DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

ENAC ENSAYOS Nº 51/LE147

FCC LISTED, REGISTRATION NUMBER: 720267

Test report No:

NIE: 53101RRF.002

Test report
REFERENCE STANDARD: USA FCC Part 90

Identificación del objeto ensayado.....: Identification of item tested	Digital Handheld Terminal
Marca .....: Trade	PowerTrunk
Modelo y/o referencia tipo .....: Model and /or type reference	HTT-500-2
Other identification of the product .....:	FCC ID: WT7PTHTT500760D
HW version .....:	B model
SW version .....:	173402509091
Características .....: Features	---
Solicitante.....: Applicant	TELTRONIC, S.A.U. Polígono Malpica, Calle C/F-Oeste (50016). Zaragoza (SPAIN).
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 90 10-01-16 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: 2017.04.25 10:23:06 +02'00'
Fecha de realización .....: Date of issue	2017-04-20
Formato de informe No. .....: Report template No	FDT08_19

Index

Competences and guarantees....3
General conditions....3
Uncertainty....3
Usage of samples....4
Test sample description....6
Identification of the client....6
Testing period....6
Environmental conditions....6
Remarks and comments....7
Testing verdicts....8
Appendix A – Test results....9

Competences and guarantees

DEKRA Testing and Certification 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.

DEKRA Testing and Certification 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, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification 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 DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification 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 DEKRA Testing and Certification.

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 DEKRA Testing and Certification.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification 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
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/027	Antenna λ/4	300-00498	---	2017-03-09
52844B/022	Remote speaker microphone	300-00733	---	2017-03-09
52844B/032	Earpiece	300-00564	---	2017-03-09

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

   All radiated tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/026	Antenna λ/2	300-01938	---	2017-03-09
52844B/022	Remote speaker microphone	300-00733	---	2017-03-09
52844B/032	Earpiece	300-00564	---	2017-03-09

1. Sample S/02 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/03 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/026	Antenna λ/2	300-01938	---	2017-03-09
52844B/033	RAC 2 Wire kit acoustic tube earhanger	300-01628	---	2017-03-09

1. Sample S/03 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/04 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/026	Antenna λ/2	300-01938	---	2017-03-09
52844B/033	RAC 2 Wire kit acoustic tube earhanger	300-01628	---	2017-03-09

1. Sample S/04 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/05 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/027	Antenna λ/4	300-00498	---	2017-03-09
52844B/029	Remote control unit	300-00301	---	2017-03-09
52844B/030	Covert inductive loop	300-00929	---	2017-03-09
52844B/031	Covert RAC lead	300-00735	---	2017-03-09

1. Sample S/05 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/06 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/026	Antenna λ/2	300-01938	---	2017-03-09
52844B/029	Remote control unit	300-00301	---	2017-03-09
52844B/030	Covert inductive loop	300-00929	---	2017-03-09
52844B/031	Covert RAC lead	300-00735	---	2017-03-09

1. Sample S/06 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/07 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/014	Portable terminal	HTT-500-2	1PR001636GKC7BQ (NYPB-12)	2017-03-09
51697/008	Dummy battery with power supply cable	300-00742	---	2016-11-22

1. Sample S/02 has undergone the test(s).

   All conducted tests indicated in appendix A.

Test sample description

The test sample consists of a Digital handheld terminal for TETRA, TI D-LMR and P25 with external antenna, keypad and display. It can also include a Bluetooth module and a GPS receiver inside.

Identification of the client

TELTRONIC, S.A.U.

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

Testing period

The performed test started on 2017-03-13 and finished on 2017-04-10.

The tests have been performed at DEKRA Testing and Certification.

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 R&S CMTA 84	2015/07	2018/07
5.	Power sensor R&S NRP-Z91	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	2016/11	2019/11
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 20 MHz-7 GHz A. H. SYSTEMS PAM-0207	2016/09	2017/09
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”.

Appendix A – Test results

INDEX

TEST CONDITIONS 11

Modulation Characteristics 15

Occupied Bandwidth 19

RF Output Power 34

Emission Mask 36

Adjacent channel power 42

Frequency Stability 83

Spurious emissions at antenna terminals 86

Radiated emissions 115

TEST CONDITIONS

Power supply (V):

V_{nom} = 7.4 Vdc

V_{max} = 8.4 Vdc

V_{min} = 6.29 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 rechargeable battery

Type of antenna = external connectable antenna

Rated RF Output Power:

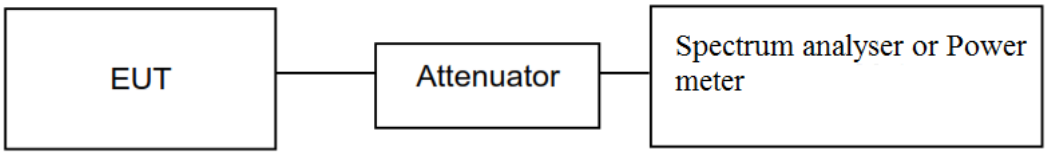
- Mode P25 C4FM (8.1 kHz bandwidth): 35 dBm (3.16 W)
- Mode TETRA (22 kHz bandwidth): 32.5 dBm (1.78 W)
- Mode TI D-LMR (20 kHz bandwidth): 32.5 dBm (1.78 W)

TEST FREQUENCIES:

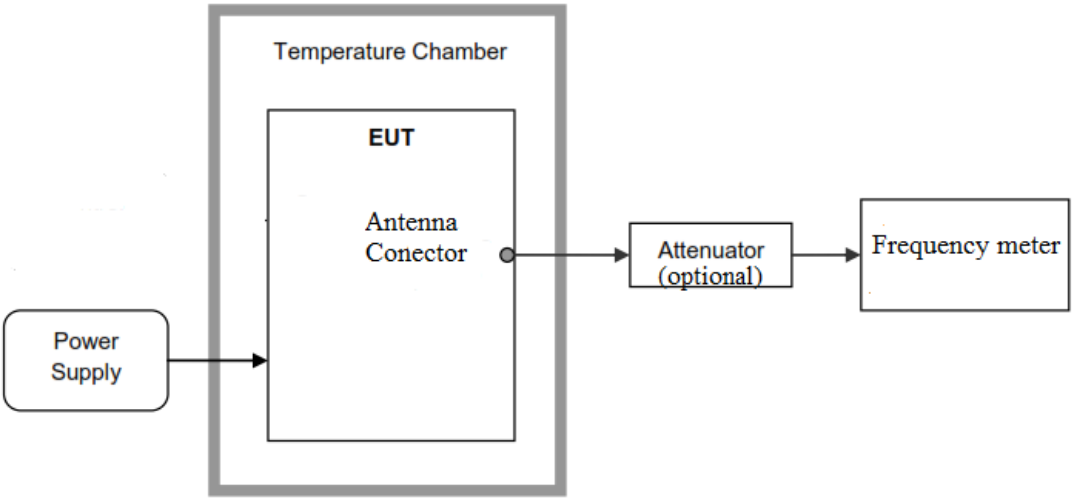
	769-775 MHz band	**799-805 MHz band**	**809-824 MHz band**	**854-869 MHz band**
Lowest channel	769.0125 MHz	799.0125 MHz	809.0125 MHz	854.0125 MHz
Middle channel	772.0125 MHz	802.0125 MHz	816.5 MHz	861.5 MHz
Highest channel	774.9875 MHz	804.9875 MHz	823.9875 MHz	868.9875 MHz

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.

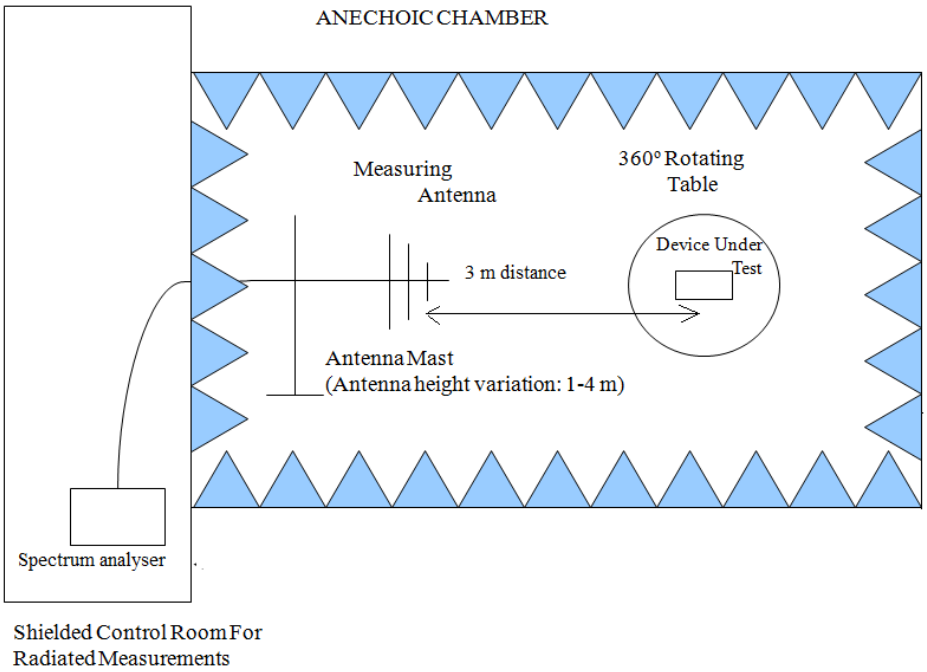
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-10 GHz (1 GHz-18 GHz Double ridge horn antenna).

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

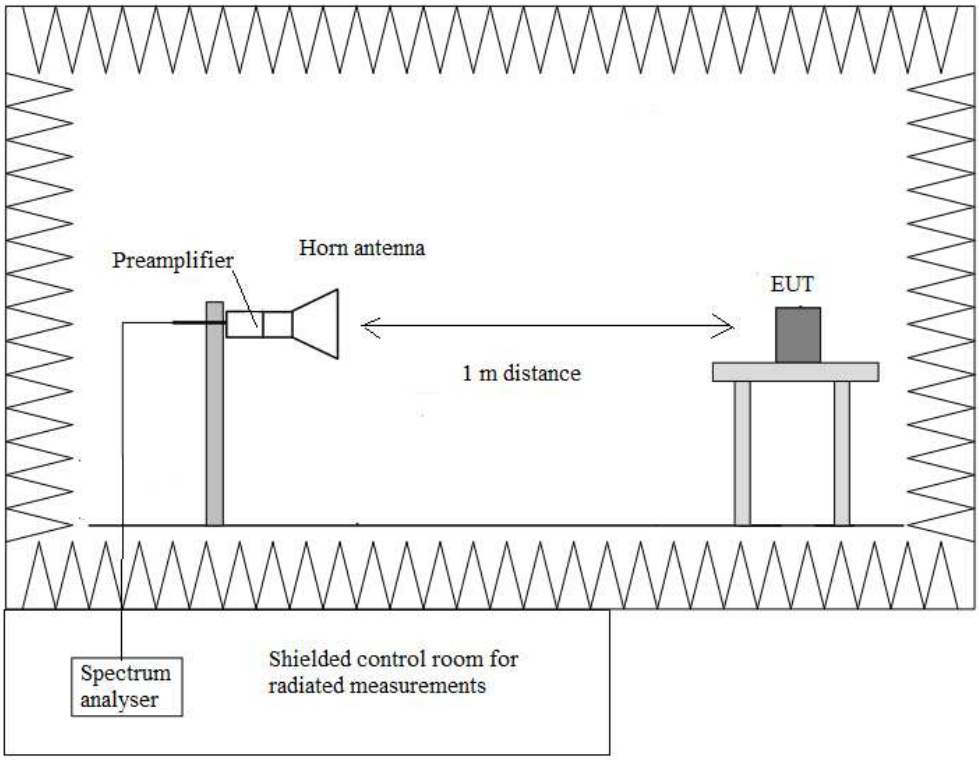
The equipment under test was set up on a non-conductive platform and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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 $1920 \text{ Hz} < |f| < 2880 \text{ Hz}$

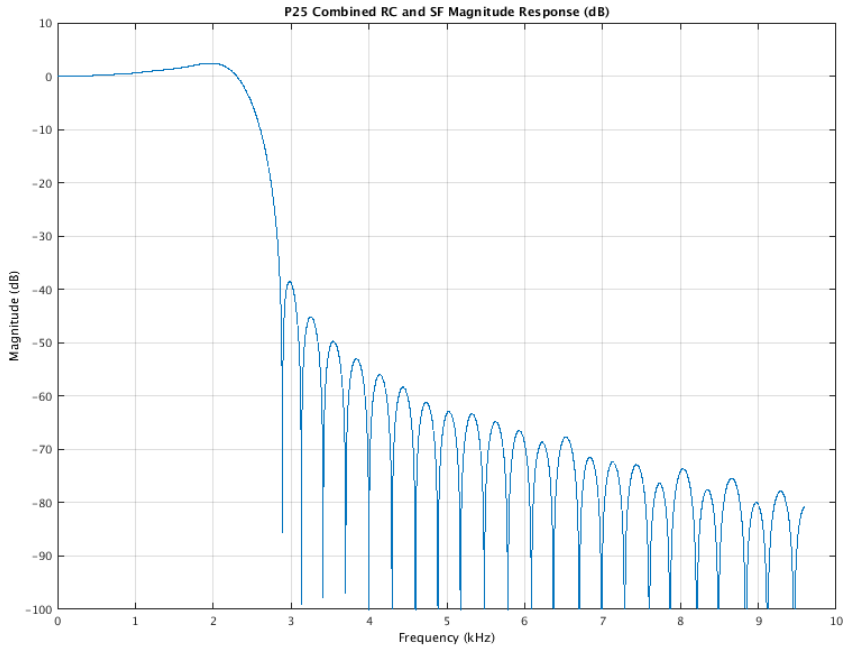
$H(f) = 0$ for $|f| >$ 2880 Hz

The theoretical frequency response of the SF is :

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

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

HTT-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 $|f| \leq (1 - \alpha)/2T$

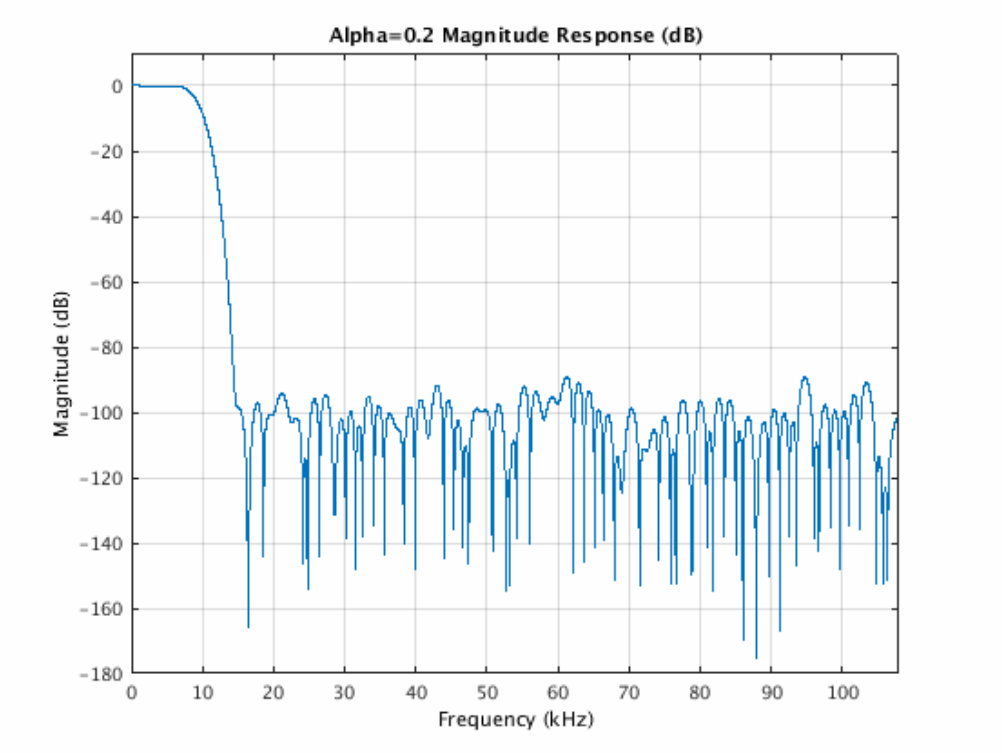
$$G(f) = \sqrt{0.5\left(1 - \sin\left(\frac{\pi(2|f|T-1)}{2\alpha}\right)\right)} \quad \text{for } (1-\alpha)/2T \leq |f| \leq (1+\alpha)/2T$$

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

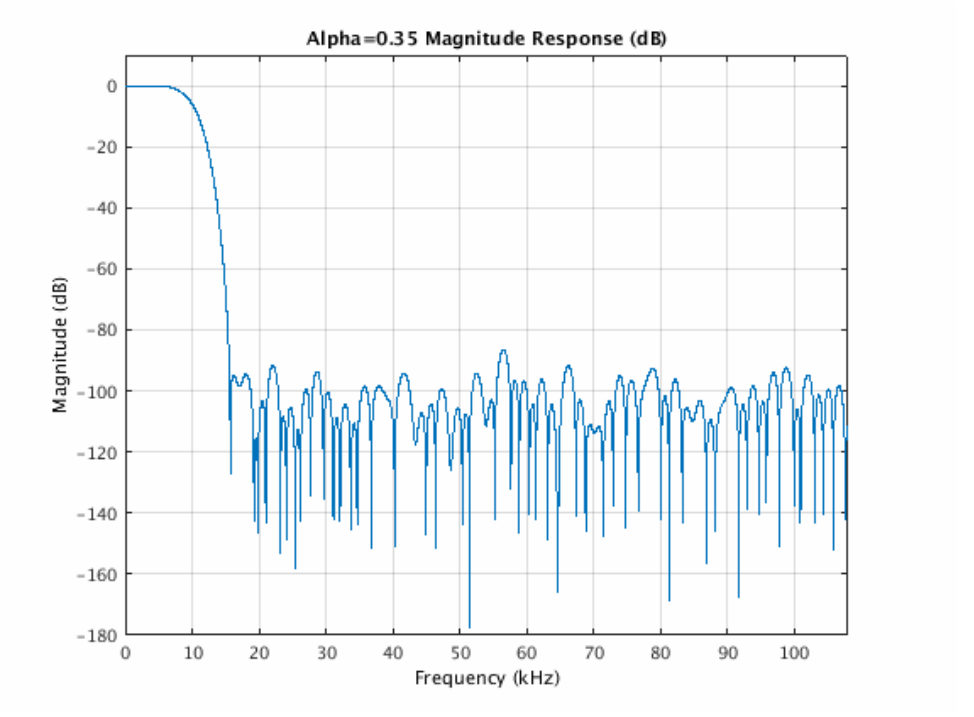
where T is the symbol period, and a is the roll-off factor.

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.

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



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



AUDIO LOW PASS FILTER (All modulations):

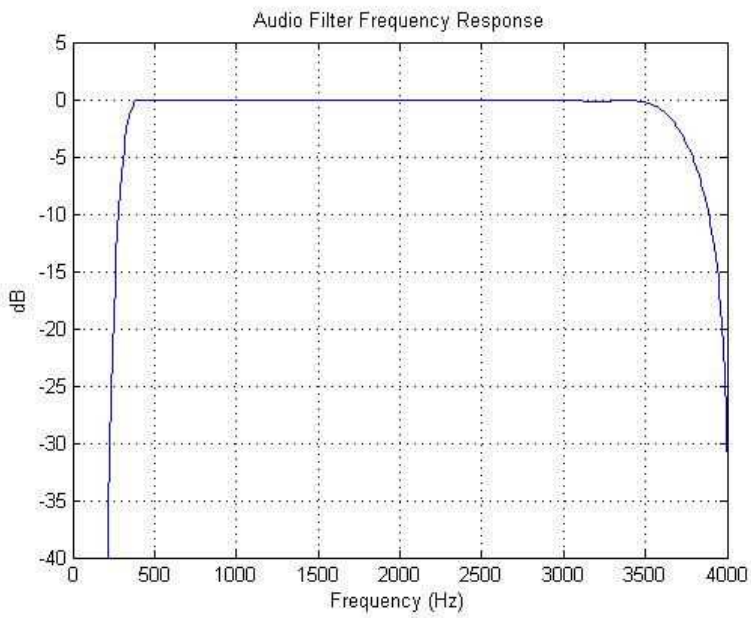
The modulation is limited by the data characteristics and its filters.

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.

HTT-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	8.0458	10.512
Highest	8.0139	10.473
Measurement uncertainty (kHz)	<±0.08	

P25 C4FM 8.1 kHz. 799-805 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	8.0316	10.547
Highest	8.0401	10.459
Measurement uncertainty (kHz)	<±0.08	

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

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.4951	22.434
Highest	19.4942	22.430
Measurement uncertainty (kHz)	<±0.17	

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

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.4974	22.444
Highest	19.4853	22.442
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz.769-775 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.1347	24.151
Highest	21.1195	24.138
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz.799-805 MHz band.

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.1249	24.029
Highest	21.1270	24.132
Measurement uncertainty (kHz)	<±0.17	

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

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.4898	22.487
Middle	19.4888	22.432
Highest	19.5067	22.448
Measurement uncertainty (kHz)	<±0.17	

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

Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	19.5140	22.441
Middle	19.5055	22.383
Highest	19.5161	22.491
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz. 809-824 MHz band.

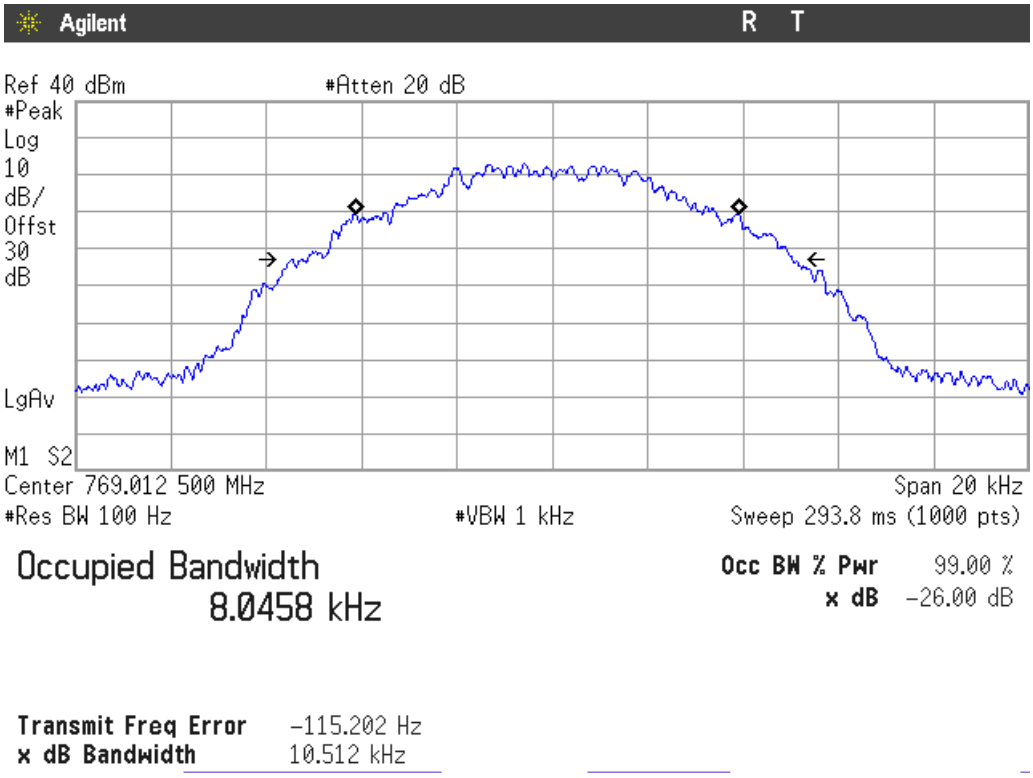
Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.1190	24.158
Middle	21.1951	24.169
Highest	21.1178	24.144
Measurement uncertainty (kHz)	<±0.17	

TETRA 22 kHz. 854-869 MHz band.

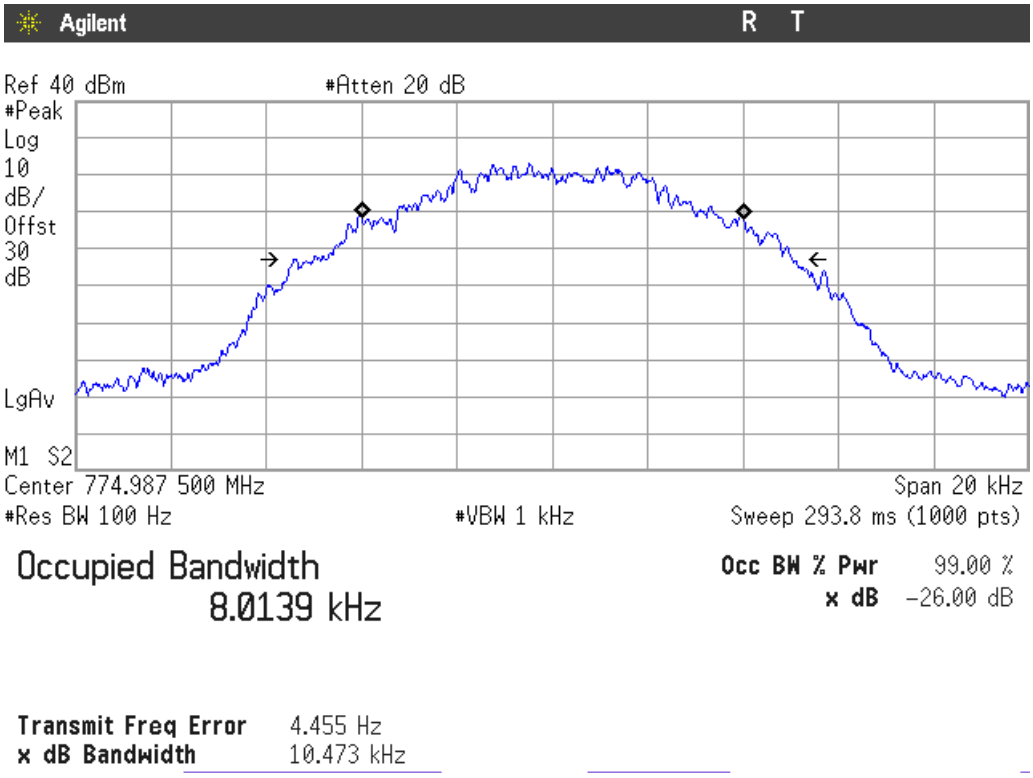
Channel	99% Occupied bandwidth (kHz)	-26 dBc bandwidth (kHz)
Lowest	21.1181	24.041
Middle	21.1145	24.121
Highest	21.1389	24.121
Measurement uncertainty (kHz)	<±0.17	

P25 C4FM 8.1 kHz. 769-775 MHz band.

Lowest Channel

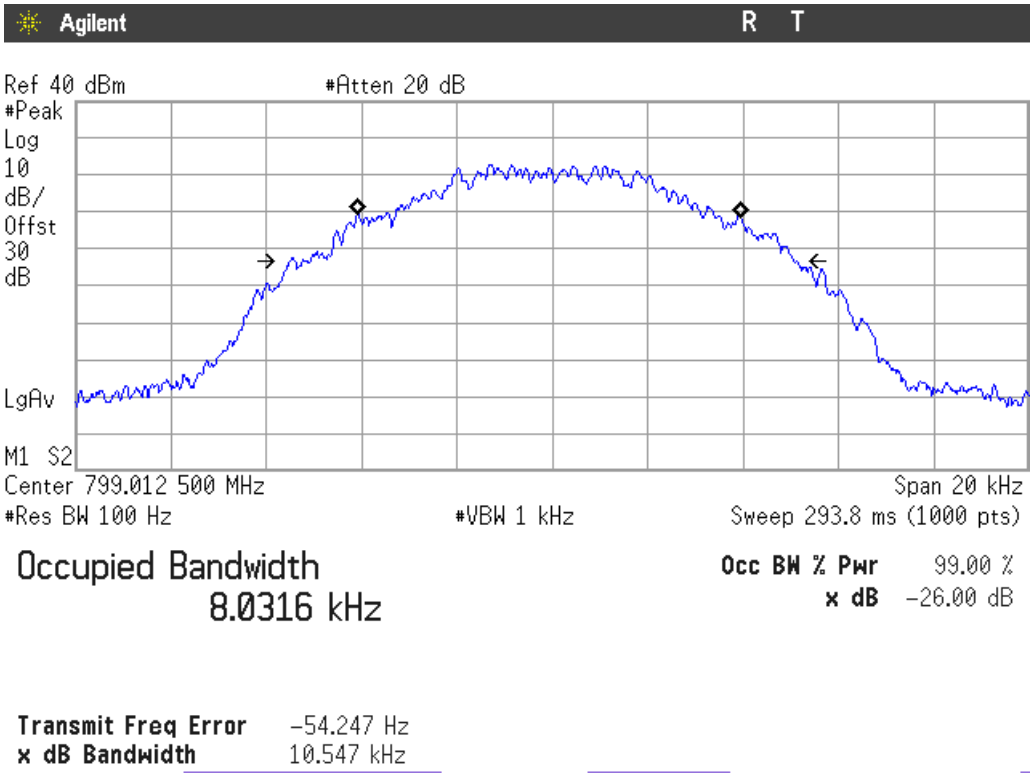


Highest Channel

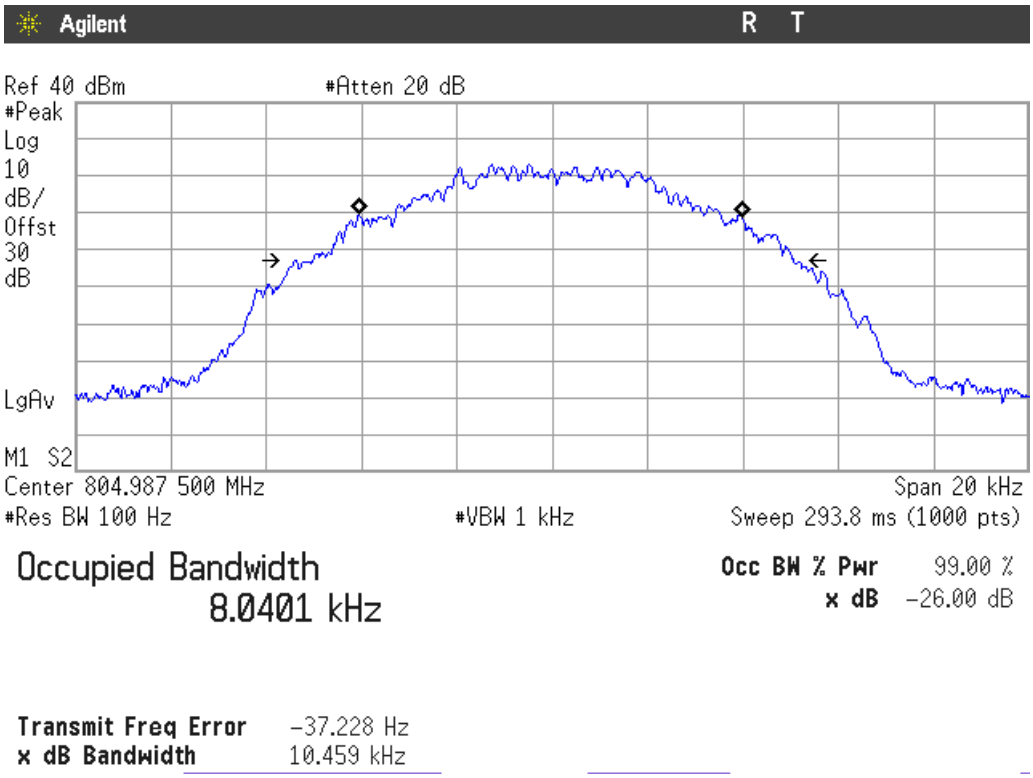


P25 C4FM 8.1 kHz. 799-805 MHz band.

Lowest Channel

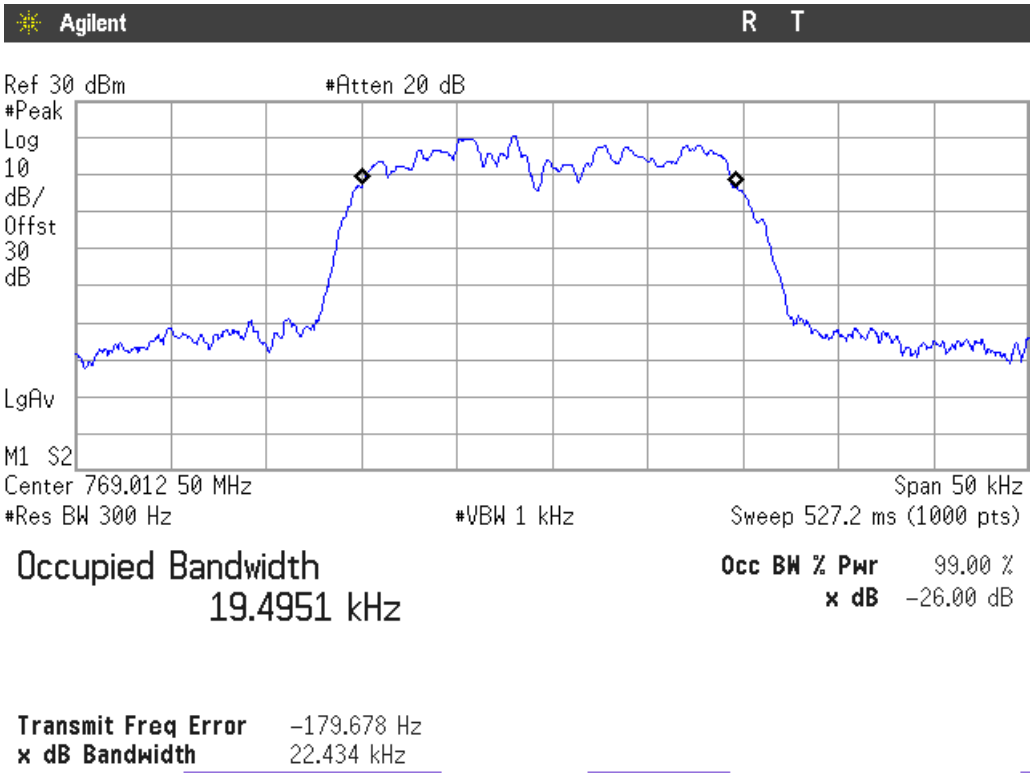


Highest Channel

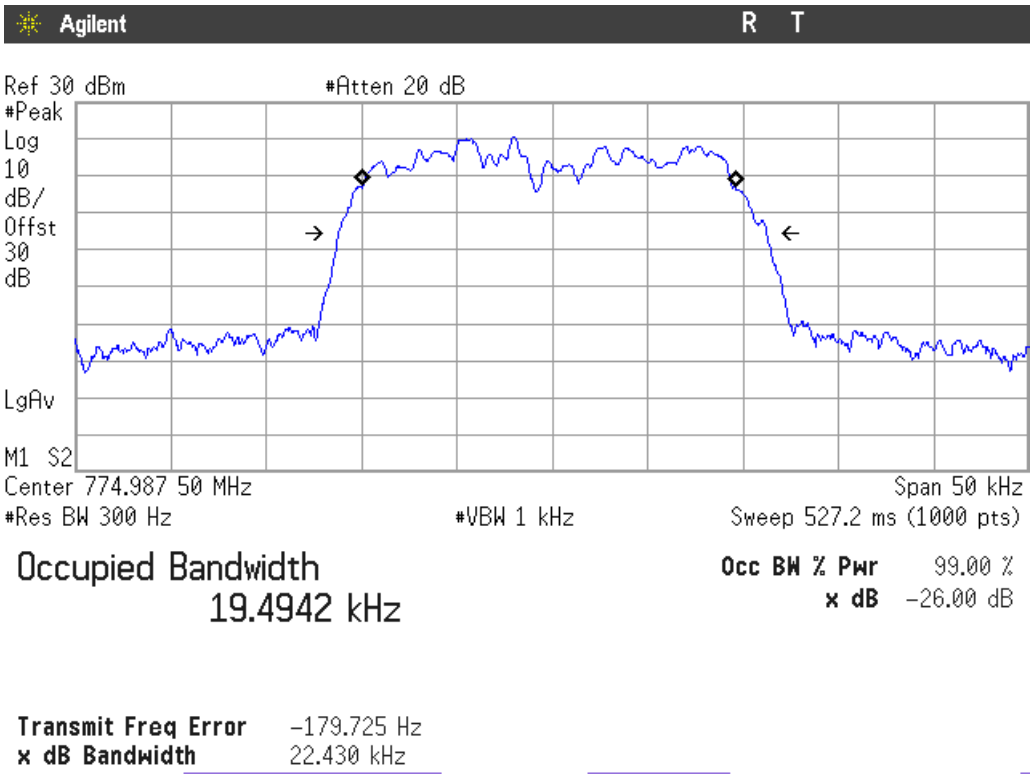


TI D-LMR 20 kHz. 769-775 MHz band.

Lowest Channel

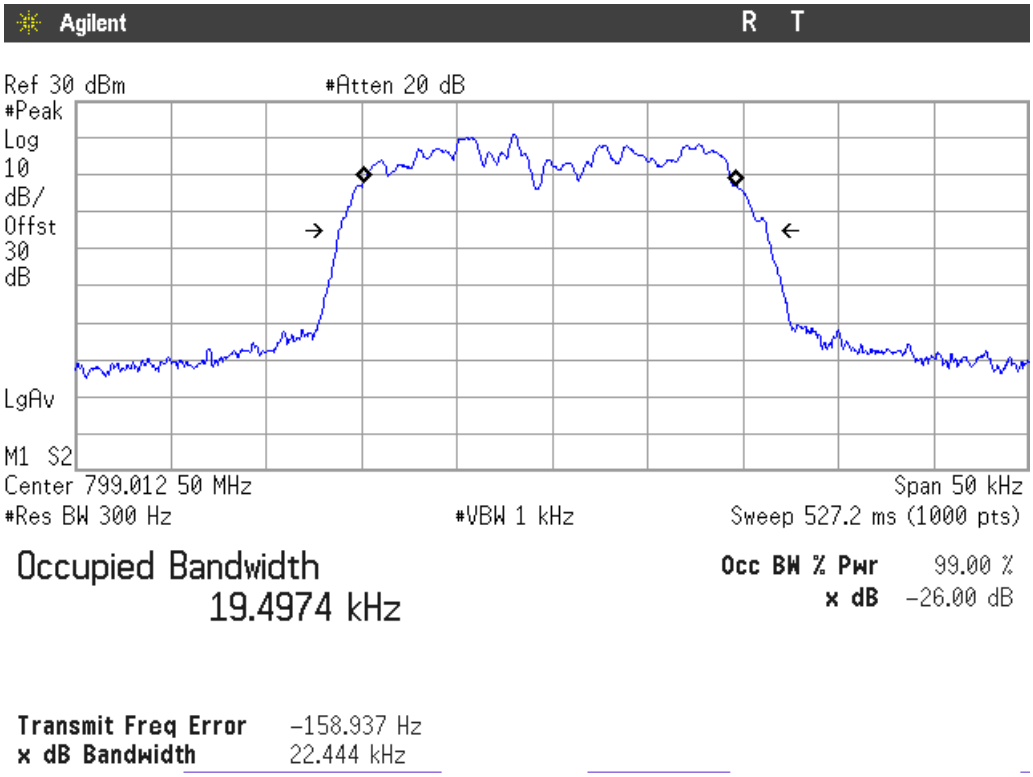


Highest Channel

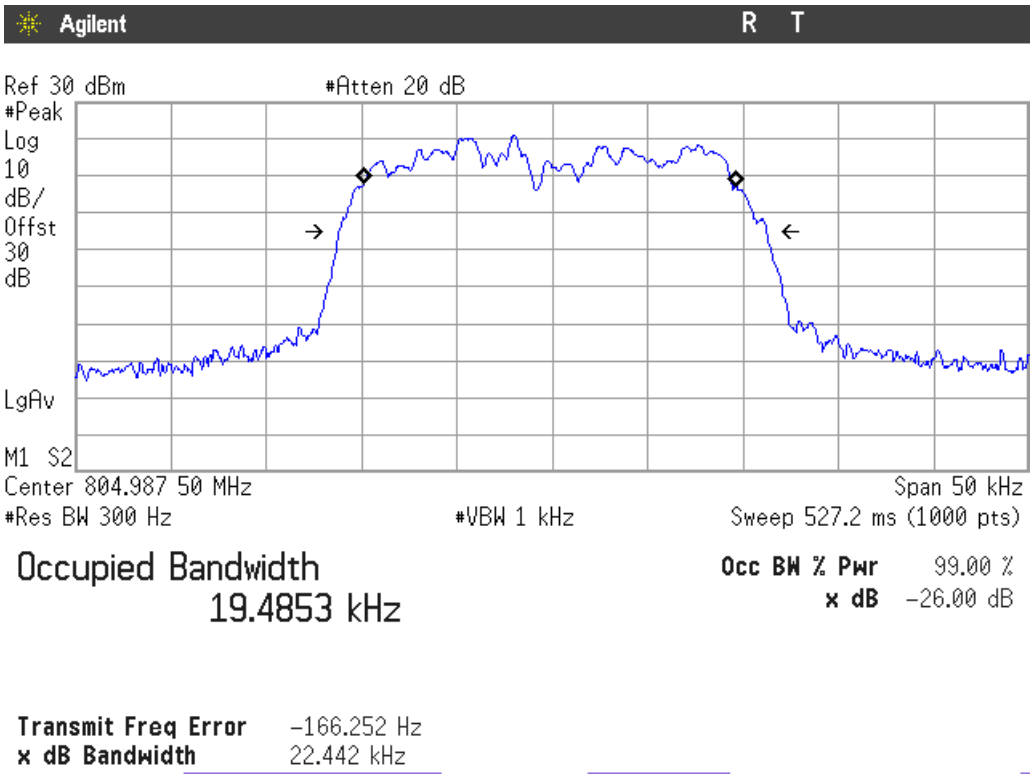


TI D-LMR 20 kHz. 799-805 MHz band.

Lowest Channel

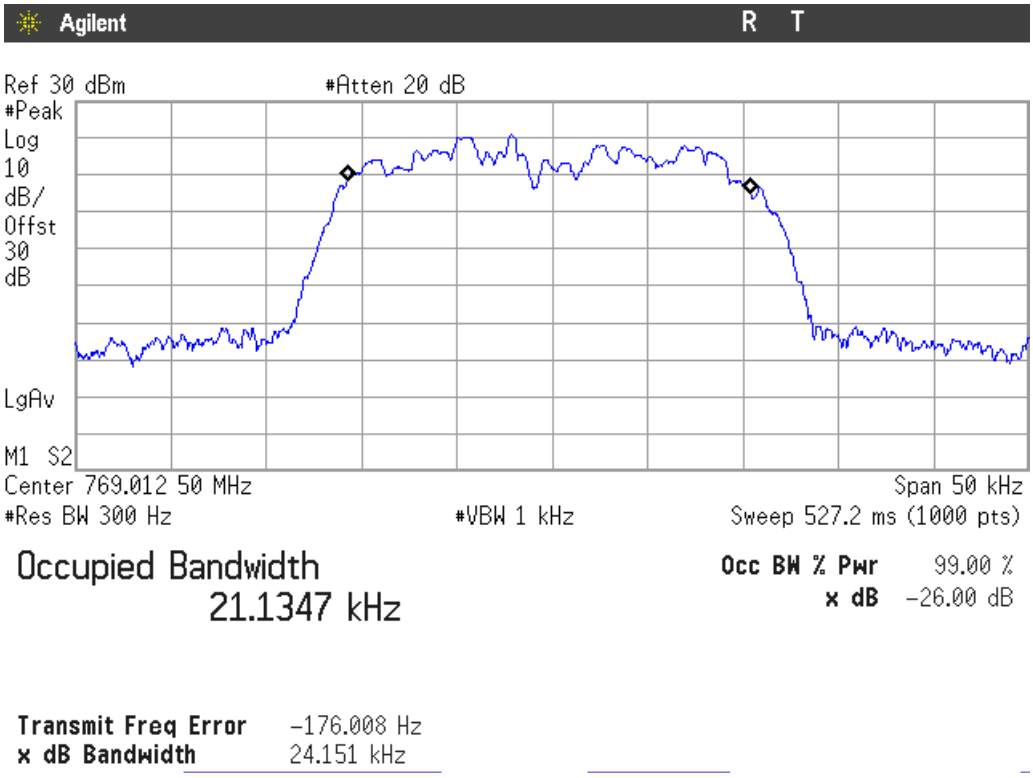


Highest Channel

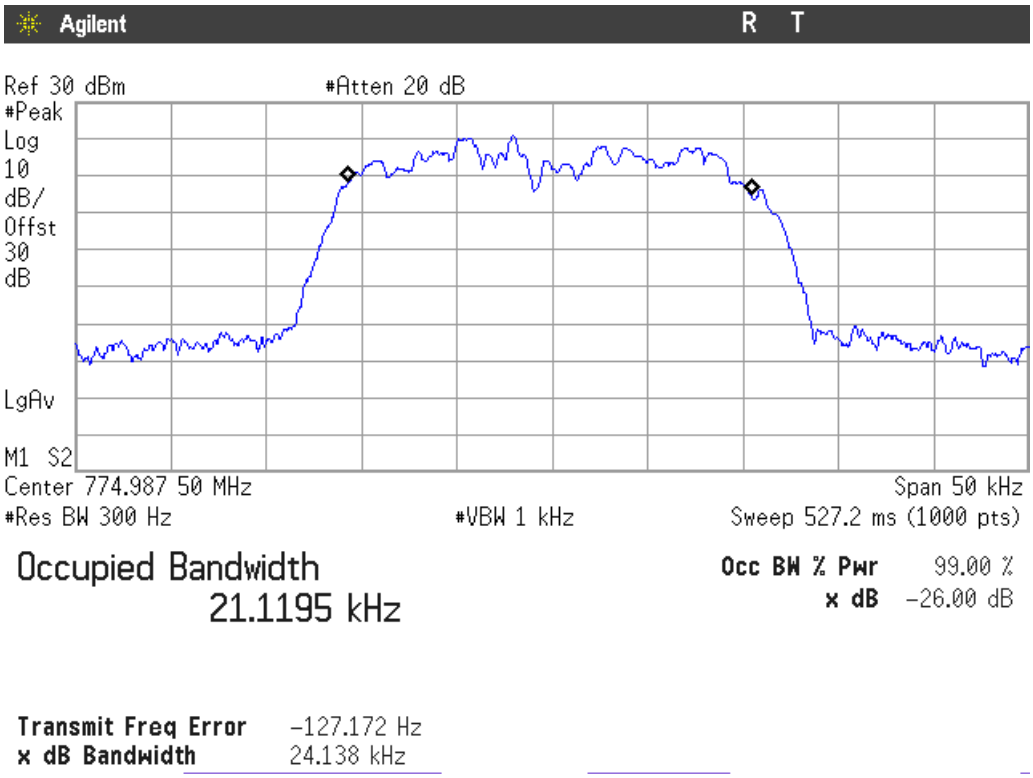


TETRA 22 kHz.769-775 MHz band.

Lowest Channel

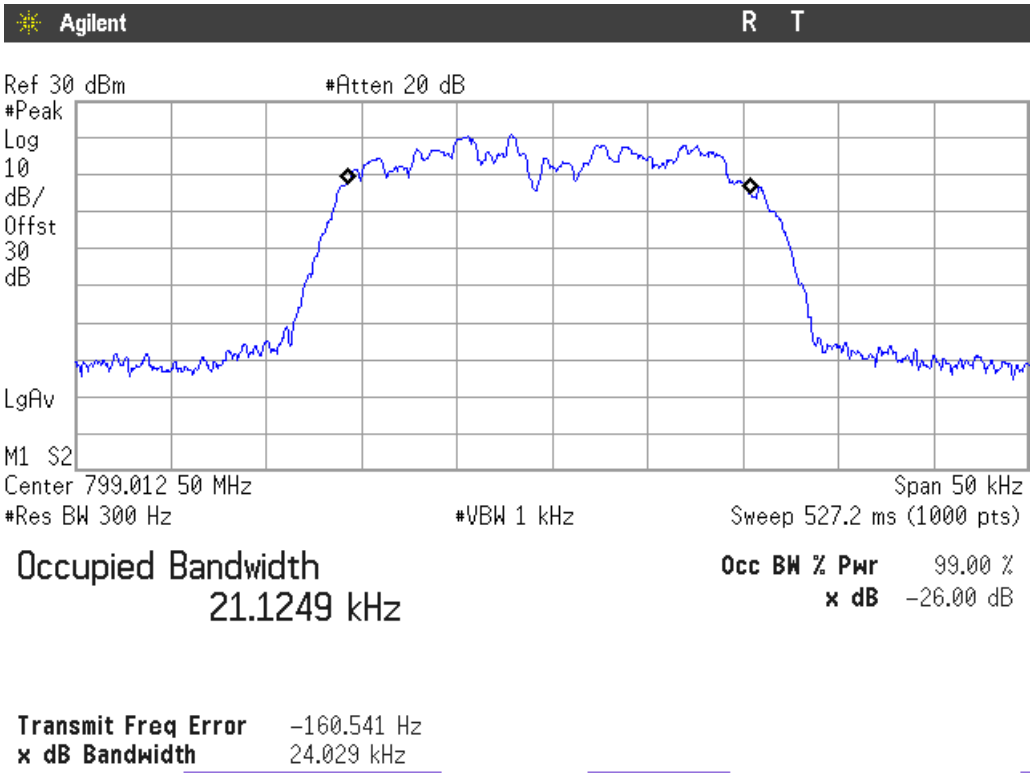


Highest Channel

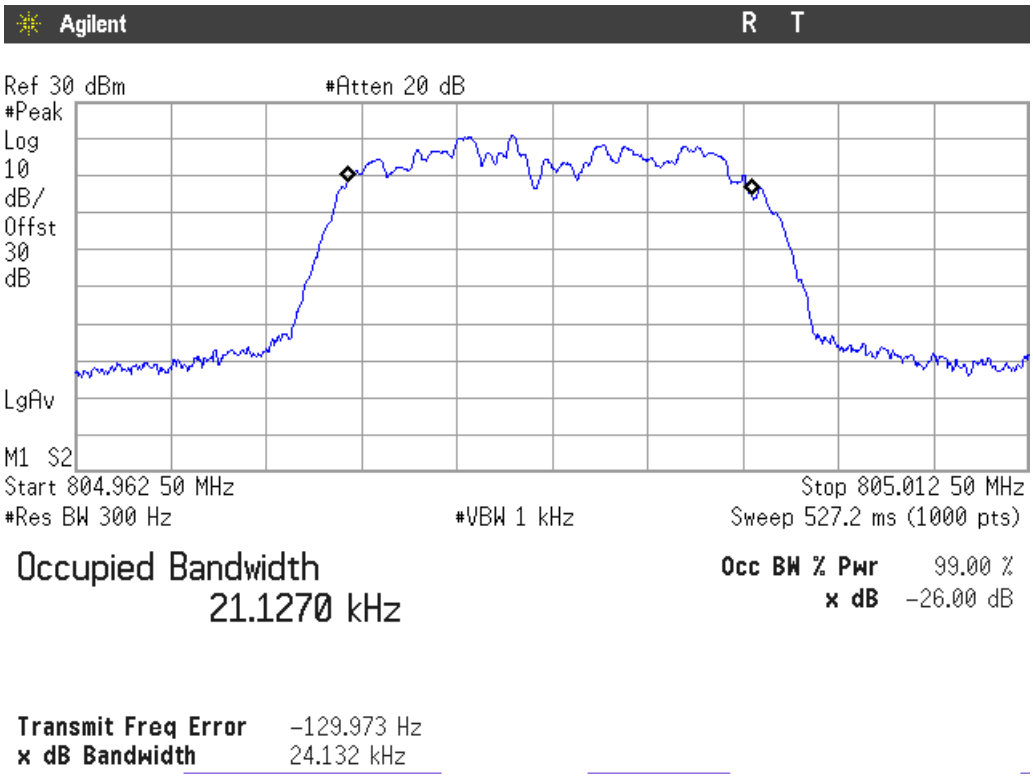


TETRA 22 kHz.799-805 MHz band.

Lowest Channel

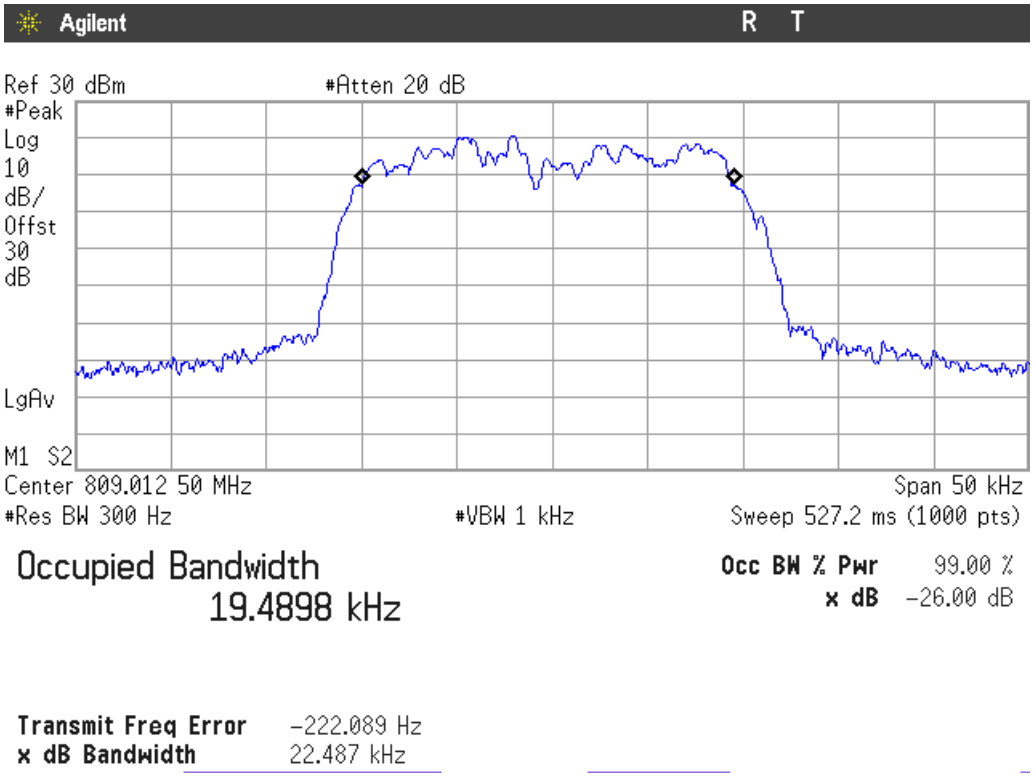


Highest Channel

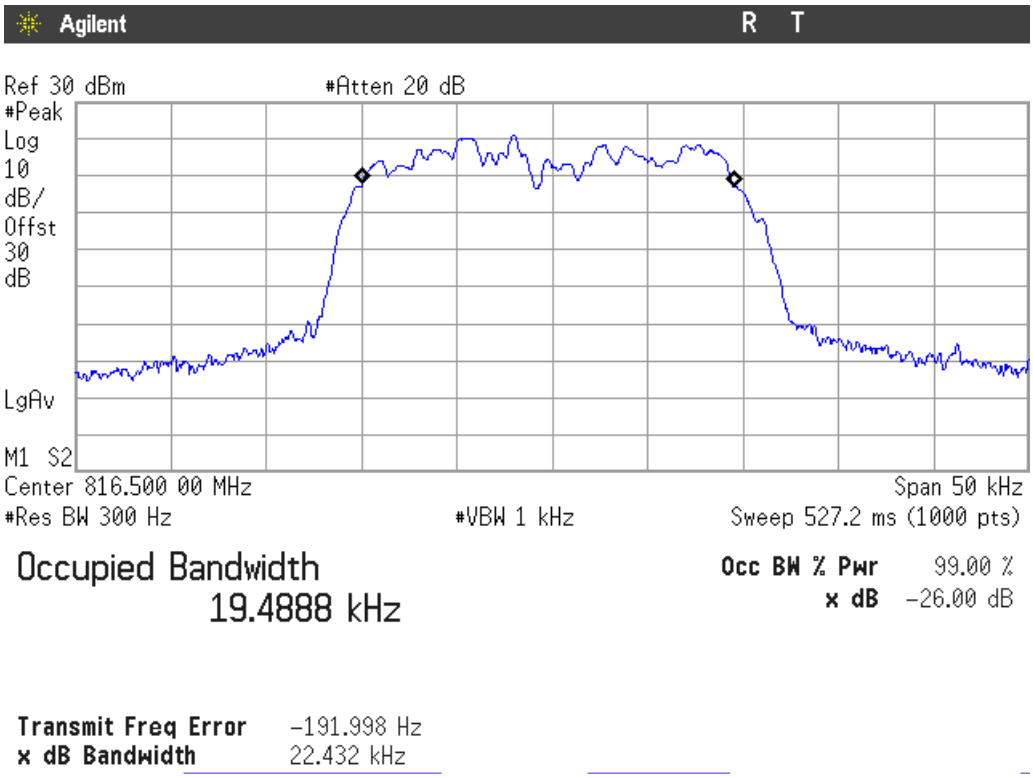


TI D-LMR 20 kHz. 809-824 MHz band.

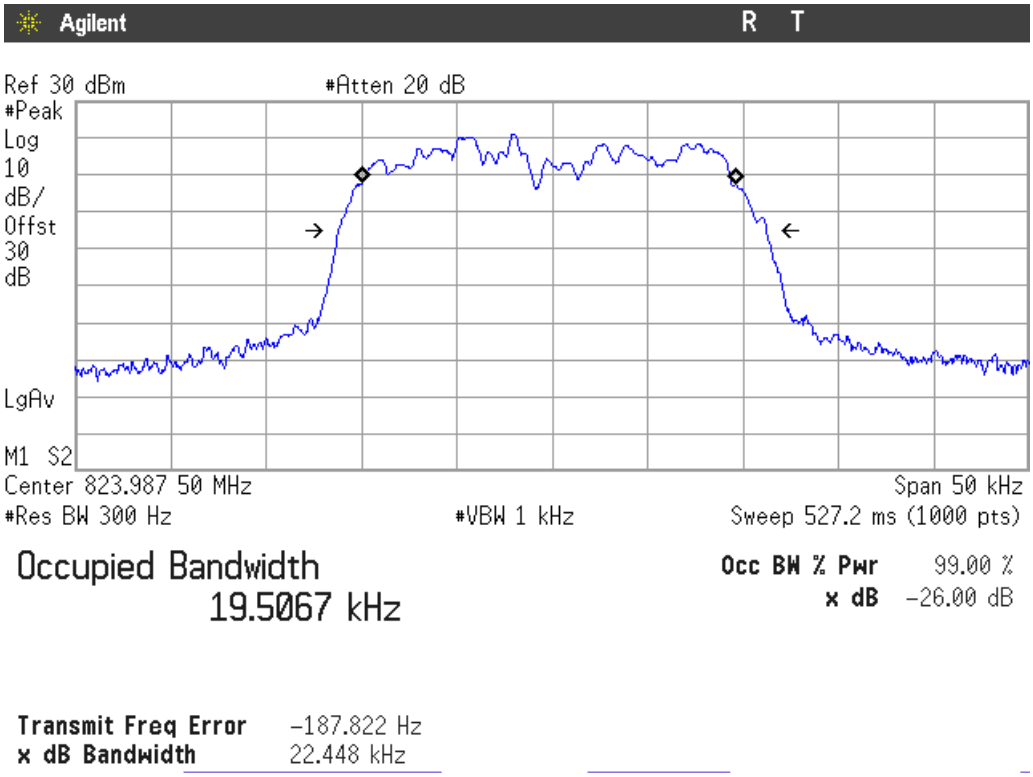
Lowest Channel



Middle Channel

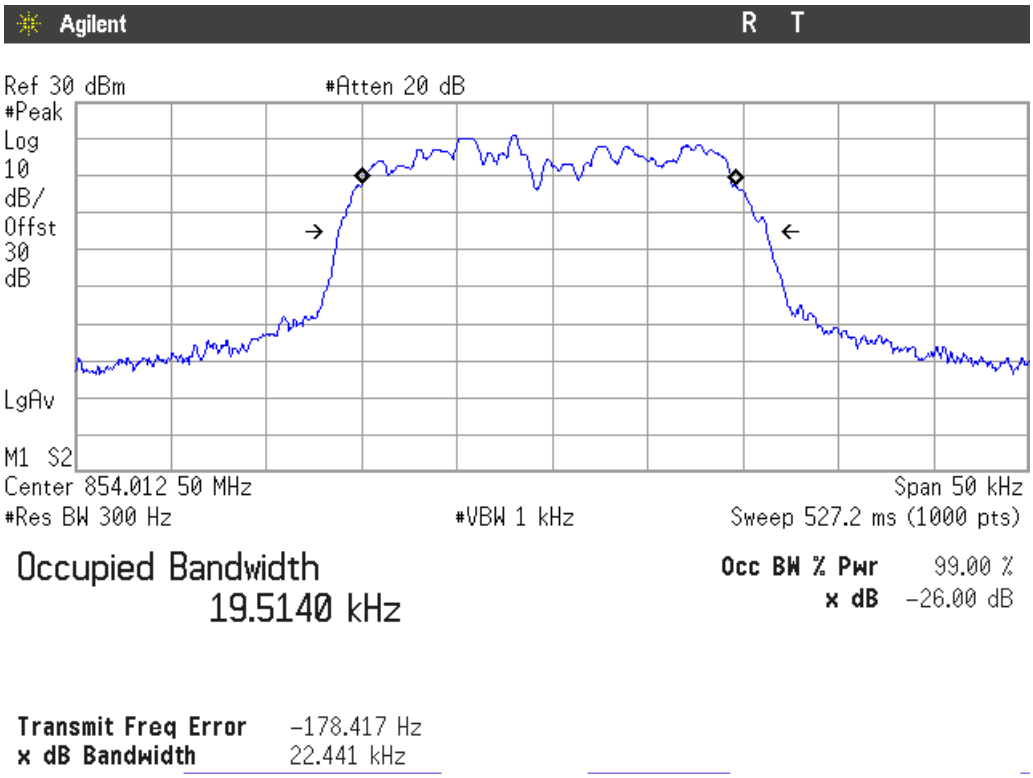


Highest Channel

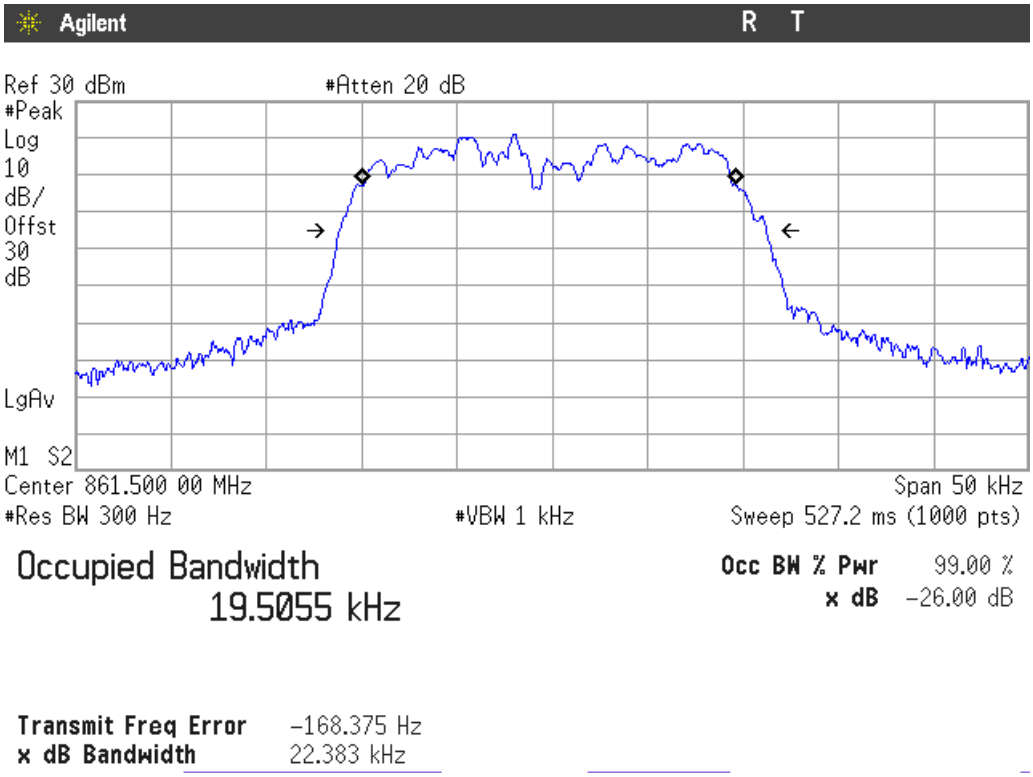


TI D-LMR 20 kHz. 854-869 MHz band.

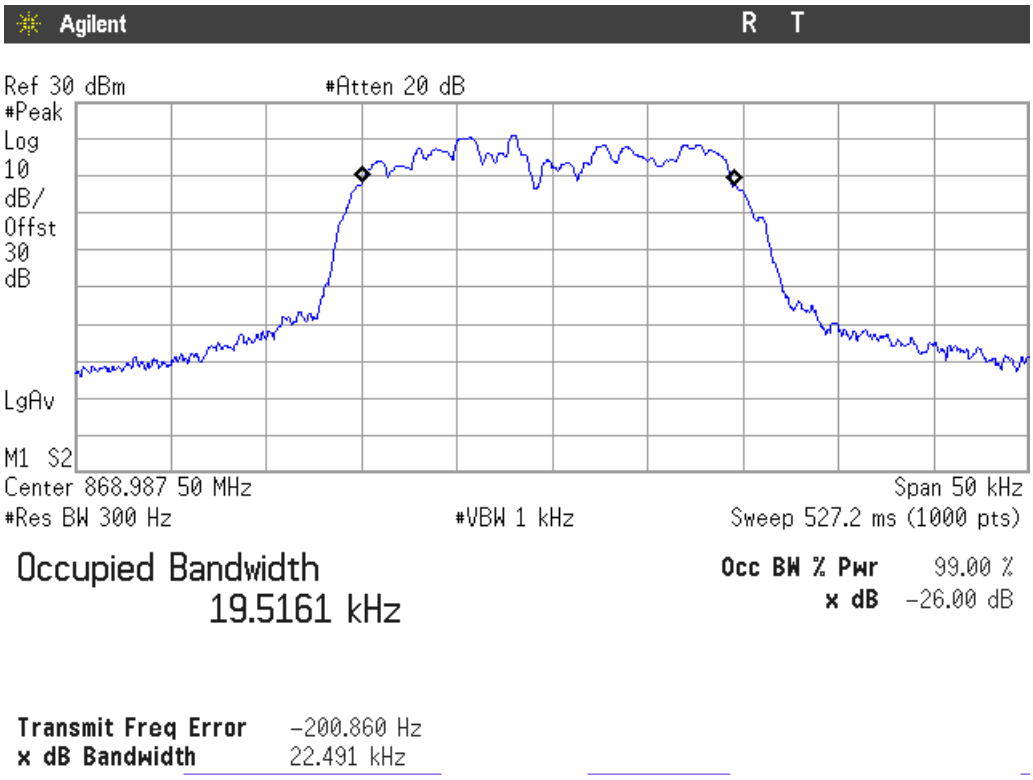
Lowest Channel



Middle Channel

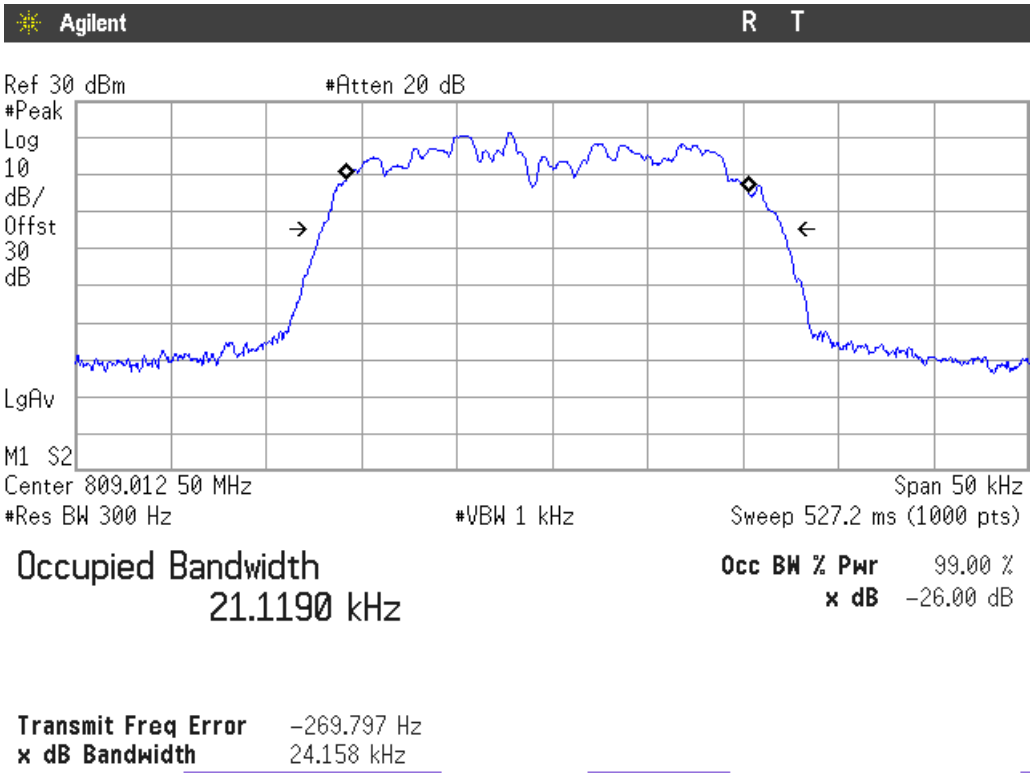


Highest Channel

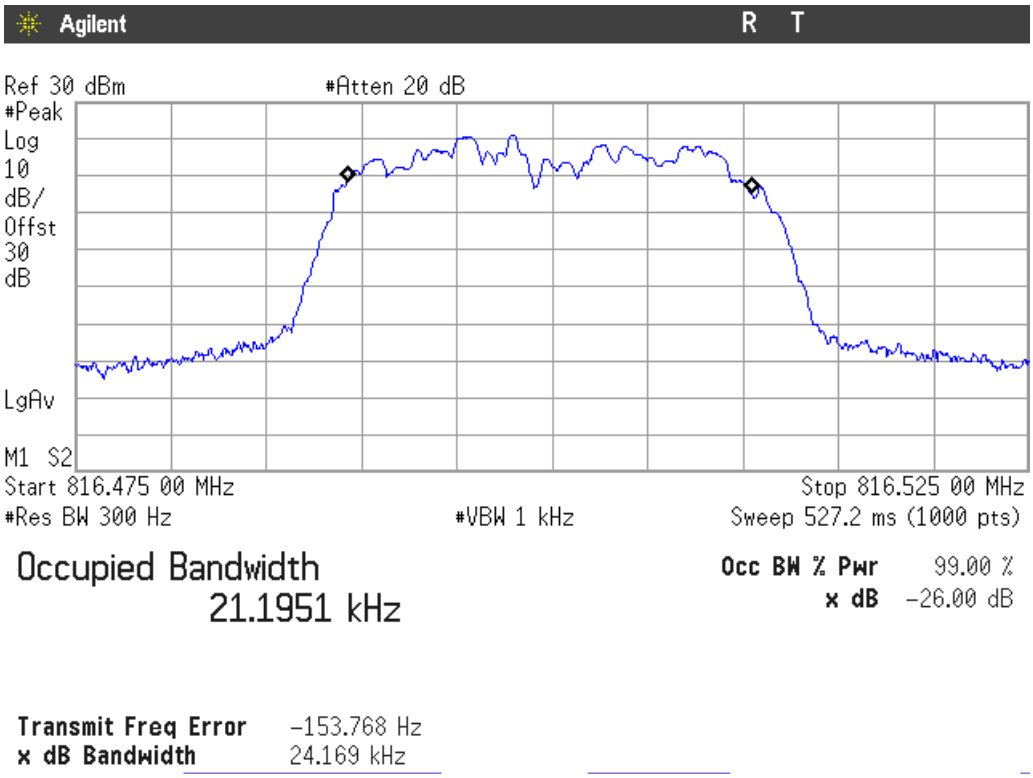


TETRA 22 kHz. 809-824 MHz band.

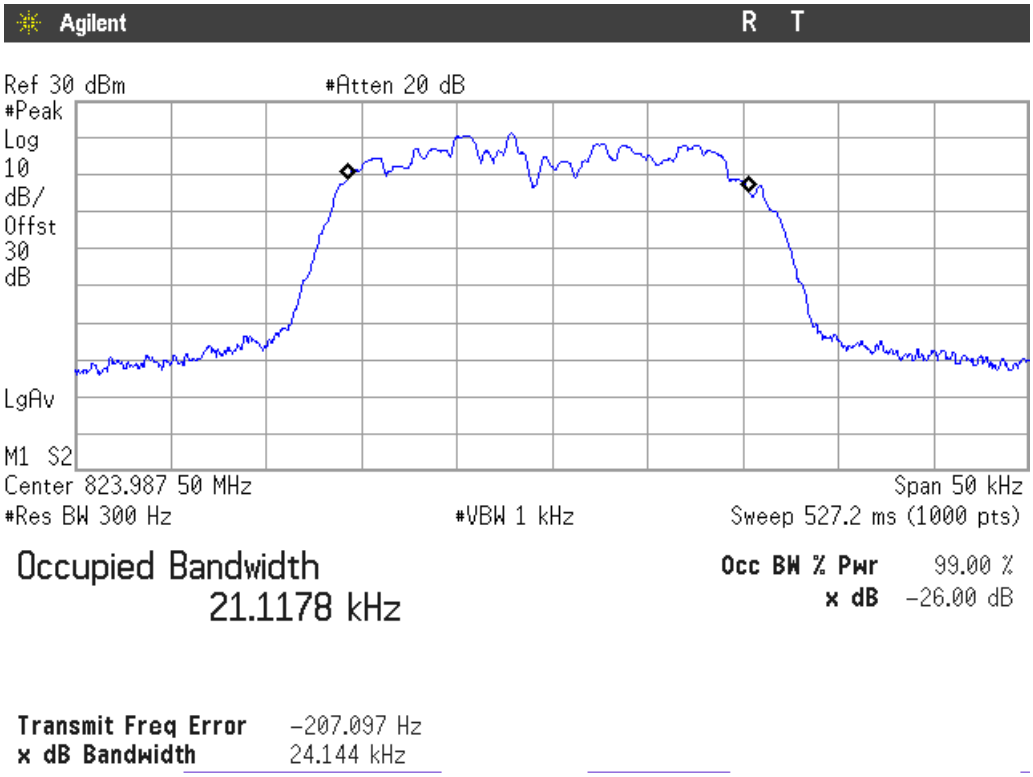
Lowest Channel



Middle Channel

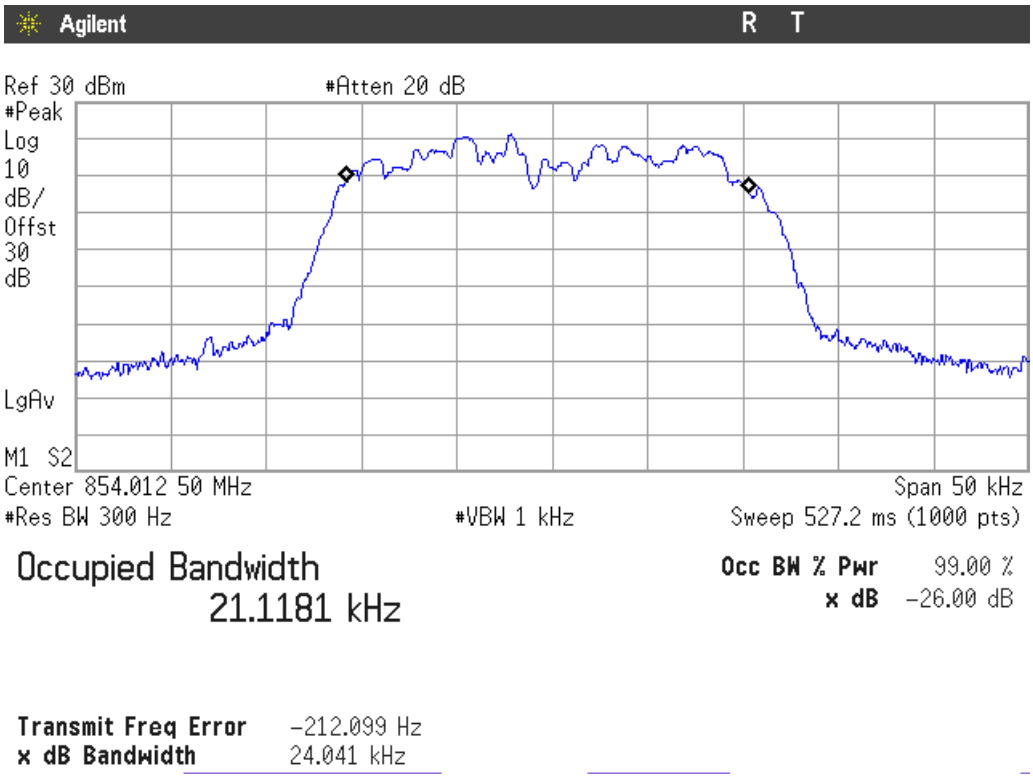


Highest Channel

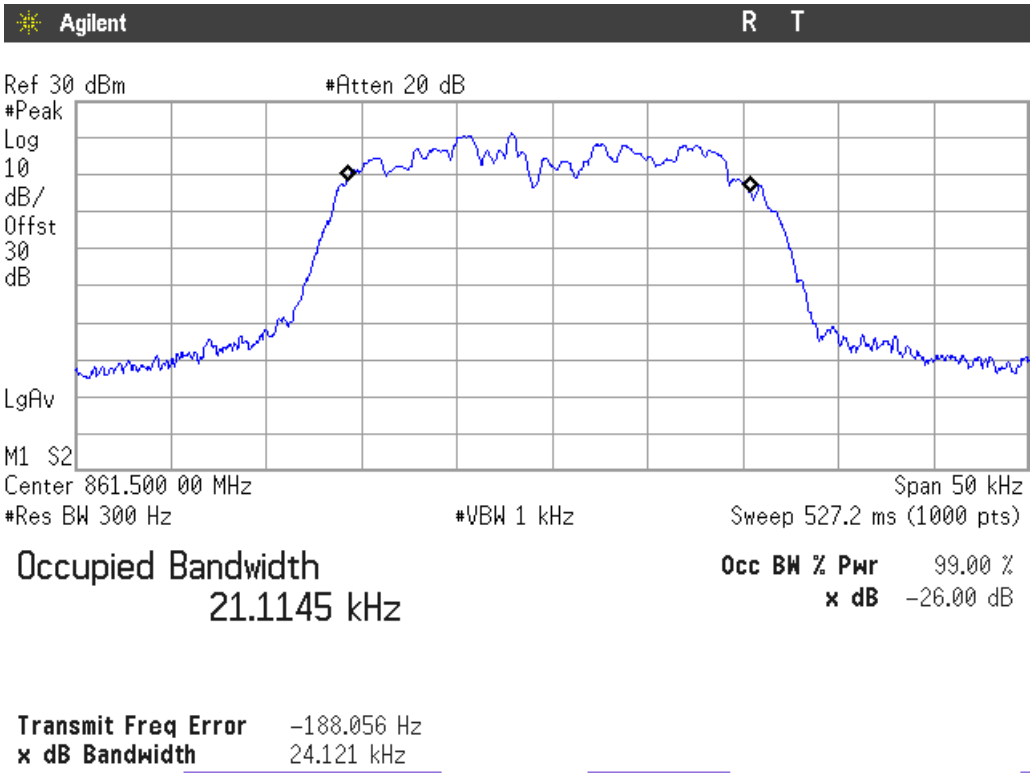


TETRA 22 kHz. 854-869 MHz band.

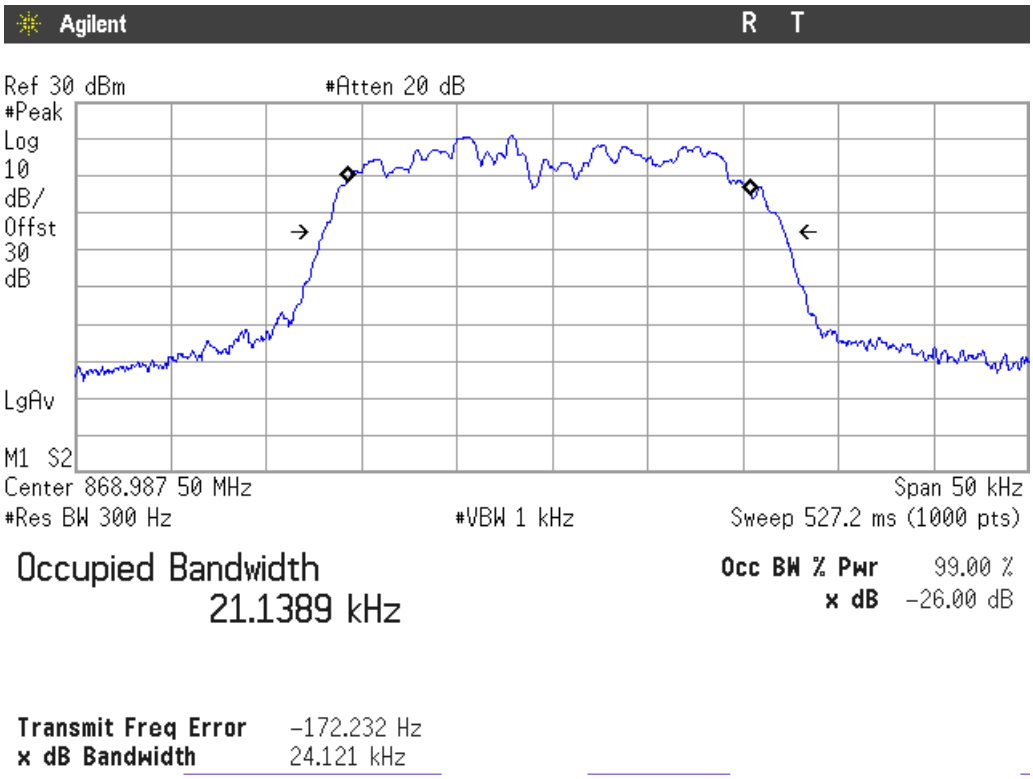
Lowest Channel



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 portable (hand-held) unit must not exceed 3 watts ERP (34.77 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

Maximum declared antenna gain: 1.4 dBi (-0.75 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	34.50	33.75
	774.9875	34.49	33.74
799-805 MHz band	799.0125	34.47	33.72
	804.9875	34.45	33.70
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	32.57	31.82
	774.9875	32.52	31.77
799-805 MHz band	799.0125	32.43	31.68
	804.9875	32.46	31.71
809-824 MHz band	809.0125	32.55	31.80
	816.5	32.56	31.81
	823.9875	32.54	31.79
854-869 MHz band	854.0125	32.60	31.85
	861.5	32.58	31.83
	868.9875	32.58	31.83
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	32.66	31.91
	774.9875	32.60	31.85
799-805 MHz band	799.0125	32.52	31.77
	804.9875	32.49	31.74
809-824 MHz band	809.0125	32.55	31.80
	816.5	32.54	31.79
	823.9875	32.53	31.78
854-869 MHz band	854.0125	32.62	31.87
	861.5	32.62	31.87
	868.9875	32.58	31.83
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)

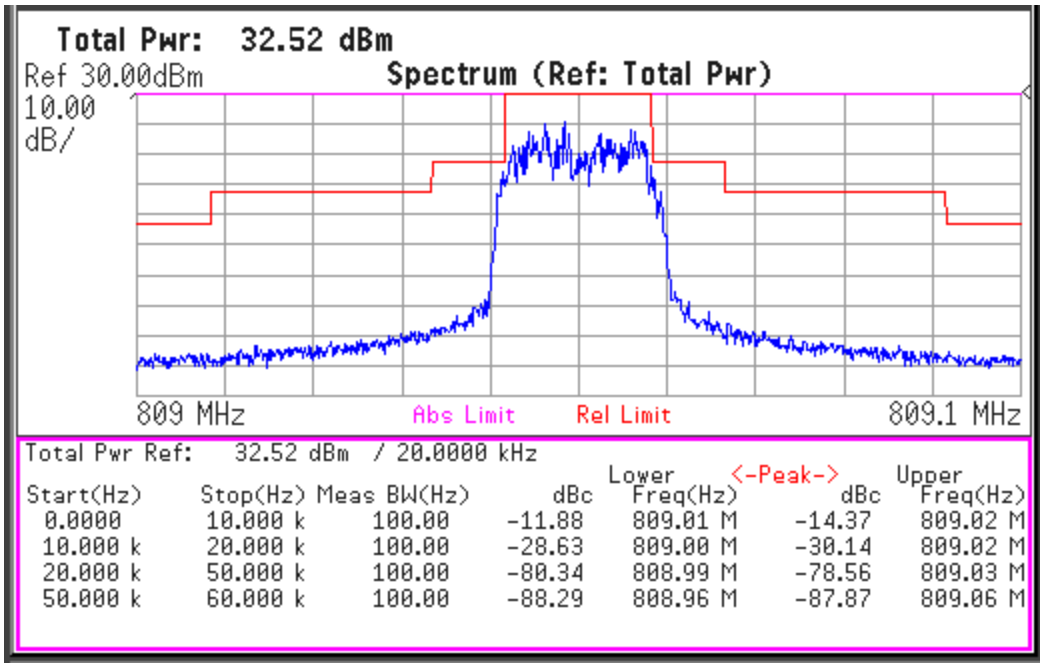
Measurement uncertainty (dB)	<±0.33

Verdict: PASS

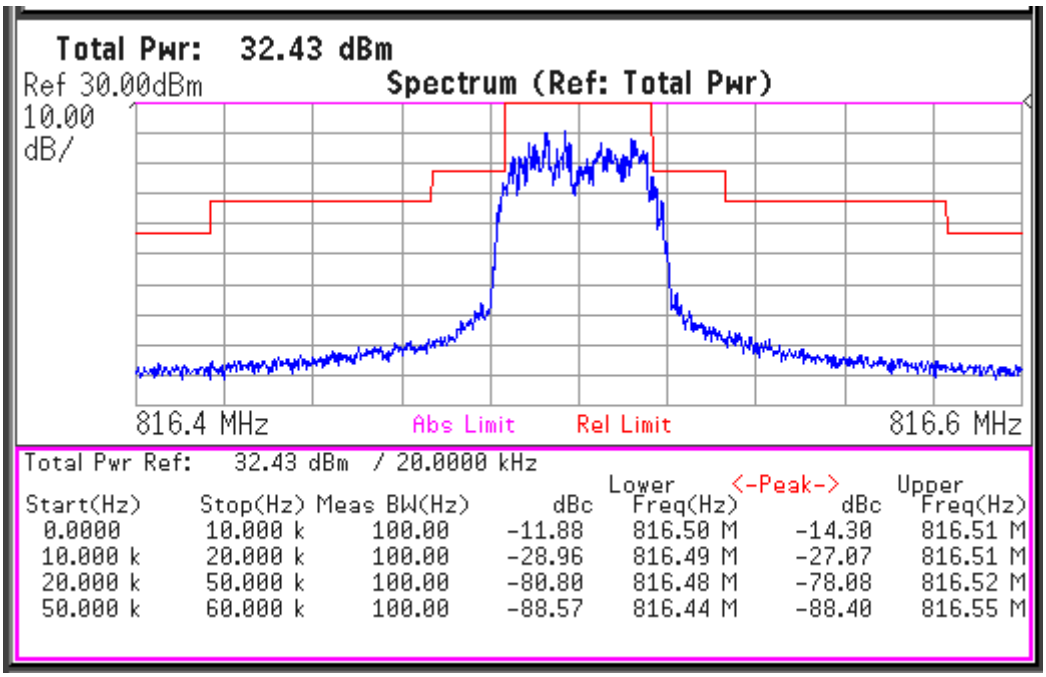
Emission Mask B.

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

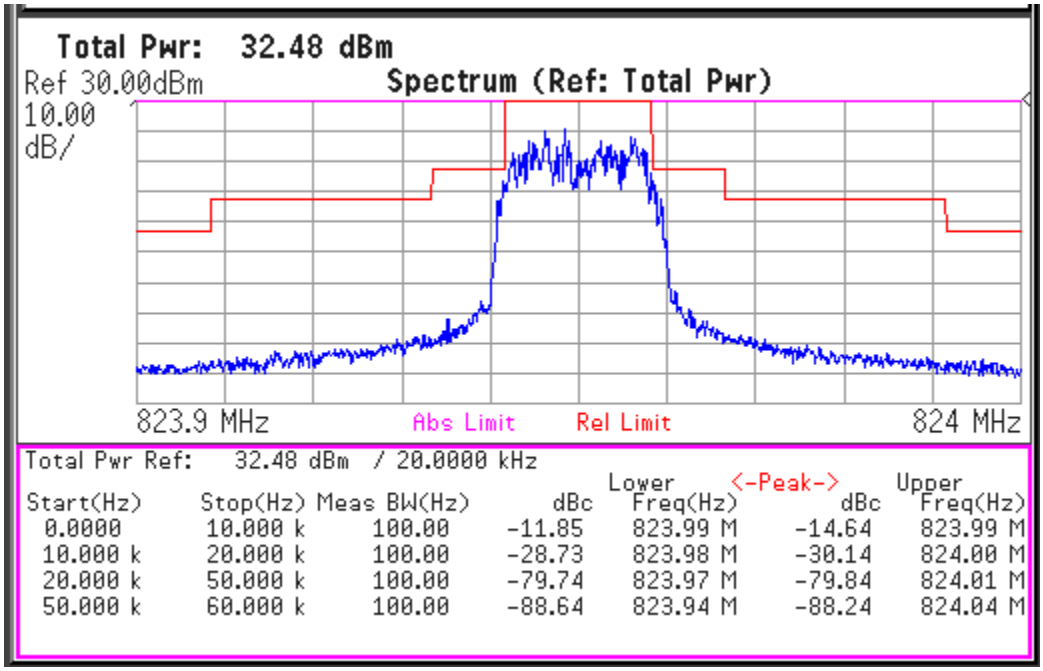
Lowest Channel



Middle Channel

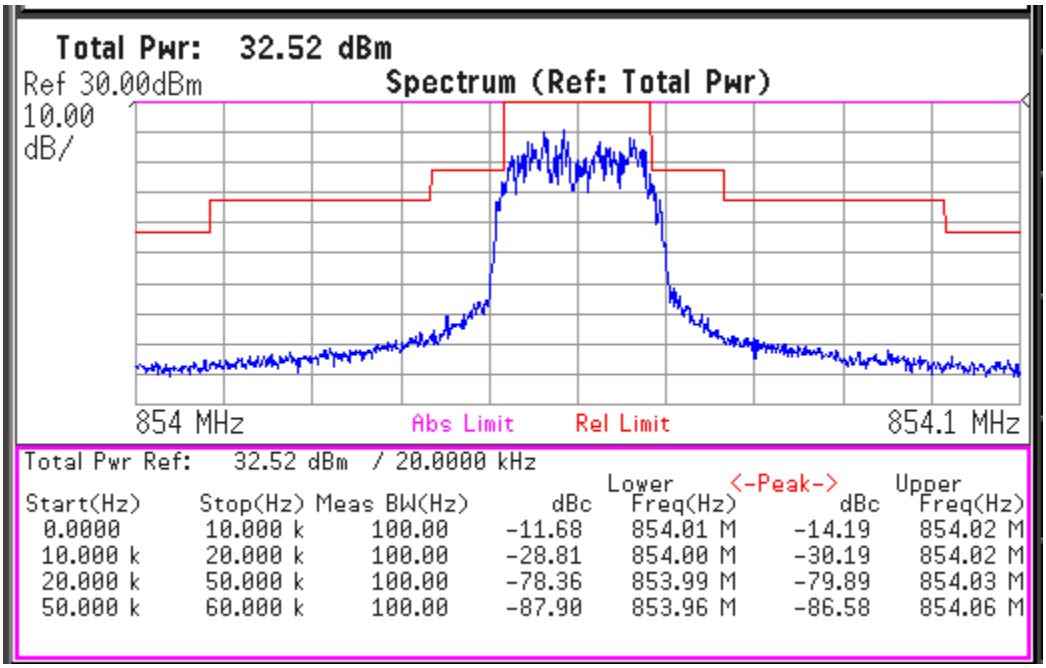


Highest Channel

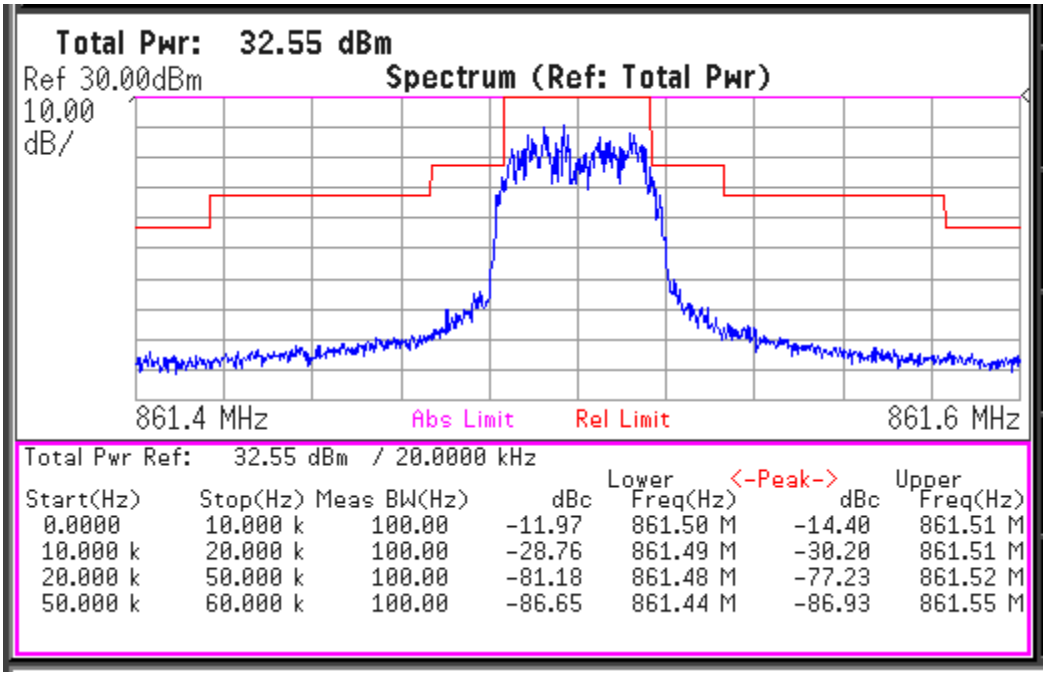


854-869 MHz band. TI D-LMR 20 kHz Bandwidth.

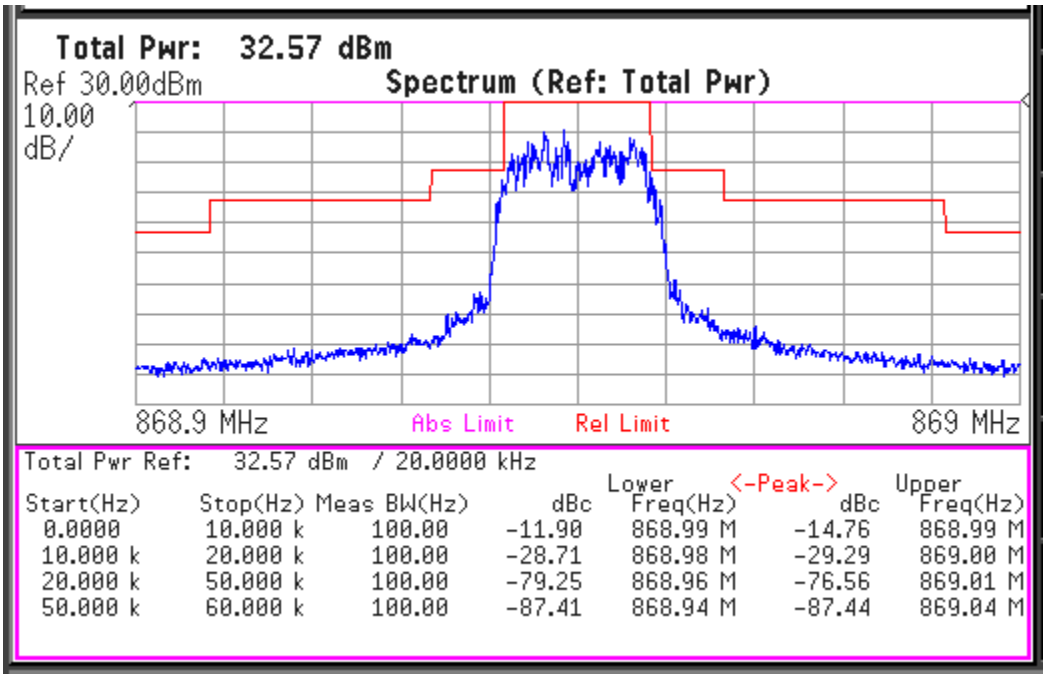
Lowest Channel



Middle Channel



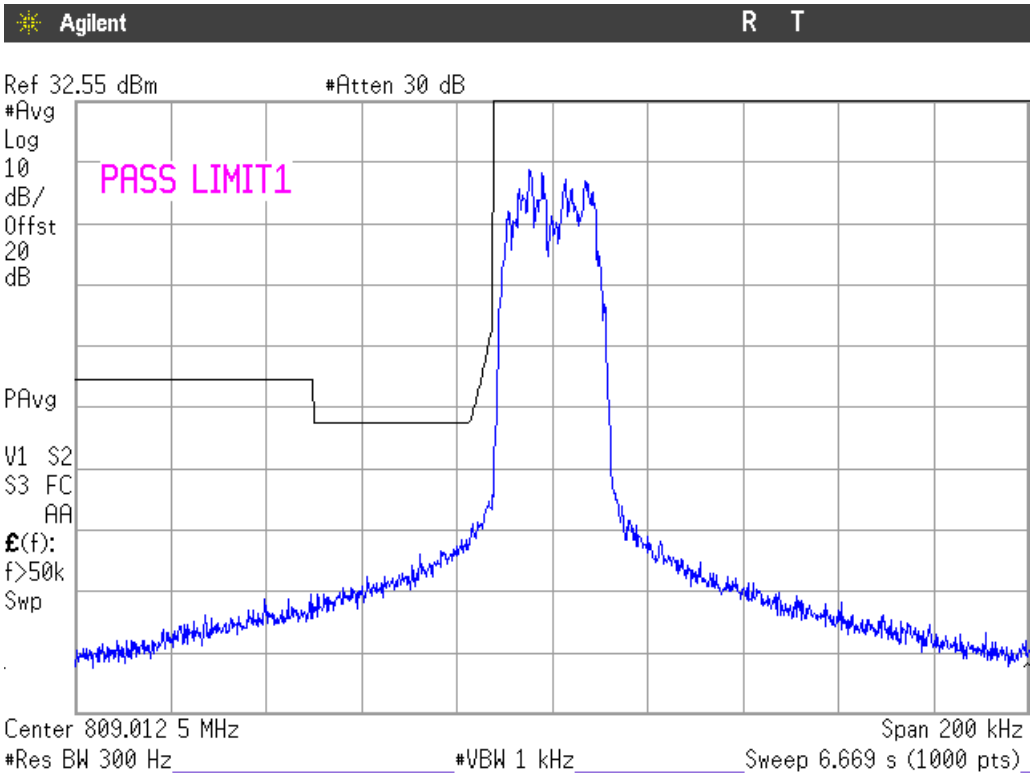
Highest Channel



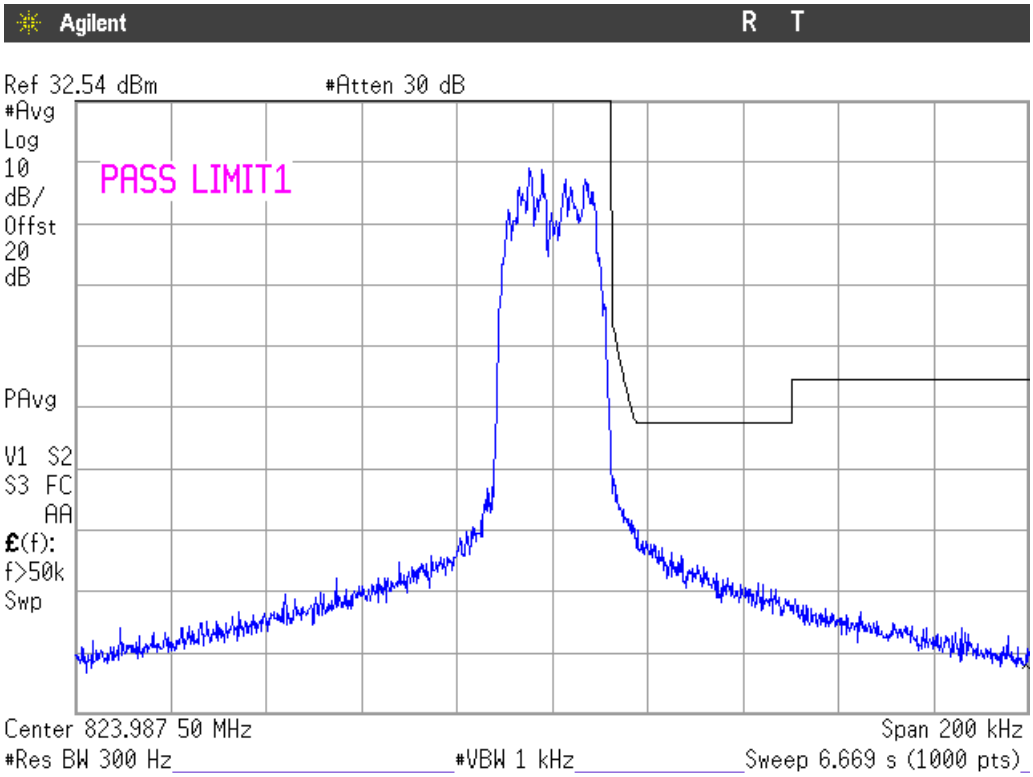
Emission Mask EA.

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

Lowest Channel

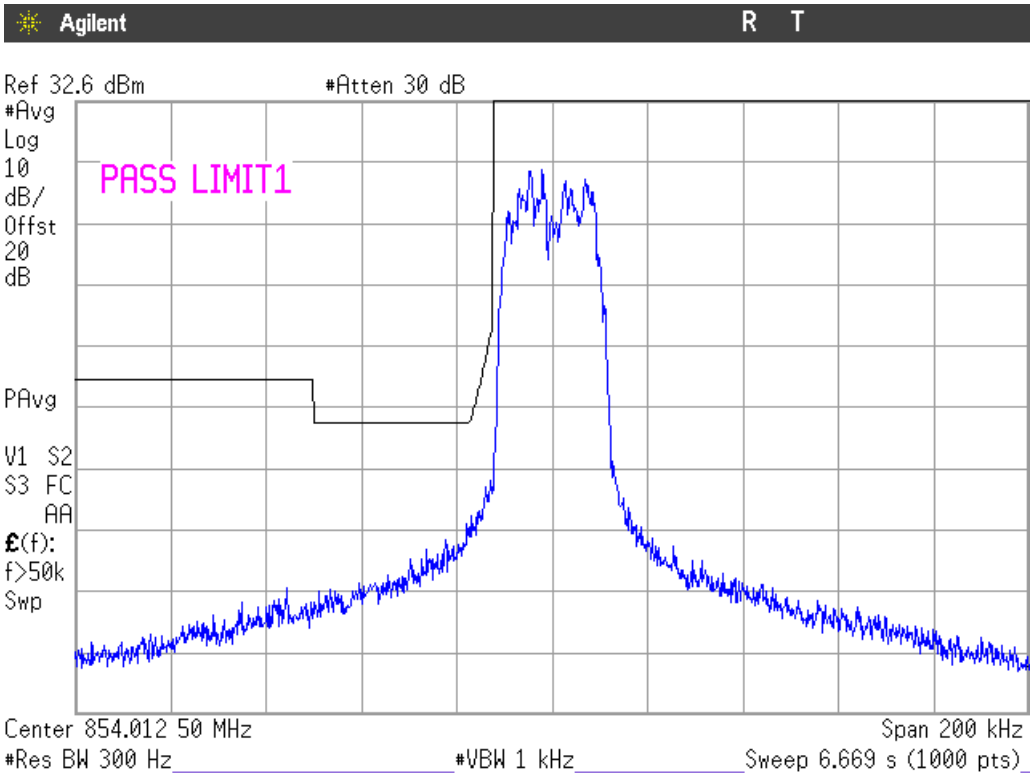


Highest Channel

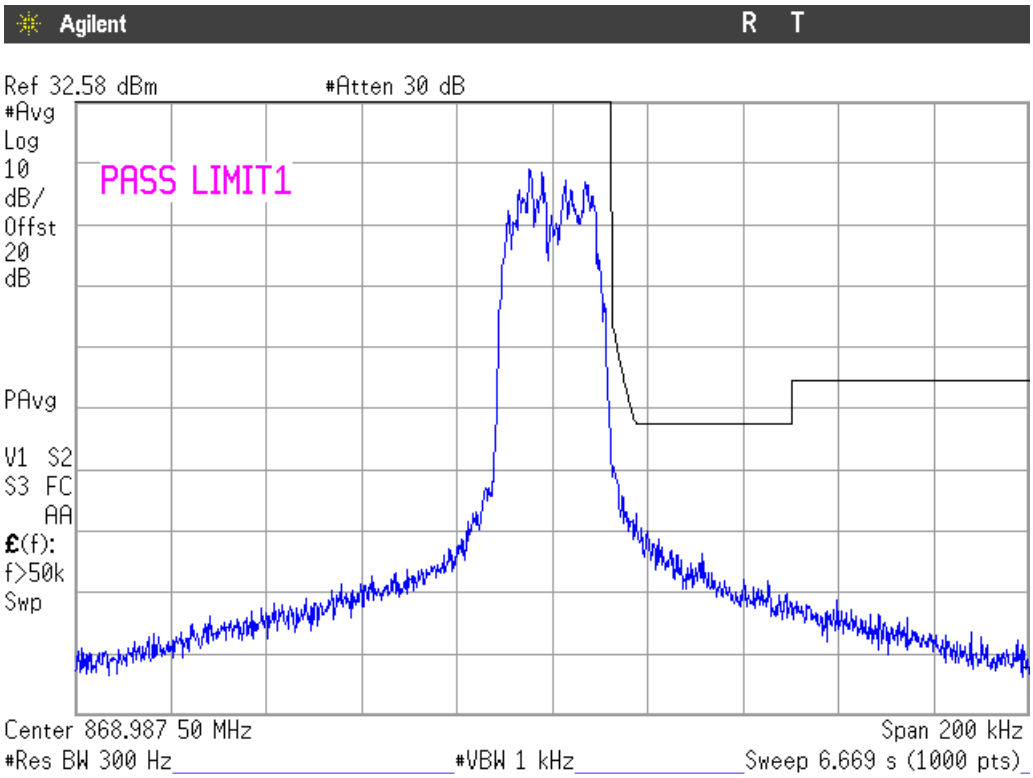


854-869 MHz band. TI D-LMR 20 kHz Bandwidth.

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.

12.5 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.

25 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

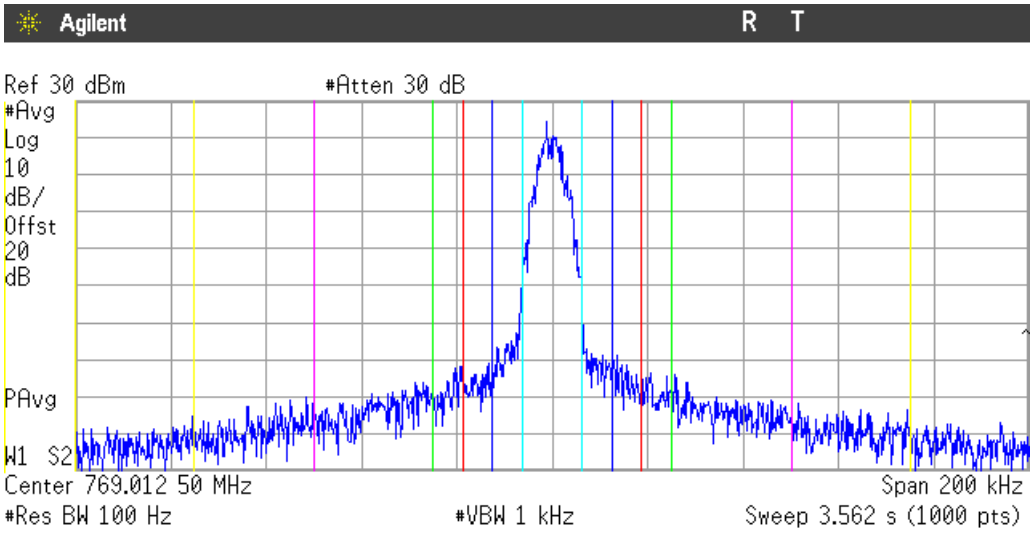
See next plots.

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

Verdict: PASS

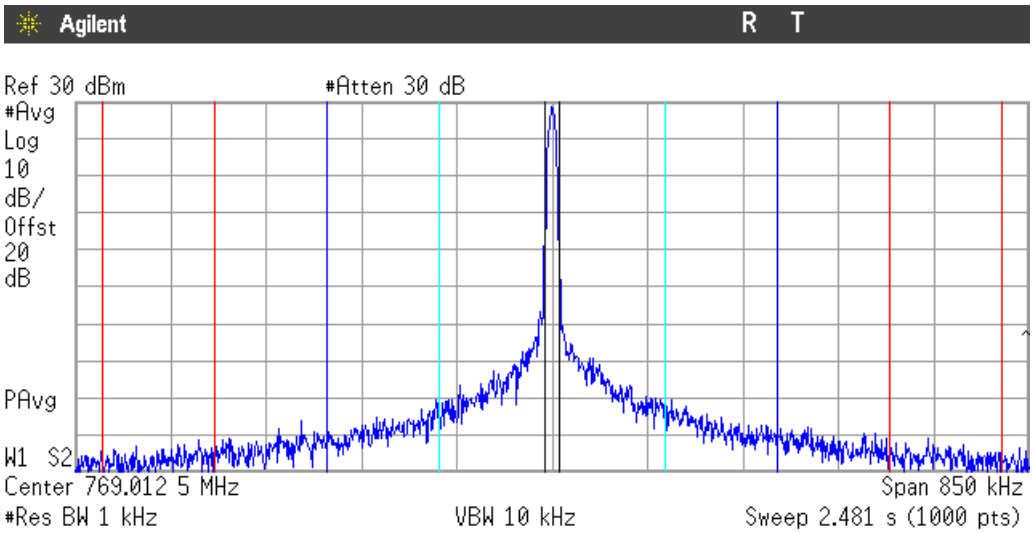
P25 C4FM 8.1 kHz. 769-775 MHz band.

Lowest Channel



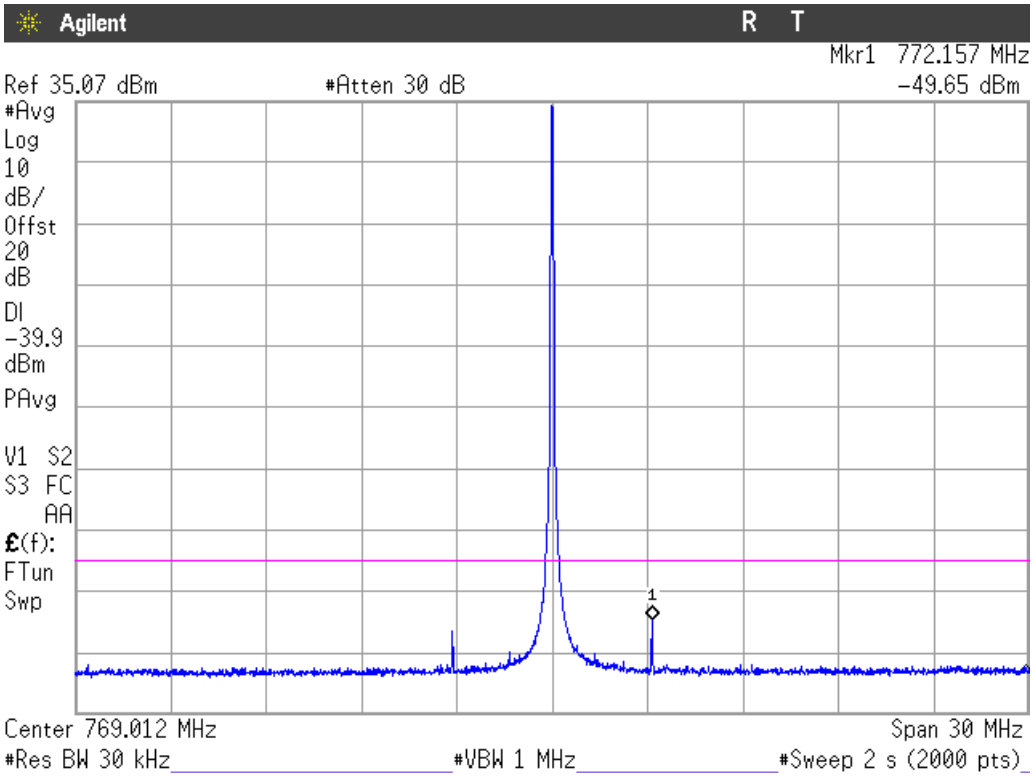
RMS Results
Carrier Power
35.07 dBm /
12.5000 kHz

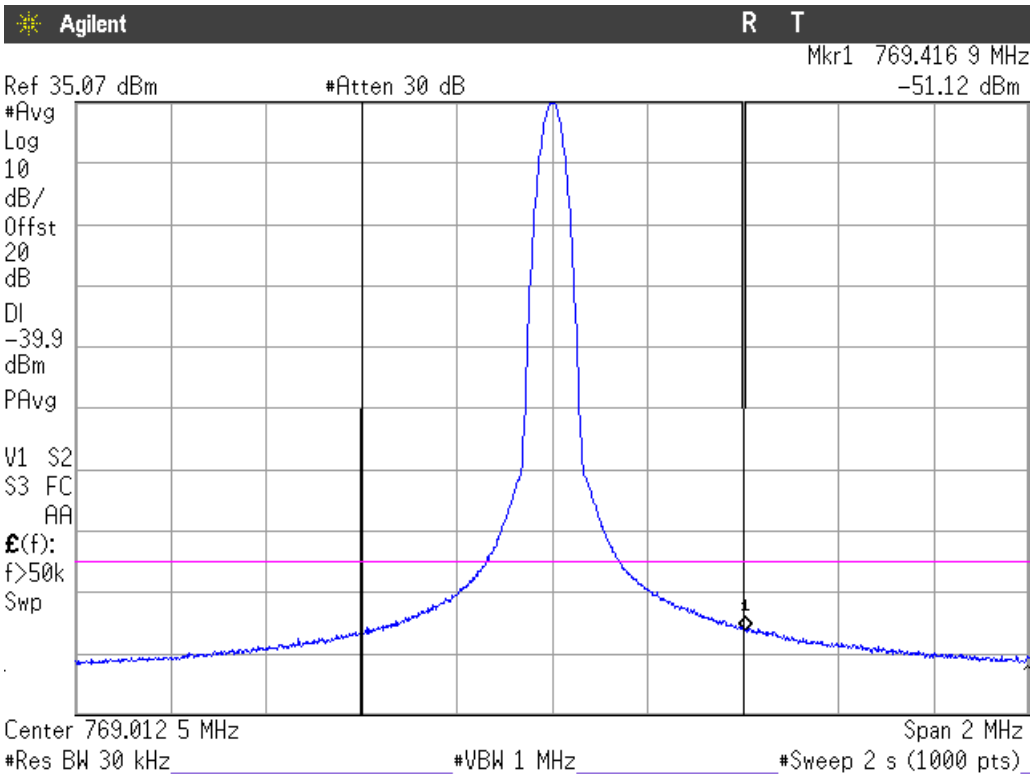
Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
9.375 kHz	6.250 kHz	-47.77	-12.70	-55.40	-20.33
15.63 kHz	6.250 kHz	-63.29	-28.21	-62.19	-27.11
21.88 kHz	6.250 kHz	-64.92	-29.85	-65.86	-30.78
37.50 kHz	25.00 kHz	-63.97	-28.90	-64.25	-29.18
62.50 kHz	25.00 kHz	-69.48	-34.40	-69.88	-34.81
87.50 kHz	25.00 kHz	-73.75	-38.68	-73.84	-38.77

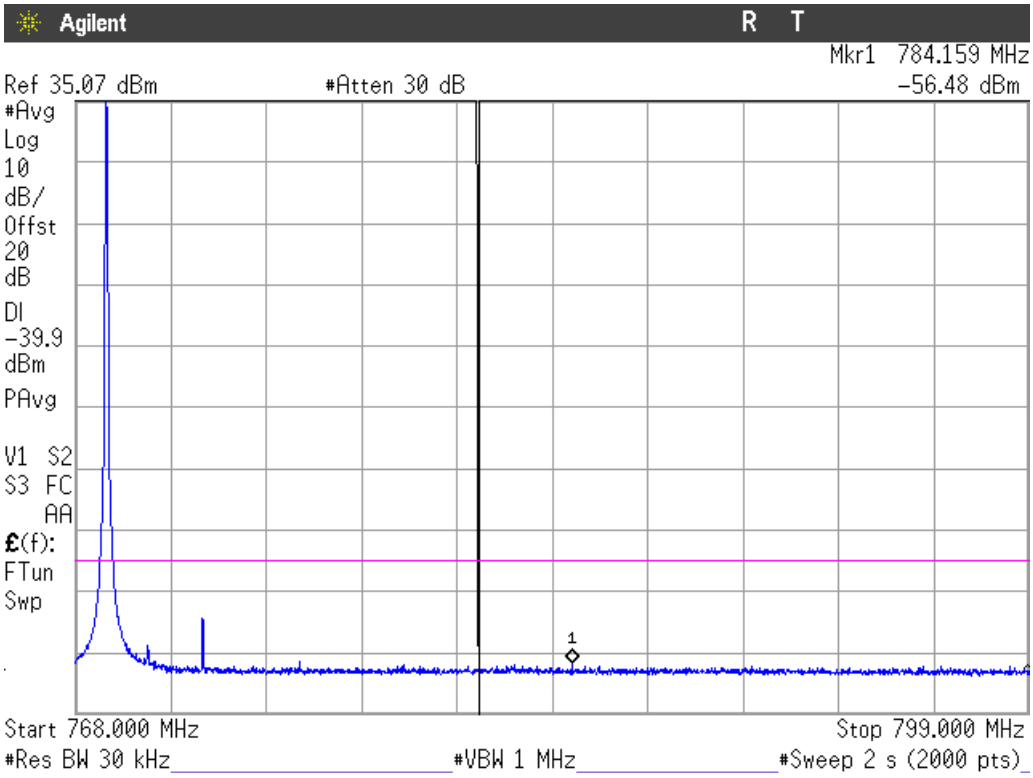


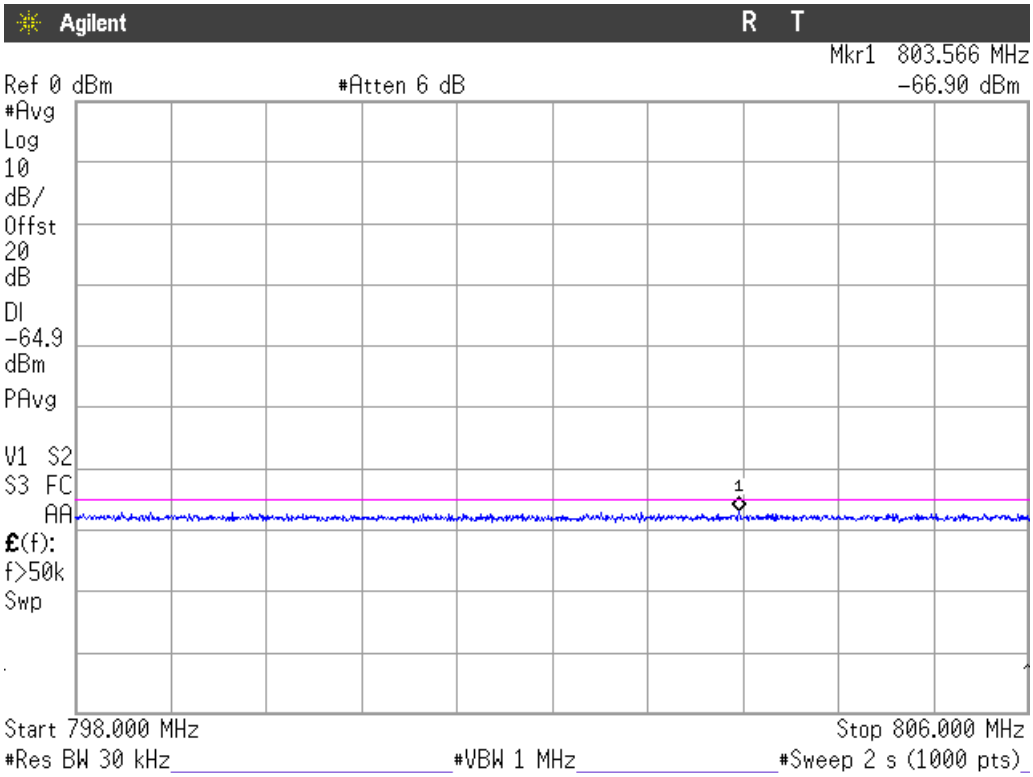
RMS Results
Carrier Power
34.88 dBm /
12.5000 kHz

Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
150.0 kHz	100.0 kHz	-73.03	-38.14	-72.35	-37.47
250.0 kHz	100.0 kHz	-78.23	-43.34	-77.63	-42.75
350.0 kHz	100.0 kHz	-81.65	-46.77	-80.91	-46.03

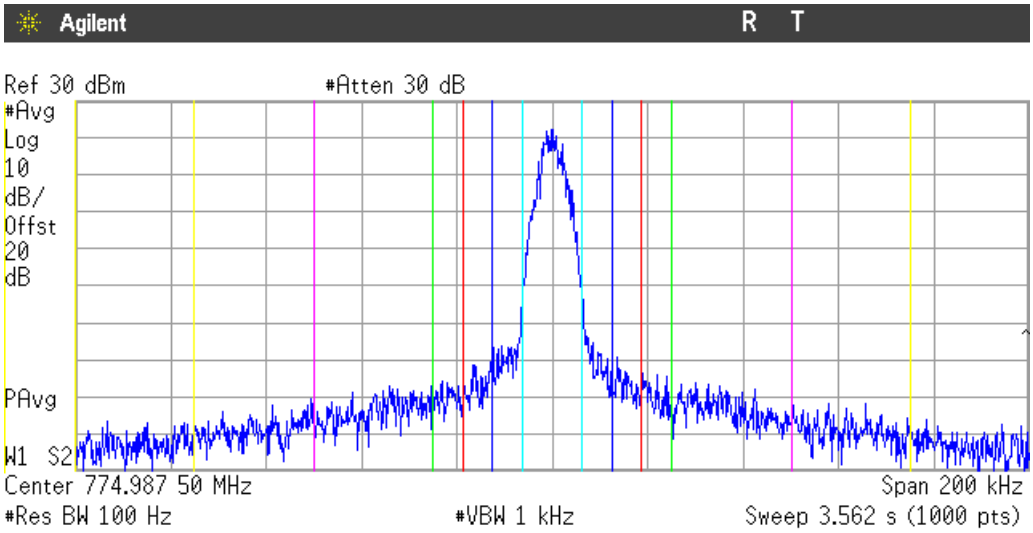

Agilent
R T
Mkr1 772.157 MHz
Ref 35.07 dBm
#Atten 30 dB
-49.65 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-39.9
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 769.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 769.416 9 MHz
Ref 35.07 dBm
#Atten 30 dB
-51.12 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-39.9
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 784.159 MHz
Ref 35.07 dBm
#Atten 30 dB
-56.48 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-39.9
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)

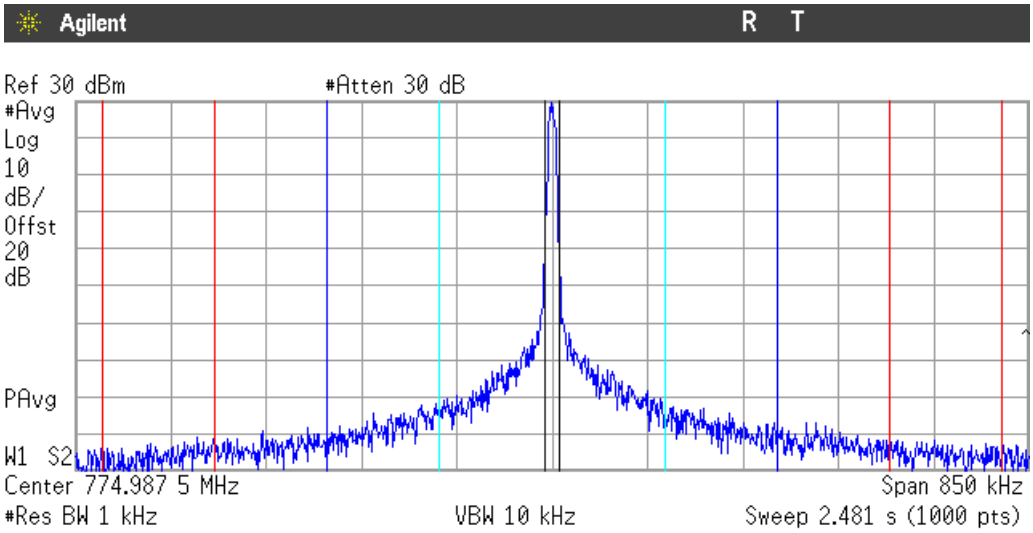

Agilent
R T
Mkr1 803.566 MHz
Ref 0 dBm
#Atten 6 dB
-66.90 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-64.9
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 798.000 MHz
Stop 806.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)

Highest Channel



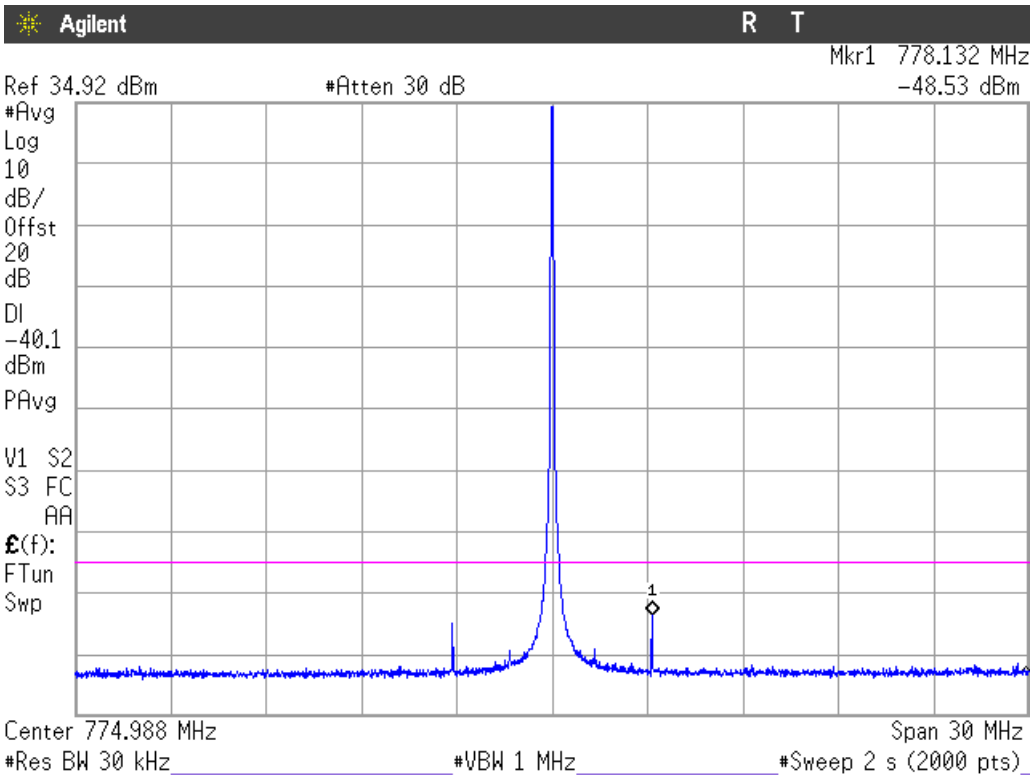
RMS Results

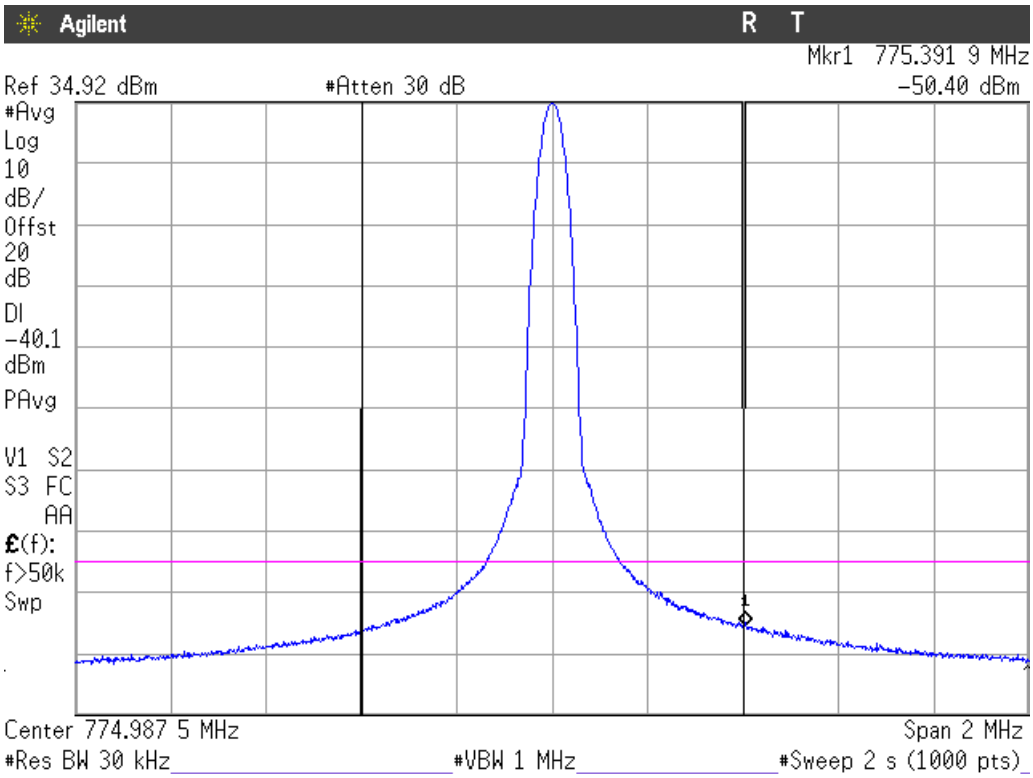
	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 34.92 dBm / 12.5000 kHz	9.375 kHz	6.250 kHz	-52.27	-17.35	-51.93	-17.01
	15.63 kHz	6.250 kHz	-62.41	-27.48	-63.28	-28.35
	21.88 kHz	6.250 kHz	-66.82	-31.90	-65.91	-30.99
	37.50 kHz	25.00 kHz	-63.92	-29.00	-63.76	-28.84
	62.50 kHz	25.00 kHz	-69.33	-34.41	-69.30	-34.38
	87.50 kHz	25.00 kHz	-73.38	-38.46	-73.54	-38.61

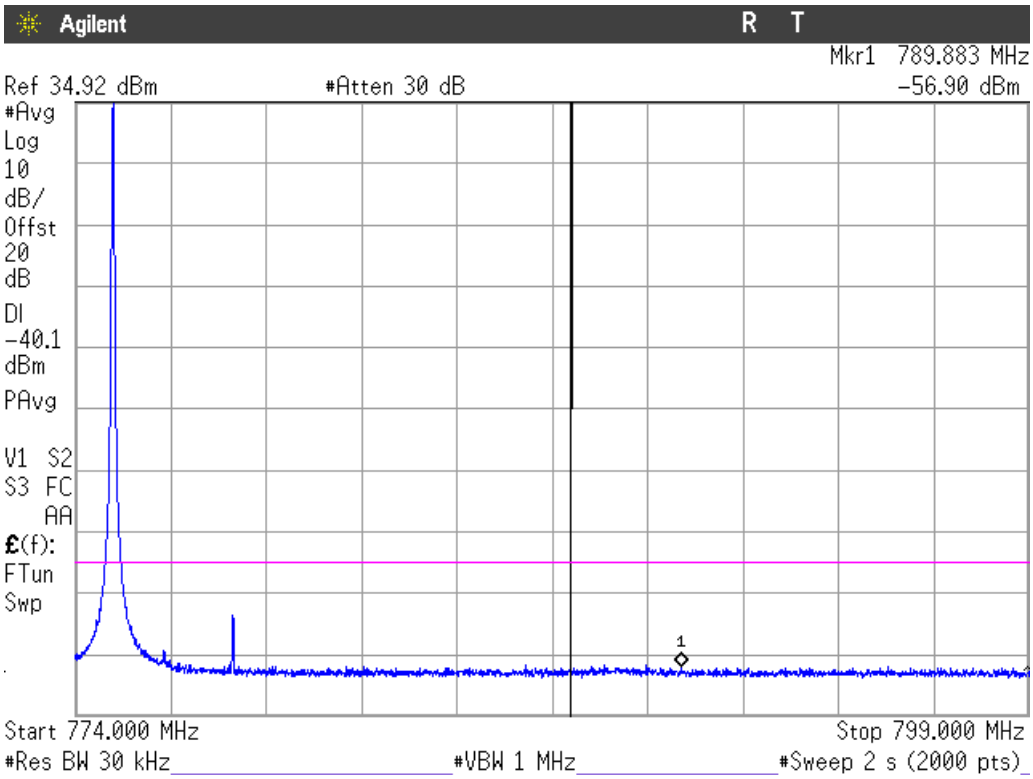


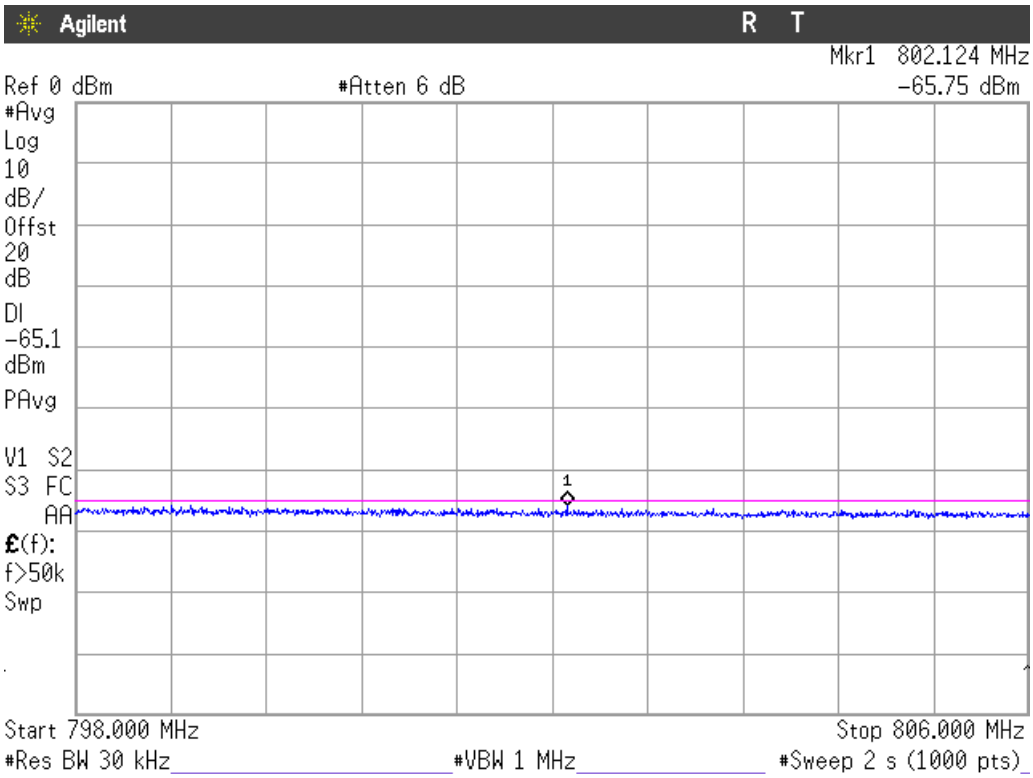
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 34.84 dBm / 12.5000 kHz	150.0 kHz	100.0 kHz	-72.65	-37.81	-72.71	-37.86
	250.0 kHz	100.0 kHz	-78.39	-43.55	-77.36	-42.52
	350.0 kHz	100.0 kHz	-80.71	-45.87	-80.34	-45.50


Agilent
R T
Mkr1 778.132 MHz
Ref 34.92 dBm
#Atten 30 dB
-48.53 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-40.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 774.988 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

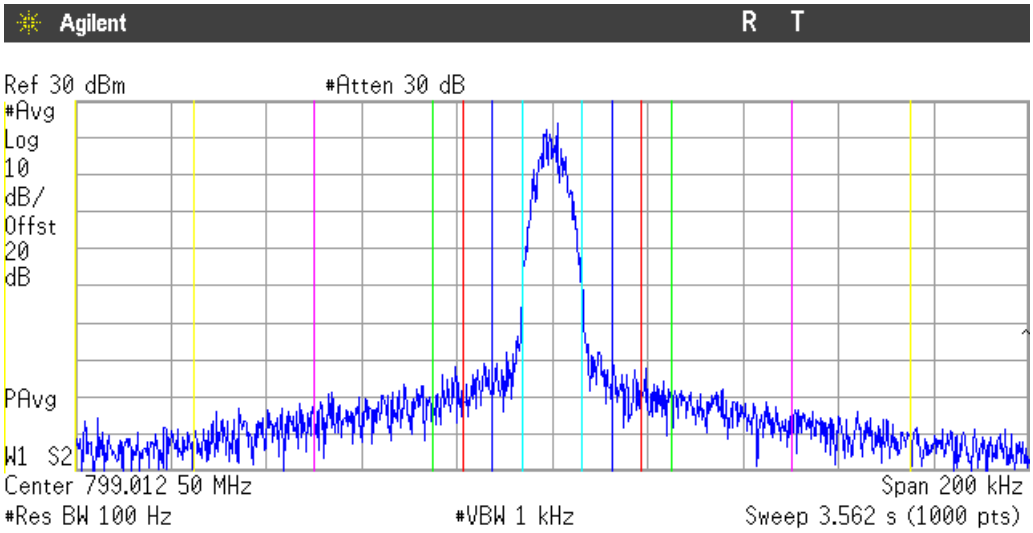

Agilent
R T
Mkr1 775.391 9 MHz
Ref 34.92 dBm
#Atten 30 dB
-50.40 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-40.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 774.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 789.883 MHz
Ref 34.92 dBm
#Atten 30 dB
-56.90 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-40.1
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 802.124 MHz
Ref 0 dBm
#Atten 6 dB
-65.75 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-65.1
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 2 s (1000 pts)

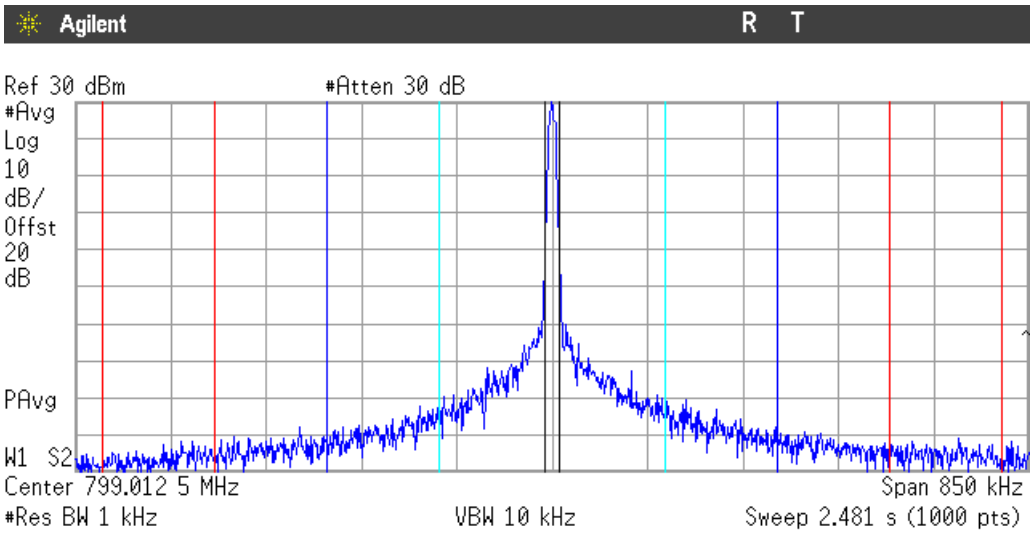
P25 C4FM 8.1 kHz. 799-805 MHz band.

Lowest Channel



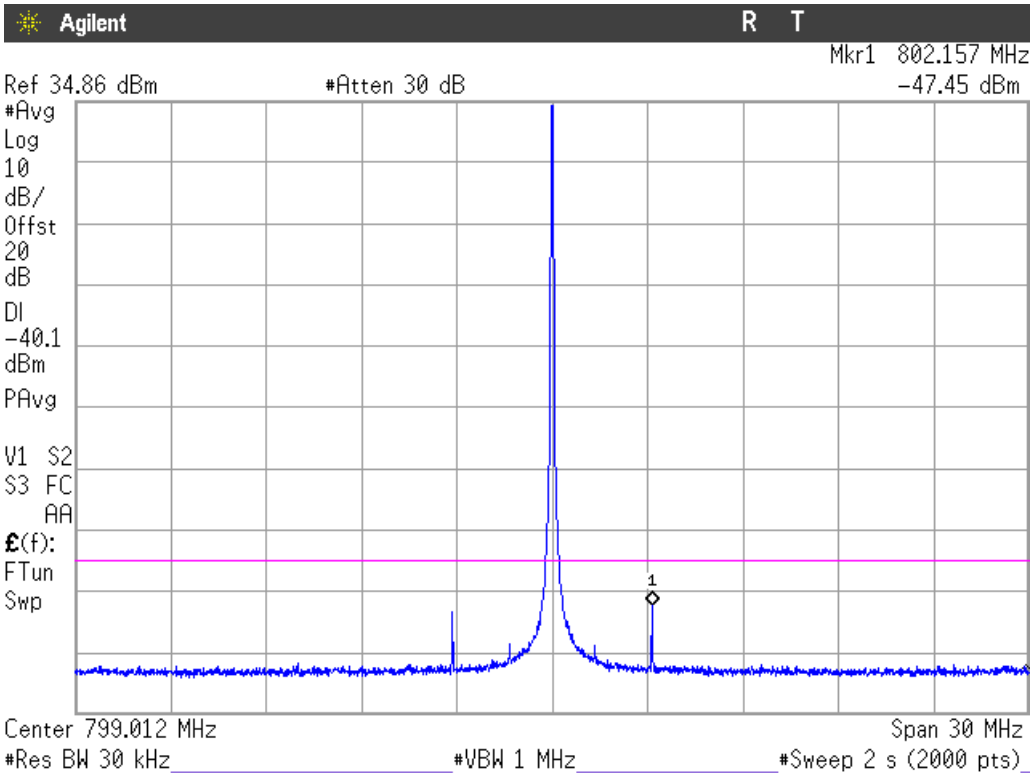
RMS Results
Carrier Power
34.86 dBm /
12.5000 kHz

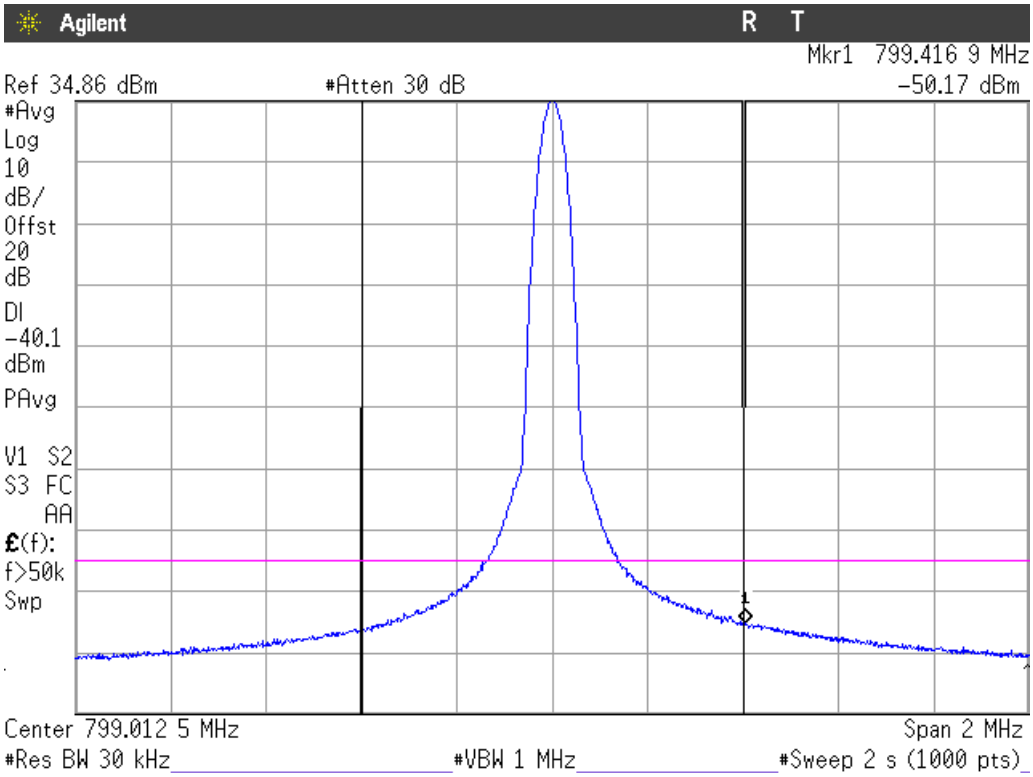
Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
9.375 kHz	6.250 kHz	-53.10	-18.24	-50.27	-15.42
15.63 kHz	6.250 kHz	-63.69	-28.83	-64.81	-29.96
21.88 kHz	6.250 kHz	-66.09	-31.23	-66.52	-31.66
37.50 kHz	25.00 kHz	-64.07	-29.21	-64.31	-29.45
62.50 kHz	25.00 kHz	-69.27	-34.41	-69.52	-34.67
87.50 kHz	25.00 kHz	-73.99	-39.14	-74.19	-39.33

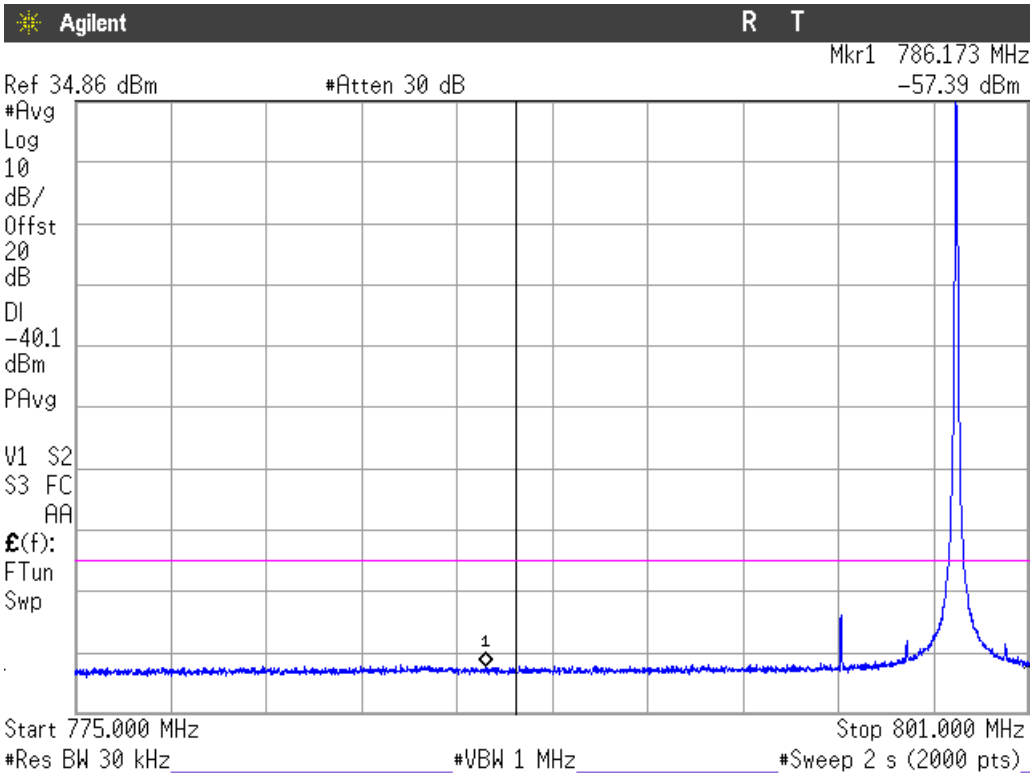


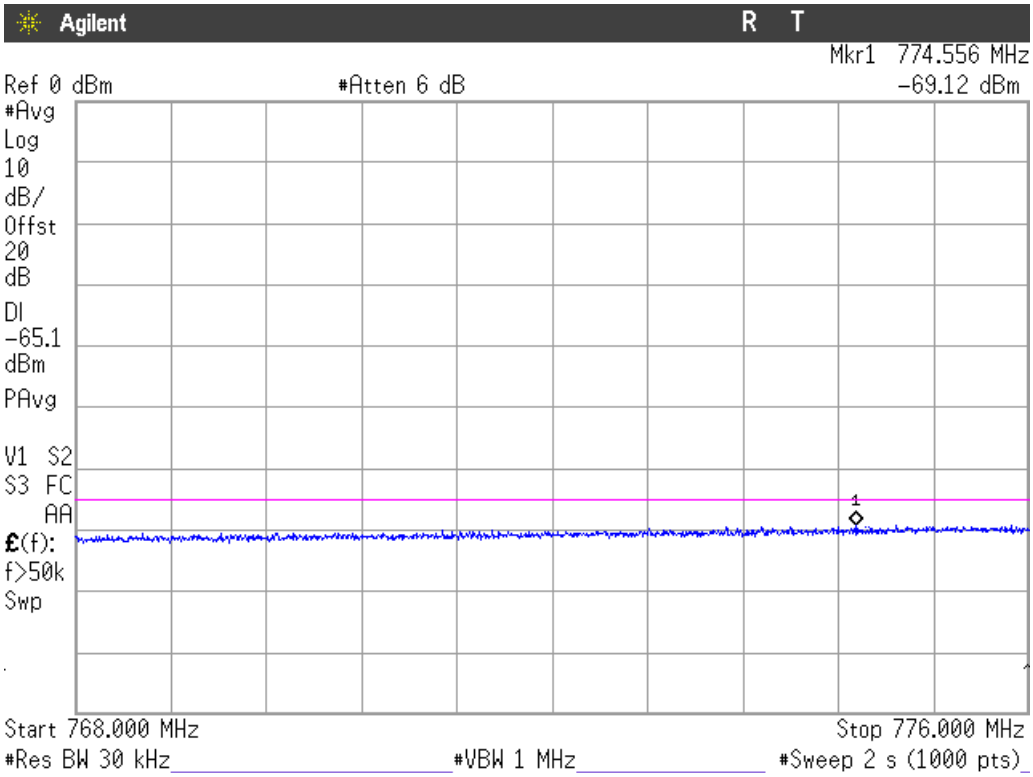
RMS Results
Carrier Power
35.32 dBm /
12.5000 kHz

Freq Offset	Ref BW	Lower dBc	Lower dBm	Upper dBc	Upper dBm
150.0 kHz	100.0 kHz	-73.85	-38.52	-73.06	-37.74
250.0 kHz	100.0 kHz	-79.18	-43.86	-78.59	-43.27
350.0 kHz	100.0 kHz	-81.69	-46.37	-80.75	-45.43

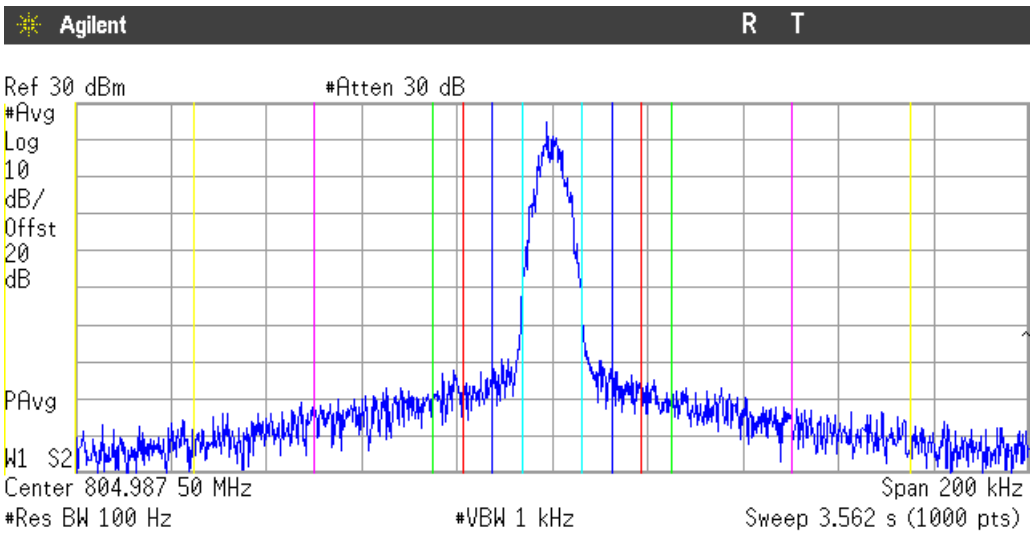

Agilent
R T
Mkr1 802.157 MHz
Ref 34.86 dBm
#Atten 30 dB
-47.45 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-40.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 799.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 799.416 9 MHz
Ref 34.86 dBm
#Atten 30 dB
-50.17 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-40.1
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)

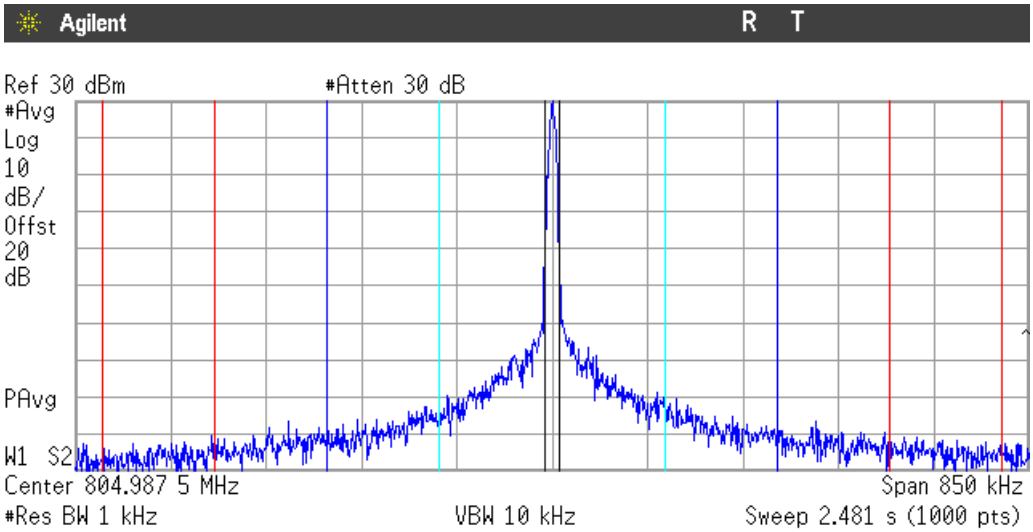

Agilent
R T
Mkr1 786.173 MHz
Ref 34.86 dBm
#Atten 30 dB
-57.39 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-40.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Start 775.000 MHz
Stop 801.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 774.556 MHz
Ref 0 dBm
#Atten 6 dB
-69.12 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-65.1
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)

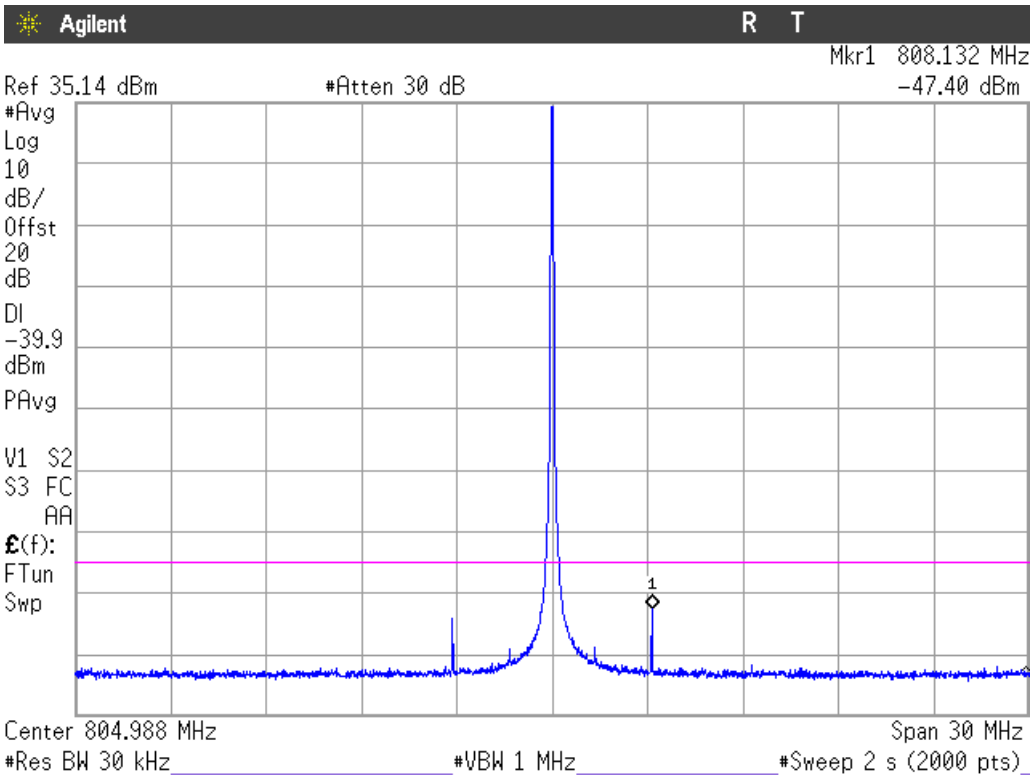
Highest Channel

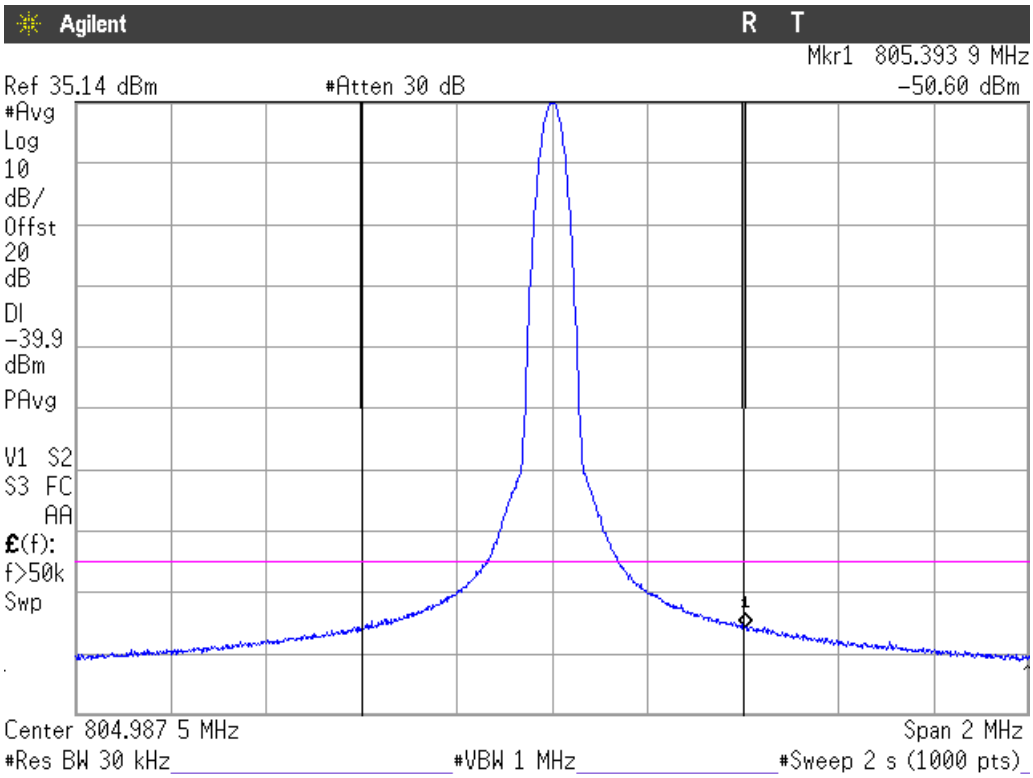


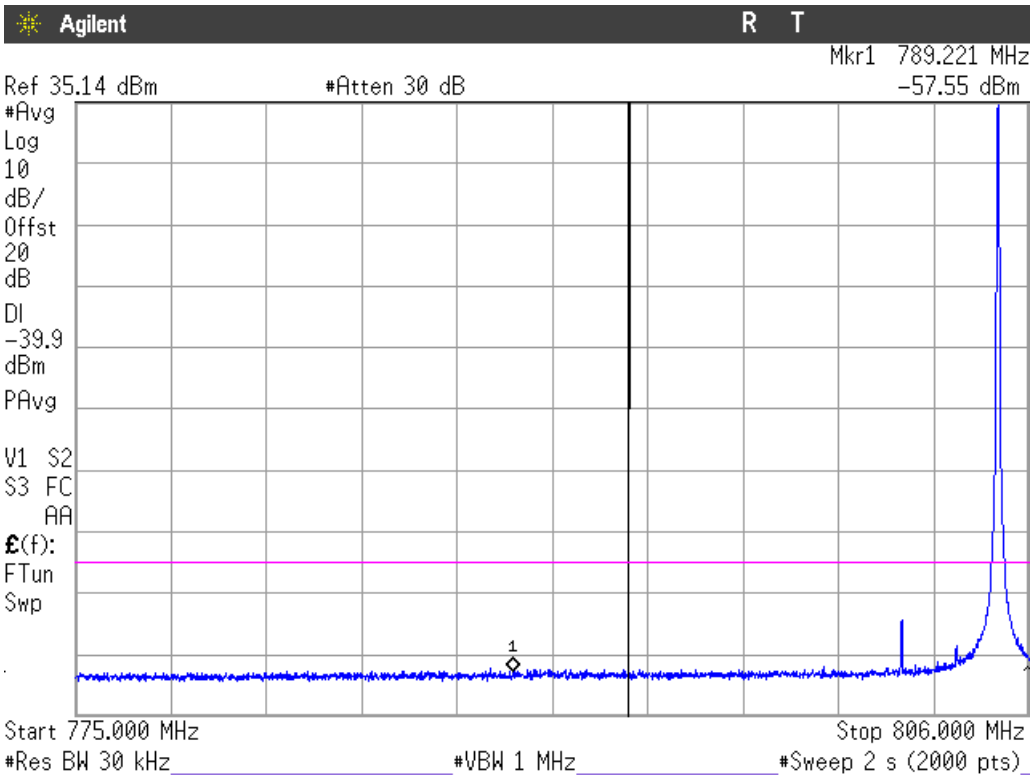
RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	9.375 kHz	6.250 kHz	-50.58	-15.43	-55.93	-20.79
35.14 dBm /	15.63 kHz	6.250 kHz	-64.86	-29.71	-63.86	-28.72
12.5000 kHz	21.88 kHz	6.250 kHz	-65.08	-29.93	-66.82	-31.67
	37.50 kHz	25.00 kHz	-63.95	-28.81	-64.15	-29.01
	62.50 kHz	25.00 kHz	-69.49	-34.35	-69.90	-34.76
	87.50 kHz	25.00 kHz	-73.90	-38.76	-73.68	-38.53

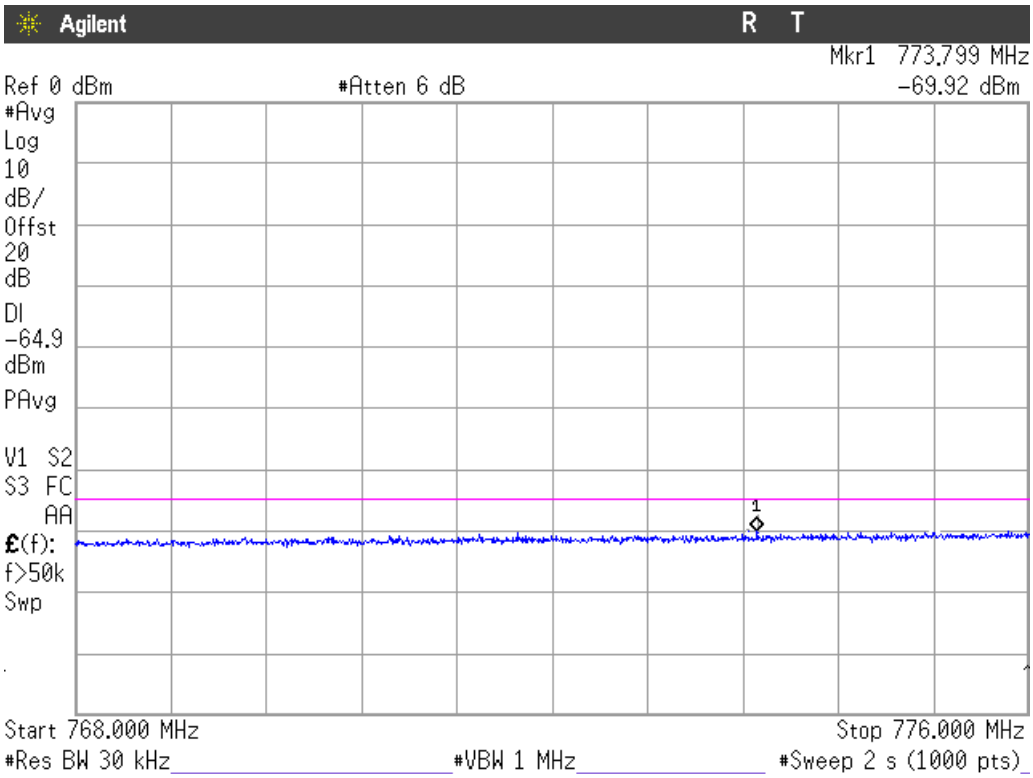


RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	150.0 kHz	100.0 kHz	-73.49	-38.53	-72.63	-37.67
34.96 dBm /	250.0 kHz	100.0 kHz	-77.97	-43.01	-77.47	-42.52
12.5000 kHz	350.0 kHz	100.0 kHz	-81.07	-46.11	-79.99	-45.03


Agilent
R T
Mkr1 808.132 MHz
Ref 35.14 dBm
#Atten 30 dB
-47.40 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-39.9
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 804.988 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

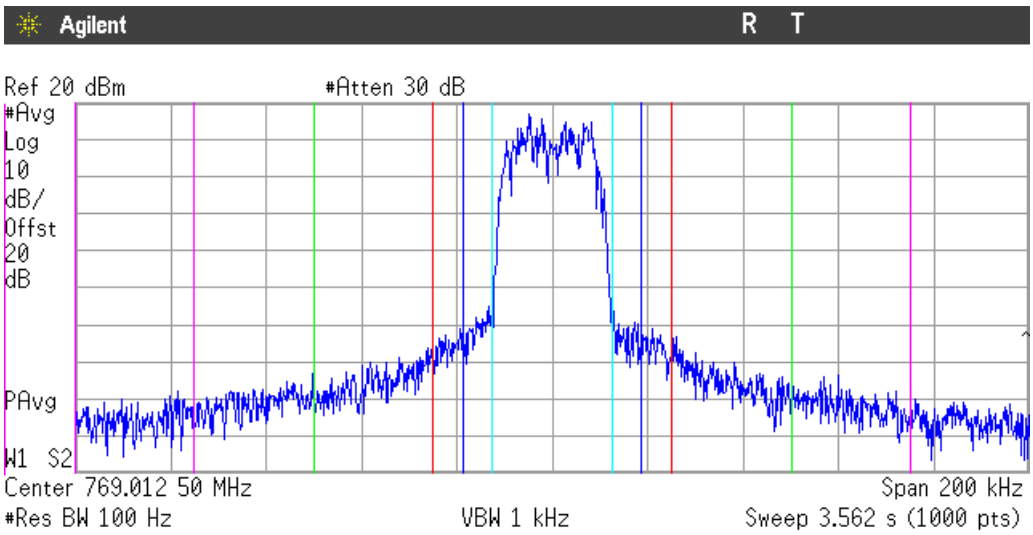

Agilent
R T
Mkr1 805.393 9 MHz
Ref 35.14 dBm
#Atten 30 dB
-50.60 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-39.9
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 804.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 789.221 MHz
Ref 35.14 dBm
#Atten 30 dB
-57.55 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-39.9
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 773.799 MHz
Ref 0 dBm
#Atten 6 dB
-69.92 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-64.9
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)

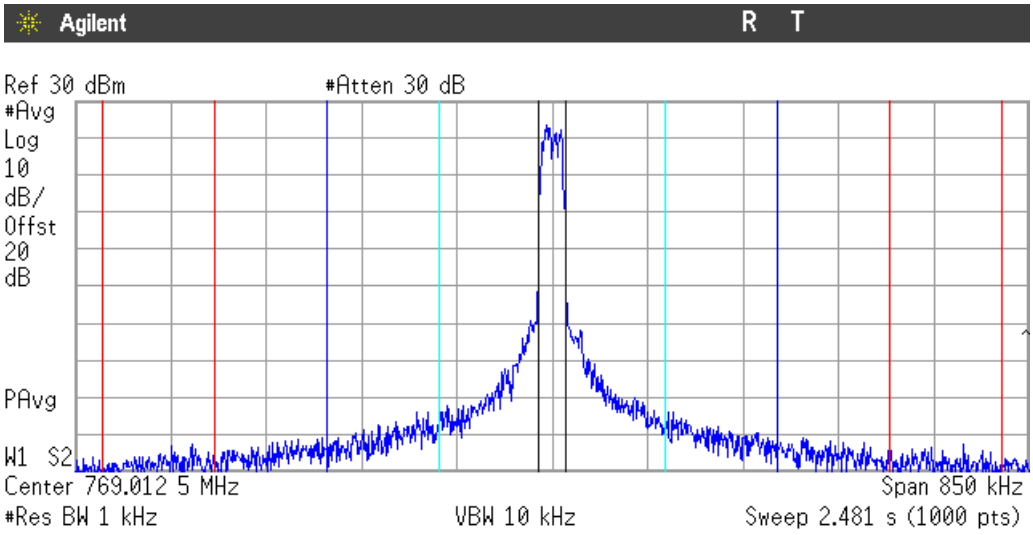
TI D-LMR 20 kHz. 769-775 MHz band.

Lowest Channel



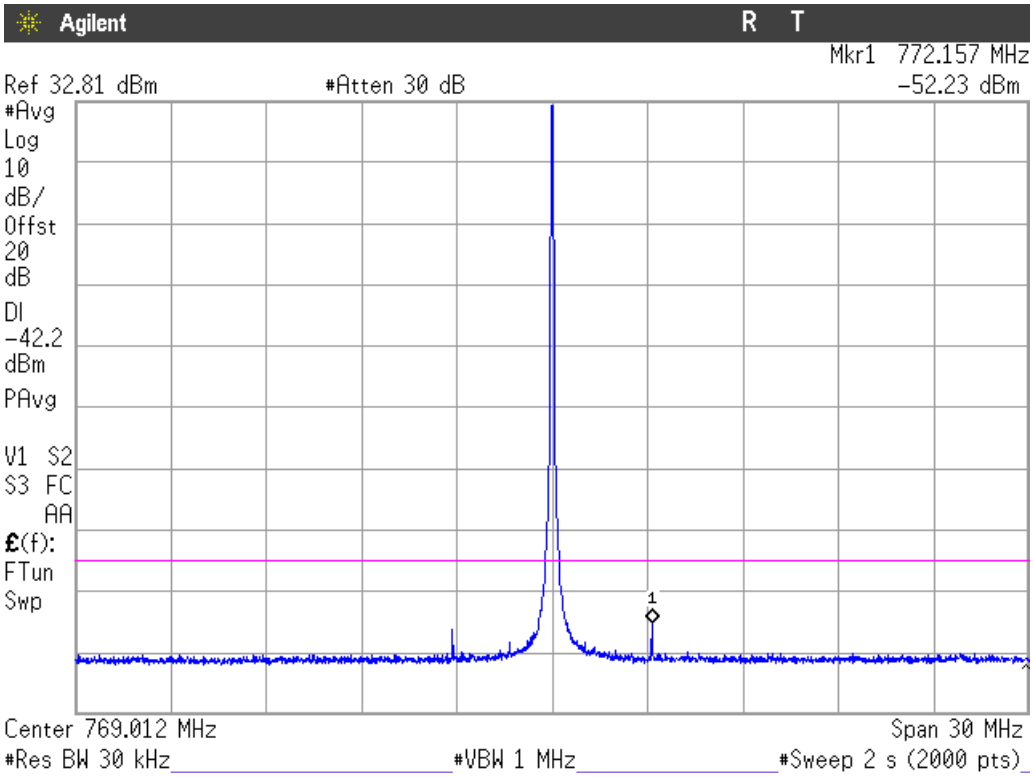
RMS Results

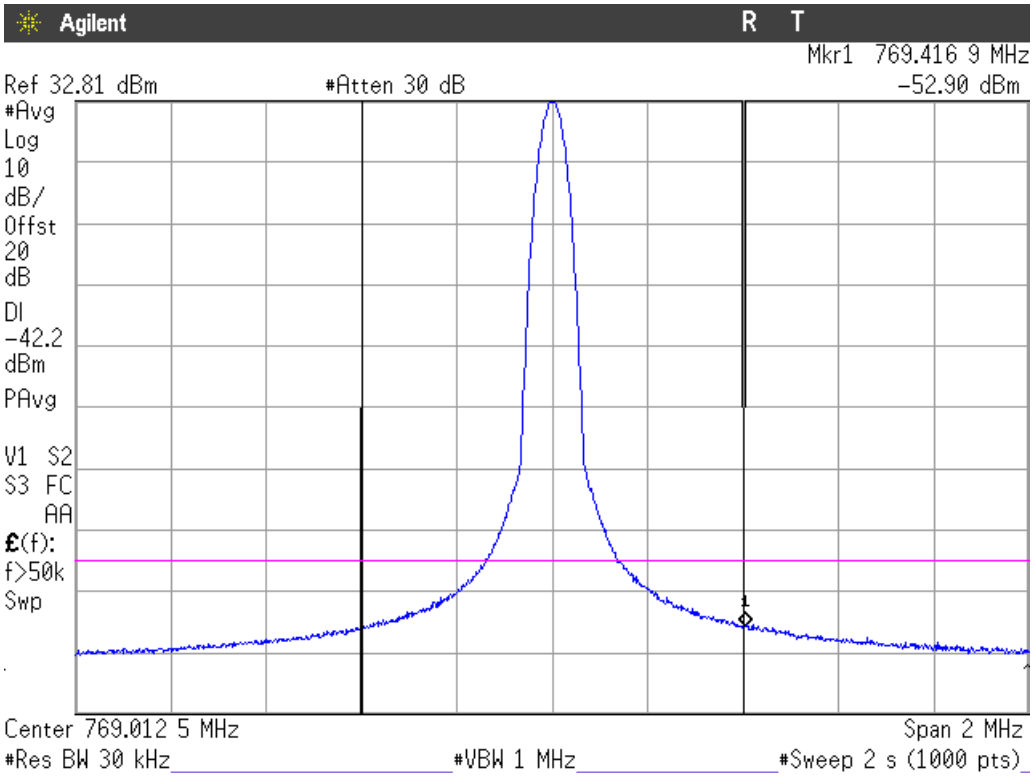
	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	15.63 kHz	6.250 kHz	-55.69	-22.88	-57.29	-24.48
32.81 dBm /	21.88 kHz	6.250 kHz	-60.87	-28.06	-60.63	-27.82
25.0000 kHz	37.50 kHz	25.00 kHz	-62.71	-29.90	-62.25	-29.44
	62.50 kHz	25.00 kHz	-69.41	-36.60	-70.01	-37.20
	87.50 kHz	25.00 kHz	-73.77	-40.96	-74.49	-41.68

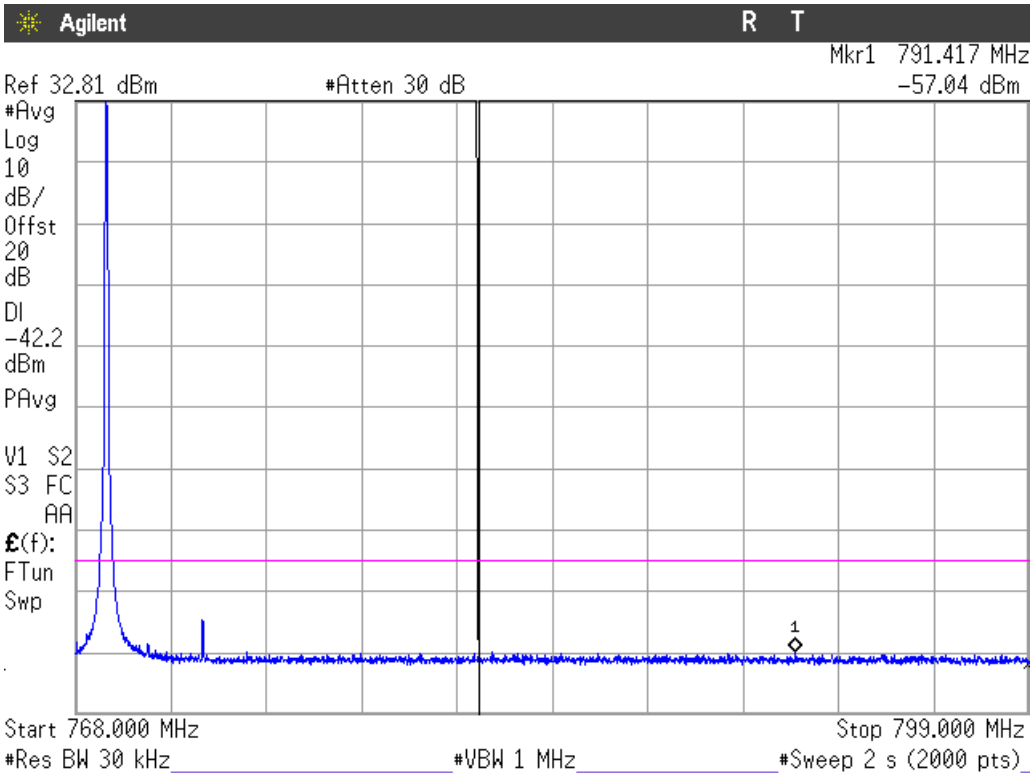


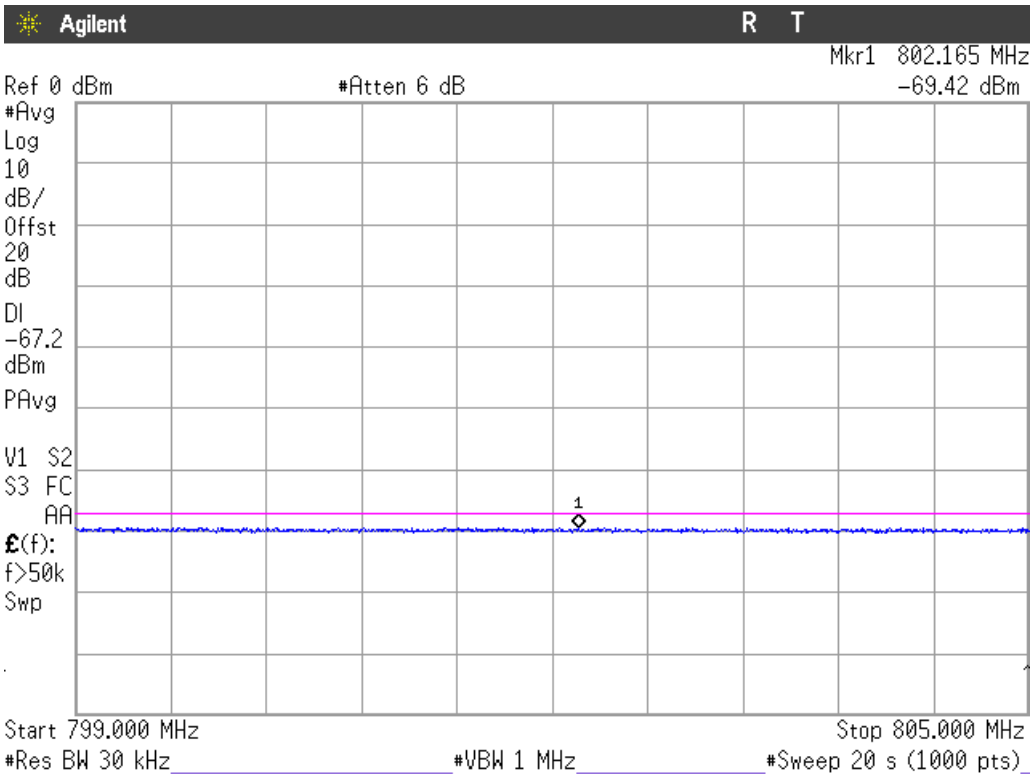
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	150.0 kHz	100.0 kHz	-73.33	-40.41	-73.30	-40.37
32.92 dBm /	250.0 kHz	100.0 kHz	-78.38	-45.45	-78.28	-45.36
25.0000 kHz	350.0 kHz	100.0 kHz	-80.95	-48.03	-80.66	-47.74

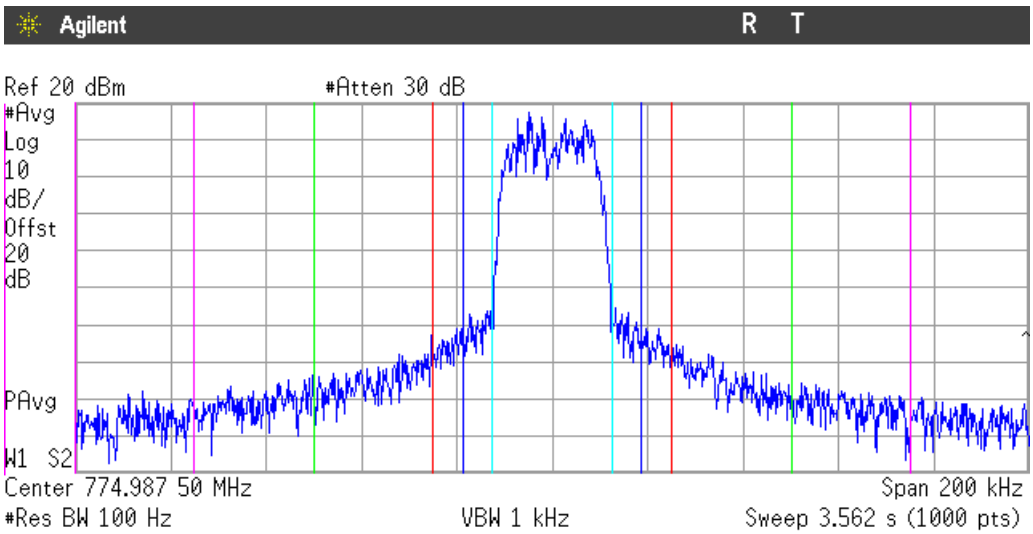

Agilent
R T
Mkr1 772.157 MHz
Ref 32.81 dBm
#Atten 30 dB
-52.23 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.2
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 769.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 769.416 9 MHz
Ref 32.81 dBm
#Atten 30 dB
-52.90 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.2
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 791.417 MHz
Ref 32.81 dBm
#Atten 30 dB
-57.04 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.2
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)

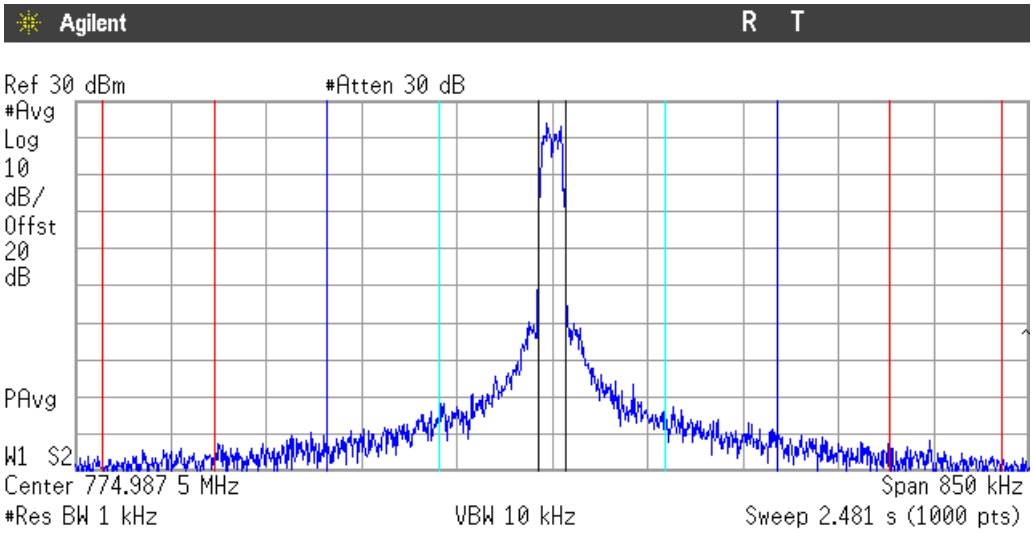

Agilent
R T
Mkr1 802.165 MHz
Ref 0 dBm
#Atten 6 dB
-69.42 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-67.2
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 799.000 MHz
Stop 805.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

Highest Channel



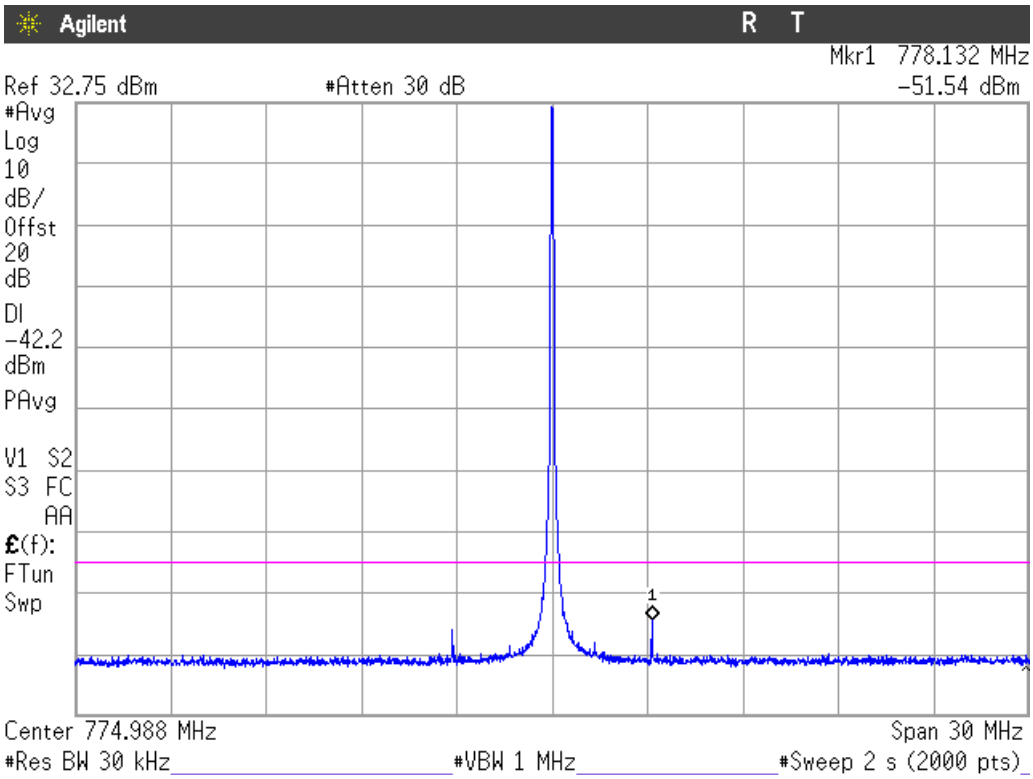
RMS Results
Carrier Power
32.75 dBm /
25.0000 kHz

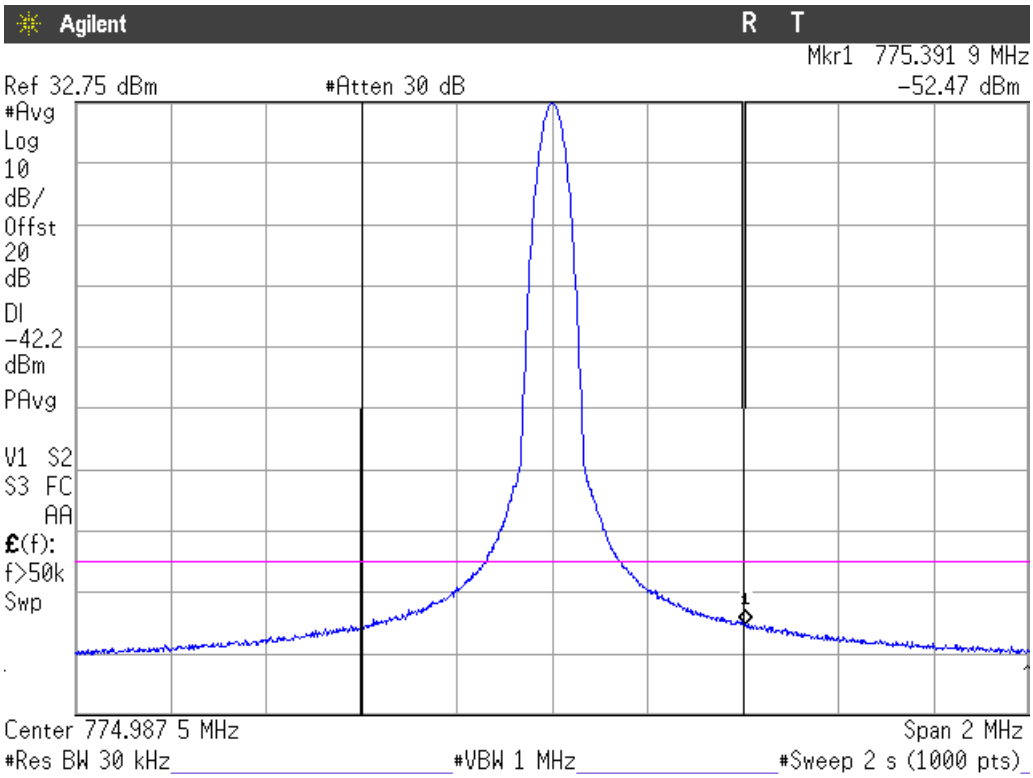
Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
15.63 kHz	6.250 kHz	-55.55	-22.79	-55.76	-23.01
21.88 kHz	6.250 kHz	-60.36	-27.61	-60.40	-27.64
37.50 kHz	25.00 kHz	-62.05	-29.29	-62.35	-29.60
62.50 kHz	25.00 kHz	-69.76	-37.00	-70.63	-37.88
87.50 kHz	25.00 kHz	-74.04	-41.28	-74.12	-41.36

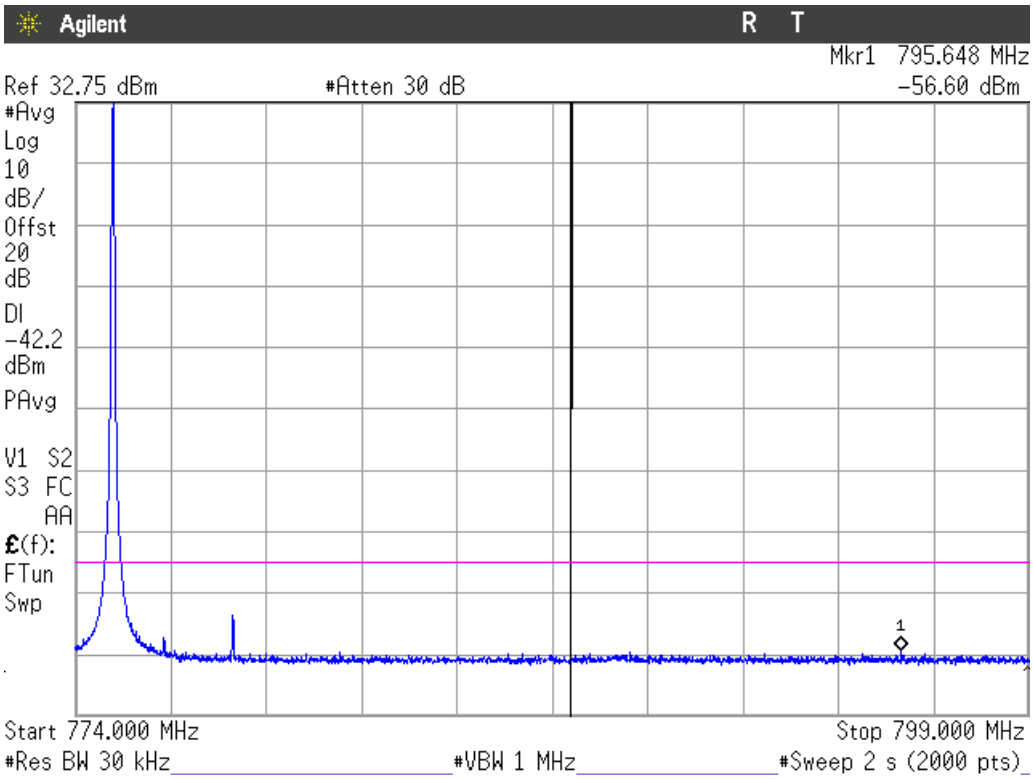


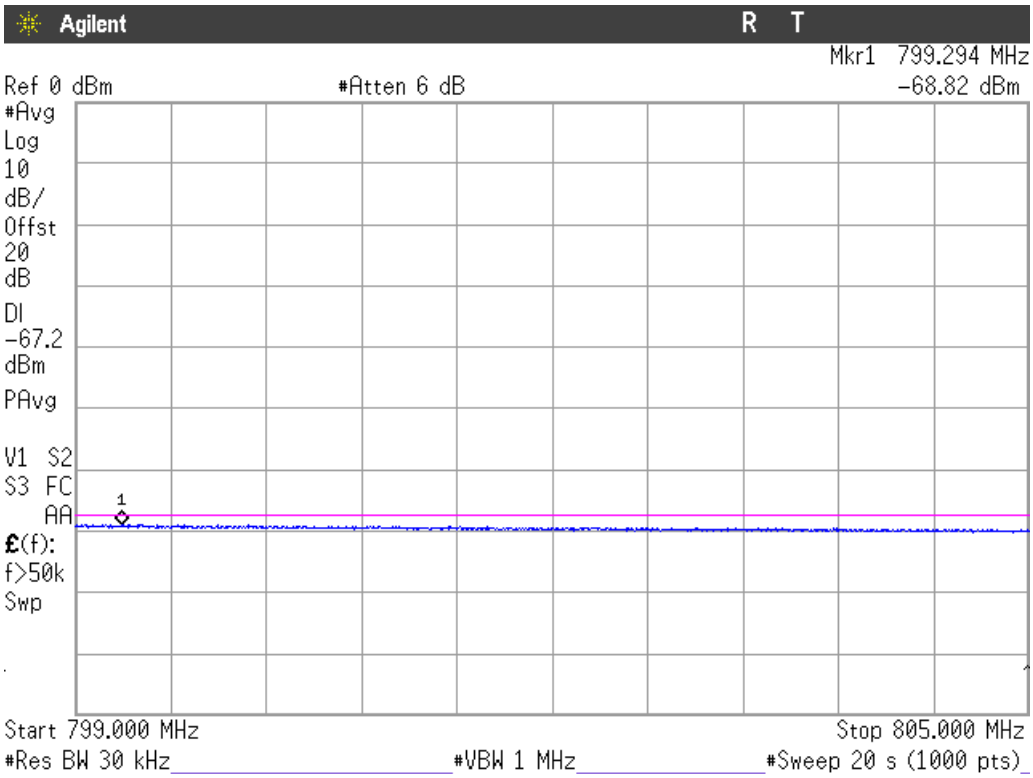
RMS Results
Carrier Power
32.86 dBm /
25.0000 kHz

Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
150.0 kHz	100.0 kHz	-72.83	-39.97	-72.41	-39.55
250.0 kHz	100.0 kHz	-78.12	-45.26	-77.58	-44.72
350.0 kHz	100.0 kHz	-80.53	-47.68	-80.38	-47.52


Agilent
R T
Mkr1 778.132 MHz
Ref 32.75 dBm
#Atten 30 dB
-51.54 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.2
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 774.988 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

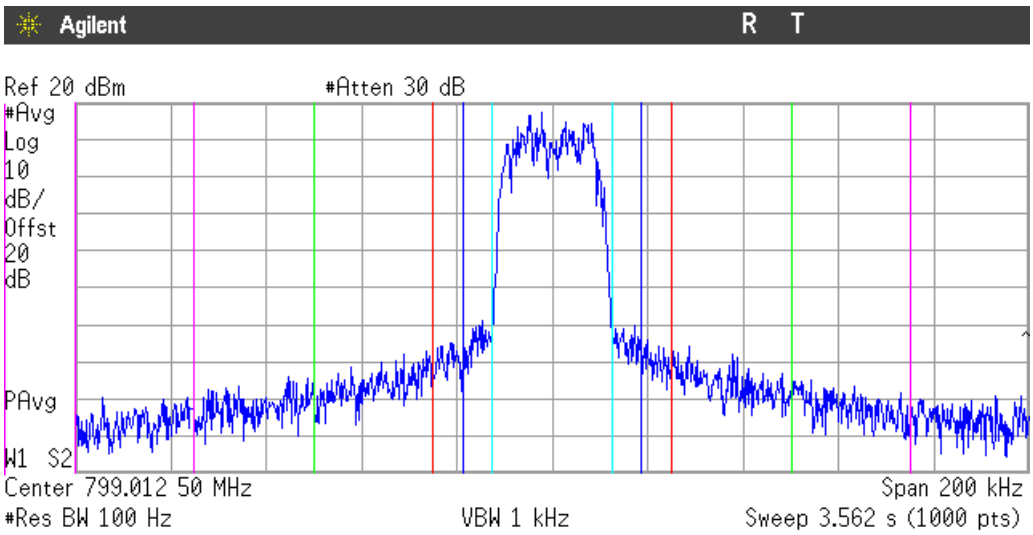

Agilent
R T
Mkr1 775.391 9 MHz
Ref 32.75 dBm
#Atten 30 dB
-52.47 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.2
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 774.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 795.648 MHz
Ref 32.75 dBm
#Atten 30 dB
-56.60 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.2
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)

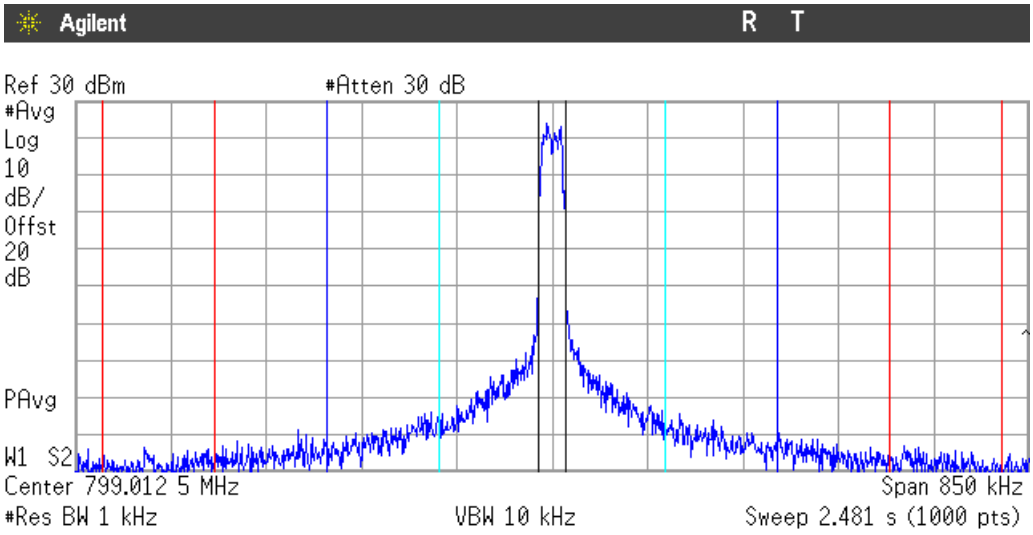

Agilent
R T
Mkr1 799.294 MHz
Ref 0 dBm
#Atten 6 dB
-68.82 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-67.2
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 799.000 MHz
Stop 805.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

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

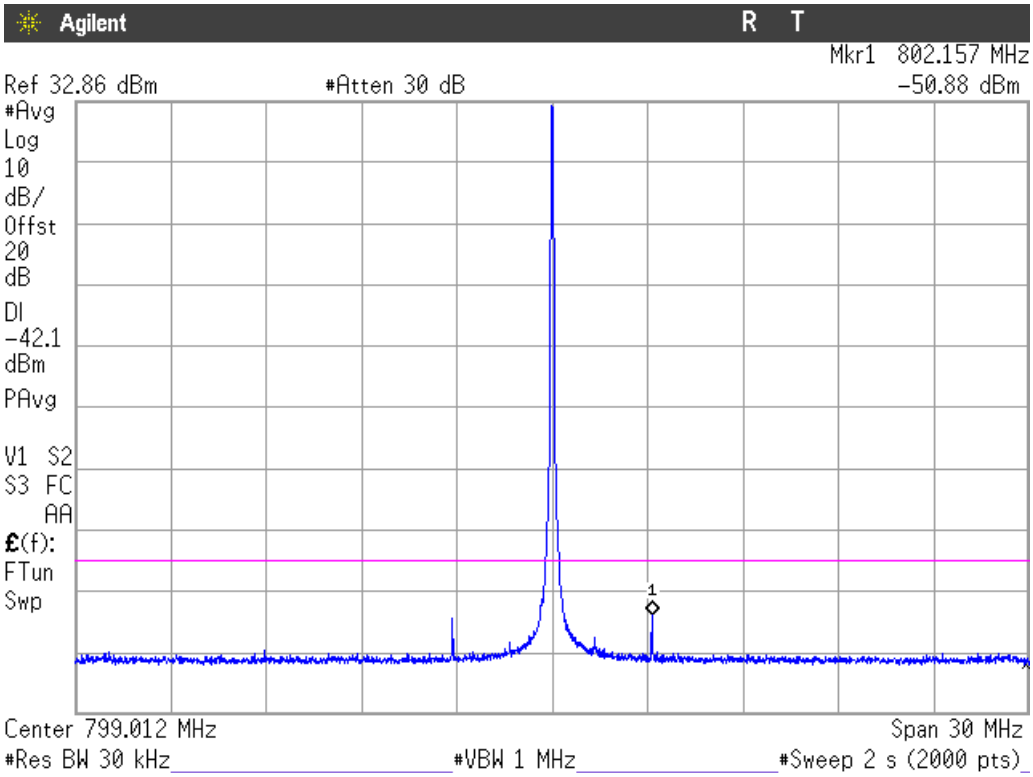
Lowest Channel

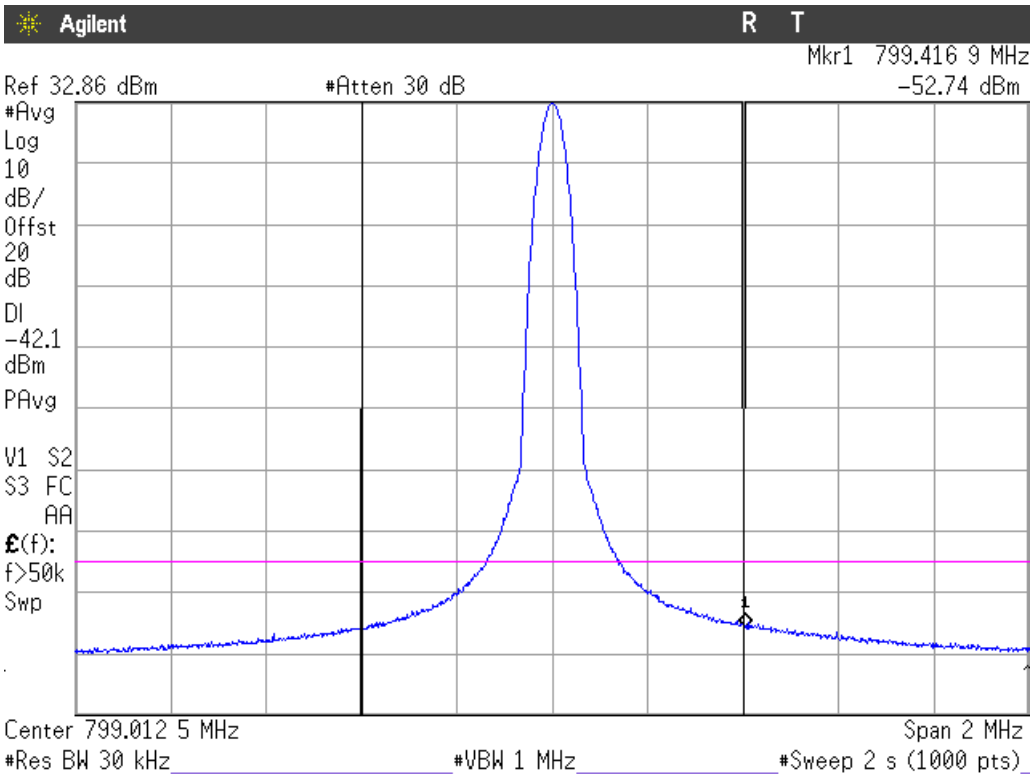


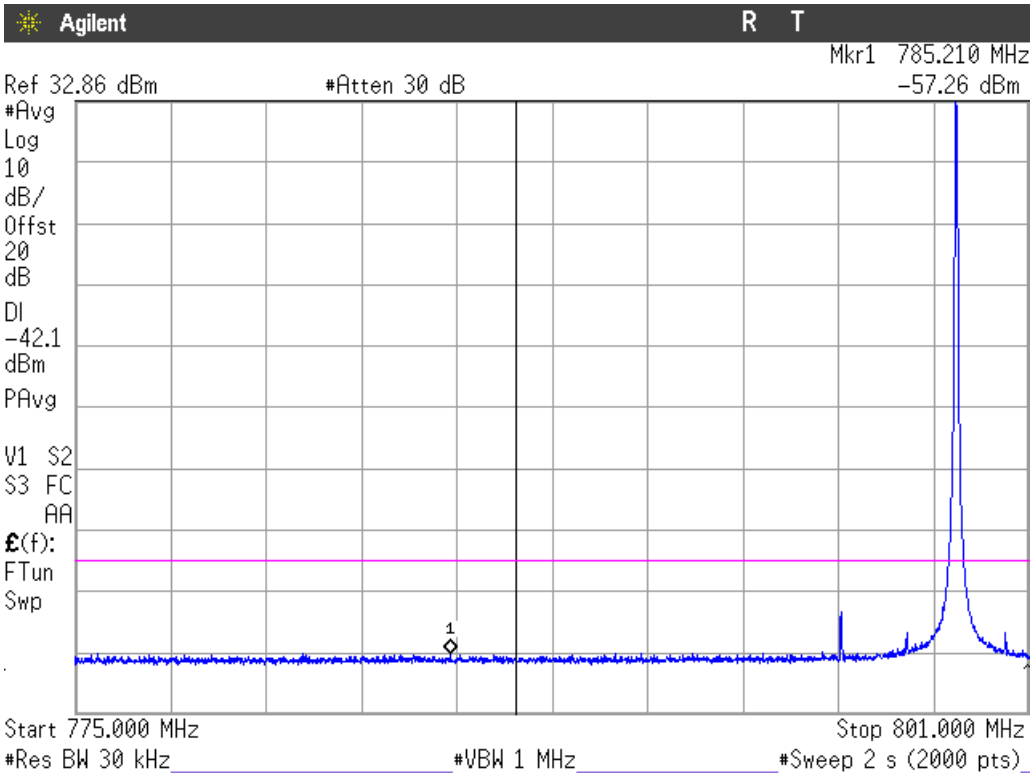
RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	15.63 kHz	6.250 kHz	-58.87	-26.01	-59.31	-26.45
32.86 dBm /	21.88 kHz	6.250 kHz	-63.97	-31.12	-64.43	-31.58
25.0000 kHz	37.50 kHz	25.00 kHz	-64.02	-31.16	-63.59	-30.74
	62.50 kHz	25.00 kHz	-69.95	-37.09	-69.98	-37.12
	87.50 kHz	25.00 kHz	-74.55	-41.70	-73.88	-41.02

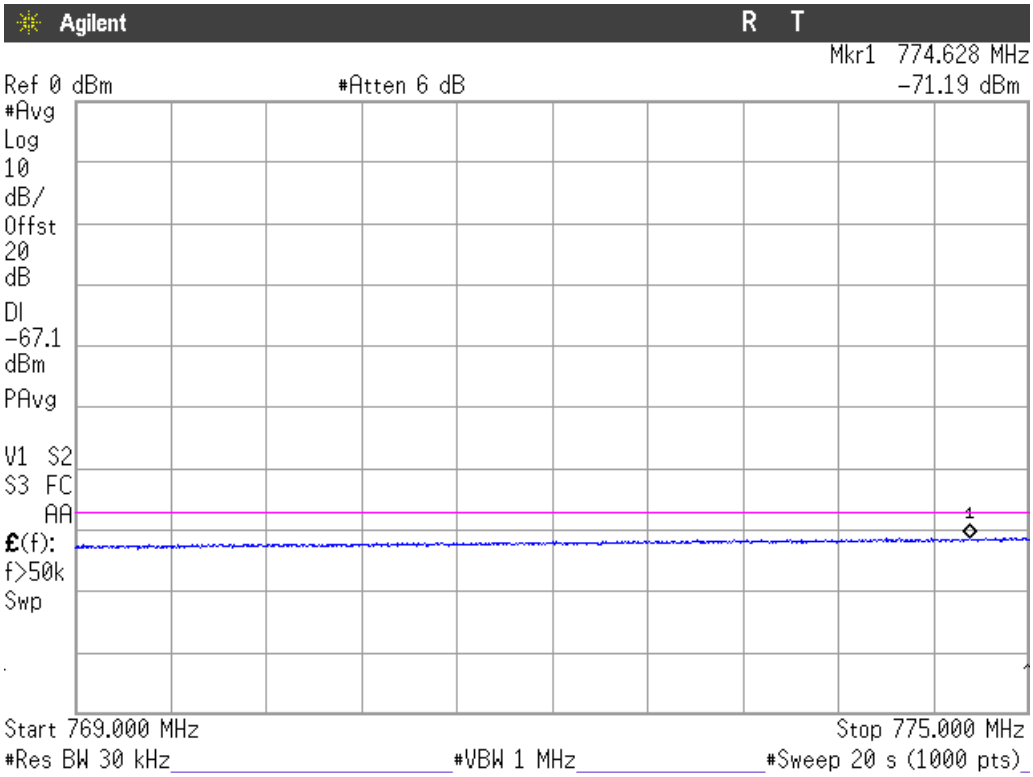


RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	150.0 kHz	100.0 kHz	-73.45	-40.46	-74.02	-41.03
32.99 dBm /	250.0 kHz	100.0 kHz	-78.69	-45.70	-78.43	-45.44
25.0000 kHz	350.0 kHz	100.0 kHz	-81.21	-48.22	-80.83	-47.84

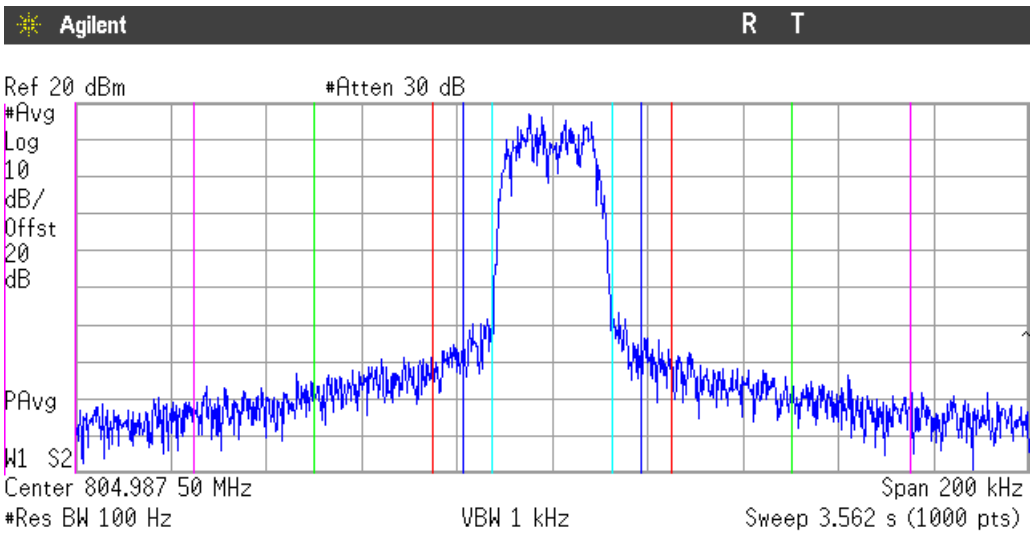

Agilent
R T
Mkr1 802.157 MHz
Ref 32.86 dBm
#Atten 30 dB
-50.88 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 799.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 799.416 9 MHz
Ref 32.86 dBm
#Atten 30 dB
-52.74 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
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 785.210 MHz
Ref 32.86 dBm
#Atten 30 dB
-57.26 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
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)

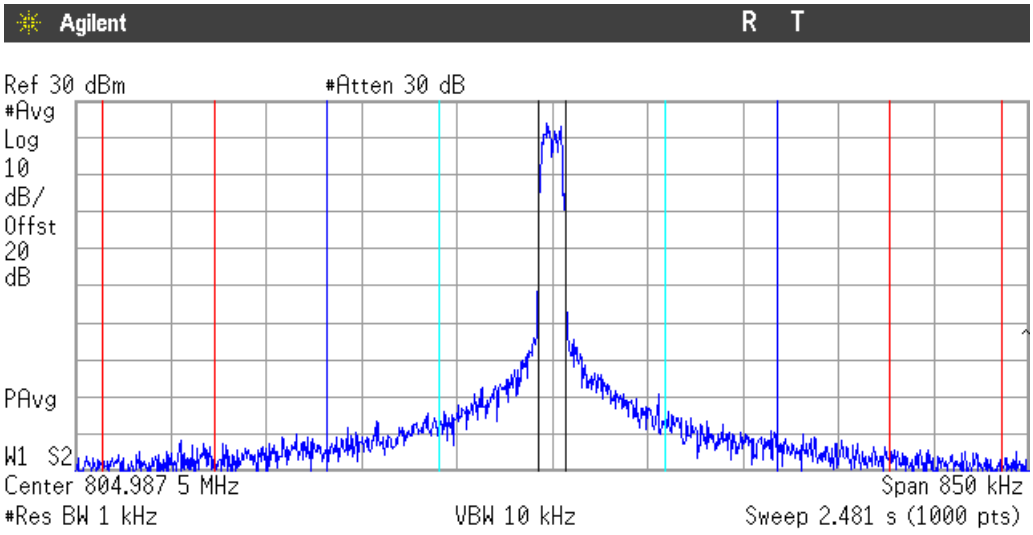

Agilent
R T
Mkr1 774.628 MHz
Ref 0 dBm
#Atten 6 dB
-71.19 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-67.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 769.000 MHz
Stop 775.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

Highest Channel



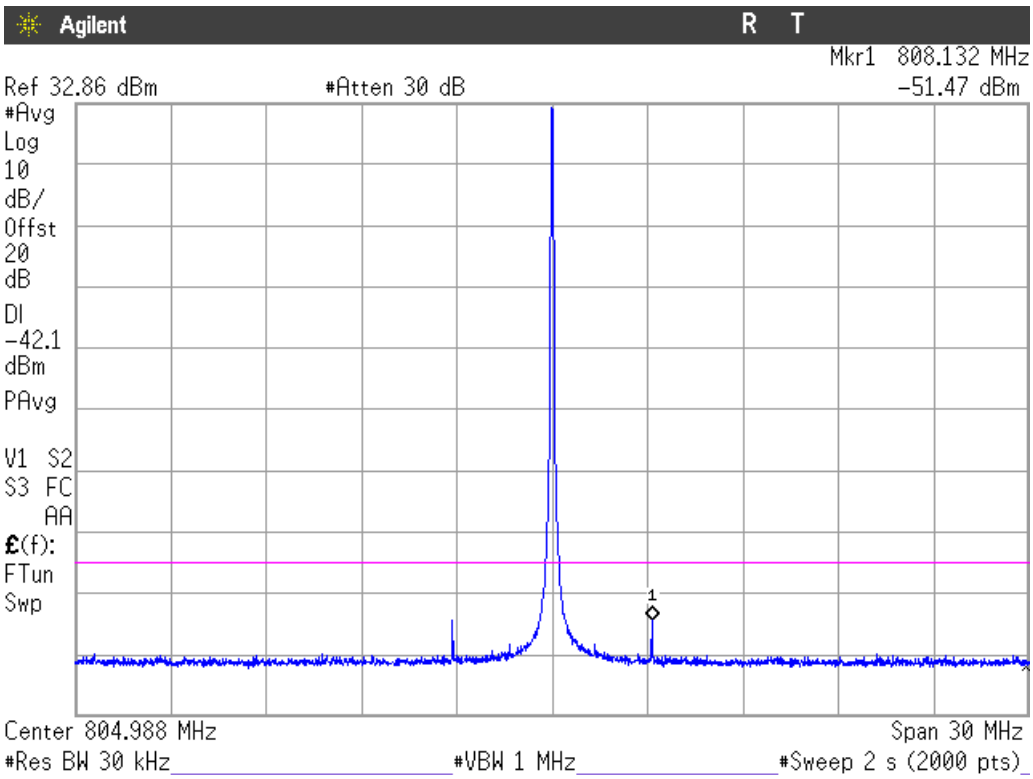
RMS Results
Carrier Power
32.86 dBm /
25.0000 kHz

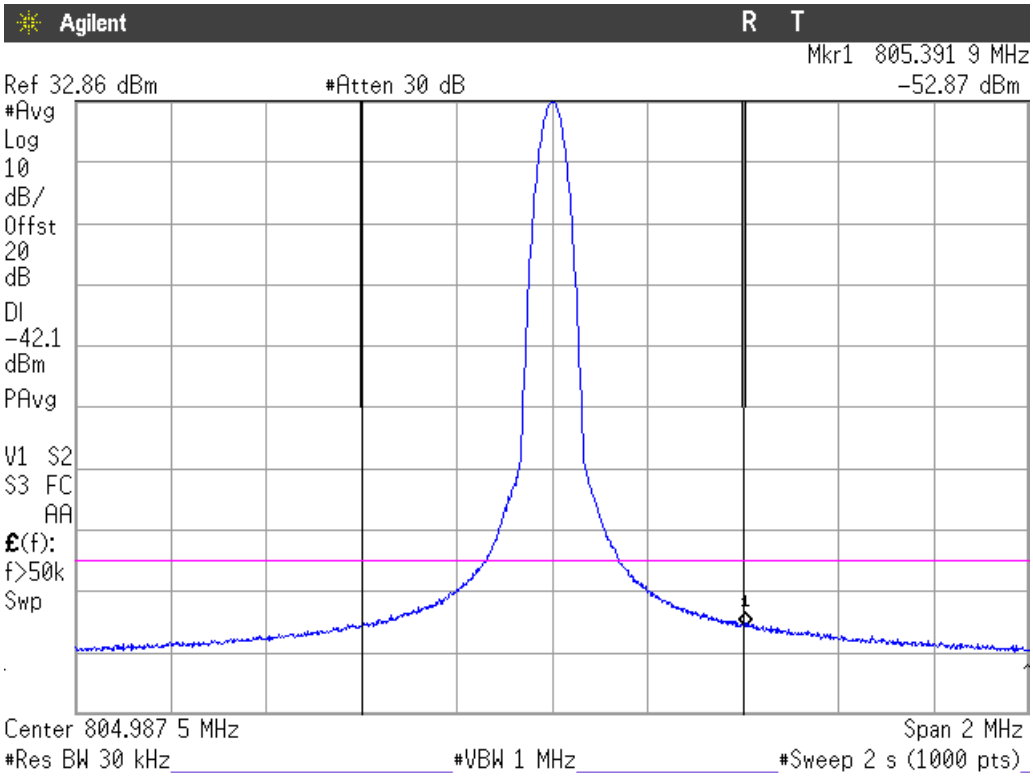
Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
15.63 kHz	6.250 kHz	-58.56	-25.70	-58.78	-25.92
21.88 kHz	6.250 kHz	-64.39	-31.53	-63.79	-30.93
37.50 kHz	25.00 kHz	-63.69	-30.83	-63.96	-31.10
62.50 kHz	25.00 kHz	-70.02	-37.16	-70.00	-37.14
87.50 kHz	25.00 kHz	-74.44	-41.59	-73.67	-40.81

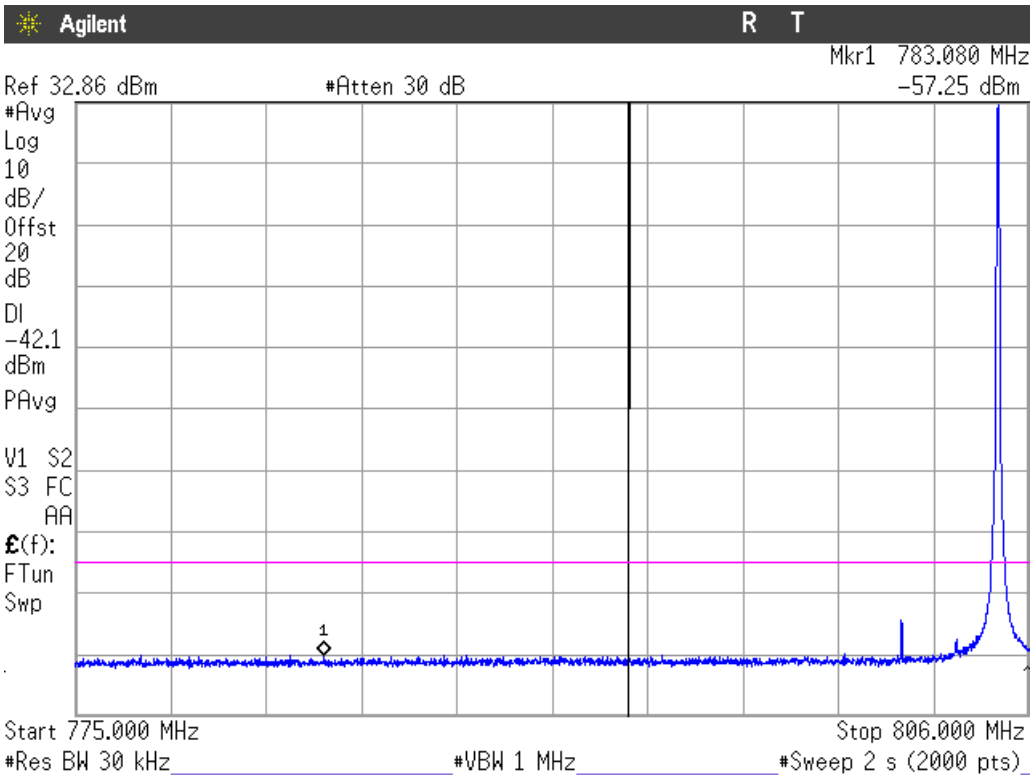


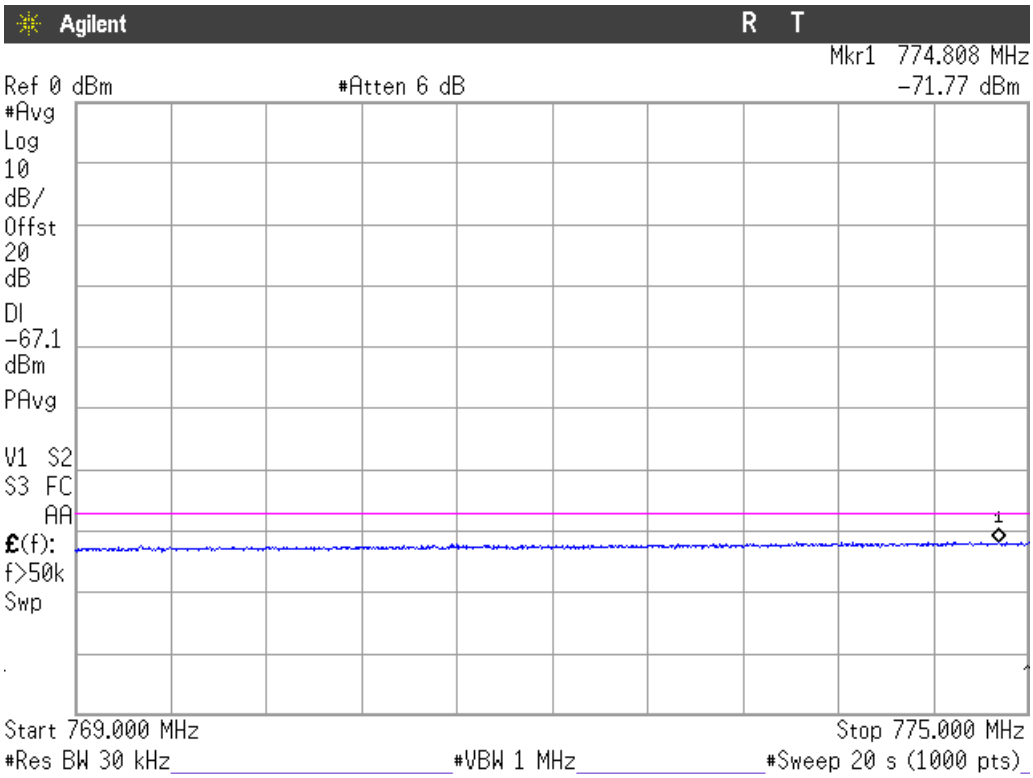
RMS Results
Carrier Power
33.07 dBm /
25.0000 kHz

Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
150.0 kHz	100.0 kHz	-73.55	-40.48	-73.37	-40.29
250.0 kHz	100.0 kHz	-78.29	-45.22	-78.24	-45.17
350.0 kHz	100.0 kHz	-80.78	-47.70	-81.14	-48.06


Agilent
R T
Mkr1 808.132 MHz
Ref 32.86 dBm
#Atten 30 dB
-51.47 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 804.988 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

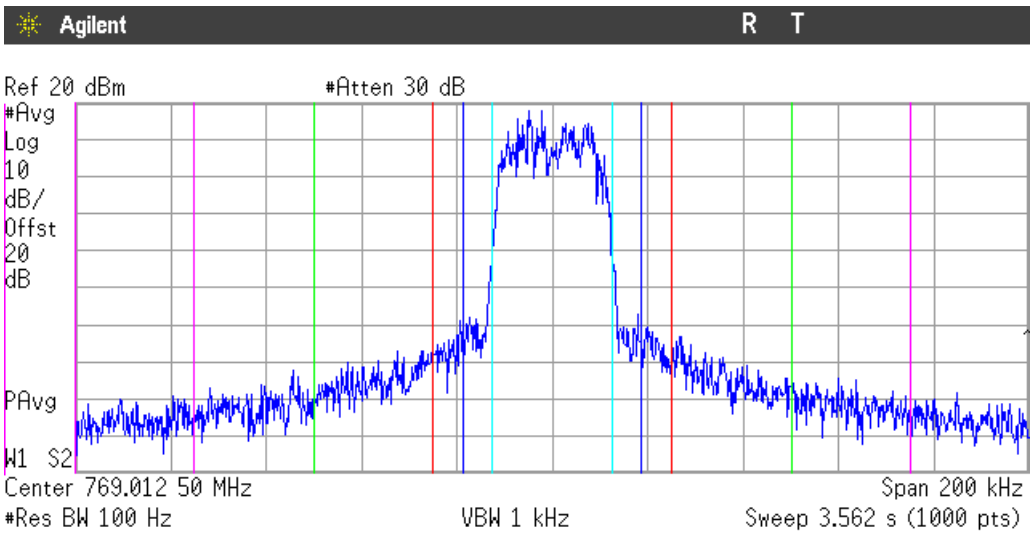

Agilent
R T
Mkr1 805.391 9 MHz
Ref 32.86 dBm
#Atten 30 dB
-52.87 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 804.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 783.080 MHz
Ref 32.86 dBm
#Atten 30 dB
-57.25 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
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 774.808 MHz
Ref 0 dBm
#Atten 6 dB
-71.77 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-67.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 769.000 MHz
Stop 775.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

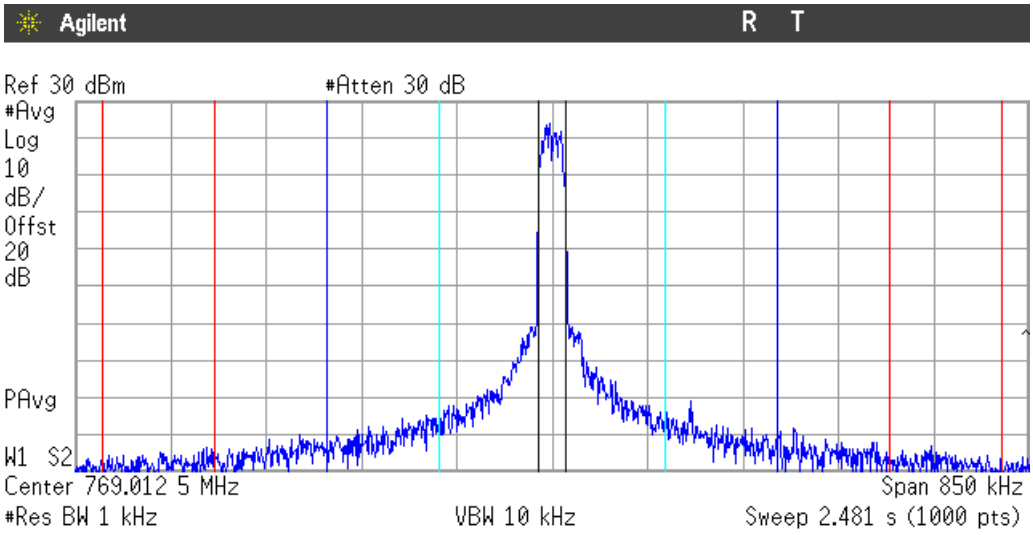
TETRA 22 kHz.769-775 MHz band.

Lowest Channel



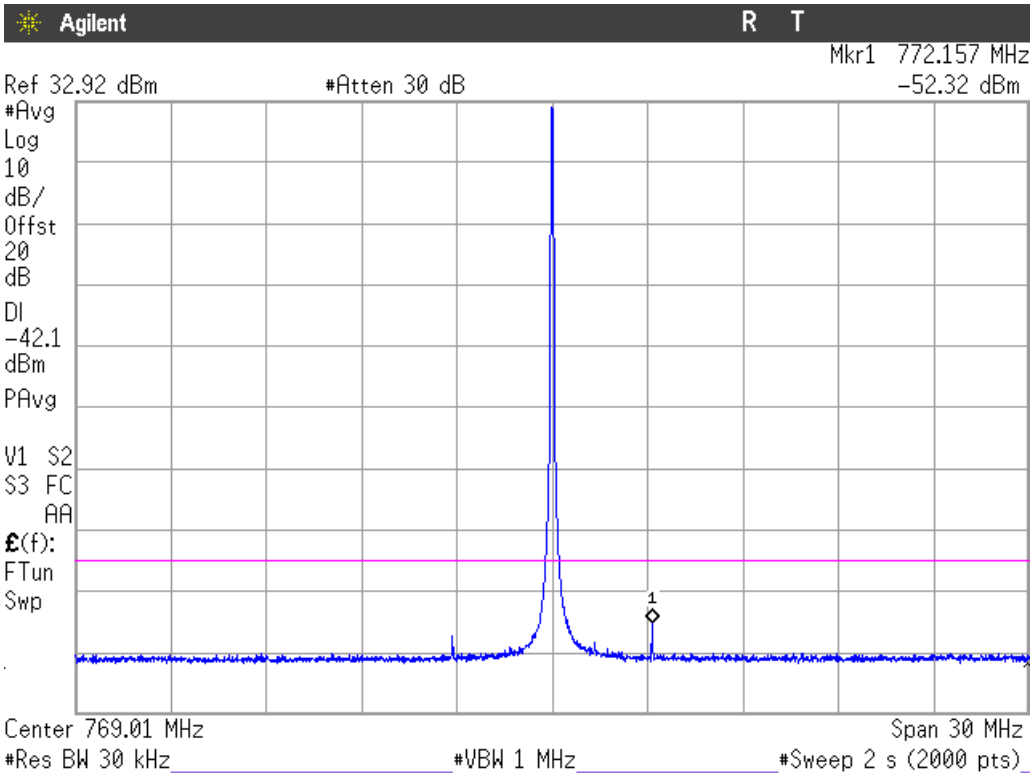
RMS Results

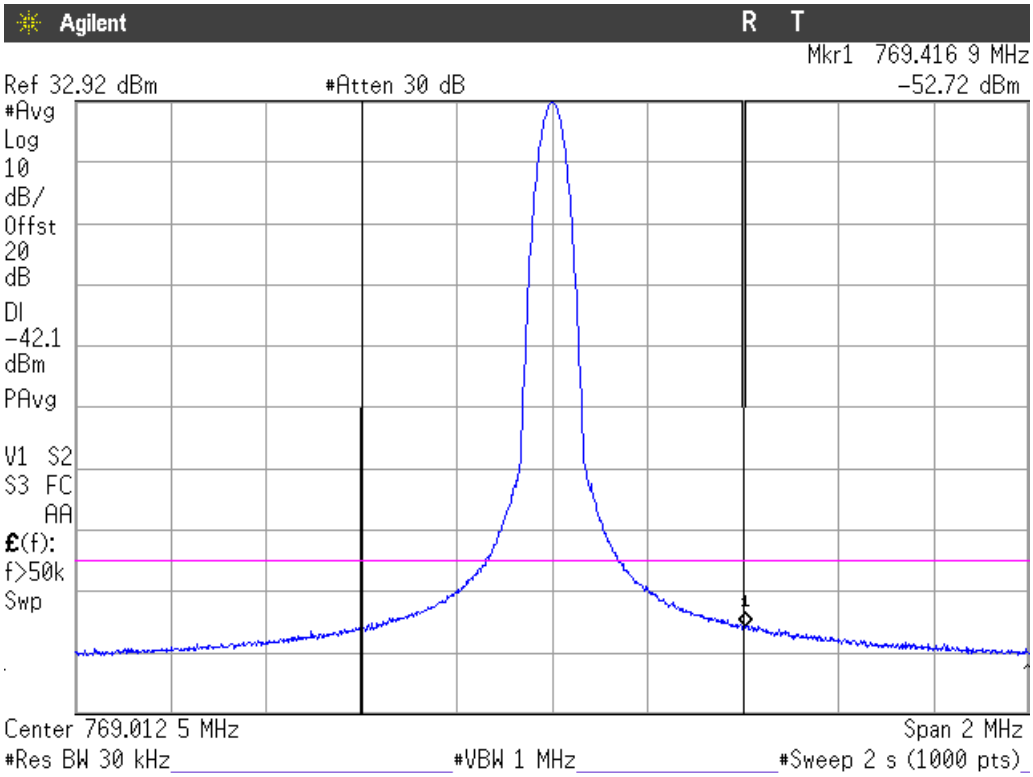
	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 32.92 dBm / 25.0000 kHz	15.63 kHz	6.250 kHz	-46.31	-13.39	-48.88	-15.96
	21.88 kHz	6.250 kHz	-61.38	-28.47	-60.73	-27.82
	37.50 kHz	25.00 kHz	-62.73	-29.81	-61.64	-28.72
	62.50 kHz	25.00 kHz	-70.47	-37.56	-69.83	-36.91
	87.50 kHz	25.00 kHz	-74.43	-41.51	-74.45	-41.53

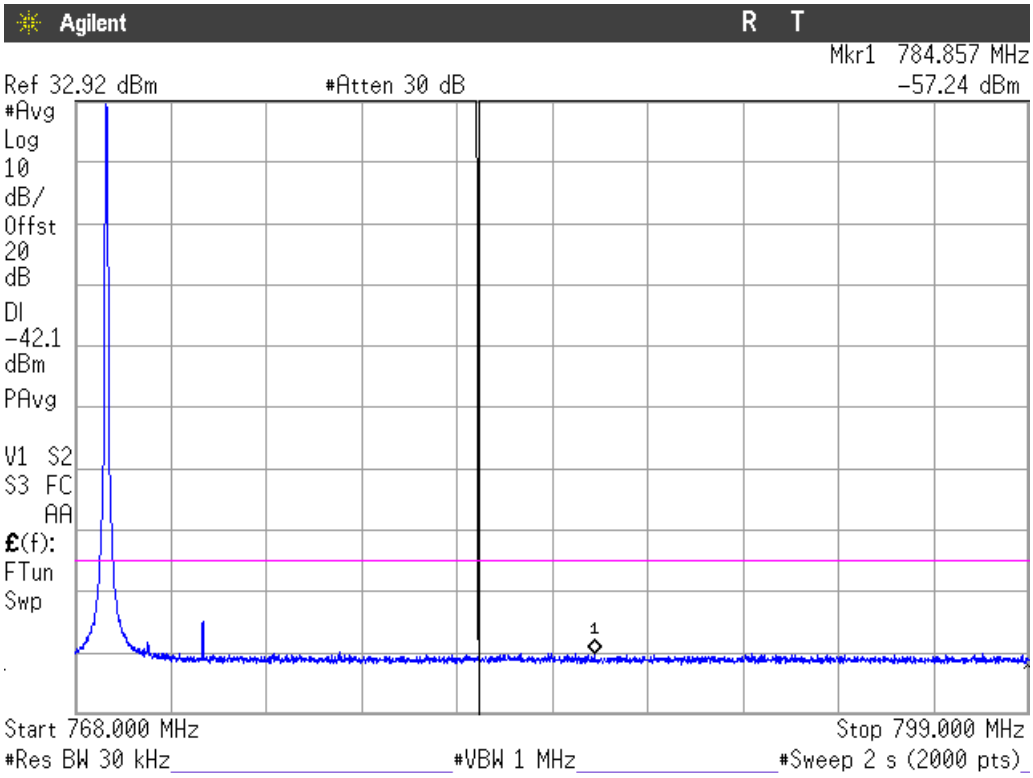


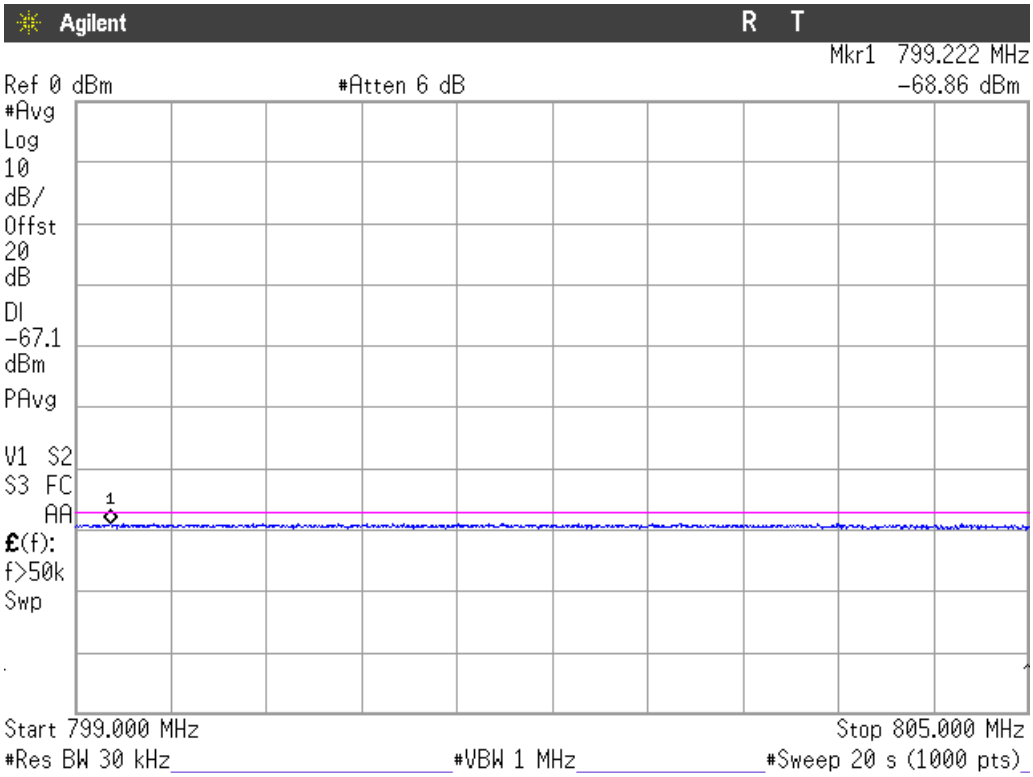
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 33.08 dBm / 25.0000 kHz	150.0 kHz	100.0 kHz	-73.38	-40.30	-72.99	-39.90
	250.0 kHz	100.0 kHz	-78.31	-45.23	-77.82	-44.74
	350.0 kHz	100.0 kHz	-81.14	-48.05	-80.83	-47.75

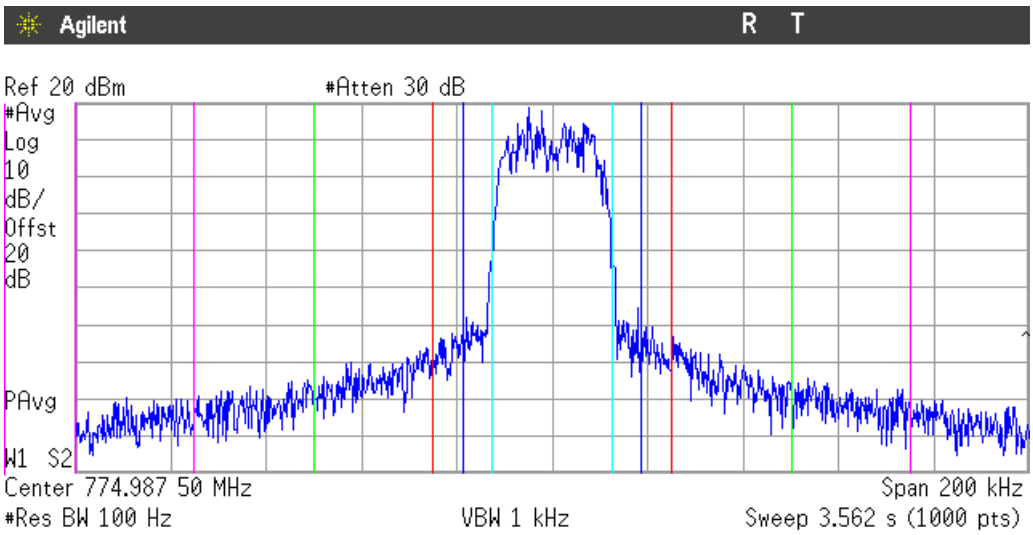

Agilent
R T
Mkr1 772.157 MHz
Ref 32.92 dBm
#Atten 30 dB
-52.32 dBm
#Avg
Log
10
dB/
Offst
20
dB
DI
-42.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 769.01 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 769.416 9 MHz
Ref 32.92 dBm
#Atten 30 dB
-52.72 dBm
#Avg
Log
10
dB/
Offst
20
dB
DI
-42.1
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 784.857 MHz
Ref 32.92 dBm
#Atten 30 dB
-57.24 dBm
#Avg
Log
10
dB/
Offst
20
dB
DI
-42.1
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)

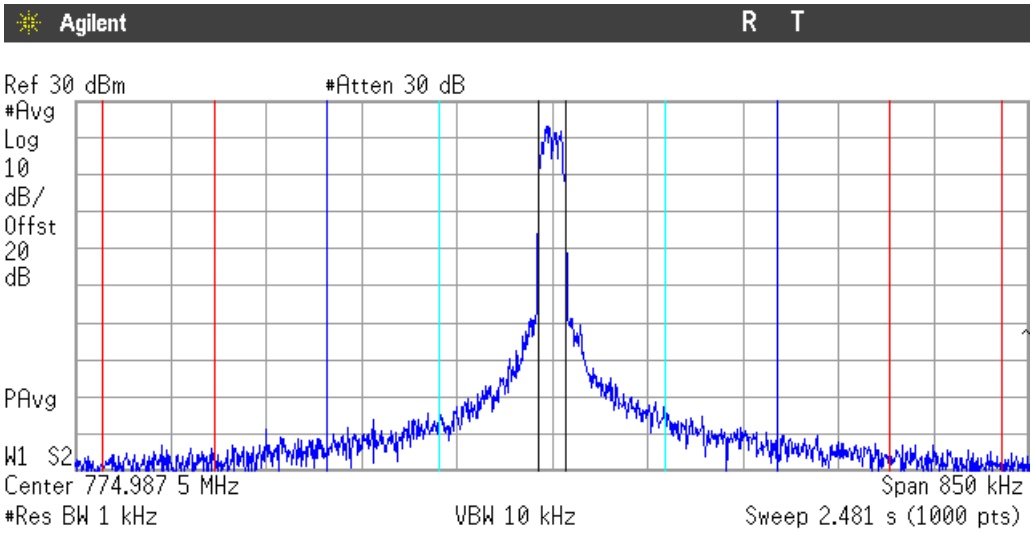

Agilent
R T
Mkr1 799.222 MHz
Ref 0 dBm
#Atten 6 dB
-68.86 dBm
#Avg
Log
10
dB/
Offst
20
dB
DI
-67.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 799.000 MHz
Stop 805.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

Highest Channel



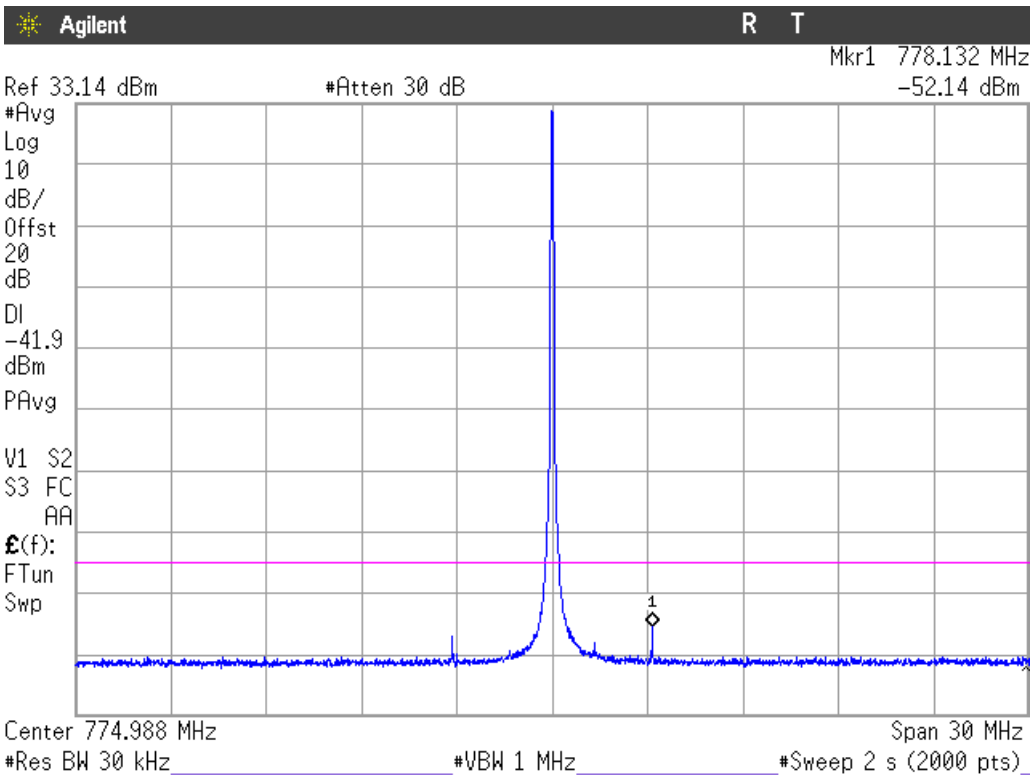
RMS Results

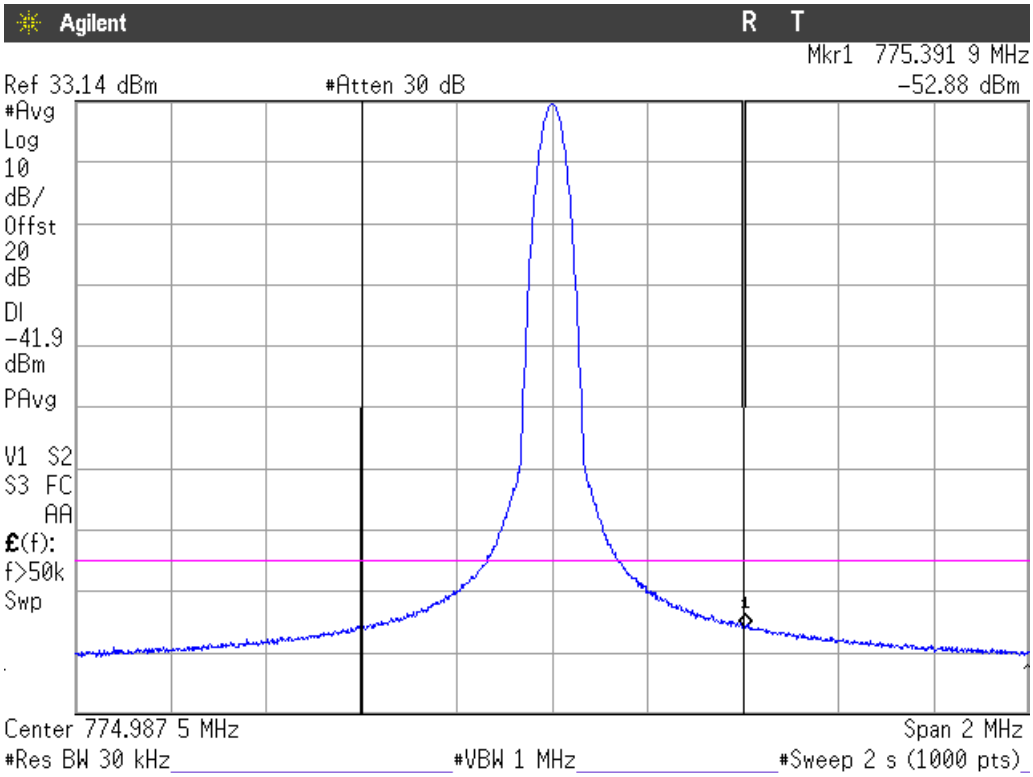
Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
33.14 dBm /	15.63 kHz	6.250 kHz	-45.10	-11.96	-48.15	-15.01
25.0000 kHz	21.88 kHz	6.250 kHz	-61.87	-28.73	-61.58	-28.44
	37.50 kHz	25.00 kHz	-62.87	-29.73	-61.82	-28.68
	62.50 kHz	25.00 kHz	-70.38	-37.24	-70.21	-37.06
	87.50 kHz	25.00 kHz	-74.79	-41.65	-75.09	-41.95

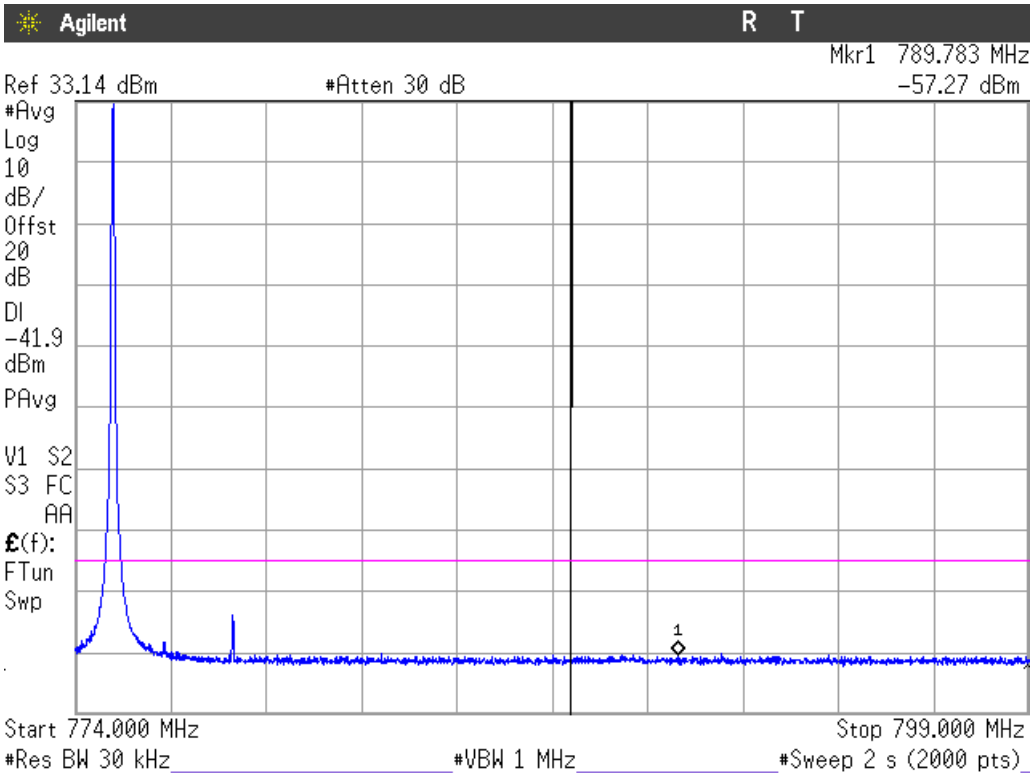


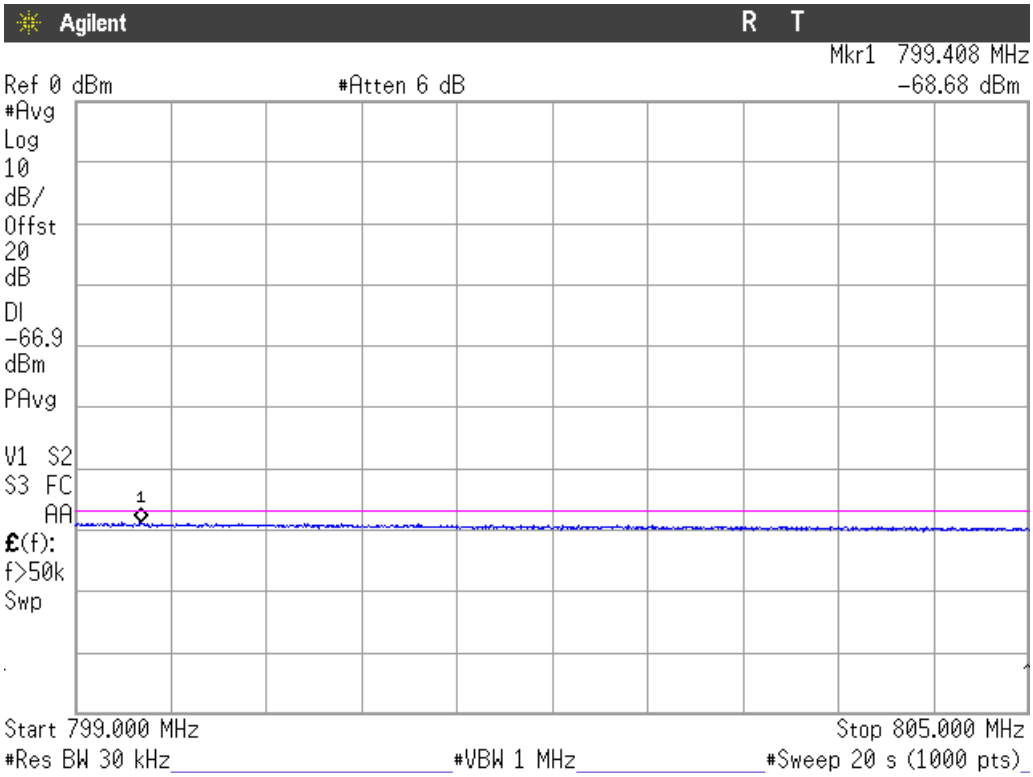
RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
32.97 dBm /	150.0 kHz	100.0 kHz	-73.35	-40.38	-72.92	-39.95
25.0000 kHz	250.0 kHz	100.0 kHz	-78.07	-45.10	-77.79	-44.82
	350.0 kHz	100.0 kHz	-80.93	-47.96	-80.38	-47.41


Agilent
R T
Mkr1 778.132 MHz
Ref 33.14 dBm
#Atten 30 dB
-52.14 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-41.9
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 774.988 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

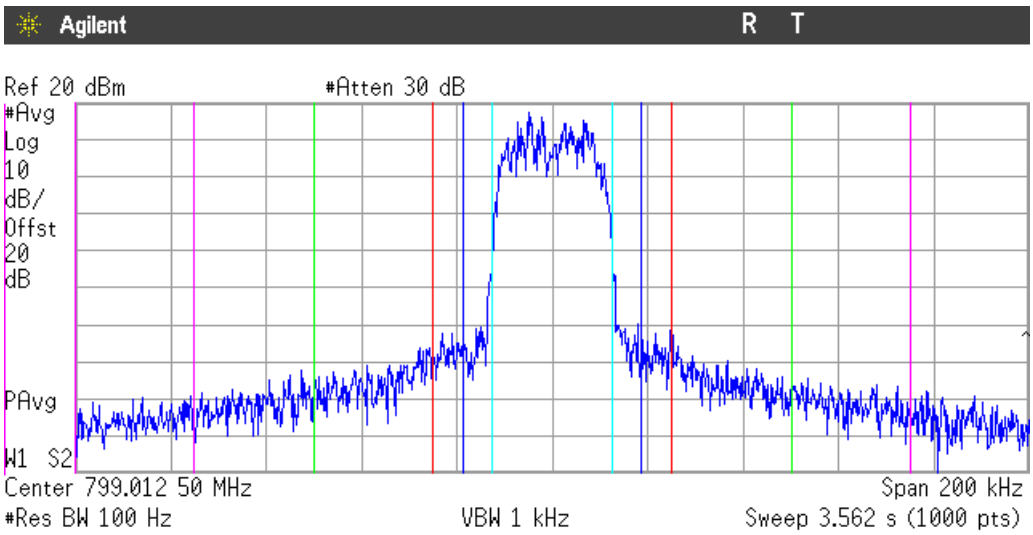

Agilent
R T
Mkr1 775.391 9 MHz
Ref 33.14 dBm
#Atten 30 dB
-52.88 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-41.9
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 774.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 789.783 MHz
Ref 33.14 dBm
#Atten 30 dB
-57.27 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-41.9
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 799.408 MHz
Ref 0 dBm
#Atten 6 dB
-68.68 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-66.9
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 799.000 MHz
Stop 805.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

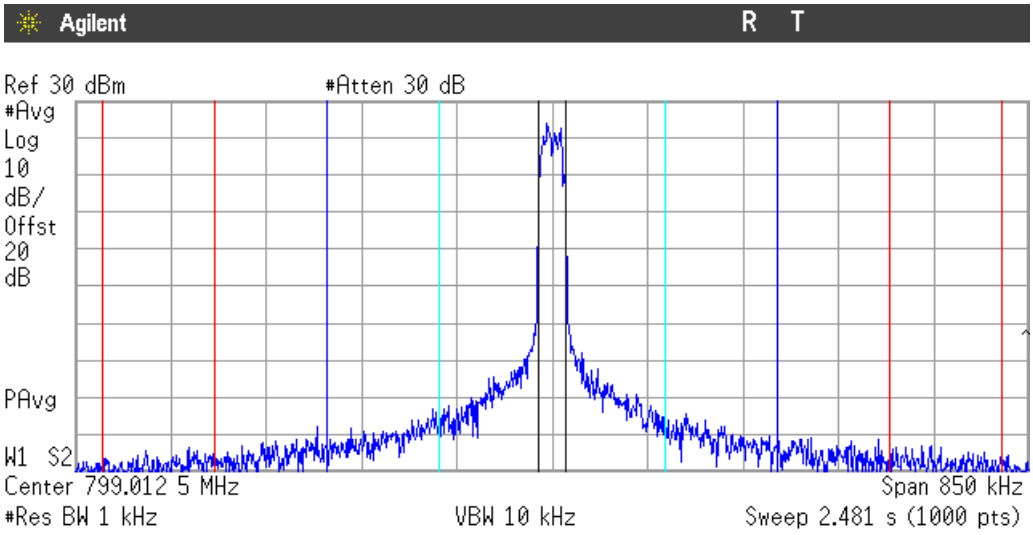
TETRA 22 kHz.799-805 MHz band.

Lowest Channel



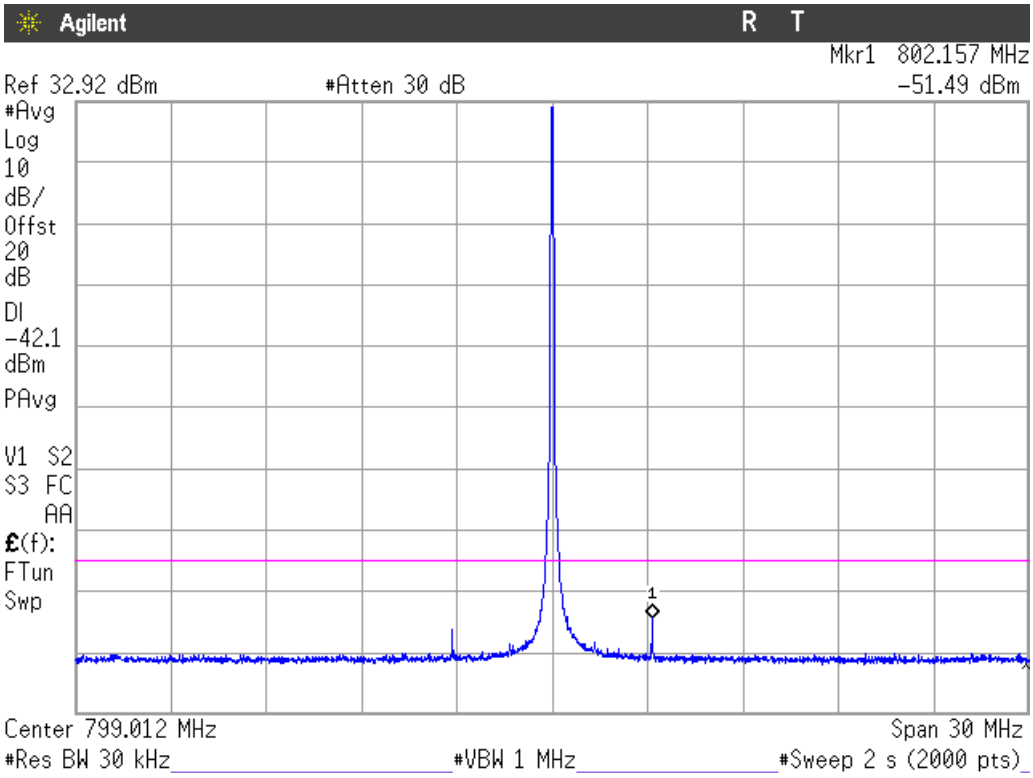
RMS Results

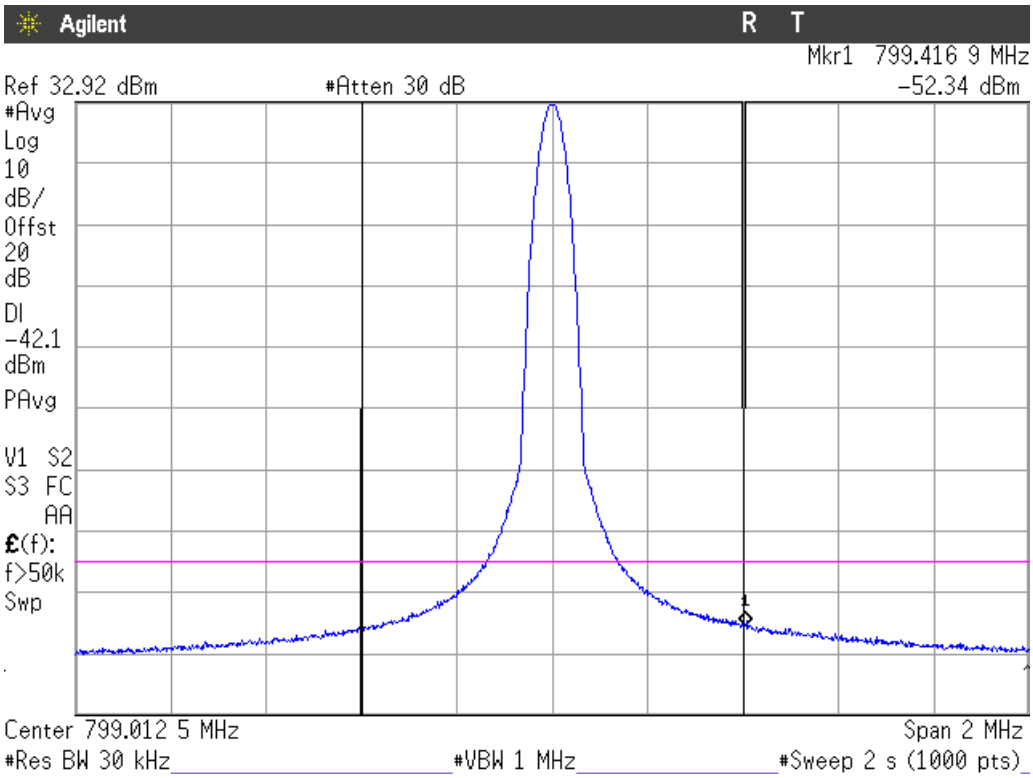
	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 32.92 dBm / 25.0000 kHz	15.63 kHz	6.250 kHz	-45.65	-12.72	-48.34	-15.42
	21.88 kHz	6.250 kHz	-62.32	-29.39	-62.78	-29.86
	37.50 kHz	25.00 kHz	-62.91	-29.98	-63.04	-30.12
	62.50 kHz	25.00 kHz	-69.87	-36.94	-69.81	-36.88
	87.50 kHz	25.00 kHz	-74.49	-41.57	-74.21	-41.28

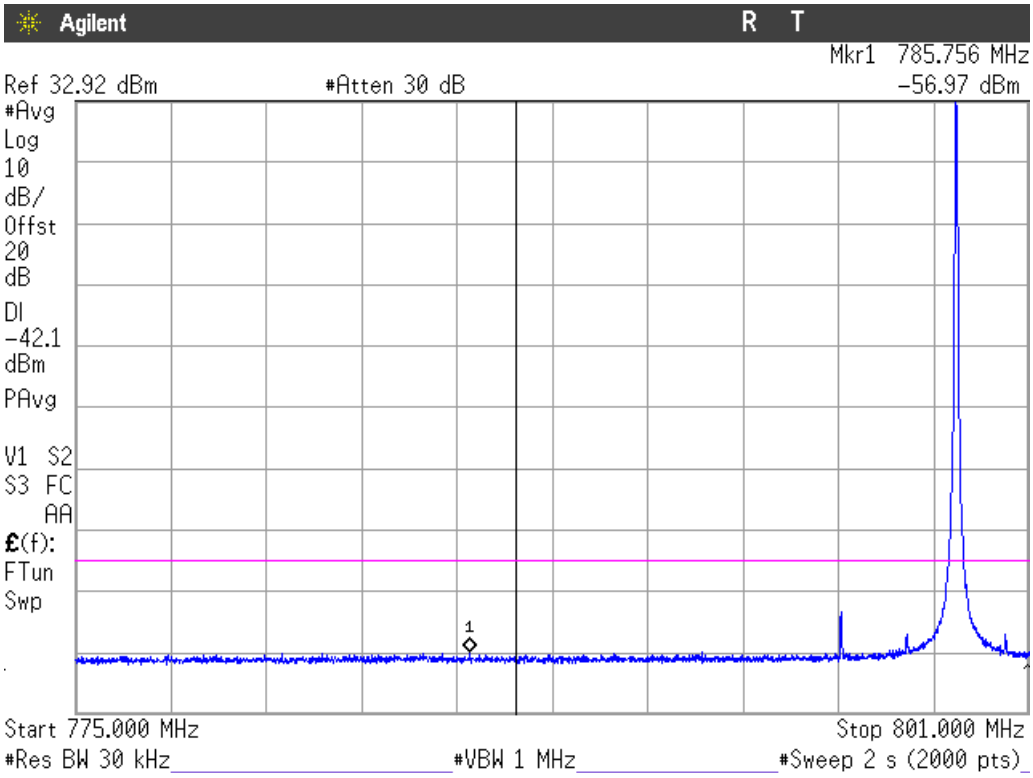


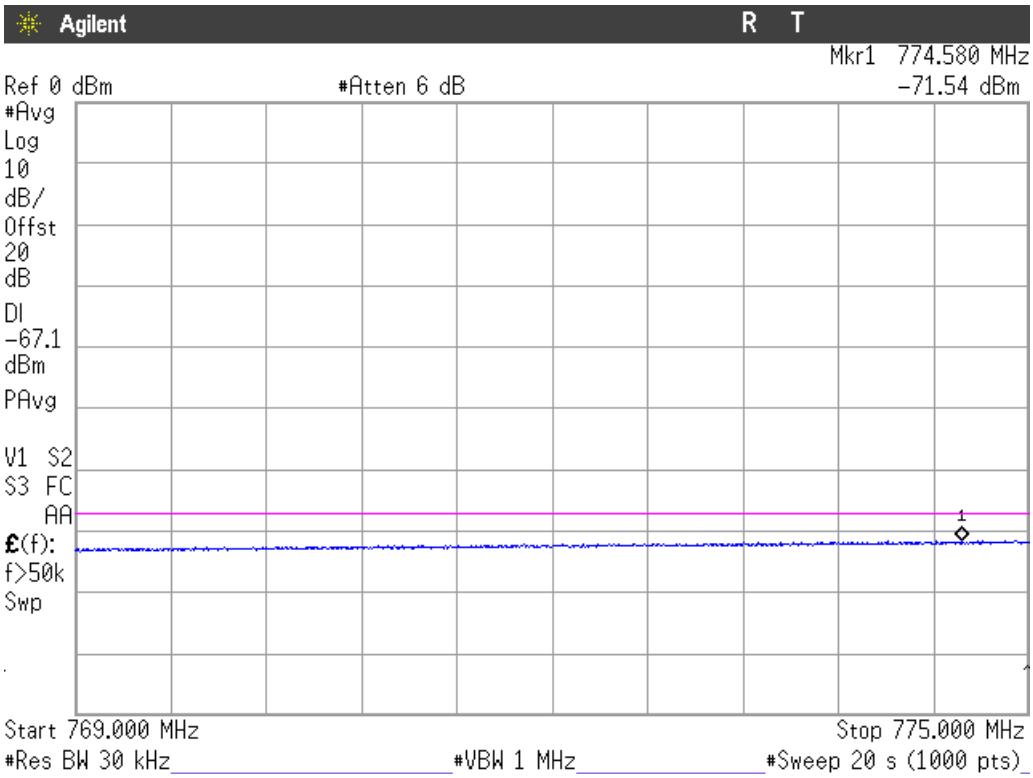
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 32.82 dBm / 25.0000 kHz	150.0 kHz	100.0 kHz	-73.26	-40.45	-73.59	-40.77
	250.0 kHz	100.0 kHz	-78.24	-45.42	-78.46	-45.65
	350.0 kHz	100.0 kHz	-81.15	-48.34	-80.41	-47.59

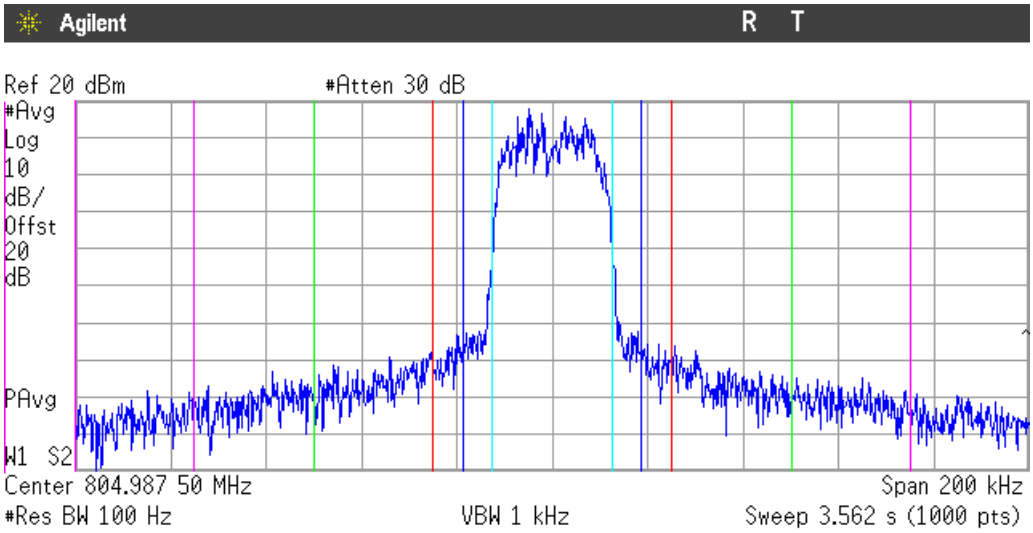

Agilent
R T
Mkr1 802.157 MHz
Ref 32.92 dBm
#Atten 30 dB
-51.49 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 799.012 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)


Agilent
R T
Mkr1 799.416 9 MHz
Ref 32.92 dBm
#Atten 30 dB
-52.34 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
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 785.756 MHz
Ref 32.92 dBm
#Atten 30 dB
-56.97 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.1
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)

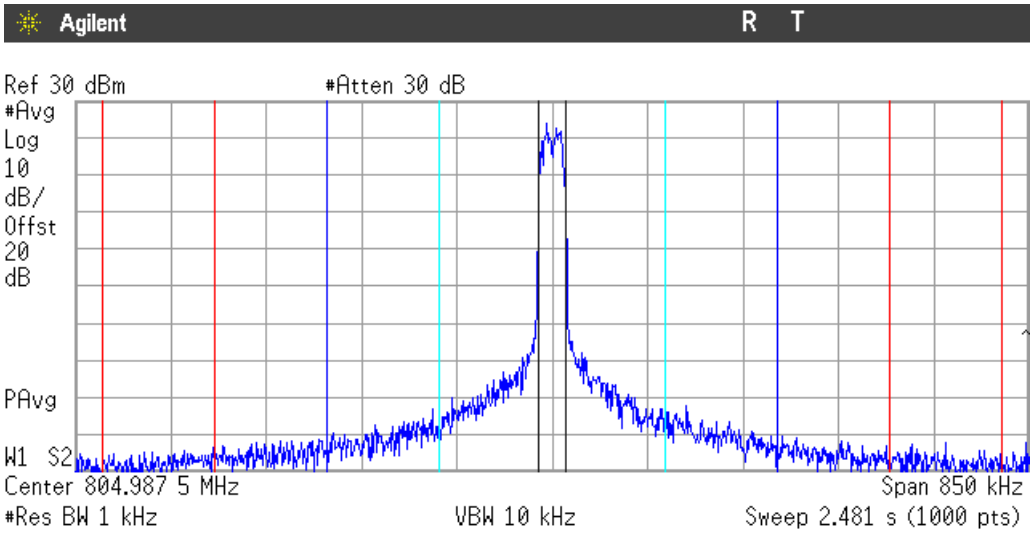

Agilent
R T
Mkr1 774.580 MHz
Ref 0 dBm
#Atten 6 dB
-71.54 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-67.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 769.000 MHz
Stop 775.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

Highest Channel



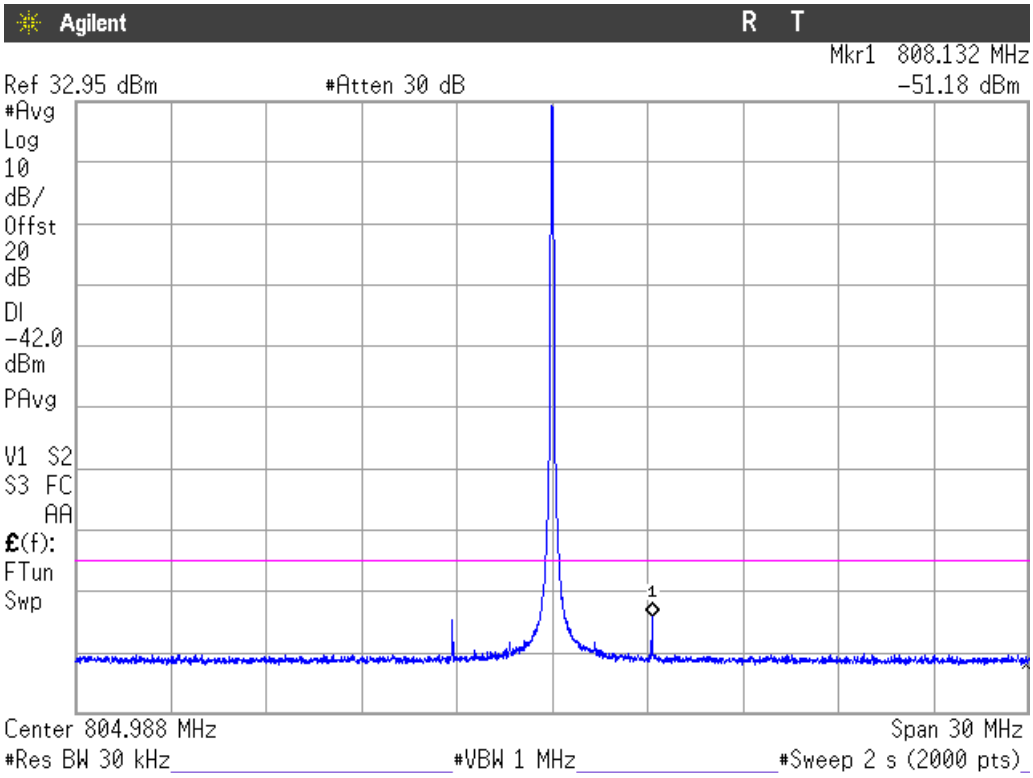
RMS Results
Carrier Power
32.95 dBm /
25.0000 kHz

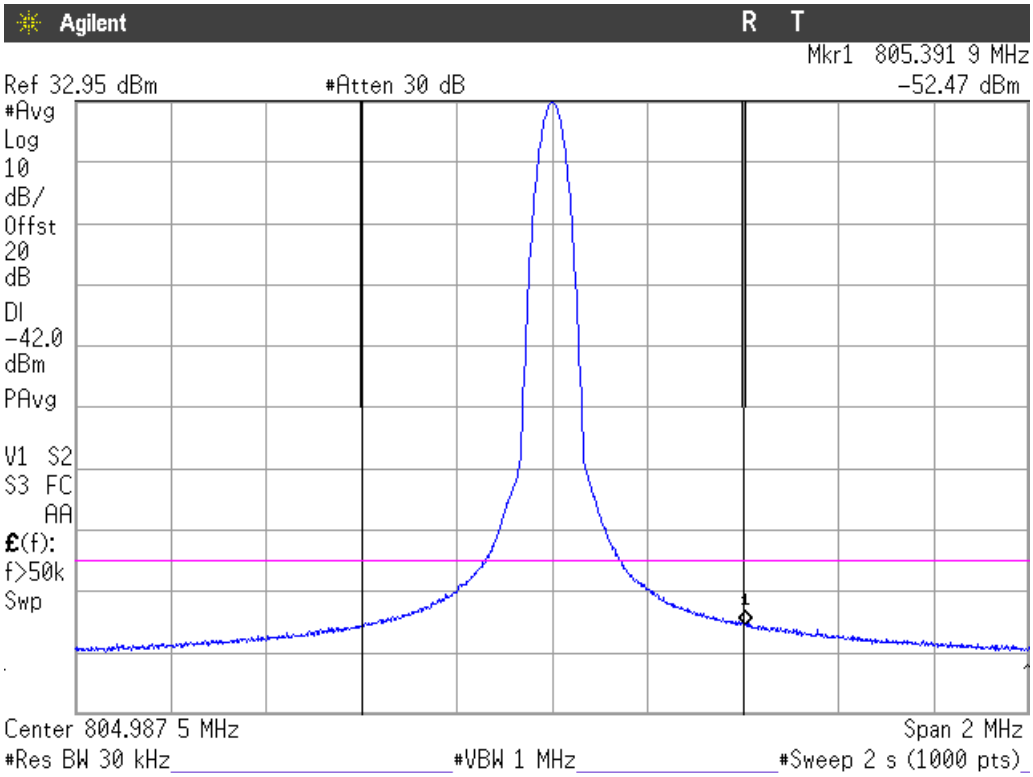
Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
15.63 kHz	6.250 kHz	-46.46	-13.51	-48.30	-15.34
21.88 kHz	6.250 kHz	-64.66	-31.70	-65.68	-32.73
37.50 kHz	25.00 kHz	-64.30	-31.35	-64.61	-31.66
62.50 kHz	25.00 kHz	-70.00	-37.04	-69.91	-36.96
87.50 kHz	25.00 kHz	-74.51	-41.56	-74.52	-41.56

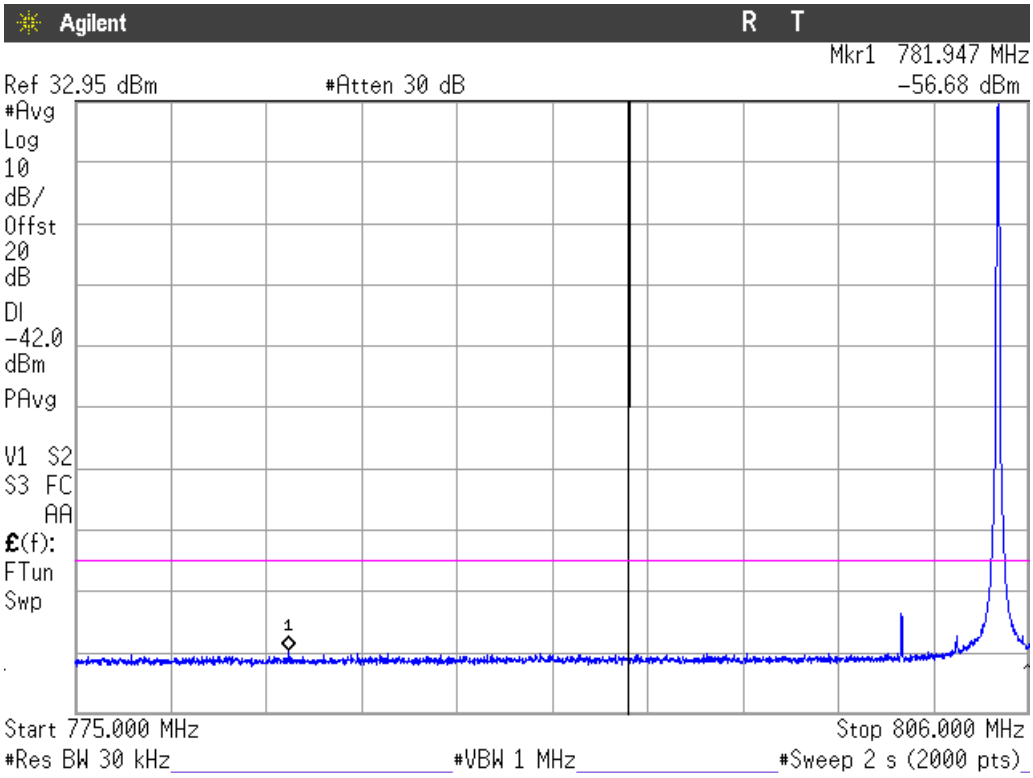


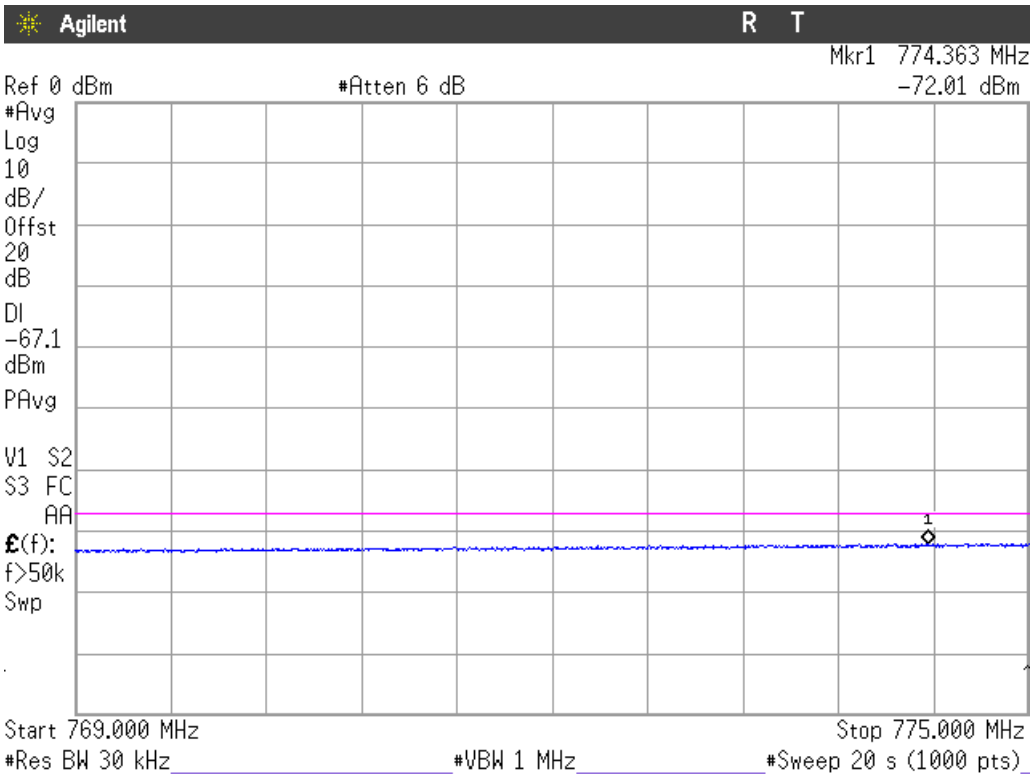
RMS Results
Carrier Power
32.70 dBm /
25.0000 kHz

Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
150.0 kHz	100.0 kHz	-73.23	-40.53	-72.38	-39.68
250.0 kHz	100.0 kHz	-77.95	-45.25	-78.21	-45.51
350.0 kHz	100.0 kHz	-80.53	-47.83	-80.34	-47.64


Agilent
R T
Mkr1 808.132 MHz
Ref 32.95 dBm
#Atten 30 dB
-51.18 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.0
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
1
Center 804.988 MHz
Span 30 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (2000 pts)

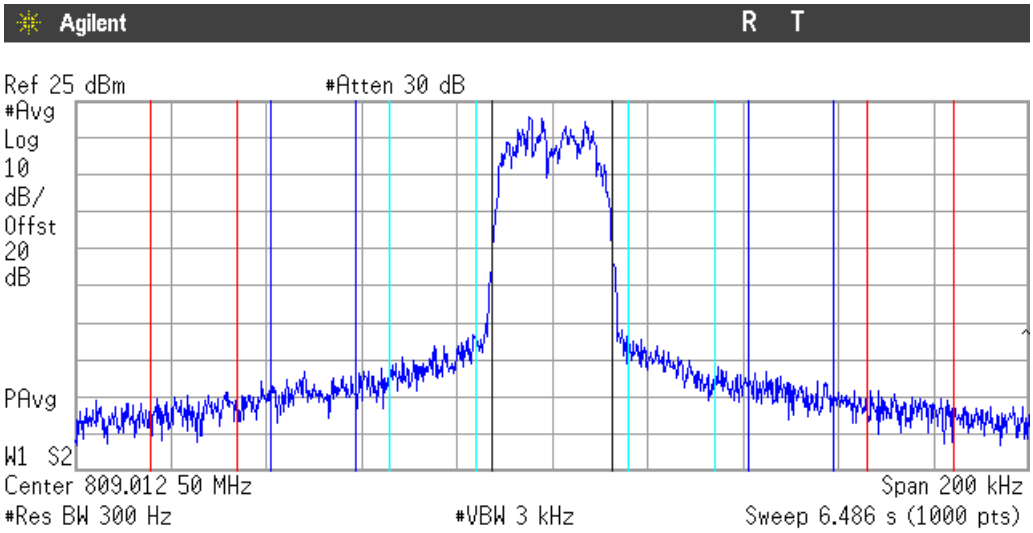

Agilent
R T
Mkr1 805.391 9 MHz
Ref 32.95 dBm
#Atten 30 dB
-52.47 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.0
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Center 804.987 5 MHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 2 s (1000 pts)


Agilent
R T
Mkr1 781.947 MHz
Ref 32.95 dBm
#Atten 30 dB
-56.68 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-42.0
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 774.363 MHz
Ref 0 dBm
#Atten 6 dB
-72.01 dBm
#Avg
Log
10
dB/
Offst
20
dB
Dl
-67.1
dBm
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1
Start 769.000 MHz
Stop 775.000 MHz
#Res BW 30 kHz
#VBW 1 MHz
#Sweep 20 s (1000 pts)

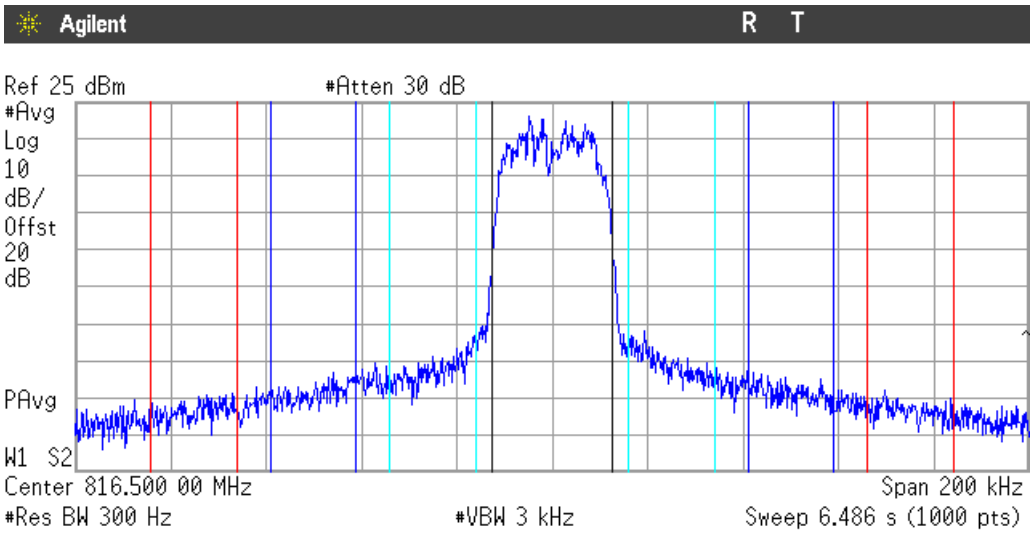
TETRA, 22 kHz. 809-824 MHz band.

Lowest Channel



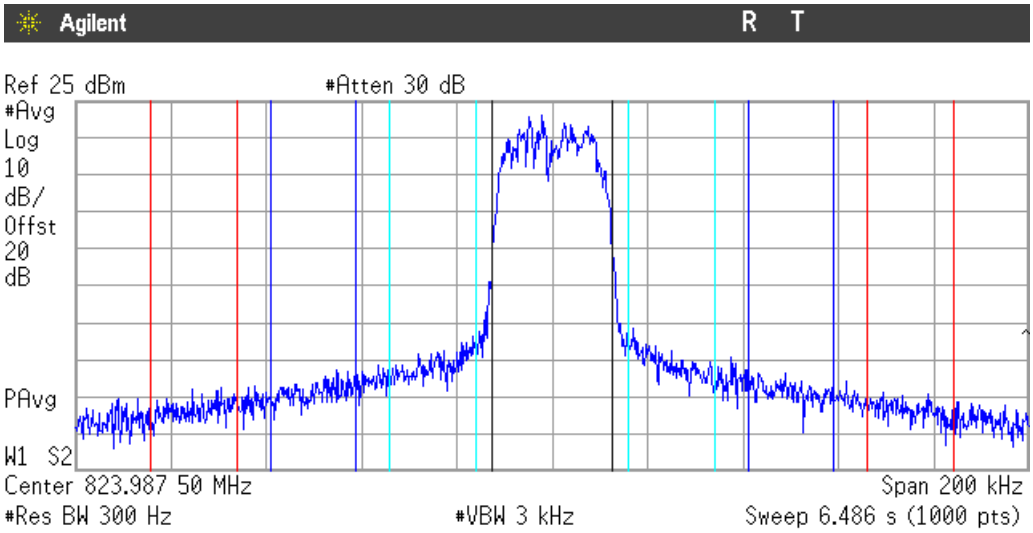
RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	25.00 kHz	18.00 kHz	-60.28	-27.42	-60.78	-27.92
32.86 dBm /	50.00 kHz	18.00 kHz	-68.65	-35.79	-68.74	-35.88
25.0000 kHz	75.00 kHz	18.00 kHz	-73.46	-40.60	-73.54	-40.68

Middle Channel



RMS Results	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	25.00 kHz	18.00 kHz	-61.13	-28.43	-59.67	-26.97
32.70 dBm /	50.00 kHz	18.00 kHz	-68.38	-35.68	-68.31	-35.61
25.0000 kHz	75.00 kHz	18.00 kHz	-73.37	-40.67	-73.12	-40.42

Highest Channel

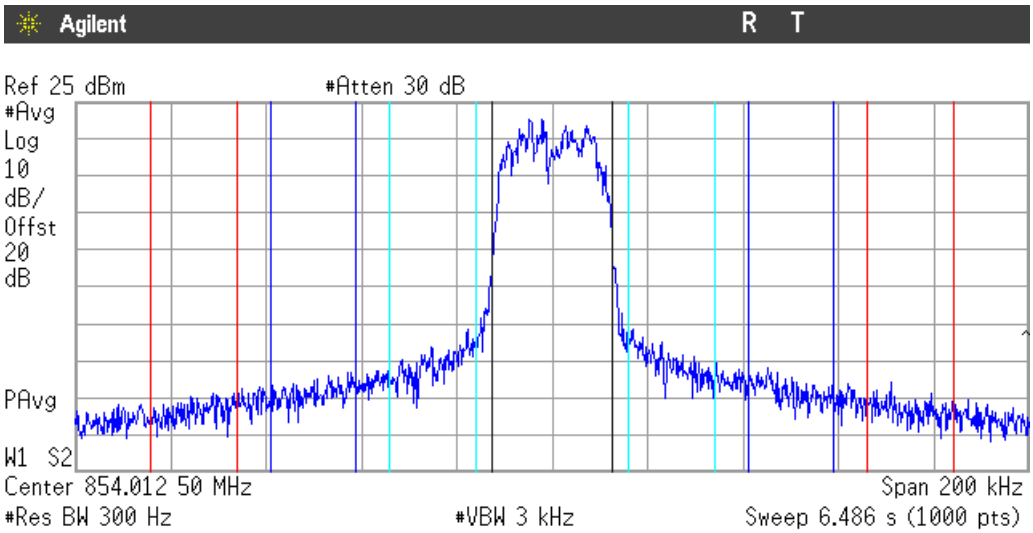


RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
32.75 dBm /	25.00 kHz	18.00 kHz	-60.85	-28.10	-60.07	-27.32
25.0000 kHz	50.00 kHz	18.00 kHz	-68.20	-35.45	-68.20	-35.45
	75.00 kHz	18.00 kHz	-72.96	-40.21	-73.33	-40.58

TETRA, 22 kHz. 854-869 MHz band.

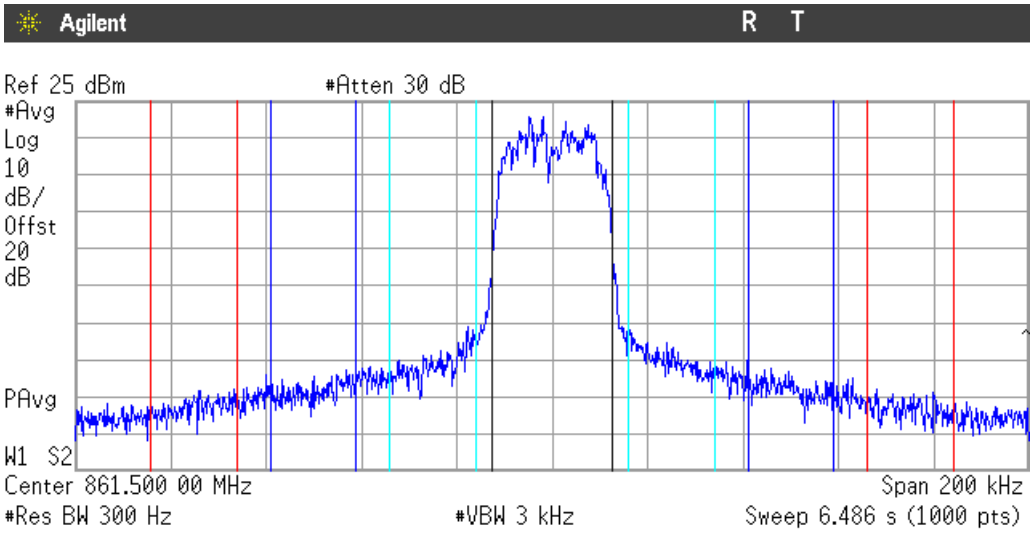
Lowest Channel



RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
32.72 dBm /	25.00 kHz	18.00 kHz	-59.54	-26.82	-59.18	-26.46
25.0000 kHz	50.00 kHz	18.00 kHz	-68.23	-35.51	-67.58	-34.86
	75.00 kHz	18.00 kHz	-72.97	-40.25	-72.90	-40.18

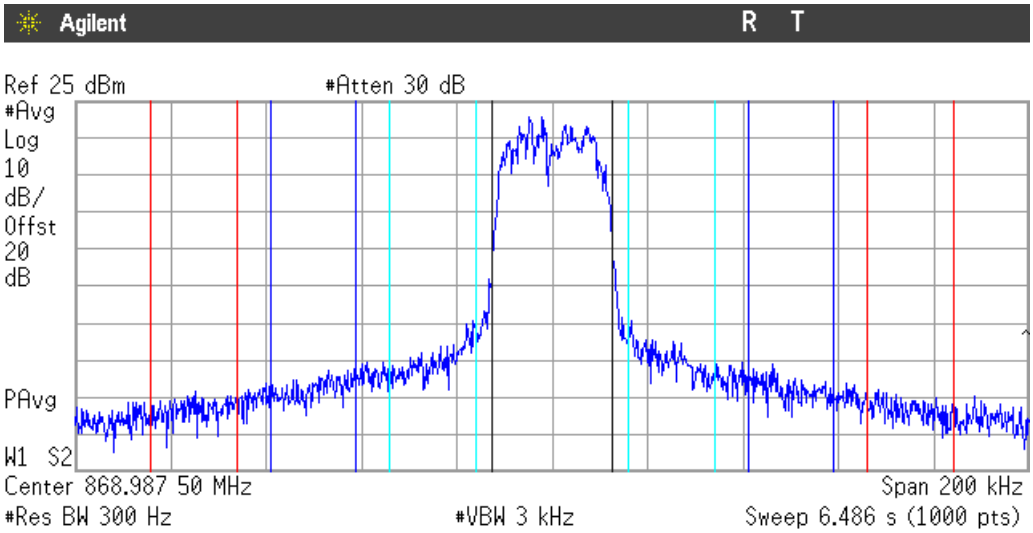
Middle Channel



RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
32.68 dBm /	25.00 kHz	18.00 kHz	-59.46	-26.79	-59.20	-26.52
25.0000 kHz	50.00 kHz	18.00 kHz	-67.98	-35.31	-67.57	-34.89
	75.00 kHz	18.00 kHz	-72.60	-39.92	-72.93	-40.25

Highest Channel



RMS Results

Carrier Power	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
32.76 dBm /	25.00 kHz	18.00 kHz	-58.44	-25.68	-58.53	-25.77
25.0000 kHz	50.00 kHz	18.00 kHz	-67.31	-34.56	-67.35	-34.59
	75.00 kHz	18.00 kHz	-73.05	-40.29	-72.93	-40.17

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 R&S CMTA84.

RESULTS

809-824 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
7.4	+50	132	0.16167
	+40	118	0.14452
	+30	60	0.07348
	+20	51	0.06246
	+10	41	0.05021
	0	116	0.14207
	-10	135	0.16534
	-20	95	0.11635
	-30	71	0.08696
Frequency stability with Supply Voltage			
8.4	20	53	0.06491
6.29	20	54	0.06614

854-869 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
7.4	+50	120	0.13929
	+40	98	0.11376
	+30	53	0.06152
	+20	51	0.05920
	+10	50	0.05804
	0	97	0.11259
	-10	138	0.16019
	-20	108	0.12536
	-30	64	0.07429
Frequency stability with Supply Voltage			
8.4	20	40	0.04643
6.29	20	46	0.05340

769-775 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
7.4	+50	120	0.15544
	+40	122	0.15803
	+30	86	0.11140
	+20	73	0.09456
	+10	69	0.08938
	0	135	0.17487
	-10	121	0.15673
	-20	60	0.07772
	-30	67	0.08679
Frequency stability with Supply Voltage			
8.4	20	66	0.08549
6.29	20	70	0.09067

799-805 MHz band. Middle Channel.

Voltage (Vdc)	Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
Frequency stability with Temperature			
7.4	+50	115	0.14339
	+40	107	0.13341
	+30	49	0.06110
	+20	38	0.04738
	+10	40	0.04987
	0	132	0.16459
	-10	130	0.16209
	-20	82	0.10224
	-30	70	0.08728
Frequency stability with Supply Voltage			
8.4	20	51	0.06359
6.29	20	54	0.06733

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

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

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5384	-23.77	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5505	-25.28	< ± 2.03

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

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5977	-30.44	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6098	-30.14	< ± 2.03

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

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5384	-23.05	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5505	-24.74	< ± 2.03

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

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5977	-29.08	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6098	-29.18	< ± 2.03

TETRA 22 kHz bandwidth. 769-775 MHz band.

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5384	-23.89	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5505	-25.08	< ± 2.03

TETRA 22 kHz bandwidth. 799-805 MHz band.

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.5977	-30.33	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6098	-29.54	< ± 2.03

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

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6175	-28.84	< ± 2.03

CHANNEL: MIDDLE

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6329	-28.49	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6483	-28.03	< ± 2.03

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

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7076	-25.58	< ± 2.03

CHANNEL: MIDDLE

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.723	-25.05	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7384	-24.68	< ± 2.03

TETRA 22 kHz bandwidth. 809-824 MHz band.

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6186	-29.40	< ± 2.03

CHANNEL: MIDDLE

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6329	-29.05	< ± 2.03

CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.6483	-28.22	< ± 2.03

TETRA 22 kHz bandwidth. 854-869 MHz band.

CHANNEL: LOWEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7076	-26.17	< ± 2.03

CHANNEL: MIDDLE

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.723	-25.26	< ± 2.03

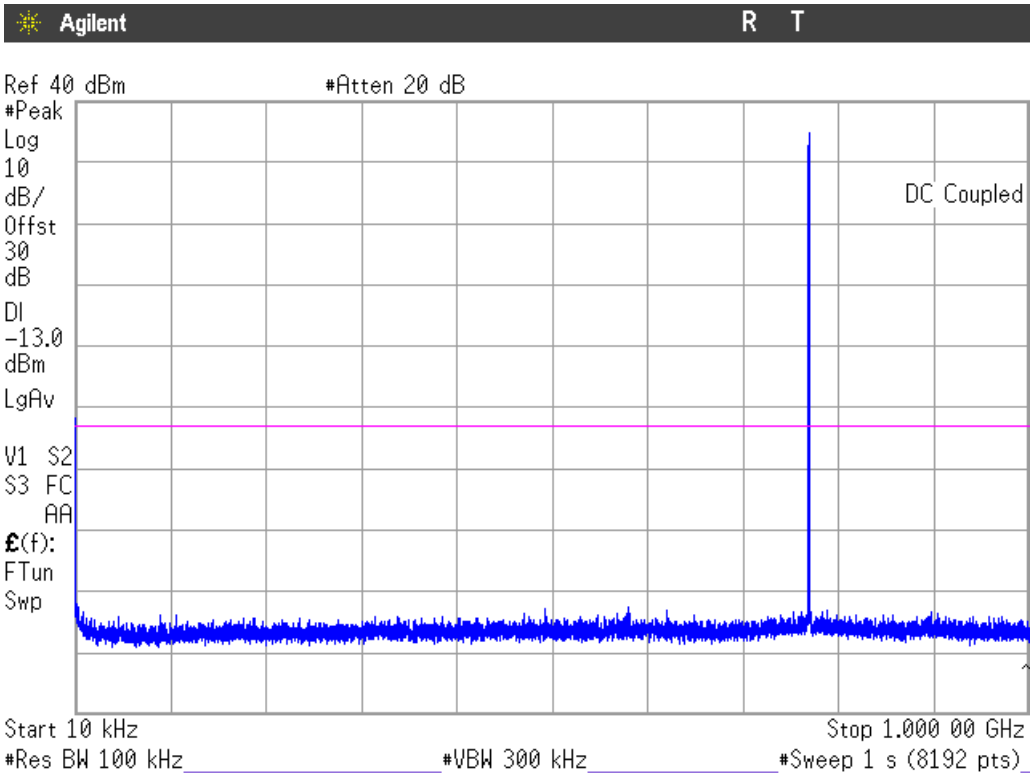
CHANNEL: HIGHEST

Spurious Frequency (GHz)	Level (dBm)	Uncertainty (dB)
1.7384	-25.35	< ± 2.03

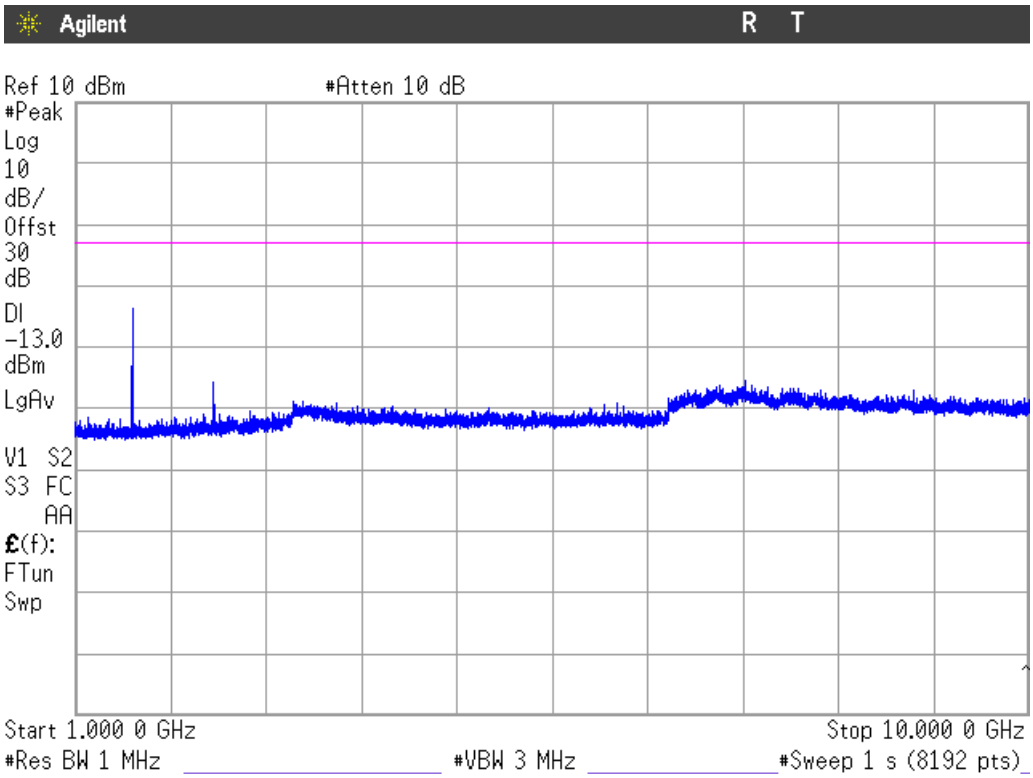
Verdict: PASS

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

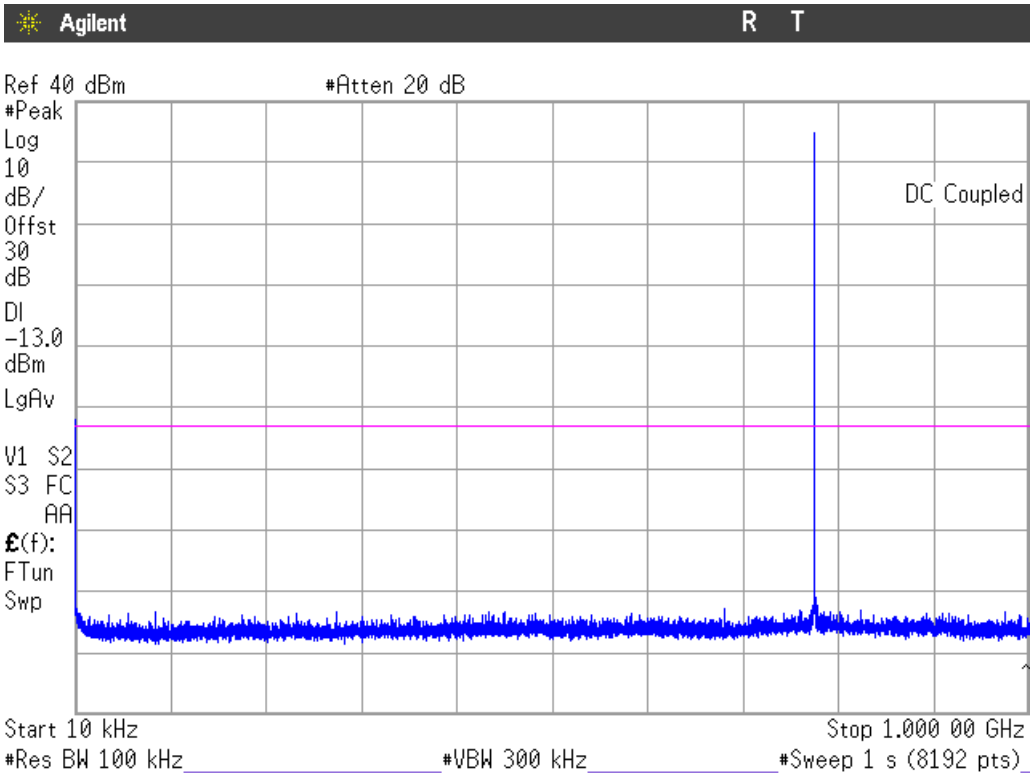
CHANNEL: LOWEST



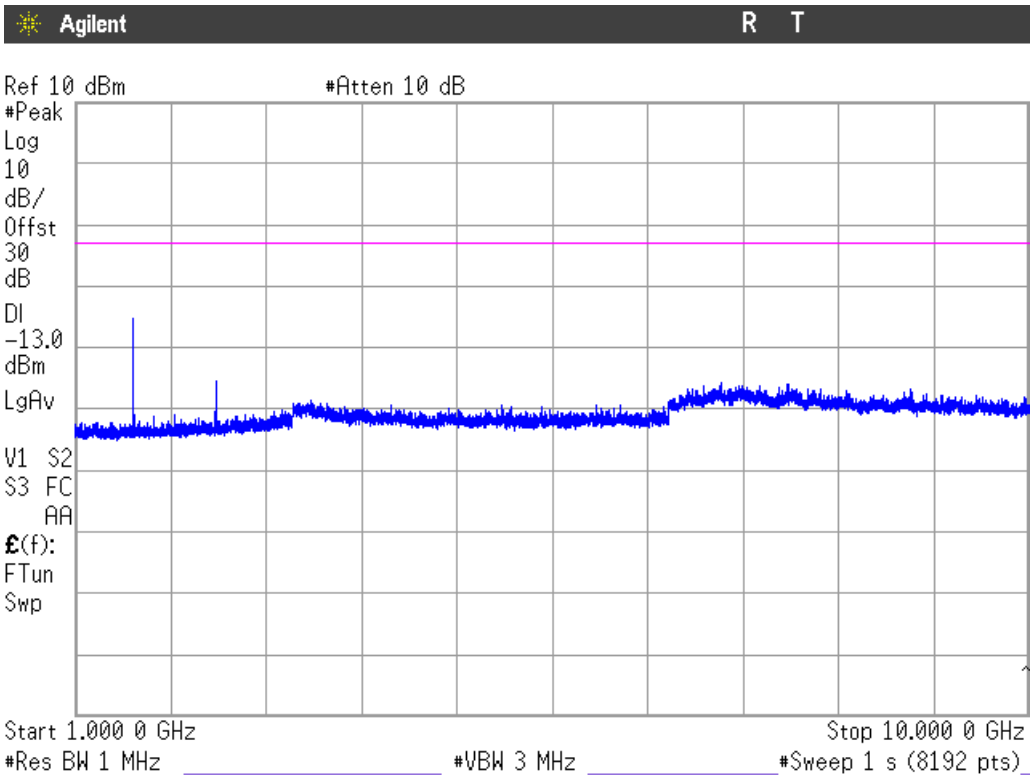
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

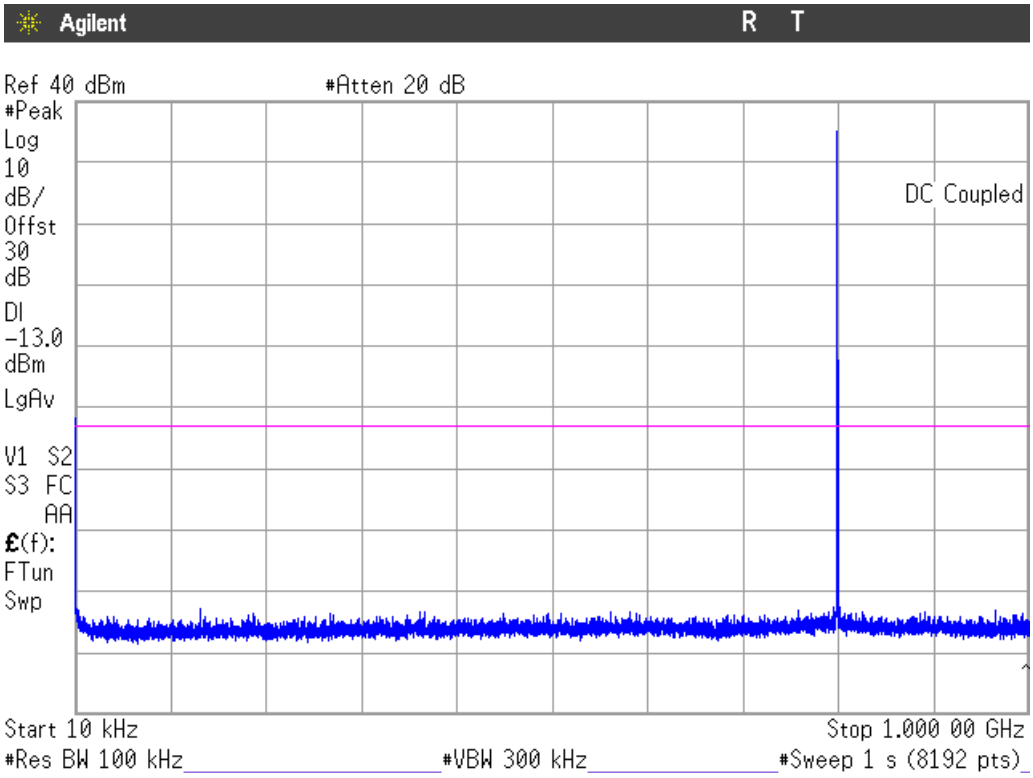


Note: The peak above the limit is the carrier frequency.

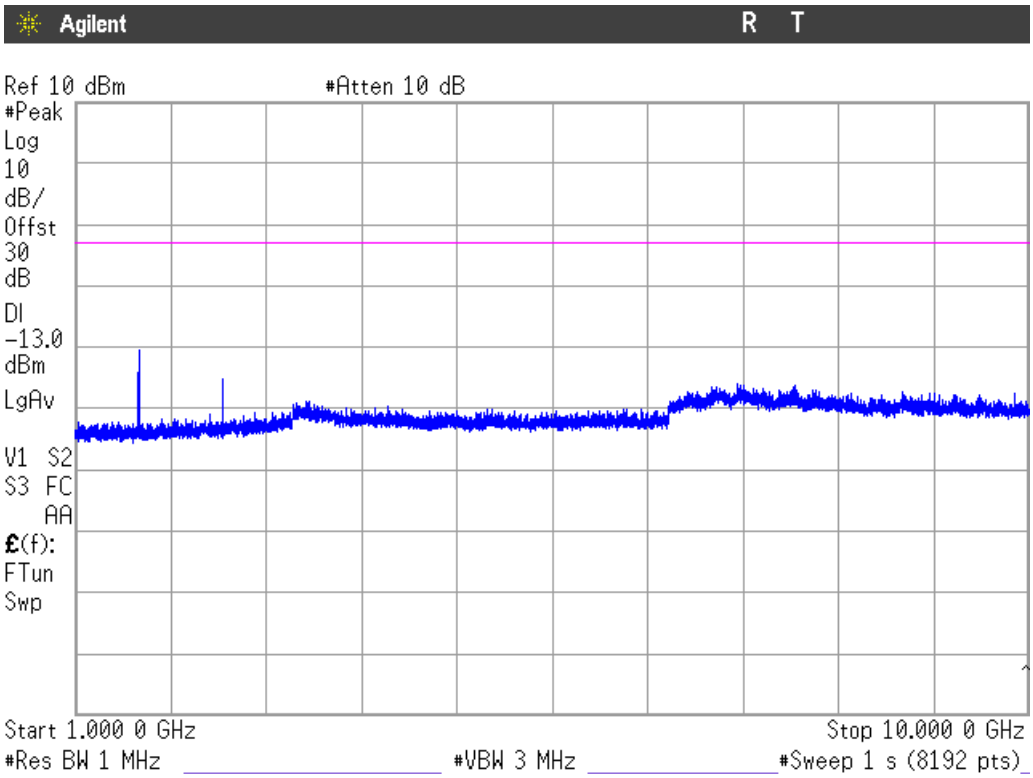


P25 C4FM 8.1 kHz bandwidth. 799-805 MHz band.

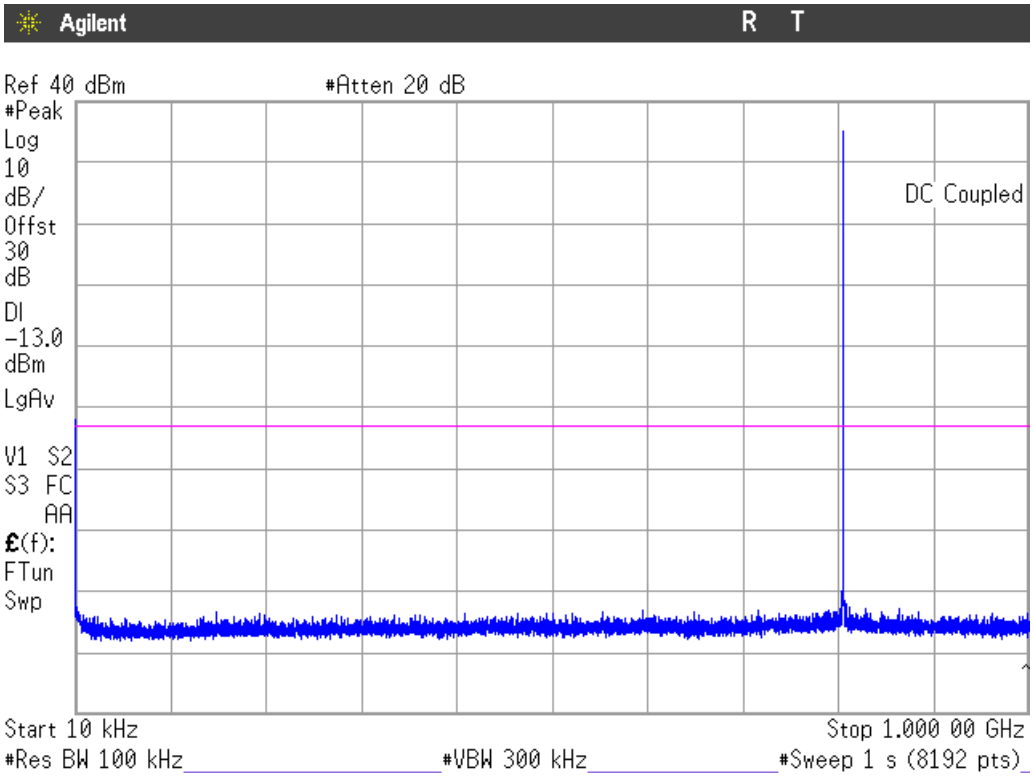
CHANNEL: LOWEST



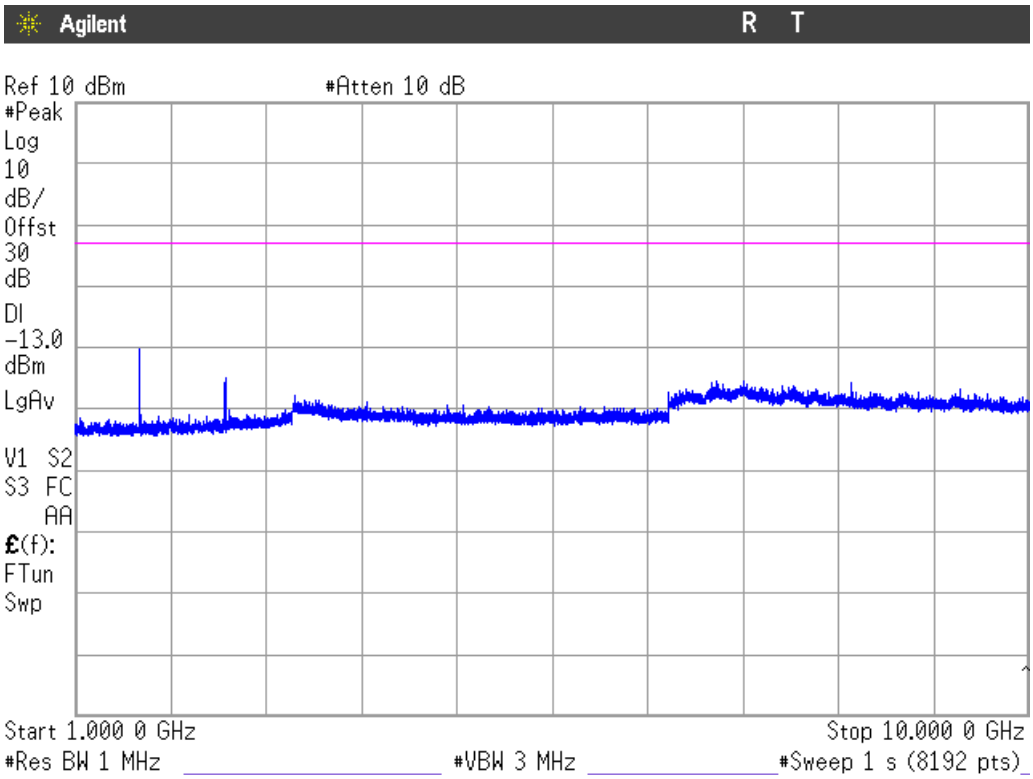
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

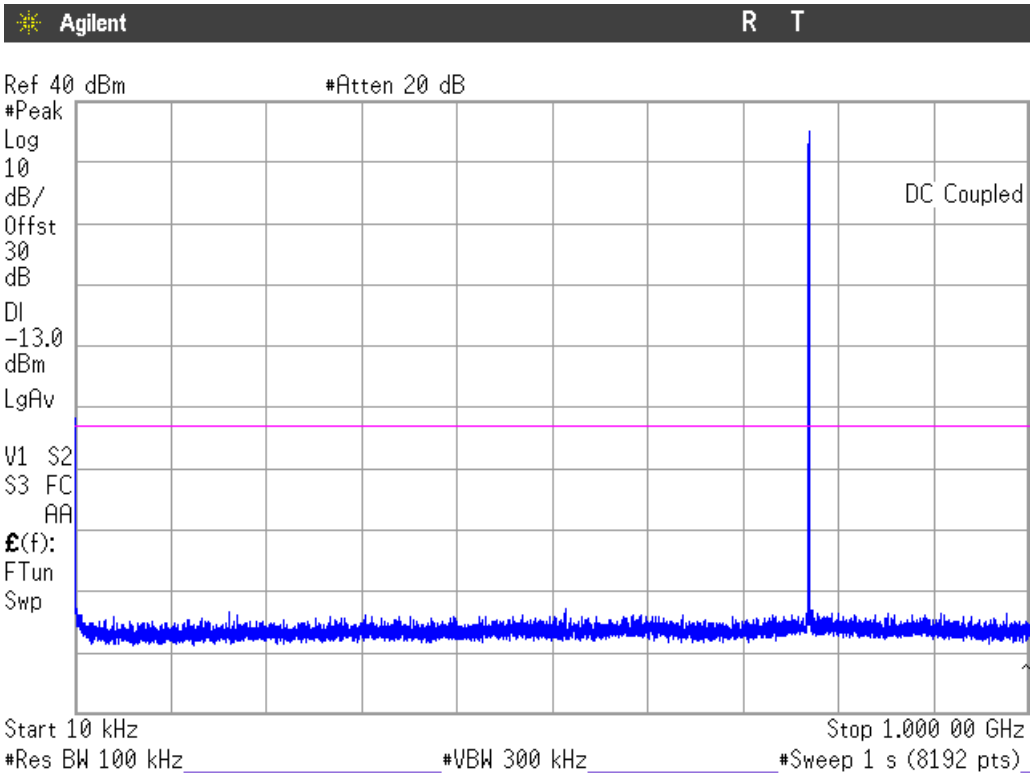


Note: The peak above the limit is the carrier frequency.

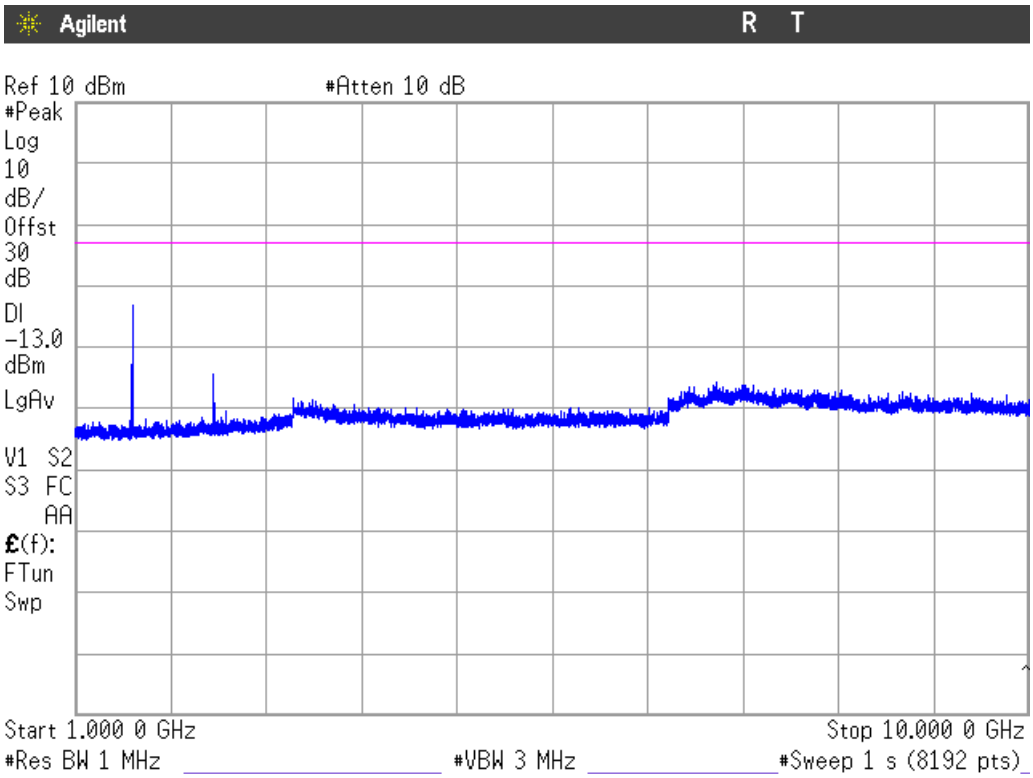


TI D-LMR 20 kHz bandwidth. 769-775 MHz band.

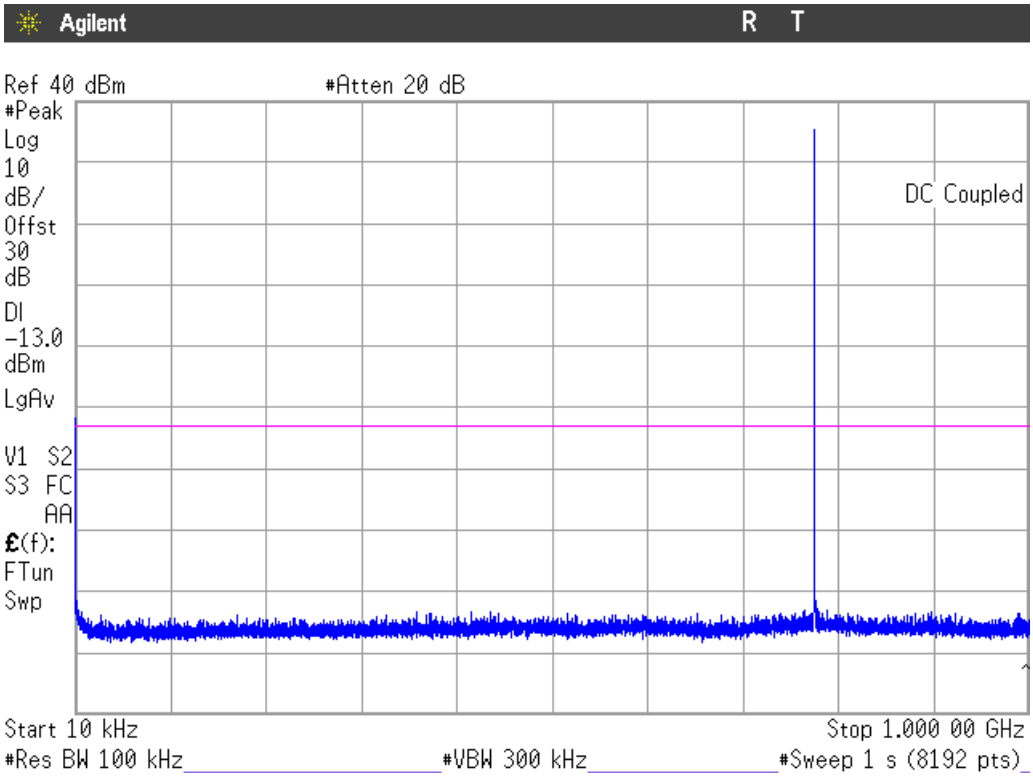
CHANNEL: LOWEST



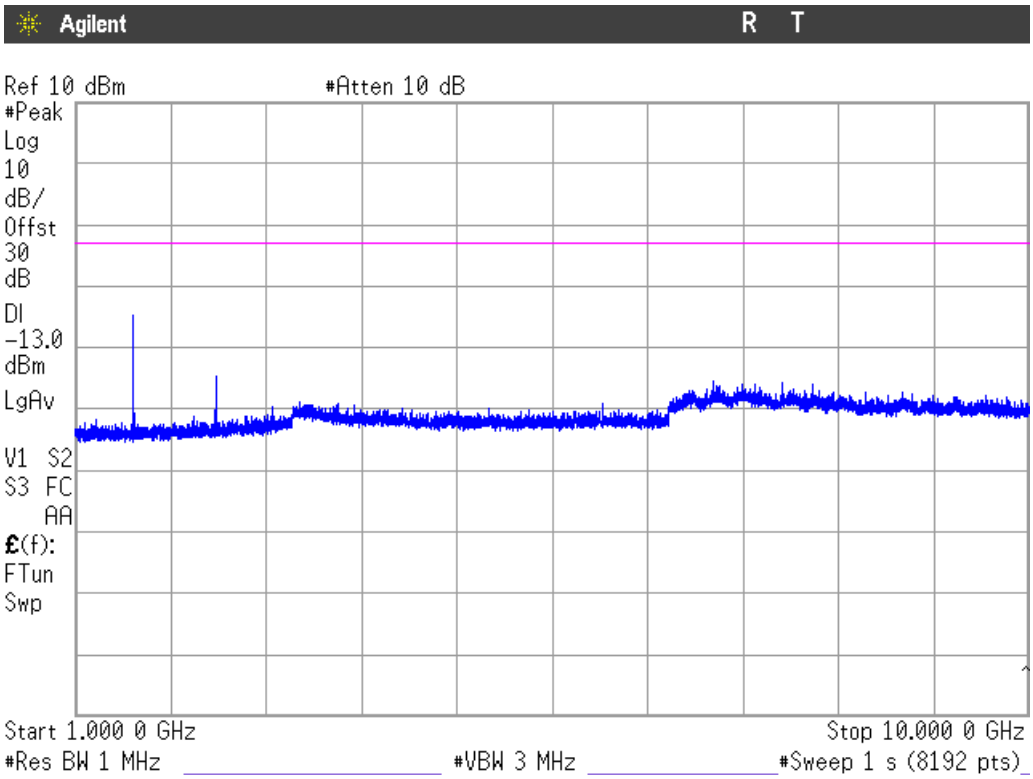
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

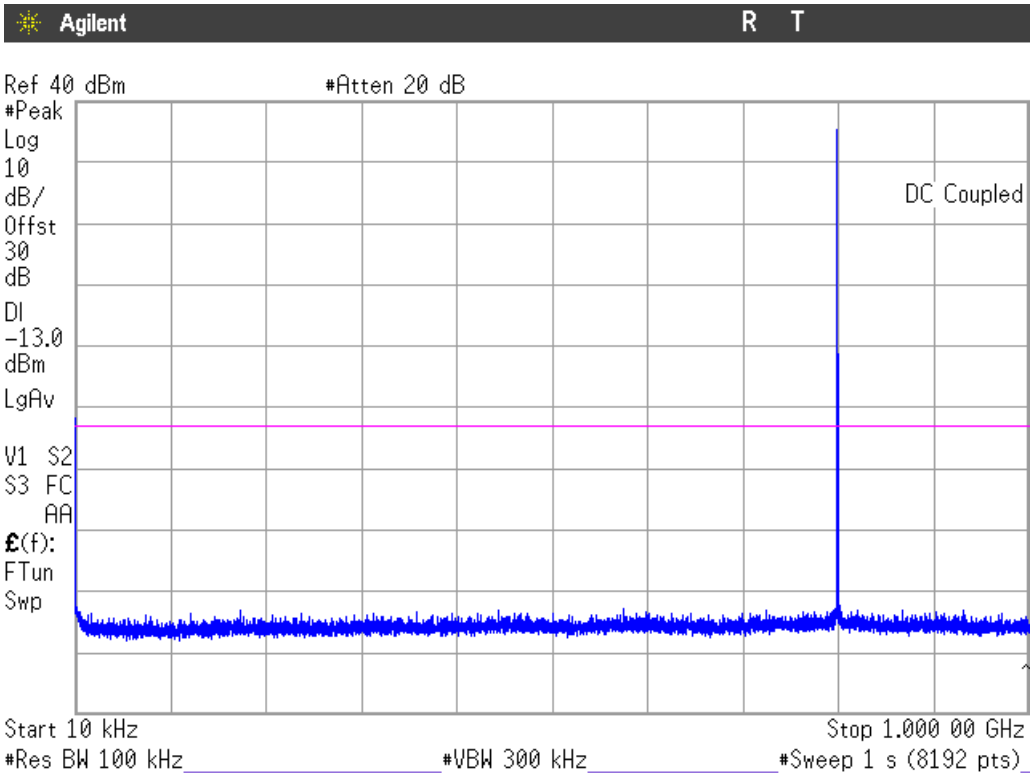


Note: The peak above the limit is the carrier frequency.

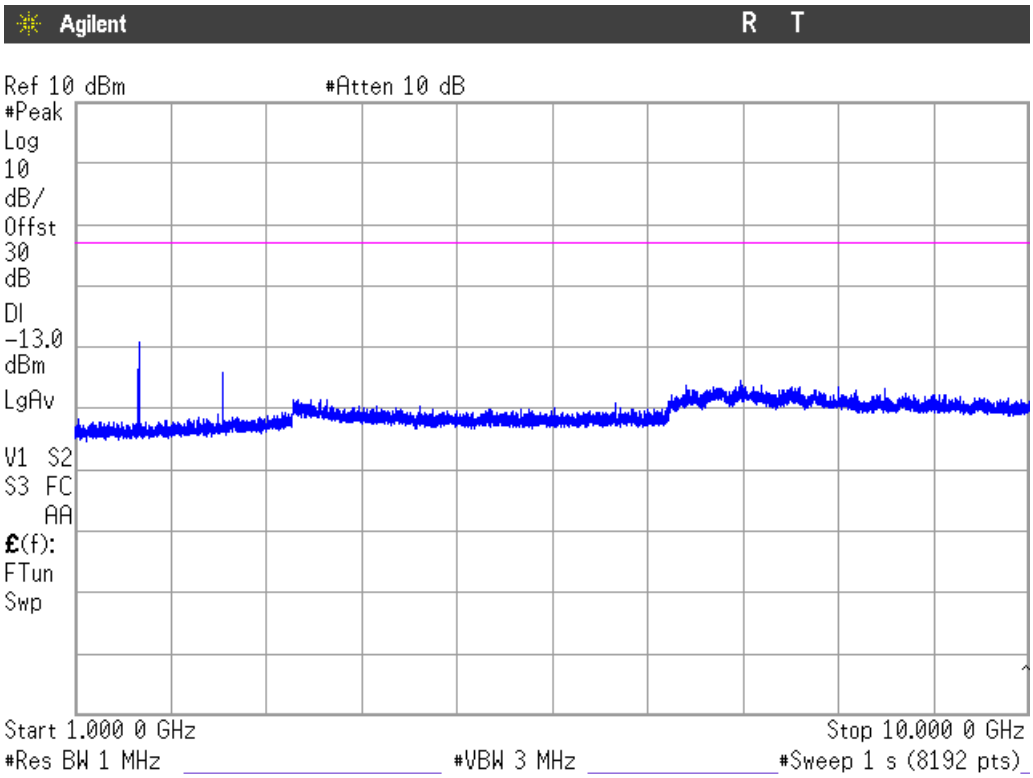


TI D-LMR 20 kHz bandwidth. 799-805 MHz band.

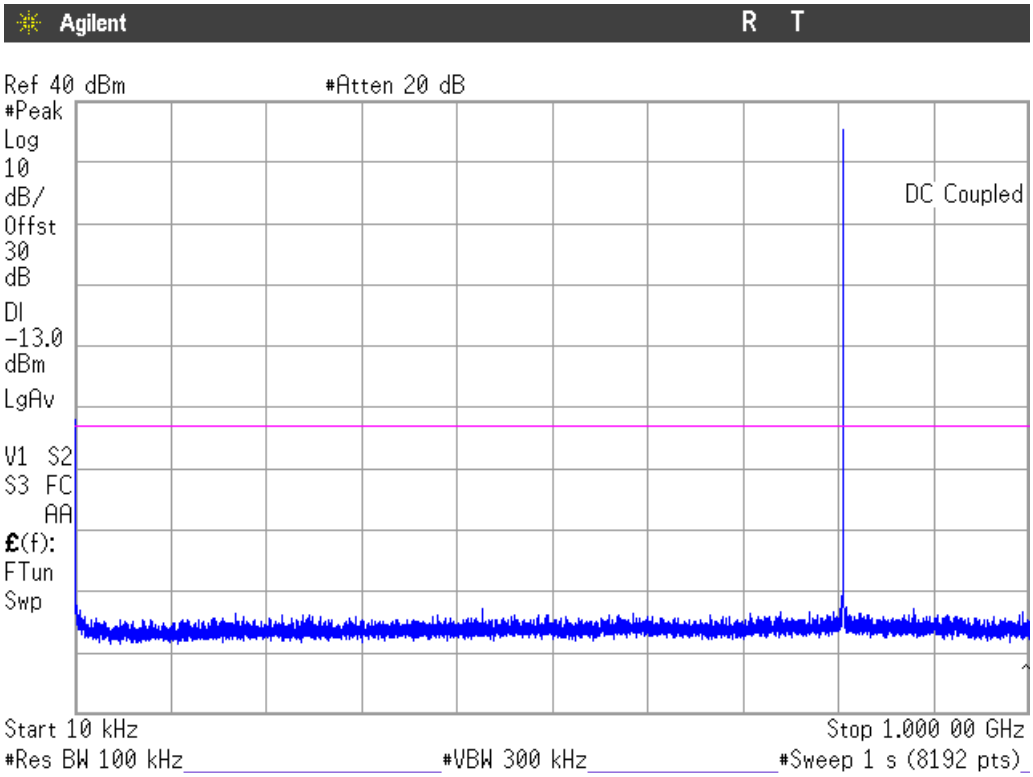
CHANNEL: LOWEST



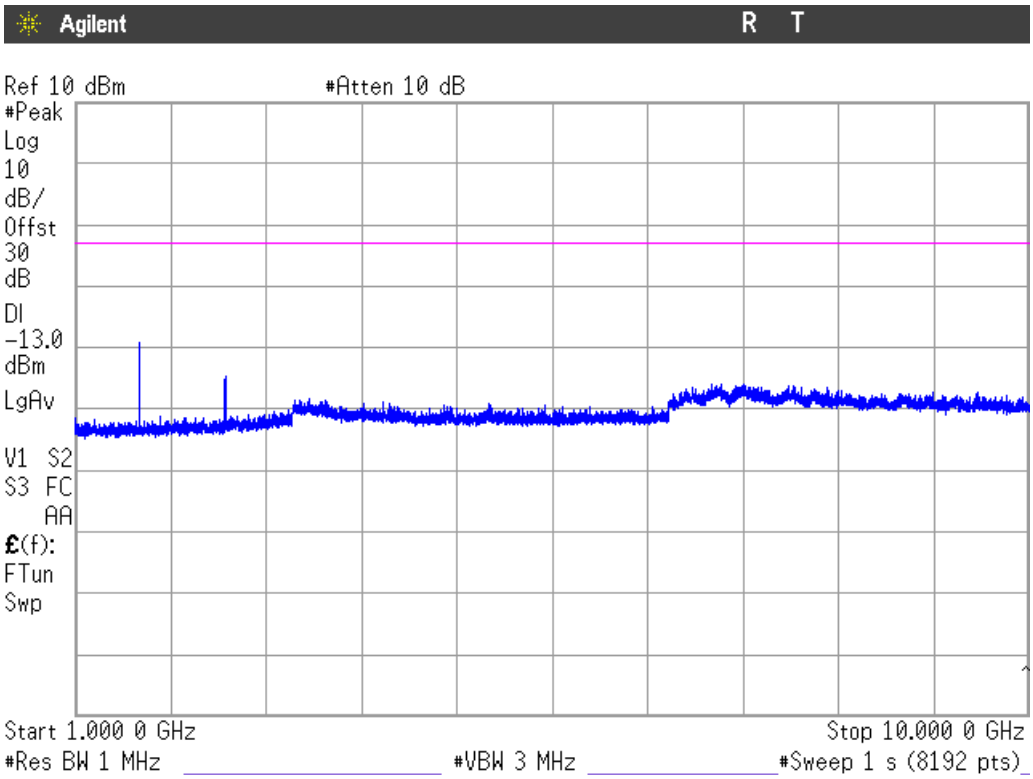
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

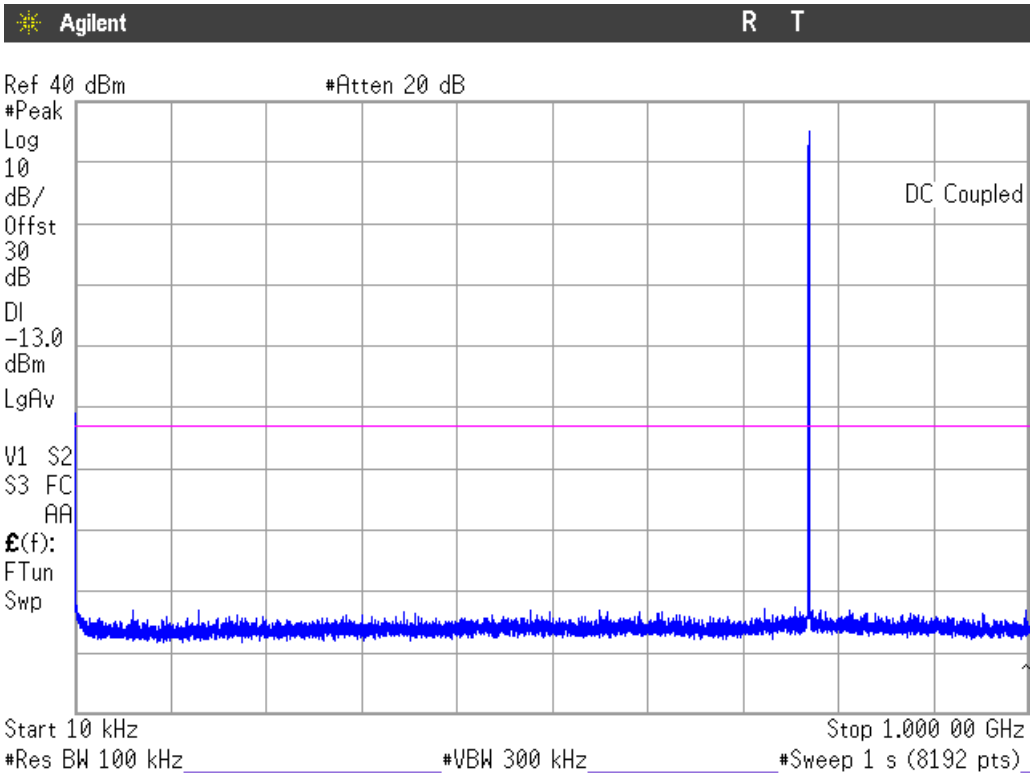


Note: The peak above the limit is the carrier frequency.

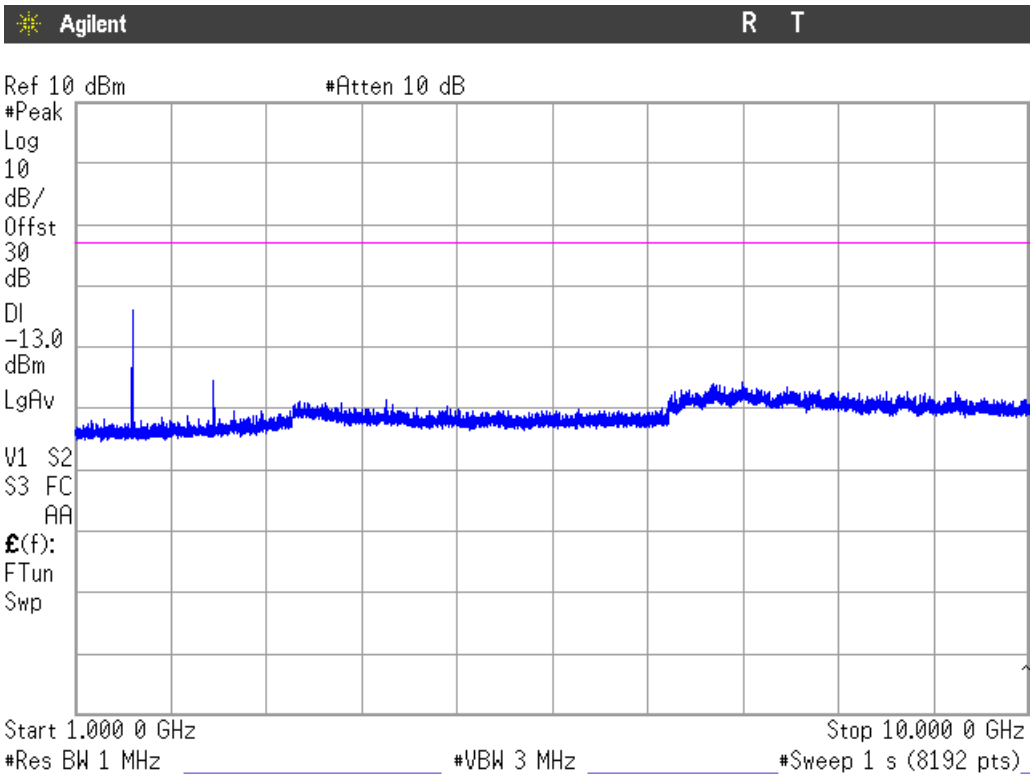


TETRA 22 kHz bandwidth. 769-775 MHz band.

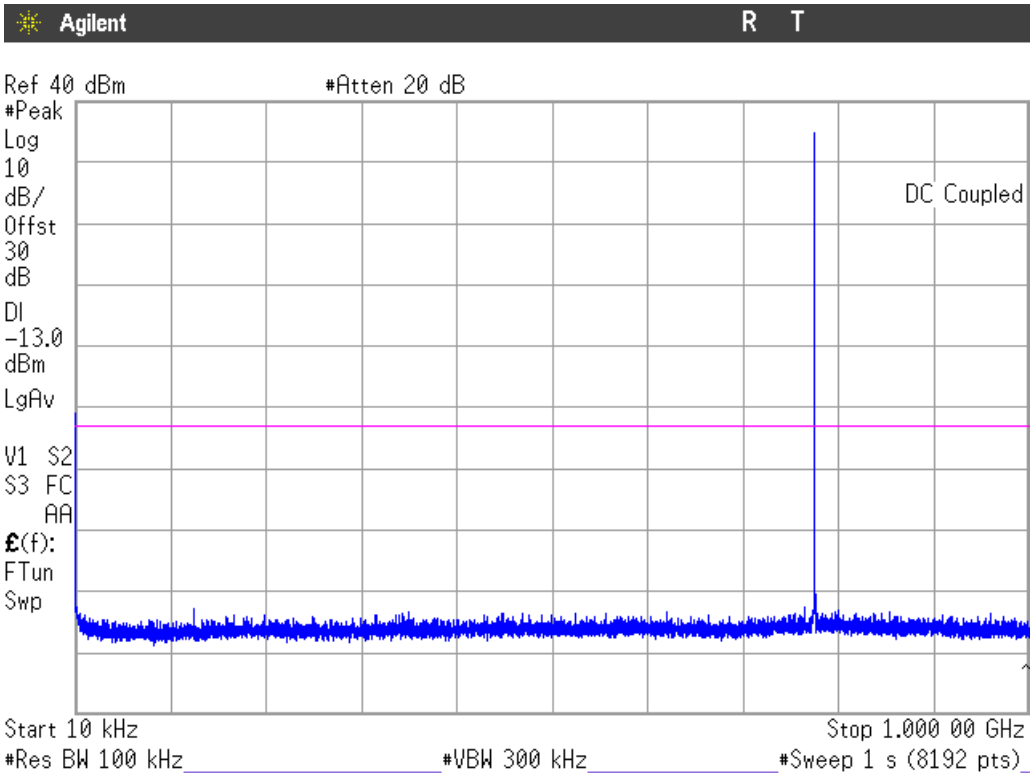
CHANNEL: LOWEST



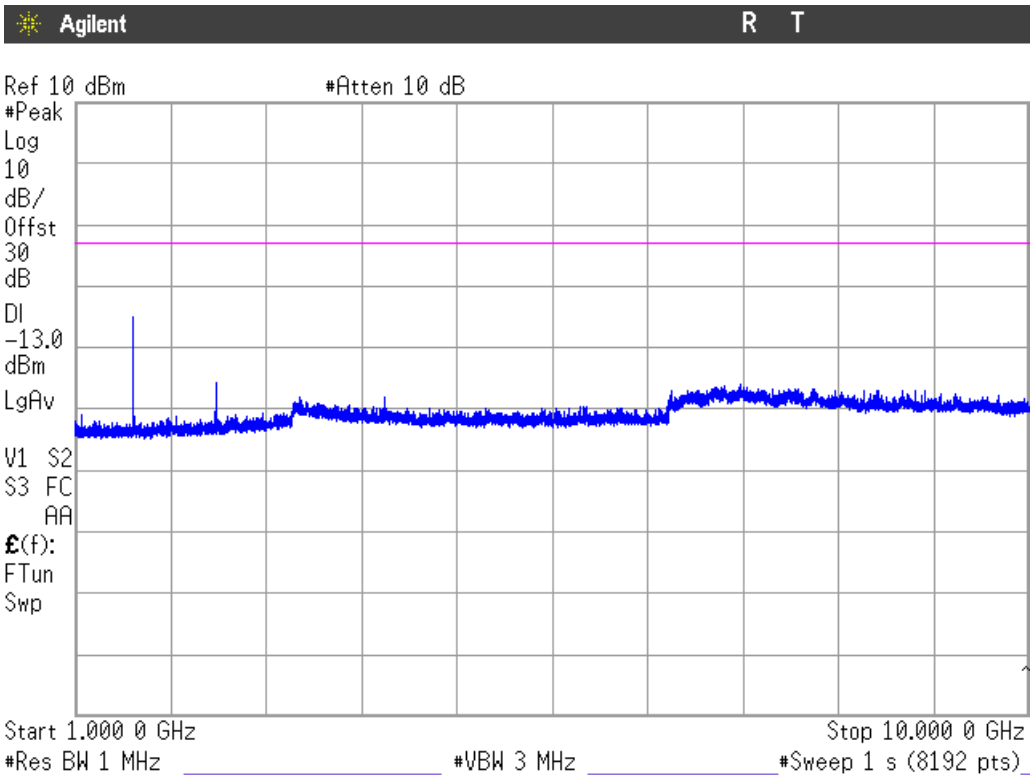
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

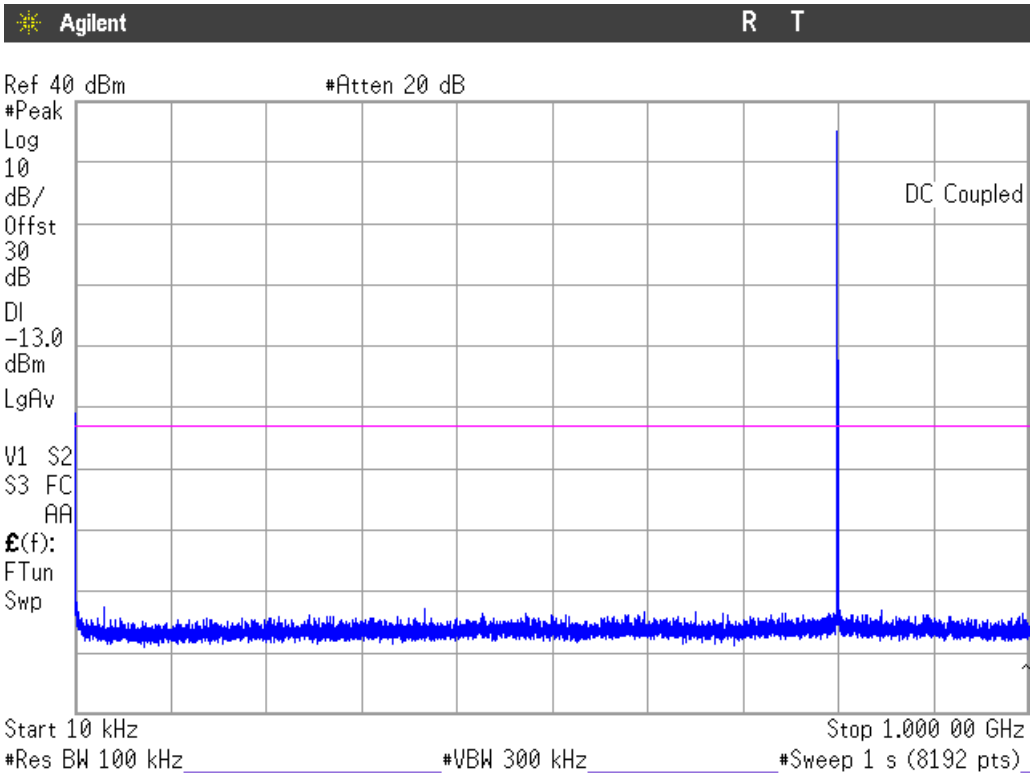


Note: The peak above the limit is the carrier frequency.

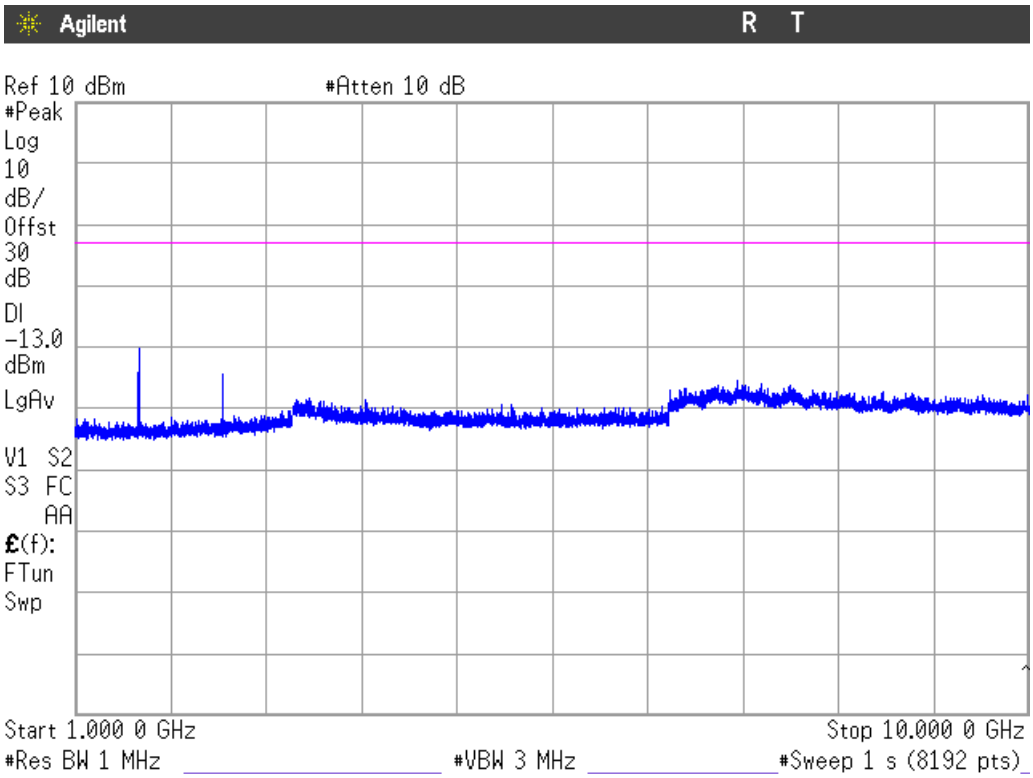


TETRA 22 kHz bandwidth. 799-805 MHz band.

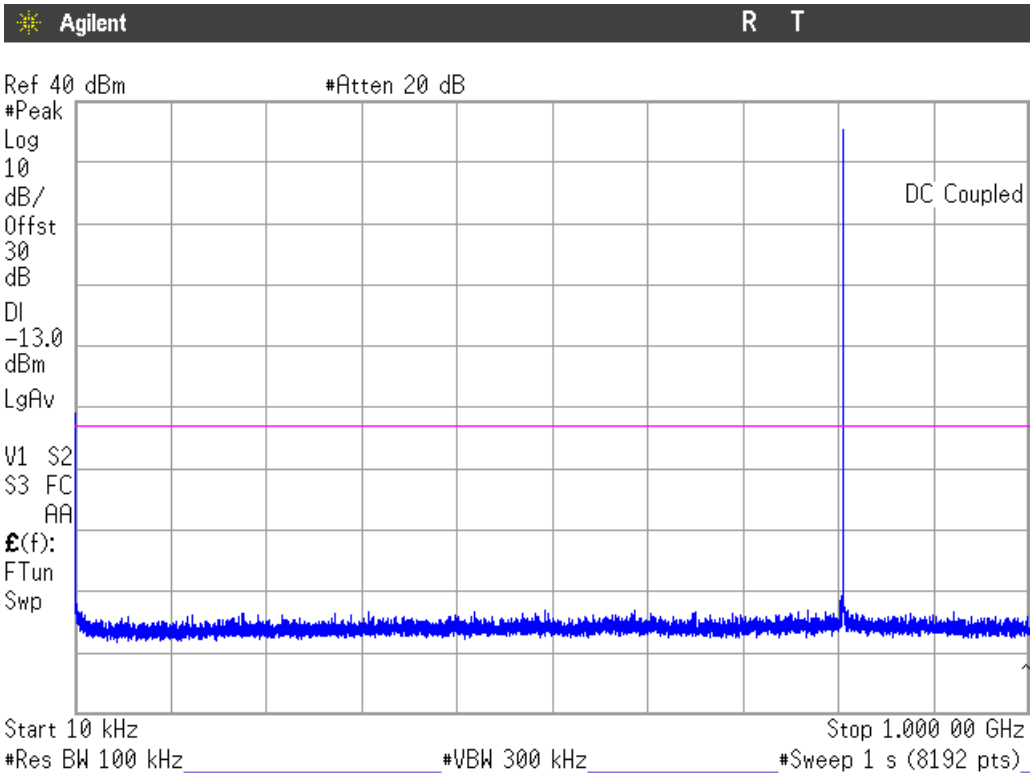
CHANNEL: LOWEST



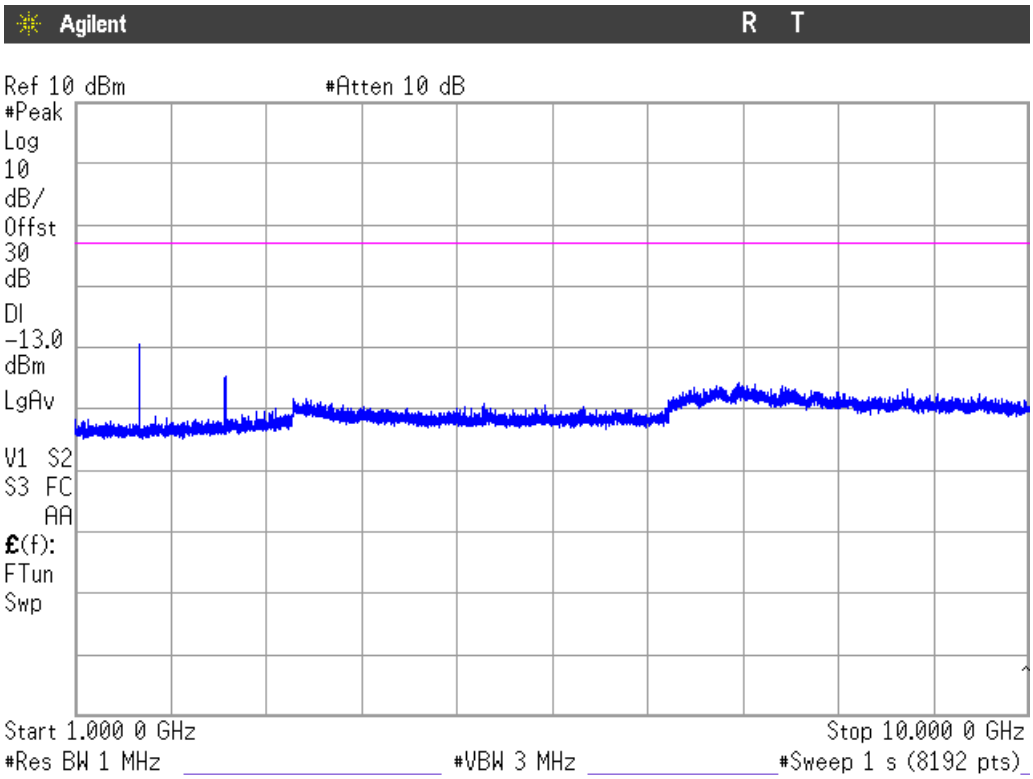
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

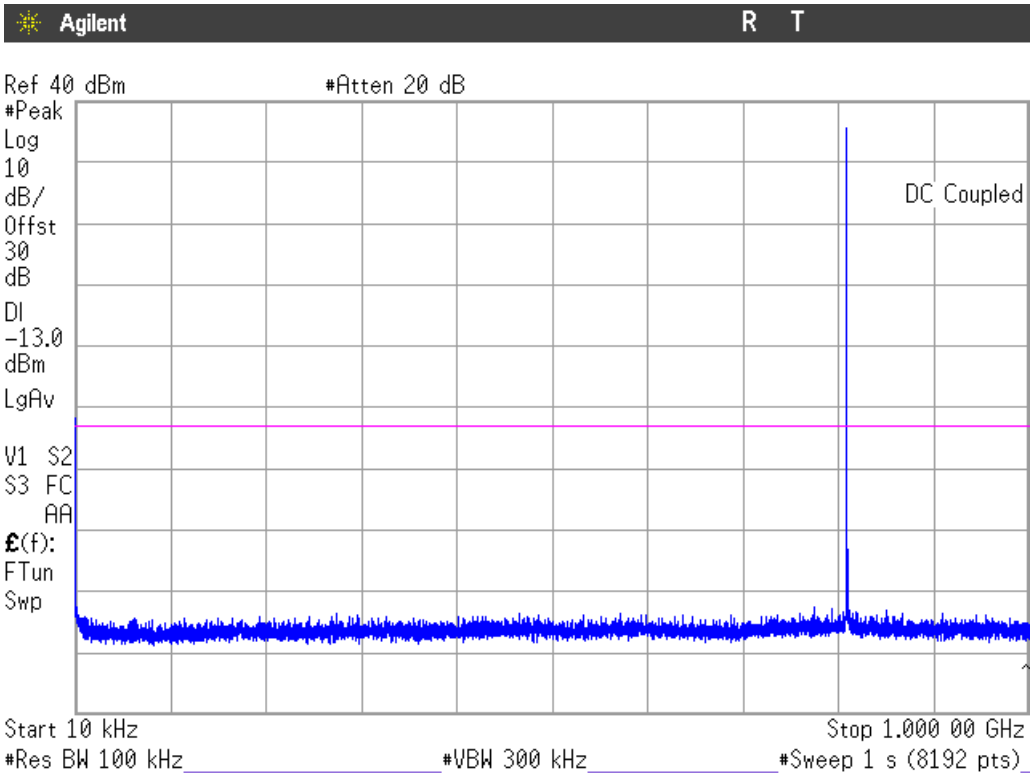


Note: The peak above the limit is the carrier frequency.

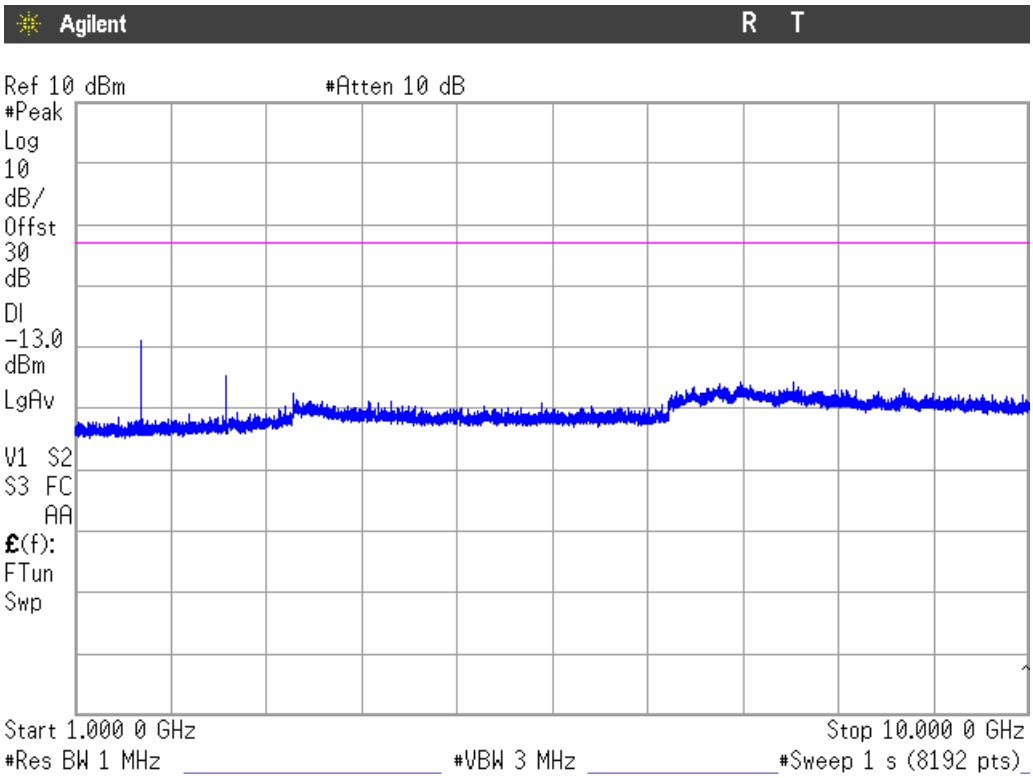


TI D-LMR 20 kHz bandwidth. 809-824 MHz band.

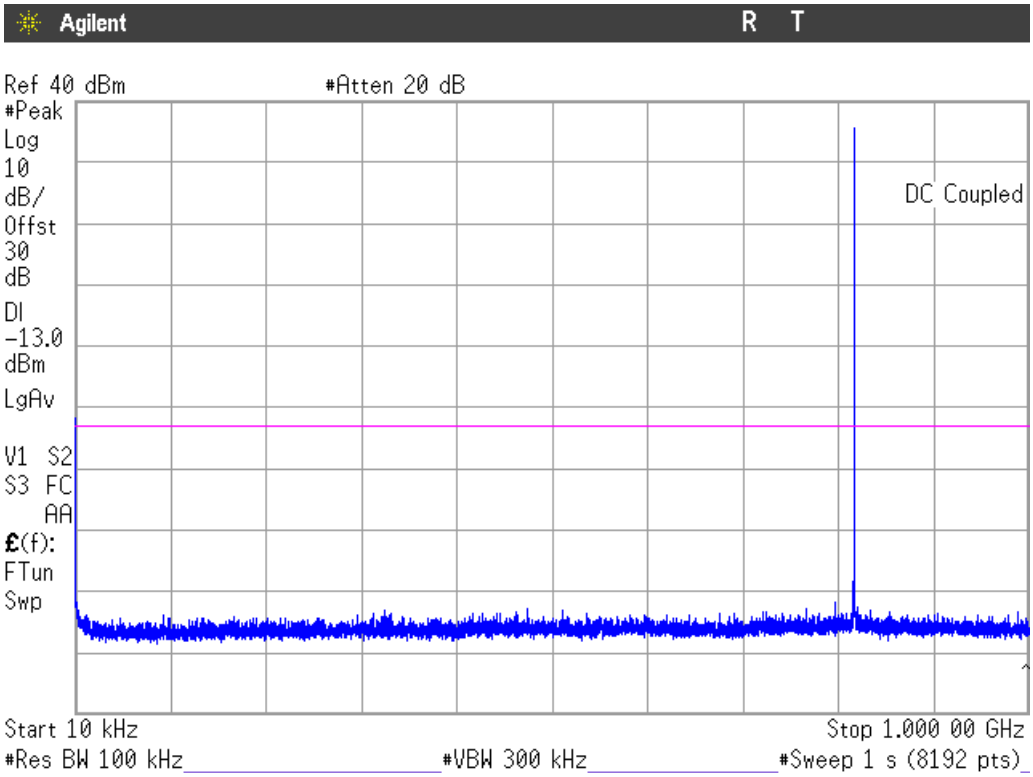
CHANNEL: LOWEST



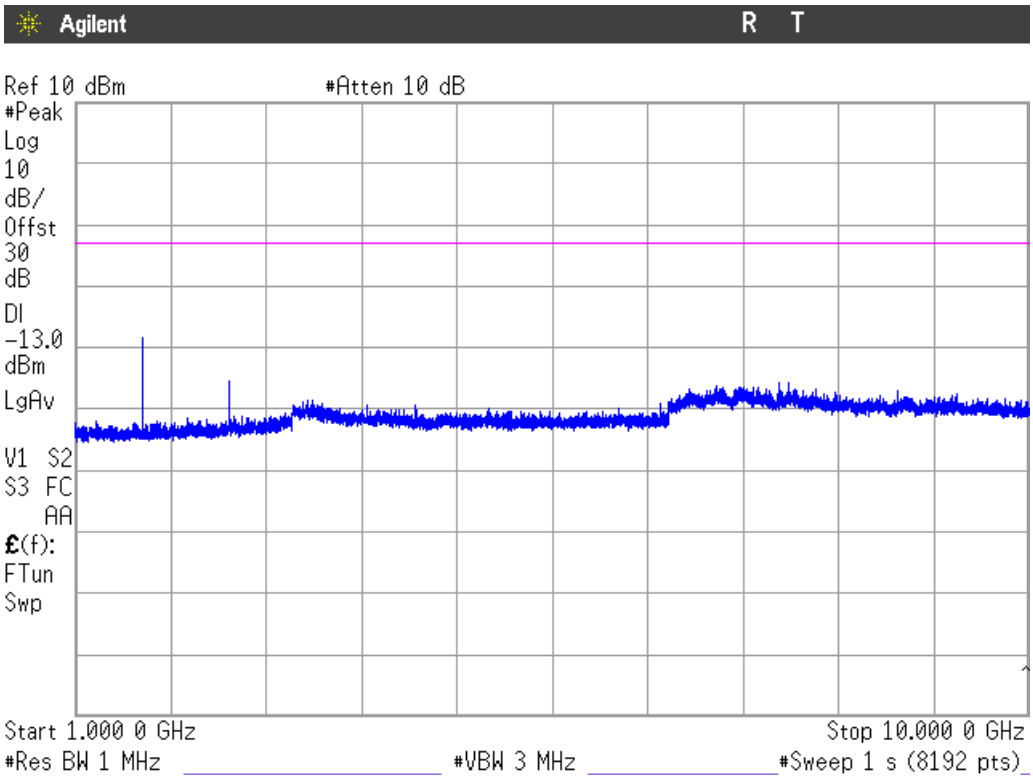
Note: The peak above the limit is the carrier frequency.



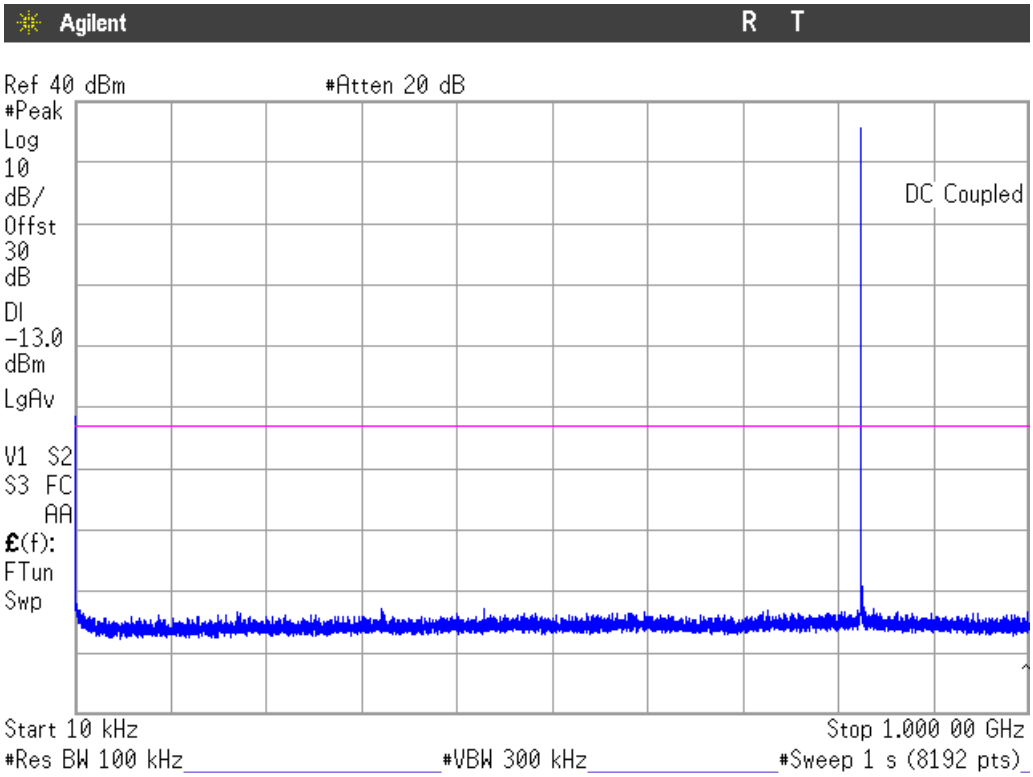
CHANNEL: MIDDLE



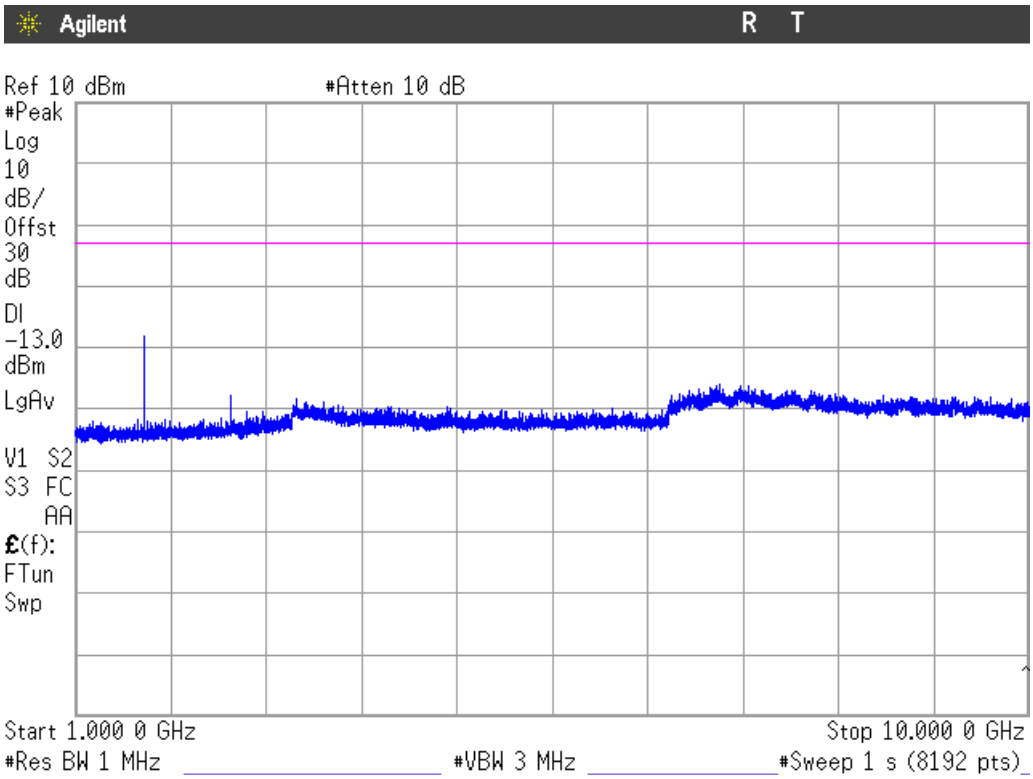
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

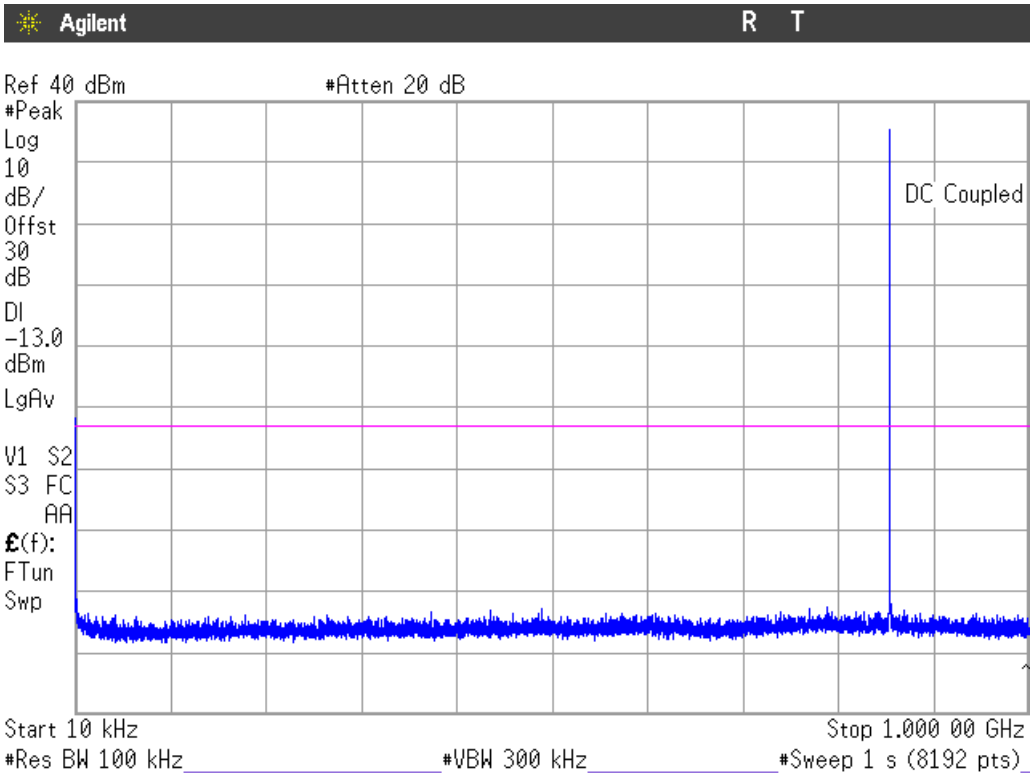


Note: The peak above the limit is the carrier frequency.

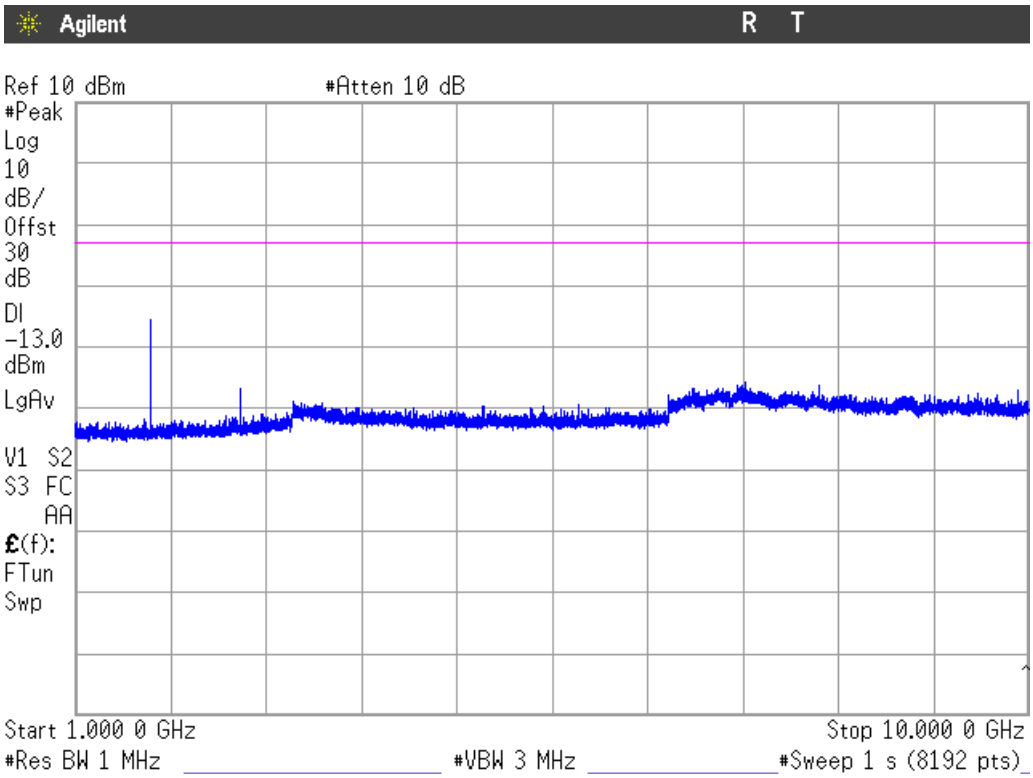


TI D-LMR 20 kHz bandwidth. 854-869 MHz band.

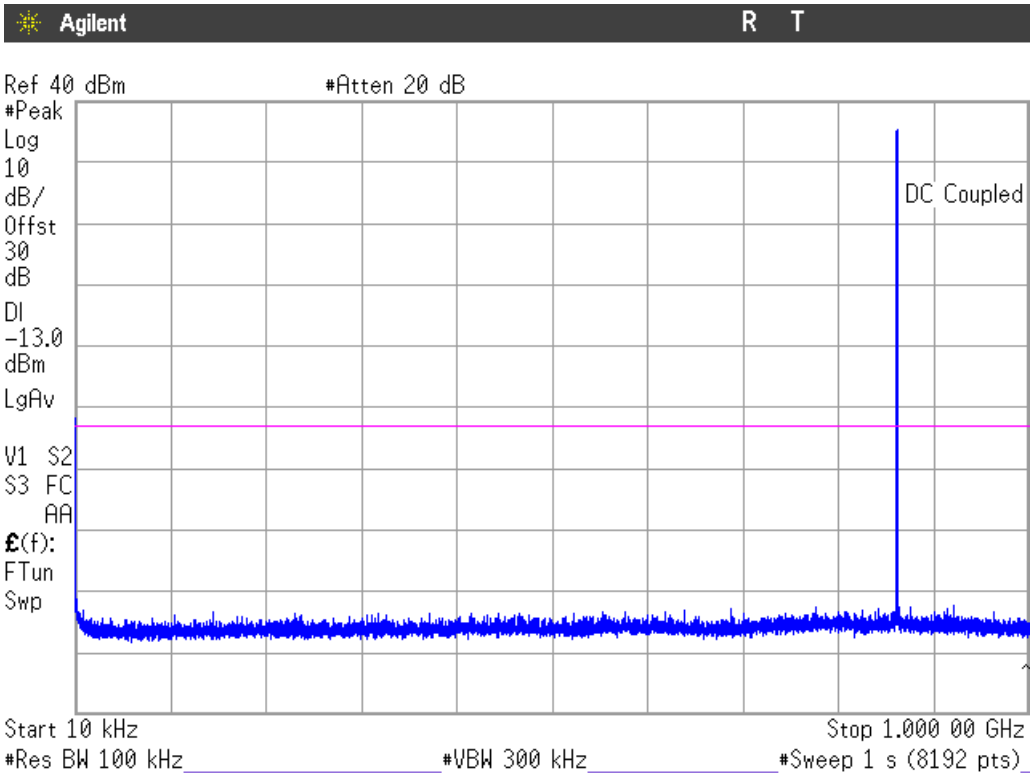
CHANNEL: LOWEST



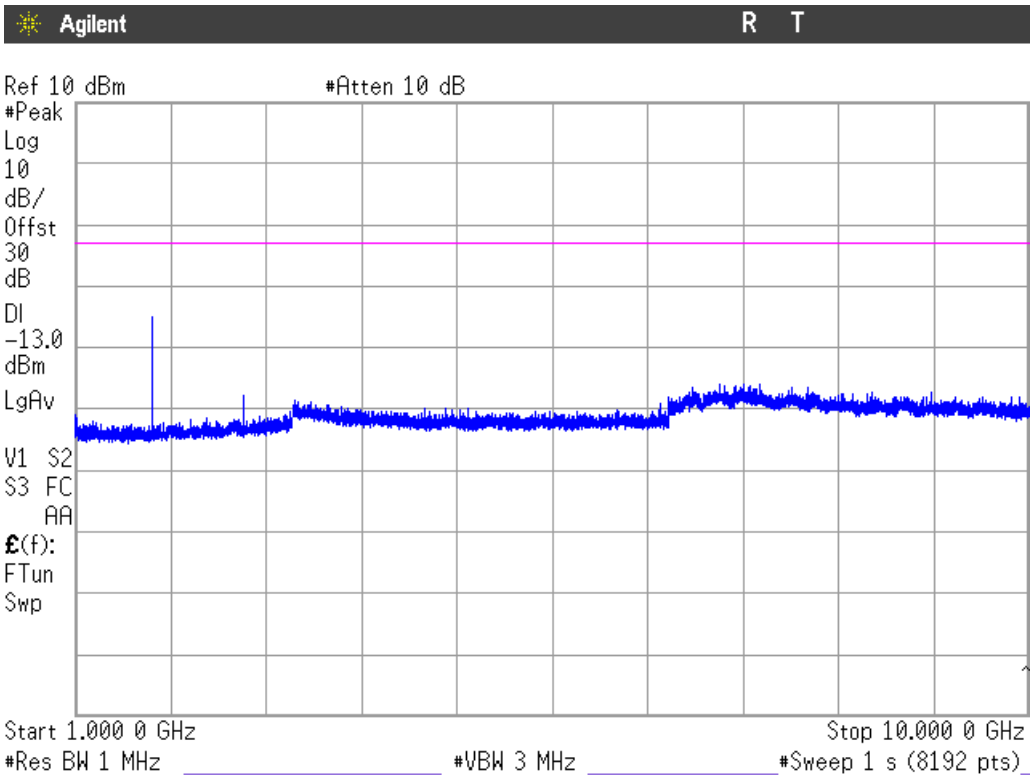
Note: The peak above the limit is the carrier frequency.



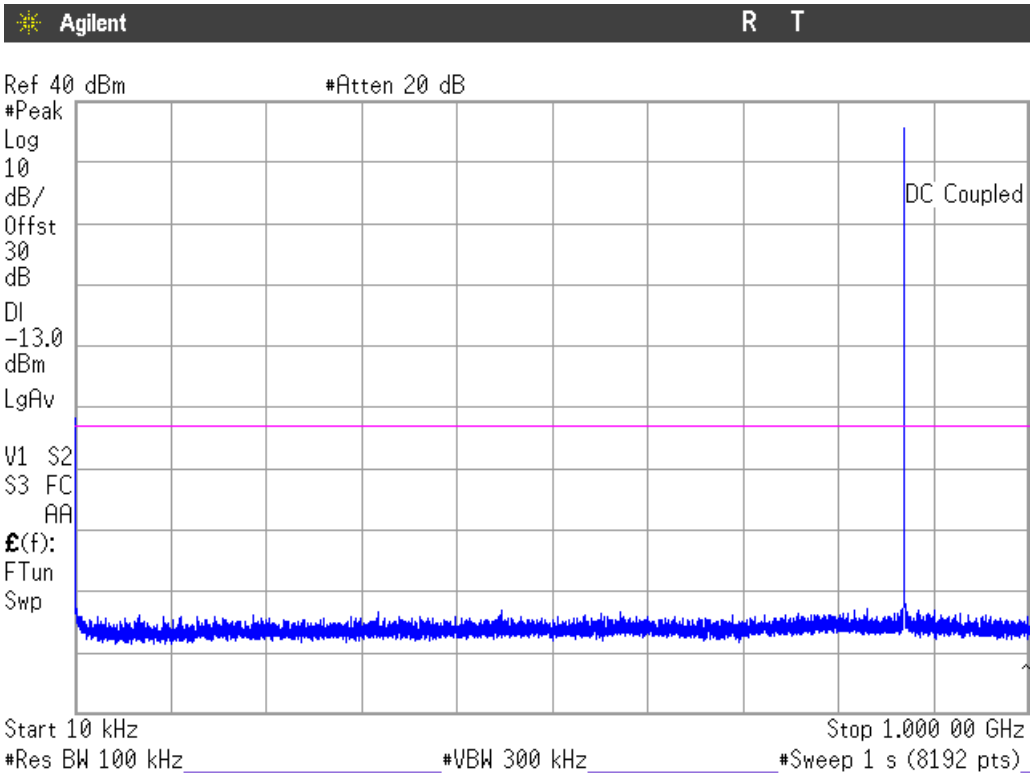
CHANNEL: MIDDLE



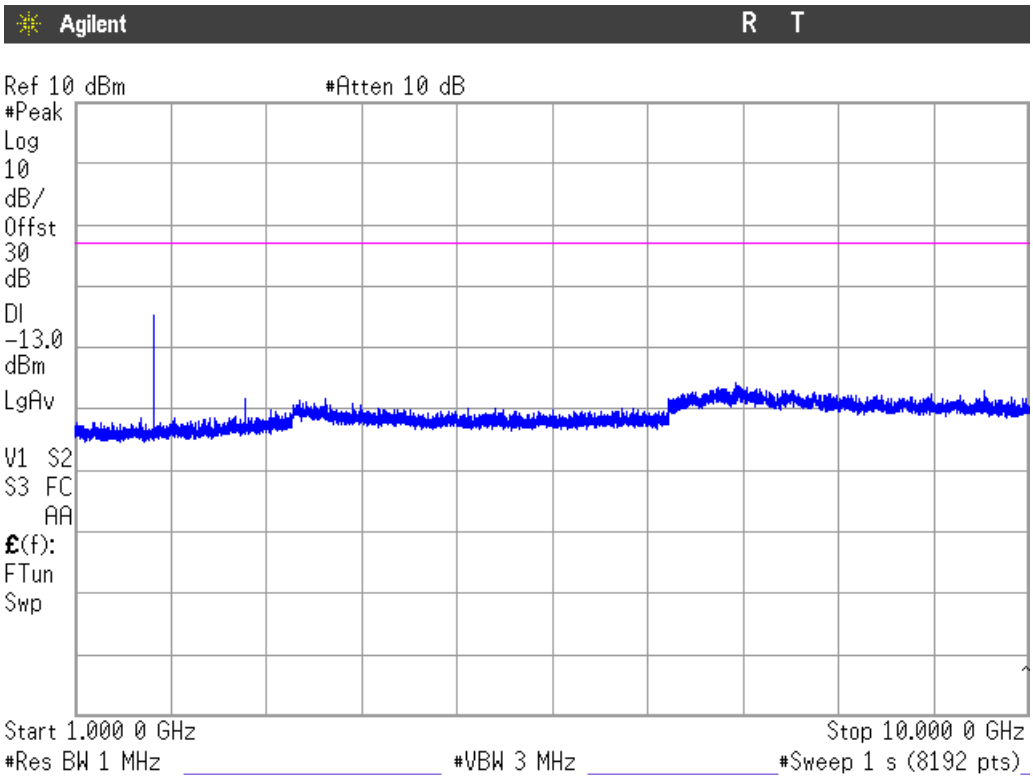
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

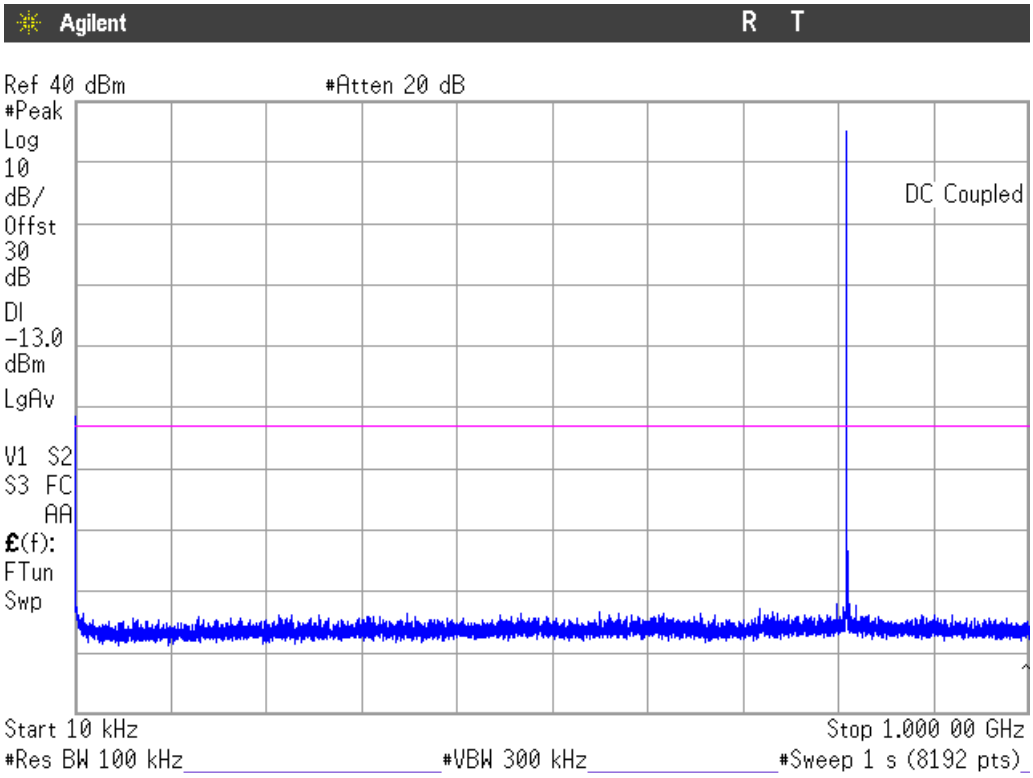


Note: The peak above the limit is the carrier frequency.

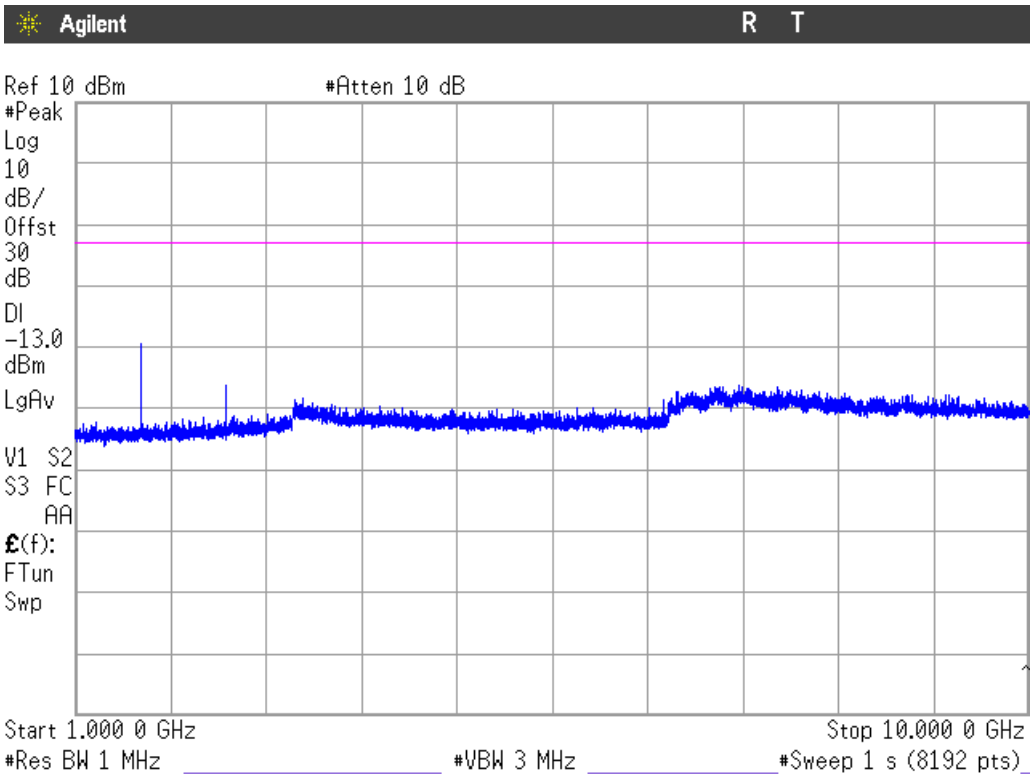


TETRA 22 kHz bandwidth. 809-824 MHz band.

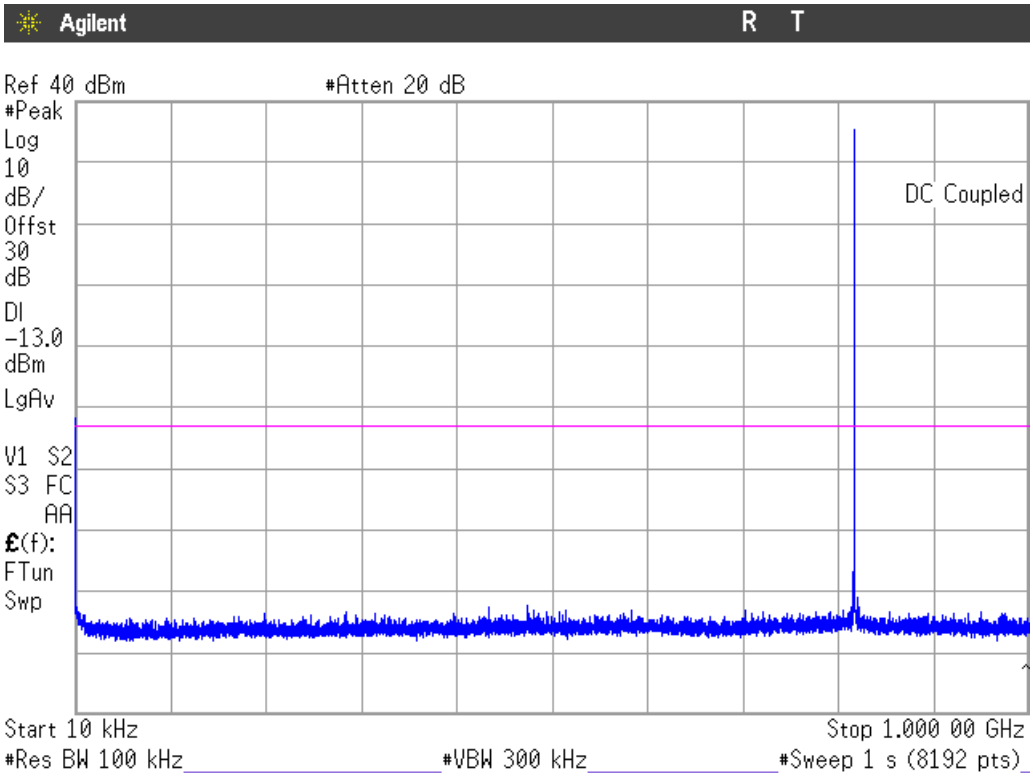
CHANNEL: LOWEST



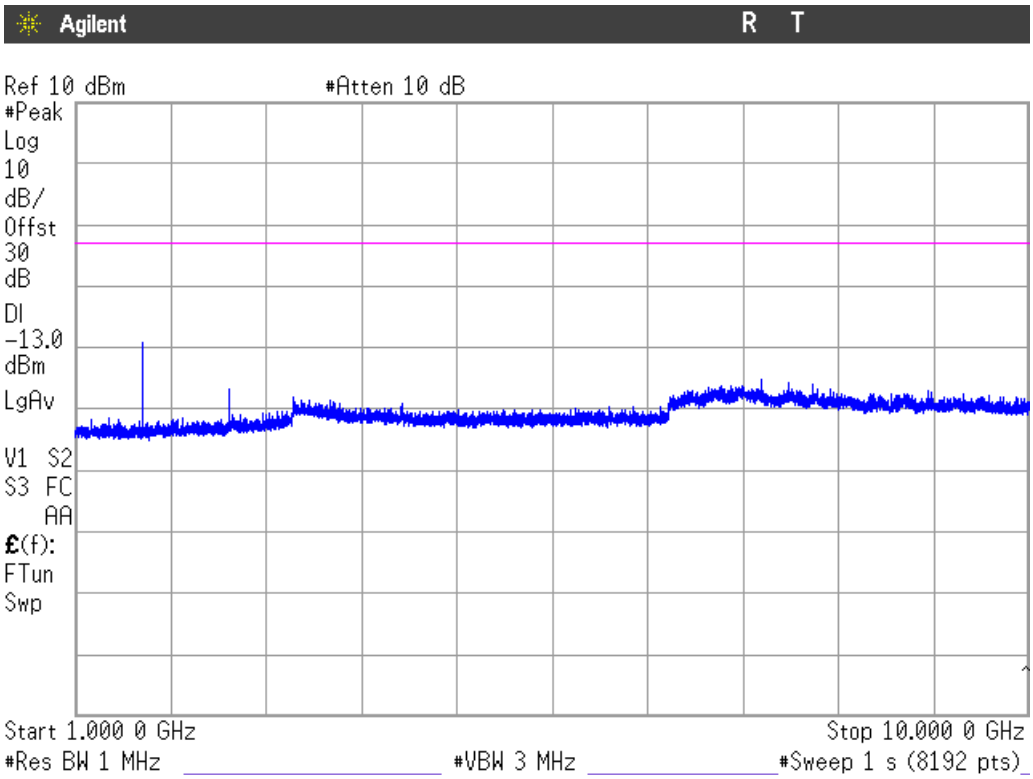
Note: The peak above the limit is the carrier frequency.



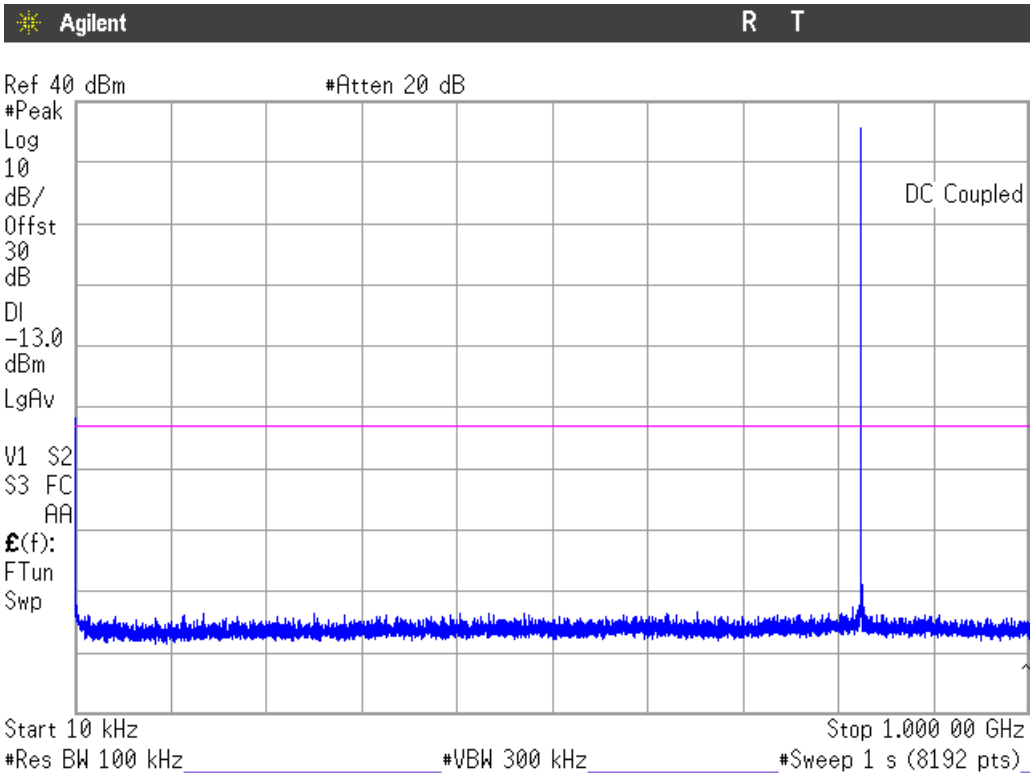
CHANNEL: MIDDLE



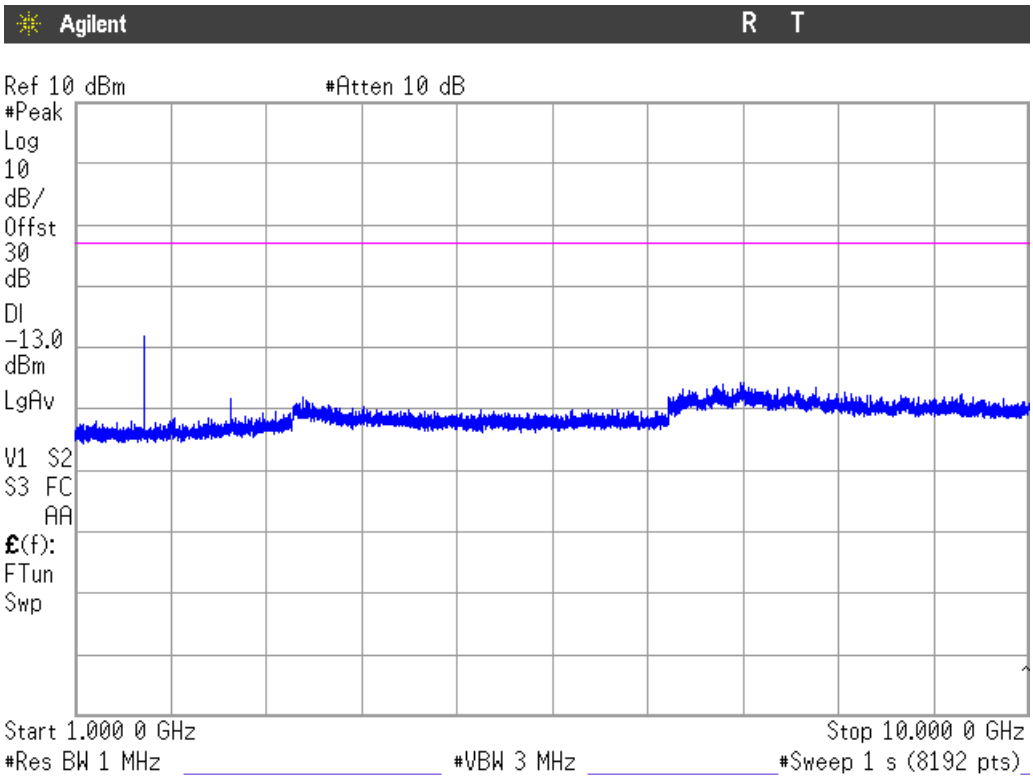
Note: The peak above the limit is the carrier frequency.



CHANNEL: HIGHEST

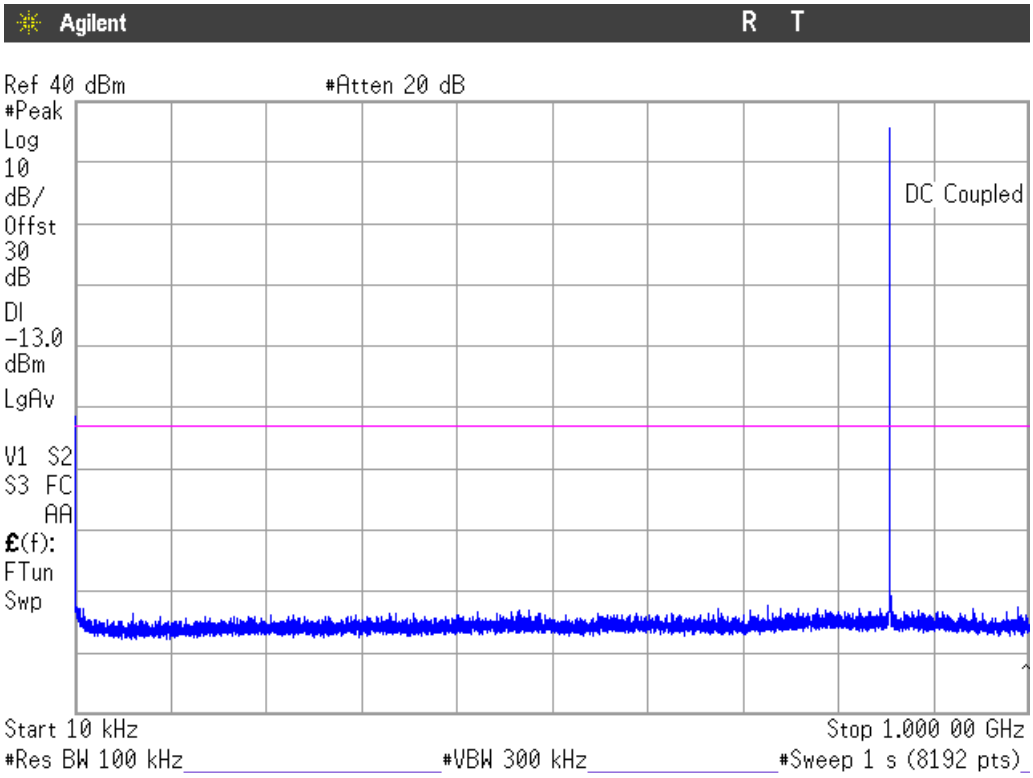


Note: The peak above the limit is the carrier frequency.

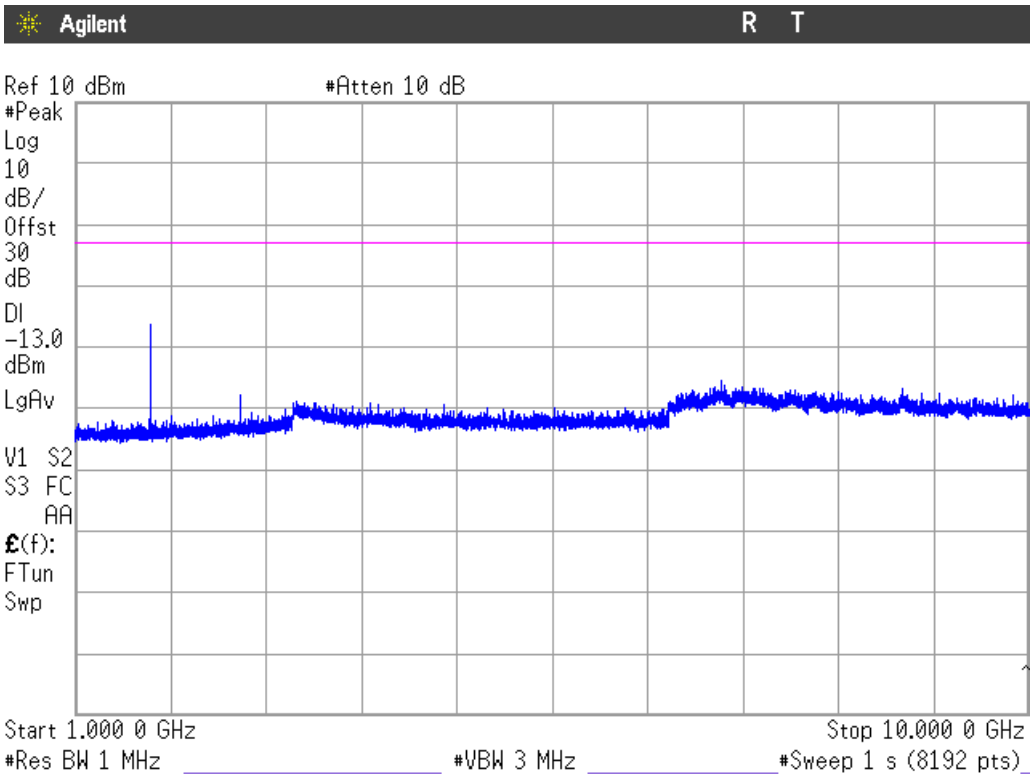


TETRA 22 kHz bandwidth. 854-869 MHz band.

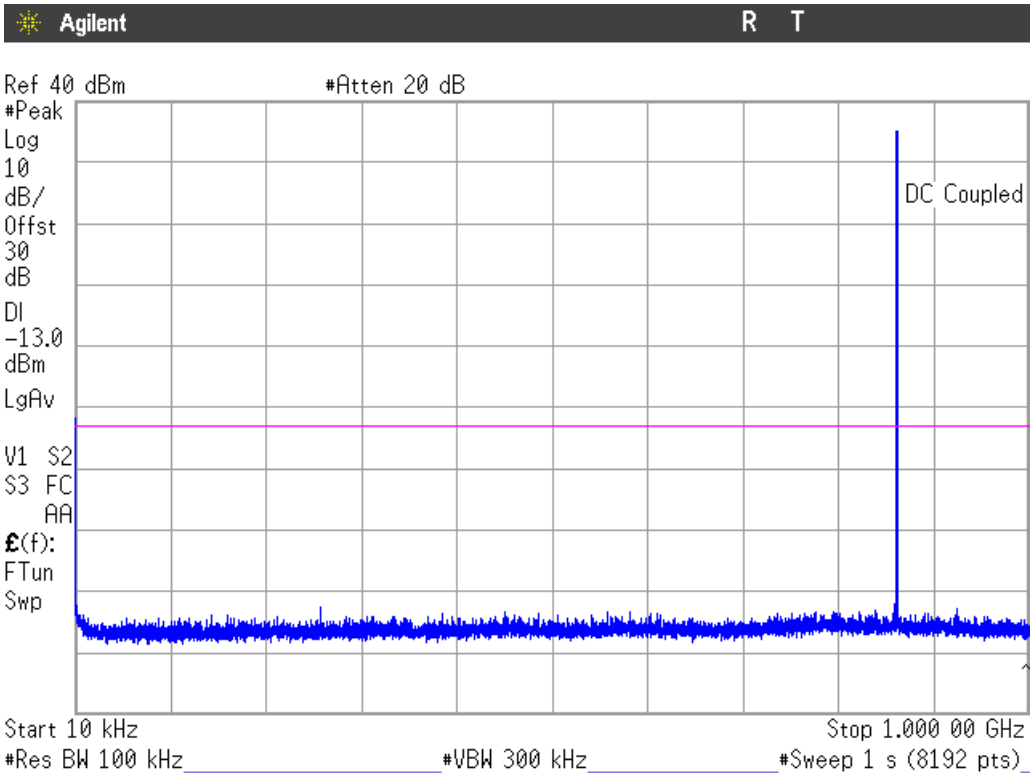
CHANNEL: LOWEST



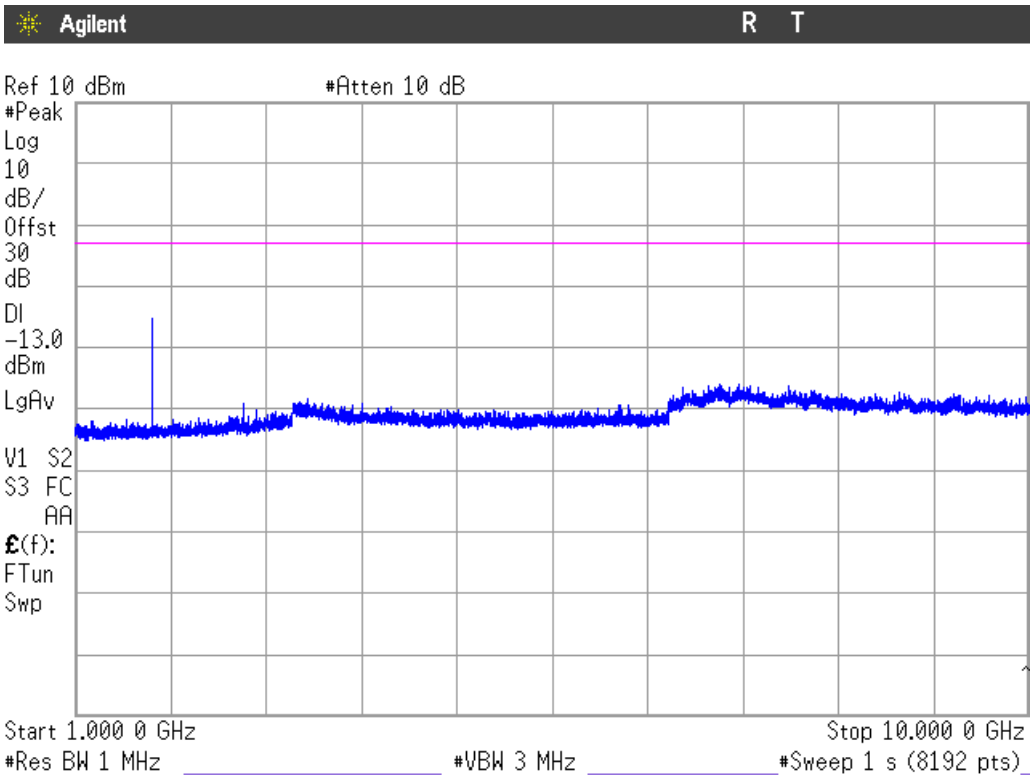
Note: The peak above the limit is the carrier frequency.



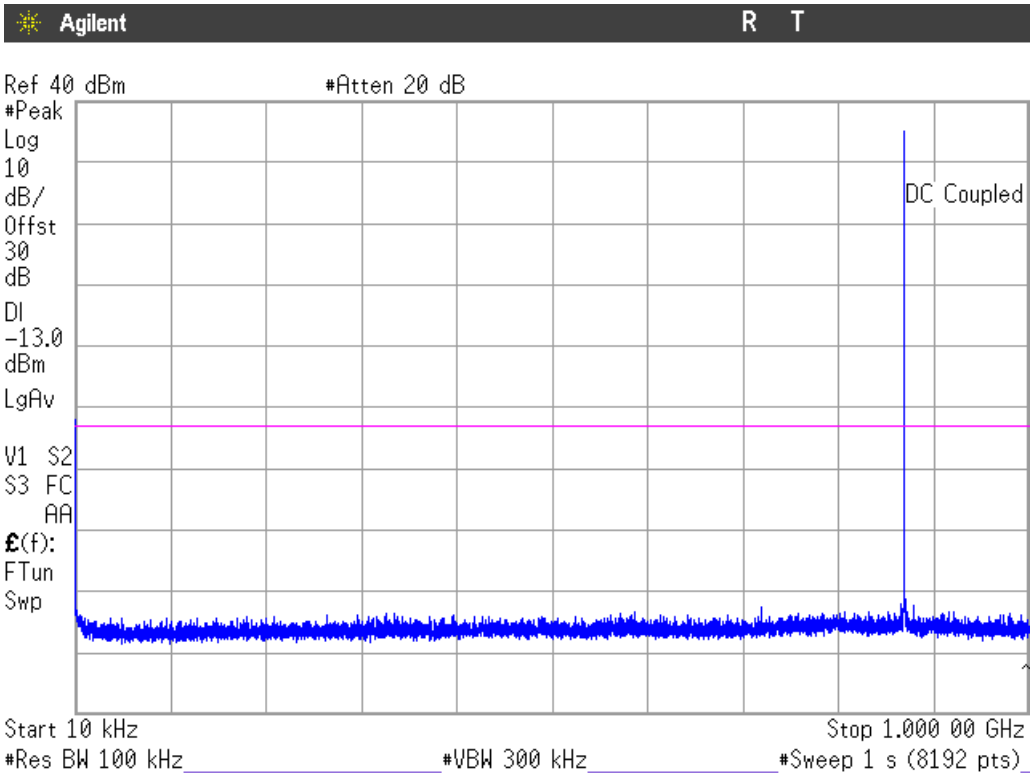
CHANNEL: MIDDLE



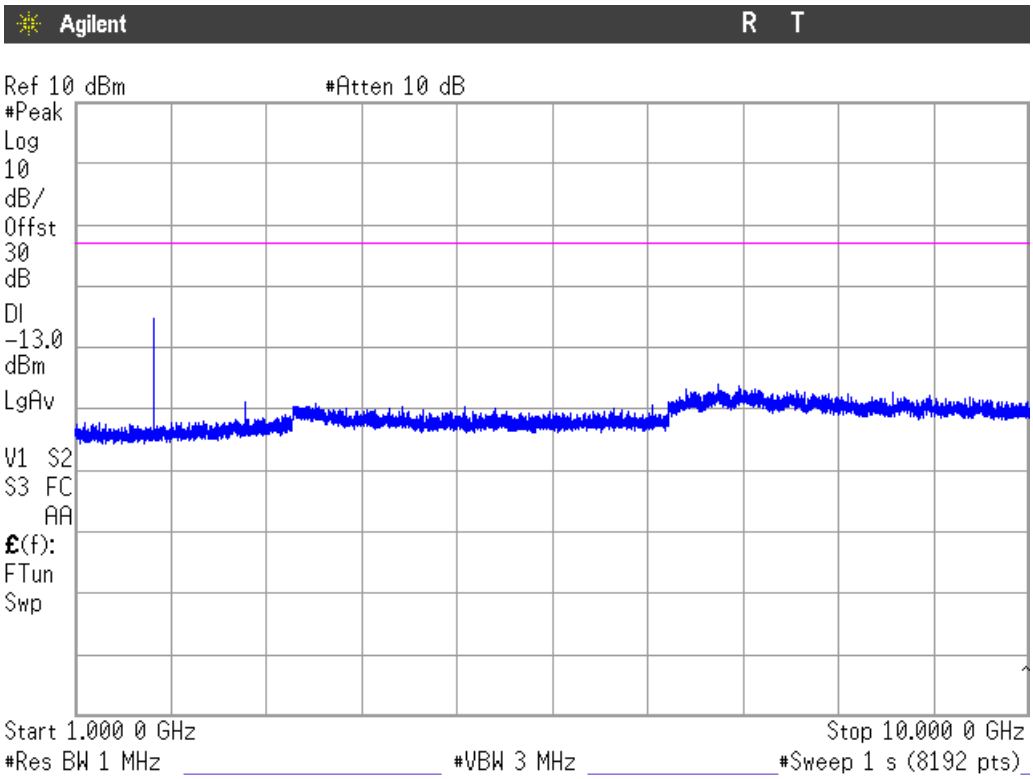
Note: The peak above the limit is the carrier frequency.



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 EUT can operate with three different accessories configuration and two types of attachable antenna:

Accessories configuration:

- Configuration 1: EUT with remote speaker microphone and earpiece.
- Configuration 2: EUT with wire kit acoustic tube earhanger.
- Configuration 3: EUT with covert RAC lead, remote control unit, covert inductive loop and shoulder harness.

Types of attachable antenna:

- ¼ wave antenna.
- ½ wave antenna.

The measurement was performed with the EUT inside an anechoic chamber with the accessories connected. 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.

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.

A preliminary scan was performed to determine the worst case of accessories configuration and antenna.

Each detected emission at less than 20 dB respect to the limit is substituted by the Substitution method in accordance with the ANSI/TIA-603-D: 2010.

The test was performed with the equipment transmitting first in only TETRA, TI D-LMR or P25 mode (worst case) and repeated with the BT EDR radio transmitting simultaneously in the worst case of modulation (GFSK, π/4-DQPK or 8-DPSK) to check the impact of the co-location of both radio interfaces. The results and plots below show the worst results obtained in both modes.

RESULTS

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

EUT terminated with 50 ohm load. A preliminary scan determined the P25 C4FM 8.1 kHz bandwidth mode with remote speaker microphone and earpiece accessories configuration as the worst case. The following tables and plots show the results for this configuration.

EUT terminated with attachable antenna for emissions in the band 1559-1610 MHz. A preliminary scan determined the TI D-LMR 20 kHz bandwidth mode with ¼ wave antenna and remote speaker microphone and earpiece accessories configuration as the worst case. The following tables and plots show the results for this configuration.

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)
2.30695	-15.91	1000	Peak	Horizontal	-33.94	2.00	10.39	-25.55

Frequency range 1559 MHz-1610 GHz.
All peaks are more than 20 dB below the limit.

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)
2.32495	-18.27	1000	Peak	Vertical	-36.28	2.00	10.42	-27.86

Frequency range 1559 MHz-1610 GHz.
All peaks are more than 20 dB below the limit.

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

EUT terminated with 50 ohm load. A preliminary scan determined the P25 C4FM 8.1 kHz bandwidth mode with remote speaker microphone and earpiece accessories configuration as the worst case. The following tables and plots show the results for this configuration.

EUT terminated with attachable antenna for emissions in the band 1559-1610 MHz. A preliminary scan determined the TI D-LMR 20 kHz bandwidth mode with ¼ wave antenna and remote speaker microphone and earpiece accessories configuration as the worst case. The following tables and plots show the results for this configuration.

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)
2.39695	-15.25	1000	Peak	Vertical	-33.19	2.00	10.54	-24.65

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)
1.5979581	-28.47	1000	Peak	Vertical	-46.70	1.79	8.45	-40.04
1.5979581	-34.66	1000	RMS	Vertical	-52.89	1.79	8.45	-46.23

Note: The signal detected is not a discrete emission of less than 700 Hz bandwidth.

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)
2.41495	-15.57	1000	Peak	Vertical	-33.48	2.00	10.56	-24.92

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)
1.60998785	-30.70	1000	Peak	Vertical	-48.92	1.82	8.50	-42.24
1.60998785	-37.01	1000	RMS	Vertical	-55.23	1.82	8.50	-48.55

Note: The signal detected is not a discrete emission of less than 700 Hz bandwidth.

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

A preliminary scan determined the TI D-LMR 20 kHz bandwidth mode with remote speaker microphone and earpiece accessories configuration as the worst case. The following tables and plots show the results for this configuration.

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)
2.42725	-14.79	1000	Peak	Vertical	-32.69	2.00	10.58	-24.11

2. CHANNEL: MIDDLE.

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)
2.44945	-15.17	1000	Peak	Vertical	-33.05	2.00	10.62	-24.43

3. 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)
2.47225	-14.10	1000	Peak	Vertical	-31.96	2.00	10.66	-23.30

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

A preliminary scan determined the TI D-LMR 20 kHz bandwidth mode with remote speaker microphone and earpiece accessories configuration as the worst case. The following tables and plots show the results for this configuration.

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)
2.56195	-12.80	1000	Peak	Vertical	-30.29	2.16	10.72	-21.73

2. CHANNEL: MIDDLE.

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)
2.58475	-12.11	1000	Peak	Vertical	-29.52	2.18	10.73	-20.97

3. 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)
2.60695	-12.21	1000	Peak	Vertical	-29.53	2.20	10.74	-20.99

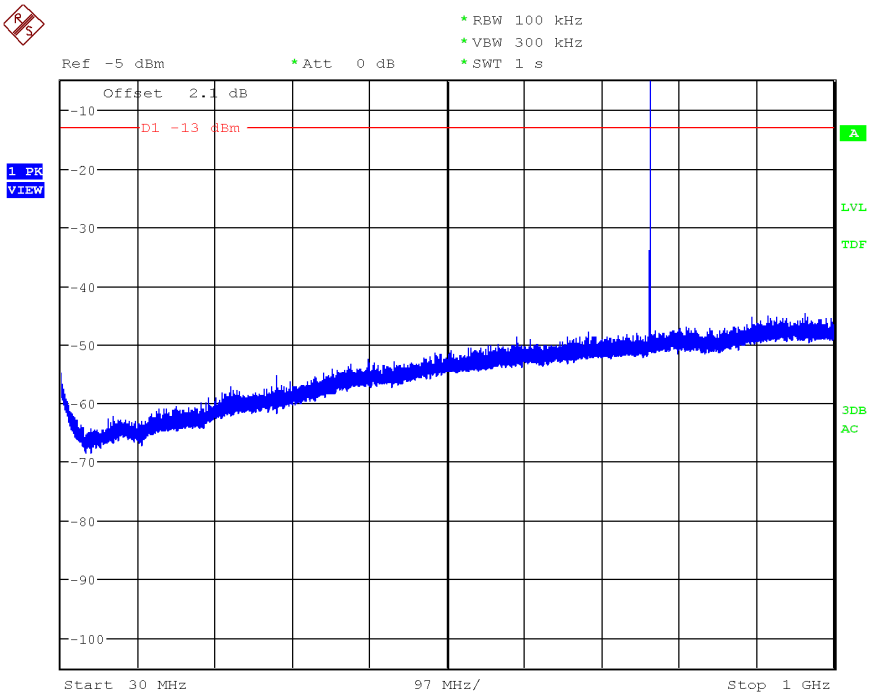
Measurement uncertainty (dB)	<±3.88 for f < 1GHz <±4.87 for f ≥ 1 GHz up to 18 GHz

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

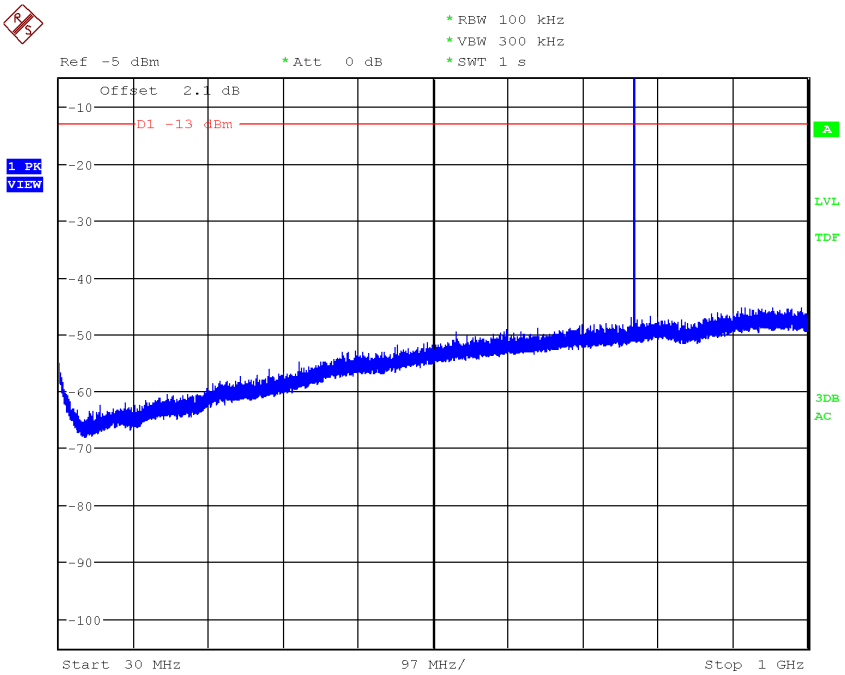
769-775 MHz band.

CHANNEL: LOWEST.



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

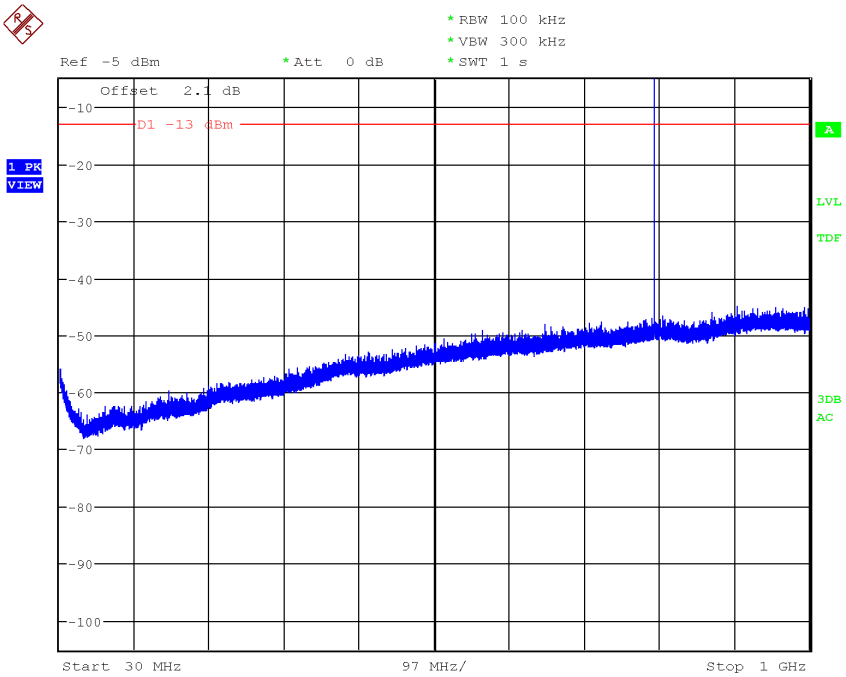
CHANNEL: HIGHEST.



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

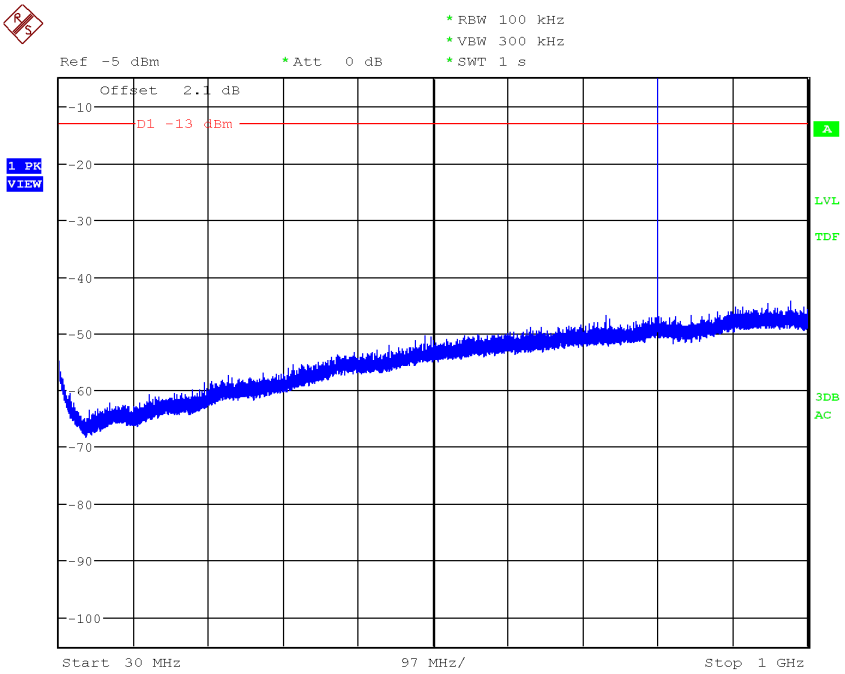
799-805 MHz band.

CHANNEL: LOWEST.



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

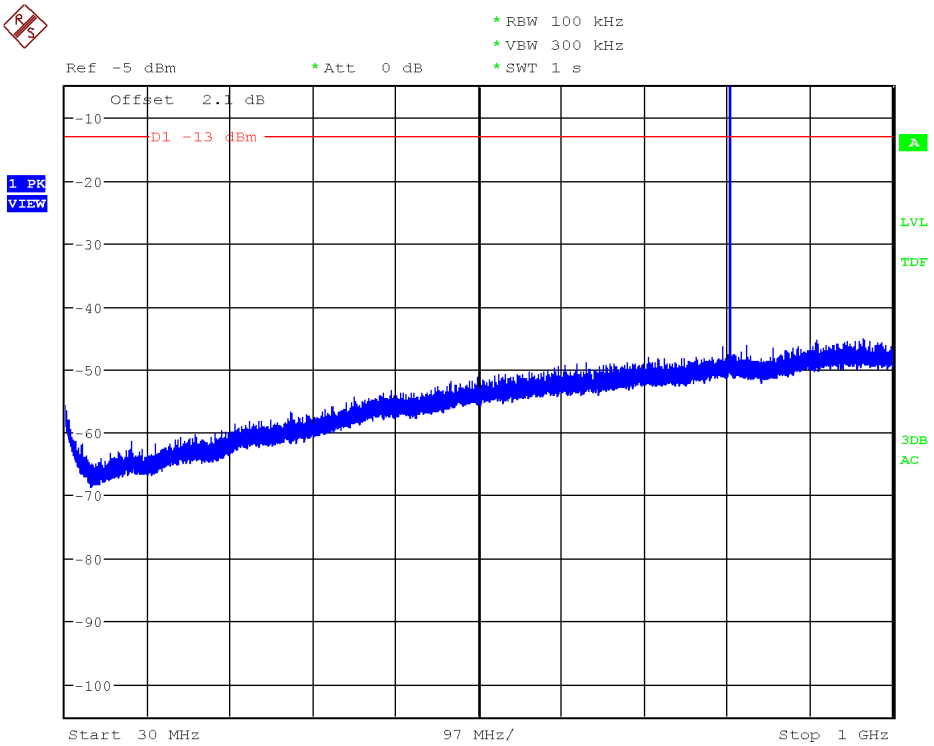
CHANNEL: HIGHEST.



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

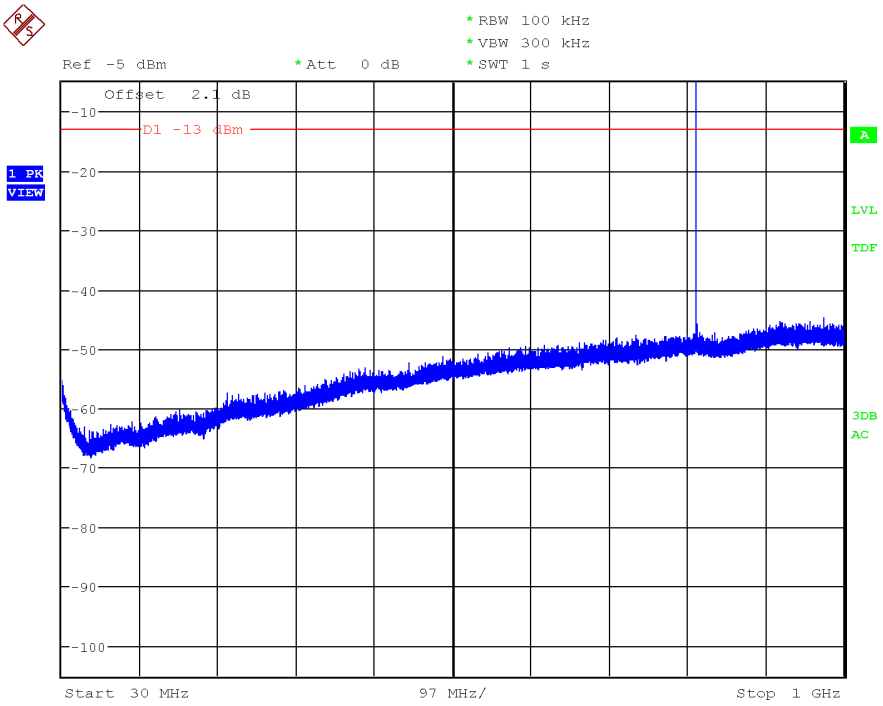
809-824 MHz band.

CHANNEL: LOWEST.



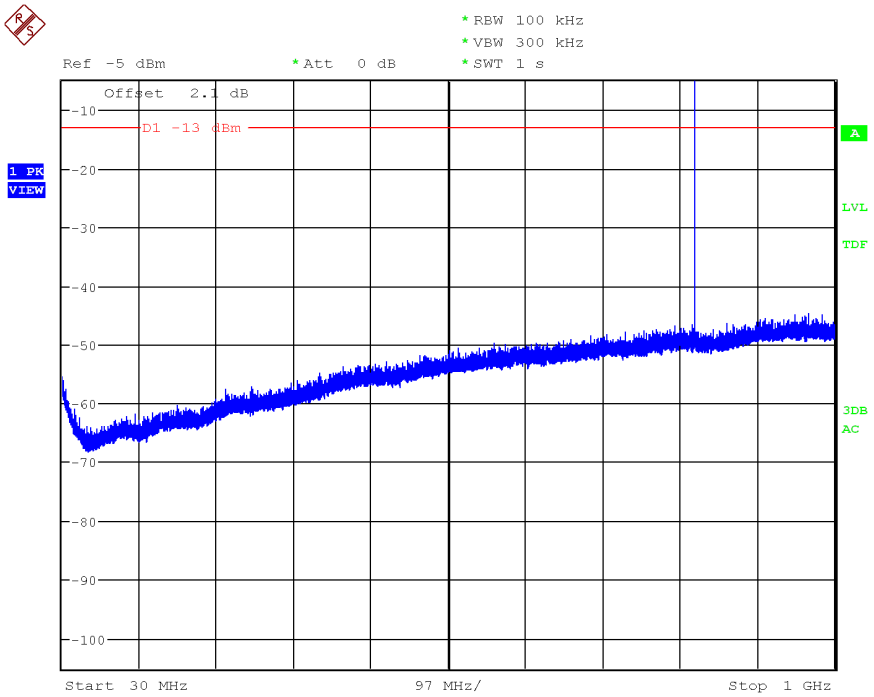
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE.



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

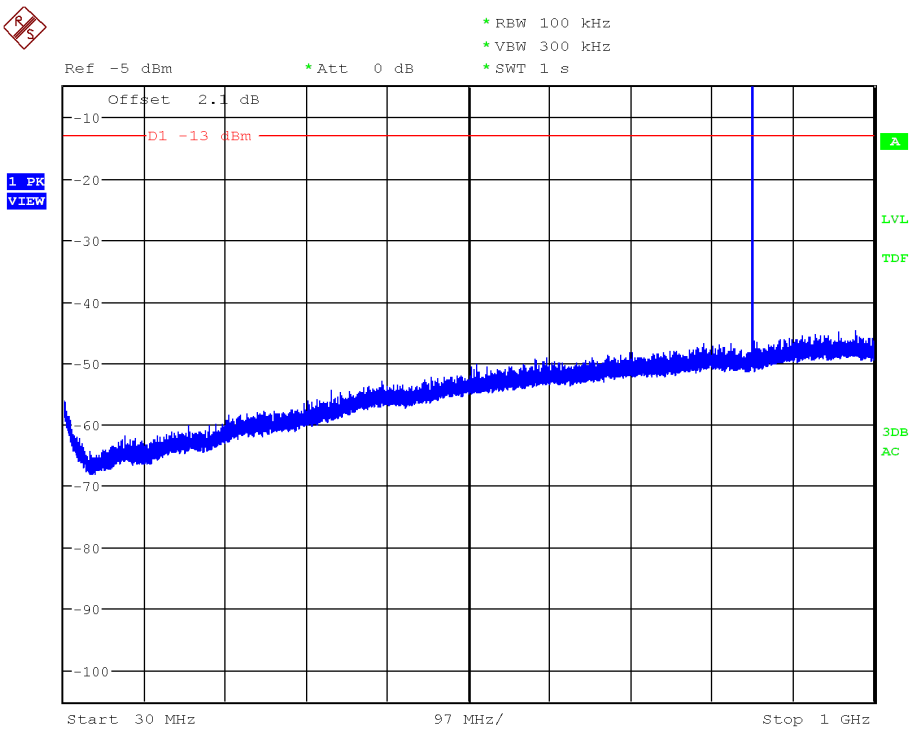
CHANNEL: HIGHEST.



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

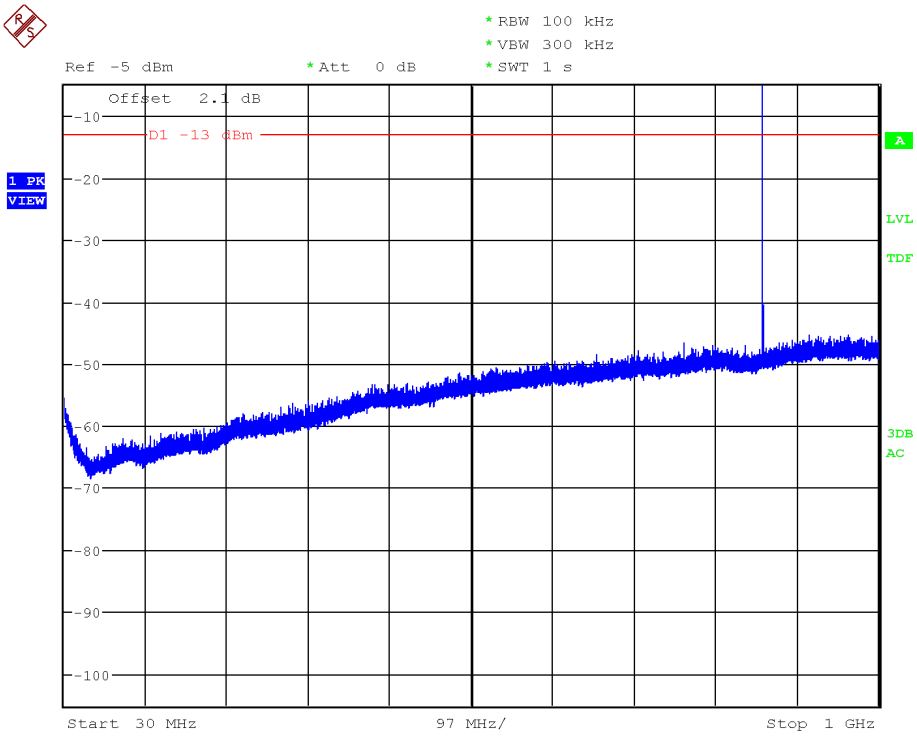
854-869 MHz band.

CHANNEL: LOWEST.



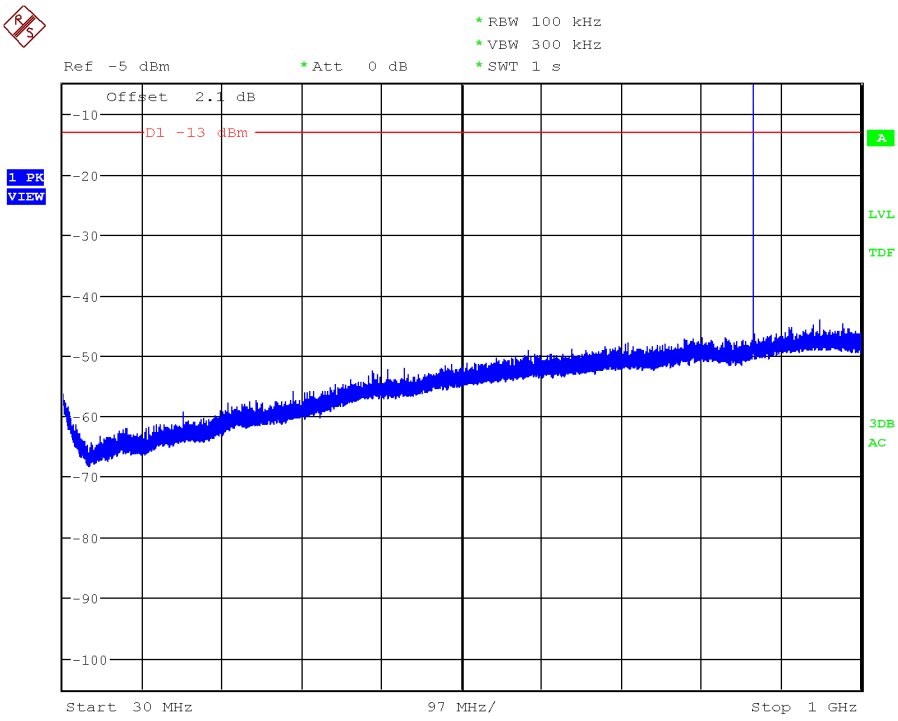
Note: The peak above the limit is the carrier frequency..

CHANNEL: MIDDLE.



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

CHANNEL: HIGHEST.

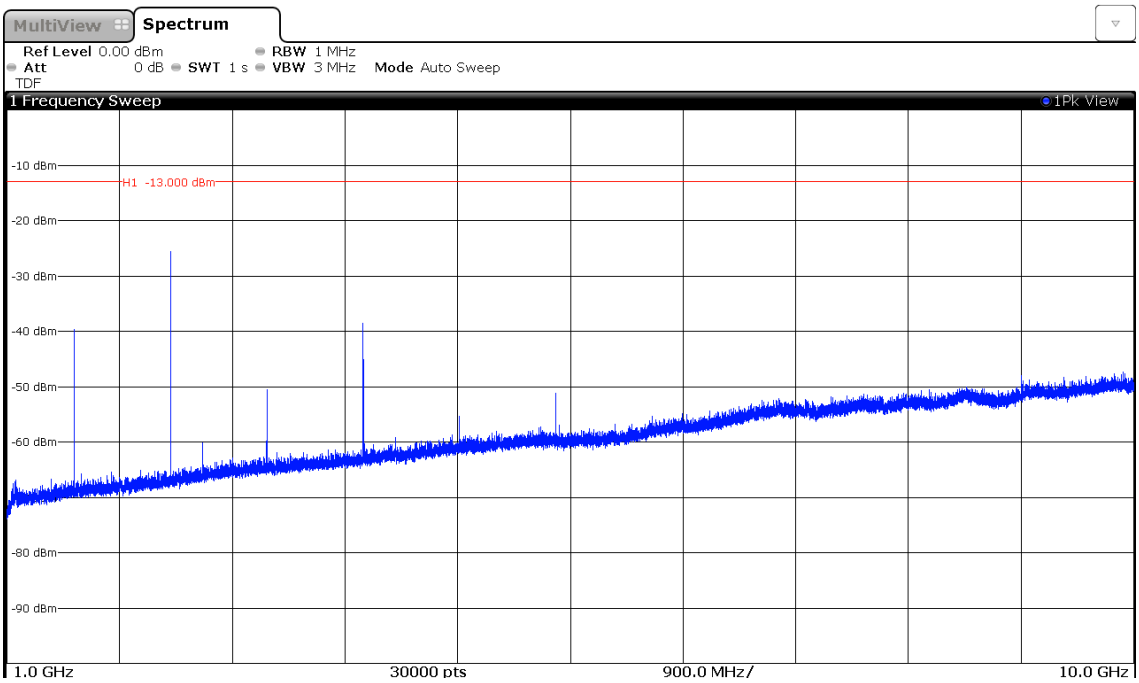


Note: The peak above the limit is the carrier frequency.

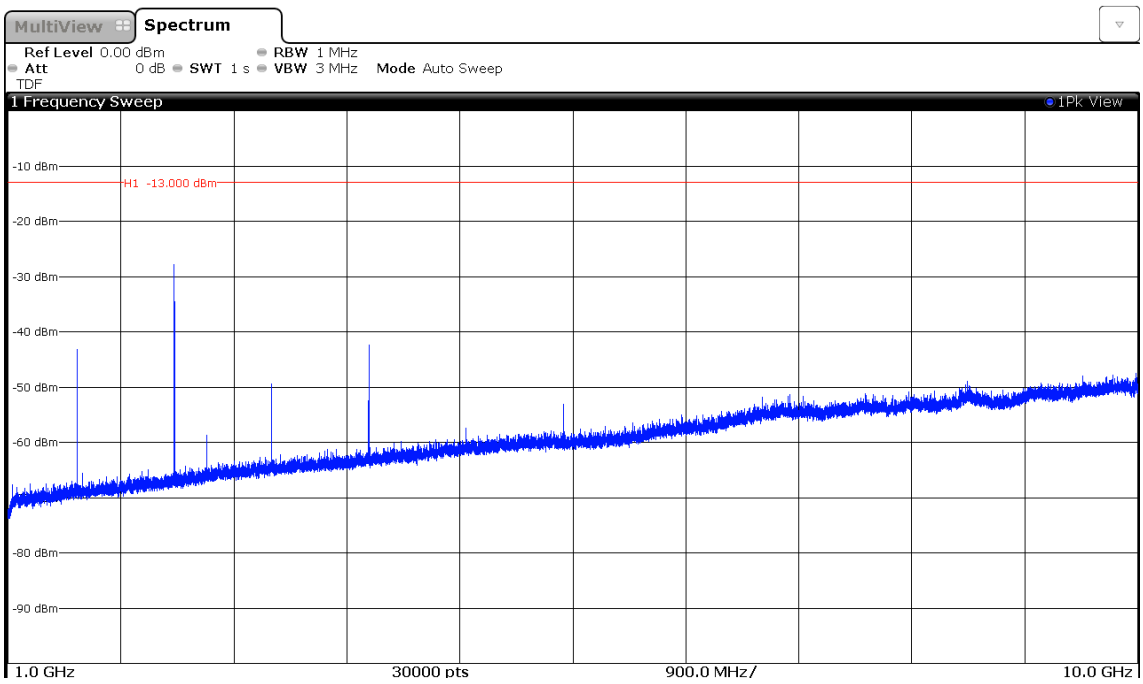
FREQUENCY RANGE 1 GHz to 10 GHz.

769-775 MHz band.

CHANNEL: LOWEST.

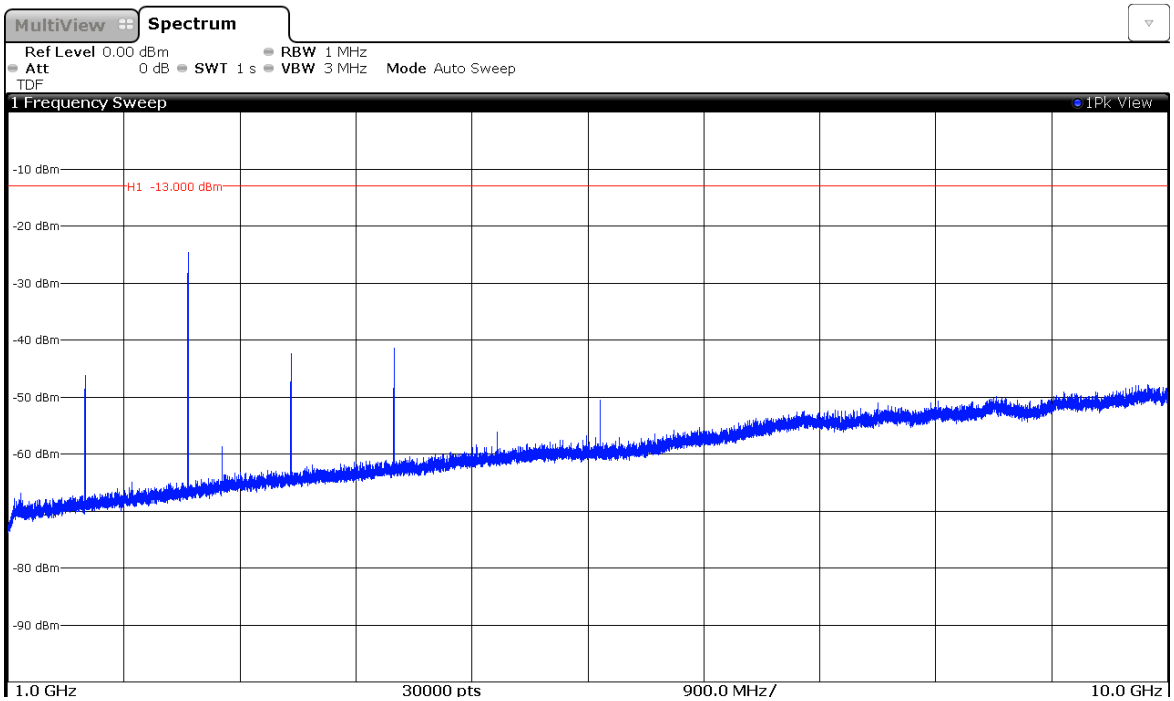


CHANNEL: HIGHEST.

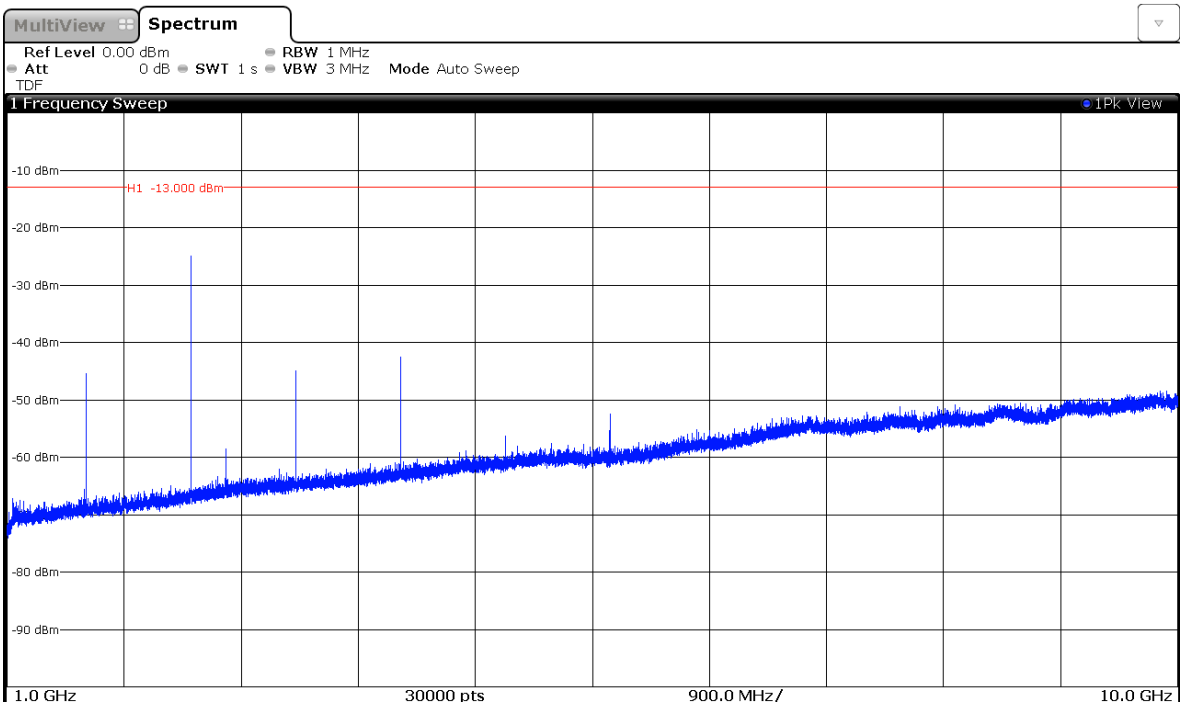


799-805 MHz band.

CHANNEL: LOWEST.

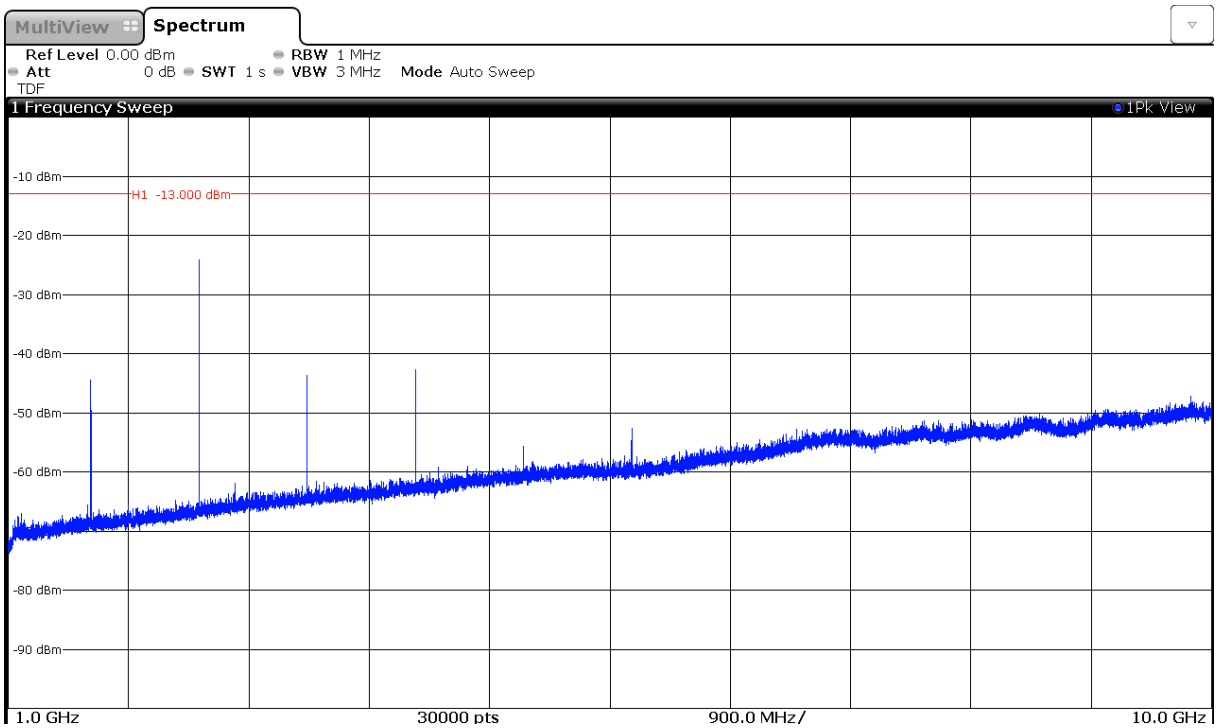


CHANNEL: HIGHEST.

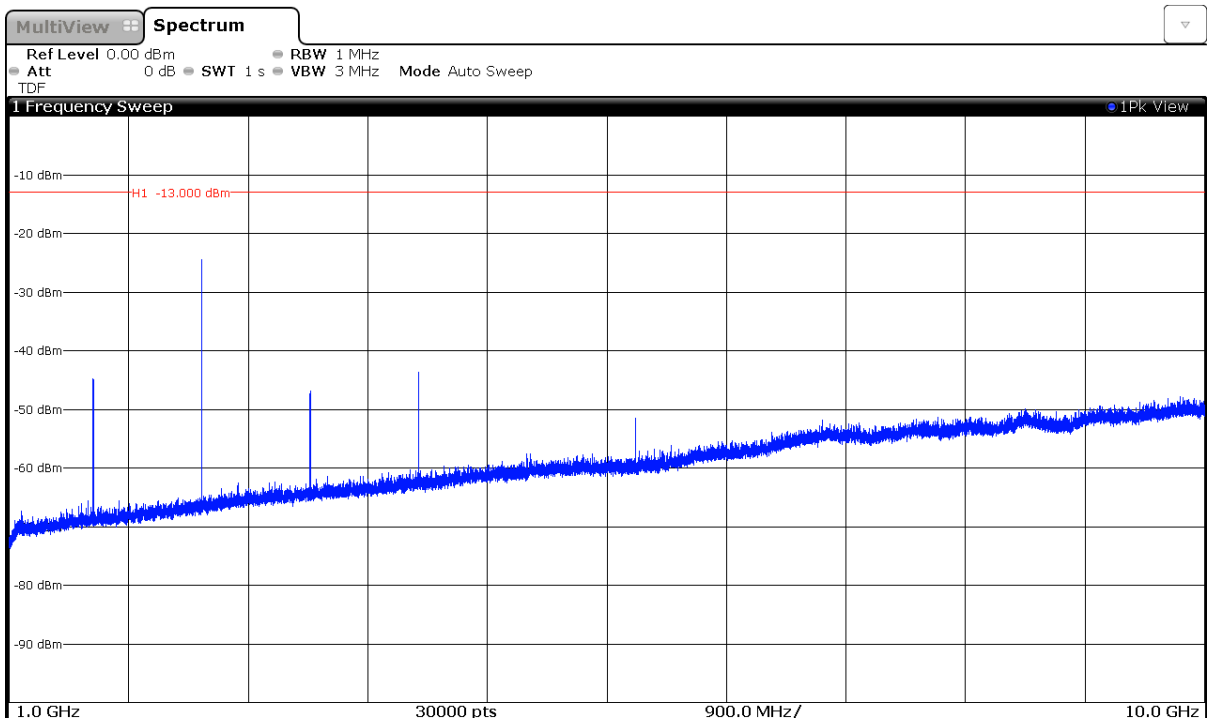


809-824 MHz band.

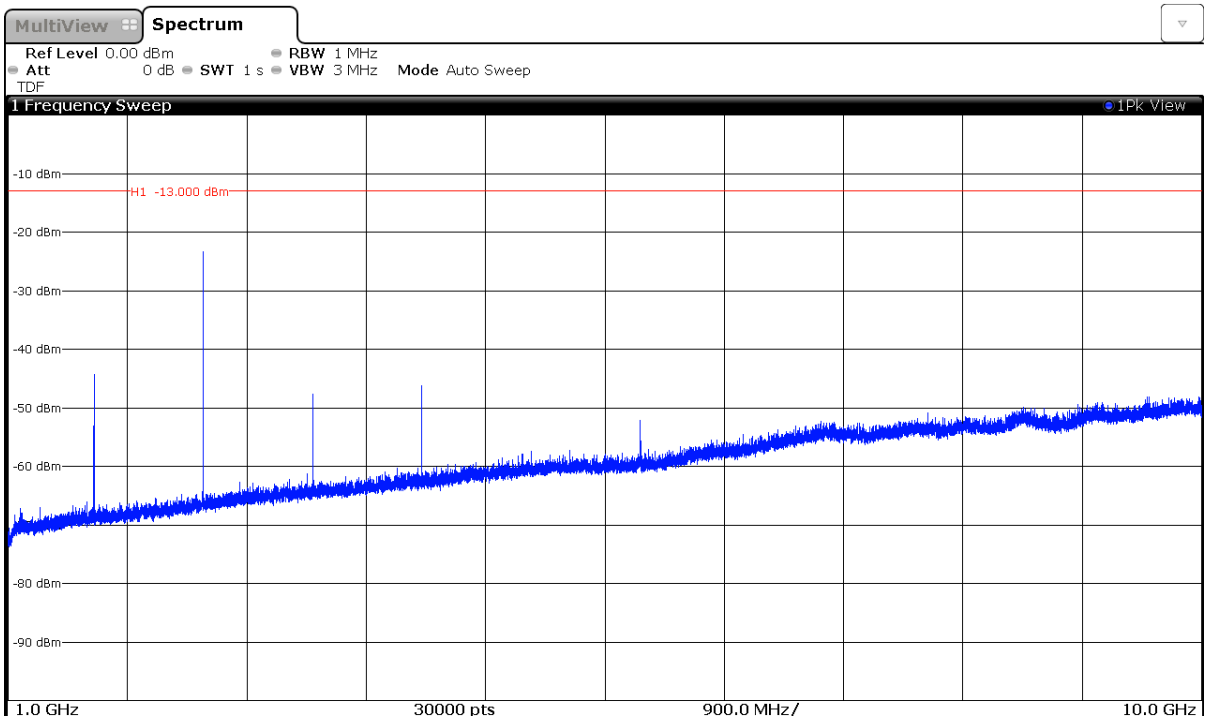
CHANNEL: LOWEST.



CHANNEL: MIDDLE.

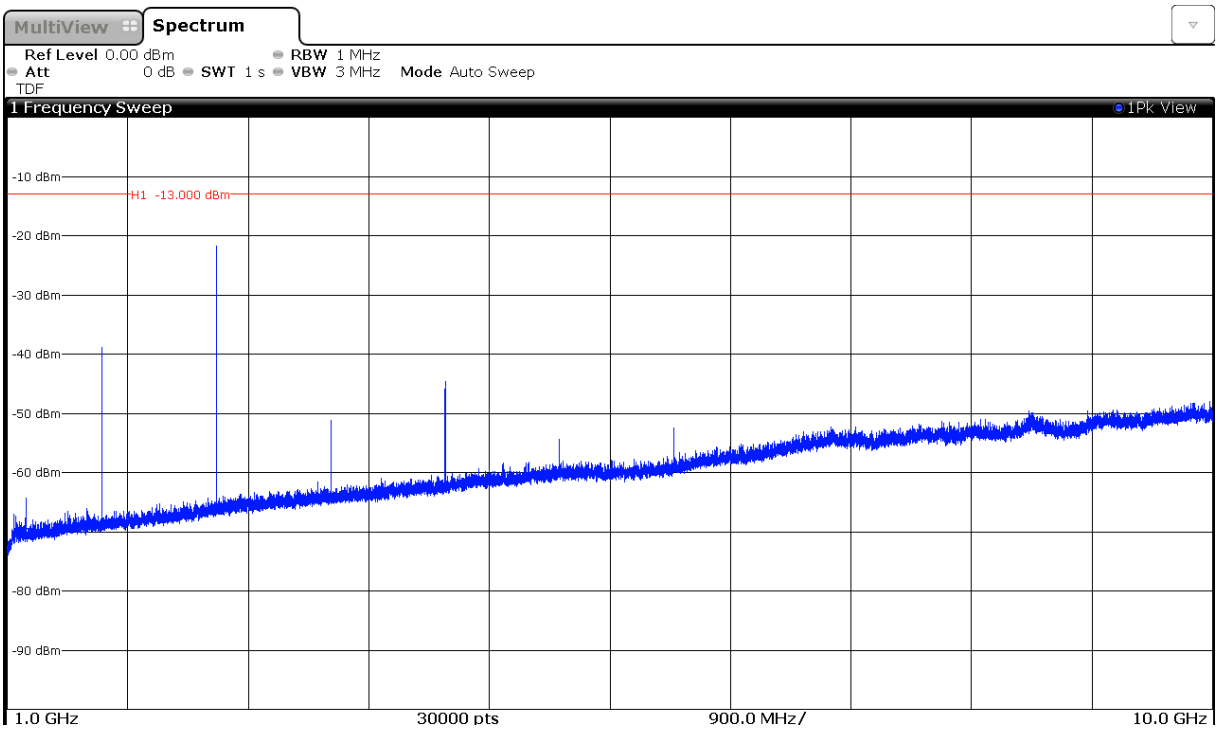


CHANNEL: HIGHEST.

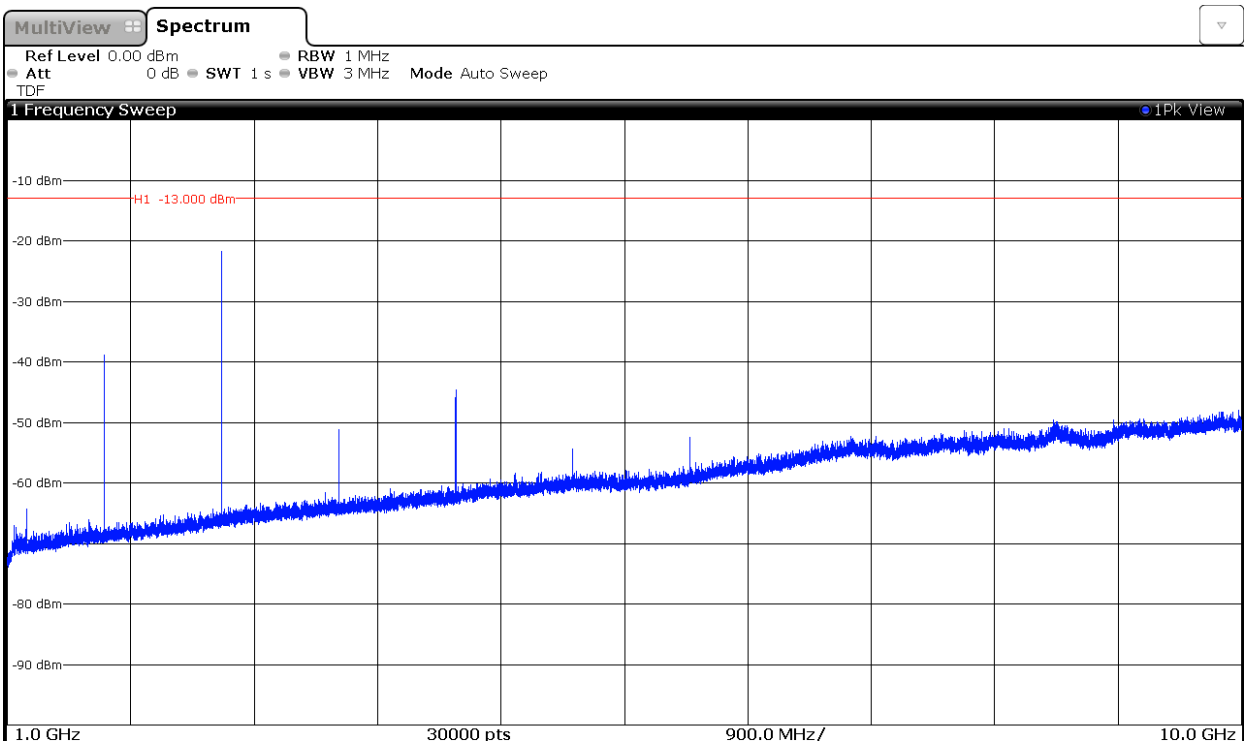


854-869 MHz band.

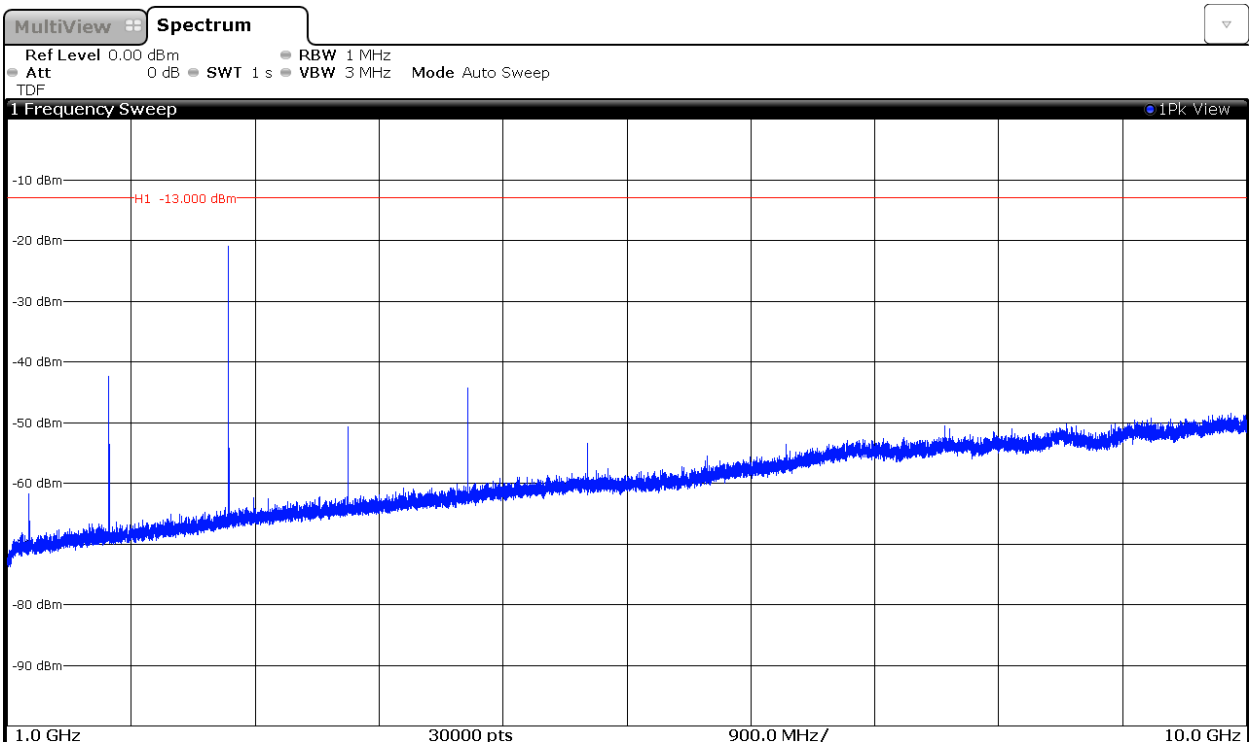
CHANNEL: LOWEST.



CHANNEL: MIDDLE.



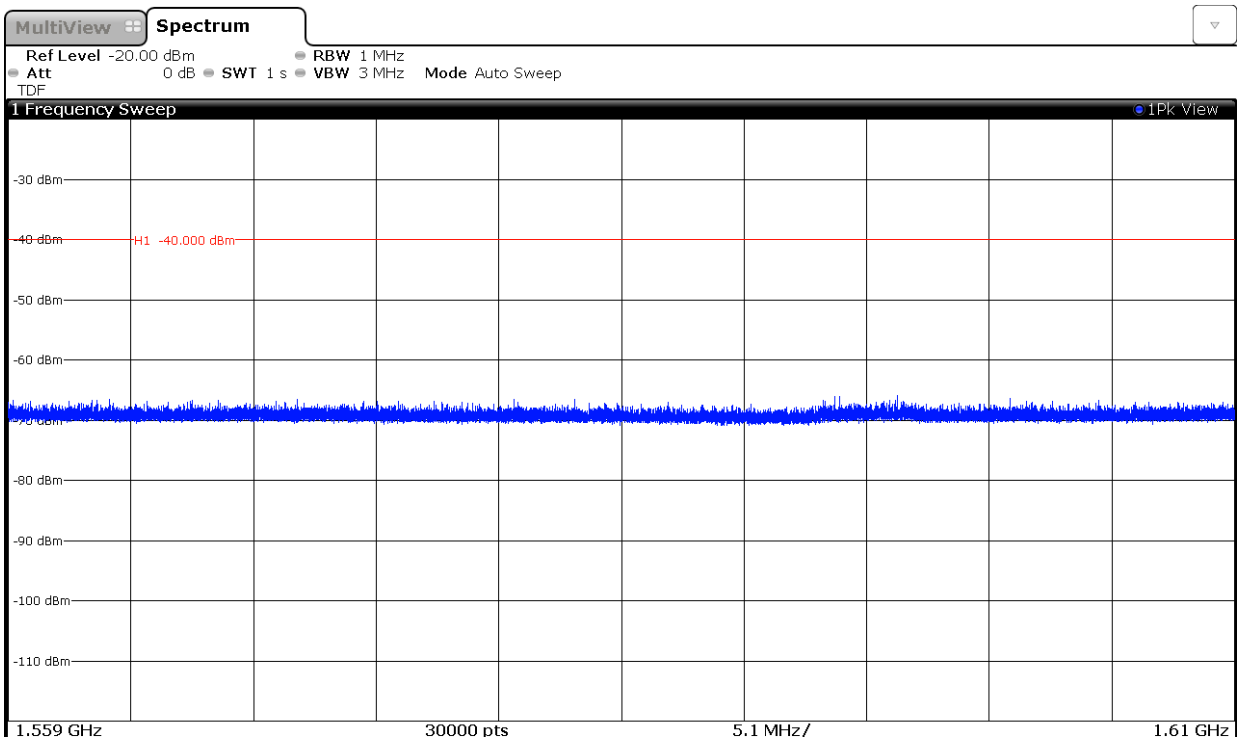
CHANNEL: HIGHEST.



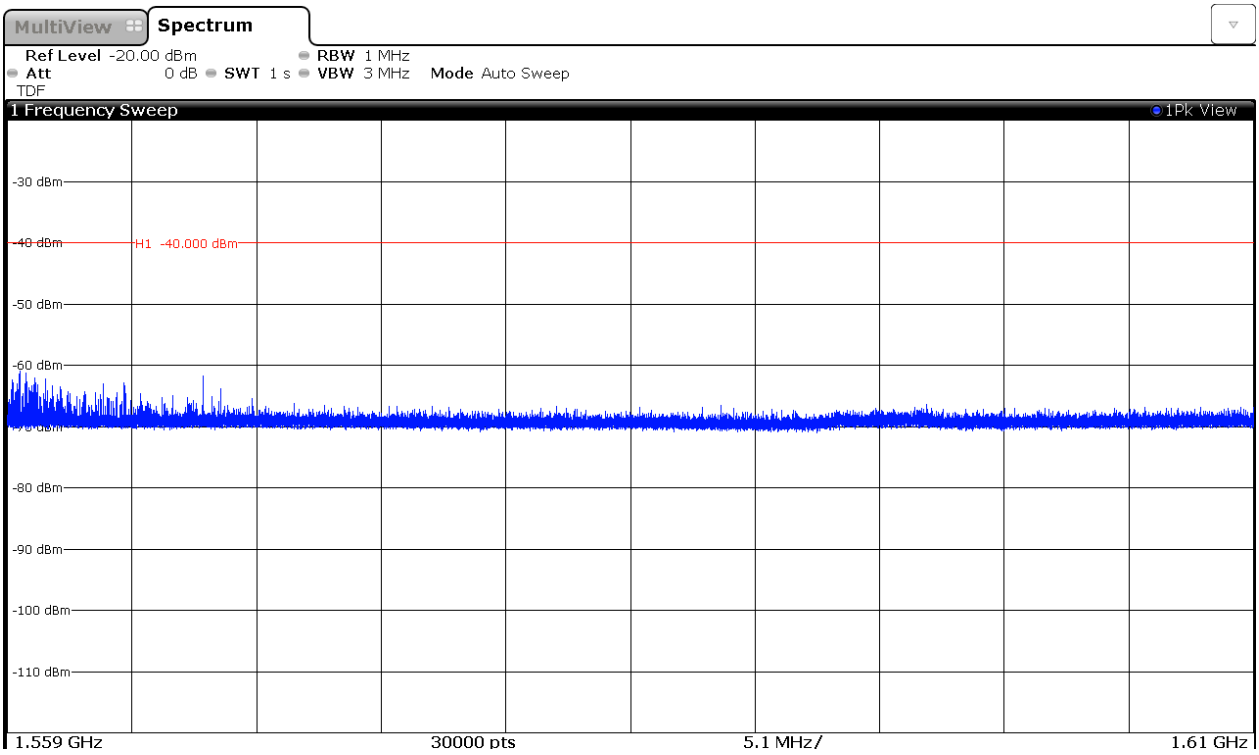
FREQUENCY RANGE 1559 MHz to 1610 MHz.

769-775 MHz band.

CHANNEL: LOWEST.

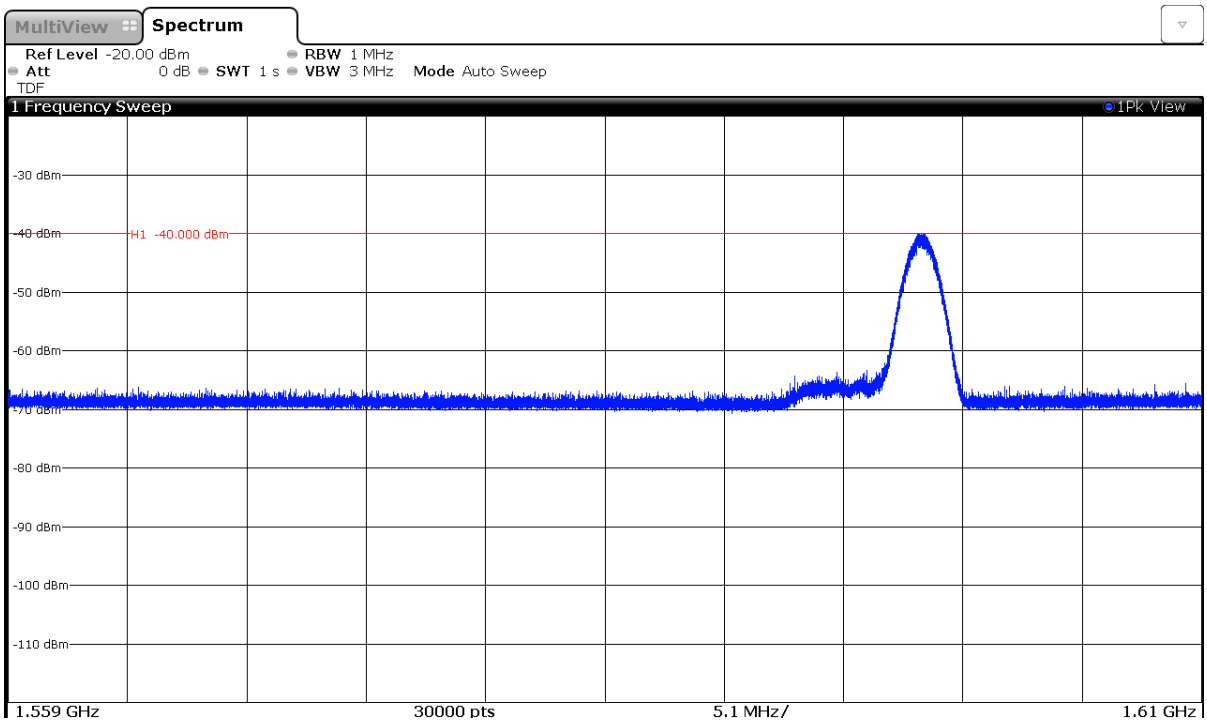
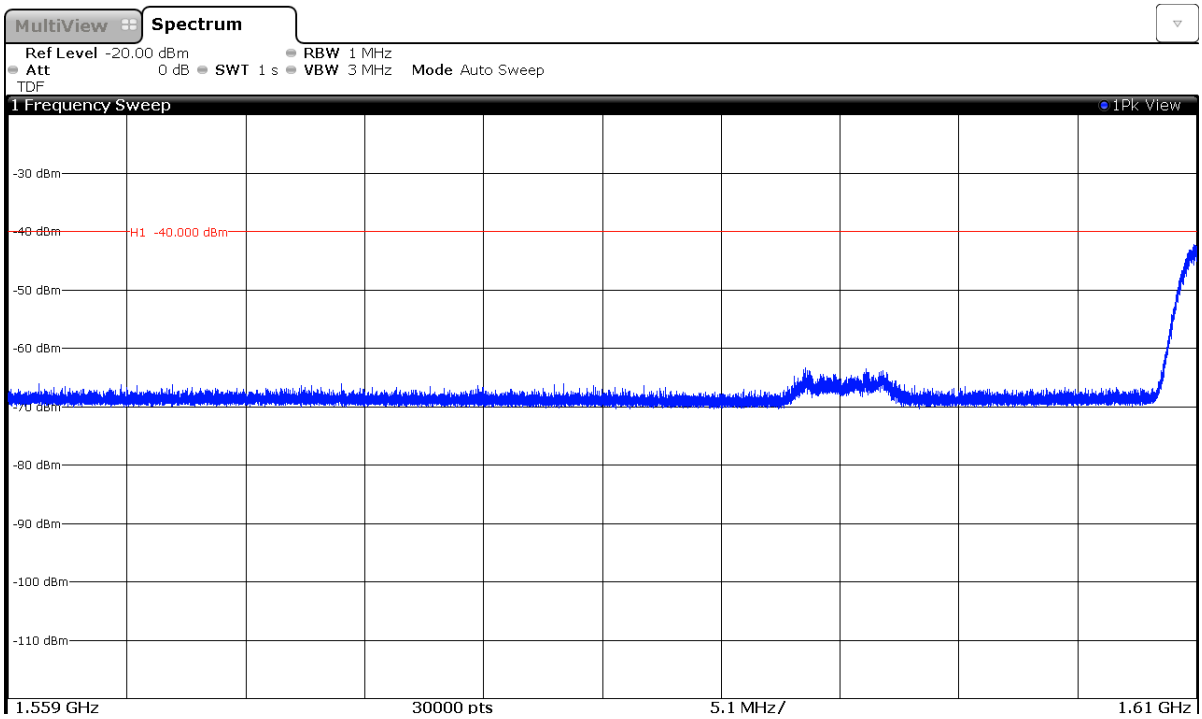


CHANNEL: HIGHEST.



799-805 MHz band.

CHANNEL: LOWEST.



CHANNEL: HIGHEST.