

Test report

317744-1TRFWL

Date of issue: April 26, 2017

Applicant:

fiplex

Product:

BI-DIRECTIONAL AMPLIFIER

Model:

H7

FCC ID:

P3TH7

Specification:

FCC 47 CFR Part 90

PRIVATE LAND MOBILE RADIO SERVICES

Test location

Company name	Nemko Canada Inc.
Address	303 River Road
City	Ottawa
Province	Ontario
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Country	Canada
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Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC test site registration number: 176392, IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Kevin Rose, Wireless/EMC Specialist
Reviewed by	Russell Grant, Senior Technical Assessor
Date	April 26, 2017
Signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Fiplex Communications, Inc.
Address	7331 N.W. 54th Street
City	Miami
Province/State	FL
Postal/Zip code	33166
Country	USA

1.2 Test specifications

FCC 47 CFR Part 90	PRIVATE LAND MOBILE RADIO SERVICES
935210 D02 Signal Boosters Certification v03r02	SIGNAL BOOSTERS BASIC CERTIFICATION REQUIREMENTS
935210 D05 Indus Booster Basic Meas v01r01	MEASUREMENTS GUIDANCE FOR INDUSTRIAL AND NON-CONSUMER SIGNAL BOOSTER, REPEATER, AND AMPLIFIER DEVICES

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 90 test results

Part	Test description	Verdict
§90.219(e)(1), §90.205(j)	RF Output Power	Pass
§90.219(e)(3), §90.543(c), 90.543(e)	Conducted Spurious	Pass
§90.219(e)(3), §90.543 (c)	Radiated Spurious	Pass
§90.219(e)(4), §90.543(c)	Input Output	Pass
935210 D05 v01r01 4.2	AGC threshold	Reported
935210 D05 v01r01 4.3	Out-of-band rejection	Reported
§90.543 (e)(f)	Radiated Spurious	Pass
§90.219 (e)(2)	Noise figure	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	February 12, 2015
Nemko sample ID number	1

3.2 EUT information

Product name	BI-DIRECTIONAL AMPLIFIER
Model	H7
Serial number	None

3.3 Technical information

Operating band	DL 763-775 MHz / UL 793 - 805 MHz
Modulation type/ Emission designator	P25 8K10F1E C4FM voice
	P25 8K10F1D C4FM data
	TETRA 20K0D1E 4/TDMA voice
	TETRA 20K0D1D 4/TDMA data
	DMR 7K60FXE 4 Level FSK, 2/TDMA
	DMR 7K60FXD 4 Level FSK, 2/TDMA
	Analog 16K0F3E voice
Analog 11K0F3E voice	
Power requirements	120 Vac 60 Hz
Gain	80 dB
Antenna information	External Antenna is not provided EUT used a 50 Ω termination.

3.4 Product description and theory of operation

This Signal boosters extends the radio coverage into areas inside the Base Station range where propagation losses prevent reliable communication.

The system receives the UL signal through a Donor antenna to be amplified, filtered and re-radiated through the Service antennas. The DL signal is received by the Service antennas to be amplified, filtered and re-radiated through the Donor antenna back to the Base Station. This way, the system works as a Bidirectional Amplifier.

This signal booster is capable of handling one Adjustable Bandwidth band from 700KHz to 12/13Mhz in uplink and downlink. The start and stop frequency can be tuned via a software interface.

3.5 EUT exercise details

The EUT was controlled software GUI.

3.6 EUT setup diagram

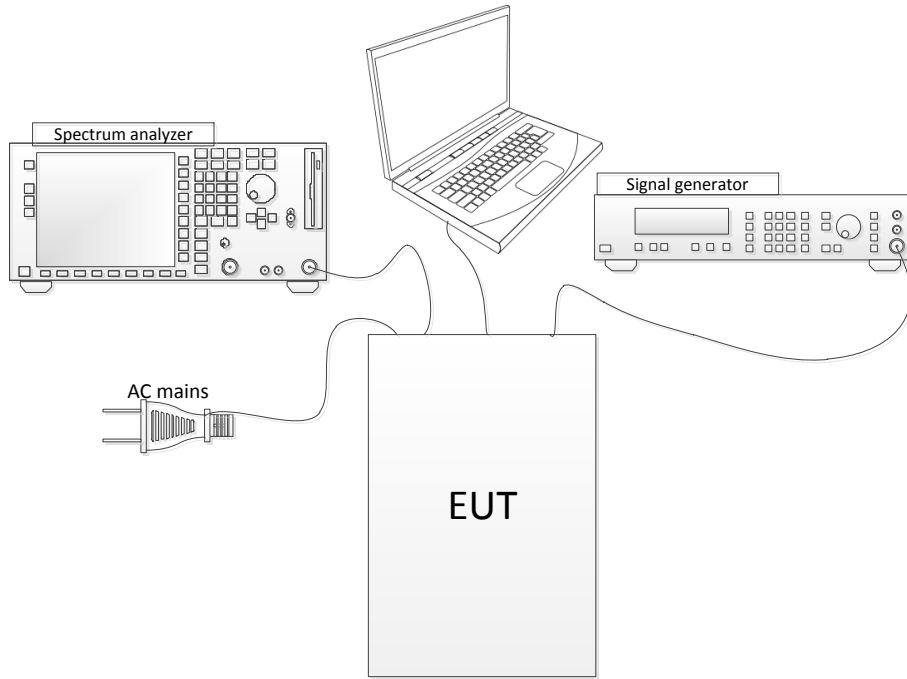


Figure 3.6-1: Setup diagram

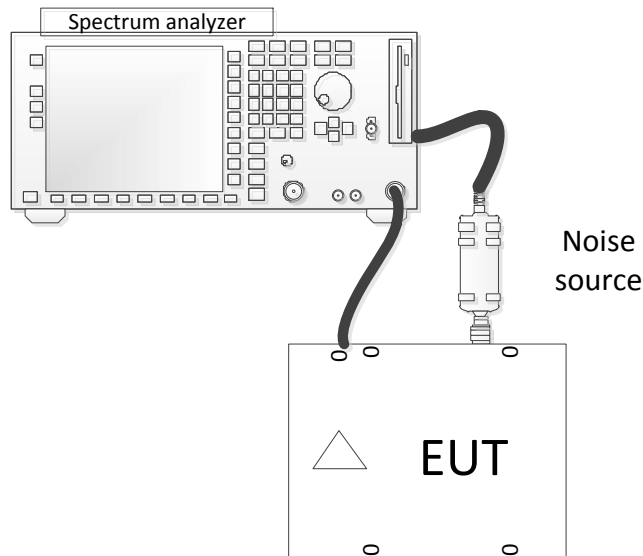


Figure 3.6-2: Noise figure setup diagram

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of $K = 2$ with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Dec. 01/17
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
AC Power source	California Instruments	3001i	FA001021	1 year	Sept. 08/17
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/17
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 28/17
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 26/17
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	April 26/17
50 Ω coax cable	Huber + Suhner	None	FA002074	1 year	April 26/17
50 Ω coax cable	Huber + Suhner	None	FA002830	1 year	July 29/17
Spectrum analyzer	Rohde & Schwarz	FSP	FA001920	1 year	Aug. 20/17
Signal generator	Rohde & Schwarz	SMIQ03E	FA001269	1 year	Apr. 08/17
Signal generator	Rohde & Schwarz	SMIQ06B	FA001878	1 year	Apr. 07/17
Noise Source	Agilent	346C	AGIL-346C	—	NCR

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC §90.219(e)(1), §90.205(j) RF Output Power

8.1.1 Definitions and limits

90.219(e)(1) The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

90.205(j) 758-775 MHz and 788-805 MHz. Power and height limitations are specified in §90.541 and 90.542.

8.1.2 Test summary

Test date	January 11, 2017	Temperature	24 °C
Test engineer	Kevin Rose	Air pressure	1002 mbar
Verdict	Pass	Relative humidity	34 %

8.1.3 Observations, settings and special notes

Worst case limit is used. Test receiver settings:

Detector mode	Peak
Resolution bandwidth	1 MHz
Intergration bandwidth	>OBW
Video bandwidth	>RBW
Trace mode	Max Hold
Measurement time	Auto

8.1.4 Test data

Table 8.1-1: AGC results

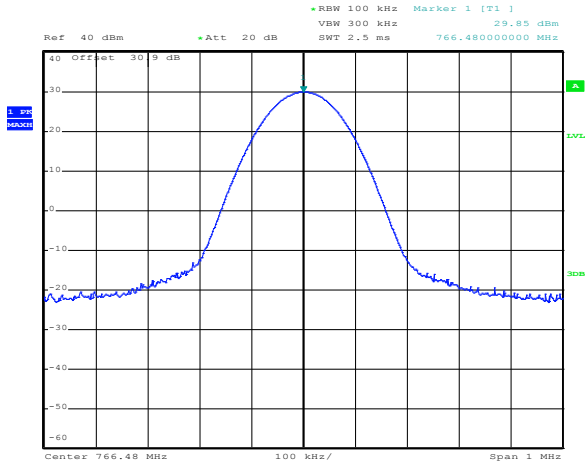
Frequency, MHz	Input, dBm	output, dBm	Gain, dB	Rated Gain, dB
804.68	-59.7	22.56	82.26	80
766.48	-49.5	29.85	79.35	80

Table 8.1-2: AGC results 3 dB above AGC threshold

Frequency, MHz	Input, dBm	output, dBm	Gain, dB	Rated Gain, dB
804.68	-56.86	22.55	79.41	80
766.48	-46.62	29.89	76.51	80

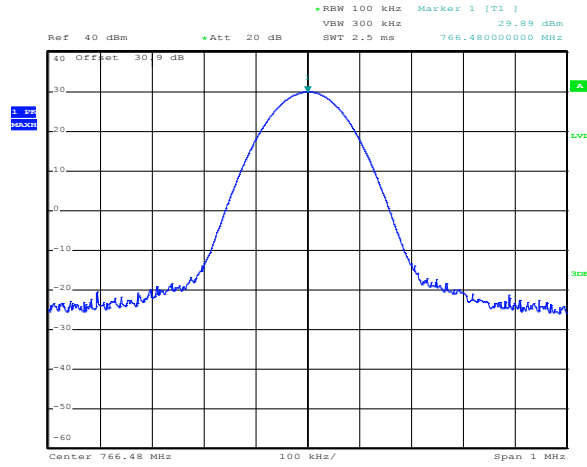
Table 8.1-3: RF Output power results

Frequency, MHz	Input, dBm	output, dBm	Gain, dB	Rated Gain, dB
804.68	-59.7	22.56	82.26	80
766.48	-49.5	29.85	79.35	80



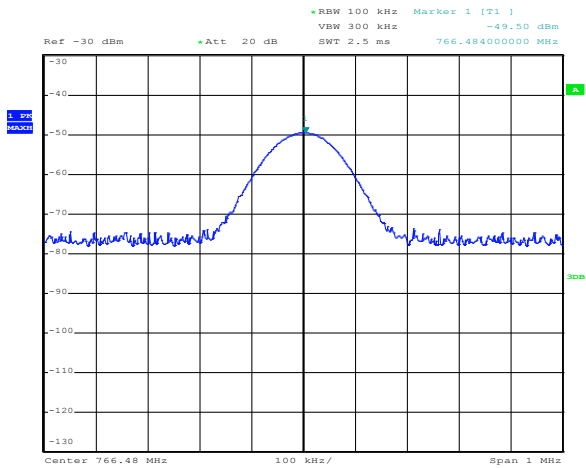
Date: 11.JAN.2017 19:17:17

Figure 8.1-1: 766.48 MHz output power



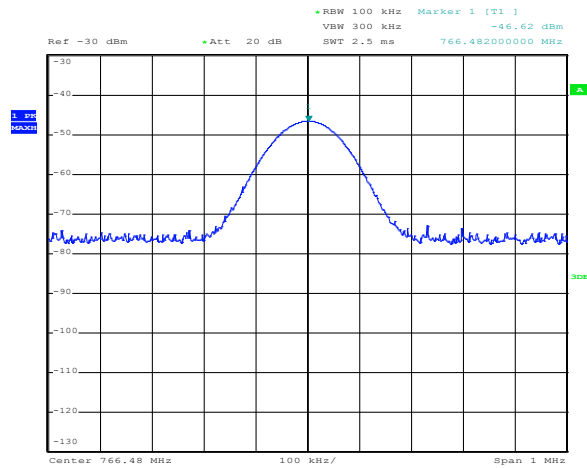
Date: 11.JAN.2017 19:17:42

Figure 8.1-2: 766.48 MHz output power plus 3 dB above AGC threshold



Date: 11.JAN.2017 19:19:20

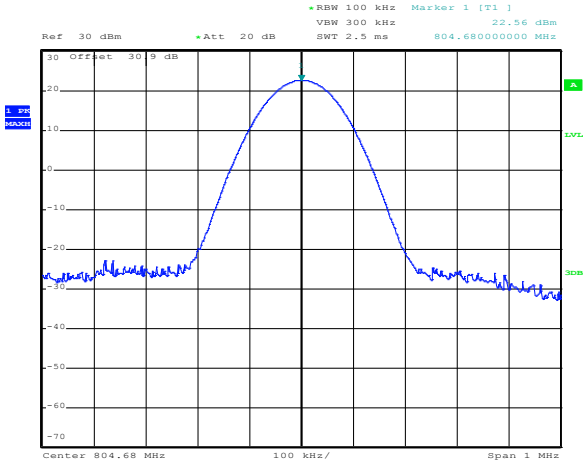
Figure 8.1-3: 766.48 MHz input power



Date: 11.JAN.2017 19:19:01

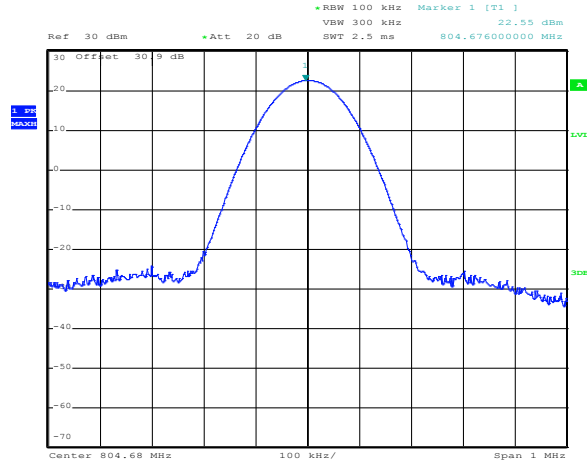
Figure 8.1-4: 766.48 MHz input power plus 3 dB above AGC threshold

8.1.4 Test data continued



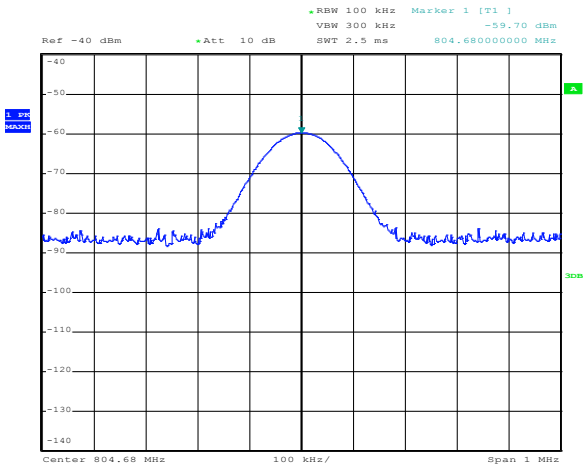
Date: 11.JAN.2017 19:25:33

Figure 8.1-5: 804.68 MHz output power



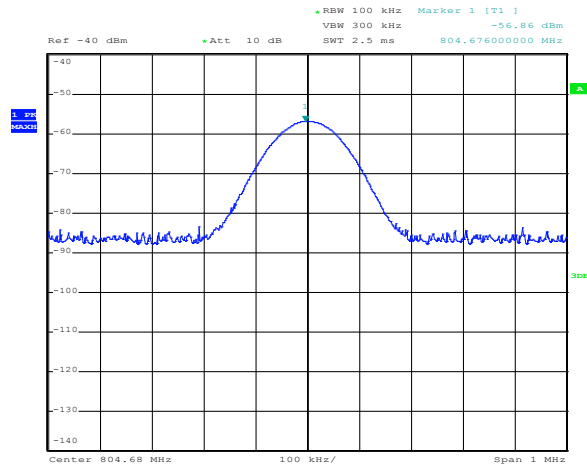
Date: 11.JAN.2017 19:24:43

Figure 8.1-6: 804.68 MHz output power plus 3 dB above AGC threshold



Date: 11.JAN.2017 19:27:33

Figure 8.1-7: 804.68 MHz input power



Date: 11.JAN.2017 19:27:56

Figure 8.1-8: 804.68 MHz input power plus 3 dB above AGC threshold

8.2 FCC §90.219(e)(3), §90.543(c), 90.543(e) Conducted Spurious

8.2.1 Definitions and limits

90.219(e)(3) Spurious emissions from a signal booster must not exceed -13 dBm within any 100 kHz measurement bandwidth.

90.543(c) Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ 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.

90.543(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10\log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
- (2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $65 + 10\log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.
- (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10\log(P)$ dB.
- (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

8.2.2 Test summary

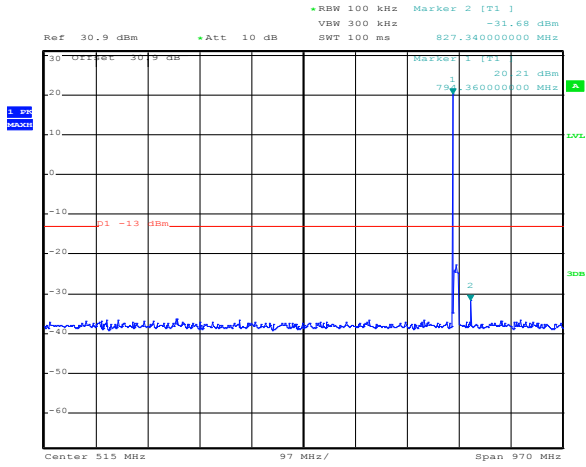
Test date	January 11, 2017	Temperature	24 °C
Test engineer	Kevin Rose	Air pressure	1002 mbar
Verdict	Pass	Relative humidity	34 %

8.2.3 Observations, settings and special notes

During the Part 90 543 (e)(3) testing the TX filter was adjusted to 763 to 768 MHz and 793 to 798 MHz

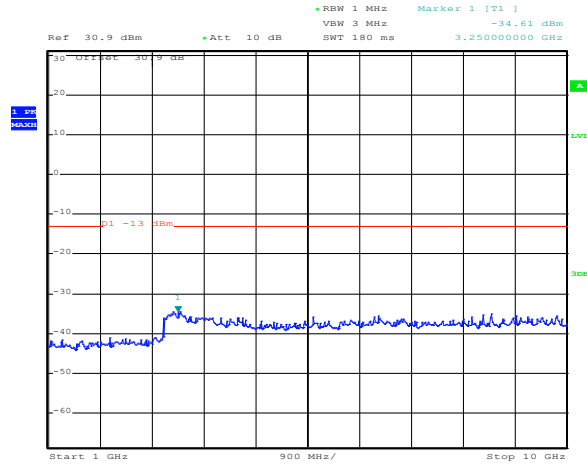
No Emission were detected within 20 dB of the -13 dBm limit

Frequency range	30 MHz to 10th harmonic
Detector mode	Peak
Resolution bandwidth sweep	100 kHz (below 1 GHz), 1000 kHz (above 1 GHz)
Resolution bandwidth band edge	> 1 % of OBW
Video bandwidth	>RBW
Trace mode	Max Hold
Measurement time	Auto



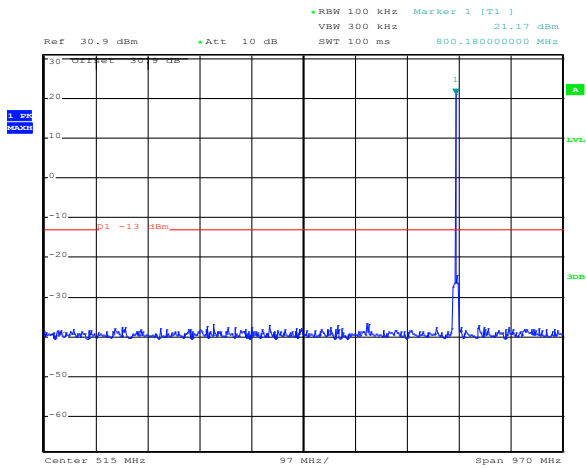
Date: 11.JAN.2017 17:46:10

Figure 8.2-1: 793.0125 MHz Spurious 30-1000 MHz



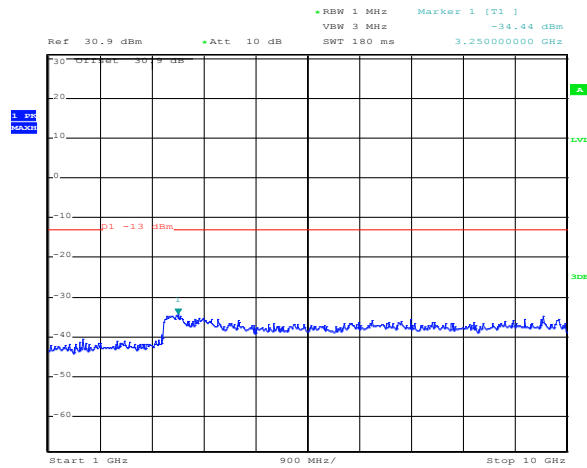
Date: 11.JAN.2017 17:50:27

Figure 8.2-2: 793.0125 MHz Spurious 1-10 GHz



Date: 11.JAN.2017 17:47:53

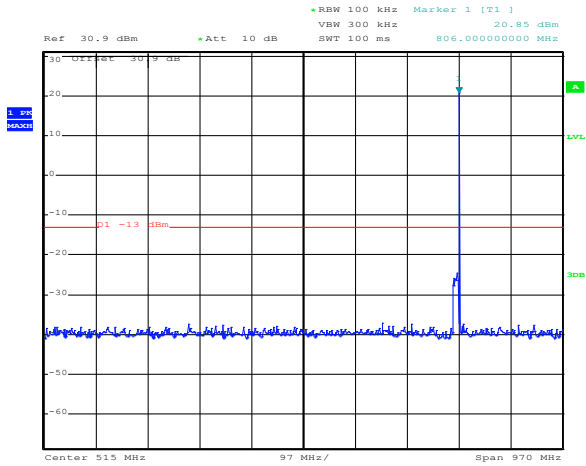
Figure 8.2-3: 799 MHz Spurious 30-1000 MHz



Date: 11.JAN.2017 17:49:49

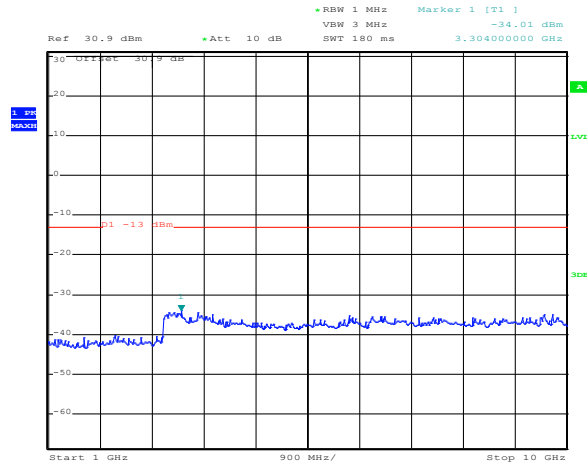
Figure 8.2-4: 799 MHz Spurious 1-10 GHz

8.2.4 Test data continued



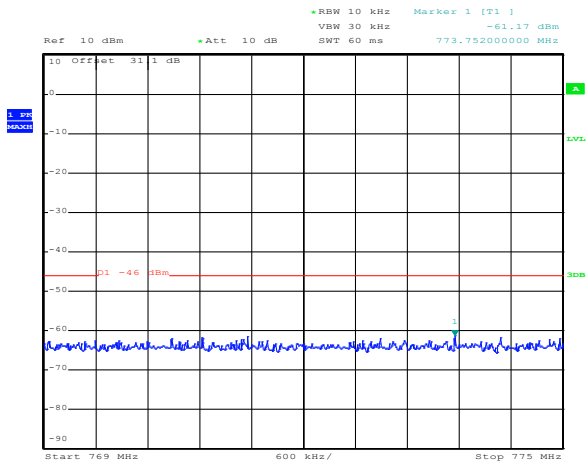
Date: 11.JAN.2017 17:48:45

Figure 8.2-5: 804.9875 MHz Spurious 30-1000 MHz



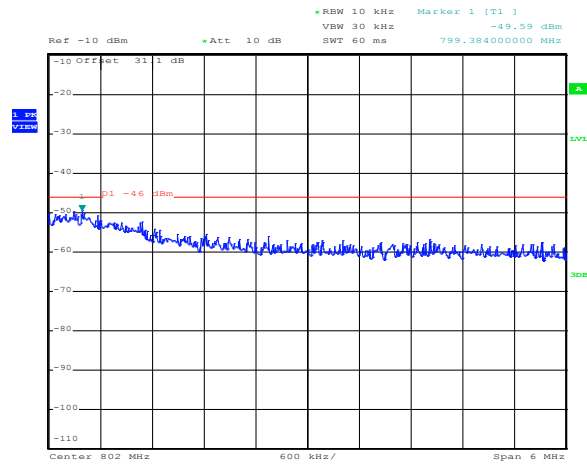
Date: 11.JAN.2017 17:49:24

Figure 8.2-6: 804.9875 MHz Spurious 1-10 GHz



Date: 2.MAR.2017 13:19:22

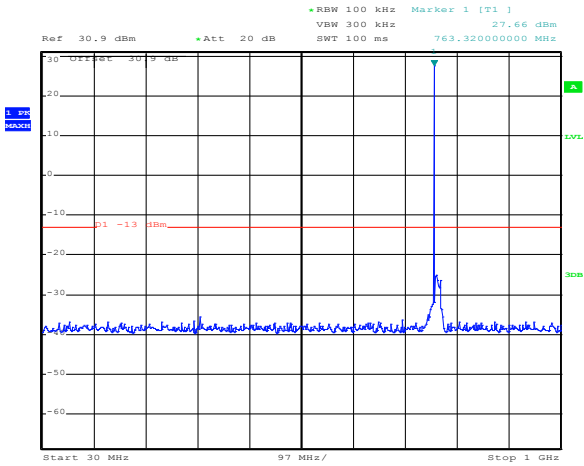
Figure 8.2-7: Tx 798 MHz 769-775 MHz



Date: 7.MAR.2017 12:55:38

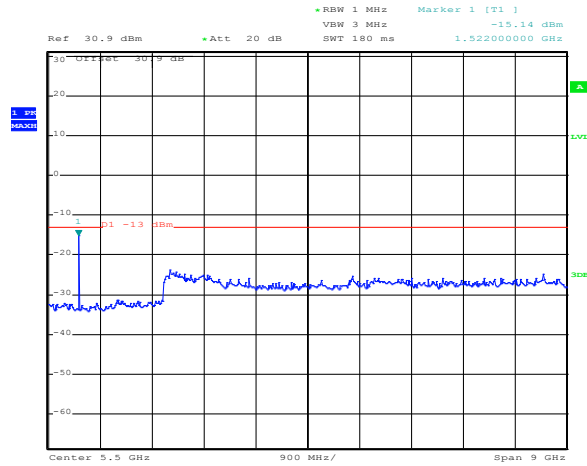
Figure 8.2-8: Tx 798 MHz 799-805 MHz

8.2.1 Test data continued



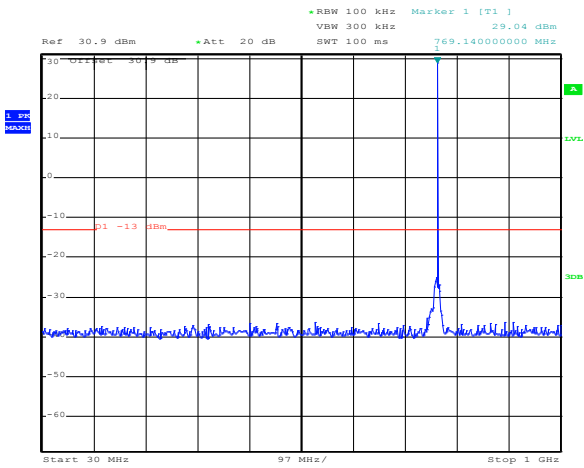
Date: 11.JAN.2017 17:58:02

Figure 8.2-9: 763.0125 MHz Spurious 30-1000 MHz



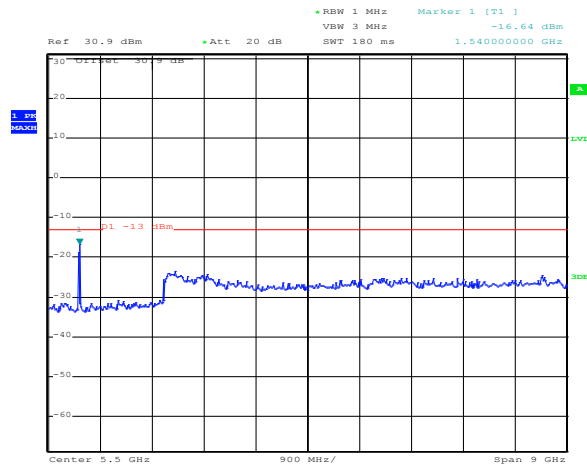
Date: 11.JAN.2017 17:53:29

Figure 8.2-10: 763.0125 MHz Spurious 1-10 GHz



Date: 11.JAN.2017 17:57:27

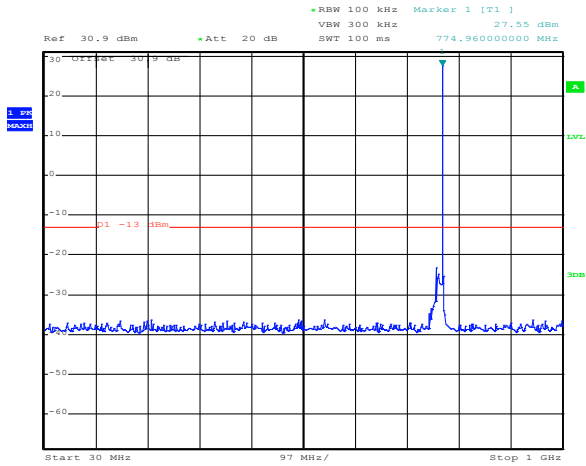
Figure 8.2-11: 769 MHz Spurious 30-1000 MHz



Date: 11.JAN.2017 17:55:00

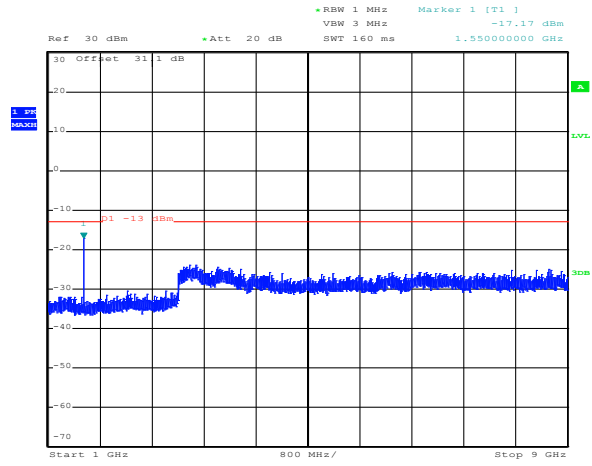
Figure 8.2-12: 769 MHz Spurious 1-8 GHz

8.2.2 Test data continued



Date: 11.JAN.2017 17:56:30

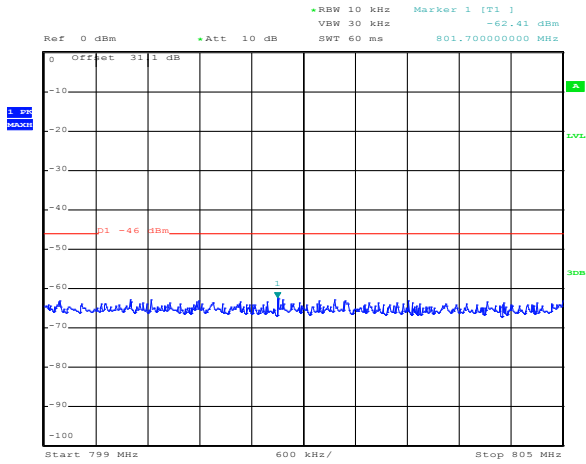
Figure 8.2-13: 774.9875 MHz Spurious 30-1000 MHz



Date: 2.MAR.2017 13:54:17

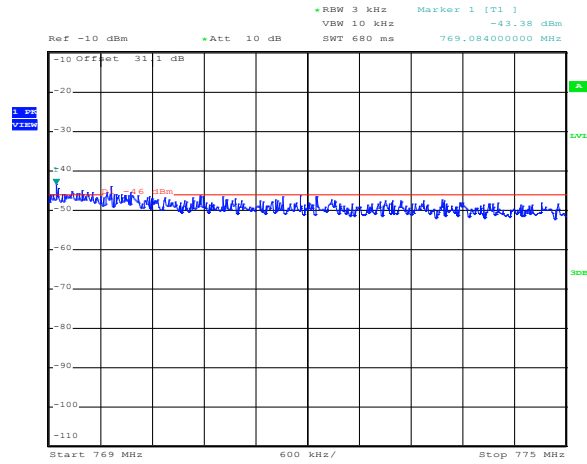
Figure 8.2-14: 774.9875 MHz Spurious 1-9 GHz

8.2.1 Test data continued



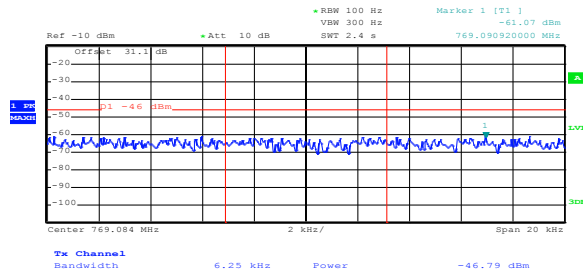
Date: 2.MAR.2017 13:37:13

Figure 8.2-15: Tx 768 MHz 799-805 MHz



Date: 7.MAR.2017 12:50:05

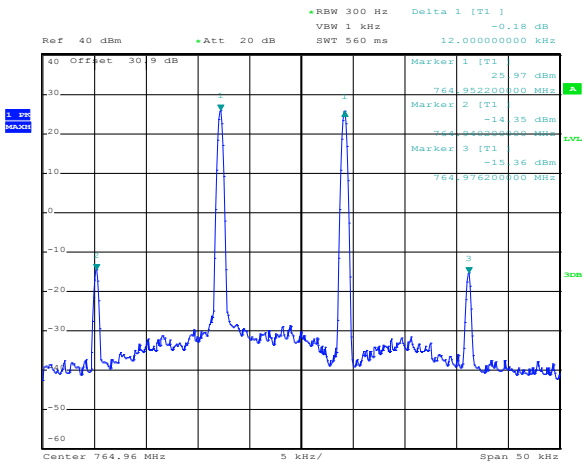
Figure 8.2-16: Tx 768 MHz 769-775 MHz



Date: 7.MAR.2017 12:51:38

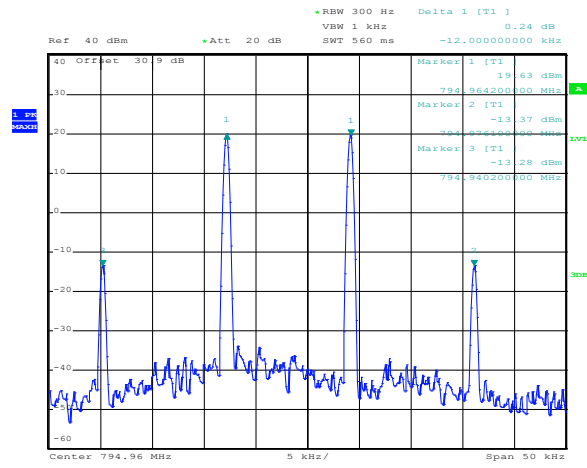
Figure 8.2-17: Tx 768 MHz 769.084 MHz 6.25 kHz channel power measurement.

8.2.1 Test data continued



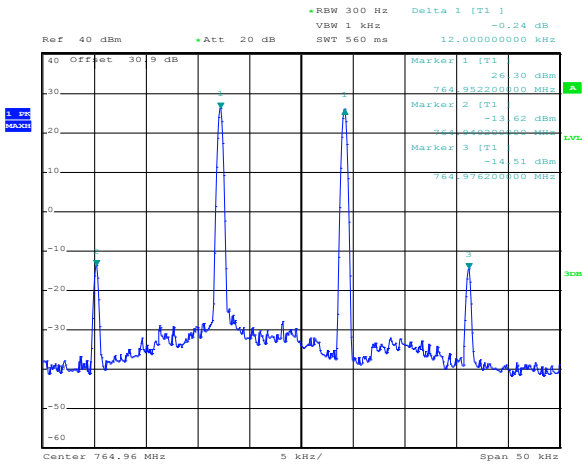
Date: 5.JAN.2017 15:44:38

Figure 8.2-18: Intermodulation $f_0 - 6$ KHz, $f_0 + 6$ KHz



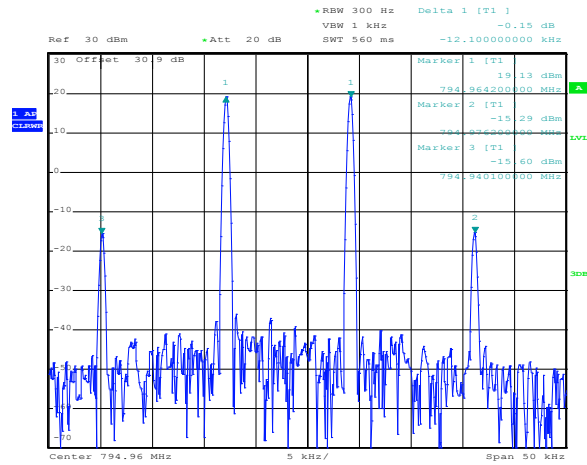
Date: 5.JAN.2017 16:29:38

Figure 8.2-19: Intermodulation $f_0 - 6$ KHz, $f_0 + 6$ KHz



Date: 5.JAN.2017 15:40:56

Figure 8.2-20: Intermodulation $f_0 - 6$ KHz, $f_0 + 6$ KHz Plus 3 dB above AGC threshold



Date: 5.JAN.2017 15:32:33

Figure 8.2-21: Intermodulation $f_0 - 6$ KHz, $f_0 + 6$ KHz Plus 3 dB above AGC threshold

8.3 FCC §90.219(e)(3), §90.543 (c) Radiated Spurious

8.3.1 Definitions and limits

90.219(e)(3) Spurious emissions from a signal booster must not exceed -13 dBm within any 100 kHz measurement bandwidth.
 90.543(c) Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, 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.

8.3.2 Test summary

Test date	December 8, 2016	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1003 mbar
Verdict	Pass	Relative humidity	46 %

8.3.3 Observations, settings and special notes

Low, Mid, and High channels of all modulations were investigated. Worst case examples are provided.
 No emissions were detected within 20 dB of the -13 dBm limit.

Receiver settings were:

Frequency range	30 MHz to 10 th harmonic
Detector mode	Peak
Resolution bandwidth	100 kHz (below 1 GHz), 1000 kHz (above 1 GHz)
Video bandwidth	>RBW
Trace mode	Max Hold

8.3.4 Test data

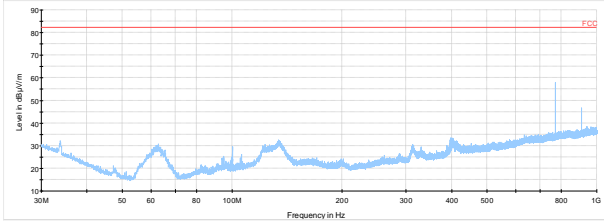


Figure 8.3-1: 30-1000 MHz 769 MHz

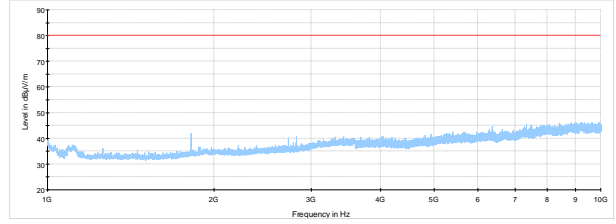


Figure 8.3-2: 1-10 GHz 769 MHz

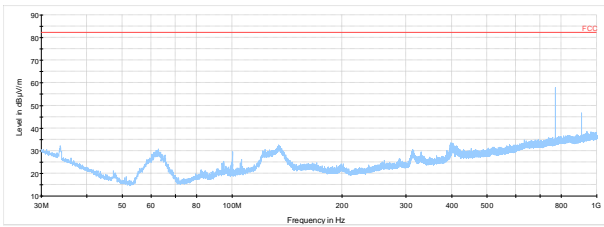


Figure 8.3-3: 30-1000 MHz 799 MHz

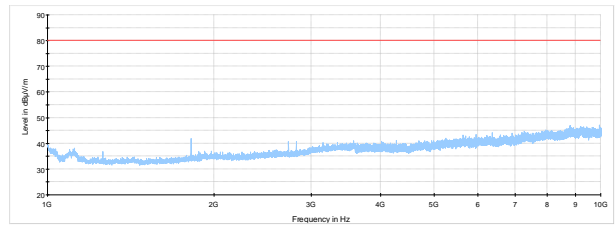


Figure 8.3-4: 1-10 GHz 799 MHz

8.4 FCC §90.219(e)(4), §90.543(c) Input Output

8.4.1 Definitions and limits

90.219(e)(4)A signal booster must be designed such that all signals that it retransmits meet the following requirements:

- (i) The signals are retransmitted on the same channels as received. Minor departures from the exact provider or reference frequencies of the input signals are allowed, provided that the retransmitted signals meet the requirements of §90.213.
- (ii) There is no change in the occupied bandwidth of the retransmitted signals.
- (iii) The retransmitted signals continue to meet the unwanted emissions limits of §90.210 applicable to the corresponding received signals (assuming that these received signals meet the applicable unwanted emissions limits by a reasonable margin).

90.543(c) Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ 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.

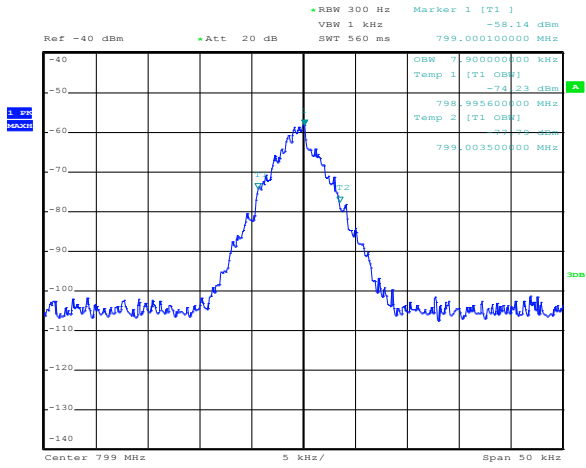
8.4.2 Test summary

Test date	December 8, 2016	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1003 mbar
Verdict	Pass	Relative humidity	46 %

8.4.3 Observations, settings and special notes

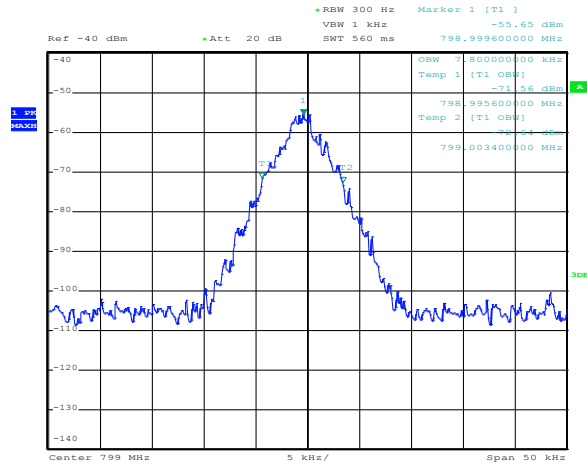
Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	$\geq 1\%$ of OBW
Video bandwidth	\geq RBW
Trace mode	Max Hold



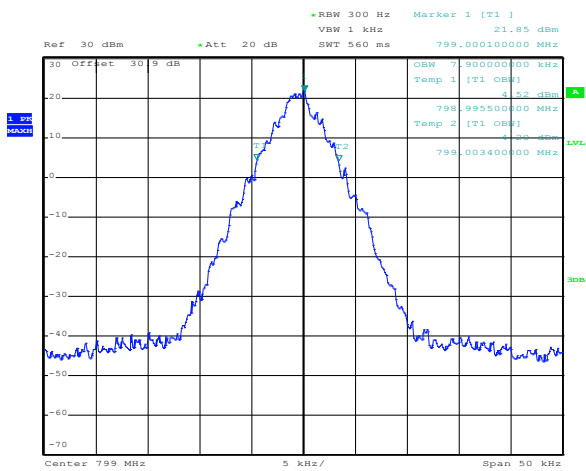
Date: 11.JAN.2017 19:56:49

Figure 8.4-1: 799 MHz DMR input



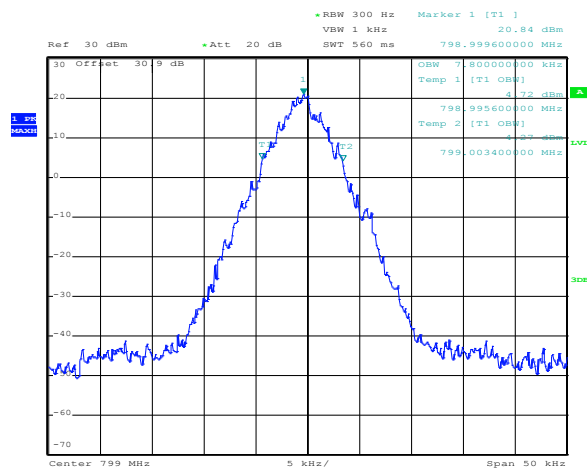
Date: 11.JAN.2017 19:56:09

Figure 8.4-2: 799 MHz DMR input Plus 3 dB above AGC threshold



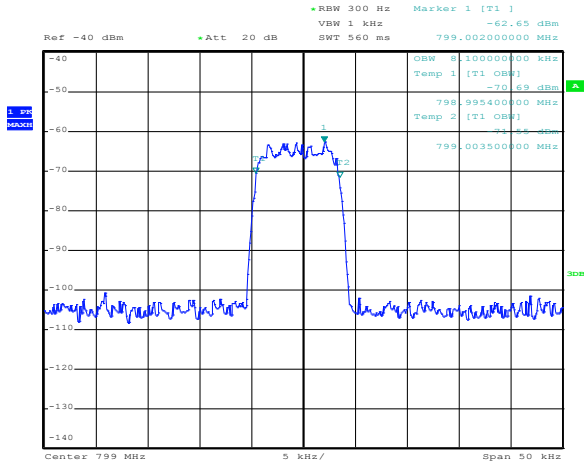
Date: 11.JAN.2017 19:53:32

Figure 8.4-3: 799 MHz DMR output



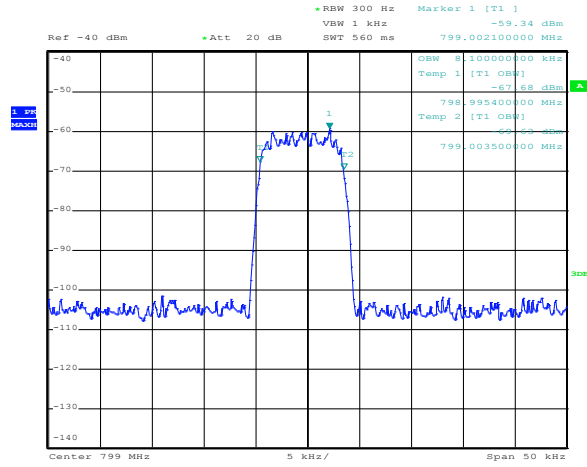
Date: 11.JAN.2017 19:54:43

Figure 8.4-4: 799 MHz DMR output Plus 3 dB above AGC threshold



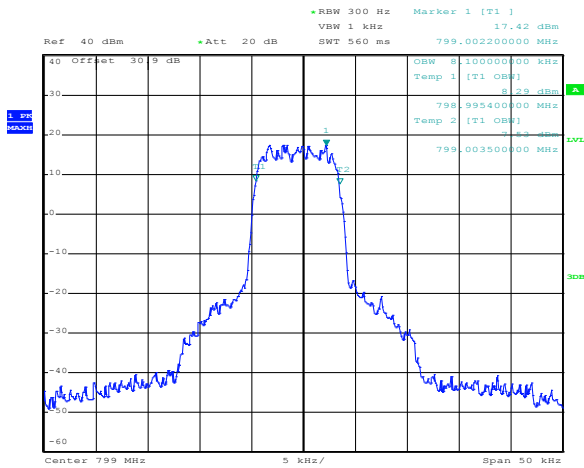
Date: 11.JAN.2017 20:23:56

Figure 8.4-5: 799 MHz P25 input



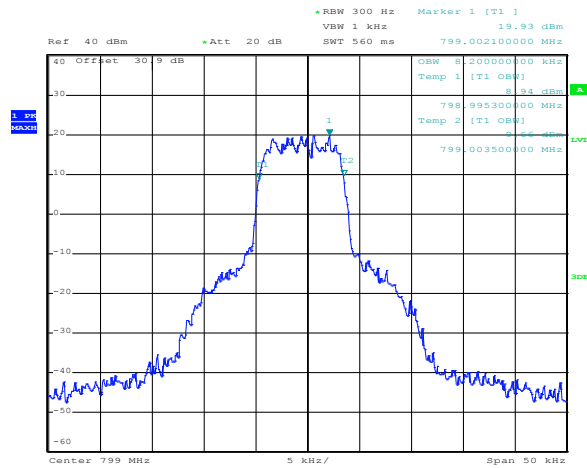
Date: 11.JAN.2017 20:23:18

Figure 8.4-6: 799 MHz P25 input Plus 3 dB above AGC threshold



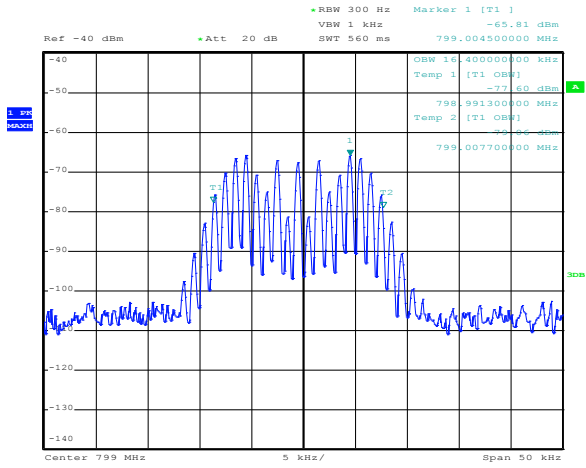
Date: 11.JAN.2017 20:19:31

Figure 8.4-7: 799 MHz P25 output



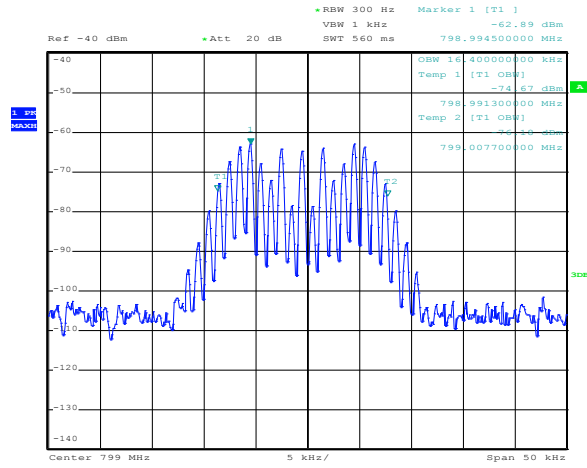
Date: 11.JAN.2017 20:21:59

Figure 8.4-8: 799 MHz P25 output Plus 3 dB above AGC threshold



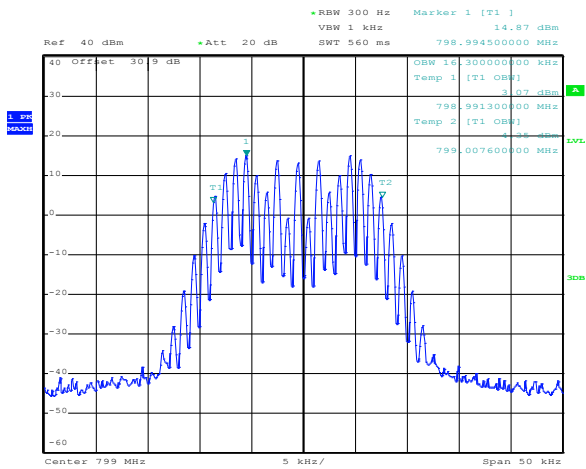
Date: 11.JAN.2017 21:23:13

Figure 8.4-9: 799 MHz analog input



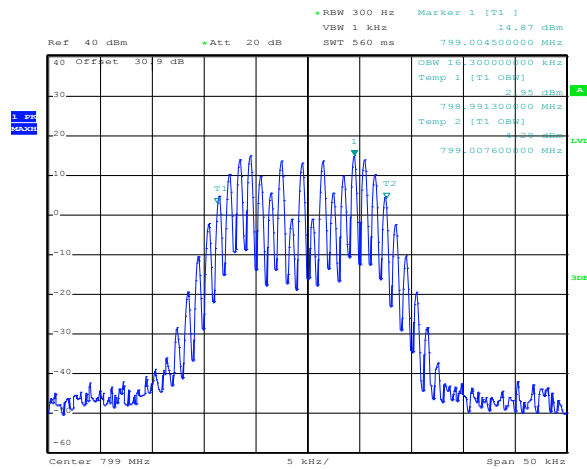
Date: 11.JAN.2017 21:22:50

Figure 8.4-10: 799 MHz analog input Plus 3 dB above AGC threshold



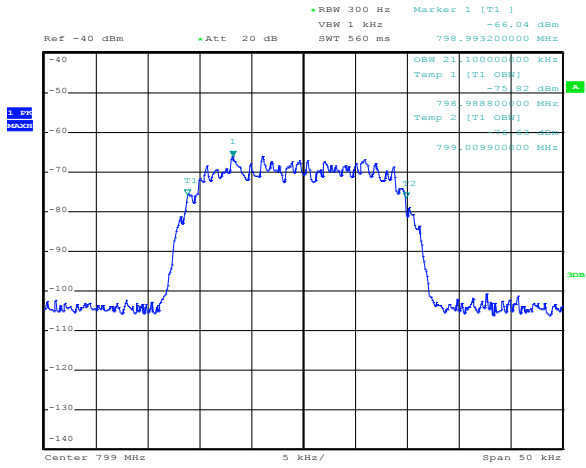
Date: 11.JAN.2017 21:20:03

Figure 8.4-11: 799 MHz analog output



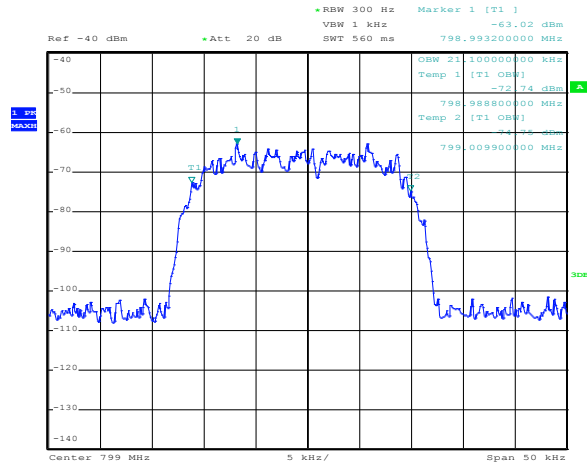
Date: 11.JAN.2017 21:21:41

Figure 8.4-12: 799 MHz analog output Plus 3 dB above AGC threshold



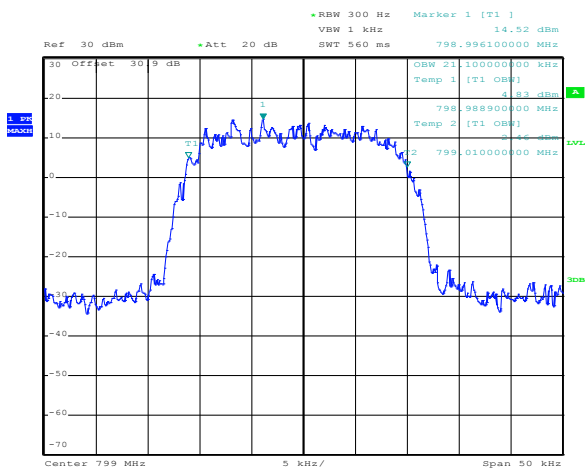
Date: 11.JAN.2017 20:26:30

Figure 8.4-13: 799 MHz TETRA input



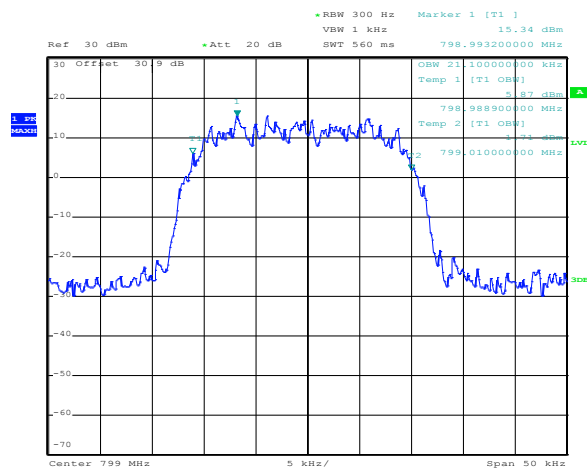
Date: 11.JAN.2017 20:27:07

Figure 8.4-14: 799 MHz TETRA input Plus 3 dB above AGC threshold



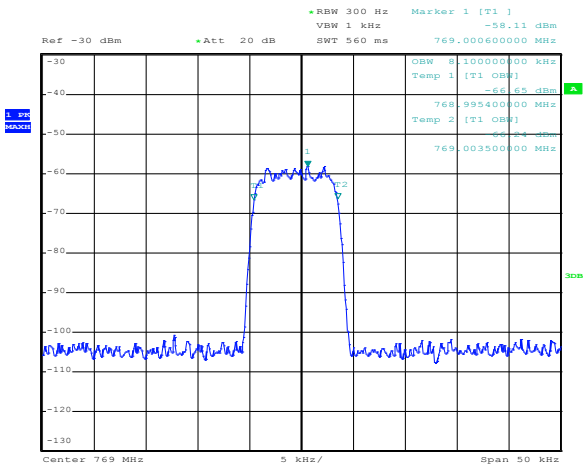
Date: 11.JAN.2017 20:30:18

Figure 8.4-15: 799 MHz TETRA output



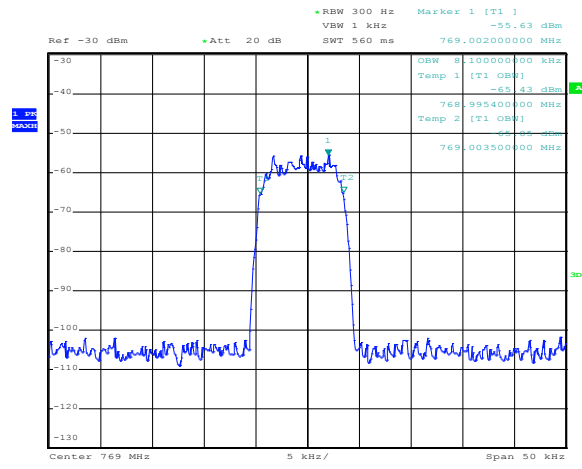
Date: 11.JAN.2017 20:29:43

Figure 8.4-16: 799 MHz TETRA output Plus 3 dB above AGC threshold



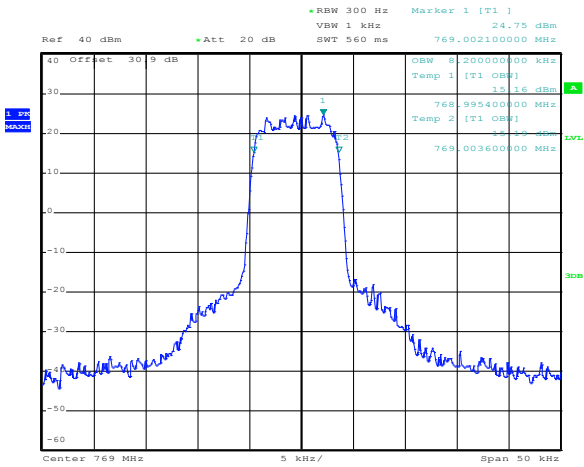
Date: 11.JAN.2017 20:07:42

Figure 8.4-17: 769 MHz P25 input



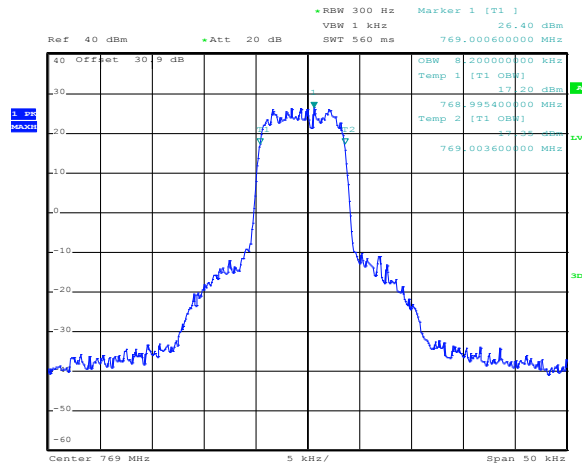
Date: 11.JAN.2017 20:08:19

Figure 8.4-18: 769 MHz P25 input Plus 3 dB above AGC threshold



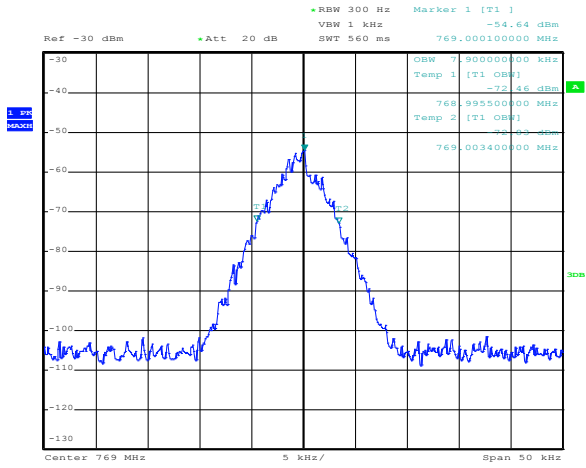
Date: 11.JAN.2017 20:10:33

Figure 8.4-19: 769 MHz P25 output



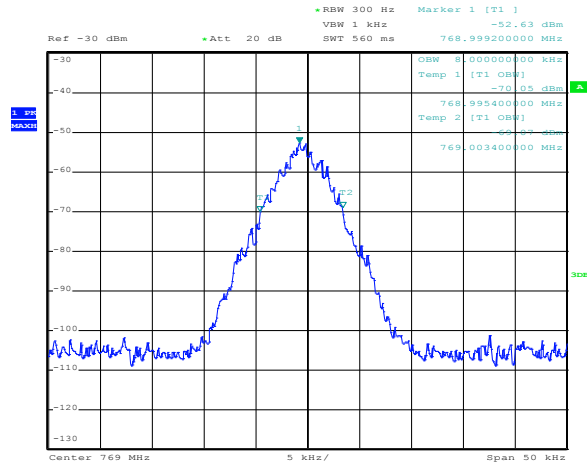
Date: 11.JAN.2017 20:09:50

Figure 8.4-20: 769 MHz P25 output Plus 3 dB above AGC threshold



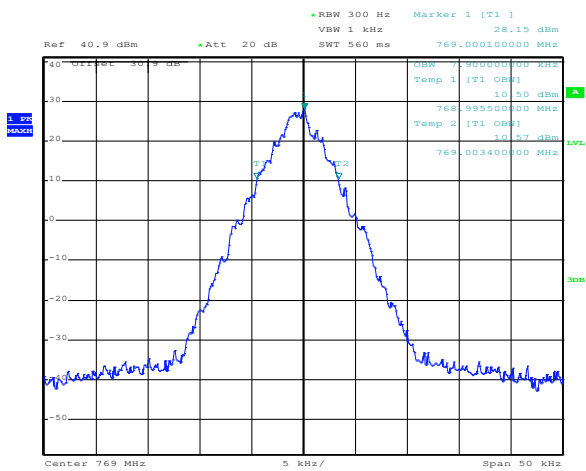
Date: 11.JAN.2017 20:01:52

Figure 8.4-21: 769 MHz DMR input



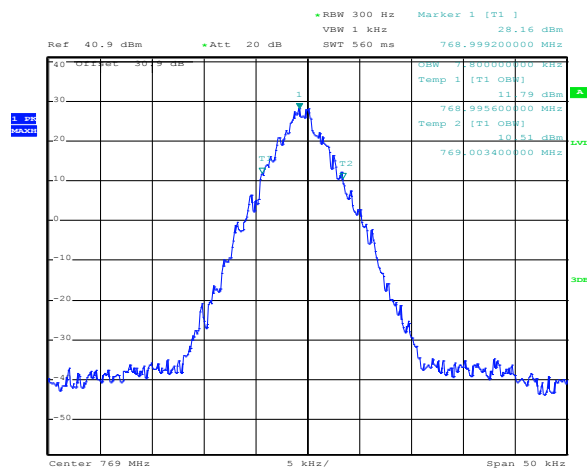
Date: 11.JAN.2017 20:01:19

Figure 8.4-22: 769 MHz DMR input Plus 3 dB above AGC threshold



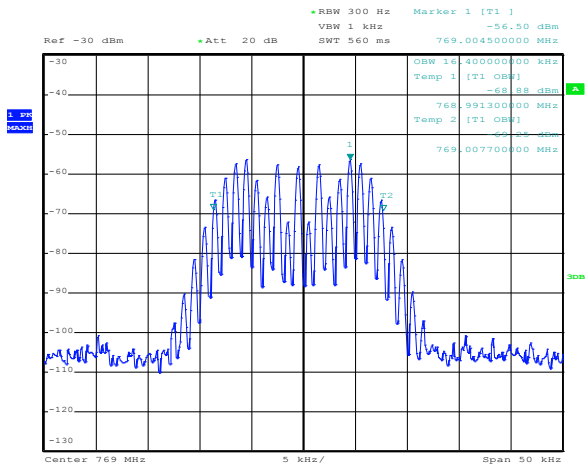
Date: 11.JAN.2017 20:00:03

Figure 8.4-23: 769 MHz DMR output



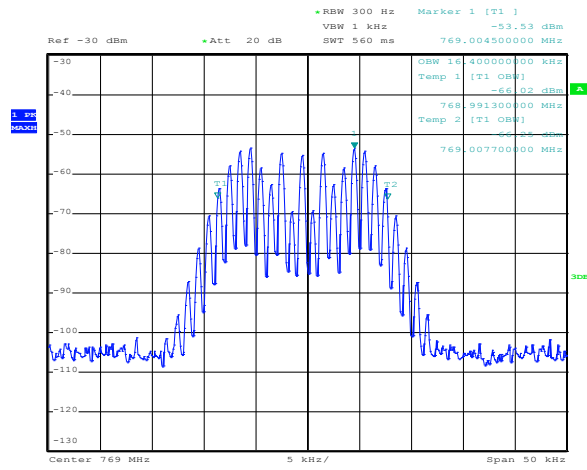
Date: 11.JAN.2017 20:00:24

Figure 8.4-24: 769 MHz DMR output Plus 3 dB above AGC threshold



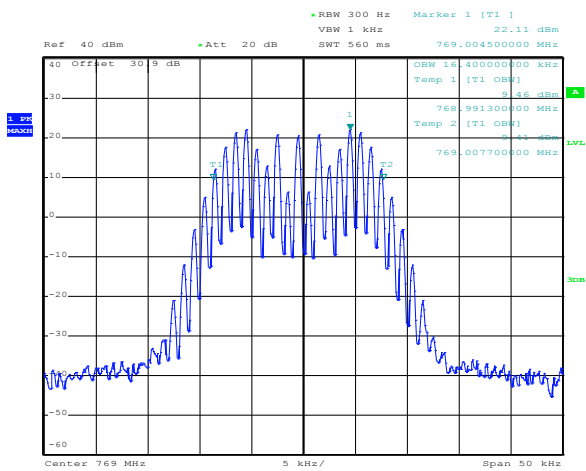
Date: 11.JAN.2017 20:37:33

Figure 8.4-25: 769 MHz analog input



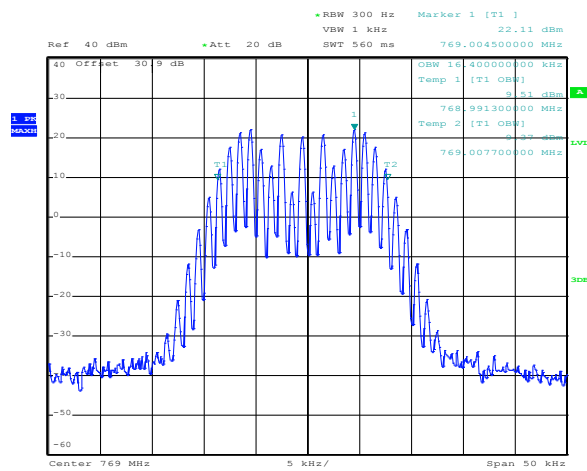
Date: 11.JAN.2017 20:38:11

Figure 8.4-26: 769 MHz analog input Plus 3 dB above AGC threshold



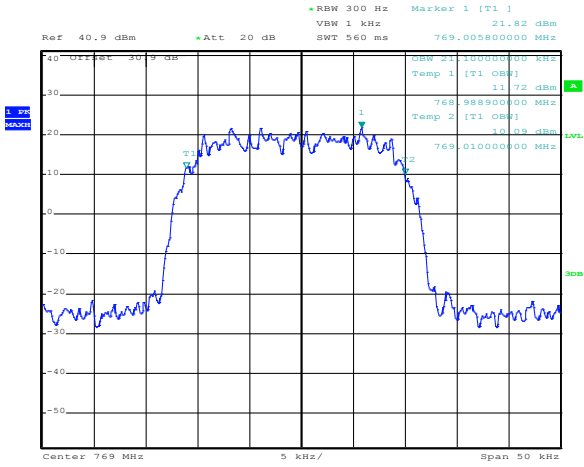
Date: 11.JAN.2017 20:39:34

Figure 8.4-27: 769 MHz analog output



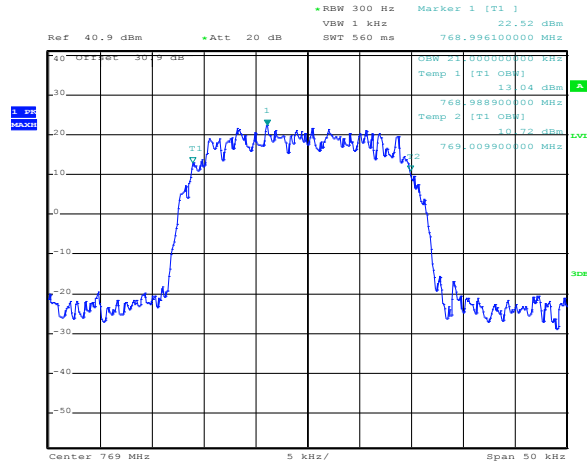
Date: 11.JAN.2017 20:39:09

Figure 8.4-28: 769 MHz analog output Plus 3 dB above AGC threshold



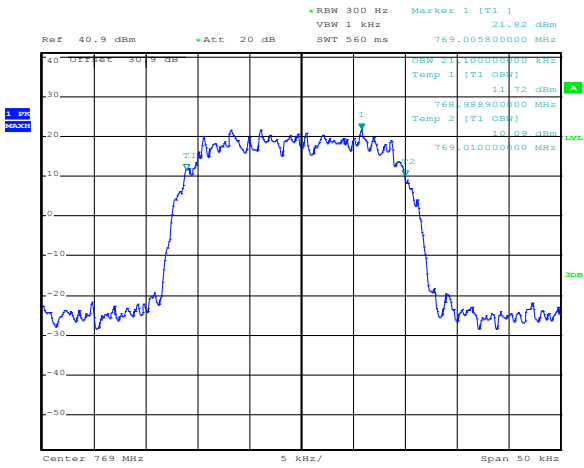
Date: 11.JAN.2017 20:34:09

Figure 8.4-29: 769 MHz Tetra output



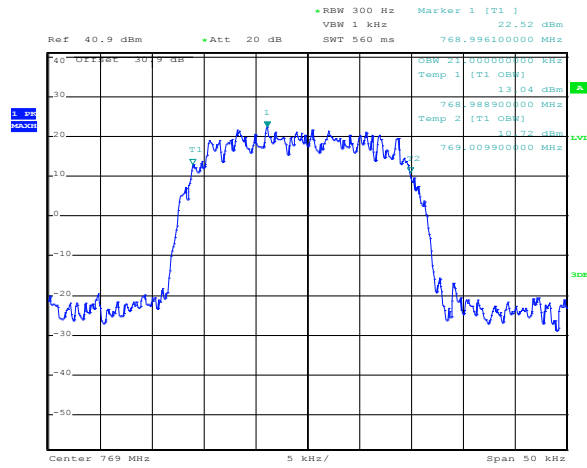
Date: 11.JAN.2017 20:34:40

Figure 8.4-30: 769 MHz Tetra output plus 3 dB above AGC threshold



Date: 11.JAN.2017 20:34:09

Figure 8.4-31: 769 MHz Tetra output



Date: 11.JAN.2017 20:34:40

Figure 8.4-32: 769 MHz Tetra output plus 3 dB above AGC threshold

8.5 KDB 935210 D05 v01r01 4.2 Measuring AGC threshold

8.5.1 Definitions and limits

Testing at and above the AGC threshold will be required. 4 The AGC threshold shall be determined by applying the procedure of 3.2, but with the signal generator configured to produce a test signal defined in Table 1 , a CW input signal.

8.5.2 Test summary

Test date	November 16, 2016	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1003 mbar
Verdict	Pass	Relative humidity	46 %

8.5.3 Observations, settings and special notes

Assessed to remain within assigned band. Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	1 MHz
Intergration bandwidth	>OBW
Video bandwidth	>RBW
Trace mode	Max Hold
Measurement time	Auto

8.5.4 Test data

Table 8.5-1: AGC results

Frequency, MHz	Input, dBm	output, dBm	Gain, dB	Rated Gain, dB
804.68	-59.7	22.56	82.26	80
766.48	-49.5	29.85	79.35	80

Table 8.5-2: AGC results 3 dB above AGC threshold

Frequency, MHz	Input, dBm	output, dBm	Gain, dB	Rated Gain, dB
804.68	-56.86	22.55	79.41	80
766.48	-46.62	29.89	76.51	80

8.6 KDB 935210 D05 v01r01 4.3 Out-of-band rejection

8.6.1 Definitions and limits

After the trace is completely filled, place a marker at the peak amplitude, which is designated as f_0 , and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the level has fallen by 20 dB).

8.6.2 Test summary

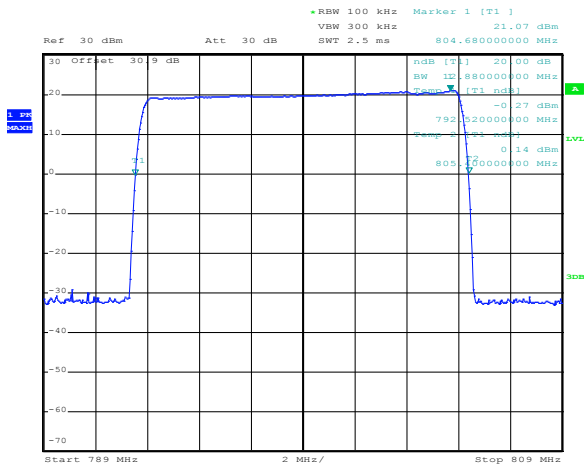
Test date	January 11, 2017	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1003 mbar
Verdict	Pass	Relative humidity	46 %

8.6.3 Observations, settings and special notes

Assessed to remain within assigned band. Spectrum analyzer settings:

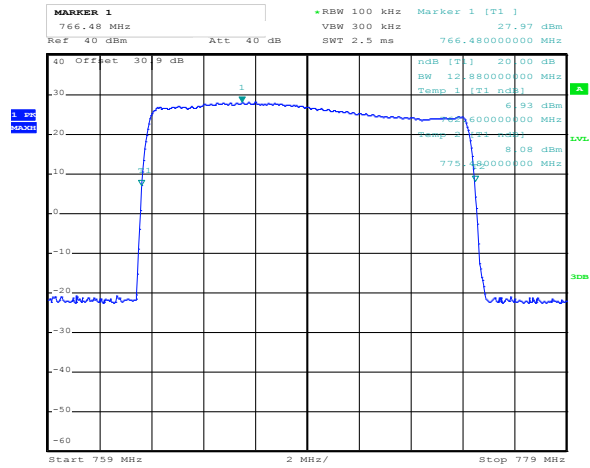
Detector mode	Peak
Resolution bandwidth	100 kHz
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.6.4 Test data



Date: 11.JAN.2017 14:54:39

Figure 8.6-1: UL Out of band reject



Date: 11.JAN.2017 15:09:23

Figure 8.6-2: DL Out of band reject

8.7 FCC §90.543 (e)(f); Radiated Spurious

8.7.1 Definitions and limits

90.543(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

90.543(f) 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/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW 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.

8.7.2 Test summary

Test date	February 28, 2017	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	1005 mbar
Verdict	Pass	Relative humidity	35 %

8.7.3 Observations, settings and special notes

None

Receiver settings were:

Frequency range	30 MHz to 10 th harmonic
Detector mode	Peak
Resolution bandwidth	100 kHz (below 1 GHz), 1 MHz (above 1 GHz)
Video bandwidth	>RBW
Trace mode	Max Hold

8.7.4 Test data

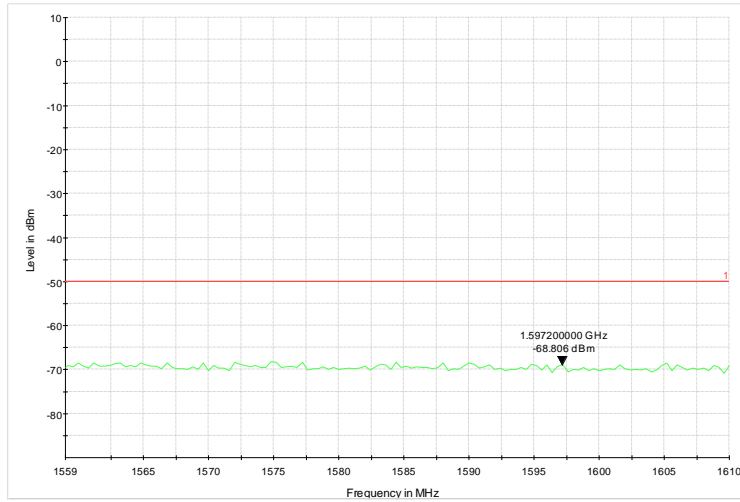


Figure 8.7-1: DL 1559–1610 MHz Spurious

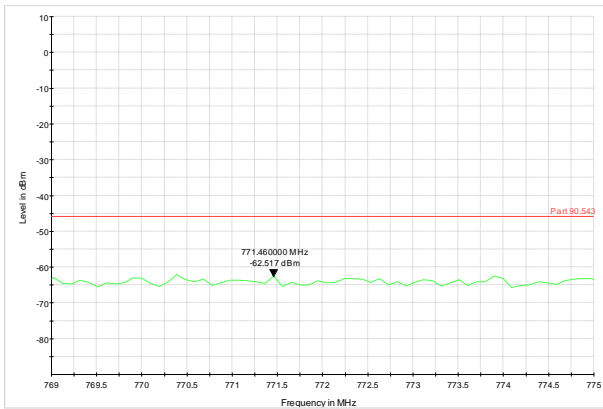


Figure 8.7-2: DL 769–775 MHz Spurious

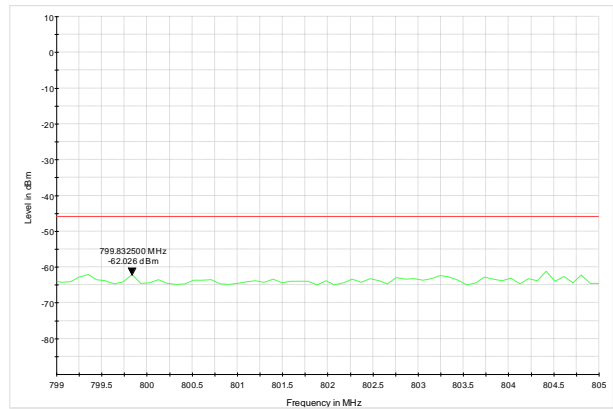


Figure 8.7-3: UL 779–805 MHz Spurious

Note: dBuV/m @ 3m to EIRP dBm (A signal substitution factor was added to the dBuV/m measurement to obtain EIRP measurement. TX frequency of 798 MHz was used

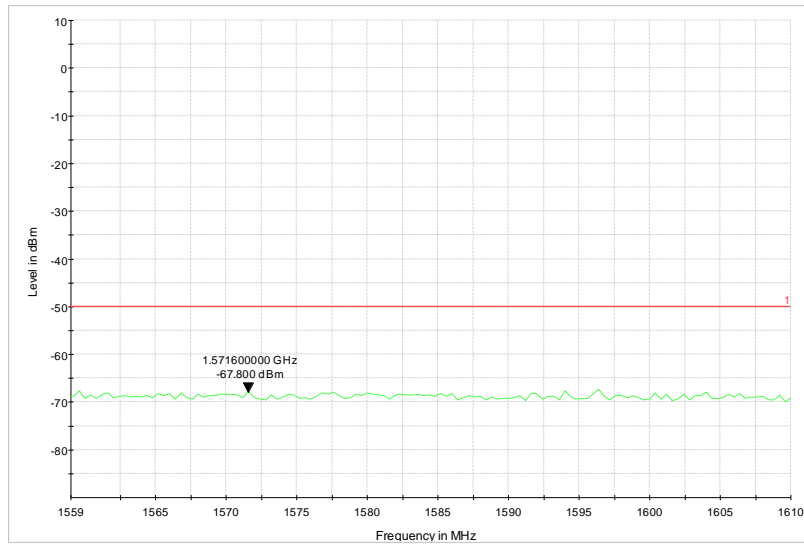


Figure 8.7-4: UL 1559–1610 MHz Spurious

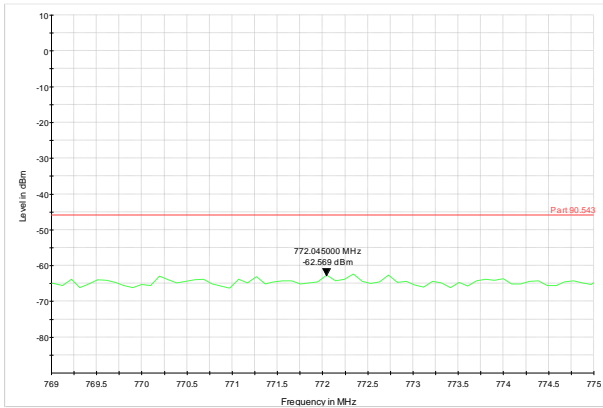


Figure 8.7-5: DL 769–775 MHz Spurious

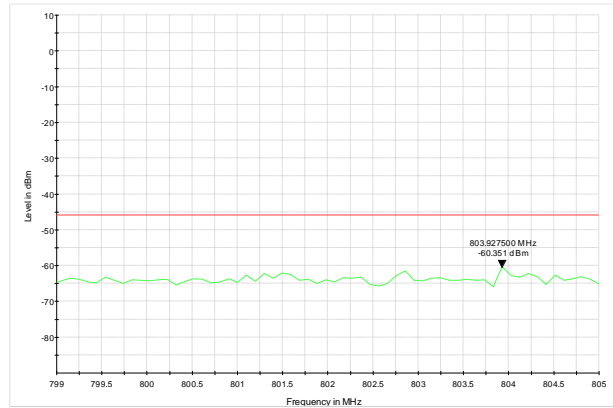


Figure 8.7-6: UL 779–805 MHz Spurious

Note: dBuV/m @ 3m to EIRP dBm (A signal substitution factor was added to the dBuV/m measurement to obtain EIRP measurement. TX frequency of 768 MHz was used)

8.8 FCC §90.219 (e)(2) Noise figure

8.8.1 Definitions and limits

90.219(e)(2) The noise figure of a signal booster must not exceed 9 dB in either direction.

8.8.2 Test summary

Test date	November 16, 2016	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1003 mbar
Verdict	Pass	Relative humidity	46 %

8.8.3 Observations, settings and special notes

The EUT is powered on and the Spectrum analyzer is centered on the band. Then the noise source is turned on. Then Noise floor is remeasured and the delta between two measurements is then used in the formula below.

Assessed to remain within assigned band. Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	20 Hz
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.8.4 Test data

Table 8.8-1: Noise figure result

DL/UL	Noise Source OFF, dBm	Noise Source ON, dBm	ENR, dB	NF Result, dB	Limit, dB	Margin, dB
DL	-46.65	-41.06	12.83	8.64	9	0.36
UL	-49.47	-41.03	12.83	5.06	9	3.94

$$\text{Noise Figure (NF)} = 10 \times \log_{10} \left\{ \frac{10^{\text{ENR}/10}}{[10^{(Y/10)} - 1]} \right\}$$

Y= Noise Source ON - Noise Source OFF

ENR= Noise level above Thermal noise

Section 9. Setup Photos

9.1 Set-up

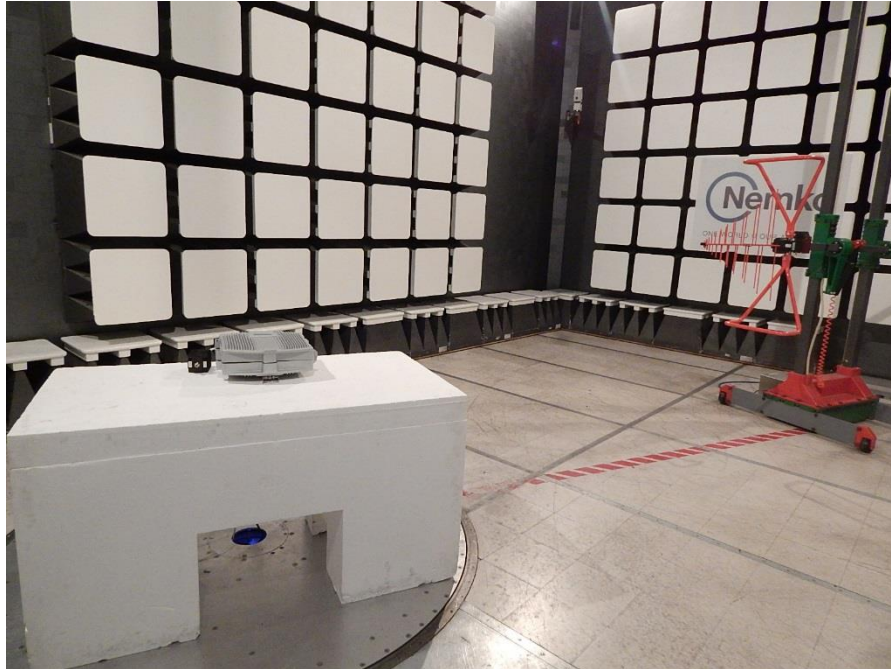
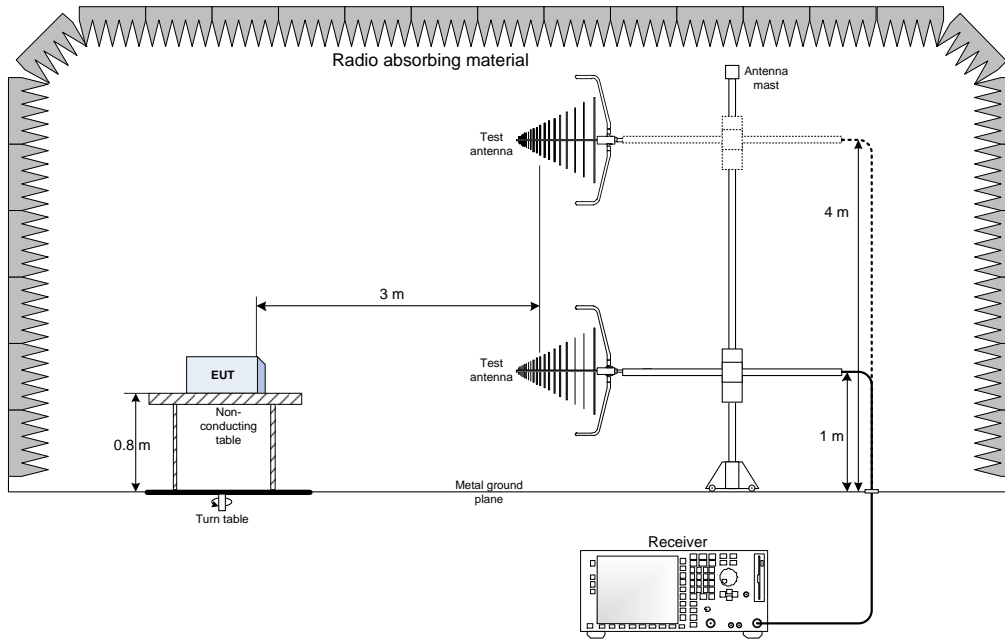


Figure 9.1-1: Radiated setup photo

Section 10. Block diagrams of test set-ups

10.1 Radiated emissions set-up



10.2 Noise figure set-up

