ENGINEERING TEST REPORT

UHF P25 Transceiver
Model No.: IC-F7540
FCC ID: AFJ399100

Applicant:

ICOM Incorporated
1-1-32, Kaminominami, Hirano-ku
Osaka, Japan, 547-0003

Tested in Accordance With

Federal Communications Commission (FCC)
47 CFR, Parts 2, 22 and 90 (Subpart R, S)

UltraTech's File No.: 19ICOM10_FCC90

This Test report is Issued under the Authority of Tri M. Luu, BASc, Vice President of Engineering UltraTech Group of Labs Date: May 15, 2019	
Report Prepared by: Santhosh Fernandez Issued Date: May 15, 2019	Tested by: Nimisha Desai Test Dates: April 22-May 14, 2019

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2, 22, 74,and 90 (Subpart R & S)
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication – Parts 2, 22, and 90
Purpose of Test:	To obtain FCC Certification Authorization for Radio operating in the Frequency Band 769-775 MHz, 799-805 MHz & 806-824 MHz and 851-869 MHz
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with TIA/EIA Standard TIA/EIA-603-E – Land Mobile FM or PM Communications Equipment Measurement and performance Standards.

1.2. REVISION HISTORY

Document	Issue Date	Description
19ICOM10_FCC90	May 15, 2019	Original Report

1.3. RELATED SUBMITTAL(S)/GRANT(S)

None

1.4. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2018	Code of Federal Regulations – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/TIA-603-E	2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI C63.26	2015	American National Standard for Compliance Testing of Transmitters used in Licensed Radio Services

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Icom Incorporated
Address:	1-1-32, Kamiminami Hirano-ku, Osaka Japan, 547-0003
Contact Person:	Mr. Atsushi Tomiyama Phone #: +81 6 6793 5302 Fax #: +81 6 6793 0013 Email Address: world_support@icom.co.jp

MANUFACTURER	
Name:	Icom Incorporated
Address:	1-1-32, Kamiminami Hirano-ku, Osaka Japan, 547-0003
Contact Person:	Mr. Atsushi Tomiyama Phone #: +81 6 6793 5302 Fax #: +81 6 6793 0013 Email Address: world_support@icom.co.jp

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The applicant has supplied the following information (with the exception of the Date of Receipt).

Brand Name:	ICOM Incorporated
Product Name:	UHF P25 Transceiver
Model Name or Number:	IC-F7540
Serial Number:	00000012
Type of Equipment:	Licensed Non-Broadcast Station Transmitter
Power Supply Requirement:	13.6 VDC nominal
Transmitting/Receiving Antenna Type:	Non-integral
Primary User Functions of EUT:	2-Way Wireless Voice & Data Communication

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Mobile
Intended Operating Environment:	Restricted to Occupational Use only
Power Supply Requirement:	13.6 VDC Nominal
RF Output Power Rating: 769-775 MHz, 799-805 MHz: 806-824 MHz and 851-869 MHz:	 30 Watts(High) / 2 Watts (Low) 35 Watts(High) / 2 Watts (Low)
Operating Frequency Range:	769-775 MHz, 799-805 MHz & 806-824 MHz and 851-869 MHz
RF Output Impedance:	50 Ω
Channel Spacing:	25 kHz, 20 kHz, 12.5 kHz
Occupied Bandwidth (99%):	15.62 kHz (25 kHz Analog) F3E 10.48 kHz (20 kHz Analog) F3E 10.74 kHz (12.5 kHz Analog) F3E 8.09 kHz (12.5 kHz Digital) F1D/F1E 8.09 kHz (12.5 kHz Digital) F1W
Emission Designation*:	Analog: 16K0F3E**, 14K0F3E, 11K0F3E, Digital: 8K10F1E, 8K10F1D, 8K10F1W

* For an average case of commercial telephony, the Necessary Bandwidth is calculated as follows:
For FM Voice Modulation:
Channel Spacing = 25 KHz, D = 5 KHz max, K = 1, M = 3 KHz
B_n = 2M + 2DK = 2(3) + 2(5)(1) = **16 KHz**
Emission designation: 16K0F3E

Channel Spacing = 20 KHz, D = 4 KHz max, K = 1, M = 3 KHz
B_n = 2M + 2DK = 2(3) + 2(4)(1) = **14 KHz**
Emission designation: 14K0F3E

Channel Spacing = 12.5 KHz, D = 2.5 KHz max, K = 1, M = 3 KHz
B_n = 2M + 2DK = 2(3) + 2(2.5)(1) = **11 KHz**
Emission designation: 11K0F3E
****Note:** The emission designation 16K0F3E with 25 KHz Channel bandwidth is only applied to the device operated in FCC Rules Part 22, 74 & 80 frequencies. The operation of 16K0F3E emission will be disabled in the firmware by the manufacturer for device that operates in FCC Rules Part 90 frequencies (Private Land Mobile) as declared by the applicant.

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Terminated with
1	Microphone Connector	1	8 Pin-connector Jack	Microphone
2	Antenna Connector	1	N	50 Ohm Load
3.	USB	1	Micro- USB connector	Micro USB Cable
4.	DC POWER	1	2 wire	DC supply
5.	Ignition	1	1 Wire	Open cable
6.	D-Sub	1	25 Pin	Open cable
7	GPS Antenna	1	SMA	GPS Antenna
8.	EXT. Speaker	1	1/8" Jack	Speaker

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Microphone
Brand name:	ICOM
Model Name or Number:	HM218
Connected to EUT's Port:	Microphone Connector

Ancillary Equipment # 2	
Description:	External Speaker
Brand name:	ICOM
Model Name or Number:	SP-30
Connected to EUT's Port:	EXT Speaker

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C - 24°C
Humidity:	45% to 58%
Pressure:	102 kPa
Power Input Source:	13.6 VDC Nominal

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	N/A
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the antenna port terminated to a 50 Ohm RF Load.

Transmitter Test Signals	
Frequency Band(s):	769-775 MHz, 799-805 MHz & 806-824 MHz and 851-869 MHz
Test Frequencies: (Near lowest, near middle & near highest frequencies in the frequency range of operation of applicable band)	769.1 MHz, 774.9 MHz, 799.1 MHz, 804.9 MHz, 806.1 MHz, 808.9 MHz, 815.1 MHz, 823.9 MHz, 851.1 MHz,853.9 MHz, 860.1 MHz, 868.9 MHz
Transmitter Wanted Output Test Signals: Transmitter Power (measured maximum output power): Normal Test Modulation: Modulating signal source:	 769-775 MHz& 799-805 MHz band: 28.18W 806-824 MHz and 851-869 MHz band:36.39W FM Voice/Digital External

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

4.2. APPLICABILITY & SUMMARY OF EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Applicability (Yes/No)
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
2.1046, 22.565, 90.205, 90.541 (d)	RF Power Output	Yes
90.543(f)	GNSS (EIRP)	N/A-Not Wideband or Discrete emission <700 Hz
2.1047(a), & 90.242(b)(8)	Audio Frequency Response	Not applicable to new standard. However, tests are conducted under FCC's recommendation.
2.1047(b) & 90.210	Modulation Limiting	Yes
2.1049 90.209, 90.210, 90.691	Emission Limitation & Emission Mask	Yes
2.1051, 2.1057, 90.210, 90.543	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
2.1053, 2.1057, 22.359, 90.210, 90.543	Emission Limits - Field Strength of Spurious Emissions	Yes
90.543	Adjacent Channel Power	Yes for 769-805MHz Band
2.1055, 22.355, 90.213 & 90.539	Frequency Stability	Yes
90.214	Transient Frequency Behavior	N/A
UHF P25 Transceiver, Model No.: IC-F7540, by ICOM Incorporated has also been tested and found to comply with FCC Part 15, Subpart B - Radio Receivers and Class B Digital Devices. The engineering test report has been documented and kept on file and is available upon request.		

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

4.3.1. DEVIATION OF STANDARD TEST PROCEDURES

None

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in EXHIBIT 8 of this report.

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.
Refer to Exhibit 7 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

The essential function of the EUT is to communicate to and from radios over RF link.

5.5. RF POWER OUTPUT [§§ 2.1046, 22.565, 90.205, 90.541& 90.543]

5.5.1. Limits

Please refer to FCC 47 CFR 90.205, 90.541, 90.543 & 22.565 for specification details.

5.5.2. Method of Measurements

Refer to Section 8.1 (Conducted) and 8.2 (Radiated) of this report for measurement details

5.5.3. Test Data

769-805 MHz band Conducted power

Frequencies MHz	Power Rating dBm	Power dBm	Actual Power Watts	Power Rating Watts
769.100	44.77	44.50	28.18	30.0
774.900	44.77	44.44	27.80	30.0
799.100	44.77	44.24	26.55	30.0
804.900	44.77	44.18	26.18	30.0
769.100	33.01	33.37	2.17	2.0
774.900	33.01	33.34	2.16	2.0
799.100	33.01	33.06	2.02	2.0
804.900	33.01	33.00	2.00	2.0
769.100	41.76	41.65	14.62	15.0
774.900	41.76	41.63	14.55	15.0
799.100	41.76	41.36	13.68	15.0
804.900	41.76	41.29	13.46	15.0

806-869MHz Band Conducted power

Frequencies MHz	Power Rating dBm	Actual Power dBm	Actual Power Watts	Power Rating Watts
806.100	45.44	45.47	35.24	35.0
808.900	45.44	45.45	35.08	35.0
815.100	45.44	45.54	35.81	35.0
823.900	45.44	45.61	36.39	35.0
851.100	45.44	45.18	32.96	35.0
853.900	45.44	45.10	32.36	35.0
860.100	45.44	45.08	32.21	35.0
868.900	45.44	45.01	31.70	35.0
806.100	33.01	32.99	1.99	2.0
808.900	33.01	33.01	2.00	2.0
815.100	33.01	33.06	2.02	2.0
823.900	33.01	33.17	2.07	2.0
851.100	33.01	32.86	1.93	2.0
808.900	33.01	33.01	2.00	2.0
860.100	33.01	32.76	1.89	2.0
868.900	33.01	32.77	1.89	2.0
806.100	41.76	41.29	13.46	15.0
808.900	41.76	41.32	13.55	15.0
815.100	41.76	41.38	13.74	15.0
823.900	41.76	41.50	14.13	15.0
851.100	41.76	41.22	13.24	15.0
853.900	41.76	41.16	13.06	15.0
860.100	41.76	41.14	13.00	15.0
868.900	41.76	41.14	13.00	15.0

5.6. AUDIO FREQUENCY RESPONSE [§ 2.1047(a) & 90.242(b)(8)]

5.6.1. Limits

§ **2.1047(a):** Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

§ **90.242(b)(8):** Recommended audio filter attenuation characteristics are given below:

Audio band	Minimum Attenuation Rel. to 1 kHz Attenuation
3 –20 KHz	60 $\log_{10}$(f/3) dB where f is in kHz
20 – 30 KHz	50dB

5.6.2. Method of Measurements

The rated audio input signal was applied to the input of the audio low-pass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT Digital Spectrum Analyzer. Tests were repeated at different audio signal frequencies from 0 to 50 KHz.

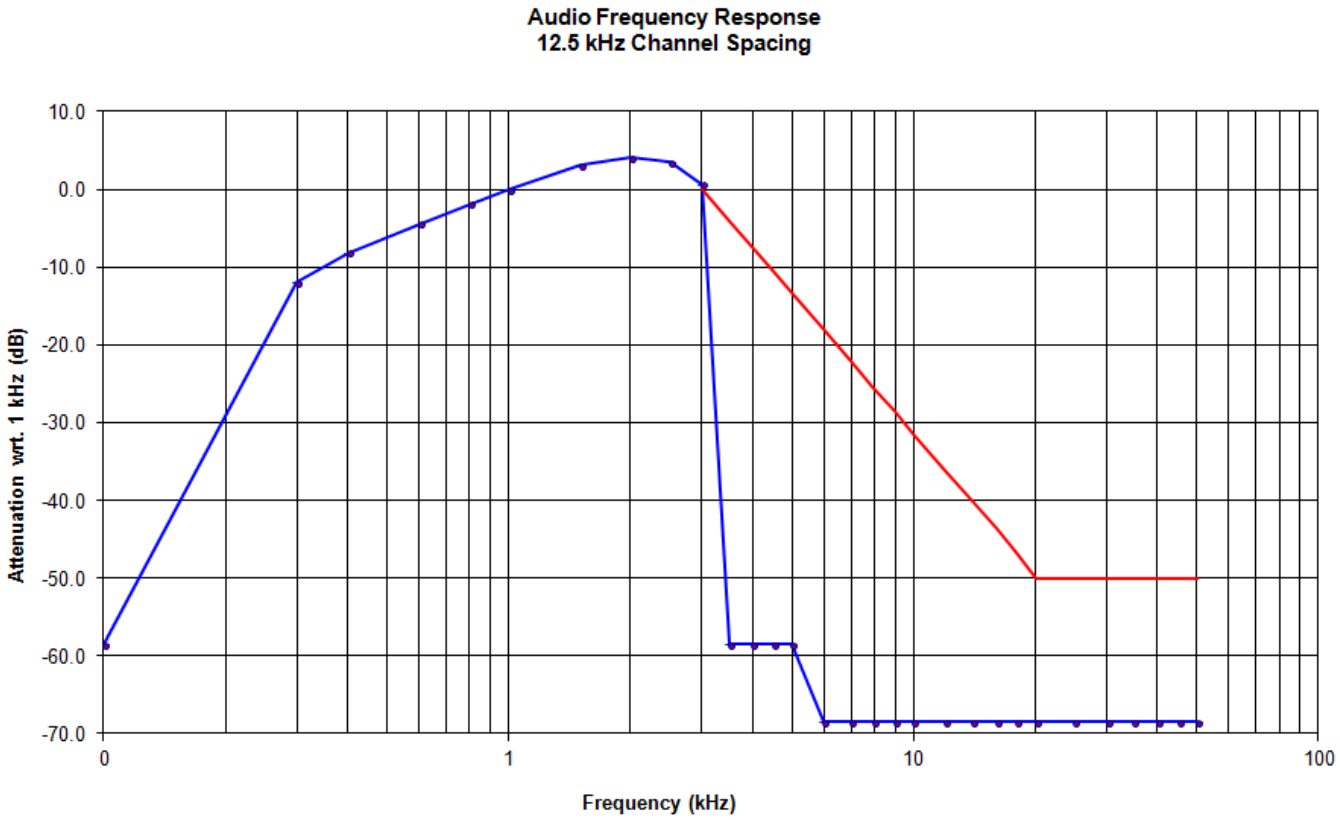
5.6.3. Test Data

Note: Audio Freq Response and Modulation limiting tests were performed only for 12.5 , 20 & 25 kHz channel spacing. These tests were not performed for 6.25 kHz ch spacing as there is no FM voice capability for this device.

5.6.3.1. 12.5 KHz Channel Spacing, F3E, Frequency of All Modulation States (769-775 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

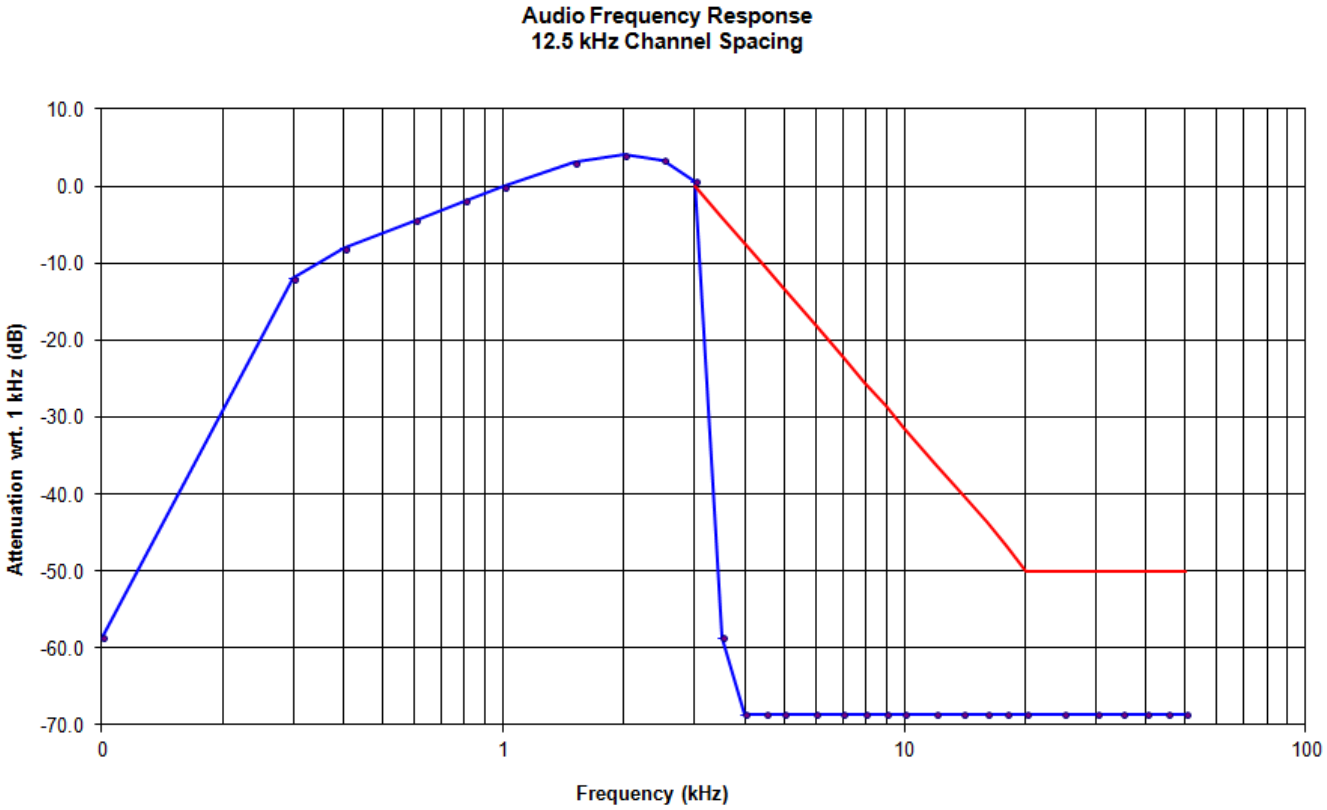
Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.74	-60.00	-12.3	-58.5	--
0.3	-47.74	-13.47	34.3	-12.0	--
0.4	-47.74	-9.59	38.2	-8.1	--
0.6	-47.74	-5.89	41.9	-4.4	--
0.8	-47.74	-3.34	44.4	-1.9	--
1.0	-47.74	-1.47	46.3	0.0	--
1.5	-47.74	1.61	49.4	3.1	--
2.0	-47.74	2.59	50.3	4.1	--
2.5	-47.74	2.00	49.7	3.5	--
3.0	-47.74	-0.76	47.0	0.7	0
3.5	-47.74	-60.00	-12.3	-58.5	-4
4.0	-47.74	-60.00	-12.3	-58.5	-7
4.5	-47.74	-60.00	-12.3	-58.5	-11
5.0	-47.74	-60.00	-12.3	-58.5	-13
6.0	-47.74	-70.00	-22.3	-68.5	-18
7.0	-47.74	-70.00	-22.3	-68.5	-22
8.0	-47.74	-70.00	-22.3	-68.5	-26
9.0	-47.74	-70.00	-22.3	-68.5	-29
10.0	-47.74	-70.00	-22.3	-68.5	-31
12.0	-47.74	-70.00	-22.3	-68.5	-36
14.0	-47.74	-70.00	-22.3	-68.5	-40
16.0	-47.74	-70.00	-22.3	-68.5	-44
18.0	-47.74	-70.00	-22.3	-68.5	-47
20.0	-47.74	-70.00	-22.3	-68.5	-50
25.0	-47.74	-70.00	-22.3	-68.5	-50
30.0	-47.74	-70.00	-22.3	-68.5	-50
35.0	-47.74	-70.00	-22.3	-68.5	-50
40.0	-47.74	-70.00	-22.3	-68.5	-50
45.0	-47.74	-70.00	-22.3	-68.5	-50
50.0	-47.74	-70.00	-22.3	-68.5	-50



5.6.3.2. 12.5 KHz Channel Spacing, F3E, Frequency of All Modulation States (799-805 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

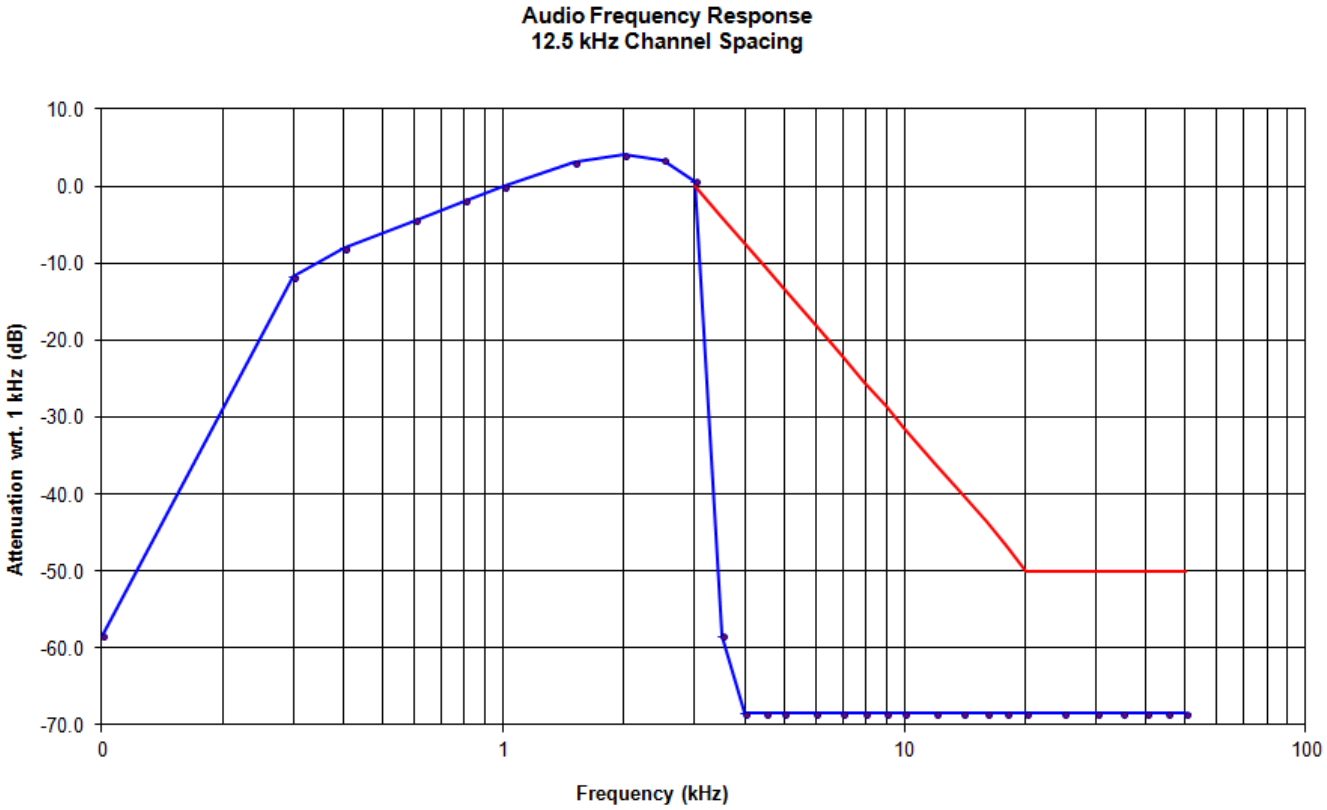
Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.74	-60.00	-12.3	-58.6	--
0.3	-47.74	-13.42	34.3	-12.0	--
0.4	-47.74	-9.52	38.2	-8.1	--
0.6	-47.74	-5.84	41.9	-4.4	--
0.8	-47.74	-3.29	44.5	-1.9	--
1.0	-47.74	-1.43	46.3	0.0	--
1.5	-47.74	1.62	49.4	3.1	--
2.0	-47.74	2.61	50.4	4.0	--
2.5	-47.74	2.01	49.8	3.4	--
3.0	-47.74	-0.74	47.0	0.7	0
3.5	-47.74	-60.00	-12.3	-58.6	-4
4.0	-47.74	-70.00	-22.3	-68.6	-7
4.5	-47.74	-70.00	-22.3	-68.6	-11
5.0	-47.74	-70.00	-22.3	-68.6	-13
6.0	-47.74	-70.00	-22.3	-68.6	-18
7.0	-47.74	-70.00	-22.3	-68.6	-22
8.0	-47.74	-70.00	-22.3	-68.6	-26
9.0	-47.74	-70.00	-22.3	-68.6	-29
10.0	-47.74	-70.00	-22.3	-68.6	-31
12.0	-47.74	-70.00	-22.3	-68.6	-36
14.0	-47.74	-70.00	-22.3	-68.6	-40
16.0	-47.74	-70.00	-22.3	-68.6	-44
18.0	-47.74	-70.00	-22.3	-68.6	-47
20.0	-47.74	-70.00	-22.3	-68.6	-50
25.0	-47.74	-70.00	-22.3	-68.6	-50
30.0	-47.74	-70.00	-22.3	-68.6	-50
35.0	-47.74	-70.00	-22.3	-68.6	-50
40.0	-47.74	-70.00	-22.3	-68.6	-50
45.0	-47.74	-70.00	-22.3	-68.6	-50
50.0	-47.74	-70.00	-22.3	-68.6	-50



5.6.3.3. 12.5 KHz Channel Spacing, F3E, Frequency of All Modulation States (806-824 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

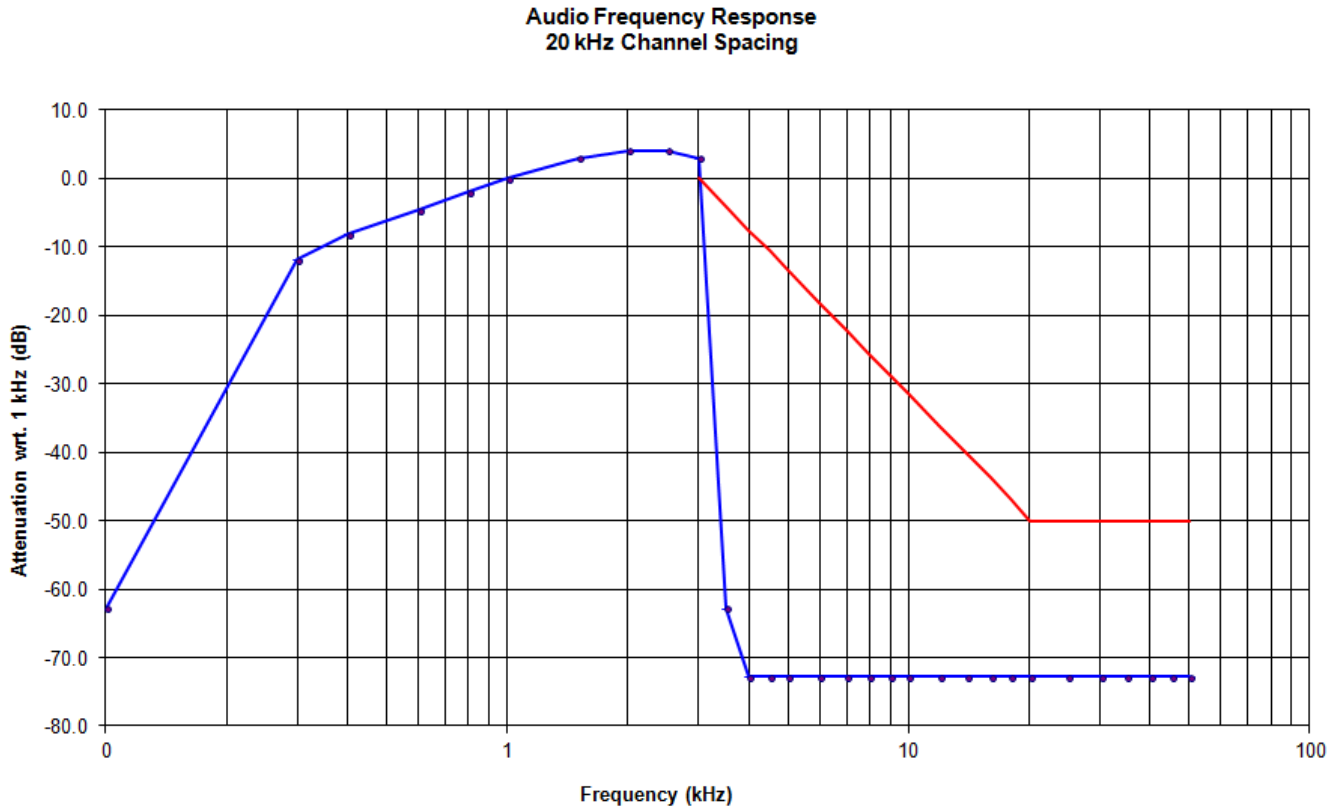
Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.74	-60.00	-12.3	-58.4	--
0.3	-47.74	-13.37	34.4	-11.8	--
0.4	-47.74	-9.64	38.1	-8.1	--
0.6	-47.74	-5.95	41.8	-4.4	--
0.8	-47.74	-3.41	44.3	-1.8	--
1.0	-47.74	-1.56	46.2	0.0	--
1.5	-47.74	1.51	49.3	3.1	--
2.0	-47.74	2.48	50.2	4.0	--
2.5	-47.74	1.88	49.6	3.4	--
3.0	-47.74	-0.88	46.9	0.7	0
3.5	-47.74	-60.00	-12.3	-58.4	-4
4.0	-47.74	-70.00	-22.3	-68.4	-7
4.5	-47.74	-70.00	-22.3	-68.4	-11
5.0	-47.74	-70.00	-22.3	-68.4	-13
6.0	-47.74	-70.00	-22.3	-68.4	-18
7.0	-47.74	-70.00	-22.3	-68.4	-22
8.0	-47.74	-70.00	-22.3	-68.4	-26
9.0	-47.74	-70.00	-22.3	-68.4	-29
10.0	-47.74	-70.00	-22.3	-68.4	-31
12.0	-47.74	-70.00	-22.3	-68.4	-36
14.0	-47.74	-70.00	-22.3	-68.4	-40
16.0	-47.74	-70.00	-22.3	-68.4	-44
18.0	-47.74	-70.00	-22.3	-68.4	-47
20.0	-47.74	-70.00	-22.3	-68.4	-50
25.0	-47.74	-70.00	-22.3	-68.4	-50
30.0	-47.74	-70.00	-22.3	-68.4	-50
35.0	-47.74	-70.00	-22.3	-68.4	-50
40.0	-47.74	-70.00	-22.3	-68.4	-50
45.0	-47.74	-70.00	-22.3	-68.4	-50
50.0	-47.74	-70.00	-22.3	-68.4	-50



5.6.3.4. 20 KHz Channel Spacing, F3E, Frequency of All Modulation States (806-824 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

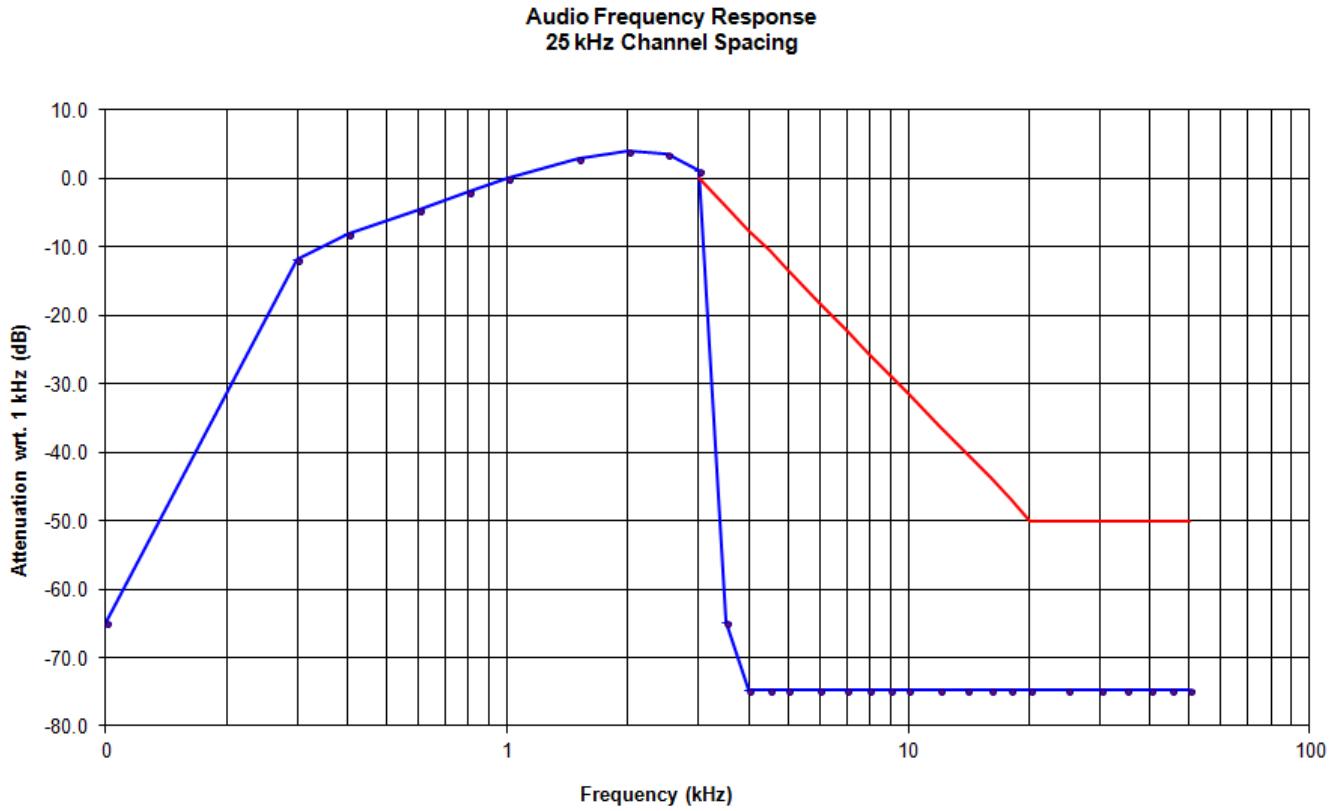
Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.74	-60.00	-12.3	-62.8	--
0.3	-47.74	-9.01	38.7	-11.8	--
0.4	-47.74	-5.27	42.5	-8.1	--
0.6	-47.74	-1.72	46.0	-4.5	--
0.8	-47.74	0.84	48.6	-2.0	--
1.0	-47.74	2.82	50.6	0.0	--
1.5	-47.74	5.89	53.6	3.1	--
2.0	-47.74	6.99	54.7	4.2	--
2.5	-47.74	6.99	54.7	4.2	--
3.0	-47.74	5.83	53.6	3.0	0
3.5	-47.74	-60.00	-12.3	-62.8	-4
4.0	-47.74	-70.00	-22.3	-72.8	-7
4.5	-47.74	-70.00	-22.3	-72.8	-11
5.0	-47.74	-70.00	-22.3	-72.8	-13
6.0	-47.74	-70.00	-22.3	-72.8	-18
7.0	-47.74	-70.00	-22.3	-72.8	-22
8.0	-47.74	-70.00	-22.3	-72.8	-26
9.0	-47.74	-70.00	-22.3	-72.8	-29
10.0	-47.74	-70.00	-22.3	-72.8	-31
12.0	-47.74	-70.00	-22.3	-72.8	-36
14.0	-47.74	-70.00	-22.3	-72.8	-40
16.0	-47.74	-70.00	-22.3	-72.8	-44
18.0	-47.74	-70.00	-22.3	-72.8	-47
20.0	-47.74	-70.00	-22.3	-72.8	-50
25.0	-47.74	-70.00	-22.3	-72.8	-50
30.0	-47.74	-70.00	-22.3	-72.8	-50
35.0	-47.74	-70.00	-22.3	-72.8	-50
40.0	-47.74	-70.00	-22.3	-72.8	-50
45.0	-47.74	-70.00	-22.3	-72.8	-50
50.0	-47.74	-70.00	-22.3	-72.8	-50



5.6.3.5. 25 KHz Channel Spacing, F3E, Frequency of All Modulation States (806-824 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

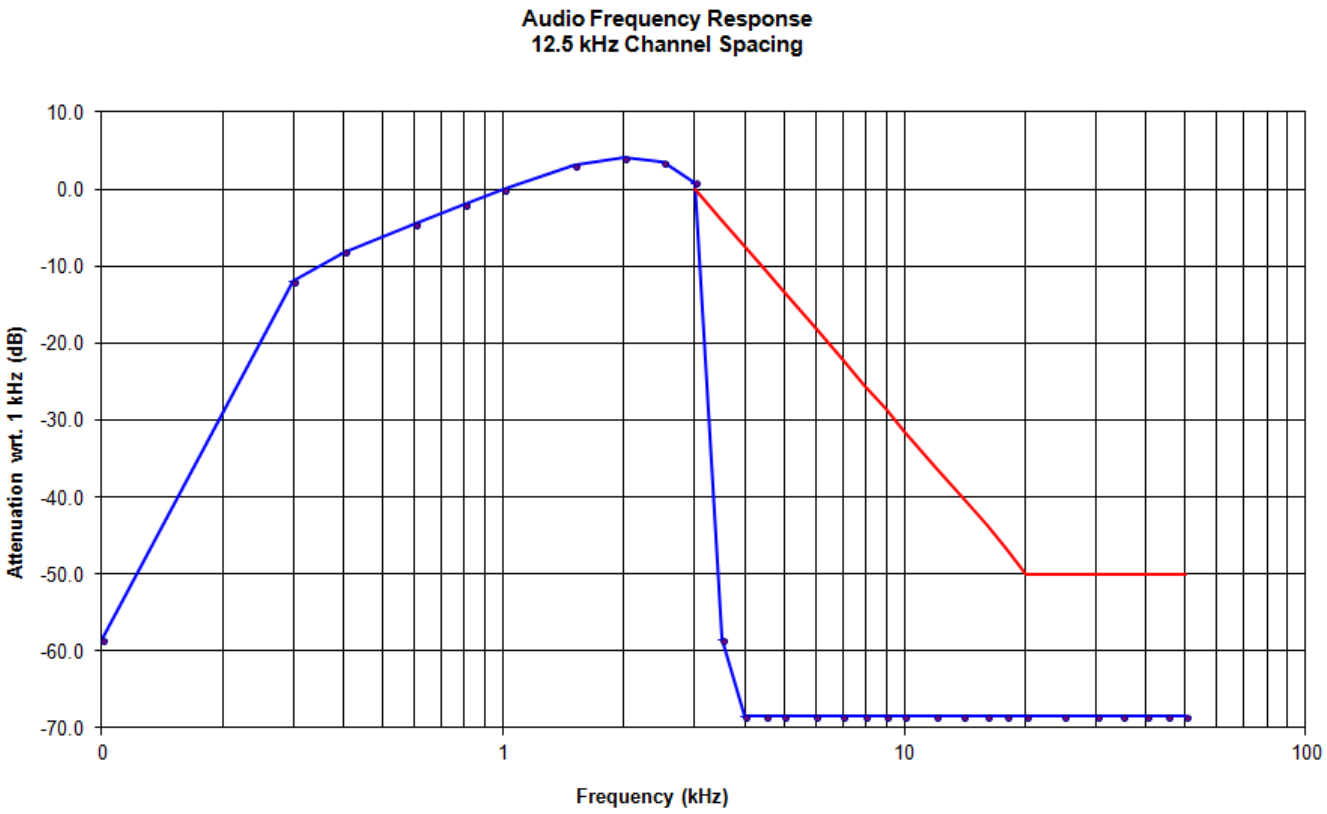
Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.74	-60.00	-12.3	-64.7	--
0.3	-47.74	-7.08	40.7	-11.8	--
0.4	-47.74	-3.35	44.4	-8.1	--
0.6	-47.74	0.20	47.9	-4.5	--
0.8	-47.74	2.74	50.5	-2.0	--
1.0	-47.74	4.73	52.5	0.0	--
1.5	-47.74	7.78	55.5	3.1	--
2.0	-47.74	8.78	56.5	4.1	--
2.5	-47.74	8.30	56.0	3.6	--
3.0	-47.74	5.95	53.7	1.2	0
3.5	-47.74	-60.00	-12.3	-64.7	-4
4.0	-47.74	-70.00	-22.3	-74.7	-7
4.5	-47.74	-70.00	-22.3	-74.7	-11
5.0	-47.74	-70.00	-22.3	-74.7	-13
6.0	-47.74	-70.00	-22.3	-74.7	-18
7.0	-47.74	-70.00	-22.3	-74.7	-22
8.0	-47.74	-70.00	-22.3	-74.7	-26
9.0	-47.74	-70.00	-22.3	-74.7	-29
10.0	-47.74	-70.00	-22.3	-74.7	-31
12.0	-47.74	-70.00	-22.3	-74.7	-36
14.0	-47.74	-70.00	-22.3	-74.7	-40
16.0	-47.74	-70.00	-22.3	-74.7	-44
18.0	-47.74	-70.00	-22.3	-74.7	-47
20.0	-47.74	-70.00	-22.3	-74.7	-50
25.0	-47.74	-70.00	-22.3	-74.7	-50
30.0	-47.74	-70.00	-22.3	-74.7	-50
35.0	-47.74	-70.00	-22.3	-74.7	-50
40.0	-47.74	-70.00	-22.3	-74.7	-50
45.0	-47.74	-70.00	-22.3	-74.7	-50
50.0	-47.74	-70.00	-22.3	-74.7	-50



5.6.3.6. 12.5 KHz Channel Spacing, F3E, Frequency of All Modulation States (851-869 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

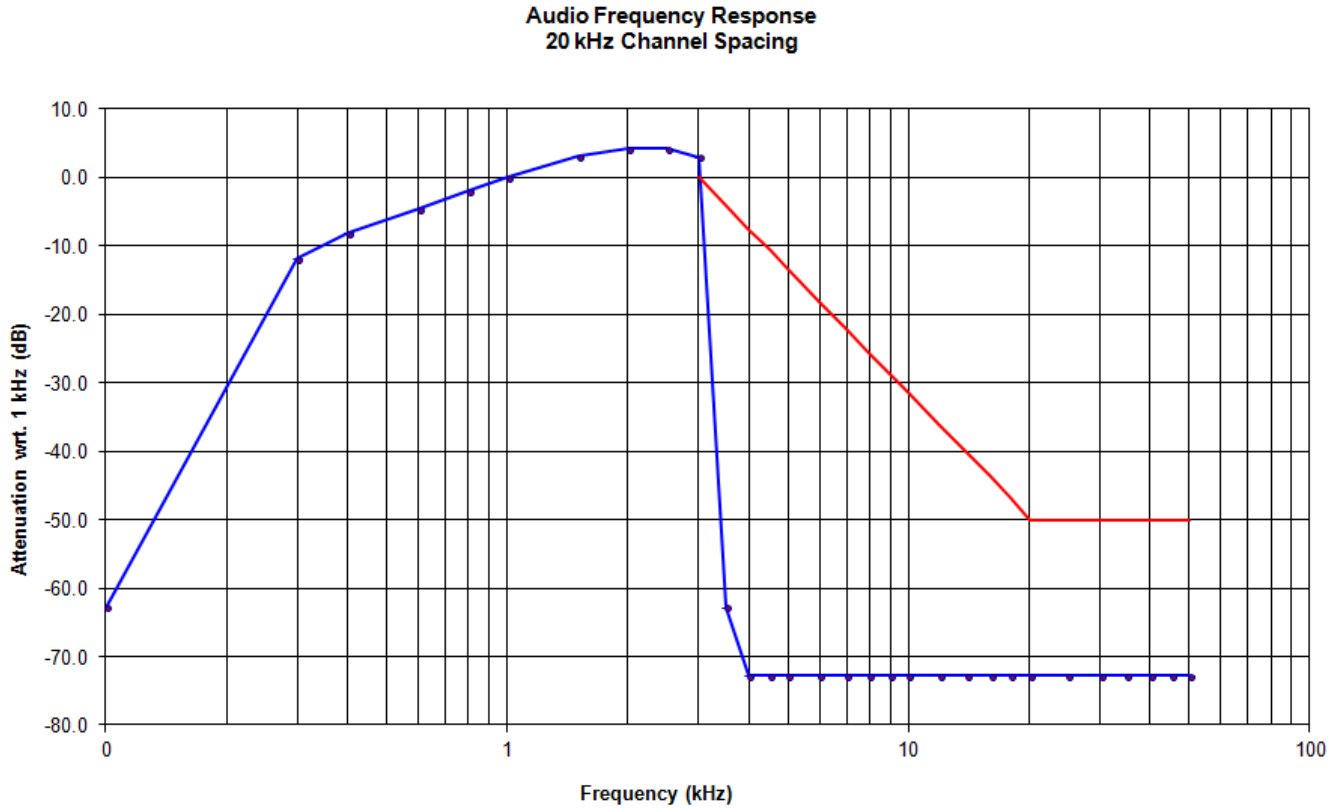
Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.82	-60.00	-12.2	-58.5	--
0.3	-47.82	-13.37	34.4	-11.8	--
0.4	-47.82	-9.64	38.2	-8.1	--
0.6	-47.82	-5.95	41.9	-4.4	--
0.8	-47.82	-3.39	44.4	-1.9	--
1.0	-47.82	-1.53	46.3	0.0	--
1.5	-47.82	1.56	49.4	3.1	--
2.0	-47.82	2.58	50.4	4.1	--
2.5	-47.82	2.00	49.8	3.5	--
3.0	-47.82	-0.63	47.2	0.9	0
3.5	-47.82	-60.00	-12.2	-58.5	-4
4.0	-47.82	-70.00	-22.2	-68.5	-7
4.5	-47.82	-70.00	-22.2	-68.5	-11
5.0	-47.82	-70.00	-22.2	-68.5	-13
6.0	-47.82	-70.00	-22.2	-68.5	-18
7.0	-47.82	-70.00	-22.2	-68.5	-22
8.0	-47.82	-70.00	-22.2	-68.5	-26
9.0	-47.82	-70.00	-22.2	-68.5	-29
10.0	-47.82	-70.00	-22.2	-68.5	-31
12.0	-47.82	-70.00	-22.2	-68.5	-36
14.0	-47.82	-70.00	-22.2	-68.5	-40
16.0	-47.82	-70.00	-22.2	-68.5	-44
18.0	-47.82	-70.00	-22.2	-68.5	-47
20.0	-47.82	-70.00	-22.2	-68.5	-50
25.0	-47.82	-70.00	-22.2	-68.5	-50
30.0	-47.82	-70.00	-22.2	-68.5	-50
35.0	-47.82	-70.00	-22.2	-68.5	-50
40.0	-47.82	-70.00	-22.2	-68.5	-50
45.0	-47.82	-70.00	-22.2	-68.5	-50
50.0	-47.82	-70.00	-22.2	-68.5	-50



5.6.3.7. 20 KHz Channel Spacing, F3E, Frequency of All Modulation States (851-869 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

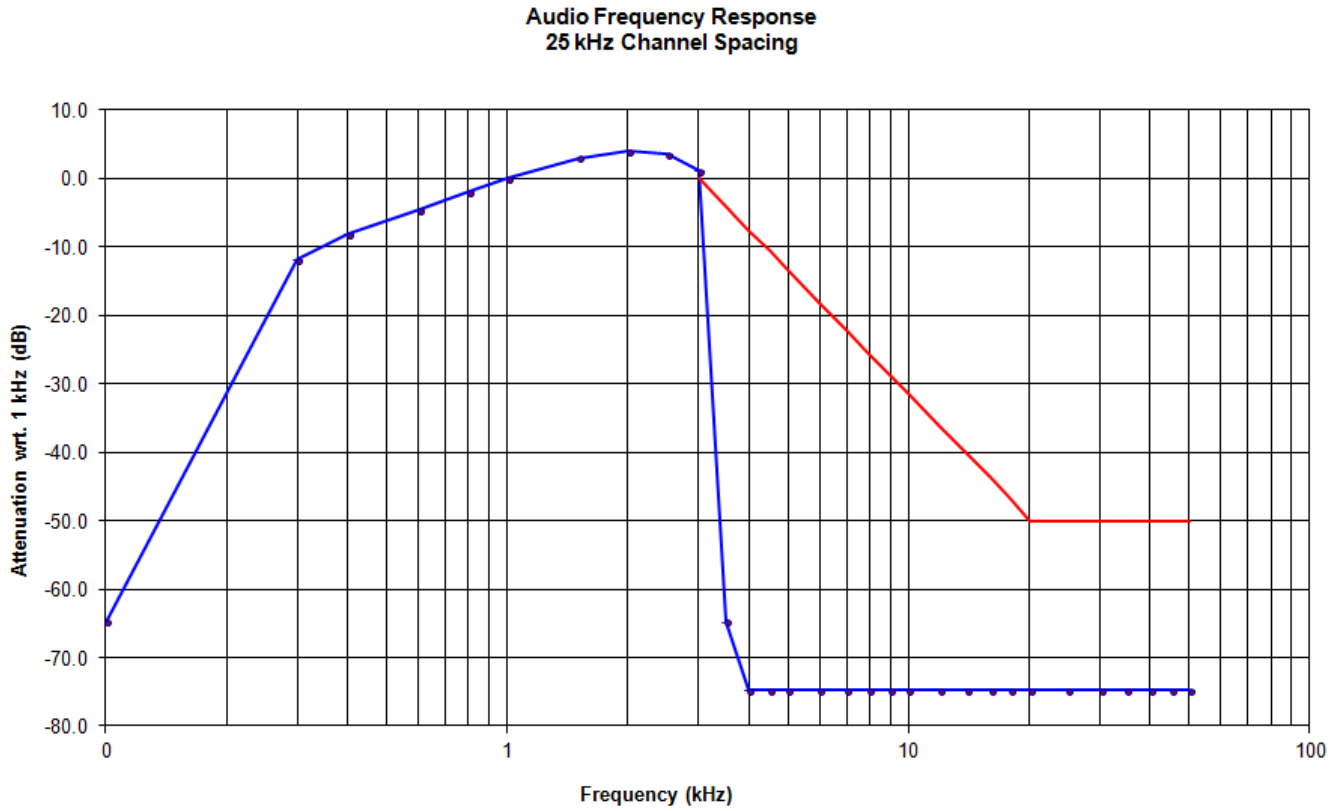
Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.74	-60.00	-12.3	-62.8	--
0.3	-47.74	-9.09	38.7	-11.9	--
0.4	-47.74	-5.33	42.4	-8.1	--
0.6	-47.74	-1.76	46.0	-4.5	--
0.8	-47.74	0.79	48.5	-2.0	--
1.0	-47.74	2.78	50.5	0.0	--
1.5	-47.74	5.86	53.6	3.1	--
2.0	-47.74	6.96	54.7	4.2	--
2.5	-47.74	6.97	54.7	4.2	--
3.0	-47.74	5.78	53.5	3.0	0
3.5	-47.74	-60.00	-12.3	-62.8	-4
4.0	-47.74	-70.00	-22.3	-72.8	-7
4.5	-47.74	-70.00	-22.3	-72.8	-11
5.0	-47.74	-70.00	-22.3	-72.8	-13
6.0	-47.74	-70.00	-22.3	-72.8	-18
7.0	-47.74	-70.00	-22.3	-72.8	-22
8.0	-47.74	-70.00	-22.3	-72.8	-26
9.0	-47.74	-70.00	-22.3	-72.8	-29
10.0	-47.74	-70.00	-22.3	-72.8	-31
12.0	-47.74	-70.00	-22.3	-72.8	-36
14.0	-47.74	-70.00	-22.3	-72.8	-40
16.0	-47.74	-70.00	-22.3	-72.8	-44
18.0	-47.74	-70.00	-22.3	-72.8	-47
20.0	-47.74	-70.00	-22.3	-72.8	-50
25.0	-47.74	-70.00	-22.3	-72.8	-50
30.0	-47.74	-70.00	-22.3	-72.8	-50
35.0	-47.74	-70.00	-22.3	-72.8	-50
40.0	-47.74	-70.00	-22.3	-72.8	-50
45.0	-47.74	-70.00	-22.3	-72.8	-50
50.0	-47.74	-70.00	-22.3	-72.8	-50



5.6.3.8. 25 KHz Channel Spacing, F3E, Frequency of All Modulation States (851-869 MHz band)

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 kHz in comparison with the recommended audio filter attenuation.

Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 1 KHz (dB)	Recommended Attenuation (dB)
0.1	-47.60	-60.00	-12.4	-64.7	--
0.3	-47.60	-7.15	40.5	-11.9	--
0.4	-47.60	-3.40	44.2	-8.1	--
0.6	-47.60	0.18	47.8	-4.5	--
0.8	-47.60	2.72	50.3	-2.0	--
1.0	-47.60	4.71	52.3	0.0	--
1.5	-47.60	7.76	55.4	3.1	--
2.0	-47.60	8.73	56.3	4.0	--
2.5	-47.60	8.25	55.9	3.5	--
3.0	-47.60	5.90	53.5	1.2	0
3.5	-47.60	-60.00	-12.4	-64.7	-4
4.0	-47.60	-70.00	-22.4	-74.7	-7
4.5	-47.60	-70.00	-22.4	-74.7	-11
5.0	-47.60	-70.00	-22.4	-74.7	-13
6.0	-47.60	-70.00	-22.4	-74.7	-18
7.0	-47.60	-70.00	-22.4	-74.7	-22
8.0	-47.60	-70.00	-22.4	-74.7	-26
9.0	-47.60	-70.00	-22.4	-74.7	-29
10.0	-47.60	-70.00	-22.4	-74.7	-31
12.0	-47.60	-70.00	-22.4	-74.7	-36
14.0	-47.60	-70.00	-22.4	-74.7	-40
16.0	-47.60	-70.00	-22.4	-74.7	-44
18.0	-47.60	-70.00	-22.4	-74.7	-47
20.0	-47.60	-70.00	-22.4	-74.7	-50
25.0	-47.60	-70.00	-22.4	-74.7	-50
30.0	-47.60	-70.00	-22.4	-74.7	-50
35.0	-47.60	-70.00	-22.4	-74.7	-50
40.0	-47.60	-70.00	-22.4	-74.7	-50
45.0	-47.60	-70.00	-22.4	-74.7	-50
50.0	-47.60	-70.00	-22.4	-74.7	-50



5.7. MODULATION LIMITING [§§ 2.1047 (b), 74.463, 80.213 & 90.210]

5.7.1. Limits

§ **2.1047(b):** Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

Recommended frequency deviation characteristics are given below:

- 1.25 kHz for 6.25 kHz Channel Spacing System
- 2.5 KHz for 12.5 kHz Channel Spacing System

5.7.2. Method of Measurements

For Audio Transmitter: The carrier frequency deviation was measured with the tone input signal level varied from 0 Vp to audio input rating level plus 16 dB at frequencies 0.1, 0.5, 1.0, 3.0 and 5.0 kHz. The maximum deviation was recorded at each test condition.

For Data Transmitter with Maximum Frequency Deviation set by Factory: The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

5.7.3. Test Data

5.7.3.1. Voice Modulation Limiting for 12.5 KHz Channel Spacing Operation (769-775 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz)					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.088	0.25	0.42	0.78	0.093	2.5
2	0.095	0.39	0.71	1.21	0.093	2.5
4	0.090	0.63	1.22	1.39	0.093	2.5
6	0.091	0.92	1.65	1.48	0.097	2.5
8	0.093	1.12	1.87	1.48	0.096	2.5
10	0.095	1.30	1.97	1.48	0.094	2.5
15	0.091	1.65	2.10	1.48	0.098	2.5
20	0.095	1.77	2.14	1.48	0.098	2.5
25	0.096	1.74	2.12	1.48	0.098	2.5
30	0.093	1.78	2.15	1.49	0.098	2.5
35	0.096	1.74	2.13	1.48	0.098	2.5
40	0.093	1.77	2.15	1.49	0.098	2.5
45	0.093	1.79	2.14	1.49	0.098	2.5
50	0.093	1.77	2.13	1.48	0.102	2.5
60	0.093	1.78	2.13	1.48	0.102	2.5
70	0.093	1.76	2.13	1.48	0.102	2.5
80	0.093	1.76	2.13	1.48	0.102	2.5
90	0.093	1.79	2.13	1.48	0.102	2.5

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.1 mV+ 16 dB = 28.26 dB(mVrms) = 25.87 mVrms	
Modulation Frequency (kHz)	**Peak Deviation (kHz)**	**Maximum Limit (kHz)**
0.1	0.09	2.5
0.2	0.10	2.5
0.3	1.33	2.5
0.4	1.72	2.5
0.6	1.82	2.5
0.8	2.03	2.5
1.0	2.12	2.5
1.2	2.15	2.5
1.4	2.16	2.5
1.6	2.19	2.5
1.8	2.20	2.5
2.0	2.22	2.5
2.5	2.08	2.5
3.0	1.48	2.5
3.5	0.10	2.5
4.0	0.09	2.5
4.5	0.09	2.5
5.0	0.10	2.5
6.0	0.09	2.5
7.0	0.09	2.5
8.0	0.10	2.5
9.0	0.09	2.5
10.0	0.09	2.5

5.7.3.2. Voice Modulation Limiting for 12.5 KHz Channel Spacing Operation (799-805 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz)					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.096	0.25	0.45	0.78	0.089	2.5
2	0.096	0.39	0.76	1.21	0.085	2.5
4	0.095	0.63	1.22	1.39	0.088	2.5
6	0.096	0.91	1.66	1.46	0.093	2.5
8	0.093	1.15	1.88	1.47	0.088	2.5
10	0.094	1.31	1.98	1.48	0.095	2.5
15	0.093	1.67	2.10	1.49	0.099	2.5
20	0.093	1.77	2.15	1.47	0.096	2.5
25	0.093	1.78	2.16	1.48	0.098	2.5
30	0.095	1.78	2.16	1.48	0.105	2.5
35	0.088	1.79	2.16	1.47	0.103	2.5
40	0.089	1.77	2.12	1.48	0.102	2.5
45	0.094	1.79	2.13	1.48	0.101	2.5
50	0.096	1.78	2.14	1.48	0.103	2.5
60	0.095	1.78	2.14	1.47	0.103	2.5
70	0.096	1.78	2.14	1.47	0.103	2.5
80	0.097	1.77	2.15	1.48	0.102	2.5
90	0.098	1.77	2.15	1.48	0.103	2.5

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.1 mV+ 16 dB = 28.26 dB(mVrms) = 25.87 mVrms	
Modulation Frequency (kHz)	**Peak Deviation (kHz)**	**Maximum Limit (kHz)**
0.1	0.10	2.5
0.2	0.09	2.5
0.3	1.39	2.5
0.4	1.73	2.5
0.6	1.82	2.5
0.8	2.03	2.5
1.0	2.14	2.5
1.2	2.15	2.5
1.4	2.16	2.5
1.6	2.18	2.5
1.8	2.21	2.5
2.0	2.22	2.5
2.5	2.08	2.5
3.0	1.48	2.5
3.5	0.09	2.5
4.0	0.09	2.5
4.5	0.09	2.5
5.0	0.10	2.5
6.0	0.10	2.5
7.0	0.09	2.5
8.0	0.10	2.5
9.0	0.09	2.5
10.0	0.09	2.5

5.7.3.3. Voice Modulation Limiting for 12.5 KHz Channel Spacing Operation (806-824 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz)					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.099	0.24	0.44	0.77	0.097	2.5
2	0.094	0.39	0.74	1.19	0.097	2.5
4	0.093	0.63	1.21	1.36	0.095	2.5
6	0.095	0.90	1.64	1.46	0.098	2.5
8	0.092	1.12	1.86	1.46	0.095	2.5
10	0.094	1.29	1.95	1.47	0.097	2.5
15	0.094	1.65	2.06	1.46	0.097	2.5
20	0.093	1.75	2.12	1.46	0.097	2.5
25	0.092	1.77	2.12	1.45	0.107	2.5
30	0.096	1.75	2.13	1.46	0.104	2.5
35	0.094	1.76	2.12	1.46	0.105	2.5
40	0.095	1.74	2.12	1.46	0.107	2.5
45	0.097	1.77	2.11	1.46	0.105	2.5
50	0.095	1.76	2.11	1.46	0.103	2.5
60	0.095	1.76	2.12	1.46	0.104	2.5
70	0.095	1.75	2.12	1.46	0.105	2.5
80	0.095	1.76	2.12	1.46	0.105	2.5
90	0.095	1.76	2.11	1.46	0.105	2.5

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.1 mV+ 16 dB = 28.26 dB(mVrms) = 25.87 mVrms	
Modulation Frequency (kHz)	**Peak Deviation (kHz)**	**Maximum Limit (kHz)**
0.1	0.10	2.5
0.2	0.10	2.5
0.3	1.38	2.5
0.4	1.71	2.5
0.6	1.80	2.5
0.8	2.01	2.5
1.0	2.11	2.5
1.2	2.12	2.5
1.4	2.14	2.5
1.6	2.15	2.5
1.8	2.18	2.5
2.0	2.18	2.5
2.5	2.05	2.5
3.0	1.46	2.5
3.5	0.10	2.5
4.0	0.10	2.5
4.5	0.10	2.5
5.0	0.10	2.5
6.0	0.10	2.5
7.0	0.09	2.5
8.0	0.09	2.5
9.0	0.09	2.5
10.0	0.09	2.5

5.7.3.4. Voice Modulation Limiting for 20 KHz Channel Spacing Operation (806-824 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz) at the following modulating frequency:					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.096	0.37	0.68	1.56	0.094	4.0
2	0.094	0.59	1.19	2.46	0.092	4.0
4	0.099	0.99	1.94	2.83	0.096	4.0
6	0.097	1.45	2.63	2.98	0.104	4.0
8	0.093	1.81	2.99	3.03	0.105	4.0
10	0.097	2.10	3.13	3.02	0.103	4.0
15	0.095	2.67	3.37	3.04	0.109	4.0
20	0.096	2.84	3.48	3.02	0.120	4.0
25	0.094	2.86	3.49	3.03	0.130	4.0
30	0.095	2.85	3.49	3.03	0.136	4.0
35	0.095	2.86	3.49	3.03	0.140	4.0
40	0.095	2.83	3.47	3.03	0.130	4.0
45	0.096	2.87	3.47	3.03	0.125	4.0
50	0.093	2.86	3.49	3.03	0.132	4.0
60	0.093	2.86	3.49	3.03	0.130	4.0
70	0.093	2.85	3.49	3.03	0.131	4.0
80	0.093	2.84	3.47	3.03	0.130	4.0
90	0.093	2.85	3.47	3.03	0.130	4.0
100	0.093	2.85	3.49	3.03	0.130	4.0

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.1 mV+ 16 dB = 28.26 dB(mVrms) = 25.87 mVrms	
Modulation Frequency (KHz)	**Peak Deviation (KHz)**	**Maximum Limit (KHz)**
0.1	0.10	4.0
0.2	0.10	4.0
0.3	2.23	4.0
0.4	2.78	4.0
0.6	3.00	4.0
0.8	3.22	4.0
1.0	3.46	4.0
1.2	3.51	4.0
1.4	3.51	4.0
1.6	3.54	4.0
1.8	3.57	4.0
2.0	3.60	4.0
2.5	3.59	4.0
3.0	3.03	4.0
3.5	0.10	4.0
4.0	0.10	4.0
4.5	0.10	4.0
5.0	0.12	4.0
6.0	0.10	4.0
7.0	0.10	4.0
8.0	0.10	4.0
9.0	0.10	4.0
10.0	0.10	4.0

5.7.3.5. Voice Modulation Limiting for 25 KHz Channel Spacing Operation (806-824 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz) at the following modulating frequency:					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.101	0.44	0.83	1.59	0.105	5.0
2	0.107	0.72	1.46	2.50	0.101	5.0
4	0.104	1.23	2.47	2.86	0.103	5.0
6	0.107	1.79	3.40	3.06	0.104	5.0
8	0.105	2.23	3.77	3.07	0.105	5.0
10	0.105	2.58	3.94	3.07	0.116	5.0
15	0.100	3.31	4.20	3.08	0.123	5.0
20	0.107	3.54	4.30	3.07	0.136	5.0
25	0.100	3.56	4.32	3.07	0.135	5.0
30	0.103	3.56	4.33	3.08	0.139	5.0
35	0.101	3.55	4.32	3.07	0.132	5.0
40	0.100	3.53	4.31	3.08	0.134	5.0
45	0.101	3.57	4.28	3.07	0.129	5.0
50	0.103	3.55	4.32	3.07	0.128	5.0
60	0.105	3.56	4.33	3.07	0.126	5.0
70	0.102	3.55	4.32	3.07	0.127	5.0
80	0.102	3.53	4.30	3.07	0.124	5.0
90	0.102	3.56	4.30	3.07	0.125	5.0
100	0.102	3.55	4.30	3.07	0.125	5.0

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.1 mV+ 16 dB = 28.26 dB(mVrms) = 25.87 mVrms	
Modulation Frequency (KHz)	**Peak Deviation (KHz)**	**Maximum Limit (KHz)**
0.1	0.11	5.0
0.2	0.12	5.0
0.3	2.77	5.0
0.4	3.45	5.0
0.6	3.64	5.0
0.8	4.06	5.0
1.0	4.28	5.0
1.2	4.30	5.0
1.4	4.32	5.0
1.6	4.36	5.0
1.8	4.43	5.0
2.0	4.45	5.0
2.5	4.23	5.0
3.0	3.07	5.0
3.5	0.10	5.0
4.0	0.11	5.0
4.5	0.12	5.0
5.0	0.11	5.0
6.0	0.10	5.0
7.0	0.10	5.0
8.0	0.11	5.0
9.0	0.11	5.0
10.0	0.11	5.0

5.7.3.6. Voice Modulation Limiting for 12.5 KHz Channel Spacing Operation (851-869 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz)					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.097	0.26	0.45	0.78	0.098	2.5
2	0.095	0.39	0.76	1.22	0.099	2.5
4	0.098	0.64	1.23	1.39	0.097	2.5
6	0.099	0.91	1.66	1.47	0.099	2.5
8	0.098	1.14	1.89	1.49	0.100	2.5
10	0.098	1.32	1.98	1.49	0.110	2.5
15	0.094	1.66	2.09	1.49	0.108	2.5
20	0.095	1.77	2.16	1.48	0.107	2.5
25	0.097	1.78	2.16	1.49	0.106	2.5
30	0.097	1.78	2.16	1.48	0.105	2.5
35	0.095	1.78	2.16	1.48	0.106	2.5
40	0.094	1.78	2.15	1.49	0.106	2.5
45	0.095	1.79	2.14	1.49	0.106	2.5
50	0.095	1.79	2.15	1.49	0.107	2.5
60	0.095	1.79	2.16	1.49	0.107	2.5
70	0.095	1.78	2.15	1.49	0.107	2.5
80	0.095	1.77	2.15	1.49	0.107	2.5
90	0.095	1.78	2.15	1.49	0.107	2.5

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.065 mV+ 16 dB = 28.18 dB(mVrms) = 25.65 mVrms	
Modulation Frequency (kHz)	**Peak Deviation (kHz)**	**Maximum Limit (kHz)**
0.1	0.10	2.5
0.2	0.10	2.5
0.3	1.39	2.5
0.4	1.73	2.5
0.6	1.83	2.5
0.8	2.03	2.5
1.0	2.13	2.5
1.2	2.15	2.5
1.4	2.16	2.5
1.6	2.20	2.5
1.8	2.21	2.5
2.0	2.23	2.5
2.5	2.08	2.5
3.0	1.49	2.5
3.5	0.10	2.5
4.0	0.10	2.5
4.5	0.10	2.5
5.0	0.10	2.5
6.0	0.10	2.5
7.0	0.10	2.5
8.0	0.10	2.5
9.0	0.10	2.5
10.0	0.10	2.5

5.7.3.7. Voice Modulation Limiting for 20 KHz Channel Spacing Operation (851-869 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz) at the following modulating frequency:					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.105	0.36	0.68	1.57	0.098	4.0
2	0.102	0.60	1.18	2.46	0.097	4.0
4	0.102	0.99	1.93	2.83	0.103	4.0
6	0.105	1.44	2.63	2.99	0.107	4.0
8	0.104	1.80	2.99	3.03	0.117	4.0
10	0.106	2.08	3.14	3.03	0.113	4.0
15	0.105	2.64	3.37	3.03	0.118	4.0
20	0.110	2.83	3.48	3.03	0.135	4.0
25	0.104	2.84	3.50	3.03	0.138	4.0
30	0.112	2.86	3.49	3.03	0.137	4.0
35	0.107	2.84	3.49	3.04	0.138	4.0
40	0.103	2.82	3.47	3.02	0.133	4.0
45	0.102	2.86	3.46	3.03	0.132	4.0
50	0.102	2.85	3.48	3.03	0.133	4.0
60	0.102	2.84	3.48	3.03	0.134	4.0
70	0.102	2.84	3.49	3.03	0.134	4.0
80	0.102	2.83	3.49	3.03	0.134	4.0
90	0.102	2.86	3.47	3.03	0.134	4.0
100	0.102	2.84	3.49	3.03	0.134	4.0

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.1 mV+ 16 dB = 28.26 dB(mVrms) = 25.87 mVrms	
Modulation Frequency (KHz)	**Peak Deviation (KHz)**	**Maximum Limit (KHz)**
0.1	0.11	4.0
0.2	0.10	4.0
0.3	2.23	4.0
0.4	2.77	4.0
0.6	2.91	4.0
0.8	3.22	4.0
1.0	3.45	4.0
1.2	3.51	4.0
1.4	3.50	4.0
1.6	3.54	4.0
1.8	3.56	4.0
2.0	3.61	4.0
2.5	3.59	4.0
3.0	3.03	4.0
3.5	0.10	4.0
4.0	0.10	4.0
4.5	0.10	4.0
5.0	0.14	4.0
6.0	0.10	4.0
7.0	0.11	4.0
8.0	0.11	4.0
9.0	0.10	4.0
10.0	0.10	4.0

5.7.3.8. Voice Modulation Limiting for 25 KHz Channel Spacing Operation (851-869 MHz band)

Modulating Signal Level	Peak Frequency Deviation (kHz) at the following modulating frequency:					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
1	0.101	0.43	0.83	1.58	0.100	5.0
2	0.104	0.73	1.46	2.49	0.105	5.0
4	0.109	1.21	2.40	2.86	0.104	5.0
6	0.107	1.77	3.29	3.03	0.105	5.0
8	0.103	2.27	3.73	3.05	0.112	5.0
10	0.108	2.56	3.92	3.05	0.113	5.0
15	0.107	3.26	4.18	3.06	0.118	5.0
20	0.105	3.51	4.28	3.07	0.128	5.0
25	0.108	3.52	4.30	3.06	0.133	5.0
30	0.106	3.53	4.29	3.06	0.135	5.0
35	0.104	3.52	4.30	3.06	0.138	5.0
40	0.103	3.50	4.28	3.06	0.132	5.0
45	0.112	3.54	4.26	3.05	0.135	5.0
50	0.117	3.51	4.29	3.05	0.132	5.0
60	0.110	3.52	4.29	3.06	0.135	5.0
70	0.108	3.51	4.30	3.06	0.135	5.0
80	0.104	3.49	4.28	3.07	0.133	5.0
90	0.107	3.54	4.26	3.06	0.137	5.0
100	0.107	3.52	4.30	3.06	0.133	5.0

Voice Signal Input Level	= STD MOD Level + 16 dB = 4.17 mV+ 16 dB = 28.40 dB(mVrms) = 26.31 mVrms	
Modulation Frequency (KHz)	**Peak Deviation (KHz)**	**Maximum Limit (KHz)**
0.1	0.11	5.0
0.2	0.11	5.0
0.3	2.78	5.0
0.4	3.41	5.0
0.6	3.62	5.0
0.8	4.03	5.0
1.0	4.26	5.0
1.2	4.28	5.0
1.4	4.29	5.0
1.6	4.36	5.0
1.8	4.40	5.0
2.0	4.43	5.0
2.5	4.24	5.0
3.0	3.05	5.0
3.5	0.10	5.0
4.0	0.10	5.0
4.5	0.10	5.0
5.0	0.12	5.0
6.0	0.10	5.0
7.0	0.10	5.0
8.0	0.10	5.0
9.0	0.10	5.0
10.0	0.10	5.0

5.7.3.9. Digital Modulation

Max Deviation measured for:

Phase 1(Digital)	Channel 21	769.1 MHz	±2.83 kHz
Phase 1(Digital)	Channel 24	799.1 MHz	±2.86 kHz
Phase 1(Digital)	Channel 27	806.1 MHz	±2.87 kHz
Phase 1(Digital)	Channel 30	851.1 MHz	±2.88 kHz

5.8. OCCUPIED BANDWIDTH & EMISSION MASK [§§ 2.1049, 90.209, 90.210, 90.210 & 90.691]

5.8.1. Limits

Frequency band (MHz)	Channel Spacing (kHz)	Authorized bandwidth (kHz)
150-174	7.5	20/11.25/6
406-512	6.25	20/11.25/6
806-809/851-854	12.5	20
809-817/854-862	12.5	*20/11.25
817-824/862-869	25	*20
896-901/935-940	12.5	13.6

*Operations using equipment designed to operate with a 25 kilohertz channel bandwidth may be authorized up to a 20 kilohertz bandwidth unless the equipment meets the Adjacent Channel Power limits of § 90.221 in which case operations may be authorized up to a 22 kilohertz bandwidth. Operations using equipment designed to operate with a 12.5 kilohertz channel bandwidth may be authorized up to an 11.25 kilohertz bandwidth.

Emissions shall be attenuated below the mean output power of the transmitter as follows:
Emission Mask Requirement- FCC Reference: 90.210 and90.691

Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
150-174 [2]	B, D, or E	C, D or E
421-512 [2 5]	B, D, or E	C, D, or E
806-809/851-854 [6]	B	H
809-824/854-869 [35]	B, D	D, G.

1 Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
2 Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.
3 Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of § 90.691 of this chapter.
4 DSRCS Roadside Units equipment in the 5850-5925 MHz band is governed under subpart M of this part.
5 Equipment designed to operate on 25 kilohertz bandwidth channels must meet the requirements of either Emission Mask B or G, whichever is applicable, while equipment designed to operate on 12.5 kilohertz bandwidth channels must meet the requirements of Emission Mask D. Equipment designed to operate on 25 kilohertz bandwidth channels may alternatively meet the Adjacent Channel Power limits of § 90.221.
6 Transmitters utilizing analog emissions that are equipped with an audio low-pass filter must meet Emission Mask B. All transmitters utilizing digital emissions and those transmitters using analog emissions without an audio low-pass filter must meet Emission Mask H.

§ 90.691 Emission mask requirements for EA-based systems

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.
(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

5.8.2. Method of Measurements

Refer to Section 8.4 of this report for measurement details.

Masks selected
Channel Bandwidth 12.5KHz, 20KHz & 25KHz

Frequency		Analog	Digital
806-809	851-854	B	H
809-824	854-869	B,D	G

Frequency	**Analog**	**Mask**
806.1	12.5, 20 & 25kHz	B
808.9	20KHz	B
815.1	12.5 & 25kHz	B,D, 90.691
823.9	12.5 & 25kHz	B, D,90.691
851.1	12.5, 20 & 25kHz	B
853.9	20KHz	B
860.1	12.5 & 25kHz	B,D, 90.691
868.9	12.5 & 25kHz	B, D,90.691

Frequency	**Digital**	**Mask**
806.1	Phase 1&2	H
815.1	Phase 1&2	D, 90.691
823.9	Phase 1&2	D, 90.691
851.1	Phase 1&2	H
860.1	Phase 1&2	D, 90.691
868.9	Phase 1&2	D, 90.691

5.8.3. Test Data- OCCUPIED BANDWIDTH

5.8.3.1. 99% Occupied Bandwidth

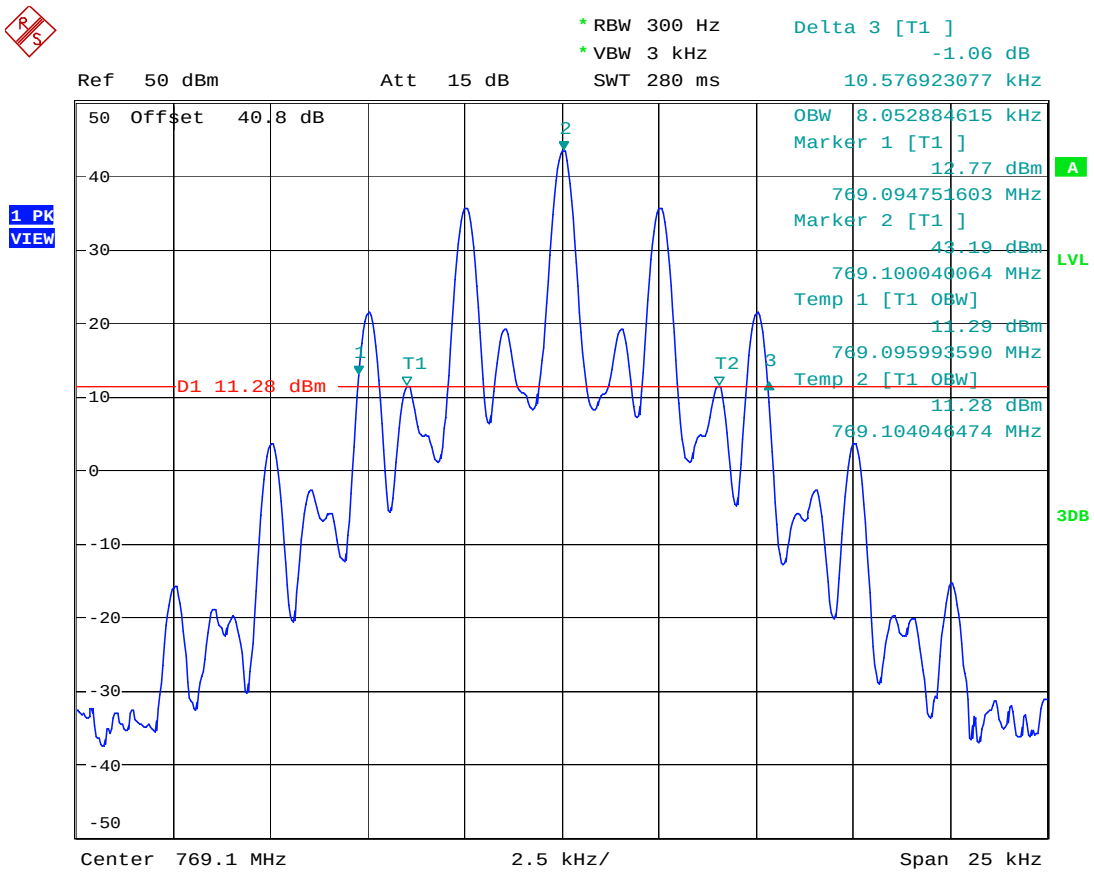
Frequency (MHz)	Channel Spacing (kHz)	Analog FM with 2.5 KHz sine wave signal	Digital F1D/F1E	Digital F1W	Maximum Authorized Bandwidth (kHz)
769.1	12.5	1058	8.01	8.05	11.25
774.9	12.5	10.58	7.97	8.05	11.25
799.1	12.5	10.62	7.89	8.09	11.25
804.9	12.5	10.74	7.97	7.93	11.25
806.1	12.5	10.74	8.05	7.93	20
815.1	12.5	10.62	8.05	8.01	20
823.9	12.5	10.7	8.05	8.09	20
806.1	20	10.48	N/A	N/A	20
808.9	20	10.43	N/A	N/A	20
806.1	25	15.62	N/A	N/A	20
815.1	25	14.52	N/A	N/A	20
823.9	25	15.53	N/A	N/A	20
851.1	12.5	10.62	8.09	7.97	20
860.1	12.5	10.66	8.09	8.01	20
868.9	12.5	10.62	8.09	8.01	20
851.1	20	10.43	N/A	N/A	20
853.9	20	10.43	N/A	N/A	20
851.1	25	15.43	N/A	N/A	20
860.1	25	15.58	N/A	N/A	20
868.9	25	15.58	N/A	N/A	20

Note: 99% Occupied Bandwidth measurements were done using the built-in auto function of the analyzer.

5.8.4. Test Data- OBW

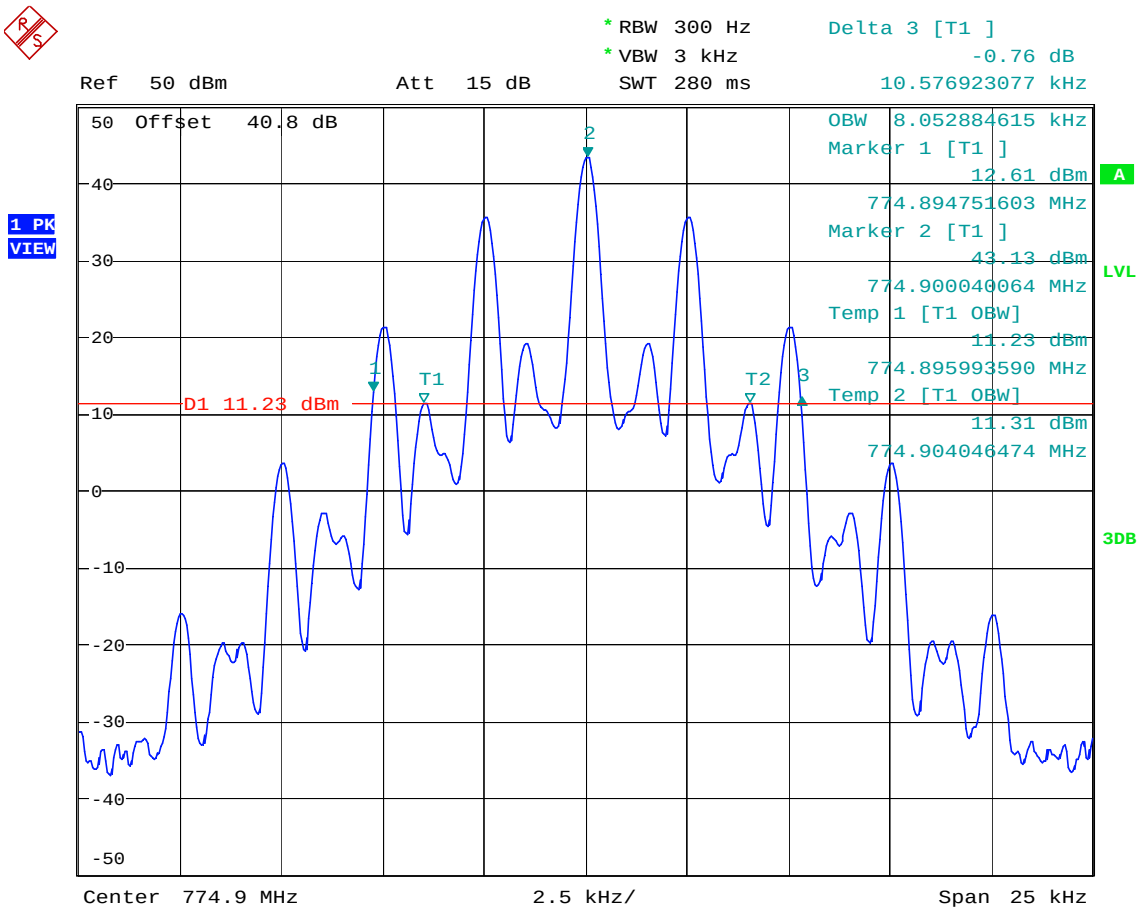
5.8.4.1. Configuration: 99% OBW, Band 1: 769-775MHz, 769.1MHz, 12.5 KHz, Analog, High power

OBW: 10.58 KHz



5.8.4.2. Configuration: 99% OBW, Band 1: 769-775MHz, 774.9MHz, 12.5 KHz, Analog, High power

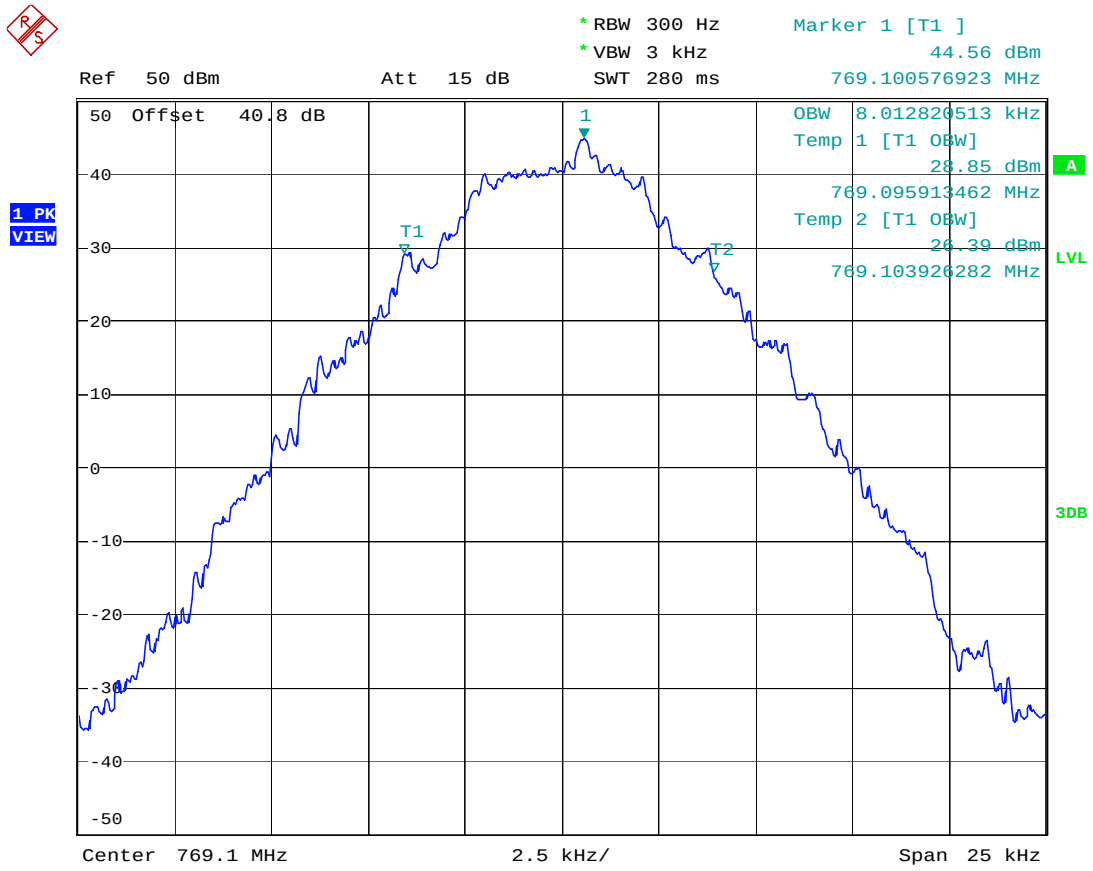
OBW: 10.58 KHz



Date: 24.APR.2019 09:36:13

5.8.4.3. Configuration: 99% OBW, Band 1: 769-775MHz, 769.1MHz, Digital, F1E& F1D, High power

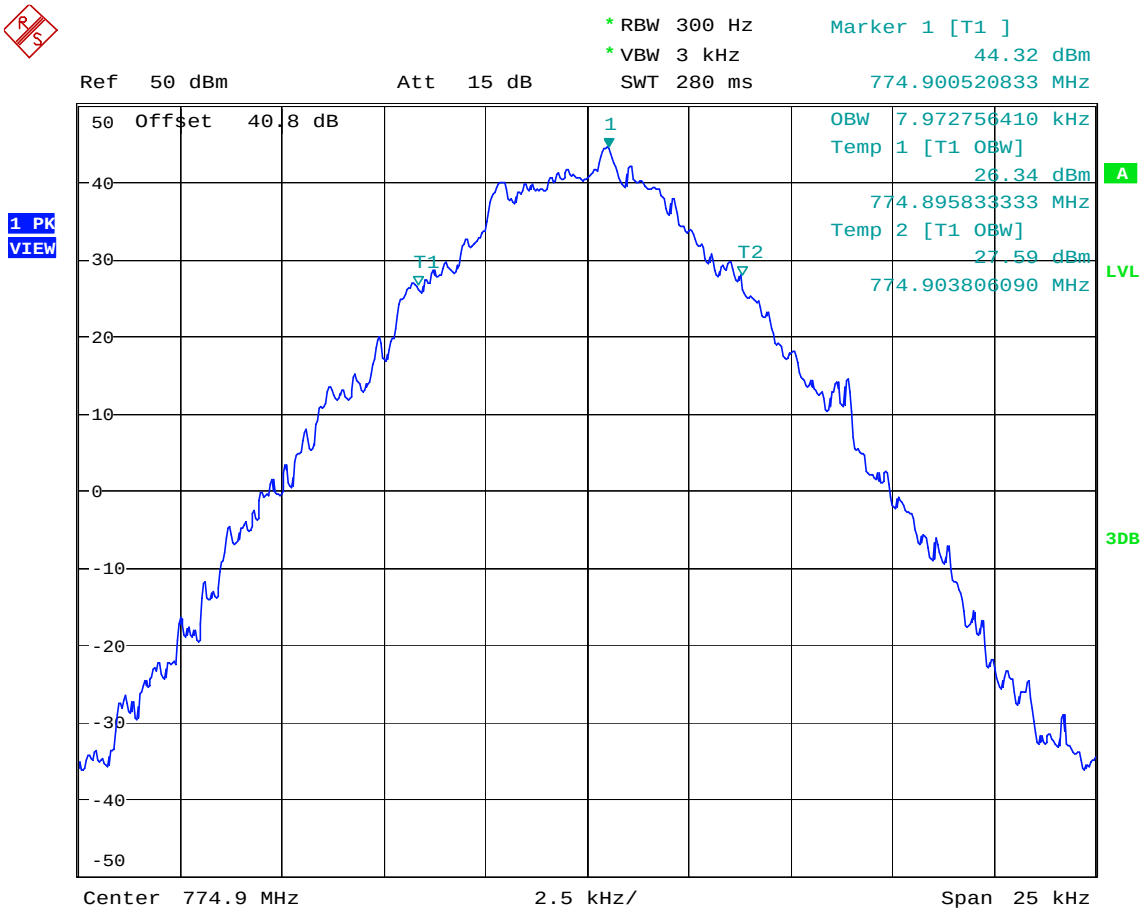
OBW: 8.01 KHz



Date: 24.APR.2019 09:42:06

5.8.4.4. Configuration: 99% OBW, Band 1: 769-775MHz, 774.9MHz, Digital, F1E& F1D, High power

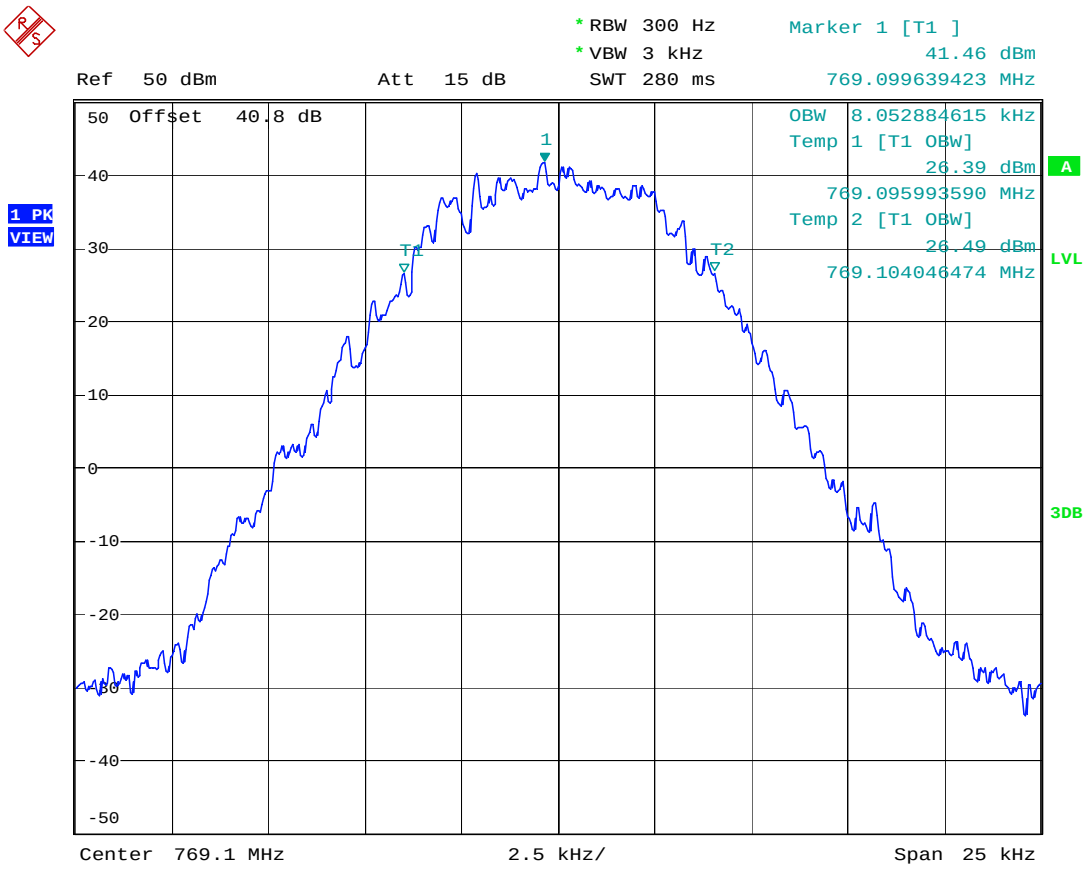
OBW: 7.97 KHz



Date: 24.APR.2019 09:47:45

5.8.4.5. Configuration: 99% OBW, Band 1: 769-775MHz, 769.1MHz, Digital, F1W, High power

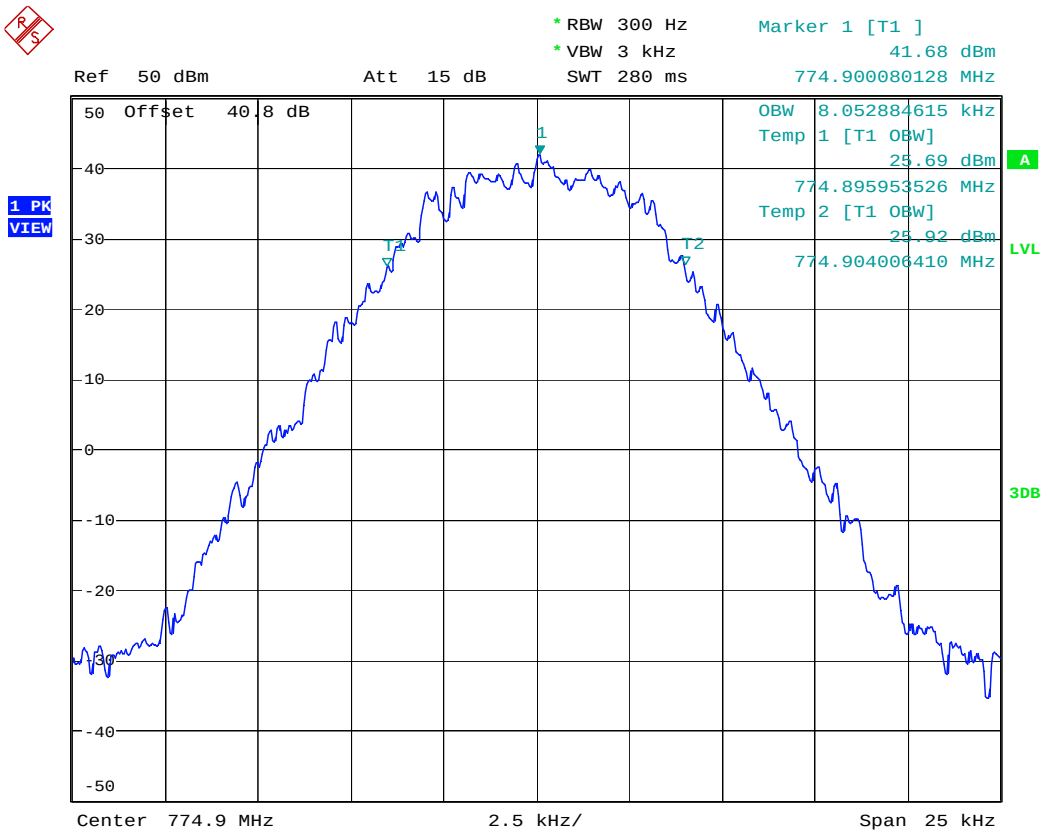
OBW: 8.05 KHz



Date: 24.APR.2019 09:49:53

5.8.4.6. Configuration: 99% OBW, Band 1: 769-775MHz, 774.9MHz, Digital, F1W, High power

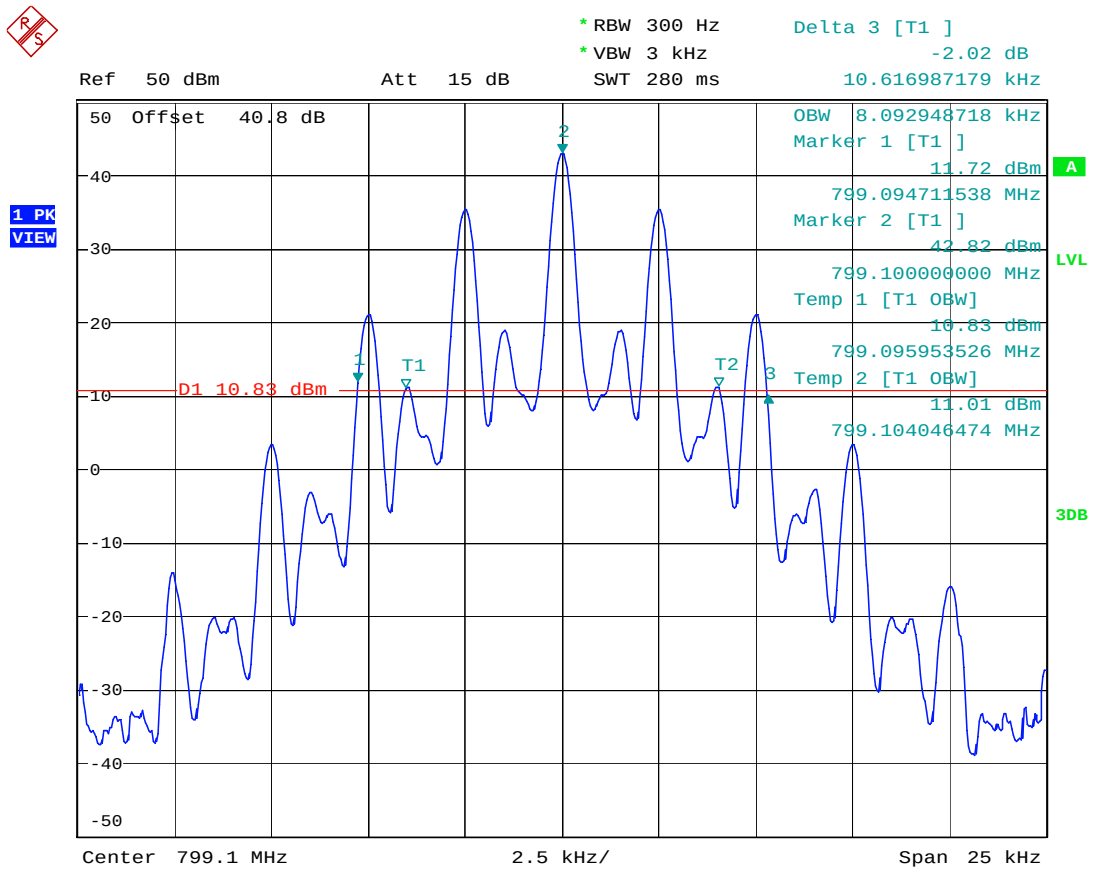
OBW: 8.05 KHz



Date: 24.APR.2019 09:52:10

5.8.4.7. Configuration: 99% OBW, Band 2: 799-805MHz, 799.1MHz, 12.5 KHz, Analog, High power

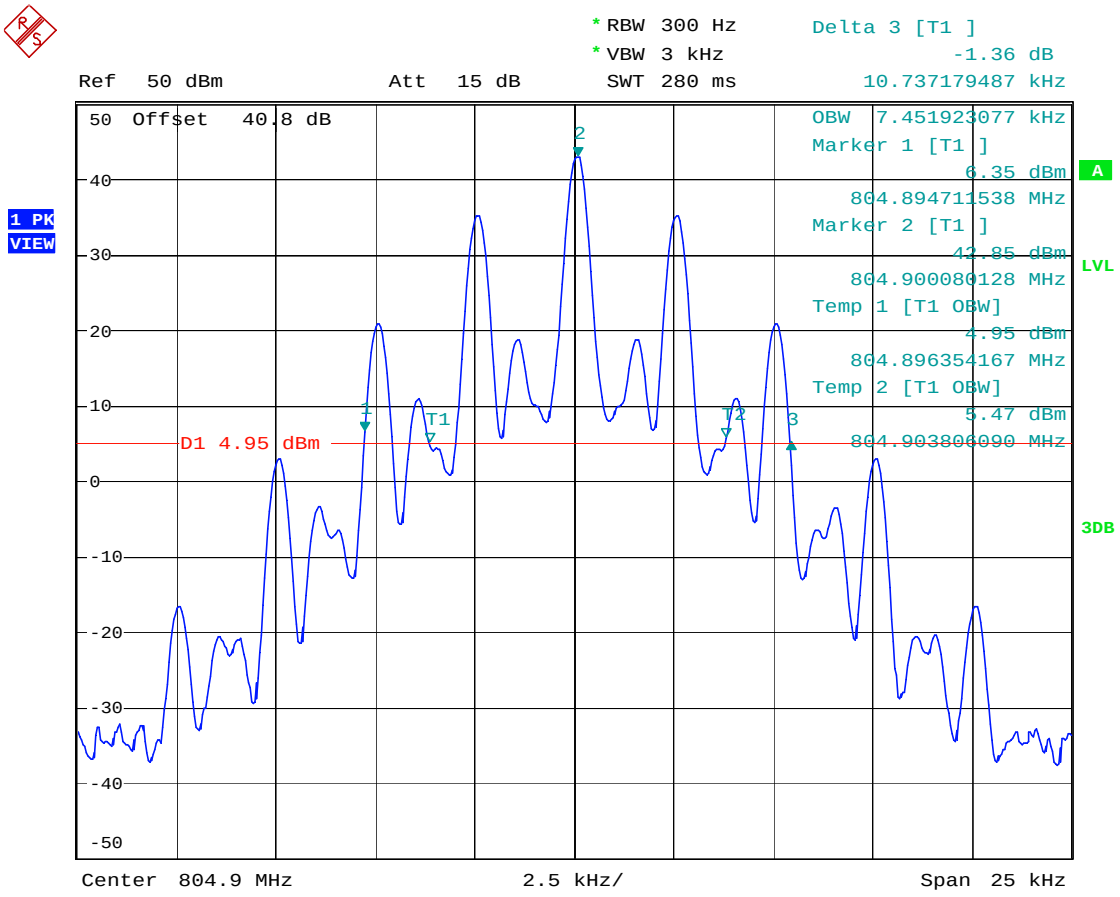
OBW: 10.62 KHz



Date: 24.APR.2019 09:59:04

5.8.4.8. Configuration: 99% OBW, Band 2: 799-805MHz, 804.9MHz, 12.5 KHz, Analog, High power

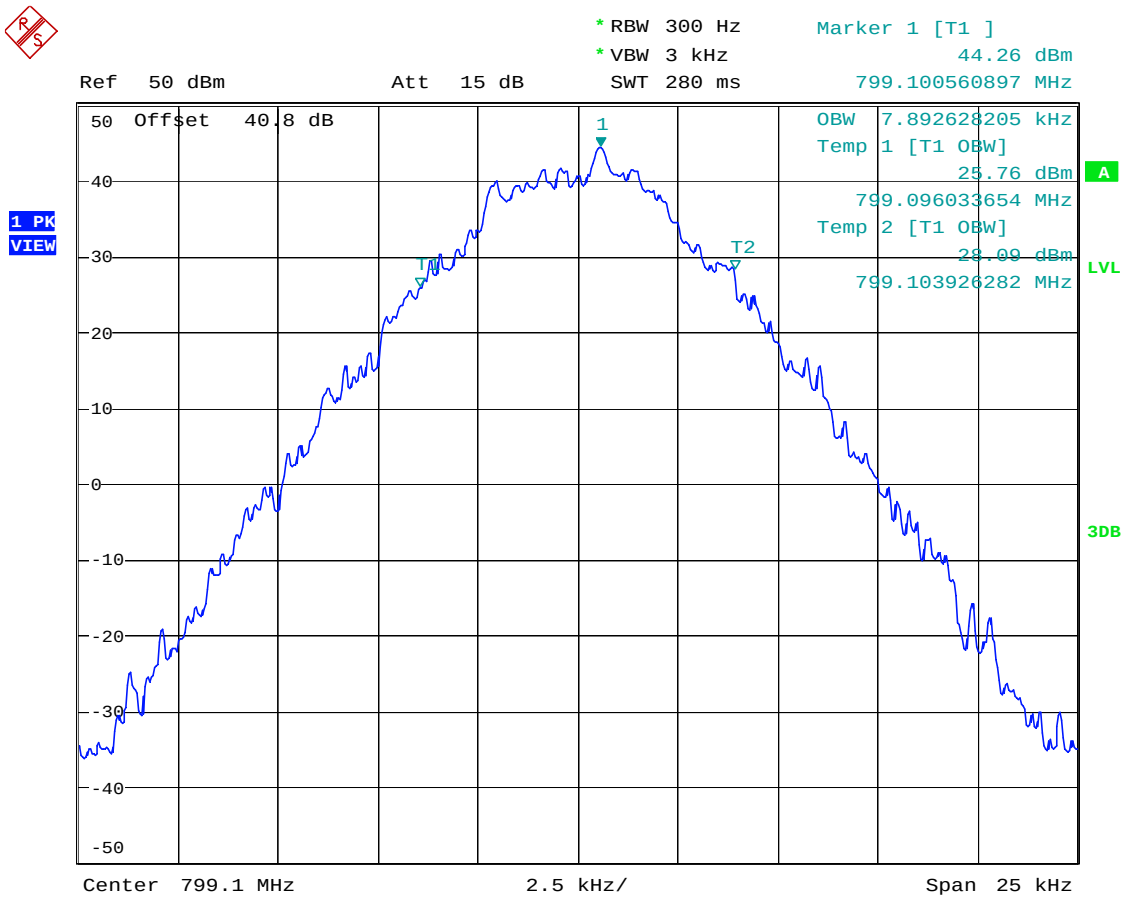
OBW: 10.74 KHz



Date: 24.APR.2019 10:04:41

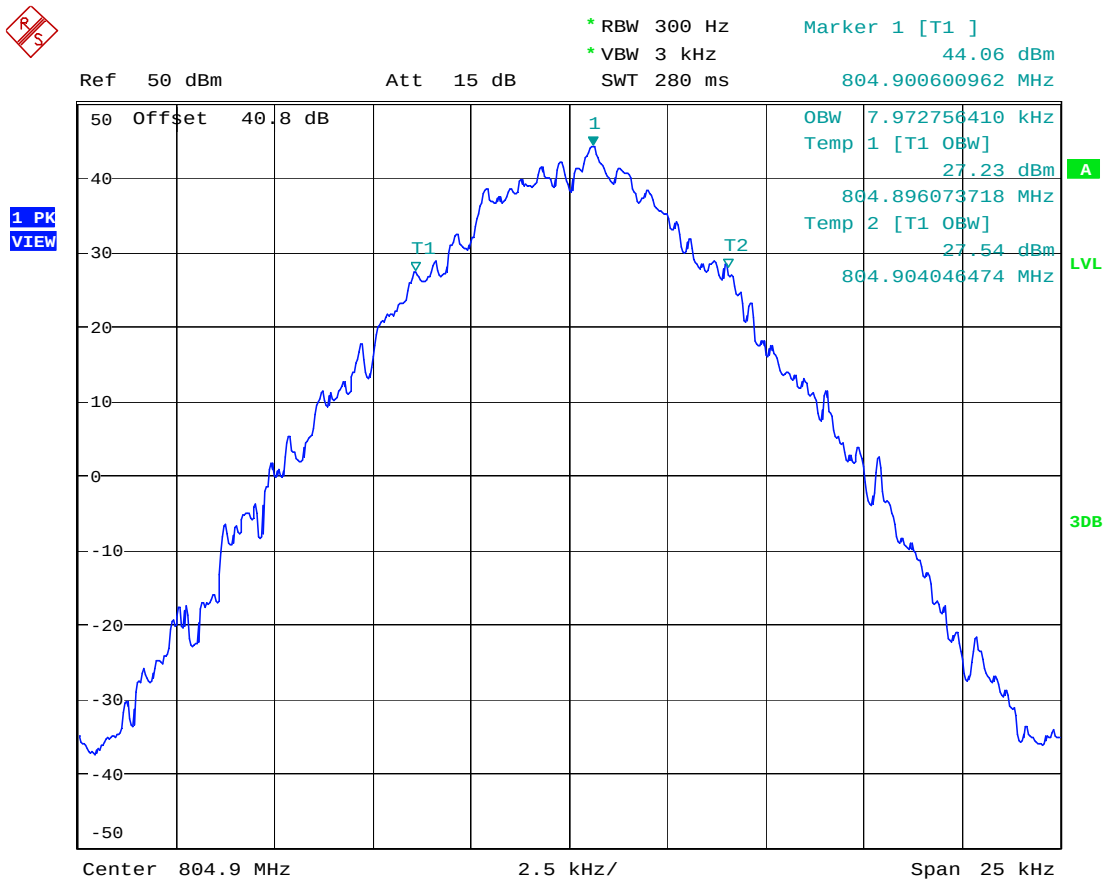
5.8.4.9. Configuration: 99% OBW, Band 2: 799-805MHz, 799.1MHz, Digital, F1E& F1D, High power

OBW: 7.89 KHz



5.8.4.10. Configuration: 99% OBW, Band 2: 799-805MHz, 804.9MHz, Digital, F1E& F1D, High power

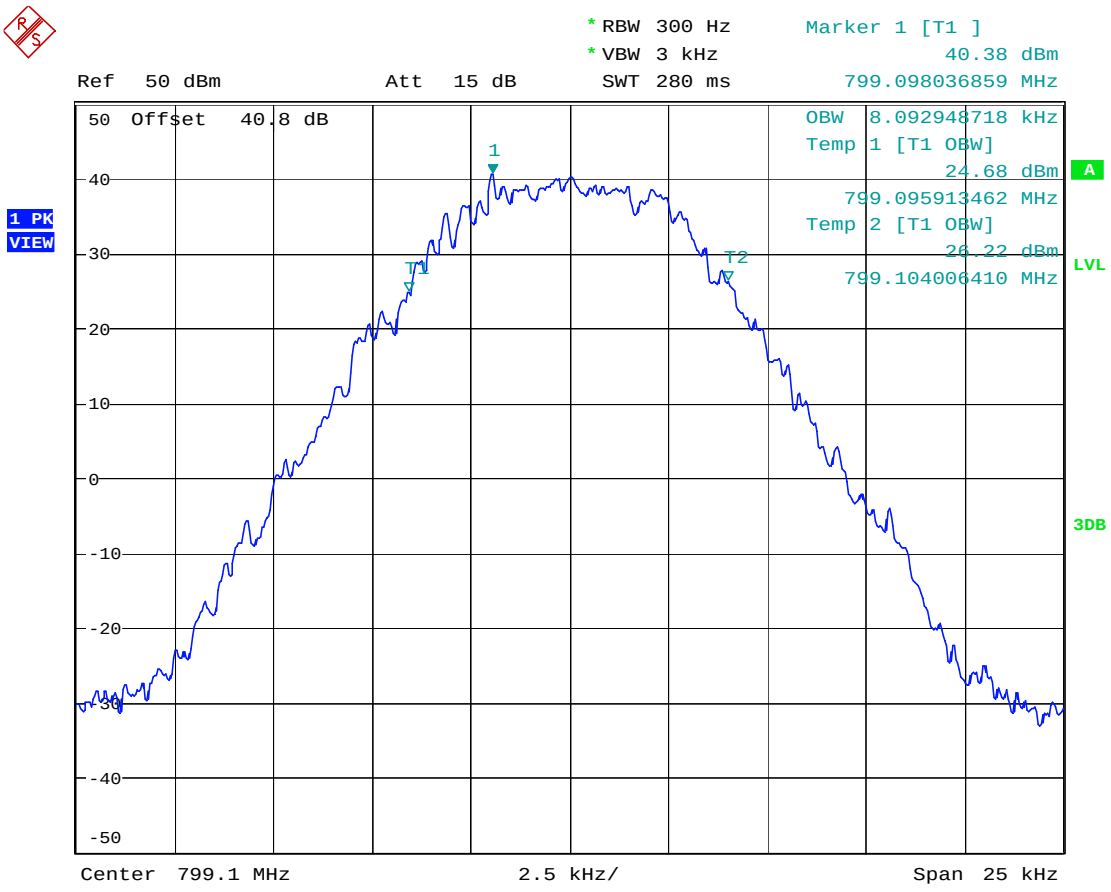
OBW: 7.97 KHz



Date: 24.APR.2019 10:28:51

5.8.4.11. Configuration: 99% OBW, Band 2: 799-805MHz, 799.1MHz, Digital, F1W, High power

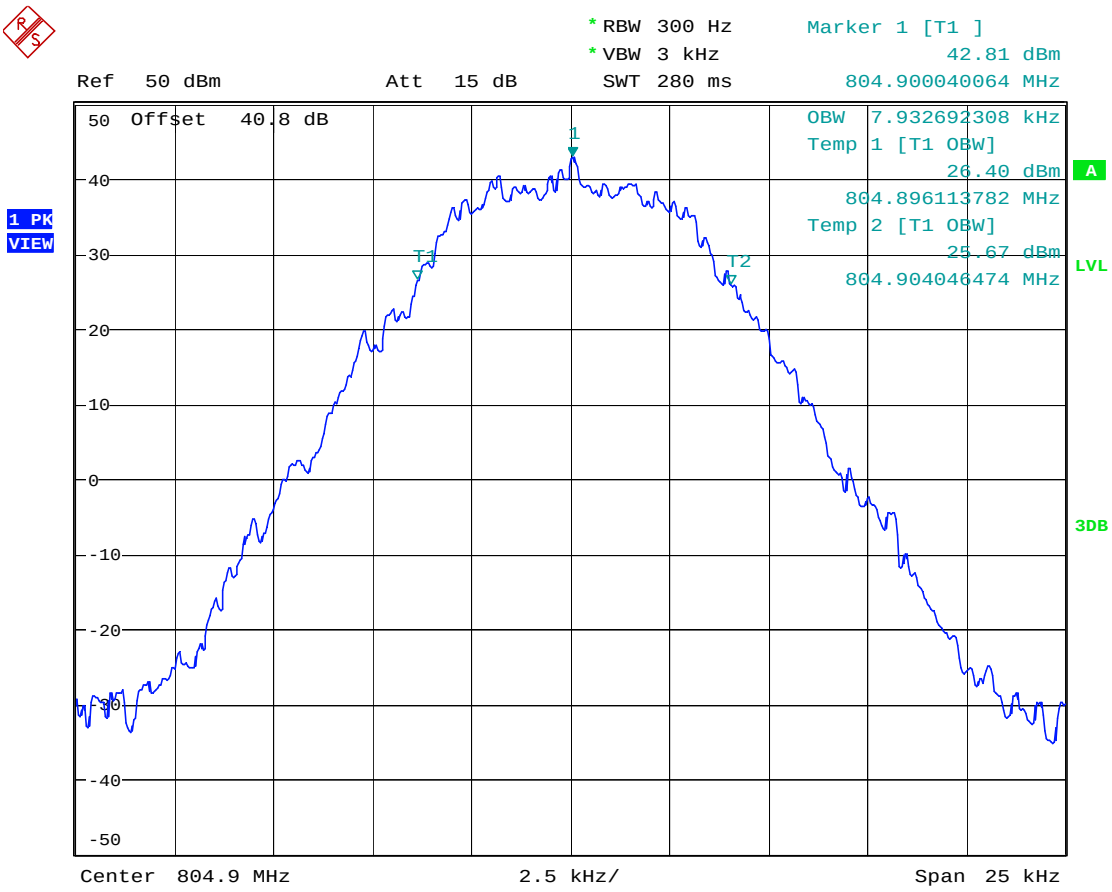
OBW: 8.09 KHz



Date: 24.APR.2019 10:31:15

5.8.4.12. Configuration: 99% OBW, Band 2: 799-805MHz, 804.9MHz, Digital, F1W, High power

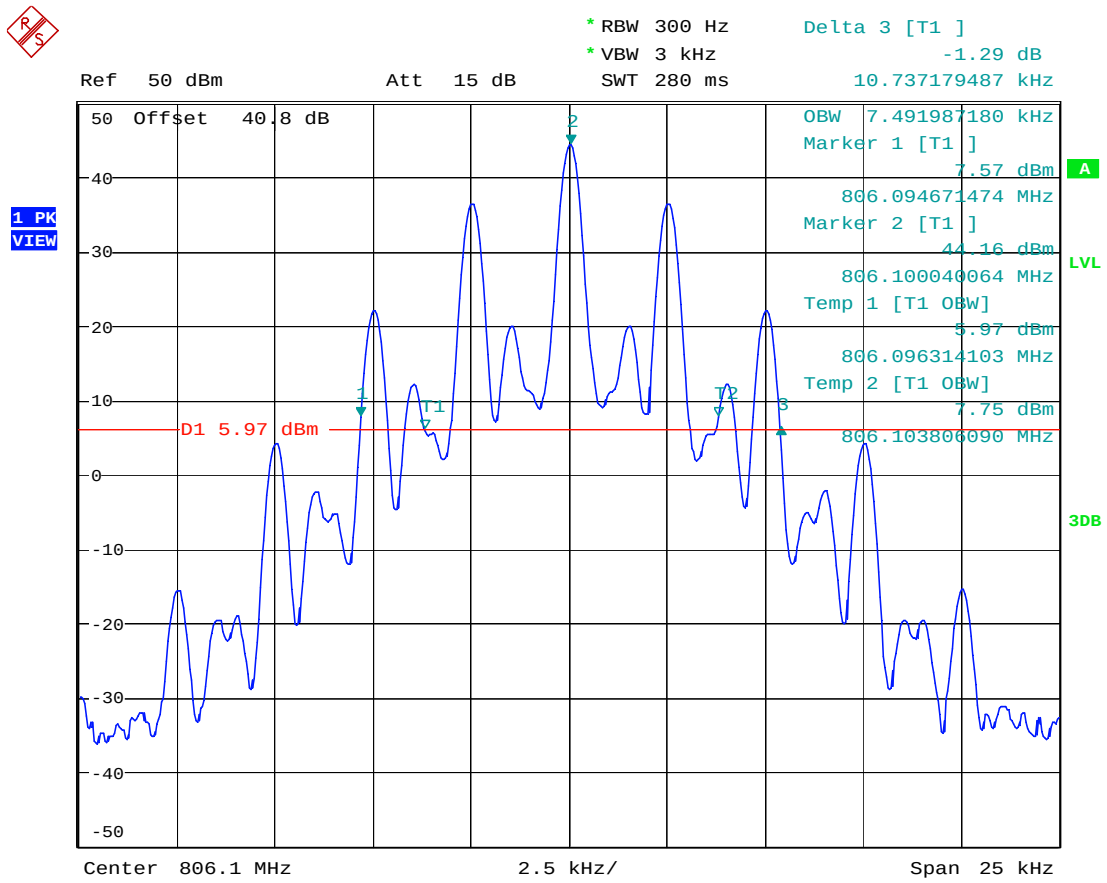
OBW: 7.93 KHz



Date: 24.APR.2019 10:33:16

5.8.4.13. Configuration: 99% OBW, Band 3: 806-824MHz, 806.1MHz, 12.5 KHz, Analog, High power

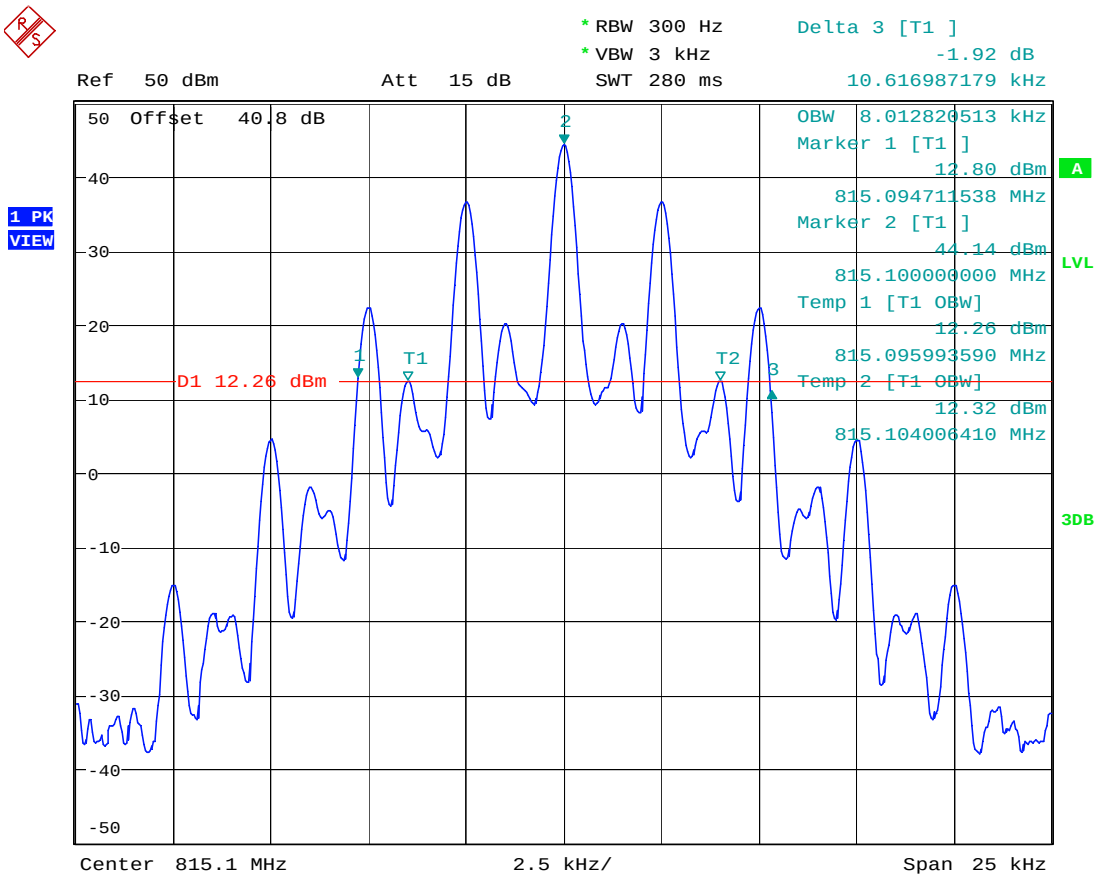
OBW: 10.74 KHz



Date: 24.APR.2019 10:41:33

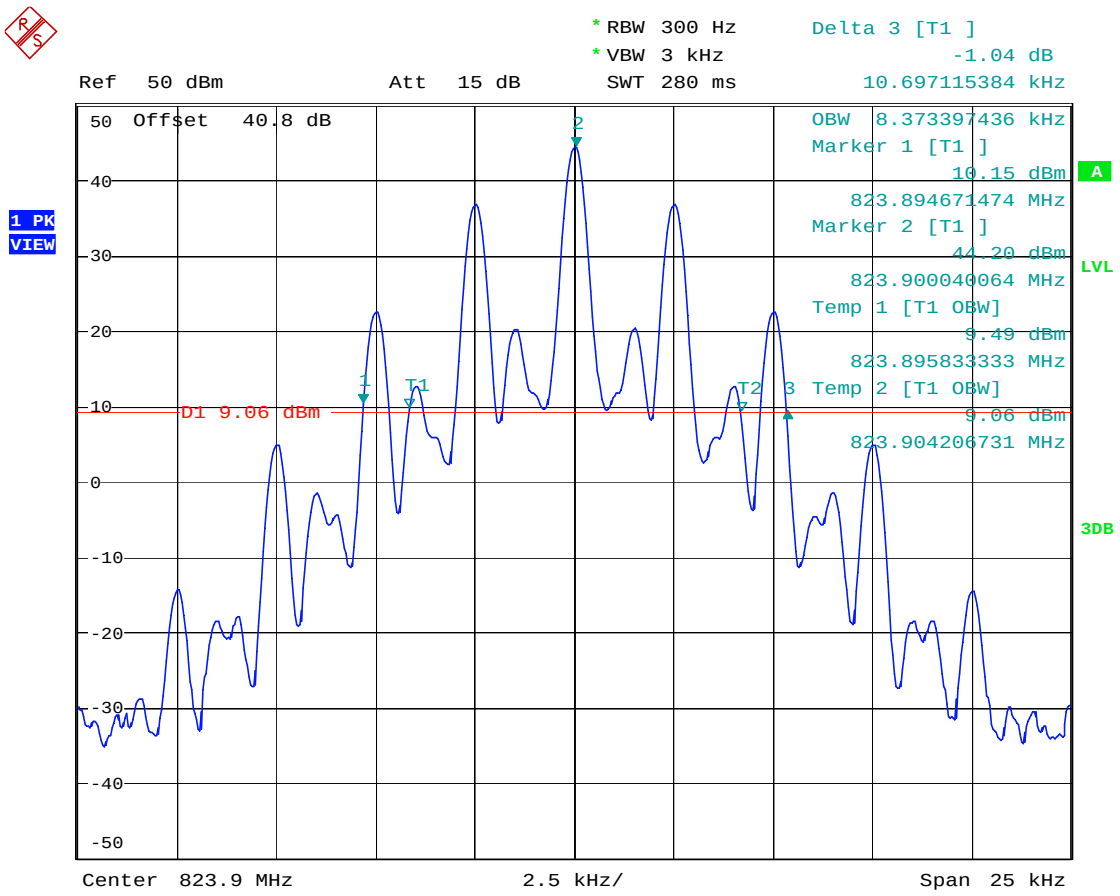
5.8.4.14. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 815.1MHz, 12.5 KHz, Analog, High power

OBW: 10.62 KHz



5.8.4.15. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 823.9MHz, 12.5 KHz, Analog, High power

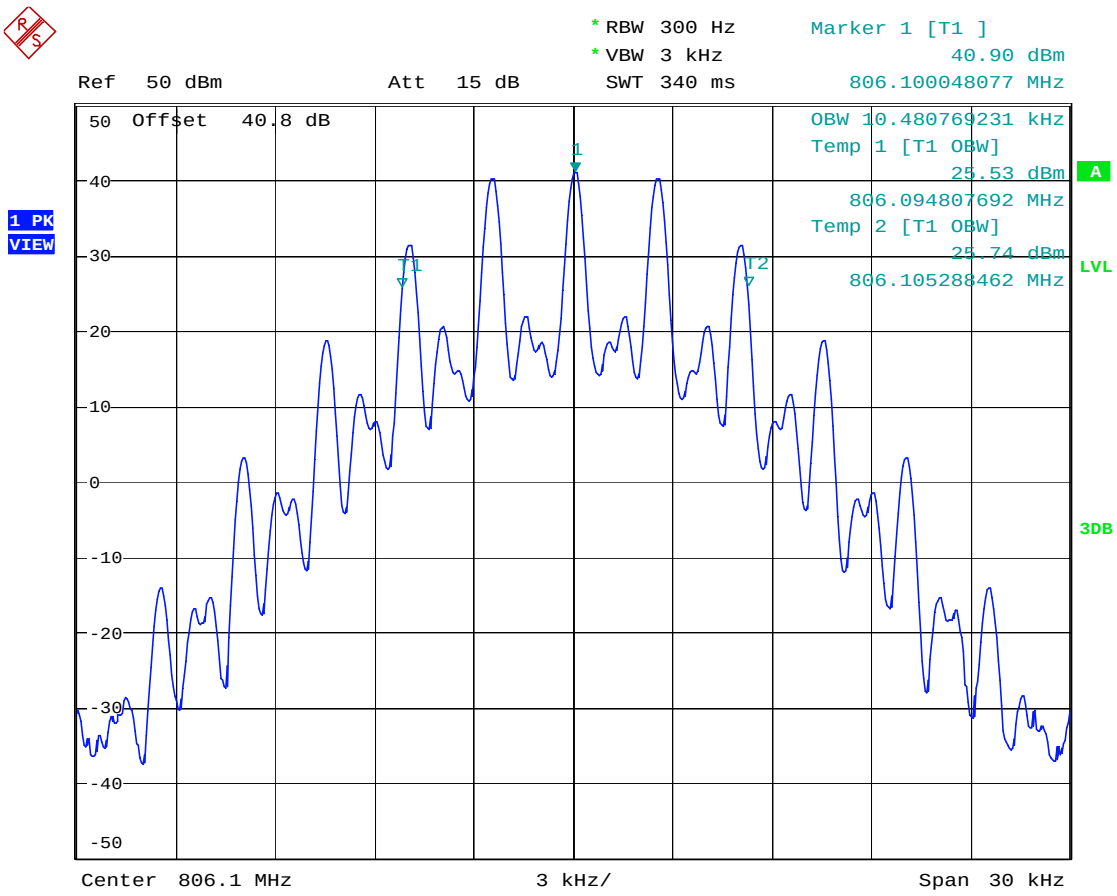
OBW: 10.70 KHz



Date: 24.APR.2019 10:48:44

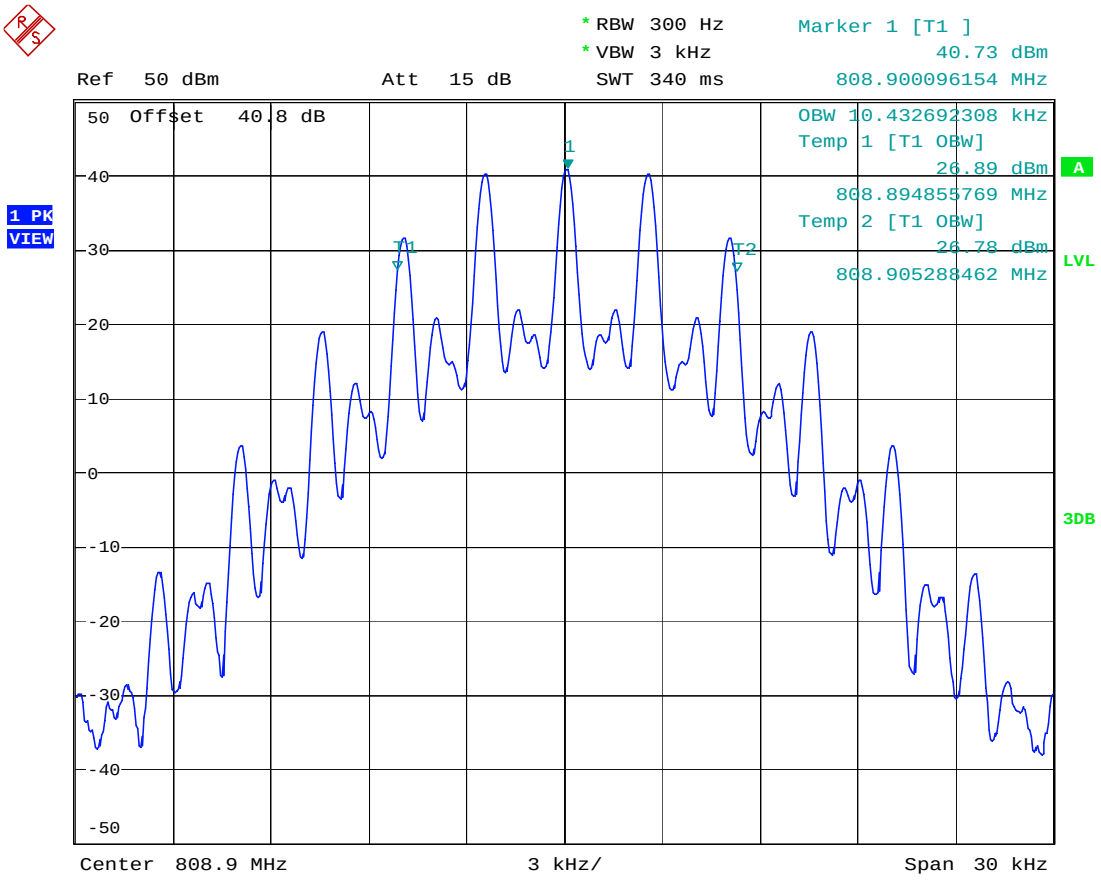
5.8.4.16. Configuration: 99% OBW, Band 3: 806-809MHz, 806.1MHz, 20 KHz, Analog, High power

OBW: 10.48 KHz



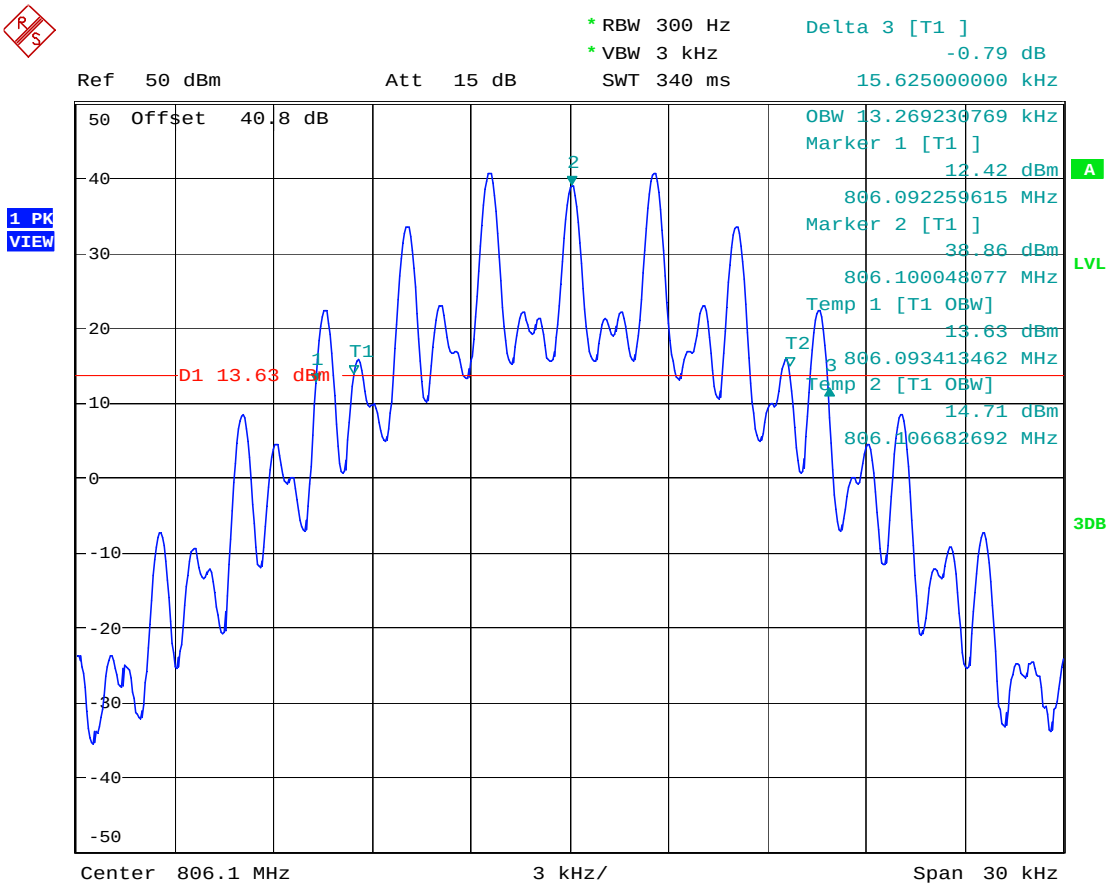
5.8.4.17. Configuration: 99% OBW, Band 3: 806-809MHz MHz, 808.9MHz, 20 KHz, Analog, High power

OBW: 10.43 KHz



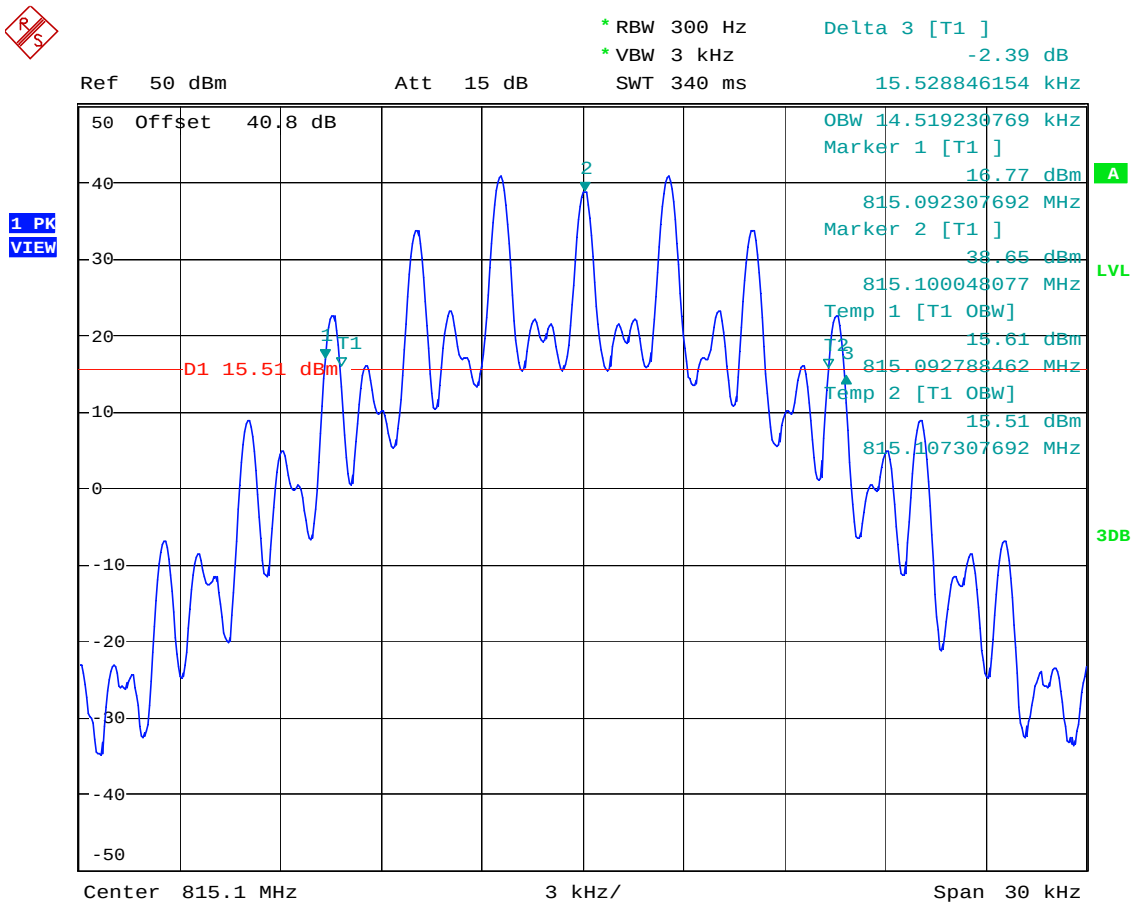
5.8.4.18. Configuration: 99% OBW, Band 3: 806-824MHz, 806.1MHz, 25 KHz, Analog, High power

OBW: 15.62 KHz



5.8.4.19. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 815.1MHz, 25 KHz, Analog, High power

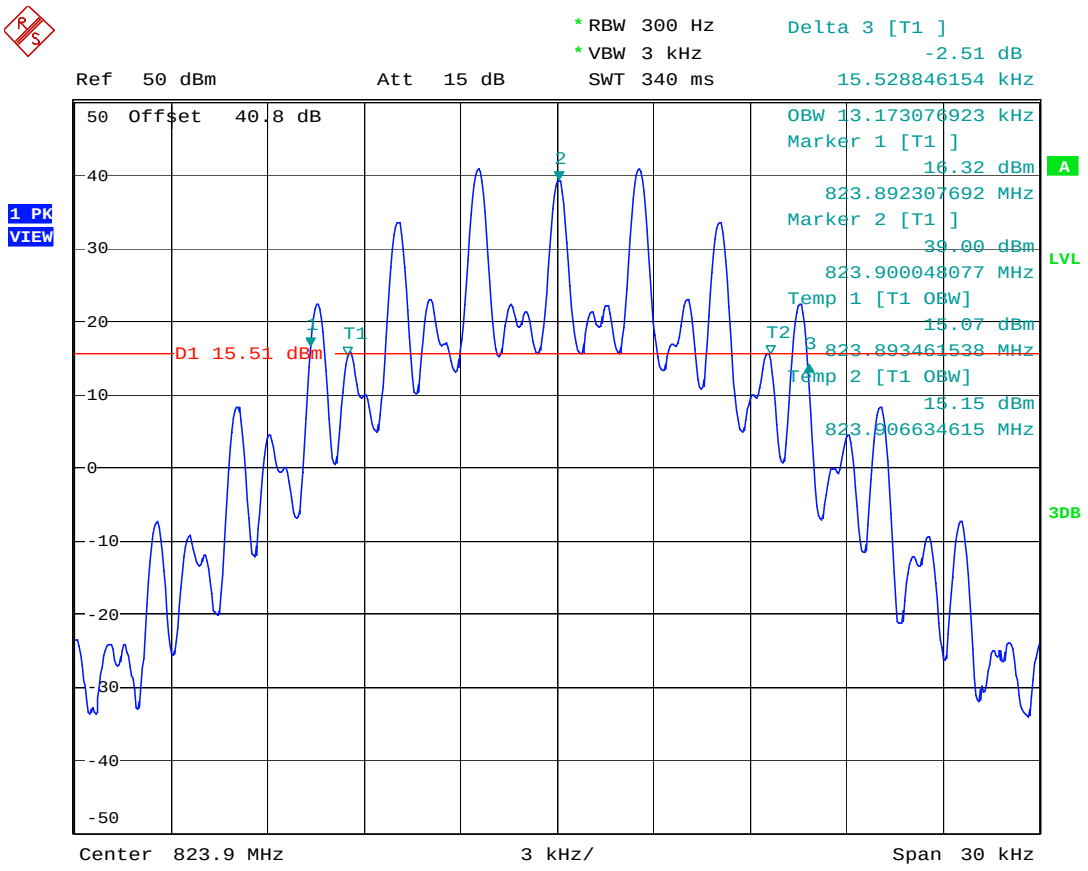
OBW: 14.52 KHz



Date: 24.APR.2019 12:07:43

5.8.4.20. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 823.9MHz, 25 KHz, Analog, High power

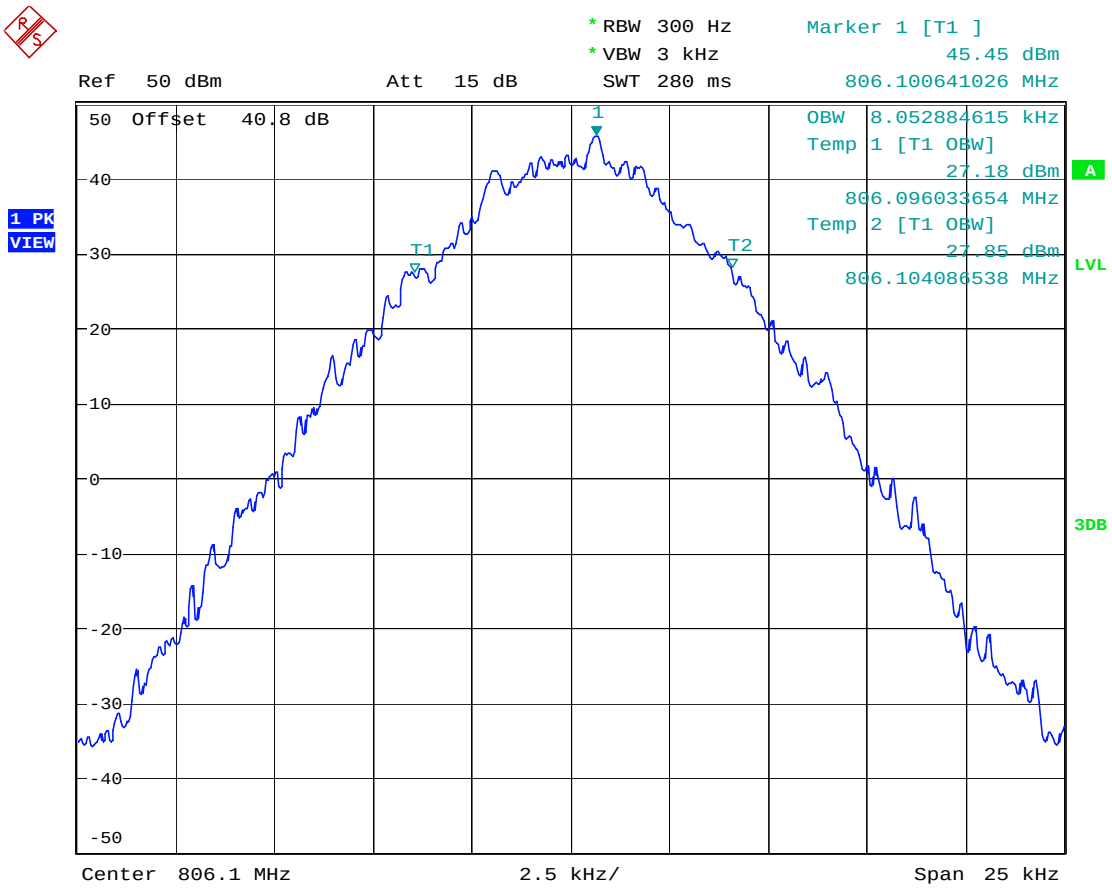
OBW: 15.53 KHz



Date: 24.APR.2019 12:09:44

5.8.4.21. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 806.1MHz, Digital, F1E& F1D, High power

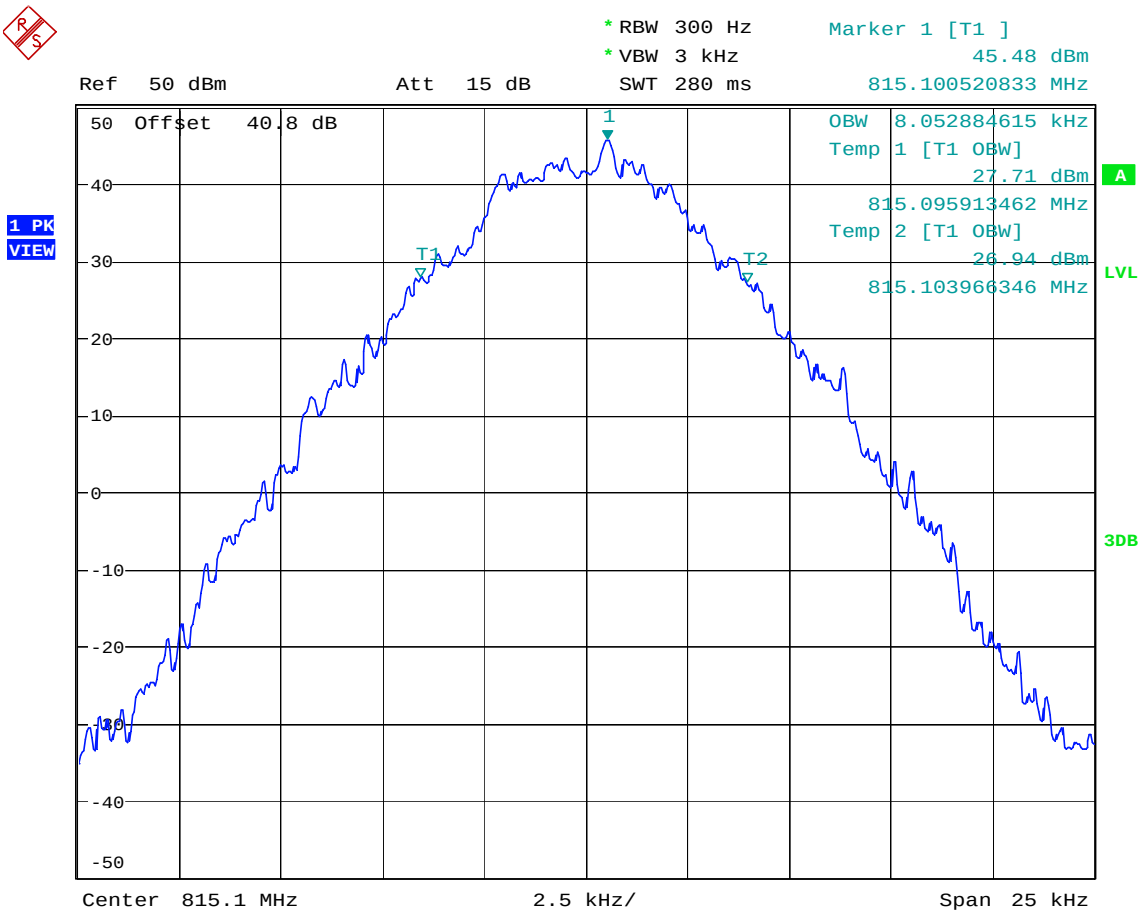
OBW: 8.05 KHz



Date: 24.APR.2019 12:13:23

5.8.4.22. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 815.1MHz, Digital, F1E& F1D, High power

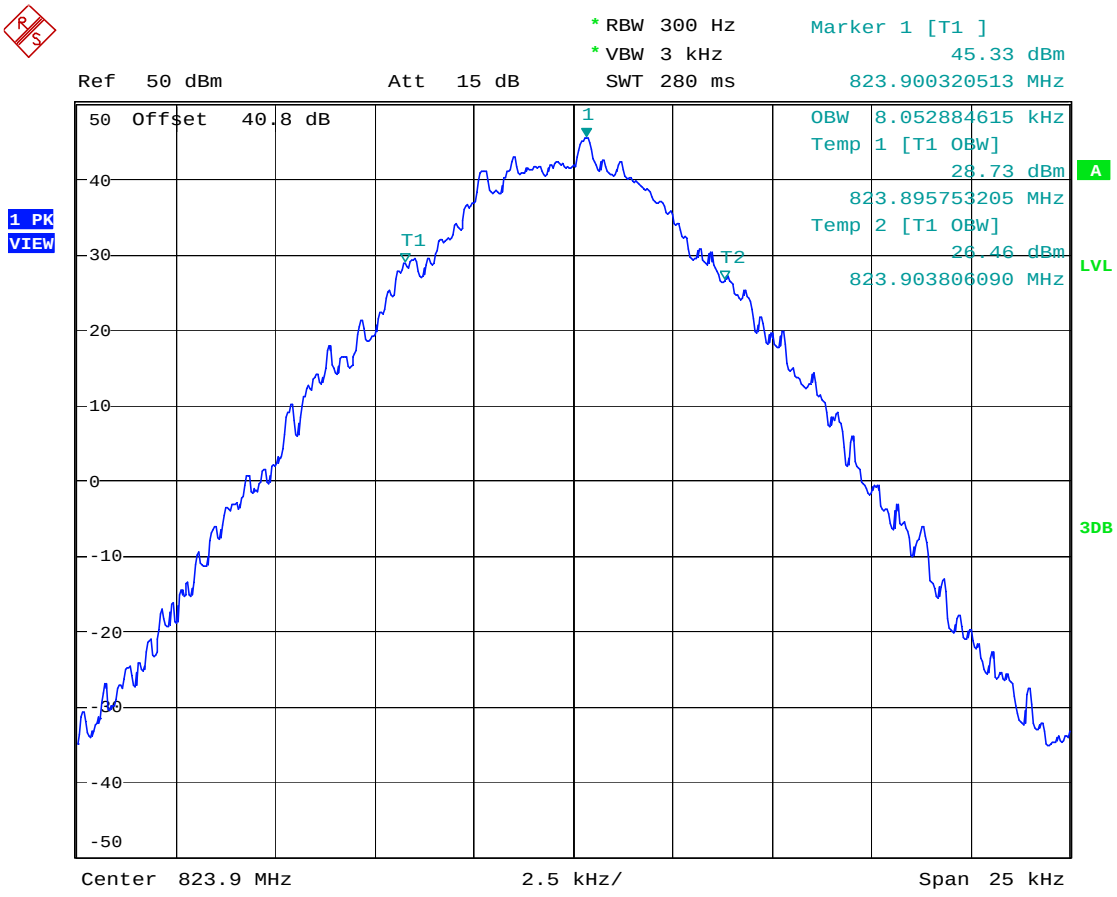
OBW: 8.05 KHz



Date: 24.APR.2019 12:15:26

5.8.4.23. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 823.9MHz, Digital, F1E& F1D, High power

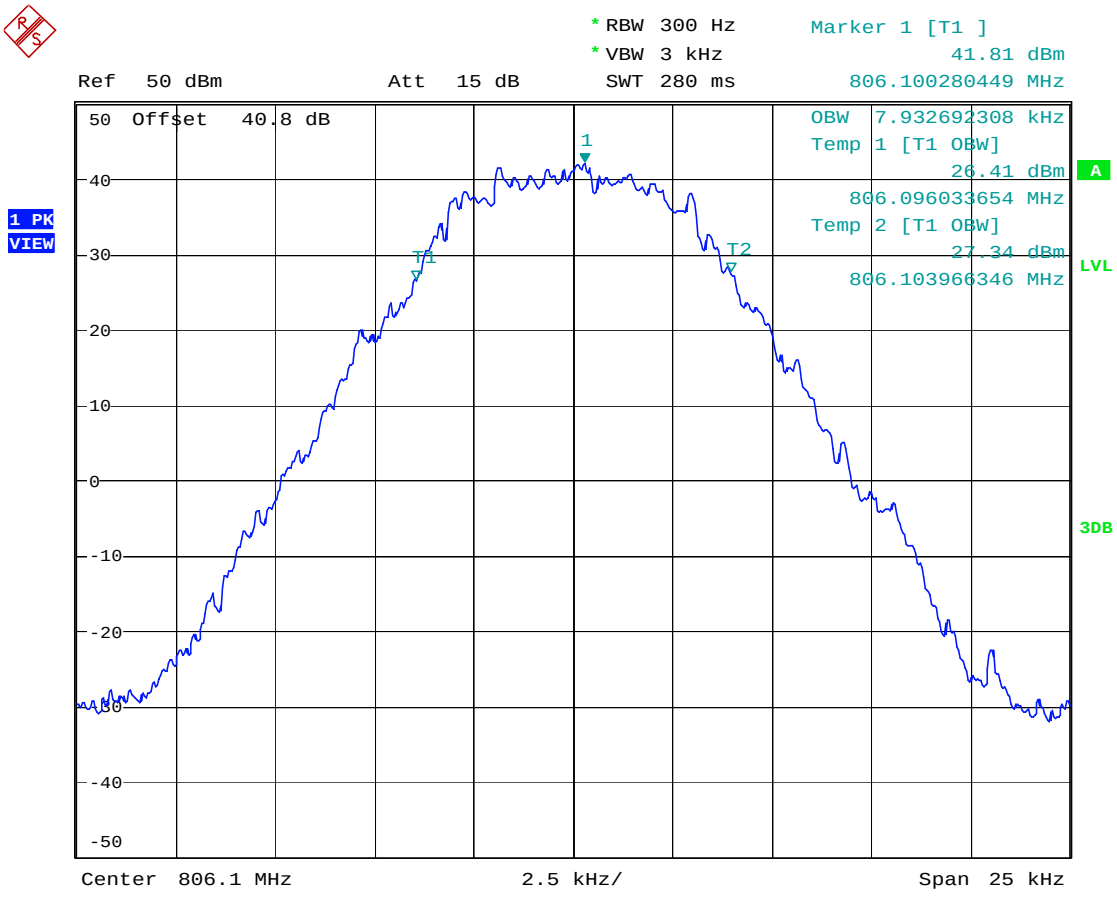
OBW: 8.05 KHz



Date: 24.APR.2019 12:19:59

5.8.4.24. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 806.1MHz, Digital, F1W, High power

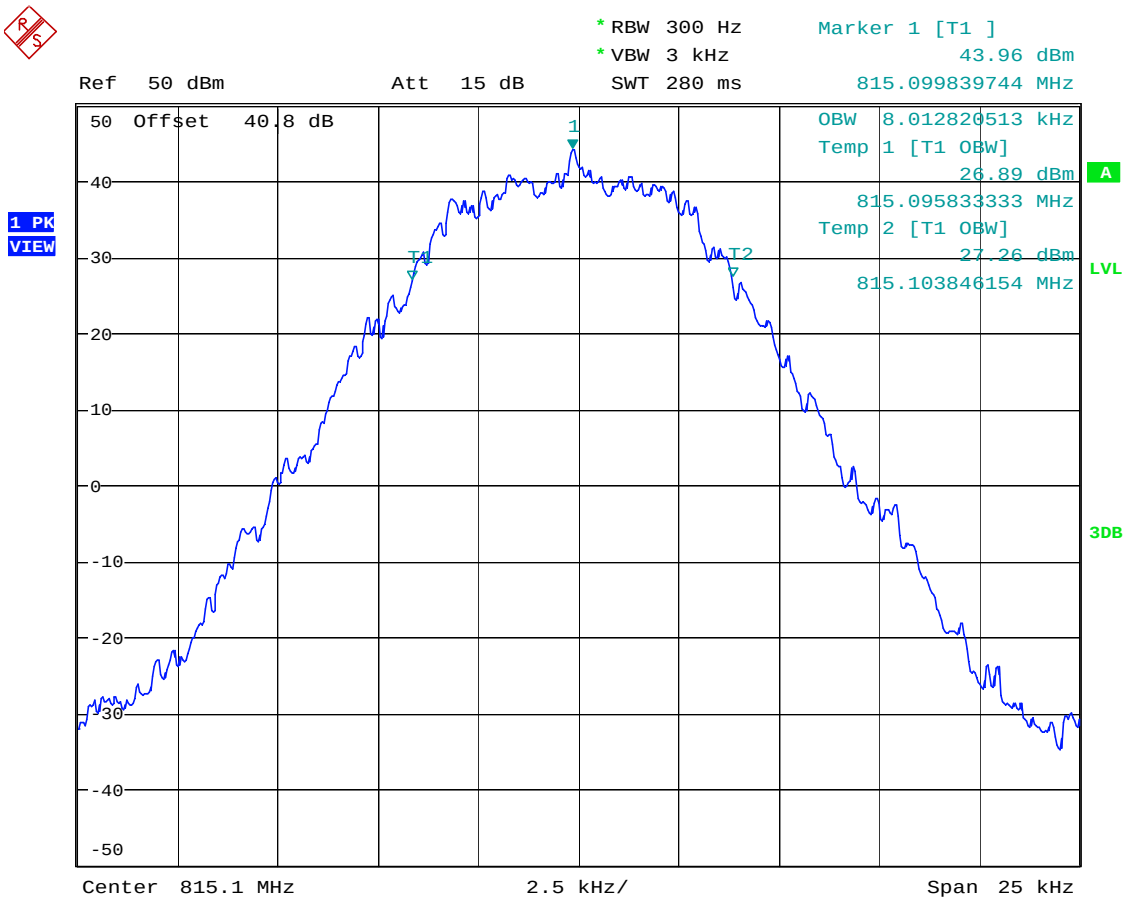
OBW: 7.93 KHz



Date: 24.APR.2019 12:21:53

5.8.4.25. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 815.1MHz, Digital, F1W, High power

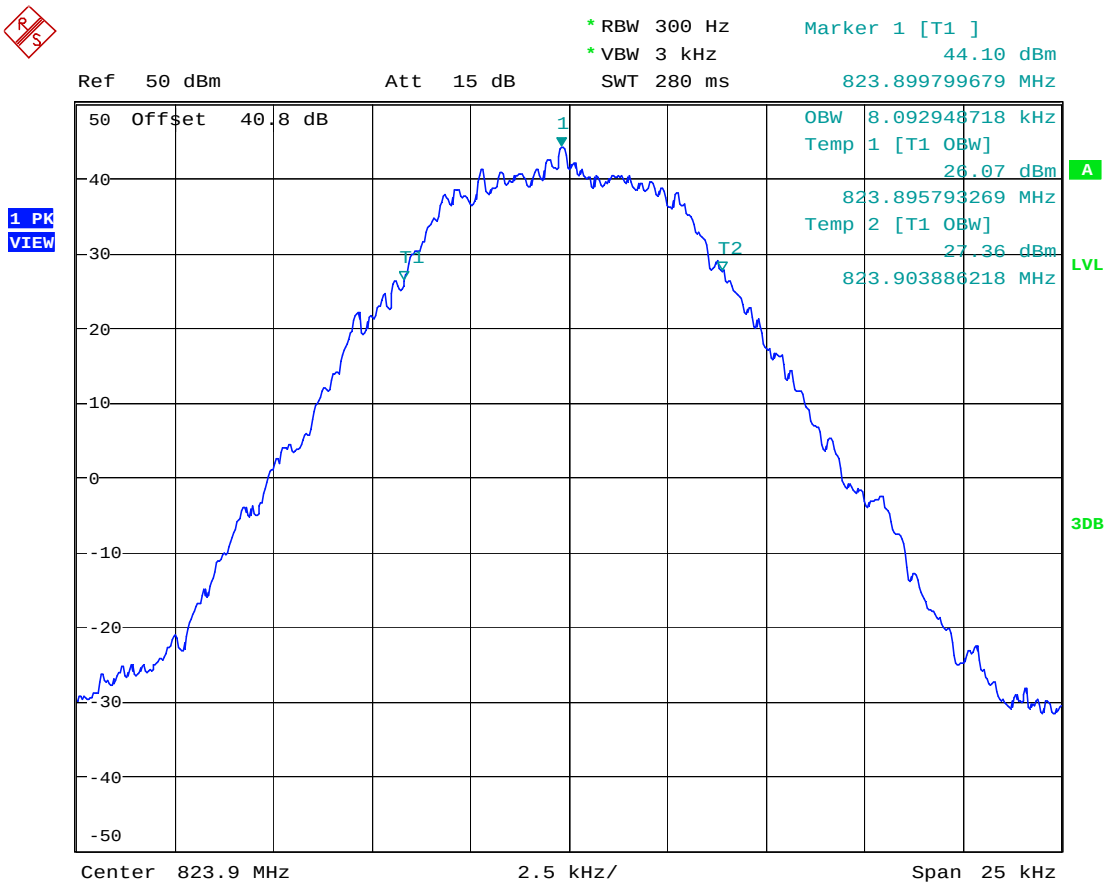
OBW: 8.01



Date: 24.APR.2019 12:23:40

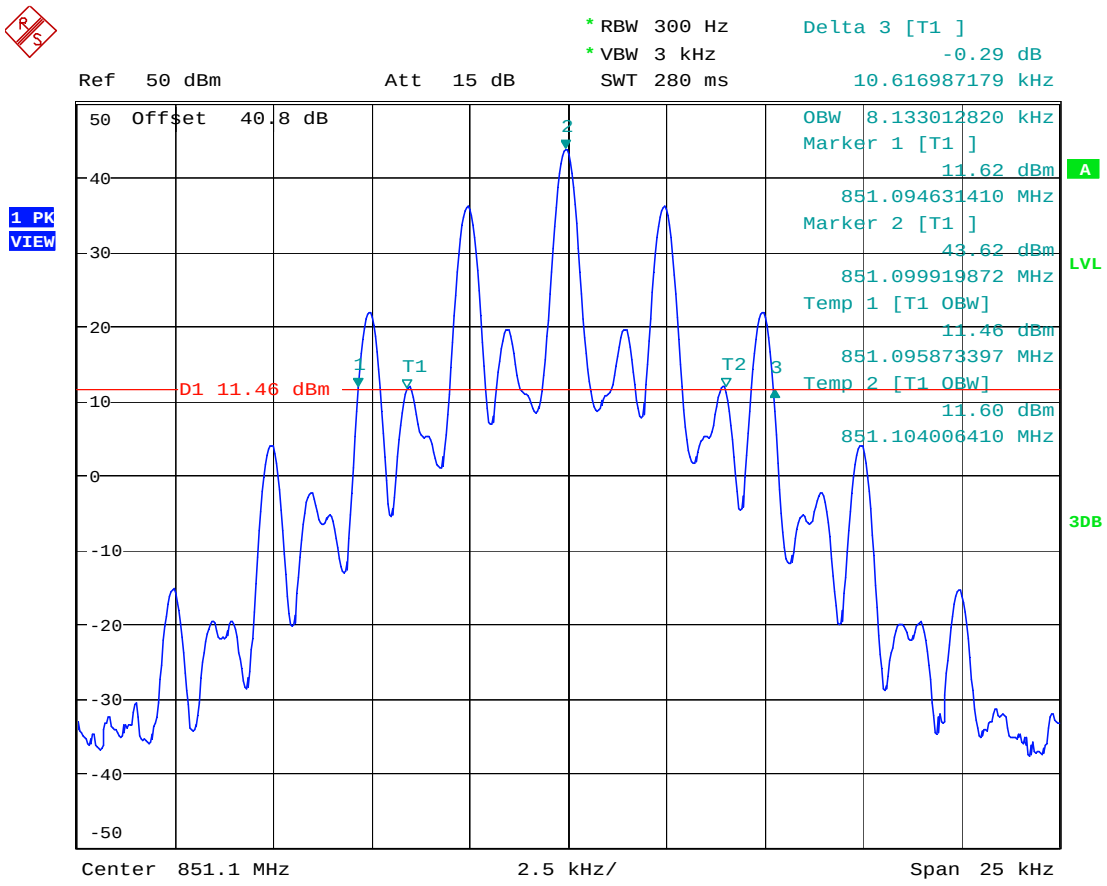
5.8.4.26. Configuration: 99% OBW, Band 3: 806-824MHz MHz, 823.9MHz, Digital, F1W, High power

OBW: 8.09 KHz



5.8.4.27. Configuration: 99% OBW, Band 4: 851-869MHz, 851.1MHz, 12.5 KHz, Analog, High power

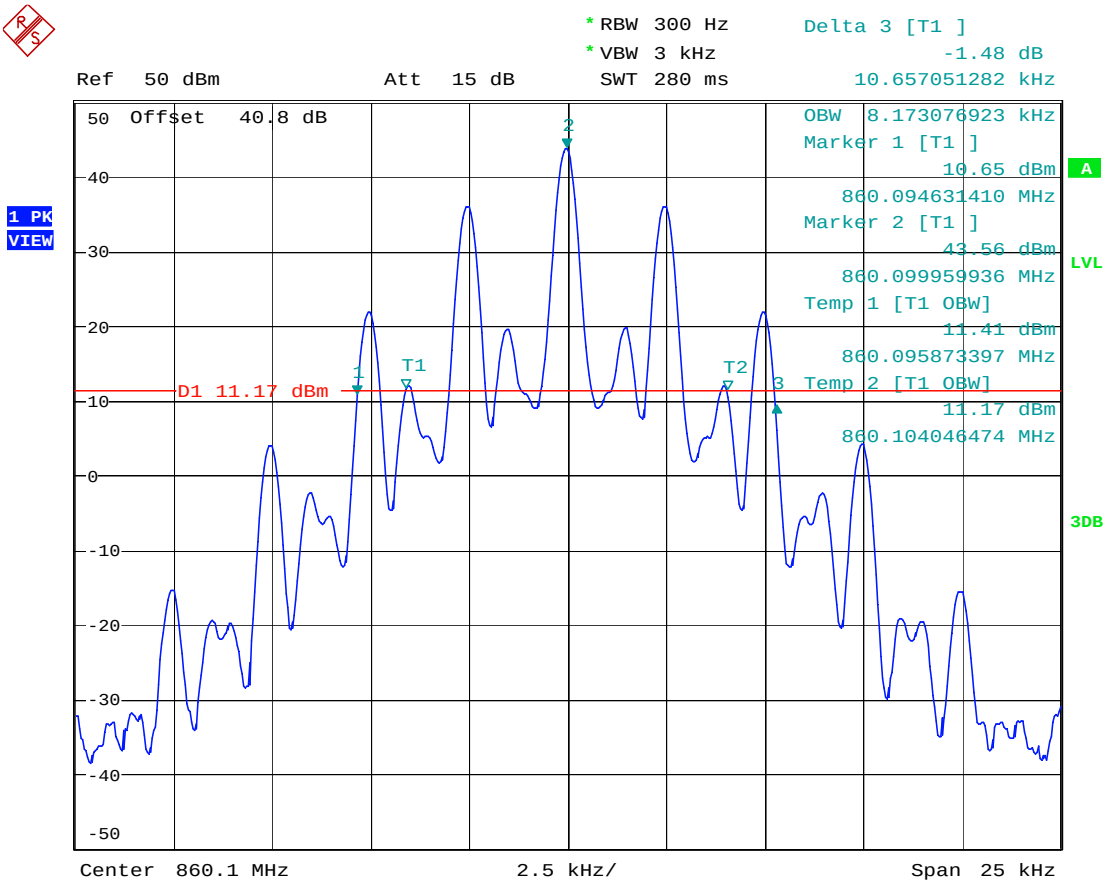
OBW: 10.62 KHz



Date: 24.APR.2019 12:30:51

5.8.4.28. Configuration: 99% OBW, Band 4: 851-869MHz, 860.1MHz, 12.5 KHz, Analog, High power

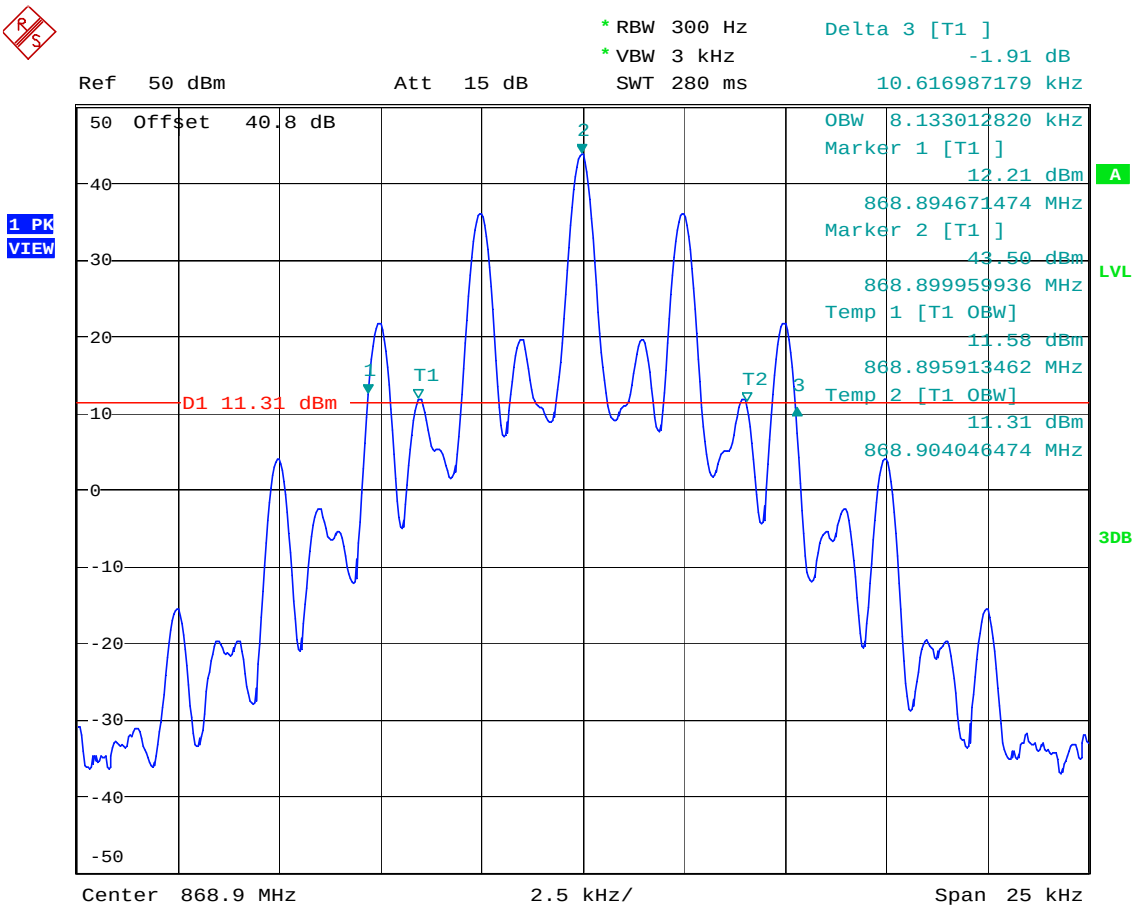
OBW: 10.66 KHz



Date: 24.APR.2019 12:32:33

5.8.4.29. Configuration: 99% OBW, Band 4: 851-869MHz, 868.9MHz, 12.5 KHz, Analog, High power

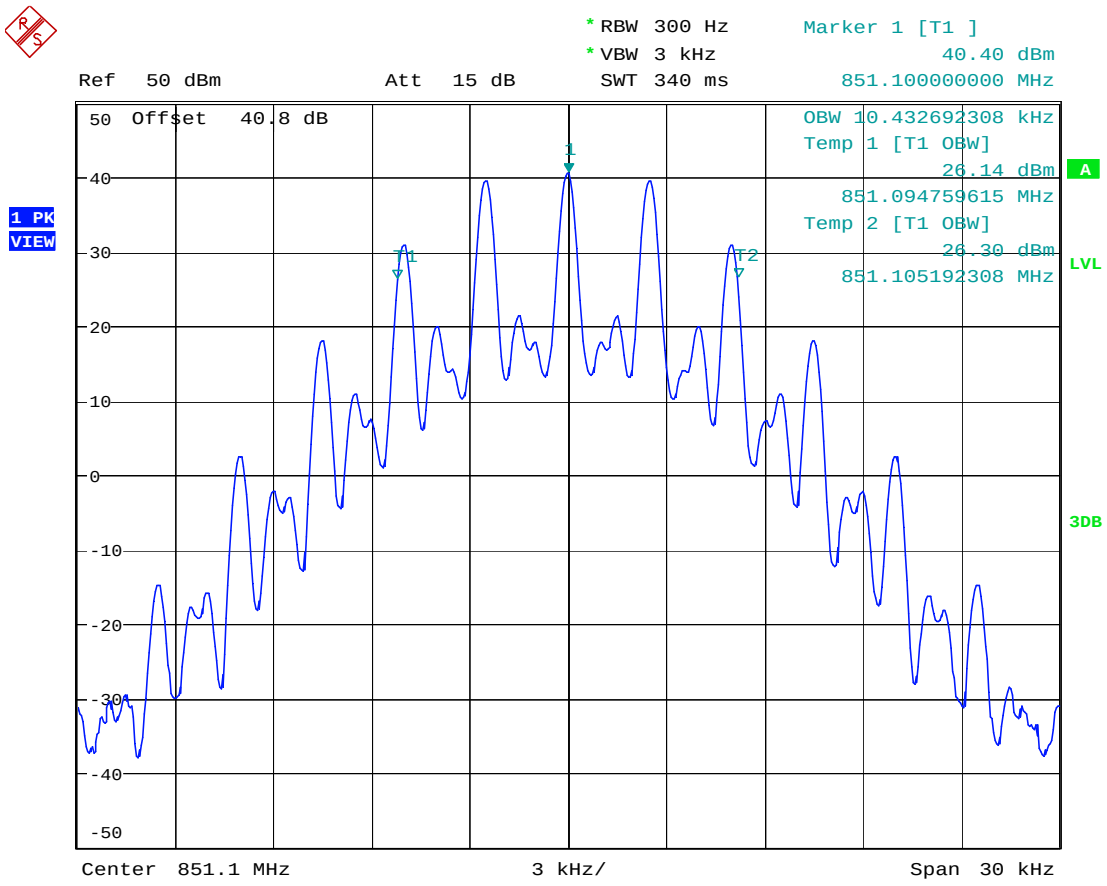
OBW: 10.62 KHz



Date: 24.APR.2019 12:34:18

5.8.4.30. Configuration: 99% OBW, Band 4: 851-854MHz, 851.1MHz, 20 KHz, Analog, High power

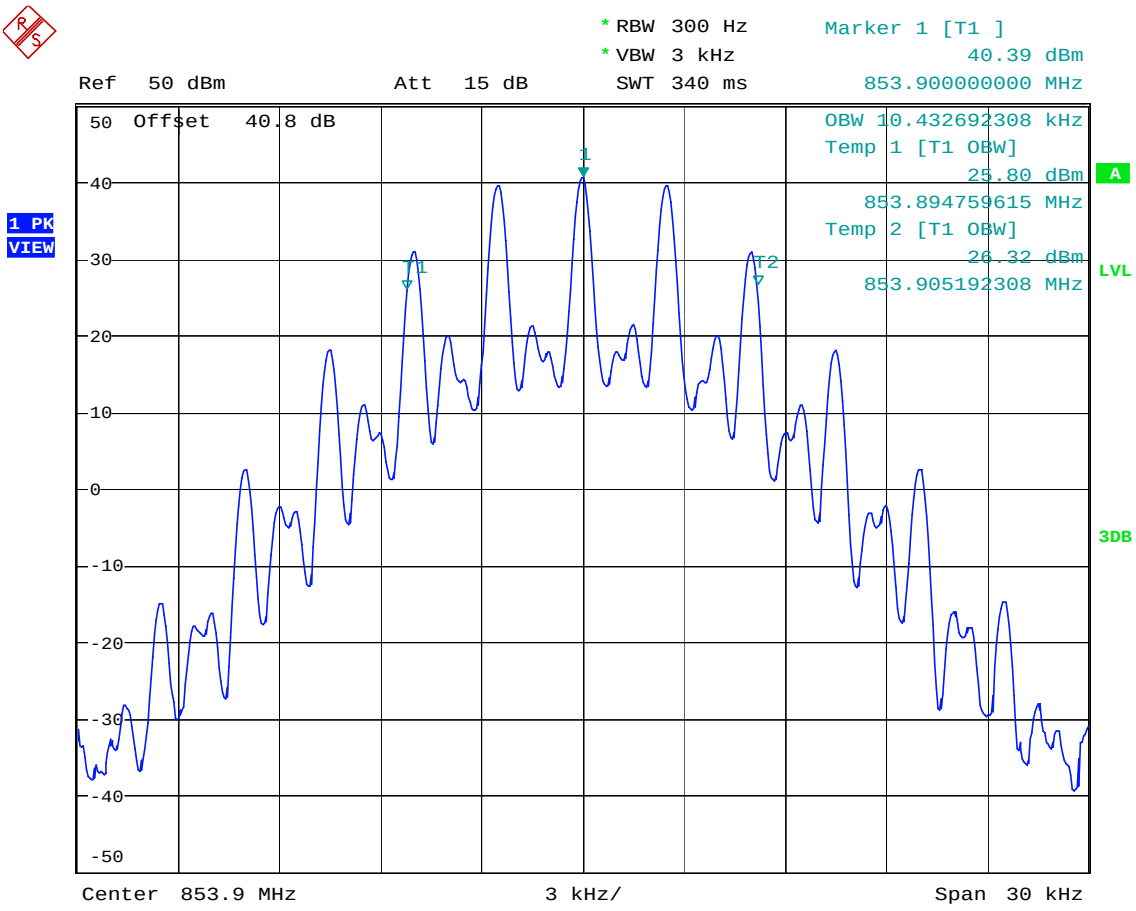
OBW: 10.43 KHz



Date: 24.APR.2019 12:35:47

5.8.4.31. Configuration: 99% OBW, Band 4: 851-854MHz, 853.9MHz, 20 KHz, Analog, High power

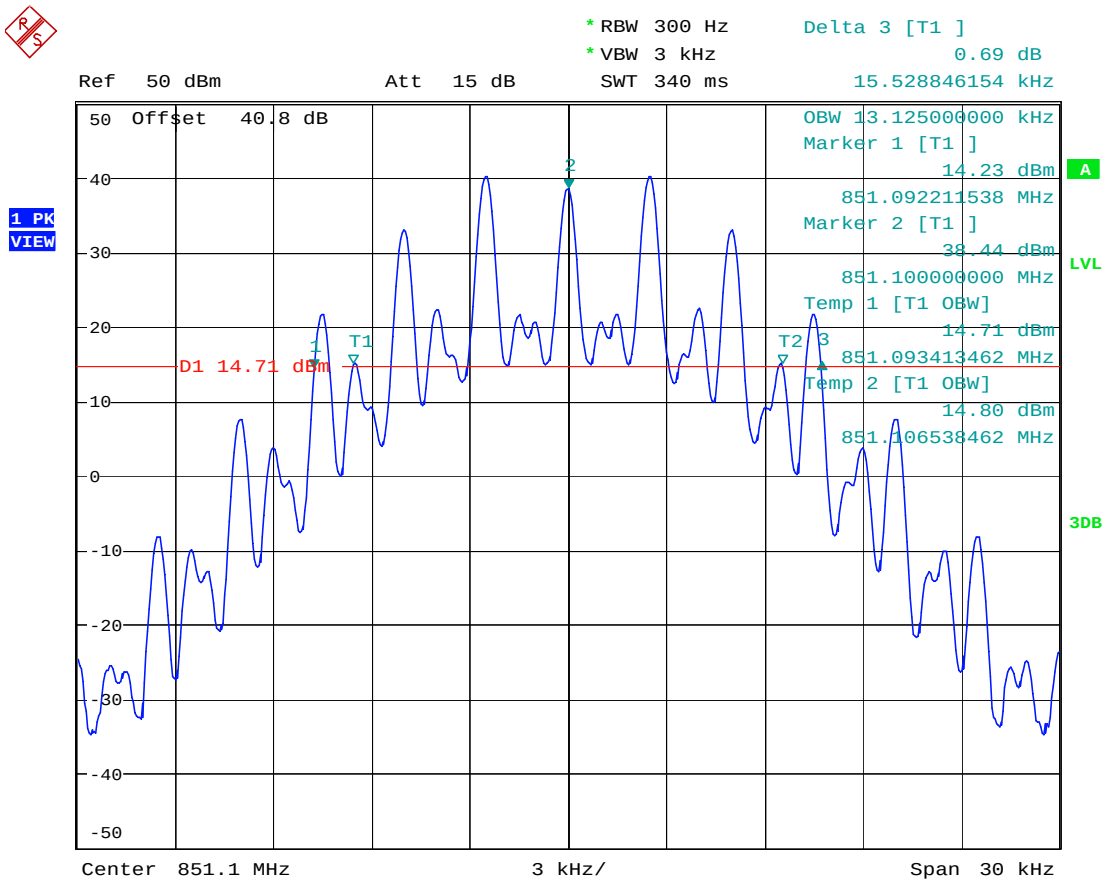
OBW: 10.43 KHz



Date: 24.APR.2019 12:37:31

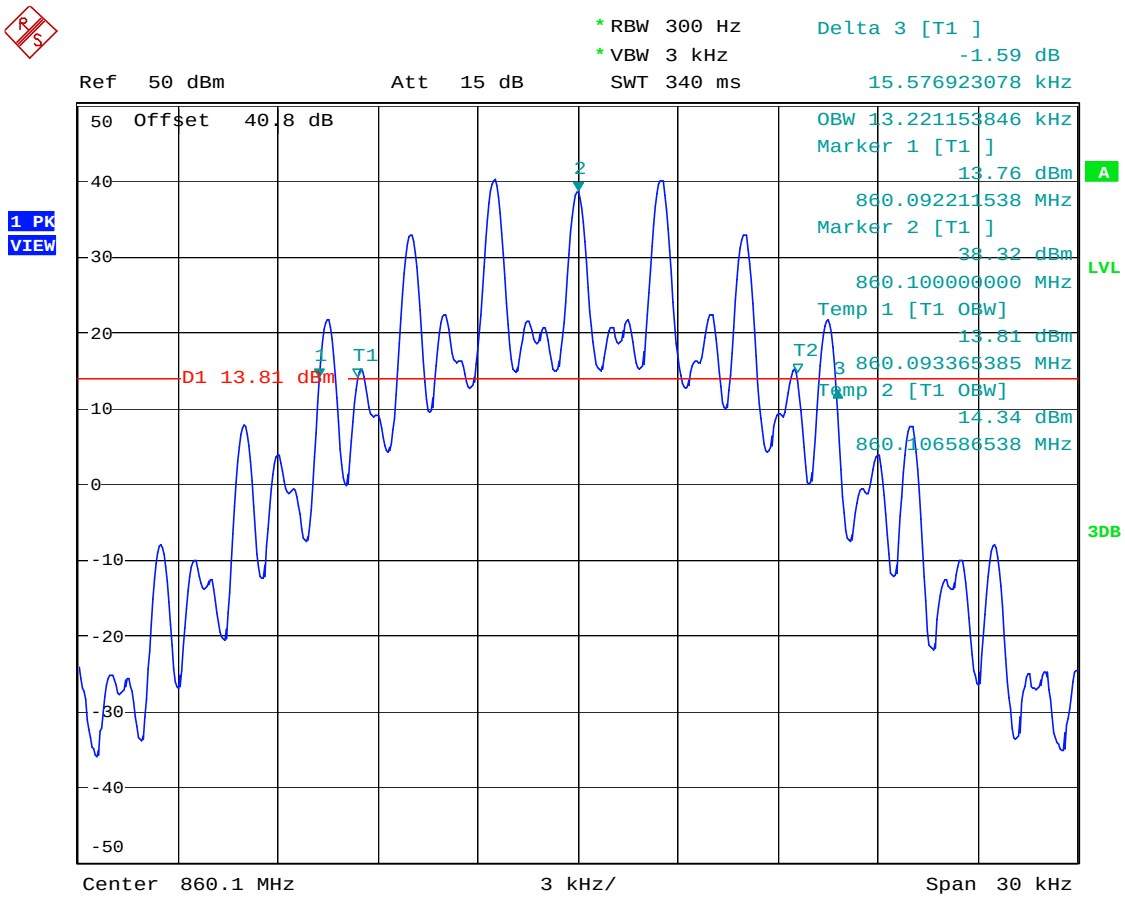
5.8.4.32. Configuration: 99% OBW, Band 4: 851-869MHz, 851.1MHz, 25 KHz, Analog, High power

OBW: 15.53 KHz



5.8.4.33. Configuration: 99% OBW, Band 4: 851-869MHz, 860.1MHz, 25 KHz, Analog, High power

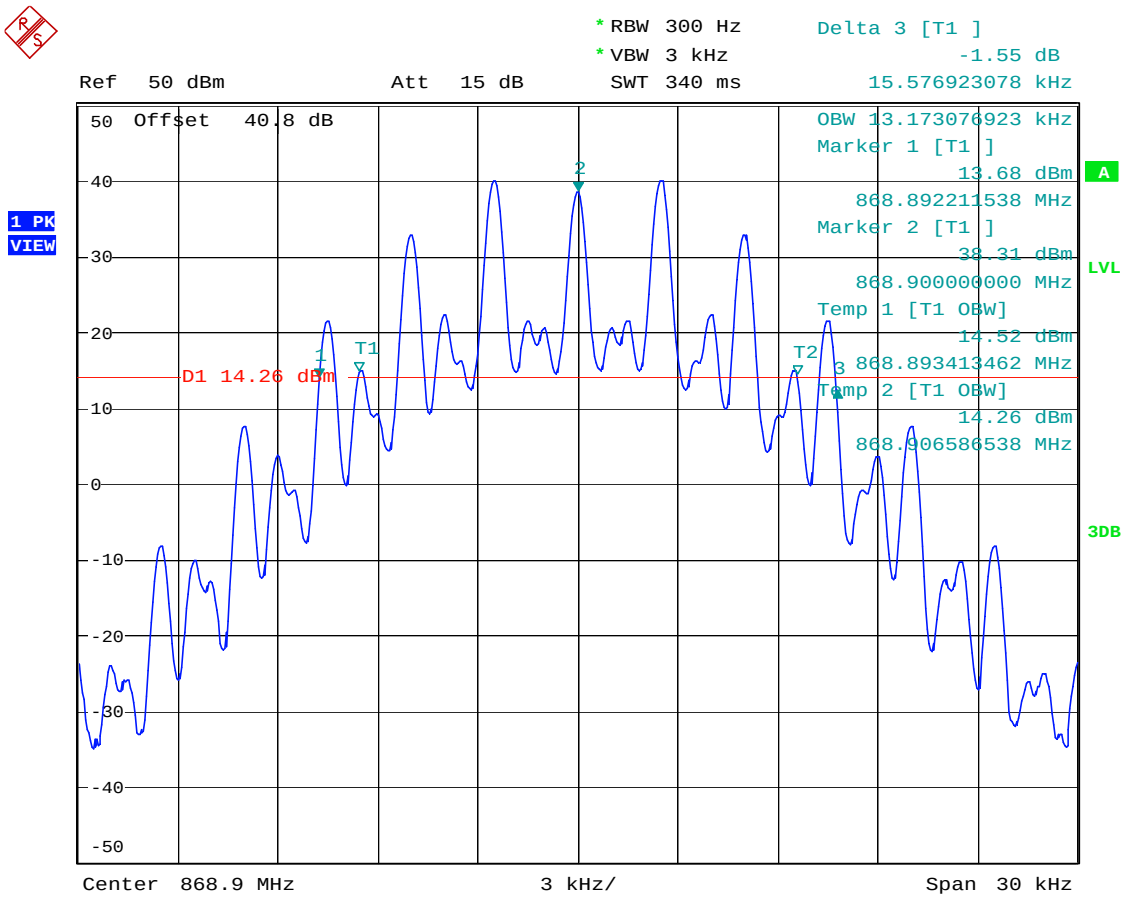
OBW: 15.58 KHz



Date: 24.APR.2019 12:41:09

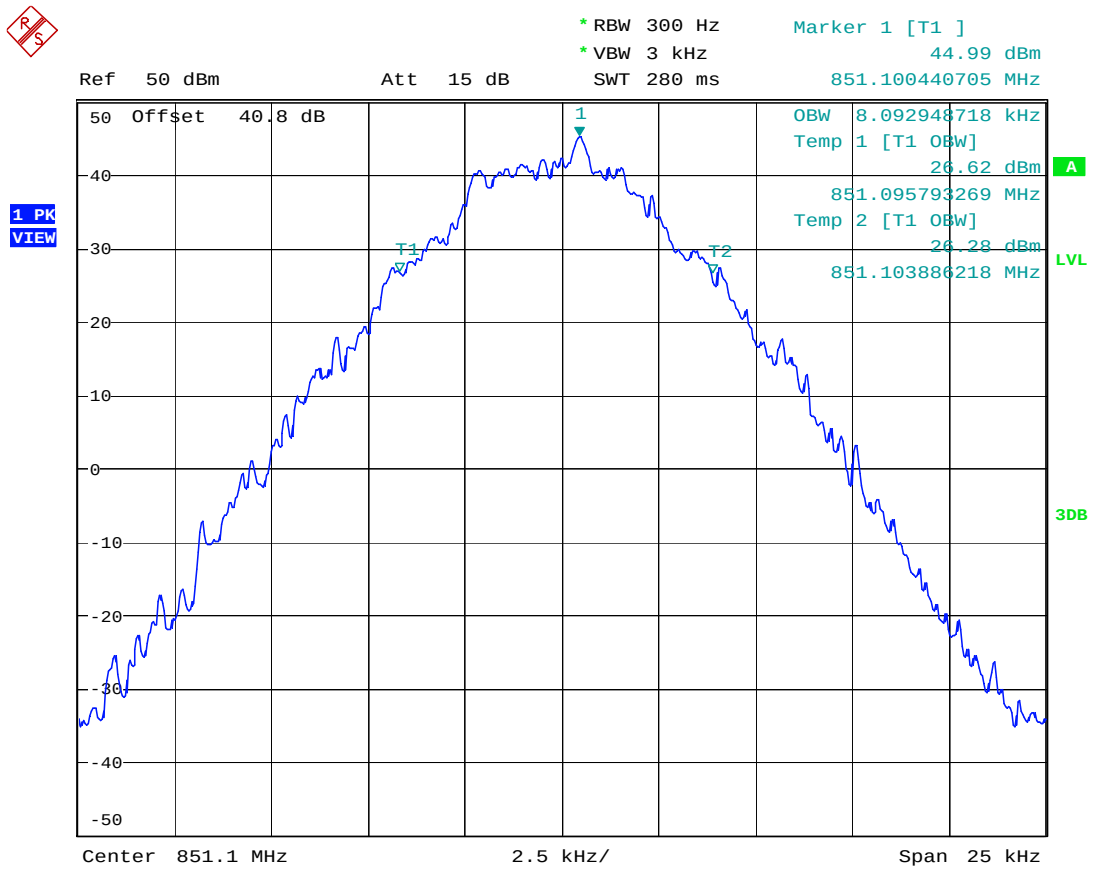
5.8.4.34. Configuration: 99% OBW, Band 4: 851-869MHz, 868.9MHz, 25 KHz, Analog, High power

OBW: 15.58 KHz



5.8.4.35. Configuration: 99% OBW, Band 4: 851-869MHz, 851.1MHz, Digital, F1E& F1D, High power

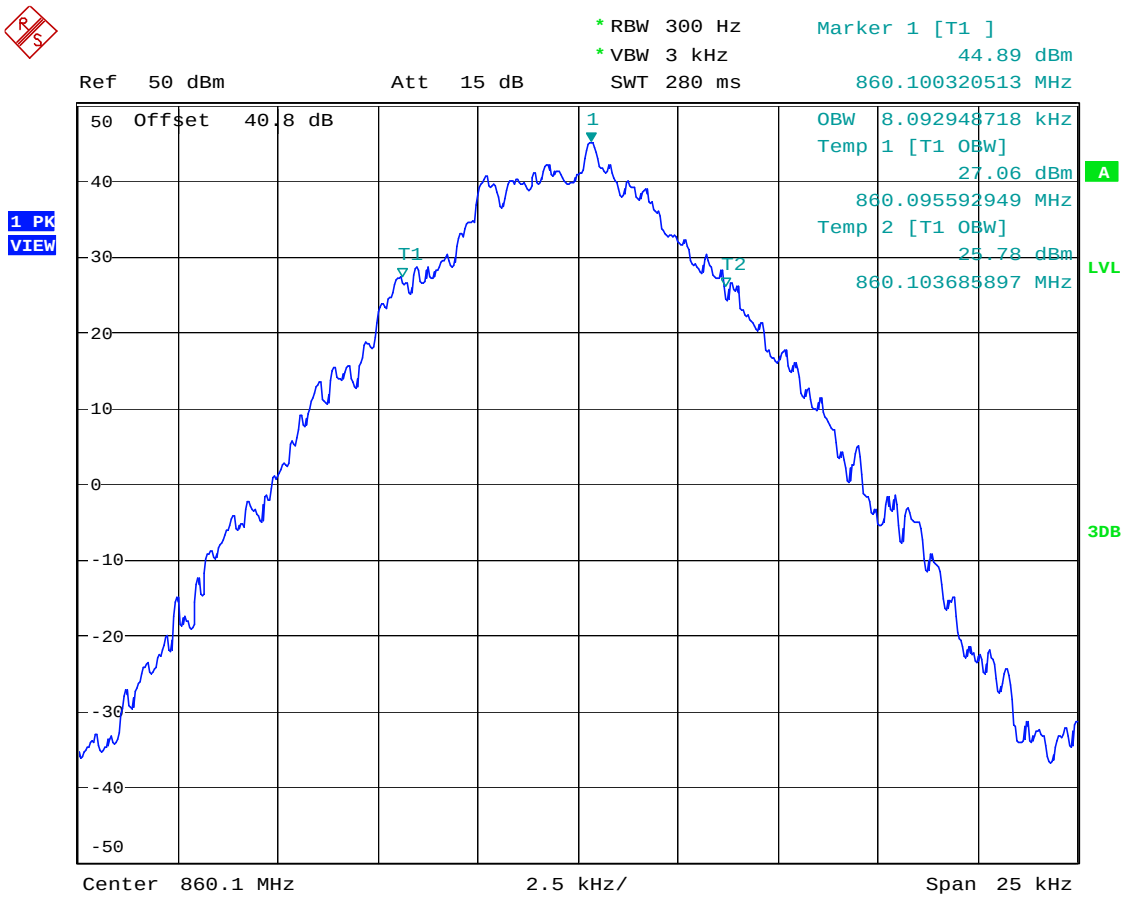
OBW: 8.09 KHz



Date: 24.APR.2019 12:47:46

5.8.4.36. Configuration: 99% OBW, Band 4: 851-869MHz, 860.1MHz, Digital, F1E& F1D, High power

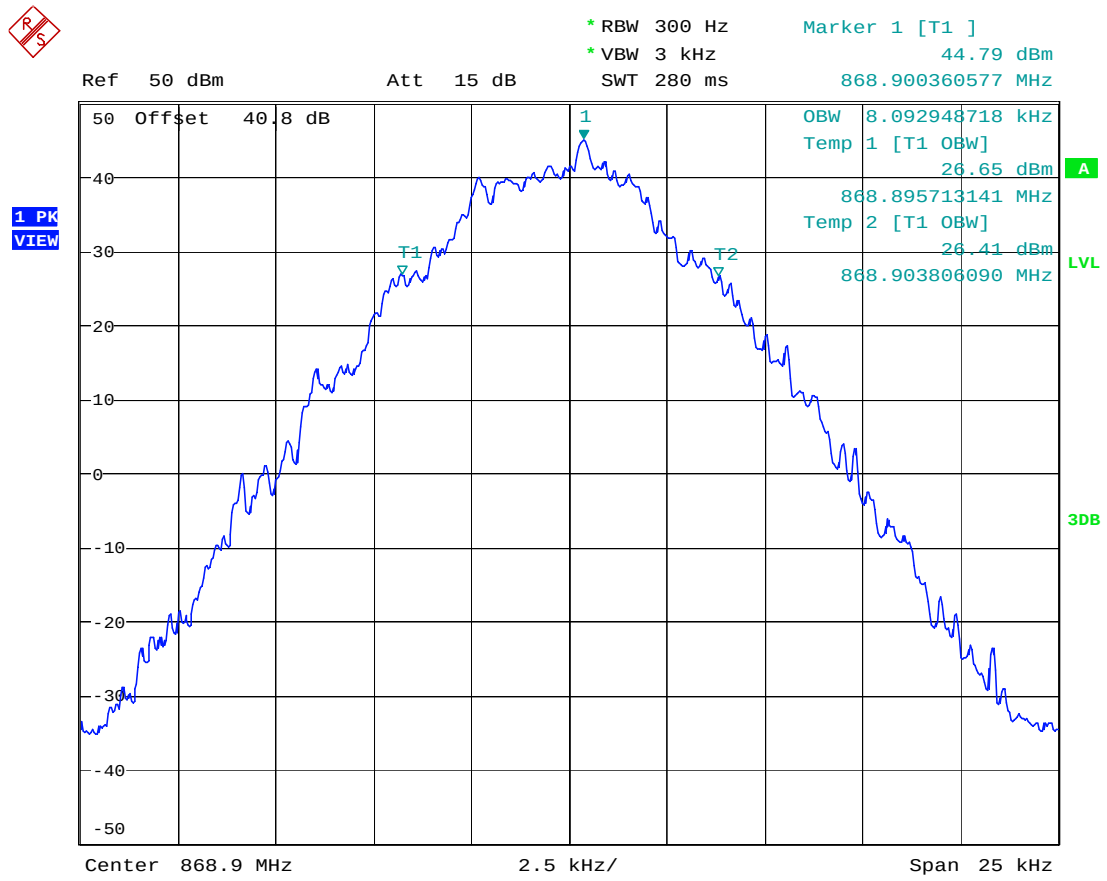
OBW: 8.09 KHz



Date: 24.APR.2019 12:50:17

5.8.4.37. Configuration: 99% OBW, Band 4: 851-869MHz, 868.9MHz, Digital, F1E& F1D, High power

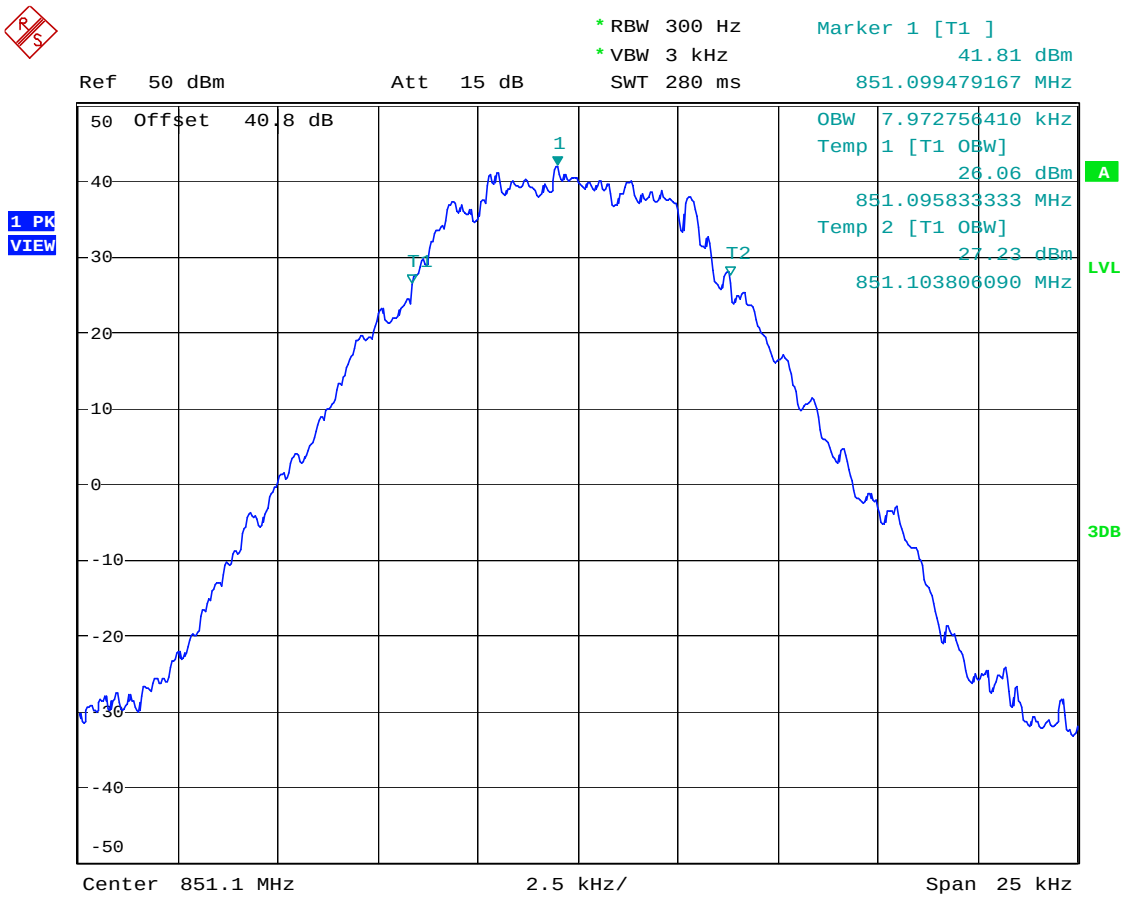
OBW: 8.09 KHz



Date: 24.APR.2019 12:52:12

5.8.4.38. Configuration: 99% OBW, Band 4: 851-869MHz, 851.1MHz, Digital, F1W, High power

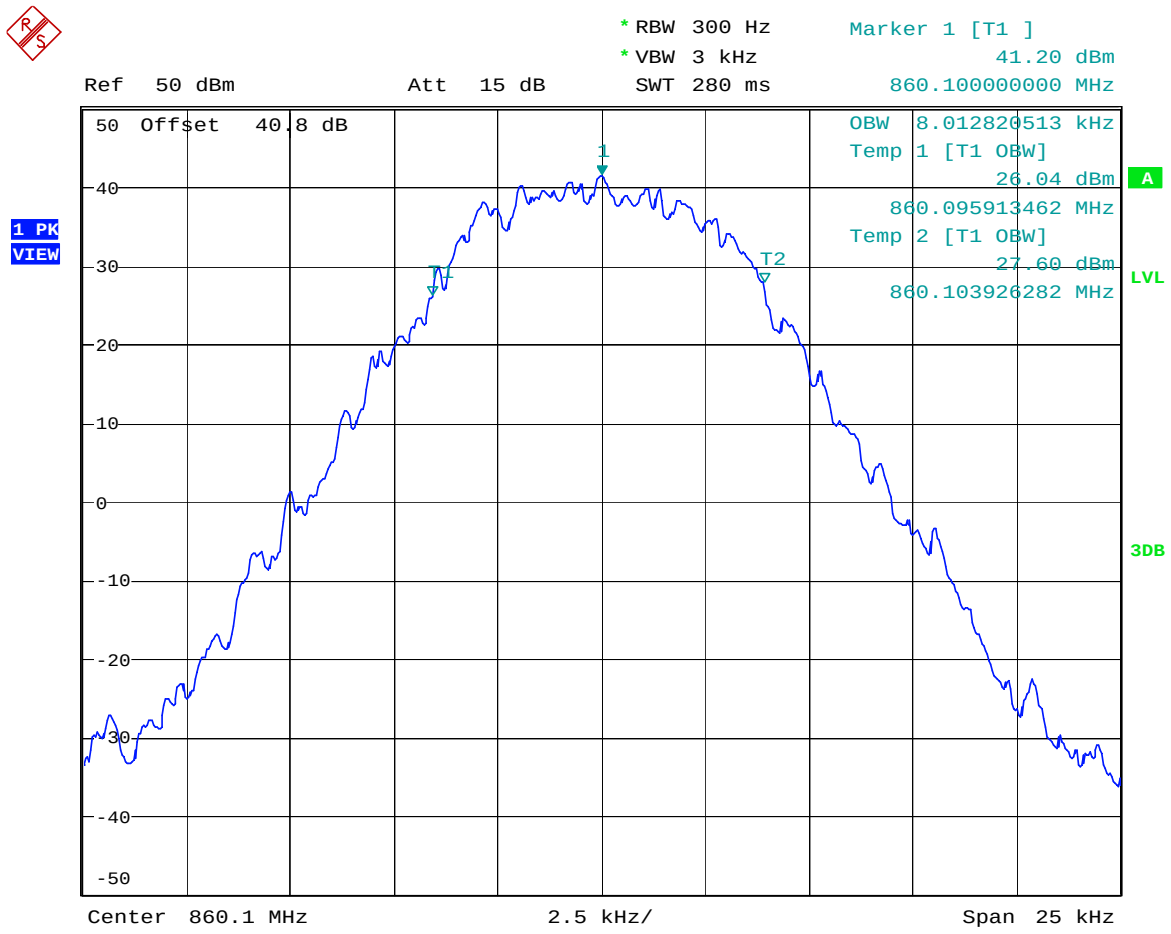
OBW: 7.97 KHz



Date: 24.APR.2019 12:54:25

5.8.4.39. Configuration: 99% OBW, Band 4: 851-869MHz, 860.1MHz, Digital, F1W, High power

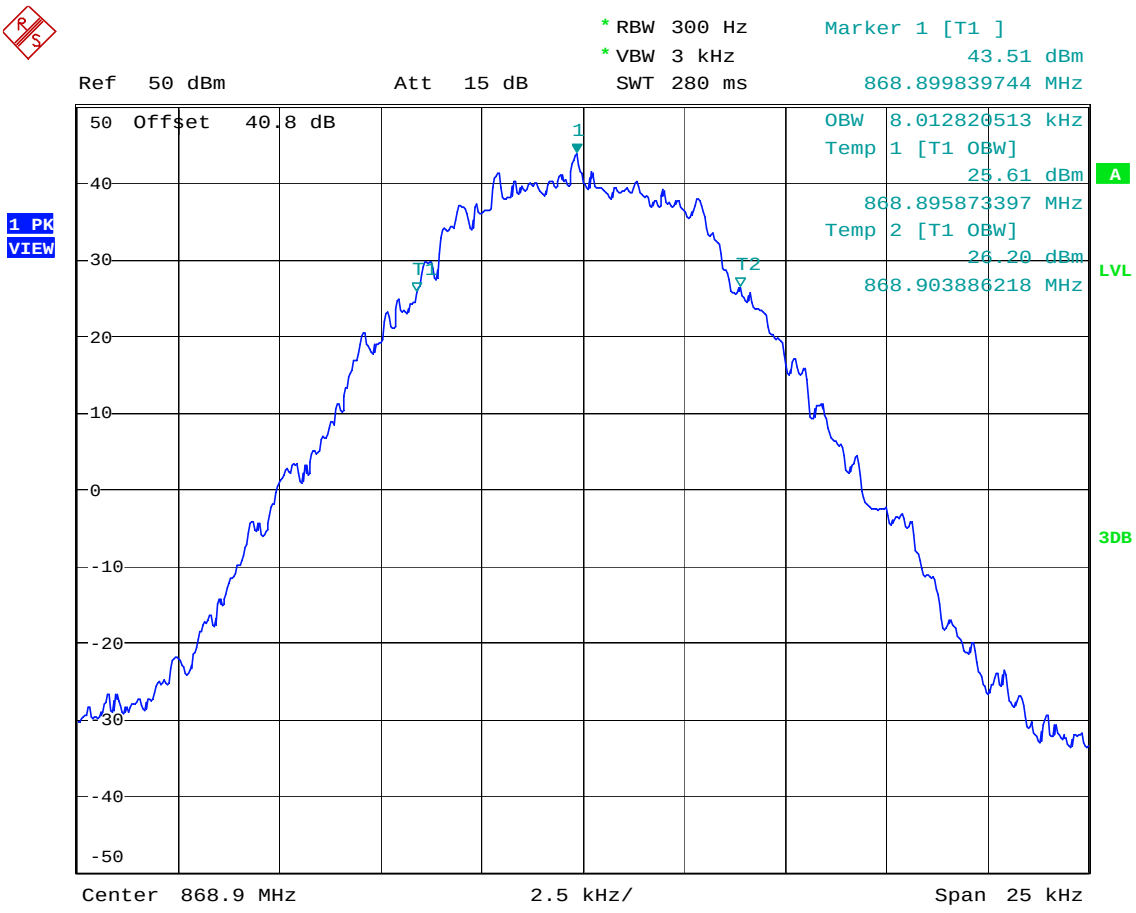
OBW: 8.01 KHz



Date: 24.APR.2019 12:55:56

5.8.4.40. Configuration: 99% OBW, Band 4: 851-869MHz, 868.9MHz, Digital, F1W, High power

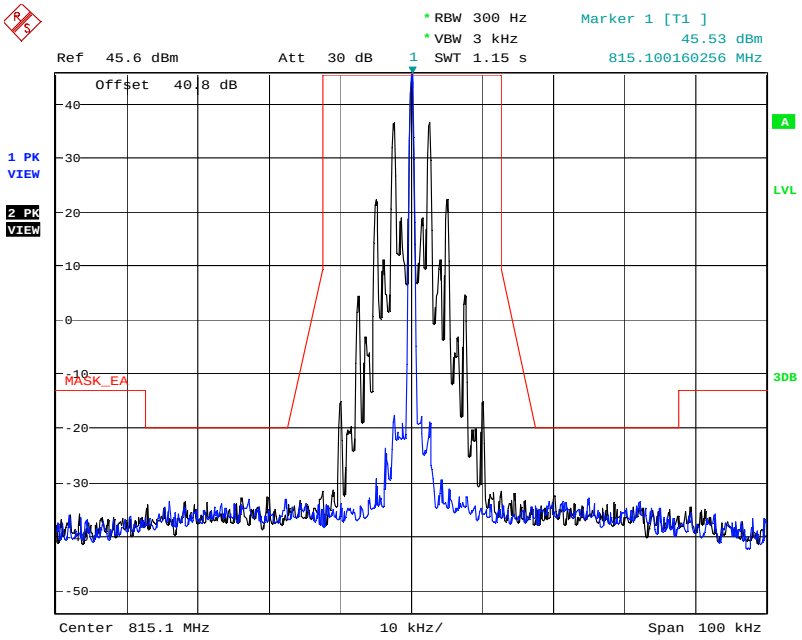
OBW: 8.01 KHz



Date: 24.APR.2019 12:57:34

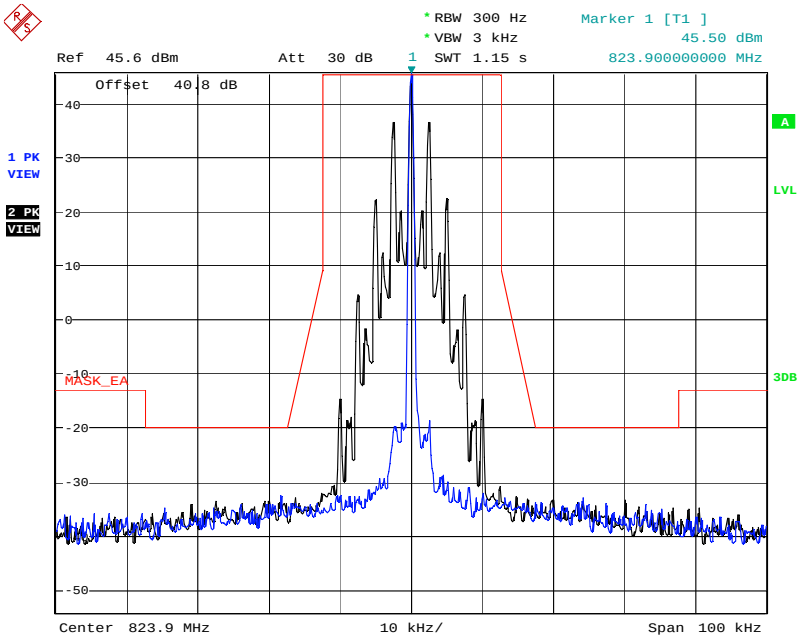
5.8.5. Test Data- EMISSION MASKS- MASK 90.691

5.8.5.1. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, 12.5 KHz, Analog, High power



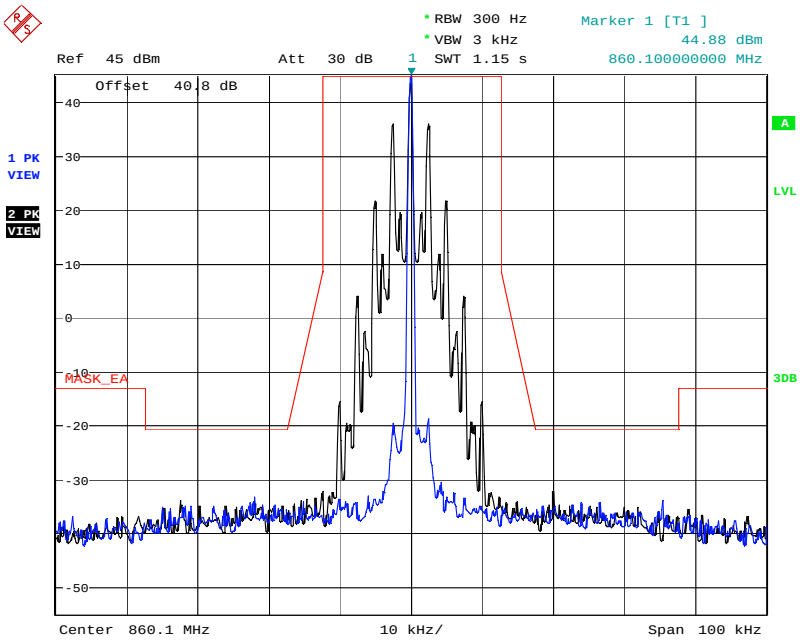
Date: 25.APR.2019 12:25:17

5.8.5.2. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, 12.5 KHz, Analog, High power



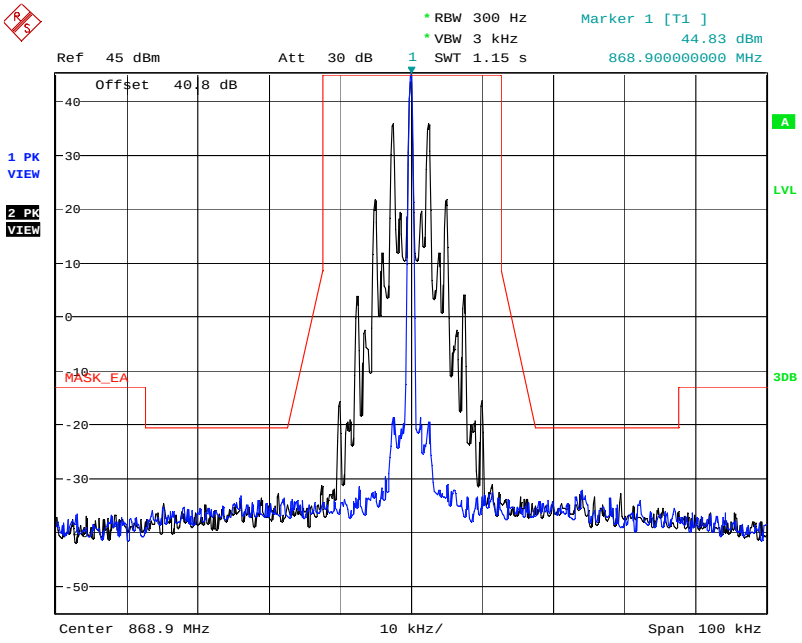
Date: 25.APR.2019 12:32:40

5.8.5.3. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, 12.5 KHz, Analog, High power



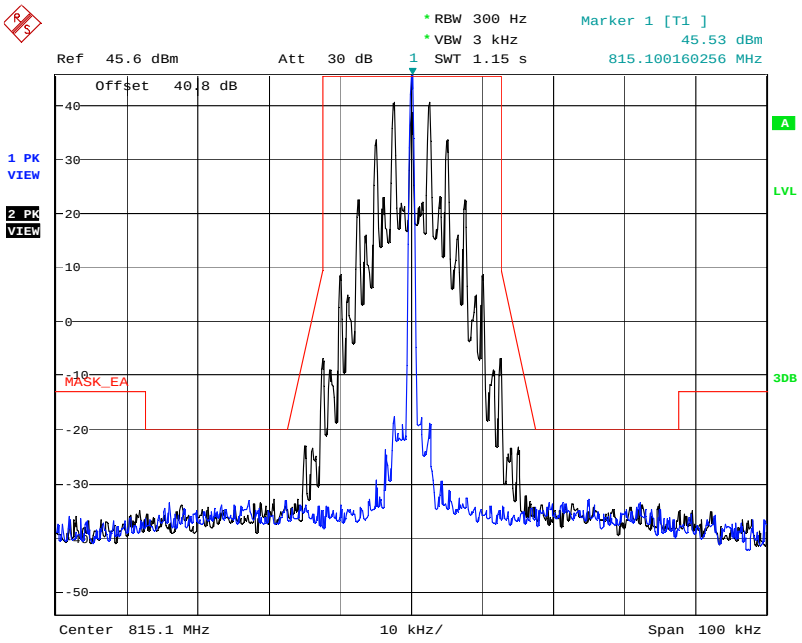
Date: 25.APR.2019 12:41:41

5.8.5.4. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, 12.5 KHz, Analog, High power



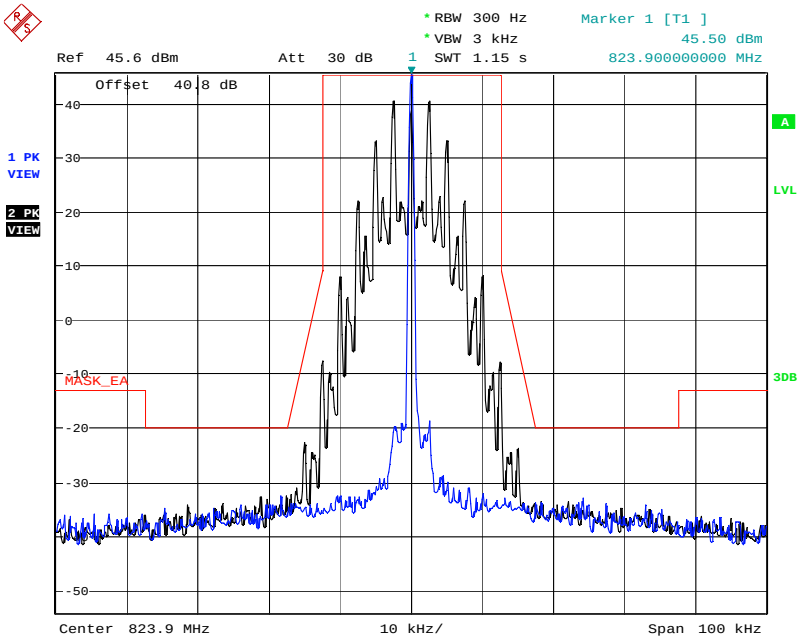
Date: 25.APR.2019 12:48:53

5.8.5.5. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, 25 KHz, Analog, High power



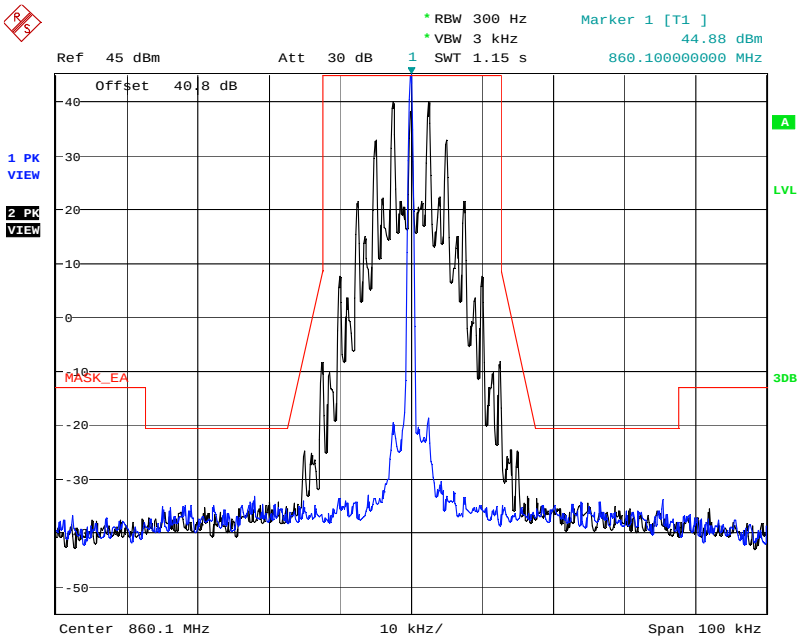
Date: 25.APR.2019 12:27:04

5.8.5.6. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, 25 KHz, Analog, High power



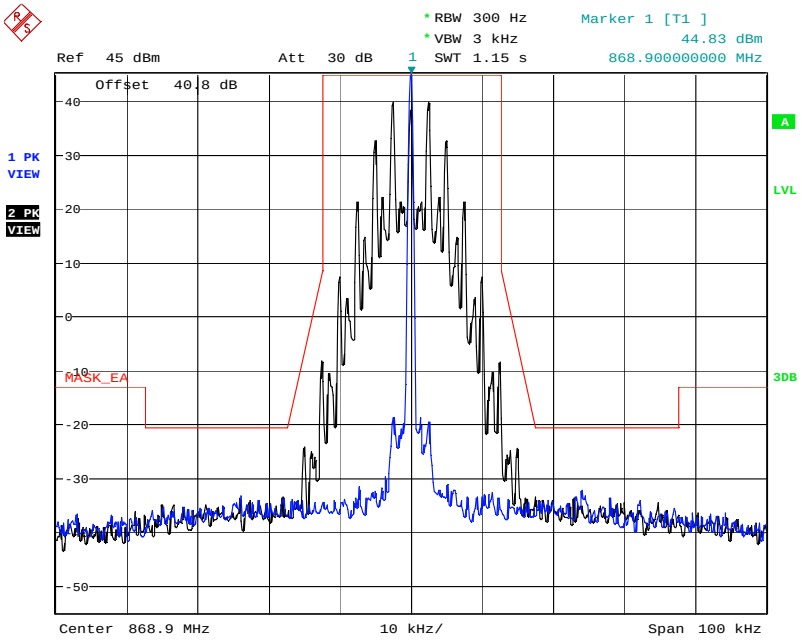
Date: 25.APR.2019 12:34:05

5.8.5.7. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, 25 KHz, Analog, High power



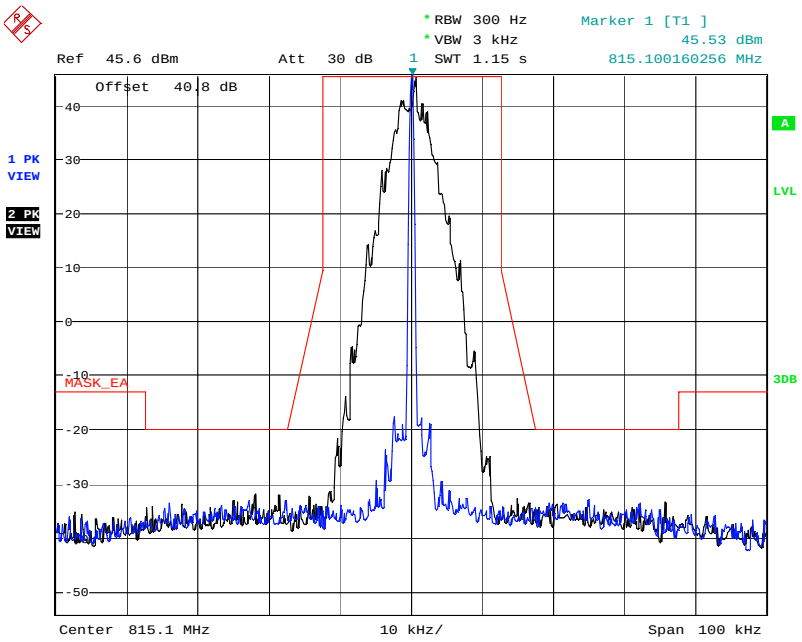
Date: 25.APR.2019 12:43:15

5.8.5.8. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, 25 KHz, Analog, High power



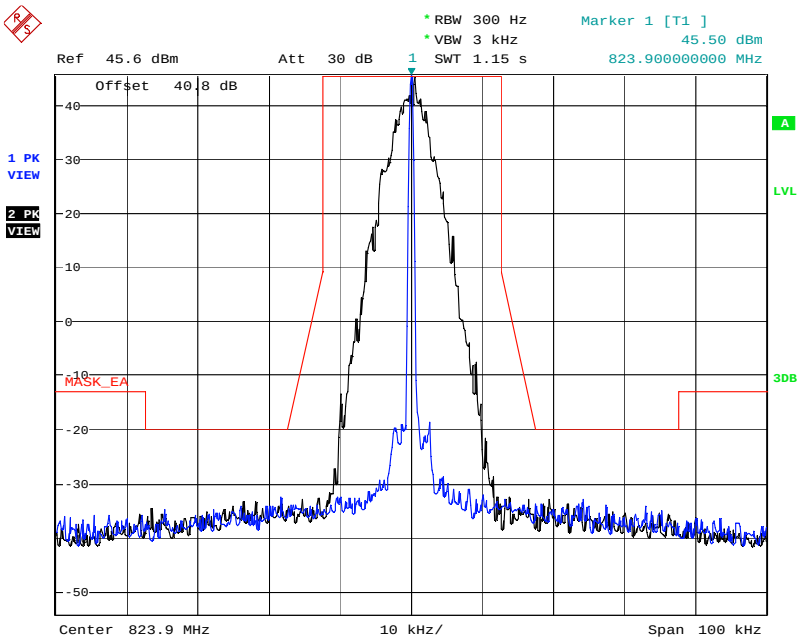
Date: 25.APR.2019 12:49:50

5.8.5.9. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, F1E&F1D, Digital, High power



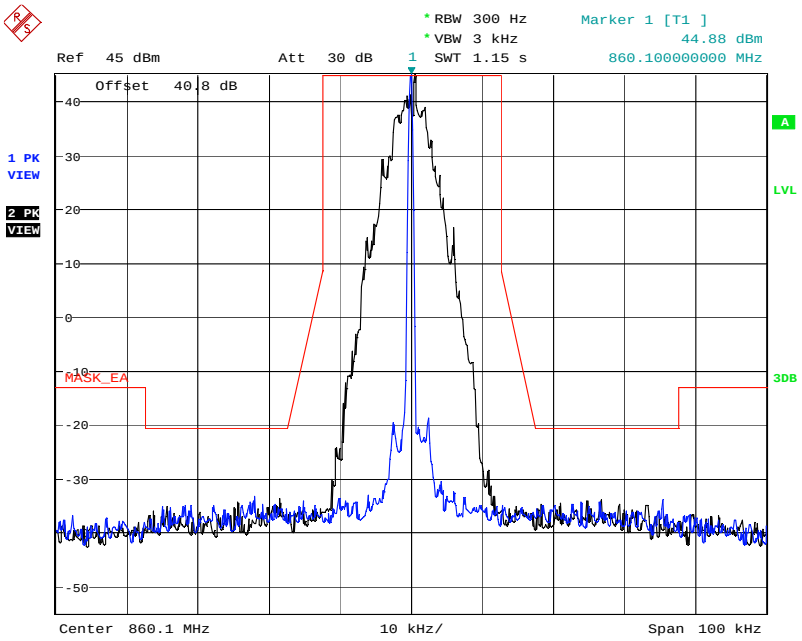
Date: 25.APR.2019 12:28:20

5.8.5.10. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, F1E&F1D, Digital, High power



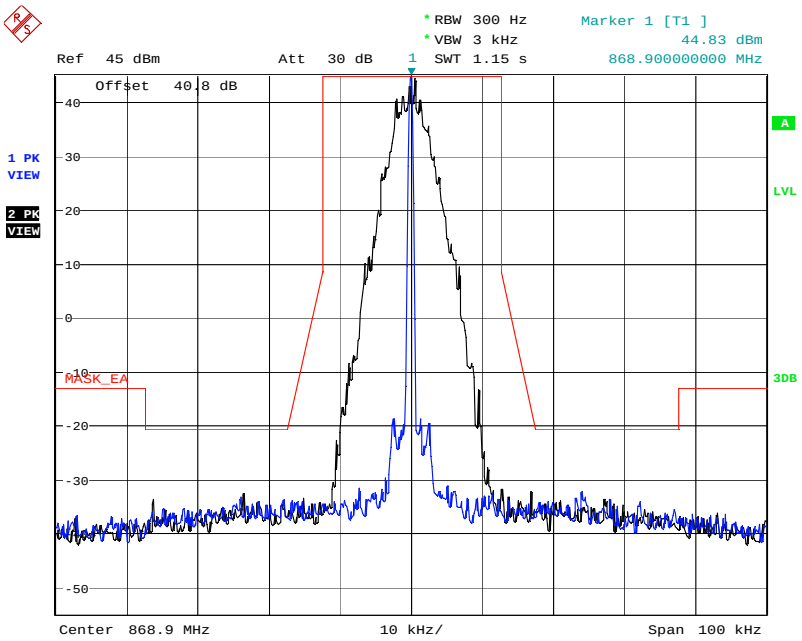
Date: 25.APR.2019 12:35:10

5.8.5.11. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, F1E&F1D, Digital, High power



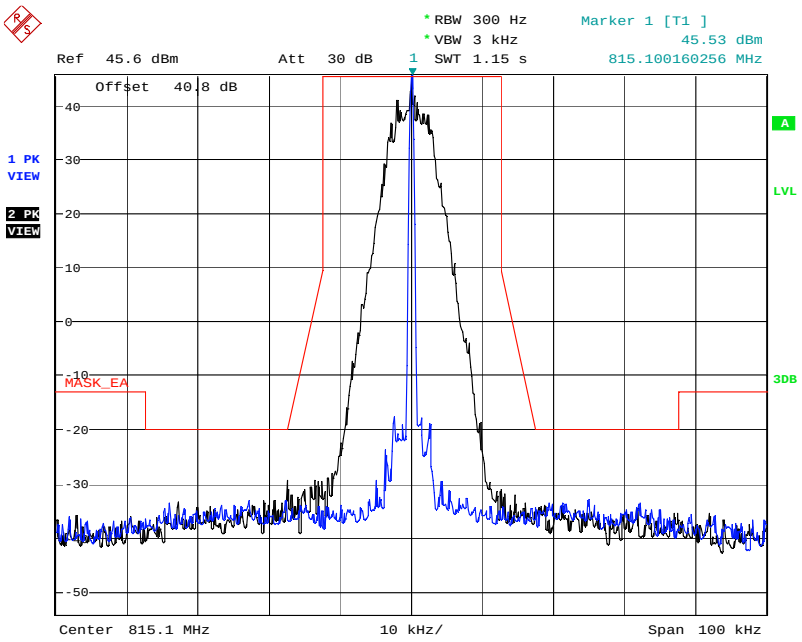
Date: 25.APR.2019 12:44:20

5.8.5.12. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, F1E&F1D, Digital, High power



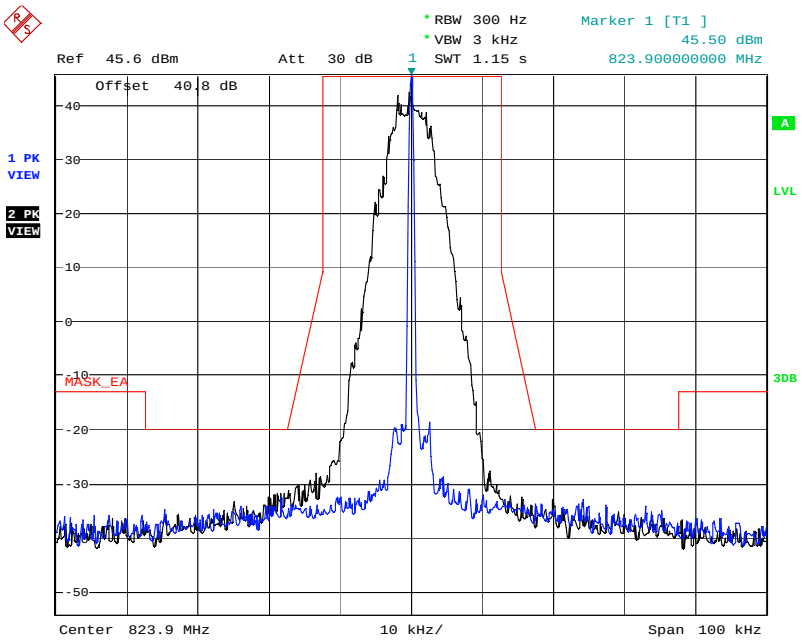
Date: 25.APR.2019 12:50:51

5.8.5.13. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, F1W, Digital, High power



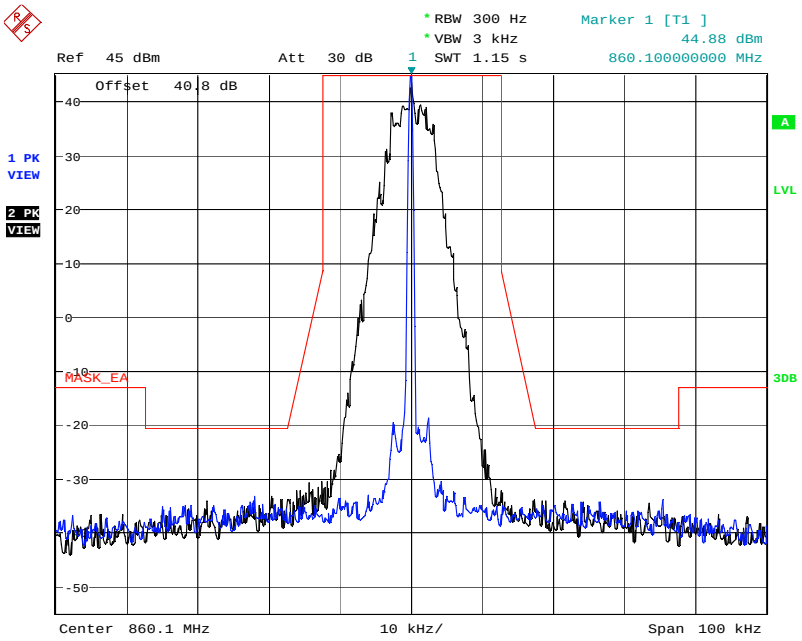
Date: 25.APR.2019 12:29:33

5.8.5.14. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, F1W, Digital, High power



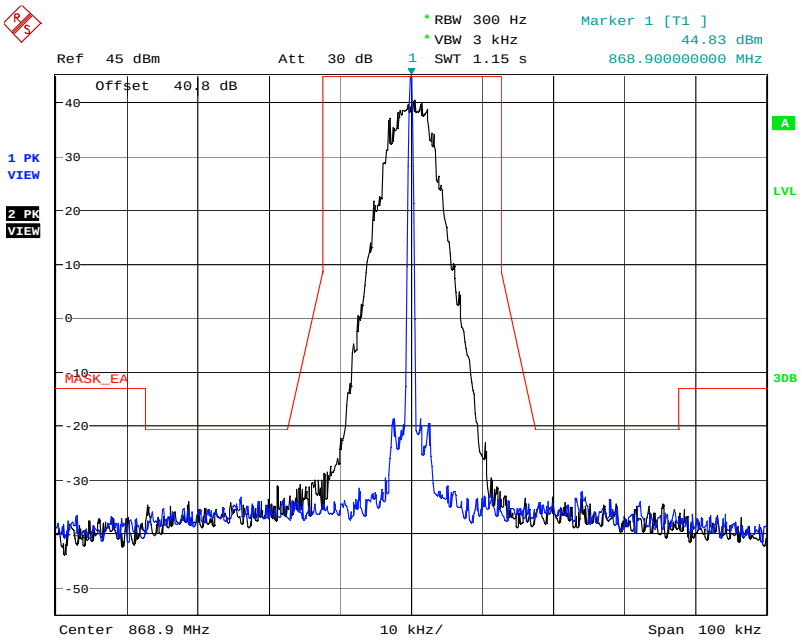
Date: 25.APR.2019 12:36:21

5.8.5.15. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, F1W, Digital, High power



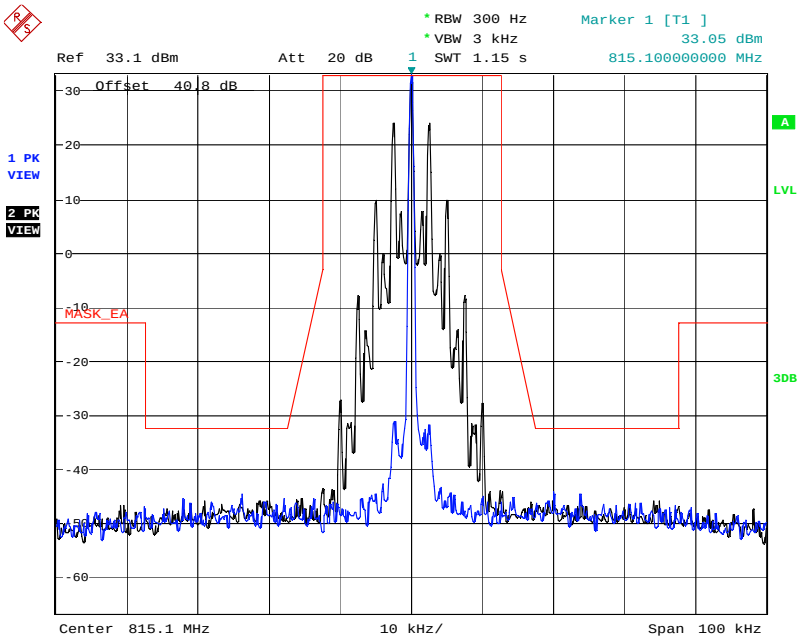
Date: 25.APR.2019 12:45:28

5.8.5.16. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, F1W, Digital, High power



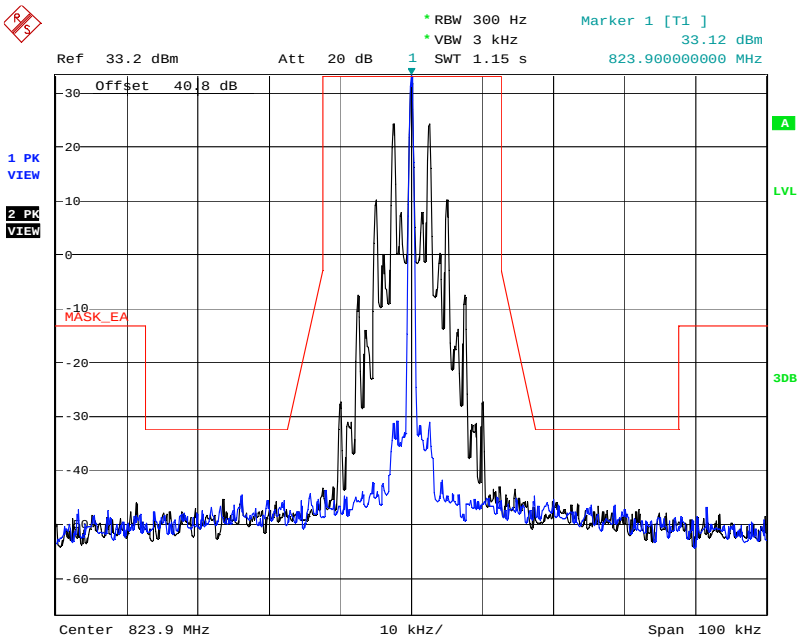
Date: 25.APR.2019 12:52:20

5.8.5.17. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, 12.5 KHz, Analog, Low power



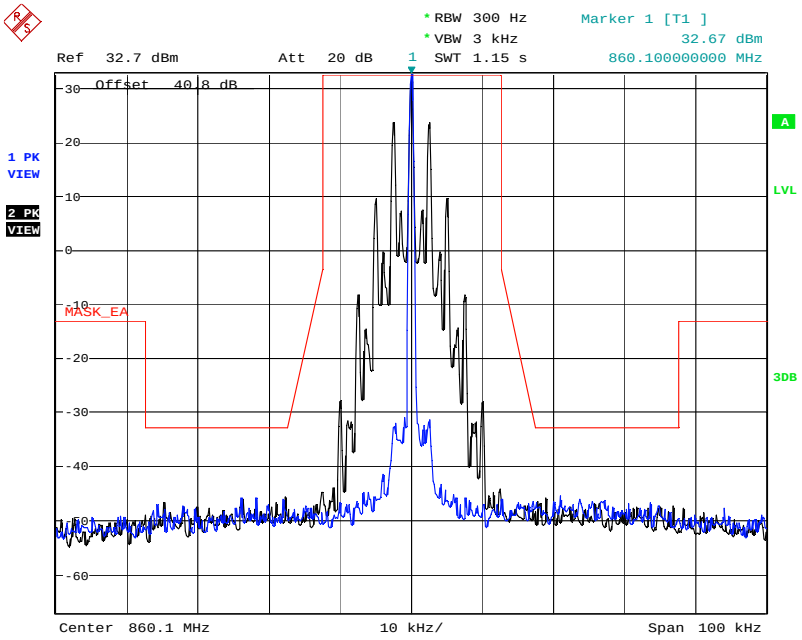
Date: 25.APR.2019 13:37:51

5.8.5.18. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, 12.5 KHz, Analog, Low power



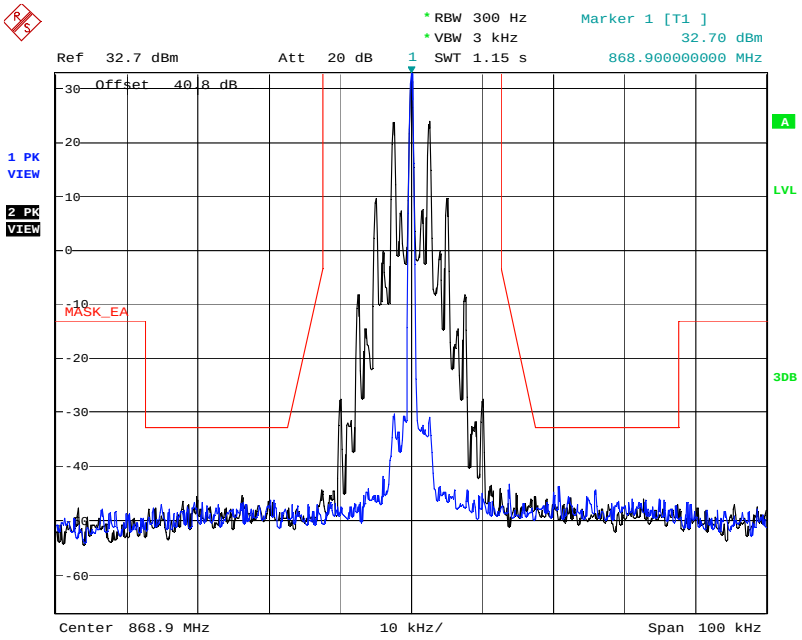
Date: 25.APR.2019 13:48:22

5.8.5.19. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, 12.5 KHz, Analog, Low power



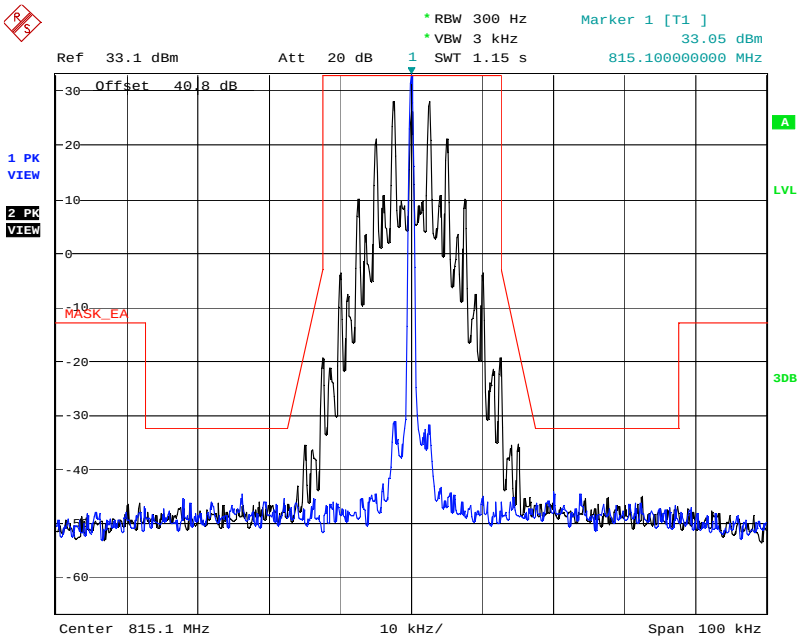
Date: 25.APR.2019 13:54:57

5.8.5.20. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, 12.5 KHz, Analog, Low power



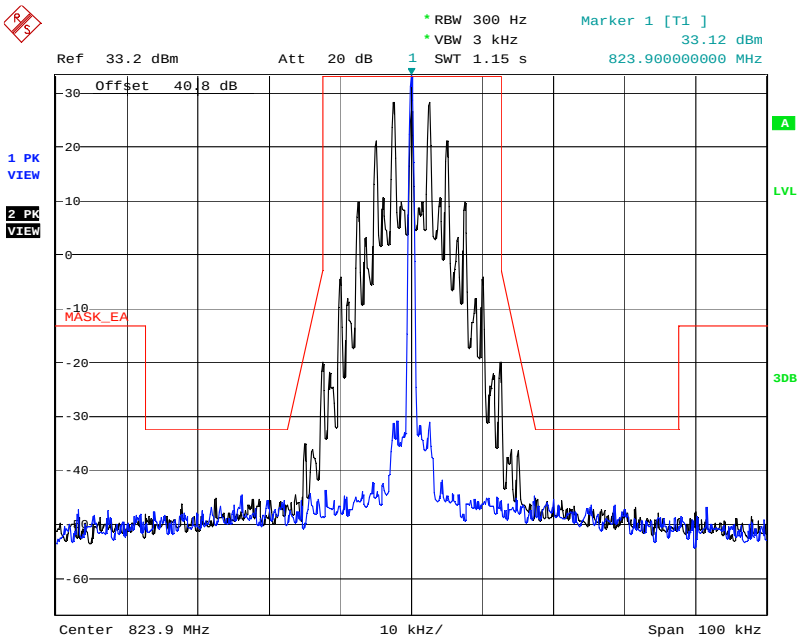
Date: 25.APR.2019 14:02:09

5.8.5.21. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, 25 KHz, Analog, Low power



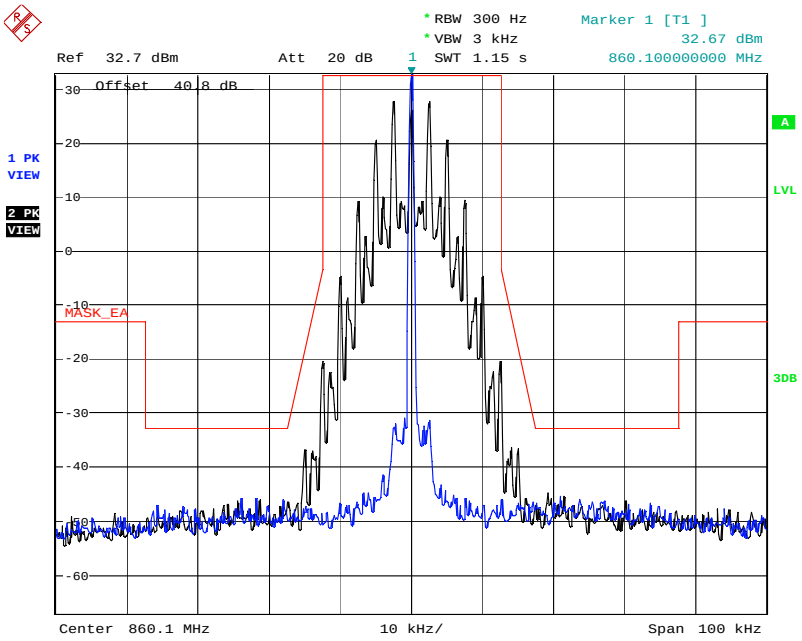
Date: 25.APR.2019 13:39:04

5.8.5.22. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, 25 KHz, Analog, Low power



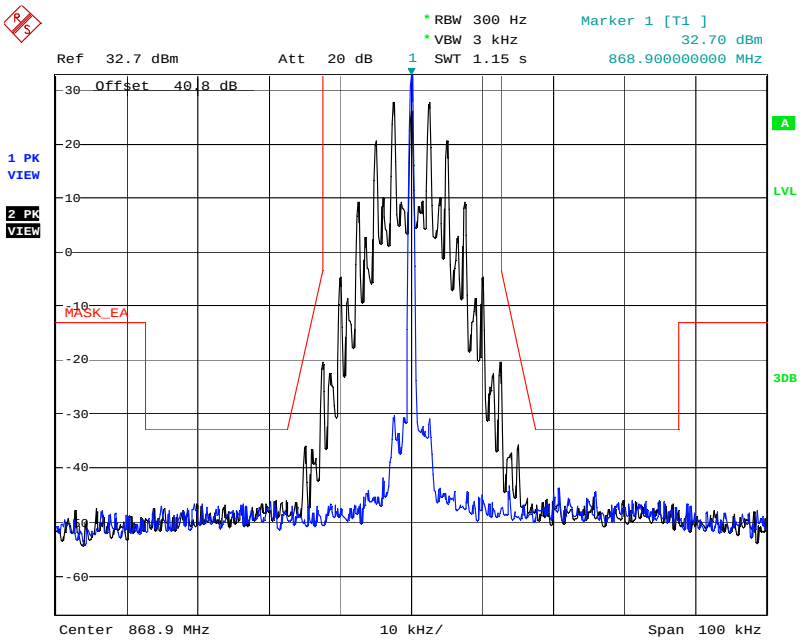
Date: 25.APR.2019 13:49:30

5.8.5.23. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, 25 KHz, Analog, Low power



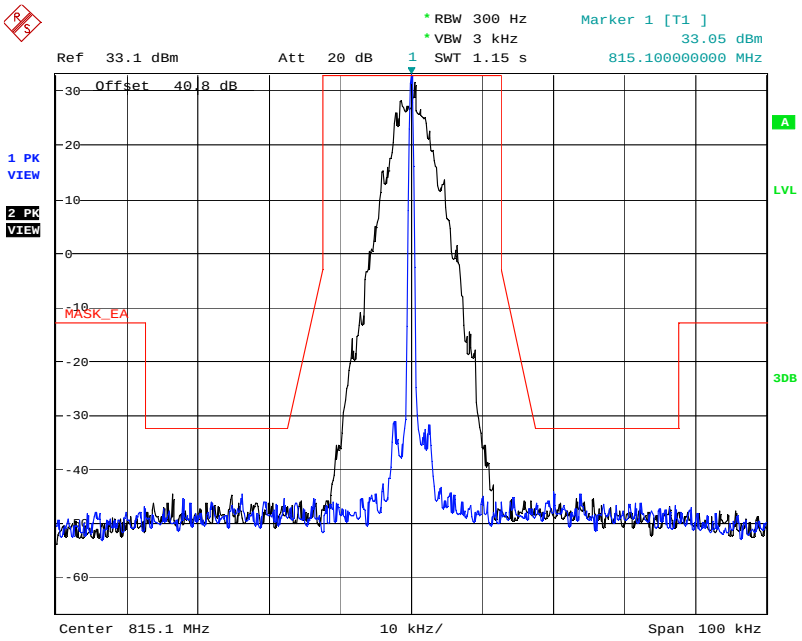
Date: 25.APR.2019 13:56:03

5.8.5.24. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, 25 KHz, Analog, Low power



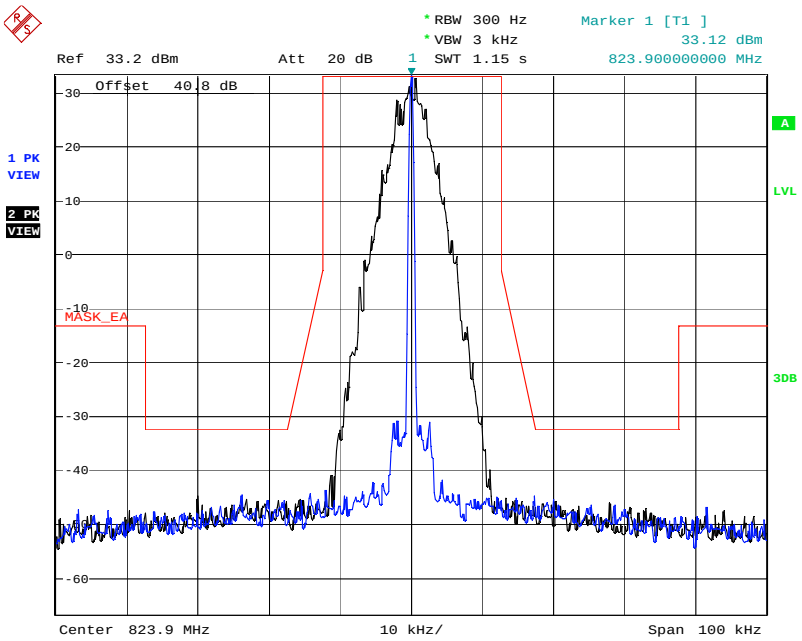
Date: 25.APR.2019 14:03:11

5.8.5.25. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, F1E&F1D, Digital, Low power



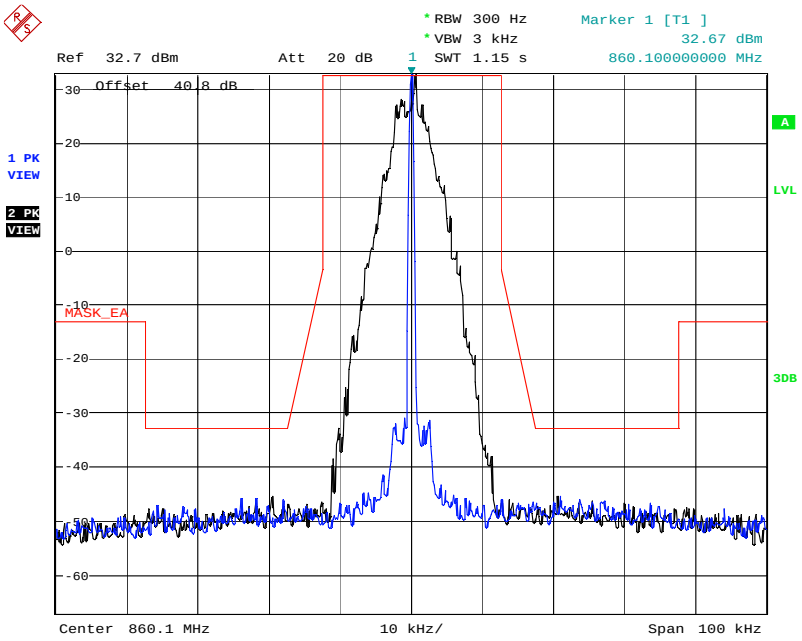
Date: 25.APR.2019 13:40:10

5.8.5.26. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, F1E&F1D, Digital, Low power



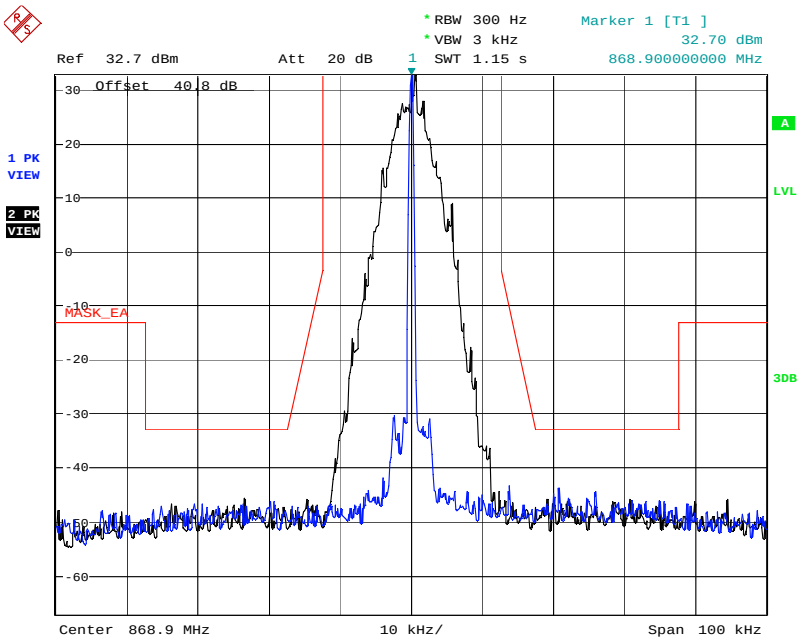
Date: 25.APR.2019 13:50:27

5.8.5.27. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, F1E&F1D, Digital, Low power



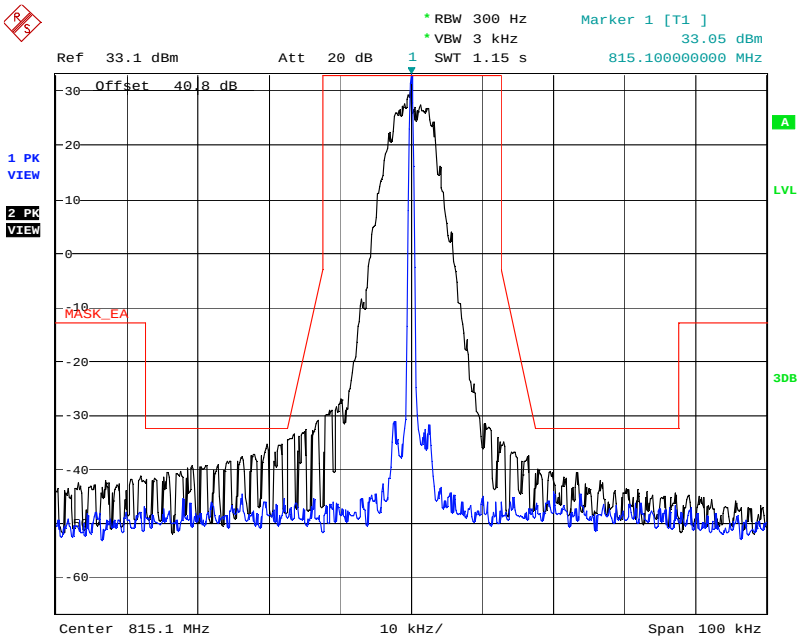
Date: 25.APR.2019 13:57:17

5.8.5.28. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, F1E&F1D, Digital, Low power



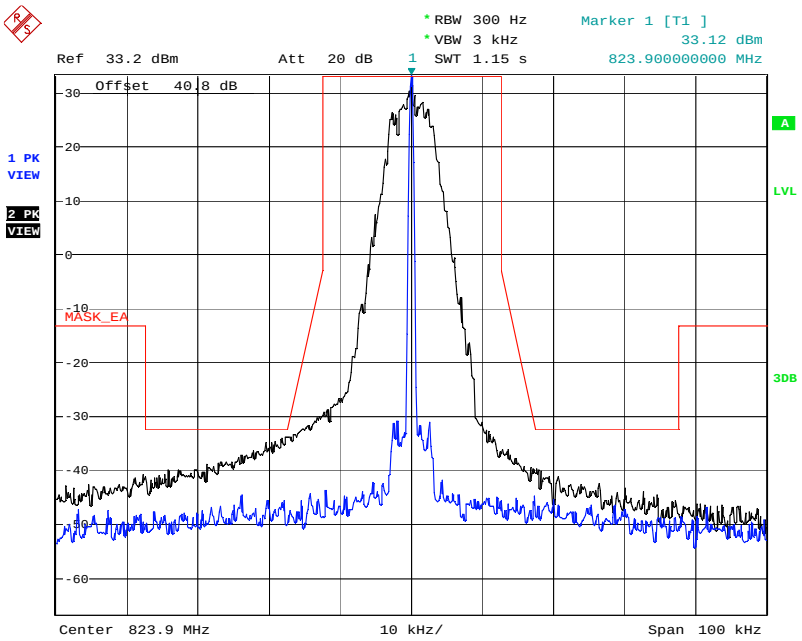
Date: 25.APR.2019 14:04:11

5.8.5.29. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 815.1MHz, F1W, Digital, Low power



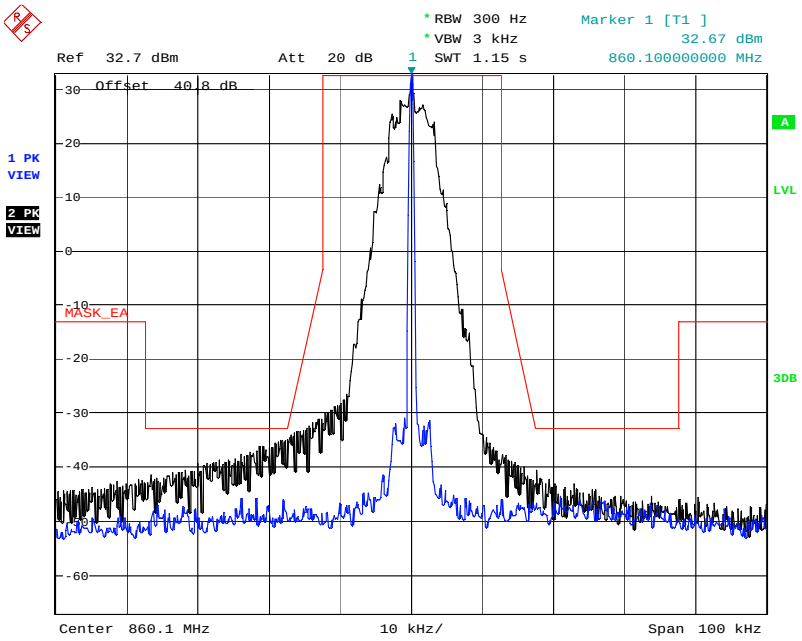
Date: 25.APR.2019 13:44:19

5.8.5.30. Configuration: Mask 90.691, Sub Band 3: 809-824MHz, 823.9MHz, F1W, Digital, Low power



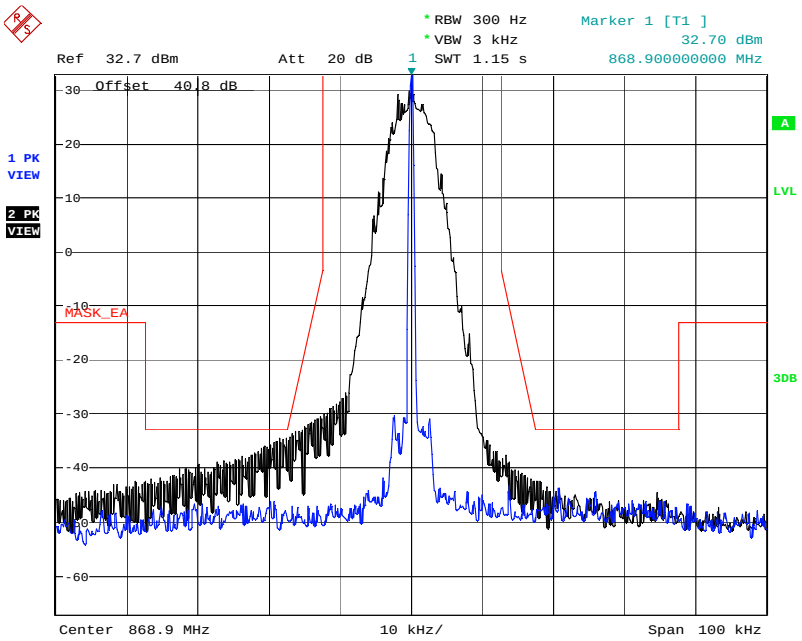
Date: 25.APR.2019 13:51:55

5.8.5.31. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 860.1MHz, F1W, Digital, Low power



Date: 25.APR.2019 13:59:12

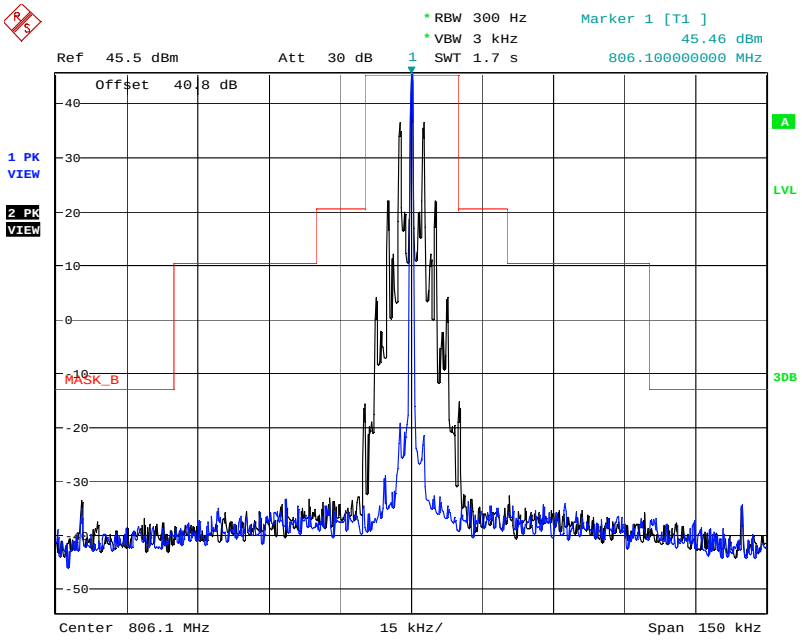
5.8.5.32. Configuration: Mask 90.691, Sub Band 4: 854-869MHz, 868.9MHz, F1W, Digital, Low power



Date: 25.APR.2019 14:05:29

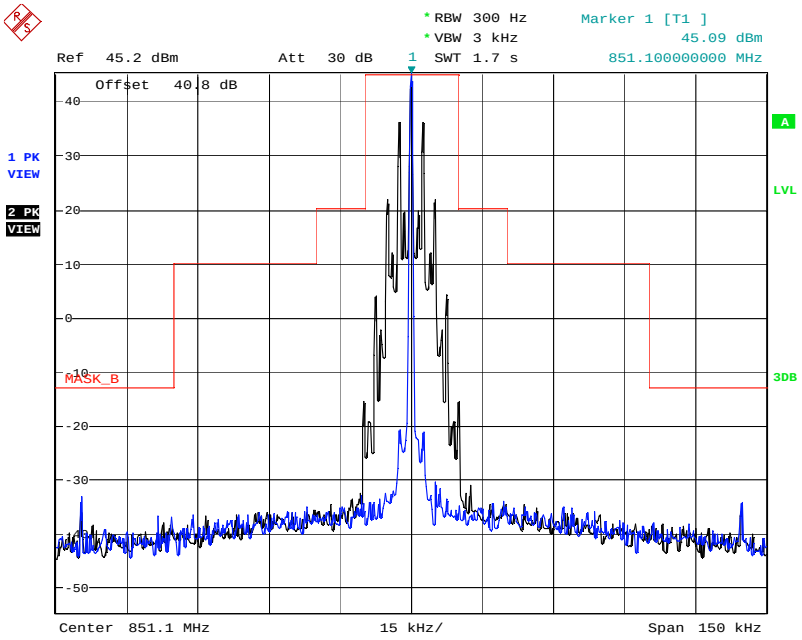
5.8.6. Test Data- EMISSION MASKS- MASK B

5.8.6.1. Configuration: Mask B, Band 3: 806-824MHz, 806.1MHz, 12.5 KHz, Analog, High power



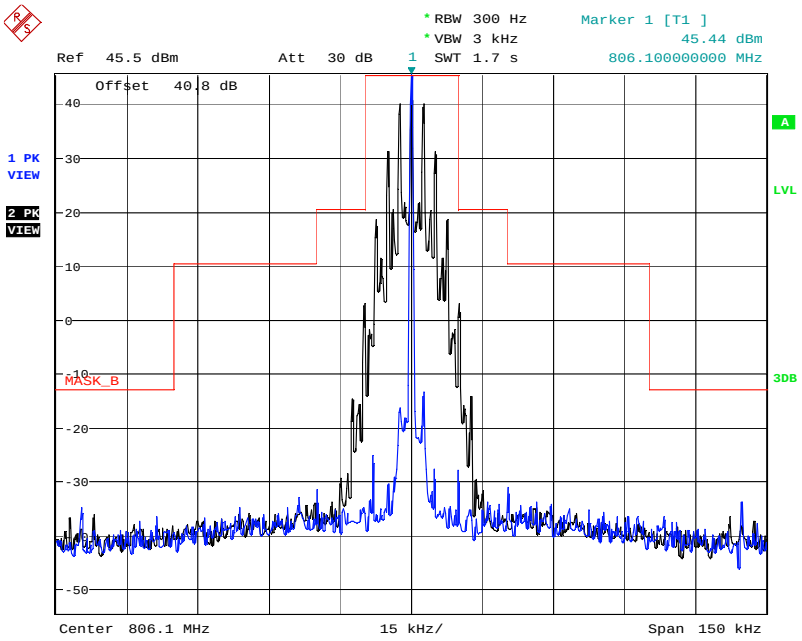
Date: 24.APR.2019 15:08:25

5.8.6.2. Configuration: Mask B, Band 4: 851-869MHz, 851.1MHz, 12.5 KHz, Analog, High power



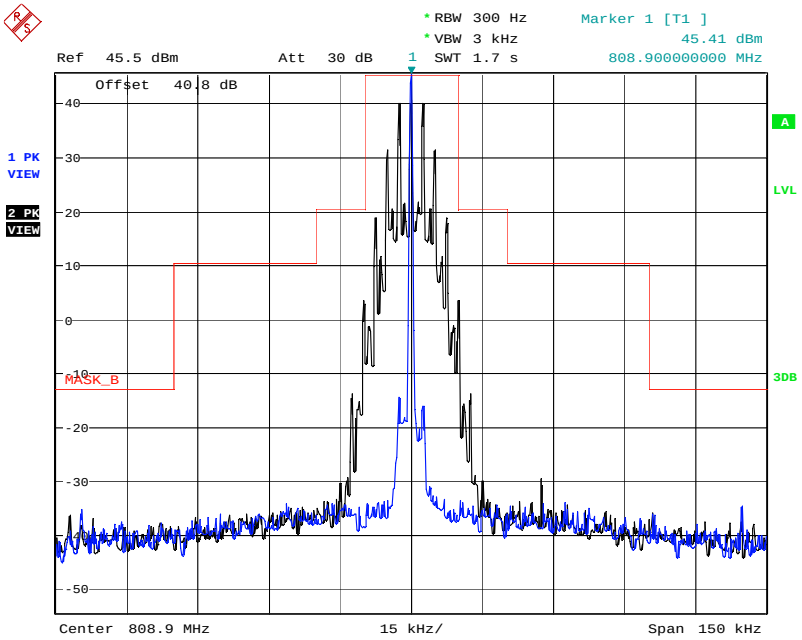
Date: 24.APR.2019 15:11:35

5.8.6.3. Configuration: Mask B, Sub Band 3: 806-809MHz, 806.1MHz, 20 KHz, Analog, High power



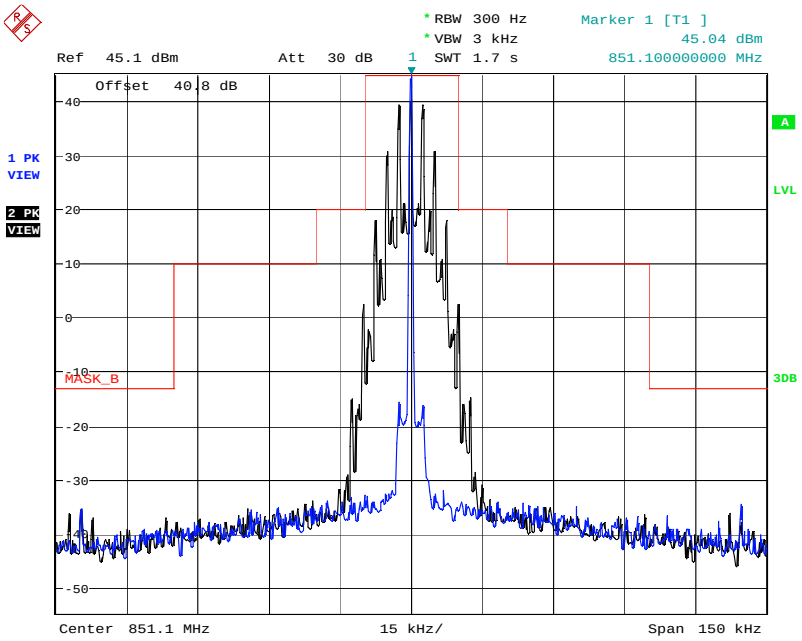
Date: 24.APR.2019 15:14:24

5.8.6.4. Configuration: Mask B, Sub Band 3: 806-809MHz, 808.9MHz, 20 KHz, Analog, High power



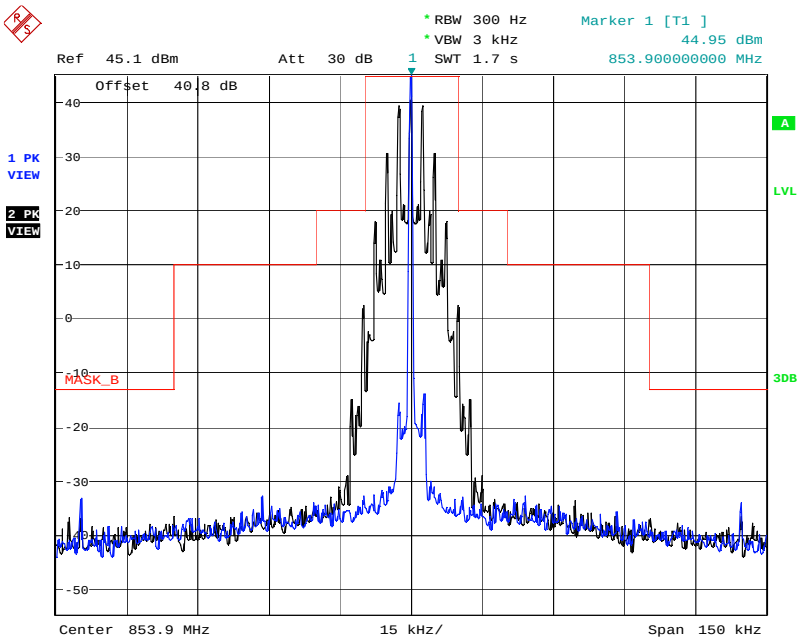
Date: 24.APR.2019 15:16:43

5.8.6.5. Configuration: Mask B, Sub Band 4: 851-854MHz, 851.1MHz, 20 KHz, Analog, High power



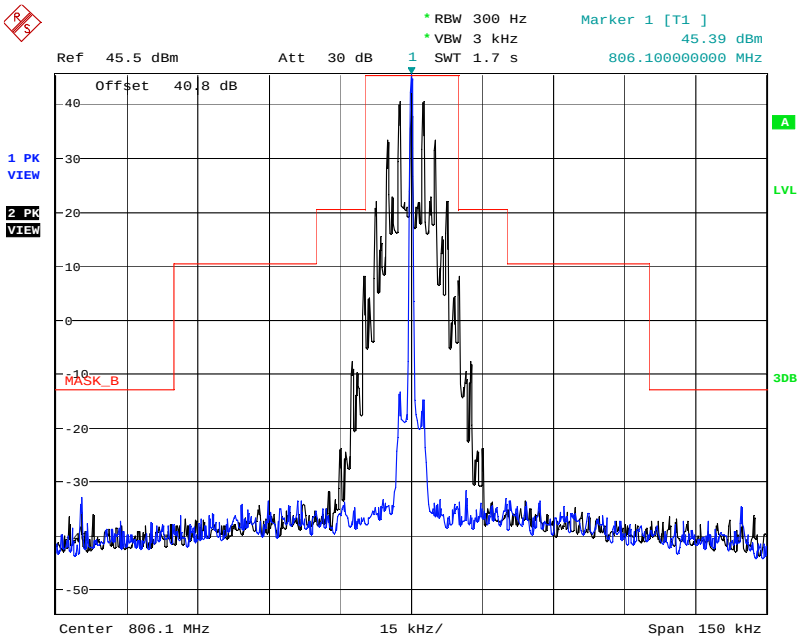
Date: 24.APR.2019 15:19:30

5.8.6.6. Configuration: Mask B, Sub Band 4: 851-854MHz, 853.9MHz, 20 KHz, Analog, High power



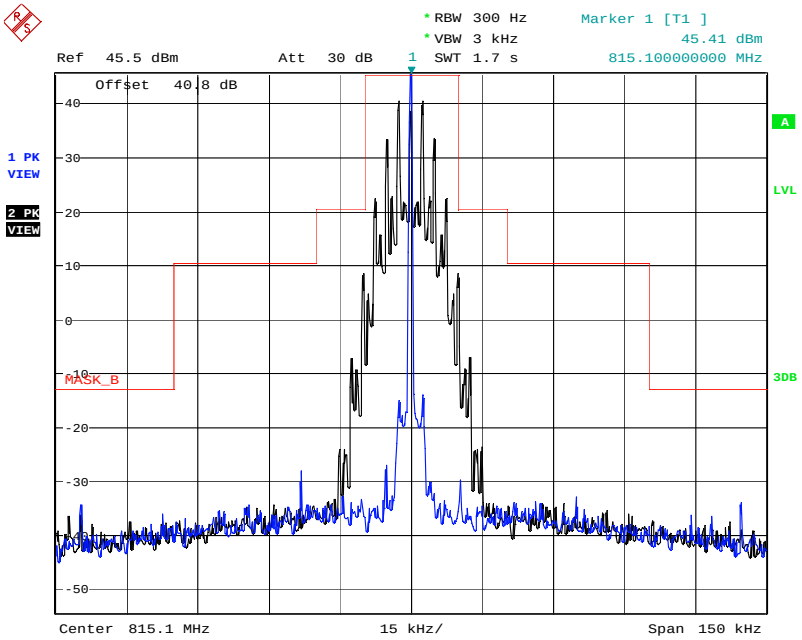
Date: 24.APR.2019 15:22:18

5.8.6.7. Configuration: Mask B, Band 3: 806-824MHz, 806.1MHz, 25 KHz, Analog, High power



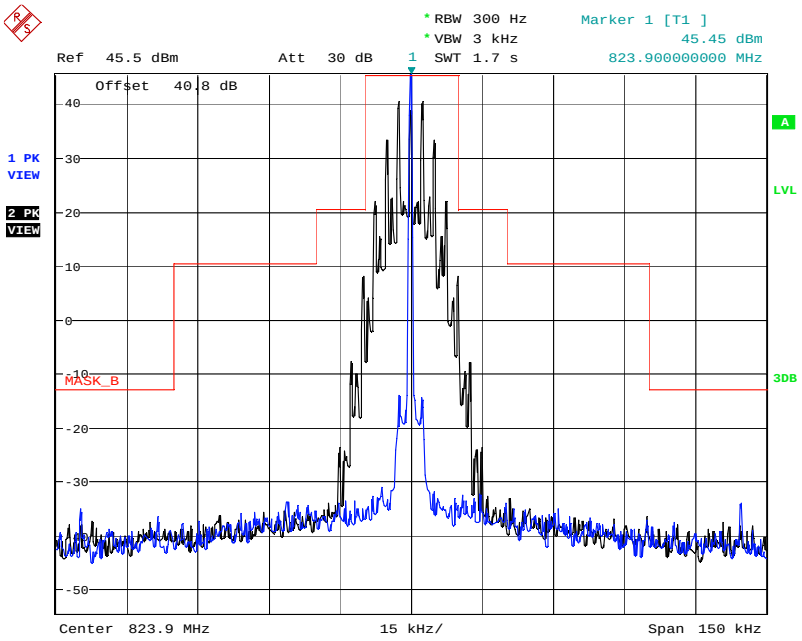
Date: 24.APR.2019 15:25:07

5.8.6.8. Configuration: Mask B, Band 3: 806-824MHz, 815.1MHz, 25 KHz, Analog, High power



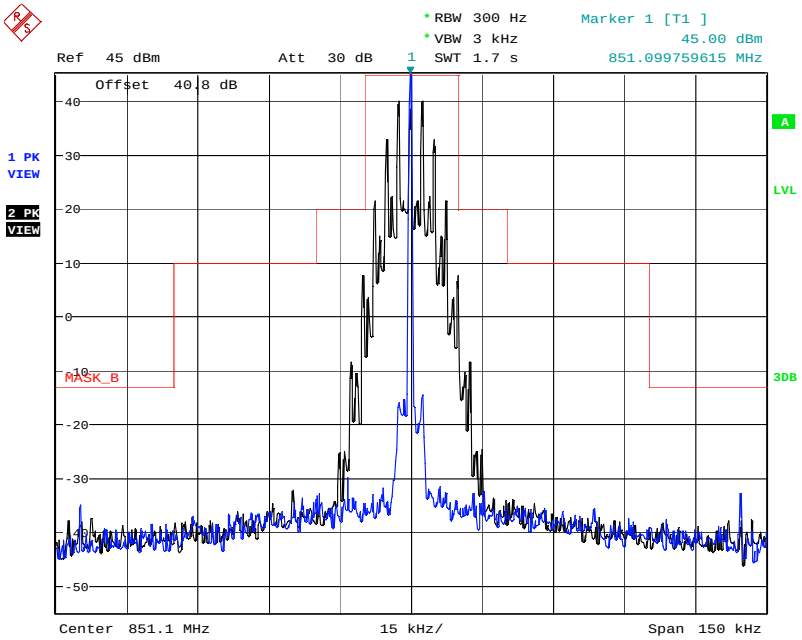
Date: 24.APR.2019 15:27:24

5.8.6.9. Configuration: Mask B, Band 3: 806-824MHz, 823.9MHz, 25 KHz, Analog, High power



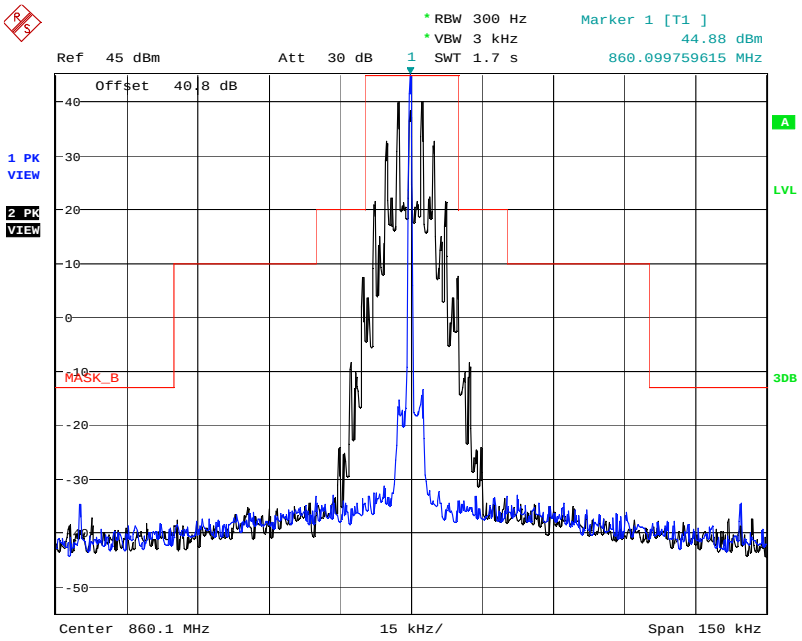
Date: 24.APR.2019 15:29:29

5.8.6.10. Configuration: Mask B, Band 4: 851-869MHz, 851.1MHz, 25 KHz, Analog, High power



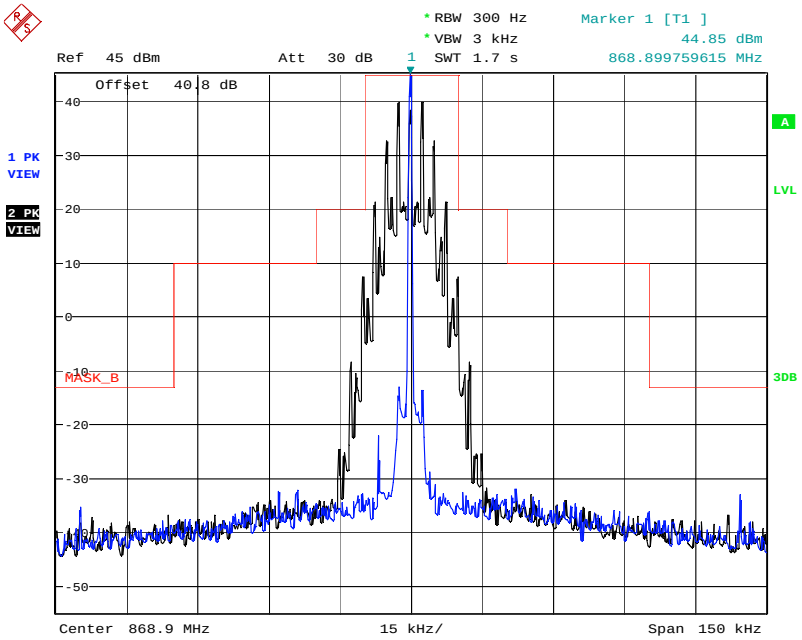
Date: 24.APR.2019 15:31:38

5.8.6.11. Configuration: Mask B, Band 4: 851-869MHz, 860.1MHz, 25 KHz, Analog, High power



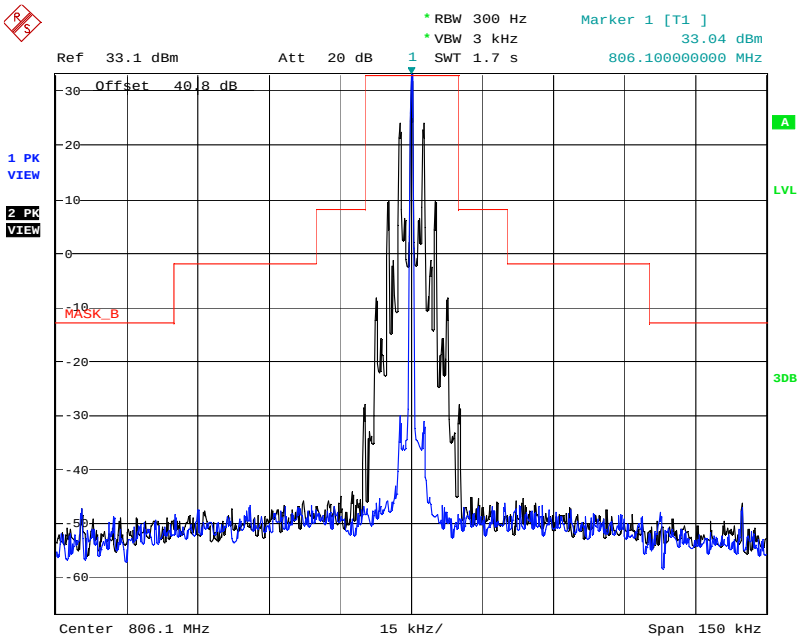
Date: 24.APR.2019 15:34:23

5.8.6.12. Configuration: Mask B, Band 4: 851-869MHz, 868.9MHz, 25 KHz, Analog, High power



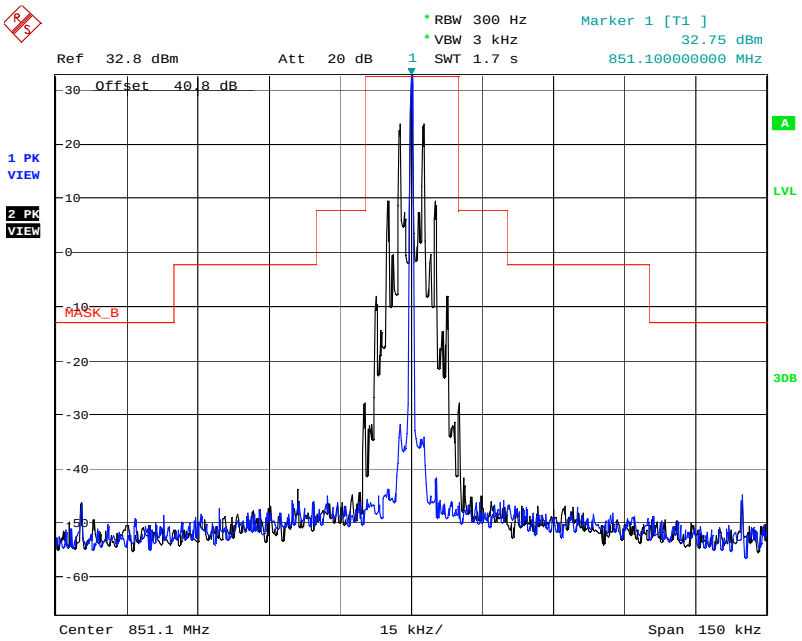
Date: 24.APR.2019 15:36:54

5.8.6.13. Configuration: Mask B, Band 3: 806-824MHz, 806.1MHz, 12.5 KHz, Analog, Low power



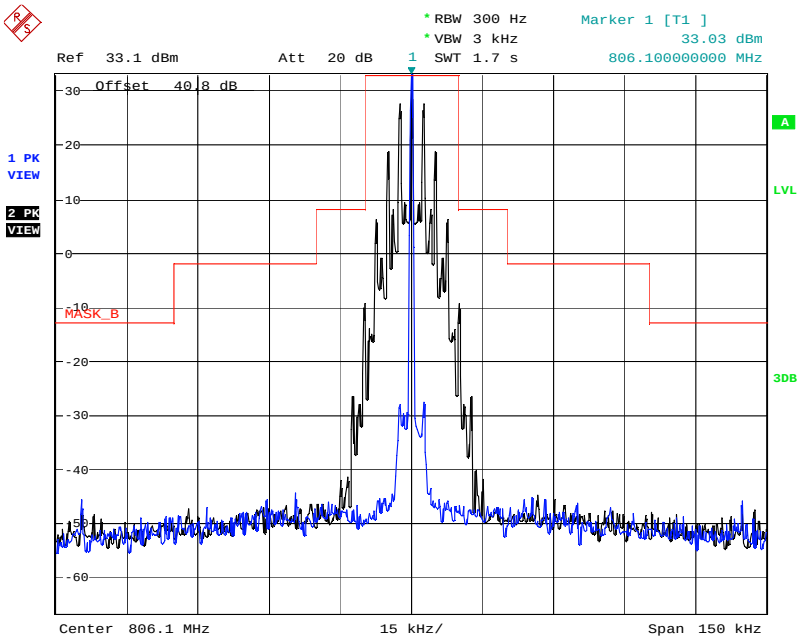
Date: 25.APR.2019 08:03:23

5.8.6.14. Configuration: Mask B, Band 4: 851-869MHz, 851.1MHz, 12.5 KHz, Analog, Low power



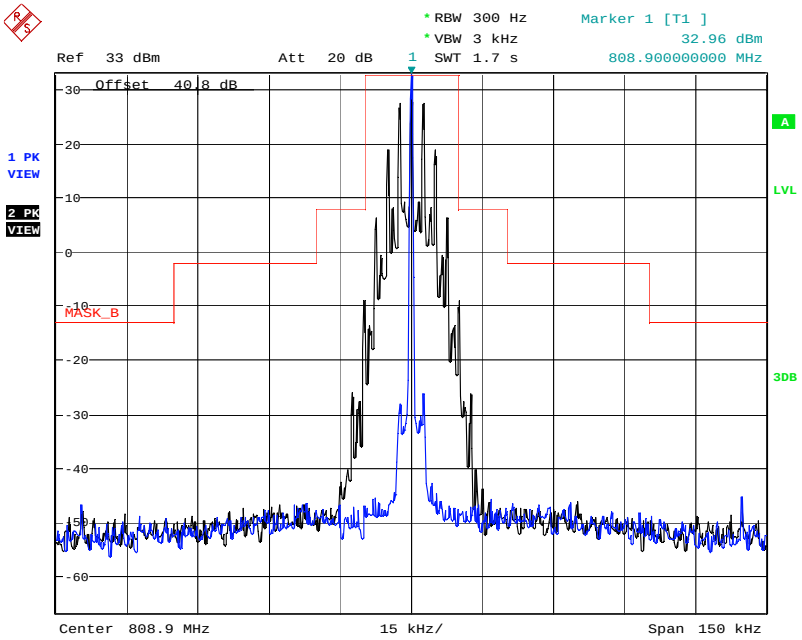
Date: 25.APR.2019 08:06:40

5.8.6.15. Configuration: Mask B, Sub Band 3: 806-809MHz, 806.1MHz, 20 KHz, Analog, Low power



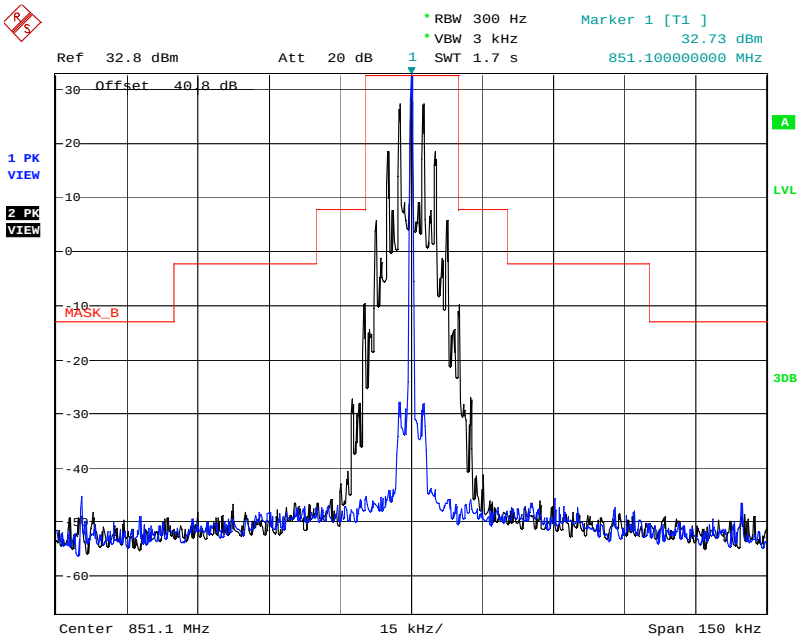
Date: 25.APR.2019 08:09:14

5.8.6.16. Configuration: Mask B, Sub Band 3: 806-809MHz, 808.9MHz, 20 KHz, Analog, Low power



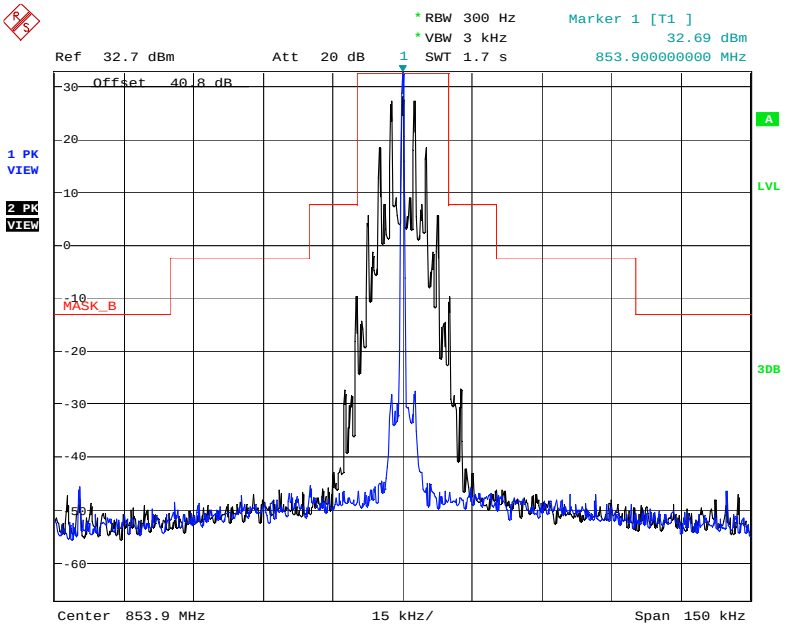
Date: 25.APR.2019 08:11:29

5.8.6.17. Configuration: Mask B, Sub Band 4: 851-854MHz, 851.1MHz, 20 KHz, Analog, Low power



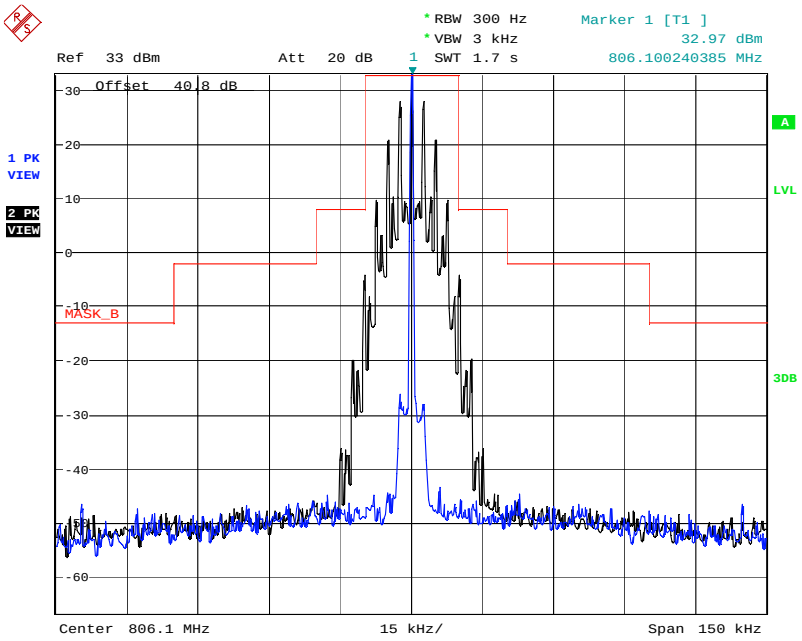
Date: 25.APR.2019 08:14:34

5.8.6.18. Configuration: Mask B, Sub Band 4: 851-854MHz, 853.9MHz, 20 KHz, Analog, Low power



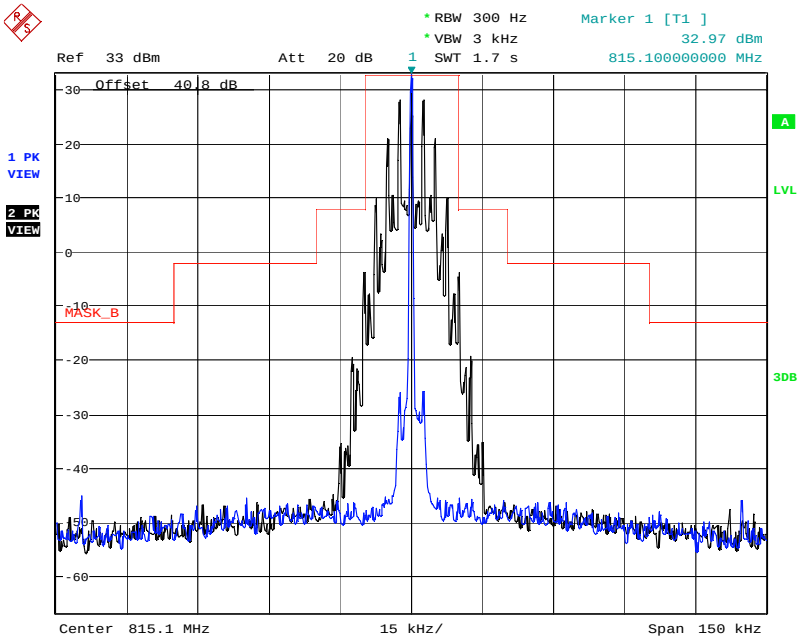
Date: 25.APR.2019 08:17:18

5.8.6.19. Configuration: Mask B, Band 3: 806-824MHz, 806.1MHz, 25 KHz, Analog, Low power



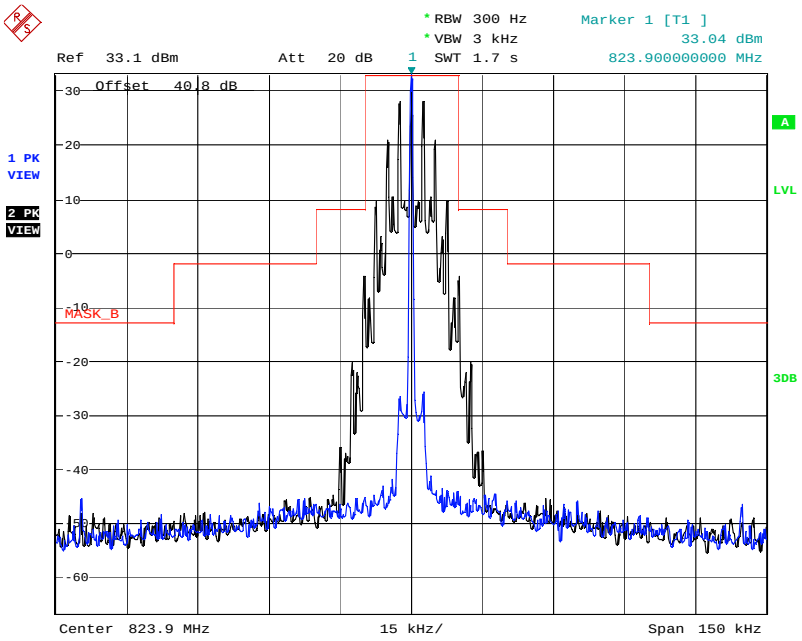
Date: 25.APR.2019 08:20:06

5.8.6.20. Configuration: Mask B, Band 3: 806-824MHz, 815.1MHz, 25 KHz, Analog, Low power



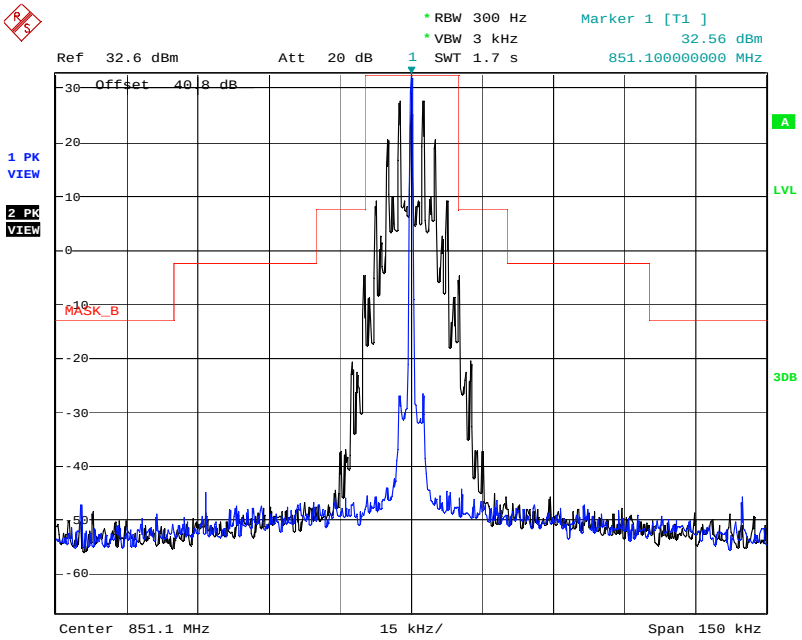
Date: 25.APR.2019 08:21:57

5.8.6.21. Configuration: Mask B, Band 3: 806-824MHz, 823.9MHz, 25 KHz, Analog, Low power



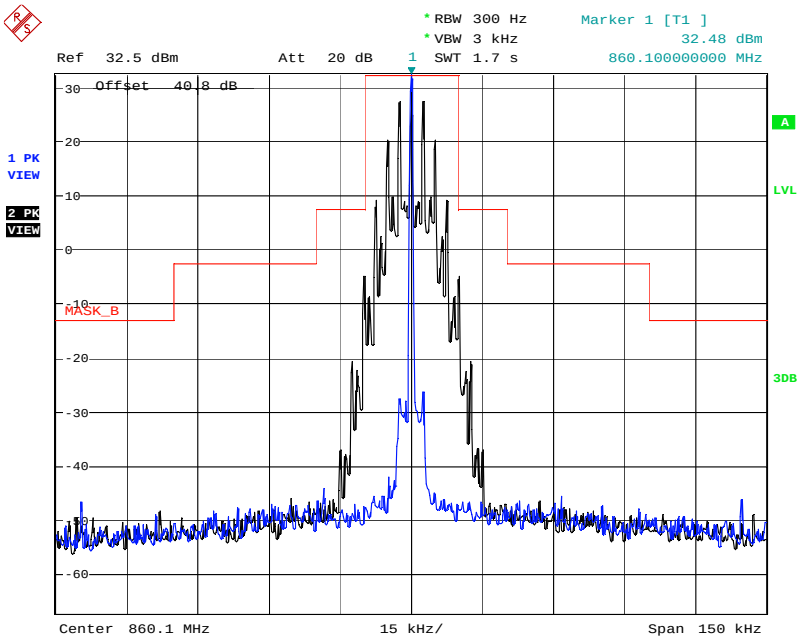
Date: 25.APR.2019 08:26:46

5.8.6.22. Configuration: Mask B, Band 4: 851-869MHz, 851.1MHz, 25 KHz, Analog, Low power



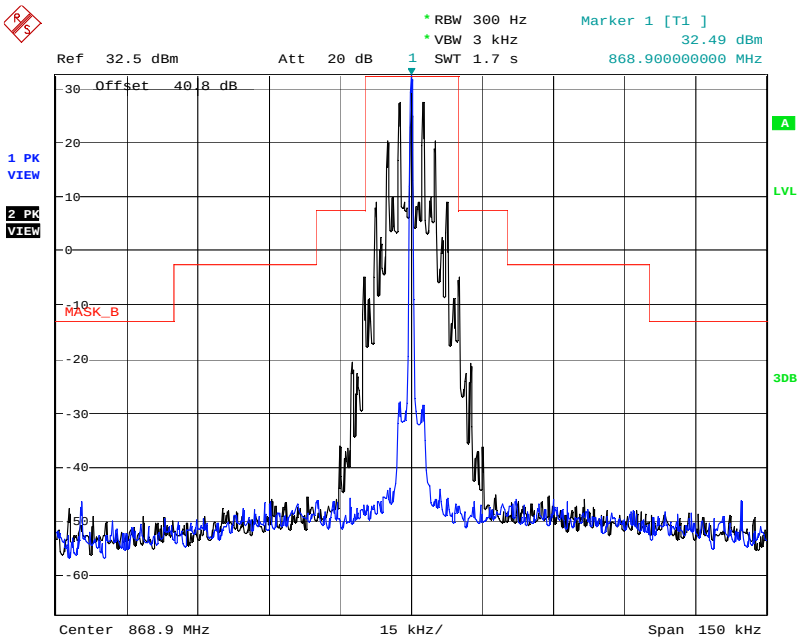
Date: 25.APR.2019 08:29:35

5.8.6.23. Configuration: Mask B, Band 4: 851-869MHz, 860.1MHz, 25 KHz, Analog, Low power



Date: 25.APR.2019 08:32:01

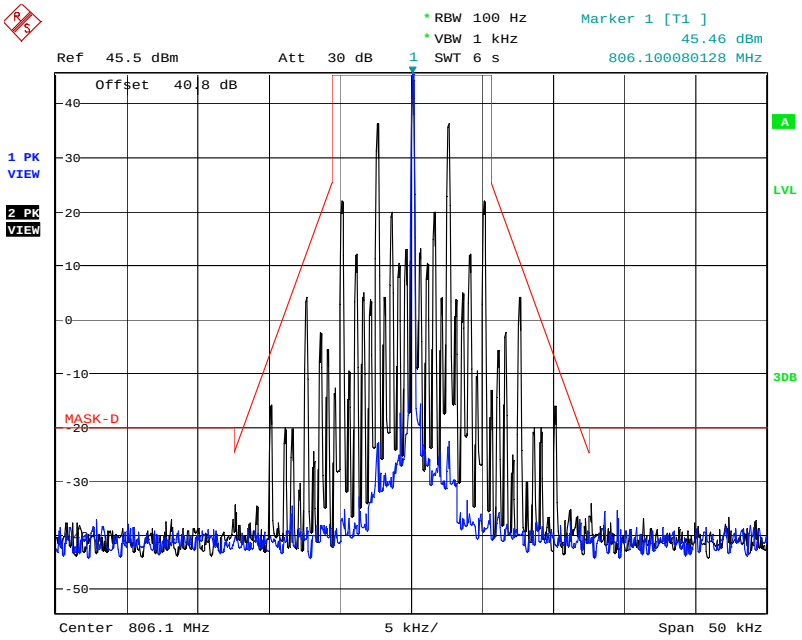
5.8.6.24. Configuration: Mask B, Band 4: 851-869MHz, 868.9MHz, 25 KHz, Analog, Low power



Date: 25.APR.2019 08:34:43

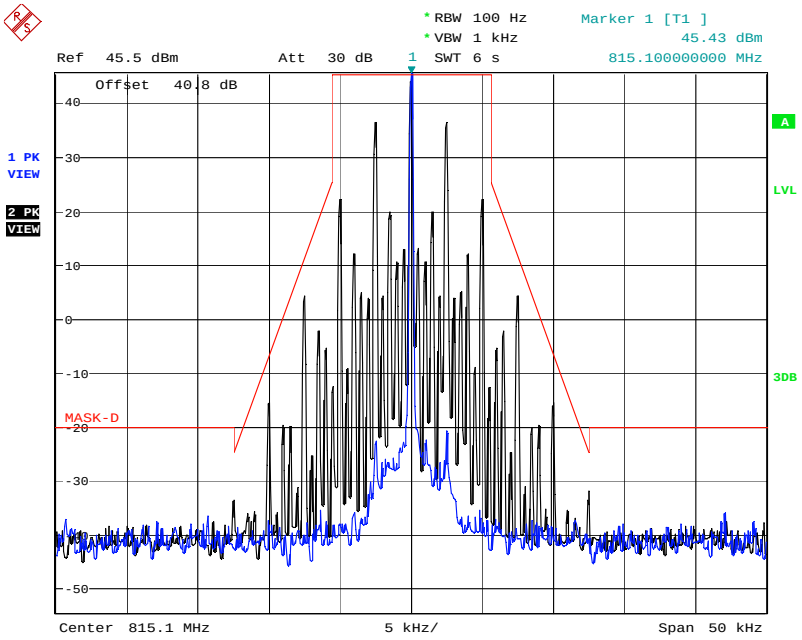
5.8.7. Test Data- EMISSION MASKS- MASK D

5.8.7.1. Configuration: Mask D, Band 3:, 806.1MHz, 12.5 KHz, Analog, High power, Rule Part: IC



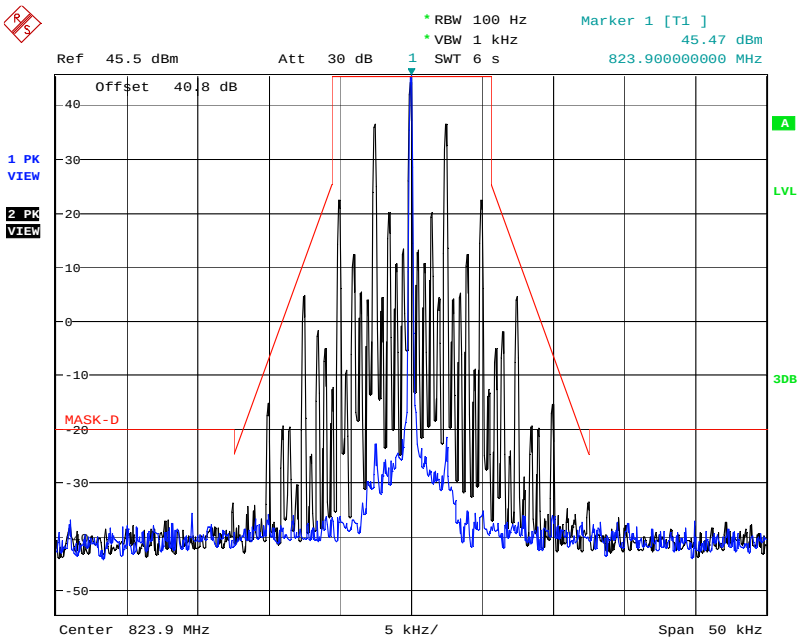
Date: 26.APR.2019 08:16:21

5.8.7.2. Configuration: Mask D, Band 3: 815.1MHz, 12.5 KHz, Analog, High power, Part: FCC 90.210 & IC



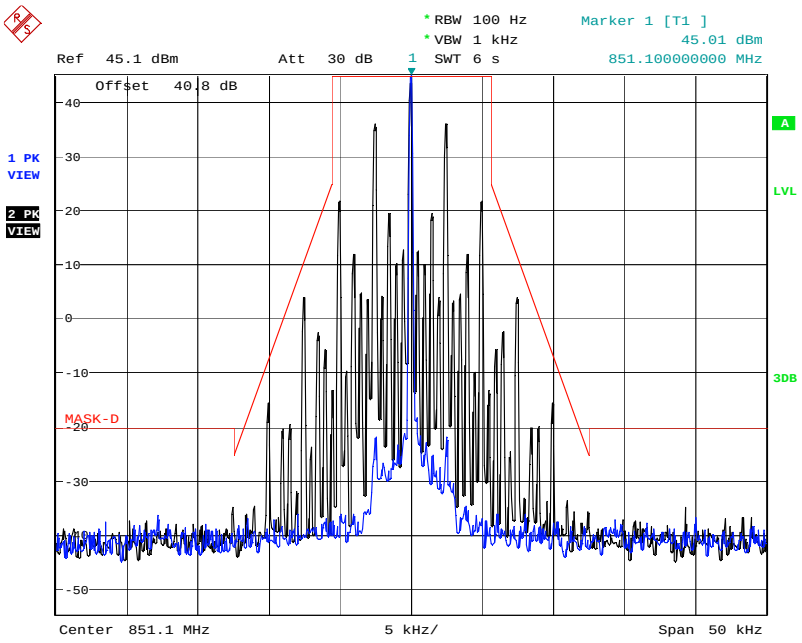
Date: 26.APR.2019 08:24:32

5.8.7.3. Configuration: Mask D, Band 3: 823.9MHz, 12.5 KHz, Analog, High power Part: FCC 90.210 & IC



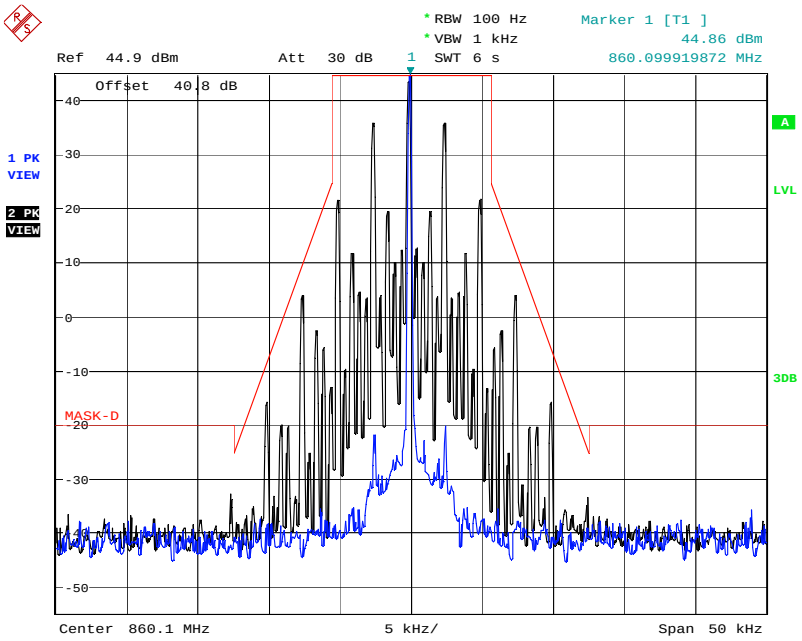
Date: 26.APR.2019 08:37:40

5.8.7.4. Configuration: Mask D, Band 4: 851.1MHz, 12.5 KHz, Analog, High power Rule Part: IC



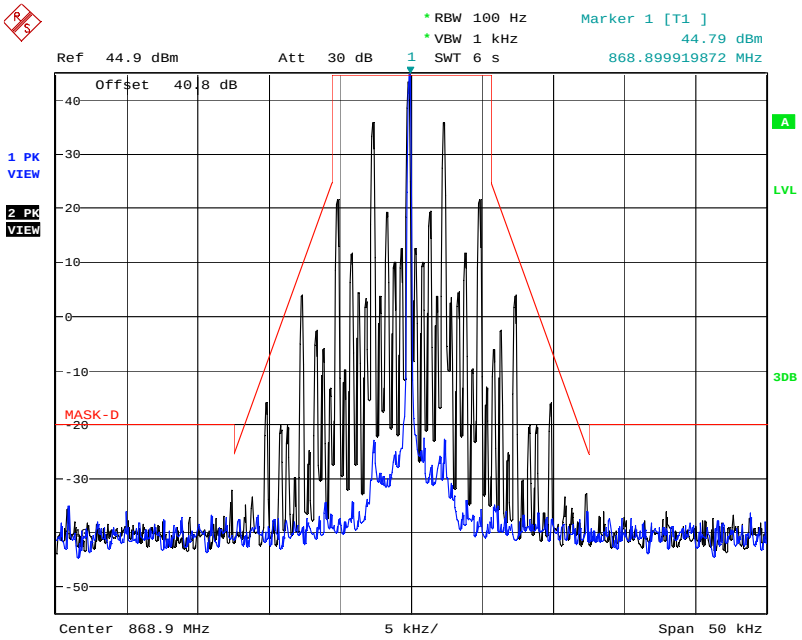
Date: 26.APR.2019 09:01:50

5.8.7.5. Configuration: Mask D, Band 4: 860.1MHz, 12.5 KHz, Analog, High power FCC 90.210 & IC



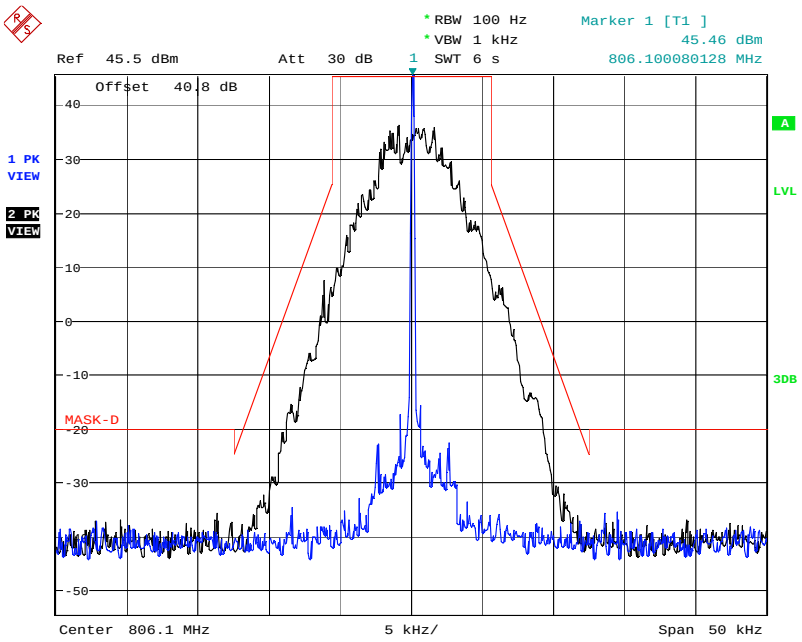
Date: 26.APR.2019 09:04:59

5.8.7.6. Configuration: Mask D, Band 4: 868.9MHz, 12.5 KHz, Analog, High power FCC 90.210 & IC



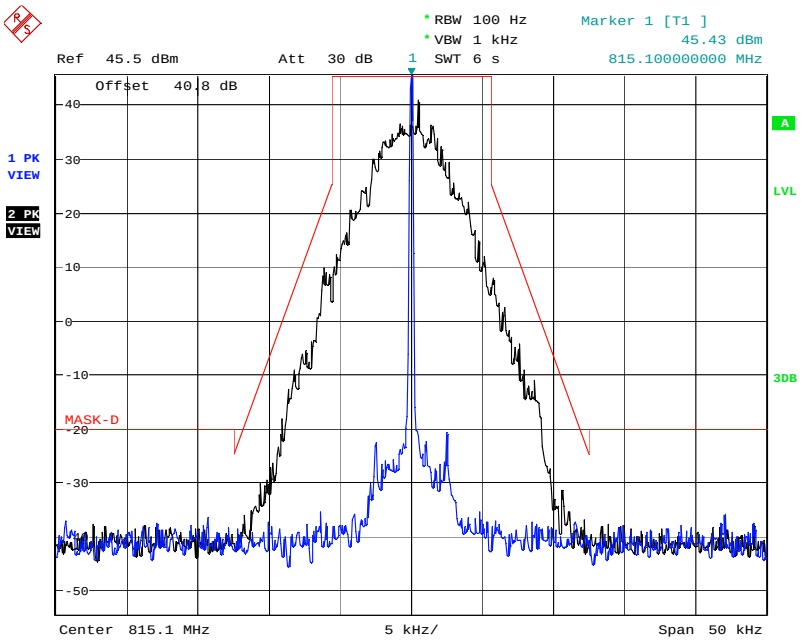
Date: 26.APR.2019 09:11:59

5.8.7.7. Configuration: Mask D, Band 3: 806.1MHz, F1E&F1D, Digital, High power Rule Part: IC



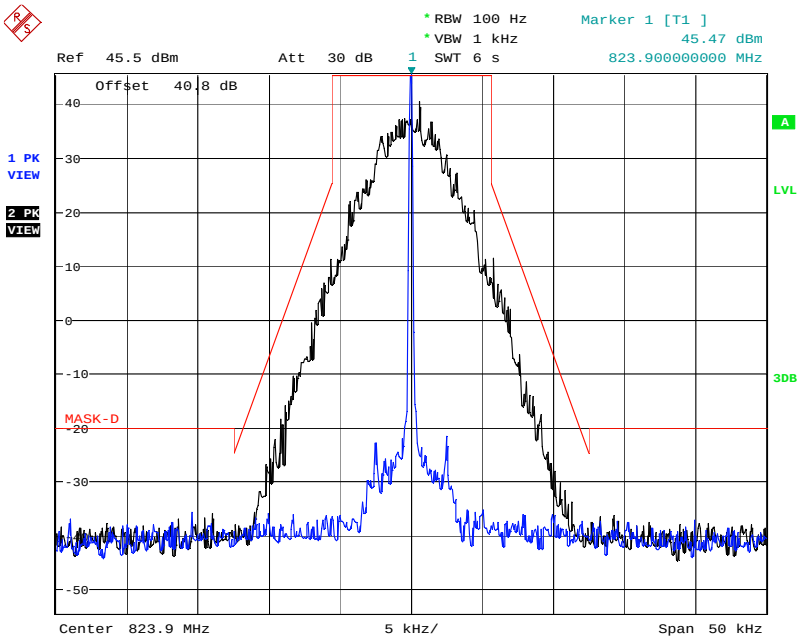
Date: 26.APR.2019 08:18:32

5.8.7.8. Configuration: Mask D, Band 3: 815.1MHz, F1E&F1D, Digital, High power FCC 90.210 & IC



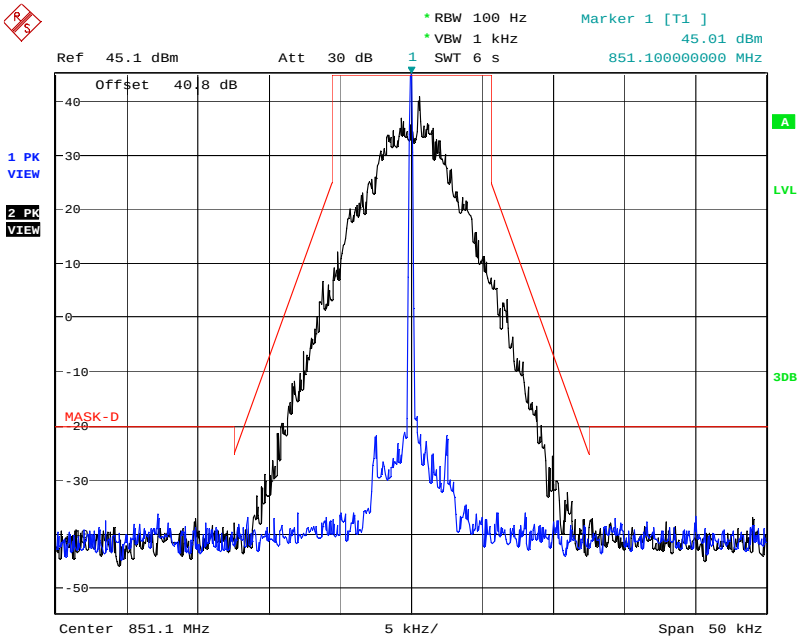
Date: 26.APR.2019 08:26:23

5.8.7.9. Configuration: Mask D, Band 3: 823.9MHz, F1E&F1D, Digital, High power FCC 90.210 & IC



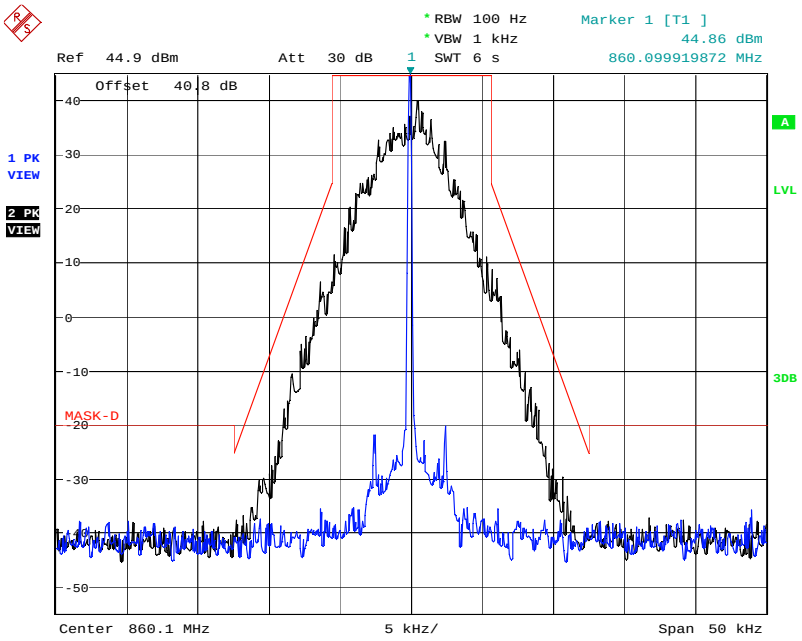
Date: 26.APR.2019 08:44:33

5.8.7.10. Configuration: Mask D, Band 4: 851.1MHz, F1E&F1D, Digital, High power Rule Part: IC



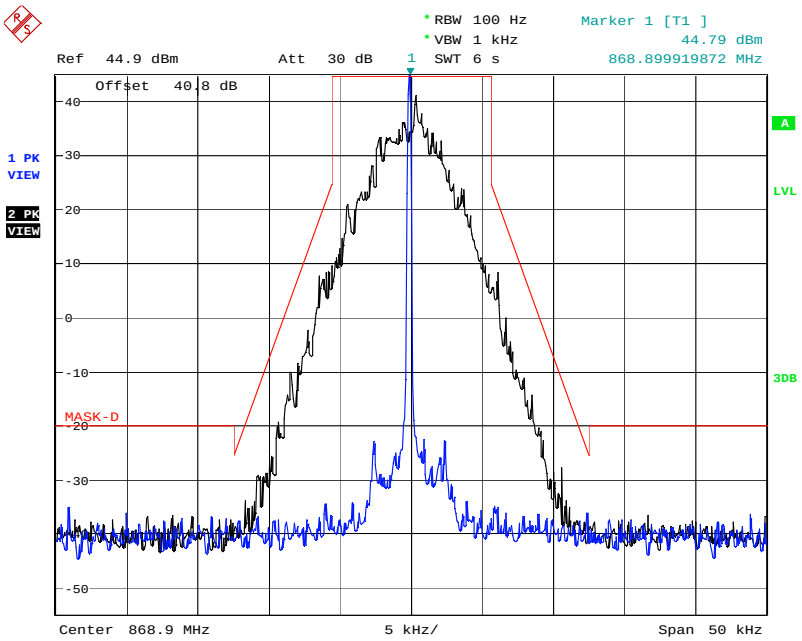
Date: 26.APR.2019 09:00:29

5.8.7.11. Configuration: Mask D, Band 4: 860.1MHz, F1E&F1D, Digital, High power FCC 90.210 & IC



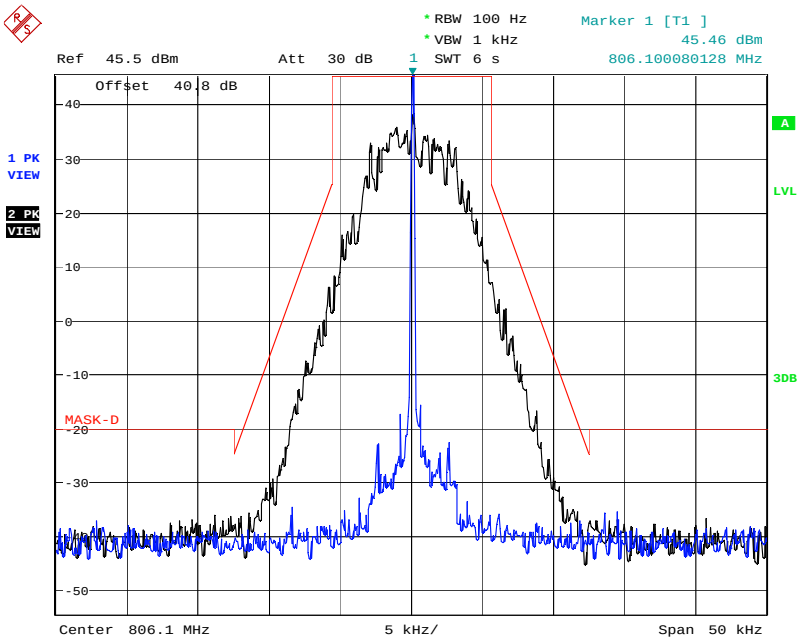
Date: 26.APR.2019 09:06:25

5.8.7.12. Configuration: Mask D, Band 4: 868.9MHz, F1E&F1D, Digital, High power FCC 90.210 & IC



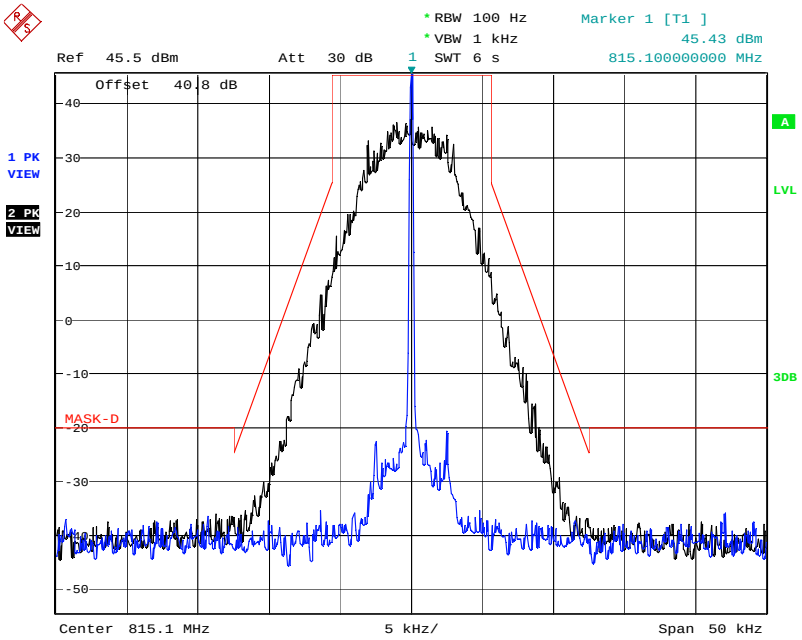
Date: 26.APR.2019 09:13:36

5.8.7.13. Configuration: Mask D, Band 3: 806.1MHz, F1W, Digital, High power Rule Part: IC



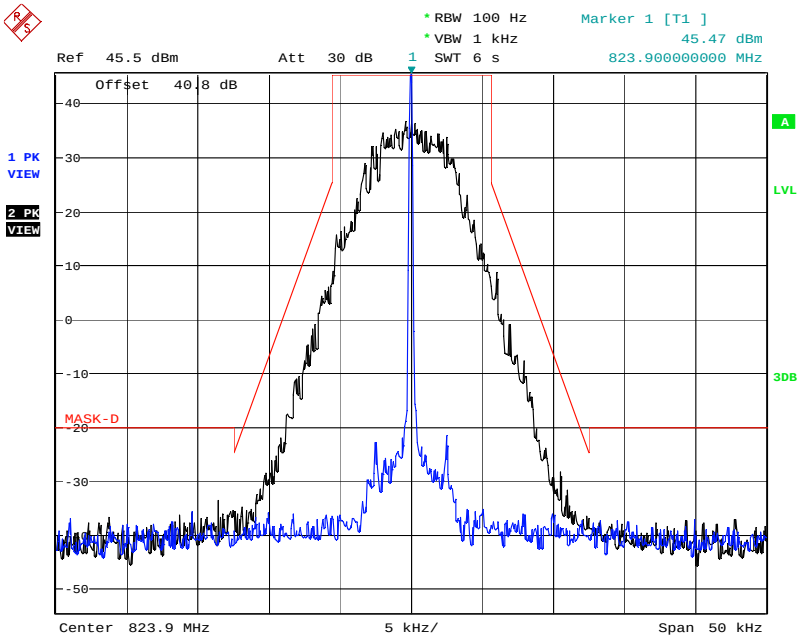
Date: 26.APR.2019 08:20:37

5.8.7.14. Configuration: Mask D, Band 3: 815.1MHz, F1W, Digital, High power FCC 90.210 & IC



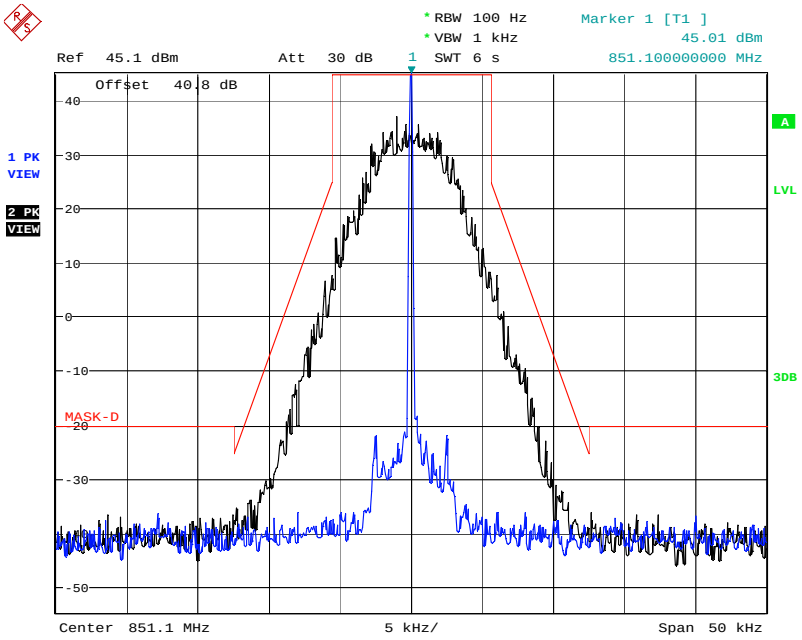
Date: 26.APR.2019 08:28:39

5.8.7.15. Configuration: Mask D, Band 3: 823.9MHz, F1W, Digital, High power FCC 90.210 & IC



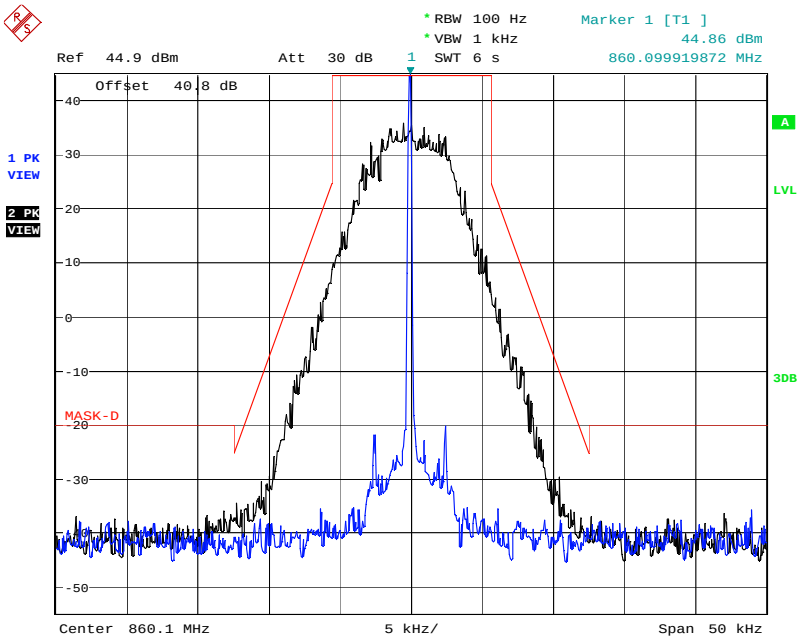
Date: 26.APR.2019 08:46:29

5.8.7.16. Configuration: Mask D, Band 4: 851.1MHz, F1W, Digital, High power Rule Part: IC



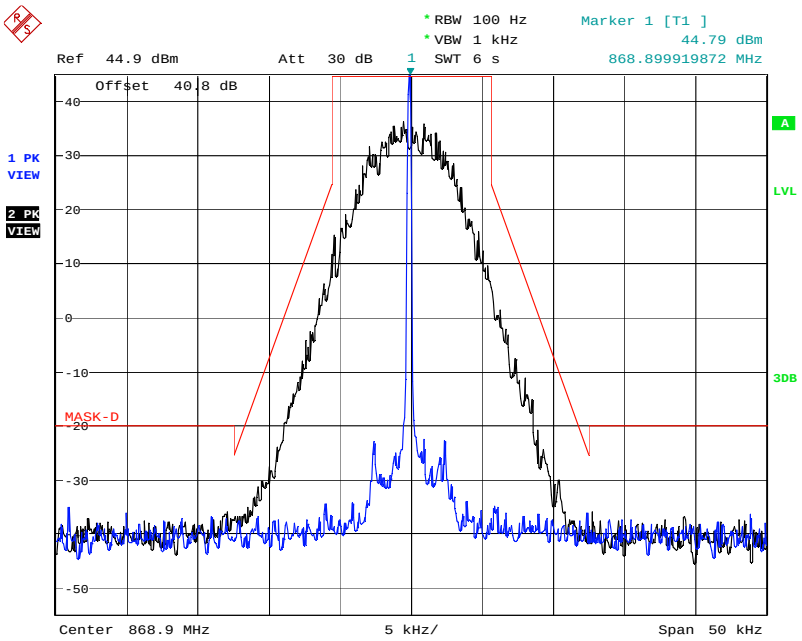
Date: 26.APR.2019 08:59:15

5.8.7.17. Configuration: Mask D, Band 4: 860.1MHz, F1W, Digital, High power FCC 90.210 & IC



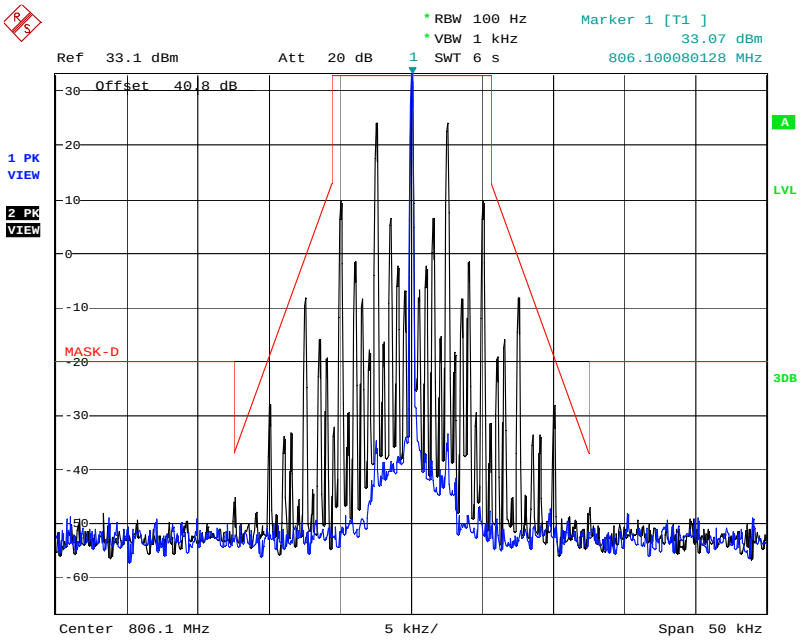
Date: 26.APR.2019 09:08:02

5.8.7.18. Configuration: Mask D, Band 4: 868.9MHz, F1W, Digital, High power FCC 90.210 & IC



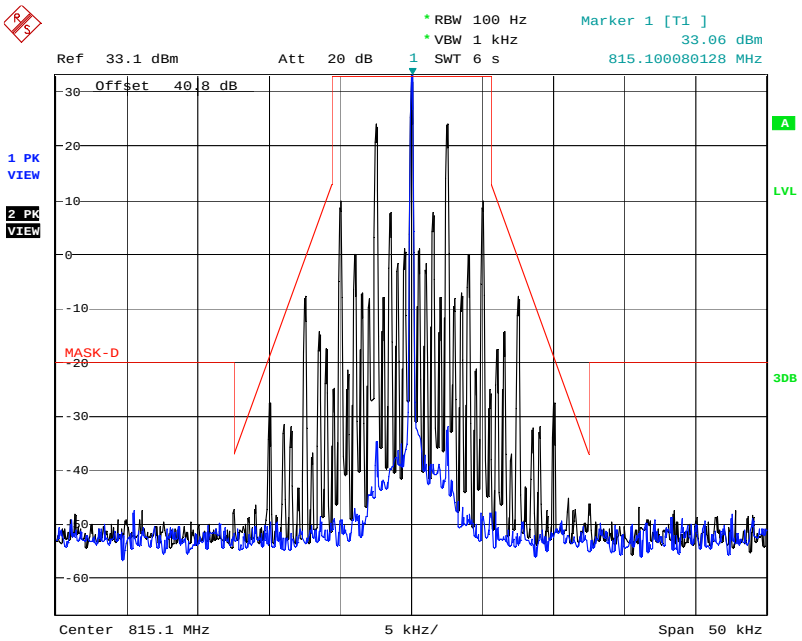
Date: 26.APR.2019 09:16:11

5.8.7.19. Configuration: Mask D, Band 3: 806.1MHz, 12.5 KHz, Analog, Low power Rule Part: IC



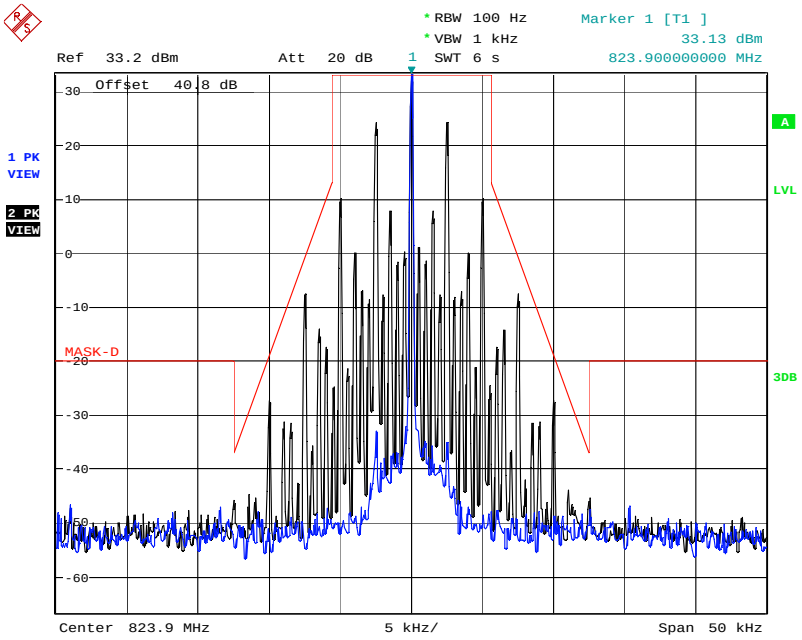
Date: 26.APR.2019 10:02:28

5.8.7.20. Configuration: Mask D, Band 3: 815.1MHz, 12.5 KHz, Analog, Low power FCC 90.210 & IC



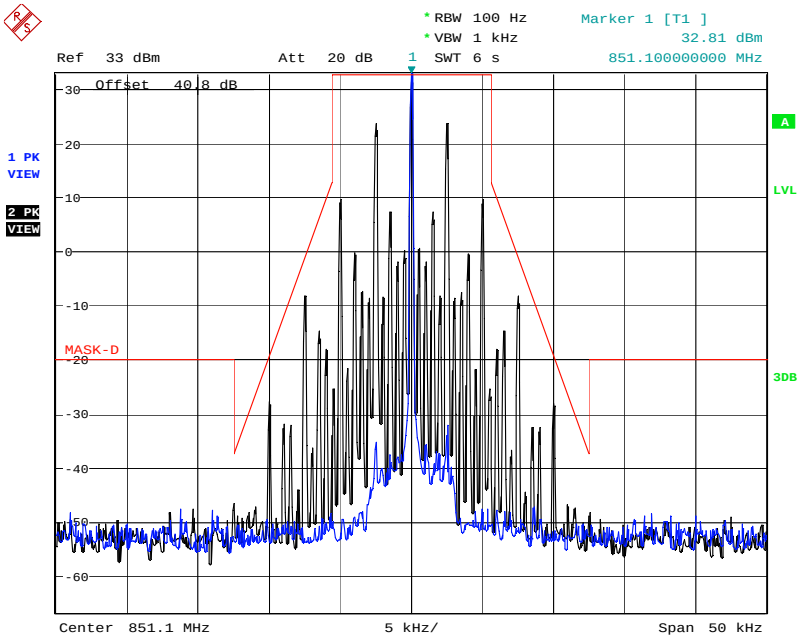
Date: 26.APR.2019 10:09:49

5.8.7.21. Configuration: Mask D, Band 3: 823.9MHz, 12.5 KHz, Analog, Low power FCC 90.210 & IC



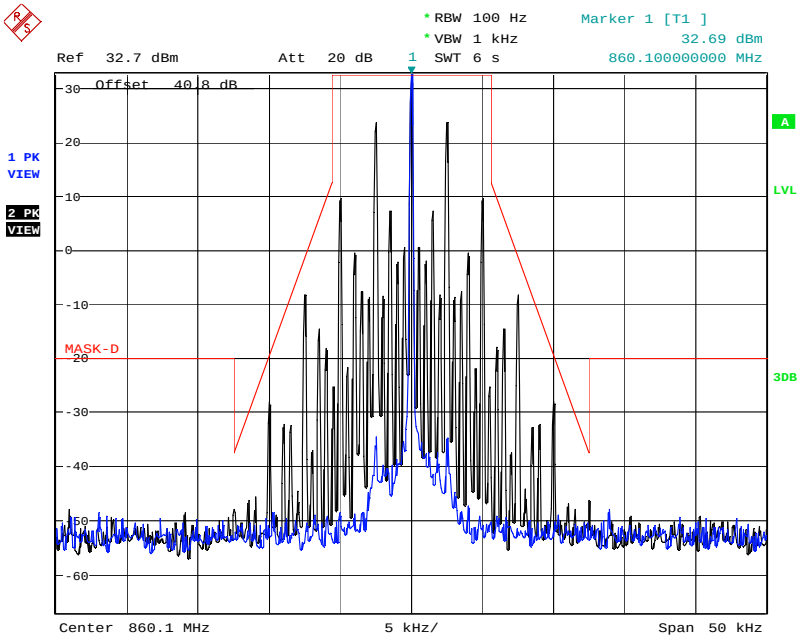
Date: 26.APR.2019 10:19:00

5.8.7.22. Configuration: Mask D, Band 4: 851.1MHz, 12.5 KHz, Analog, Low power Rule Part: IC



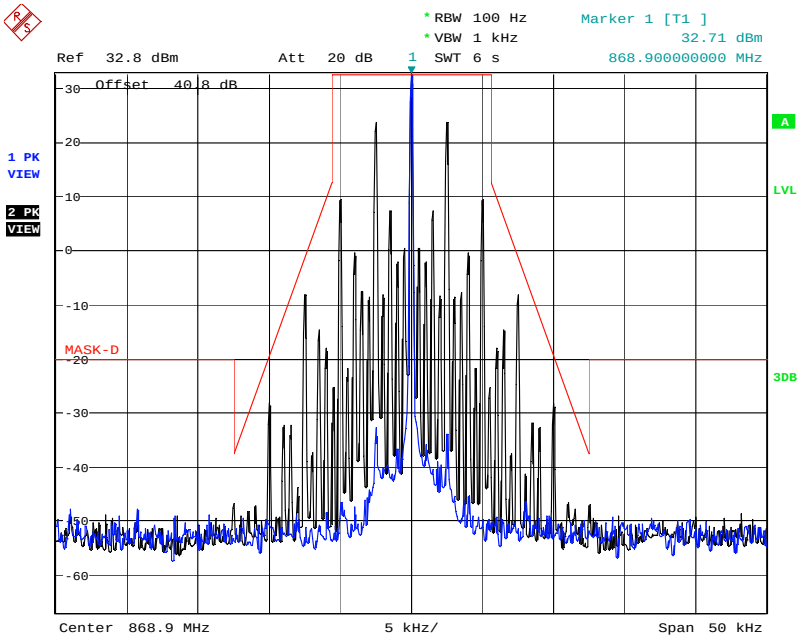
Date: 26.APR.2019 10:28:42

5.8.7.23. Configuration: Mask D, Band 4: 860.1MHz, 12.5 KHz, Analog, Low power FCC 90.210 & IC



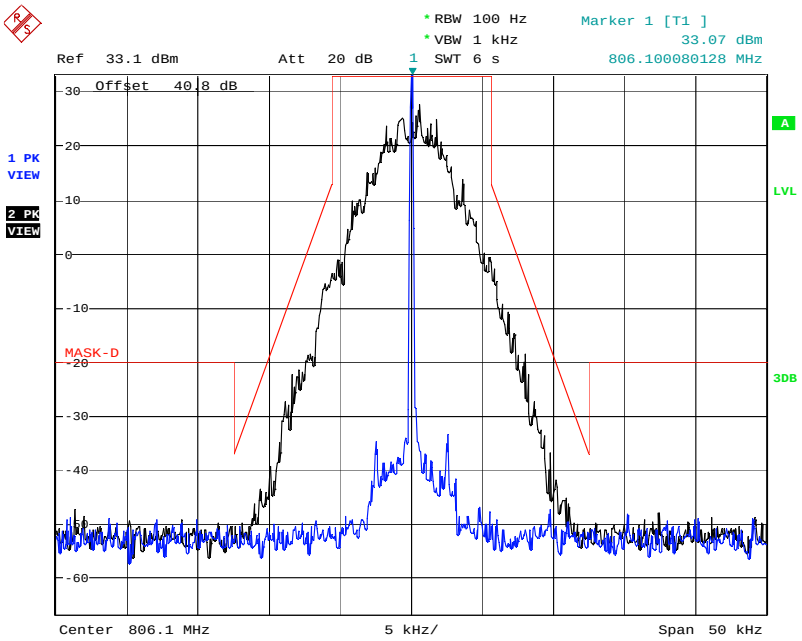
Date: 26.APR.2019 10:35:59

5.8.7.24. Configuration: Mask D, Band 4: 868.9MHz, 12.5 KHz, Analog, Low power FCC 90.210 & IC



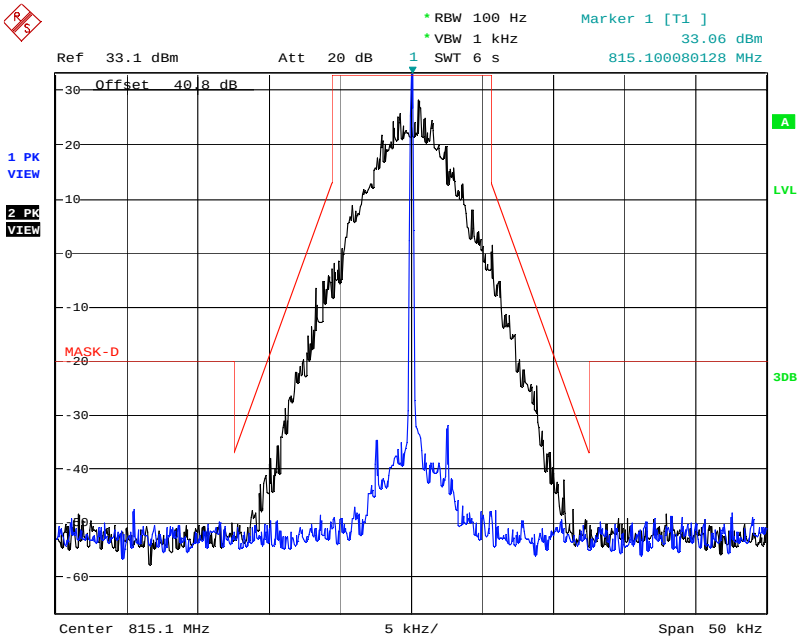
Date: 26.APR.2019 10:43:07

5.8.7.25. Configuration: Mask D, Band 3: 806.1MHz, F1E&F1D, Digital, Low power Rule Part: IC



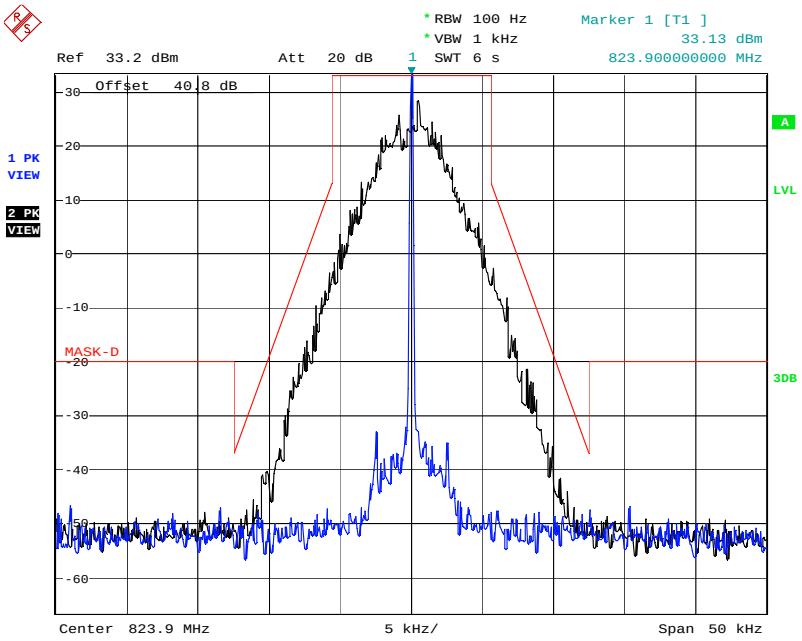
Date: 26.APR.2019 10:04:24

5.8.7.26. Configuration: Mask D, Band 3: 815.1MHz, F1E&F1D, Digital, Low power FCC 90.210 & IC



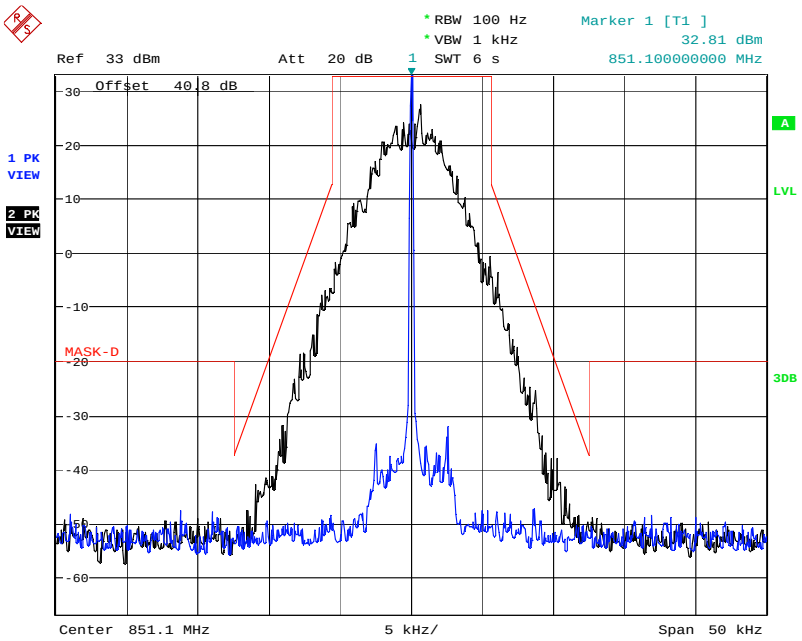
Date: 26.APR.2019 10:11:38

5.8.7.27. Configuration: Mask D, Band 3: 823.9MHz, F1E&F1D, Digital, Low power FCC 90.210 & IC



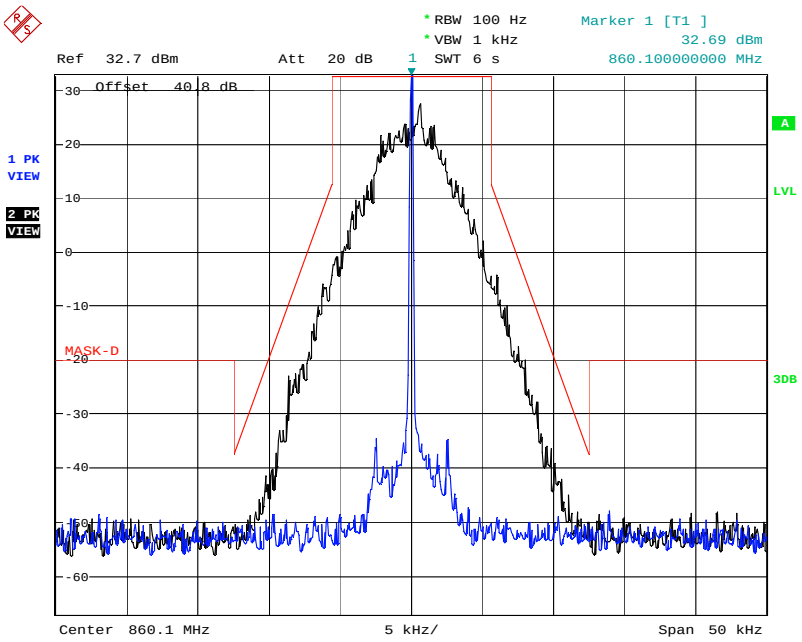
Date: 26.APR.2019 10:20:28

5.8.7.28. Configuration: Mask D, Band 4: 851.1MHz, F1E&F1D, Digital, Low power Rule Part: IC



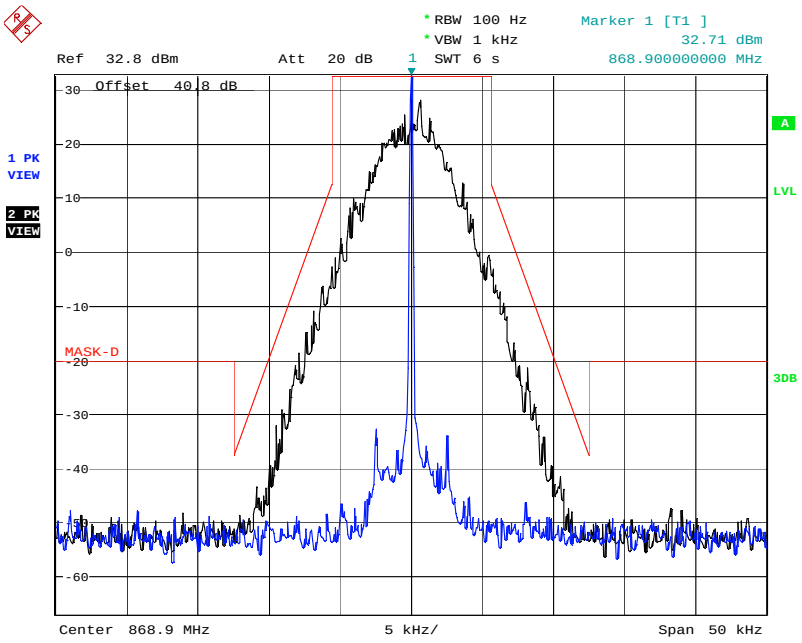
Date: 26.APR.2019 10:30:13

5.8.7.29. Configuration: Mask D, Band 4: 860.1MHz, F1E&F1D, Digital, Low power FCC 90.210 & IC



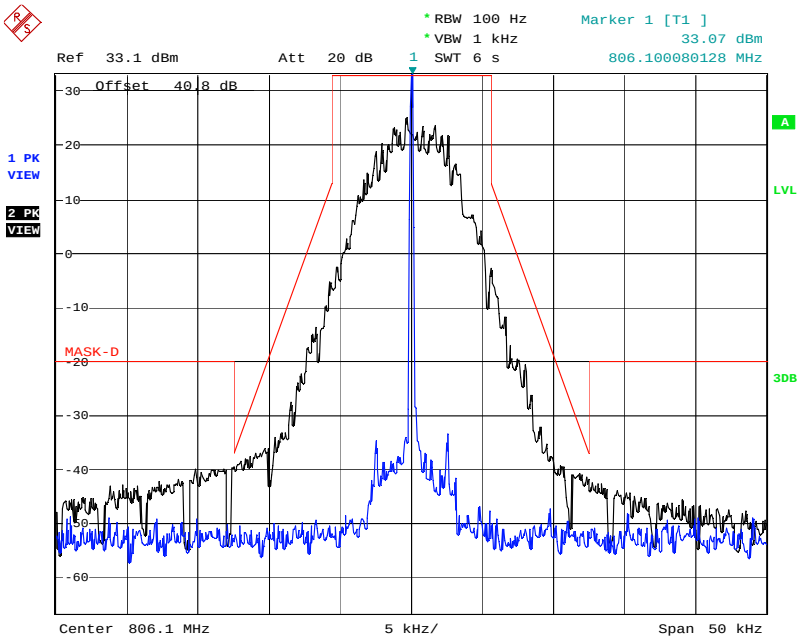
Date: 26.APR.2019 10:37:34

5.8.7.30. Configuration: Mask D, Band 4: 868.9MHz, F1E&F1D, Digital, Low power FCC 90.210 & IC



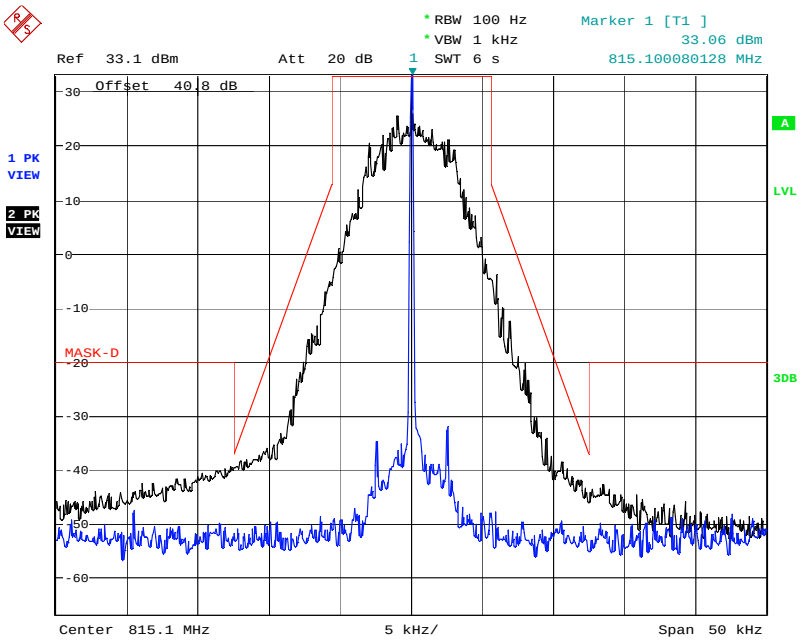
Date: 26.APR.2019 10:44:44

5.8.7.31. Configuration: Mask D, Band 3: 806.1MHz, F1W, Digital, Low power Rule Part: IC



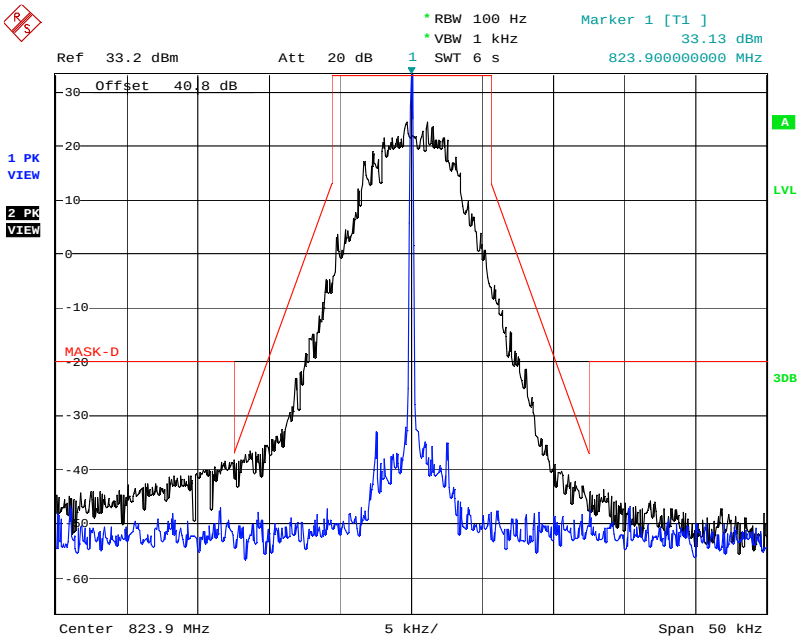
Date: 26.APR.2019 10:06:24

5.8.7.32. Configuration: Mask D, Band 3: 815.1MHz, F1W, Digital, Low power FCC 90.210 & IC



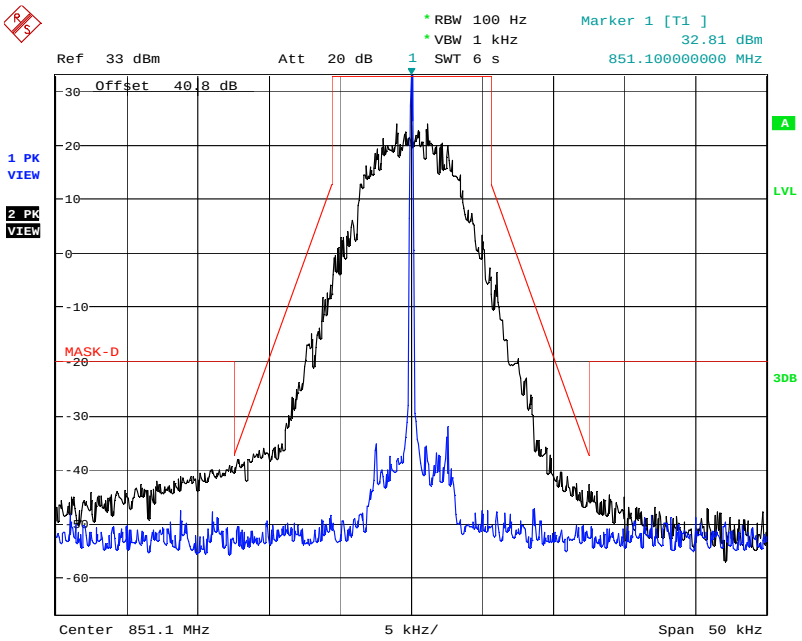
Date: 26.APR.2019 10:14:12

5.8.7.33. Configuration: Mask D, Band 3: 823.9MHz, F1W, Digital, Low power FCC 90.210 & IC



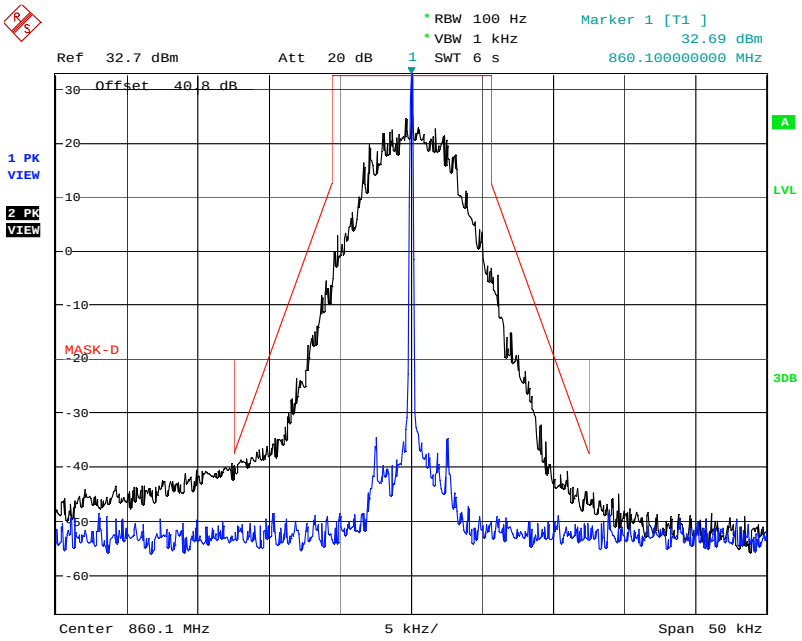
Date: 26.APR.2019 10:25:01

5.8.7.34. Configuration: Mask D, Band 4:851.1MHz, F1W, Digital, Low power Rule Part: IC



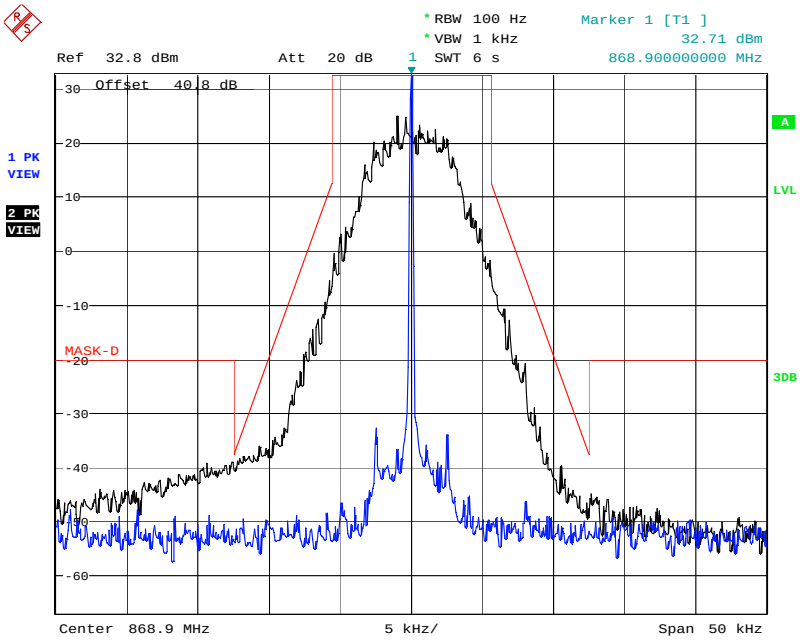
Date: 26.APR.2019 10:32:02

5.8.7.35. Configuration: Mask D, Band 4: 860.1MHz, F1W, Digital, Low power FCC 90.210 & IC



Date: 26.APR.2019 10:39:54

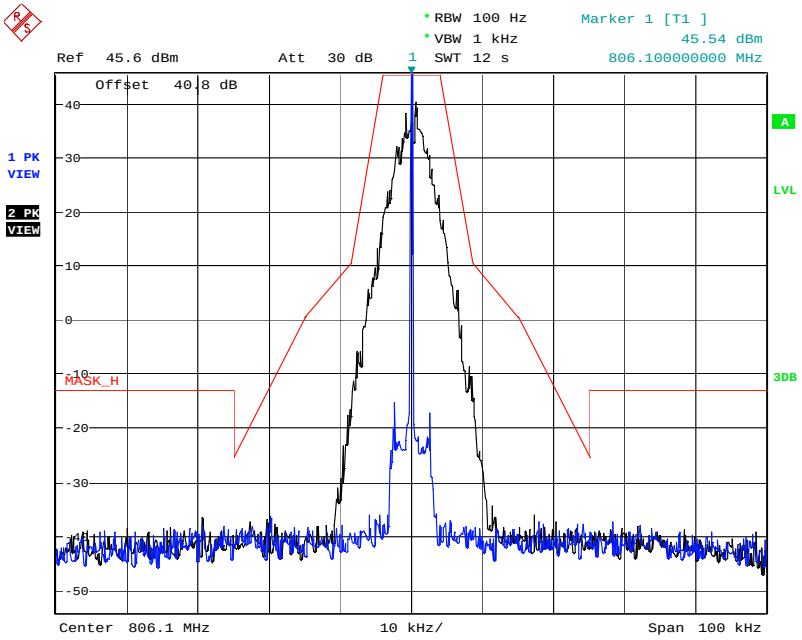
5.8.7.36. Configuration: Mask D, Band 4: 868.9MHz, F1W, Digital, Low power FCC 90.210 & IC



Date: 26.APR.2019 10:46:37

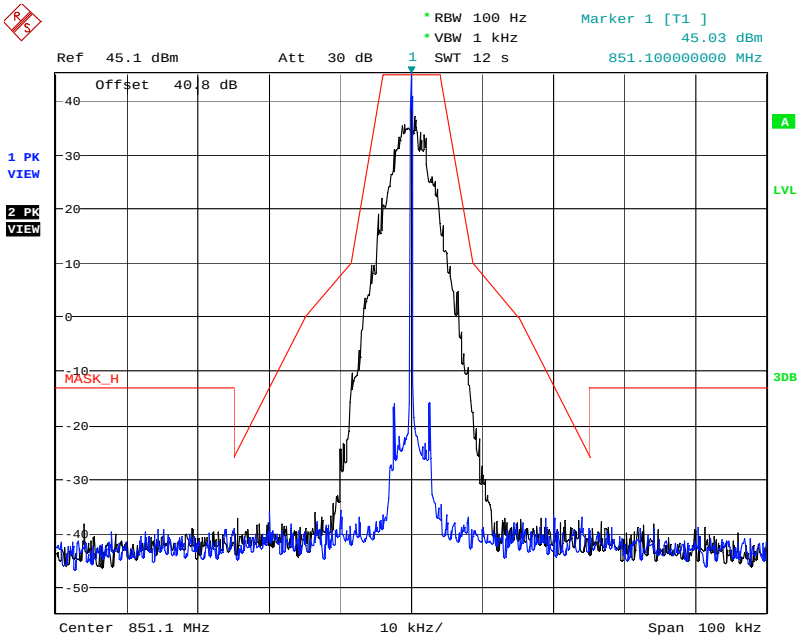
5.8.8. Test Data- EMISSION MASKS- MASK H

5.8.8.1. Configuration: Mask H, Sub Band 3: 806-809MHz, 806.1MHz, F1E&F1D, Digital, High power



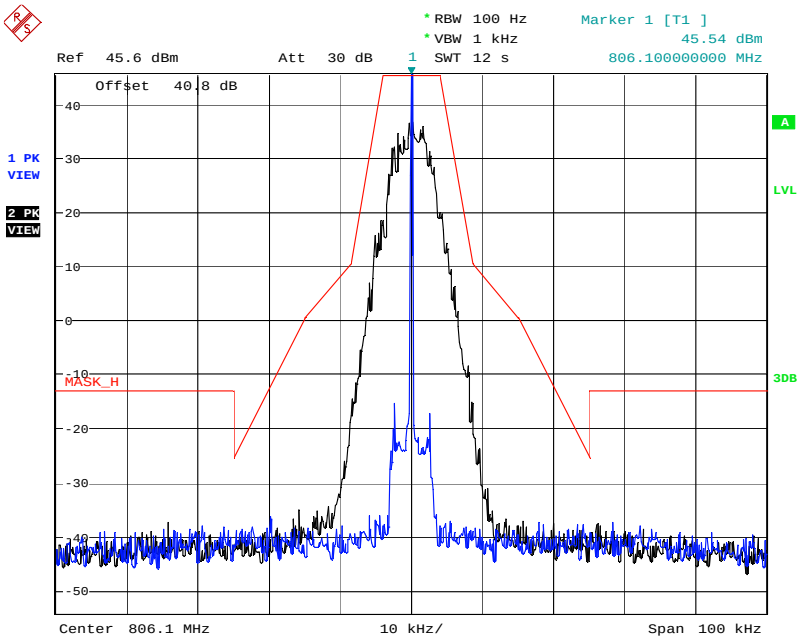
Date: 25.APR.2019 14:50:44

5.8.8.2. Configuration: Mask H, Sub Band 4: 851-854MHz, 851.1MHz, F1E&F1D, Digital, High power



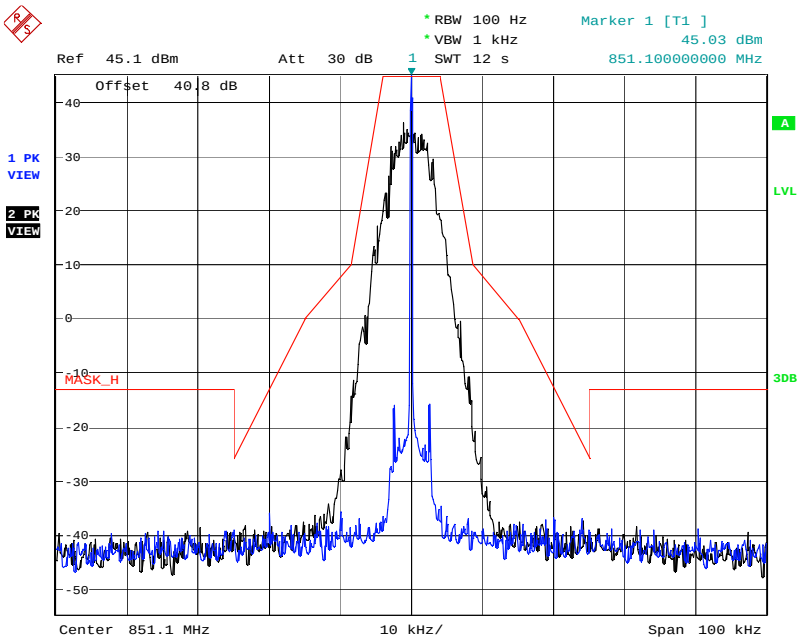
Date: 25.APR.2019 14:57:15

5.8.8.3. Configuration: Mask H, Sub Band 3: 806-809MHz, 806.1MHz, F1W, Digital, High power



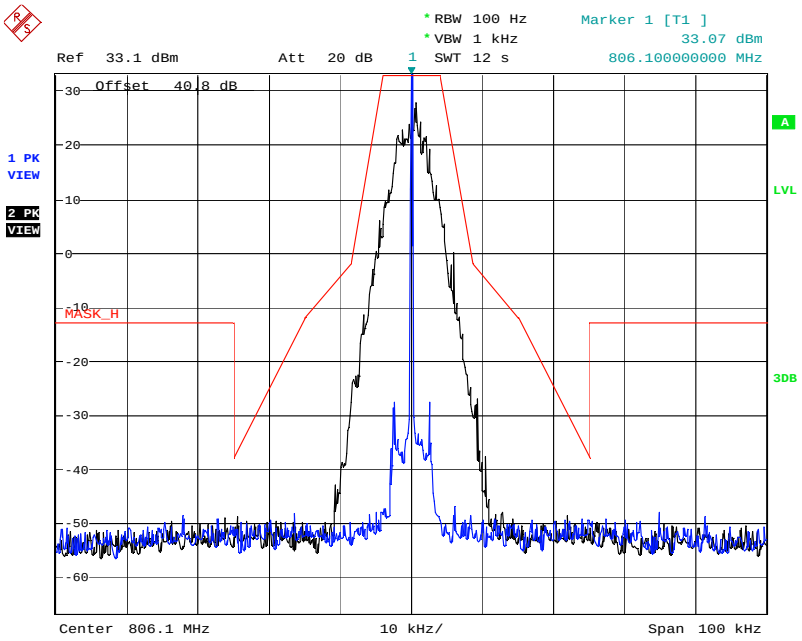
Date: 25.APR.2019 14:52:47

5.8.8.4. Configuration: Mask H, Sub Band 4: 851-854MHz, 851.1MHz, F1W, Digital, High power



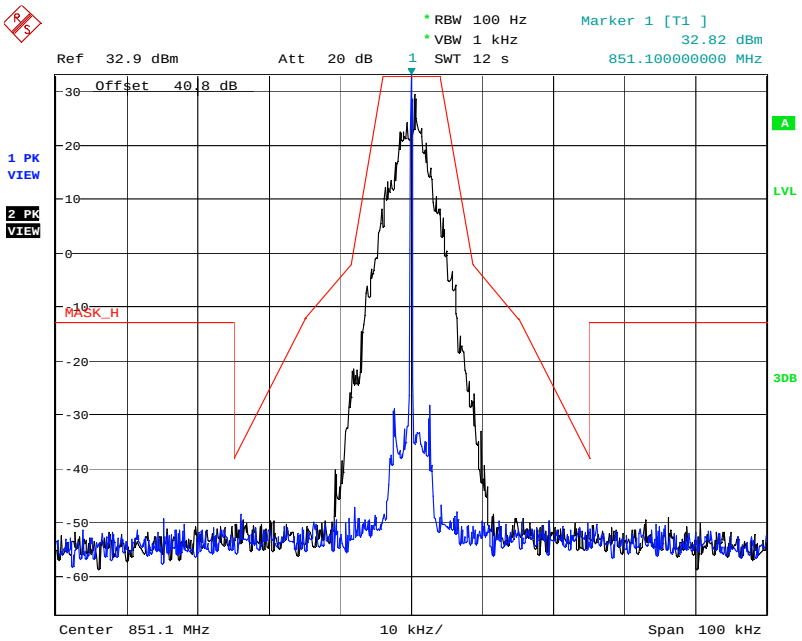
Date: 25.APR.2019 14:59:40

5.8.8.5. Configuration: Mask H, Sub Band 3: 806-809MHz, 806.1MHz, F1E&F1D, Digital, Low power



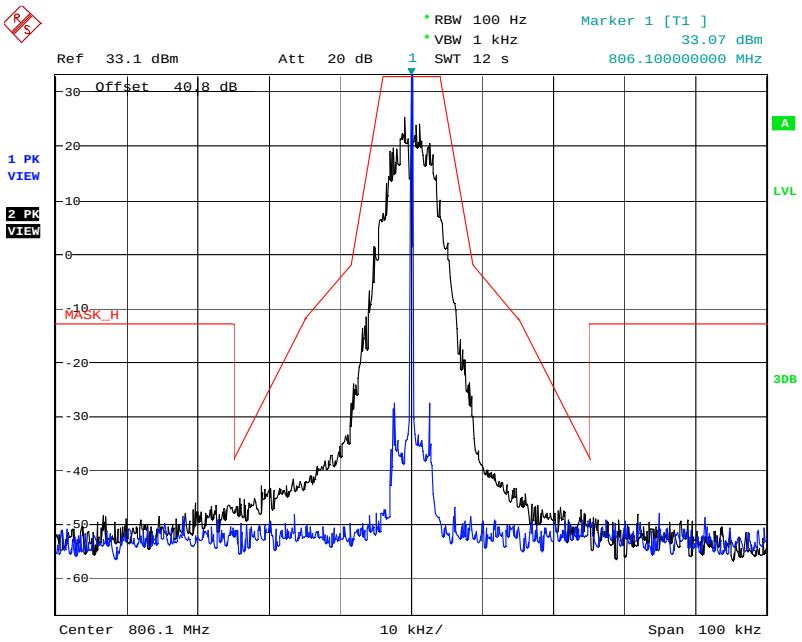
Date: 25.APR.2019 15:12:16

5.8.8.6. Configuration: Mask H, Sub Band 4: 851-854MHz, 851.1MHz, F1E&F1D, Digital, Low power



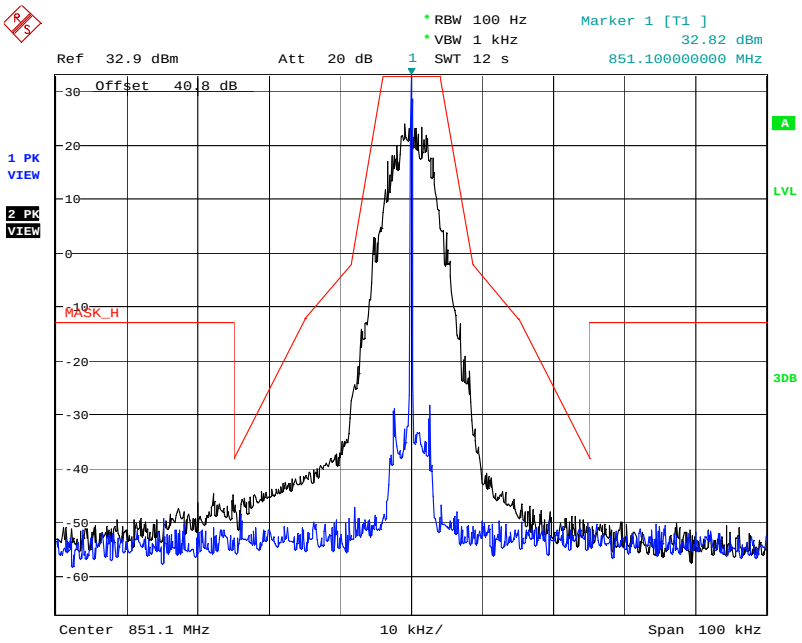
Date: 25.APR.2019 15:18:08

5.8.8.7. Configuration: Mask H, Sub Band 3: 806-809MHz, 806.1MHz, F1W, Digital, Low power



Date: 25.APR.2019 15:14:10

5.8.8.8. Configuration: Mask H, Sub Band 4: 851-854MHz, 851.1MHz, F1W, Digital, Low power



Date: 25.APR.2019 15:20:14

5.9. TRANSMITTER ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS [§ 2.1051, 2.1057, 22.359, & 90.210]

5.9.1. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 90.210(b)	At least 43 + 10 log (P) dB.
§ 90.210(d)	At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.
§ 90.543(b)	At least 43 + 10 log (P) dB

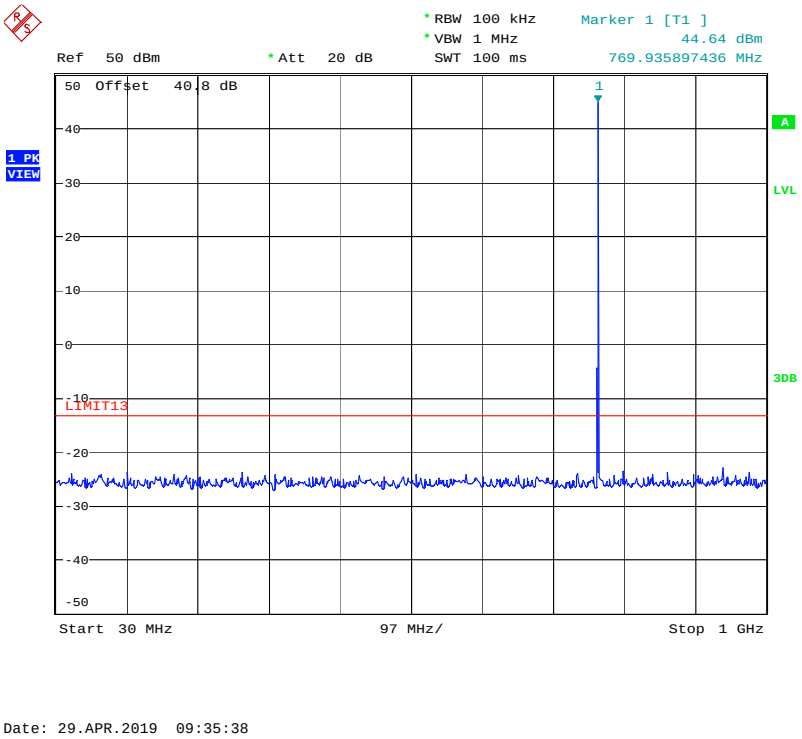
5.9.2. Method of Measurements

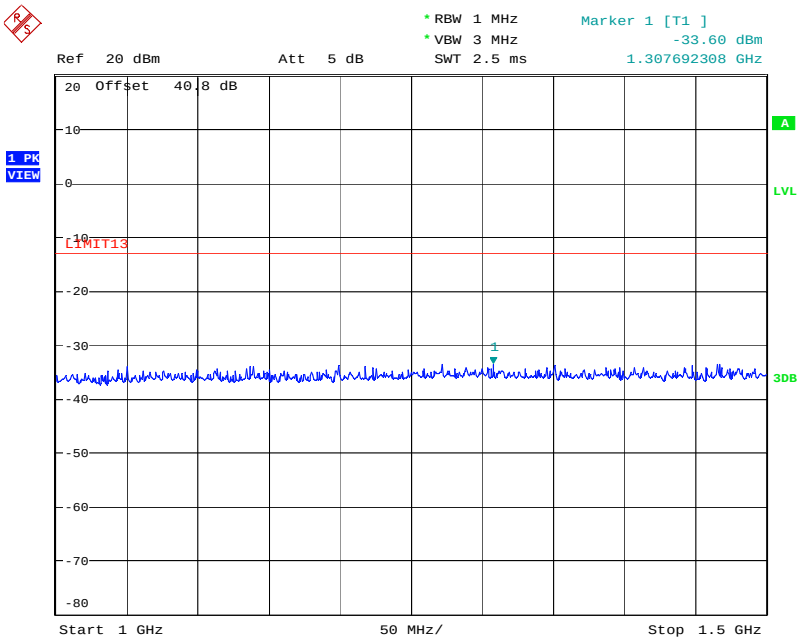
Refer to Section 8.5 of this report for measurement details

5.9.3. Test Data

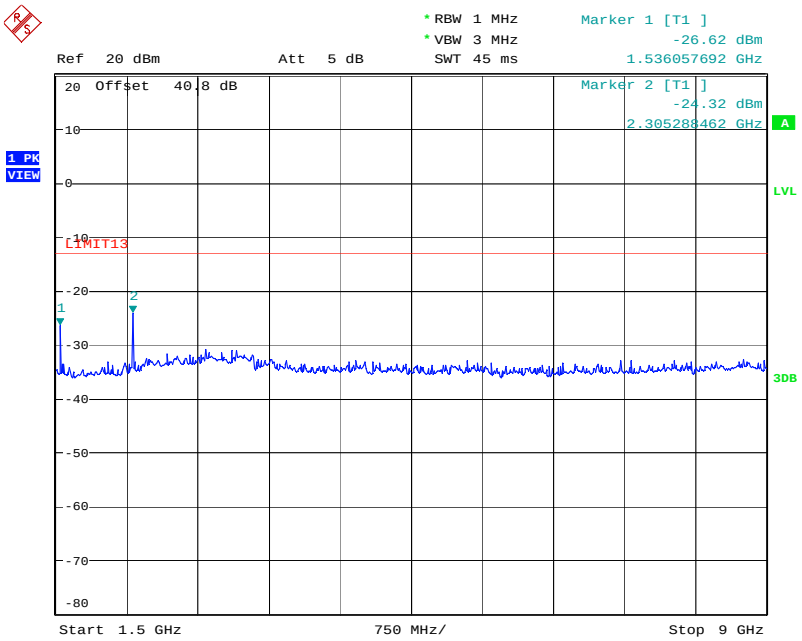
Note: There was no difference in spurious/harmonic emissions on the pre-scans for different channel spacing and modulation types. Therefore, the rf spurious/harmonic emissions in this section would be performed for Digital modulation with 12.5 kHz channel spacing F1W Digital. The frequencies were investigated from 30 MHz- 9 GHz.

5.9.3.1. Configuration: Tx Conducted Emission, Band 1: 769-775MHz, 769.1MHz, F1W, Digital, High power



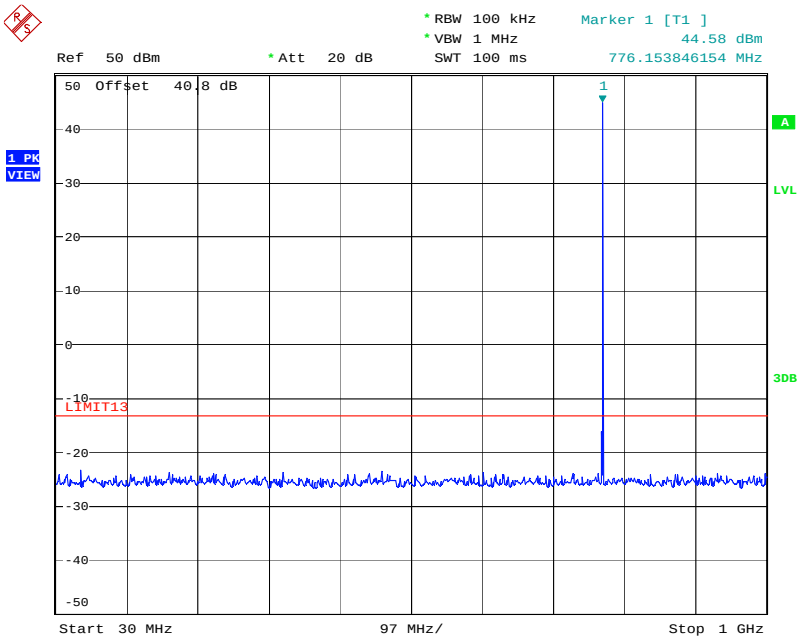


Date: 29.APR.2019 09:50:28

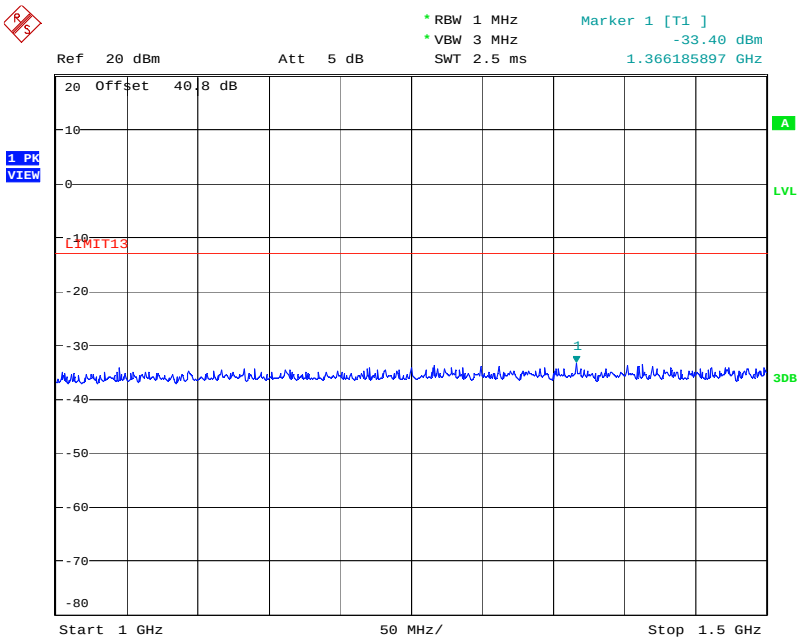


Date: 29.APR.2019 09:55:59

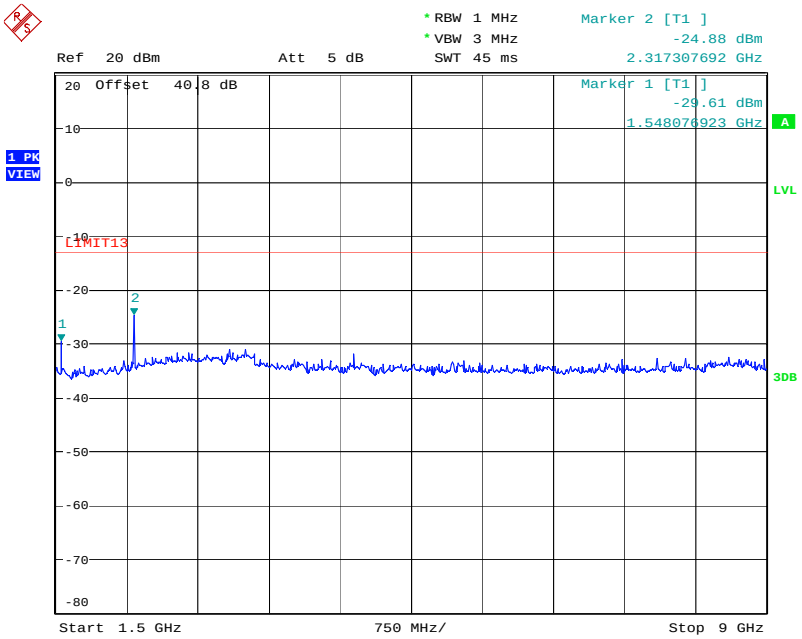
5.9.3.2. Configuration: Tx Conducted Emission, Band 1: 769-775MHz, 774.9MHz, F1W, Digital, High power



Date: 29.APR.2019 09:36:46

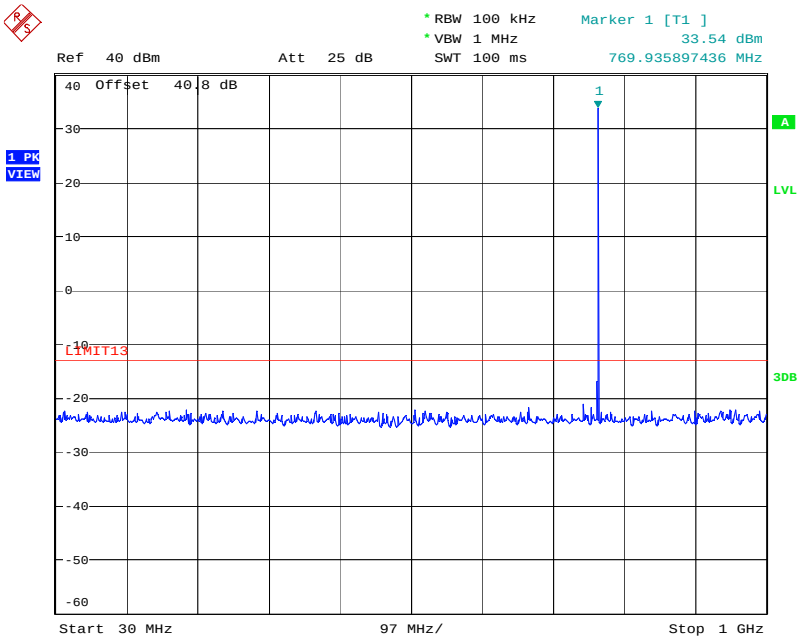


Date: 29.APR.2019 09:51:15

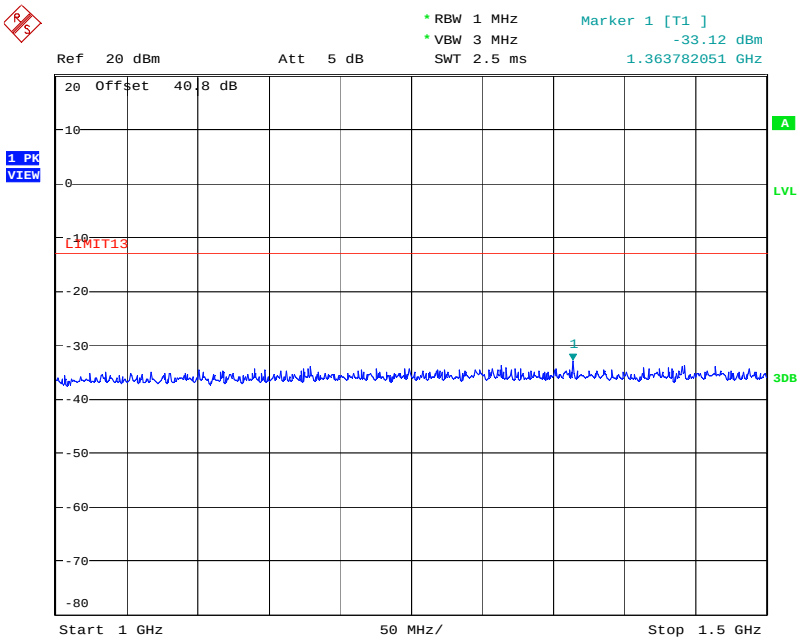


Date: 29.APR.2019 09:57:40

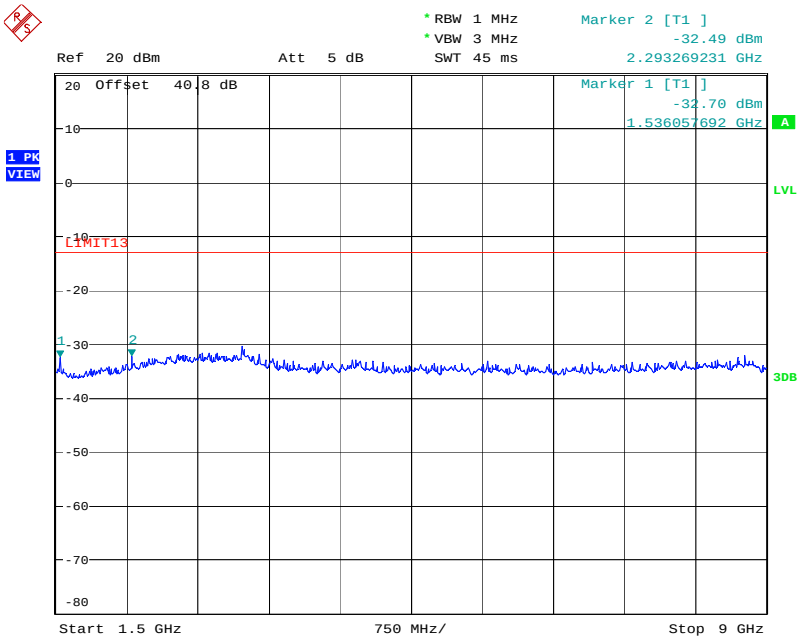
5.9.3.3. Configuration: Tx Conducted Emission, Band 1: 769-775MHz, 769.1MHz, F1W, Digital, Low power



Date: 29.APR.2019 09:45:11

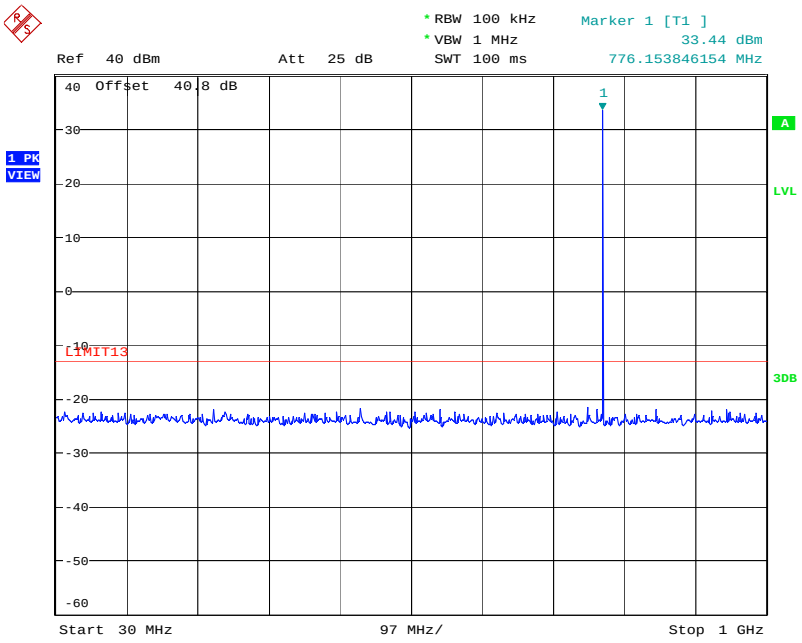


Date: 29.APR.2019 09:52:08

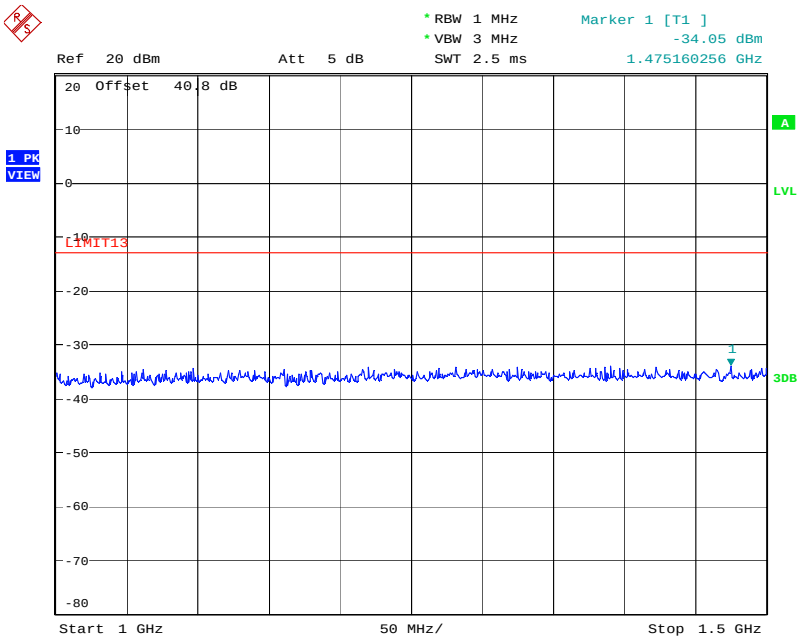


Date: 29.APR.2019 09:59:40

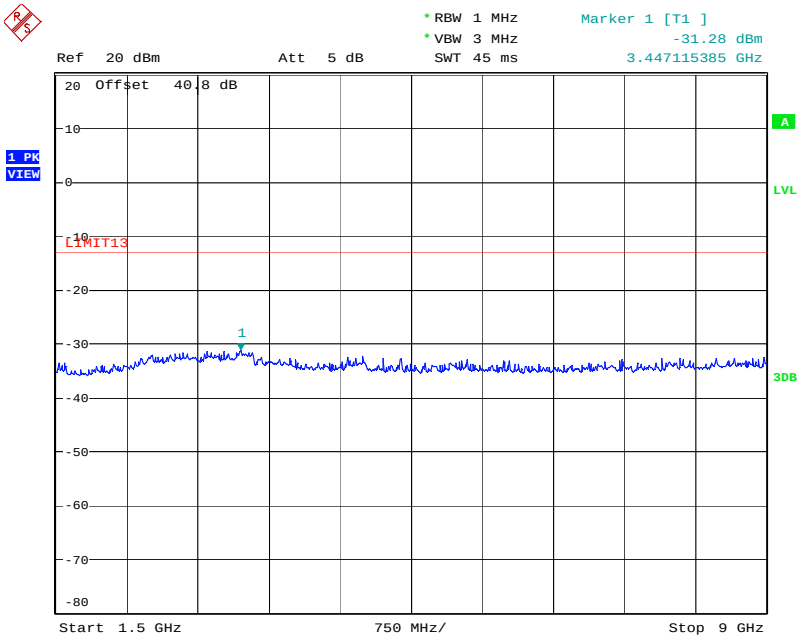
5.9.3.4. Configuration: Tx Conducted Emission, Band 1: 769-775MHz, 774.9MHz, F1W, Digital, Low power



Date: 29.APR.2019 09:46:10

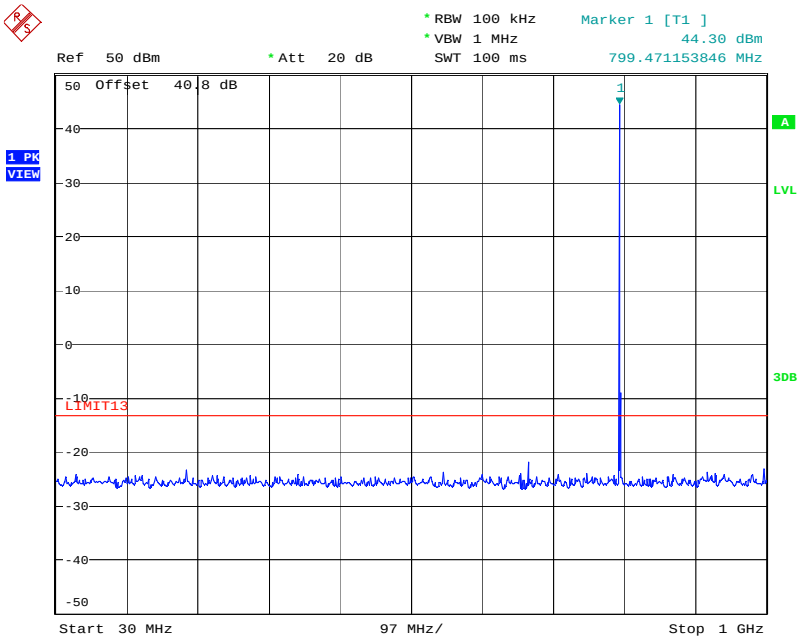


Date: 29.APR.2019 09:52:46

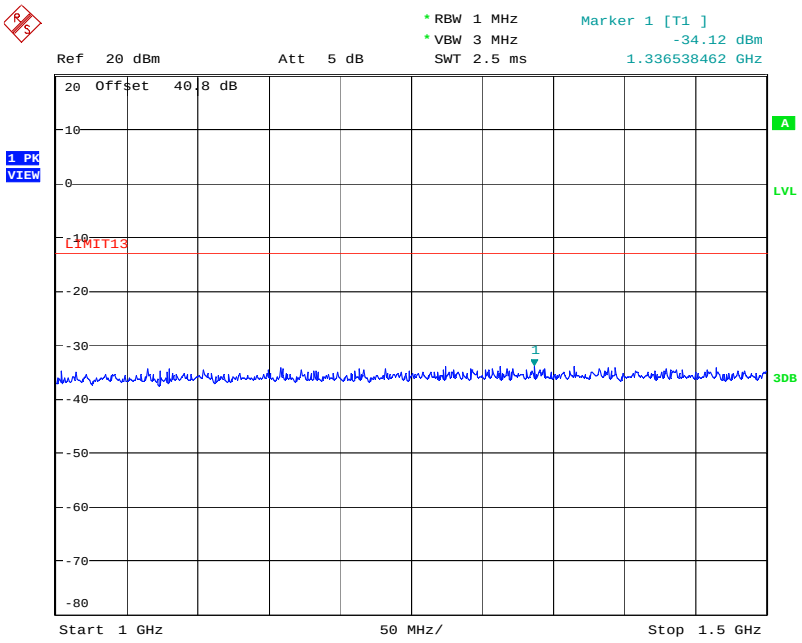


Date: 29.APR.2019 10:01:07

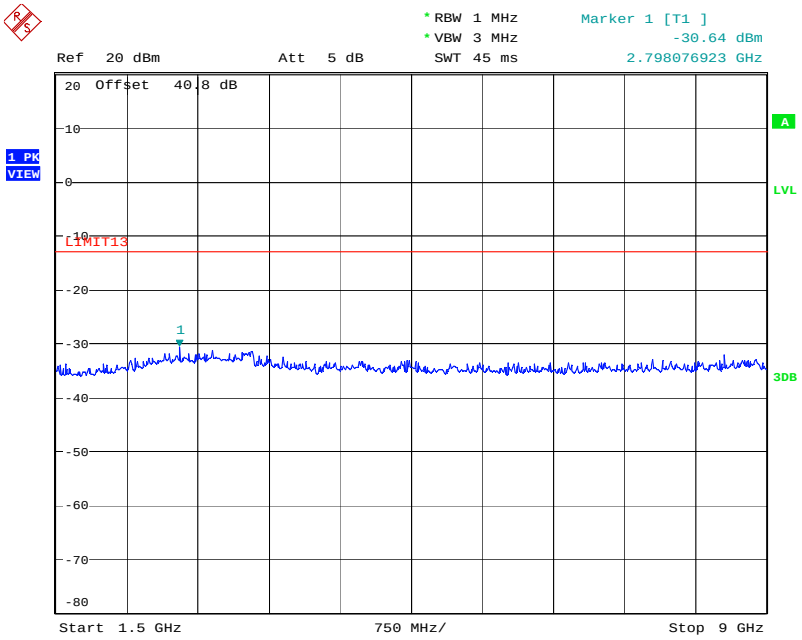
5.9.3.5. Configuration: Tx Conducted Emission, Band 2: 799-805MHz, 799.1MHz, F1W, Digital, High power



Date: 29.APR.2019 10:11:59

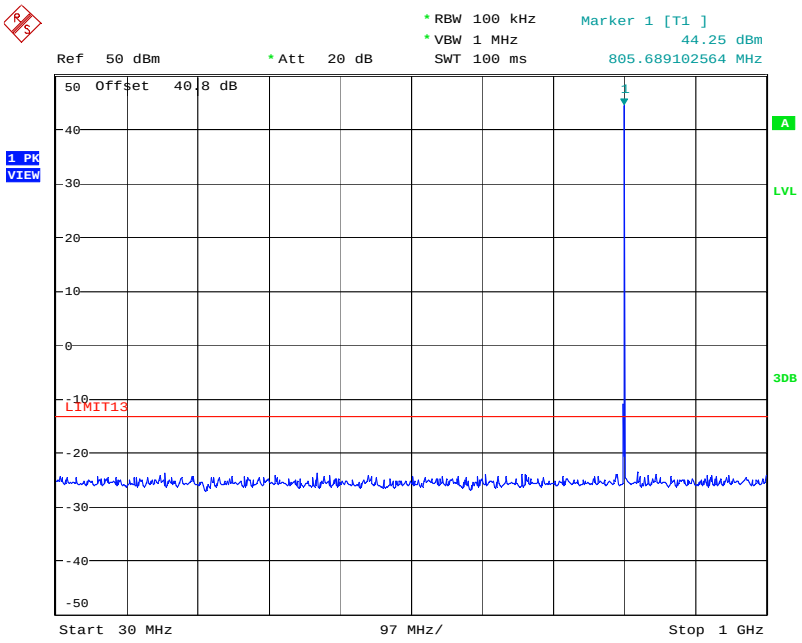


Date: 29.APR.2019 10:19:00

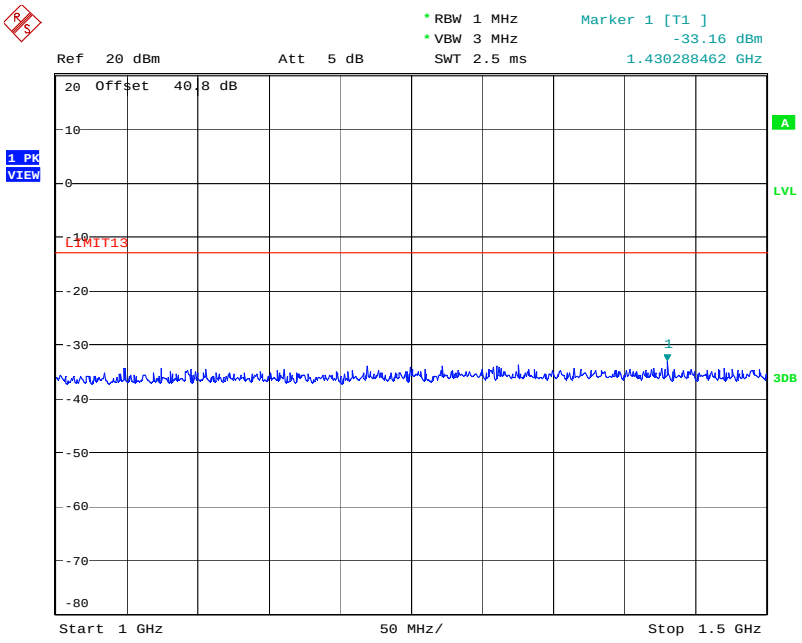


Date: 29.APR.2019 10:27:14

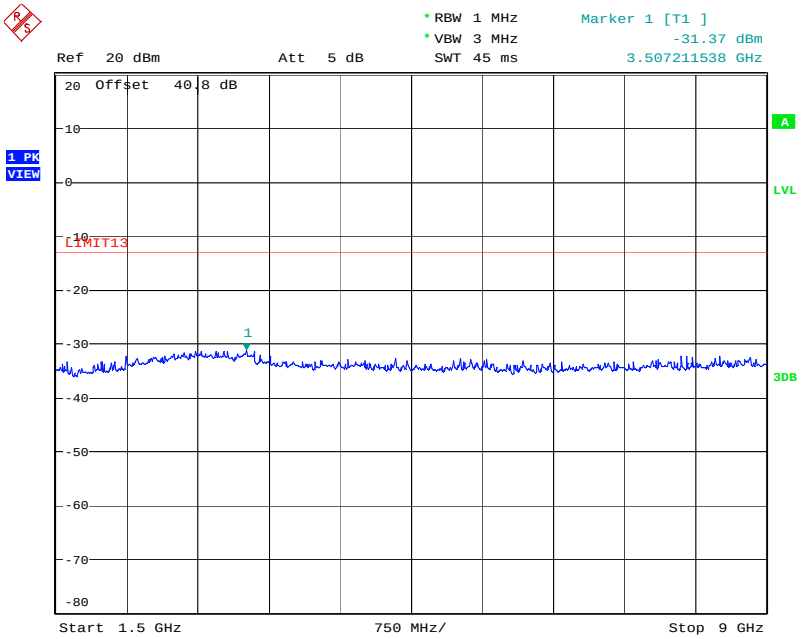
5.9.3.6. Configuration: Tx Conducted Emission, Band 2: 799-805MHz, 804.9MHz, F1W, Digital, High power



Date: 29.APR.2019 10:13:02

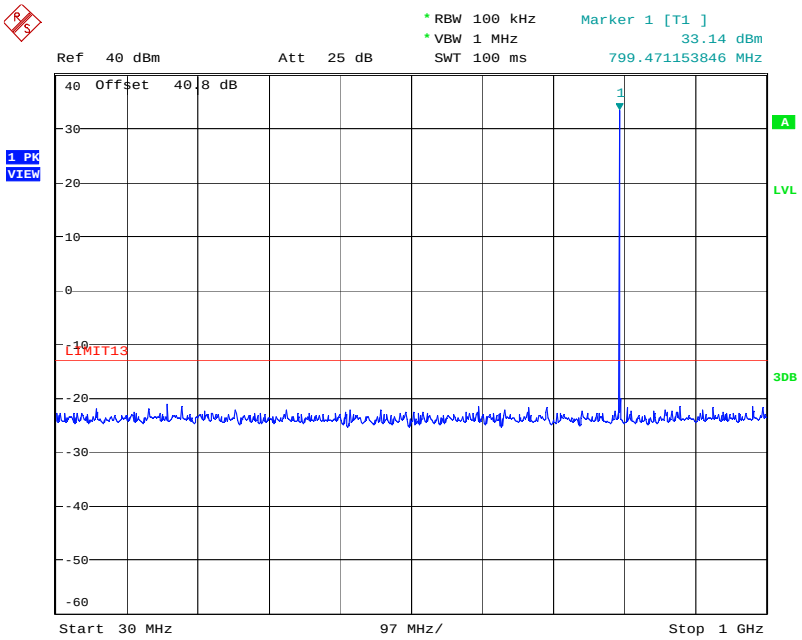


Date: 29.APR.2019 10:20:07

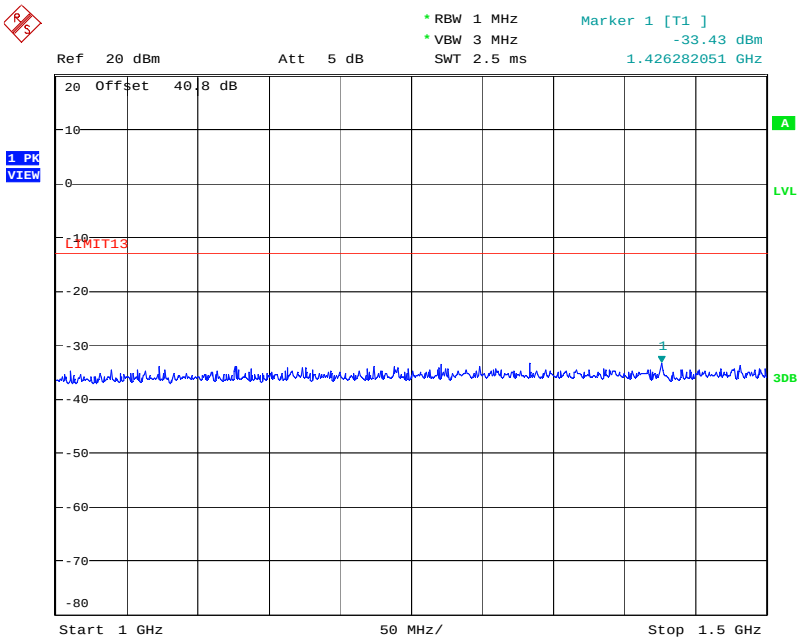


Date: 29.APR.2019 10:28:36

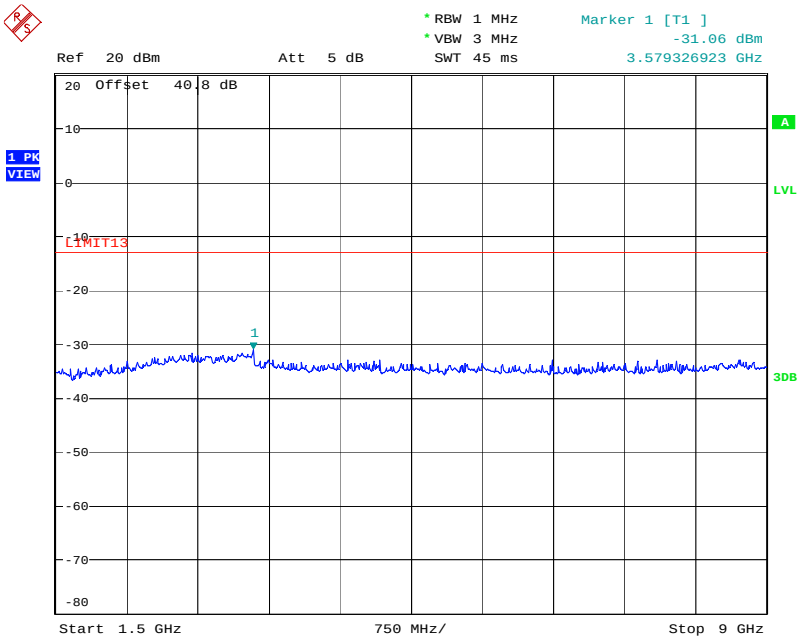
5.9.3.7. Configuration: Tx Conducted Emission, Band 2: 799-805MHz, 799.1MHz, F1W, Digital, Low power



Date: 29.APR.2019 10:14:08

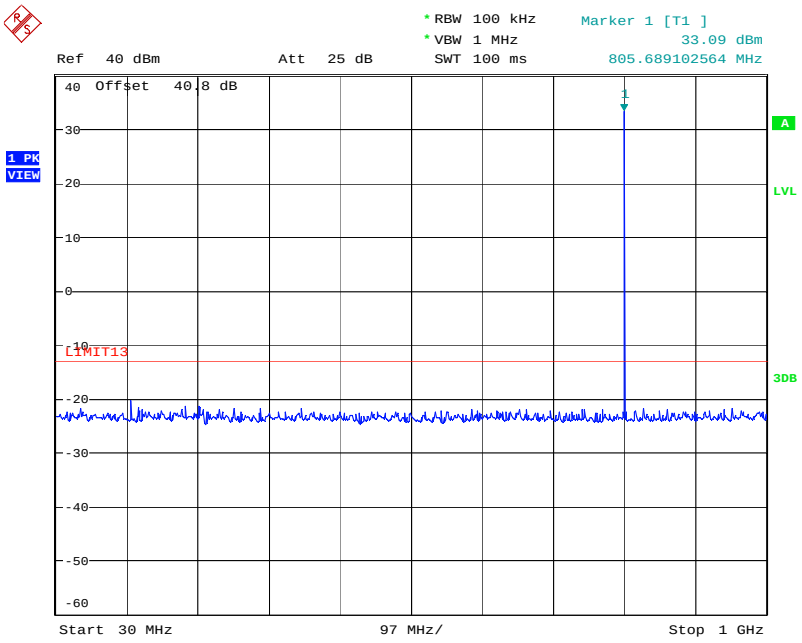


Date: 29.APR.2019 10:21:07

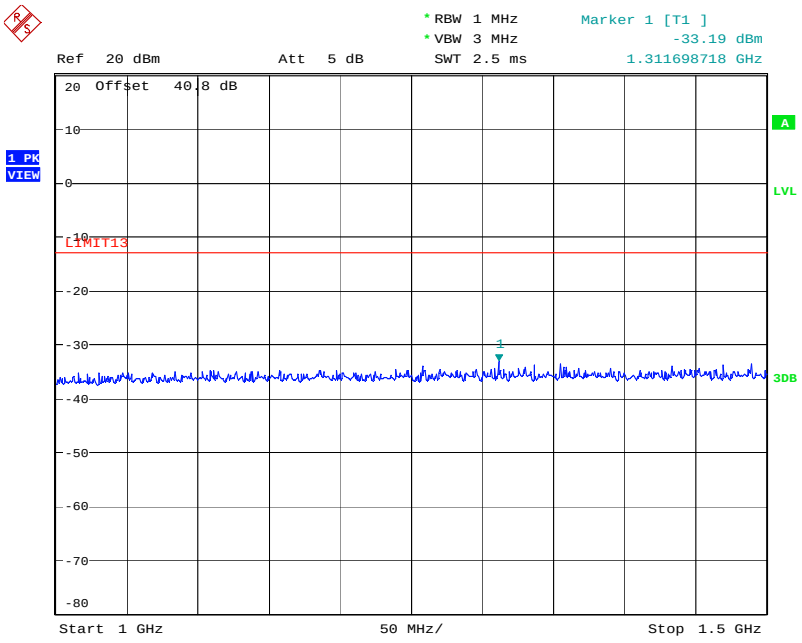


Date: 29.APR.2019 10:29:46

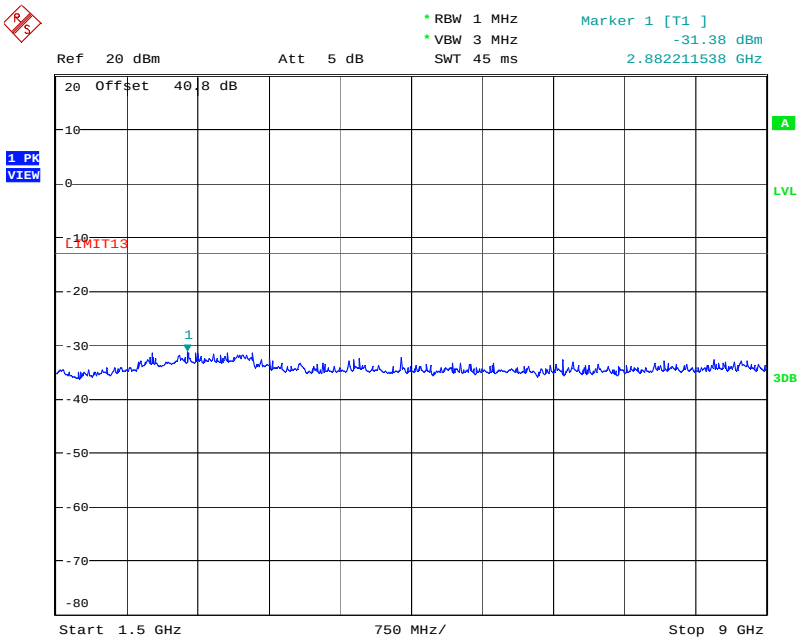
5.9.3.8. Configuration: Tx Conducted Emission, Band 2: 799-805MHz, 804.9MHz, F1W, Digital, Low power



Date: 29.APR.2019 10:17:06

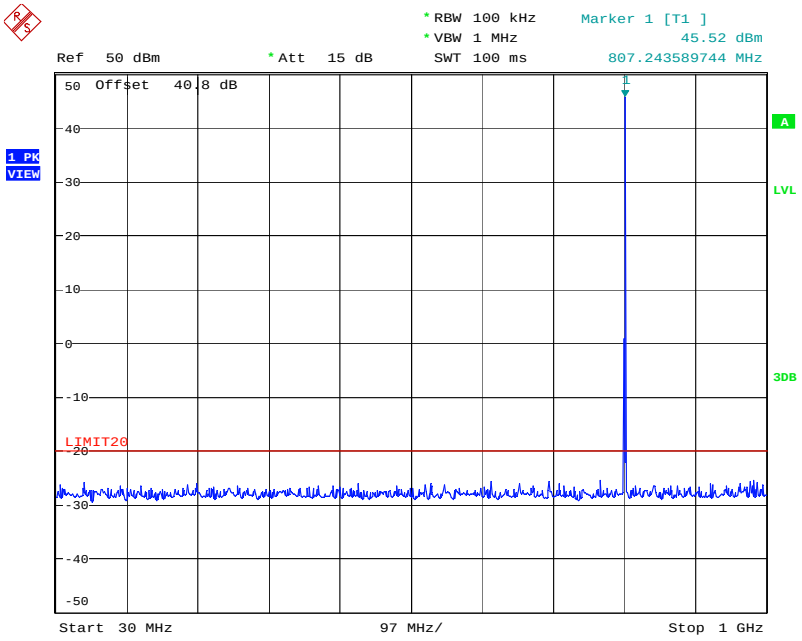


Date: 29.APR.2019 10:21:53

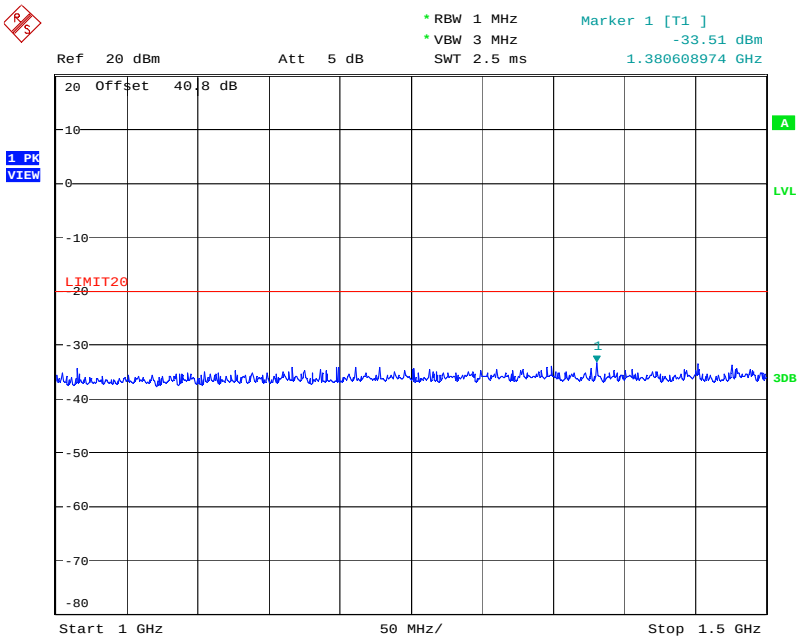


Date: 29.APR.2019 10:30:34

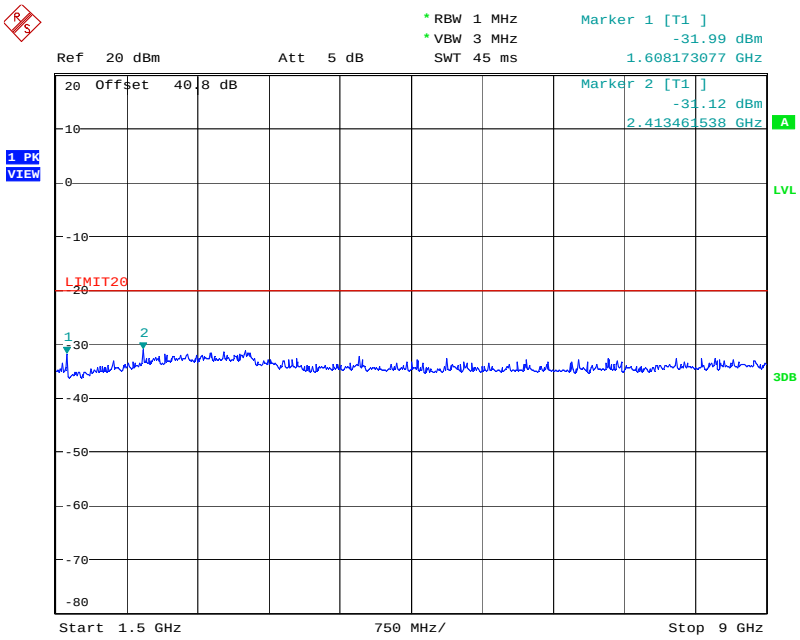
5.9.3.9. Configuration: Tx Conducted Emission, Band 3: 806-824MHz, 806.1MHz, F1W, Digital, High power



Date: 29.APR.2019 10:40:40

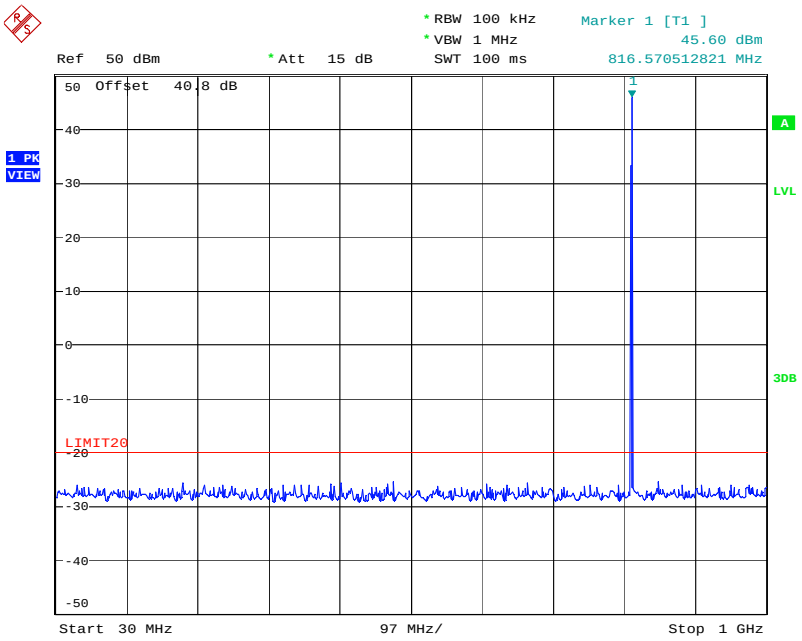


Date: 29.APR.2019 10:54:06

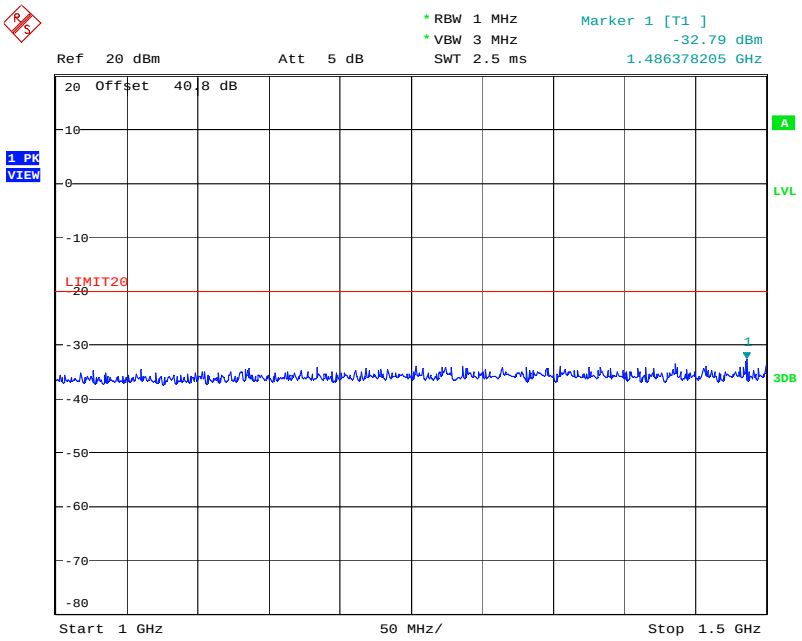


Date: 29.APR.2019 11:34:24

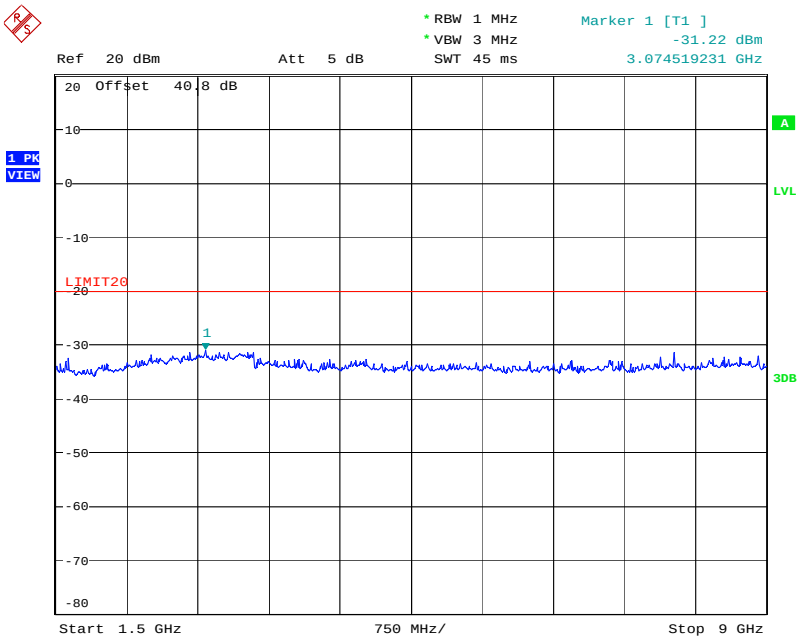
5.9.3.10. Configuration: Tx Conducted, Band 3: 806-824MHz, 815.1MHz, F1W, Digital, High power



Date: 29.APR.2019 10:40:01

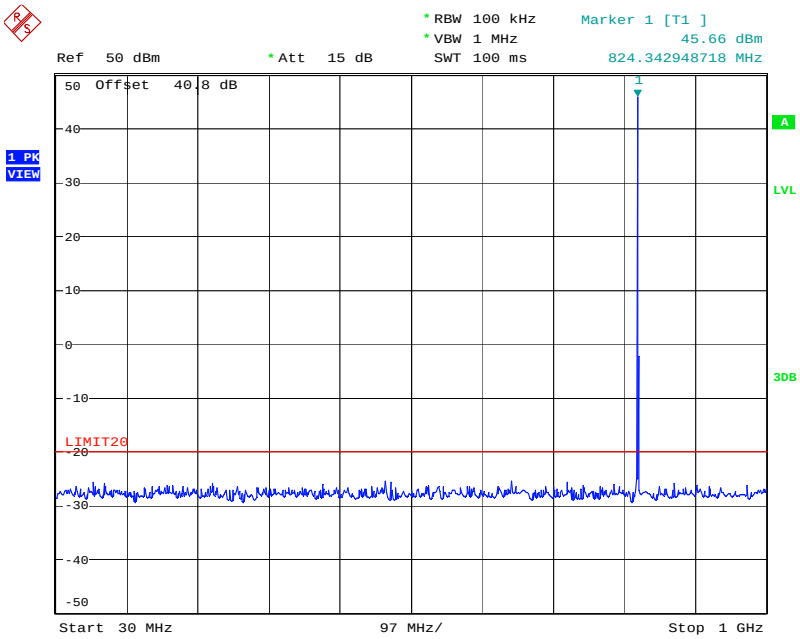


Date: 29.APR.2019 10:54:47

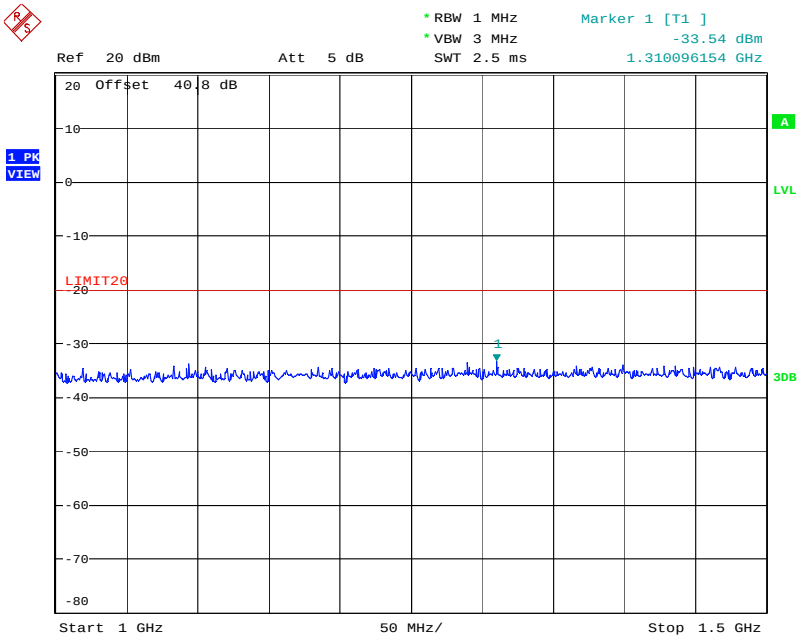


Date: 29.APR.2019 11:25:07

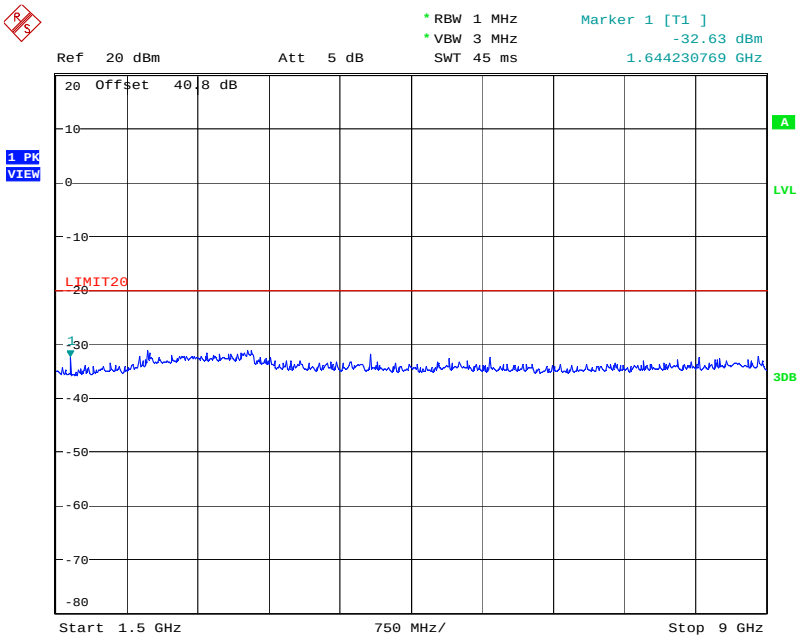
5.9.3.11. Configuration: Tx Conducted, Band 3: 806-824MHz, 823.9MHz, F1W, Digital, High power



Date: 29.APR.2019 10:41:32

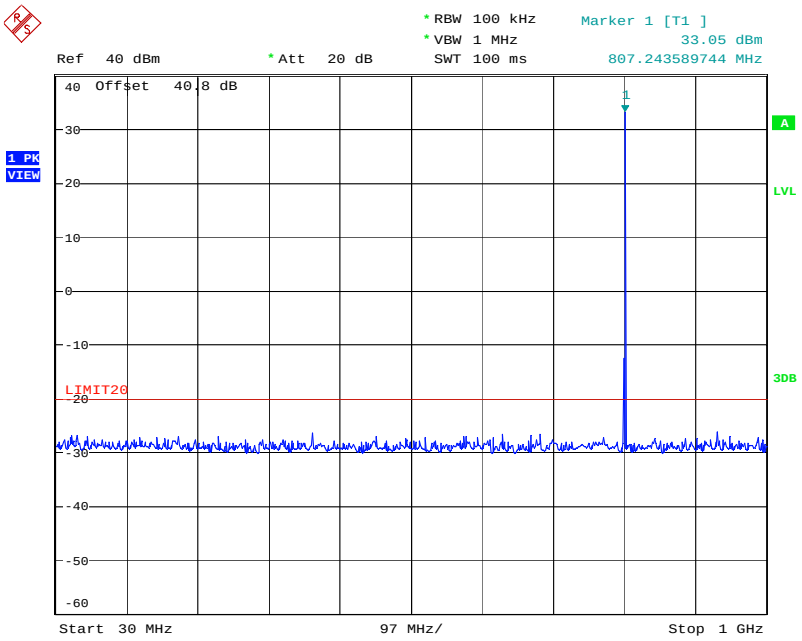


Date: 29.APR.2019 10:55:33

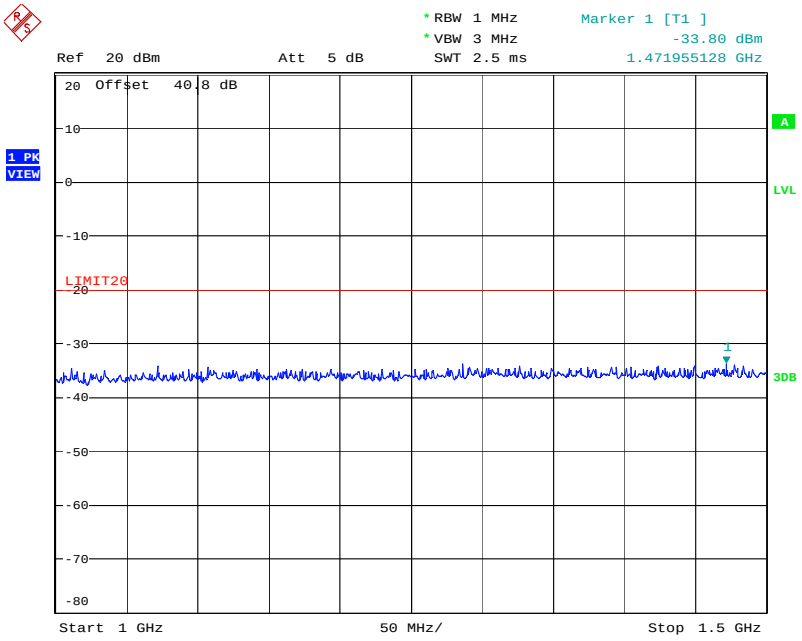


Date: 29.APR.2019 11:26:53

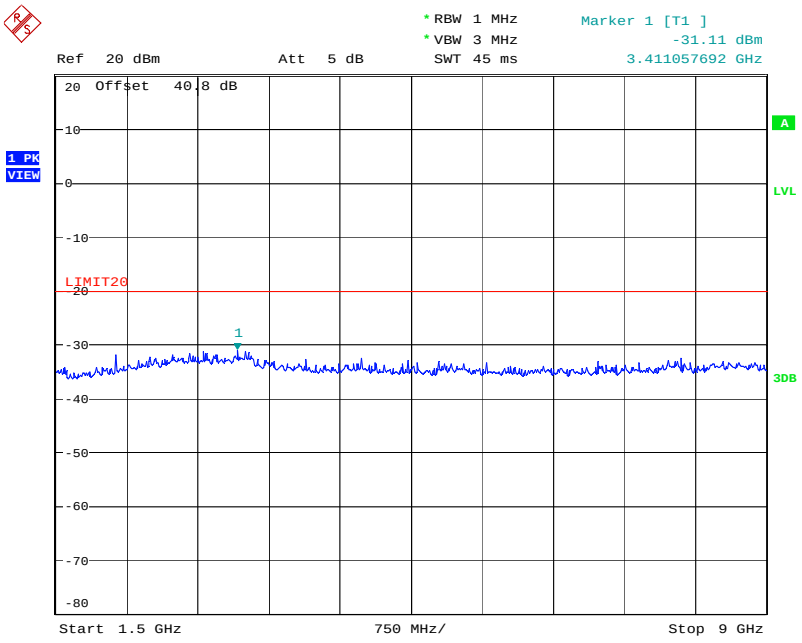
5.9.3.12. Configuration: Tx Conducted, Band 3: 806-824MHz, 806.1MHz, F1W, Digital, Low power



Date: 29.APR.2019 10:44:38

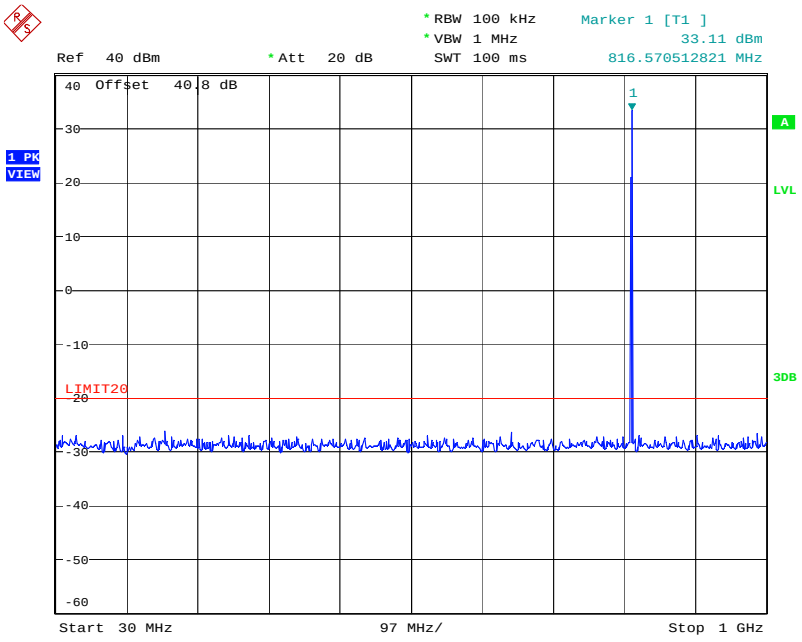


Date: 29.APR.2019 10:56:17

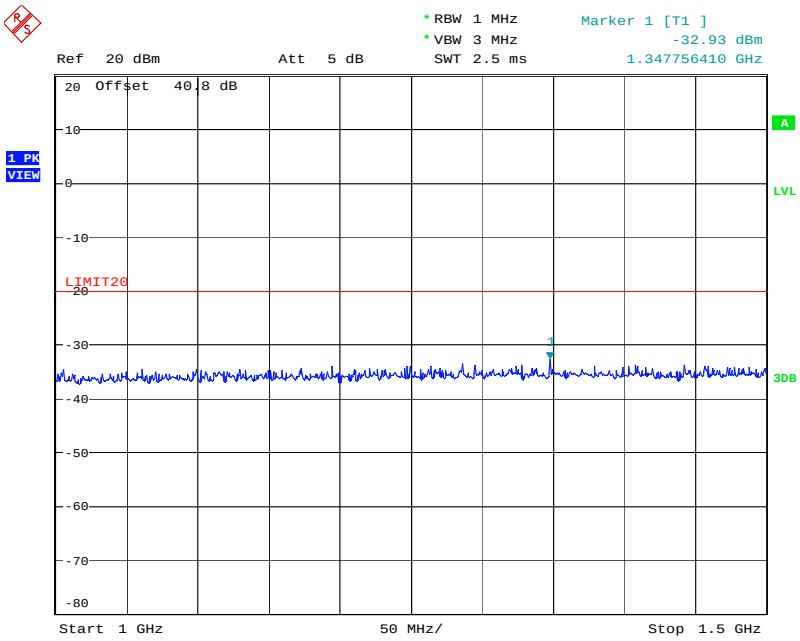


Date: 29.APR.2019 11:29:03

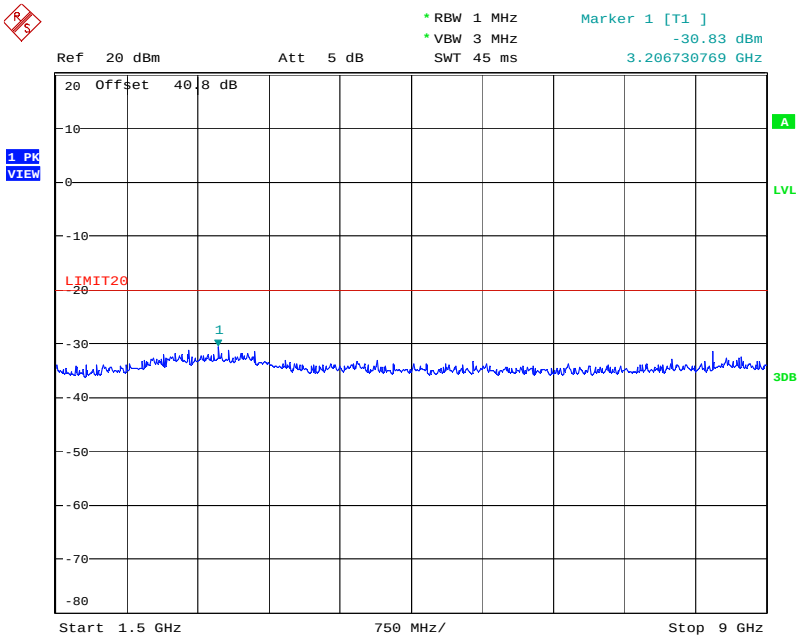
5.9.3.13. Configuration: Tx Conducted , Band 3: 806-824MHz, 815.1MHz, F1W, Digital, Low power



Date: 29.APR.2019 10:45:44

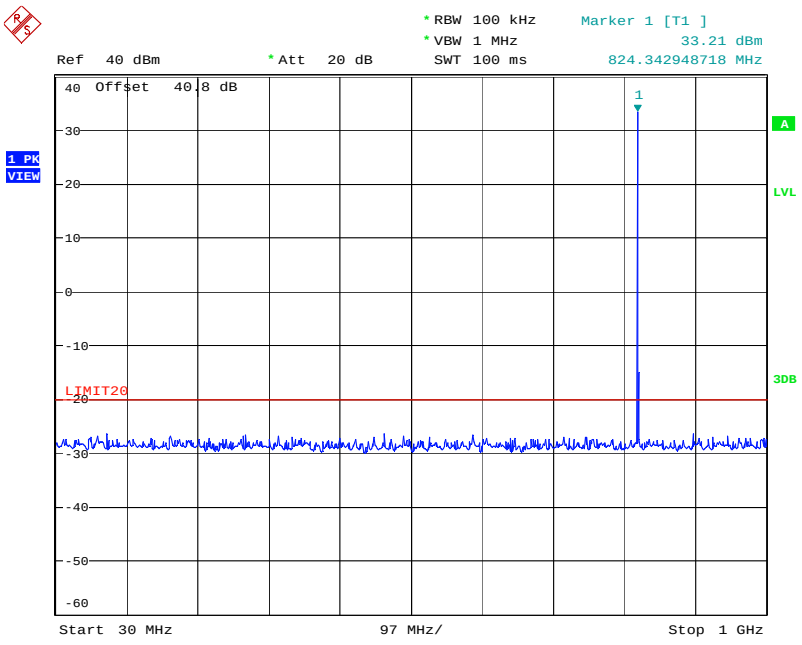


Date: 29.APR.2019 10:57:16

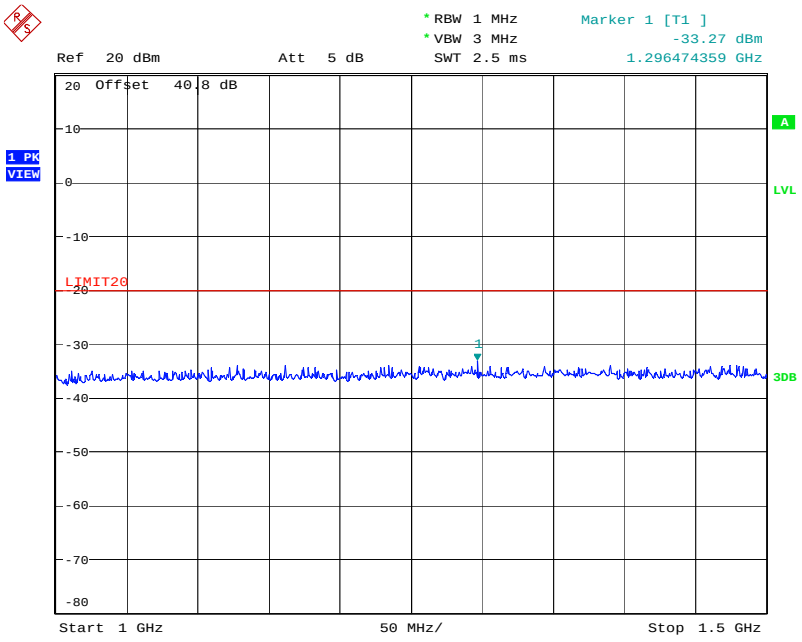


Date: 29.APR.2019 11:29:56

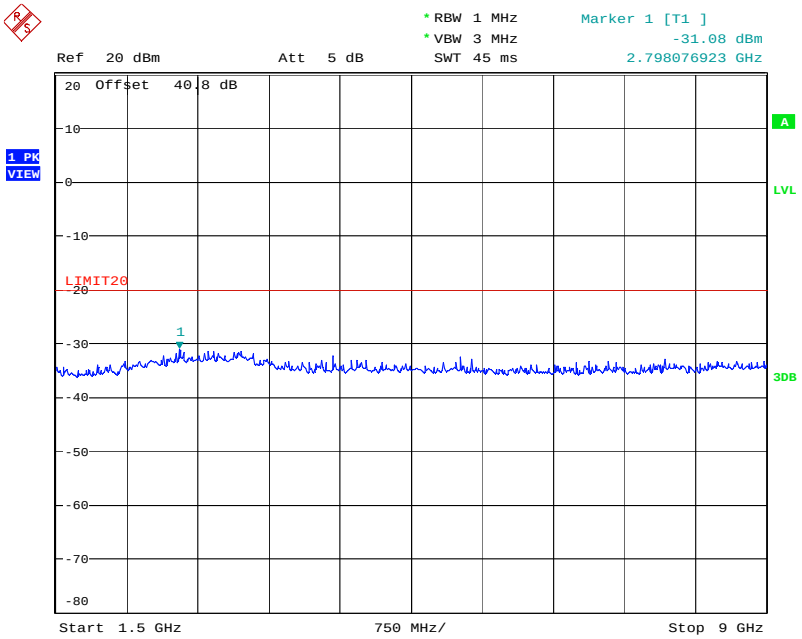
5.9.3.14. Configuration: Tx Conducted , Band 3: 806-824MHz, 823.9MHz, F1W, Digital, Low power



Date: 29.APR.2019 10:46:24

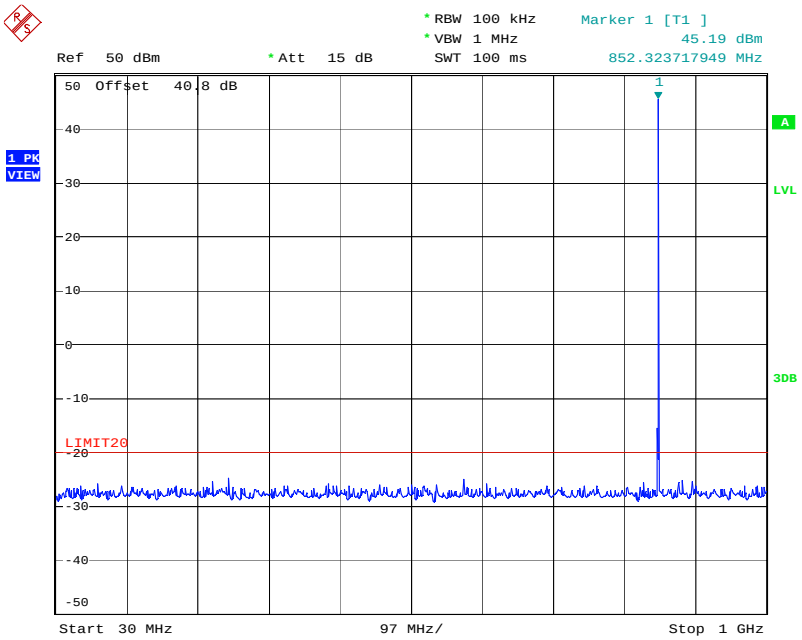


Date: 29.APR.2019 10:58:05

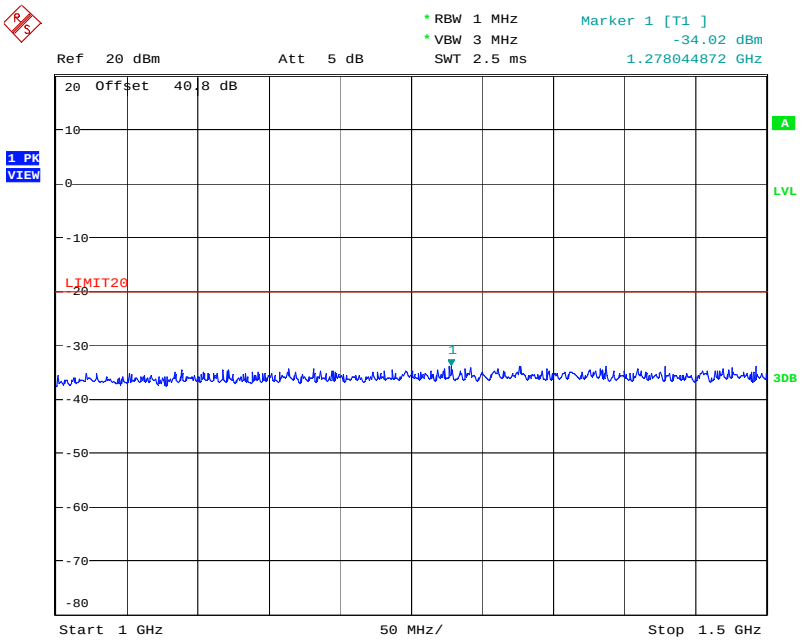


Date: 29.APR.2019 11:30:40

5.9.3.15. Configuration: Tx Conducted , Band 4: 851-869MHz, 851.1MHz, F1W, Digital, High power



Date: 29.APR.2019 12:44:10



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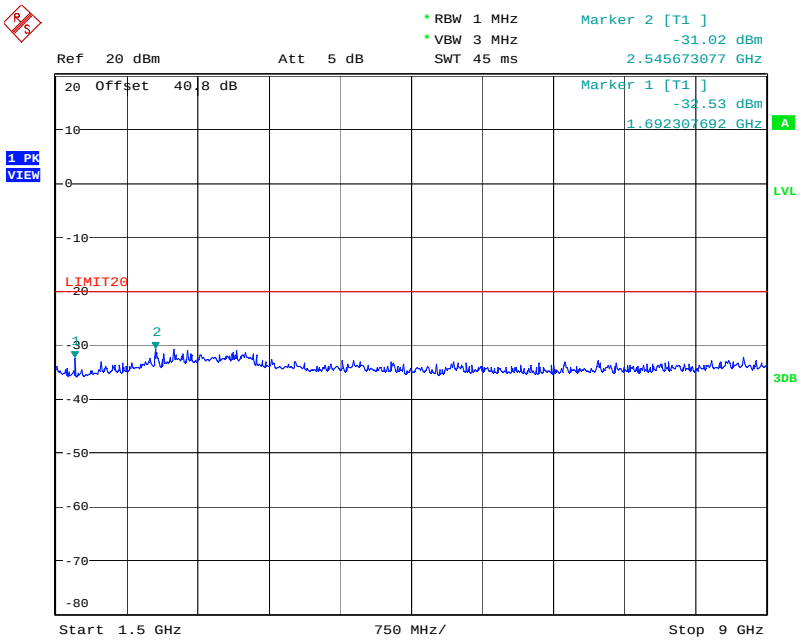
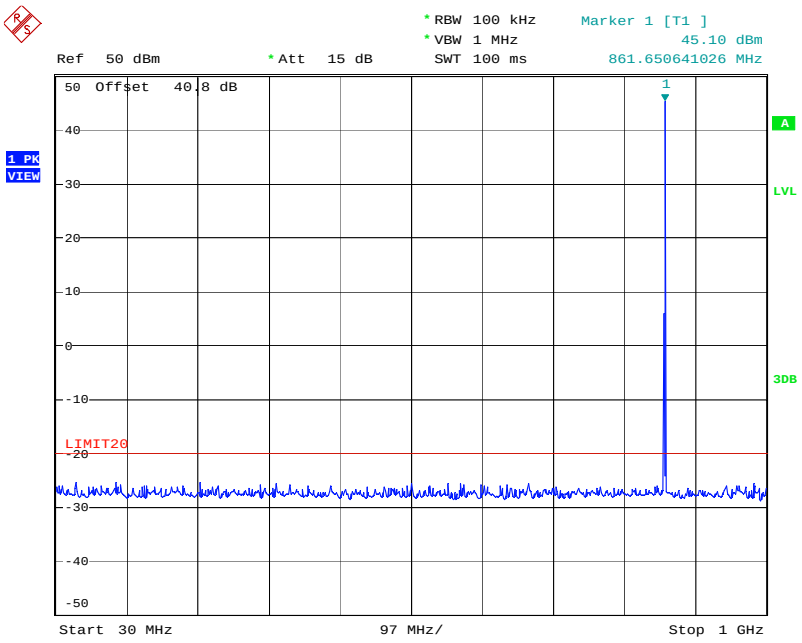


Date: 29.APR.2019 12:57:53

5.9.3.16. Configuration: Tx Conducted , Band 4: 851-869MHz, 860.1MHz, F1W, Digital, High power



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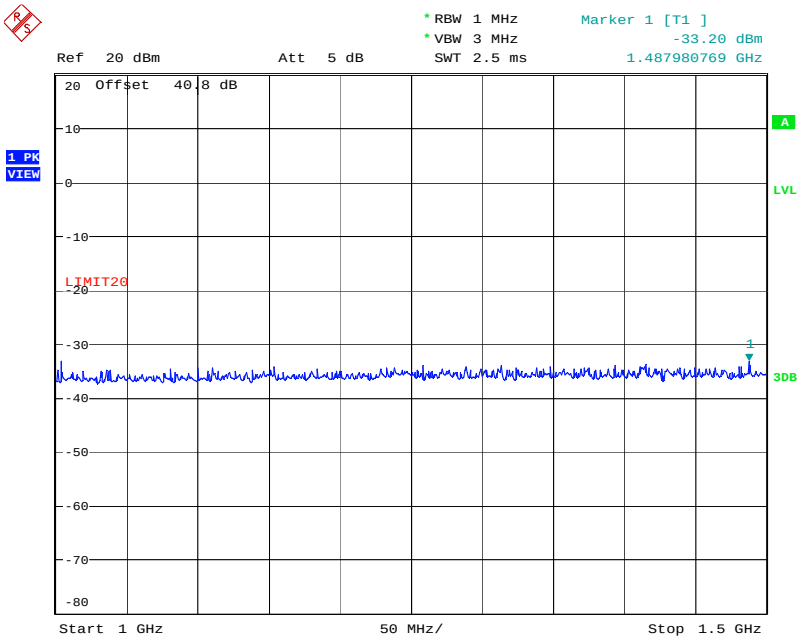

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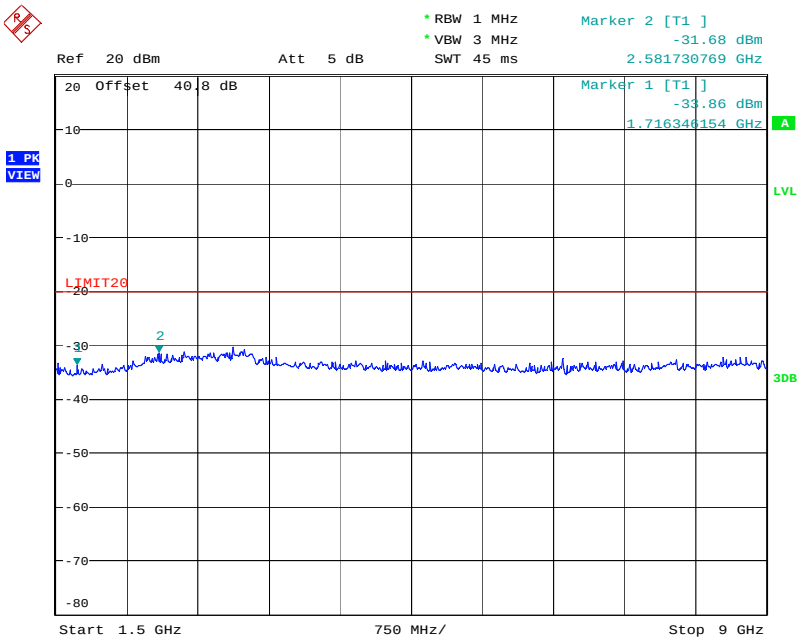
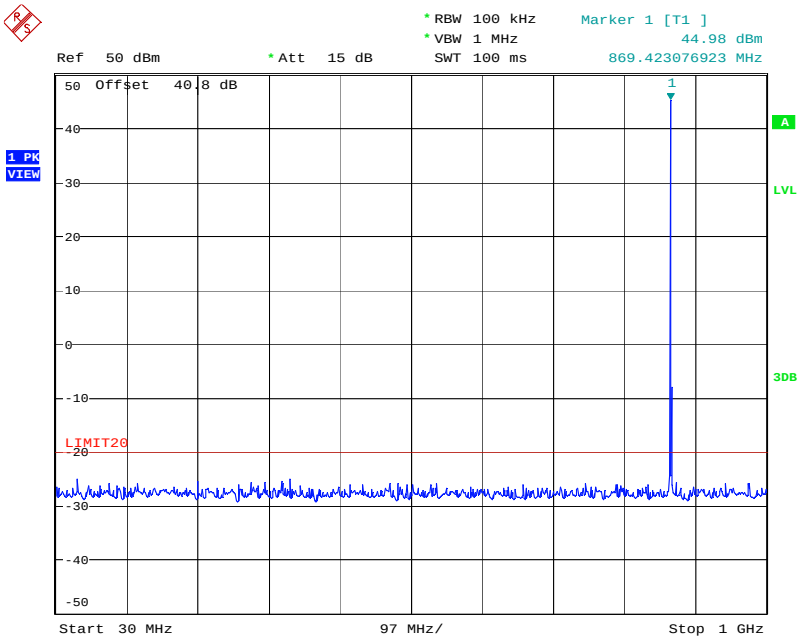


Date: 29.APR.2019 13:00:08

5.9.3.17. Configuration: Tx Conducted , Band 4: 851-869MHz, 868.9MHz, F1W, Digital, High power



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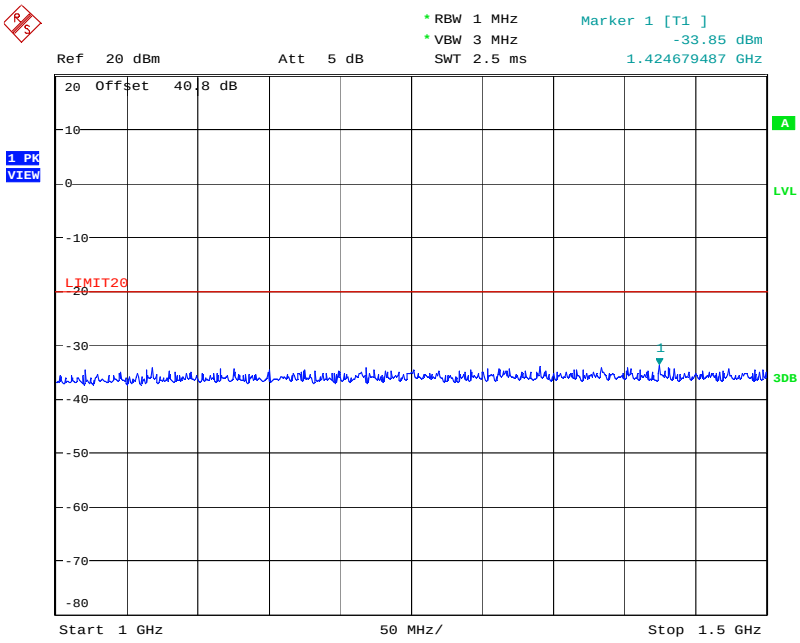

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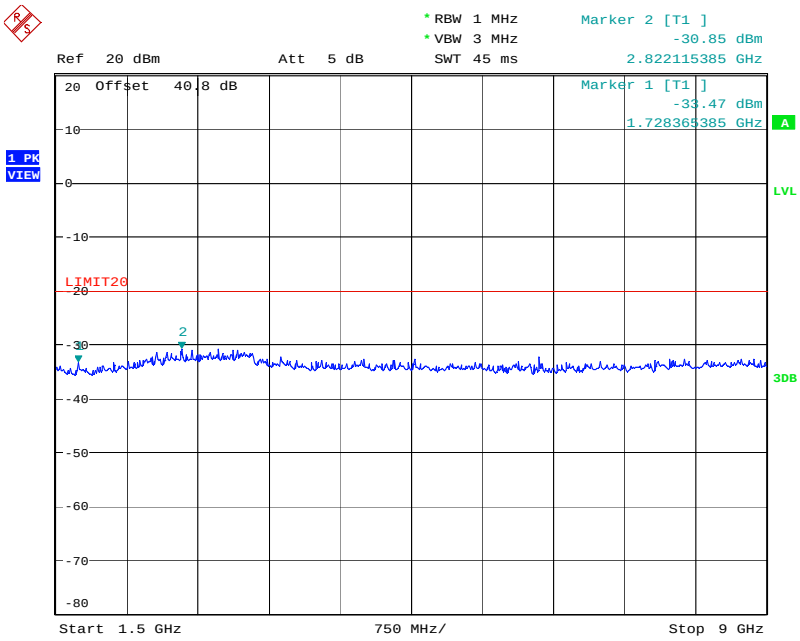
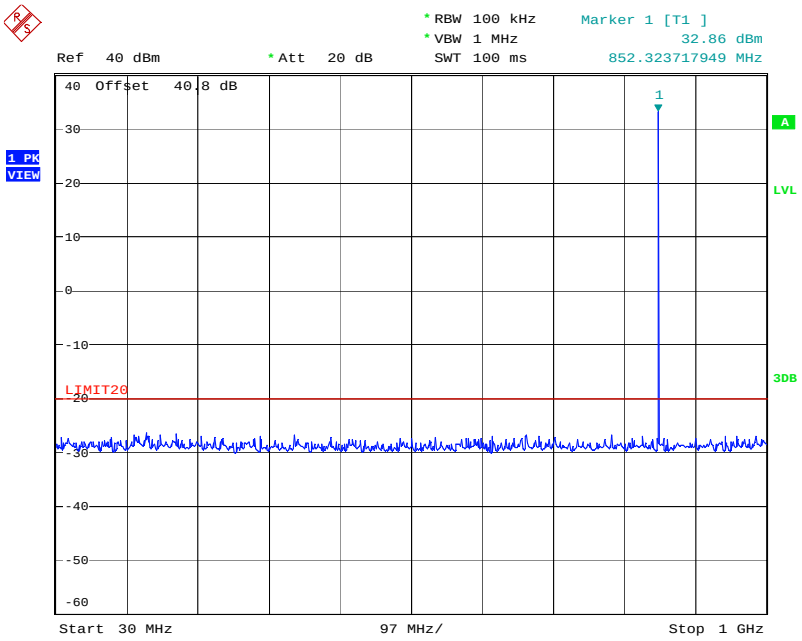


Date: 29.APR.2019 13:02:12

5.9.3.18. Configuration: Tx Conducted , Band 4: 851-869MHz, 851.1MHz, F1W, Digital, Low power



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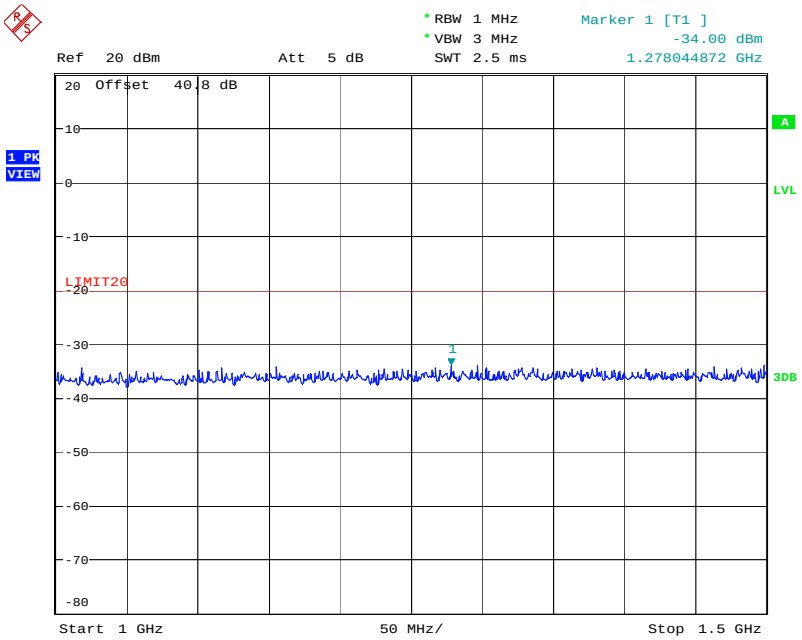

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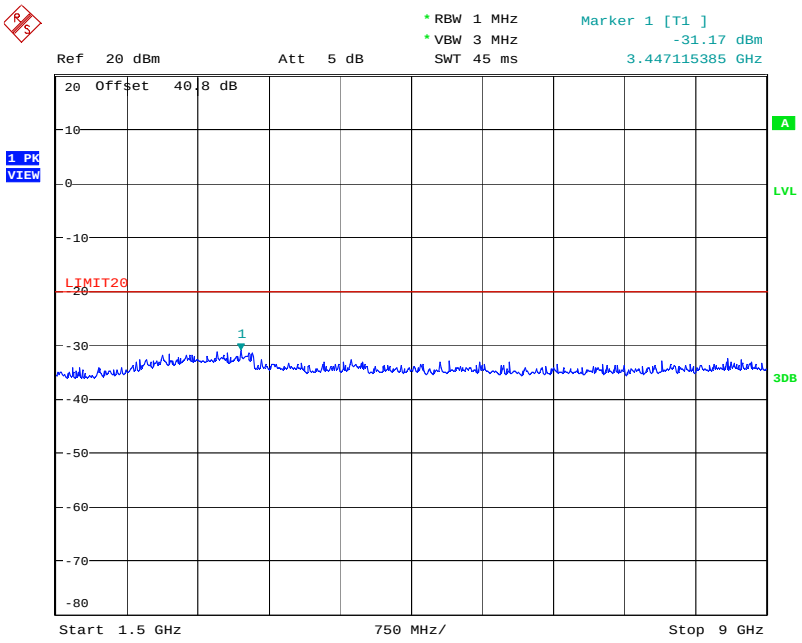
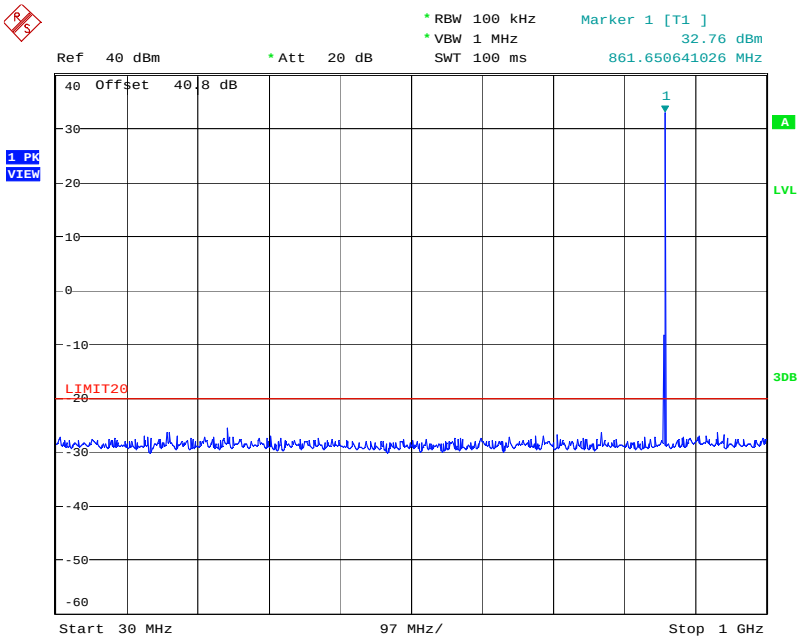
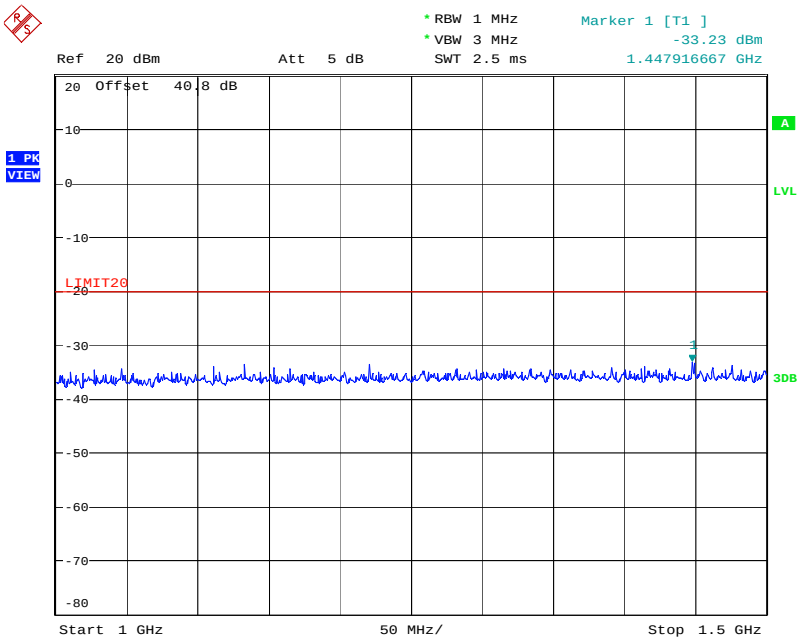


Date: 29.APR.2019 13:03:13

5.9.3.19. Configuration: Tx Conducted , Band 4: 851-869MHz, 860.1MHz, F1W, Digital, Low power



Date: 29.APR.2019 12:48:15



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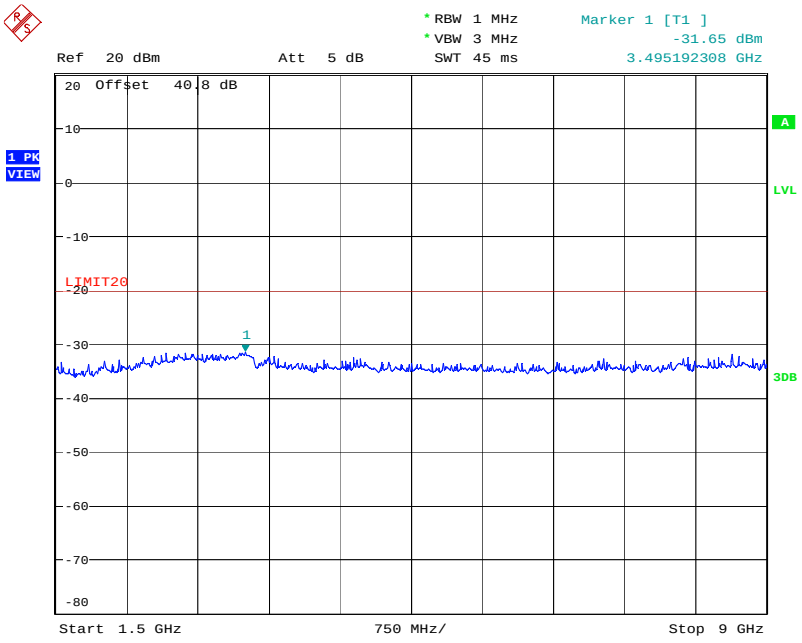
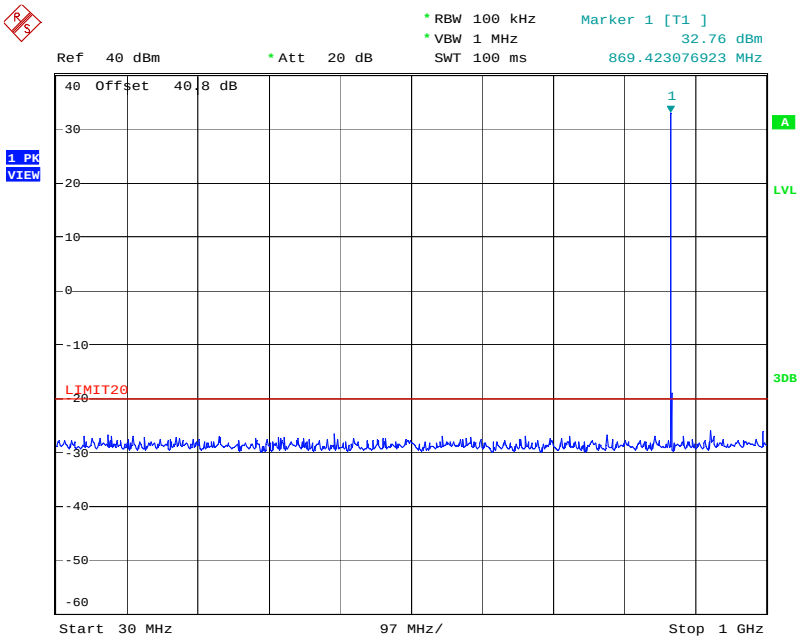


Date: 29.APR.2019 13:04:15

5.9.3.20. Configuration: Tx Conducted , Band 4: 851-869MHz, 868.9MHz, F1W, Digital, Low power



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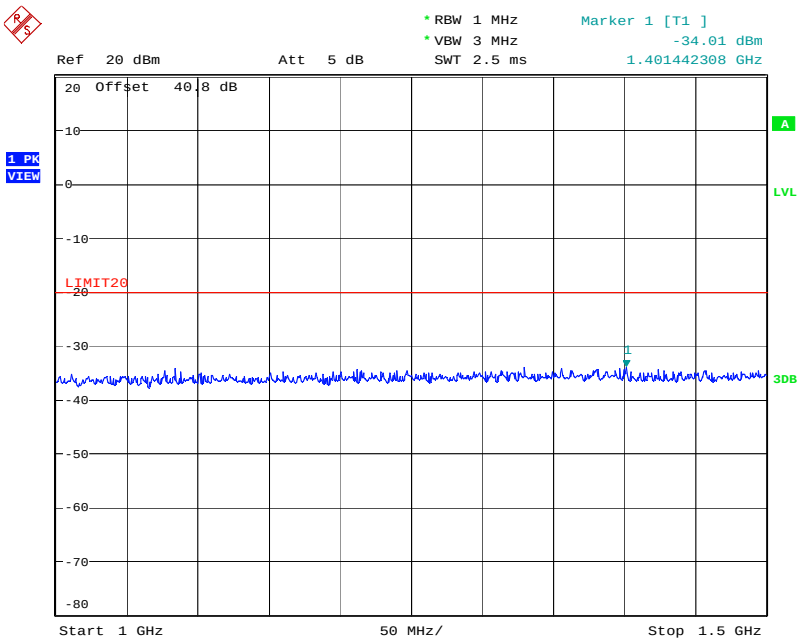

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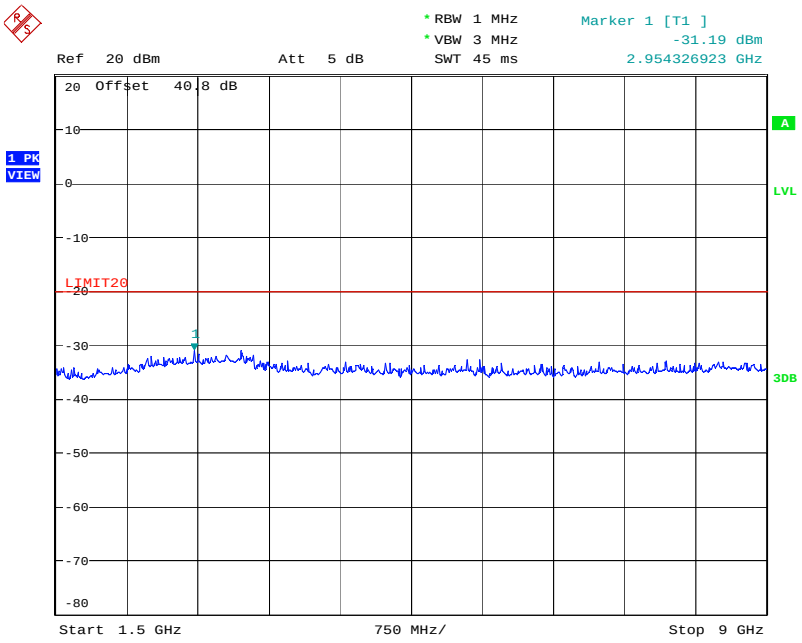


Date: 29.APR.2019 13:04:59

5.10. ADJACENT CHANNEL POWER [§ 90.543]

5.10.1. Limits

§ 90.543 (a) The adjacent channel power (ACP) requirements for transmitters designed for various channel sizes are shown in the following tables. Mobile station requirements apply to handheld, car mounted and control station units. The tables specify a value for the ACP as a function of the displacement from the channel center frequency and measurement bandwidth. In the following tables, "(s)" indicates a swept measurement may be used.

12.5 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
9.375	6.25	−40
15.625	6.25	−60
21.875	6.25	−60
37.50	25.00	−60
62.50	25.00	−65
87.50	25.00	−65
150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

25 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
15.625	6.25	−40
21.875	6.25	−60
37.50	25	−60
62.50	25	−65
87.50	25	−65
150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 kHz to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

5.10.2. Method of Measurements

TIA-603-E and § 90.543

5.10.3. Test Data

5.10.3.1. Analog 12.5 kHz @ 769.1 MHZ

Mode		Analog		
Frequency(MHz)		769.1		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-49.50	-49.88	-40
15.625	6.25	-71.99	-71.43	-60
21.875	6.25	-72.64	-71.98	-60
37.5	25	-66.37	-66.47	-60
62.5	25	-69.30	-69.45	-65
87.5	25	-71.78	-71.22	-65
150	100	-69.66	-69.90	-65
250	100	-74.26	-73.91	-65
350	100	-76.71	-76.75	-65
400	30	-86.35	-86.29	-75
12M	30	-93.80	-93.00	-75

5.10.3.2. Analog 12.5 kHz @ 774.9 MHZ

Mode		Analog		
Frequency(MHz)		774.9		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-49.22	-52.17	-40
15.625	6.25	-72.69	-73.63	-60
21.875	6.25	-73.33	-73.44	-60
37.5	25	-68.17	-68.06	-60
62.5	25	-70.22	-70.60	-65
87.5	25	-72.43	-72.34	-65
150	100	-69.65	-69.63	-65
250	100	-73.71	-73.78	-65
350	100	-76.26	-76.48	-65
400	30	-85.01	-85.96	-75
12M	30	-93.71	-92.78	-75

5.10.3.3. Analog 12.5 kHz @ 799.1 MHZ

Mode		Analog		
Frequency(MHz)		799.1		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-49.33	-51.11	-40
15.625	6.25	-73.26	-73.90	-60
21.875	6.25	-73.86	-73.31	-60
37.5	25	-68.32	-67.84	-60
62.5	25	-70.35	-70.67	-65
87.5	25	-72.30	-72.68	-65
150	100	-69.74	-69.86	-65
250	100	-74.45	-74.38	-65
350	100	-76.90	-76.88	-65
400	30	-85.59	-85.83	-75
12M	30	-93.71	-92.86	-75
In paired receive band	30(swept)	-102.13	-103.26	-100

5.10.3.4. Analog 12.5 kHz @ 804.9 MHZ

Mode		Analog		
Frequency(MHz)		804.9		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-50.11	-49.94	-40
15.625	6.25	-72.51	-72.35	-60
21.875	6.25	-72.68	-72.75	-60
37.5	25	-67.01	-69.35	-60
62.5	25	-69.16	-69.35	-65
87.5	25	-71.90	-71.42	-65
150	100	-68.09	-68.08	-65
250	100	-72.24	-72.04	-65
350	100	-74.89	-74.81	-65
400	30	-84.15	-84.11	-75
12M	30	-93.28	-92.44	-75
In paired receive band	30(Swept)	-102.52	-103.01	-100

5.10.3.5. Digital F1E&F1D 12.5 kHz @ 769.1 MHZ

Mode		Digital F1E&F1D		
Frequency(MHz)		769.1		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-40.66	-43.65	-40
15.625	6.25	-71.96	-72.27	-60
21.875	6.25	-72.68	-72.71	-60
37.5	25	-68.16	-67.80	-65
62.5	25	-70.38	-70.56	-65
87.5	25	-72.93	-72.95	-65
150	100	-70.79	-70.59	-65
250	100	-74.68	-74.57	-65
350	100	-77.03	-77.74	-65
400	30	-84.72	-85.07	-75
12M	30	-93.49	-94.00	-75

5.10.3.6. Digital F1E&F1D 12.5 kHz @ 774.9 MHZ

Mode		Digital F1E&F1D		
Frequency(MHz)		774.9		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-40.68	-41.83	-40
15.625	6.25	-74.81	-74.69	-60
21.875	6.25	-74.88	-75.73	-60
37.5	25	-68.44	-68.34	-65
62.5	25	-70.44	-71.07	-65
87.5	25	-72.22	-72.57	-65
150	100	-69.43	-69.37	-65
250	100	-73.63	-73.26	-65
350	100	-76.23	-76.26	-65
400	30	-84.83	-85.07	-75
12M	30	-93.57	-93.61	-75

5.10.3.7. Digital F1E&F1D 12.5 kHz @ 799.1 MHZ

Mode		Digital F1E&F1D		
Frequency(MHz)		799.1		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-40.49	-43.70	-40
15.625	6.25	-73.89	-74.54	-60
21.875	6.25	-73.86	-74.21	-60
37.5	25	-68.56	-68.03	-65
62.5	25	-70.59	-71.15	-65
87.5	25	-73.67	-73.32	-65
150	100	-69.90	-69.94	-65
250	100	-74.22	-74.55	-65
350	100	-77.05	-76.89	-65
400	30	-85.95	-86.00	-75
12M	30	-93.42	-93.91	-75
In receive band	30(Swept)	-101.47	-103.02	-100

5.10.3.8. Digital F1E&F1D 12.5 kHz @ 804.9 MHZ

Mode		Digital F1E&F1D		
Frequency(MHz)		804.9		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-41.98	-41.34	-40
15.625	6.25	-73.87	-73.08	-60
21.875	6.25	-73.08	-74.19	-60
37.5	25	-67.43	-69.53	-65
62.5	25	-69.30	-69.53	-65
87.5	25	-71.74	-71.24	-65
150	100	-68.61	-68.85	-65
250	100	-73.21	-72.88	-65
350	100	-75.60	-75.61	-65
400	30	-83.82	-83.96	-75
12M	30	-92.41	-92.45	-75
In receive band	30(Swept)	-101.64	-101.98	-100

5.10.3.9. Digital F1W 12.5 kHz @ 769.1 MHZ

Mode		Digital F1W		
Frequency(MHz)		769.1		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-41.87	-41.64	-40
15.625	6.25	-72.70	-72.06	-60
21.875	6.25	-73.21	-73.91	-60
37.5	25	-69.27	-69.24	-65
62.5	25	-72.10	-71.90	-65
87.5	25	-74.24	-74.51	-65
150	100	-70.17	-70.08	-65
250	100	-74.14	-74.30	-65
350	100	-77.15	-77.15	-65
400	30	-85.99	-85.28	-75
12M	30	-93.65	-93.63	-75

5.10.3.10. Digital F1W 12.5 kHz @ 774.9 MHZ

Frequency(MHz)		774.9		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-41.10	-42.93	-40
15.625	6.25	-71.74	-71.74	-60
21.875	6.25	-73.10	-74.13	-60
37.5	25	-68.97	-69.94	-65
62.5	25	-71.63	-71.84	-65
87.5	25	-73.61	-74.05	-65
150	100	-70.17	-69.98	-65
250	100	-74.46	-74.29	-65
350	100	-77.14	-77.14	-65
400	30	-86.95	-87.00	-75
12M	30	-93.09	-93.03	-75

5.10.3.11. Digital F1W 12.5 kHz @ 799.1 MHZ

Mode		Digital F1W		
Frequency(MHz)		799.1		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-40.65	-43.72	-40
15.625	6.25	-72.40	-73.83	-60
21.875	6.25	-73.82	-74.14	-60
37.5	25	-69.08	-69.24	-65
62.5	25	-71.43	-71.67	-65
87.5	25	-73.87	-73.82	-65
150	100	-70.81	-70.35	-65
250	100	-74.68	-75.37	-65
350	100	-77.54	-77.89	-65
400	30	-85.28	-86.16	-75
12M	30	-93.35	-92.98	-75
In receive band	30(Swept)	-102.12	-103.09	-100

5.10.3.12. Digital F1W 12.5 kHz @ 804.9 MHZ

Mode		Digital F1W		
Frequency(MHz)		804.9		
Channel Spacing(KHz)		12.5		
Offset (KHz)	Measurement BW (KHz)	Lower ACP (dBc)	Upper ACP (dBc)	Maximum ACP Relative (dBc)
9.375	6.25	-45.88	-45.33	-40
15.625	6.25	-72.73	-72.89	-60
21.875	6.25	-73.11	-73.41	-60
37.5	25	-68.61	-70.00	-65
62.5	25	-71.23	-70.00	-65
87.5	25	-73.06	-73.00	-65
150	100	-69.35	-69.01	-65
250	100	-73.66	-73.59	-65
350	100	-75.88	-75.79	-65
400	30	-84.22	-84.28	-75
12M	30	-92.25	-92.81	-75
In receive band	30(Swept)	-101.52	-102.17	-100

5.11. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS [§§ 2.1053, 2.1057, 22.359, 80.211(f)(3) & 90.210]

5.11.1. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 90.210(b)	At least 43 + 10 log (P) dB.
§ 90.210(d)	At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.
§ 90.543(b)	At least 43 + 10 log (P) dB

5.11.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Section 8.2 of this report.

5.11.3. Test Data

Remarks:

- The RF spurious/harmonic emission characteristics for different channel spacing are indistinguishable. Therefore, the following radiated emissions were performed at 12.5 kHz channel spacing Digital F1W operation,
- The radiated emissions were performed with high power setting at 3 m distance to represents the worst-case test configuration.
- The emissions were scanned from 30 MHz to 10th harmonics; all spurious emissions that are in excess of 20dB below the specified limit shall be recorded.

5.11.3.1. Near Lowest Frequency (769.1MHz) –Band 1

Test Frequency (MHz):	769.1					
Power Setting:	HIGH					
Limit (dBm):	-13.0					
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured (dBm)	Limit (dBm)	Margin (dB)
1538.2	69.07	PEAK	V	-32.05	-13.0	-19.05
1538.2	70.59	PEAK	H	-28.85	-13.0	-15.85
All other emissions are more than 20 dB below the limit line.						

5.11.3.2. Near Highest Frequency (774.9MHz) –Band 1

Test Frequency (MHz):	774.9					
Power Setting:	HIGH					
Limit (dBm):	-13.0					
Frequency (MHz)	**E-Field (dBµV/m)**	**EMI Detector (Peak/QP)**	**Antenna Polarization (H/V)**	**ERP Measured (dBm)**	**Limit (dBm)**	**Margin (dB)**
1549.8	69.20	PEAK	V	-31.65	-13.0	-18.65
All other emissions are more than 20 dB below the limit line.						

5.11.3.3. Near Lowest Frequency (799.1 MHz) –Band 2

Test Frequency (MHz):	799.1
Power Setting:	HIGH
Limit (dBm):	-13.0
All emissions are more than 20 dB below the limit line.	

5.11.3.4. Near Highest Frequency (804.9MHz) –Band 2

Test Frequency (MHz):	804.9
Power Setting:	HIGH
Limit (dBm):	-13.0
All emissions are more than 20 dB below the limit line.	

5.11.3.5. Near Lowest Frequency (806.1MHz) –Band 3

Test Frequency (MHz):		806.1				
Power Setting:		HIGH				
Limit (dBm):		-13.0				
Frequency (MHz)	**E-Field (dBµV/m)**	**EMI Detector (Peak/QP)**	**Antenna Polarization (H/V)**	**ERP Measured (dBm)**	**Limit (dBm)**	**Margin (dB)**
1612.2	74.45	PEAK	V	-25.85	-13.0	-12.85
1612.2	75.14	PEAK	H	-25.05	-13.0	-12.05
All other emissions are more than 20 dB below the limit line.						

5.11.3.6. Near Middle Frequency (815.1 MHz) –Band 3

Test Frequency (MHz):		815.1				
Power Setting:		HIGH				
Limit (dBm):		-13.0				
Frequency (MHz)	**E-Field (dBµV/m)**	**EMI Detector (Peak/QP)**	**Antenna Polarization (H/V)**	**ERP Measured (dBm)**	**Limit (dBm)**	**Margin (dB)**
1630.2	77.23	PEAK	V	-24.35	-13.0	-11.35
1630.2	76.75	PEAK	H	-24.05	-13.0	-11.05
All other emissions are more than 20 dB below the limit line.						

5.11.3.7. Near Highest Frequency (823.9MHz) –Band 3

Test Frequency (MHz):		823.9				
Power Setting:		HIGH				
Limit (dBm):		-13.0				
Frequency (MHz)	**E-Field (dBµV/m)**	**EMI Detector (Peak/QP)**	**Antenna Polarization (H/V)**	**ERP Measured (dBm)**	**Limit (dBm)**	**Margin (dB)**
1647.8	76.95	PEAK	V	-23.75	-13.0	-10.75
1647.8	76.53	PEAK	H	-23.55	-13.0	-10.55
All other emissions are more than 20 dB below the limit line.						

5.11.3.8. Near Lowest Frequency (851.1MHz) –Band 4

Test Frequency (MHz):		851.1				
Power Setting:		HIGH				
Limit (dBm):		-13.0				
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured (dBm)	Limit (dBm)	Margin (dB)
1702.2	66.58	PEAK	V	-32.35	-13.0	-19.35
All other emissions are more than 20 dB below the limit line.						

5.11.3.9. Near Middle Frequency (860.1 MHz) –Band 4

Test Frequency (MHz):		860.1				
Power Setting:		HIGH				
Limit (dBm):		-13.0				
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured (dBm)	Limit (dBm)	Margin (dB)
All emissions are more than 20 dB below the limit line.						

5.11.3.10. Near Highest Frequency (868.9 MHz) –Band 4

Test Frequency (MHz):		868.9				
Power Setting:		HIGH				
Limit (dBm):		-13.0				
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured (dBm)	Limit (dBm)	Margin (dB)
1737.8	66.92	PEAK	V	-32.35	-13.0	-19.35
All other emissions are more than 20 dB below the limit line.						

5.12. FREQUENCY STABILITY [§§ 2.1055, 22.355, 90.213& 90.539]

5.12.1. Limits

§ 90.213 Transmitters used must have minimum frequency stability as specified in the following table.

Frequency Range (MHz)	Channel Bandwidth (KHz)	Frequency Tolerance (ppm)		
		Fixed and Base Stations	Mobile Stations	
			> 2 W	≤ 2 W
150-174 MHz	6.25 12.5 25	1.0 2.5 5.0	2.0 5.0 5.0	2.0 5.0 50.0*
421-512 MHz	6.25 12.5 25	0.5 1.5 2.5	1.0 2.5 5.0	1.0 2.5 5.0

- Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
- Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

§ 22.355 Transmitters used must have minimum frequency stability as specified in the following table.

TABLE C–1—FREQUENCY TOLERANCE FOR TRANSMITTERS IN THE PUBLIC MOBILE SERVICES

Frequency range (MHz)	Base, fixed (ppm)	Mobile ≤3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

§ 90.539 Transmitters designed to operate in 769–775 MHz and 799–805 MHz frequency bands must meet the frequency stability requirements in this section.
(a) Mobile, portable and control transmitters must normally use automatic frequency control (AFC) to lock on to the base station signal.
(b) The frequency stability of base transmitters operating in the narrowband segment must be 100 parts per billion or better.
(c) The frequency stability of mobile, portable, and control transmitters operating in the narrowband segment must be 400 parts per billion or better when AFC is locked to the base station. When AFC is not locked to the base station, the frequency stability must be at least 1.0 ppm for 6.25 kHz, 1.5 ppm for 12.5 kHz (2 channel aggregate), and 2.5 ppm for 25 kHz (4 channel aggregate).
(d) The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.
(e) The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

Note: For 90.539 band the EUT was tested while AFC was not locked and hence the limit is 1.5ppm. For this unit a limit of 1 ppm is specified by manufacturer.

5.12.2. Method of Measurements

Refer to Section 8.3 of this report for measurement details

5.12.3. Test Data

Test Frequency:	**769.1 MHz**
Full Power Level:	28.18W
Frequency Tolerance Limit:	± 1.0 ppm or ± 769.1 Hz
Max. Frequency Tolerance Measured:	430 Hz or 0.56 ppm
Input Voltage Rating:	13.6VDC (nominal)

Ambient Temperature (°C)	**Frequency Drift (Hz)**		
	Supply Voltage (Nominal) 13.6 VDC	**Supply Voltage(-15%) 11.56 Vdc**	**Supply Voltage(+15%) 15.64 Vdc**
-30	258	--	--
-20	251	--	--
-10	223	--	--
0	244	--	--
10	-203	--	--
20	-225	-228	-237
30	-229	--	--
40	-243	--	--
50	-255	--	--
60	430	--	--

Test Frequency:	**868.9 MHz**
Full Power Level:	31.7 W
Frequency Tolerance Limit:	± 1.0 ppm or ± 868.9 Hz
Max. Frequency Tolerance Measured:	646 Hz or 0.74 ppm
Input Voltage Rating:	13.6 VDC (nominal)

Ambient Temperature (°C)	**Frequency Drift (Hz)**		
	Supply Voltage (Nominal) 13.6 VDC	**Supply Voltage(-15%) 11.56 Vdc**	**Supply Voltage(+15%) 15.64 Vdc**
-30	357	--	--
-20	301	--	--
-10	293	--	--
0	193	--	--
10	217	--	--
20	-262	-264	-270
30	-274	--	--
40	-285	--	--
50	-297	--	--
60	646	--	--

5.13. RF EXPOSURE REQUIREMENTS [§§ 1.1310 & 2.1091]

5.13.1. Limits

§ **1.1310:** The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

5.13.2. Method of Measurements

Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi \cdot r^2} = \frac{EIRP}{4\pi \cdot r^2}$$

Where, P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

$$r = \sqrt{\frac{PG}{4\pi \cdot S}} = \sqrt{\frac{EIRP}{4\pi \cdot S}}$$

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device.

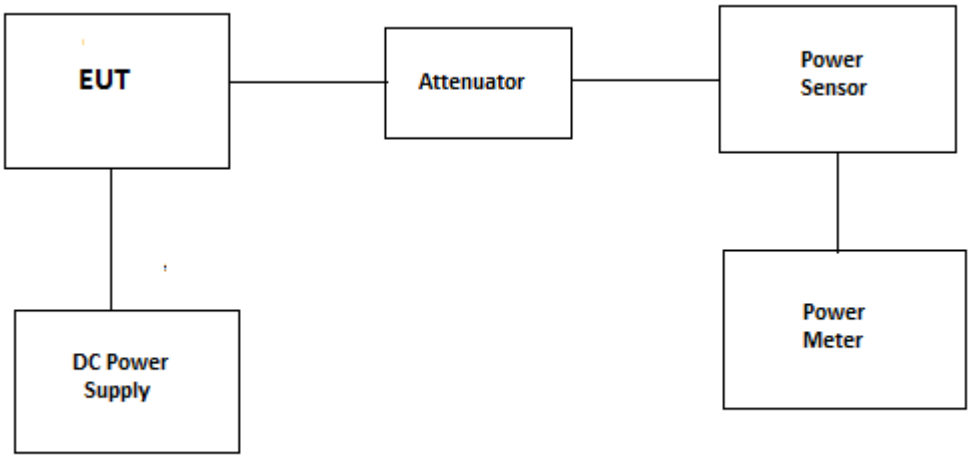
5.13.3. Evaluation of RF Exposure Compliance Requirements

. This mobile radio also contains a **Bluetooth Module** which may transmit simultaneously with Tx output power of 0.00204 Watts which is very low and category excluded for mobile application where minimum 20cm user separation distance from the radio is always maintained

Maximum RF Power conducted, $\mathbf{P_{conducted}[W]}$:	36.4
Maximum Antenna Gain, **G[dBi]**:	0
Maximum EIRP, $\mathbf{P_{EIRP}[W]}$:	36.4
User-based time-average for PTT	50%
MPE Limit for Occupational/Controlled Exposure, $\mathbf{S_{controlled}[mW/cm^2]}$:	2.56
MPE Limit for General Population/Uncontrolled Exposure, $\mathbf{S_{uncontrolled}[mW/cm^2]}$	0.512
Min Calculated RF Safety Distance for Occupational/Controlled Exposure, $\mathbf{r_{safety\_controlled}[cm]}$:	**24**
Min Calculated RF Safety Distance for General Population/Uncontrolled Exposure, $\mathbf{r_{safety\_uncontrolled}[cm]}$	**54**

EXHIBIT 6. Block Diagram & Test Equipment List

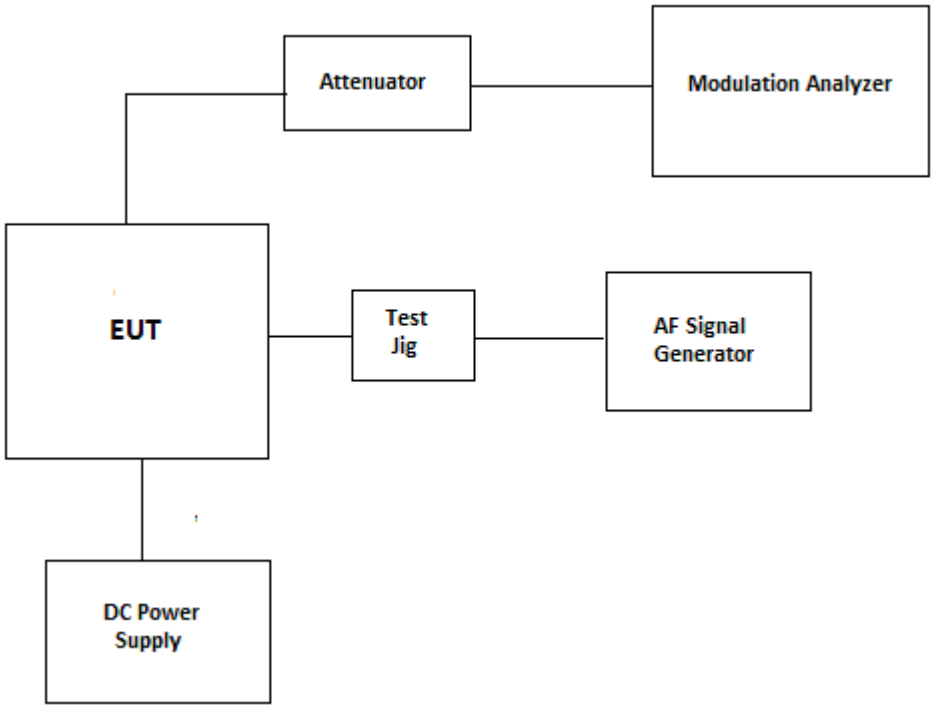
6.1. Conducted Power



Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Power Meter	HP	436A	2709A27515	100KHz-sensor dependant	04 May 2019*
Power Sensor	HP	8482A	MY41172054	10MHz-18GHz	26 Oct 2019
Attenuator(20dB)	Weinschel	WA 35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

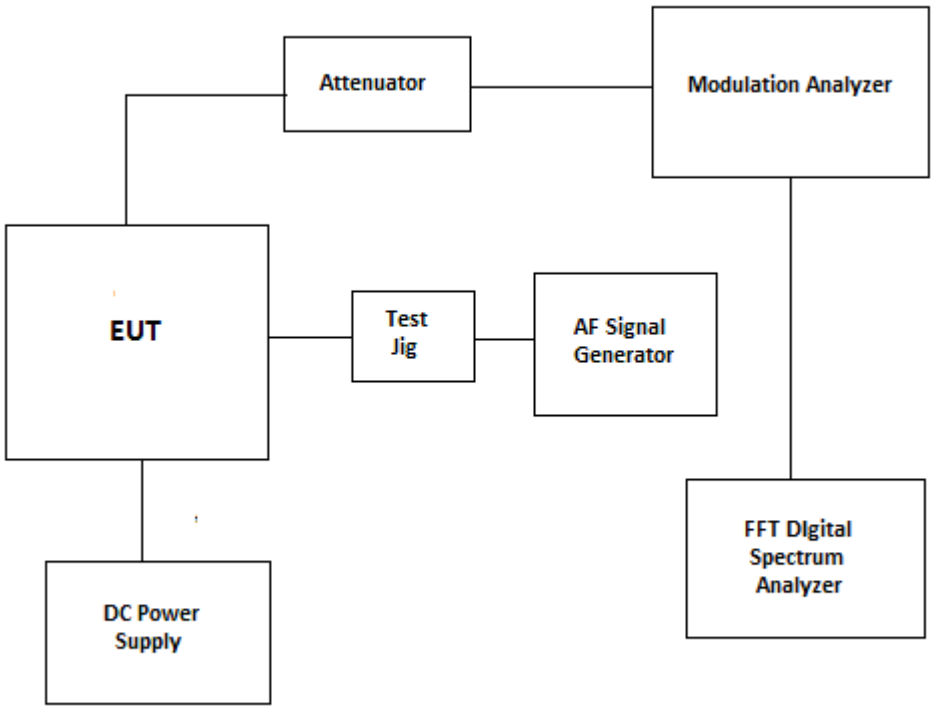
*Test completed before this date on April 22, 2019

6.2. Modulation Limit



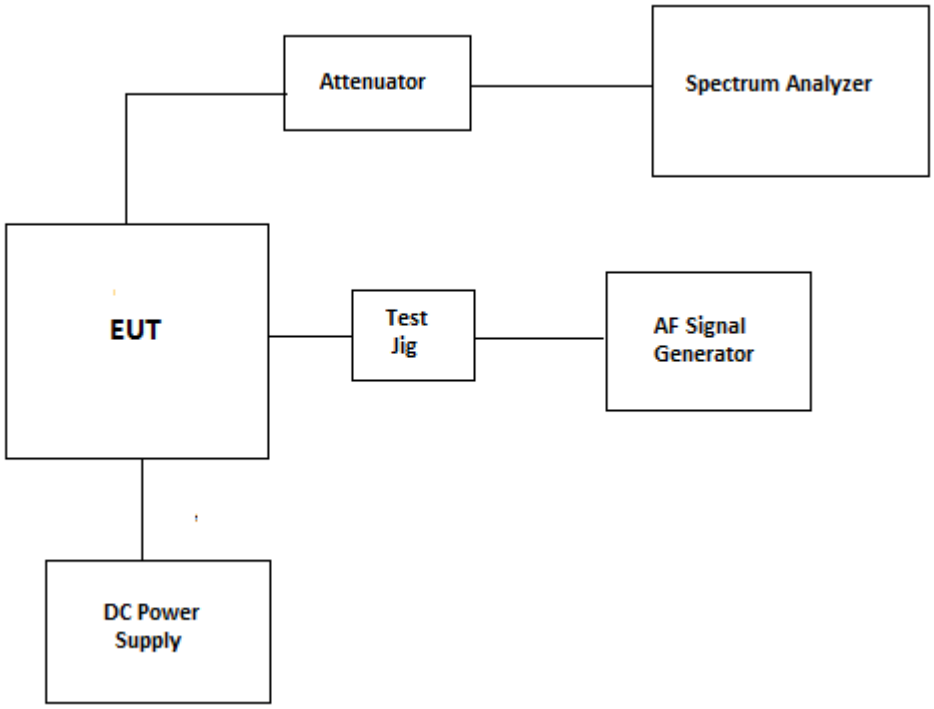
Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Modulation Analyzer	HP	HP-8901B	3226A04606	150KHz-1300MHz	23 Mar 2020
AF Signal Generator	Kuman	FY6600-60M	170966000106	DC-60M	02 Apr 2020
Digital Voltmeter	HP	3456A	2015A04523	--	19 Dec 2019
Attenuator(20dB)	Weinschel	WA 35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

6.3. Audio Frequency Response



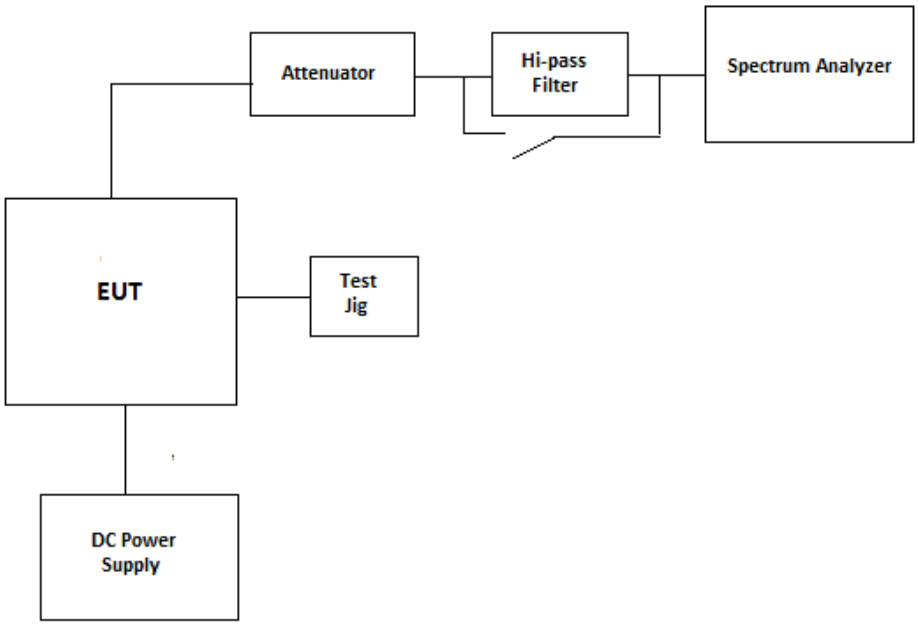
Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Modulation Analyzer	HP	HP-8901B	3226A04606	150KHz-1300MHz	23 Mar 2020
AF Signal Generator	Kuman	FY6600-60M	170966000106	DC-60M	02 Apr 2020
Digital Voltmeter	HP	3456A	2015A04523	--	19 Dec 2019
FFT Digital Spectrum Analyzer	Advantest	R9211E	8202336	10MHz-100KHz	12 Sep 2020
Attenuator(20dB)	Weinschel	WA 35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

6.4. 99% OBW and Mask



Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	06 Oct 2019
AF Signal Generator	Kuman	FY6600-60M	170966000106	DC-60M	02 Apr 2020
Digital Voltmeter	HP	3456A	2015A04523	--	19 Dec 2019
Attenuator(20dB)	Weinschel	WA 35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

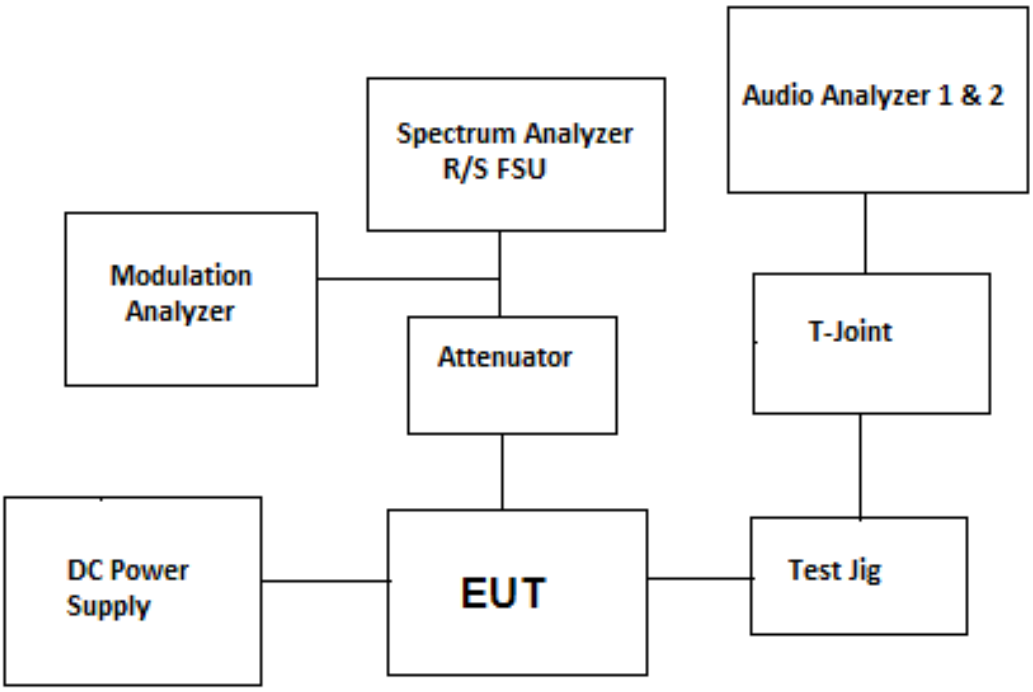
6.5. Tx Conducted Emission



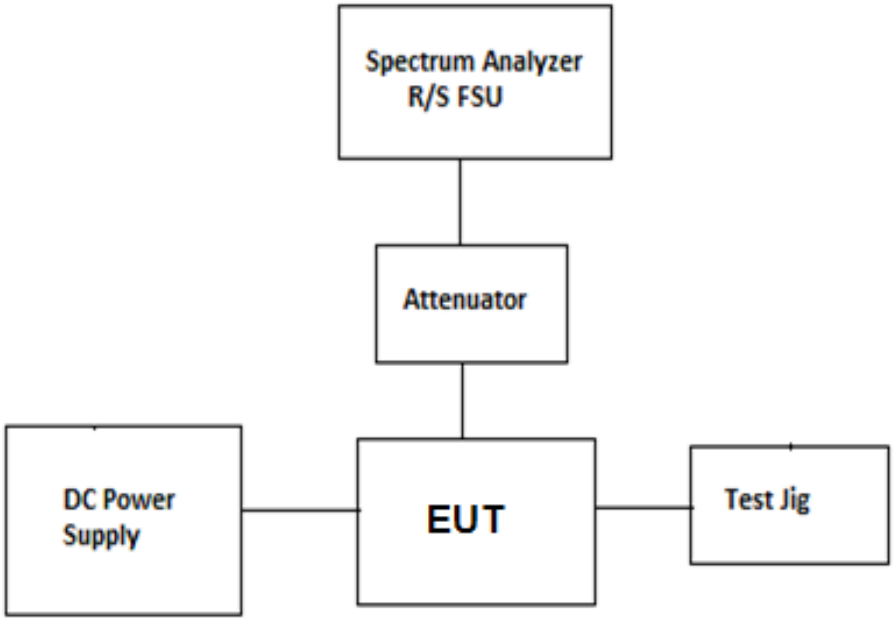
Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	06 Oct 2019
Hi-pass filter	K&L	11SH10-1500/T8000-0/0	2	Cut off 1500MHz	Cal on use
Attenuator(20dB)	Weinschel	WA 35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

6.6. Emission Limitations (ACP)

6.6.1. Test Setup (Analog)

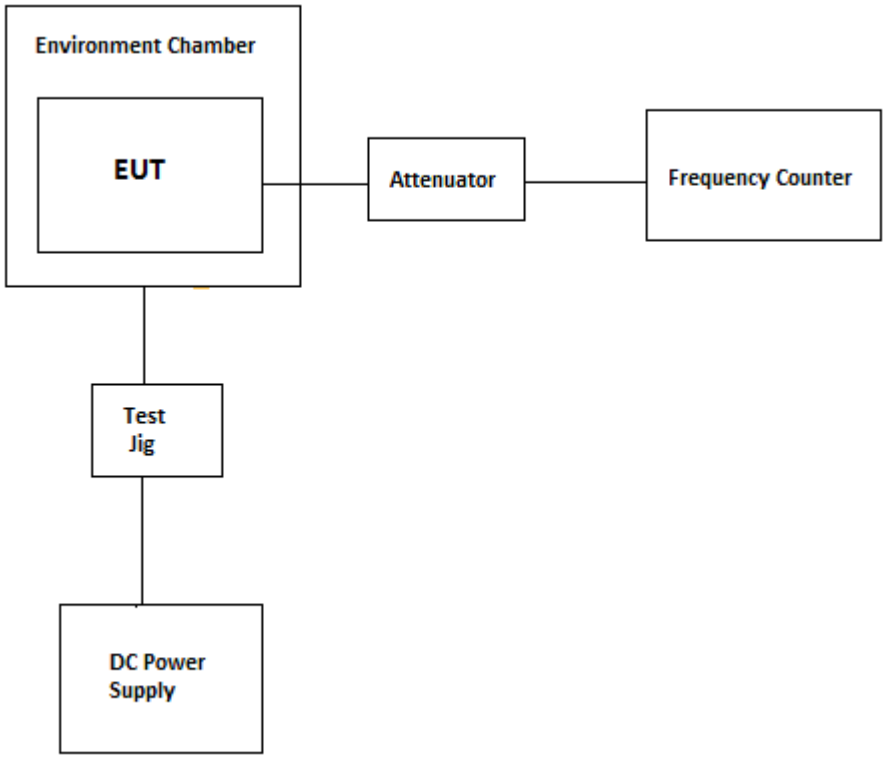


6.7. Test Setup (Digital)



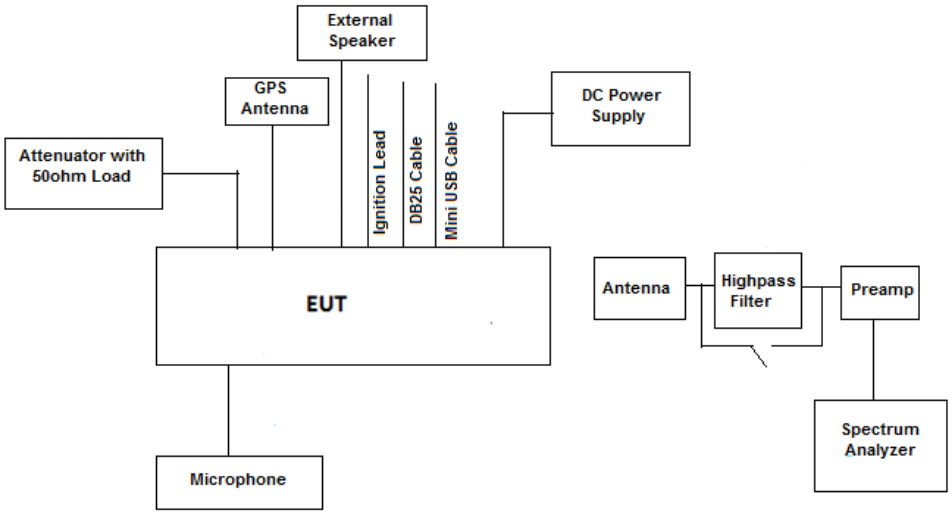
Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	06 Oct 2019
Modulation Analyzer	HP	HP-8901B	3226A04606	150KHz-1300MHz	23 Mar 2020
AF Signal Generator	Kuman	FY6600-60M	170966000106	DC-60M	02 Apr 2020
Digital Voltmeter	HP	3456A	2015A04523	--	19 Dec 2019
Attenuator(20dB)	Weinschel	WA 35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

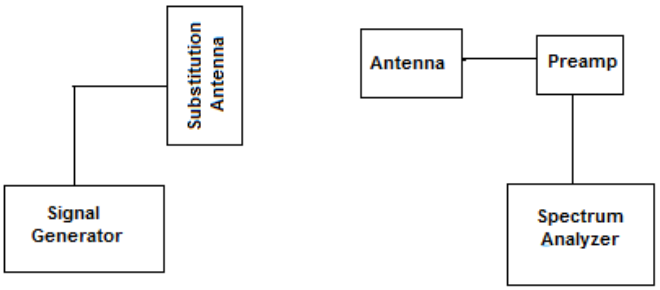
6.8. Frequency Stability



Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177° C	15 Jun 2019
Frequency Counter	HP	5352B	3049A04423	10MHz-40GHz	08 May 2020
Attenuator(20dB)	Aeroflex\Weinschel	34-20-34	BP6023	DC-18GHz	Cal on use
Attenuator(20dB)	Narda	26298	A577	DC-1GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

6.9. Tx Radiated





Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	06 Oct 2019
Bicon Antenna	ETS	3110B	3379	30-200MHz	06 Feb 2020
Log Periodic Antenna	ETS	3148	00023845	200-2000MHz	02 Aug 2020
Horn Antenna	ETS	3117	00119425	1-18GHz	29 Jun 2019
Horn Antenna	ETS	3115	5061	1-18GHz	30 Apr 2020
Signal Generator	Rhode & Schwarz	SMIQ 06ATE	100086	300KHz-6.4GHz	27 Mar 2020
Preamplifier	Com-Power	PAM-118A	551016	500MHz-18GHz	18 Mar 2020
Preamplifier	Com-Power	PA-103	161040	1-1000MHz	12 Apr 2020
Hi-pass filter	K&L	11SH10-1500/T8000-0/0	2	Cut off 1500MHz	Cal on use
Attenuator(20dB)	Weinschel	WA 35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Load(50ohm)	Mini-Circuits	KARN-50+	--	DC-18GHz	Cal on use
Power Supply	HP	6012A	2504A12106	1-60V, DC 50A	----
Multimeter	Fluke	8842A	4142058	---	05 Sep 2020

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 2.15**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.30**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 2.14**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.29**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 1.52**	**Under consideration**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.04**	**Under consideration**

EXHIBIT 8. MEASUREMENT METHODS

8.1. CONDUCTED POWER MEASUREMENTS

- The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
- I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

Step 1: Duty Cycle measurements if the transmitter's transmission is transient

- Using a EMI Receiver with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

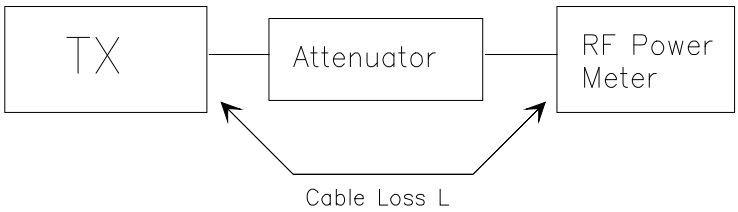
Step 2: Calculation of Average EIRP. See Figure 1

- The average output power of the transmitter shall be determined using a wideband, calibrated RF average power meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);
- The e.i.r.p. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:

EIRP = A + G + 10log(1/x)

{X = 1 for continuous transmission => 10log(1/x) = 0 dB}

Figure 1.



8.2. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

8.2.1. MAXIMIZING RF EMISSION LEVEL (E-FIELD)

(a) The measurements were performed with full rf output power and modulation.
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBμV/m) = Reading (dBμV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver and #2 as follows:

Center Frequency:	test frequency
Resolution BW:	100 KHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies.

8.2.2. Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	100 KHz
Video BW:	VBW > RBW
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna:
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

Where:	P:	Actual RF Power fed into the substitution antenna port after corrected.
	P1:	Power output from the signal generator
	P2:	Power measured at attenuator A input
	P3:	Power reading on the Average Power Meter
	EIRP:	EIRP after correction
	ERP:	ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

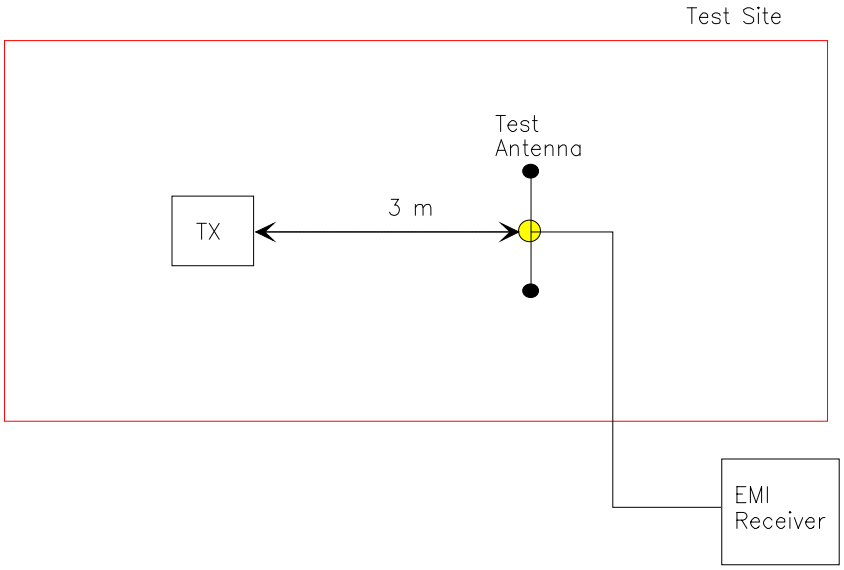
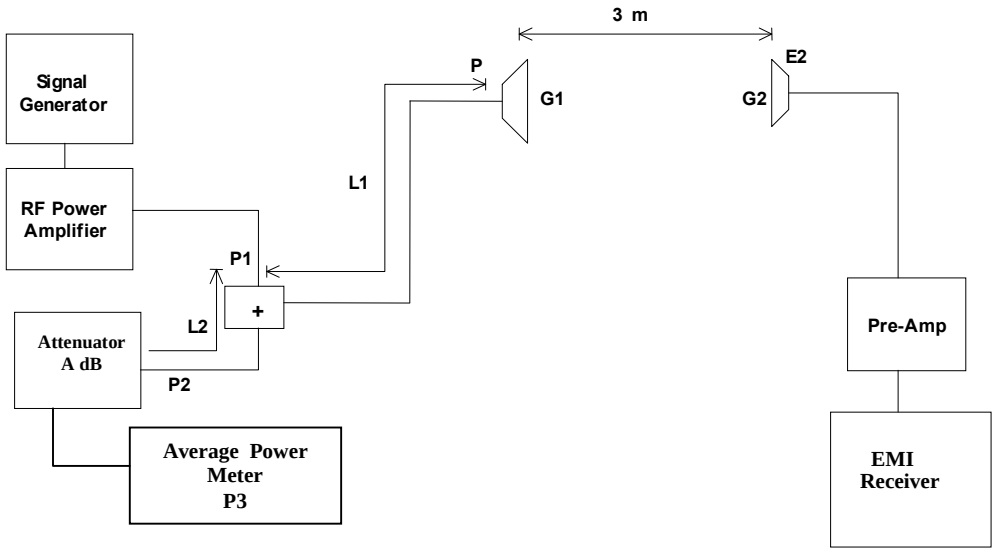


Figure 3



8.3. FREQUENCY STABILITY

Refer to FCC @ 2.1055.

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

8.4. EMISSION MASK

Voice or Digital Modulation Through a Voice Input Port @ 2.1049(c)(i):- The transmitter was modulated by a 2.5 KHz tone signal at an input level 16 dB greater than that required to produce 50% modulation (e.g.: ±2.5 KHz peak deviation at 1 KHz modulating frequency). The input level was established at the frequency of maximum response of the audio modulating circuit.

Digital Modulation Through a Data Input Port @ 2.1049(h):- Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the Emission Masks shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the discretion of the user.

The following EMI Receiver bandwidth shall be used for measurement of Emission Mask/Out-of-Band Emission Measurements:

(1) For 25 KHz Channel Spacing: RBW = 300 Hz
(2) For 12.5 KHz or 6.25 KHz Channel Spacings: RBW = 100 Hz

The all cases the Video Bandwidth shall be equal or greater than the measuring bandwidth.

8.5. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 30 KHz minimum , VBW ≥ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC 47 CFR 2.1057 - Frequency spectrum to be investigated: The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The
amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC 47 CFR 2.1051 - Spurious Emissions at Antenna Terminal: The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be specified.