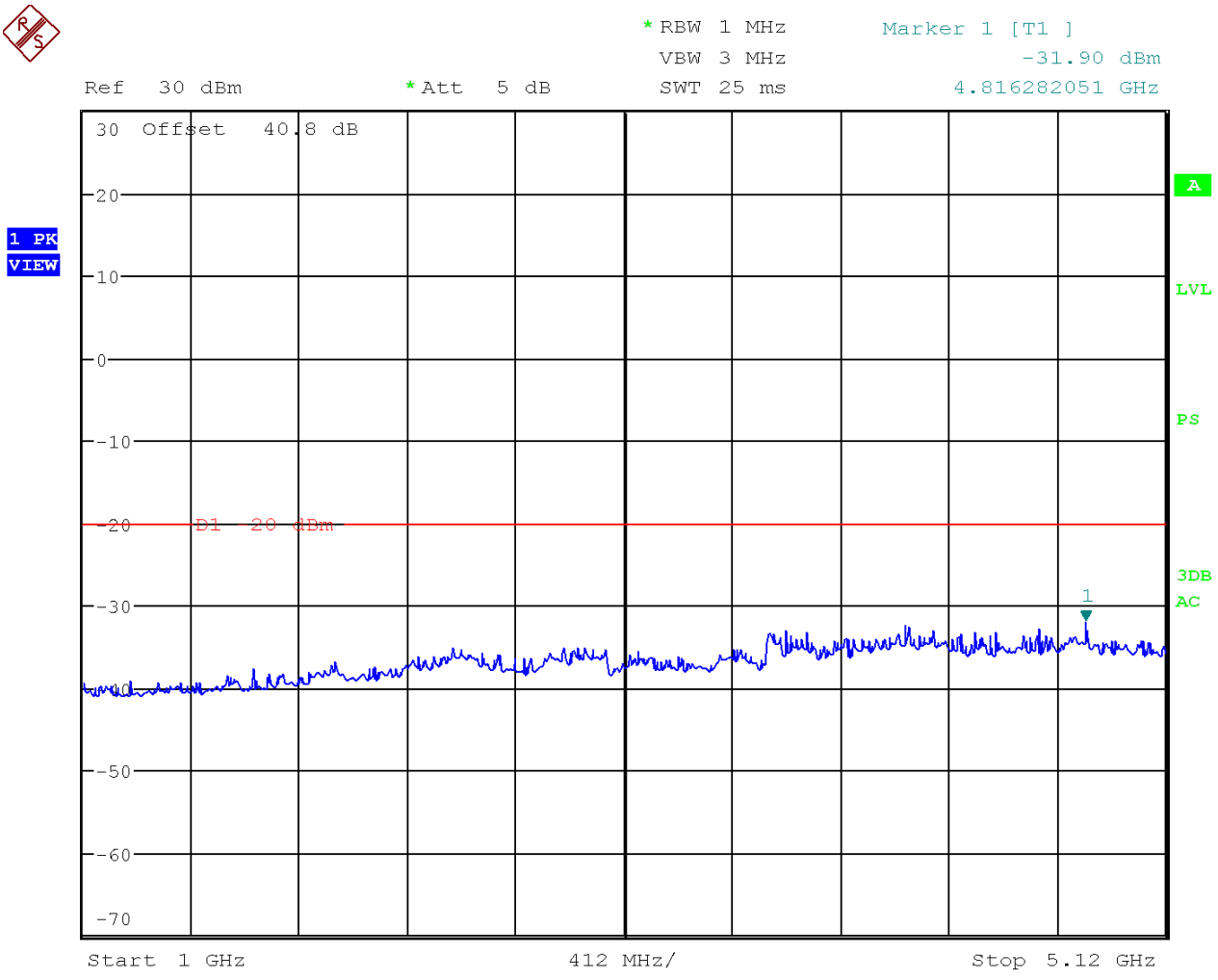


Date: 22.FEB.2021 18:11:41

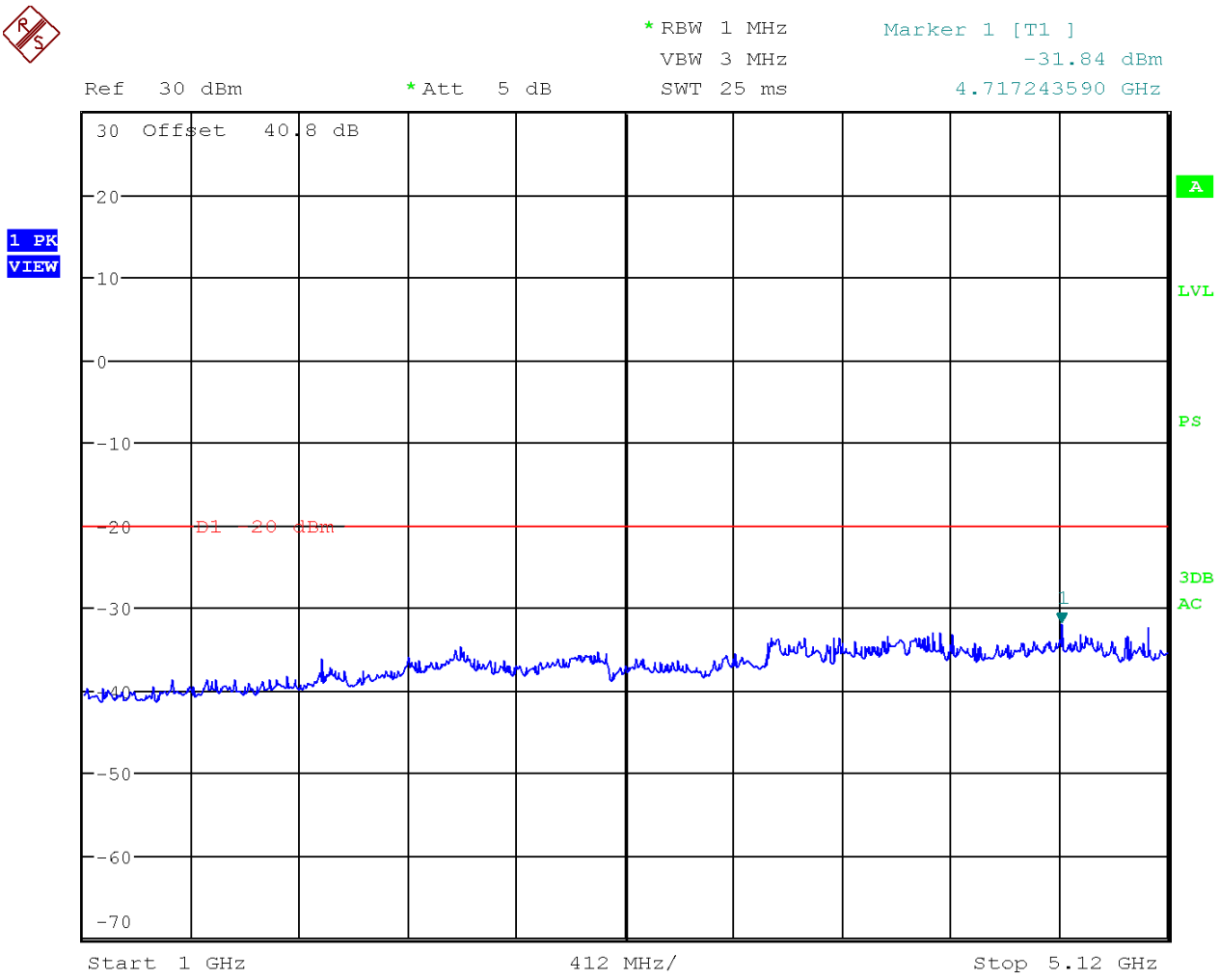


Date: 22.FEB.2021 18:11:03

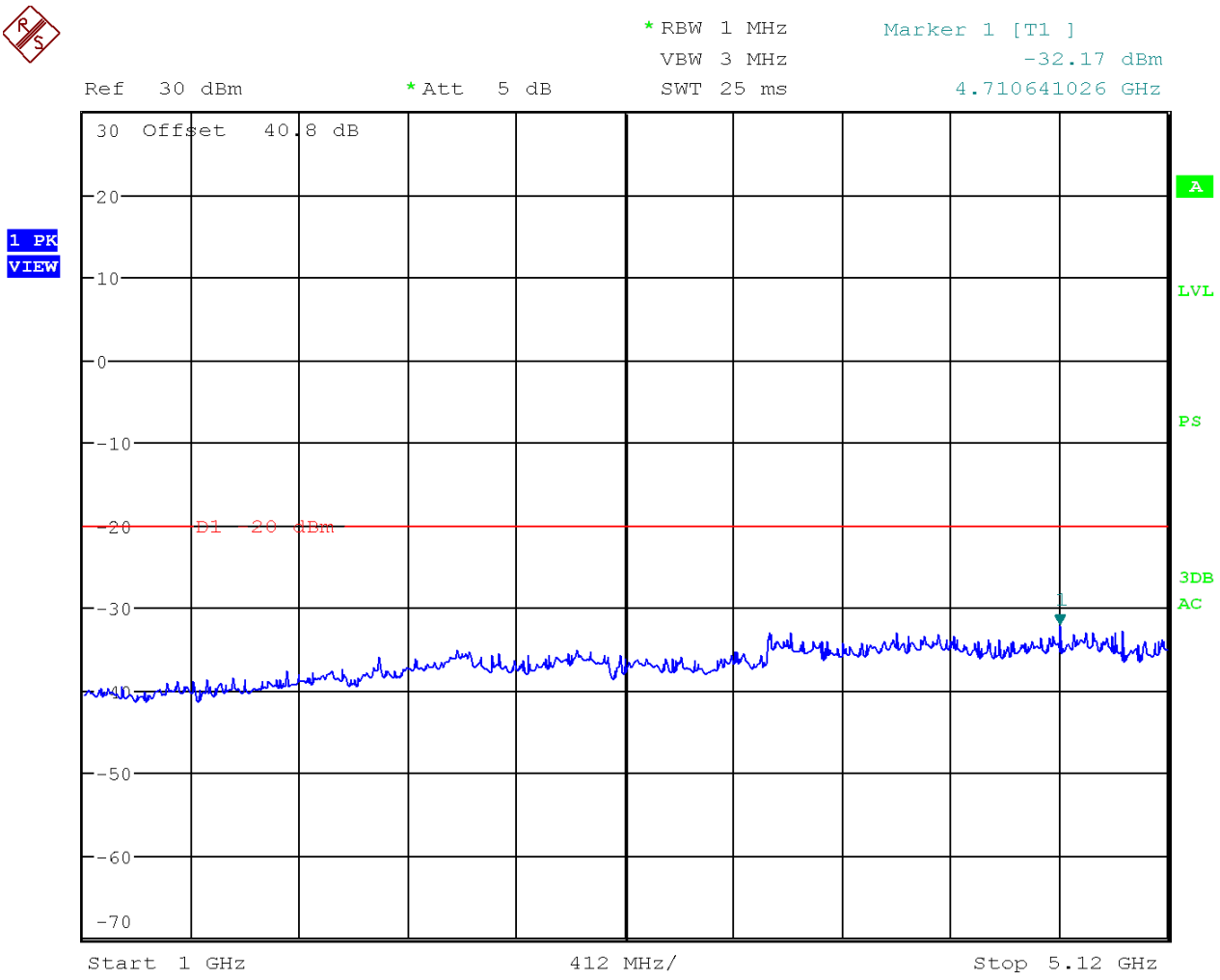
8.8.2 1 GHz to 10th Harmonic, VHF Band Uplink



Date: 22.FEB.2021 18:14:06

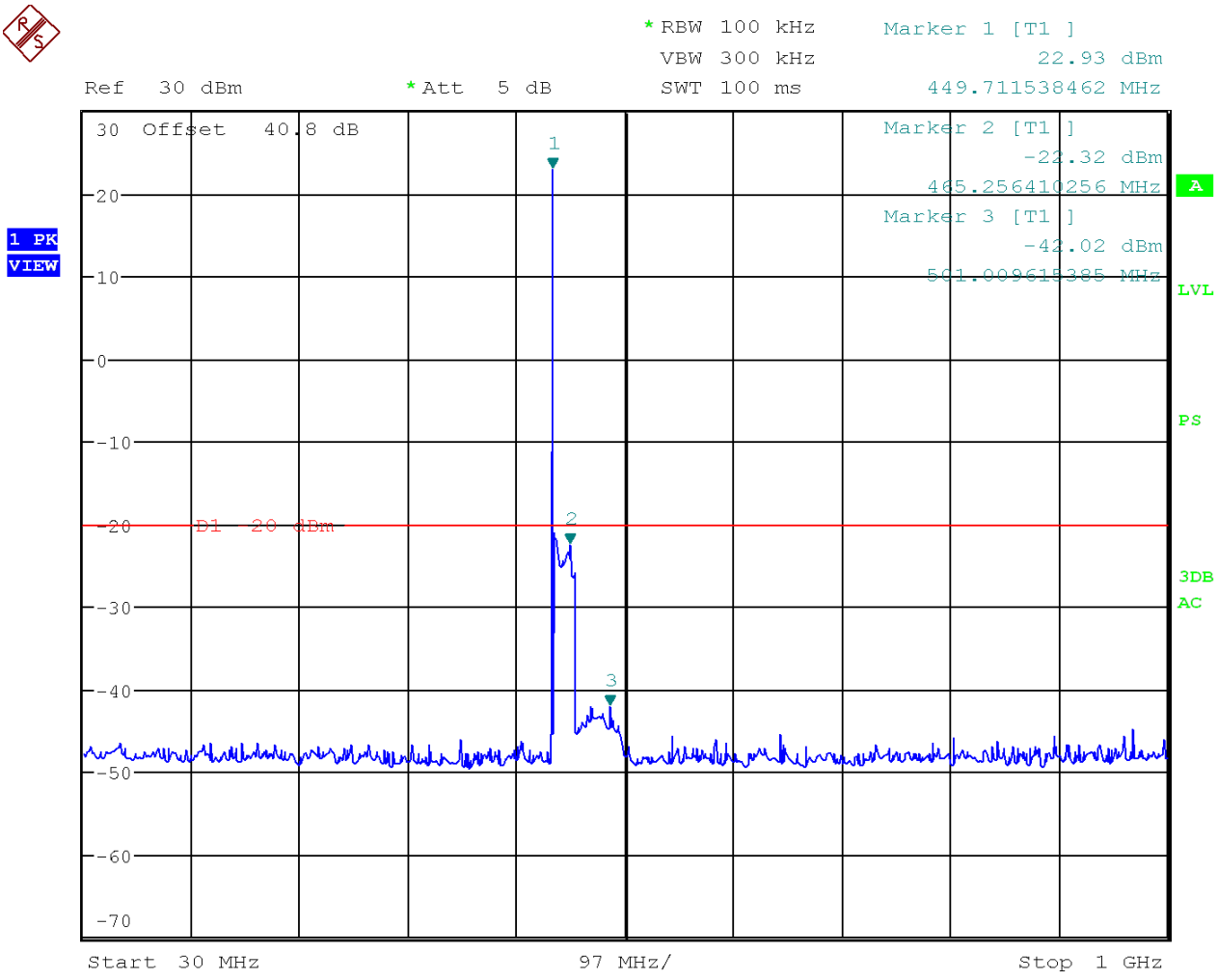


Date: 22.FEB.2021 18:14:38

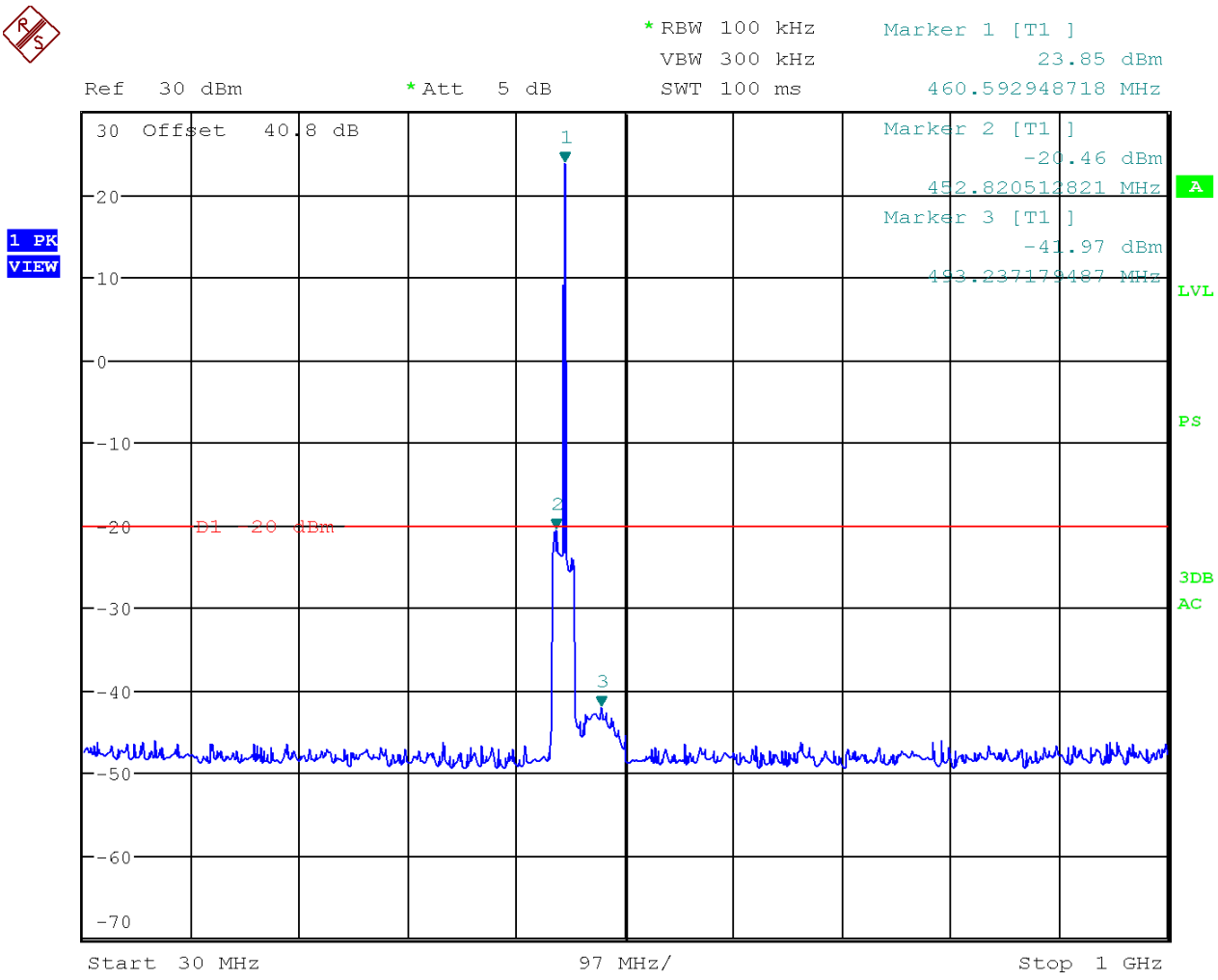


Date: 22.FEB.2021 18:14:59

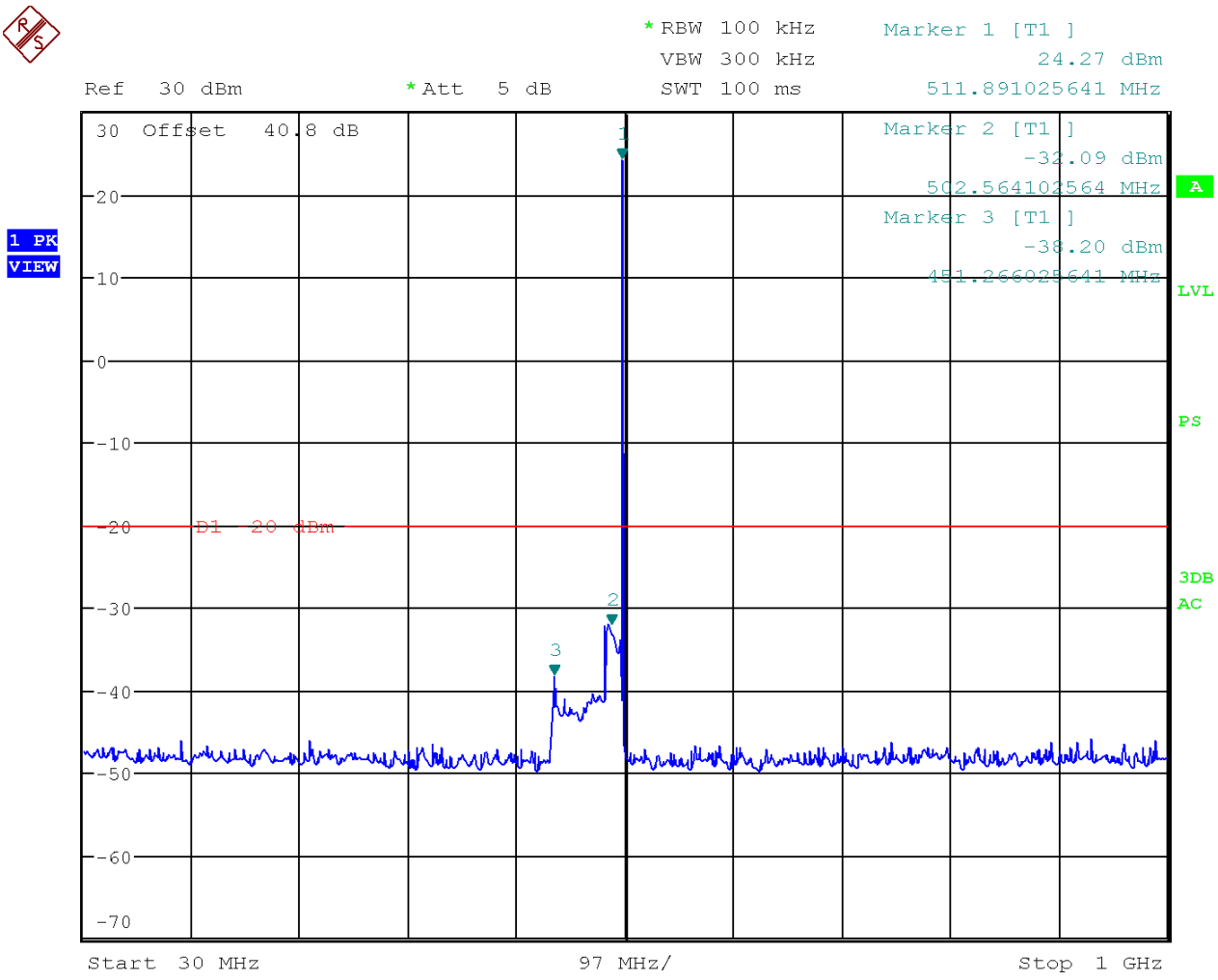
8.8.3 30 MHz to 1 GHz, UHF Band Uplink



Date: 22.FEB.2021 13:44:24

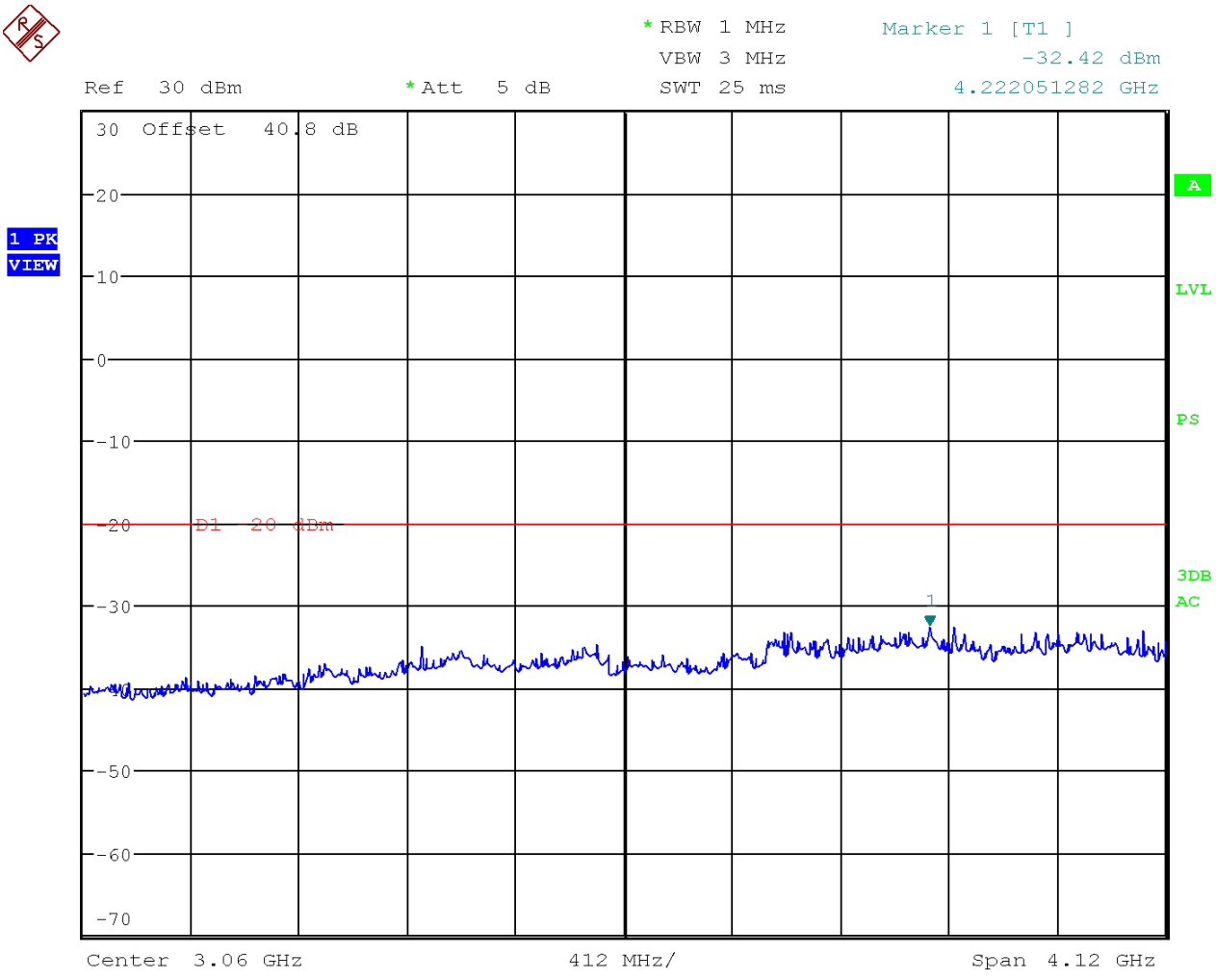


Date: 22.FEB.2021 13:40:51

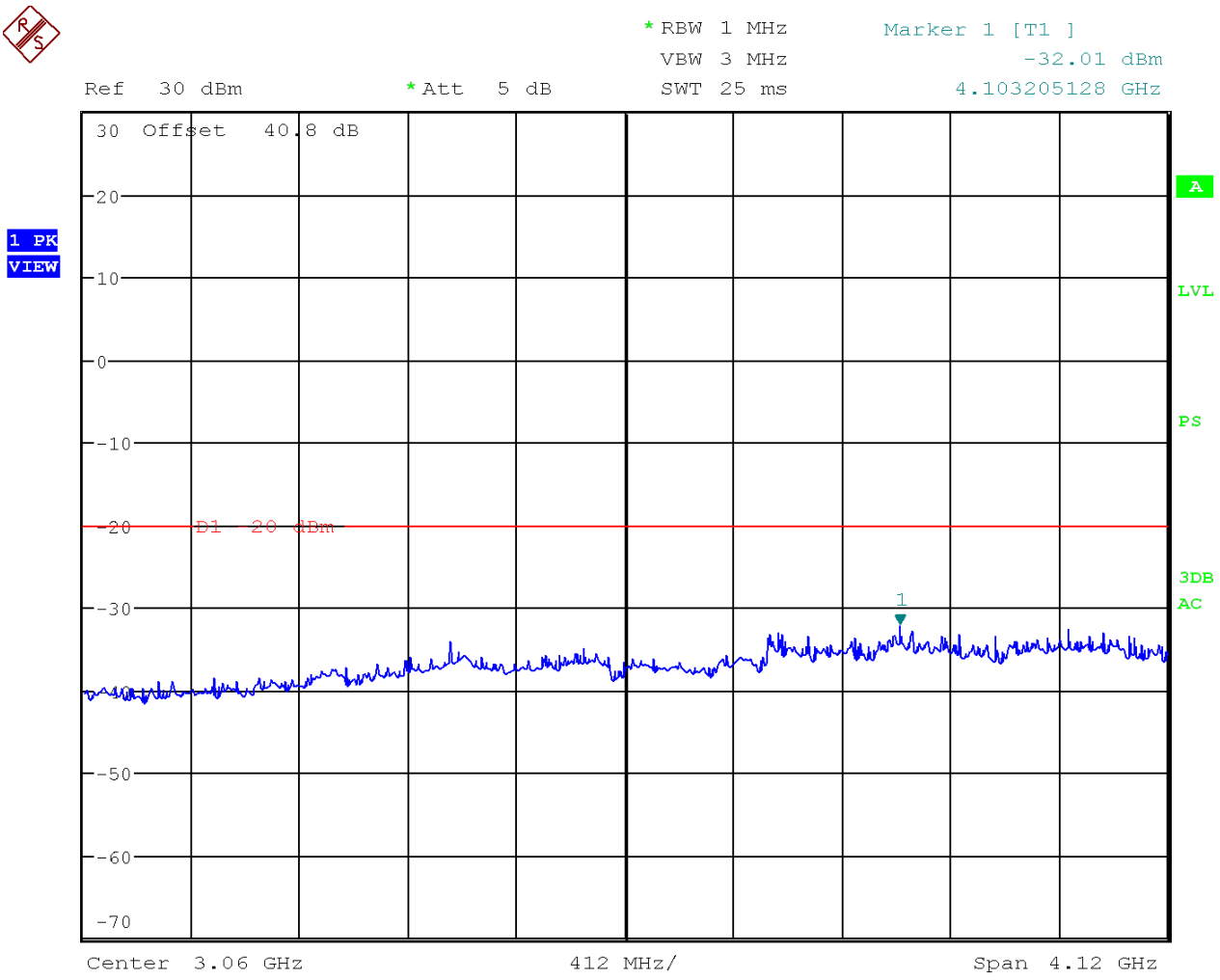


Date: 24.FEB.2021 13:49:07

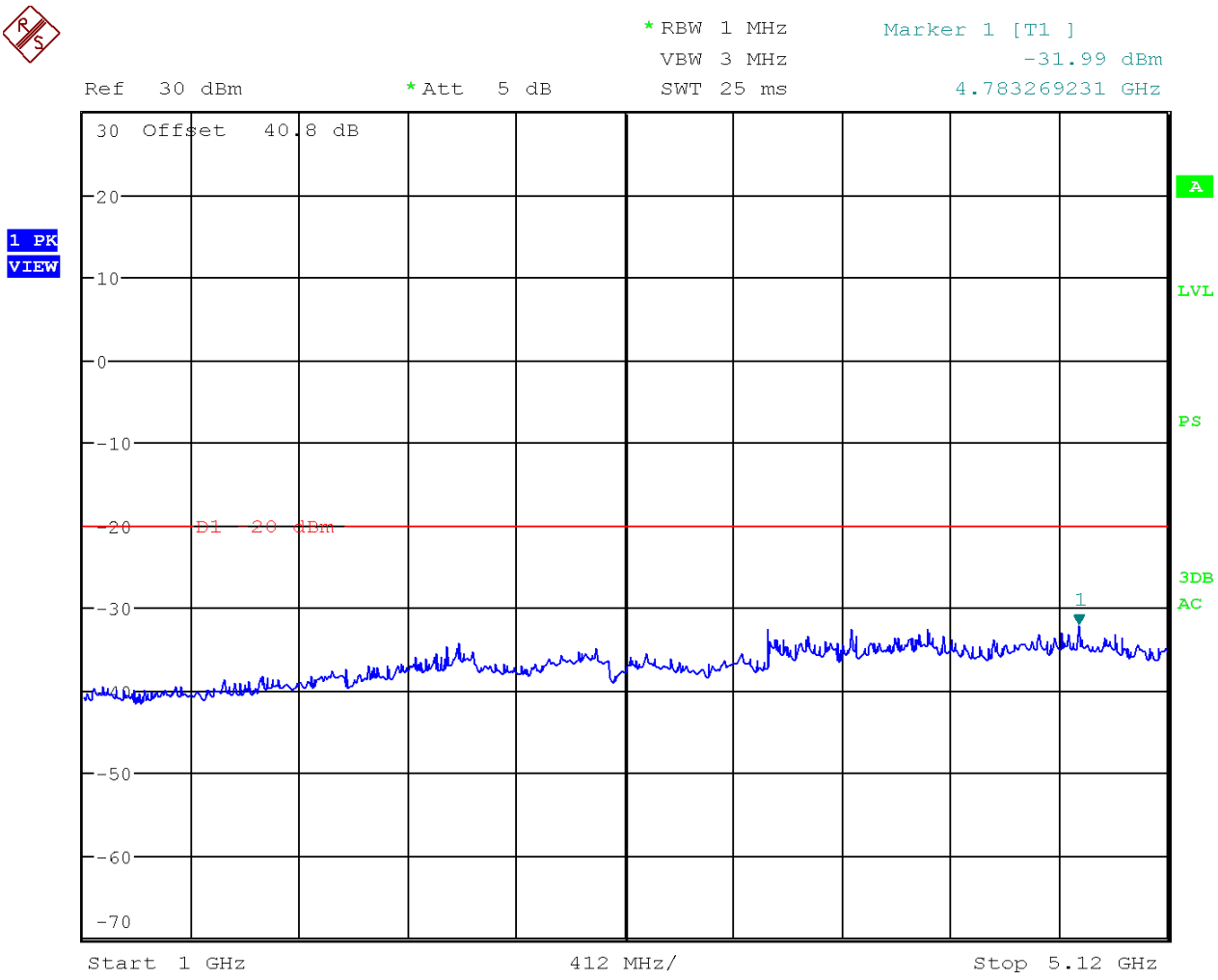
8.8.4 1 GHz to 10th Harmonic, UHF Band Uplink



Date: 22.FEB.2021 13:42:41



Date: 22.FEB.2021 13:41:43

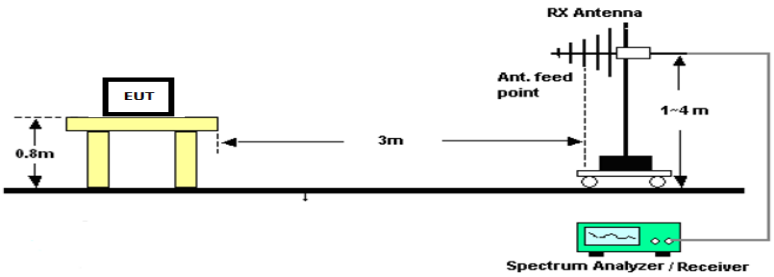


Date: 24.FEB.2021 13:48:05

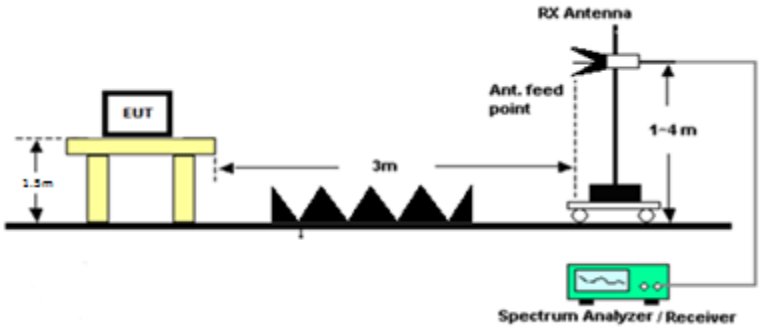
8.9 Spurious Radiated Emissions

Limits from FCC Parts 2.1053, 90.210 and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

Radiated Test Setup, 30 – 1000 MHz



Radiated Test Setup, Above 1000 MHz



Radiated Emissions, Tabular Data, VHF Band

8.9.1 VHF Uplink

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBm)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
162.10	56.43	PK	20.58	V	0.88	8.87	3.00	30.33	-67.05	-20.00	47.05
162.10	189.02	PK	18.28	V	1.59	13.70	3.00	33.57	-63.81	-20.00	43.81
162.10	75.77	PK	25.37	H	1.04	7.23	3.00	33.64	-63.73	-20.00	43.73
162.10	128.62	PK	24.52	H	1.28	12.69	3.00	38.49	-58.89	-20.00	38.89
162.10	229.81	PK	19.27	H	1.74	10.30	3.00	31.31	-66.07	-20.00	46.07
162.10	290.39	PK	16.29	V	2.08	13.19	3.00	31.56	-65.82	-20.00	45.82
162.10	324.20	PK	11.37	H	2.09	13.73	3.00	27.19	-70.19	-20.00	50.19
162.10	324.20	PK	12.41	V	2.09	13.73	3.00	28.23	-69.15	-20.00	49.15
162.10	486.30	PK	17.07	H	2.61	16.80	3.00	36.48	-60.90	-20.00	40.90
162.10	486.30	PK	12.45	V	2.61	16.80	3.00	31.86	-65.52	-20.00	45.52
162.10	648.40	PK	3.31	H	2.96	19.70	3.00	25.97	-71.41	-20.00	51.41
162.10	648.40	PK	5.20	V	2.96	19.70	3.00	27.86	-69.52	-20.00	49.52
162.10	810.50	PK	6.93	H	3.38	20.41	3.00	30.72	-66.66	-20.00	46.66
162.10	810.50	PK	3.93	V	3.38	20.41	3.00	27.72	-69.66	-20.00	49.66
162.10	972.60	PK	3.21	H	3.66	22.70	3.00	29.57	-67.81	-20.00	47.81
162.10	972.60	PK	5.31	V	3.66	22.70	3.00	31.67	-65.71	-20.00	45.71
162.10	1134.70	PK	22.69	H	3.90	27.29	3.00	53.87	-43.51	-20.00	23.51
162.10	1134.70	PK	22.72	V	3.90	27.29	3.00	53.90	-43.48	-20.00	23.48
162.10	1296.80	PK	21.89	H	4.17	28.66	3.00	54.72	-42.66	-20.00	22.66
162.10	1296.80	PK	22.63	V	4.17	28.66	3.00	55.46	-41.92	-20.00	21.92
162.10	1458.90	PK	19.67	H	4.38	28.02	3.00	52.08	-45.30	-20.00	25.30
162.10	1458.90	PK	19.33	V	4.38	28.02	3.00	51.74	-45.64	-20.00	25.64
162.10	1621.00	PK	17.41	H	4.69	28.30	3.00	50.40	-46.98	-20.00	26.98
162.10	1621.00	PK	19.24	V	4.69	28.30	3.00	52.23	-45.15	-20.00	25.15

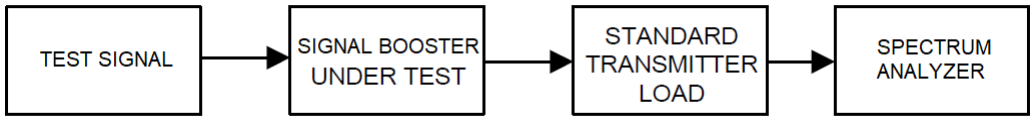
8.9.2 UHF Uplink

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBm)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
460.00	79.04	PK	25.61	V	1.07	8.21	3.00	34.89	-62.49	-20.00	42.49
460.00	128.35	PK	24.90	V	1.28	12.61	3.00	38.79	-58.59	-20.00	38.59
460.00	56.43	PK	20.07	H	0.88	8.87	3.00	29.82	-67.56	-20.00	47.56
460.00	134.34	PK	17.96	H	1.31	14.10	3.00	33.37	-64.00	-20.00	44.00
460.00	230.77	PK	19.93	H	1.74	10.32	3.00	31.99	-65.39	-20.00	45.39
460.00	289.74	PK	17.14	V	2.08	13.19	3.00	32.41	-64.96	-20.00	44.96
460.00	920.00	PK	6.76	H	3.58	22.30	3.00	32.64	-64.74	-20.00	44.74
460.00	920.00	PK	7.49	V	3.58	22.30	3.00	33.37	-64.01	-20.00	44.01
460.00	1380.00	PK	20.38	H	4.30	28.58	3.00	53.26	-44.11	-20.00	24.11
460.00	1380.00	PK	23.66	V	4.30	28.58	3.00	56.54	-40.83	-20.00	20.83
460.00	1840.00	PK	17.44	H	4.96	30.76	3.00	53.16	-44.21	-20.00	24.21
460.00	1840.00	PK	17.65	V	4.96	30.76	3.00	53.37	-44.00	-20.00	24.00
460.00	2300.00	PK	13.92	H	5.49	31.52	3.00	50.93	-46.45	-20.00	26.45
460.00	2300.00	PK	13.56	V	5.49	31.52	3.00	50.57	-46.81	-20.00	26.81
460.00	2760.00	PK	11.34	H	6.11	32.41	3.00	49.86	-47.51	-20.00	27.51
460.00	2760.00	PK	12.76	V	6.11	32.41	3.00	51.28	-46.09	-20.00	26.09
460.00	3220.00	PK	10.51	H	6.63	32.68	3.00	49.82	-47.56	-20.00	27.56
460.00	3220.00	PK	11.60	V	6.63	32.68	3.00	50.91	-46.47	-20.00	26.47
460.00	3680.00	PK	8.56	H	6.62	33.19	3.00	48.38	-49.00	-20.00	29.00
460.00	3680.00	PK	10.47	V	6.62	33.19	3.00	50.29	-47.09	-20.00	27.09
460.00	4140.00	PK	7.59	H	7.04	33.42	3.00	48.05	-49.33	-20.00	29.33
460.00	4140.00	PK	7.75	V	7.04	33.42	3.00	48.21	-49.17	-20.00	29.17
460.00	4600.00	PK	7.48	H	7.55	34.06	3.00	49.08	-48.29	-20.00	28.29
460.00	4600.00	PK	7.13	V	7.55	34.06	3.00	48.73	-48.64	-20.00	28.64

8.10 Modulation Characteristics

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

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

Test Setup


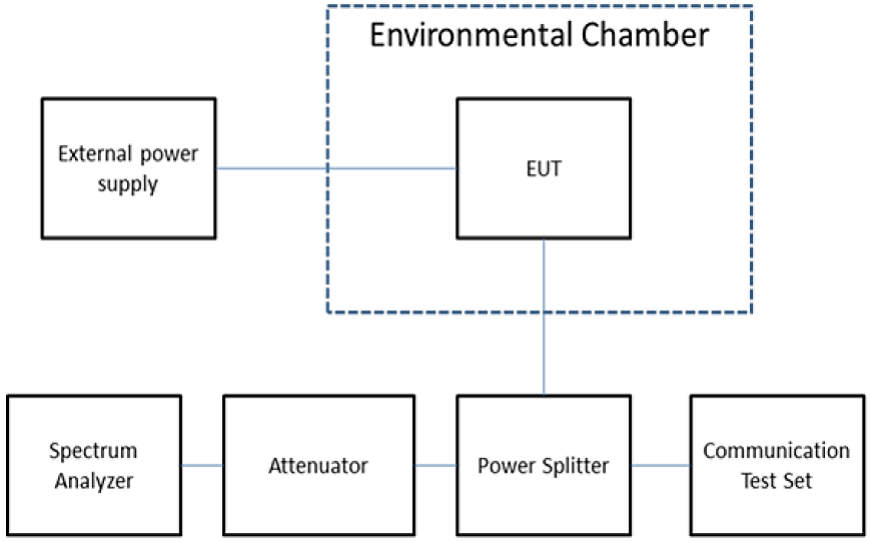
N/A. The EUT does not have any means to modulate the incoming signal.

8.11Frequency Stability

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

Limits from FCC Parts 2.1055, 90.213 (a); and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

Test Setup



Test Results, Mode 1		
Tuned Frequency (MHz)	Max Deviation (ppm)	Limit (ppm)
n/a	n/a	n/a

N/A. The EUT does not alter the input signal in any way.

8.12 Transient Frequency Behavior

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

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

N/A. The EUT does not "key-on" or "key off", and instead transmits indefinitely.

8.13 Adjacent channel power limits

Referenced from test report "TR_0713-21_FCC_PT90_Booster Class B_1.docx".

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

N/A. Testing Not Applicable.

9. 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. Test Setup Photographs

Test setup photographs are located in a separate supplementary document labelled TEST SETUP PHOTOS.

11. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_0717-21_FCC_PT90_Booster Class A_1	1	Initial release	February 23, 2021
TR_0717-21_FCC_PT90_Booster Class A_2	2	Corrected Power at the Final Amplifier	March 18, 2021

END OF TEST REPORT