EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 103247864BOX-001
Project Number: G103247864

Report Issue Date: 11/14/2017

Model(s) Tested: Wearable Biosensor G5- 453564741731
Model(s) Partially Tested: N/A
Model(s) Not Tested but declared equivalent by the client: N/A

Standards: FCC 47CFR Part 15 Subpart C: 2017,
FCC 47CFR Part 15 Subpart B: 2017,
RSS-247 Issue 2 February 2017,
ICES-003 Issue 6 January 2016,
RSS-102 Issue 5 March 19 2015

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
Philips Connected Sensing
50 Milk Street
18th Floor
Boston, MA 02109
USA

Report prepared by Vathana Ven

Vathana Ven/EMC Staff Engineer

Report reviewed by Michael Murphy

Michael Murphy/EMC Engineering Supervisor

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Maximum Peak Power (Antenna Port Conducted) and Human RF Exposure (CFR47 FCC Part 15 Subpart C (15.247):11/2017, RSS-247 Issue 2 February 2017, RSS-102 Issue 5 March 19 2015)	Pass
7	Power Spectral Density (Antenna Port Conducted) (CFR47 FCC Part 15 Subpart C (15.247):11/2017, RSS-247 Issue 2 February 2017)	Pass
8	Occupied (99%), 6 dB, and 20 dB Bandwidth (Antenna Port Conducted) (CFR47 FCC Part 15 Subpart C (15.247):11/2017, RSS-247 Issue 2 February 2017)	Pass
9	Spurious and Band edge emissions (Antenna Port Conducted) (CFR47 FCC Part 15 Subpart C (15.247):11/2017, RSS-247 Issue 2 February 2017)	Pass
10	Radiated Spurious and Restricted-band band-edge (CFR47 FCC Part 15 Subpart C (15.247):11/2017, RSS-247 Issue 2 February 2017)	Pass
11	Digital Device Radiated Spurious Emissions (CFR47 FCC Part 15 Subpart B:11/2017, ICES-003 Issue 6 January 2016)	Pass
12	Revision History	--

3 Client Information

This EUT was tested at the request of:

Client: Philips Connected Sensing
50 Milk Street
18th Floor
Boston, MA 02109 USA
USA

Contact: Ryan Loehr
Email: ryan.loehr@philips.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Philips Connected Sensing
50 Milk Street
18th Floor
Boston, MA 02109 USA
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Wearable Health Device	Philips Connected Sensing	Wearable Biosensor G5-453564741731	0009fbb87070
Wearable Health Device	Philips Connected Sensing	Wearable Biosensor G5-453564741731	0009fbb87050

Receive Date:	11/02/2017
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)

Philips wearable biosensor-G5 solution is a patient heart rate sensing system – comprised of a *Philips wearable biosensor-G5* and a software application *G5 application* – which gathers, stores and displays a patient's heart rate. The biosensor G5 is designed to connect with the G5 application to let clinicians review and export patient heart rate. Heart rate measurements are sent to a compatible device using a USB cable for offline review and analysis.

Philips wearable biosensor-G5 is a wireless, single-use, single-location chest-worn device that acquires surface electrical waveforms related to cardiac excitations, and measures beat-to-beat intervals. The biosensor calculates patient heart rate based upon a combination of patient's single-vector ECG and their motion data. The biosensor has two days of wear life, after which it turns off automatically.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3VDC	N/A	N/A	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Tx mode
2	Rx mode

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	FW 3.0, FCC FW

Radio/Receiver Characteristics	
Frequency Band(s)	2402-2480 MHz
Modulation Type(s)	GFSK
Maximum Output Power	Low Channel: -23.29 dBm Mid Channel: -23.98 dBm High Channel: -25.16 dBm
Test Channels	Low Channel: 2402 MHz Mid Channel: 2442 MHz High Channel: 2480 MHz
Occupied Bandwidth	Low Channel: -23.29 MHz Mid Channel: -23.98 MHz High Channel: -25.16 MHz
Frequency Hopper: Number of Hopping Channels	N/A
Frequency Hopper: Channel Dwell Time	N/A
Frequency Hopper: Max interval between two instances of use of the same channel	N/A
MIMO Information (# of Transmit and Receive antenna ports)	N/A
Equipment Type	Standalone
ETSI LBT/Adaptivity	N/A
ETSI Adaptivity Type	N/A
ETSI Temperature Category (I, II, III)	N/A
ETSI Receiver Category (1, 2, 3)	N/A
Antenna Type and Gain	Integral (Antenna gain -2 d(Bi))

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 System Setup and Method

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
	N/A				

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	HP	EliteBook 8460p	N/L

5.1 Method:

Configuration as required by FCC Part 15.247, RSS-247.

5.2 EUT Block Diagram:

6 Maximum Peak Power (Antenna Port Conducted) and Human RF exposure

6.1 Method

Tests are performed in accordance with FCC Part 15.247, RSS-247.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61A	05/10/2017	05/10/2018
CBLHF2012-2M-1	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/08/2017	02/08/2018
145108	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	05/23/2017	05/23/2018

Software Utilized:

Name	Manufacturer	Version
None	--	--

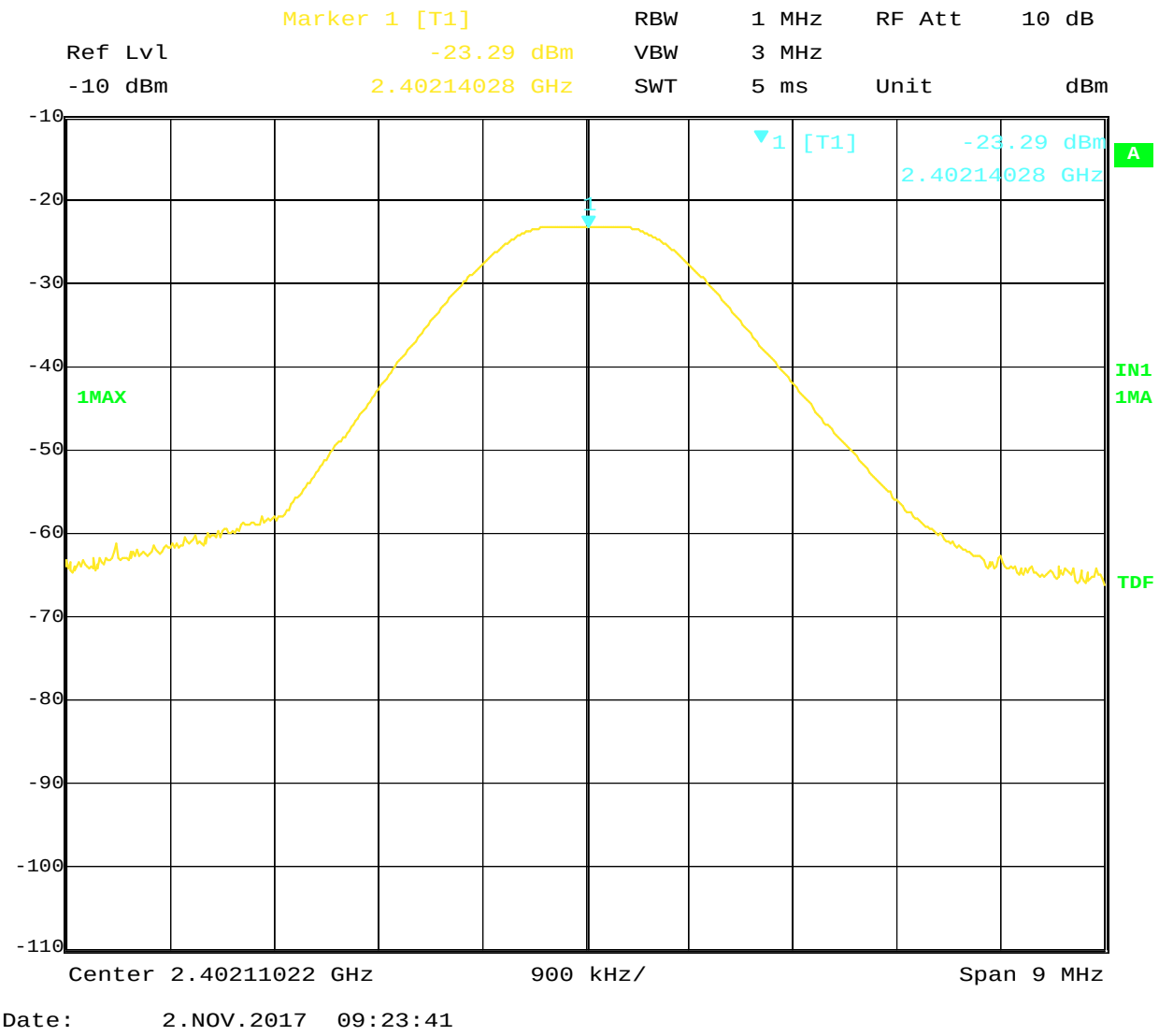
6.3 Results:

The sample tested was found to Comply.

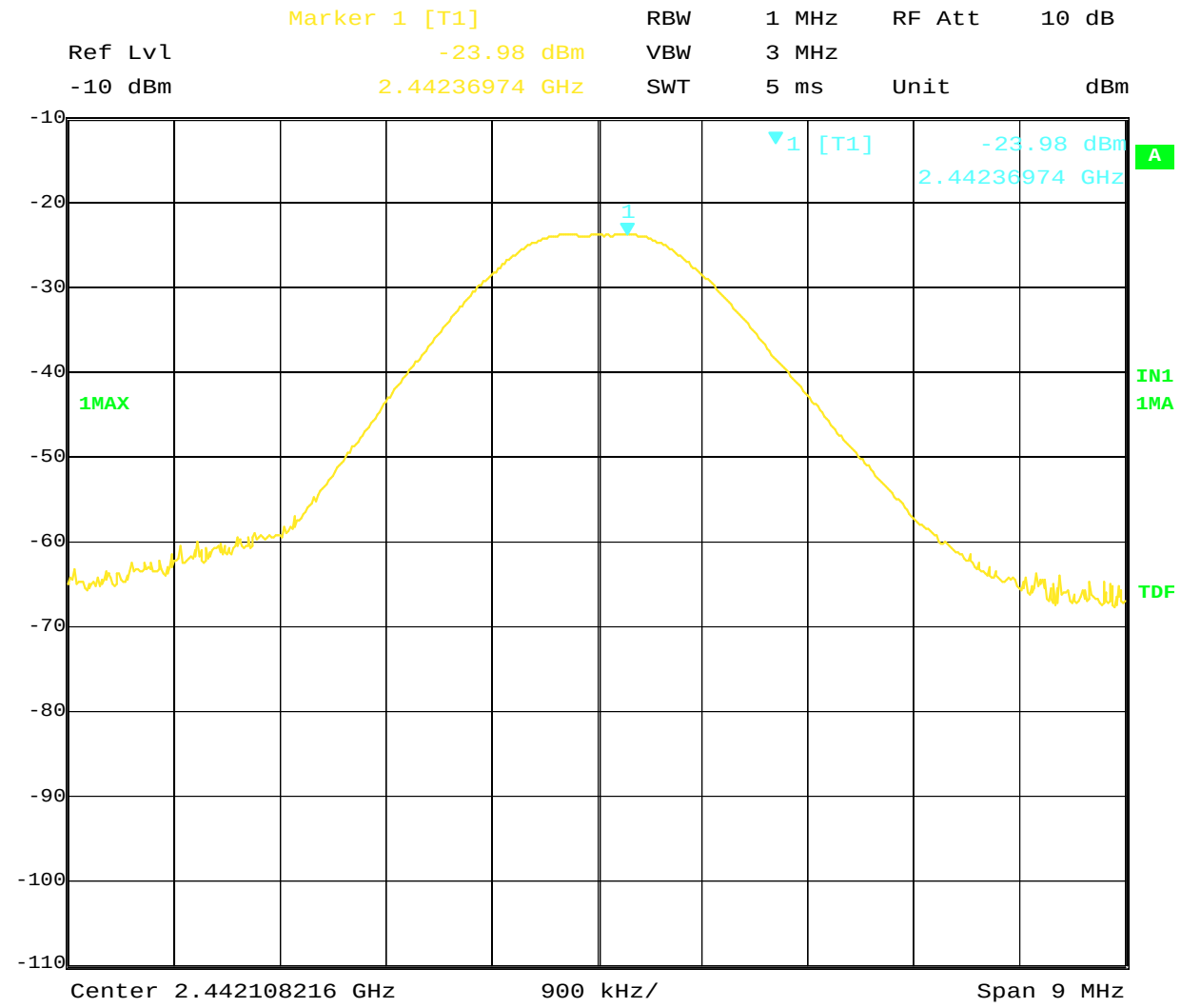
§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt or 30 dBm.

6.4 Plots/Data:

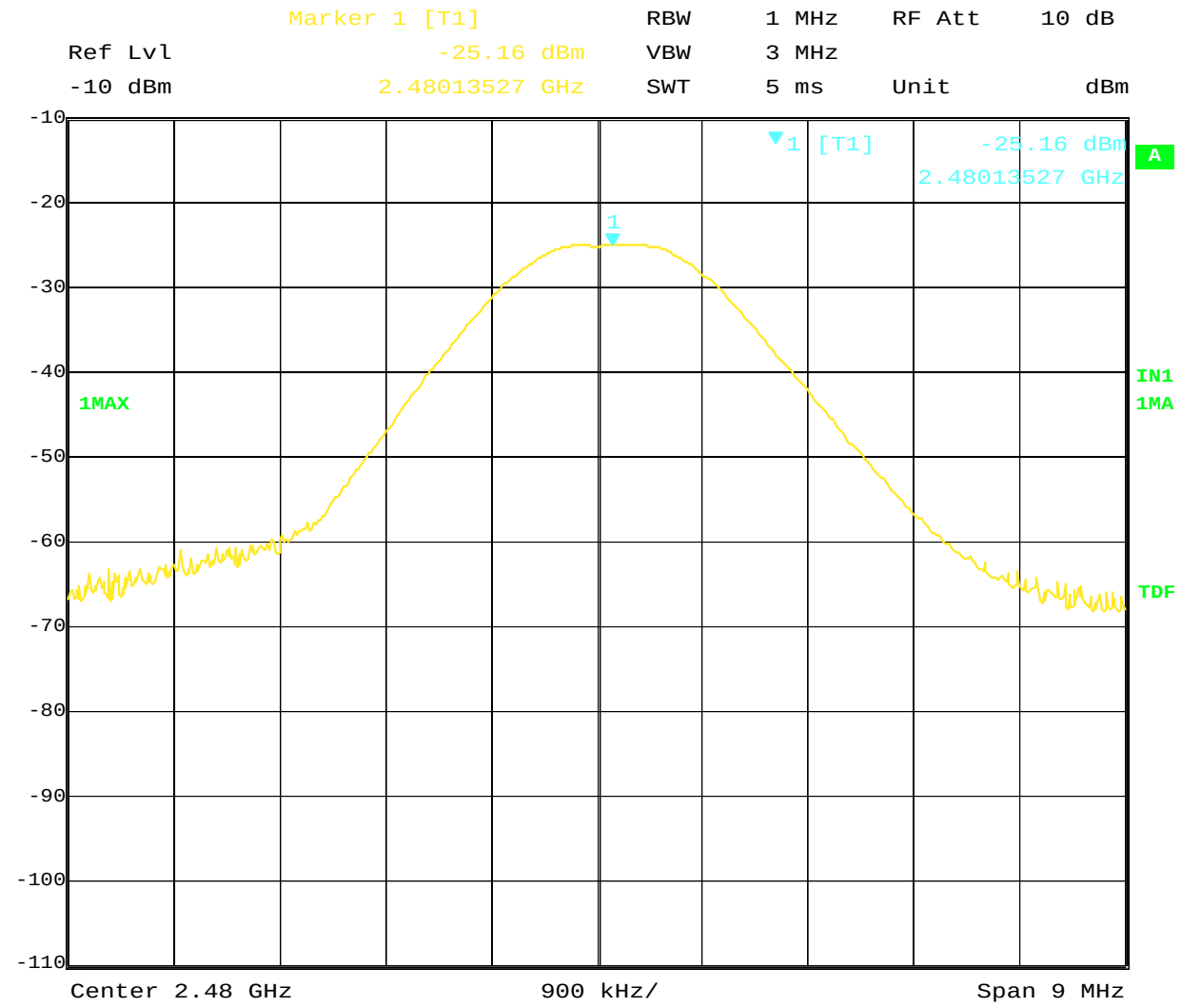
Low Channel Output Power, -23.29 dBm



Mid Channel Power, -23.98 dBm



High Channel Power, -25.16 dBm



Human RF Exposure

FCC SAR Exemption per KDB 447498

Maximum output power measured = -23.29 dBm = 0.0046881338215 mW

a) For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following:

[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,[30] where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz

= (0.0046881338215/5)*(sqrt(2.402))

= 0.001453 < 3.0 (below the limit SAR Exempt per FCC)

RSS 102 SAR Exemption

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

The measured maximum output power 0.0046881338215 mW is less than 2 mW limit at 3500 MHz. So the device meets the SAR exemption requirements.

Test Personnel:	Kouma Sinn KPS	Test Date:	11/02/2017
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15.247, RSS-247	Limit Applied:	See report section 6.3
Input Voltage:	3VDC (Coin Battery)	Ambient Temperature:	22 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**N/A**	Relative Humidity:	44 %
		Atmospheric Pressure:	1015 mbars

Deviations, Additions, or Exclusions: None

7 Power Spectral Density (Antenna Port Conducted)

7.1 Method

Tests are performed in accordance with FCC Part 15.247, RSS-247, and 558074 D01 DTS Meas Guidance v04.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61A	05/10/2017	05/10/2018
CBLHF2012-2M-1	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/08/2017	02/08/2018
145108	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	05/23/2017	05/23/2018

Software Utilized:

Name	Manufacturer	Version
None	--	--

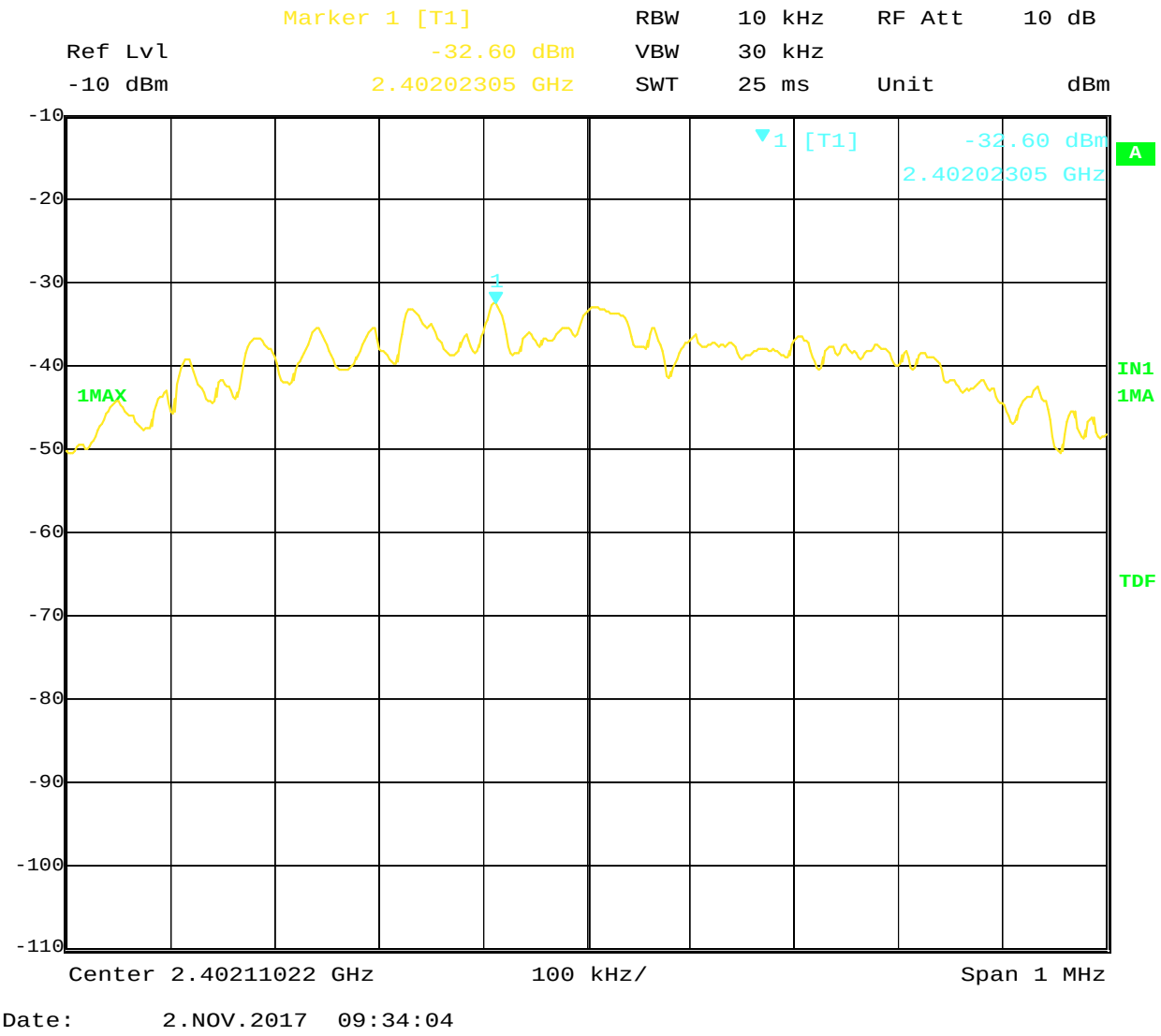
7.3 Results:

The sample tested was found to Comply.

§15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.4 Plots/Data:

Low Channel Power Spectral Density, -32.60 dBm



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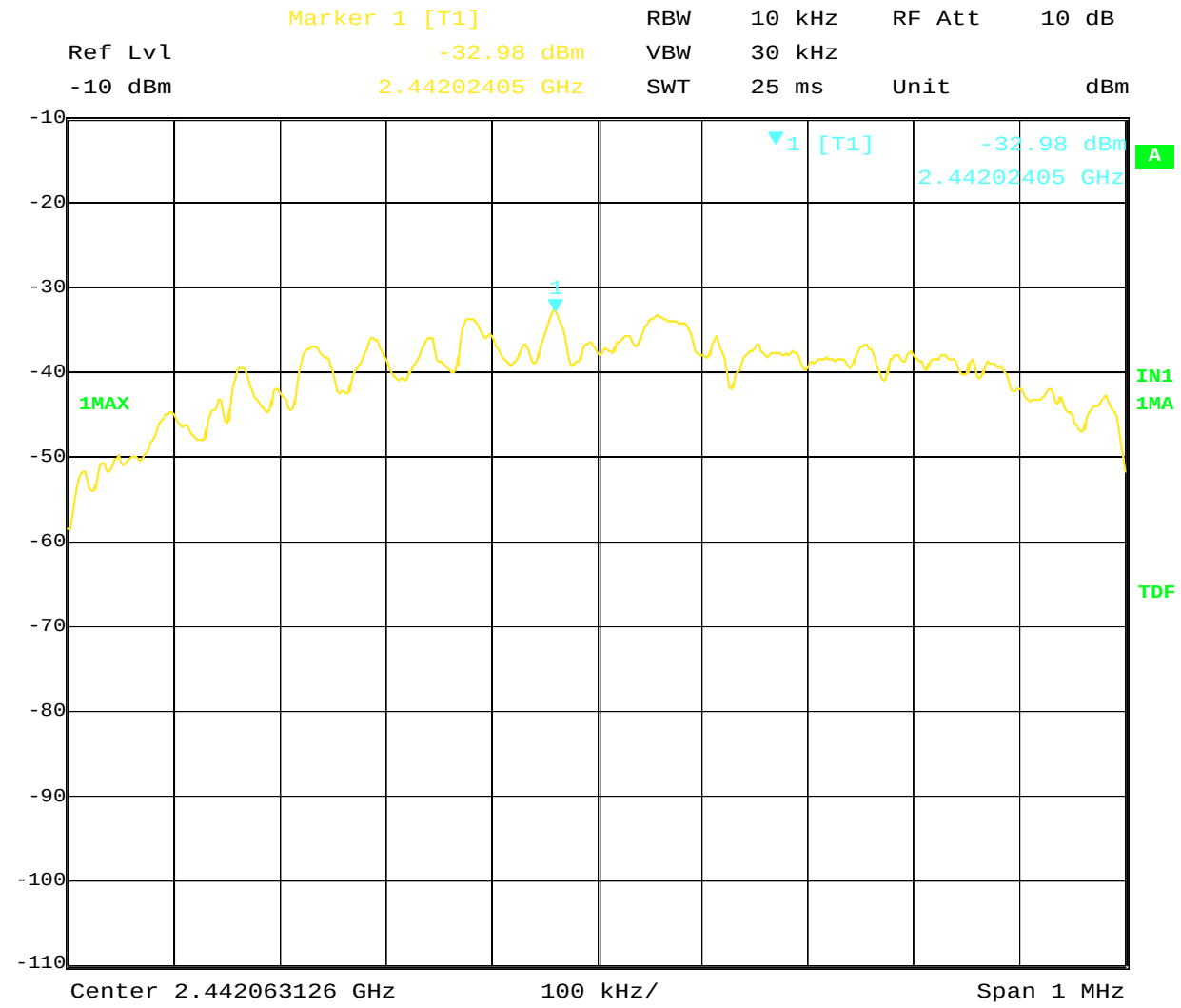
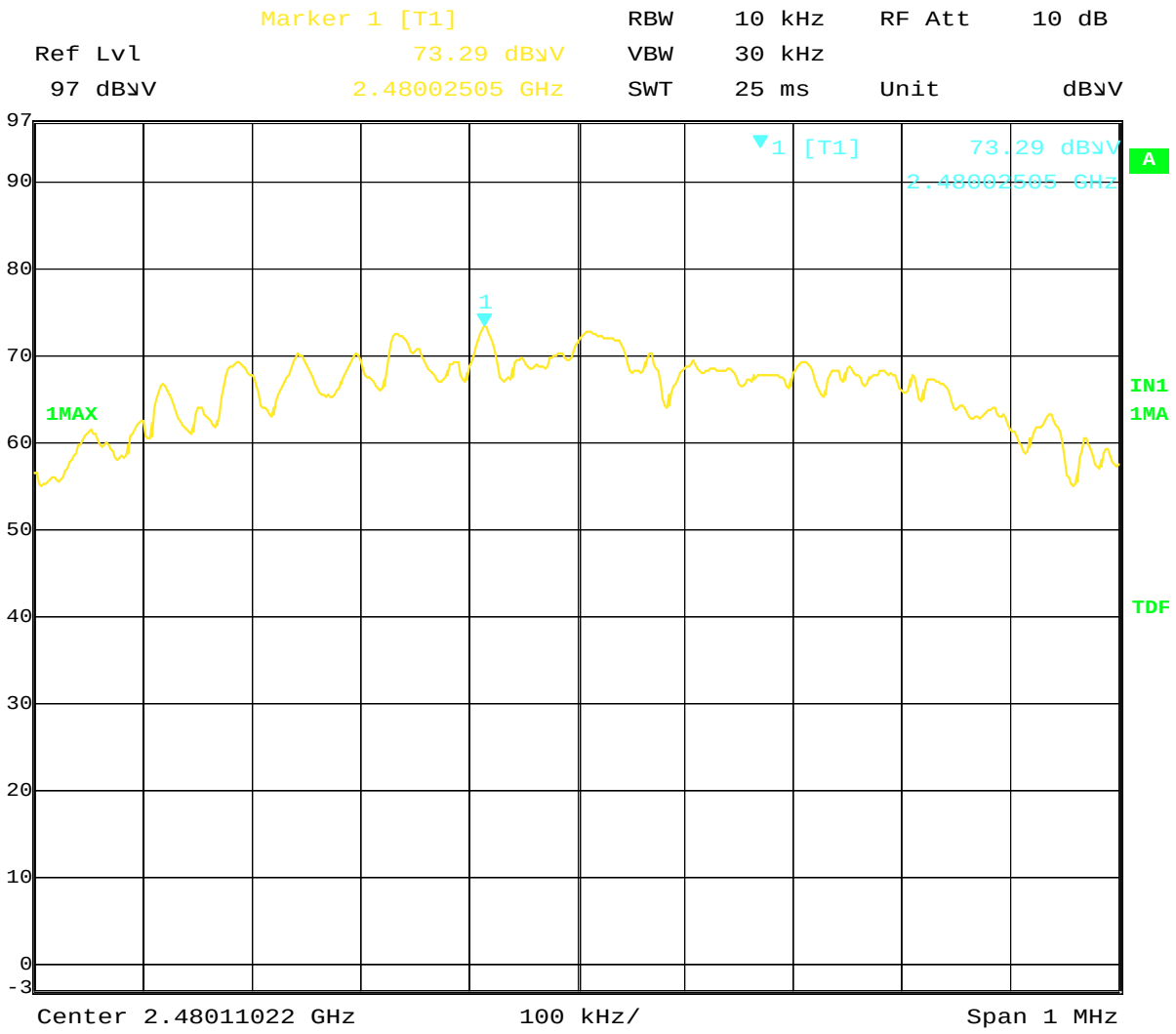
Mid Channel Power Spectral Density, -32.98



High Channel Power Spectral Density, -33.71 dBm



Test Personnel:	Kouma Sinn KPS	Test Date:	11/02/2017
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15.247, RSS-247	Limit Applied:	See report section 7.3
Input Voltage:	3VDC (Coin Battery)	Ambient Temperature:	22 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**N/A**	Relative Humidity:	44 %
		Atmospheric Pressure:	1015 mbars

Deviations, Additions, or Exclusions: None

8 Occupied, 6 dB, and 20 dB Bandwidths (Antenna Port Conducted)

8.1 Method

Tests are performed in accordance with FCC Part 15.247, RSS-247, and 558074 D01 DTS Meas Guidance v04.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61A	05/10/2017	05/10/2018
CBLHF2012-2M-1	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/08/2017	02/08/2018
145108	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	05/23/2017	05/23/2018

Software Utilized:

Name	Manufacturer	Version
None	--	--

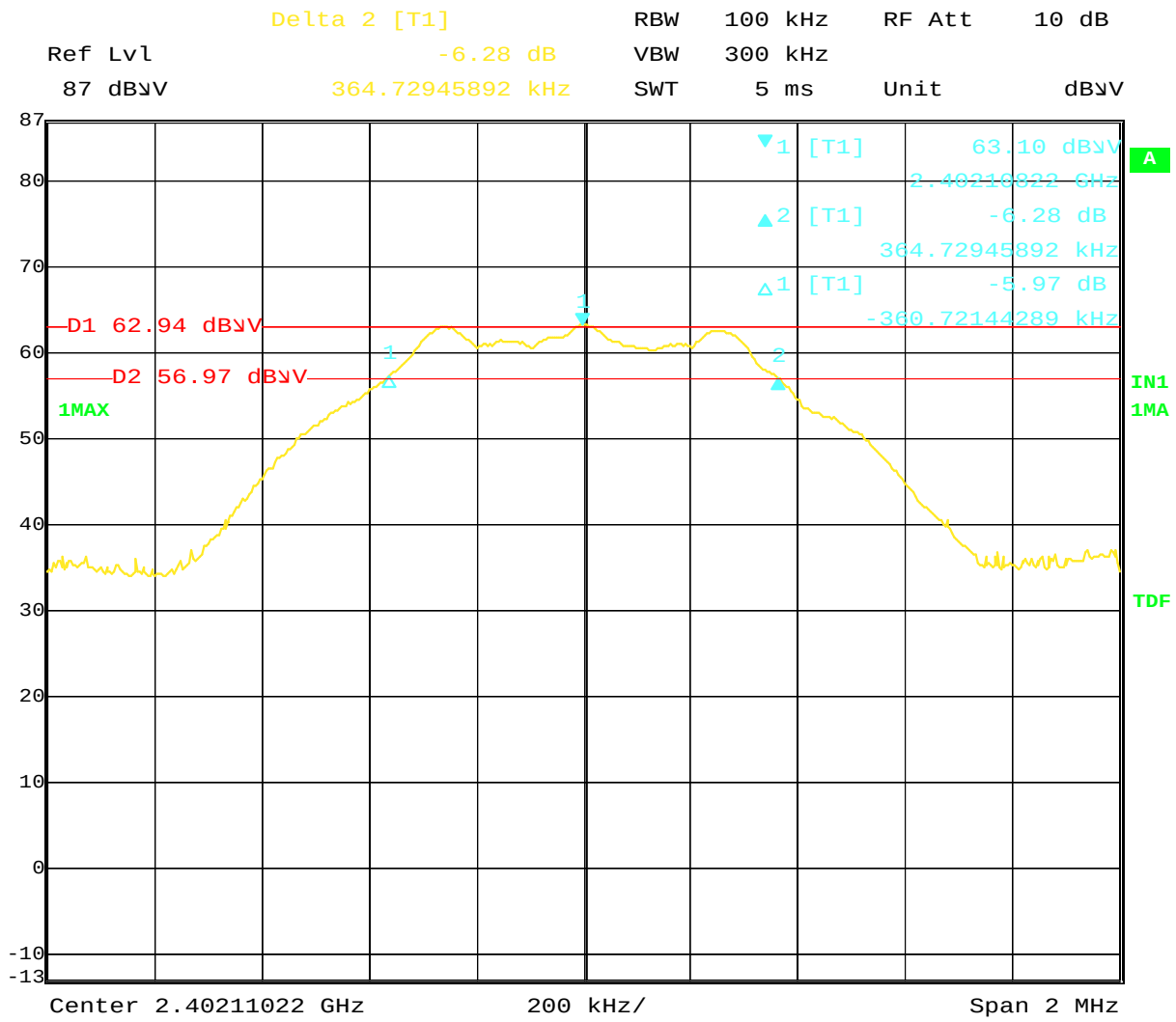
8.3 Results:

The sample tested was found to Comply.

§15.247 (a) (2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.4 Plots/Data:

Low Channel 6 dB Bandwidth, 725.45 kHz



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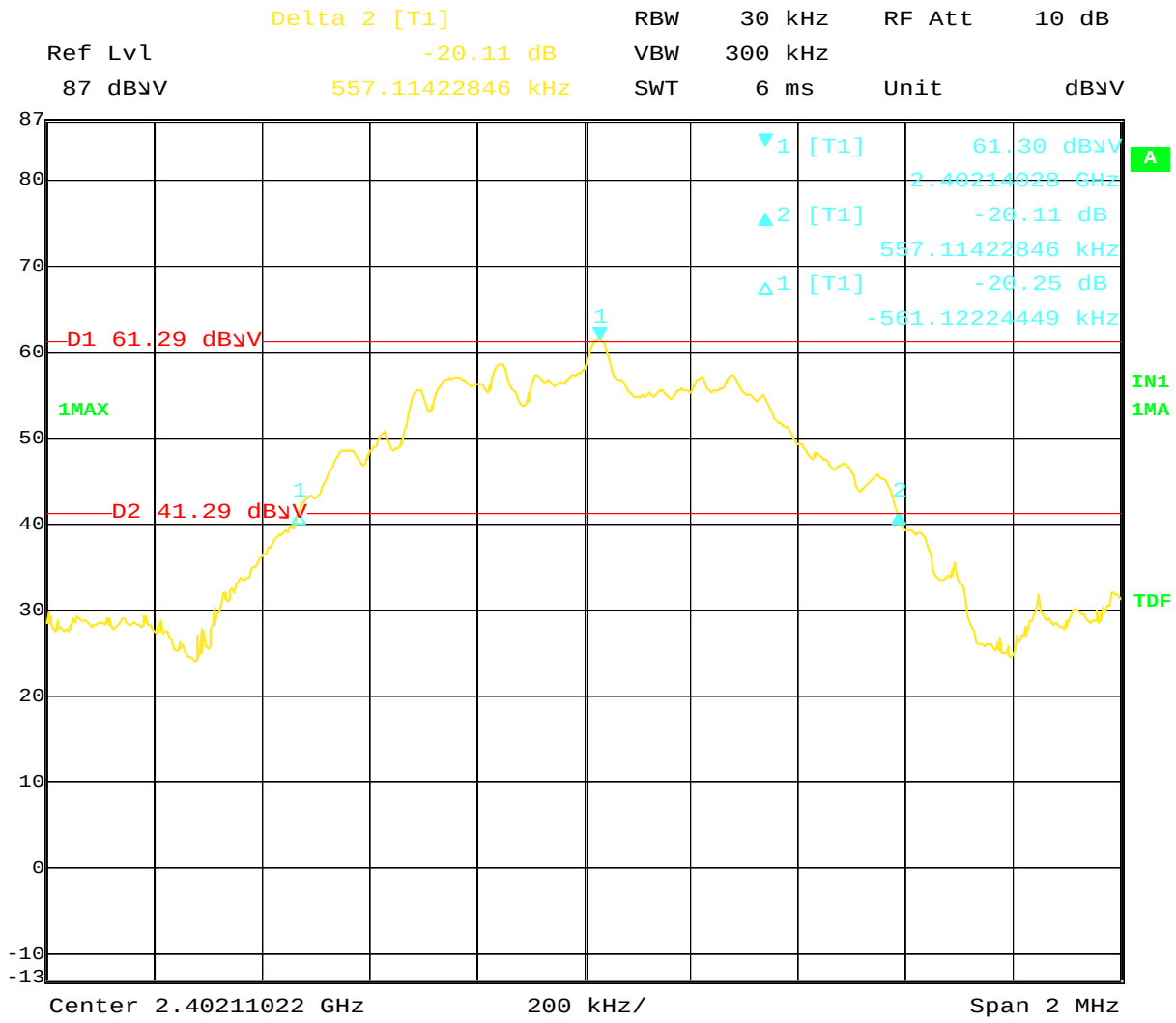
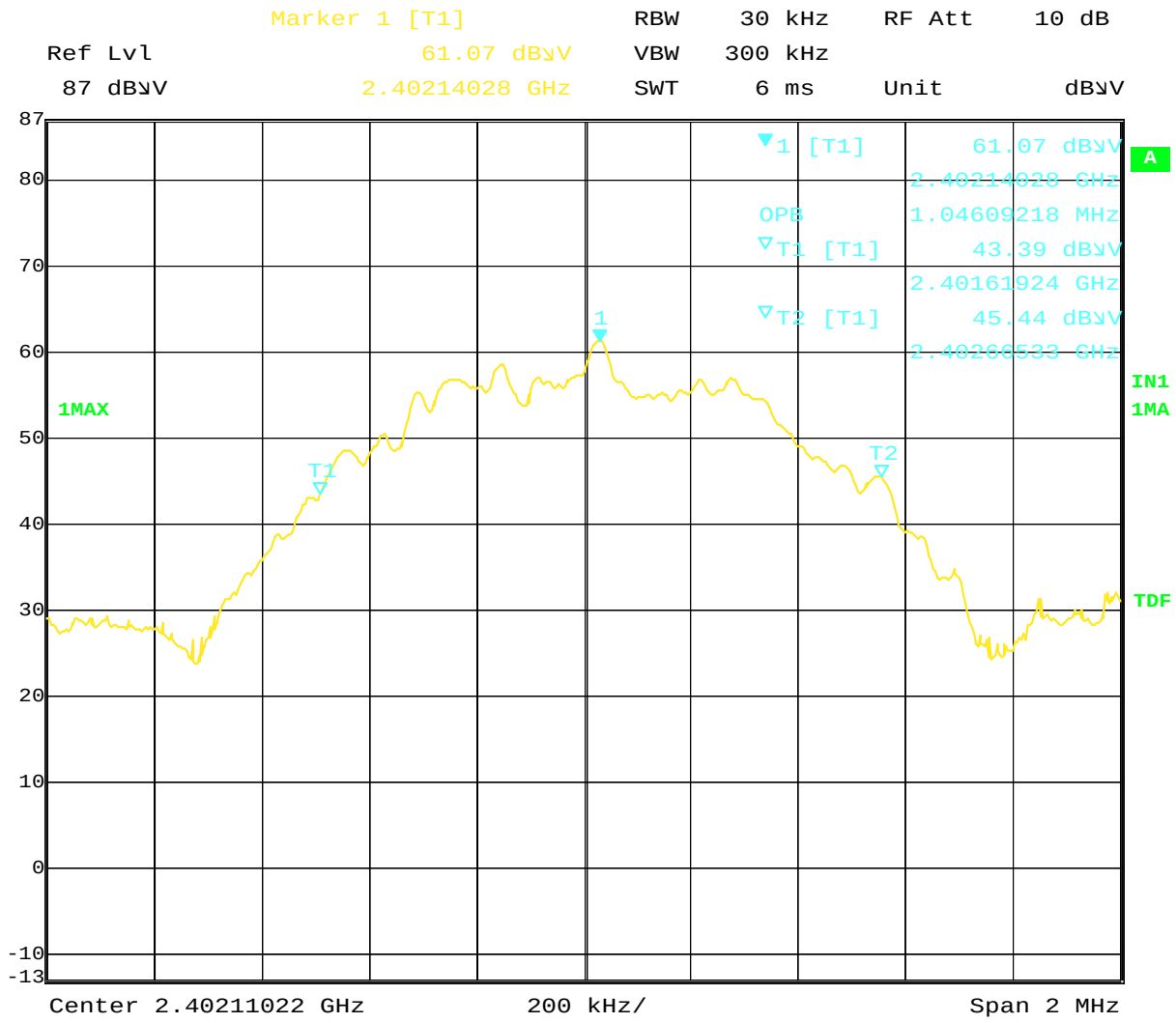
Low Channel 20 dB Bandwidth, 1.118 MHz



Date: 2.NOV.2017 08:45:34

Low Channel Occupied Bandwidth, 1.046 MHz



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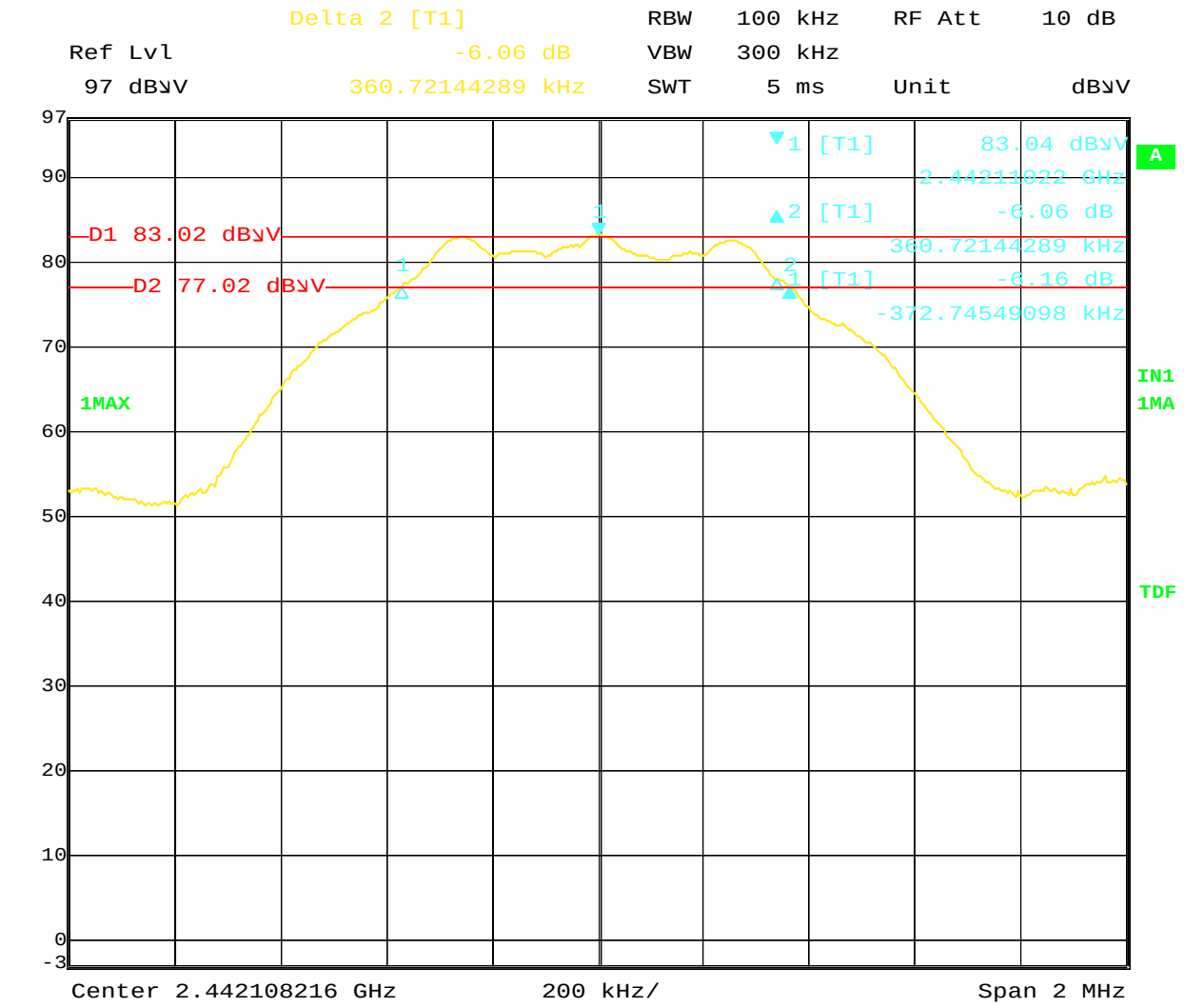
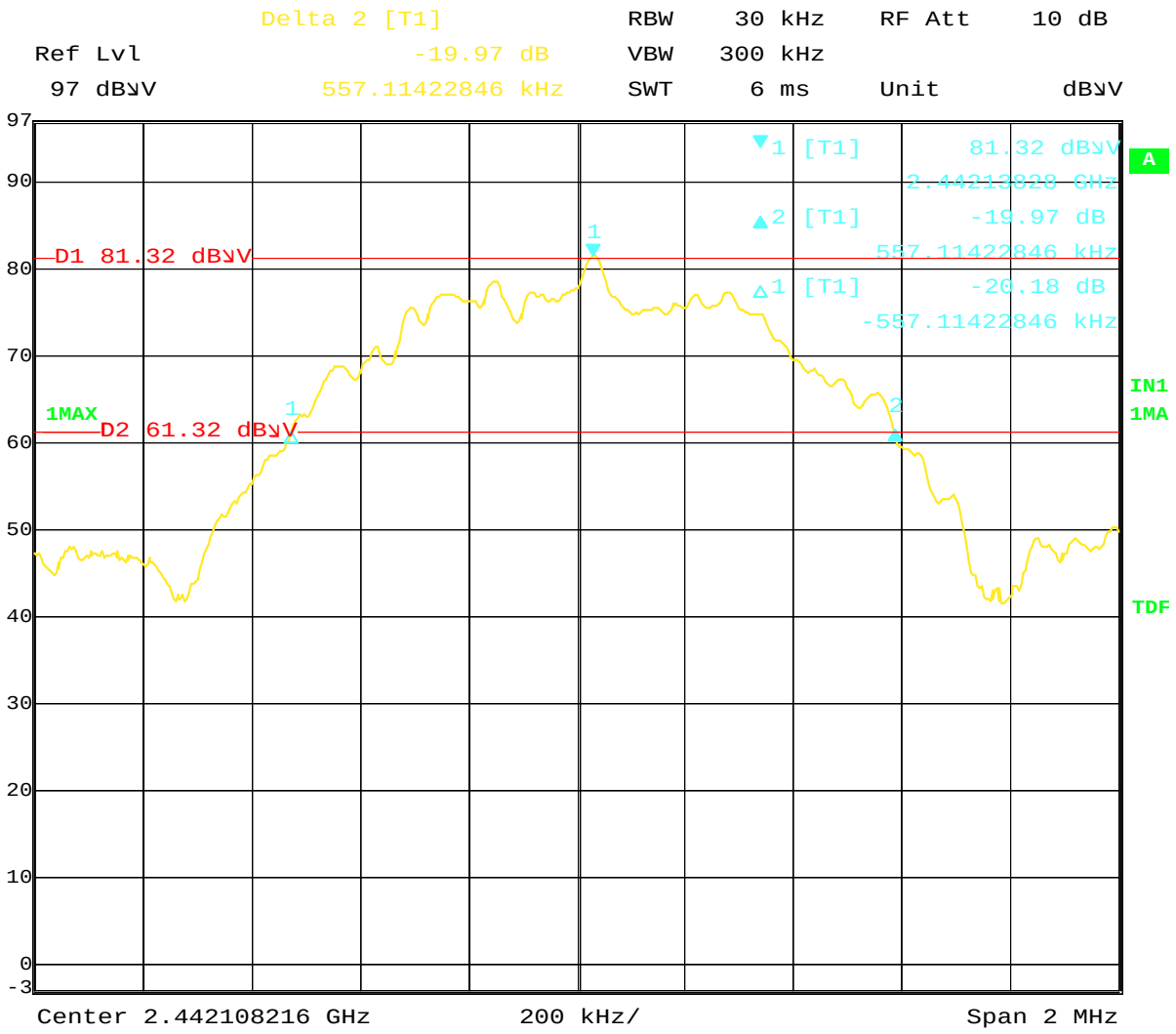
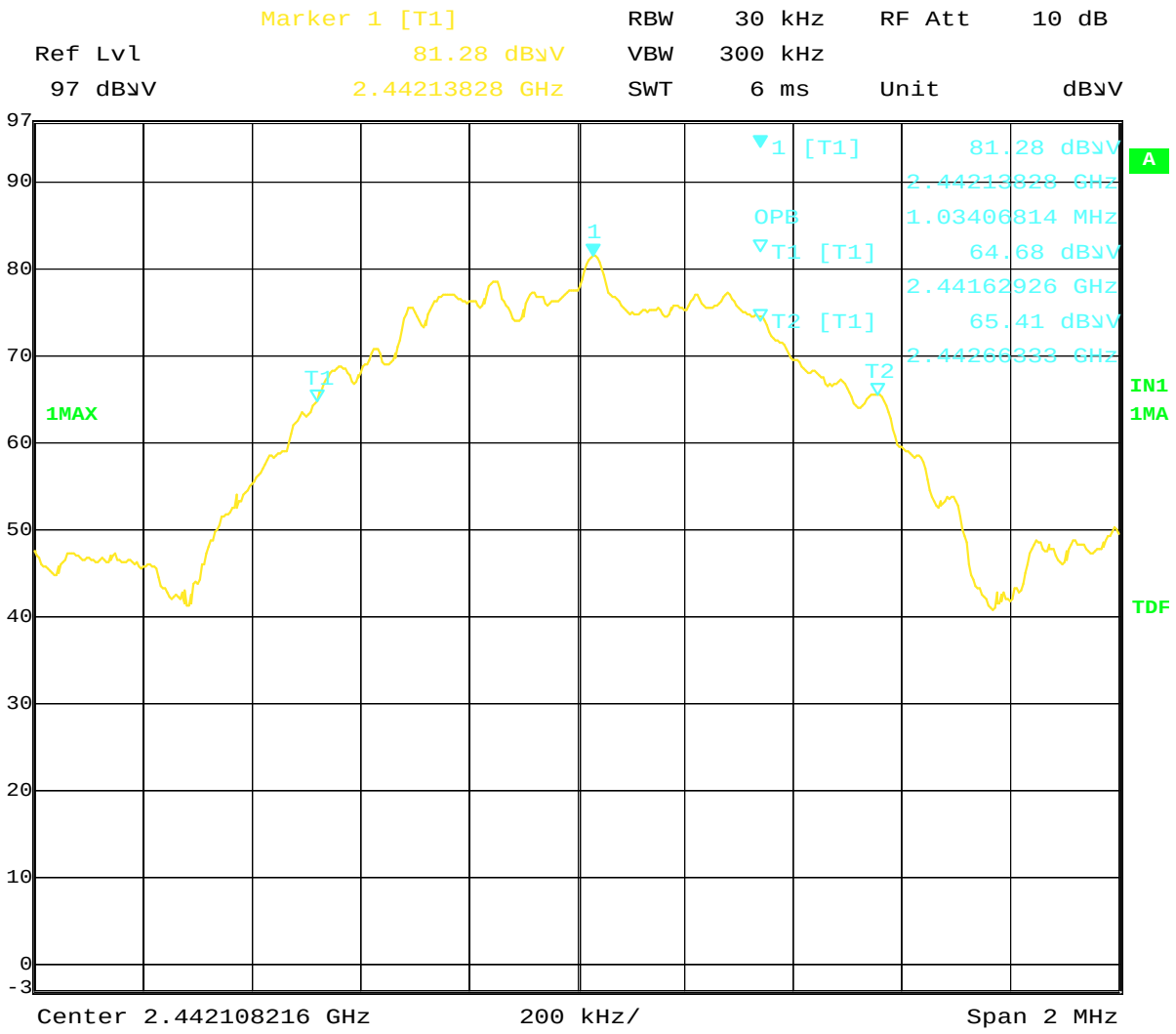
Mid Channel 6 dB Bandwidth, 733.466 kHz



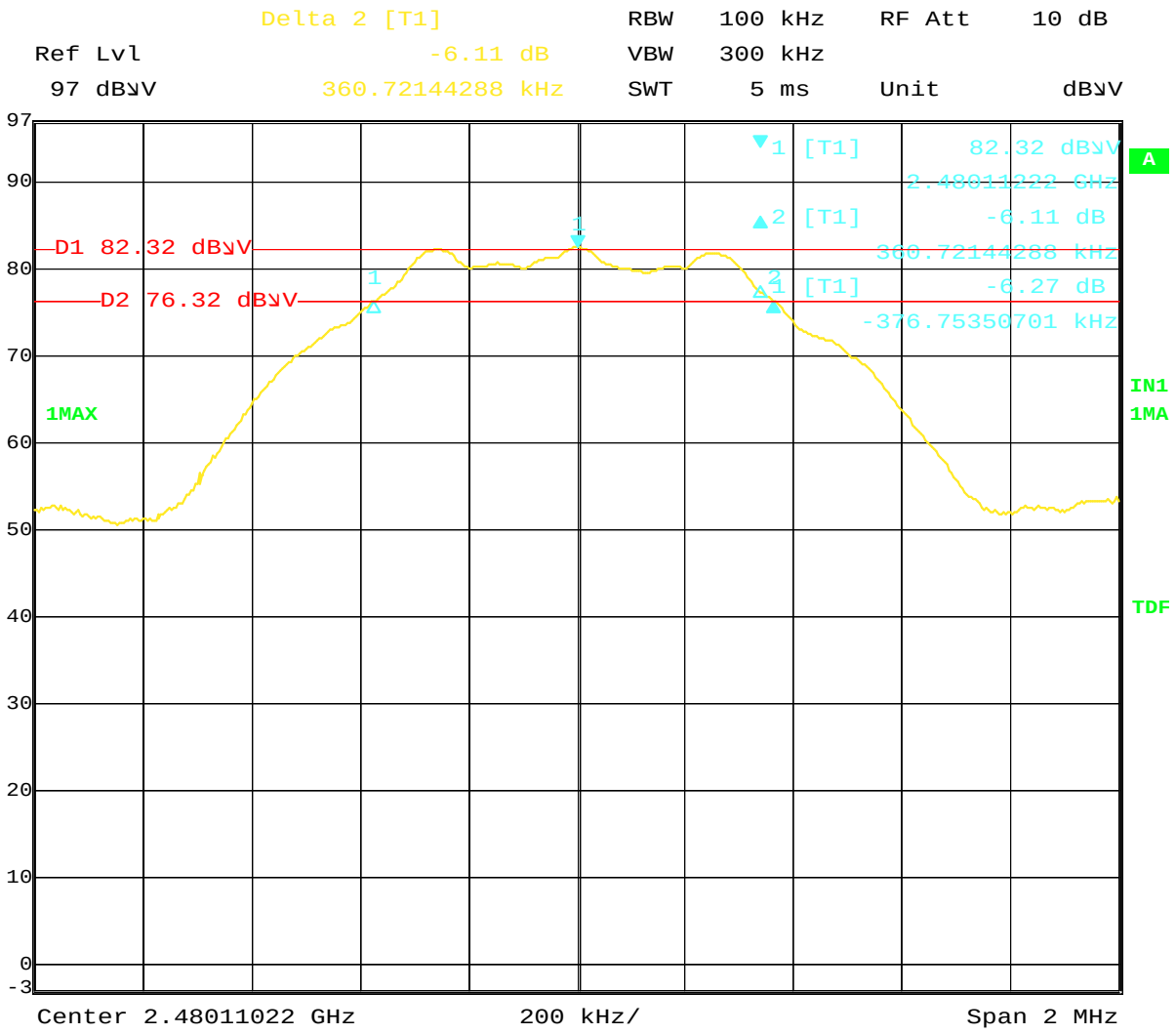
Mid Channel 20 dB Bandwidth, 1.114 MHz



Mid Channel Occupied Bandwidth, 1.034 MHz



High Channel 6 dB Bandwidth, 1.098 MHz



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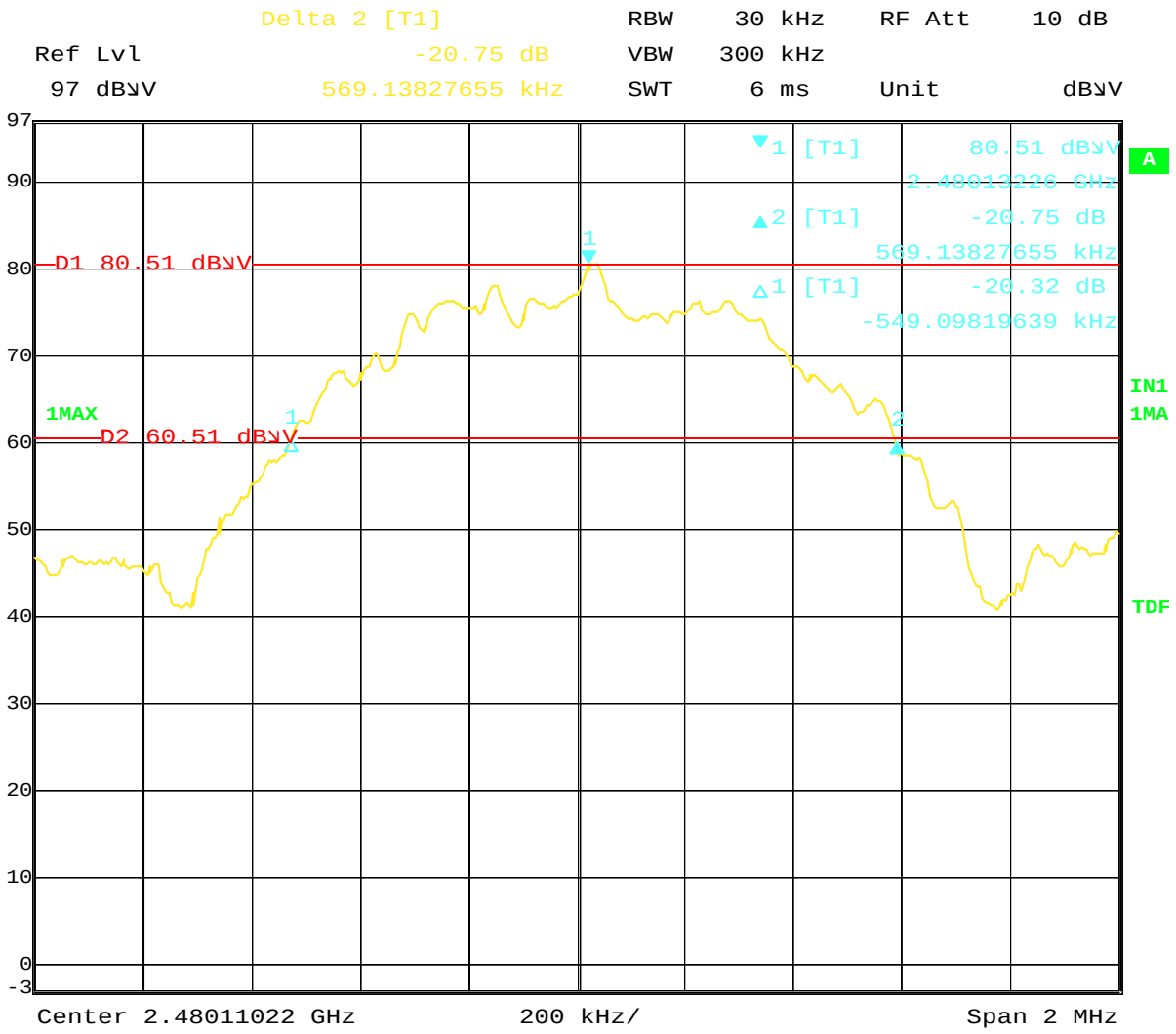
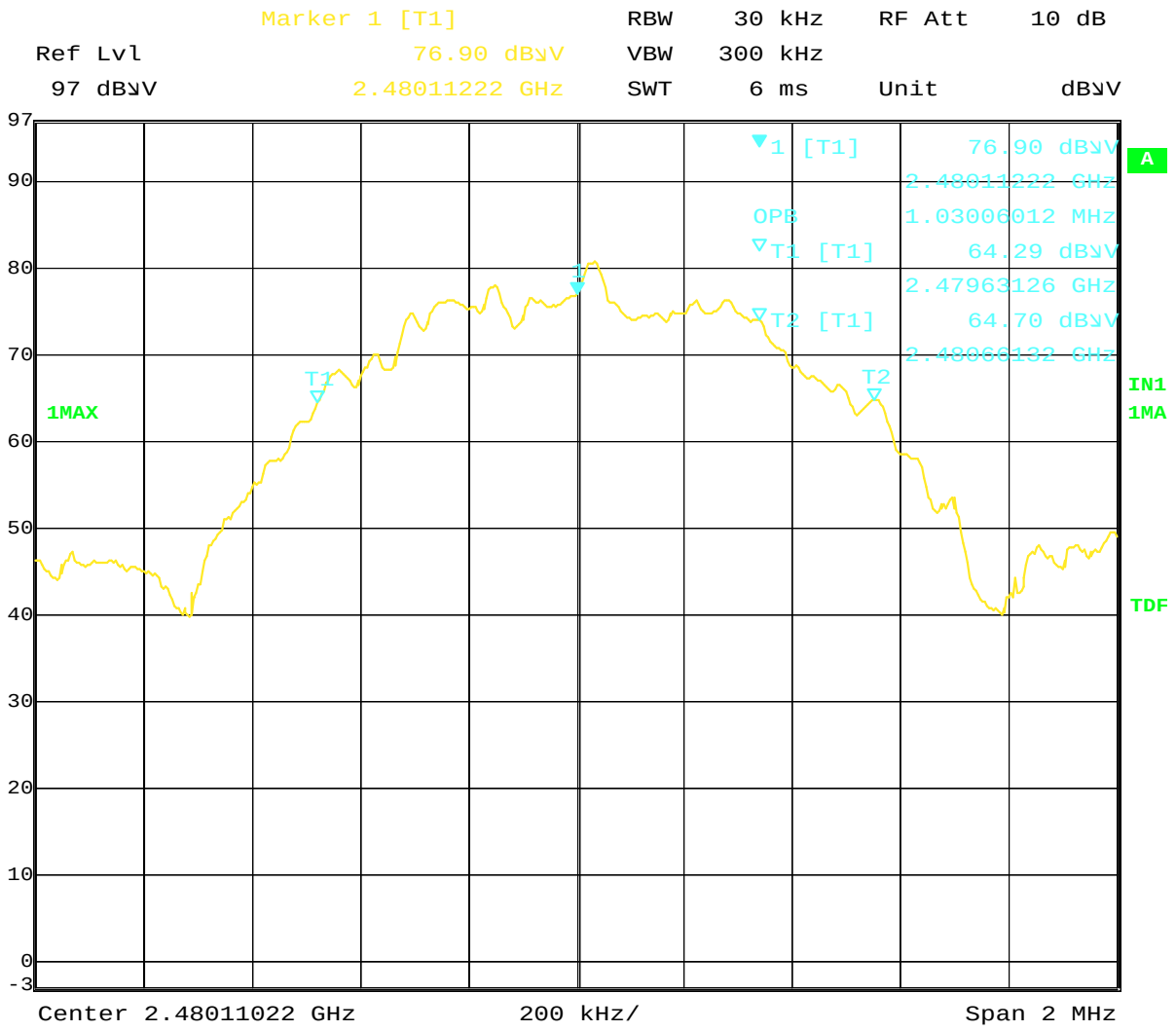
High Channel 20 dB Bandwidth, 1.118 MHz



High Channel Occupied Bandwidth, 1.030 MHz



Test Personnel:	Kouma Sinn KPS	Test Date:	11/02/2017
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15.247, RSS-247	Limit Applied:	See report section 8.3
Input Voltage:	3VDC (Coin Battery)	Ambient Temperature:	22 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**N/A**	Relative Humidity:	44 %
		Atmospheric Pressure:	1015 mbars

Deviations, Additions, or Exclusions: None

9 Spurious and Band edge emissions (Antenna Port Conducted)

9.1 Method

Tests are performed in accordance with FCC Part 15.247, RSS-247, and 558074 D01 DTS Meas Guidance v04.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61A	05/10/2017	05/10/2018
CBLHF2012-2M-1	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/08/2017	02/08/2018
145108	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	05/23/2017	05/23/2018

Software Utilized:

Name	Manufacturer	Version
None	--	--

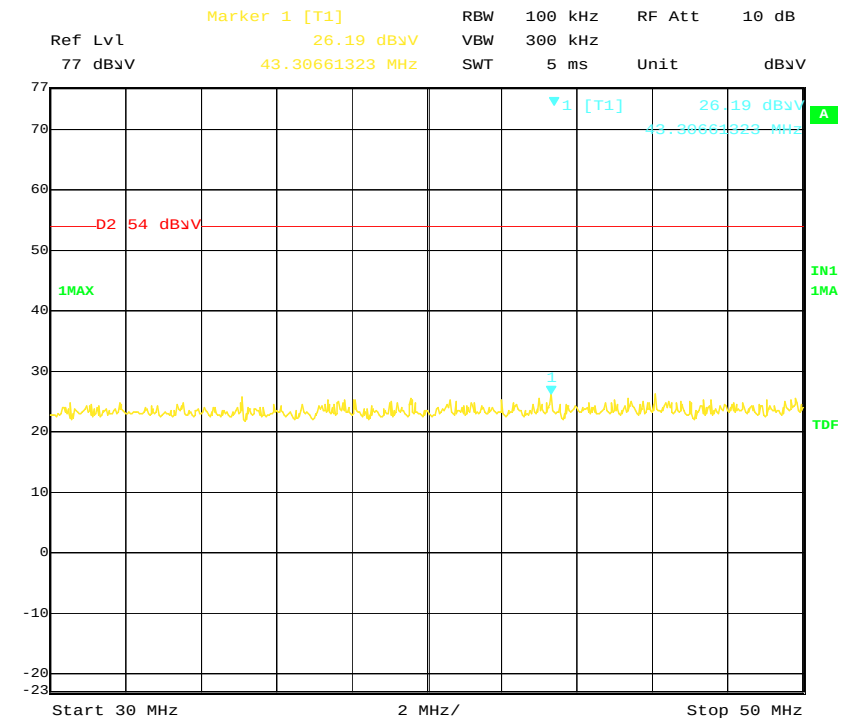
9.3 Results:

The sample tested was found to Comply.

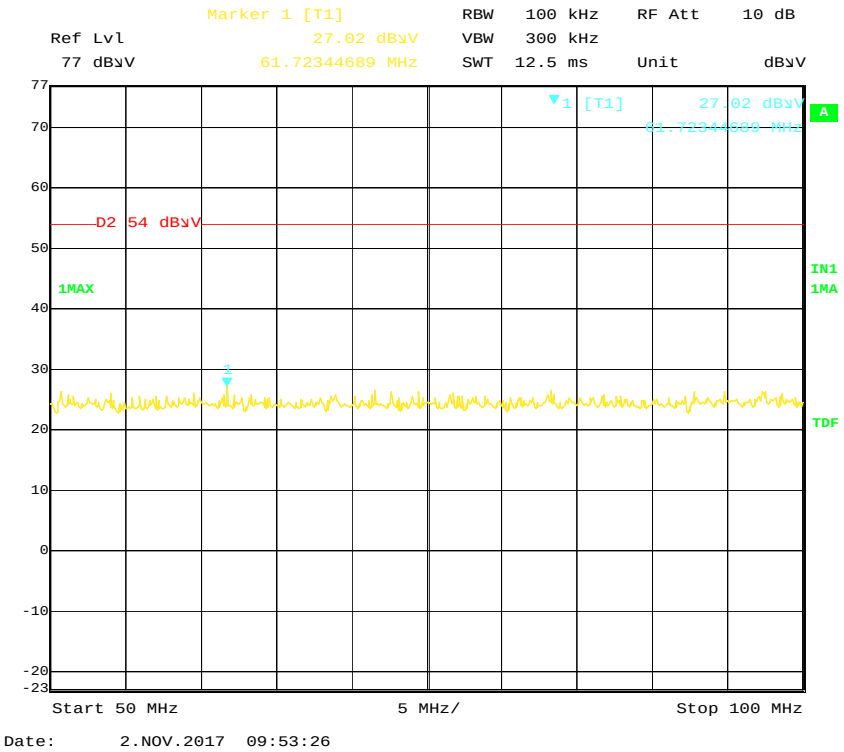
§15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

9.4 Plots/Data:

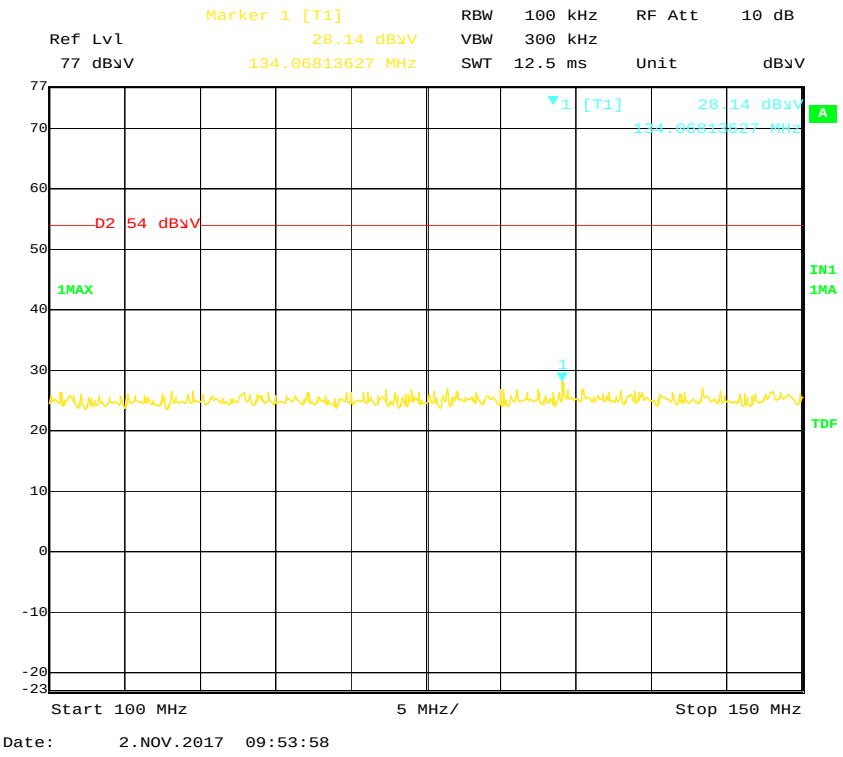
Low Channel Spurious, 30-50 MHz



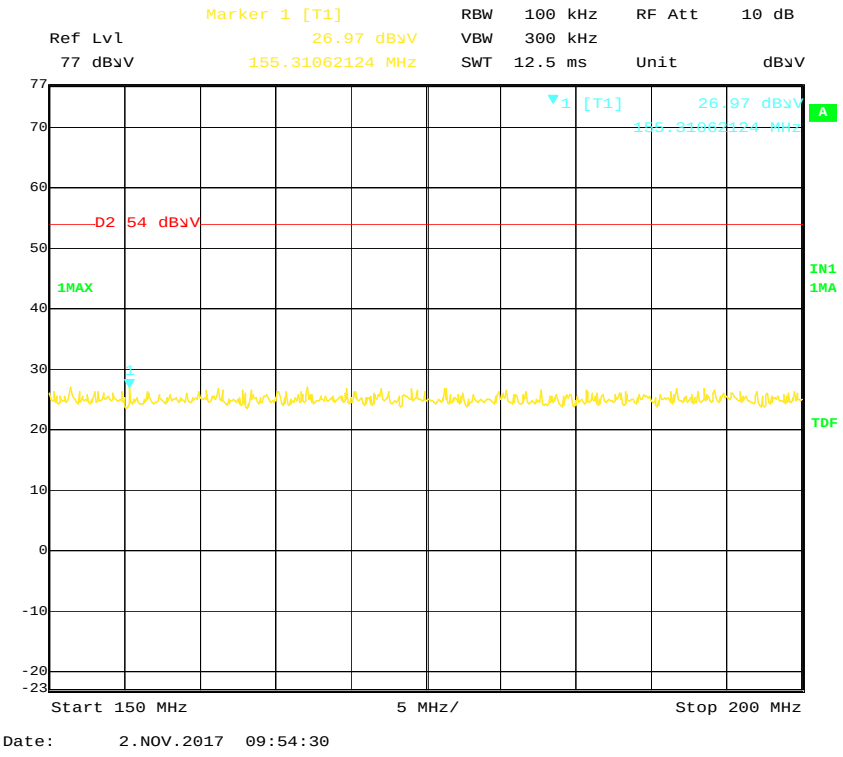
Low Channel Spurious, 50-100 MHz



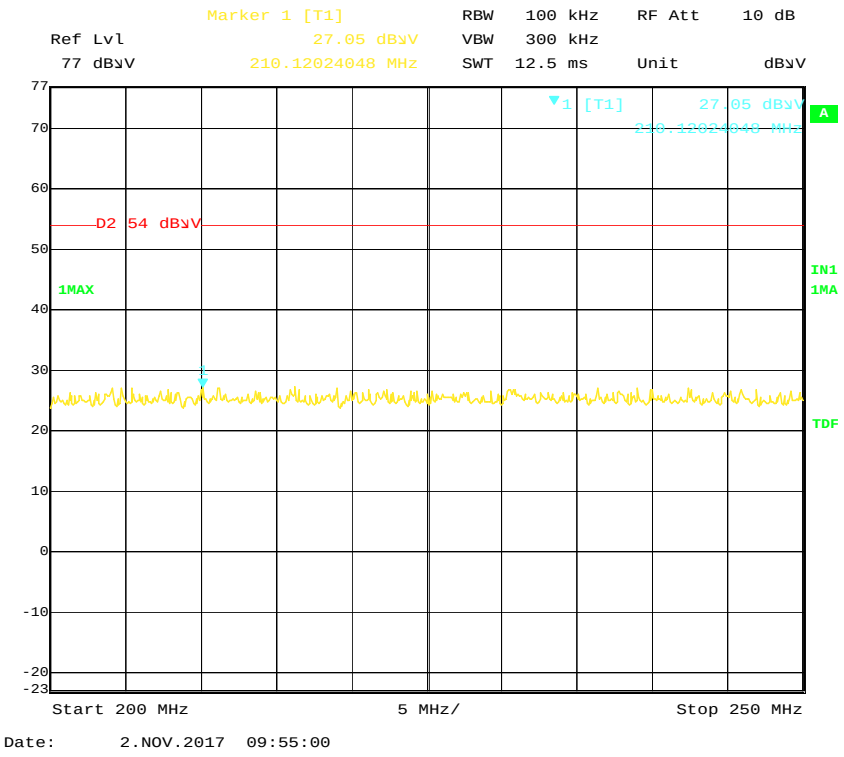
Low Channel Spurious, 100-150 MHz



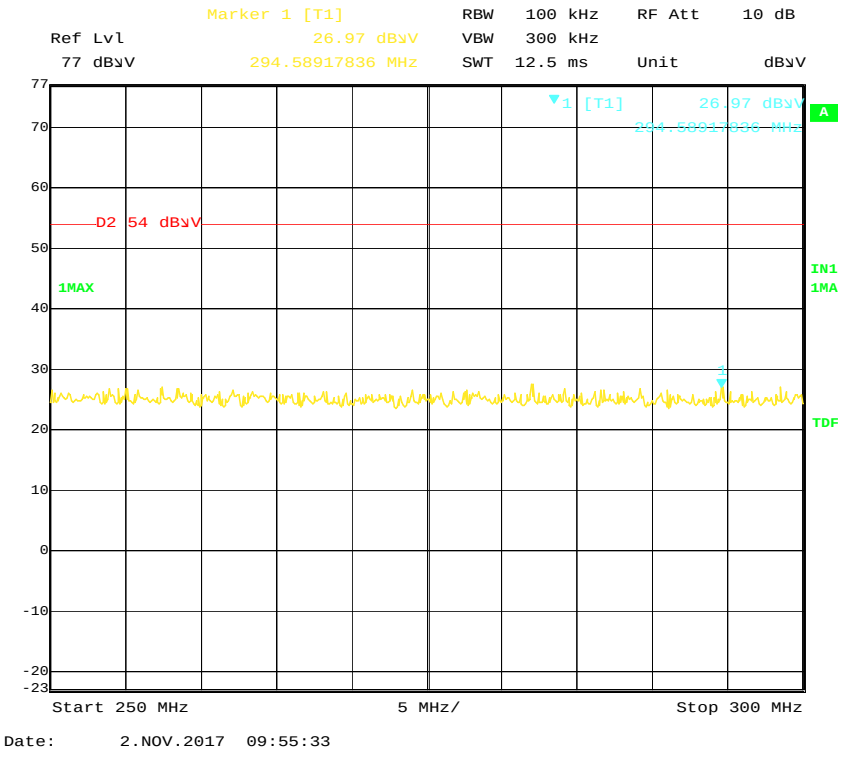
Low Channel Spurious, 150-200 MHz



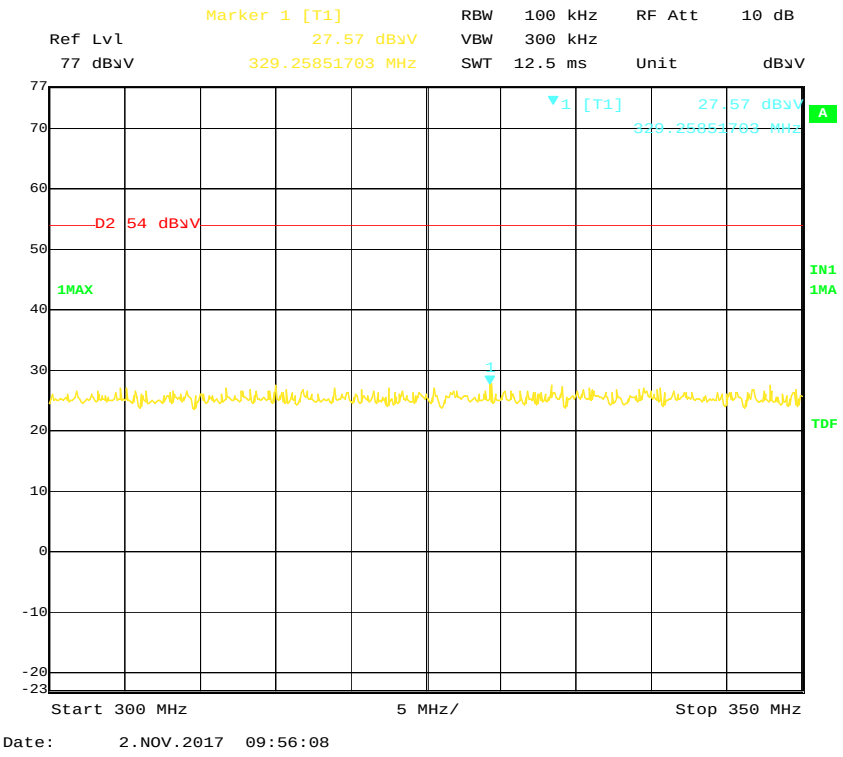
Low Channel Spurious, 200-250 MHz



Low Channel Spurious, 250-300 MHz



Low Channel Spurious, 300-350 MHz



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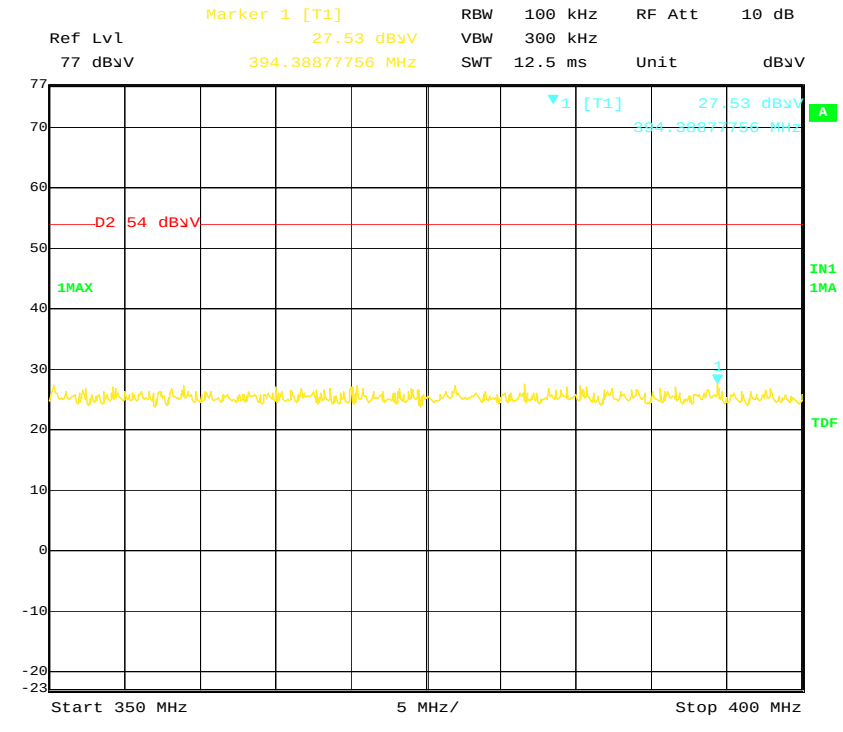
Low Channel Spurious, 350-400 MHz



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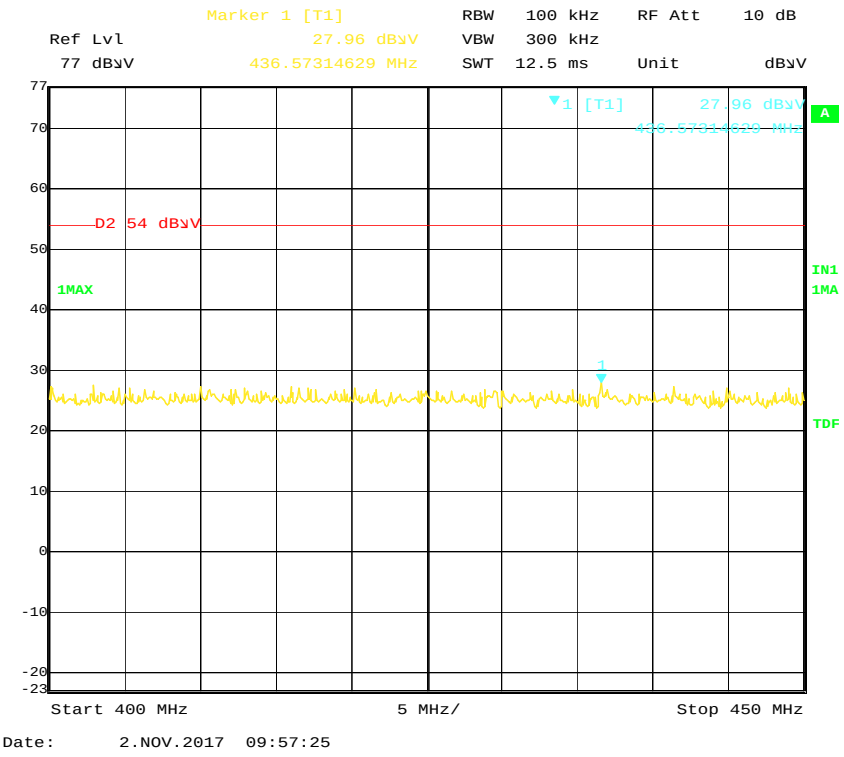
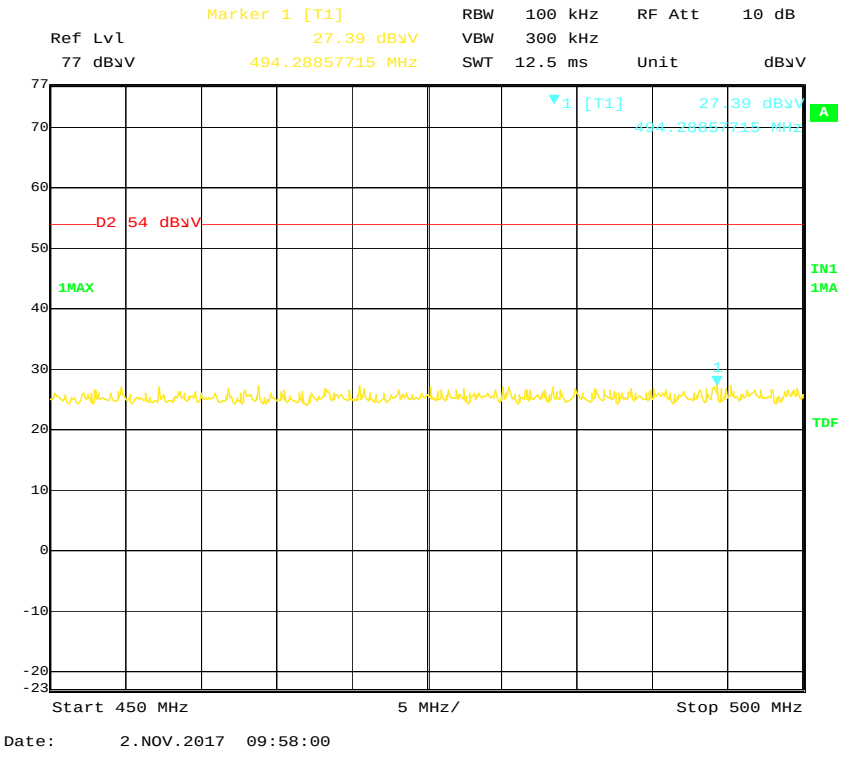
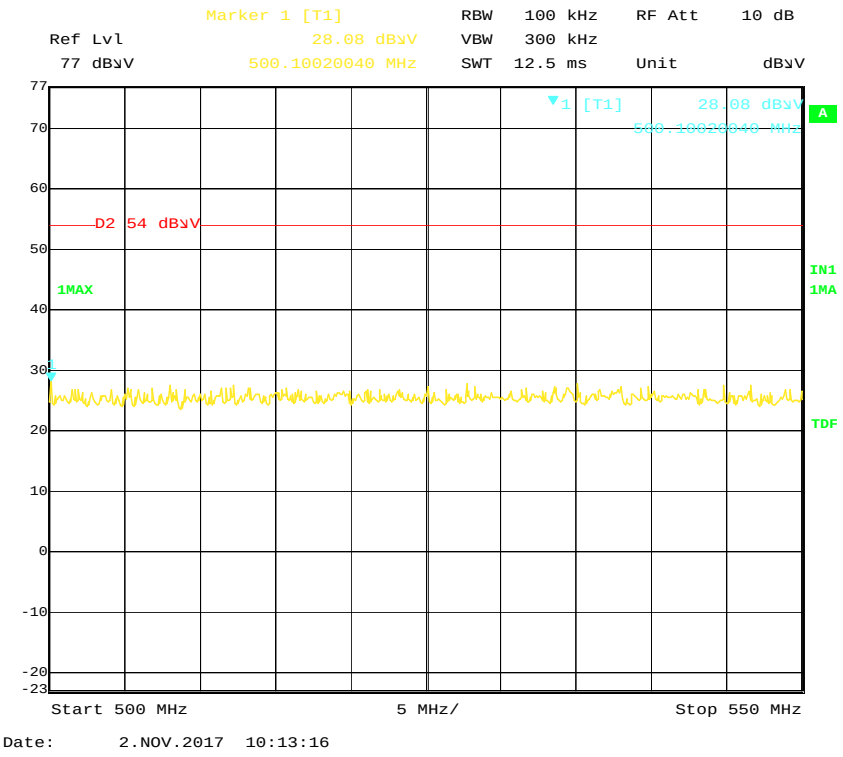
Low Channel Spurious, 400-450 MHz



Low Channel Spurious, 450-500 MHz



Low Channel Spurious, 500-550 MHz



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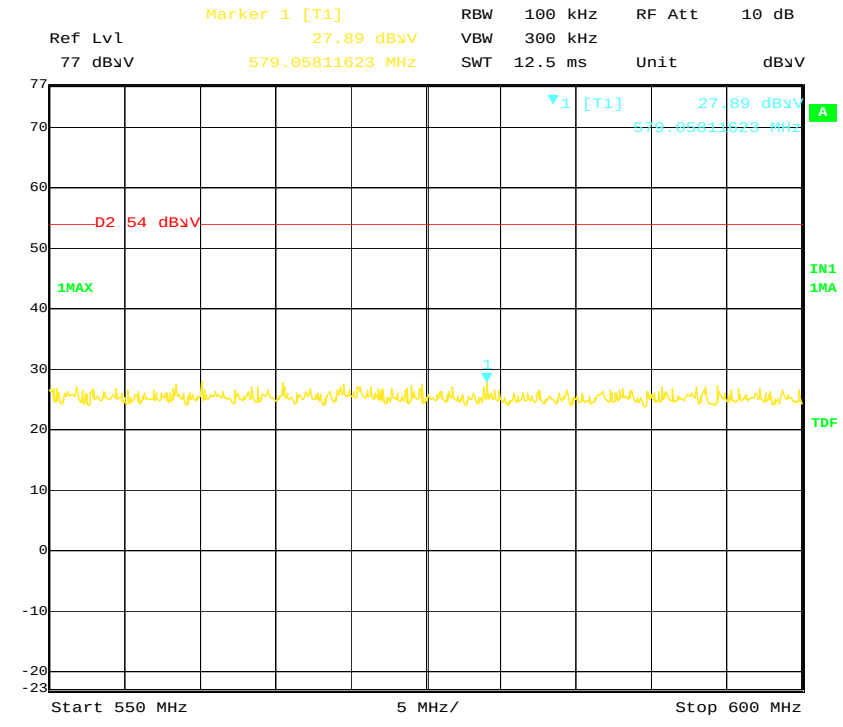
Low Channel Spurious, 550-600 MHz



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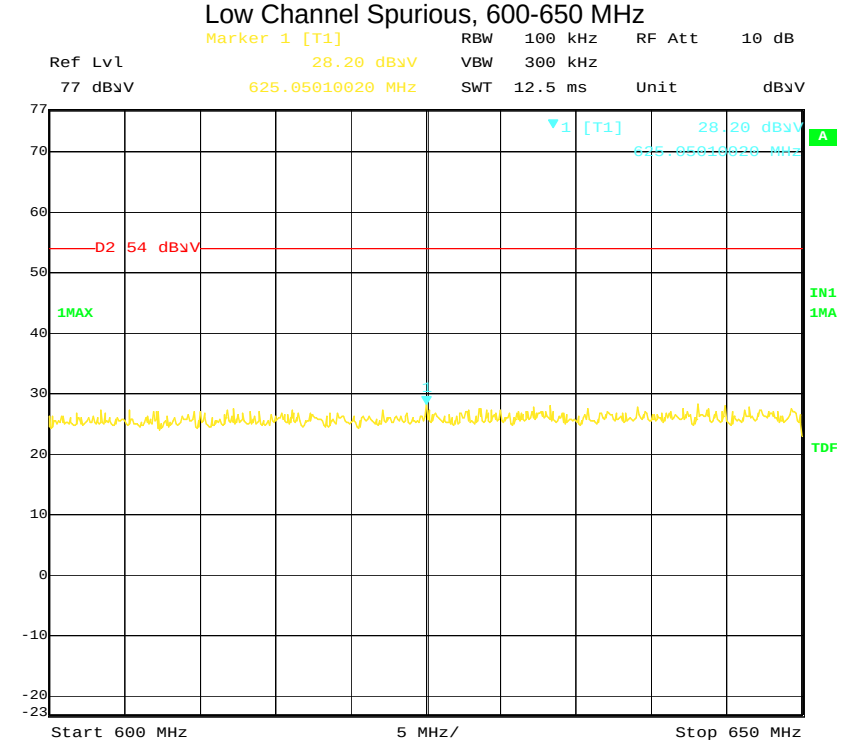
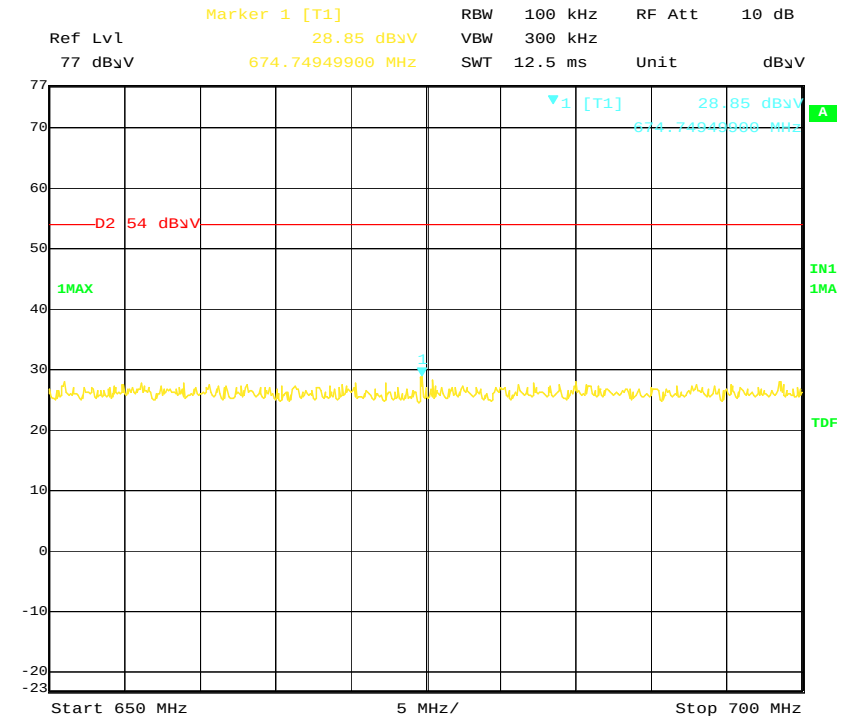
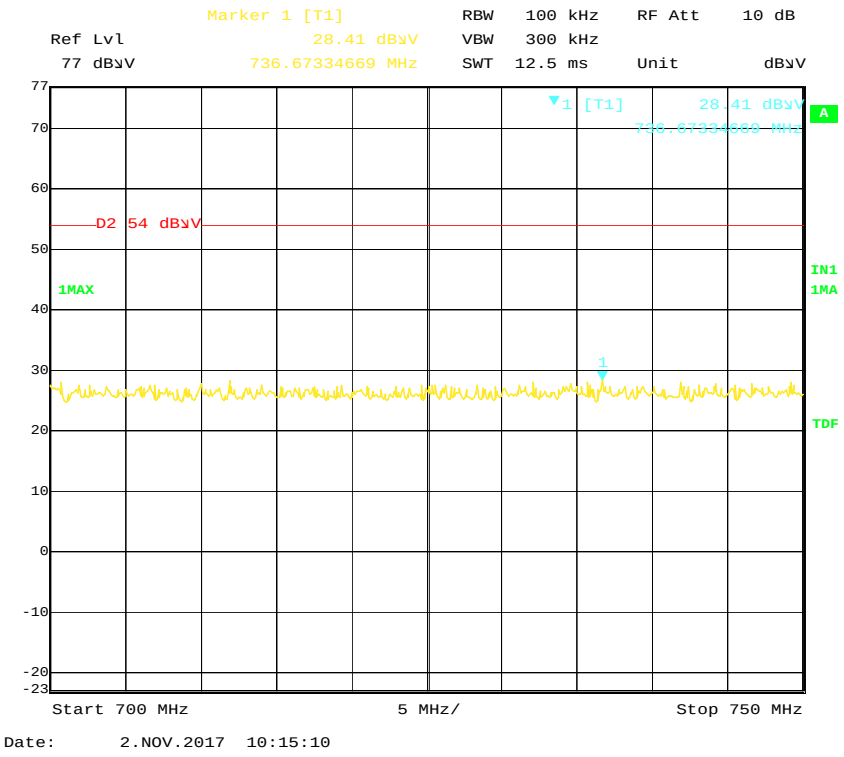
Low Channel Spurious, 600-650 MHz



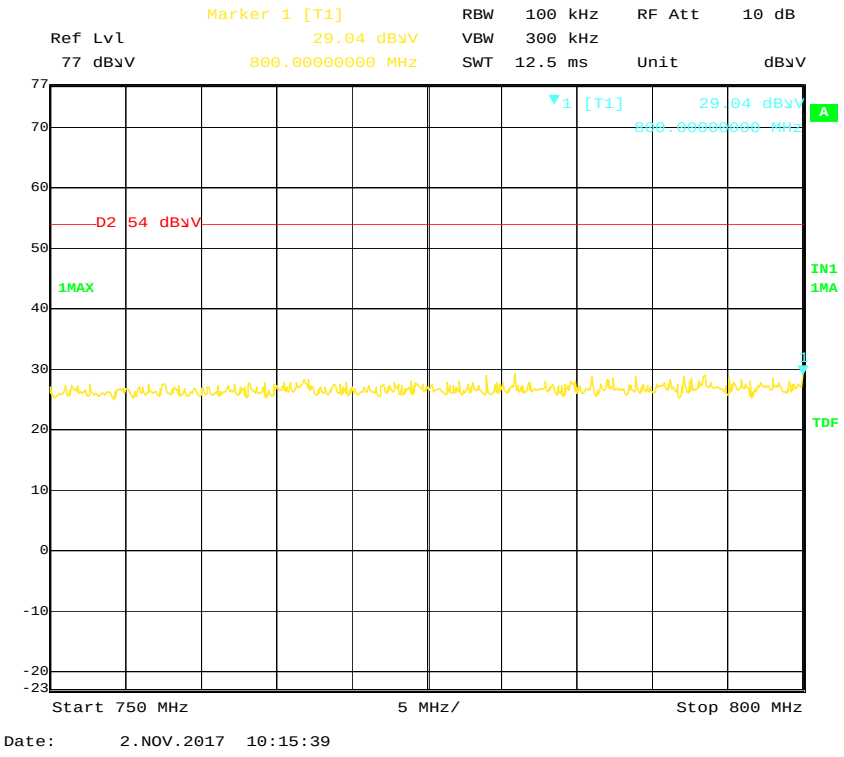
Low Channel Spurious, 650-700 MHz



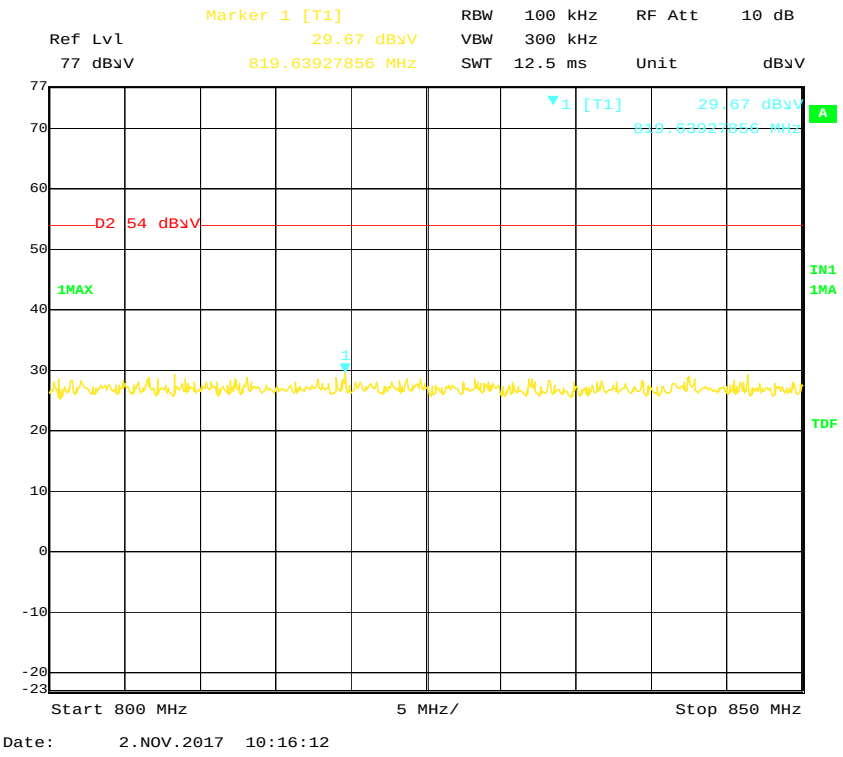
Low Channel Spurious, 700-750 MHz



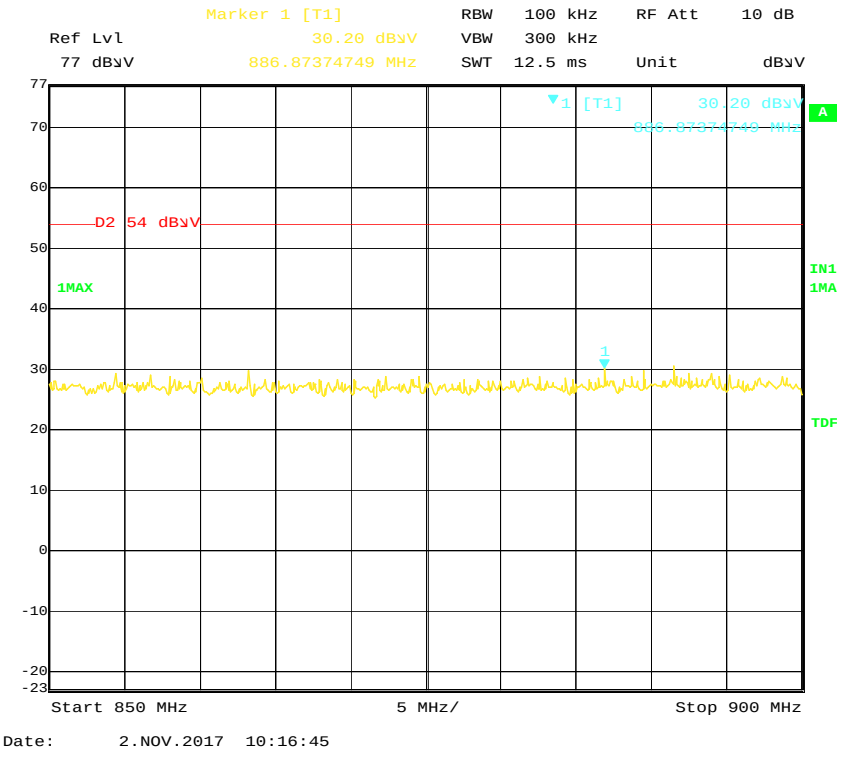
Low Channel Spurious, 750-800 MHz



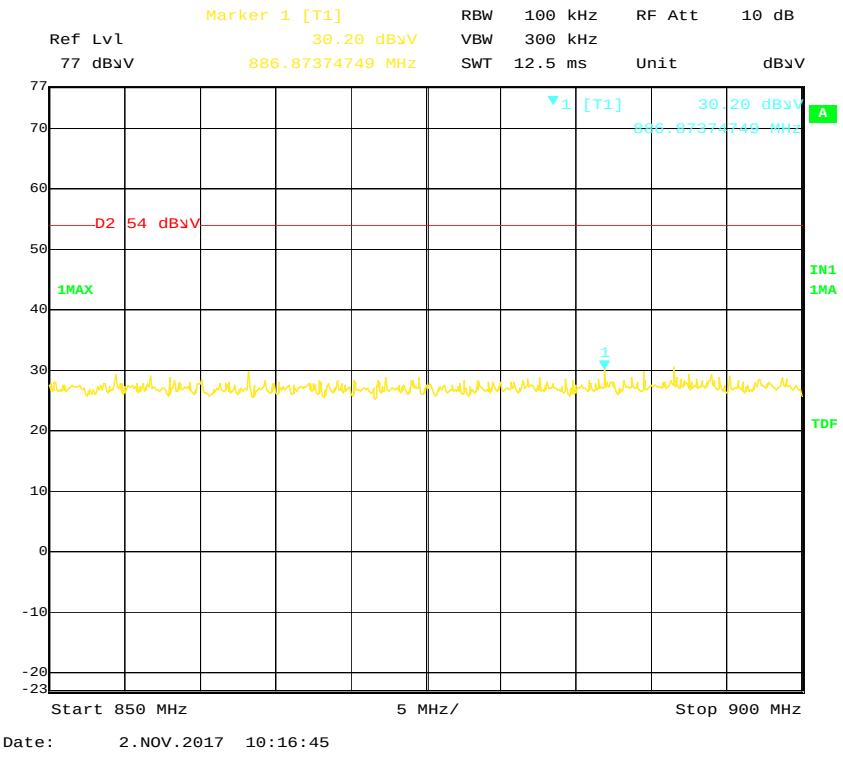
Low Channel Spurious, 800-850 MHz



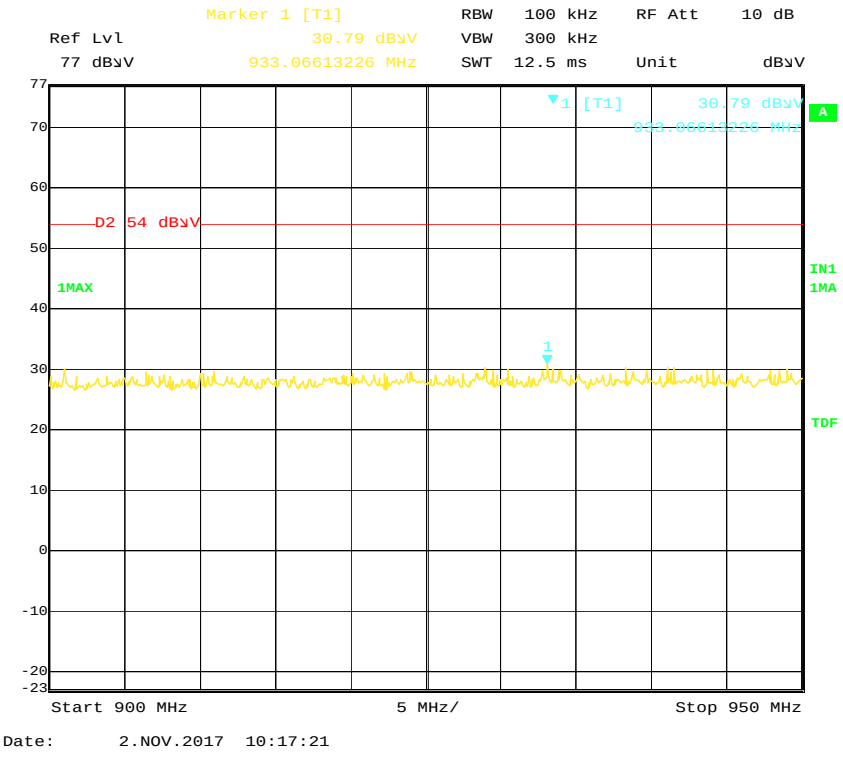
Low Channel Spurious, 800-850 MHz



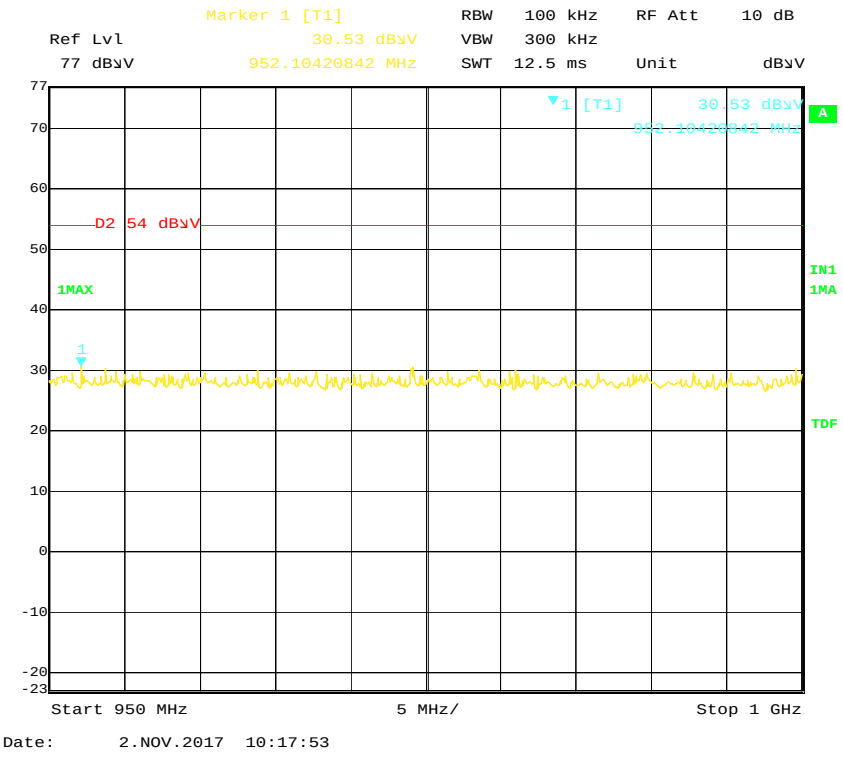
Low Channel Spurious, 850-900 MHz



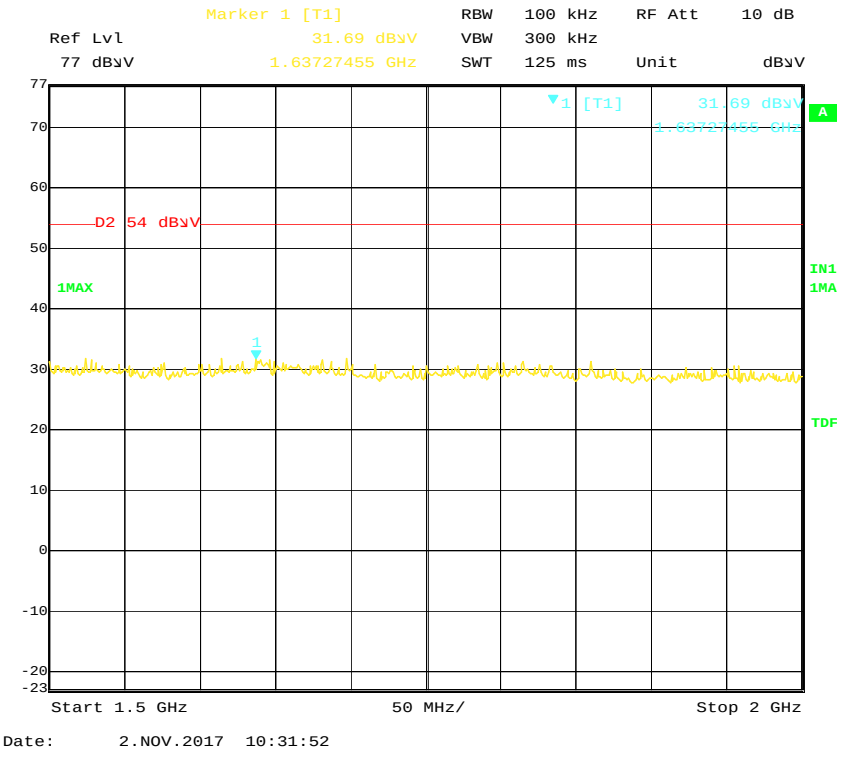
Low Channel Spurious, 900-950 MHz



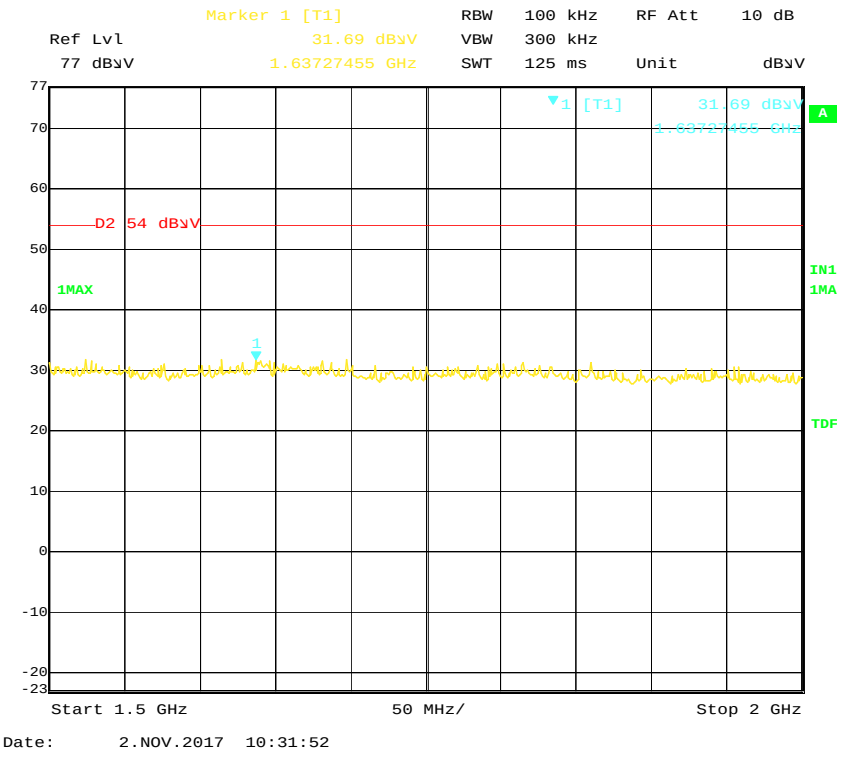
Low Channel Spurious, 950-1000 MHz



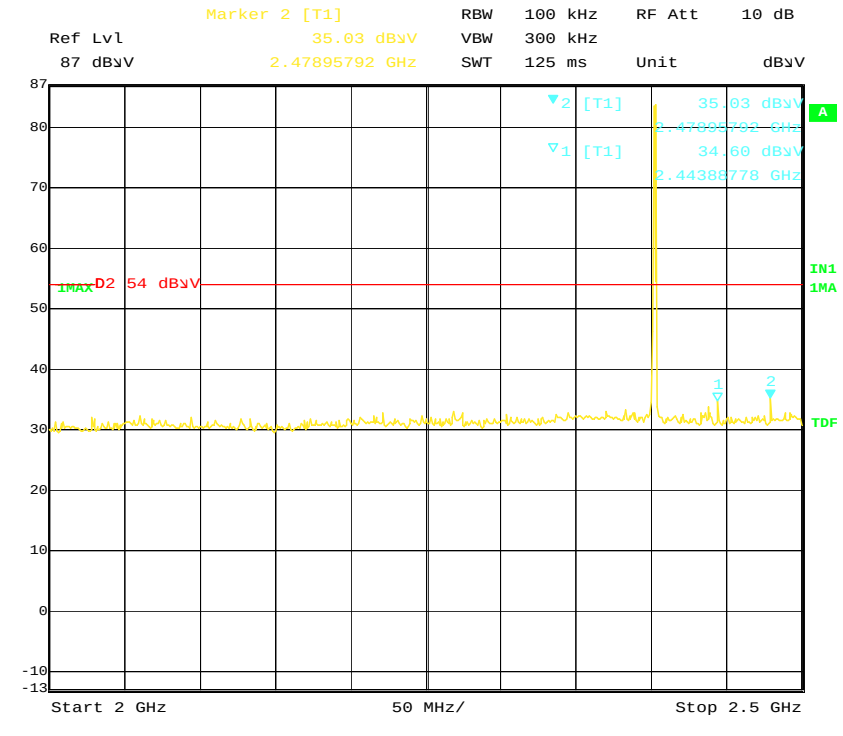
Low Channel Spurious, 1-1.5 GHz



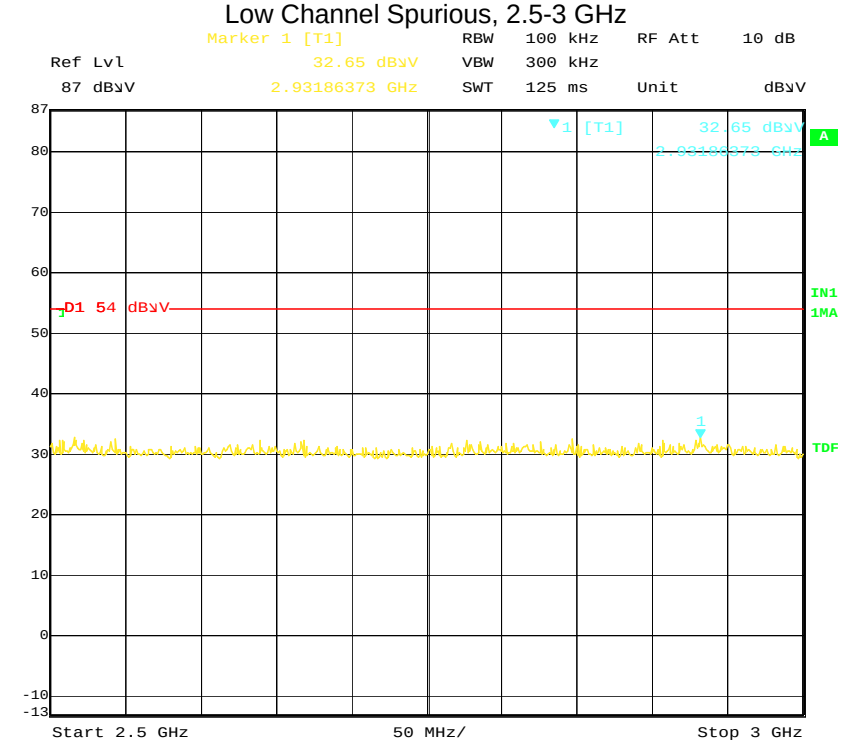
Low Channel Spurious, 1.5-2.0 GHz



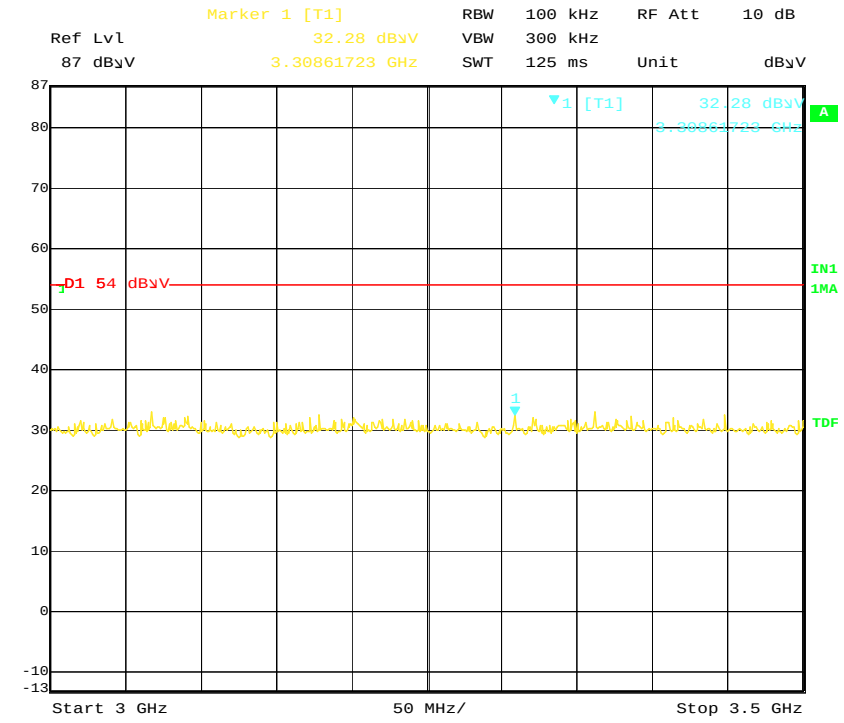
Low Channel Spurious, 2-2.5 GHz



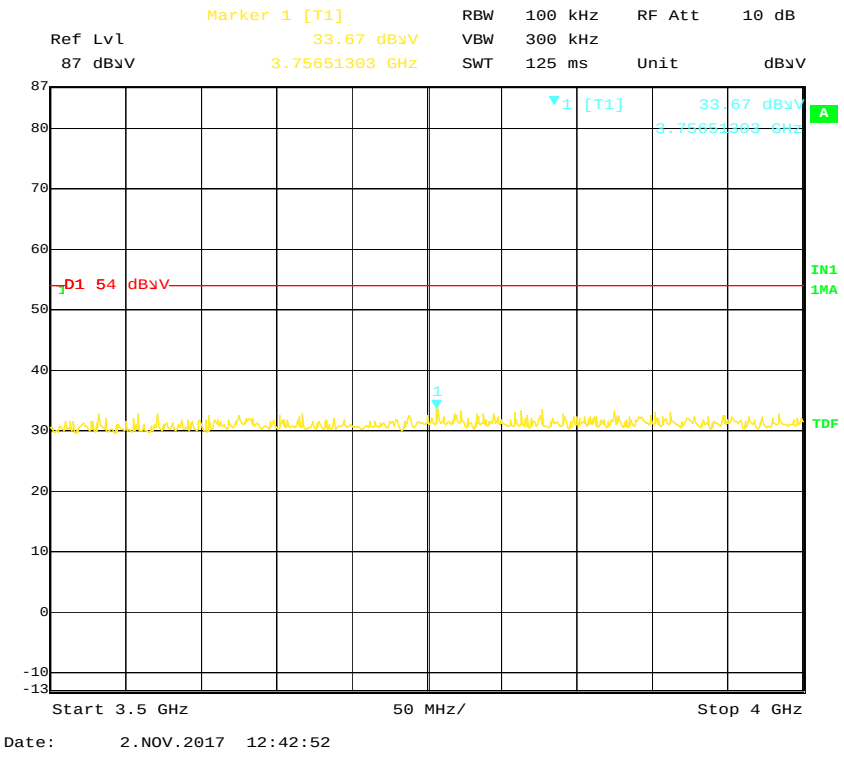
Low Channel Spurious, 2.5-3 GHz



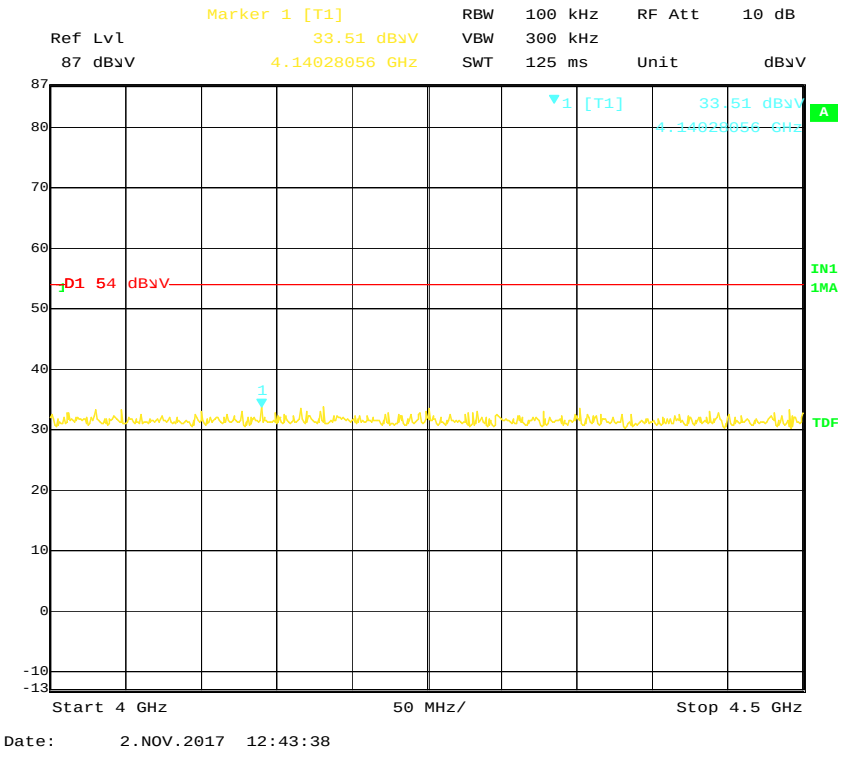
Low Channel Spurious, 3-3.5 GHz



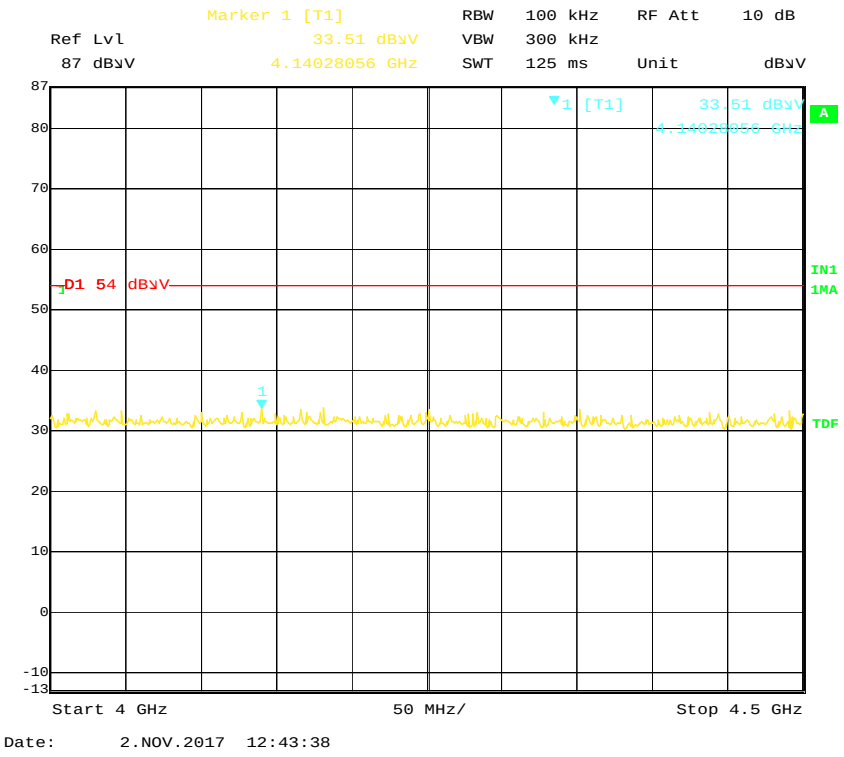
Low Channel Spurious, 3.5-4 GHz



Low Channel Spurious, 4-4.5 GHz



Low Channel Spurious, 4.5-5 GHz



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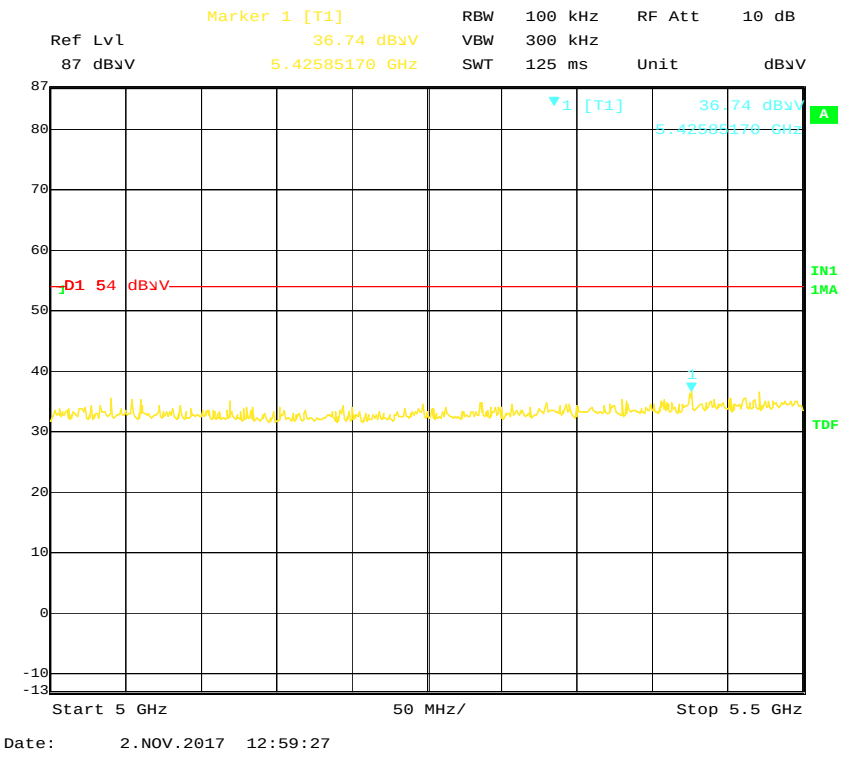
Low Channel Spurious, 5-5.5 GHz



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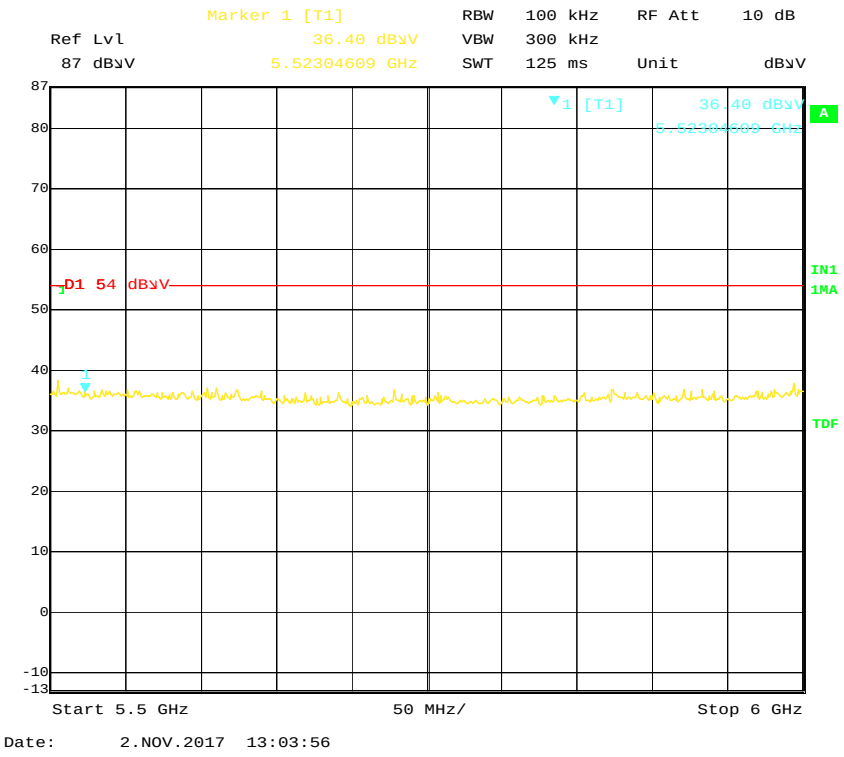
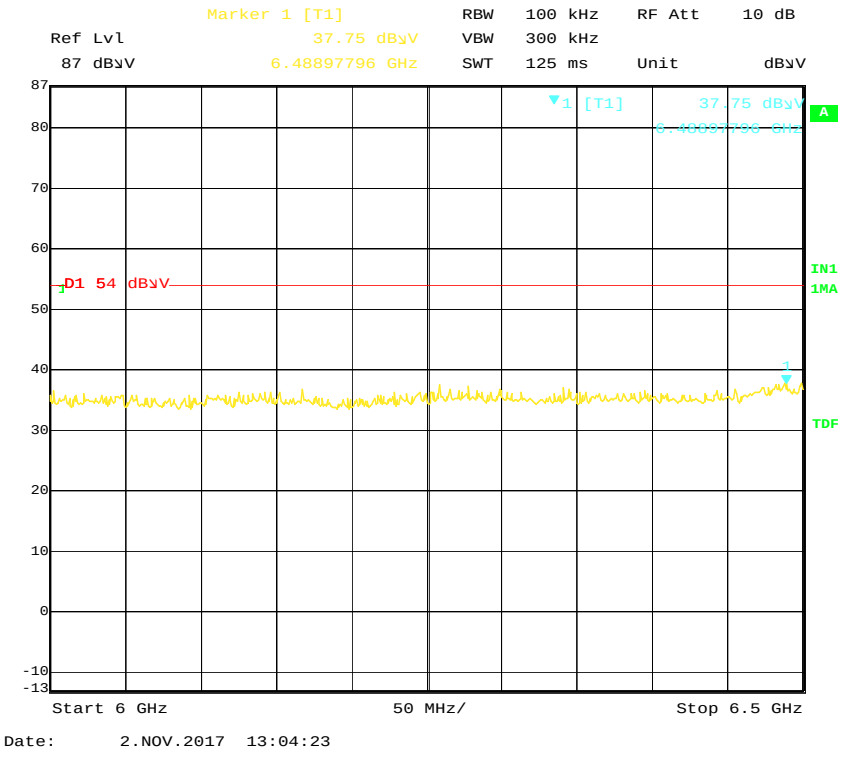
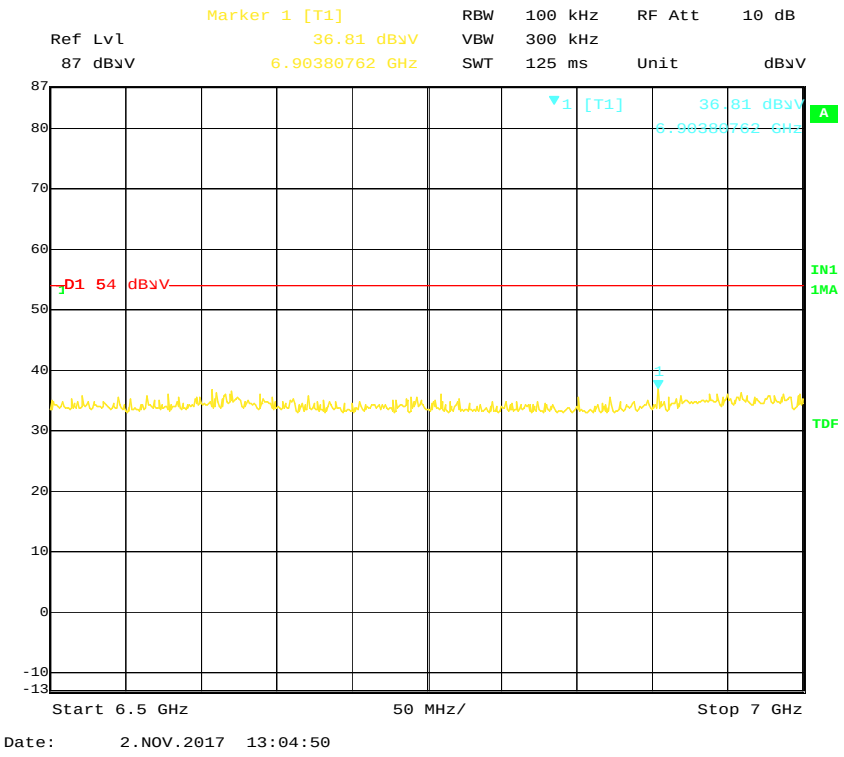
Low Channel Spurious, 5.5-6 GHz



Low Channel Spurious, 6-6.5 GHz



Low Channel Spurious, 6.5-7 GHz



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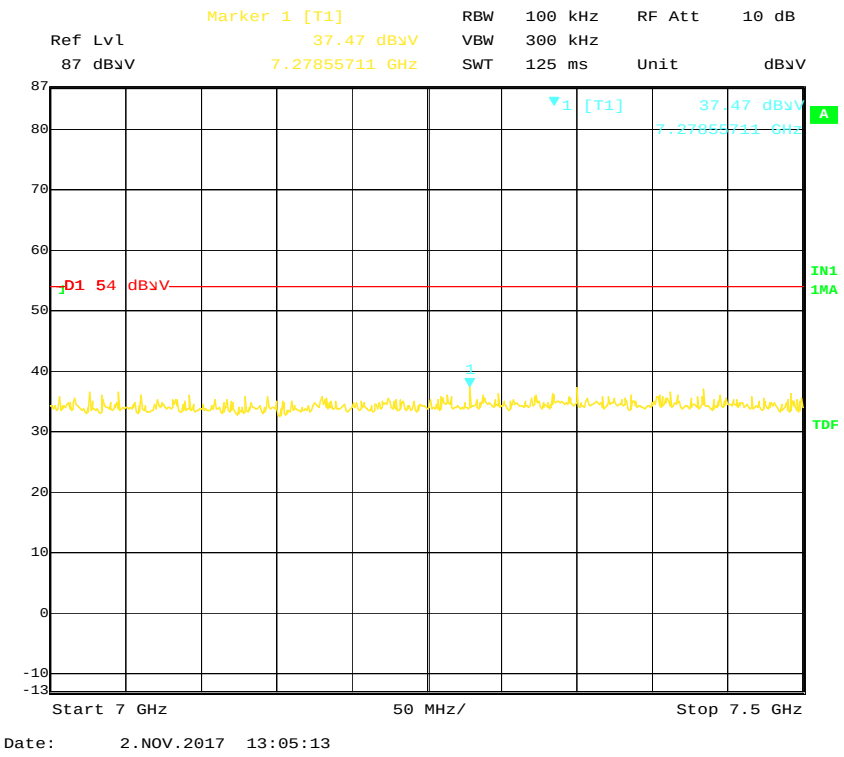
Low Channel Spurious, 7-7.5 GHz



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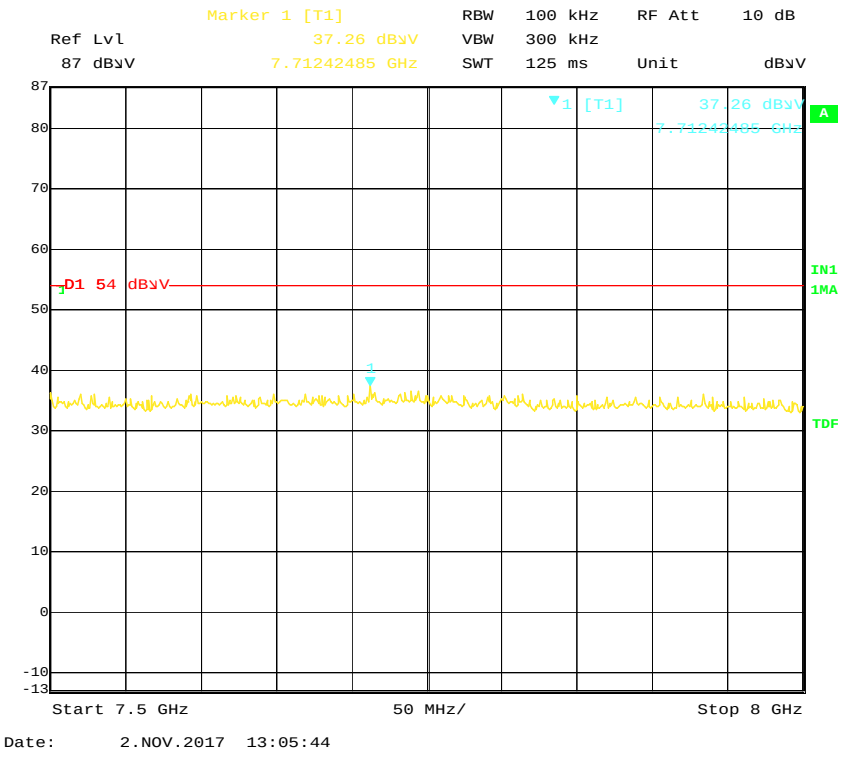
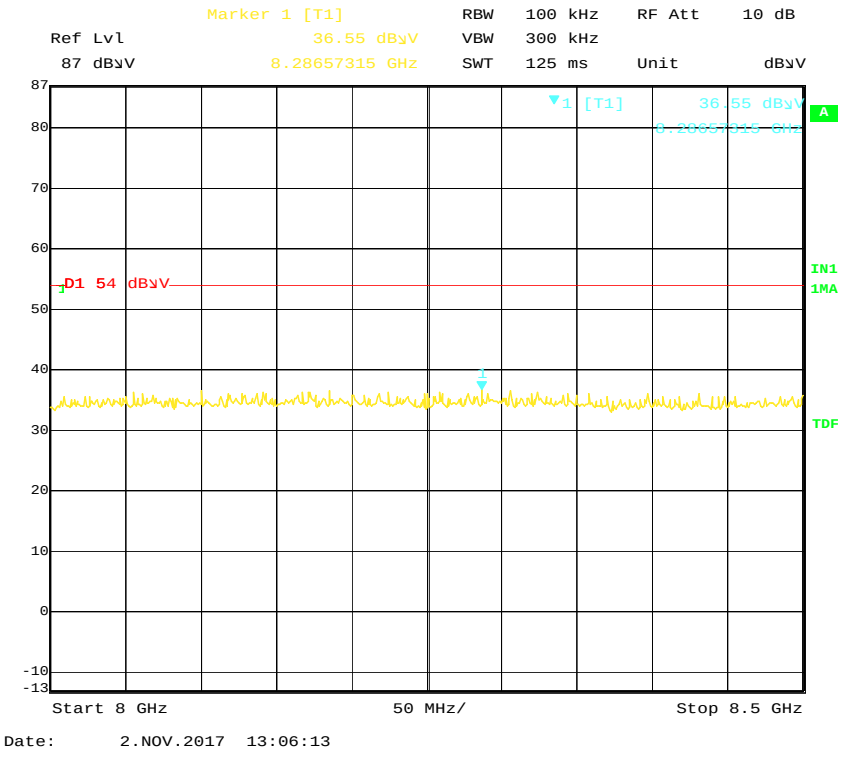
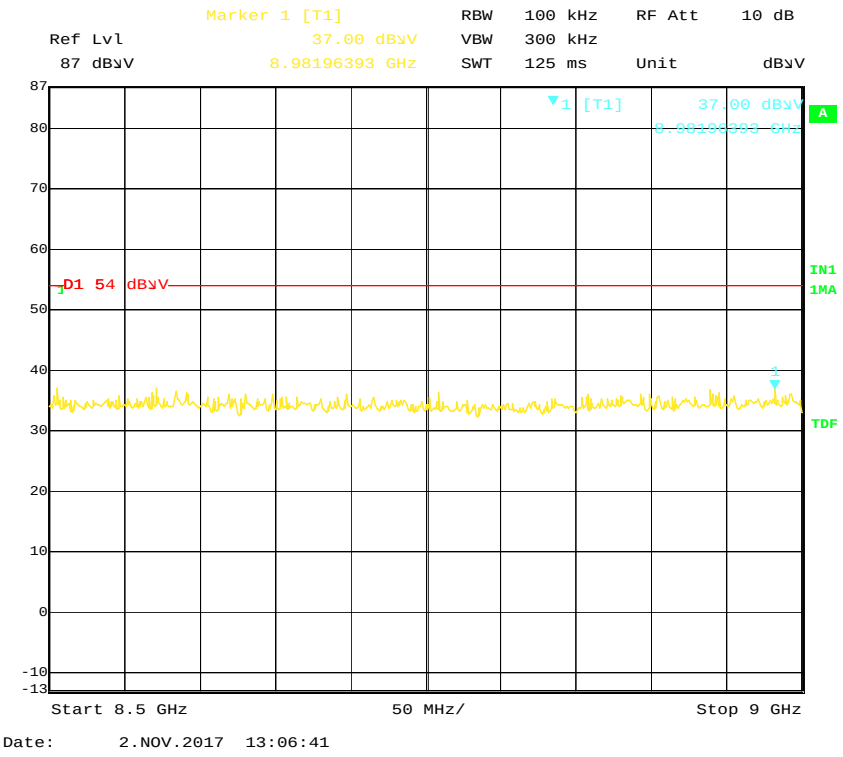
Low Channel Spurious, 7.5-8 GHz



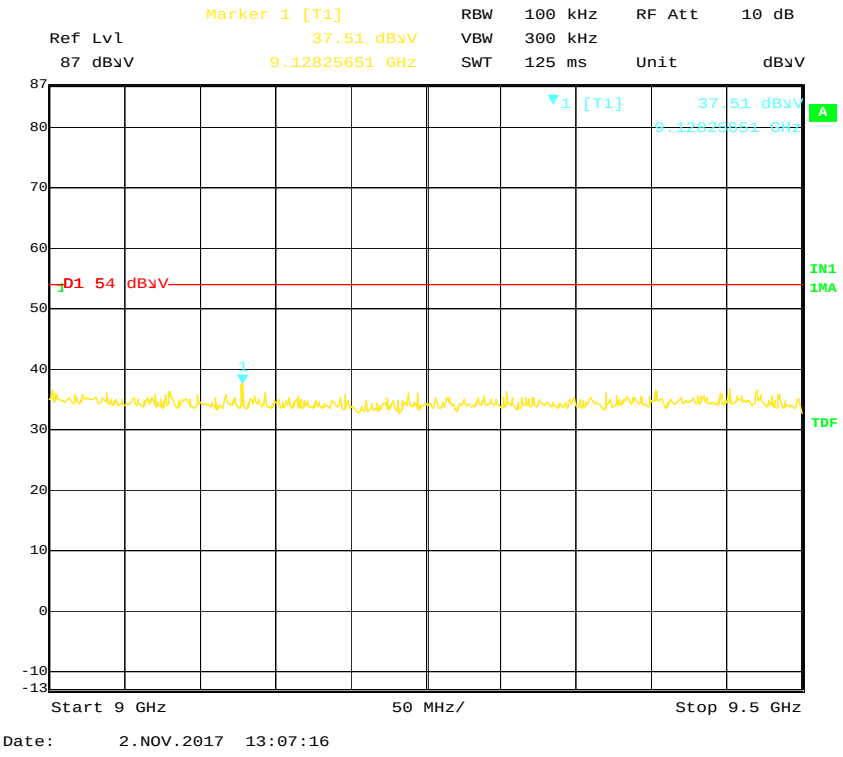
Low Channel Spurious, 8-8.5 GHz



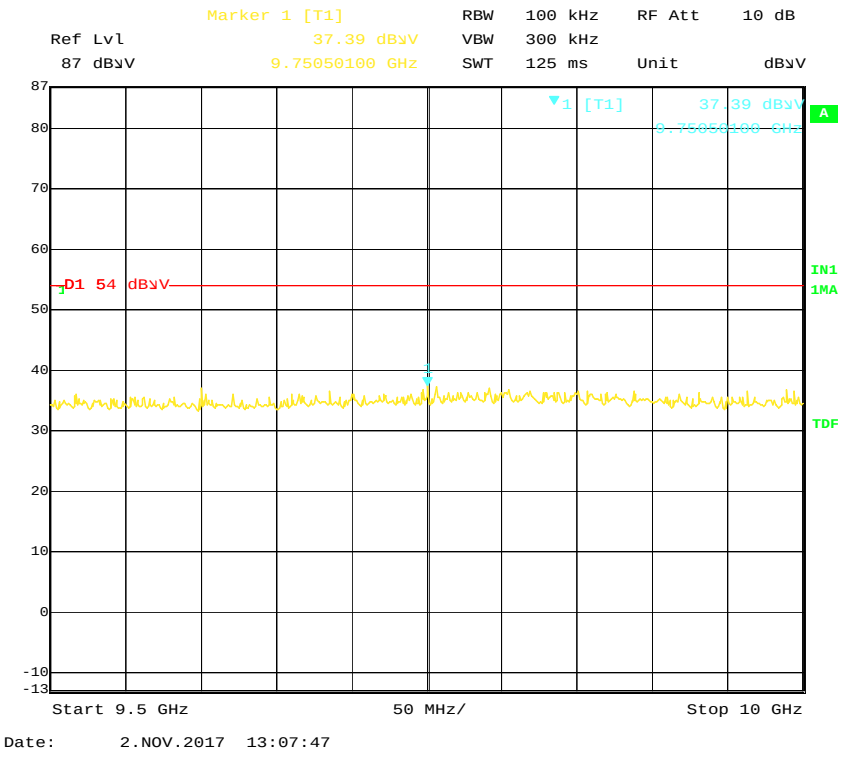
Low Channel Spurious, 8.5-9 GHz



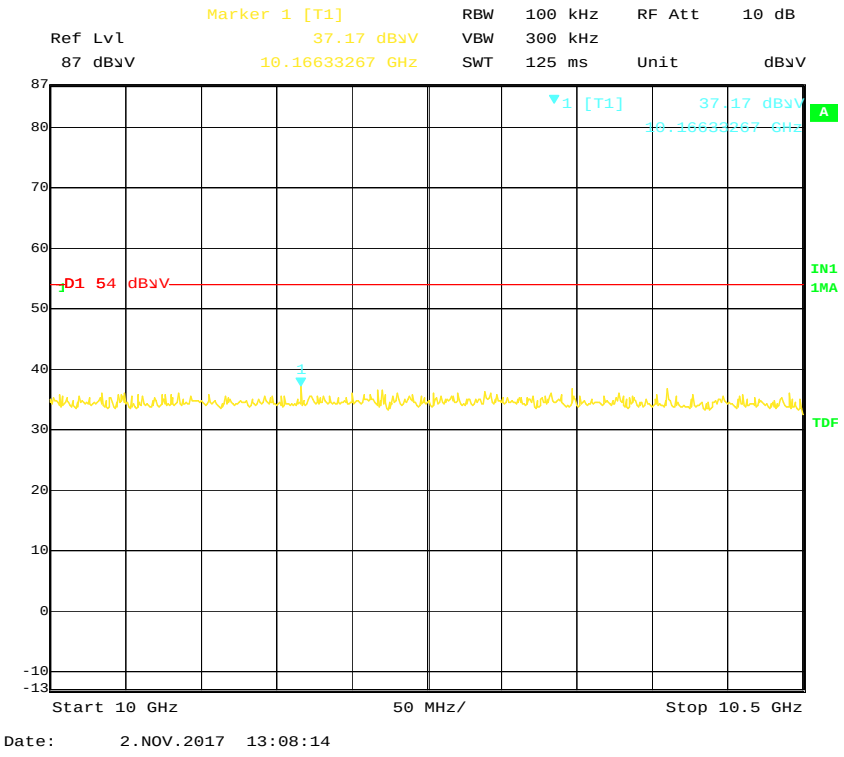
Low Channel Spurious, 9-9.5 GHz



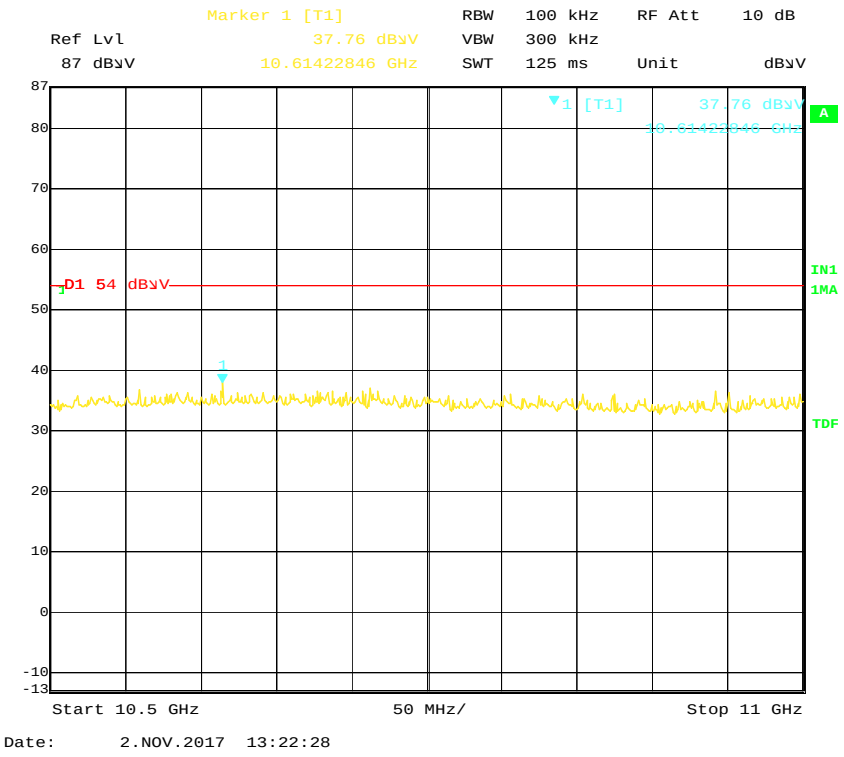
Low Channel Spurious, 9.5-10 GHz



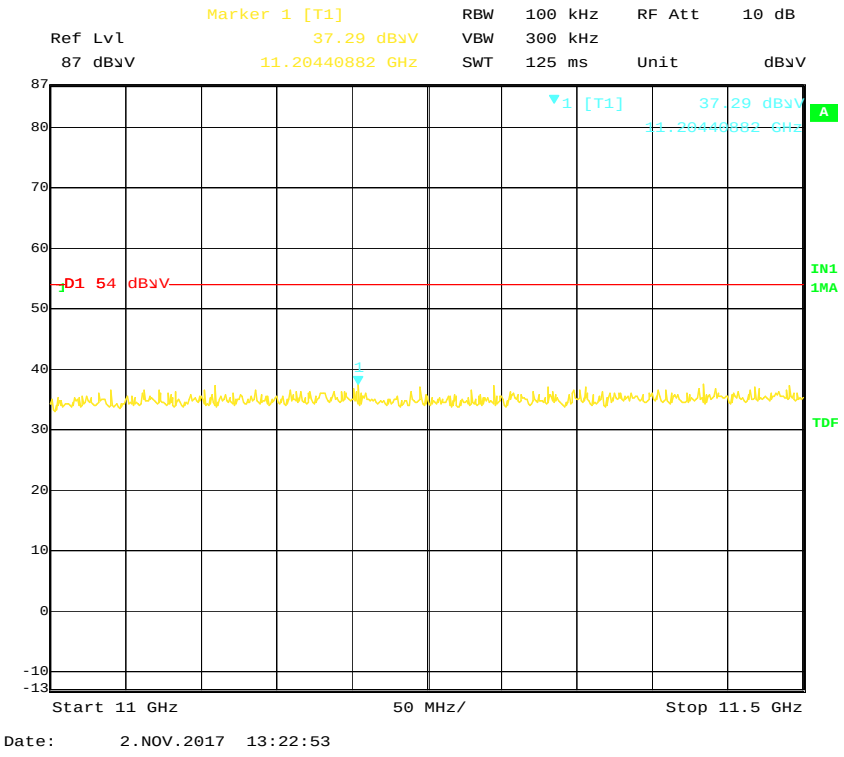
Low Channel Spurious, 10-10.5 GHz



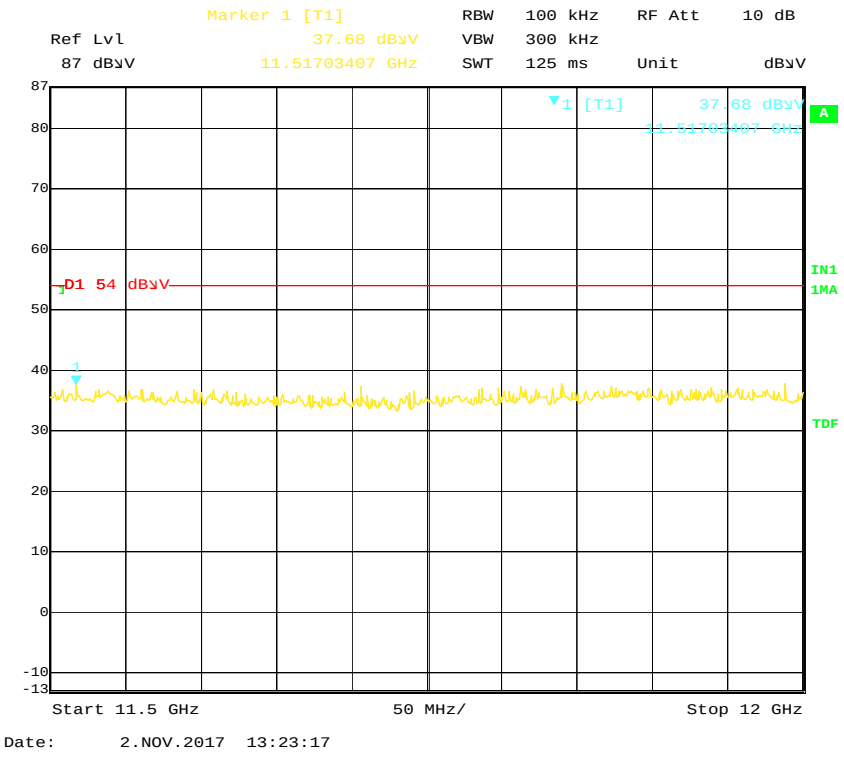
Low Channel Spurious, 10.5-11 GHz



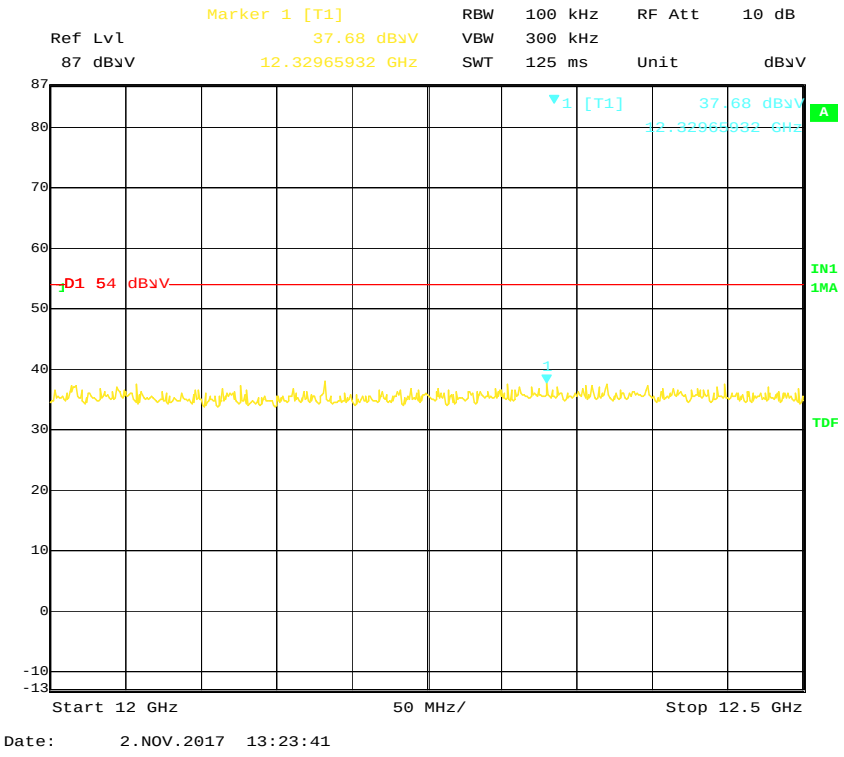
Low Channel Spurious, 11-11.5 GHz



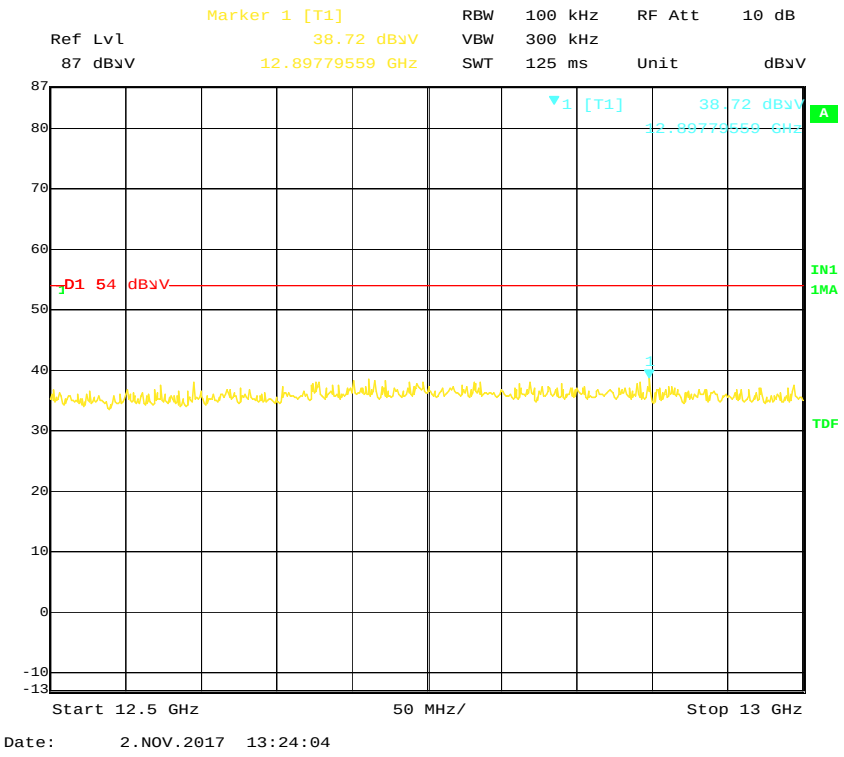
Low Channel Spurious, 11.5-12 GHz



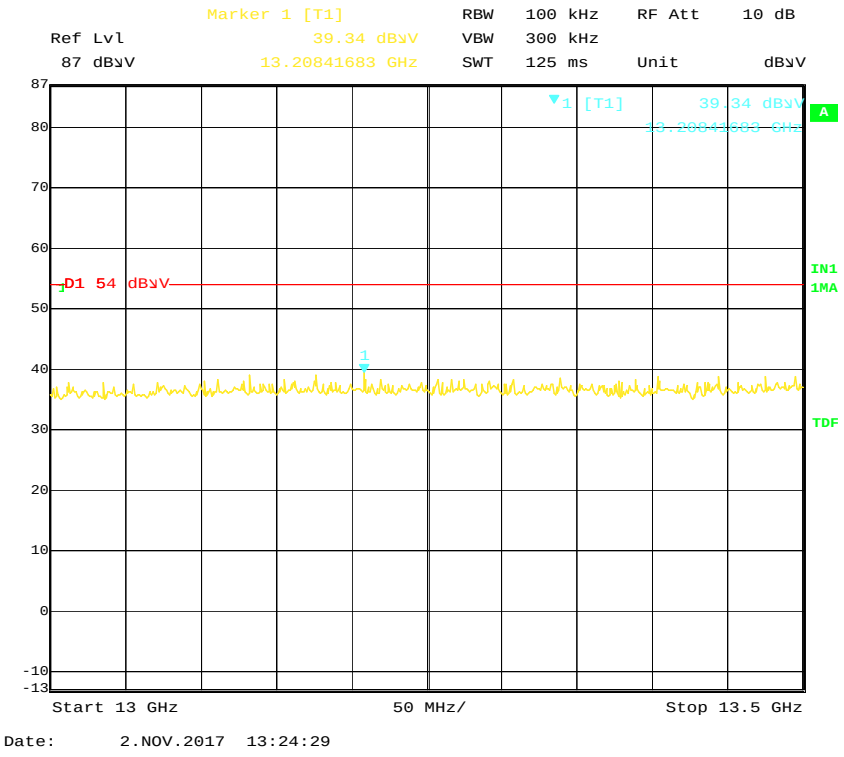
Low Channel Spurious, 12-12.5 GHz



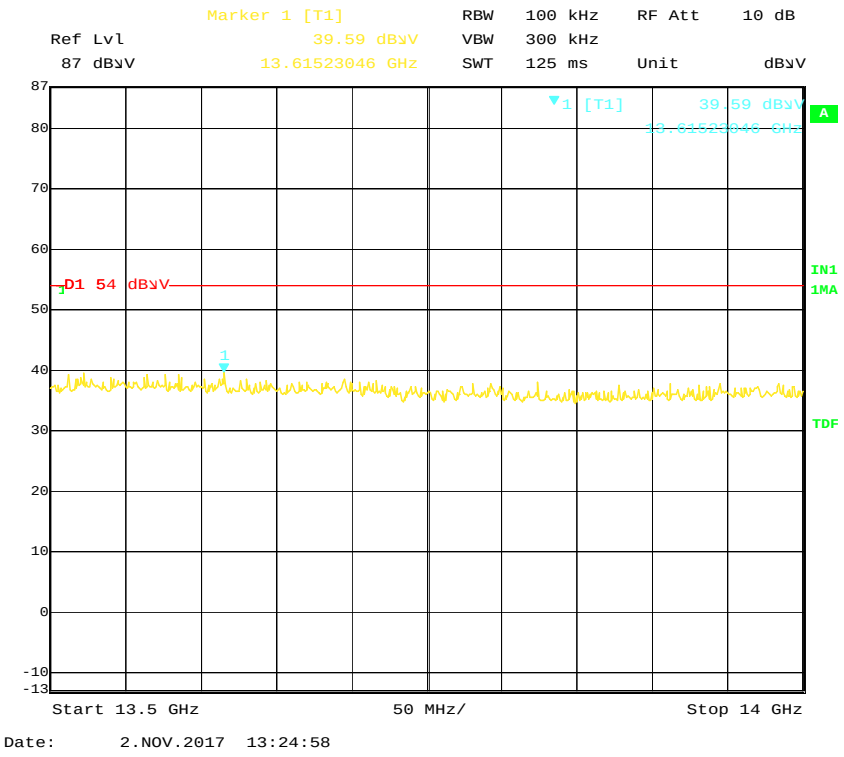
Low Channel Spurious, 12.5-13 GHz



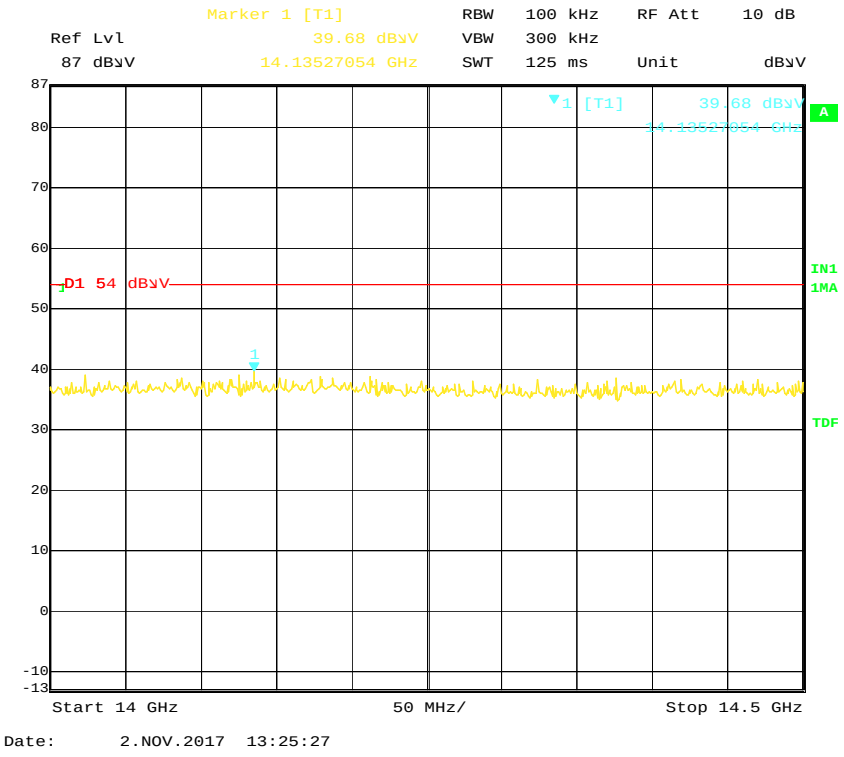
Low Channel Spurious, 13-13.5 GHz



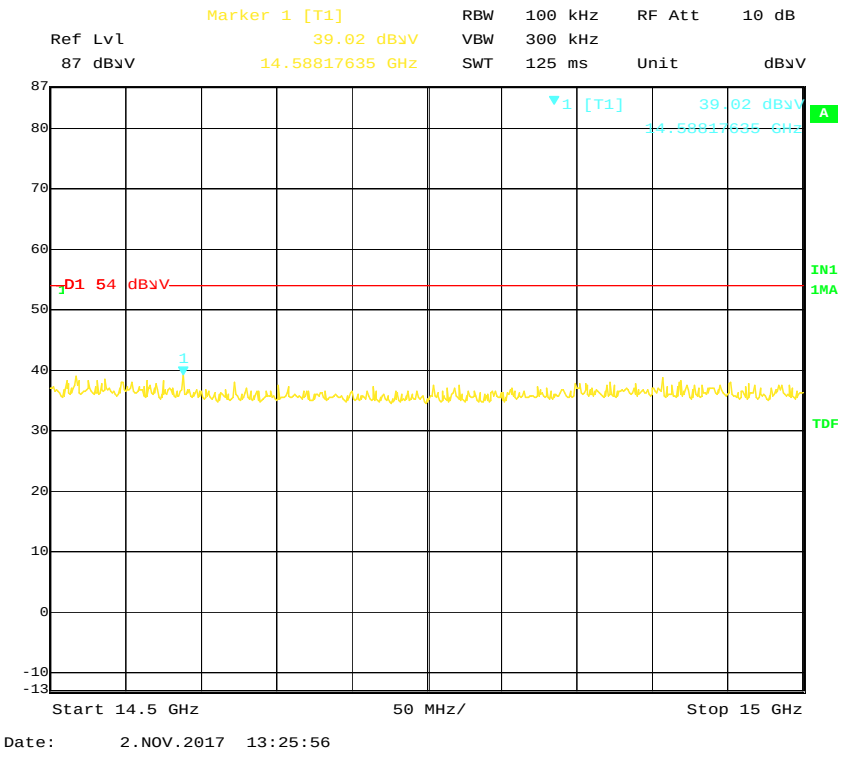
Low Channel Spurious, 13.5-14 GHz



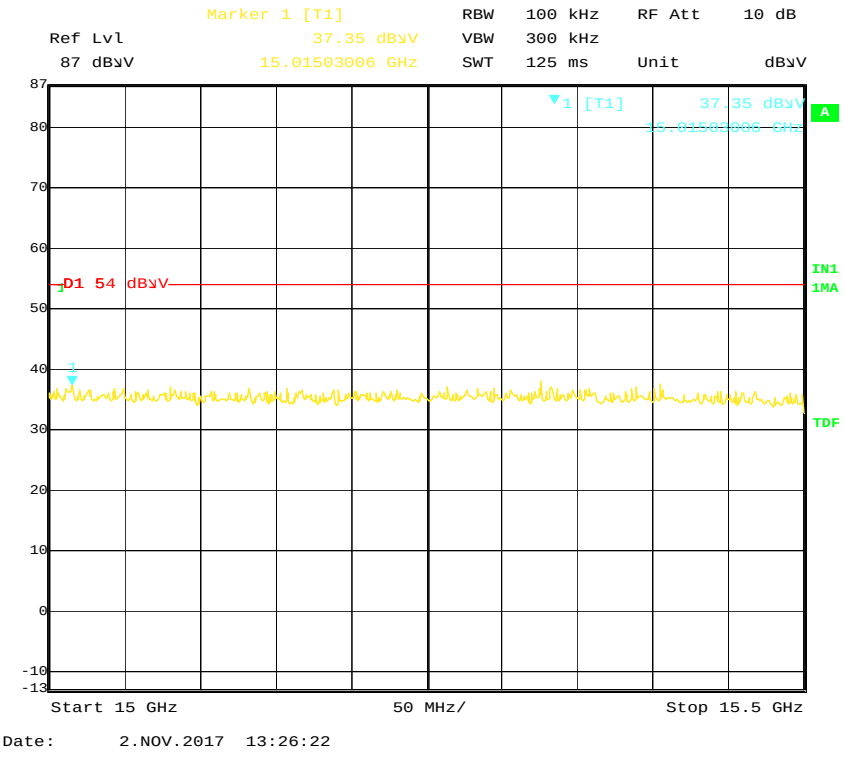
Low Channel Spurious, 14-14.5 GHz



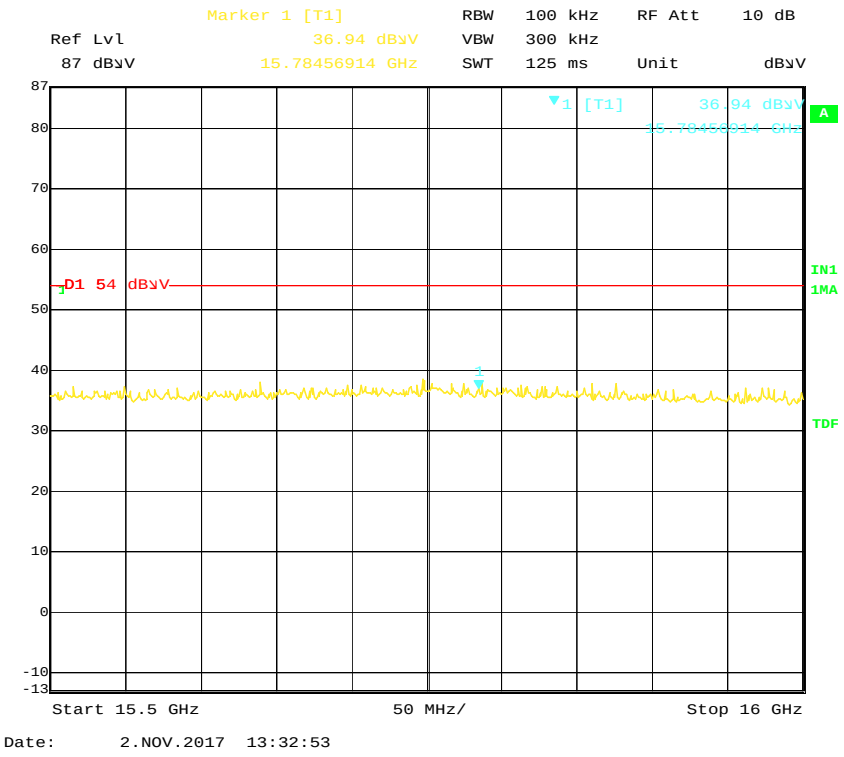
Low Channel Spurious, 14.5-15 GHz



Low Channel Spurious, 15-15.5 GHz



Low Channel Spurious, 15.5-16 GHz



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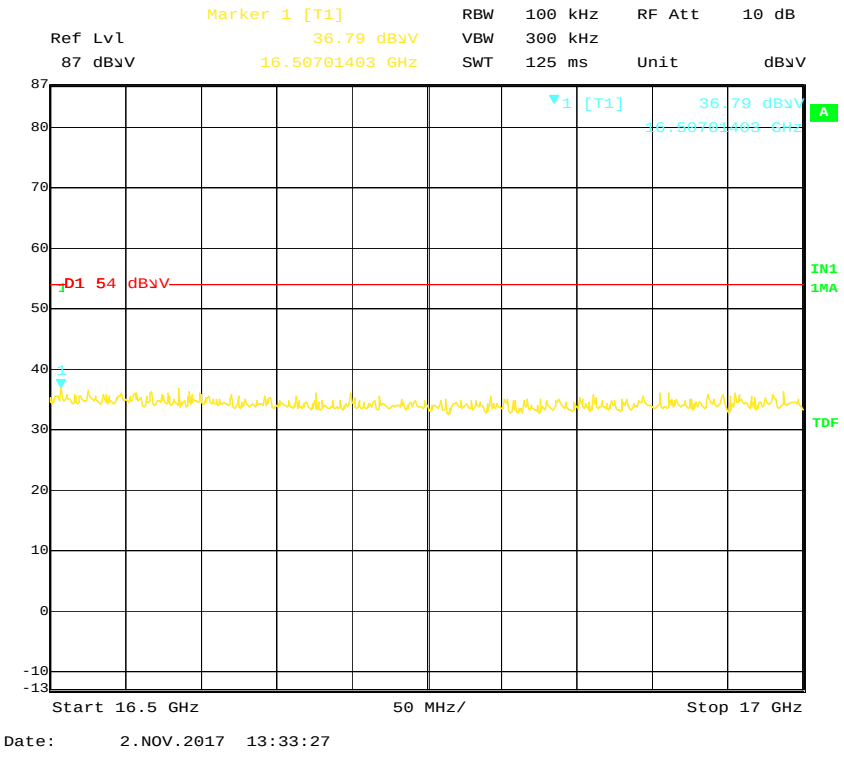
Low Channel Spurious, 16.5-17 GHz



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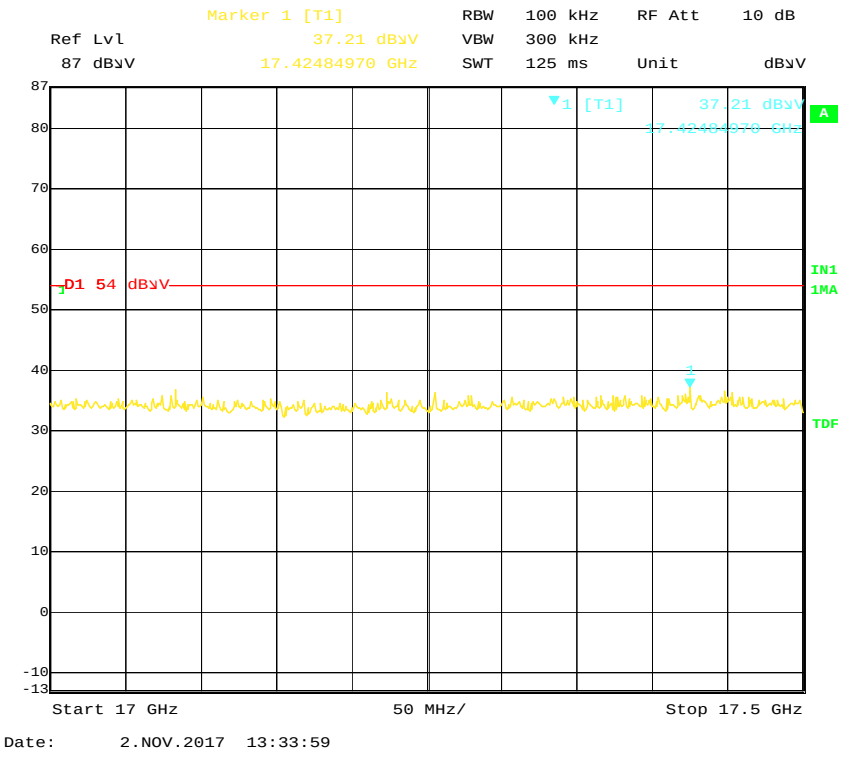
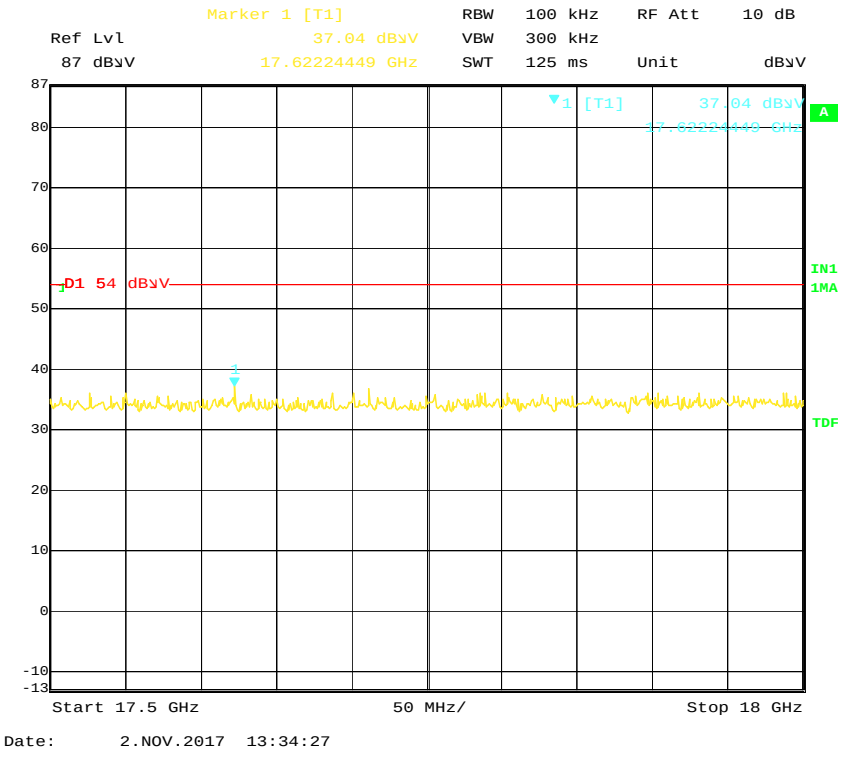
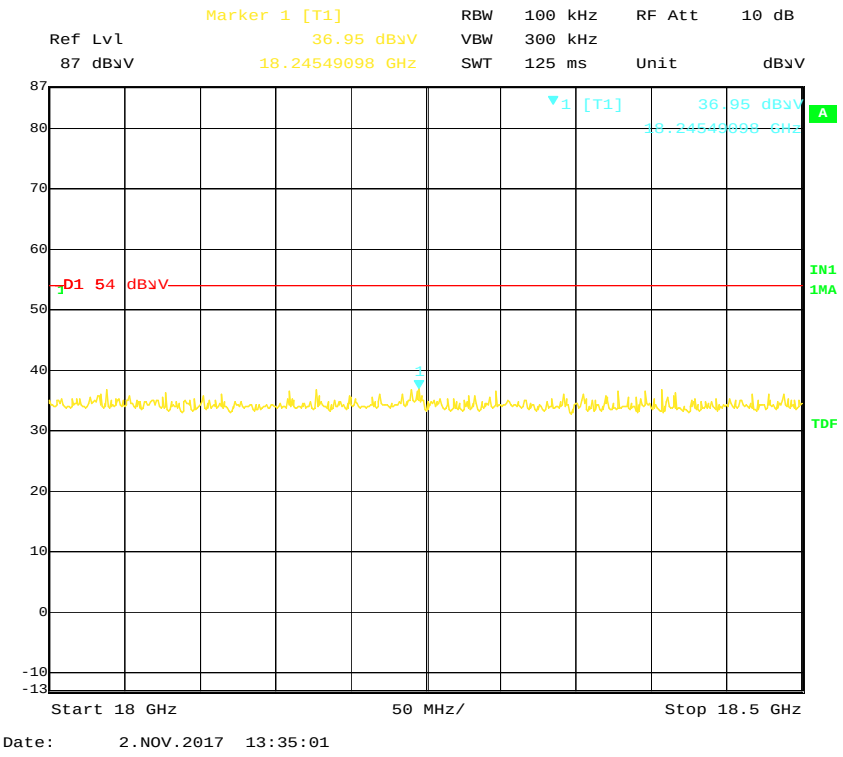
Low Channel Spurious, 17-17.5 GHz



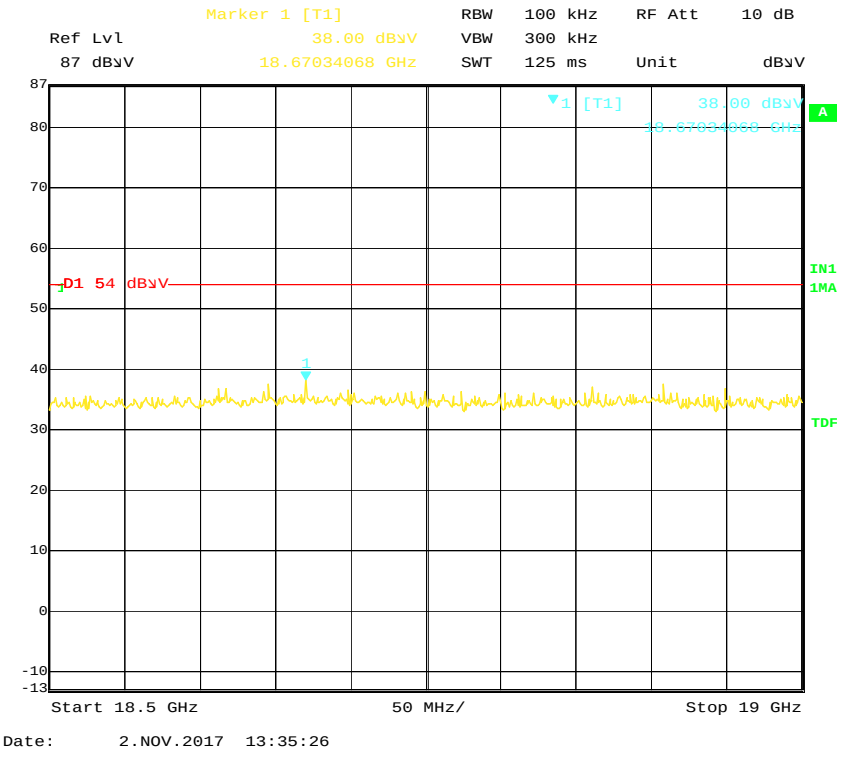
Low Channel Spurious, 17.5-18 GHz



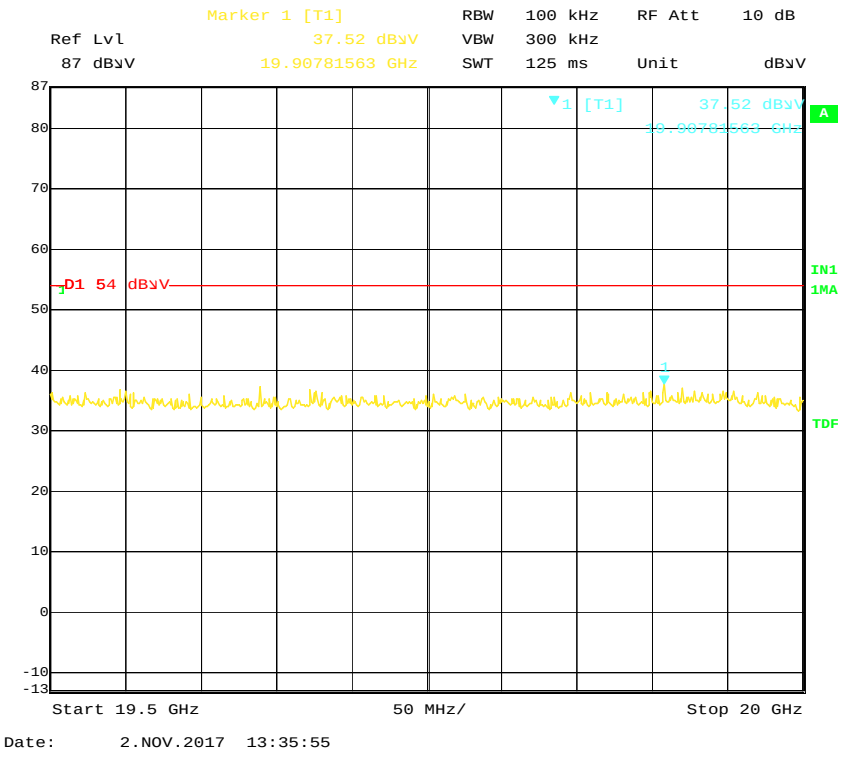
Low Channel Spurious, 18-18.5 GHz



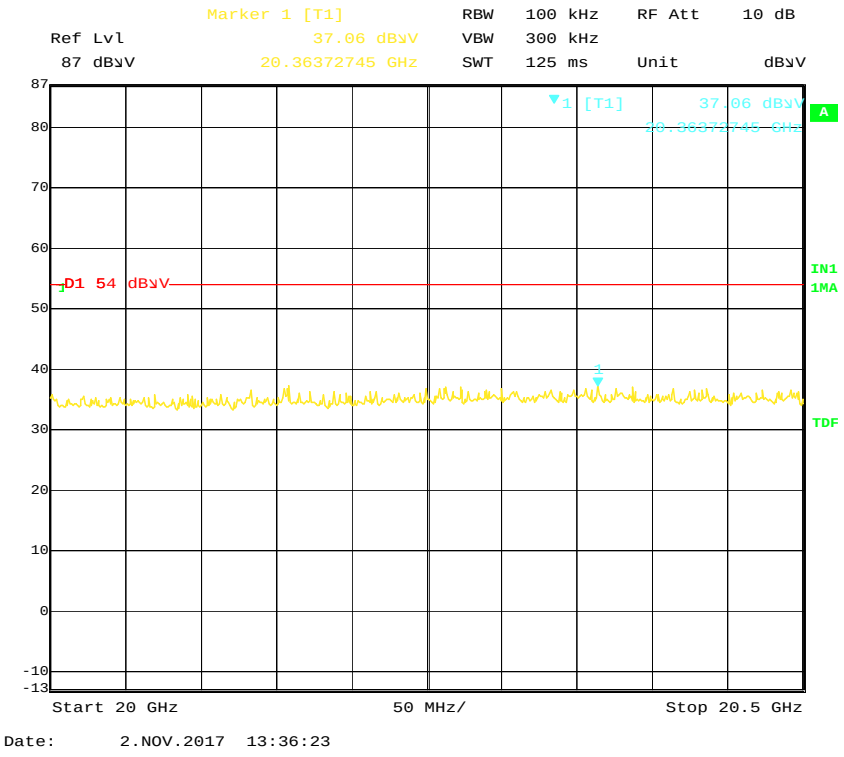
Low Channel Spurious, 18.5-19 GHz



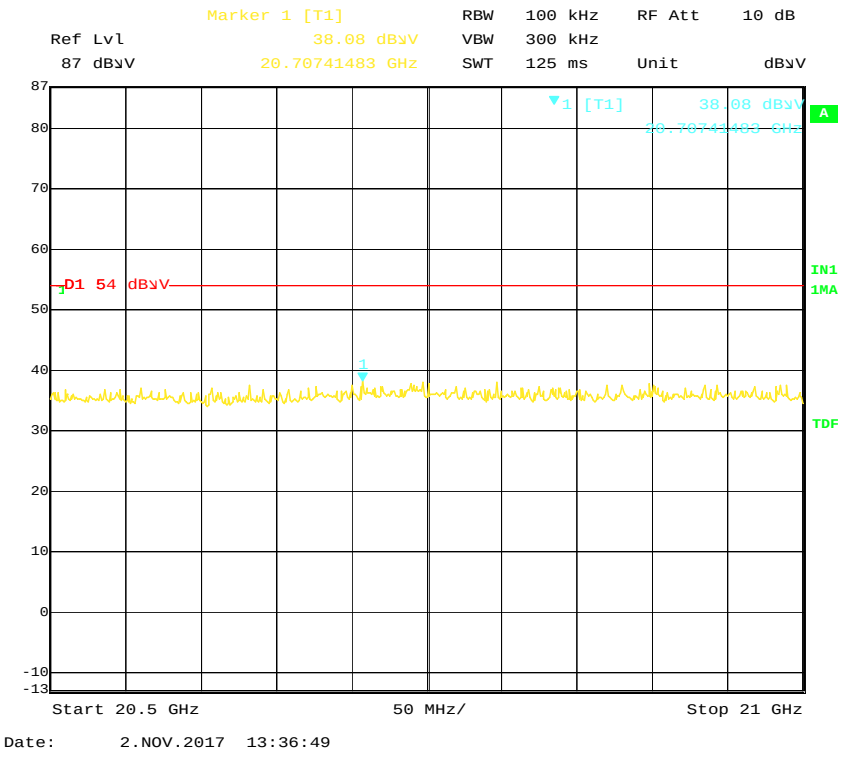
Low Channel Spurious, 19.5-20 GHz



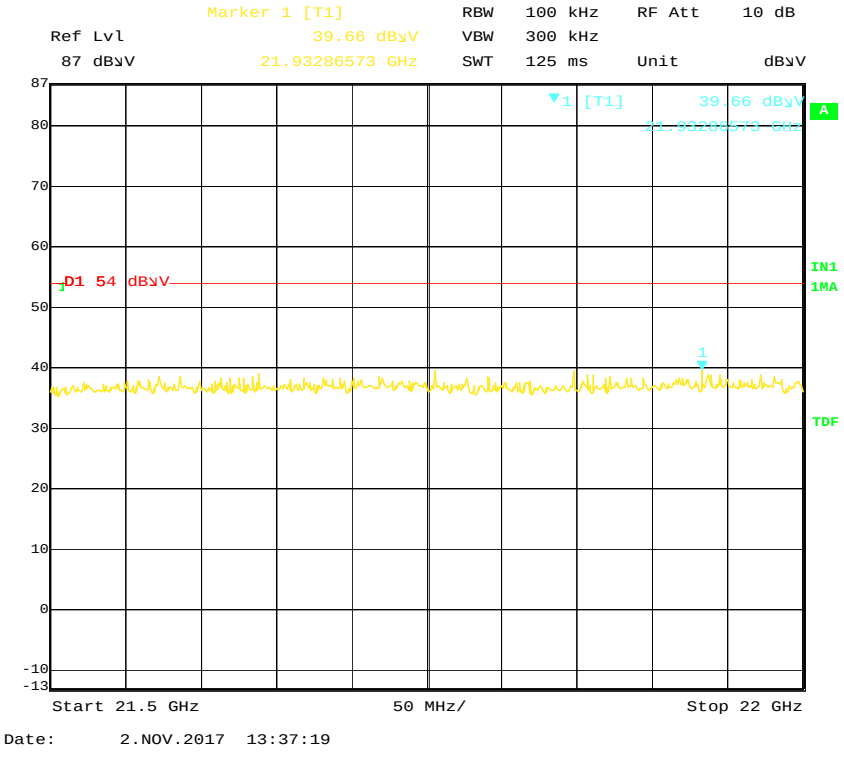
Low Channel Spurious, 20-20.5 GHz



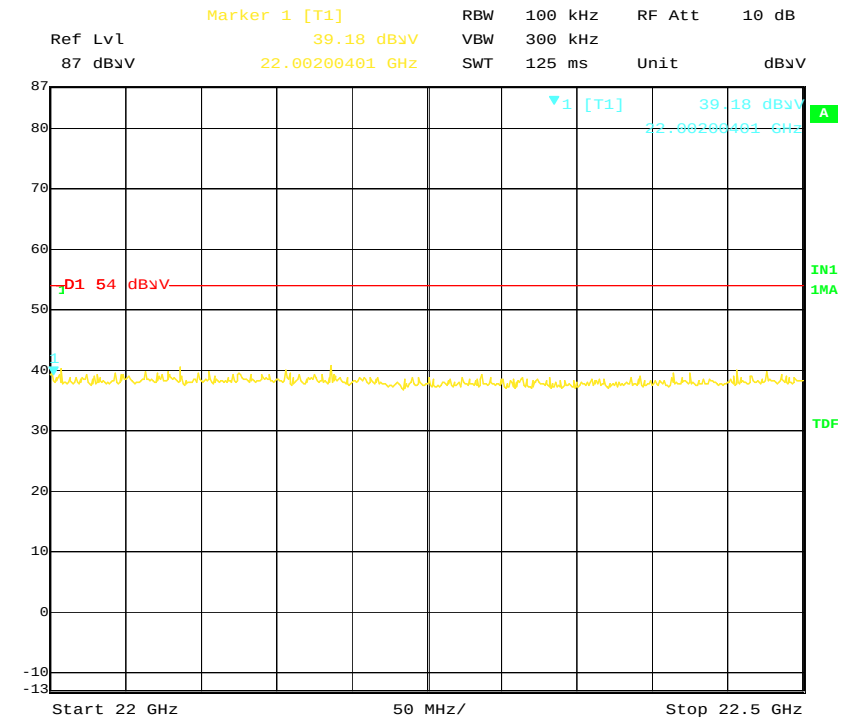
Low Channel Spurious, 20.5-21 GHz



Low Channel Spurious, 21.5-22 GHz



Low Channel Spurious, 22-22.5 GHz



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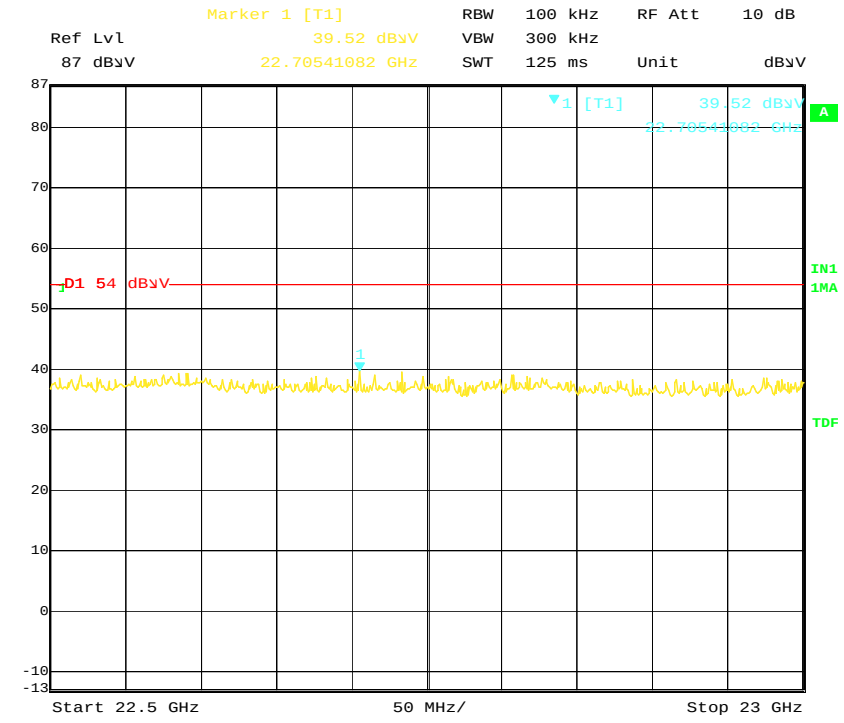
Low Channel Spurious, 22.5-23 GHz



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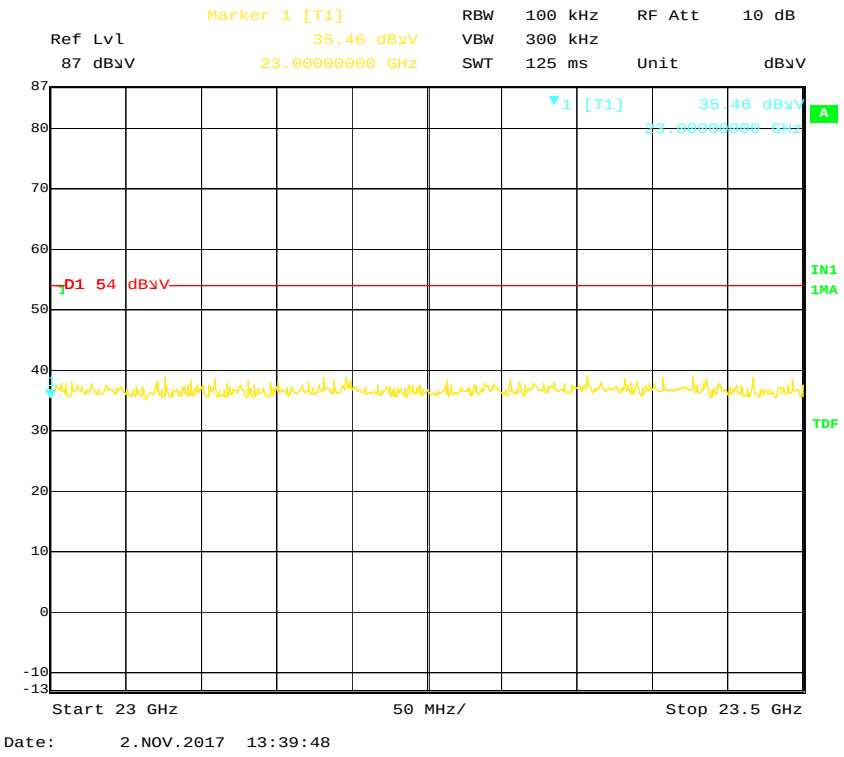
Low Channel Spurious, 23-23.5 GHz



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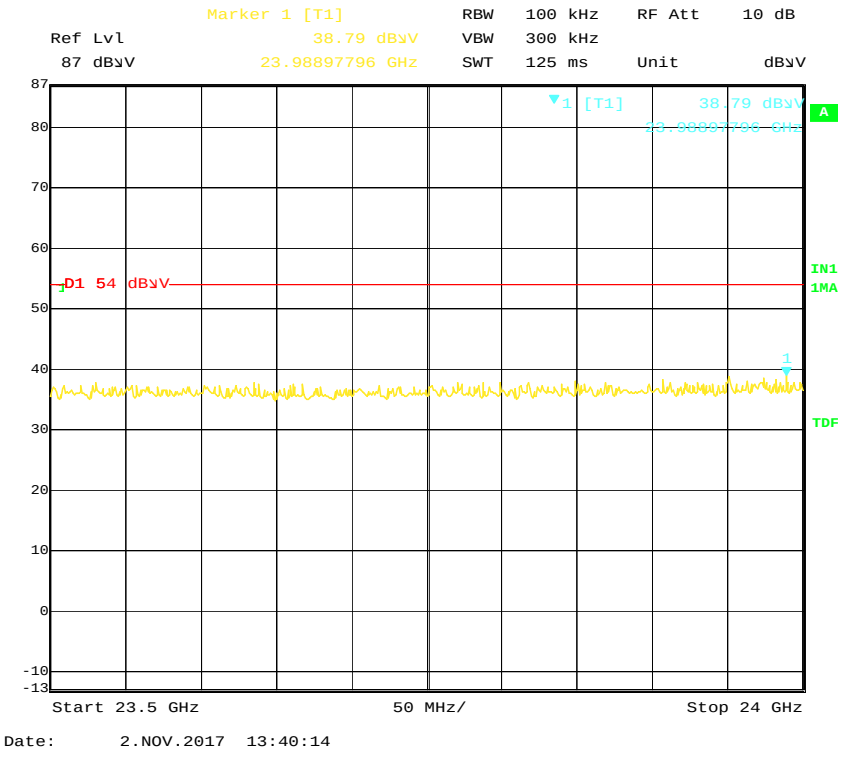
Low Channel Spurious, 23.5-24 GHz



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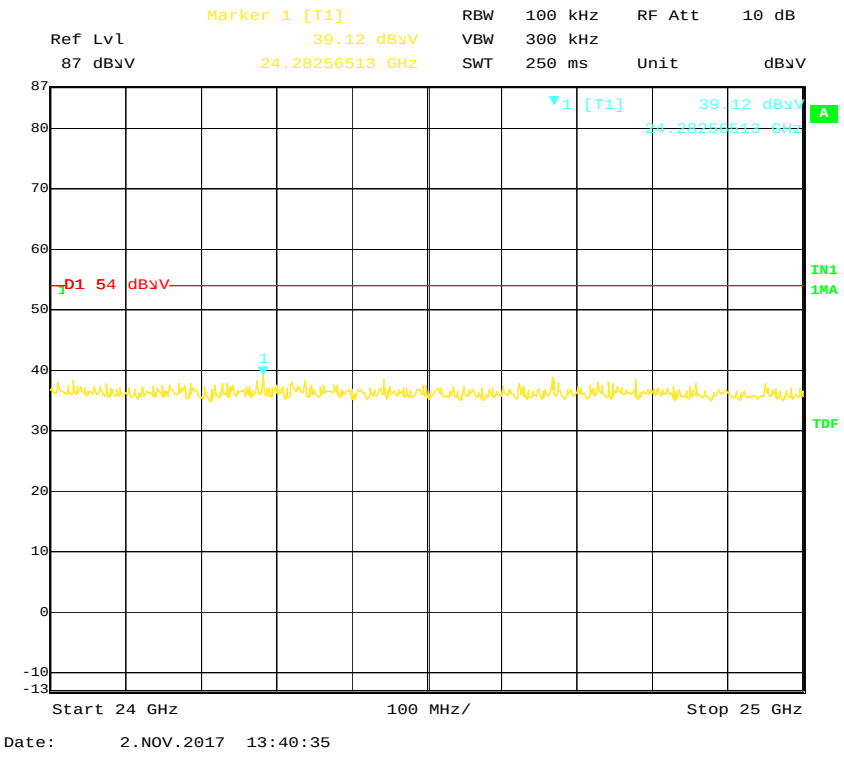
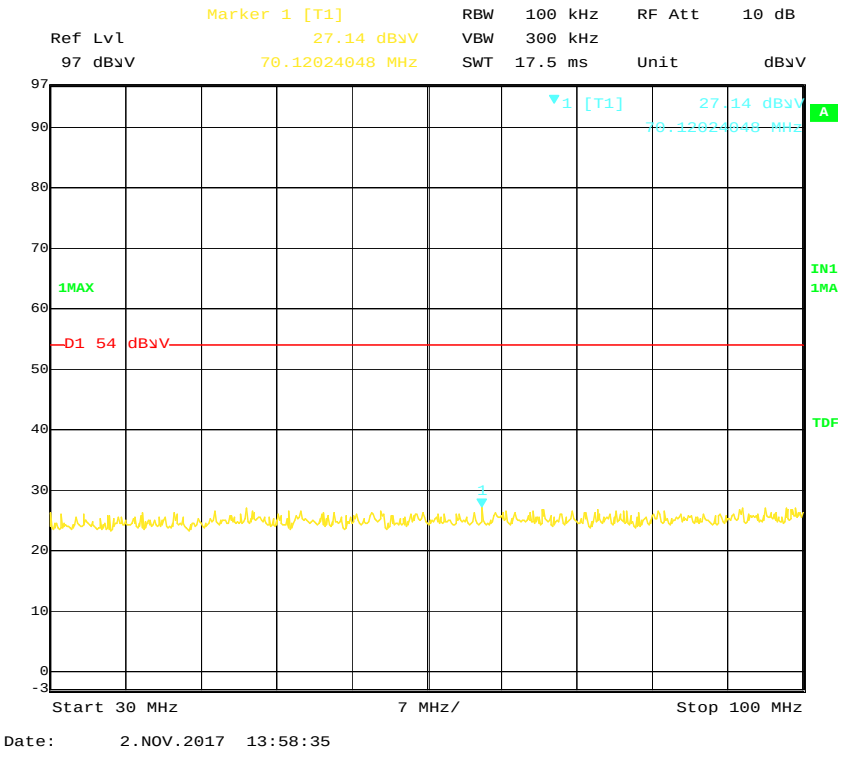
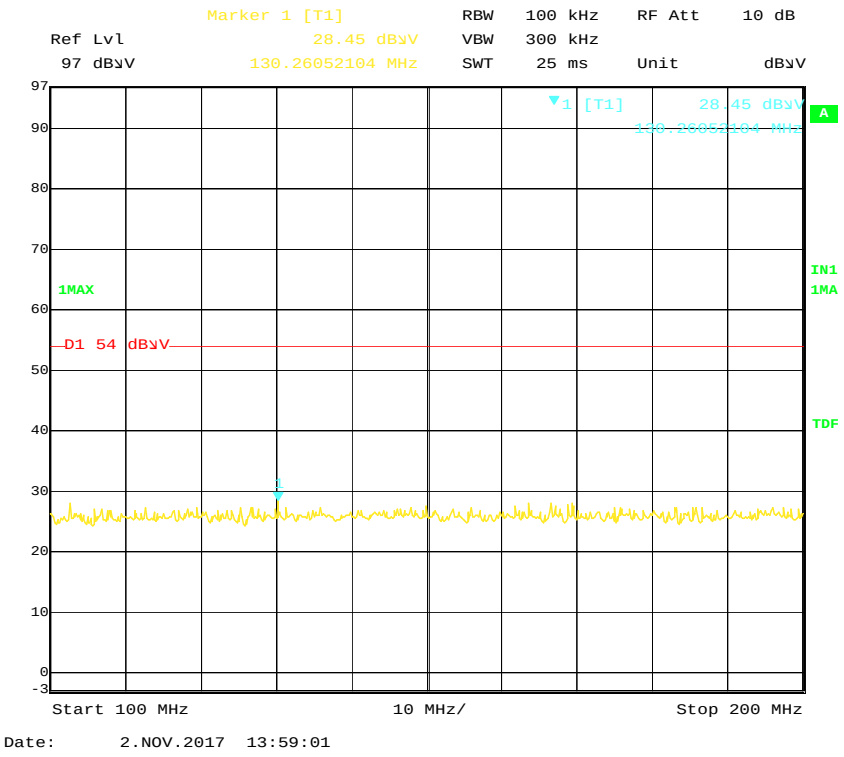
Low Channel Spurious, 24-25 GHz



Mid Channel Spurious, 30-100 MHz



Mid Channel Spurious, 100-200 MHz



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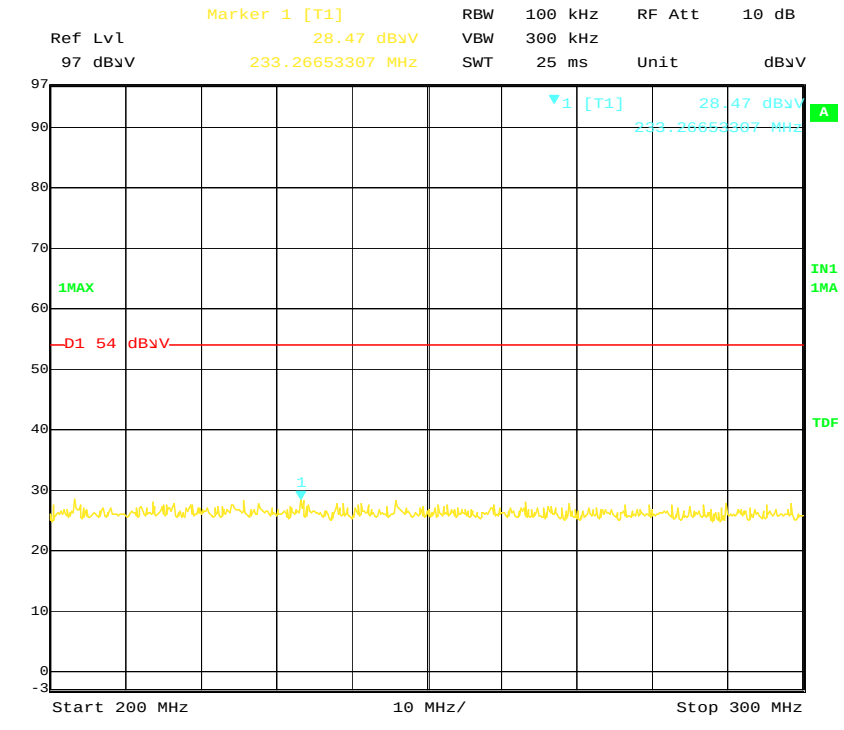
Mid Channel Spurious, 200-300 MHz



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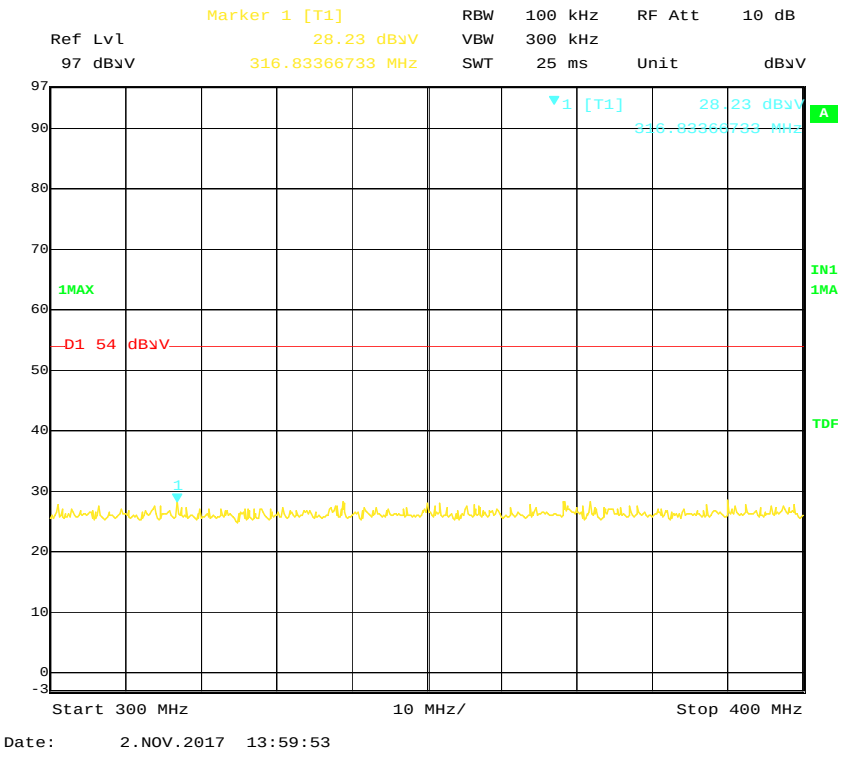
Mid Channel Spurious, 300-400 MHz



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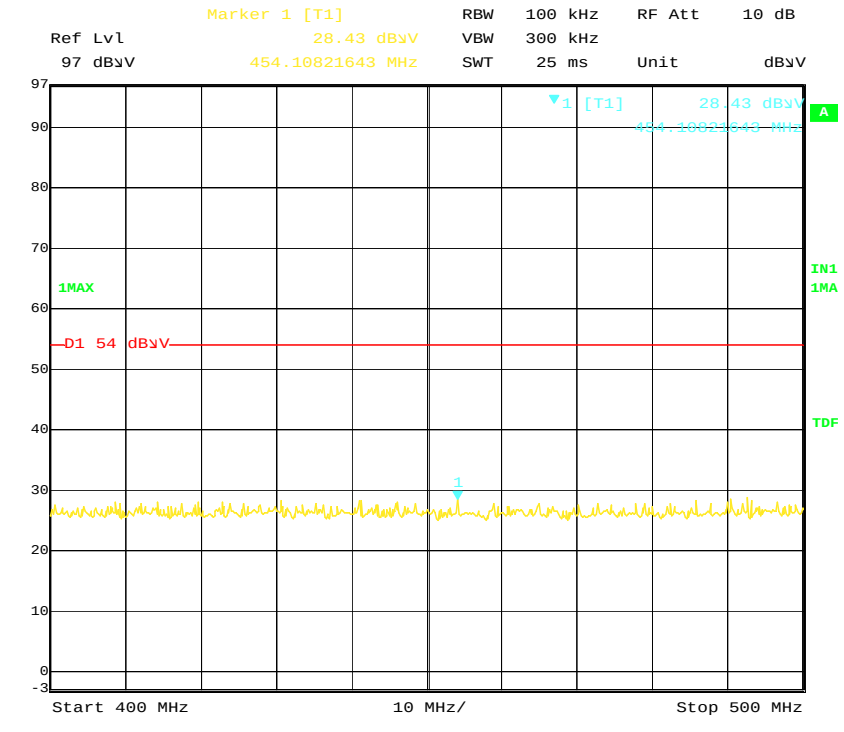
Mid Channel Spurious, 400-500 MHz



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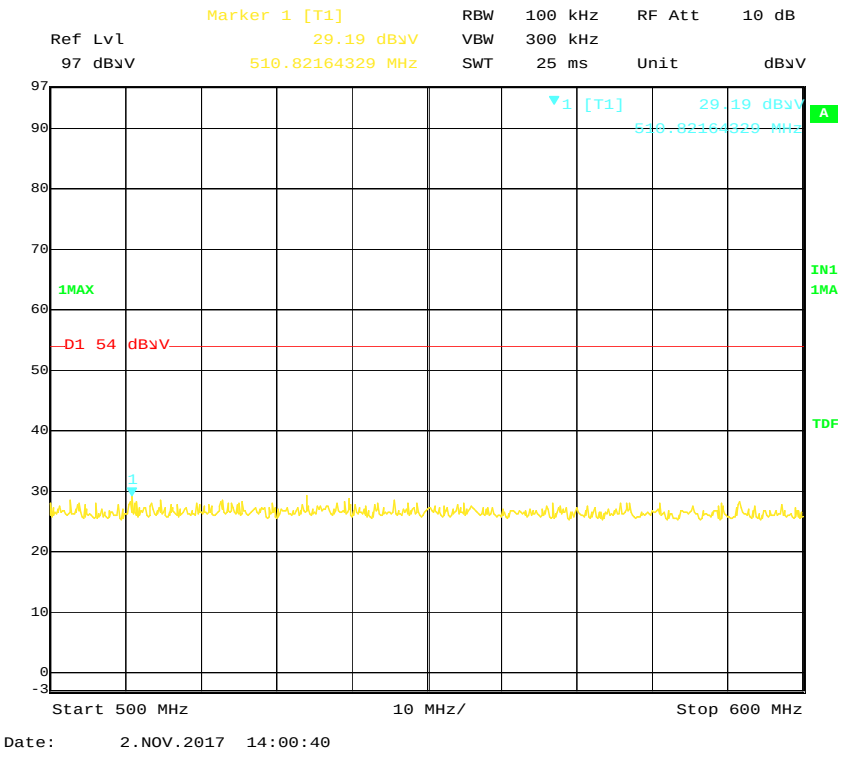
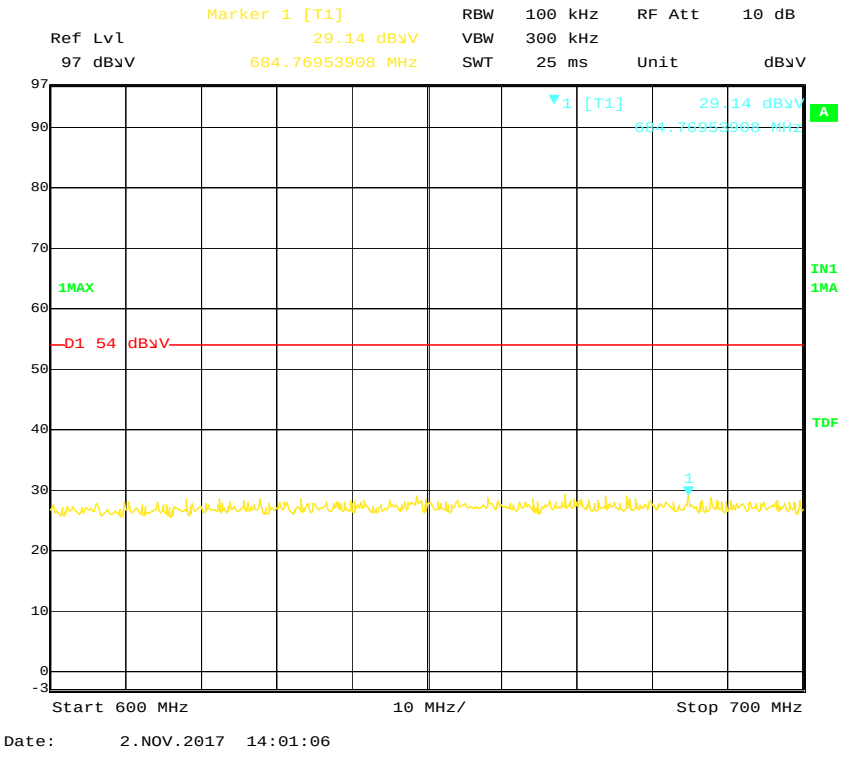
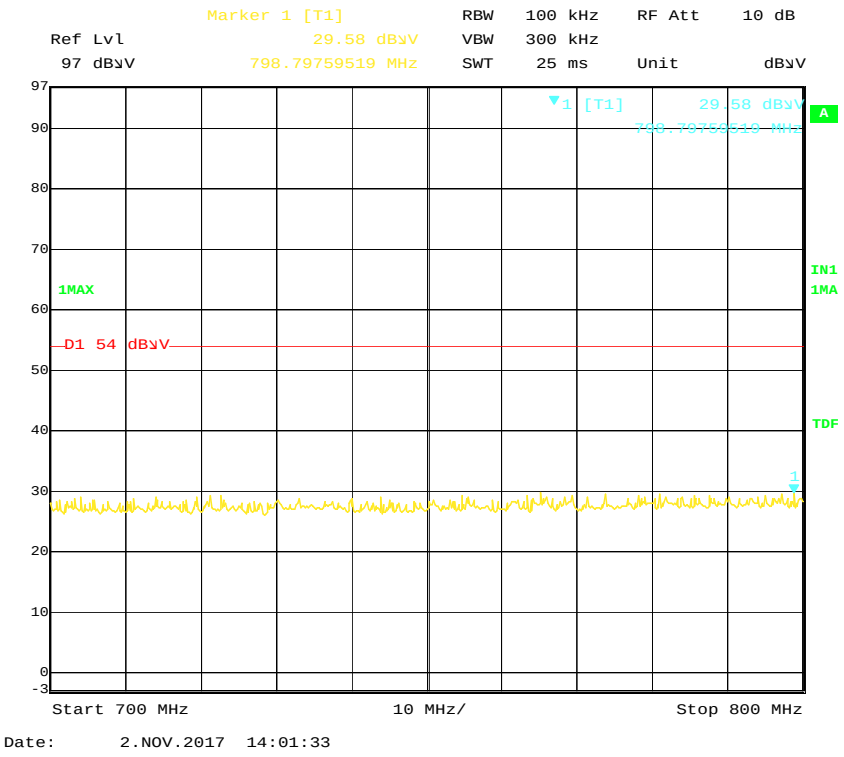
Mid Channel Spurious, 500-600 MHz



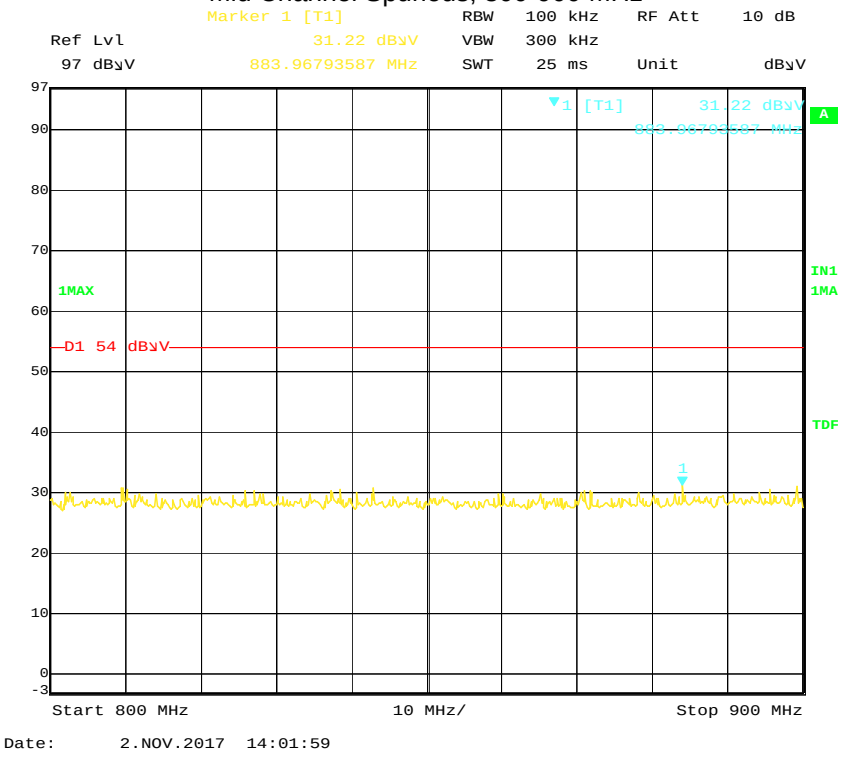
Mid Channel Spurious, 600-700 MHz



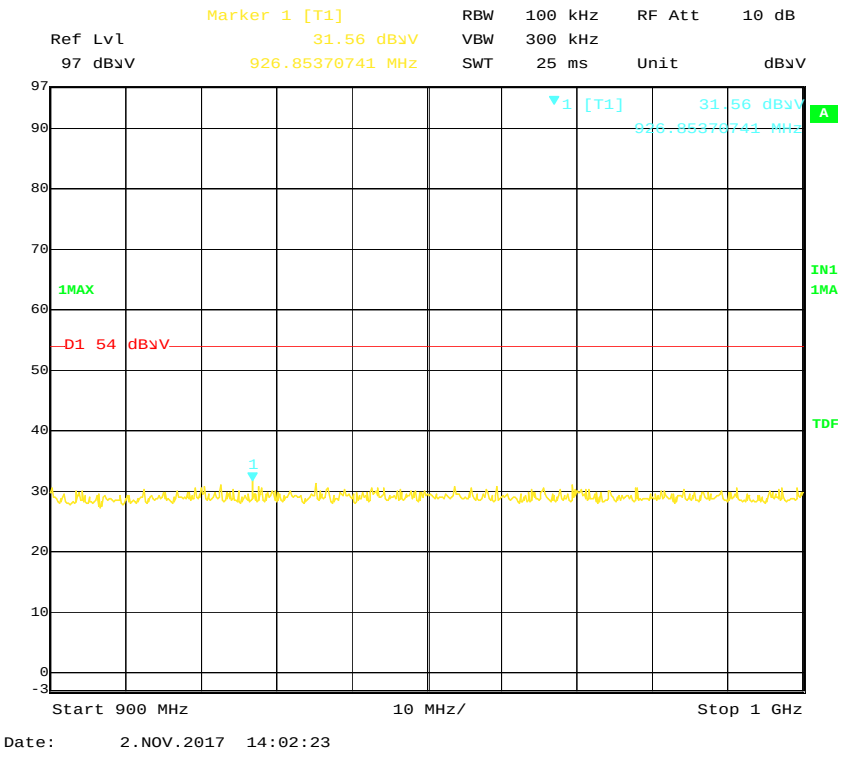
Mid Channel Spurious, 700-800 MHz



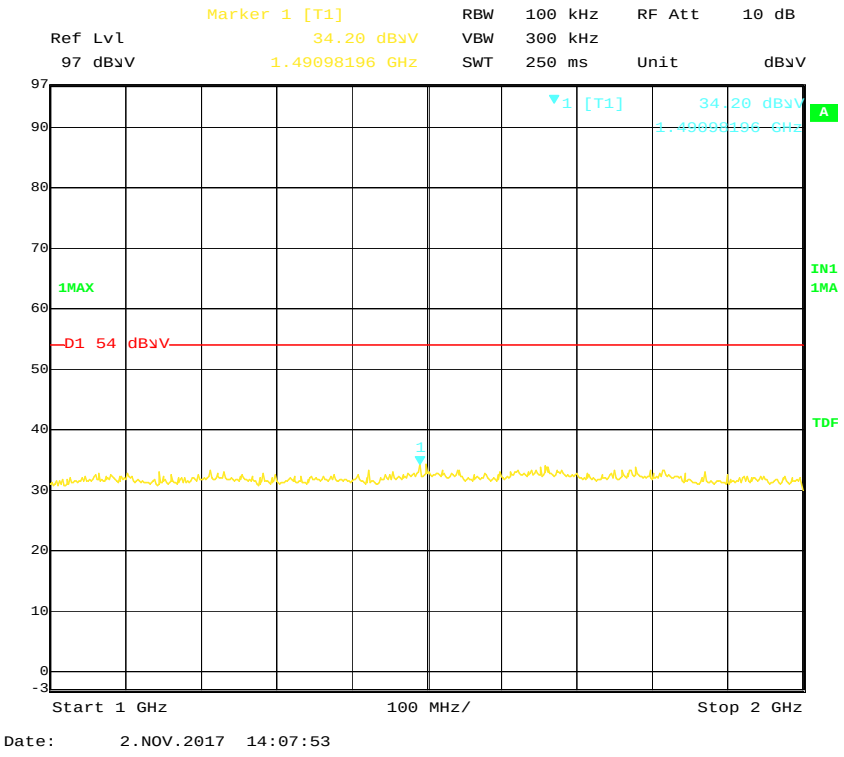
Mid Channel Spurious, 800-900 MHz



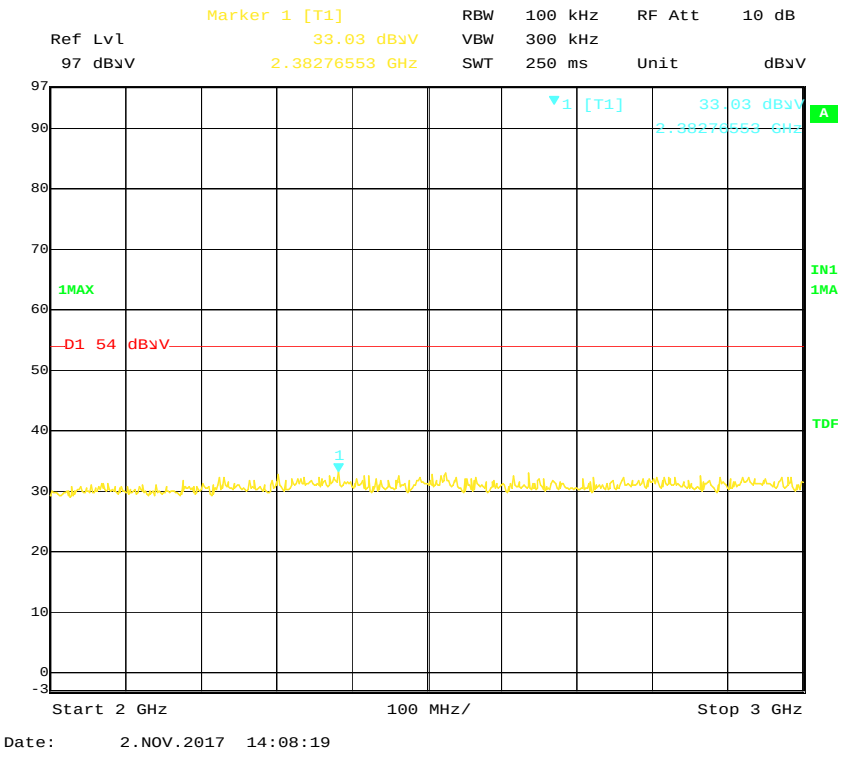
Mid Channel Spurious, 900-1000 MHz



Mid Channel Spurious, 1-2 GHz



Mid Channel Spurious, 2-3 GHz



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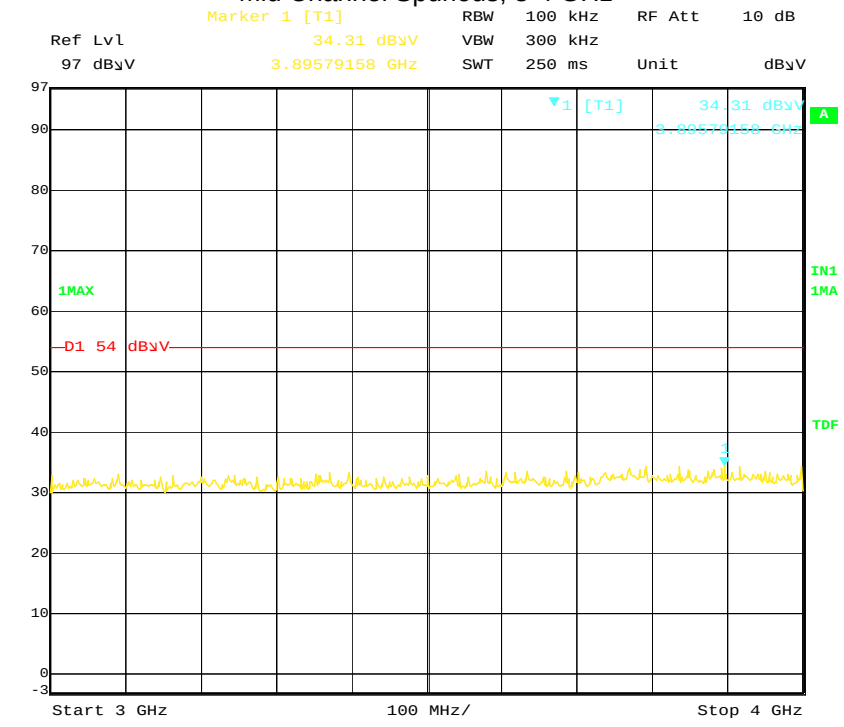
Mid Channel Spurious, 3-4 GHz



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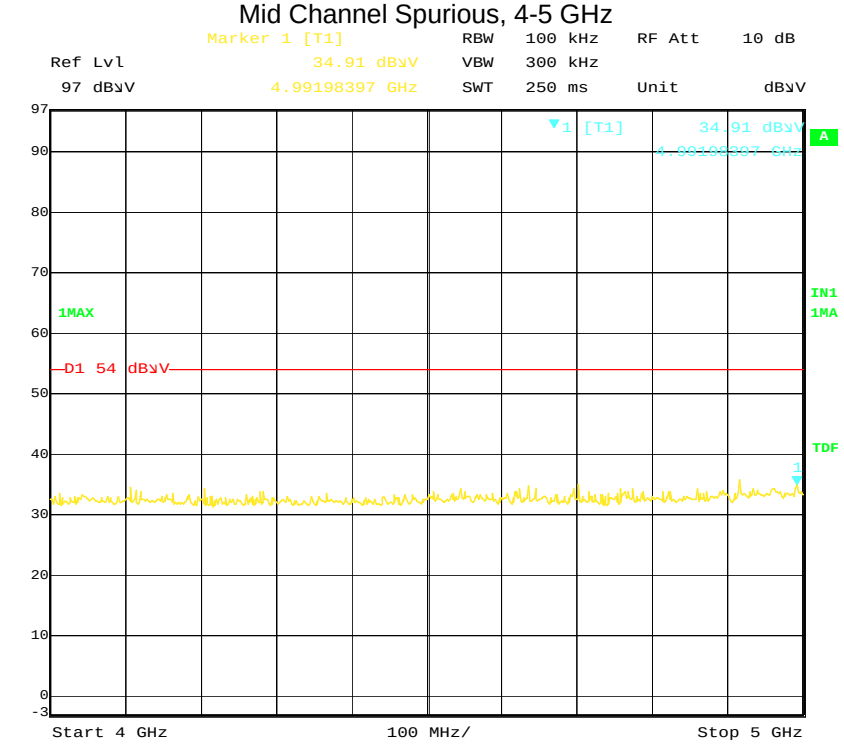
Mid Channel Spurious, 4-5 GHz



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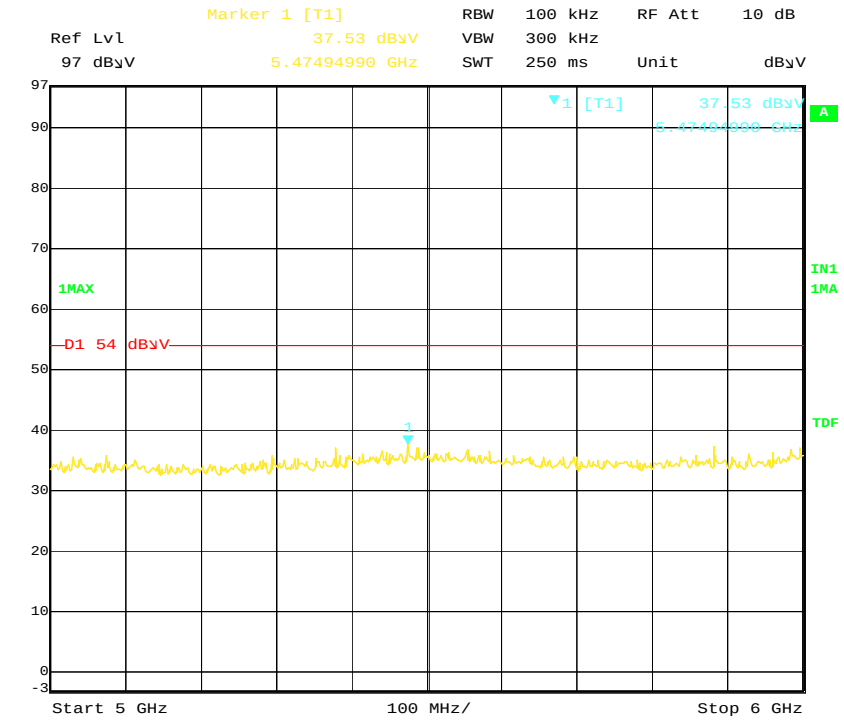
Mid Channel Spurious, 5-6 GHz



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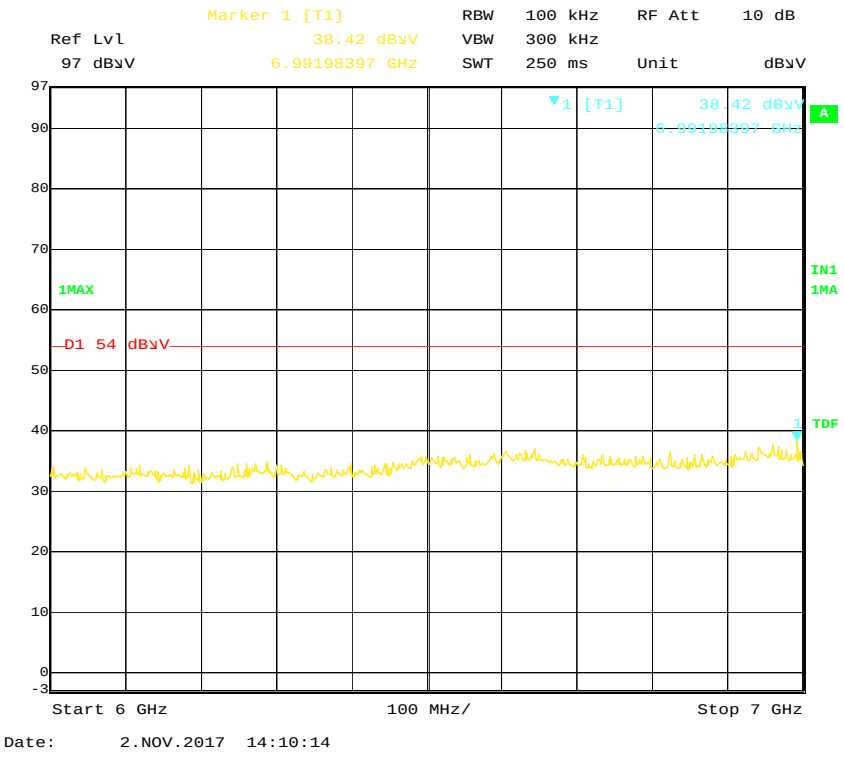
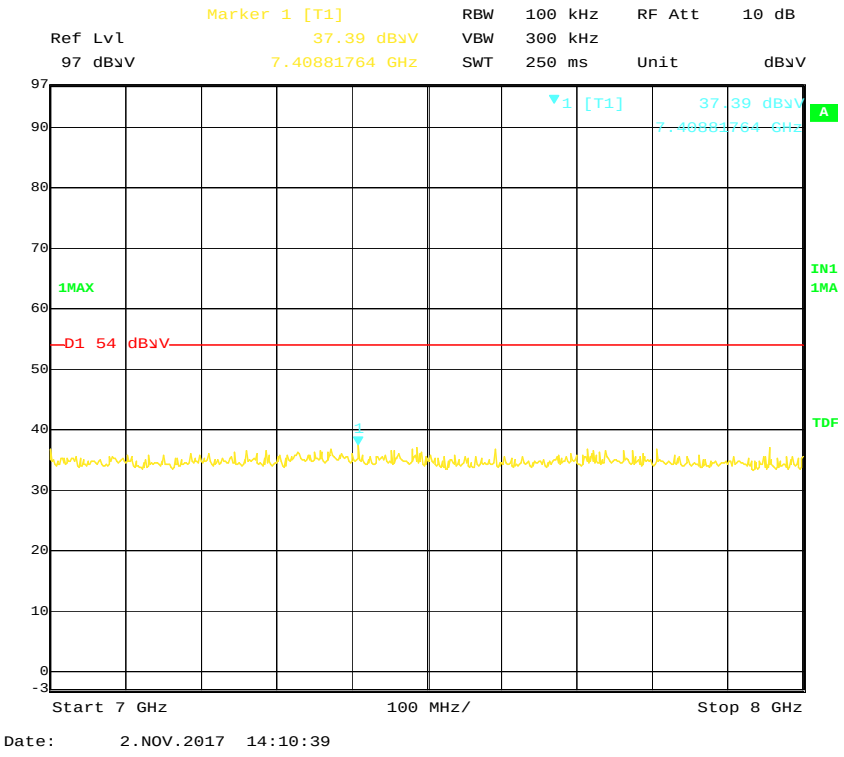
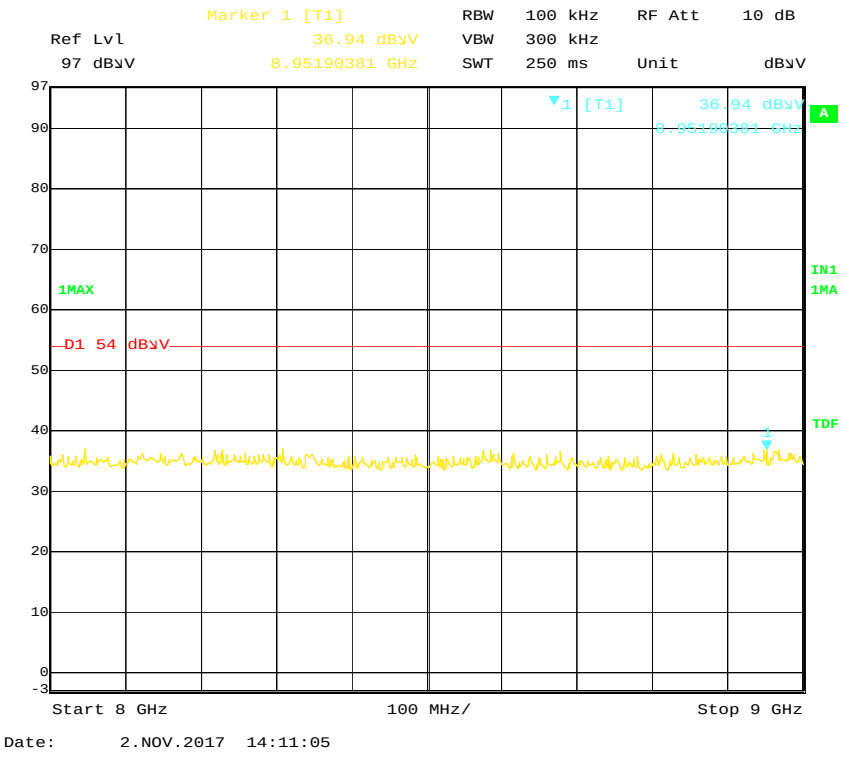
Mid Channel Spurious, 6-7 GHz



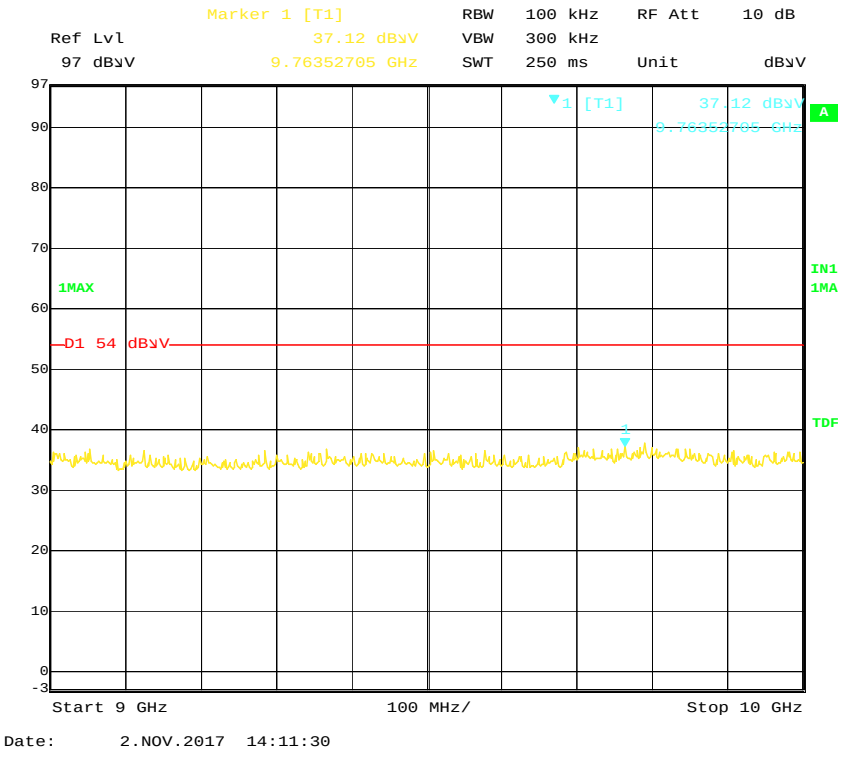
Mid Channel Spurious, 7-8 GHz



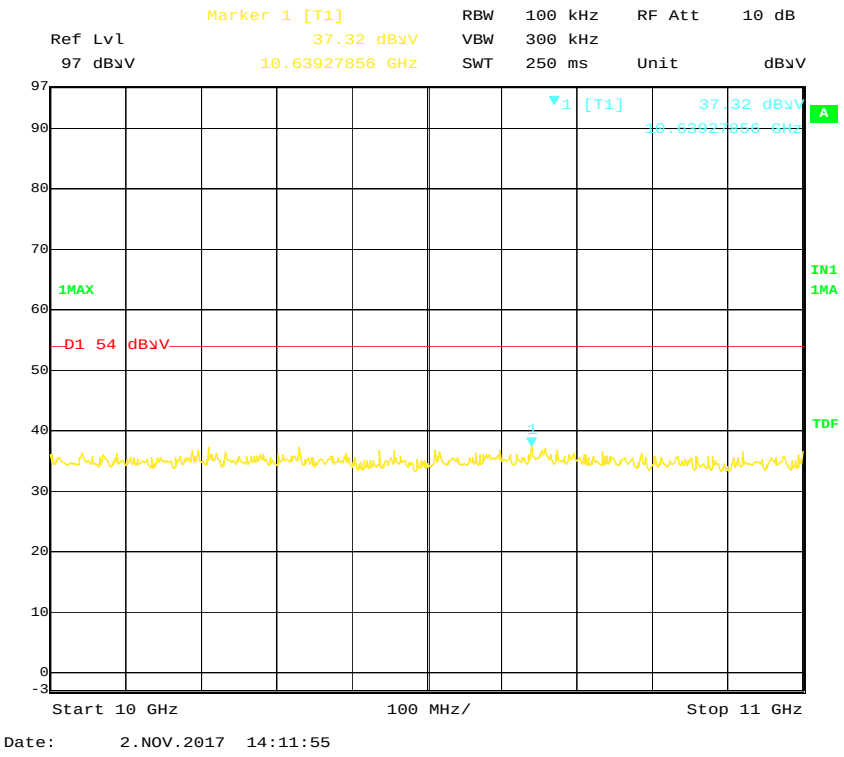
Mid Channel Spurious, 8-9 GHz



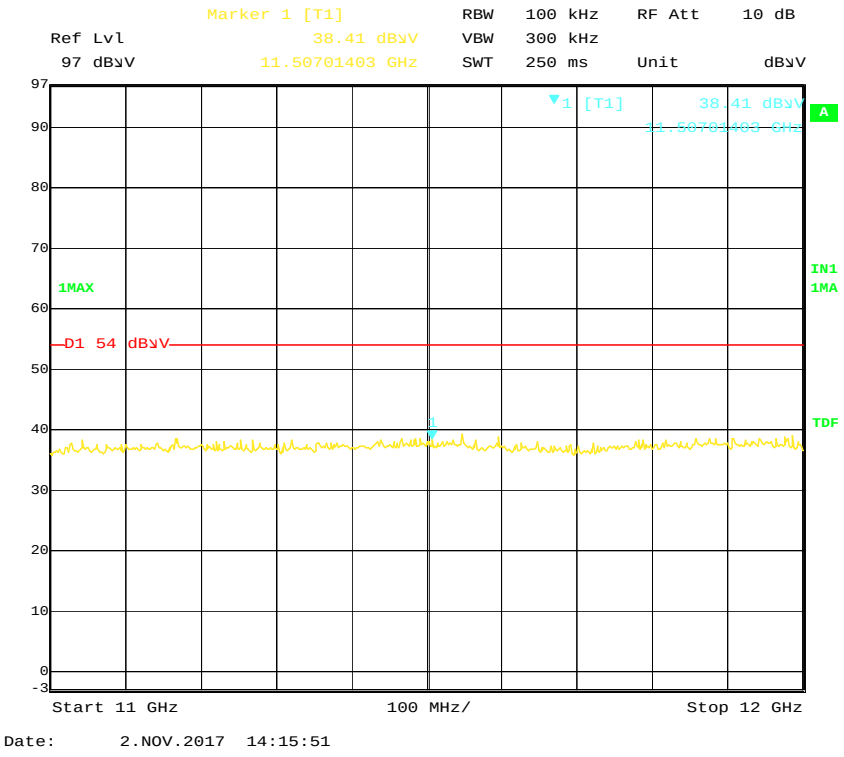
Mid Channel Spurious, 9-10 GHz



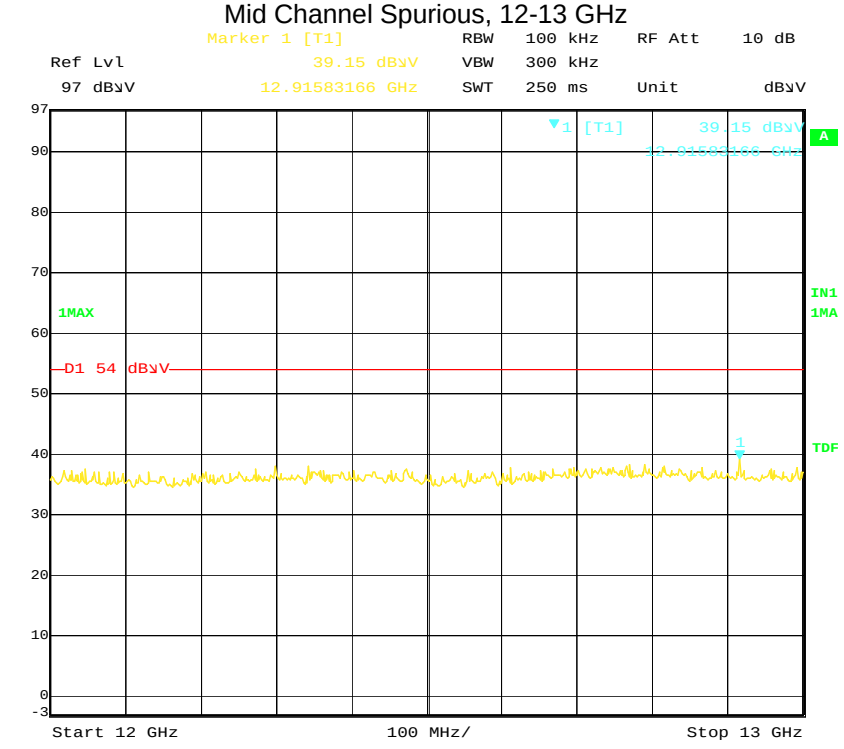
Mid Channel Spurious, 10-11 GHz



Mid Channel Spurious, 11-12 GHz



Mid Channel Spurious, 12-13 GHz



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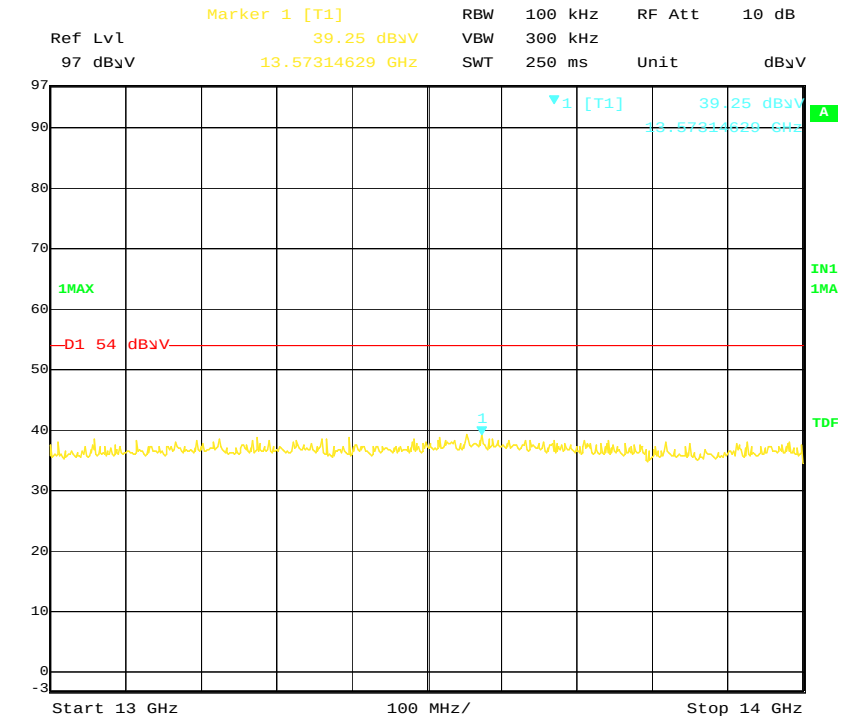
Mid Channel Spurious, 13-14 GHz



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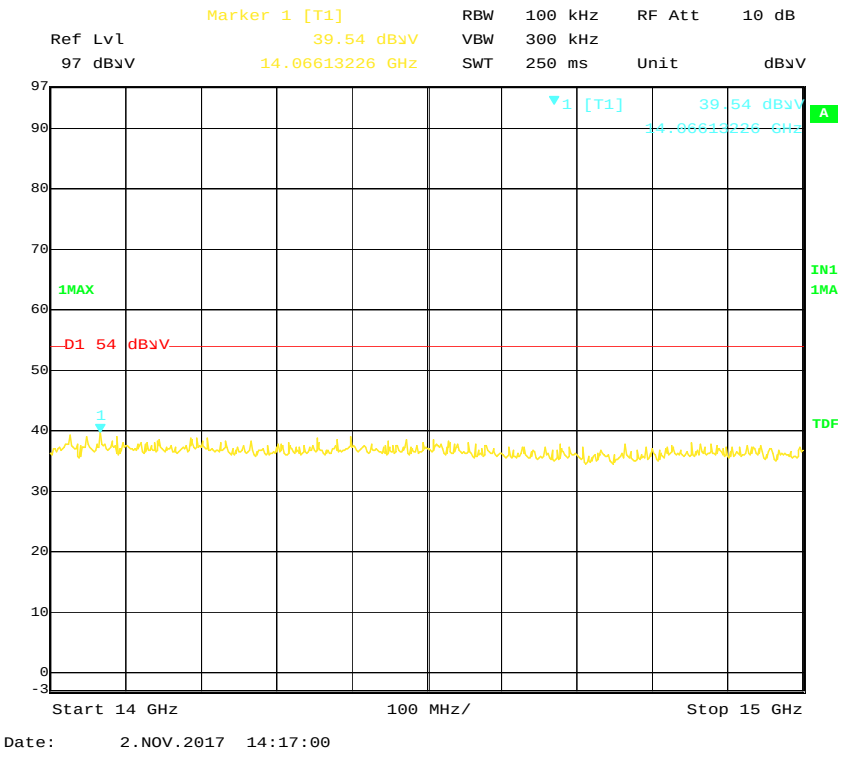
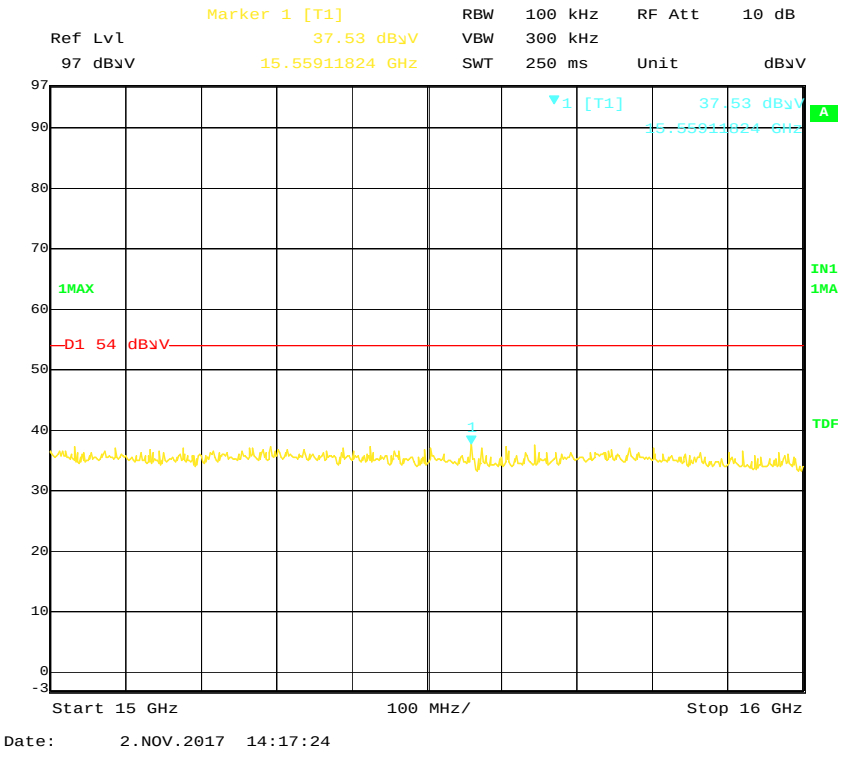
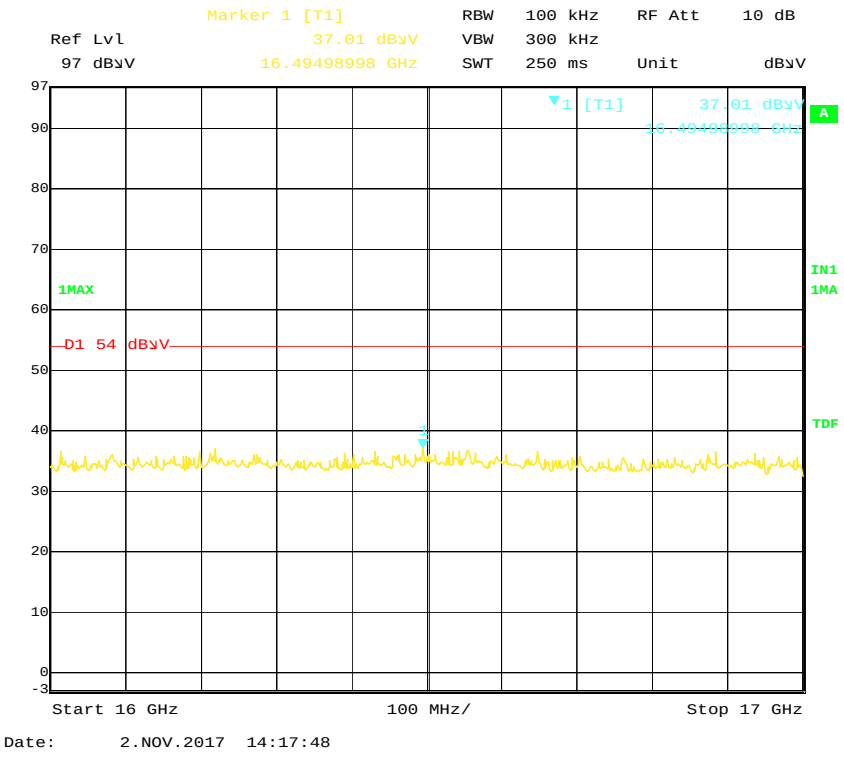
Mid Channel Spurious, 14-15 GHz



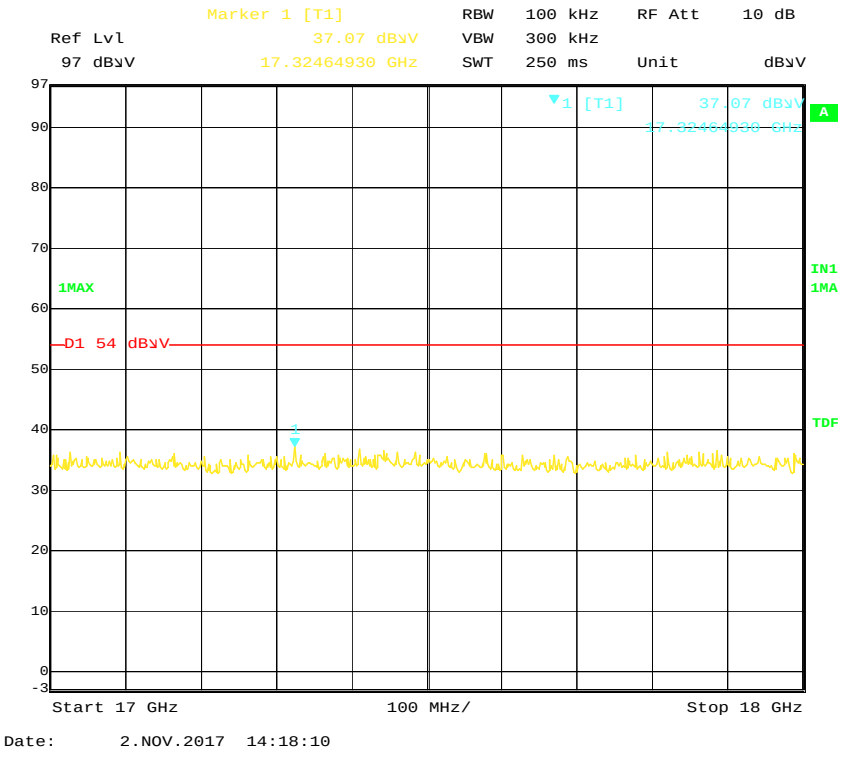
Mid Channel Spurious, 15-16 GHz



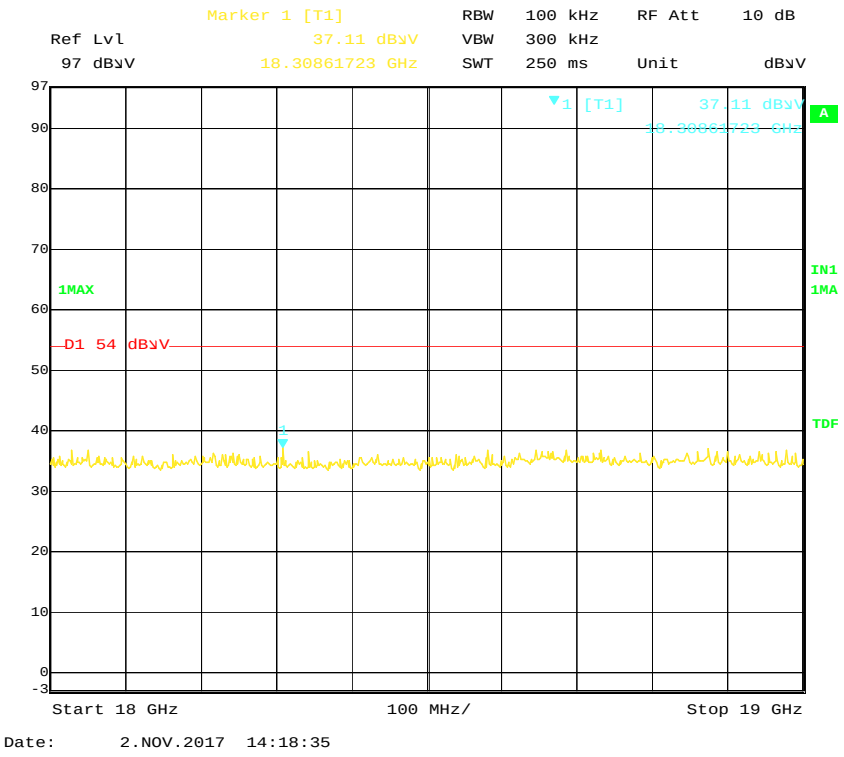
Mid Channel Spurious, 16-17 GHz



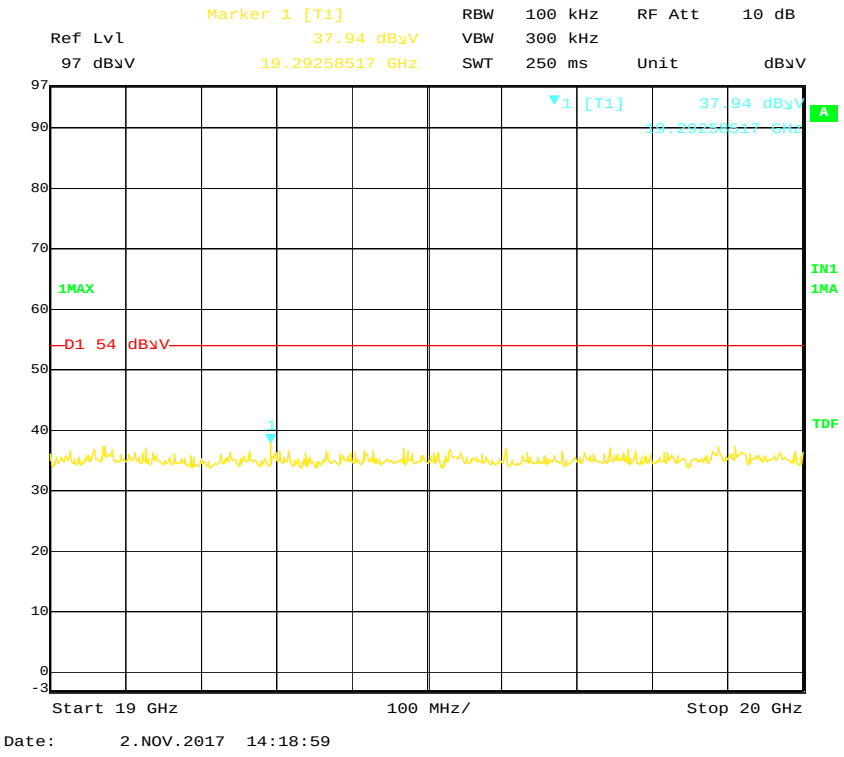
Mid Channel Spurious, 17-18 GHz



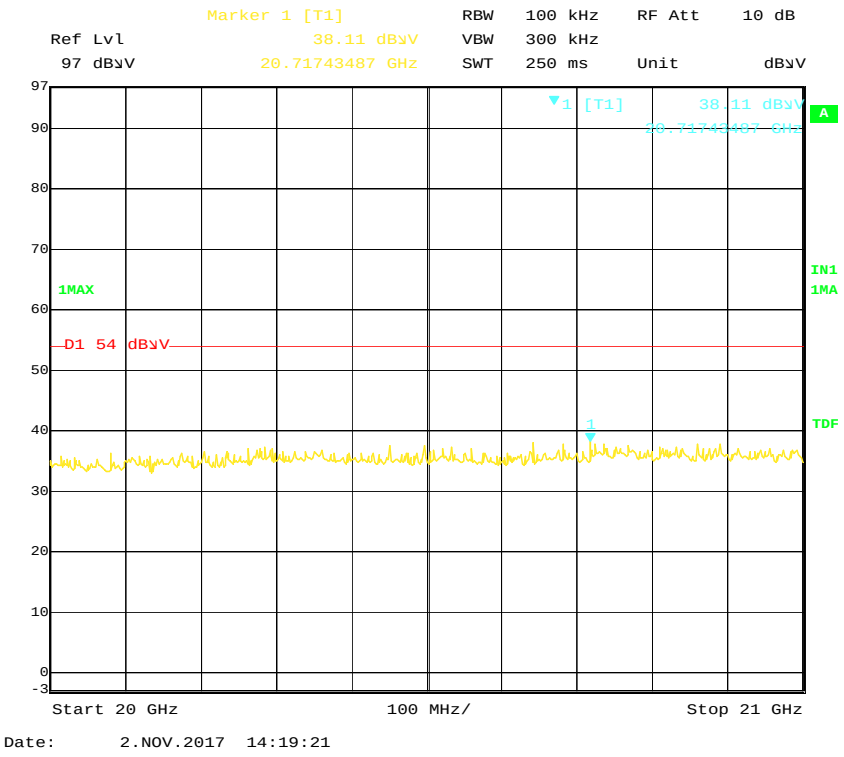
Mid Channel Spurious, 18-19 GHz



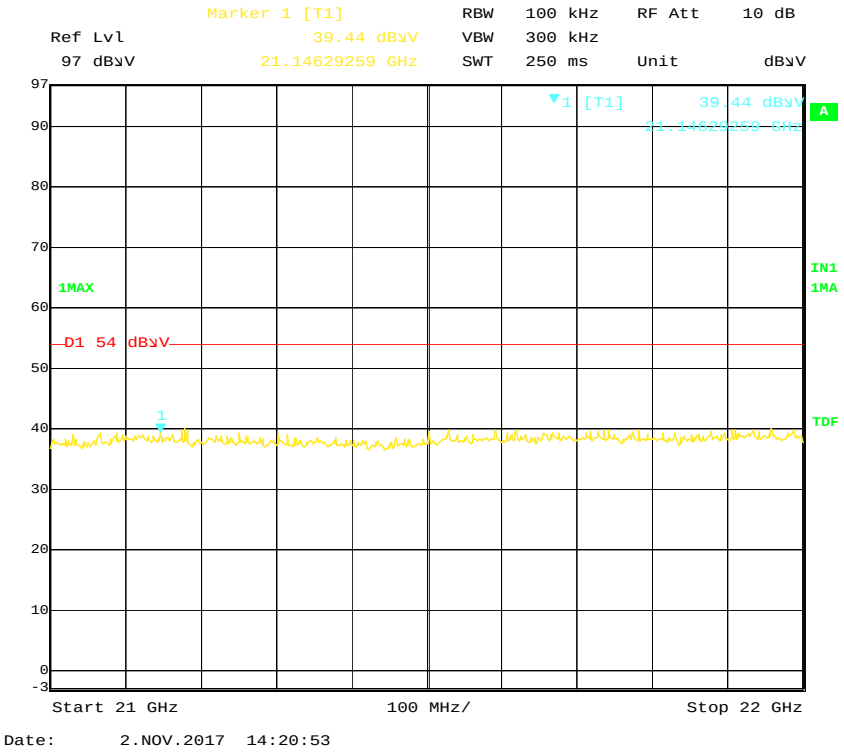
Mid Channel Spurious, 19-20 GHz



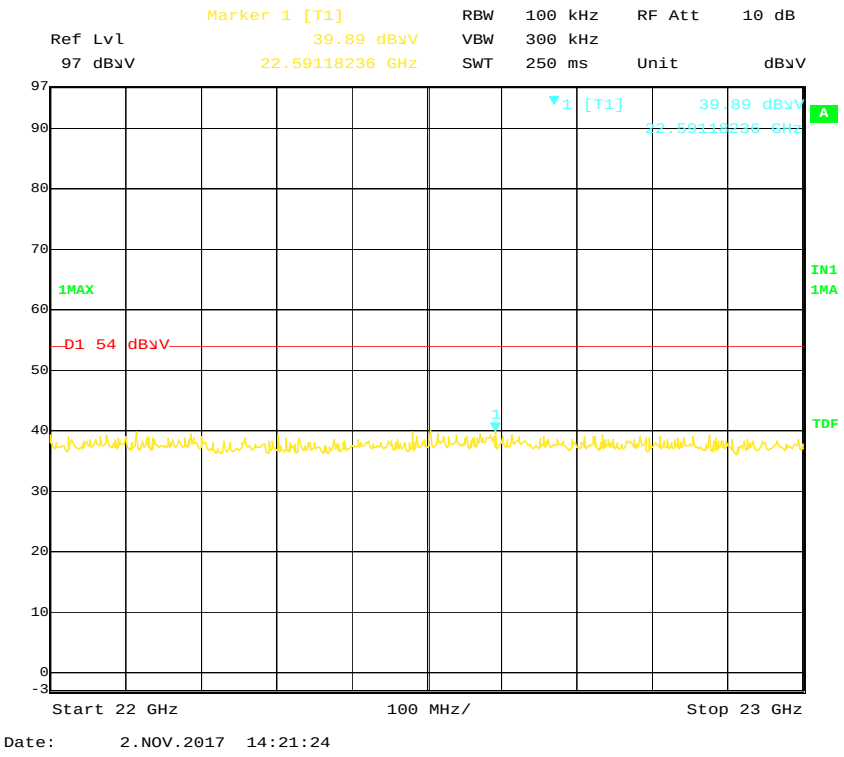
Mid Channel Spurious, 20-21 GHz



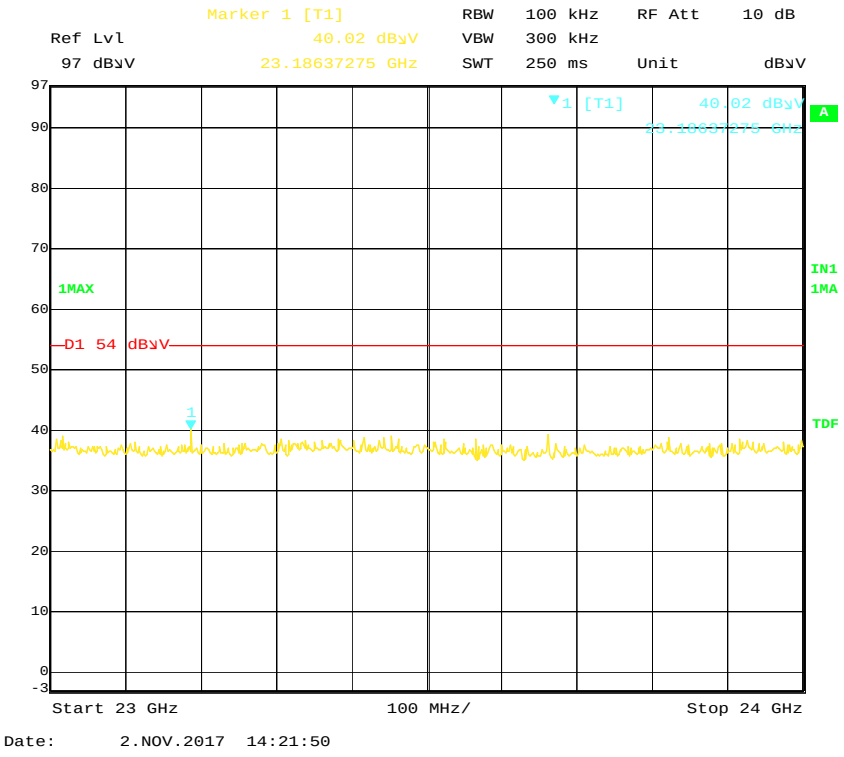
Mid Channel Spurious, 21-22 GHz



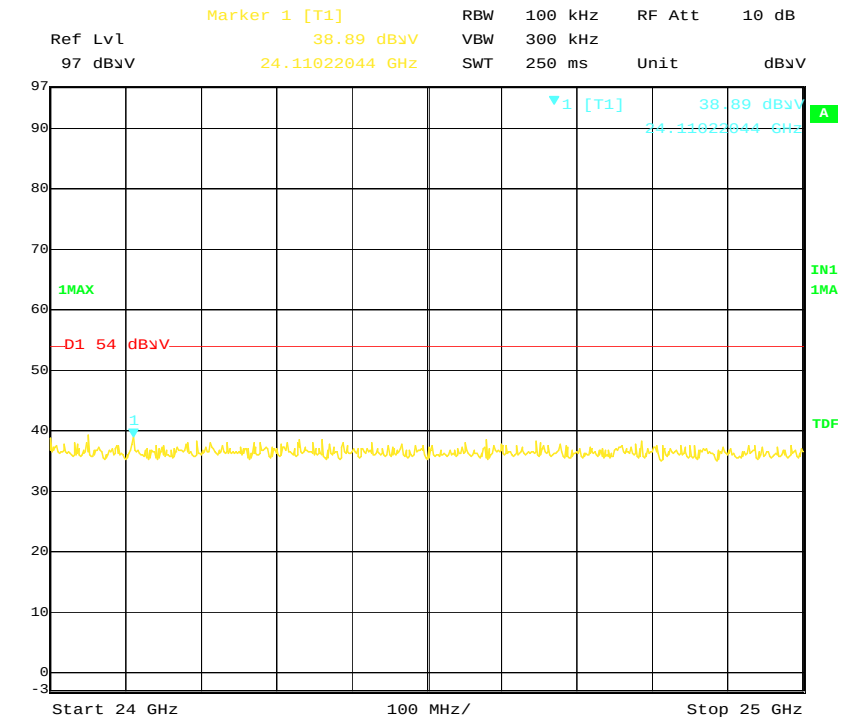
Mid Channel Spurious, 22-23 GHz



Mid Channel Spurious, 23-24 GHz



Mid Channel Spurious, 24-25 GHz



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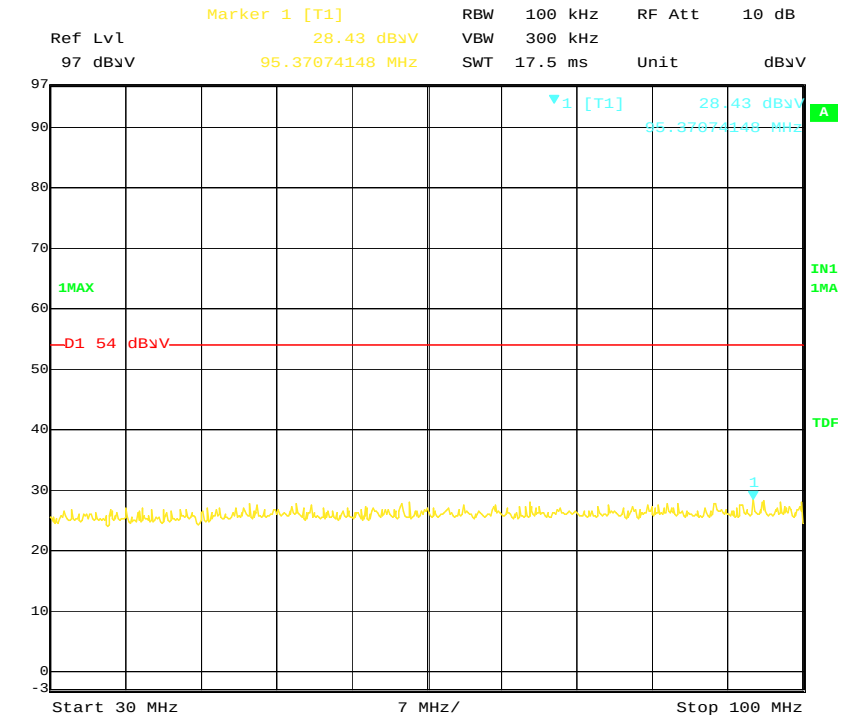
High Channel Spurious, 30-100 MHz



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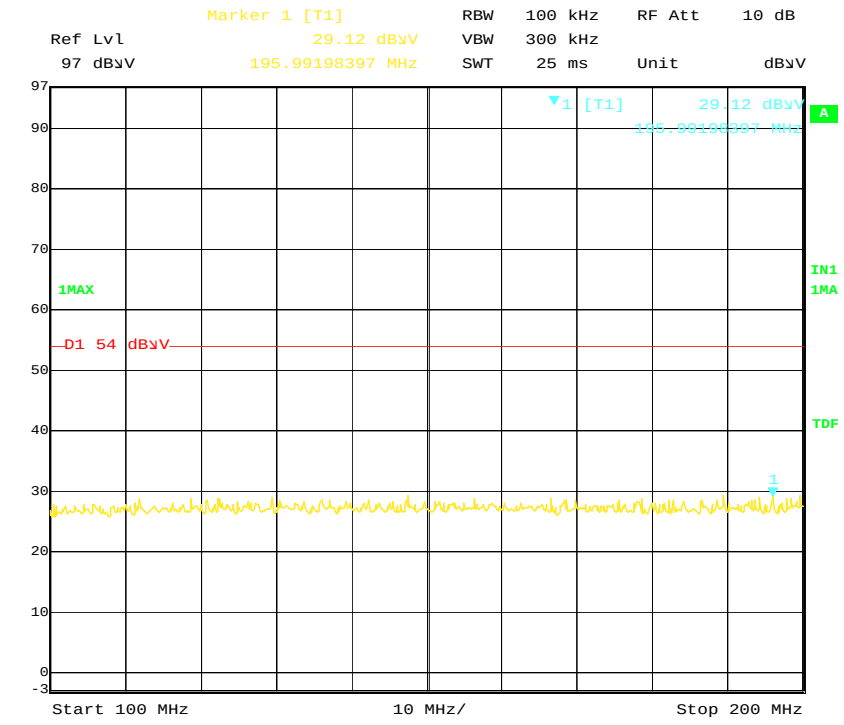
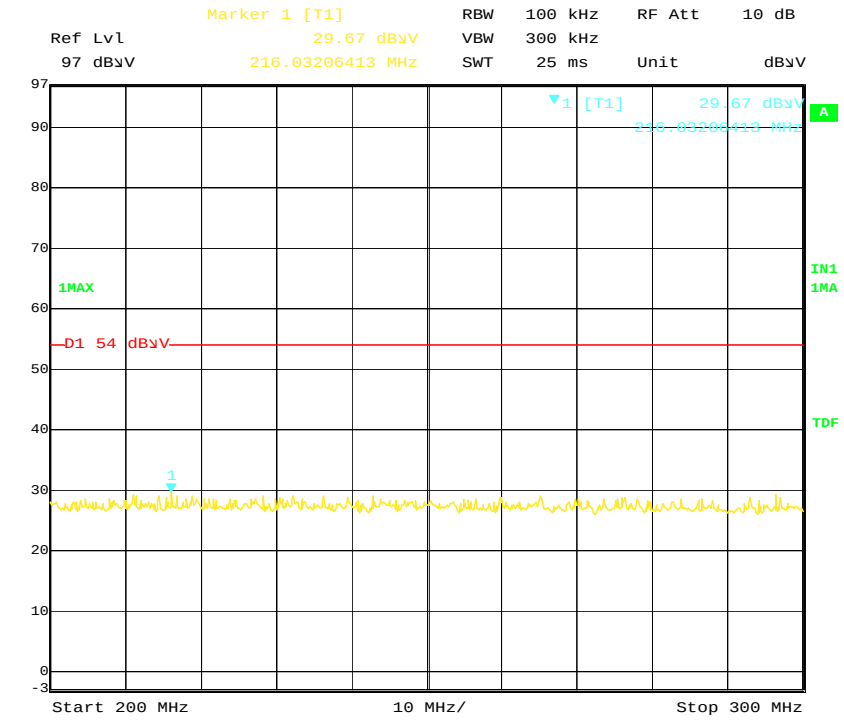
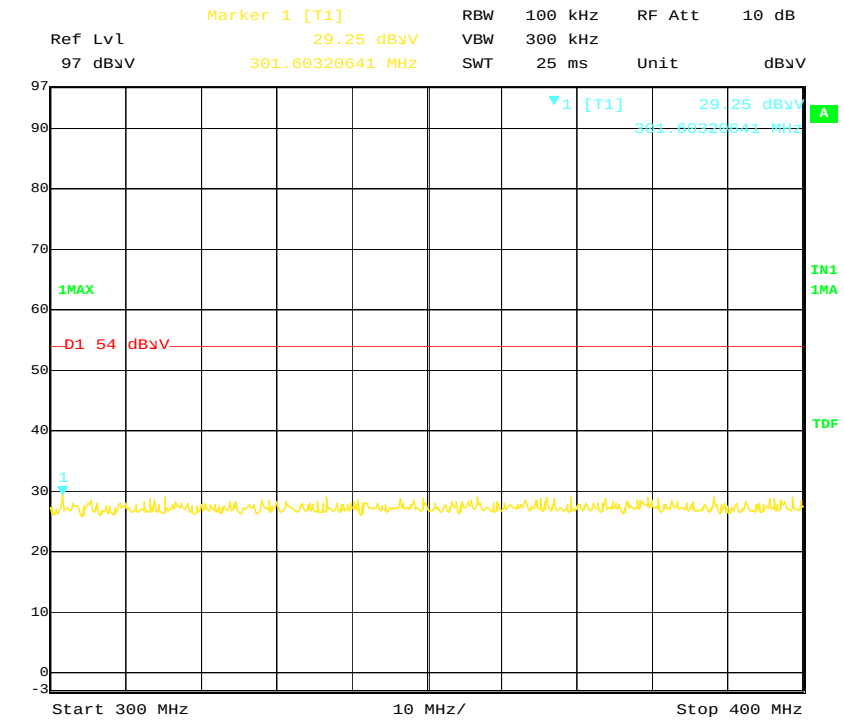
High Channel Spurious, 100-200 MHz



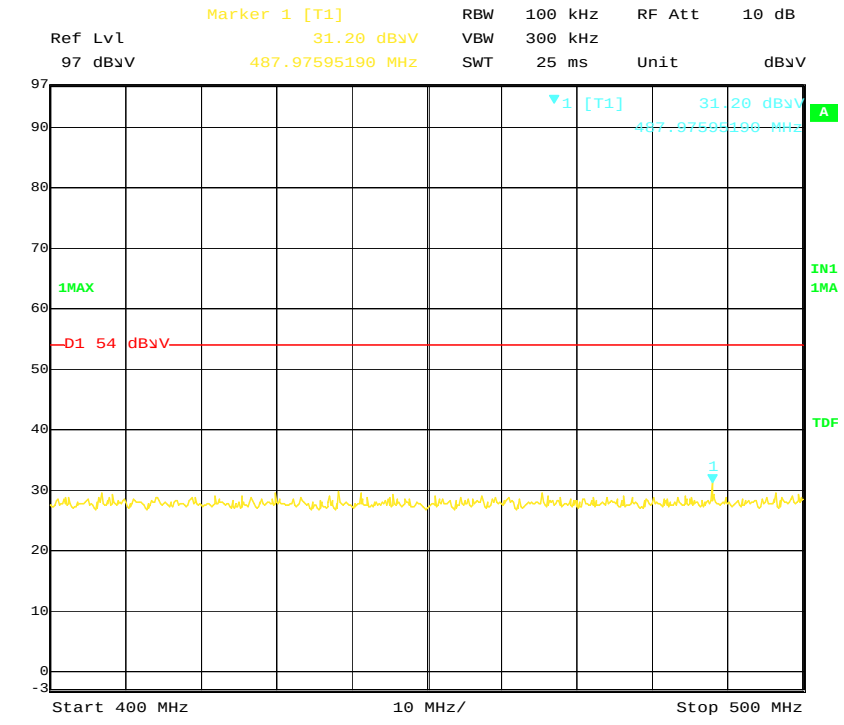
High Channel Spurious, 200-300 MHz



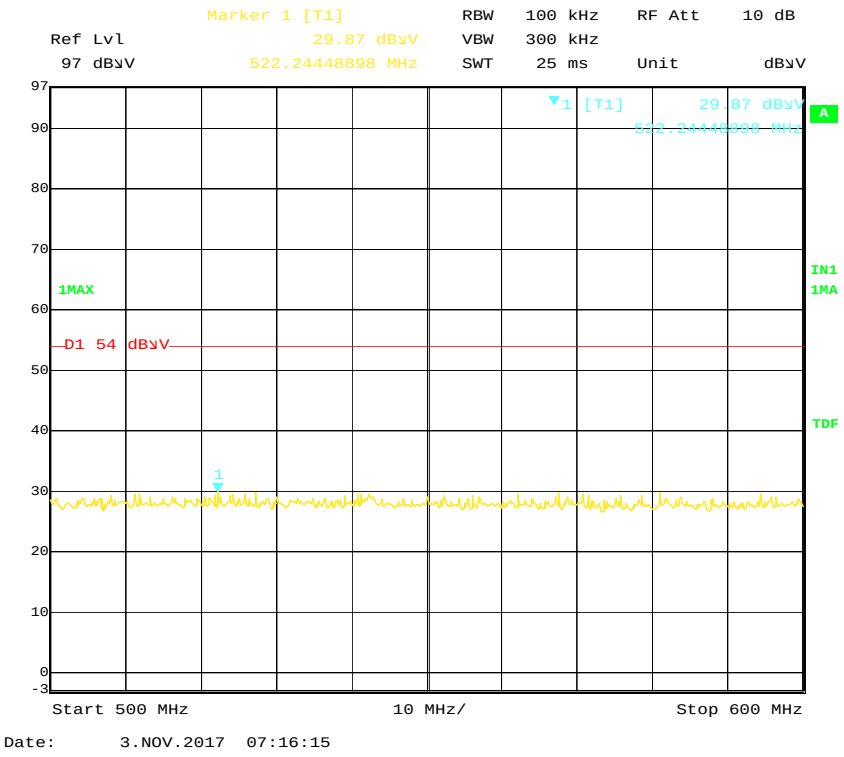
High Channel Spurious, 300-400 MHz



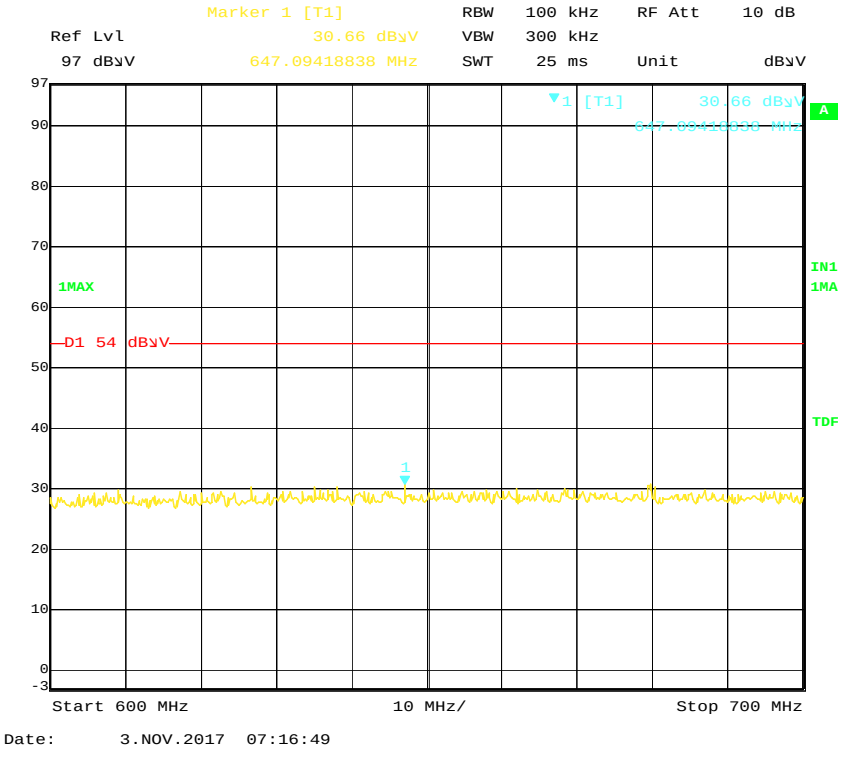
High Channel Spurious, 400-500 MHz



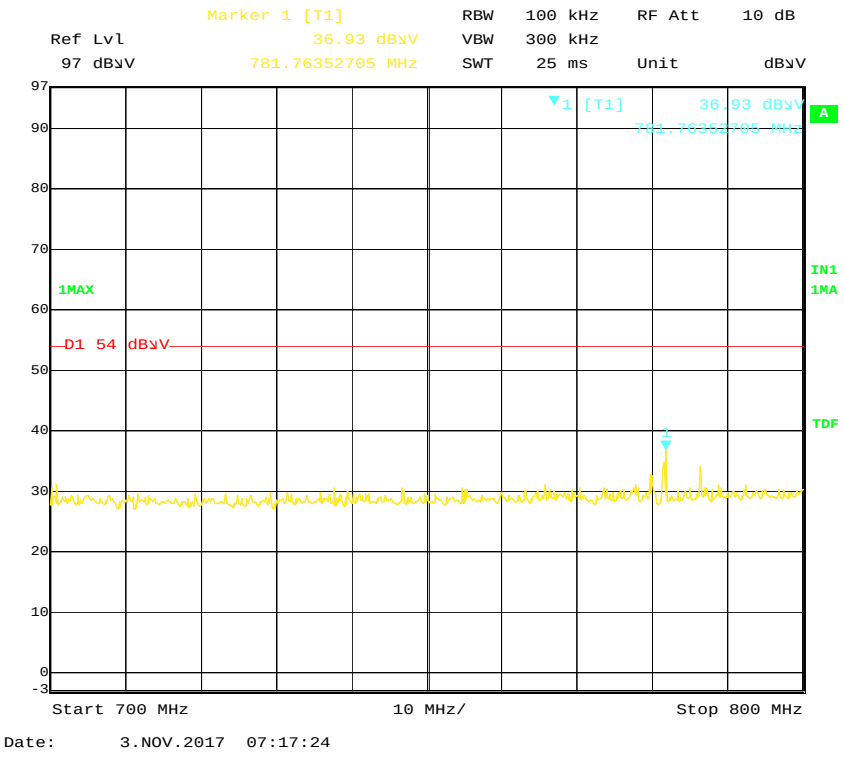
High Channel Spurious, 500-600 MHz



High Channel Spurious, 600-700 MHz



High Channel Spurious, 700-800 MHz



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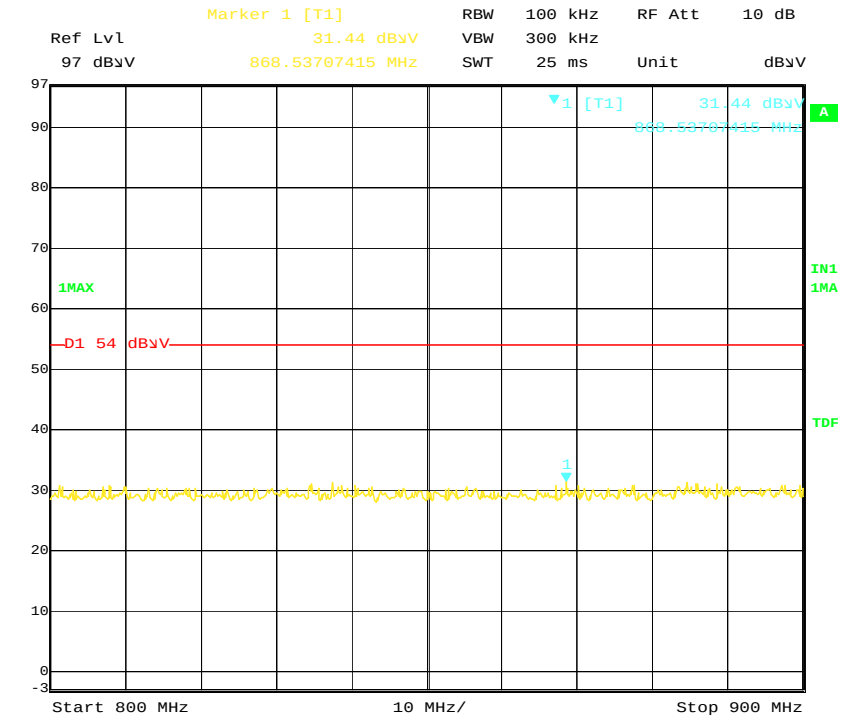
High Channel Spurious, 800-900 MHz



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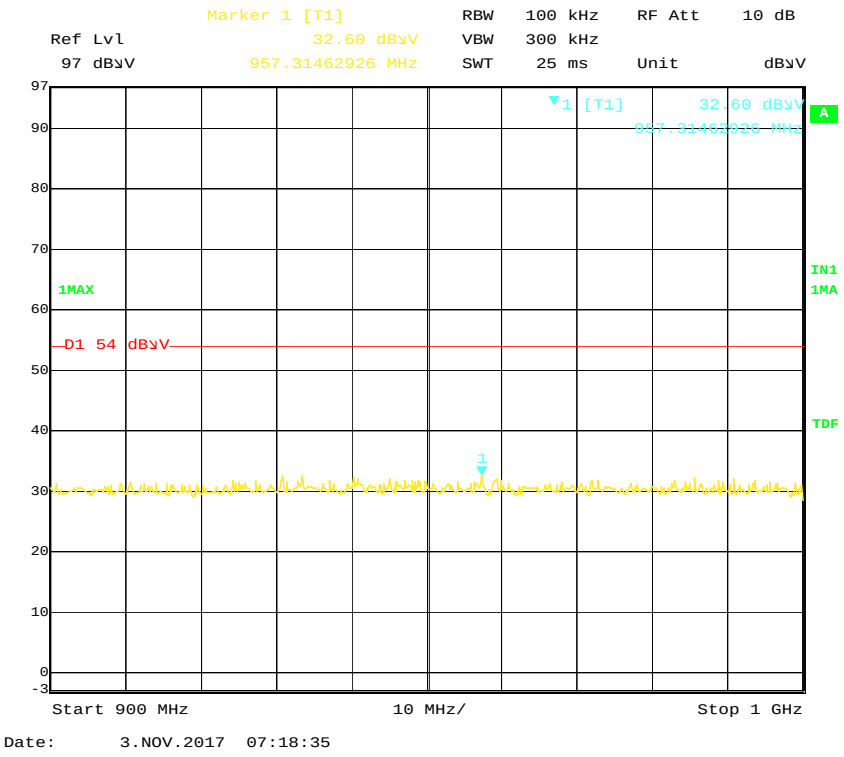
High Channel Spurious, 900-1000 MHz



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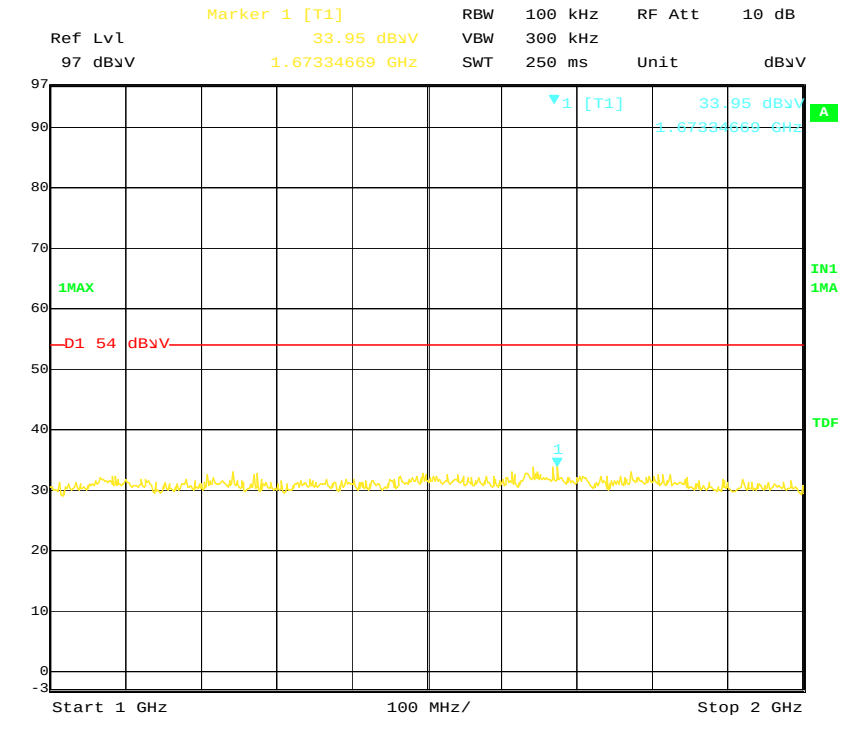
High Channel Spurious, 1-2 GHz



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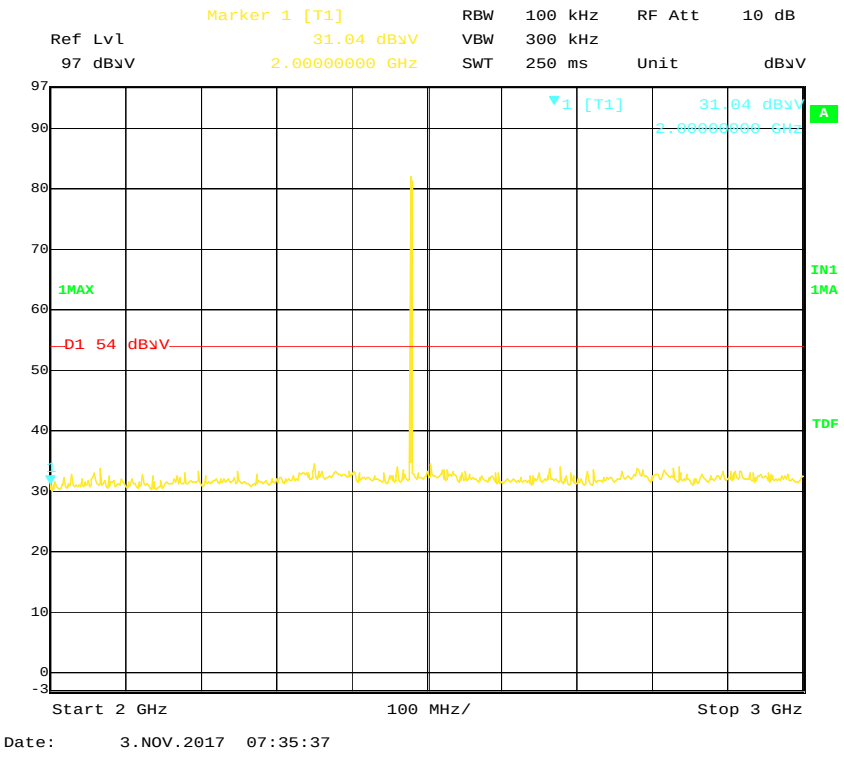
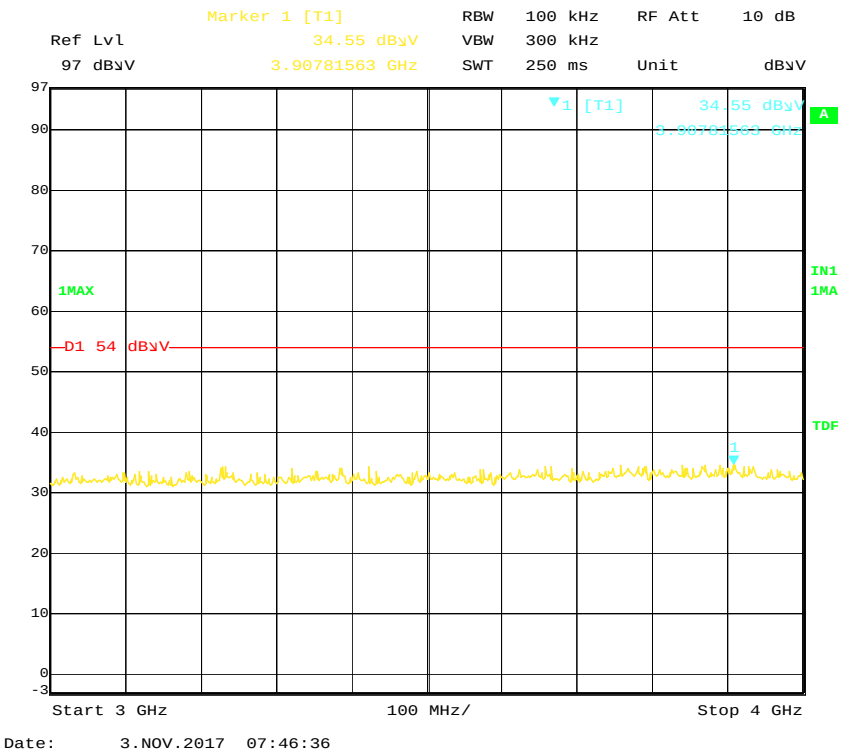
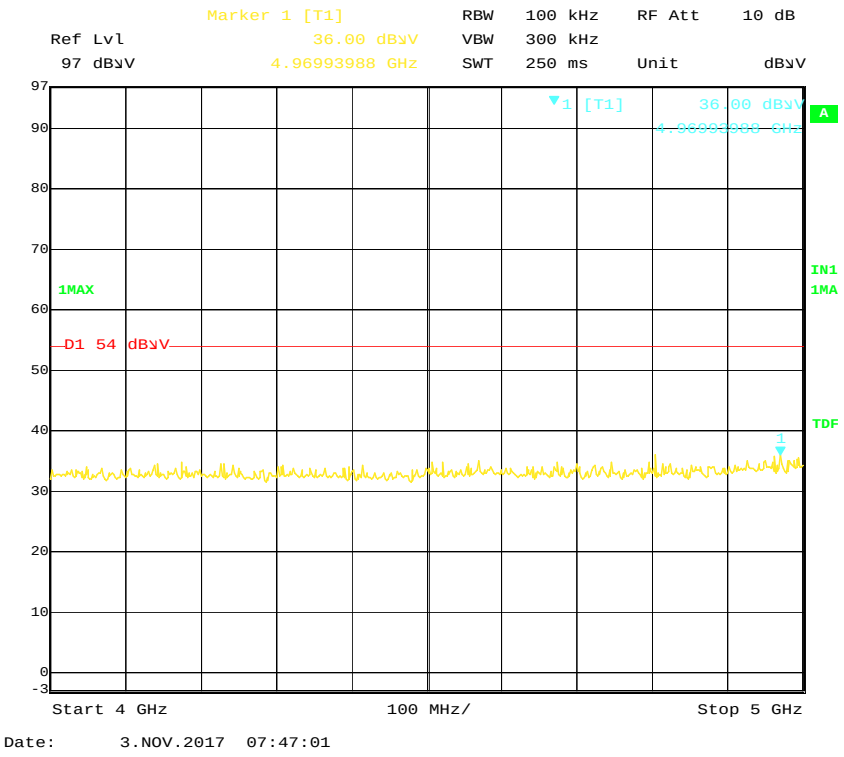
High Channel Spurious, 2-3 GHz



High Channel Spurious, 3-4 GHz



High Channel Spurious, 4-5 GHz



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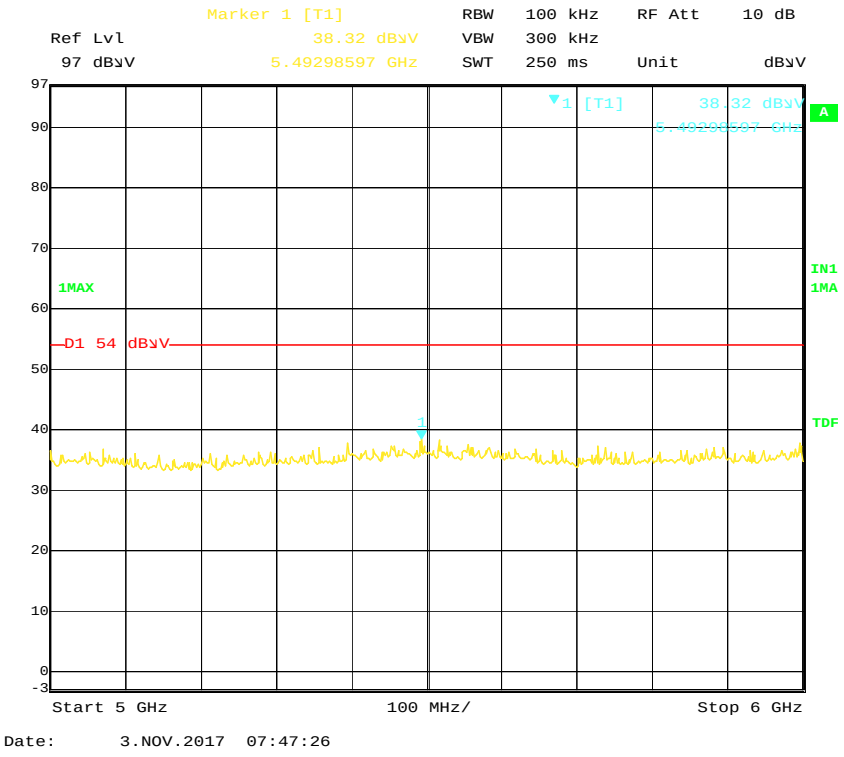
High Channel Spurious, 5-6 GHz



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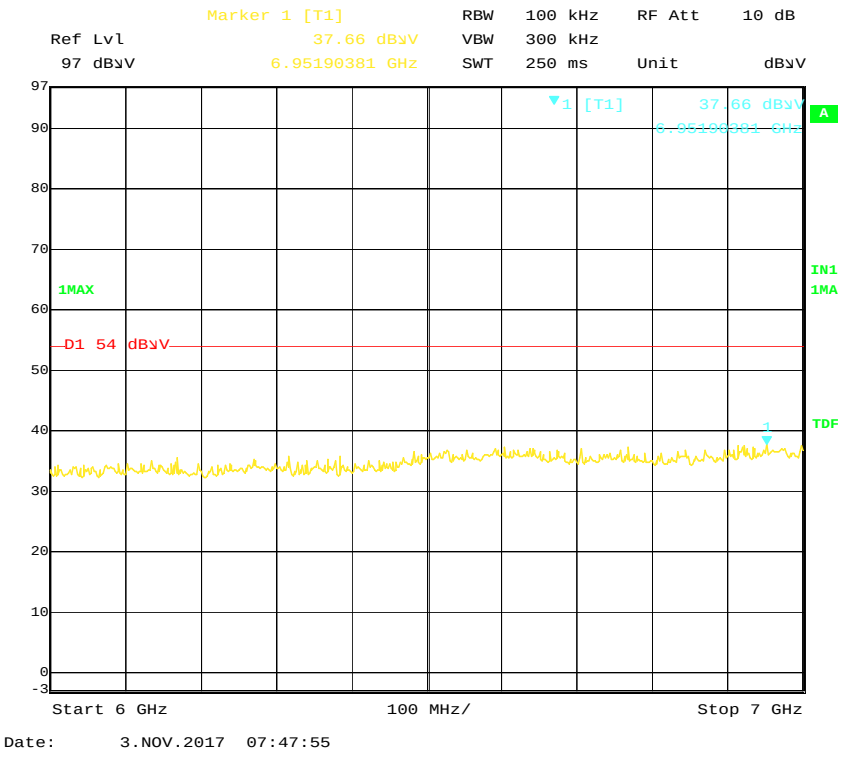
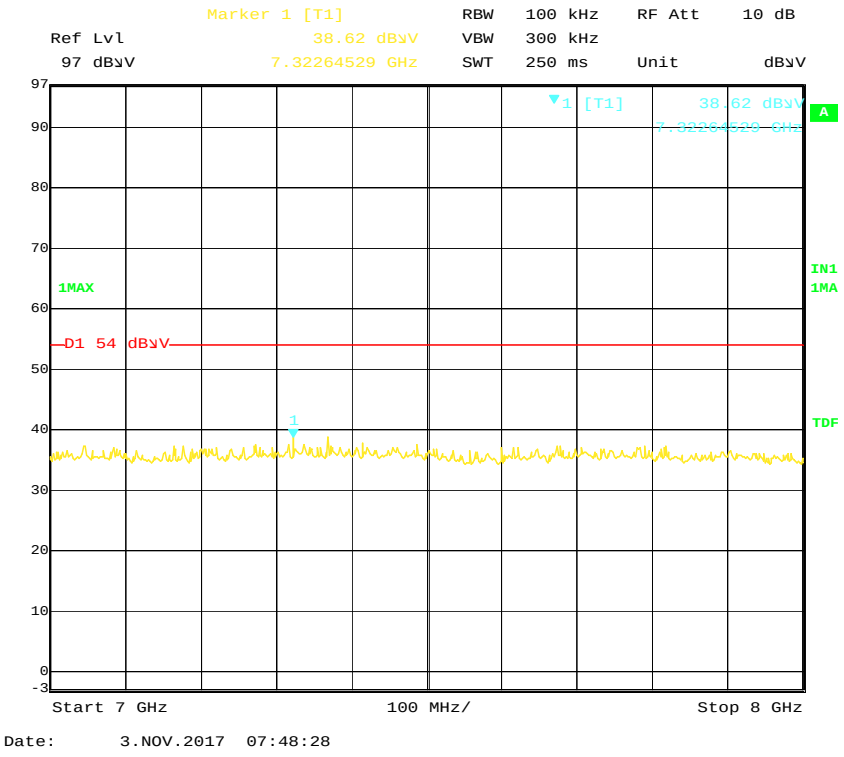
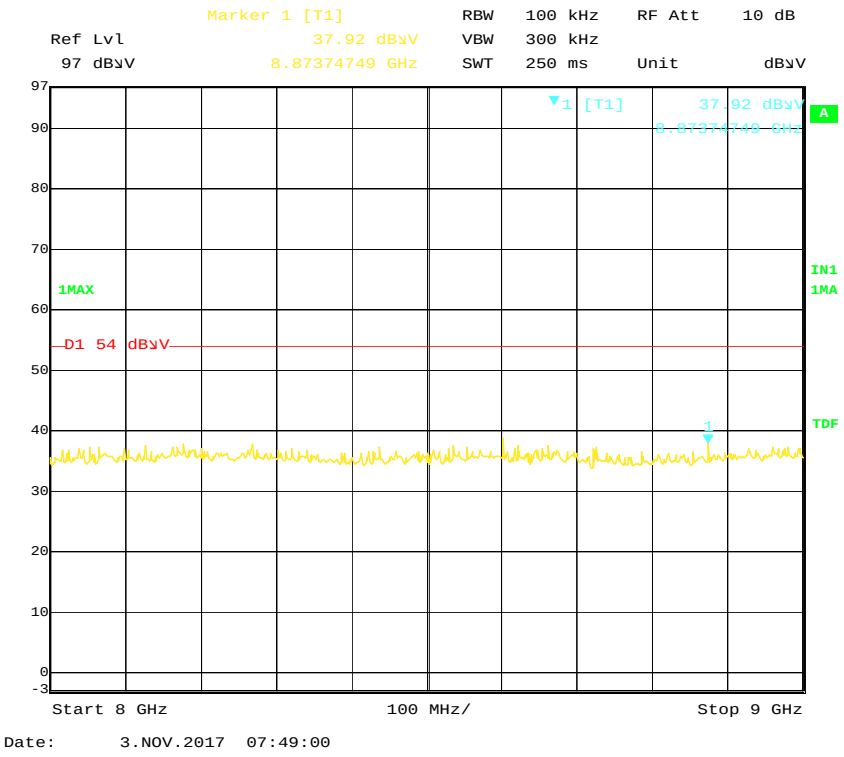
High Channel Spurious, 6-7 GHz



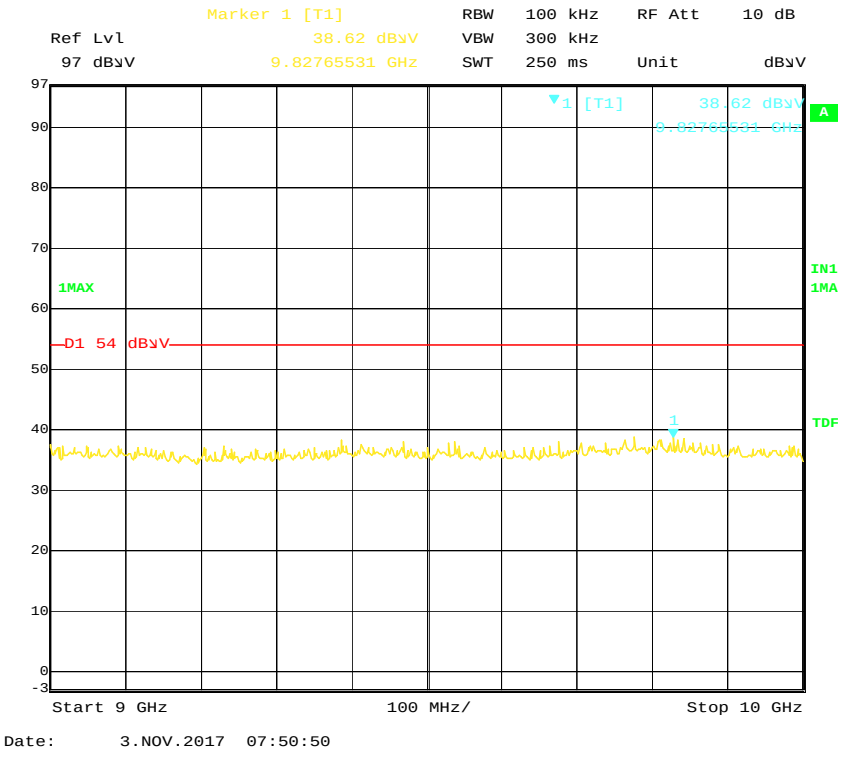
High Channel Spurious, 7-8 GHz



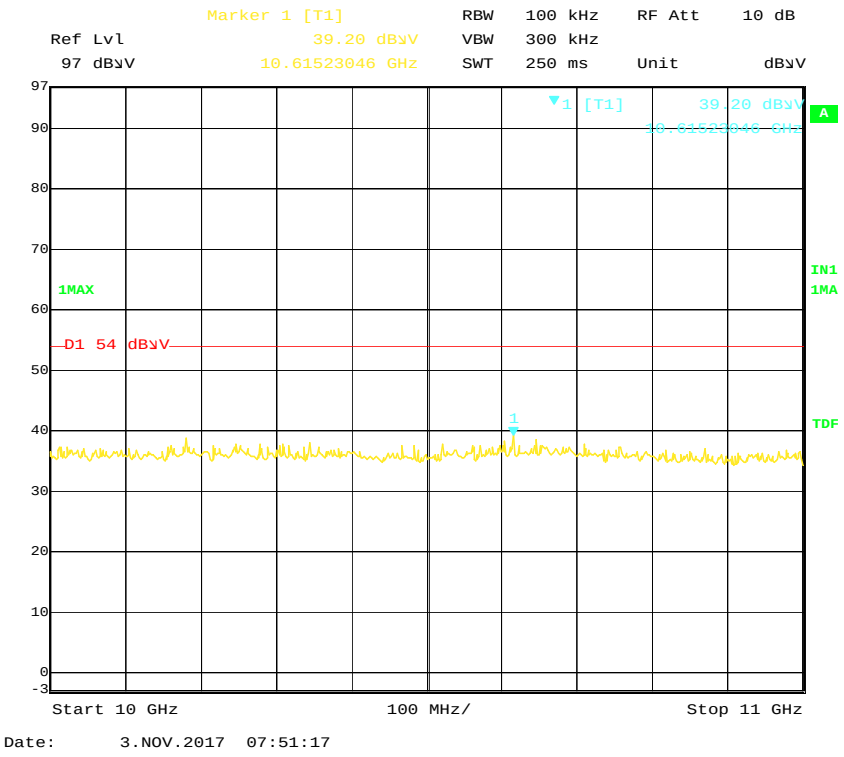
High Channel Spurious, 8-9 GHz



High Channel Spurious, 9-10 GHz



High Channel Spurious, 10-11 GHz



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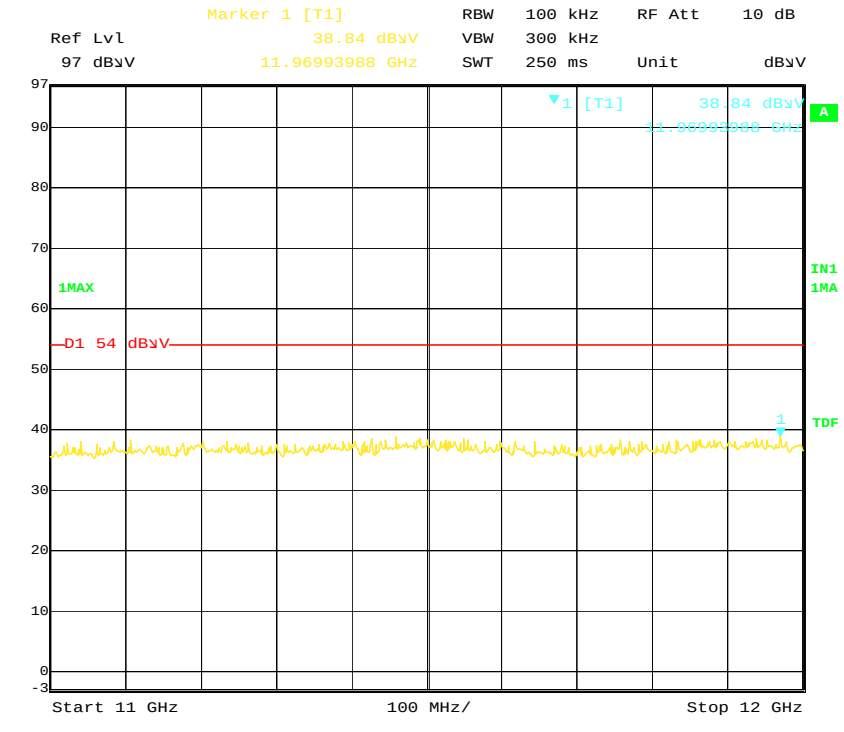
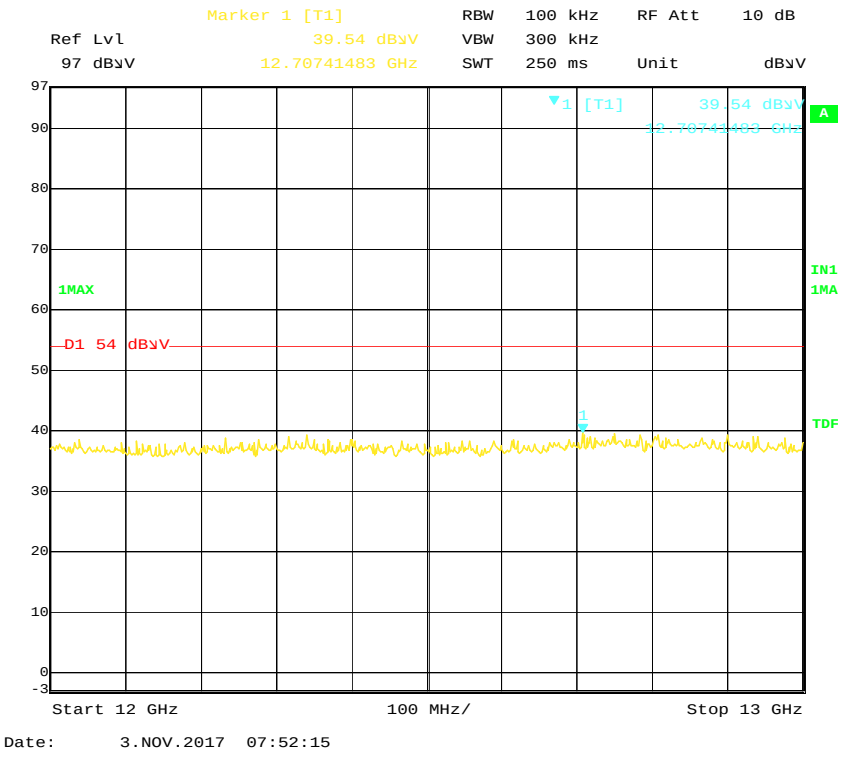
High Channel Spurious, 11-12 GHz

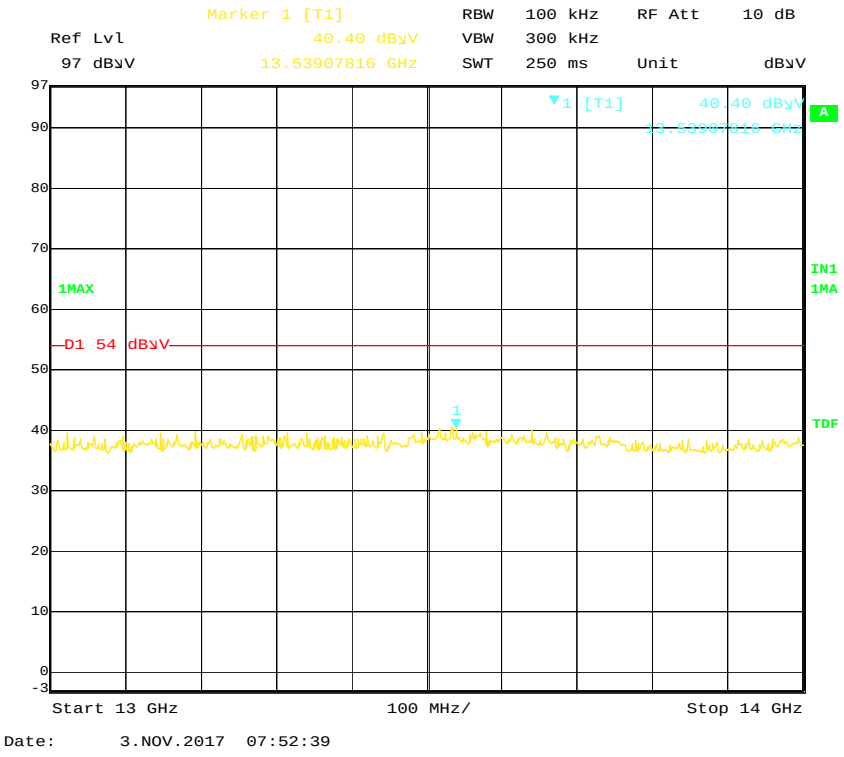


Date: 3.NOV.2017 07:51:46

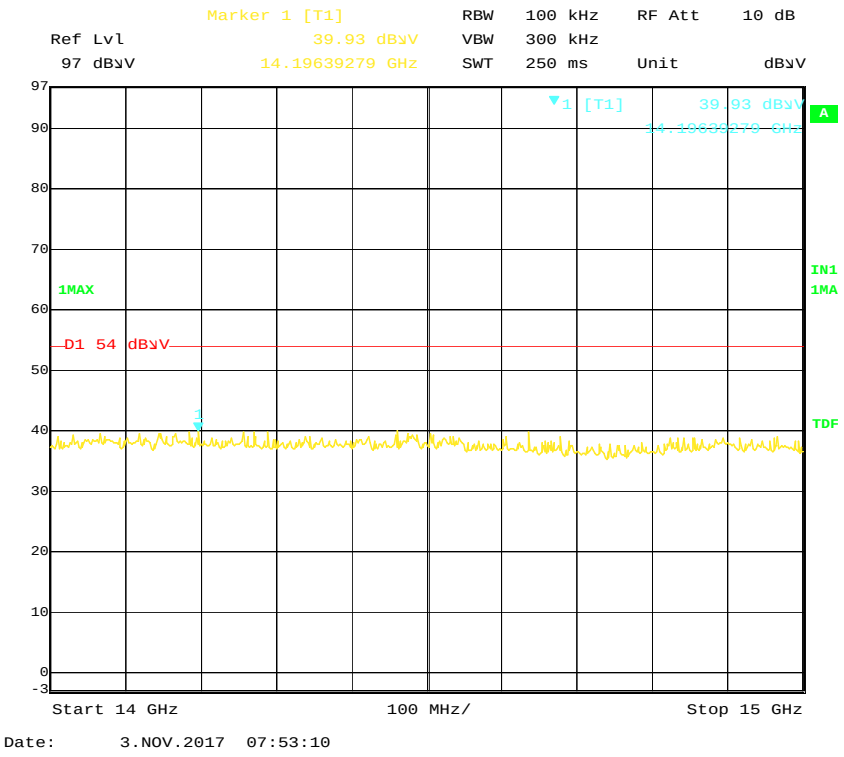
High Channel Spurious, 12-13 GHz



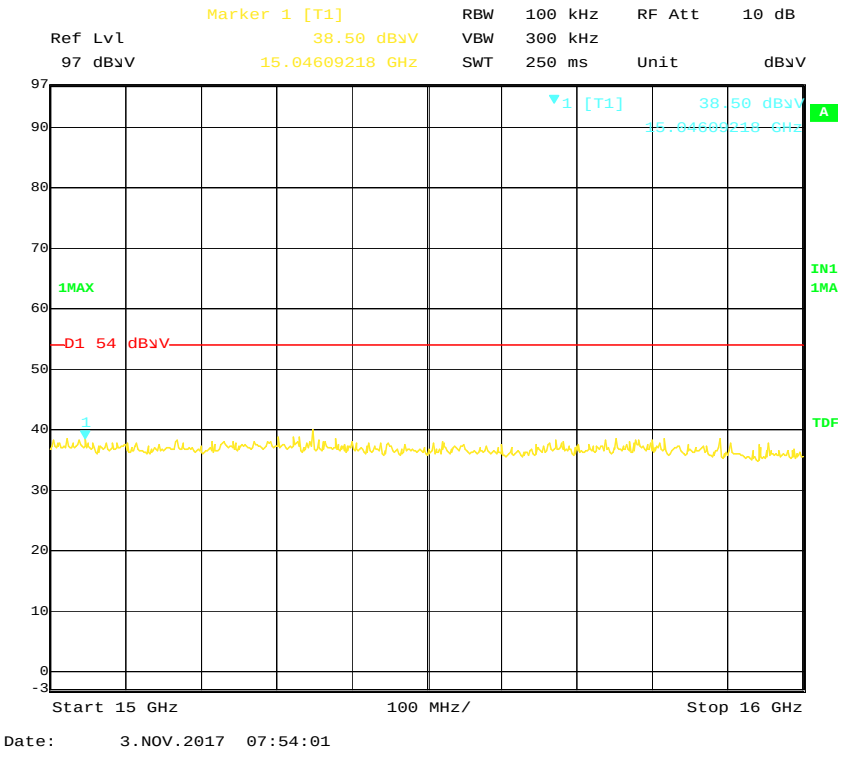
High Channel Spurious, 13-14 GHz



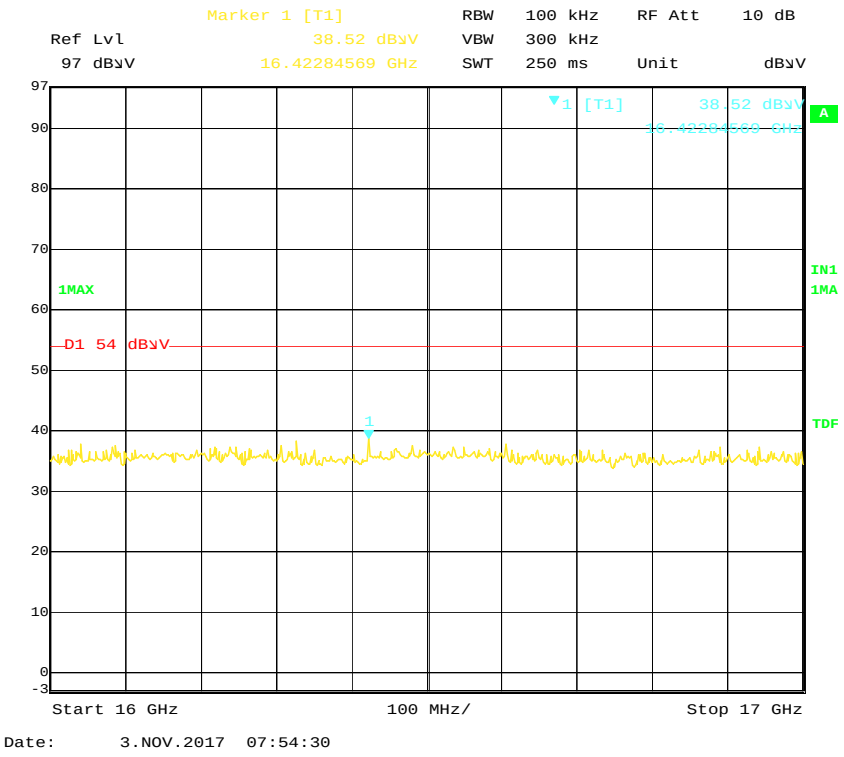
High Channel Spurious, 14-15 GHz



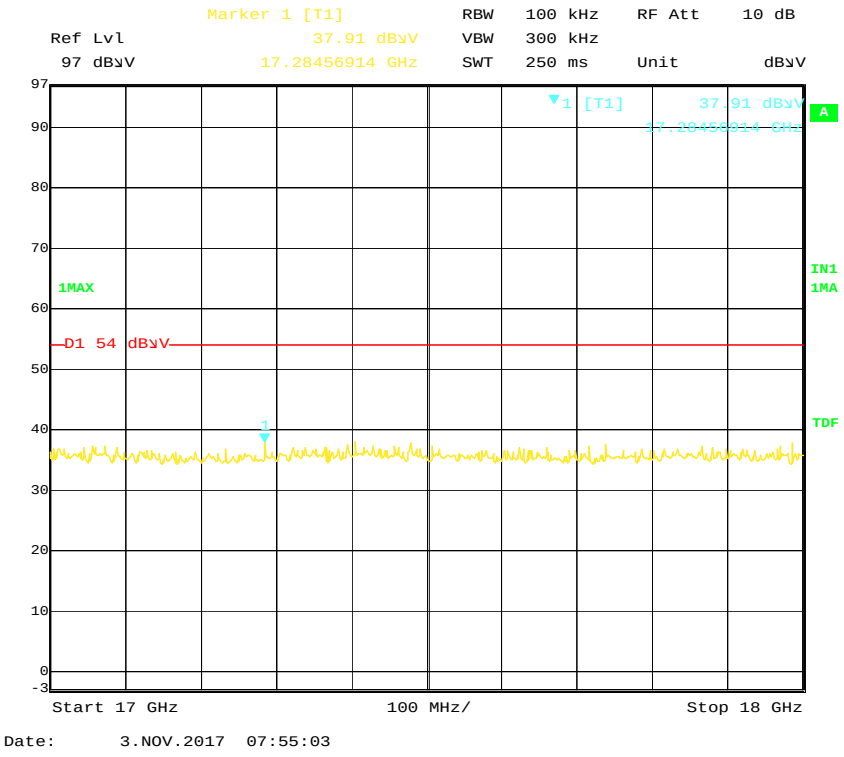
High Channel Spurious, 15-16 GHz



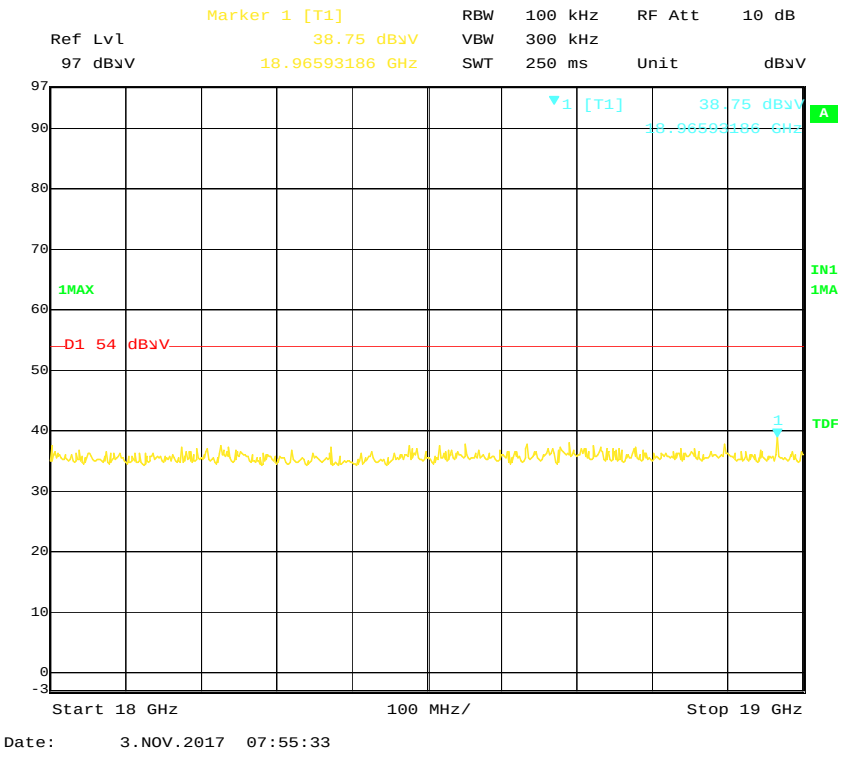
High Channel Spurious, 16-17 GHz



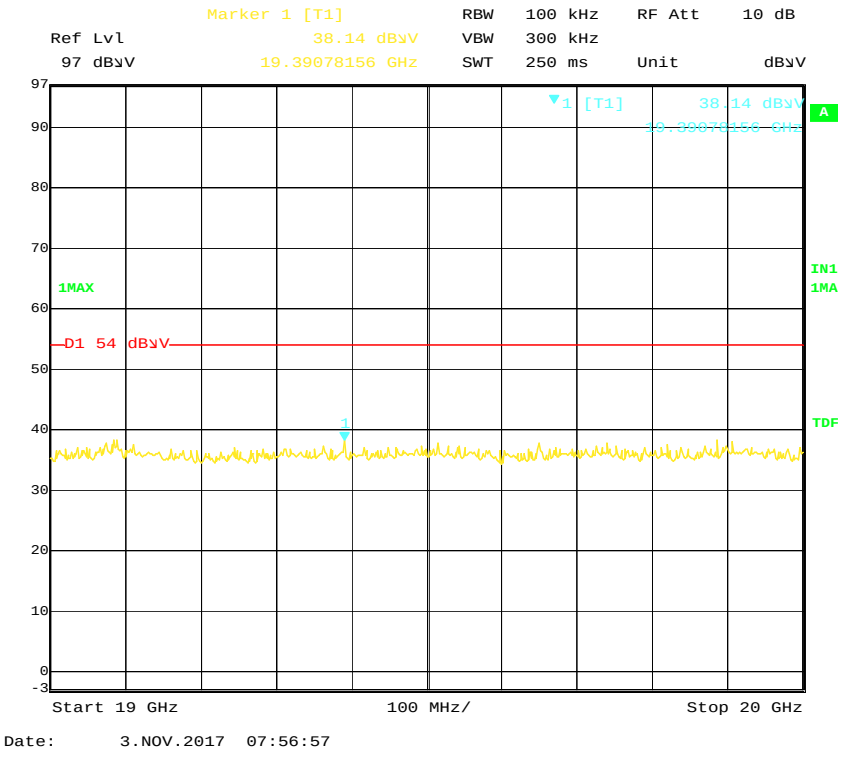
High Channel Spurious, 17-18 GHz



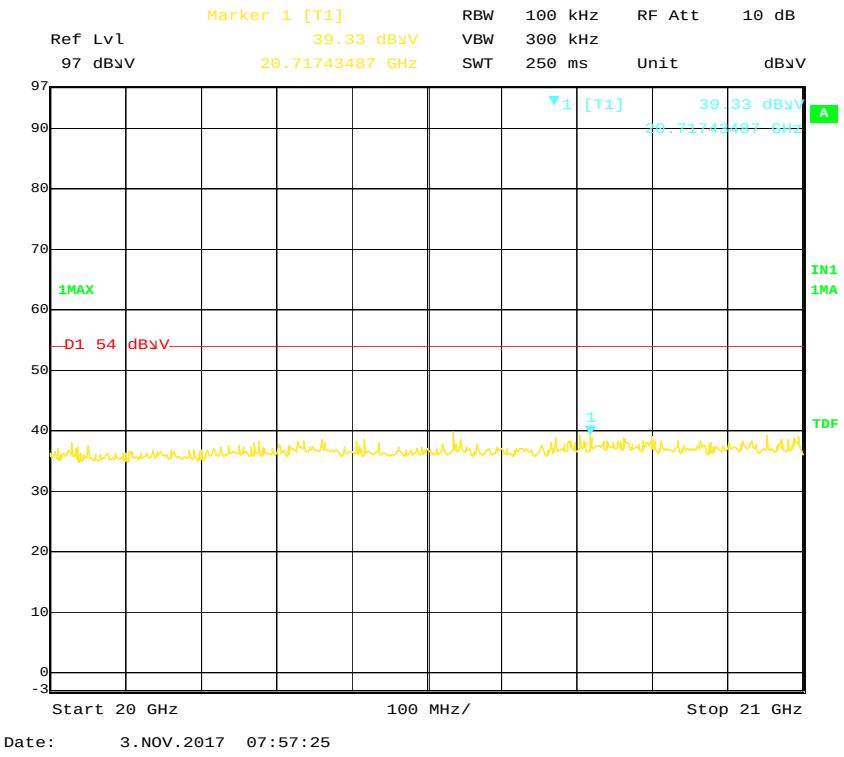
High Channel Spurious, 18-19 GHz



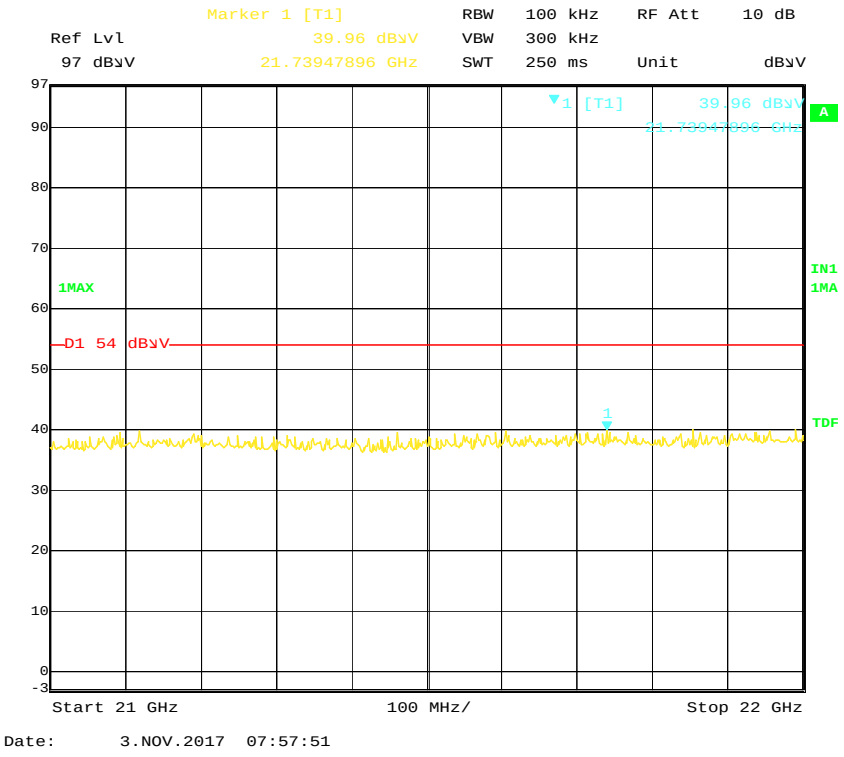
High Channel Spurious, 19-20 GHz



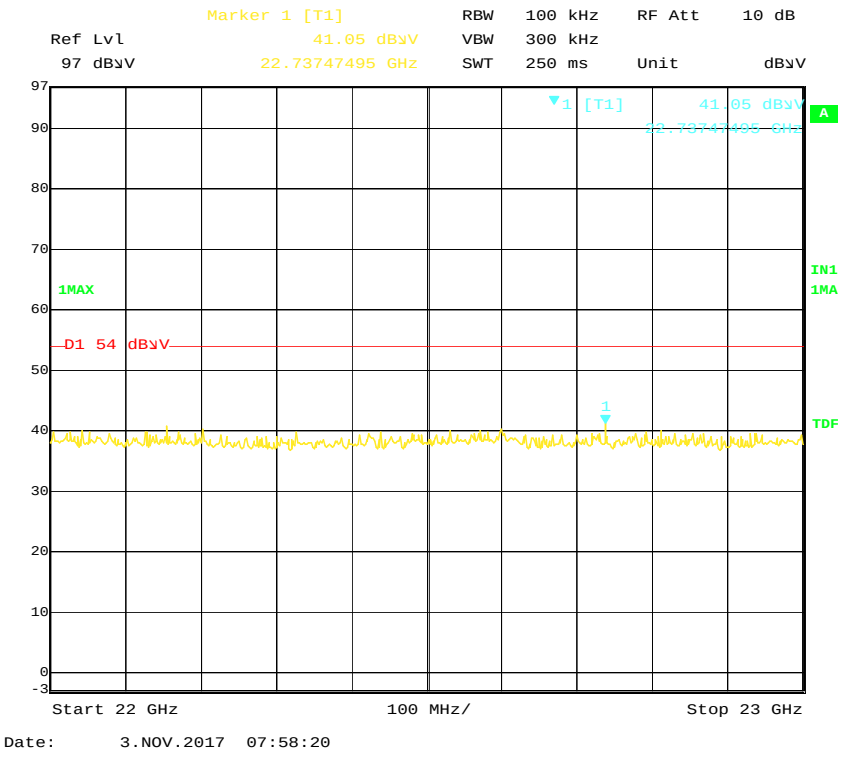
High Channel Spurious, 20-21 GHz



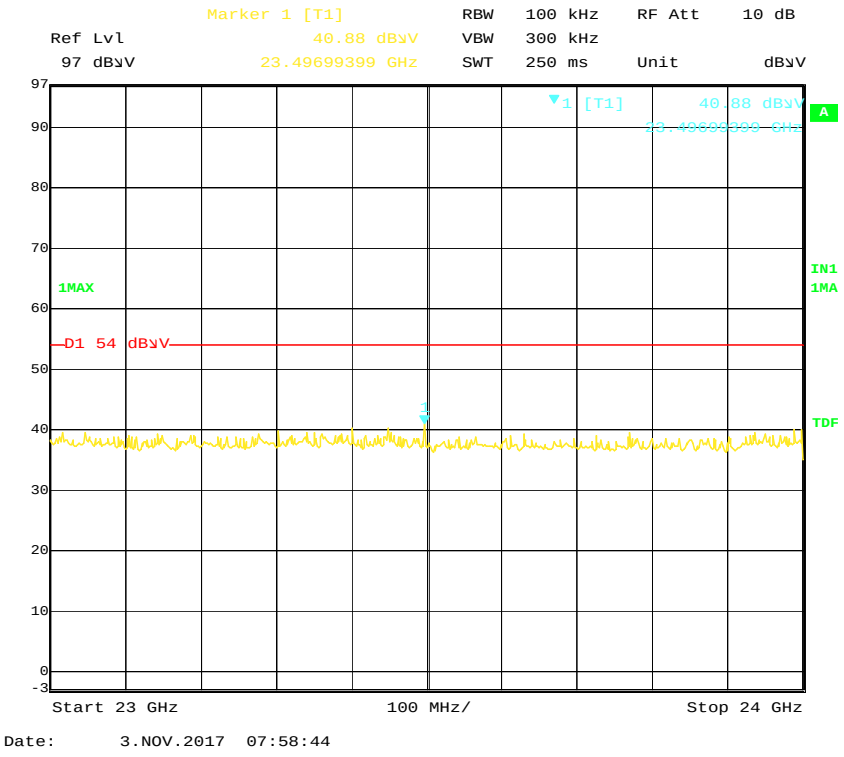
High Channel Spurious, 21-22 GHz



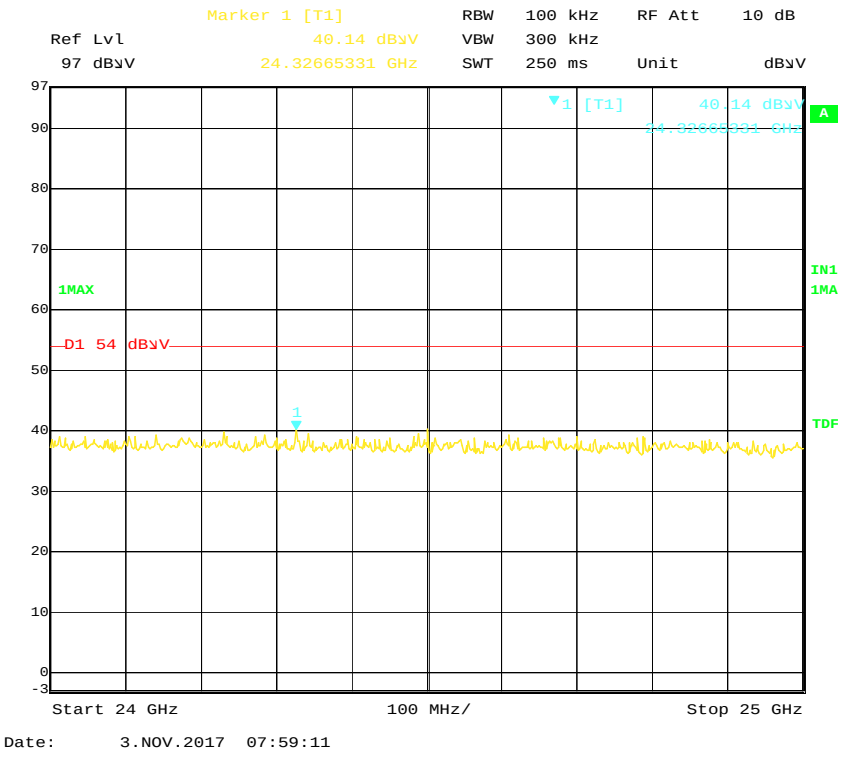
High Channel Spurious, 22-23 GHz



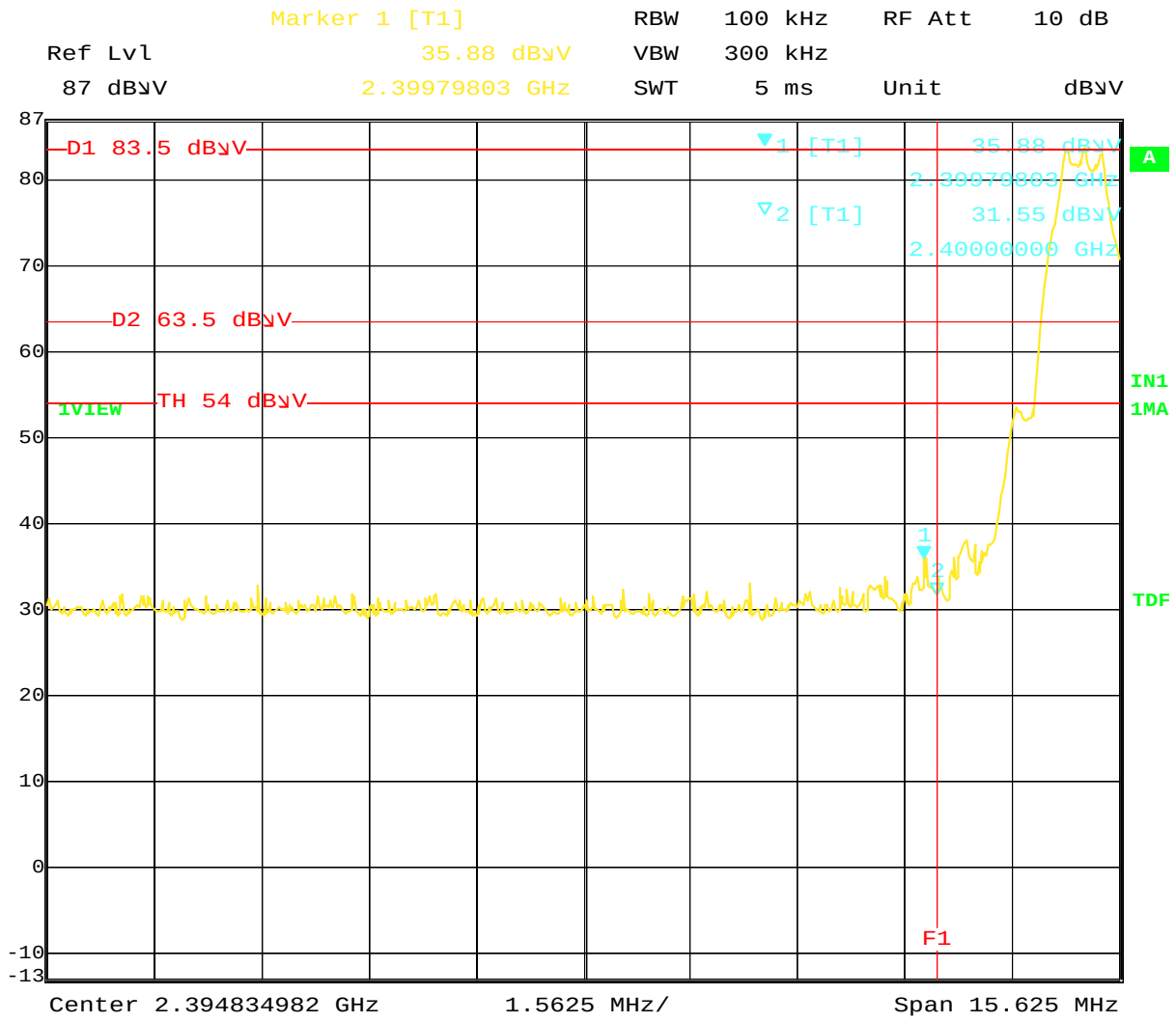
High Channel Spurious, 23-24 GHz



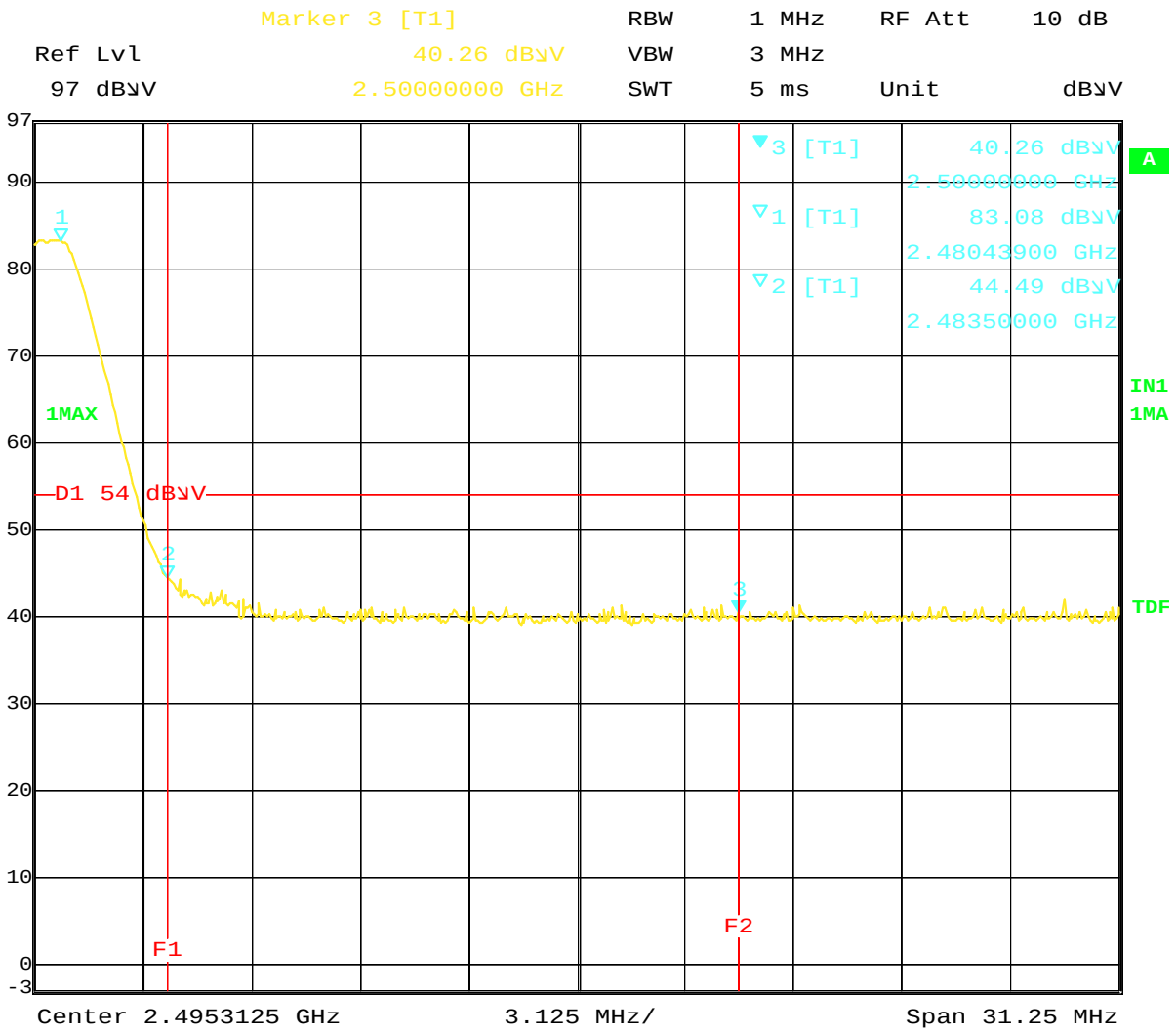
High Channel Spurious, 24-25 GHz



Lower Bandedge



Upper Band-edge



Test Personnel:	Kouma Sinn KPS	Test Date:	11/02/2017, 11/03/2017
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15.247, RSS-247	Limit Applied:	See report section 9.3
Input Voltage:	3VDC (Coin Battery)	Ambient Temperature:	22, 21 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**N/A**	Relative Humidity:	44, 52 %
		Atmospheric Pressure:	1015, 1001 mbars

Deviations, Additions, or Exclusions: None

10 Transmitter Spurious Emissions and Restricted-band band-edge

10.1 Method

Tests are performed in accordance with FCC 15.247, FCC 15.209, FCC 15.209, RSS-247, ANSI C63.4:2014, and ANSI C63.10:2013.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

Alternately, when BAT-EMC Emission Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. The “Correction” includes Antenna Factor, Preamp, and Cable Loss. These are already accounted for in the “Level” column.

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003'	Weather Station	Davis Instruments	7400	PE80529A39A	11/28/2016	11/28/2017
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/15/2017	03/15/2018
145-410	Cables 145-420 145-421 145-422 145-406	Huber + Suhner	10m Track A Cables	multiple	07/25/2017	07/25/2018
PRE10'	30-1000MHz pre-amp	ITS	PRE10	PRE10	12/16/2016	12/16/2017
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	05/02/2017	05/02/2018
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	06/03/2017	06/03/2018
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	02/13/2017	02/13/2018
145-416'	Cables 145-420 145-423 145-425 145-408	Huber + Suhner	3m Track B cables	multiple	07/25/2017	07/25/2018
REA004'	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	02/17/2017	02/17/2018
EMC04'	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	09/21/2017	09/21/2018
PRE8'	PREAMPLFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	10/02/2017	10/02/2018
145108'	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	05/23/2017	05/23/2018
CBLHF2012 -5M-2'	5m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252676002	02/08/2017	02/08/2018
CBLHF2012 -2M-2'	2m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252675002	02/08/2017	02/08/2018

Software Utilized:

Name	Manufacturer	Version
BAT-EMC Emissions	Nexio	3.16.0.69

10.3 Results:

The sample tested was found to comply.

§15.209 Radiated emission limits; general requirements applied to all emissions.

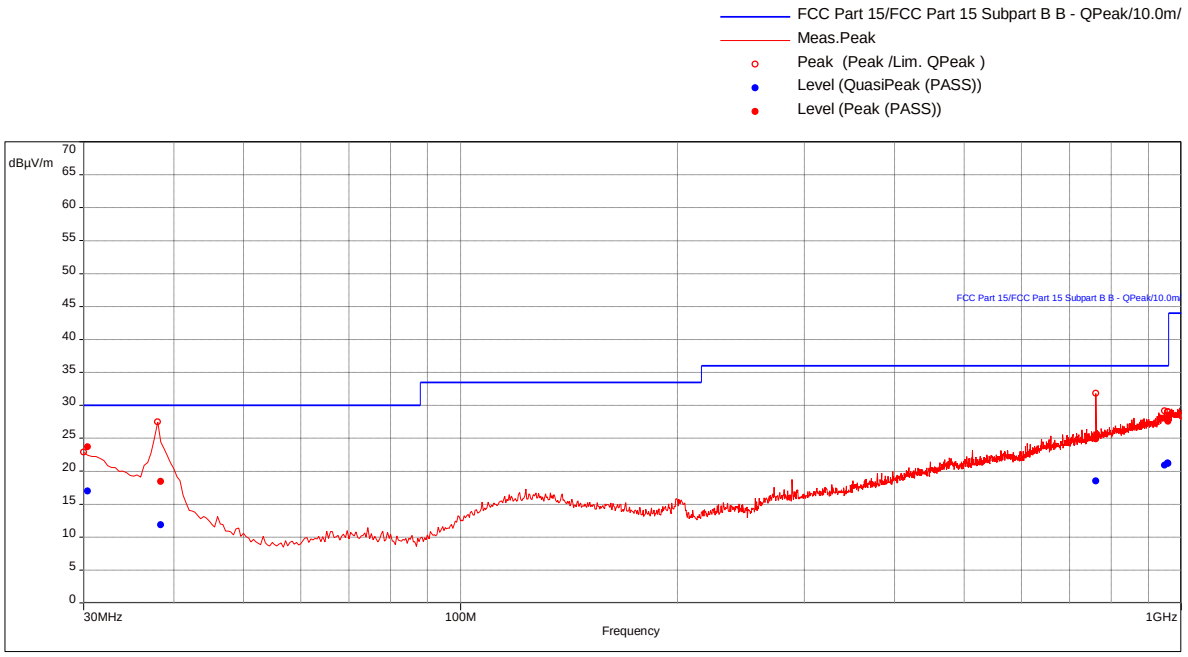
10.4 Plots/Data:

Transmit at Low Channel: 2402 MHz, 30-1000 MHz, X-axis

Test Information:

Date and Time	11/2/2017 5:20:28 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 30-1000MHz_Tx Lo Ch_X-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

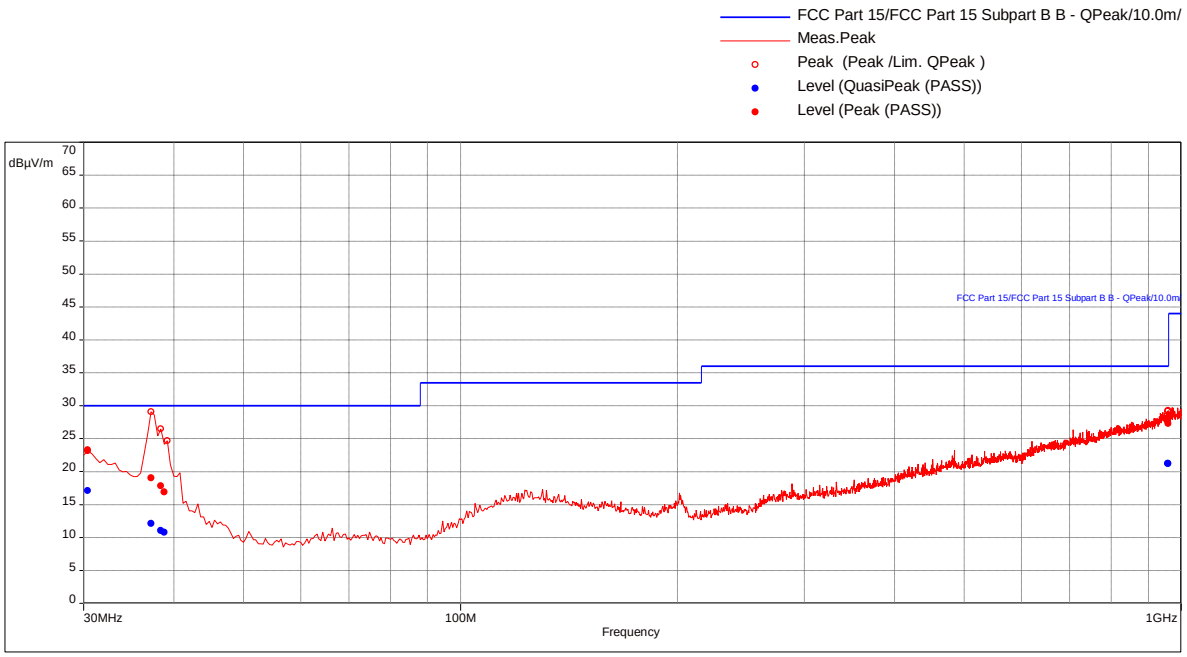
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
30.55263158	17.00	30.00	-13.00	249.00	1.86	Vertical	120000.00	-12.63
38.31578947	11.87	30.00	-18.13	63.00	1.57	Vertical	120000.00	-18.54
761.1894737	18.53	36.00	-17.47	285.00	1.65	Vertical	120000.00	-8.58
948.5578947	20.91	36.00	-15.09	62.00	1.37	Horizontal	120000.00	-5.74
957.8421053	21.20	36.00	-14.80	31.00	1.85	Vertical	120000.00	-5.51
958.8842105	21.14	36.00	-14.86	86.00	2.86	Horizontal	120000.00	-5.51

Transmit at Low Channel: 2402 MHz, 30-1000 MHz, Y-axis

Test Information:

Date and Time	11/2/2017 6:23:15 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 30-1000MHz_Tx Lo Ch_Y-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

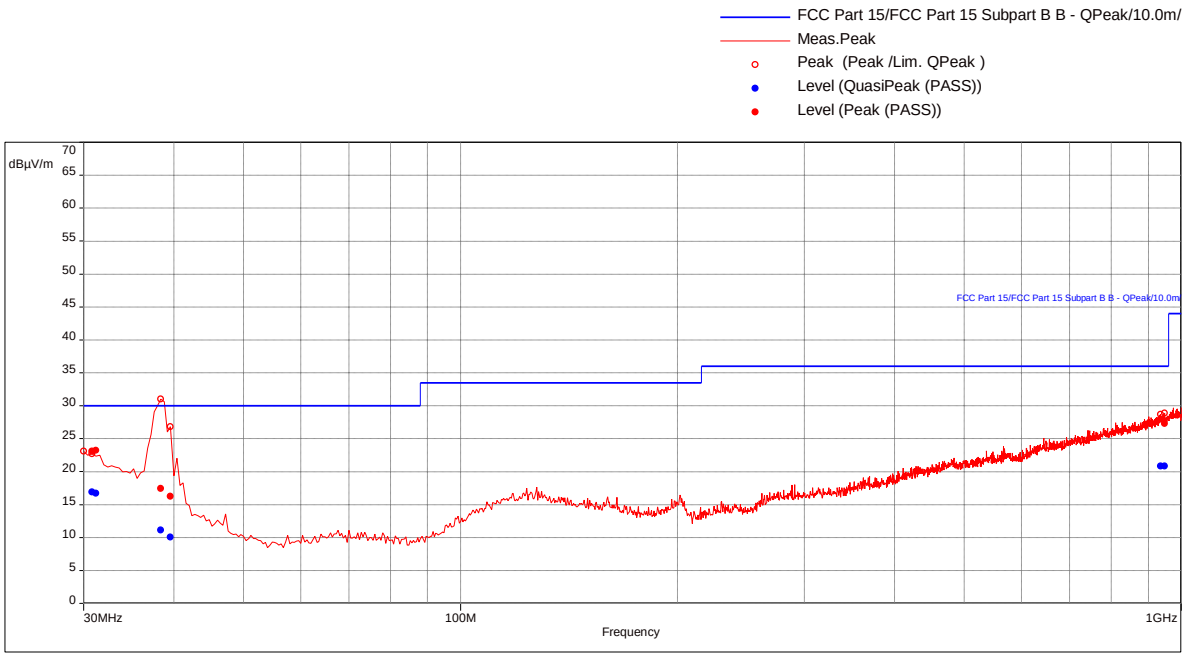
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
30.43157895	17.09	30.00	-12.91	249.00	2.79	Vertical	120000.00	-12.55
37.16842105	12.14	30.00	-17.86	22.00	3.71	Vertical	120000.00	-17.59
38.49473684	11.07	30.00	-18.93	12.00	2.84	Vertical	120000.00	-18.66
38.78947368	10.77	30.00	-19.23	17.00	2.71	Vertical	120000.00	-18.87
957.4105263	21.20	36.00	-14.80	22.00	1.50	Vertical	120000.00	-5.51
958.4947368	21.20	36.00	-14.80	209.00	2.29	Vertical	120000.00	-5.51

Transmit at Low Channel: 2402 MHz, 30-1000 MHz, Z-axis

Test Information:

Date and Time	11/2/2017 7:22:48 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 30-1000MHz_Tx Lo Ch_Z-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

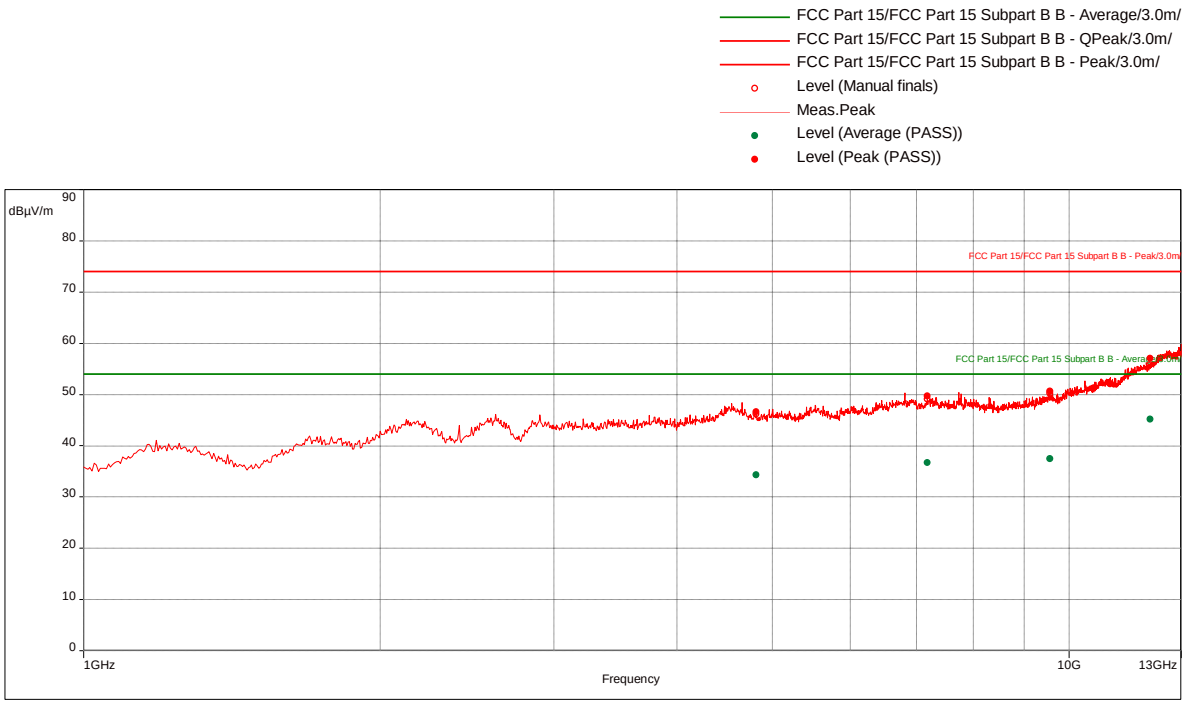
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
30.64736842	16.94	30.00	-13.06	250.00	3.68	Vertical	120000.00	-12.70
31.08421053	16.72	30.00	-13.28	287.00	3.20	Horizontal	120000.00	-13.02
38.52631579	11.09	30.00	-18.91	13.00	1.79	Vertical	120000.00	-18.69
39.6	10.07	30.00	-19.93	22.00	3.84	Vertical	120000.00	-19.42
935.9684211	20.82	36.00	-15.18	319.00	3.88	Vertical	120000.00	-5.89
948.2736842	20.84	36.00	-15.16	226.00	3.05	Vertical	120000.00	-5.74

Transmit at Low Channel: 2402 MHz, 1-25 GHz, X-axis

Test Information:

Date and Time	11/2/2017 9:54:12 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 1 to 13 GHz_Tx Lo Ch_X-axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4816.315789	46.61	74.00	-27.39	122.00	1.37	Horizontal	1000000.00	9.19
7179.473684	49.69	74.00	-24.31	58.00	1.00	Horizontal	1000000.00	11.98
9560.526316	50.62	74.00	-23.38	182.00	2.17	Horizontal	1000000.00	12.91
12083.15789	57.09	74.00	-16.91	112.00	3.56	Vertical	1000000.00	21.41

Average (PASS) (4)

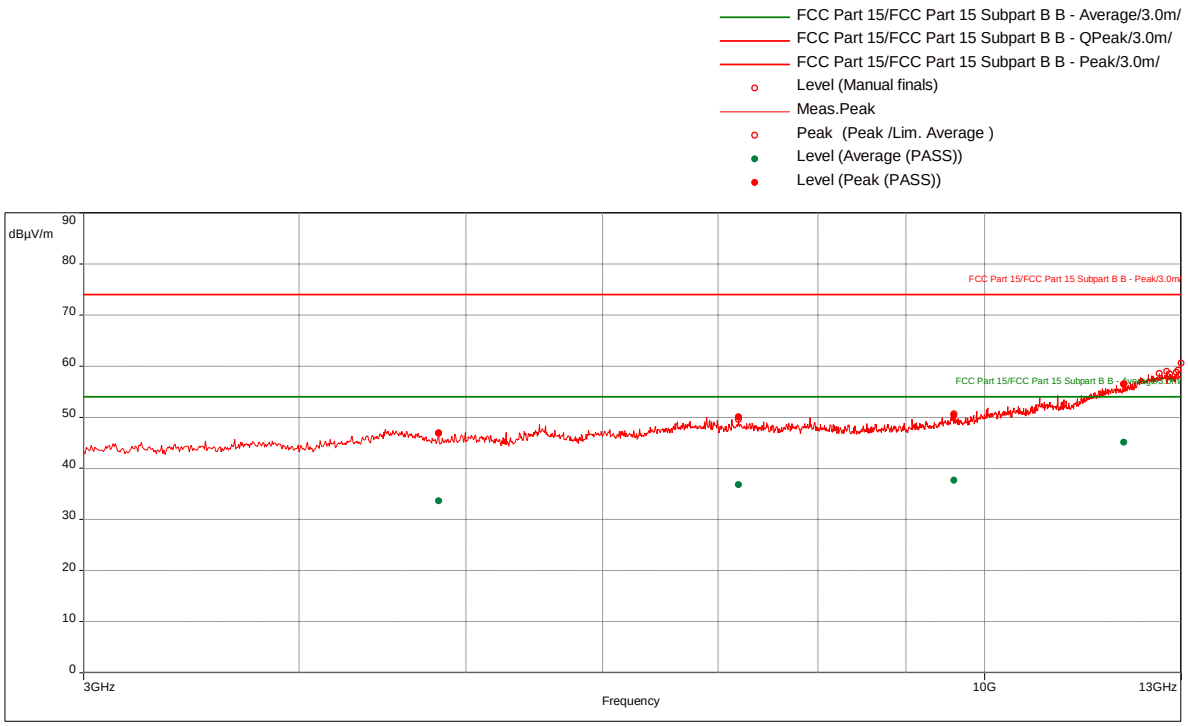
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4816.315789	34.29	54.00	-19.71	122.00	1.37	Horizontal	1000000.00	9.19
7179.473684	36.67	54.00	-17.33	58.00	1.00	Horizontal	1000000.00	11.98
9560.526316	37.52	54.00	-16.48	182.00	2.17	Horizontal	1000000.00	12.91
12083.15789	45.22	54.00	-8.78	112.00	3.56	Vertical	1000000.00	21.41

Transmit at Low Channel: 2402 MHz, 1-25 GHz, Y-axis

Test Information:

Date and Time	11/2/2017 10:25:40 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 3 to 13 GHz_Tx Lo Ch_Y-axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4820	46.90	74.00	-27.10	149.00	2.55	Horizontal	1000000.00	9.19
7194.473684	50.09	74.00	-23.91	213.00	1.96	Vertical	1000000.00	11.98
9594.736842	50.40	74.00	-23.60	236.00	1.48	Vertical	1000000.00	12.98
12039.73684	56.43	74.00	-17.57	194.00	2.19	Horizontal	1000000.00	21.32

Average (PASS) (4)

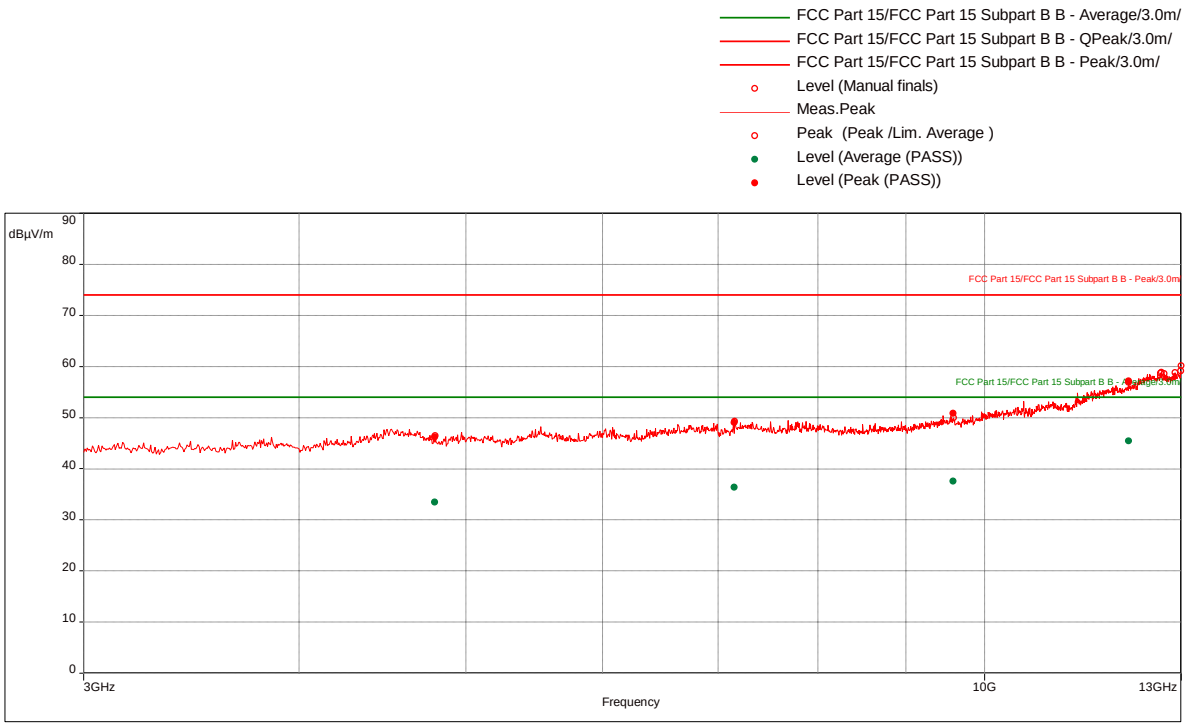
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4820	33.63	54.00	-20.37	149.00	2.55	Horizontal	1000000.00	9.19
7194.473684	36.75	54.00	-17.25	213.00	1.96	Vertical	1000000.00	11.98
9594.736842	37.67	54.00	-16.33	236.00	1.48	Vertical	1000000.00	12.98
12039.73684	45.12	54.00	-8.88	194.00	2.19	Horizontal	1000000.00	21.32

Transmit at Low Channel: 2402 MHz, 1-25 GHz, Z-axis

Test Information:

Date and Time	11/2/2017 11:05:08 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 3 to 13 GHz_Tx Lo Ch_Z-axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4796.842105	46.20	74.00	-27.80	208.00	1.44	Vertical	1000000.00	9.18
7155.789474	49.00	74.00	-25.00	350.00	3.28	Vertical	1000000.00	11.98
9586.578947	50.81	74.00	-23.19	327.00	2.81	Horizontal	1000000.00	12.97
12120.78947	57.15	74.00	-16.85	291.00	1.84	Vertical	1000000.00	21.47

Average (PASS) (4)

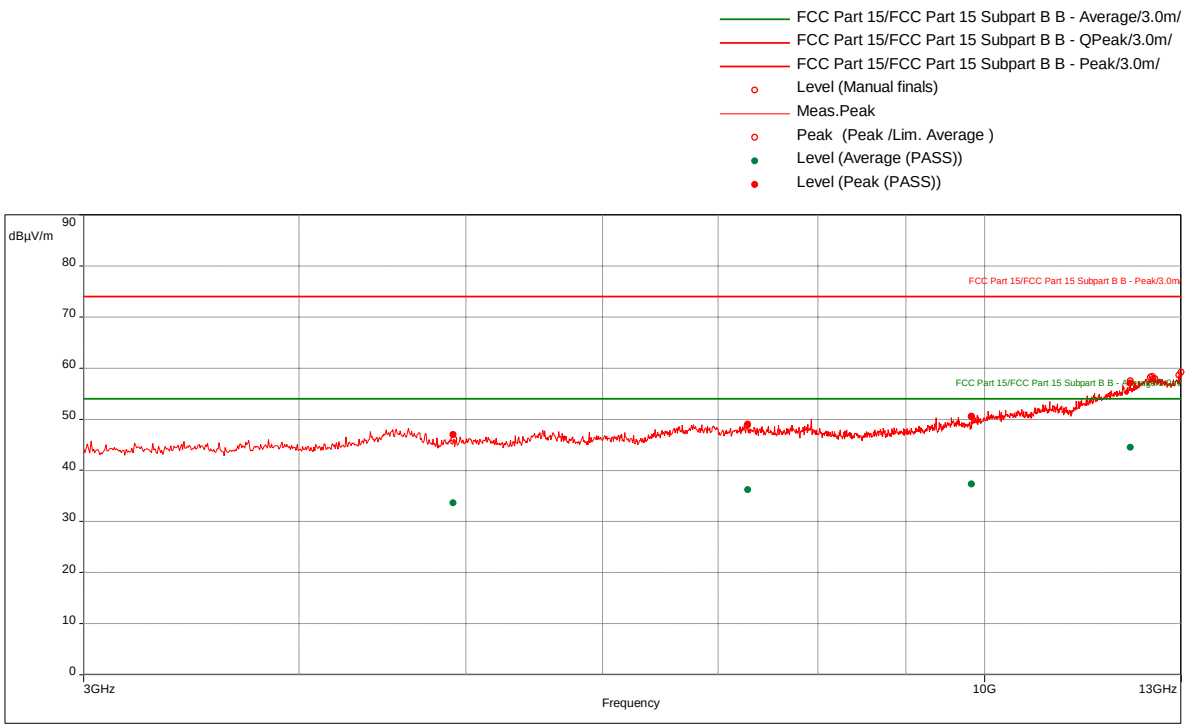
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4796.842105	33.44	54.00	-20.56	208.00	1.44	Vertical	1000000.00	9.18
7155.789474	36.33	54.00	-17.67	350.00	3.28	Vertical	1000000.00	11.98
9586.578947	37.57	54.00	-16.43	327.00	2.81	Horizontal	1000000.00	12.97
12120.78947	45.46	54.00	-8.54	291.00	1.84	Vertical	1000000.00	21.47

Transmit at Mid Channel: 2442 MHz, 1-25 GHz, X-axis

Test Information:

Date and Time	11/3/2017 5:08:35 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	51%
Atmospheric Pressure	1012 mB
Comments	RE 3 to 13 GHz_Tx Mid Ch_X-Axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4917.368421	47.01	74.00	-26.99	98.00	2.41	Vertical	1000000.00	9.30
7282.894737	49.02	74.00	-24.98	13.00	3.62	Vertical	1000000.00	12.00
9825.263158	50.60	74.00	-23.40	9.00	3.03	Horizontal	1000000.00	13.58
12142.63158	57.03	74.00	-16.97	157.00	2.42	Vertical	1000000.00	21.50

Average (PASS) (4)

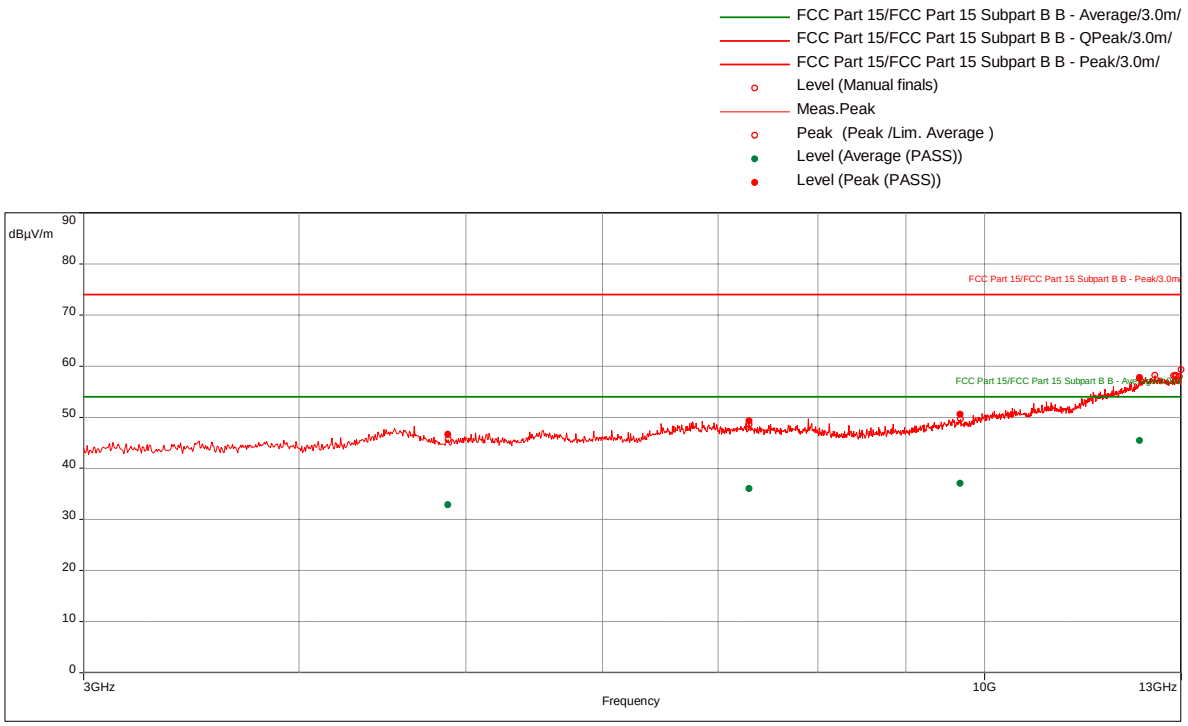
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4917.368421	33.65	54.00	-20.35	98.00	2.41	Vertical	1000000.00	9.30
7282.894737	36.17	54.00	-17.83	13.00	3.62	Vertical	1000000.00	12.00
9825.263158	37.29	54.00	-16.71	9.00	3.03	Horizontal	1000000.00	13.58
12142.63158	44.52	54.00	-9.48	157.00	2.42	Vertical	1000000.00	21.50

Transmit at Mid Channel: 2442 MHz, 1-25 GHz, Y-axis

Test Information:

Date and Time	11/3/2017 5:38:52 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	51%
Atmospheric Pressure	1012 mB
Comments	RE 3 to 13 GHz_Tx Mid Ch_Y-Axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4882.368421	46.67	74.00	-27.33	171.00	1.58	Horizontal	1000000.00	9.25
7298.157895	49.28	74.00	-24.72	301.00	2.49	Vertical	1000000.00	11.99
9675.789474	50.52	74.00	-23.48	250.00	1.84	Horizontal	1000000.00	13.10
12300.52632	57.62	74.00	-16.38	205.00	2.41	Vertical	1000000.00	21.94

Average (PASS) (4)

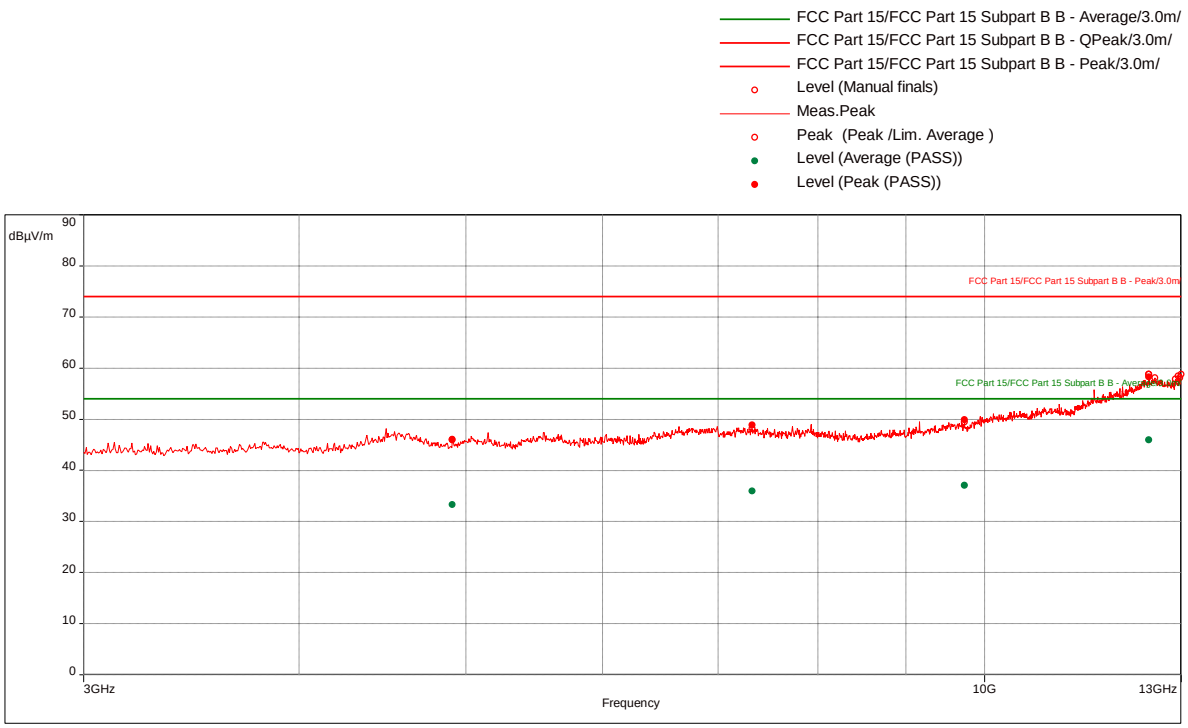
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4882.368421	32.86	54.00	-21.14	171.00	1.58	Horizontal	1000000.00	9.25
7298.157895	35.98	54.00	-18.02	301.00	2.49	Vertical	1000000.00	11.99
9675.789474	37.09	54.00	-16.91	250.00	1.84	Horizontal	1000000.00	13.10
12300.52632	45.46	54.00	-8.54	205.00	2.41	Vertical	1000000.00	21.94

Transmit at Mid Channel: 2442 MHz, 1-25 GHz, Z-axis

Test Information:

Date and Time	11/3/2017 6:07:02 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	51%
Atmospheric Pressure	1012 mB
Comments	RE 3 to 13 GHz_Tx Mid Ch_Z-Axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4910	46.06	74.00	-27.94	59.00	1.83	Horizontal	1000000.00	9.29
7328.157895	48.84	74.00	-25.16	246.00	3.36	Horizontal	1000000.00	11.94
9732.105263	49.87	74.00	-24.13	153.00	2.49	Vertical	1000000.00	13.24
12449.21053	58.24	74.00	-15.76	22.00	3.45	Horizontal	1000000.00	22.83

Average (PASS) (4)

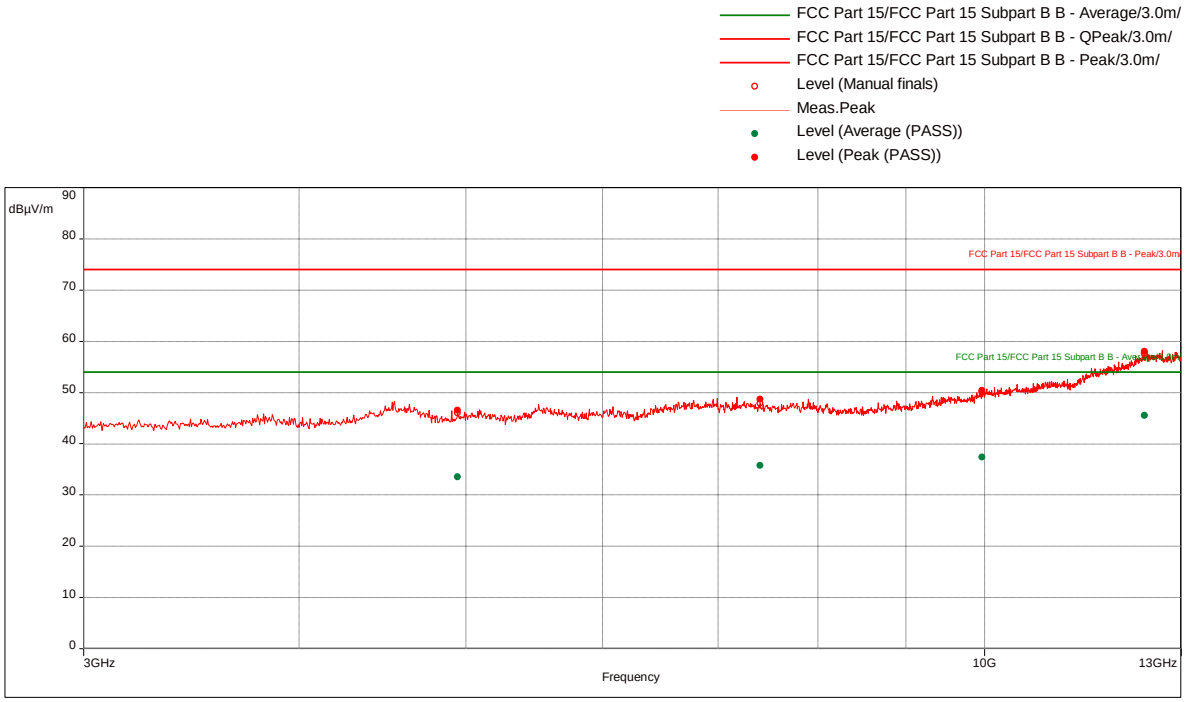
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4910	33.27	54.00	-20.73	59.00	1.83	Horizontal	1000000.00	9.29
7328.157895	35.93	54.00	-18.07	246.00	3.36	Horizontal	1000000.00	11.94
9732.105263	37.05	54.00	-16.95	153.00	2.49	Vertical	1000000.00	13.24
12449.21053	45.95	54.00	-8.05	22.00	3.45	Horizontal	1000000.00	22.83

Transmit at High Channel: 2480 MHz, 1-25 GHz, X-axis

Test Information:

Date and Time	11/3/2017 7:36:38 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	51%
Atmospheric Pressure	1012 mB
Comments	RE 3 to 13 GHz_Tx High Ch_X-Axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4945	46.52	74.00	-27.48	78.00	1.41	Horizontal	1000000.00	9.36
7404.473684	48.72	74.00	-25.28	312.00	1.92	Vertical	1000000.00	11.82
9963.157895	50.36	74.00	-23.64	92.00	3.01	Horizontal	1000000.00	14.00
12374.47368	58.04	74.00	-15.96	152.00	3.91	Horizontal	1000000.00	22.36

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4945	33.53	54.00	-20.47	78.00	1.41	Horizontal	1000000.00	9.36
7404.473684	35.80	54.00	-18.20	312.00	1.92	Vertical	1000000.00	11.82
9963.157895	37.42	54.00	-16.58	92.00	3.01	Horizontal	1000000.00	14.00
12374.47368	45.48	54.00	-8.52	152.00	3.91	Horizontal	1000000.00	22.36

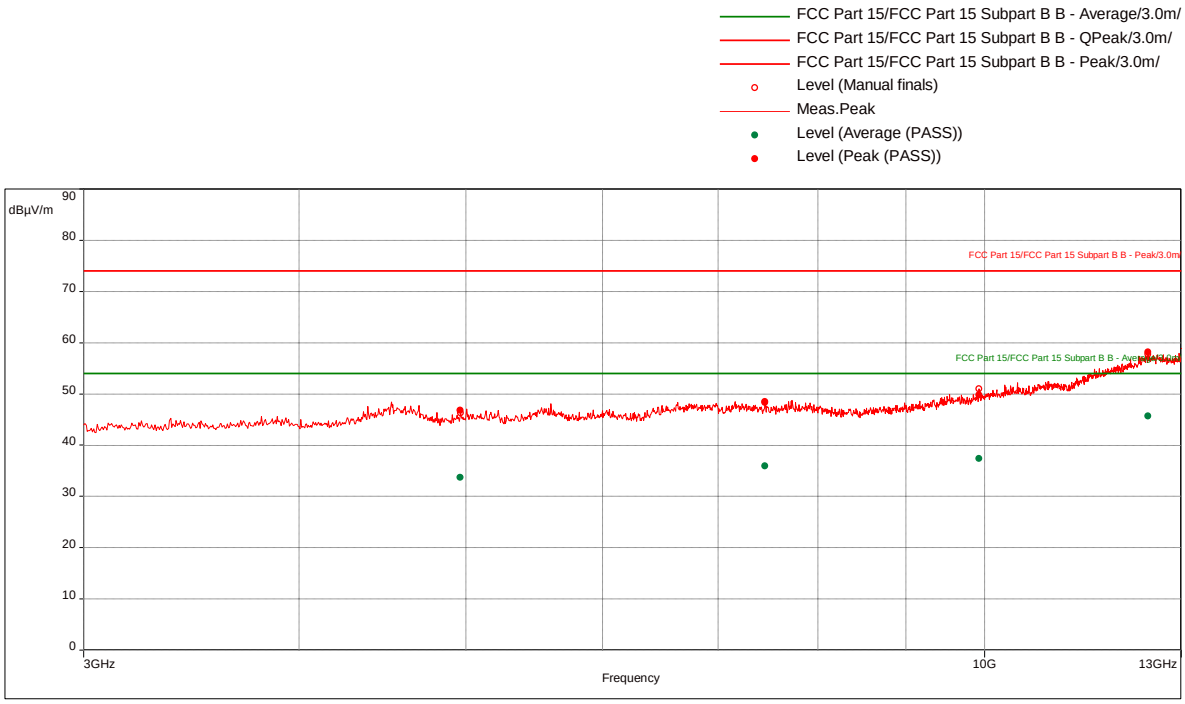
Transmit at High Channel: 2480 MHz, 1-25 GHz, Y-axis

Test Information:

Date and Time	11/3/2017 7:08:00 PM
Client and Project Number	Philips Connected_G103247864

Engineer	Vathana Ven
Temperature	22 deg C
Humidity	51%
Atmospheric Pressure	1012 mB
Comments	RE 3 to 13 GHz_Tx High Ch_Y-Axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4961.578947	46.82	74.00	-27.18	177.00	2.94	Horizontal	1000000.00	9.39
7453.947368	48.35	74.00	-25.65	0.00	1.30	Horizontal	1000000.00	11.86
9921.842105	49.83	74.00	-24.17	69.00	2.38	Vertical	1000000.00	13.85
12436.84211	58.16	74.00	-15.84	330.00	1.37	Horizontal	1000000.00	22.74

Average (PASS) (4)

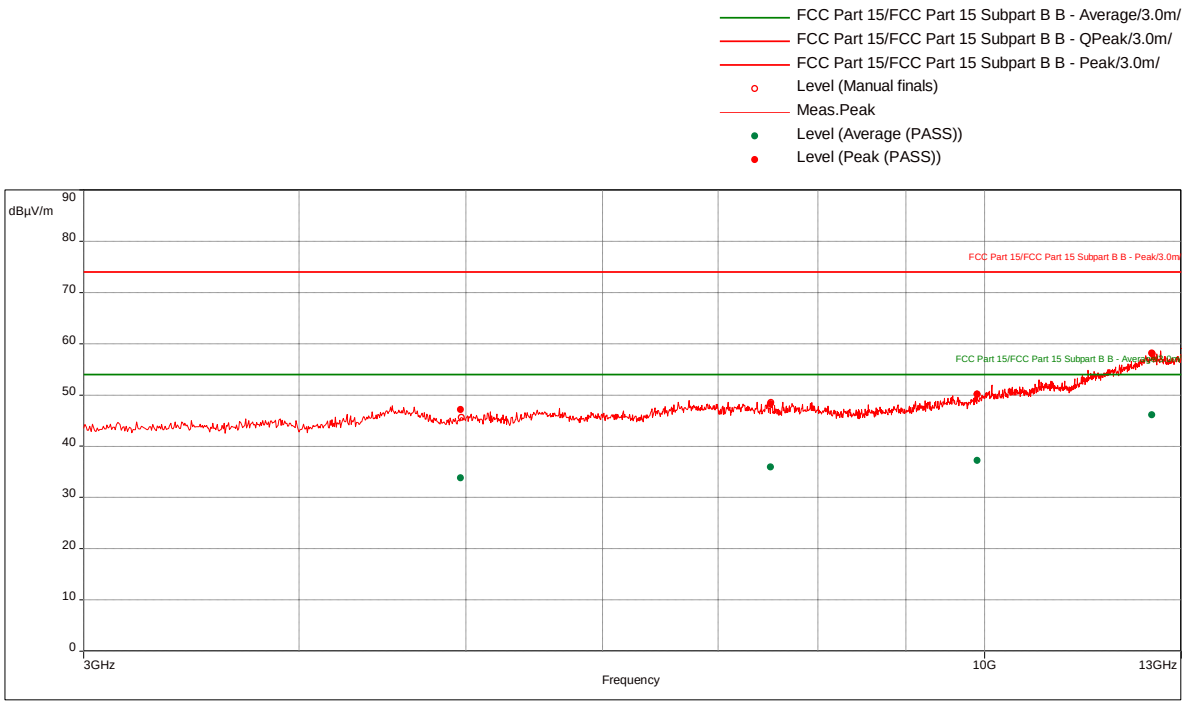
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4961.578947	33.74	54.00	-20.26	177.00	2.94	Horizontal	1000000.00	9.39
7453.947368	35.94	54.00	-18.06	0.00	1.30	Horizontal	1000000.00	11.86
9921.842105	37.37	54.00	-16.63	69.00	2.38	Vertical	1000000.00	13.85
12436.84211	45.66	54.00	-8.34	330.00	1.37	Horizontal	1000000.00	22.74

Transmit at High Channel: 2480 MHz, 1-25 GHz, Z-axis

Test Information:

Date and Time	11/3/2017 6:40:14 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	51%
Atmospheric Pressure	1012 mB
Comments	RE 3 to 13 GHz_Tx High Ch_Z-Axis

Graph:



Note : 1-3 GHz and 13-25 GHz scans were performed manually, no emissions were detected above the equipment measuring noise floor. High Pass filter used above 3 GHz.

Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4967.105263	47.12	74.00	-26.88	51.00	3.52	Horizontal	1000000.00	9.41
7512.105263	48.25	74.00	-25.75	208.00	2.87	Vertical	1000000.00	11.88
9900	50.14	74.00	-23.86	0.00	3.57	Horizontal	1000000.00	13.77
12502.36842	58.15	74.00	-15.85	307.00	2.96	Horizontal	1000000.00	23.17

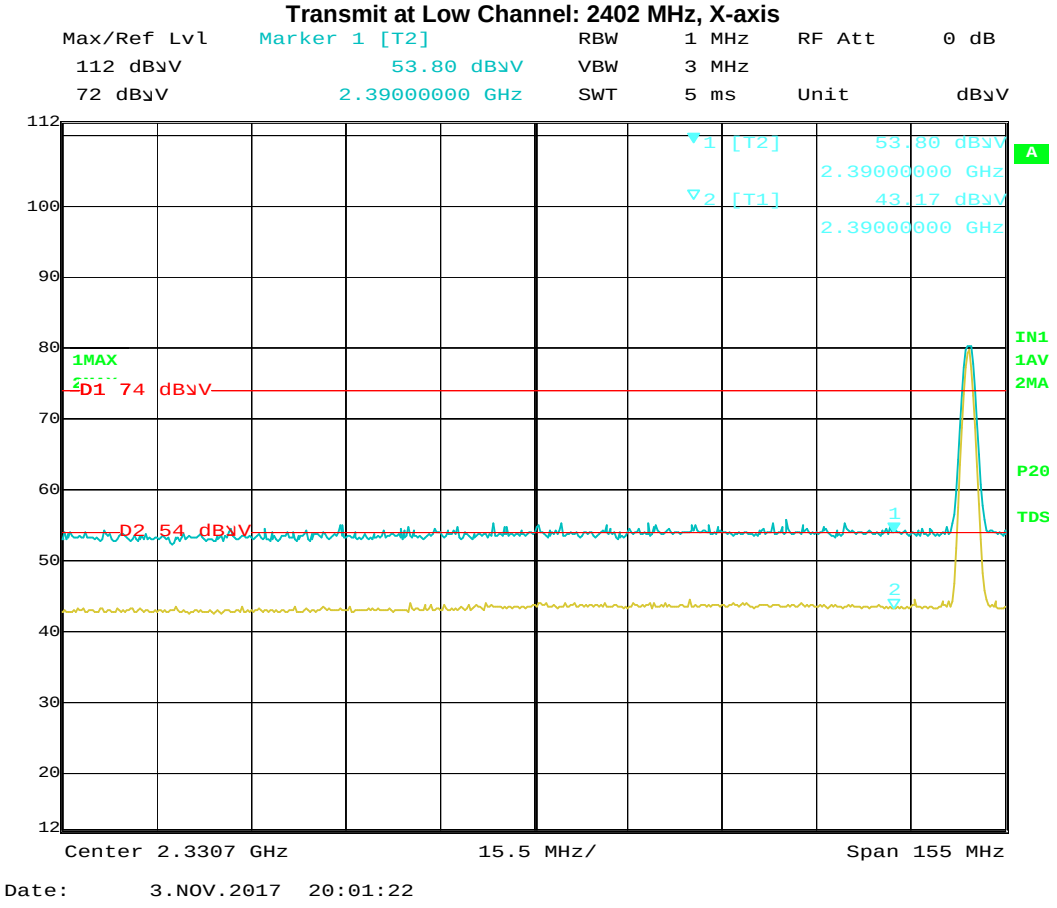
Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4967.105263	33.84	54.00	-20.16	51.00	3.52	Horizontal	1000000.00	9.41
7512.105263	35.96	54.00	-18.04	208.00	2.87	Vertical	1000000.00	11.88
9900	37.19	54.00	-16.81	0.00	3.57	Horizontal	1000000.00	13.77
12502.36842	46.09	54.00	-7.91	307.00	2.96	Horizontal	1000000.00	23.17

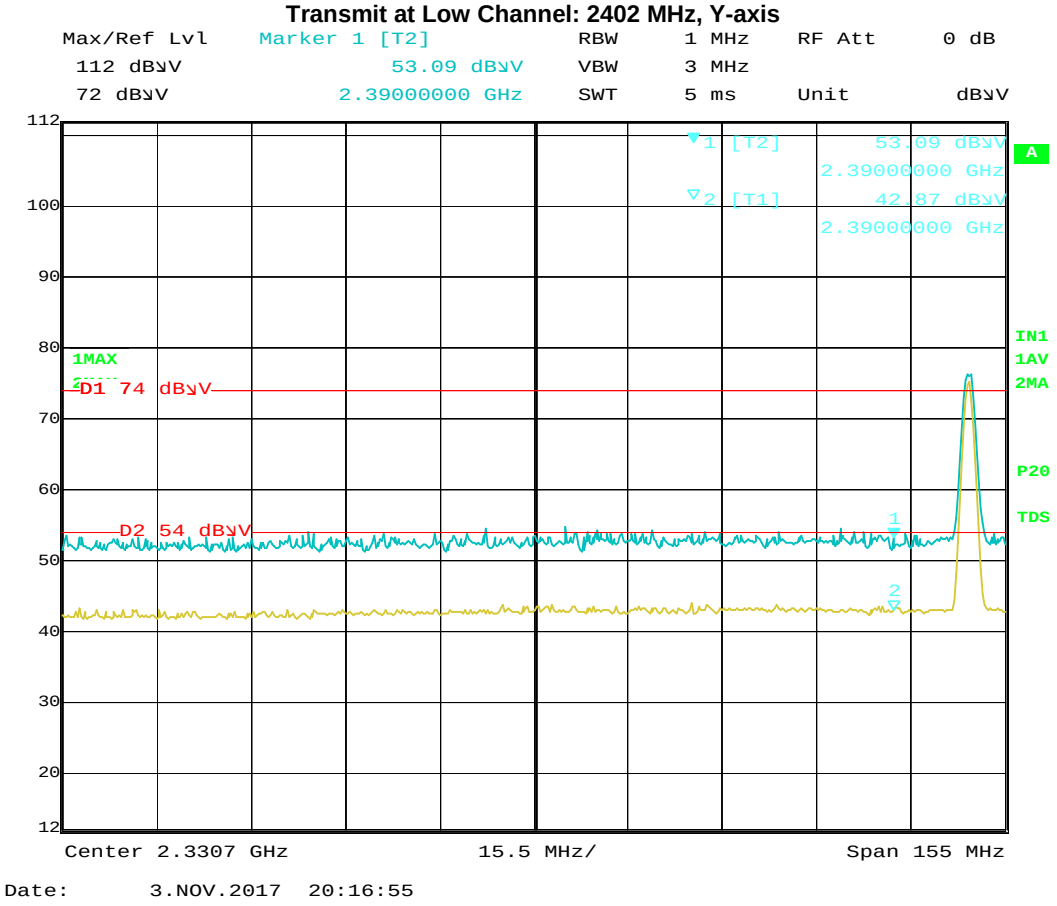
Restricted-band band-edge measurements:

Lower Band-edge

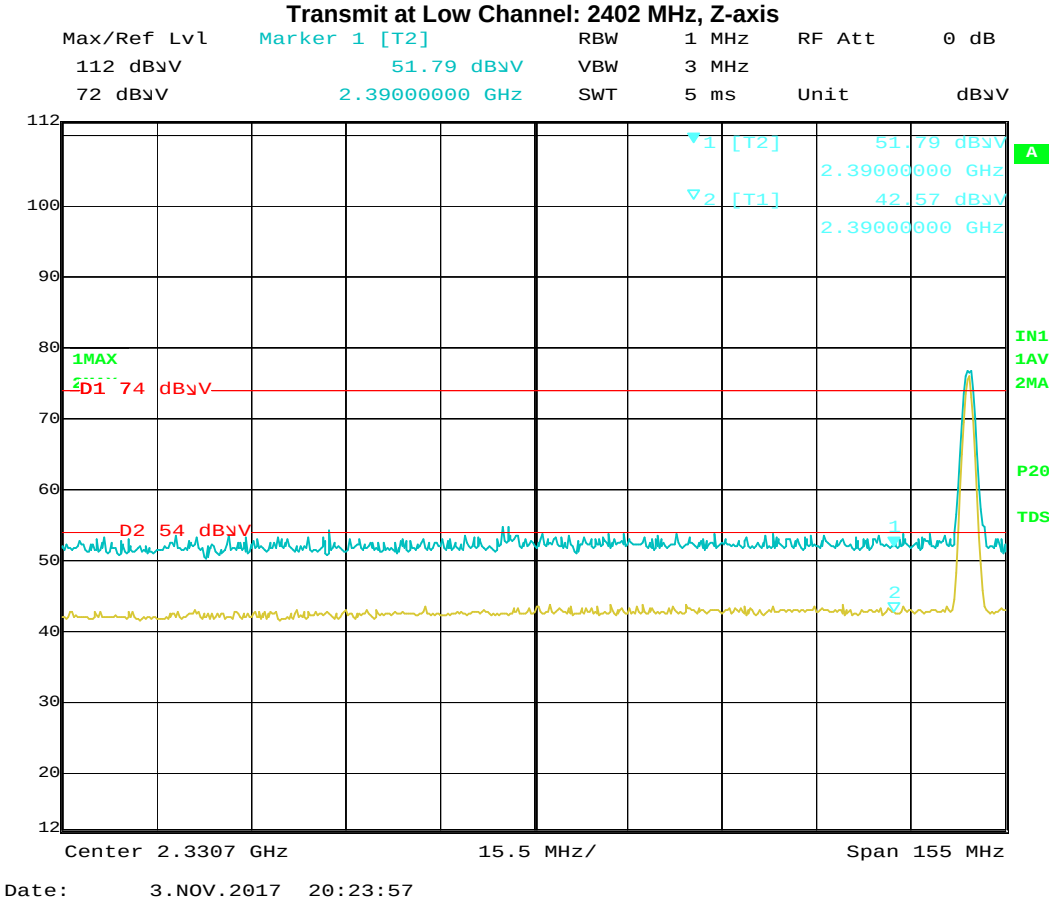
Transmit at Low Channel: 2402 MHz, X-axis



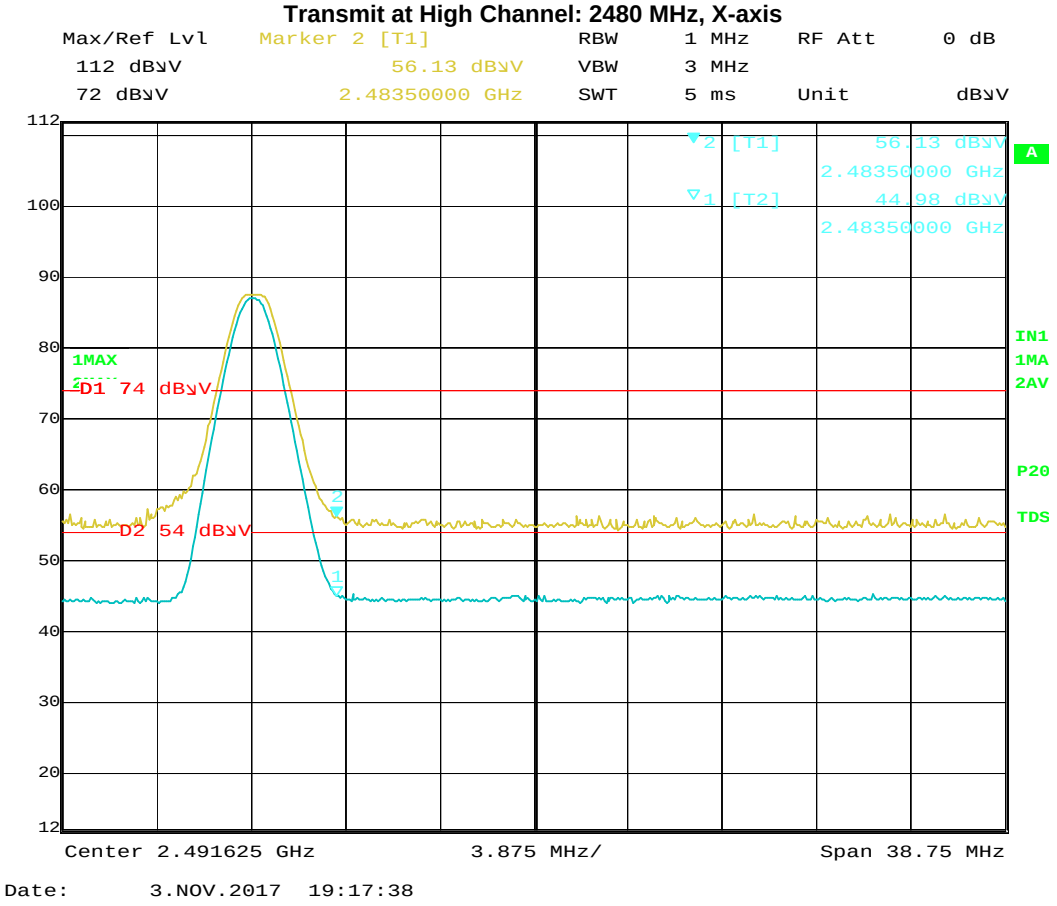
Transmit at Low Channel: 2402 MHz, Y-axis



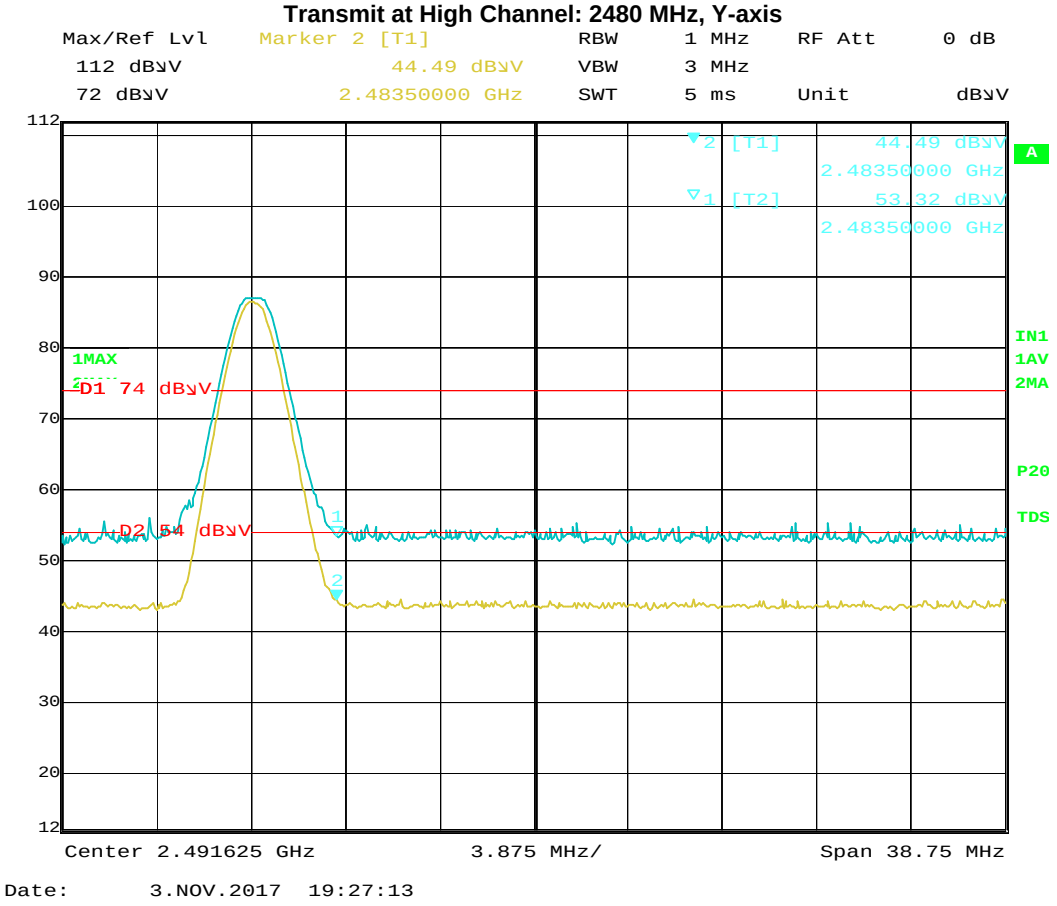
Transmit at Low Channel: 2402 MHz, Z-axis



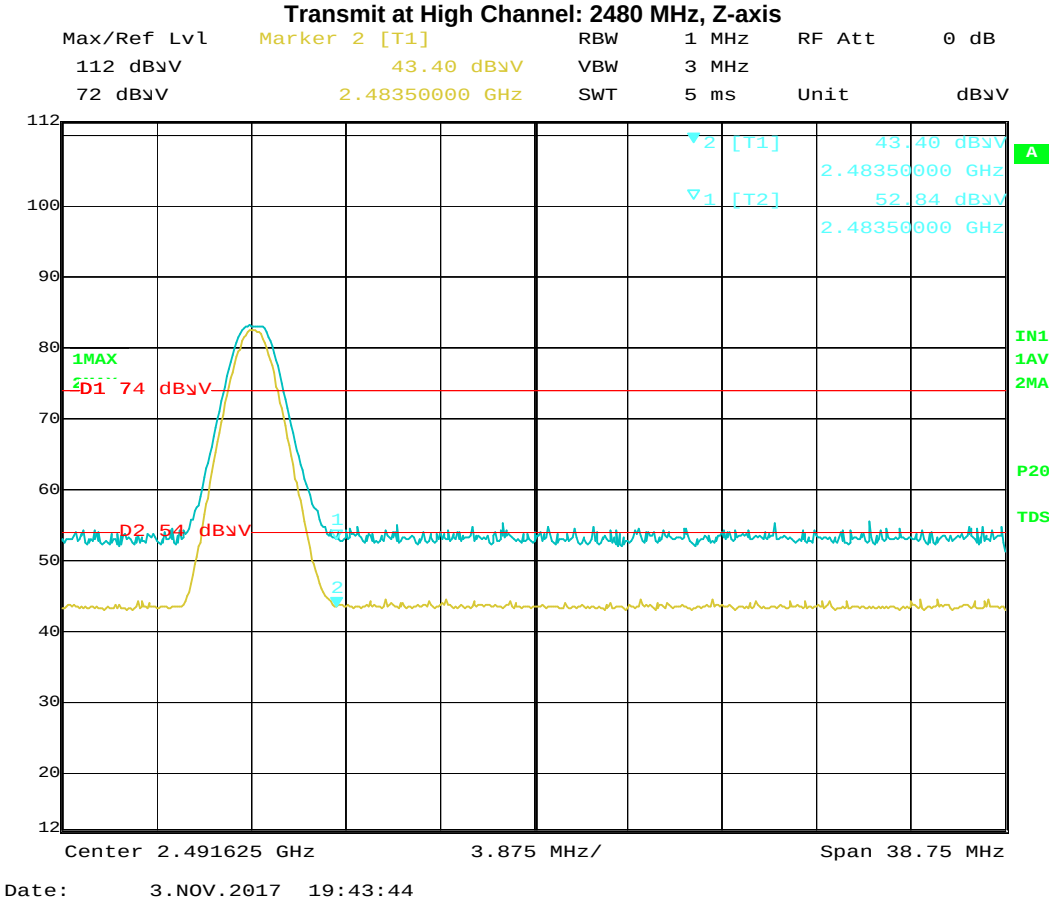
Upper Band-edge
Transmit at High Channel: 2480 MHz, X-axis



Transmit at High Channel: 2480 MHz, Y-axis



Transmit at High Channel: 2480 MHz, Z-axis



Notes: General limits applied to all emissions.

Test Personnel:	Vathana Ven	Test Date:	11/02/2017, 11/03/2017
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 15.247, FCC 15.209, FCC 15.109, RSS-247, ICES-003	Limit Applied:	As specified in section 10.3
Input Voltage:	Internal Battery		
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Ambient Temperature:	22, 21 ºC
		Relative Humidity:	57, 43 %
		Atmospheric Pressure:	994, 1009 mbars

Deviations, Additions, or Exclusions: None

11 Digital Electronics Spurious Emissions

11.1 Method

Tests are performed in accordance with FCC 15.109, RSS-247, ICES-003, and ANSI C63.4:2014.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

Alternately, when BAT-EMC Emission Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. The “Correction” includes Antenna Factor, Preamp, and Cable Loss. These are already accounted for in the “Level” column.

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003'	Weather Station	Davis Instruments	7400	PE80529A39A	11/28/2016	11/28/2017
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/15/2017	03/15/2018
145-410	Cables 145-420 145-421 145-422 145-406	Huber + Suhner	10m Track A Cables	multiple	07/25/2017	07/25/2018
PRE10'	30-1000MHz pre-amp	ITS	PRE10	PRE10	12/16/2016	12/16/2017
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	05/02/2017	05/02/2018
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	06/03/2017	06/03/2018
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	02/13/2017	02/13/2018
145-416'	Cables 145-420 145-423 145-425 145-408	Huber + Suhner	3m Track B cables	multiple	07/25/2017	07/25/2018

Software Utilized:

Name	Manufacturer	Version
BAT-EMC Emissions	Nexio	3.16.0.69

11.3 Results:

The sample tested was found to comply.

§15.109 (a) The field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/meter)
30-88	100
88-216	150
216-960	200
Above 960	500

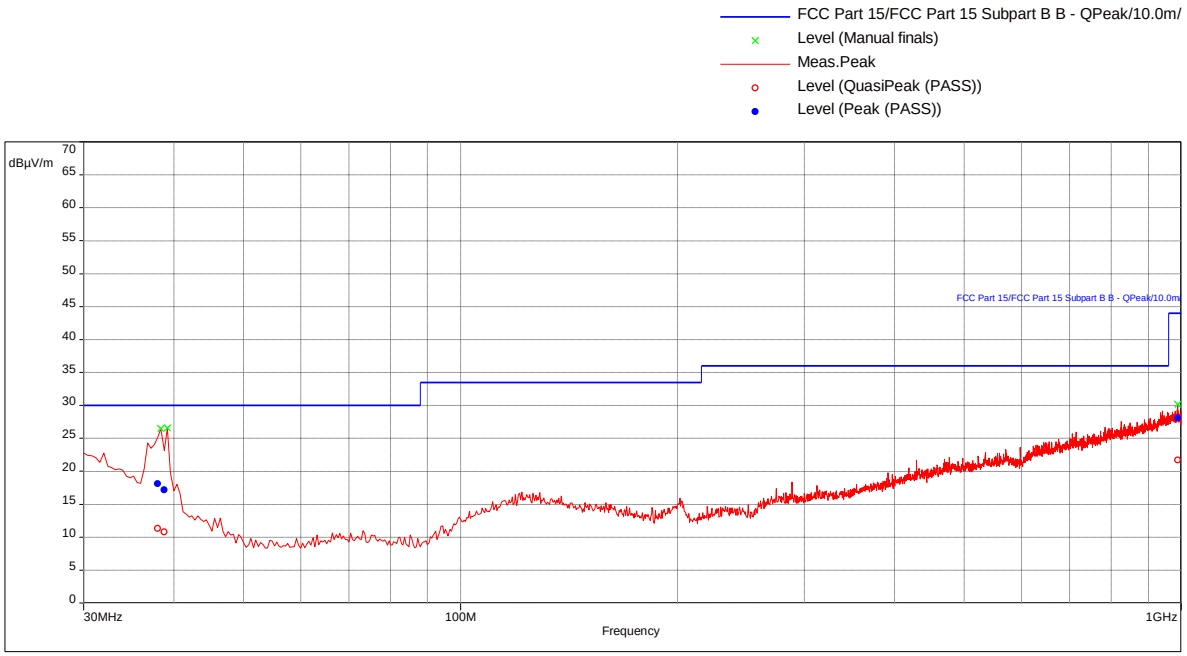
11.4 Plots/Data:

Transmitter in Idle, 30-1000 MHz

Test Information:

Date and Time	11/2/2017 8:25:17 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 30-1000MHz_Rx/Idle mode

Graph:



Results:

QuasiPeak (PASS) (3)

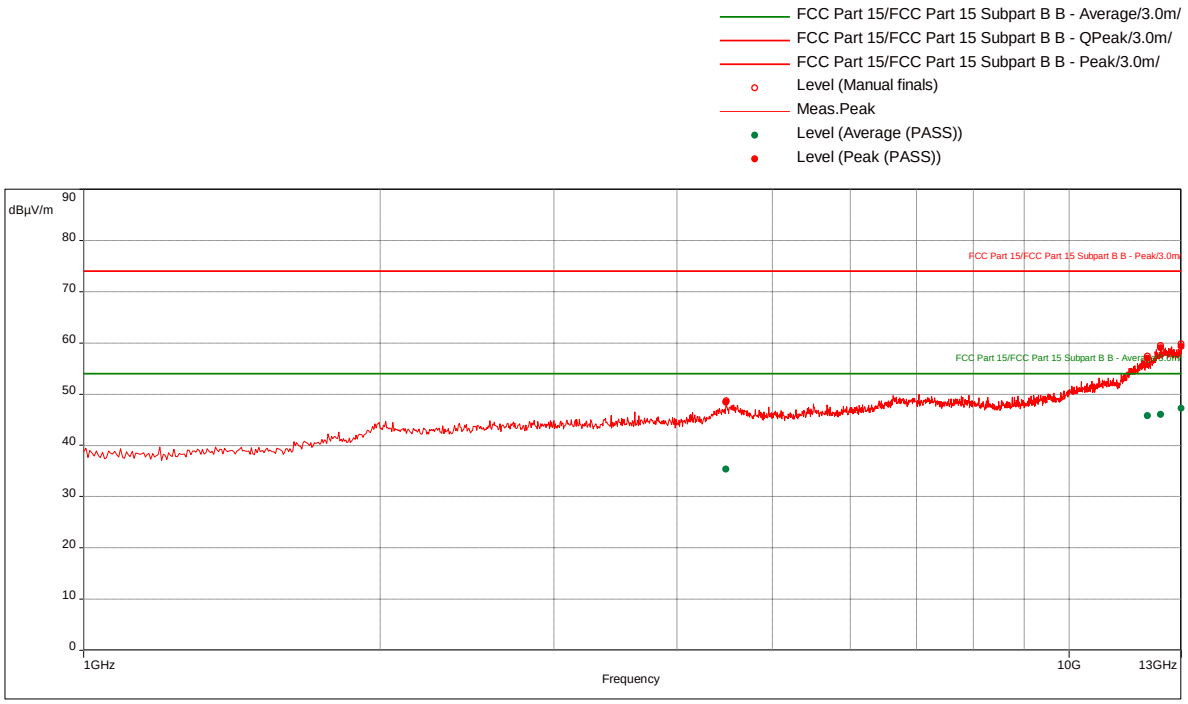
Frequency (MHz)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
38.11578947	30.00	-18.68	22.00	3.32	Vertical	120000.00	-18.41
38.94736842	30.00	-19.20	13.00	2.48	Vertical	120000.00	-18.98
988.8421053	44.00	-22.27	58.00	3.90	Vertical	120000.00	-5.12

Transmitter in Idle, 1-13 GHz

Test Information:

Date and Time	11/2/2017 8:59:07 PM
Client and Project Number	Philips Connected_G103247864
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	52%
Atmospheric Pressure	1011 mB
Comments	RE 1 to 13 GHz_Rx/Idle mode

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4486.578947	48.41	74.00	-25.59	309.00	2.08	Vertical	1000000.00	10.03
12019.73684	56.96	74.00	-17.04	17.00	2.10	Vertical	1000000.00	21.27
12385.52632	59.05	74.00	-14.95	149.00	3.39	Vertical	1000000.00	22.42
12996.57895	59.27	74.00	-14.73	358.00	1.55	Vertical	1000000.00	24.01

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
4486.578947	35.38	54.00	-18.62	309.00	2.08	Vertical	1000000.00	10.03
12019.73684	45.80	54.00	-8.20	17.00	2.10	Vertical	1000000.00	21.27
12385.52632	46.04	54.00	-7.96	149.00	3.39	Vertical	1000000.00	22.42
12996.57895	47.23	54.00	-6.77	358.00	1.55	Vertical	1000000.00	24.01

Test Personnel:	Vathana Ven VSV	Test Date:	11/02/2017
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 15.247, FCC 15.209, FCC 15.109, RSS-247, ICES-003	Limit Applied:	As specified in section 11.3
Input Voltage:	Internal Battery		
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Ambient Temperature:	21 ºC
		Relative Humidity:	54 %
		Atmospheric Pressure:	997 mbars

Deviations, Additions, or Exclusions: None

12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	11/14/2017	103247864BOX-001	VFV	MFM	Original Issue