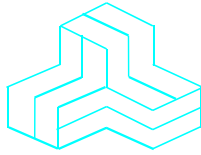


ENGINEERING TEST REPORT



1W Dual Frequency 900MHz/2.4GHz Digital Data Link

Model: pDDL900

FCC ID: NS917PDDL900

Applicant:

Microhard Systems Inc.

150 Country Hills Landing NW

Calgary, Alberta

Canada T3K 5P3

In Accordance With

Federal Communications Commission (FCC)

Part 15, Subpart C, Section 15.247

Digital Modulation Systems (DTS) Operating in 902 - 928 MHz Band

UltraTech's File No.: 17MCRS101_FCC15C247D0G9

This Test report is Issued under the Authority of
Tri M. Luu
Vice President of Engineering
UltraTech Group of Labs

Date: April 13, 2017

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: April 13, 2017

Test Dates: November 21-27, 2016
January 17 - April 10, 2017

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by any agency of the US Government.*
- *This test report shall not be reproduced, except in full, without a written approval from UltraTech*

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

Tel.: (905) 829-1570 Fax.: (905) 829-8050

Website: www.ultratech-labs.com, Email: vic@ultratech-labs.com, Email: tri@ultratech-labs.com



91038



1309



46390-2049



AT-1945



SL2-IN-E-1119R



Korea
KCC-RRR
CA2049

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	Equipment Certification for Digital Modulation Systems (DTS) Operating Under §15.247
Test Procedures:	- ANSI C63.4 - ANSI C63.10 - FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r05
Environmental Classification:	☒ Commercial, industrial or business environment ☒ Residential environment

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

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2017	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
FCC, KDB Publication No. 558074 D01 DTS Meas Guidance v03r05	2016	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Microhard Systems Inc.
Address:	150 Country Hills Landing NW Calgary, Alberta Canada T3K 5P3
Contact Person:	Mr. Hany Shenouda Phone #: 403 248-0028 Fax #: 403 248 2762 Email Address: shenouda@microhardcorp.com

MANUFACTURER	
Name:	Microhard Systems Inc.
Address:	150 Country Hills Landing NW Calgary, Alberta Canada T3K 5P3
Contact Person:	Mr. Hany Shenouda Phone #: 403 248-0028 Fax #: 403 248-2762 Email Address: shenouda@microhardcorp.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

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

Brand Name:	Microhard Systems Inc.
Product Name:	1W Dual Frequency 900MHz/2.4GHz Digital Data Link
Model Name or Number:	pDDL900
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	External DC Power Supply
Primary User Functions of EUT:	The pDDL900 is a high power, OEM, Dual Frequency, Wireless Digital Data Link. The pDDL900 is designed to provide high performance wireless capabilities in a compact and rugged OEM module for system integration.

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter			
Equipment Type:	- Mobile - Base Station (fixed use)		
Intended Operating Environment:	- Commercial, industrial or business environment - Residential environment		
Power Supply Requirement:	3.3 VDC		
RF Output Power Rating:	9 – 30 dBm typical		
¹ Tx Gain Setting:	0-70		
Operating Frequency Range:	Bandwidth	² Data Rate 1, 2, 3	² Data Rate 4, 5, 6, 7
	1 MHz	903 - 927 MHz	903 - 927 MHz
	2 MHz	904 - 926 MHz	904 - 926 MHz
	4 MHz	905 - 925 MHz	905 - 925 MHz
	8 MHz	906 - 924 MHz	907 - 923 MHz
RF Output Impedance:	50 Ω		
Duty Cycle:	Continuous		
Modulation Type:	COFDM		
Antenna Connector Types:	U.FL		

¹TX gain setting is a factory tune-up parameter, not available to end users

²Refer to operational description exhibit for more information on data rates and operational restrictions, 1MHz bandwidth at data rate 3 shall be disabled.

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

Antenna Type	Maximum Gain (dBi)
Rubber Ducky	3
Transit Antenna	3
Yagi Antenna	13.15
Patch Antenna	8
Omni Directional Antenna	8.15

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	RF port	2	U.FL	Shielded cable
2	DC supply and I/O port	1	Pin header	Direct connection (no cable)

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

April 13, 2017

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

2.6. ANCILLARY EQUIPMENT

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

Ancillary Equipment # 1	
Description:	Test Jig
Brand name:	Microhard Systems Inc.
Model Name or Number:	N/A
Connected to EUT's Port:	I/O Port

Ancillary Equipment # 2	
Description:	AC/DC Adapter
Brand name:	BI Switching Power Supply
Model Name or Number:	BI30-120200-AdU
Connected to EUT's Port:	Test Jig of the EUT

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 °C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	3.3 VDC

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Test software provided by the Applicant to operate the EUT at each channel frequency continuously and in the range of typical modes of operation.
Special Hardware Used:	Test Jig
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as non-integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	903 – 927 MHz 904 – 926 MHz 905 – 925 MHz 906 – 924 MHz 907 - 923 MHz
Frequency(ies) Tested:	903 MHz, 904 MHz, 905 MHz, 906 MHz, 907 MHz, 915 MHz, 923 MHz, 924 MHz, 925 MHz, 926 MHz, 927 MHz
RF Power Output: (measured maximum output power at antenna terminals)	29.99 dBm Peak
Normal Test Modulation:	COFDM
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

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

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2020-03-27.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)(2)	6 dB Bandwidth	Yes
15.247(b)(3)	Peak Conducted Output Power - DTS	Yes
15.247(d)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	Yes
15.247(i), 1.1307, 1.1310, 2.1091	RF Exposure	Yes

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

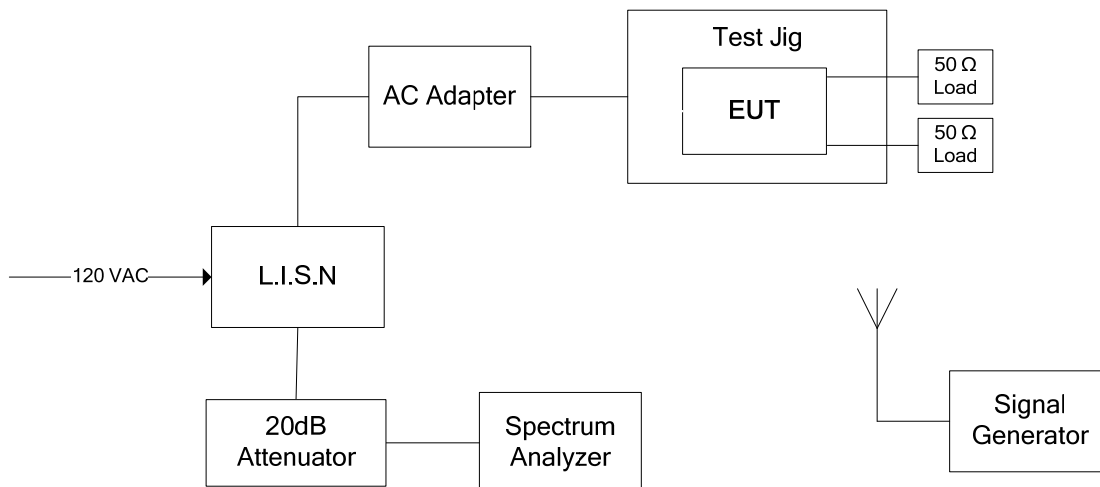
Frequency of emission (MHz)	Conducted Limits (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

ANSI C63.4

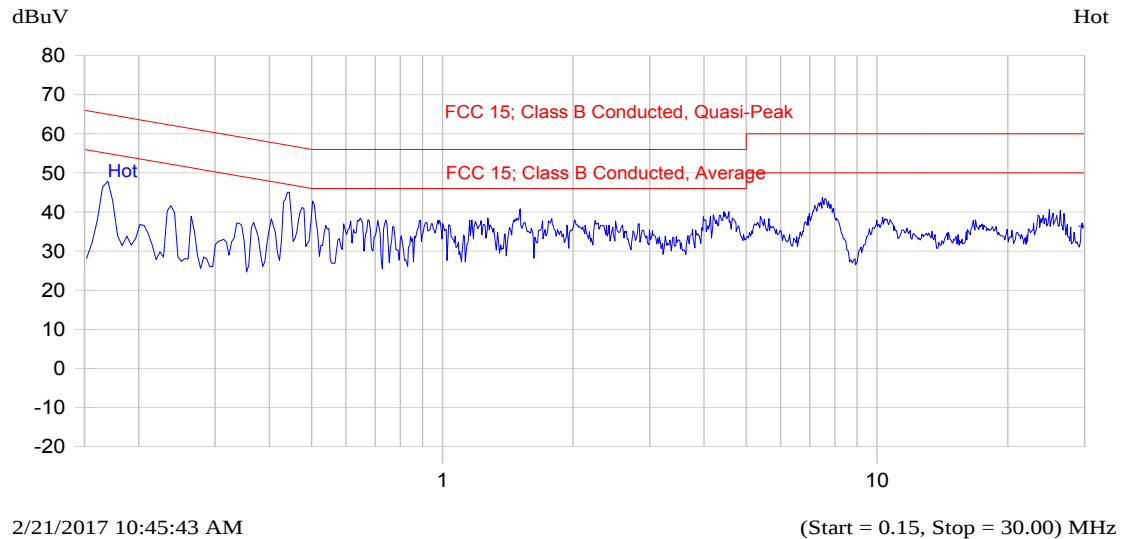
5.1.3. Test Arrangement



5.1.4. Test Data

Plot 5.1.4.1. Power Line Conducted Emissions (Test Configuration 1: Tx Mode at 2440 MHz)
Line Voltage: 120 VAC; Line Tested: Hot

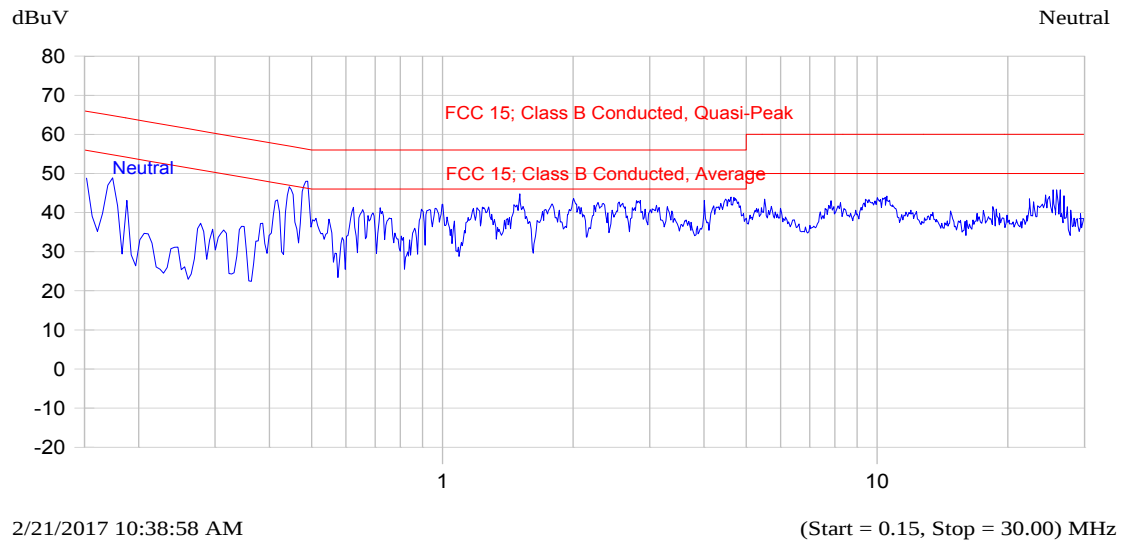
Current Graph



Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.167	54.1	48.7	-16.4	37.2	-17.9	Hot
0.437	46.8	44.6	-12.5	42.1	-5.1	Hot
0.499	44.6	41.3	-14.7	34.6	-11.4	Hot
7.469	44.0	39.9	-20.1	34.1	-15.9	Hot

Plot 5.1.4.2. Power Line Conducted Emissions (Test Configuration 1: Tx Mode at 2440 MHz)
Line Voltage 120 VAC; Line Tested: Neutral

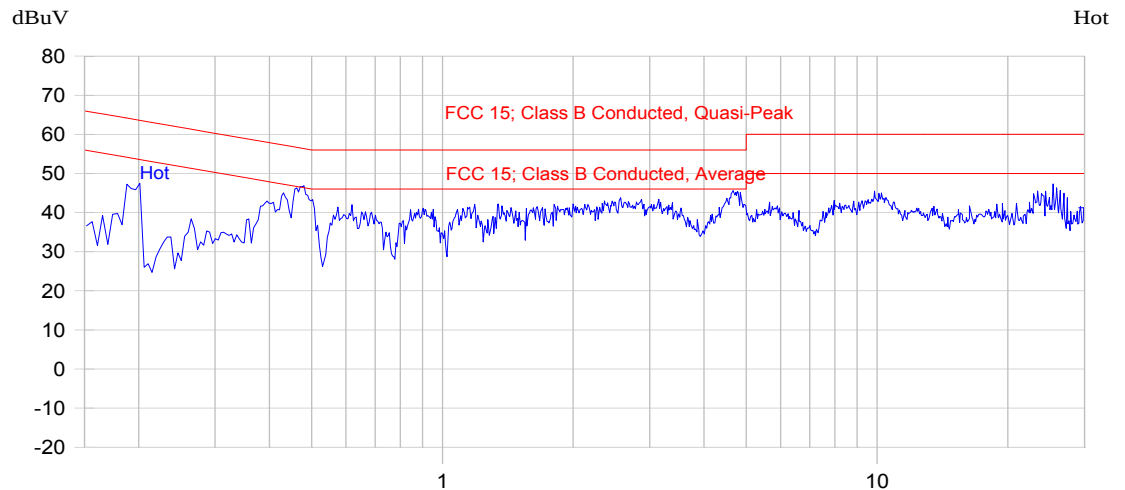
Current Graph



Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.168	52.8	48.8	-16.3	38.3	-16.8	Neutral
0.435	49.1	47.2	-10.0	44.5	-2.7	Neutral
0.498	47.6	44.7	-11.4	38.3	-7.8	Neutral
1.498	46.8	43.8	-12.2	39.8	-6.2	Neutral
4.604	44.9	40.5	-15.5	34.3	-11.7	Neutral

Plot 5.1.4.3. Power Line Conducted Emissions (Test Configuration 2: Tx Mode at 915 MHz)
Line Voltage 120 VAC; Line Tested: Neutral

Current Graph



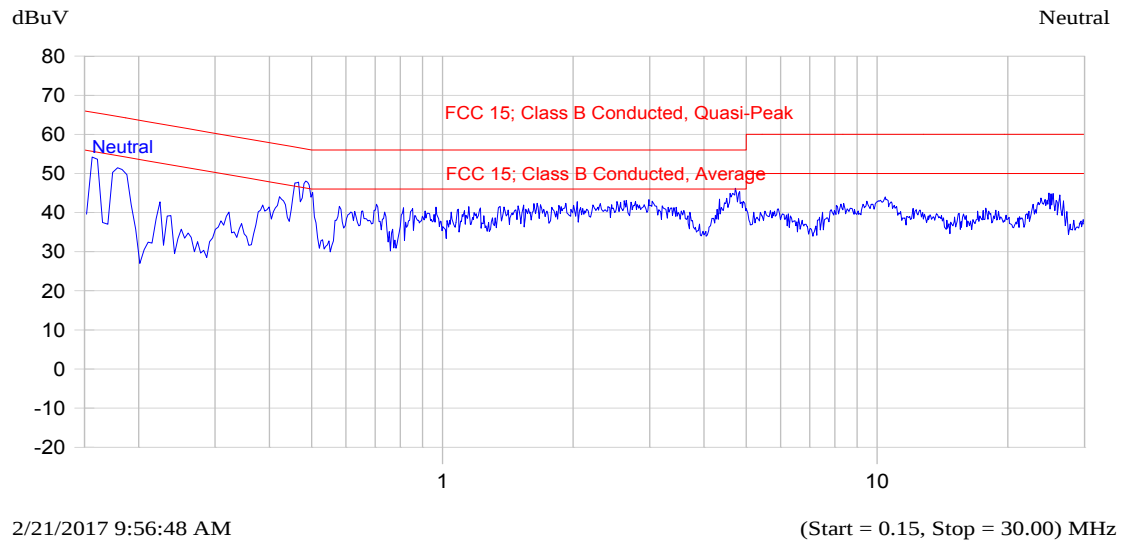
2/21/2017 10:23:21 AM

(Start = 0.15, Stop = 30.00) MHz

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.185	50.0	44.7	-19.6	33.3	-21.0	Hot
0.469	49.5	46.3	-10.2	41.3	-5.3	Hot
4.660	46.4	42.0	-14.0	35.6	-10.4	Hot
25.395	48.3	44.4	-15.6	41.1	-8.9	Hot

Plot 5.1.4.4. Power Line Conducted Emissions (Test Configuration 2: Tx Mode at 915 MHz)
Line Voltage 120 VAC; Line Tested: Neutral

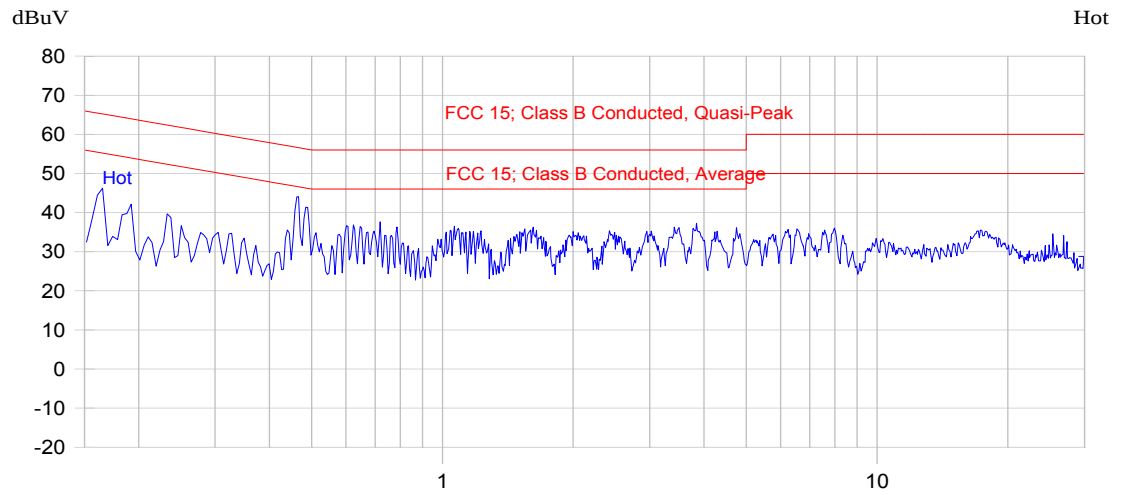
Current Graph



Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.157	44.0	37.1	-28.5	30.1	-25.5	Neutral
0.184	42.0	35.2	-29.1	28.1	-26.2	Neutral
0.475	45.8	42.9	-13.6	34.8	-11.6	Neutral
4.709	38.4	31.8	-24.2	25.2	-20.8	Neutral

Plot 5.1.4.5. Power Line Conducted Emissions (Test Configuration 3: Rx Mode at 915 MHz)
Line Voltage 120 VAC; Line Tested: Neutral

Current Graph



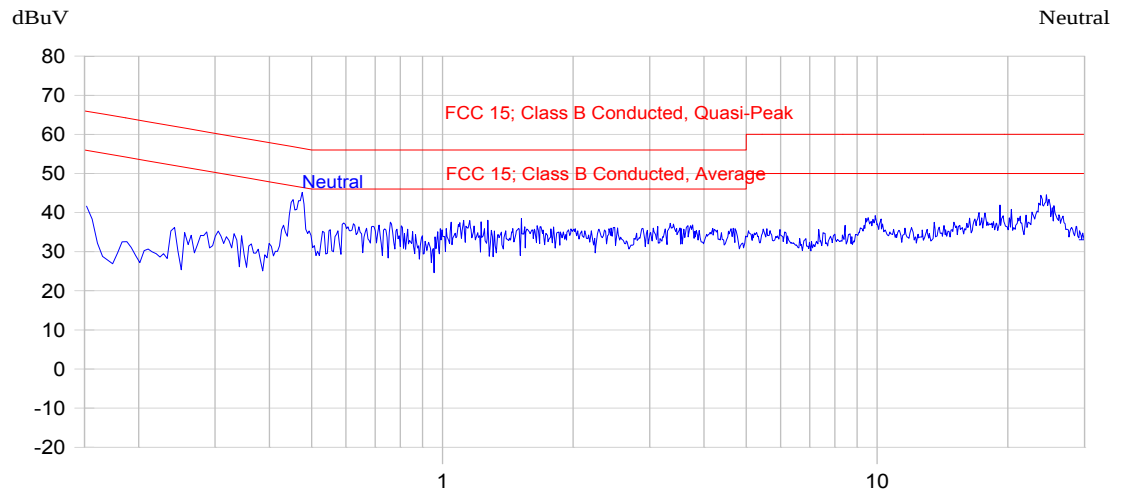
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(Start = 0.15, Stop = 30.00) MHz

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.162	48.5	43.7	-21.6	33.0	-22.3	Hot
0.463	45.6	42.9	-13.7	40.4	-6.2	Hot
0.713	39.4	35.9	-20.1	32.2	-13.8	Hot
3.846	38.9	35.1	-20.9	31.1	-14.9	Hot

Plot 5.1.4.6. Power Line Conducted Emissions (Test Configuration 3: Rx Mode at 915 MHz)
Line Voltage 120 VAC; Line Tested: Neutral

Current Graph



2/21/2017 10:32:21 AM

(Start = 0.15, Stop = 30.00) MHz

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.465	47.2	43.2	-13.4	35.2	-11.4	Neutral
24.534	44.7	36.7	-23.3	29.1	-20.9	Neutral

5.2. OCCUPIED BANDWIDTH [§ 15.247(a)(2)]

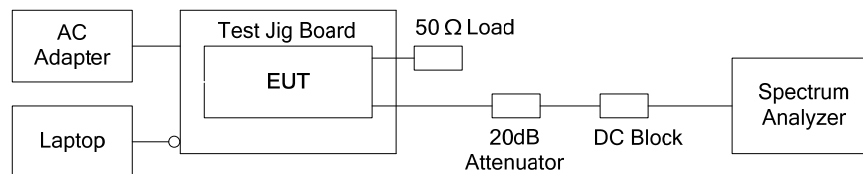
5.2.1. Limit(s)

The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.2. Method of Measurements

KDB 558074D01 DTS Meas Guidance v03r05, Section 8.1 DTS bandwidth Option 1 or 2 methods

5.2.3. Test Arrangement



5.2.4. Test Data

Operating Mode	Data Rate	Frequency (MHz)	6dB BW (MHz)	Min. Limit (kHz)
Bandwidth: 1 MHz TX Gain: 20	1	903	0.508	500
		915	0.506	500
		927	0.512	500
	2	903	0.517	500
		915	0.519	500
		927	0.517	500
Bandwidth: 2 MHz TX Gain: 25	1	904	0.952	500
		915	0.939	500
		926	0.933	500
	2	904	0.974	500
		915	0.962	500
		926	0.946	500
	3	904	0.878	500
		915	0.904	500
		926	0.878	500

Operating Mode	Data Rate	Frequency (MHz)	6dB BW (MHz)	Min. Limit (kHz)
Bandwidth: 4 MHz TX Gain: 32	1	905	1.827	500
		915	1.827	500
		925	1.814	500
	2	905	1.923	500
		915	1.846	500
		925	1.788	500
	3	905	1.859	500
		915	1.840	500
		925	1.776	500
Bandwidth: 8 MHz TX Gain: 40	1	906	3.590	500
		915	3.606	500
		924	3.830	500
	2	906	3.670	500
		915	3.766	500
		924	3.558	500
	3	906	3.510	500
		915	3.526	500
		924	3.558	500

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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Operating Mode	Data Rate	Frequency (MHz)	6dB BW (MHz)	Min. Limit (kHz)
Bandwidth: 1 MHz TX Gain: 36	4	903	1.042	500
		915	1.046	500
		927	1.038	500
	5	903	1.046	500
		915	1.046	500
		927	1.046	500
	6	903	1.062	500
		915	1.066	500
		927	1.046	500
	7	903	1.014	500
		915	1.034	500
		927	1.038	500
Bandwidth: 2 MHz TX Gain: 36	4	904	2.099	500
		915	2.091	500
		926	2.099	500
	5	904	2.123	500
		915	2.091	500
		926	2.107	500
	6	904	2.107	500
		915	2.099	500
		926	2.075	500
	7	904	2.091	500
		915	2.075	500
		926	2.091	500

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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April 13, 2017

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Operating Mode	Data Rate	Frequency (MHz)	6dB BW (MHz)	Min. Limit (kHz)
Bandwidth: 4 MHz TX Gain: 36	4	905	4.151	500
		915	4.151	500
		925	4.151	500
	5	905	4.151	500
		915	4.183	500
		925	4.135	500
	6	905	4.199	500
		915	4.183	500
		925	4.135	500
	7	905	4.167	500
		915	4.167	500
		925	4.151	500
Bandwidth: 8 MHz TX Gain: 36	4	907	8.205	500
		915	8.237	500
		923	8.237	500
	5	907	8.269	500
		915	8.301	500
		923	8.237	500
	6	907	8.269	500
		915	8.301	500
		923	8.301	500
	7	907	8.333	500
		915	8.333	500
		923	8.301	500

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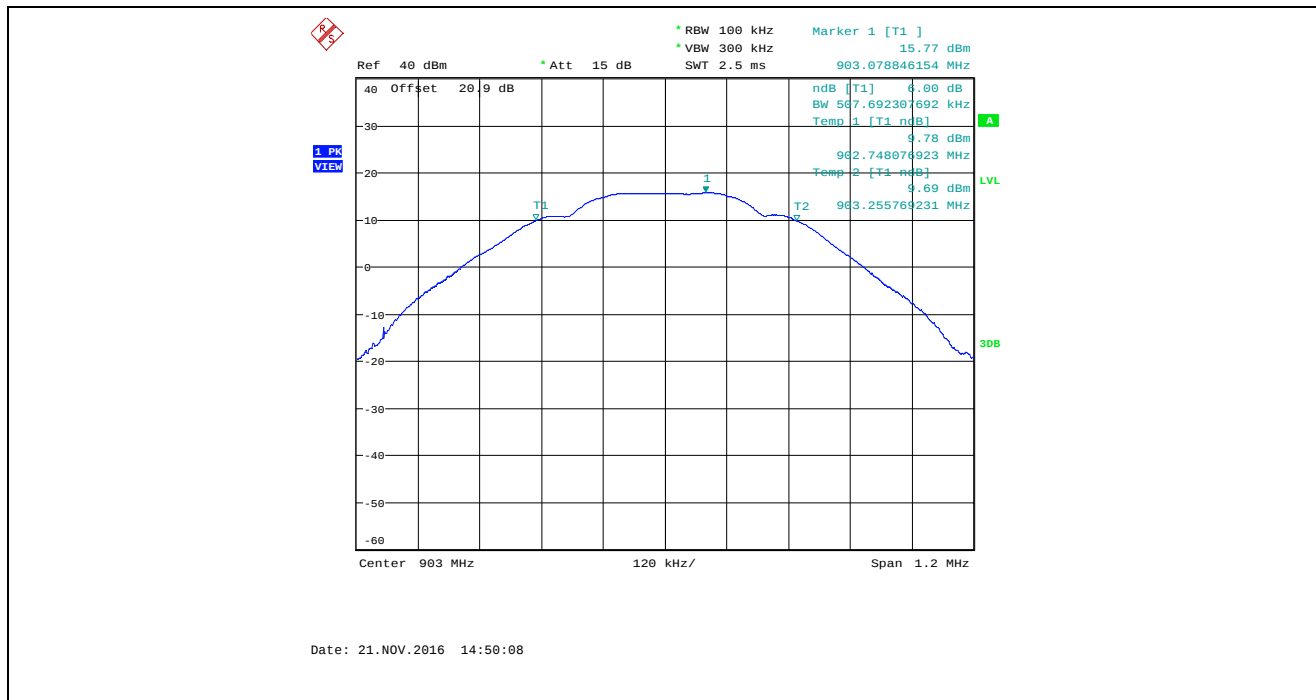
3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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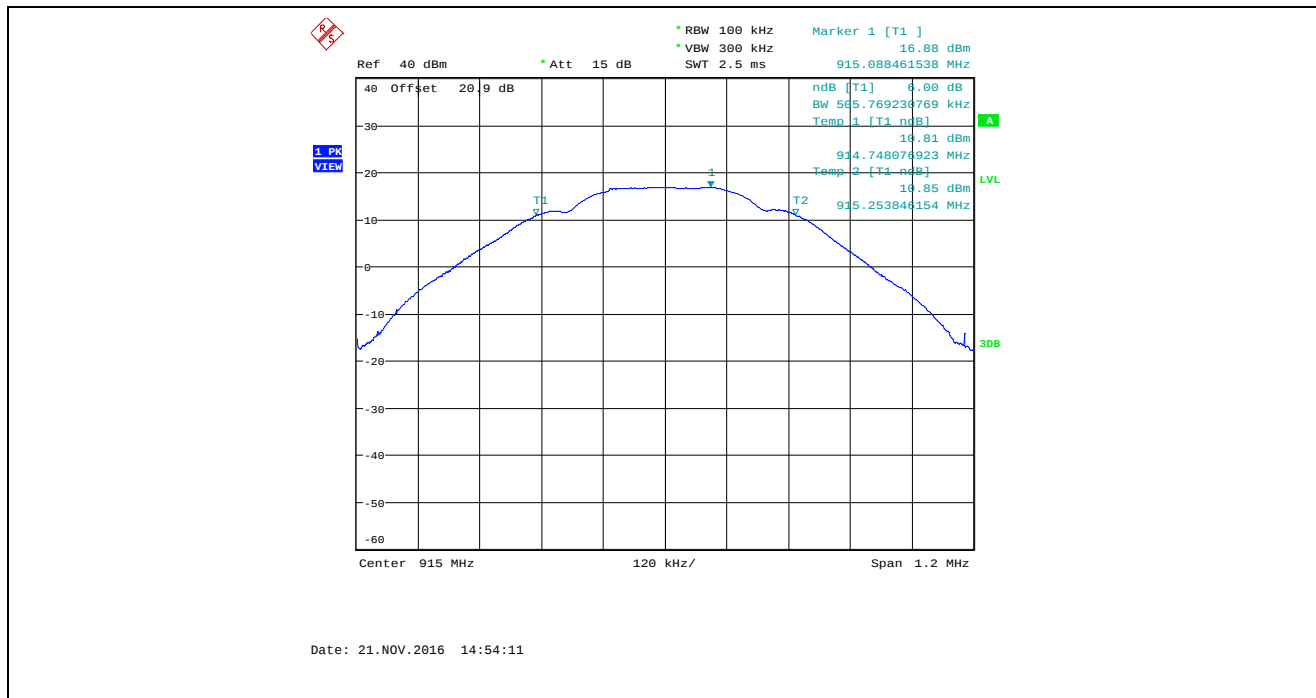
April 13, 2017

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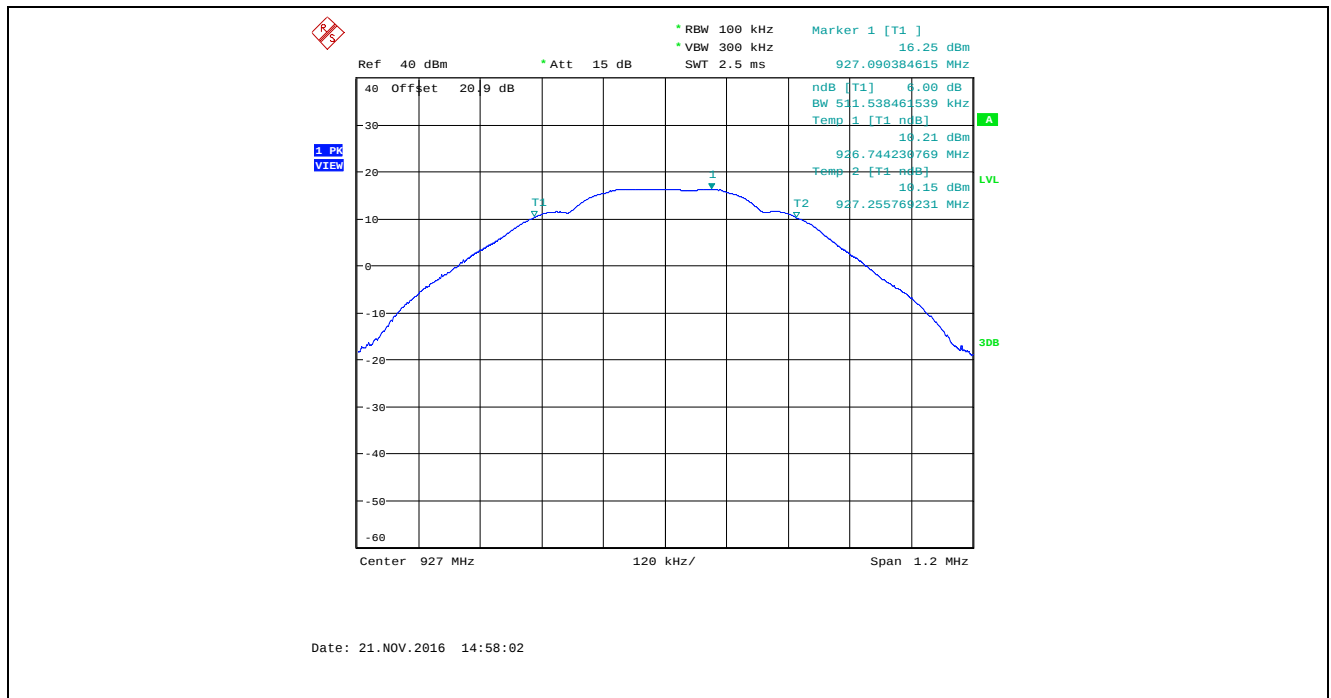
Plot 5.2.4.1. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 20, Data Rate 1, 903 MHz



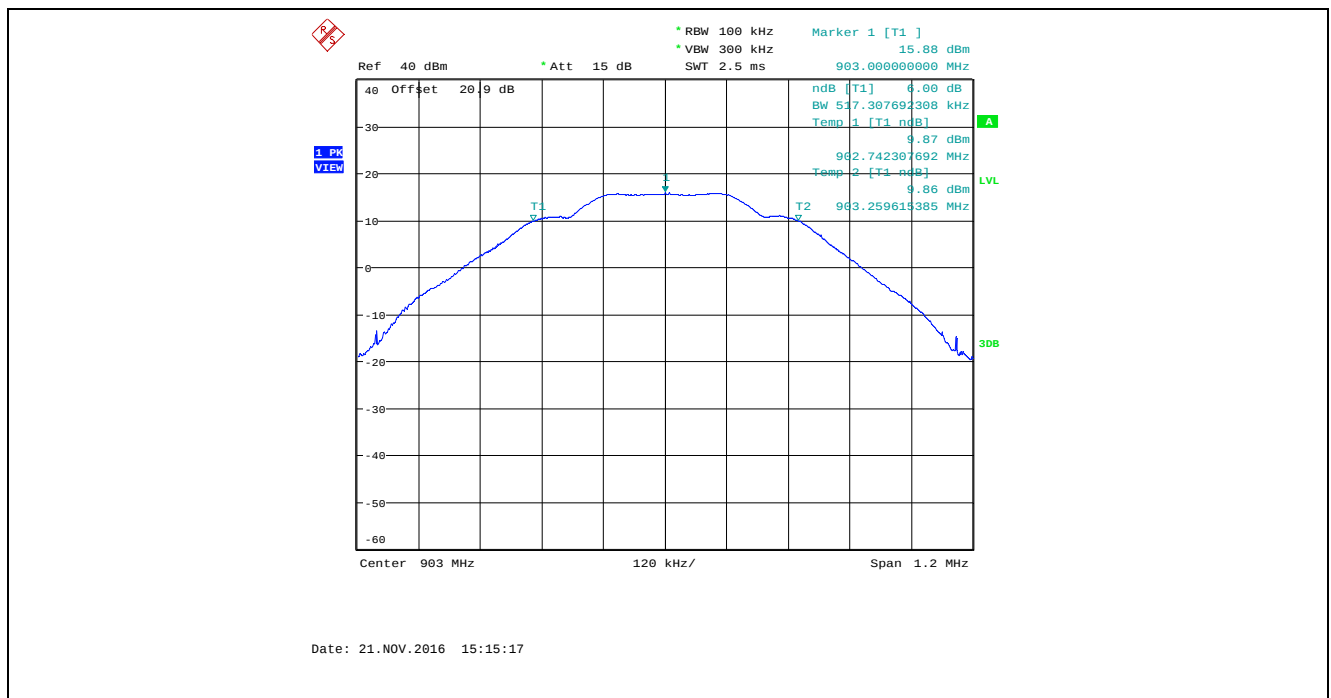
Plot 5.2.4.2. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 20, Data Rate 1, 915 MHz



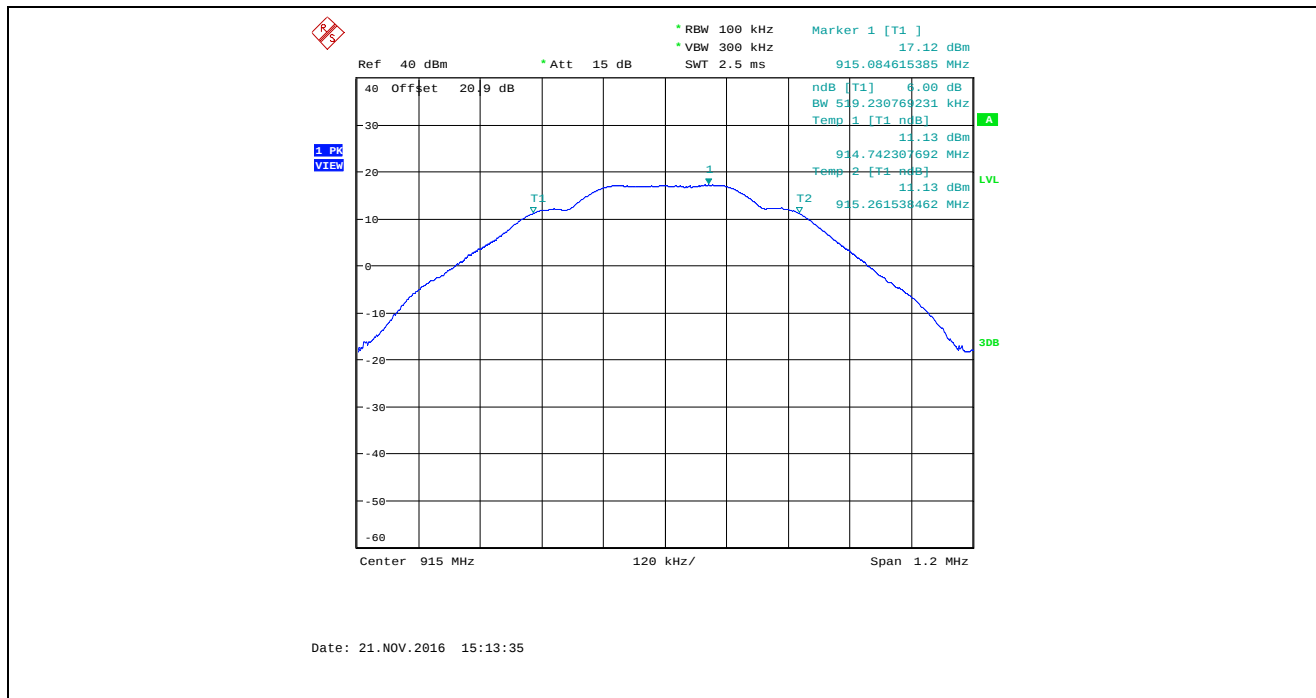
Plot 5.2.4.3. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 20, Data Rate 1, 927 MHz



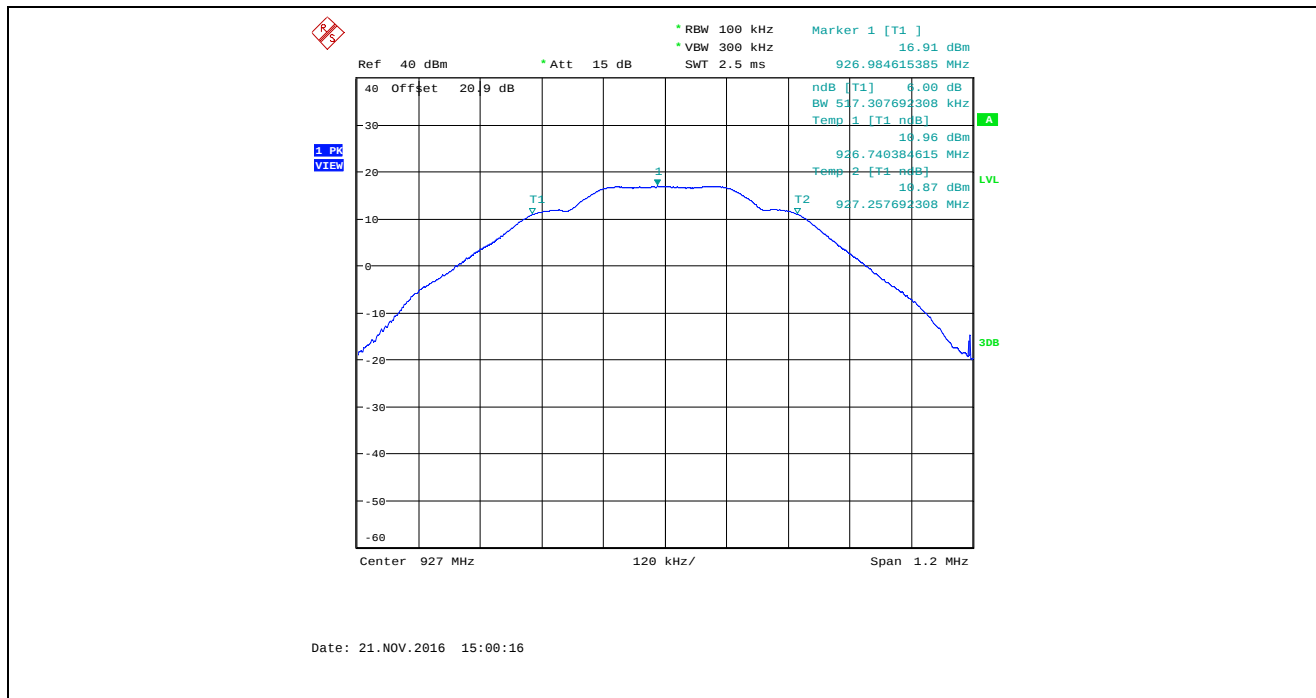
Plot 5.2.4.4. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 20, Data Rate 2, 903 MHz



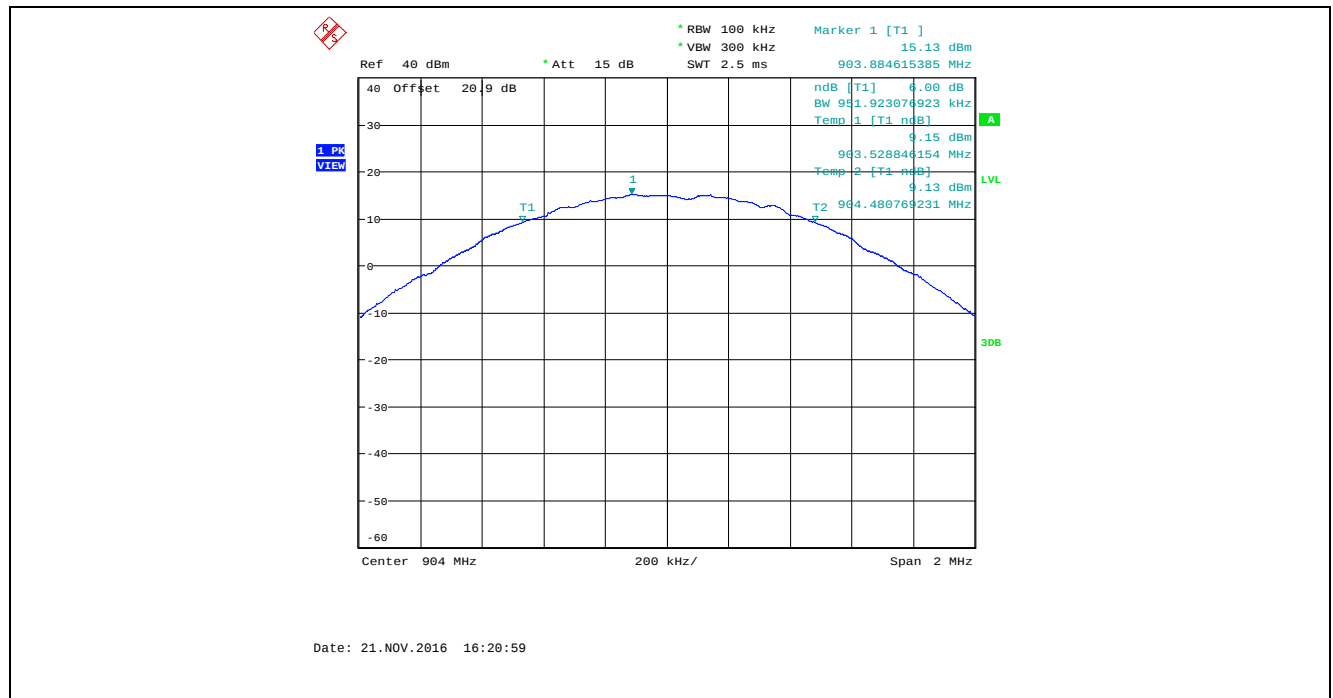
Plot 5.2.4.5. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 20, Data Rate 2, 915 MHz



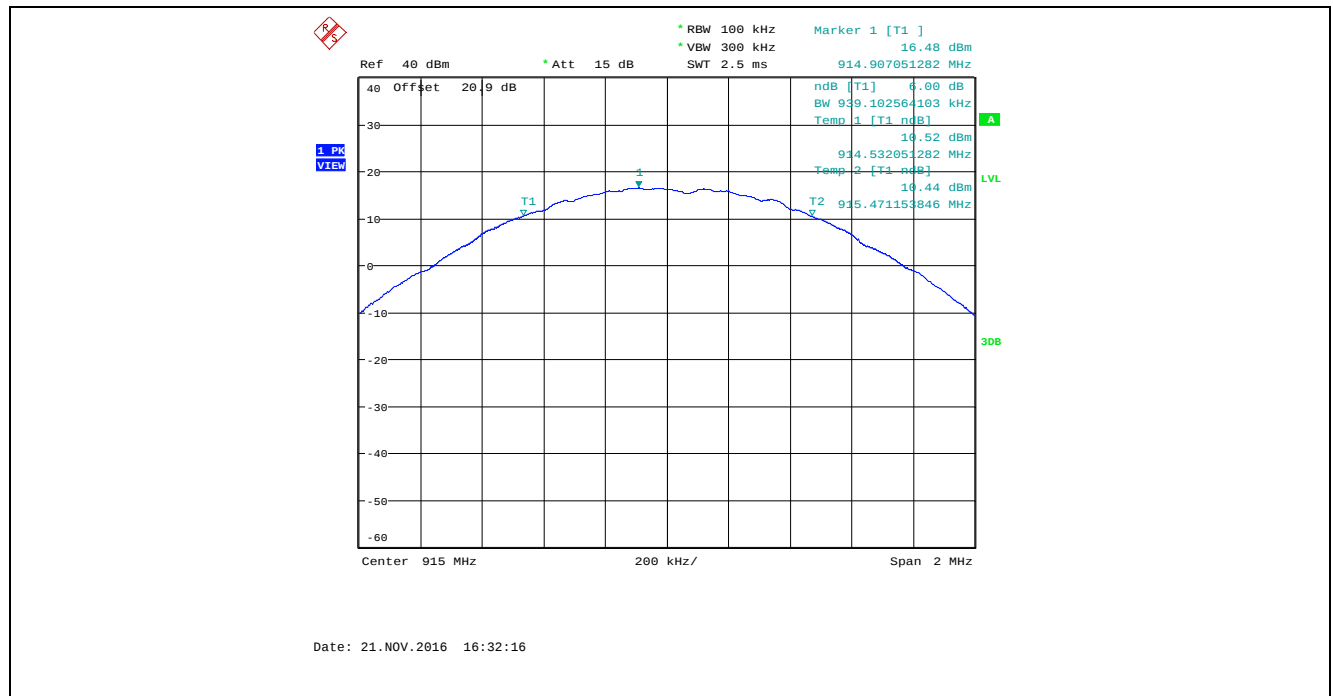
Plot 5.2.4.6. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 20, Data Rate 2, 927 MHz



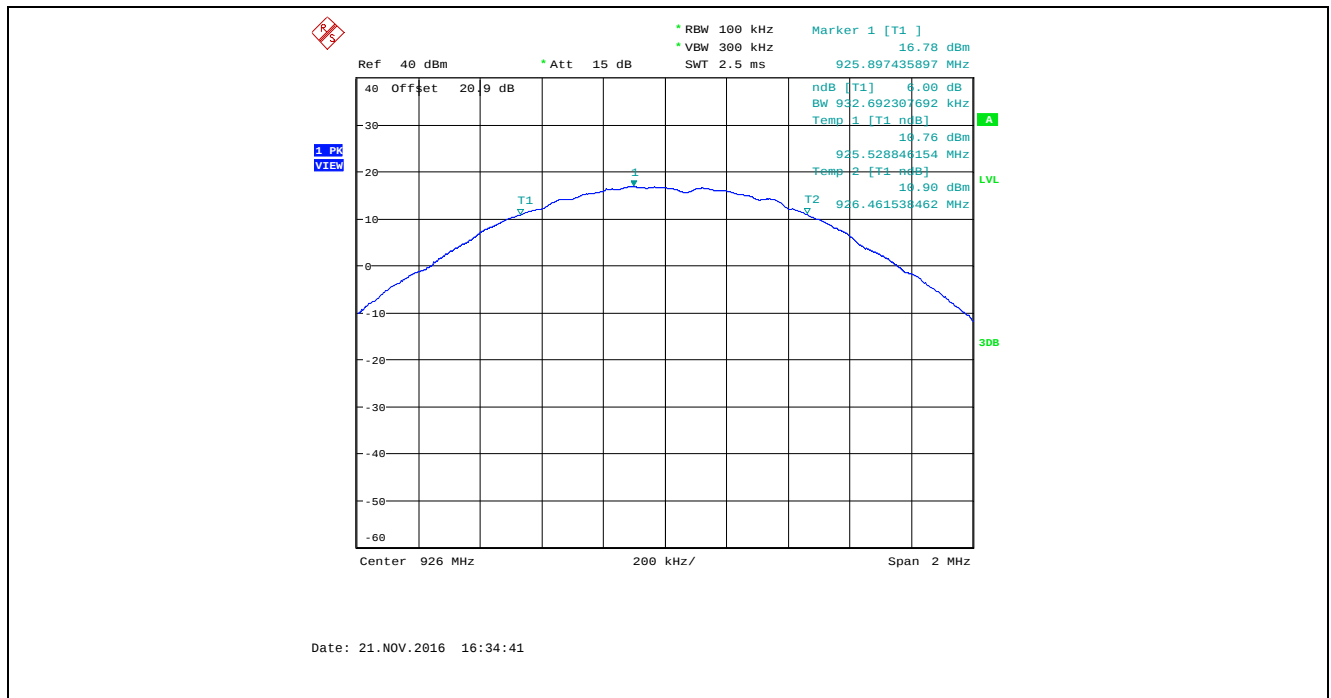
Plot 5.2.4.7. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 1, 904 MHz



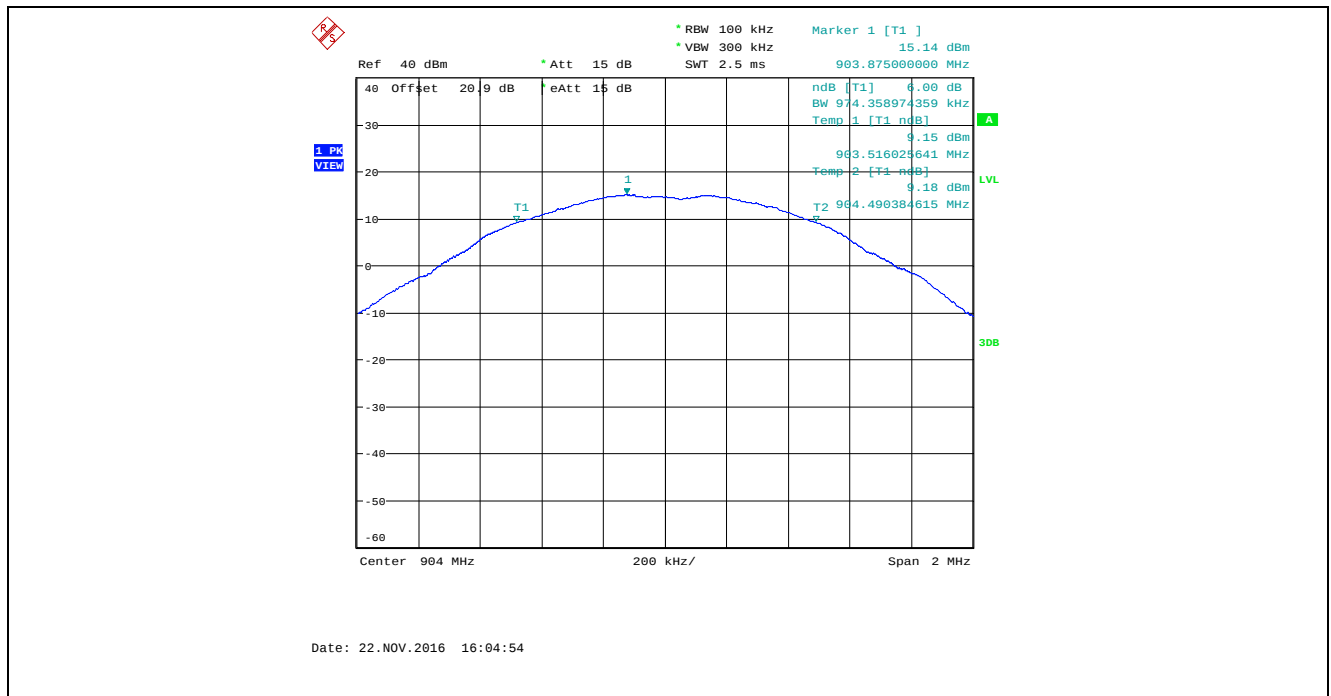
Plot 5.2.4.8. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 1, 915 MHz



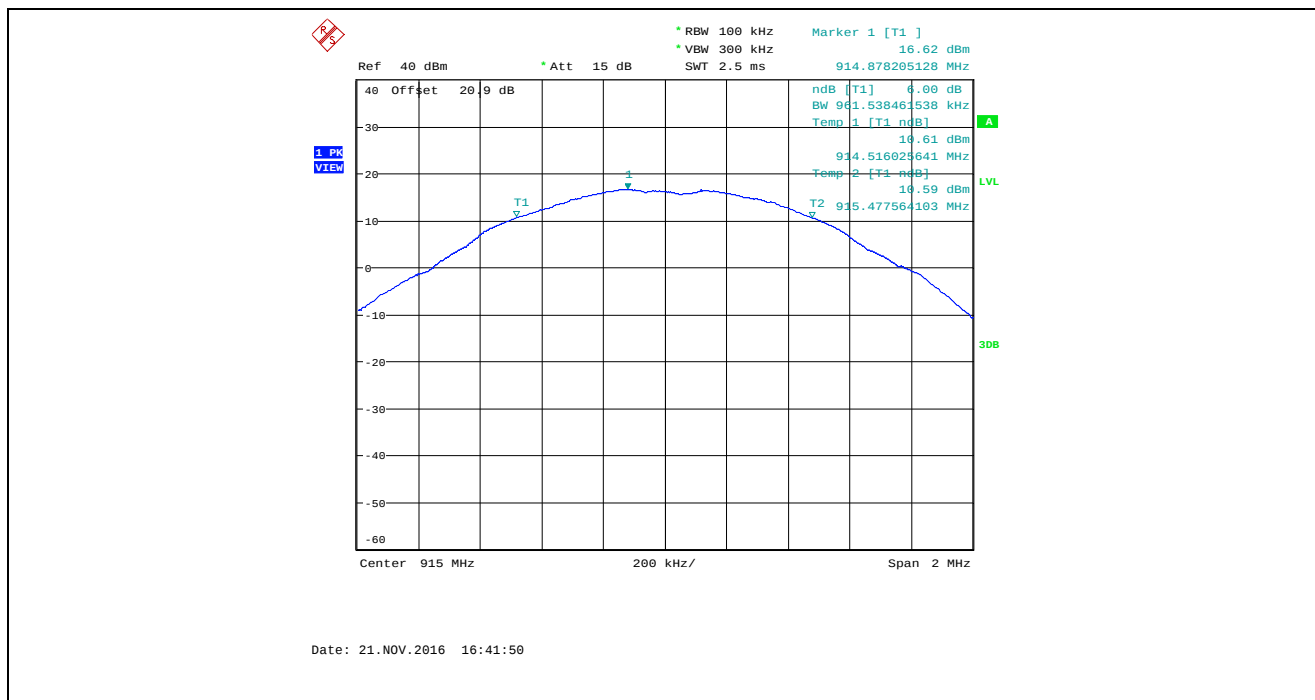
Plot 5.2.4.9. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 1, 926 MHz



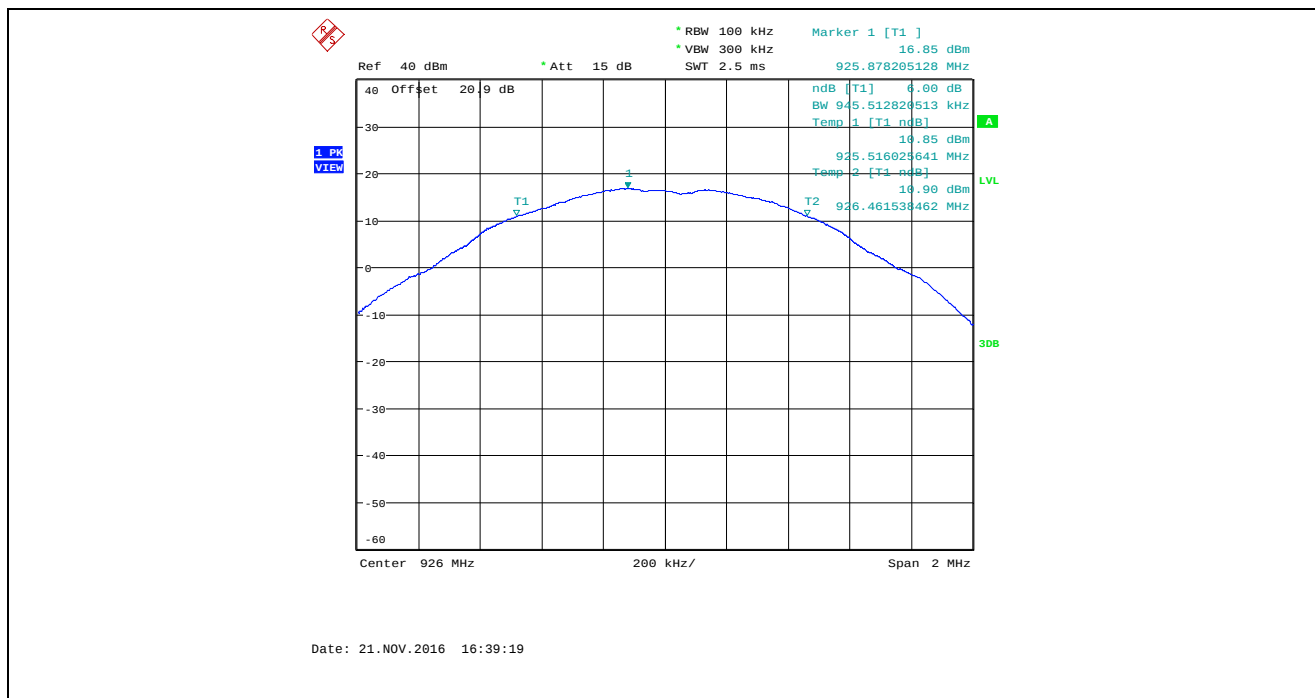
Plot 5.2.4.10. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 2, 904 MHz



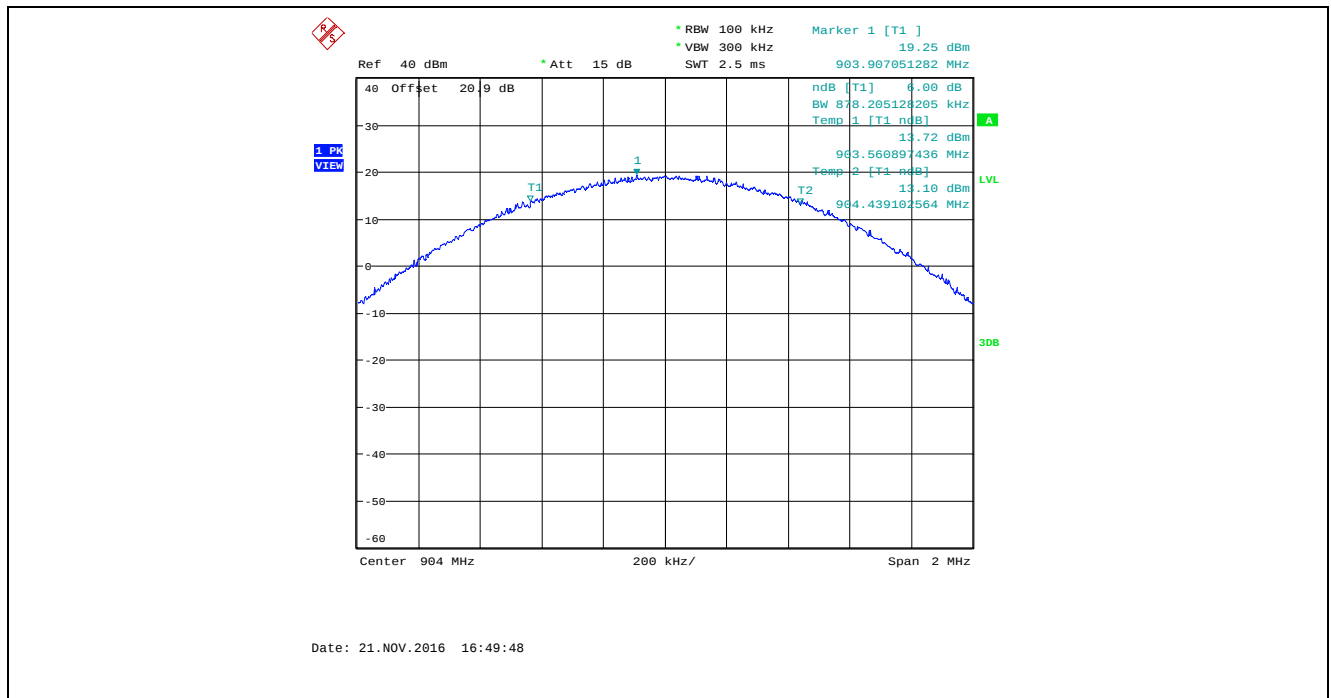
Plot 5.2.4.11. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 2, 915 MHz



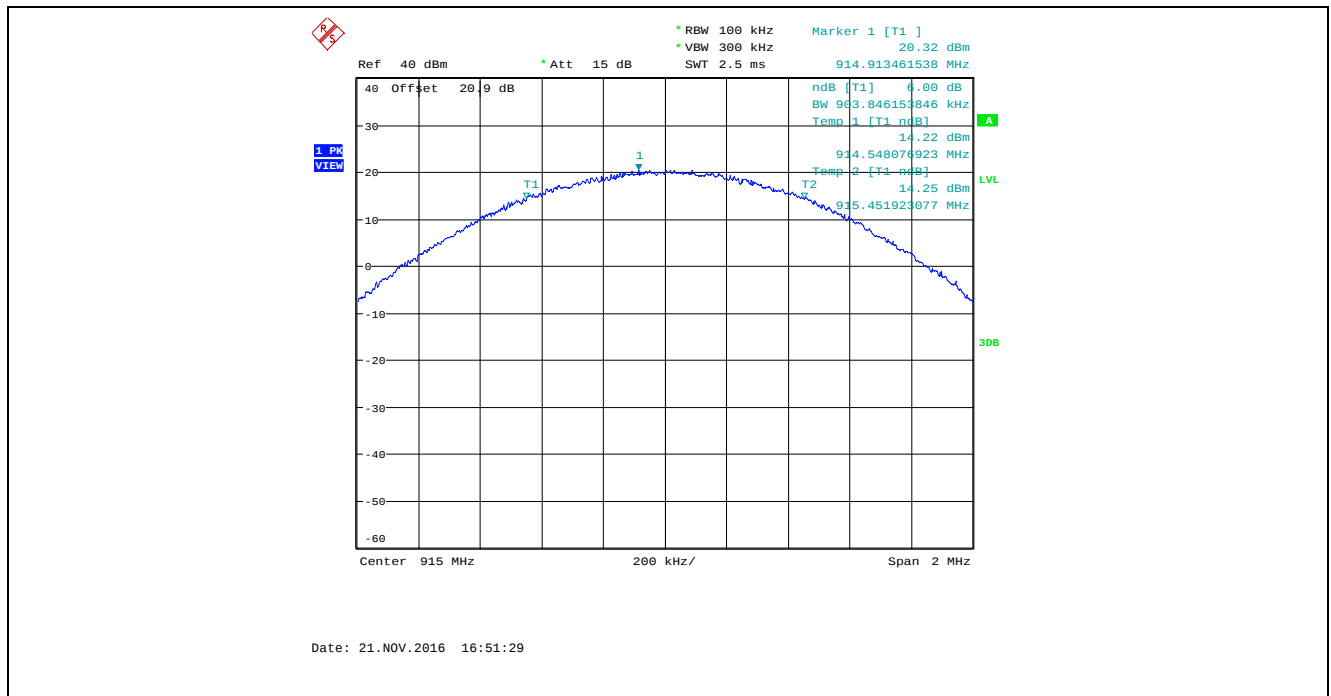
Plot 5.2.4.12. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 2, 926 MHz



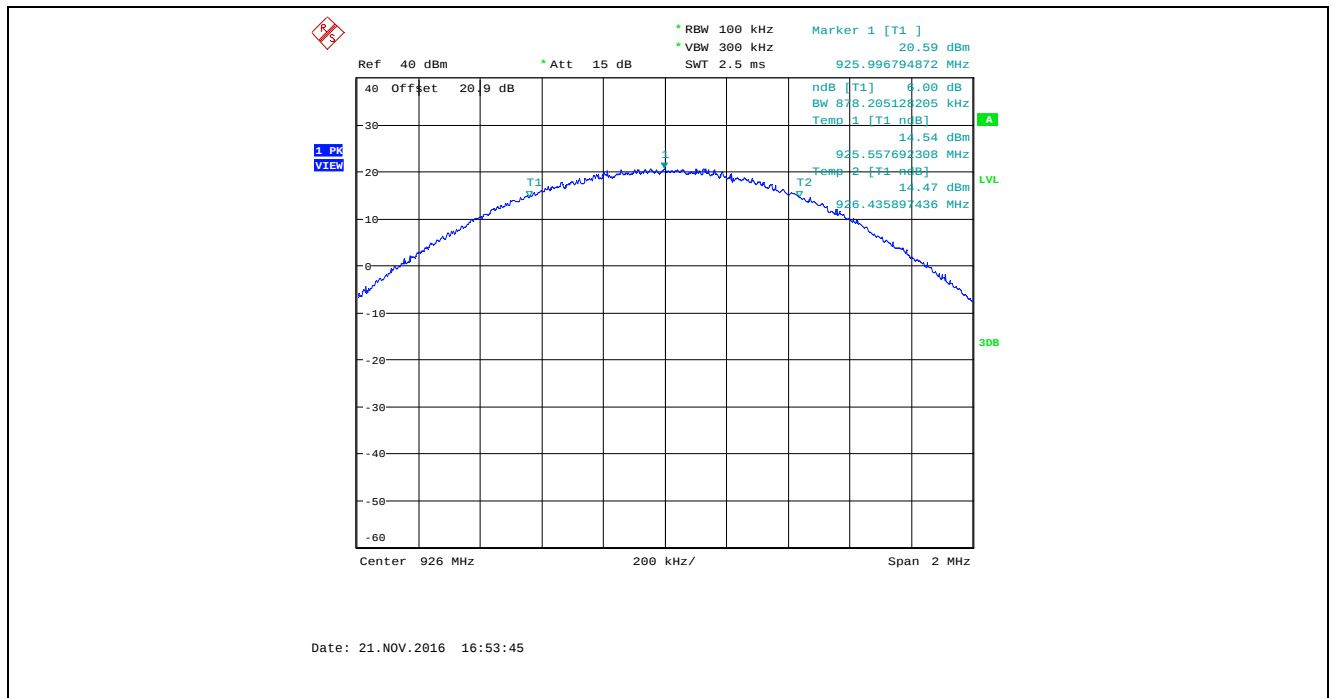
Plot 5.2.4.13. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 3, 904 MHz



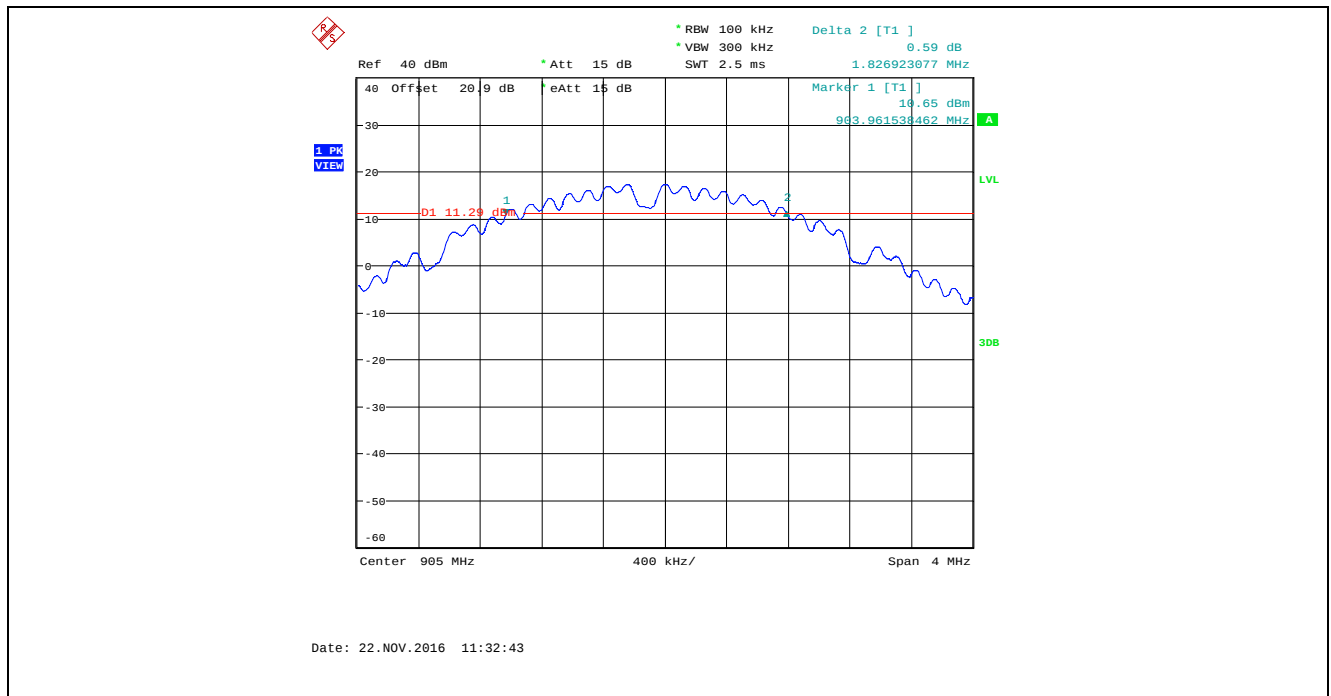
Plot 5.2.4.14. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 3, 915 MHz



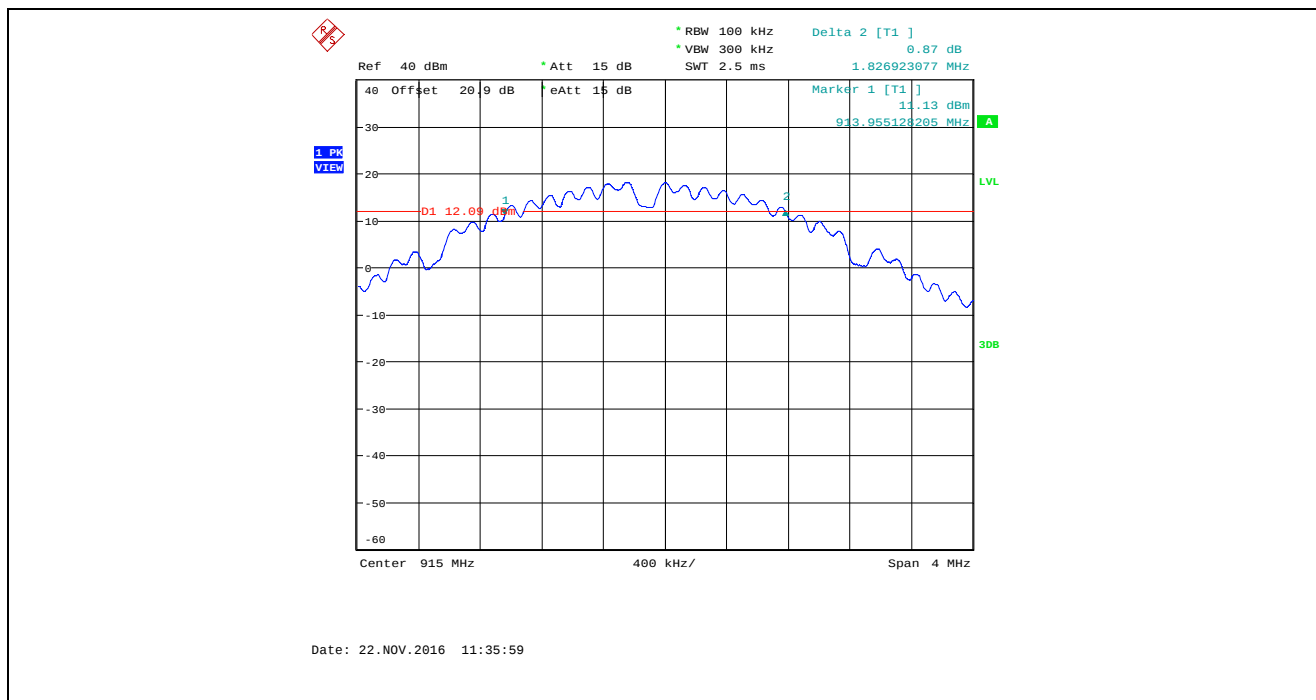
Plot 5.2.4.15. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 25, Data Rate 3, 926 MHz



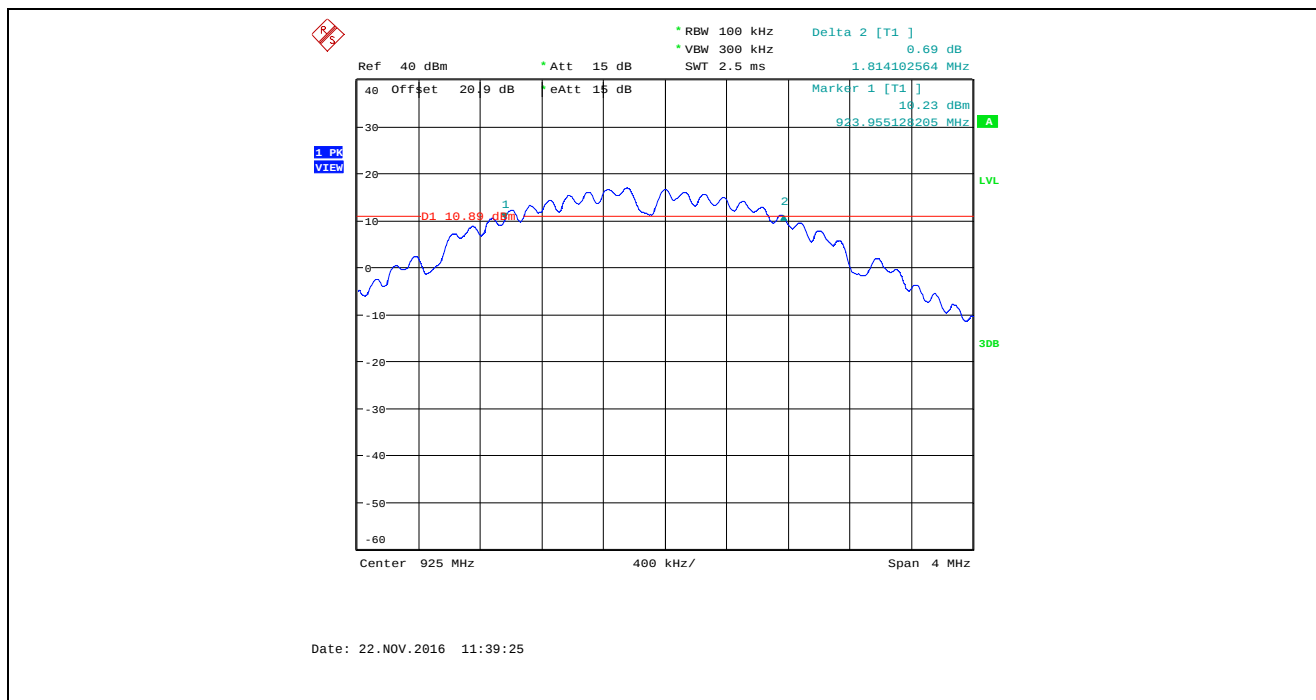
Plot 5.2.4.16. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 32, Data Rate 1, 905 MHz



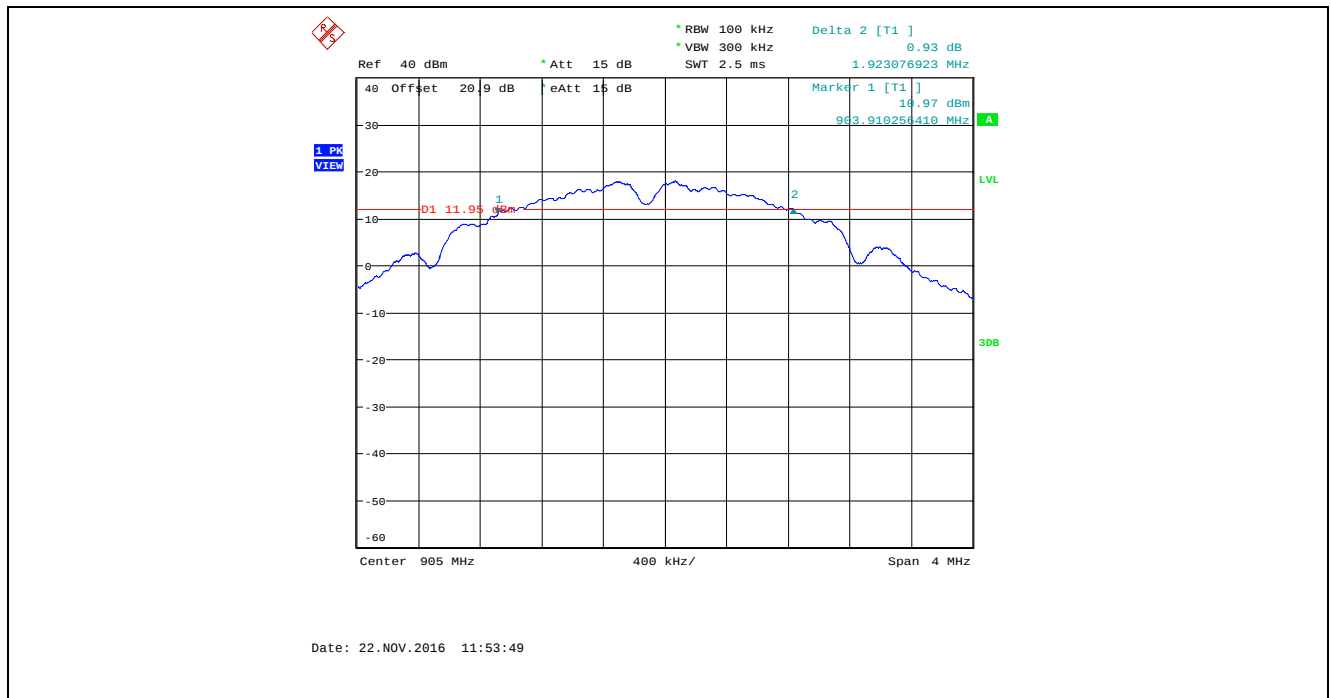
Plot 5.2.4.17. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 32, Data Rate 1, 915 MHz



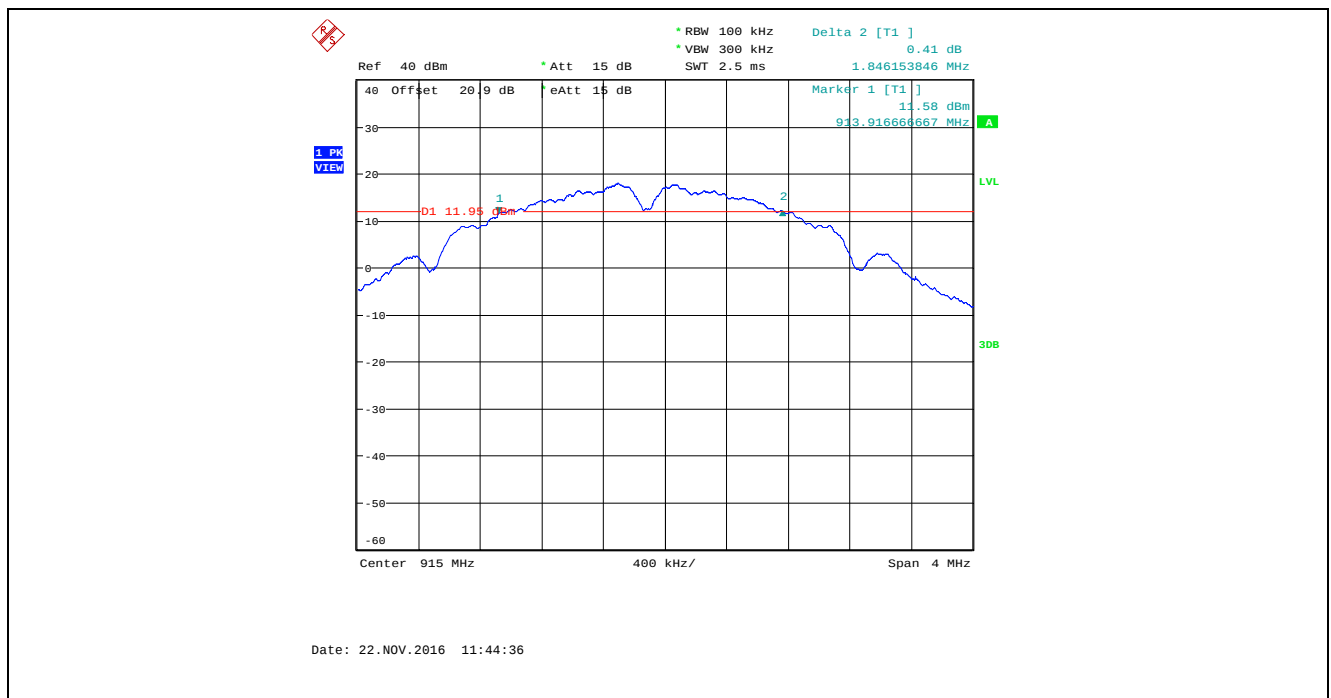
Plot 5.2.4.18. 6 dB Bandwidth, Bandwidth:4 MHz, TX Gain: 32, Data Rate 1, 925 MHz



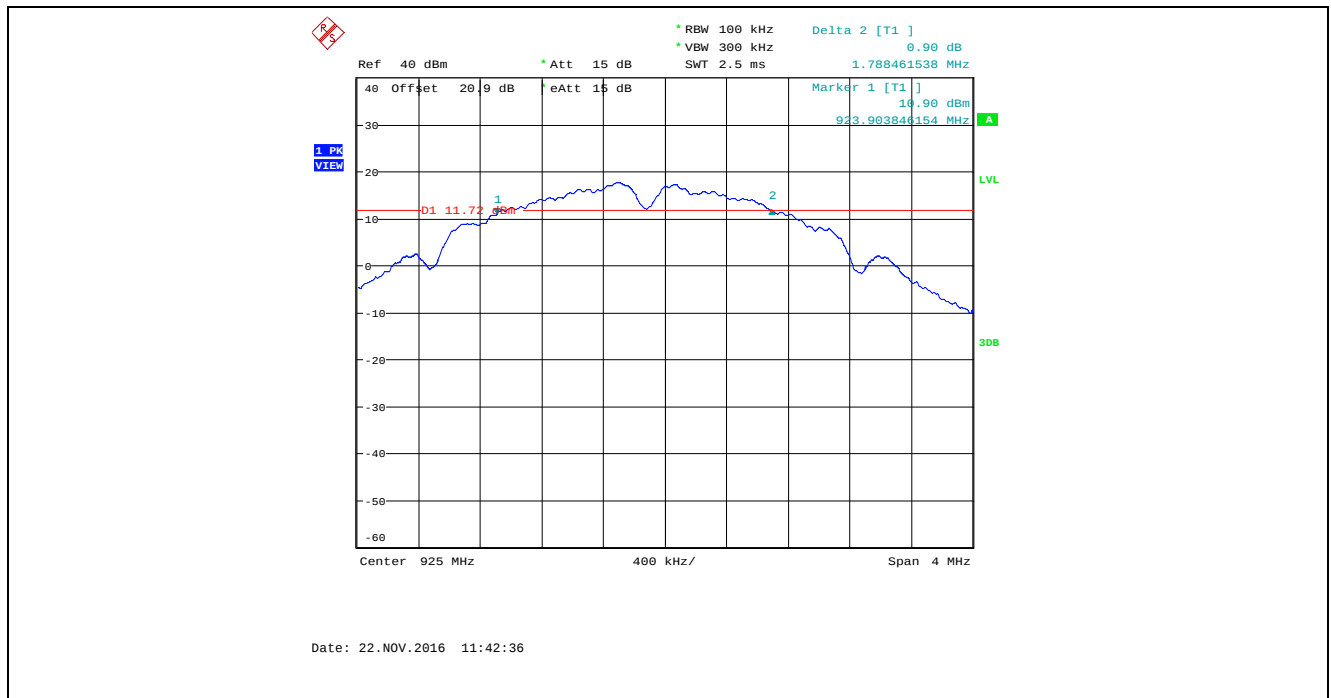
Plot 5.2.4.19. 6 dB Bandwidth, Bandwidth:4 MHz, TX Gain: 32, Data Rate 2, 905 MHz



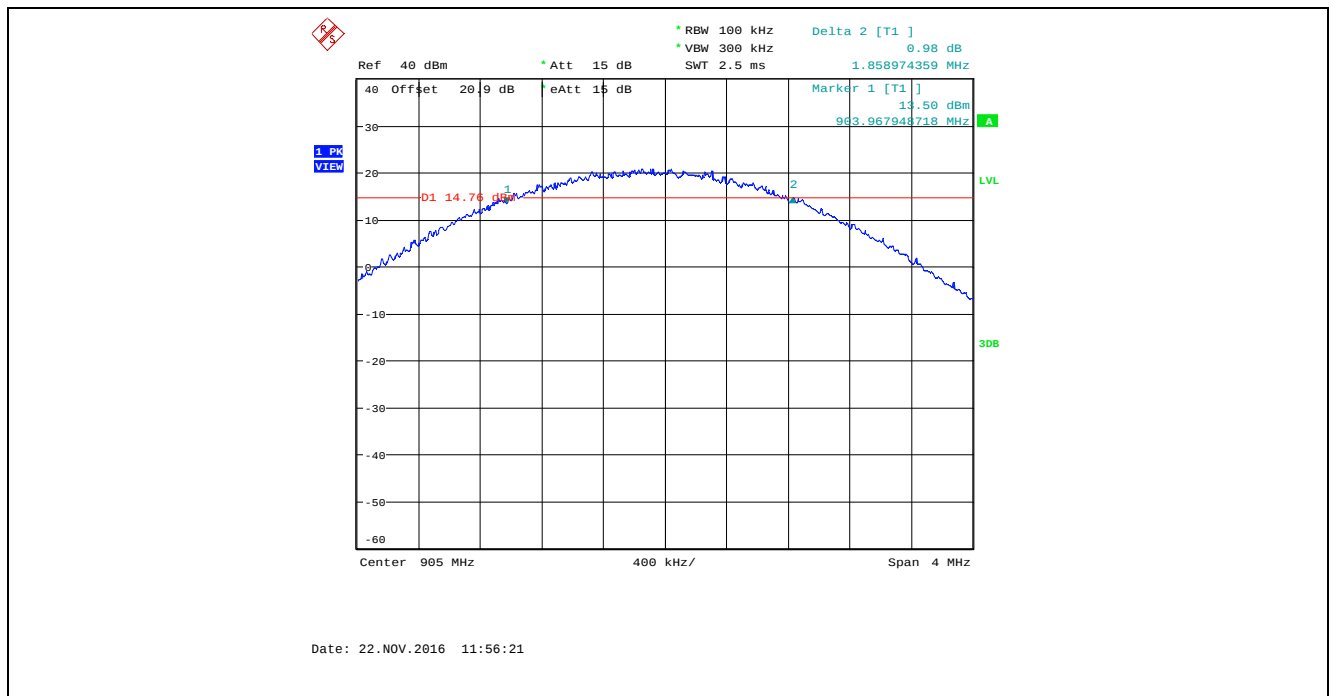
Plot 5.2.4.20. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 32, Data Rate 2, 915 MHz



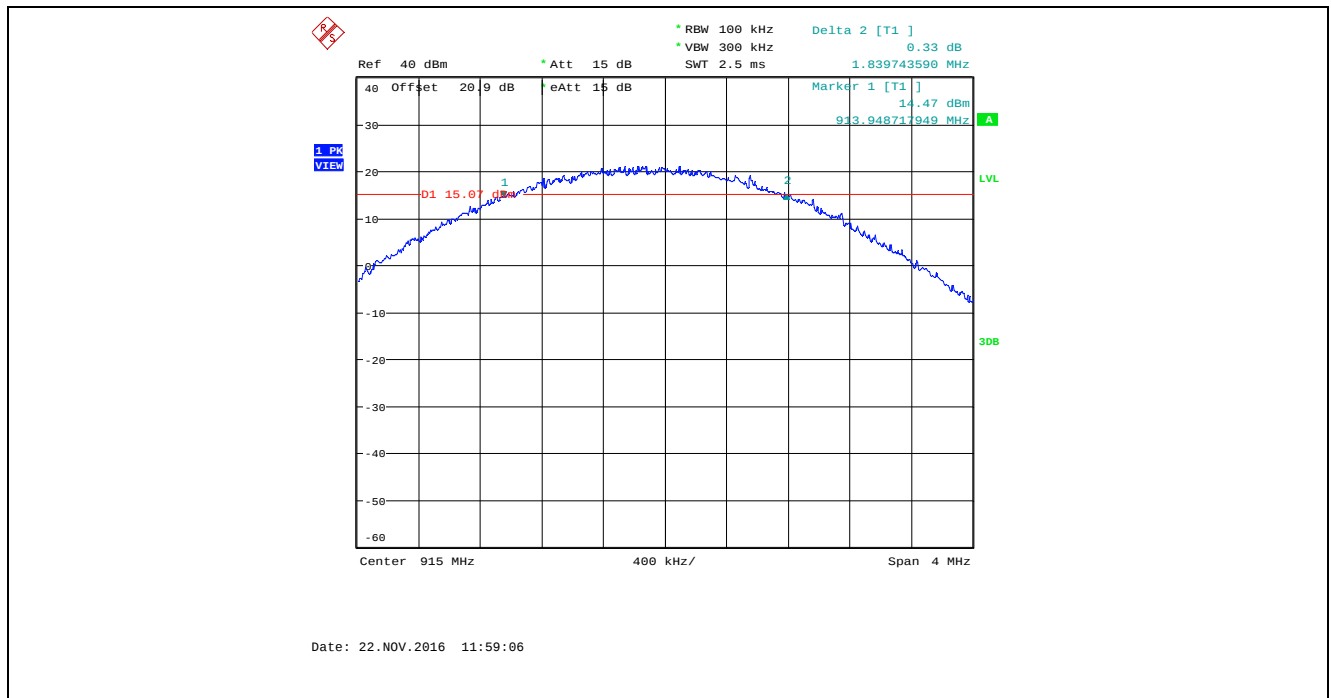
Plot 5.2.4.21. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 32, Data Rate 2, 925 MHz



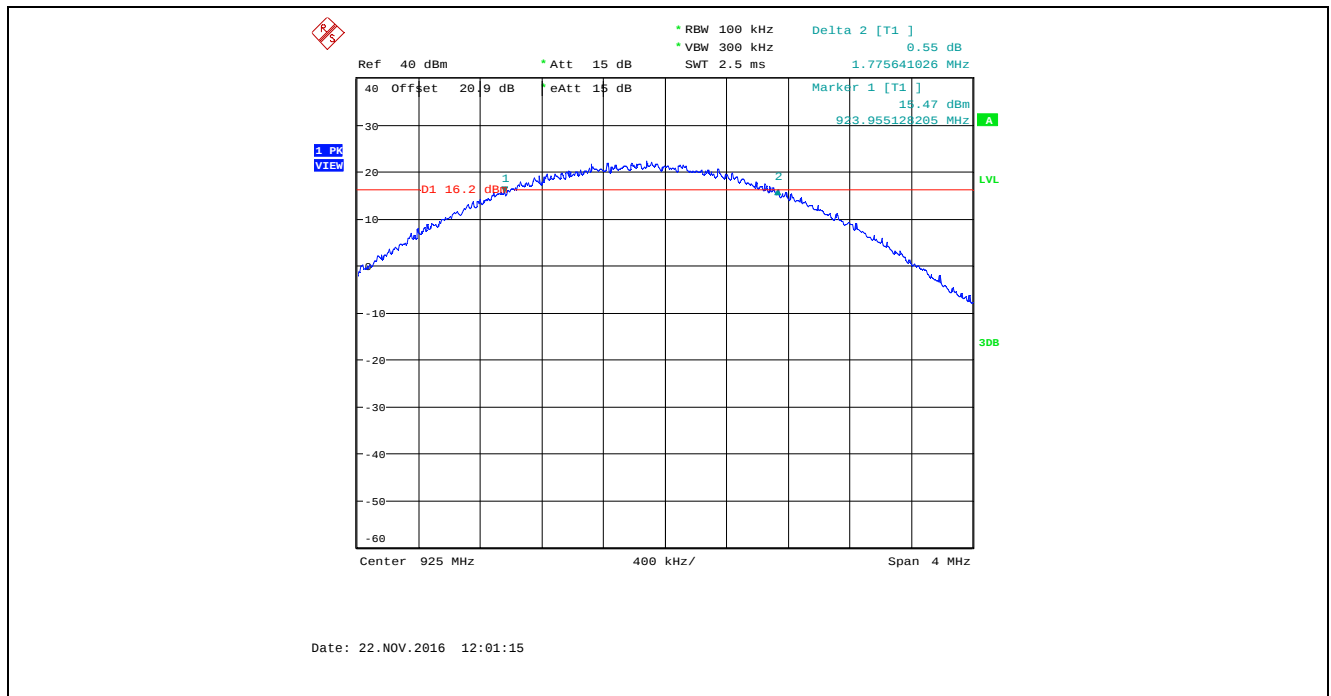
Plot 5.2.4.22. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 32, Data Rate 3, 905 MHz



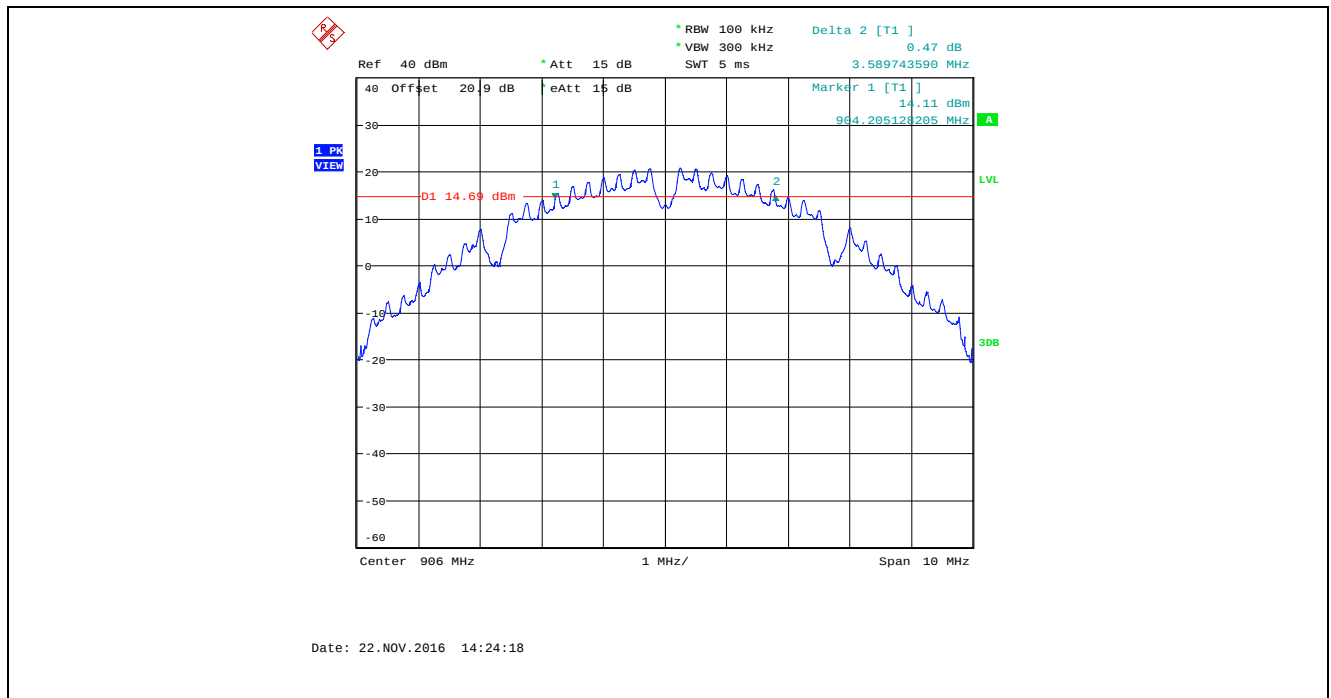
Plot 5.2.4.23. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 32, Data Rate 3, 915 MHz



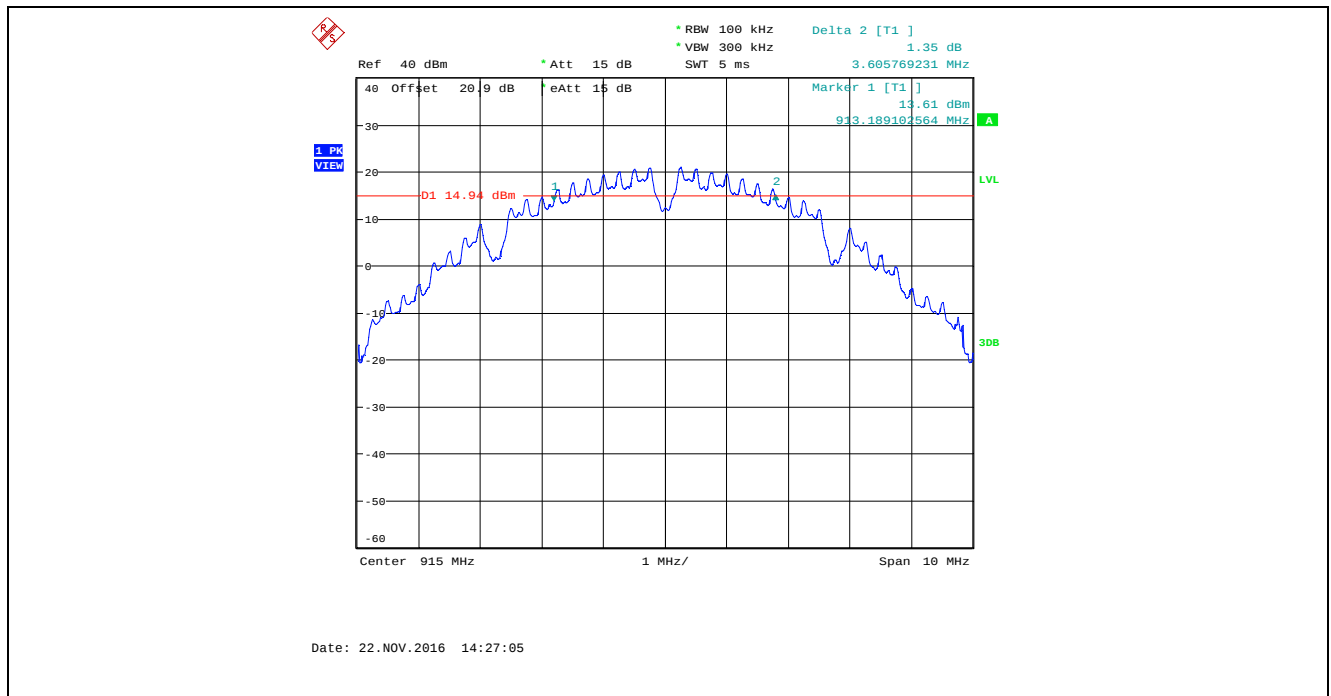
Plot 5.2.4.24. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 32, Data Rate 3, 925 MHz



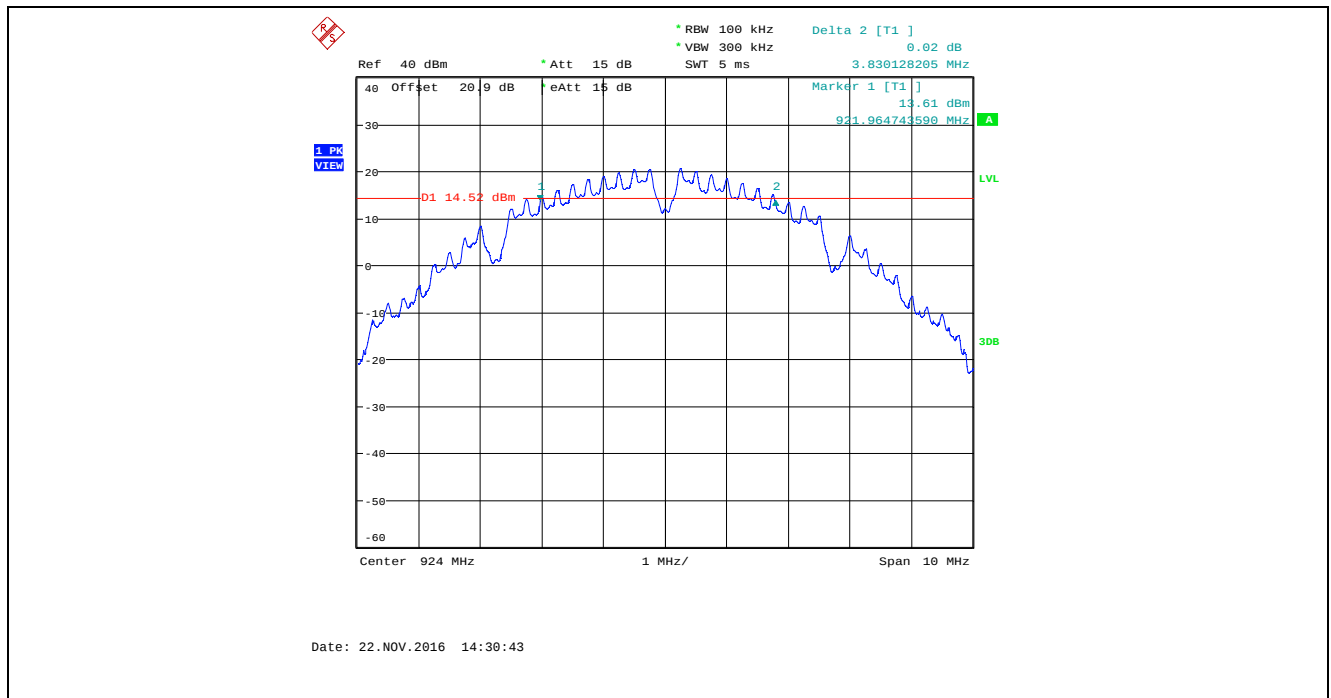
Plot 5.2.4.25. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 40, Data Rate 1, 906 MHz



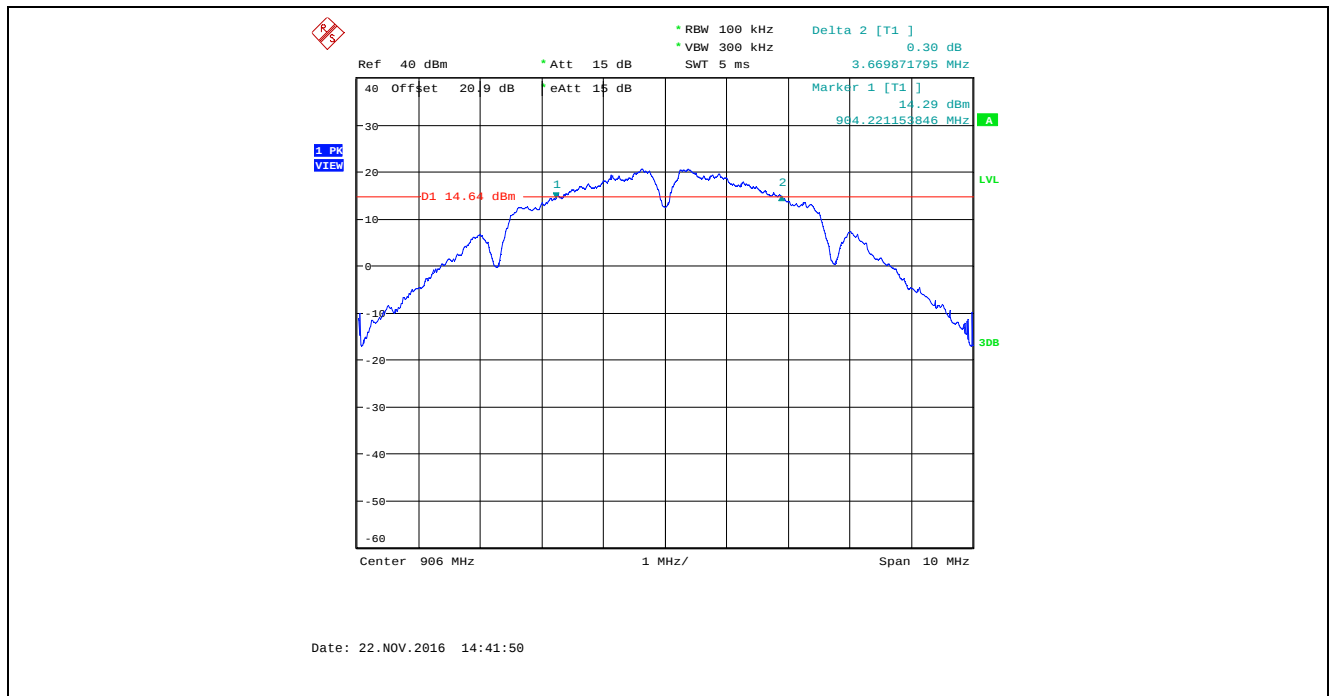
Plot 5.2.4.26. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 40, Data Rate 1, 915 MHz



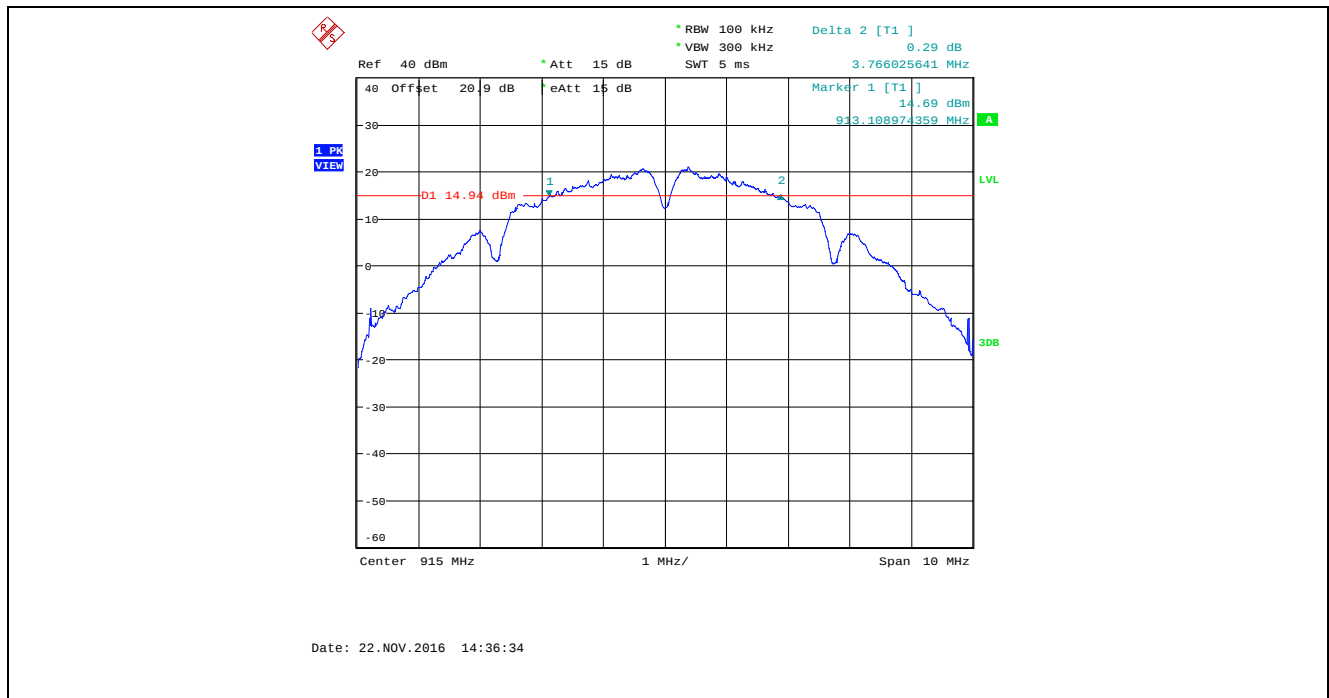
Plot 5.2.4.27. 6 dB Bandwidth, Bandwidth:8 MHz, TX Gain: 40, Data Rate 1, 924 MHz



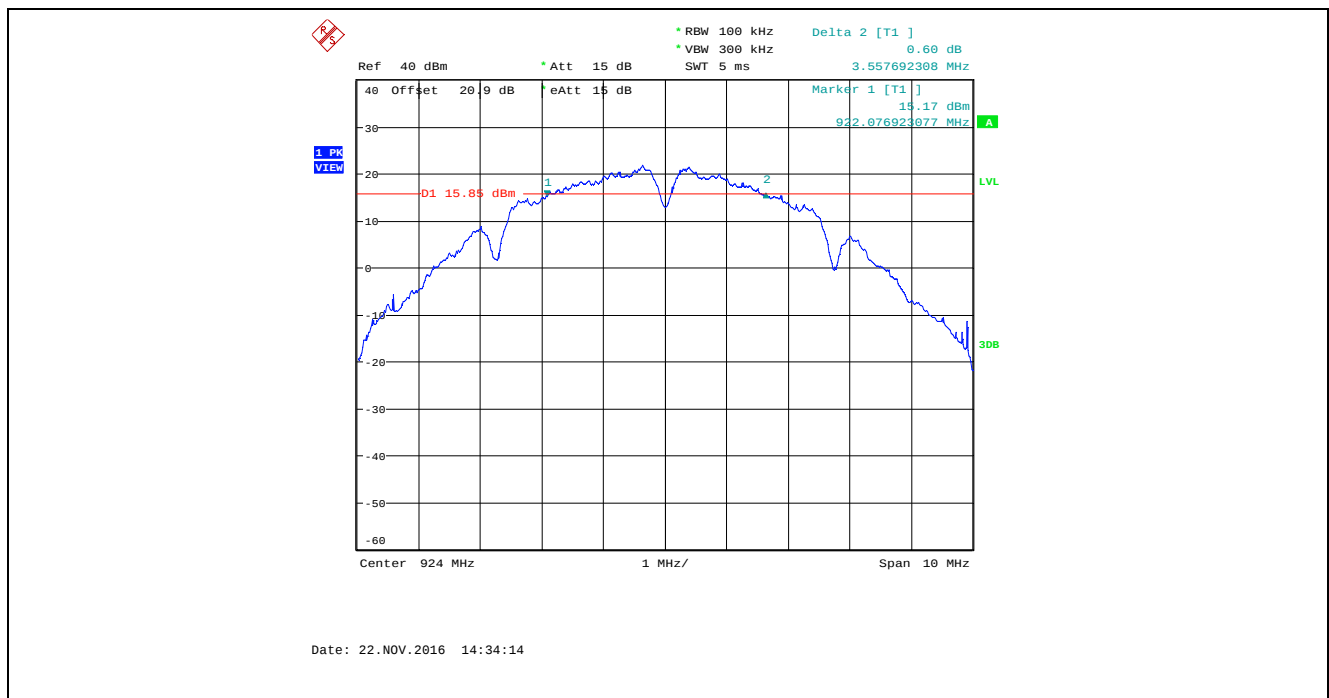
Plot 5.2.4.28. 6 dB Bandwidth, Bandwidth:8 MHz, TX Gain: 40, Data Rate 2, 906 MHz



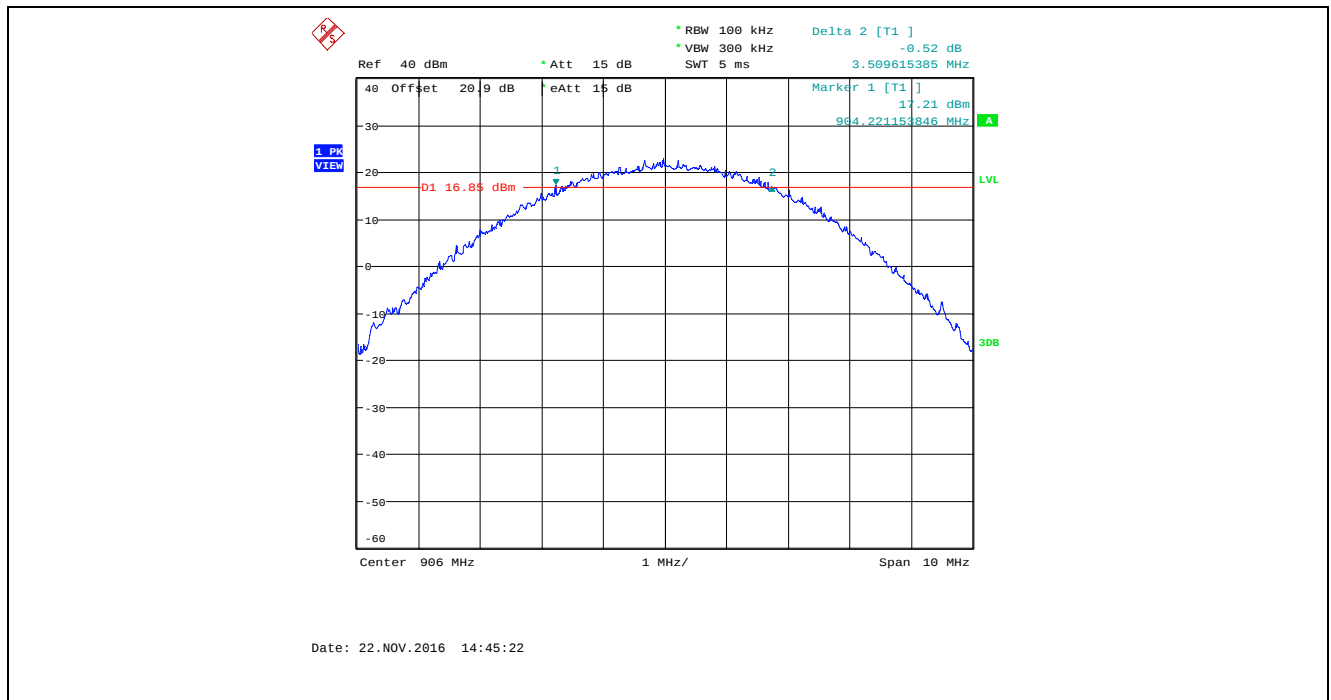
Plot 5.2.4.29. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 40, Data Rate 2, 915 MHz



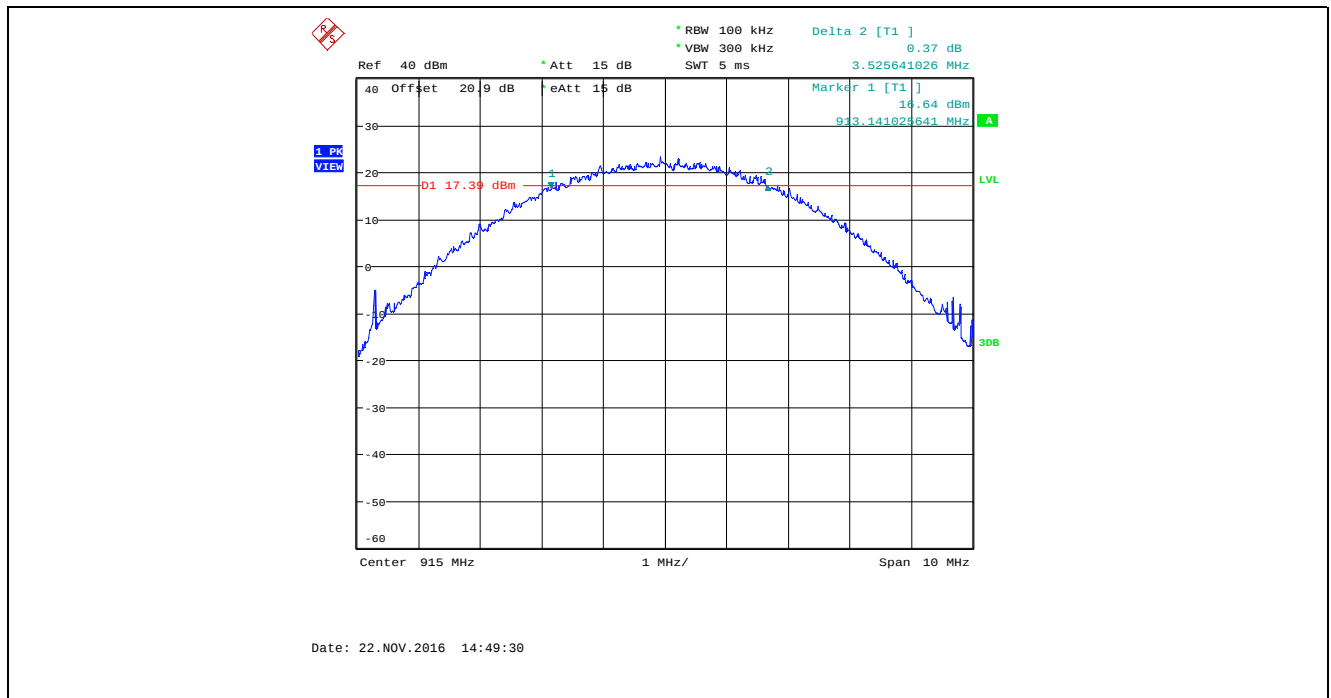
Plot 5.2.4.30. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 40, Data Rate 2, 924 MHz



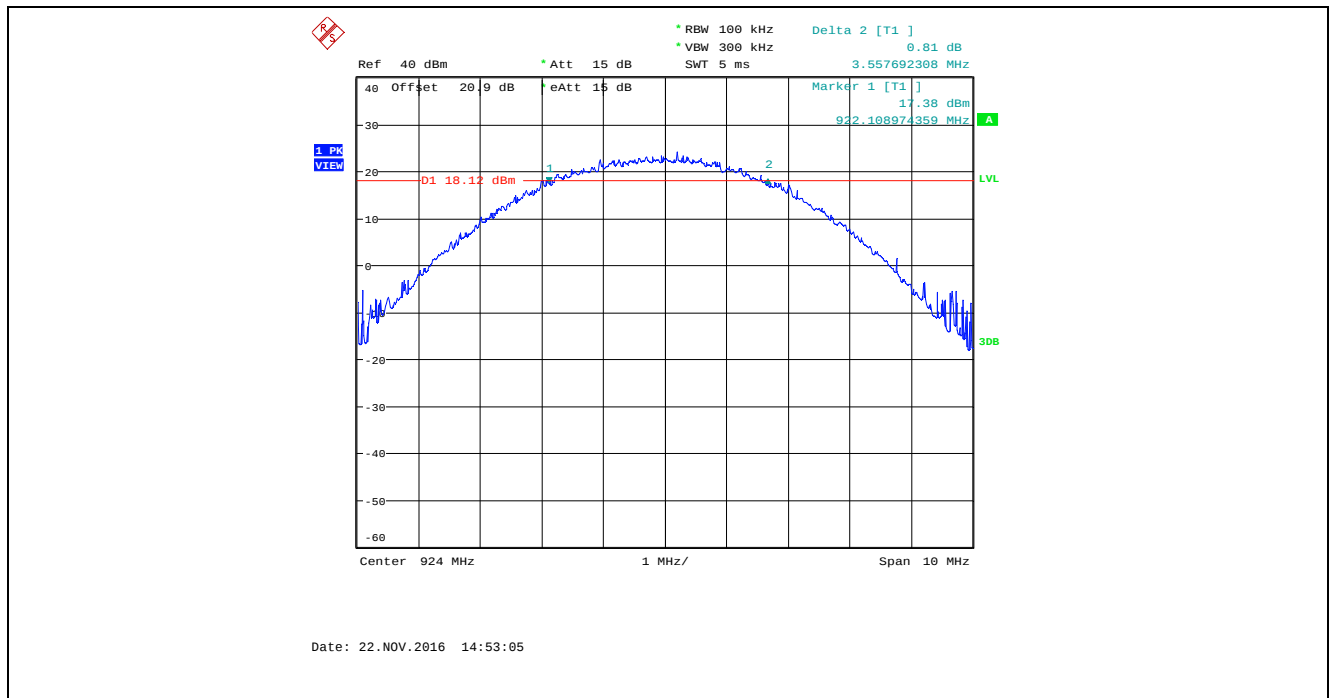
Plot 5.2.4.31. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 40, Data Rate 3, 906 MHz



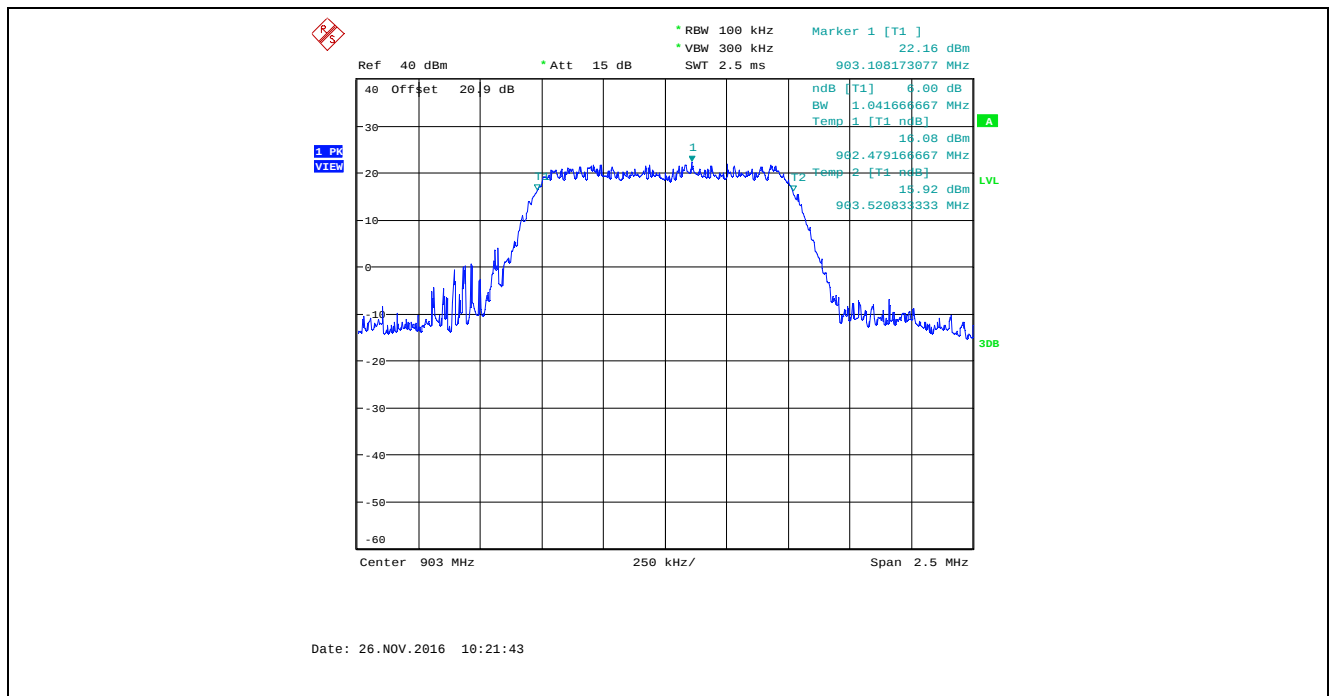
Plot 5.2.4.32. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 40, Data Rate 3, 915 MHz



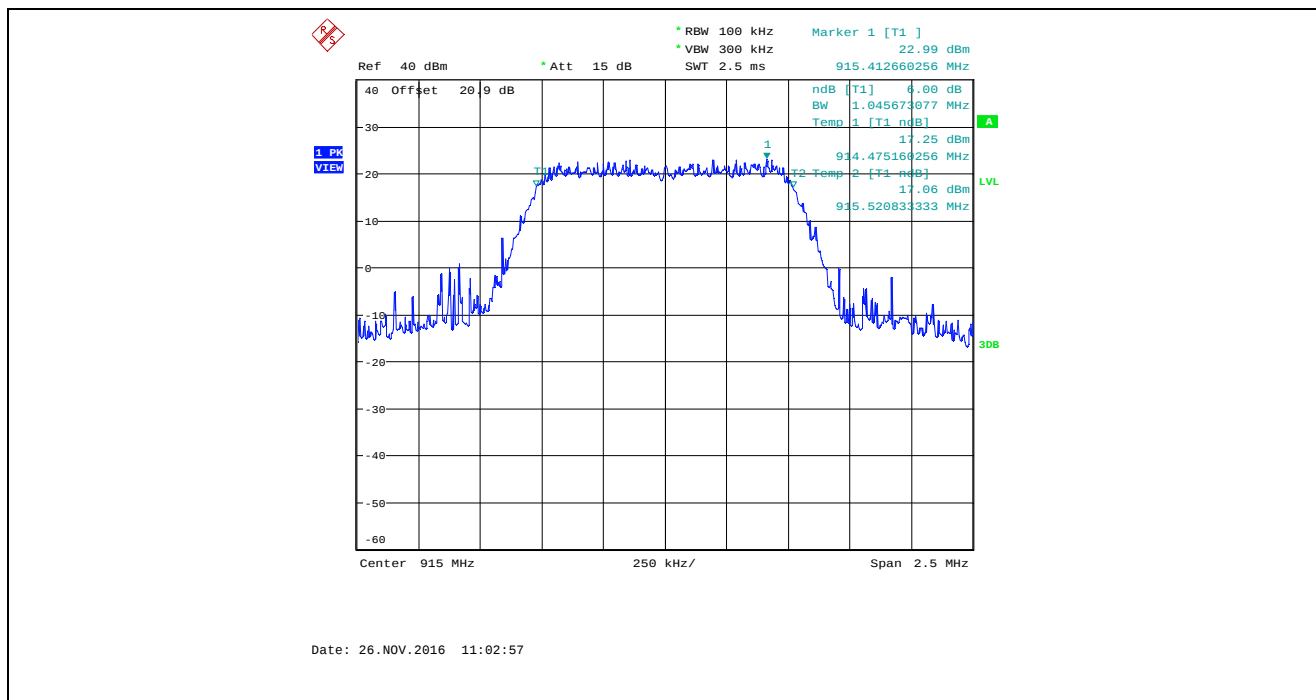
Plot 5.2.4.33. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 40, Data Rate 3, 924 MHz



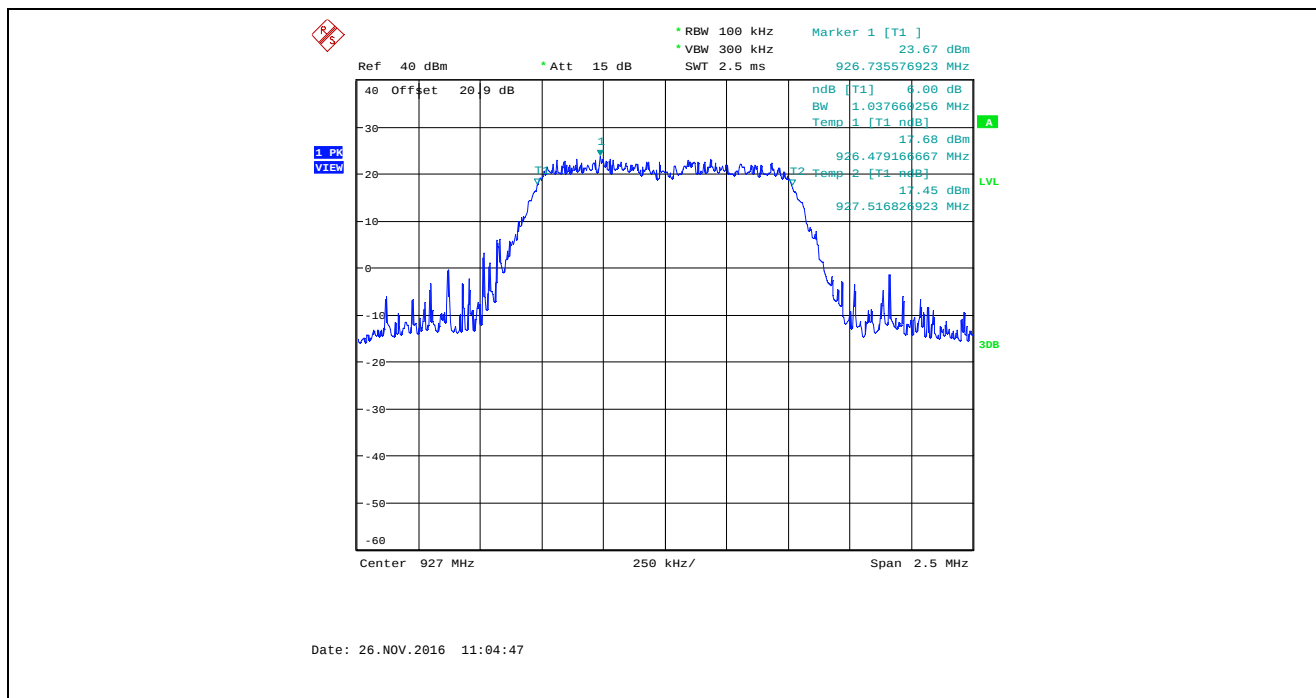
Plot 5.2.4.34. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 4, 903 MHz



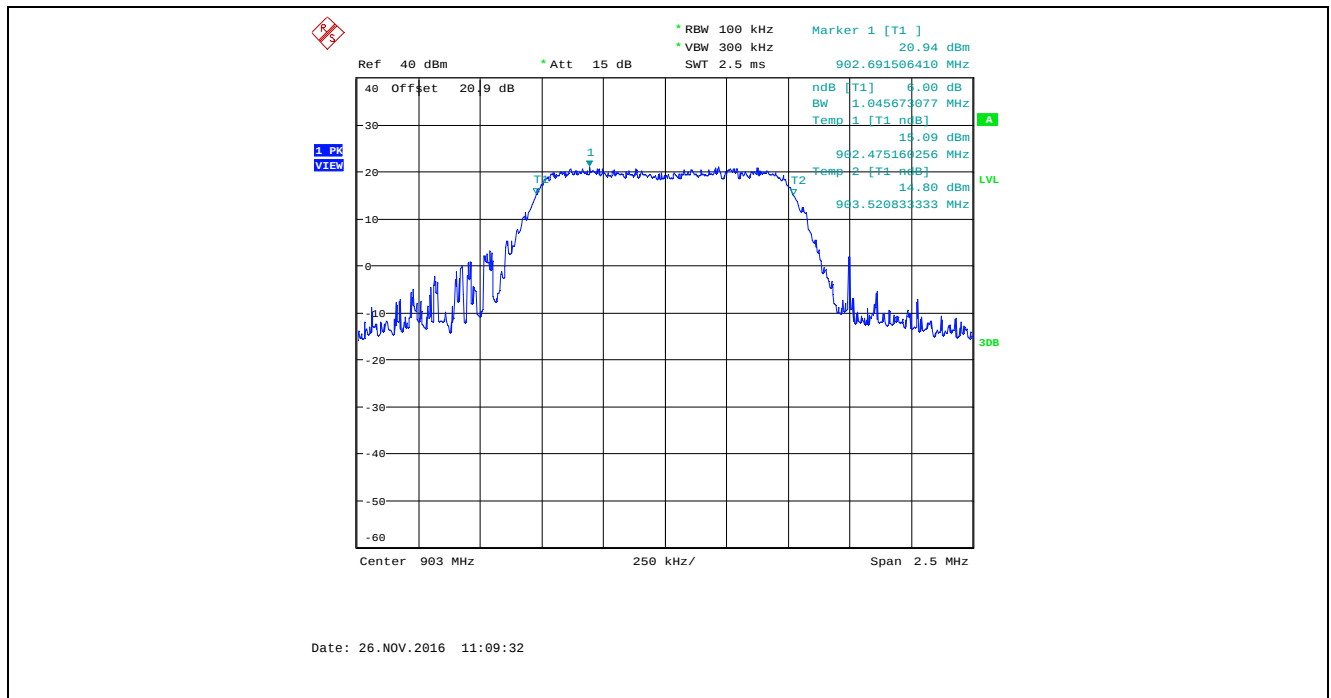
Plot 5.2.4.35. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 4, 915 MHz



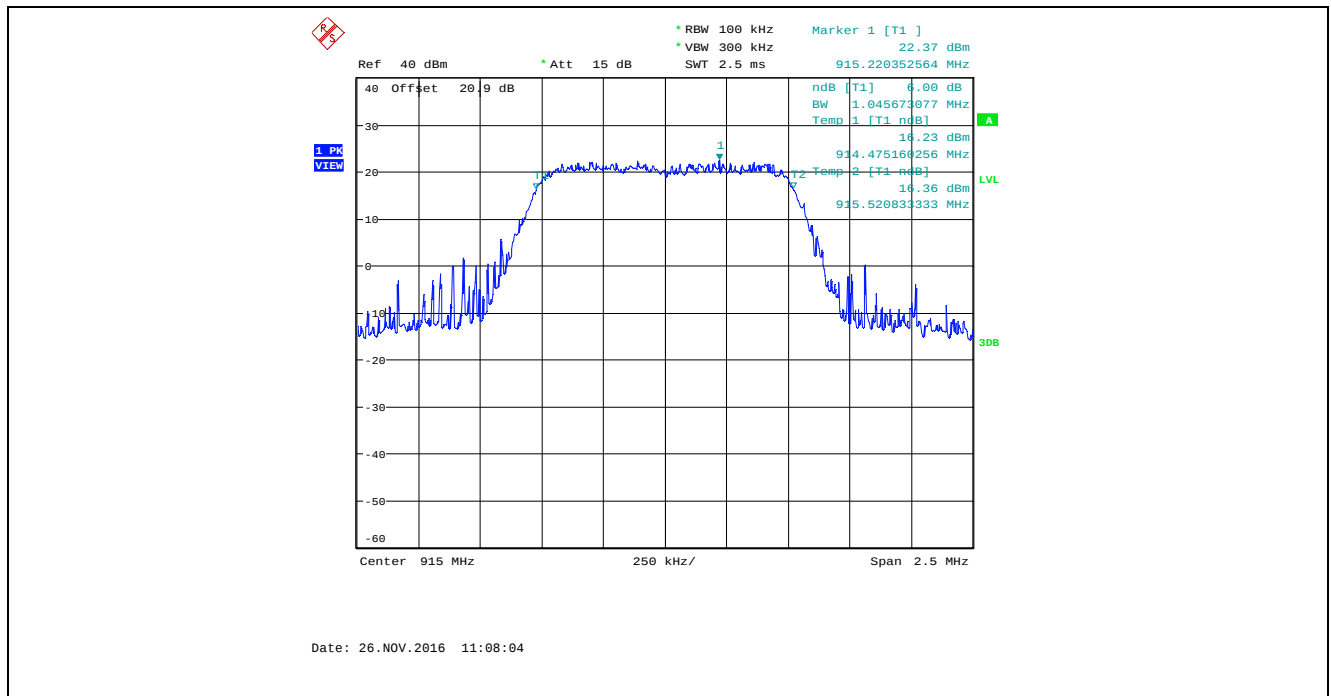
Plot 5.2.4.36. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 4, 927 MHz



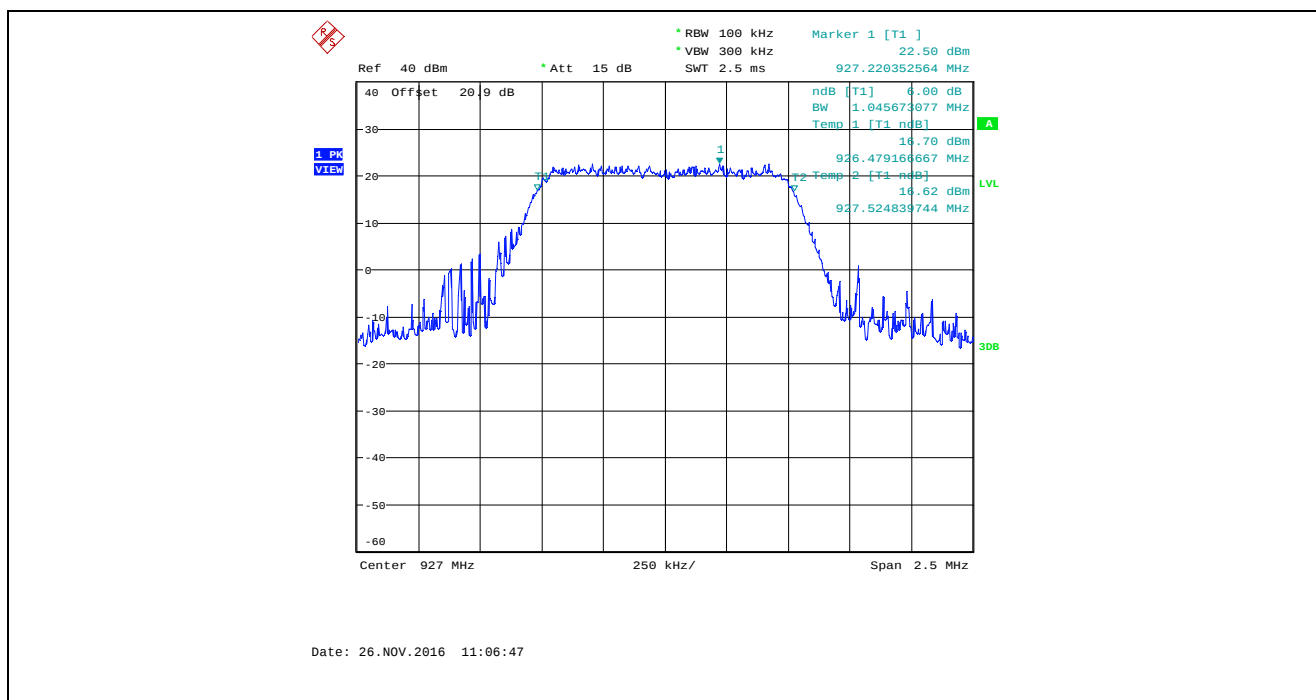
Plot 5.2.4.37. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 5, 903 MHz



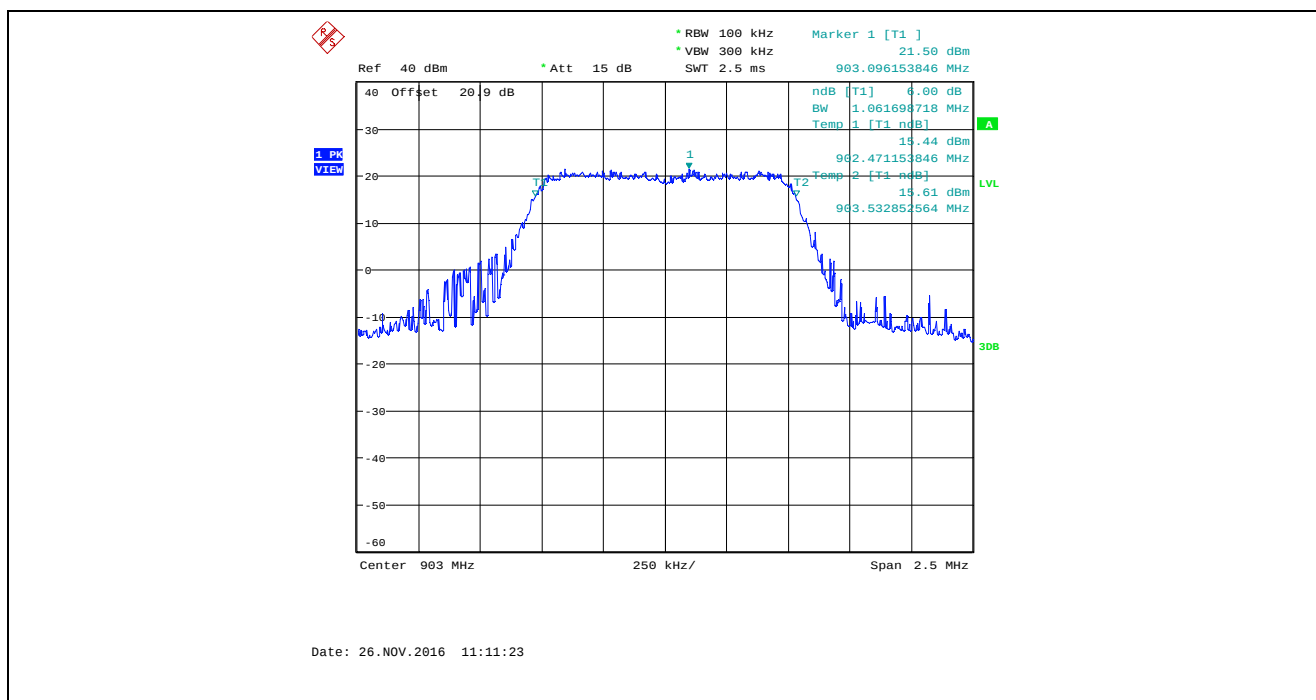
Plot 5.2.4.38. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 5, 915 MHz



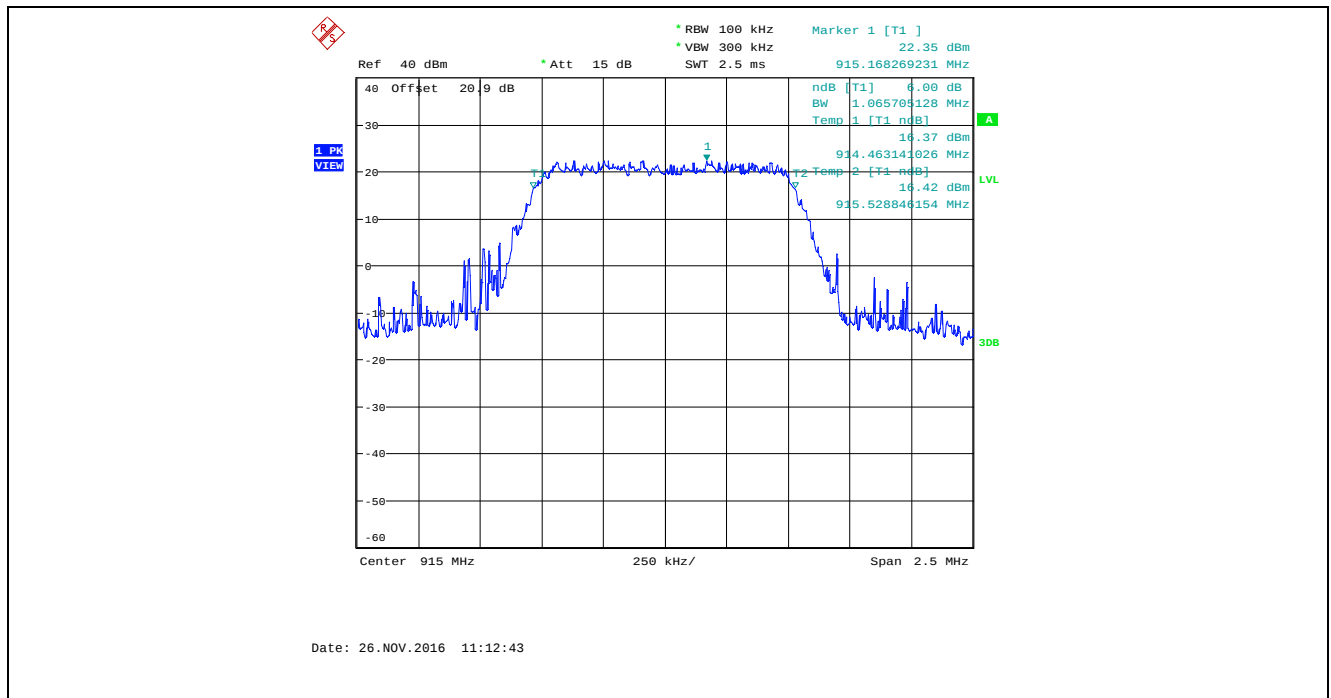
Plot 5.2.4.39. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 5, 927 MHz



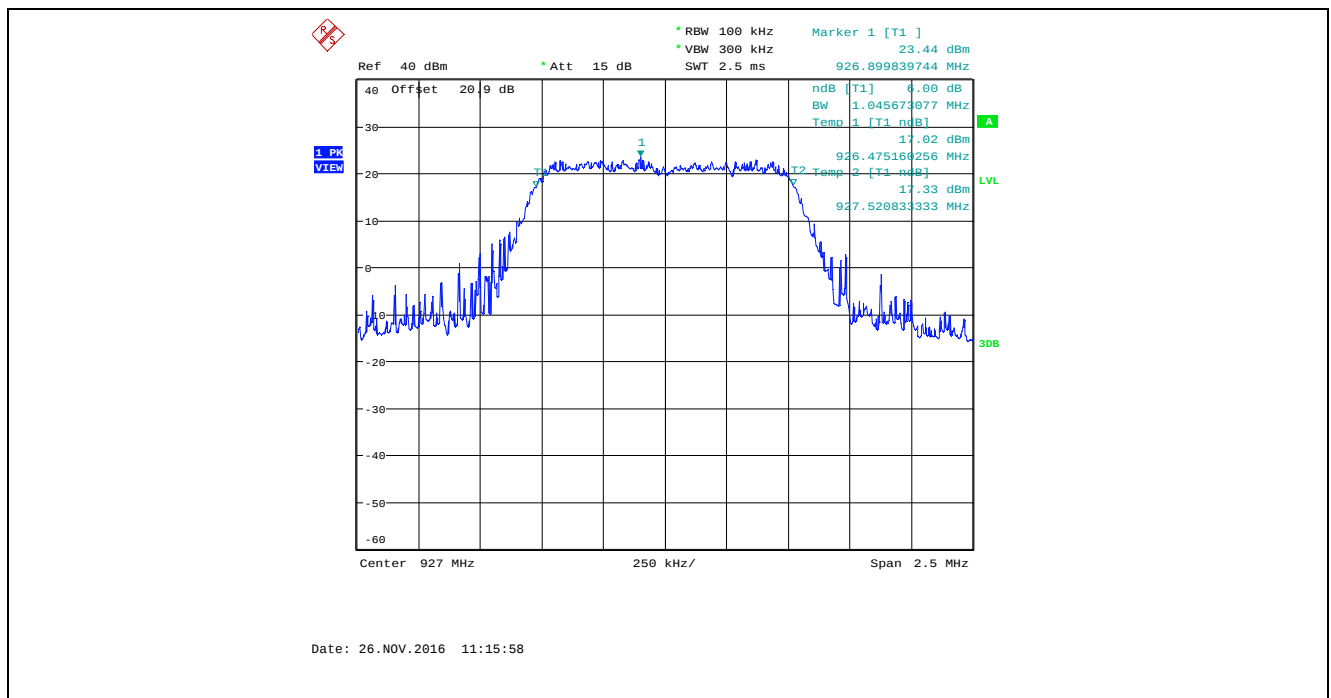
Plot 5.2.4.40. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 6, 903 MHz



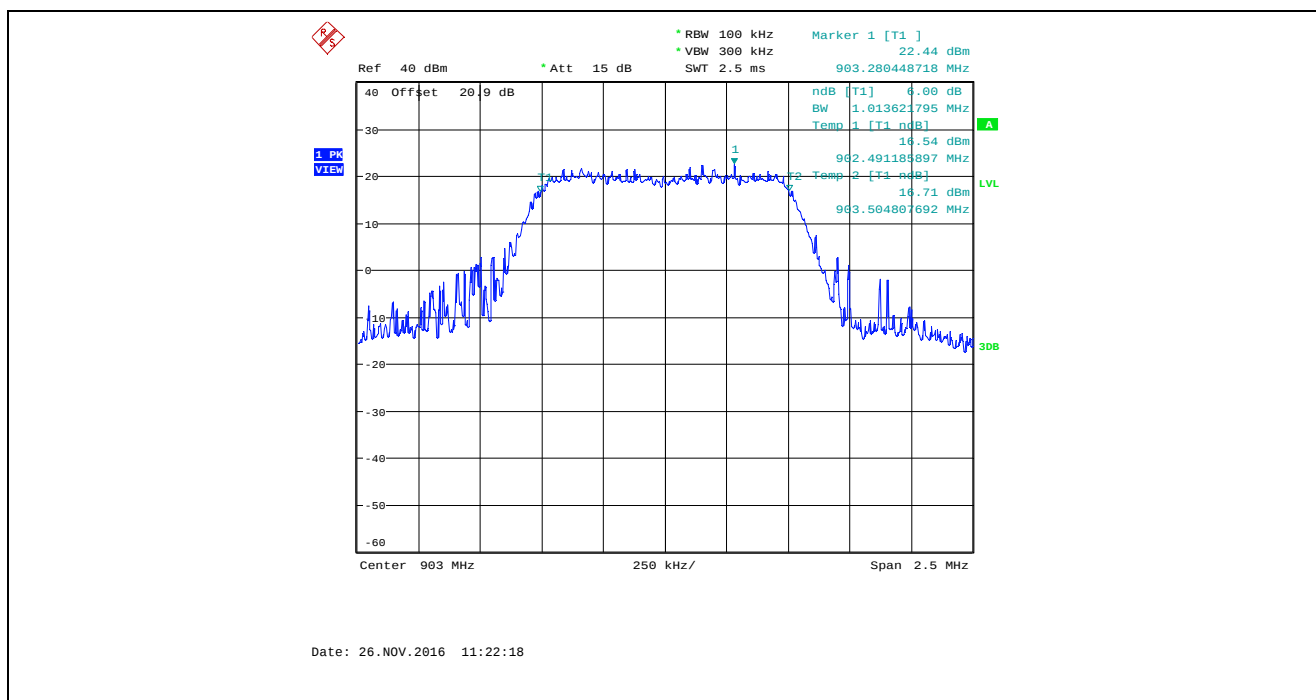
Plot 5.2.4.41. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 6, 915 MHz



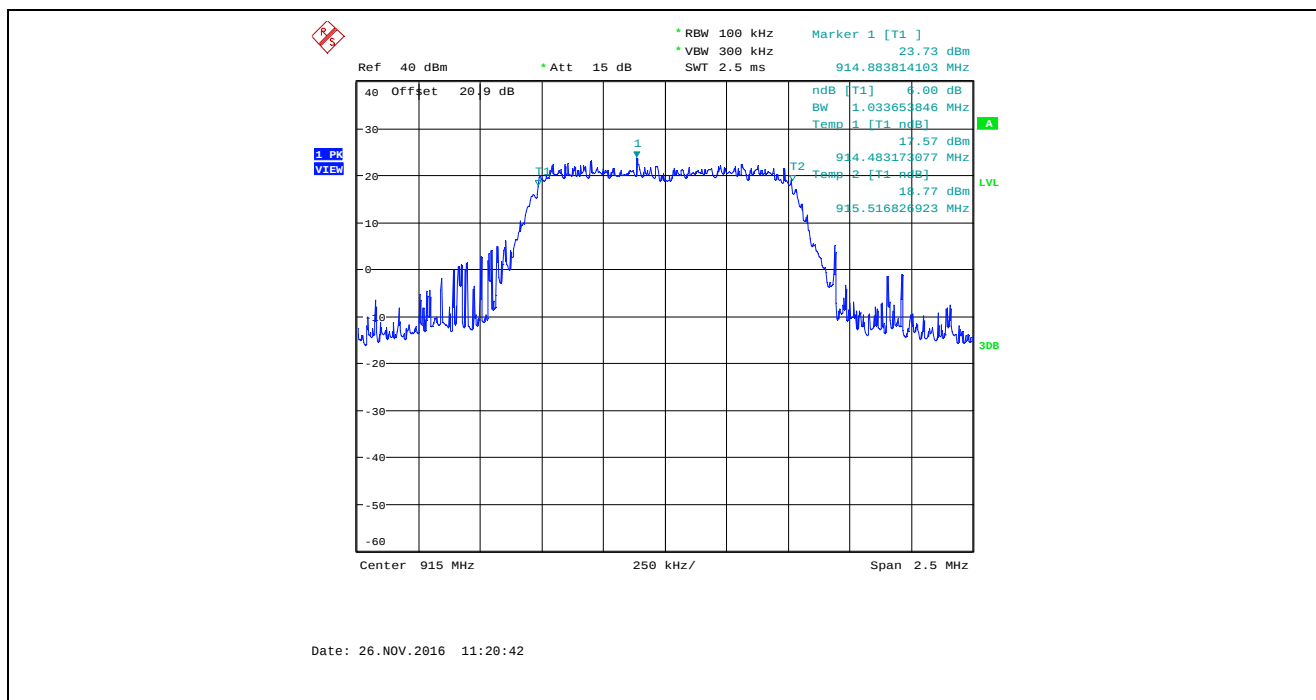
Plot 5.2.4.42. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 6, 927 MHz



Plot 5.2.4.43. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 7, 903 MHz



Plot 5.2.4.44. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 7, 915 MHz



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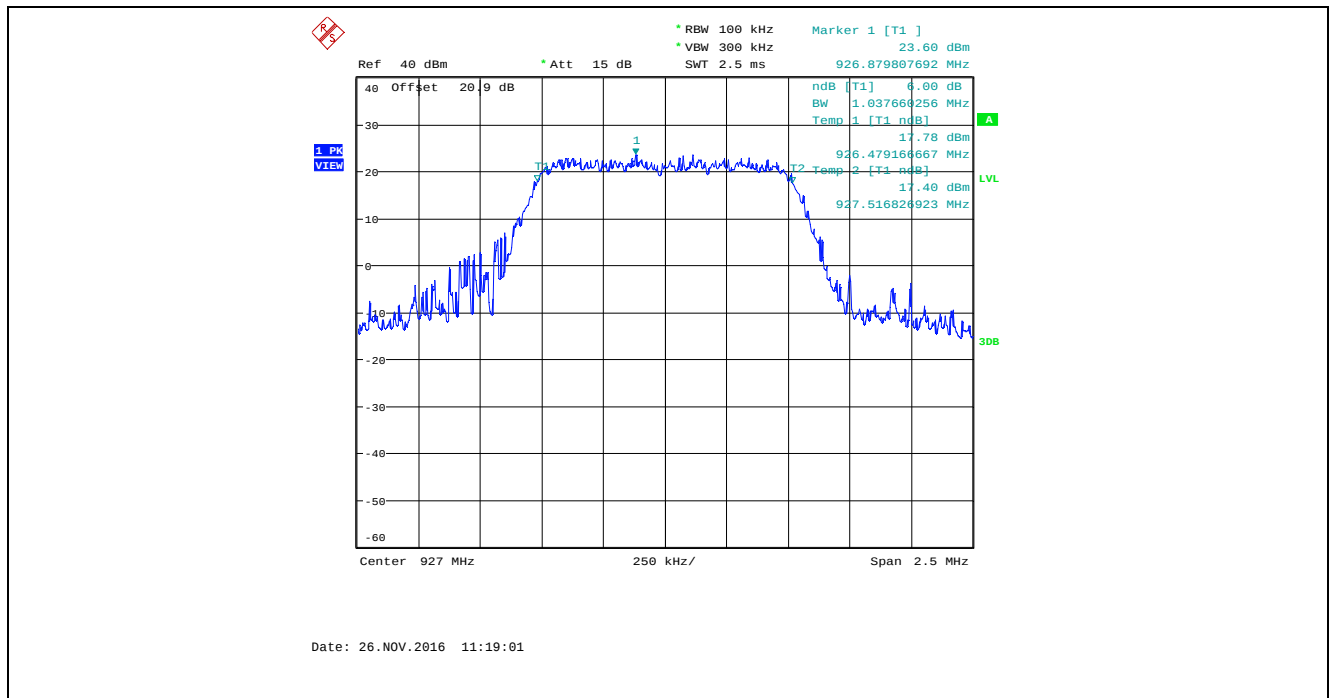
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

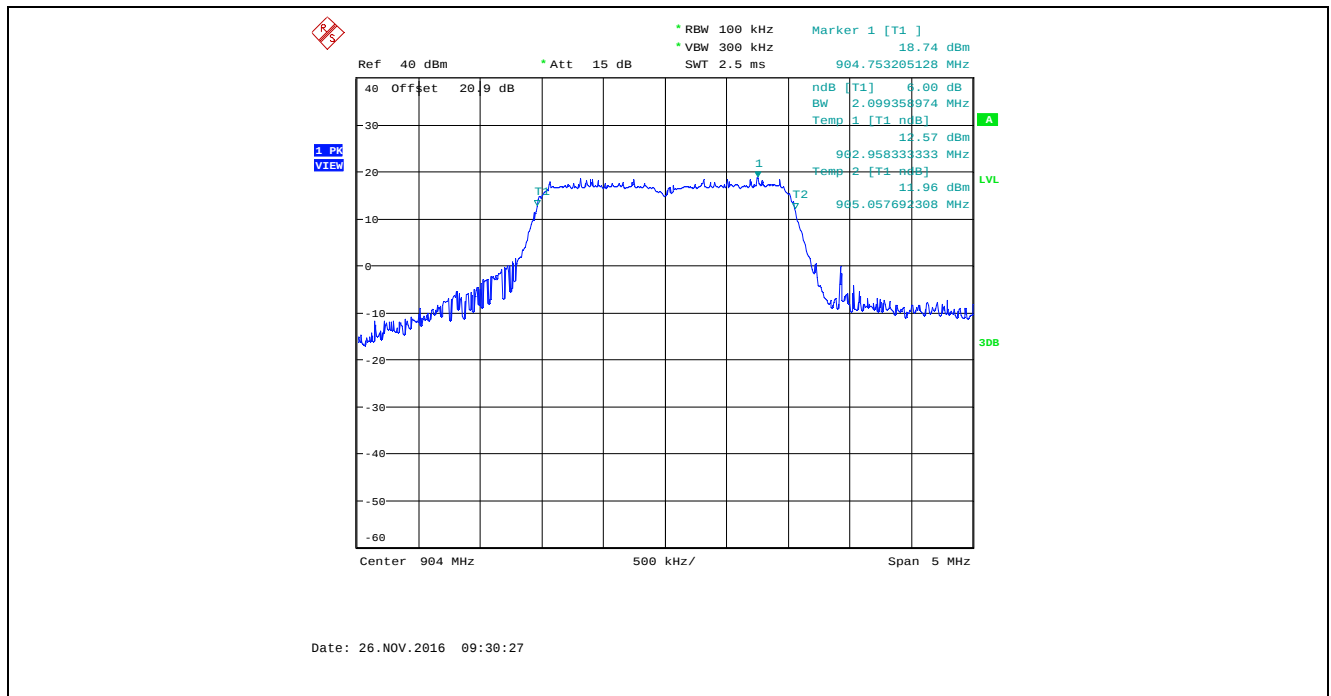
April 13, 2017

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

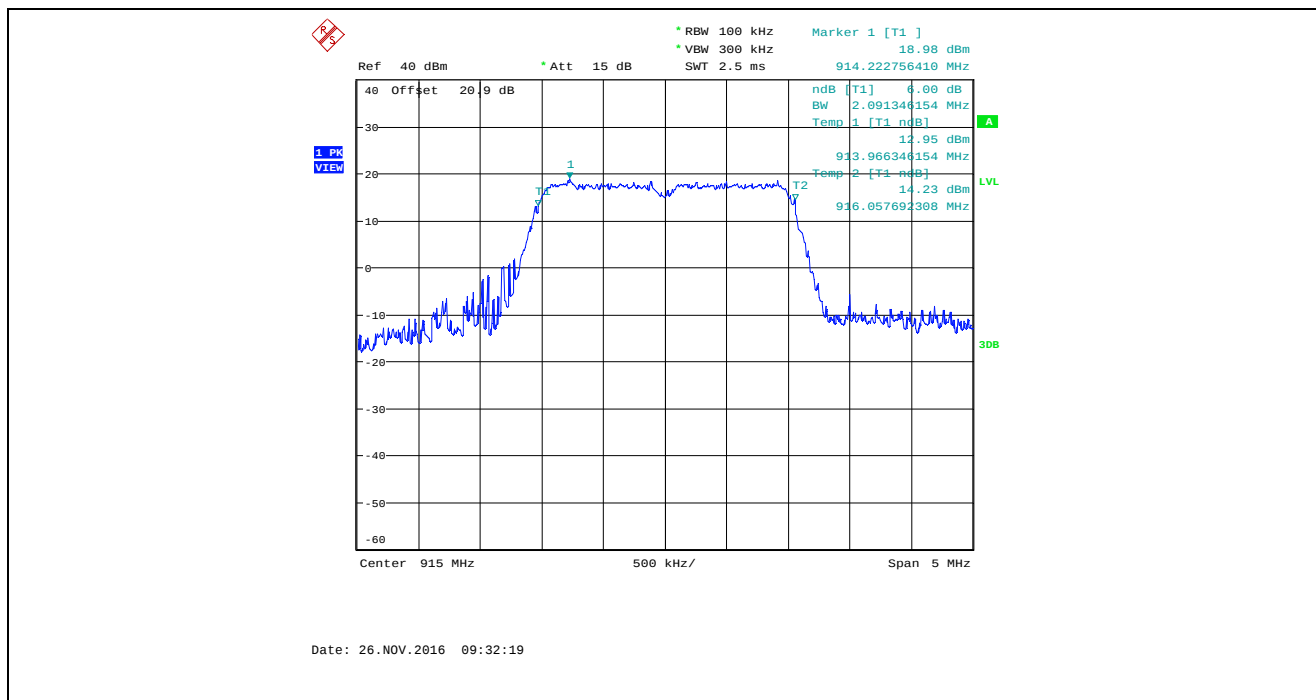
Plot 5.2.4.45. 6 dB Bandwidth, Bandwidth: 1 MHz, TX Gain: 36, Data Rate 7, 927 MHz



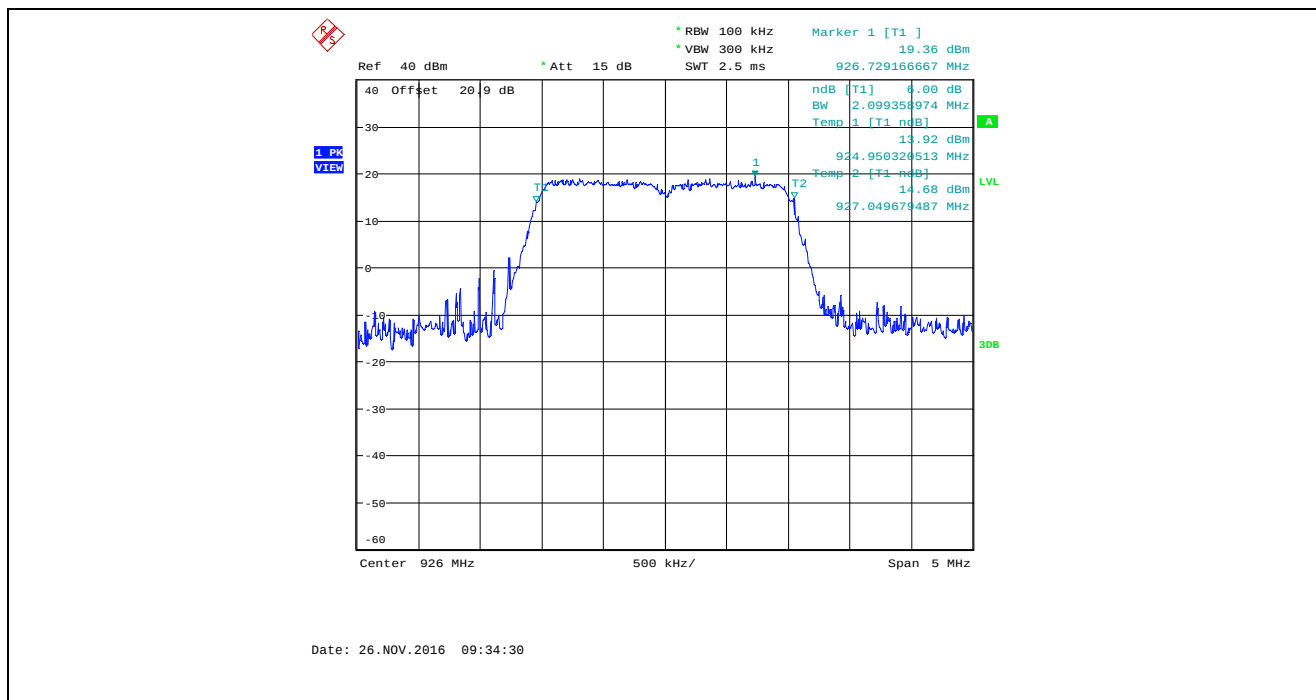
Plot 5.2.4.46. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 4, 904 MHz



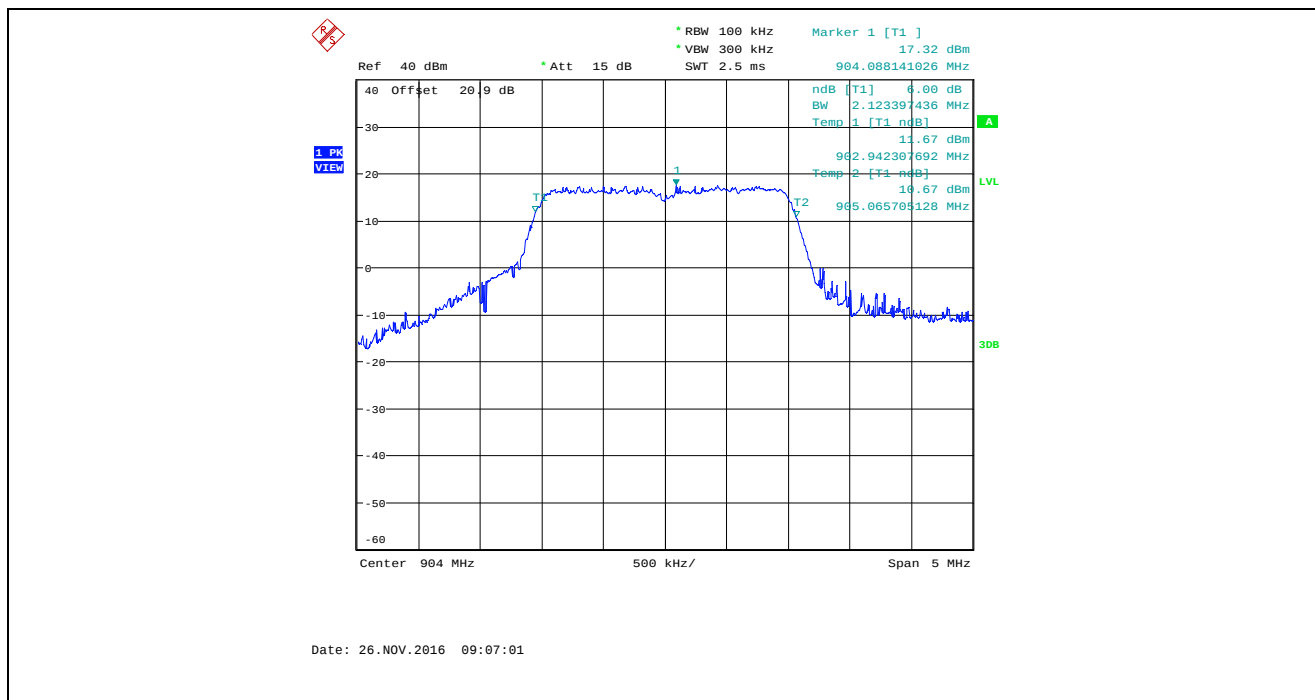
Plot 5.2.4.47. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 4, 915 MHz



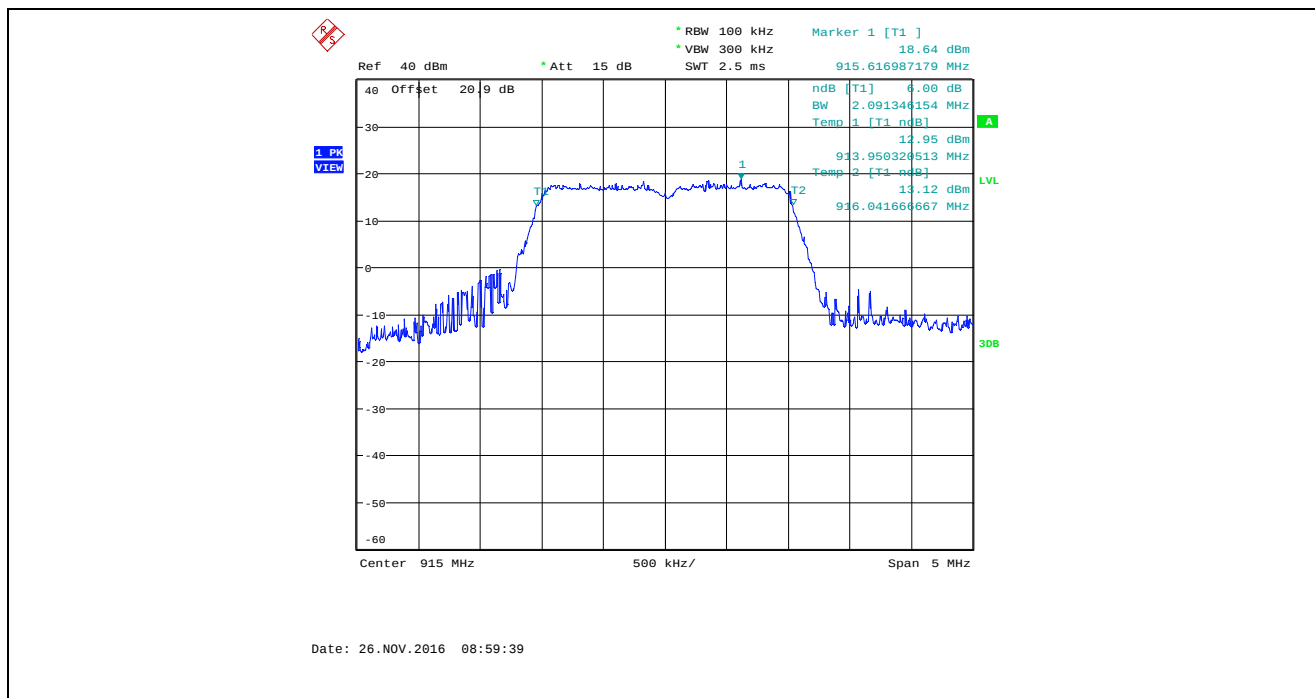
Plot 5.2.4.48. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 4, 926 MHz



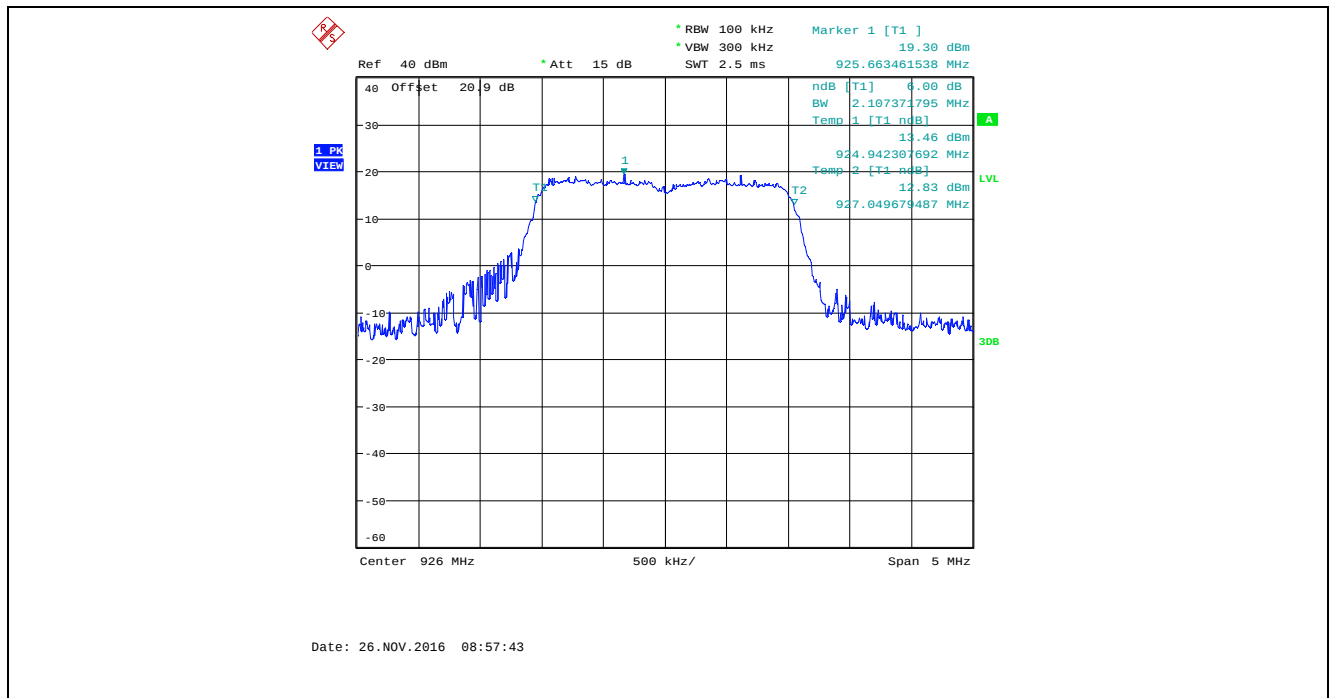
Plot 5.2.4.49. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 5, 904 MHz



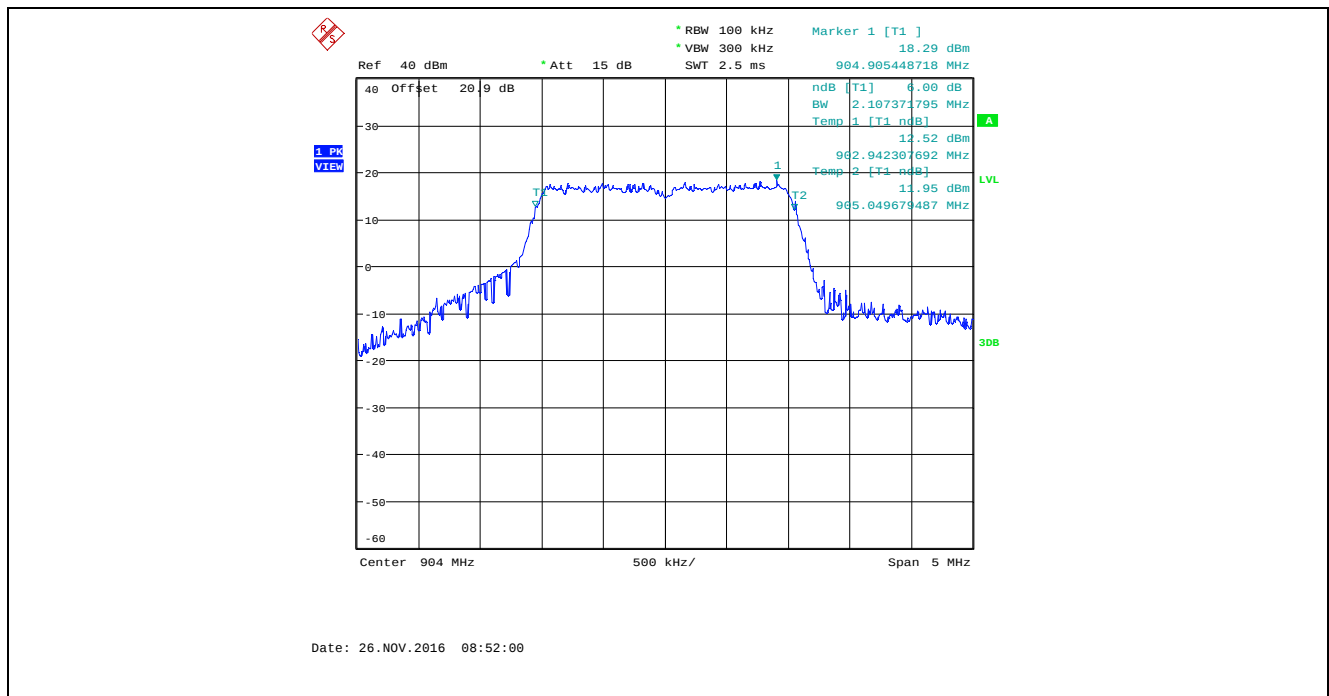
Plot 5.2.4.50. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 5, 915 MHz



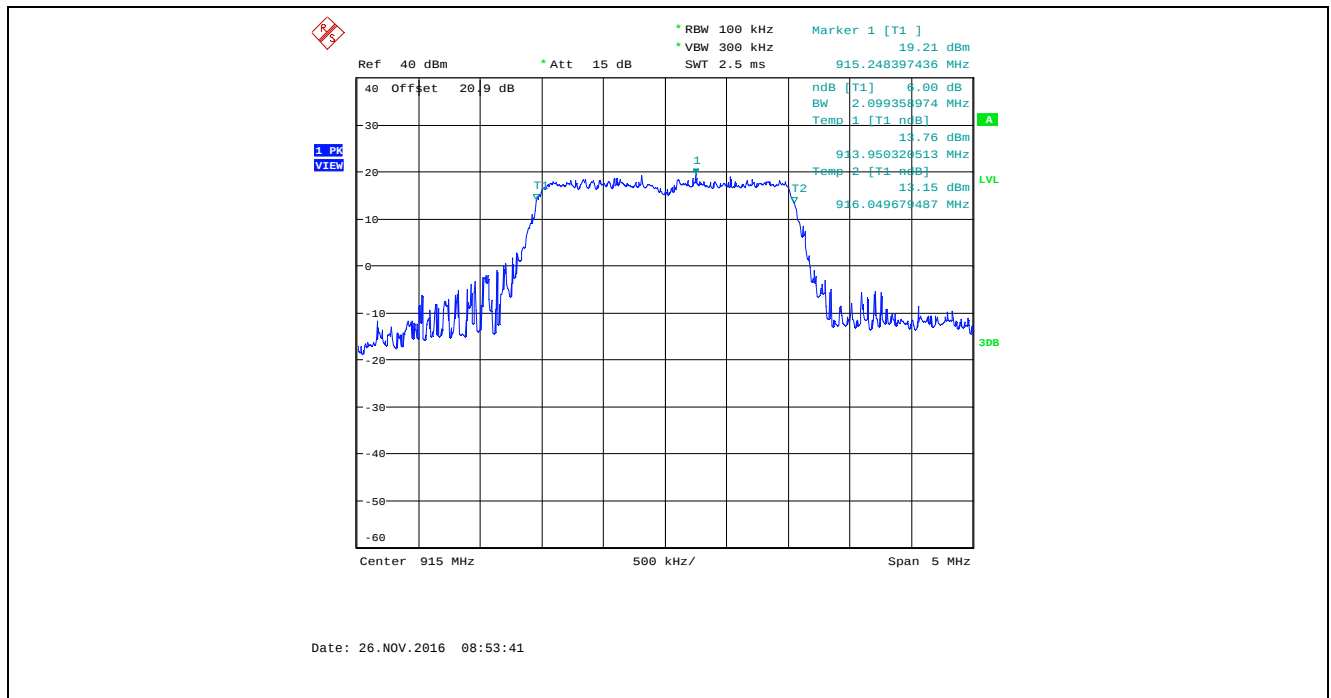
Plot 5.2.4.51. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 5, 926 MHz



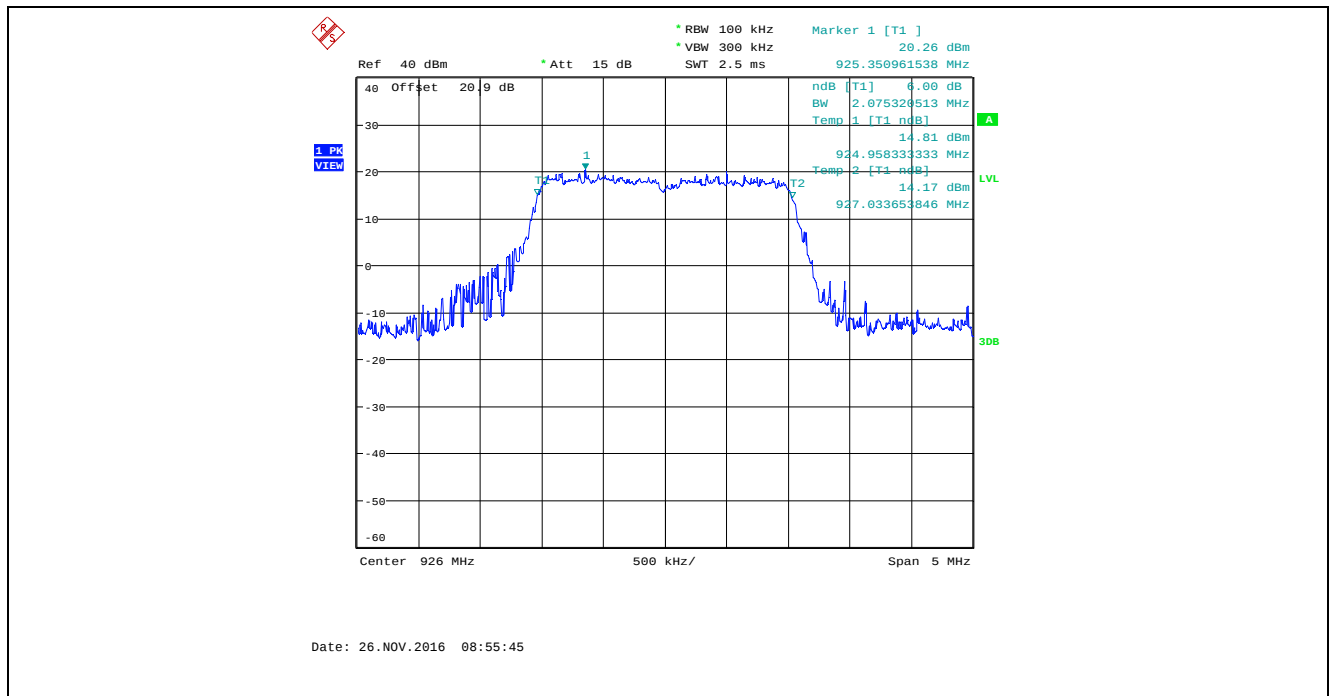
Plot 5.2.4.52. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 6, 904 MHz



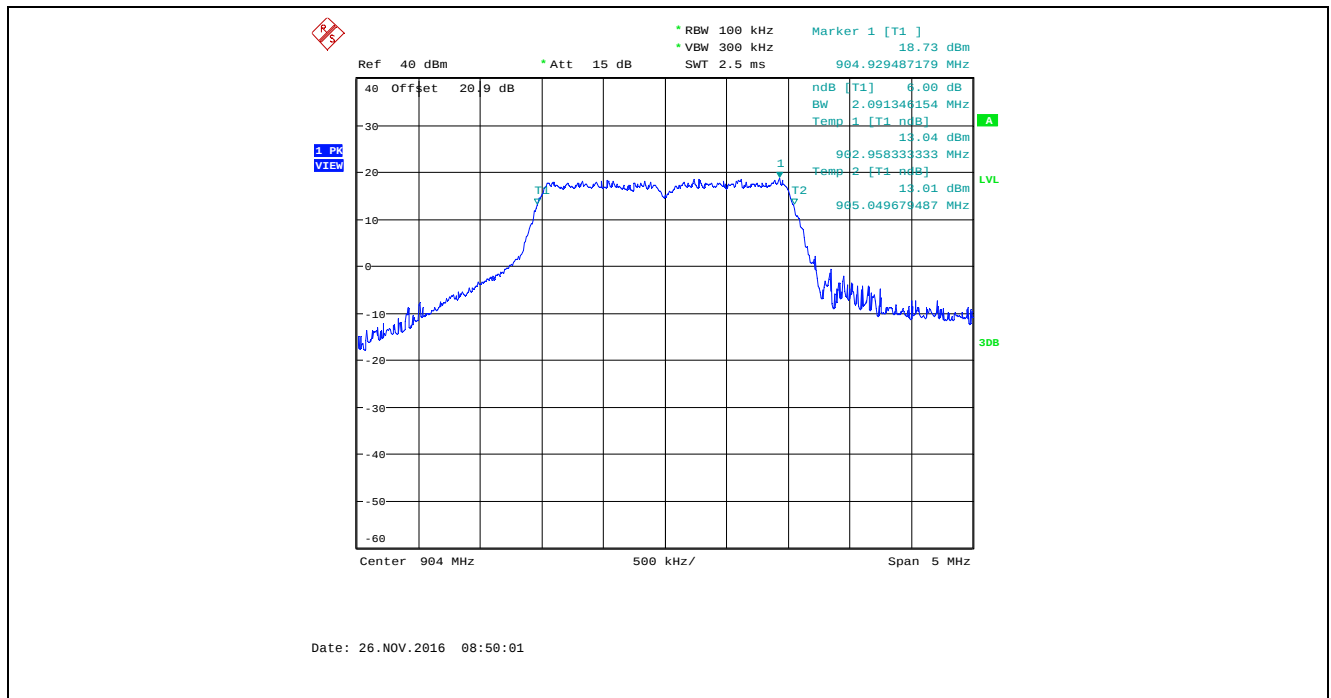
Plot 5.2.4.53. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 6, 915 MHz



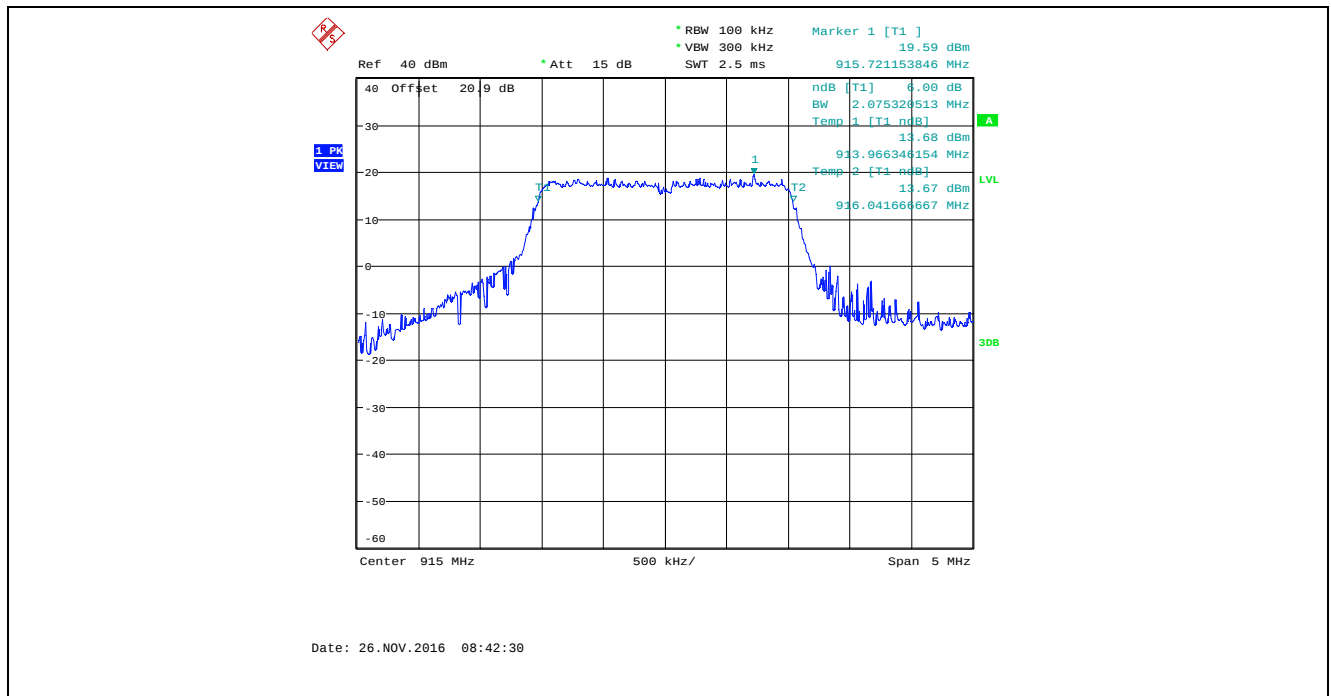
Plot 5.2.4.54. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 6, 926 MHz



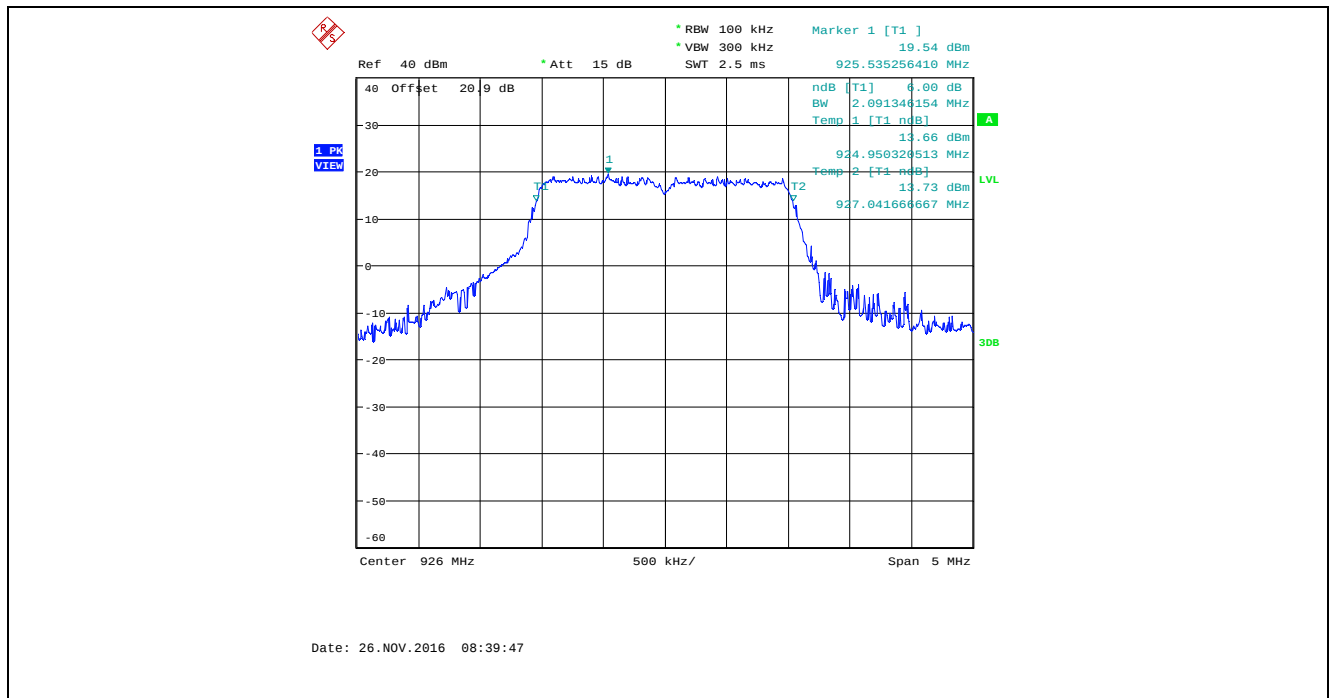
Plot 5.2.4.55. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 7, 904 MHz



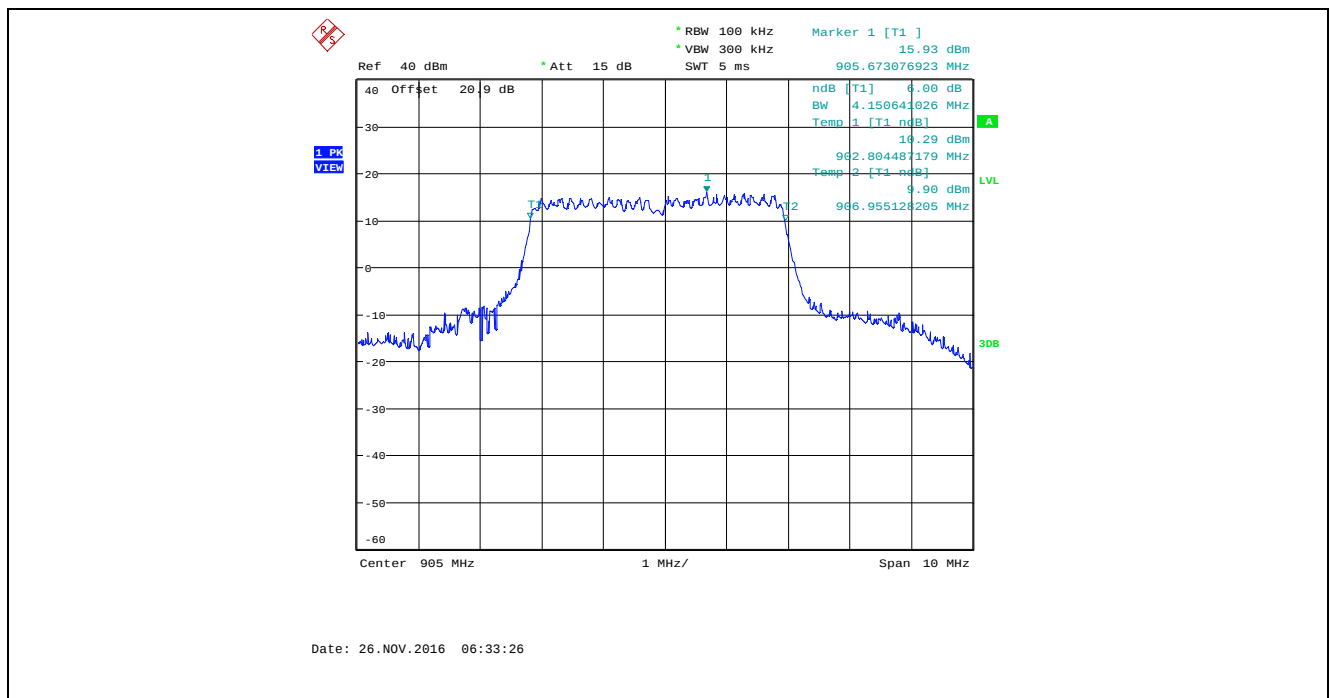
Plot 5.2.4.56. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 7, 915 MHz



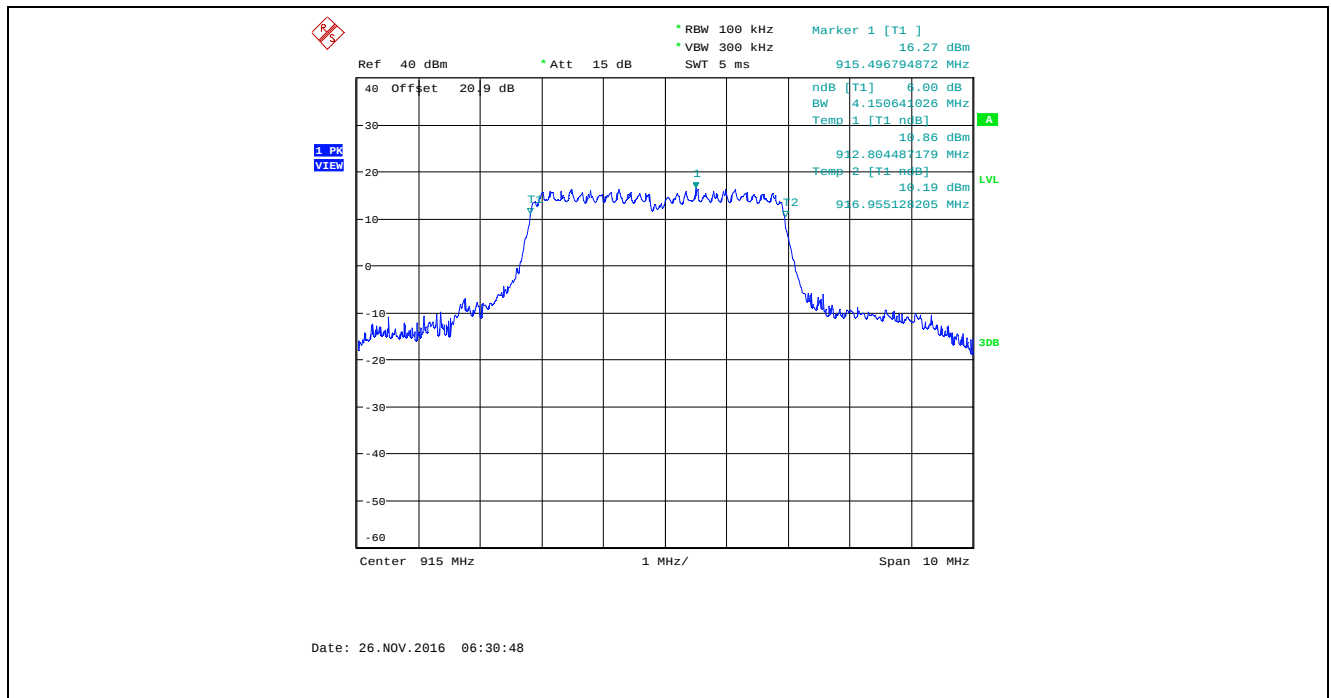
Plot 5.2.4.57. 6 dB Bandwidth, Bandwidth: 2 MHz, TX Gain: 36, Data Rate 7, 926 MHz



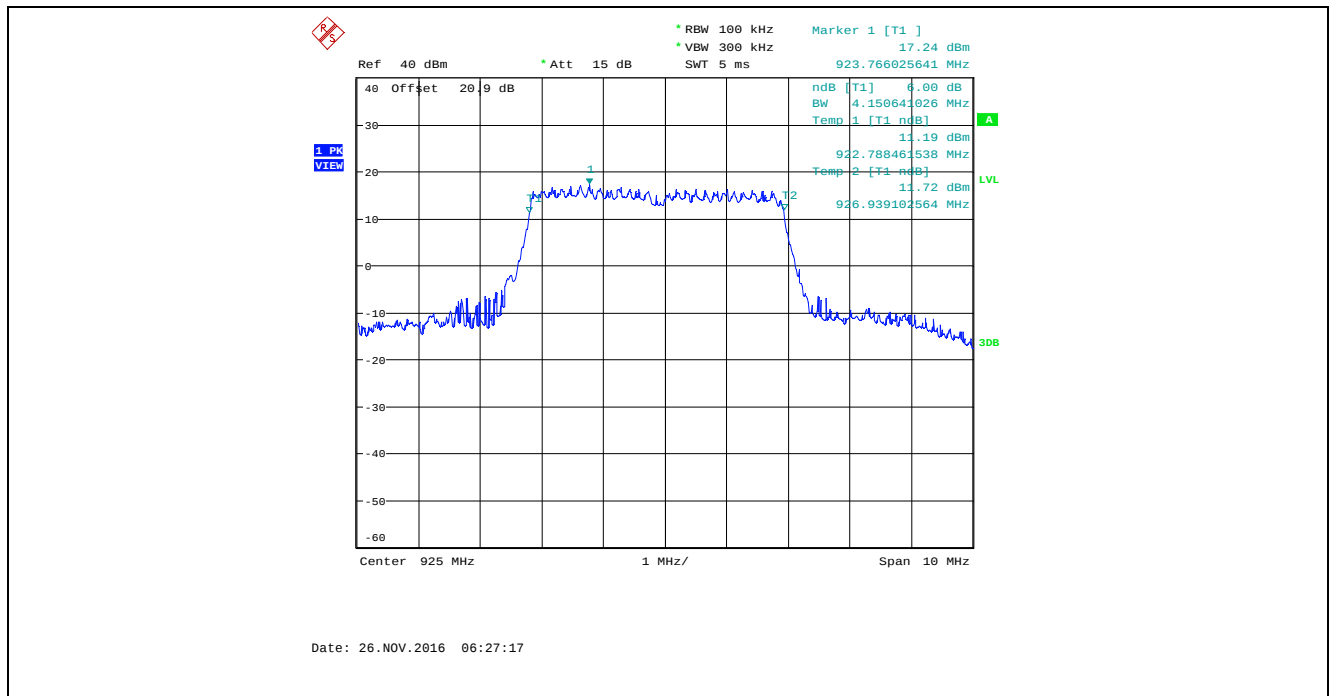
Plot 5.2.4.58. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 4, 905 MHz



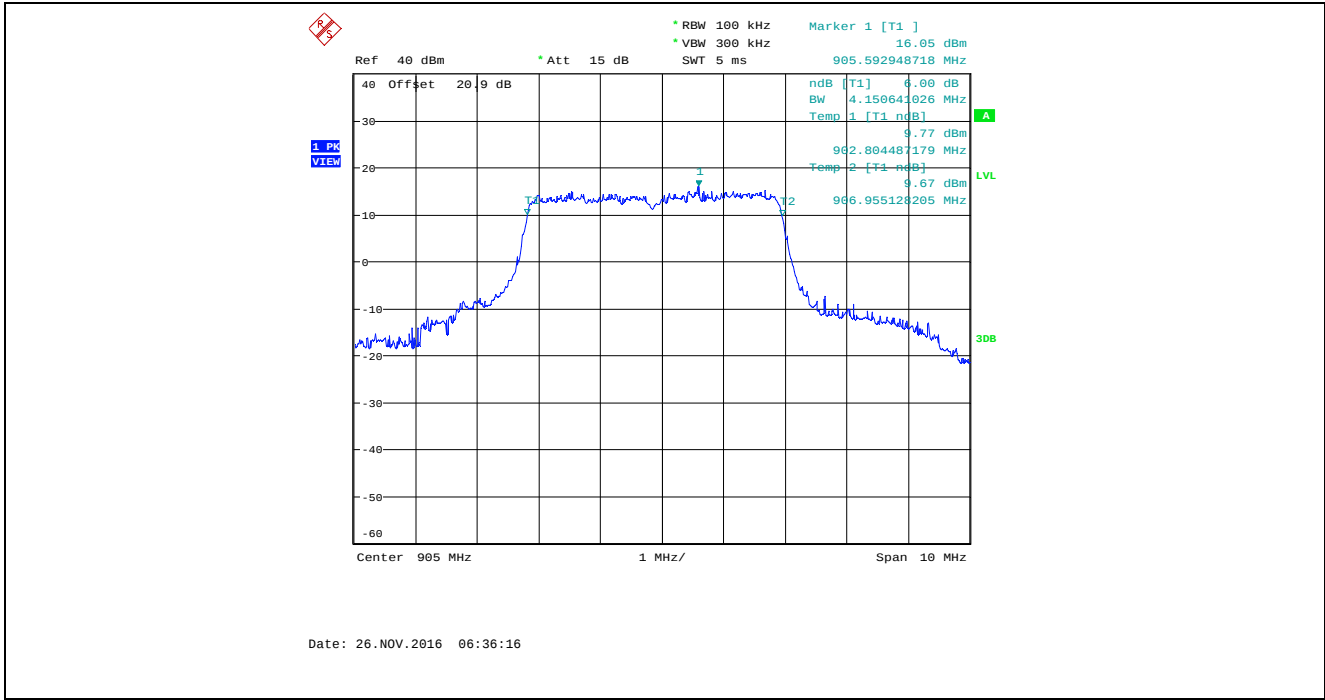
Plot 5.2.4.59. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 4, 915 MHz



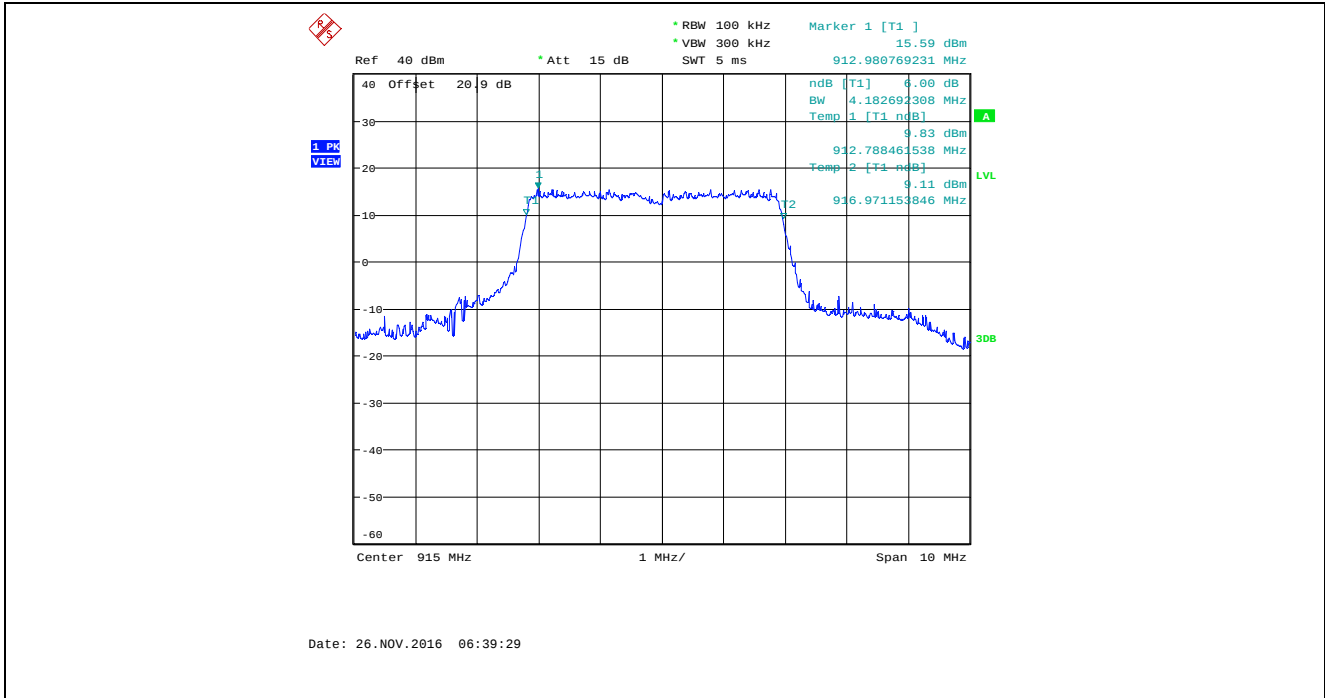
Plot 5.2.4.60. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 4, 925 MHz



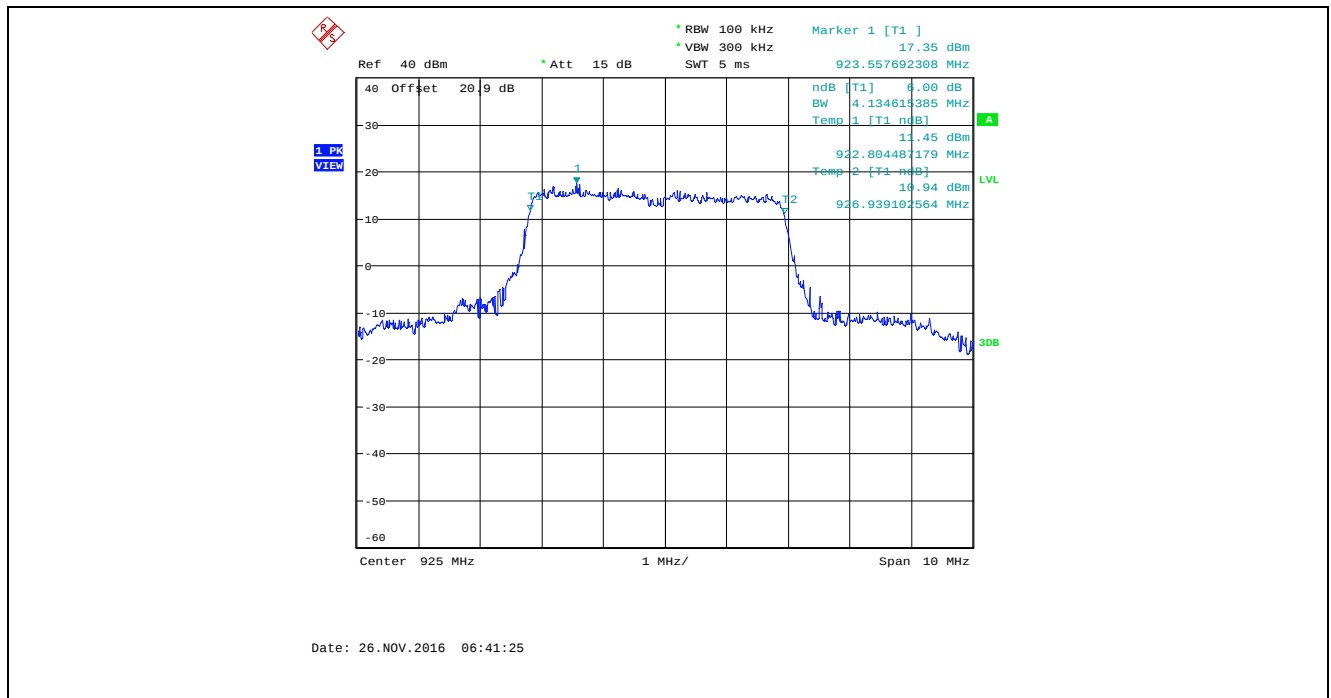
Plot 5.2.4.61. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 5, 905 MHz



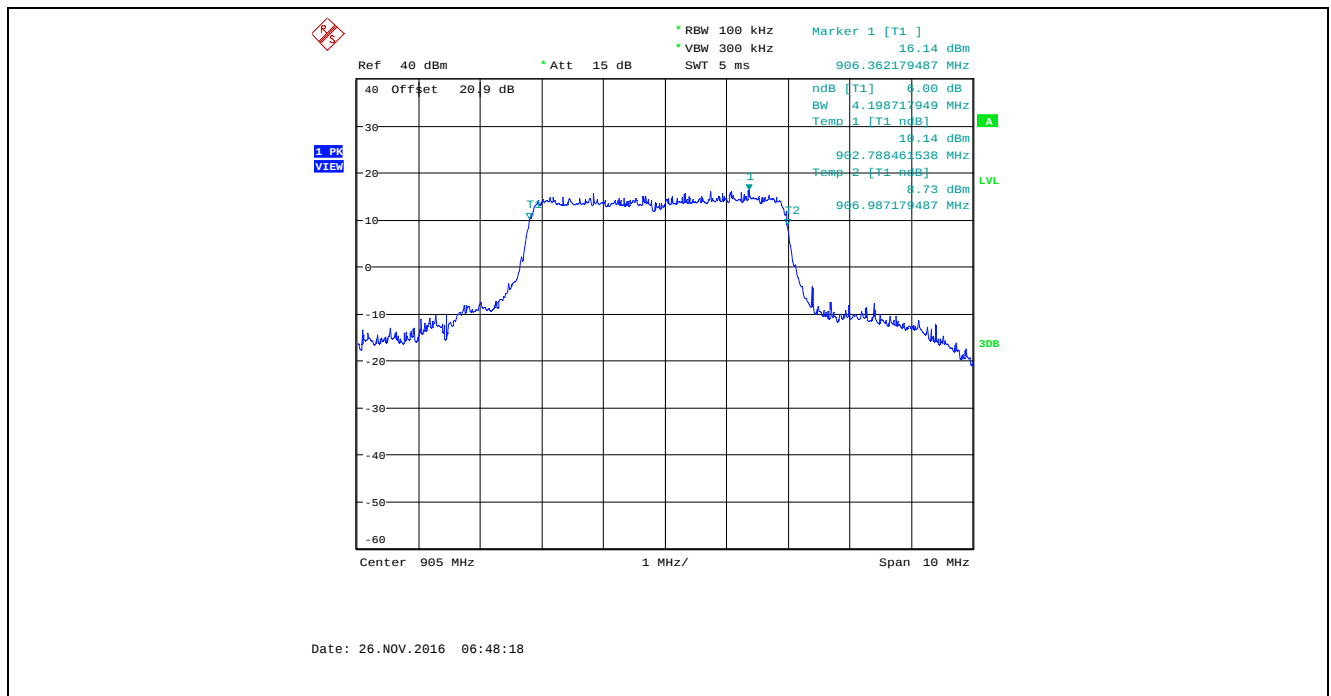
Plot 5.2.4.62. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 5, 915 MHz



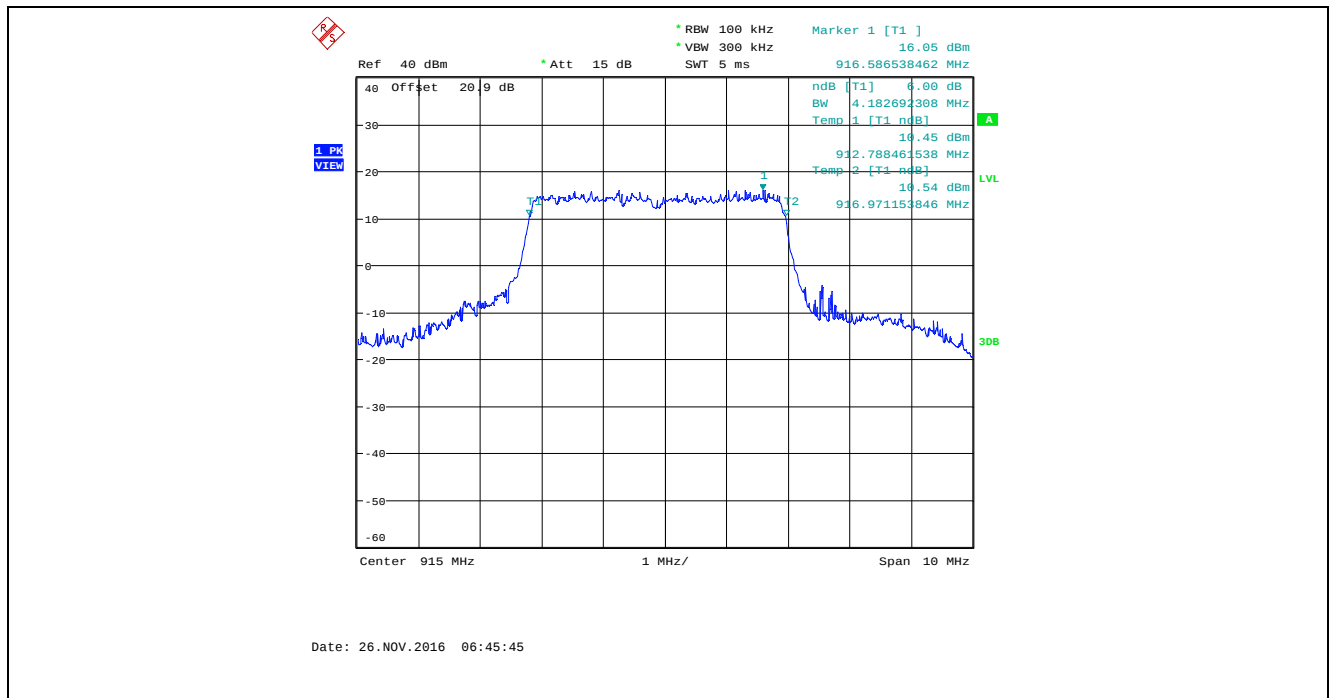
Plot 5.2.4.63. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 5, 925 MHz



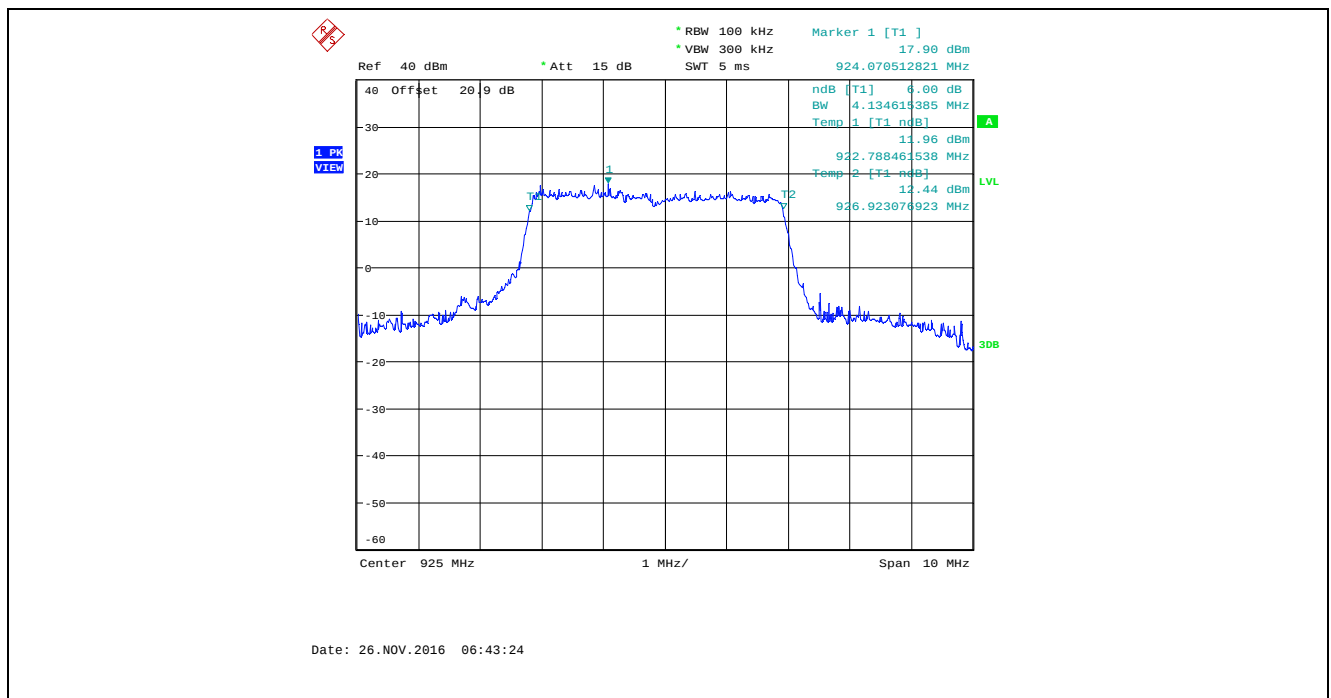
Plot 5.2.4.64. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 6, 905 MHz



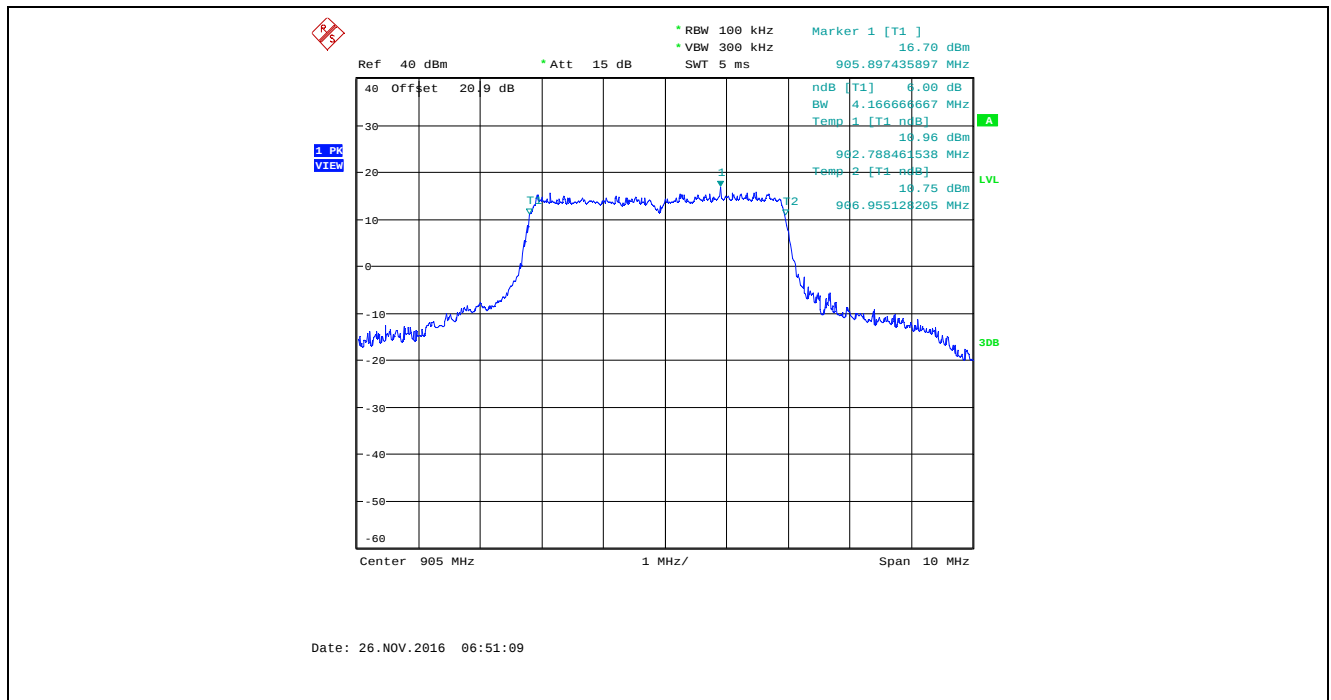
Plot 5.2.4.65. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 6, 915 MHz



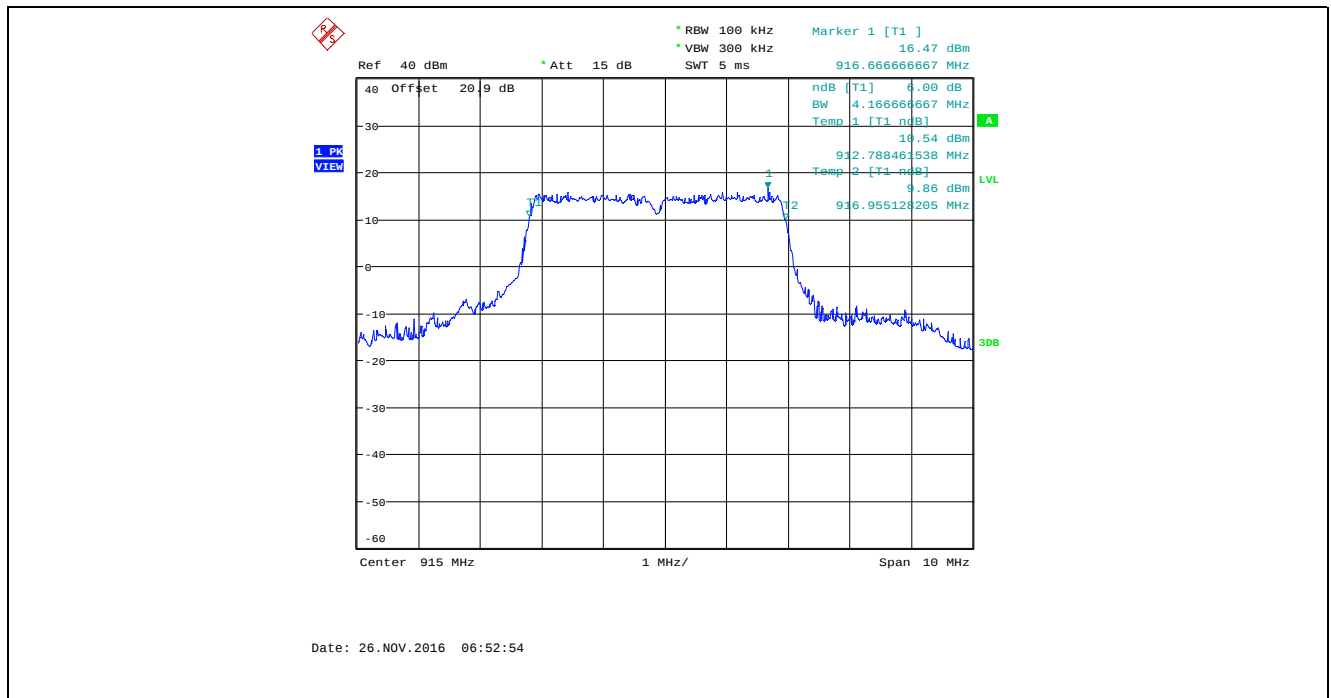
Plot 5.2.4.66. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 6, 925 MHz



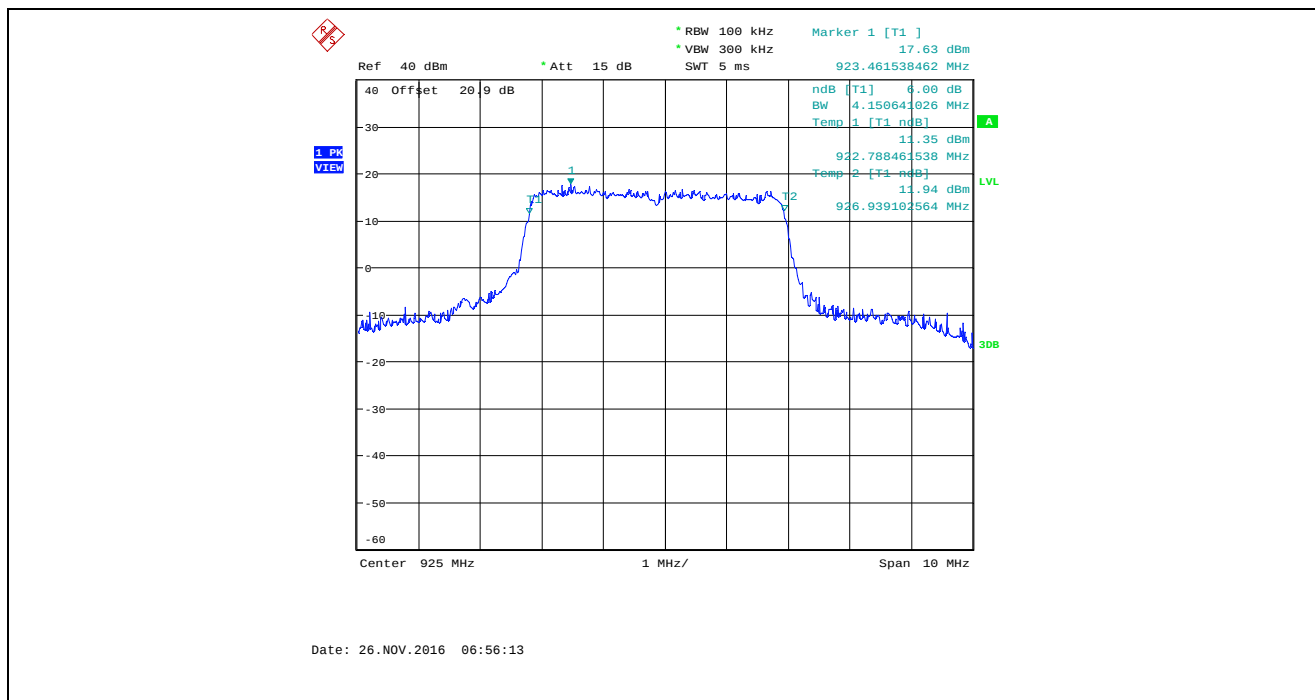
Plot 5.2.4.67. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 7, 905 MHz



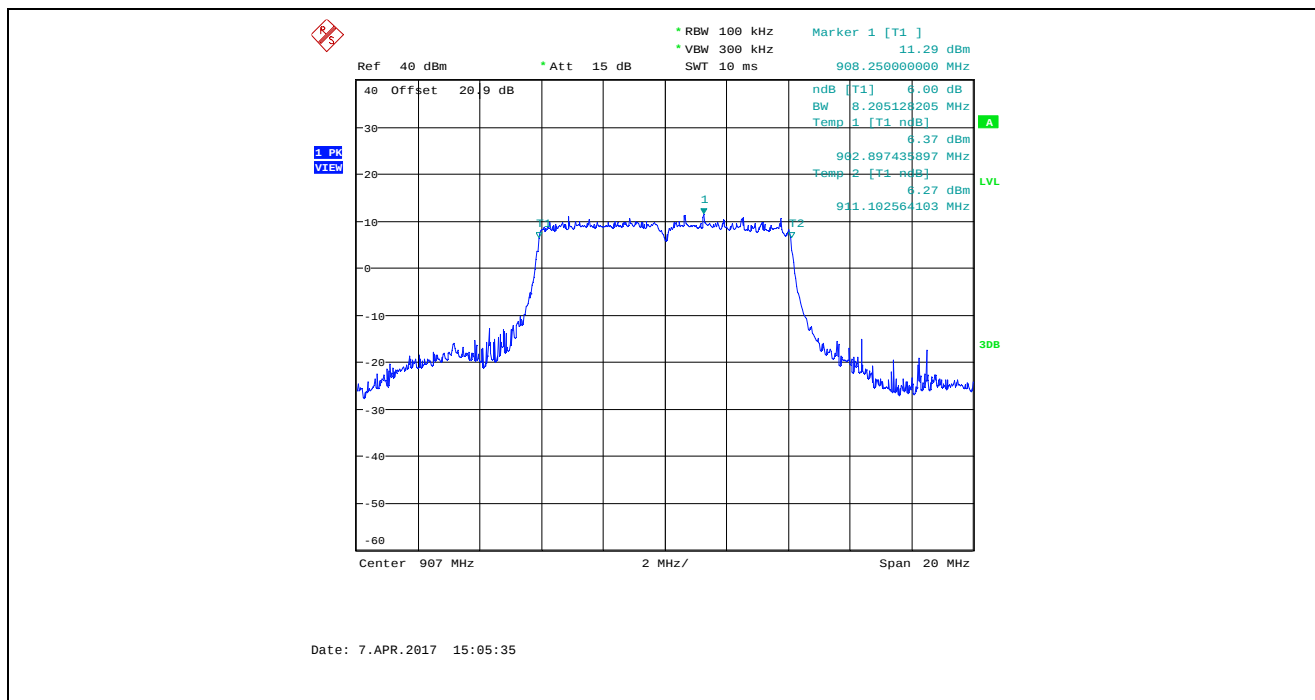
Plot 5.2.4.68. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 7, 915 MHz



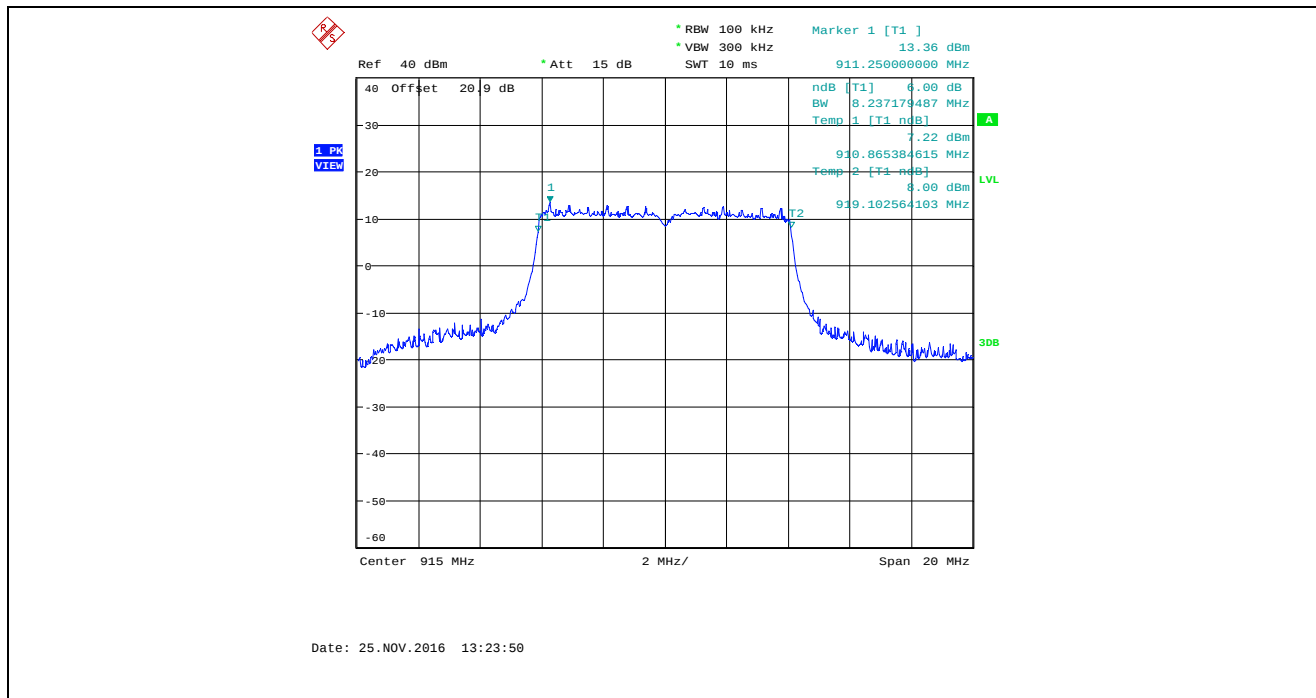
Plot 5.2.4.69. 6 dB Bandwidth, Bandwidth: 4 MHz, TX Gain: 36, Data Rate 7, 925 MHz



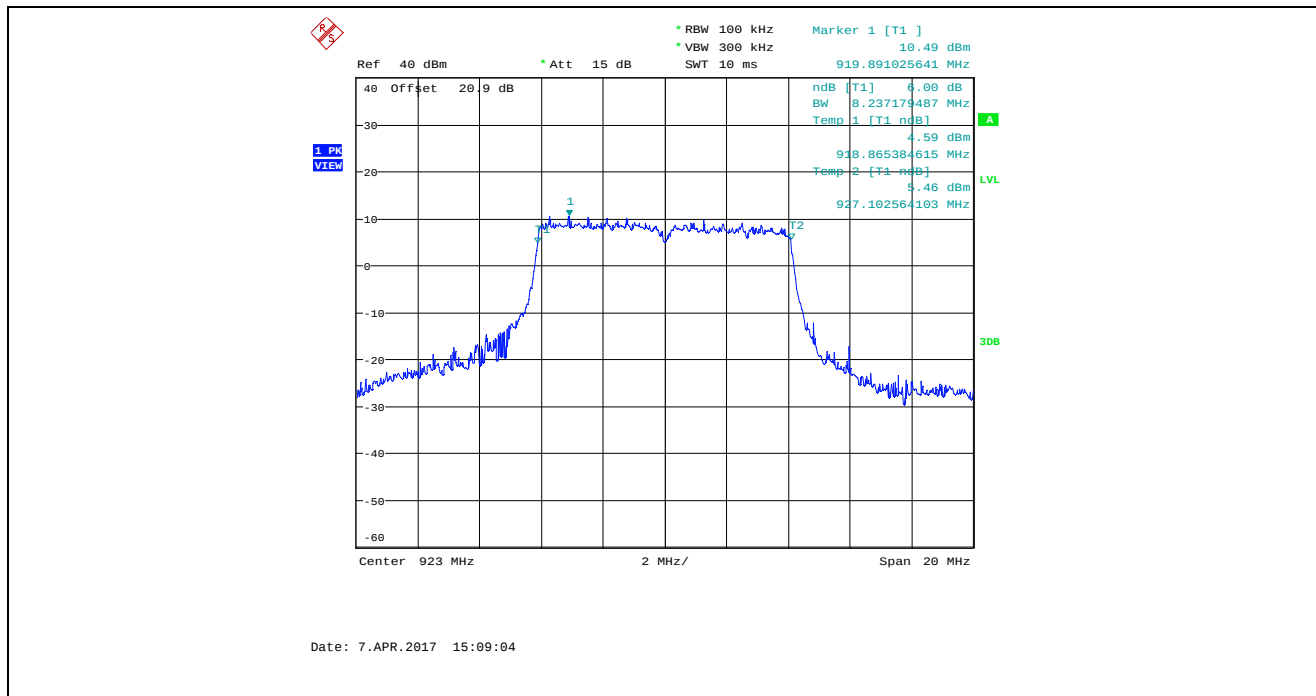
Plot 5.2.4.70. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 4, 907 MHz



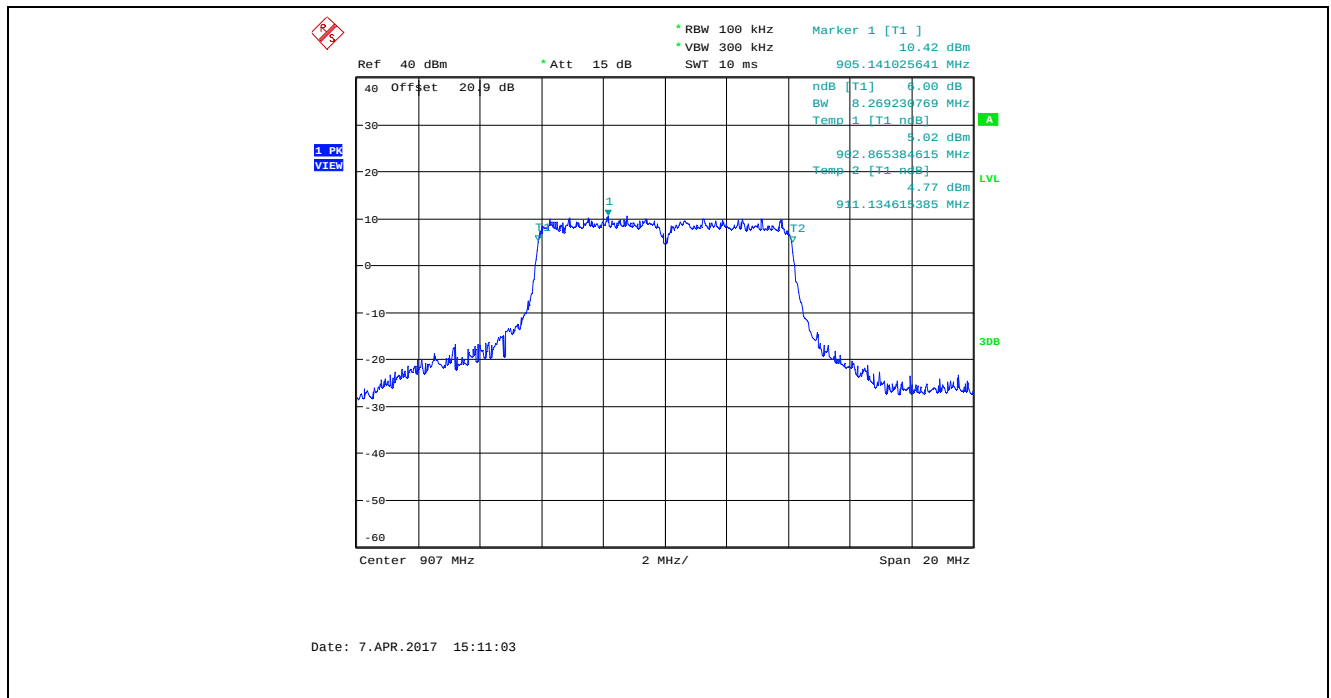
Plot 5.2.4.71. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 4, 915 MHz



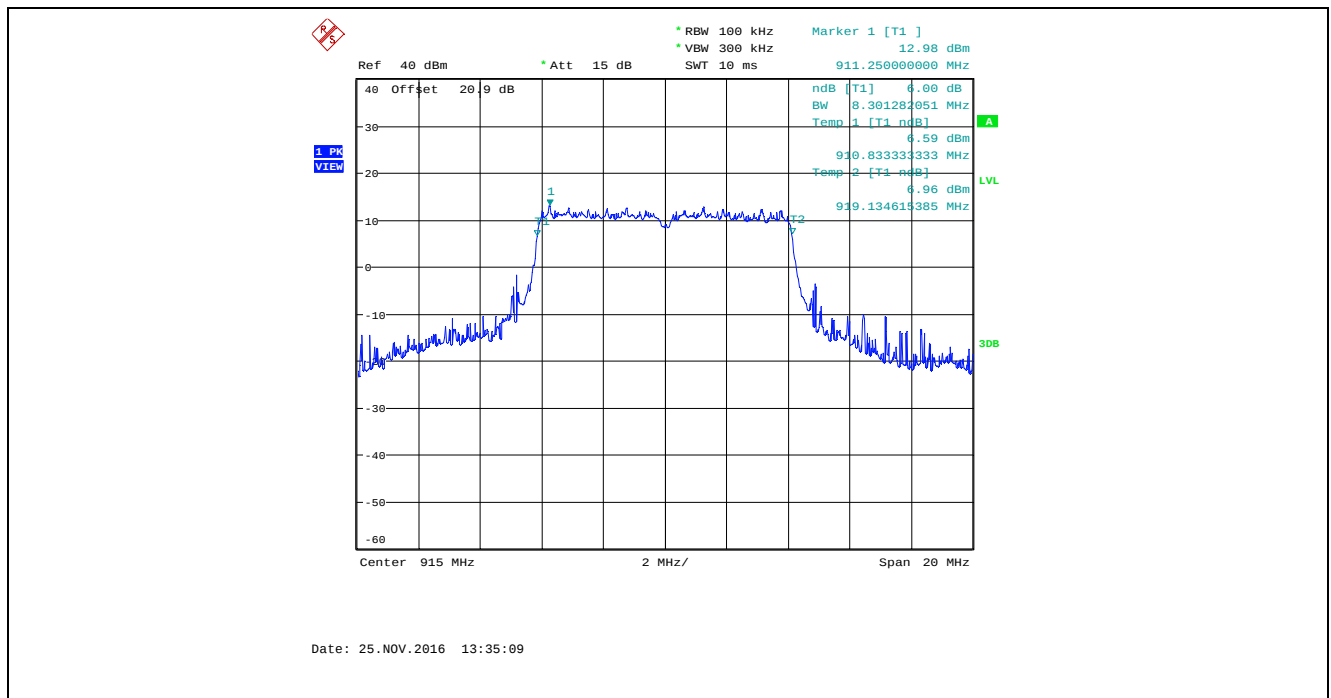
Plot 5.2.4.72. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 4, 923 MHz



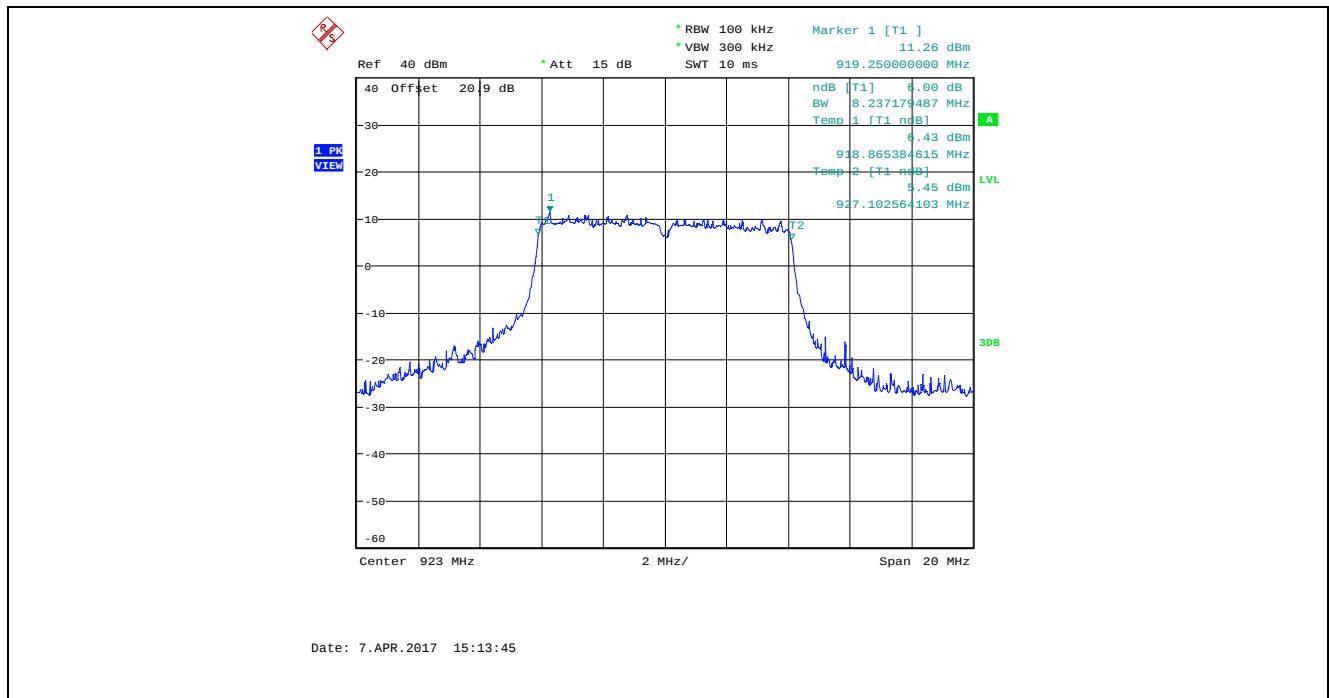
Plot 5.2.4.73. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 5, 907 MHz



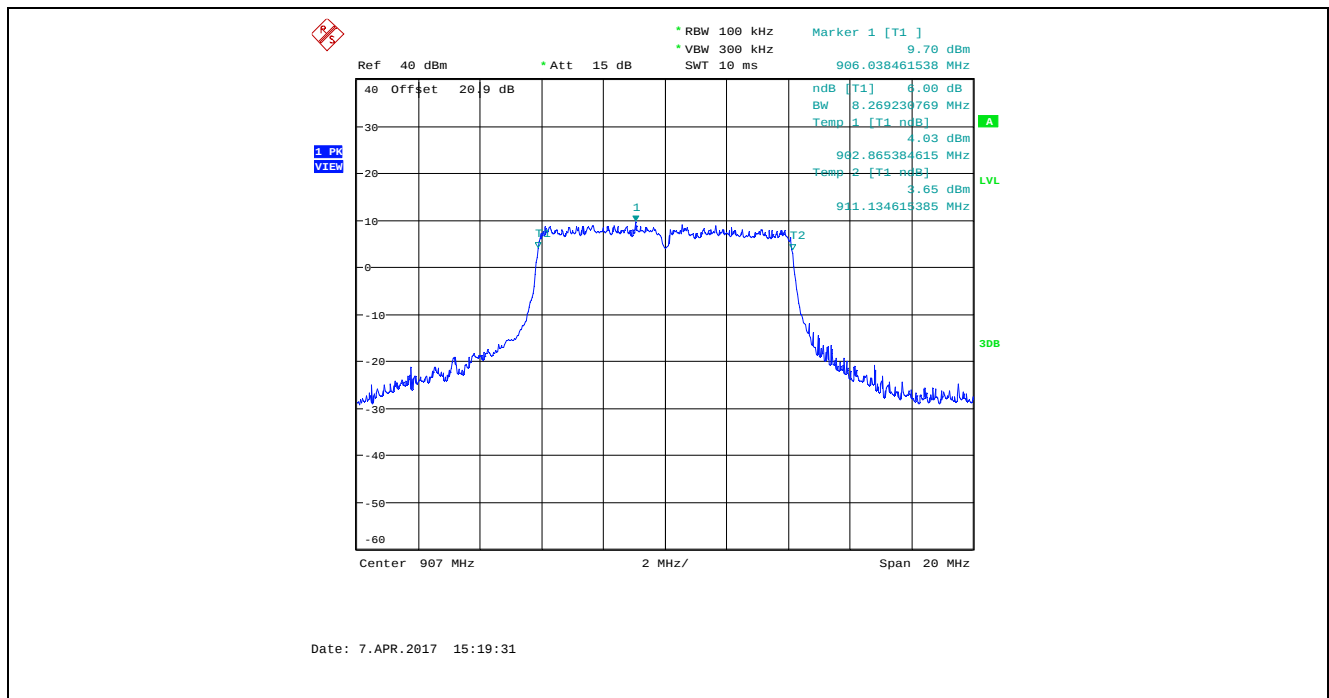
Plot 5.2.4.74. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 5, 915 MHz



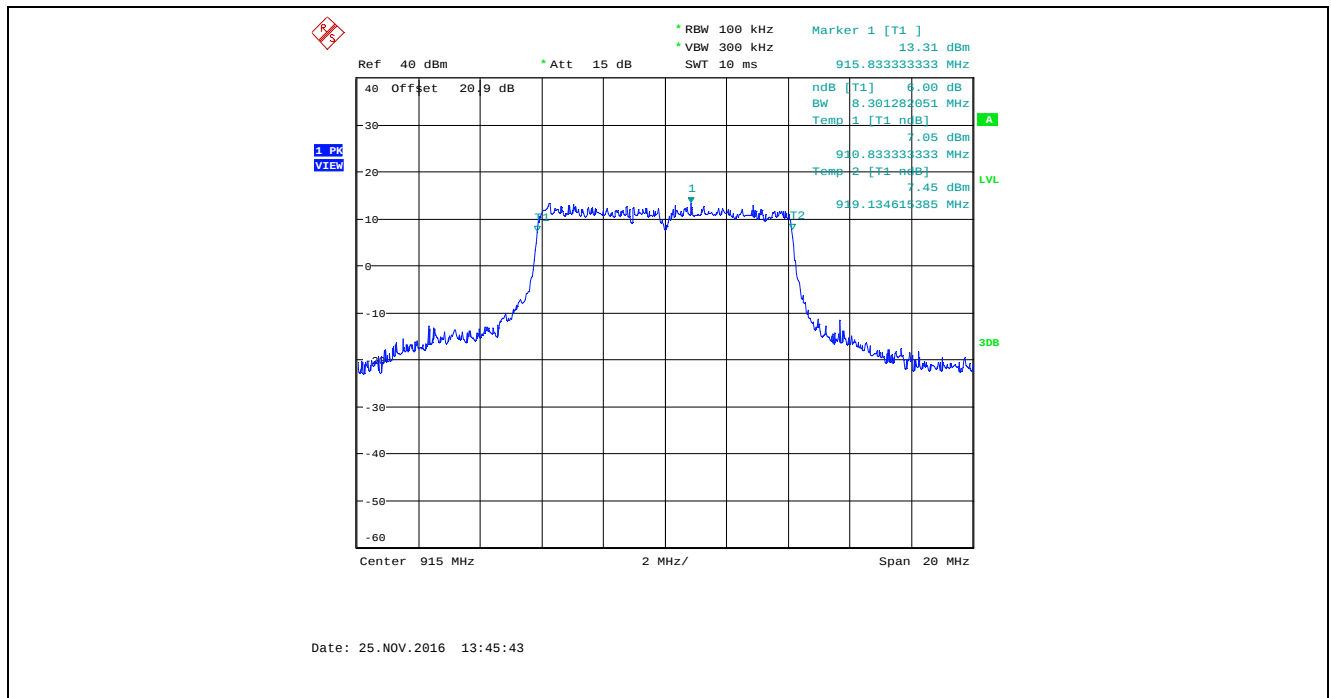
Plot 5.2.4.75. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 5, 923 MHz



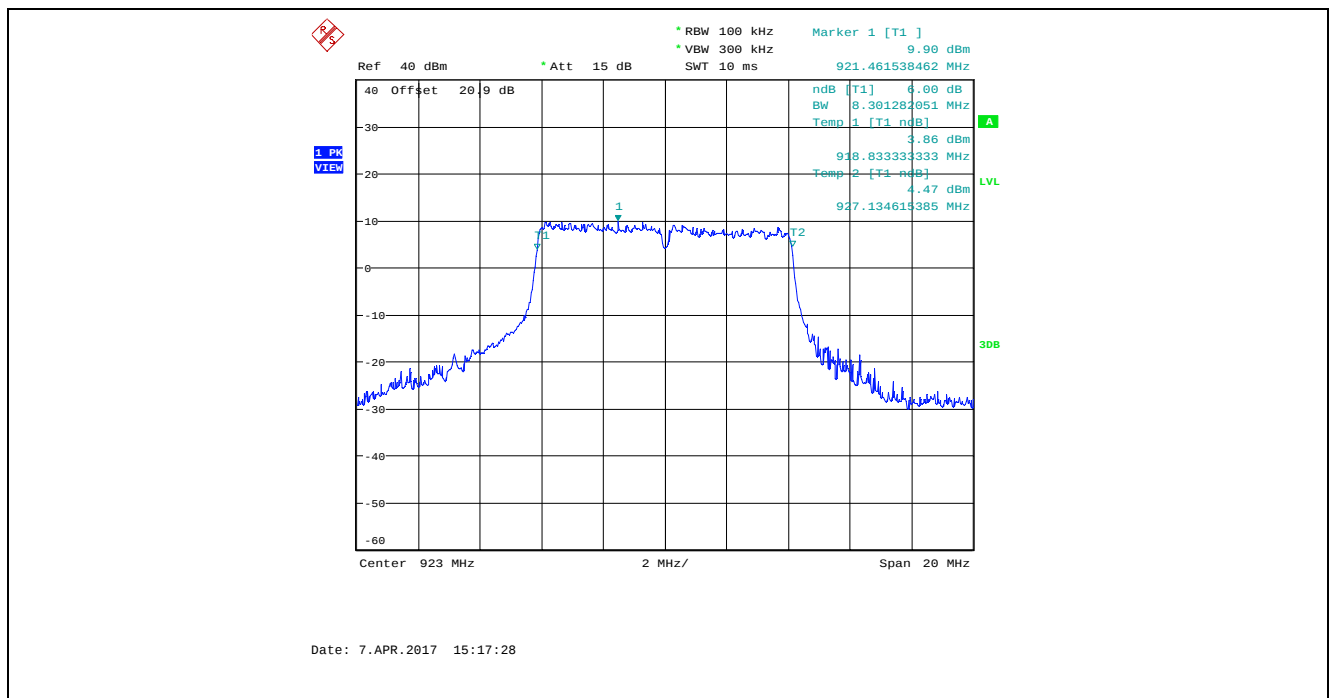
Plot 5.2.4.76. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 6, 907 MHz



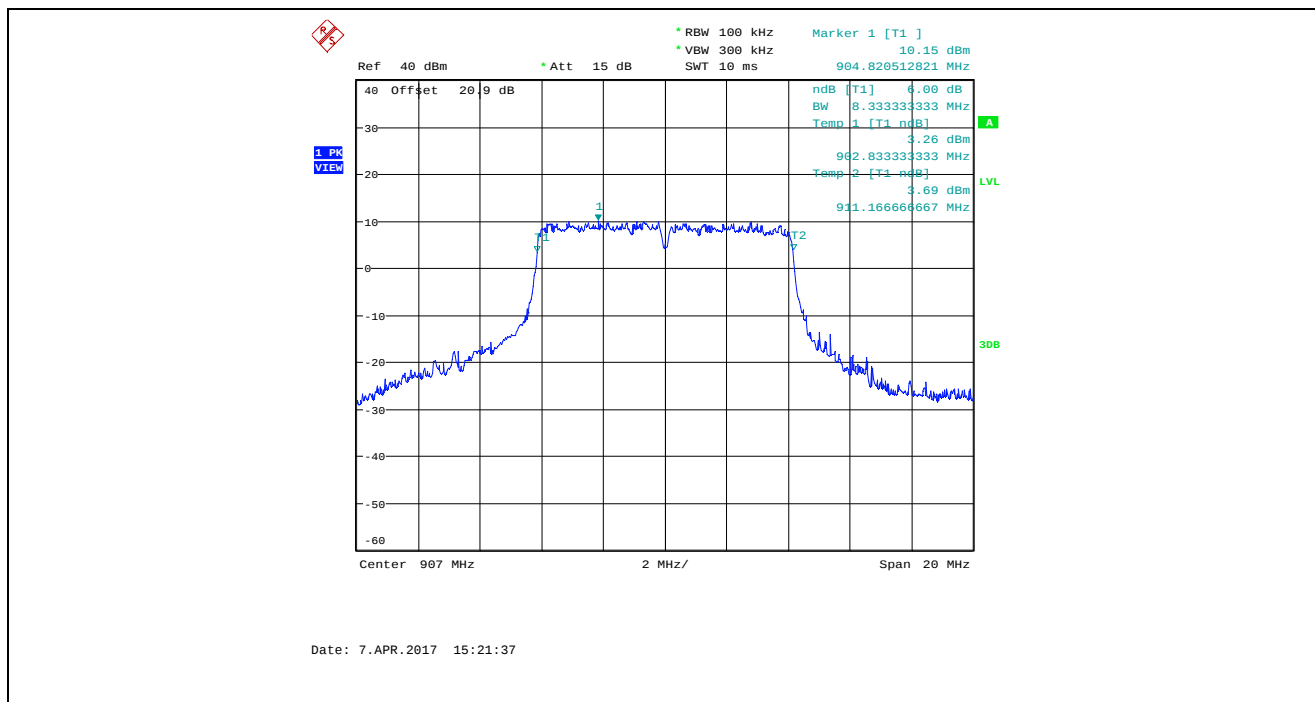
Plot 5.2.4.77. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 6, 915 MHz



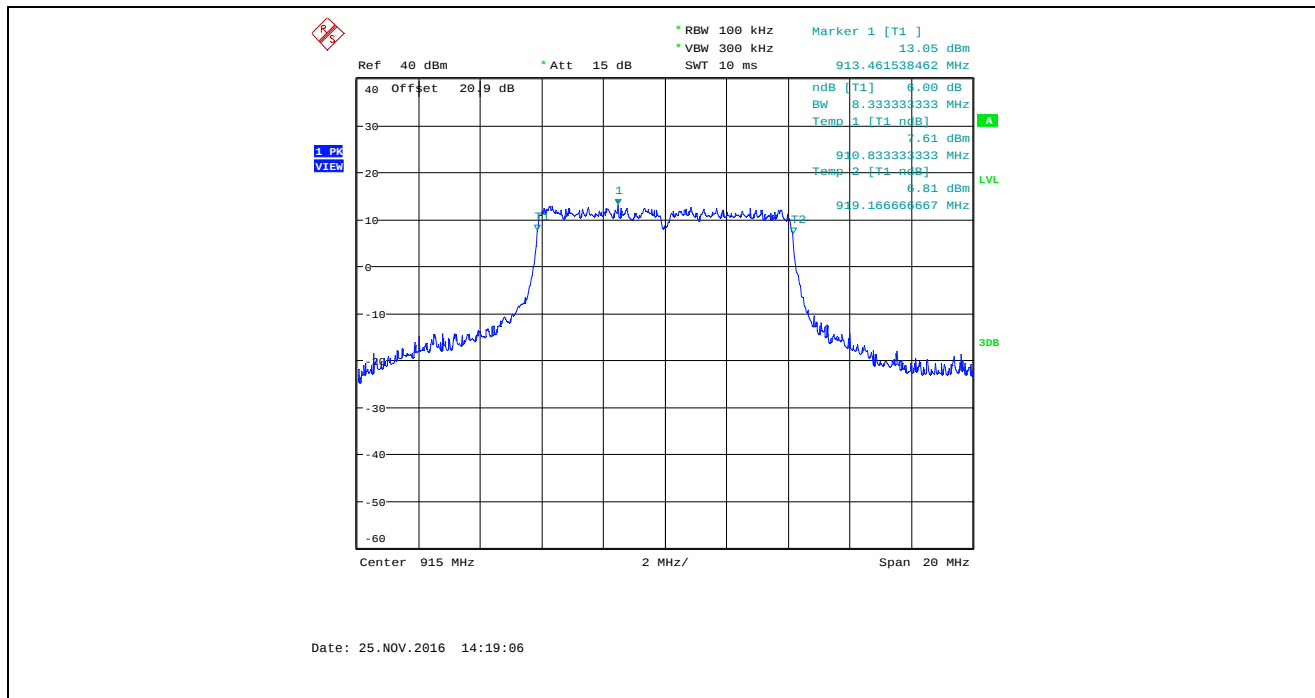
Plot 5.2.4.78. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 6, 923 MHz



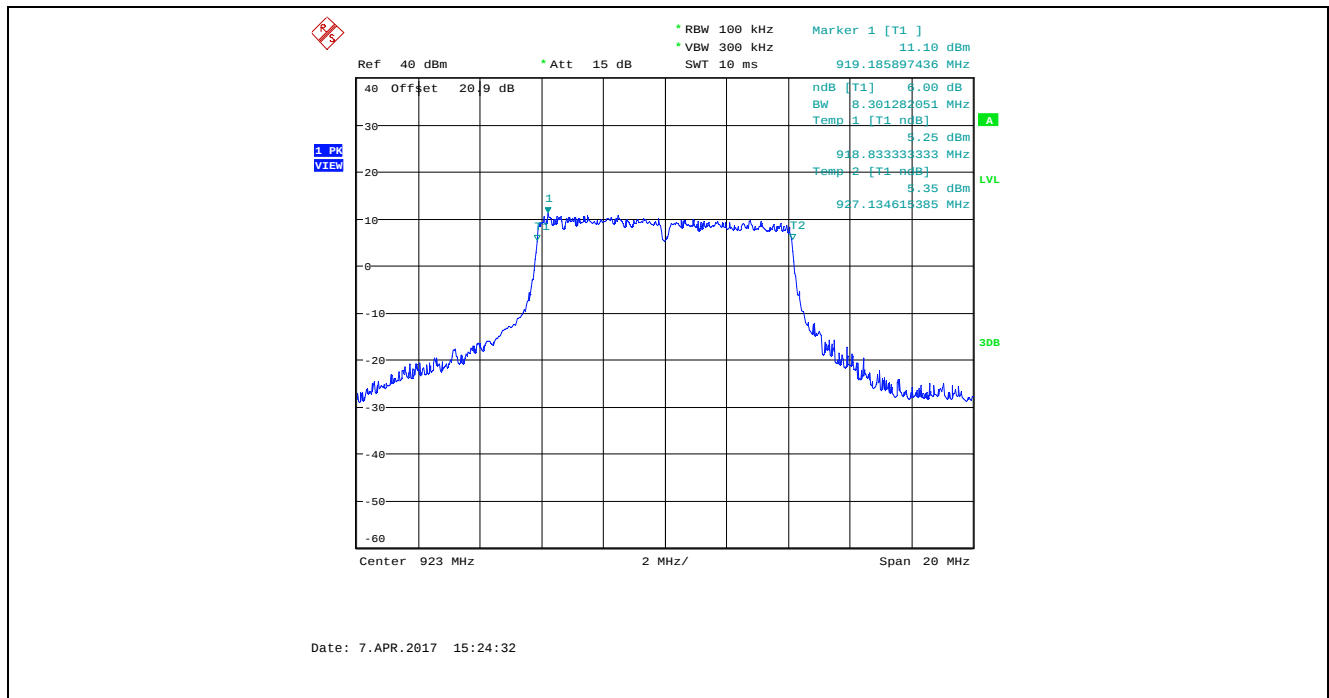
Plot 5.2.4.79. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 7, 907 MHz



Plot 5.2.4.80. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 7, 915 MHz



Plot 5.2.4.81. 6 dB Bandwidth, Bandwidth: 8 MHz, TX Gain: 36, Data Rate 7, 923 MHz



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3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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5.3. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]

5.3.1. Limit(s)

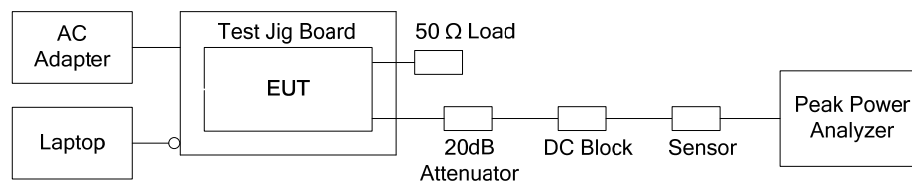
§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.2. Method of Measurements & Test Arrangement

KDB 558074 D01 DTS Meas Guidance v03r05, Section 9.1.2 PKPM1 Peak power meter method

5.3.3. Test Arrangement



5.3.4. Test Data

Remarks:

1. The EIRP shall be calculated based on the transmitter antenna gain (G_{dBi}), cable loss (CL_{dB}) and peak output power at antenna terminal (P_{dBm}). Calculated EIRP = $P_{dBm} + G_{dBi} - CL_{dB}$
2. EIRP shall not exceed 36 dBm limit (Power Setting = 36 dBm - $G_{dBi} + CL_{dB}$). See Operating Manual for instruction of power setting.

Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
High Power (TX Gain Setting 20) Bandwidth: 1 MHz	1	903	20.78	30	-9.22
		915	21.78	30	-8.22
		927	21.85	30	-8.15
	2	903	20.41	30	-9.59
		915	21.80	30	-8.20
		927	21.66	30	-8.34
High Power (TX Gain Setting 25) Bandwidth: 2 MHz	1	904	23.62	30	-6.38
		915	24.48	30	-5.52
		926	24.95	30	-5.05
	2	904	23.51	30	-6.49
		915	24.46	30	-5.54
		926	24.94	30	-5.06
	3	904	23.56	30	-6.44
		915	24.66	30	-5.34
		926	24.97	30	-5.03
High Power (TX Gain Setting 32) Bandwidth: 4 MHz	1	905	26.76	30	-3.24
		915	27.15	30	-2.85
		925	27.43	30	-2.57
	2	905	26.72	30	-3.28
		915	27.18	30	-2.82
		925	27.66	30	-2.34
	3	905	26.76	30	-3.24
		915	27.32	30	-2.68
		925	27.88	30	-2.12

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3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
High Power (TX Gain Setting 40) Bandwidth: 8 MHz	1	906	29.98	30	-0.02
		915	29.98	30	-0.02
		924	29.99	30	-0.01
	2	906	29.99	30	-0.01
		915	29.99	30	-0.01
		924	29.98	30	-0.02
	3	906	29.99	30	-0.01
		915	29.99	30	-0.01
		924	29.98	30	-0.02

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Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
High Power (TX Gain Setting 36) Bandwidth: 1 MHz	4	903	29.77	30	-0.23
		915	29.99	30	-0.01
		927	29.99	30	-0.01
	5	903	29.58	30	-0.42
		915	29.98	30	-0.02
		927	29.99	30	-0.01
	6	903	29.39	30	-0.61
		915	29.99	30	-0.01
		927	29.99	30	-0.01
	7	903	29.97	30	-0.03
		915	29.95	30	-0.05
		927	29.99	30	-0.01
High Power (TX Gain Setting 36) Bandwidth: 2 MHz	4	904	29.30	30	-0.70
		915	29.99	30	-0.01
		926	29.99	30	-0.01
	5	904	29.59	30	-0.41
		915	29.99	30	-0.01
		926	29.98	30	-0.02
	6	904	29.10	30	-0.90
		915	29.98	30	-0.02
		926	29.99	30	-0.01
	7	904	29.62	30	-0.38
		915	29.99	30	-0.01
		926	29.99	30	-0.01

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Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
High Power (TX Gain Setting 36) Bandwidth: 4 MHz	4	905	29.99	30	-0.01
		915	29.99	30	-0.01
		925	29.98	30	-0.02
	5	905	29.99	30	-0.01
		915	29.98	30	-0.02
		925	29.98	30	-0.02
	6	905	29.98	30	-0.02
		915	29.99	30	-0.01
		925	29.99	30	-0.01
	7	905	29.98	30	-0.02
		915	29.98	30	-0.02
		925	29.99	30	-0.01
High Power (TX Gain Setting 36) Bandwidth: 8 MHz	4	907	29.99	30	-0.01
		915	29.98	30	-0.02
		923	29.99	30	-0.01
	5	907	29.99	30	-0.01
		915	29.99	30	-0.01
		923	29.98	30	-0.02
	6	907	29.98	30	-0.02
		915	29.99	30	-0.01
		923	29.99	30	-0.01
	7	907	29.99	30	-0.01
		915	29.98	30	-0.02
		923	29.98	30	-0.02

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Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
Low Power (TX Gain Setting 0) Bandwidth: 1 MHz	1	903	9.56	30	-20.44
		915	10.23	30	-19.77
		927	10.13	30	-19.87
	2	903	9.68	30	-20.32
		915	10.36	30	-19.64
		927	10.27	30	-19.73
Low Power (TX Gain Setting 0) Bandwidth: 2 MHz	1	904	9.68	30	-20.32
		915	10.38	30	-19.62
		926	10.41	30	-19.59
	2	904	9.42	30	-20.58
		915	10.15	30	-19.85
		926	10.16	30	-19.84
	3	904	9.28	30	-20.72
		915	10.39	30	-19.61
		926	10.18	30	-19.82
Low Power (TX Gain Setting 0) Bandwidth: 4MHz	1	905	10.06	30	-19.94
		915	10.33	30	-19.67
		925	10.59	30	-19.41
	2	905	10.19	30	-19.81
		915	10.32	30	-19.68
		925	10.62	30	-19.38
	3	905	9.97	30	-20.03
		915	10.12	30	-19.88
		925	10.56	30	-19.44

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Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
Low Power (TX Gain Setting 0) Bandwidth: 8 MHz	1	906	10.63	30	-19.37
		915	10.43	30	-19.57
		924	10.75	30	-19.25
	2	906	10.51	30	-19.49
		915	10.18	30	-19.82
		924	10.72	30	-19.28
	3	906	10.43	30	-19.57
		915	10.45	30	-19.55
		924	10.69	30	-19.31

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Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
Low Power (TX Gain Setting 0) Bandwidth: 1 MHz	4	903	10.49	30	-19.51
		915	11.23	30	-18.77
		927	10.56	30	-19.44
	5	903	10.87	30	-19.13
		915	11.36	30	-18.64
		927	11.06	30	-18.94
	6	903	10.39	30	-19.61
		915	11.26	30	-18.74
		927	10.87	30	-19.13
	7	903	10.61	30	-19.39
		915	11.47	30	-18.53
		927	10.99	30	-19.01
Low Power (TX Gain Setting 0) Bandwidth: 2 MHz	4	904	11.45	30	-18.55
		915	11.18	30	-18.82
		926	11.32	30	-18.68
	5	904	10.86	30	-19.14
		915	11.55	30	-18.45
		926	11.41	30	-18.59
	6	904	10.62	30	-19.38
		915	11.54	30	-18.46
		926	10.91	30	-19.09
	7	904	10.67	30	-19.33
		915	10.75	30	-19.25
		926	11.08	30	-18.92

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3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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Operating Mode	Data Rate	Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Margin (dBm)
Low Power (TX Gain Setting 0) Bandwidth: 4 MHz	4	905	11.55	30	-18.45
		915	11.27	30	-18.73
		925	11.46	30	-18.54
	5	905	11.45	30	-18.55
		915	11.32	30	-18.68
		925	11.47	30	-18.53
	6	905	11.53	30	-18.47
		915	11.36	30	-18.64
		925	11.62	30	-18.38
	7	905	11.49	30	-18.51
		915	11.27	30	-18.73
		925	11.49	30	-18.51
Low Power (TX Gain Setting 0) Bandwidth: 8 MHz	4	907	11.53	30	-18.47
		915	11.20	30	-18.80
		923	11.91	30	-18.09
	5	907	11.74	30	-18.26
		915	11.72	30	-18.28
		923	11.83	30	-18.17
	6	907	11.61	30	-18.39
		915	11.56	30	-18.44
		923	11.48	30	-18.52
	7	907	11.43	30	-18.57
		915	11.25	30	-18.75
		923	11.42	30	-18.58

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5.4. TRANSMITTER BAND-EDGE & SPURIOUS CONDUCTED EMISSIONS [§ 15.247(d)]

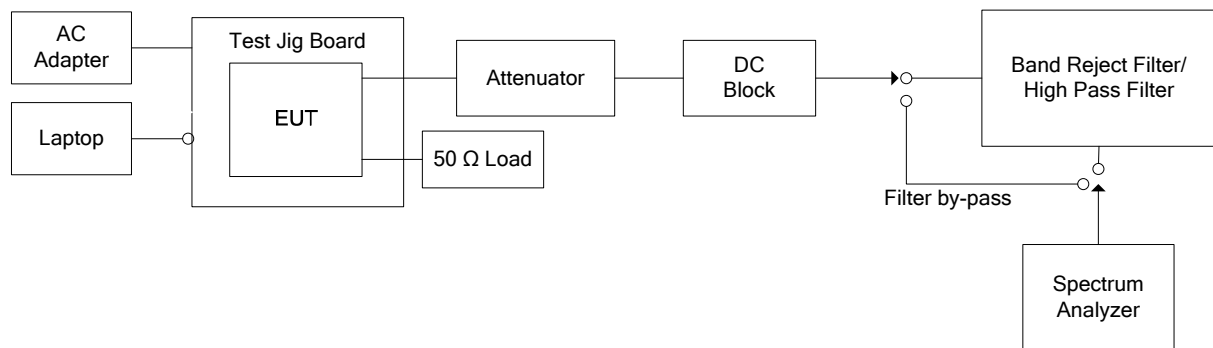
5.4.1. Limit(s)

§ 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)).

5.4.2. Method of Measurements

KDB 558074 D01 DTS Meas Guidance V03r05, Sections 11, 12 and 13.

5.4.3. Test Arrangement

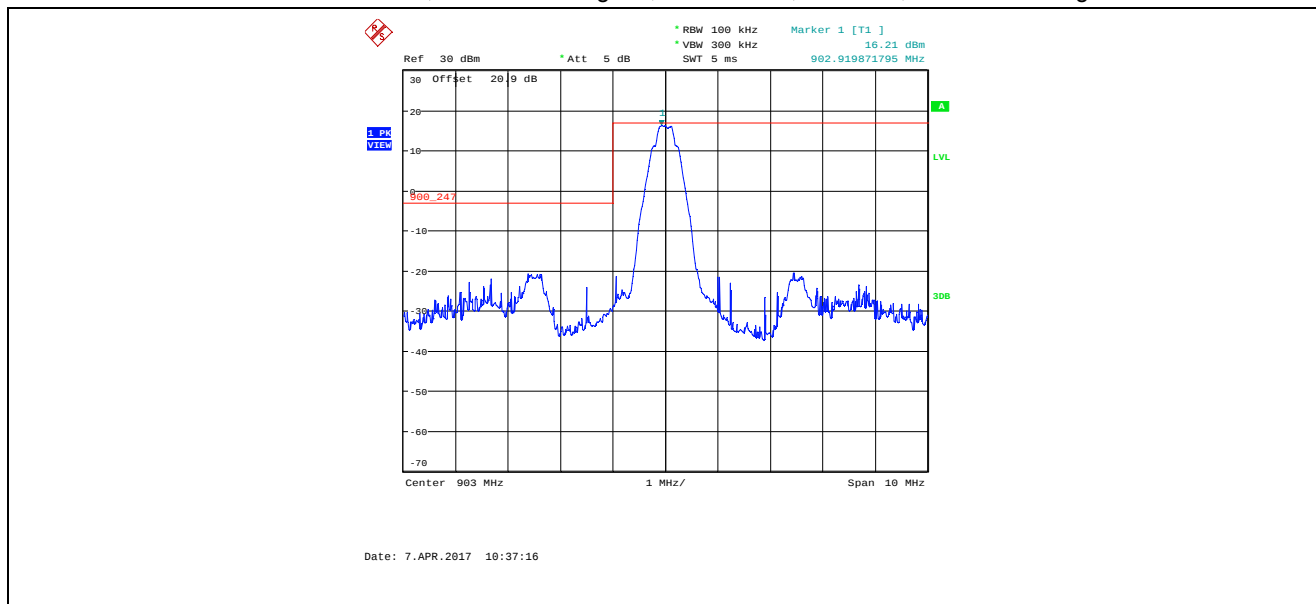


5.4.4. Test Data

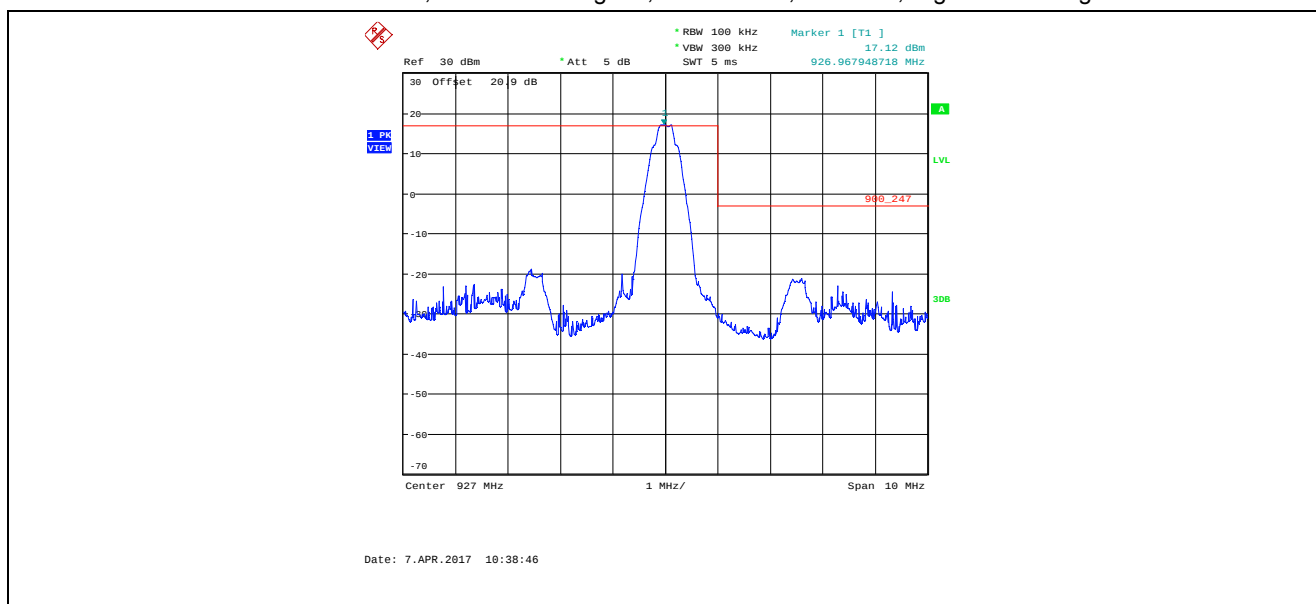
Remark(s): Exploratory tests performed to determined worst-case test configurations, the following test results represent the worst-case.

5.4.4.1. Band-Edge RF Conducted Emissions

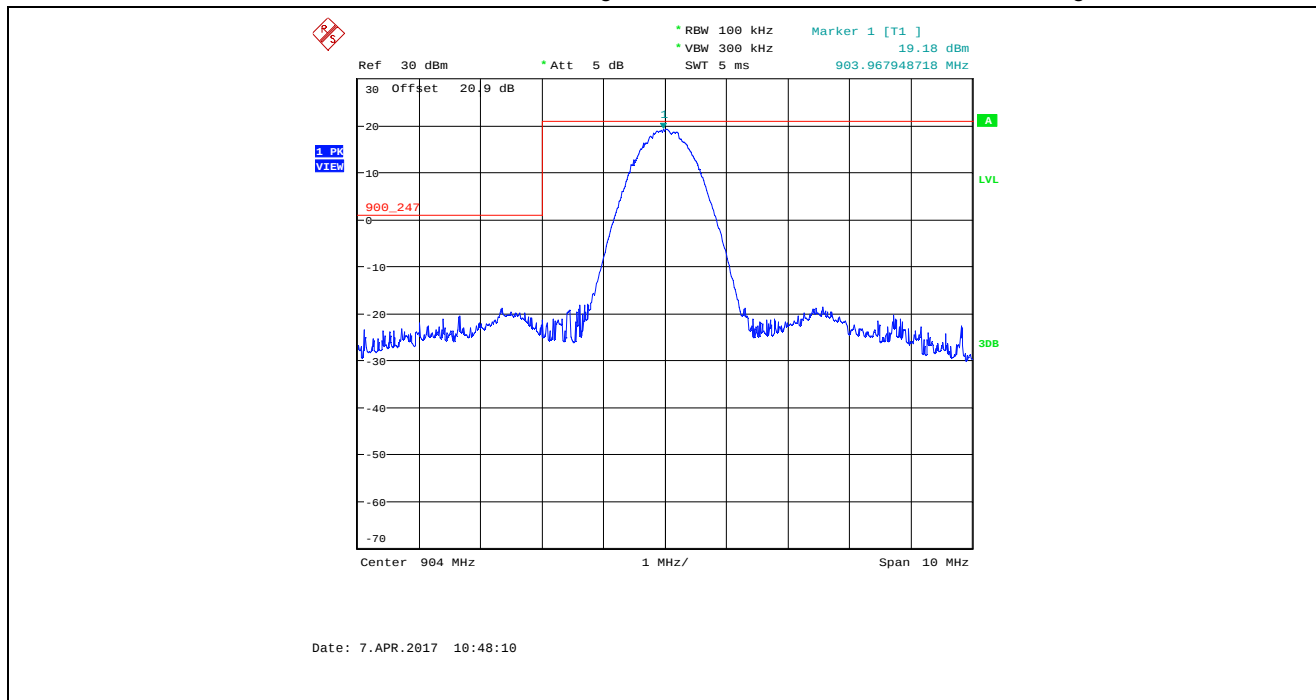
Plot 5.4.4.1.1. Band-Edge RF Conducted Emissions
Bandwidth: 1 MHz, TX Gain Setting: 20, Data Rate 2, 903 MHz, Lower Band-edge



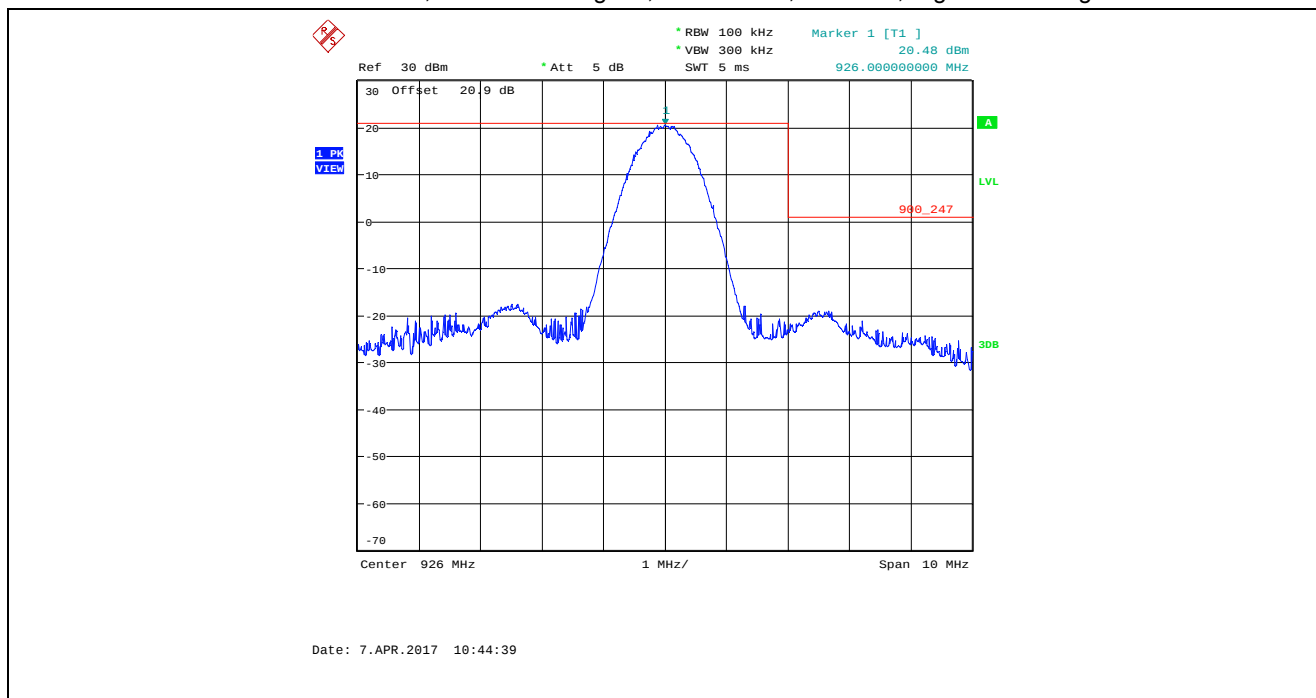
Plot 5.4.4.1.2. Band-Edge RF Conducted Emissions
Bandwidth: 1 MHz, TX Gain Setting: 20, Data Rate 2, 927 MHz, Higher Band-edge



Plot 5.4.4.1.3. Band-Edge RF Conducted Emissions
Bandwidth: 2 MHz, TX Gain Setting: 25 Data Rate 3, 904 MHz, Lower Band-edge



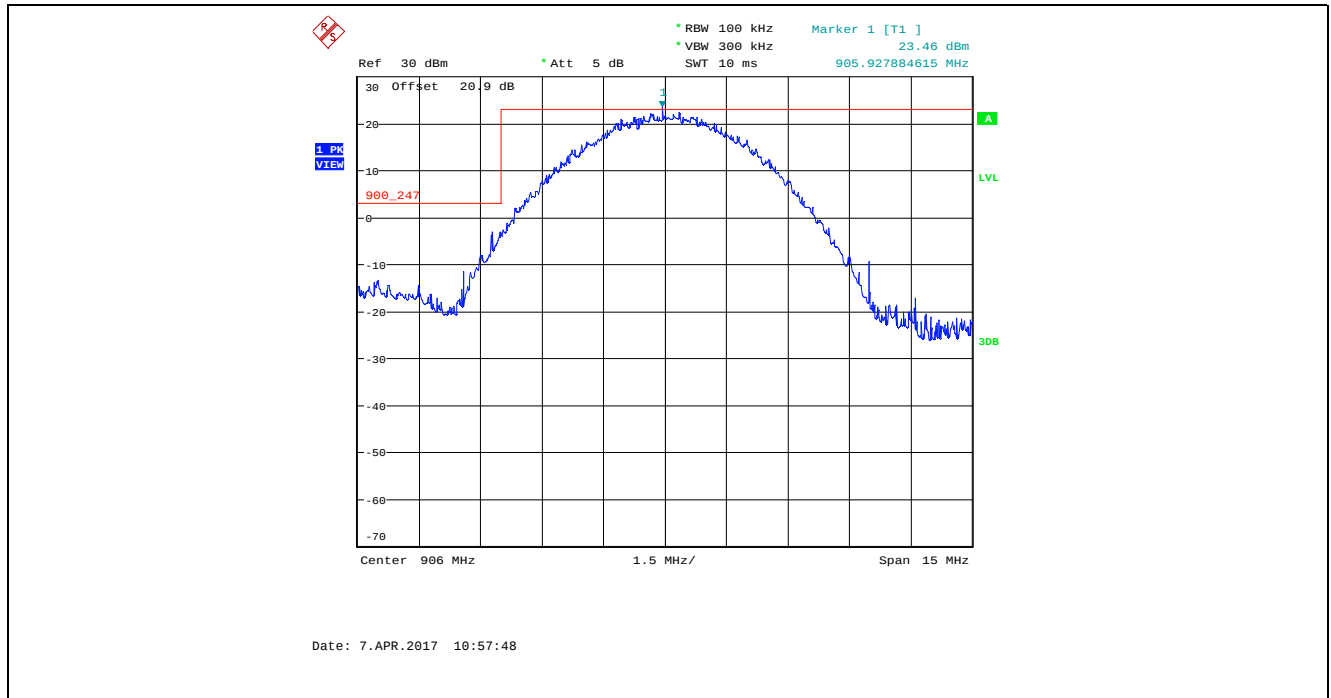
Plot 5.4.4.1.4. Band-Edge RF Conducted Emissions
Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 3, 926 MHz, Higher Band-edge



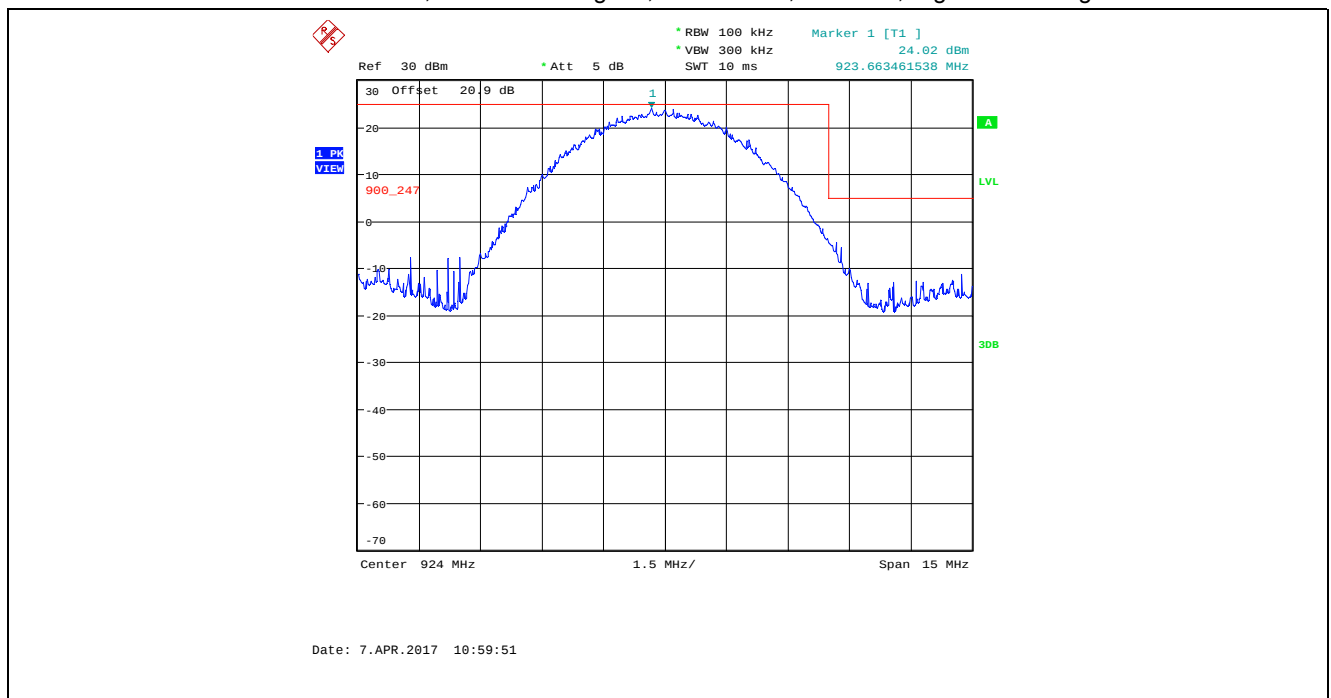
Date: 7.APR.2017 10:51:25

Date: 7.APR.2017 10:53:35

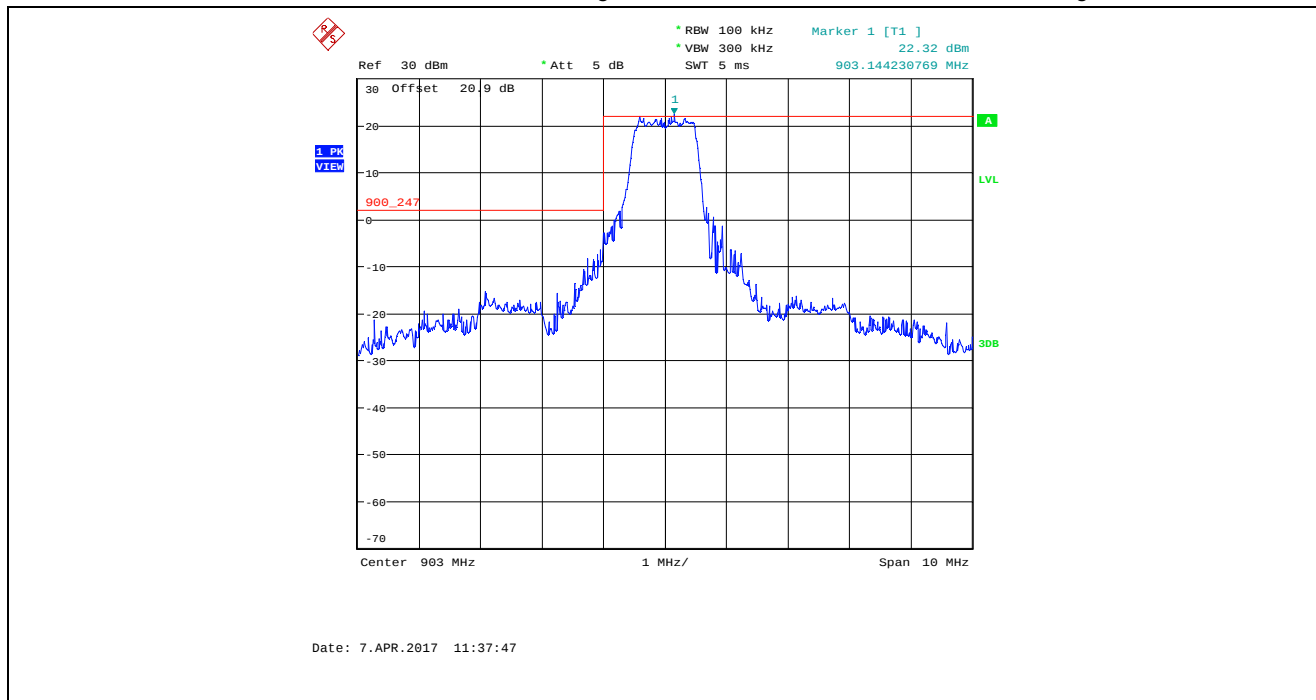
Plot 5.4.4.1.7. Band-Edge RF Conducted Emissions
Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 3, 906 MHz, Lower Band-edge



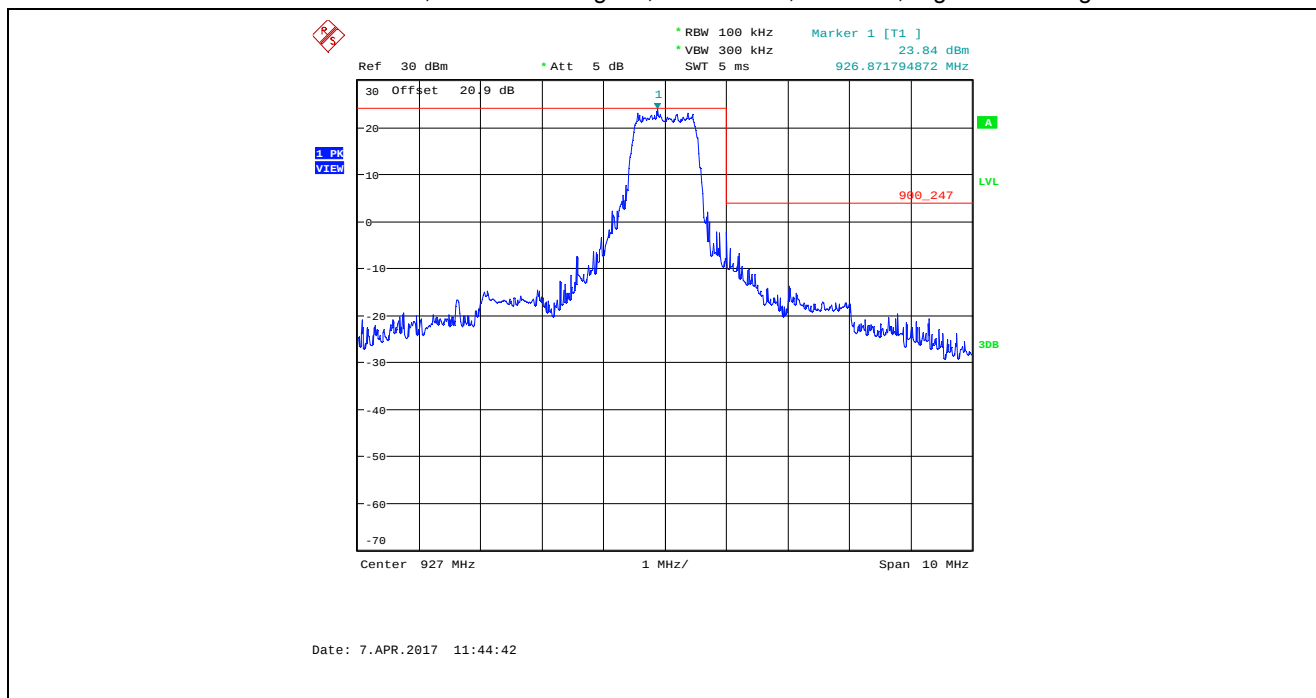
Plot 5.4.4.1.8. Band-Edge RF Conducted Emissions
Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 3, 924 MHz, Higher Band-edge



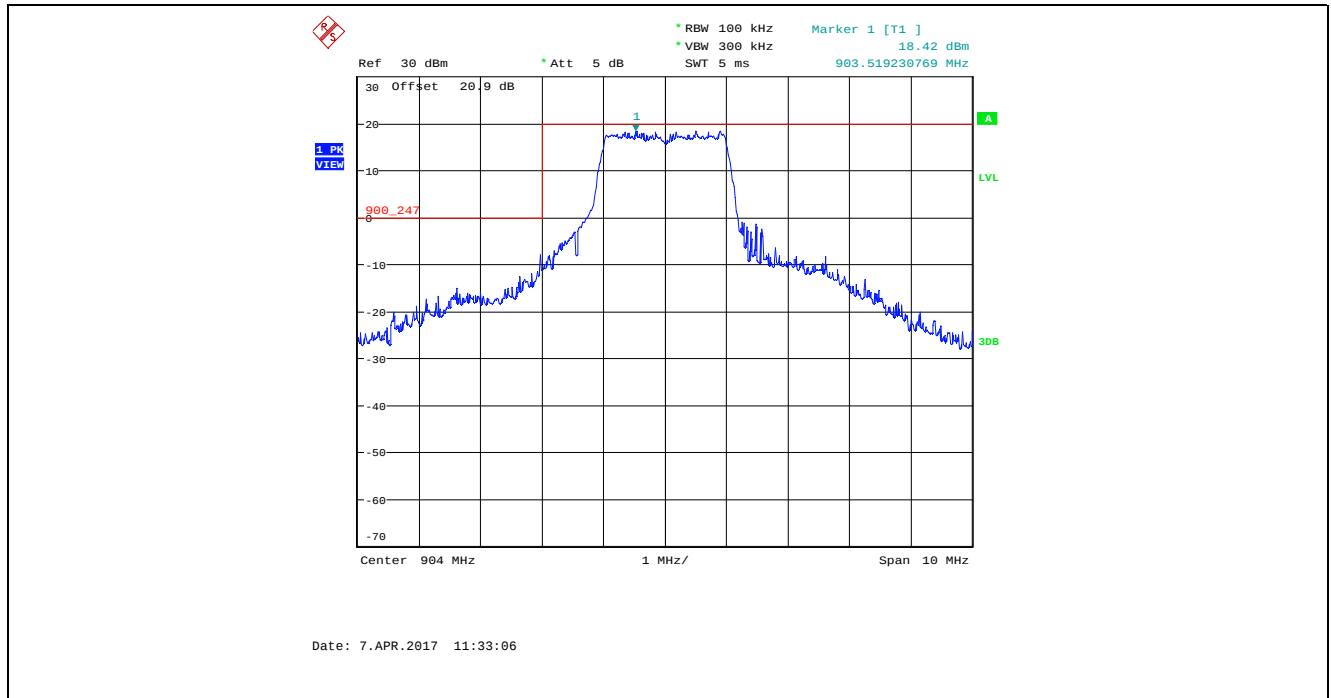
Plot 5.4.4.1.9. Band-Edge RF Conducted Emissions
Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 7, 903 MHz, Lower Band-edge



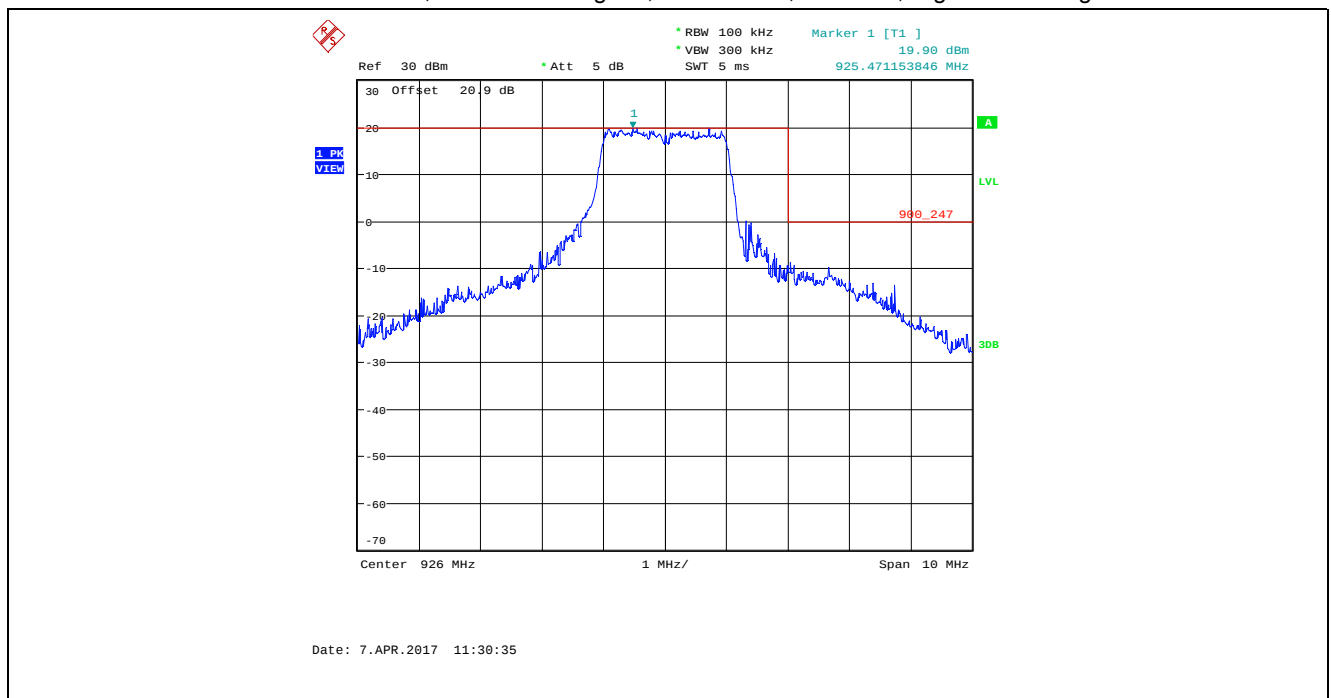
Plot 5.4.4.1.10. Band-Edge RF Conducted Emissions
Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 7, 927 MHz, Higher Band-edge



Plot 5.4.4.1.11. Band-Edge RF Conducted Emissions
Bandwidth: 2 MHz, TX Gain Setting: 45, Data Rate 7, 904 MHz, Lower Band-edge



Plot 5.4.4.1.12. Band-Edge RF Conducted Emissions
Bandwidth: 2 MHz, TX Gain Setting: 45, Data Rate 7, 926 MHz, Higher Band-edge



Ref 30 dBm Att 5 dB RBW 100 kHz VBW 300 kHz SWT 5 ms Marker 1 [T1] 15.44 dBm 905.977564103 MHz

30 Offset 20.9 dB

15.44 dBm 15.44 dBm

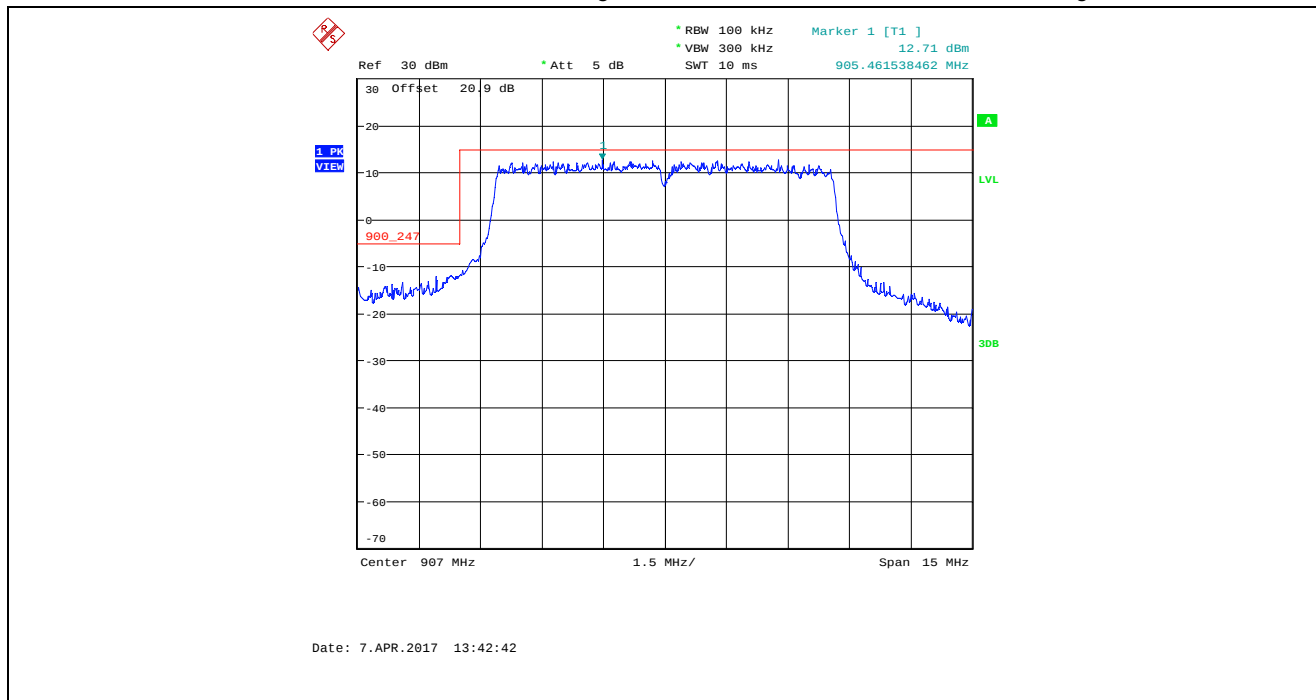
905_247

Center 905 MHz 1 MHz/ Span 10 MHz

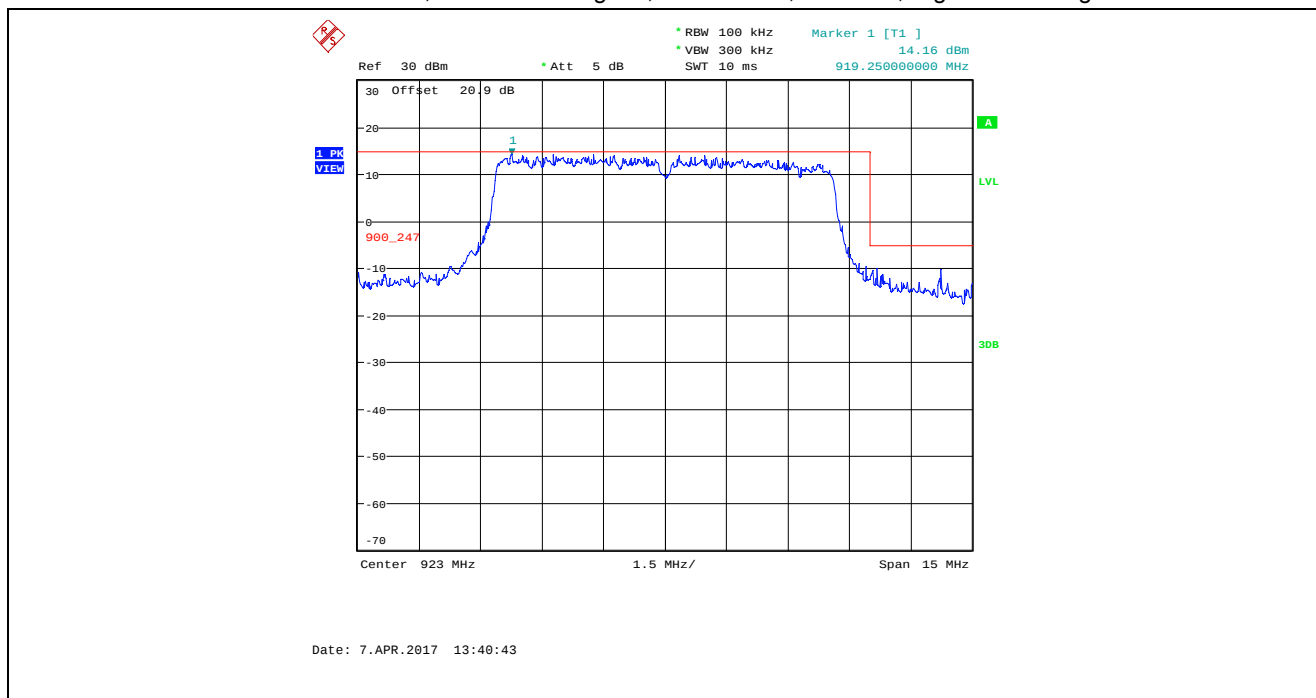
[illegible]

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.4.4.1.15. Band-Edge RF Conducted Emissions
Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 7, 907 MHz, Lower Band-edge

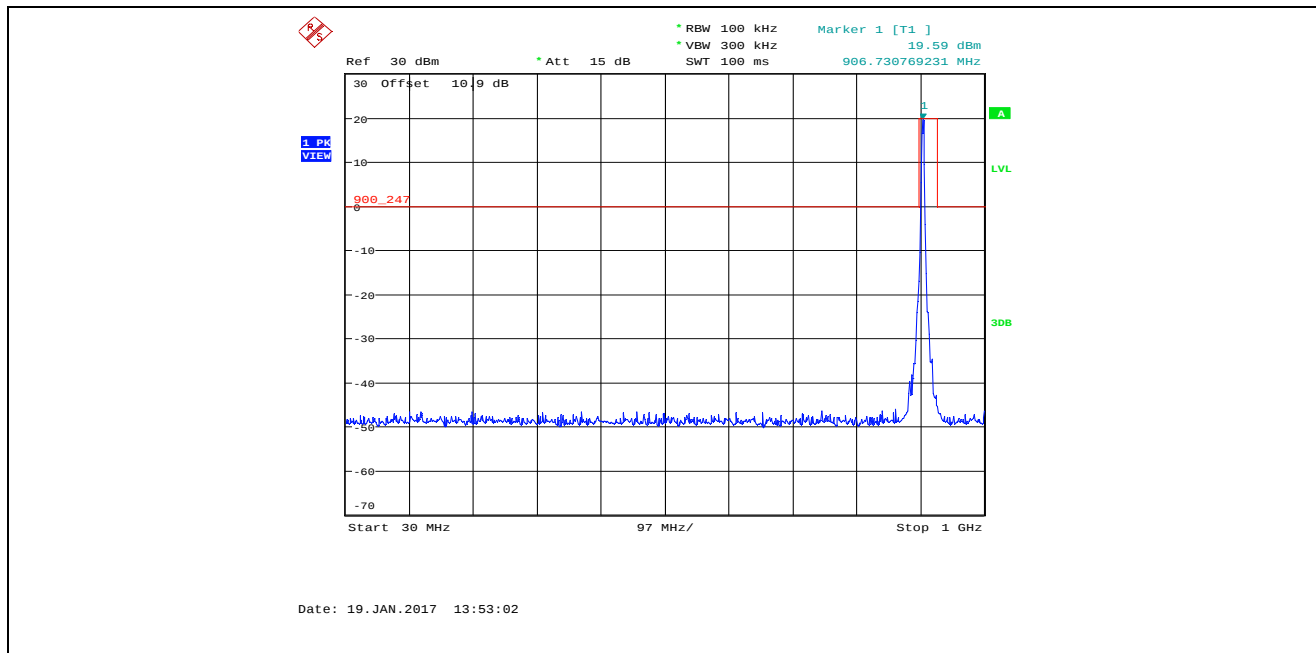


Plot 5.4.4.1.16. Band-Edge RF Conducted Emissions
Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 7, 923 MHz, Higher Band-edge

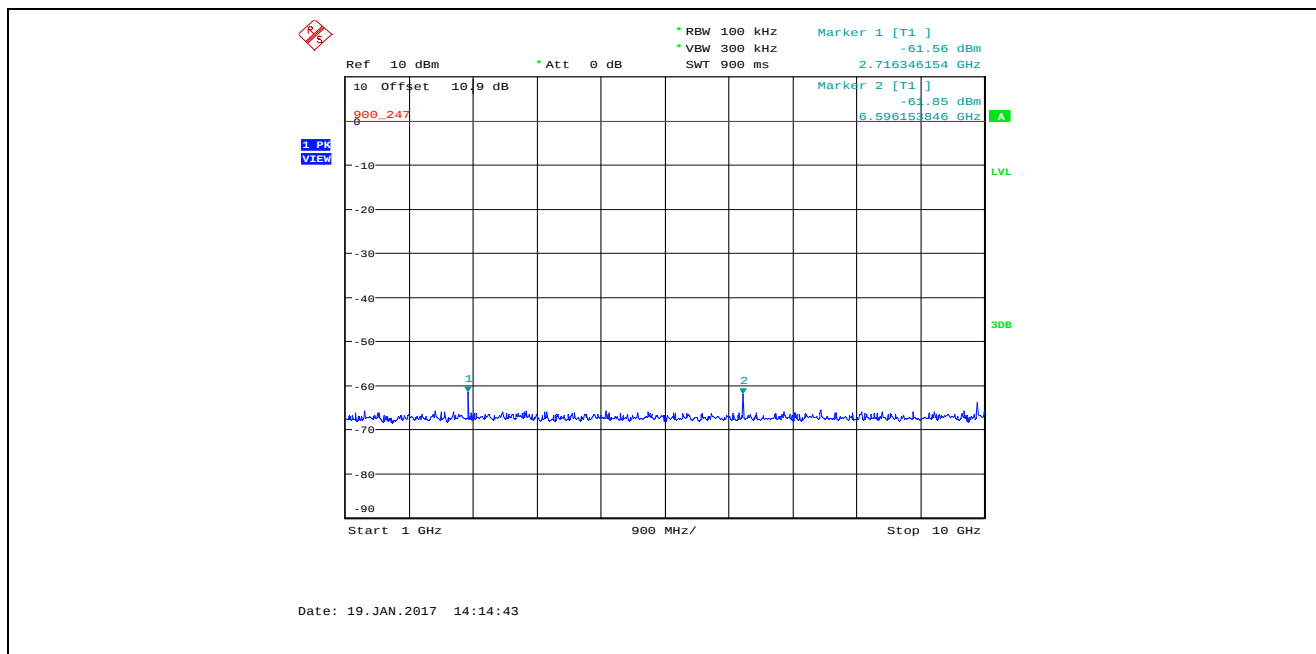


5.4.4.2. Spurious RF Conducted Emissions in Non-restricted Frequency Bands

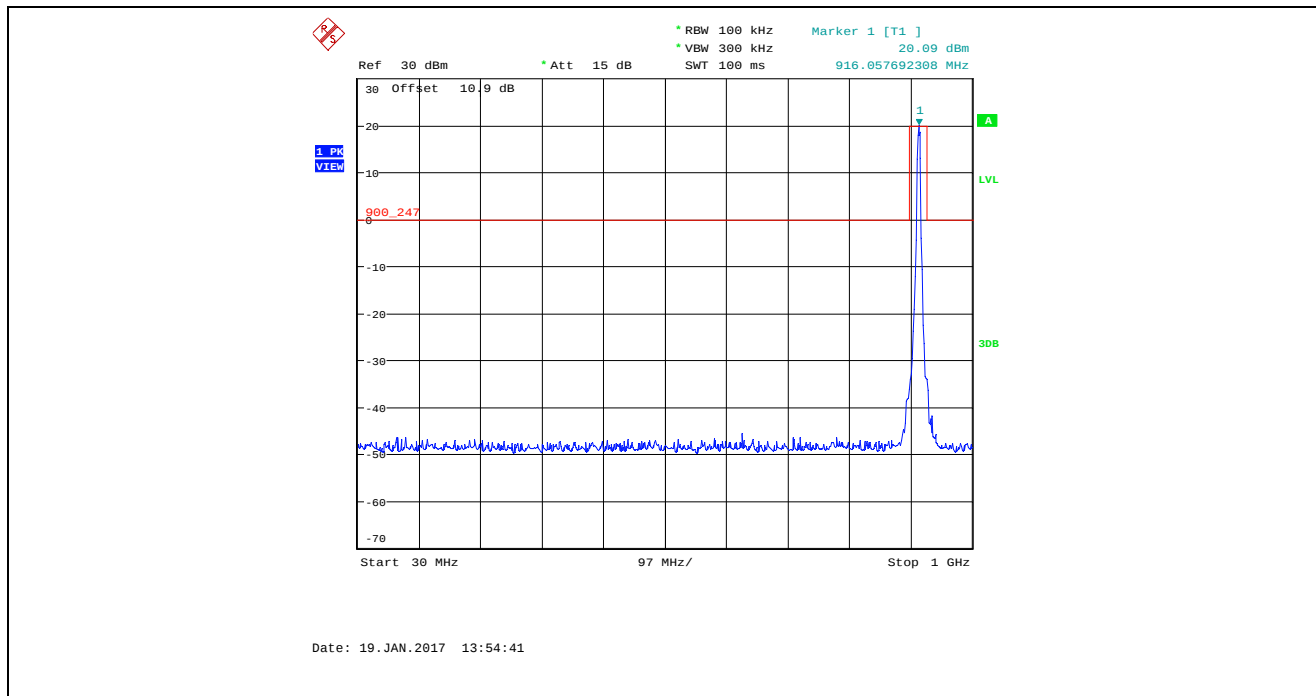
Plot 5.4.4.2.1. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 40, Data Rate 1, 906 MHz, 30 MHz – 1 GHz



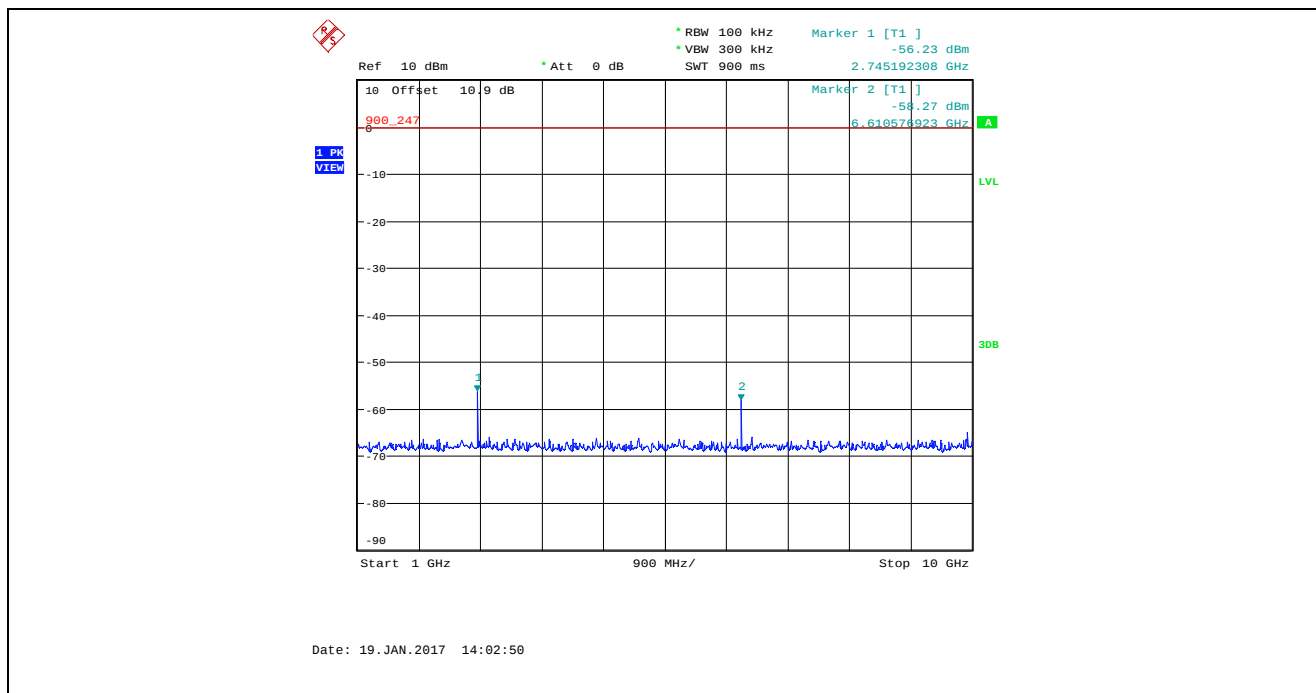
Plot 5.4.4.2.2. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 40, Data Rate 1, 906 MHz, 1 GHz – 10 GHz



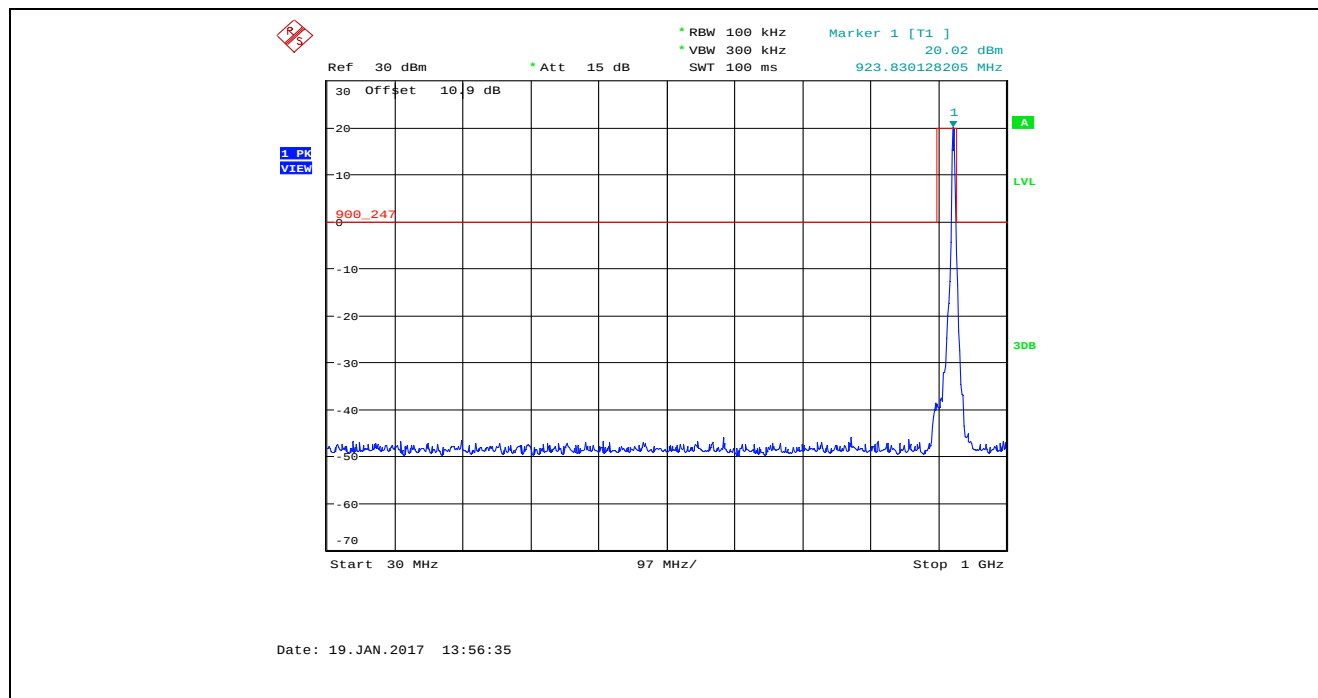
Plot 5.4.4.2.3. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 40, Data Rate 1, 915 MHz, 30 MHz – 1 GHz



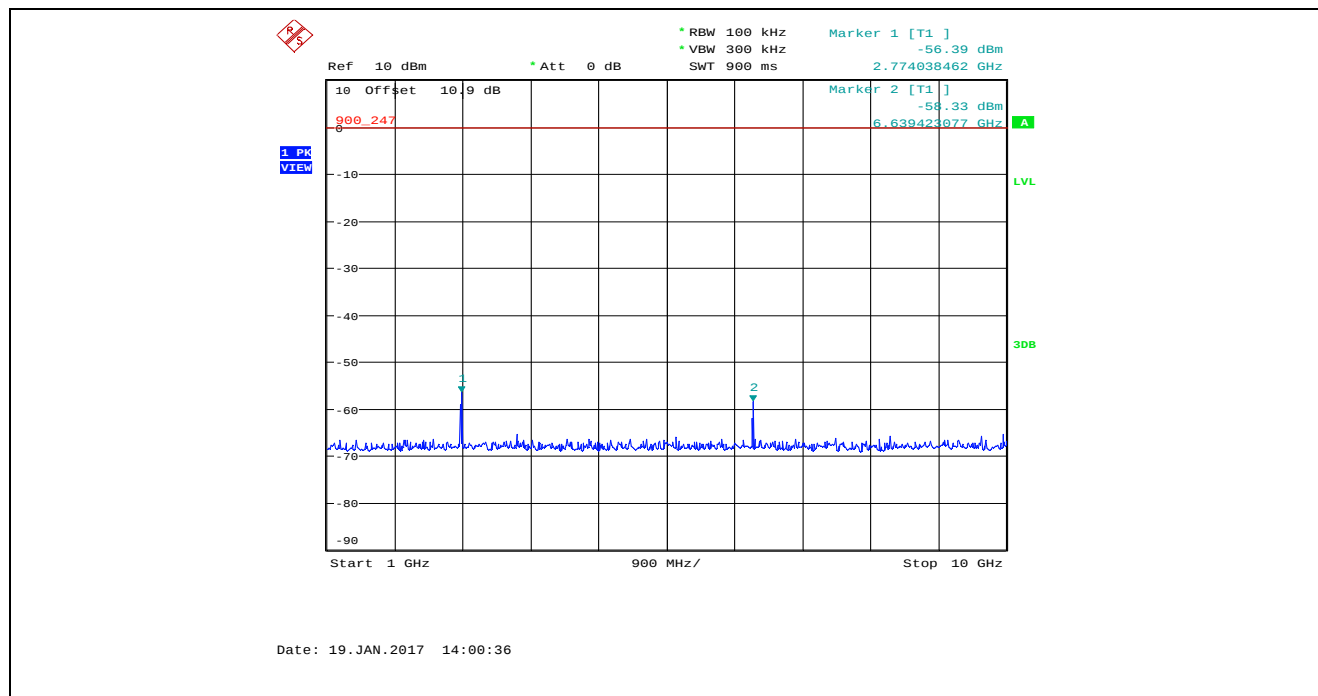
Plot 5.4.4.2.4. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 40, Data Rate 1, 915 MHz, 1 GHz – 10 GHz



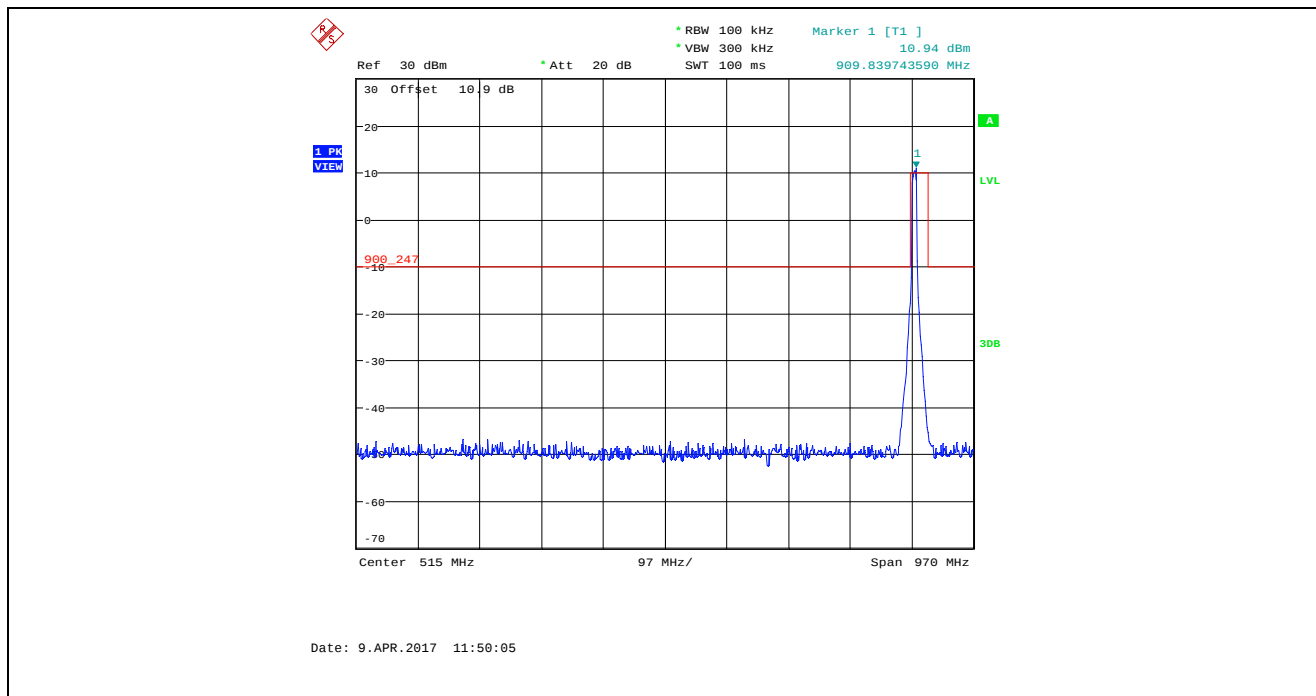
Plot 5.4.4.2.5. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 40, Data Rate 1, 924 MHz, 30 MHz – 1 GHz



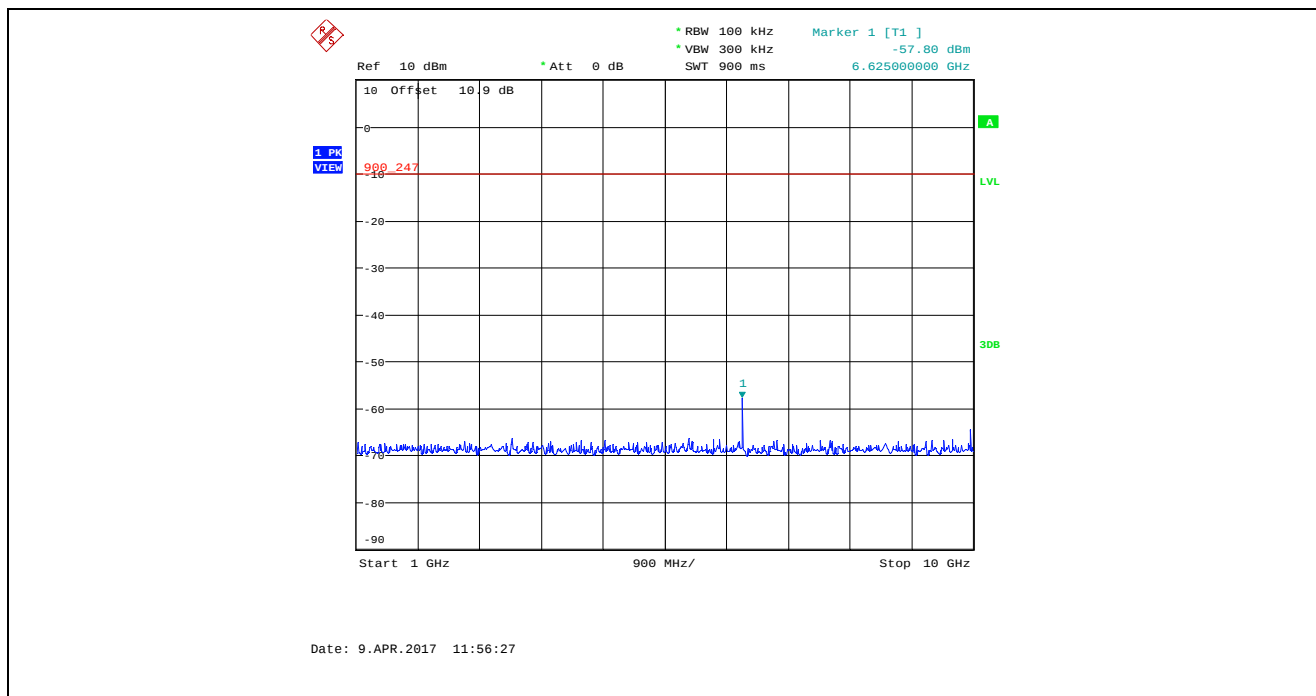
Plot 5.4.4.2.6. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 40, Data Rate 1, 924 MHz, 1 GHz – 10 GHz



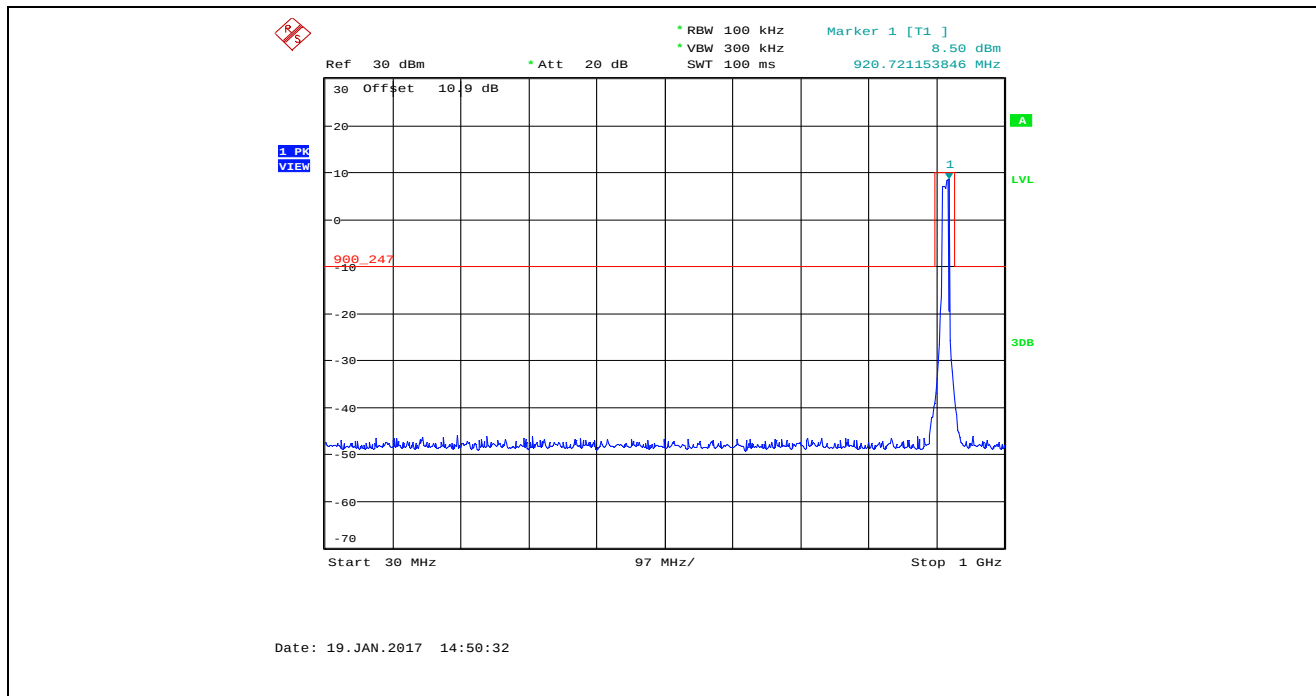
Plot 5.4.4.2.7. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 36, Data Rate 4, 907 MHz, 30 MHz – 1 GHz



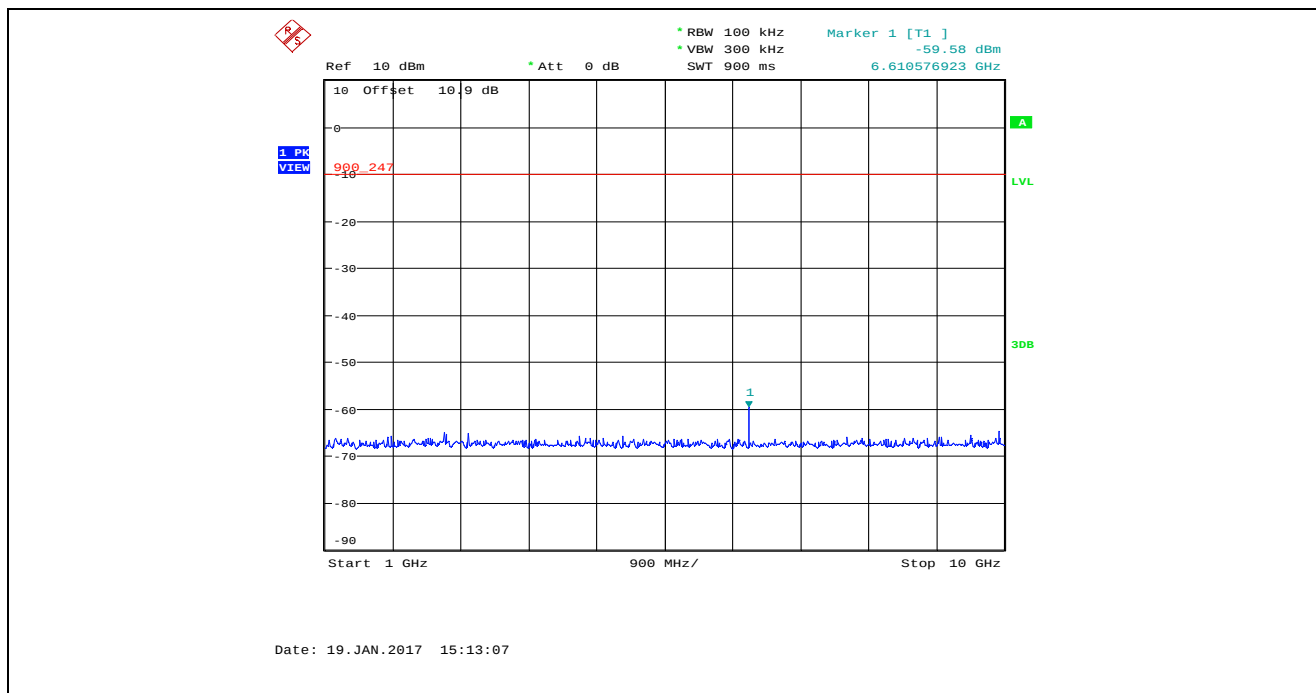
Plot 5.4.4.2.8. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 36, Data Rate 4, 907 MHz, 1 GHz – 10 GHz



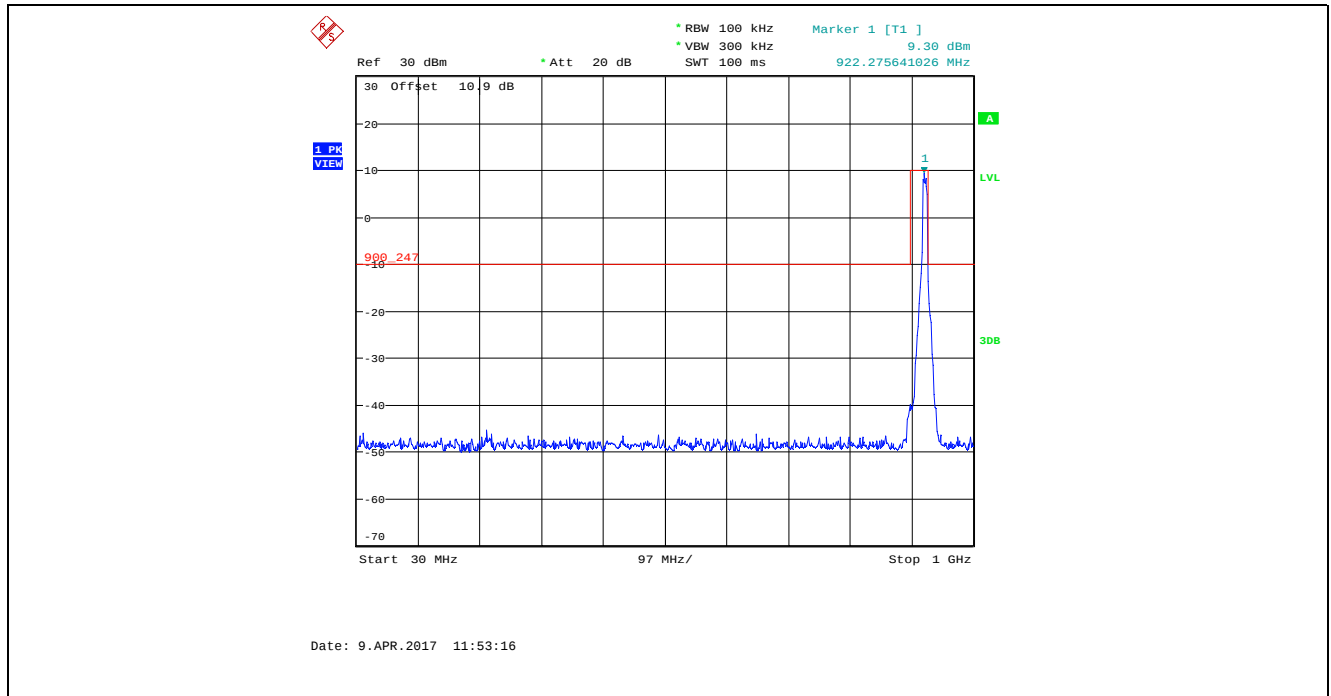
Plot 5.4.4.2.9. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 36, Data Rate 4, 915 MHz, 30 MHz – 1 GHz



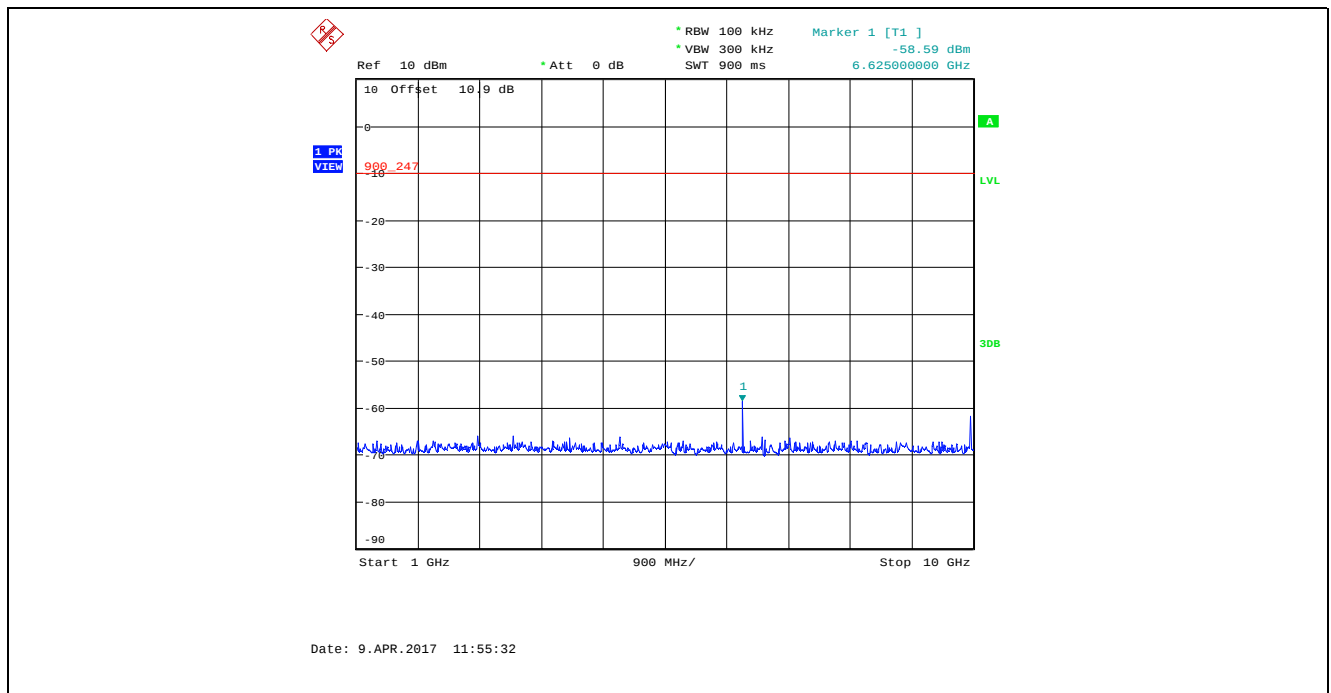
Plot 5.4.4.2.10. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 36, Data Rate 4, 915 MHz, 1 GHz – 10 GHz



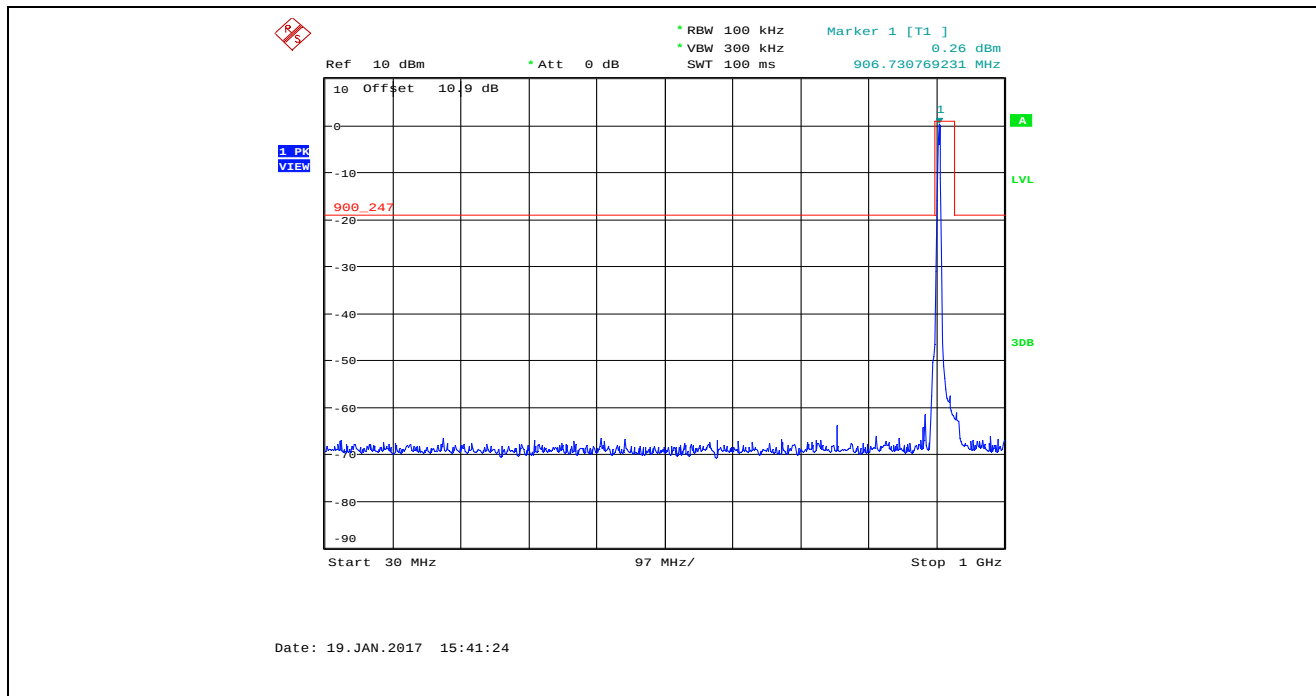
Plot 5.4.4.2.11. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 36, Data Rate 4, 923 MHz, 30 MHz – 1 GHz



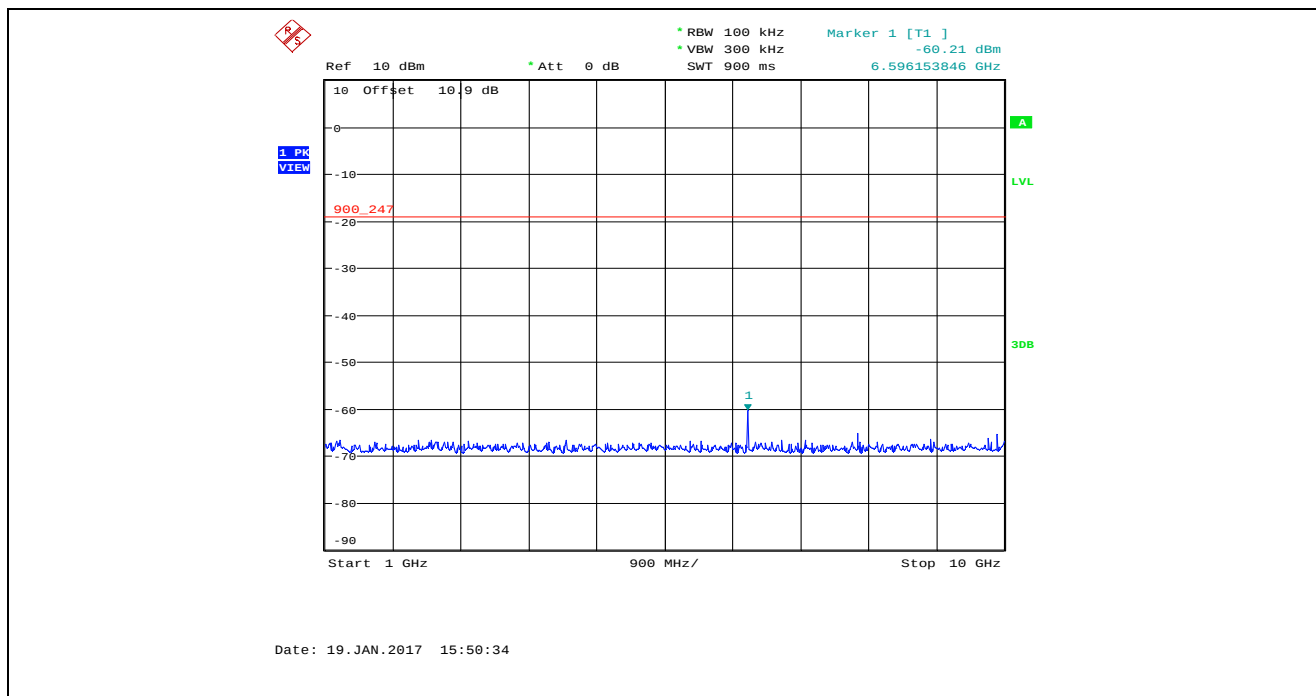
Plot 5.4.4.2.12. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 36, Data Rate 4, 923 MHz, 1 GHz – 10 GHz



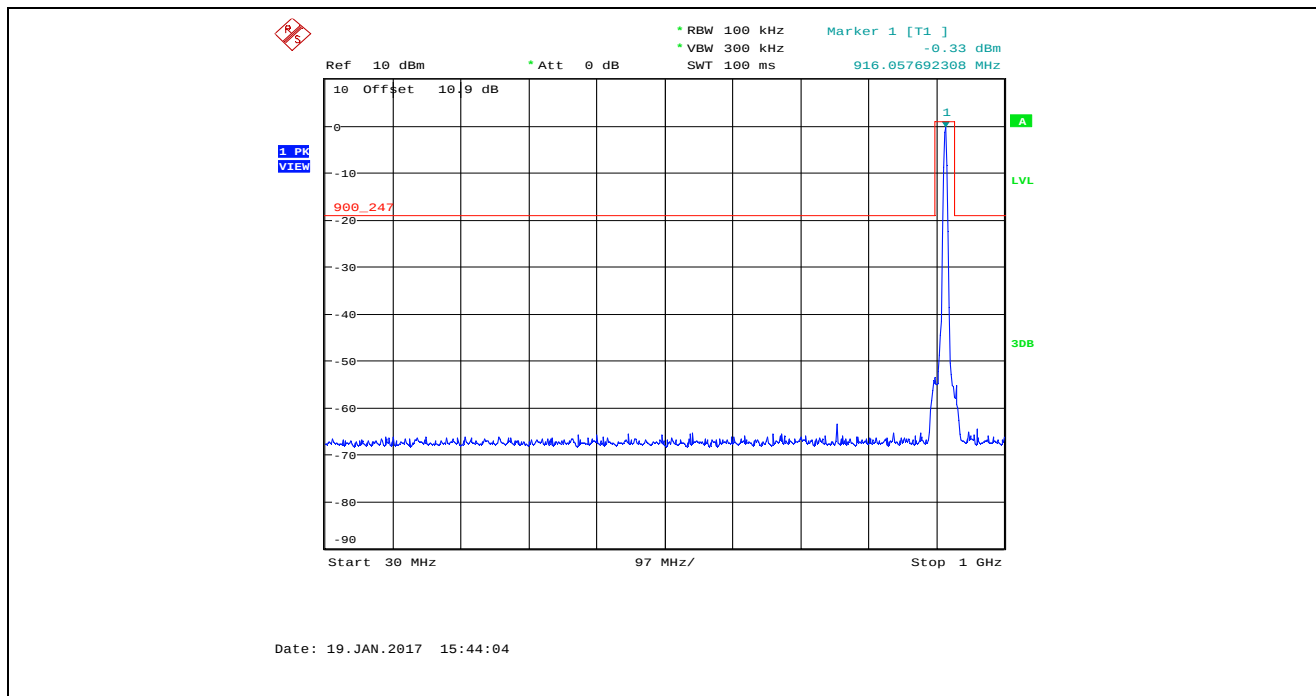
Plot 5.4.4.2.13. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 1, 906 MHz, 30 MHz – 1 GHz



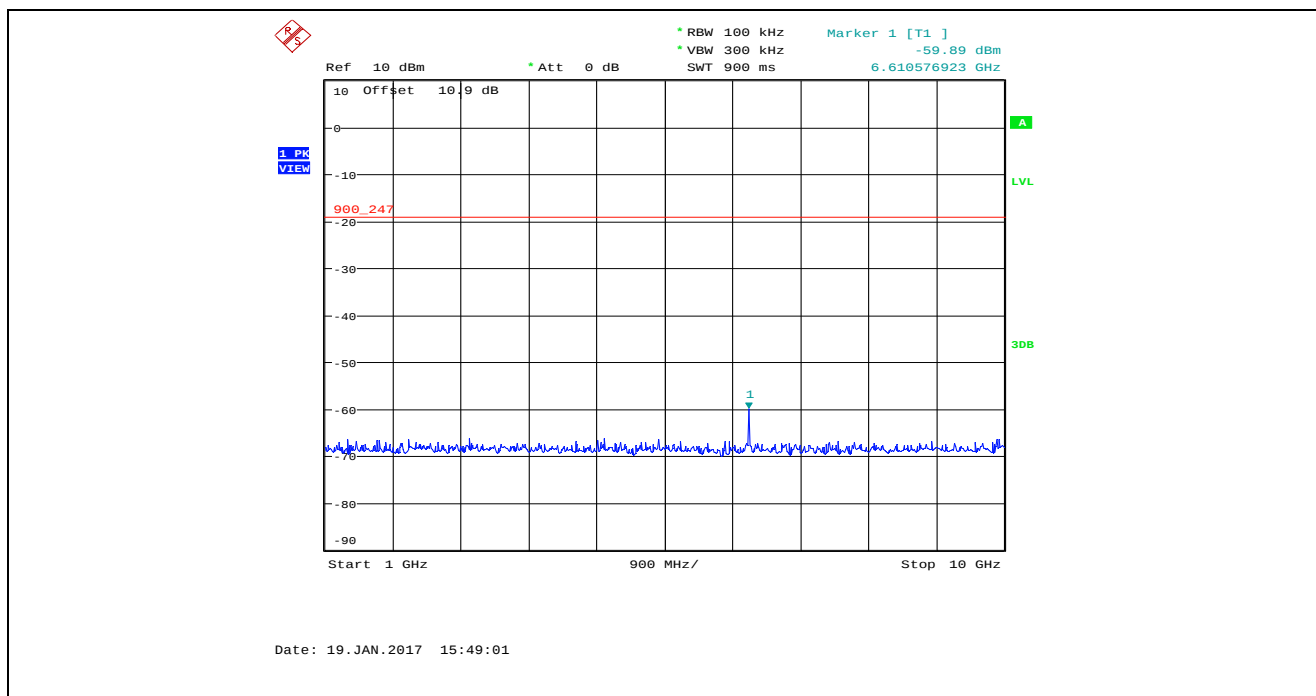
Plot 5.4.4.2.14. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 1, 906 MHz, 1 GHz – 10 GHz



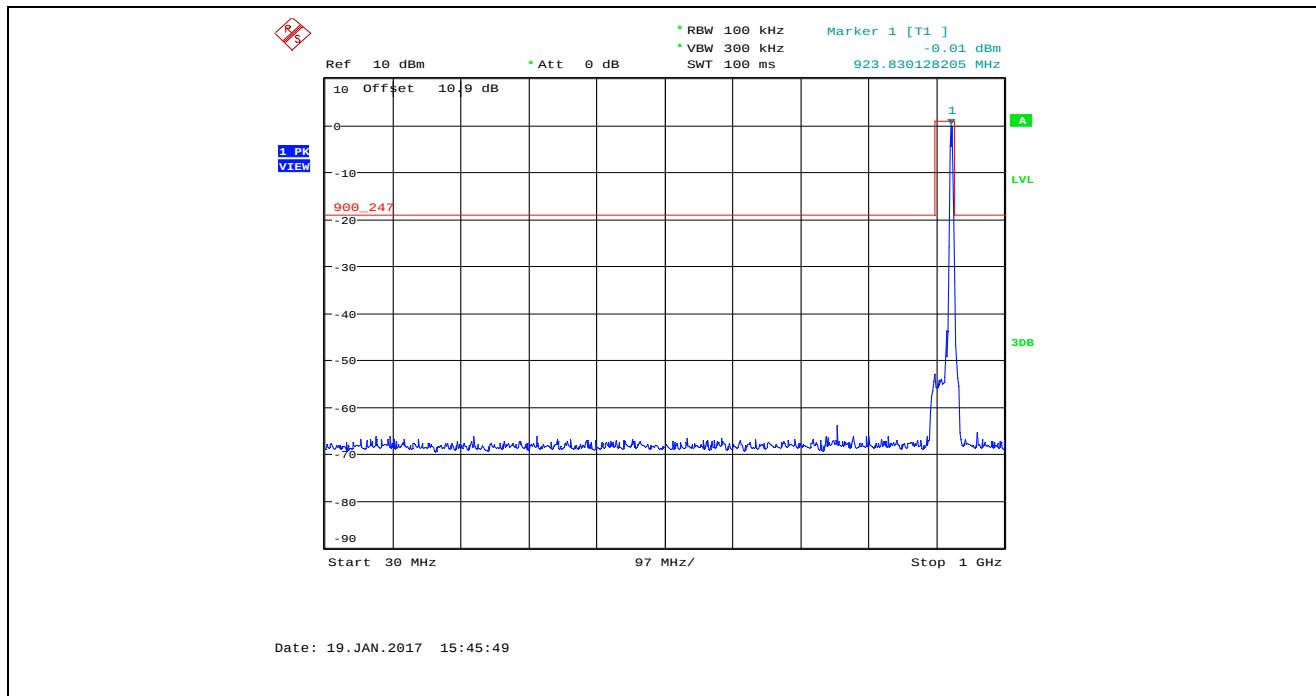
Plot 5.4.4.2.15. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 1, 915 MHz, 30 MHz – 1 GHz



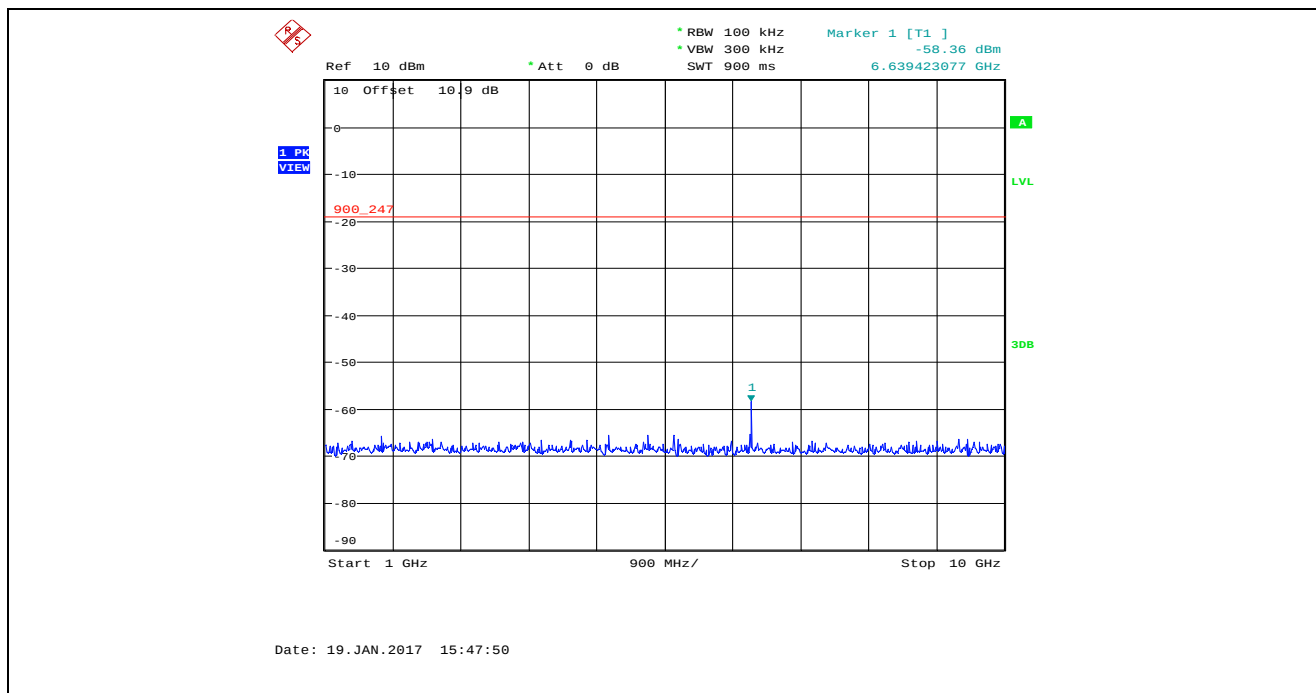
Plot 5.4.4.2.16. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 1, 915 MHz, 1 GHz – 10 GHz



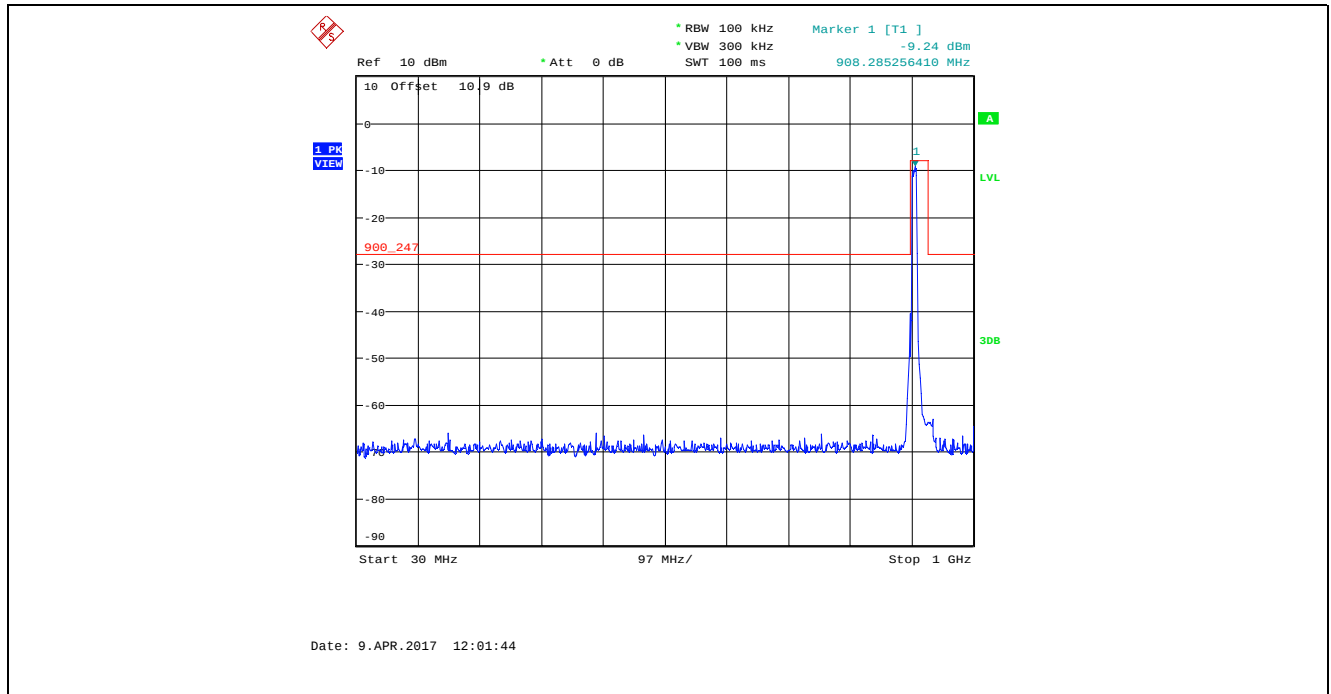
Plot 5.4.4.2.17. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 1, 924 MHz, 30 MHz – 1 GHz



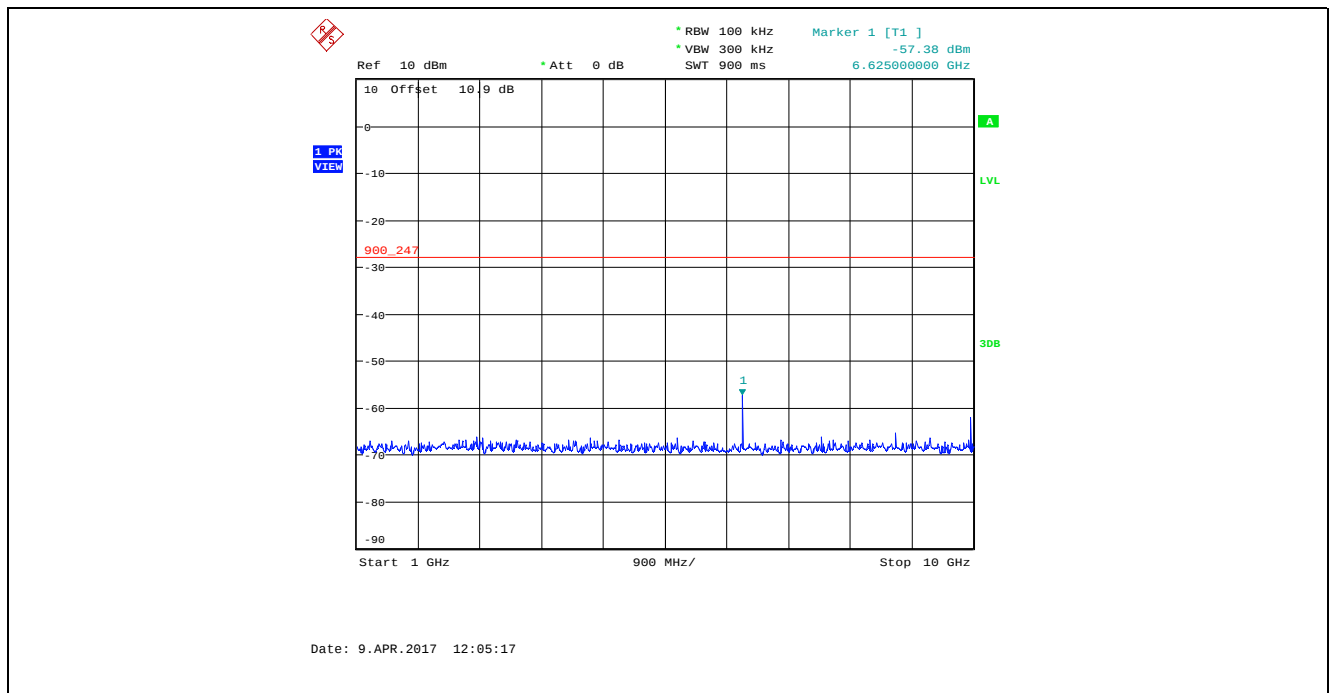
Plot 5.4.4.2.18. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 1, 924 MHz, 1 GHz – 10 GHz



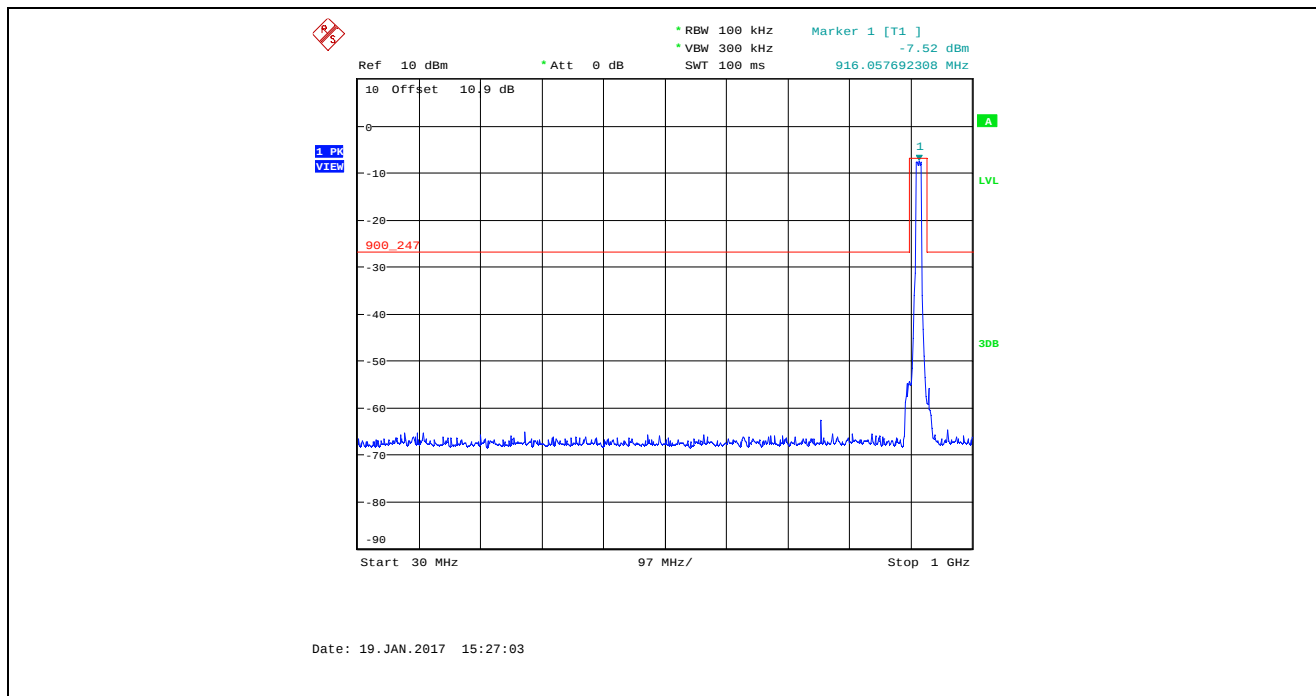
Plot 5.4.4.2.19. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 4, 907 MHz, 30 MHz – 1 GHz



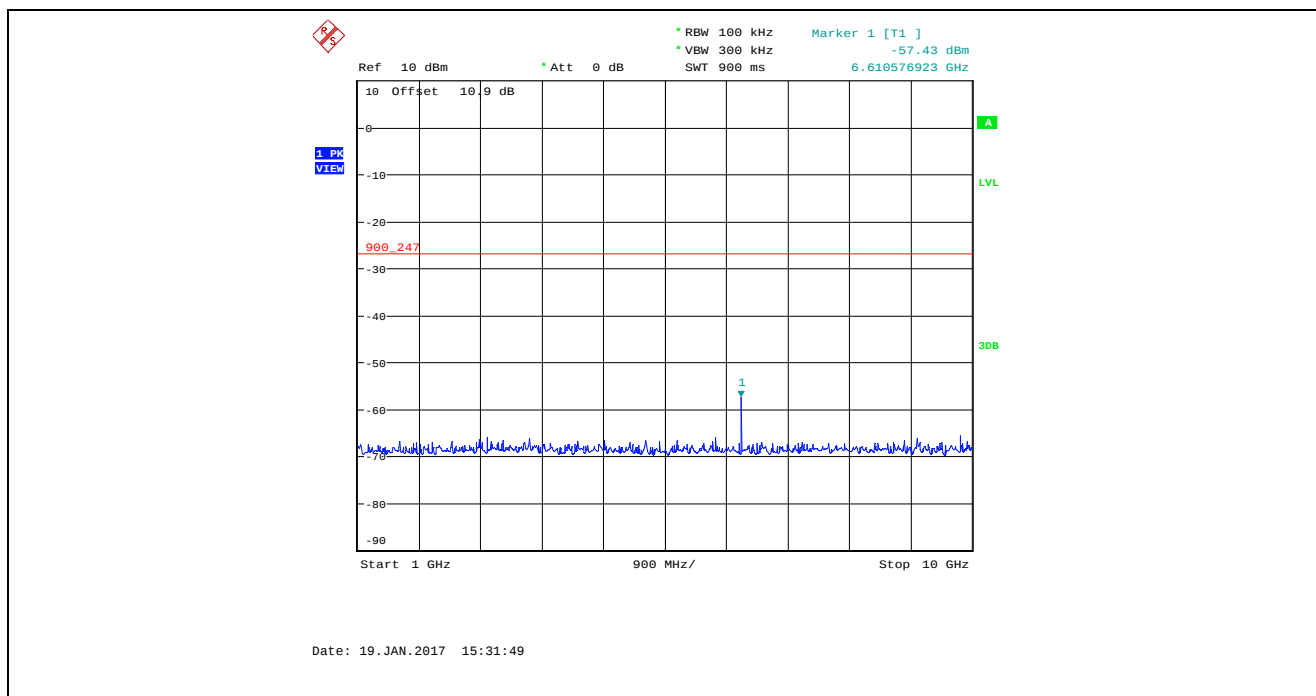
Plot 5.4.4.2.20. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 4, 907 MHz, 1 GHz – 10 GHz



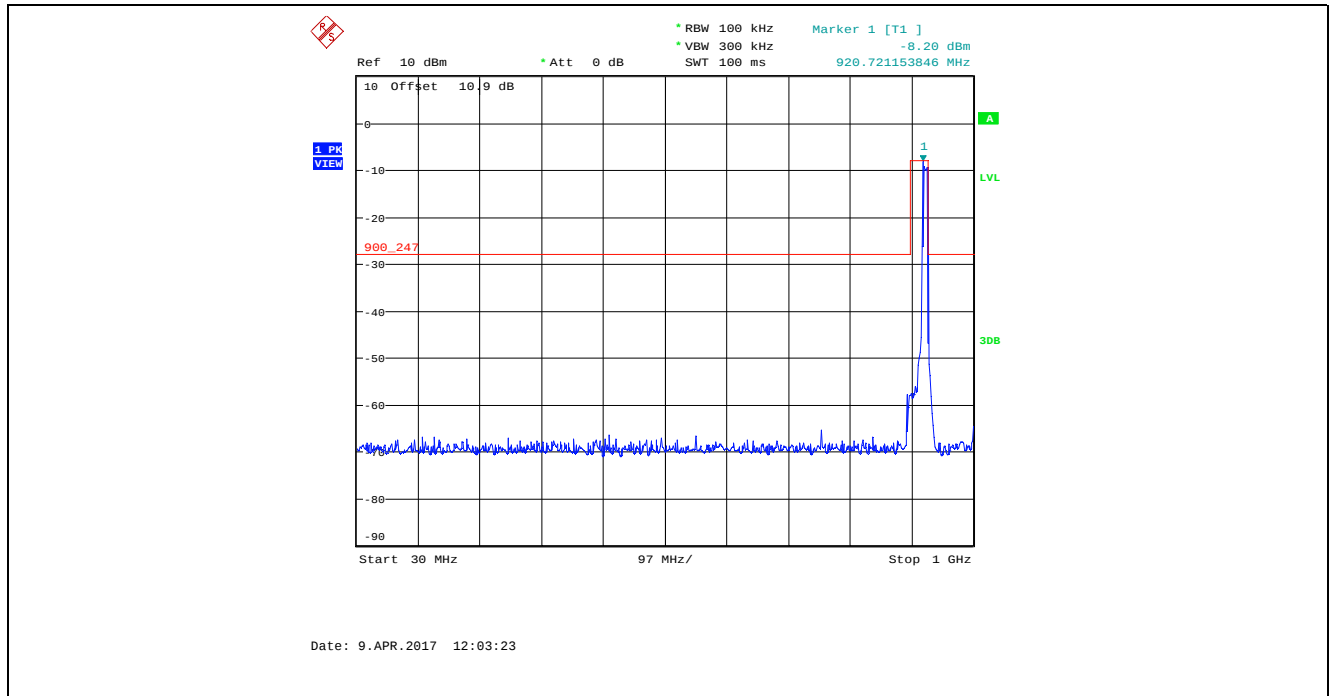
Plot 5.4.4.2.21. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 4, 915 MHz, 30 MHz – 1 GHz



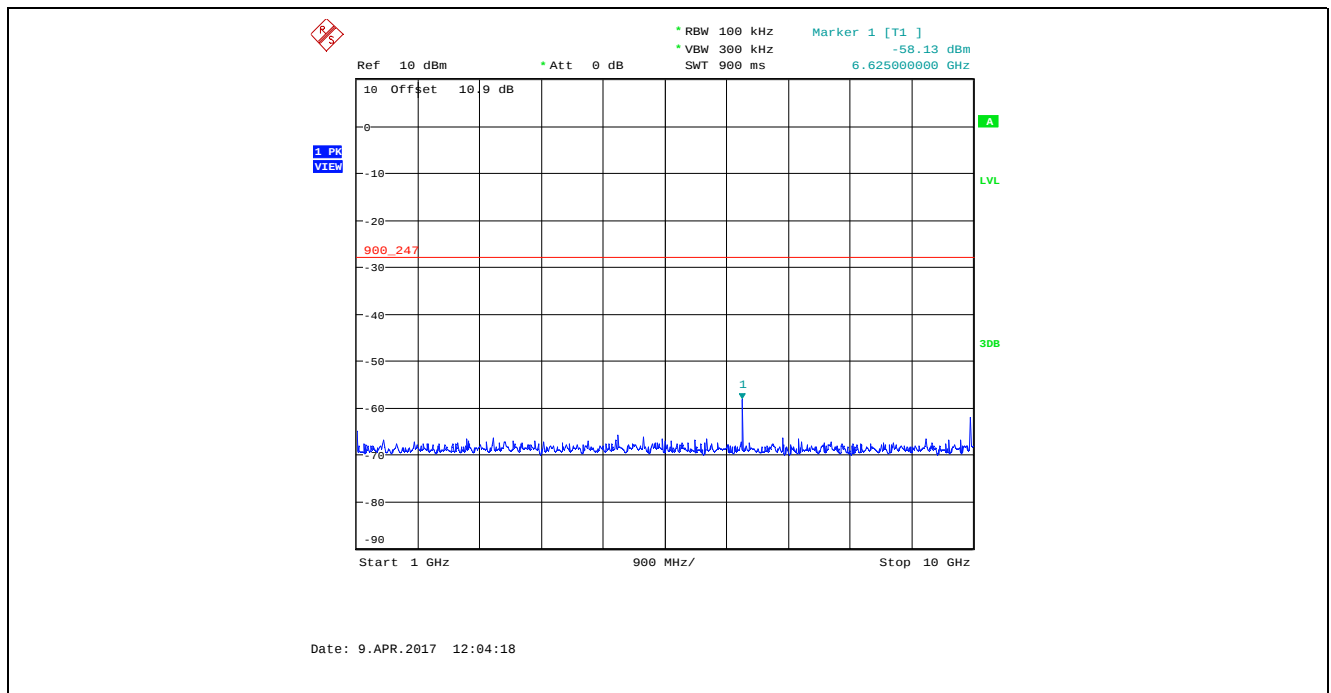
Plot 5.4.4.2.22. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 4, 915 MHz, 1 GHz – 10 GHz



Plot 5.4.4.2.23. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 4, 923 MHz, 30 MHz – 1 GHz



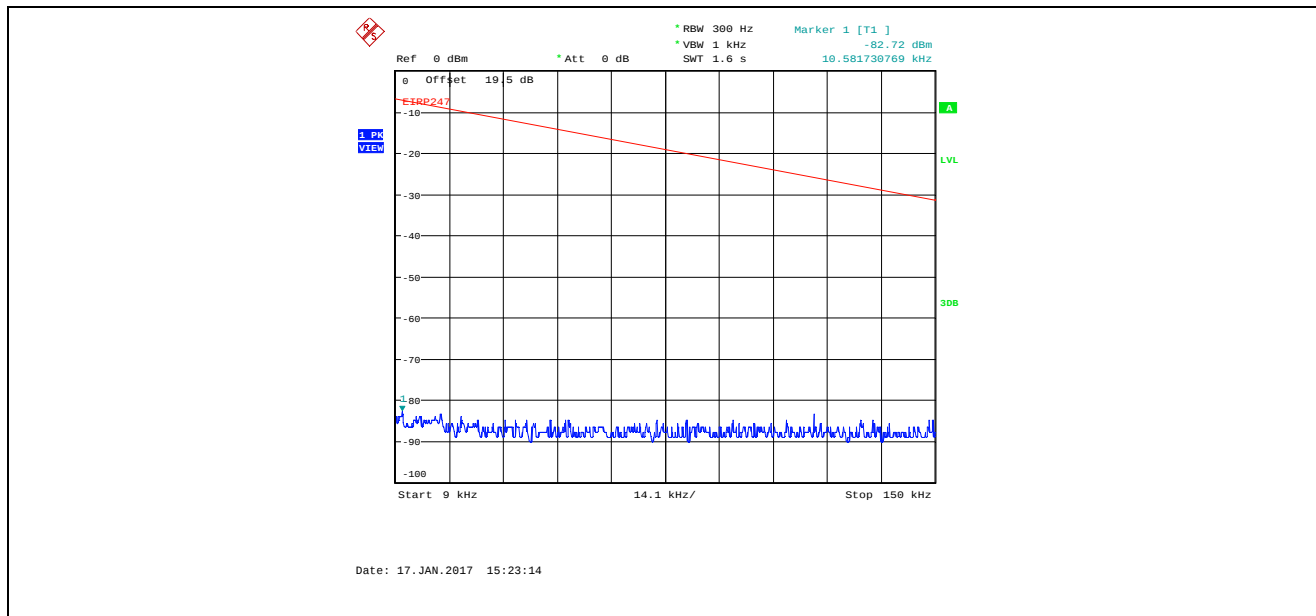
Plot 5.4.4.2.24. Conducted Spurious Emissions in Non-restricted Frequency Bands
Bandwidth: 8, TX Gain: 0, Data Rate 4, 923 MHz, 1 GHz – 10 GHz



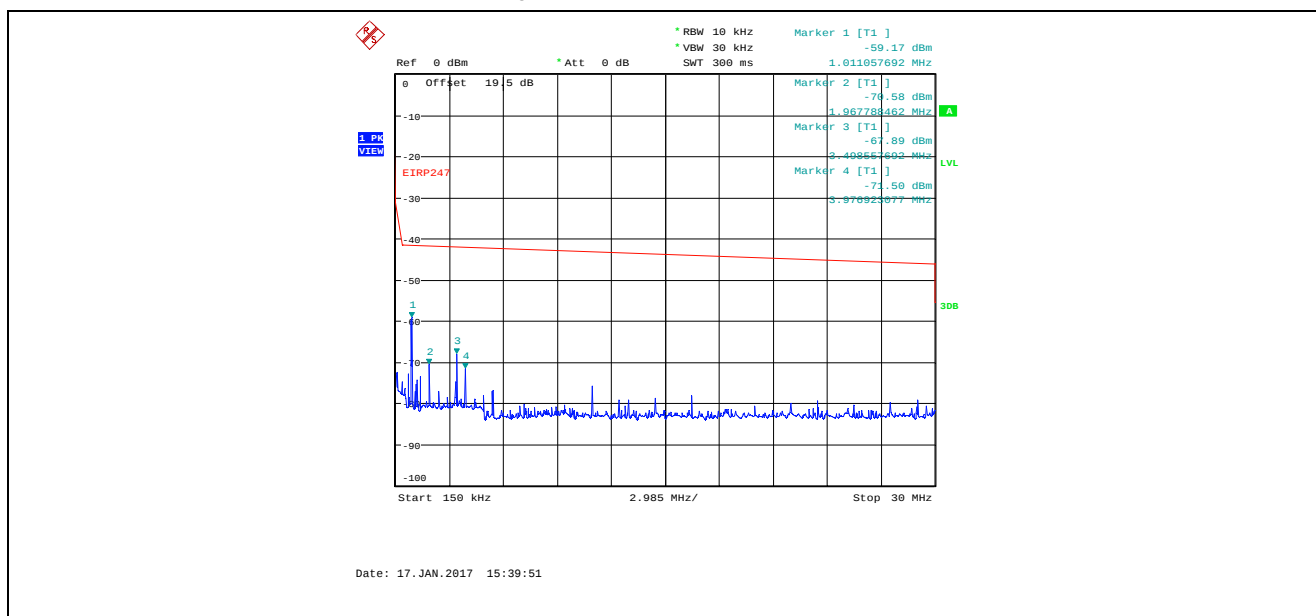
5.4.4.3. Conducted Spurious Emissions in Restricted Frequency Bands, Highest Power Setting for Lowest Antenna Gain (3.0dBi, with Antenna Assembly Gain 2.6 dBi)

Remark: Offset = [Insertion Loss] + [Transmit Antenna Gain (in dBi)] + [Maximum Ground Reflection Factor]

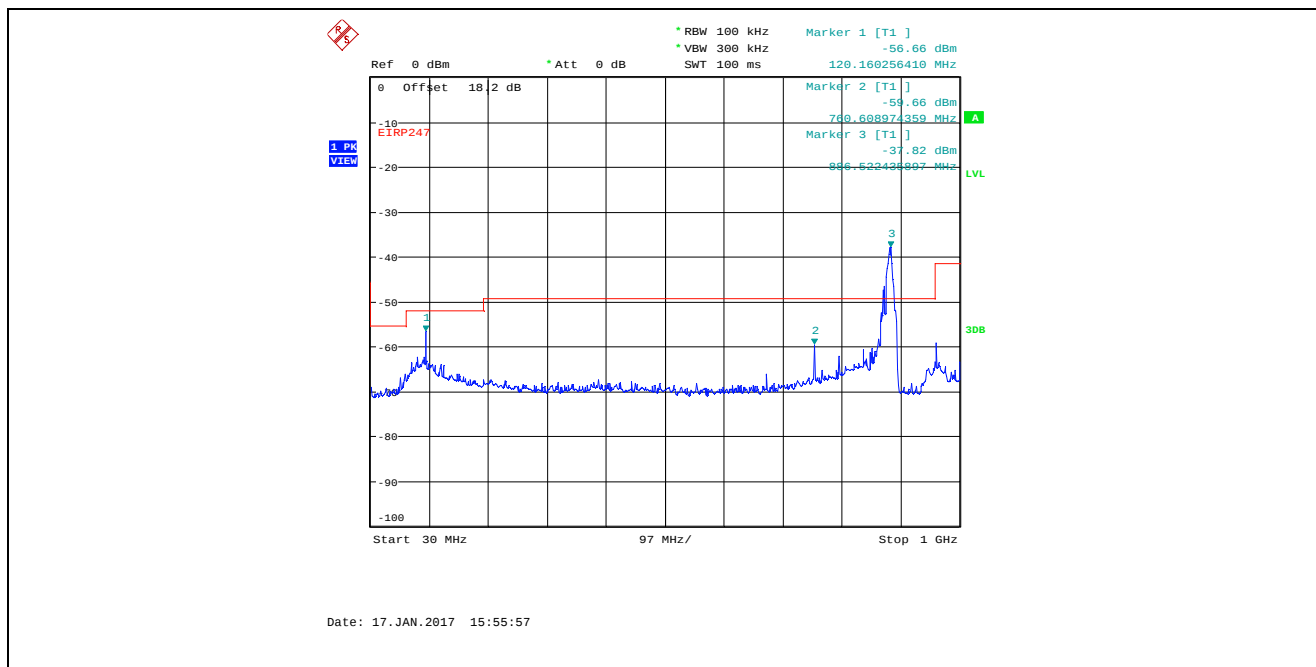
Plot 5.4.4.3.1. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 906 MHz, 9 kHz - 150 kHz, Peak Detector



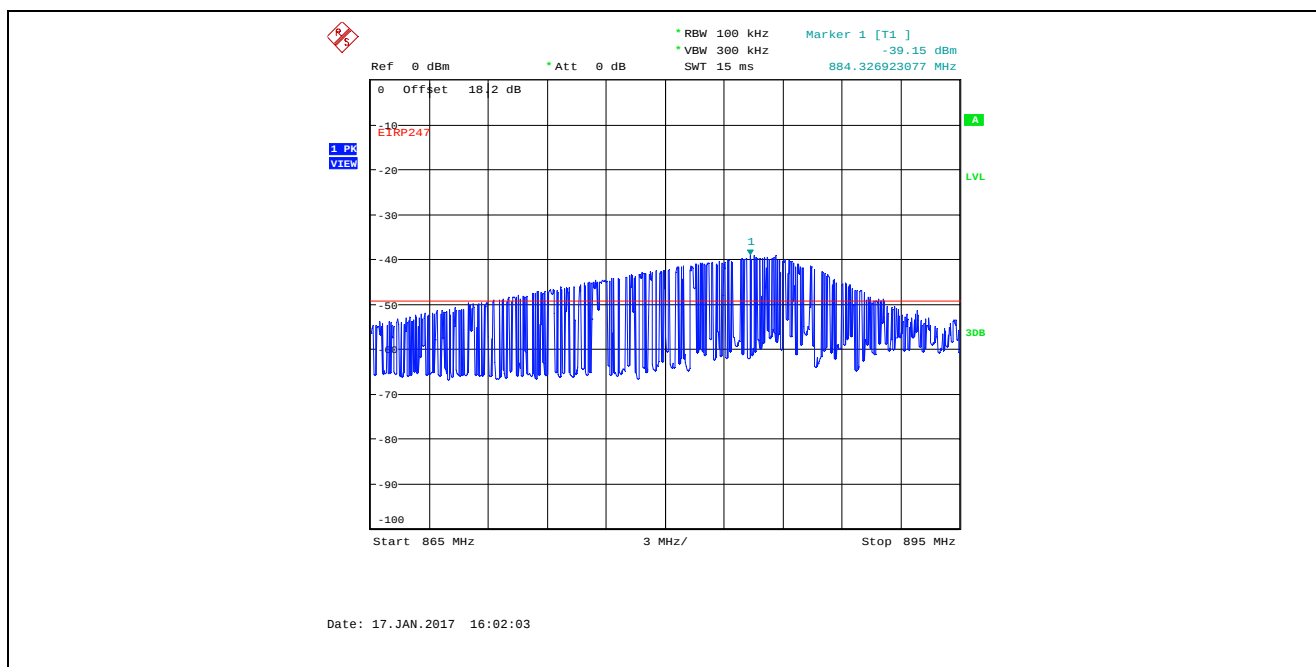
Plot 5.4.4.3.2. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 906 MHz, 150 kHz - 30 MHz, Peak Detector



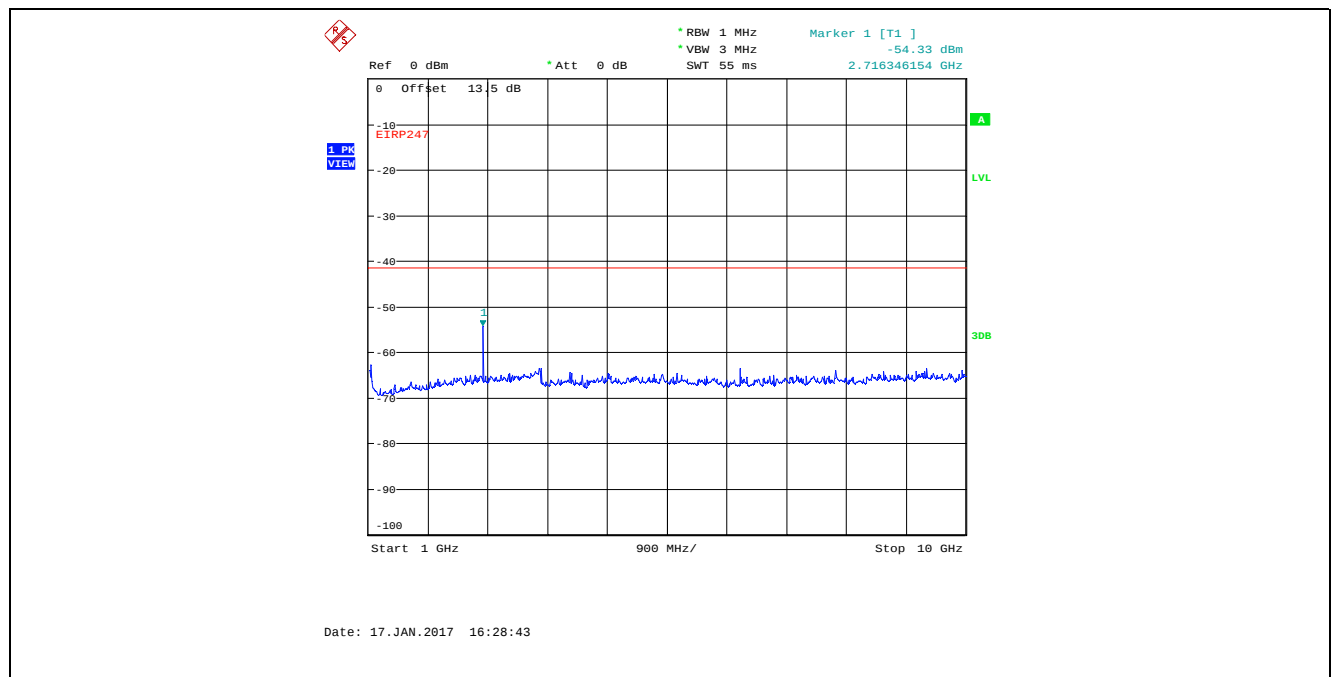
Plot 5.4.4.3.3. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 906 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.3.4. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 906 MHz, Peak Detector
865-895 MHz is Outside of Restricted Bands



Plot 5.4.4.3.5. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 906 MHz, 1 GHz - 10 GHz, Peak Detector



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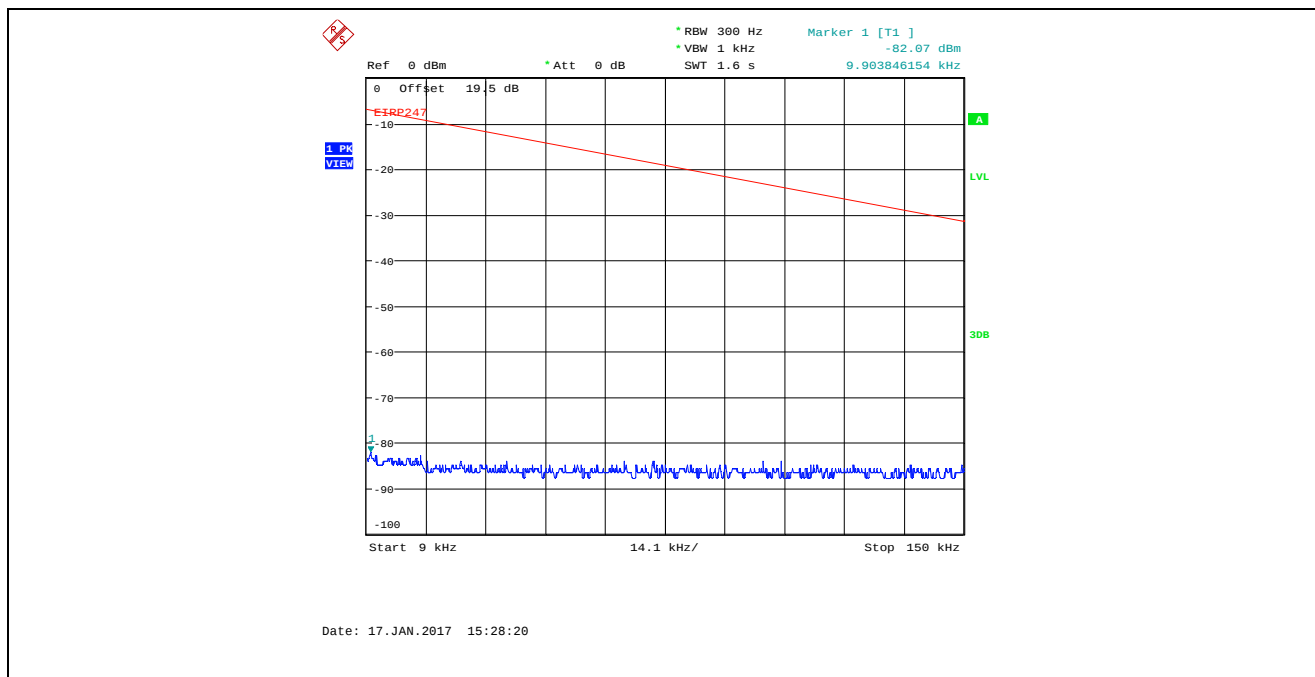
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

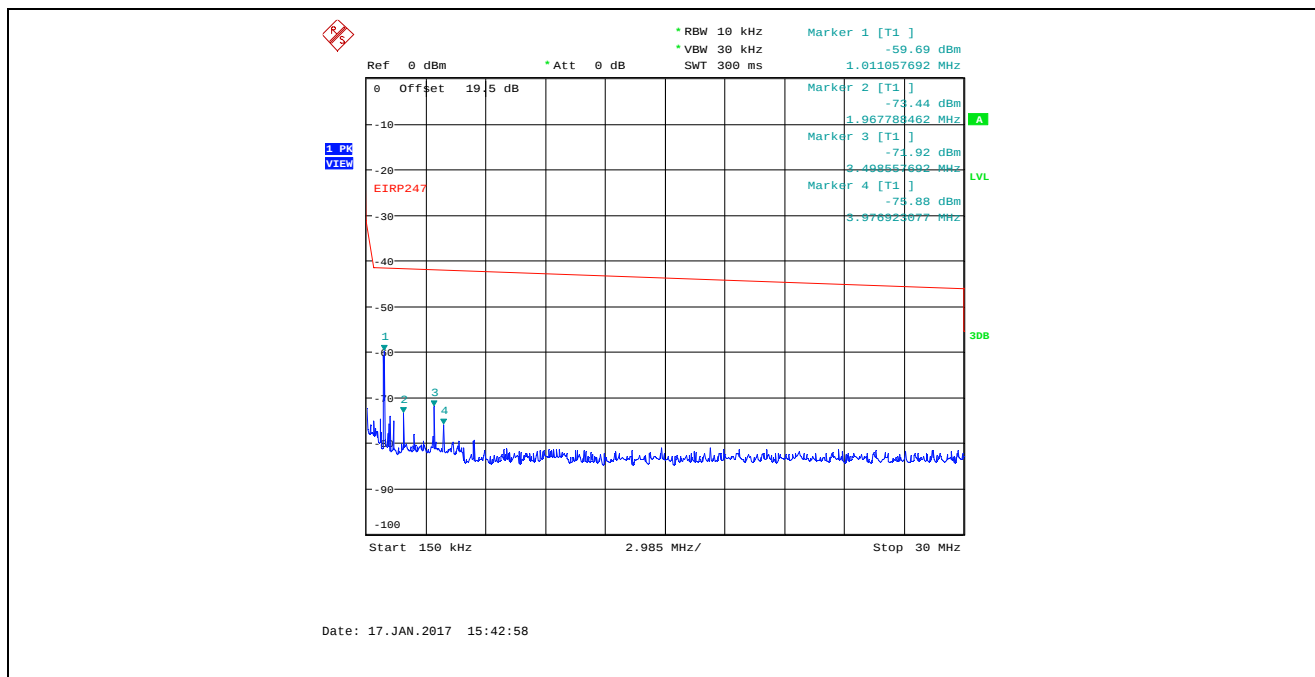
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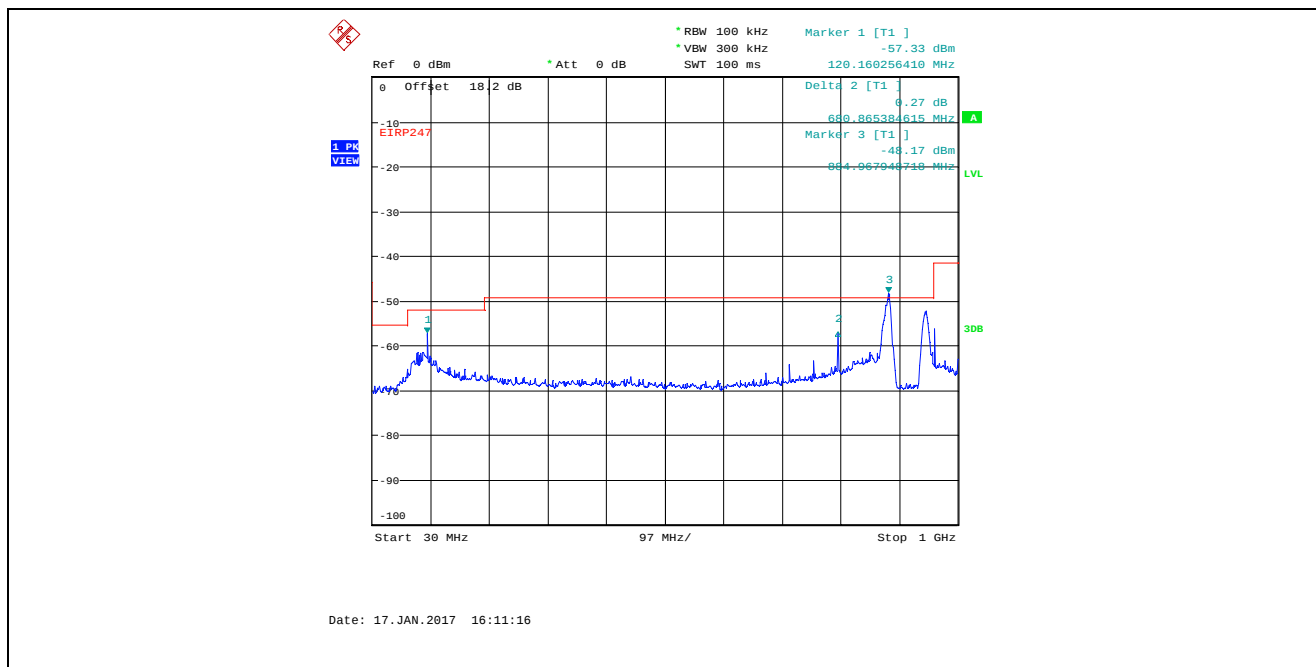
Plot 5.4.4.3.6. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 915 MHz, 9 kHz - 150 kHz, Peak Detector



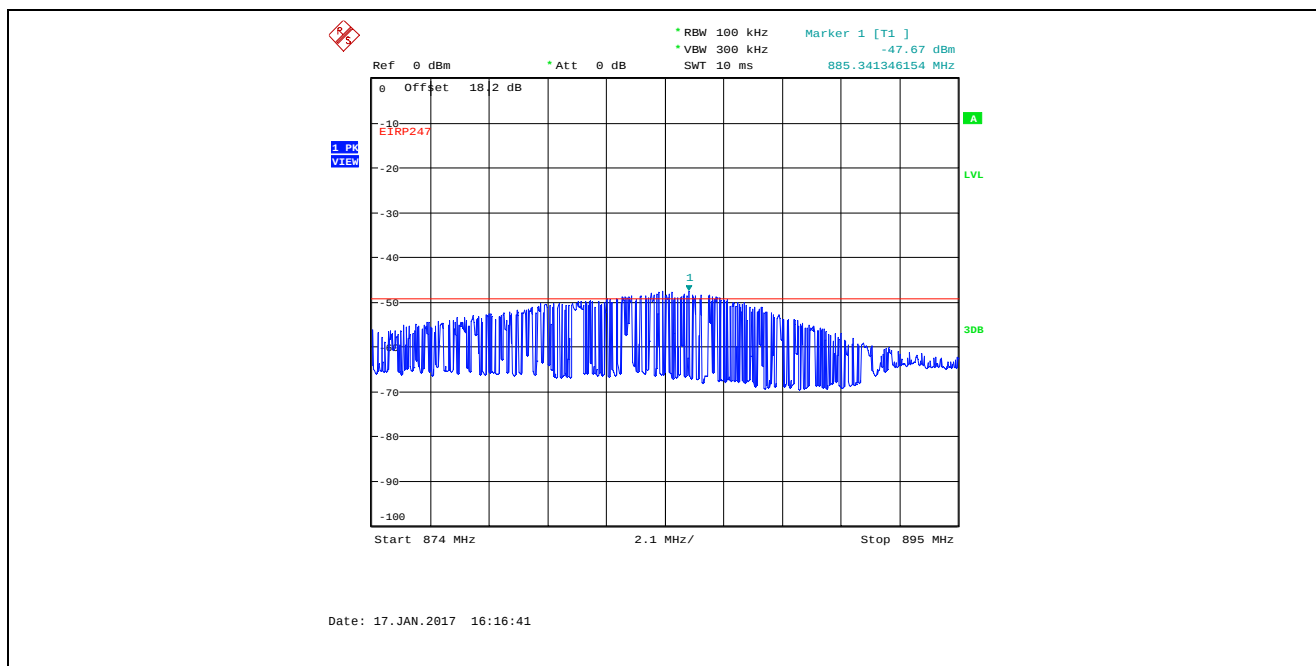
Plot 5.4.4.3.7. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 915 MHz, 150 kHz - 30 MHz, Peak Detector



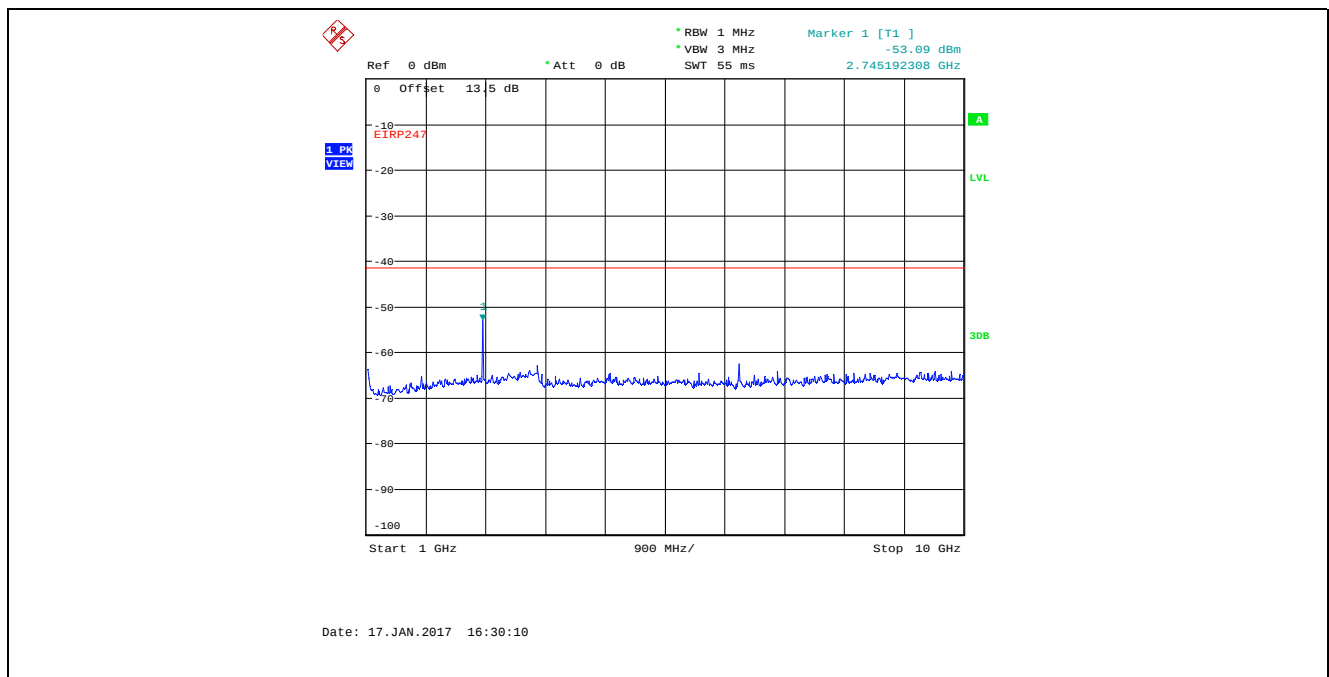
Plot 5.4.4.3.8. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 915 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.3.9. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 915 MHz, Peak Detector
874 - 895 MHz is Outside of Restricted Bands



Plot 5.4.4.3.10. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 915 MHz, 1 GHz - 10 GHz, Peak Detector



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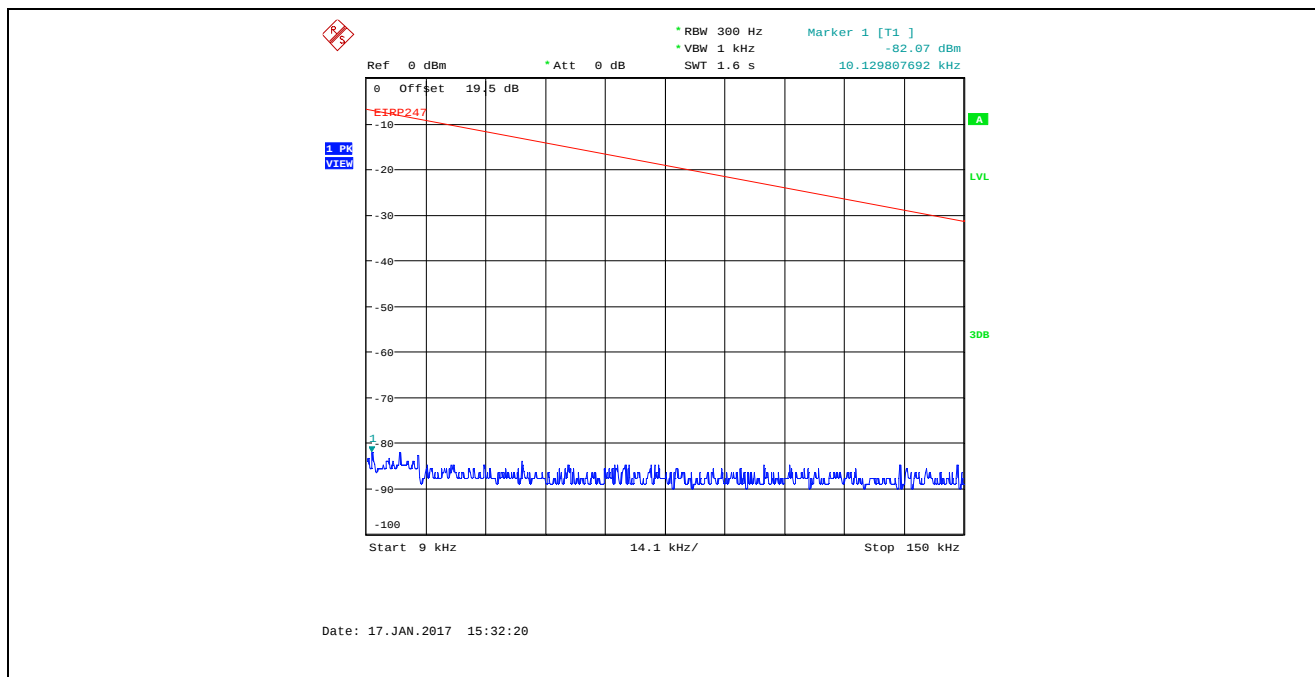
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

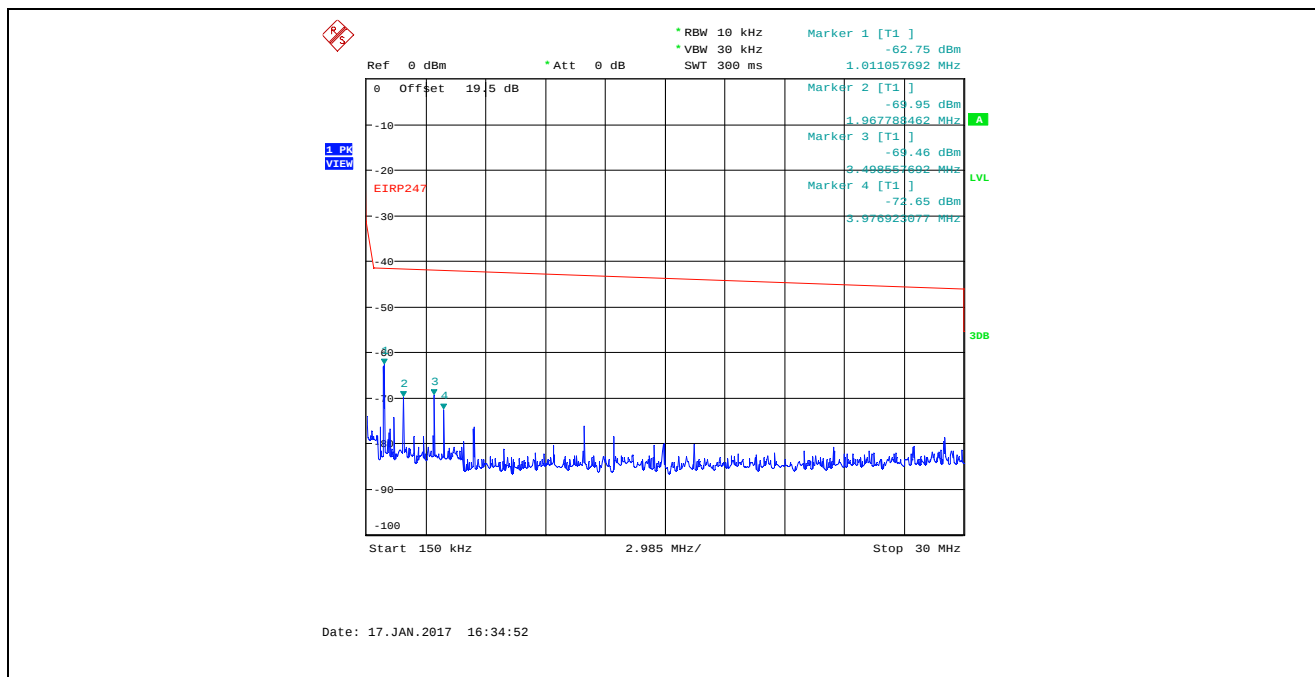
April 13, 2017

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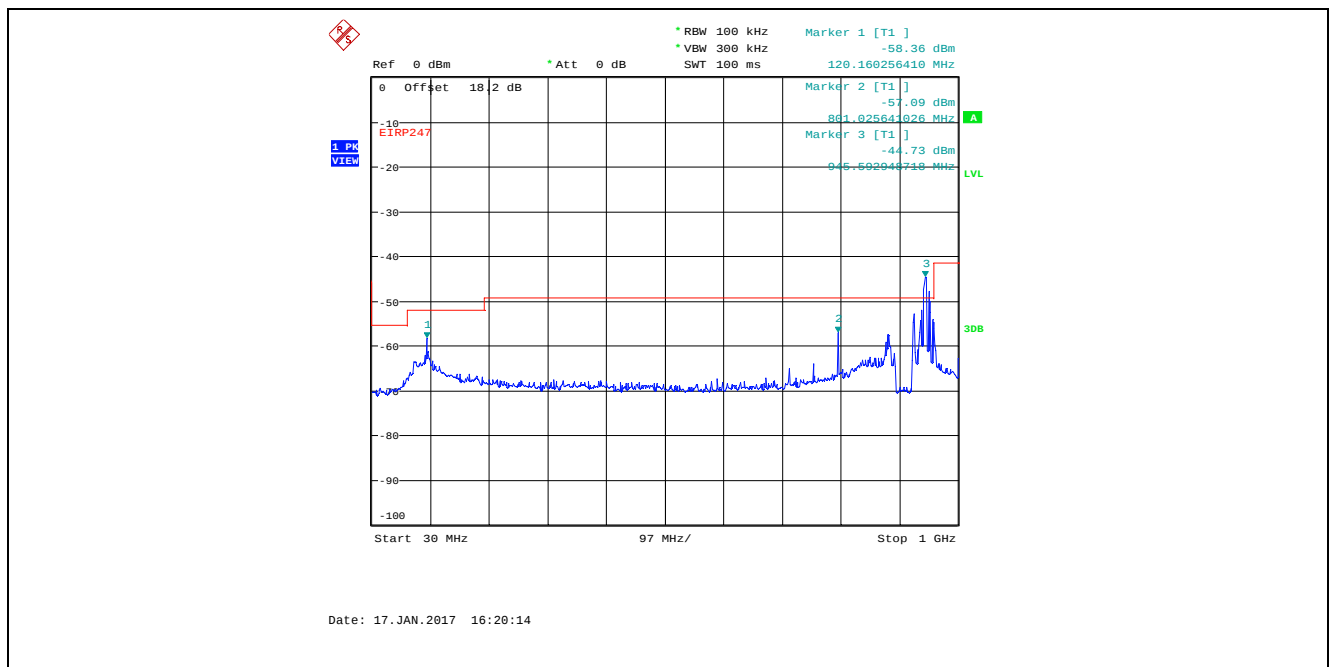
Plot 5.4.4.3.11. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 924 MHz, 9 kHz - 150 kHz, Peak Detector



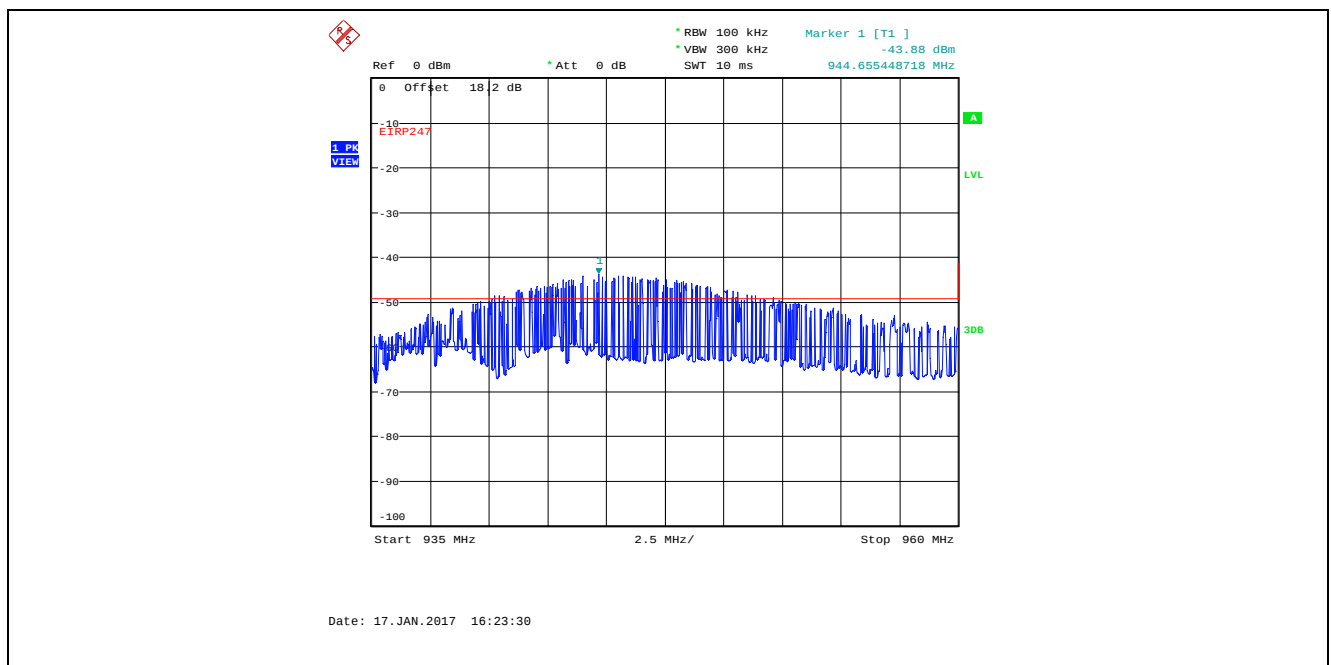
Plot 5.4.4.3.12. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 924 MHz, 150 kHz - 30 MHz, Peak Detector



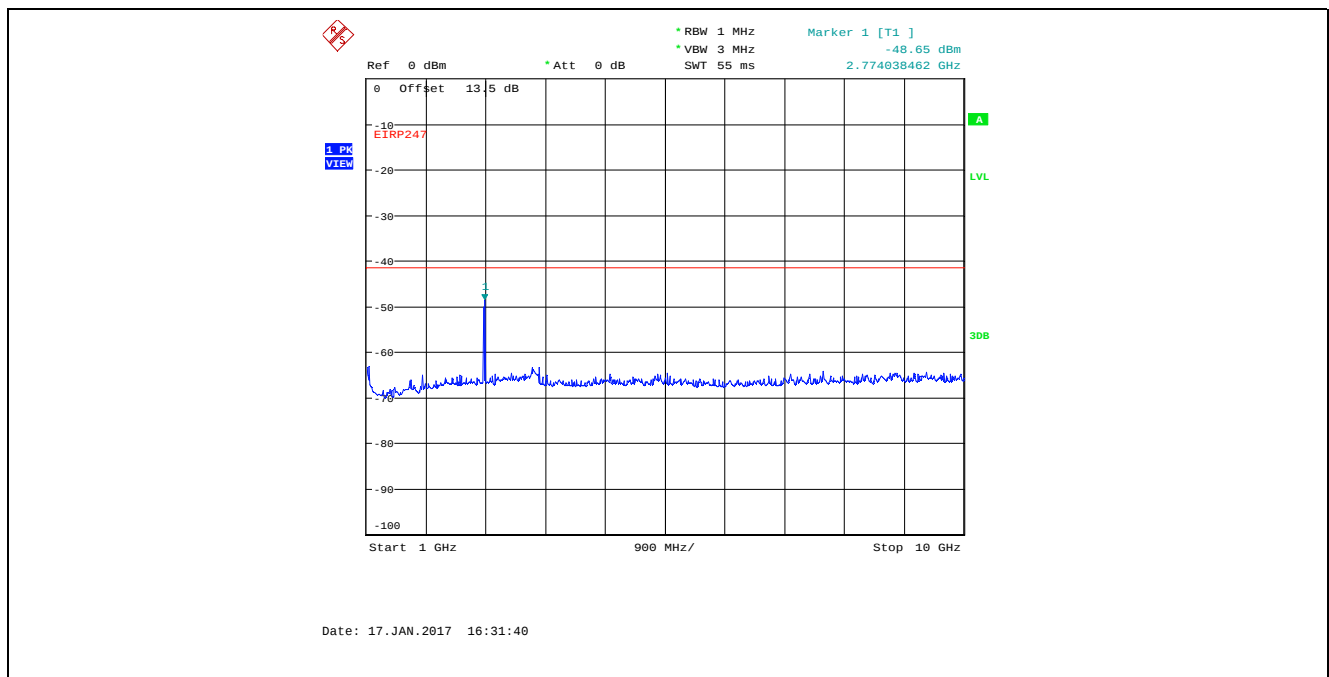
Plot 5.4.4.3.13. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 924 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.3.14. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 924 MHz, Peak Detector
935 - 960 MHz is Outside of Restricted Bands



Plot 5.4.4.3.15. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 40, Data Rate 1, 924 MHz, 1 GHz - 10 GHz, Peak Detector



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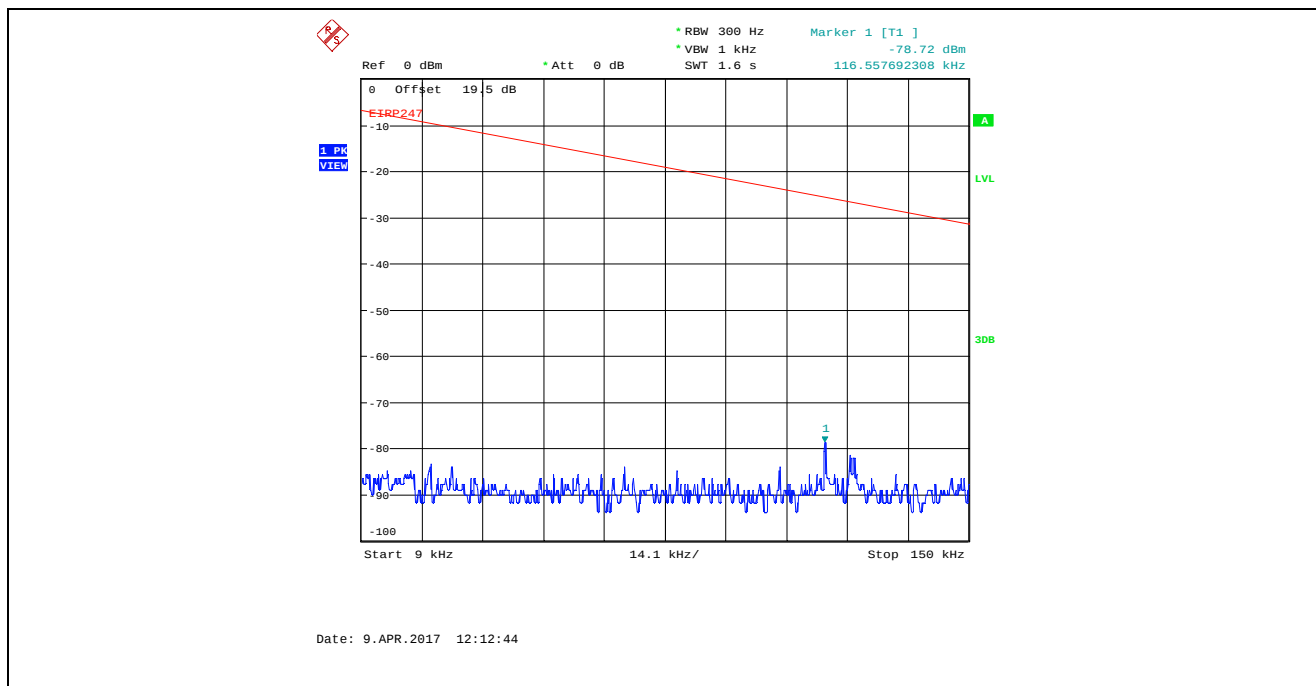
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

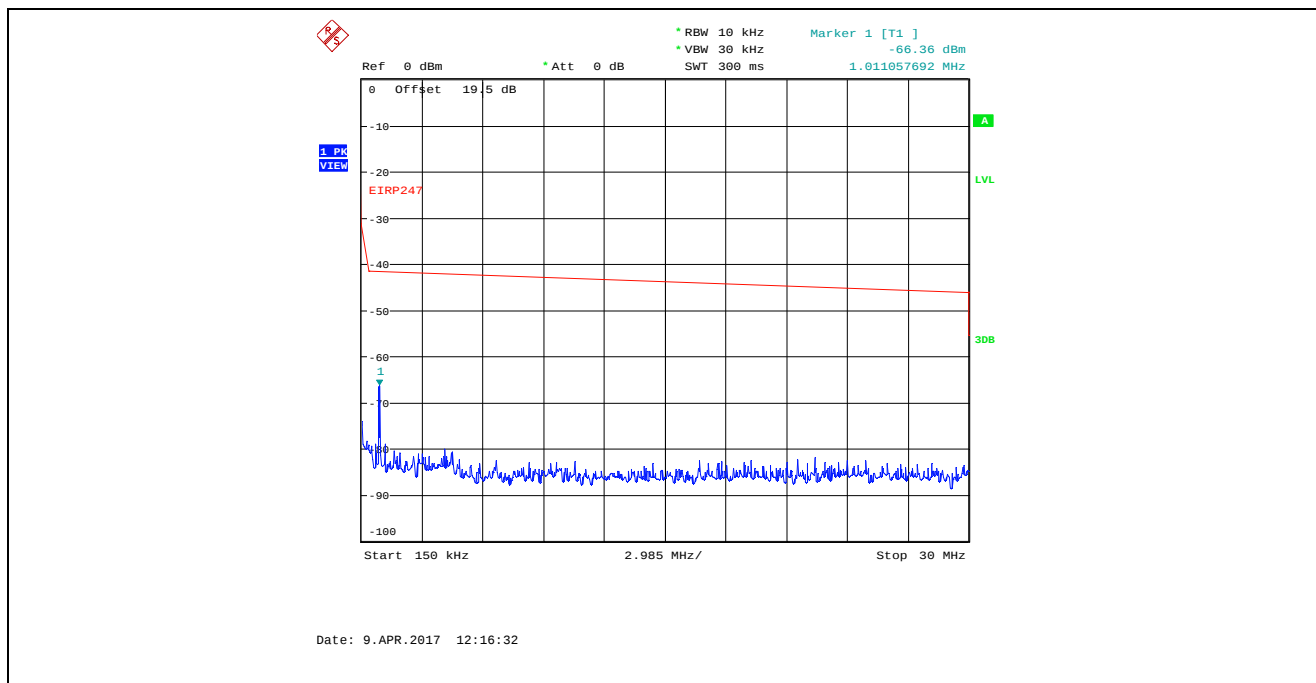
April 13, 2017

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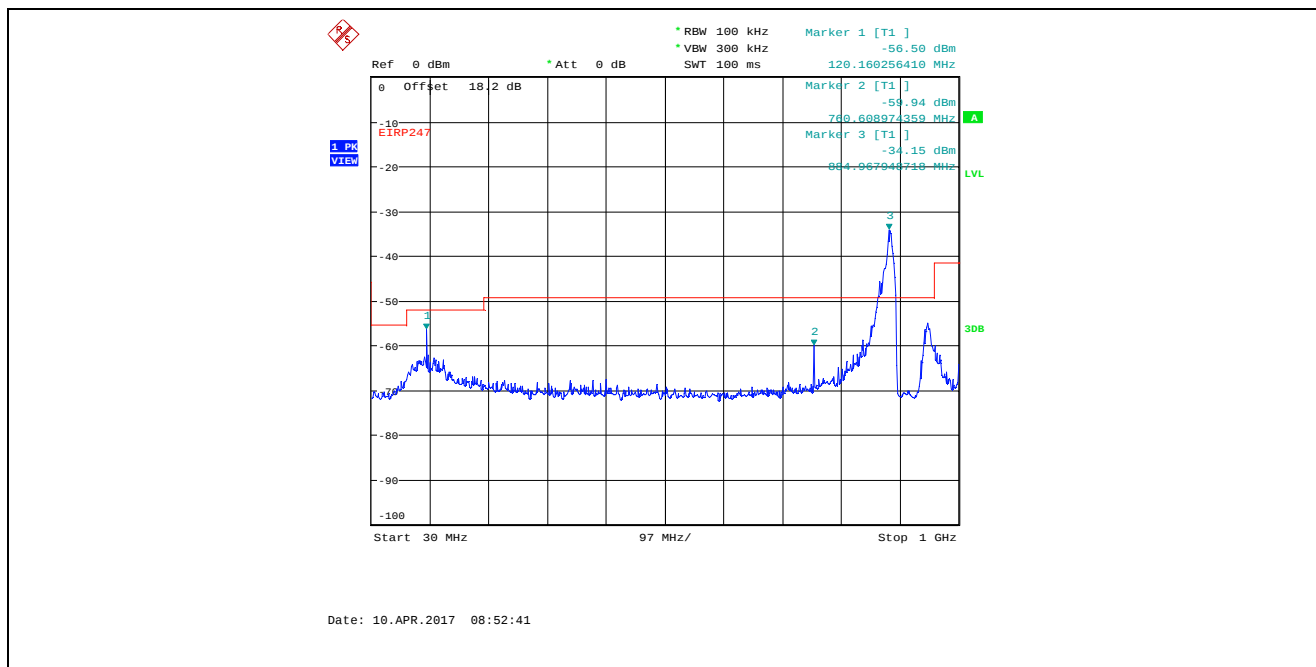
Plot 5.4.4.3.16. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 907 MHz, 9 kHz - 150 kHz, Peak Detector



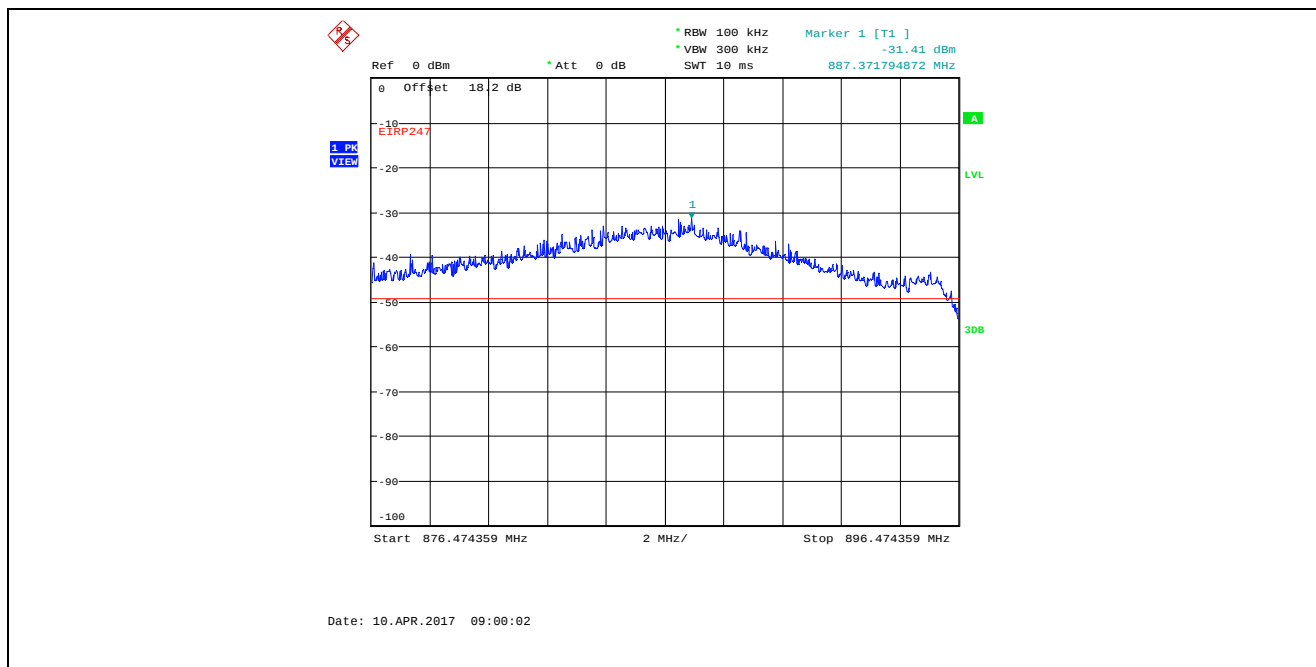
Plot 5.4.4.3.17. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 907 MHz, 150 kHz - 30 MHz, Peak Detector



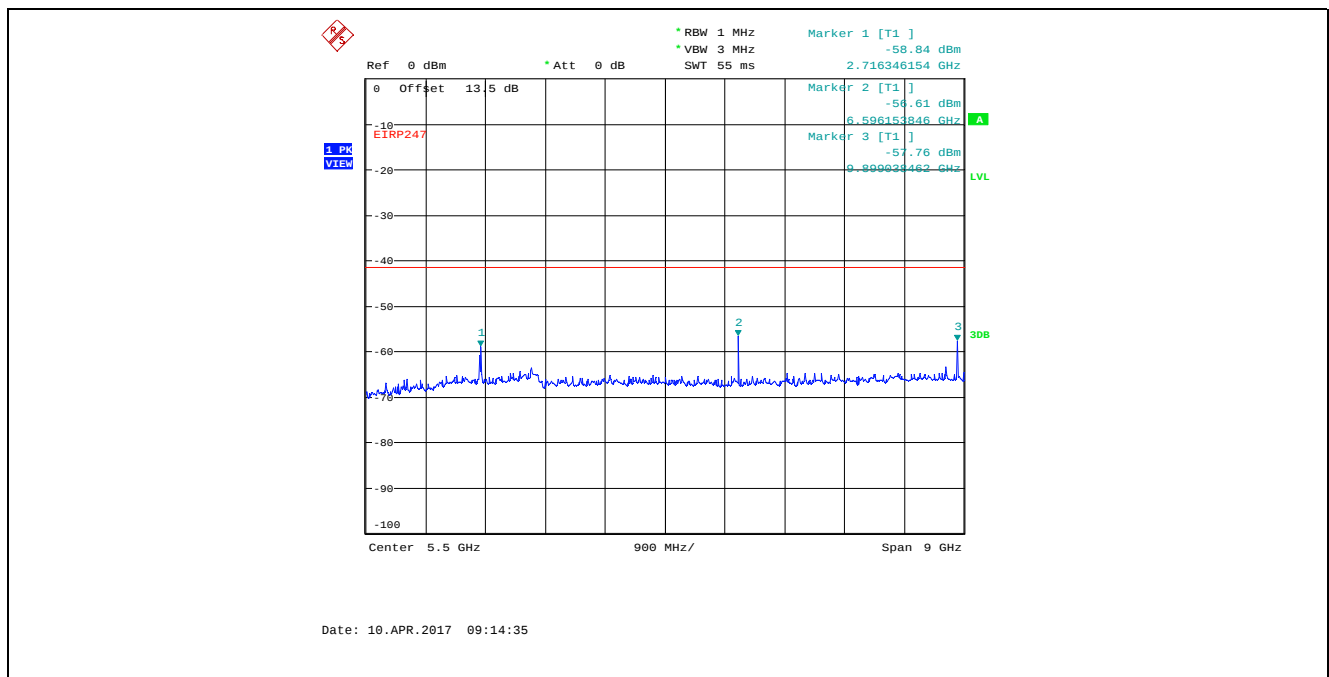
Plot 5.4.4.3.18. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 907 MHz, 30 MHz - 1 GHz, Peak Detector



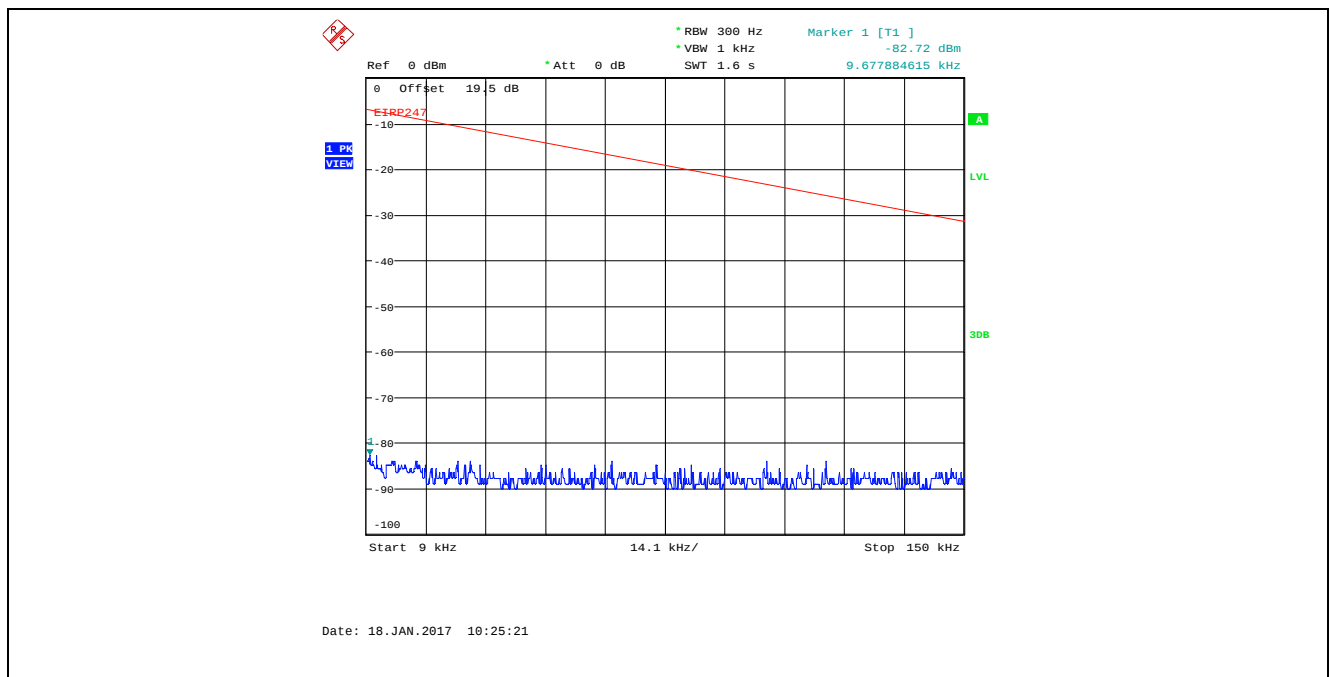
Plot 5.4.4.3.19. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 907 MHz, Peak Detector
Emission Band Below is Outside of Restricted Bands



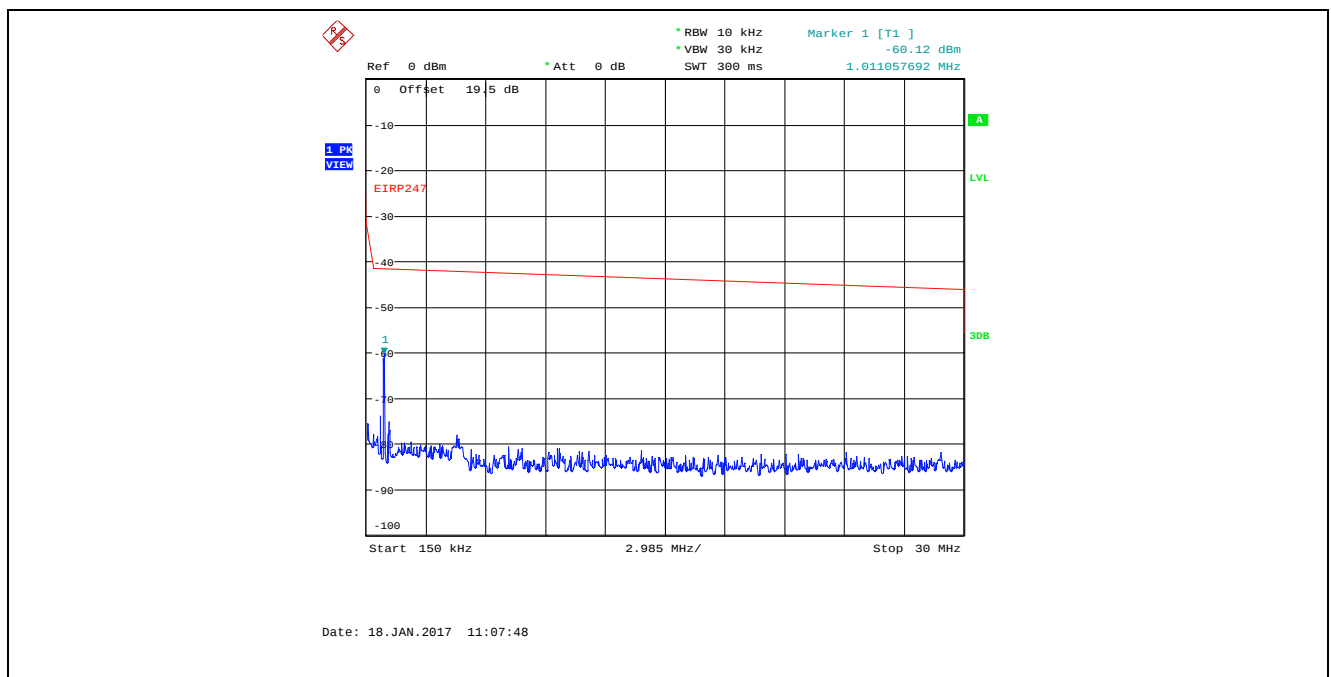
Plot 5.4.4.3.20. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 907 MHz, 1 GHz - 10 GHz, Peak Detector



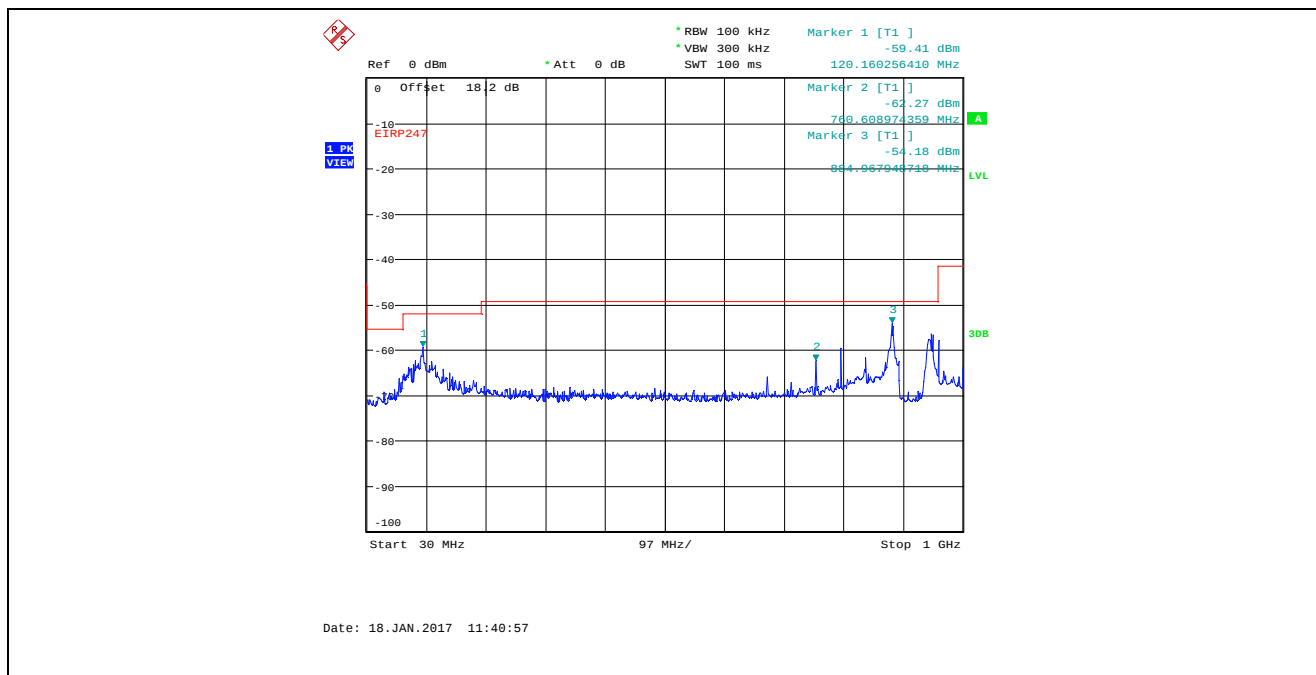
Plot 5.4.4.3.21. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 915 MHz, 9 kHz - 150 kHz, Peak Detector



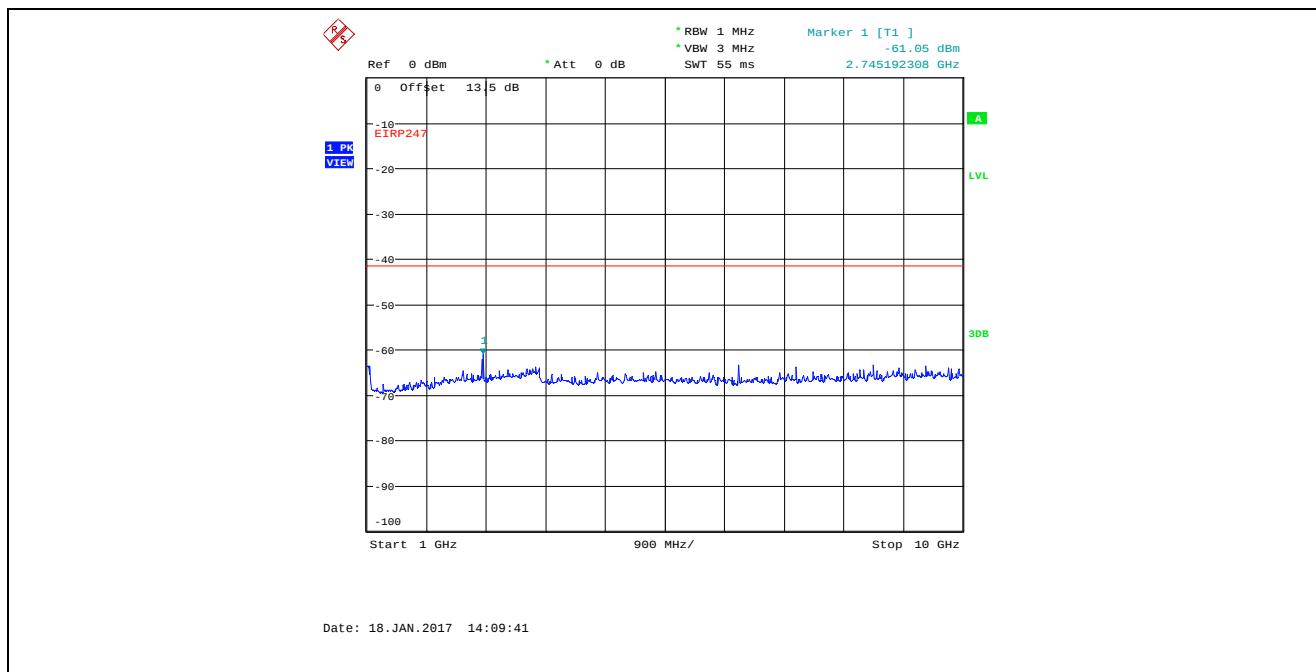
Plot 5.4.4.3.22. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 915 MHz, 150 kHz - 30 MHz, Peak Detector



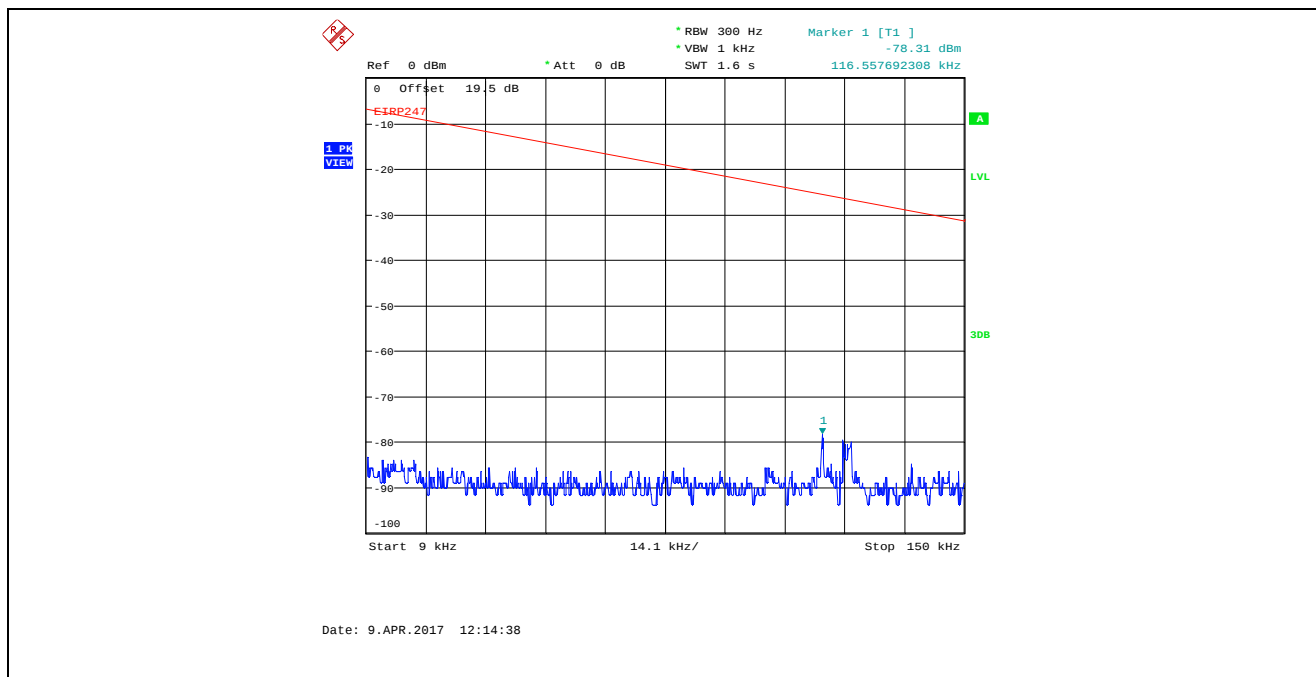
Plot 5.4.4.3.23. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 915 MHz, 30 MHz - 1 GHz, Peak Detector



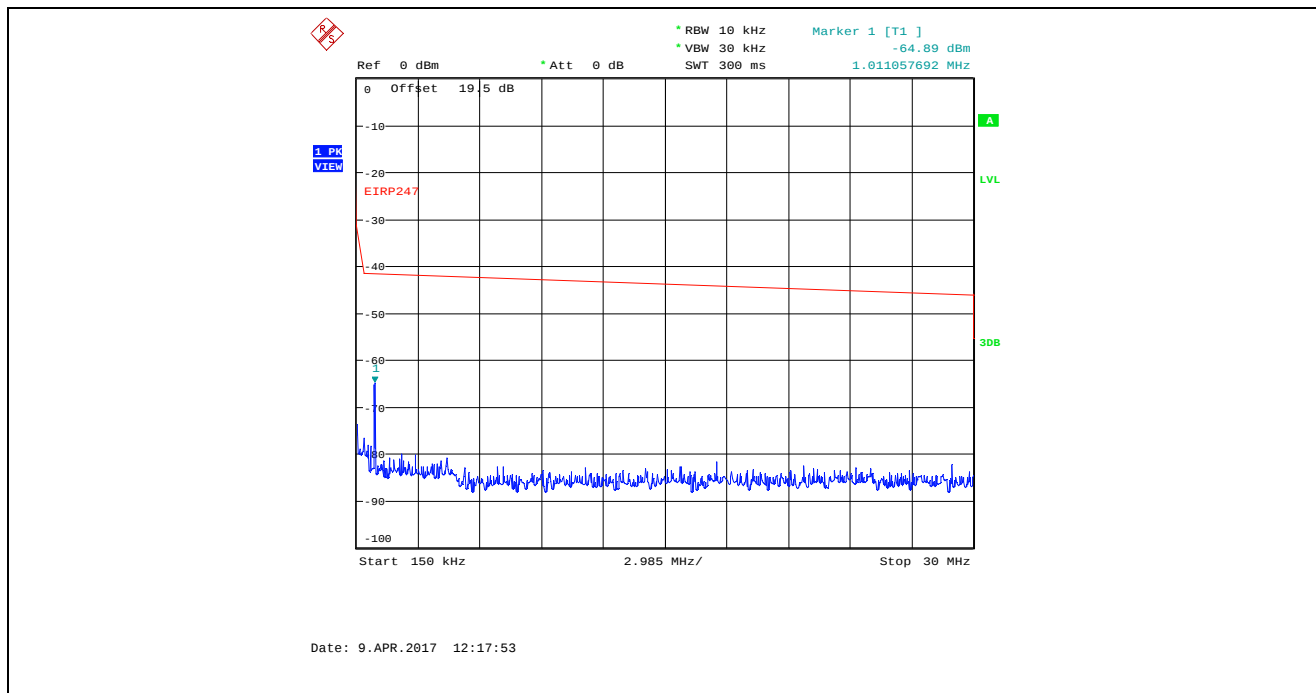
Plot 5.4.4.3.24. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 915 MHz, 1 GHz - 10 GHz, Peak Detector



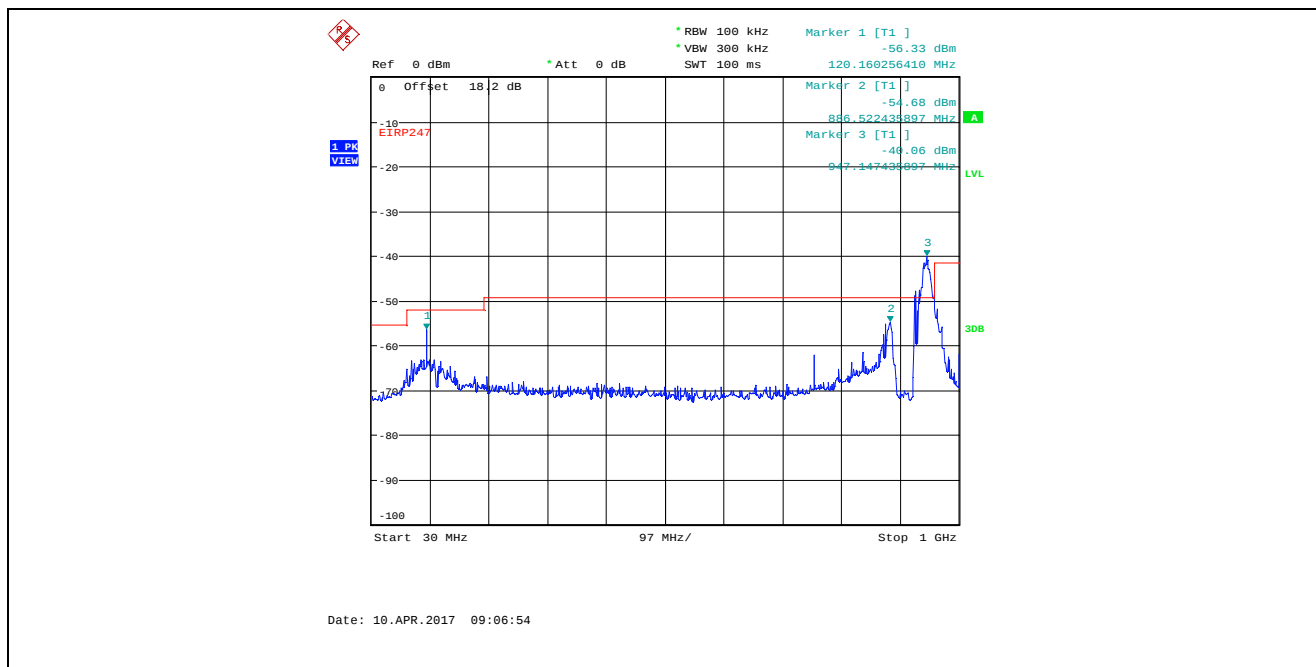
Plot 5.4.4.3.25. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 923 MHz, 9 kHz - 150 kHz, Peak Detector



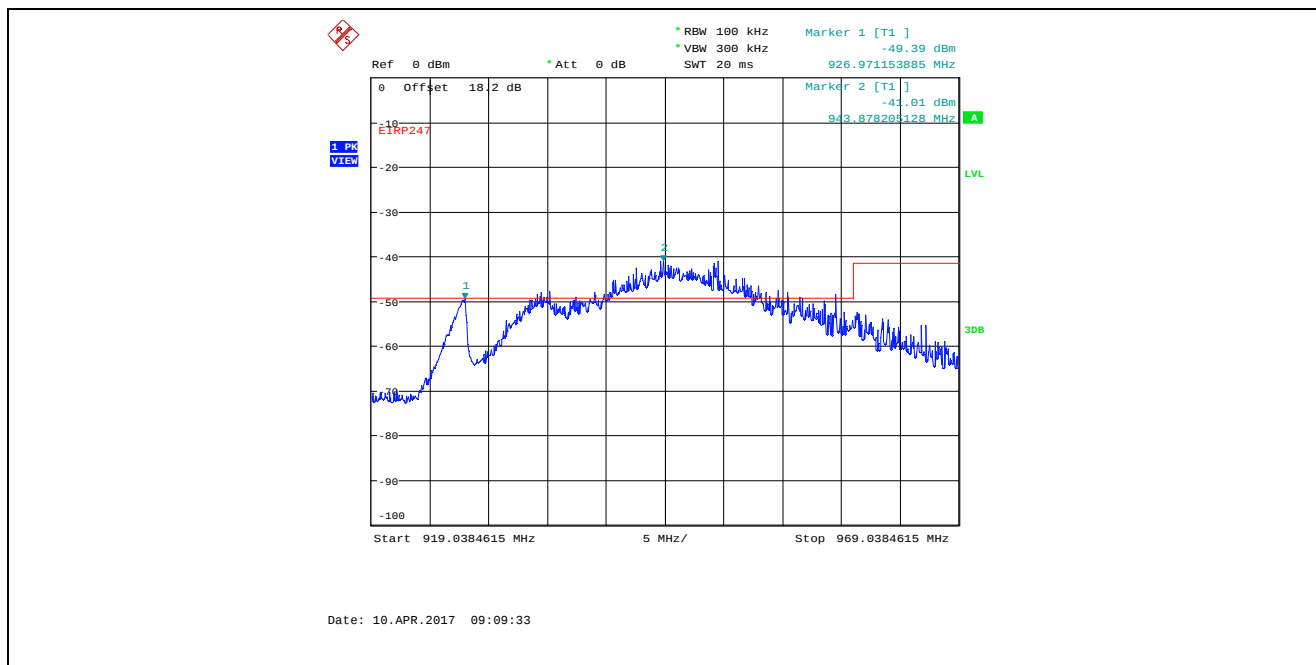
Plot 5.4.4.3.26. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 923 MHz, 150 kHz - 30 MHz, Peak Detector



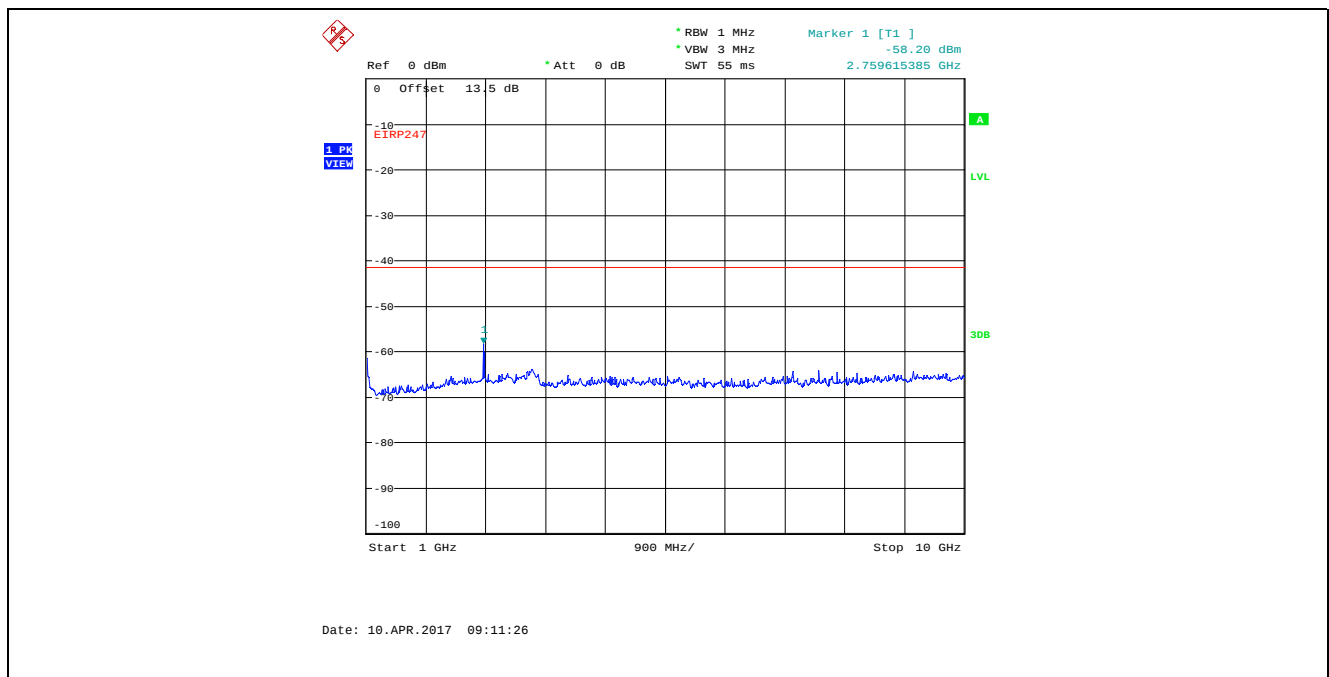
Plot 5.4.4.3.27. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 923 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.3.28. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 923 MHz, Peak Detector
Emission Band Below is Outside of Restricted Bands



Plot 5.4.4.3.29. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 36, Data Rate 4, 923 MHz, 1 GHz - 10 GHz, Peak Detector



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File #: 17MCRS101_FCC15C247D0G9

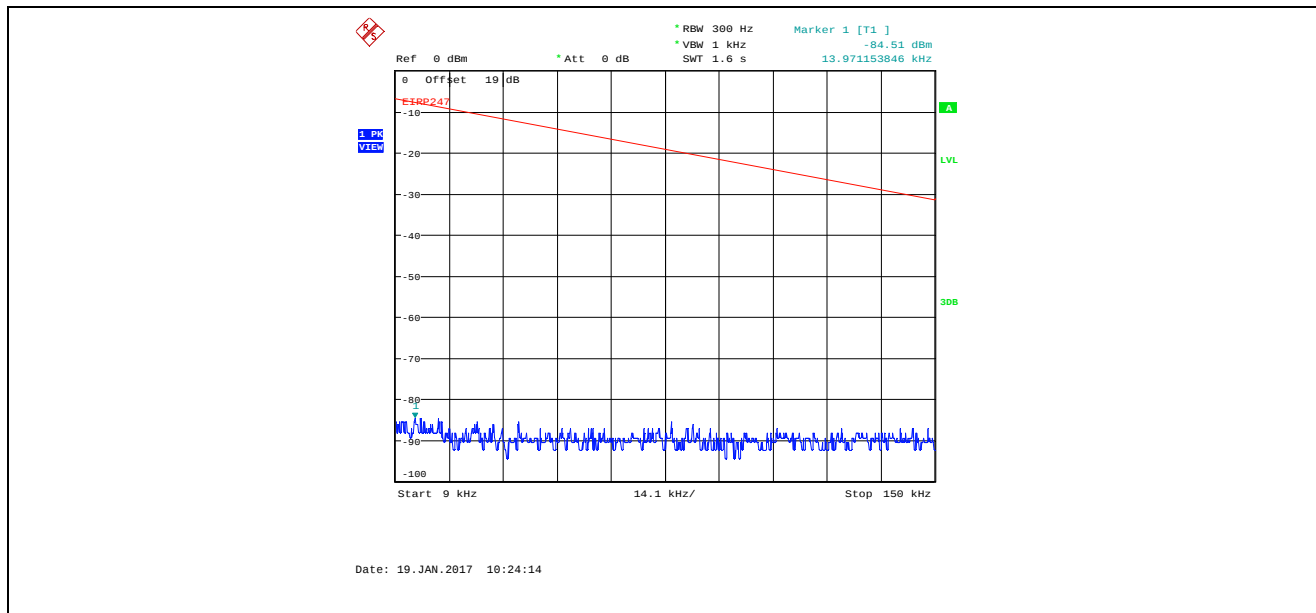
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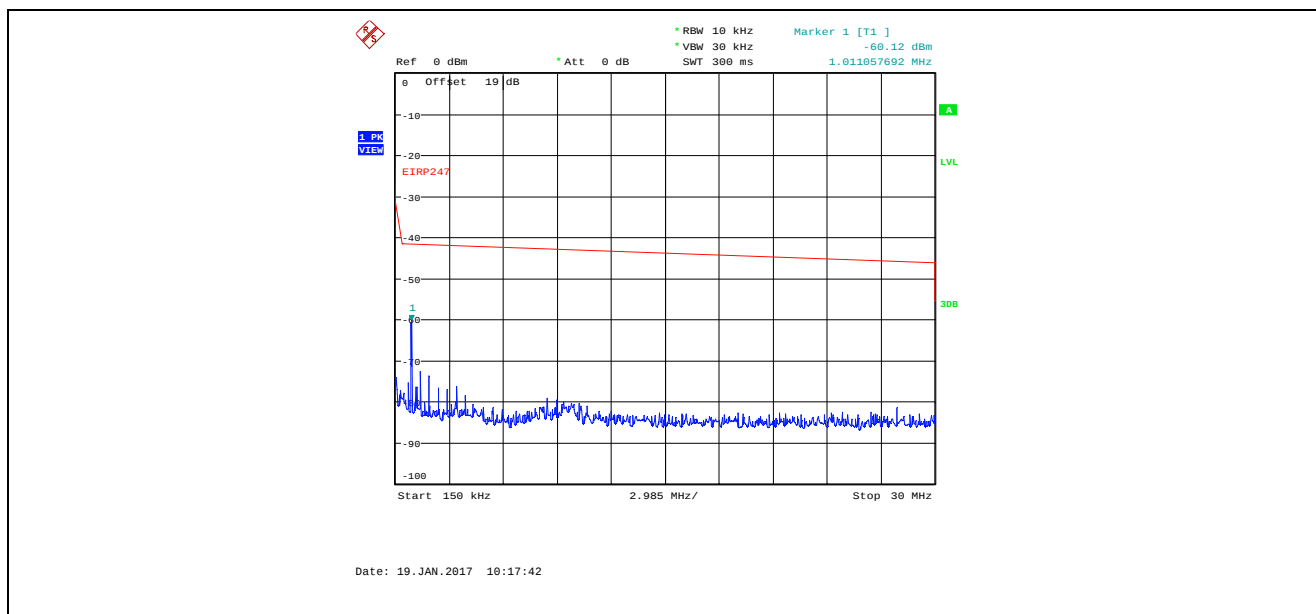
5.4.4.4. Conducted Spurious Emissions in Restricted Frequency Bands, Lower Power Setting for Highest Gain Antenna (13.15 dBi, with Antenna Assembly Gain of 12.18 dBi)

Remark: Offset = [Insertion Loss] + [Transmit Antenna Gain (in dBi)] + [Maximum Ground Reflection Factor]

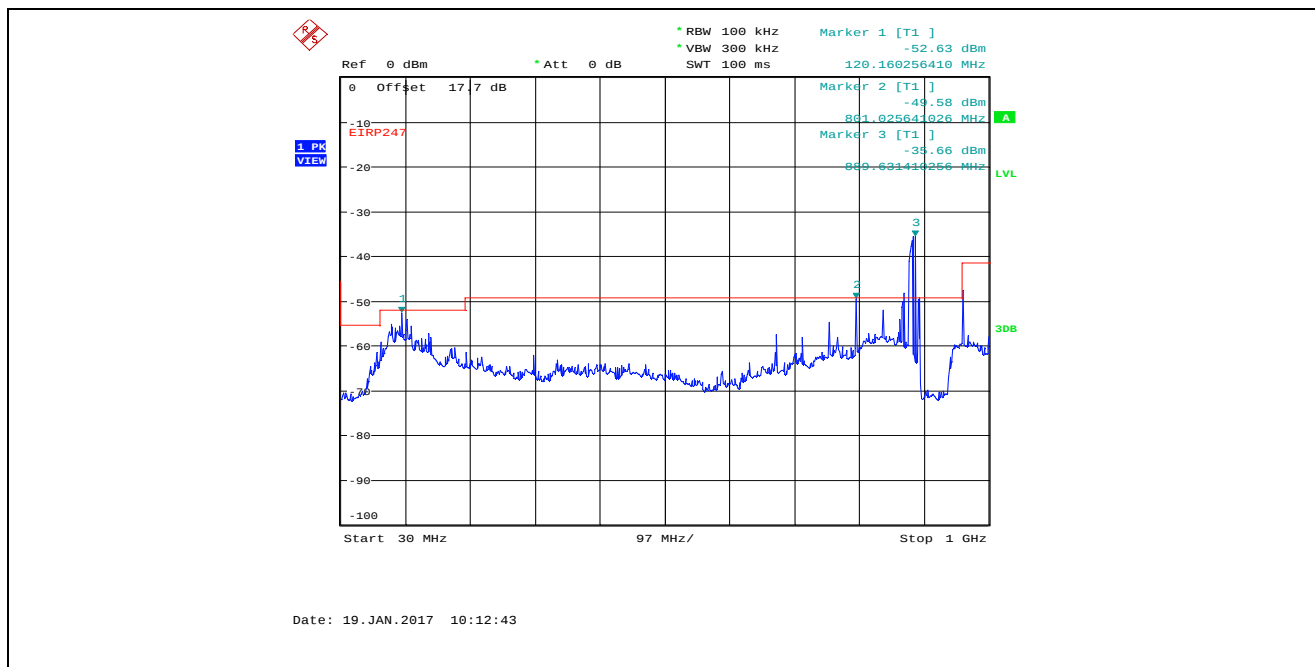
Plot 5.4.4.4.1. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 906 MHz, 9 kHz - 150 kHz, Peak Detector



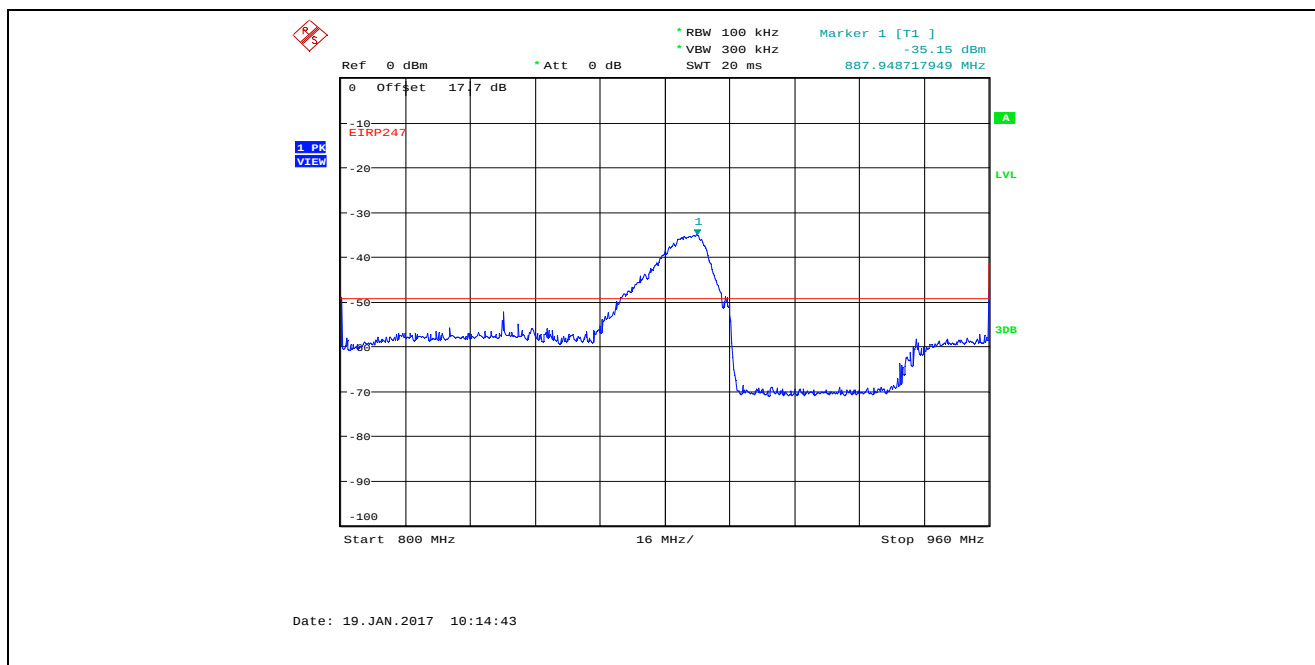
Plot 5.4.4.4.2. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 906 MHz, 150 kHz - 30 MHz, Peak Detector



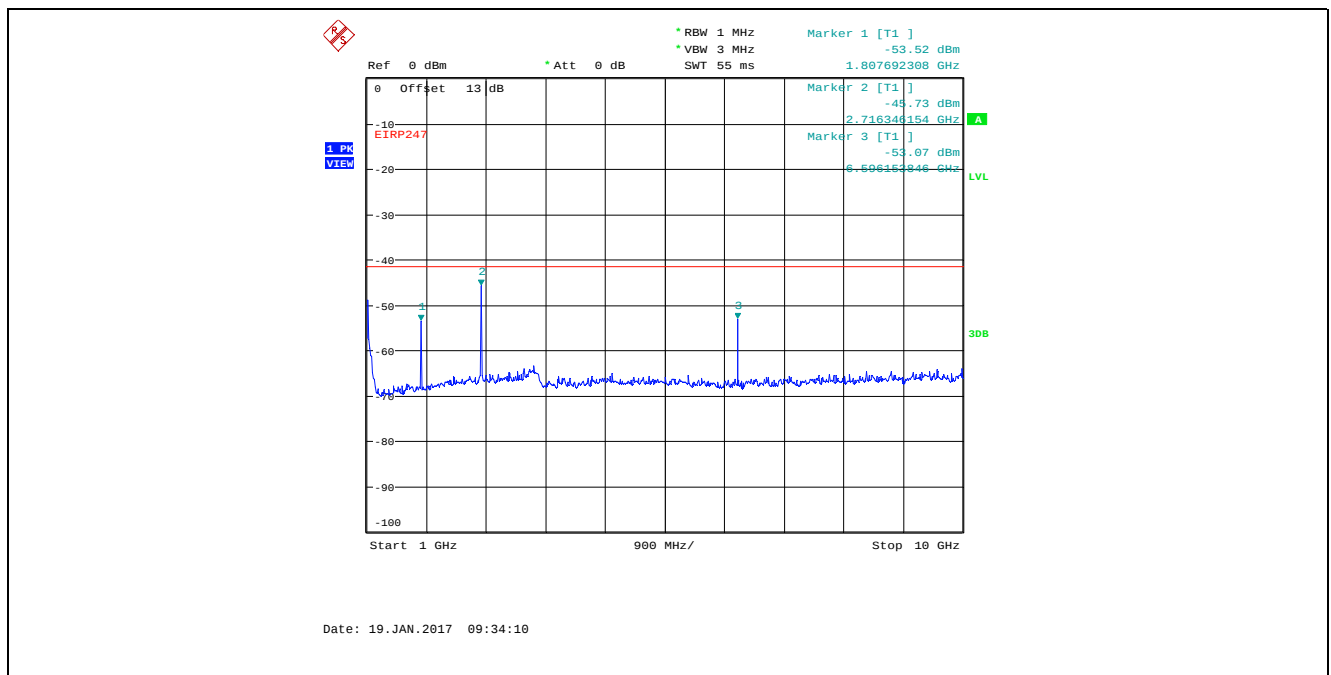
Plot 5.4.4.3. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 906 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.4. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 906 MHz, Peak Detector
800 – 960 MHz is Outside of Restricted Bands



Plot 5.4.4.4.5. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 906 MHz, 1 GHz - 10 GHz, Peak Detector



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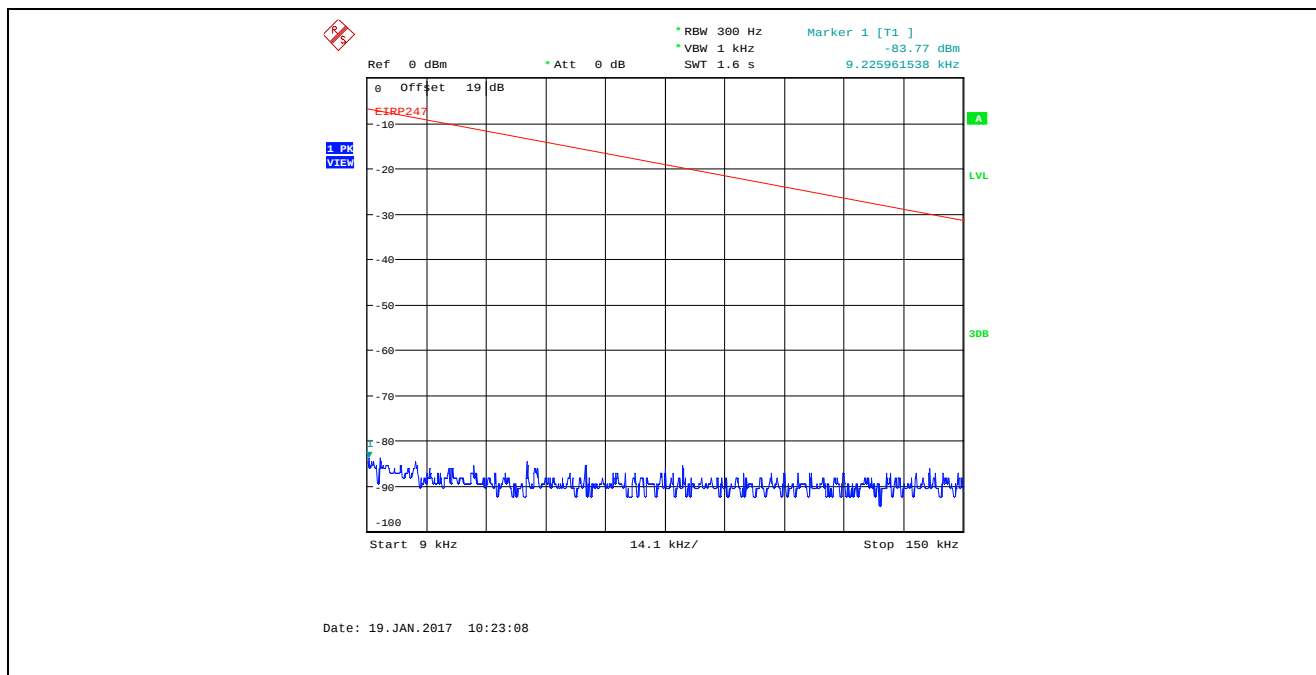
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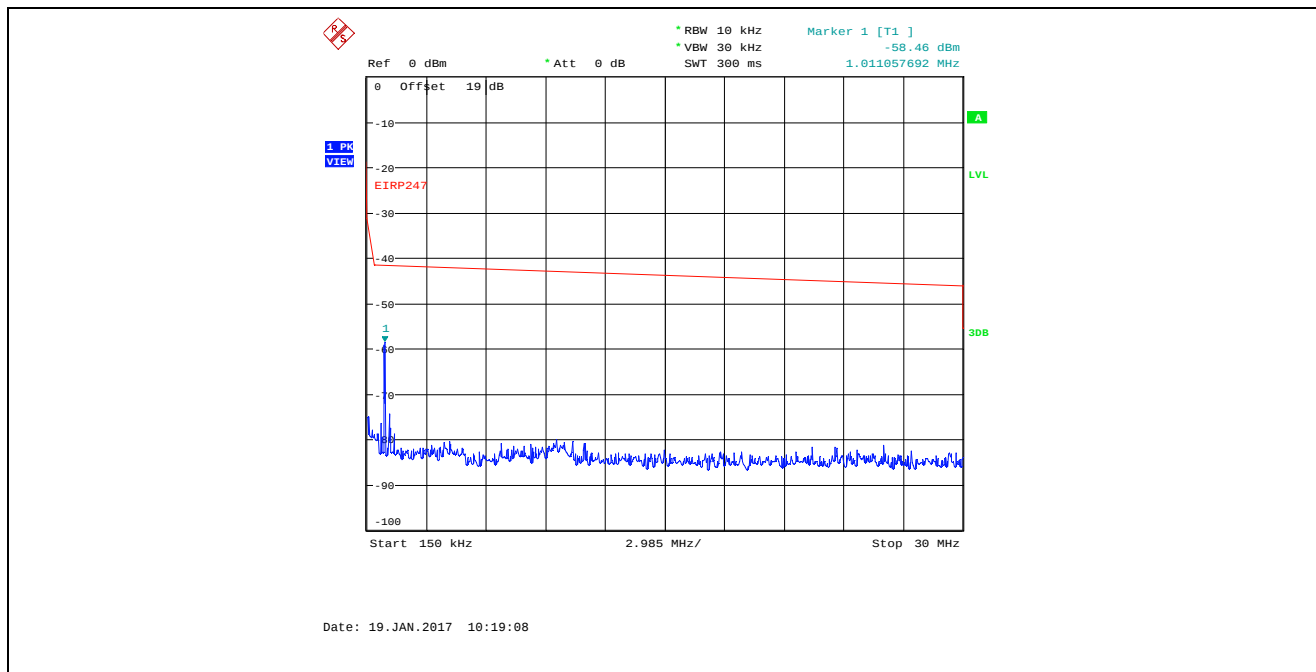
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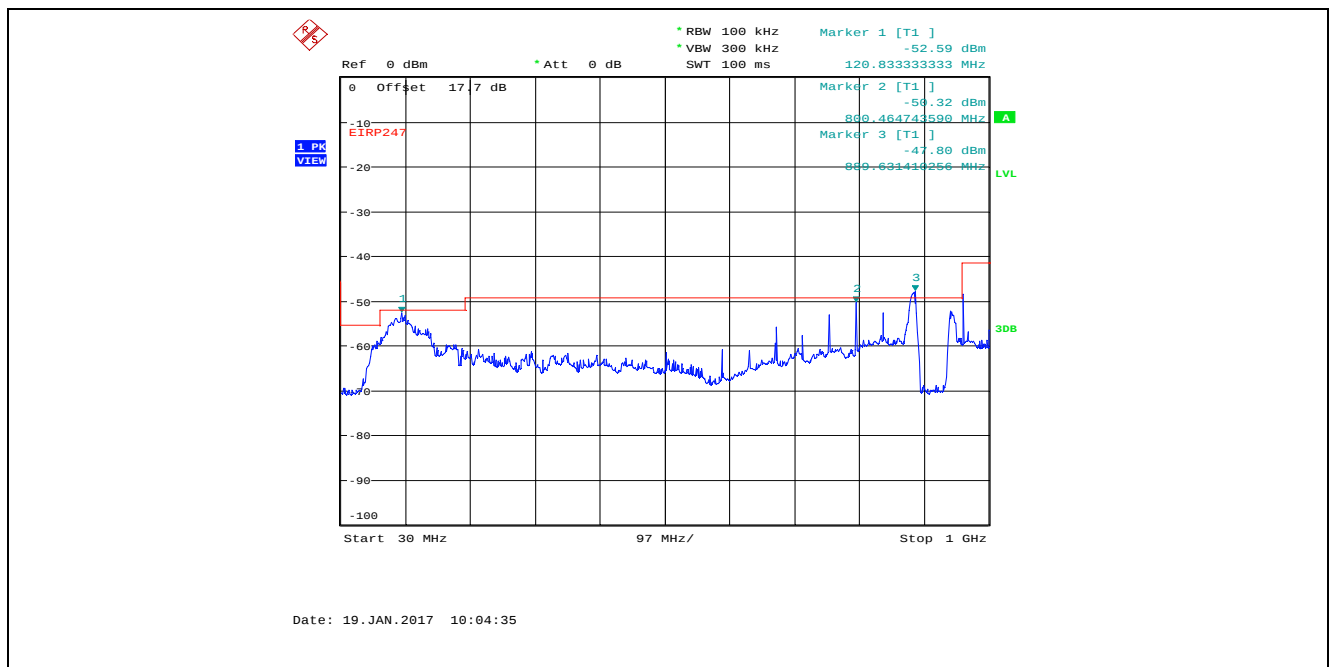
Plot 5.4.4.4.6. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 915 MHz, 9 kHz - 150 kHz, Peak Detector



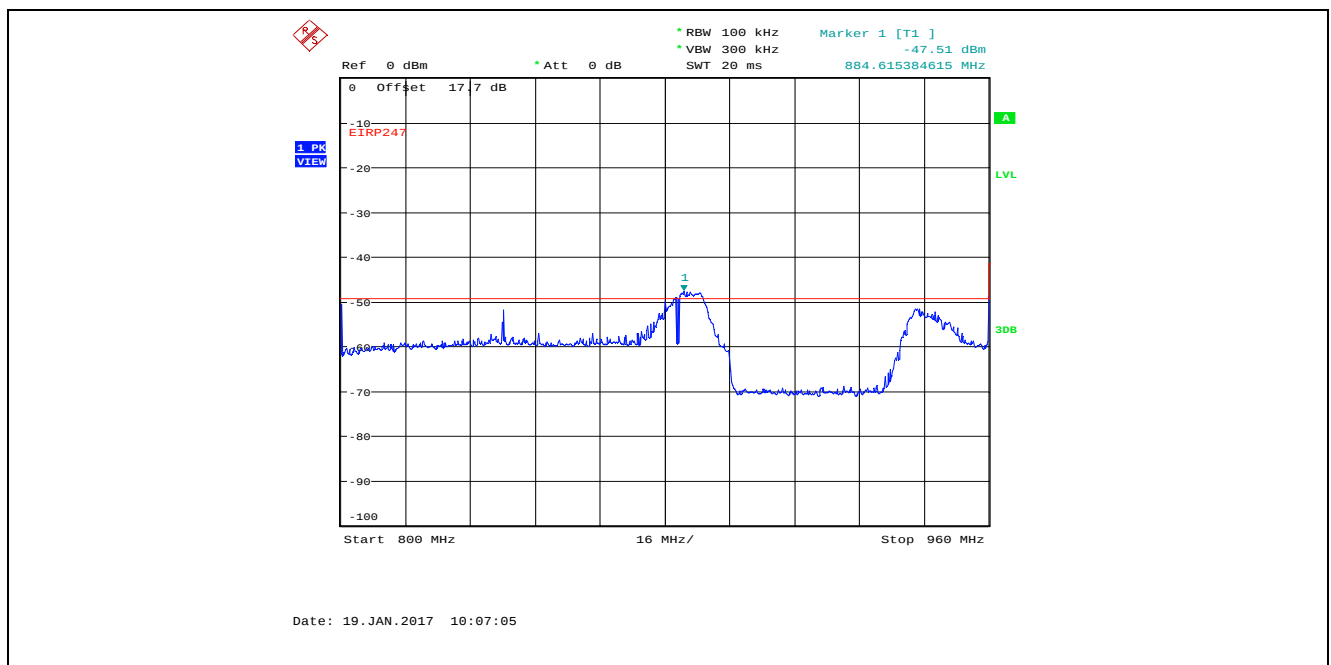
Plot 5.4.4.4.7. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 915 MHz, 150 kHz - 30 MHz, Peak Detector



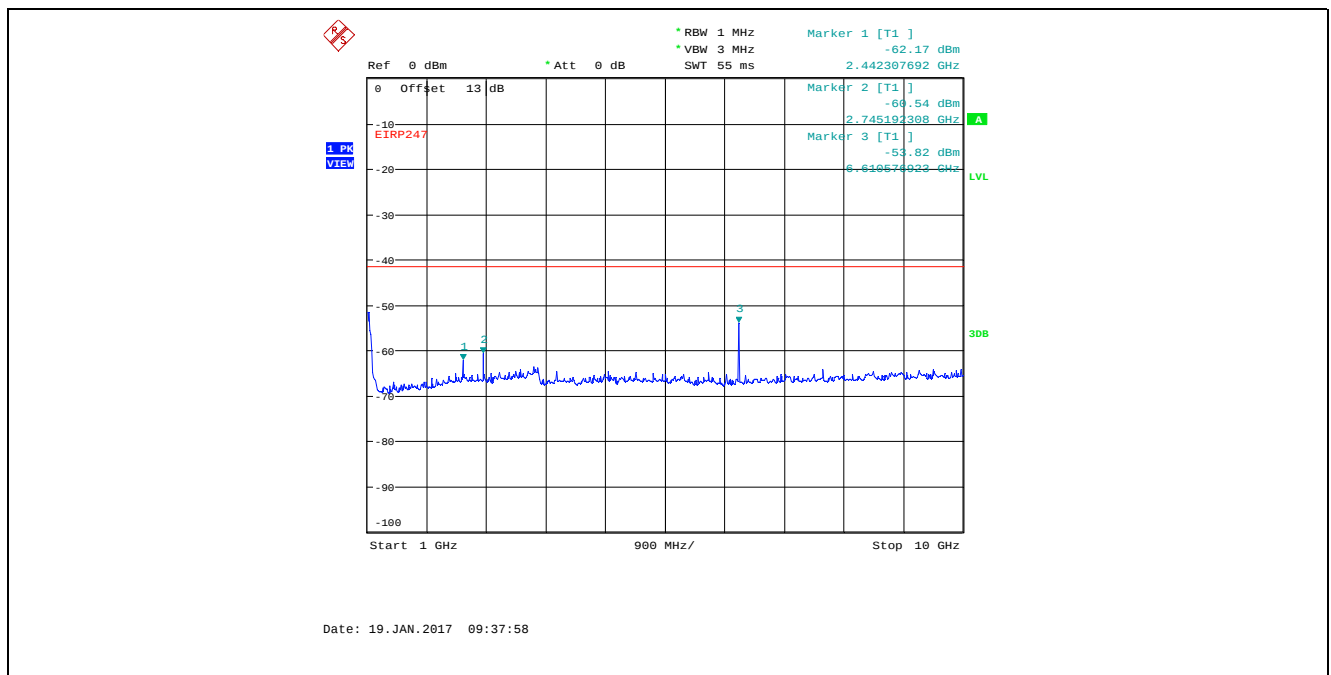
Plot 5.4.4.8. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 915 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.9. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 915 MHz, Peak Detector
800 - 960 MHz is Outside of Restricted Bands



Plot 5.4.4.4.10. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 915 MHz, 1 GHz - 10 GHz, Peak Detector



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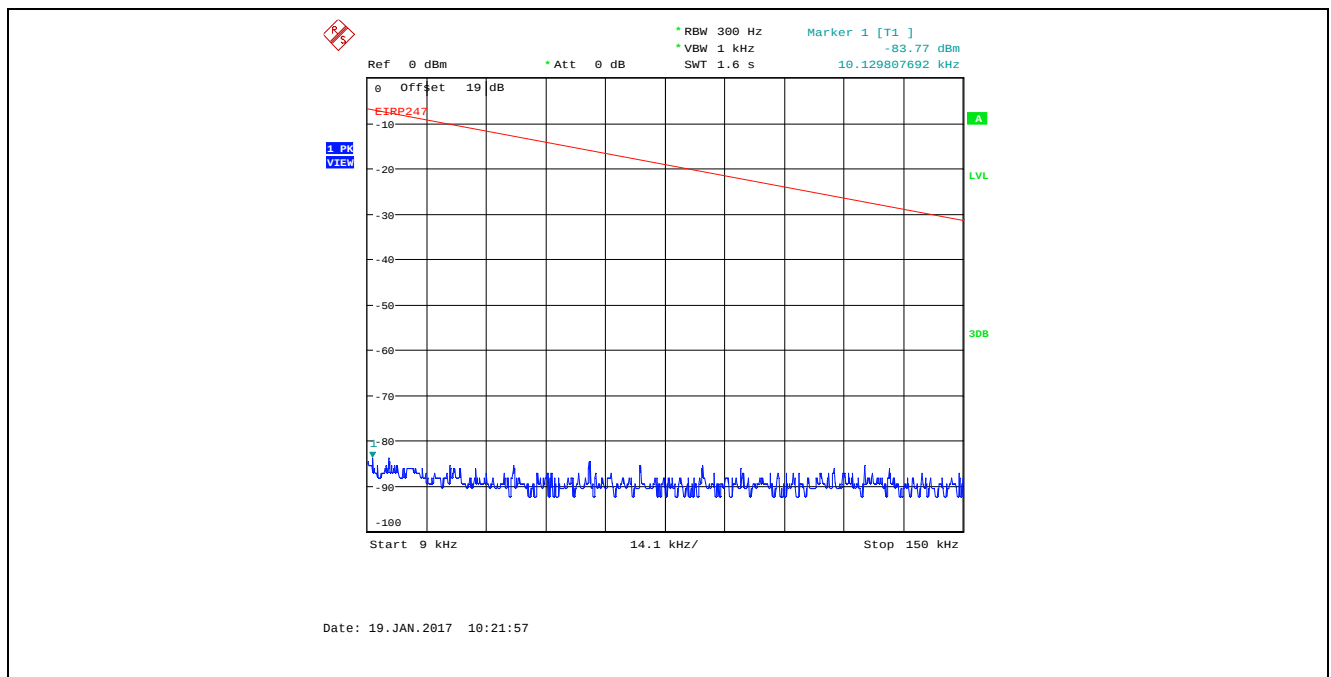
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File #: 17MCRS101_FCC15C247D0G9

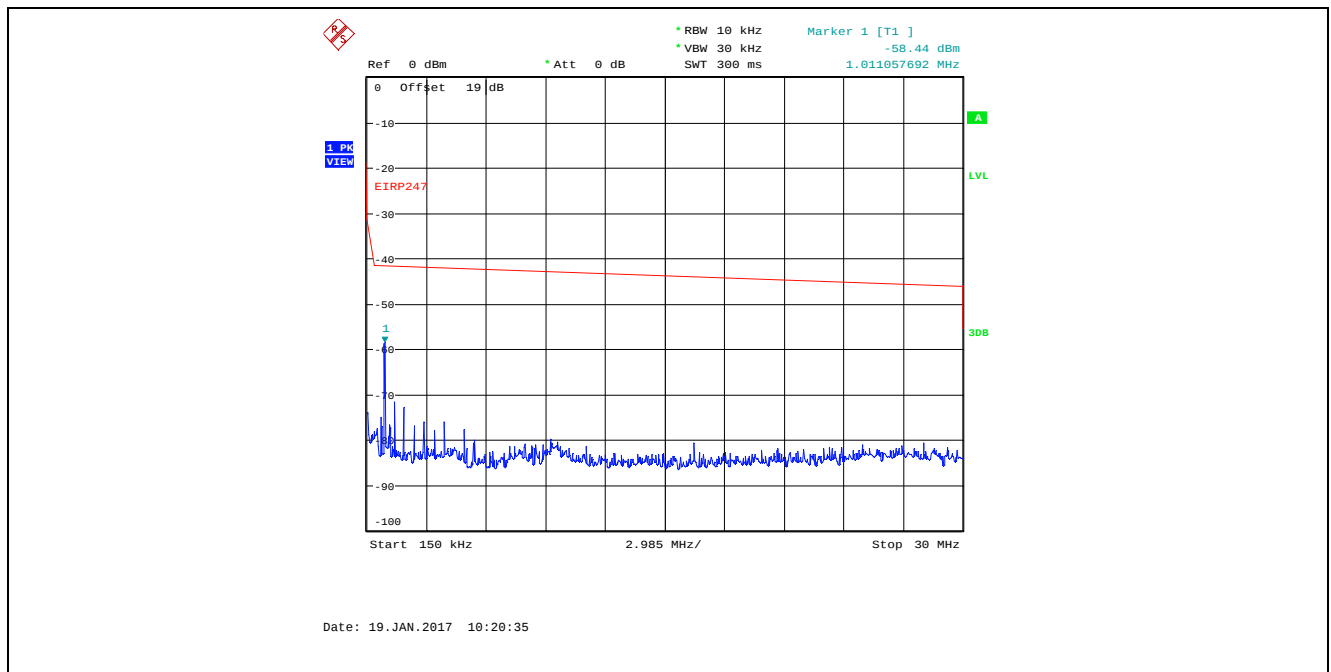
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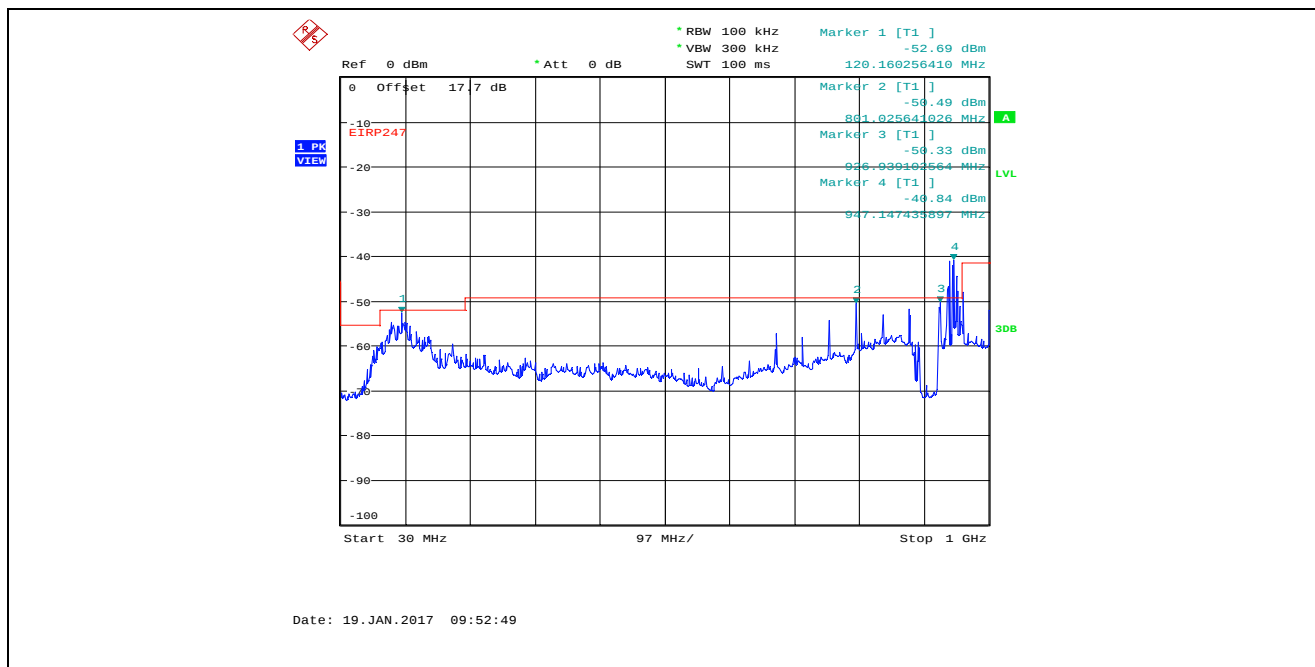
Plot 5.4.4.4.11. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 924 MHz, 9 kHz - 150 kHz, Peak Detector



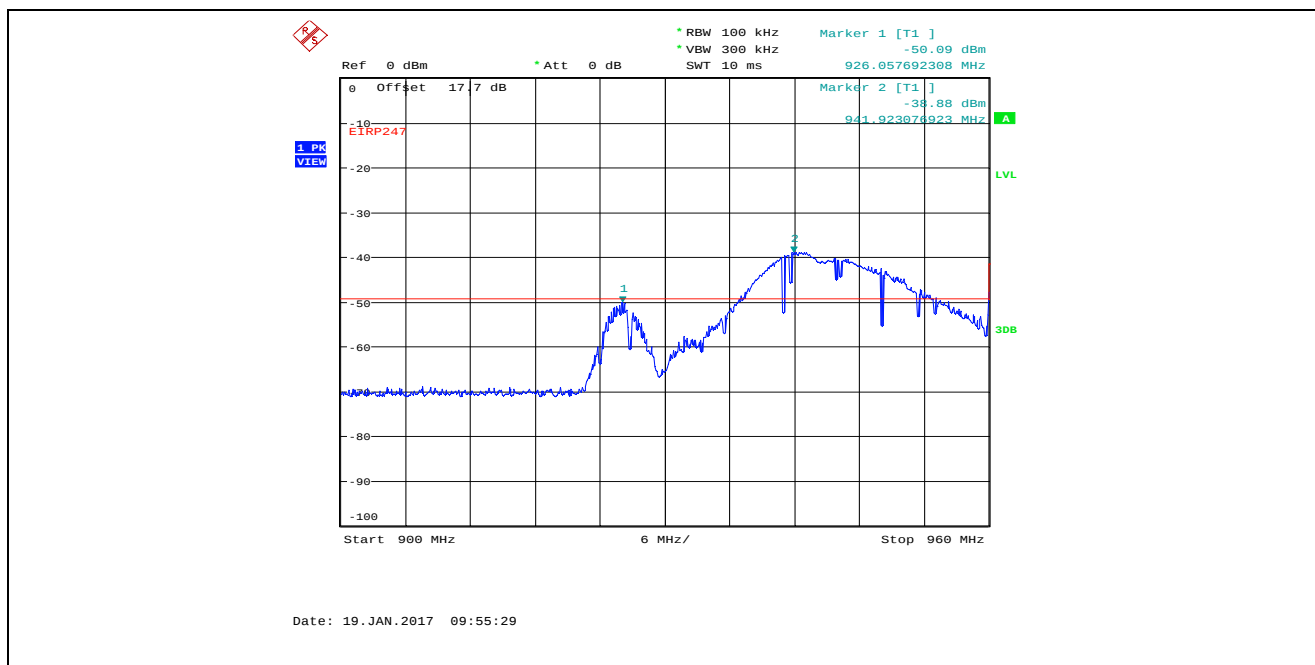
Plot 5.4.4.4.12. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 924 MHz, 150 kHz - 30 MHz, Peak Detector



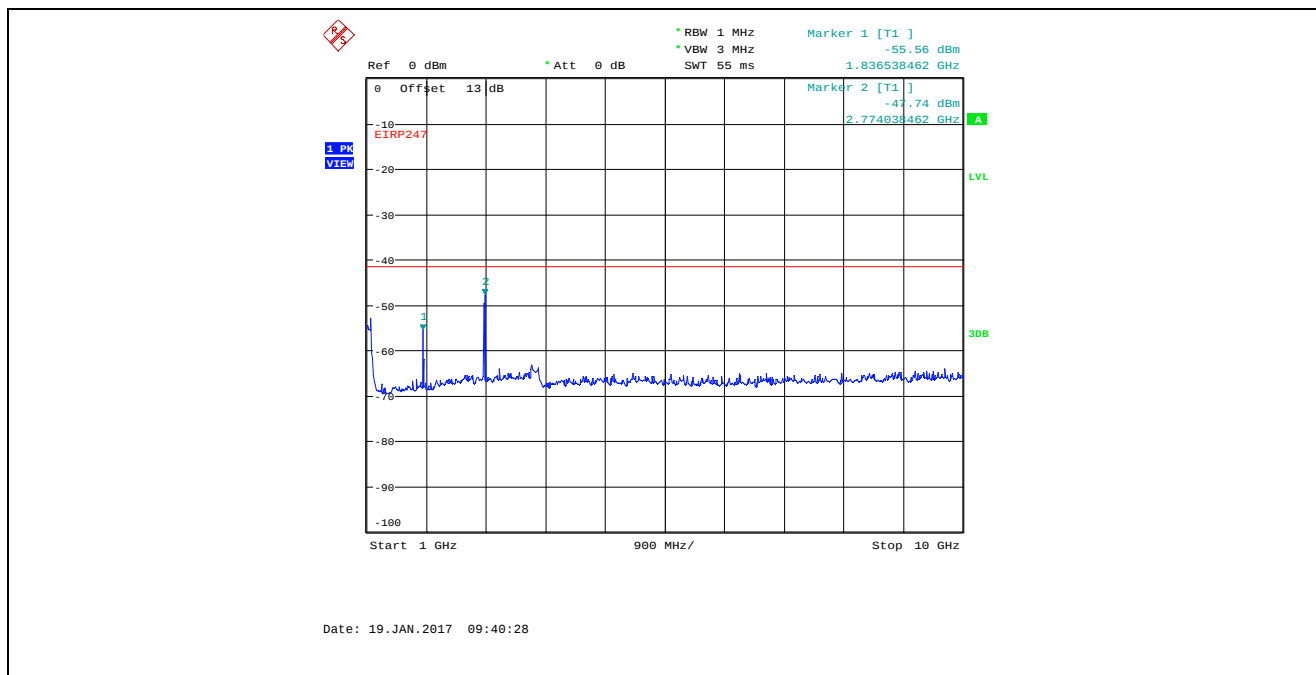
Plot 5.4.4.13. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 924 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.14. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 924 MHz, Peak Detector
900 - 960 MHz is Outside of Restricted Bands



Plot 5.4.4.15. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 1, 924 MHz, 1 GHz - 10 GHz, Peak Detector



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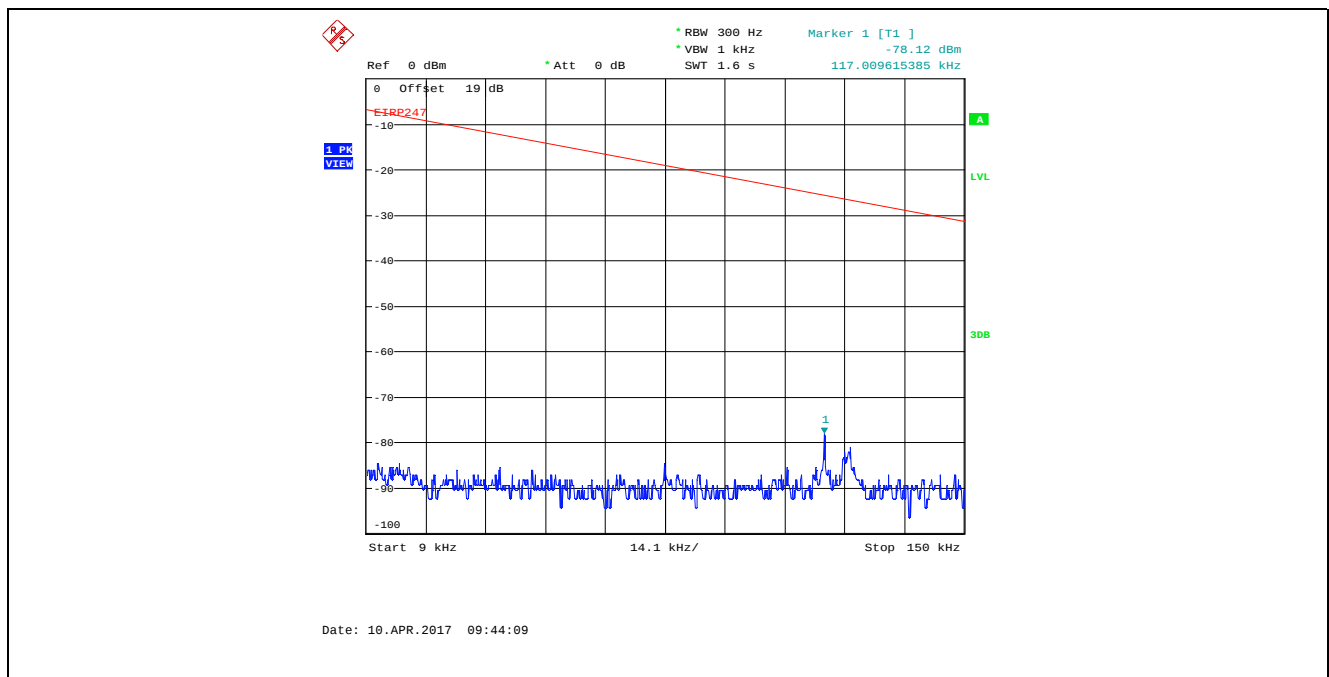
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File #: 17MCRS101_FCC15C247D0G9

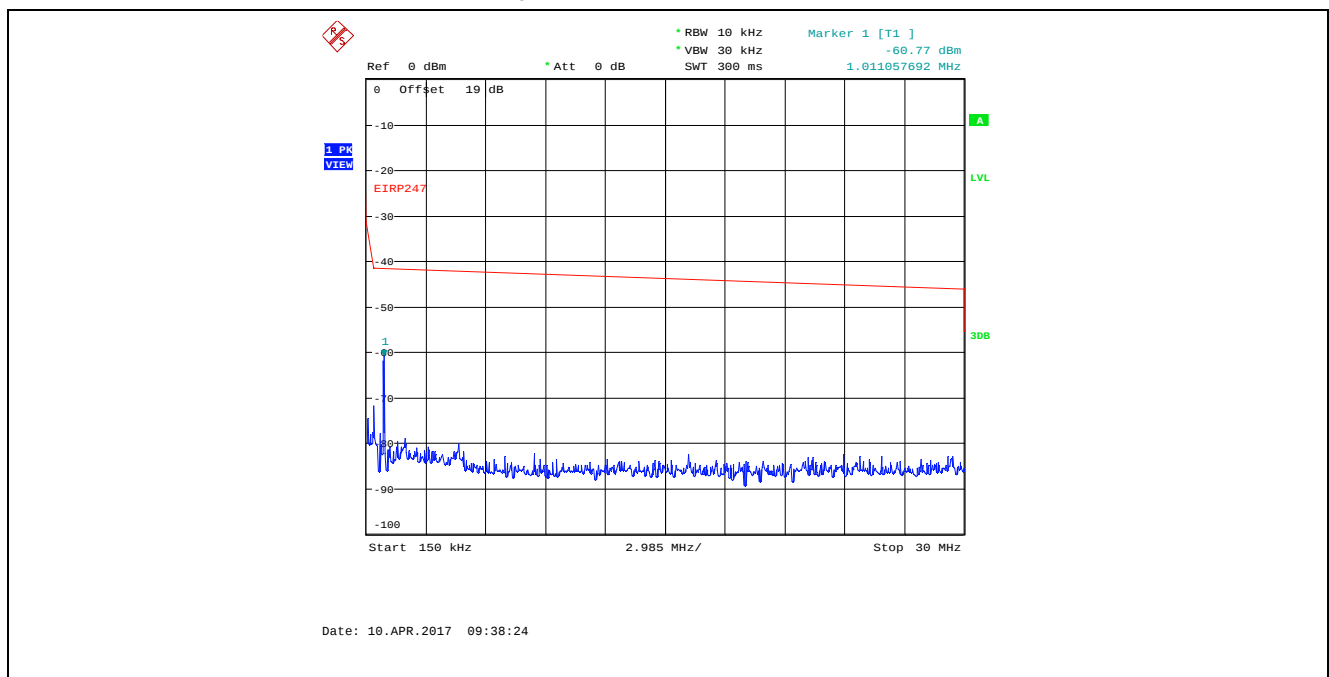
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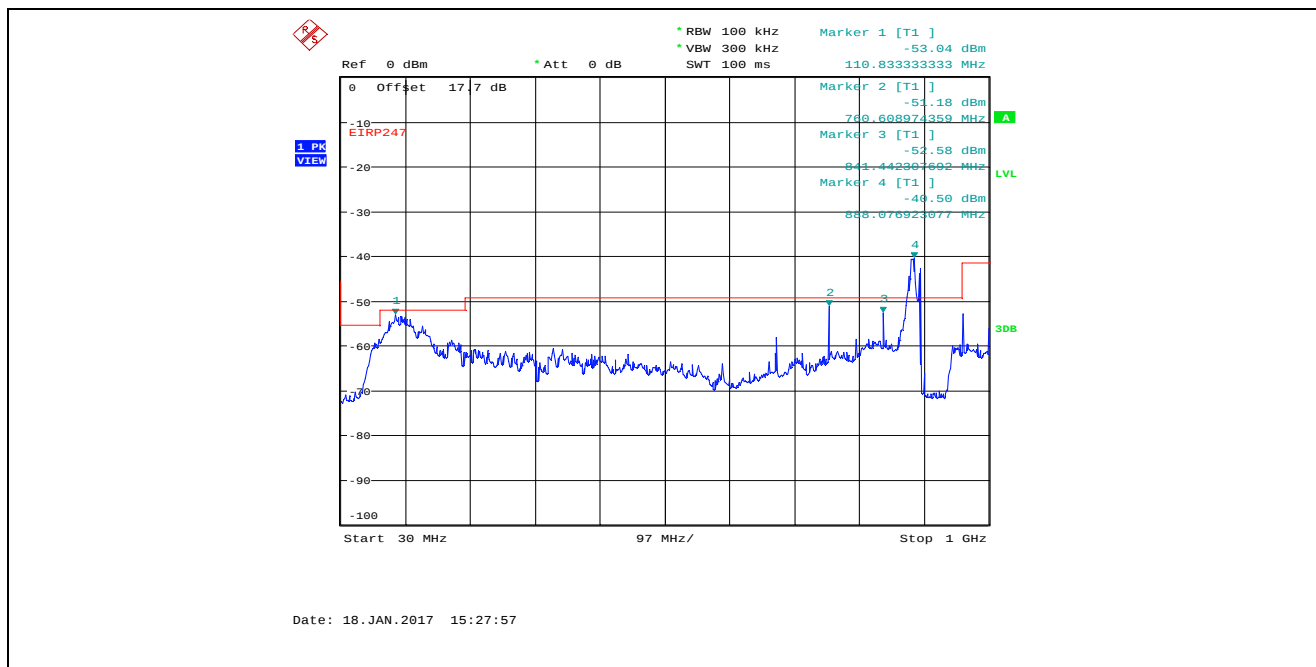
Plot 5.4.4.16. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 907 MHz, 9 kHz - 150 kHz, Peak Detector



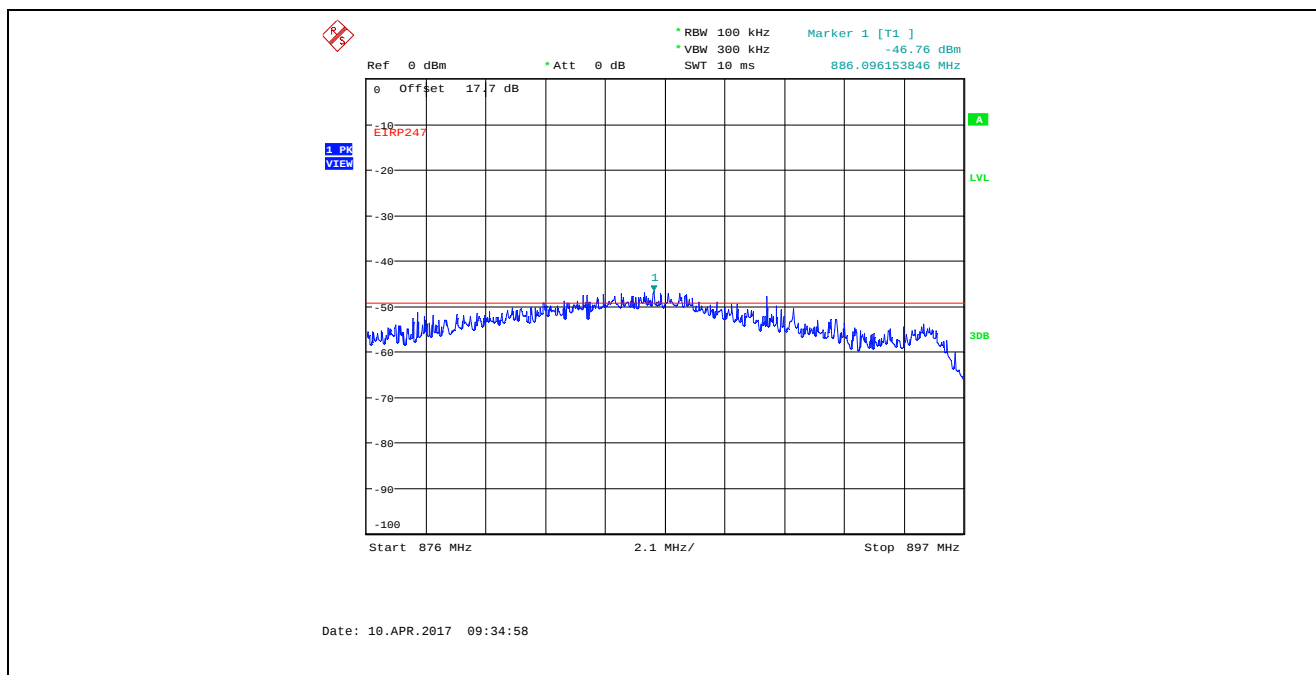
Plot 5.4.4.17. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 907 MHz, 150 kHz - 30 MHz, Peak Detector



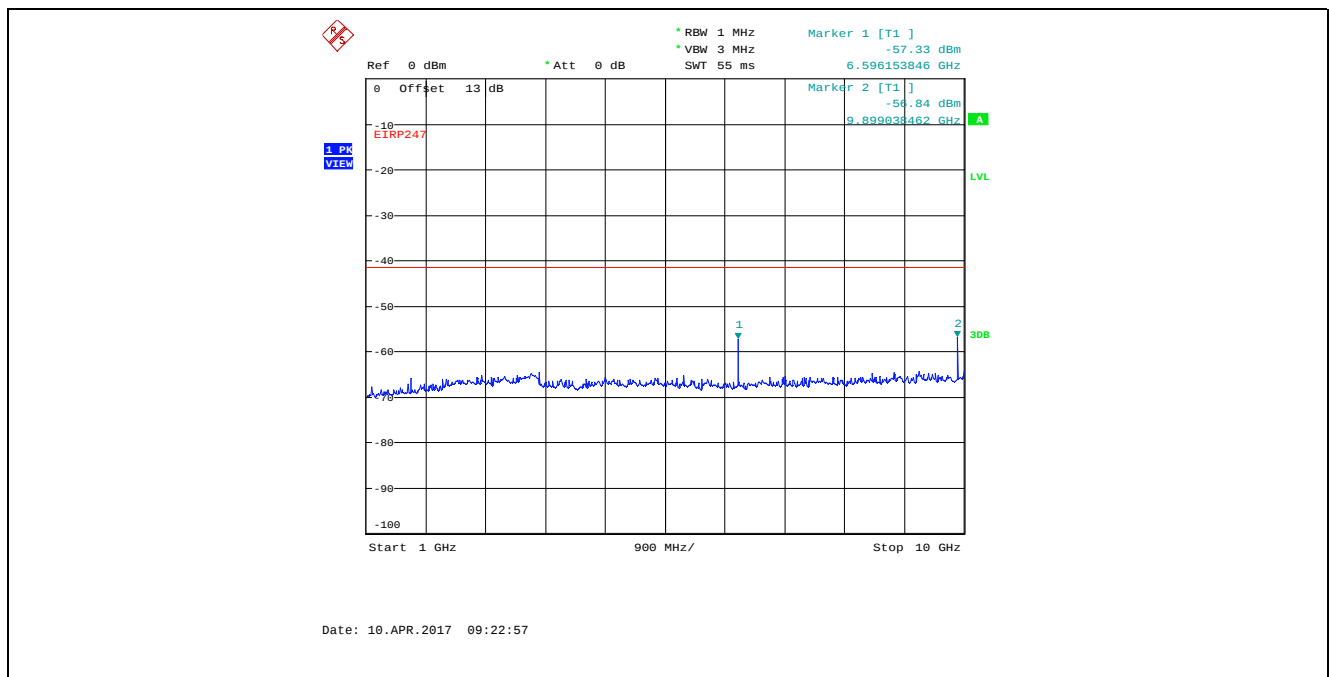
Plot 5.4.4.18. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 907 MHz, 30 MHz - 1 GHz, Peak Detector



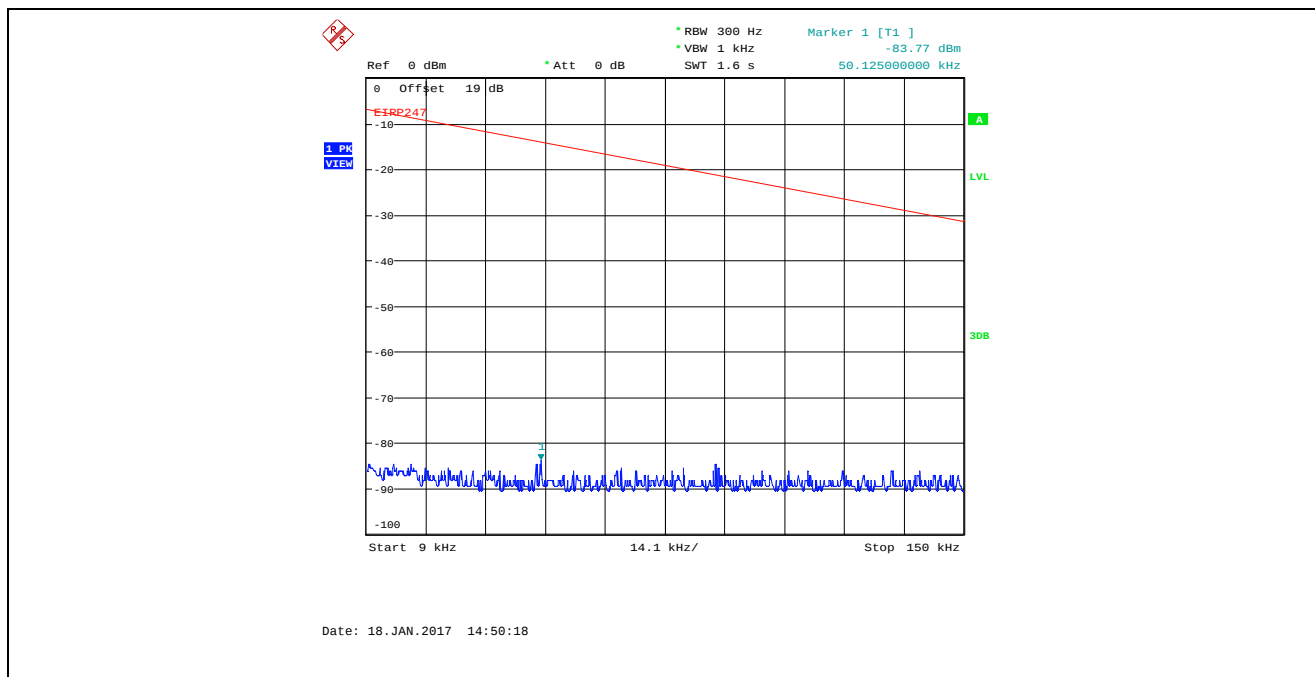
Plot 5.4.4.19. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 907 MHz, Peak Detector
Emission Band Below is Outside of Restricted Bands



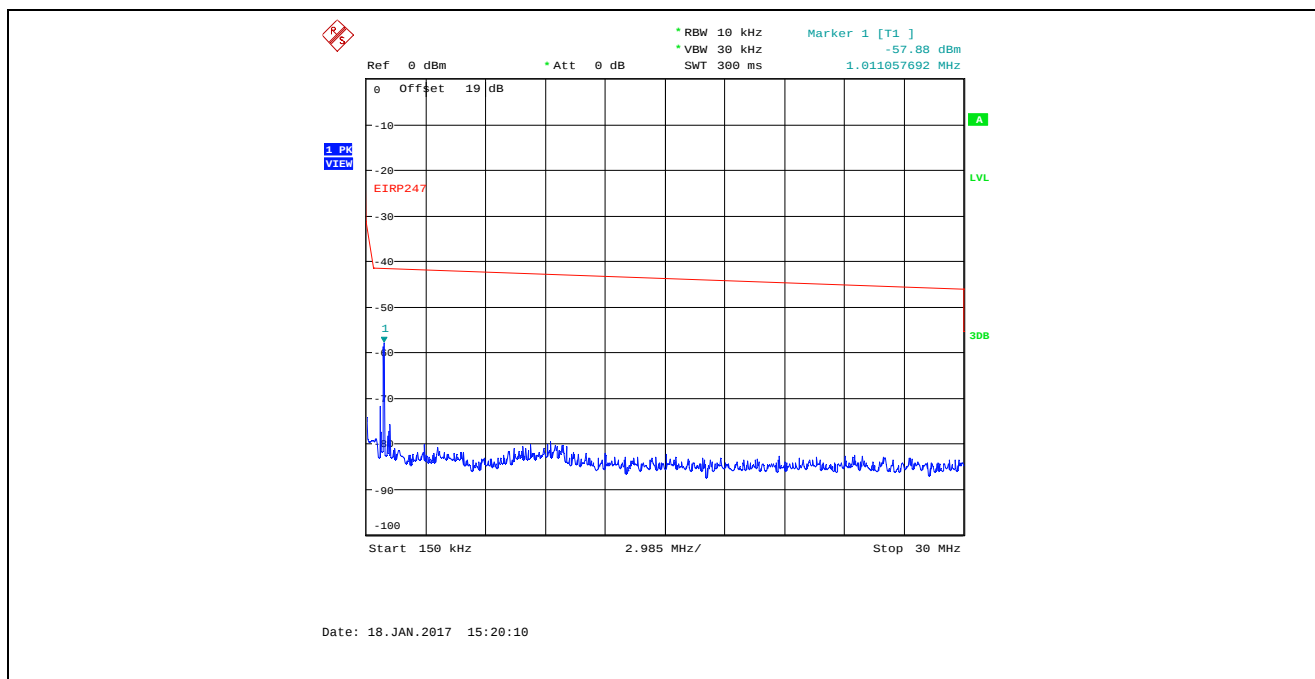
Plot 5.4.4.4.20. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 907 MHz, 1 GHz - 10 GHz, Peak Detector



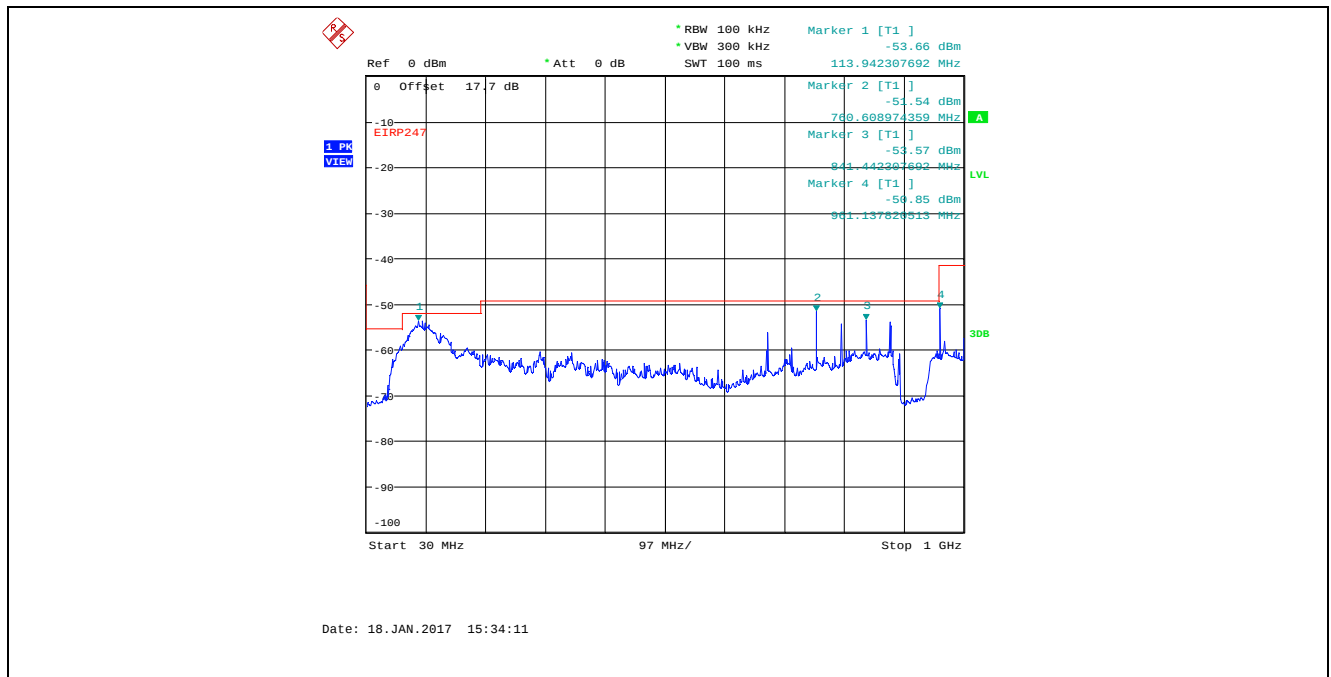
Plot 5.4.4.21. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 915 MHz, 9 kHz - 150 kHz, Peak Detector



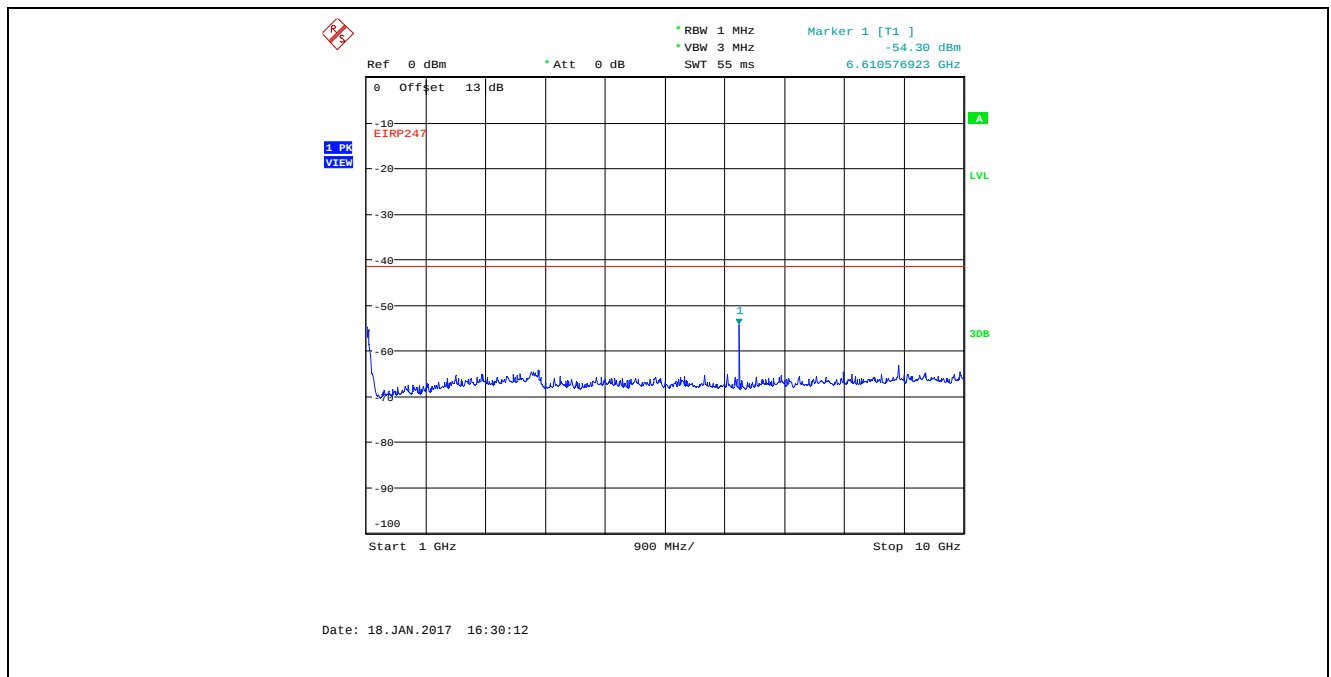
Plot 5.4.4.22. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 915 MHz, 150 kHz - 30 MHz, Peak Detector



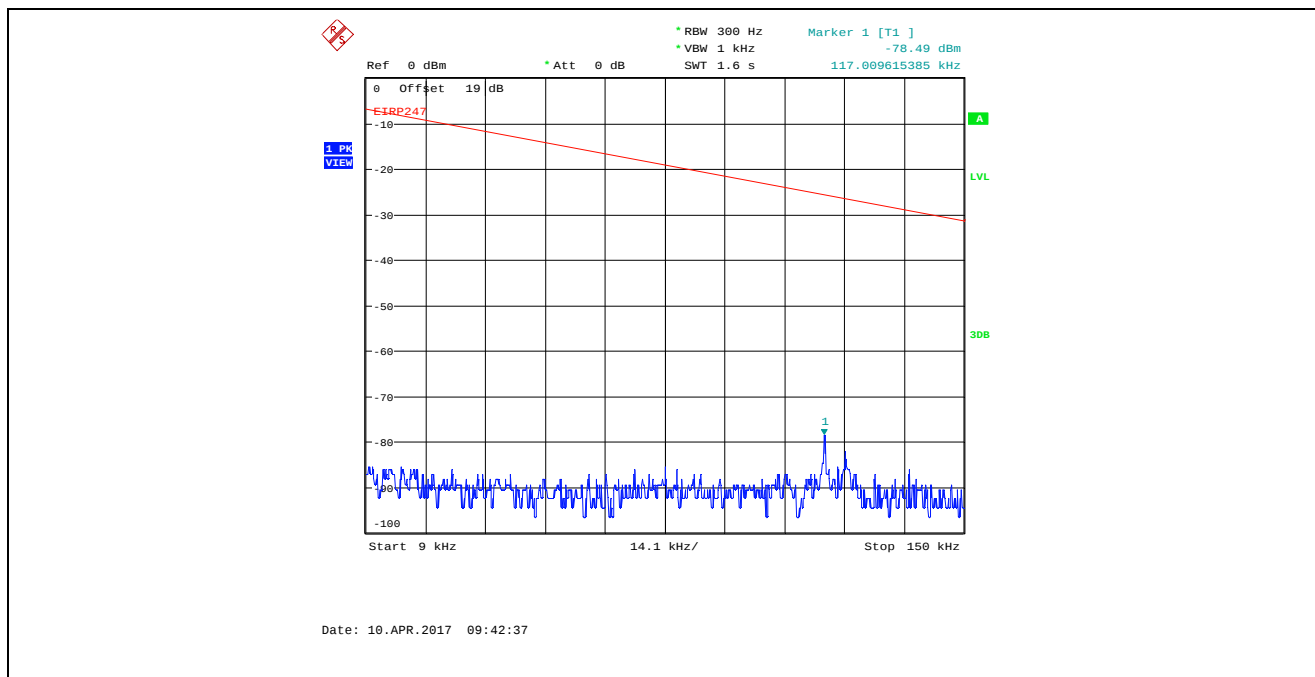
Plot 5.4.4.23. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 915 MHz, 30 MHz - 1 GHz, Peak Detector



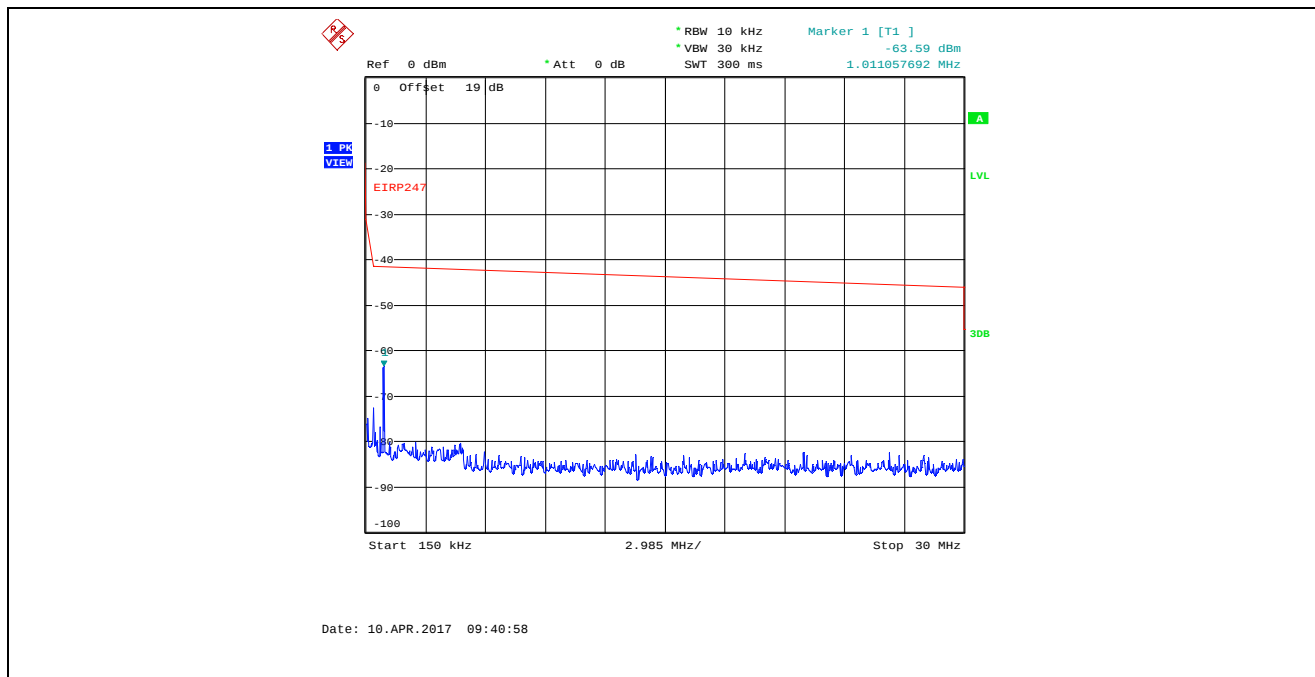
Plot 5.4.4.24. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 915 MHz, 1 GHz - 10 GHz, Peak Detector



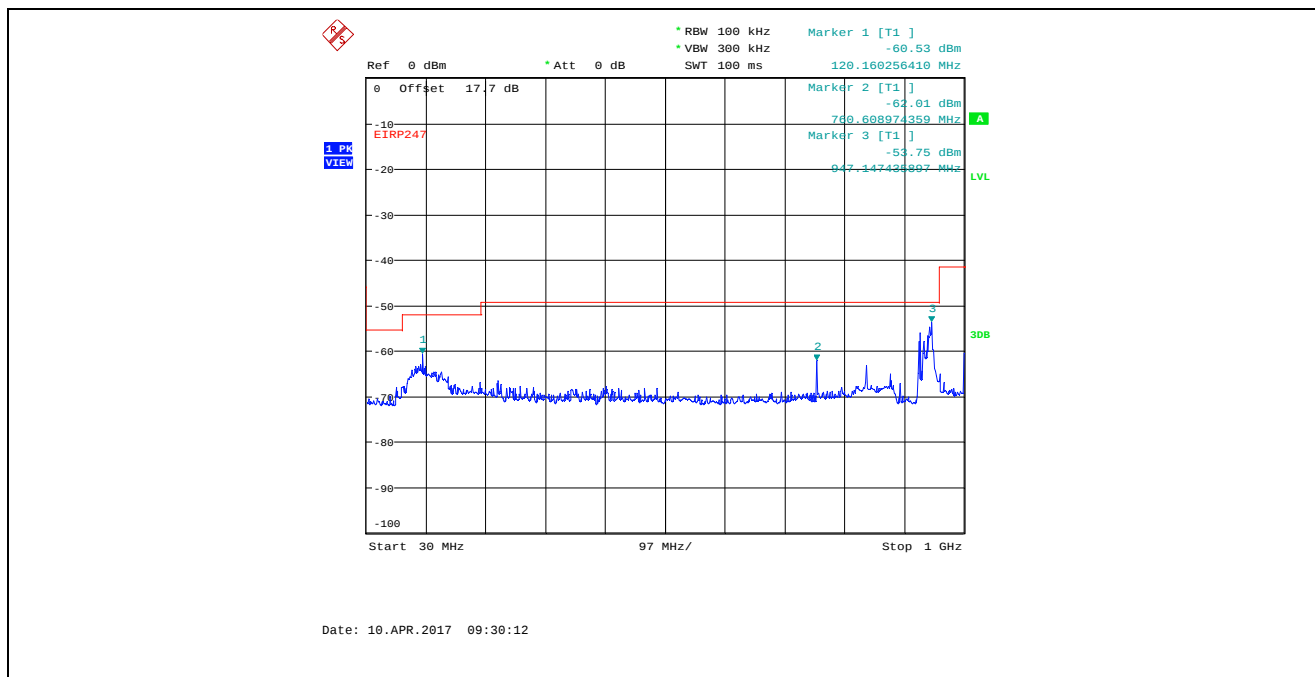
Plot 5.4.4.25. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 923 MHz, 9 kHz - 150 kHz, Peak Detector



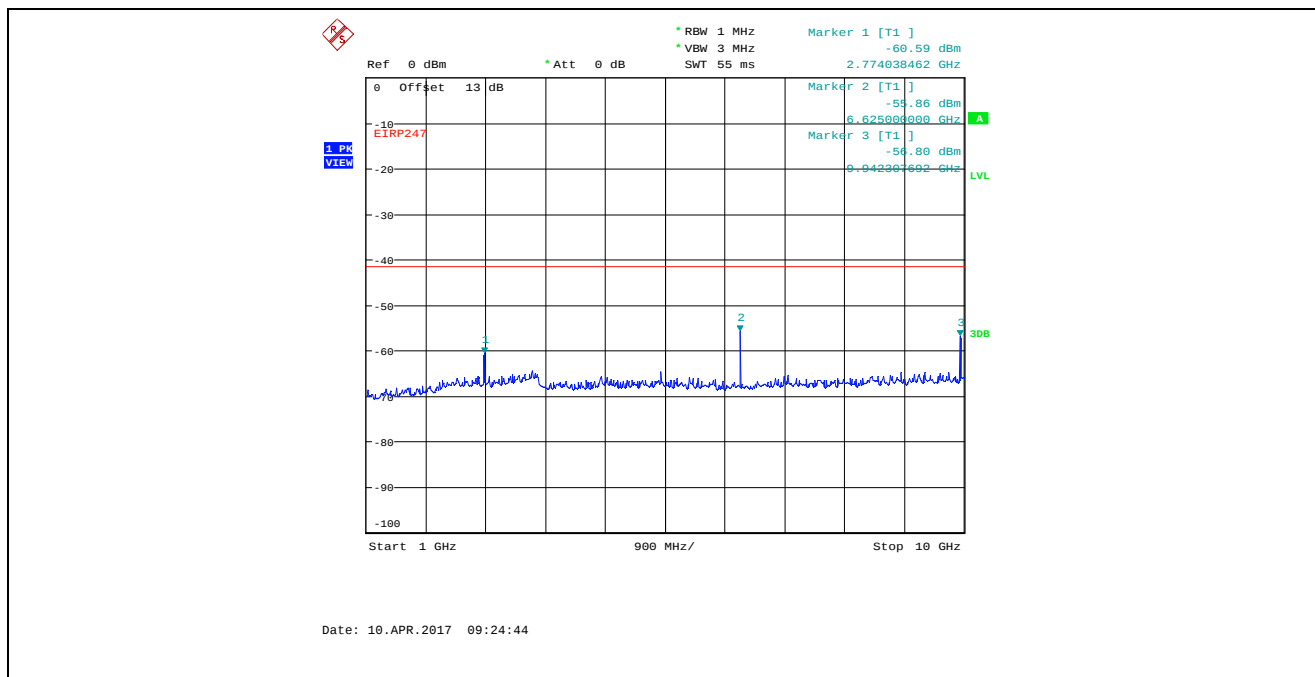
Plot 5.4.4.26. Conducted Spurious Emissions in Restricted Frequency Bands
Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 923 MHz, 150 kHz - 30 MHz, Peak Detector



Plot 5.4.4.27. Conducted Spurious Emissions in Restricted Frequency Bands
 Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 923 MHz, 30 MHz - 1 GHz, Peak Detector



Plot 5.4.4.28. Conducted Spurious Emissions in Restricted Frequency Bands
 Bandwidth: 8 MHz, TX Gain Setting 23, Data Rate 4, 923 MHz, 1 GHz - 10 GHz, Peak Detector



5.5. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.5.1. Limit(s)

§ 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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(²)
13.36–13.41.			

¹ Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

² Above 38.6

Section 15.209(a) - Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

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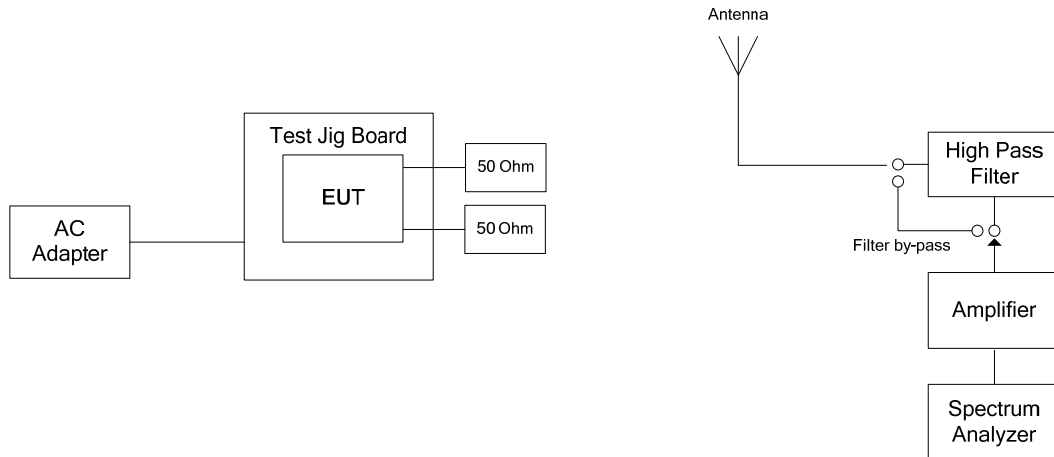
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5.5.2. Method of Measurements

KDB 558074 D01 DTS Meas Guidance v03r05, Section Section 12.2.7 and ANSI C63.10.

5.5.3. Test Arrangement



5.5.4. Test Data

Remark(s):

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- § 15.247 (d) spurious emission limit:
 $E = (EIRP - 20\log(d) + 104.8) - 20 = (36 \text{ dBm} - 20\log(3) + 104.8) - 20 = 111.3 \text{ dB}\mu\text{V/m}$
- Exploratory tests performed to determined worst-case test configurations, the following test results at high power setting represent the worst-case.

5.5.4.1. Bandwidth: 8 MHz, Data Rate 1, High Power, TX Gain Setting 40

Fundamental Frequency:		906 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/Fail
30 - 10000	*	*	H/V	*	*	*	*
*Spurious emissions and harmonics are more than 20 dB below the applicable limit.							

Fundamental Frequency:		915 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/Fail
30 - 10000	*	*	H/V	*	*	*	*
*Spurious emissions and harmonics are more than 20 dB below the applicable limit.							

Fundamental Frequency:		924 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/Fail
30 - 10000	*	*	H/V	*	*	*	*
*Spurious emissions and harmonics are more than 20 dB below the applicable limit.							

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5.5.4.2. Bandwidth: 8 MHz, Data Rate 4, High Power, TX Gain Setting 36

Fundamental Frequency:		907 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBμV/m)	RF Avg Level (dBμV/m)	Antenna Plane (H/V)	Limit 15.209 (dBμV/m)	Limit 15.247 (dBμV/m)	Margin (dB)	Pass/Fail
30 - 10000	*	*	H/V	*	*	*	*
*Spurious emissions and harmonics are more than 20 dB below the applicable limit.							

Fundamental Frequency:		915 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBμV/m)	RF Avg Level (dBμV/m)	Antenna Plane (H/V)	Limit 15.209 (dBμV/m)	Limit 15.247 (dBμV/m)	Margin (dB)	Pass/Fail
30 - 10000	*	*	H/V	*	*	*	*
*Spurious emissions and harmonics are more than 20 dB below the applicable limit.							

Fundamental Frequency:		923 MHz					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBμV/m)	RF Avg Level (dBμV/m)	Antenna Plane (H/V)	Limit 15.209 (dBμV/m)	Limit 15.247 (dBμV/m)	Margin (dB)	Pass/Fail
30 - 10000	*	*	H/V	*	*	*	*
*Spurious emissions and harmonics are more than 20 dB below the applicable limit.							

5.6. POWER SPECTRAL DENSITY [§ 15.247(e)]

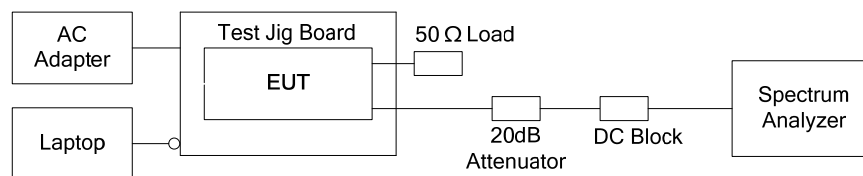
5.6.1. Limit(s)

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.

5.6.2. Method of Measurements

KDB 558074D01 DTS Meas Guidance v03r05, Section 10.2 Method PKPSD (peak PSD)

5.6.3. Test Arrangement



5.6.4. Test Data

Operating Mode	Data Rate	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)
Bandwidth: 1 MHz TX Gain: 20	1	903	7.99	8
		915	7.66	8
		927	7.57	8
	2	903	6.92	8
		915	7.46	8
		927	7.76	8
Bandwidth: 2 MHz TX Gain: 25	1	904	7.83	8
		915	7.47	8
		926	7.83	8
	2	904	7.70	8
		915	7.64	8
		926	7.94	8
	3	904	7.54	8
		915	7.60	8
		926	7.84	8

Operating Mode	Data Rate	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)
Bandwidth: 4 MHz TX Gain: 32	1	905	7.74	8
		915	7.86	8
		925	7.88	8
	2	905	7.46	8
		915	7.75	8
		925	7.33	8
	3	905	7.32	8
		915	7.47	8
		925	7.13	8
Bandwidth: 8 MHz TX Gain: 40	1	906	7.15	8
		915	7.50	8
		924	7.84	8
	2	906	7.75	8
		915	7.65	8
		924	7.93	8
	3	906	7.49	8
		915	6.61	8
		924	7.27	8

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Operating Mode	Data Rate	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)
Bandwidth: 1 MHz TX Gain: 36	4	903	7.19	8
		915	7.91	8
		927	7.49	8
	5	903	7.19	8
		915	7.95	8
		927	7.64	8
	6	903	7.70	8
		915	7.85	8
		927	7.45	8
	7	903	6.86	8
		915	7.91	8
		927	7.68	8
Bandwidth: 2 MHz TX Gain: 36	4	904	4.88	8
		915	5.10	8
		926	6.39	8
	5	904	4.67	8
		915	6.13	8
		926	6.62	8
	6	904	3.77	8
		915	5.57	8
		926	6.62	8
	7	904	5.48	8
		915	6.44	8
		926	7.05	8

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3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

April 13, 2017

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Operating Mode	Data Rate	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)
Bandwidth: 4 MHz TX Gain: 36	4	905	3.69	8
		915	3.12	8
		925	3.33	8
	5	905	2.85	8
		915	3.05	8
		925	4.27	8
	6	905	2.85	8
		915	3.52	8
		925	4.72	8
	7	905	4.22	8
		915	4.49	8
		925	5.57	8
Bandwidth: 8 MHz TX Gain: 36	4	907	-1.58	8
		915	-0.85	8
		923	-0.03	8
	5	907	-2.07	8
		915	1.05	8
		923	-1.82	8
	6	907	-3.21	8
		915	0.19	8
		923	-1.08	8
	7	907	-1.22	8
		915	0.60	8
		923	-0.38	8

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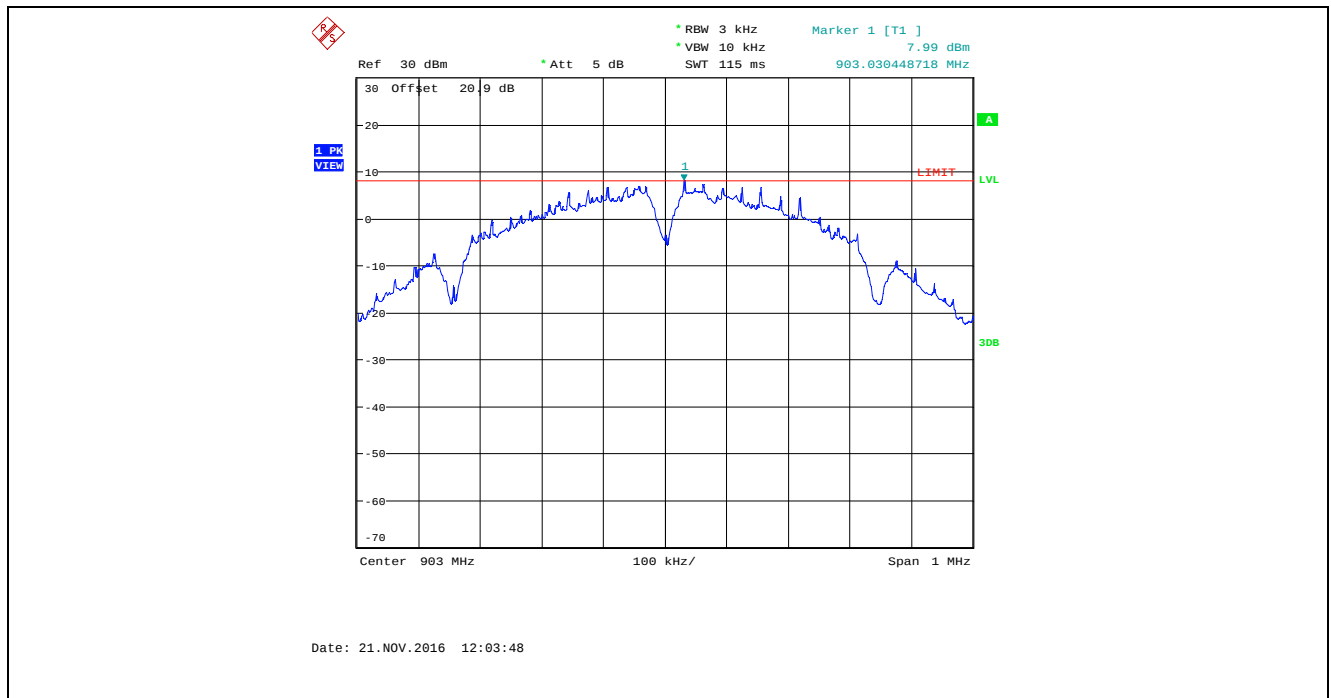
3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

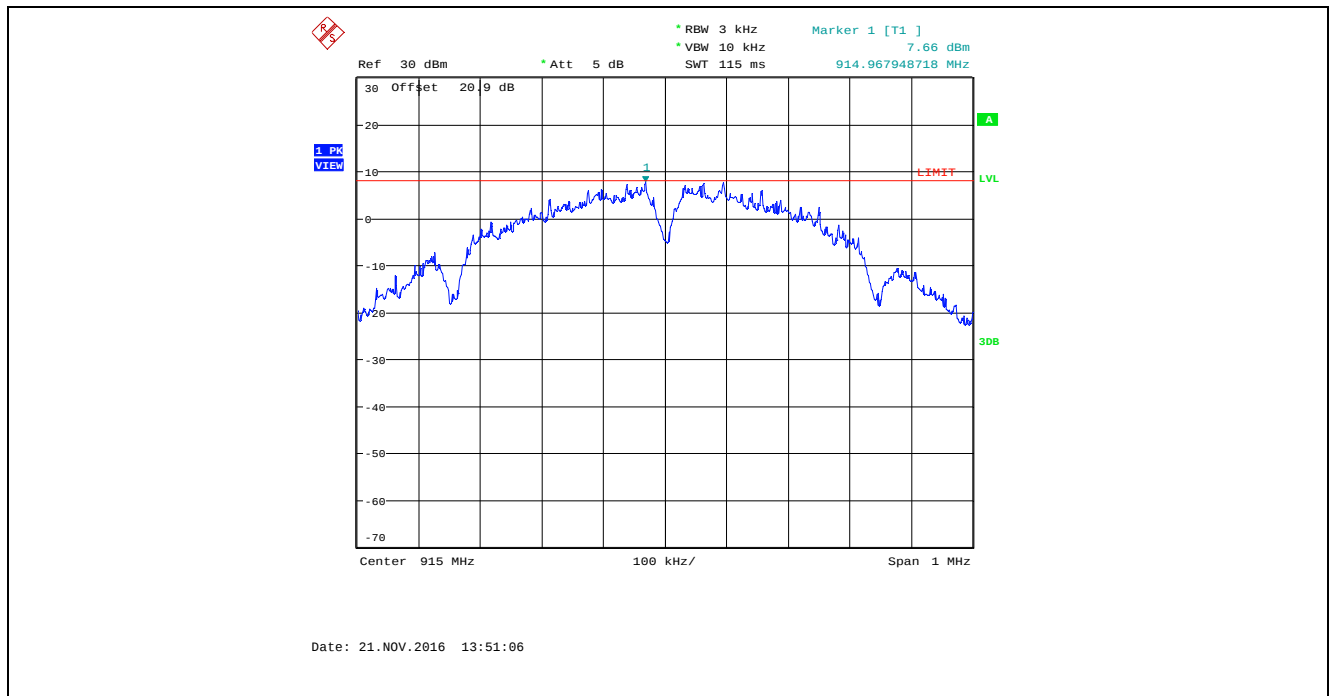
April 13, 2017

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

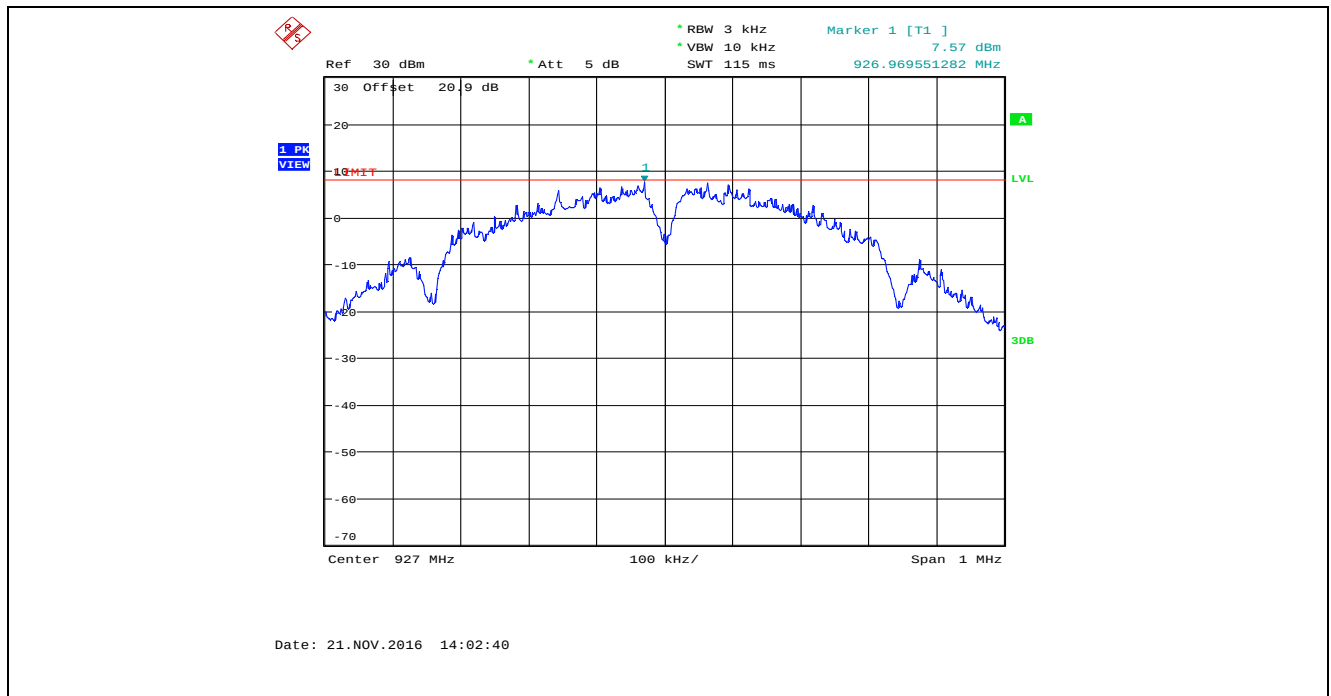
Plot 5.6.4.1. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 20, Data Rate 1, 903 MHz



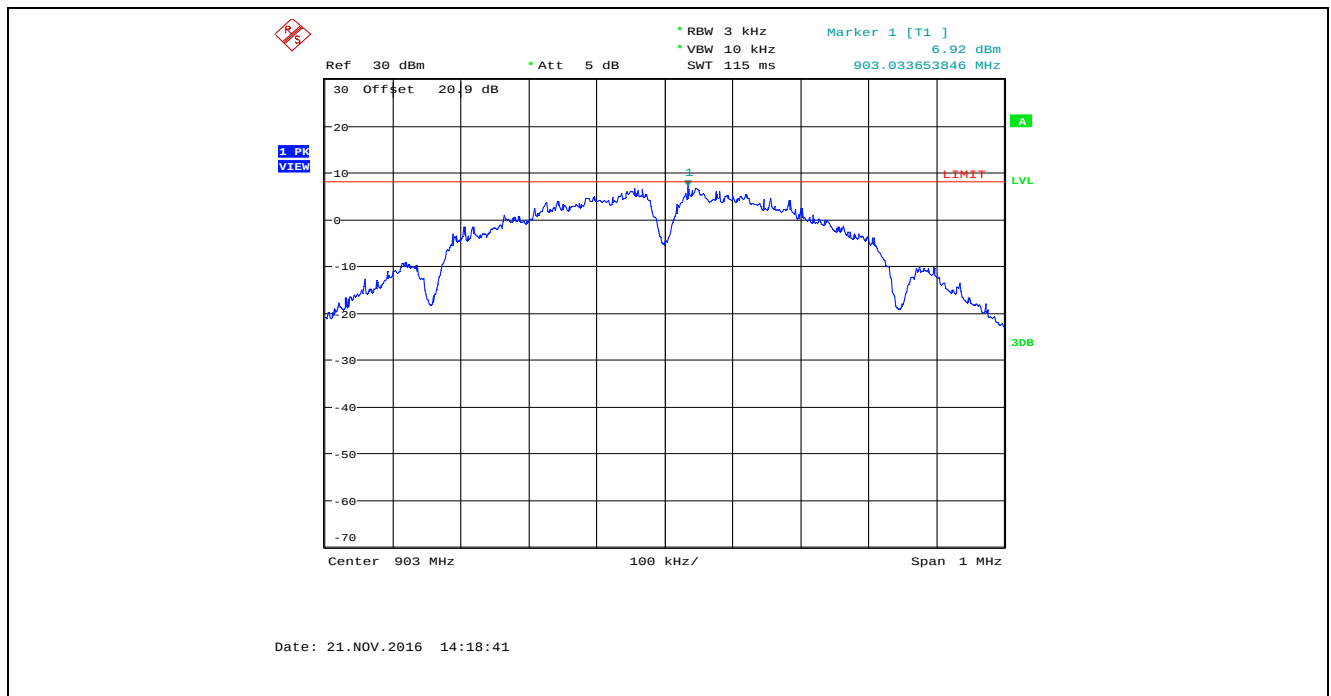
Plot 5.6.4.2. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 20, Data Rate 1, 915 MHz



Plot 5.6.4.3. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 20, Data Rate 1, 927 MHz



Plot 5.6.4.4. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 20, Data Rate 2, 903 MHz



Ref 30 dBm Att 5 dB RBW 3 kHz VBW 10 kHz SWT 115 ms Marker 1 [T1] 7.46 dBm 914.953525641 MHz

30 Offset 20.9 dB

1 PK VIEW

LIMIT LVL

3dB

Center 915 MHz 100 kHz/ Span 1 MHz

Date: 21.NOV.2016 14:16:14

Ref 30 dBm Att 5 dB RBW 3 kHz VBW 10 kHz SWT 115 ms Marker 1 [T1] 7.76 dBm 926.953525641 MHz

30 Offset 20.9 dB

1 PK VIEW

-10 dBm

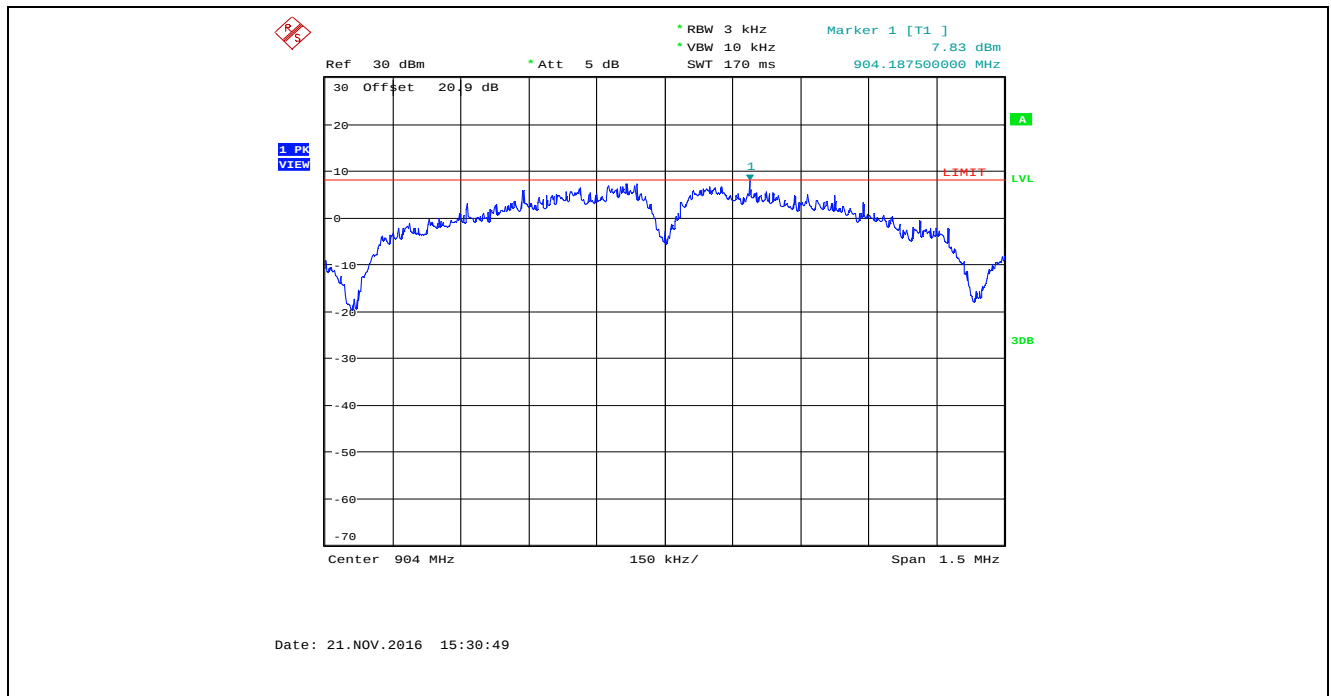
7.76 dBm

30dB

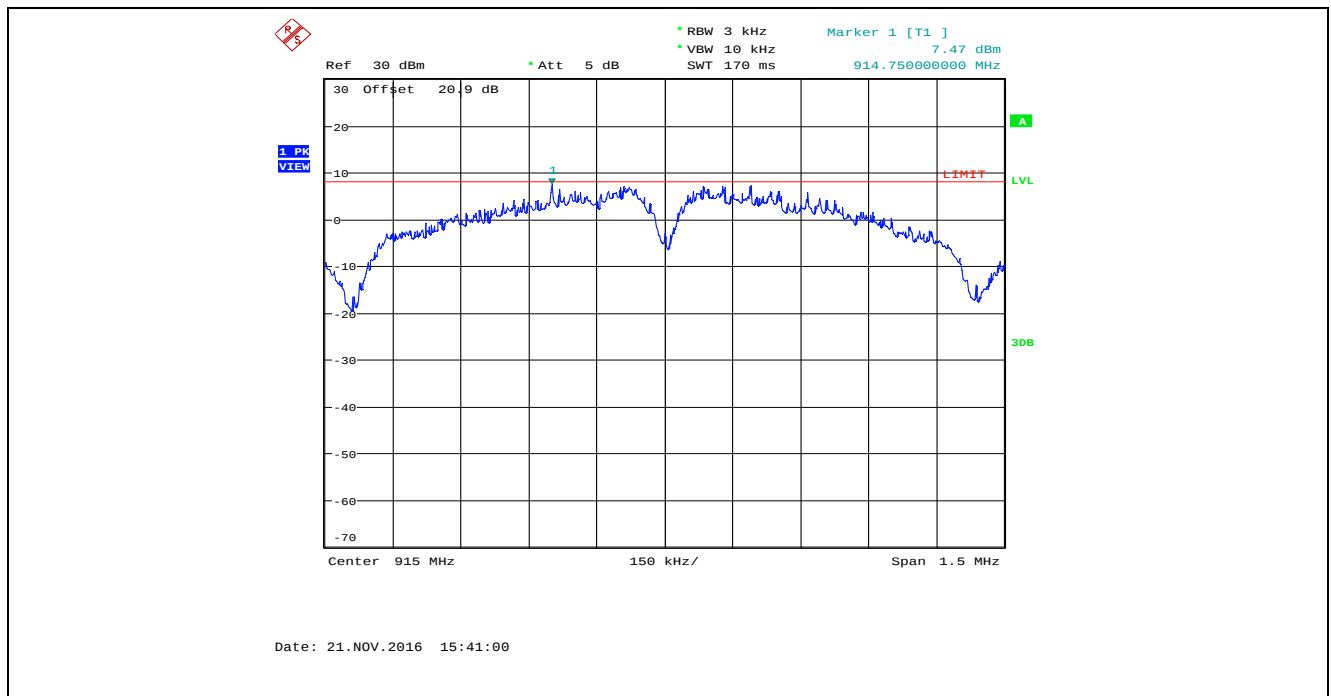
Center 927 MHz 100 kHz/ Span 1 MHz

Date: 21.NOV.2016 14:13:50

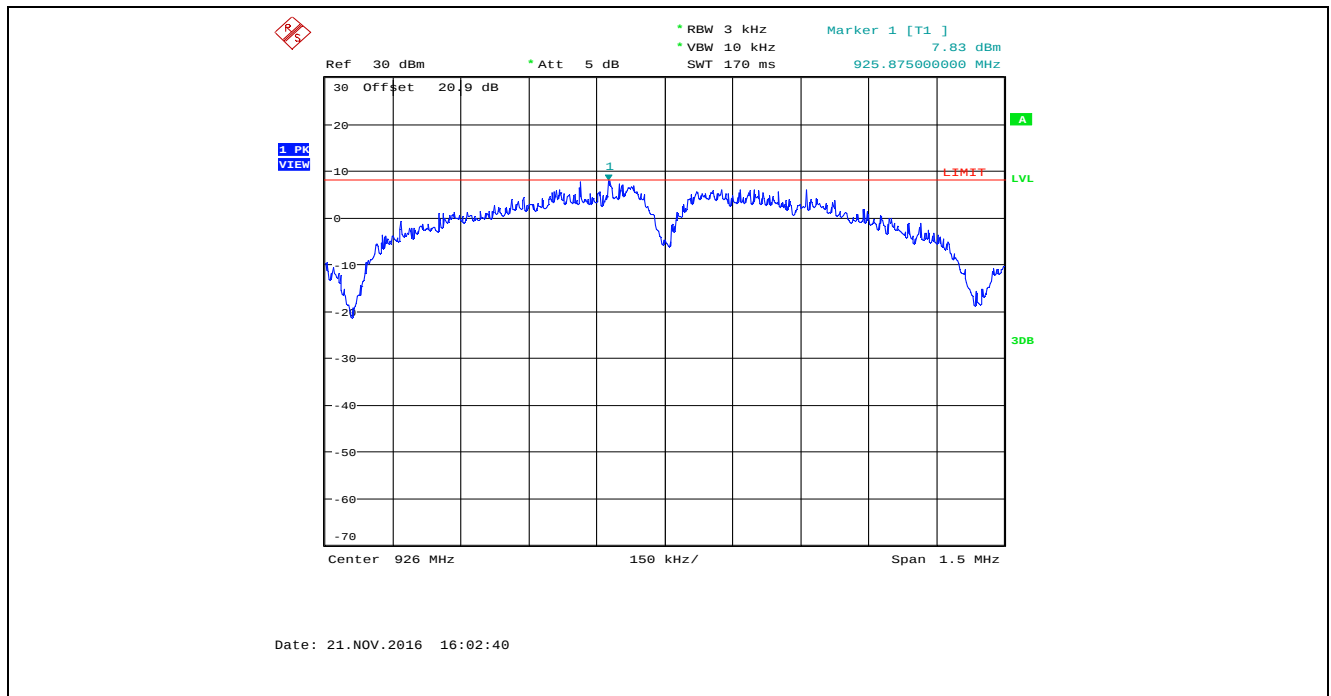
Plot 5.6.4.7. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 1, 904 MHz



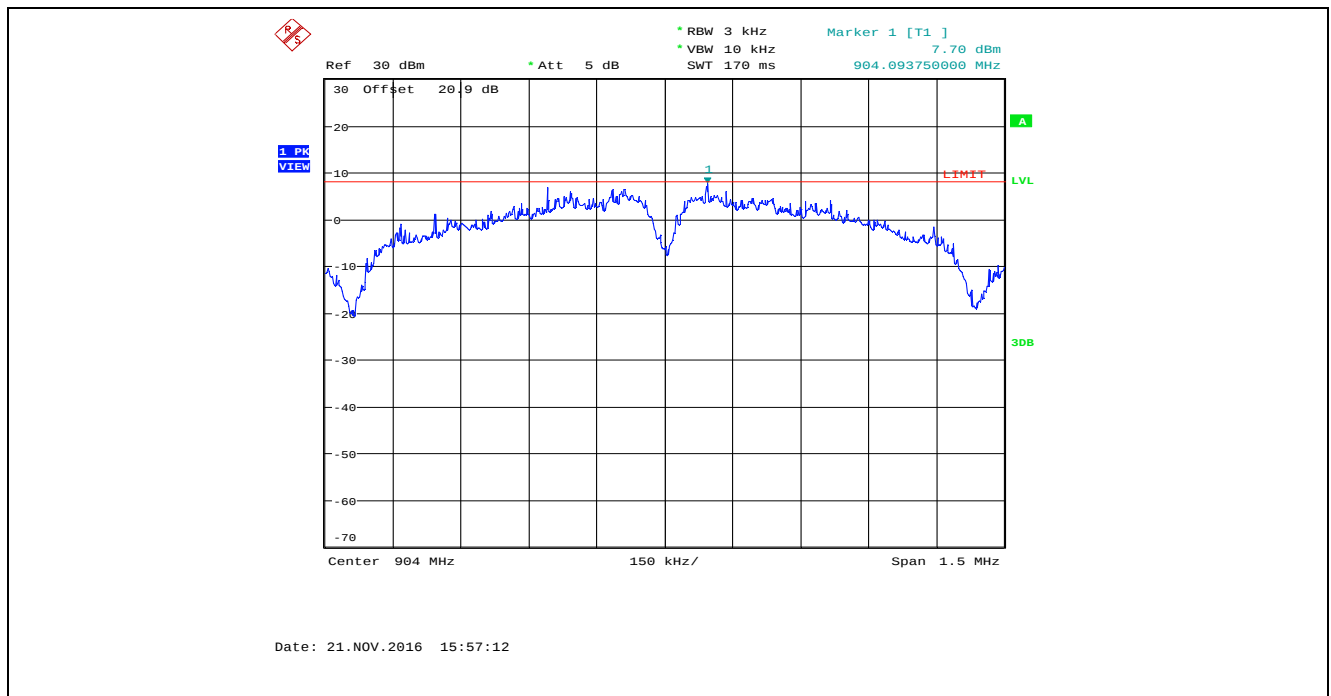
Plot 5.6.4.8. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 1, 915 MHz



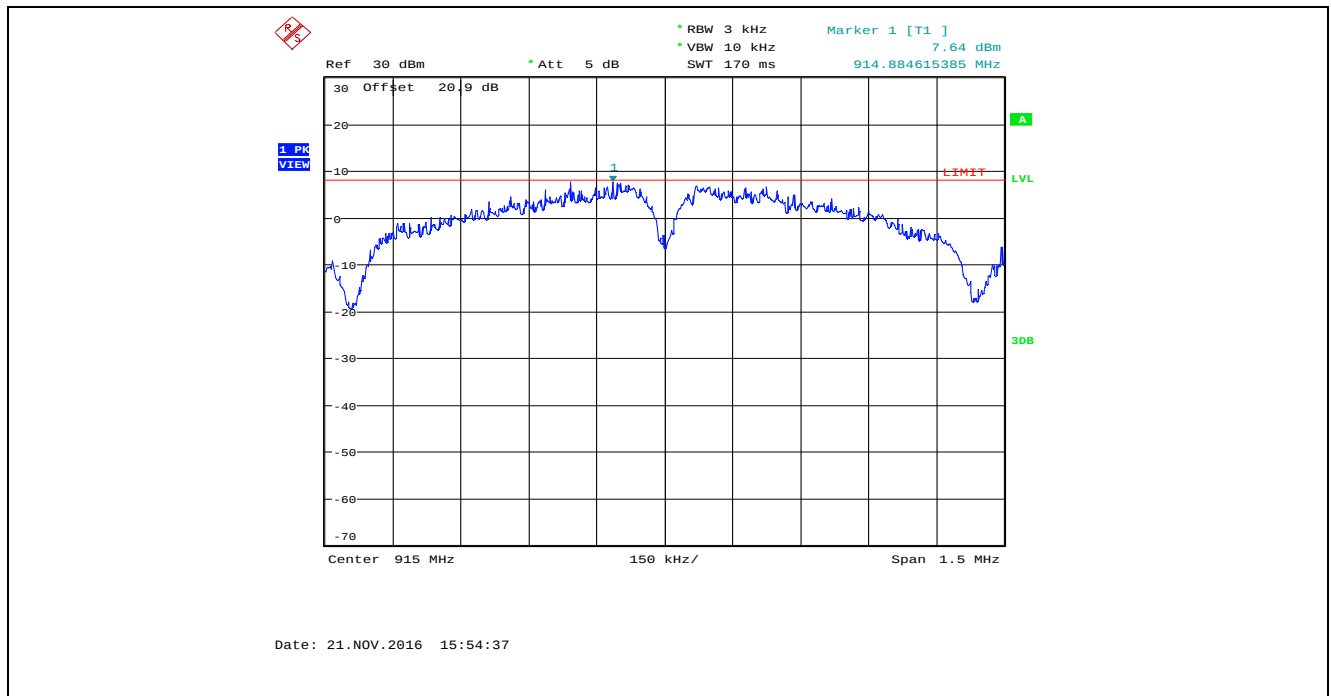
Plot 5.6.4.9. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 1, 926 MHz



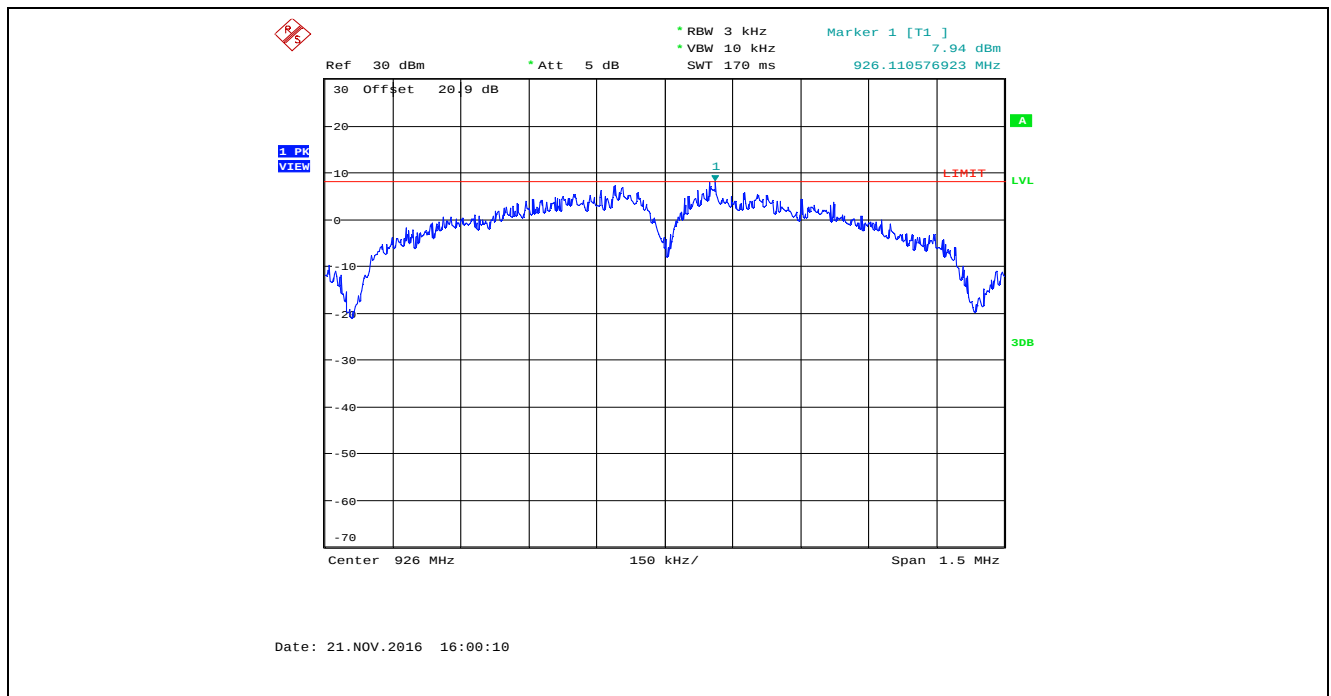
Plot 5.6.4.10. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 2, 904 MHz



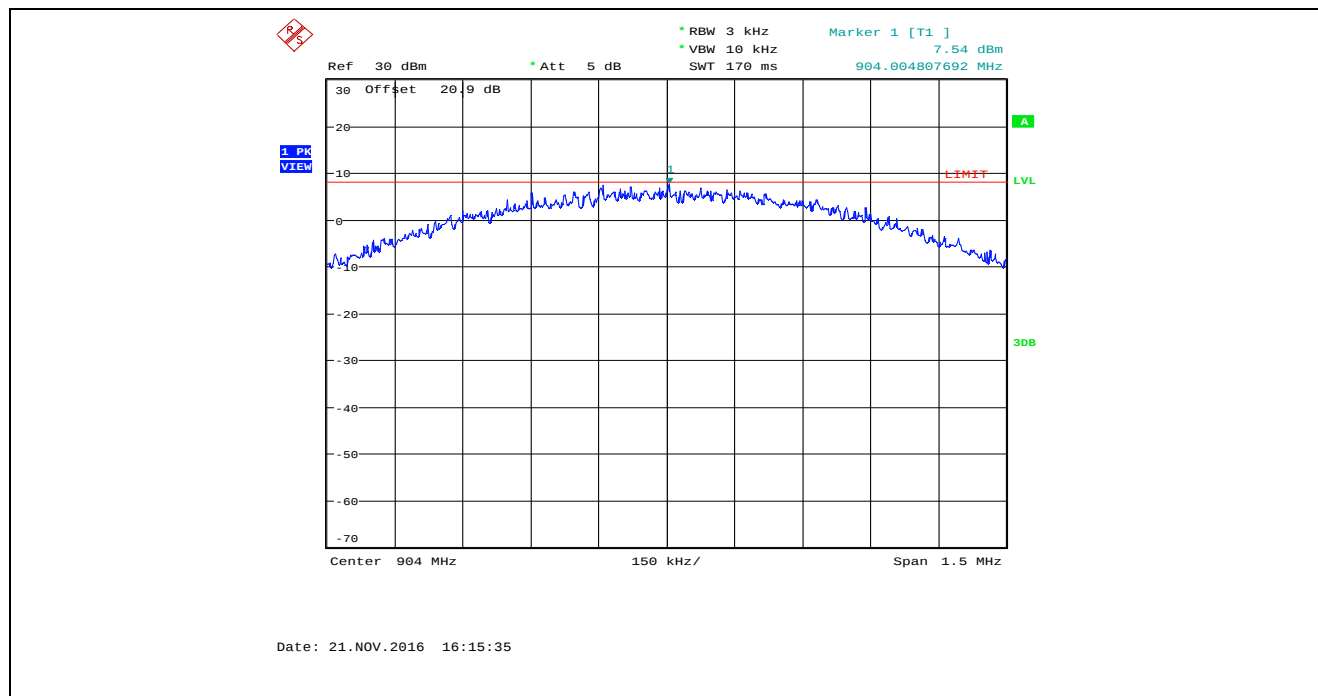
Plot 5.6.4.11. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 2, 915 MHz



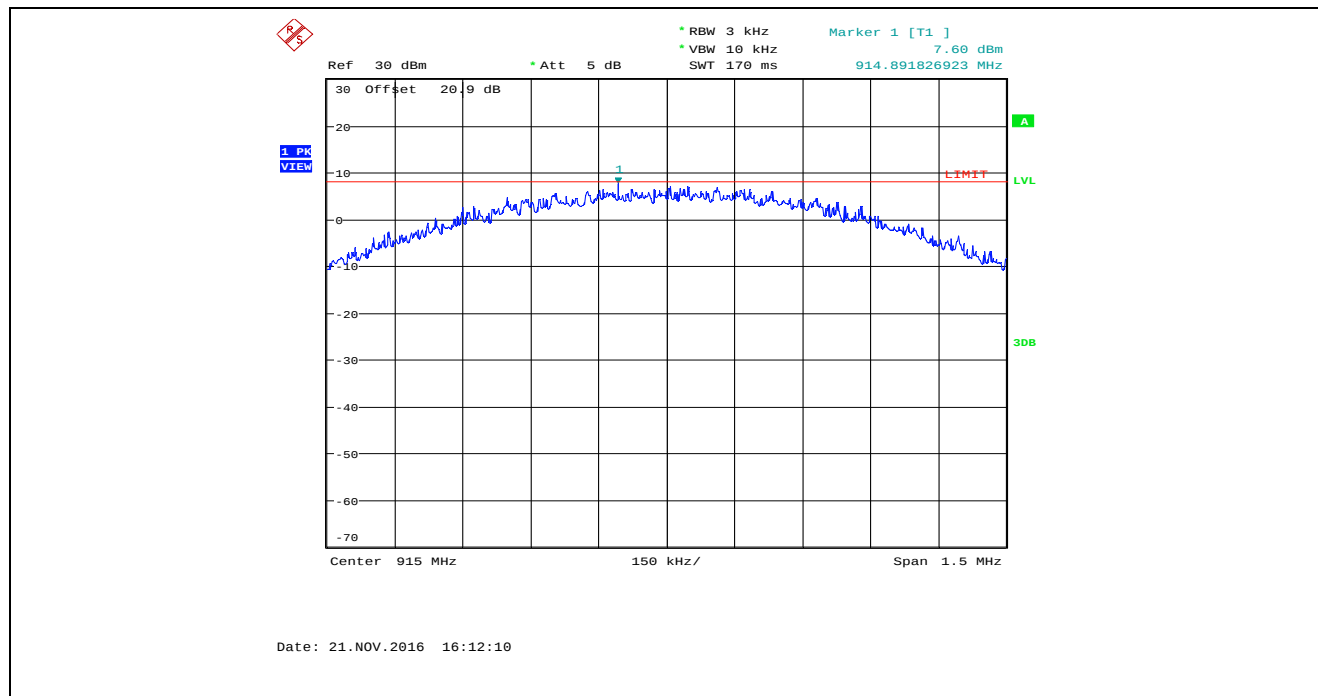
Plot 5.6.4.12. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 2, 926 MHz



Plot 5.6.4.13. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 3, 904 MHz



Plot 5.6.4.14. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 25, Data Rate 3, 915 MHz



Ref 30 dBm Att 5 dB RBW 3 kHz VBW 10 kHz SWT 170 ms Marker 1 [T1] 7.84 dBm 925.882211538 MHz

30 Offset 20.9 dB

1 PK VIEW

LIMIT LVL

30B

Center 926 MHz 150 kHz/ Span 1.5 MHz

Date: 21.NOV.2016 16:07:35

Ref 30 dBm Att 5 dB RBW 3 kHz VBW 10 kHz SWT 340 ms Marker 1 [T1] 7.74 dBm 905.024038462 MHz

30 Offset 20 dB

1 PK VIEW

IQM1T

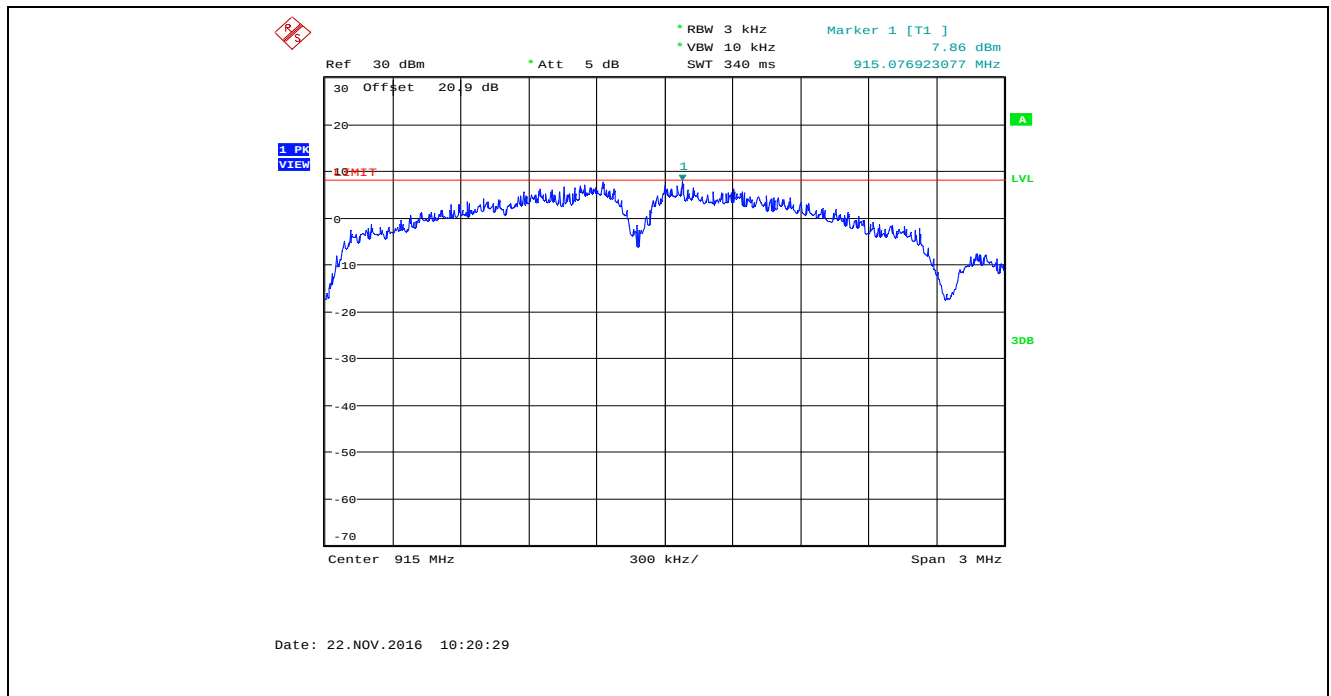
Marker 1 [T1]

30B

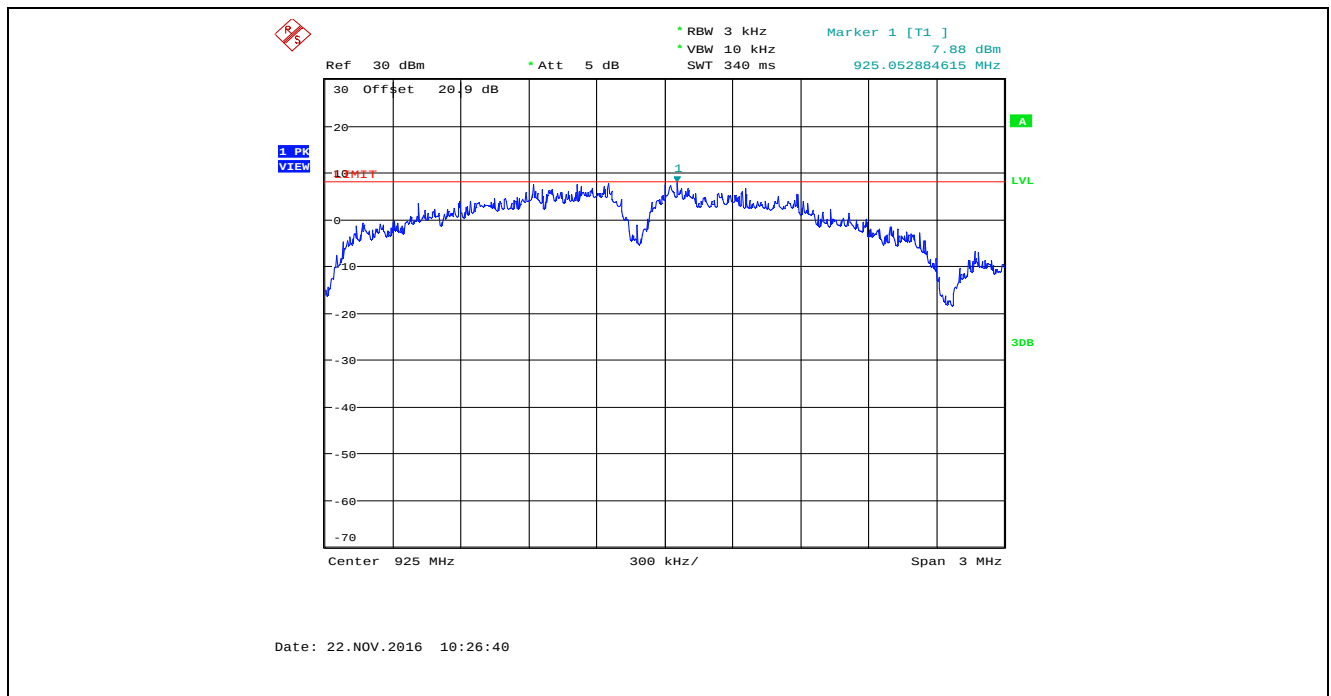
Center 905 MHz 300 kHz/ Span 3 MHz

Date: 22.NOV.2016 10:23:47

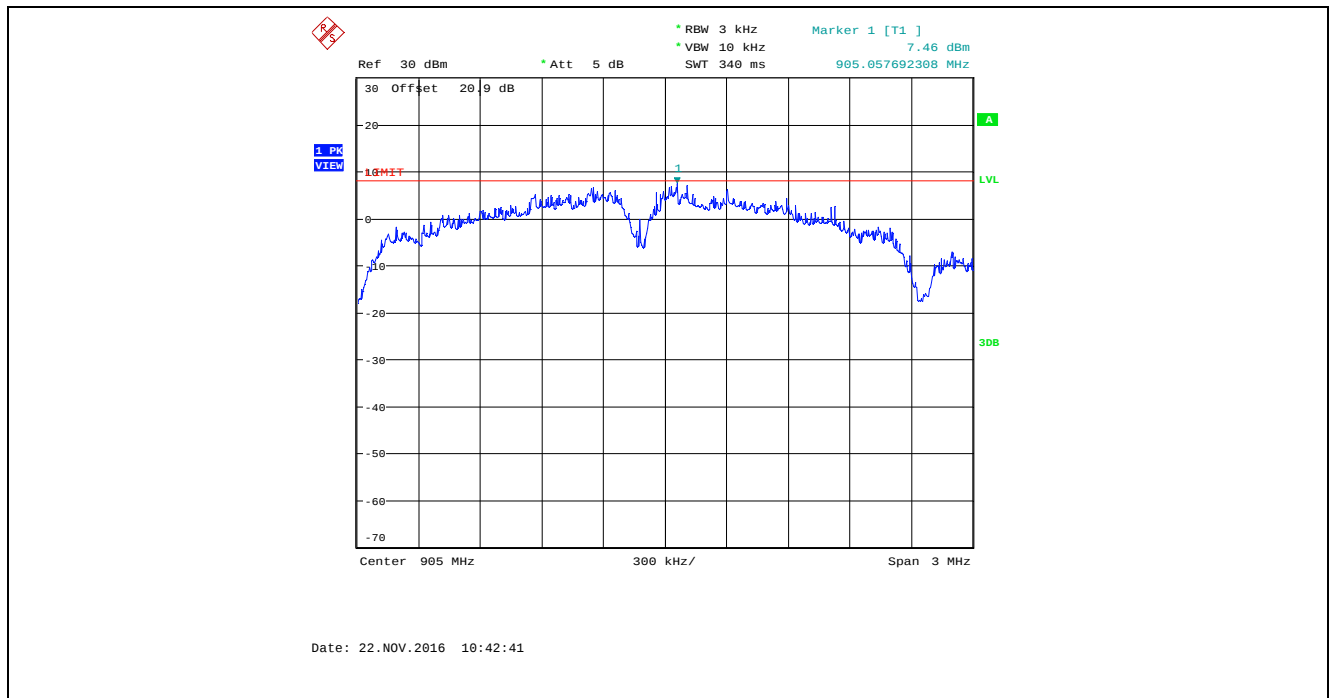
Plot 5.6.4.17. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 32, Data Rate 1, 915 MHz



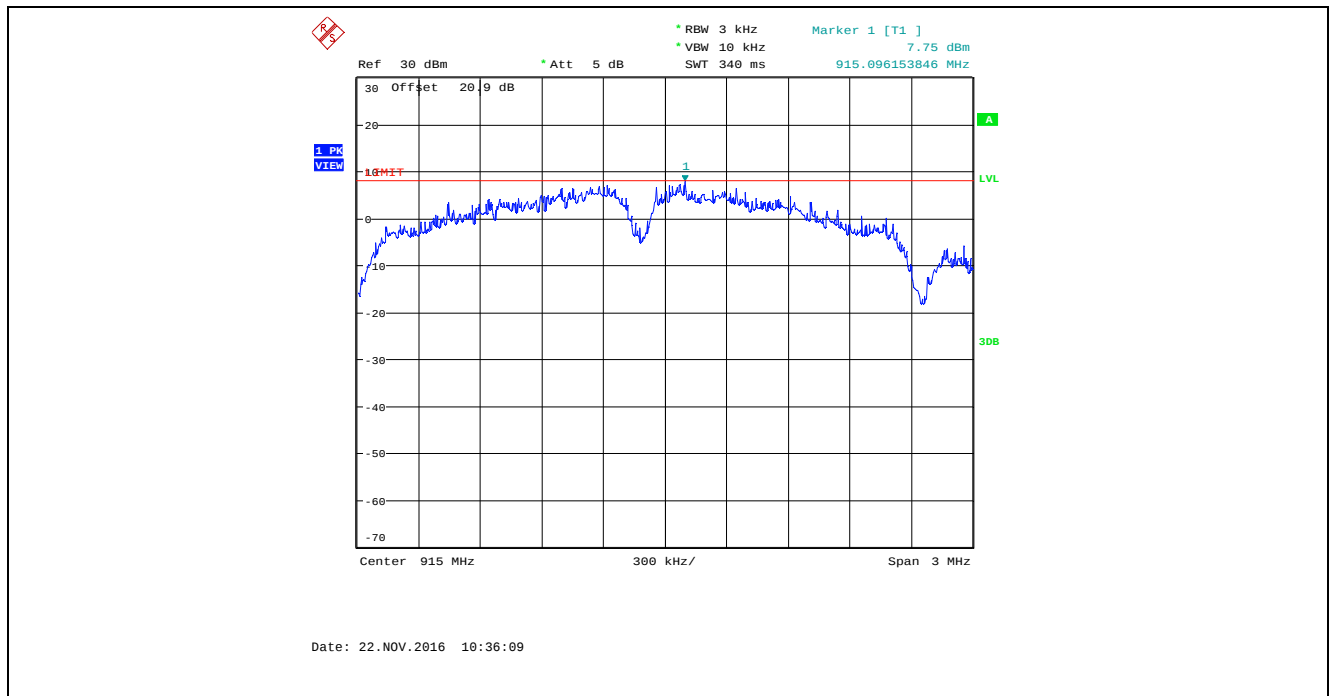
Plot 5.6.4.18. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 32, Data Rate 1, 925 MHz



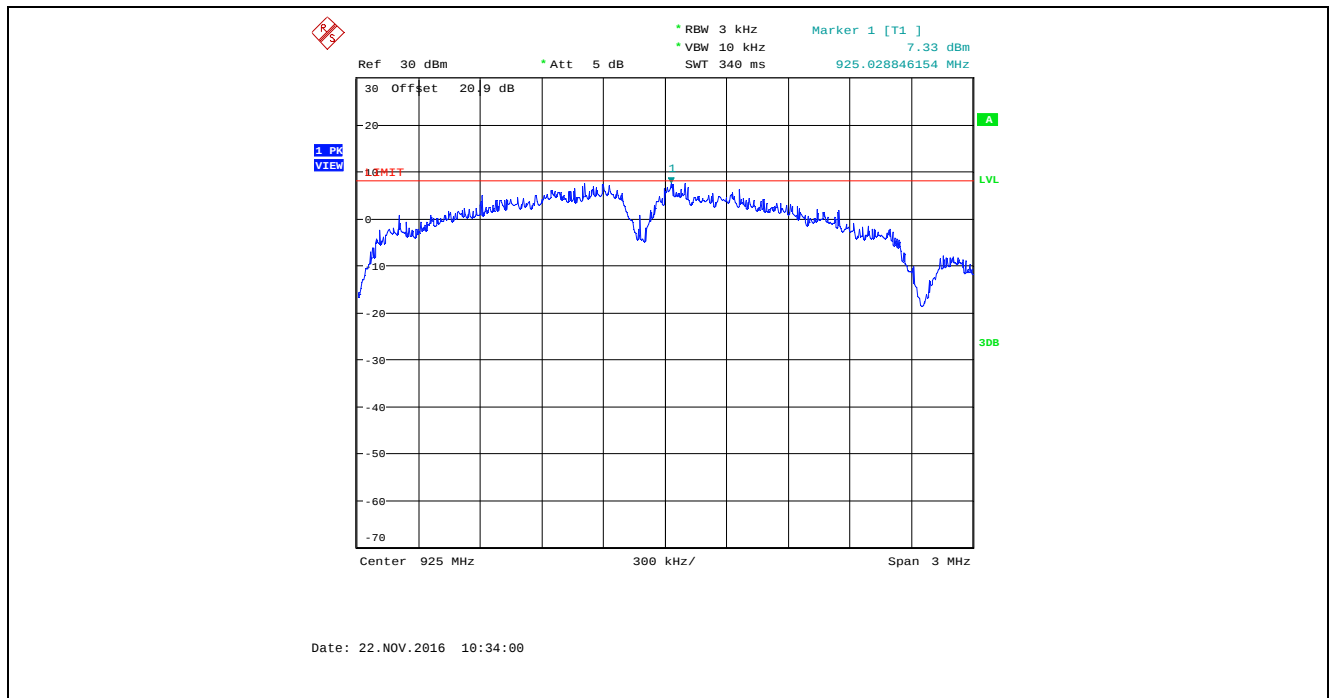
Plot 5.6.4.19. Power Spectral Density, Bandwidth:4 MHz, TX Gain Setting: 32, Data Rate 2, 905 MHz



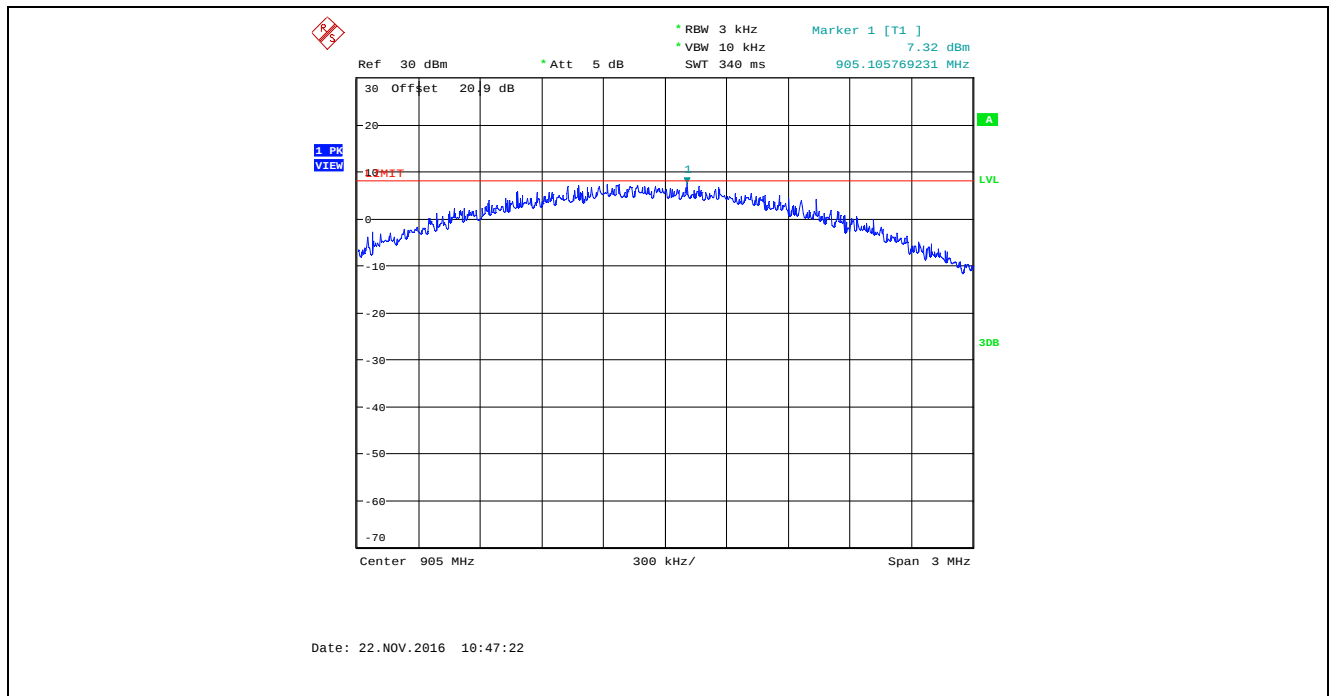
Plot 5.6.4.20. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 32, Data Rate 2, 915 MHz



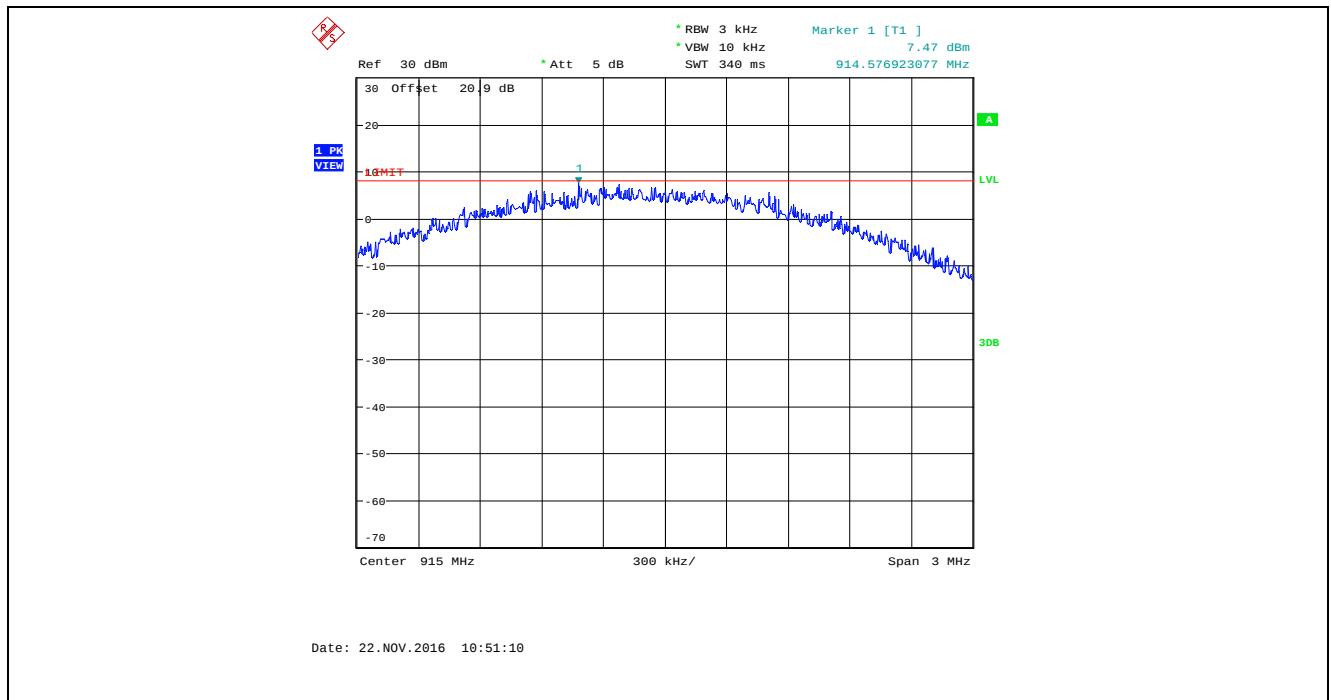
Plot 5.6.4.21. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 32, Data Rate 2, 925 MHz



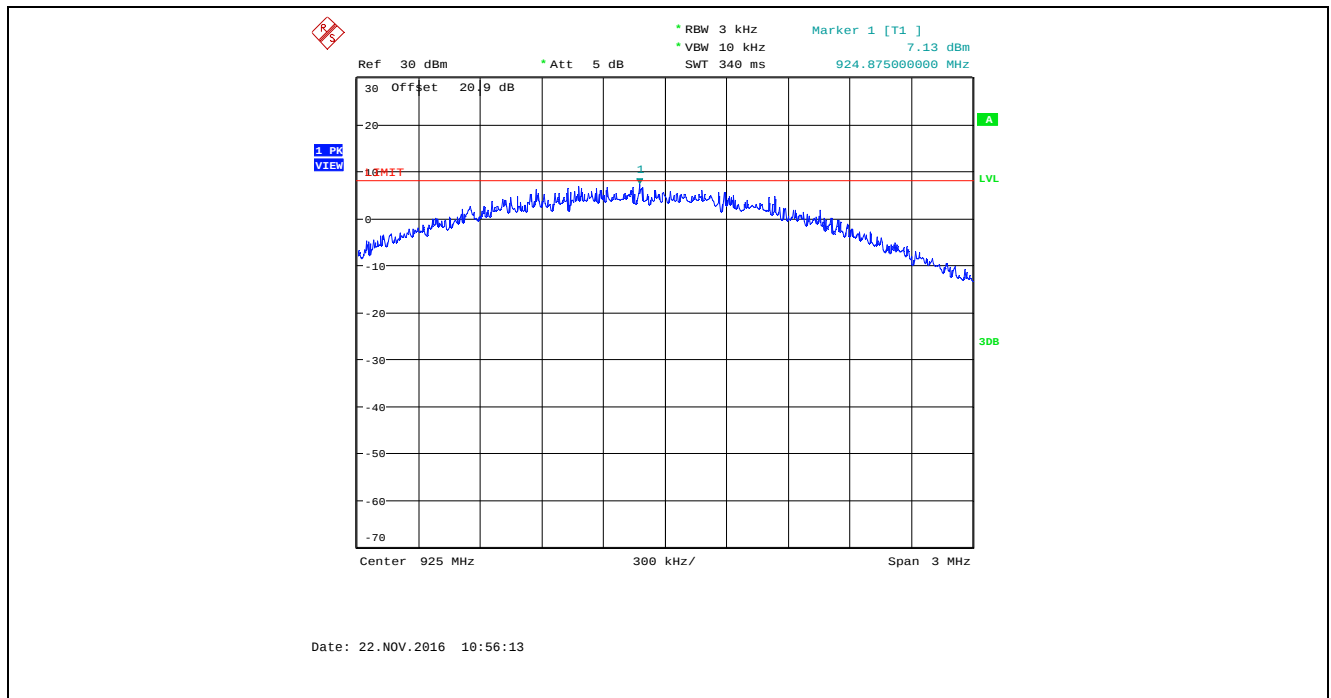
Plot 5.6.4.22. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 32, Data Rate 3, 905 MHz



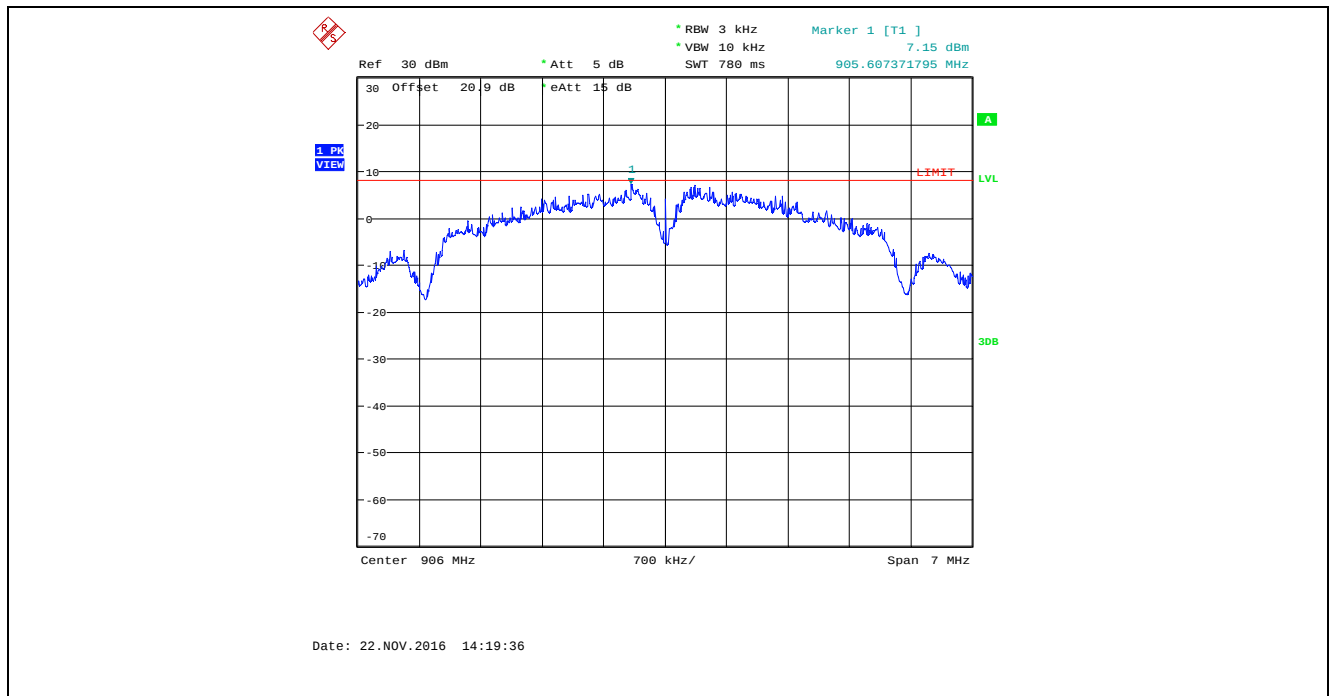
Plot 5.6.4.23. Power Spectral Density, Bandwidth:4 MHz, TX Gain Setting: 32, Data Rate 3, 915 MHz



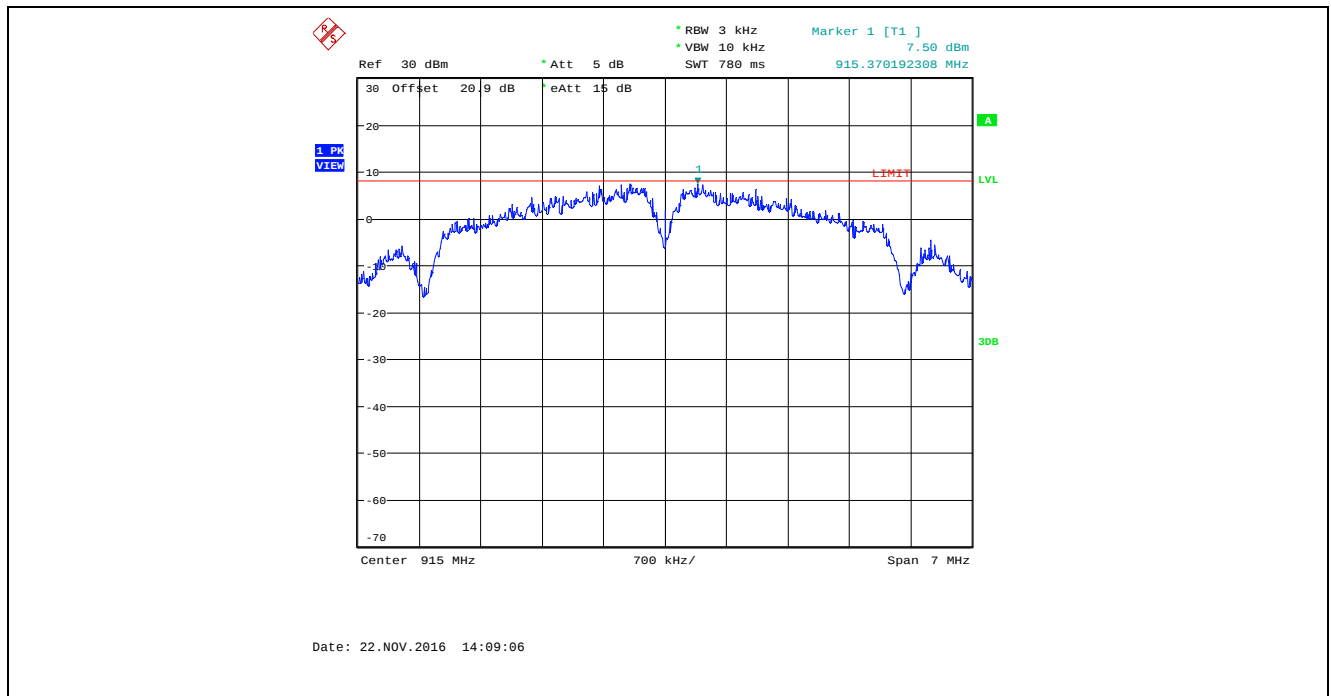
Plot 5.6.4.24. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 32, Data Rate 3, 925 MHz



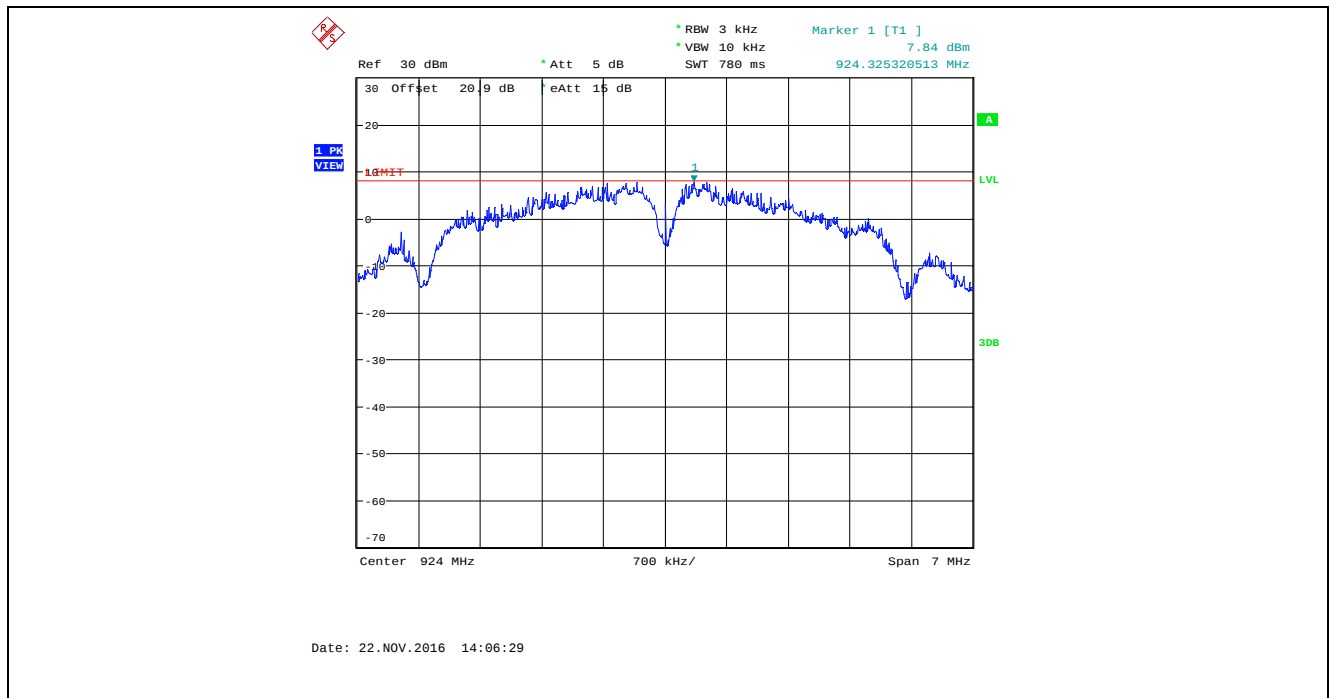
Plot 5.6.4.25. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 1, 906 MHz



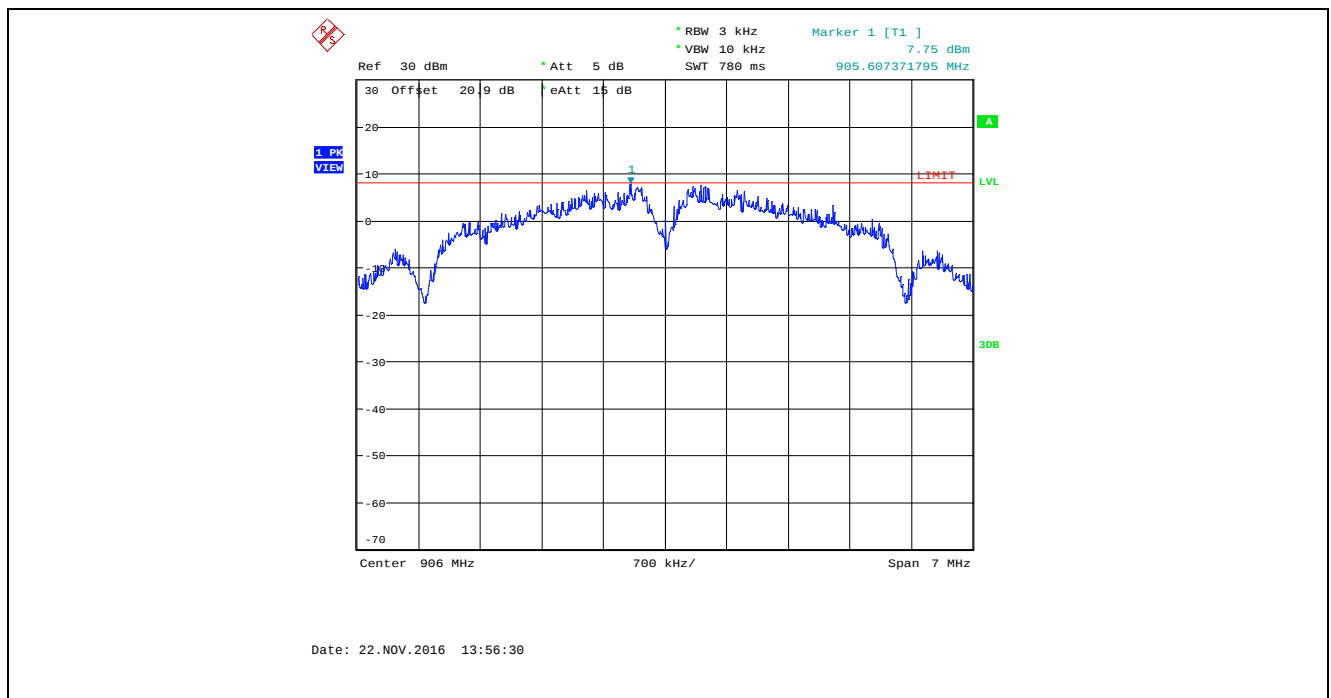
Plot 5.6.4.26. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 1, 915 MHz



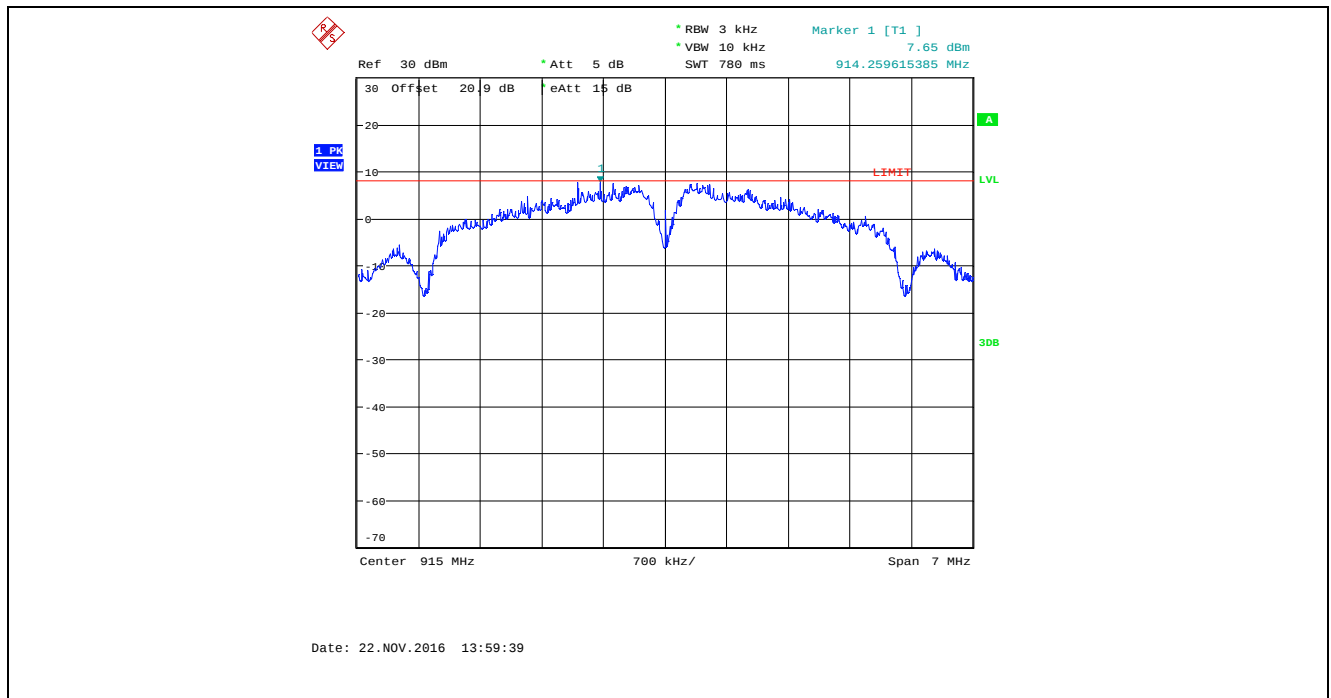
Plot 5.6.4.27. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 1, 924 MHz



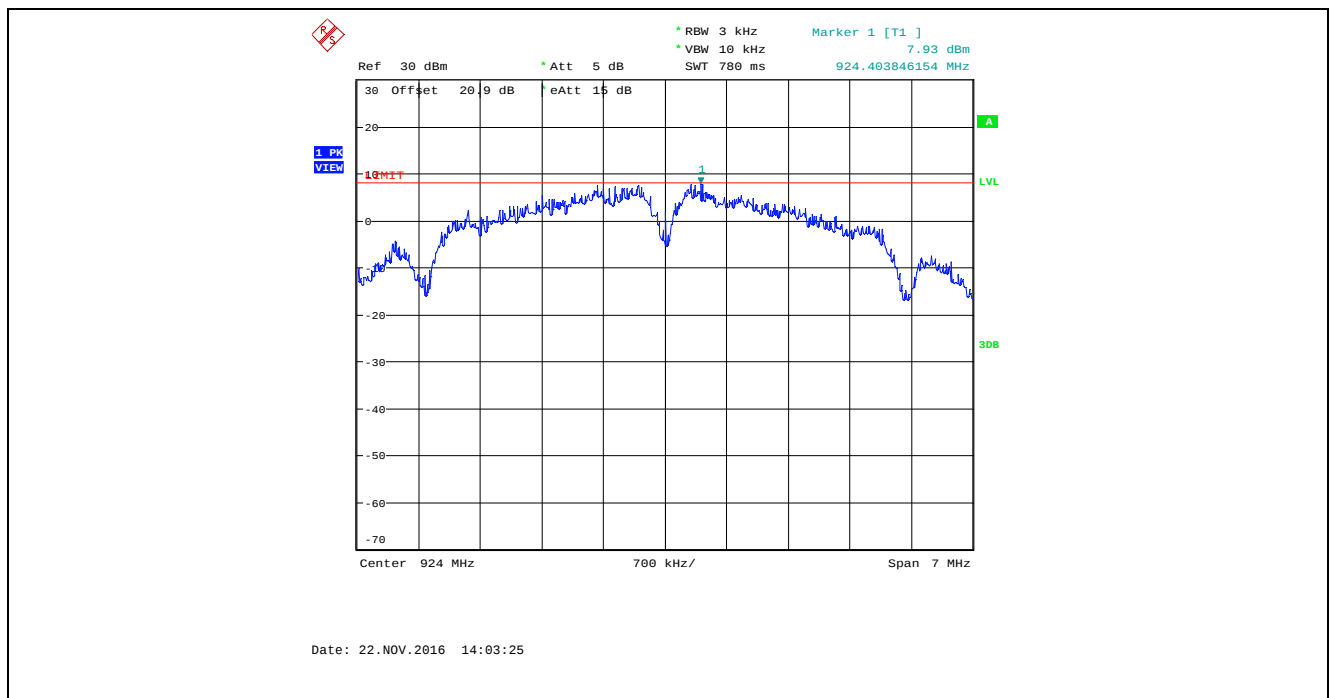
Plot 5.6.4.28. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 2, 906 MHz



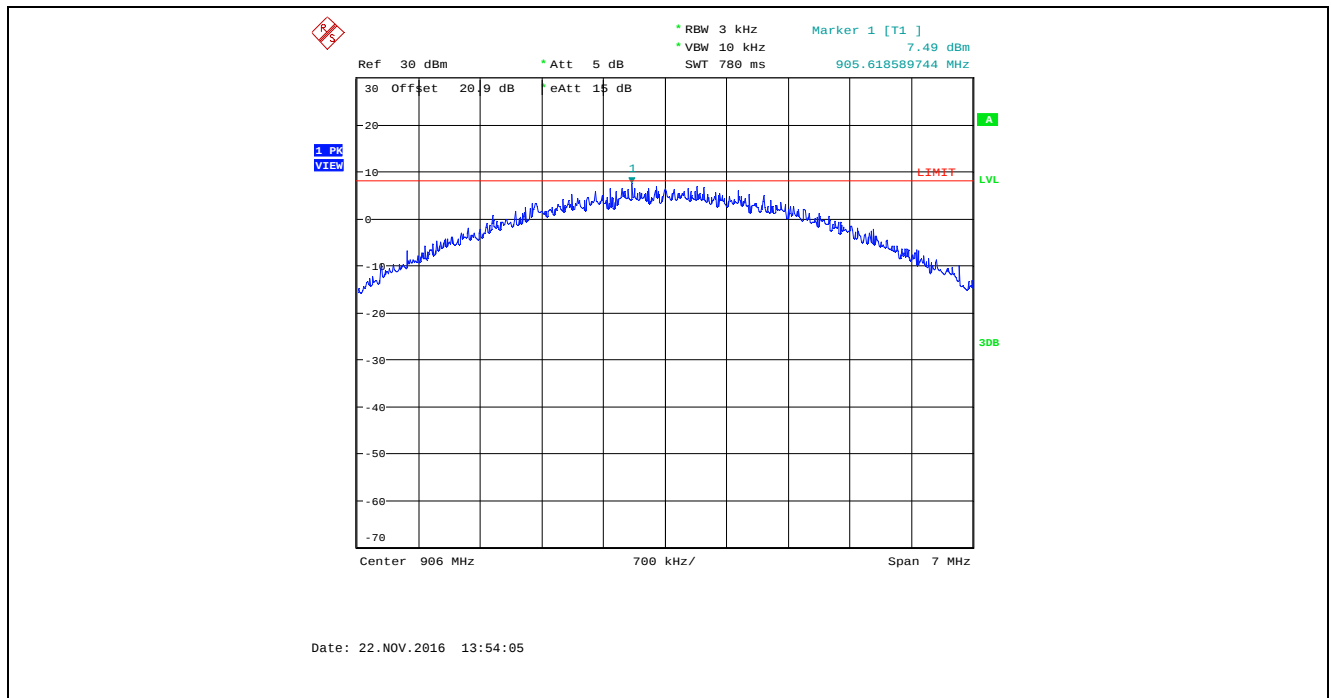
Plot 5.6.4.29. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 2, 915 MHz



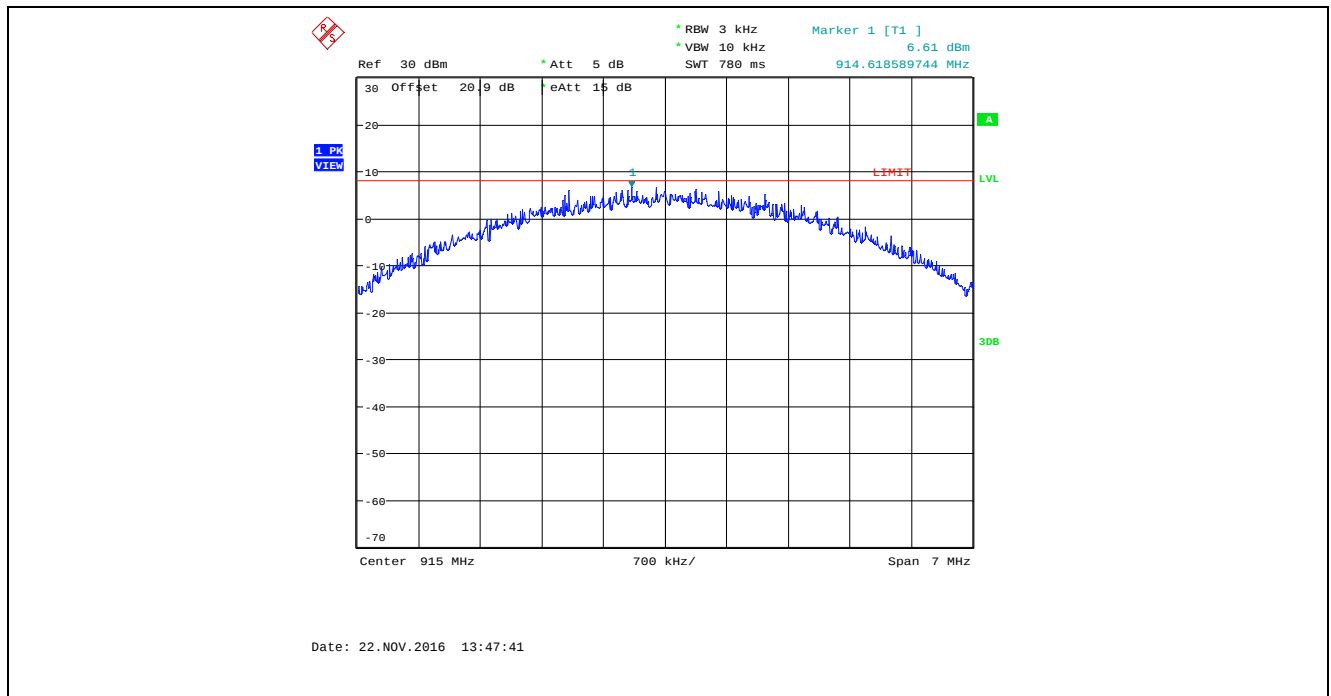
Plot 5.6.4.30. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 2, 924 MHz



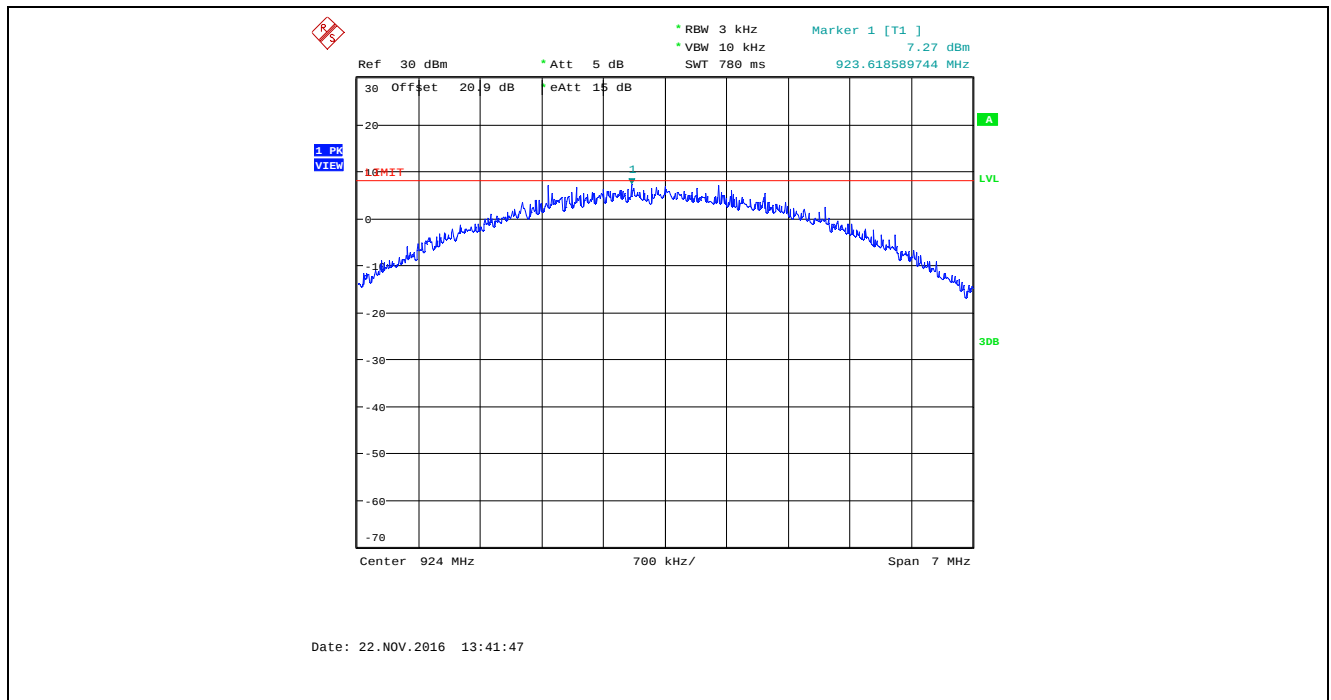
Plot 5.6.4.31. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 3, 906 MHz



Plot 5.6.4.32. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 3, 915 MHz



Plot 5.6.4.33. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 40, Data Rate 3, 924 MHz



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3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

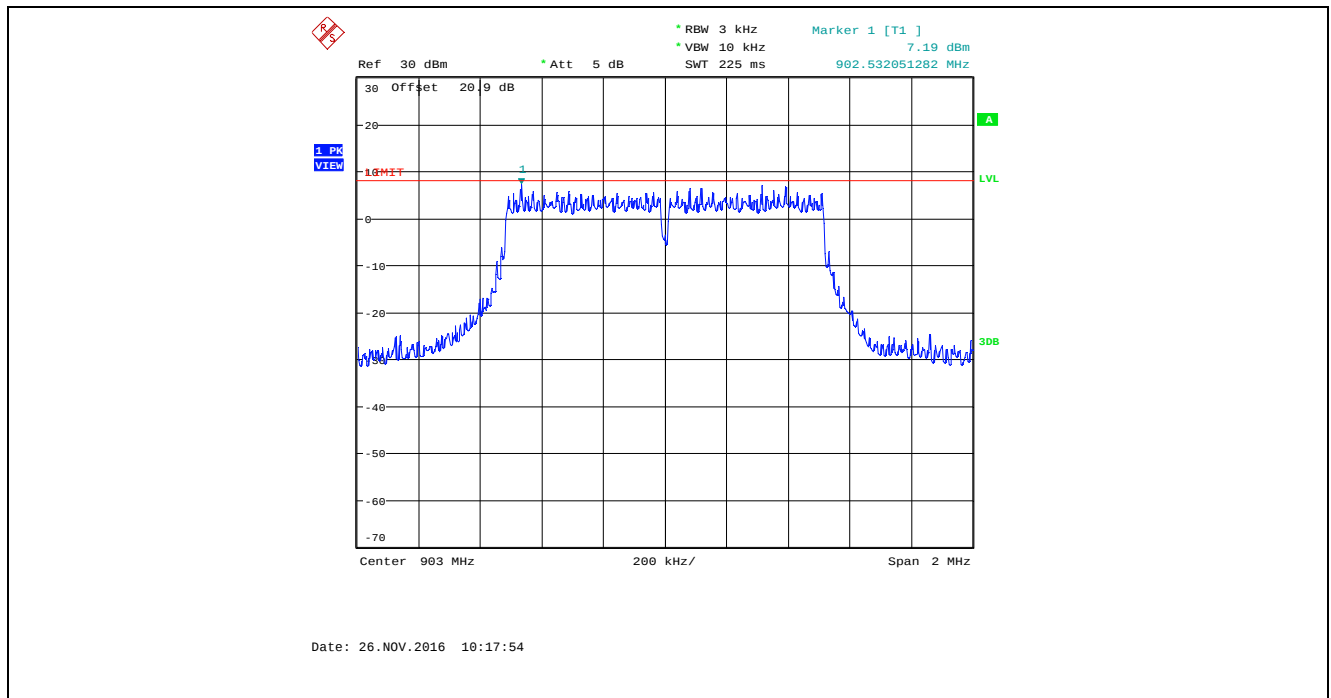
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

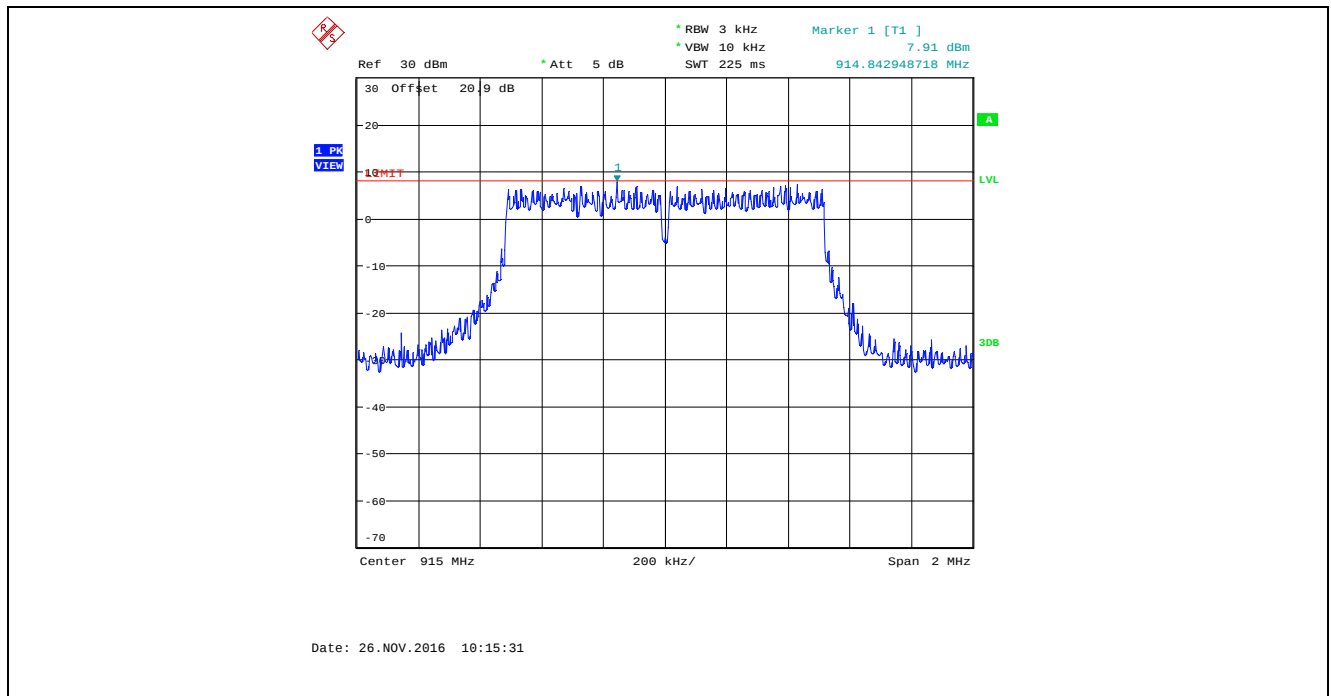
April 13, 2017

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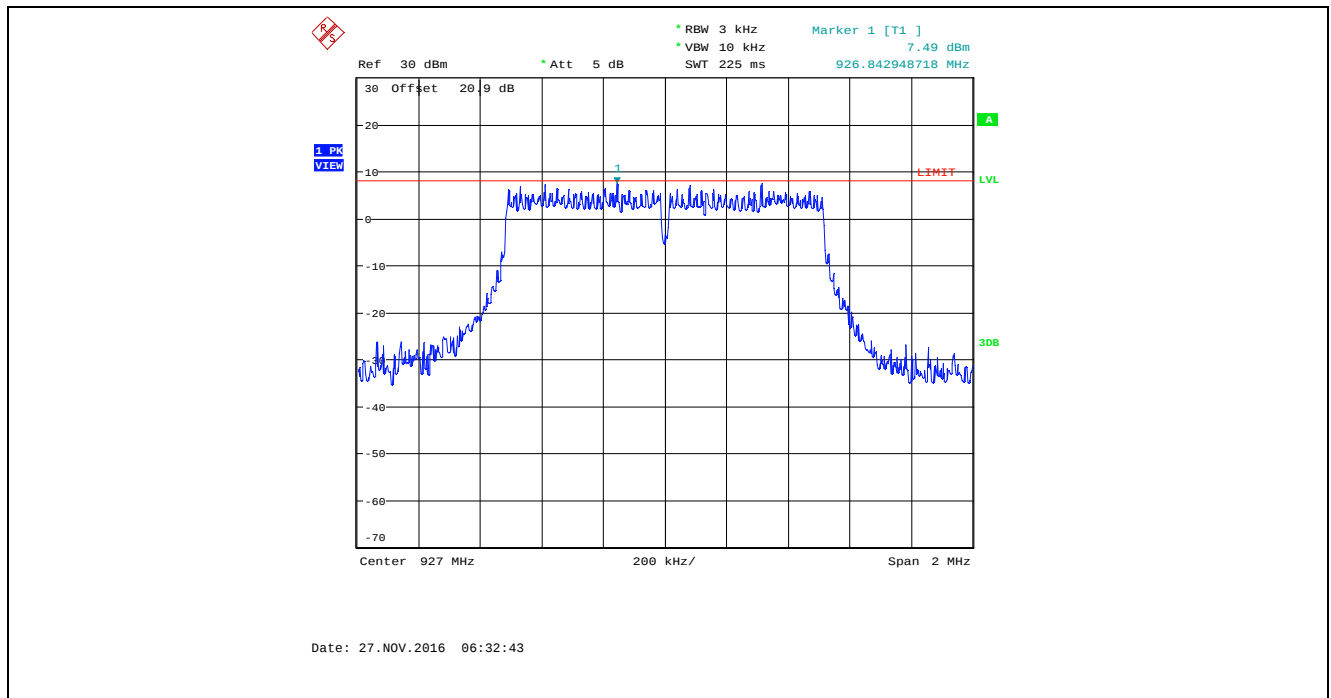
Plot 5.6.4.34. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 4, 903 MHz



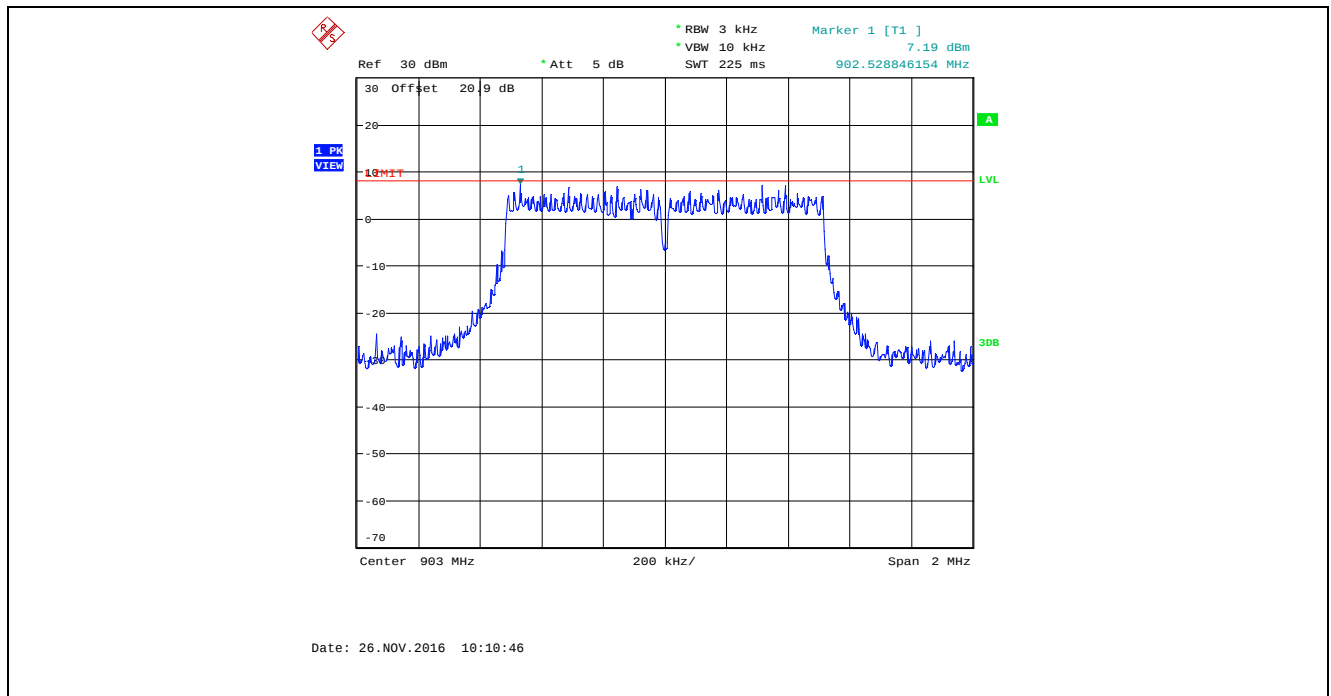
Plot 5.6.4.35. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 4, 915 MHz



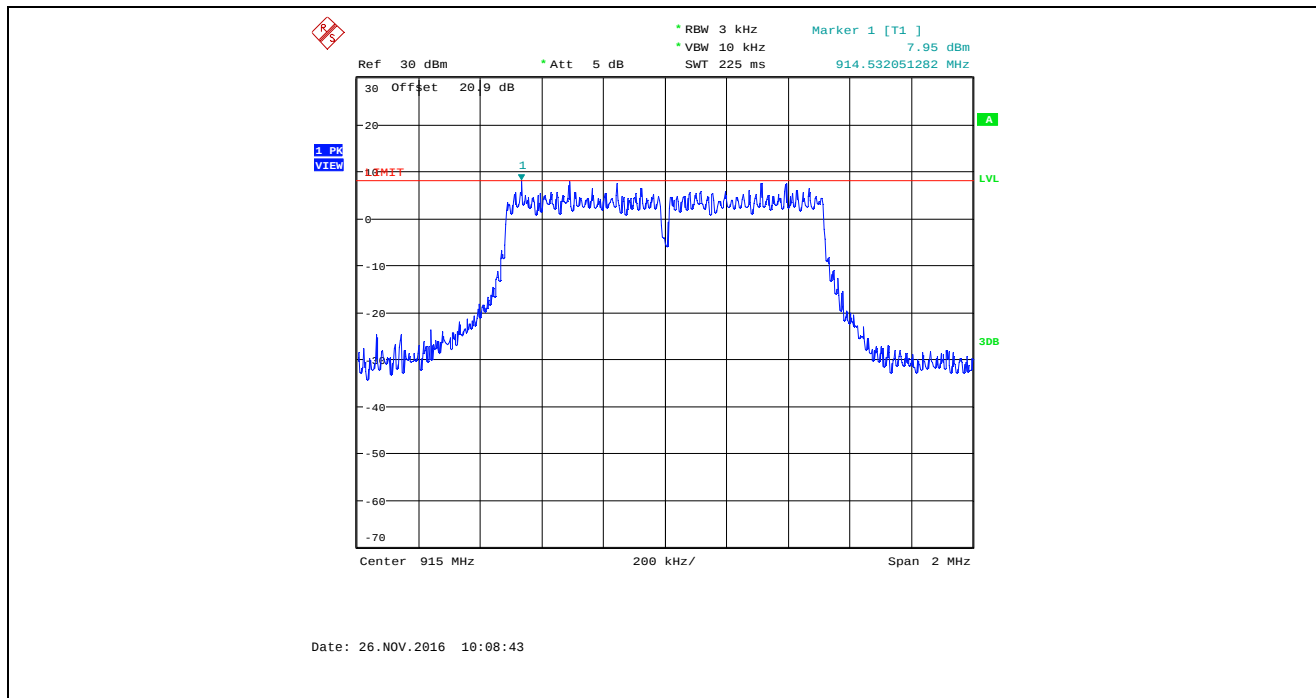
Plot 5.6.4.36. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 4, 927 MHz



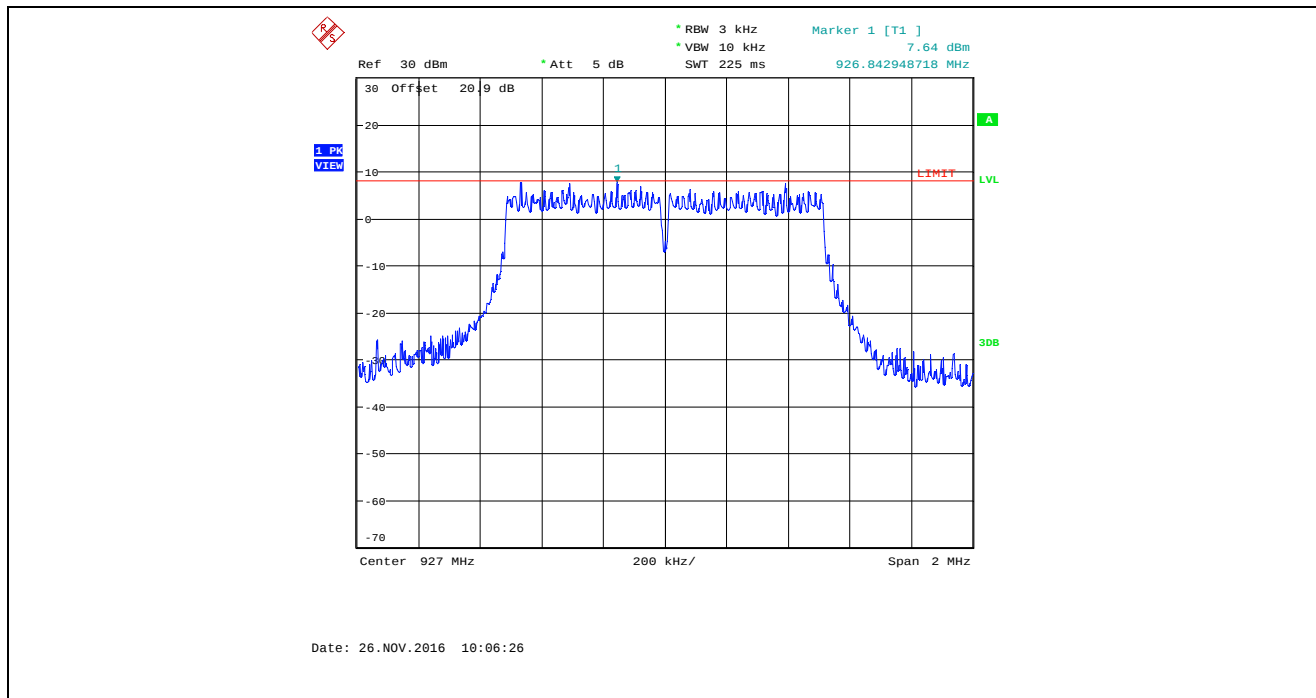
Plot 5.6.4.37. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 5, 903 MHz



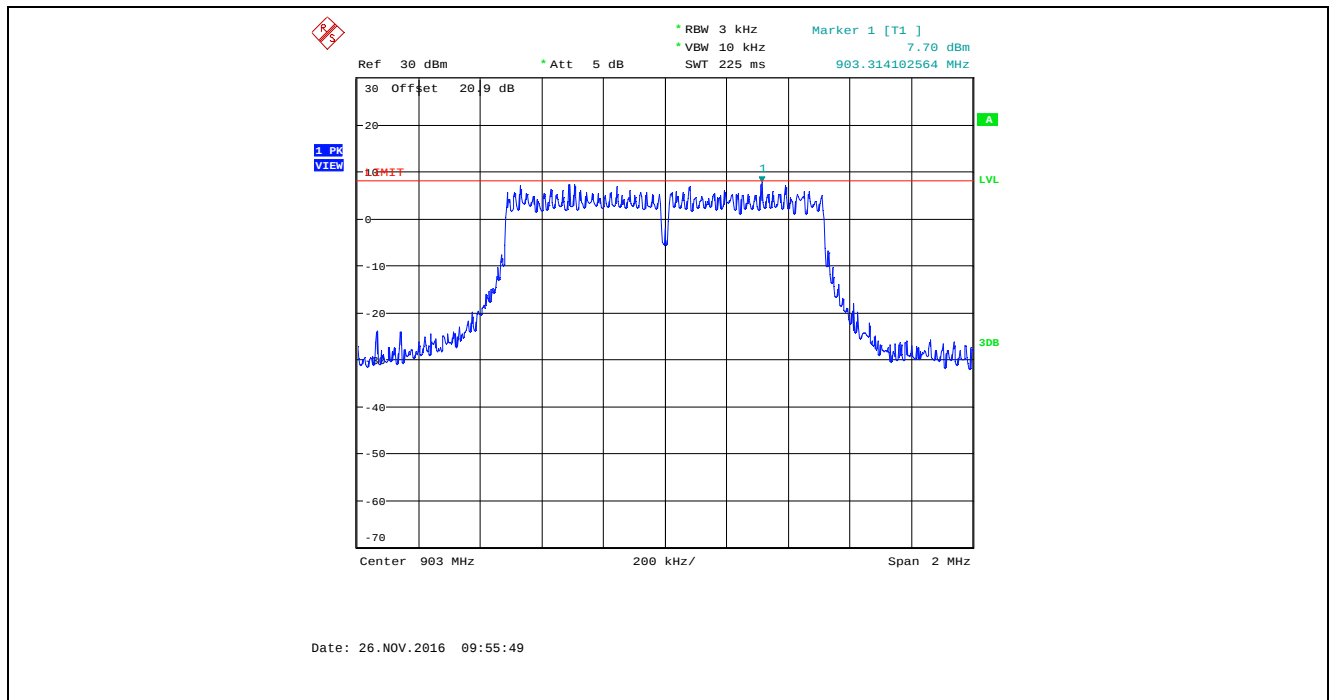
Plot 5.6.4.38. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 5, 915 MHz



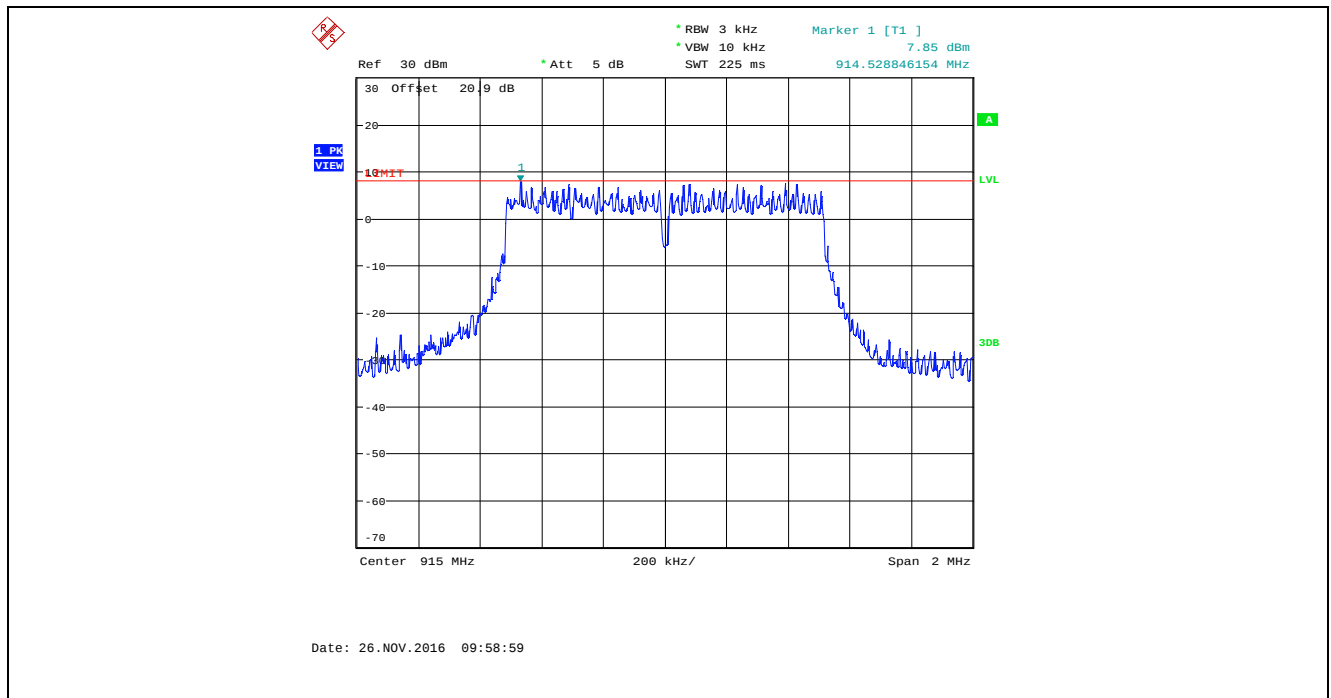
Plot 5.6.4.39. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 5, 927 MHz



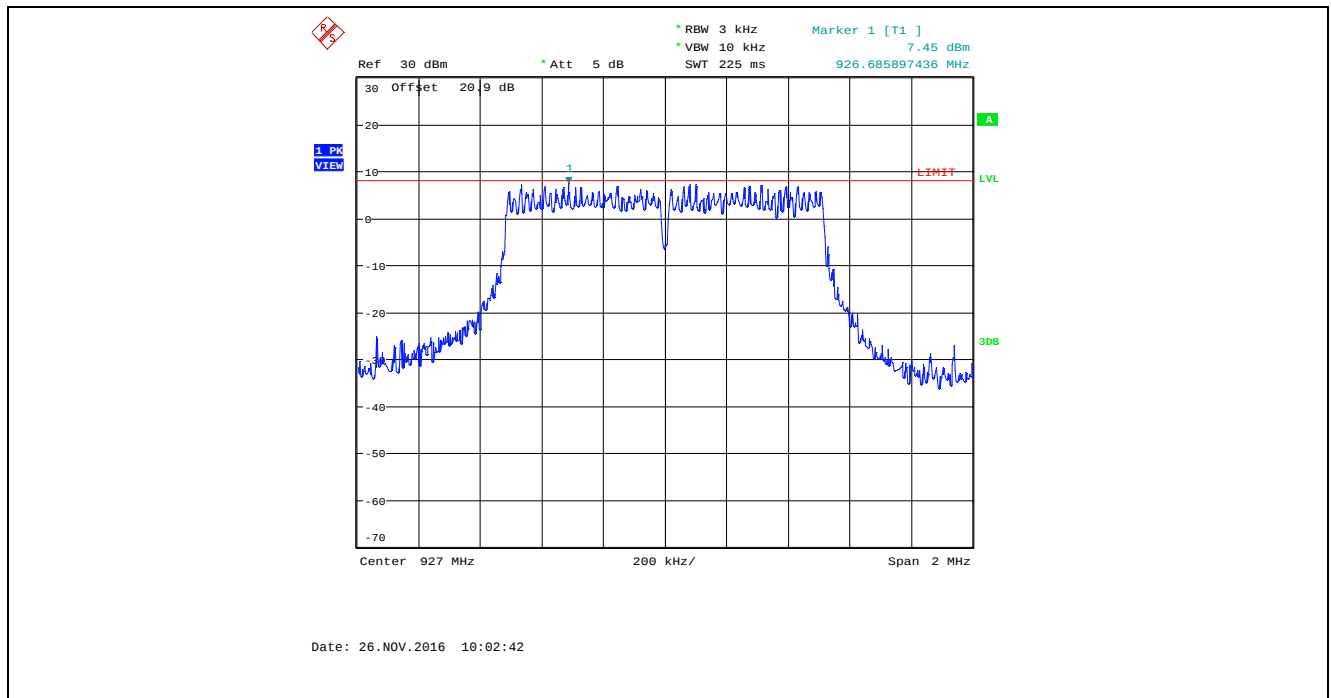
Plot 5.6.4.40. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 6, 903 MHz



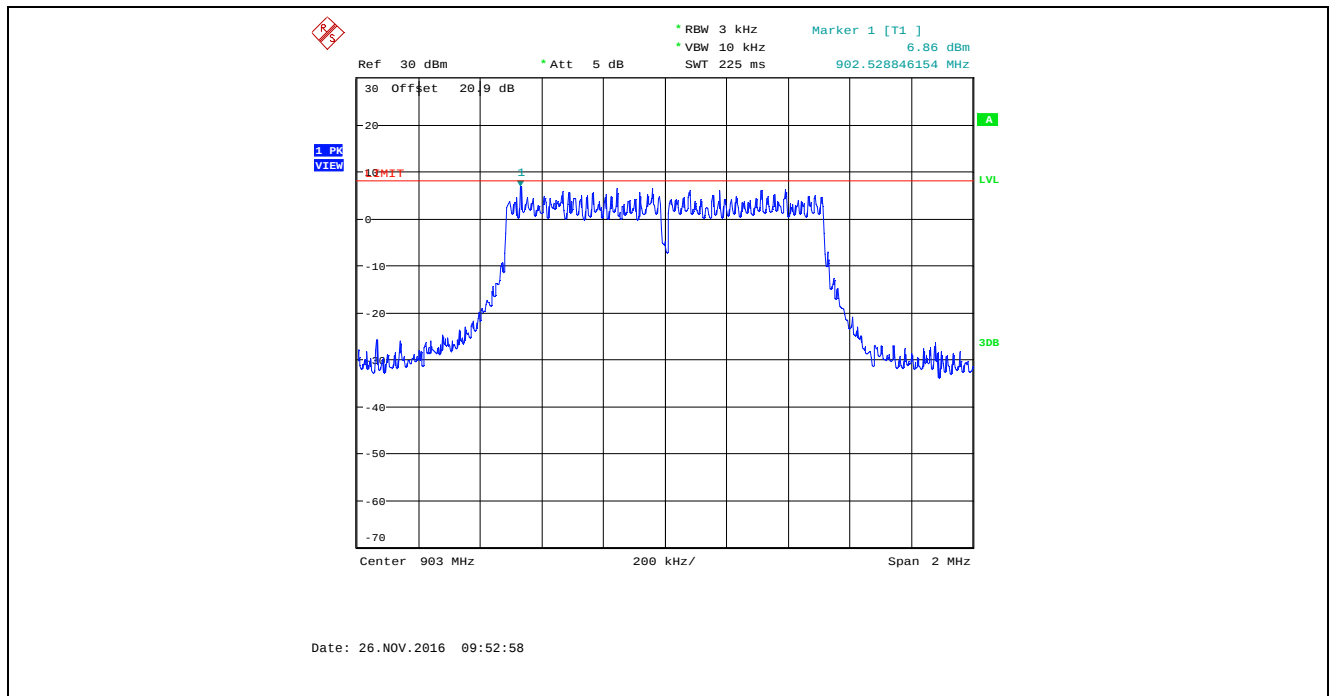
Plot 5.6.4.41. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 6, 915 MHz



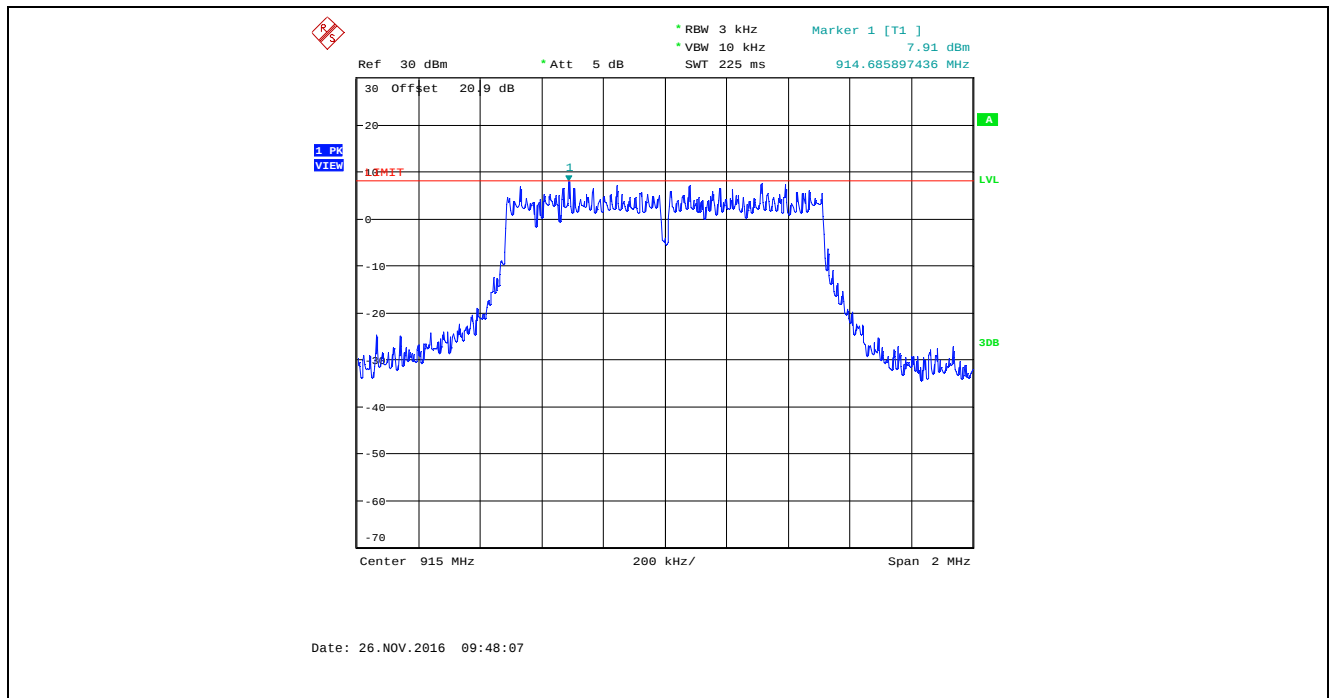
Plot 5.6.4.42. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 6, 927 MHz



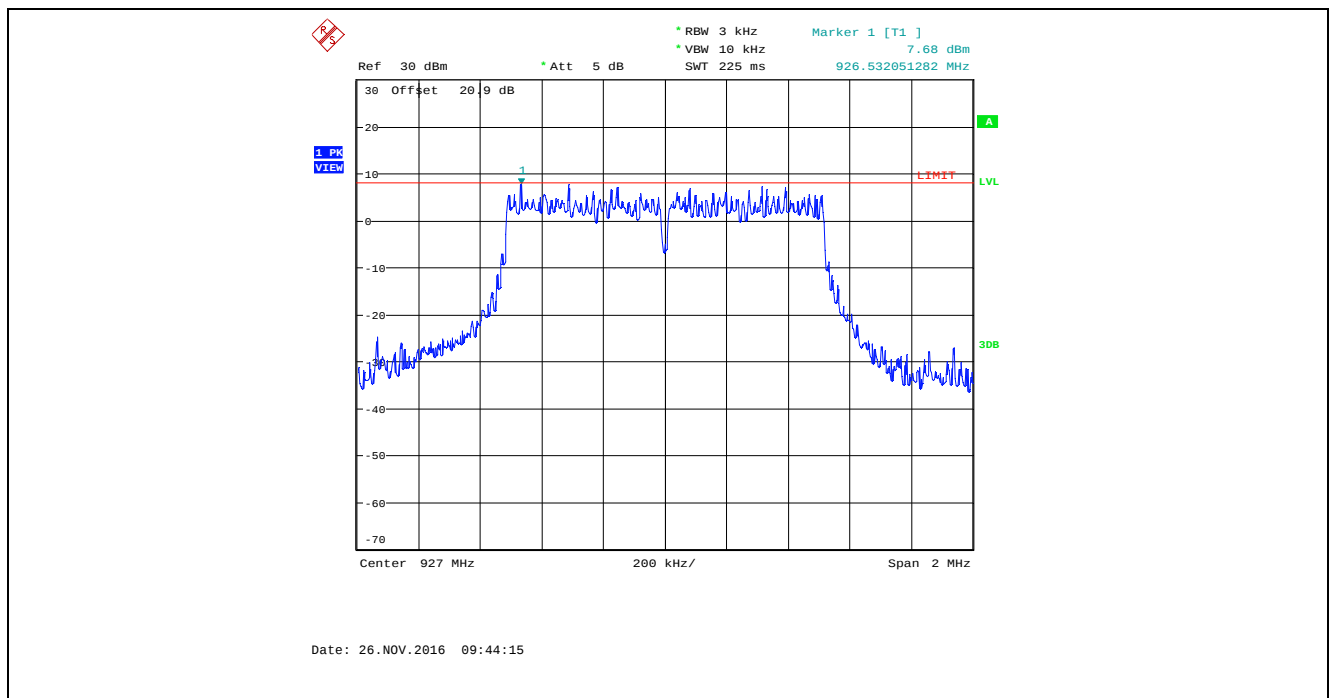
Plot 5.6.4.43. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 7, 903 MHz



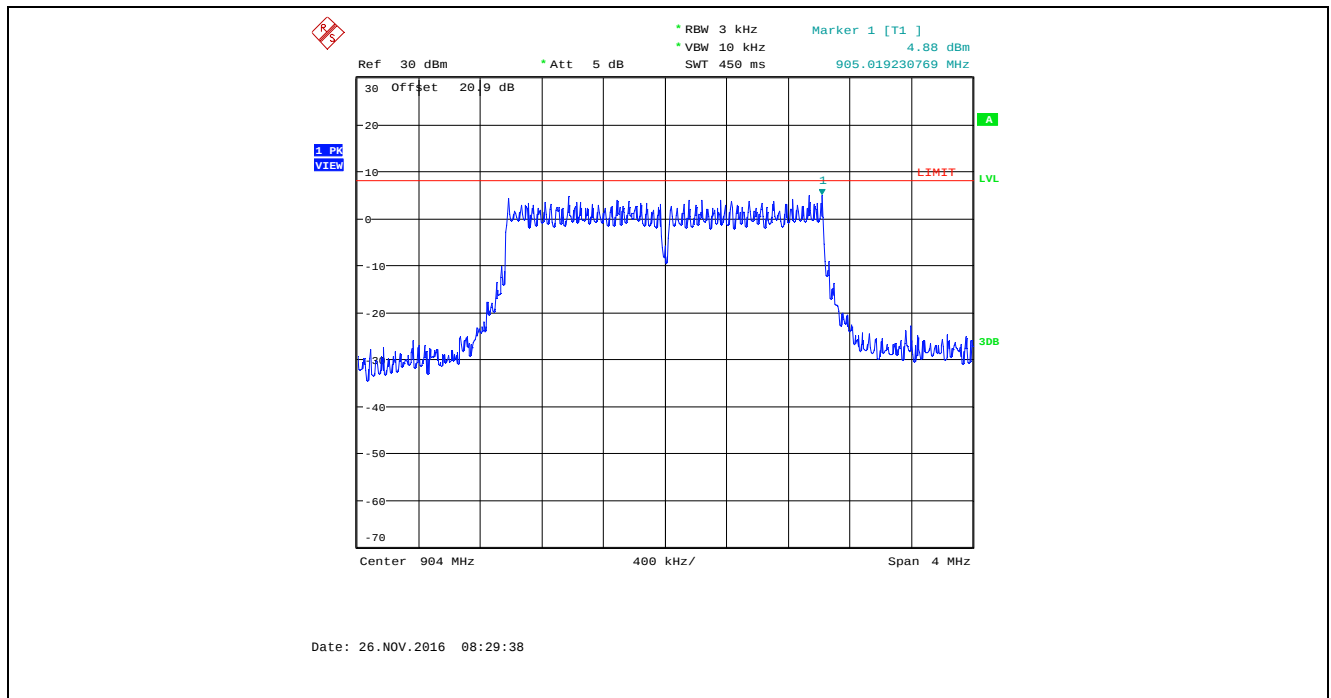
Plot 5.6.4.44. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 7, 915 MHz



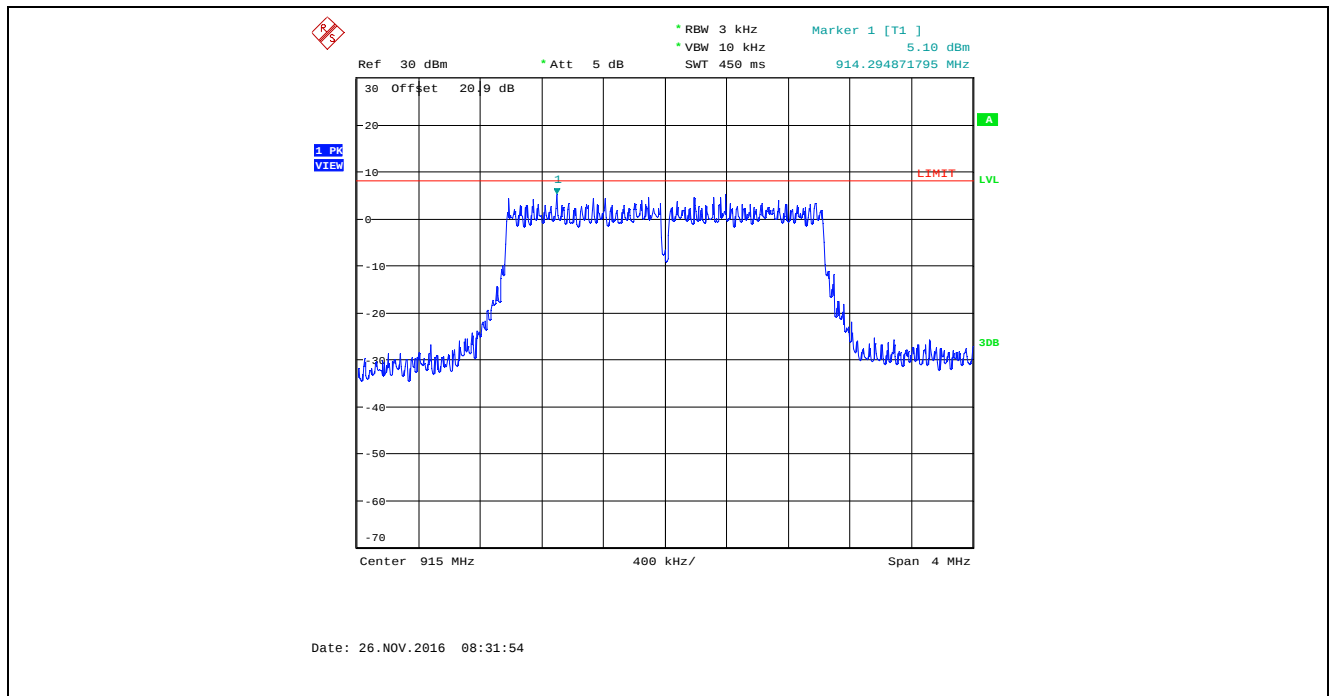
Plot 5.6.4.45. Power Spectral Density, Bandwidth: 1 MHz, TX Gain Setting: 36, Data Rate 7, 927 MHz



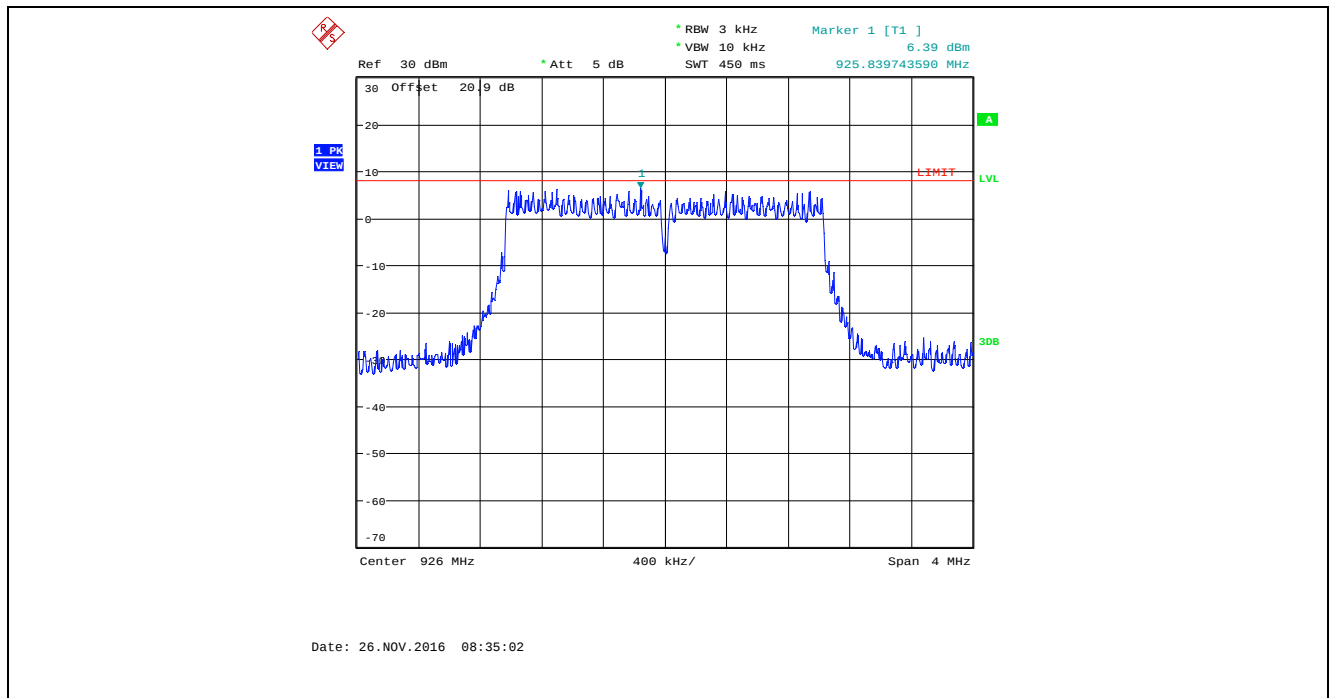
Plot 5.6.4.46. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 4, 904 MHz



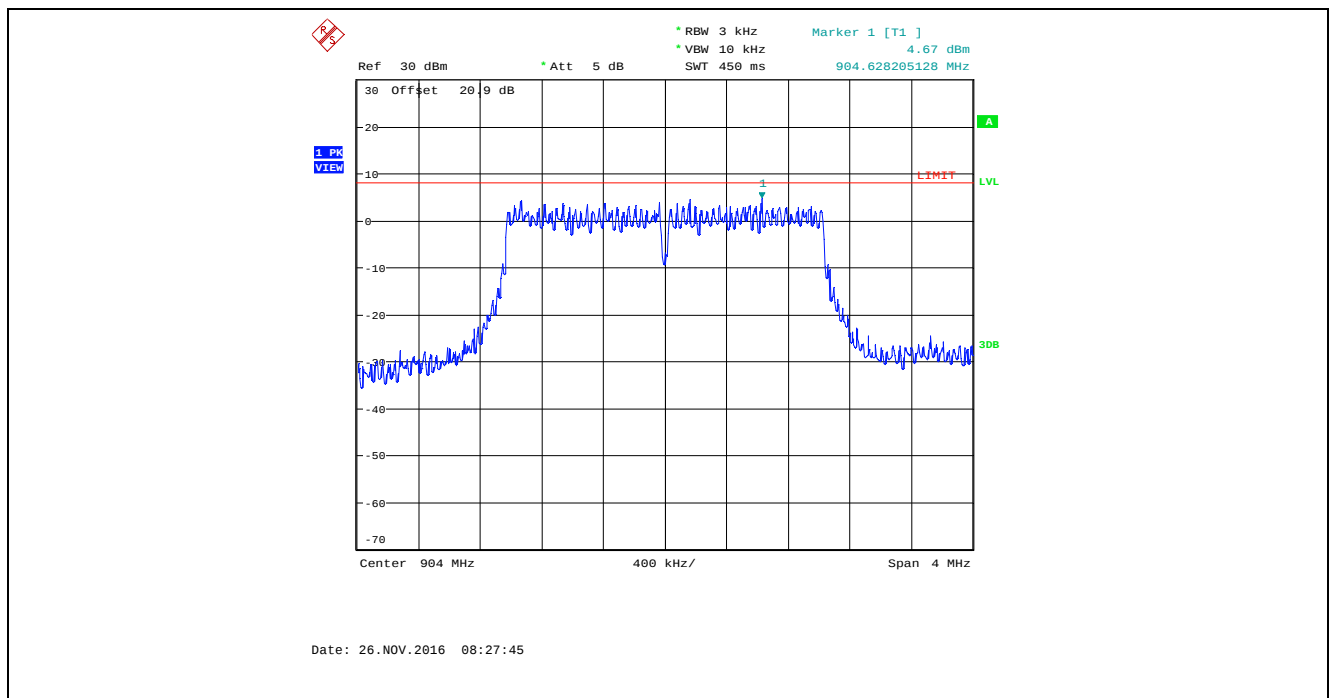
Plot 5.6.4.47. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 4, 915 MHz



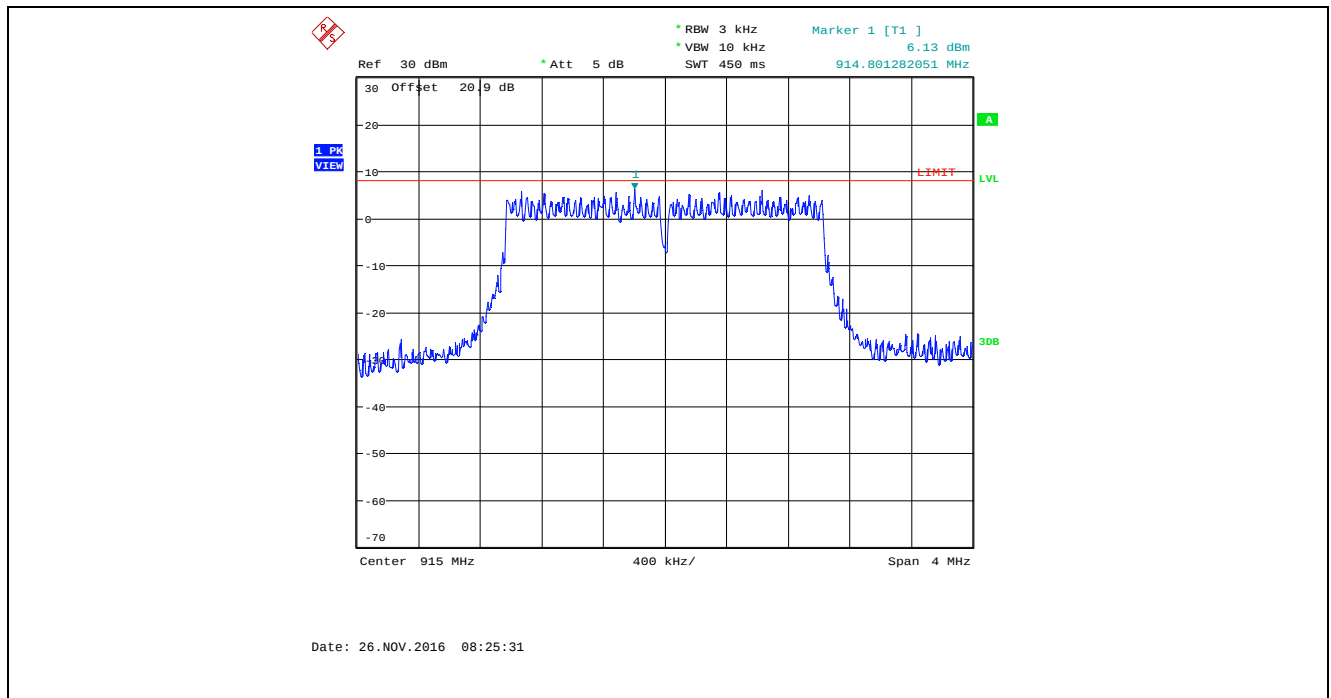
Plot 5.6.4.48. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 4, 926 MHz



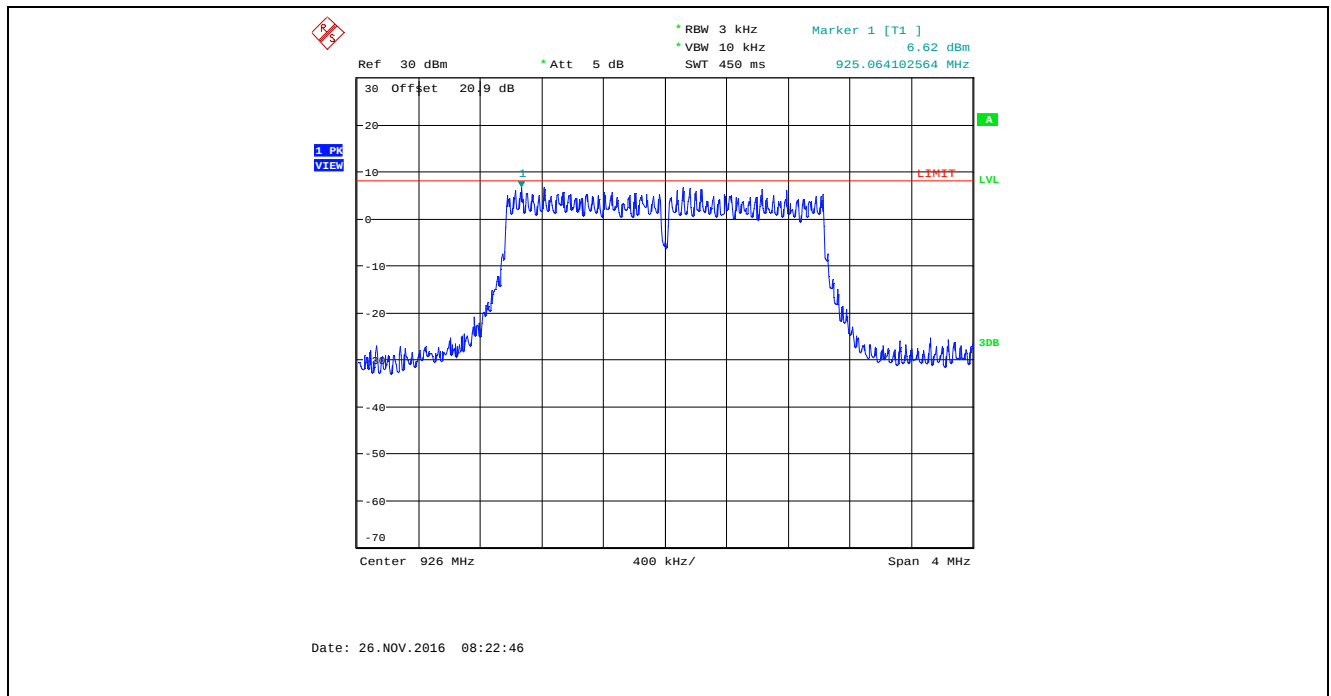
Plot 5.6.4.49. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 5, 904 MHz



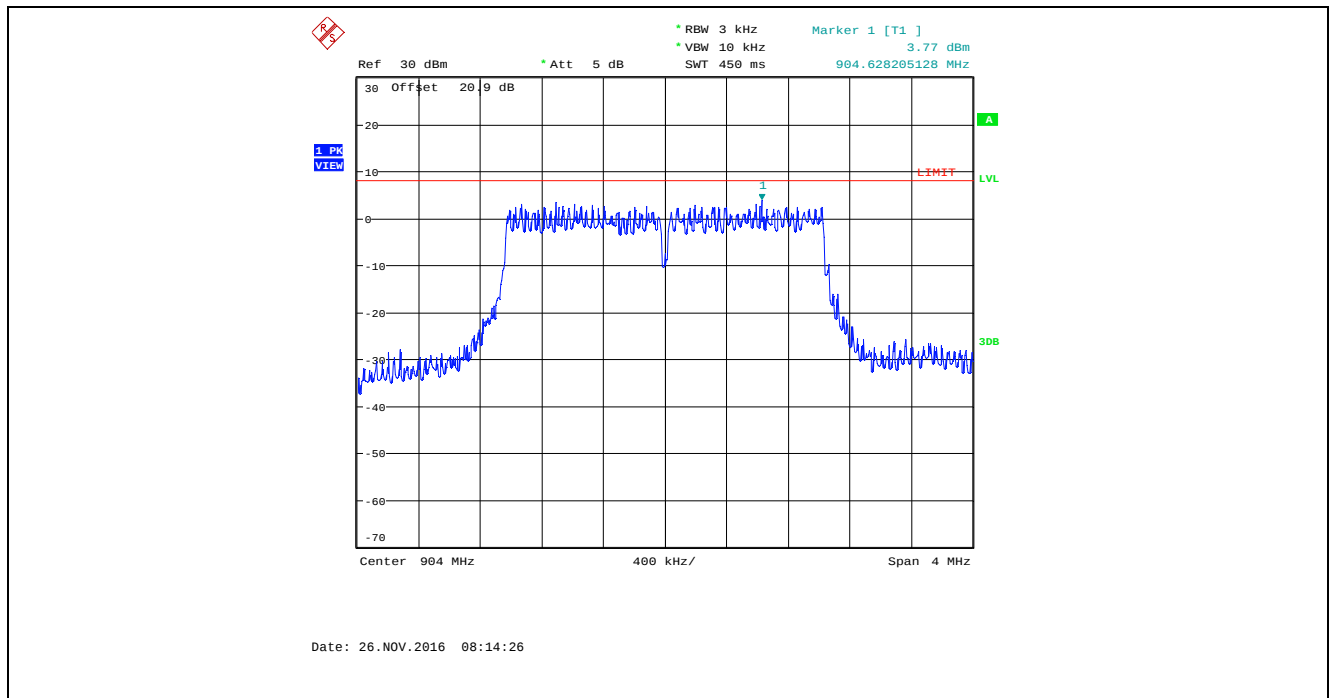
Plot 5.6.4.50. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 5, 915 MHz



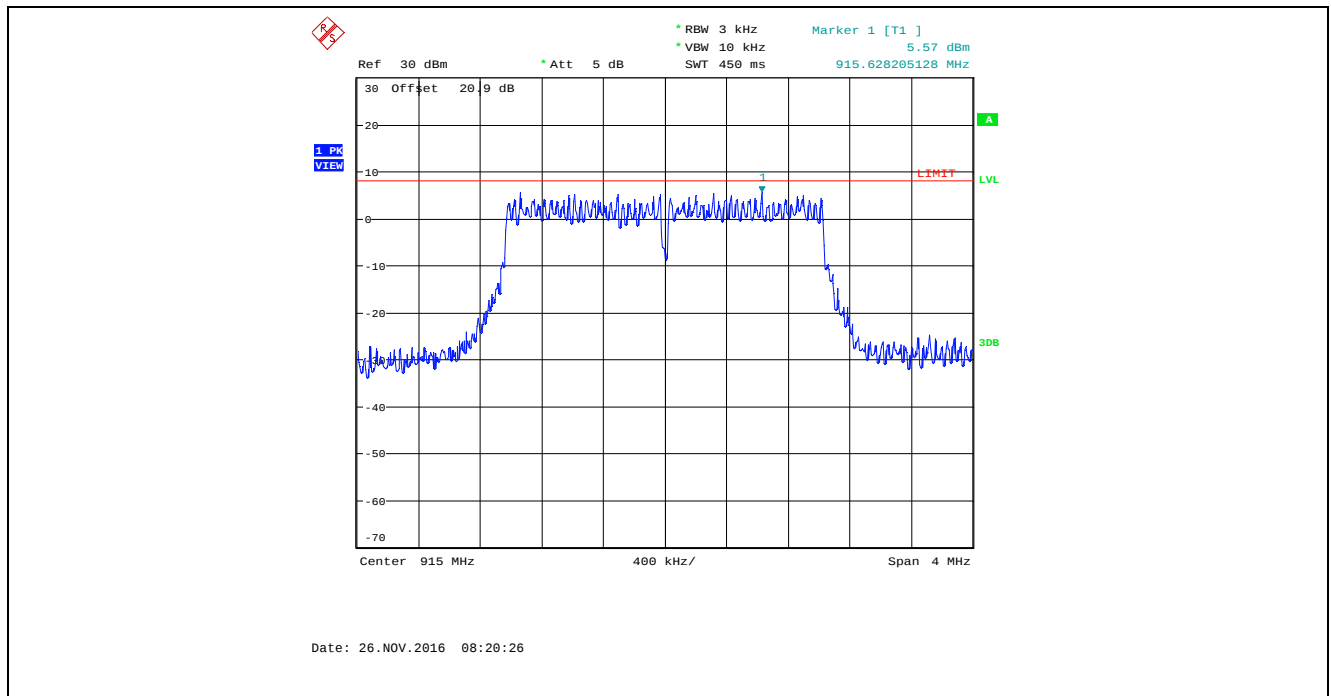
Plot 5.6.4.51. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 5, 926 MHz



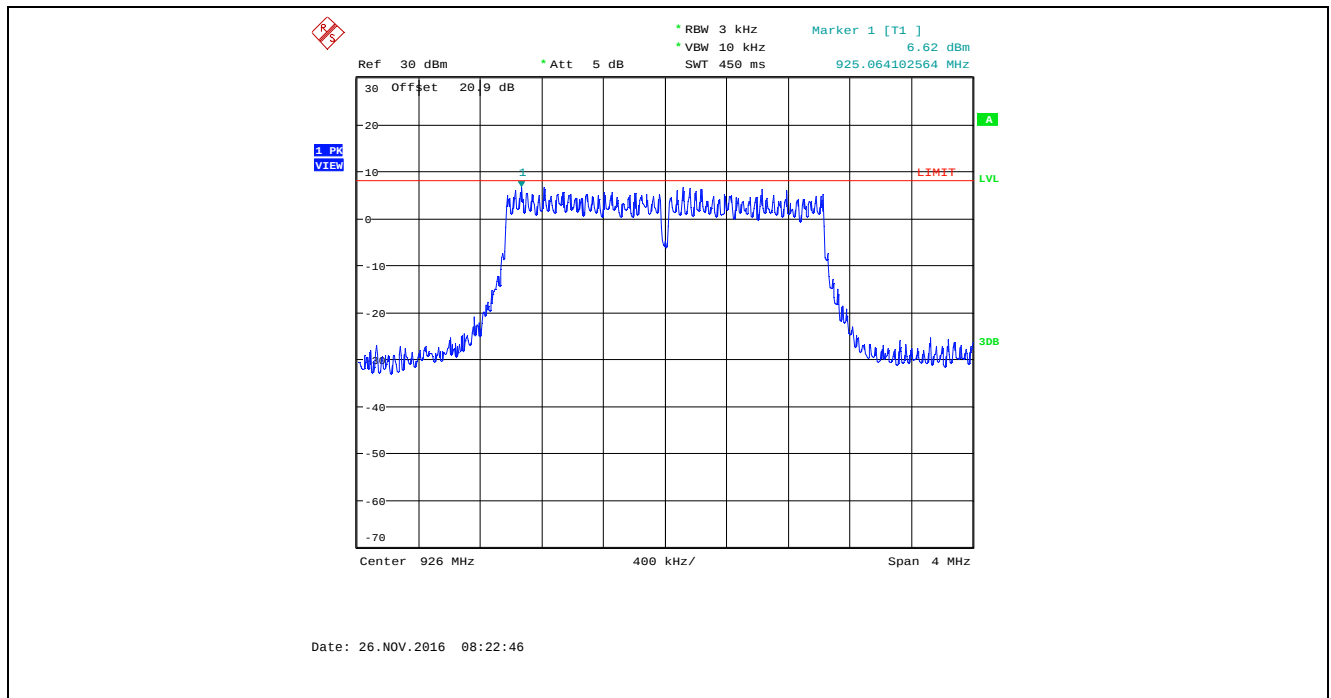
Plot 5.6.4.52. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 6, 904 MHz



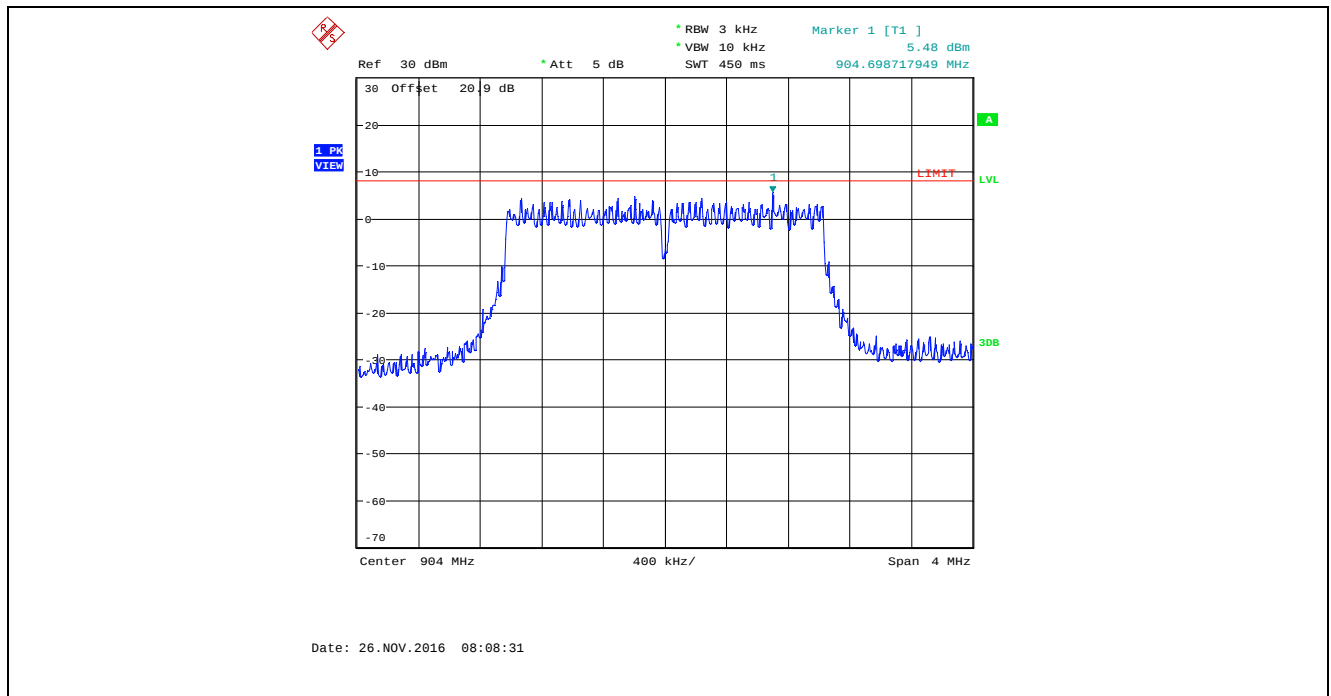
Plot 5.6.4.53. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 6, 915 MHz



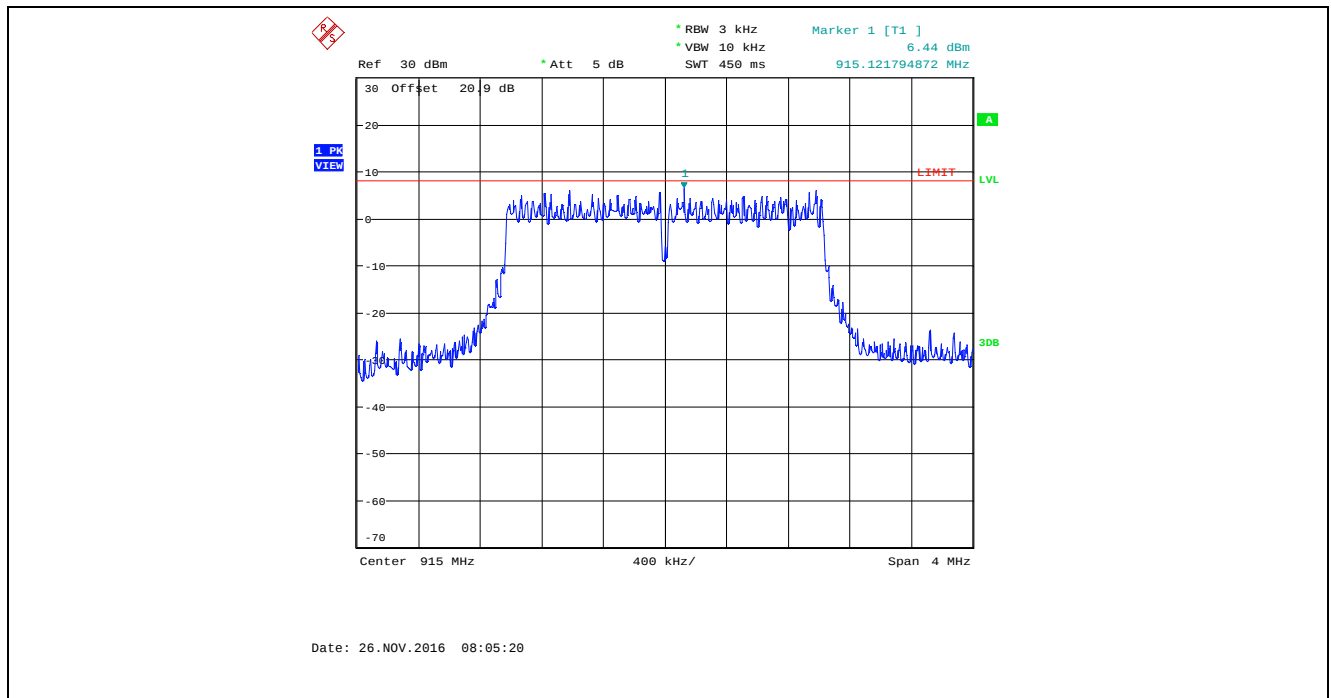
Plot 5.6.4.54. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 6, 926 MHz



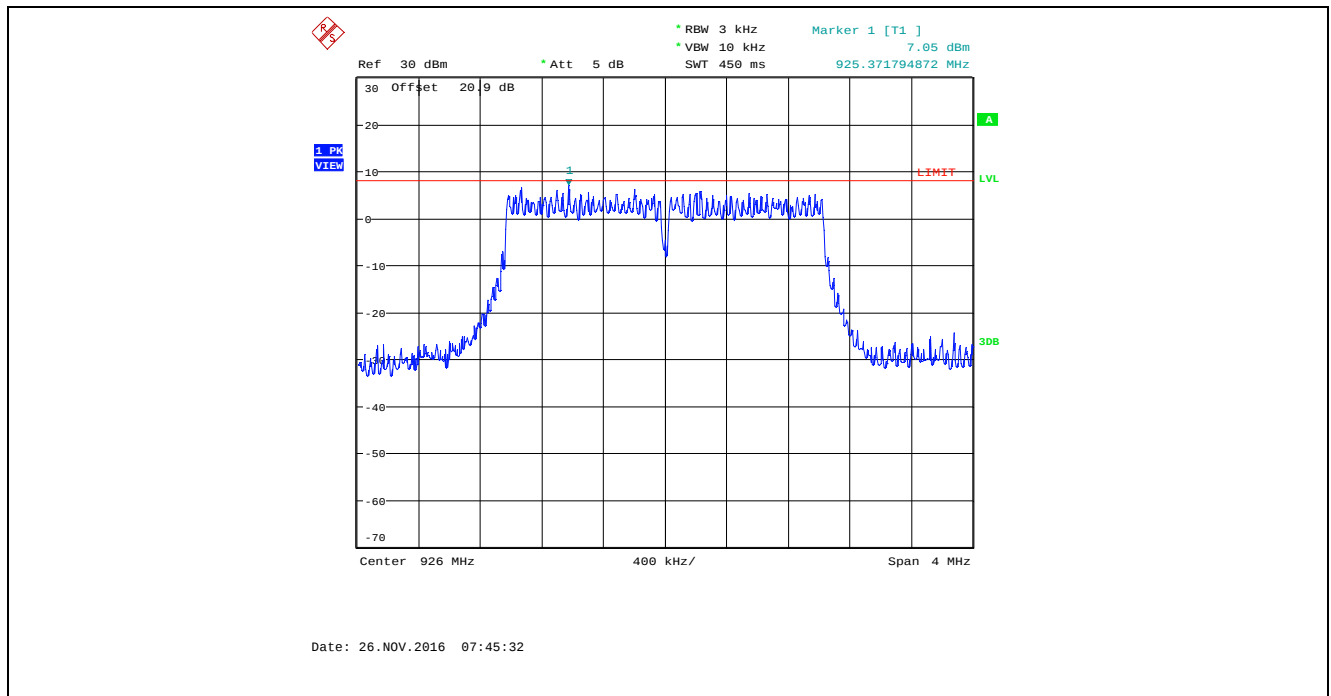
Plot 5.6.4.55. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 7, 904 MHz



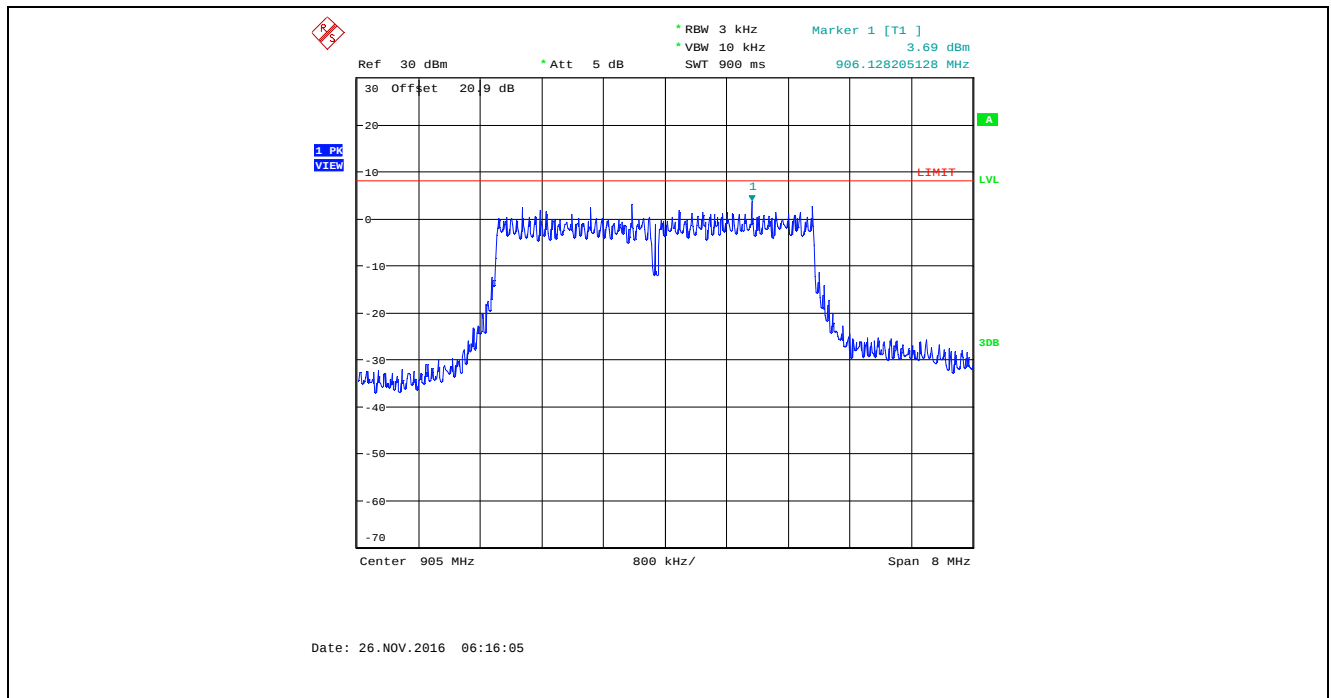
Plot 5.6.4.56. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 7, 915 MHz



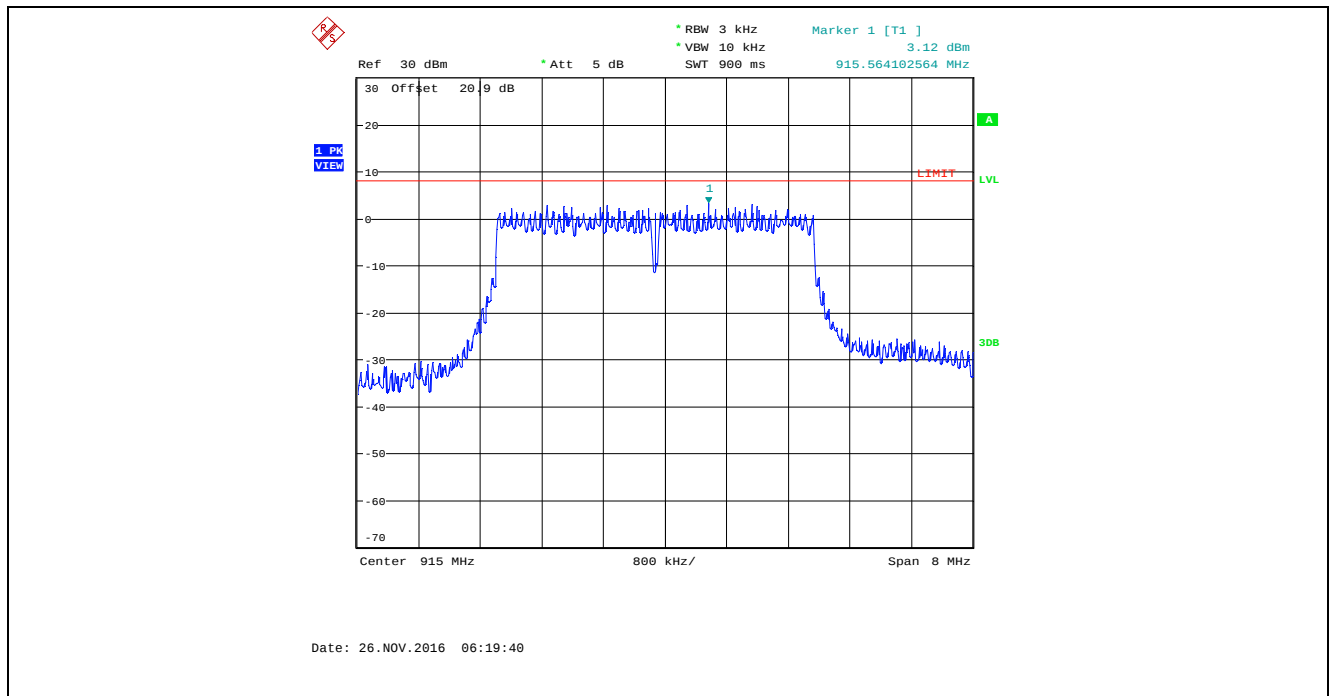
Plot 5.6.4.57. Power Spectral Density, Bandwidth: 2 MHz, TX Gain Setting: 36, Data Rate 7, 926 MHz



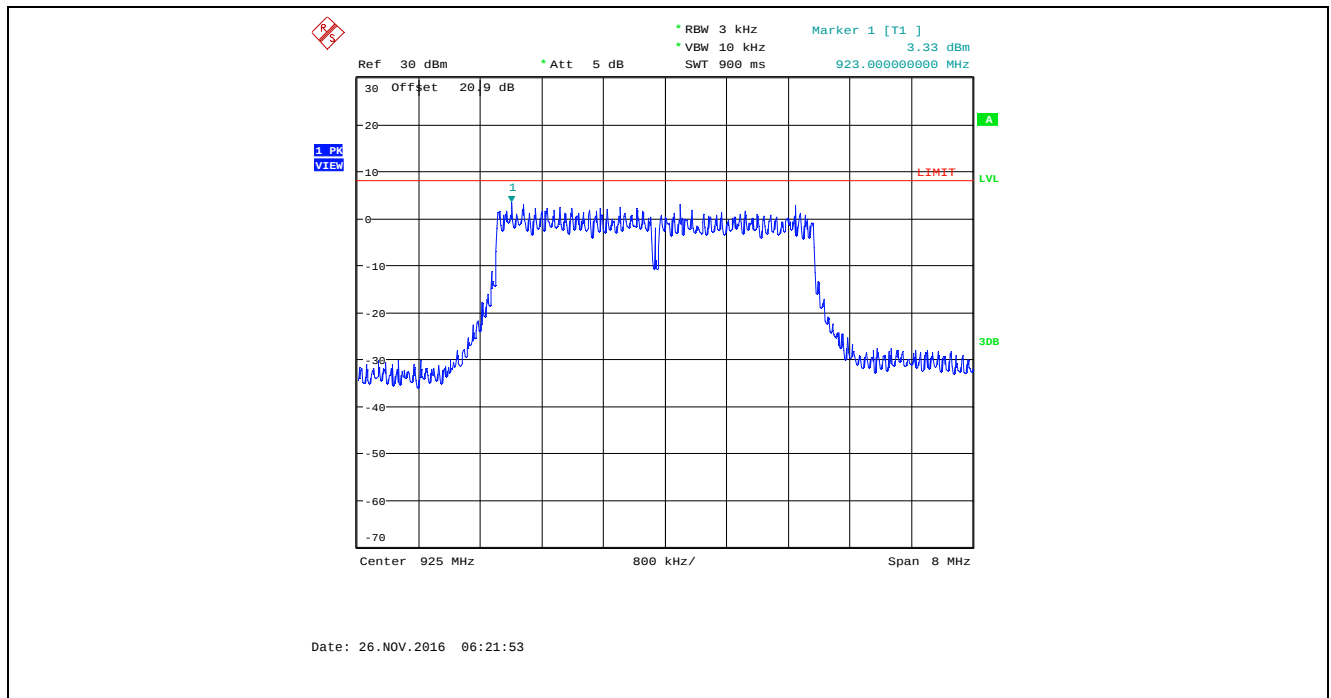
Plot 5.6.4.58. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 4, 905 MHz



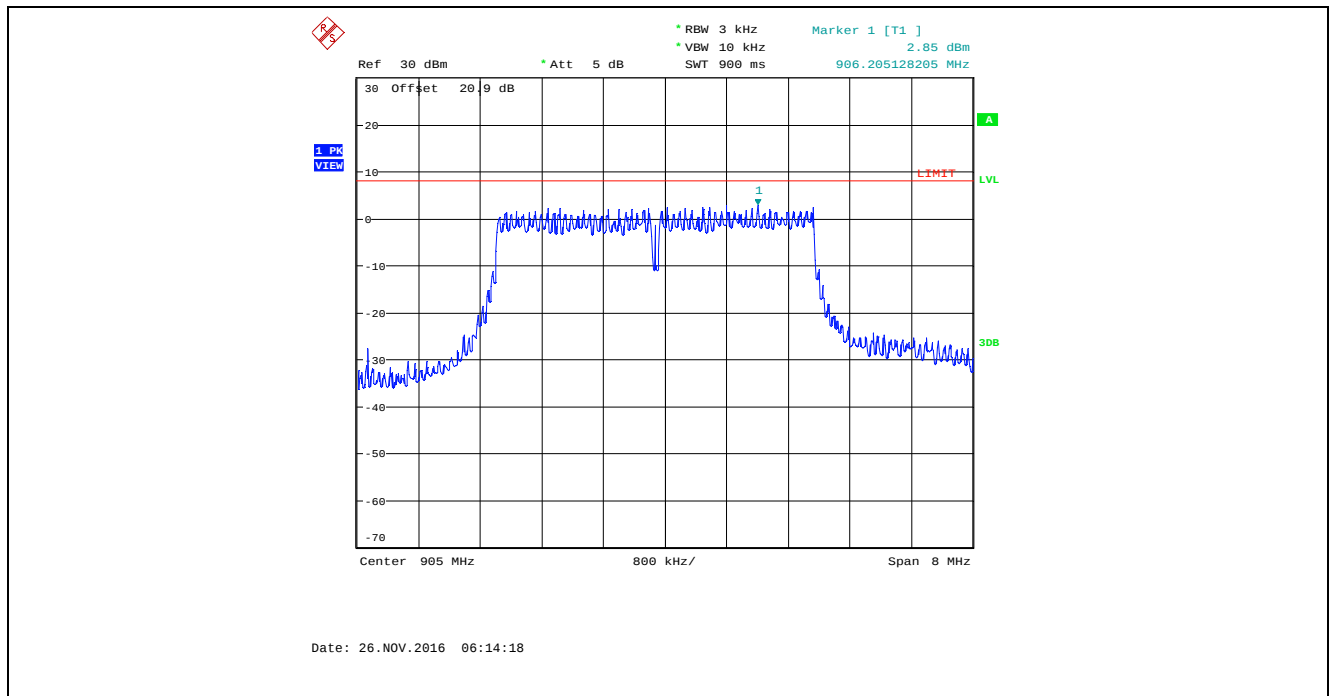
Plot 5.6.4.59. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 4, 915 MHz



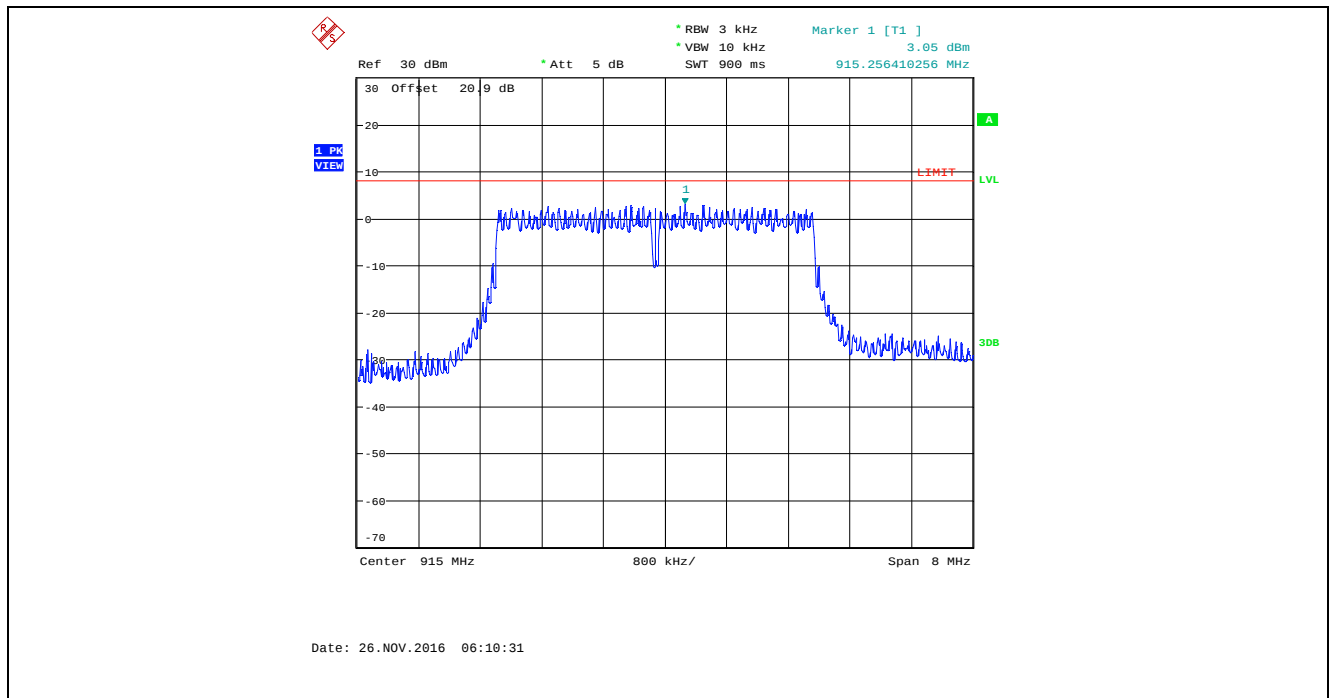
Plot 5.6.4.60. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 4, 925 MHz



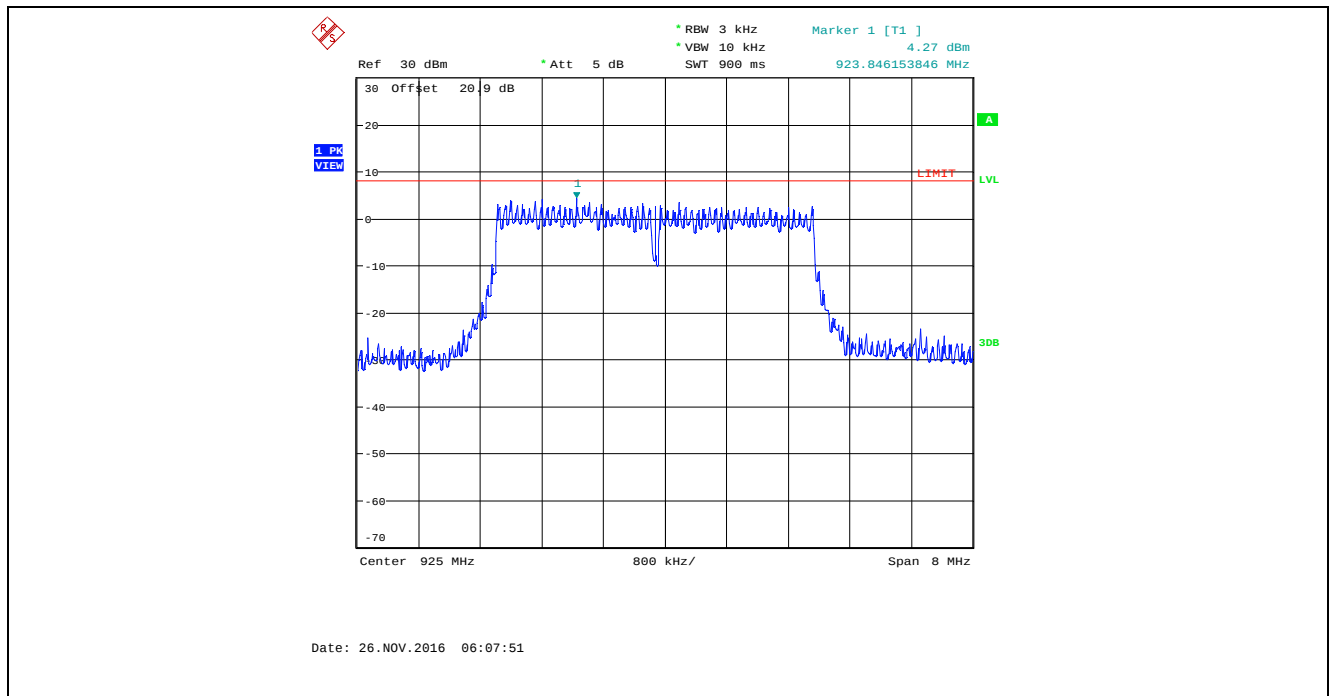
Plot 5.6.4.61. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 5, 905 MHz



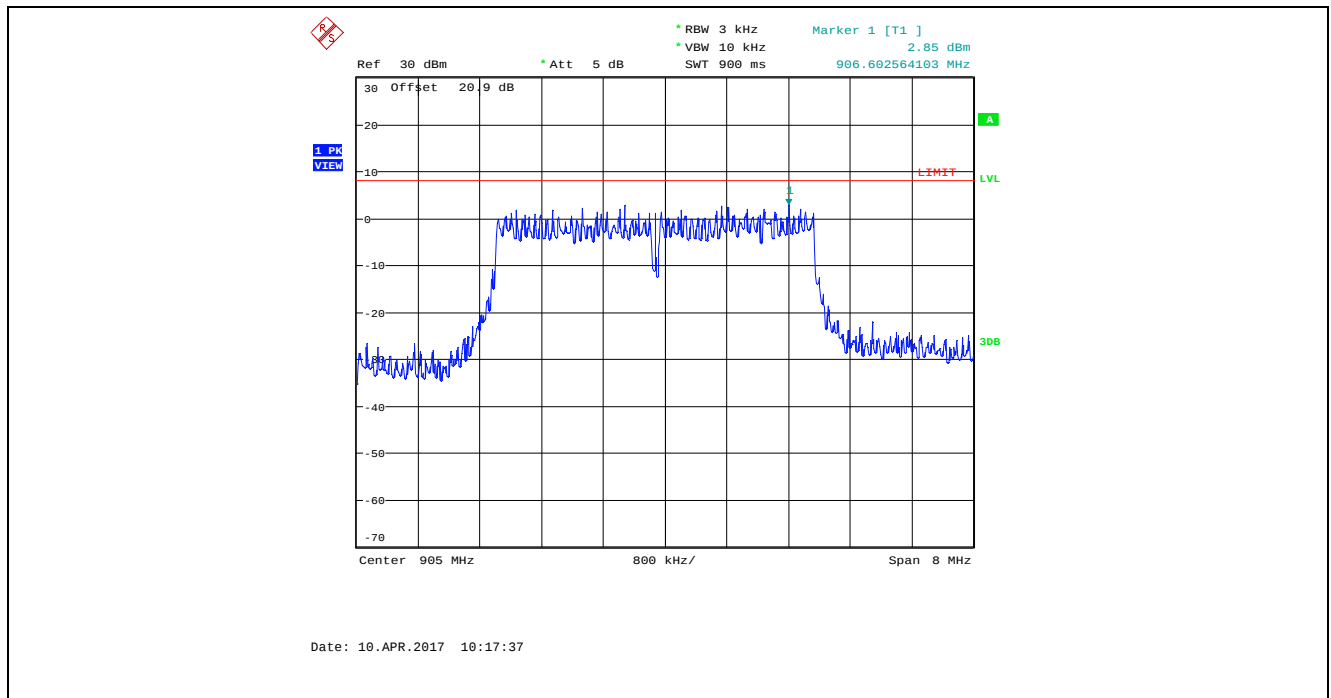
Plot 5.6.4.62. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 5, 915 MHz



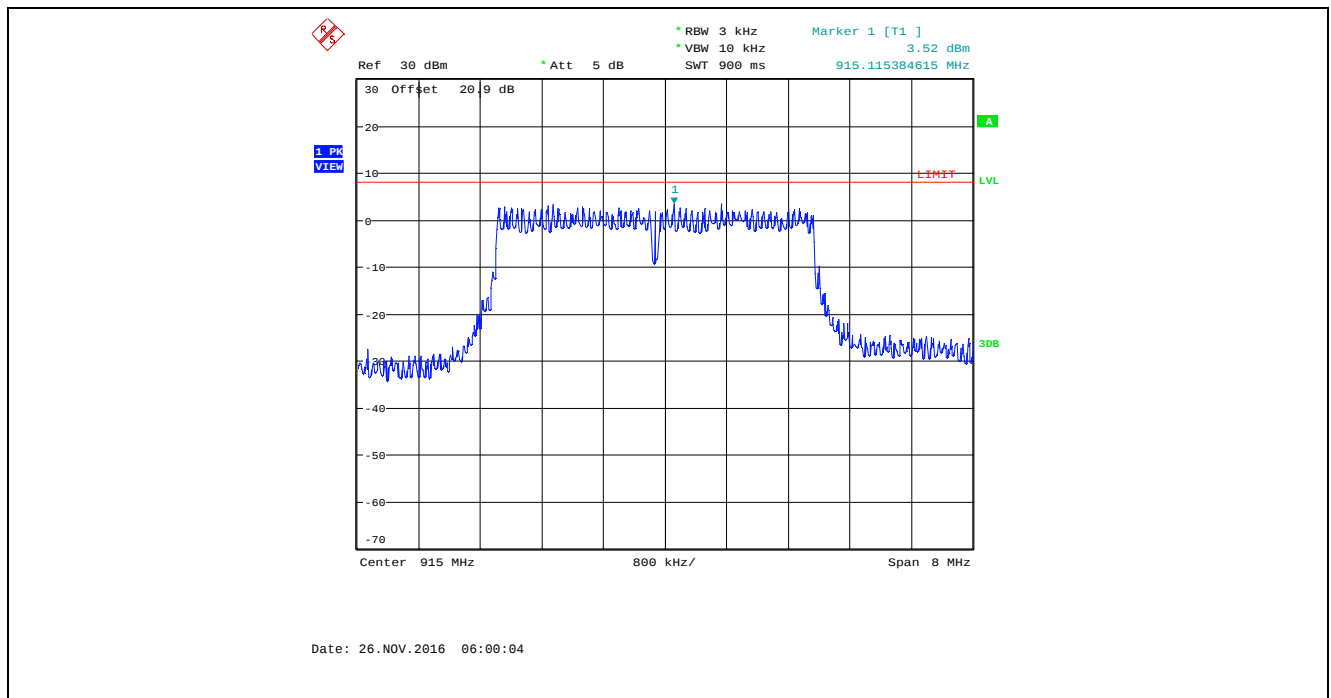
Plot 5.6.4.63. Power Spectral Density, Bandwidth:4 MHz, TX Gain Setting: 36, Data Rate 5, 925 MHz



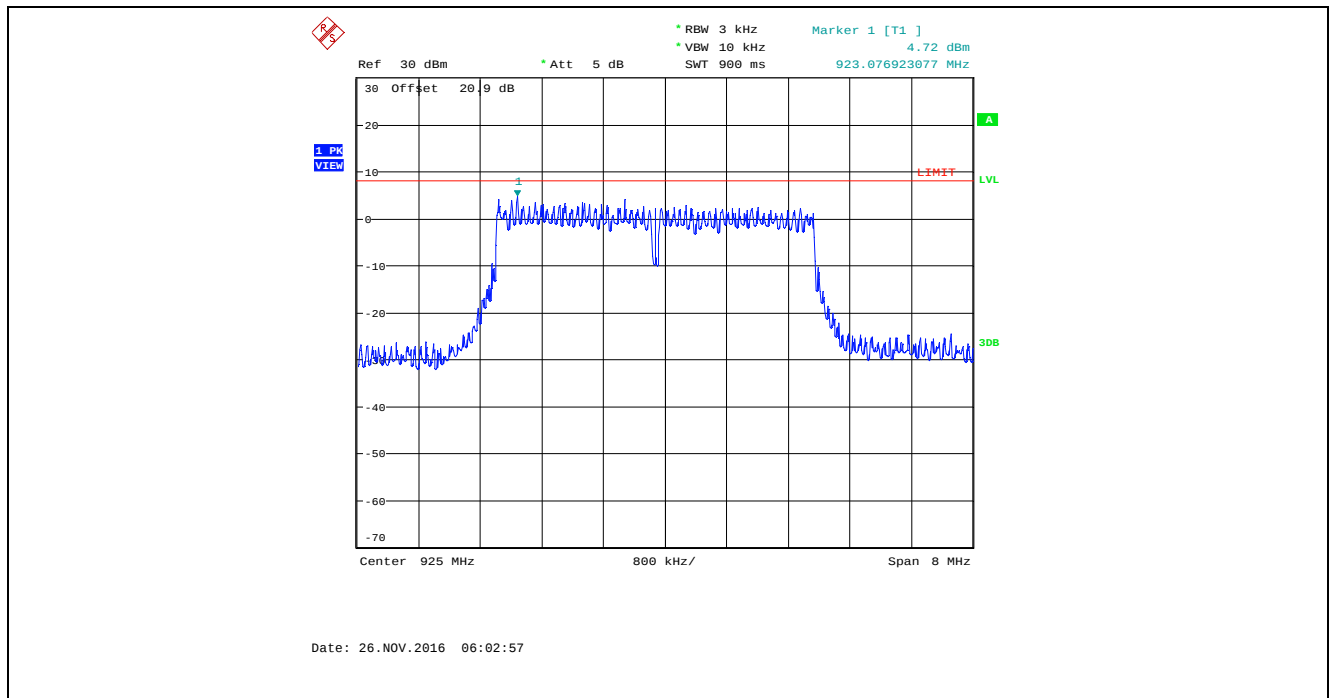
Plot 5.6.4.64. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 6, 905 MHz



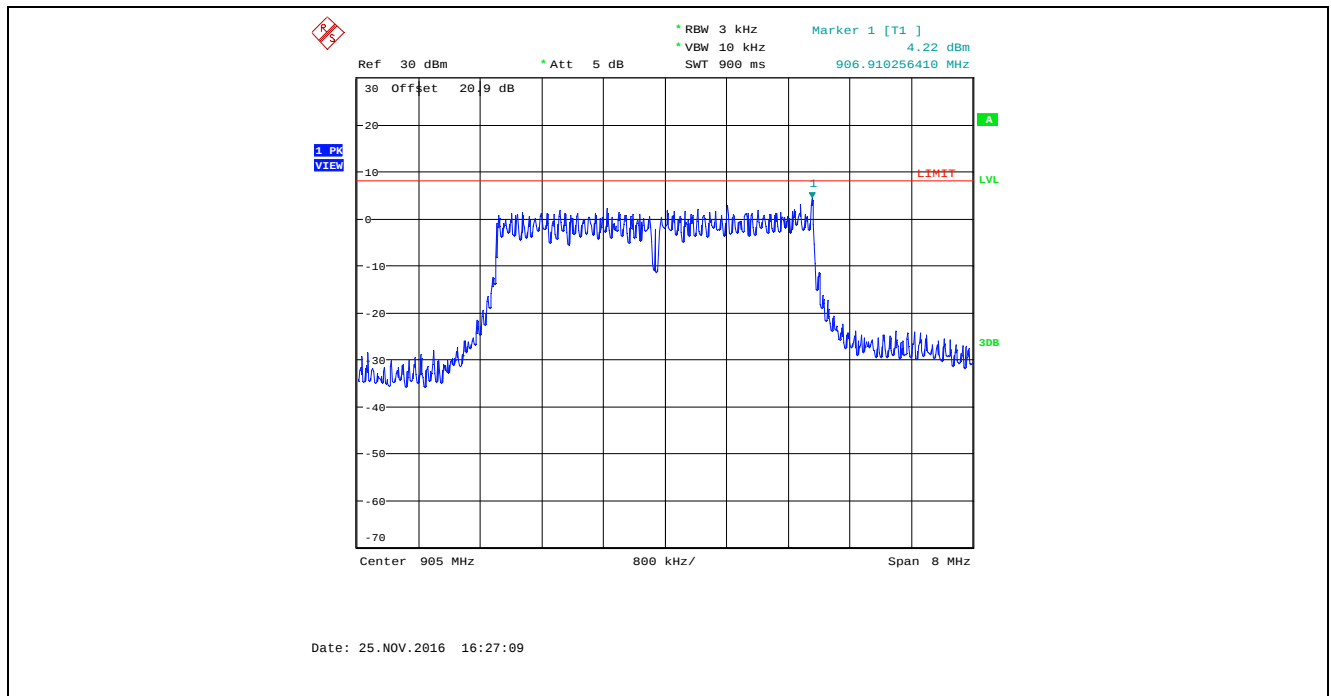
Plot 5.6.4.65. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 6, 915 MHz



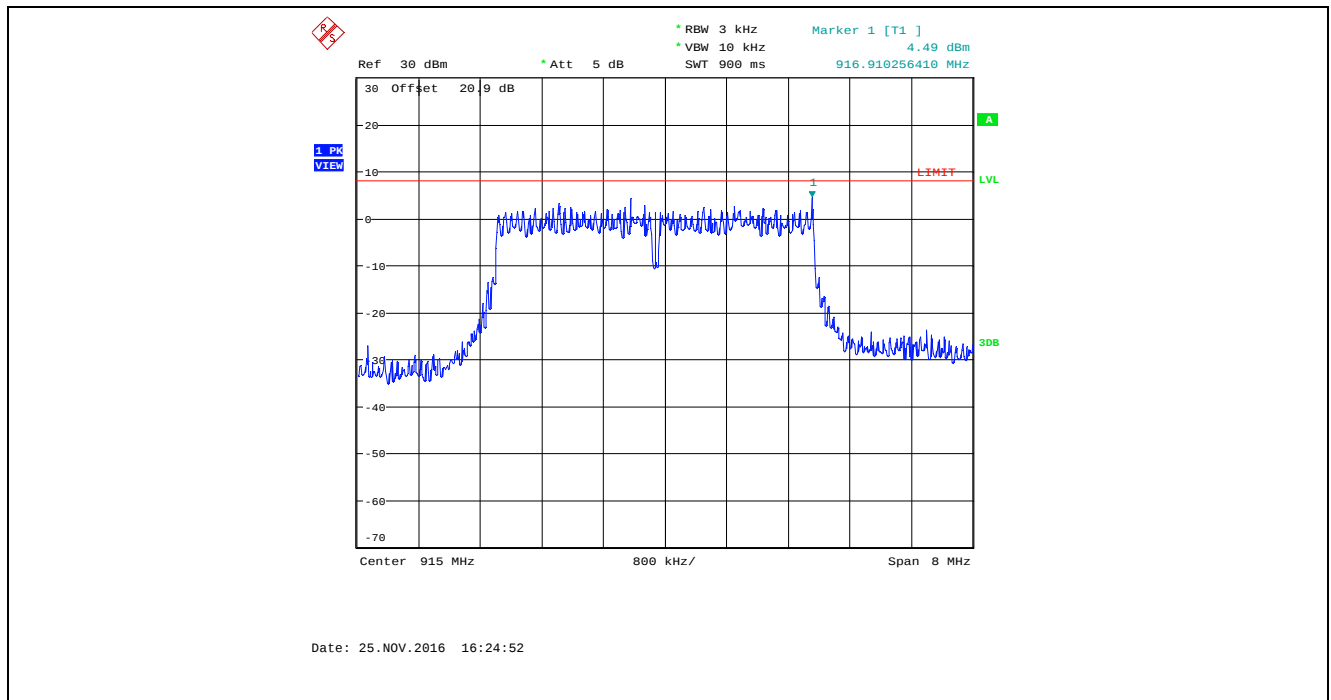
Plot 5.6.4.66. Power Spectral Density, Bandwidth:4 MHz, TX Gain Setting: 36, Data Rate 6, 925 MHz



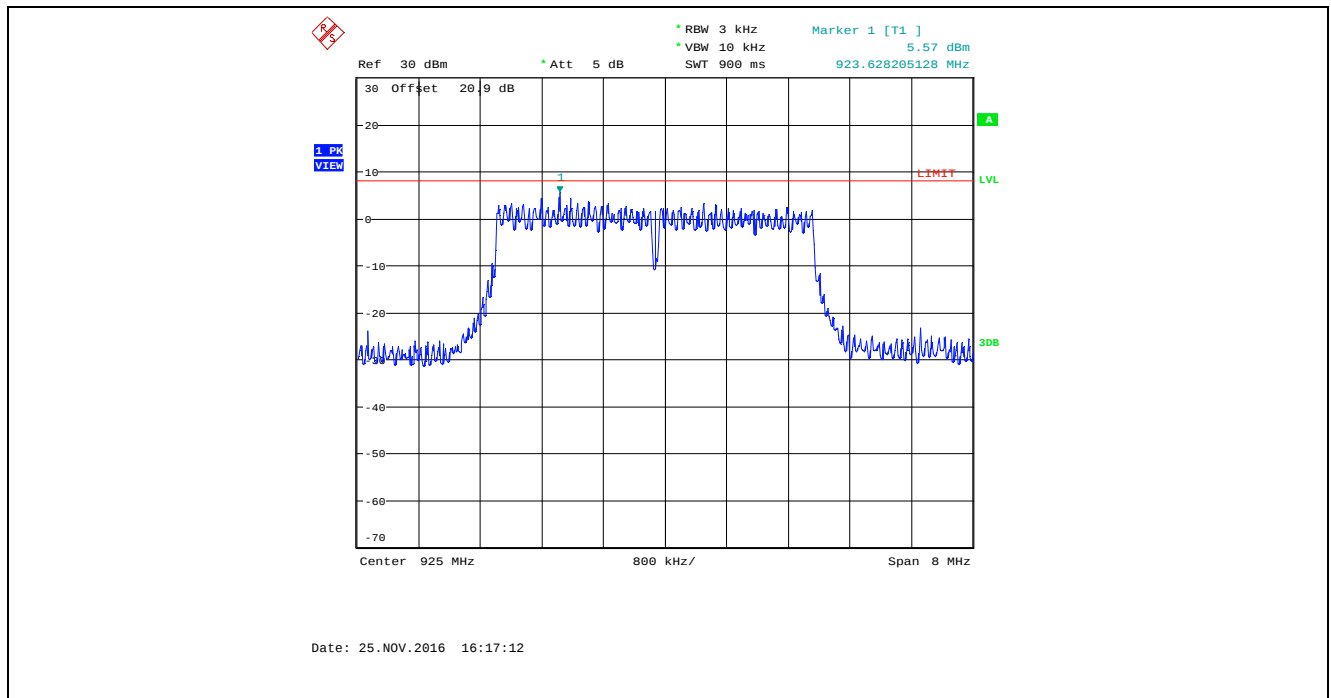
Plot 5.6.4.67. Power Spectral Density, Bandwidth:4 MHz, TX Gain Setting: 36, Data Rate 7, 905 MHz



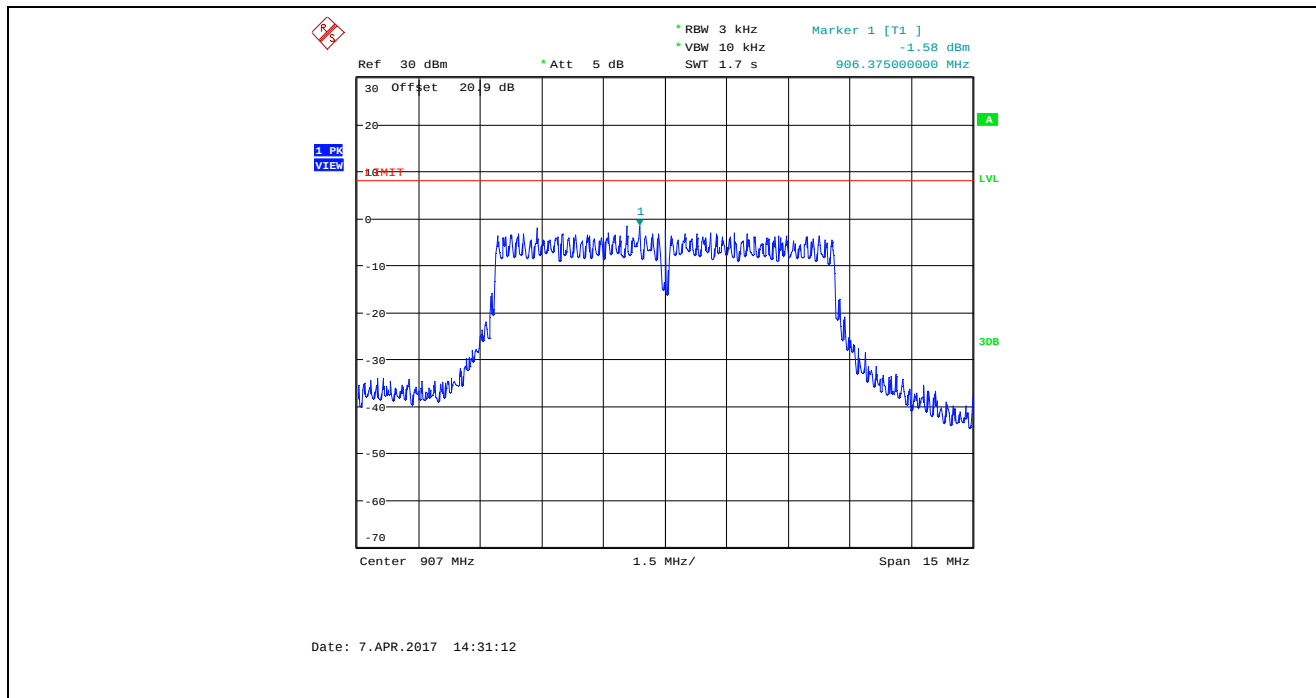
Plot 5.6.4.68. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 7, 915 MHz



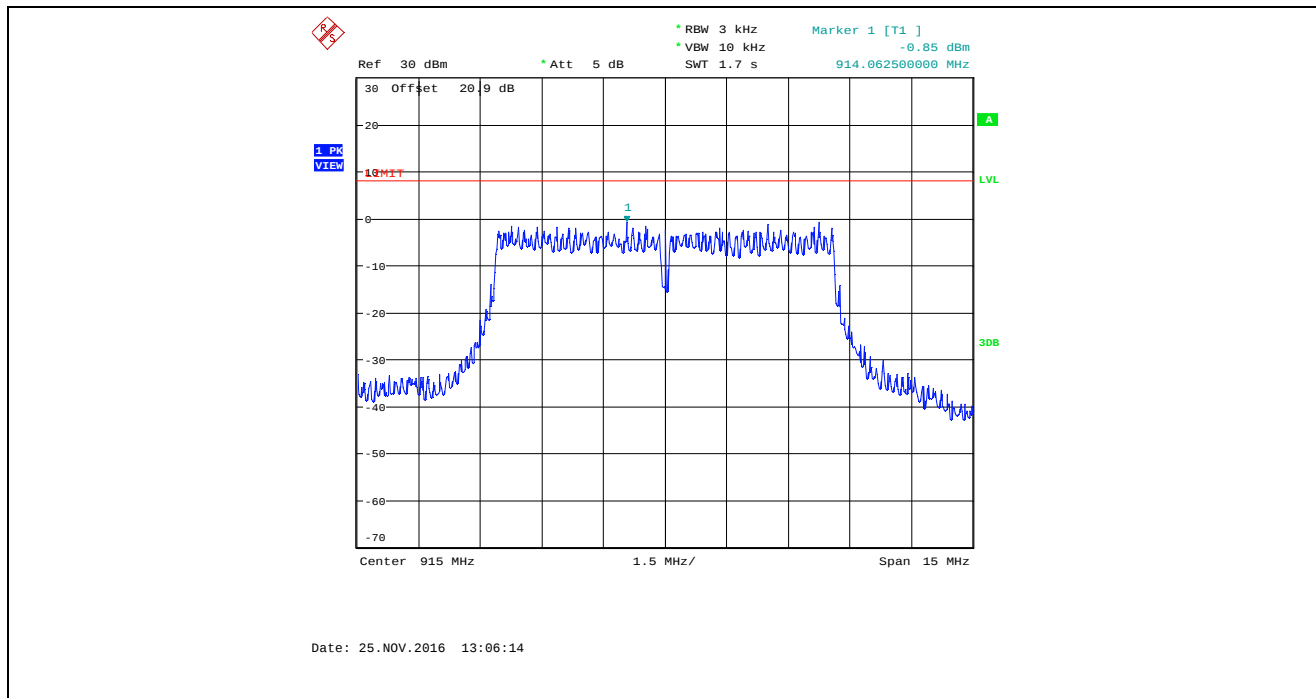
Plot 5.6.4.69. Power Spectral Density, Bandwidth: 4 MHz, TX Gain Setting: 36, Data Rate 7, 925 MHz



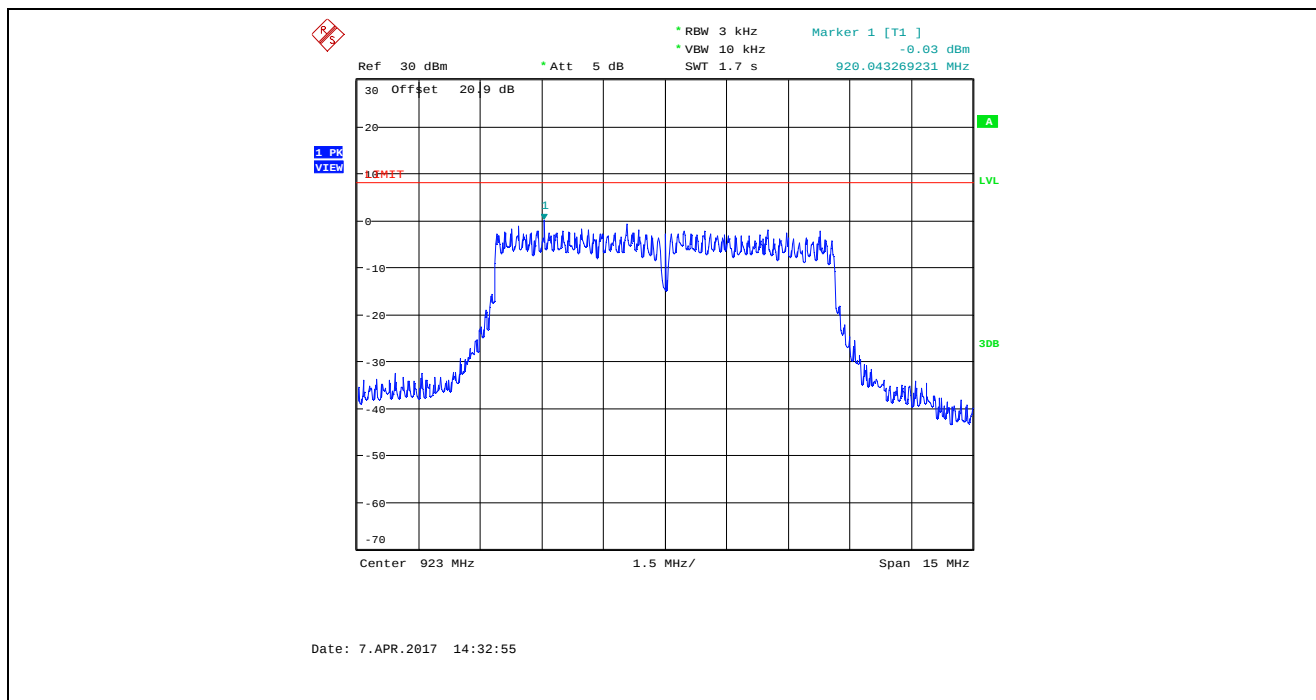
Plot 5.6.4.70. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 4, 907 MHz



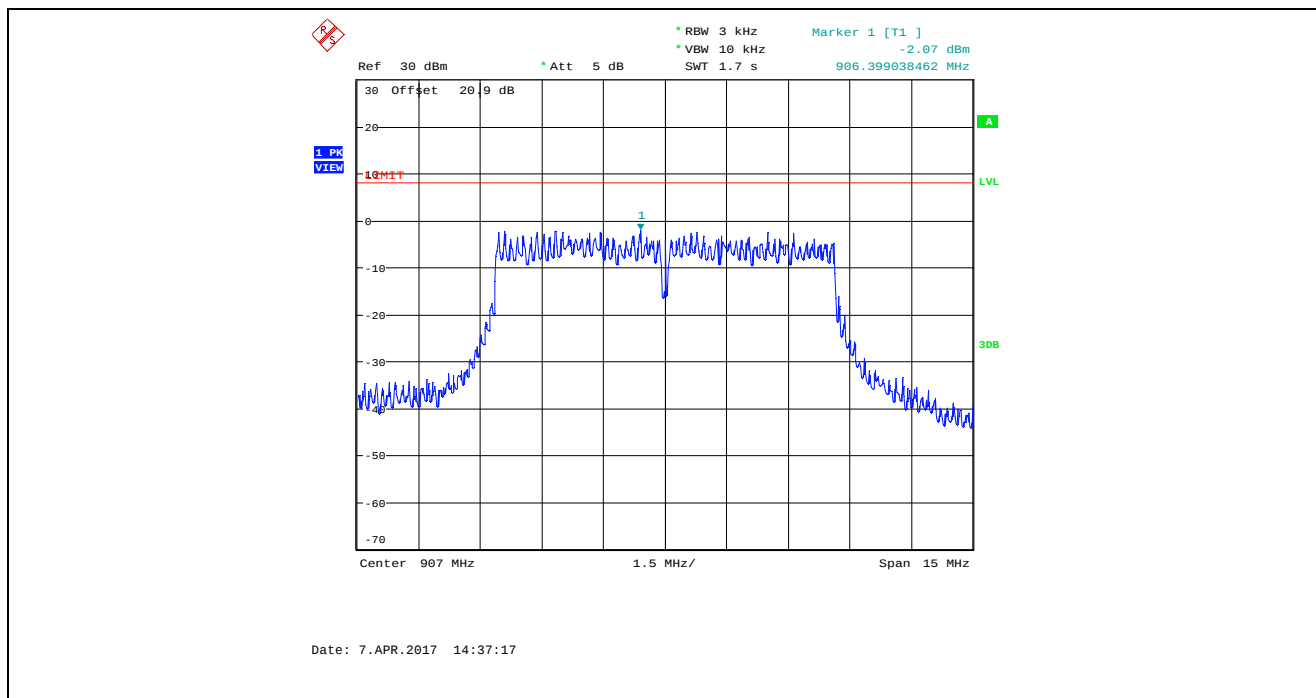
Plot 5.6.4.71. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 4, 915 MHz



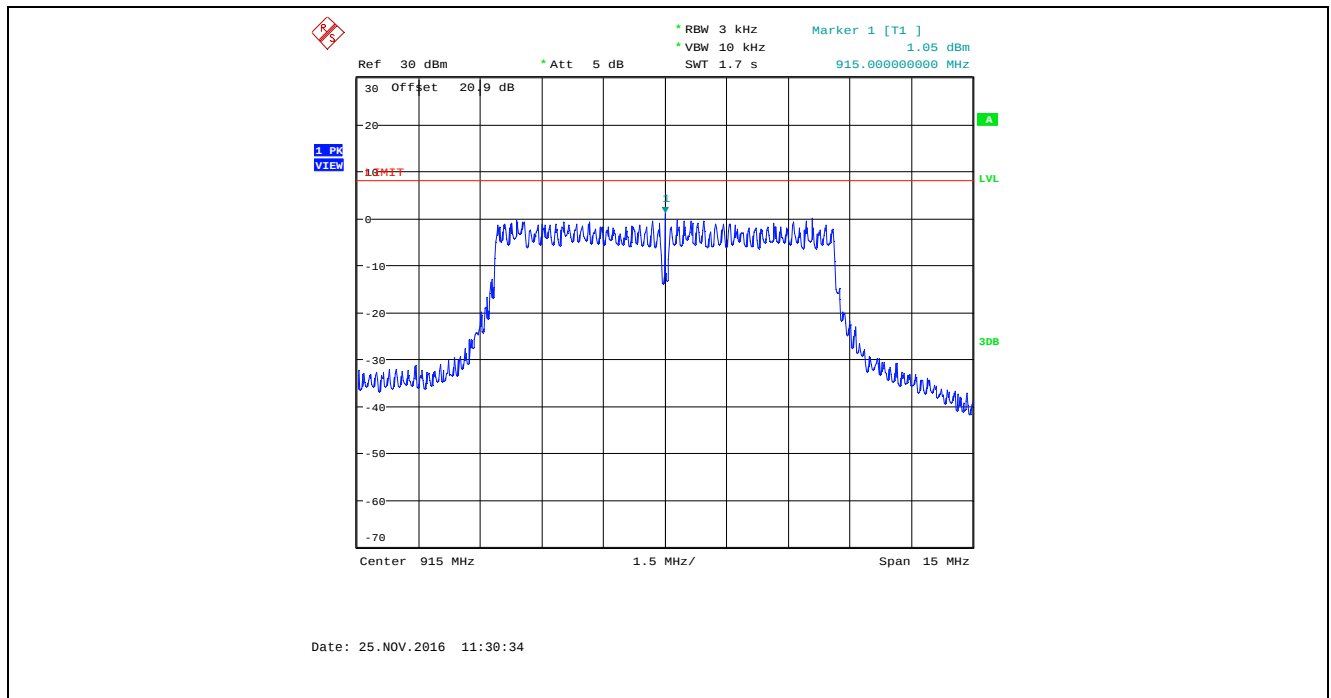
Plot 5.6.4.72. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 4, 923 MHz



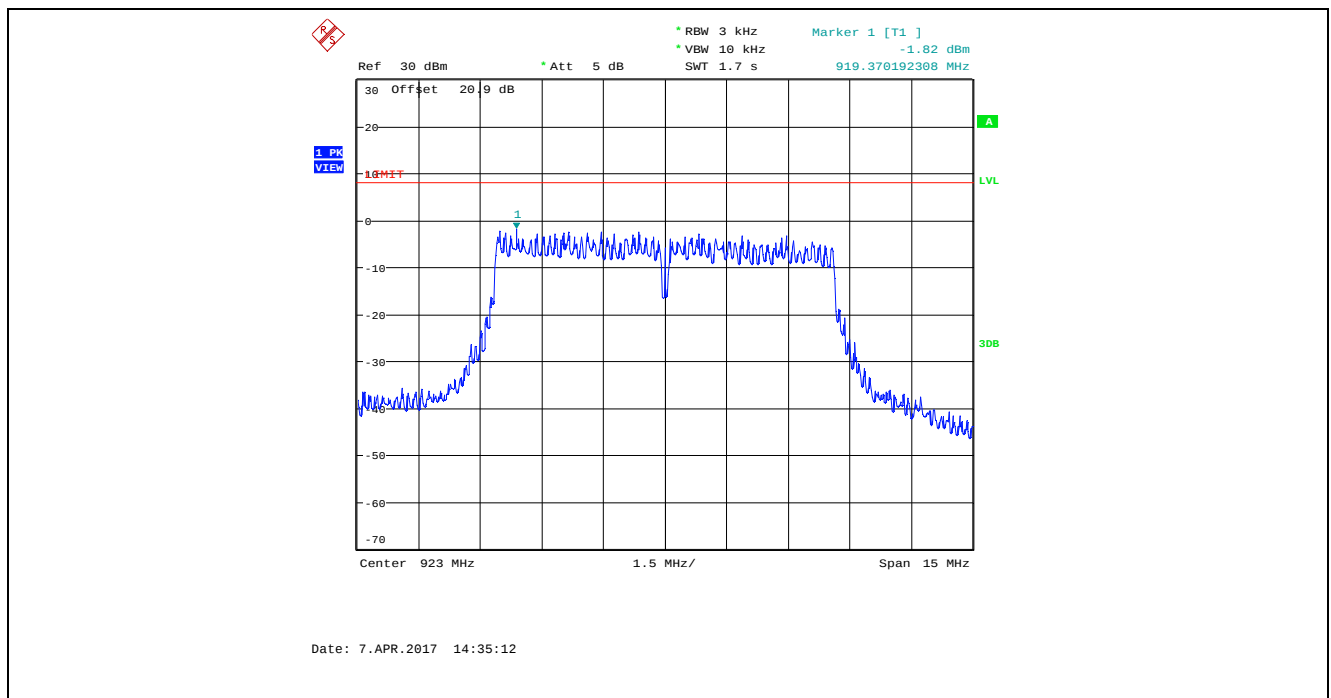
Plot 5.6.4.73. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 5, 907 MHz



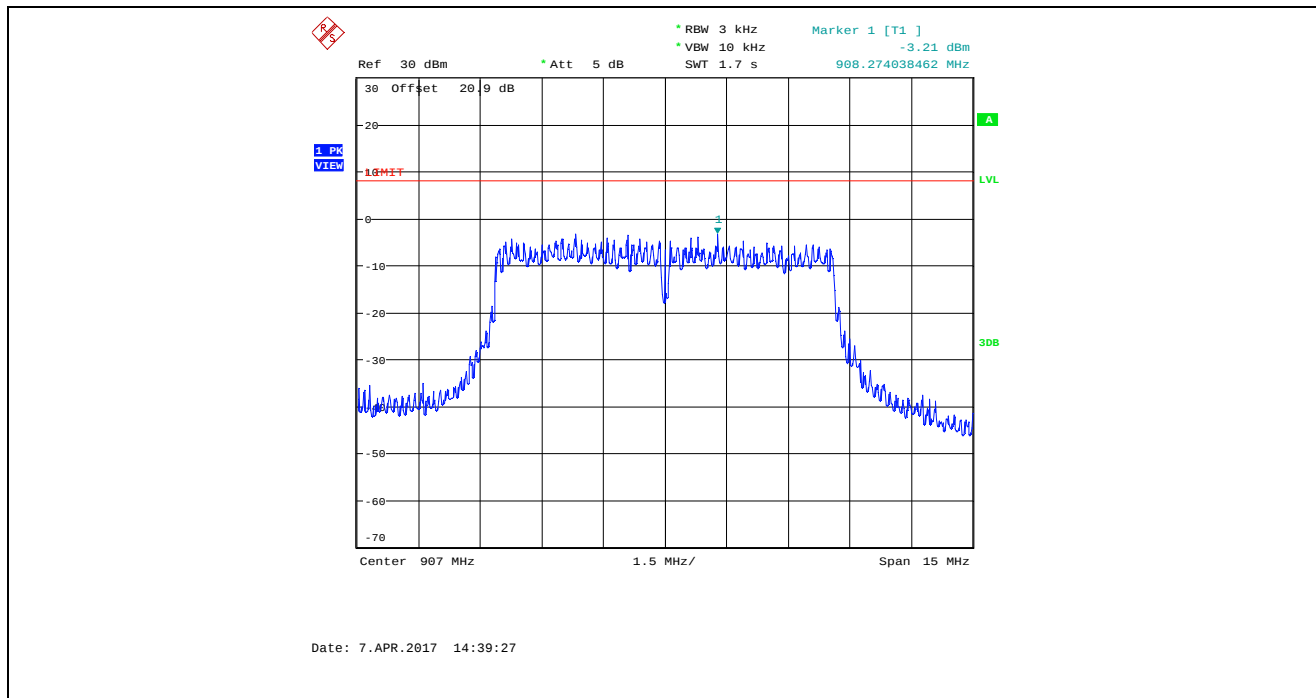
Plot 5.6.4.74. Power Spectral Density, Bandwidth:8 MHz, TX Gain Setting: 36, Data Rate 5, 915 MHz



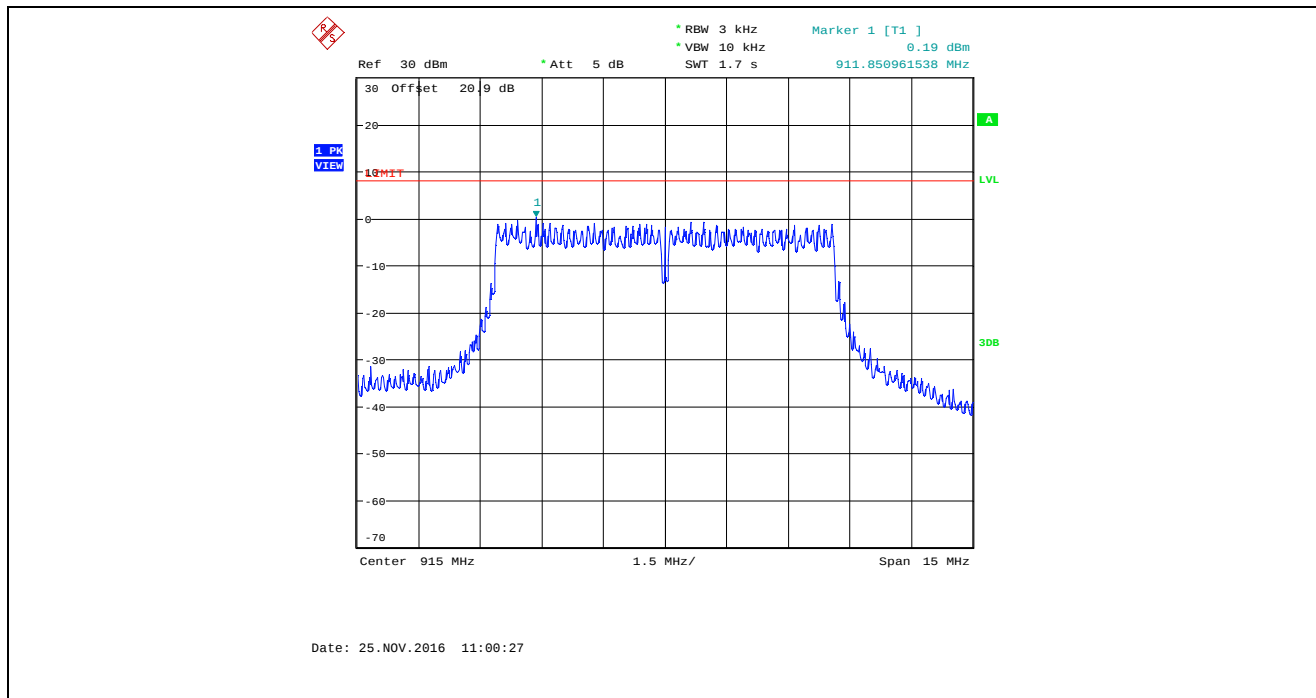
Plot 5.6.4.75. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 5, 923 MHz



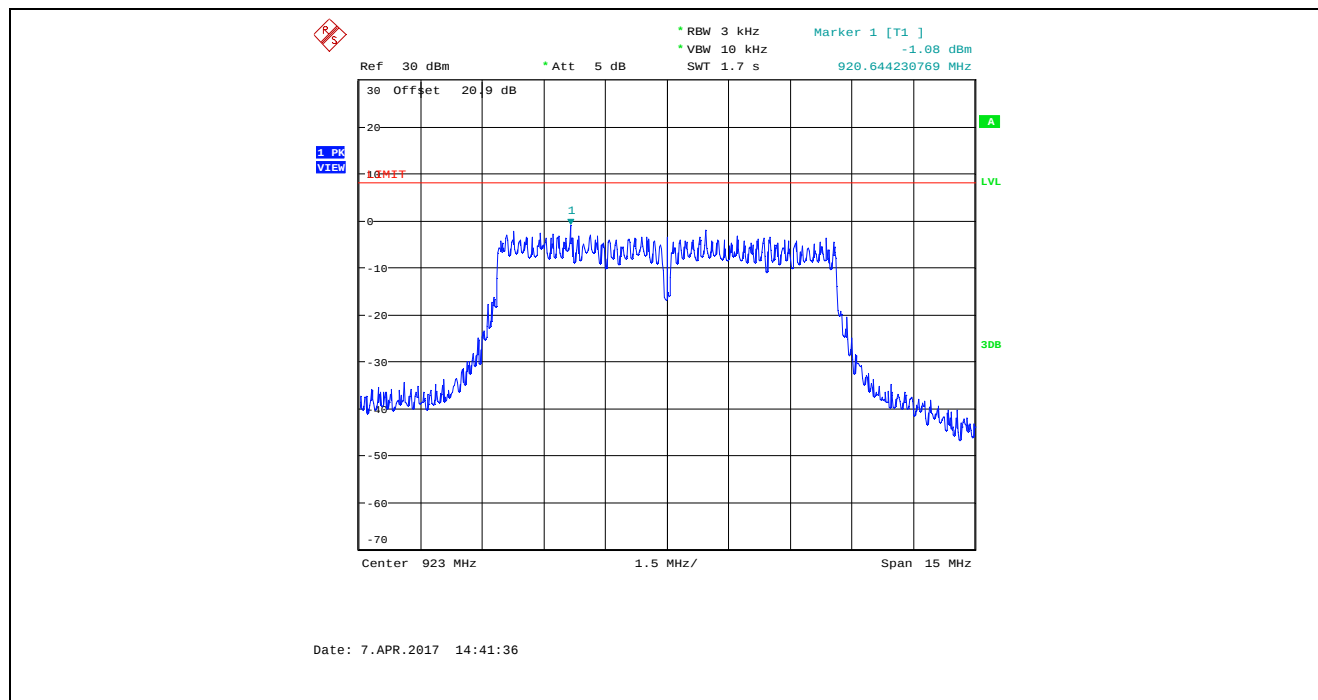
Plot 5.6.4.76. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 6, 907 MHz



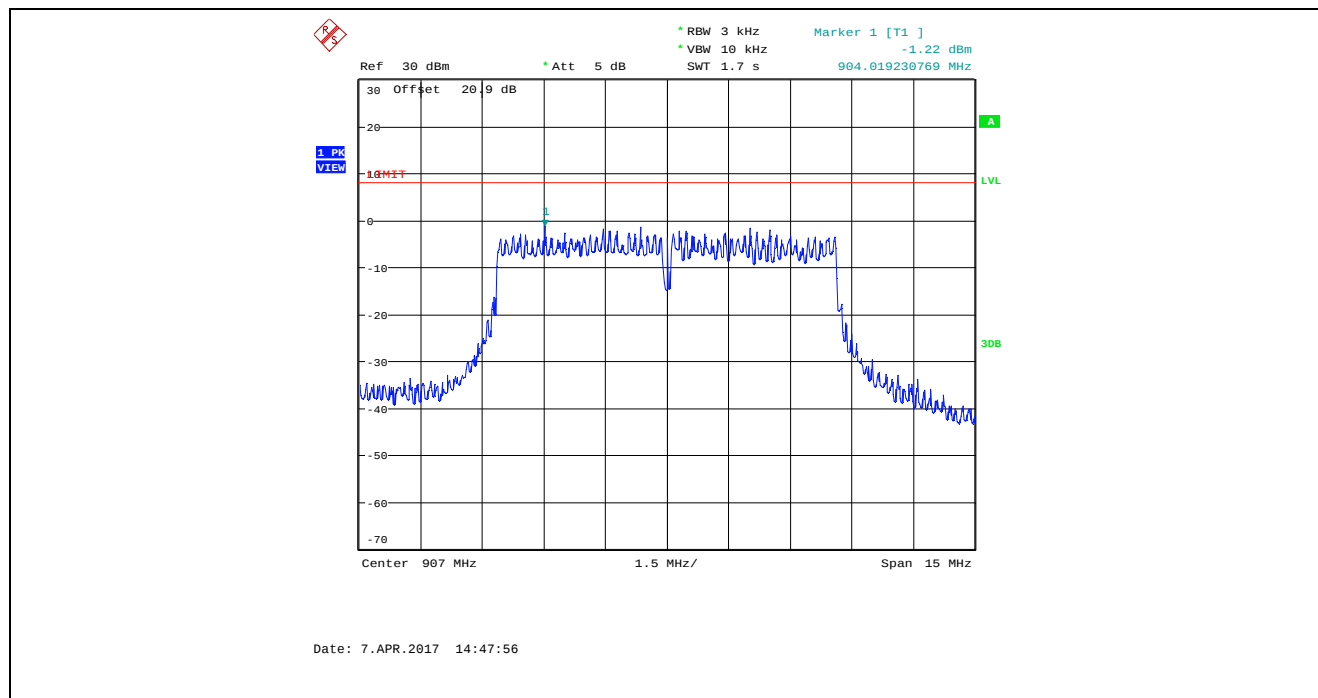
Plot 5.6.4.77. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 6, 915 MHz



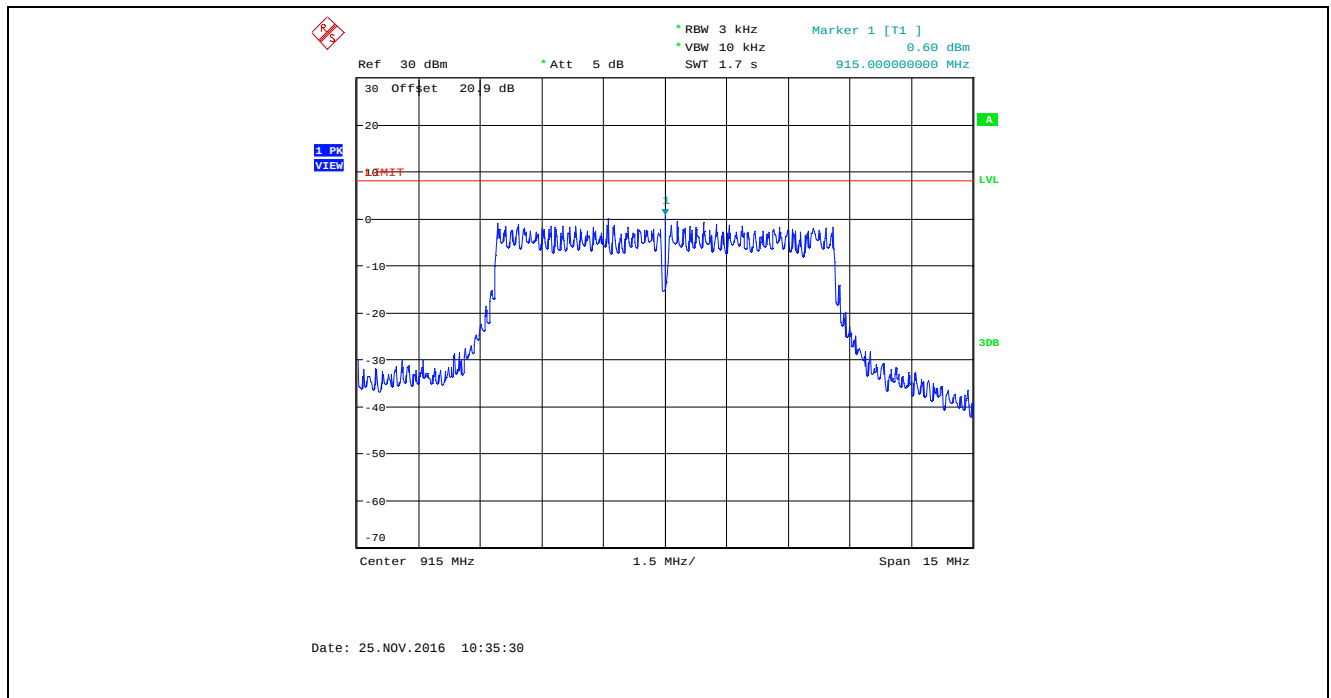
Plot 5.6.4.78. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 6, 923 MHz



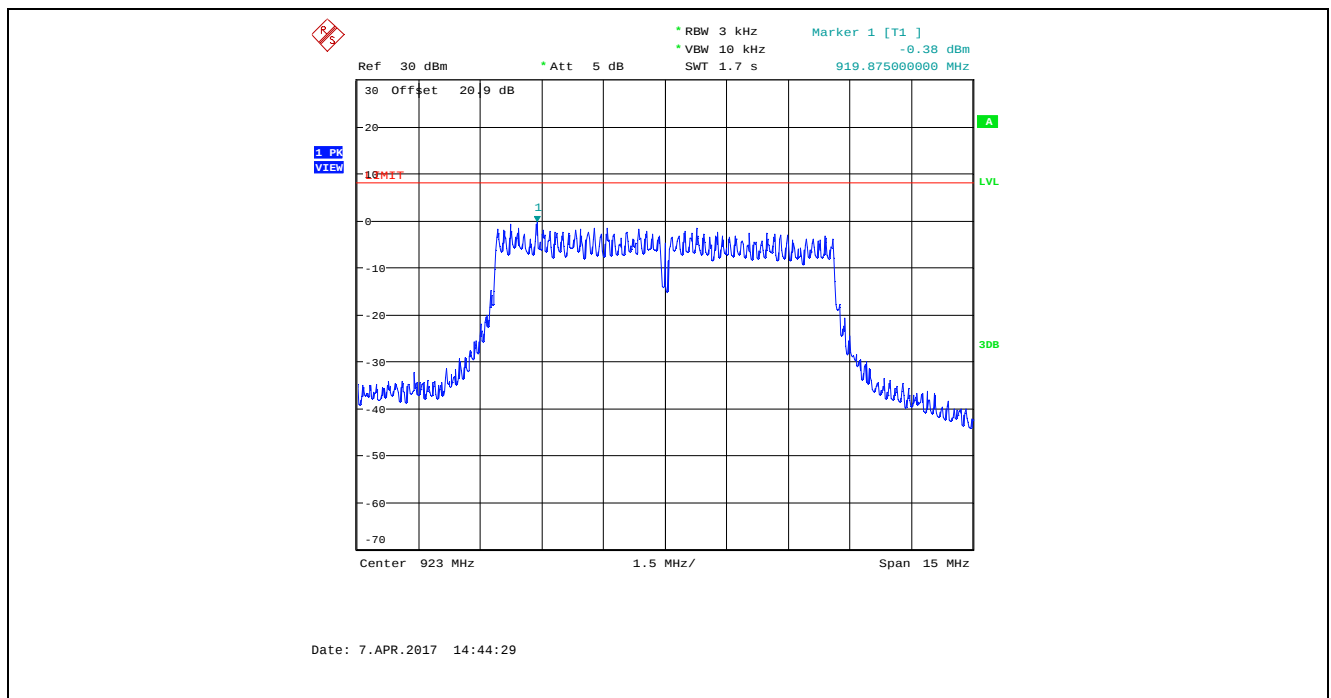
Plot 5.6.4.79. Power Spectral Density, Bandwidth:8 MHz, TX Gain Setting: 36, Data Rate 7, 907 MHz



Plot 5.6.4.80. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 7, 915 MHz



Plot 5.6.4.81. Power Spectral Density, Bandwidth: 8 MHz, TX Gain Setting: 36, Data Rate 7, 923 MHz



5.7. RF EXPOSURE REQUIRMENTS [§§ 15.247(i), 1.1310 & 2.1091]

5.7.1. Limits

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

Limits for Maximum Permissible Exposure (MPE)

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

f = frequency in MHz

* = Plane-wave equivalent power density

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

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

5.7.2. Method of Measurements

Calculation Method of Power Density/RF Safety Distance:

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

Where,
P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm²
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.7.3. RF Evaluation

5.7.3.1. Standalone

Frequency (MHz)	EIRP (dBm)	EIRP (mW)	Evaluation Distance, r (cm)	Power Density, S (mW/cm ²)	MPE Limit (mW/cm ²)	Margin (mW/cm ²)
903	36	4000	36	0.246	1.0	-0.754

5.7.3.2. Co-location

Pursuant to KDB 447498 D01 General RF Exposure Guidance v06, Section 7.2:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured field strengths or power density.

Co-location will only applies to EUT with 2.5 dBi dipole antenna, worst case EIRP of 32.5 dBm will be used in co-location at the minimum 36 cm evaluation separation distance required by the operating configurations and exposure conditions of the host device.

The maximum calculated MPE ratio of the EUT with 2.5 dBi dipole antenna

Frequency (MHz)	EUT EIRP (dBm)	EUT EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm ²)	FCC MPE Limit (mW/cm ²)	MPE Ratio
903	32.5	1778.279	36	0.109	0.602	0.181

The maximum calculated MPE ratio for the EUT with 2.5 dBi dipole antenna is 0.181, this configuration can be co-located with other antennas provided the sum of the MPE ratios for all the other simultaneous transmitting antennas incorporated in a host device is ≤ 1.0 - $0.181 \leq 0.819$. The following table addresses the co-location of the EUT with 2.5 dBi antenna with the specified radio modules.

EUT with 2.5 dBi dipole antenna co-location with radio module indentified in this table

*Radio Module	Frequency (MHz)	EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm ²)	FCC MPE Limit (mW/cm ²)	MPE Ratio	MPE Ratio of EUT with 2.5 dBi antenna	Sum of MPE Ratio	Verdict
Data Card Module (FCC ID: RI7LN930, IC: 5131A-LN930)	824.2	2511.890	36	0.154	0.549	0.281	0.181	0.462	Compliant
UMTS/LTE Data Module (FCC ID: XPYTOBYL201, IC: 8595A-TOBYL201)	710.0	2398.833	36	0.147	0.473	0.311	0.181	0.492	Compliant
LE910NA V2 LTE/3G Module (FCC ID: RI7LE910NAV2, IC: 5131A-LE910NAV2)	699	1156.112	36	0.071	0.466	0.152	0.181	0.333	Compliant
ME3630 LTE Module (FCC ID: SRQ-ME3630)	1852.4	582.103	36	0.036	1.000	0.036	0.181	0.217	Compliant

* The test data of the radio modules represented in this table is the worst-case configuration (maximum MPE ratio) derived from the original radio modules MPE reports. Refer to these reports for details.

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Hewlett Packard	HP 8593EM	3412A00103	9 kHz - 26.5 GHz	9 Apr 2017
Attenuator	Pasternack	PE7010-20	07	DC - 2 GHz	26 Mar 2017
L.I.S.N	EMCO	3825/2	1531	0.10 -100 MHz	11 Nov 2017
Signal Generator	Agilent	E8241A	US42110625	250 kHz - 20 GHz	15 Sep 2018
Spectrum Analyzer	Rohde & Schwarz	FSU26	200946	20Hz–26.5 GHz	21 Jul 2018
Attenuator	Pasternack	7024-20	6	DC–26.5 GHz	Cal on use
DC Block	Hewlett Packard	11742A	12460	0.045 – 26.5 GHz	Cal on use
Peak Power Analyzer	Hewlett Packard	8991A	3342A00657	0.5 - 40 GHz	9 Aug 2017
Peak Power Sensor	Hewlett Packard	84814A	3205A00175	0.5 - 40 GHz	15 Aug 2017
Attenuator	Pasternack	7024-10	4	DC–26.5 GHz	Cal on use
High Pass Filter	K & L	11SH10-1500/T8000	2	Cut off 900 MHz	Cal on use
Band Reject Filter	Micro-Tronics	BRC50722	001	Notch Rejection: 902 to 928 MHz	Cal on use
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz–40 GHz	8 May 2017
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20Hz–40 GHz	5,Dec 2018
RF Amplifier	Com-Power	PAM-0118A	551016	0.5 – 18 GHz	14 Jul 2017
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	5 May 2017
Biconilog	EMCO	3142	9601-1005	26-1000 MHz	12 May 2018
Horn Antenna	EMCO	3155	6570	1 – 18 GHz	13 Oct 2018
Horn Antenna	ETS-Lindgren	3160-09	00118385	18 – 26.5 GHz	11 Oct 2018
High Pass Filter	K & L	11SH10-4000/T12000	4	Cut off 2400 MHz	Cal on use

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 17MCRS101_FCC15C247D0G9

April 13, 2017

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

EXHIBIT 7. MEASUREMENT UNCERTAINTY

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

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (9 kHz – 30 MHz):	Measured	Limit
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.44	± 1.8
U	Expanded uncertainty U: $U = 2u_c(y)$	± 2.89	± 3.6

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.79	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.75	Under consideration