



An IIA Company

# Test Report - FCC PART 90 Booster Class B (B9B)

## Applicant: Fiplex Communications Inc.

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager

Date of Signature 11/17/2023

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## 1. Applicant Information

**Applicant:** Fiplex Communications Inc.  
**Address:** 2101 NW 79th Avenue  
Miami, Florida, 33122, United States

### 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.

The EUT does not function with typical AGC mode.

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.

| 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 <sup>1</sup>          |
| 90.219 (d)(6)(ii)                         | ERP of noise within the passband                         | n/a <sup>1</sup>          |
| 90.219 (d)(6)(iii)                        | ERP of noise on spectrum < 1 MHz outside of the passband | n/a <sup>1</sup>          |
| 90.219 (d)(3)(i), (e)(1)                  | ERP of Radiated Power                                    | n/a <sup>1</sup>          |
| 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                            | Pass                      |

**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 |

## 2. Location of Testing

### 2.1 Test Laboratory

Timco Engineering Inc. is a subsidiary of Industrial Inspection & Analysis, Inc. ("IIA"). Testing was performed at IIA's permanent laboratory located at 13146 NW 86<sup>th</sup> Drive, Suite 400, Alachua, Florida 32615.

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: 10/15/2023 – 11/1/2023

Signature:



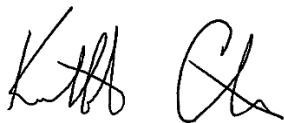
Sr. EMC Engineer  
EMC-003838-NE



Name & Title: Tim Royer, EMC Engineer

Date of Signature 11/17/2023

Signature:



Name & Title: Kristoffer Costa, EMC Technician

Date of Signature 11/17/2023

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

The test sample was received: 9/29/2023

#### 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:           | P3TDH440-1B                                |
| Brief Description | UHF Single Carrier Class B Amplifier (SCA) |
| Model(s) #        | DHS440                                     |
| Firmware version  | N/A                                        |
| Software version  | V1.5                                       |
| Serial Number     | N/A                                        |

| Technical Characteristics    |                                                                                 |
|------------------------------|---------------------------------------------------------------------------------|
| Frequency Range              | 453 MHz- 512 MHz                                                                |
| RF O/P Power (Max.)          | 38.35 dBm/ 6.83W                                                                |
| Modulation                   | FM                                                                              |
| Bandwidth & Emission Class   | 4K04F3E, 7K86F3E, 12K3F3E, 8K06F1D, 8K06F1E, 8K02F1W, 9K63F1D, 9K63F1E, 9K63D7W |
| Number of Channels           | N/A                                                                             |
| Duty Cycle                   | 100%                                                                            |
| Antenna Connector            | N Type                                                                          |
| Voltage Rating (AC or Batt.) | 110 VAC                                                                         |

| Antenna Characteristics |                 |           |              |
|-------------------------|-----------------|-----------|--------------|
| Antenna                 | Frequency Range | Mode / BW | Antenna Gain |
| 1                       | n/a             | n/a       | 0 dBi        |

- Note: Information such as antenna gain, firmware/software numbers are provided by the manufacturer and cannot be validated by the test lab.

### 3.3 Configuration of EUT

| Test Modes   |                |                        |
|--------------|----------------|------------------------|
| Band (MHz)   | Link Direction | Test Frequencies (MHz) |
| 453- 512 MHz | N/A            | 455 MHz                |
|              |                | 485 MHz                |
|              |                | 508 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 program 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                                                                                                                                                         | $\pm 3.14$ dB    |
| Radiated Emissions (9kHz – 30 MHz)                                                                                                                                          | $\pm 3.08$ dB    |
| Radiated Emissions (30 – 200 MHz)                                                                                                                                           | $\pm 2.16$ dB    |
| Radiated Emissions (200 – 1000 MHz)                                                                                                                                         | $\pm 2.15$ dB    |
| Radiated Emissions (1 GHz – 18 GHz)                                                                                                                                         | $\pm 2.14$ dB    |
| Radiated Emissions (18 GHz – 40 GHz)                                                                                                                                        | $\pm 2.31$ dB    |
| <b>Note:</b> 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:

| Parameter                                                                                                                       | Measurement |
|---------------------------------------------------------------------------------------------------------------------------------|-------------|
| Temperature                                                                                                                     | 23 C +/- 5% |
| Humidity                                                                                                                        | 55% +/- 5%  |
| Barometric Pressure                                                                                                             | 30.05 in Hg |
| <b>Note:</b> 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    |
| Antenna          | Biconical 1057                | Eaton           | 94455-1     | 1057        | 10/16/20    | 10/16/2023 |
| Antenna, NSA     | Log-Periodic 1243             | Eaton           | 96005       | 1243        | 5/4/21      | 5/3/2024   |
| Antenna          | Double-Ridged Horn/ETS Horn 1 | ETS-Lindgren    | 3117        | 00035923    | 5/31/23     | 5/30/2026  |
| CHAMBER          | CHAMBER                       | Panashield      | 3M          | N/A         | 3/12/19     | 12/21/2023 |
| Pre-amp          | Pre-amp                       | RF-LAMBDA       | RLNA00M45GA | NA          | 2/27/19     | 7/26/2025  |
| Receiver         | EMI Test Receiver R&S ESU 40  | Rohde & Schwarz | ESU 40      | 100320      | 5/27/21     | 5/26/2024  |
| Receiver         | EMI Test Receiver R&S ESW44   | Rohde & Schwarz | ESW44       | 103049      | 10/13/21    | 10/12/2024 |
| Signal Generator | Signal Generator HP 8648C     | HP              | 8648C       | 35537A01679 | 3/29/19     | 8/03/2025  |

| Software       |                 |                          |               |
|----------------|-----------------|--------------------------|---------------|
| Software       | Author          | Version                  | Validation on |
| ESU Firmware   | Rohde & Schwarz | 4.43 SP3; BIOS v5.1-24-3 | 2018          |
| RSCommander    | Rohde & Schwarz | 1.6.4                    | 2014          |
| ScopeExplorer  | LeCroy          | v2.25.0.0                | 2009          |
| Field Strength | Timco           | v4.10.7.0                | 2016          |

## 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 $\mu$ 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 $\mu$ 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 $\mu$ 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.

### Example:

| Freq (MHz) | Meter Reading | + ACF        | +CL      | = FS                     |
|------------|---------------|--------------|----------|--------------------------|
| 33         | 20 dB $\mu$ V | + 10.36 dB/m | +0.40 dB | =30.36 dB $\mu$ V/m @ 3m |

$$\text{EIRP} = \text{Pcond (dBm)} + \text{dBi}$$

## 8.1 Power at the Final Amplifier

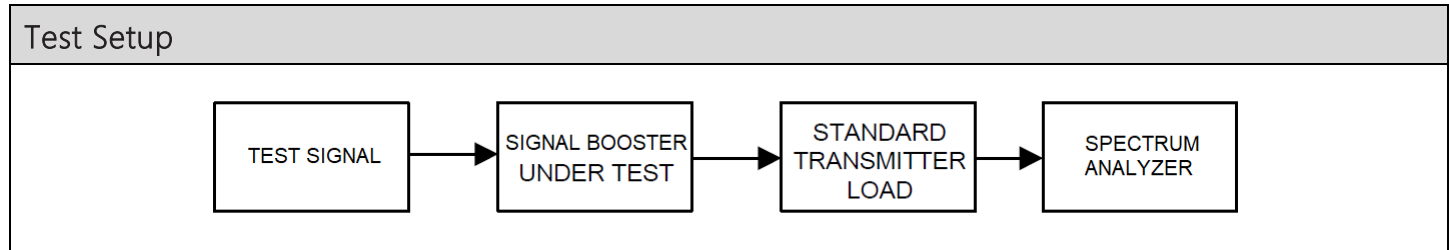
Limits from FCC Part 2.1033 (c)(8).

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 (W) |
| 24                        | 3.33            | 79.92                            |

## 8.2 RF Output Power & Gain

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 Results, Power Output |                        |                      |
|----------------------------|------------------------|----------------------|
| Link Direction             | Max Power Output (dBm) | Max Power Output (W) |
| N/A                        | 38.35                  | 6.83                 |

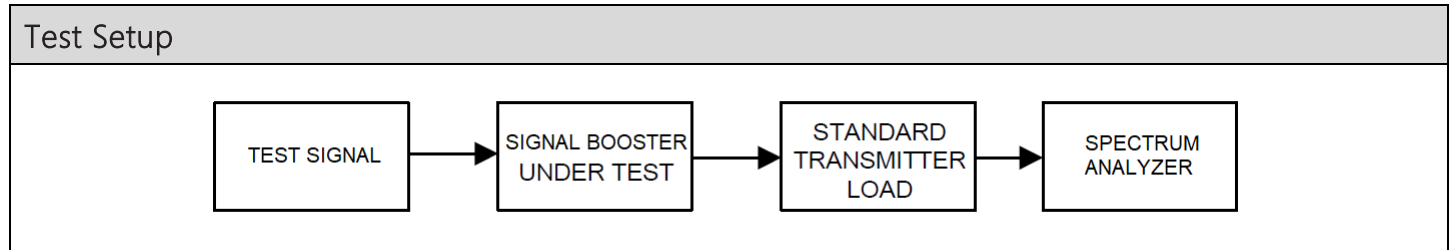
## Gain

| Test Results, Gain |                       |             |                   |                    |           |
|--------------------|-----------------------|-------------|-------------------|--------------------|-----------|
| Link Direction     | Tuned Frequency (MHz) | Input Level | Power Input (dBm) | Power Output (dBm) | Gain (dB) |
| N/A                | 455                   | AGC         | -87.1             | 38.28              | 125.38    |
|                    | 485                   | AGC         | -87.1             | 38.35              | 125.45    |
|                    | 508                   | AGC         | -87.1             | 38.03              | 125.13    |

6dB adjustment from splitter included in calculation

### 8.3 Out-of-band Rejection

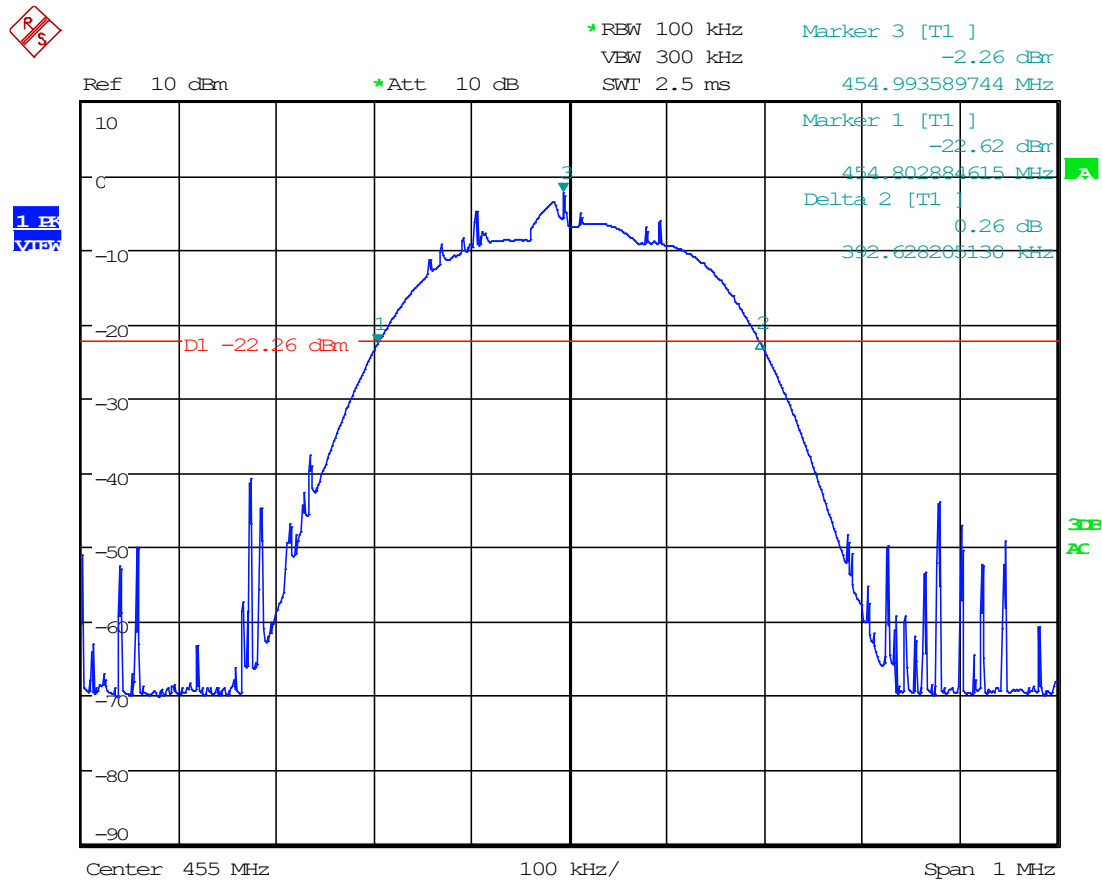
Limits and test method from FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.



| Test Results, Out-of-band Rejection and Class of Operation |                |                |                    |
|------------------------------------------------------------|----------------|----------------|--------------------|
| Operating Band (MHz)                                       | Link Direction | Passband (kHz) | Class of Operation |
| 453- 512 MHz                                               | N/A            | > 75 kHz       | Class B            |

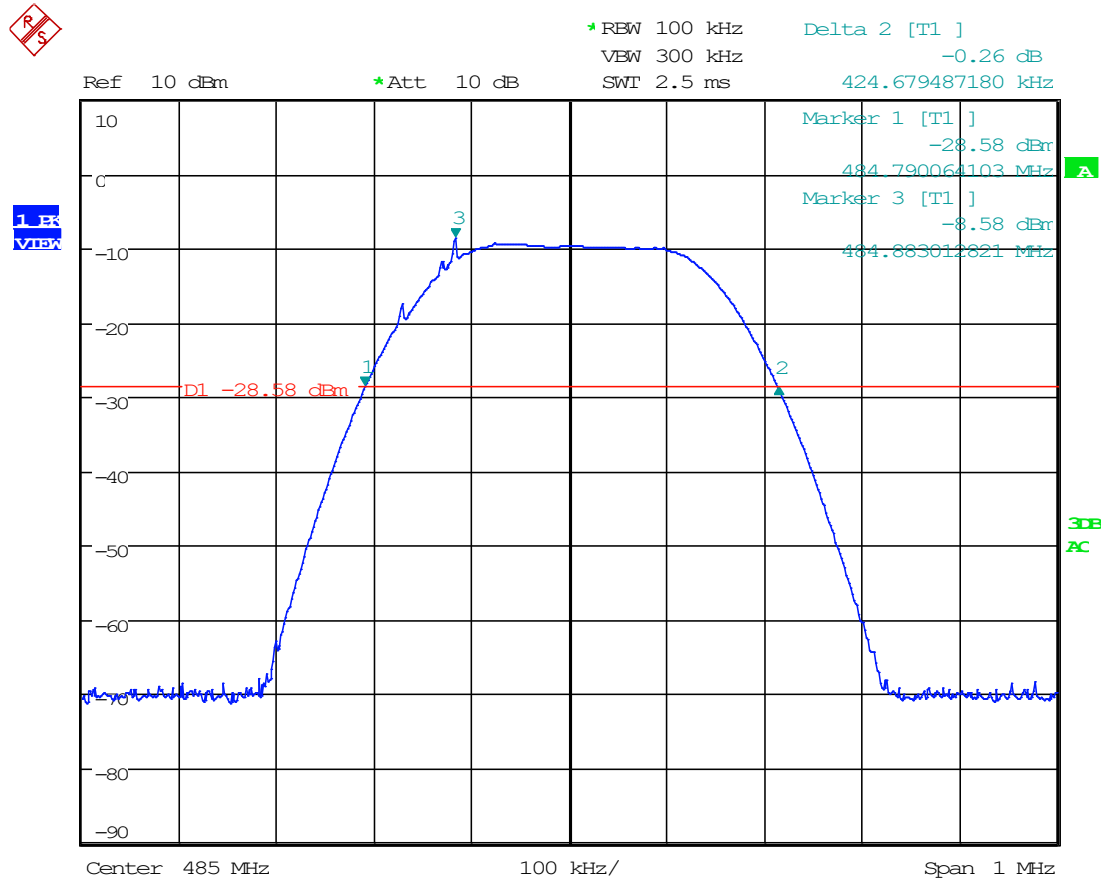
## Out-of-band Rejection, Spectrum Plots

### 8.3.1 Test Plot, 455 MHz, Class B



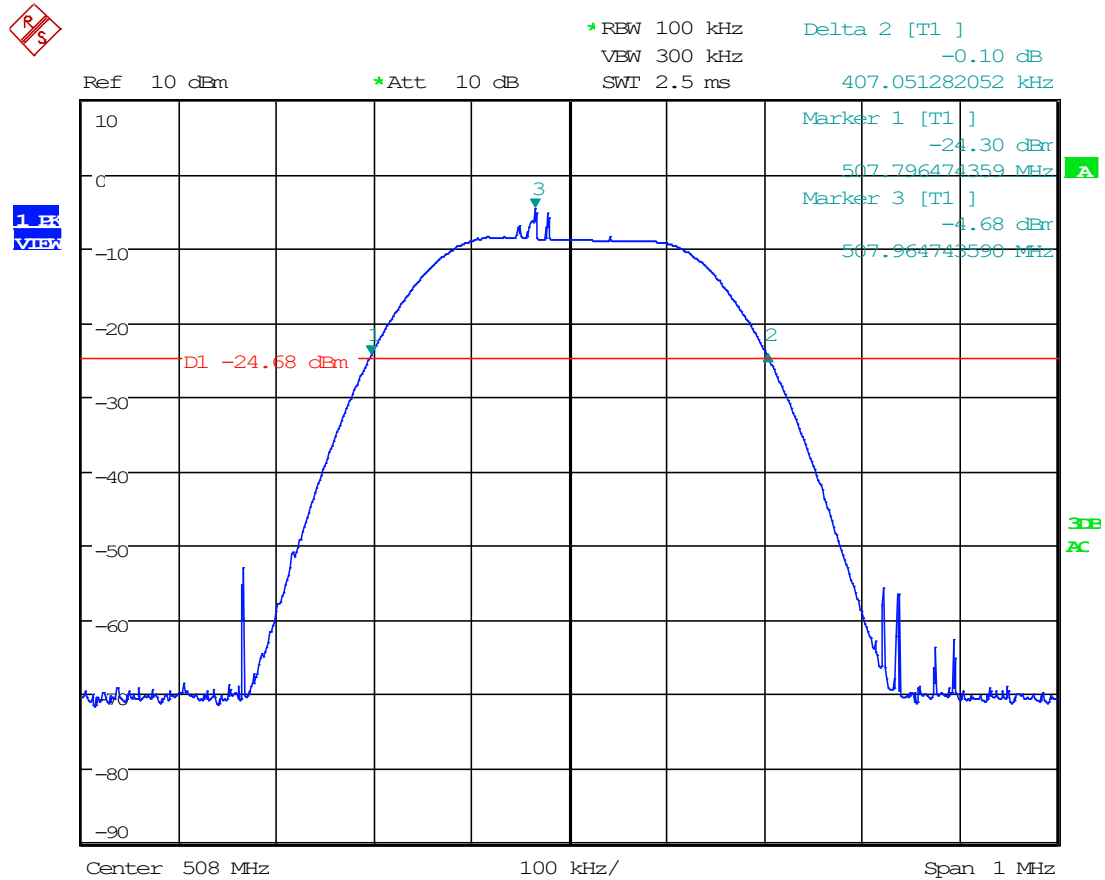
Date: 25.OCT.2023 16:11:27

### 8.3.2 Test Plot, 485 MHz, Class B



Date: 25.OCT.2023 16:14:45

### 8.3.3 Test Plot, 508 MHz, Class B



Date: 25.OCT.2023 16:16:29

## 8.4 Bandwidth & Emission

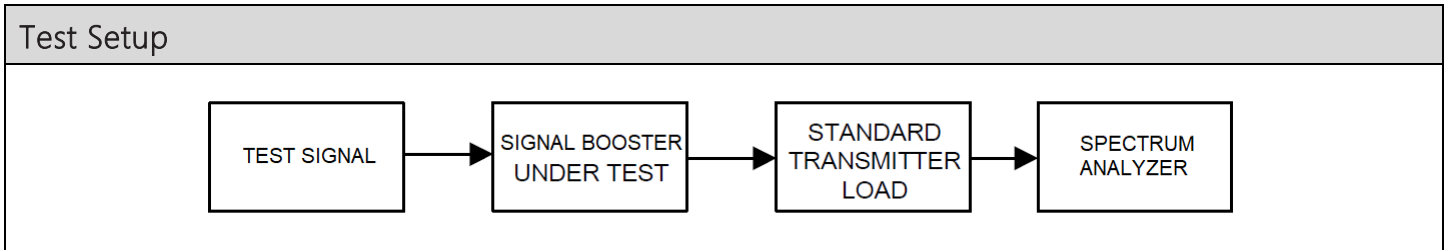
Limits from FCC Parts 90.209 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.

| Authorized Bandwidth |                 |                            |
|----------------------|-----------------|----------------------------|
| Rule Part            | Operating Range | Authorized Bandwidth (kHz) |
| Part 90              | 453- 512 MHz    | 6/11.25/20                 |

| Applicable Input Signals |                          |                                       |
|--------------------------|--------------------------|---------------------------------------|
| Signal                   | Occupied Bandwidth (kHz) | Representative Emission Designator(s) |
| CW                       | N/A                      | N/A                                   |
| 6.25 kHz FM              | 4.04                     | 4K04F3E                               |
| 12.5 kHz FM              | 7.86                     | 7K86F3E                               |
| 25 kHz FM                | 12.3                     | 12K3F3E                               |
| C4FM (P25 Phase I)       | 8.06                     | 8K06F1D, 8K06F1E                      |
| HCPM (P25 Phase II SU)   | 8.2                      | 8K02F1W                               |
| HDQPSK (P25 Phase II BS) | 9.63                     | 9K63F1D, 9K63F1E, 9K63D7W             |

## 8.5 Input VS Output Signal Comparison

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

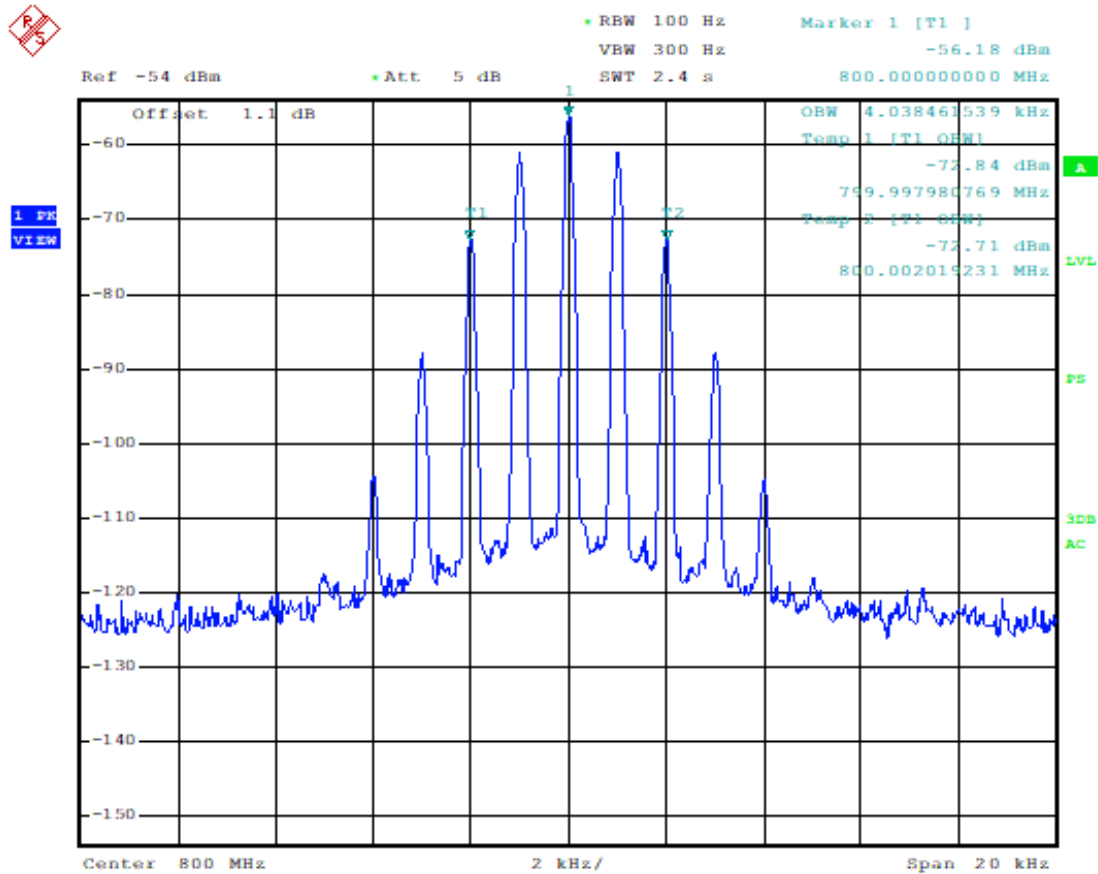


## Input VS Output Comparison

| Test Results, Input VS Output Comparison |                       |              |           |                        |                         |            |
|------------------------------------------|-----------------------|--------------|-----------|------------------------|-------------------------|------------|
| Link Direction                           | Tuned Frequency (MHz) | Input Signal | AGC Level | 99% OBW of Input (kHz) | 99% OBW of Output (kHz) | Change (%) |
| N/A                                      | 455 MHz               | 6.25 kHz FM  | @ AGC     | 4.038                  | 4.03                    | 0.008      |
|                                          |                       | 12.5 kHz FM  | @ AGC     | 6.21                   | 7.86                    | 1.65       |
|                                          |                       | 25 kHz FM    | @ AGC     | 10.21                  | 12.38                   | 2.17       |
|                                          |                       | C4FM         | @ AGC     | 7.71                   | 7.63                    | 0.08       |
|                                          |                       | HCPM         | @ AGC     | 7.71                   | 7.70                    | 0.01       |
|                                          |                       | HDQPSK       | @ AGC     | 9.91                   | 9.72                    | 0.190      |
| N/A                                      | 485 MHz               | 6.25 kHz FM  | @ AGC     | 4.038                  | 4.04                    | 0.002      |
|                                          |                       | 12.5 kHz FM  | @ AGC     | 6.21                   | 7.86                    | 1.65       |
|                                          |                       | 25 kHz FM    | @ AGC     | 10.21                  | 12.36                   | 2.15       |
|                                          |                       | C4FM         | @ AGC     | 7.71                   | 8.28                    | 0.57       |
|                                          |                       | HCPM         | @ AGC     | 7.71                   | 8.20                    | 0.49       |
|                                          |                       | HDQPSK       | @ AGC     | 9.91                   | 9.80                    | 0.11       |
| N/A                                      | 508 MHz               | 6.25 kHz FM  | @ AGC     | 4.038                  | 4.04                    | 0.002      |
|                                          |                       | 12.5 kHz FM  | @ AGC     | 6.21                   | 7.82                    | 1.61       |
|                                          |                       | 25 kHz FM    | @ AGC     | 10.21                  | 12.35                   | 2.14       |
|                                          |                       | C4FM         | @ AGC     | 7.71                   | 8.24                    | 0.53       |
|                                          |                       | HCPM         | @ AGC     | 7.71                   | 8.08                    | 0.37       |
|                                          |                       | HDQPSK       | @ AGC     | 9.91                   | 9.80                    | 0.11       |

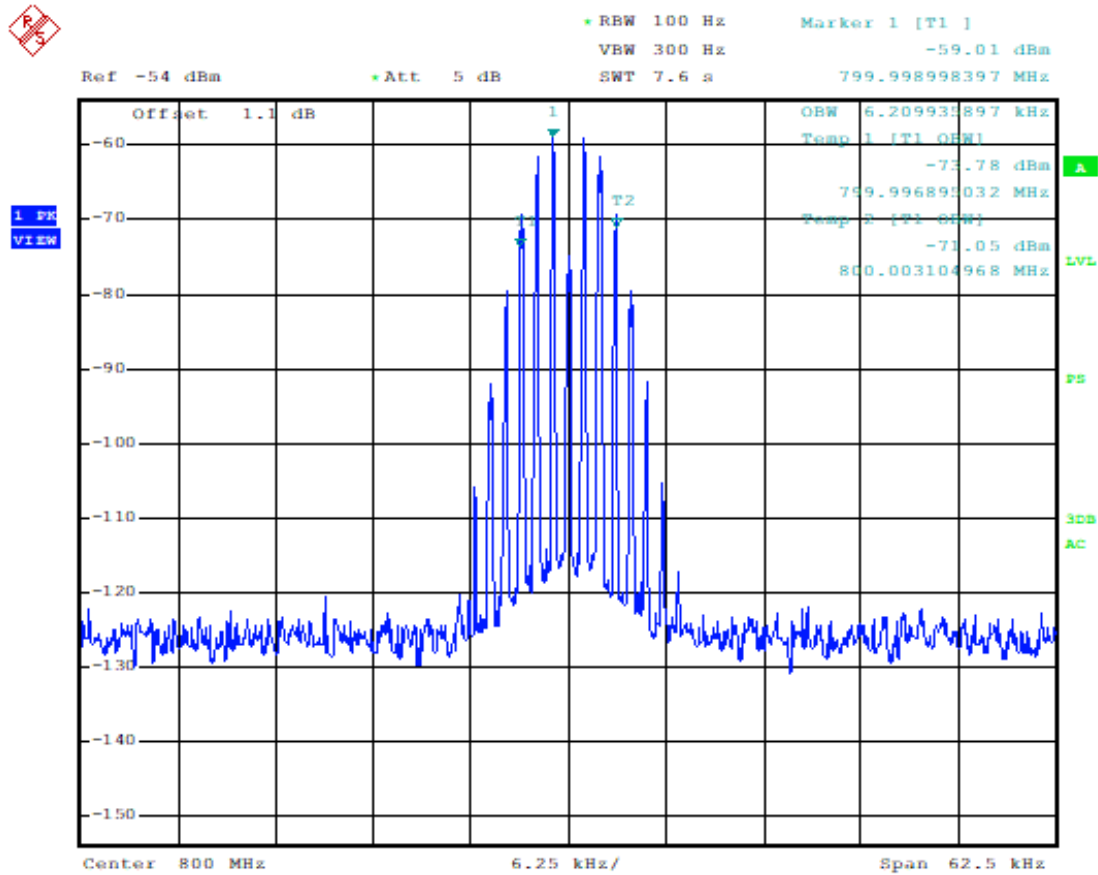
## Input VS Output, Input Spectrum Plots

### 8.5.1 6.25 kHz FM, Input Signal



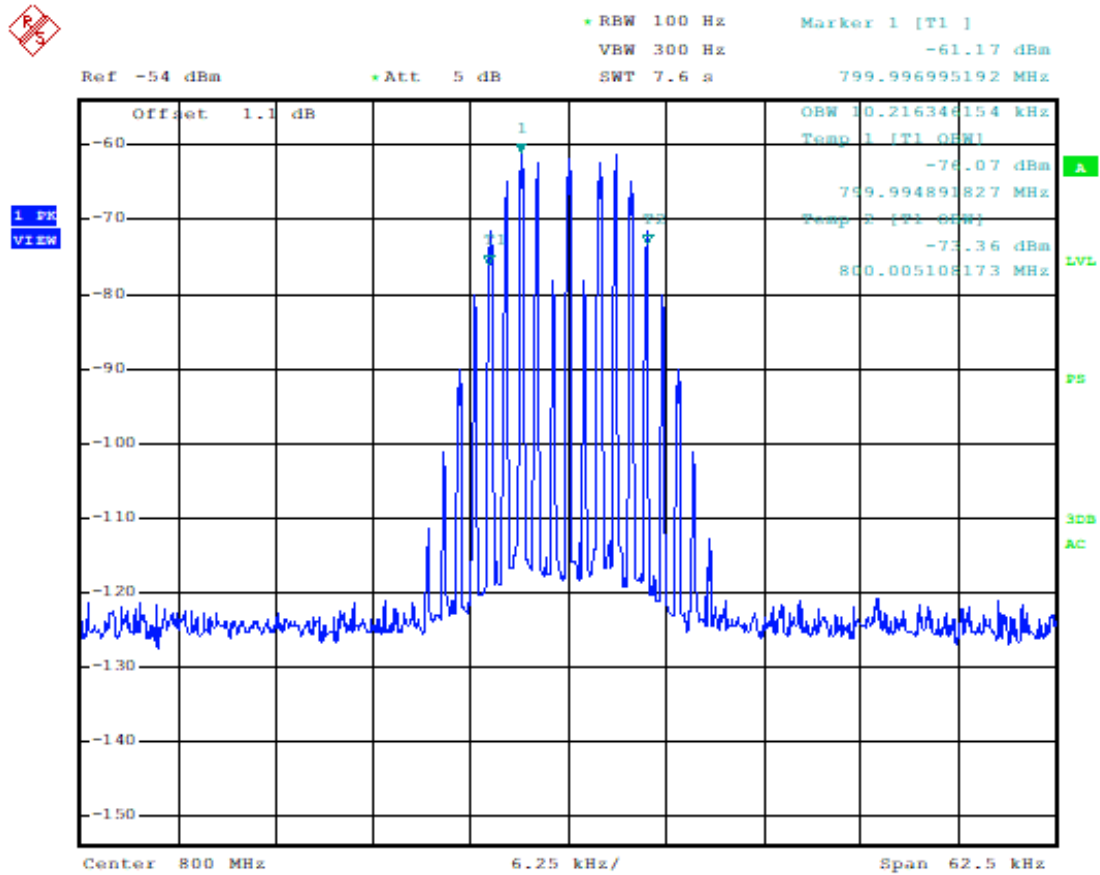
Date: 30.JAN.2019 13:10:11

## 8.5.2 12.5 kHz FM, Input Signal



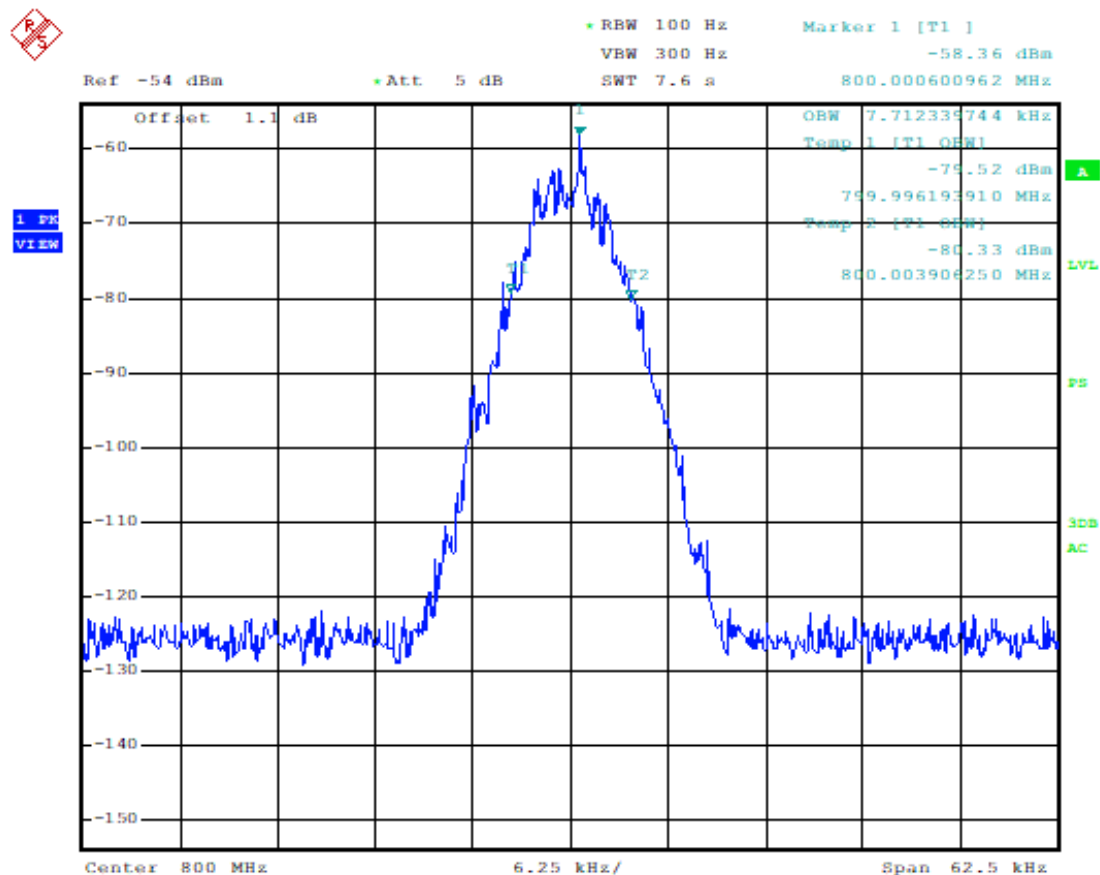
Date: 30.JAN.2019 14:19:45

### 8.5.3 25 kHz FM, Input Signal



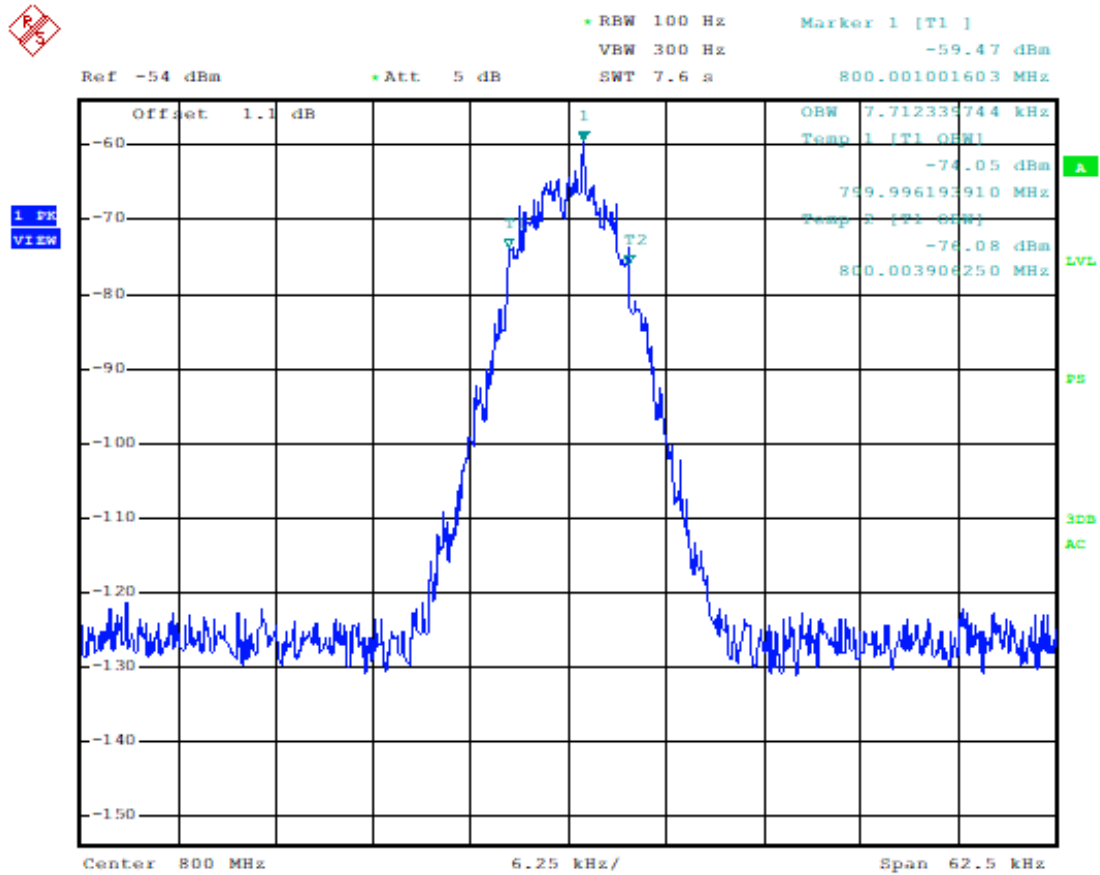
Date: 30.JAN.2019 14:23:14

## 8.5.4 C4FM, Input Signal



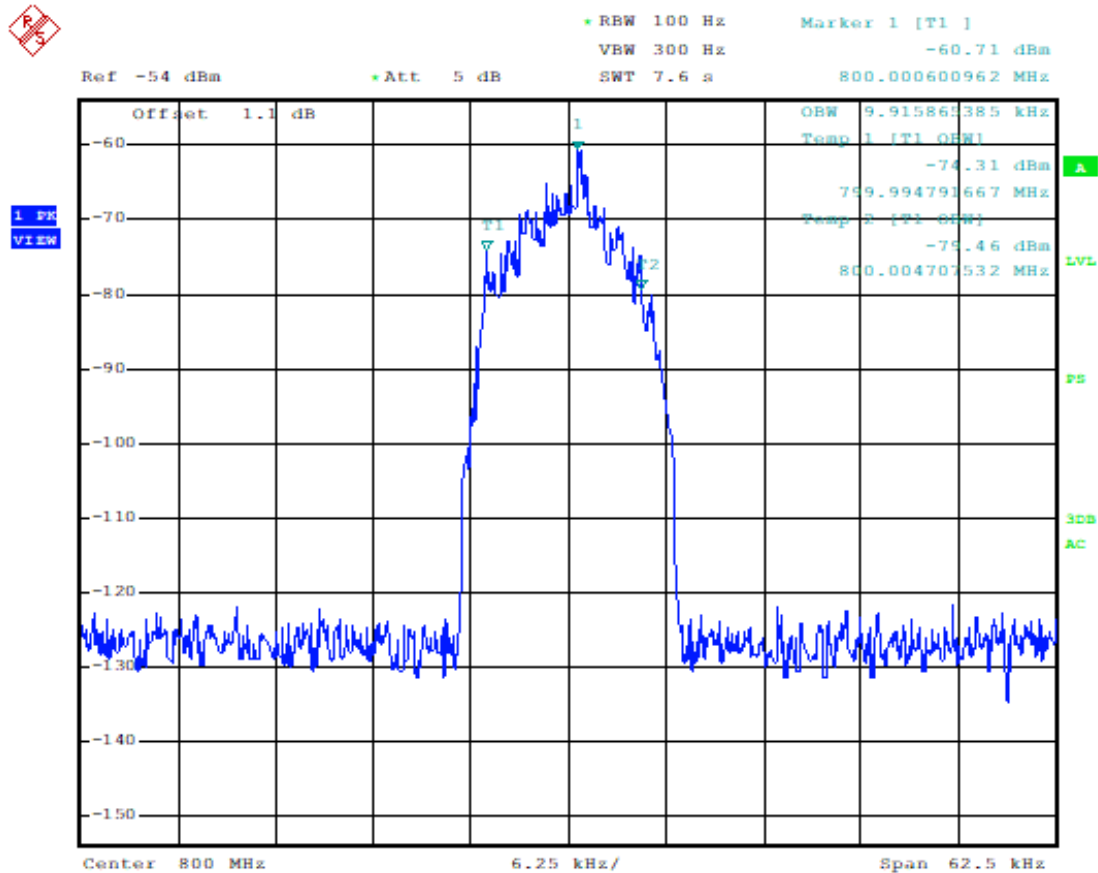
Date: 30.JAN.2019 14:28:58

## 8.5.5 H-CPM, Input Signal



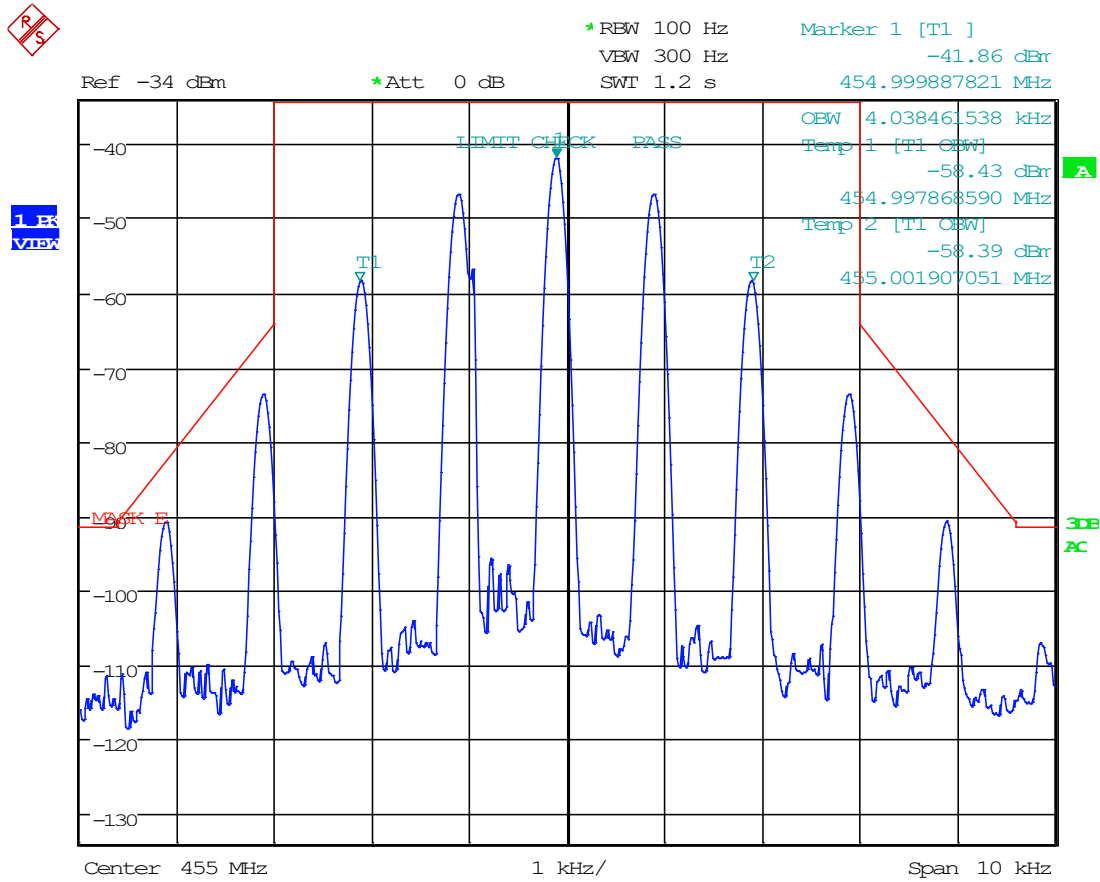
Date: 30.JAN.2019 14:30:47

## 8.5.6 H-DQPSK, Input Signal



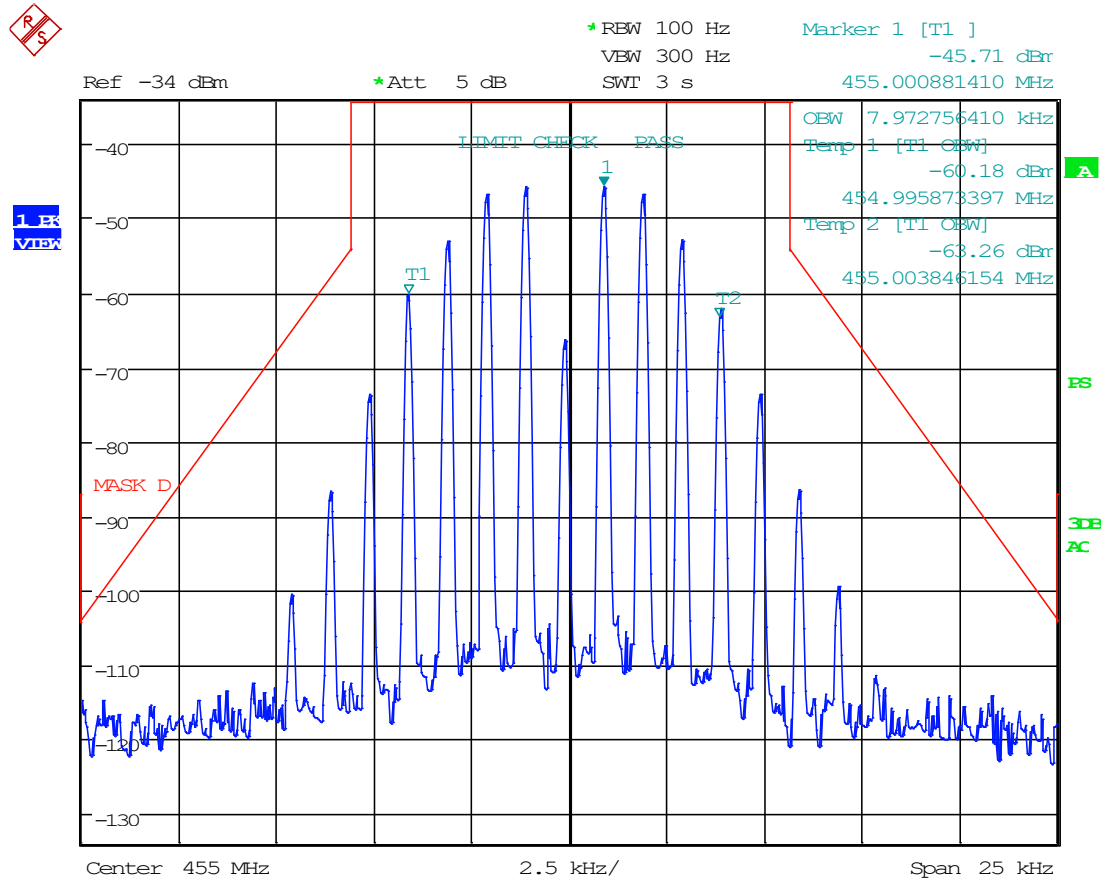
Date: 30.JAN.2019 14:32:35

### 8.5.7 6.25 kHz, FM, Mask E, AGC, 455 MHz



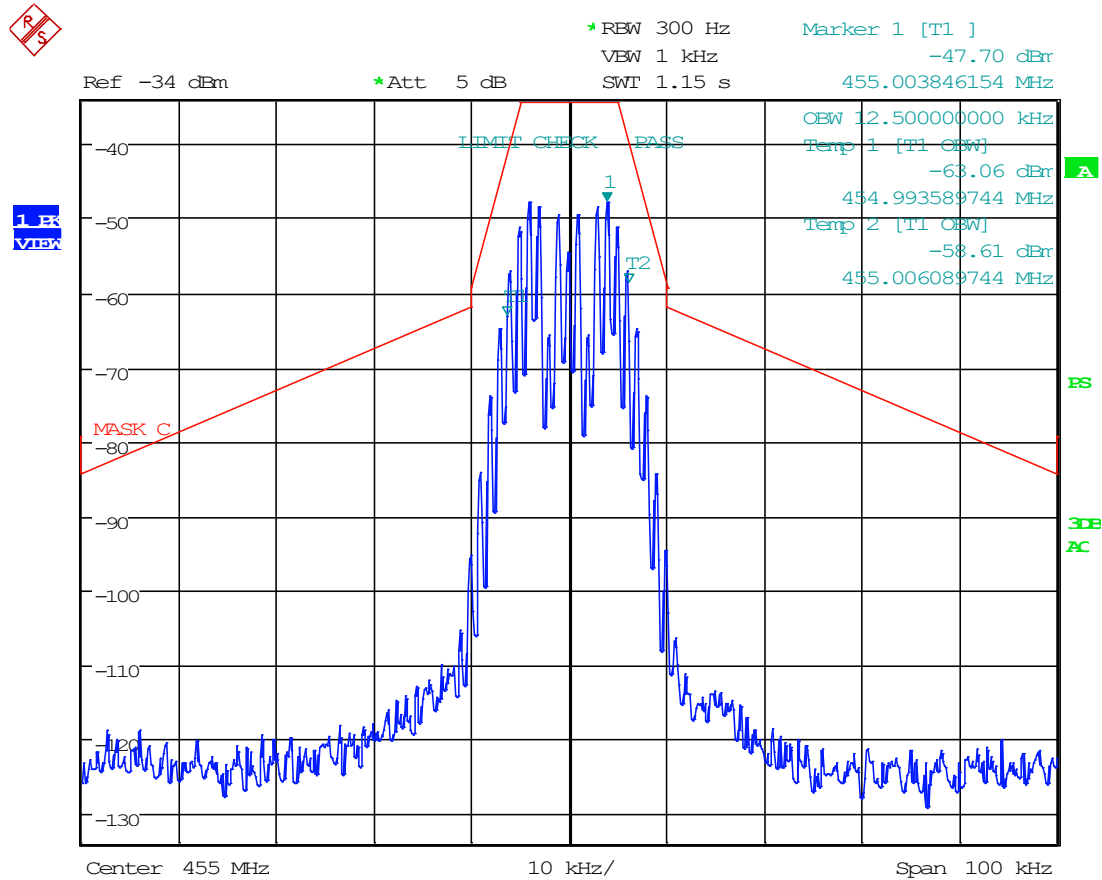
Date: 20.OCT.2023 12:48:55

## 8.5.8 12.5 kHz, FM, Mask D, AGC, 455 MHz



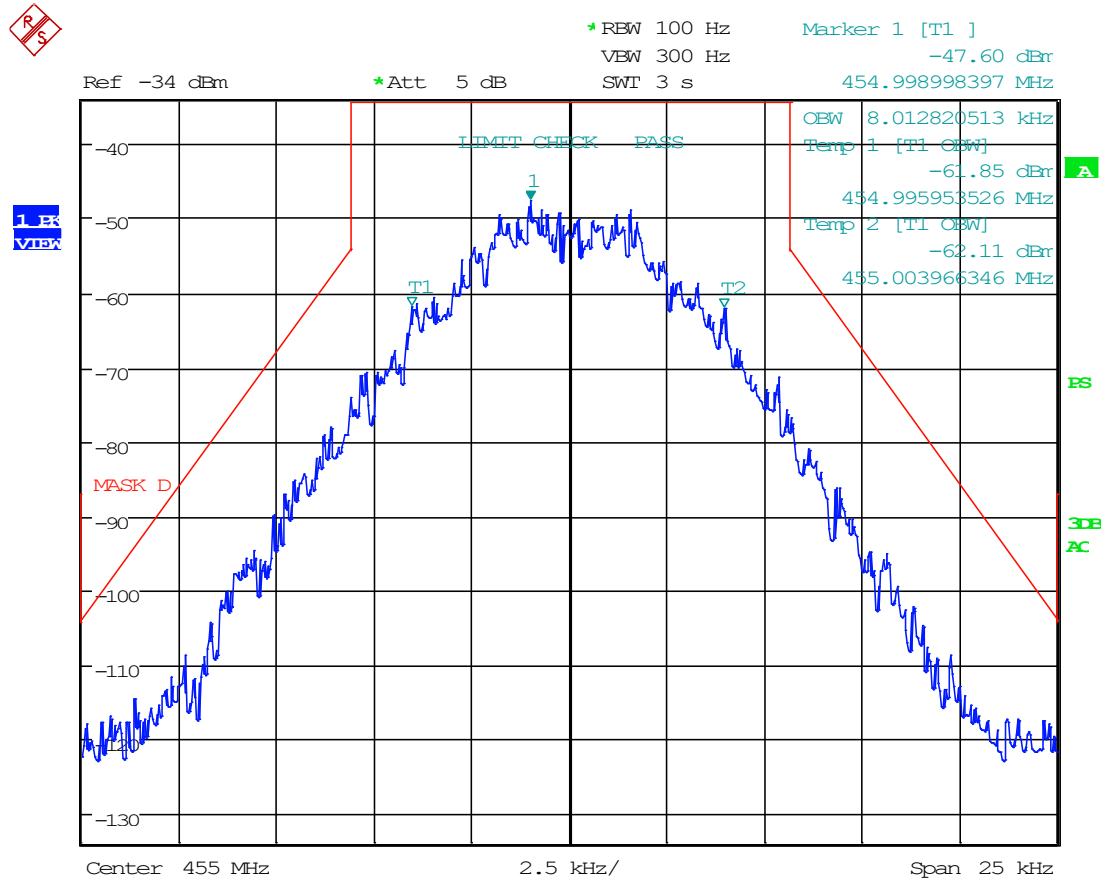
Date: 20.OCT.2023 12:44:58

### 8.5.9 25 kHz FM, Mask C, AGC, 455 MHz



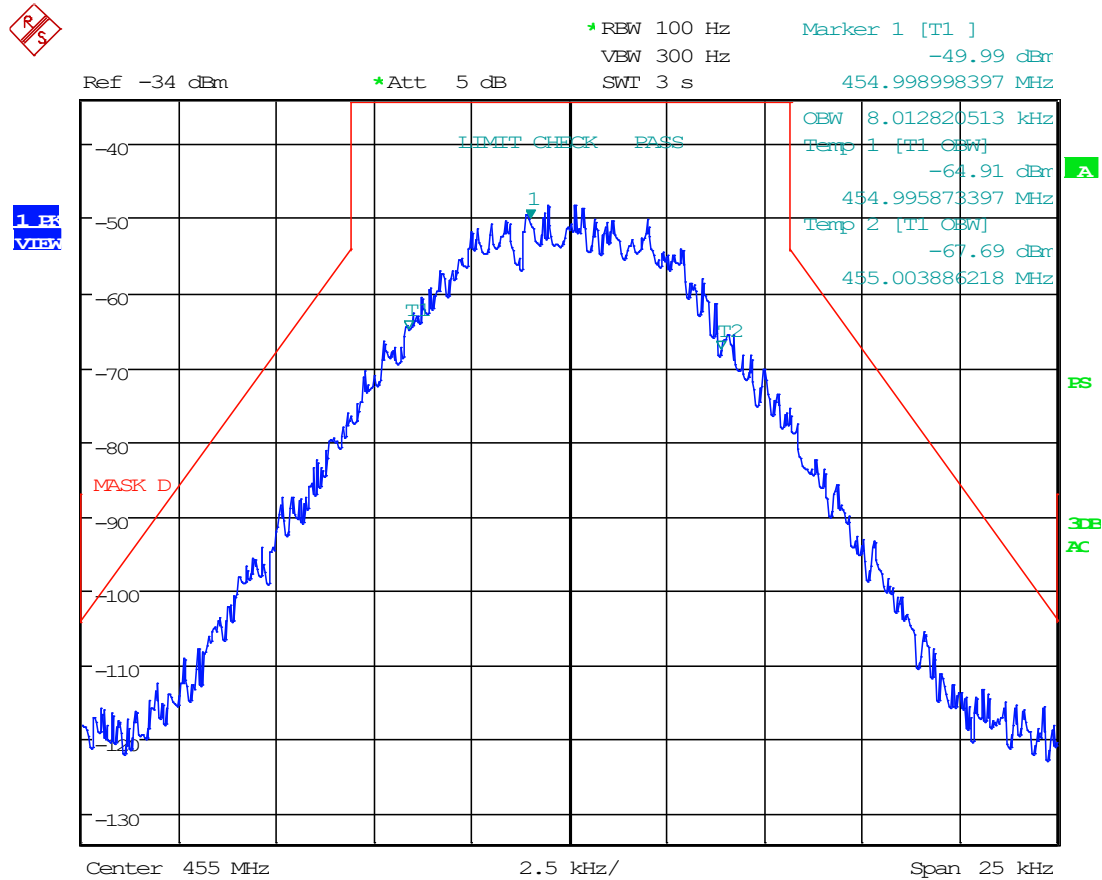
Date: 20.OCT.2023 13:00:05

### 8.5.10 C4FM, Mask D, AGC, 455 MHz



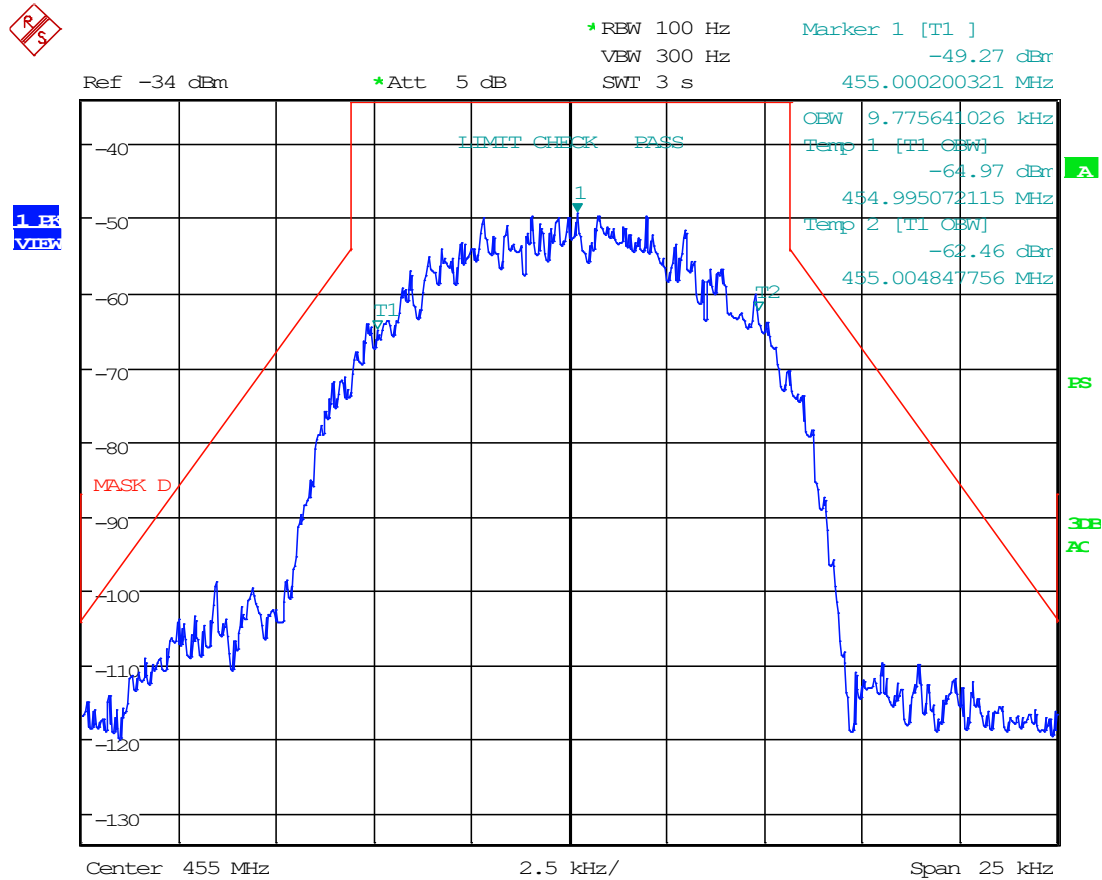
Date: 20.OCT.2023 12:45:35

## 8.5.11 H-CPM, Mask D, AGC, 455 MHz



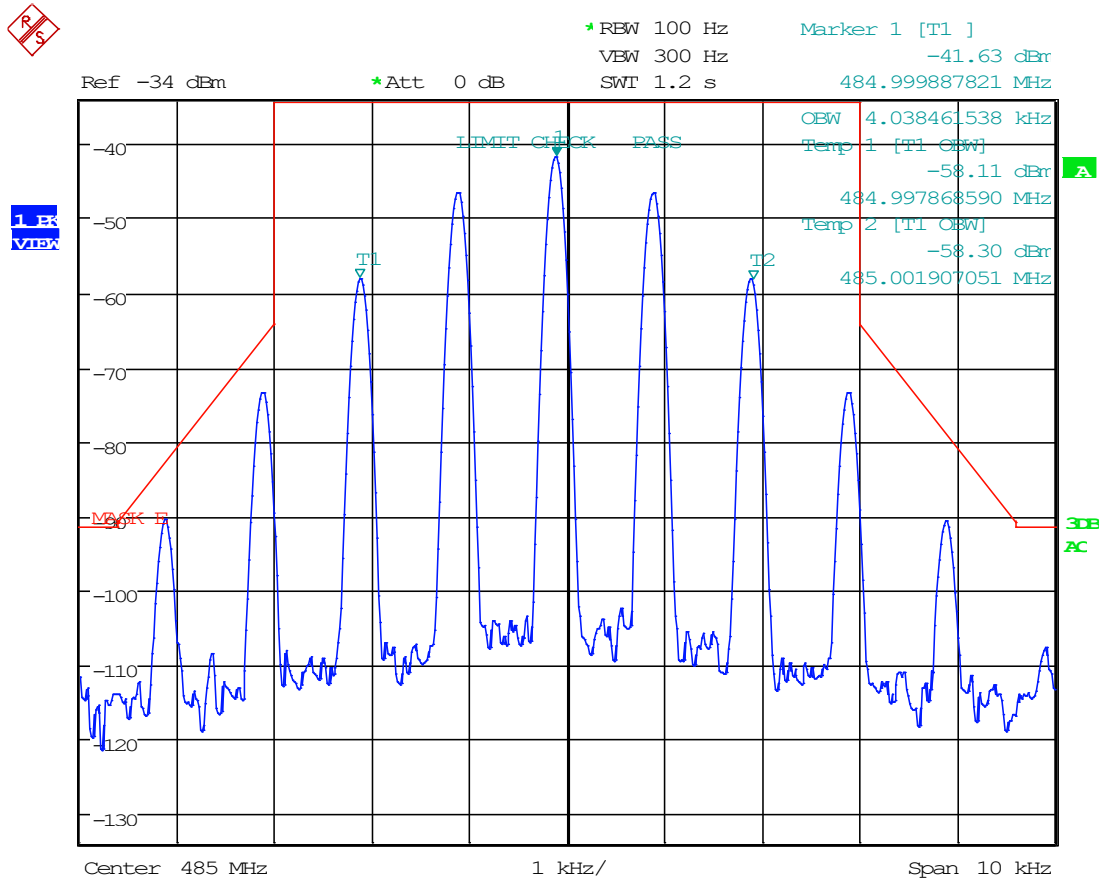
Date: 20.OCT.2023 12:46:17

## 8.5.12 H-DQPSK, Mask D, AGC, 455 MHz



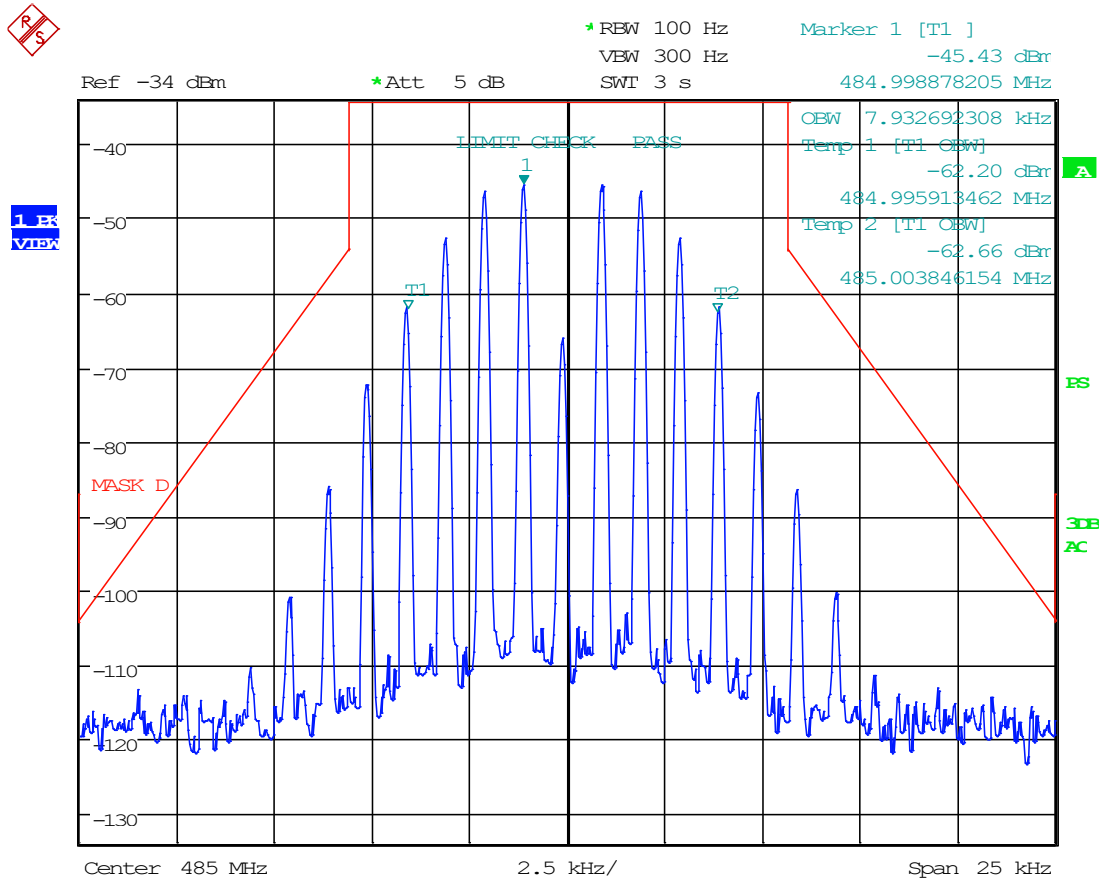
Date: 20.OCT.2023 12:47:03

### 8.5.13 6.25 kHz, FM, Mask E, AGC, 485 MHz



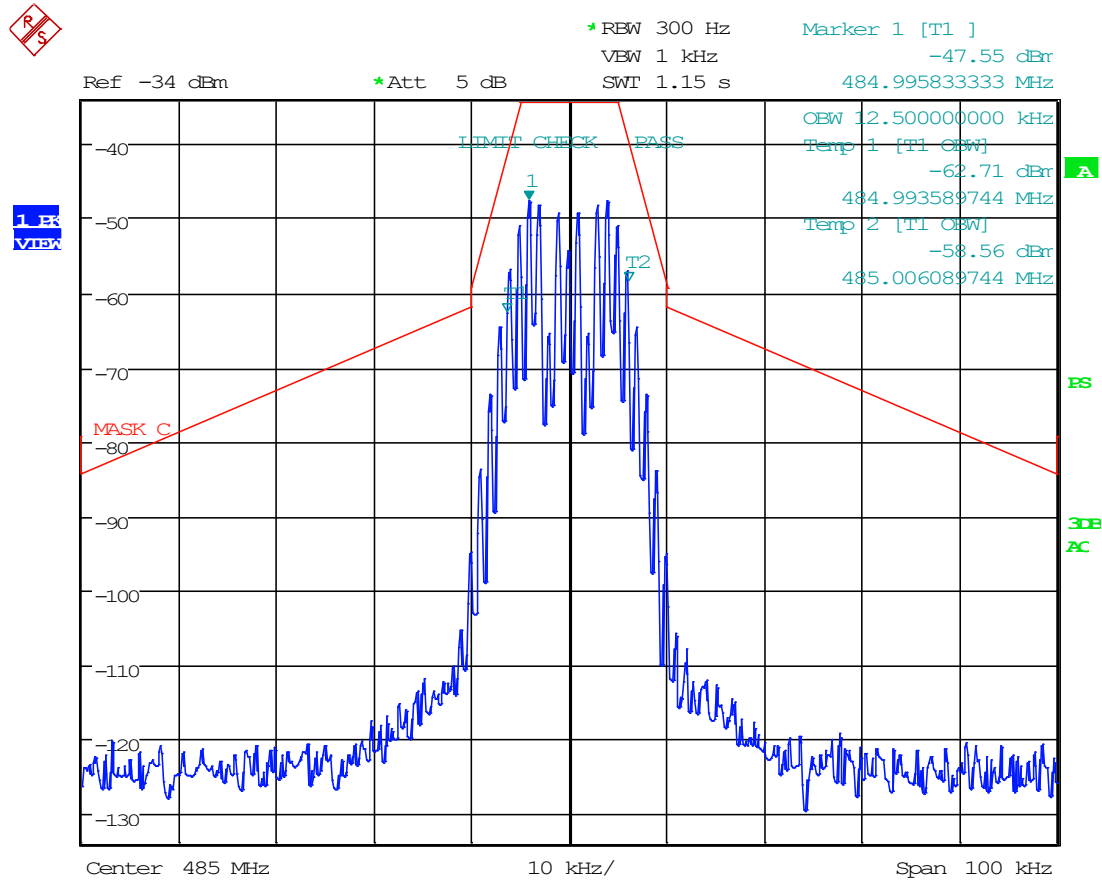
Date: 20.OCT.2023 12:49:57

### 8.5.14 12.5 kHz, FM, Mask D, AGC, 485 MHz



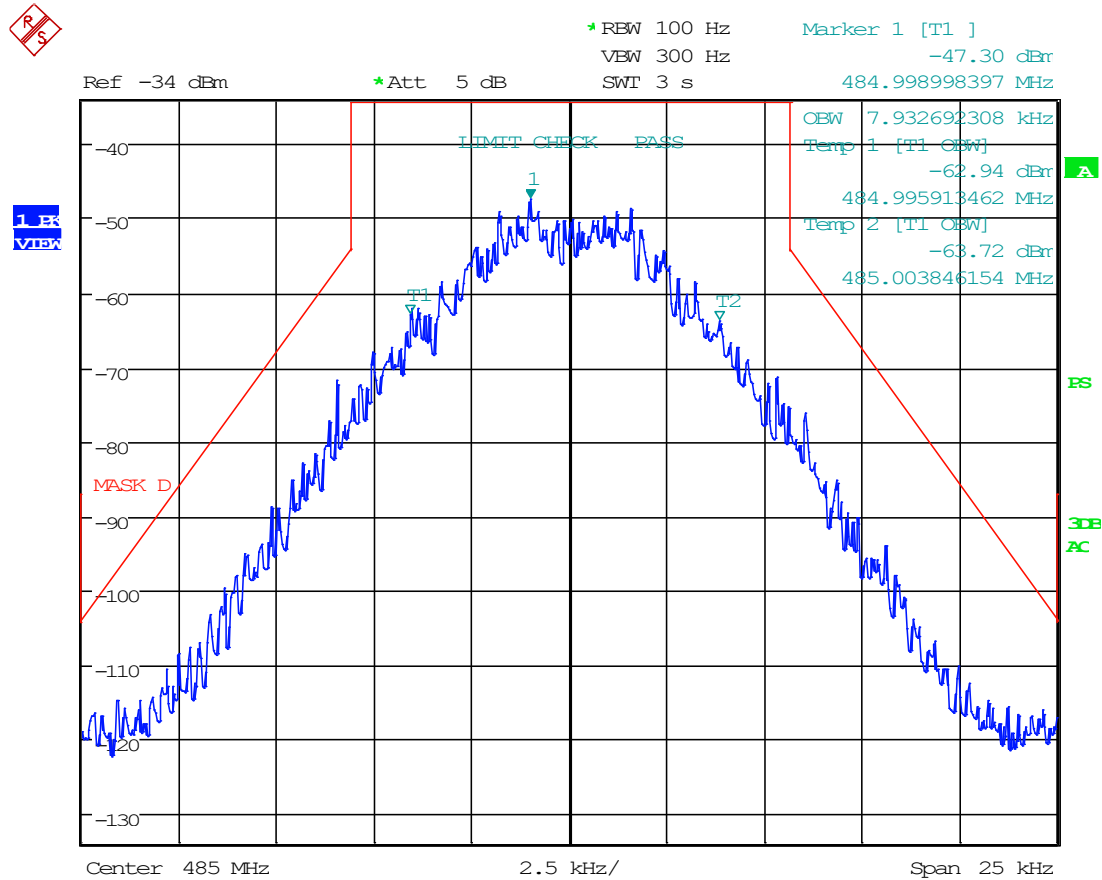
Date: 20.OCT.2023 12:40:33

### 8.5.15 25 kHz FM, Mask C, AGC, 485 MHz



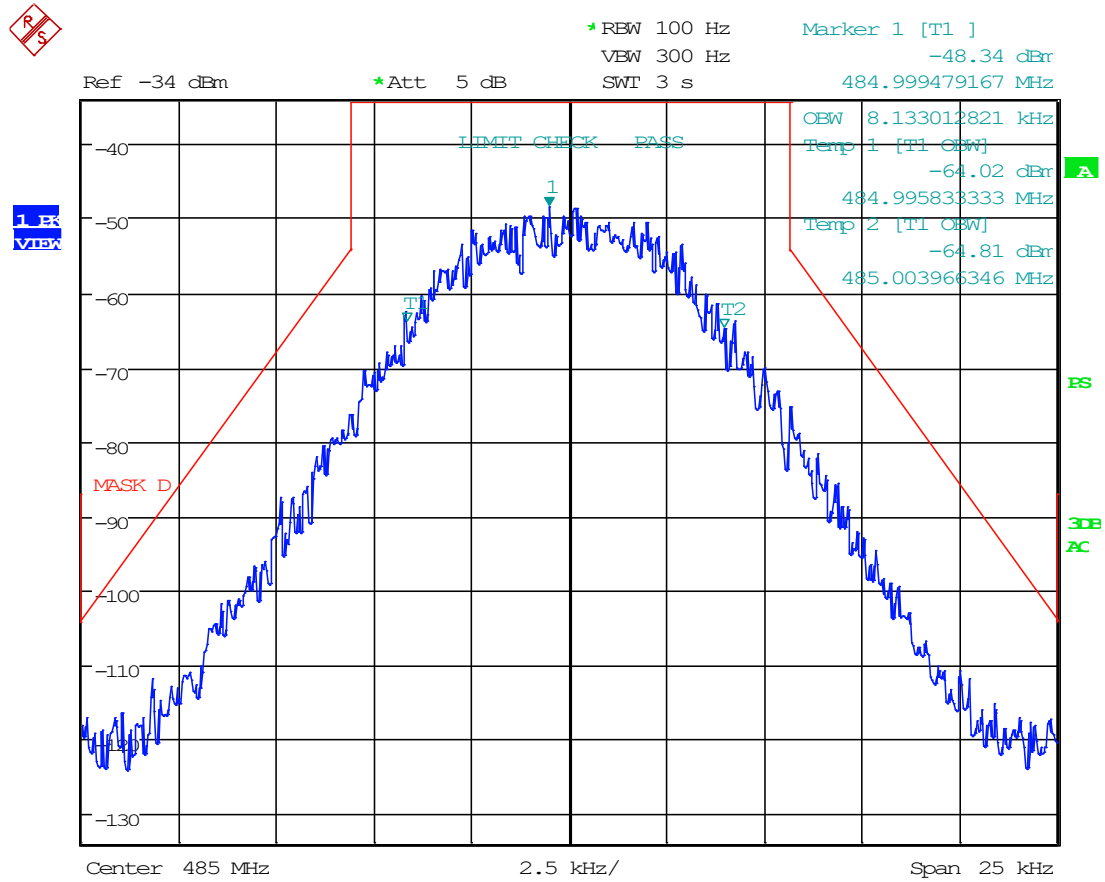
Date: 20.OCT.2023 12:54:09

## 8.5.16 C4FM, Mask D, AGC, 485 MHz



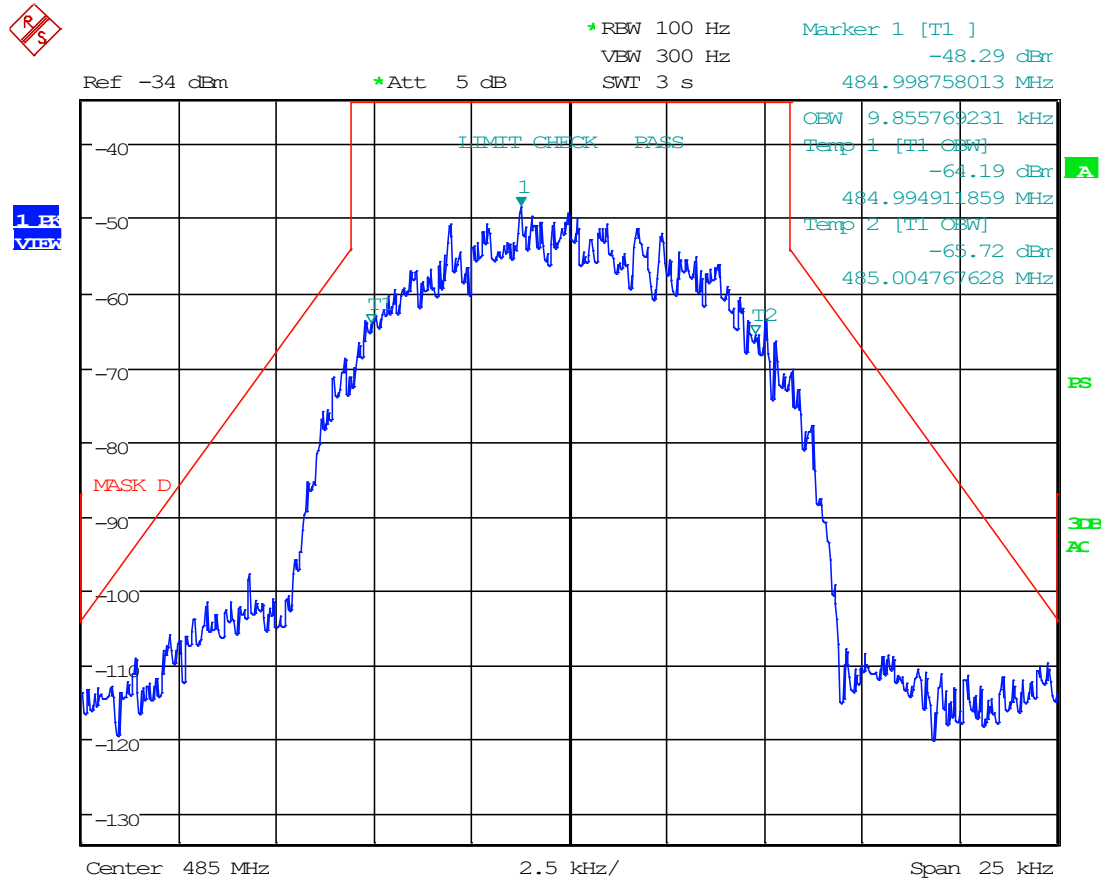
Date: 20.OCT.2023 12:41:31

### 8.5.17 H-CPM, Mask D, AGC, 485 MHz



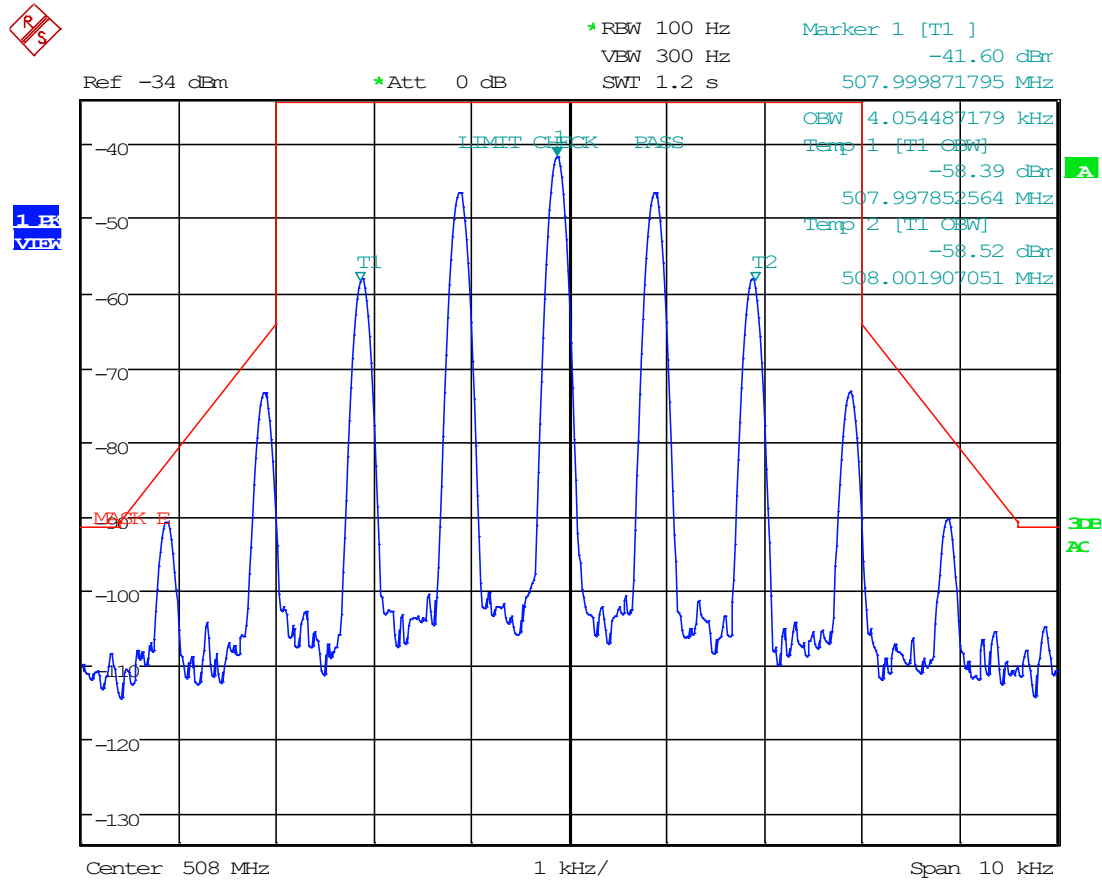
Date: 20.OCT.2023 12:42:18

## 8.5.18 H-DQPSK, Mask D, AGC, 485 MHz



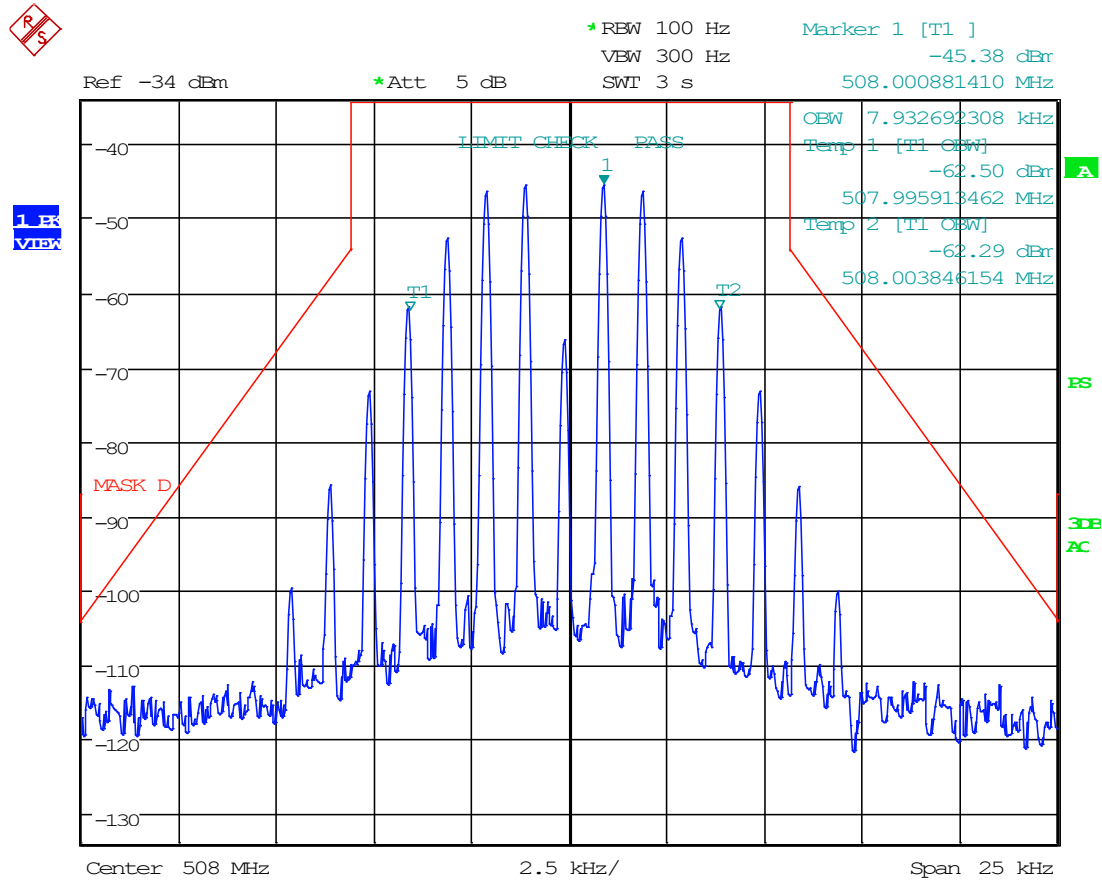
Date: 20.OCT.2023 12:43:10

### 8.5.19 6.25 kHz, FM, Mask E, AGC, 508 MHz



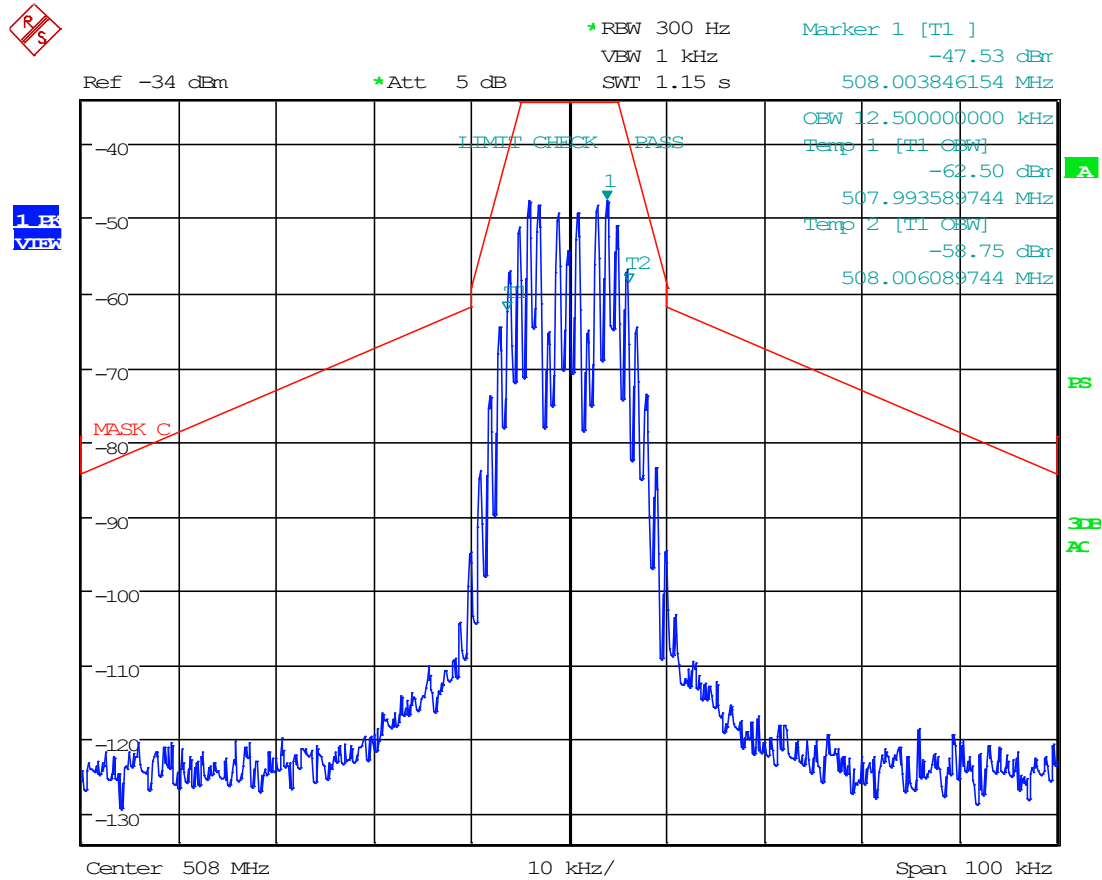
Date: 20.OCT.2023 12:51:04

## 8.5.20 12.5 kHz, FM, Mask D, AGC, 508 MHz



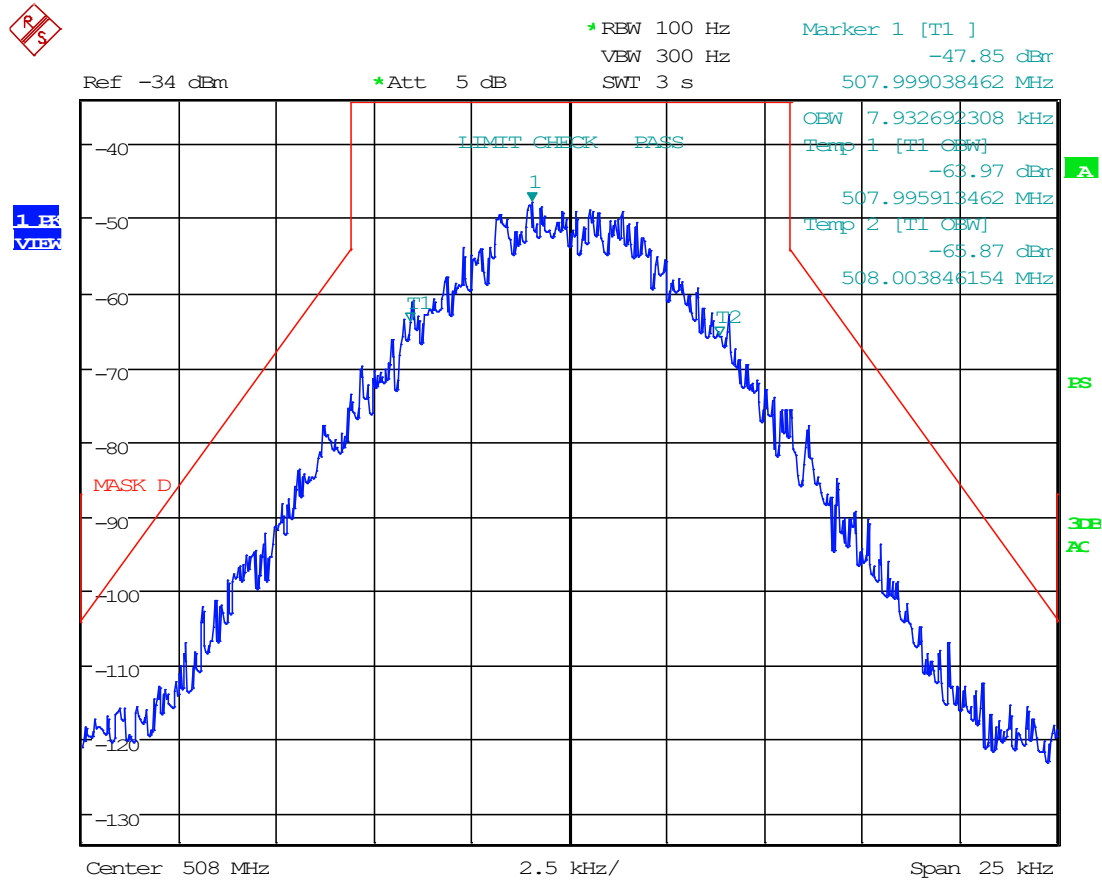
Date: 20.OCT.2023 12:32:15

### 8.5.21 25 kHz FM, Mask C, AGC, 508 MHz



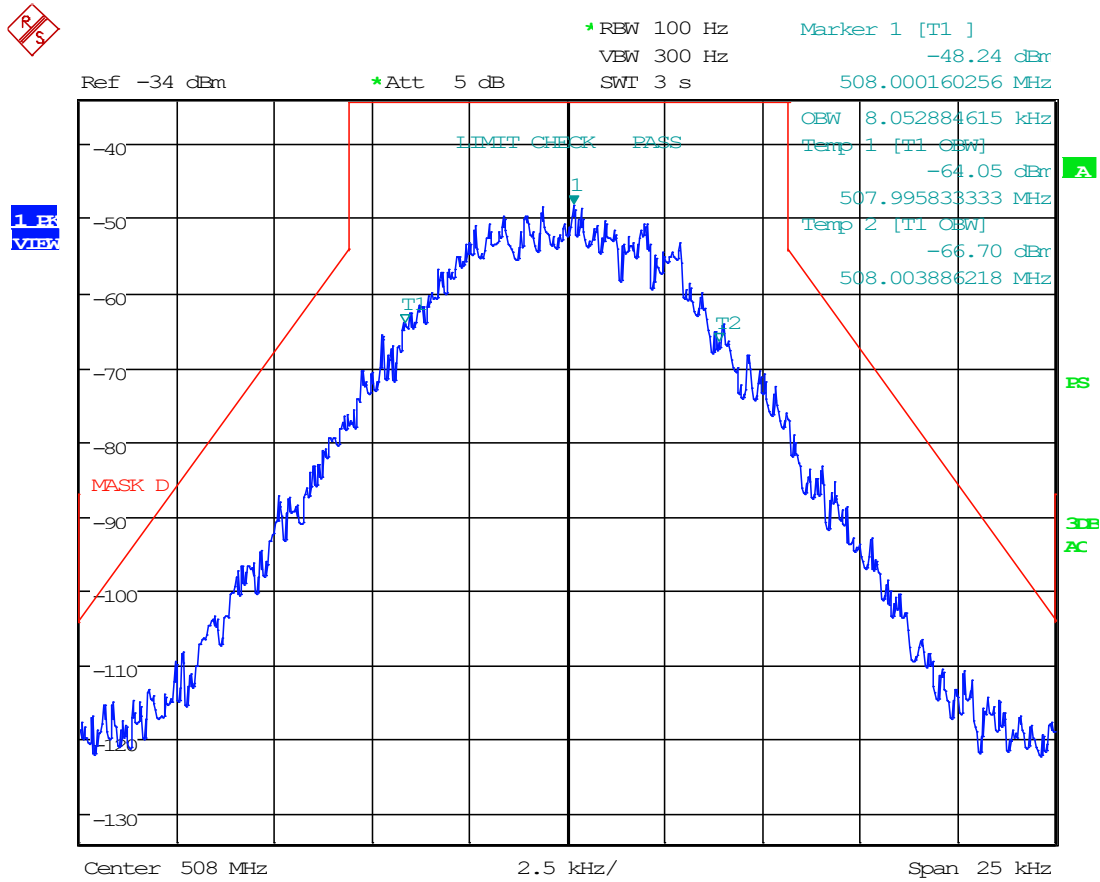
Date: 20.OCT.2023 12:53:05

## 8.5.22 C4FM, Mask D, AGC, 508 MHz



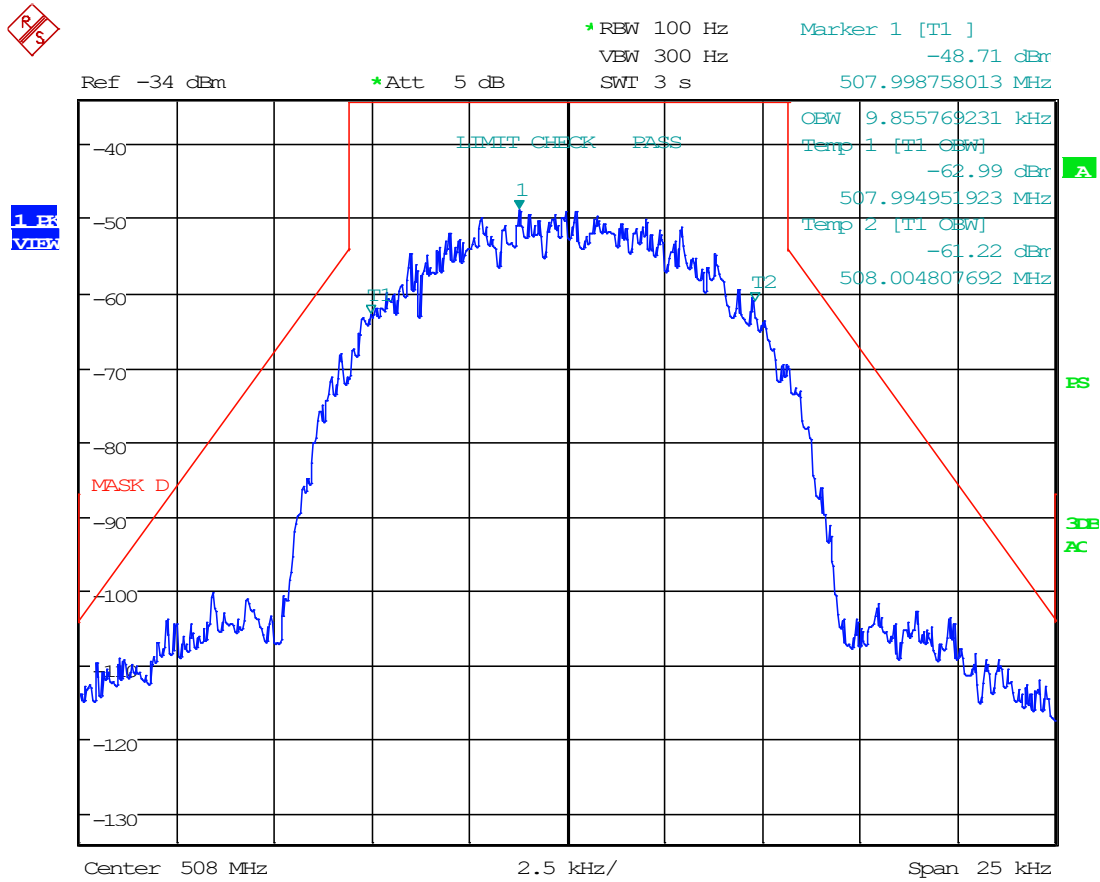
Date: 20.OCT.2023 12:36:07

### 8.5.23 H-CPM, Mask D, AGC, 508 MHz



Date: 20.OCT.2023 12:36:53

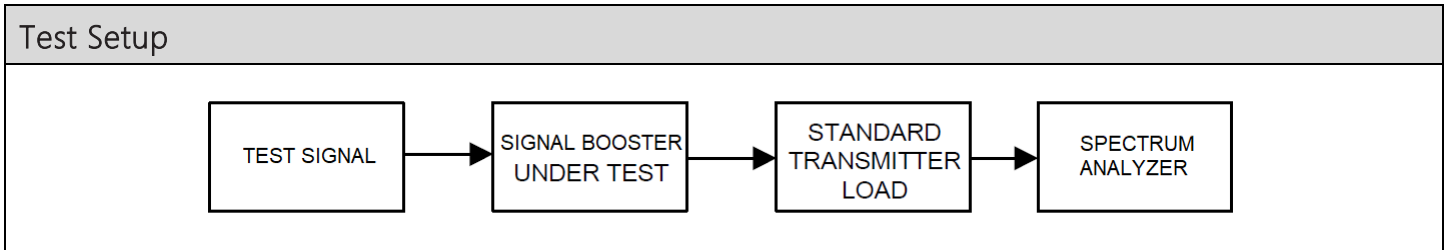
## 8.5.24 H-DQPSK, Mask D, AGC, 508 MHz



Date: 20.OCT.2023 12:38:07

## 8.6 Noise Figure

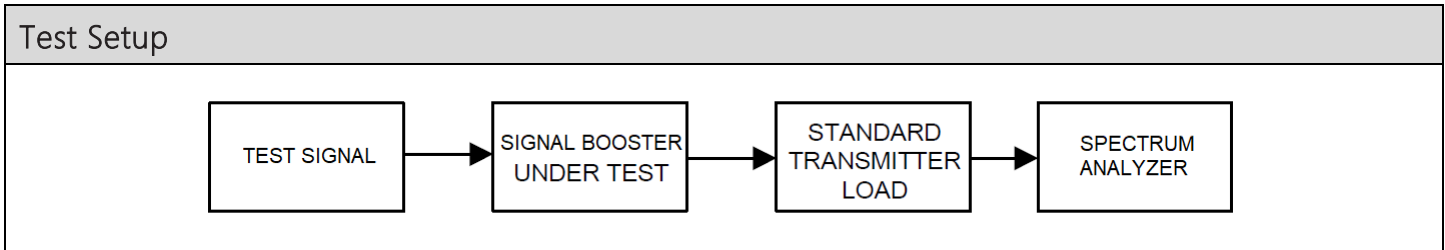
Limits from FCC 90.219 (e)(2) and KDB 935210 D05 v01r04 Industrial Signal Boosters. Test method from "Noise Figure Measurement Accuracy: The Y-Factor Method" by Keysight Technologies.



| Test Results, Out-of-band Rejection and Class of Operation |                |                   |            |
|------------------------------------------------------------|----------------|-------------------|------------|
| Operating Band (MHz)                                       | Link Direction | Noise Figure (dB) | Limit (dB) |
| 455 MHz                                                    | N/A            | 1.67              | < 9 dB     |
| 485 MHz                                                    | N/A            | 2.53              | < 9 dB     |
| 508 MHz                                                    | N/A            | 4.88              | < 9 dB     |

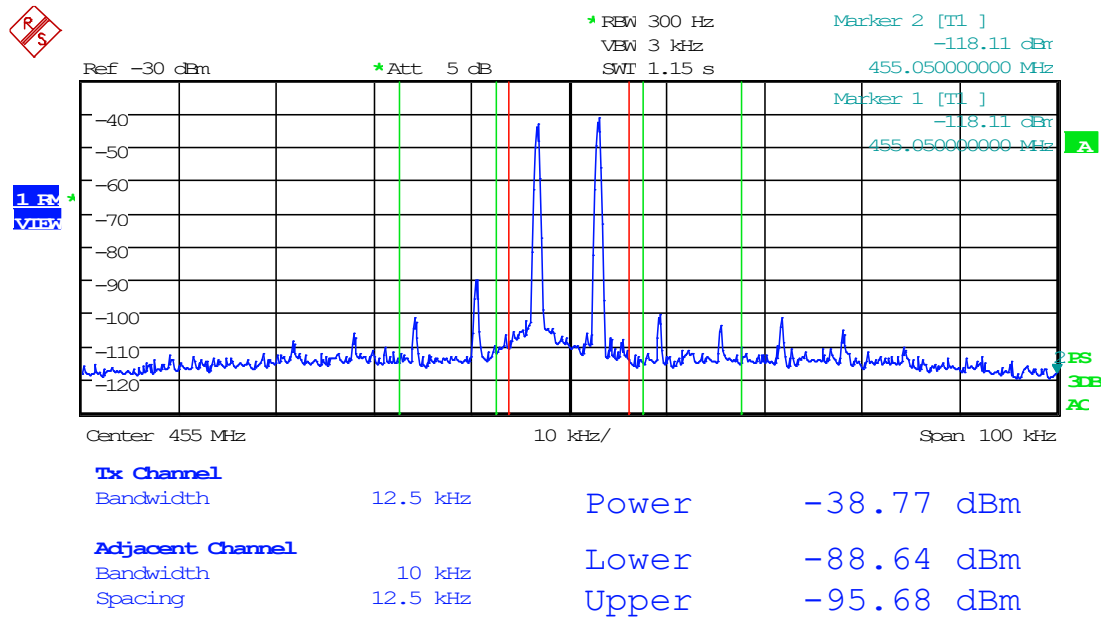
## 8.7 Out-of-Band/Out-of-Block Emissions (Intermodulation Products)

Limits from FCC Parts 2.1051, FCC Pt. 90.219(d)(6)(i), and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.



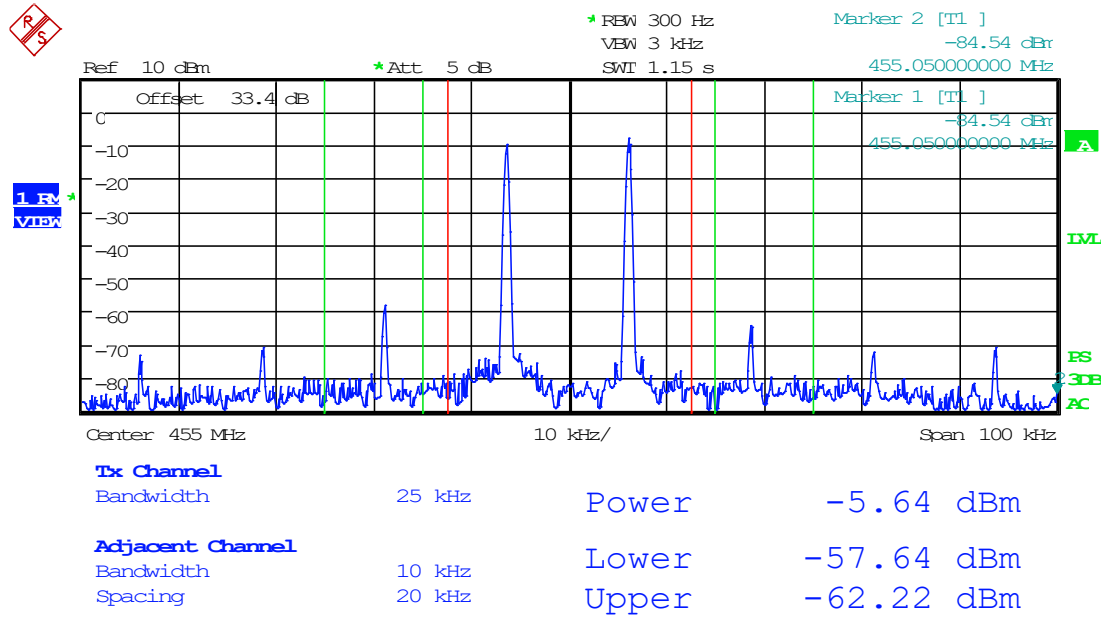
## Intermodulation Products Spectrum Plots

### 8.7.1 6.25 kHz Signal, AGC, 455 MHz



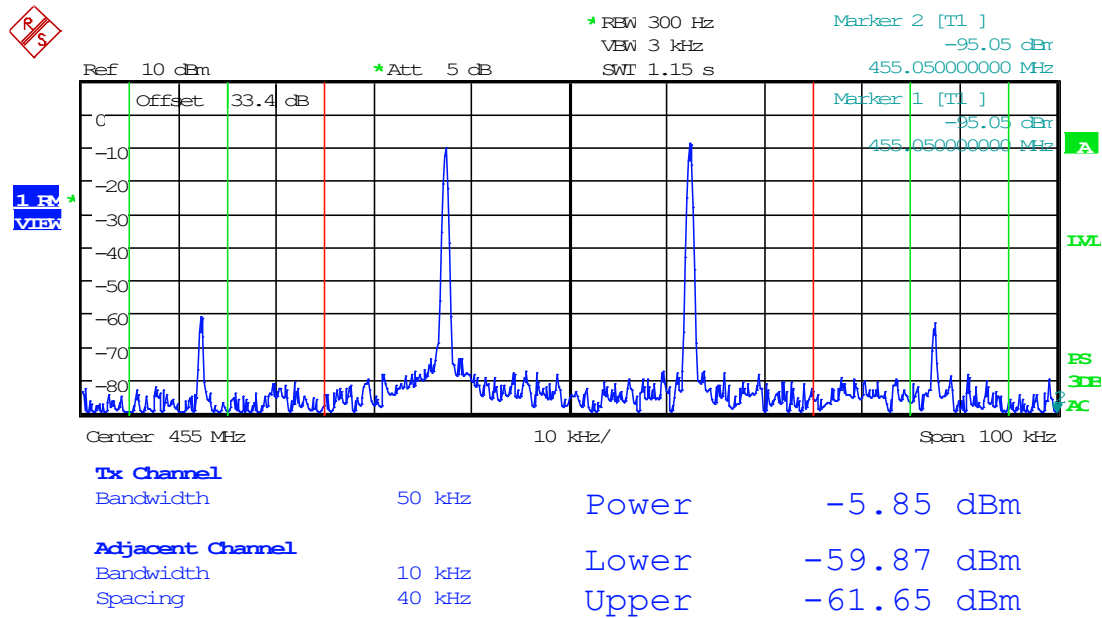
Date: 23.OCT.2023 11:05:11

## 8.7.2 12.5 kHz Signal, AGC, 455 MHz



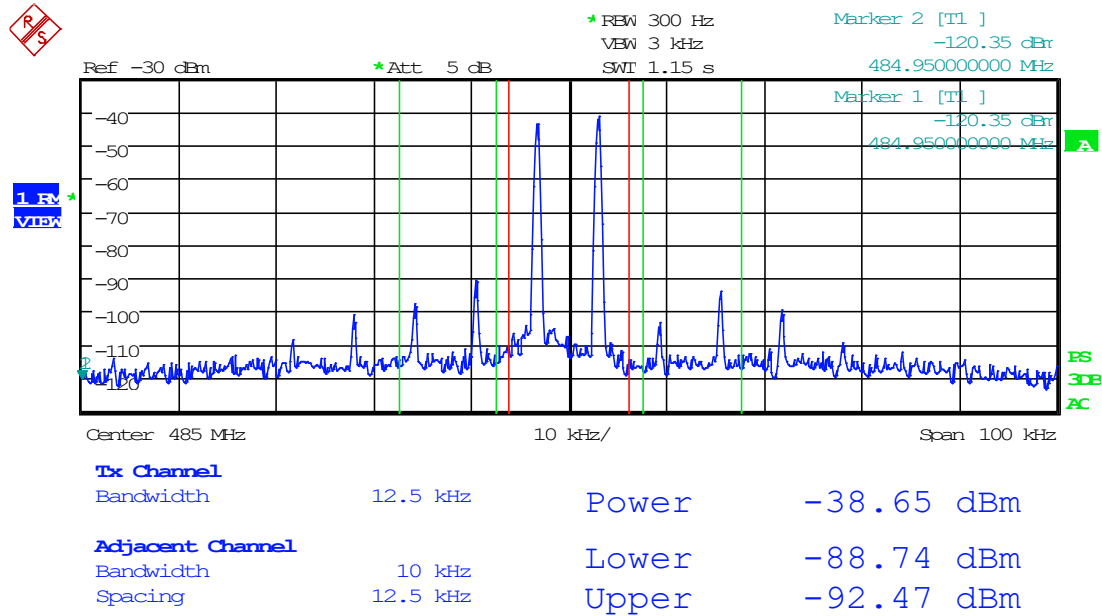
Date: 23.OCT.2023 11:39:26

### 8.7.3 25 kHz Signal, AGC, 455 MHz



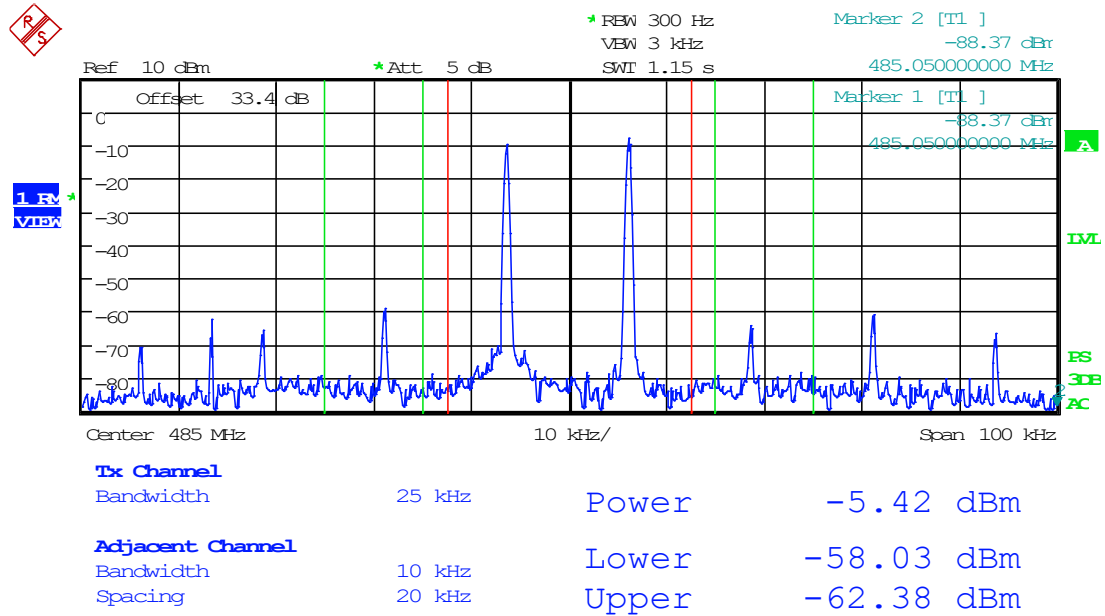
Date: 23.OCT.2023 11:40:46

### 8.7.4 6.25 kHz Signal, AGC, 485 MHz



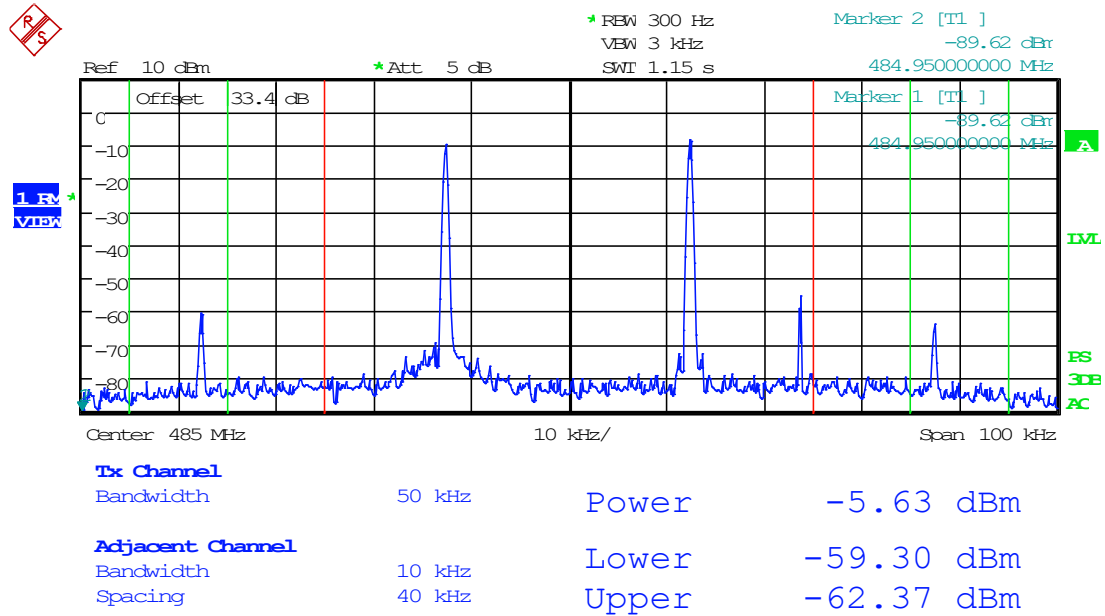
Date: 23.OCT.2023 11:06:49

### 8.7.5 12.5 kHz Signal, AGC, 485 MHz



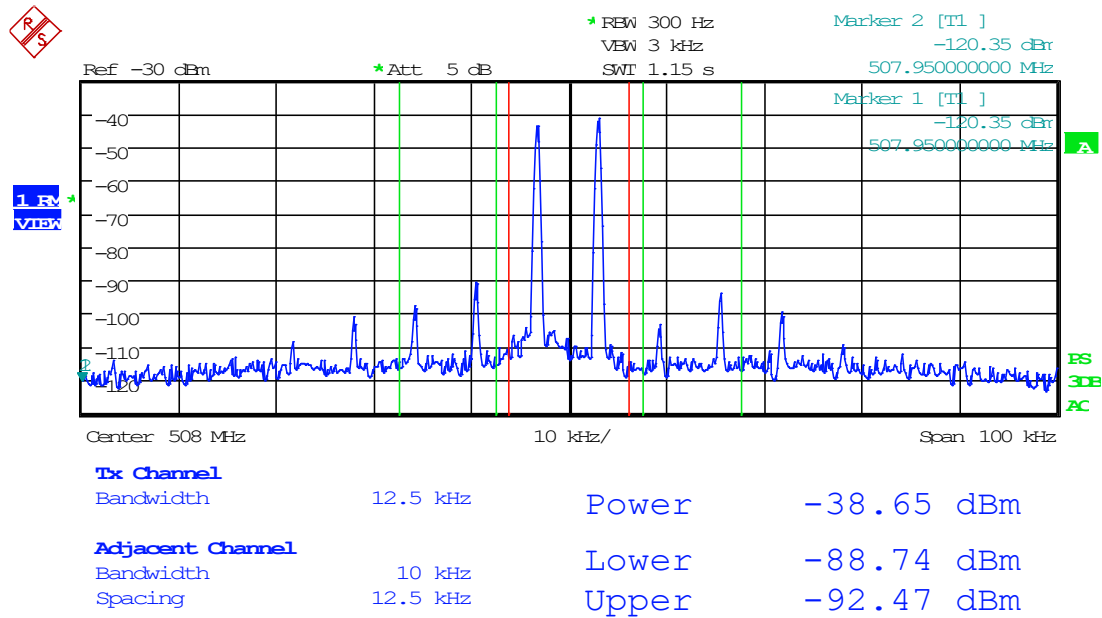
Date: 23.OCT.2023 11:37:42

## 8.7.6 25 kHz Signal, AGC, 485 MHz



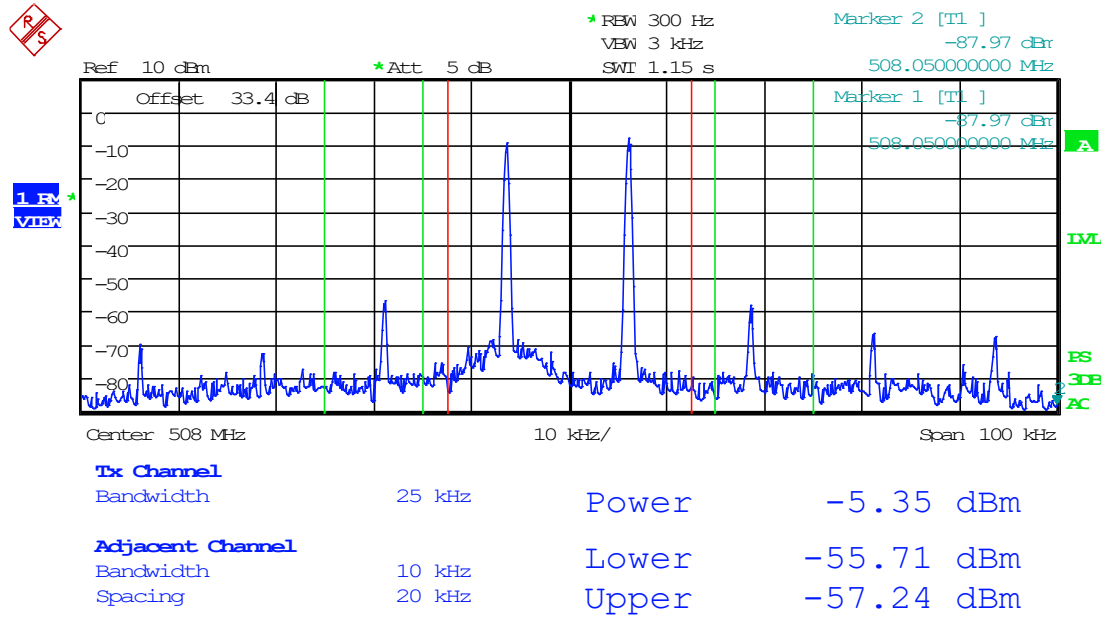
Date: 23.OCT.2023 12:29:35

### 8.7.7 6.25 kHz Signal, AGC, 508 MHz



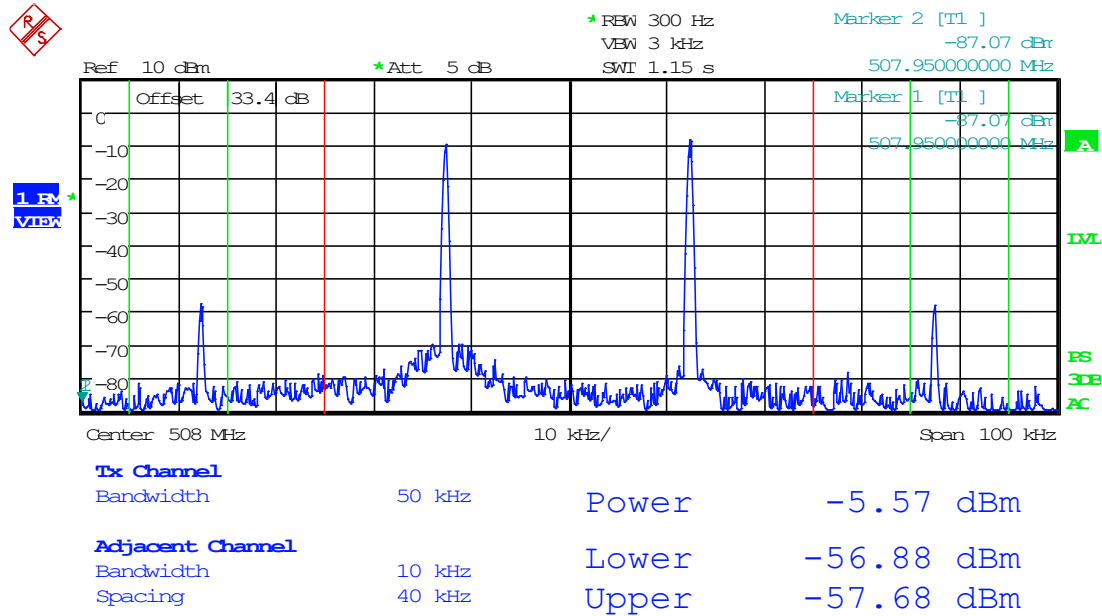
Date: 23.OCT.2023 11:35:39

## 8.7.8 12.5 kHz Signal, AGC, 508 MHz



Date: 23.OCT.2023 11:36:48

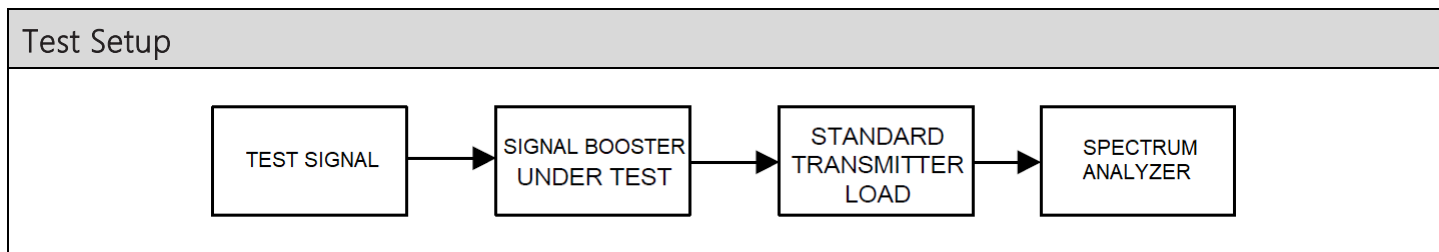
### 8.7.9 25 kHz Signal, AGC, 508 MHz



Date: 23.OCT.2023 12:31:26

## 8.8 Emission Mask, Out-of-Band

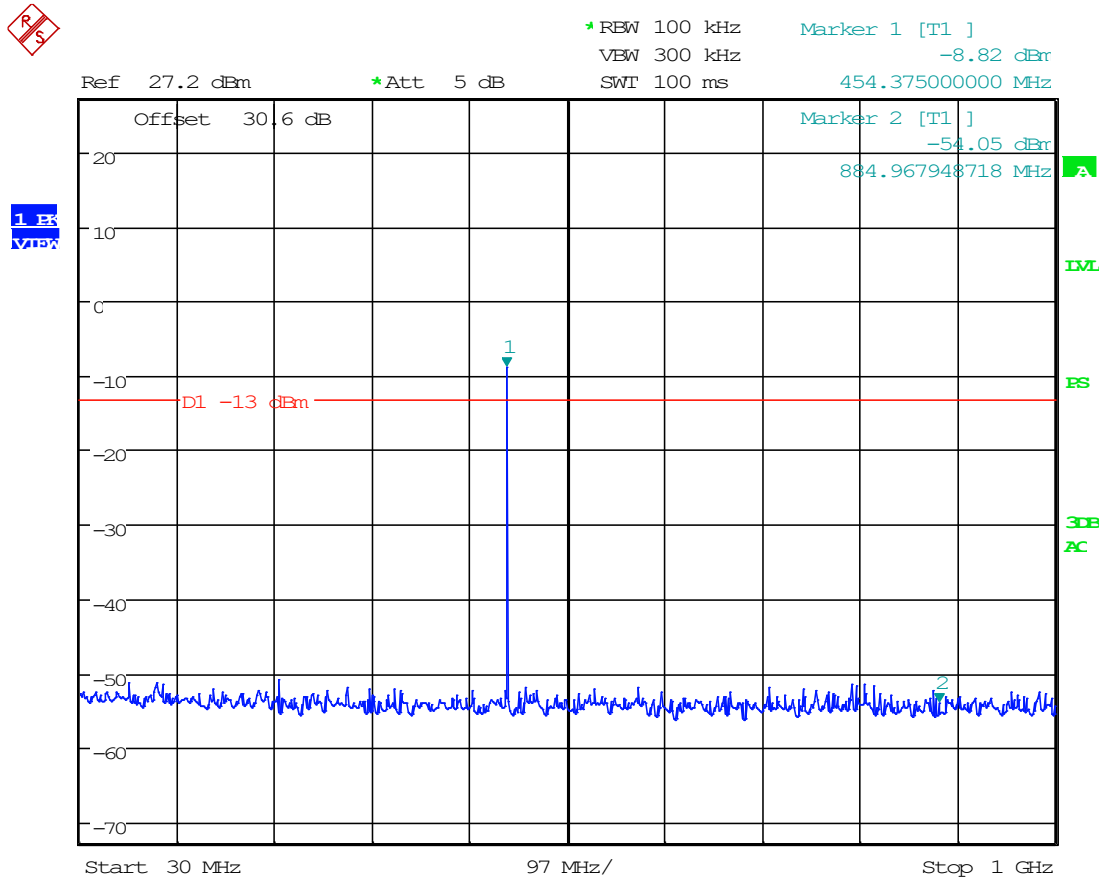
Limits from FCC Parts 2.1051, FCC Pt. 90.219(e)(3) and test procedure from ANSI C63.26-2015 and FCC KDB 935210 D05 v01r04 Industrial Signal Boosters.



**Note:** Testing was done simultaneously on all combinations of Uplinks and Downlinks to address co-location of signals.

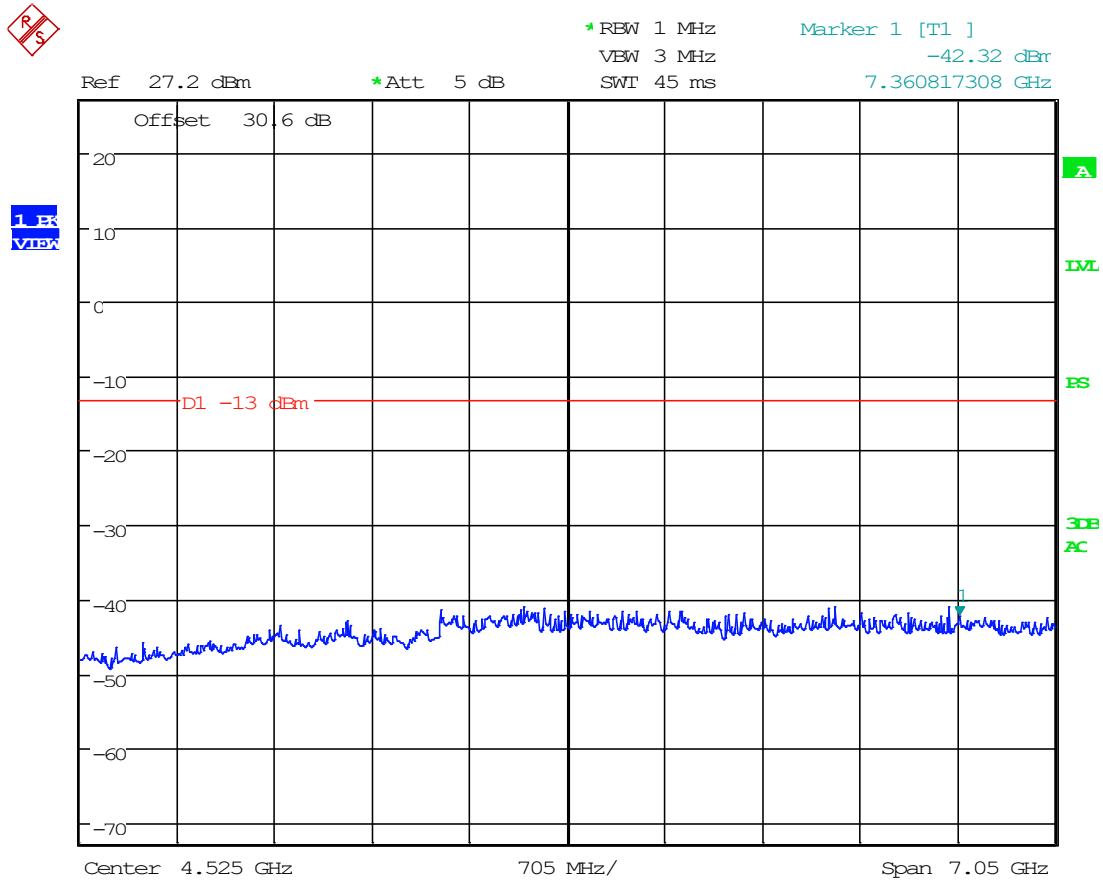
## Conducted Emissions Spectrum Plots

### 8.8.1 30 MHz to 1 GHz, 455 MHz



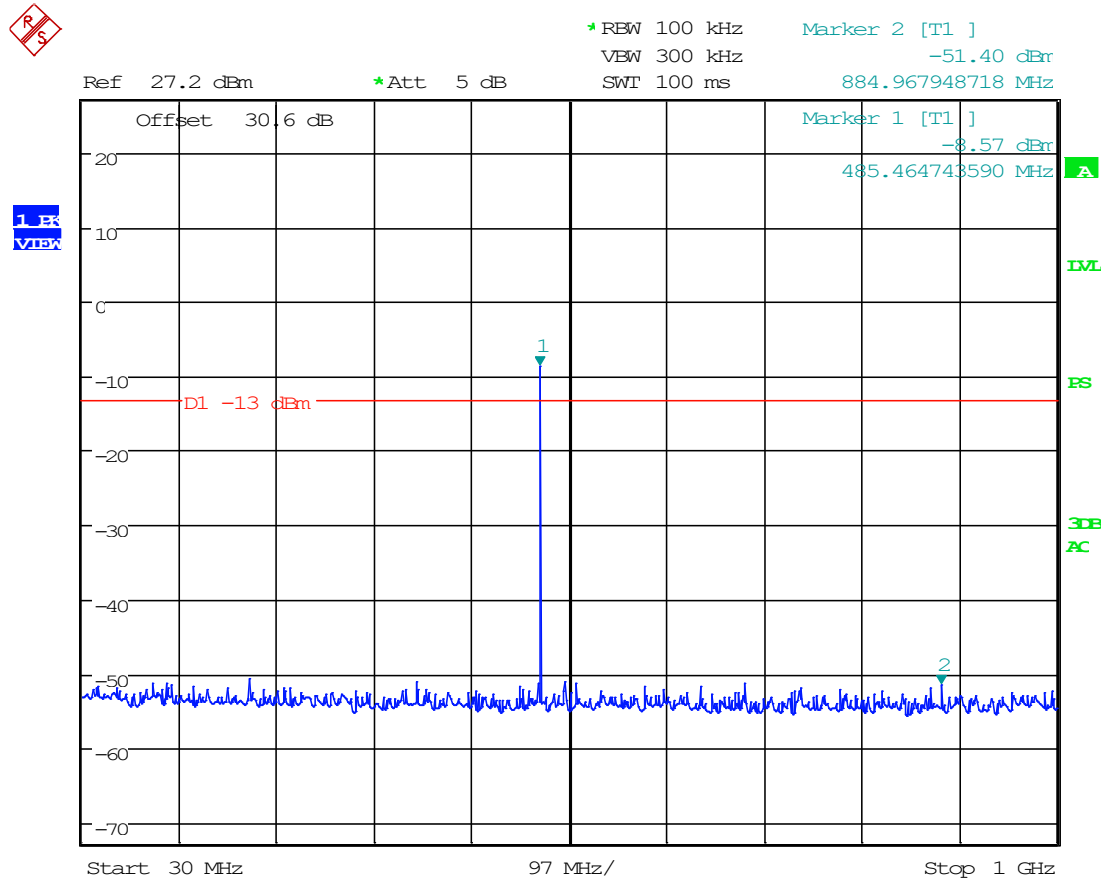
Date: 23.OCT.2023 12:45:49

## 8.8.2 1 GHz to 10<sup>th</sup> Harmonic, 455 MHz



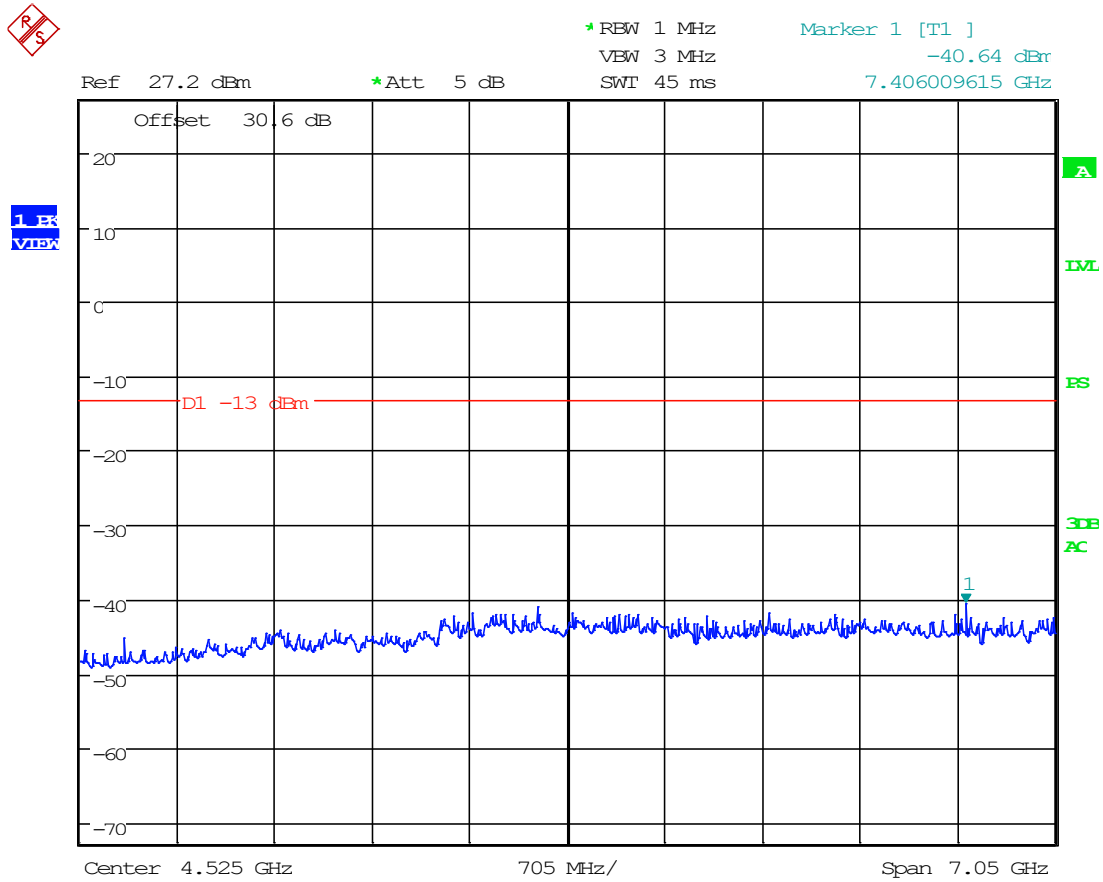
Date: 23.OCT.2023 12:46:21

### 8.8.3 30 MHz to 1 GHz, 485 MHz



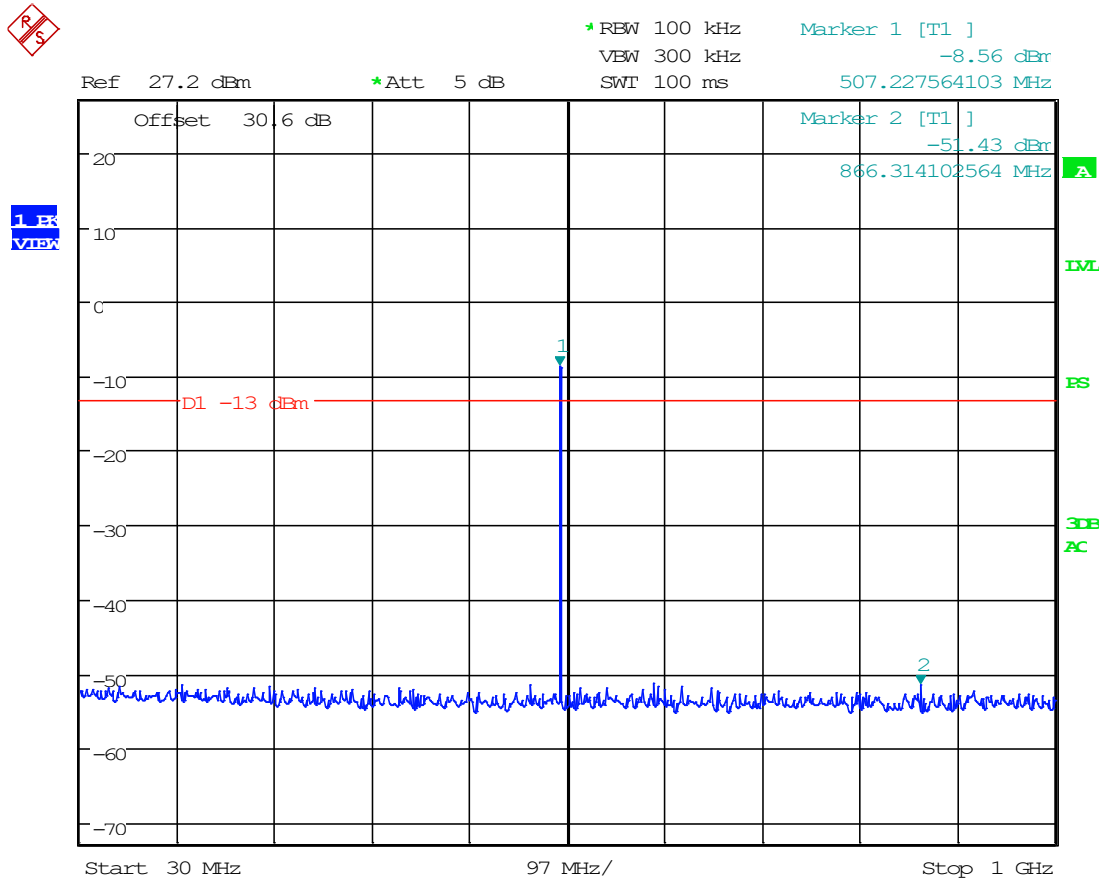
Date: 23.OCT.2023 12:45:11

## 8.8.4 1 GHz to 10<sup>th</sup> Harmonic, 485 MHz

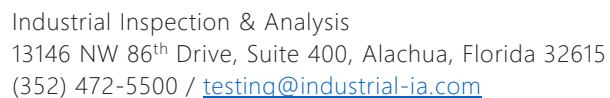


Date: 23.OCT.2023 12:46:54

## 8.8.5 30 MHz to 1 GHz, 508 MHz



Date: 23.OCT.2023 12:44:30

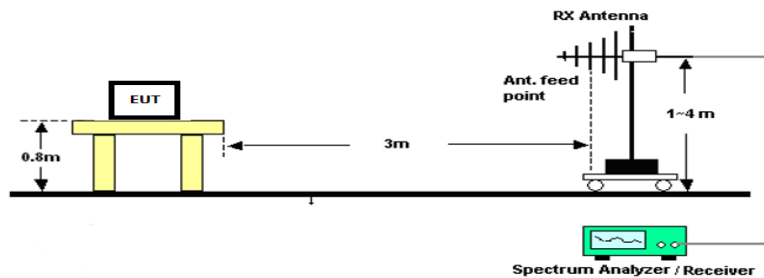


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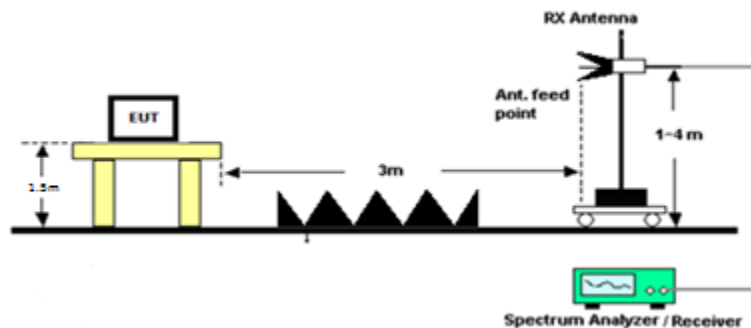
## 8.9 Spurious Radiated Emissions

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

### 8.9.1 Test Plot, 455 MHz

| Tuned Frequency (MHz) | Emission Frequency (MHz) | Detector | Meter Reading (dBuV) | Antenna Polarity | Coax Loss (dB) | Antenna Correction Factor (dB/m) | Distance (m) | Field Strength (dBuV/m) | ERP (dBm) | Spurious Limit (dBm) | Margin (dB) |
|-----------------------|--------------------------|----------|----------------------|------------------|----------------|----------------------------------|--------------|-------------------------|-----------|----------------------|-------------|
| 455.00                | 910.00                   | PK       | 24.30                | H                | -3.55          | 12.17                            | 3.00         | 32.92                   | -64.45    | -13.00               | 51.45       |
| 455.00                | 910.00                   | PK       | 25.00                | V                | -3.55          | 12.17                            | 3.00         | 33.62                   | -63.75    | -13.00               | 50.75       |
| 455.00                | 1365.00                  | PK       | 0.60                 | H                | -4.33          | 12.18                            | 3.00         | 8.45                    | -88.93    | -13.00               | 75.93       |
| 455.00                | 1365.00                  | PK       | 0.10                 | V                | -4.33          | 12.18                            | 3.00         | 7.95                    | -89.43    | -13.00               | 76.43       |
| 455.00                | 1820.00                  | PK       | 3.30                 | H                | -5.11          | 12.19                            | 3.00         | 10.38                   | -87.00    | -13.00               | 74.00       |
| 455.00                | 1820.00                  | PK       | 3.80                 | V                | -5.11          | 12.19                            | 3.00         | 10.88                   | -86.50    | -13.00               | 73.50       |
| 455.00                | 2275.00                  | PK       | 1.40                 | H                | -5.71          | 12.19                            | 3.00         | 7.88                    | -89.50    | -13.00               | 76.50       |
| 455.00                | 2275.00                  | PK       | 1.20                 | V                | -5.71          | 12.19                            | 3.00         | 7.68                    | -89.70    | -13.00               | 76.70       |
| 455.00                | 2730.00                  | PK       | 1.10                 | H                | -6.23          | 12.20                            | 3.00         | 7.07                    | -90.30    | -13.00               | 77.30       |
| 455.00                | 2730.00                  | PK       | 1.60                 | V                | -6.23          | 12.20                            | 3.00         | 7.57                    | -89.80    | -13.00               | 76.80       |
| 455.00                | 3185.00                  | PK       | 3.00                 | H                | -6.76          | 12.21                            | 3.00         | 8.45                    | -88.93    | -13.00               | 75.93       |
| 455.00                | 3185.00                  | PK       | 3.10                 | V                | -6.76          | 12.21                            | 3.00         | 8.55                    | -88.83    | -13.00               | 75.83       |
| 455.00                | 3640.00                  | PK       | 2.90                 | H                | -7.17          | 12.33                            | 3.00         | 8.05                    | -89.32    | -13.00               | 76.32       |
| 455.00                | 3640.00                  | PK       | 3.40                 | V                | -7.17          | 12.33                            | 3.00         | 8.55                    | -88.82    | -13.00               | 75.82       |
| 455.00                | 4095.00                  | PK       | 3.10                 | H                | -7.65          | 12.57                            | 3.00         | 8.03                    | -89.35    | -13.00               | 76.35       |
| 455.00                | 4095.00                  | PK       | 2.80                 | V                | -7.65          | 12.57                            | 3.00         | 7.73                    | -89.65    | -13.00               | 76.65       |
| 455.00                | 4550.00                  | PK       | 3.90                 | H                | -8.09          | 12.99                            | 3.00         | 8.80                    | -88.57    | -13.00               | 75.57       |
| 455.00                | 4550.00                  | PK       | 4.30                 | V                | -8.09          | 12.99                            | 3.00         | 9.20                    | -88.17    | -13.00               | 75.17       |

## 8.9.2 Test Plot, 485 MHz

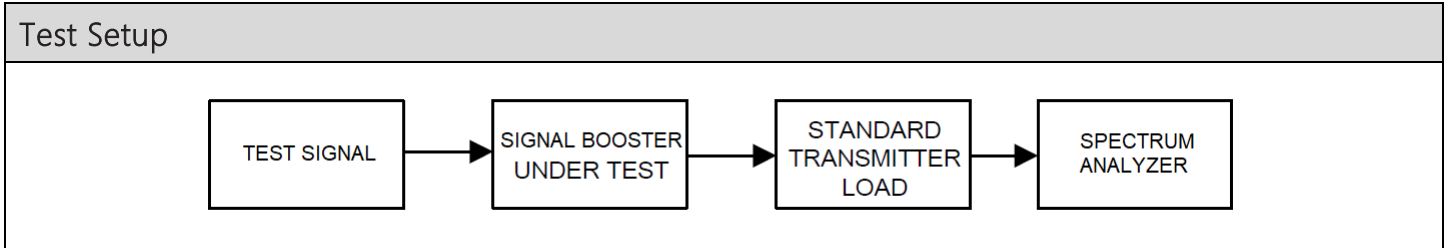
| Tuned Frequency (MHz) | Emission Frequency (MHz) | Detector | Meter Reading (dBuV) | Antenna Polarity | Coax Loss (dB) | Antenna Correction Factor (dB/m) | Distance (m) | Field Strength (dBuV/m) | ERP (dBm) | Spurious Limit (dBm) | Margin (dB) |
|-----------------------|--------------------------|----------|----------------------|------------------|----------------|----------------------------------|--------------|-------------------------|-----------|----------------------|-------------|
| 485.00                | 970.00                   | PK       | 25.00                | H                | -3.65          | 12.17                            | 3.00         | 33.52                   | -63.85    | -13.00               | 50.85       |
| 485.00                | 970.00                   | PK       | 26.50                | V                | -3.65          | 12.17                            | 3.00         | 35.02                   | -62.35    | -13.00               | 49.35       |
| 485.00                | 1455.00                  | PK       | 0.60                 | H                | -4.45          | 12.18                            | 3.00         | 8.33                    | -89.04    | -13.00               | 76.04       |
| 485.00                | 1455.00                  | PK       | -0.20                | V                | -4.45          | 12.18                            | 3.00         | 7.53                    | -89.84    | -13.00               | 76.84       |
| 485.00                | 1940.00                  | PK       | 0.20                 | H                | -5.23          | 12.19                            | 3.00         | 7.16                    | -90.21    | -13.00               | 77.21       |
| 485.00                | 1940.00                  | PK       | 0.60                 | V                | -5.23          | 12.19                            | 3.00         | 7.56                    | -89.81    | -13.00               | 76.81       |
| 485.00                | 2425.00                  | PK       | 55.70                | H                | -5.90          | 12.20                            | 3.00         | 62.00                   | -35.38    | -13.00               | 22.38       |
| 485.00                | 2425.00                  | PK       | 54.40                | V                | -5.90          | 12.20                            | 3.00         | 60.70                   | -36.68    | -13.00               | 23.68       |
| 485.00                | 2910.00                  | PK       | 2.40                 | H                | -6.43          | 12.20                            | 3.00         | 8.17                    | -89.20    | -13.00               | 76.20       |
| 485.00                | 2910.00                  | PK       | 2.00                 | V                | -6.43          | 12.20                            | 3.00         | 7.77                    | -89.60    | -13.00               | 76.60       |
| 485.00                | 3395.00                  | PK       | 2.60                 | H                | -6.94          | 12.21                            | 3.00         | 7.87                    | -89.51    | -13.00               | 76.51       |
| 485.00                | 3395.00                  | PK       | 3.20                 | V                | -6.94          | 12.21                            | 3.00         | 8.47                    | -88.91    | -13.00               | 75.91       |
| 485.00                | 3880.00                  | PK       | 5.50                 | H                | -7.45          | 12.43                            | 3.00         | 10.48                   | -86.90    | -13.00               | 73.90       |
| 485.00                | 3880.00                  | PK       | 5.50                 | V                | -7.45          | 12.43                            | 3.00         | 10.48                   | -86.90    | -13.00               | 73.90       |
| 485.00                | 4365.00                  | PK       | 3.80                 | H                | -7.91          | 12.81                            | 3.00         | 8.70                    | -88.67    | -13.00               | 75.67       |
| 485.00                | 4365.00                  | PK       | 3.90                 | V                | -7.91          | 12.81                            | 3.00         | 8.80                    | -88.57    | -13.00               | 75.57       |
| 485.00                | 4850.00                  | PK       | 6.10                 | H                | -8.30          | 13.28                            | 3.00         | 11.08                   | -86.30    | -13.00               | 73.30       |
| 485.00                | 4850.00                  | PK       | 6.50                 | V                | -8.30          | 13.28                            | 3.00         | 11.48                   | -85.90    | -13.00               | 72.90       |

### 8.9.3 Test Plot, 508 MHz

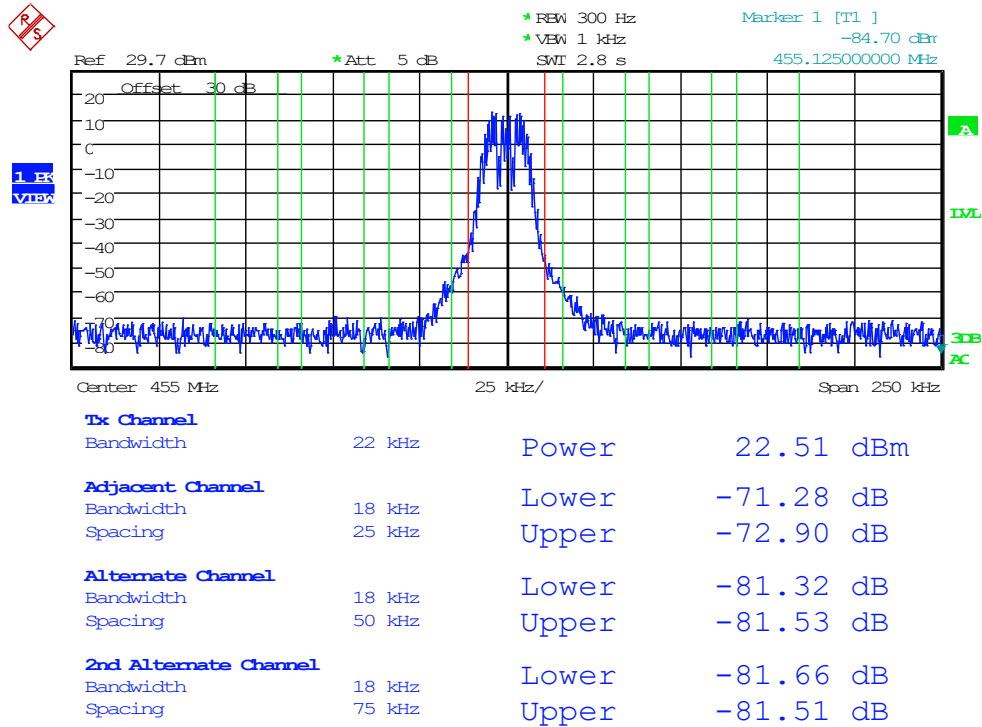
| Tuned Frequency (MHz) | Emission Frequency (MHz) | Detector | Meter Reading (dBuV) | Antenna Polarity | Coax Loss (dB) | Antenna Correction Factor (dB/m) | Distance (m) | Field Strength (dBuV/m) | ERP (dBm) | Spurious Limit (dBm) | Margin (dB) |
|-----------------------|--------------------------|----------|----------------------|------------------|----------------|----------------------------------|--------------|-------------------------|-----------|----------------------|-------------|
| 508.00                | 1016.00                  | PK       | 16.10                | H                | -3.78          | 12.18                            | 3.00         | 24.50                   | -72.88    | -13.00               | 59.88       |
| 508.00                | 1016.00                  | PK       | 16.00                | V                | -3.78          | 12.18                            | 3.00         | 24.40                   | -72.98    | -13.00               | 59.98       |
| 508.00                | 1524.00                  | PK       | 3.00                 | H                | -4.58          | 12.18                            | 3.00         | 10.61                   | -86.77    | -13.00               | 73.77       |
| 508.00                | 1524.00                  | PK       | 3.20                 | V                | -4.58          | 12.18                            | 3.00         | 10.81                   | -86.57    | -13.00               | 73.57       |
| 508.00                | 2032.00                  | PK       | 0.50                 | H                | -5.44          | 12.19                            | 3.00         | 7.25                    | -90.13    | -13.00               | 77.13       |
| 508.00                | 2032.00                  | PK       | 1.00                 | V                | -5.44          | 12.19                            | 3.00         | 7.75                    | -89.63    | -13.00               | 76.63       |
| 508.00                | 2540.00                  | PK       | 1.70                 | H                | -6.02          | 12.20                            | 3.00         | 7.88                    | -89.50    | -13.00               | 76.50       |
| 508.00                | 2540.00                  | PK       | 1.90                 | V                | -6.02          | 12.20                            | 3.00         | 8.08                    | -89.30    | -13.00               | 76.30       |
| 508.00                | 3048.00                  | PK       | 3.00                 | H                | -6.58          | 12.20                            | 3.00         | 8.62                    | -88.75    | -13.00               | 75.75       |
| 508.00                | 3048.00                  | PK       | 2.90                 | V                | -6.58          | 12.20                            | 3.00         | 8.52                    | -88.85    | -13.00               | 75.85       |
| 508.00                | 3556.00                  | PK       | 2.80                 | H                | -7.10          | 12.29                            | 3.00         | 7.99                    | -89.38    | -13.00               | 76.38       |
| 508.00                | 3556.00                  | PK       | 3.30                 | V                | -7.10          | 12.29                            | 3.00         | 8.49                    | -88.88    | -13.00               | 75.88       |
| 508.00                | 4064.00                  | PK       | 3.40                 | H                | -7.62          | 12.55                            | 3.00         | 8.33                    | -89.05    | -13.00               | 76.05       |
| 508.00                | 4064.00                  | PK       | 3.30                 | V                | -7.62          | 12.55                            | 3.00         | 8.23                    | -89.15    | -13.00               | 76.15       |
| 508.00                | 4572.00                  | PK       | 4.20                 | H                | -8.10          | 13.01                            | 3.00         | 9.11                    | -88.27    | -13.00               | 75.27       |
| 508.00                | 4572.00                  | PK       | 4.60                 | V                | -8.10          | 13.01                            | 3.00         | 9.51                    | -87.87    | -13.00               | 74.87       |
| 508.00                | 5080.00                  | PK       | 3.40                 | H                | -8.53          | 13.43                            | 3.00         | 8.31                    | -89.07    | -13.00               | 76.07       |
| 508.00                | 5080.00                  | PK       | 3.30                 | V                | -8.53          | 13.43                            | 3.00         | 8.21                    | -89.17    | -13.00               | 76.17       |

## 8.10 Adjacent channel power limits

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



### 8.10.1 ACP, 455 MHz



Date: 30.OCT.2023 11:24:55

## 9. ANNEX-B – Test Setup Photographs

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

## 10. History of Test Report Changes

| Test Report #                       | Revision # | Description     | Date of Issue |
|-------------------------------------|------------|-----------------|---------------|
| TR_10377-23_FCC 90_Booster Class B_ | 1          | Initial release | 11/10/2023    |
|                                     |            |                 |               |
|                                     |            |                 |               |



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END OF TEST REPORT

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