AT4 wireless, S.A.U.
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FCC LISTED, REGISTRATION NUMBER: 720267

Test report No:

NIE: 49985RRF.001

Test report
REFERENCE STANDARD: USA FCC Part 90

Identificación del objeto ensayado.....: Identification of item tested	Mobile terminal
Marca .....: Trade	PowerTrunk
Modelo y/o referencia tipo .....: Model and /or type reference	MDT-500-2
Other identification of the product .....:	FCC ID: WT7PTMDT500760C
HW version .....:	A model
SW version .....:	674995
Características .....: Features	---
Fabricante .....: Manufacturer	TELTRONIC, S.A.U. Polígono Malpica, Calle F-Oeste (50016). Zaragoza. (SPAIN).
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 90 10-01-15 Edition. Measurement Guidance 971168 D01 v02r02 for certification of Licensed Digital Transmitters ANSI/TIA-603-D: 2010.
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2016.09.20 17:10:23 +02'00'
Fecha de realización .....: Date of issue	2016-09-20
Formato de informe No. .....: Report template No	FDT08_18

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Competences and guarantees

AT4 wireless is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of AT4 wireless.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
49985B/001	Mobile terminal	MDT-500-2	NYMA-29	2016-07-18
49985B/008	Power supply cable	300-00066	---	2016-07-18
49985B/025	Antenna	9525 800 41021	---	2016-07-29

1. Sample S/01 has undergone the test(s).

   All tests indicated in appendix A.

Test sample description

The test sample consists of a Digital Mobile terminal for TETRA, TI D-LMR and P25.

Identification of the client

TELTRONIC, S.A.U.

Polígono Malpica, Calle F-Oeste (50016). Zaragoza. (SPAIN).

Testing period

The performed test started on 2016-07-19 and finished on 2016-09-20.

The tests have been performed at AT4 wireless.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Remarks and comments

1: Used instrumentation.

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent PSA E4440A	2015/10	2017/10
2.	Climatic chamber HERAEUS VM 04/35	2016/03	2018/03
3.	DC power supply R&S NGPE 40/40	2014/11	2017/11
4.	Radiocommunication analyzer HP 8920A	2014/01	2017/01
5.	Wideband Power sensor R&S NRP-Z81	2016/04	2018/04

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2014/03	2017/03
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2013/11	2016/11
5.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
6.	EMI Test Receiver R&S ESU 26	2015/11	2017/11
7.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2015/09	2016/09
8.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M	2016/02	2018/02

2: This information has been provided by the applicant.

Testing verdicts

Not applicable ..... :	N/A
Pass ..... :	P
Fail ..... :	F
Not measured ..... :	N/M

FCC PART 90 PARAGRAPH	VERDICT			
	NA	**P**	**F**	**NM**
Clause 90.207, 90.535: Modulation characteristics				NM[2]
Clause 90.209, 90.531: Occupied Bandwidth		P		
Clause 90.205, 90.541, 90.635: RF output power		P		
Clause 90.210, 90.691: Emission mask		P		
Clause 90.221, 90.543: Adjacent channel power		P		
Clause 90.213, 90.539: Frequency stability		P		
Clause 90.210, 90.221, 90.543, 90.691: Spurious emissions at antenna terminals		P		
Clause 90.210, 90.221, 90.543, 90.691: Radiated emissions		P		

2: see point “Remarks and comments”.

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TEST CONDITIONS

Power supply (V):

V_{nom} = 13.6 Vdc

V_{max} = 15.6 Vdc

V_{min} = 10.8 Vdc

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC Voltage from external power supply

Type of antenna = external connectable antenna

Rated RF Output Power:

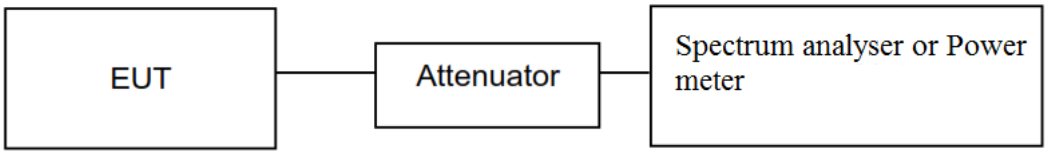
- Mode P25 C4FM (8.1 kHz bandwidth): 45 dBm (31.62 W)
- Mode TETRA (22 kHz bandwidth): 37.5 dBm (5.62 W)
- Mode TI D-LMR (20 kHz bandwidth): 37.5 dBm (5.62 W)

TEST FREQUENCIES:

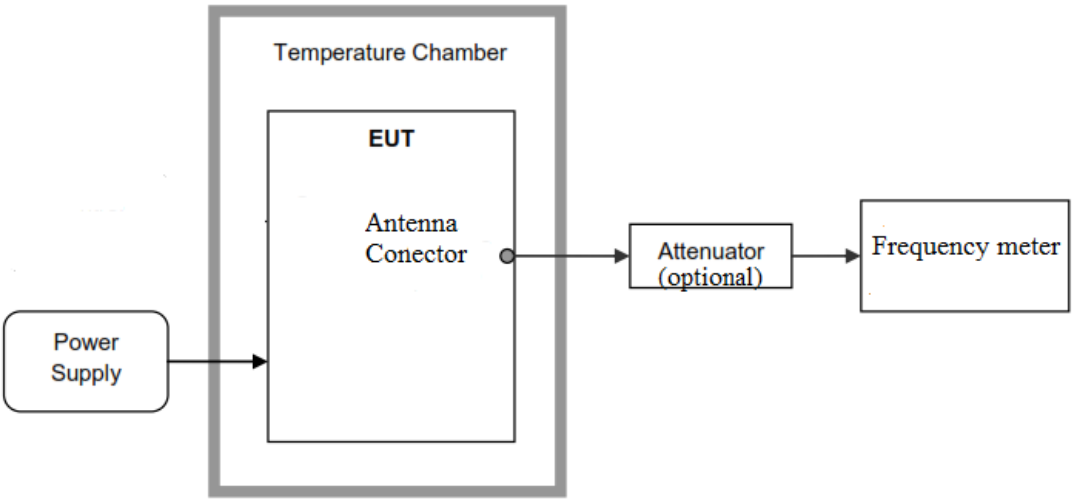
	769-775 MHz band	**799-805 MHz band**	**809-824 MHz band**	**854-869 MHz band**
Lowest channel	769.0125 MHz	799.0125 MHz	809.0125 MHz	854.0125 MHz
Middle channel	772.0125 MHz	802.0125 MHz	816.5 MHz	861.5 MHz
Highest channel	774.9875 MHz	804.9875 MHz	823.9875 MHz	868.9875 MHz

CONDUCTED MEASUREMENTS

The equipment under test (EUT) was set up in a shielded room and it is connected to the spectrum analyzer or power meter through a calibrated attenuator.



For frequency stability test the EUT was placed inside a climatic chamber and connected to a frequency meter using a low loss cable. A external DC power supply was connected to the EUT for voltage variation test.



RADIATED MEASUREMENTS

The equipment under test was scanned for spurious emissions in the frequency range 30 to 10000 MHz.

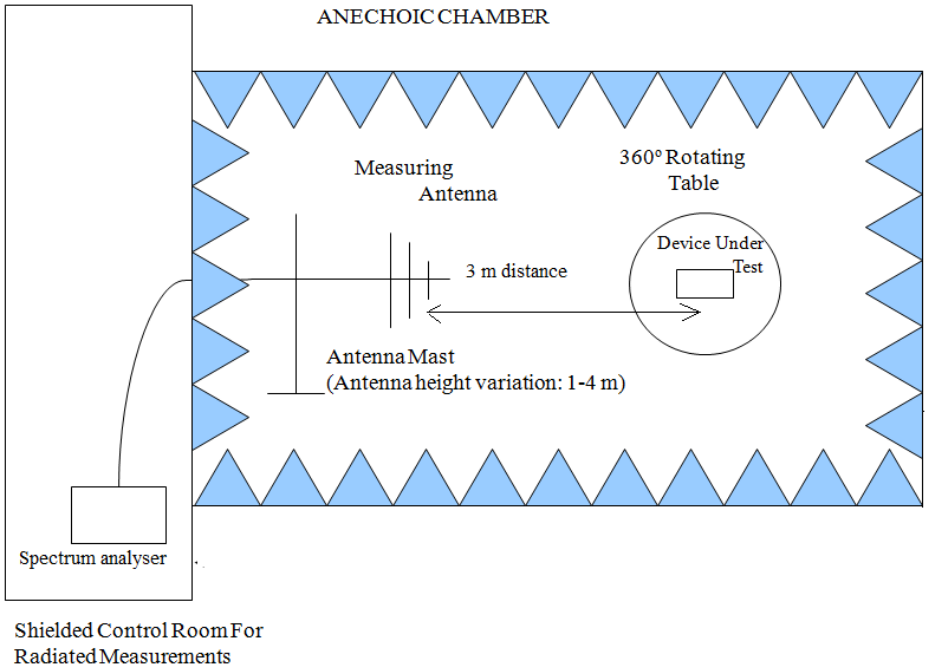
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-10 GHz (1 GHz-18 GHz Double ridge horn antenna).

For radiated emissions in the range 1 GHz-10 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance. The sample is prepared so that transmits continuously when the batteries are connected

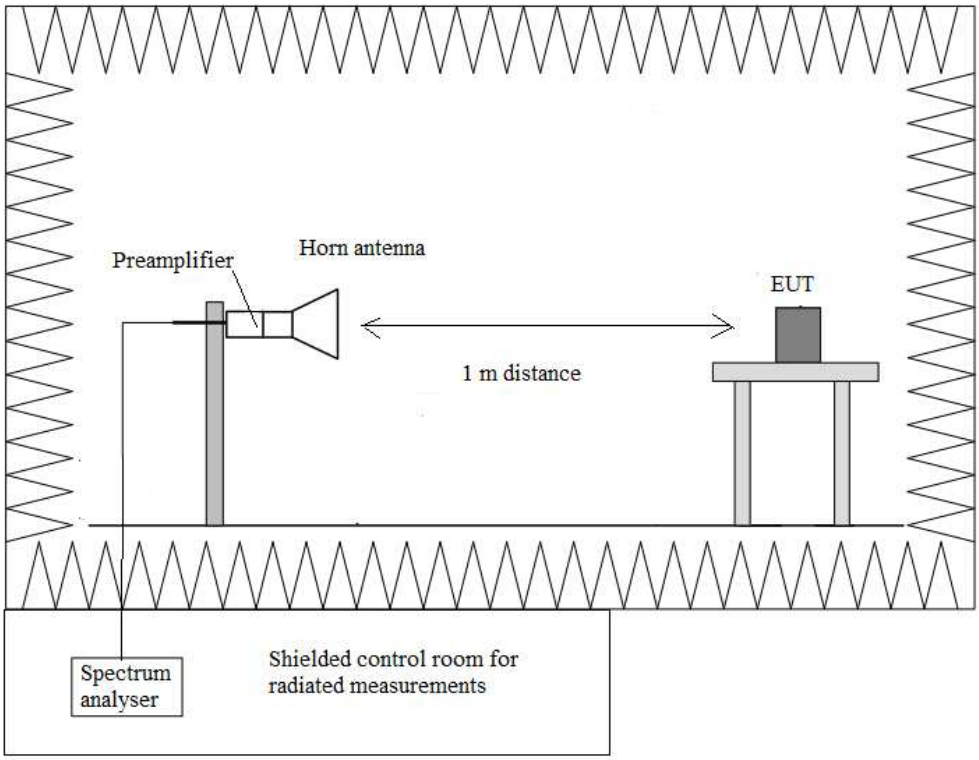
The equipment under test was set up on a non-conductive platform and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup f < 1 GHz



Radiated measurements setup f > 1 GHz



Modulation Characteristics

SPECIFICATION

FCC §2.1047 and §90.207

(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.

(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.

(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of § 2.1049 for the occupied bandwidth tests.

(d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

RESULTS (The following information has been provided by the applicant)

TRANSMITTER LOW PASS FILTER P25:

The modulation used is Continuous 4 Level Frequency Modulation (C4FM), with a modulation rate of 4.8 ksymbols/sec (9.6 kbits/sec).

The access scheme is Carrier Sense Multiple Access (CSMA).

The low pass filter used for pulse shaping in the transmitter is a cascade of a Nyquist Raised Cosine Filter (RC) followed by a Shaping Filter (SF). This is followed by an FM modulator with an FSK deviation of 1800Hz.

The theoretical frequency response of the RC filter defined by the P25 standard (TIA-102.BAAA) is:

$H(f) = 1$ for $|f| < 1920$ Hz

$H(f) = 0.5 + 0.5 \cos(2 \pi f / 1920)$ for $1920 \text{ Hz} < |f| < 2880 \text{ Hz}$

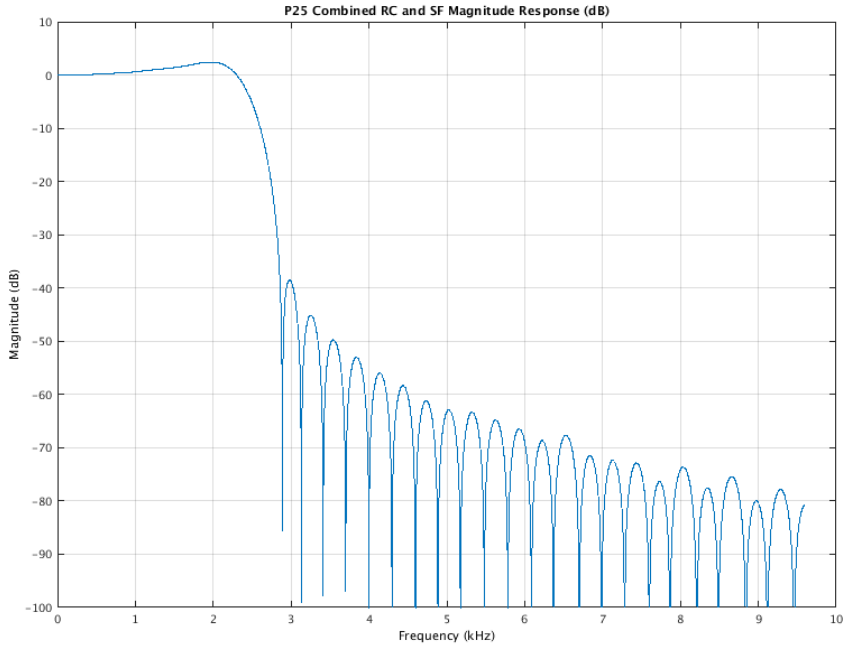
$H(f) = 0$ for $|f| > 2880$ Hz

The theoretical frequency response of the SF is :

$|P(f)| = (p f / 4800) / \sin(p f / 4800)$ for $|f| < 2880$ Hz

The following graph shows the combined transfer function of the aforementioned filters.

MDT-500-2 Transmitter low pass filter for C4FM modulation:



TRANSMITTER LOW PASS FILTER TETRA and TI D-LMR:

The modulation used is p/4-shifted Differential Quaternary Phase Shift Keying (p/4-DQPSK), with a modulation rate of 18 ksymbols/sec (36 kbits/sec).

The access scheme is TDMA with 4 physical channels per carrier.

A root-raised-cosine filter (RRC) is used as transmitting and receiving filter in this digital communication system to perform matched filtering. The combined response of such two filters is that of the raised-cosine filter. The raised-cosine filter is a frequently used filter for pulse-shaping in digital modulation, known for its ability to minimize intersymbol interference (ISI).

The theoretical frequency response of the RRC filter defined by the TETRA standard is:

$G(f) = 1$ for $|f| \leq (1 - \alpha)/2T$

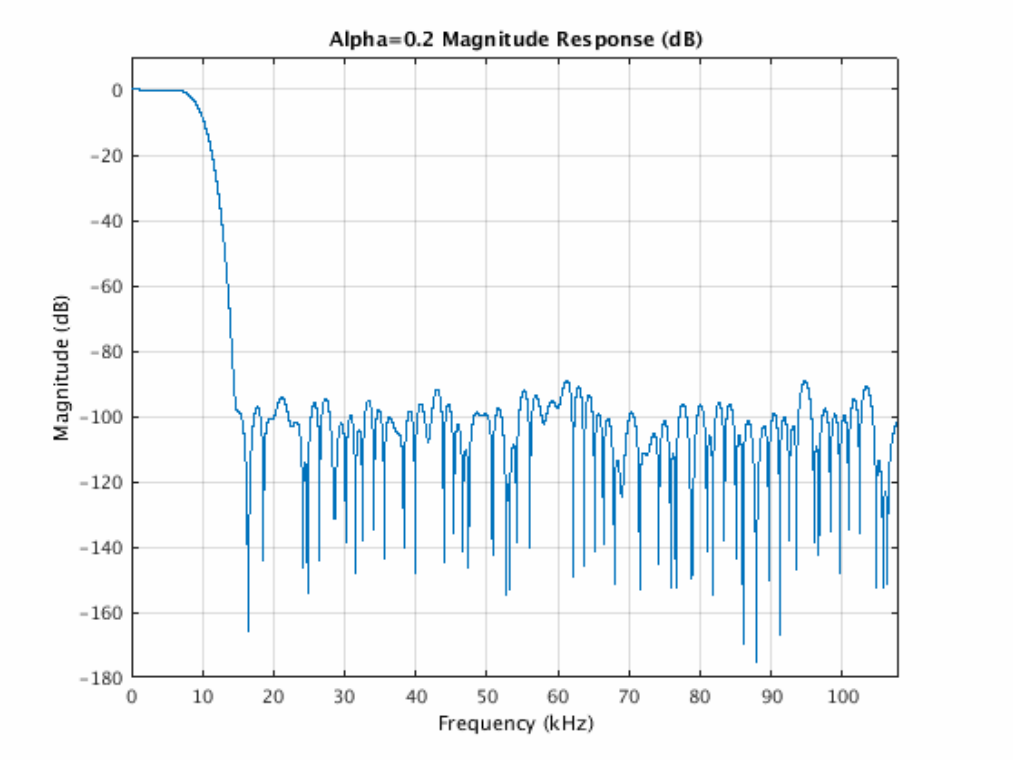
$$G(f) = \sqrt{0.5\left(1 - \sin\left(\frac{\pi(2|f|T-1)}{2\alpha}\right)\right)} \quad \text{for } (1-\alpha)/2T \leq |f| \leq (1+\alpha)/2T$$

$G(f) = 0$ for $|f| \geq (1 + \alpha)/2T$

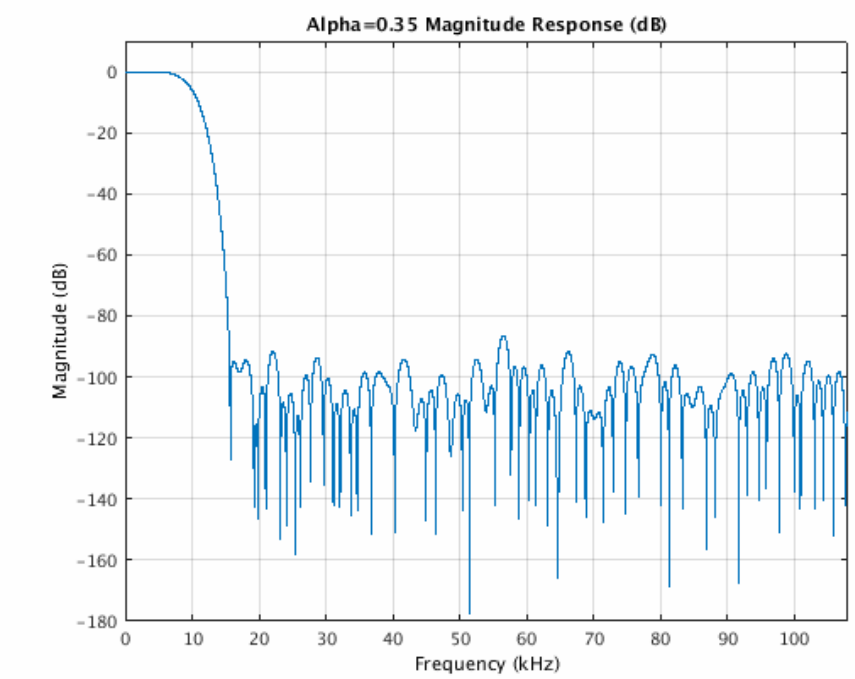
where T is the symbol period, and a is the roll-off factor.

The following two graphs show the transfer function of the aforementioned filter when the modulation is TI D-LMR ($\alpha = 0.2$) and TETRA ($\alpha = 0.35$), respectively.

MDT-500-2 Transmitter low pass filter for TI D-LMR modulation:



MDT-500-2 Transmitter low pass filter for TETRA modulation:



AUDIO LOW PASS FILTER (All modulations):

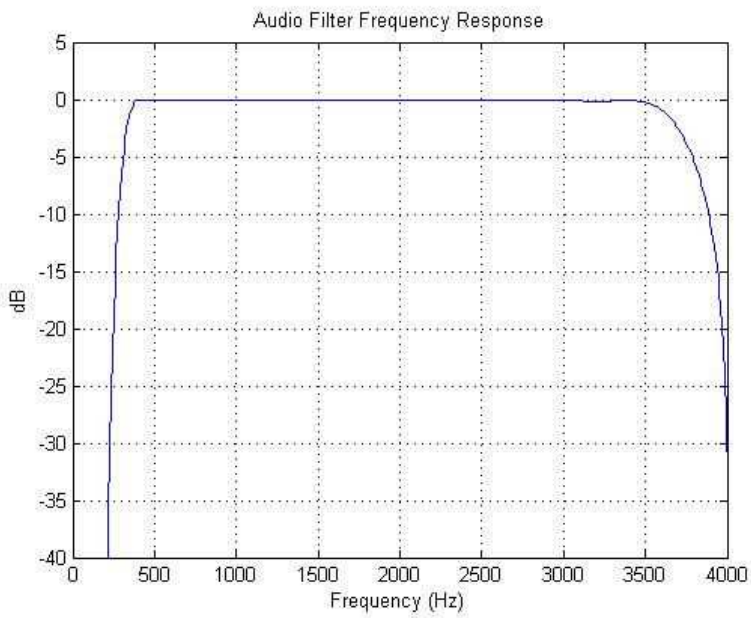
The modulation is limited by the data characteristics and its filters.

In the previous section the phase and quadrature branches (I and Q) are filtered with a root-raised cosine filter (RRC) with a symbol rate of 18 ksymbols/sec.

Then, the signal is π/4-DQPSK modulated (see the plots before).

The signal processing is carried out using a TI TLV320AIC3106 codec which contains the following low pass filter.

MDT-500-2 Audio low pass filter:



Occupied Bandwidth

SPECIFICATION

FCC §2.1049, §90.209, §90.531.

Band plan for the 758-775 MHz and 788-805 MHz bands.

Subject to compliance with the spectrum usage efficiency requirements set forth in §90.535, two or four contiguous narrowband (6.25 kHz) channels may be used in combination as 12.5 kHz or 25 kHz channels, respectively.

809-824 MHz and 854-869 MHz bands.

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
809-824/854-869	25	20

Note: Operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the Adjacent Channel Power limits of § 90.221.

METHOD

The EUT was configured to transmit a modulated carrier signal. The 99% occupied bandwidth and the -26 dBc bandwidths were measured directly using the built-in bandwidth measuring option of spectrum analyser E4440A.

The occupied Bandwidth was measured according to point 4.2 of Guidance 971168 D01 Power Meas License Digital Systems v02r02.

RESULTS (see next plots)

P25 C4FM 8.1 kHz. 769-775 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	8.0181	10.4710
Highest	8.0258	10.4820
Measurement uncertainty (kHz)	<±0.08	

P25 C4FM 8.1 kHz. 799-805 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	8.0049	10.0610
Highest	8.0350	10.0590
Measurement uncertainty (kHz)	<±0.08	

TI D-LMR 20 kHz. 769-775 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.4214	22.3870
Highest	19.4292	22.3950
Measurement uncertainty (kHz)	<±0.17	

TI D-LMR 20 kHz. 799-805 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.4324	22.3730
Highest	19.4324	22.3730
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz.769-775 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.0868	24.0920
Highest	21.1211	24.1090
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz.799-805 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.0765	24.0970
Highest	21.0420	24.0930
Measurement uncertainty (kHz)	<±0.17	

TI D-LMR 20 kHz. 809-824 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.4259	22.3870
Middle	19.4346	22.4080
Highest	19.4319	22.3890
Measurement uncertainty (kHz)	<±0.17	

TI D-LMR 20 kHz. 854-869 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.4436	22.4110
Middle	19.4239	22.3890
Highest	19.4430	22.3860
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz. 809-824 MHz band.

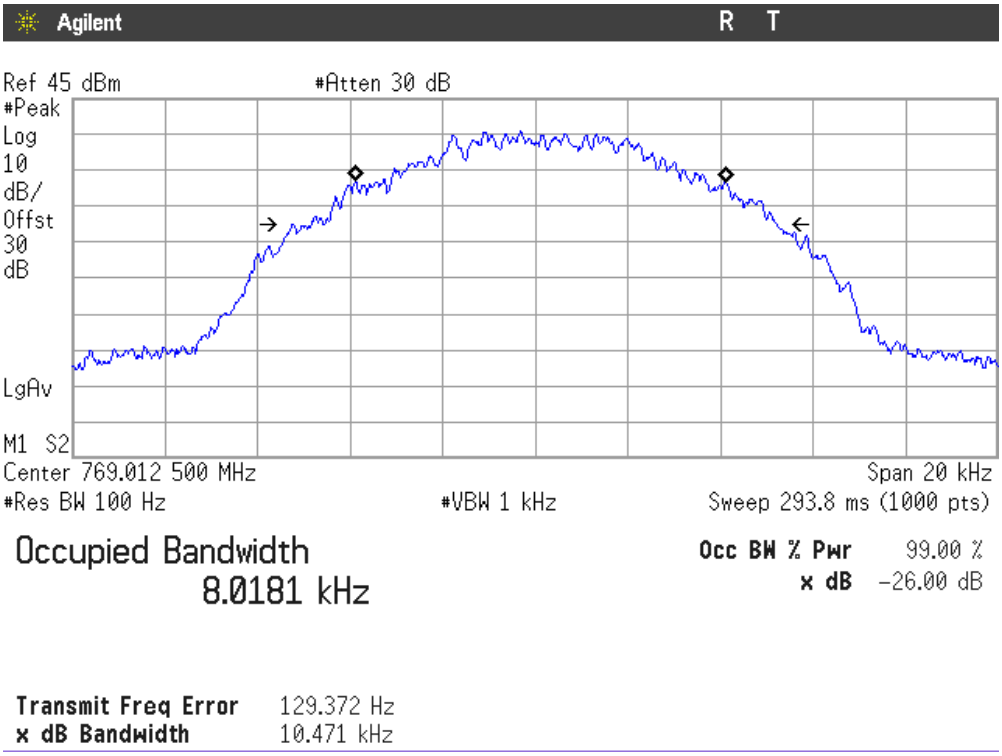
Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.1080	24.0990
Middle	21.1017	24.0970
Highest	21.1003	24.0830
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz. 854-869 MHz band.

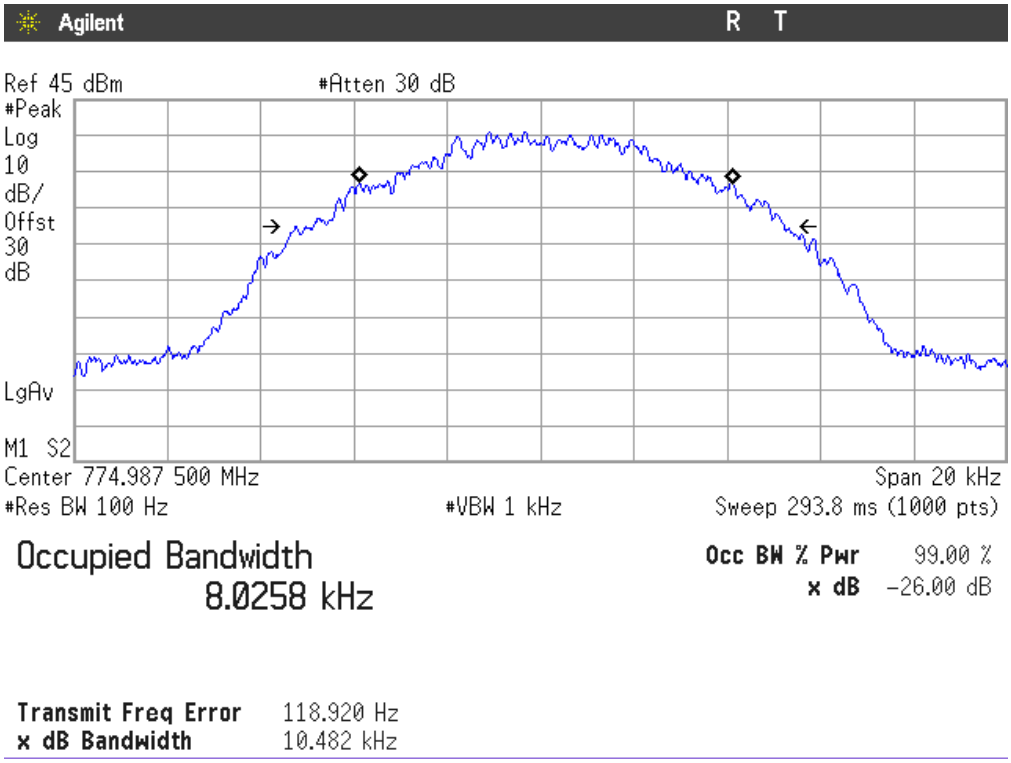
Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.0950	24.0830
Middle	21.0918	24.0870
Highest	21.1072	24.1070
Measurement uncertainty (kHz)	<±0.17	

P25 C4FM 8.1 kHz. 769-775 MHz band.

Lowest Channel

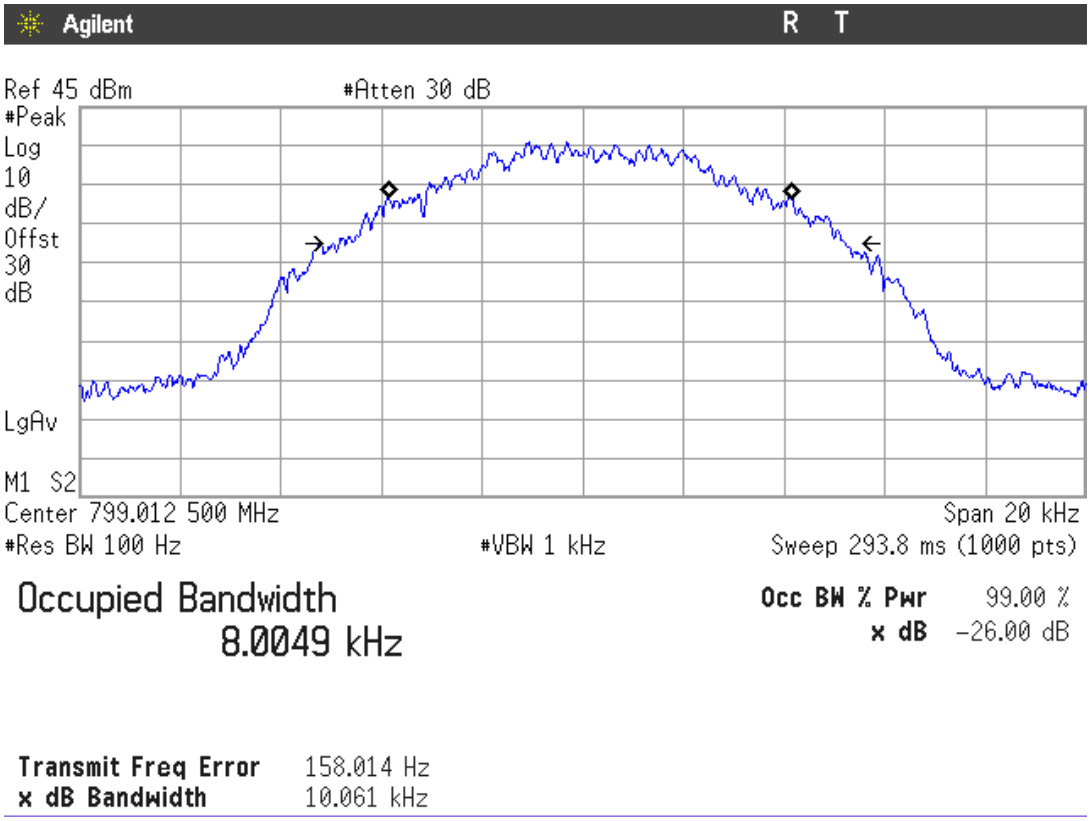


Highest Channel

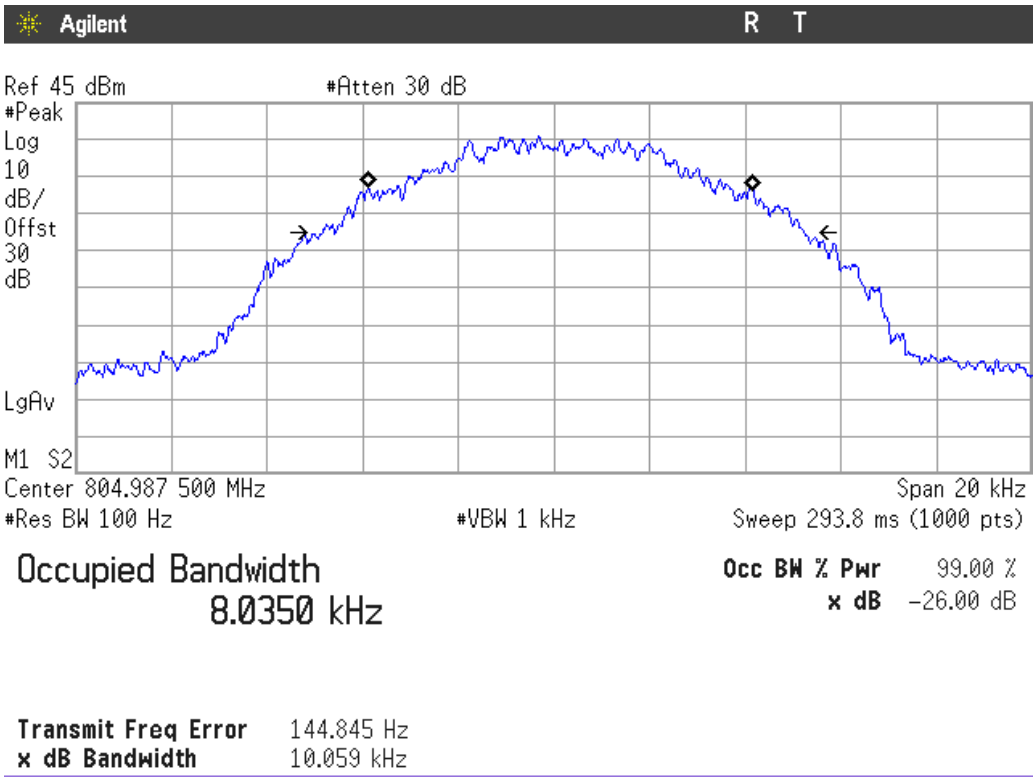


P25 C4FM 8.1 kHz. 799-805 MHz band.

Lowest Channel

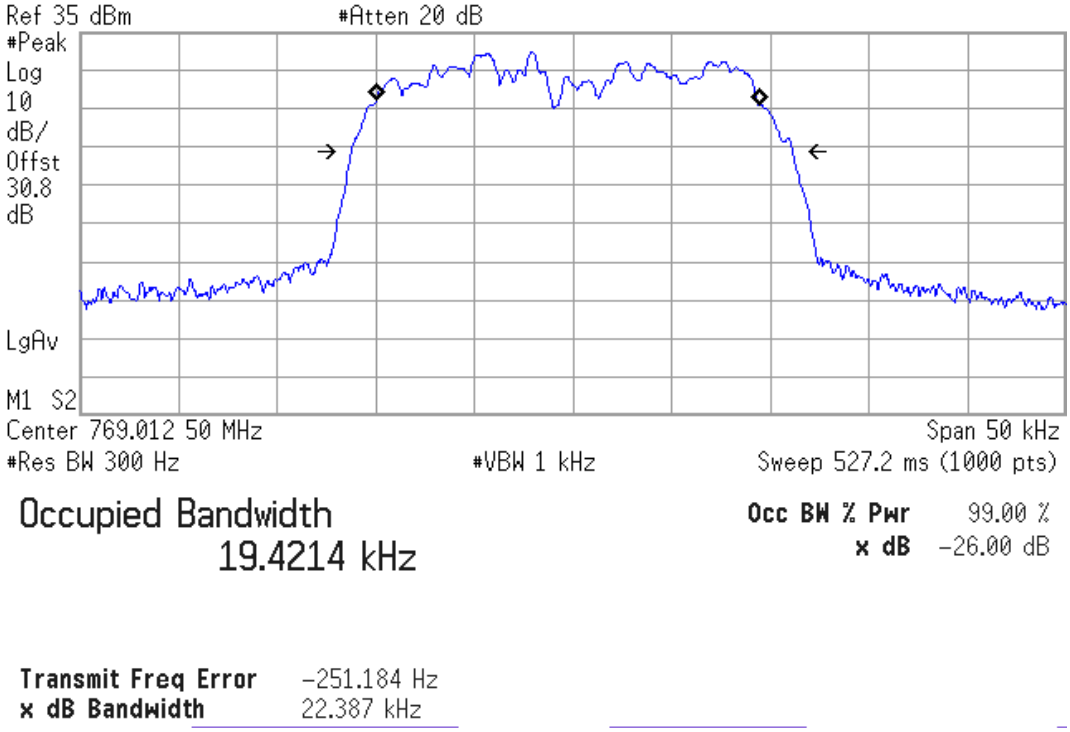


Highest Channel

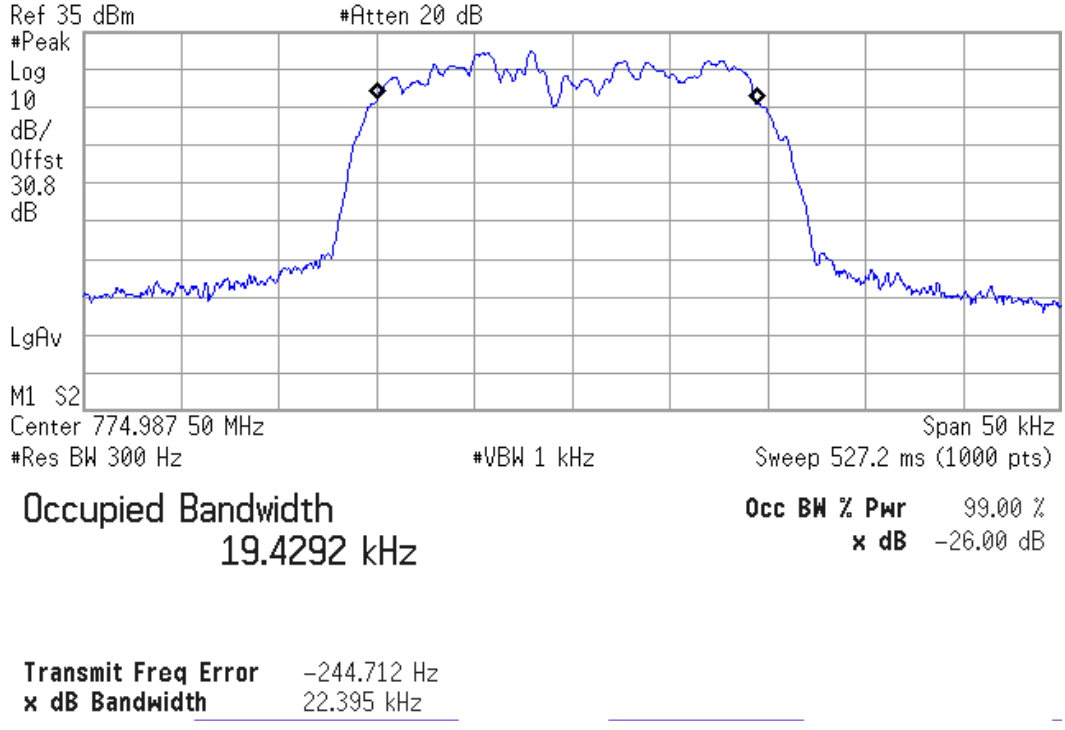


TI D-LMR 20 kHz. 769-775 MHz band.

Lowest Channel

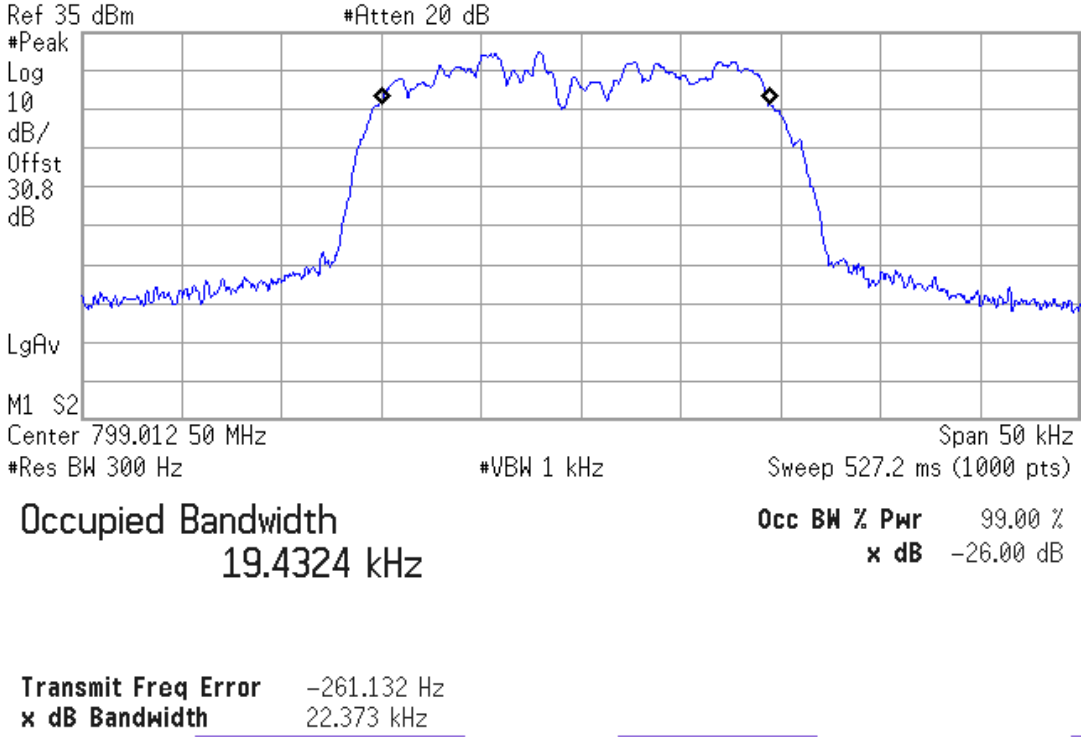


Highest Channel

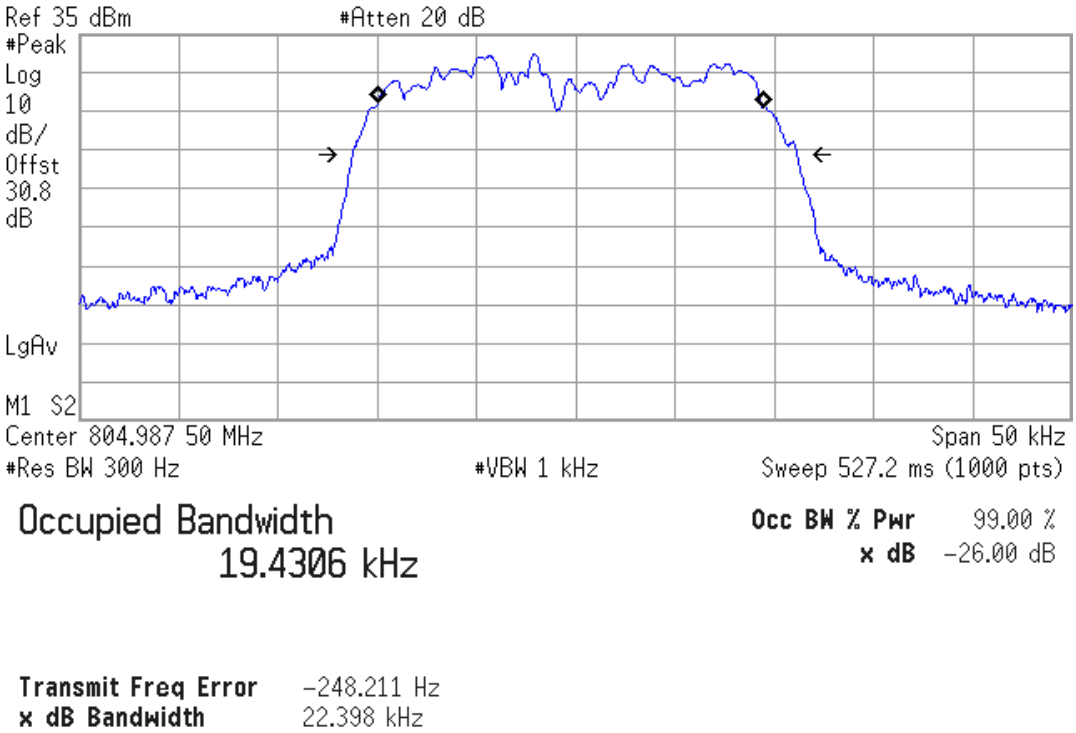


TI D-LMR 20 kHz. 799-805 MHz band.

Lowest Channel

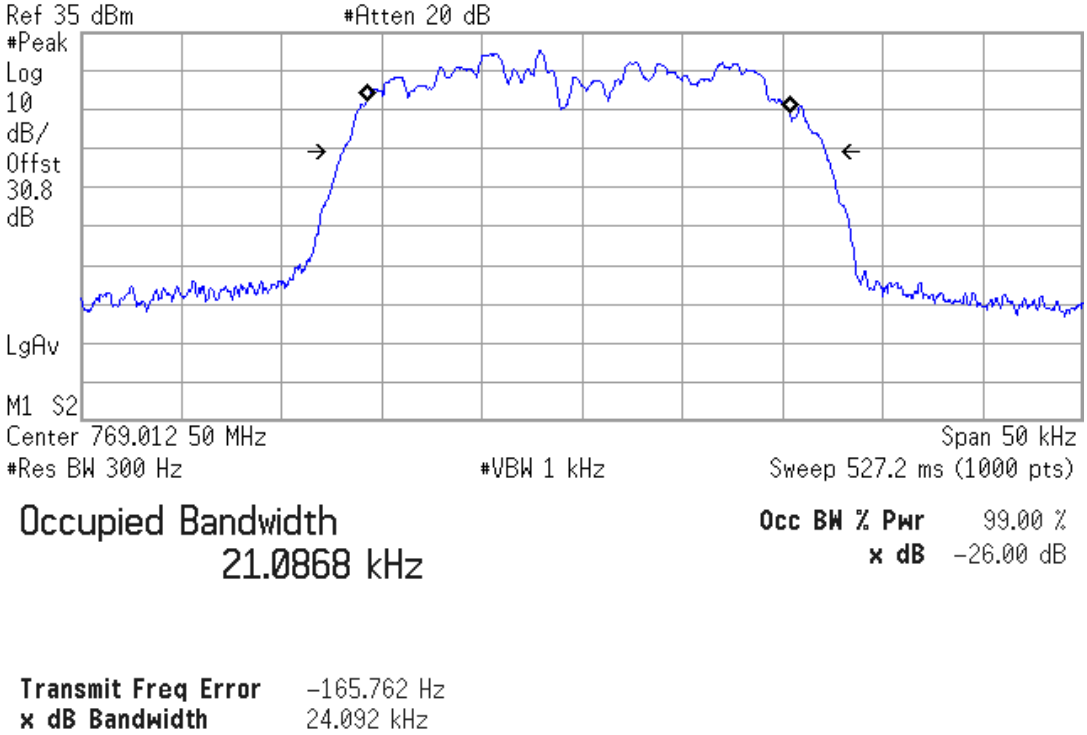


Highest Channel

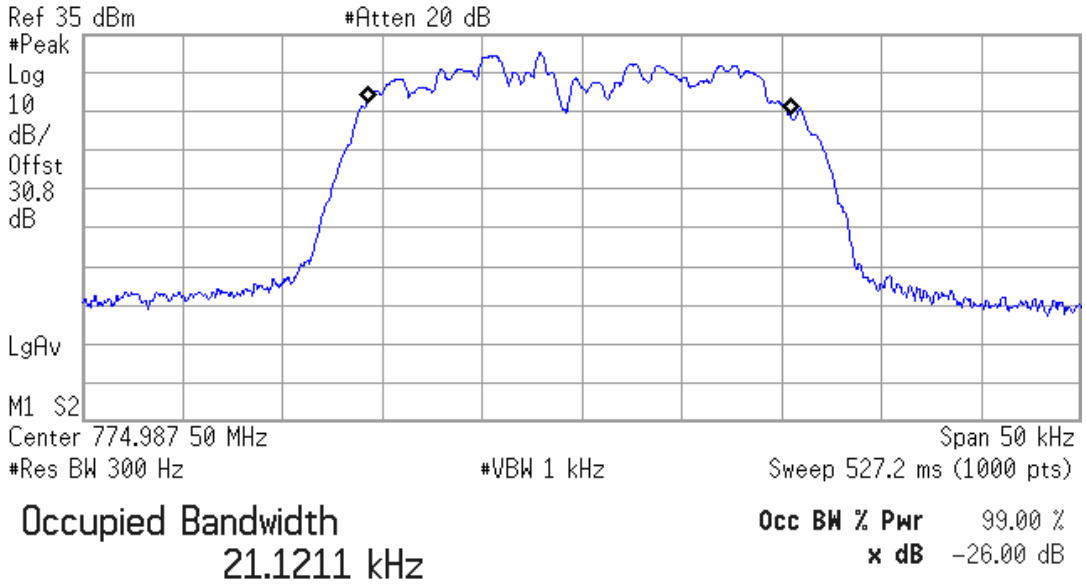


TETRA 22 kHz.769-775 MHz band.

Lowest Channel

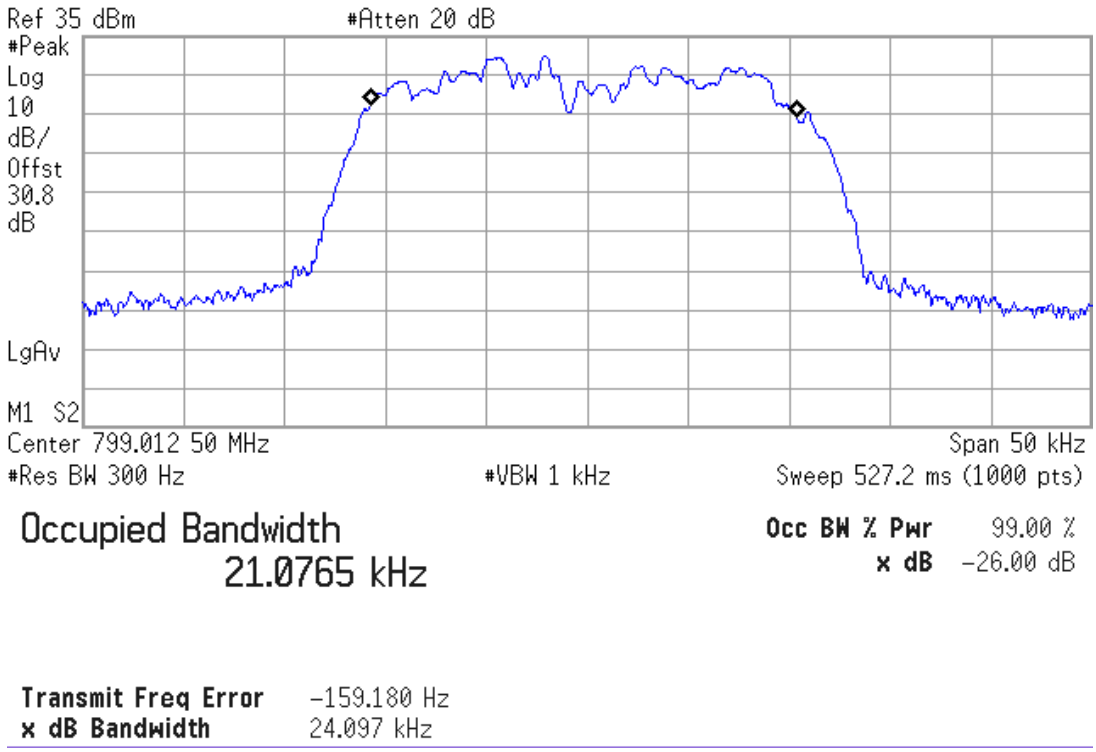


Highest Channel

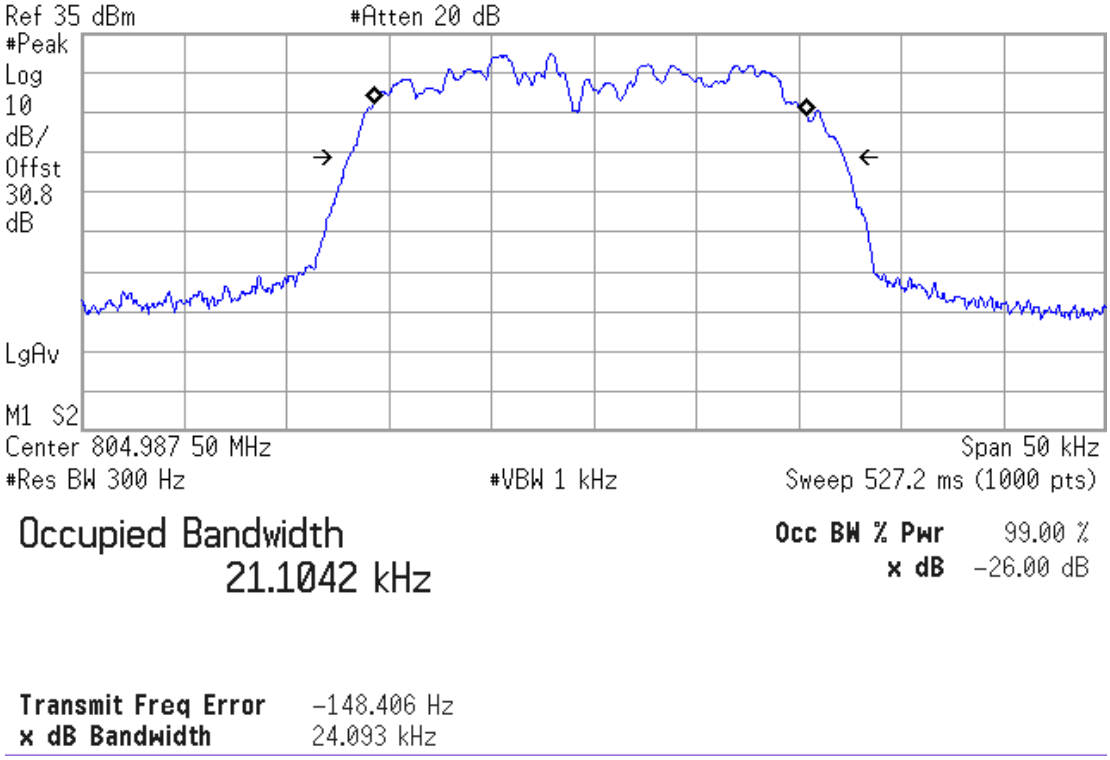


TETRA 22 kHz.799-805 MHz band.

Lowest Channel

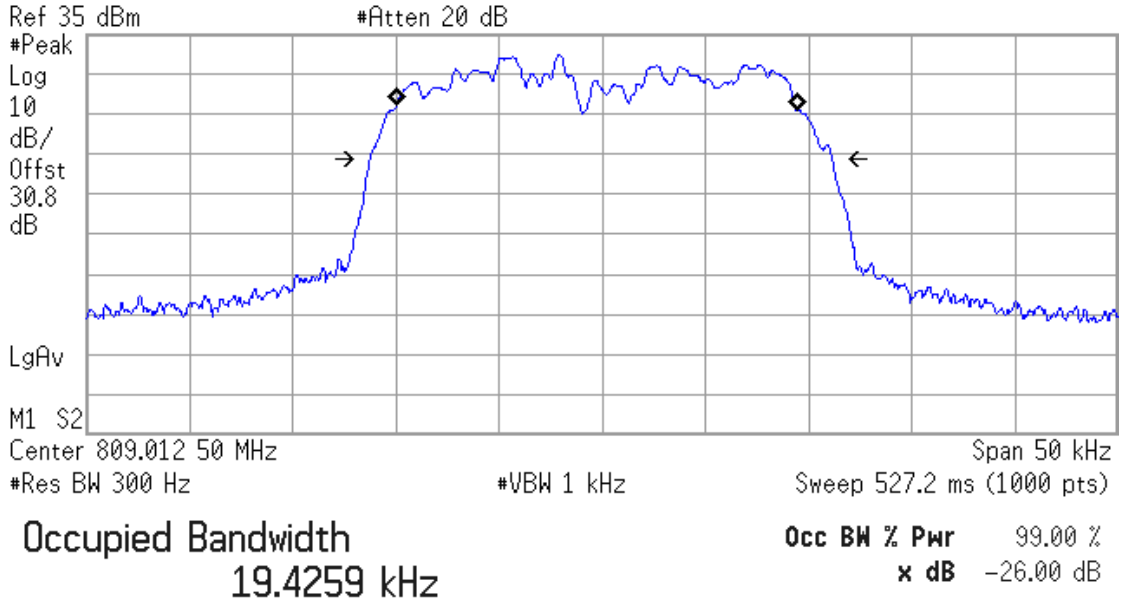


Highest Channel

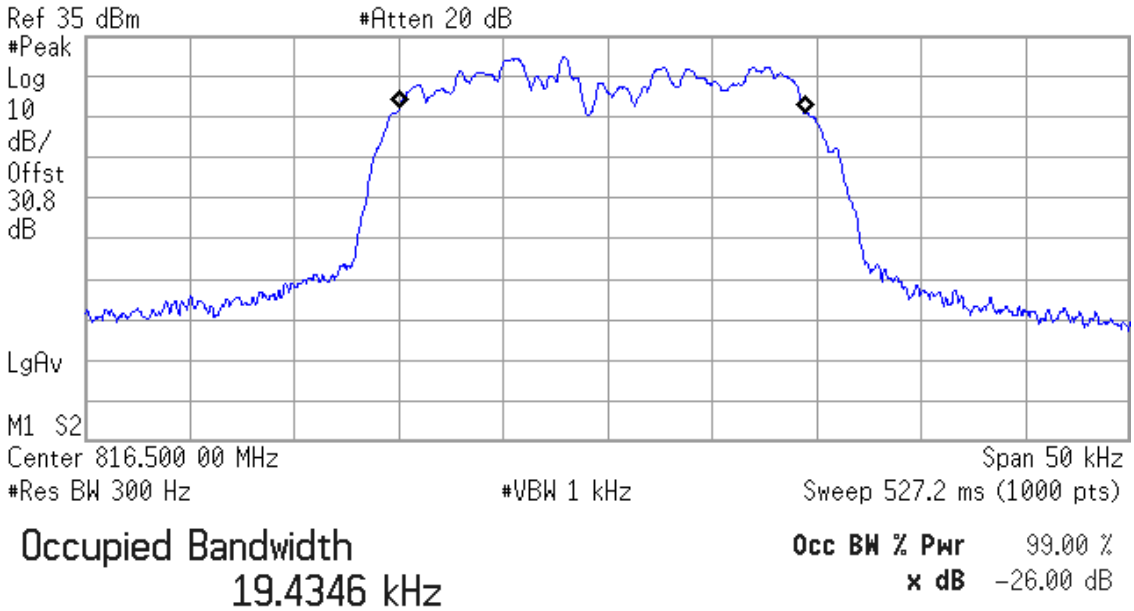


TI D-LMR 20 kHz. 809-824 MHz band.

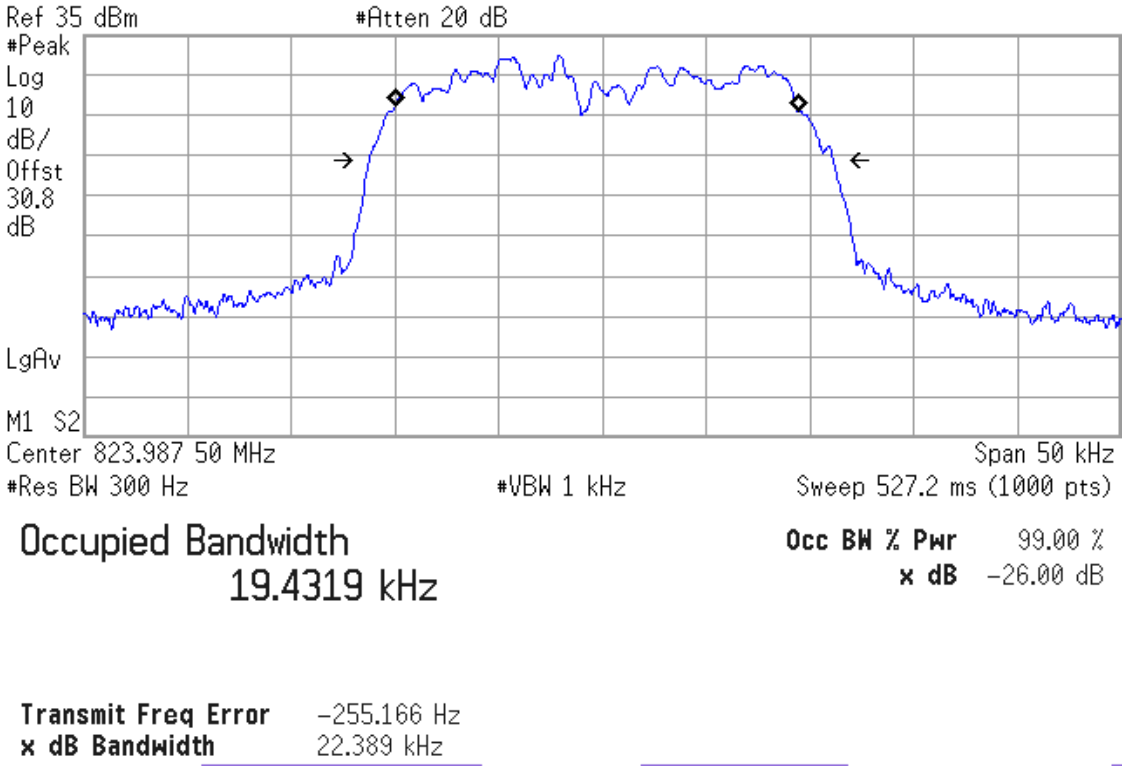
Lowest Channel



Middle Channel

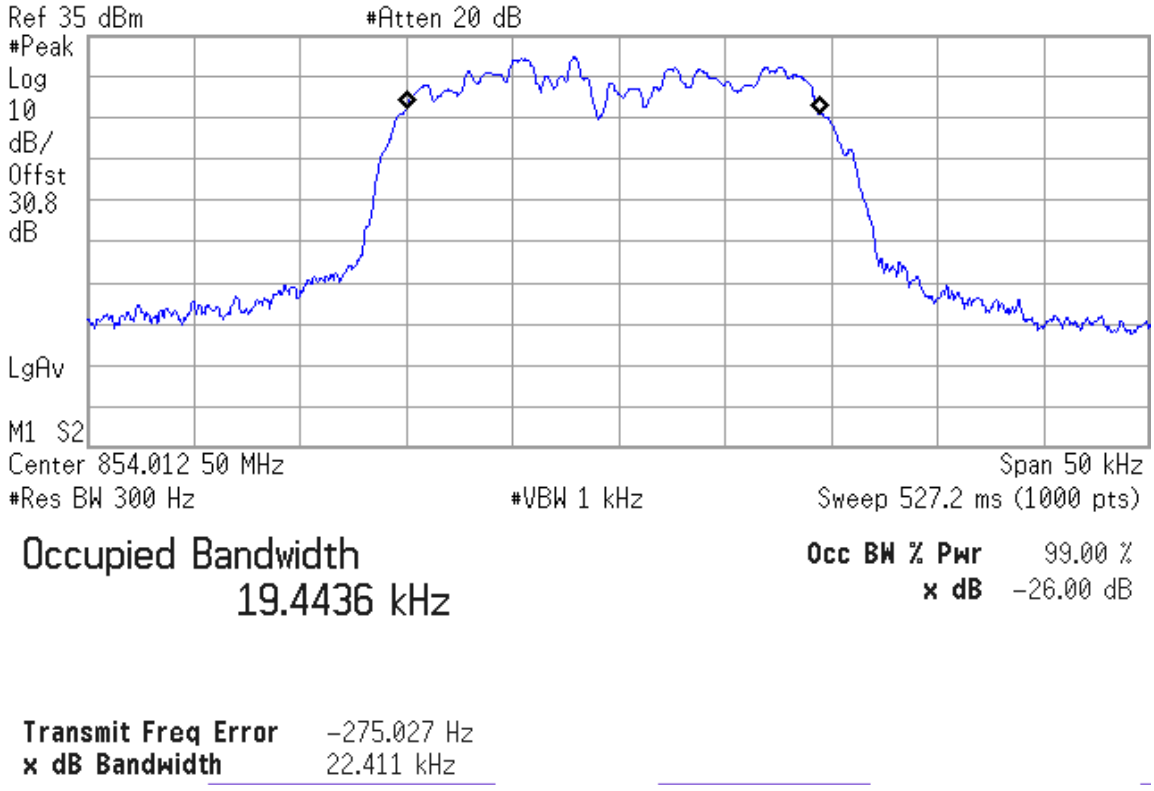


Highest Channel

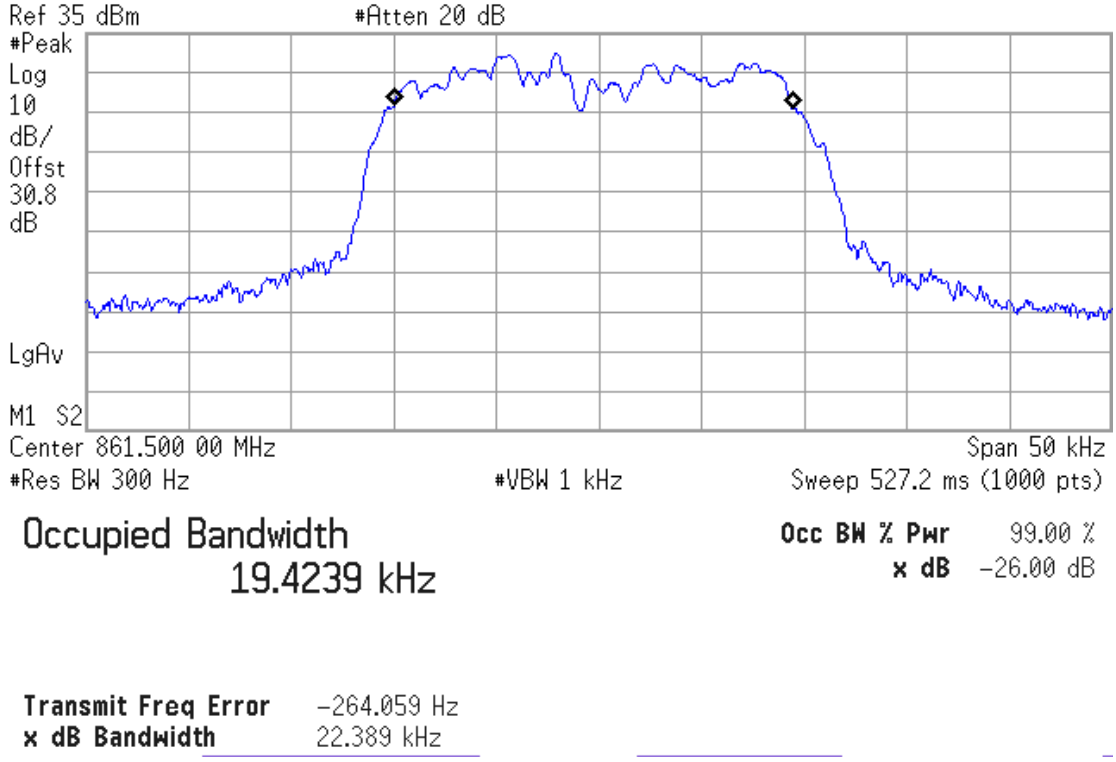


TI D-LMR 20 kHz. 854-869 MHz band.

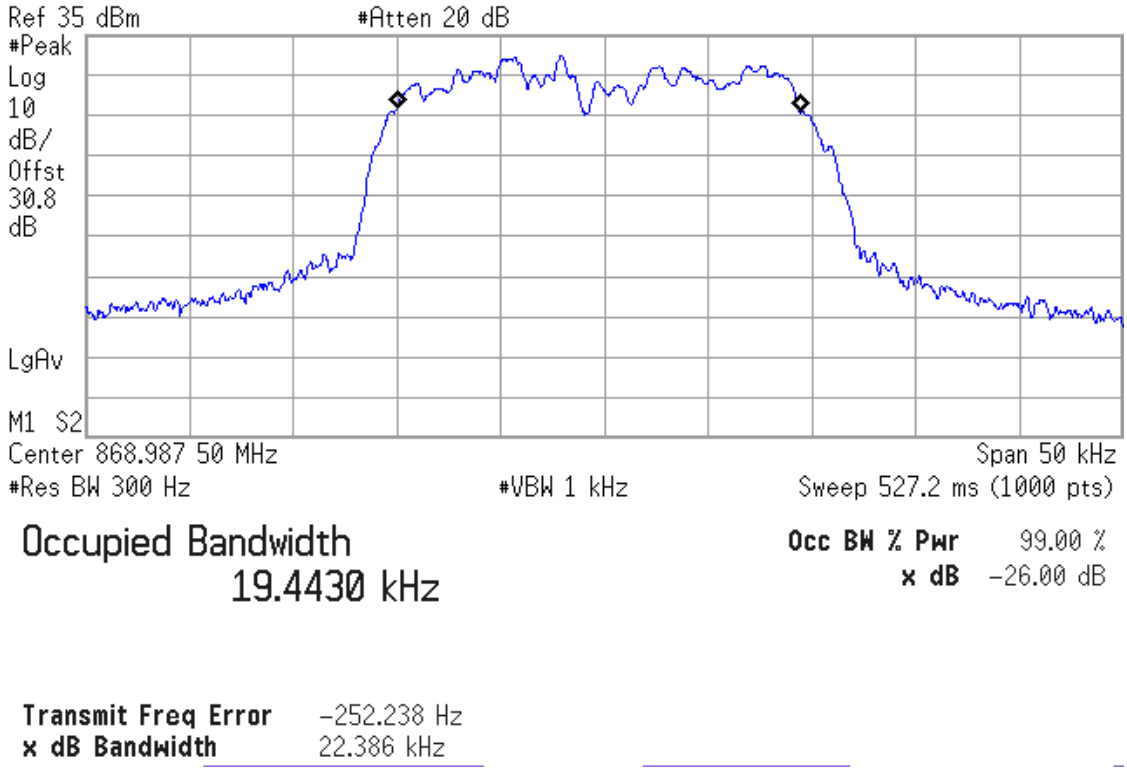
Lowest Channel



Middle Channel

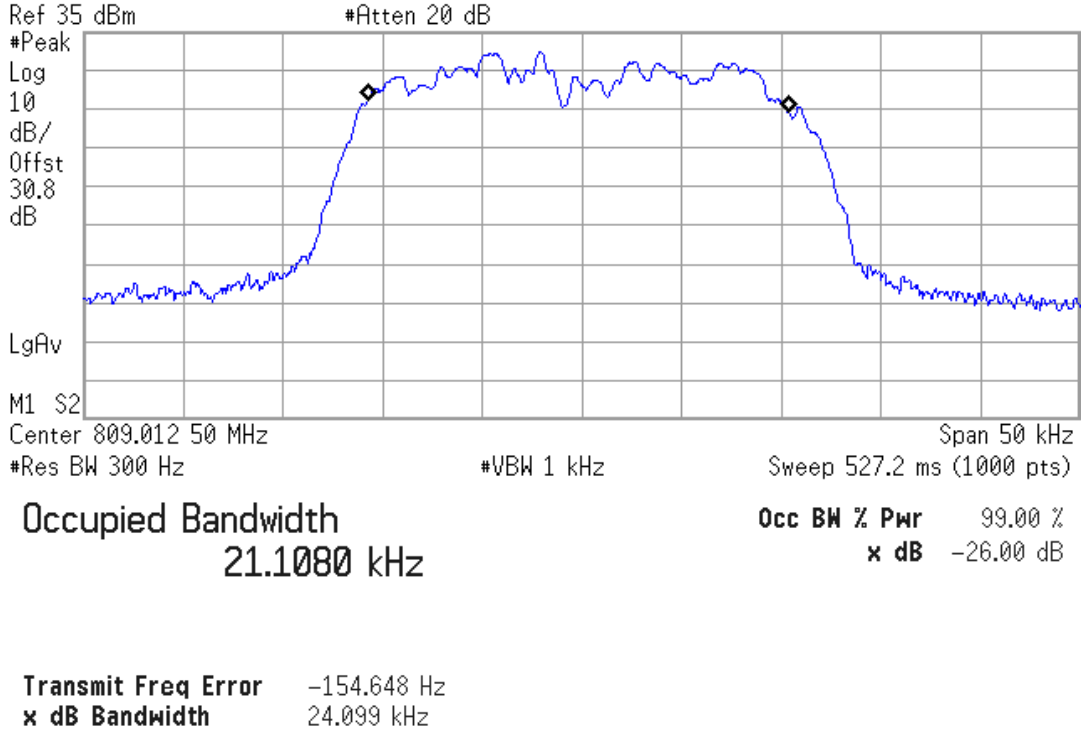


Highest Channel

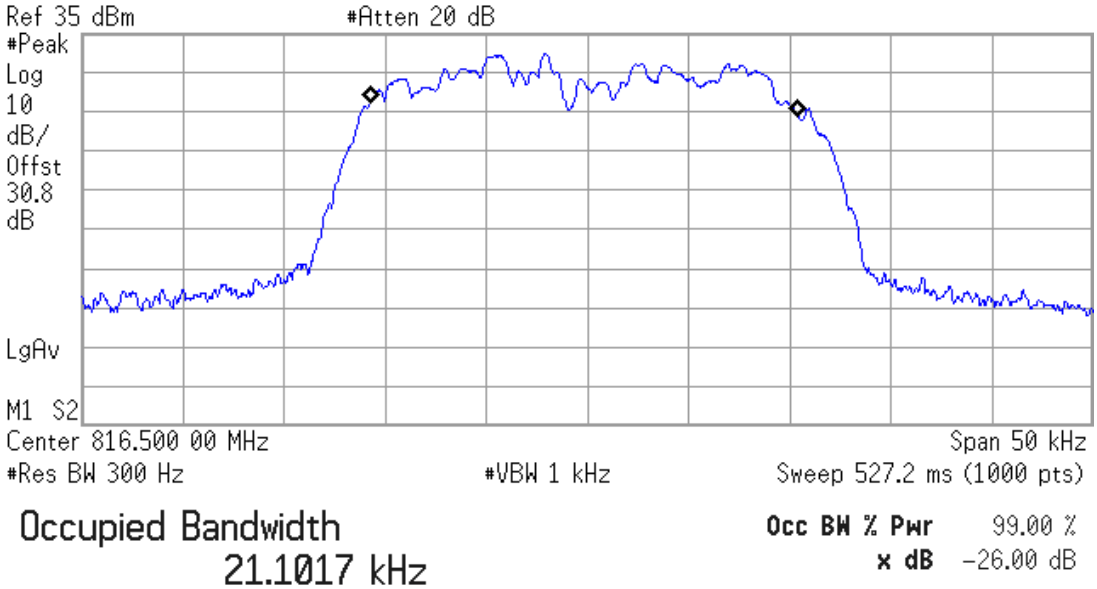


TETRA 22 kHz. 809-824 MHz band.

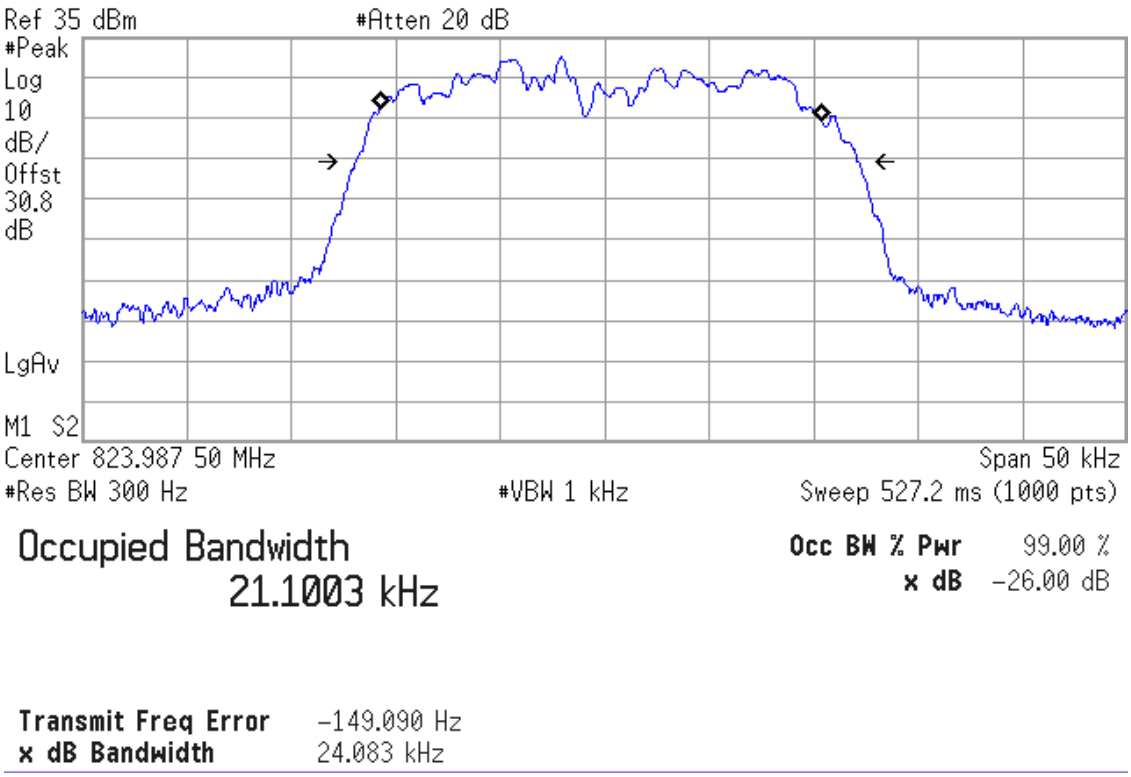
Lowest Channel



Middle Channel

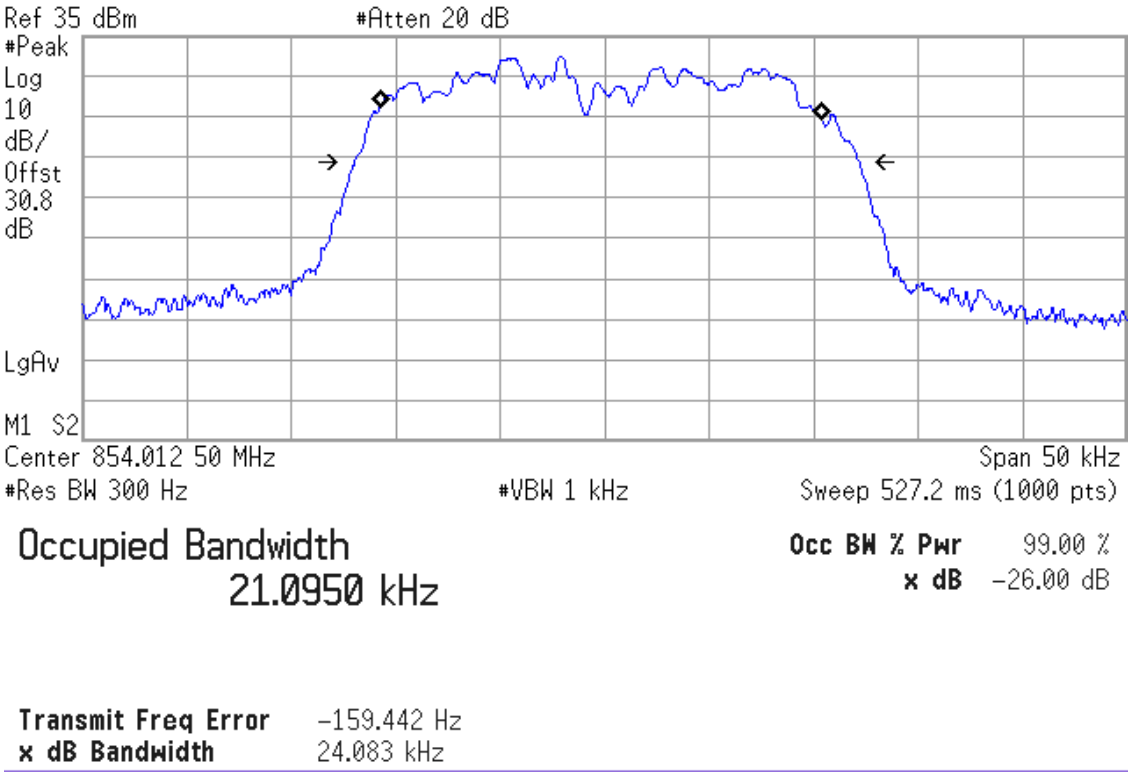


Highest Channel

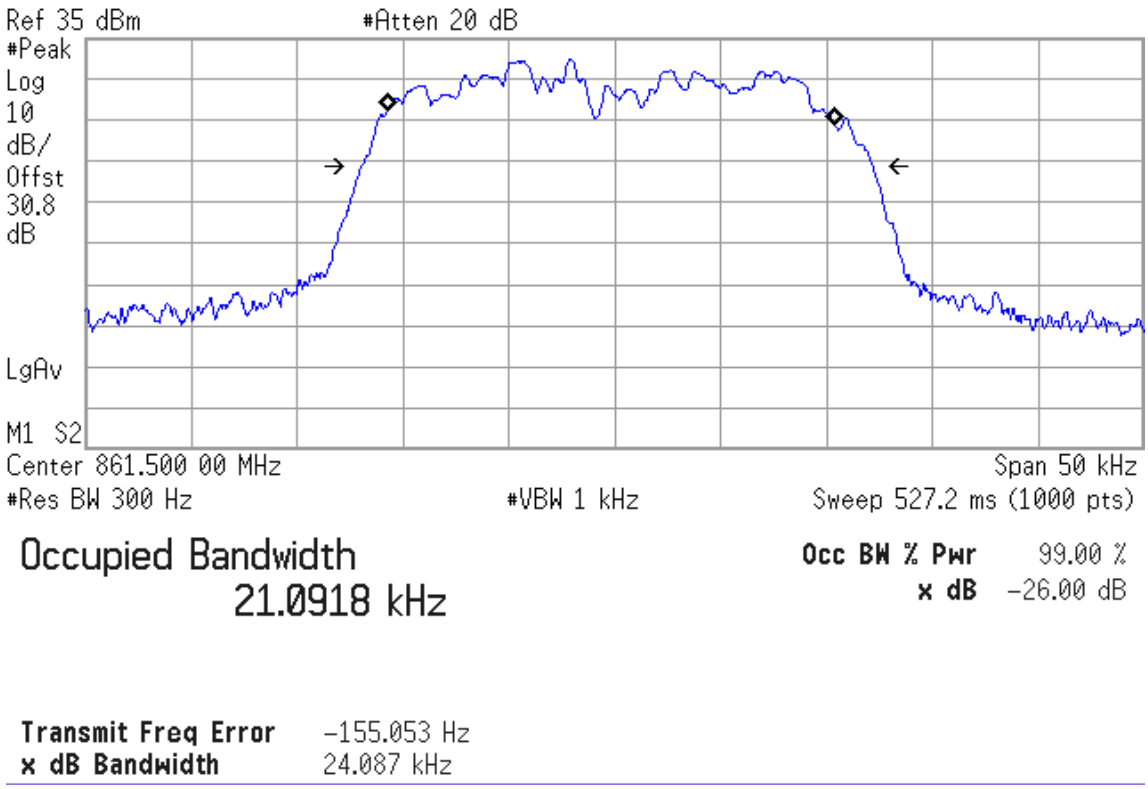


TETRA 22 kHz. 854-869 MHz band.

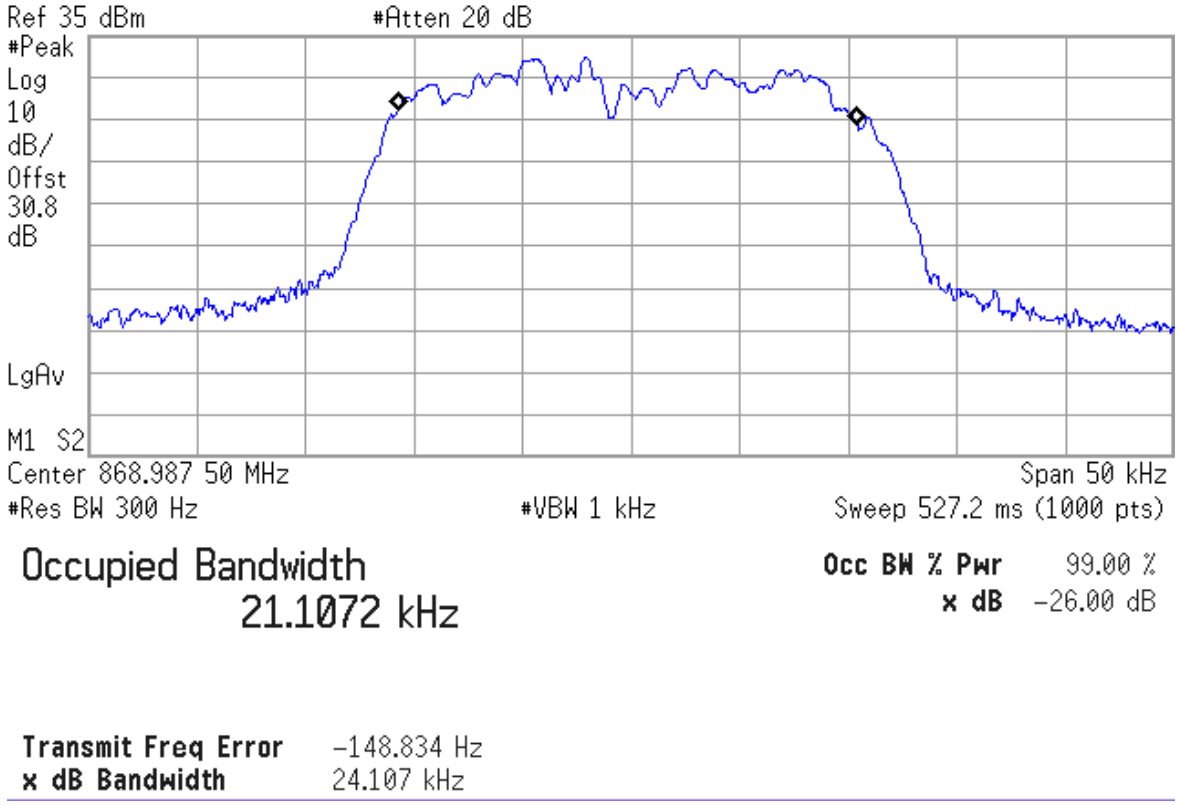
Lowest Channel



Middle Channel



Highest Channel



RF Output Power

SPECIFICATION

FCC §2.1046, §90.205 and §90.541. 769-775 MHz and 799-805 MHz bands.
The transmitting power of a mobile unit must not exceed 100 watts ERP (20 dBw / 50 dBm).

FCC §2.1046, §90.205 and §90.635. 809-824 MHz and 854-869 MHz bands.
The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw / 50 dBm).

METHOD

The conducted RF output power measurements were made at the RF output terminals of the EUT using an attenuator and a calibrated wideband power sensor.
The effective radiated power e.r.p. is calculated by adding the declared maximum antenna gain (dBd).

RESULTS

Declared antenna gain: 5 dBi (2.85 dBd).

P25 C4FM 8.1 kHz Bandwidth	Frequency (MHz)	Maximum average power (dBm)	Maximum average power e.r.p.(dBm)
769-775 MHz band	769.0125	44.24	47.09
	774.9875	44.21	47.06
799-805 MHz band	799.0125	44.14	46.99
	804.9875	44.12	46.97
Measurement uncertainty (dB)		<±0.33	

TI D-LMR. 20 kHz Bandwidth	Frequency (MHz)	Maximum average power (dBm)	Maximum average power e.r.p.(dBm)
769-775 MHz band	769.0125	38.25	41.10
	774.9875	38.24	41.09
799-805 MHz band	799.0125	38.25	41.10
	804.9875	38.24	41.09
809-824 MHz band	809.0125	38.25	41.10
	816.5	38.25	41.10
	823.9875	38.26	41.11
854-869 MHz band	854.0125	38.25	41.10
	861.5	38.27	41.12
	868.9875	38.28	41.13
Measurement uncertainty (dB)		<±0.33	

TETRA. 22 kHz Bandwidth	Frequency (MHz)	Maximum average power (dBm)	Maximum average power e.r.p.(dBm)
769-775 MHz band	769.0125	38.22	41.07
	774.9875	38.20	41.05
799-805 MHz band	799.0125	38.22	41.07
	804.9875	38.20	41.05
809-824 MHz band	809.0125	38.21	41.06
	816.5	38.23	41.08
	823.9875	38.24	41.09
854-869 MHz band	854.0125	38.22	41.07
	861.5	38.24	41.09
	868.9875	38.24	41.09
Measurement uncertainty (dB)		<±0.33	

Verdict: PASS

Emission Mask

SPECIFICATION

FCC §90.210, FCC §90.691:

Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
809-824/854-869[3,5]	B	G

3: Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of §90.691.

5: Equipment may alternatively meet the Adjacent Channel Power limits of §90.221.

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

FCC §90.691. Emission mask requirements for EA-based systems. 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 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ 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 + $10Log_{10}(P)$ 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.

METHOD

The emission masks were measured at the RF output terminals of the EUT using an attenuator and a spectrum analyser with a built-in spectrum mask measurement function.

RESULTS (see next plots)

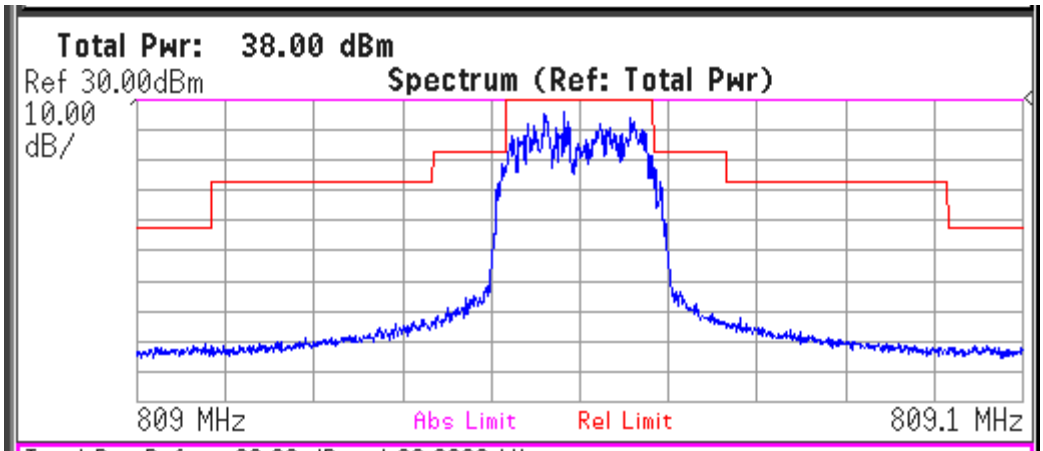
Measurement uncertainty (dB)	<±0.33

Verdict: PASS

Emission Mask B.

809-824 MHz band. TI D-LMR 20 kHz Bandwidth.

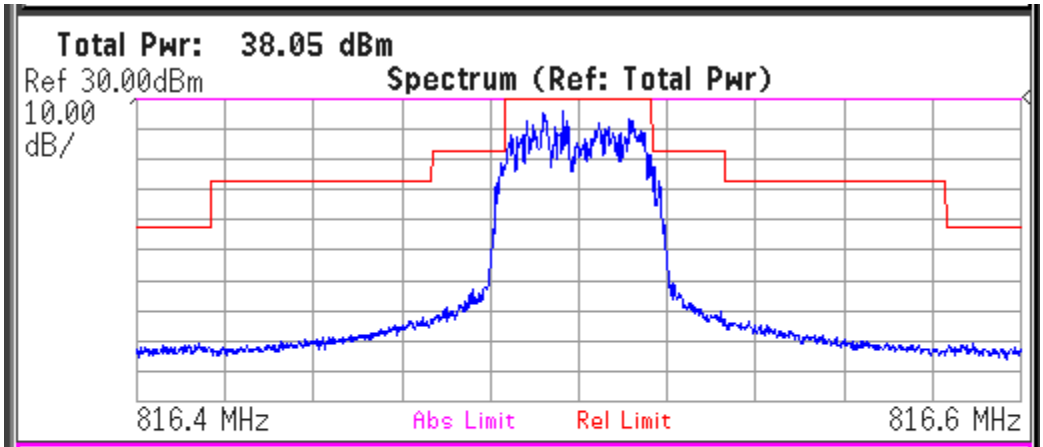
Lowest Channel



Total Pwr Ref: 38.00 dBm / 20.0000 kHz

Start(Hz)	Stop(Hz)	Meas BW(Hz)	Lower dBc	Lower Freq(Hz)	<-Peak-> dBc	Upper Freq(Hz)
0.0000	10.000 k	100.00	-11.93	809.01 M	-14.23	809.02 M
10.000 k	20.000 k	100.00	-29.05	809.00 M	-30.54	809.02 M
20.000 k	50.000 k	100.00	-80.82	808.99 M	-80.50	809.03 M
50.000 k	60.000 k	100.00	-89.00	808.96 M	-89.38	809.07 M

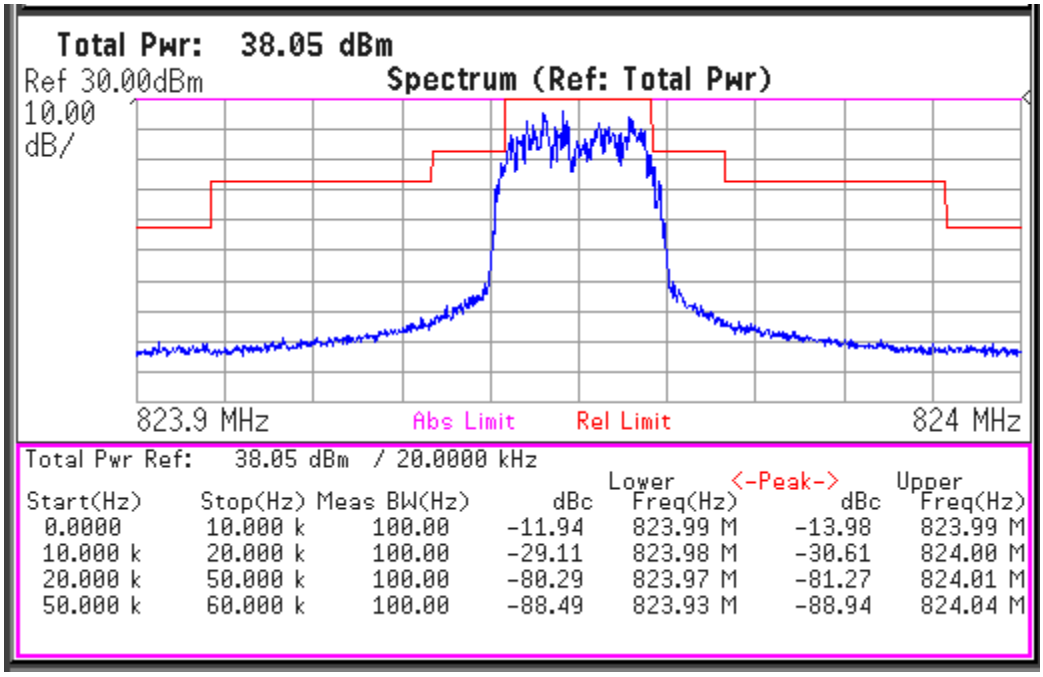
Middle Channel



Total Pwr Ref: 38.05 dBm / 20.0000 kHz

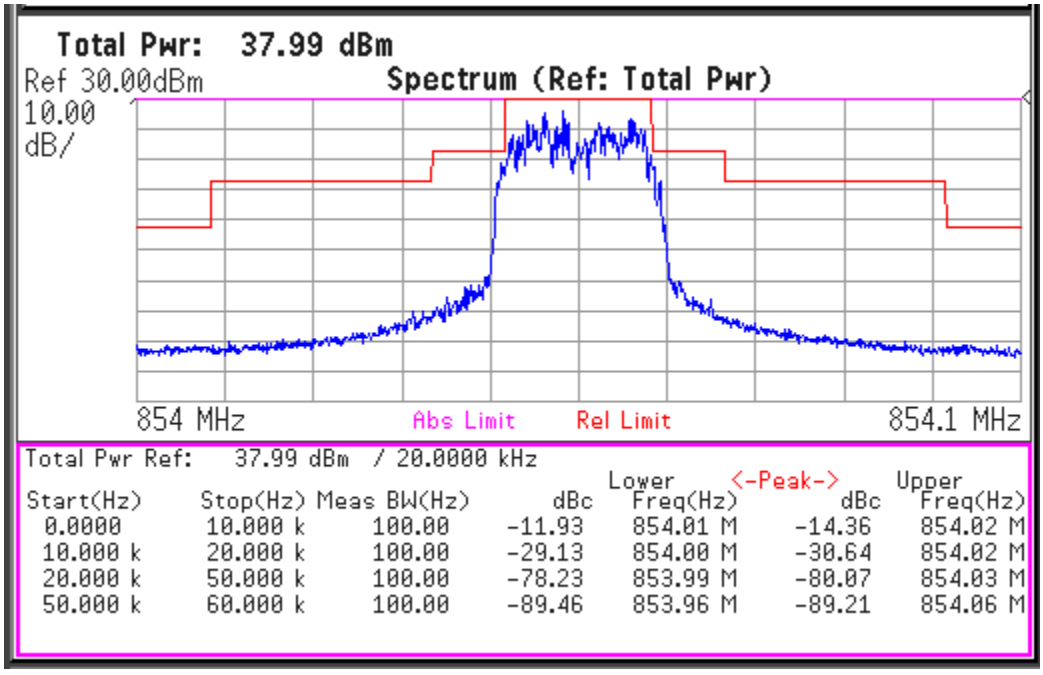
Start(Hz)	Stop(Hz)	Meas BW(Hz)	Lower dBc	Lower Freq(Hz)	<-Peak-> dBc	Upper Freq(Hz)
0.0000	10.000 k	100.00	-11.93	816.50 M	-14.44	816.51 M
10.000 k	20.000 k	100.00	-29.02	816.49 M	-30.73	816.51 M
20.000 k	50.000 k	100.00	-80.54	816.48 M	-81.29	816.52 M
50.000 k	60.000 k	100.00	-88.85	816.45 M	-89.06	816.55 M

Highest Channel

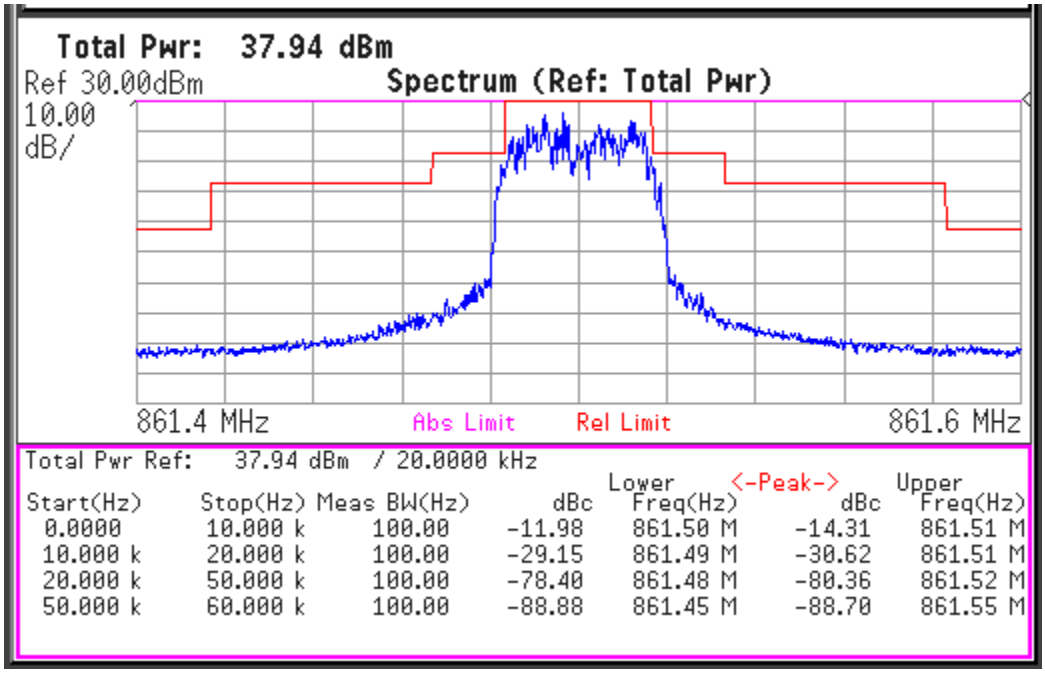


854-869 MHz band. TI D-LMR 20 kHz Bandwidth.

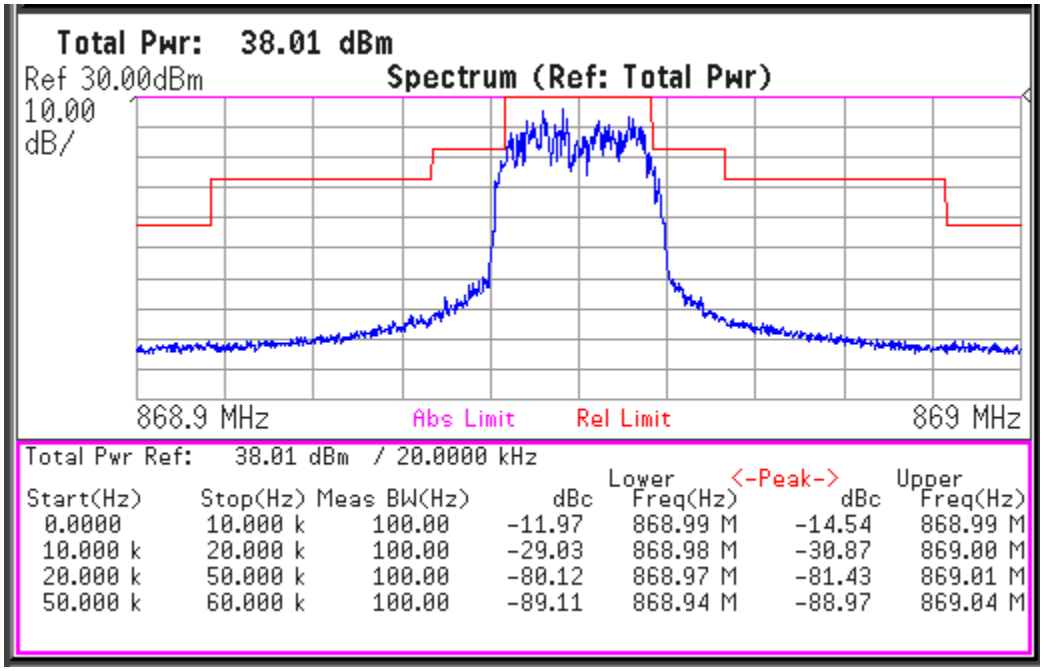
Lowest Channel



Middle Channel



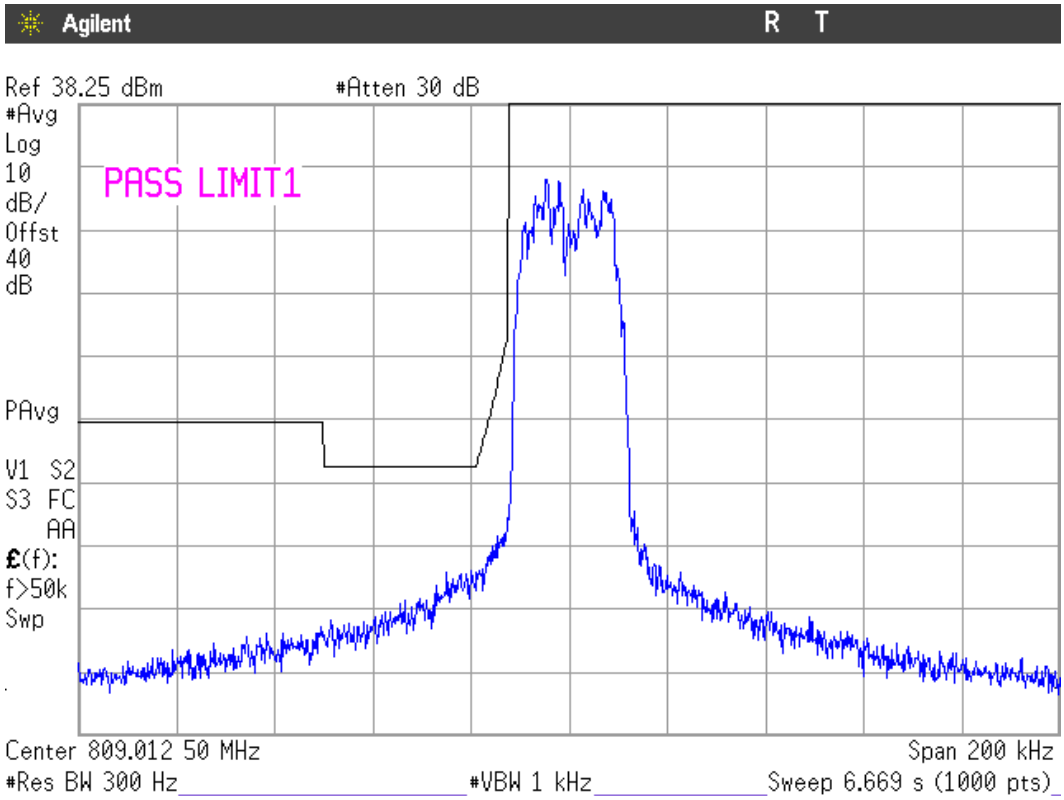
Highest Channel



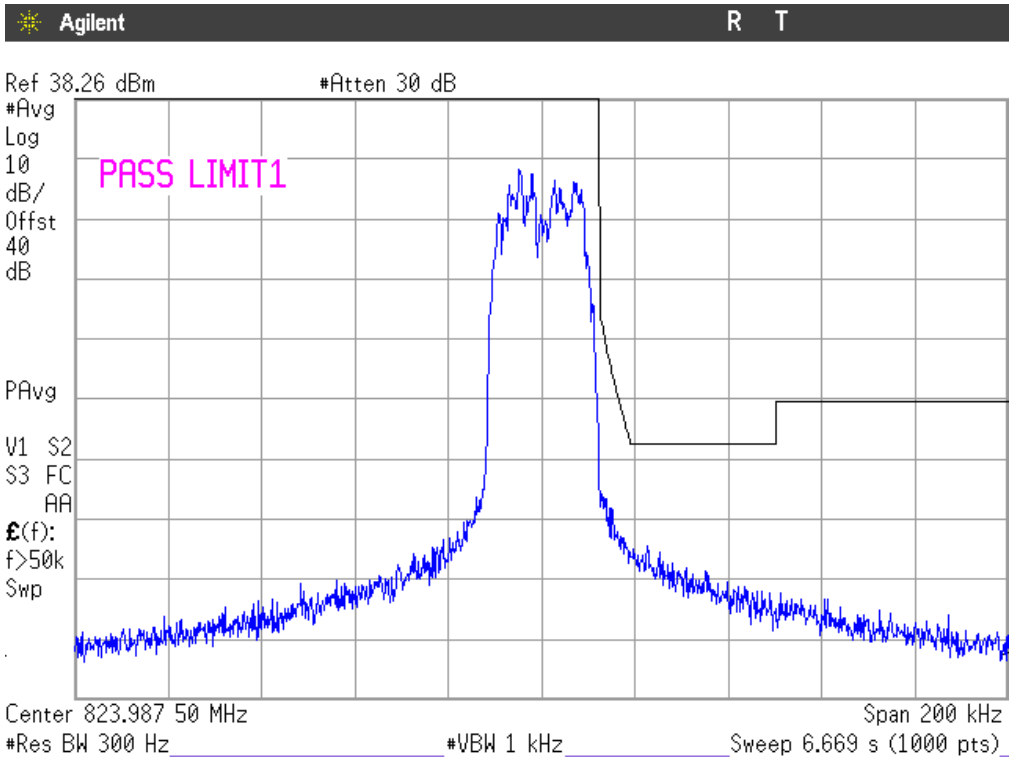
Emission Mask EA.

809-824 MHz band. TI D-LMR 20 kHz Bandwidth.

Lowest Channel

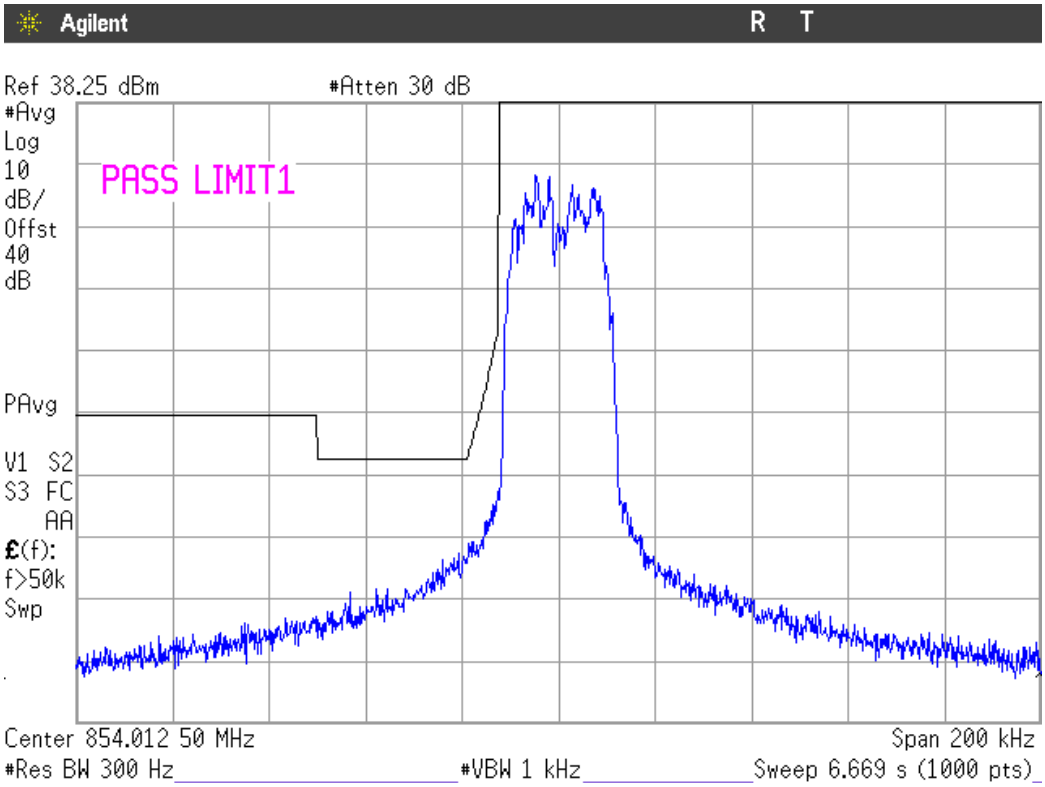


Highest Channel

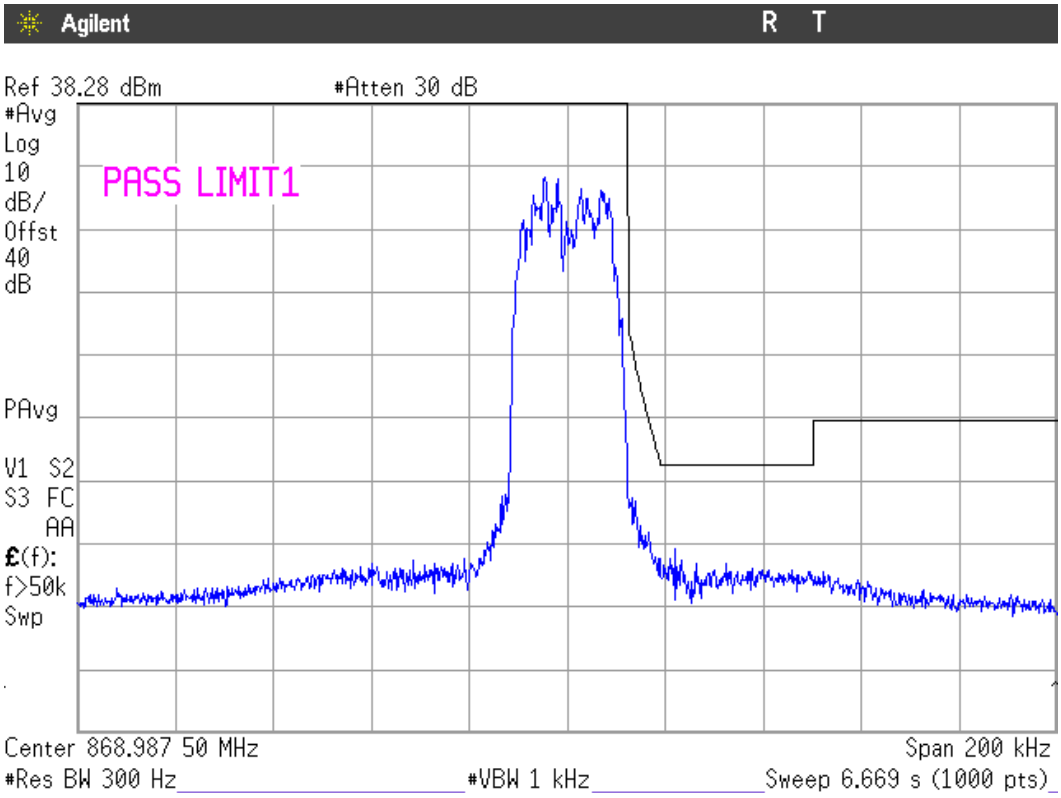


854-869 MHz band. TI D-LMR 20 kHz Bandwidth.

Lowest Channel



Highest Channel



Adjacent channel power

SPECIFICATION

FCC §90.221. 809–824/854–869 MHz bands.

(a) For the frequency bands indicated below, operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power (ACP) limits below. The table specifies a value for the ACP as a function of the displacement from the channel center frequency and a measurement bandwidth of 18 kHz.

(c)(1) Maximum adjacent power levels for frequencies in the 809–824/854–869 MHz band:

Frequency offset	Maximum ACP (dBc) for devices less than 15 watts	Maximum ACP (dBc) for devices 15 watts and above
25 kHz	-55 dBc	-55 dBc
50 kHz	-65 dBc	-65 dBc
75 kHz	-65 dBc	-70 dBc

(2) In any case, no requirement in excess of -36 dBm shall apply.

(d) On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least 43 + 10 log (Pwatts) dB.

FCC §90.543. 769–775/799–805 MHz bands.

The Adjacent Channel Power (ACP) requirements for Mobile transmitter and 12.5 kHz channel size are shown in the following table. The table 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.

25 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	**Measurement bandwidth (kHz)**	**Maximum ACP (dBc)**
9.375	6.25	-40
15.625	6.25	−60
21.875	6.25	−60
37.5	25	−60
62.5	25	−65
87.5	25	−65
150	100	−65
250	100	−65
350	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

The Adjacent Channel Power (ACP) requirements for Mobile transmitter and 25 kHz channel size are shown in the following table. The table 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 (dBc)
15.625	6.25	−40
21.875	6.25	−60
37.5	25	−60
62.5	25	−65
87.5	25	−65
150	100	−65
250	100	−65
350	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

METHOD

The Adjacent Channel Power measurements were made at the RF output terminals of the EUT using an attenuator and a spectrum analyser with a built-in adjacent channel power (ACP) measurement function.

RESULTS

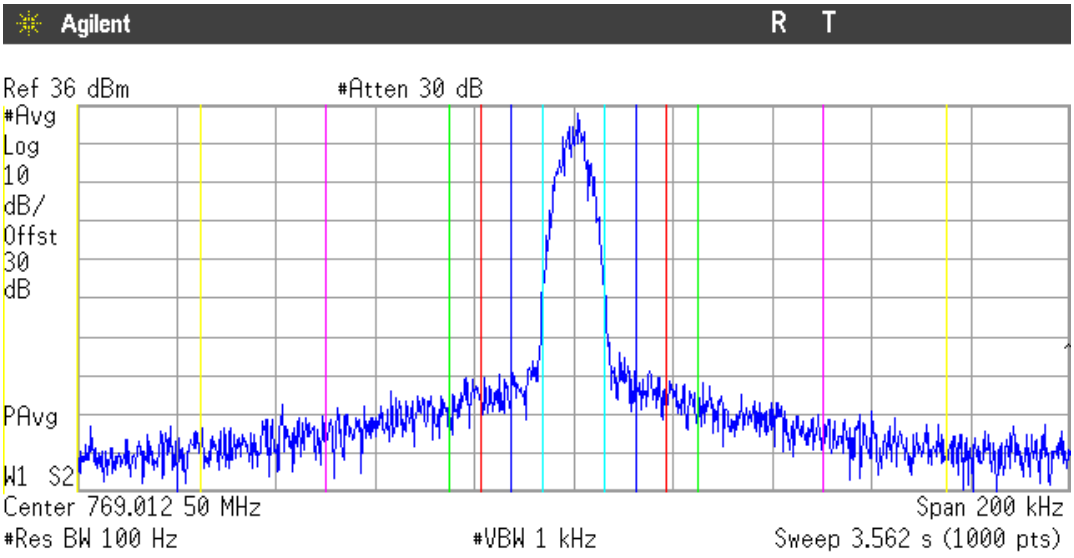
See next plots.

Measurement uncertainty (dB)	<±0.64 (Non-swept measurements) <±2.03 (Swept measurements)

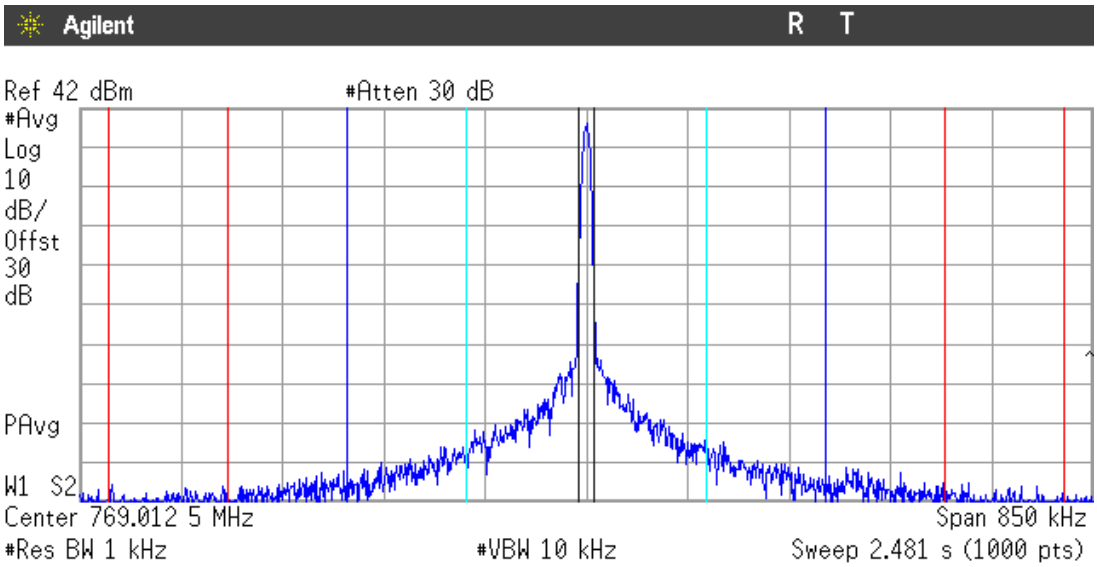
Verdict: PASS

P25 C4FM 8.1 kHz. 769-775 MHz band.

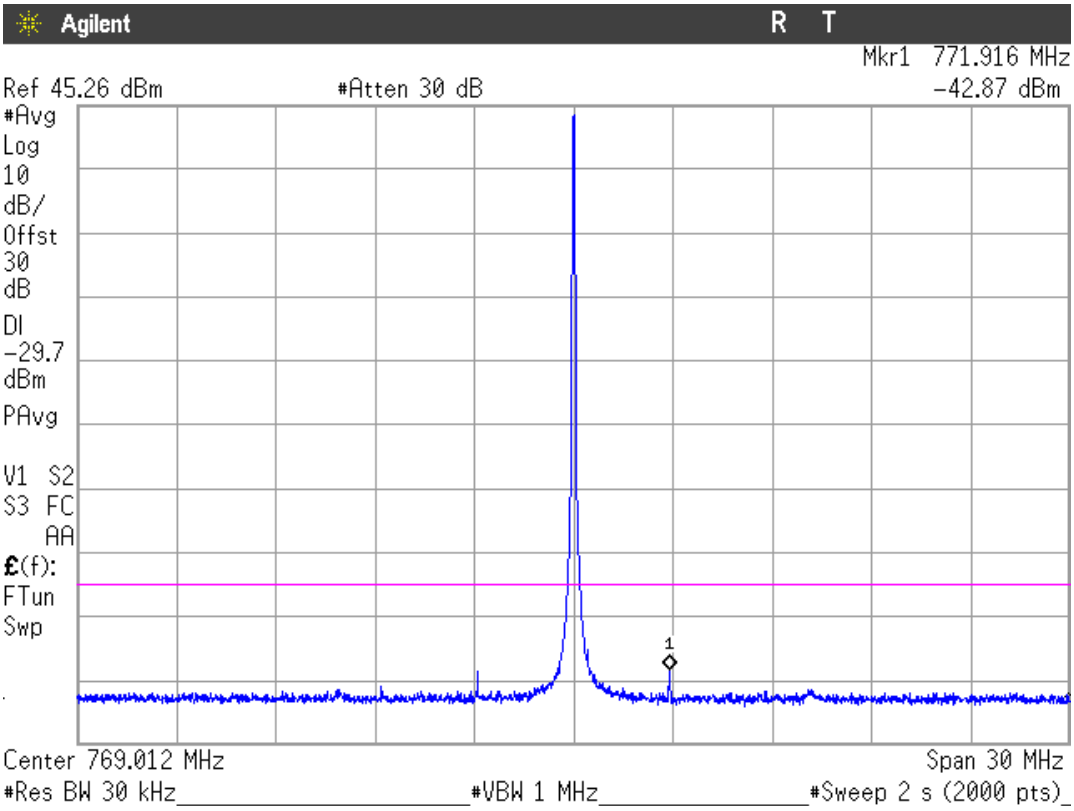
Lowest Channel

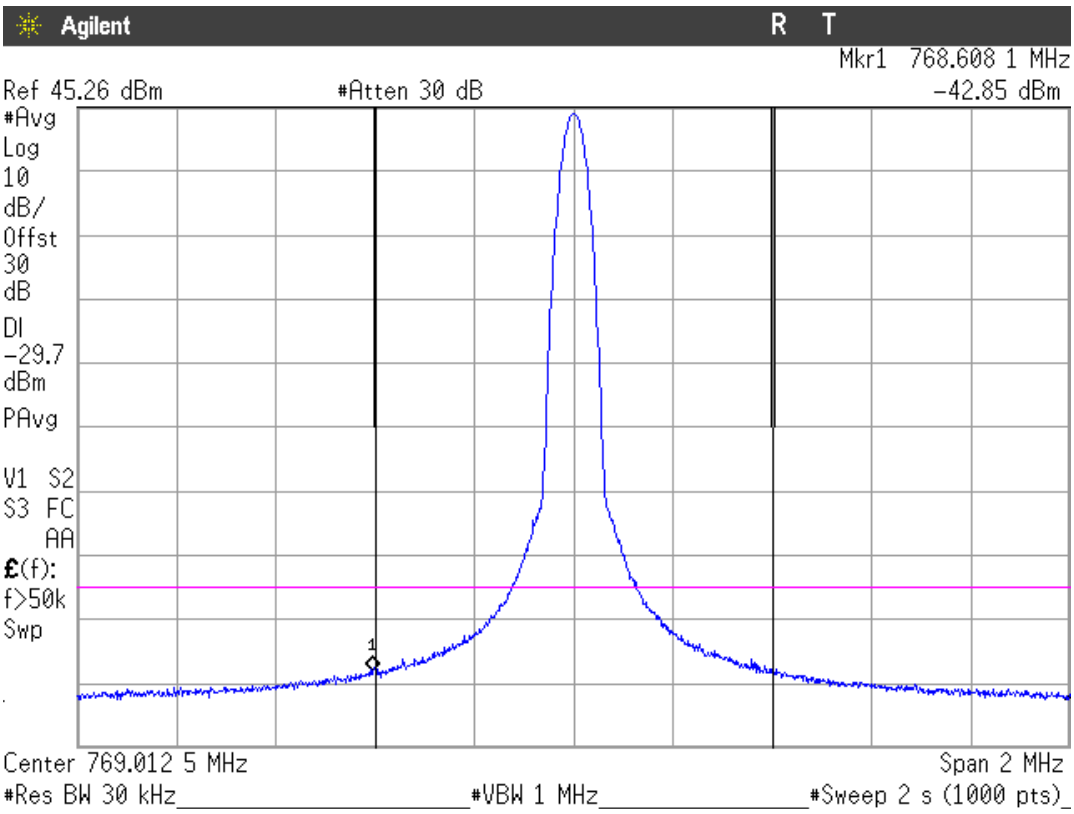


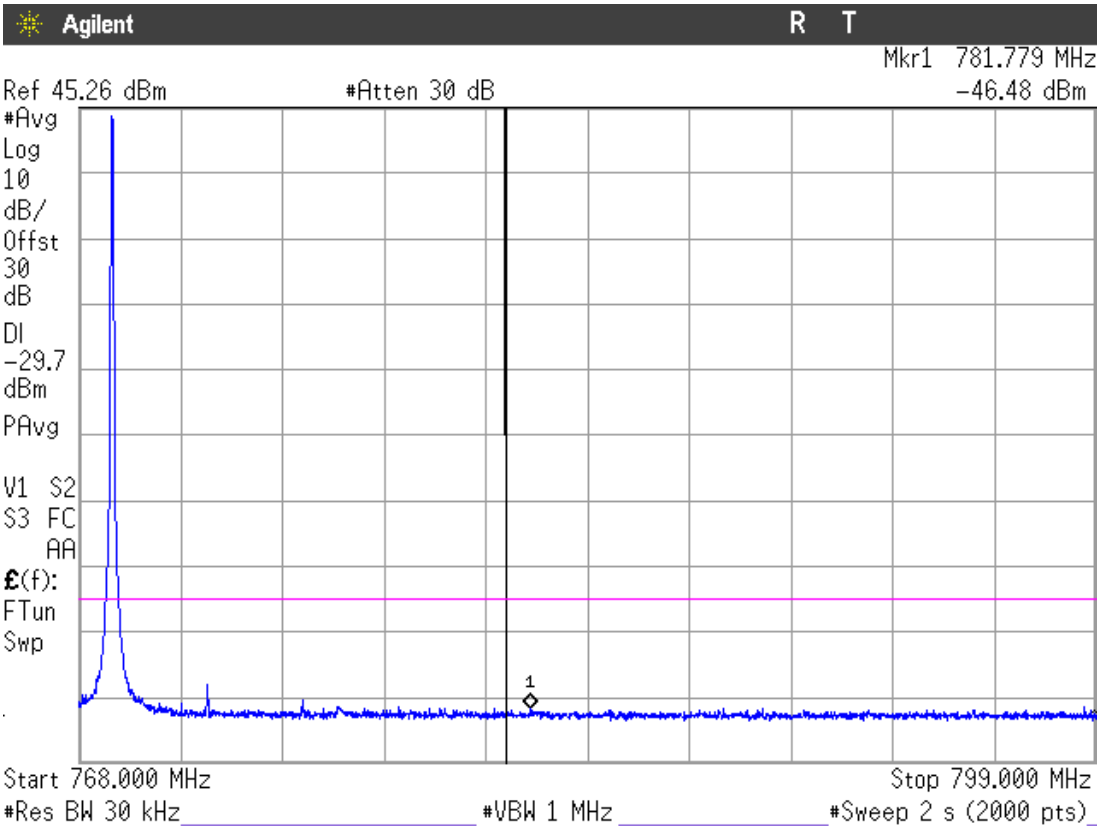
RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	9.375 kHz	6.250 kHz	-51.06	-5.80	-51.80	-6.54
45.26 dBm /	15.63 kHz	6.250 kHz	-66.14	-20.87	-65.01	-19.74
12.5000 kHz	21.88 kHz	6.250 kHz	-66.73	-21.47	-67.06	-21.80
	37.50 kHz	25.00 kHz	-66.05	-20.79	-65.56	-20.30
	62.50 kHz	25.00 kHz	-71.32	-26.05	-71.65	-26.39
	87.50 kHz	25.00 kHz	-75.18	-29.91	-74.52	-29.26

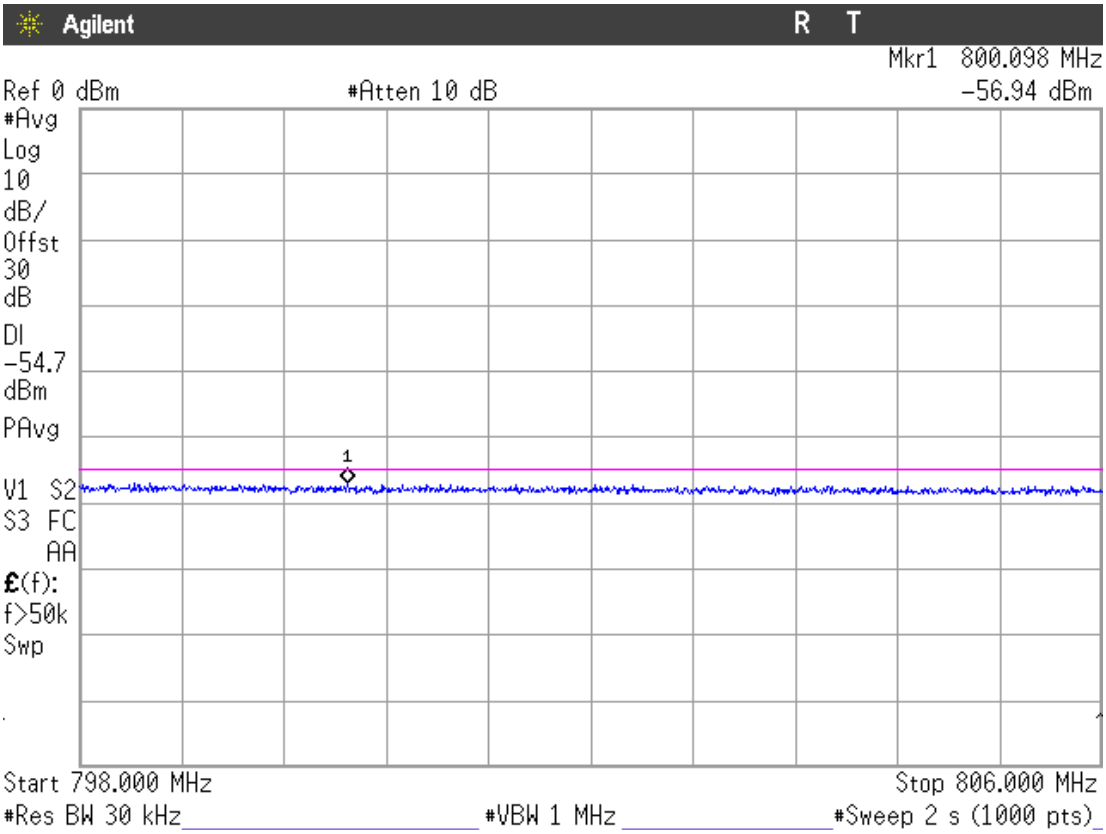


RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	150.0 kHz	100.0 kHz	-73.51	-29.73	-73.25	-29.47
43.78 dBm /	250.0 kHz	100.0 kHz	-79.19	-35.41	-78.59	-34.81
12.5000 kHz	350.0 kHz	100.0 kHz	-82.15	-38.37	-81.87	-38.08

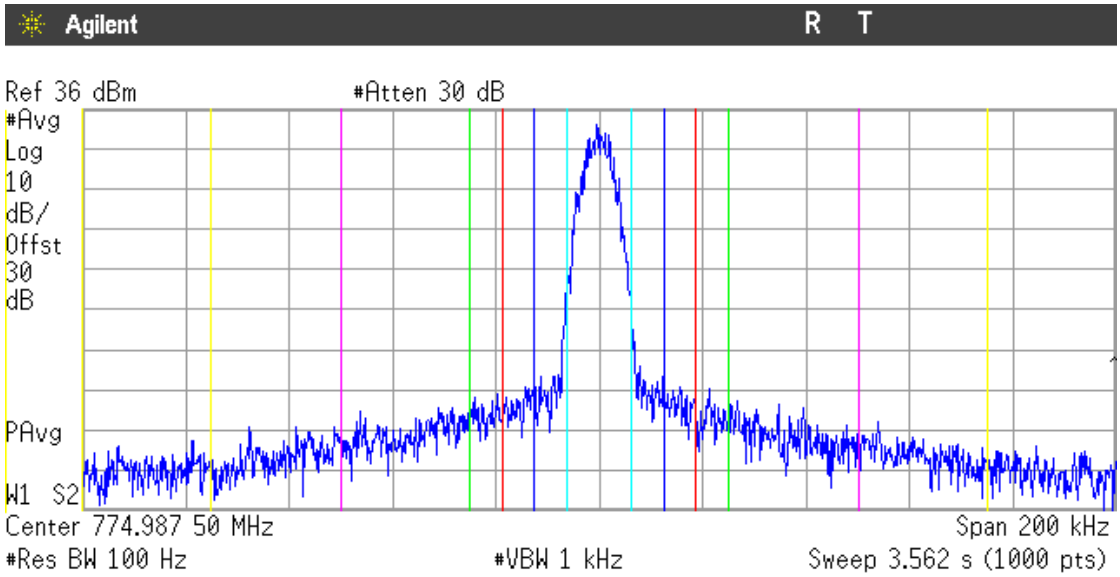

Agilent
R T
Mkr1 771.916 MHz
Ref 45.26 dBm
#Atten 30 dB
-42.87 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-29.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 769.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 768.608 1 MHz
Ref 45.26 dBm
#Atten 30 dB
-42.85 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-29.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 769.012 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 781.779 MHz
Ref 45.26 dBm
#Atten 30 dB
-46.48 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-29.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 768.000 MHz
Stop 799.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

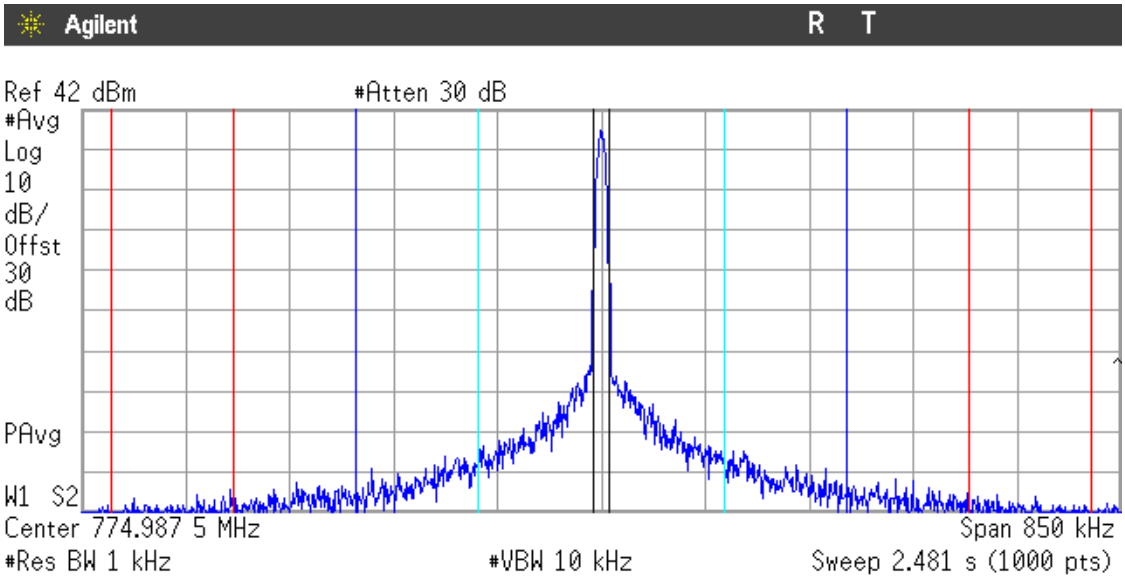

Agilent
R T
Mkr1 800.098 MHz
Ref 0 dBm
#Atten 10 dB
-56.94 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-54.7
dBm
PAvg
1
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Start 798.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

Highest Channel



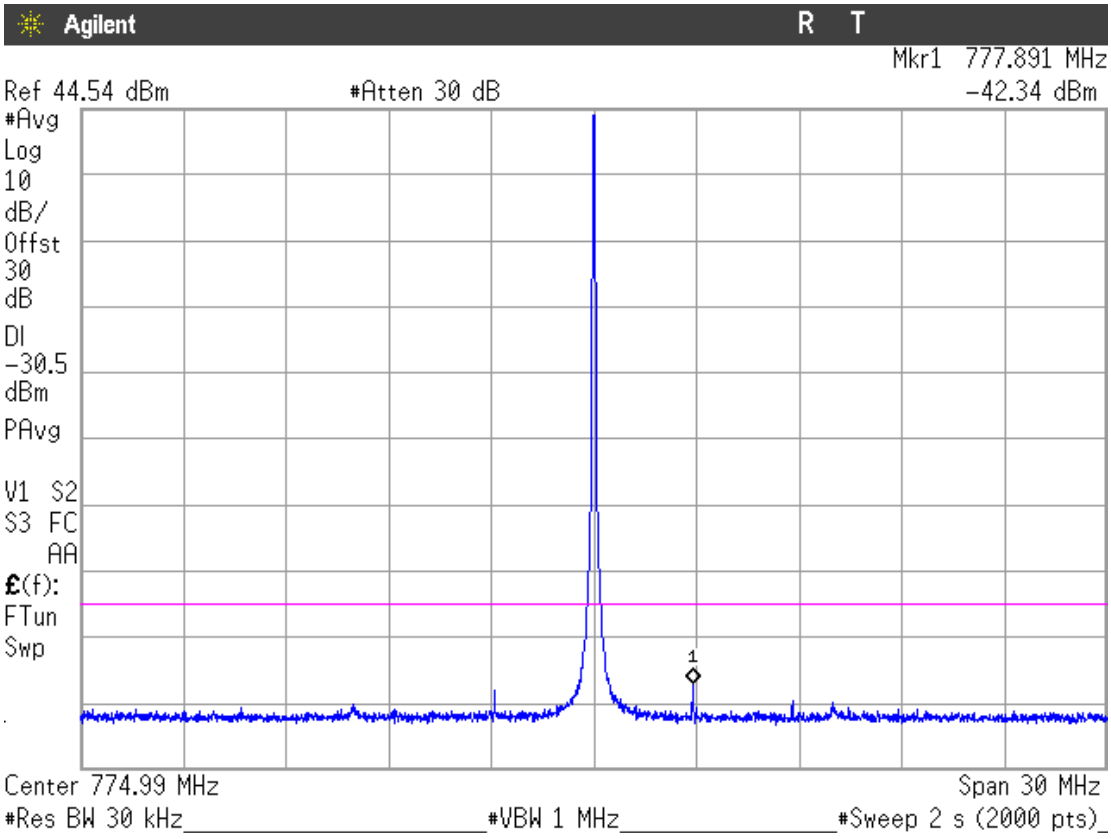
RMS Results
Carrier Power
44.54 dBm /
12.5000 kHz

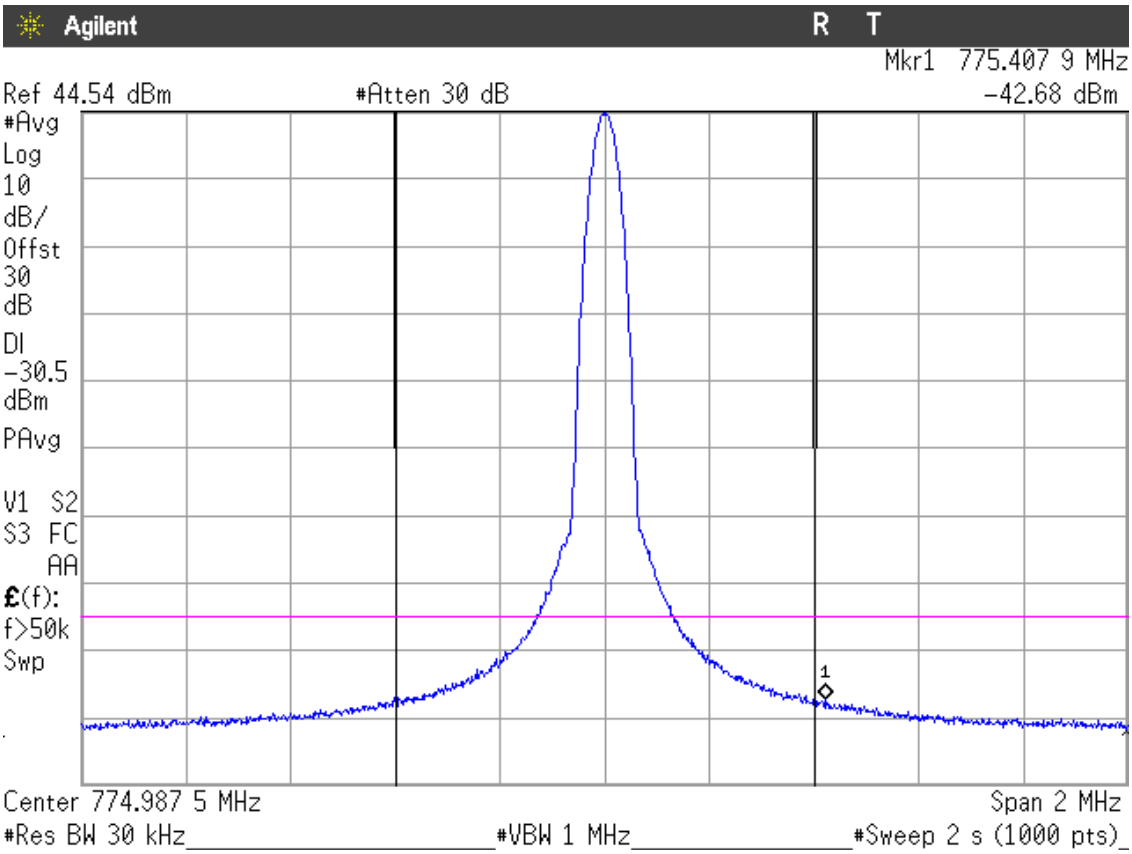
Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
9.375 kHz	6.250 kHz	-46.83	-2.28	-54.90	-10.35
15.63 kHz	6.250 kHz	-64.41	-19.87	-64.10	-19.56
21.88 kHz	6.250 kHz	-66.59	-22.05	-67.09	-22.55
37.50 kHz	25.00 kHz	-64.92	-20.38	-65.13	-20.59
62.50 kHz	25.00 kHz	-70.38	-25.84	-70.44	-25.89
87.50 kHz	25.00 kHz	-74.12	-29.58	-74.60	-30.06

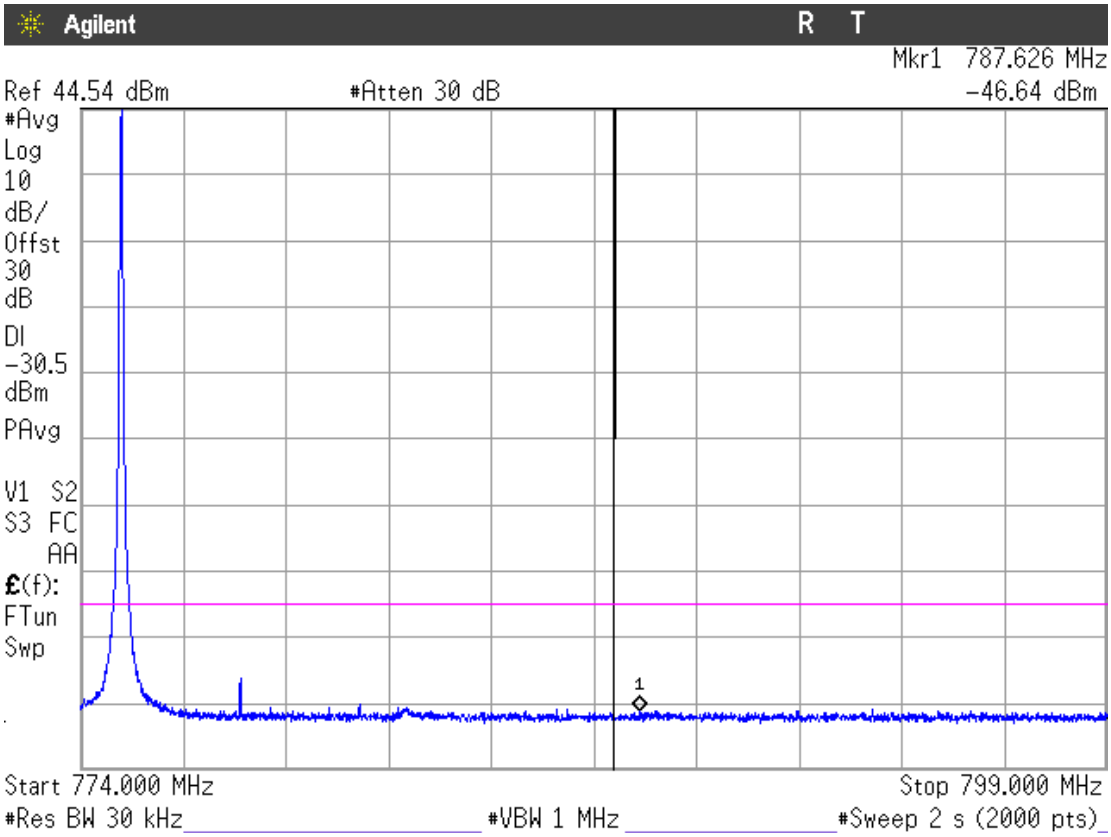


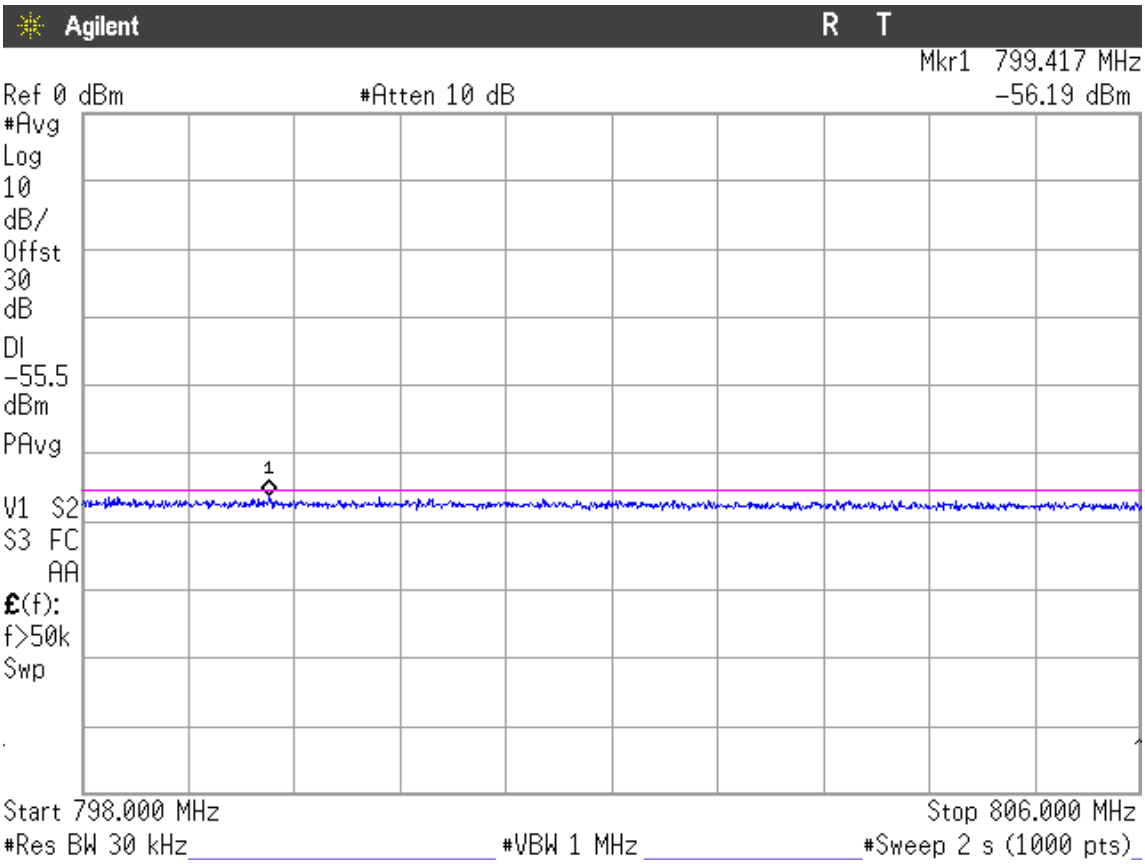
RMS Results
Carrier Power
42.75 dBm /
12.5000 kHz

Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
150.0 kHz	100.0 kHz	-72.39	-29.64	-72.05	-29.30
250.0 kHz	100.0 kHz	-78.11	-35.36	-77.81	-35.06
350.0 kHz	100.0 kHz	-80.96	-38.20	-80.77	-38.02


Agilent
R T
Mkr1 777.891 MHz
Ref 44.54 dBm
#Atten 30 dB
-42.34 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-30.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 774.99 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

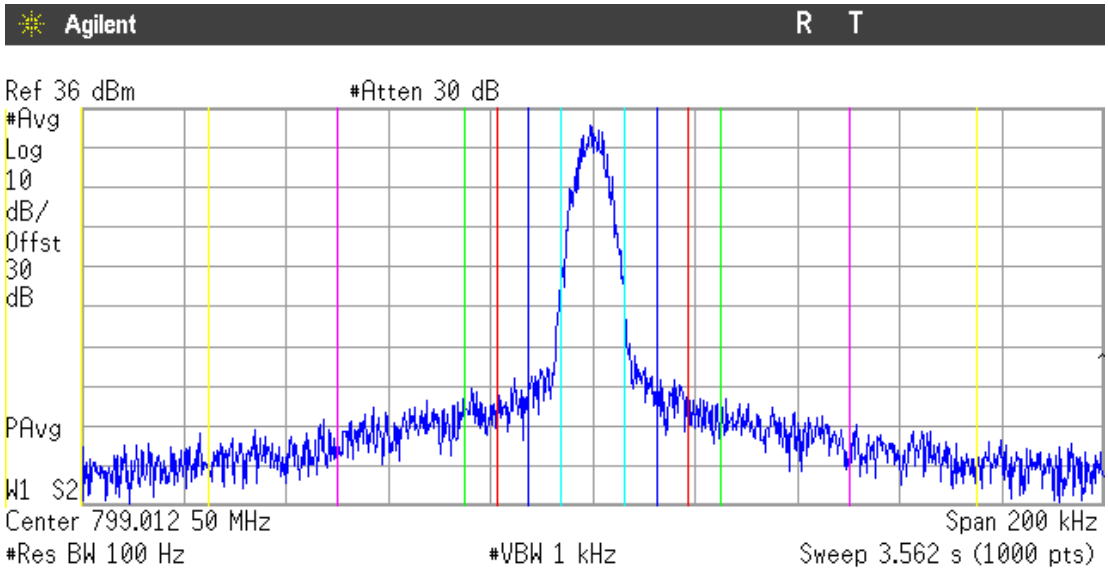

Agilent
R T
Mkr1 775.407 9 MHz
Ref 44.54 dBm
#Atten 30 dB
-42.68 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-30.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 774.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 787.626 MHz
Ref 44.54 dBm
#Atten 30 dB
-46.64 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-30.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 774.000 MHz
Stop 799.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 799.417 MHz
Ref 0 dBm
#Atten 10 dB
-56.19 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-55.5
dBm
PAvg
1
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Start 798.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

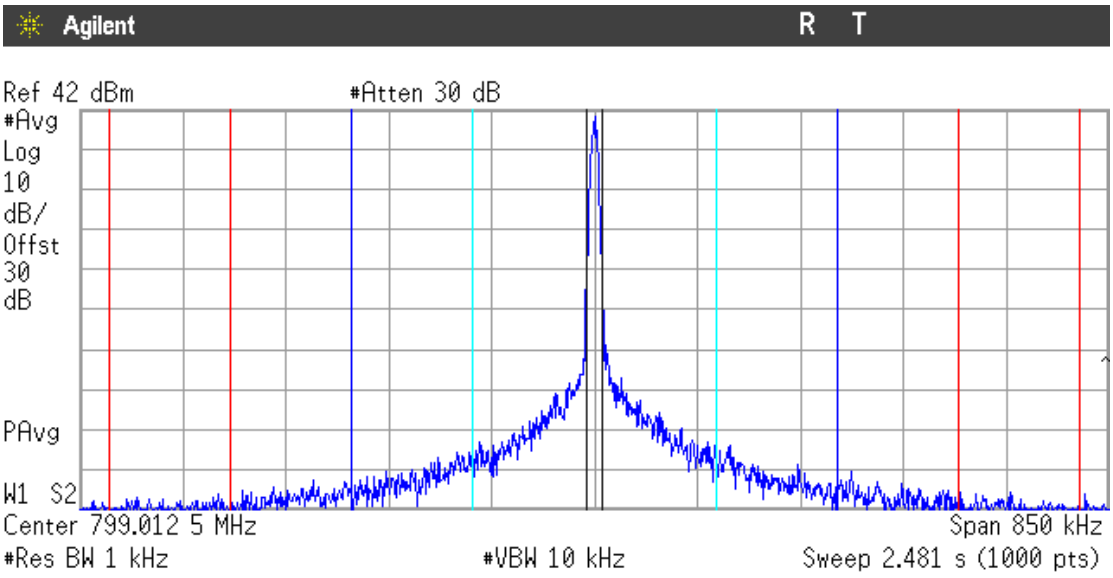
P25 C4FM 8.1 kHz. 799-805 MHz band.

Lowest Channel



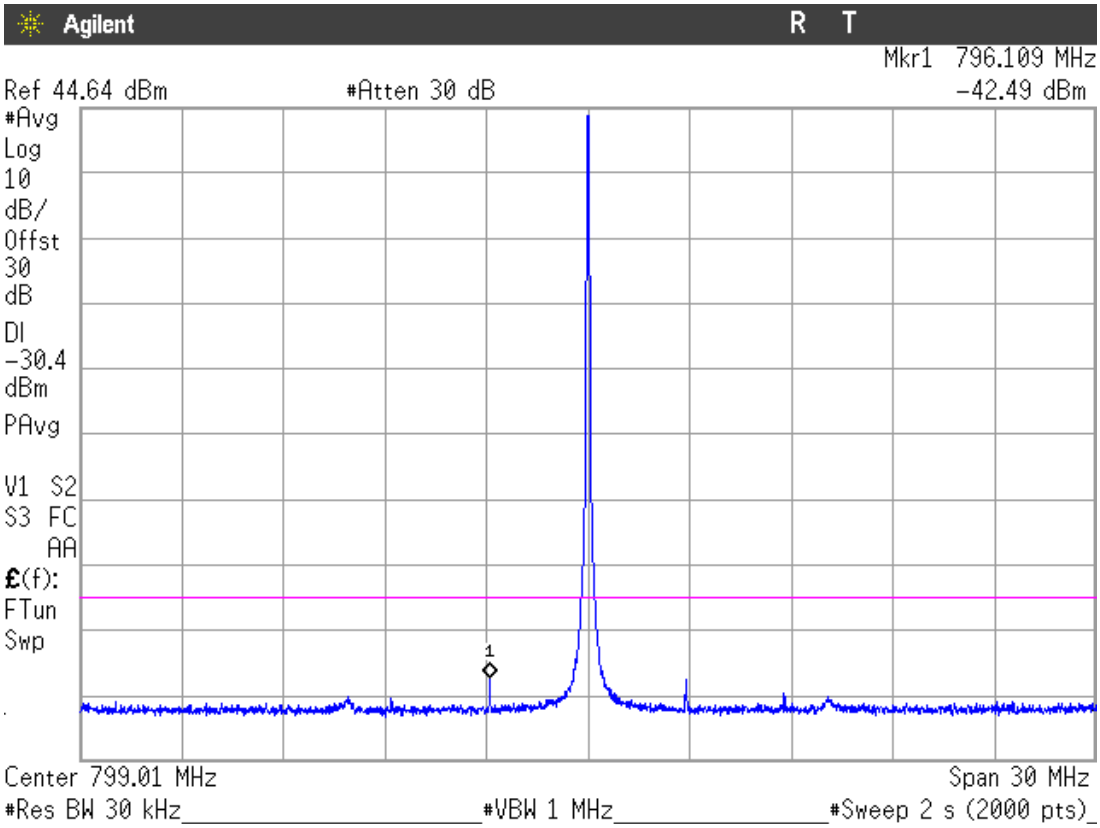
RMS Results
Carrier Power
44.64 dBm /
12.5000 kHz

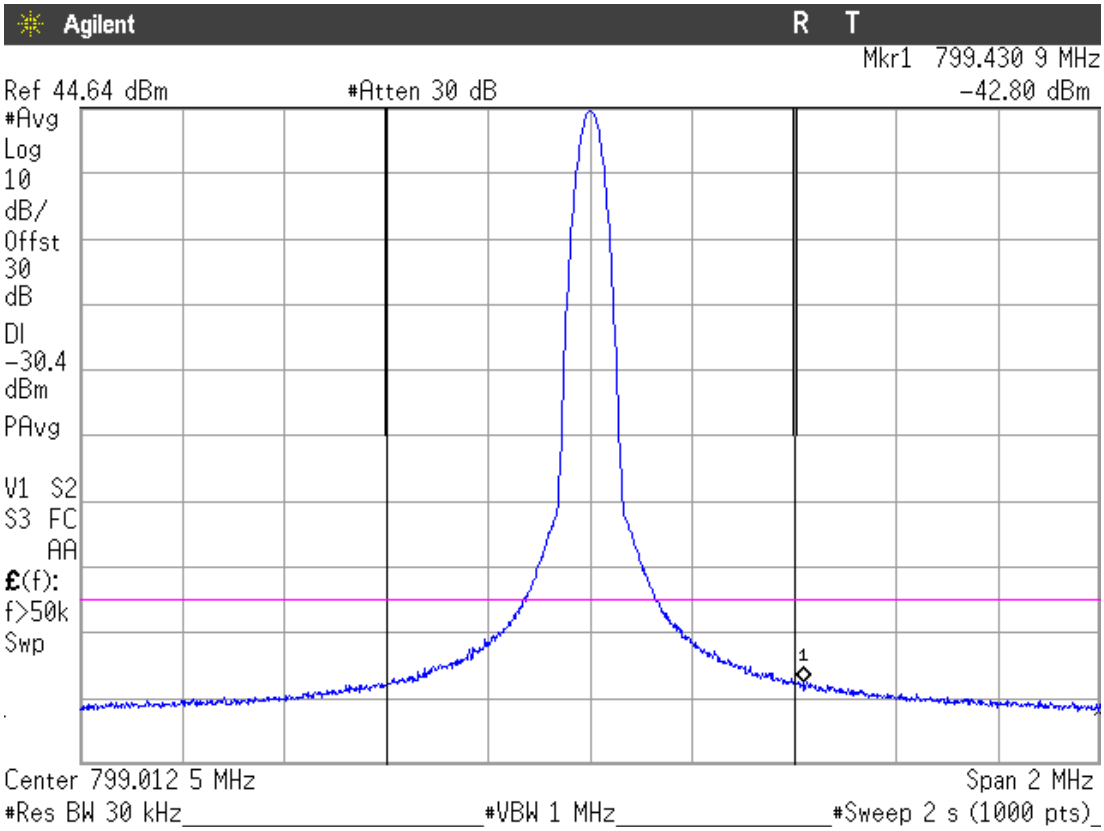
Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
9.375 kHz	6.250 kHz	-46.75	-2.11	-53.79	-9.15
15.63 kHz	6.250 kHz	-64.86	-20.22	-63.59	-18.95
21.88 kHz	6.250 kHz	-66.84	-22.20	-67.40	-22.76
37.50 kHz	25.00 kHz	-64.39	-19.75	-64.96	-20.32
62.50 kHz	25.00 kHz	-71.05	-26.41	-71.02	-26.38
87.50 kHz	25.00 kHz	-74.31	-29.67	-74.29	-29.65

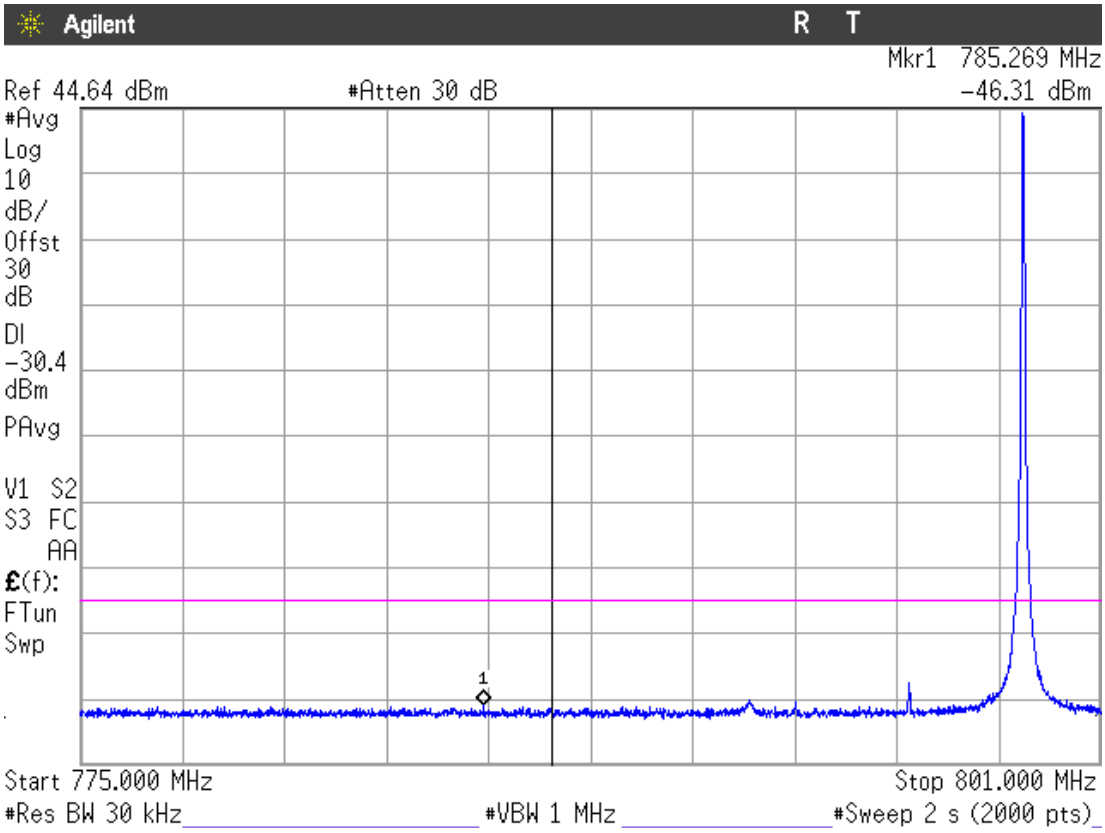


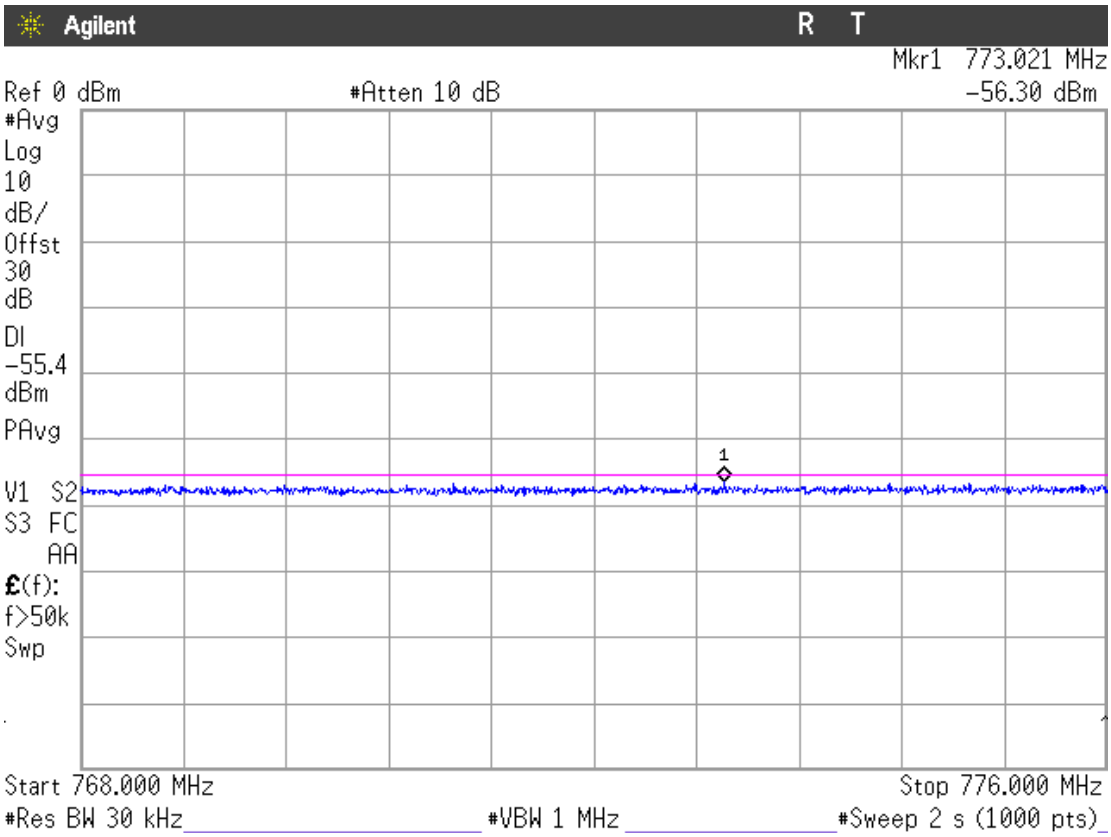
RMS Results
Carrier Power
44.73 dBm /
12.5000 kHz

Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
150.0 kHz	100.0 kHz	-74.39	-29.66	-74.12	-29.38
250.0 kHz	100.0 kHz	-80.06	-35.33	-79.76	-35.03
350.0 kHz	100.0 kHz	-82.83	-38.10	-82.79	-38.06

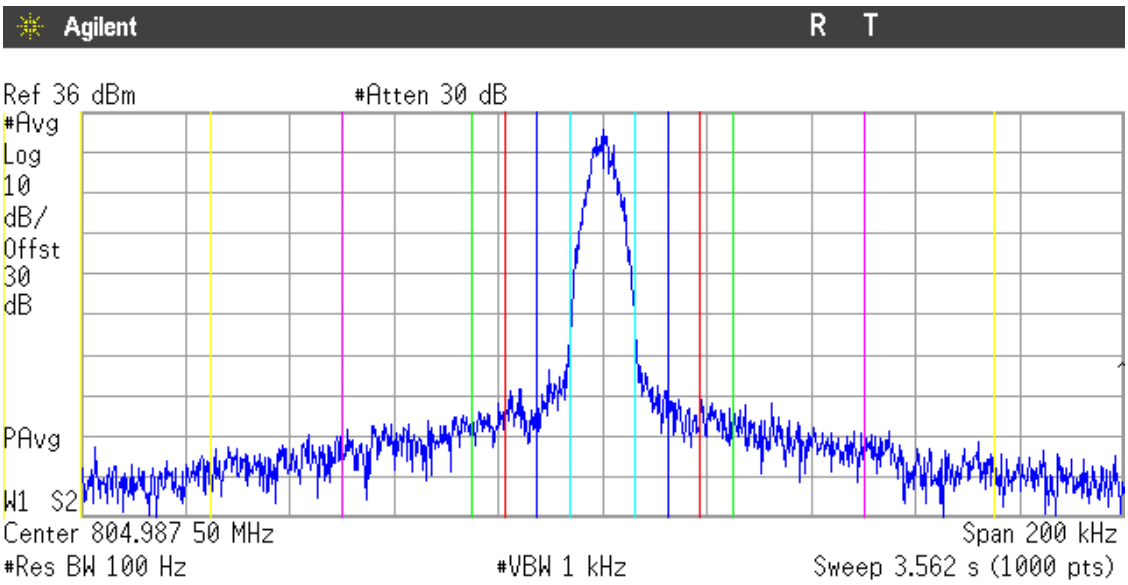

Agilent
R T
Mkr1 796.109 MHz
Ref 44.64 dBm
#Atten 30 dB
-42.49 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-30.4
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 799.01 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 799.430 9 MHz
Ref 44.64 dBm
#Atten 30 dB
-42.80 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-30.4
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 799.012 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 785.269 MHz
Ref 44.64 dBm
#Atten 30 dB
-46.31 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-30.4
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 775.000 MHz
Stop 801.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

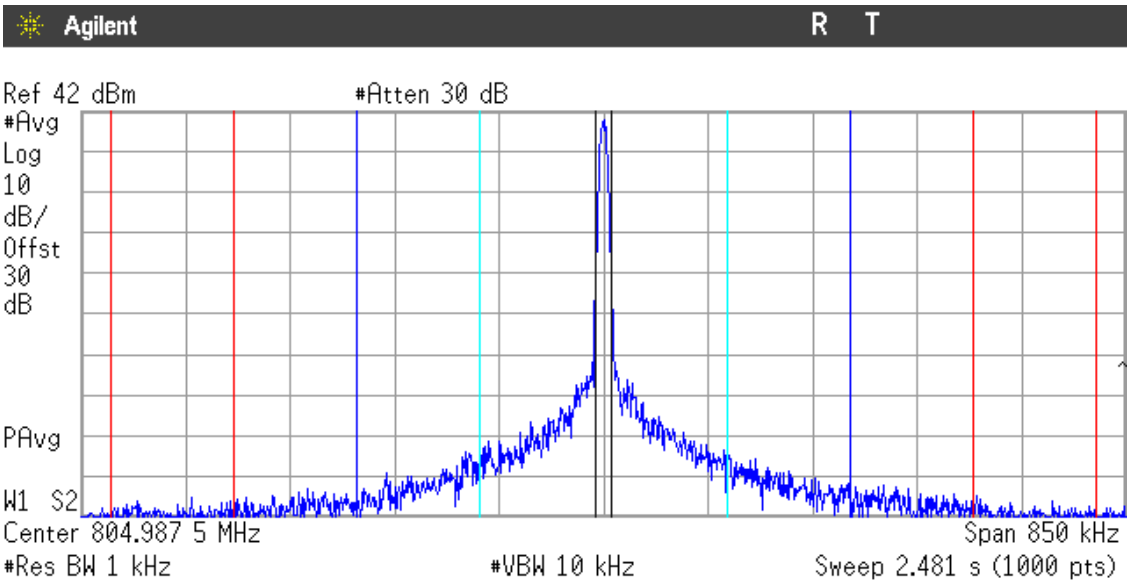

Agilent
R T
Mkr1 773.021 MHz
Ref 0 dBm
#Atten 10 dB
-56.30 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-55.4
dBm
PAvg
1
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Start 768.000 MHz
Stop 776.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

Highest Channel



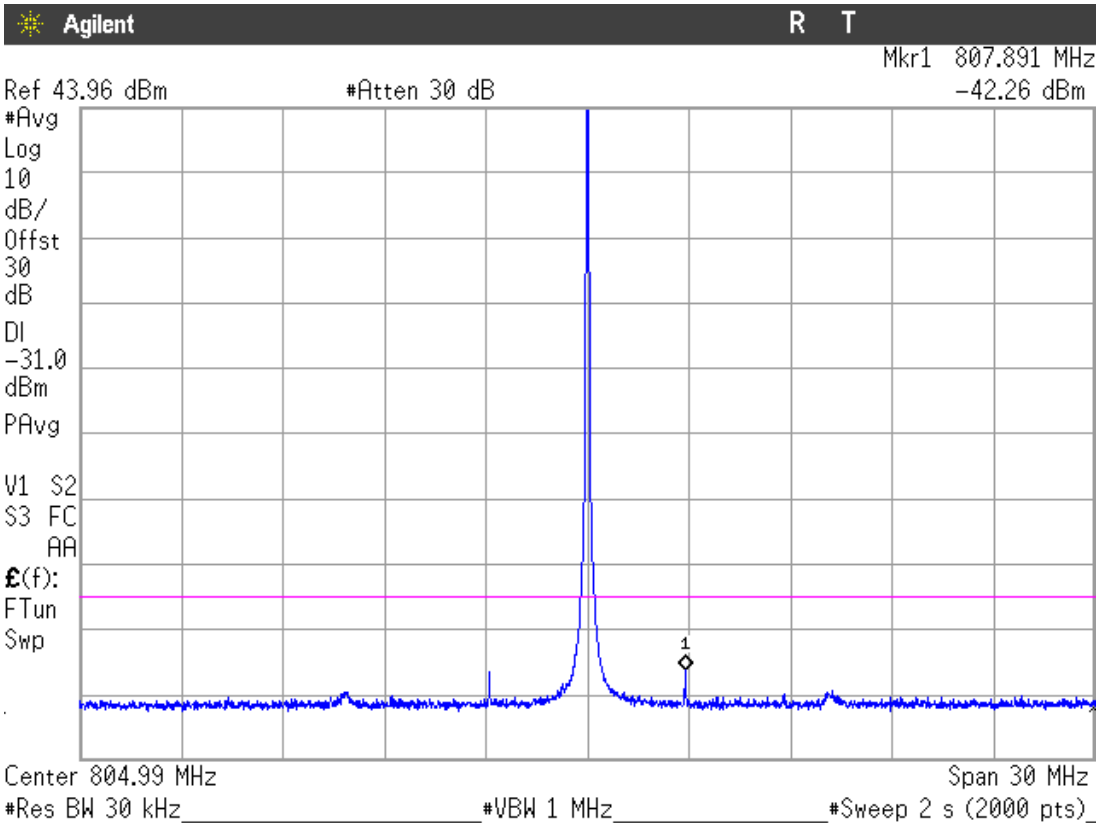
RMS Results

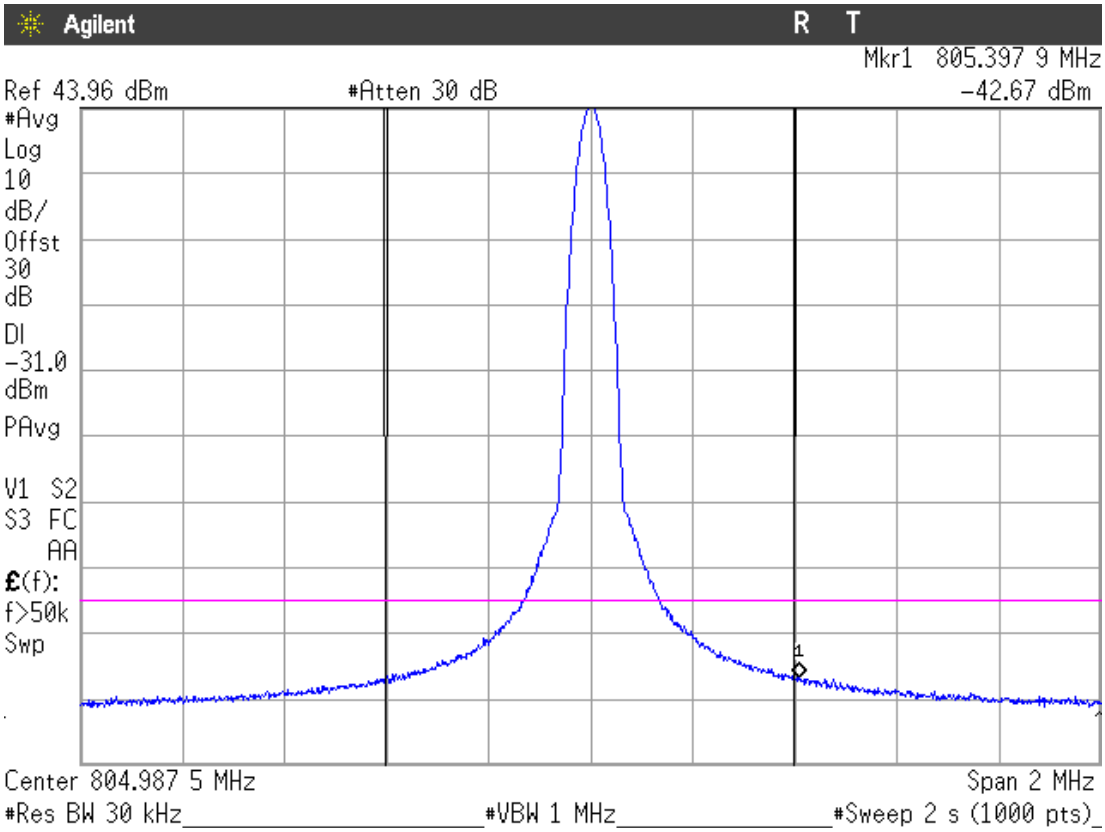
Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
43.96 dBm / 12.5000 kHz	9.375 kHz	6.250 kHz	-55.03	-11.06	-55.18	-11.22
	15.63 kHz	6.250 kHz	-63.74	-19.78	-64.76	-20.80
	21.88 kHz	6.250 kHz	-66.87	-22.91	-65.97	-22.01
	37.50 kHz	25.00 kHz	-64.40	-20.44	-63.93	-19.97
	62.50 kHz	25.00 kHz	-69.76	-25.80	-69.90	-25.94
	87.50 kHz	25.00 kHz	-74.23	-30.27	-73.83	-29.87

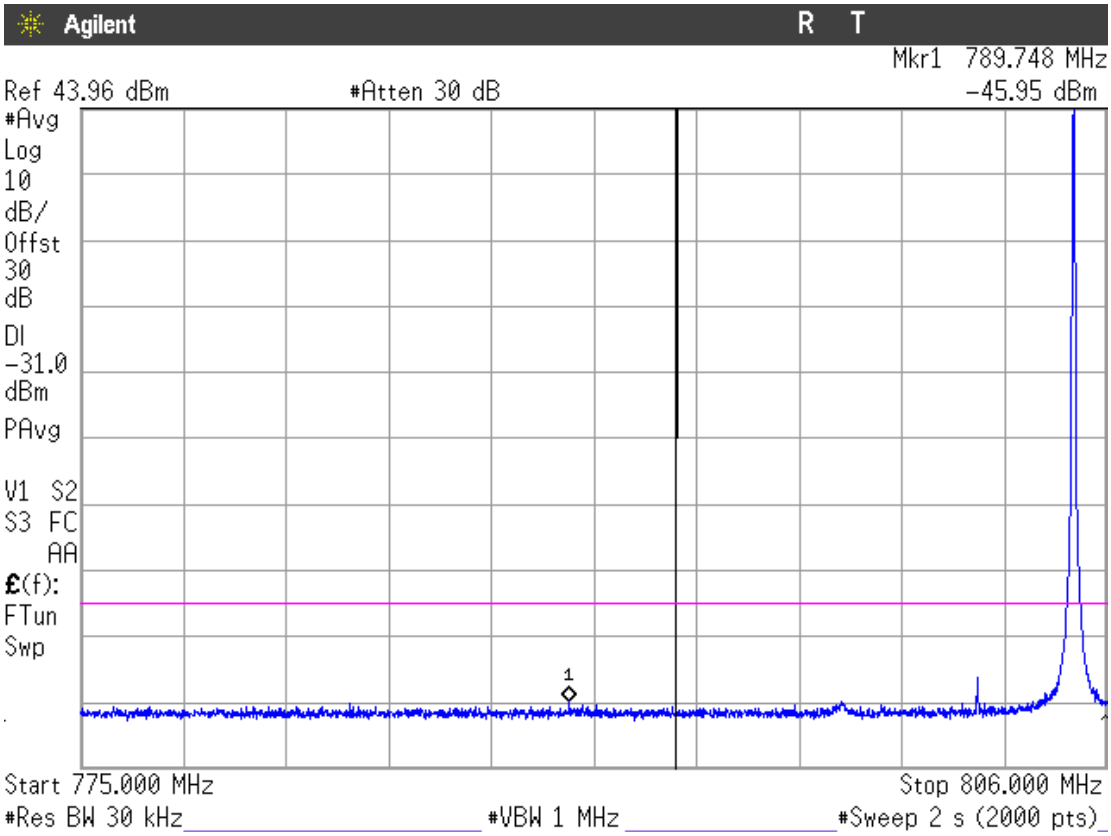


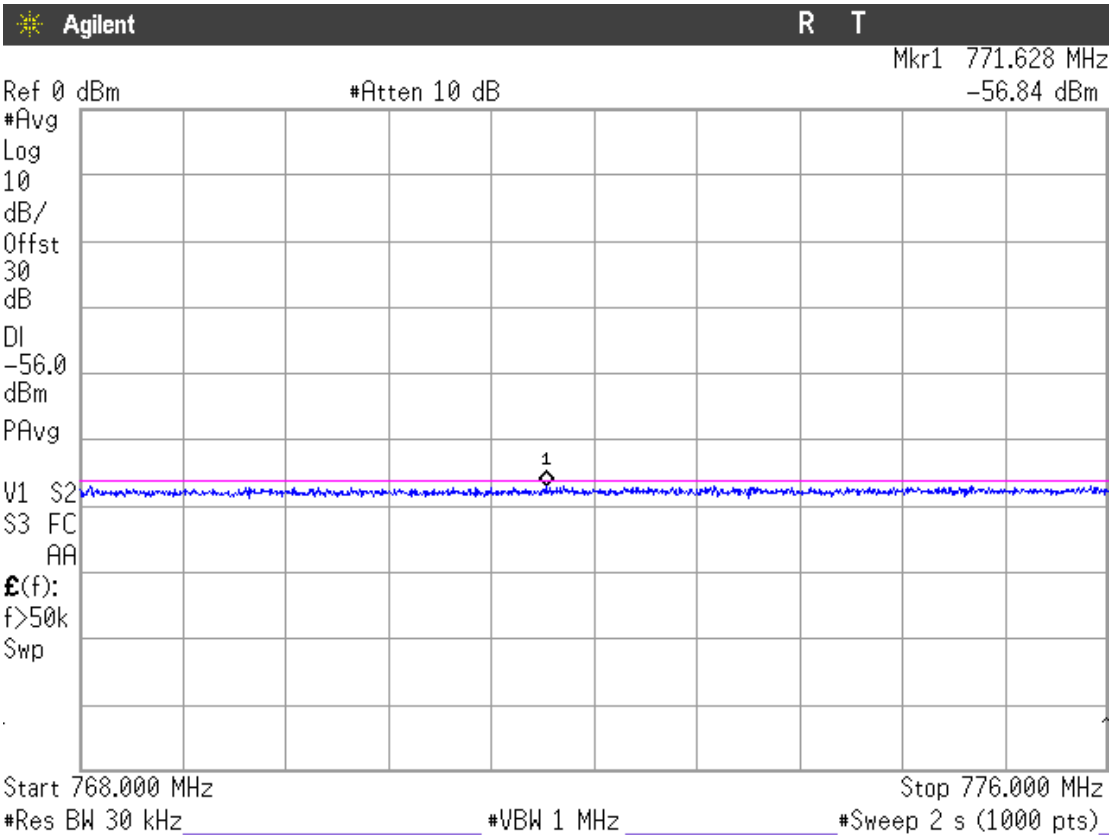
RMS Results

Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
45.60 dBm / 12.5000 kHz	150.0 kHz	100.0 kHz	-74.77	-29.17	-74.86	-29.26
	250.0 kHz	100.0 kHz	-81.21	-35.61	-80.34	-34.74
	350.0 kHz	100.0 kHz	-83.25	-37.66	-83.34	-37.75


Agilent
R T
Mkr1 807.891 MHz
Ref 43.96 dBm
#Atten 30 dB
-42.26 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-31.0
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 804.99 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

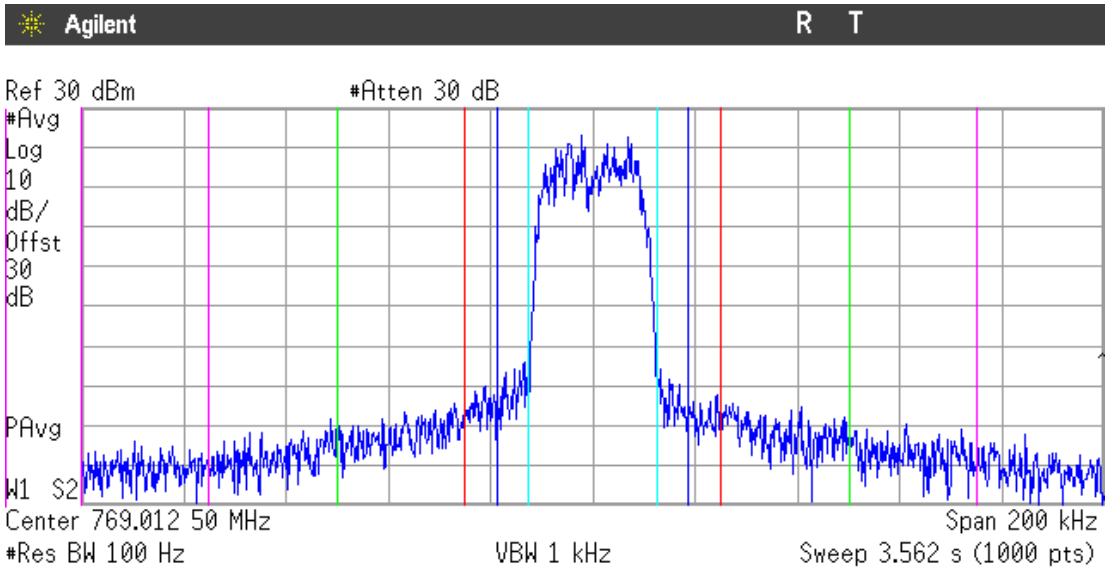

Agilent
R T
Mkr1 805.397 9 MHz
Ref 43.96 dBm
#Atten 30 dB
-42.67 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-31.0
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 804.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 789.748 MHz
Ref 43.96 dBm
#Atten 30 dB
-45.95 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-31.0
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 775.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 771.628 MHz
Ref 0 dBm
#Atten 10 dB
-56.84 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-56.0
dBm
PAvg
1
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Start 768.000 MHz
Stop 776.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

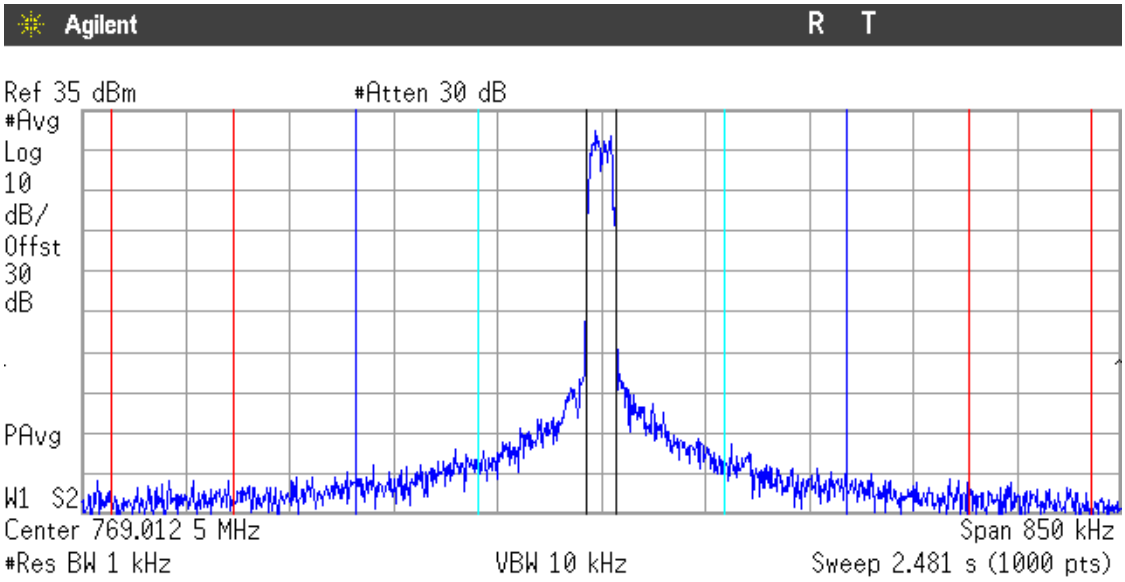
TI D-LMR 20 kHz. 769-775 MHz band.

Lowest Channel



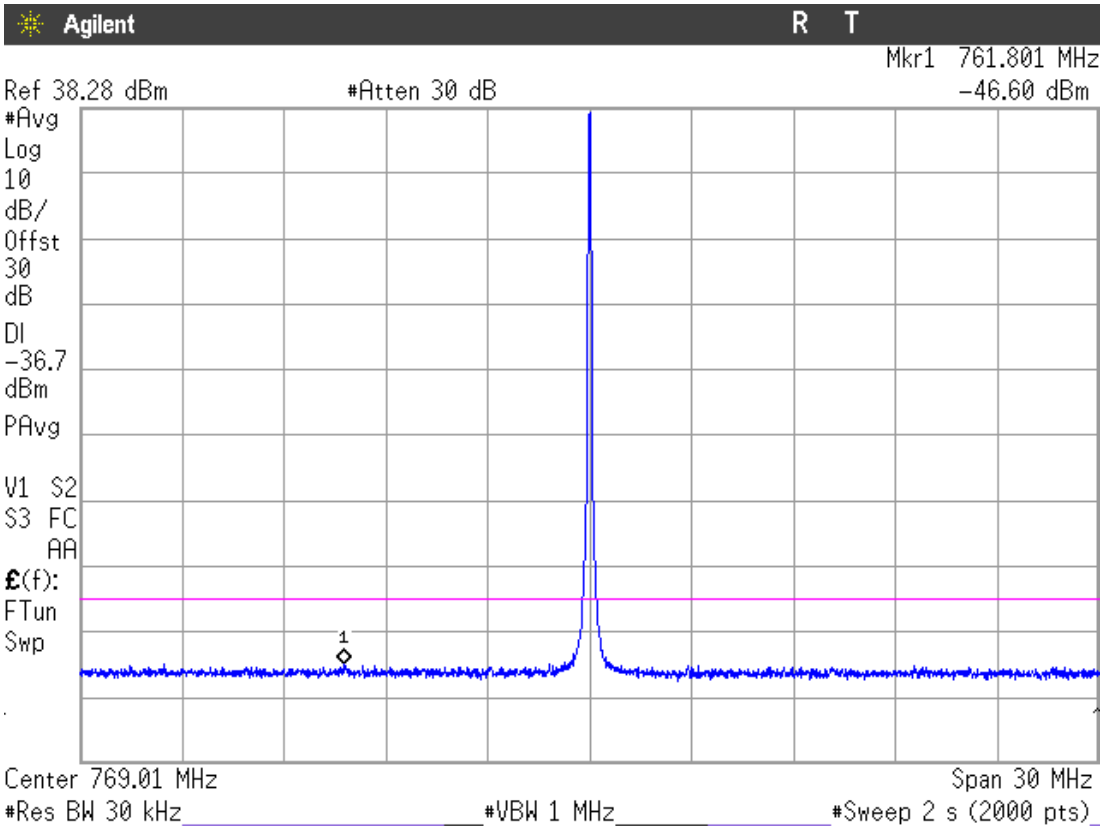
RMS Results

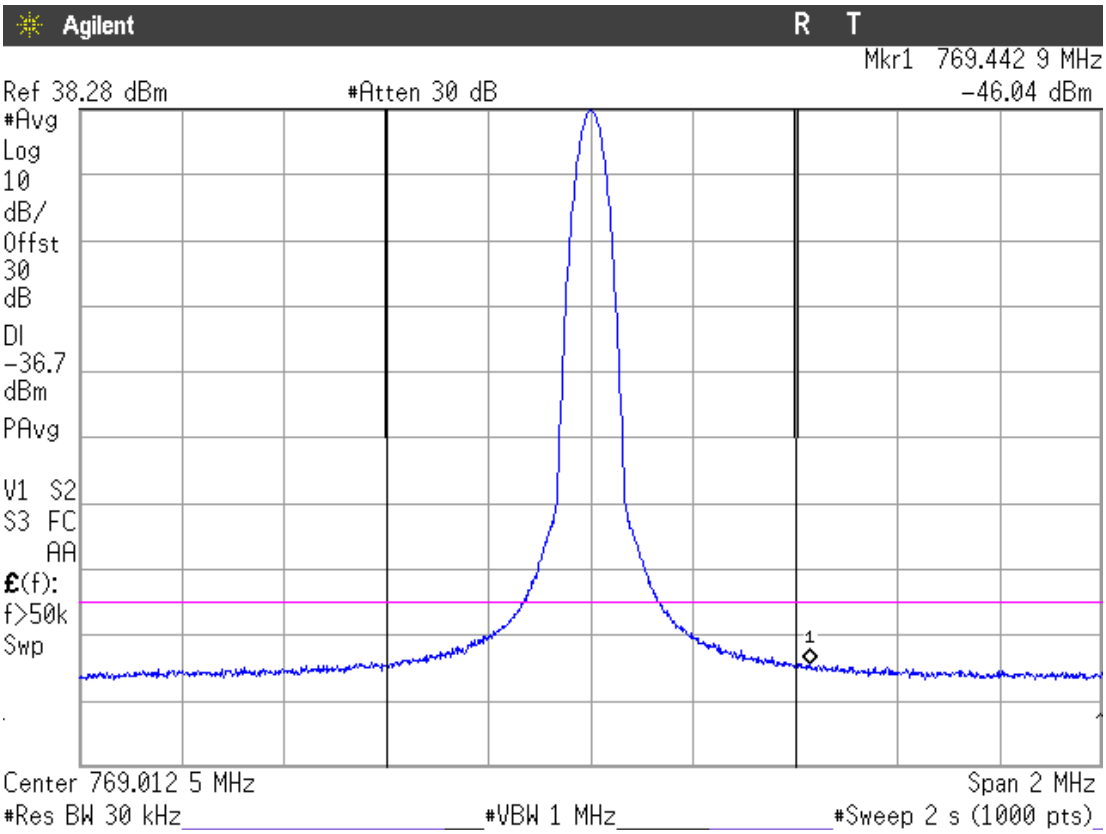
Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.28 dBm /	15.63 kHz	6.250 kHz	-60.39	-22.11	-62.65	-24.37
25.0000 kHz	21.88 kHz	6.250 kHz	-65.60	-27.32	-67.65	-29.37
	37.50 kHz	25.00 kHz	-65.70	-27.42	-65.13	-26.85
	62.50 kHz	25.00 kHz	-71.21	-32.93	-70.70	-32.42
	87.50 kHz	25.00 kHz	-74.59	-36.31	-74.58	-36.30

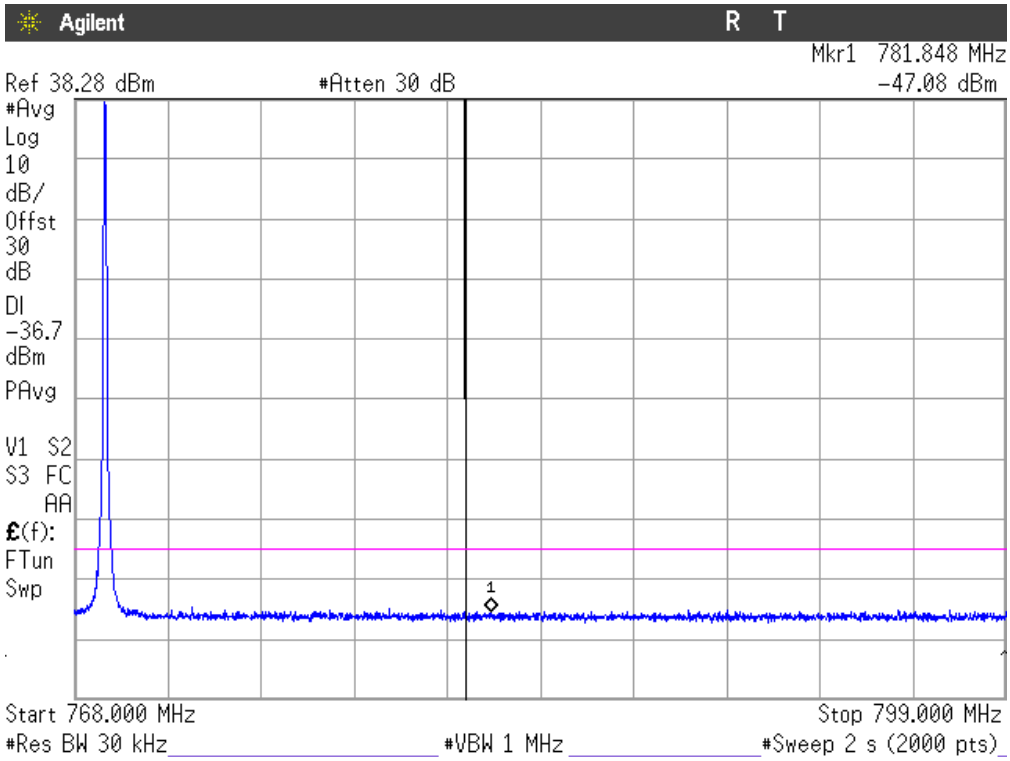


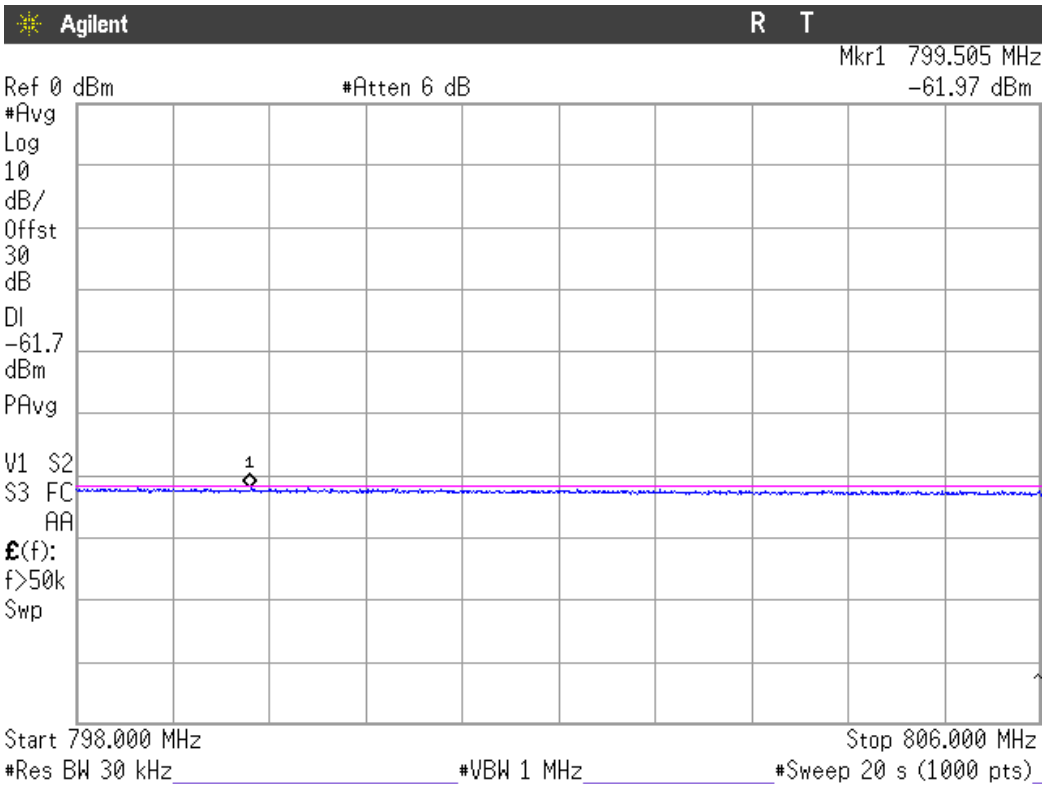
RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.59 dBm /	150.0 kHz	100.0 kHz	-74.10	-35.50	-74.09	-35.50
25.0000 kHz	250.0 kHz	100.0 kHz	-78.40	-39.80	-78.58	-39.98
	350.0 kHz	100.0 kHz	-80.30	-41.70	-80.19	-41.59

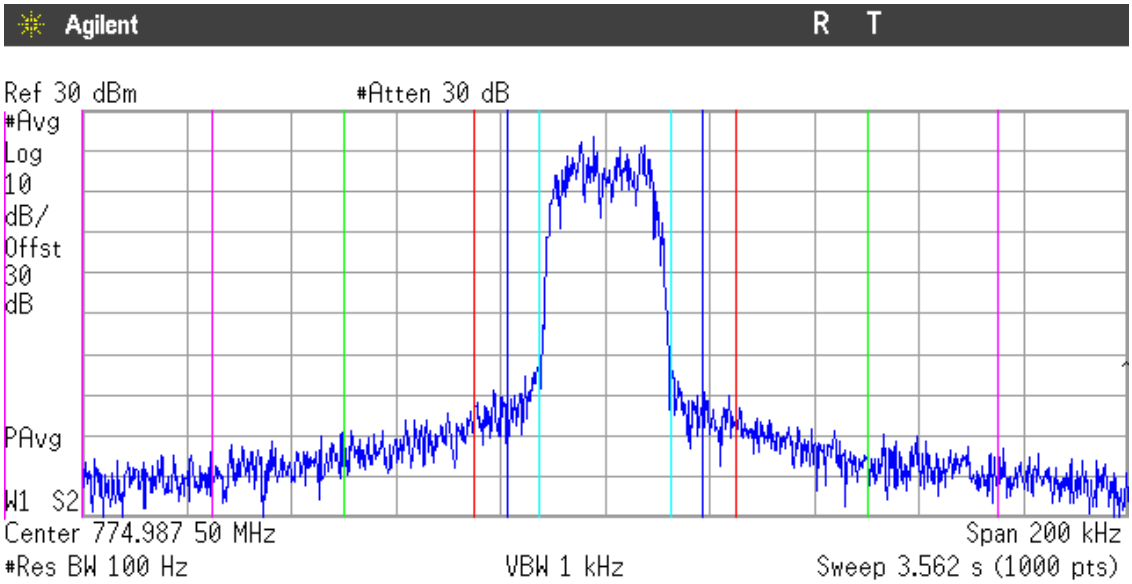

Agilent
R T
Mkr1 761.801 MHz
Ref 38.28 dBm
#Atten 30 dB
-46.60 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 769.01 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 769.442 9 MHz
Ref 38.28 dBm
#Atten 30 dB
-46.04 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 769.012 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 781.848 MHz
Ref 38.28 dBm
#Atten 30 dB
-47.08 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 768.000 MHz
Stop 799.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

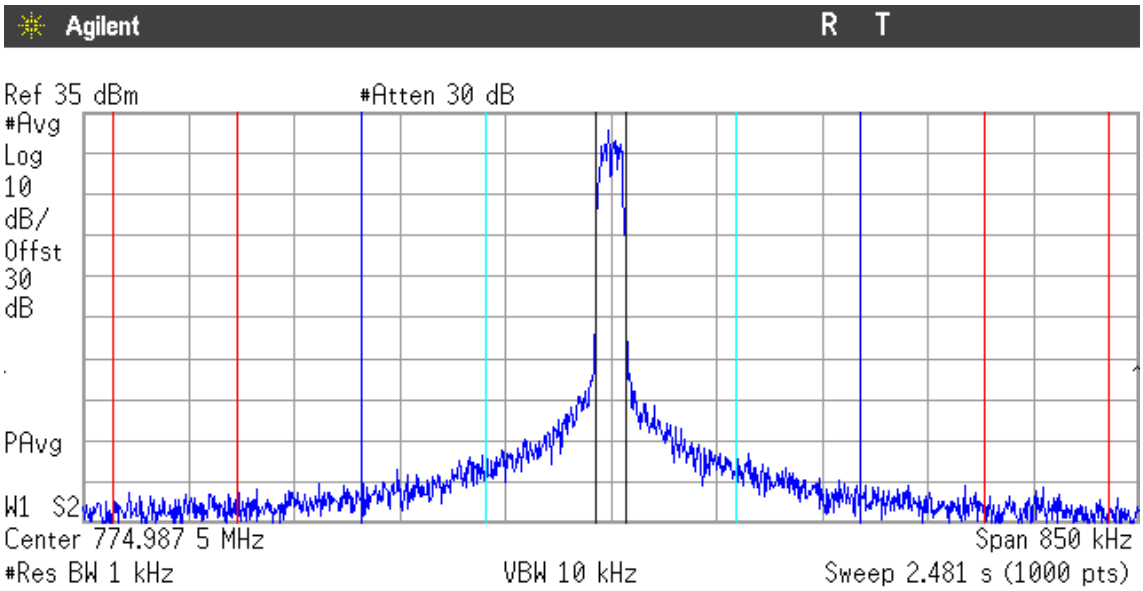

Agilent
R T
Mkr1 799.505 MHz
Ref 0 dBm
#Atten 6 dB
-61.97 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 798.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

Highest Channel



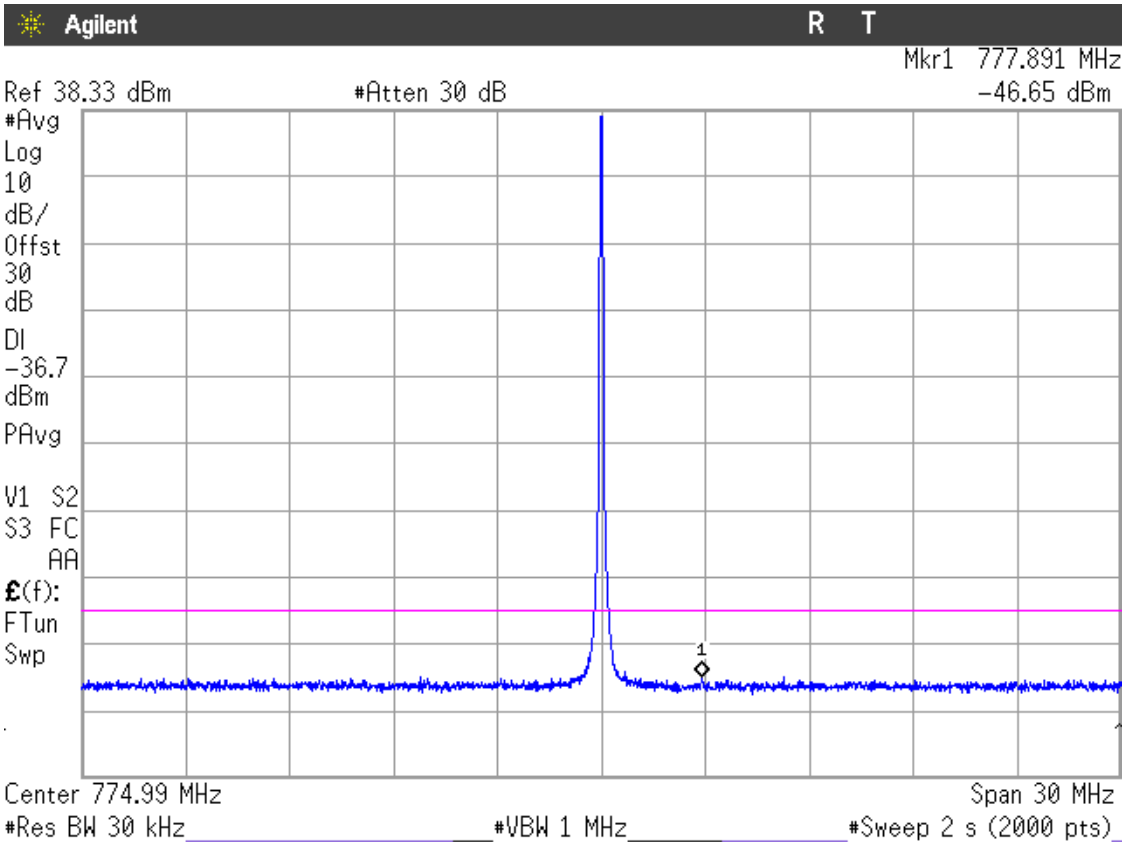
RMS Results

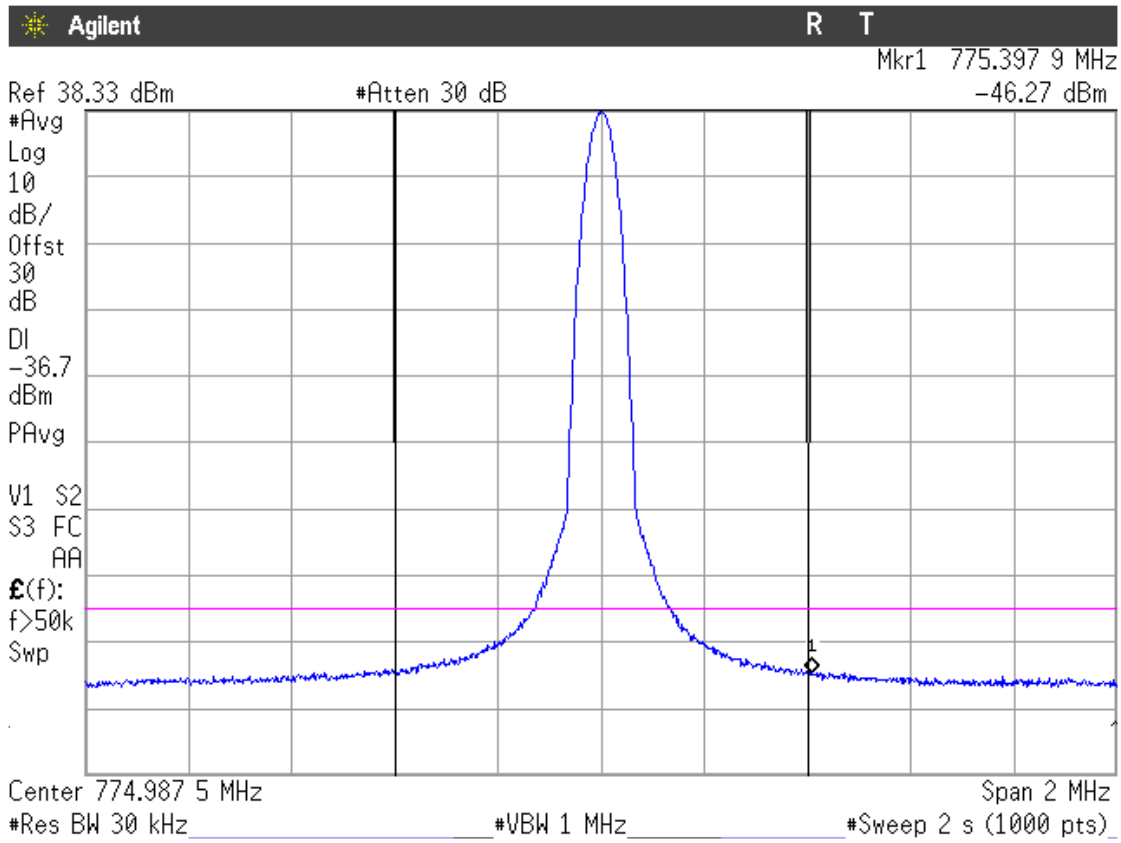
Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
38.33 dBm /	15.63 kHz	6.250 kHz	-59.80	-21.47	-61.88	-23.55
25.0000 kHz	21.88 kHz	6.250 kHz	-64.78	-26.45	-66.01	-27.69
	37.50 kHz	25.00 kHz	-65.44	-27.12	-65.65	-27.32
	62.50 kHz	25.00 kHz	-71.02	-32.70	-71.30	-32.98
	87.50 kHz	25.00 kHz	-74.60	-36.27	-74.99	-36.66

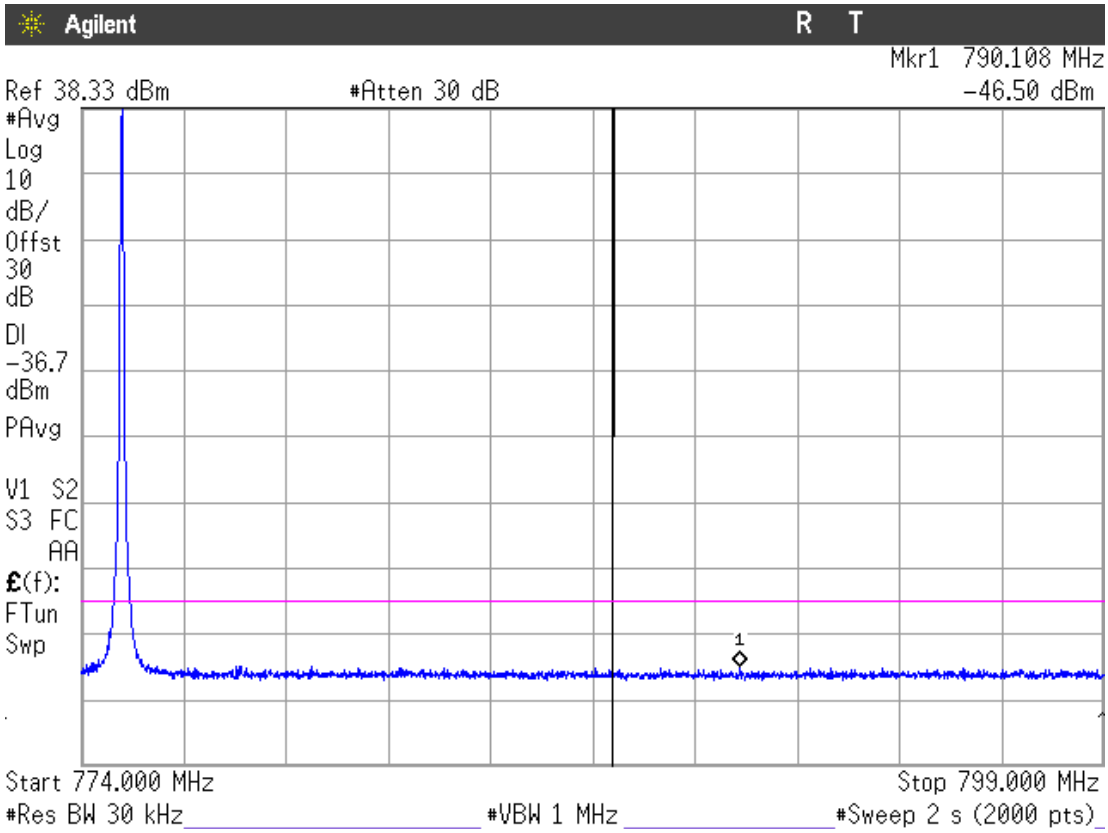


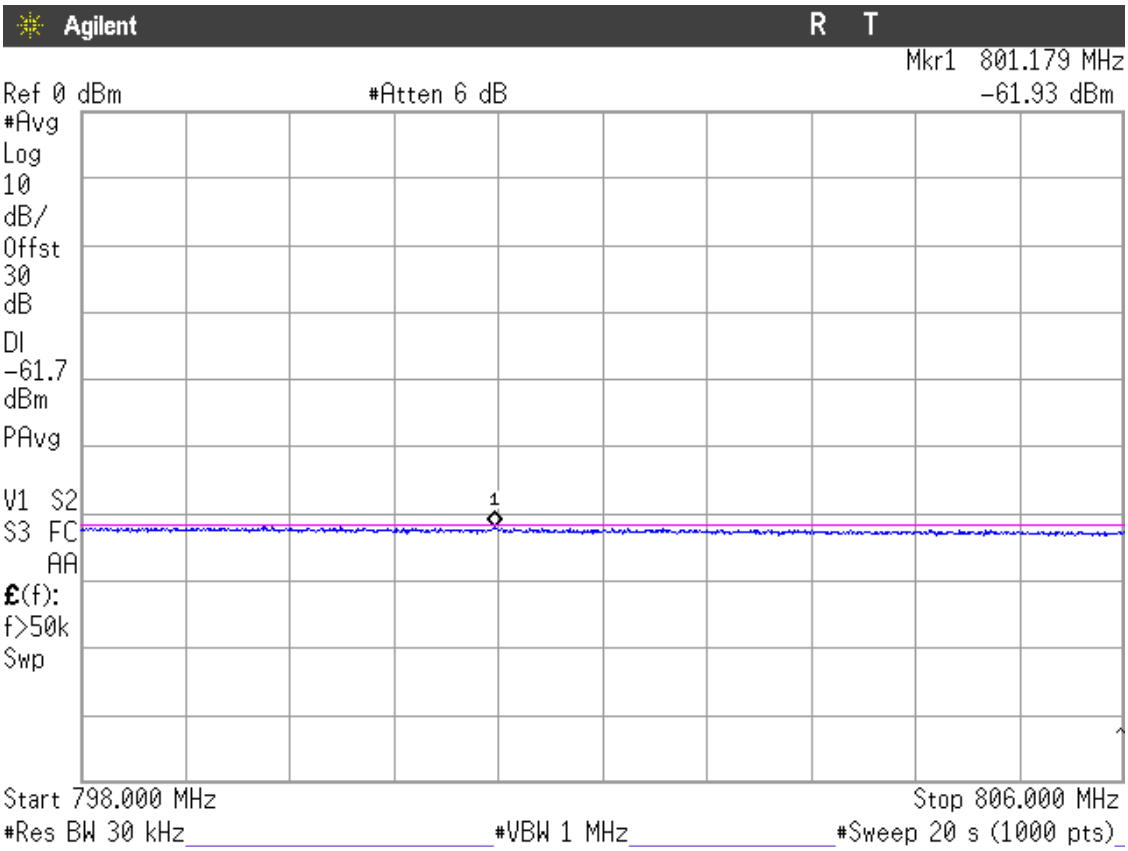
RMS Results

Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
38.37 dBm /	150.0 kHz	100.0 kHz	-73.46	-35.08	-73.67	-35.29
25.0000 kHz	250.0 kHz	100.0 kHz	-78.56	-40.19	-78.53	-40.15
	350.0 kHz	100.0 kHz	-79.95	-41.57	-80.36	-41.99


Agilent
R T
Mkr1 777.891 MHz
Ref 38.33 dBm
#Atten 30 dB
-46.65 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 774.99 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

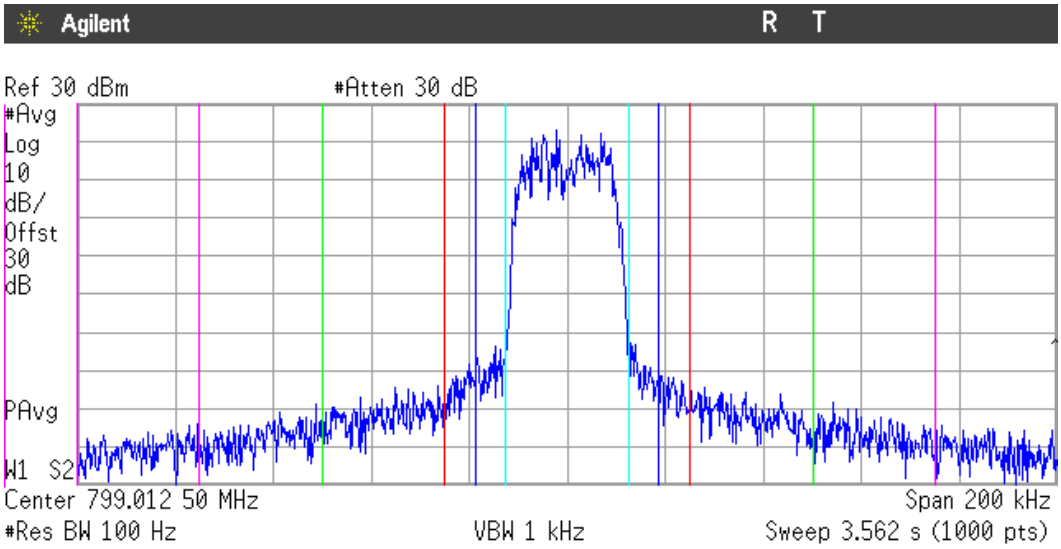

Agilent
R T
Mkr1 775.397 9 MHz
Ref 38.33 dBm
#Atten 30 dB
-46.27 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 774.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 790.108 MHz
Ref 38.33 dBm
#Atten 30 dB
-46.50 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 774.000 MHz
Stop 799.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 801.179 MHz
Ref 0 dBm
#Atten 6 dB
-61.93 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 798.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

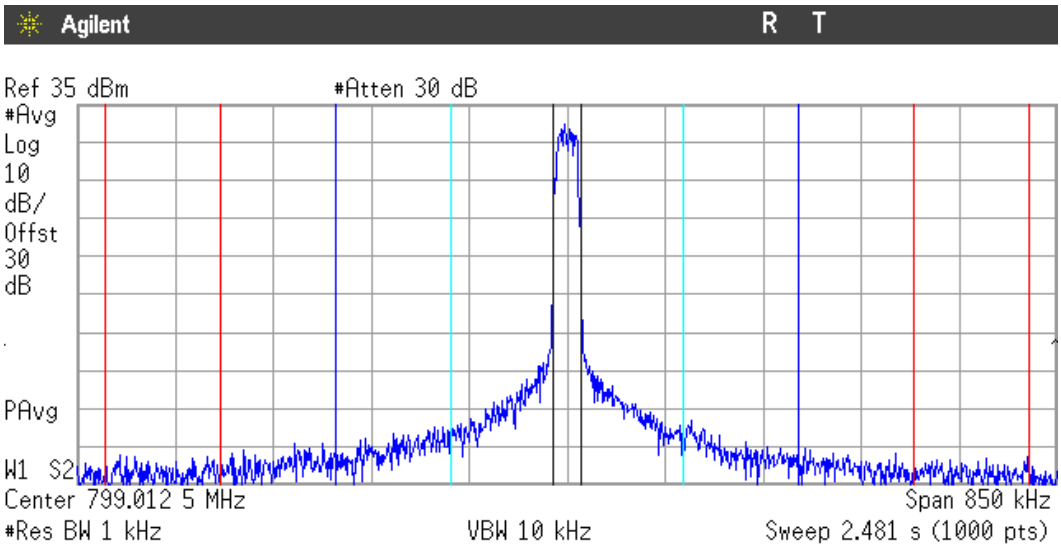
TI D-LMR 20 kHz. 799-805 MHz band.

Lowest Channel



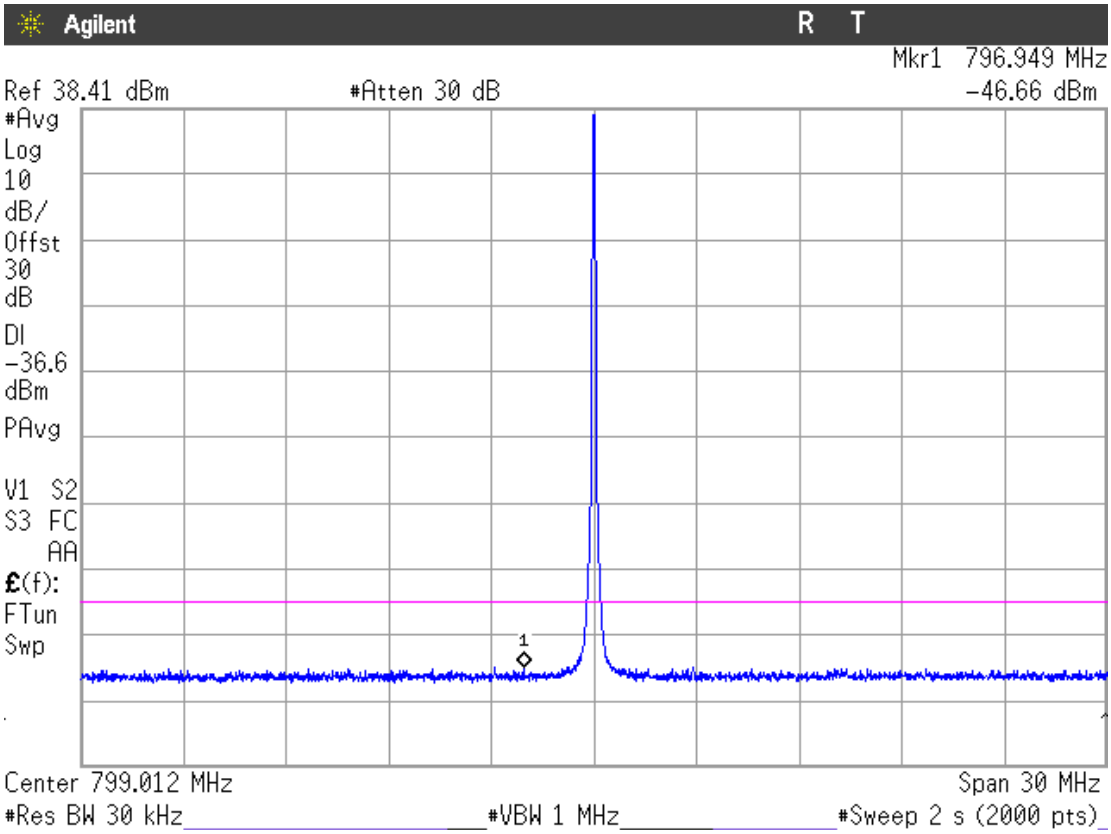
RMS Results

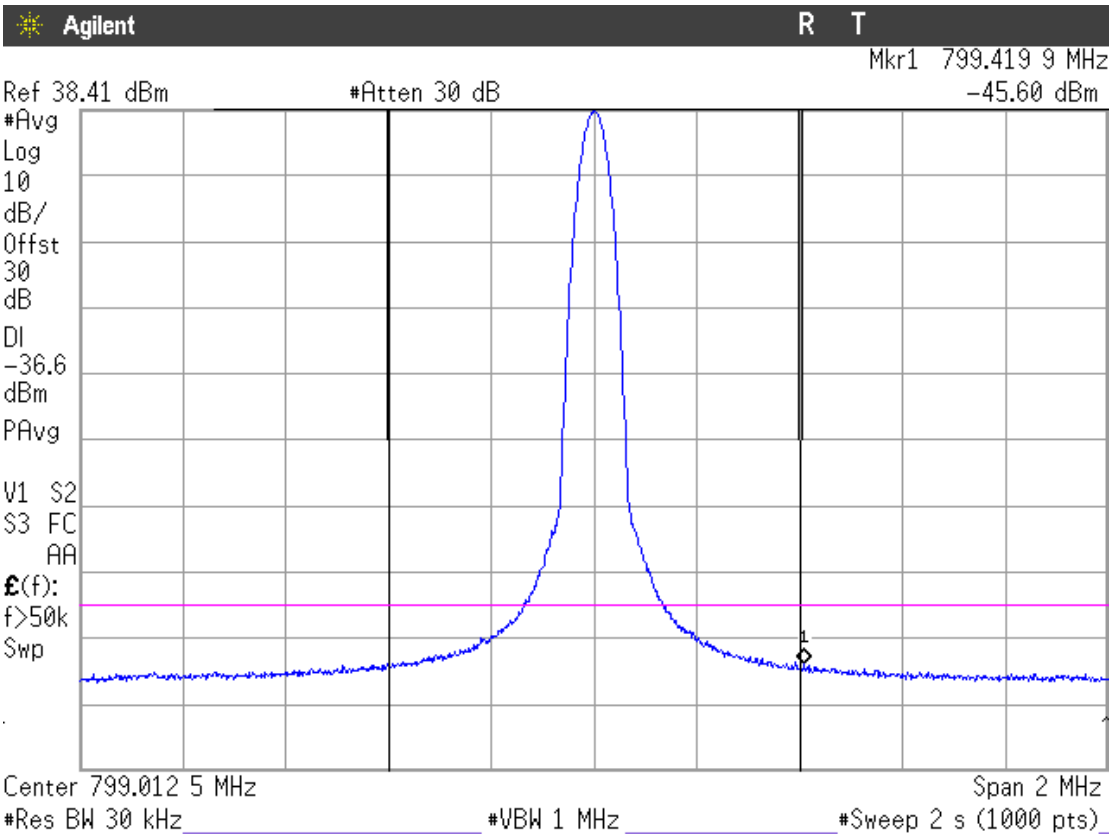
Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.41 dBm /	15.63 kHz	6.250 kHz	-59.86	-21.45	-59.75	-21.34
25.0000 kHz	21.88 kHz	6.250 kHz	-64.46	-26.05	-66.30	-27.89
	37.50 kHz	25.00 kHz	-65.64	-27.23	-65.55	-27.14
	62.50 kHz	25.00 kHz	-71.51	-33.10	-70.83	-32.42
	87.50 kHz	25.00 kHz	-74.94	-36.53	-74.86	-36.45

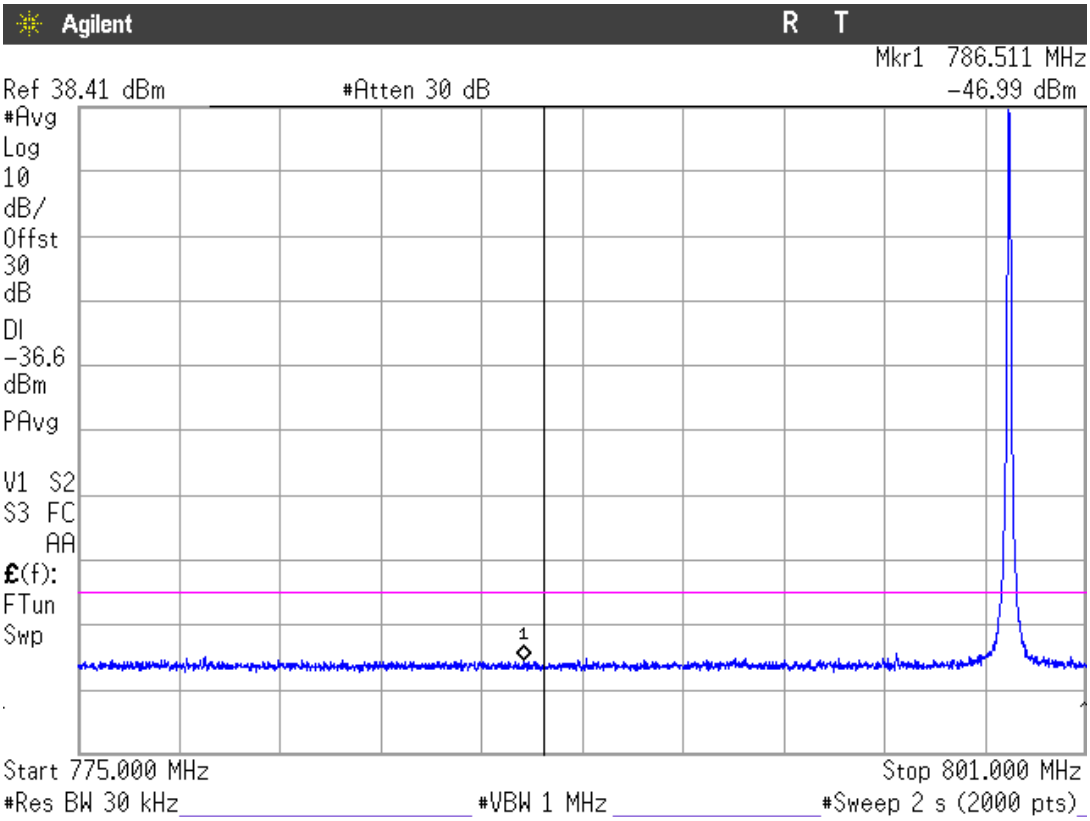


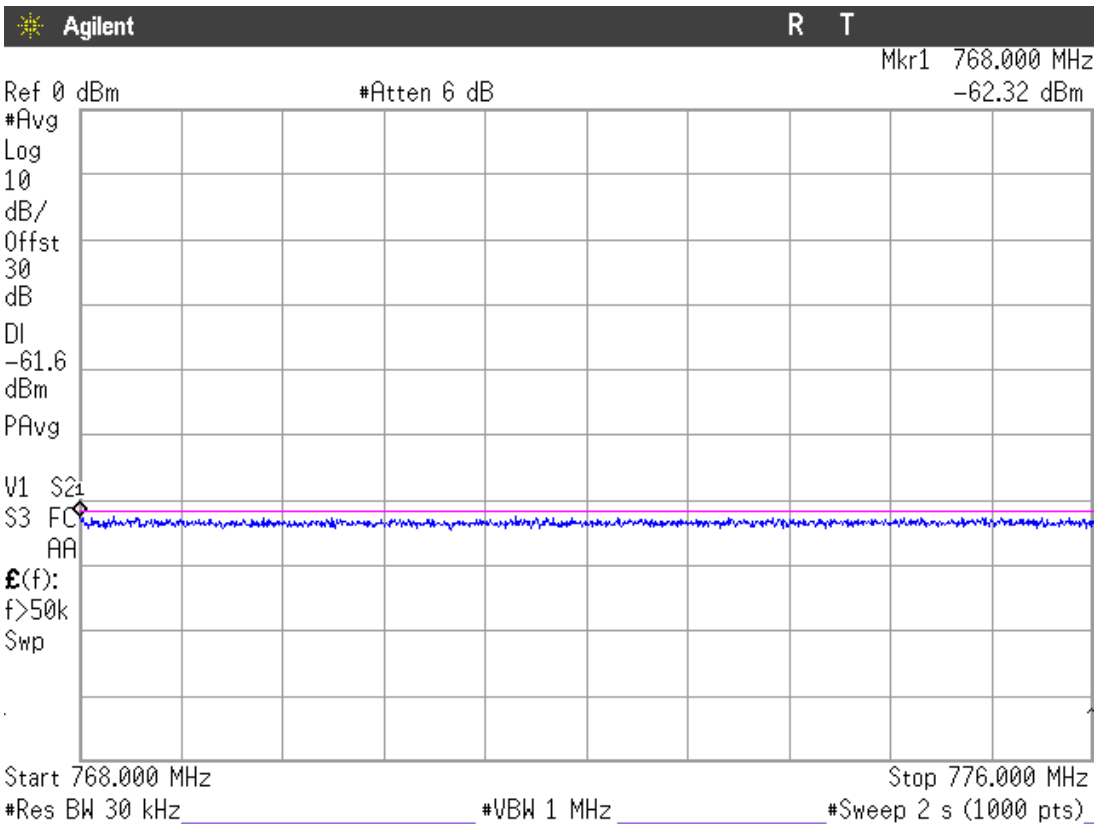
RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.71 dBm /	150.0 kHz	100.0 kHz	-73.77	-35.06	-74.31	-35.60
25.0000 kHz	250.0 kHz	100.0 kHz	-78.25	-39.54	-79.34	-40.64
	350.0 kHz	100.0 kHz	-80.54	-41.83	-80.71	-42.01

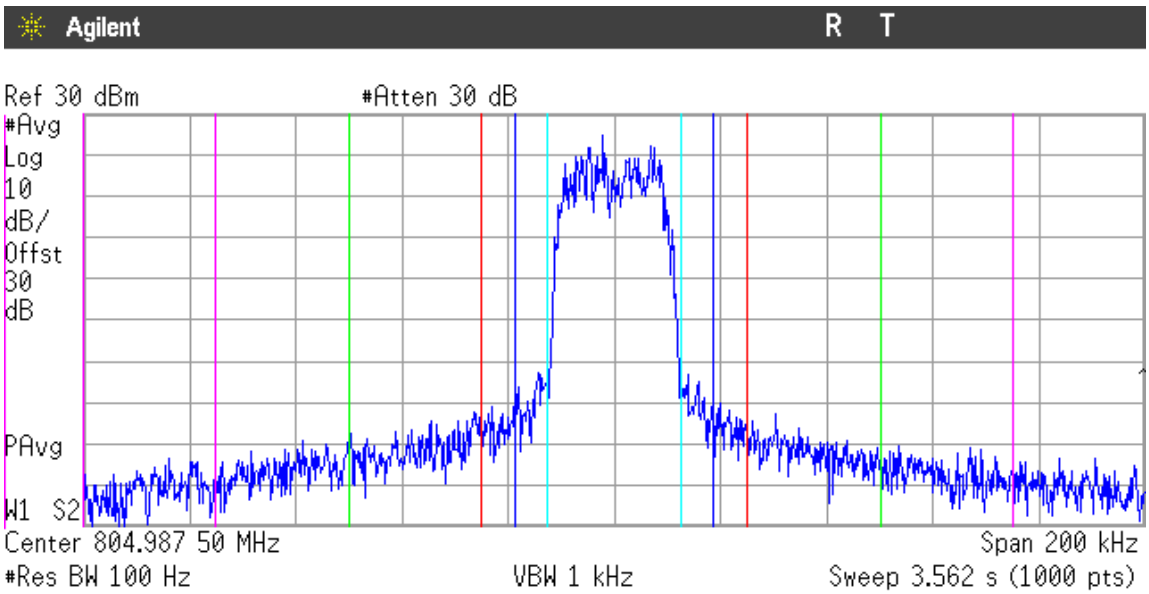

Agilent
R T
Mkr1 796.949 MHz
Ref 38.41 dBm
#Atten 30 dB
-46.66 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 799.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 799.419 9 MHz
Ref 38.41 dBm
#Atten 30 dB
-45.60 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 799.012 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 786.511 MHz
Ref 38.41 dBm
#Atten 30 dB
-46.99 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 775.000 MHz
Stop 801.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

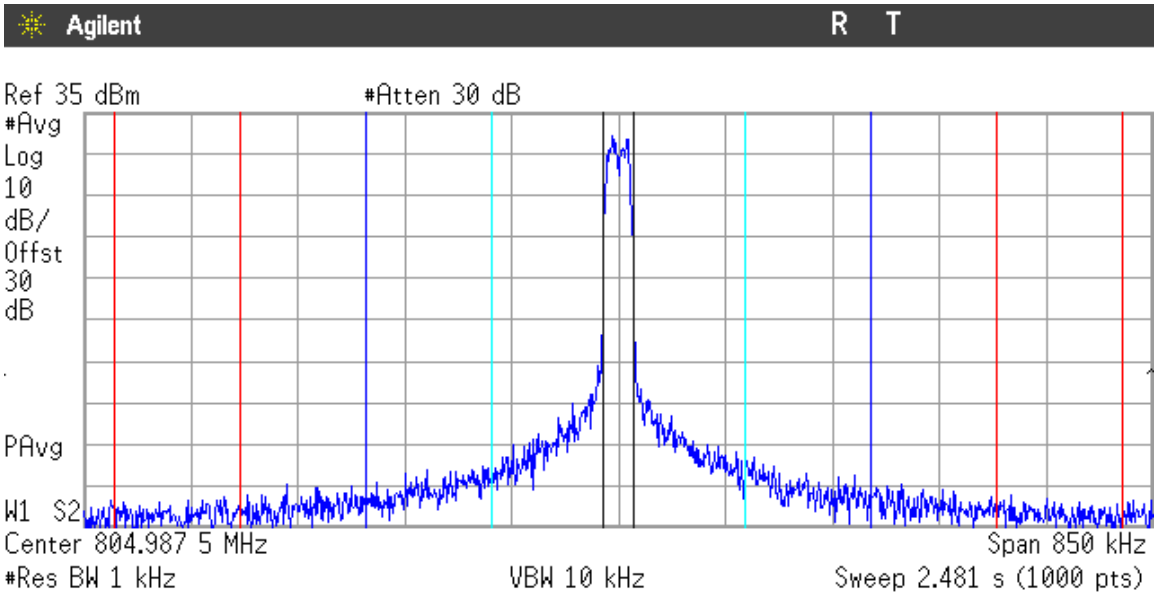

Agilent
R T
Mkr1 768.000 MHz
Ref 0 dBm
#Atten 6 dB
-62.32 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Start 768.000 MHz
Stop 776.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

Highest Channel



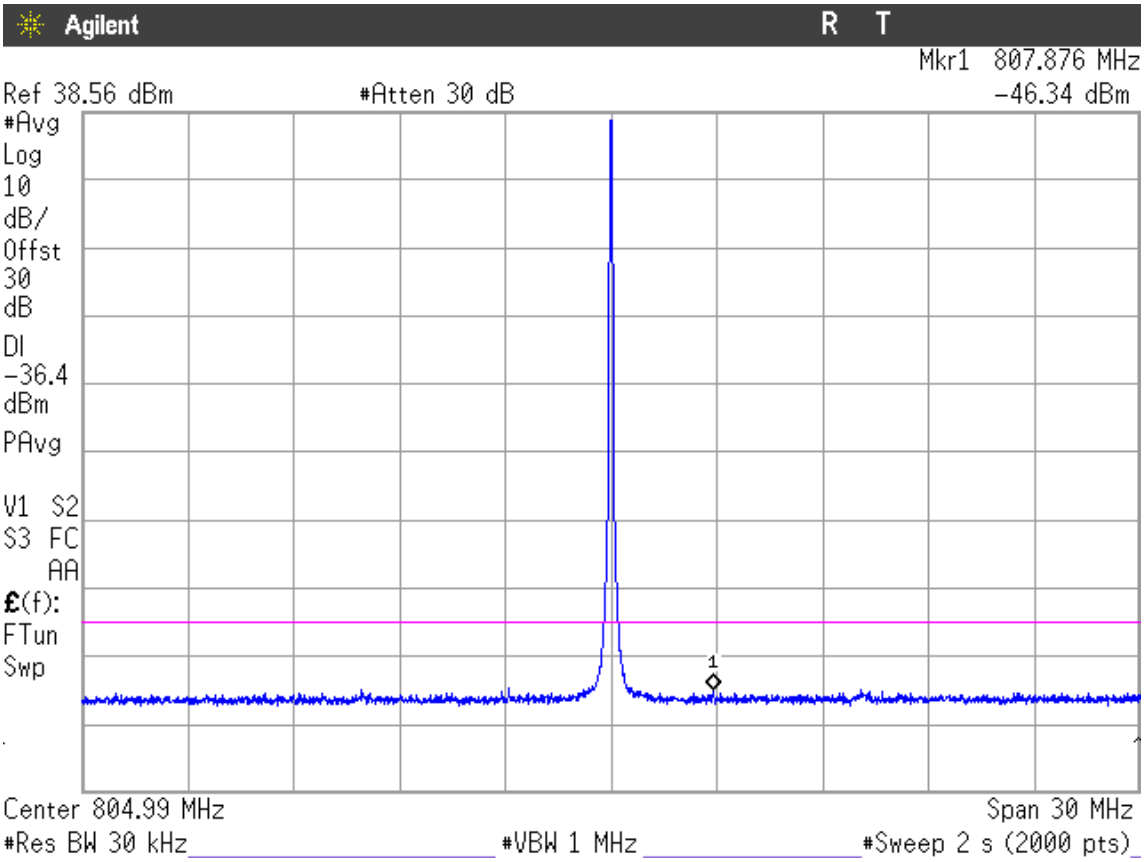
RMS Results

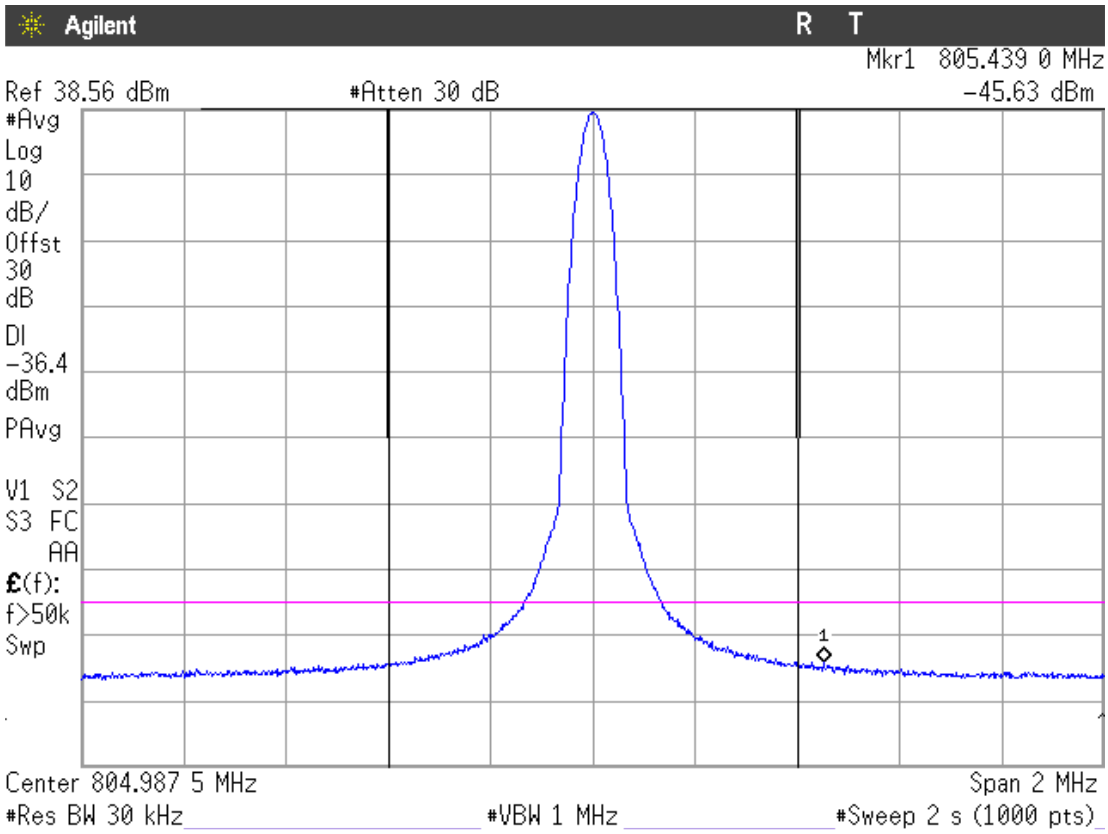
Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
38.56 dBm / 25.0000 kHz	15.63 kHz	6.250 kHz	-59.08	-20.52	-60.20	-21.64
	21.88 kHz	6.250 kHz	-66.31	-27.74	-66.32	-27.76
	37.50 kHz	25.00 kHz	-64.79	-26.22	-65.86	-27.29
	62.50 kHz	25.00 kHz	-70.40	-31.84	-71.30	-32.73
	87.50 kHz	25.00 kHz	-74.84	-36.28	-74.57	-36.01

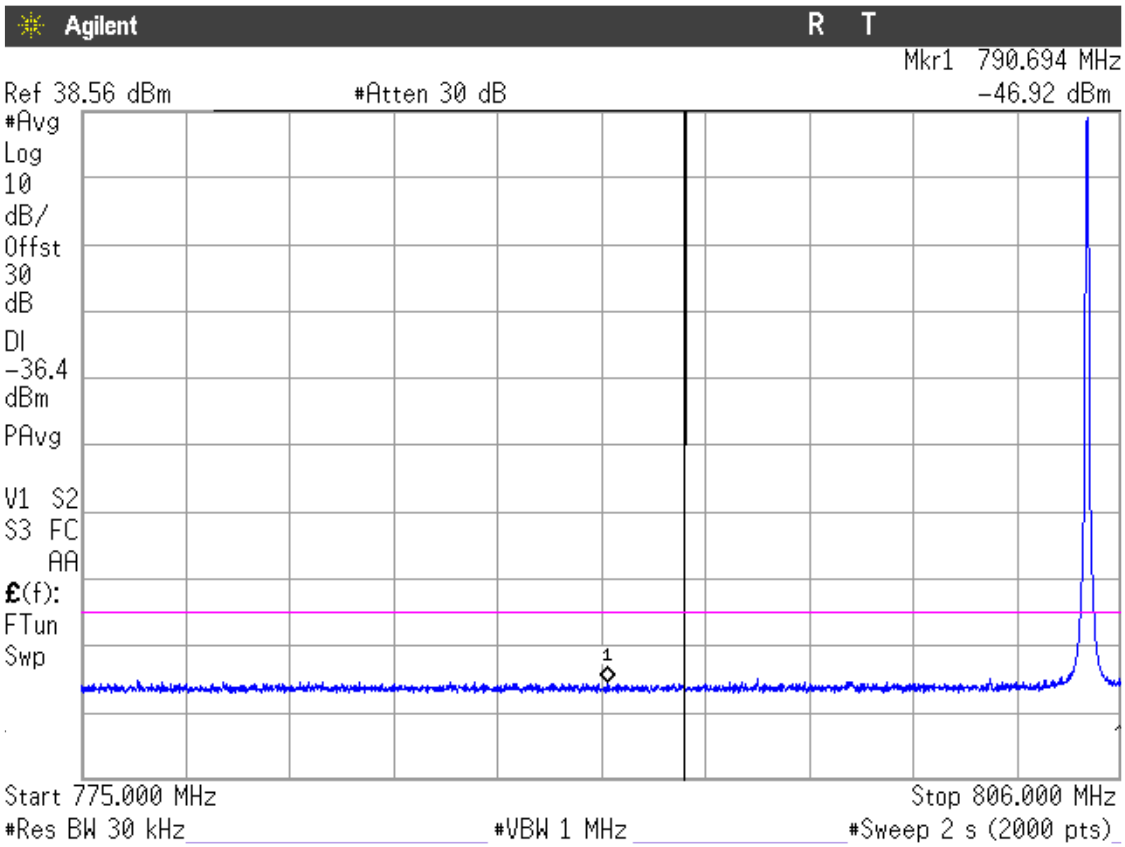


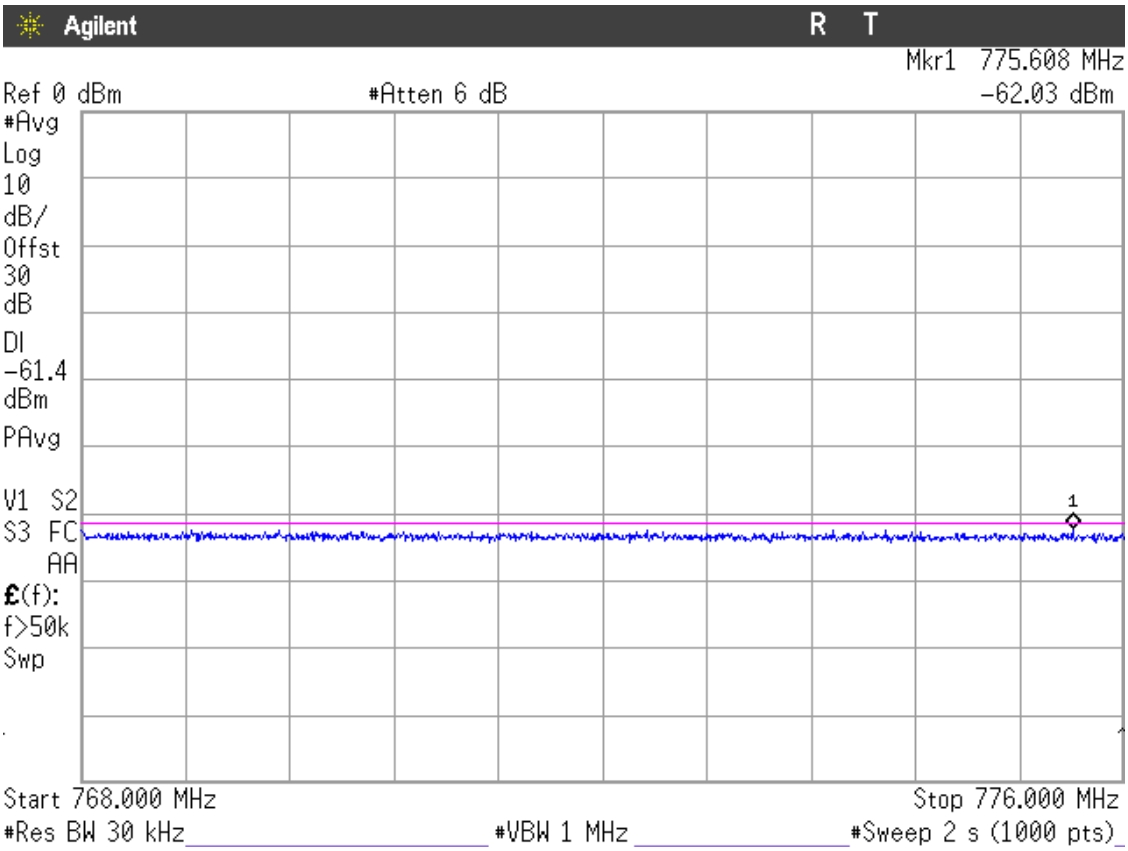
RMS Results

Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
38.63 dBm / 25.0000 kHz	150.0 kHz	100.0 kHz	-74.08	-35.45	-73.72	-35.09
	250.0 kHz	100.0 kHz	-78.52	-39.89	-78.16	-39.53
	350.0 kHz	100.0 kHz	-80.66	-42.03	-80.56	-41.93


Agilent
R T
Mkr1 807.876 MHz
Ref 38.56 dBm
#Atten 30 dB
-46.34 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.4
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 804.99 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

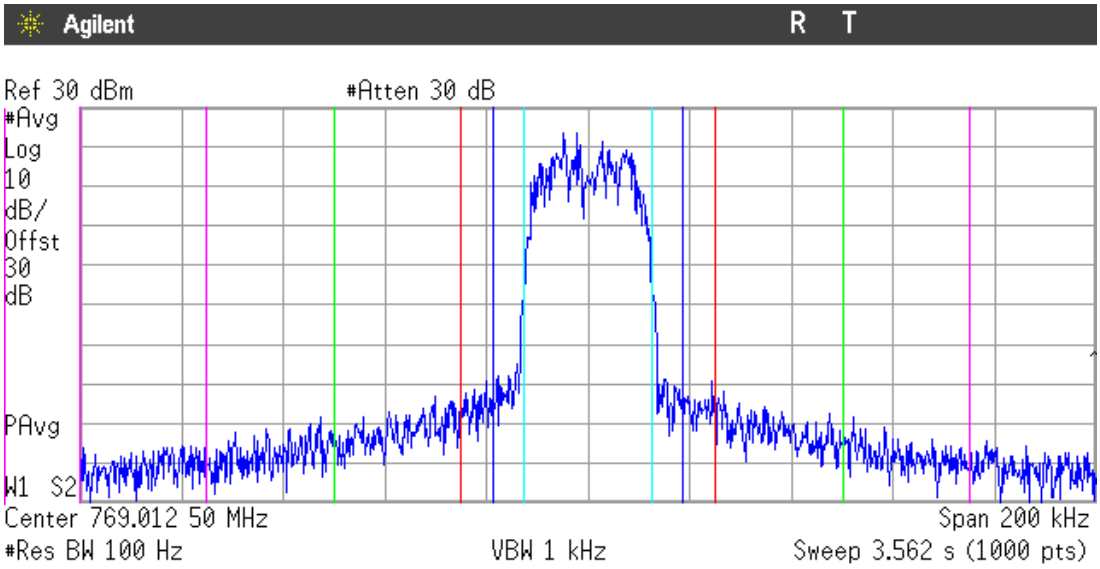

Agilent
R T
Mkr1 805.439 0 MHz
Ref 38.56 dBm
#Atten 30 dB
-45.63 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.4
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 804.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 790.694 MHz
Ref 38.56 dBm
#Atten 30 dB
-46.92 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.4
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 775.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 775.608 MHz
Ref 0 dBm
#Atten 6 dB
-62.03 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.4
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 768.000 MHz
Stop 776.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

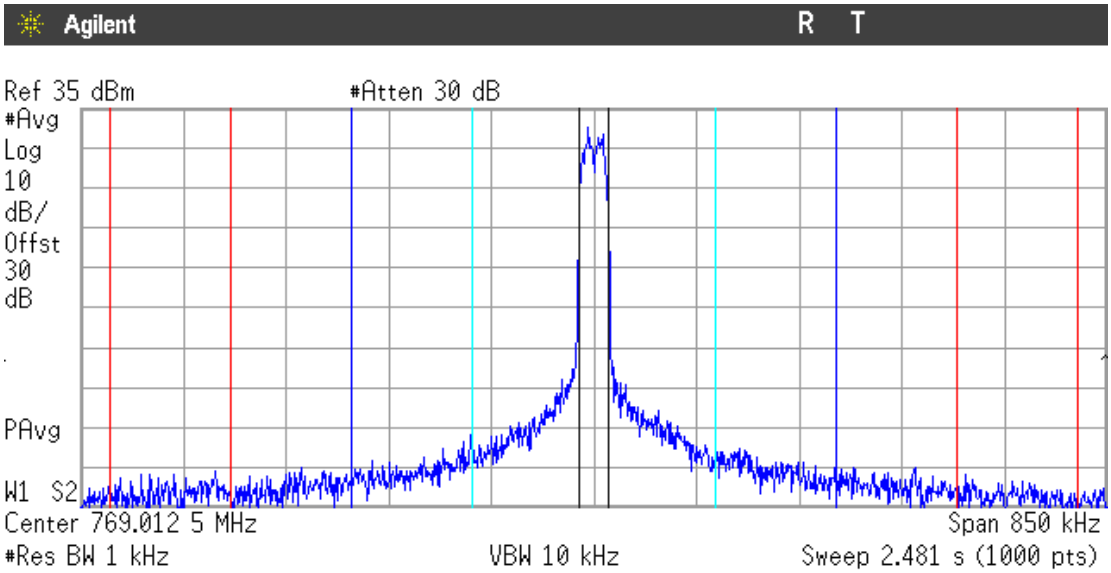
TETRA 22 kHz.769-775 MHz band.

Lowest Channel



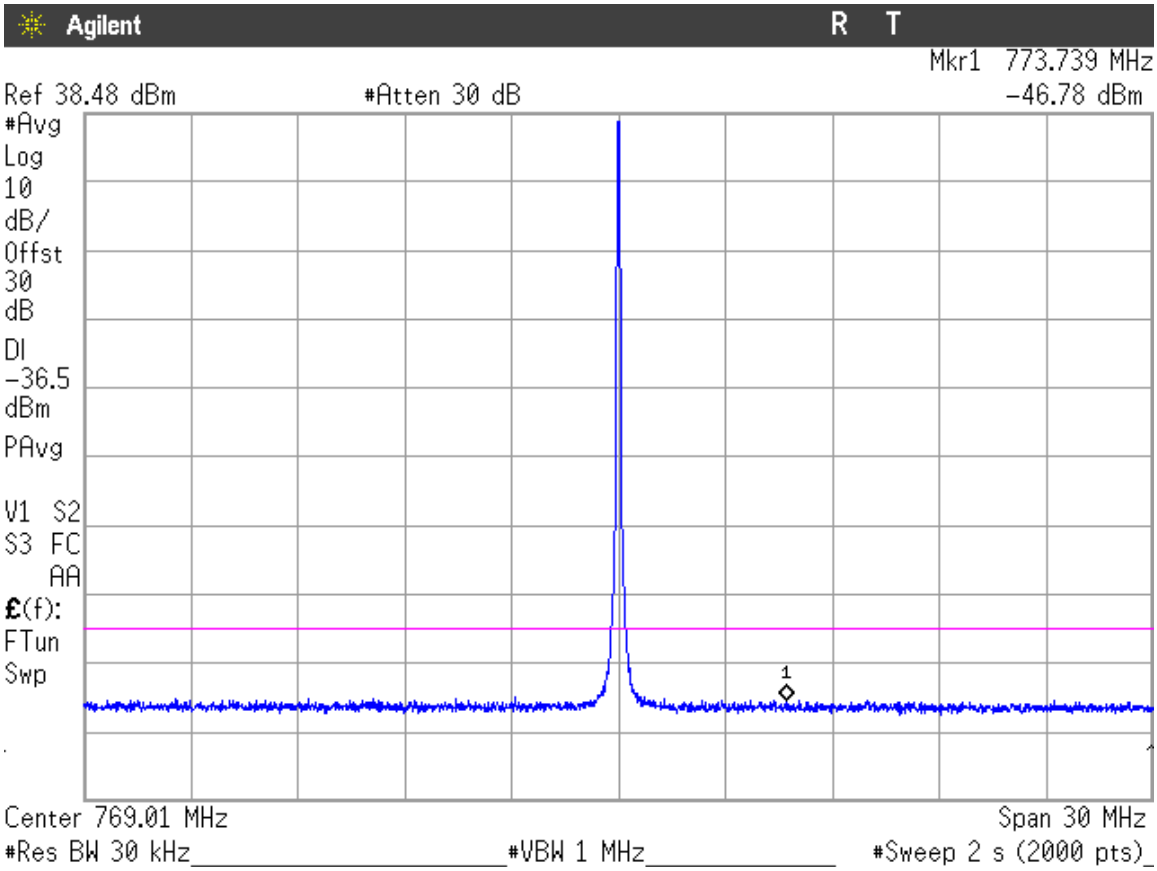
RMS Results

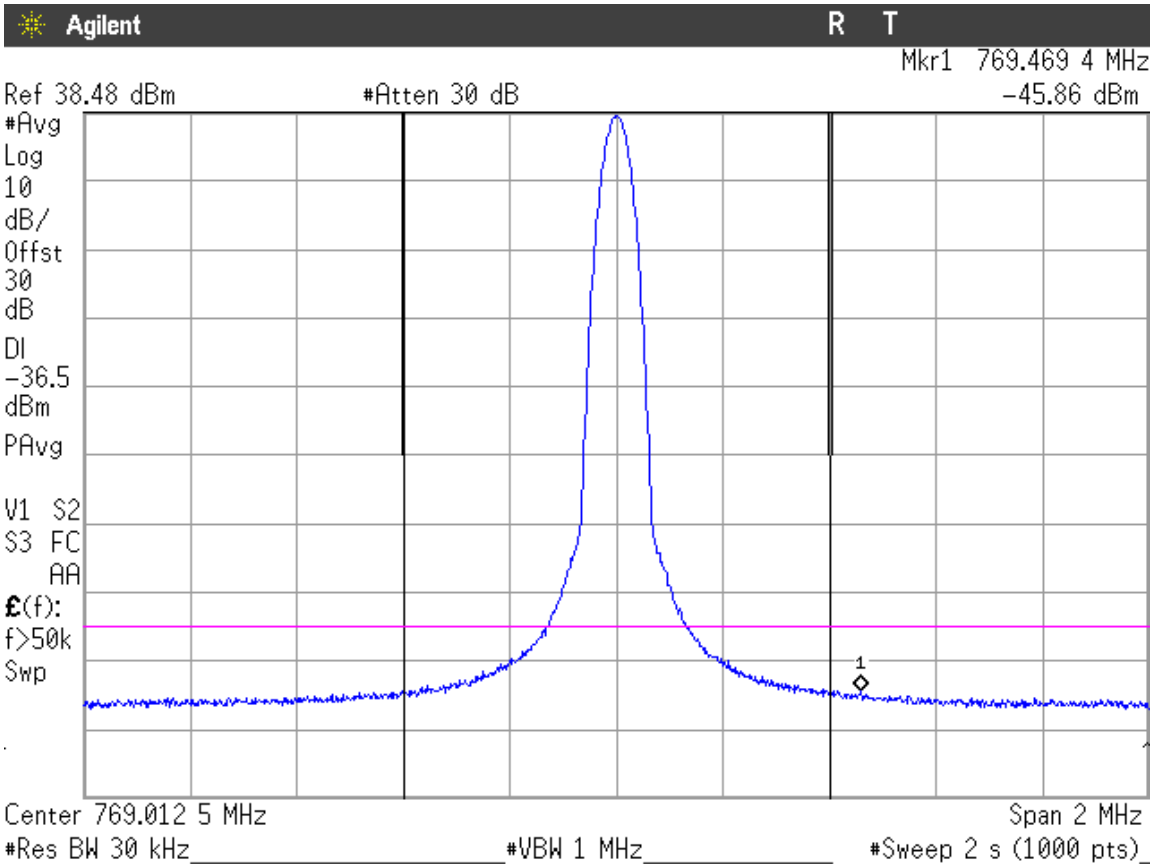
Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.48 dBm /	15.63 kHz	6.250 kHz	-49.83	-11.35	-47.05	-8.57
25.0000 kHz	21.88 kHz	6.250 kHz	-65.95	-27.47	-66.18	-27.69
	37.50 kHz	25.00 kHz	-65.43	-26.95	-65.28	-26.80
	62.50 kHz	25.00 kHz	-71.12	-32.64	-71.80	-33.32
	87.50 kHz	25.00 kHz	-75.10	-36.62	-75.43	-36.95

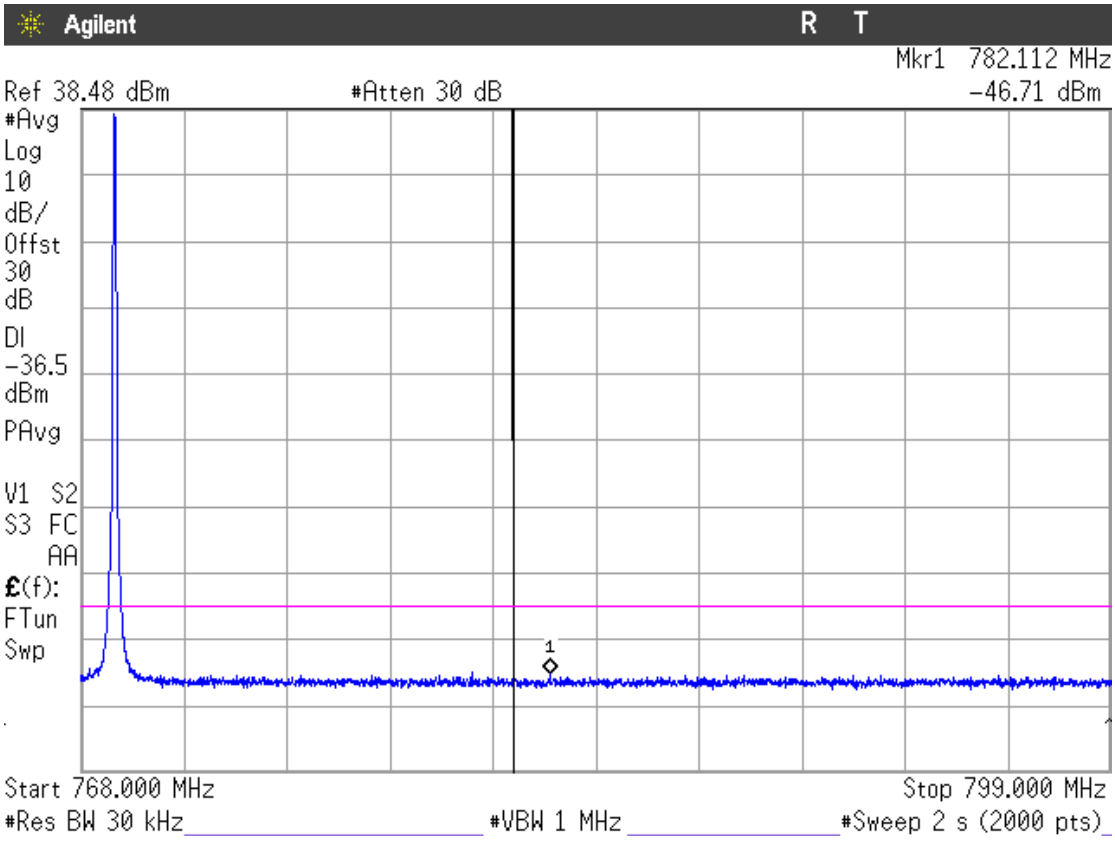


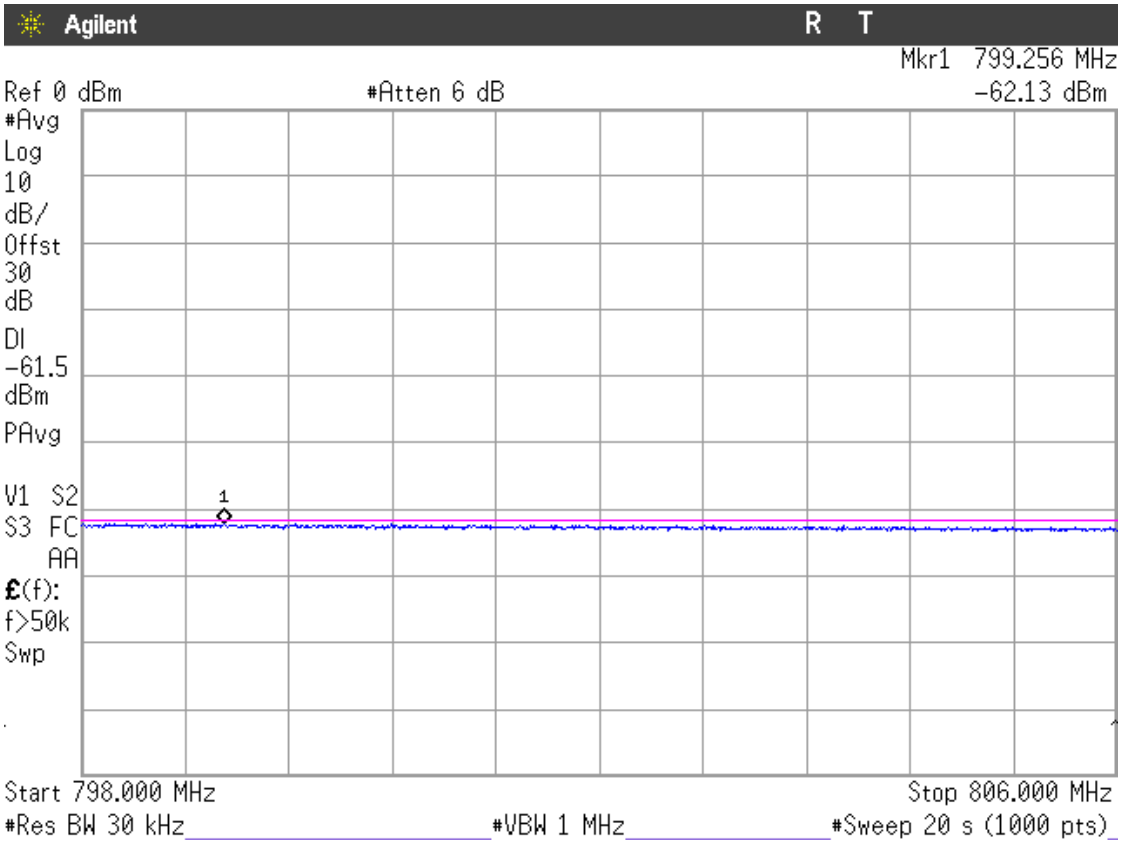
RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.37 dBm /	150.0 kHz	100.0 kHz	-73.83	-35.46	-73.76	-35.39
25.0000 kHz	250.0 kHz	100.0 kHz	-78.43	-40.06	-77.96	-39.59
	350.0 kHz	100.0 kHz	-79.71	-41.34	-80.38	-42.01

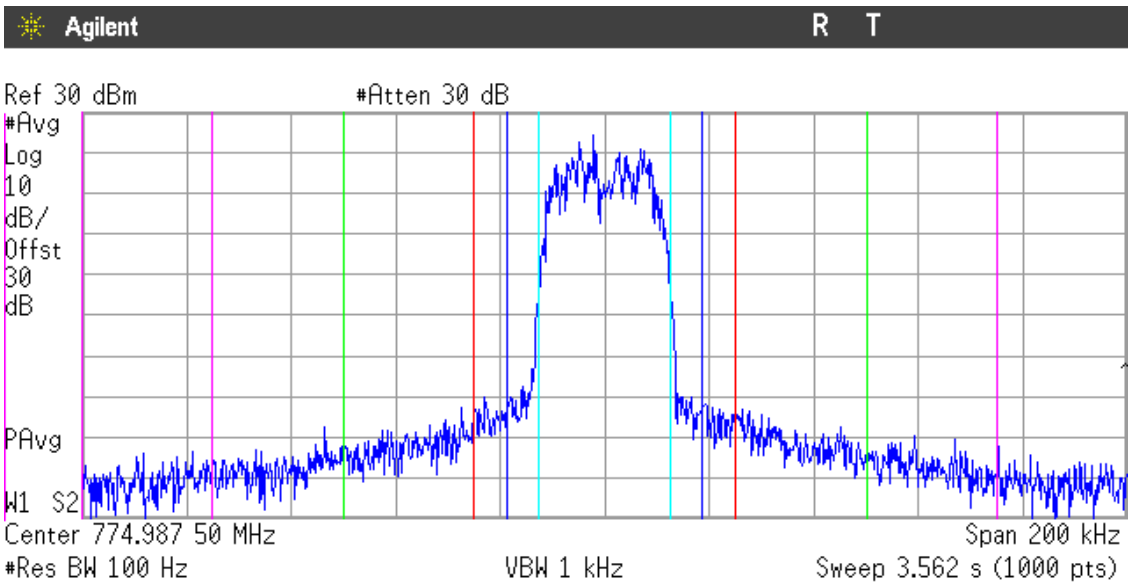

Agilent
R T
Mkr1 773.739 MHz
Ref 38.48 dBm
#Atten 30 dB
-46.78 dBm
#Avg
Log
10
dB/
Offst
30
dB
DI
-36.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 769.01 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 769.469 4 MHz
Ref 38.48 dBm
#Atten 30 dB
-45.86 dBm
#Avg
Log
10
dB/
Offst
30
dB
DI
-36.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 769.012 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 782.112 MHz
Ref 38.48 dBm
#Atten 30 dB
-46.71 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 768.000 MHz
Stop 799.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

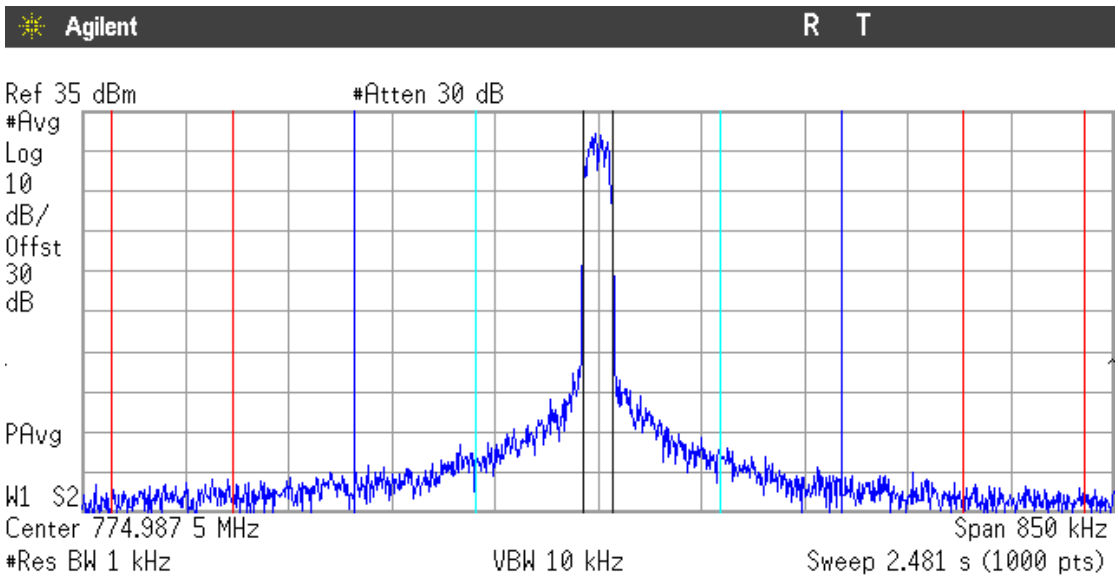

Agilent
R T
Mkr1 799.256 MHz
Ref 0 dBm
#Atten 6 dB
-62.13 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 798.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

Highest Channel



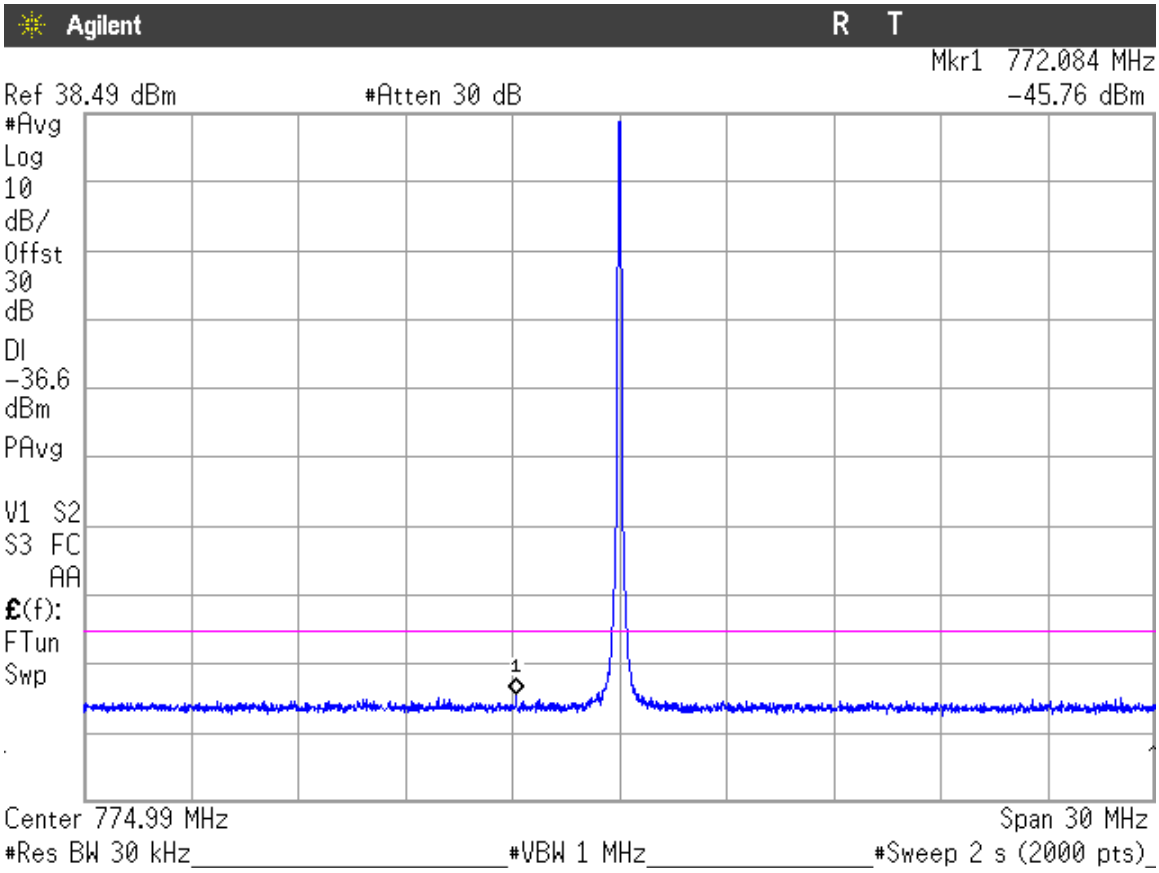
RMS Results

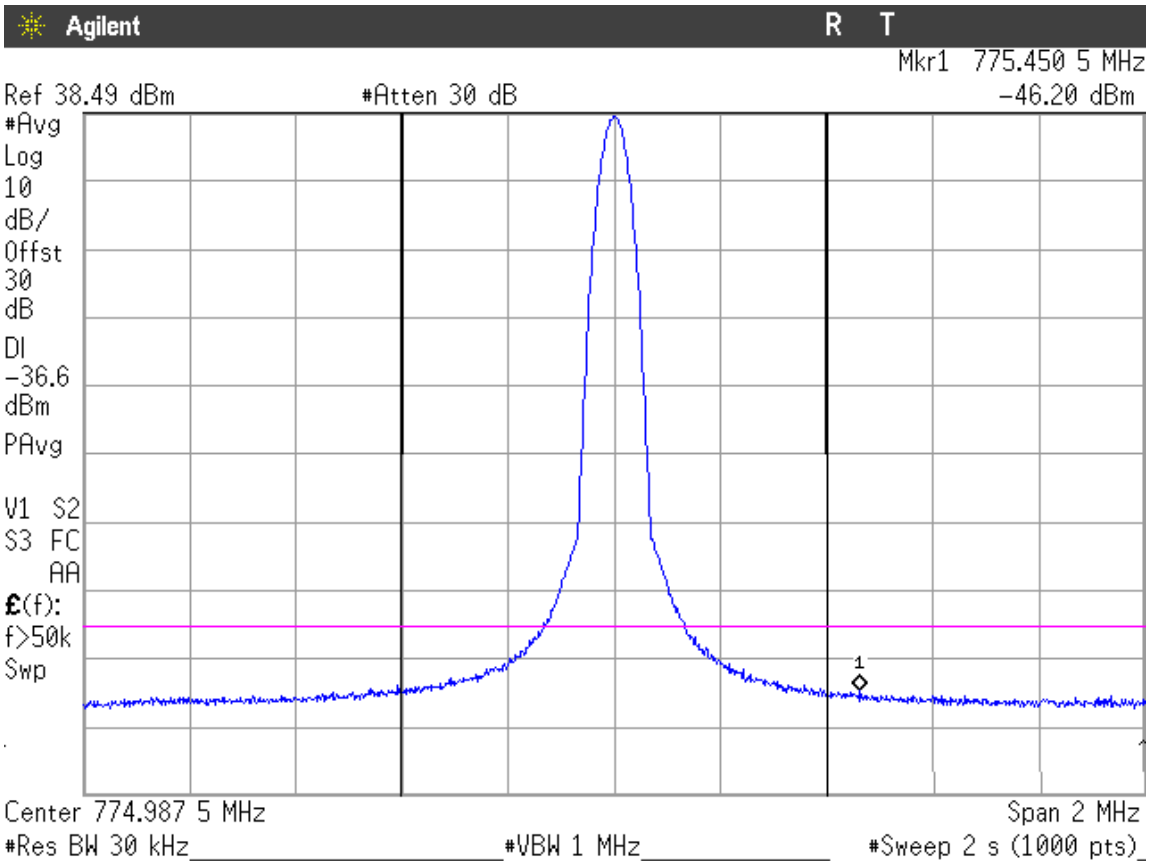
Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.49 dBm /	15.63 kHz	6.250 kHz	-48.25	-9.76	-46.41	-7.92
25.0000 kHz	21.88 kHz	6.250 kHz	-65.81	-27.32	-66.11	-27.62
	37.50 kHz	25.00 kHz	-65.92	-27.43	-65.11	-26.62
	62.50 kHz	25.00 kHz	-71.60	-33.10	-71.32	-32.83
	87.50 kHz	25.00 kHz	-75.01	-36.52	-75.27	-36.78

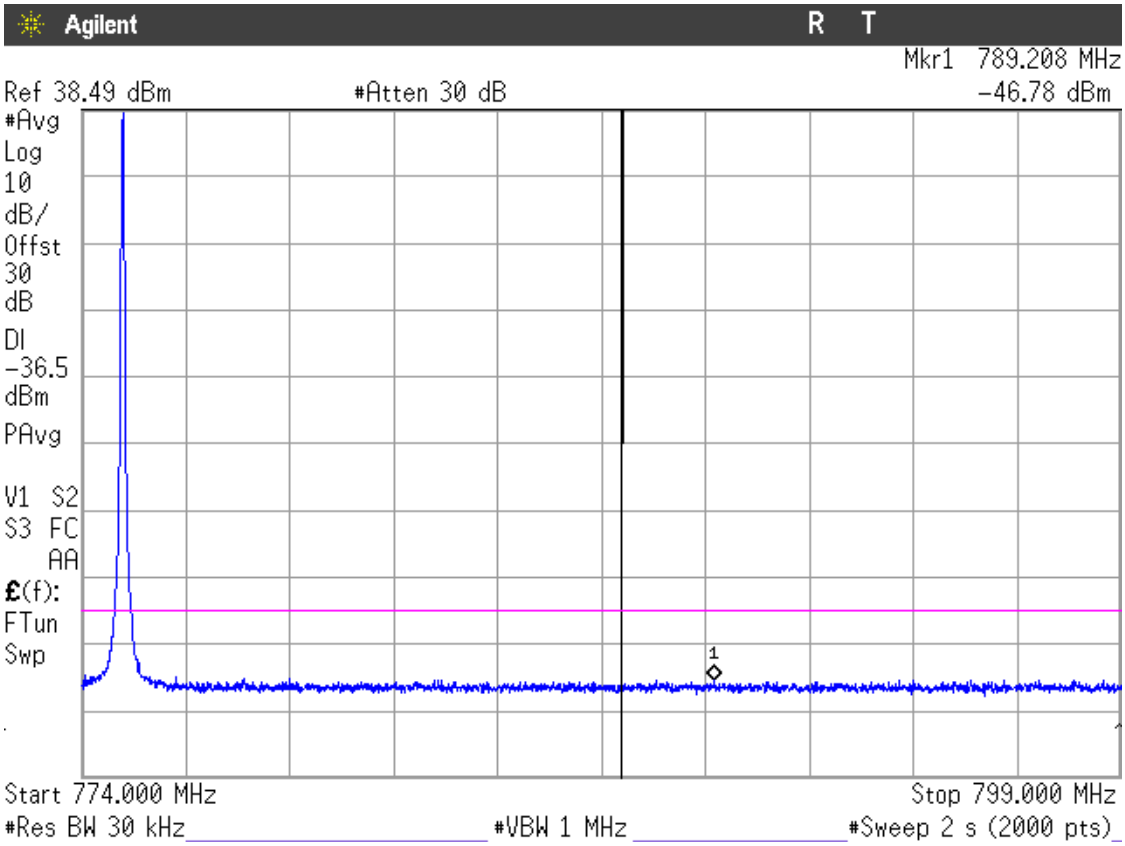


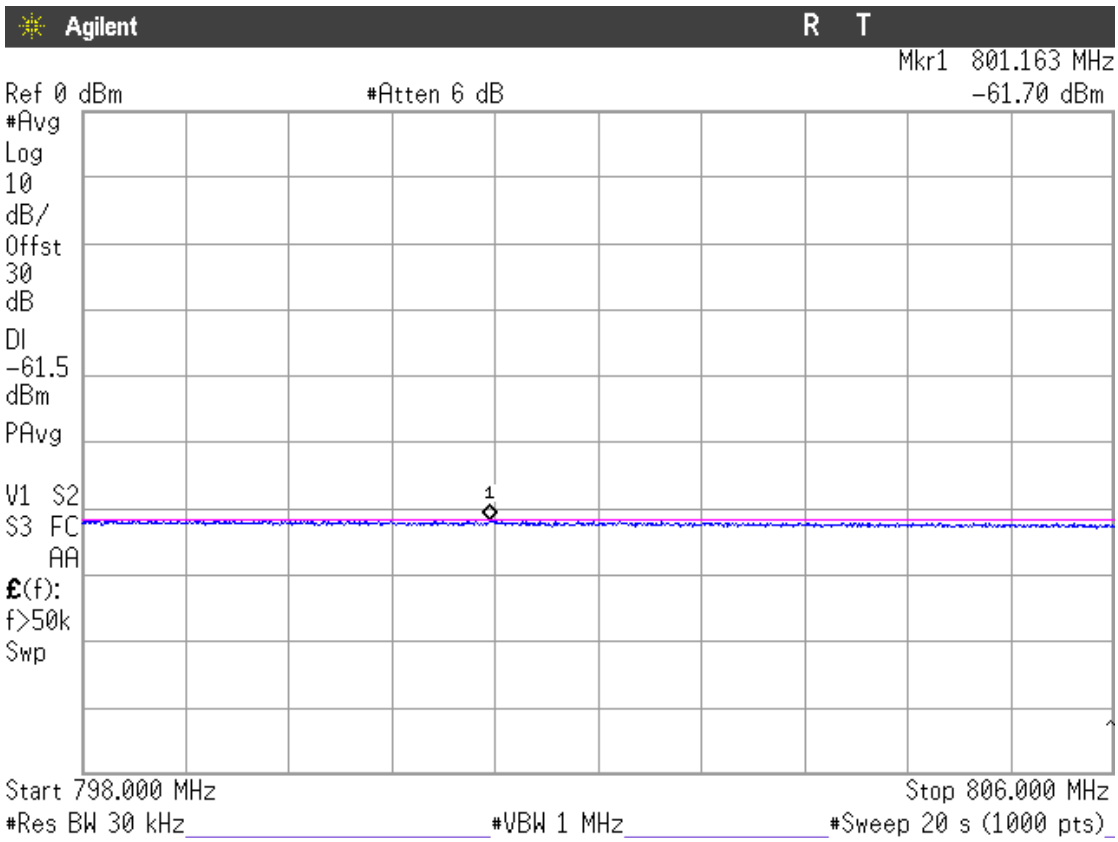
RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.52 dBm /	150.0 kHz	100.0 kHz	-73.94	-35.42	-74.01	-35.49
25.0000 kHz	250.0 kHz	100.0 kHz	-78.07	-39.55	-78.61	-40.08
	350.0 kHz	100.0 kHz	-79.83	-41.30	-80.64	-42.11


Agilent
R T
Mkr1 772.084 MHz
Ref 38.49 dBm
#Atten 30 dB
-45.76 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 774.99 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

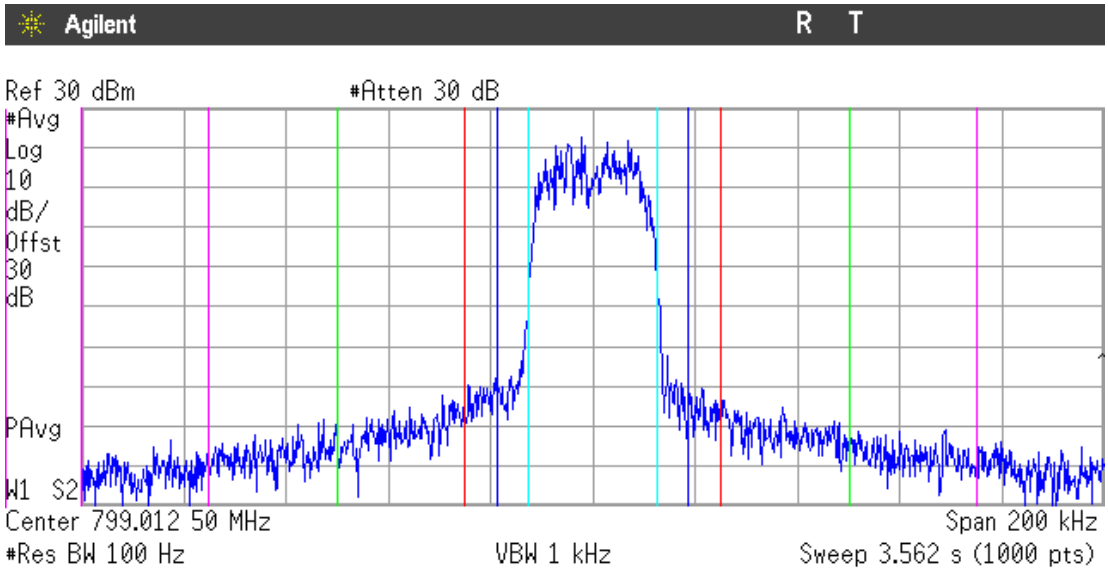

Agilent
R T
Mkr1 775.450 5 MHz
Ref 38.49 dBm
#Atten 30 dB
-46.20 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 774.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 789.208 MHz
Ref 38.49 dBm
#Atten 30 dB
-46.78 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 774.000 MHz
Stop 799.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 801.163 MHz
Ref 0 dBm
#Atten 6 dB
-61.70 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.5
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 798.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

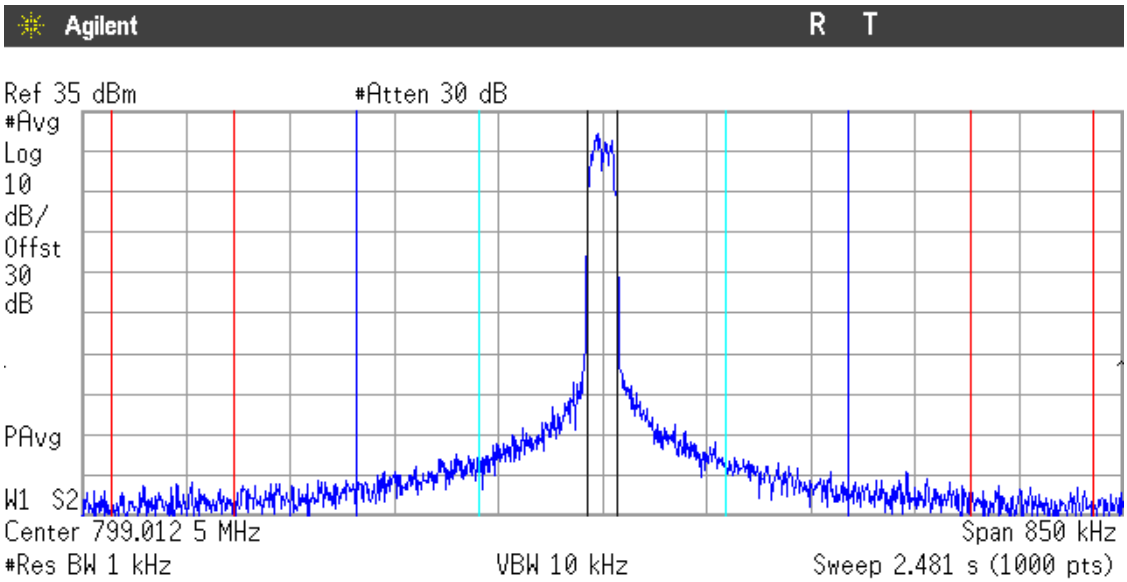
TETRA 22 kHz.799-805 MHz band.

Lowest Channel



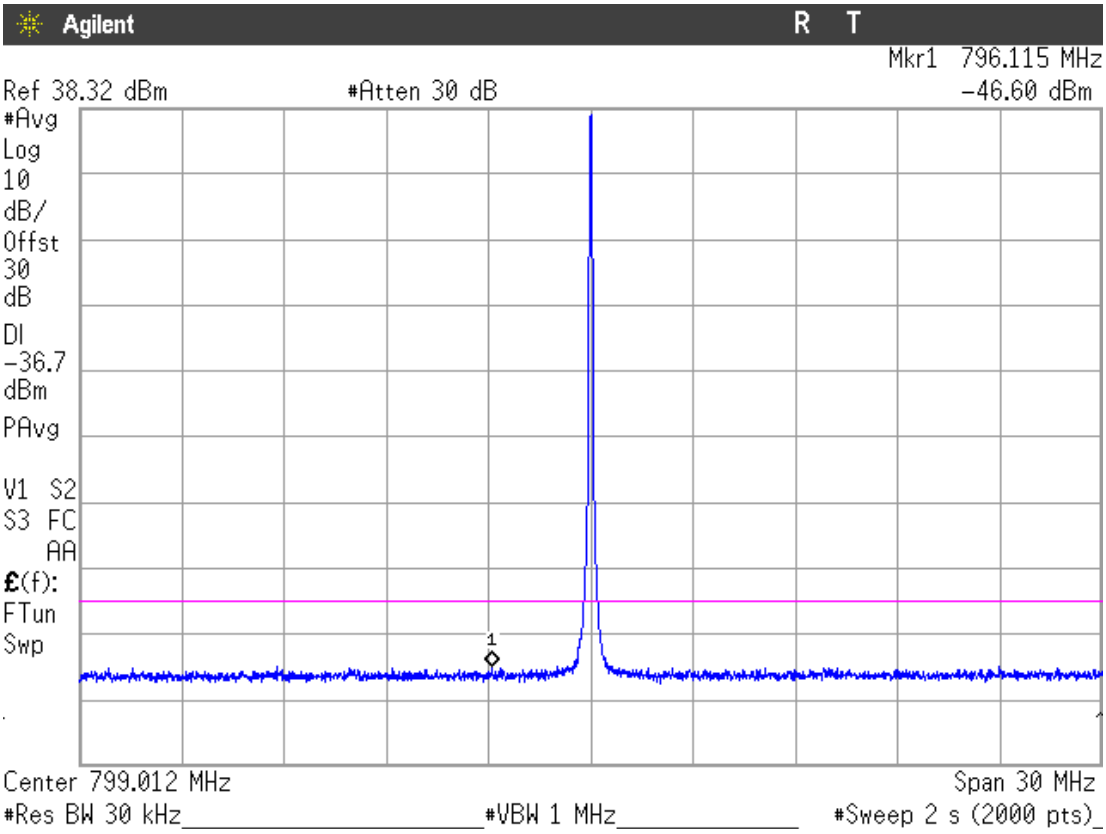
RMS Results

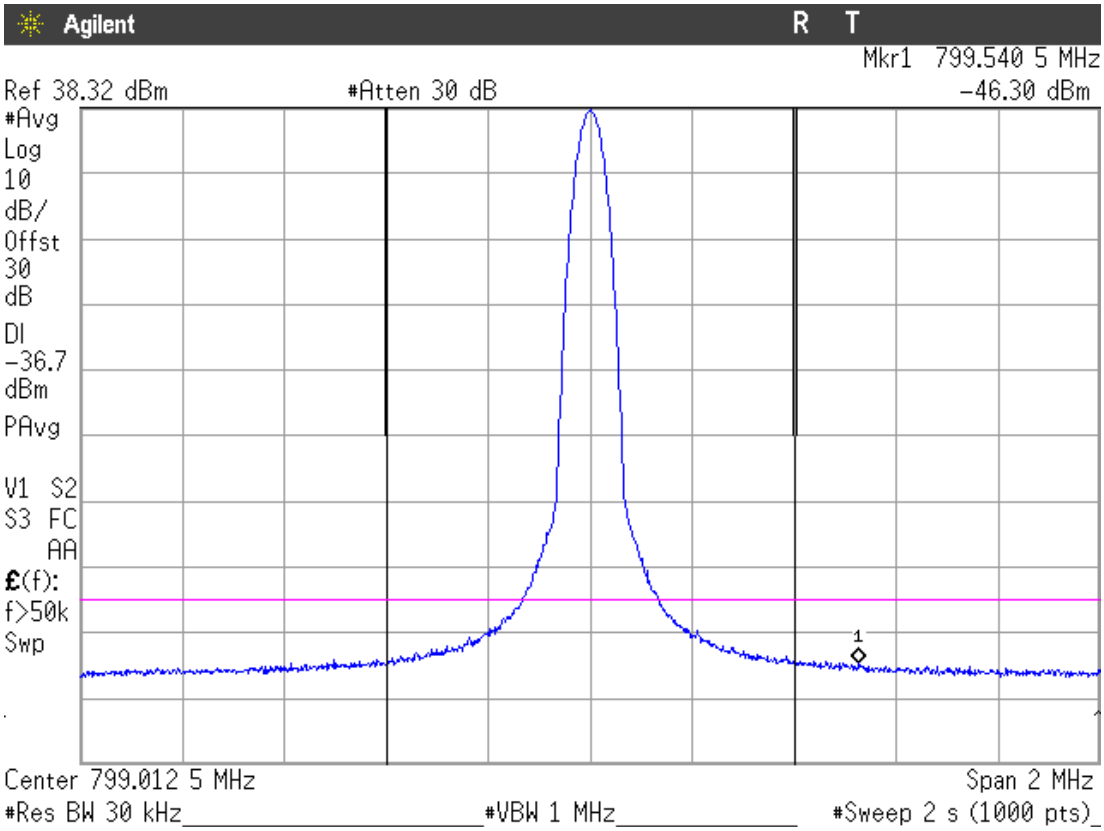
Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
38.32 dBm /	15.63 kHz	6.250 kHz	-50.01	-11.69	-46.86	-8.54
25.0000 kHz	21.88 kHz	6.250 kHz	-63.19	-24.87	-66.13	-27.81
	37.50 kHz	25.00 kHz	-64.67	-26.34	-65.22	-26.90
	62.50 kHz	25.00 kHz	-70.92	-32.60	-71.34	-33.02
	87.50 kHz	25.00 kHz	-75.46	-37.13	-74.73	-36.41

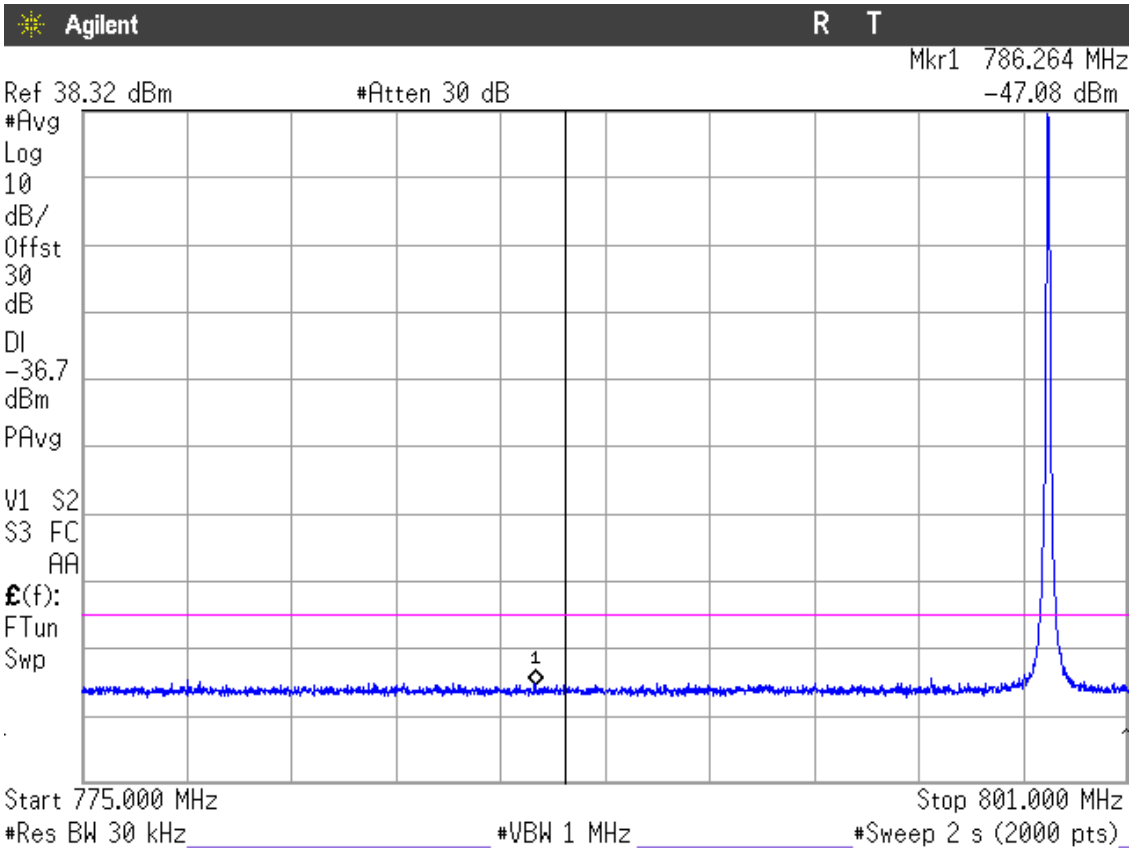


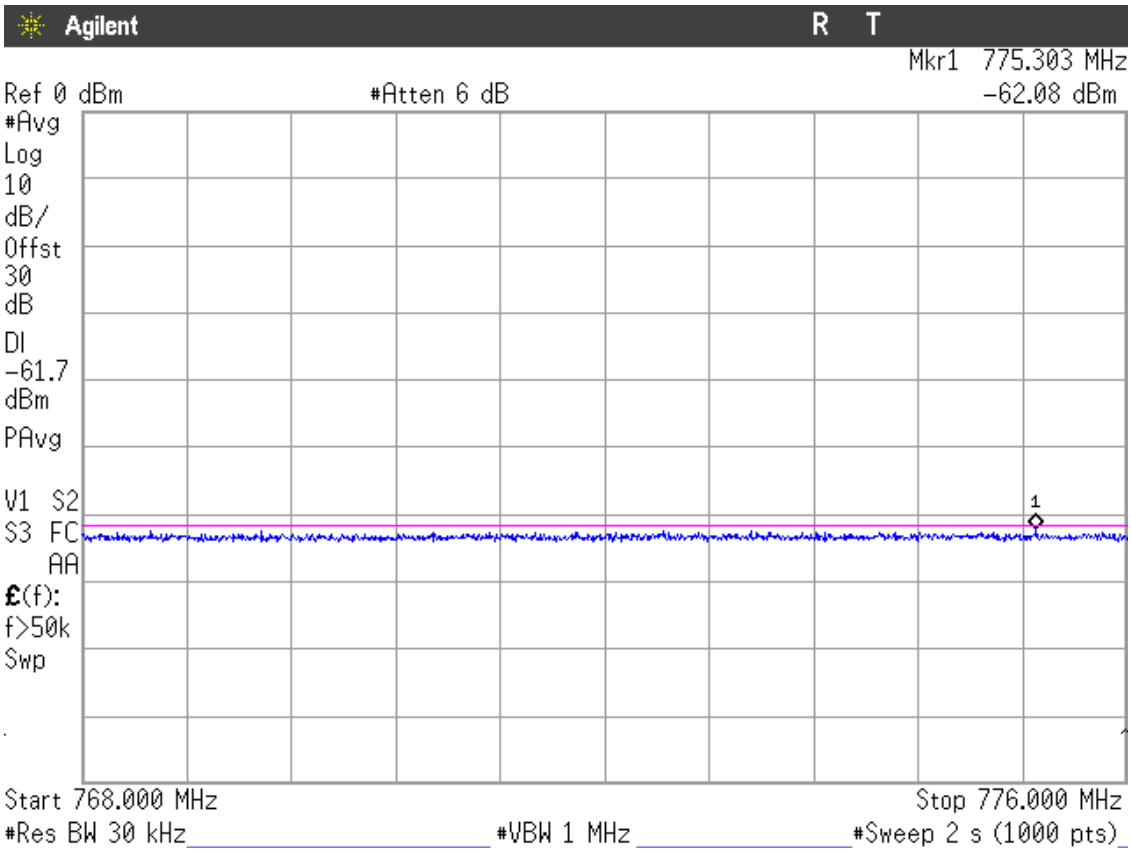
RMS Results

Carrier Power	Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
38.62 dBm /	150.0 kHz	100.0 kHz	-73.70	-35.08	-74.33	-35.70
25.0000 kHz	250.0 kHz	100.0 kHz	-78.67	-40.04	-78.69	-40.06
	350.0 kHz	100.0 kHz	-80.47	-41.85	-80.94	-42.31

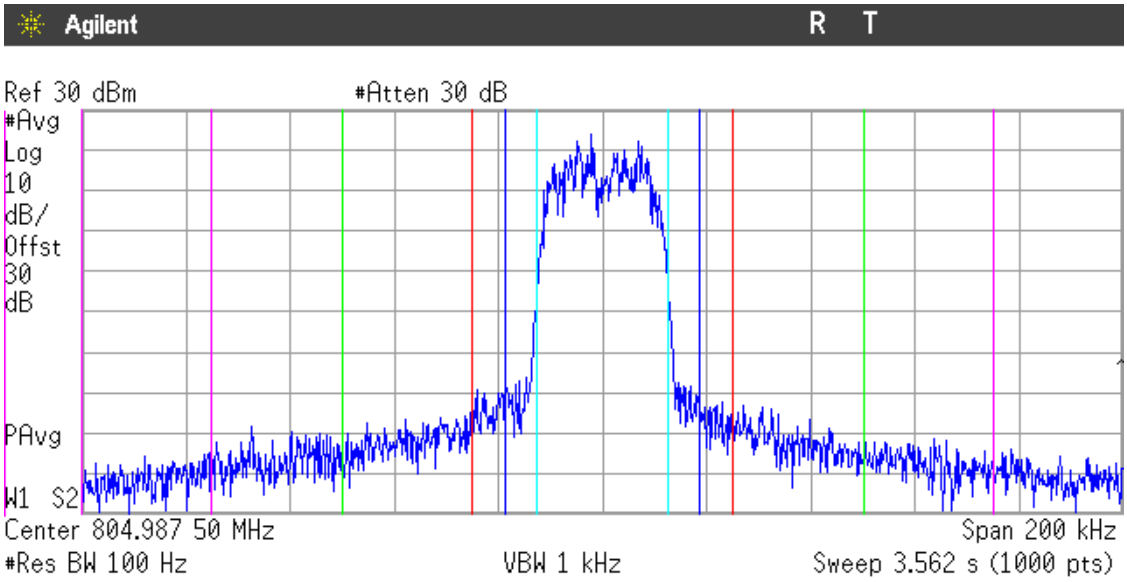

Agilent
R T
Mkr1 796.115 MHz
Ref 38.32 dBm
#Atten 30 dB
-46.60 dBm
#Avg
Log
10
dB/
Offst
30
dB
DI
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 799.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 799.540 5 MHz
Ref 38.32 dBm
#Atten 30 dB
-46.30 dBm
#Avg
Log
10
dB/
Offst
30
dB
DI
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 799.012 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 786.264 MHz
Ref 38.32 dBm
#Atten 30 dB
-47.08 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 775.000 MHz
Stop 801.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

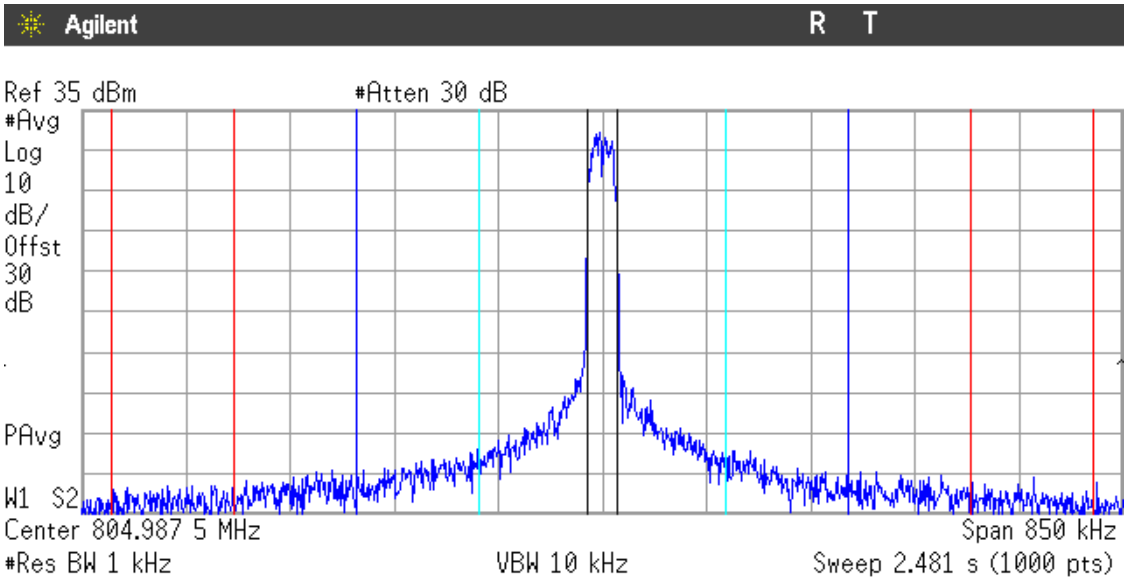

Agilent
R T
Mkr1 775.303 MHz
Ref 0 dBm
#Atten 6 dB
-62.08 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.7
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 768.000 MHz
Stop 776.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

Highest Channel



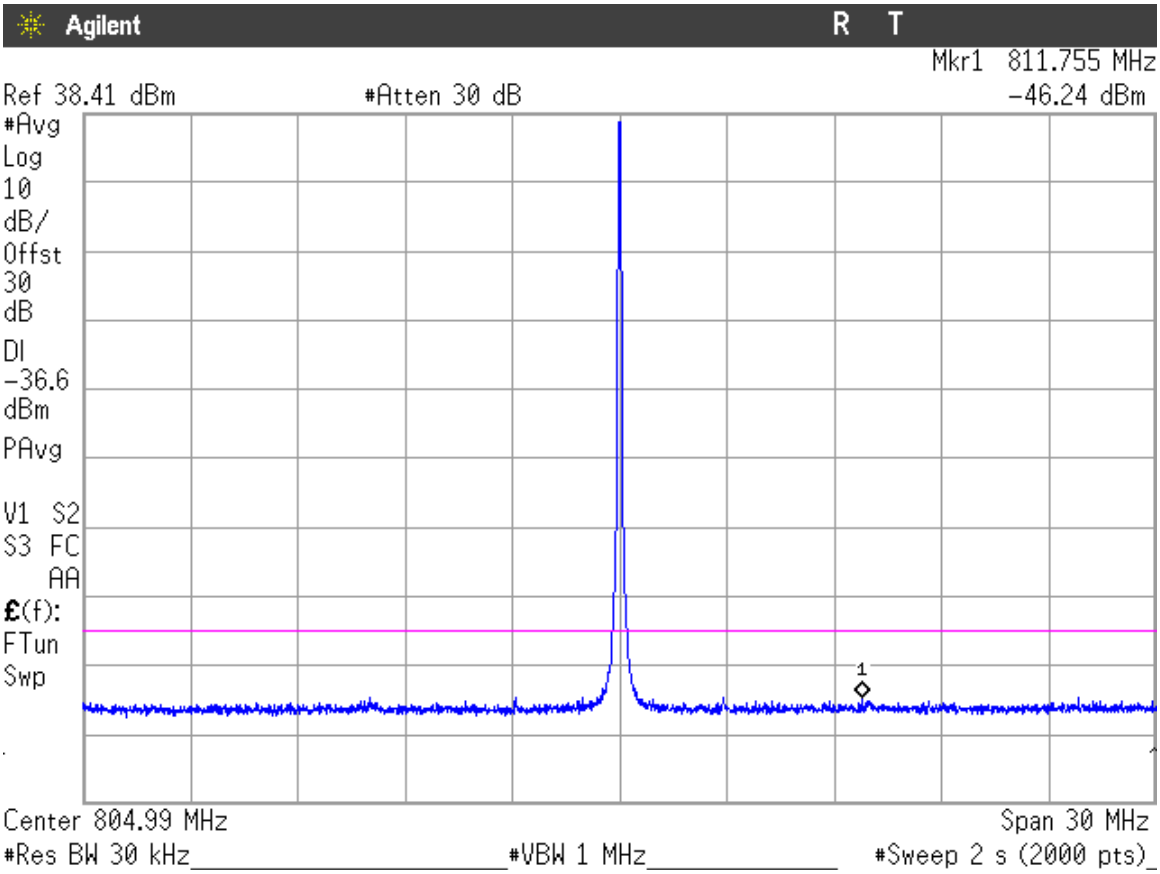
RMS Results

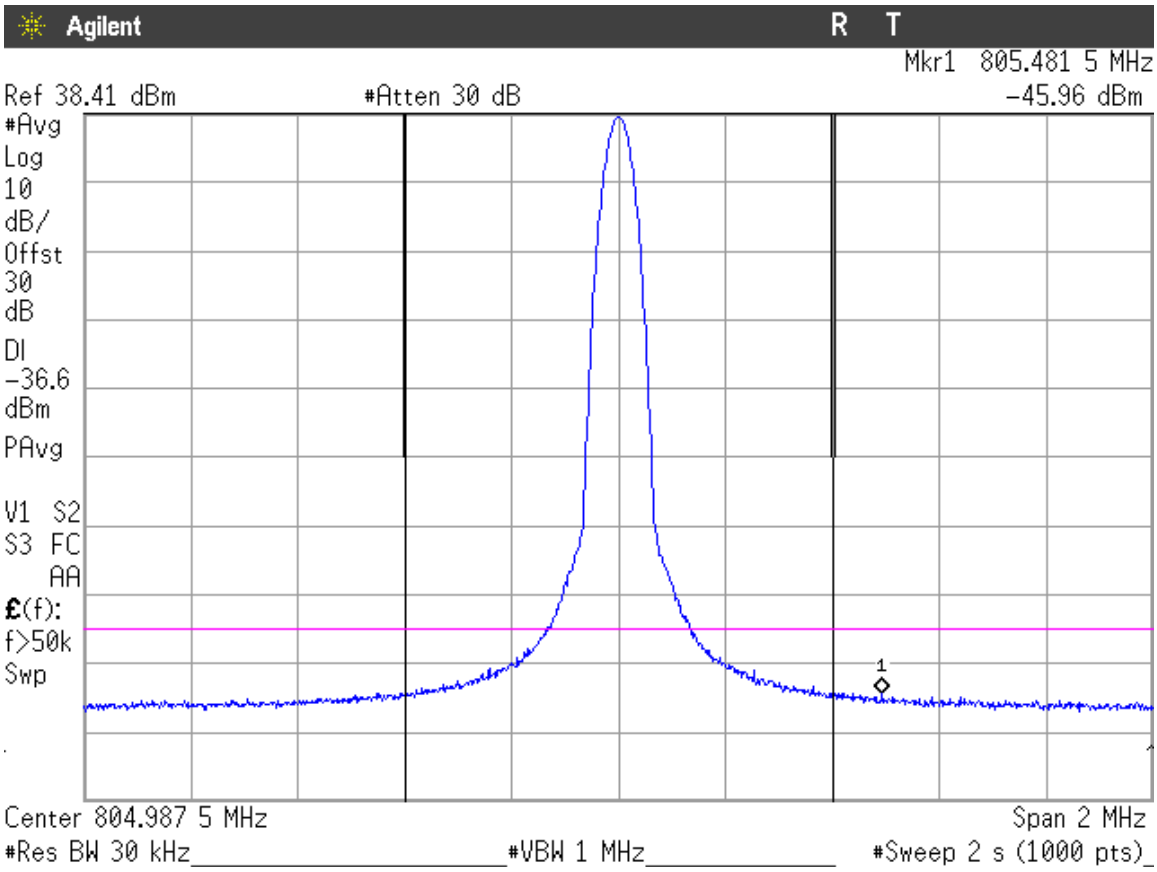
Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.41 dBm /	15.63 kHz	6.250 kHz	-49.19	-10.77	-45.81	-7.39
25.0000 kHz	21.88 kHz	6.250 kHz	-64.06	-25.65	-66.89	-28.47
	37.50 kHz	25.00 kHz	-65.44	-27.03	-65.35	-26.94
	62.50 kHz	25.00 kHz	-70.37	-31.95	-71.25	-32.84
	87.50 kHz	25.00 kHz	-75.34	-36.93	-74.84	-36.42

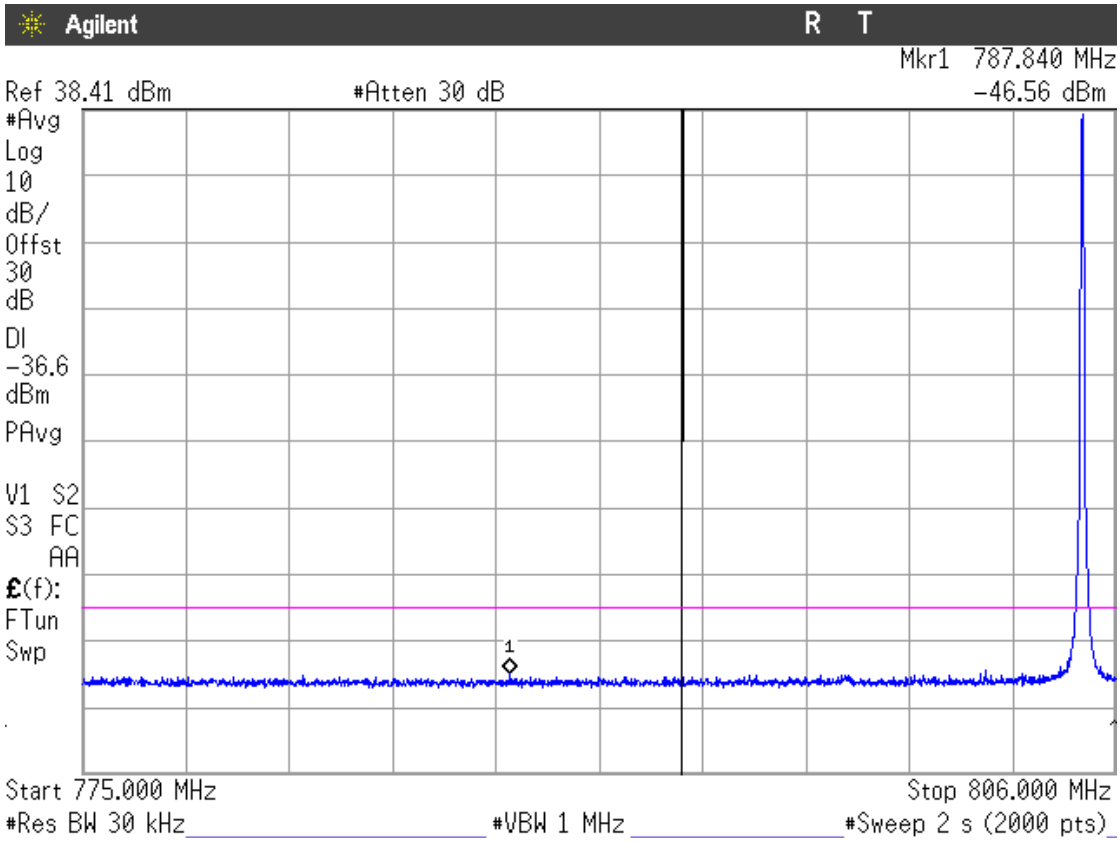


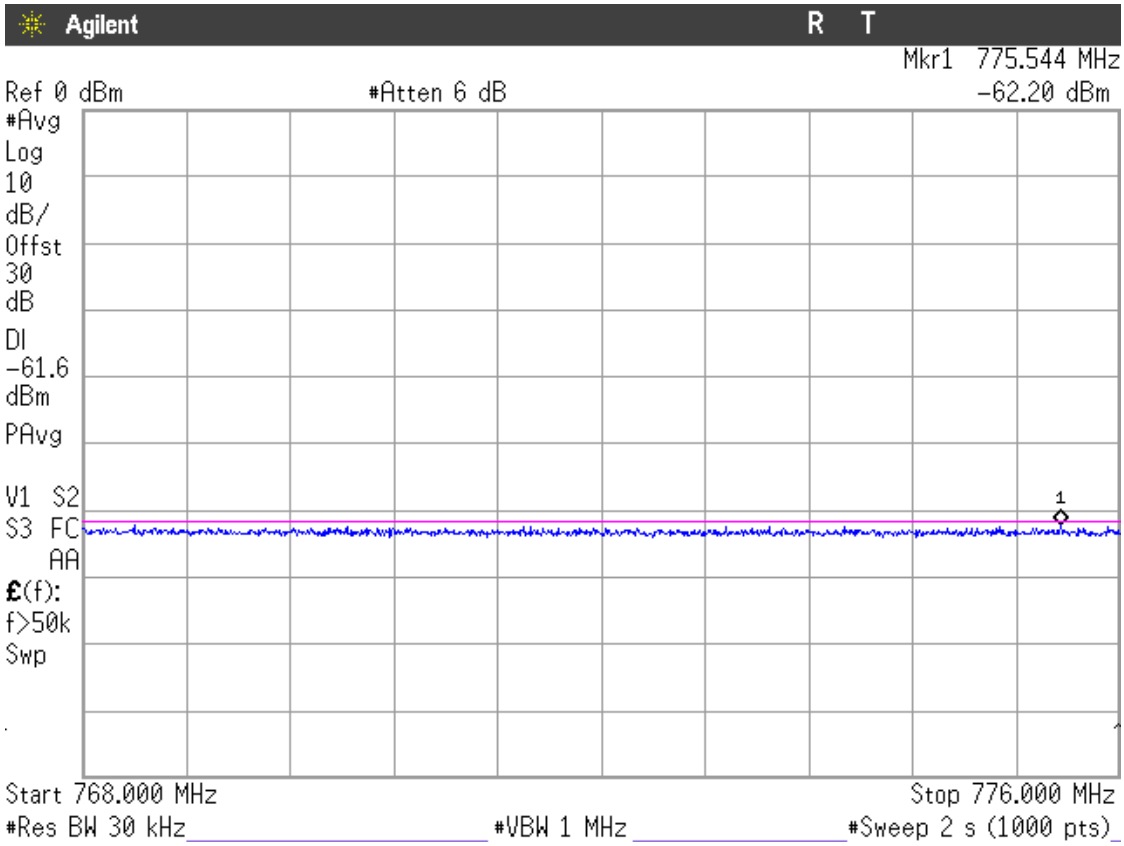
RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
38.63 dBm /	150.0 kHz	100.0 kHz	-73.66	-35.03	-74.20	-35.57
25.0000 kHz	250.0 kHz	100.0 kHz	-77.89	-39.26	-78.26	-39.63
	350.0 kHz	100.0 kHz	-80.54	-41.91	-80.52	-41.89


Agilent
R T
Mkr1 811.755 MHz
Ref 38.41 dBm
#Atten 30 dB
-46.24 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 804.99 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

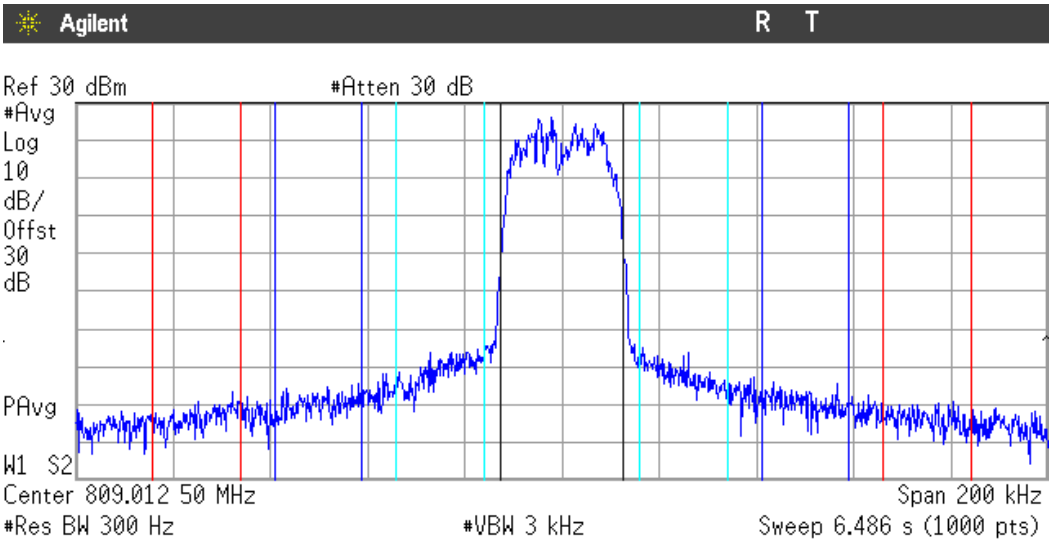

Agilent
R T
Mkr1 805.481 5 MHz
Ref 38.41 dBm
#Atten 30 dB
-45.96 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 804.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 787.840 MHz
Ref 38.41 dBm
#Atten 30 dB
-46.56 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-36.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 775.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

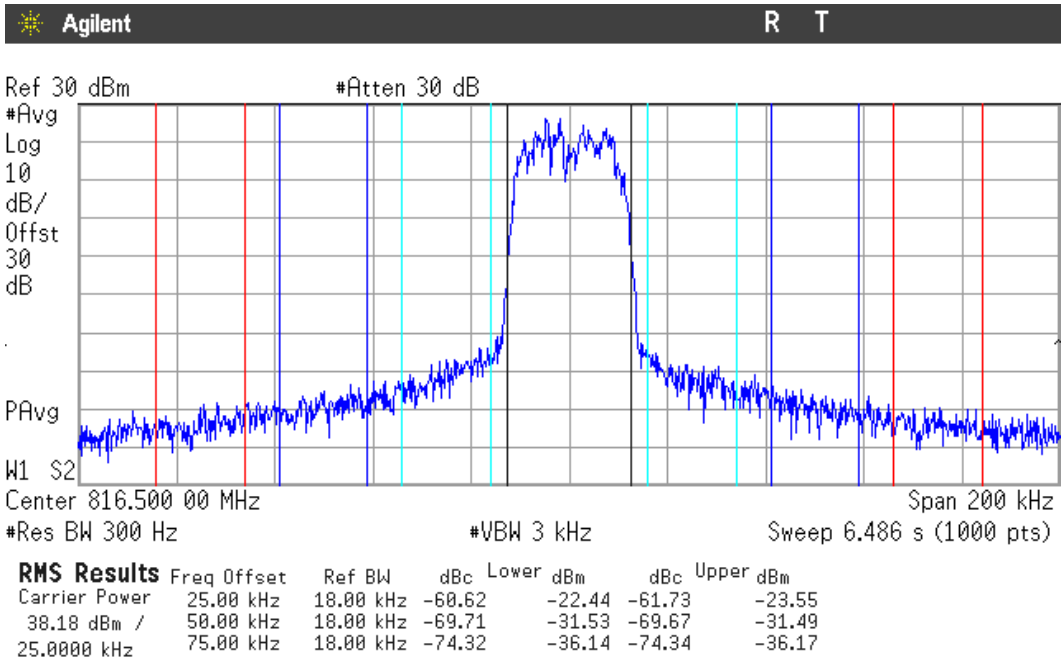

Agilent
R T
Mkr1 775.544 MHz
Ref 0 dBm
#Atten 6 dB
-62.20 dBm
#Avg
Log
10
dB/
Offst
30
dB
Dl
-61.6
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 768.000 MHz
Stop 776.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

TETRA, 22 kHz. 809-824 MHz band.

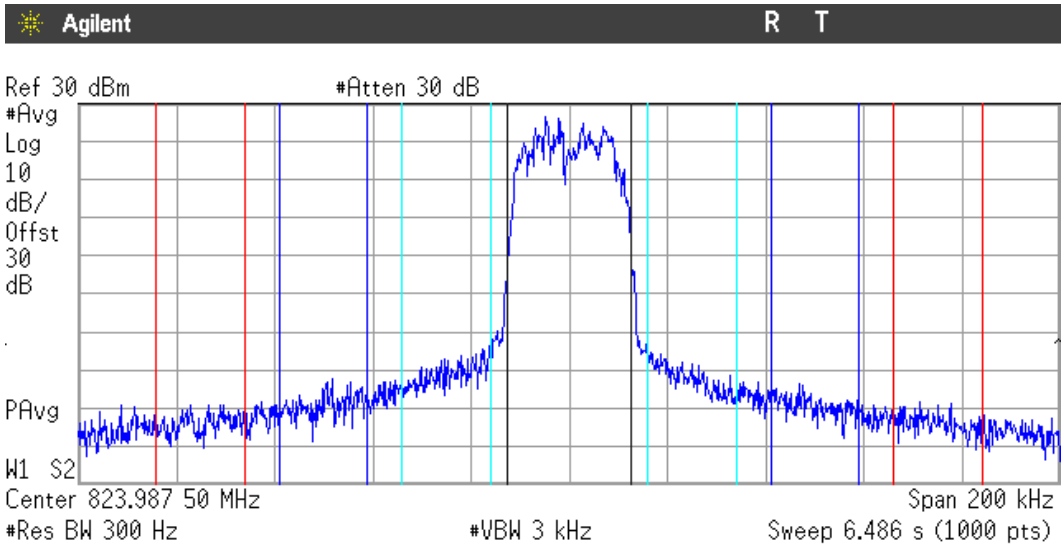
Lowest Channel



Middle Channel



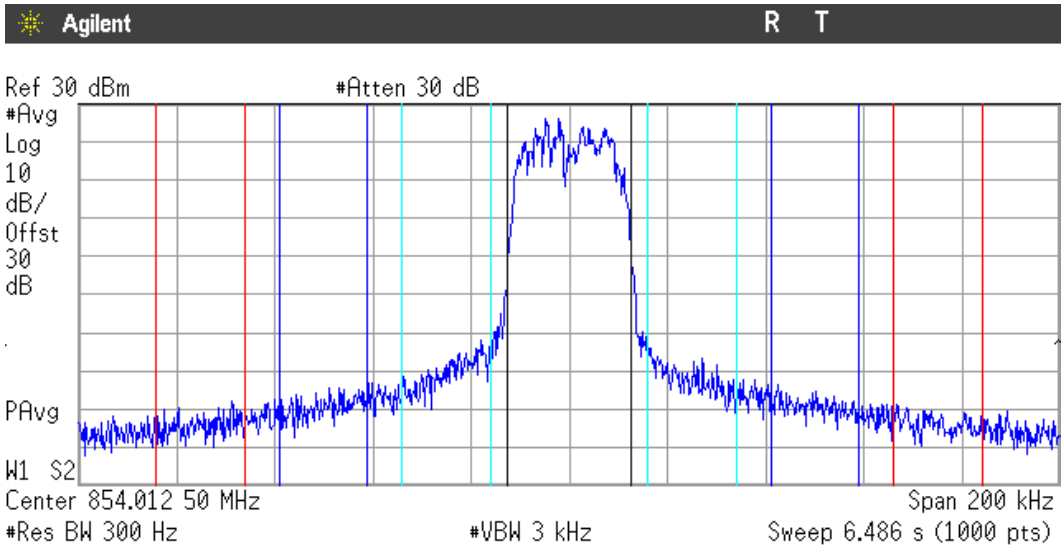
Highest Channel



RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	25.00 kHz	18.00 kHz	-60.84	-22.58	-61.59	-23.33
38.26 dBm /	50.00 kHz	18.00 kHz	-69.15	-30.89	-69.44	-31.18
25.0000 kHz	75.00 kHz	18.00 kHz	-74.22	-35.96	-73.94	-35.68

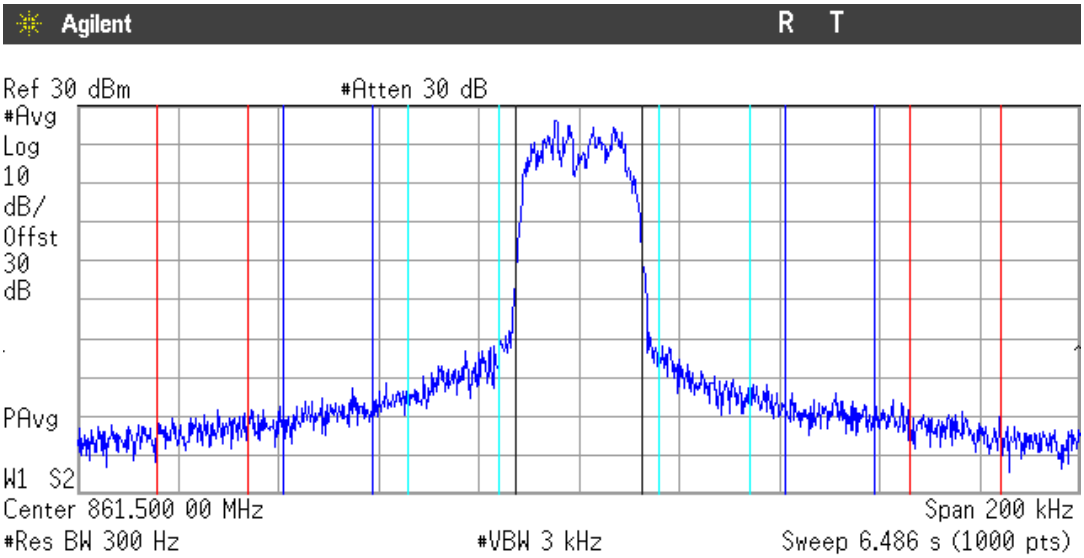
TETRA, 22 kHz. 854-869 MHz band.

Lowest Channel



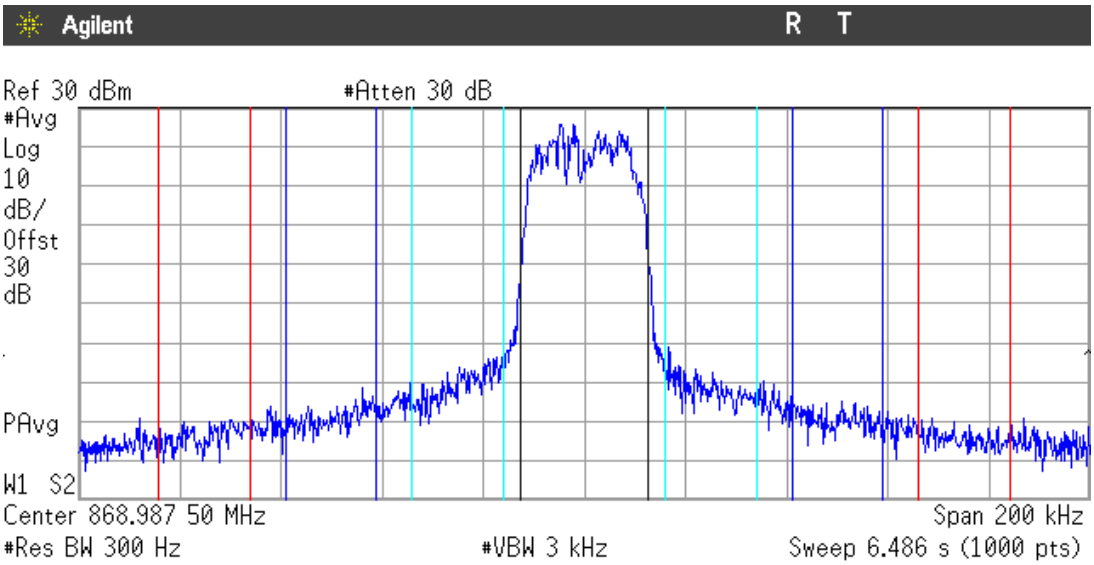
RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	25.00 kHz	18.00 kHz	-59.58	-21.37	-61.38	-23.16
38.22 dBm /	50.00 kHz	18.00 kHz	-69.55	-31.33	-69.56	-31.34
25.0000 kHz	75.00 kHz	18.00 kHz	-74.30	-36.08	-74.00	-35.79

Middle Channel



RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	25.00 kHz	18.00 kHz	-59.46	-21.15	-60.15	-21.84
38.31 dBm /	50.00 kHz	18.00 kHz	-69.83	-31.53	-69.79	-31.49
25.0000 kHz	75.00 kHz	18.00 kHz	-73.88	-35.57	-73.93	-35.62

Highest Channel



RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	25.00 kHz	18.00 kHz	-60.12	-21.82	-61.16	-22.87
38.29 dBm /	50.00 kHz	18.00 kHz	-69.28	-30.99	-69.77	-31.47
25.0000 kHz	75.00 kHz	18.00 kHz	-73.84	-35.54	-74.92	-36.62

Frequency Stability

SPECIFICATION

FCC §2.1055, §90.213. 809–824/854–869 MHz bands.

Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Frequency range (MHz)	Mobile stations	
	Over 2 watts output power	2 watts or less output power
809–824	2.5 ppm	2.5 ppm
854–869	2.5 ppm	2.5 ppm

FCC §2.1055, §90.539. 769–775/799–805 MHz bands.

The frequency stability of mobile, portable, and control transmitters operating in the narrowband segment must be 400 parts per billion (0.4 ppm) 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).

METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of –30ºC to +50ºC. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10ºC steps from –30ºC up to +50ºC.

Frequency Stability vs Voltage: Vary primary supply voltage between the extreme voltage values declared.

The EUT is set in continuous transmission without modulation (only carrier) and the frequency is measured with the frequency meter of Radiocommunication analyzer HP8920A.

RESULTS

809-824 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
13.6	+50	55	0.06736
	+40	37	0.04532
	+30	-20	-0.02449
	+20	-46	-0.05634
	+10	-2	-0.00245
	0	-10	-0.01225
	-10	-49	-0.06001
	-20	-54	-0.06614
	-30	72	0.08818
Frequency stability with Supply Voltage			
15.6	20	-61	-0.07471
10.8	20	-59	-0.07226

854-869 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
13.6	+50	56	0.06500
	+40	36	0.04179
	+30	-28	-0.03250
	+20	-47	-0.05456
	+10	2	0.00232
	0	-16	-0.01857
	-10	-50	-0.05804
	-20	-50	-0.05804
	-30	68	0.07893
Frequency stability with Supply Voltage			
15.6	20	-61	-0.07081
10.8	20	-52	-0.06036

769-775 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
13.6	+50	44	0.05699
	+40	27	0.03497
	+30	-20	-0.02591
	+20	-49	-0.06347
	+10	1	0.00130
	0	-12	-0.01554
	-10	-32	-0.04145
	-20	-43	-0.05570
	-30	60	0.07772
Frequency stability with Supply Voltage			
15.6	20	-53	-0.06865
10.8	20	-51	-0.06606

799-805 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
13.6	+50	53	0.06608
	+40	30	0.03741
	+30	-17	-0.02120
	+20	-48	-0.05985
	+10	2	0.00249
	0	-11	-0.01372
	-10	-40	-0.04987
	-20	-46	-0.05736
	-30	72	0.08977
Frequency stability with Supply Voltage			
15.6	20	-53	-0.06608
10.8	20	-55	-0.06858

Measurement uncertainty	$<\pm 1x\ 10^{-6}$

Verdict: PASS

Spurious emissions at antenna terminals

SPECIFICATION

FCC §2.1051, §90.210, §90.221, §90.691. 809–824/854–869 MHz bands.

Emission Mask B.

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Emission mask requirements for EA-based systems.

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 + 10Log_{10}(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.

Adjacent channel power limits.

On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least 43 + 10 log (Pwatts) dB.

FCC §90.543. 769–775/799–805 MHz bands.

Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

METHOD

The EUT RF output connector was connected to a spectrum analyser using a 50 ohm attenuator and the resolution bandwidth of the spectrum analyser was set to 100 kHz for frequencies < 1GHz and 1 MHz for frequencies > 1GHz. The spectrum was investigated from 10 kHz to 10 GHz.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyzer.

RESULTS (see plots in next pages)

P25 C4FM 8.1 kHz bandwidth. 769-775 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: HIGHEST
No spurious signals were found.

P25 C4FM 8.1 kHz bandwidth. 799-805 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: HIGHEST
No spurious signals were found.

TI D-LMR 20 kHz bandwidth. 769-775 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: HIGHEST
No spurious signals were found.

TI D-LMR 20 kHz bandwidth. 799-805 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: HIGHEST
No spurious signals were found.

TETRA 22 kHz bandwidth. 769-775 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: HIGHEST
No spurious signals were found.

TETRA 22 kHz bandwidth. 799-805 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: HIGHEST
No spurious signals were found.

TI D-LMR 20 kHz bandwidth. 809-824 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: MIDDLE
No spurious signals were found.

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
4.1205	-28.34	< ± 2.03

TI D-LMR 20 kHz bandwidth. 854-869 MHz band.

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7076	-26.79	< ± 2.03
4.2699	-24.50	< ± 2.03

CHANNEL: MIDDLE

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.723	-27.34	< ± 2.03
4.3073	-26.76	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7384	-25.52	< ± 2.03
4.3446	-26.22	< ± 2.03

TETRA 22 kHz bandwidth. 809-824 MHz band.

CHANNEL: LOWEST
No spurious signals were found.

CHANNEL: MIDDLE

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
4.0824	-28.38	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
4.1198	-27.95	< ± 2.03

TETRA 22 kHz bandwidth. 854-869 MHz band.

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7076	-28.06	< ± 2.03
4.2699	-26.24	< ± 2.03

CHANNEL: MIDDLE

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7231	-28.22	< ± 2.03
4.3077	-27.56	< ± 2.03

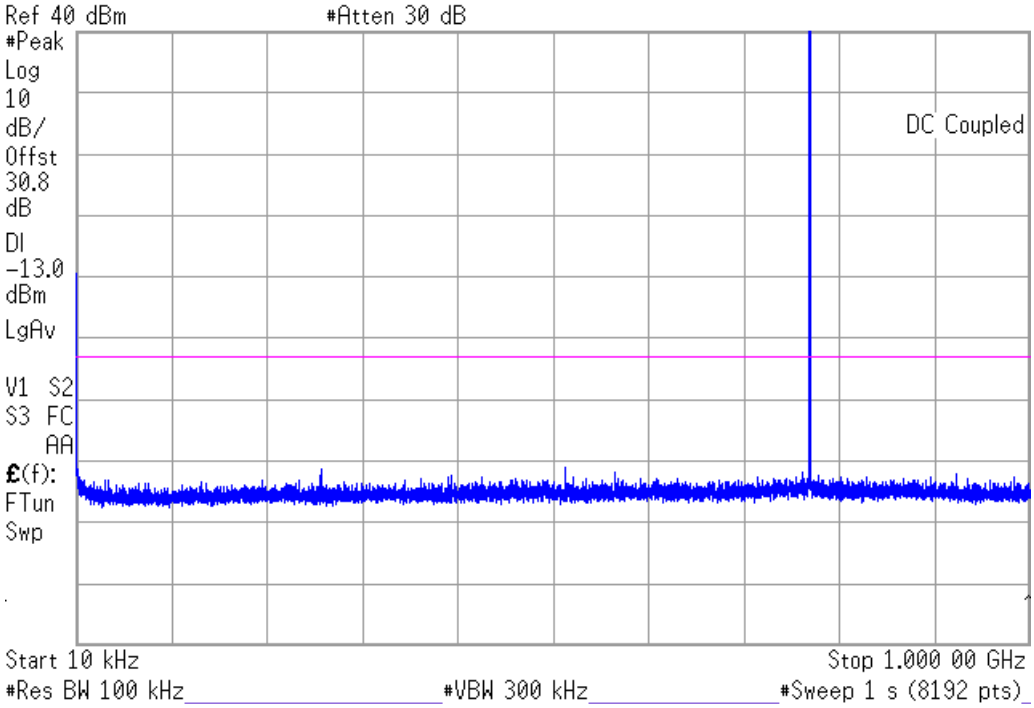
CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7384	-26.62	< ± 2.03
4.3446	-26.87	< ± 2.03

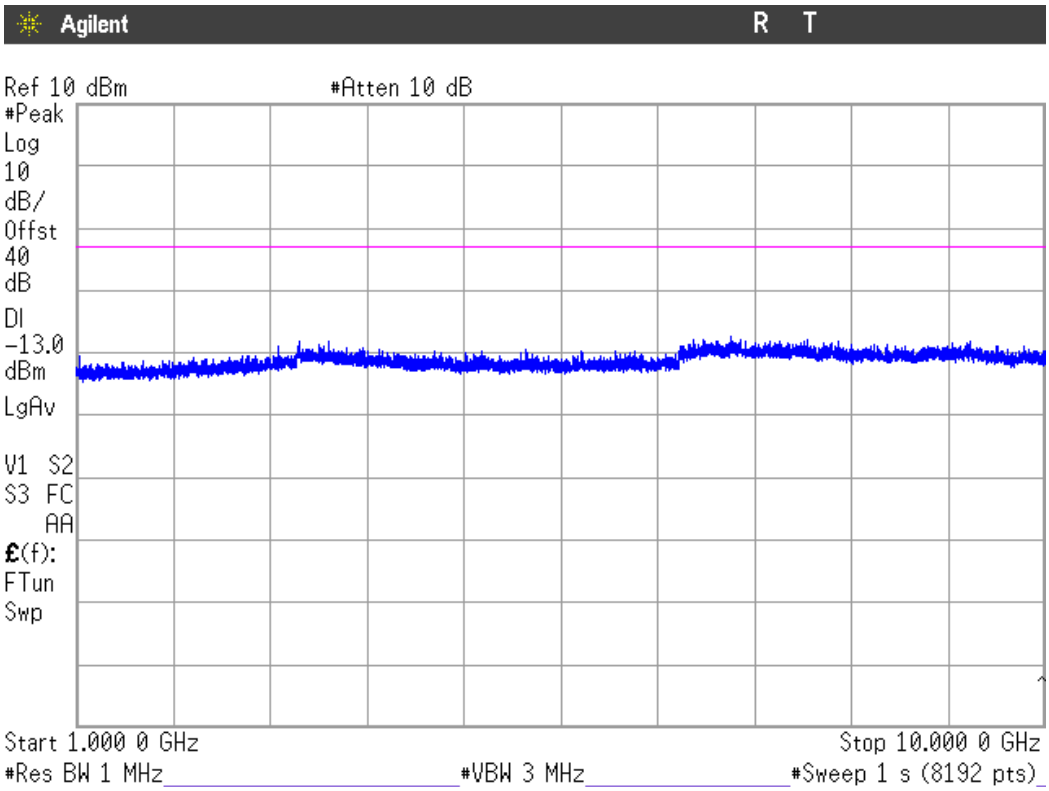
Verdict: PASS

P25 C4FM 8.1 kHz bandwidth. 769-775 MHz band.

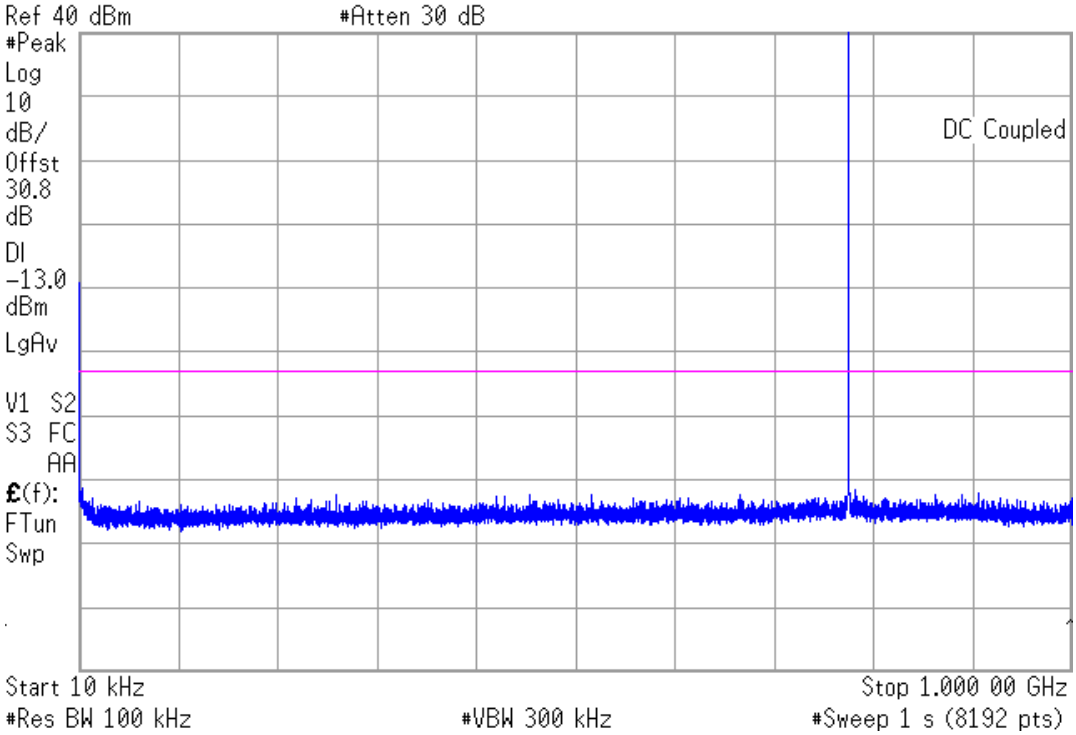
CHANNEL: LOWEST



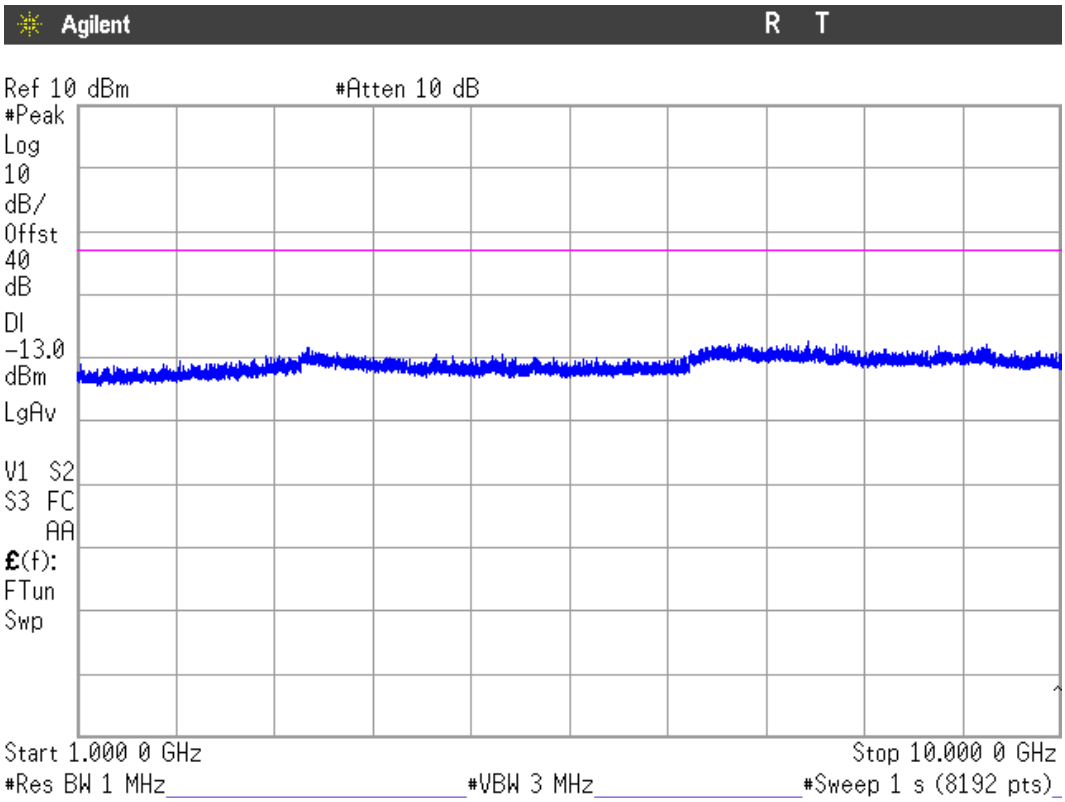
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

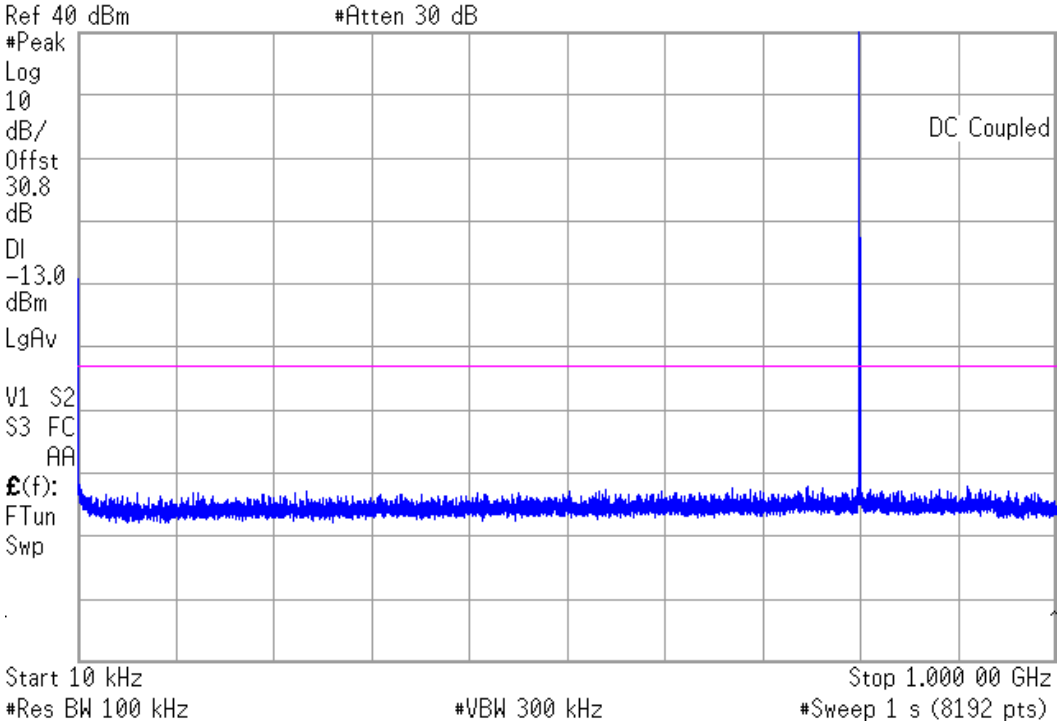


Note: The peak above the limit is the carrier frequency.

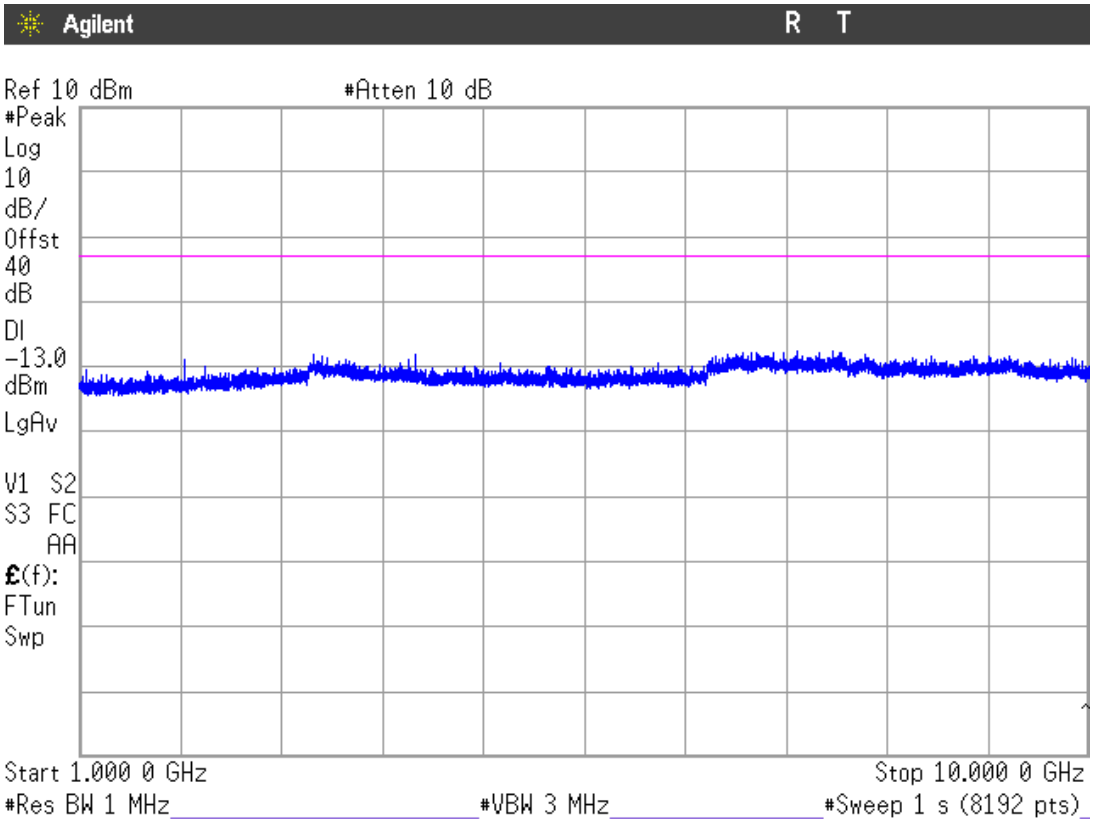


P25 C4FM 8.1 kHz bandwidth. 799-805 MHz band.

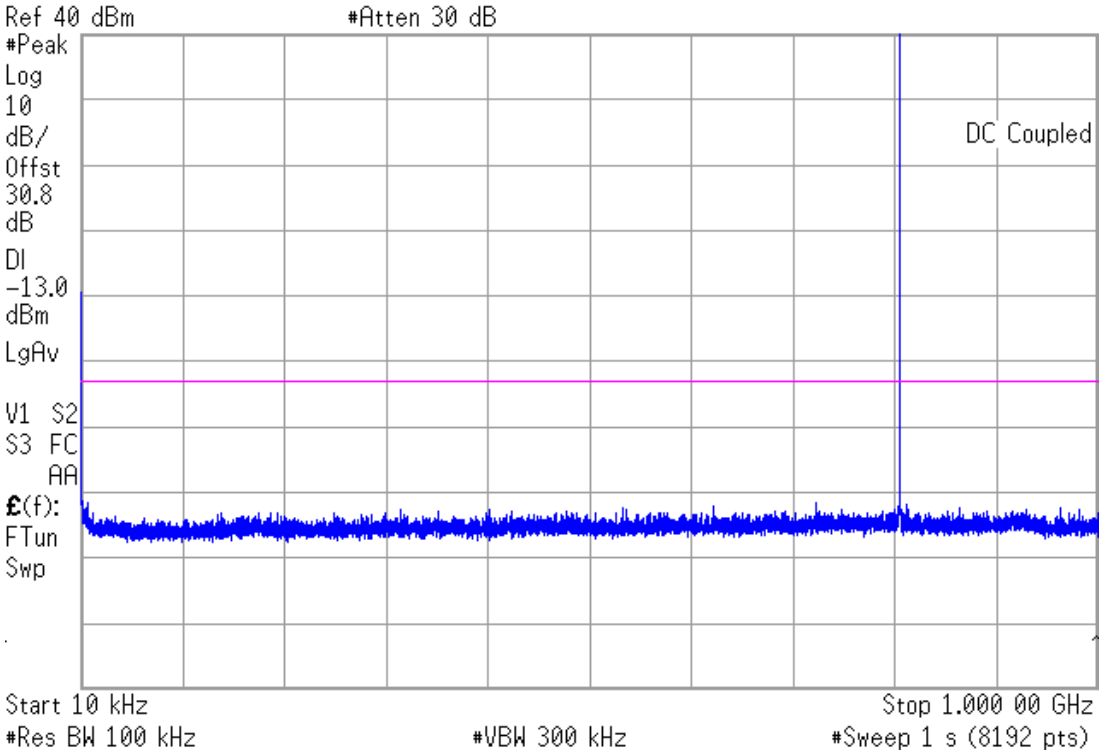
CHANNEL: LOWEST



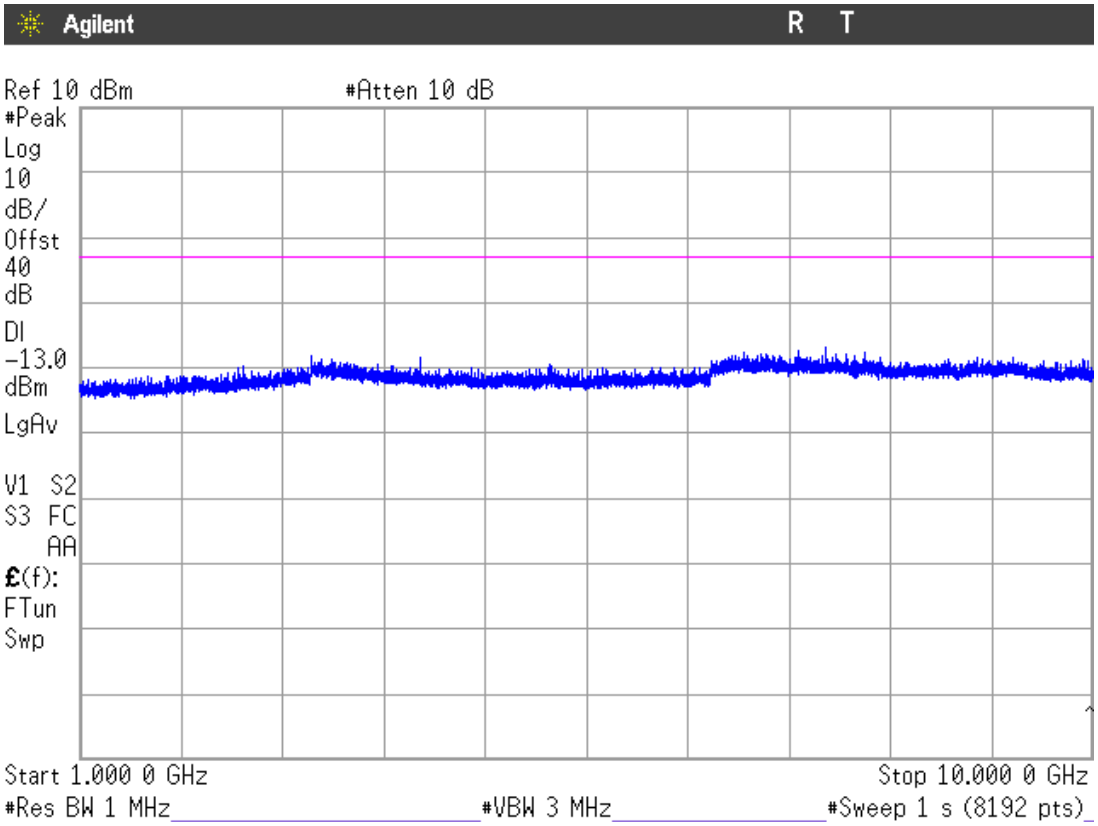
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

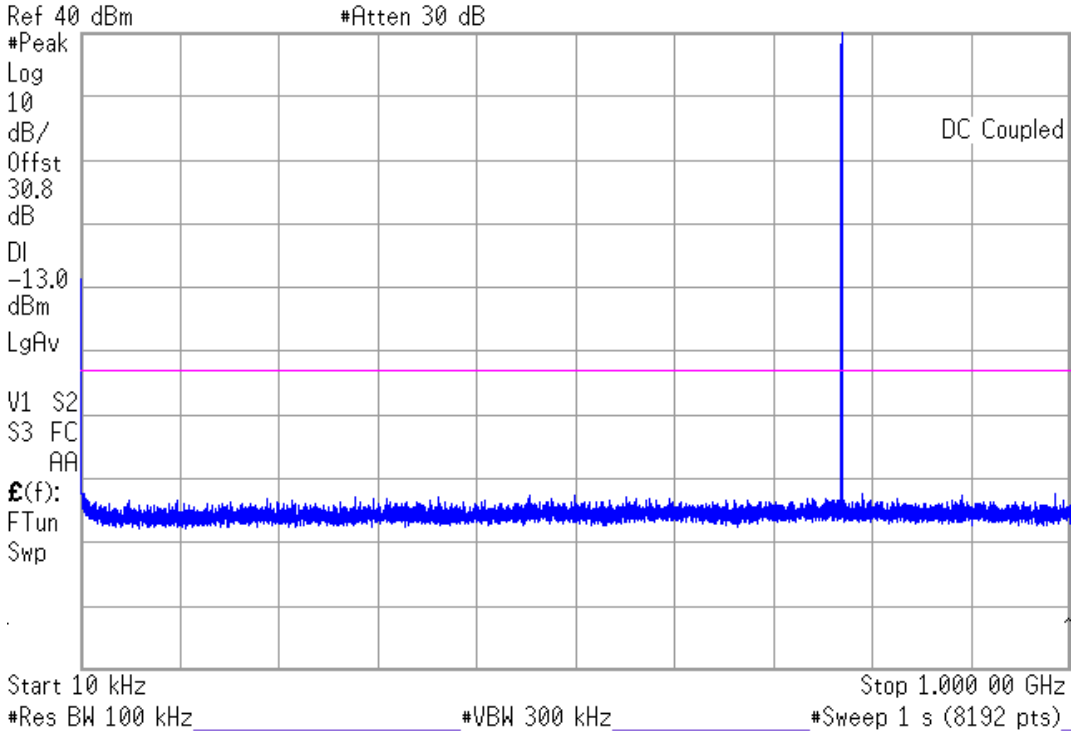


Note: The peak above the limit is the carrier frequency.

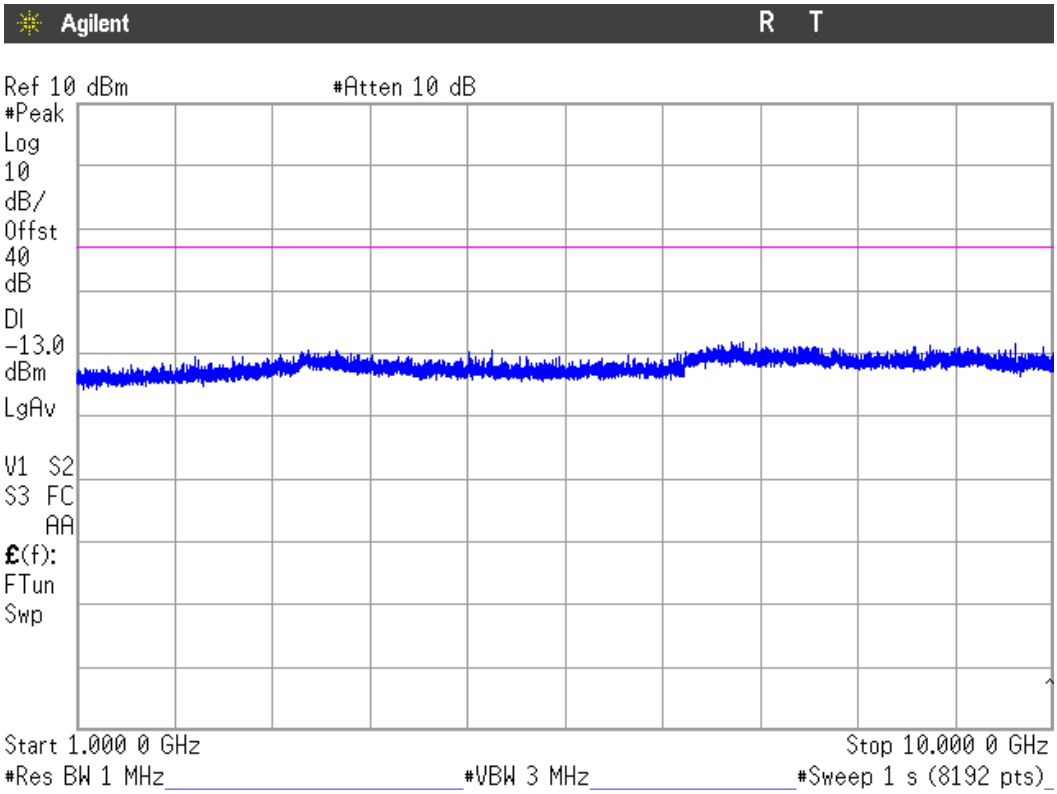


TI D-LMR 20 kHz bandwidth. 769-775 MHz band.

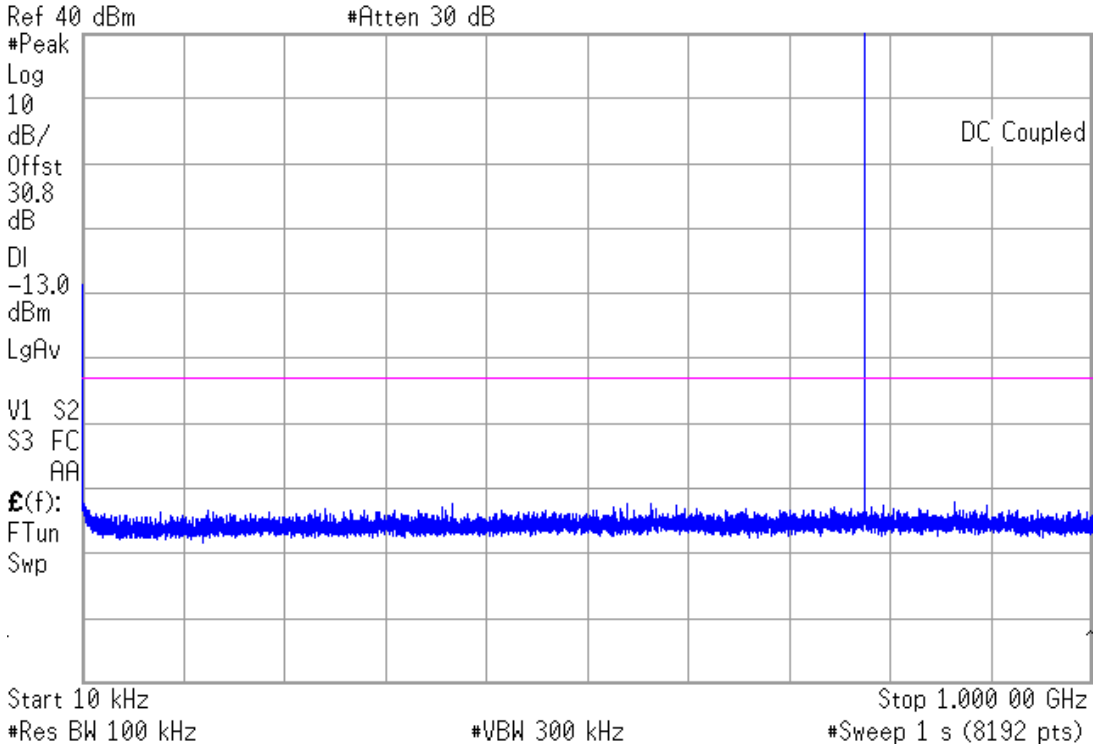
CHANNEL: LOWEST



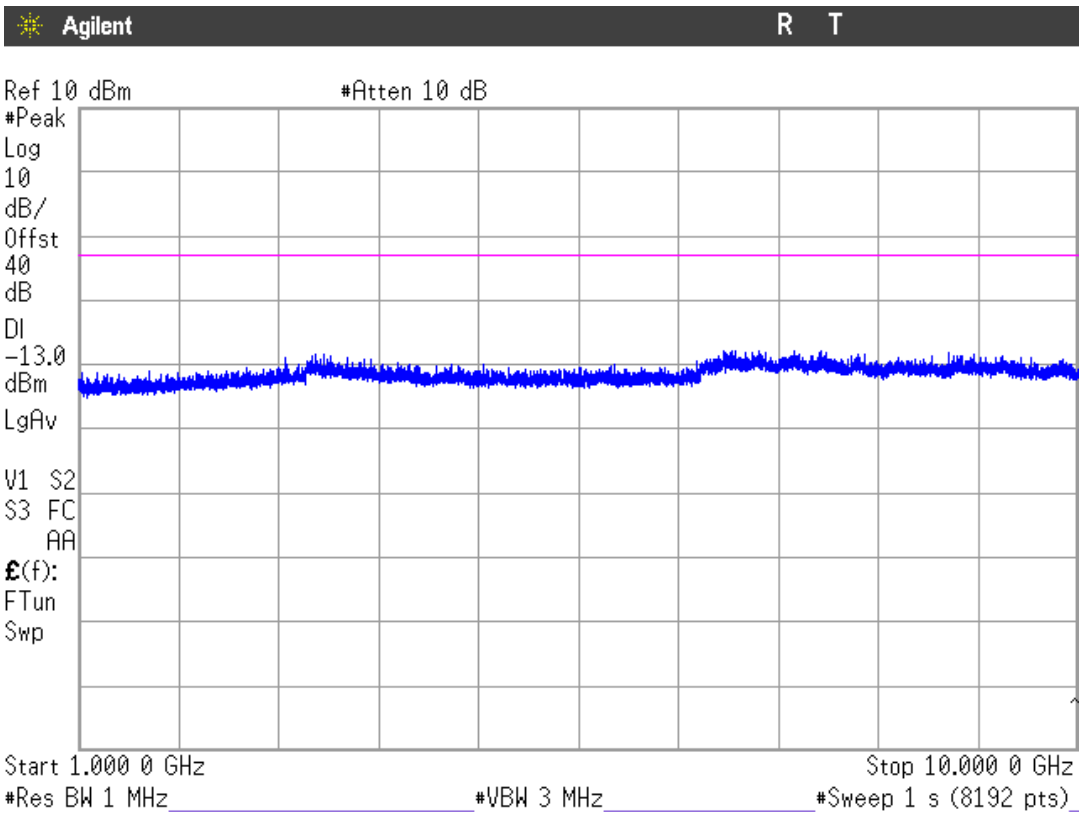
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

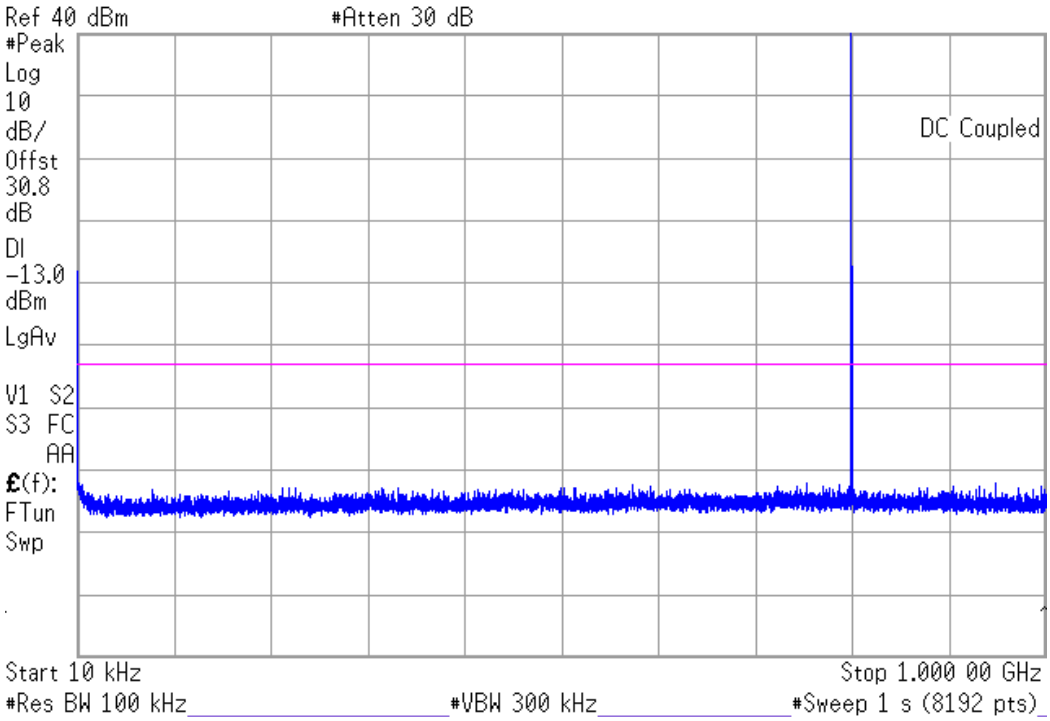


Note: The peak above the limit is the carrier frequency.

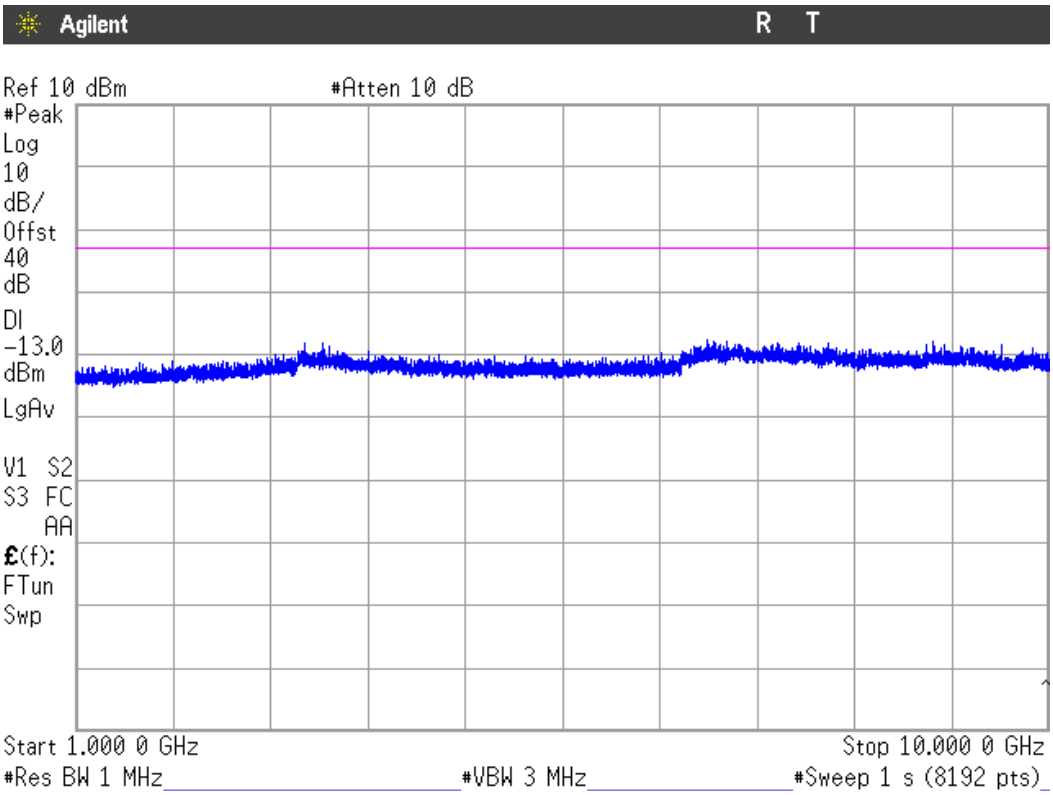


TI D-LMR 20 kHz bandwidth. 799-805 MHz band.

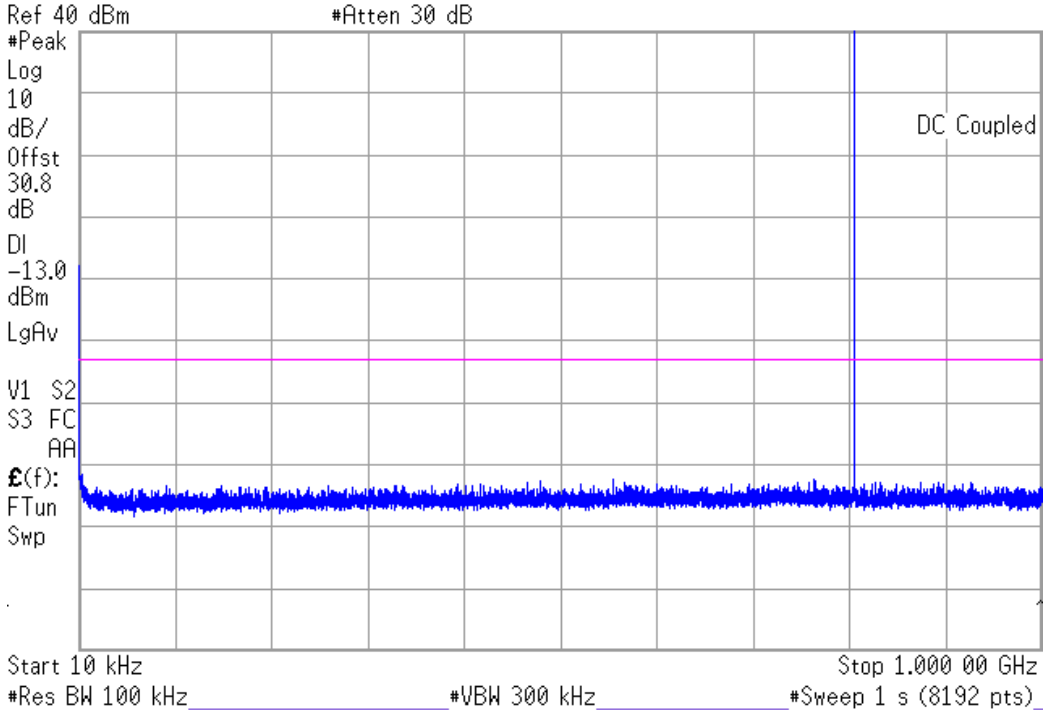
CHANNEL: LOWEST



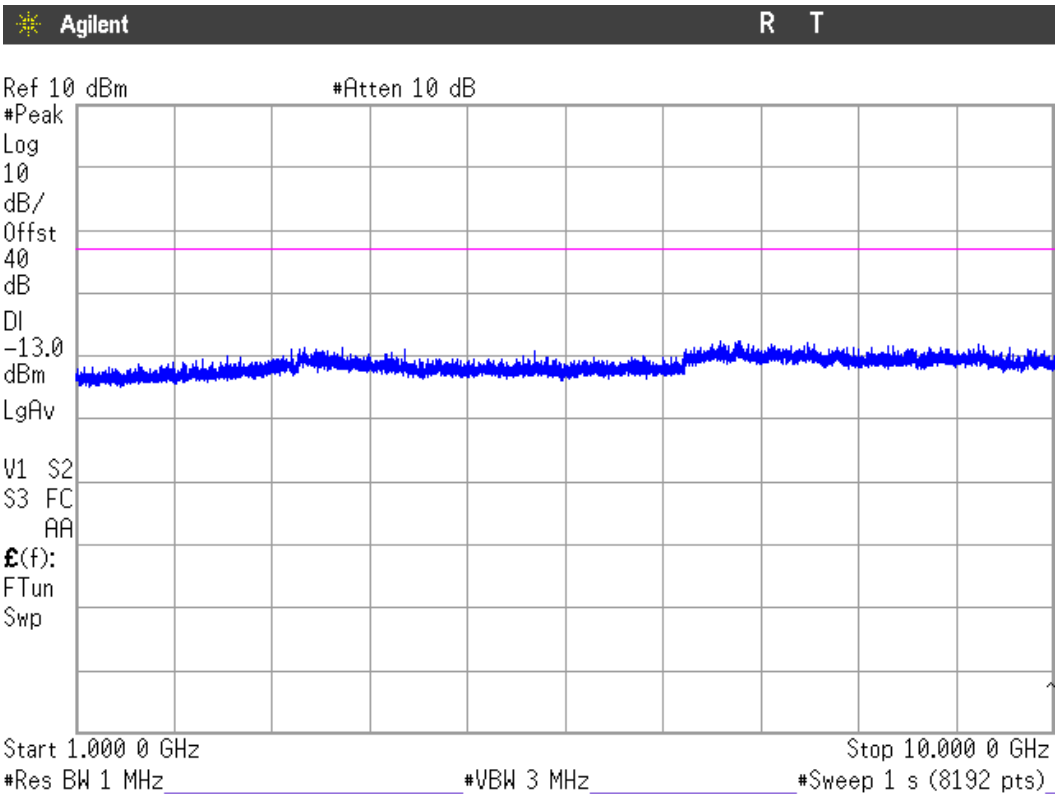
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

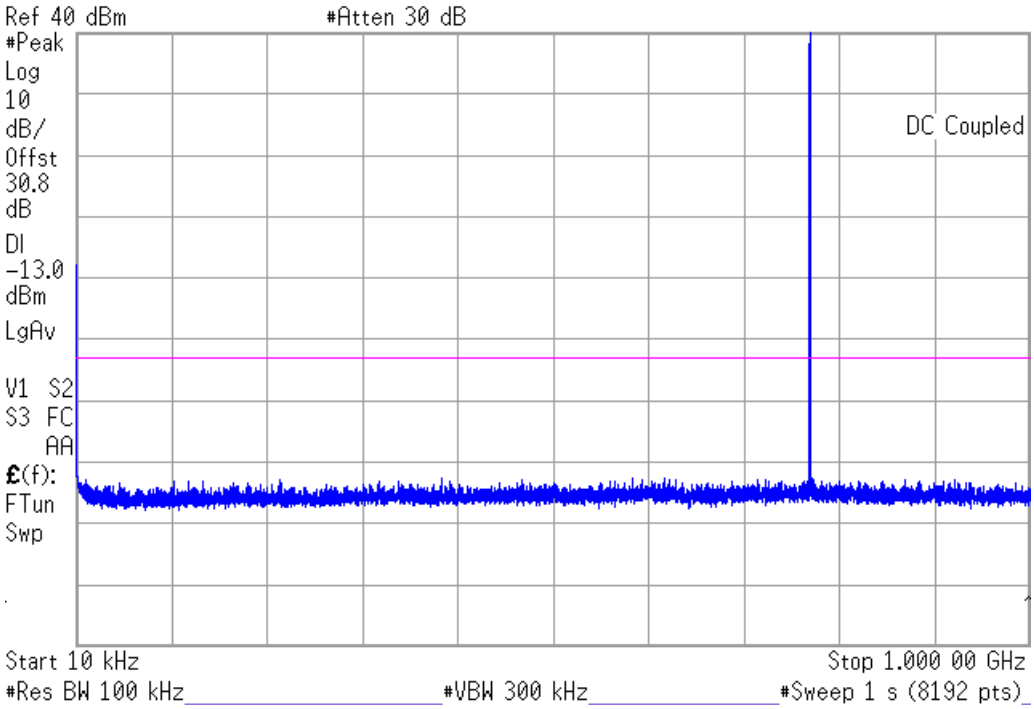


Note: The peak above the limit is the carrier frequency.

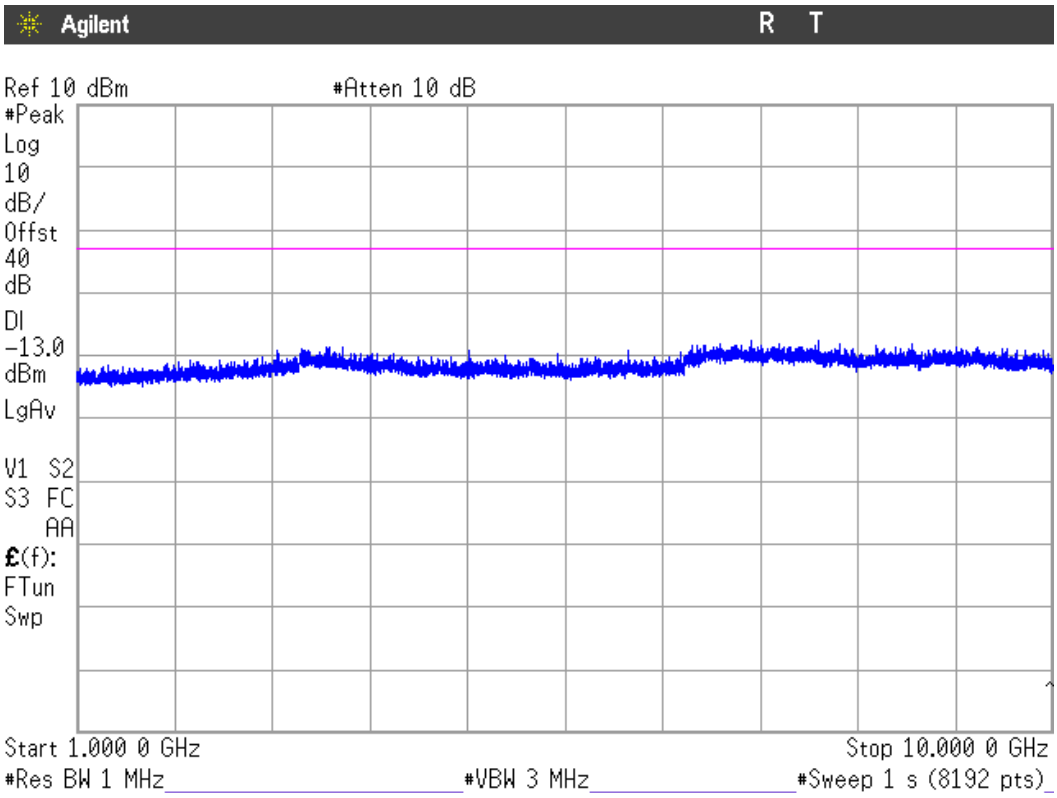


TETRA 22 kHz bandwidth. 769-775 MHz band.

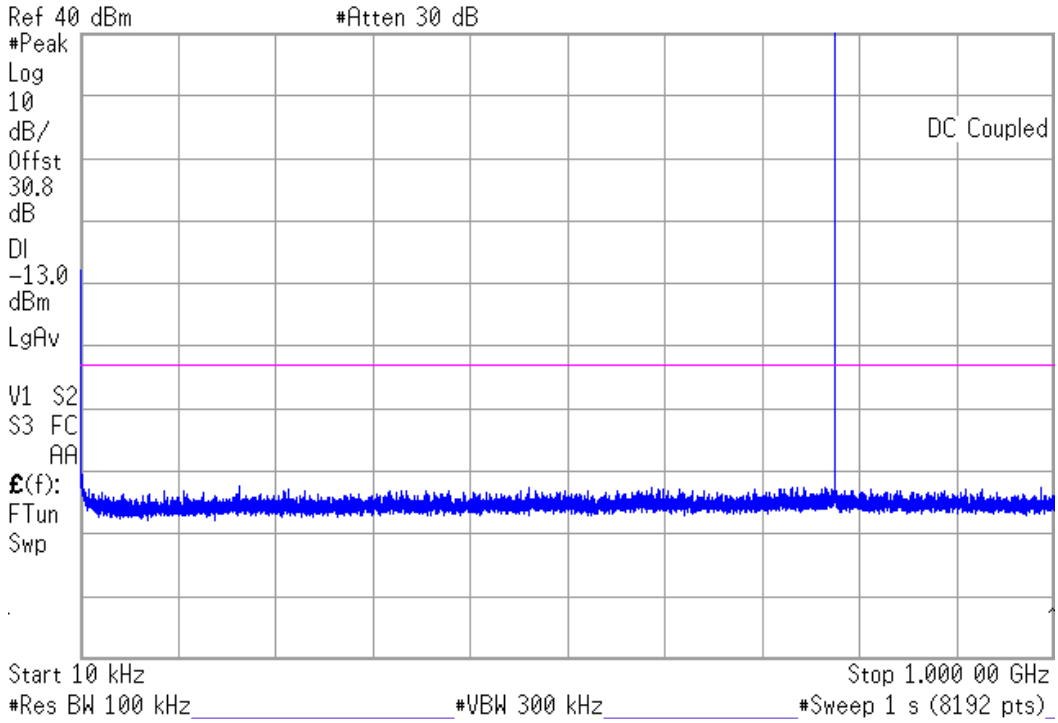
CHANNEL: LOWEST



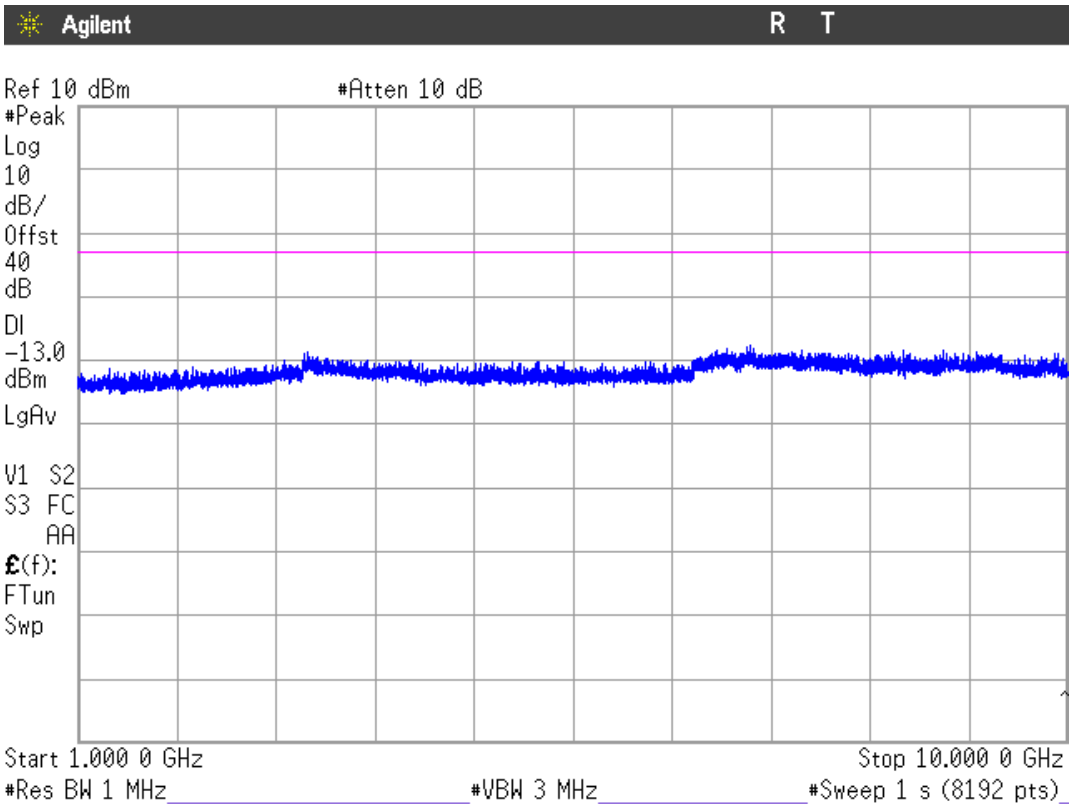
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

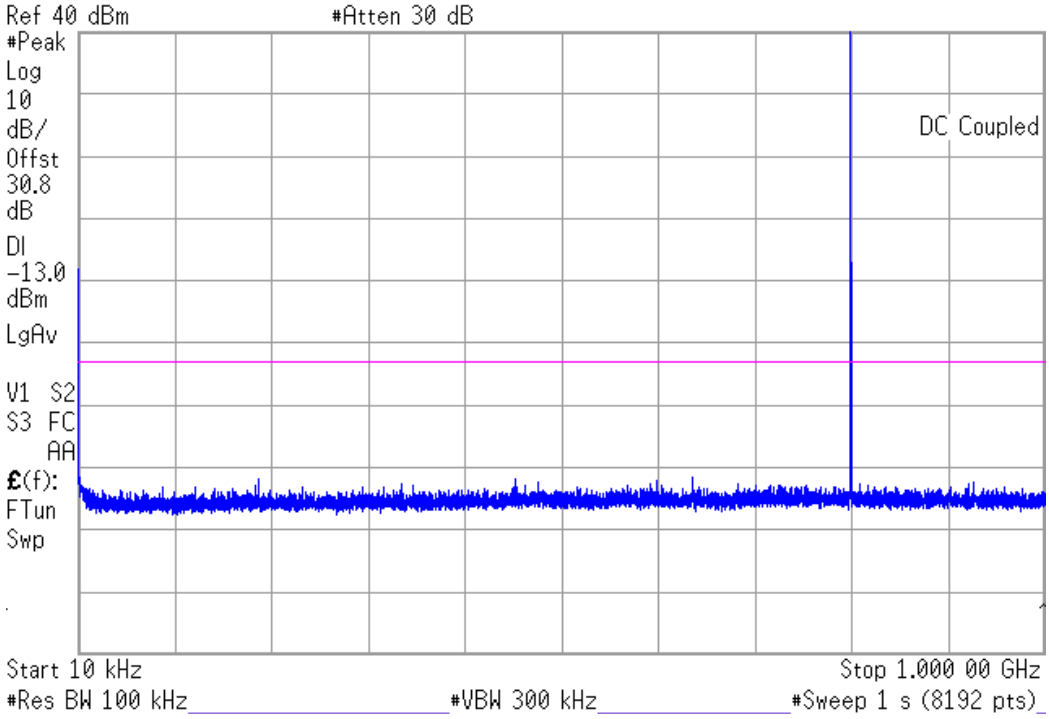


Note: The peak above the limit is the carrier frequency.

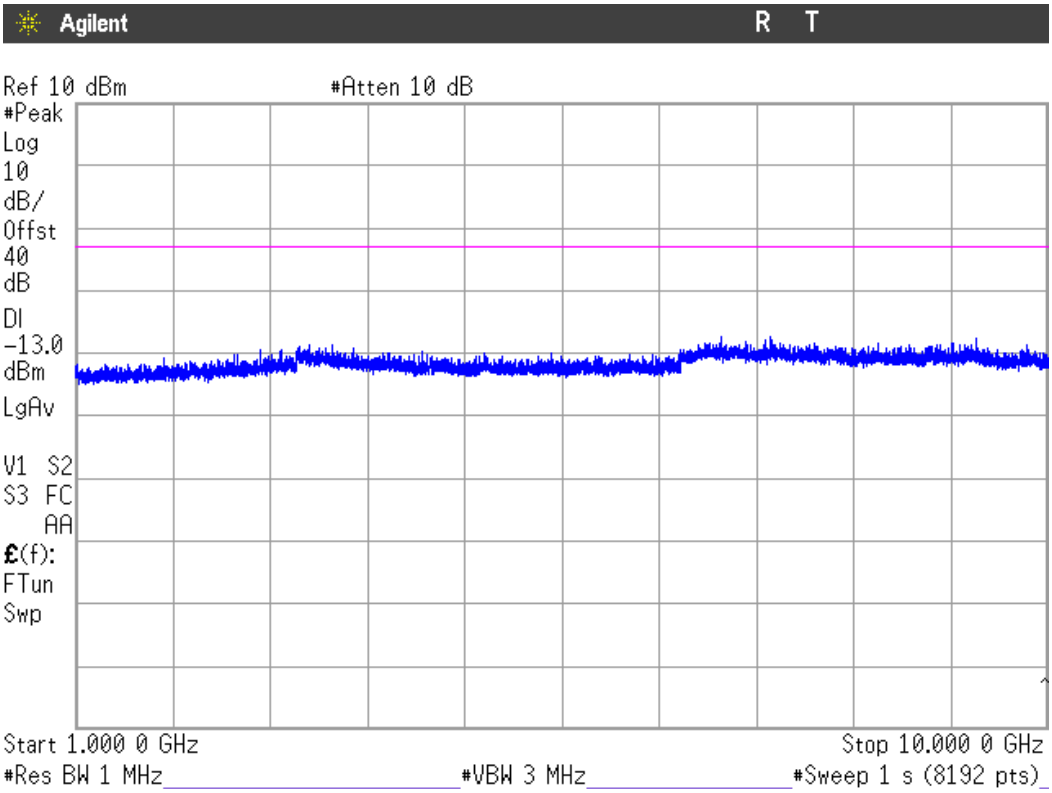


TETRA 22 kHz bandwidth. 799-805 MHz band.

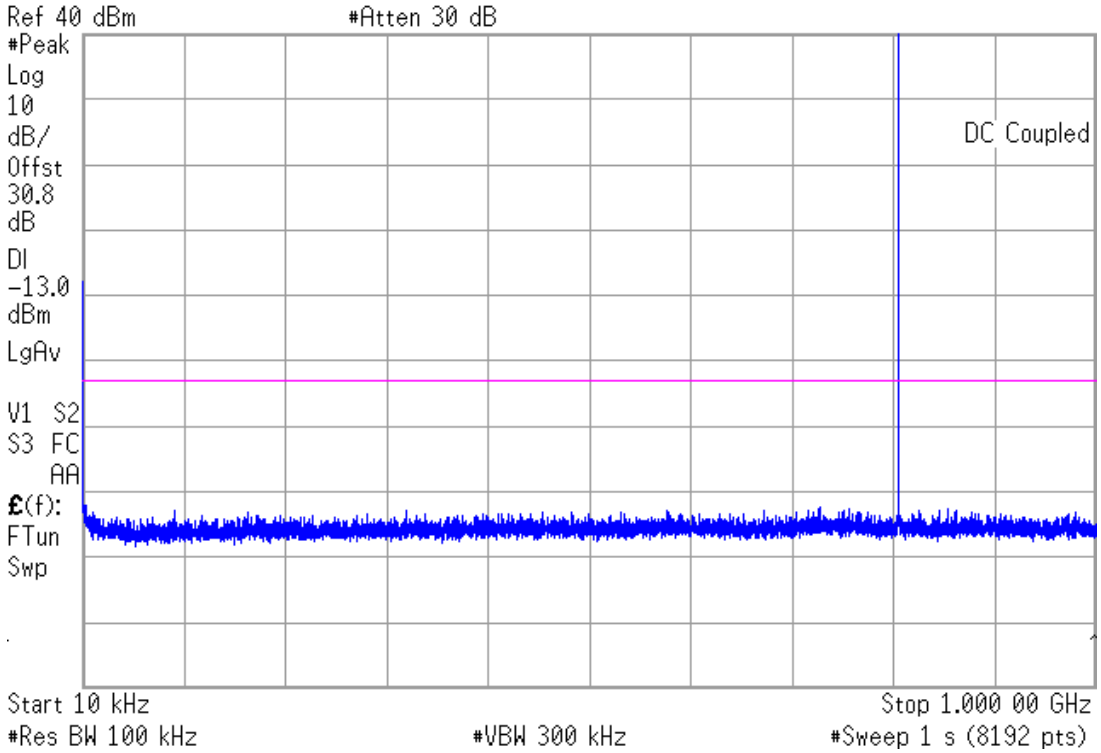
CHANNEL: LOWEST



Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST



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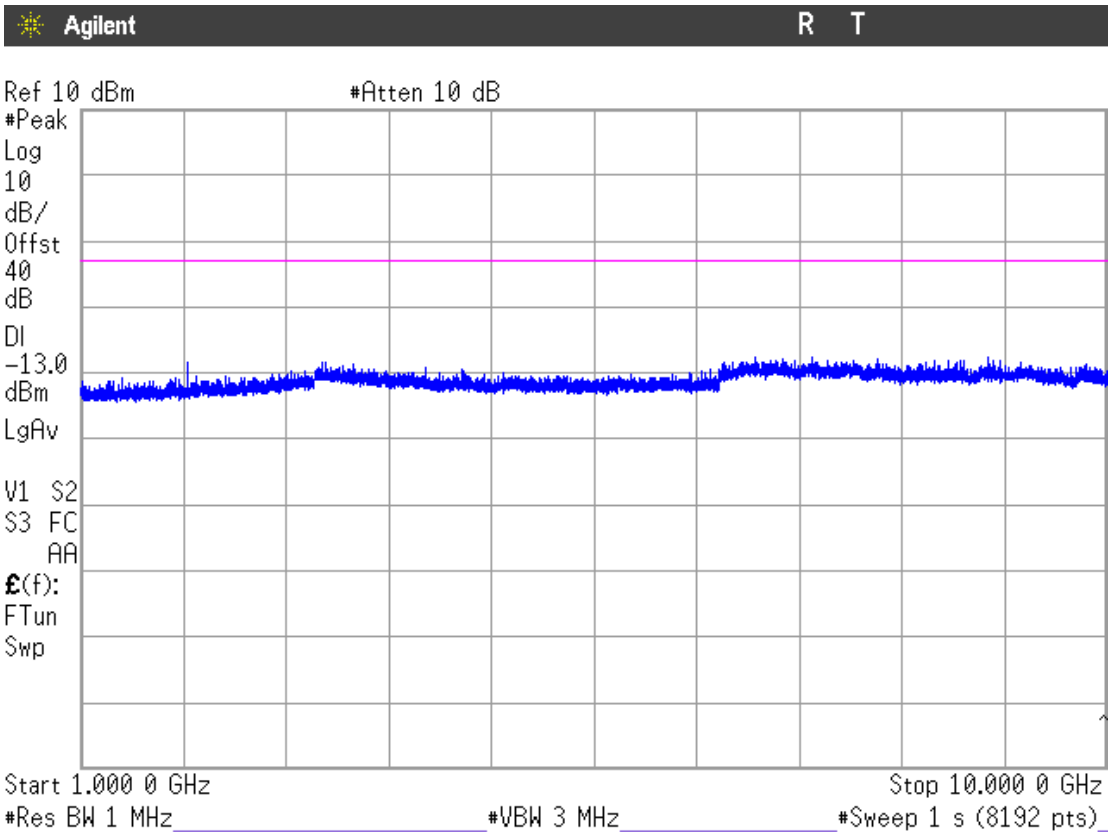
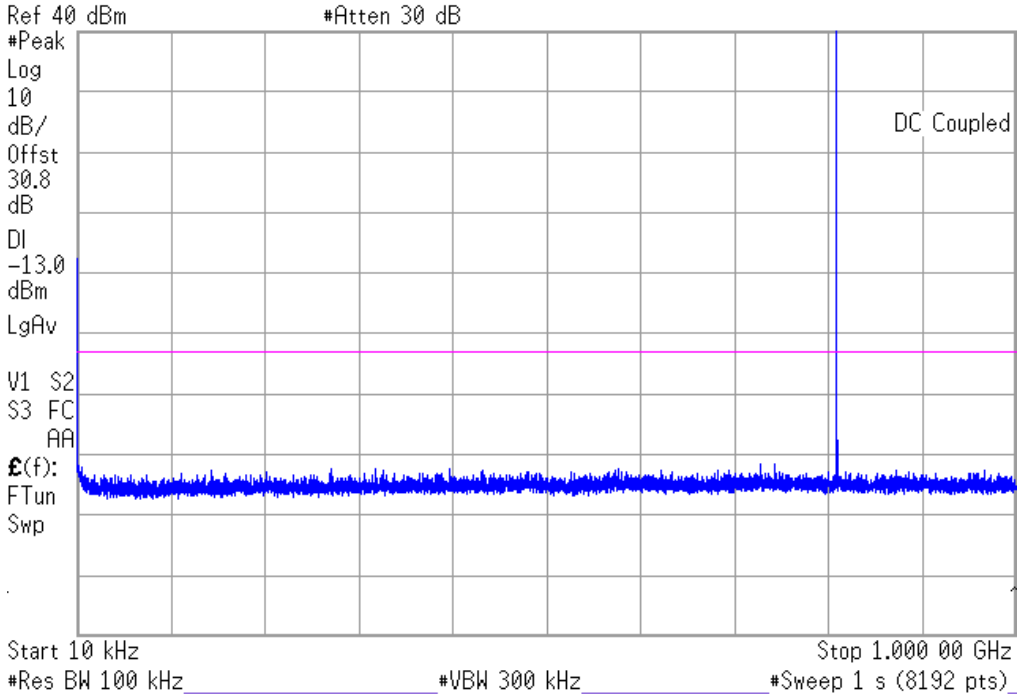
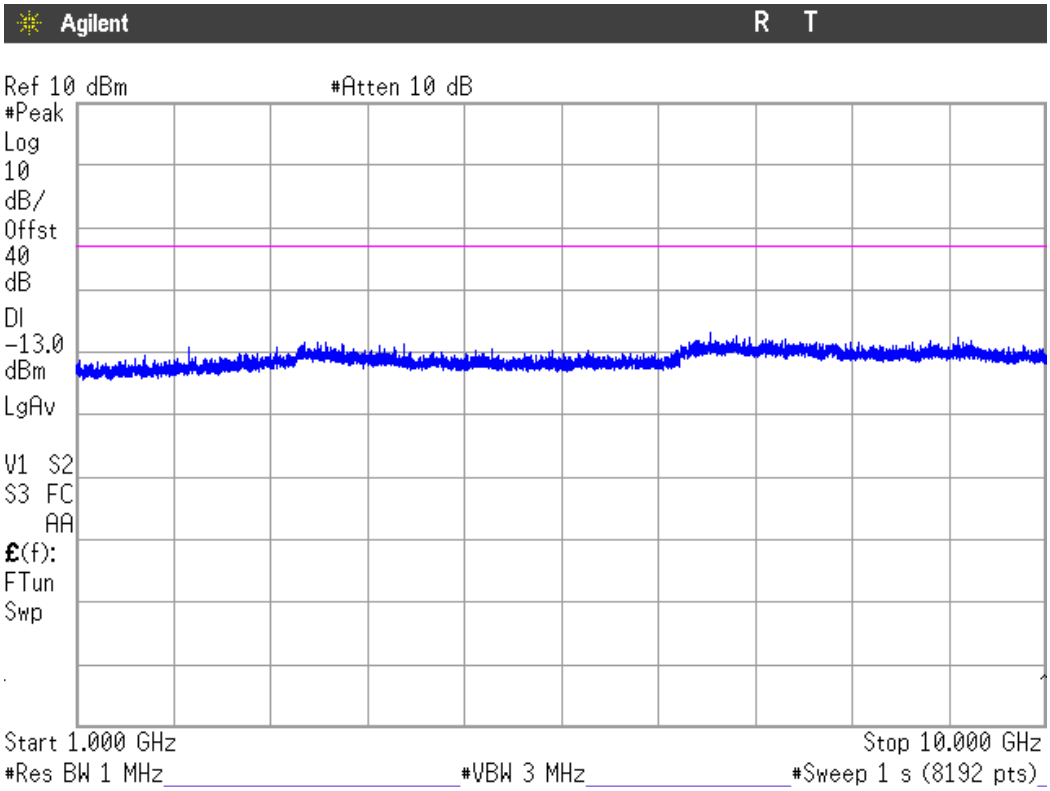


TI D-LMR 20 kHz bandwidth. 809-824 MHz band.

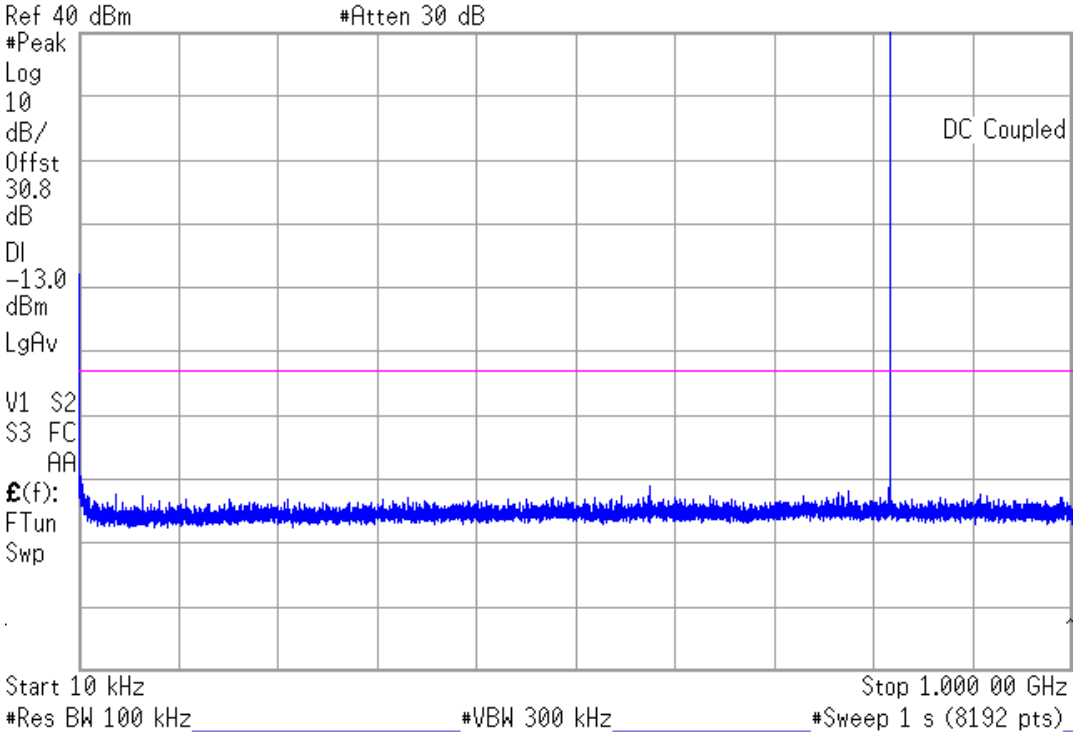
CHANNEL: LOWEST



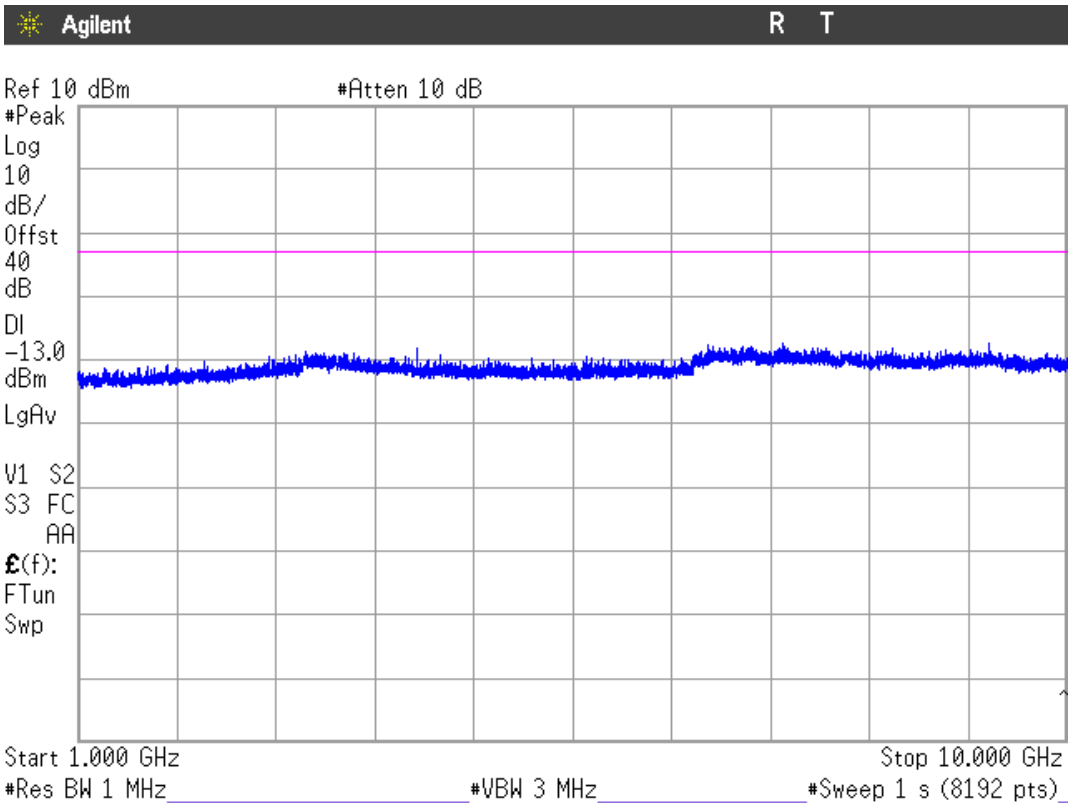
Note: The peak above the limit is the carrier frequency.



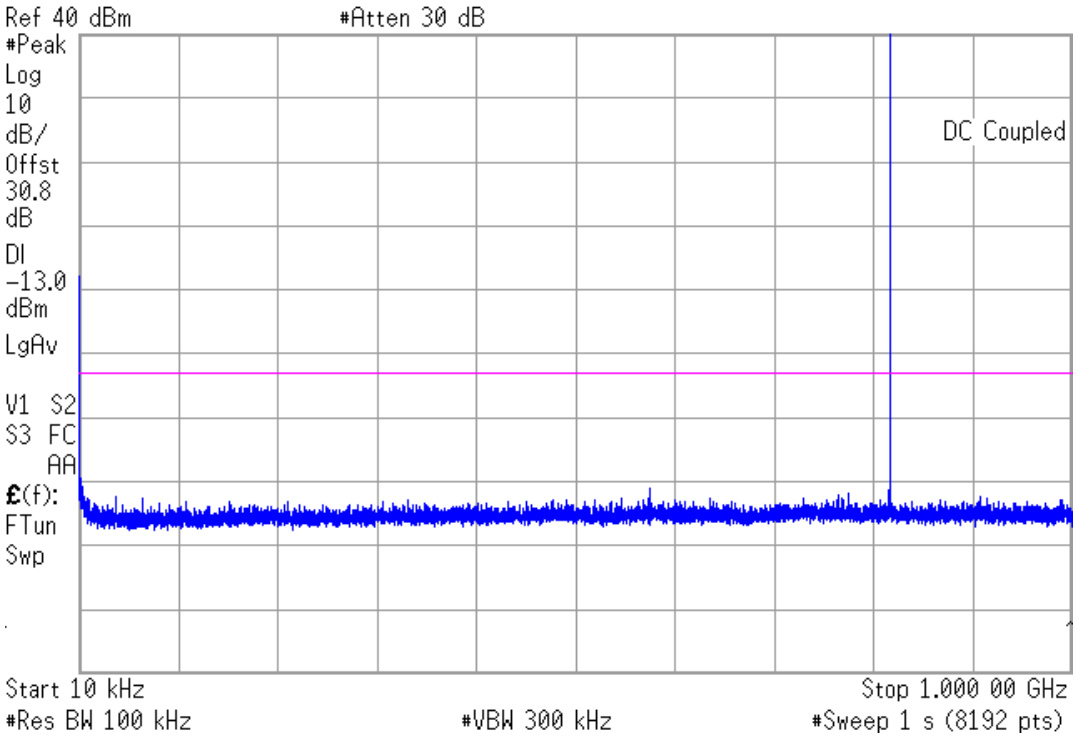
CHANNEL: MIDDLE



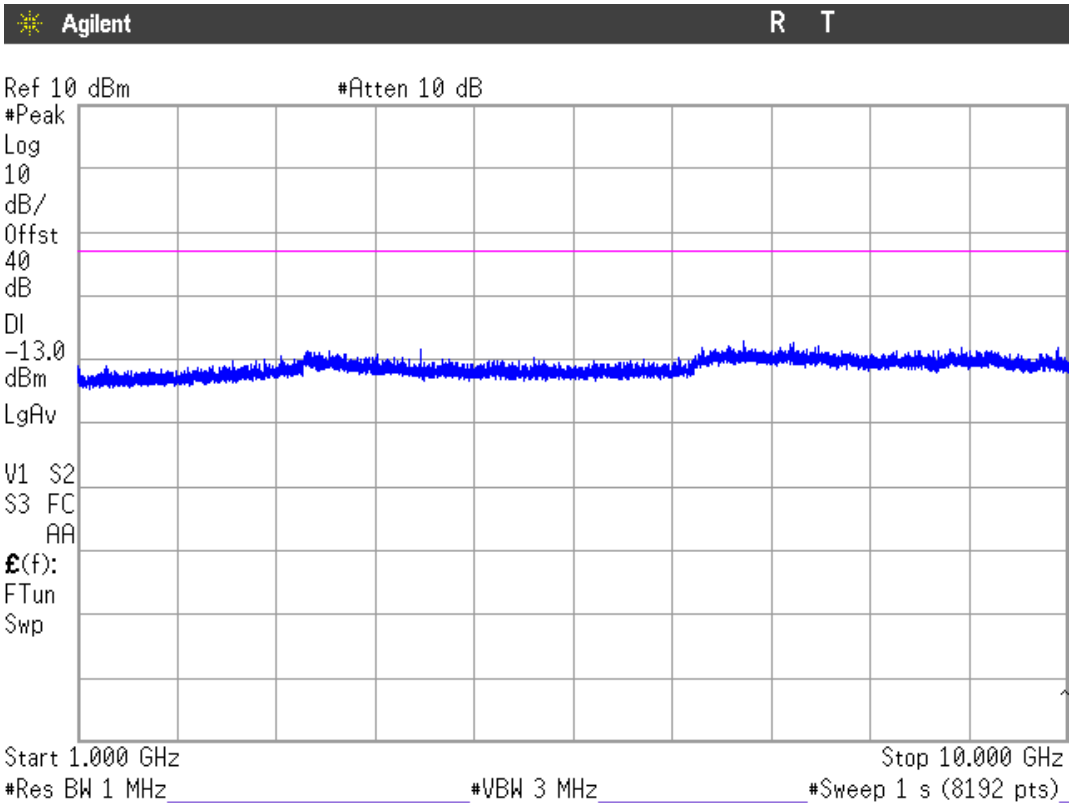
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

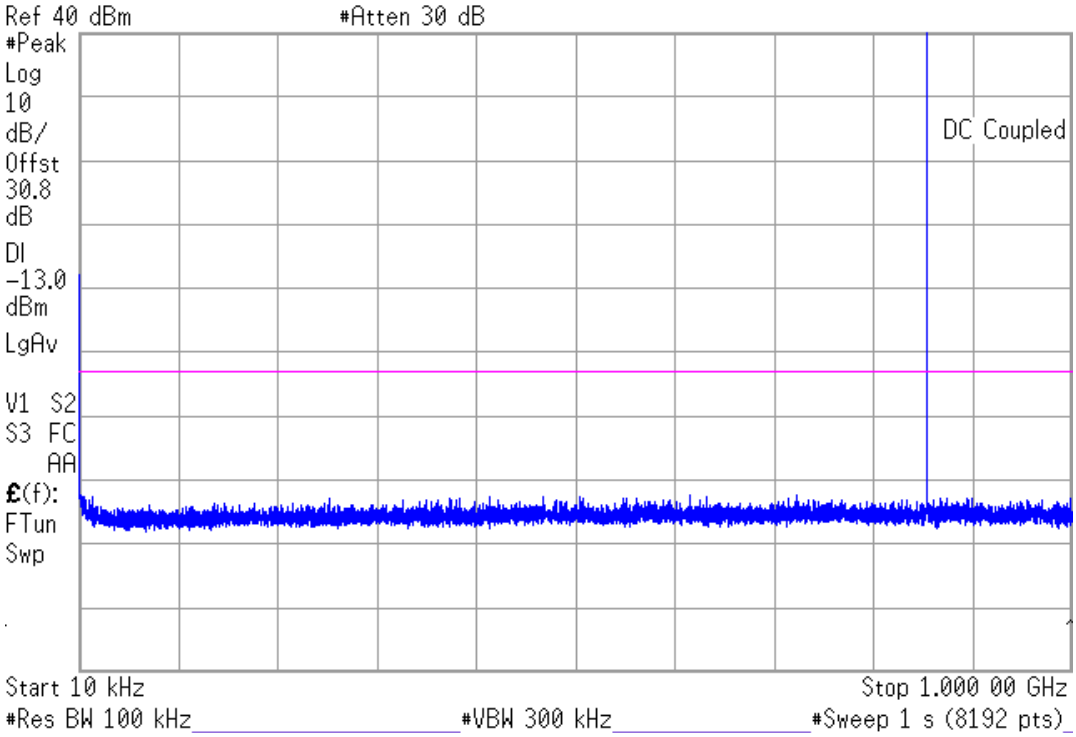


Note: The peak above the limit is the carrier frequency.

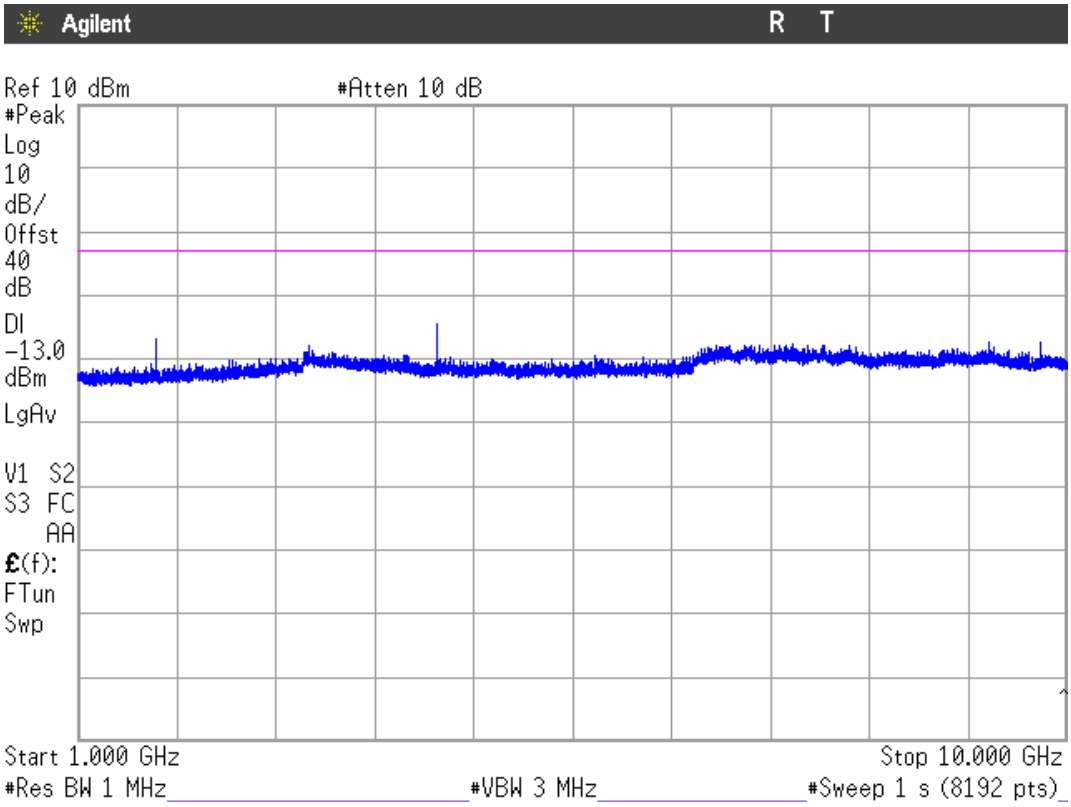


TI D-LMR 20 kHz bandwidth. 854-869 MHz band.

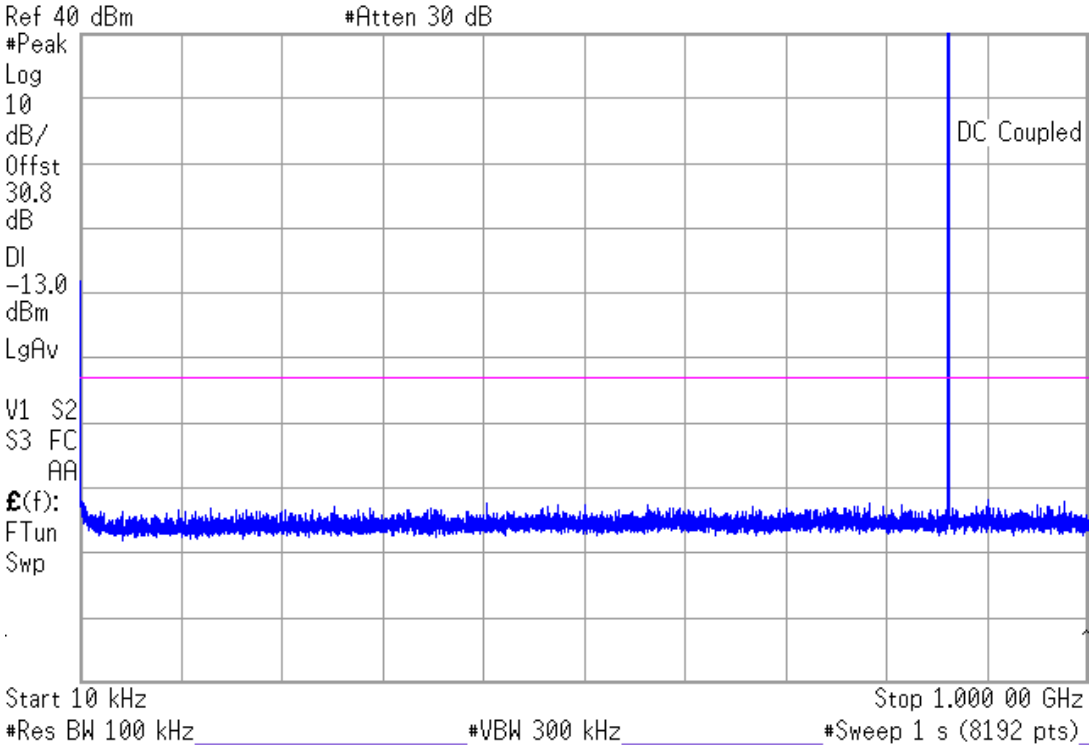
CHANNEL: LOWEST



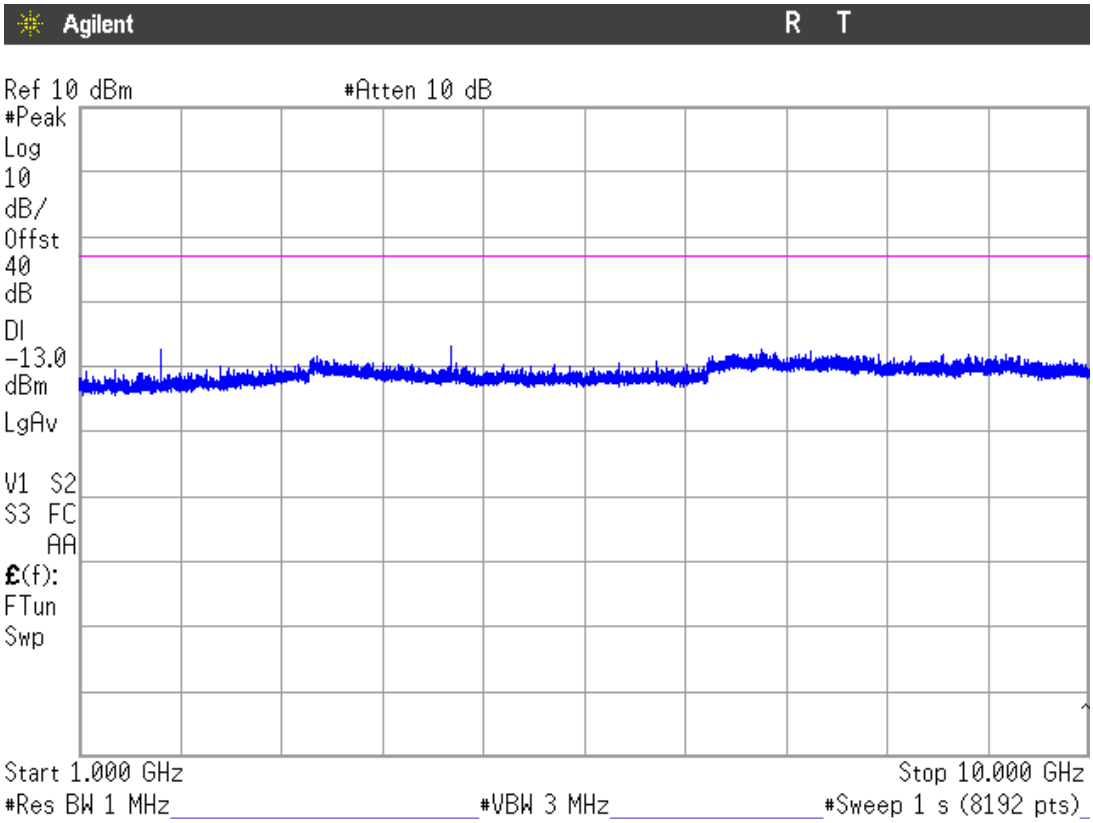
Note: The peak above the limit is the carrier frequency.



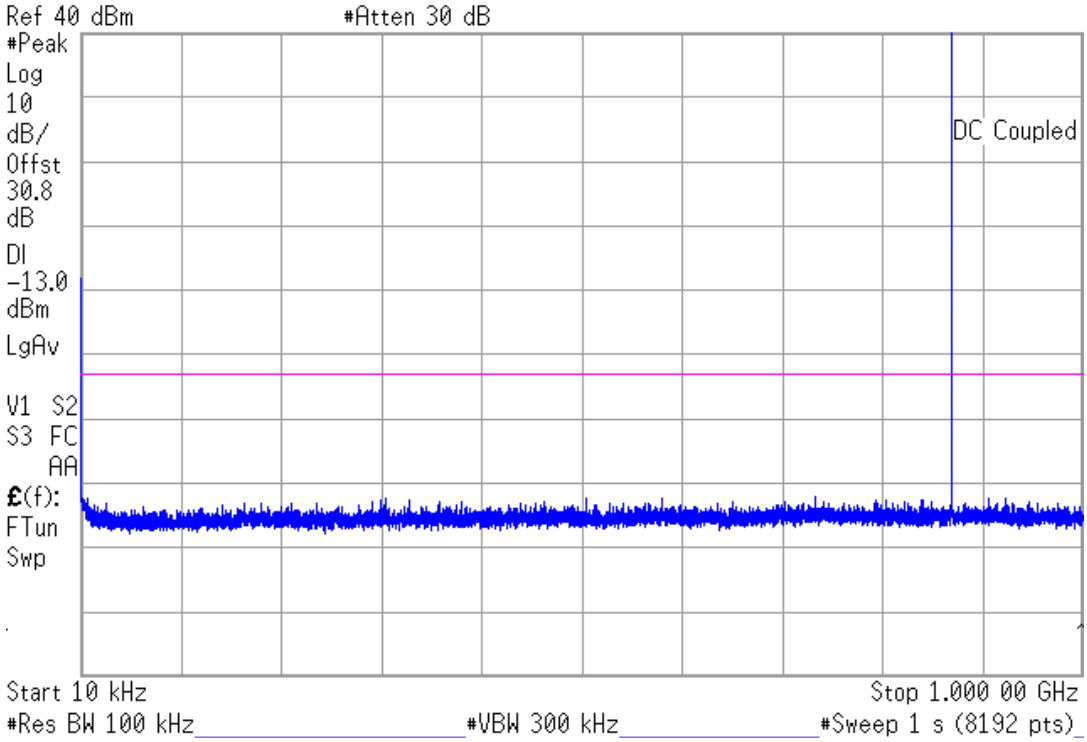
CHANNEL: MIDDLE



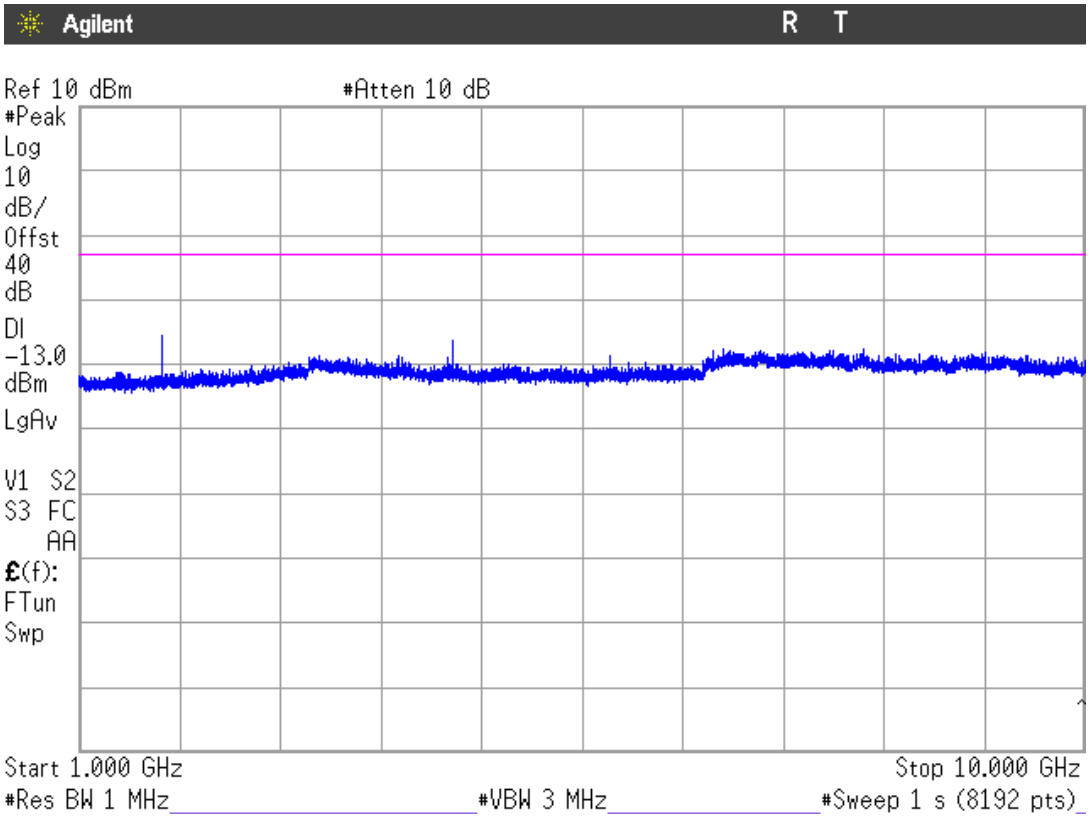
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

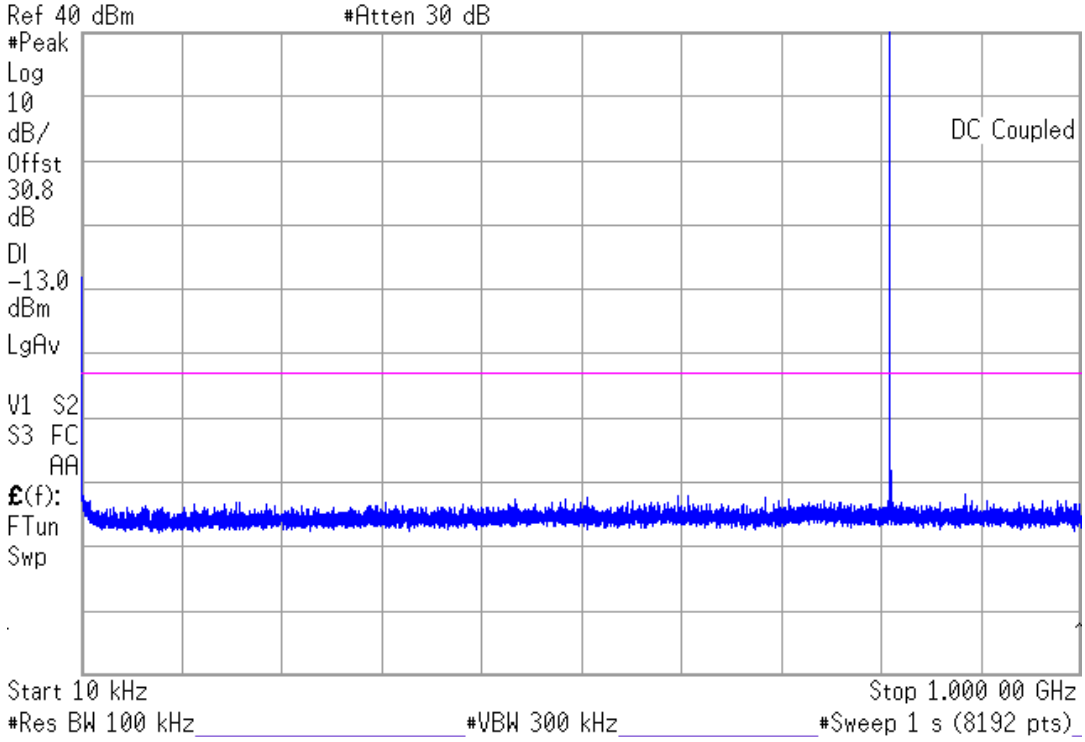


Note: The peak above the limit is the carrier frequency.

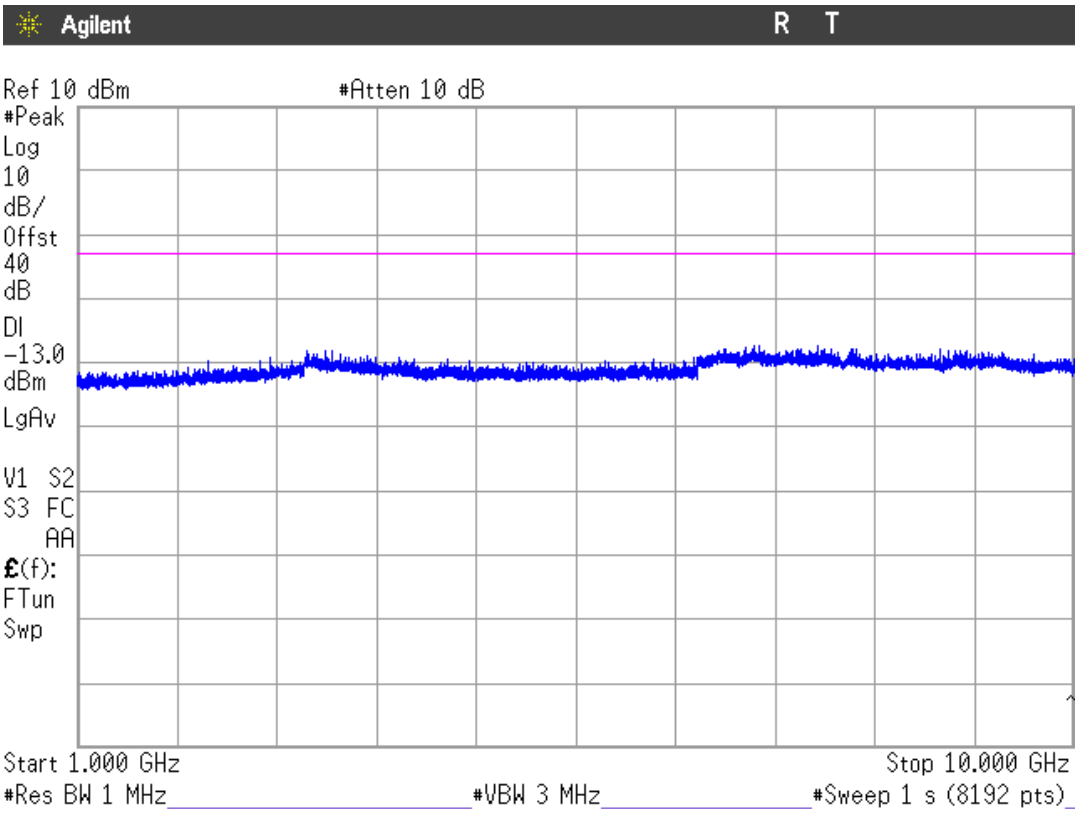


TETRA 22 kHz bandwidth. 809-824 MHz band.

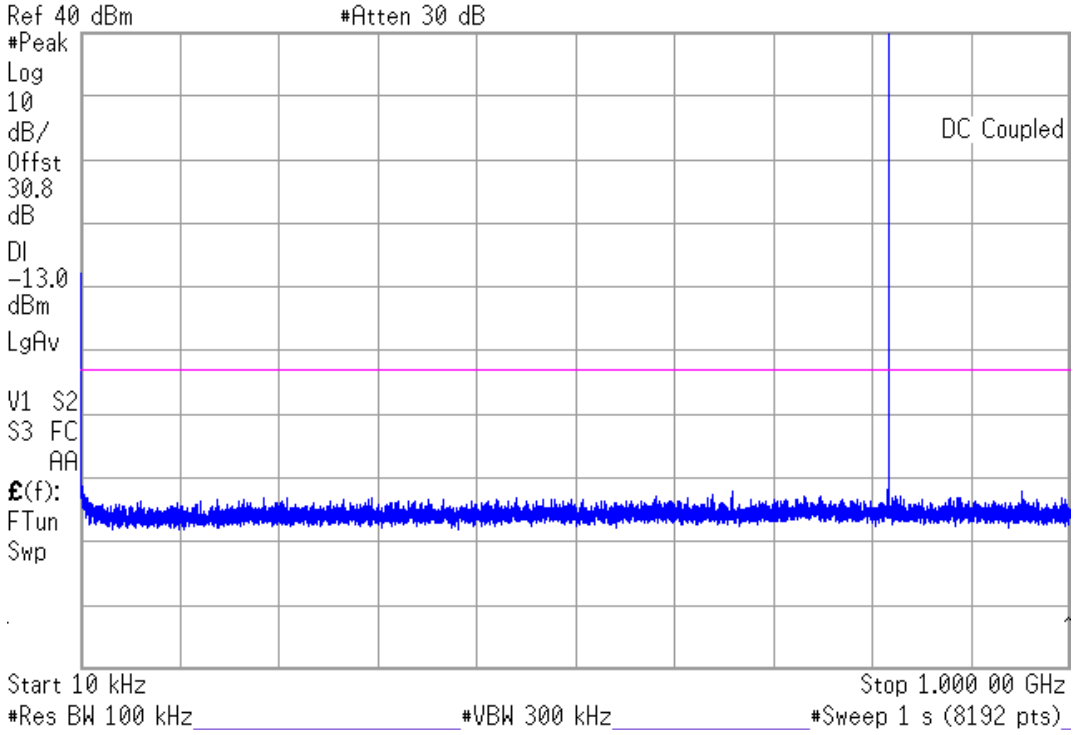
CHANNEL: LOWEST



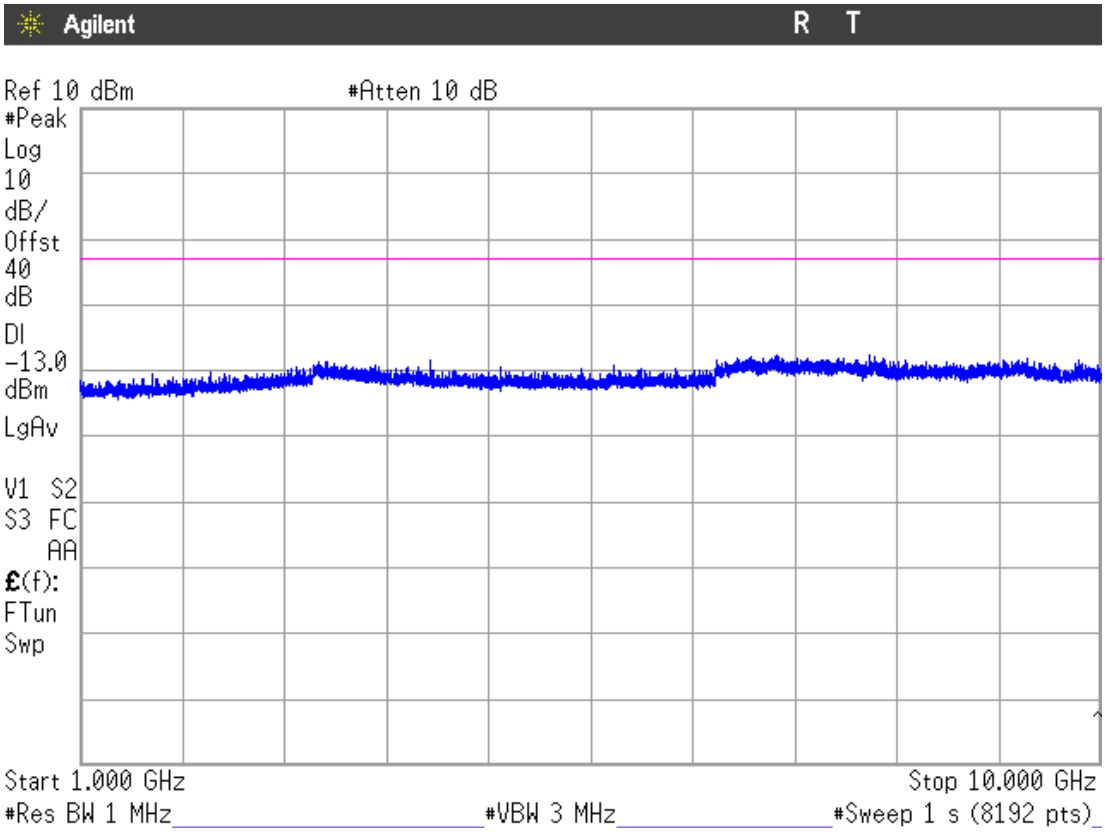
Note: The peak above the limit is the carrier frequency.



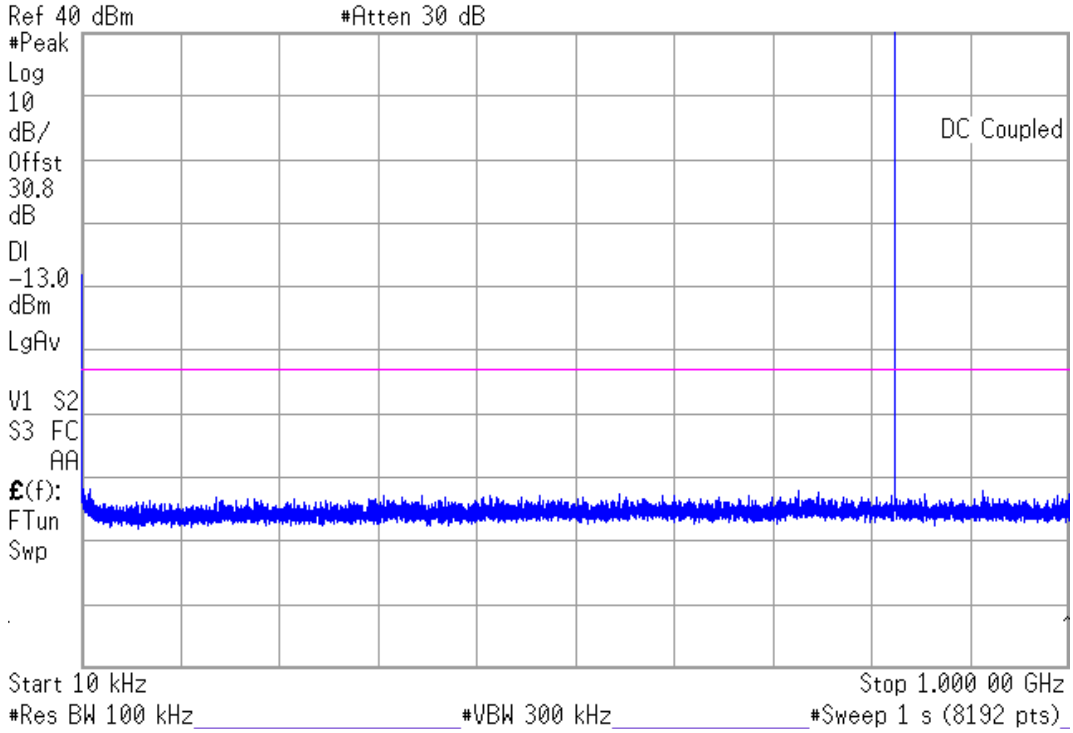
CHANNEL: MIDDLE



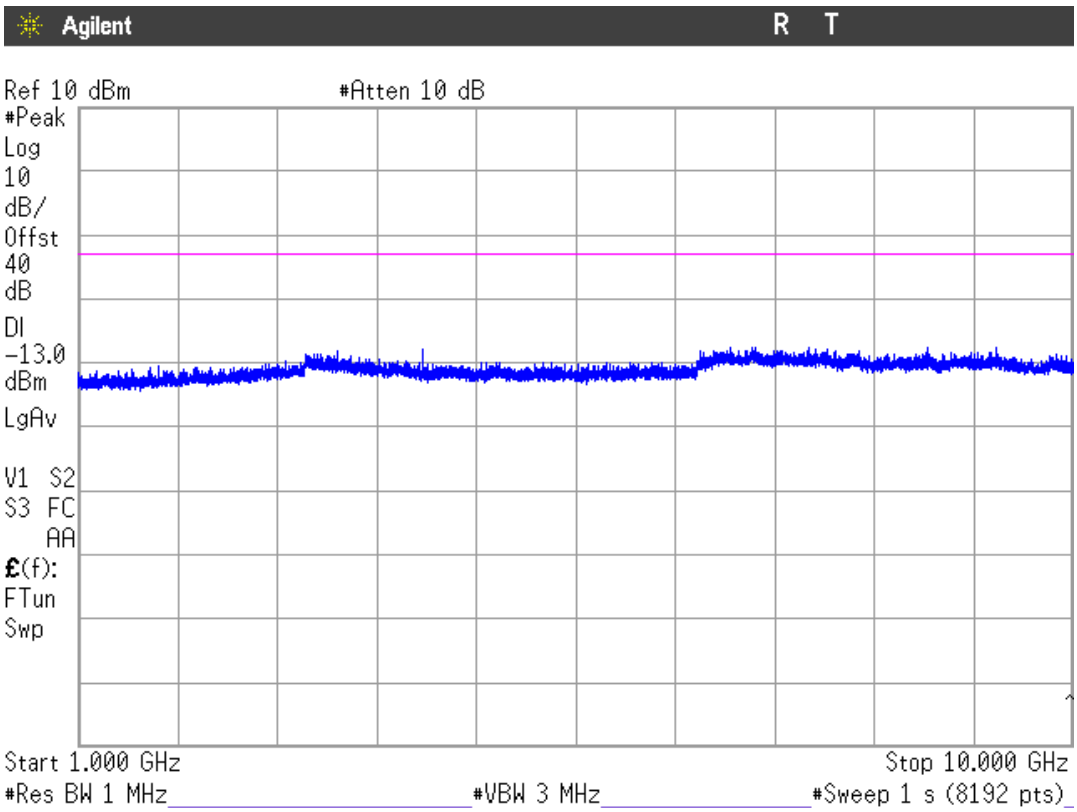
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

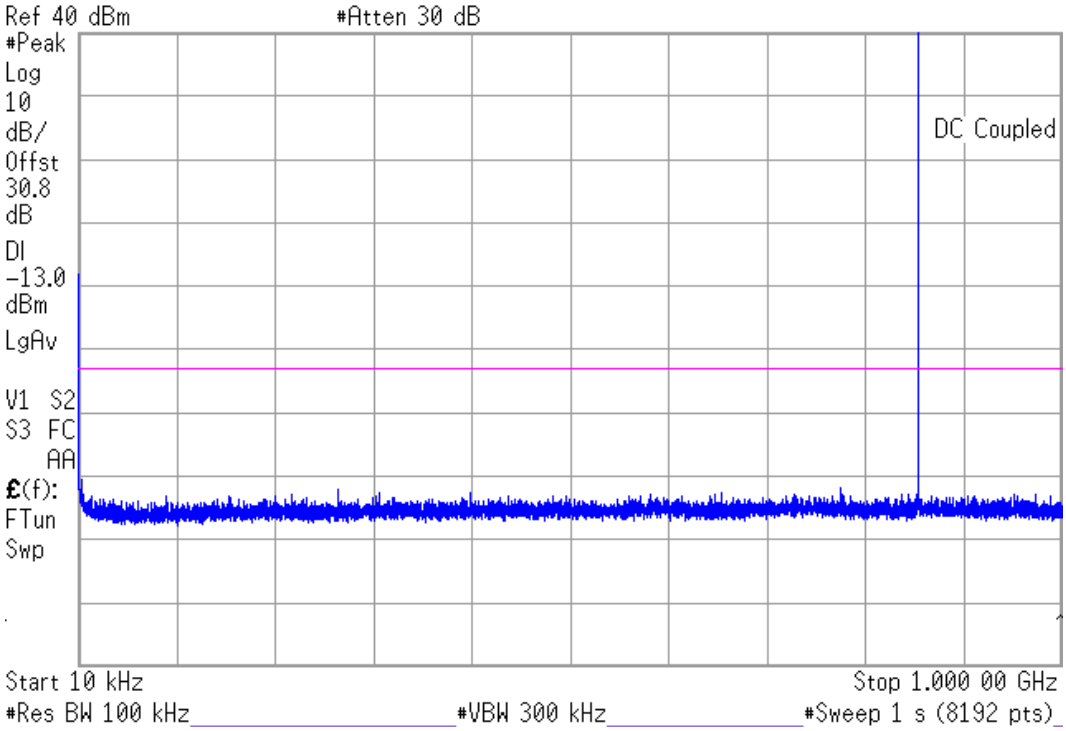


Note: The peak above the limit is the carrier frequency.

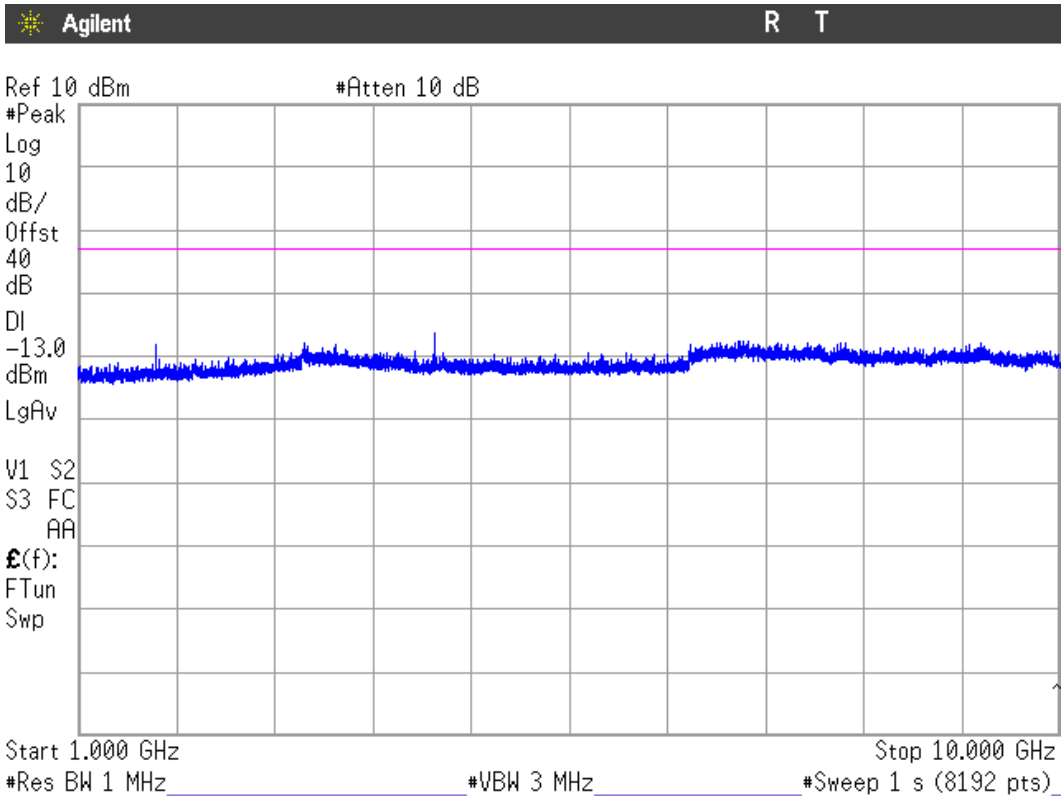


TETRA 22 kHz bandwidth. 854-869 MHz band.

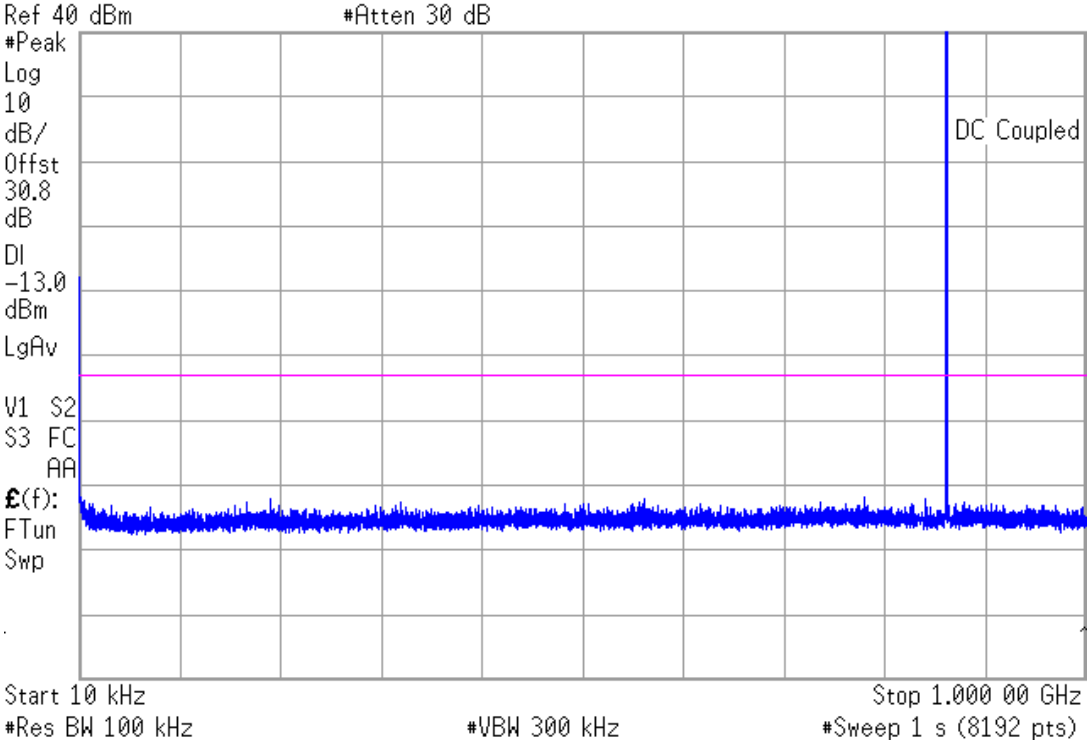
CHANNEL: LOWEST



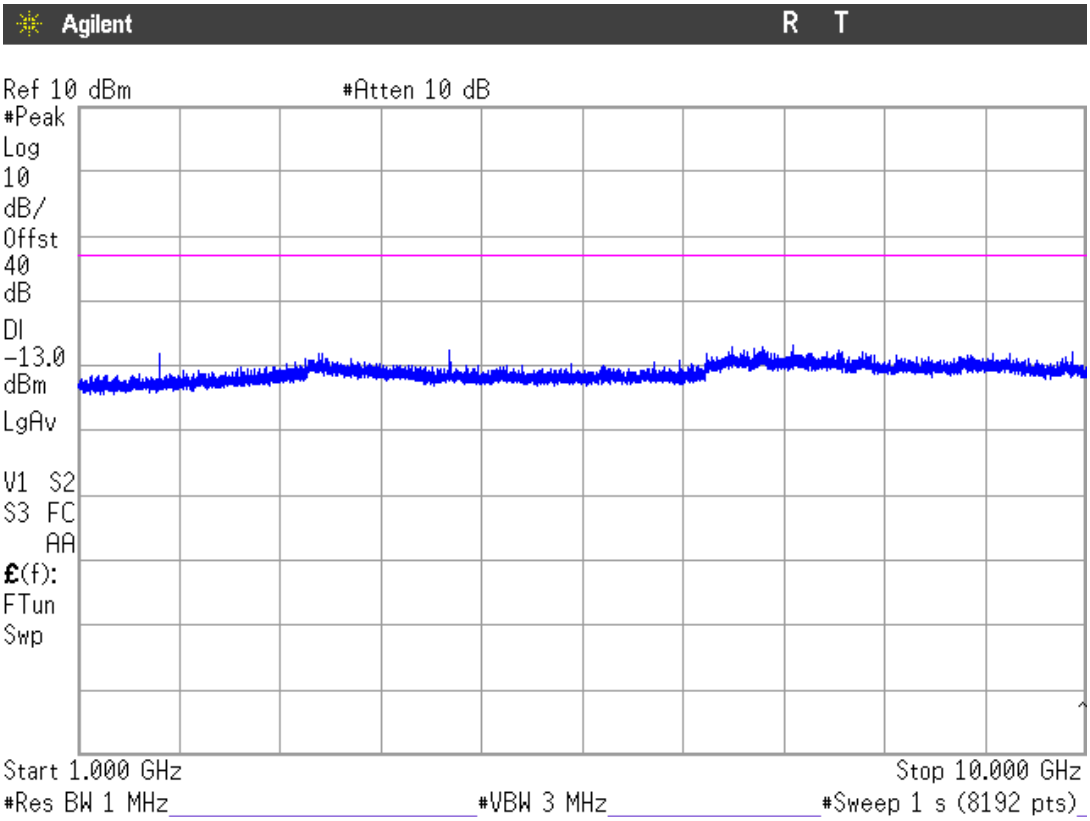
Note: The peak above the limit is the carrier frequency.



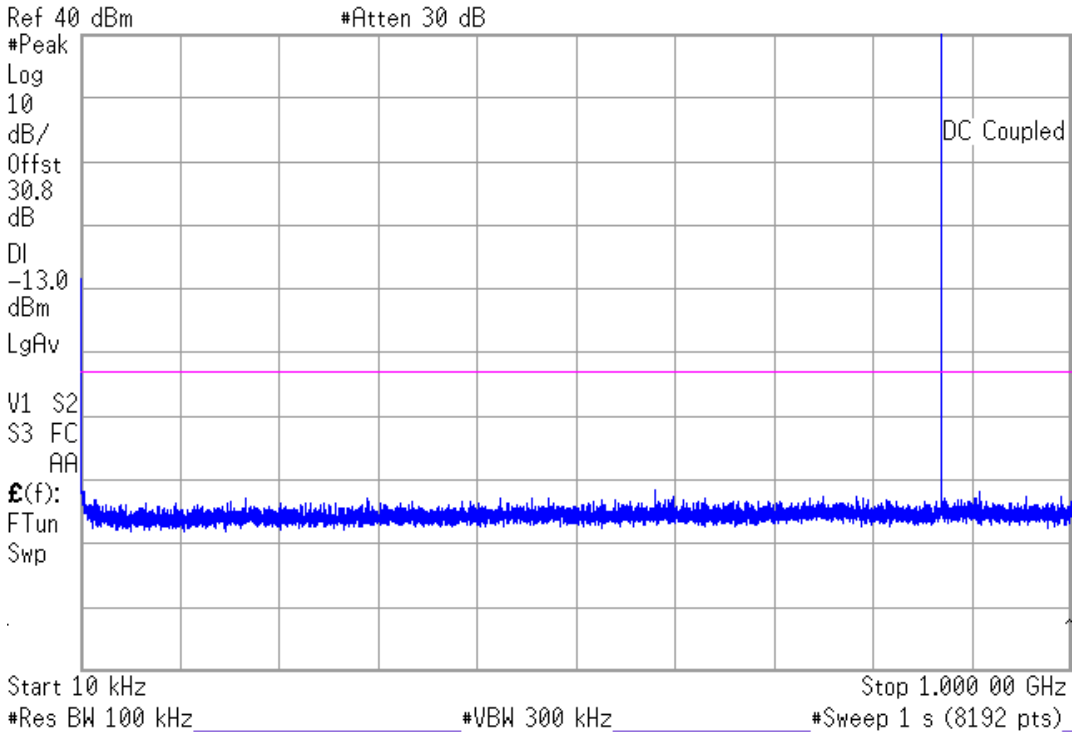
CHANNEL: MIDDLE



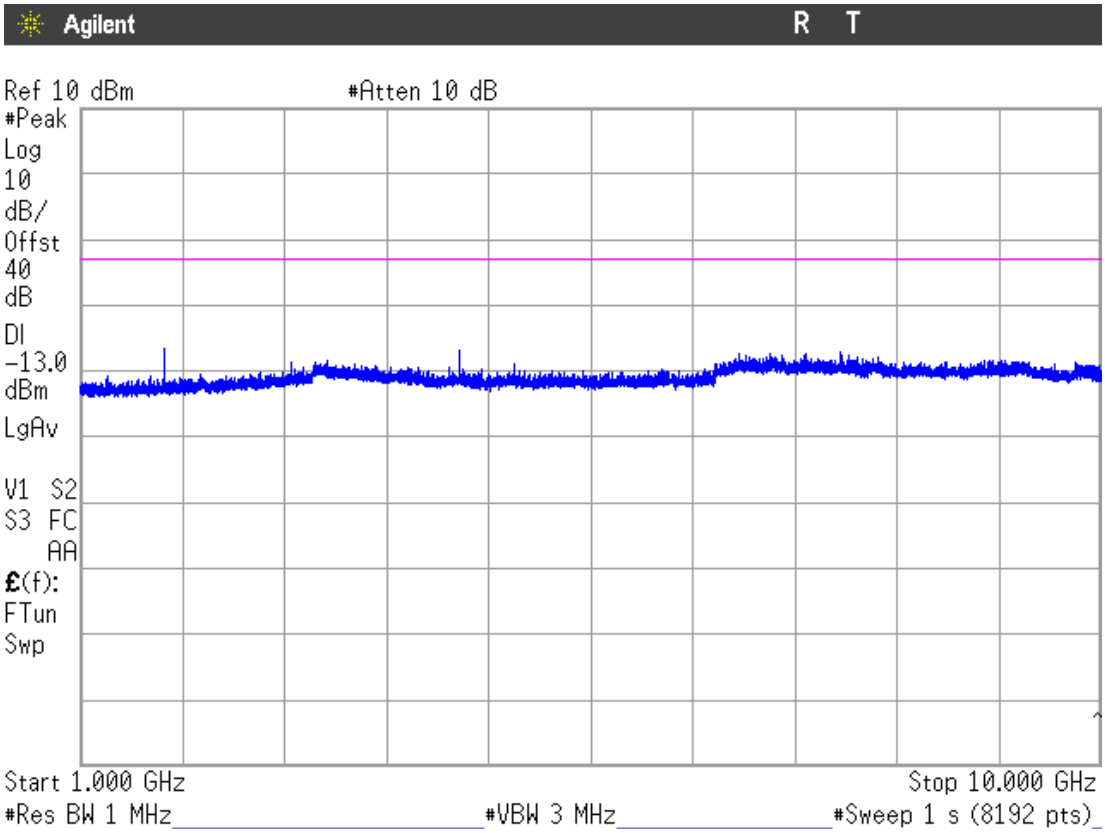
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.



Radiated emissions

SPECIFICATION

FCC §2.1051, §90.210, §90.221, §90.691. 809–824/854–869 MHz bands.

Emission Mask B.

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Emission mask requirements for EA-based systems.

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 + 10Log_{10}(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.

Adjacent channel power limits.

On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least 43 + 10 log (Pwatts) dB.

FCC §90.543. 769–775/799–805 MHz bands.

Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW (-40 dBm)/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

METHOD

The measurement was performed with the EUT inside an anechoic chamber. The RF output connector of the EUT is terminated with an attenuator and a 50 ohm load.
For emissions in the band 1559-1610 MHz the EUT was tested with an antenna that is representative of the type that will be used with the equipment in normal operation and having the highest antenna gain.
The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.
Each detected emission is substituted by the Substitution method in accordance with the ANSI/TIA-603-D: 2010.

RESULTS

769-775 MHz band for 8.1 kHz, 20 kHz and 22 kHz bandwidth.

A preliminary scan determined the P25 C4FM 8.1 kHz bandwidth as the worst case. The following tables and plots show the results for P25 C4FM 8.1 kHz bandwidth.

1. CHANNEL: LOWEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
Substitution method data

Frequency (GHz)	Instrument reading (dBm)	RBW (kHz)	Detector	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
4.61425	-38.44	1000	Peak	Horizontal	-39.61	2.90	11.63	-30.88

All other peaks are more than 20 dB below the limit.

Frequency range 1559 MHz-1610 GHz.
No spurious signals were found in all the range.

2. CHANNEL: HIGHEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
Substitution method data

Frequency (GHz)	Instrument reading (dBm)	RBW (kHz)	Detector	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
4.64995	-40.52	1000	Peak	Vertical	-40.34	2.90	11.61	-31.63

All other peaks are more than 20 dB below the limit.

Frequency range 1559 MHz-1610 GHz.
No spurious signals were found in all the range.

799-805 MHz band for 8.1 kHz, 20 kHz and 22 kHz bandwidth.

A preliminary scan determined the P25 C4FM 8.1 kHz bandwidth as the worst case. The following tables and plots show the results for P25 C4FM 8.1 kHz bandwidth.

1. CHANNEL: LOWEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

Frequency range 1559 MHz-1610 GHz.

Substitution method data

Frequency (GHz)	Instrument reading (dBm)	RBW (kHz)	Detector	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
1.5982216	-53.79	1000	RMS	Vertical	-61.93	1.50	8.45	-54.98
1.5980227	-65.52	1	RMS	Vertical	-73.66	1.50	8.45	-66.71

2. CHANNEL: HIGHEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

Frequency range 1559 MHz-1610 GHz.

Substitution method data

Frequency (GHz)	Instrument reading (dBm)	RBW (kHz)	Detector	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
1.6099686	-40.36	1000	RMS	Vertical	-52.78	1.81	8.47	-46.12
1.6017780	-57.64	1	RMS	Vertical	-69.96	1.81	8.47	-63.30

809-824 MHz band for 22 kHz and 20 kHz bandwidth.

A preliminary scan determined the TI D-LMR 20 kHz bandwidth as the worst case. The following tables and plots show the results for TI D-LMR 20 kHz bandwidth.

1. CHANNEL: LOWEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

2. CHANNEL: MIDDLE.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

3. CHANNEL: HIGHEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

854-869 MHz band for 22 kHz and 20 kHz bandwidth.

A preliminary scan determined the TI D-LMR 20 kHz bandwidth as the worst case. The following tables and plots show the results for TI D-LMR 20 kHz bandwidth.

1. CHANNEL: LOWEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

2. CHANNEL: MIDDLE.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

3. CHANNEL: HIGHEST.

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-10 GHz.
All peaks are more than 20 dB below the limit.

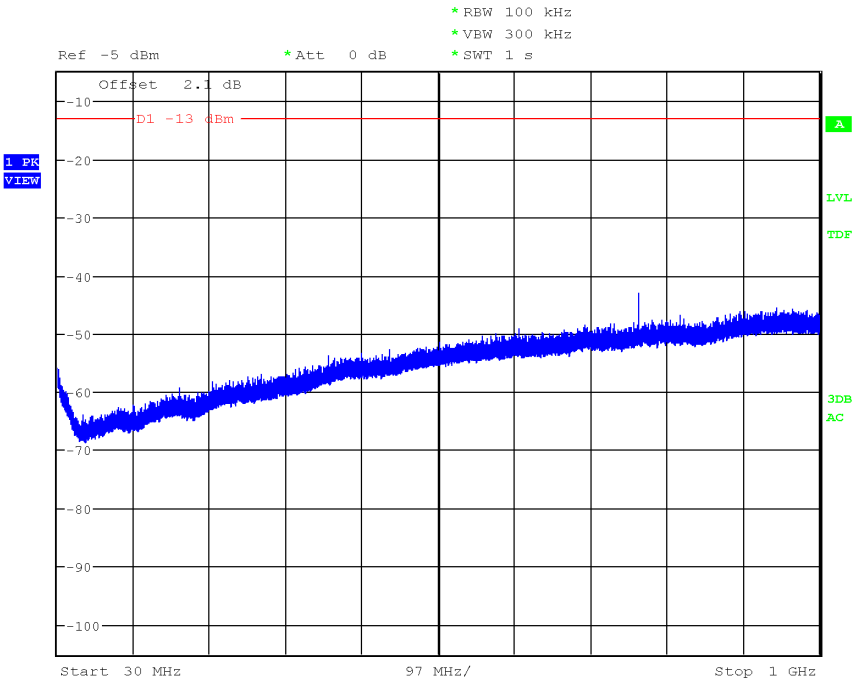
Measurement uncertainty (dB)	<±3.88 for f < 1GHz <±4.87 for f ≥ 1 GHz up to 18 GHz

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

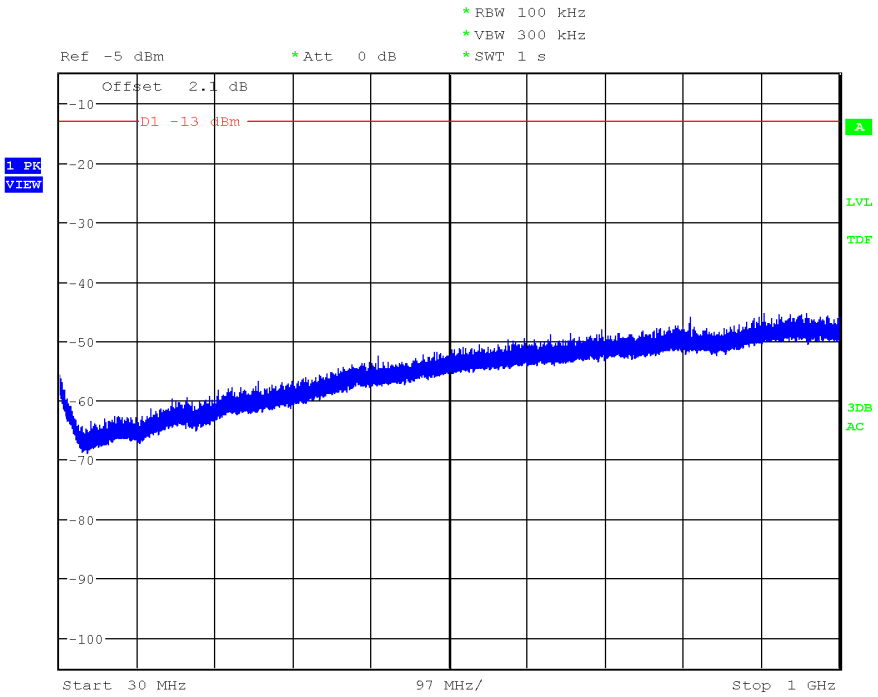
769-775 MHz band.

CHANNEL: LOWEST.



Note: The carrier has been attenuated using a notch filter.

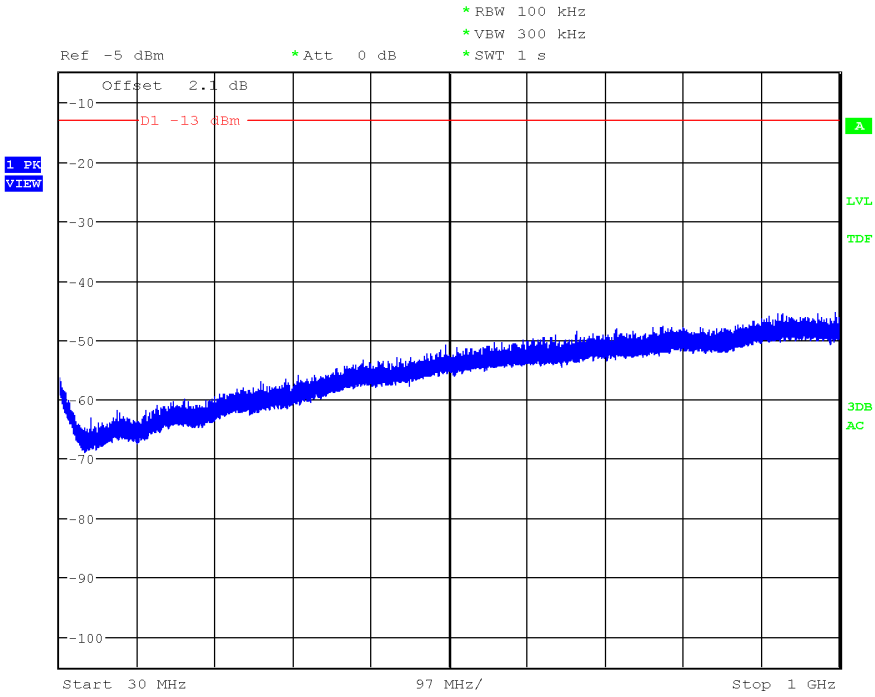
CHANNEL: HIGHEST.



Note: The carrier has been attenuated using a notch filter.

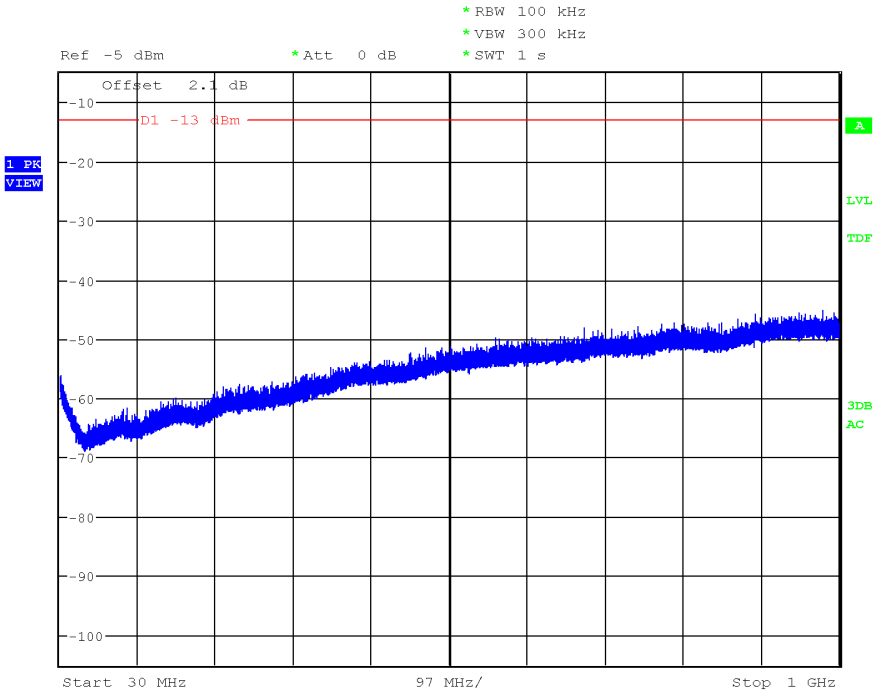
799-805 MHz band.

CHANNEL: LOWEST.



Note: The carrier has been attenuated using a notch filter.

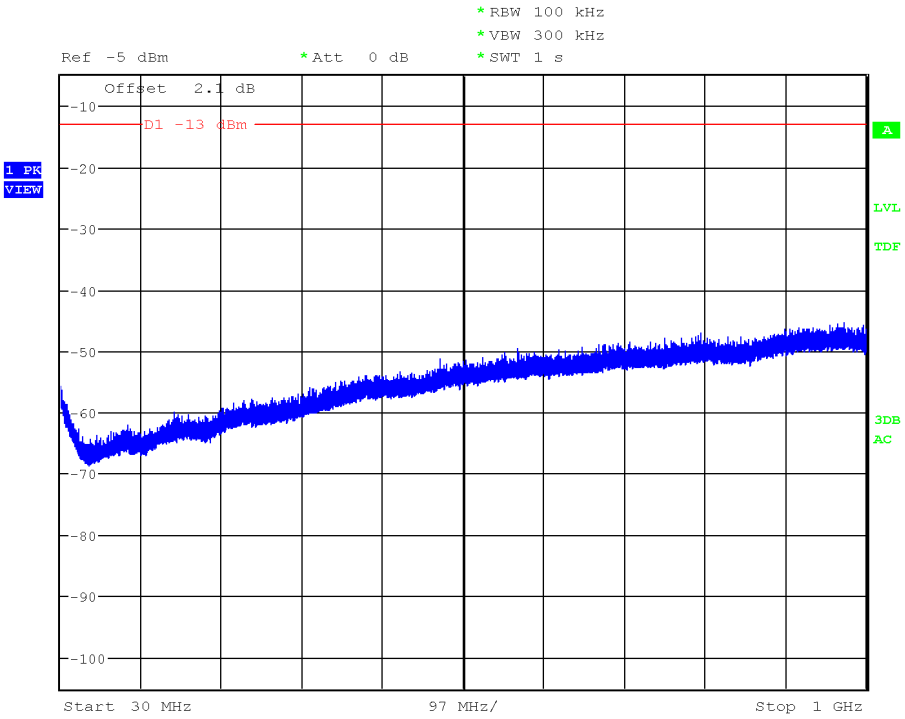
CHANNEL: HIGHEST.



Note: The carrier has been attenuated using a notch filter.

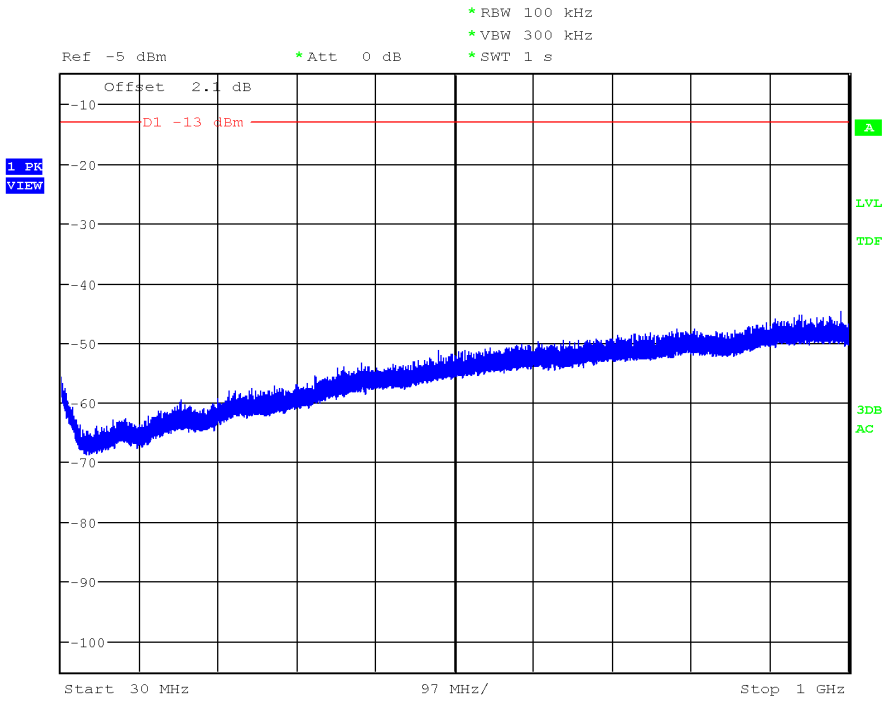
809-824 MHz band.

CHANNEL: LOWEST.



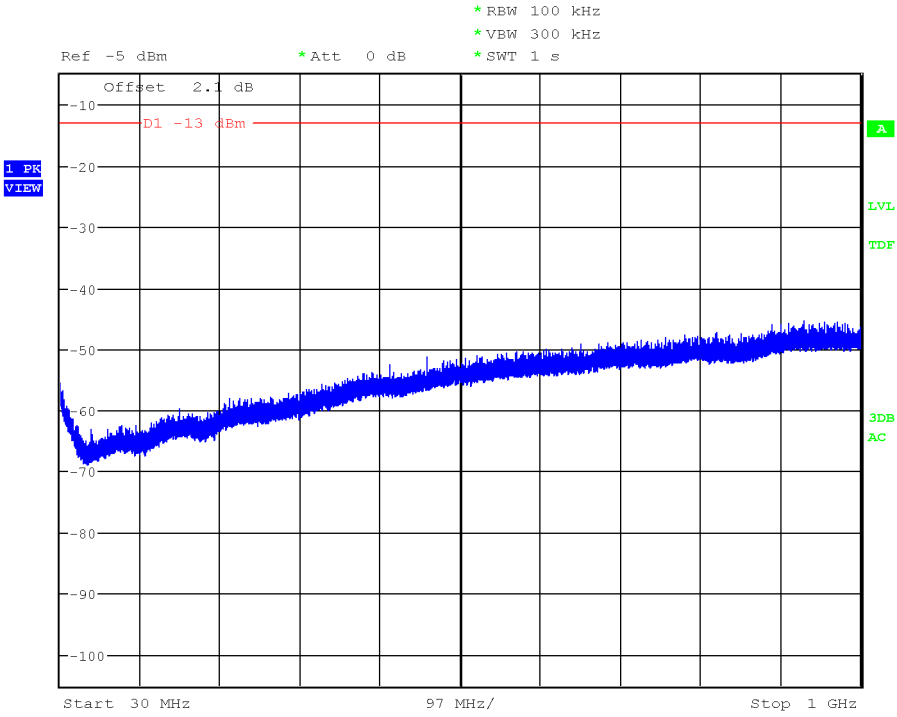
Note: The carrier has been attenuated using a notch filter.

CHANNEL: MIDDLE.



Note: The carrier has been attenuated using a notch filter.

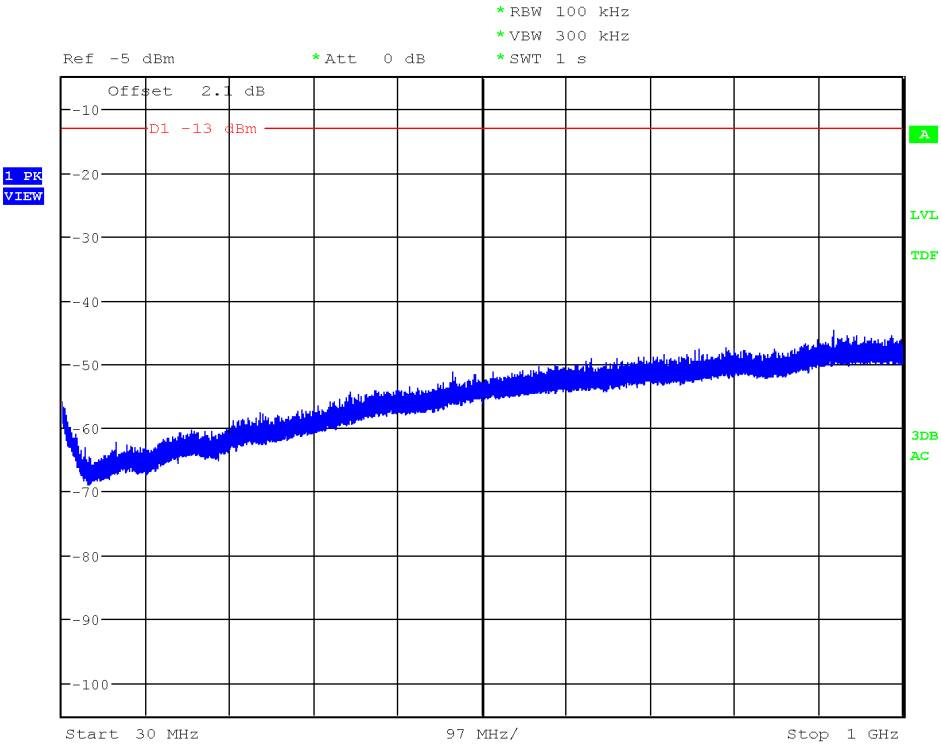
CHANNEL: HIGHEST.



Note: The carrier has been attenuated using a notch filter.

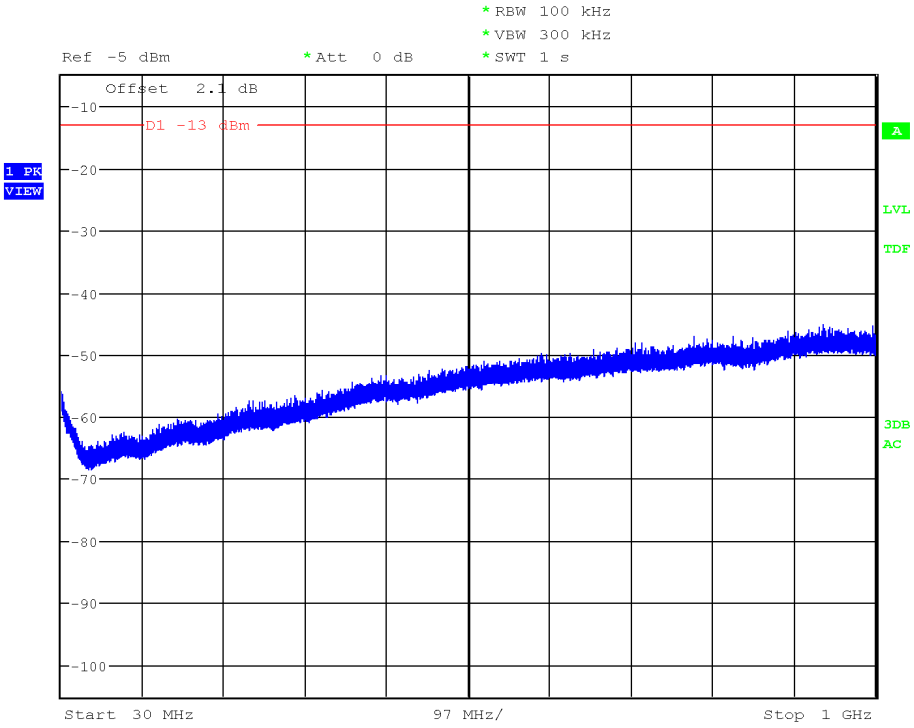
854-869 MHz band.

CHANNEL: LOWEST.



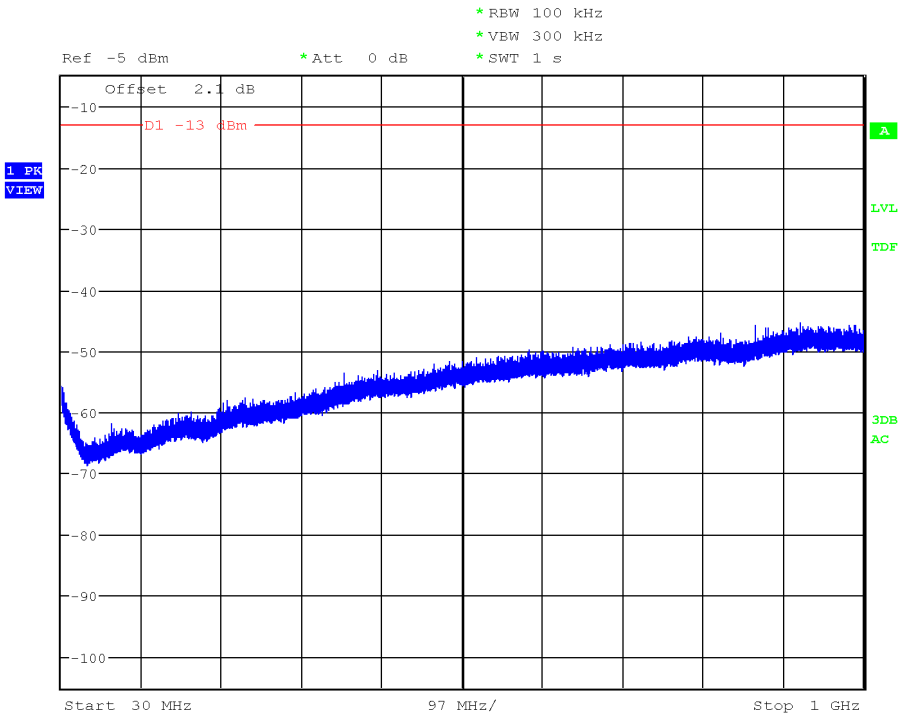
Note: The carrier has been attenuated using a notch filter.

CHANNEL: MIDDLE.



Note: The carrier has been attenuated using a notch filter.

CHANNEL: HIGHEST.

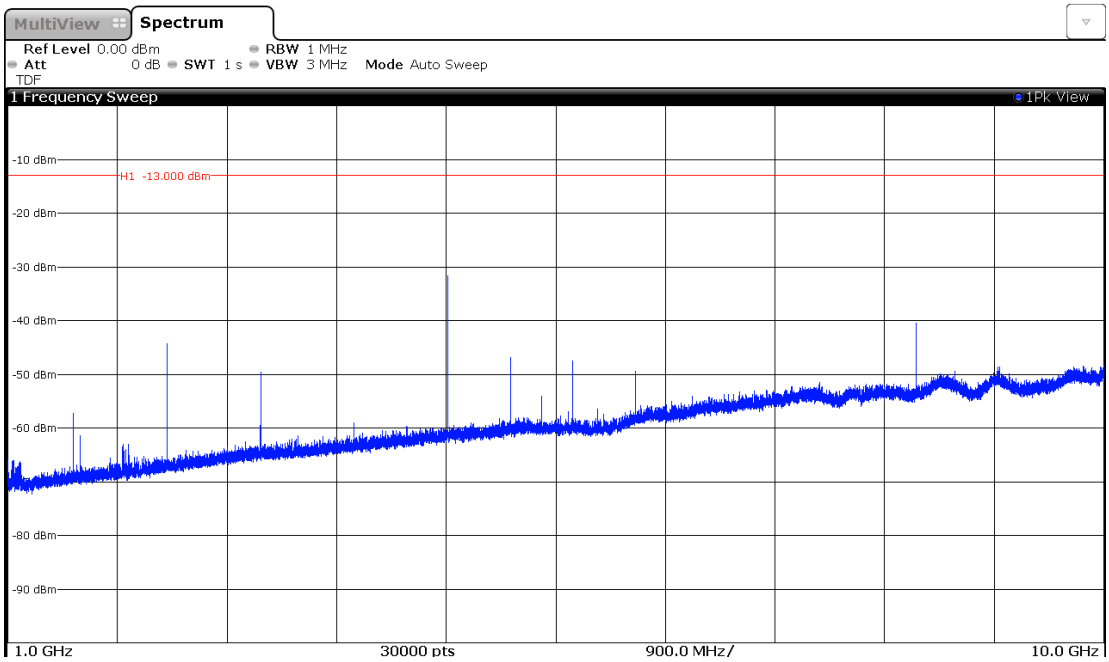


Note: The carrier has been attenuated using a notch filter.

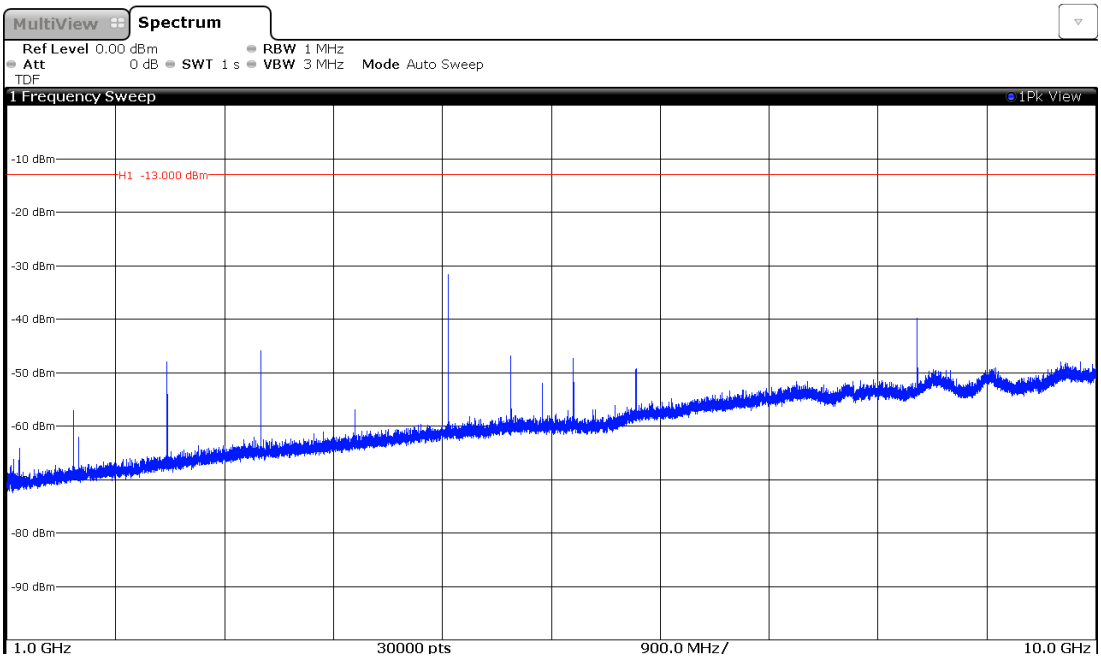
FREQUENCY RANGE 1 GHz to 10 GHz.

769-775 MHz band.

CHANNEL: LOWEST.

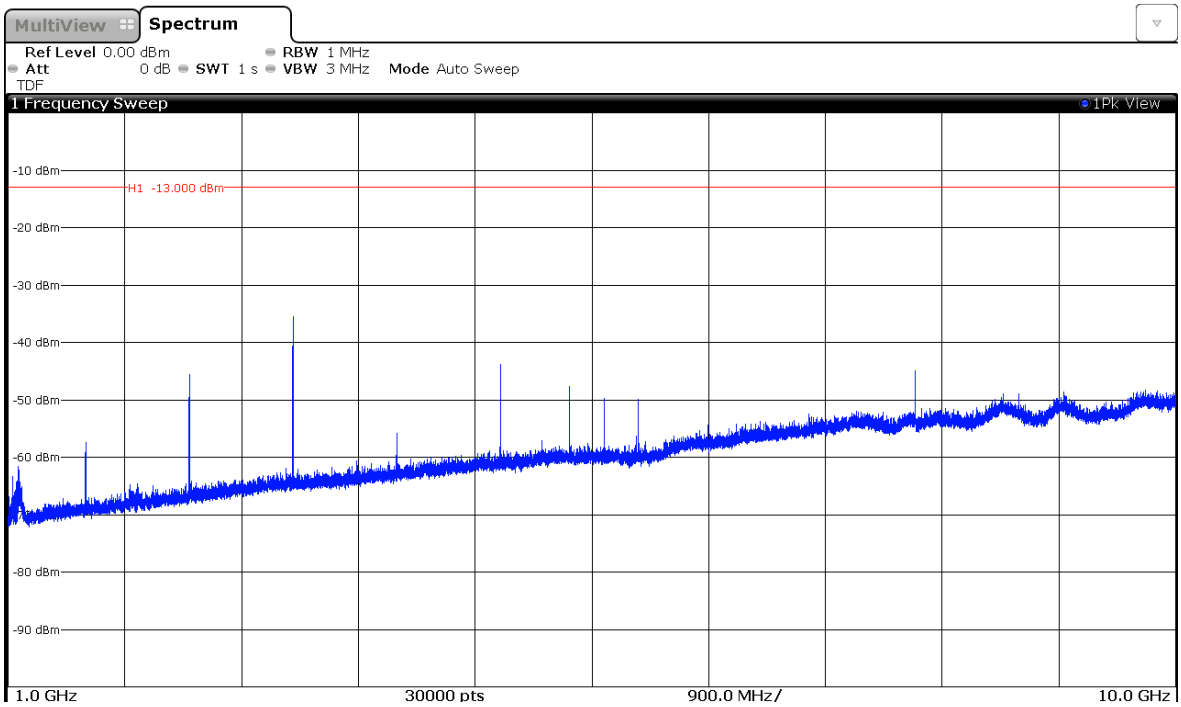


CHANNEL: HIGHEST.

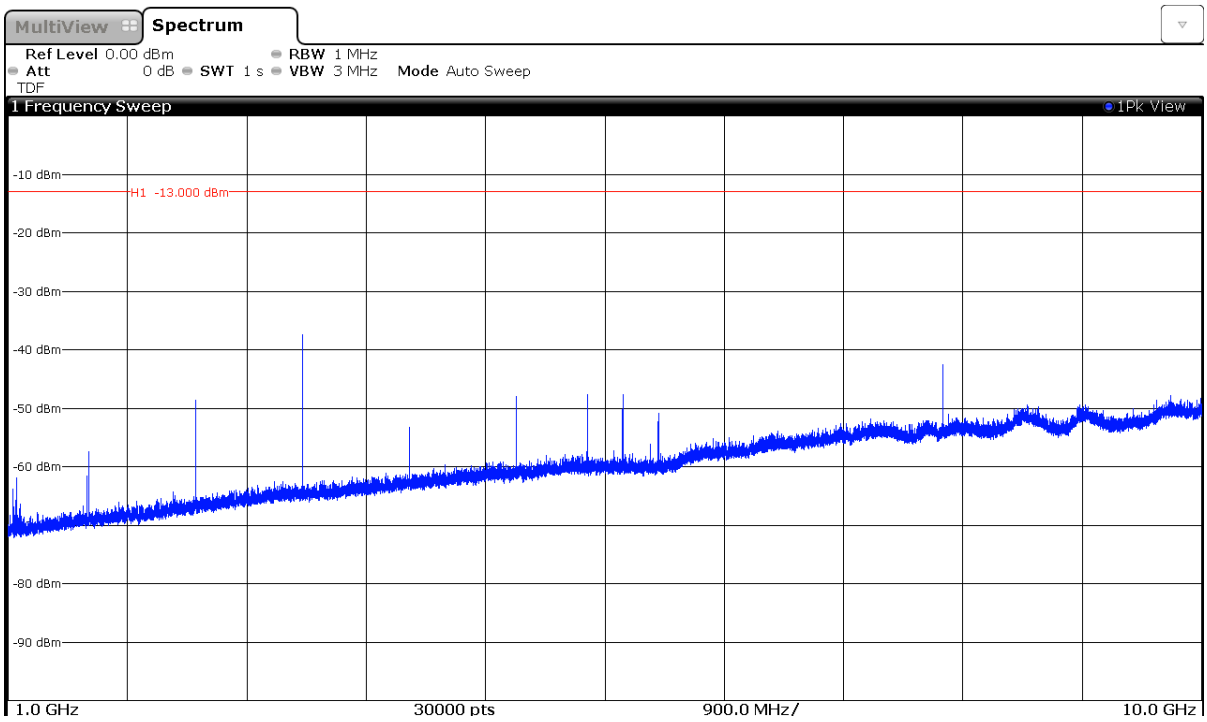


799-805 MHz band.

CHANNEL: LOWEST.

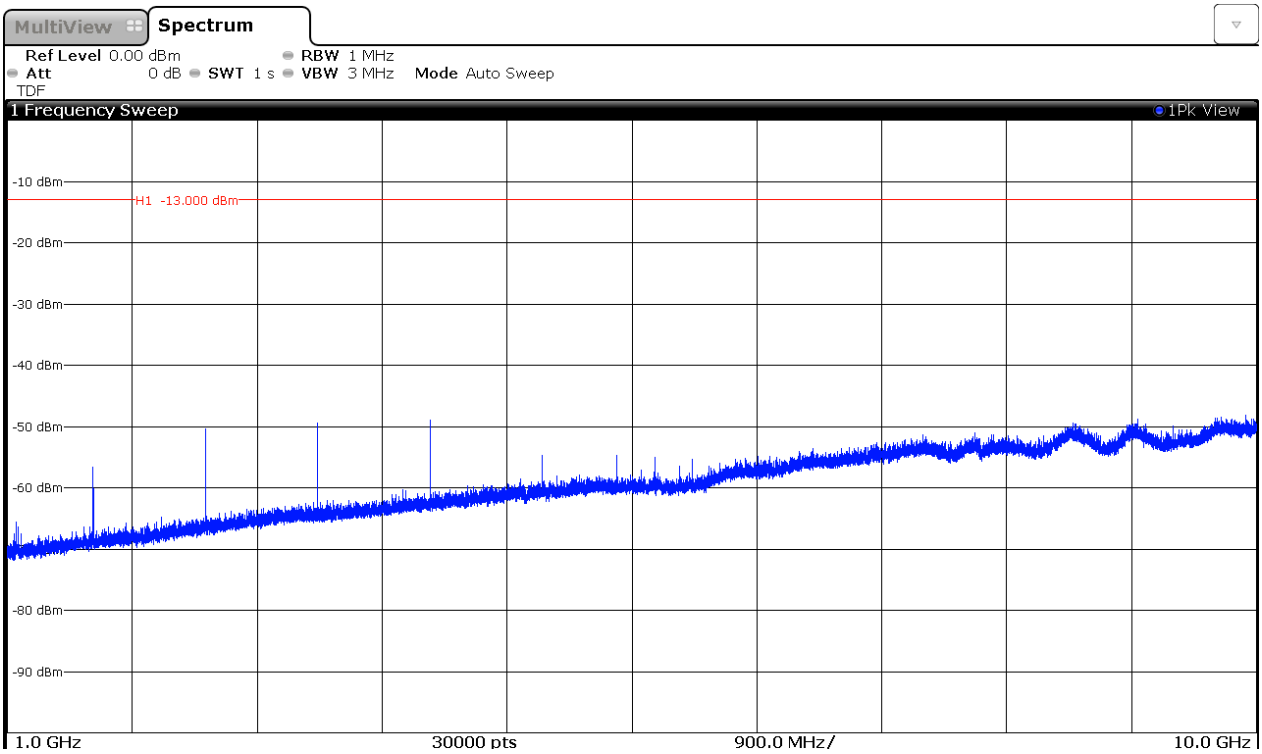


CHANNEL: HIGHEST.

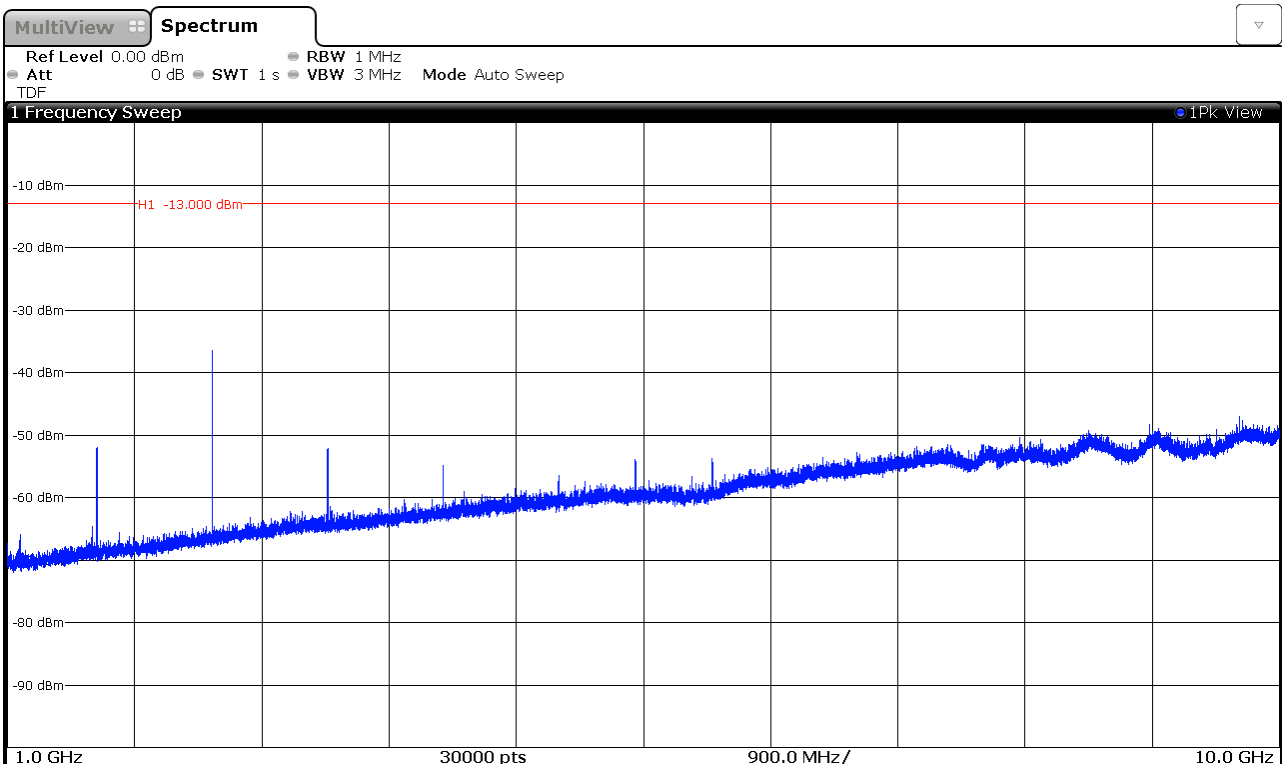


809-824 MHz band.

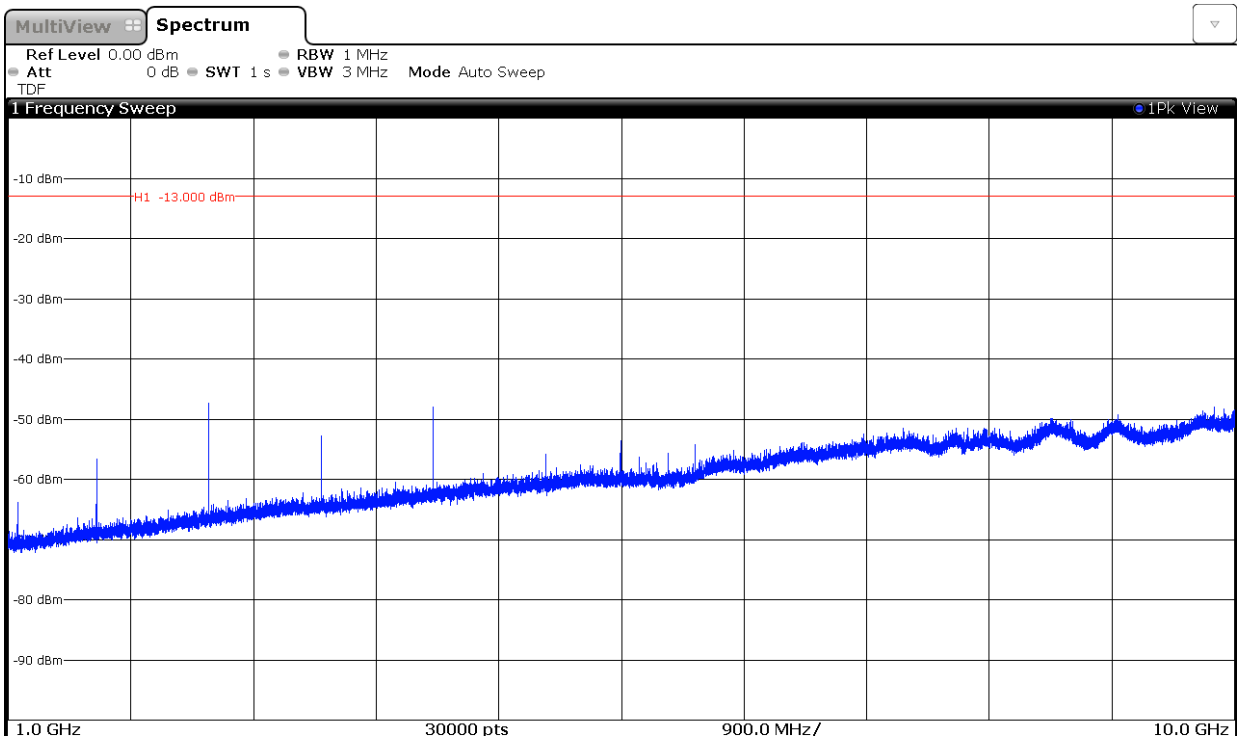
CHANNEL: LOWEST.



CHANNEL: MIDDLE.

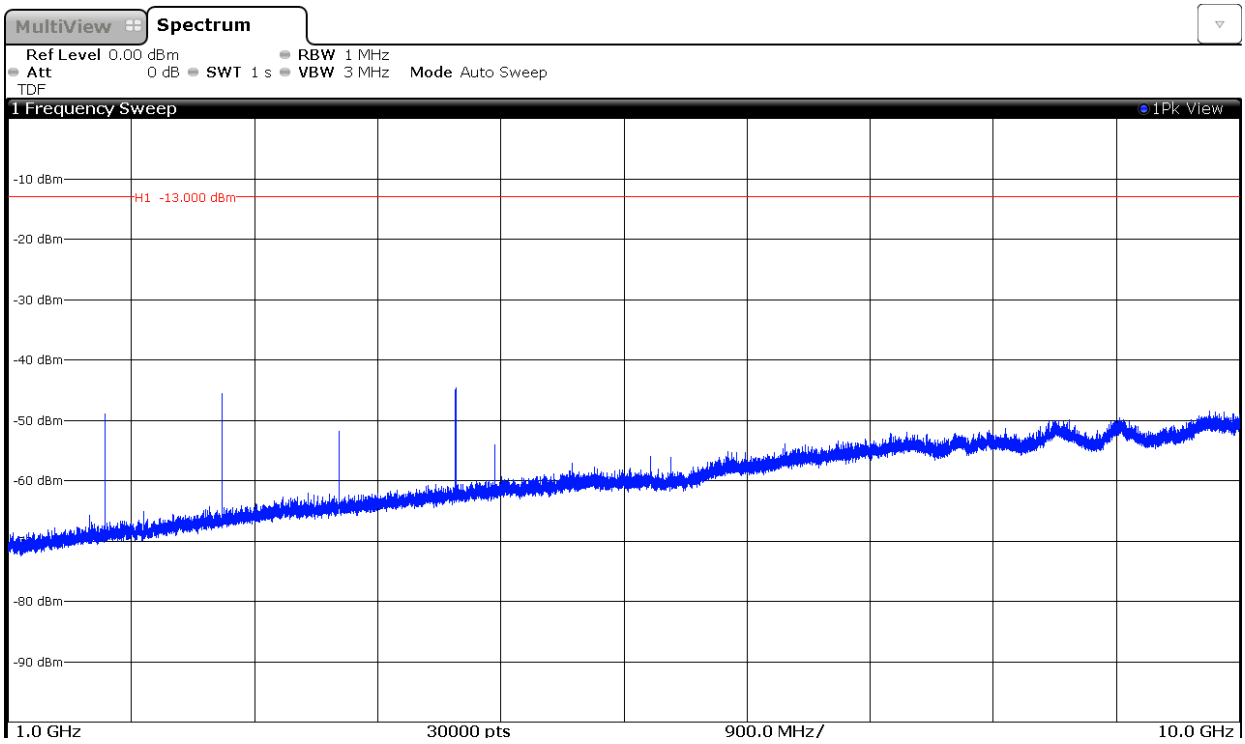


CHANNEL: HIGHEST.

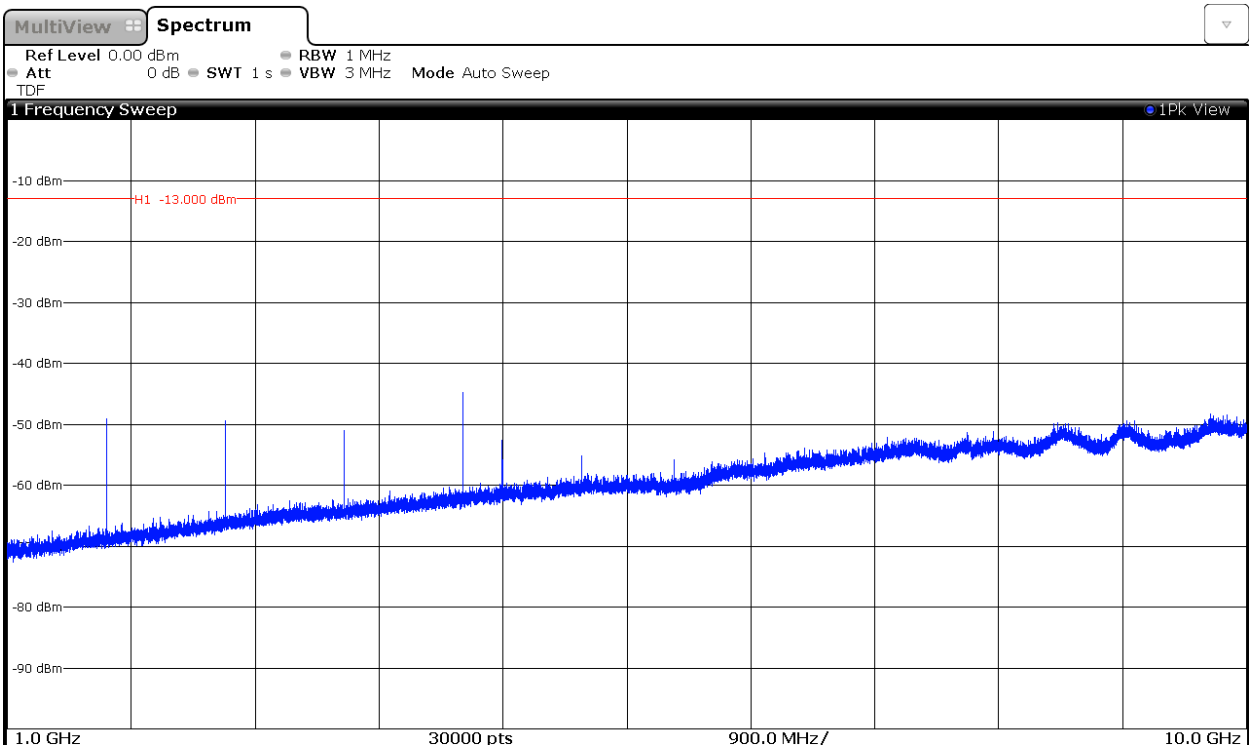


854-869 MHz band.

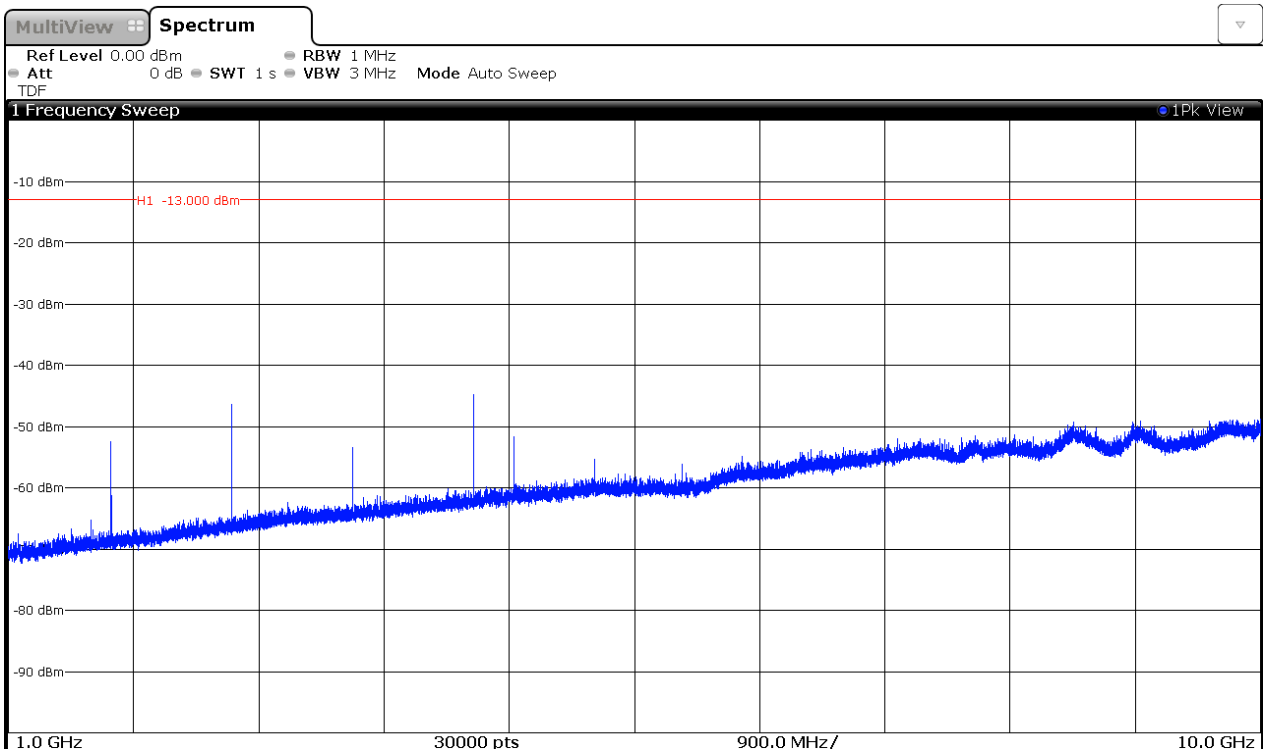
CHANNEL: LOWEST.



CHANNEL: MIDDLE.



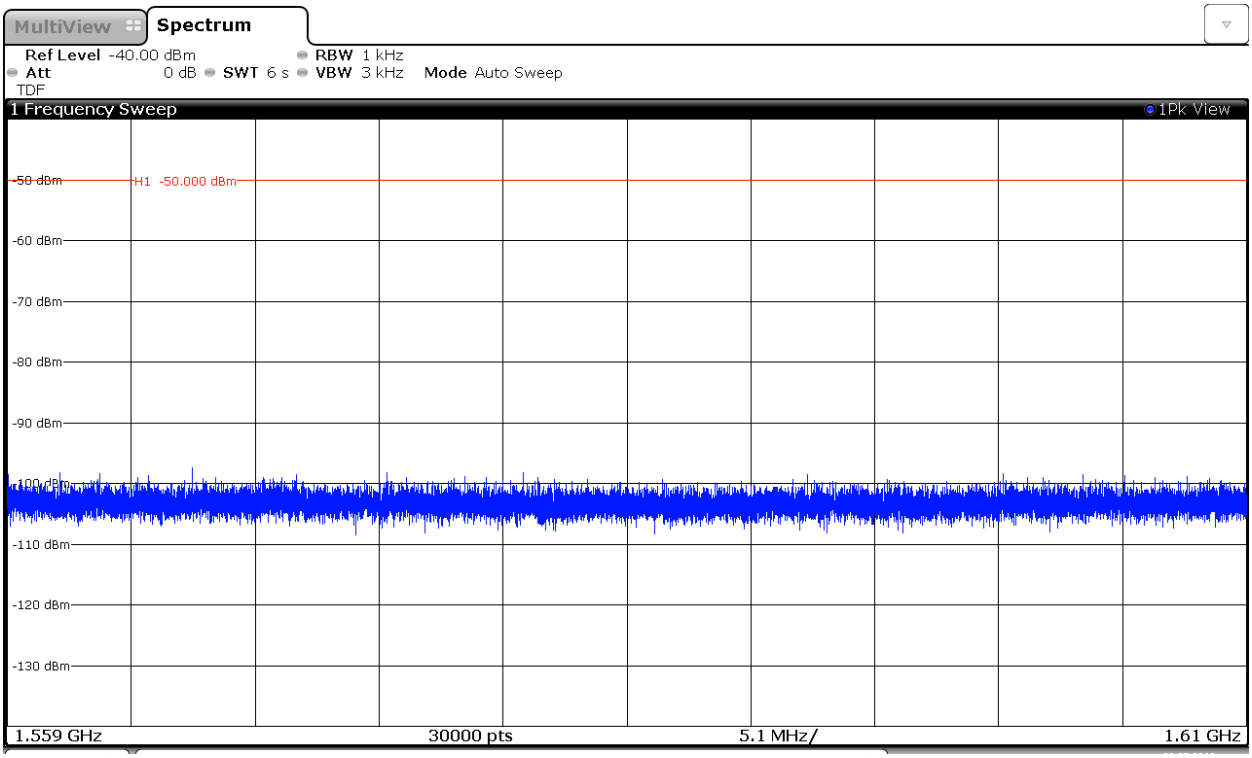
CHANNEL: HIGHEST.

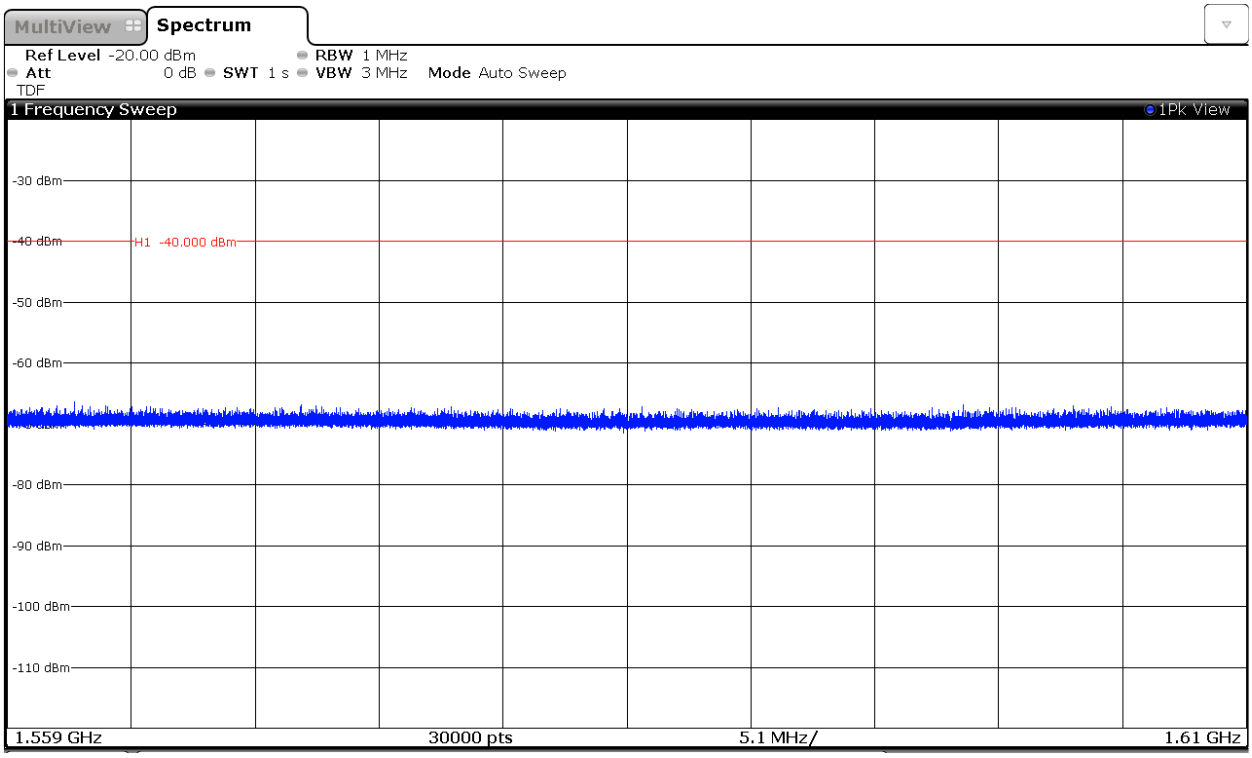


FREQUENCY RANGE 1559 MHz to 1610 MHz.

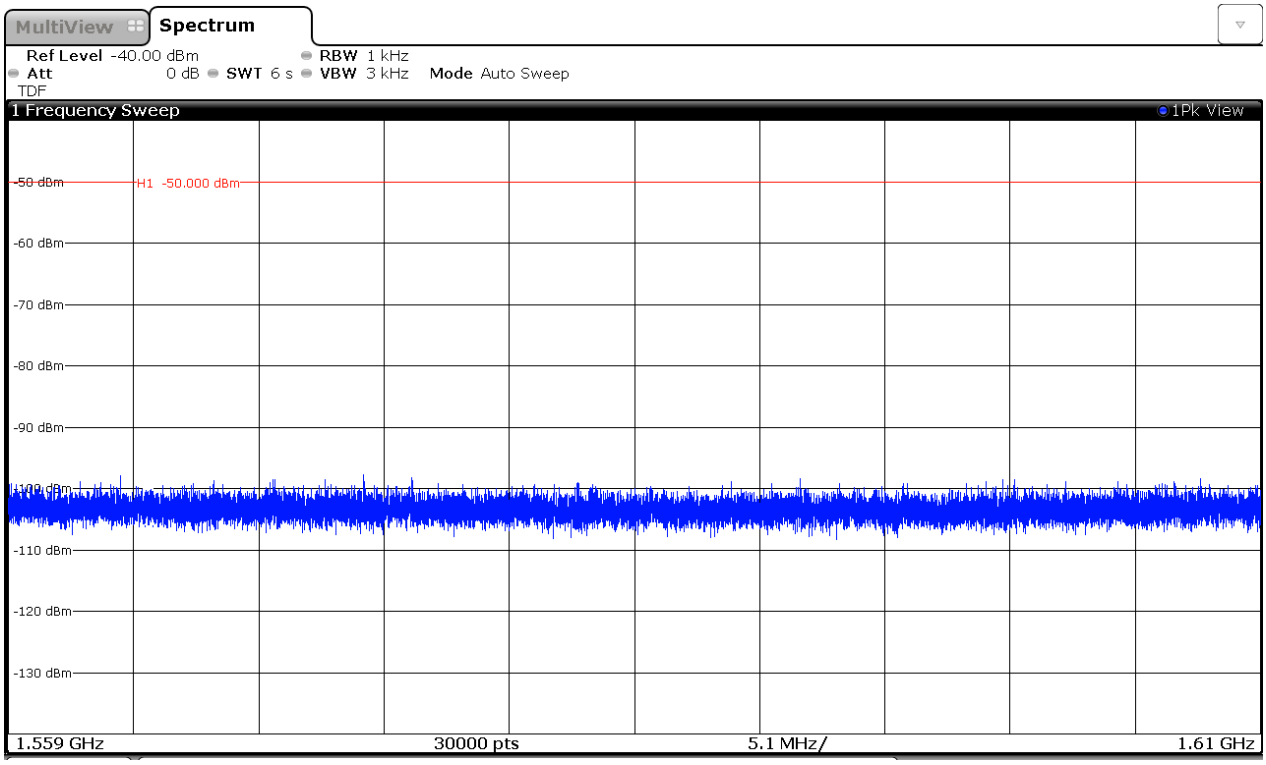
769-775 MHz band.

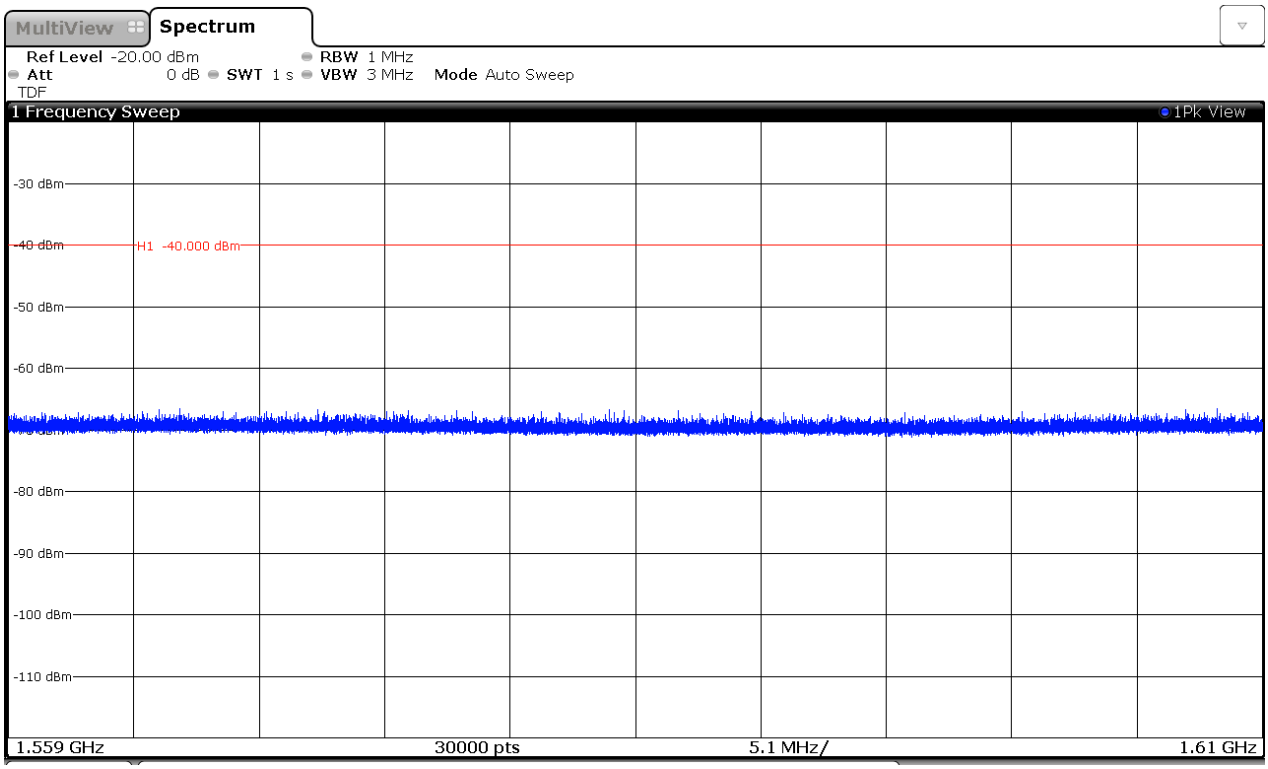
CHANNEL: LOWEST.





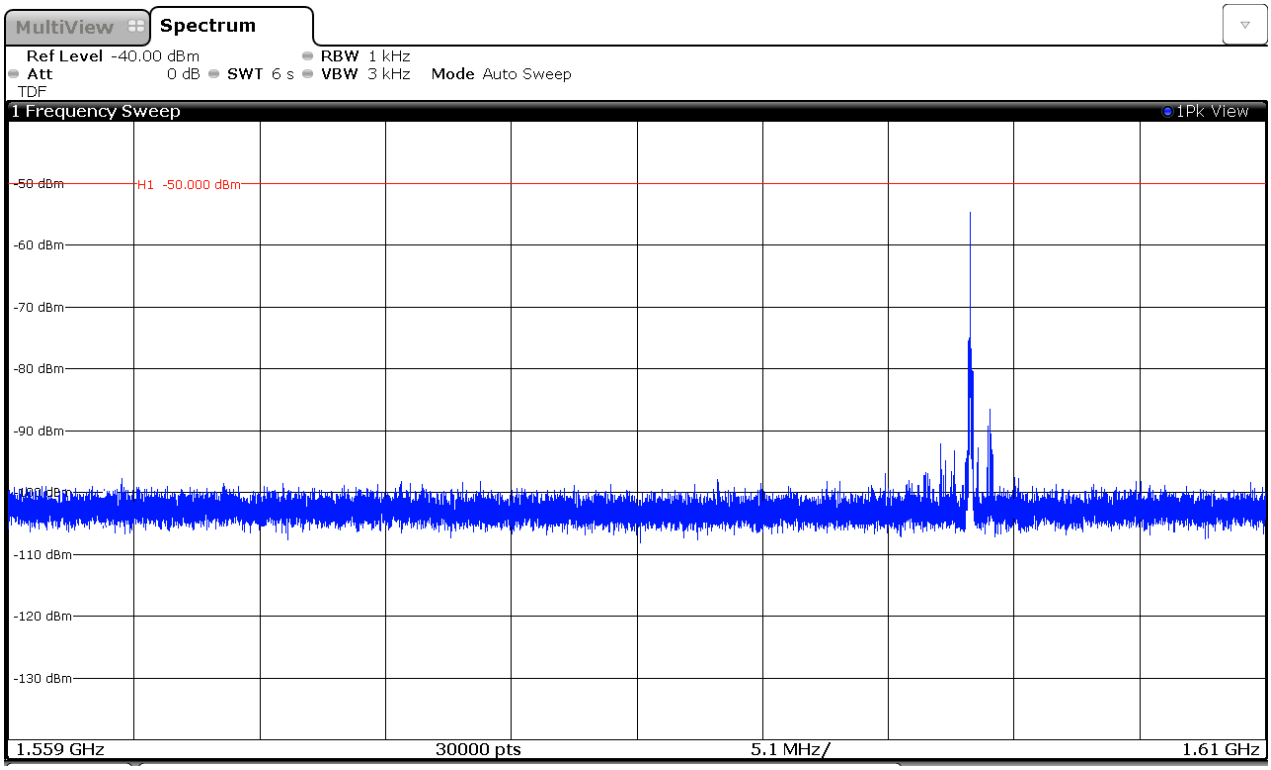
CHANNEL: HIGHEST.

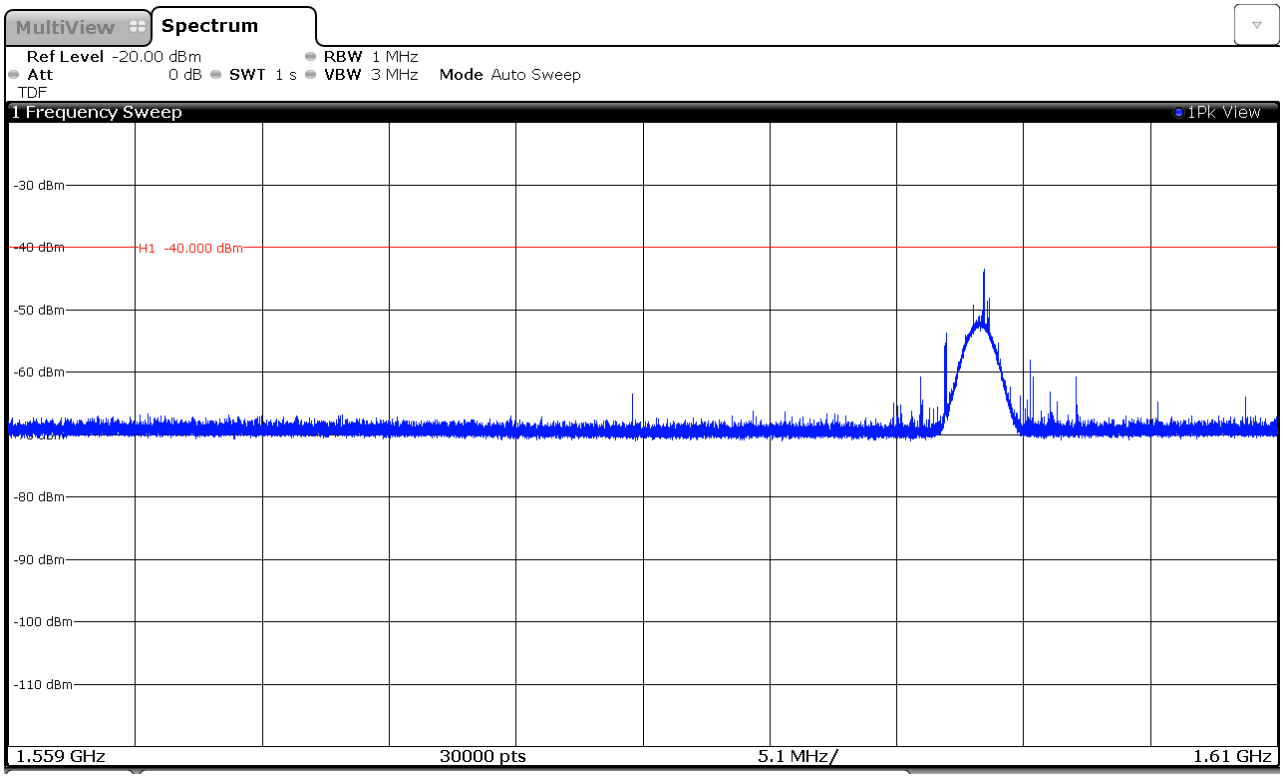
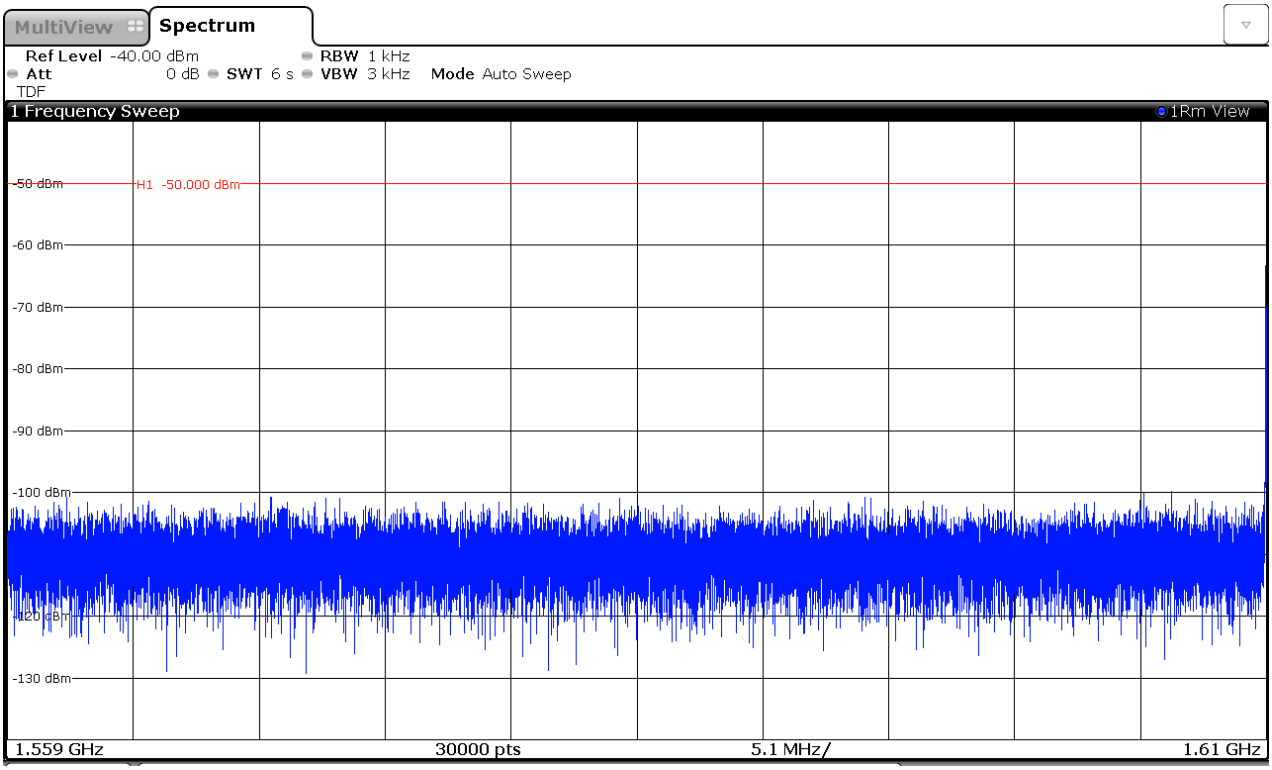
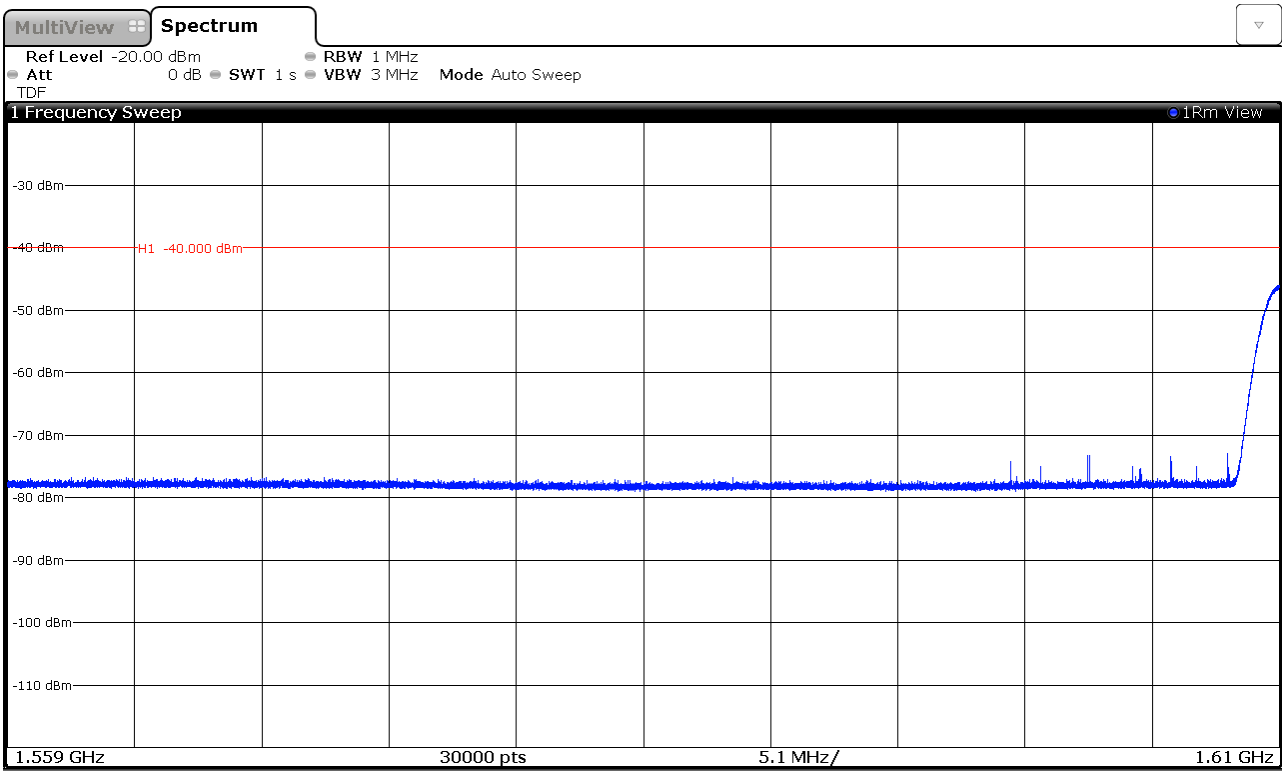




799-805 MHz band.

CHANNEL: LOWEST.





CHANNEL: HIGHEST.