



FCC RF Test Report

Product Name: 3G/4G Dual Mode Wireless Router

Model Number: EC5072/PCDH5072HS

Report No: SYBH(Z-RF)014032011-2003

FCC ID: QISEC5072

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Notice

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
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3. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-1.
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8. Normally, the test report is only responsible for the samples that have undergone the test.
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Notice 2

Modification Information:

Modification Information

Modification Information	1	
	2	
	3	<i>Not Applicable!</i>
	4	
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REGULATION	FCC CFR47 Part 2: Subpart J;
	47 CFR FCC Part 27, Subpart C&M
START OF TEST	Mar.11, 2011
END OF TEST	Mar.15, 2011
Final Judgement:	Pass

Approved By 2011-03-16 Chen Xiaohong Chen Xiaohong
 Date Name Signature

Reviewed By 2011-03-16 Xu Guangyi Xu Guangyi
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1 Summary

1.1 Results Summary

The table below summarizes the measurements and results for the equipment of QISEC5072 3G/4G Dual Mode Wireless Router. Detailed results and descriptions are shown in the following pages.

Table 1. Summary of results for FCC requirements for BRS&EBS Band

47 CFR FCC Part(s) Requirements		Description	Result
Specification	Limits		
2.1046	27.50(h)(2)	Transmitter Output Power	PASS
2.1047	---	Modulation Characteristics	PASS
2.1049	---	Occupied Bandwidth	PASS
2.1051	27.53(m)(4) 27.53(m)(6)	Band Edges Compliance	PASS
2.1051	27.53(m)(4) 27.53(m)(6)	Spurious Emission at Antenna Terminal	PASS
2.1053	27.53(m)(4) 27.53(m)(6)	Radiated Spurious Emission	PASS
2.1055	27.54	Frequency Stability	PASS

Note1: If no limits were applied, limits for product standards may be employed in this test report.

Note2: The Radiated Spurious Emissions' test results are shown in the EMC report

1.2 Supporting Standards

Table 2. Supporting Standards

Standard Name	Description
ANSI/TIA-603-C	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
WiMAX MRCT	WiMAX Forum™ Mobile Radio Conformance Tests



2 Product Description

2.1 Production Information of EUT

2.1.1 General Description

QISEC5072 is a WiMAX/EVDO dual mode and WiFi Wireless Mobile Router; it can be used as a WiFi Access Point based on standard of IEEE802.11b/g/n, max to 5 WiFi stations can be associating with EC5072 simultaneously. It also can be used as a USB modem by connecting with PC via USB cable. It supports 3G CDMA and 4G WiMAX wireless internet accessing function and GPS function. About 3G CDMA wireless mode, it supports CDMA2000 1x and 1xEV-DO Rev.0/Rev.A, operating in Band Class 0(800MHz) and Band Class 1(1900M), and the 4G WiMAX supports IEEE802.16e, operating in frequency of 2.5GHz.The WiFi frequency is 2.4GHz.

QISEC5072 supports 1Tx2Rx for 3G CDMA and 4G WiMAX, but there are also two Tx antenna for 4G WiMAX to realize TxD(TX Switching Diversity), WiFi only supports 1Tx1Rx, the GPS is only used for receiver.

2.1.2 Support Modulation and Coding Rate

The EUT supports the modulation and coding rate as follows:

Table 3. Modulation and Coding Rate List

Modulation	Coding Rate	Test Mode	Remark
QPSK	1/2	TM1	DL and UL
	3/4	TM2	DL and UL
16QAM	1/2	TM3	DL and UL
	3/4	TM4	DL and UL
64QAM	1/2	TM5	DL Only
	2/3	TM6	DL Only
	3/4	TM7	DL Only
	5/6	TM8	DL Only

Note: The test conditions and settings are defined in WiMAX MRCT.



3 Test Site Description

The test site of:

***Huawei Technologies Co. Ltd.
P.O. Box 518129
Huawei base, Bantian,
Longgang District, Shenzhen, China***

3.1 Testing Period

The test has been performed during the period of:

Date of Start (y-m-d): 2011-3-11

Date of End (y-m-d): 2011-3-15



4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4. Frequency Range for BRS&EBS Band

Uplink band:	2496 to 2690 MHz
Downlink band:	2496 to 2690 MHz

4.1.2 Channel Bandwidth

Table 5. Channel Bandwidth

Channel bandwidth:	5 MHz and 10 MHz
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4.1.3 Output Power

Table 6. Output Power

Transmitter Output Power (per Antenna Port):	QPSK:+23.5 dBm 16QAM:+21.5 dBm
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4.1.4 Antenna Profiles

Table 7. Antenna Profiles

Antenna Brand	SAA
Antenna Type	Monopole
Antenna Frequency Range	2.496GHz~2.690GHz
Antenna Maximum Peak Gain	0 dBi

4.1.5 Power Source

Table 8. DC Power Source

Charger voltage range:	~ 100-240 V, 50/60Hz
Charger current maximal:	0.2 A Max
Battery Rated capacity:	2200mAh
Battery Nominal Voltage:	== 3.7V

4.1.6 Environmental Requirements

Table 9. Environmental Requirements

Minimum temperature:	0 °C
Maximum temperature:	+35 °C
Relative Humidity:	5% to 95% RH



4.1.7 UL Zone Type

Table 10. UL Zone Type

UL Zone Type:	PUSC
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4.1.8 Tune-up Procedure

Refer to FCC 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

Note:

1. The EUT can support different DL/UL ration in the normal operation, the maximum DL/UL (29:18) ration is used for 5MHz and 10MHz in this test, which can be controlled by the software from the host equipment.
2. The EUT provides one completed transmitter and two receivers (1T2R), but the two antennas can make a TXD (TX diversity), TXD means TX Switching Diversity, TX should be switched between the two antennas, the antenna with a more stronger downlink signal will be selected, because the RF Link for two antennas before the RF Switch is the same, so only one TX conduct is mainly test in this report.
3. The above EUT information was declared by manufacture, for more detailed features description please refers to the manufacture's specifications or User's Manual.



4.2 EUT Identification List

4.2.1 Component Parts Information

The EUT involved in the test report consists of sub-assembly and ancillary Equipments as below.

(1) Sub-assembly identity of EUT

Sub-assembly identity of EUT

Model Identify	Hardware Version	Qty.	Software Version	Serial Number	Description
EC5072	CE1EC5072M	1	V100R001	NA	Main board
	CE1EC5072S	1	V100R001	NA	Slave board

(2) Sub-assembly identity of Ancillary Equipments

Table 11. Sub-assembly identity of Ancillary Equipments

Model Identify	Qty.	Hardware Version	Software Version	Serial Number	Description
/	/	/	/	/	/

4.2.2 FCC Identification

Grantee Code: QIS
 Product Code: EC5072
 FCC Identification: QISEC5072



5 Main Test Instruments

Table 12. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec.14.2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24.2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.24,2011
Signal Analyzer	R&S	FSQ40	100025	Oct.09,2011
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2012
Signal Generator	R&S	SMR40	100325	May.12,2012
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Spectrum Analyzer	R&S	FSU26	EG26725	Mar.07,2012
Test receiver	R&S	ESIB26	100318	May.04.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13.2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2012
Horn Antenna	R & S	HF906	359287/006	April.27, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.11, 2011
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20.2011



Horn Antenna	ETS-LINDGREN	3160	60006	Oct.27.2011
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6 Transmitter & Receiver Measurements

Test Ports:

The information as below is followed in tests and in the present test report:

- The EUT consists of two TRX channels, respectively named ‘TRXA’ and ‘TRXB’. Each of ports has the equivalent functions.
- “TRXA” and “TRXB” can be TX Diversity, but they use the same RF circuit and Switch, so “TRXA” was mainly used in transmitter tests in this report;
- The Uplink of EUT is relevant to Transmitter (TX), while Downlink to Receiver (RX);
- Unless otherwise stated, all “Channels under Test”, “Test Environments”, “Test Modes”, “Channel Bandwidth” and “their combinations” should be considered in tests (see detailed as following clauses).

Test Frequencies:

Table 13. Frequency points (channels) selected to perform transmitter tests

Transmitter Operating Band	Multiple Carriers	Channels under Test		
		Bottom/lowest (B)	Middle (M)	Top/highest (T)
BRS&EBS band (5 MHz Channel Bandwidth)	1	2498.5 MHz	2593 MHz	2687.5 MHz
BRS&EBS band (10 MHz Channel Bandwidth)	1	2501 MHz	2593 MHz	2685 MHz



6.1 Maximum Channel Power

6.1.1 Test Conditions

Table 14. Test Conditions

Measured at:	Antenna connectors of TRXA and TRXB
Ambient temperature:	24 °C to 26 °C
Relative humidity:	55% to 63%

6.1.2 Test Specifications and Limits

Compliance with FCC part 2.1046 and part 27.50(h)(2), Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Table 15. FCC Limits for BRS&EBS Band

Limits for mobile stations	<2W(33dBm),EIRP
Limits for user stations	<2W(33dBm),transmitter output power

6.1.3 Test Method and Setup

The EUT was connected to the Wireless Signal Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Maximum Channel Power of the EUT by the Wireless Signal Analyzer or equivalent.

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

Note 1: Compliance with FCC part 2.1046 and part 27.50(h)(2), Mobile stations are limited to 2.0 watts EIRP (see table 15);

Note 2: Equivalent EIRP can be delivered by the maximum conducted power and the antenna maximum peak gain, like $EIRP = \text{maximum conducted power} + \text{antenna maximum peak gain}$, the antenna maximum peak gain is 0dBi (see table 7);

Test setup

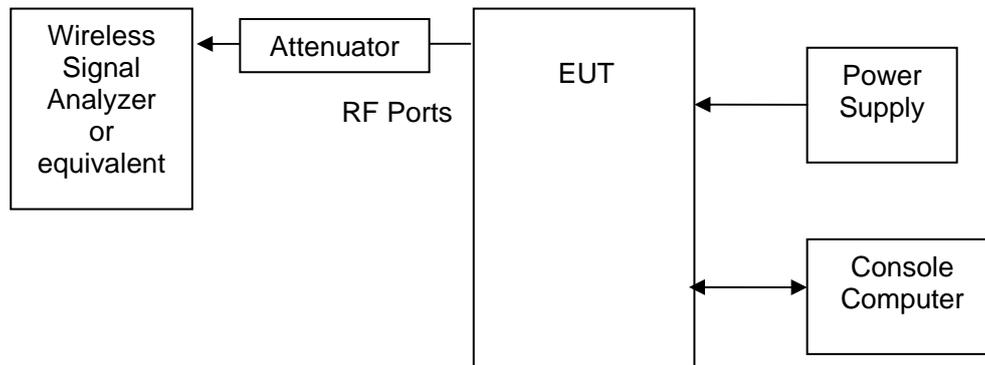


Figure 1. TEST SETUP

6.1.4 Measurement Results

6.1.4.1 Maximum Output Power at Antenna Port

(1) Channel Bandwidth = 5 MHz:

Table 16. Measurement Results for Maximum Output Power

Test Mode	Maximum Output Power (dBm)+ Maximum Peak Gain (dBi)						Limit (dBm)
	Ch. B		Ch. M		Ch. T		
	TRXA	TRXB	TRXA	TRXB	TRXA	TRXB	EIRP
TM 1	23.86	24.03	23.66	23.81	23.53	23.56	< 33
TM 2	23.88	24.00	23.57	23.80	23.48	23.52	< 33
TM 3	22.04	22.10	21.98	22.23	21.85	21.42	< 33
TM 4	21.95	22.02	21.89	22.12	21.75	21.33	< 33

(2) Channel Bandwidth = 10 MHz:

Table 17. Measurement Results for Maximum Output Power

Test Mode	Maximum Output Power (dBm)+ Maximum Peak Gain (dBi)						Limit (dBm)
	Ch. B		Ch. M		Ch. T		
	TRXA	TRXB	TRXA	TRXB	TRXA	TRXB	EIRP
TM 1	23.07	23.29	23.09	23.13	22.93	22.99	< 33
TM 2	23.02	23.18	23.07	23.12	22.90	22.97	< 33
TM 3	21.06	21.29	21.26	21.54	21.21	20.79	< 33
TM 4	21.11	21.17	21.14	21.42	21.07	20.68	< 33

Note 1: For EUT, the antenna maximum peak gain is 0dBi (see table 7), maximum conducted output power is 24.03dBm when it worked on TM1 of 5MHz bandwidth and Bottom channel (see table 16), so the maximum EIRP=24.03dBm+0dBi=24.03dBm, which is less than the limit of 33dBm.

6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.



6.2 Modulation Characteristics

6.2.1 Test Conditions

Table 18. Test Conditions

Measured at:	Antenna connectors of TRXA
Ambient temperature:	24 °C to 26 °C
Relative humidity:	55% to 63%

6.2.2 Test Specifications and Limits

No specific modulation characteristics requirement limits in FCC part 2.1047 and part 27 subpart C for BRS&EBS Band.

In addition, limits according to the technical requirements of the EUT can be adopted as showed in the following table.

Table 19. Limits According to EUT technical requirements

Limits for IEEE802.16 mobile stations:	QPSK 1/2 modulation: RCE < -15 dB QPSK 3/4 modulation: RCE < -18 dB 16QAM 1/2 modulation: RCE < -20.5 dB 16QAM 3/4 modulation: RCE < -24 dB
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6.2.3 Test Method and Setup

The EUT was connected to the Wireless Signal Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Modulation Characteristics of the EUT by the Wireless Signal Analyzer or equivalent.

Test setup

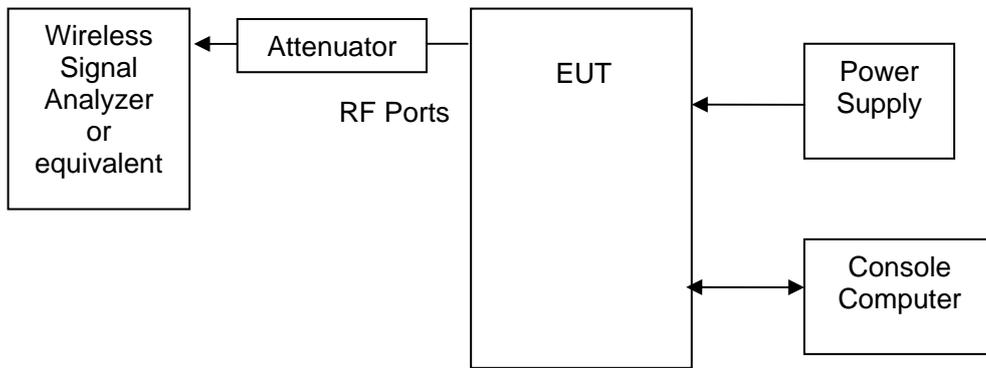


Figure 2. TEST SETUP

6.2.4 Measurement Results

(1) Channel Bandwidth = 5 MHz:

Table 20. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics (dB)			Limit
	B	M	T	
TM 1	-33.43	-34.47	-32.48	< -15 dB
TM 2	-33.62	-34.83	-32.93	< -18 dB
TM 3	-35.93	-36.69	-35.43	< -20.5 dB
TM 4	-36.34	-37.04	-35.13	< -24 dB

(2) Channel Bandwidth = 10 MHz:

Table 21. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics (dB)			Limit
	B	M	T	
TM 1	-34.95	-35.31	-33.56	< -15 dB
TM 2	-35.27	-35.51	-33.65	< -18 dB
TM 3	-36.53	-36.98	-35.31	< -20.5 dB
TM 4	-36.05	-36.65	-35.44	< -24 dB

6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to Appendix A.

6.3 Occupied Bandwidth

6.3.1 Test Conditions

Table 22. Test Conditions

Measured at:	Antenna connectors of TRXA
Ambient temperature:	24 °C to 26 °C
Relative humidity:	55% to 63%

6.3.2 Test Specifications and Limits

No specific occupied bandwidth requirement in FCC part 2.1049 and part 27 subpart C for BRS&EBS Band.

6.3.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Occupied Bandwidth of the EUT by the Spectrum Analyzer or equivalent.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured (as 99% bandwidth).

The measurement bandwidth (RBW) of Spectrum Analyzer or equivalent is set to about or less than 1% of the channel bandwidth.

Test setup

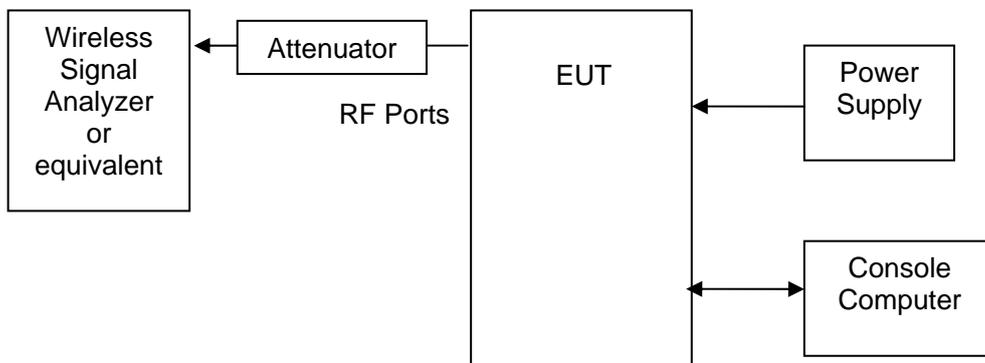


Figure 3. TEST SETUP



6.3.4 Measurement Results

Channel Bandwidth = 5 MHz:

Table 23. Measurement Results for Occupied Bandwidth

Test Mode	Occupied Bandwidth (MHz)						Limit
	B		M		T		
	99%	26dB	99%	26dB	99%	26dB	
TM 1	4.4412	4.777	4.4475	4.810	4.4471	4.852	---
TM 2	4.4464	4.814	4.4465	4.843	4.4500	4.805	
TM 3	4.4469	4.799	4.4489	4.797	4.4501	4.803	
TM 4	4.4475	4.792	4.4471	4.788	4.4462	4.810	

Channel Bandwidth = 10 MHz:

Table 24. Measurement Results for Occupied Bandwidth

Test Mode	99% Occupied Bandwidth (MHz)						Limit
	B		M		T		
	99%	26dB	99%	26dB	99%	26dB	
TM 1	9.0637	9.456	9.0628	9.457	9.0642	9.460	---
TM 2	9.0617	9.455	9.0616	9.458	9.0651	9.459	
TM 3	9.0729	9.513	9.0723	9.509	9.0748	9.518	
TM 4	9.0653	9.458	9.0648	9.458	9.0745	9.512	

6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to Appendix B.



6.4 Band Edges Compliance

6.4.1 Test Conditions

Table 25. Test Conditions

Measured at:	Antenna connectors of TRXA
Ambient temperature:	24 °C to 26 °C
Relative humidity:	55% to 63%

6.4.2 Test Specifications and Limits

FCC part 2.1051 and part 27.53(m)(4) and part 27.53(m)(6)

Table 26. Supporting Standards

ANSI/TIA-603-C	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
WiMAX MRCT	WiMAX Forum™ Mobile Radio Conformance Tests

Compliance with FCC part 2.1051 and part 27.53(m)(4) and part 27.53(m)(6), for mobile digital stations, is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB at the channel edge and $55 + 10 \log (P)$ dB at 5.5MHz from the channel edges.

Table 27. FCC Limits for BRS&EBS Band

Limit:	<p>At the channel edge: $< P - (43 + 10\log_{10}P) = 10\log_{10}(1000 * P) - (43 + 10\log_{10}P) = 30 - 43 = -13\text{dBm}$</p> <p>At 5.5MHz from the channel edges: $< P - (55 + 10\log_{10}P) = 10\log_{10}(1000 * P) - (55 + 10\log_{10}P) = 30 - 55 = -25\text{dBm}$, at 5.5MHz from the channel edges</p>
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6.4.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Band Edge Spurious Emissions of the EUT by the Spectrum Analyzer or equivalent.

Set the Spectrum Analyzer or equivalent in power averaging mode. Set the sweep span to cover at least $\pm 250\%$ of the emission bandwidth or 2 MHz, which is larger.

The measurement bandwidth (RBW) of Spectrum Analyzer or equivalent is set to at least 1% of the channel bandwidth for the 1 MHz bands immediately outside and adjacent to the frequency block. But 1MHz or greater RBW should be used for other bands offset out of 1 MHz to the frequency block.

Test setup

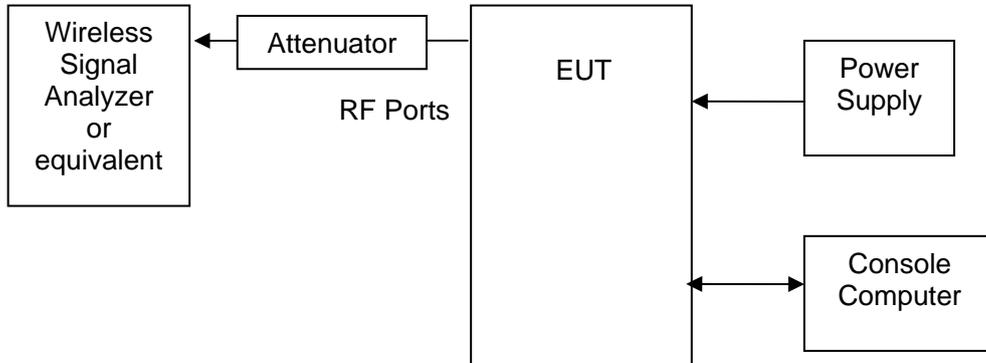


Figure 4. TEST SETUP

6.4.4 Measurement Results

6.4.4.1 Band edge emissions

Channel Bandwidth = 5 MHz:

Table 28. Measurement Results for Band Edge Characteristics

Test Mode	Test Frequency offset (MHz)	Band Edge Emissions (dBm)		
		B	T	Limit (dBm)
TM 1	< 1MHz	-31.62	-49.08	< -13
	< 5.5MHz	-17.42	-17.33	< -13
	> 5.5MHz	-46.78	-47.51	< -25
TM 2	< 1MHz	-32.39	-49.95	< -13
	< 5.5MHz	-17.45	-17.32	< -13
	> 5.5MHz	-46.75	-47.41	< -25
TM 3	< 1MHz	-28.95	-50.43	< -13
	< 5.5MHz	-19.65	-19.56	< -13
	> 5.5MHz	-49.27	-48.97	< -25
TM 4	< 1MHz	-31.71	-51.06	< -13
	< 5.5MHz	-20.62	-19.55	< -13
	> 5.5MHz	-49.31	-48.91	< -25



Channel Bandwidth = 10 MHz:

Table 29. Measurement Results for Band Edge Characteristics

Test Mode	Test Frequency offset (MHz)	Band Edge Emissions (dBm)		
		B	T	Limit (dBm)
TM 1	< 1MHz	-35.10	-43.57	< -13
	< 5.5MHz	-14.52	-14.13	< -13
	> 5.5MHz	-31.83	-32.36	< -25
TM 2	< 1MHz	-33.59	-44.07	< -13
	< 5.5MHz	-14.51	-14.19	< -13
	> 5.5MHz	-31.94	-32.55	< -25
TM 3	< 1MHz	-32.74	-47.44	< -13
	< 5.5MHz	-16.64	-16.26	< -13
	> 5.5MHz	-36.65	-38.22	< -25
TM 4	< 1MHz	-33.51	-46.86	< -13
	< 5.5MHz	-16.63	-16.31	< -13
	> 5.5MHz	-36.35	-38.23	< -25

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to Appendix C.



6.5 Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

Table 30. Test Conditions

Measured at:	Antenna connectors of TRXA
Ambient temperature:	24 °C to 26 °C
Relative humidity:	55% to 63%

6.5.2 Test Specifications and Limits

FCC part 2.1051 and part 27.53(m)(4) and part 27.53(m)(6)

Table 31. Supporting Standards

WiMAX MRCT	WiMAX Forum™ Mobile Radio Conformance Tests
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Compliance with FCC part 2.1051 and part 27.53(m)(4) and part 27.53(m)(6), for mobile digital stations, is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, the attenuation factor shall not be less than 43 + 10 log (P) dB at the channel edge and 55 + 10 log (P) dB at 5.5MHz from the channel edges.

Table 32. FCC Limits for BRS&EBS Band

Limit:	$< P - (55 + 10\log_{10}P) = 10\log_{10}(1000 * P) - (55 + 10\log_{10}P) = 30 - 55 = -25\text{dBm}$
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6.5.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Out-band Spurious Emissions of the EUT by the Spectrum Analyzer or equivalent.

According to FCC part 2.1057, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent for test frequency range of 9 kHz to 10th harmonic:

BRS&EBS Band:	1 MHz
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Alternatively, according to ITU SM.329, measurement bandwidth (RBW) of Spectrum Analyzer or equivalent can be set as following for test frequency range of 9 kHz to 30 MHz:

9 kHz – 150 KHz:	1 kHz
150 kHz – 30 MHz:	10 kHz

Detector of Spectrum Analyzer or equivalent

WiMAX equipment	RMS
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Test setup

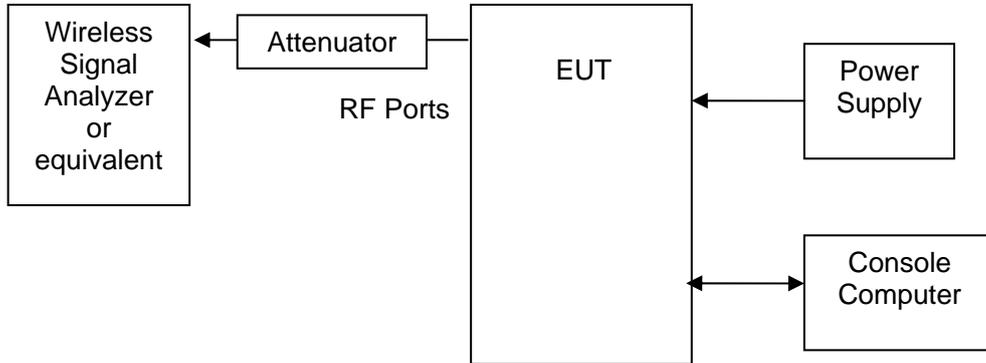


Figure 5. TEST SETUP

6.5.4 Measurement Results

Channel Bandwidth = 5 MHz:

Table 33. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Conducted Spurious Emissions (dBm)			
		B	M	T	Limit (dBm)
TM 1	9K – 150K	-48.23	-47.61	-46.95	< -25
	150K – 30M	-43.50	-44.01	-44.78	< -25
	30M – 1G	-49.53	-49.23	-47.34	< -25
	1G – 27G	-39.34	-39.37	-38.72	< -25
TM 2	9K – 150K	-48.54	-48.64	-48.95	< -25
	150K – 30M	-44.33	-45.03	-45.75	< -25
	30M – 1G	-49.73	-49.85	-49.94	< -25
	1G – 27G	-39.15	-39.13	-38.83	< -25
TM 3	9K – 150K	-48.10	-48.01	-48.40	< -25
	150K – 30M	-45.74	-45.71	-45.52	< -25
	30M – 1G	-49.71	-49.39	-49.33	< -25
	1G – 27G	-39.43	-39.34	-39.16	< -25
TM 4	9K – 150K	-47.26	-48.02	-47.95	< -25
	150K – 30M	-44.70	-44.24	-45.64	< -25
	30M – 1G	-49.54	-49.12	-49.63	< -25
	1G – 27G	-39.47	-39.58	-39.21	< -25



Channel Bandwidth = 10 MHz:

Table 34. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Conducted Spurious Emissions (dBm)			
		B	M	T	Limit (dBm)
TM 1	9K – 150K	-48.91	-49.14	-48.34	< -25
	150K – 30M	-46.25	-43.94	-46.52	< -25
	30M – 1G	-50.14	-49.75	-49.60	< -25
	1G – 27G	-39.26	-39.36	-39.00	< -25
TM 2	9K – 150K	-48.84	-46.83	-47.84	< -25
	150K – 30M	-40.49	-43.56	-44.39	< -25
	30M – 1G	-49.61	-49.49	-49.55	< -25
	1G – 27G	-39.34	-39.32	-39.34	< -25
TM 3	9K – 150K	-49.67	-48.41	-48.65	< -25
	150K – 30M	-45.24	-45.32	-41.86	< -25
	30M – 1G	-49.72	-49.70	-49.52	< -25
	1G – 27G	-39.65	-39.30	-39.61	< -25
TM 4	9K – 150K	-48.66	-48.06	-48.80	< -25
	150K – 30M	-42.77	-45.58	-43.13	< -25
	30M – 1G	-48.92	-48.57	-49.62	< -25
	1G – 27G	-39.24	-39.18	-39.27	< -25

6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to Appendix D.



6.6 Frequency Stability

6.6.1 Test Conditions

Table 35. Test Conditions

Measured at:	Antenna connector of TRXA
Ambient temperature:	See Measurement Results
Relative humidity:	70 %
Power supply:	See Measurement Results

6.6.2 Test Specifications and Limits

FCC part 2.1055 and part 27.54

Table 36. Supporting Standards

WiMAX MRCT	WiMAX Forum™ Mobile Radio Conformance Tests
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Compliance with FCC part 2.1055 and part 27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Table 37. FCC Limits for BRS&EBS Band

Limit:	(not defended)
--------	----------------

Specially, limits according to the technical requirements of the EUT can be adopted as showed in the following table:

Table 38. Limits According to EUT technical requirements for all operating bands

Limits for IEEE802.16 equipments:	< ±2 ppm
-----------------------------------	----------

6.6.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature from -30 °C to 50 °C.

Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 °C through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery

operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

The test procedure

The EUT was placed inside an environmental temperature chamber. The EUT was connected to the Signal Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Frequency Tolerance of the EUT by the Signal Analyzer or equivalent.

According to ANSI C63.4 clause 13.1.6, no modulation needs to be supplied to the intentional radiator during these tests, unless modulation is required to produce an output, e.g., single-sideband suppressed carrier transmitters.

According to IC RSS-Gen clause 4.7, with the transmitter installed in an environment test chamber, the unmodulated carrier frequency shall be measured under the conditions specified below.

The operating end points:	5 VDC (Normal USB Voltage), 4.75 VDC (Lowest USB Voltage) and 5.25 VDC (Highest USB Voltage).
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Test Set up

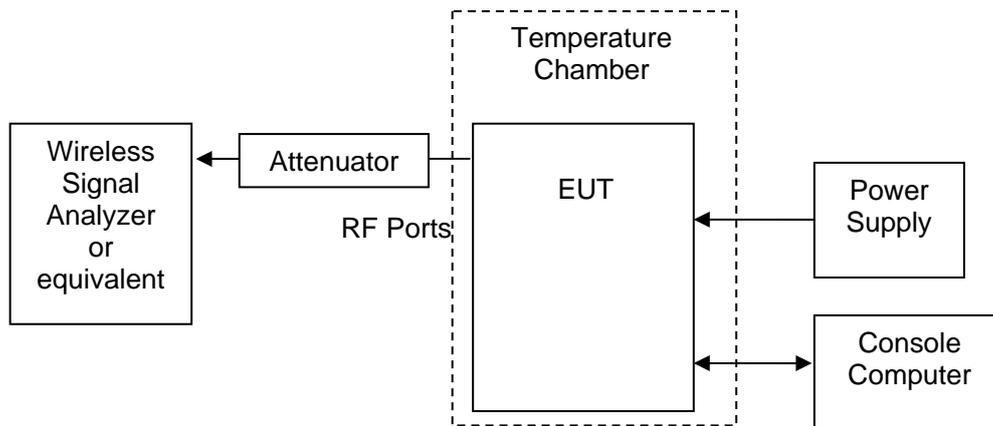


Figure 6. Test Set up



6.6.4 Measurement Results

6.6.4.1 Frequency Error vs. Temperature

Channel Bandwidth = 5 MHz:

Table 39. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error									
Test Environment			B		M		T		
Test Mode	Voltage	Temperature	Hz	ppm	Hz	ppm	Hz	ppm	Limit
TM1	5 VDC (100% rated / normal)	-30 °C	-163.5	-0.065	-163.6	-0.063	-169.7	-0.063	< ±2ppm
		-20 °C	-163.8	-0.065	-167.4	-0.067	-163.7	-0.064	
		-10 °C	-166.8	-0.066	-160.1	-0.061	-173.8	-0.064	
		0 °C	-157.3	-0.062	-167.3	-0.064	-170.9	-0.063	
		+10 °C	-160.0	-0.061	-164.6	-0.061	-161.4	-0.062	
		+20 °C	-155.6	-0.062	-157.8	-0.06	-162.6	-0.06	
		+30 °C	-153.1	-0.061	-156.4	-0.06	-166.9	-0.062	
		+40 °C	-161.4	-0.064	-155.8	-0.06	-179.4	-0.066	
		+50 °C	-159.0	-0.063	-165.5	-0.063	-169.0	-0.062	

Channel Bandwidth = 10 MHz:

Table 40. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error									
Test Environment			B		M		T		
Test Mode	Voltage	Temperature	Hz	ppm	Hz	ppm	Hz	ppm	Limit
TM1	5 VDC (100% rated / normal)	-30 °C	-161.8	-0.061	-160.3	-0.061	-163.2	-0.063	< ±2ppm
		-20 °C	-163.4	-0.065	-154.9	-0.059	-159.3	-0.059	
		-10 °C	-163.2	-0.065	-169.1	-0.065	-173.5	-0.065	
		0 °C	-163.1	-0.065	-166.6	-0.064	-169.6	-0.063	
		+10 °C	-150.3	-0.06	-153.9	-0.06	-161.3	-0.061	
		+20 °C	-148.9	-0.059	-156.9	-0.06	-163.9	-0.061	
		+30 °C	-152.2	-0.06	-154.7	-0.059	-161.3	-0.06	
		+40 °C	-157.6	-0.063	-166.8	-0.064	-170.4	-0.063	
		+50 °C	-170.9	-0.068	-161.0	-0.062	-171.0	-0.063	

6.6.4.2 Frequency Error vs. Voltage



Channel Bandwidth = 5 MHz:

Table 41. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error									
Test Environment			B		M		T		
Test Mode	Voltage	Temperature	Hz	ppm	Hz	ppm	Hz	ppm	Limit
TM1	4.25 VDC (85% rated / lowest)	+20 °C	-160.1	-0.062	-162.3	-0.062	-162.6	-0.06	< ±2ppm
	5 VDC (100% rated / normal)	+20 °C	-155.6	-0.062	-157.8	-0.06	-162.6	-0.06	
	5.75 VDC (115% rated / highest)	+20 °C	-161.9	-0.064	-170.2	-0.065	-166.9	-0.062	

Channel Bandwidth = 10 MHz:

Table 42. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error									
Test Environment			B		M		T		
Test Mode	Voltage	Temperature	Hz	ppm	Hz	ppm	Hz	ppm	Limit
TM1	4.25 VDC (85% rated / lowest)	+20 °C	-159.8	-0.062	-160.3	-0.061	-163.2	-0.061	< ±2ppm
	5 VDC (100% rated / normal)	+20 °C	-148.9	-0.059	-156.9	-0.06	-163.9	-0.061	
	5.75 VDC (115% rated / highest)	+20 °C	-154.7	-0.061	-158.5	-0.061	-165.8	-0.061	

6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.



7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 43. System Measurement Uncertainty

Items		Extended Uncertainty
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2
Field Strength of Spurious Radiation	ERP (dBm)(30MHz~1G)	U=4.6dB; k=2
	ERP (dBm) (>1G)	U=3dB; k=2
Conducted Output Power	Power (dBm)	U=0.39dB; k=2



8 Appendices

Appendix A	Measurement Results Modulation Characteristics	38Pages
Appendix B	Measurement Results Occupied Bandwidth	25Pages
Appendix C	Measurement Results Band Edges	17Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	97Pages

END



Appendix A

Modulation Characteristic Measurement According to FCC part 2.1047 and part 27 subpart C

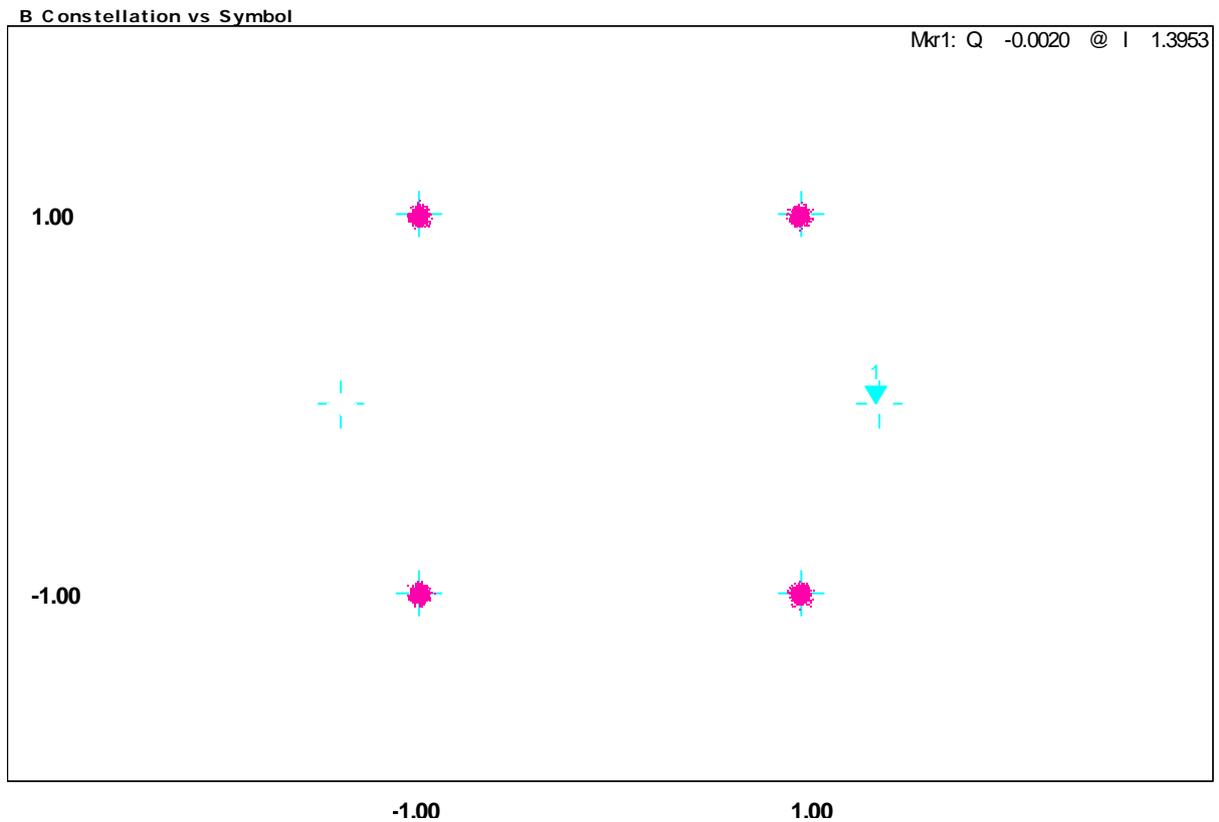


1. Channel Bandwidth = 5 MHz

1) TM 1

B

IEEE 802.16e-2005 OFDMA			
Frequency/Fs: 2.4985 GHz / 5.6 MHz	Signal Lvl. Setting/Ext. Att: 9.2 dBm / 15.2 dB	Capture Time/No.Samples: 3 ms / 16801	
Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols	
SINGLE	TRG : POWER	RF	



Measurement Complete

PO

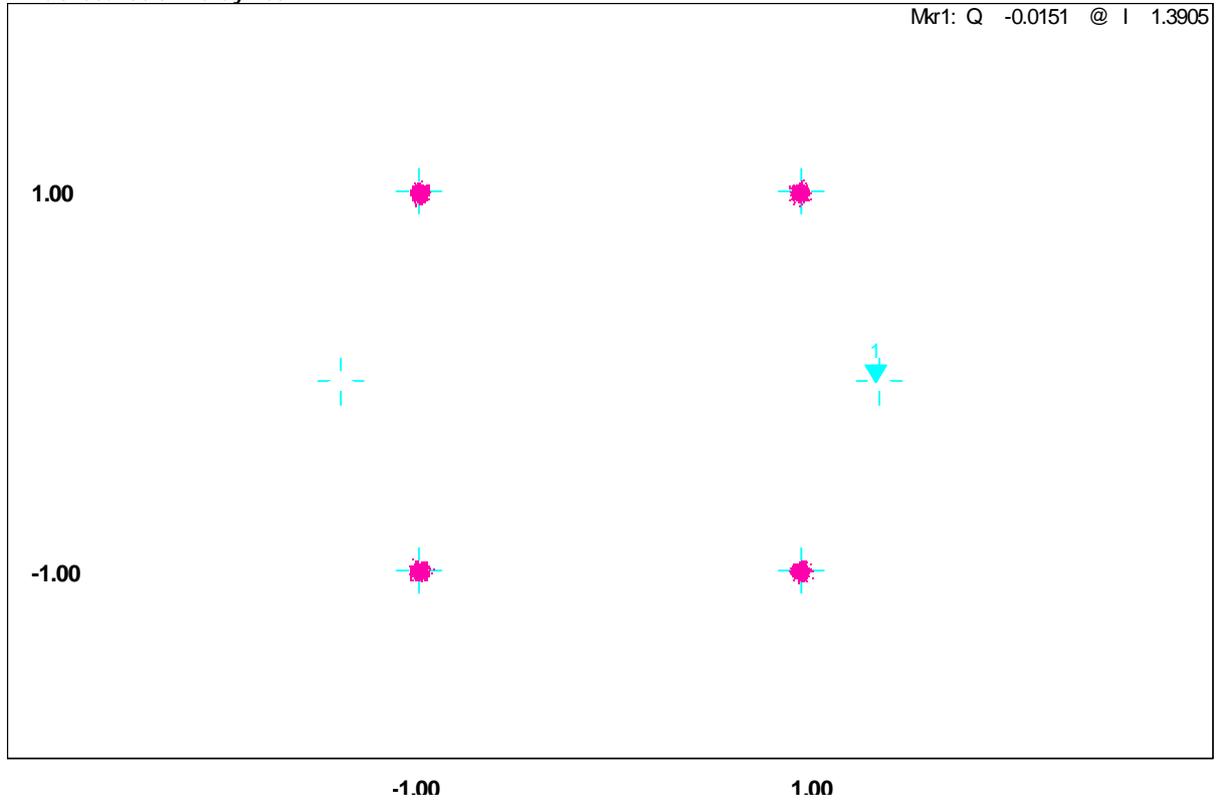
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M



IEEE 802.16e-2005 OFDMA		
Frequency/Fs: 2.593 GHz / 5.6 MHz	Signal Lvl. Setting/Ext. Att: 9.2 dBm / 15.2 dB	Capture Time/No.Samples: 3 ms / 16801
Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols
SINGLE	TRG : POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

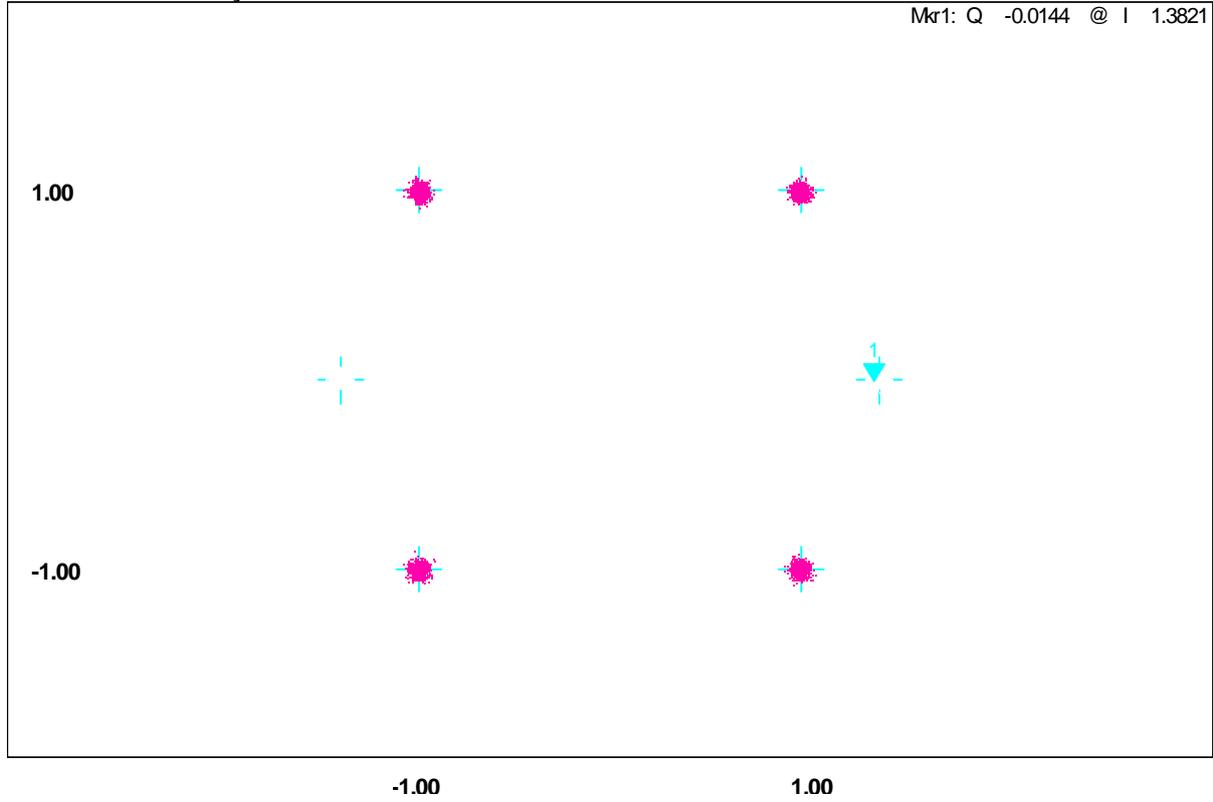
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T



IEEE 802.16e-2005 OFDMA		
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Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols
SINGLE	TRG : POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

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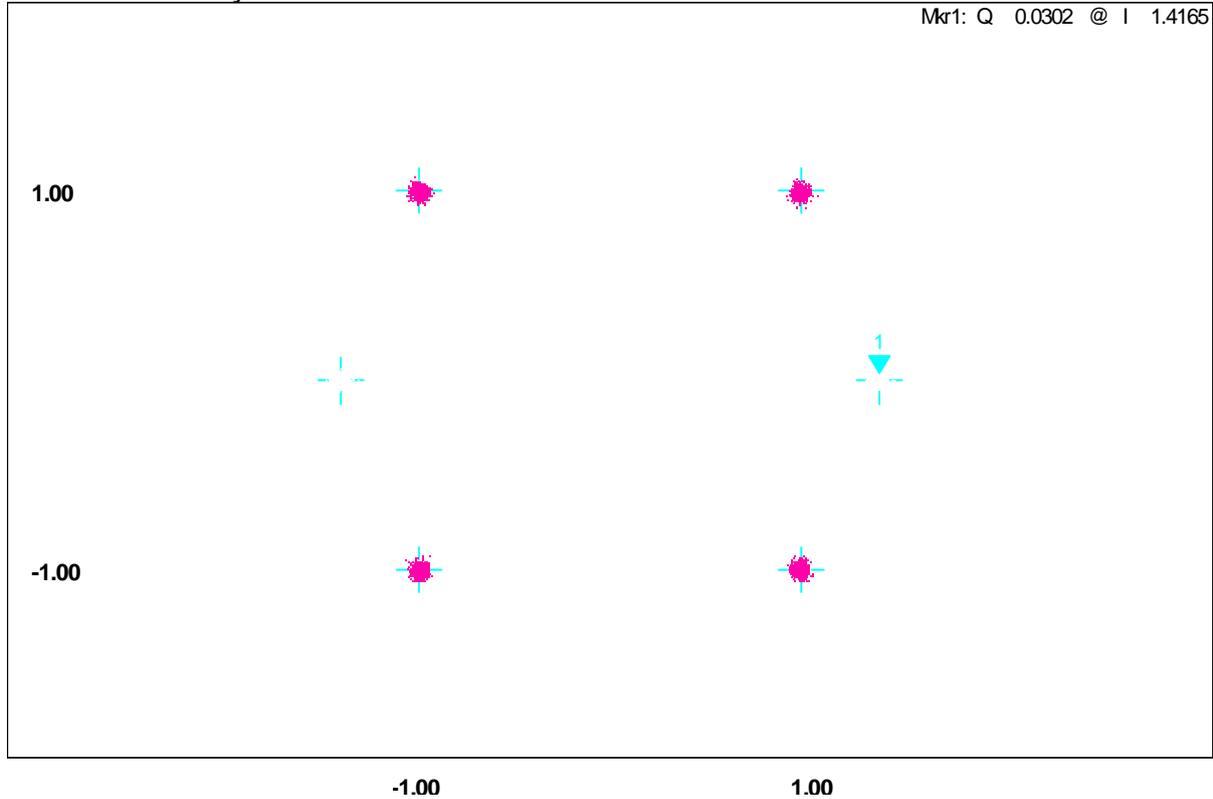
2) TM 2



B

IEEE 802.16e-2005 OFDMA		
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Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols
SINGLE	TRG: POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

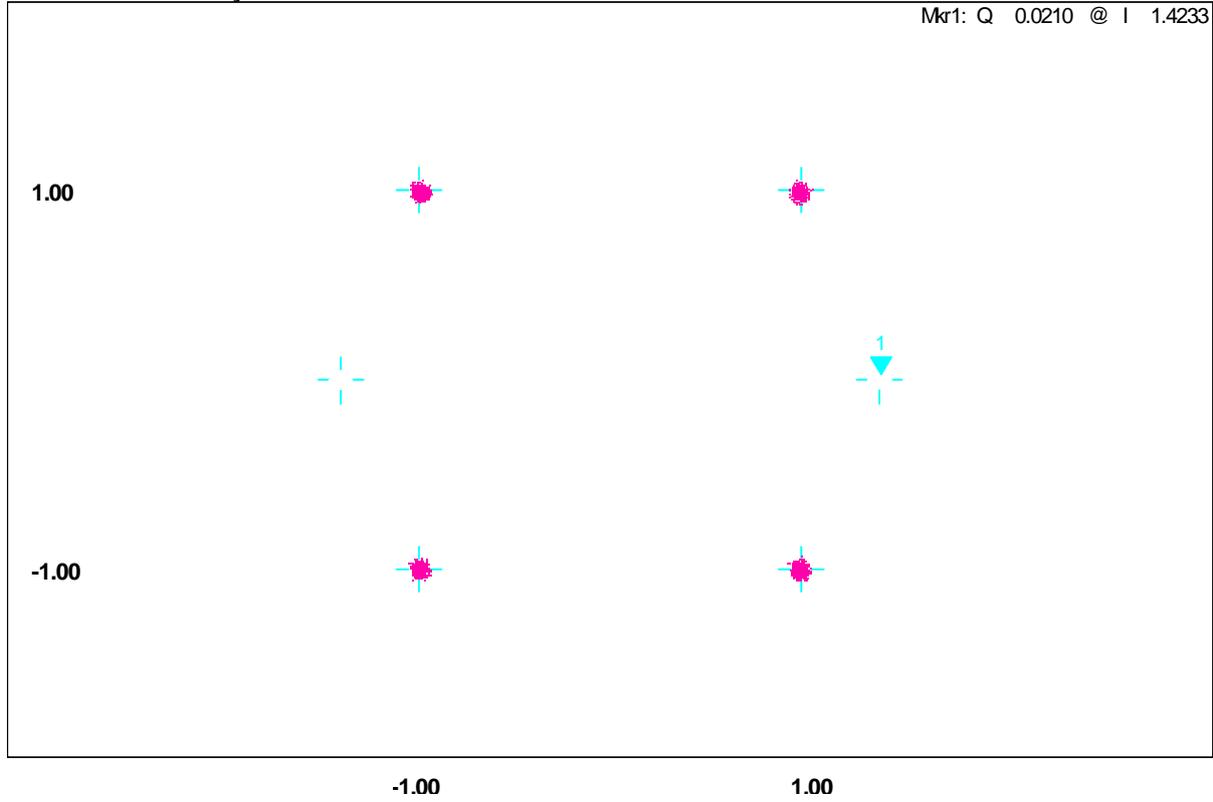
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IEEE 802.16e-2005 OFDMA		
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Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols
SINGLE	TRG : POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

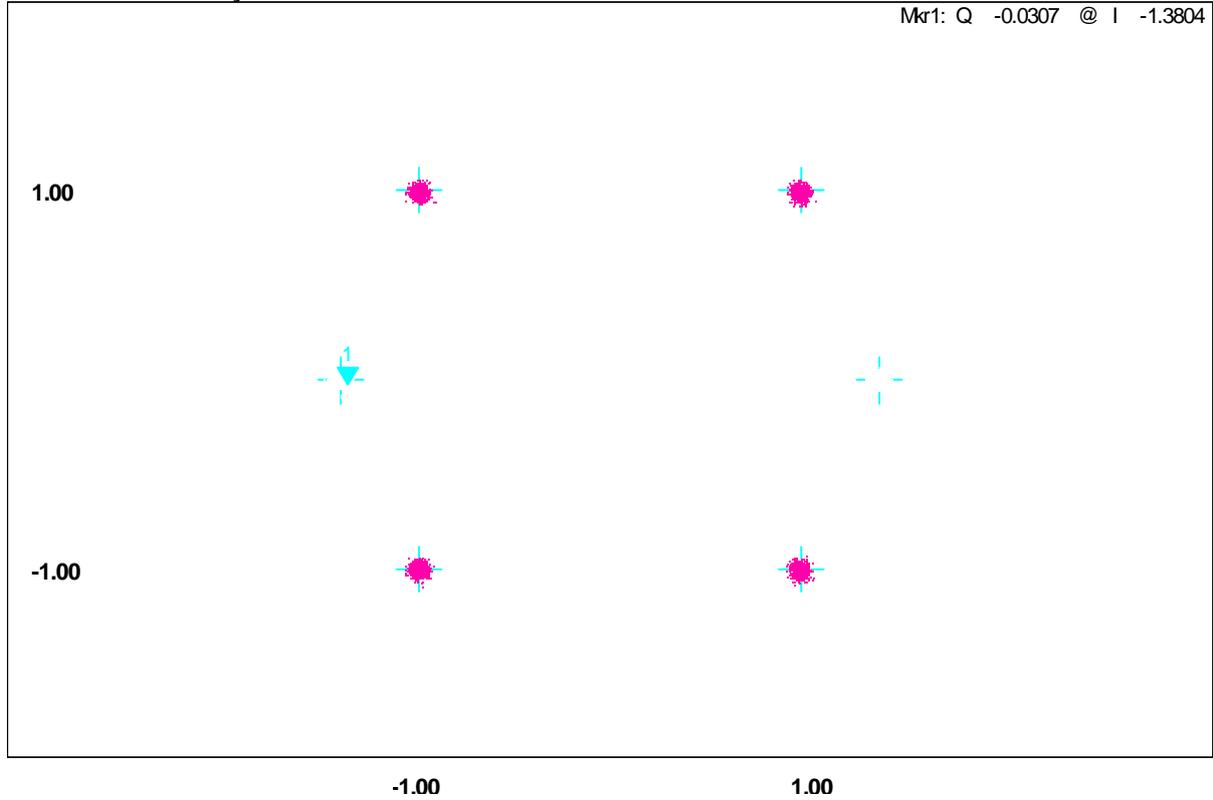
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IEEE 802.16e-2005 OFDMA		
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SINGLE	TRG : POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

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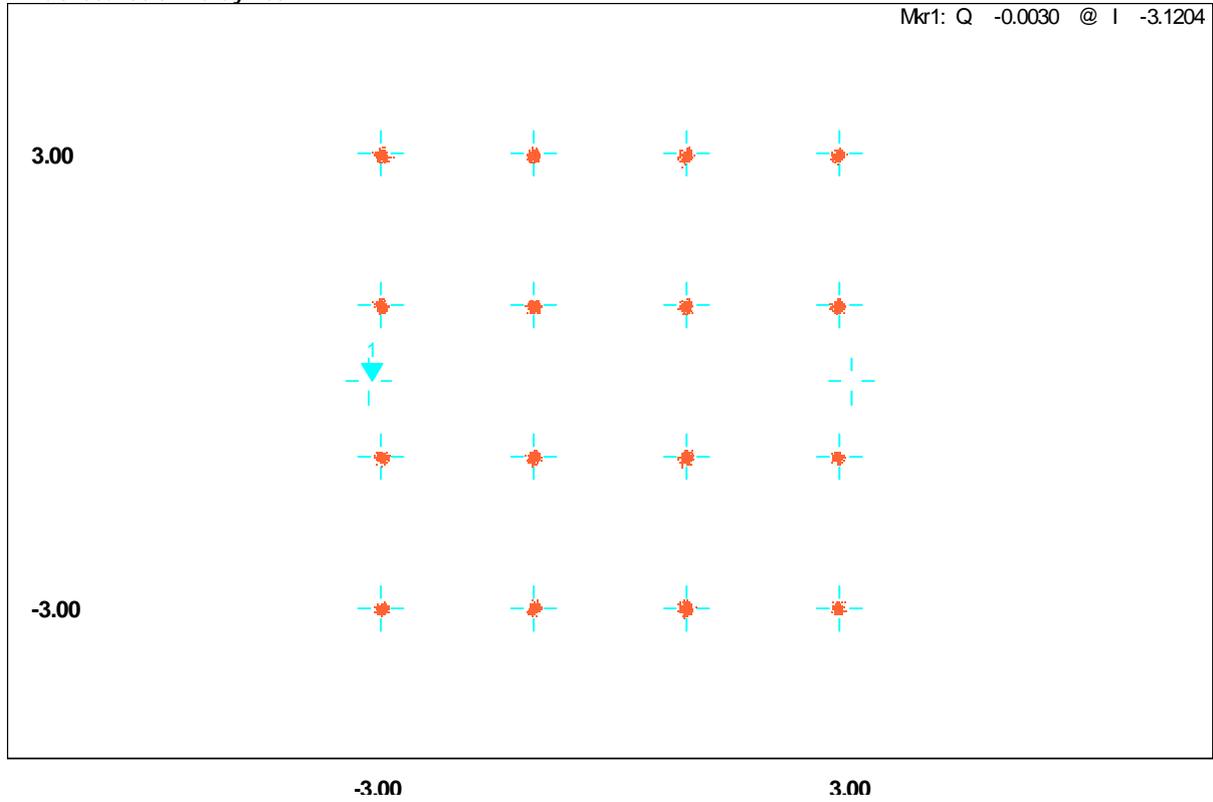
3) TM 3

B



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Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols	
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

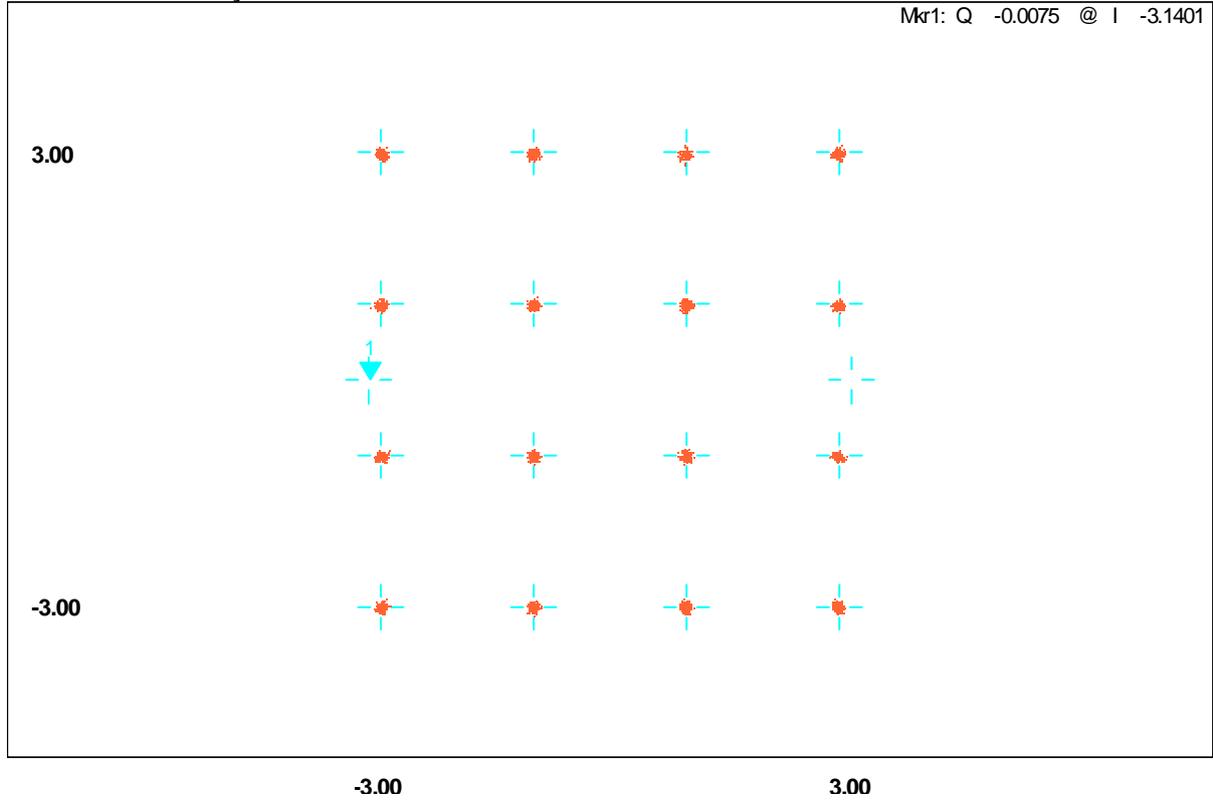
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SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

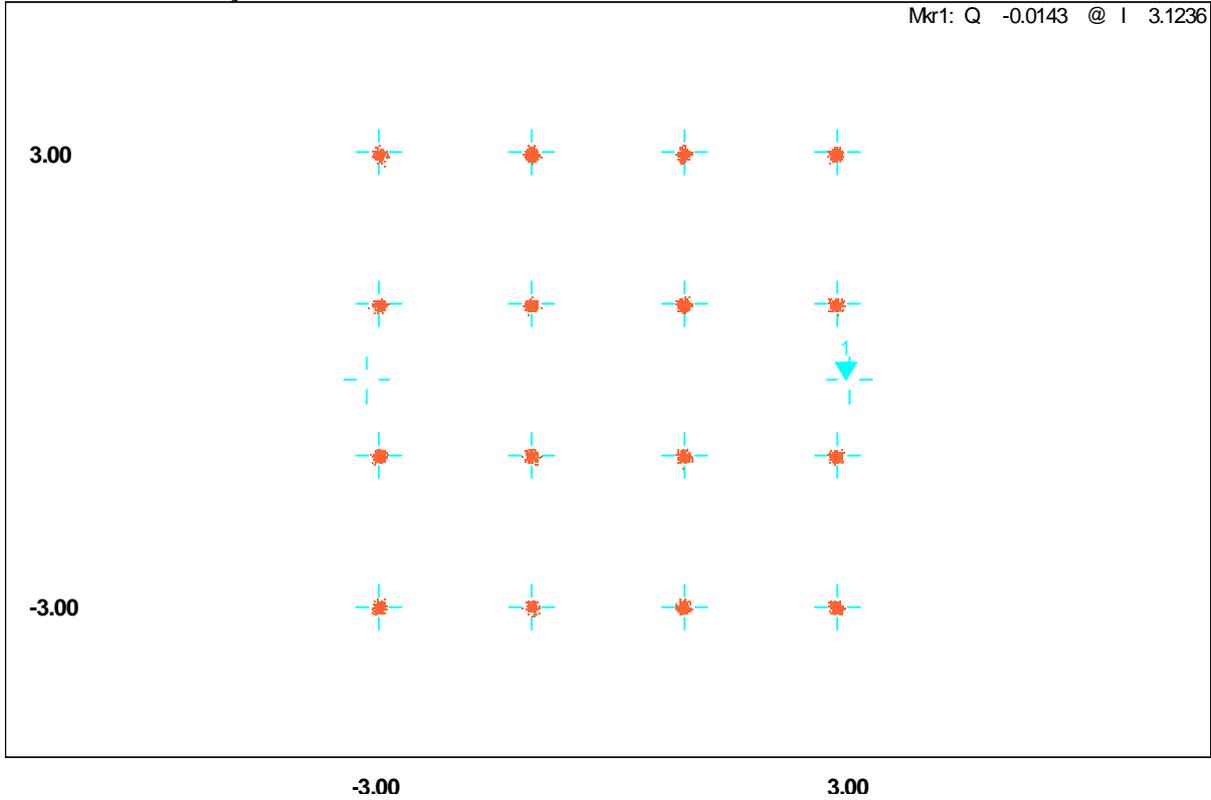
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IEEE 802.16e-2005 OFDMA			
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Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

Date: 9.MAR.2011 12:36:28

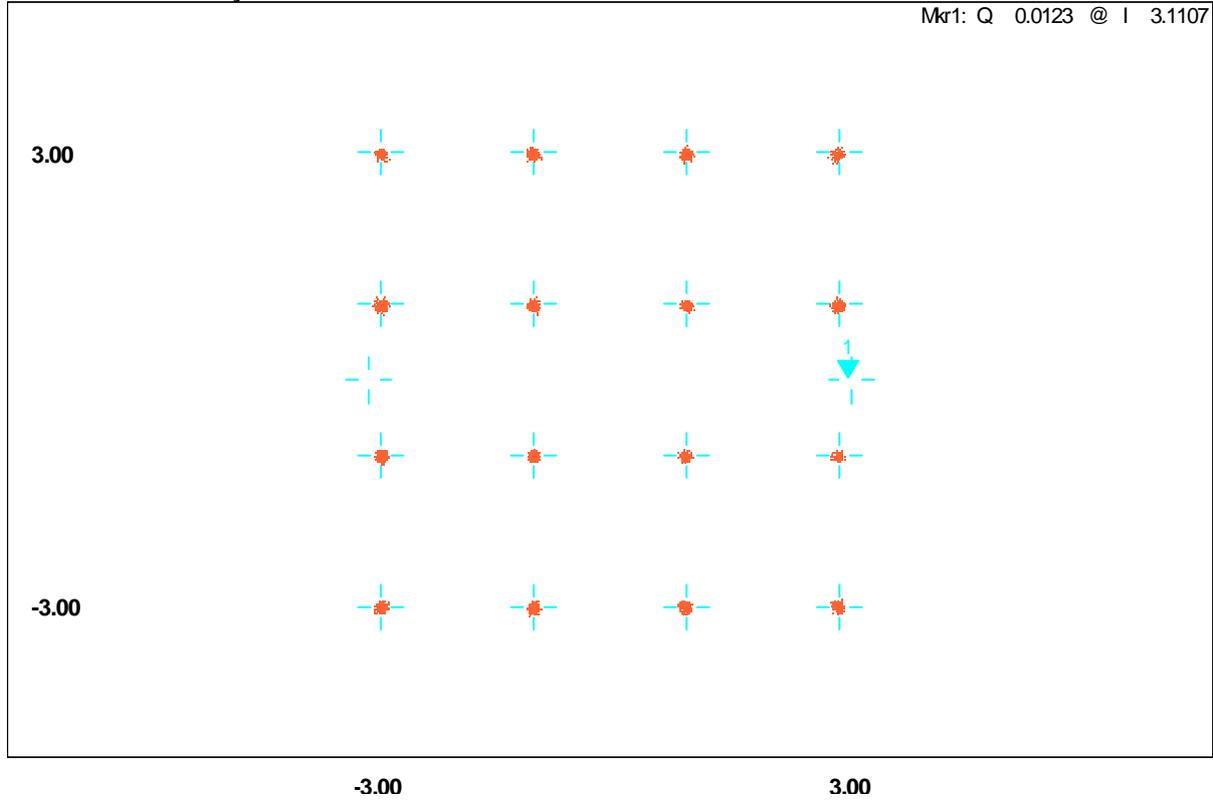
4) TM 4

B



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Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

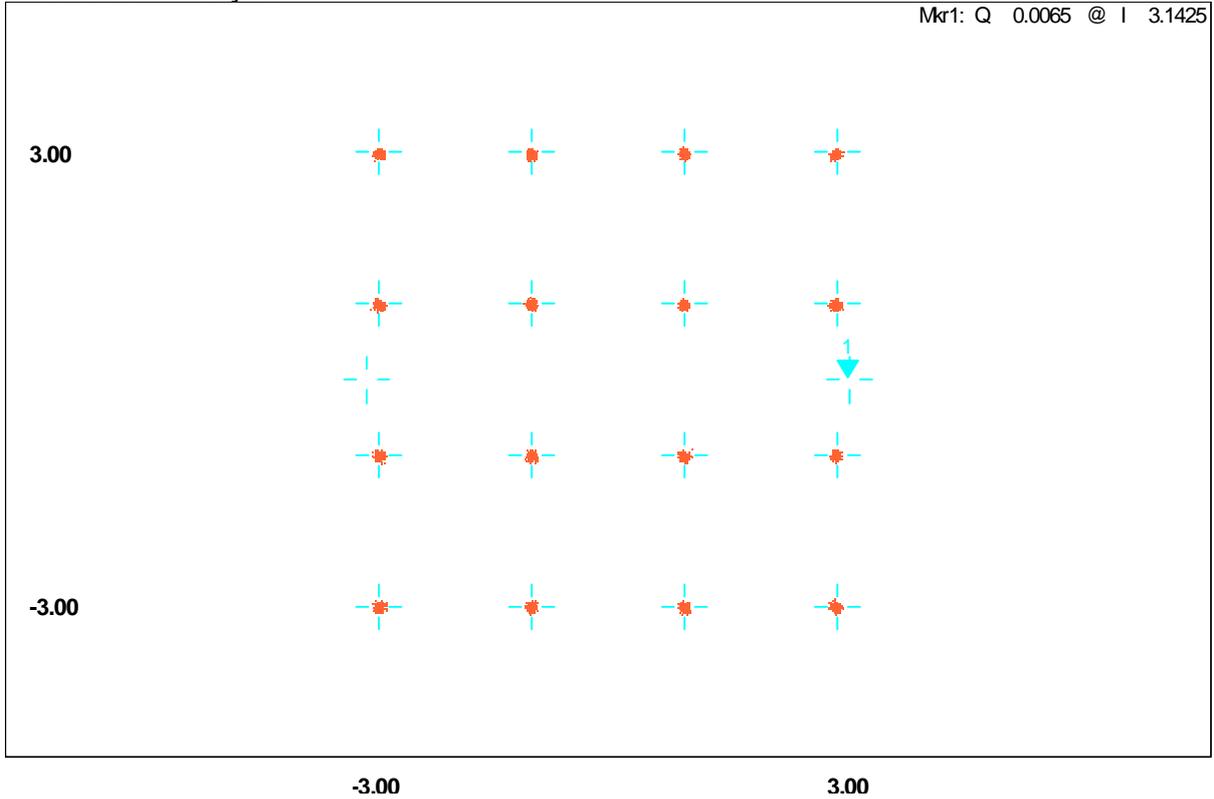
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SINGLE	TRG : POWER	RF	

B Constellation vs Symbol

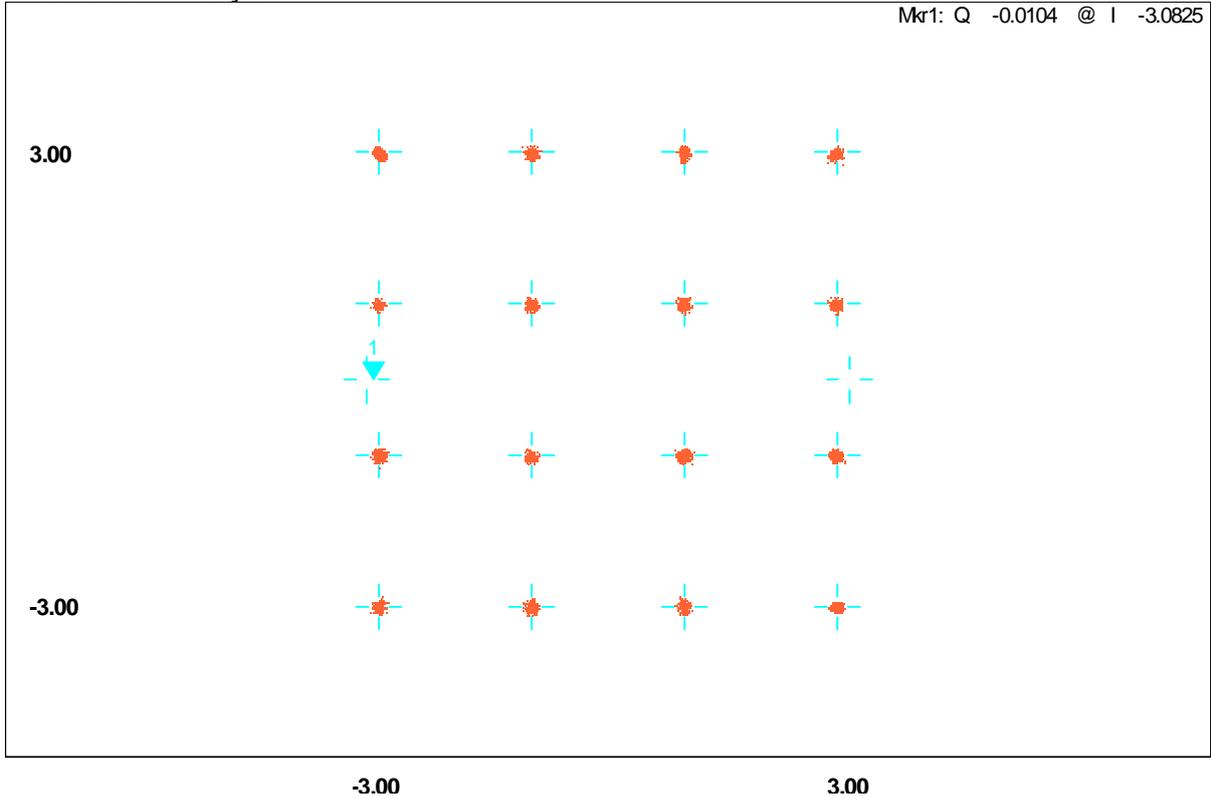




T

IEEE 802.16e-2005 OFDMA			
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Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 15 Symbols
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B Constellation vs Symbol



Measurement Complete

PO

Date: 9.MAR.2011 12:37:31



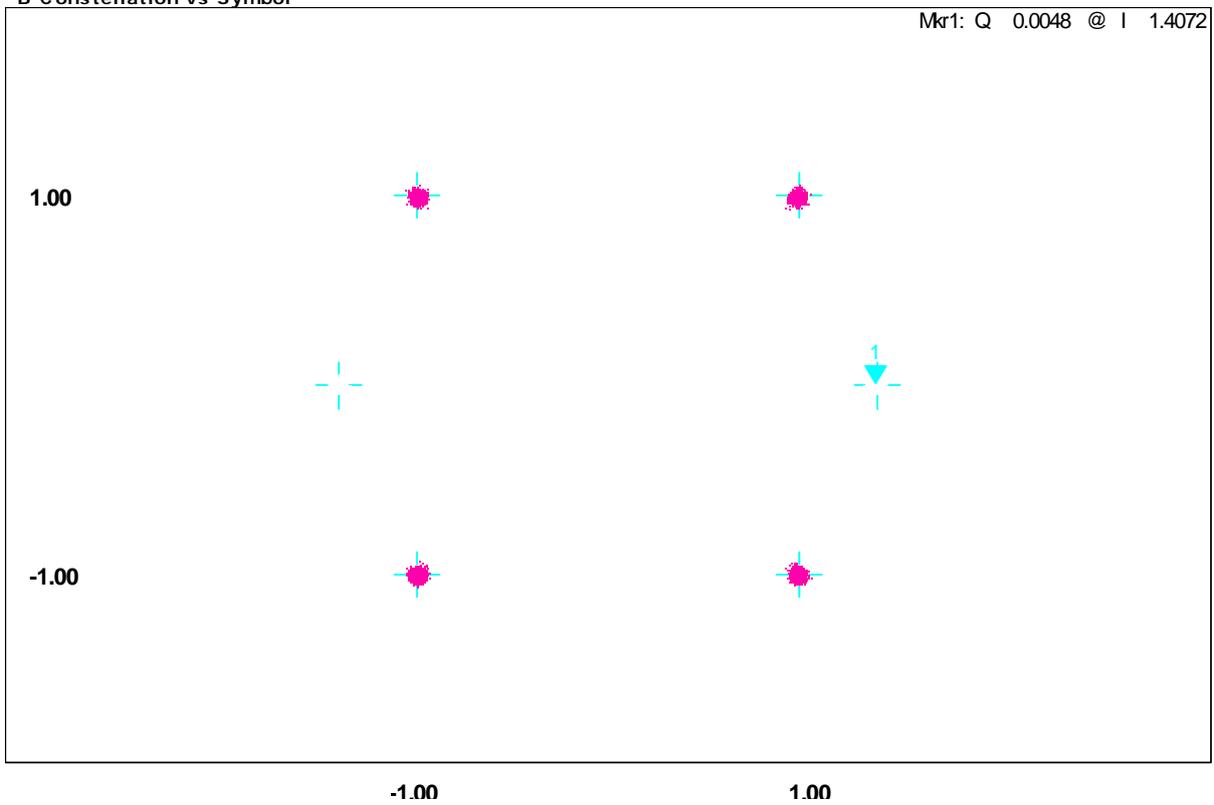
2. Channel Bandwidth = 10 MHz

1) TM 1

B

IEEE 802.16e-2005 OFDMA			
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SINGLE	TRG: POWER	RF	

B Constellation vs Symbol

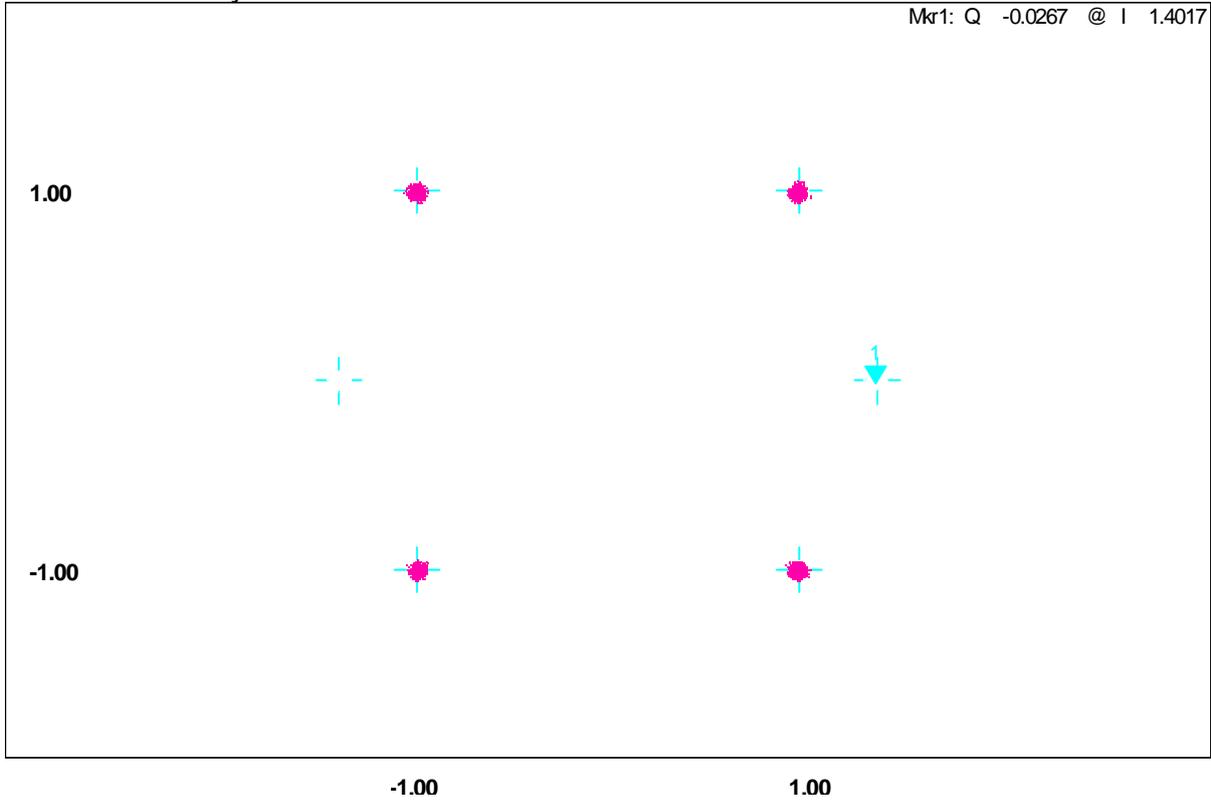




M

IEEE 802.16e-2005 OFDMA		
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Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX
Zone Offset / Len: 0 / 12 Symbols		
SINGLE	TRG: POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

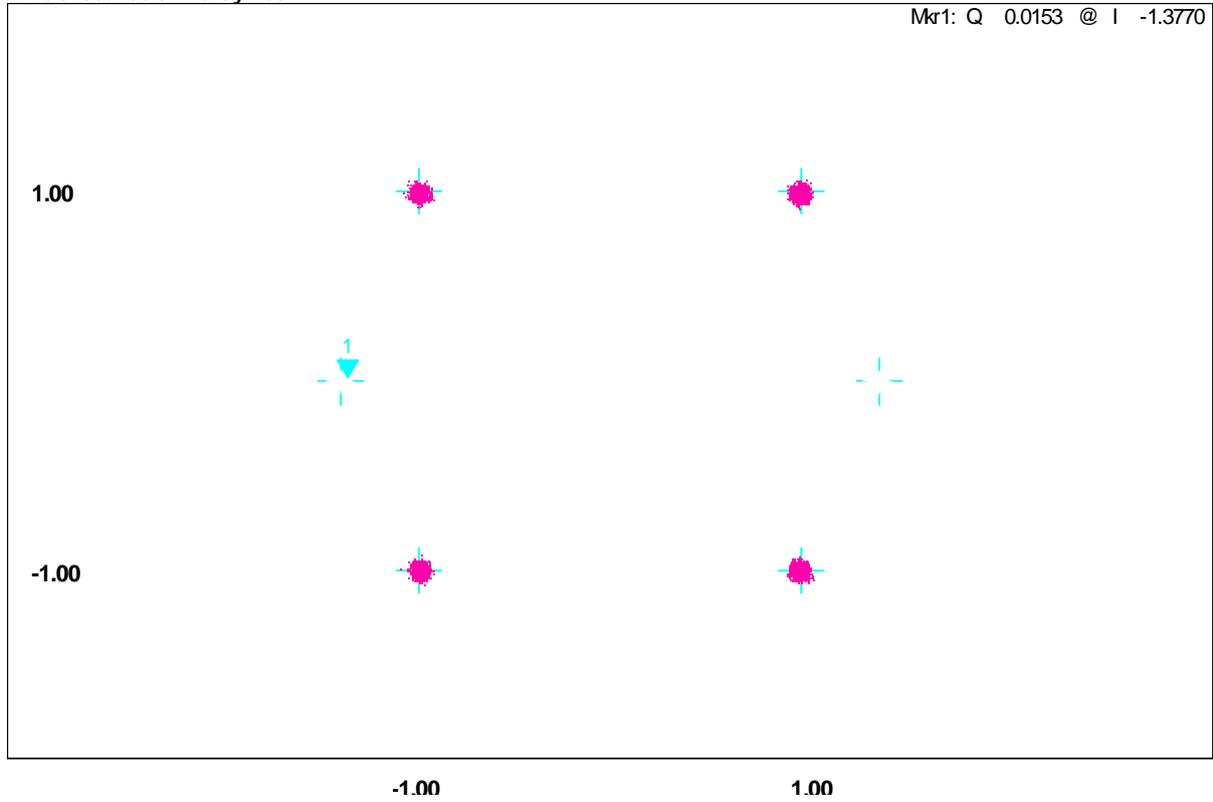
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IEEE 802.16e-2005 OFDMA		
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Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 12 Symbols
SINGLE	TRG : POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

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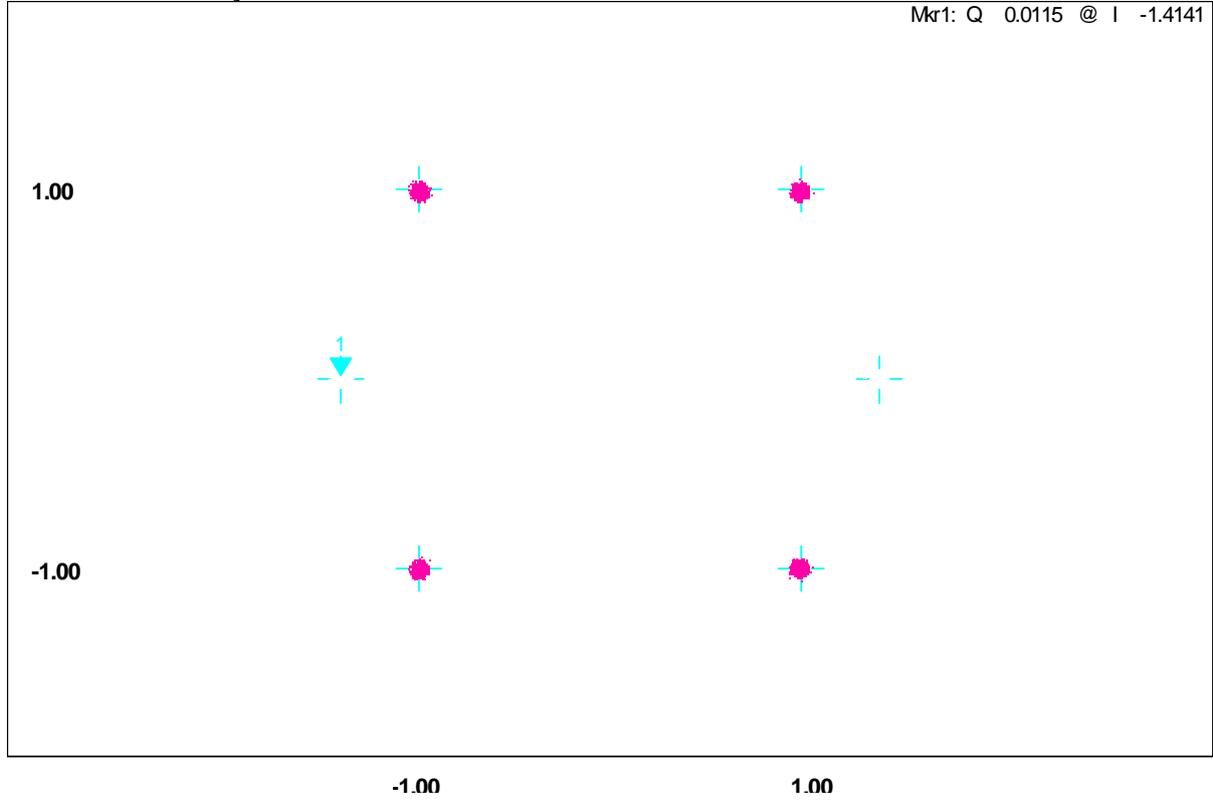
2) TM 2

B



IEEE 802.16e-2005 OFDMA		
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SINGLE	TRG : POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

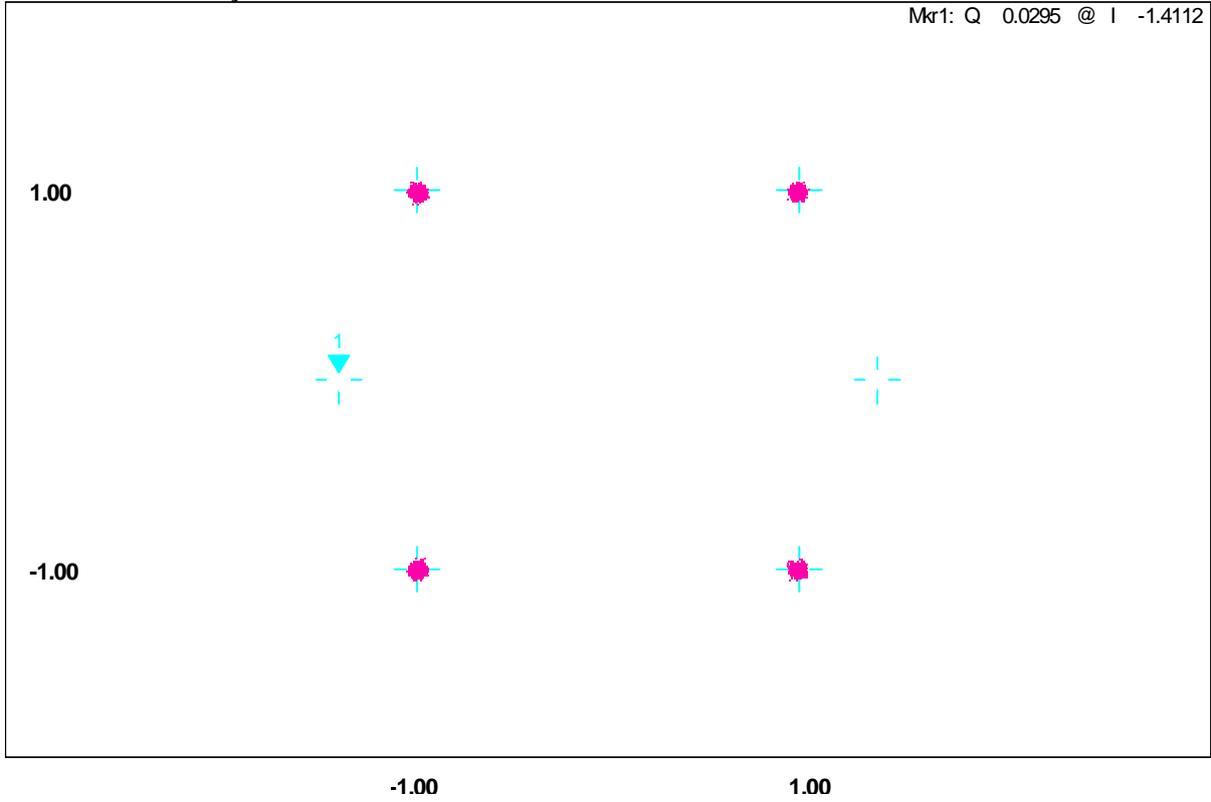
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IEEE 802.16e-2005 OFDMA		
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		Zone Offset / Len: 0 / 12 Symbols
SINGLE	TRG : POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

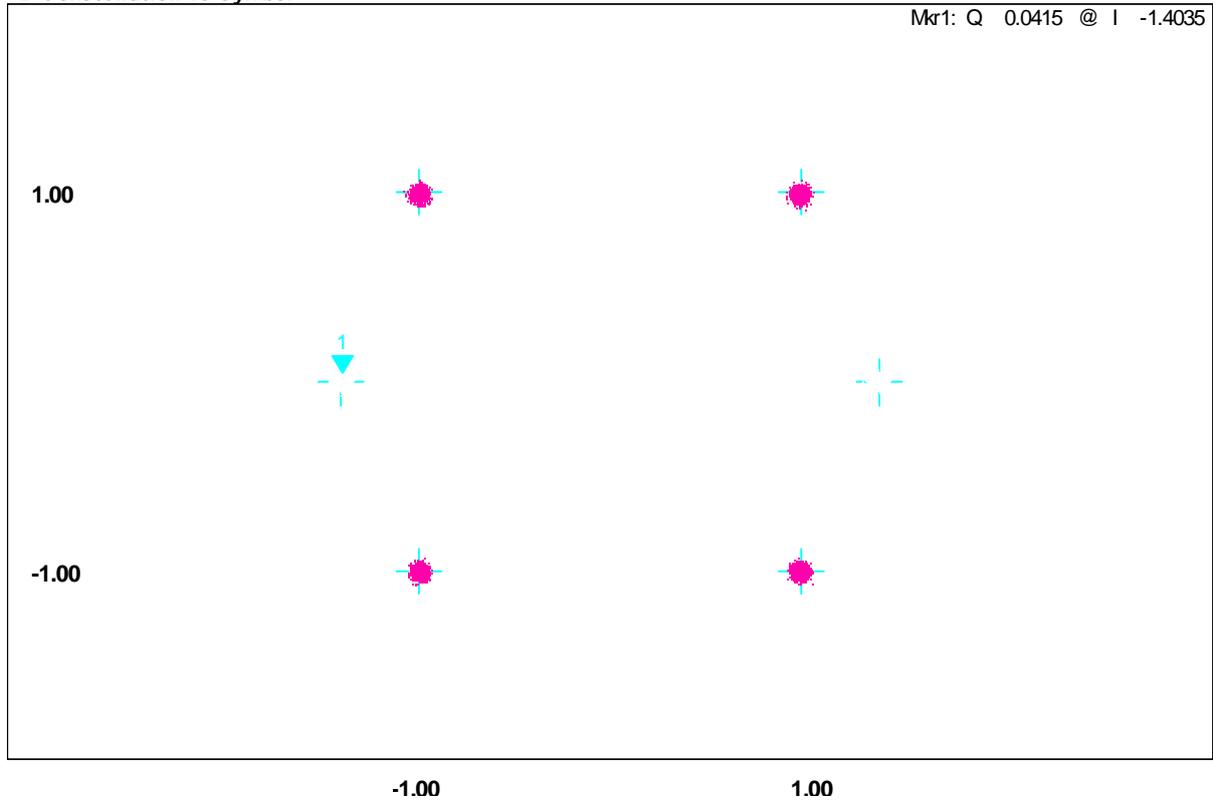
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IEEE 802.16e-2005 OFDMA		
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Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX
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SINGLE	TRG: POWER	RF

B Constellation vs Symbol



Measurement Complete

PO

Date: 9.MAR.2011 12:19:09

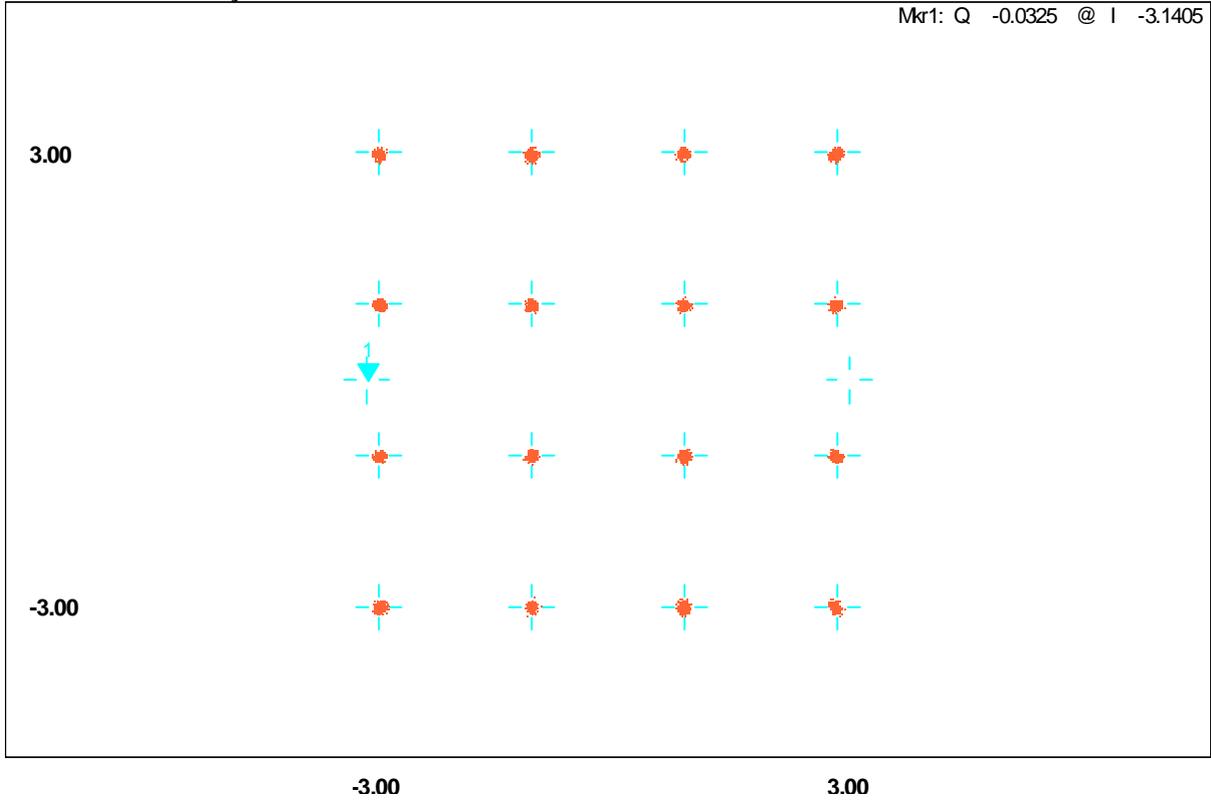
3) TM 3

B



IEEE 802.16e-2005 OFDMA			
Frequency/Fs:	2.501 GHz / 11.2 MHz	Signal Lvl. Setting/Ext. Att: 9.1 dBm / 15.2 dB	Capture Time/No.Samples: 2.5 ms / 28001
Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 12 Symbols
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

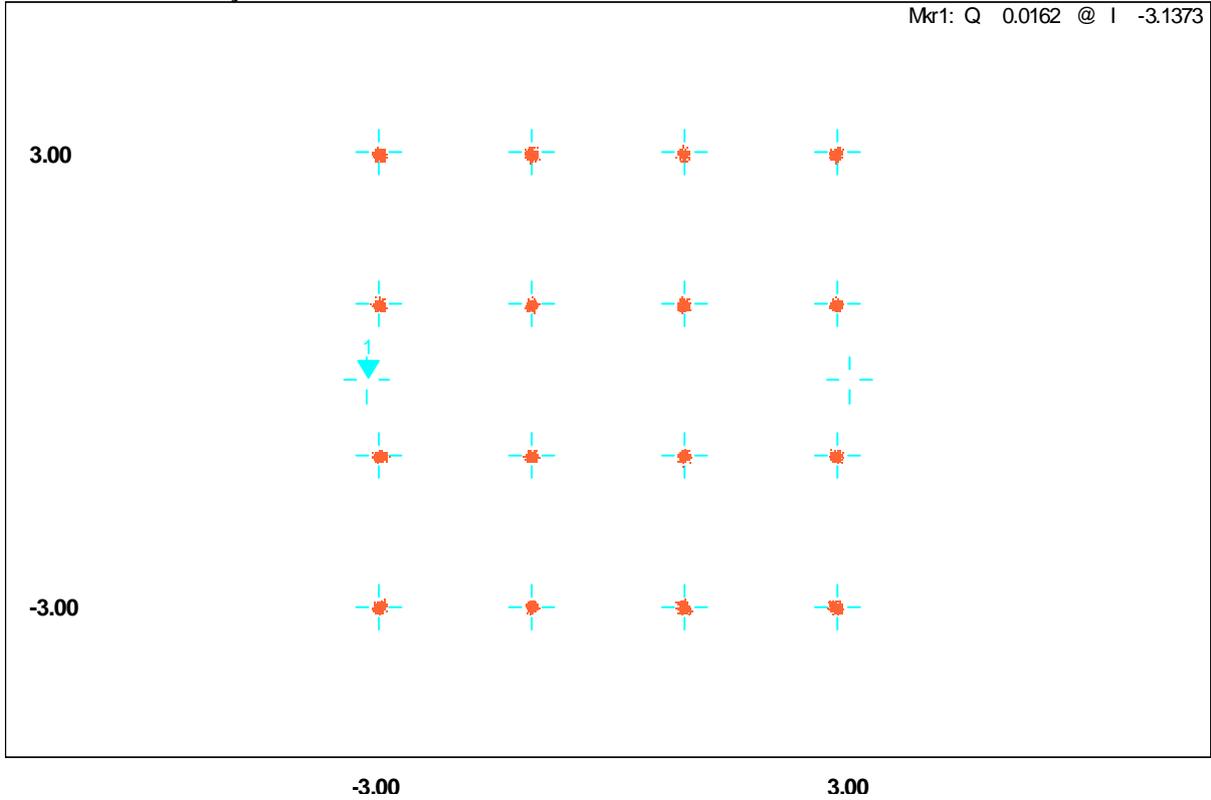
Date: 9.MAR.2011 12:19:30

M



IEEE 802.16e-2005 OFDMA			
Frequency/Fs:	2.593 GHz / 11.2 MHz	Signal Lvl. Setting/Ext. Att: 9.1 dBm / 15.2 dB	Capture Time/No.Samples: 2.5 ms / 28001
Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 12 Symbols
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

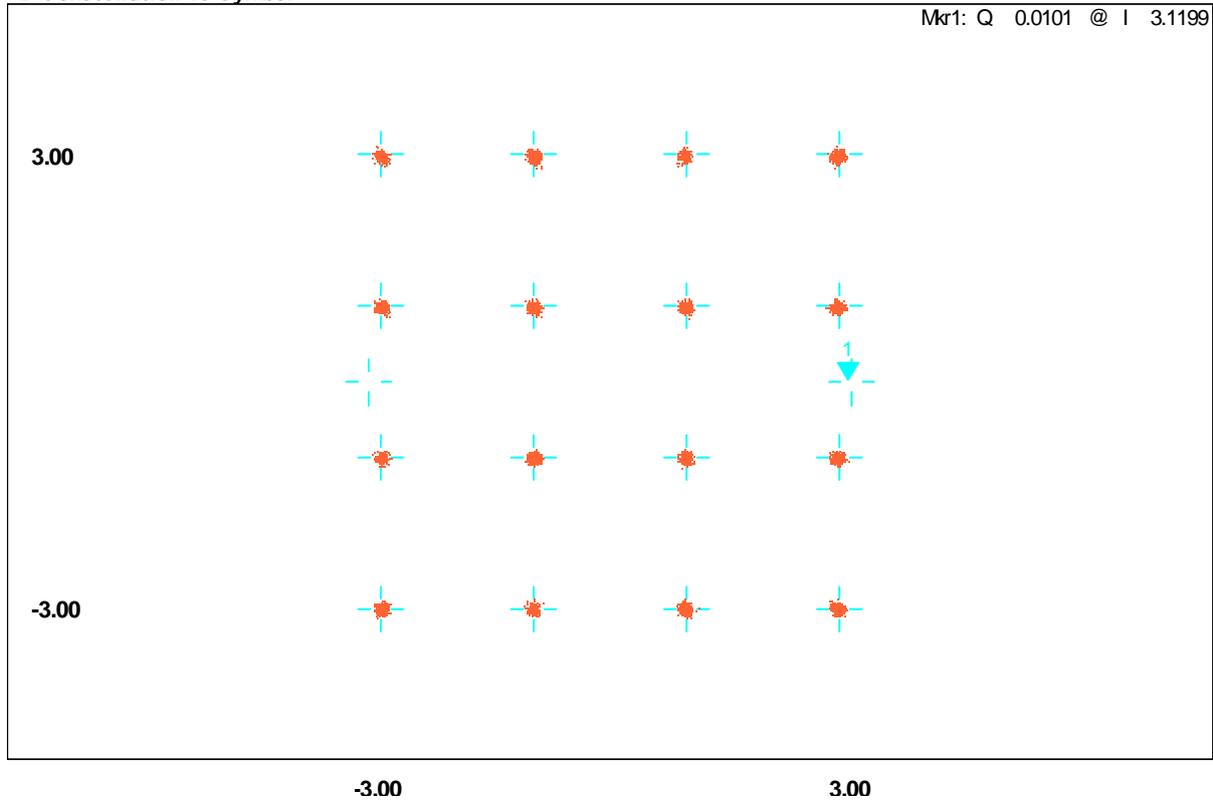
Date: 9.MAR.2011 12:19:51

T



IEEE 802.16e-2005 OFDMA			
Frequency/Fs: 2.685 GHz / 11.2 MHz	Signal Lvl. Setting/Ext. Att: 9.1 dBm / 15.2 dB	Capture Time/No.Samples: 2.5 ms / 28001	
Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 12 Symbols
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



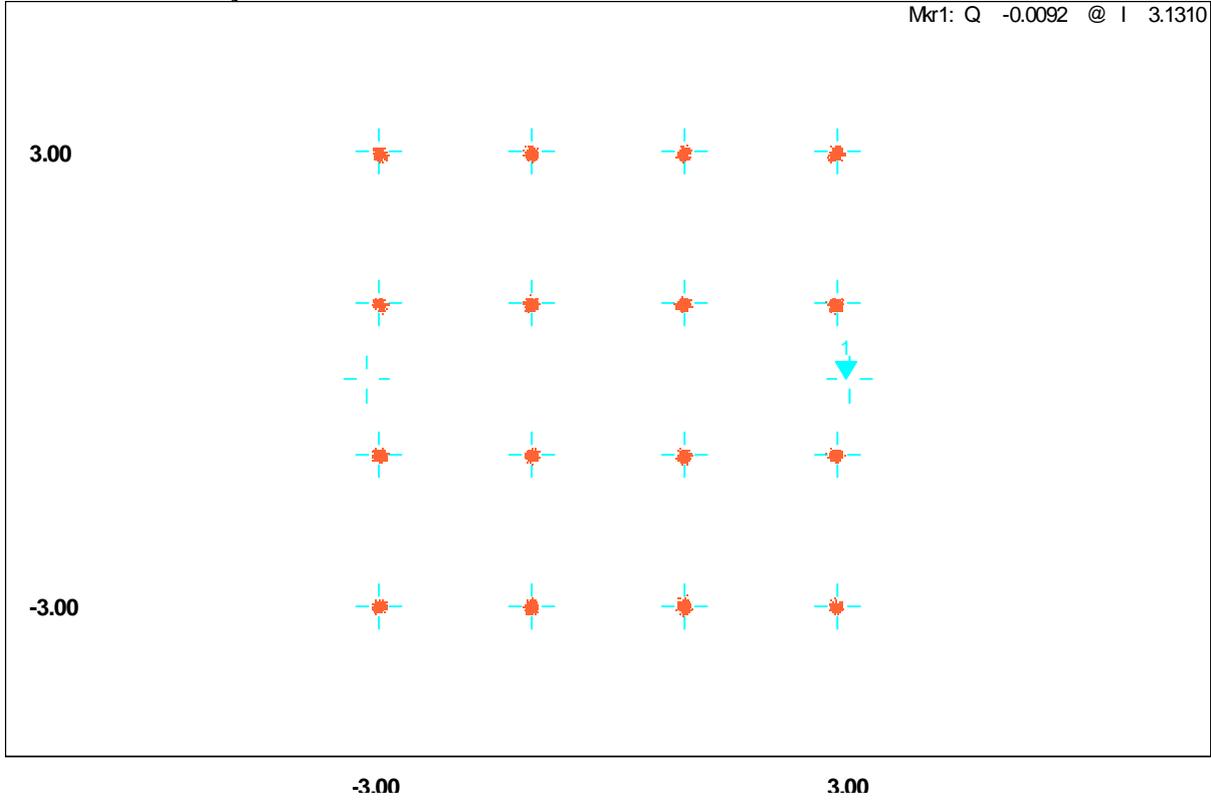
4) TM 4

B



IEEE 802.16e-2005 OFDMA			
Frequency/Fs: 2.501 GHz / 11.2 MHz	Signal Lvl. Setting/Ext. Att: 9.1 dBm / 15.2 dB	Capture Time/No.Samples: 2.5 ms / 28001	
Seg=0, UL-PUSC, ID=A 1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 12 Symbols	
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

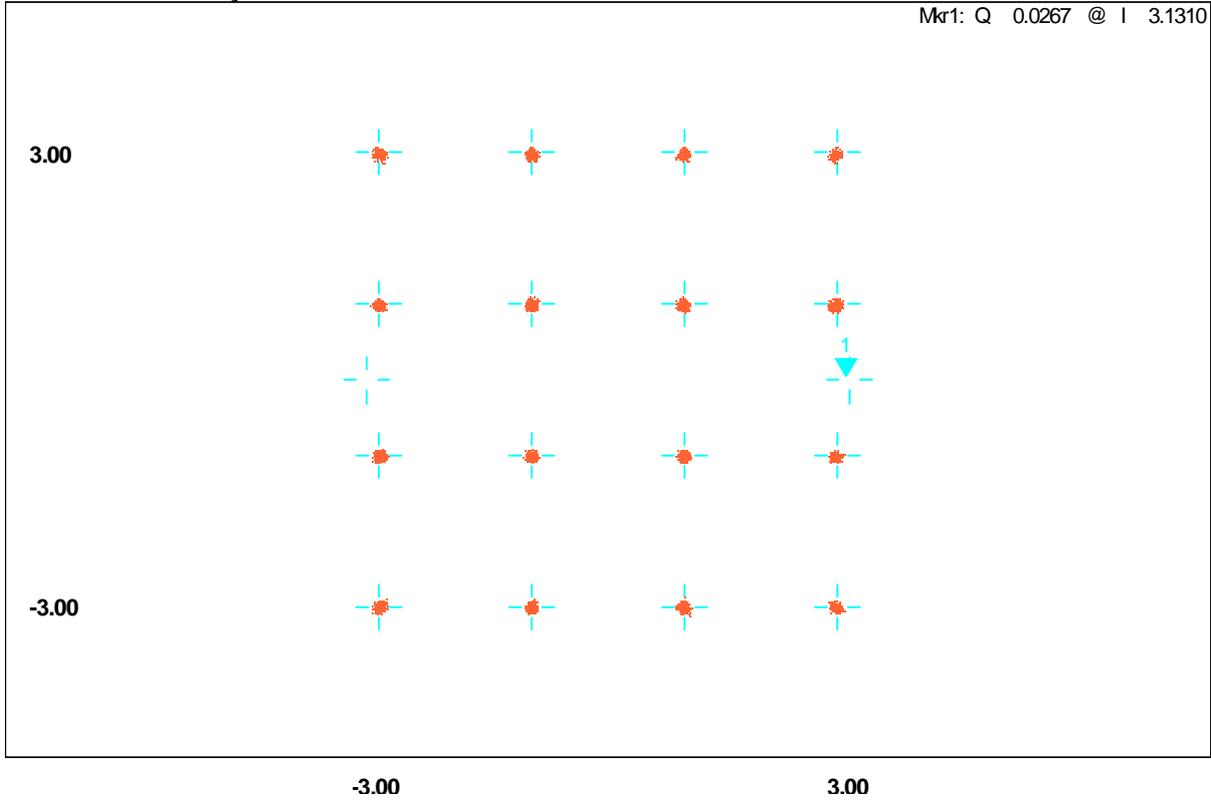
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M



IEEE 802.16e-2005 OFDMA			
Frequency/Fs:	2.593 GHz / 11.2 MHz	Signal Lvl. Setting/Ext. Att: 9.1 dBm / 15.2 dB	Capture Time/No.Samples: 2.5 ms / 28001
Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 12 Symbols
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



PO

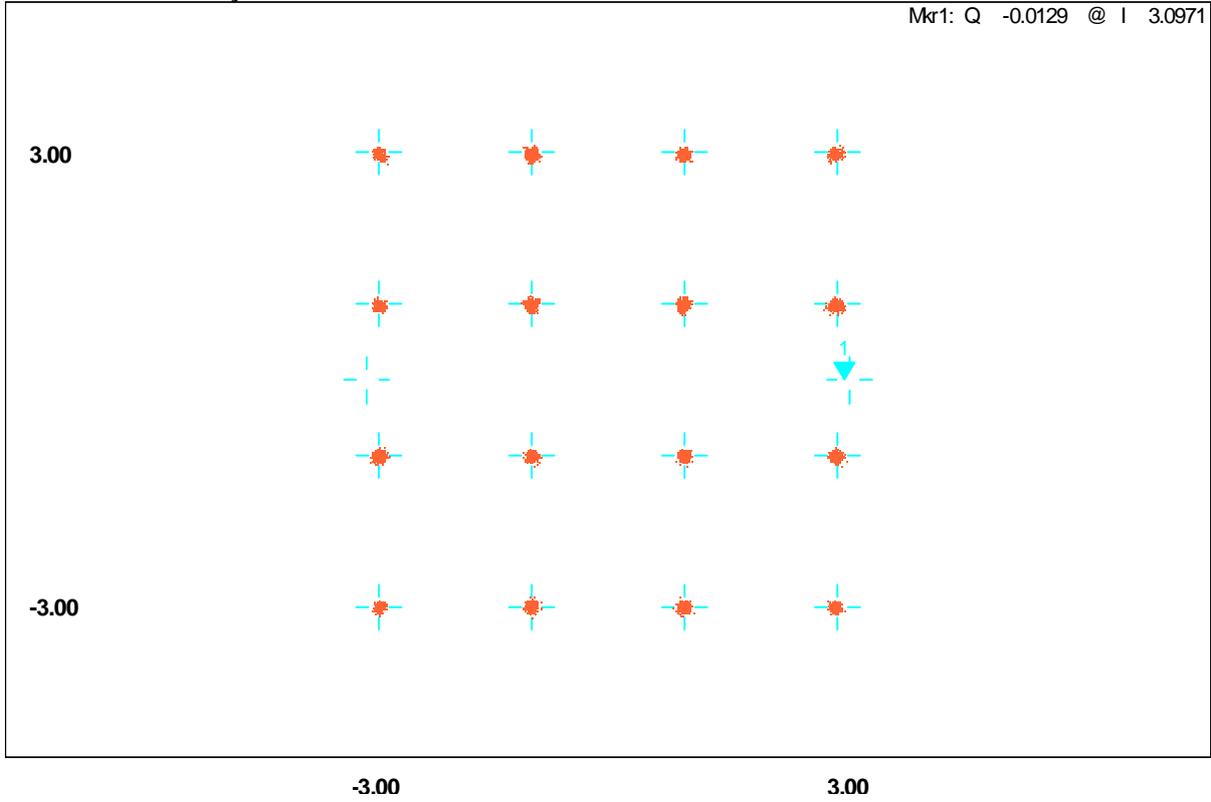
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T



IEEE 802.16e-2005 OFDMA			
Frequency/Fs: 2.685 GHz / 11.2 MHz	Signal Lvl. Setting/Ext. Att: 7.1 dBm / 15.2 dB	Capture Time/No.Samples: 2.5 ms / 28001	
Seg=0, UL-PUSC, ID=A	1/1 (1)	Meas Setup: 1 TX x 1 RX	Zone Offset / Len: 0 / 12 Symbols
SINGLE	TRG : POWER	RF	

B Constellation vs Symbol



Measurement Complete

PO

Date: 9.MAR.2011 12:21:18



Appendix B

Occupied Bandwidth Measurement

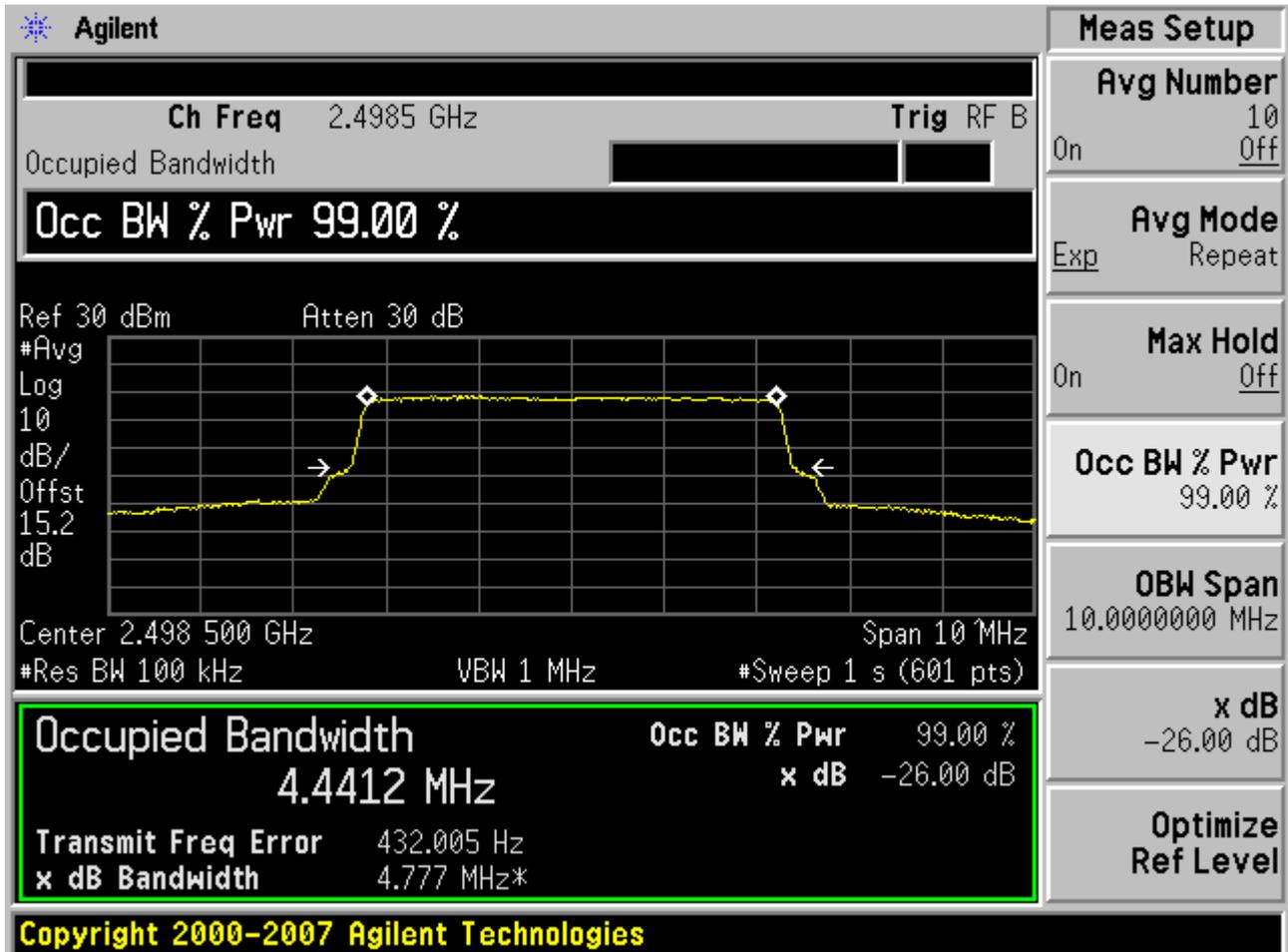
According to FCC part 2.1049 and part 27 subpart C & M



1. Channel Bandwidth = 5 MHz

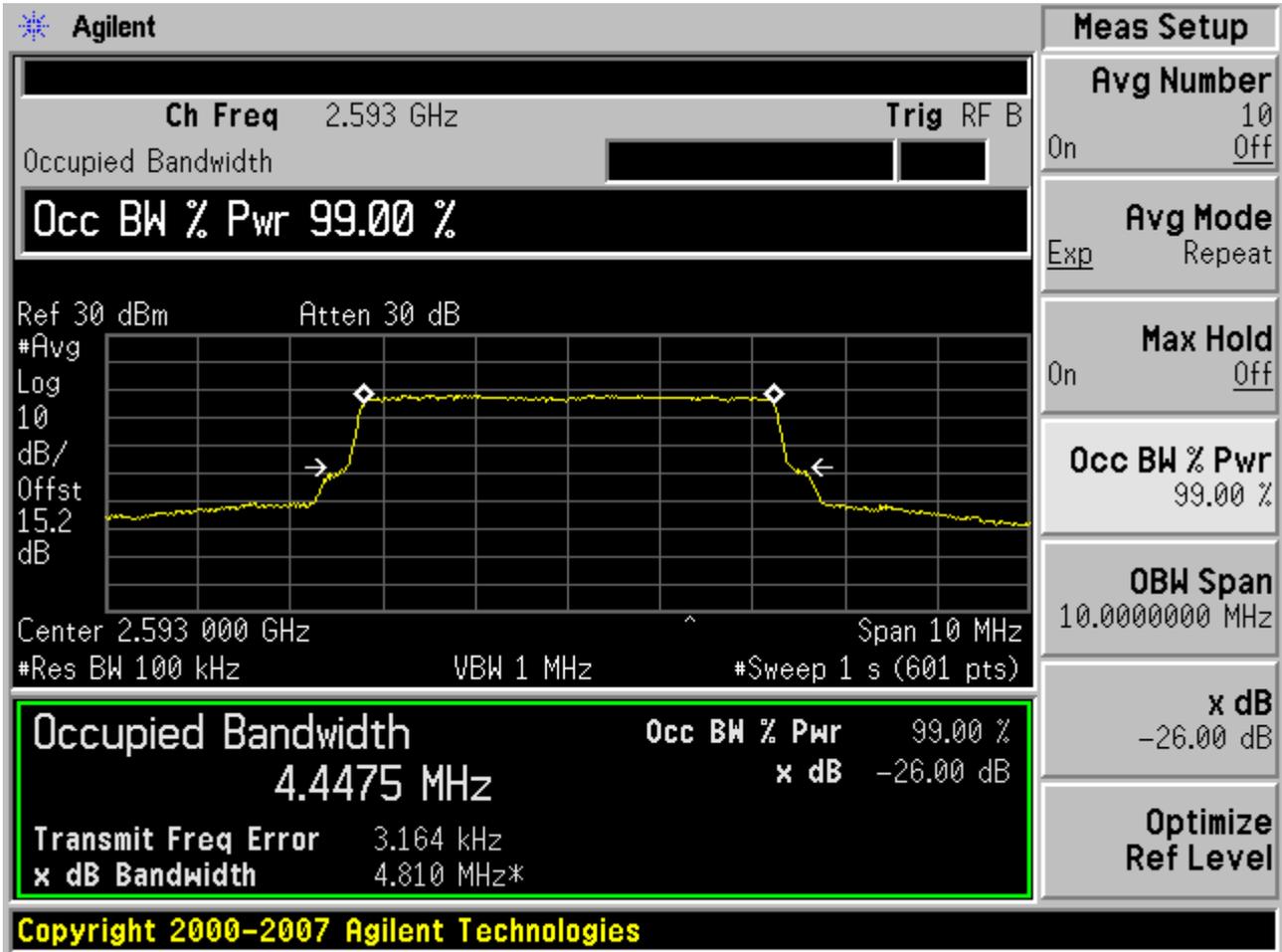
1) TM 1

B

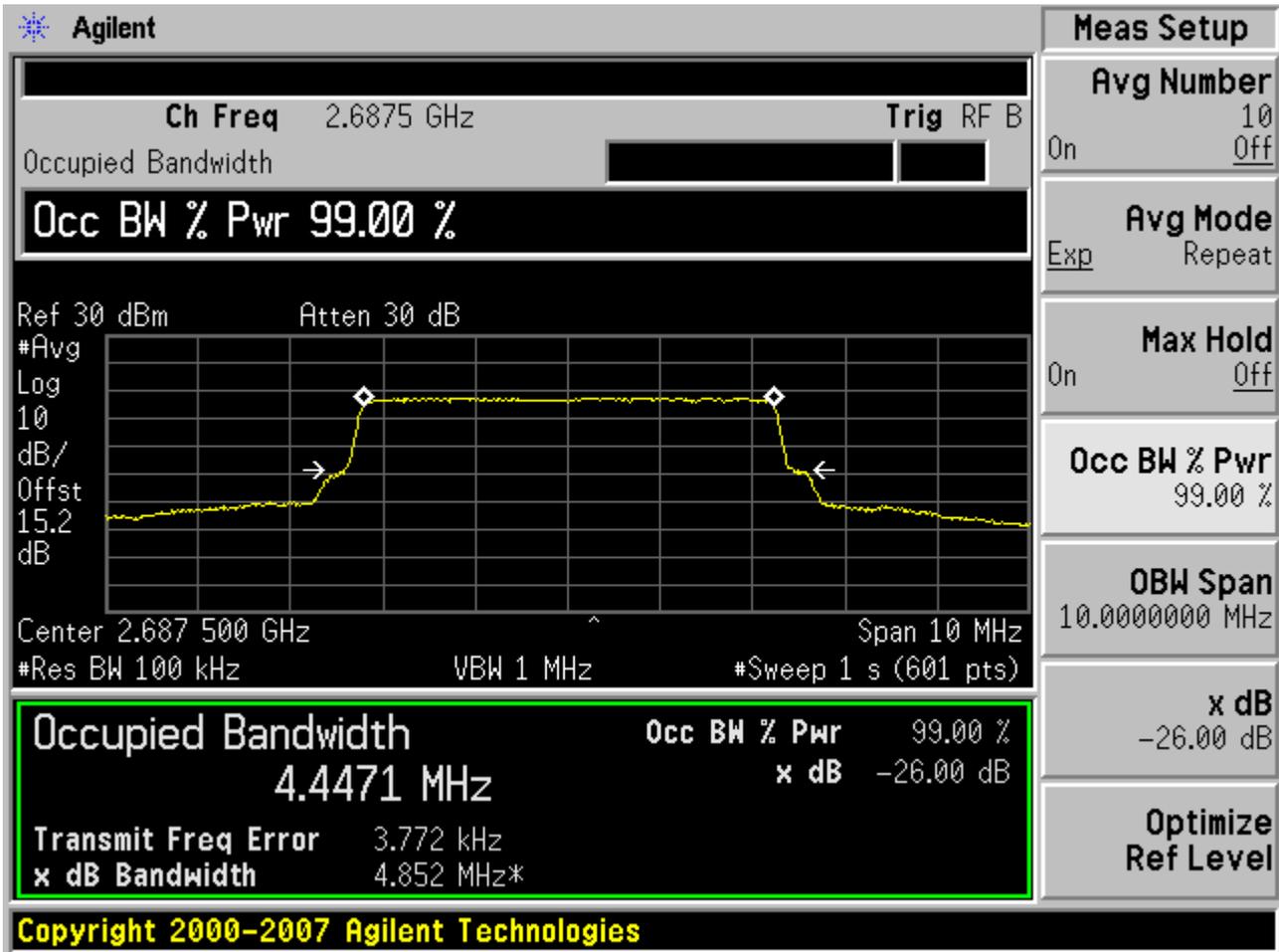




M

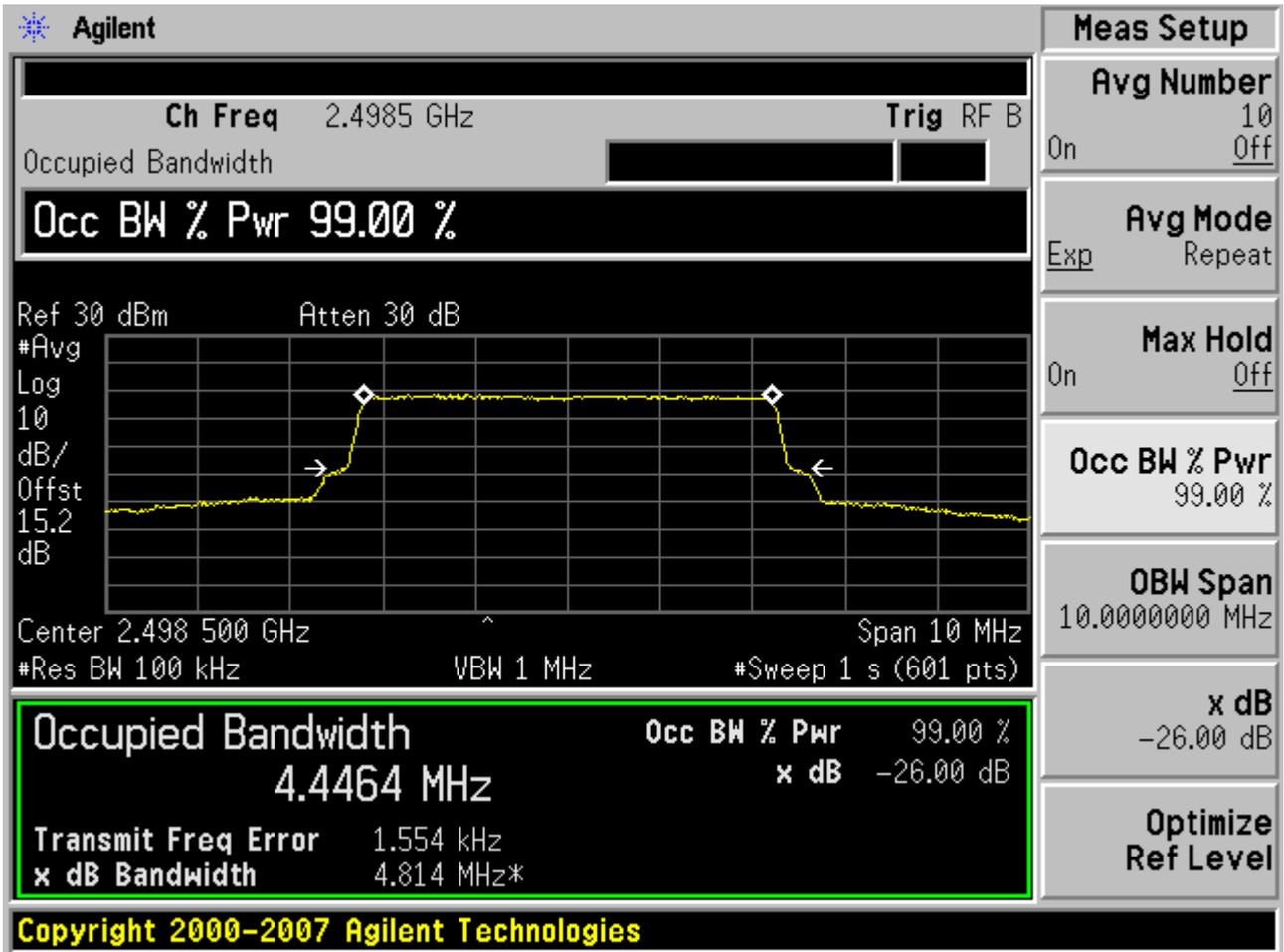


T

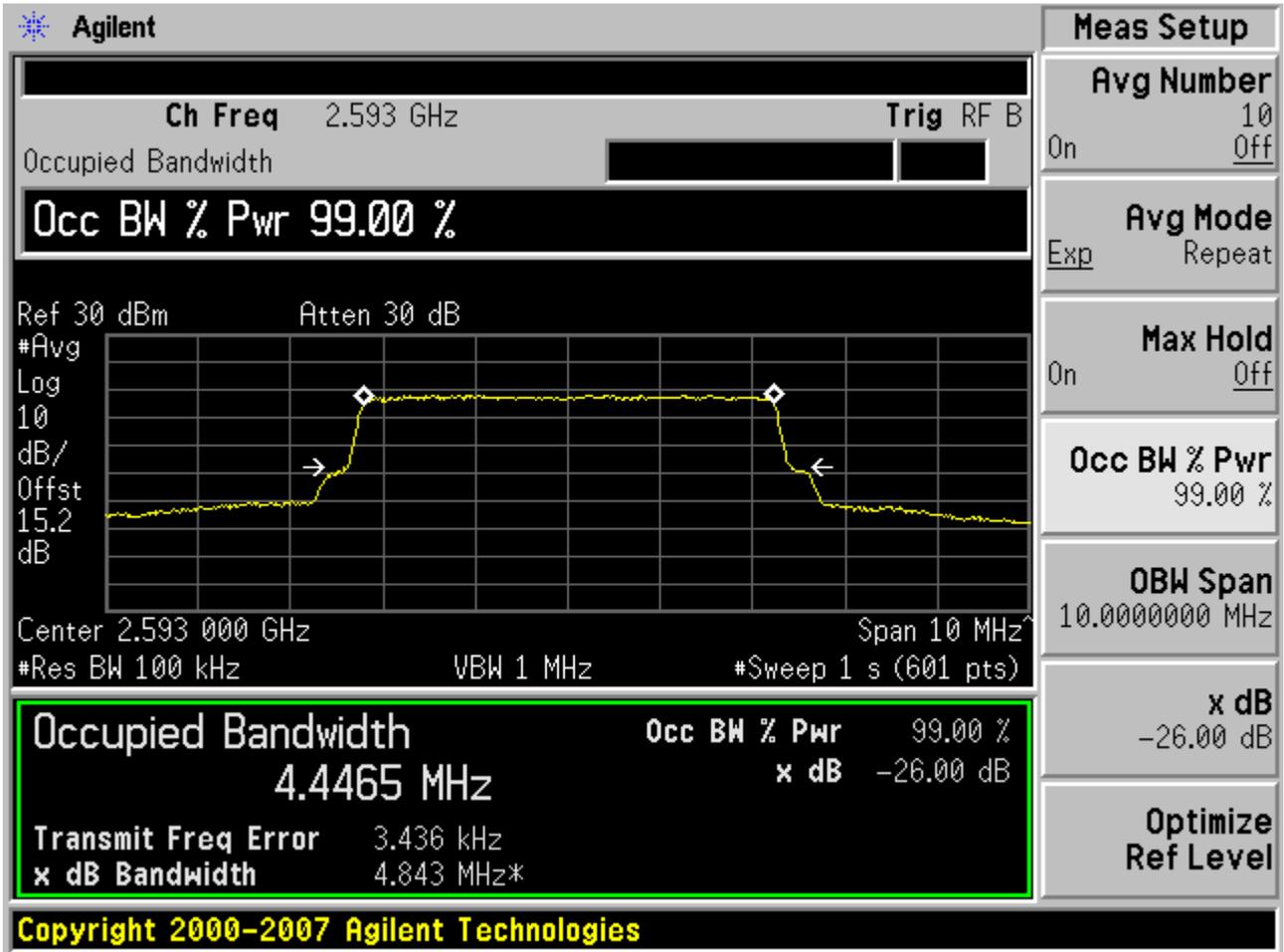


2) TM 2

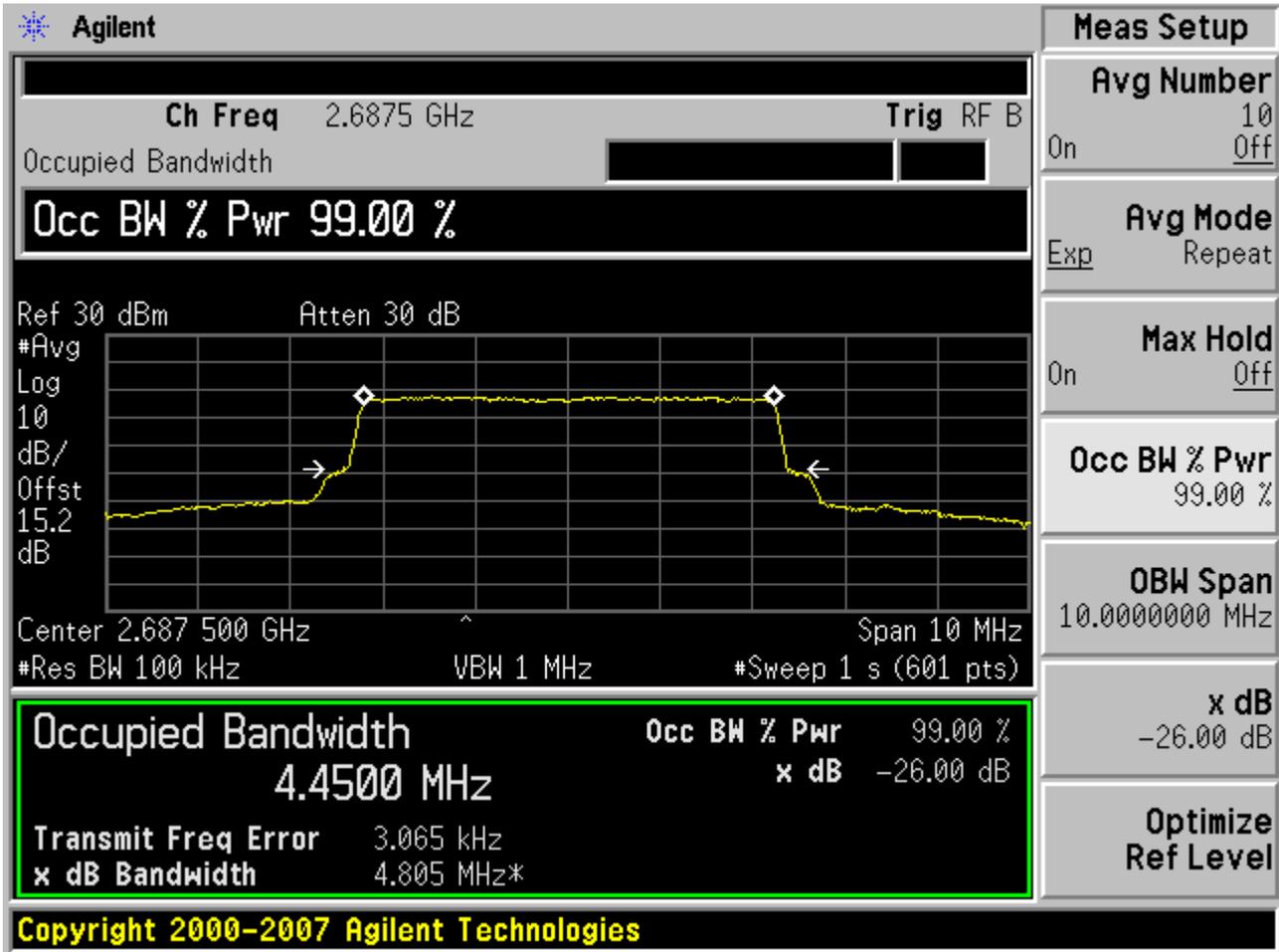
B



M

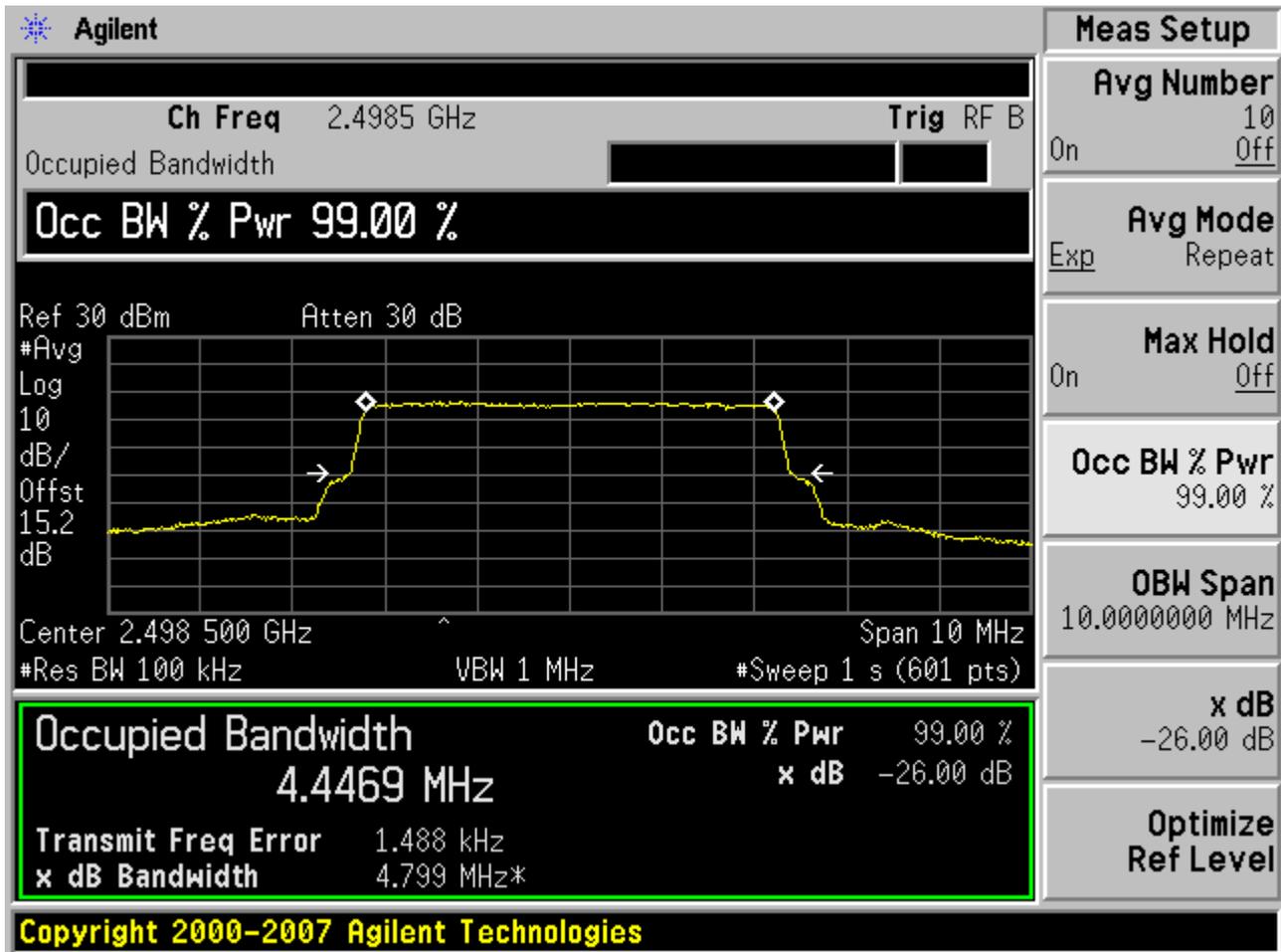


T

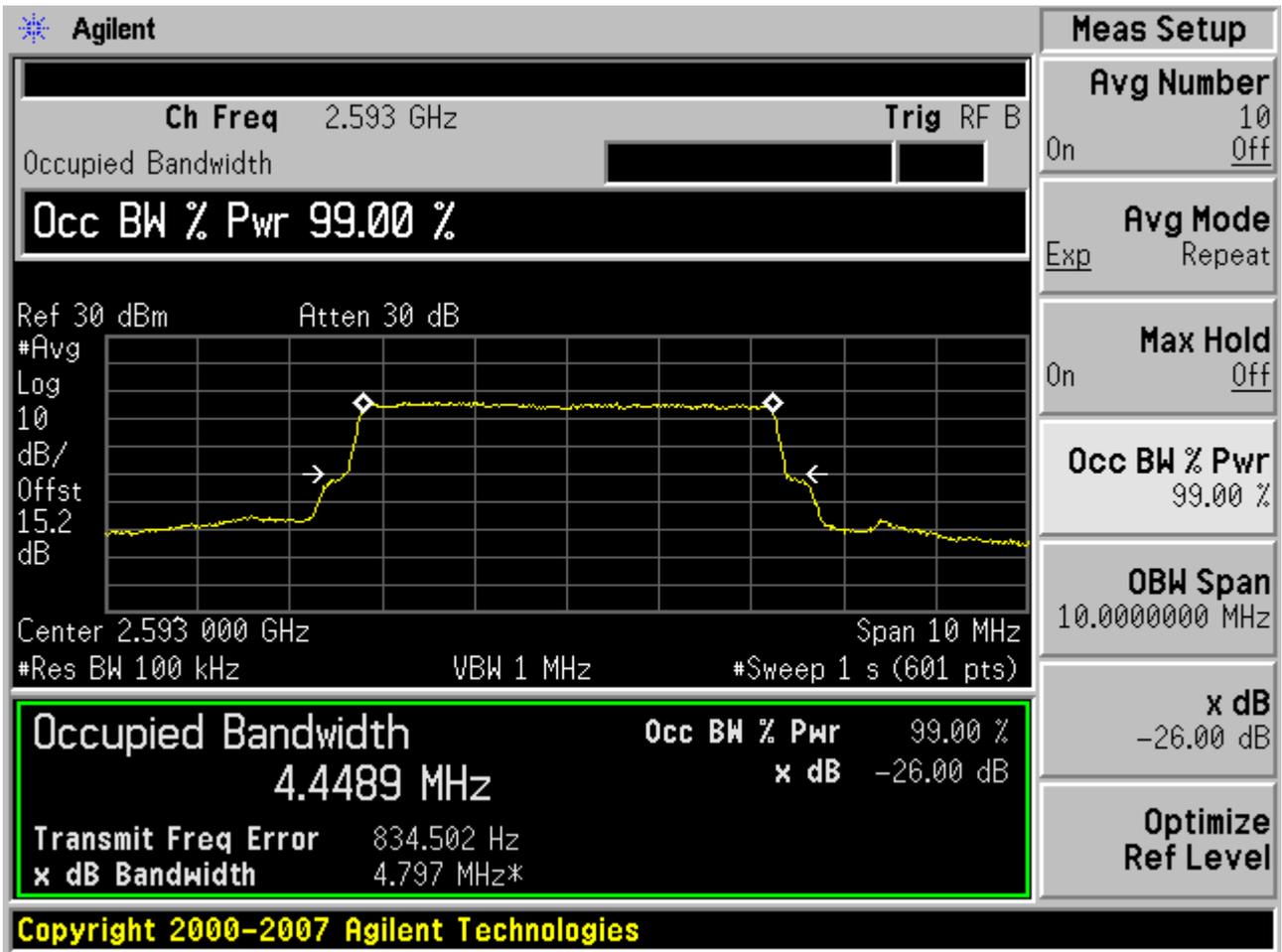


3) TM 3

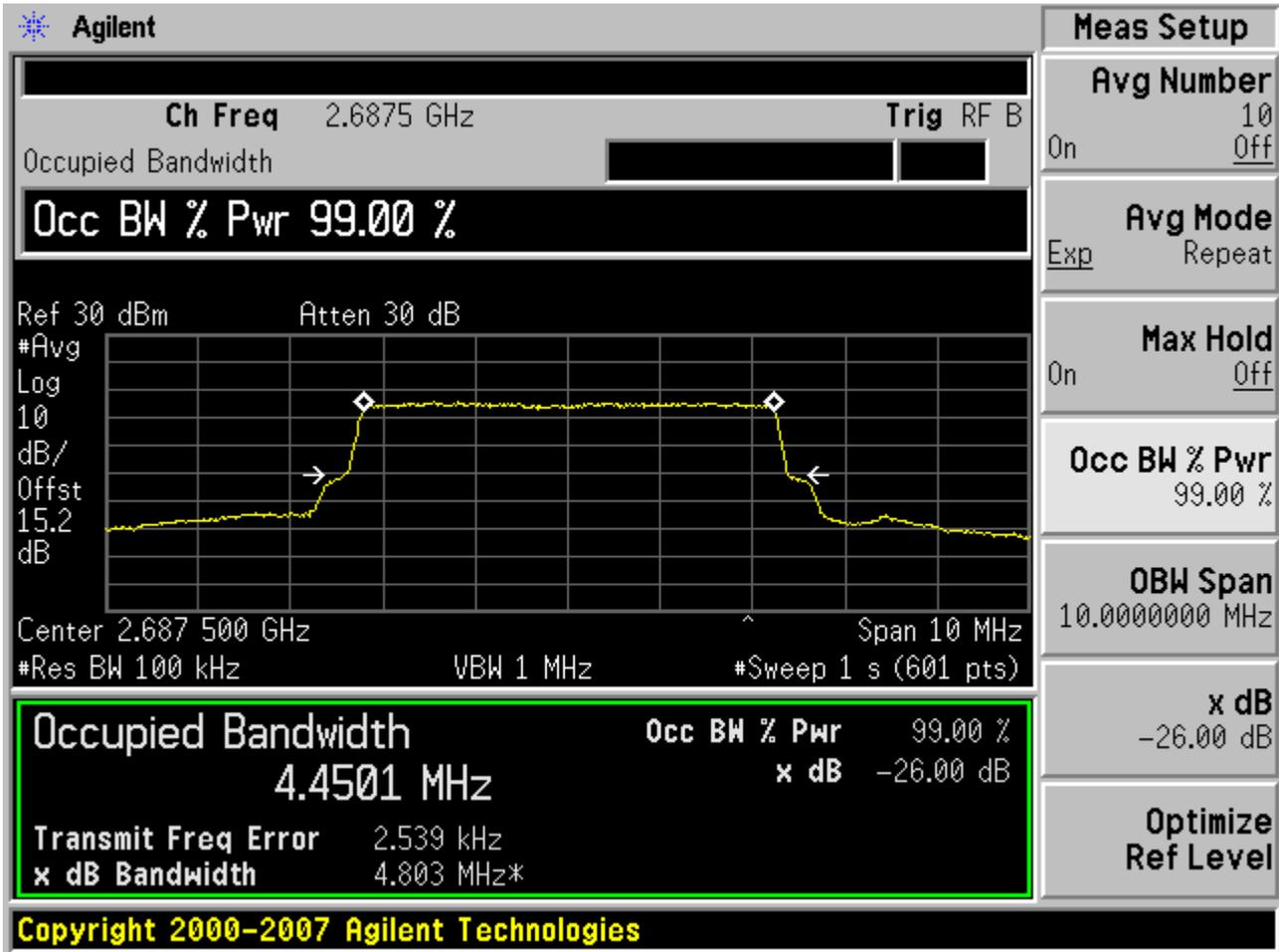
B



M

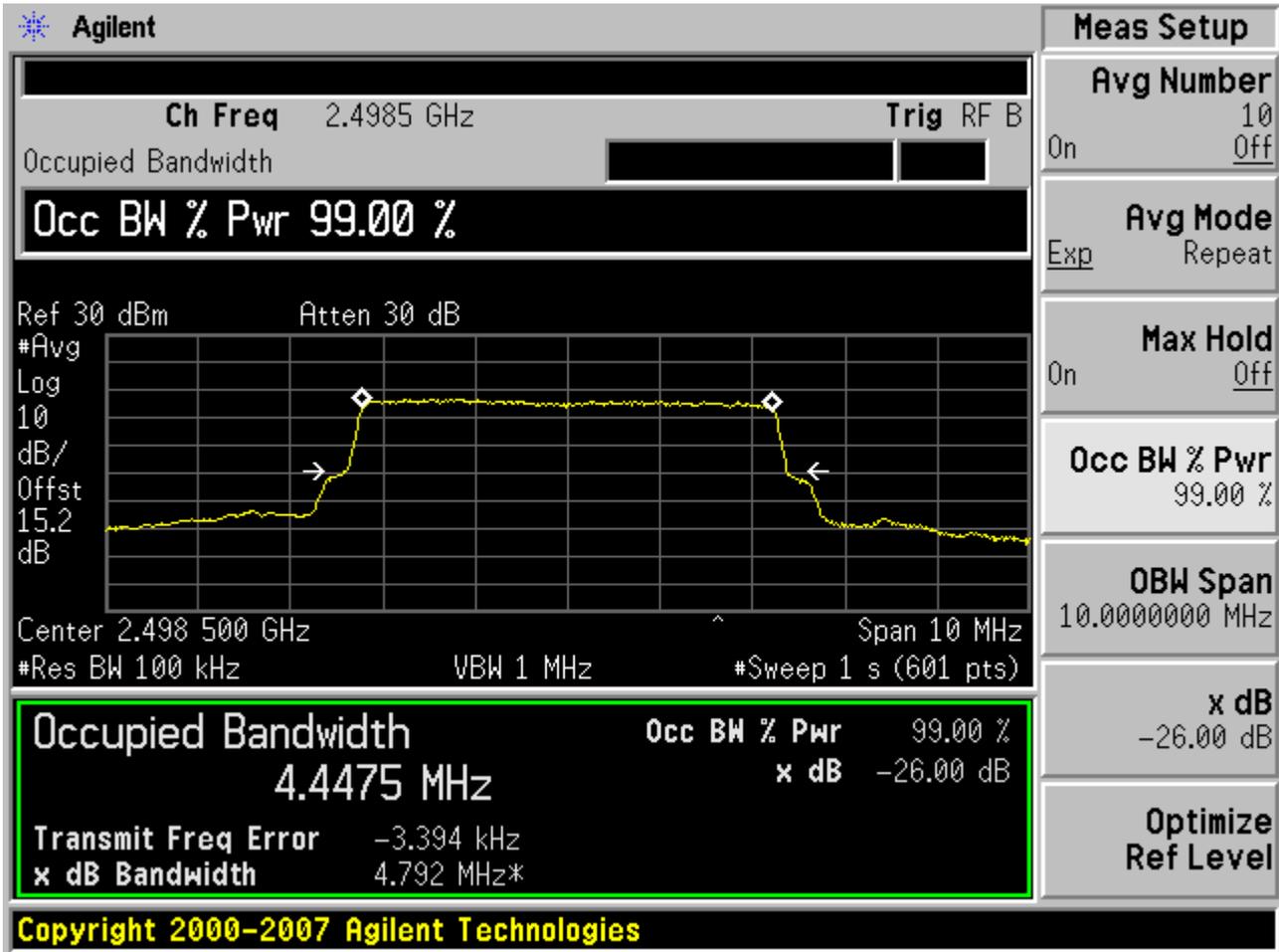


T

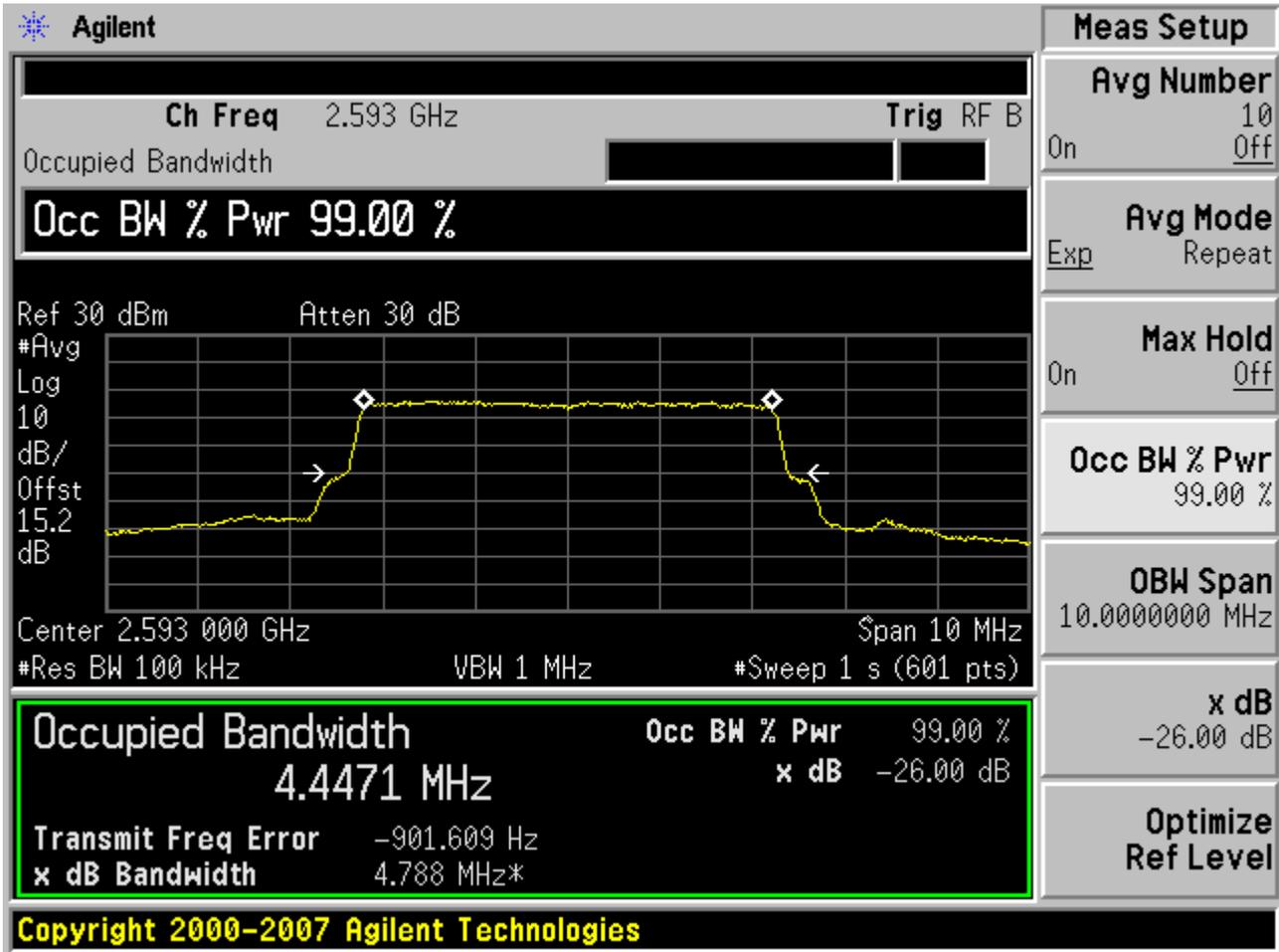


4) TM 4

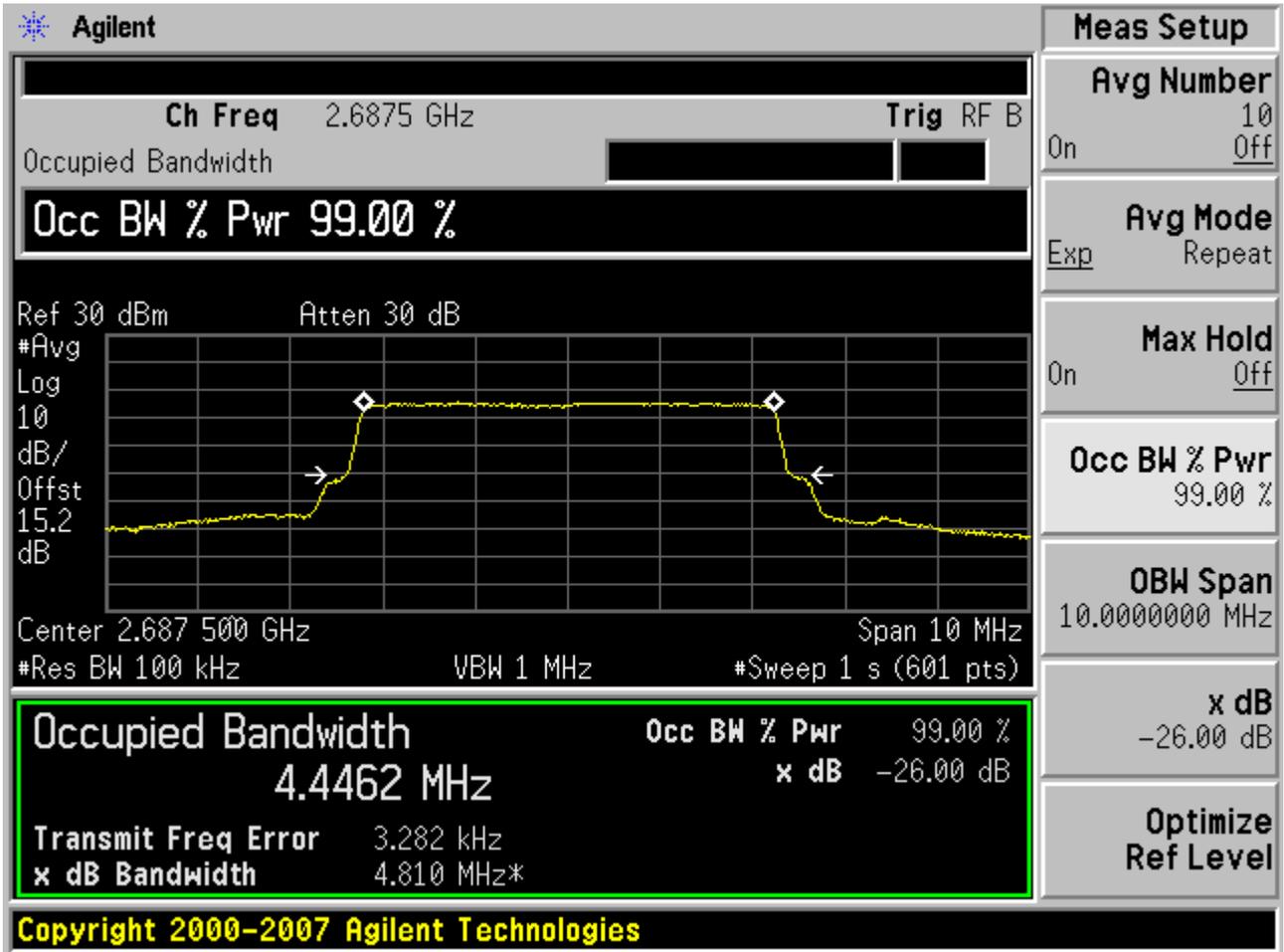
B



M



T

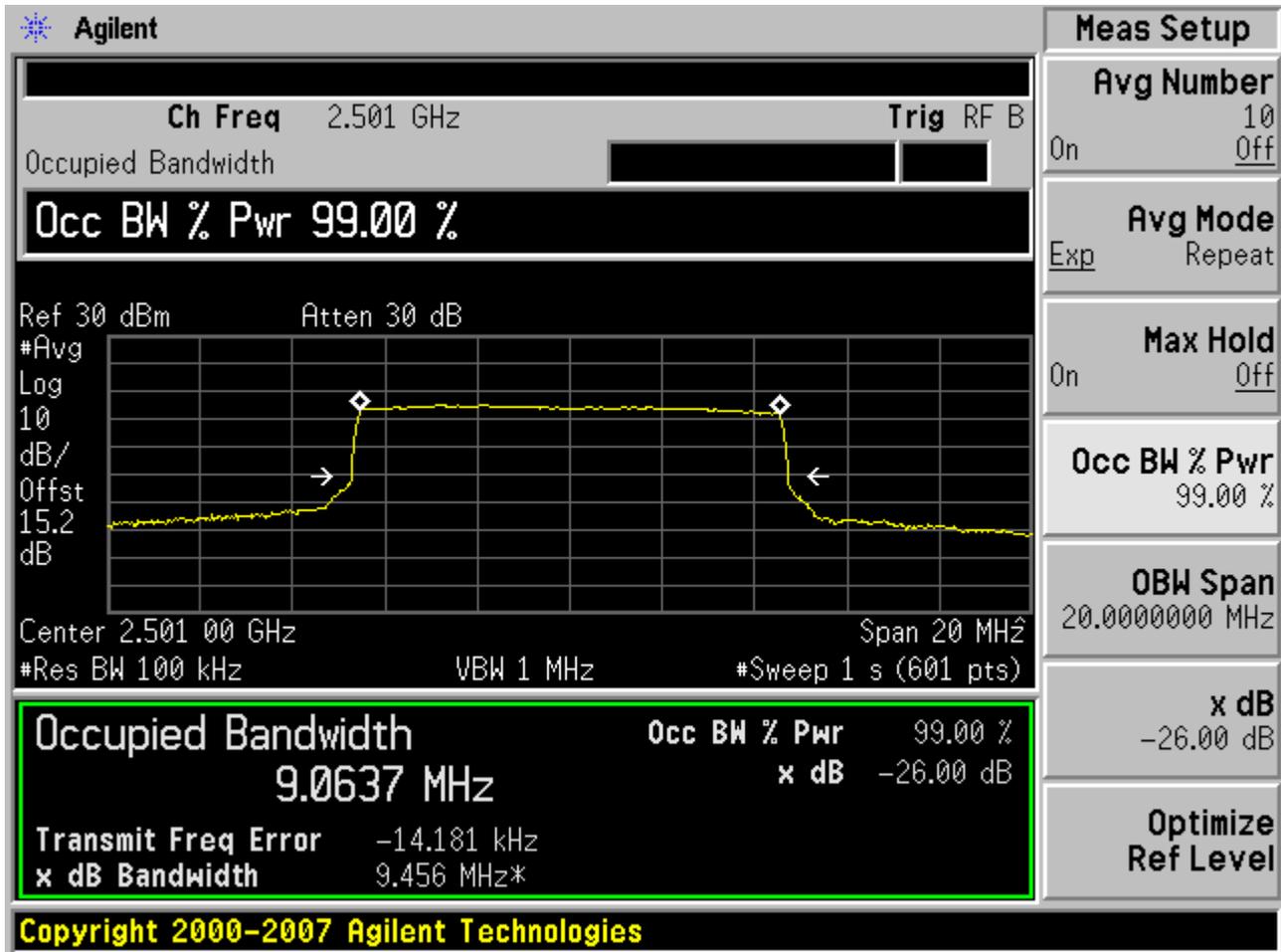


2. Channel Bandwidth = 10 MHz

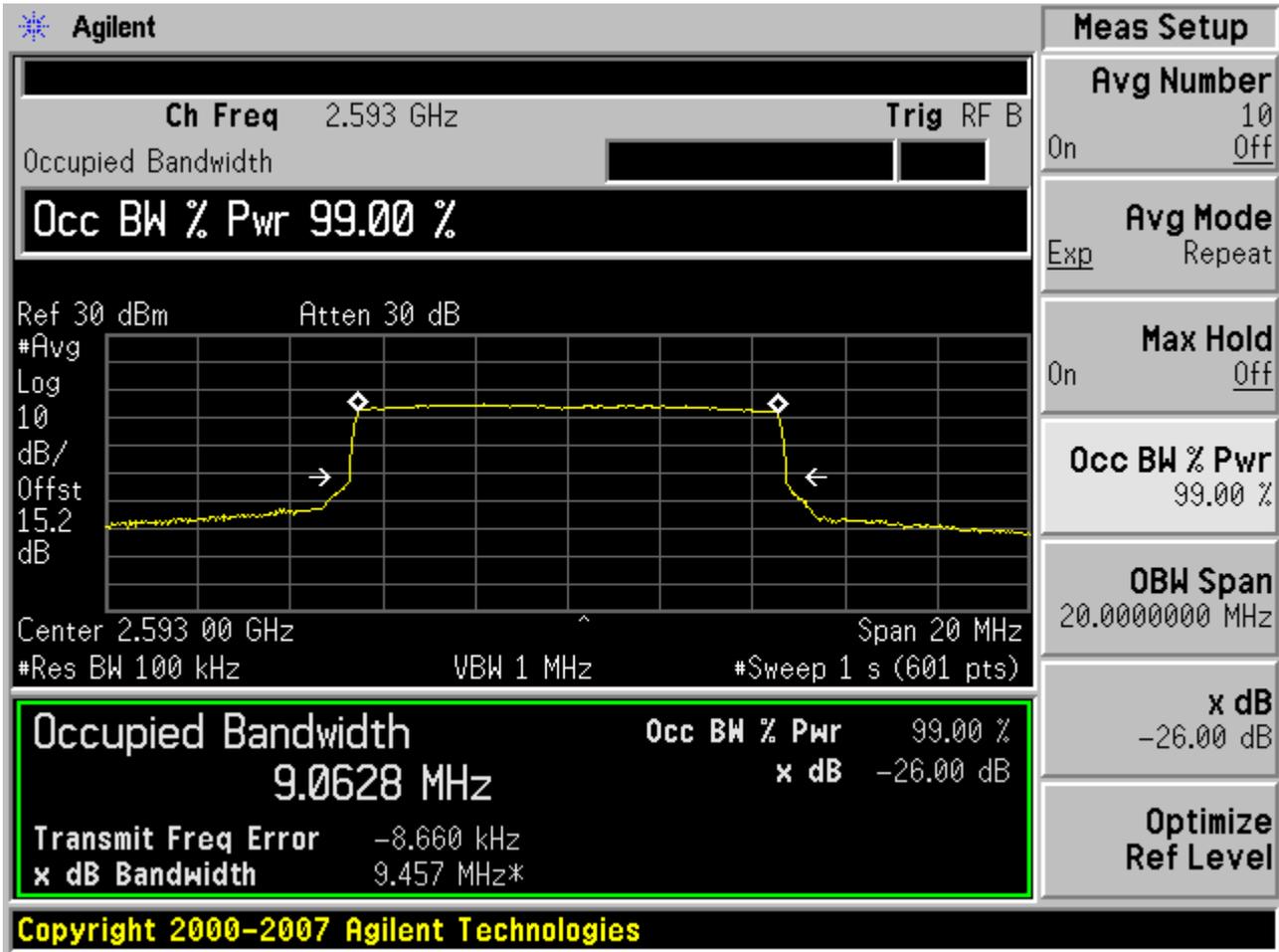


1) TM 1

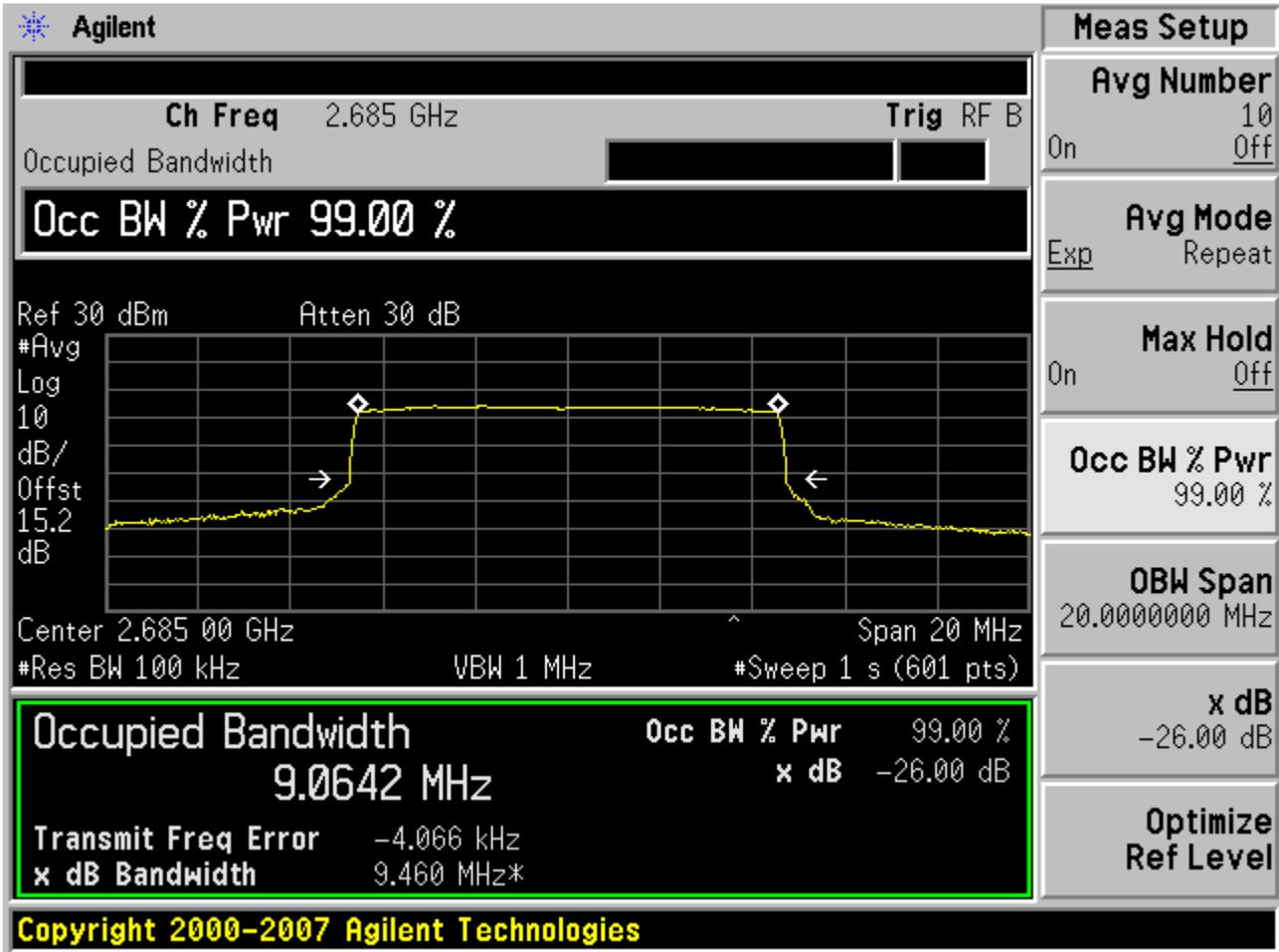
B



M

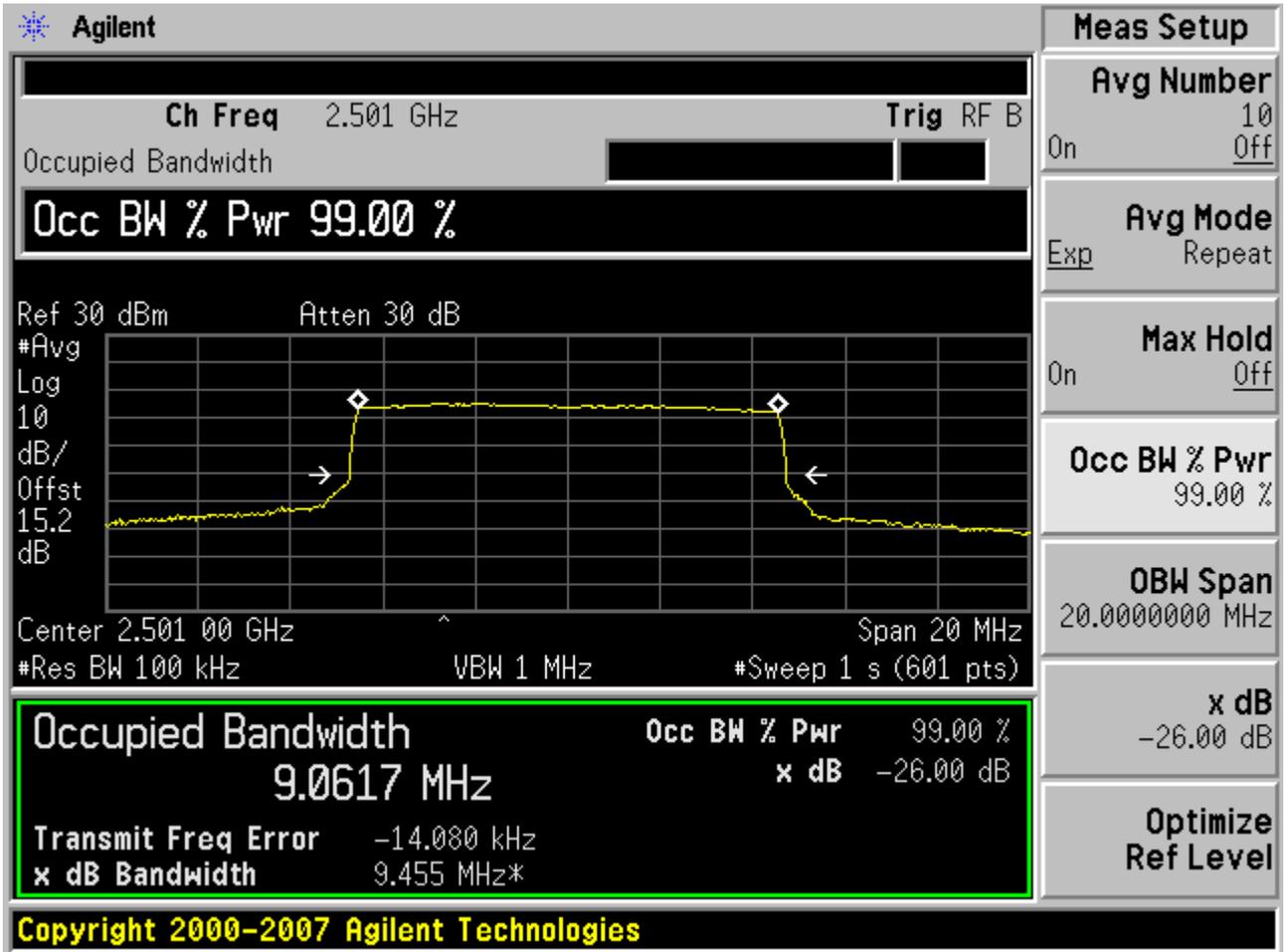


T

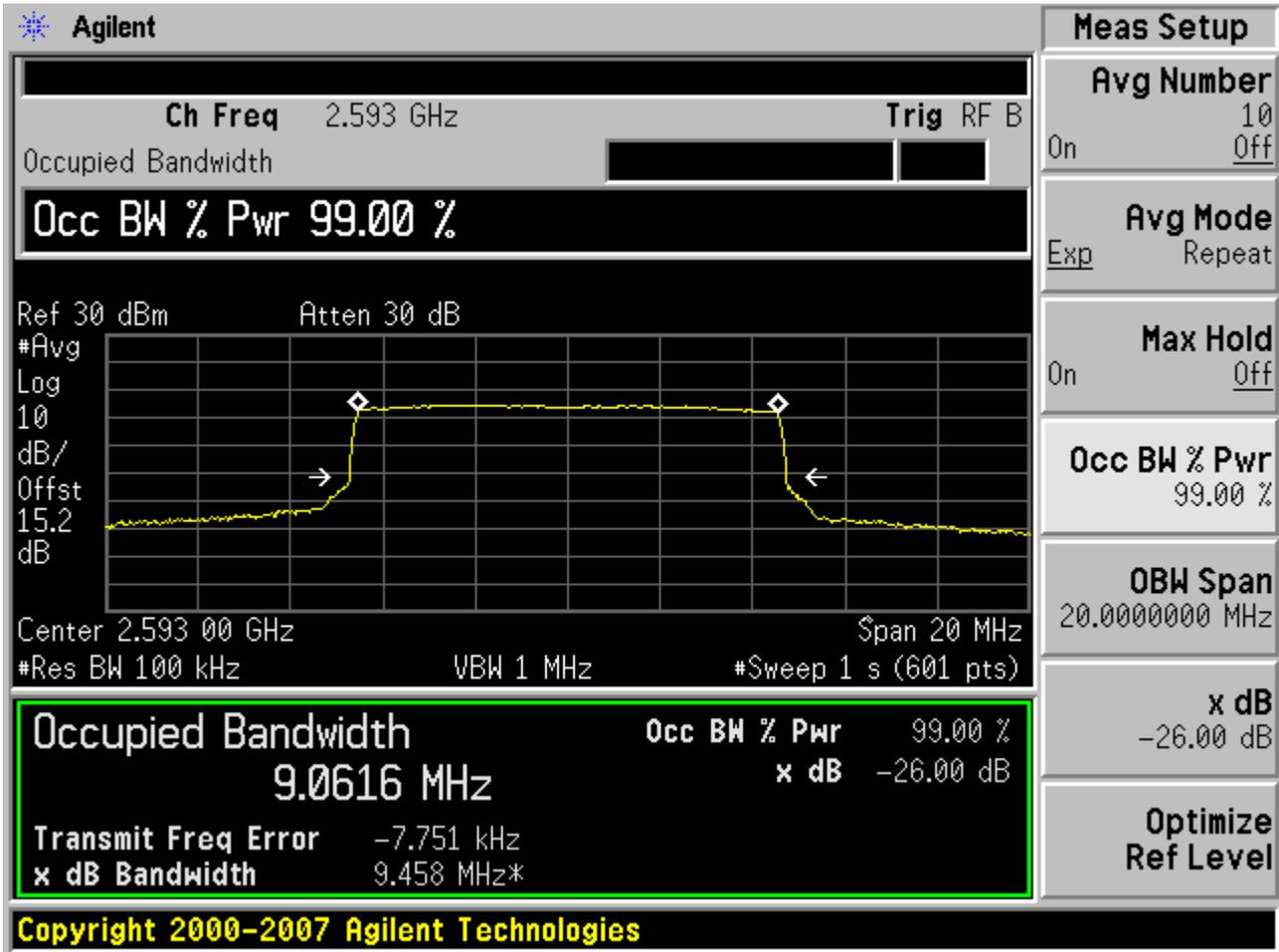


2) TM 2

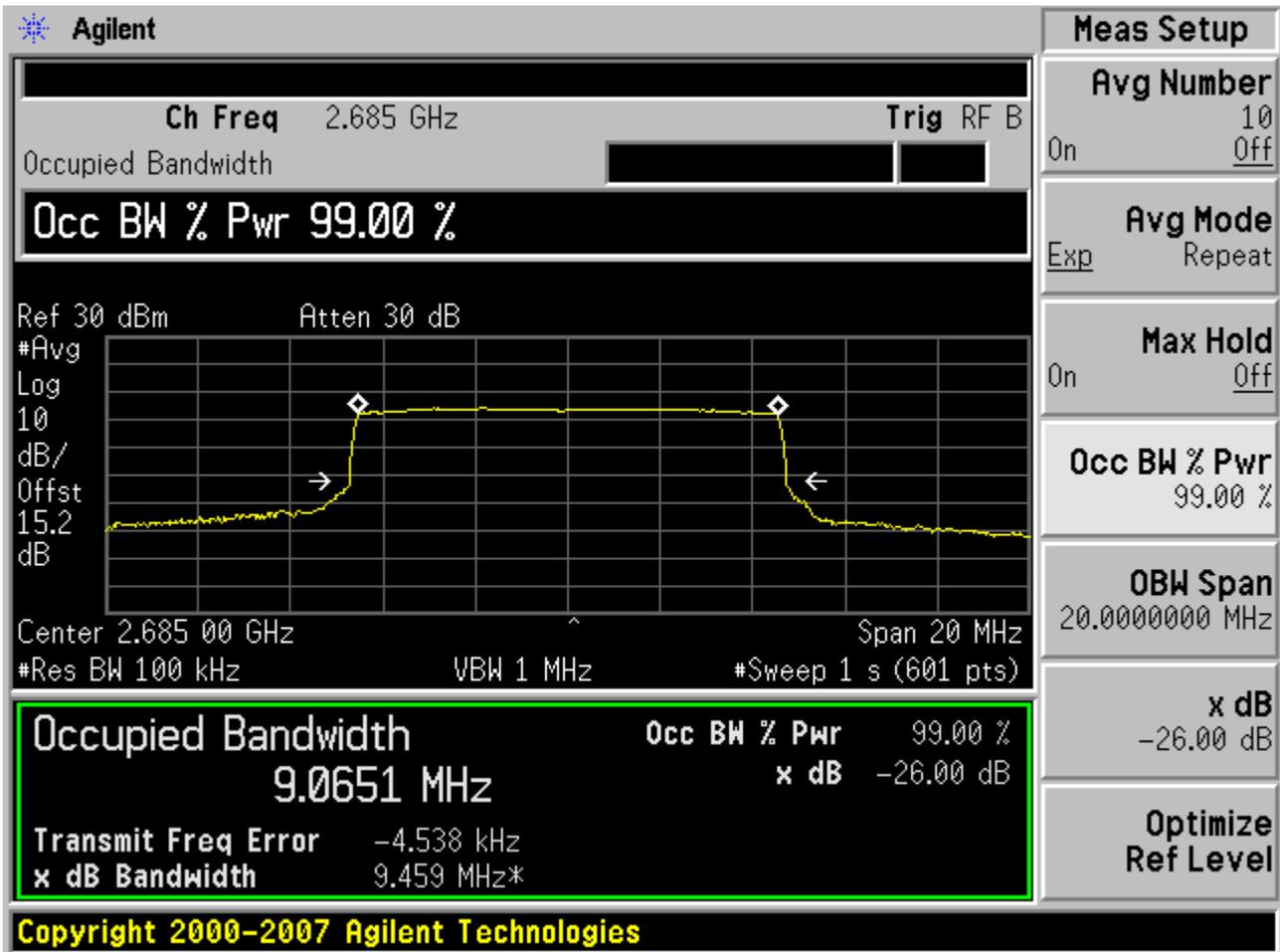
B



M

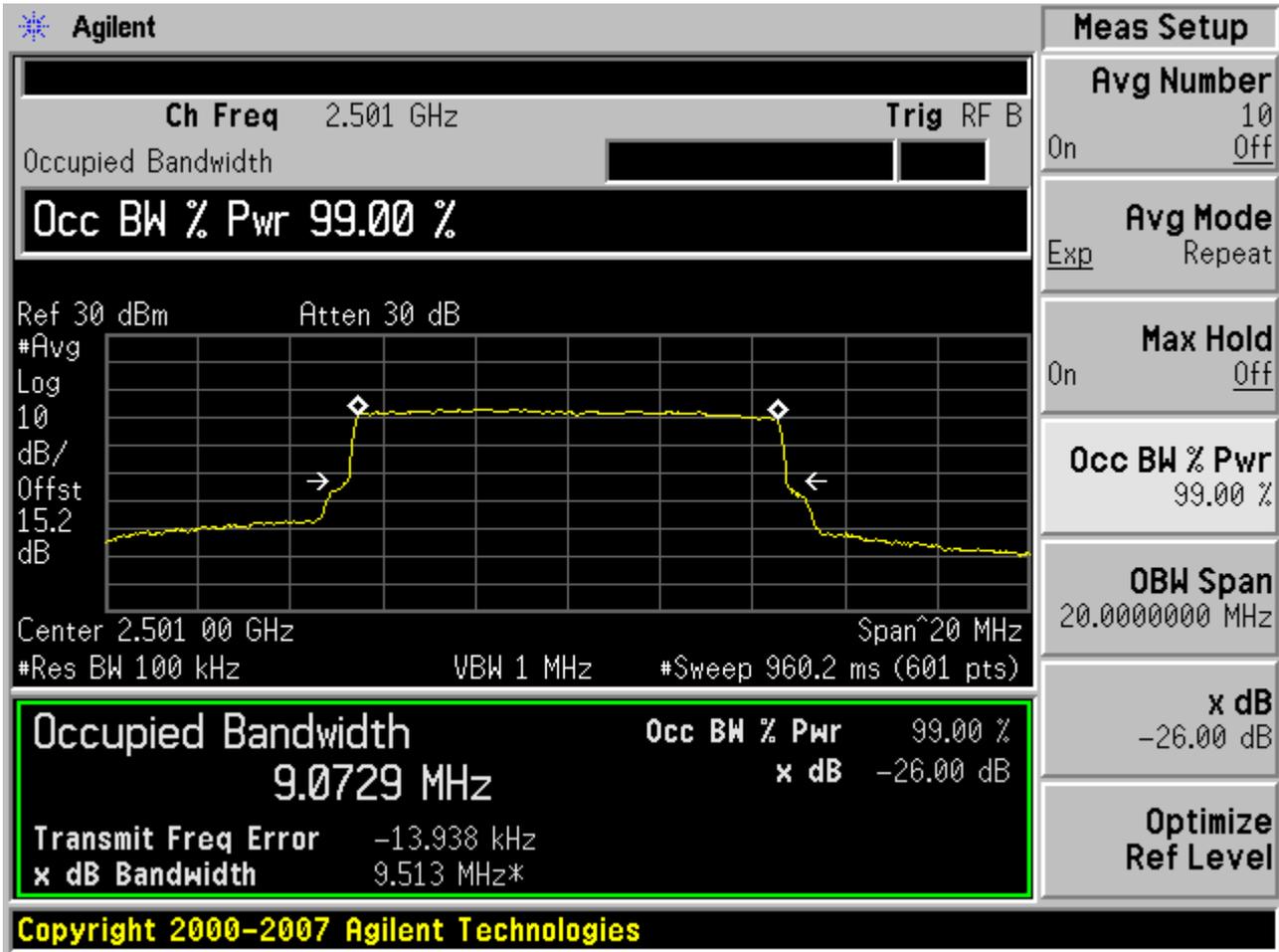


T

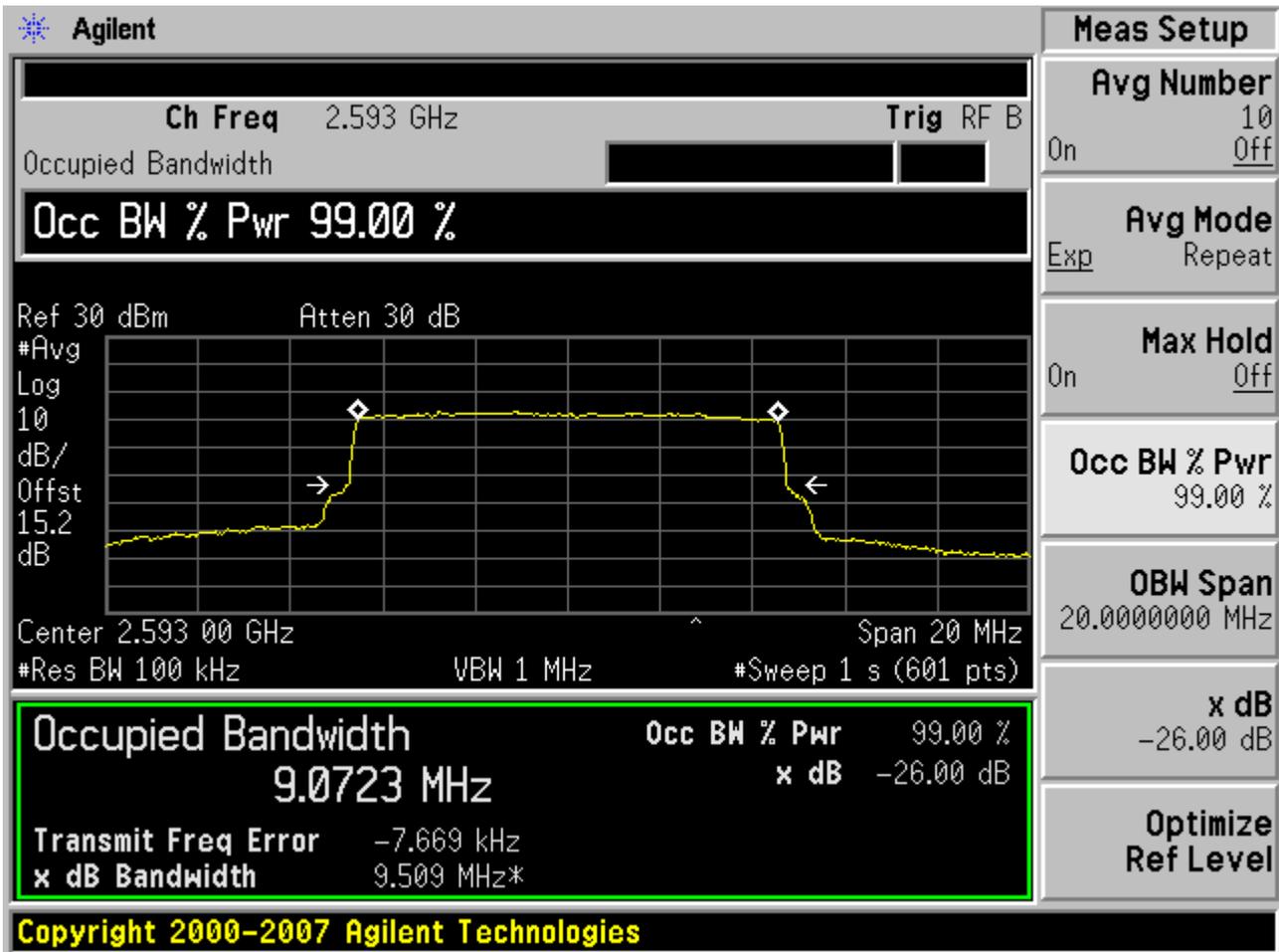


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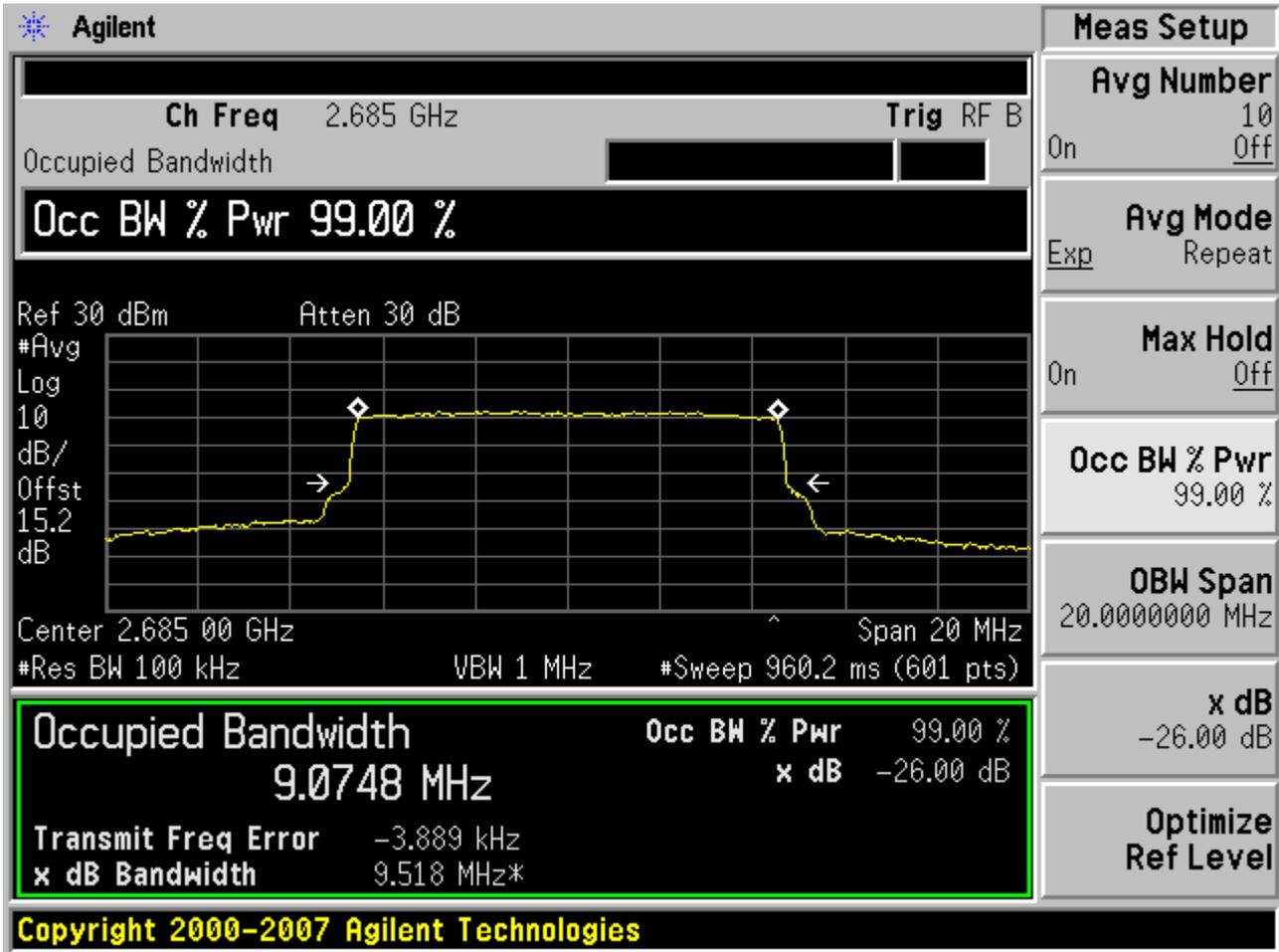
B



M



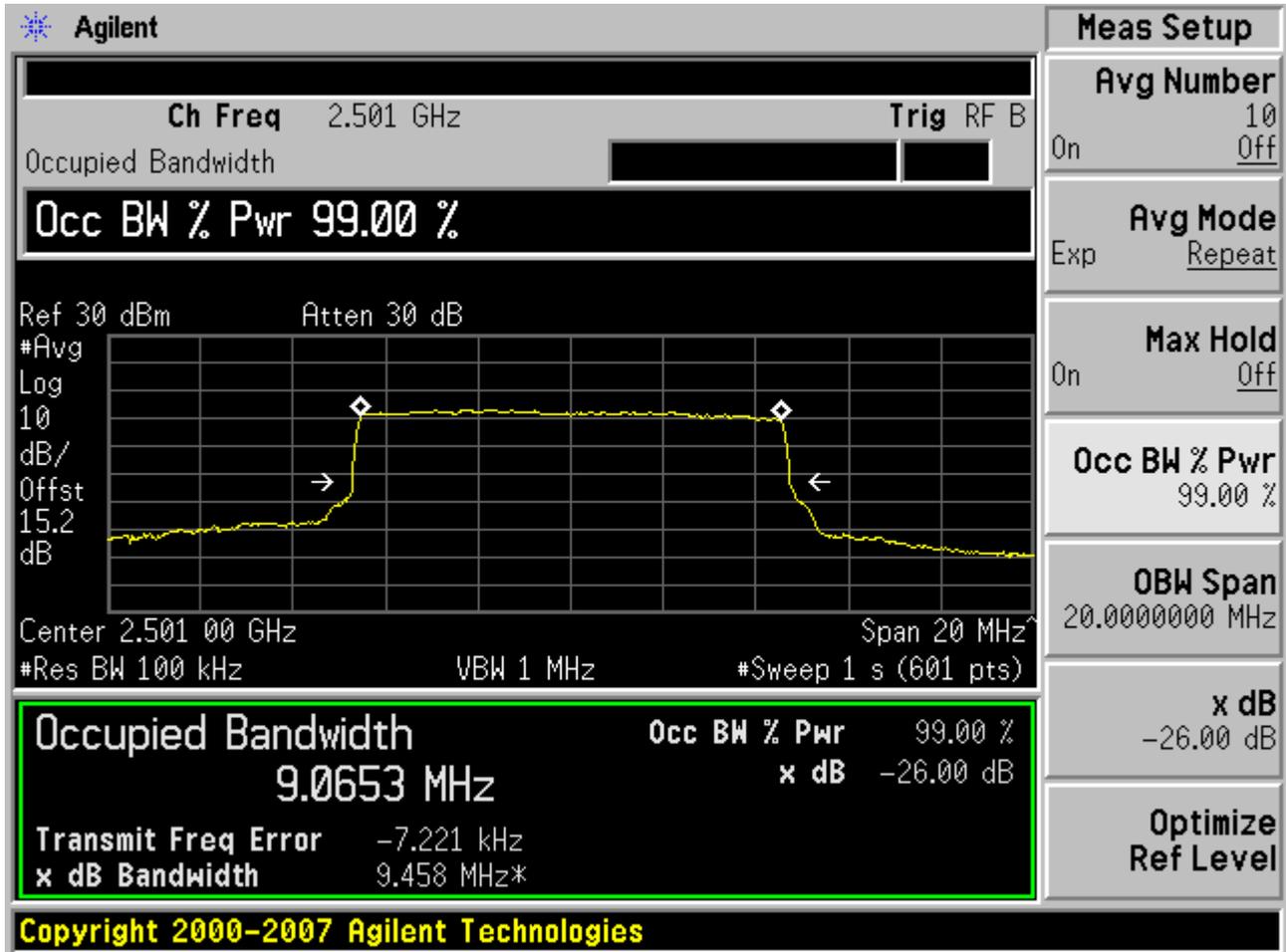
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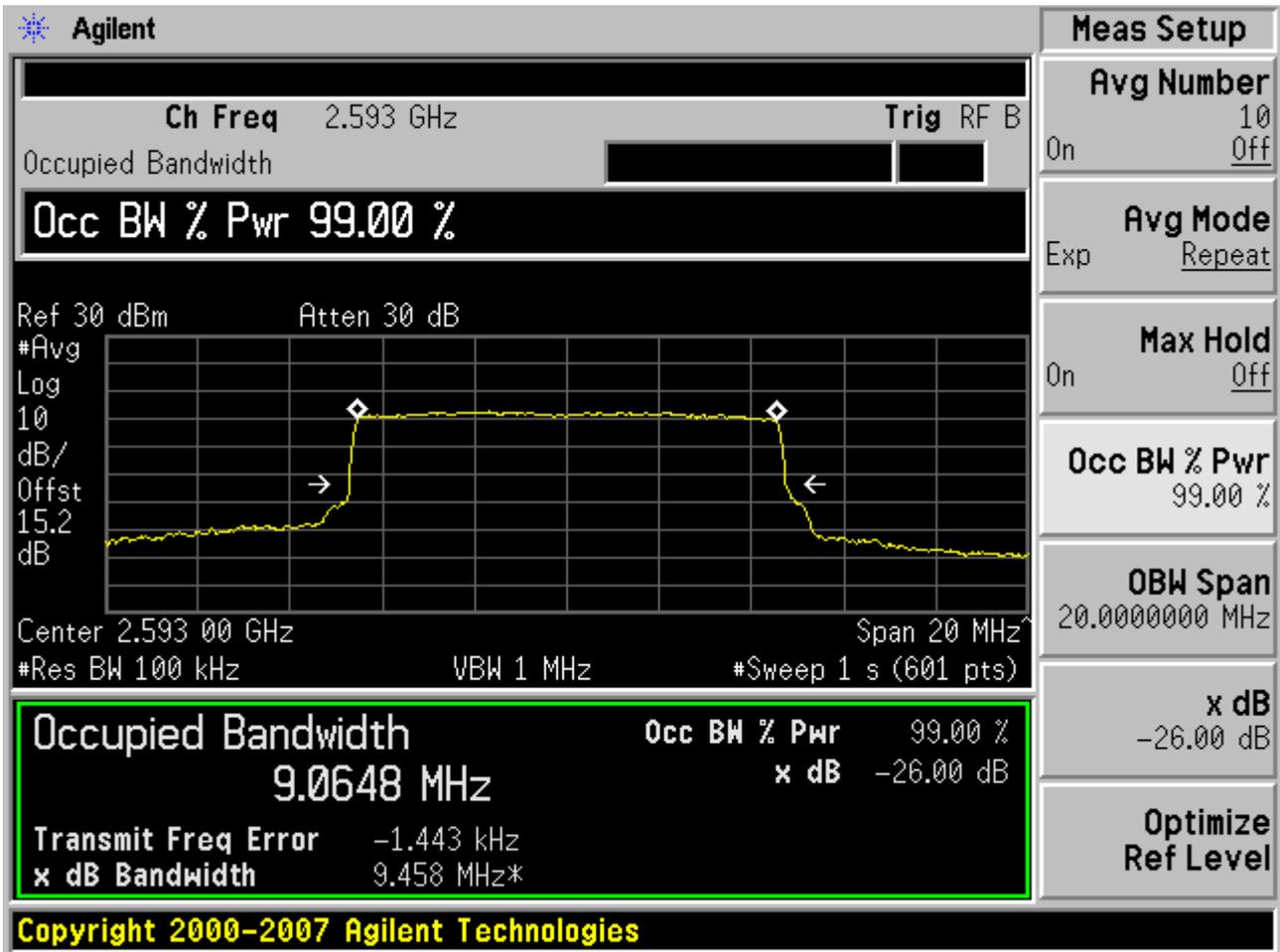
4) TM 4

B

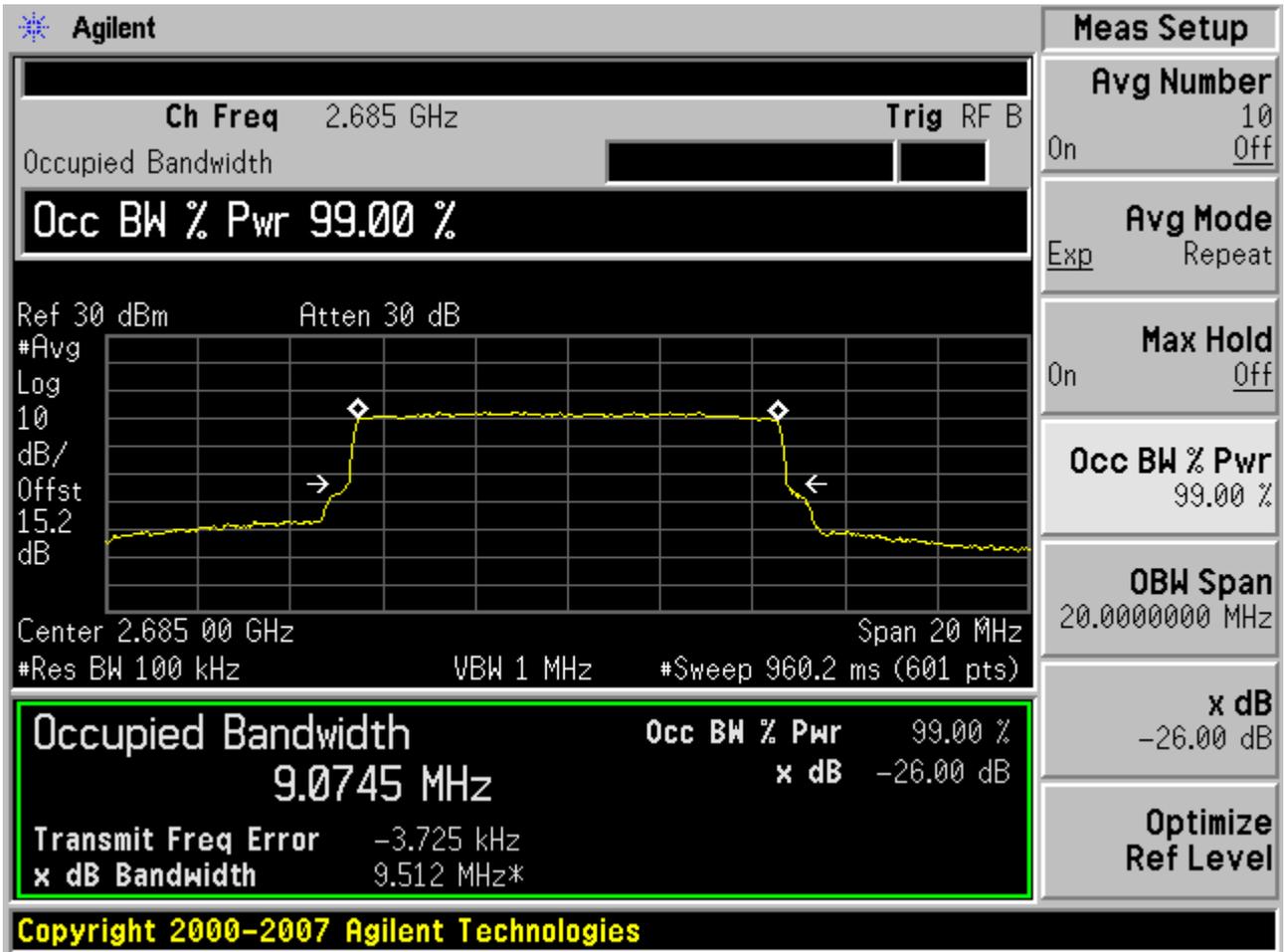




M



T





Appendix C

Band Edge Measurement

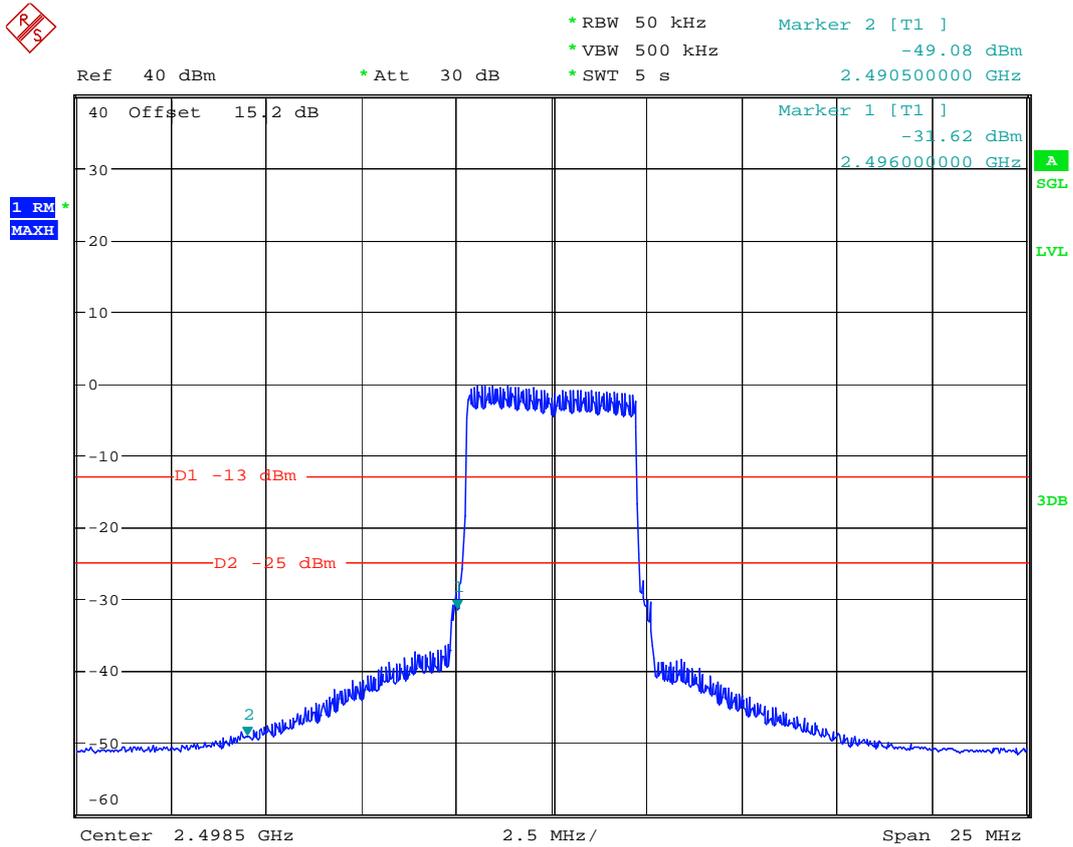
According to FCC part 2.1051 and part 27.53(m) (4) and
part 27.53(m) (6)



1. Channel Bandwidth = 5 MHz

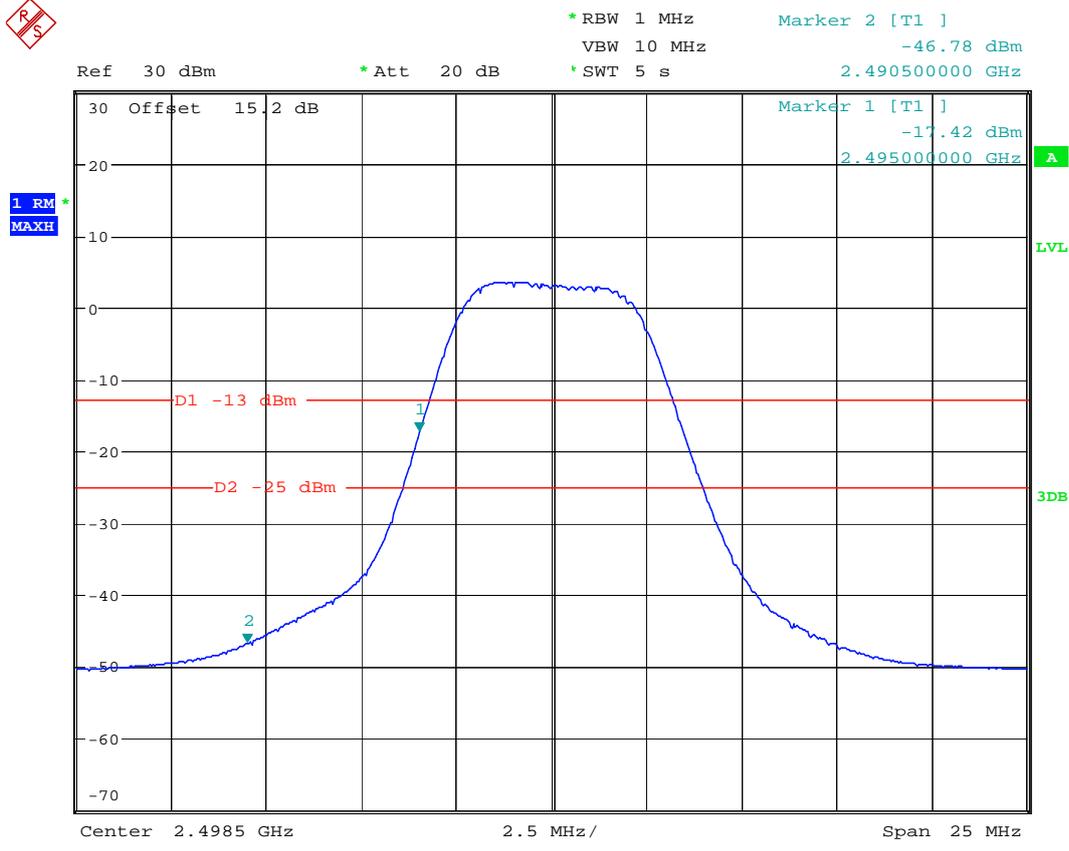
1) TM 1

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Date: 10.MAR.2011 16:44:50

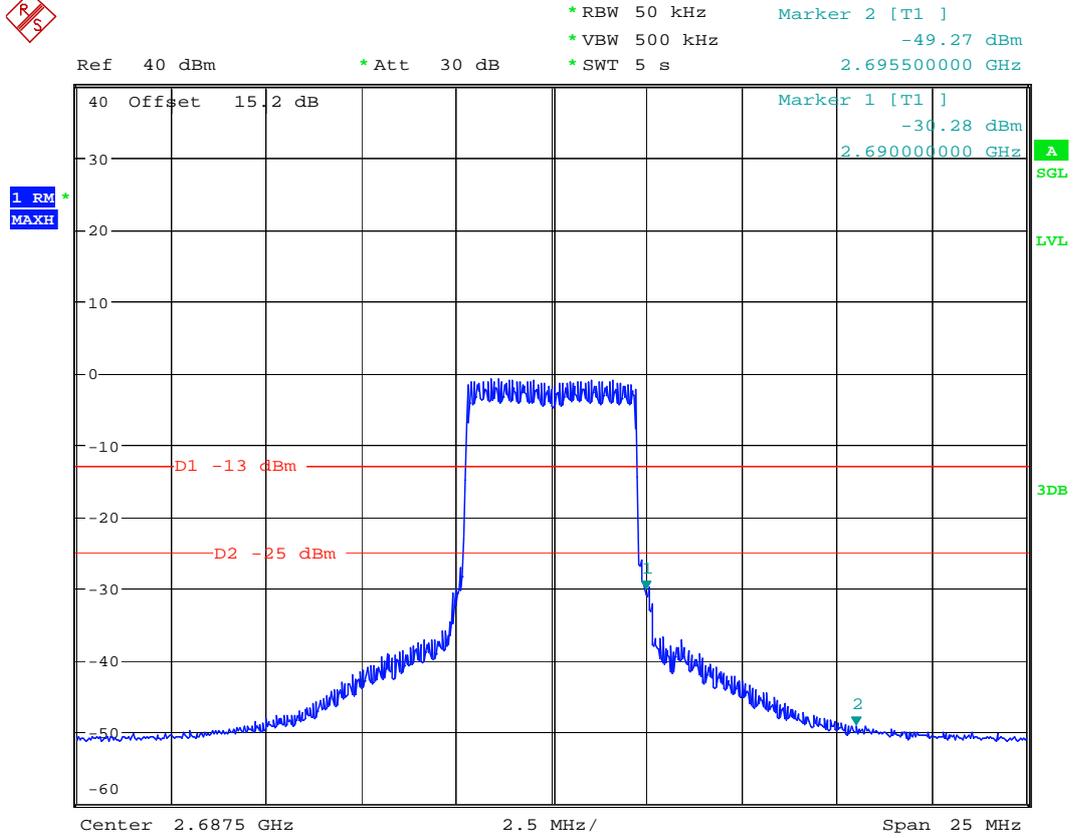


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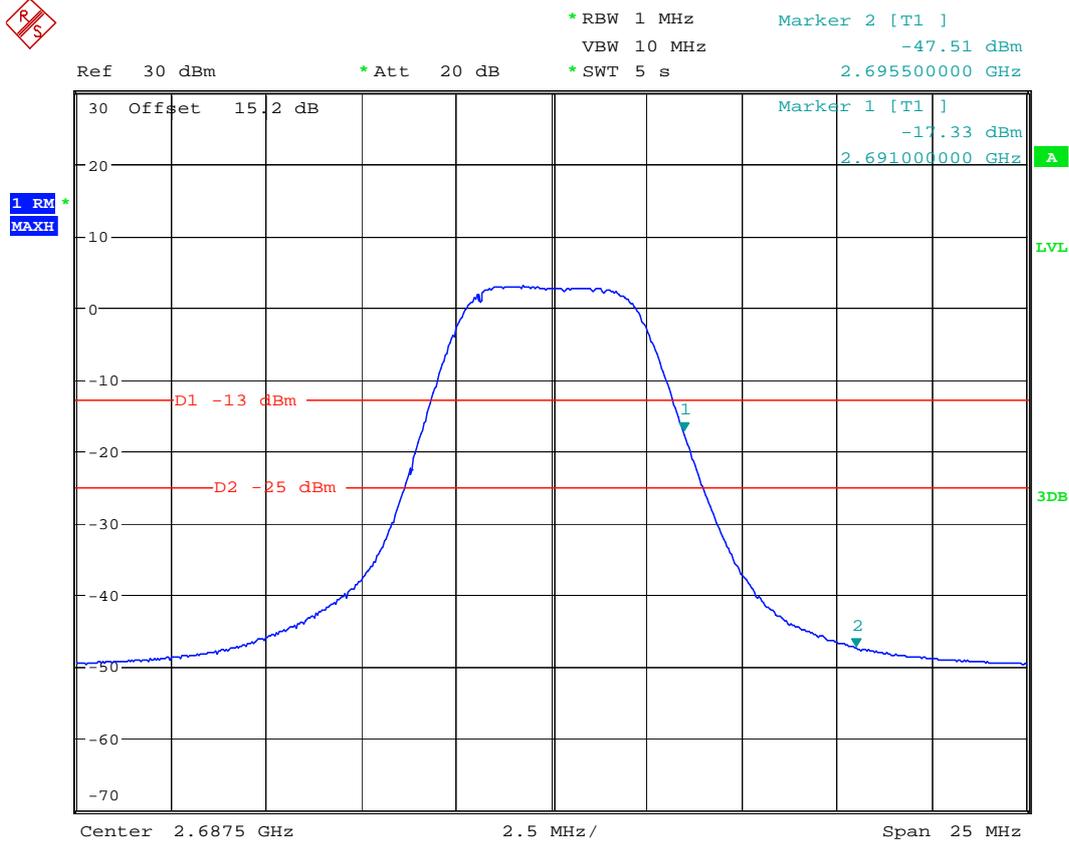


T



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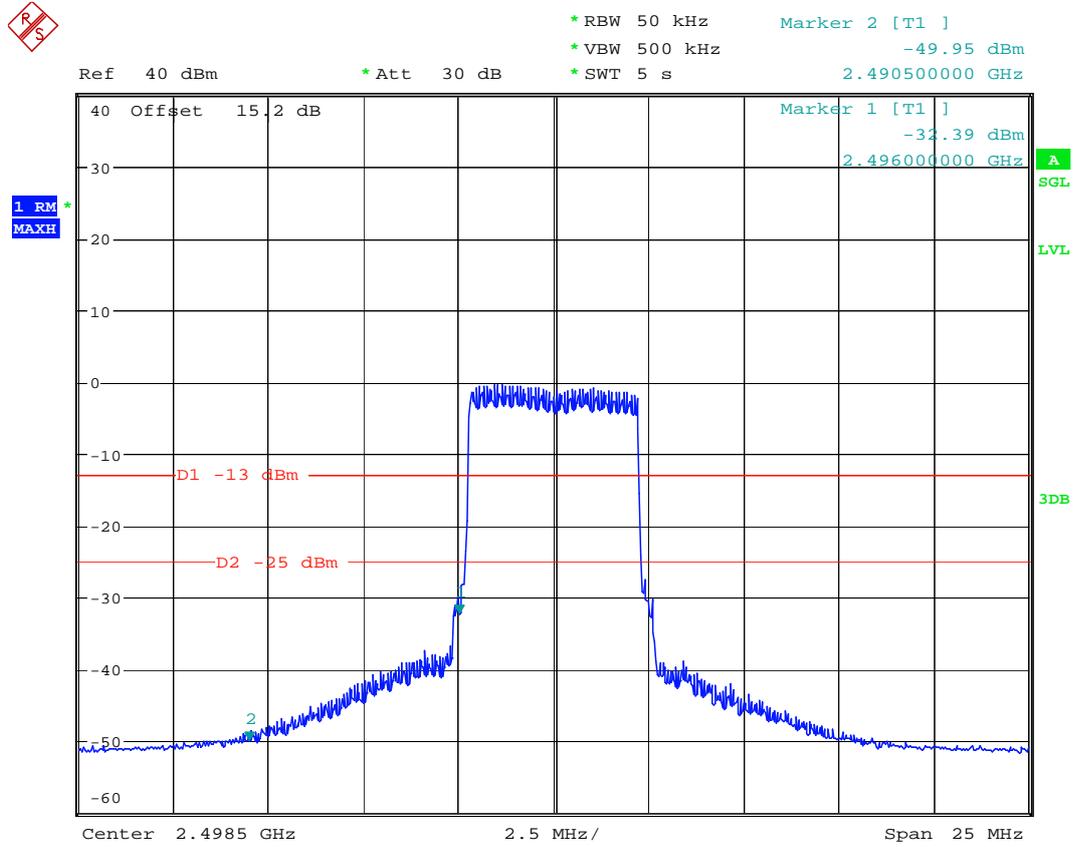
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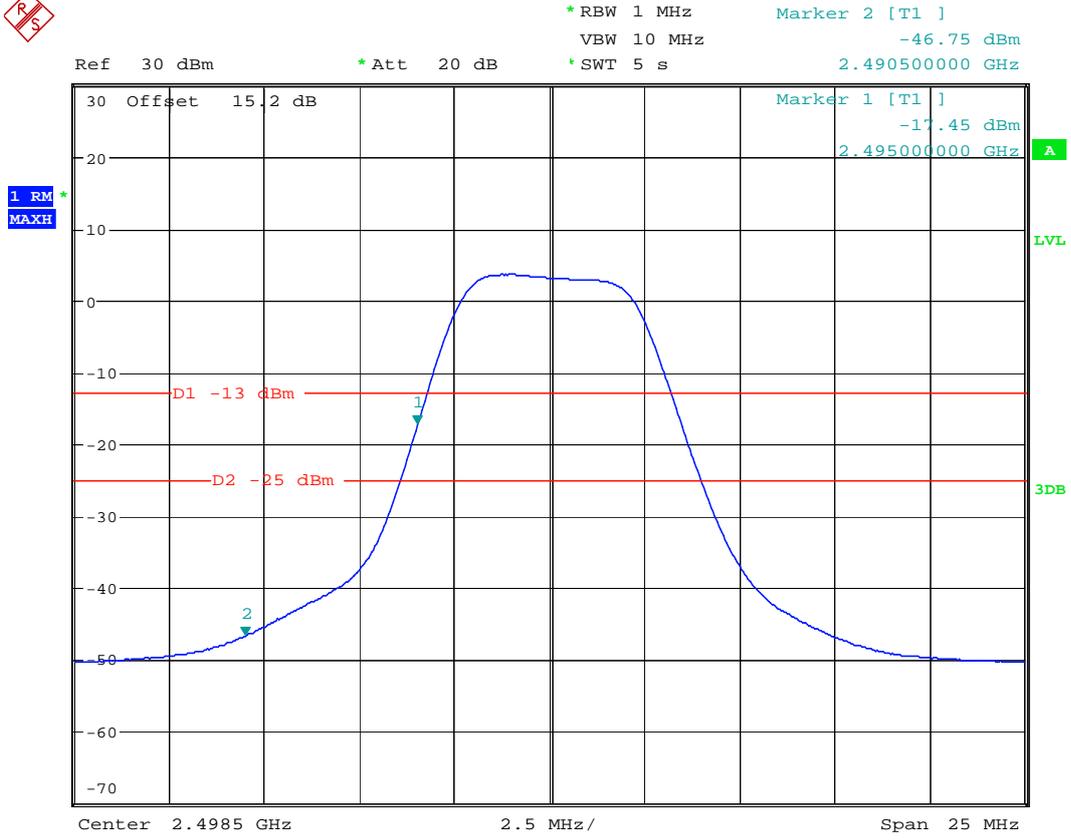
2) TM 2

B



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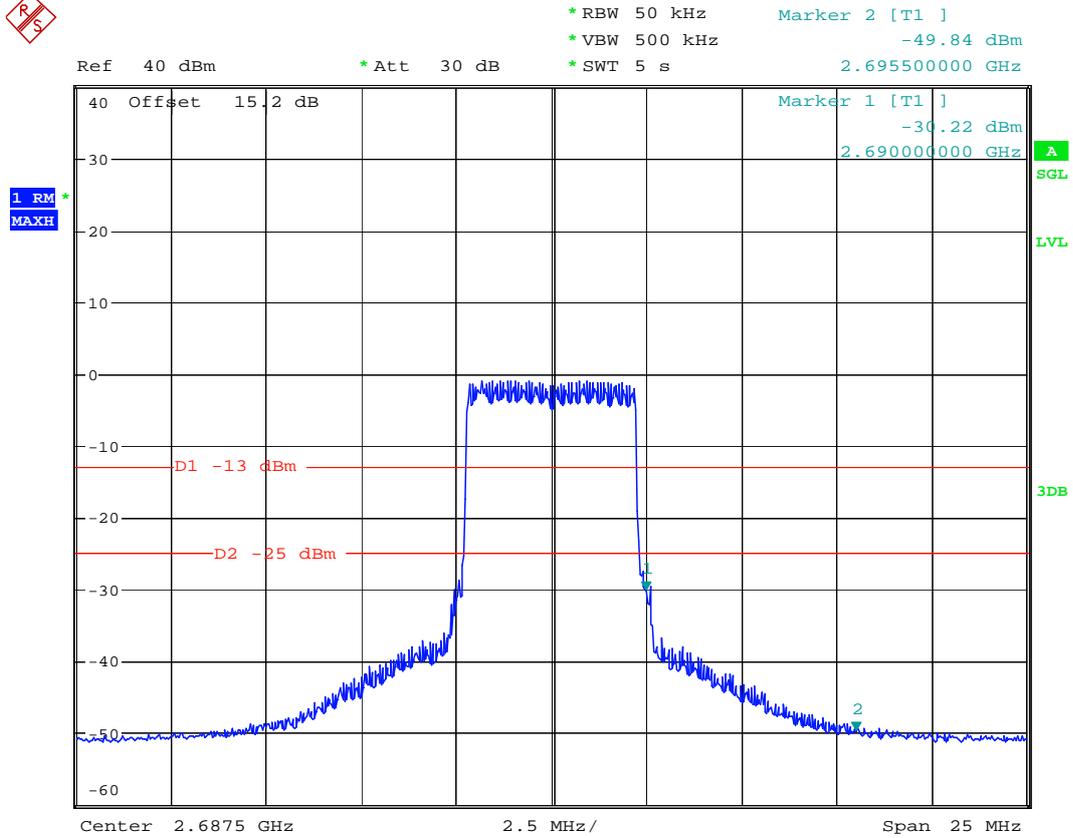


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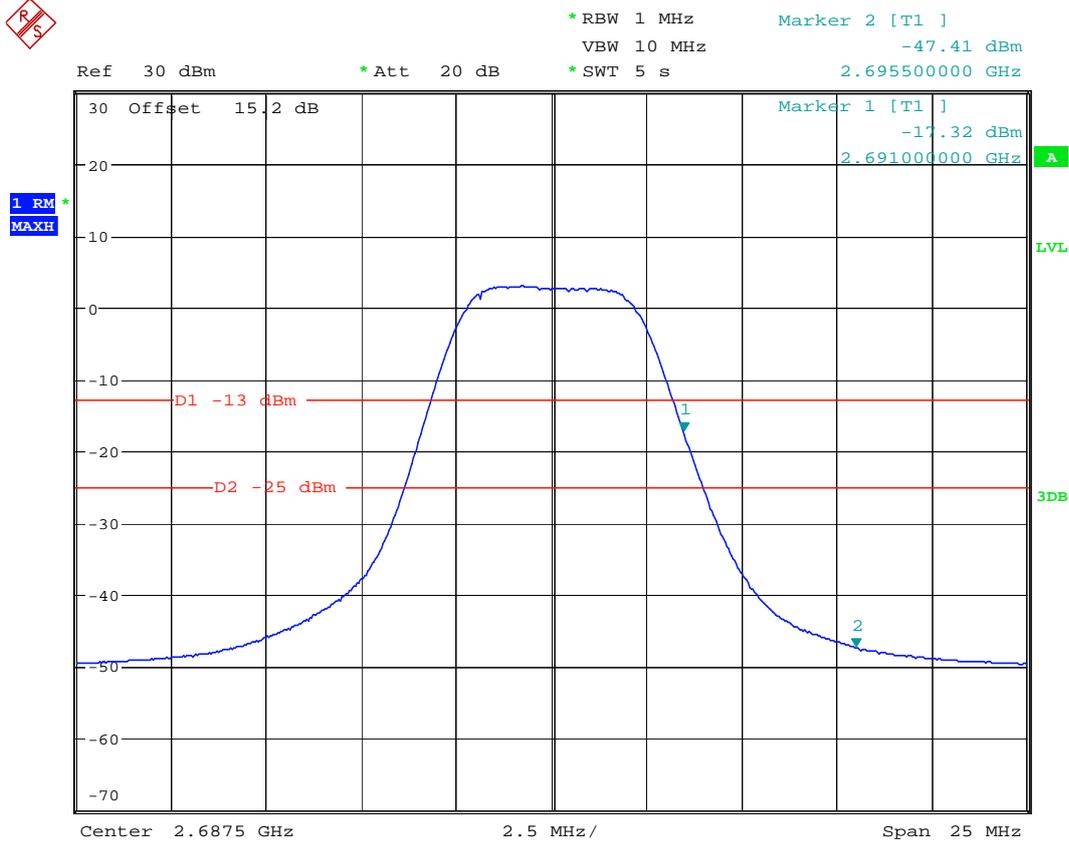


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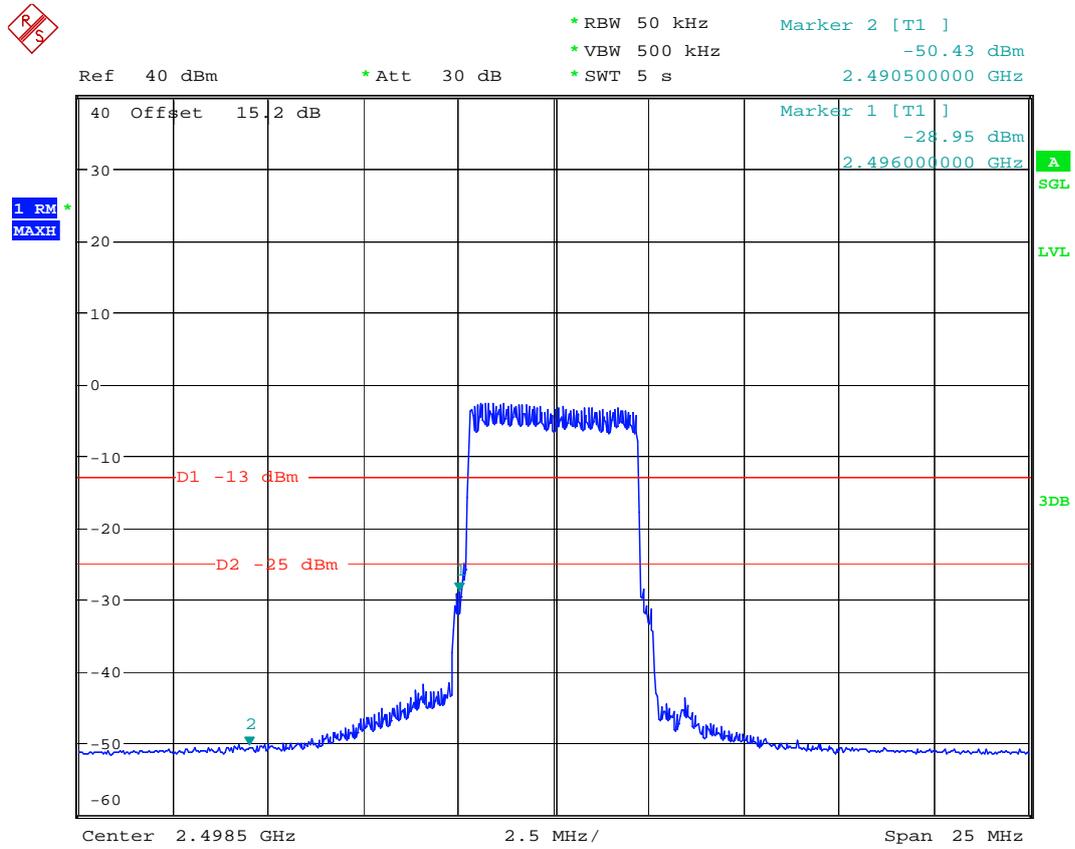
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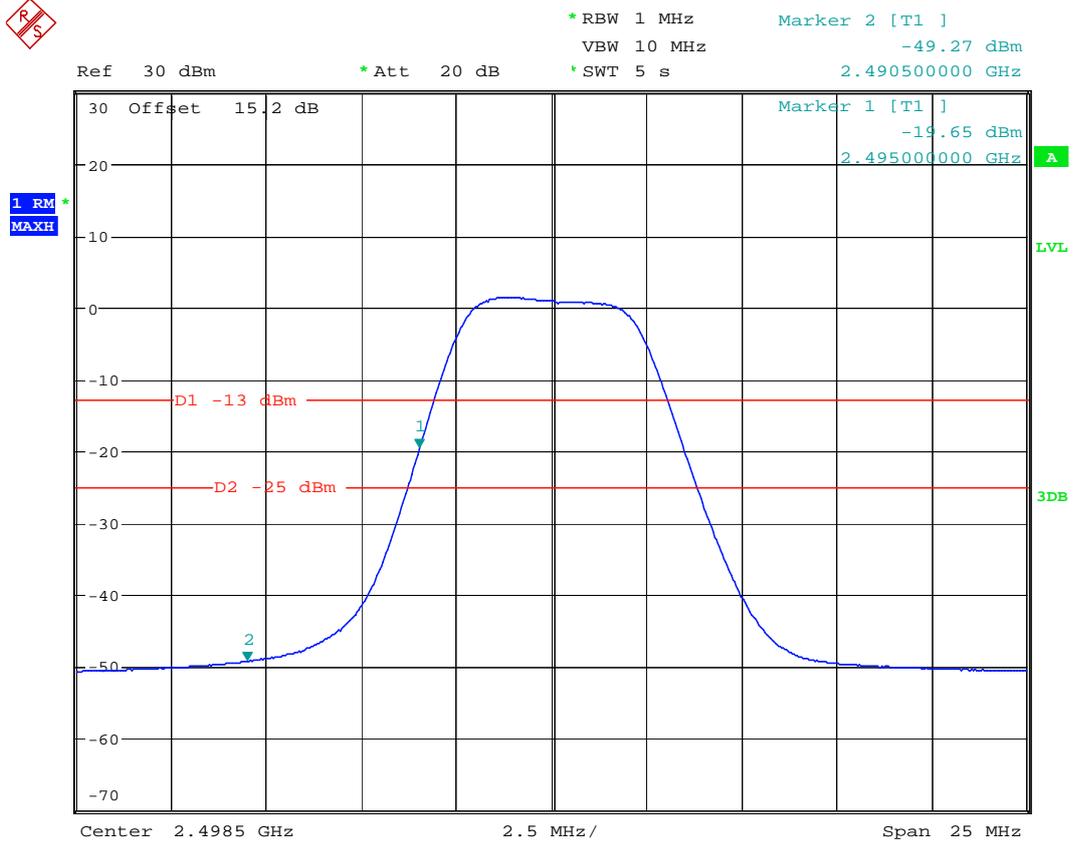
3) TM 3

B



PO

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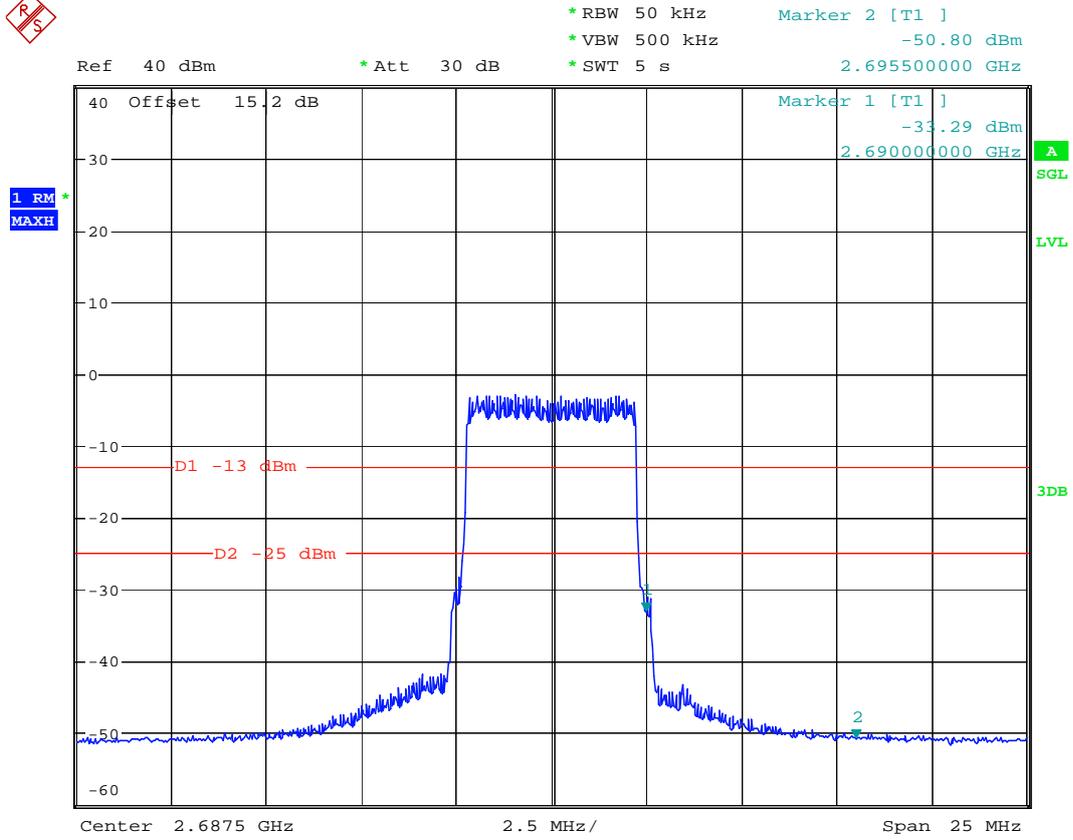


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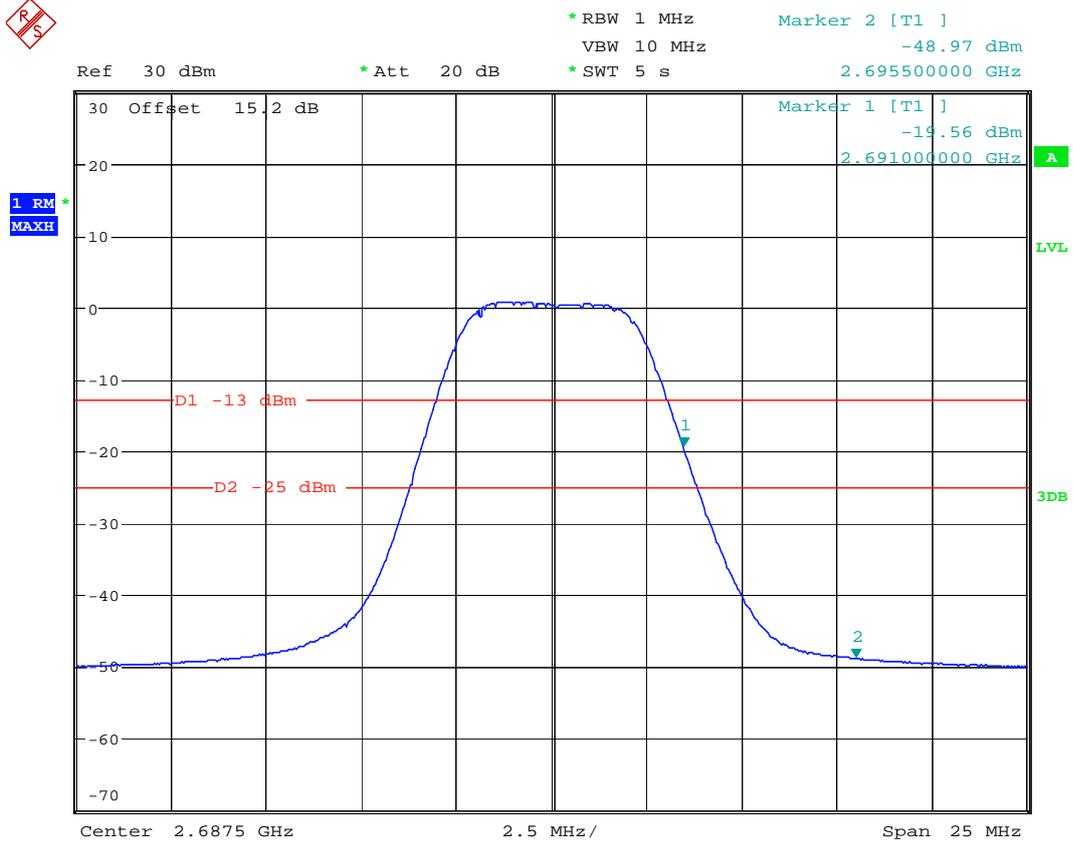


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PO

Date: 10.MAR.2011 16:47:28



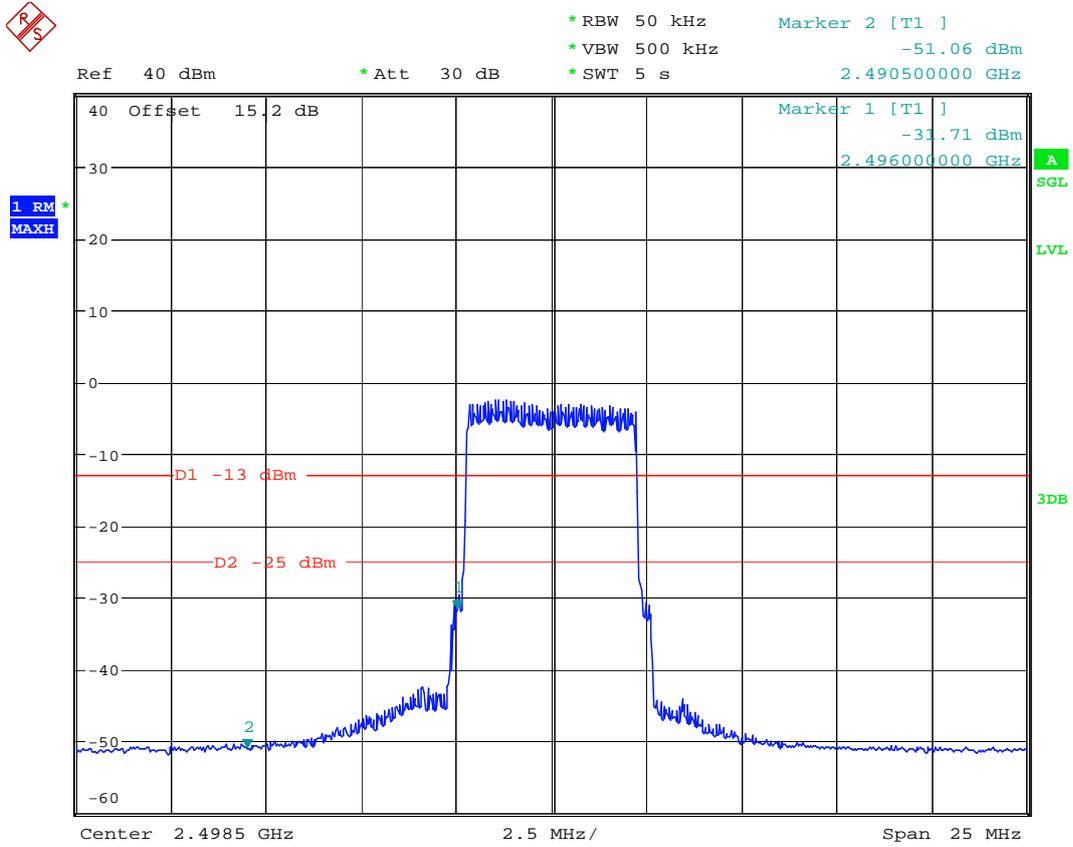
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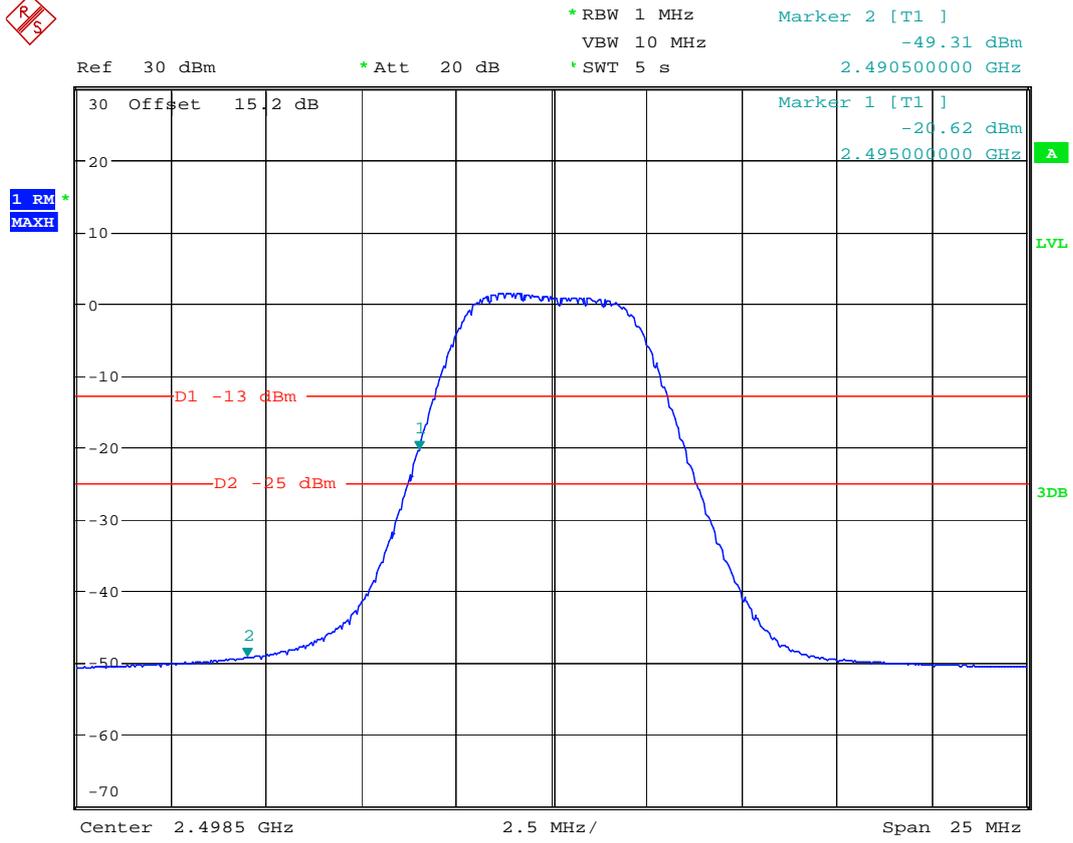
4) TM 4

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PO

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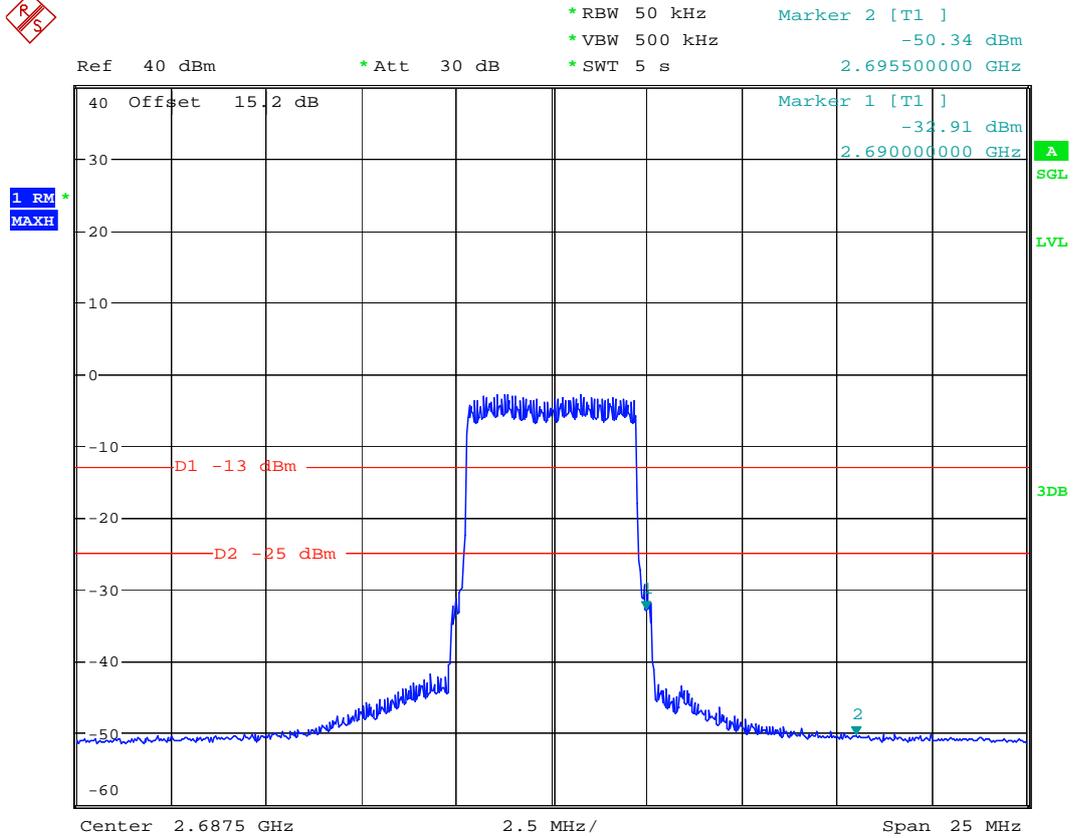


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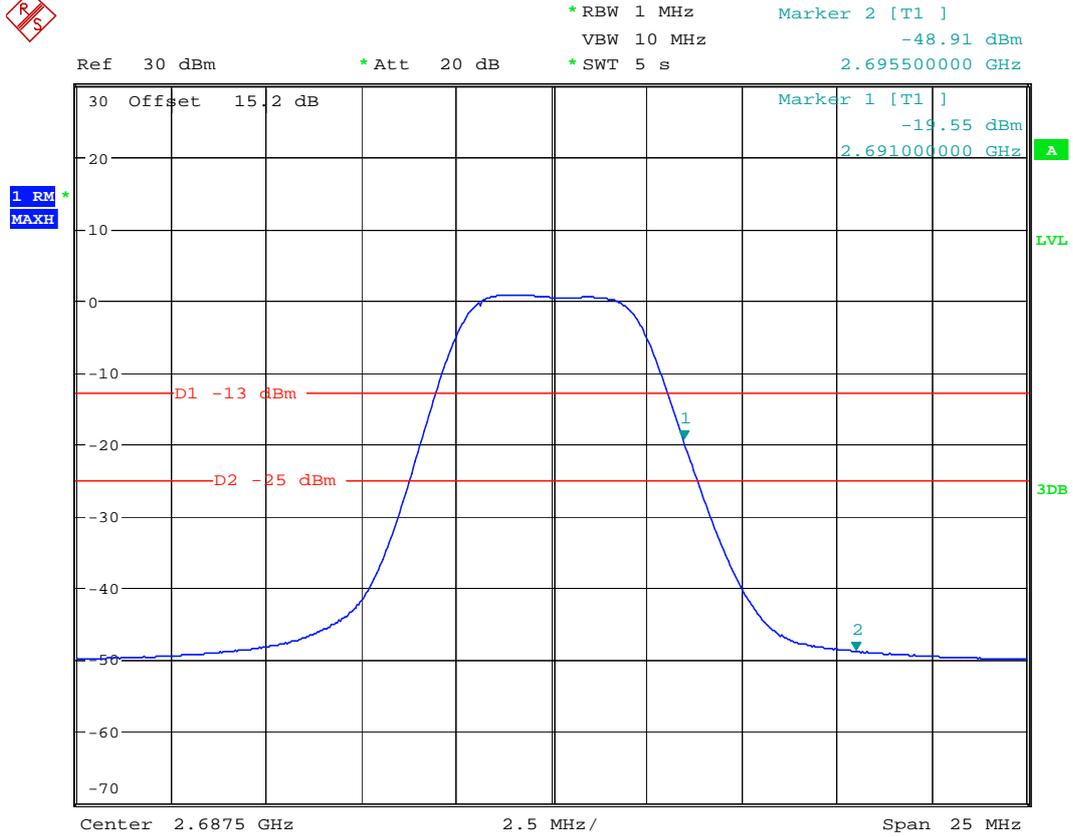


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PO

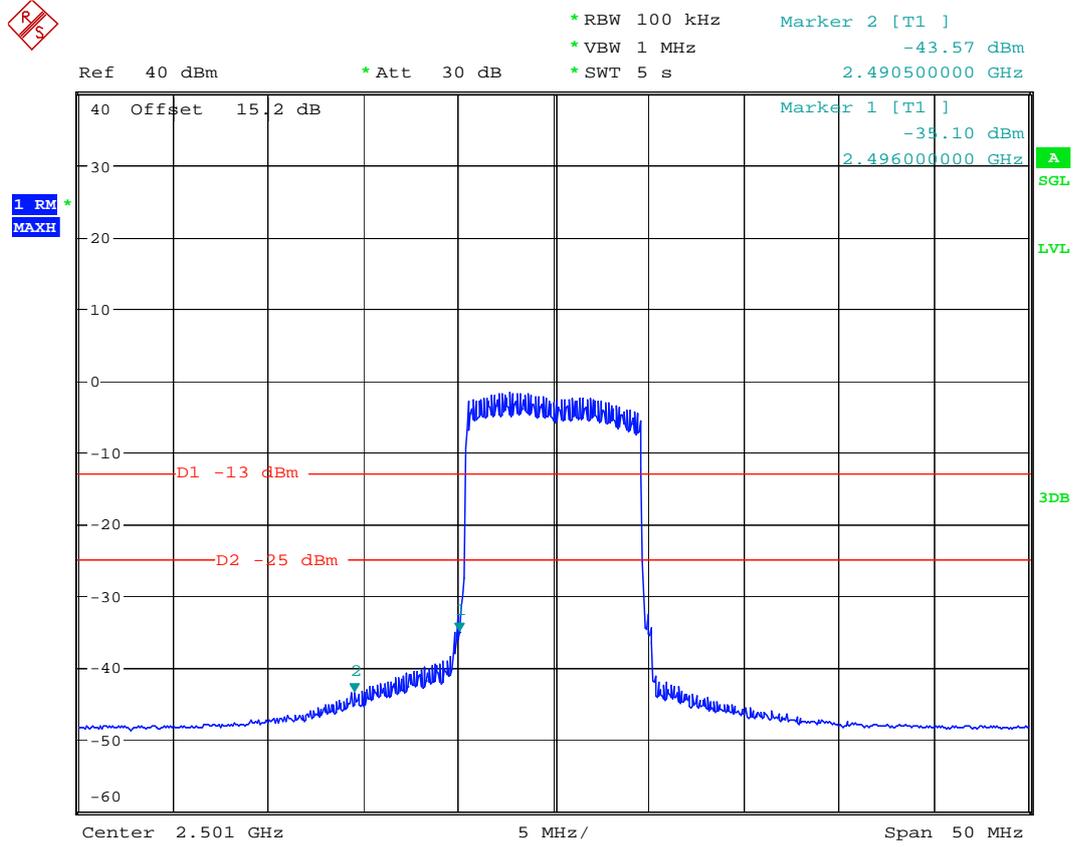
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2. Channel Bandwidth = 10 MHz

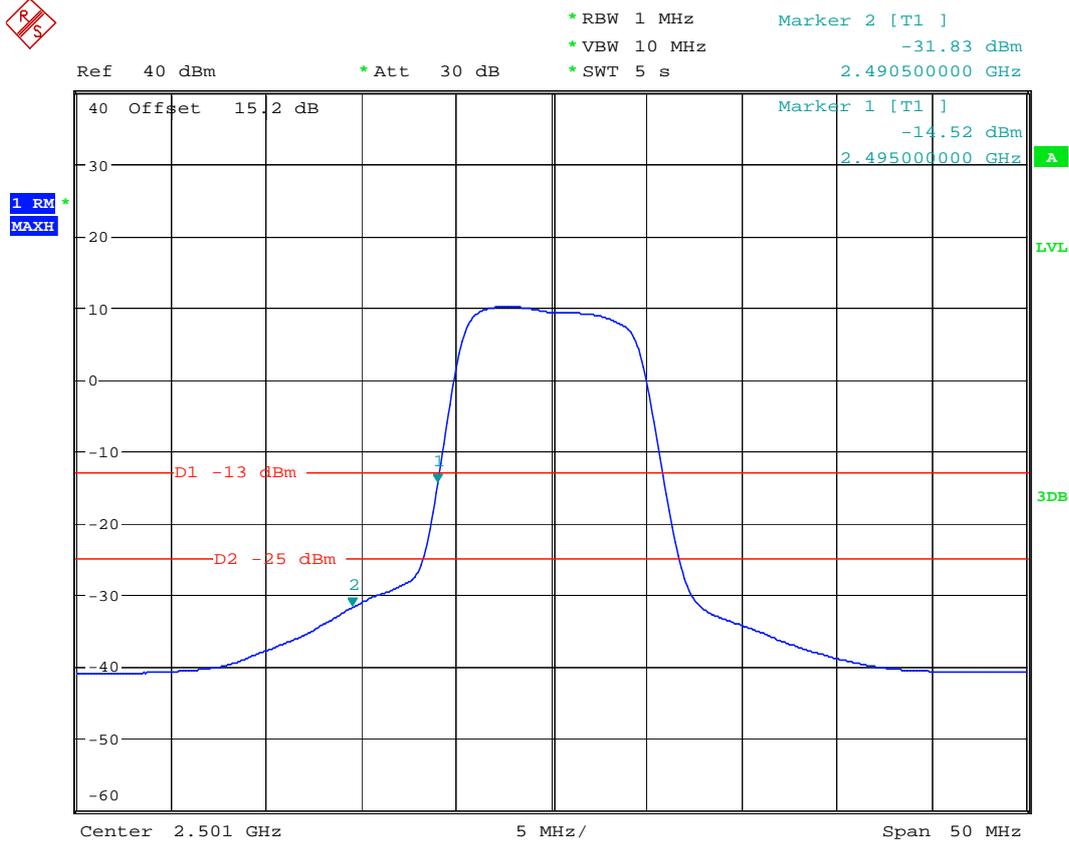
1) TM 1

B



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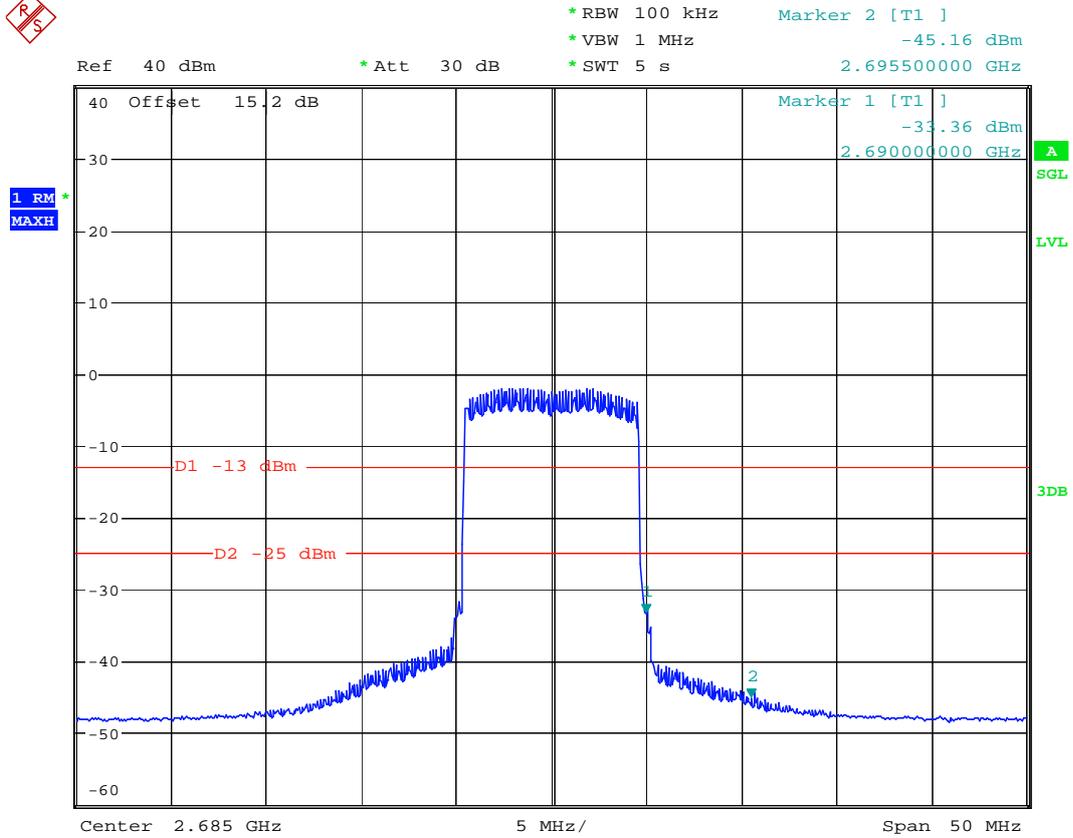


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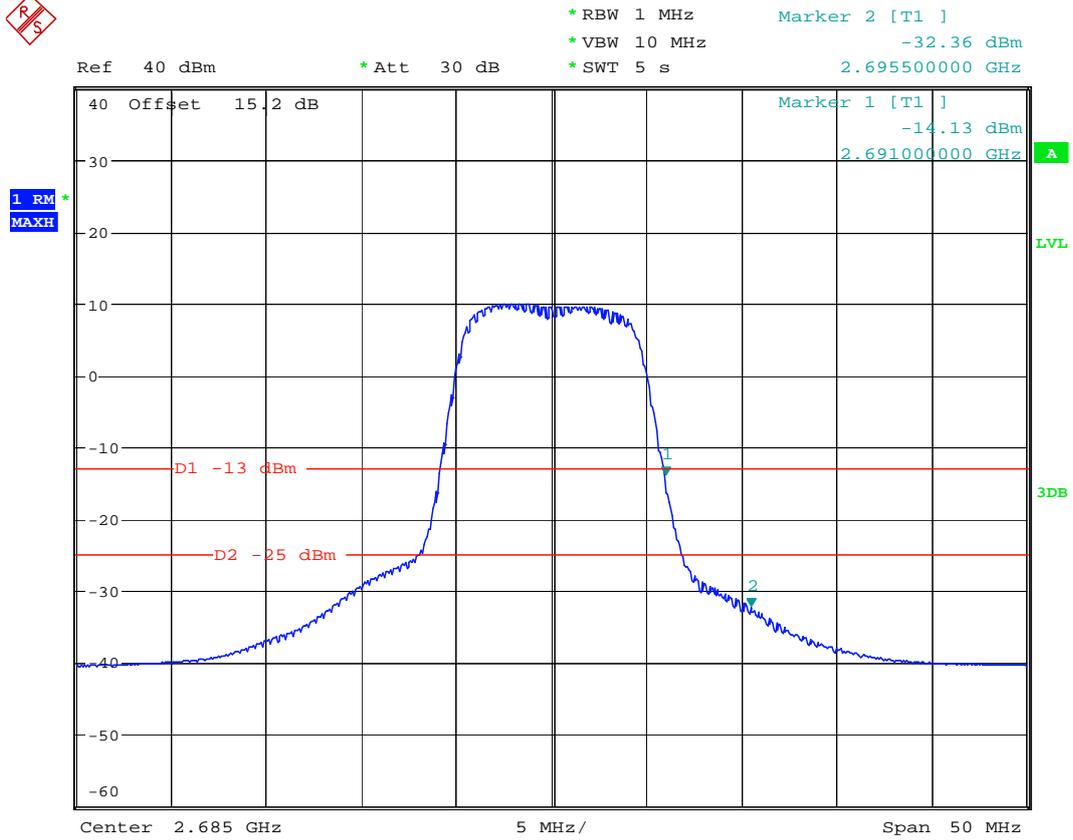


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PO

Date: 10.MAR.2011 16:25:30



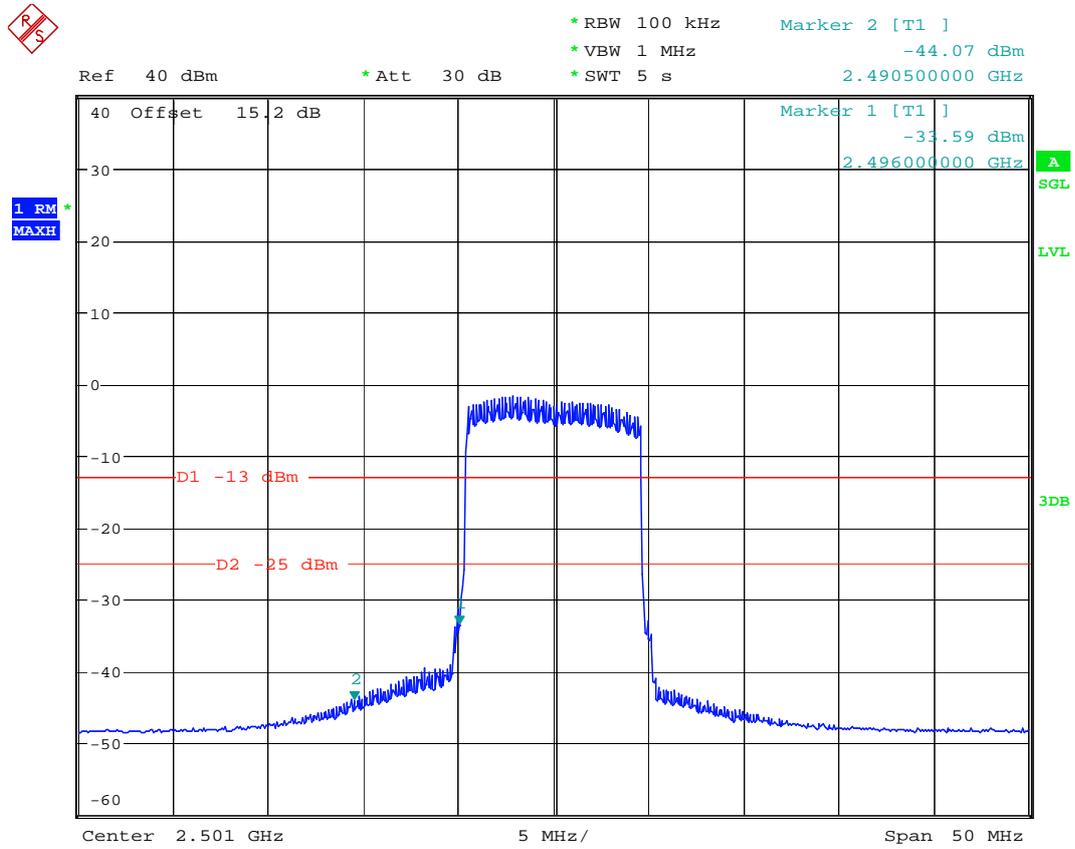
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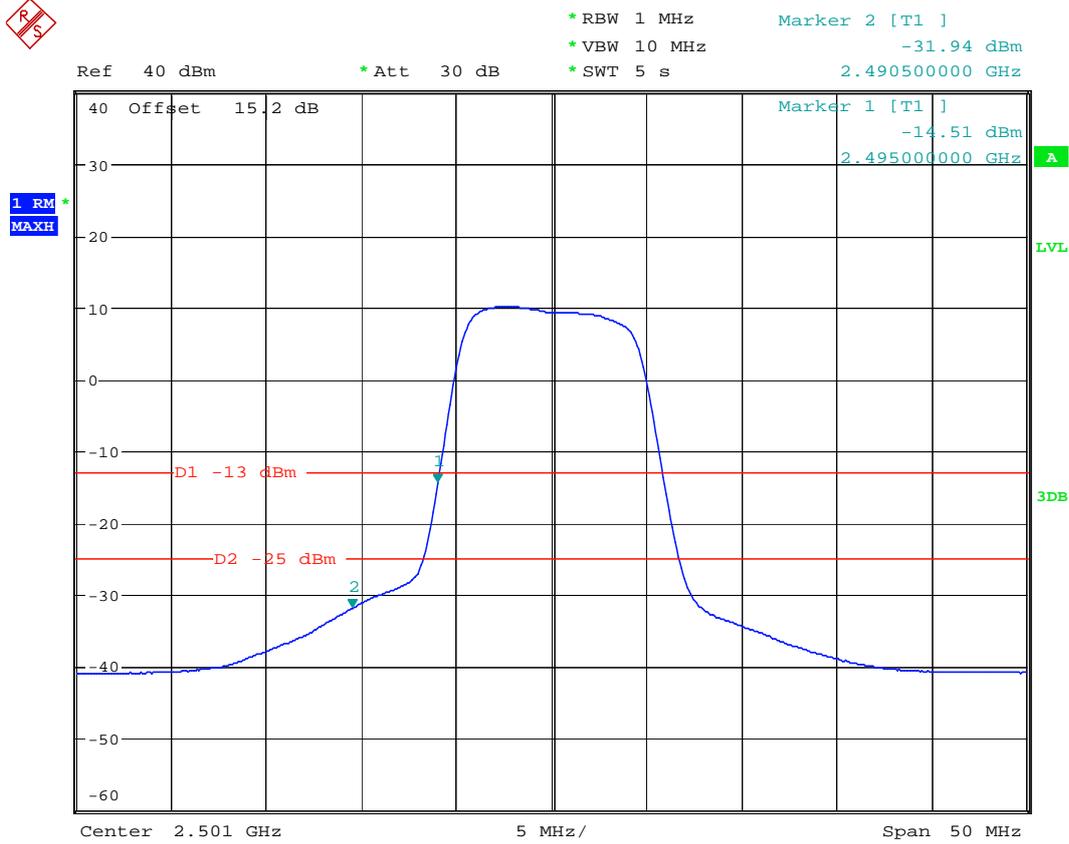
2) TM 2

B



PO

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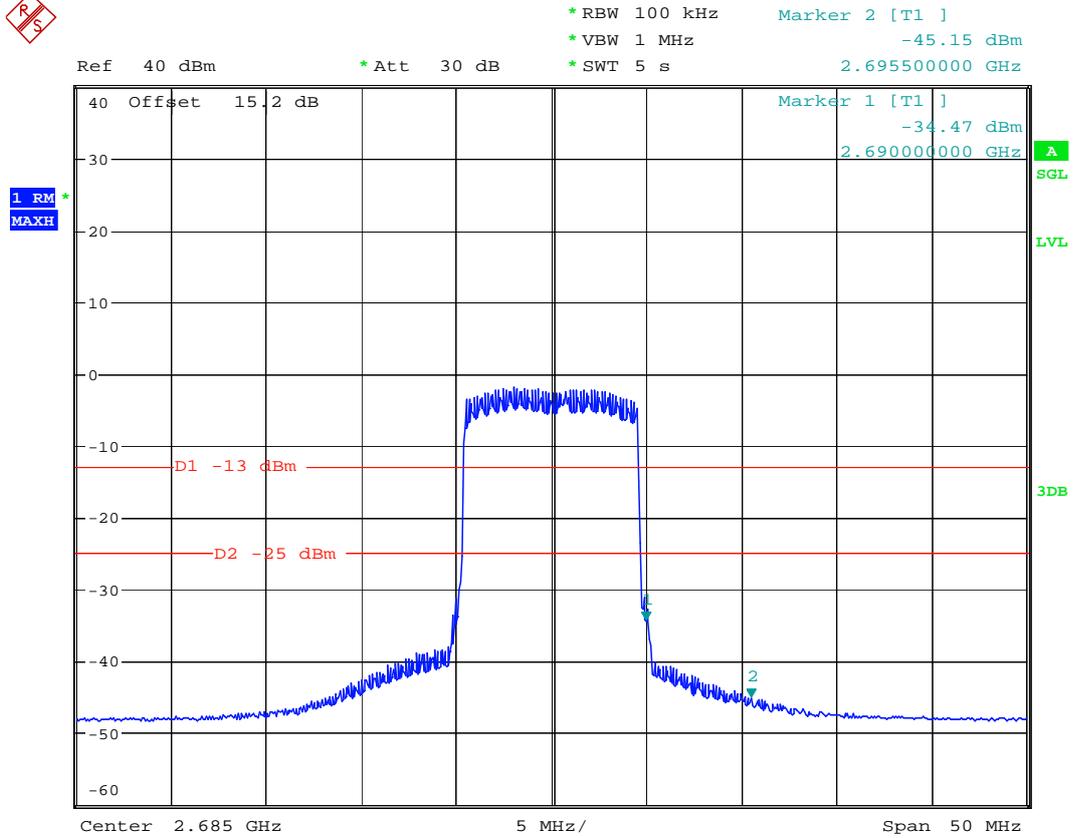


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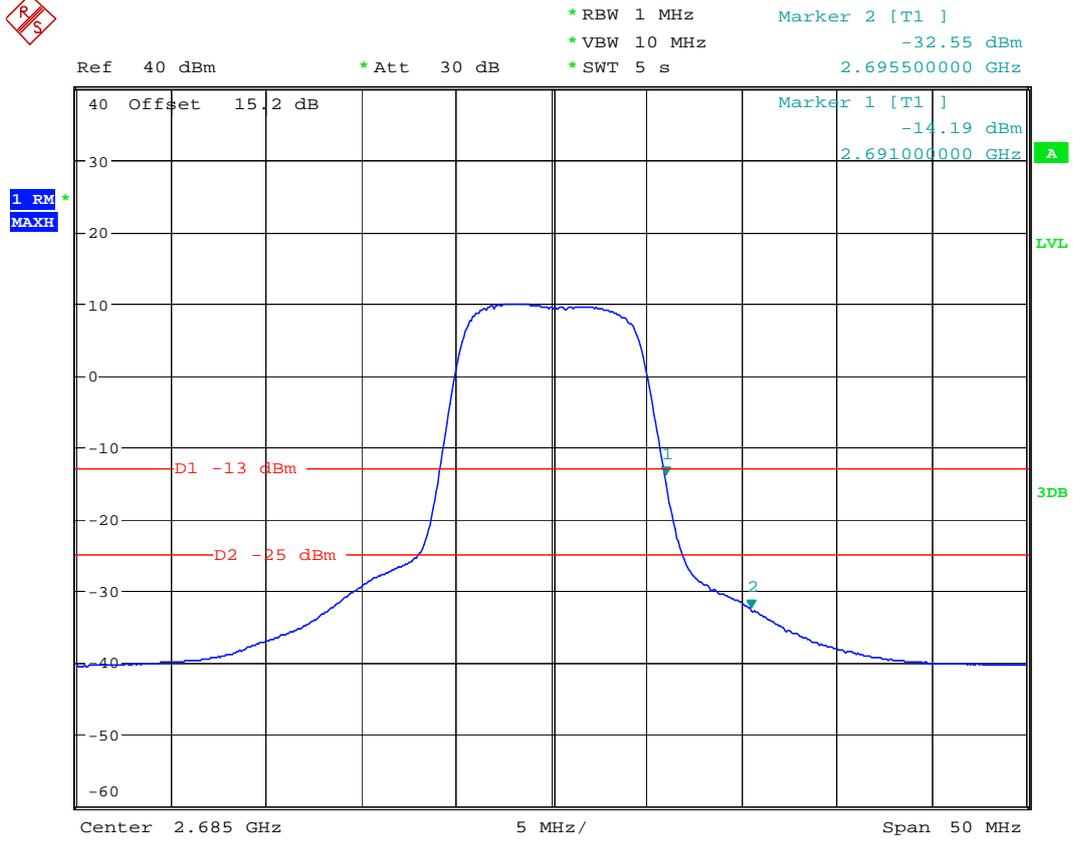


T



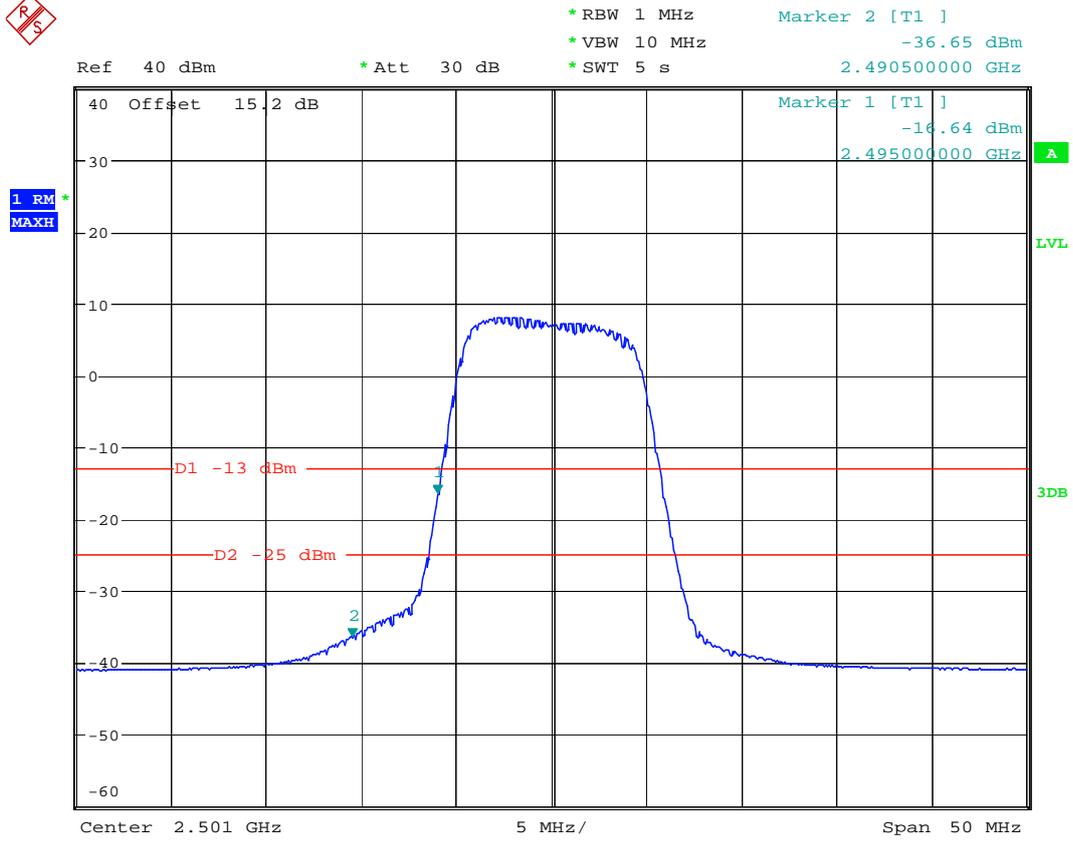
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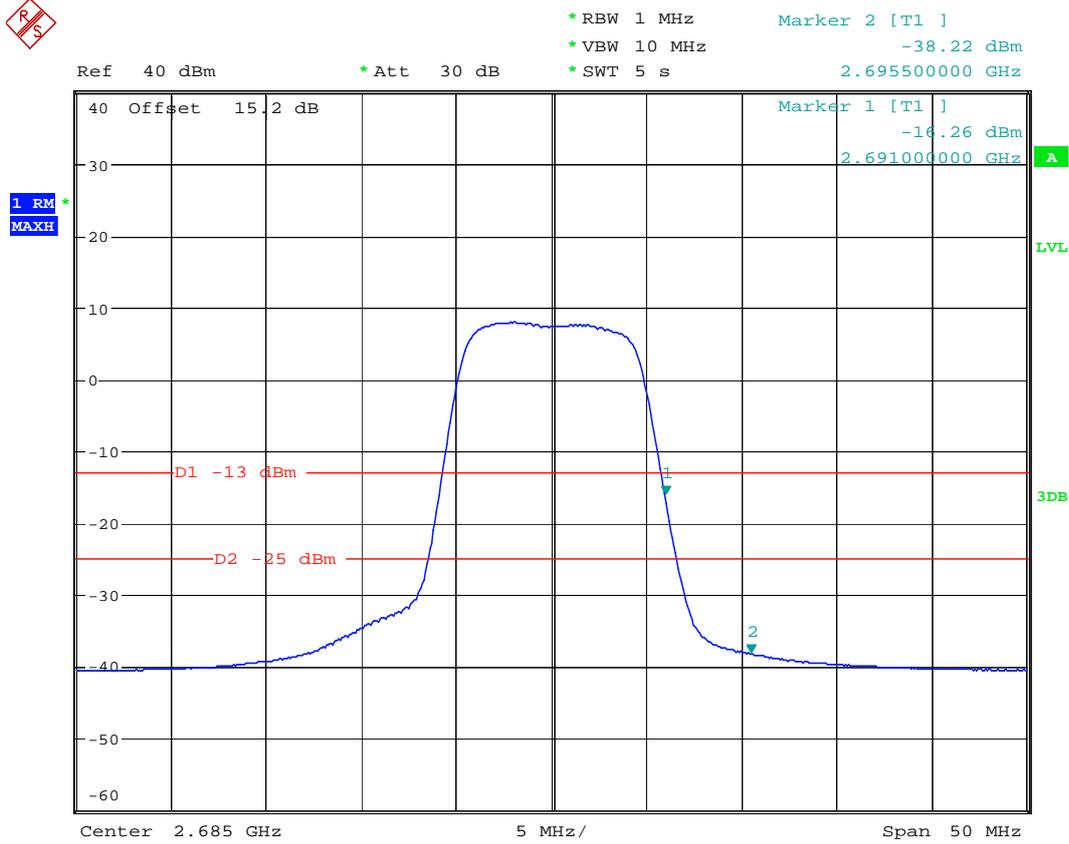
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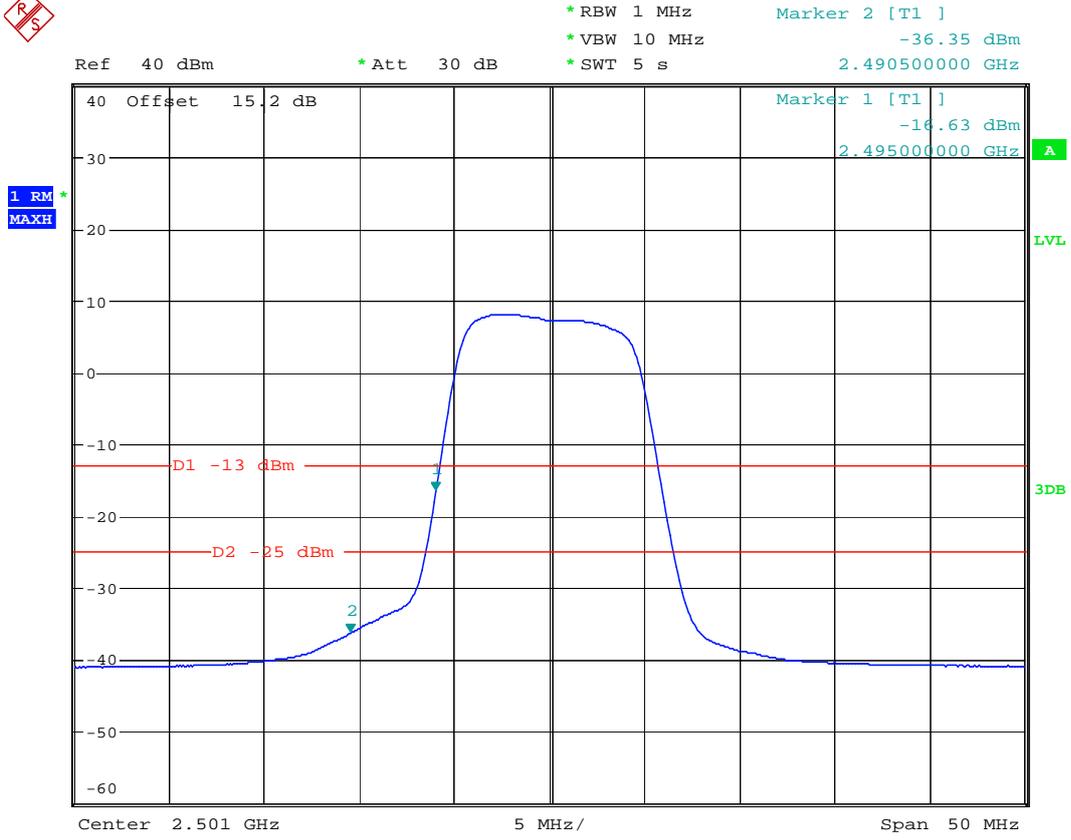
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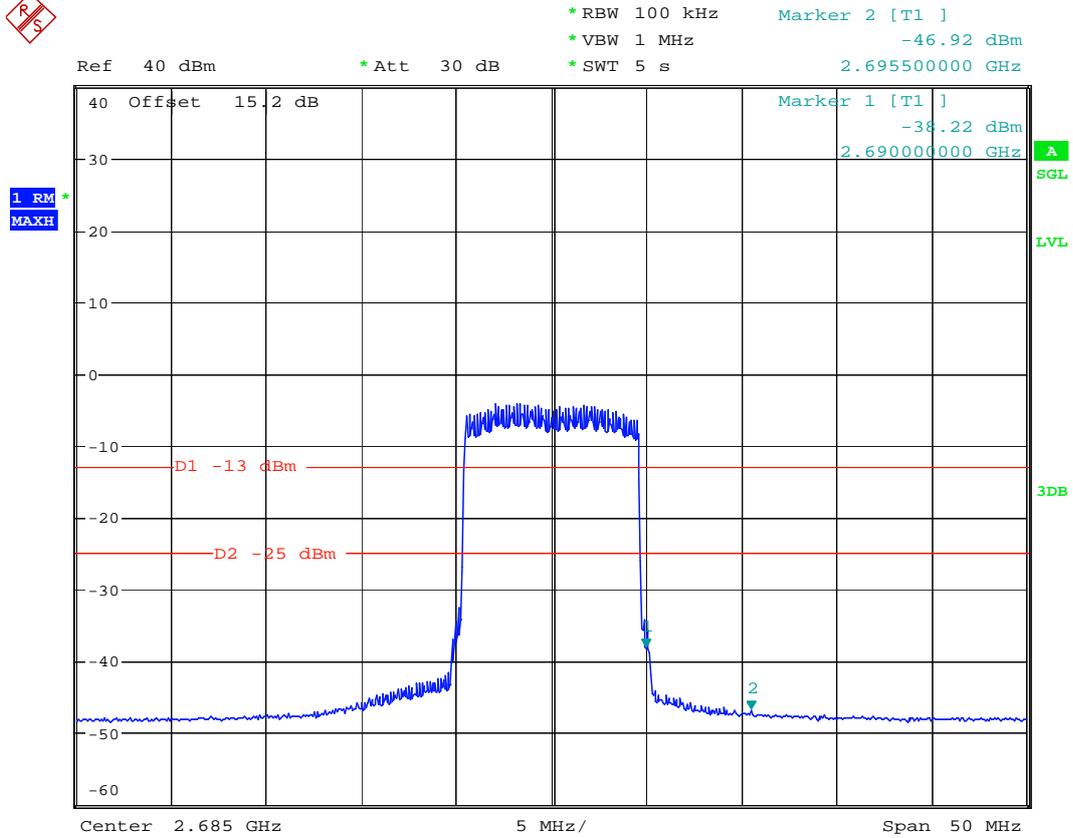


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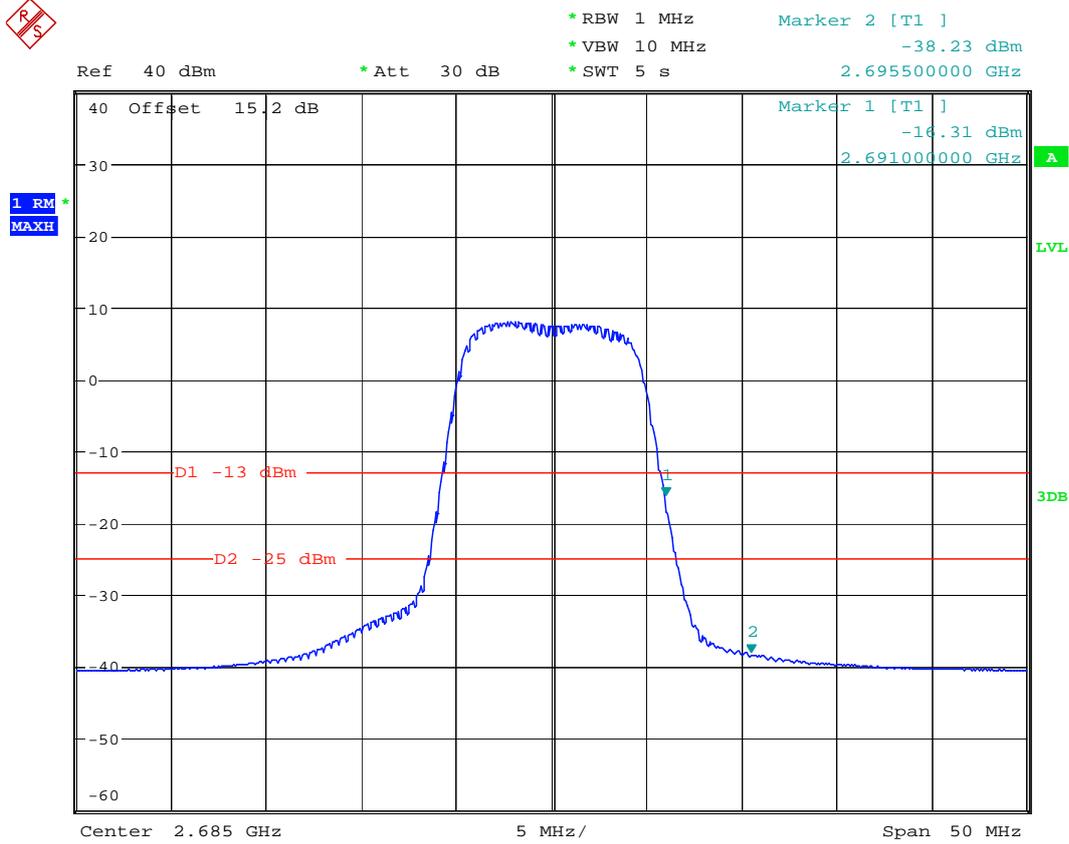


T



PO

Date: 10.MAR.2011 16:28:40



PO

Date: 22.APR.2011 13:07:00



Appendix D

Spurious Emission at Antenna Terminal Measurement

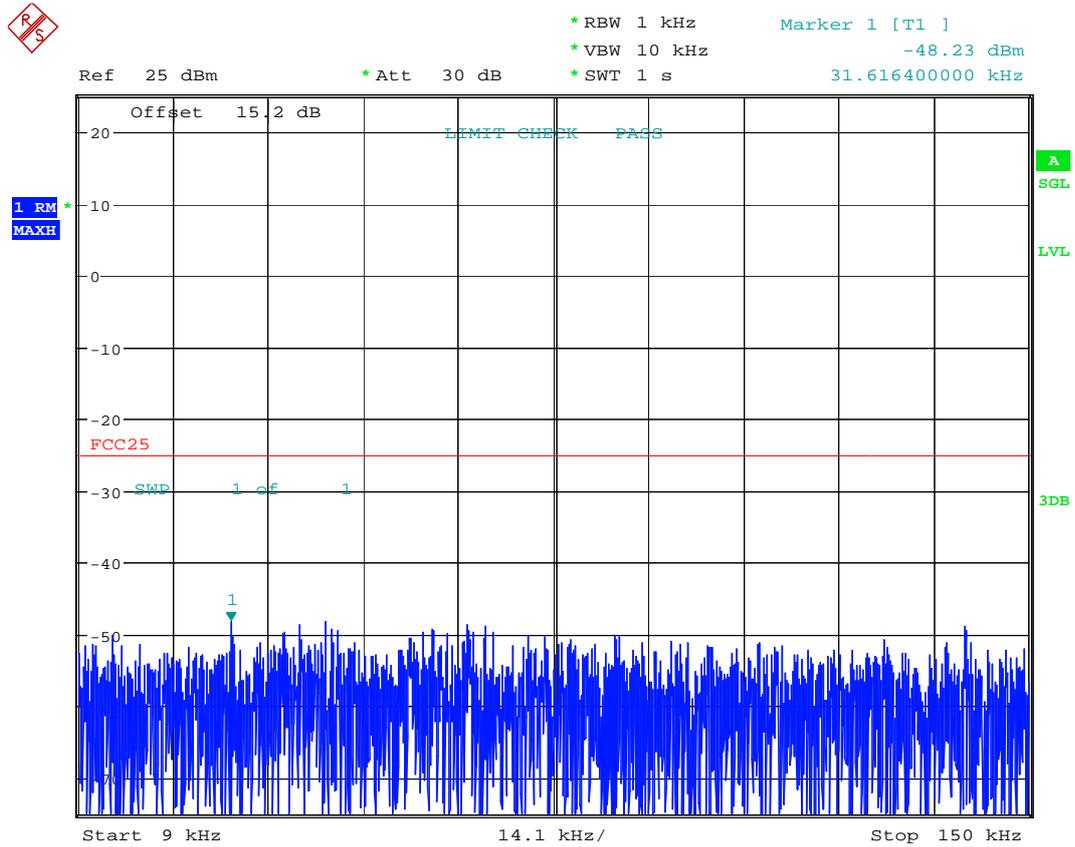
According to FCC part 2.1051 and part 27.53(m) (4) and
part 27.53(m) (6)



1. Channel Bandwidth = 5 MHz

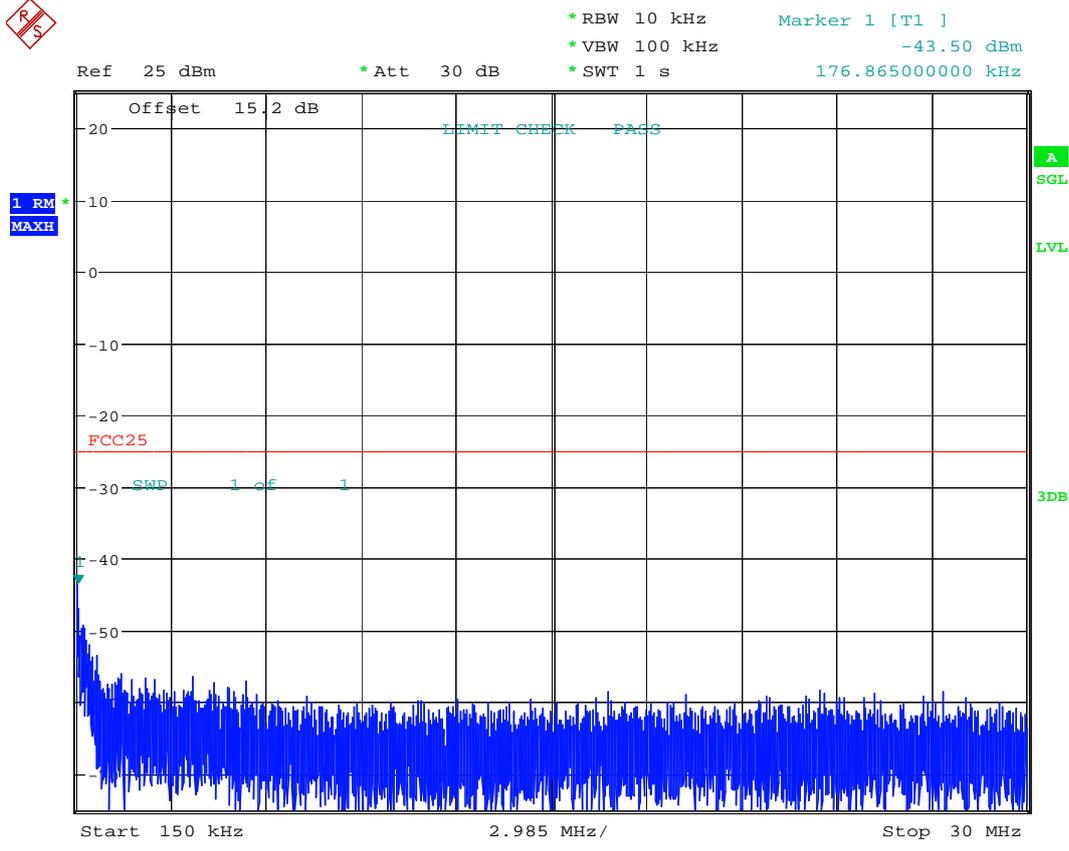
1) TM 1

B



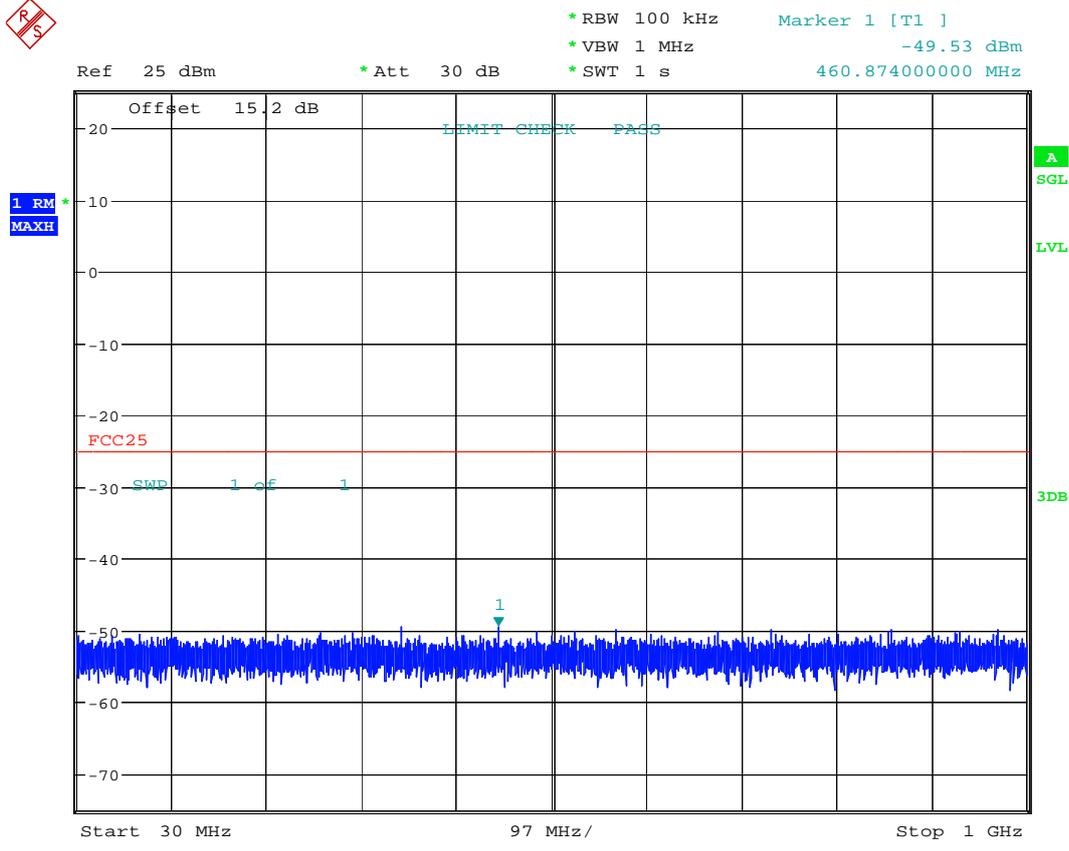
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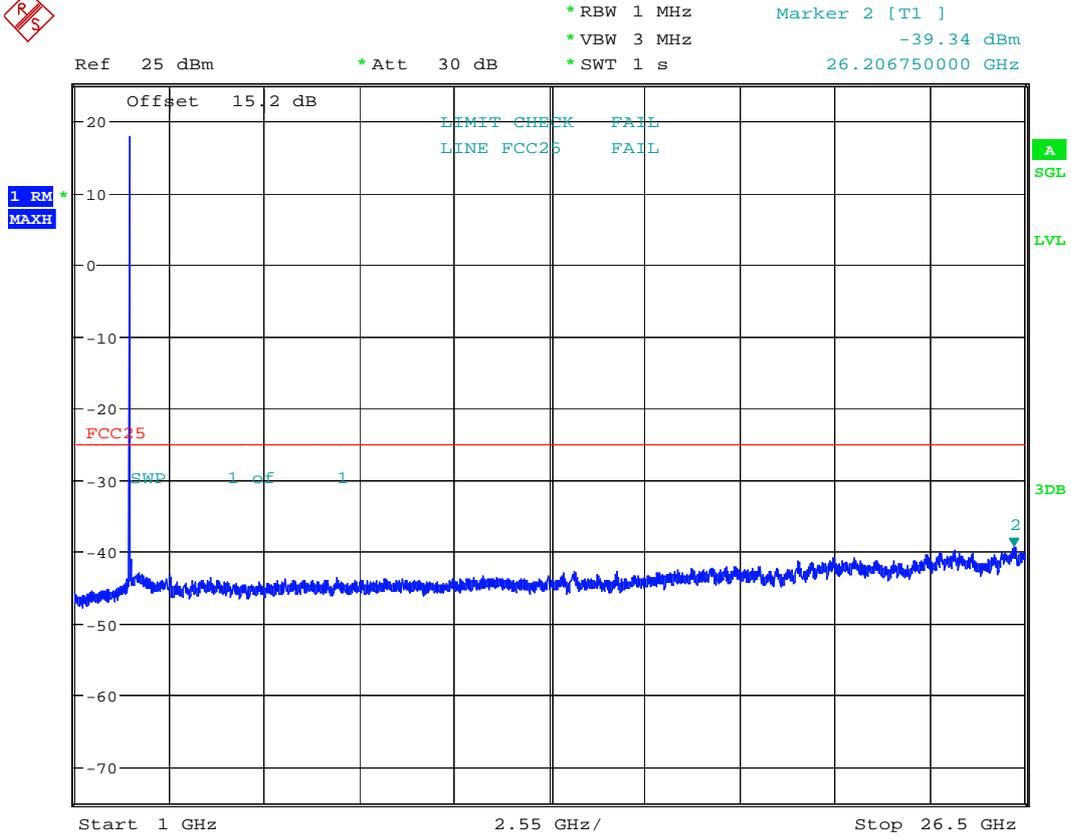
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PO

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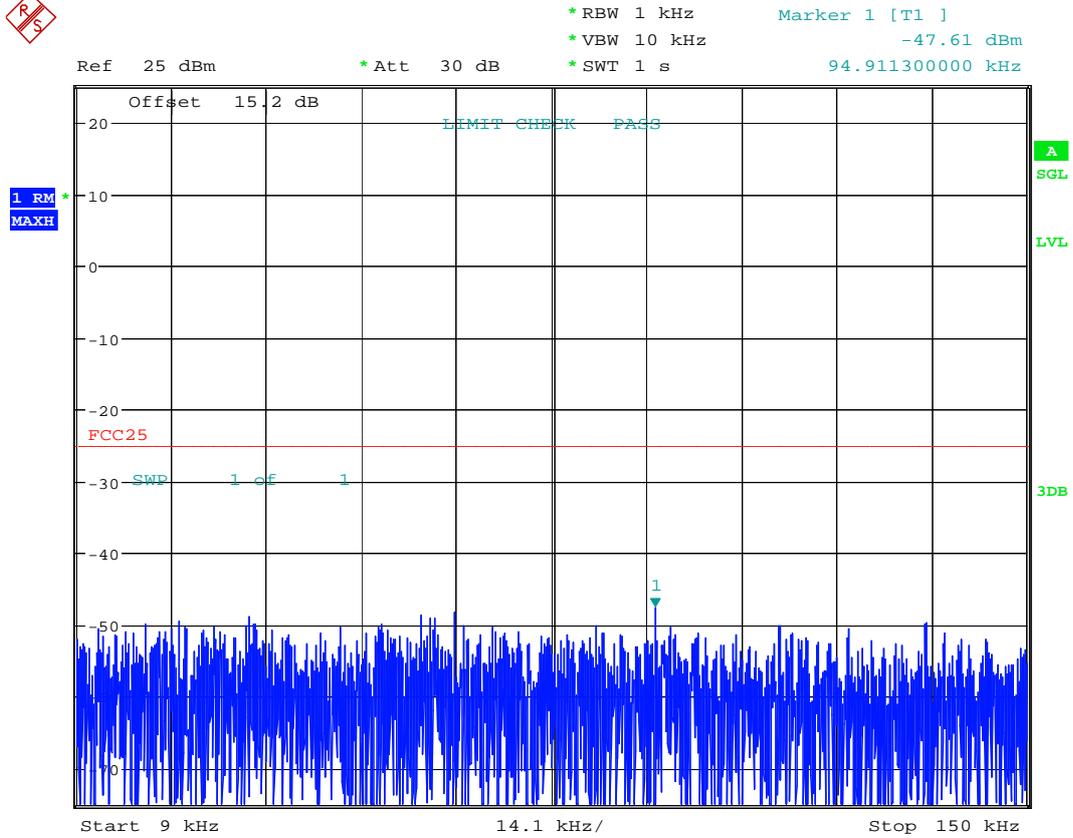


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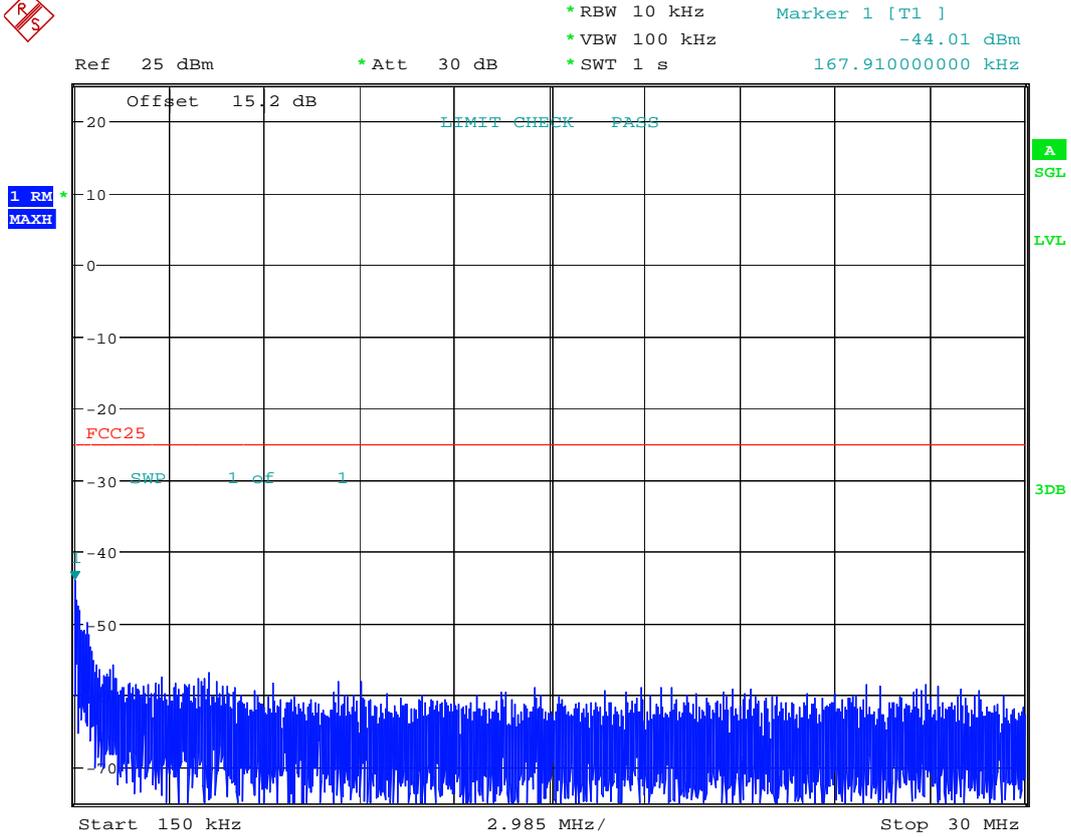


M



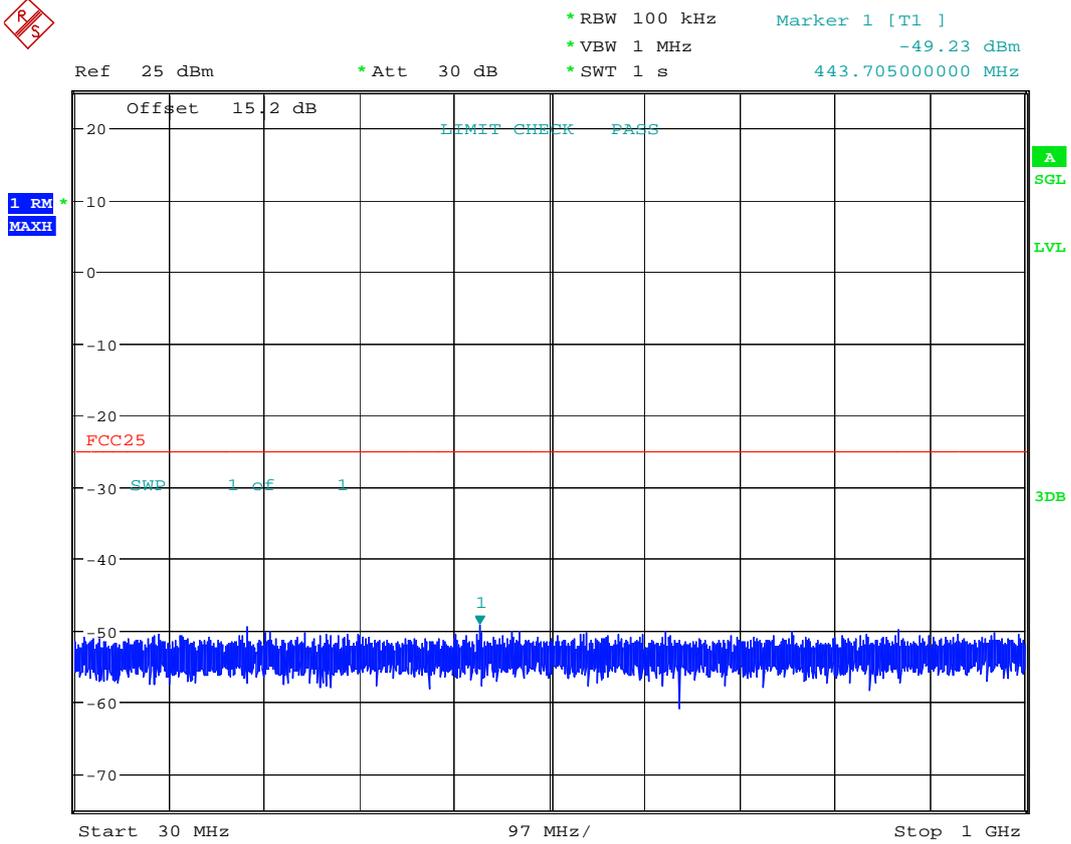
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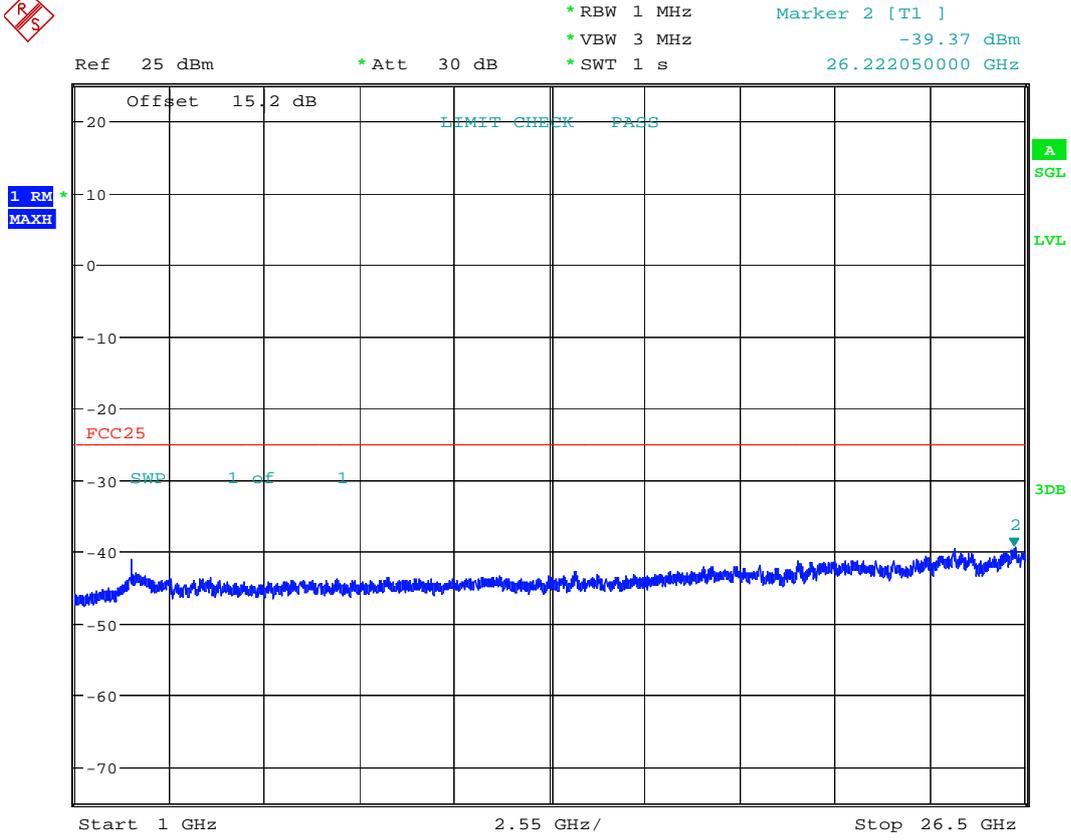
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PO

Date: 9.MAR.2011 19:11:06

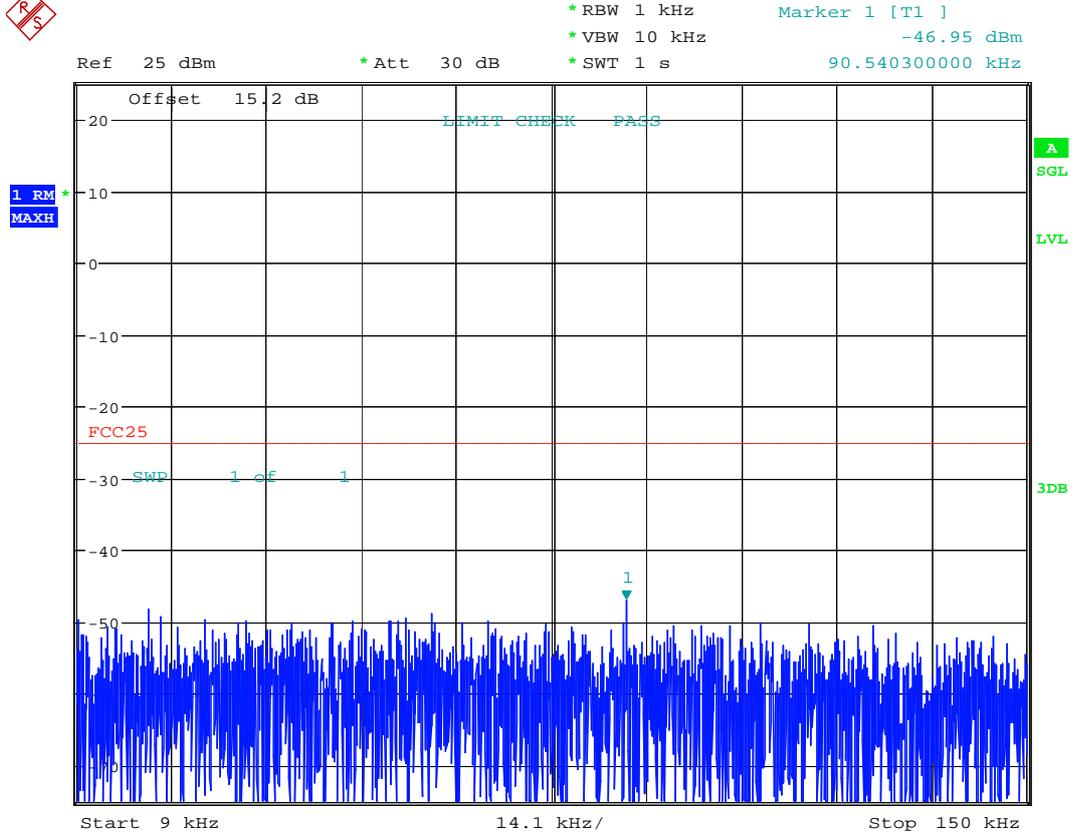


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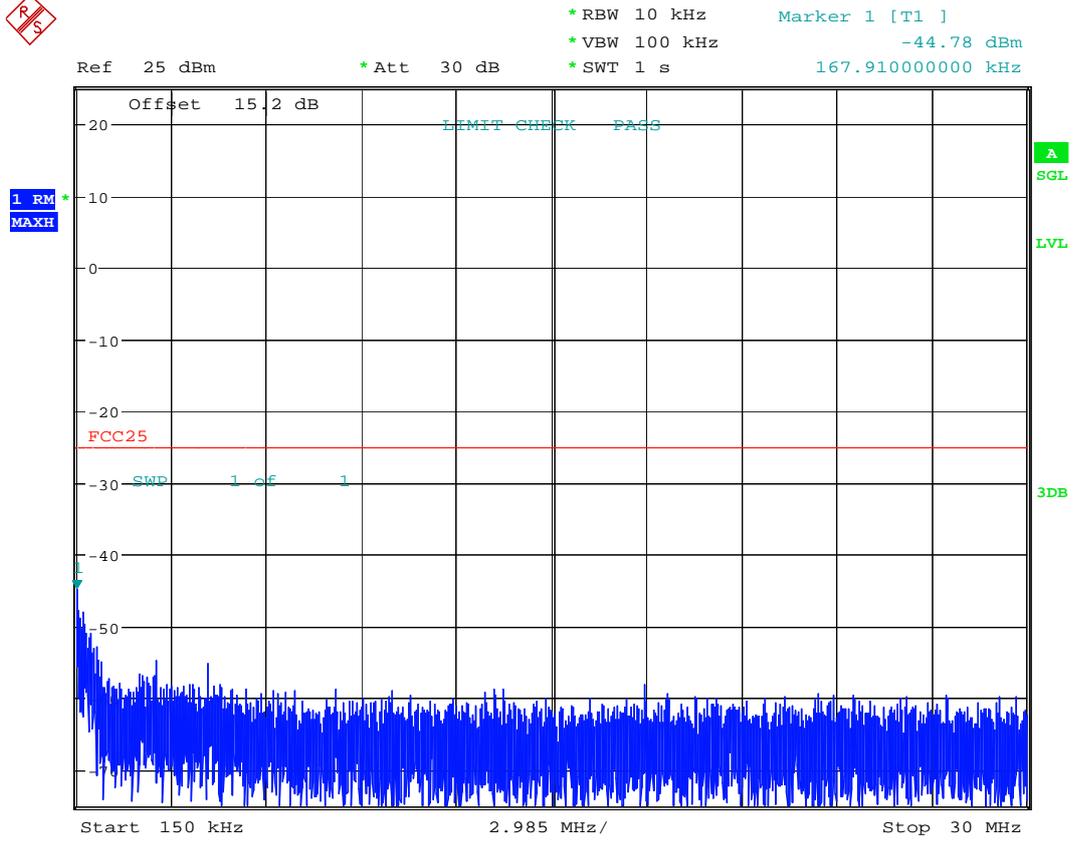


T



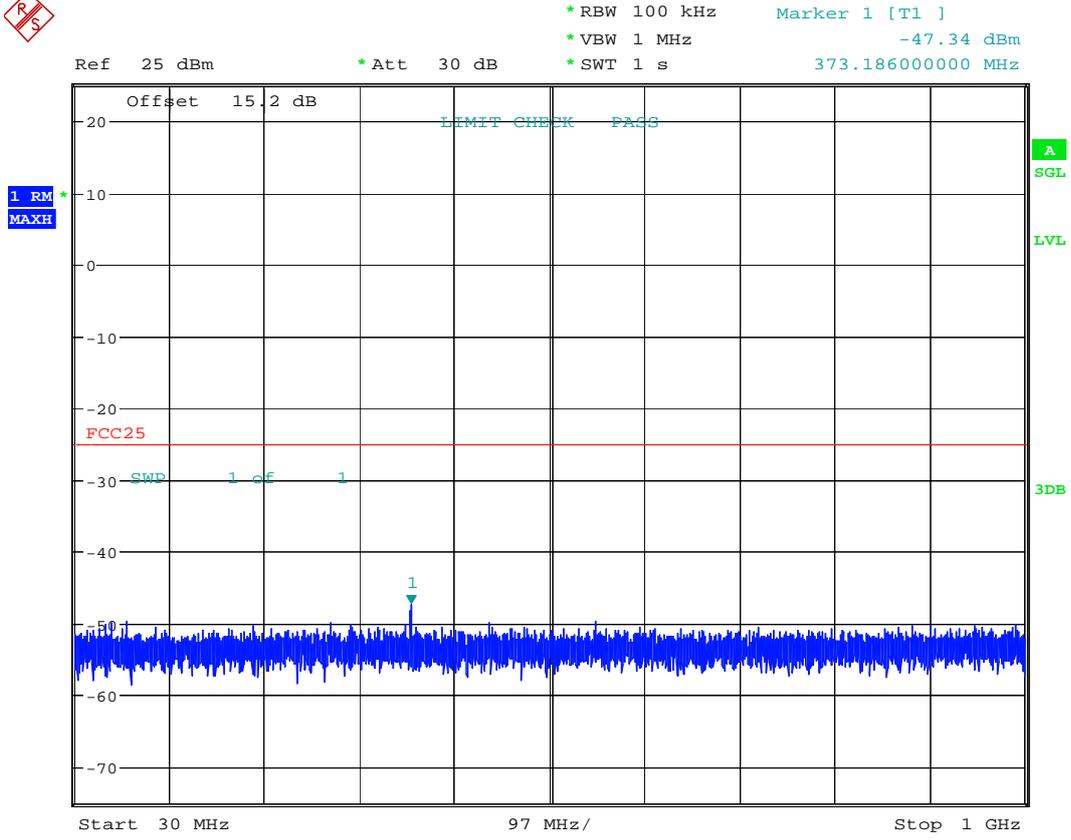
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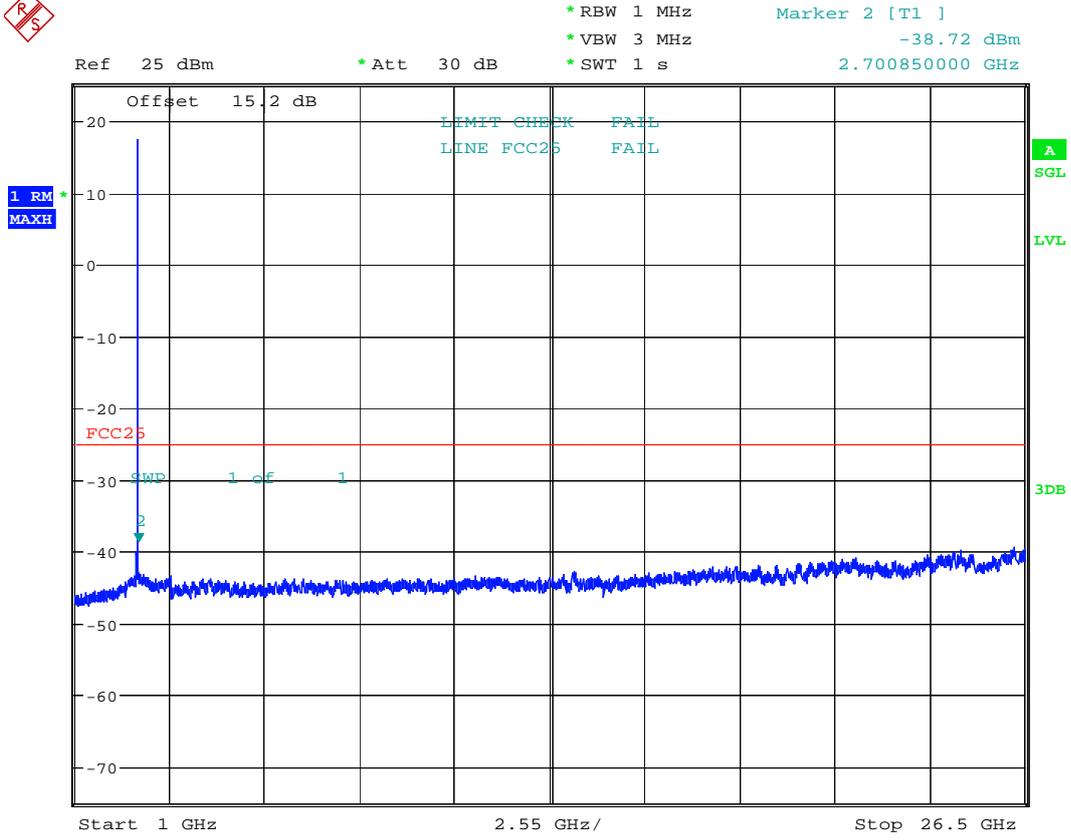
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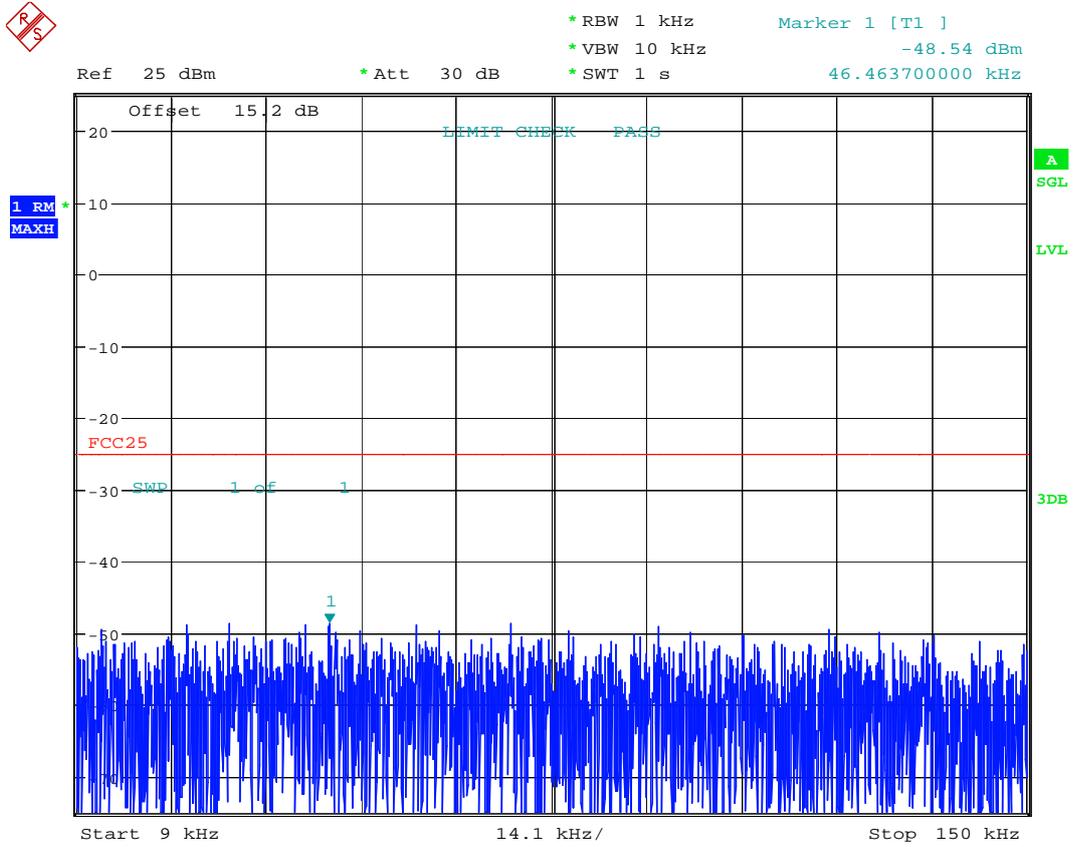
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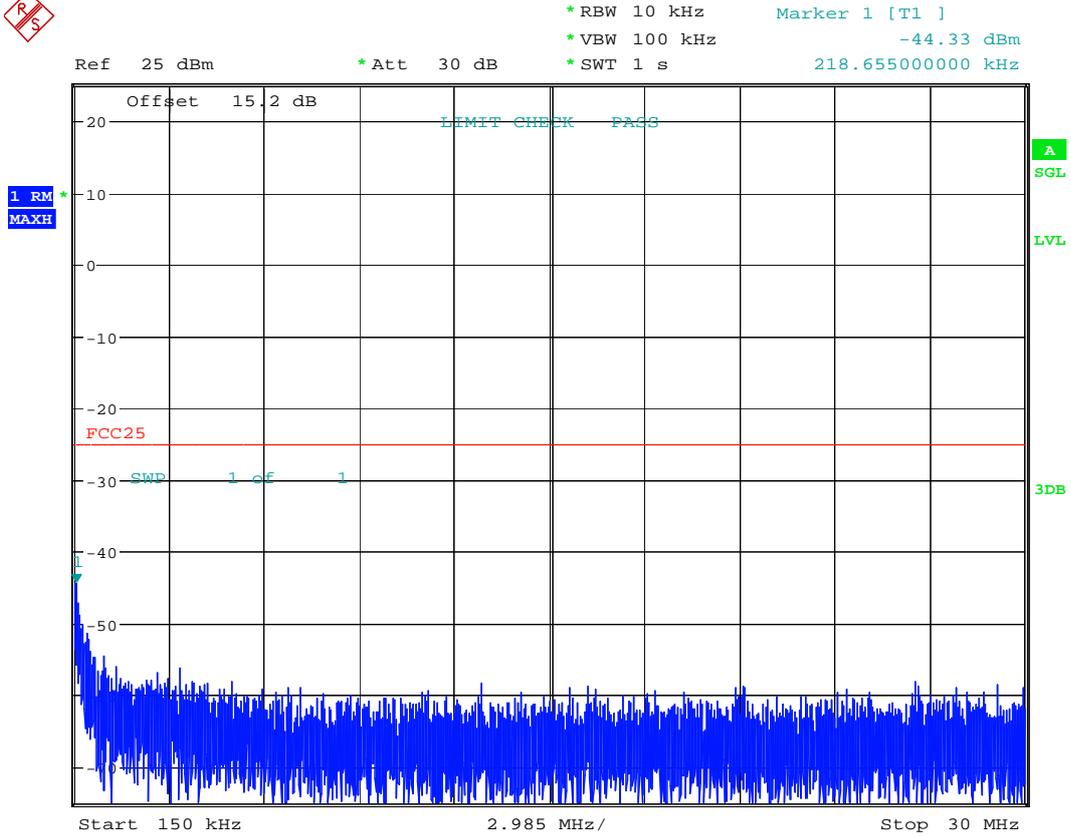
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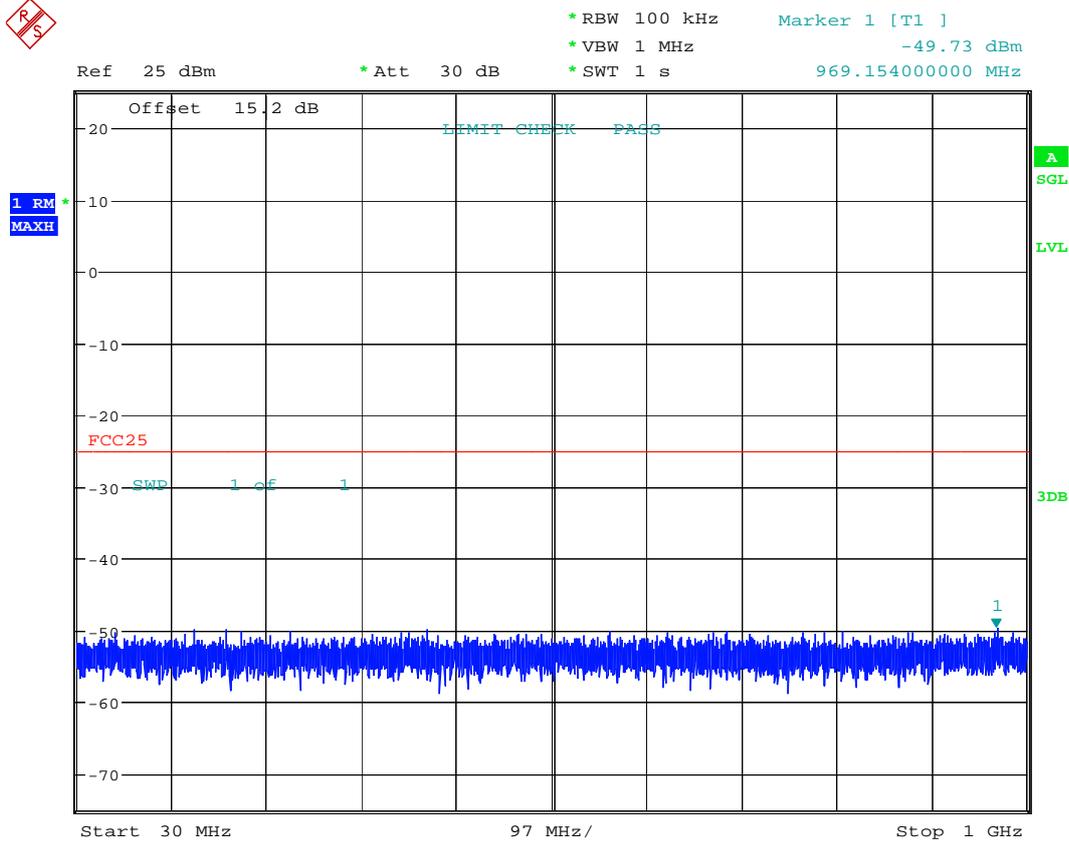
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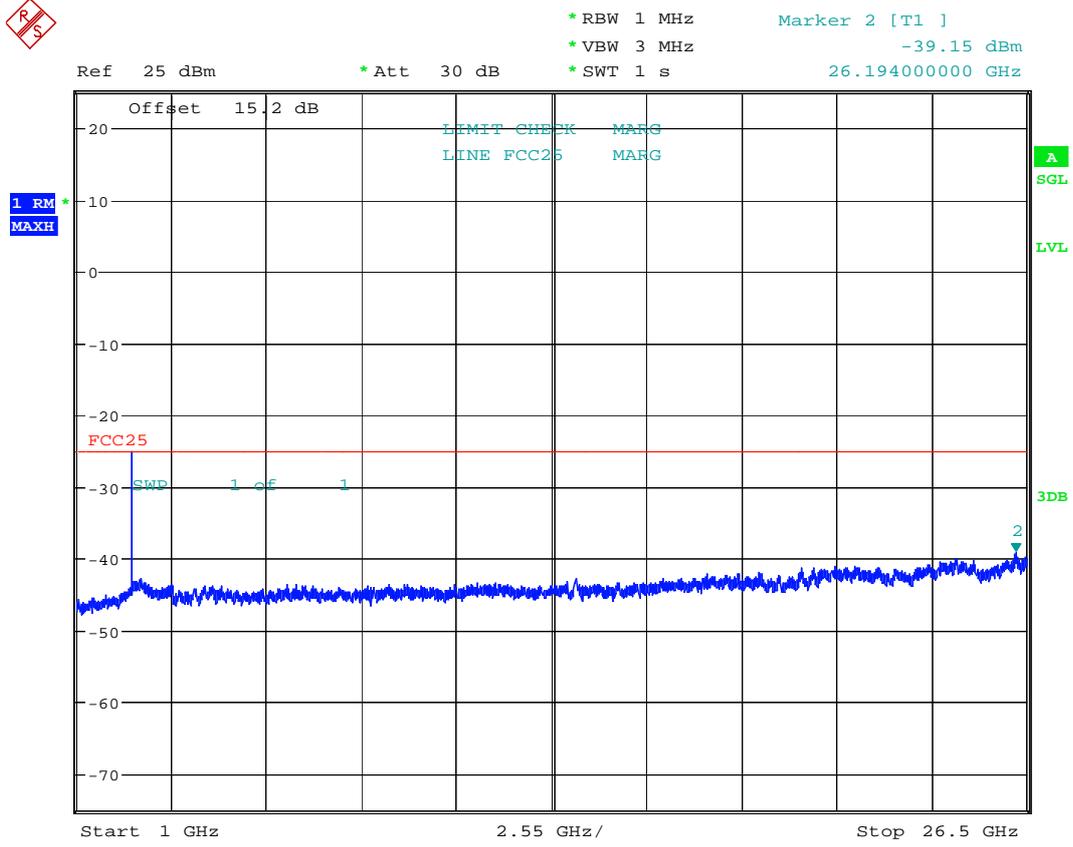
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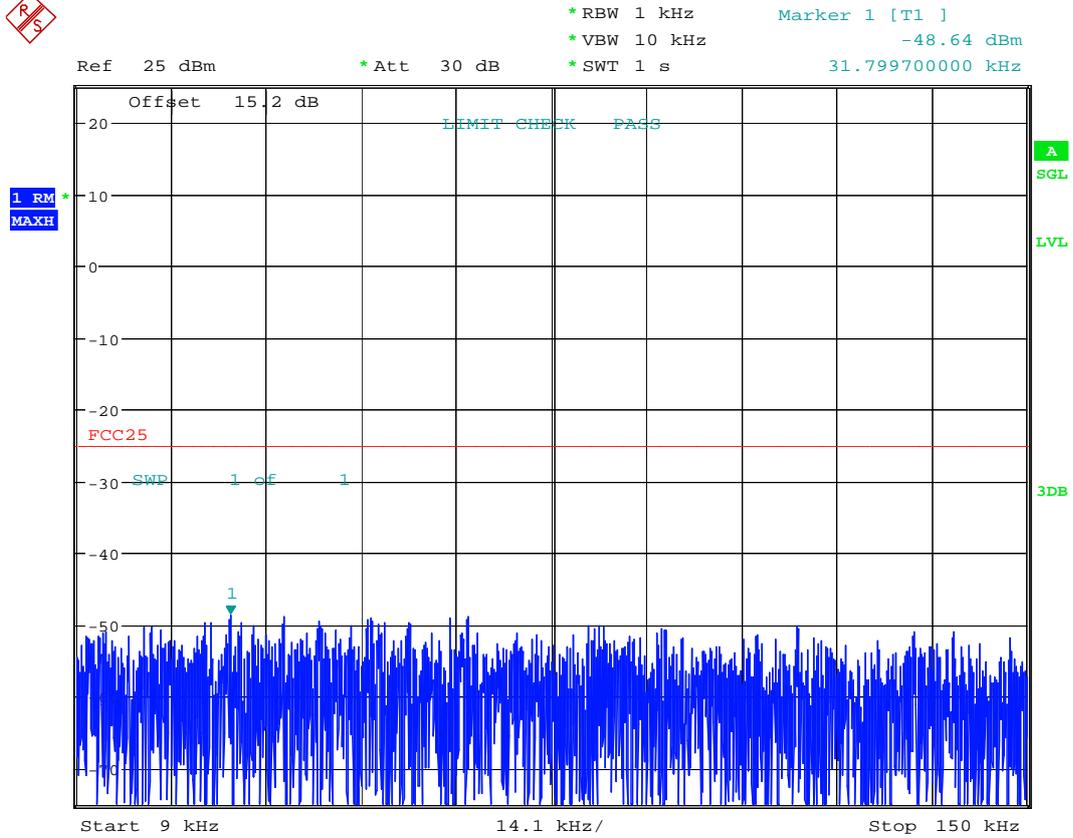


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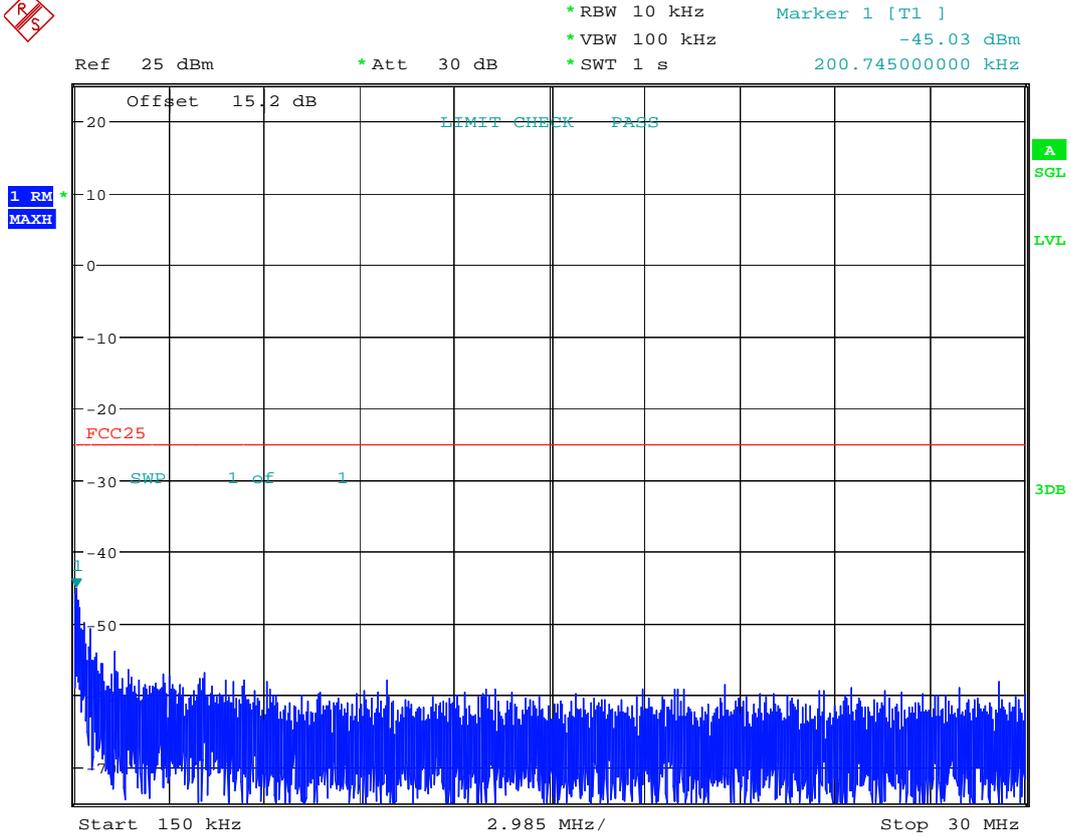


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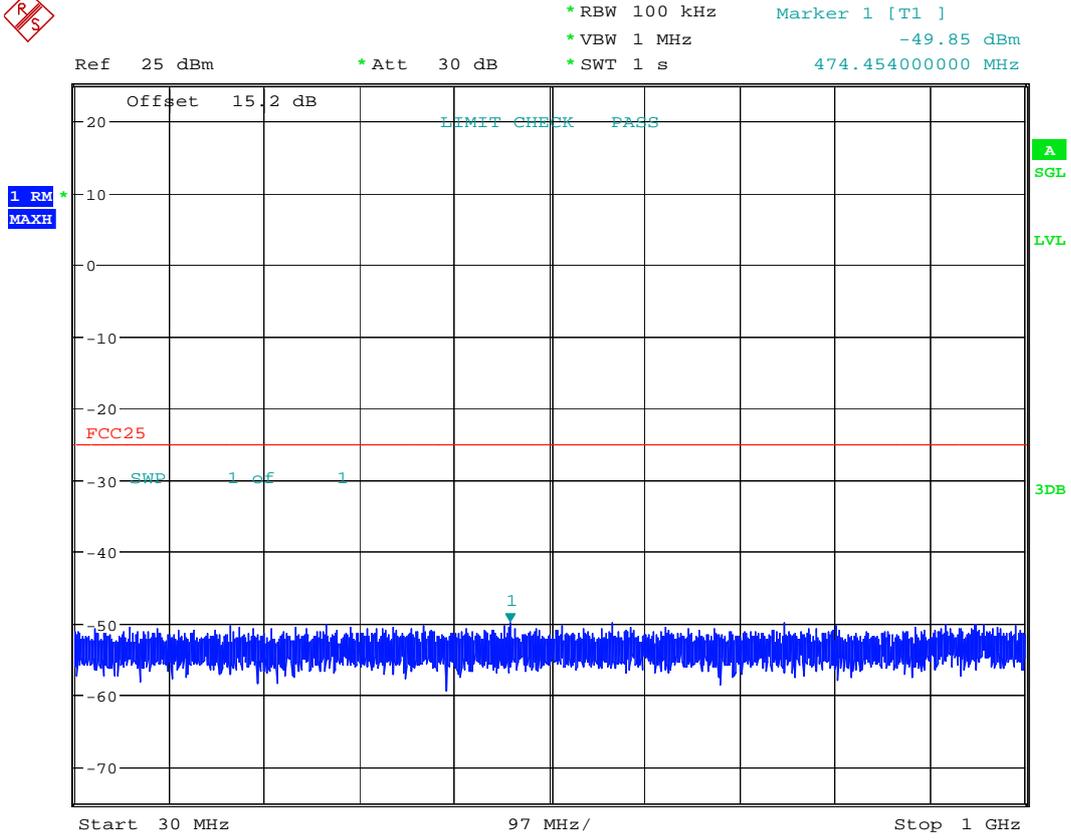
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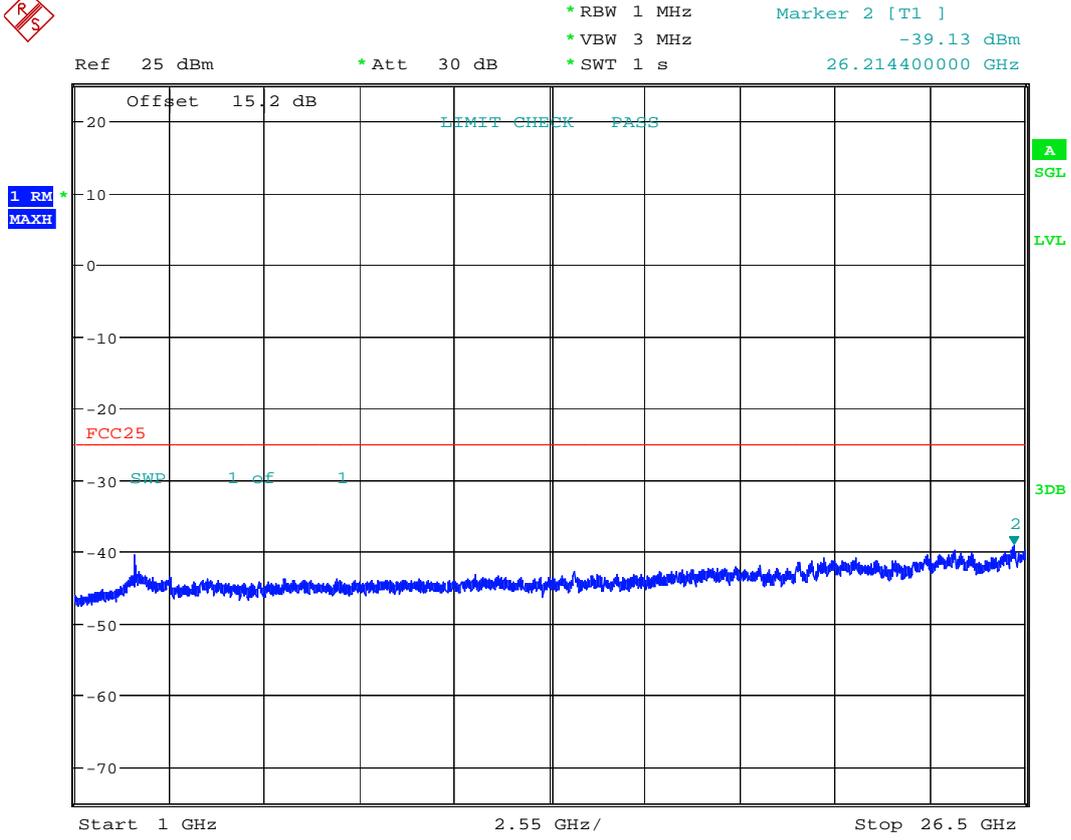
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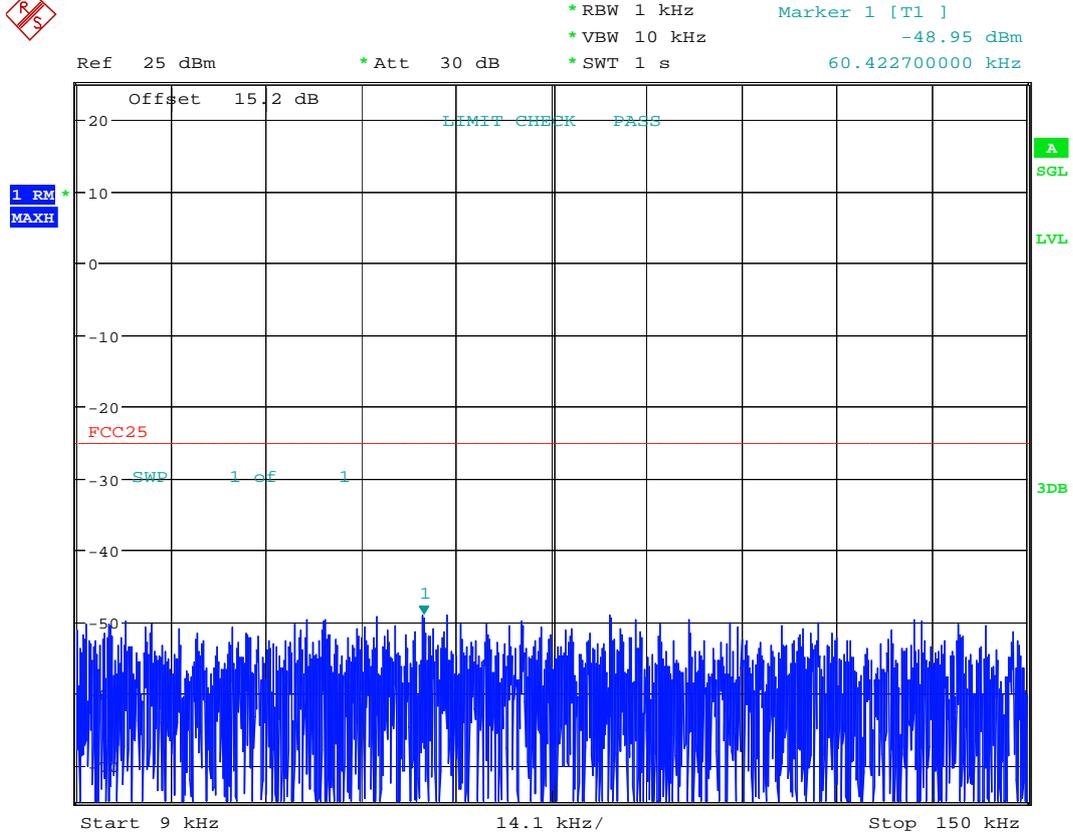


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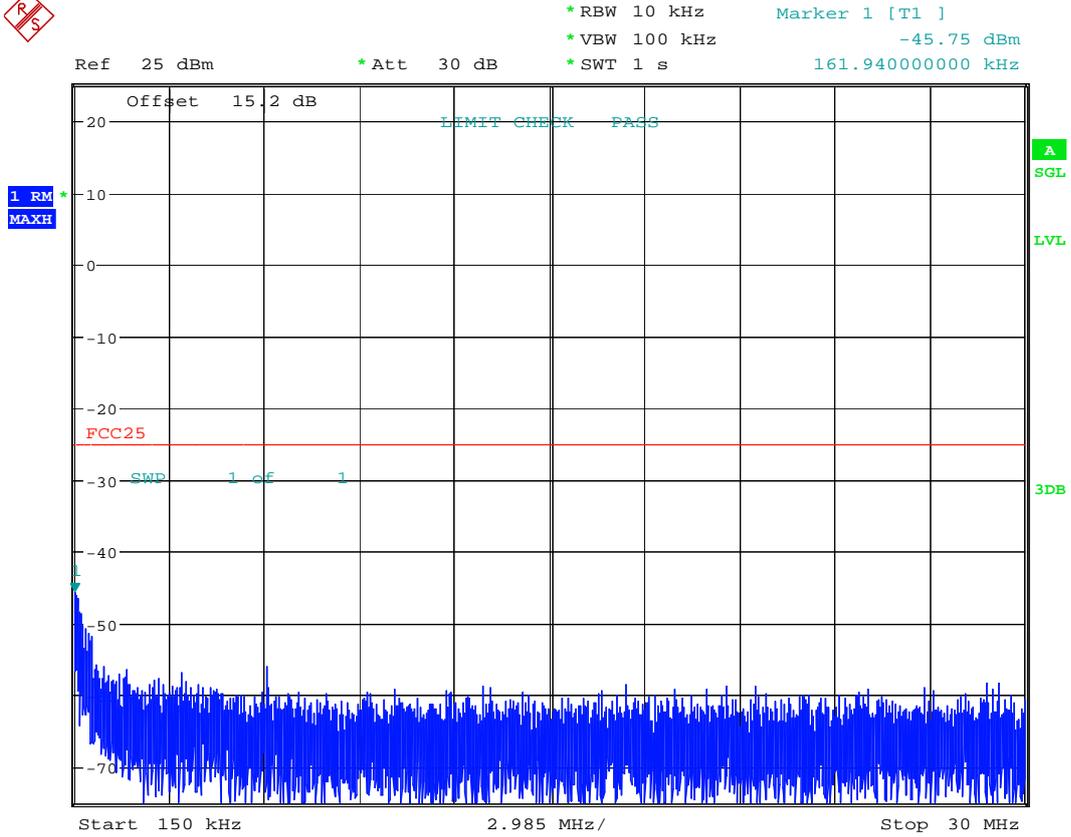


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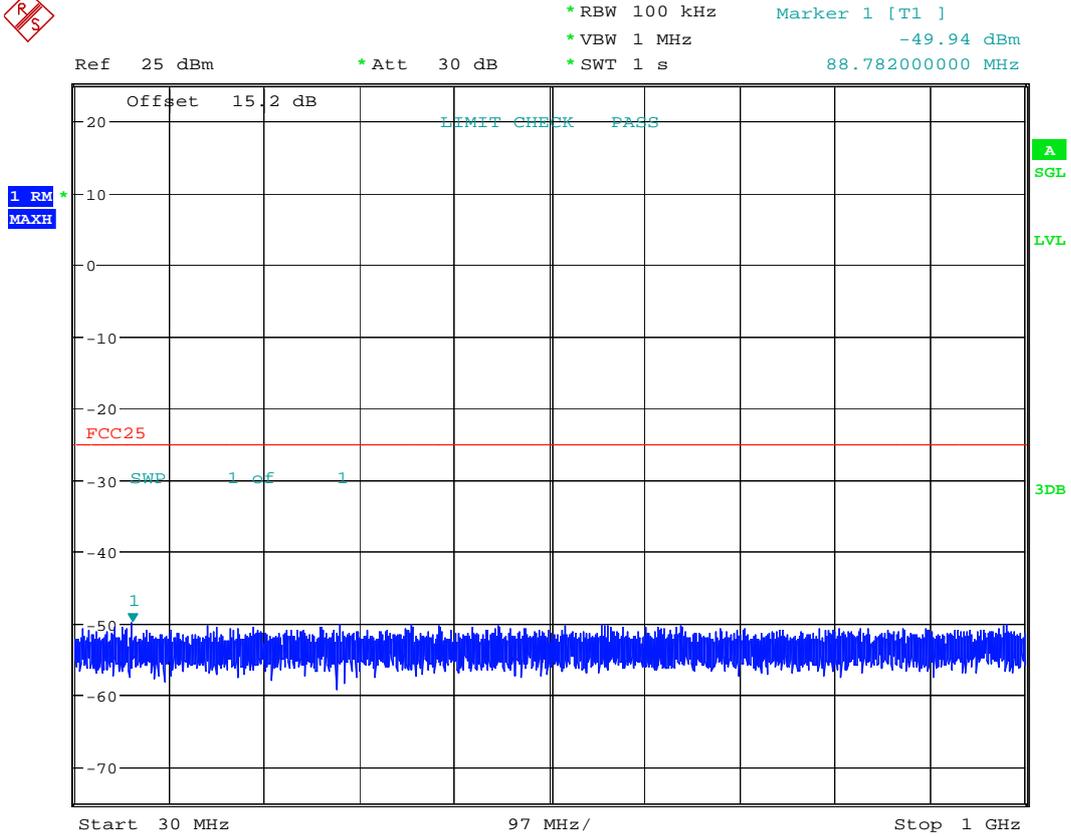
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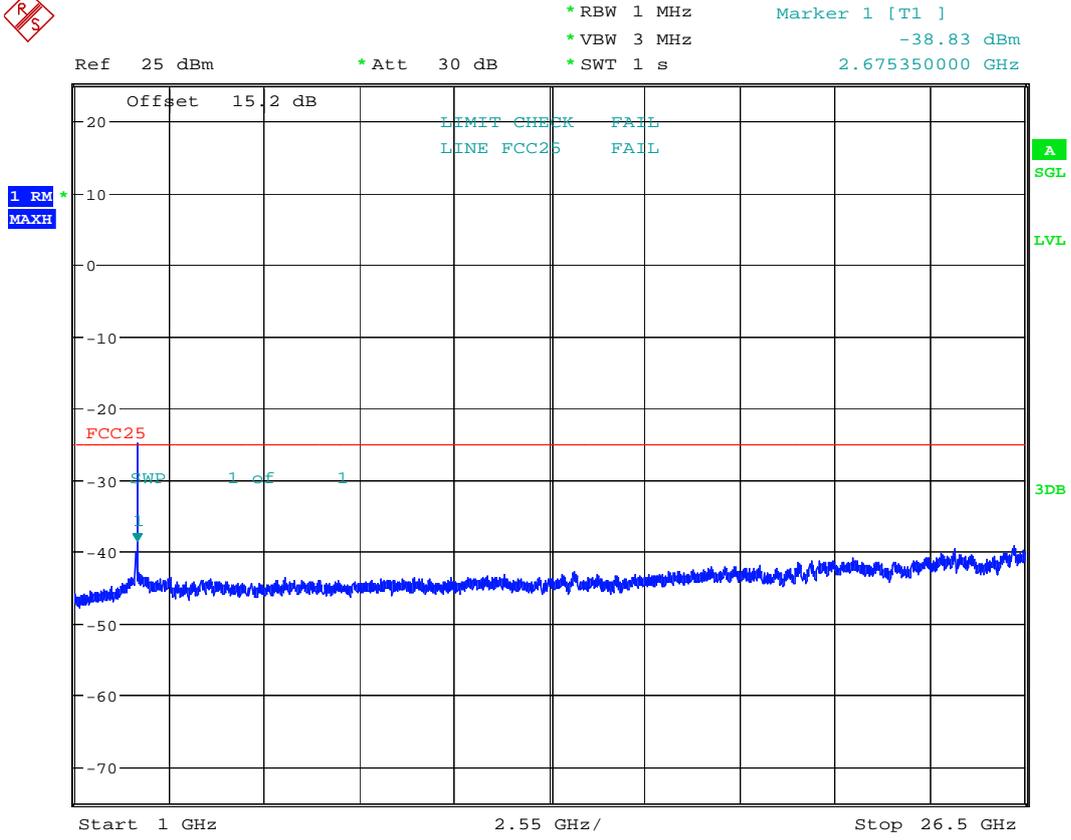
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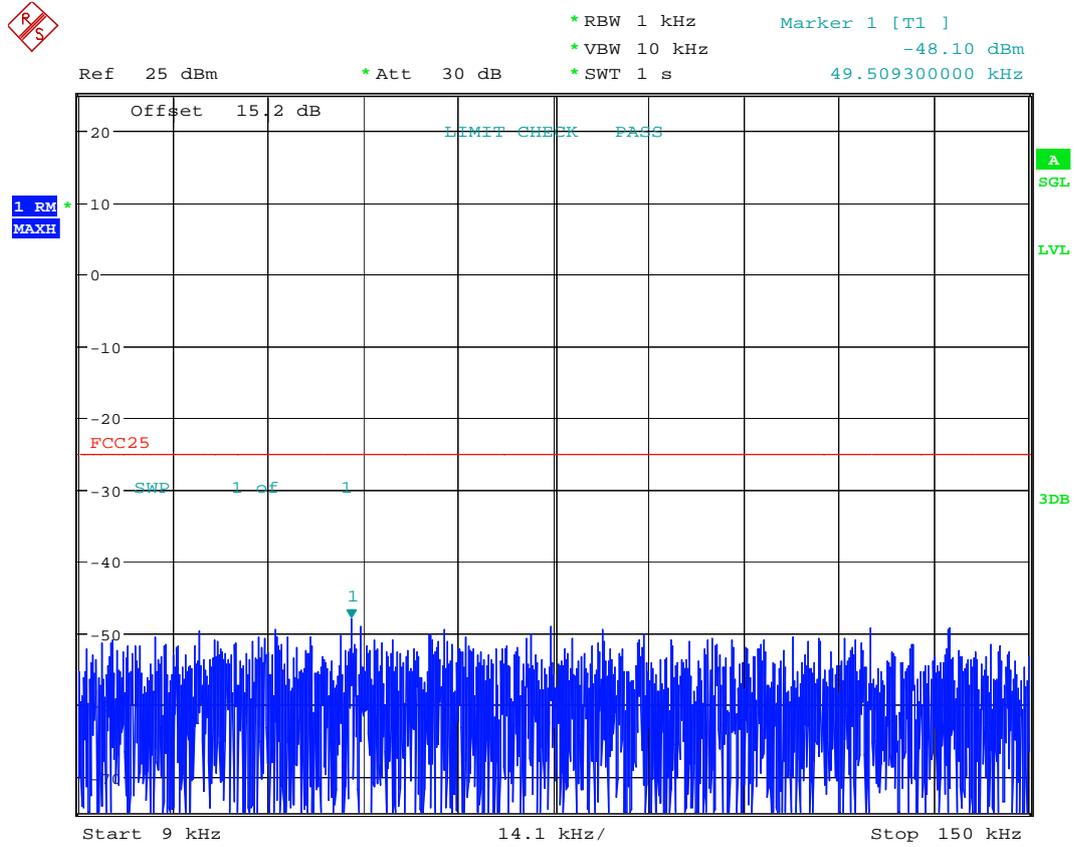
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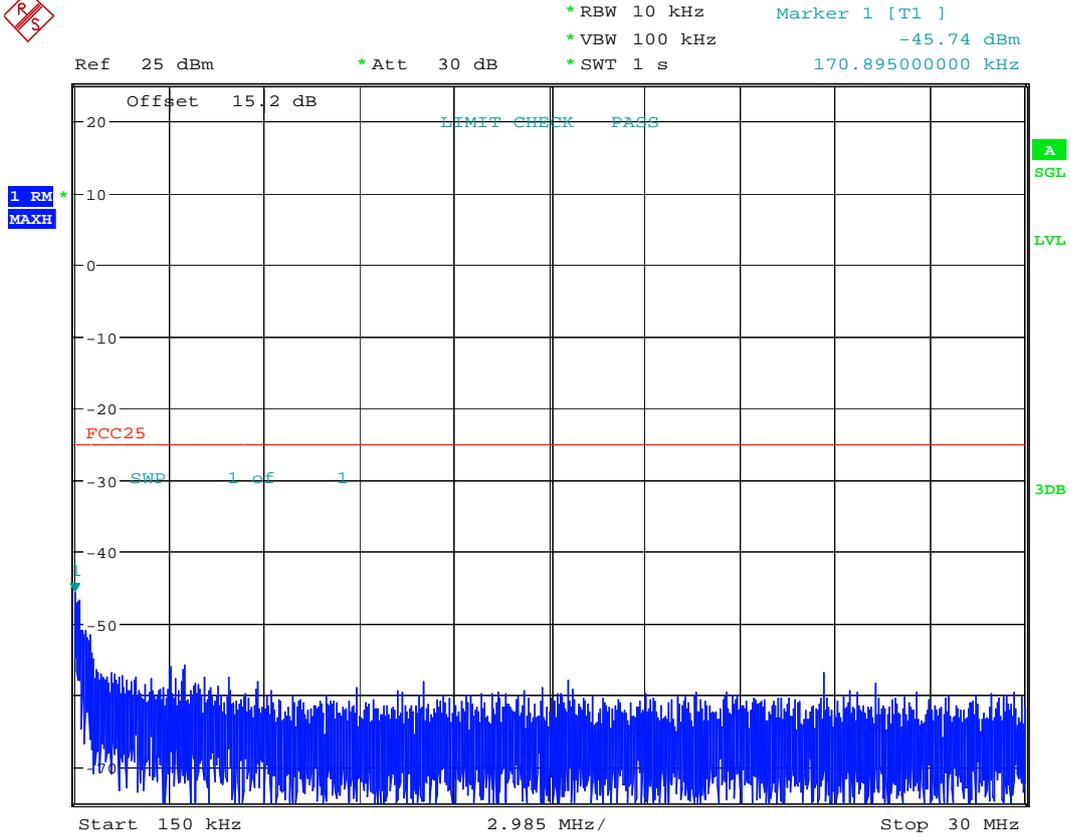
3) TM 3

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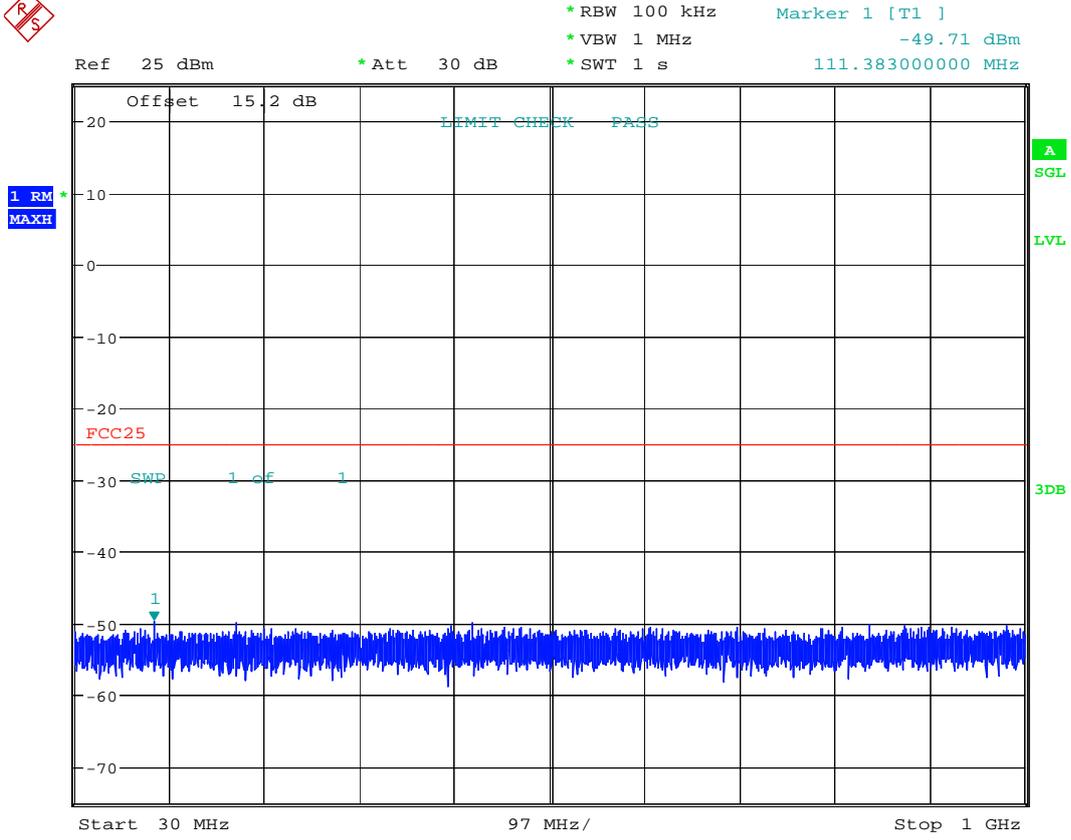
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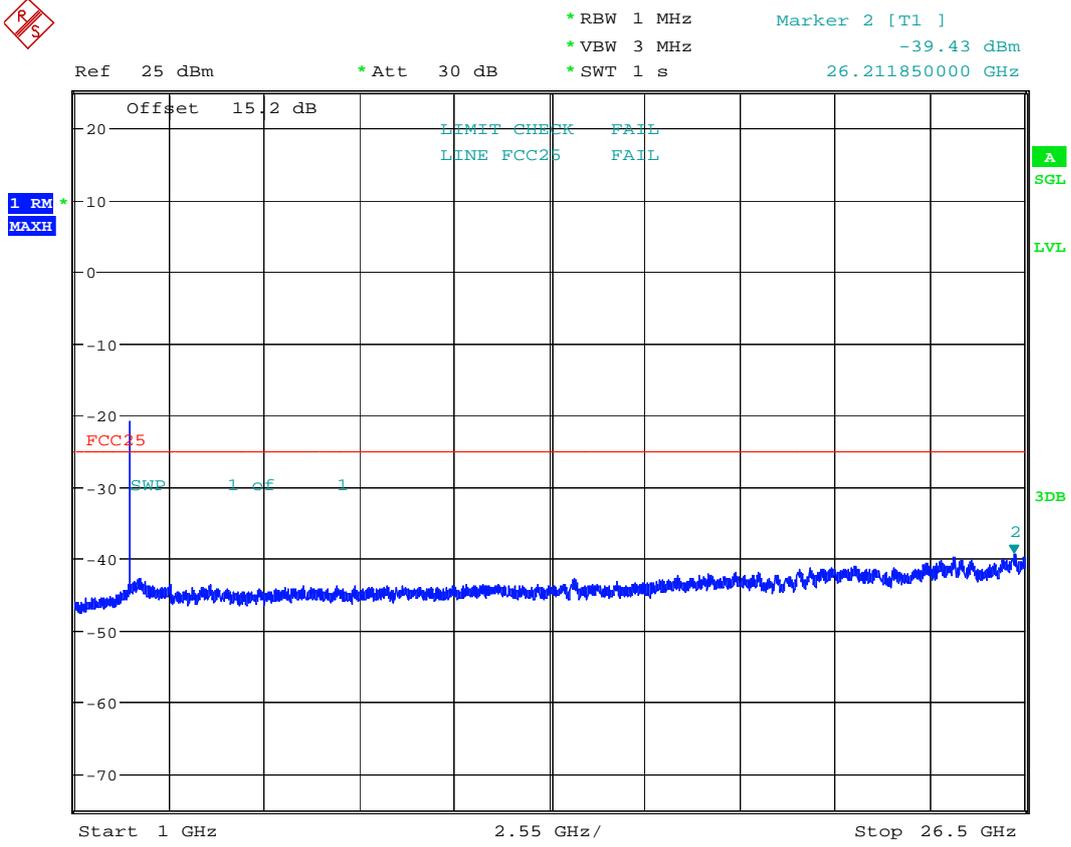
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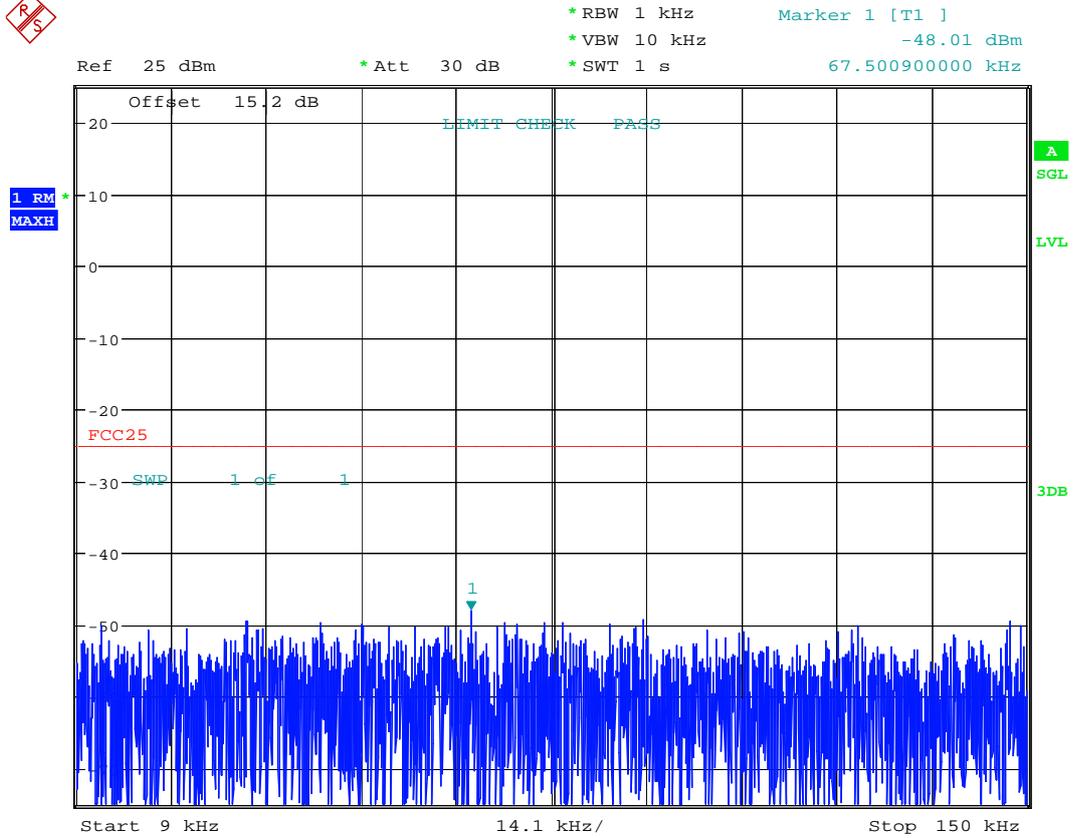


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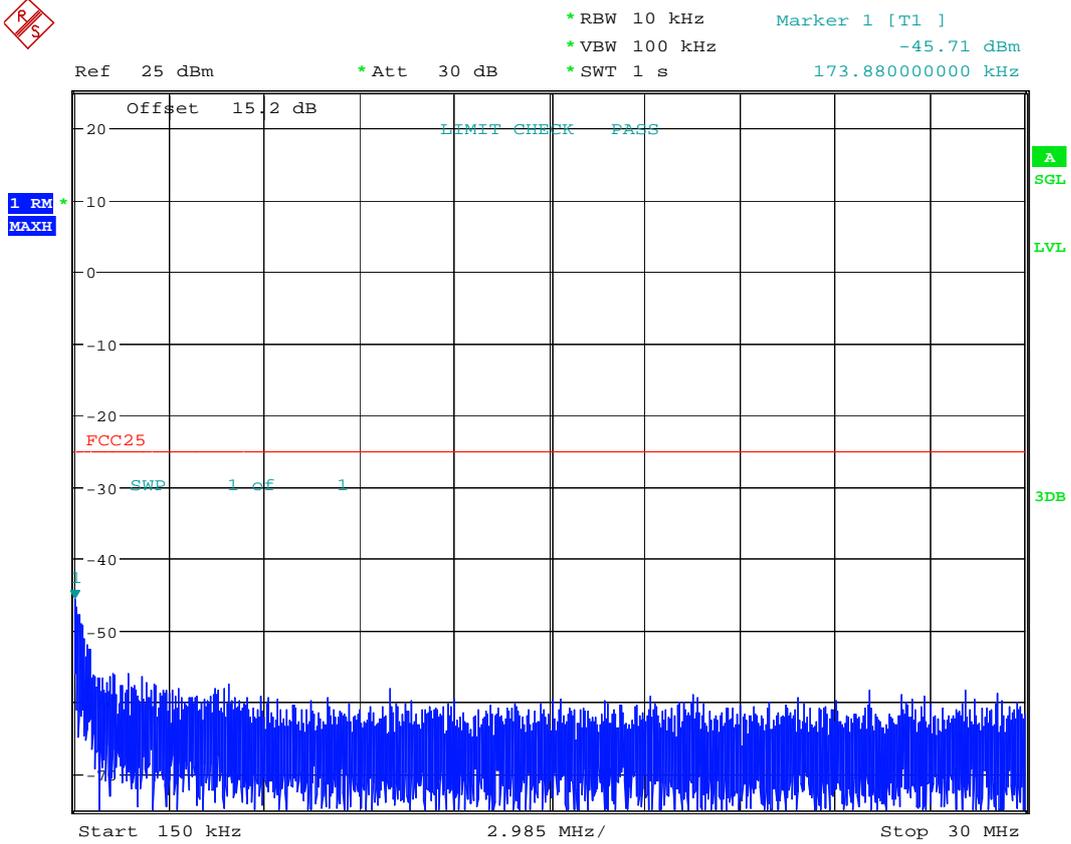


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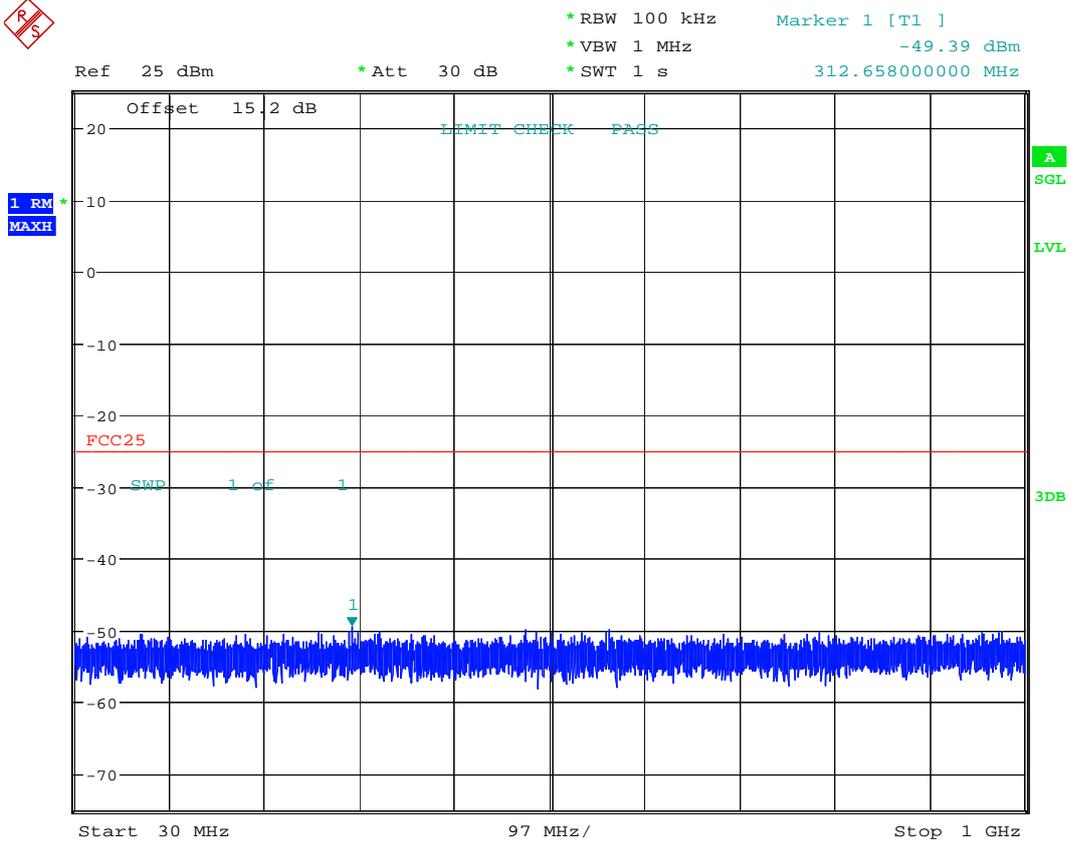
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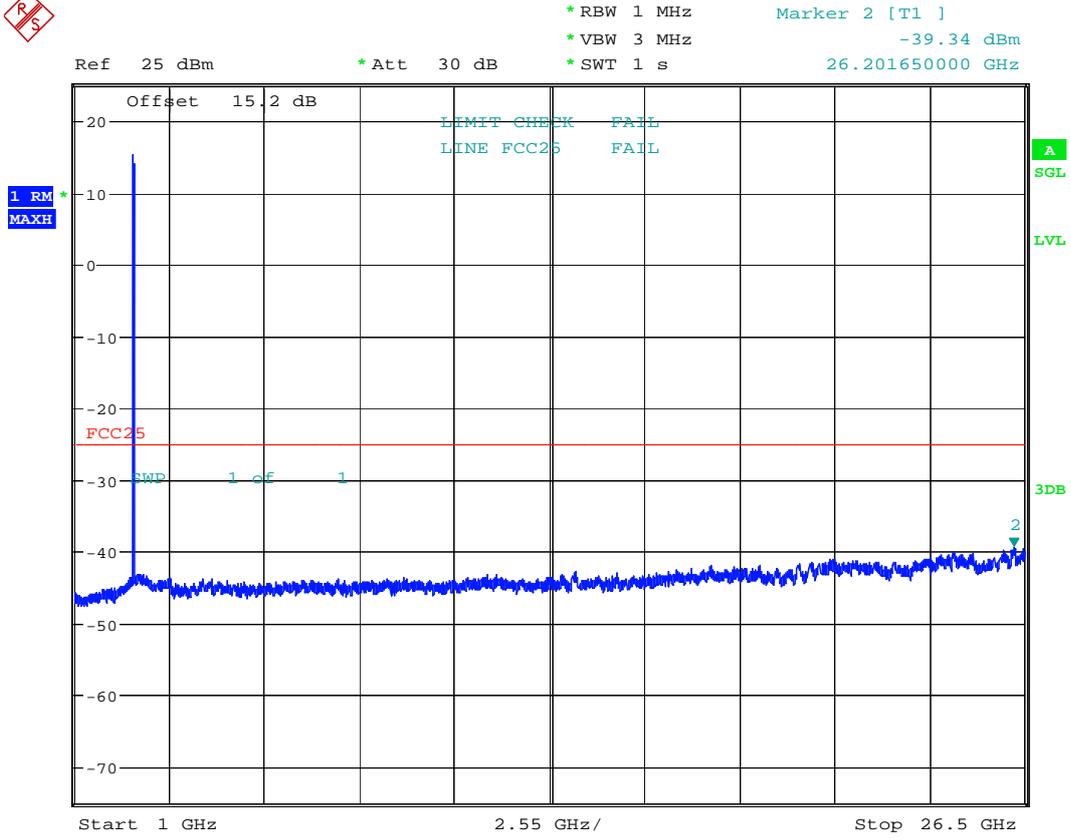
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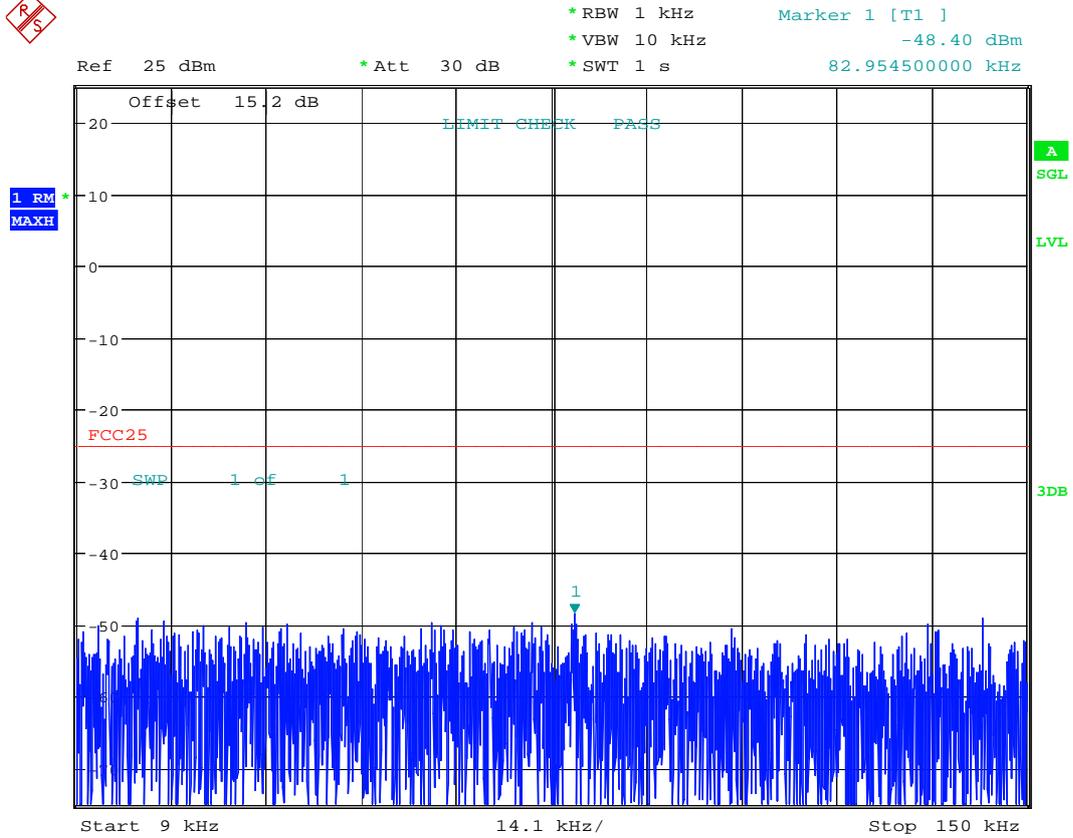


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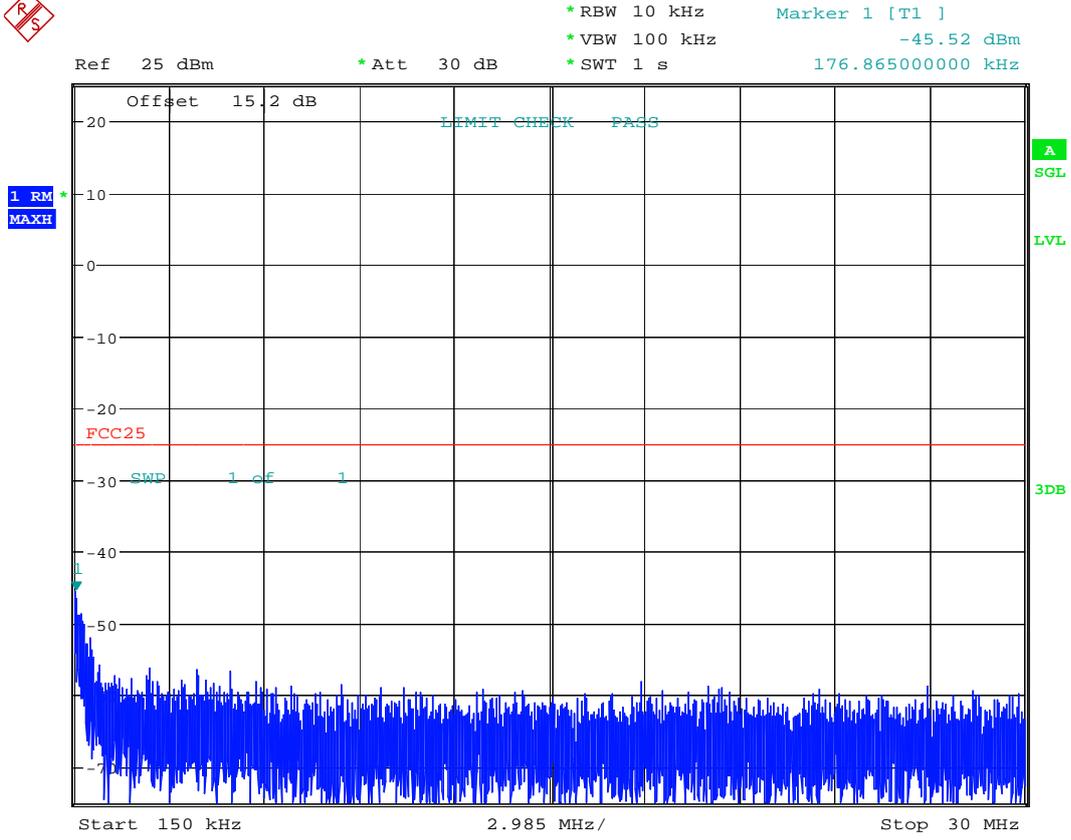


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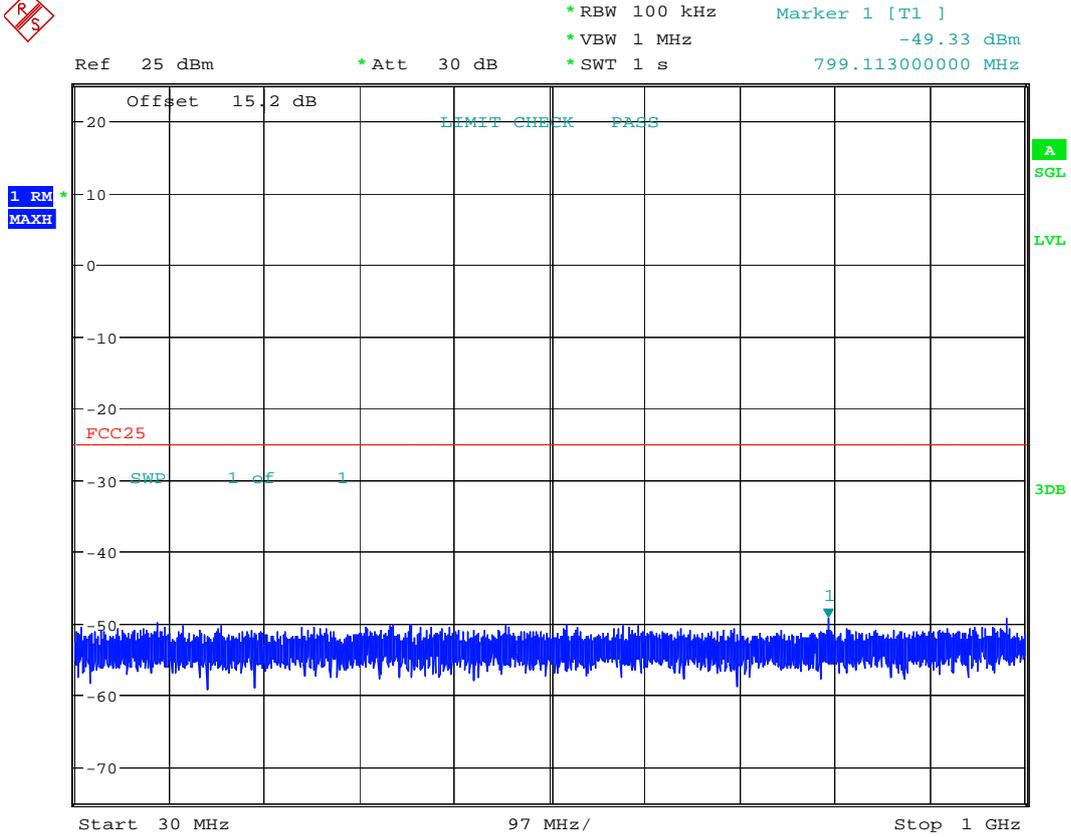
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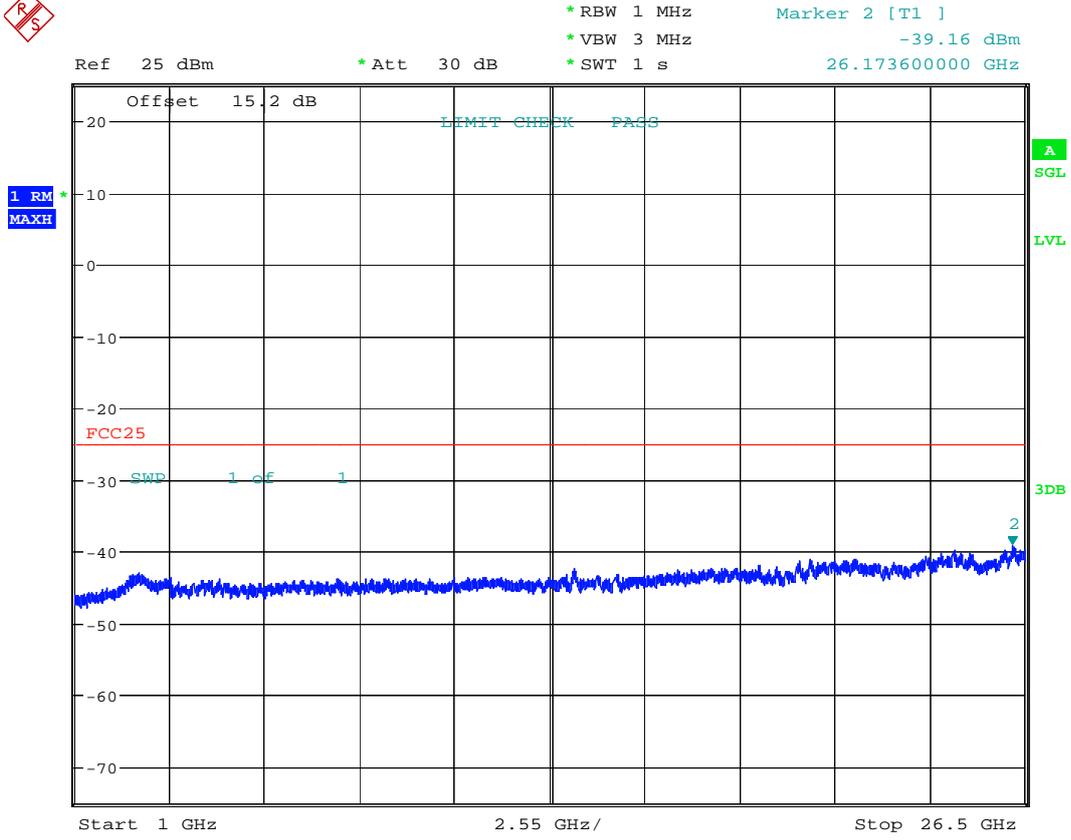
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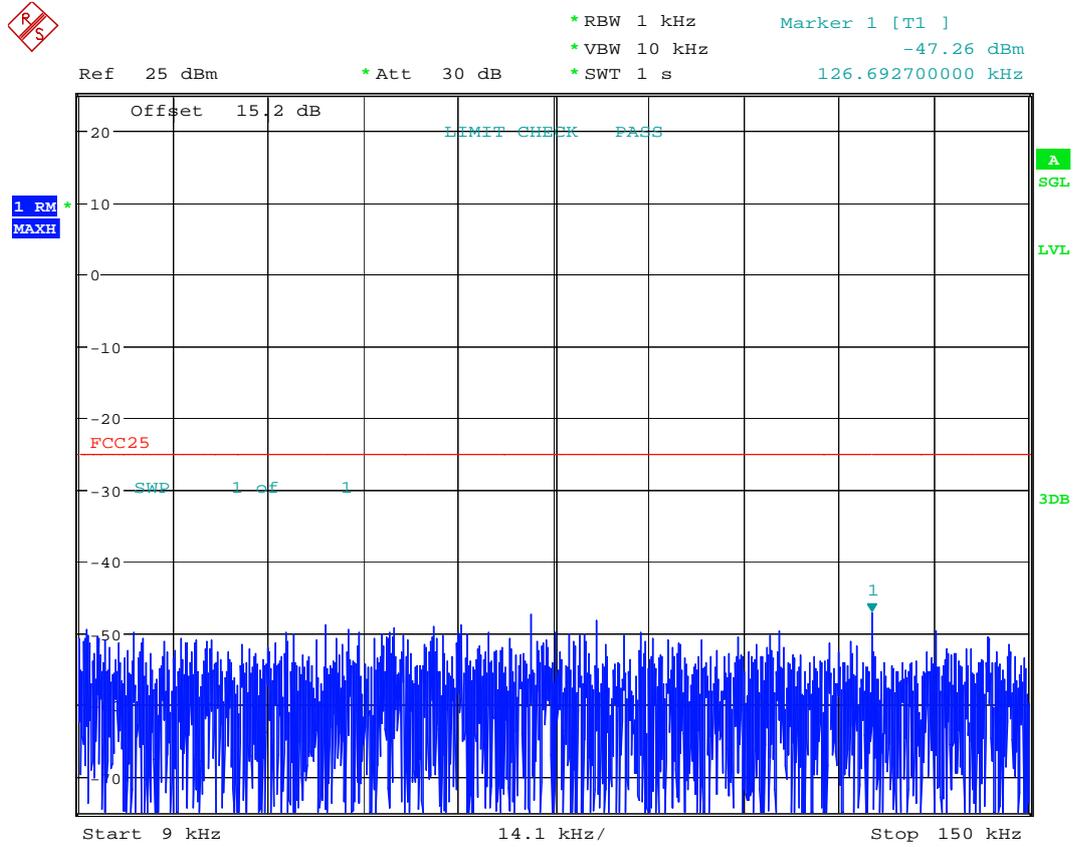
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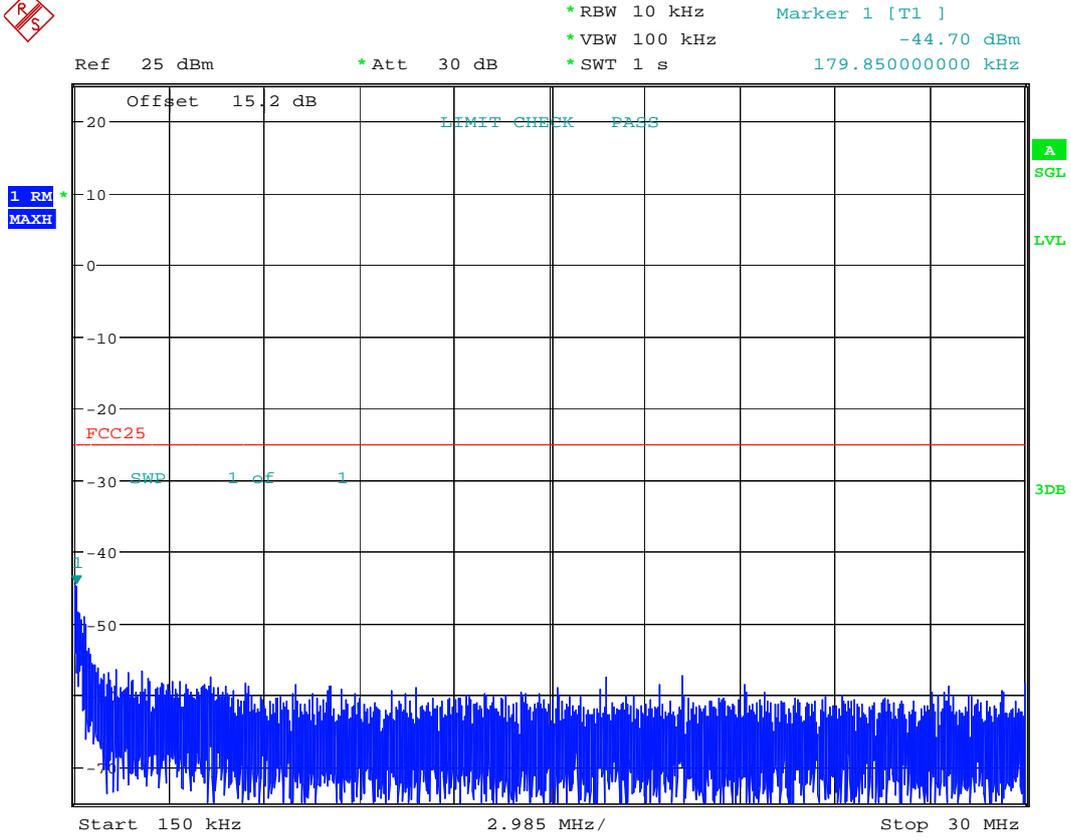
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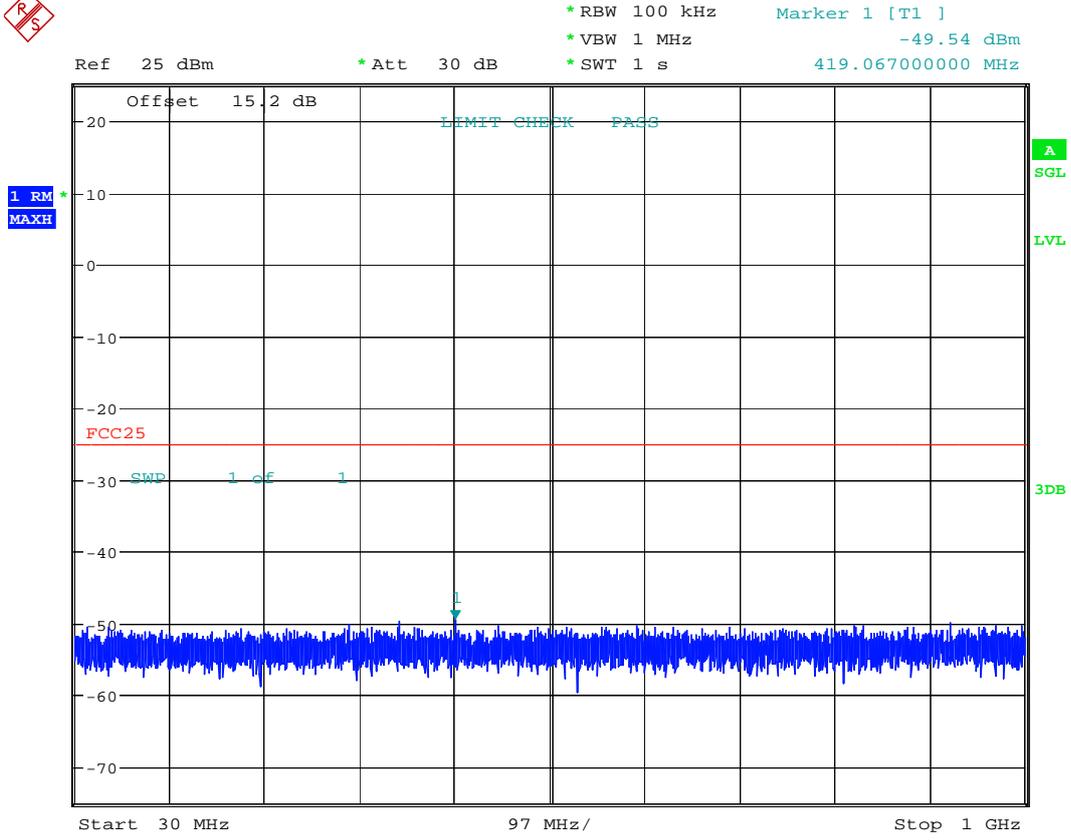
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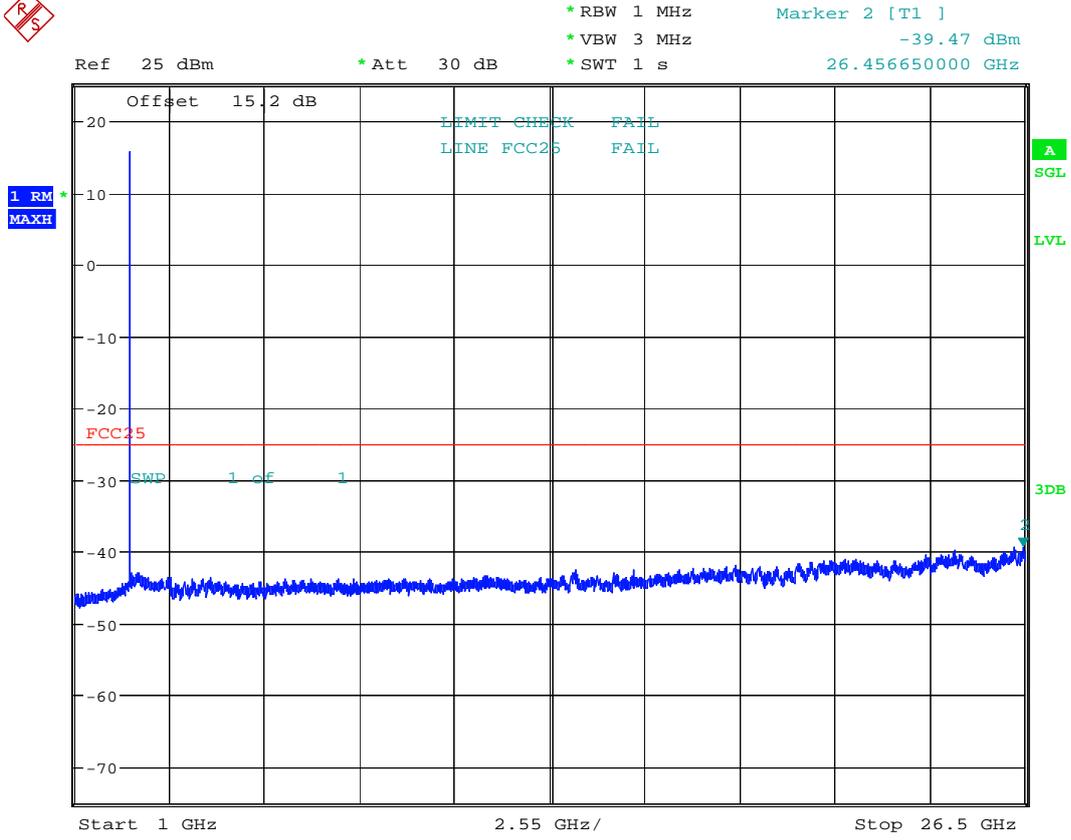
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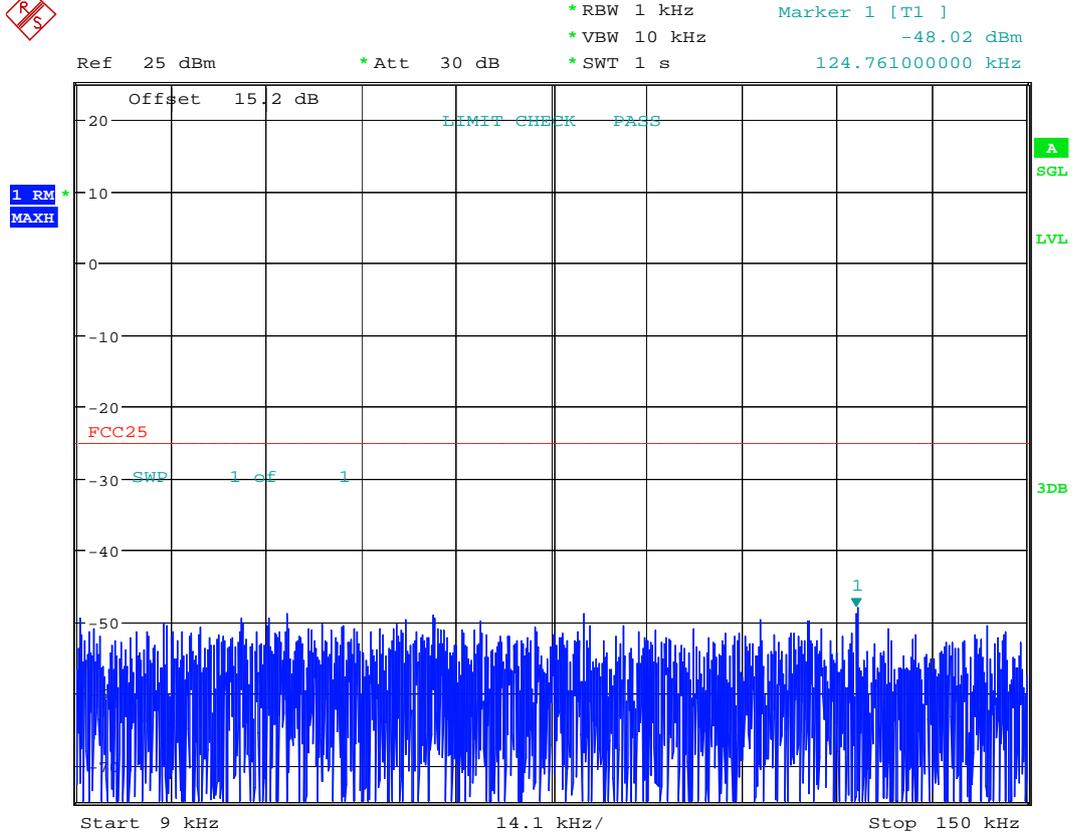


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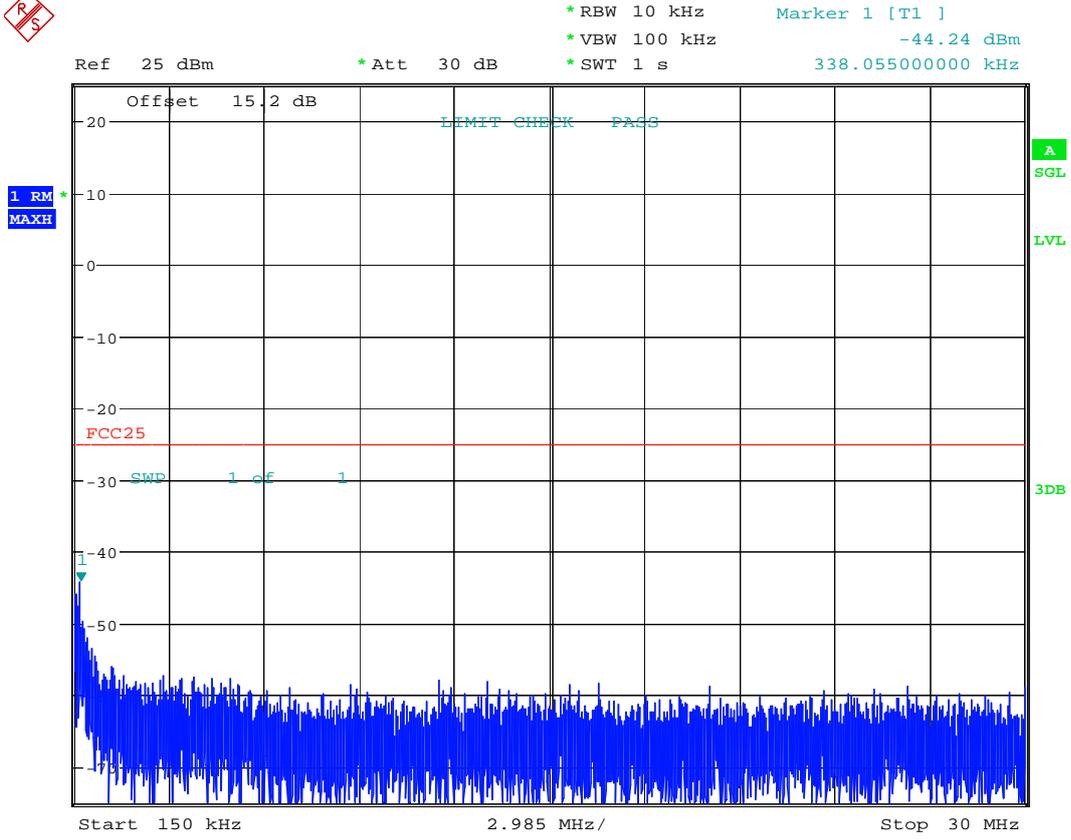


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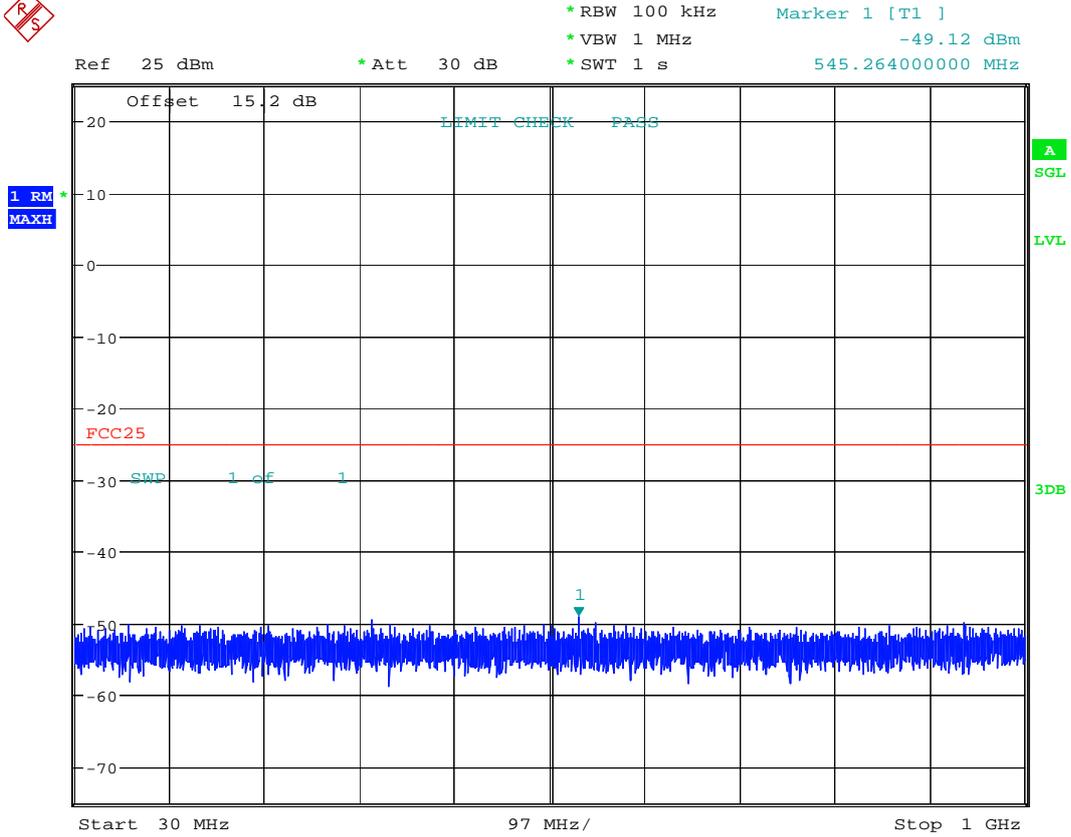
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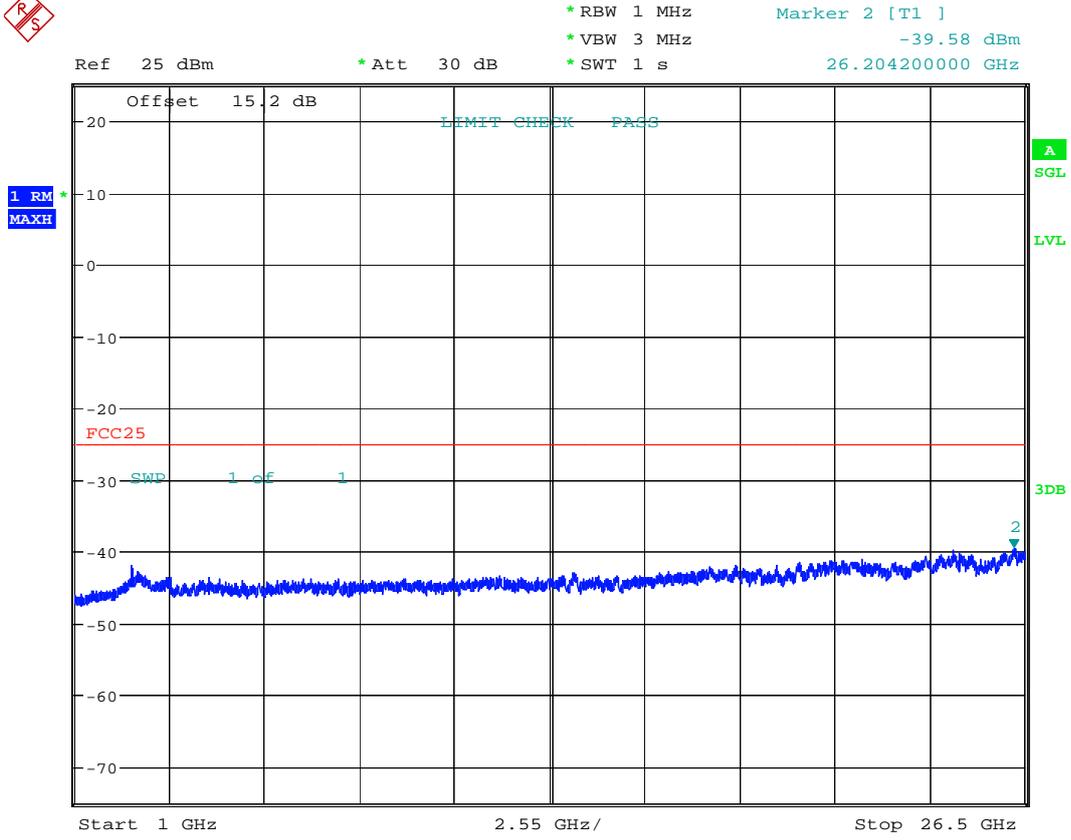
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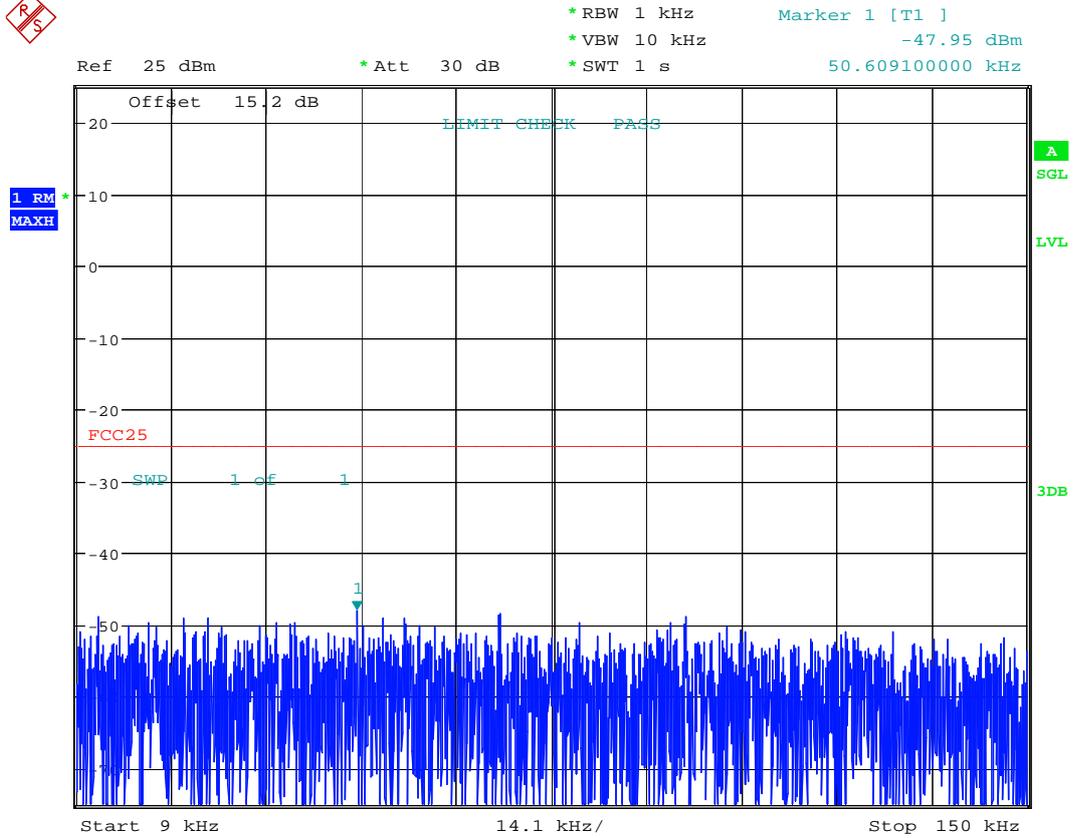


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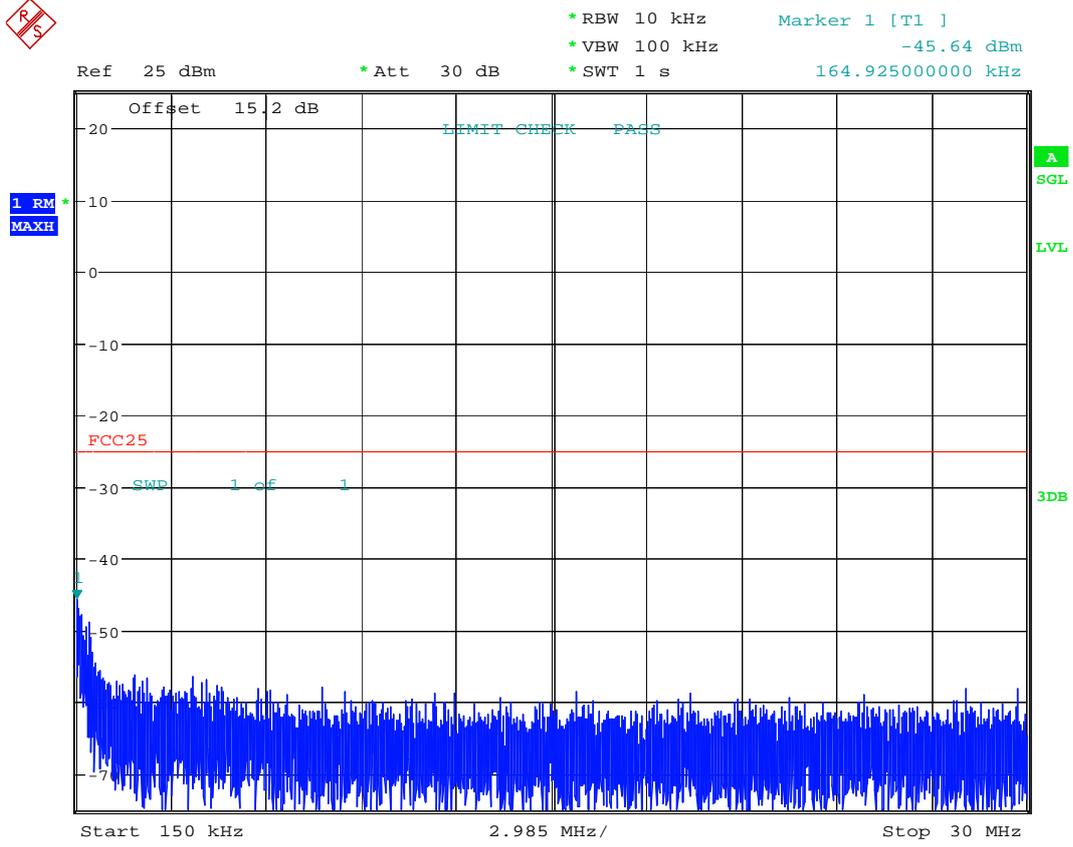


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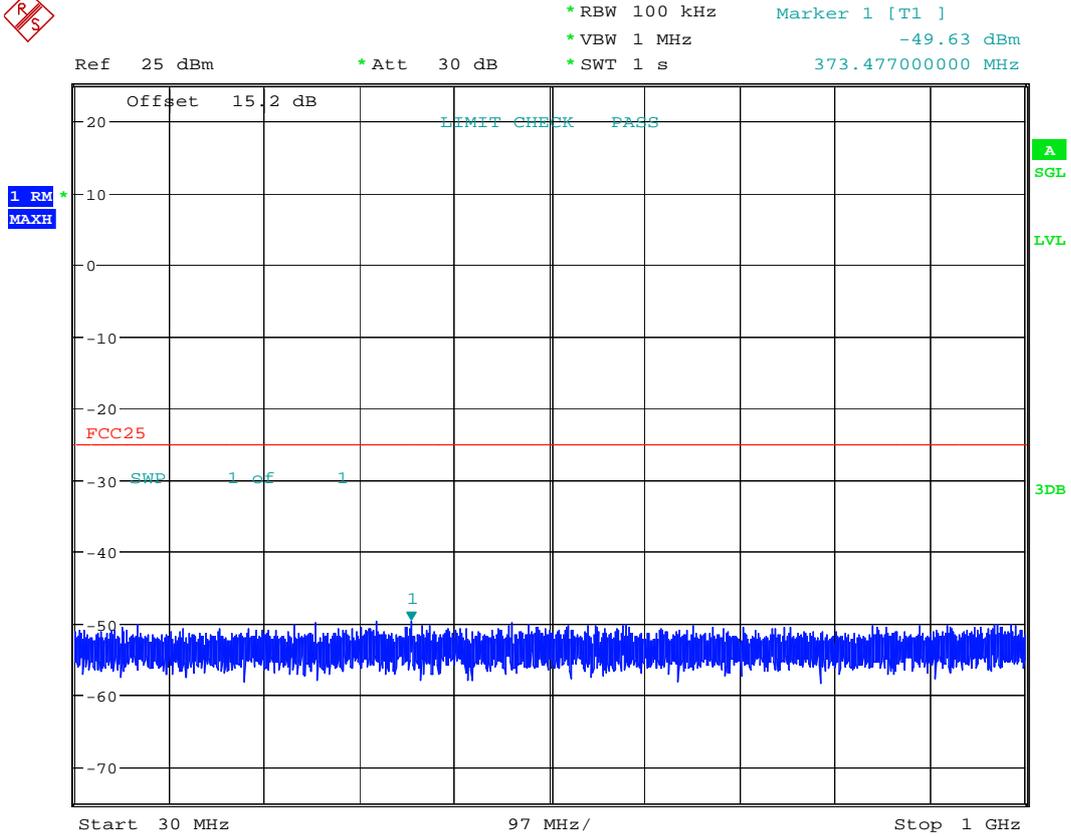
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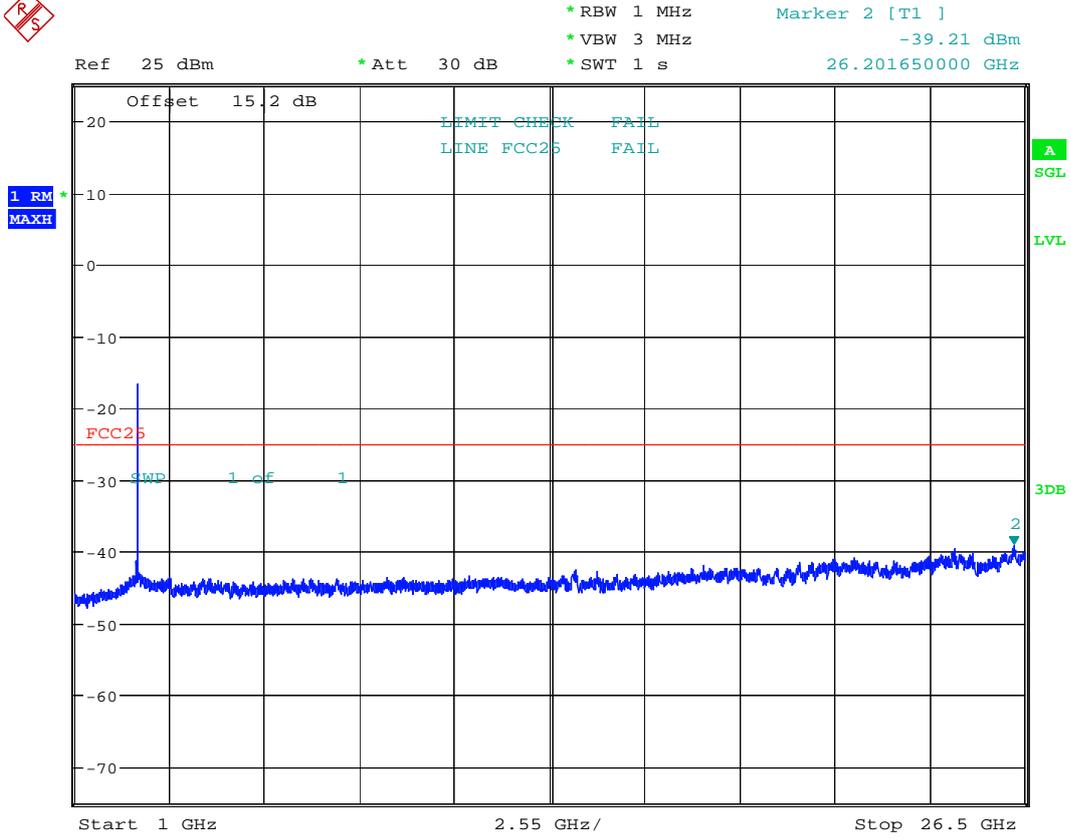
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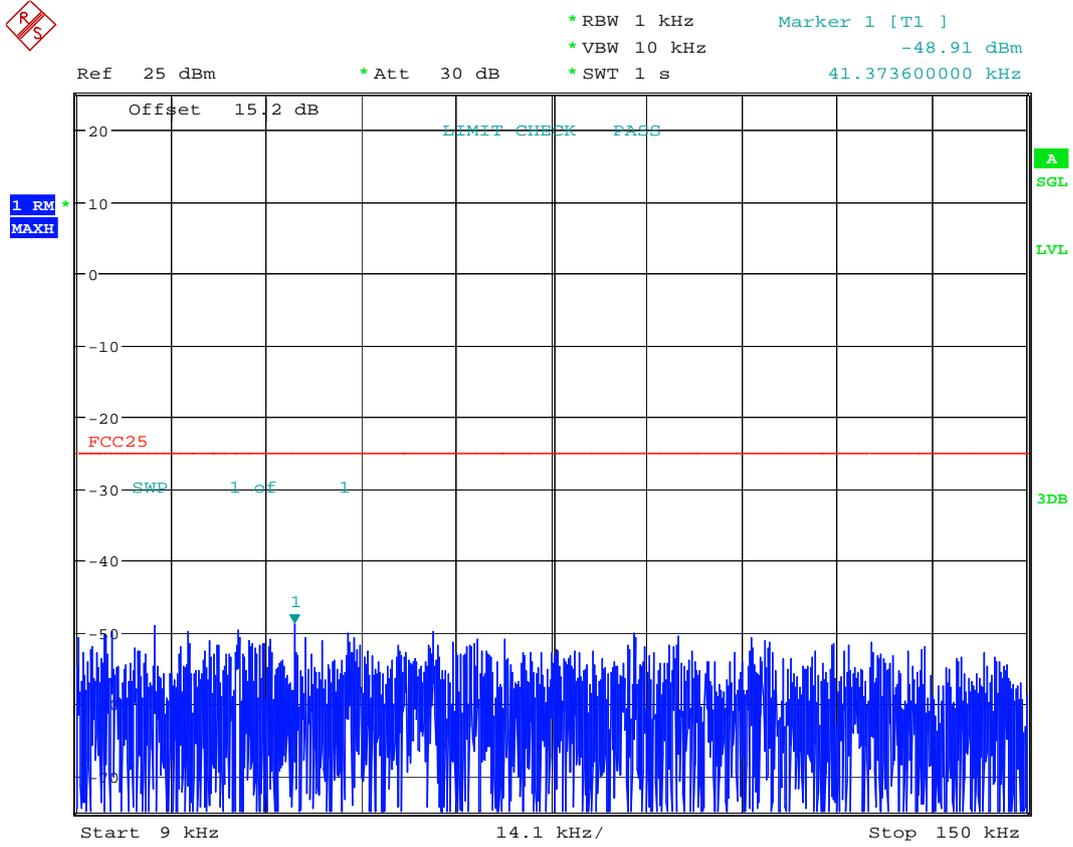
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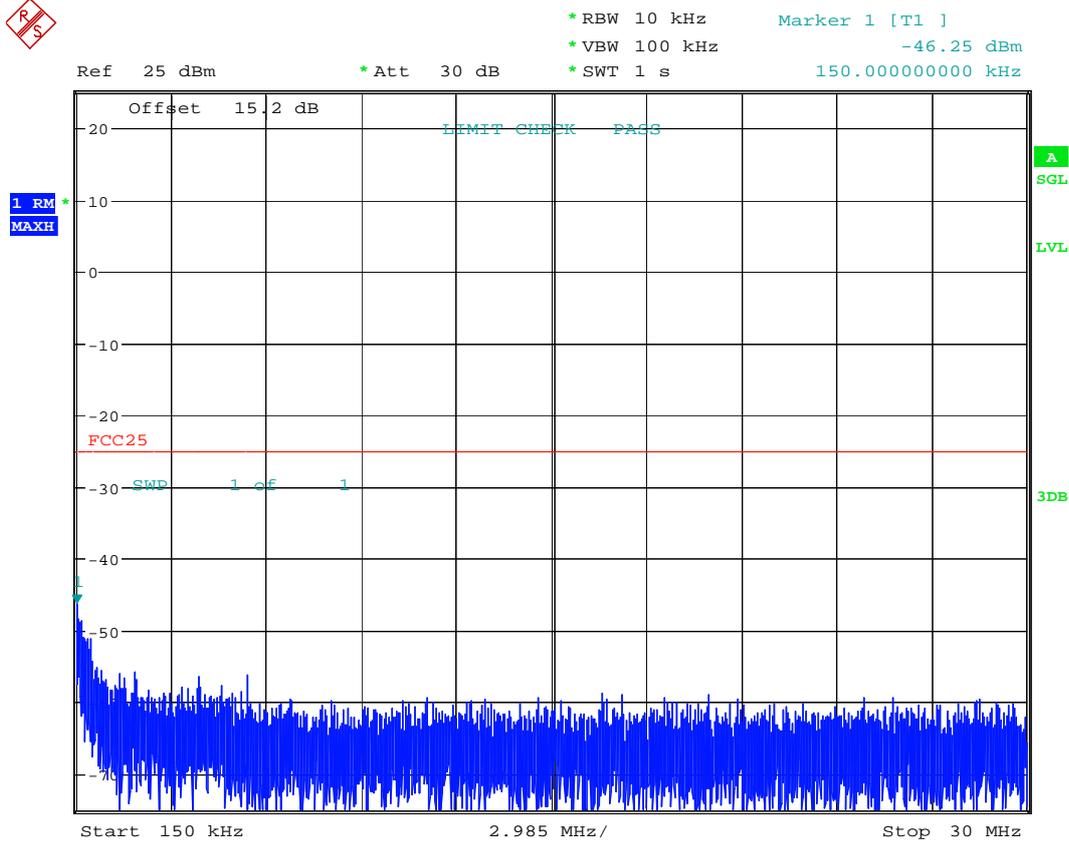
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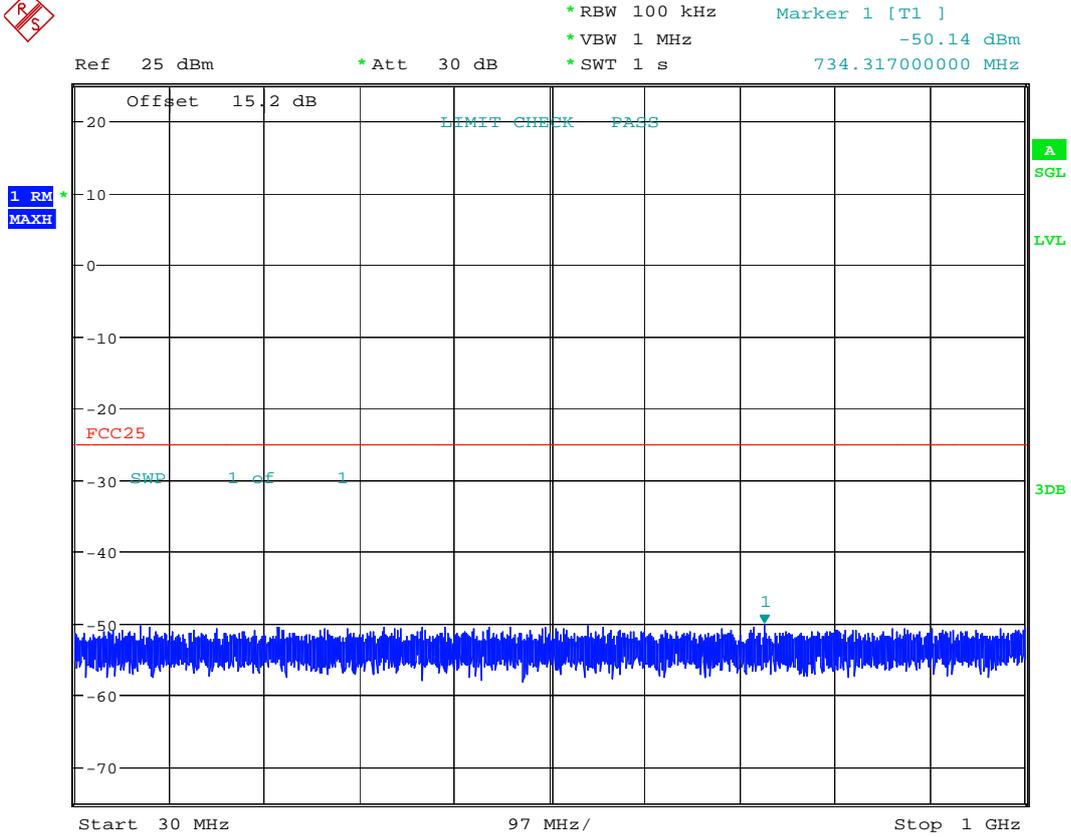
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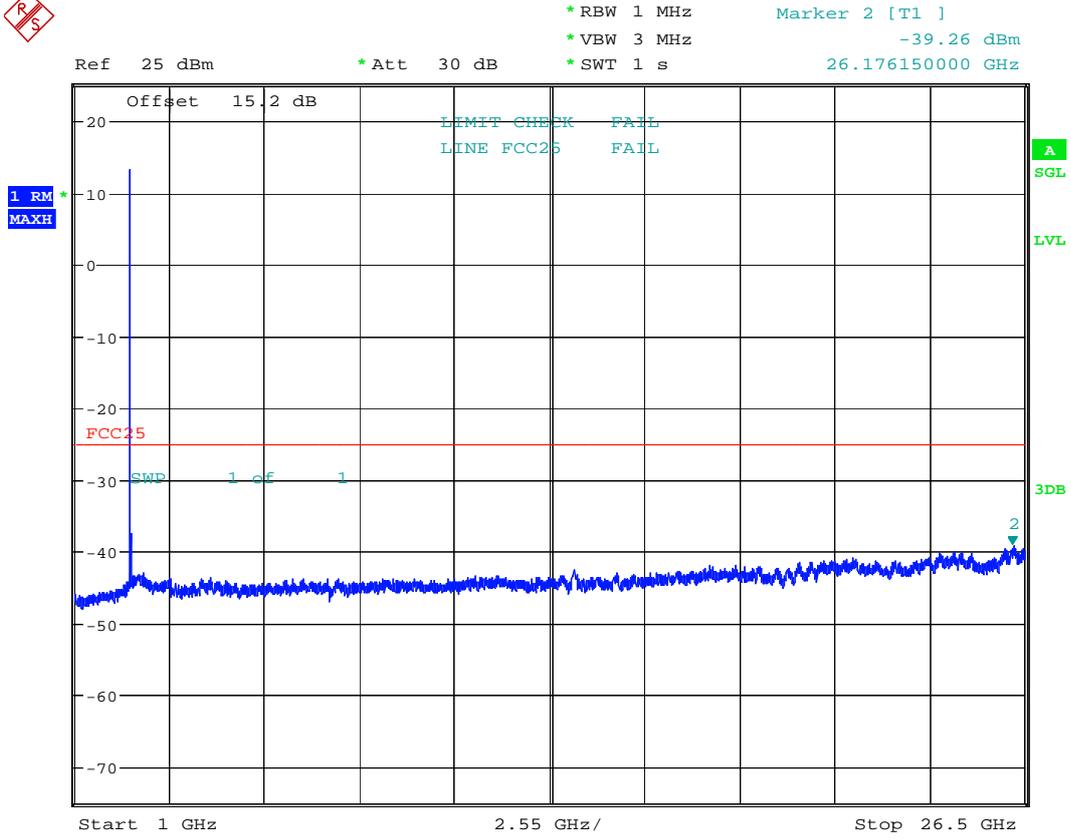
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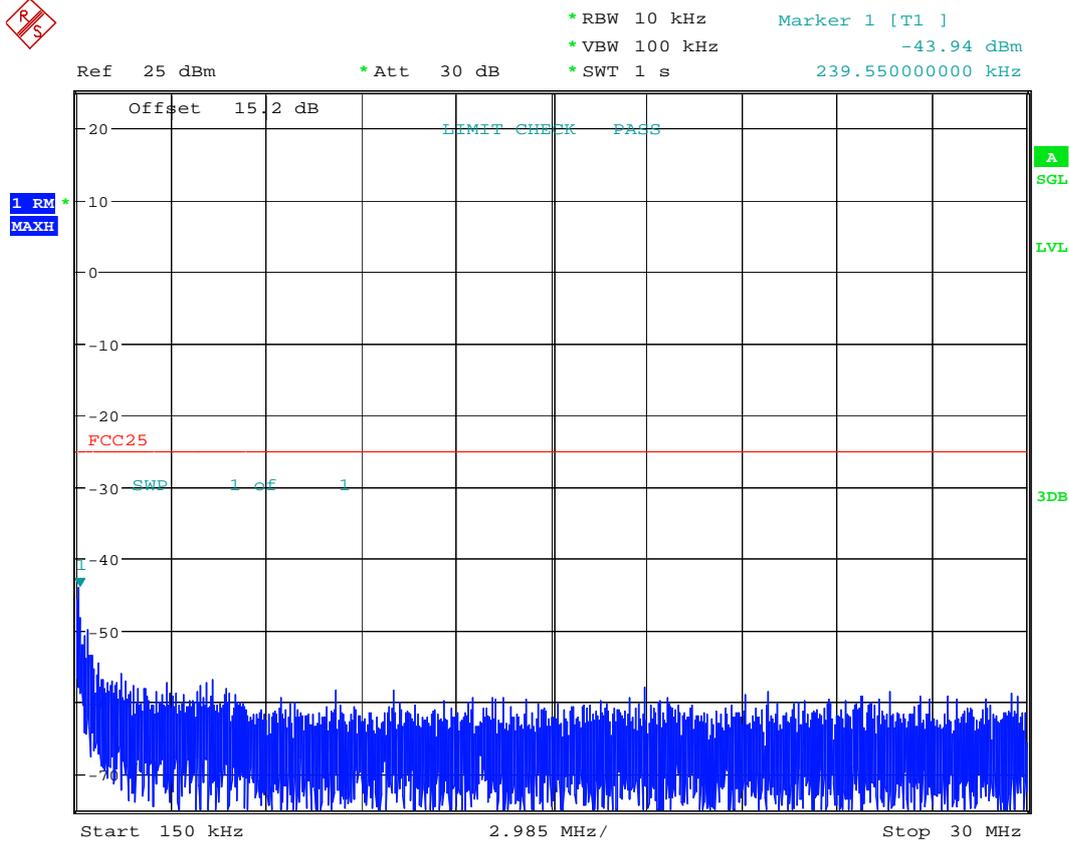
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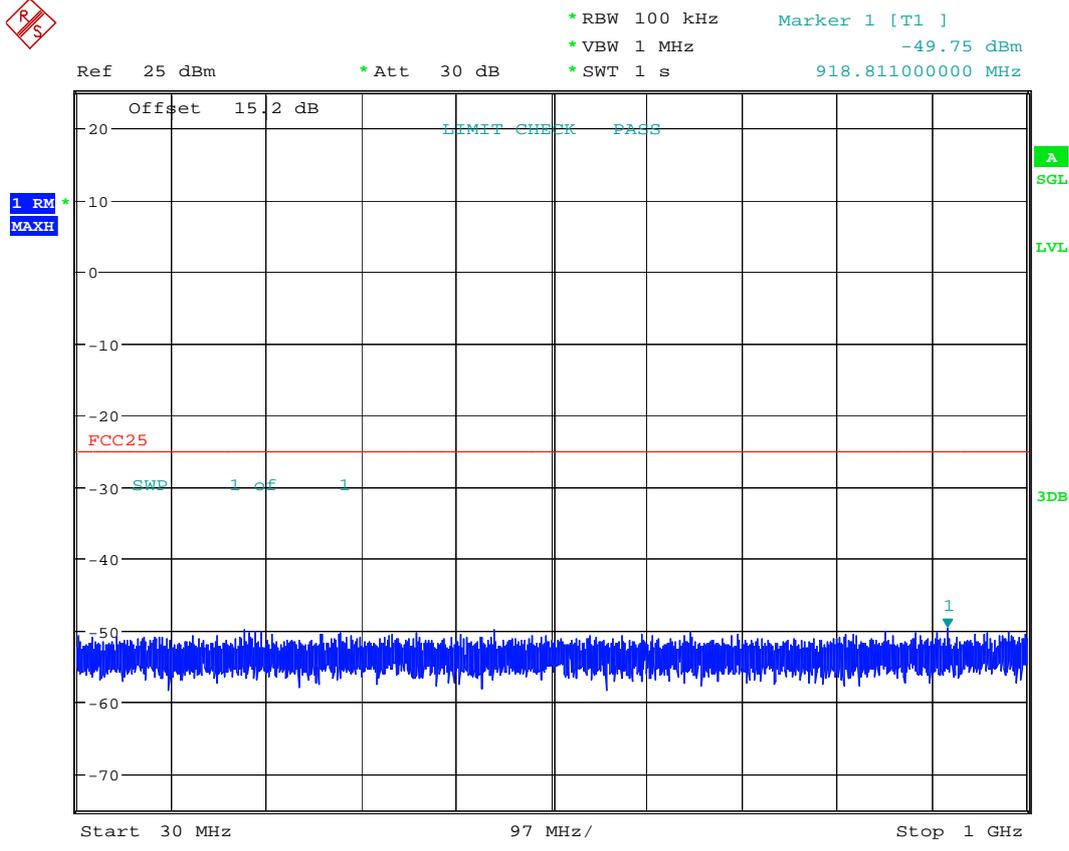
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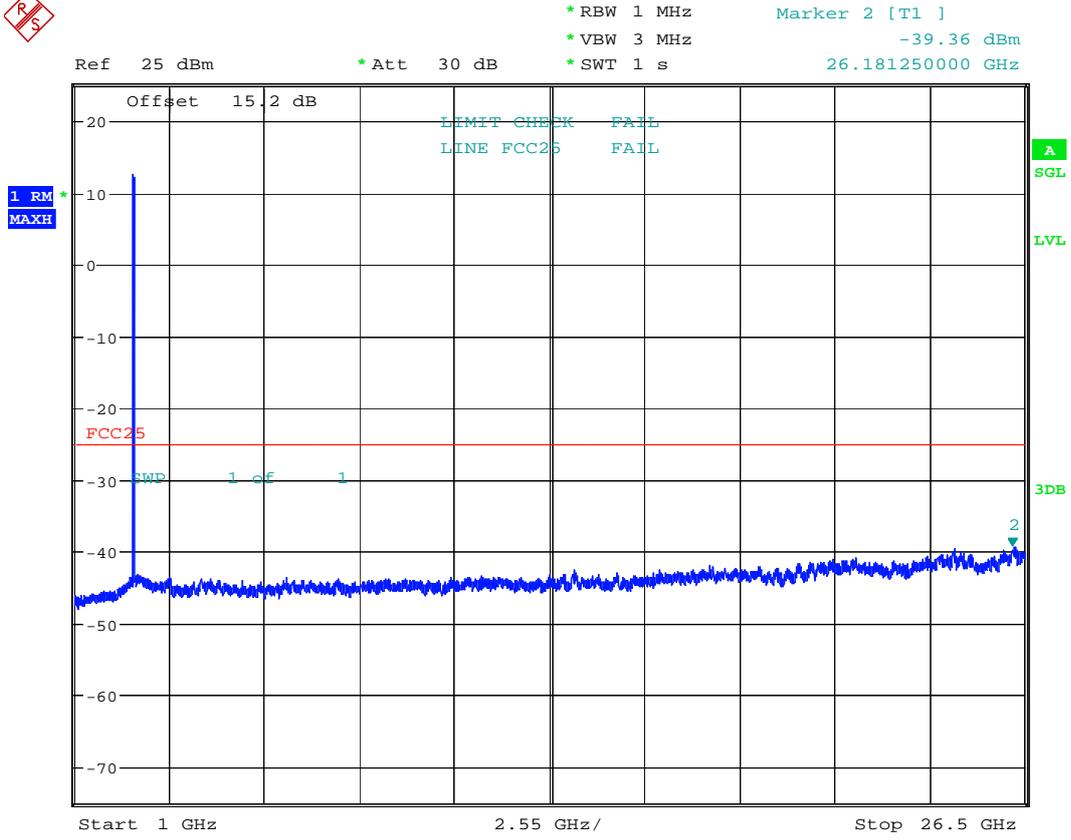
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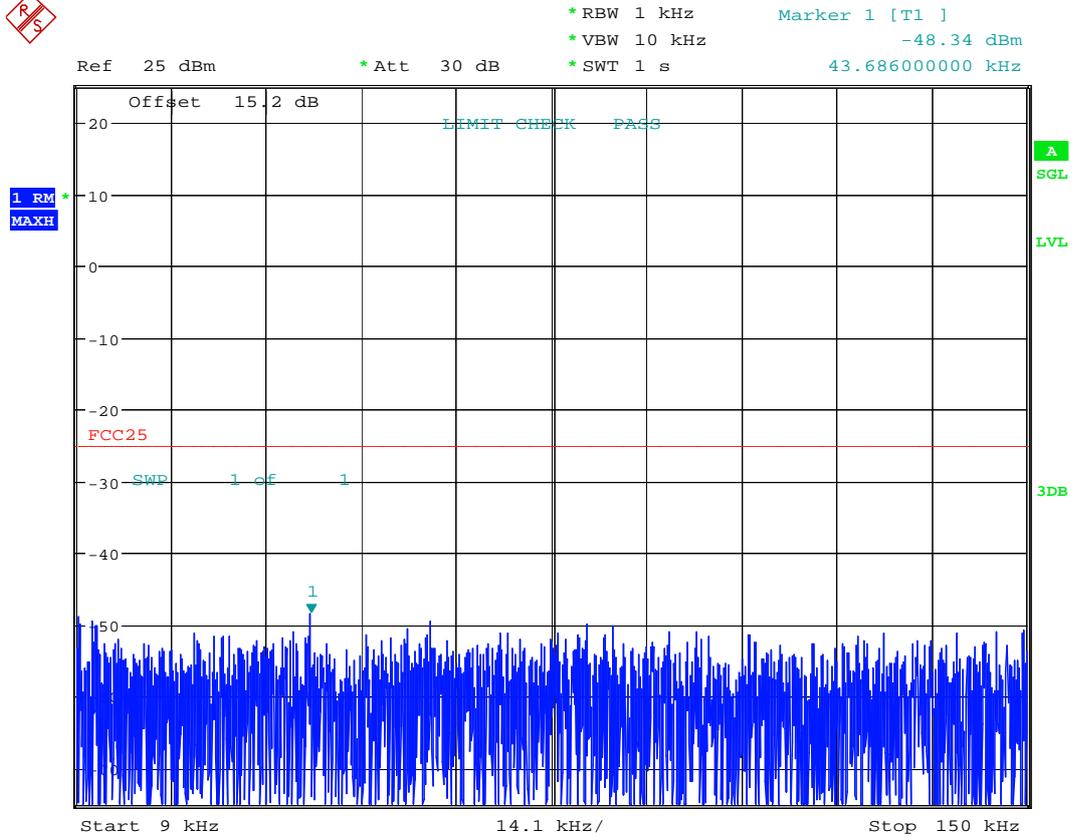


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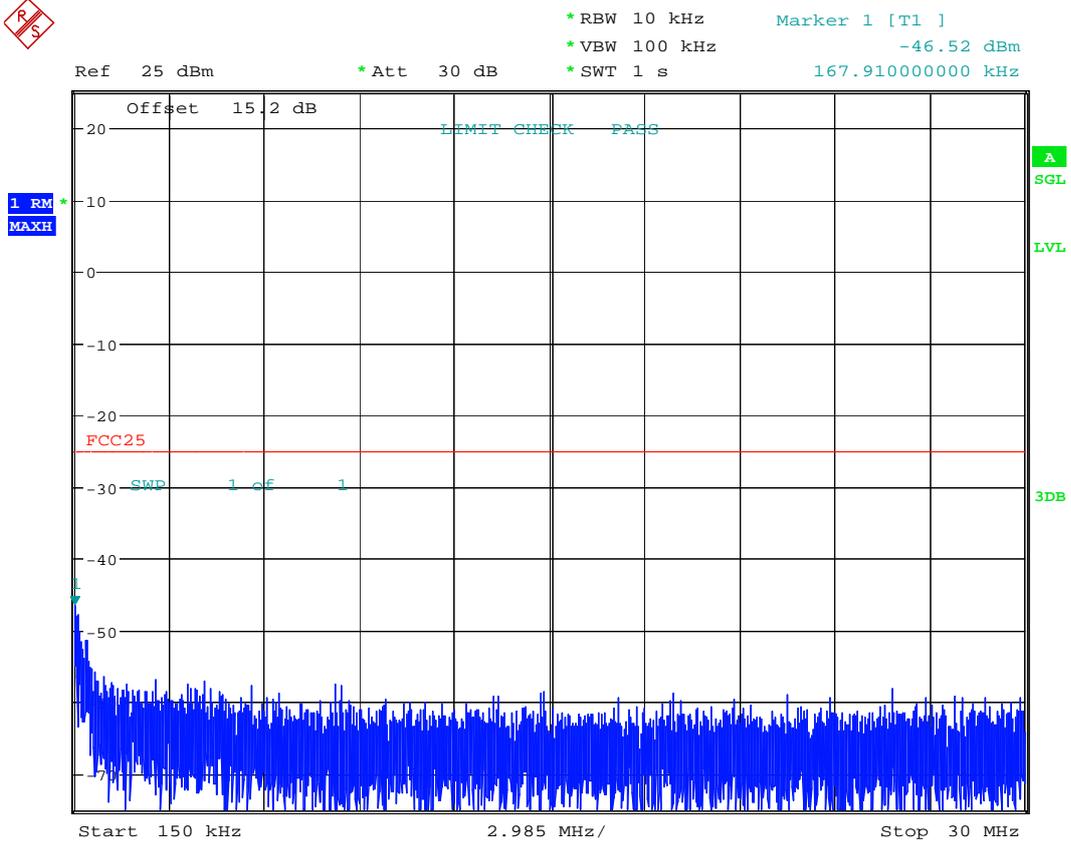


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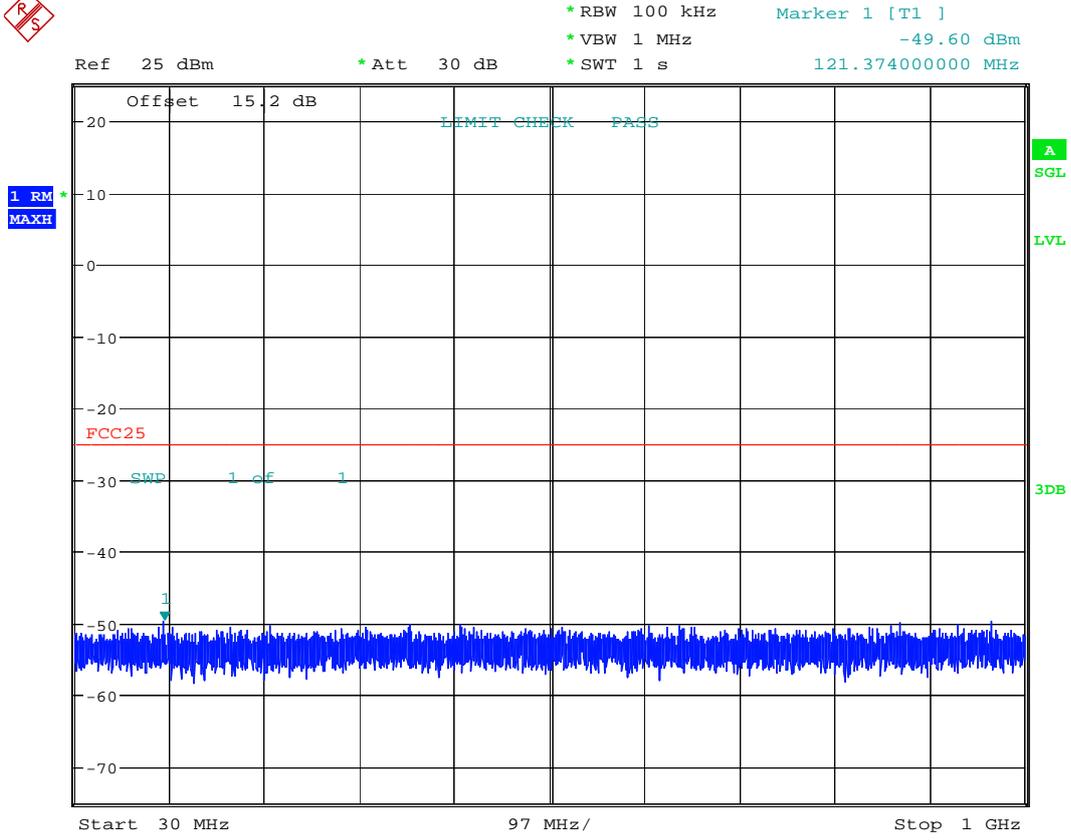
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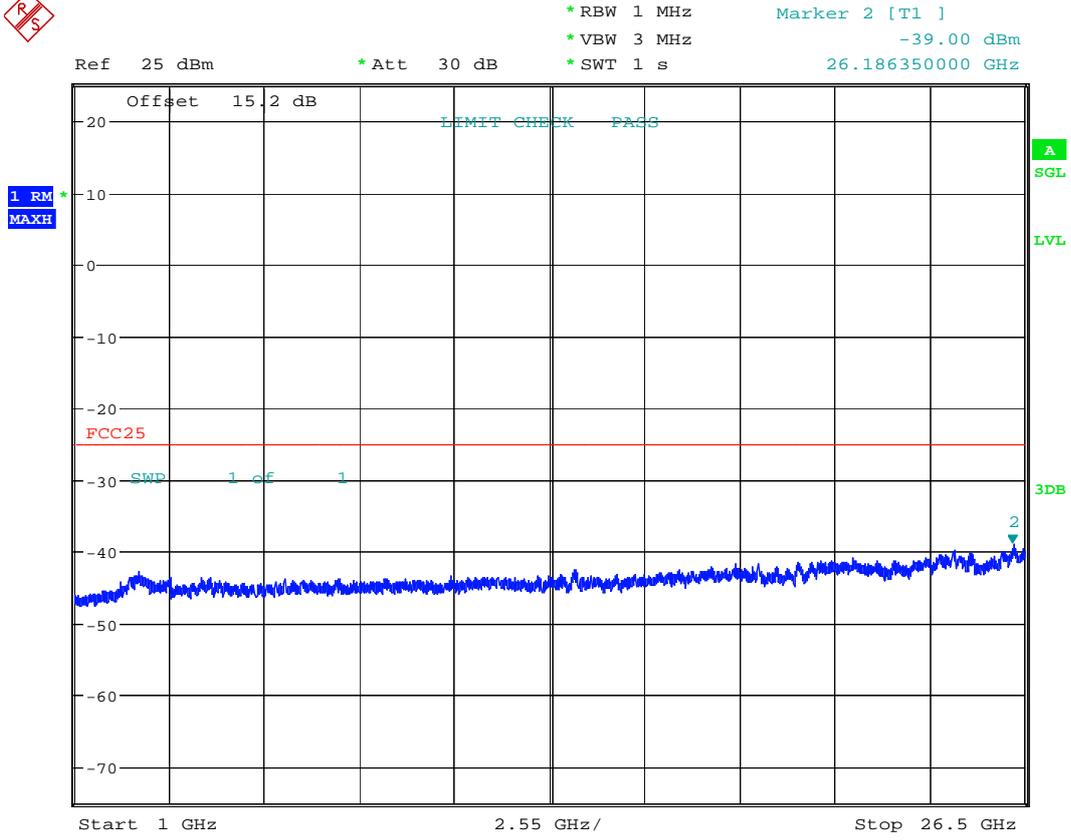
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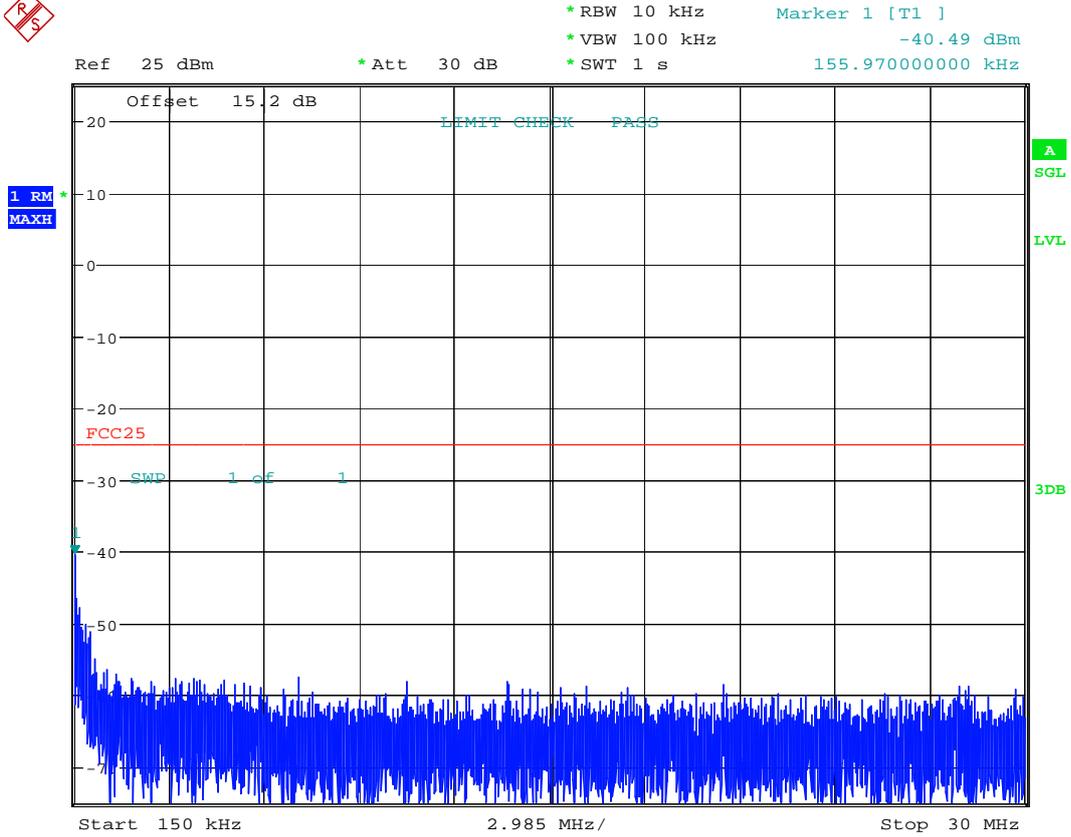
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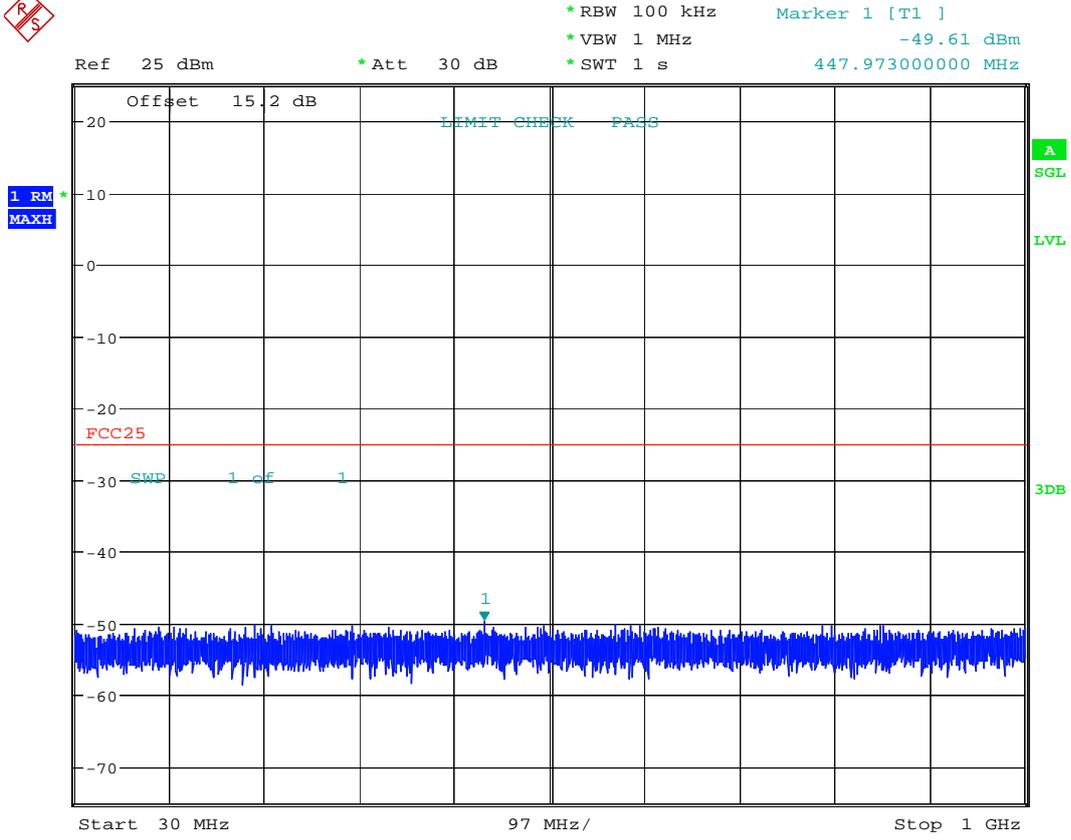
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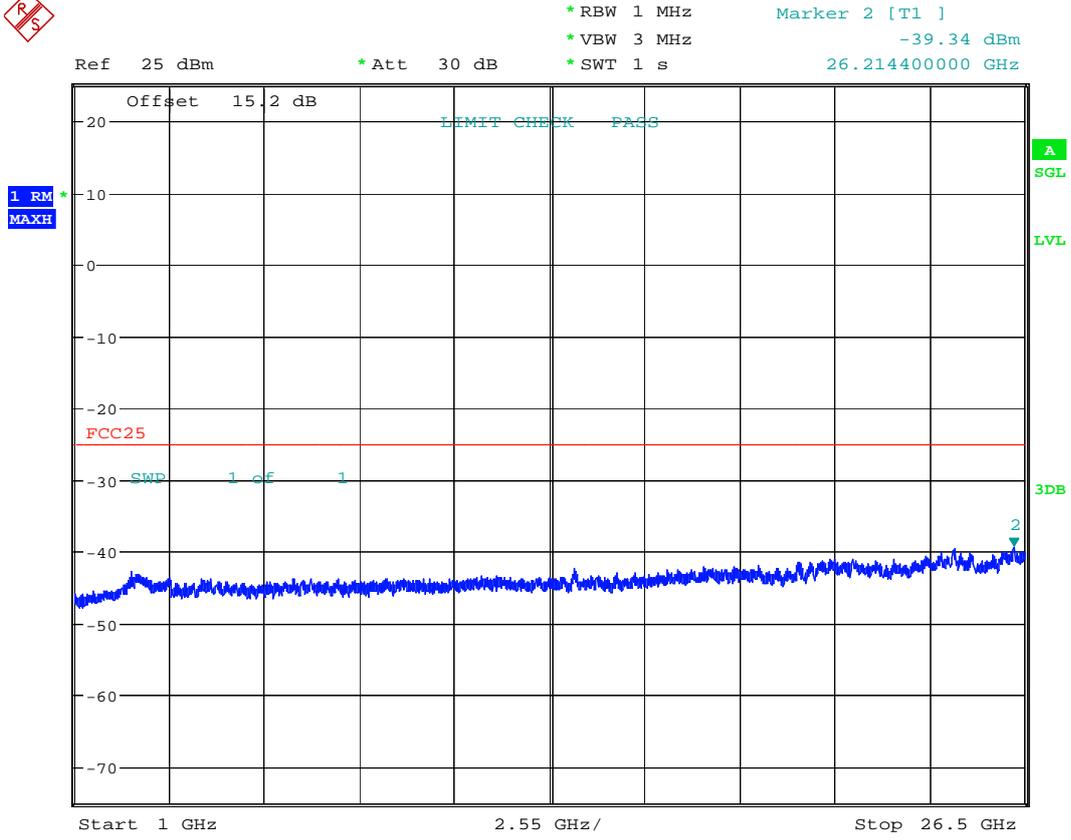
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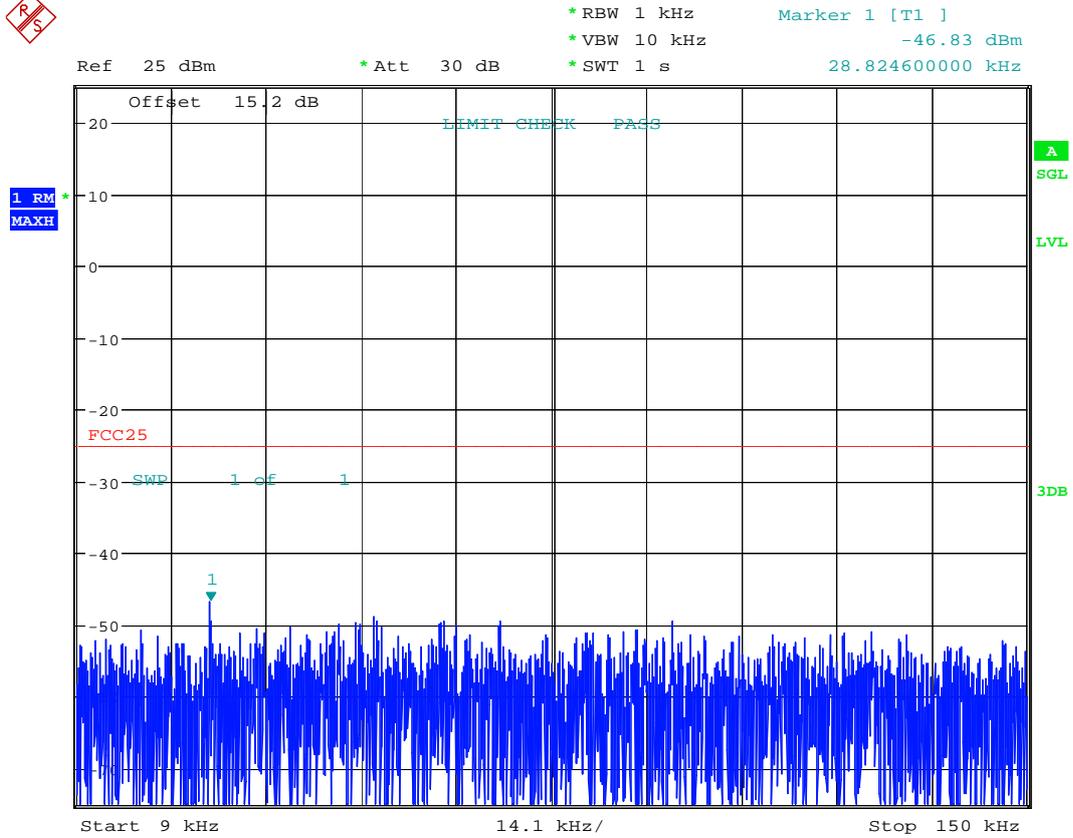


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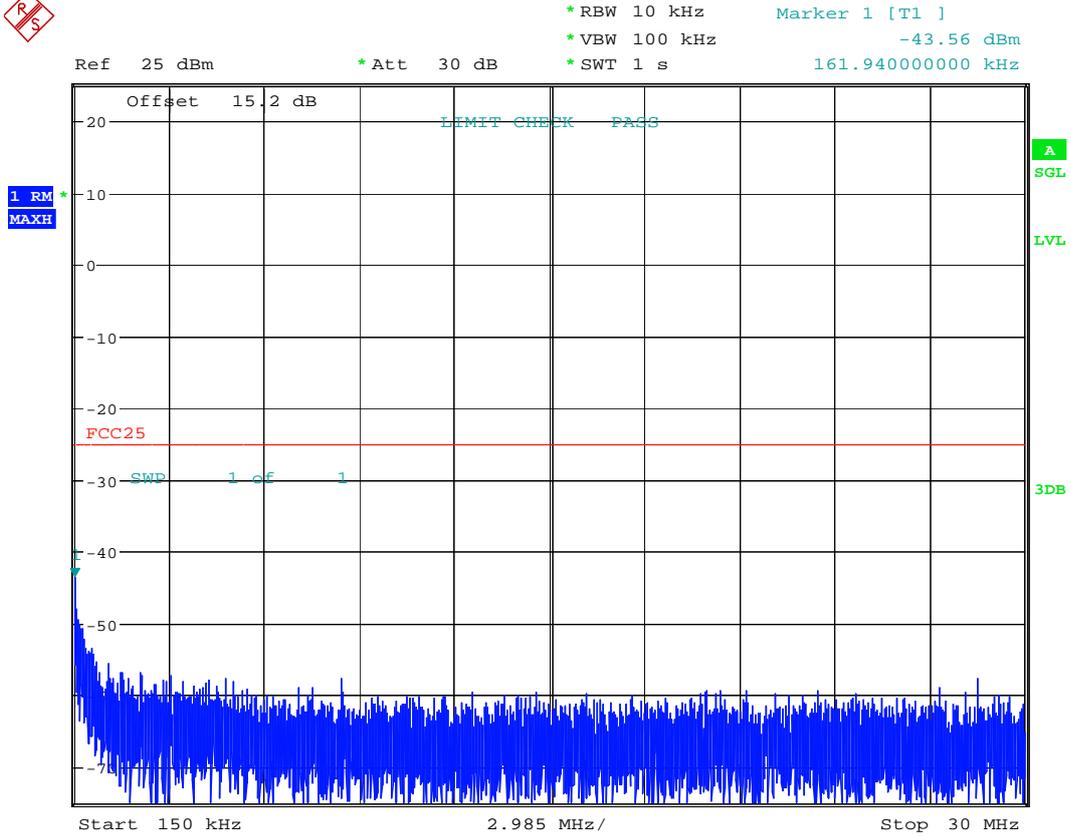


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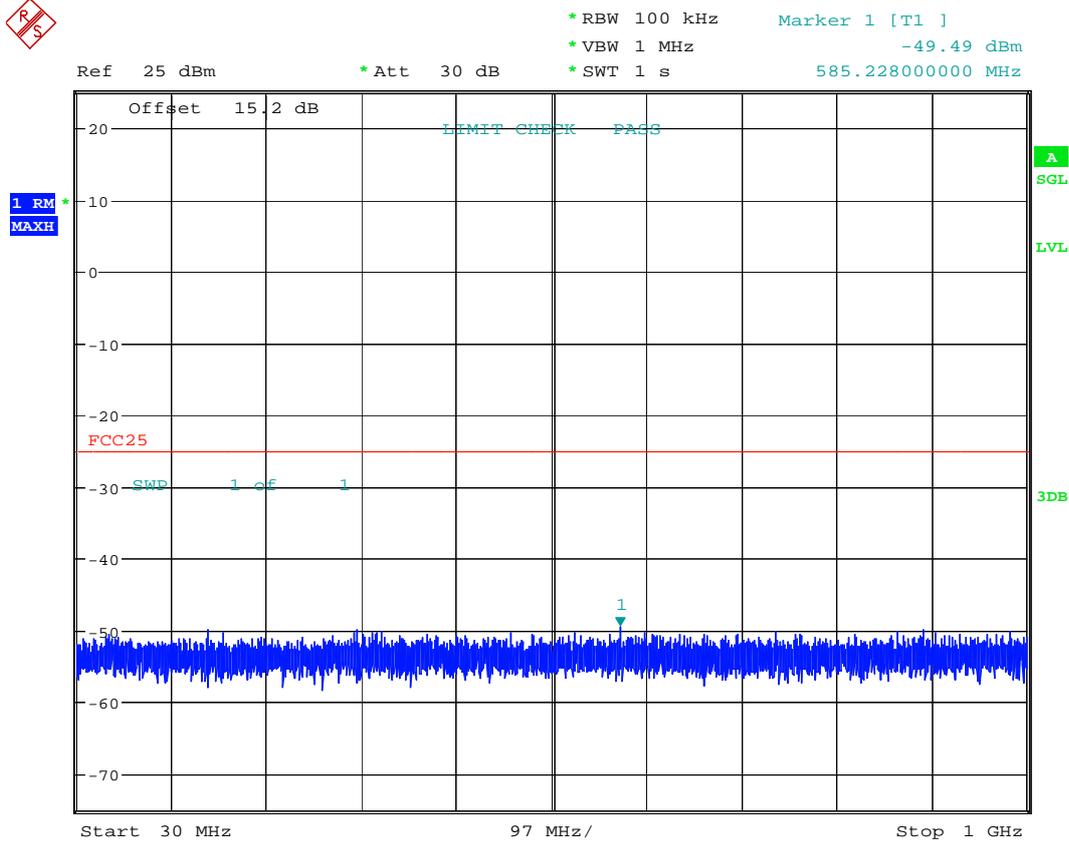
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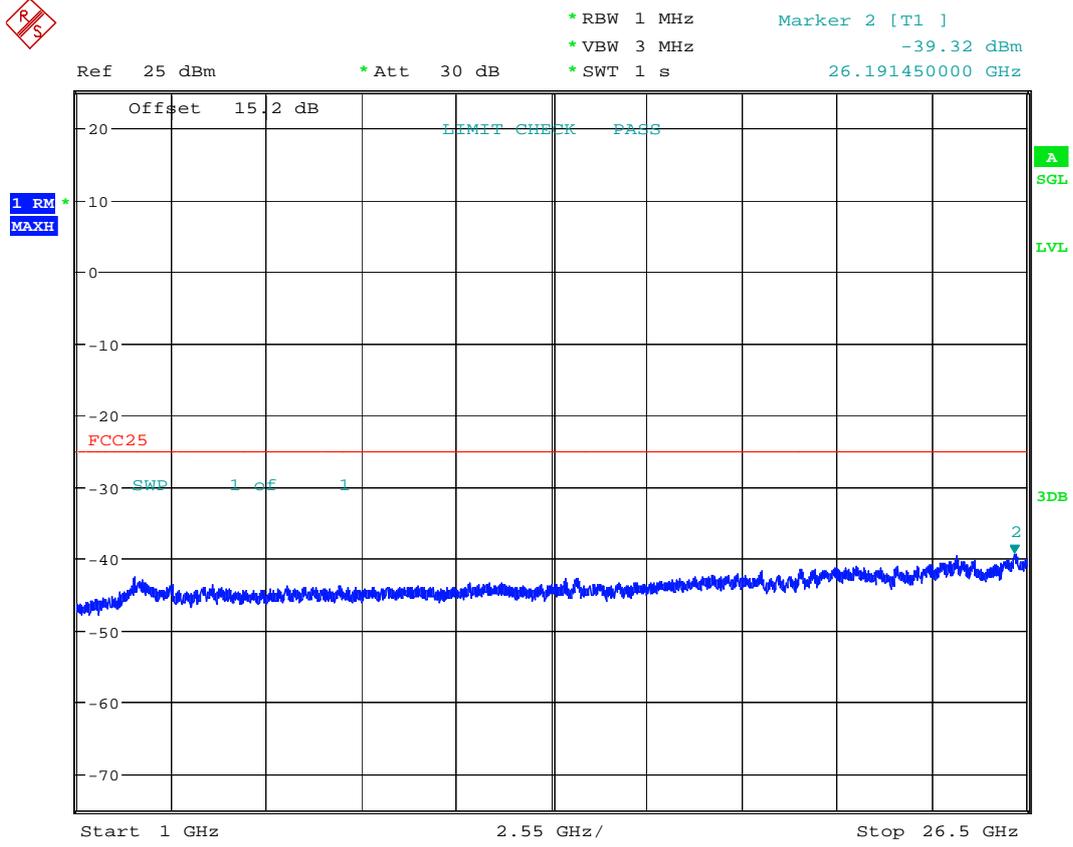
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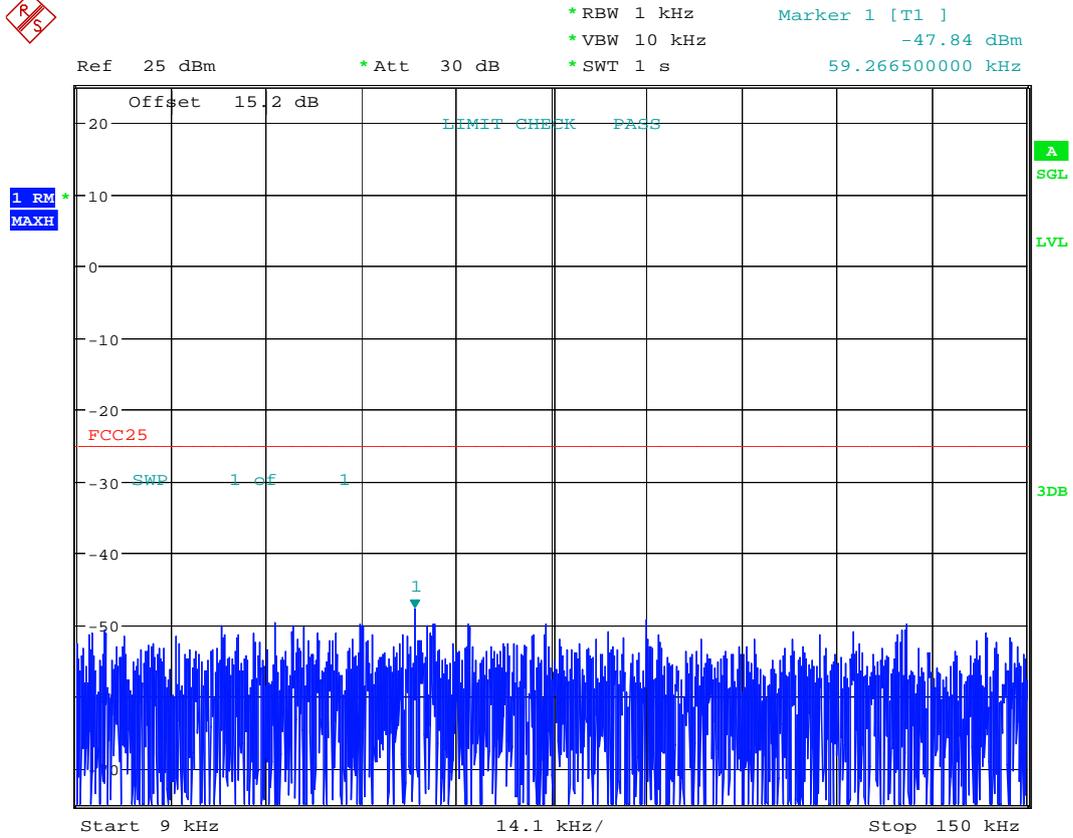


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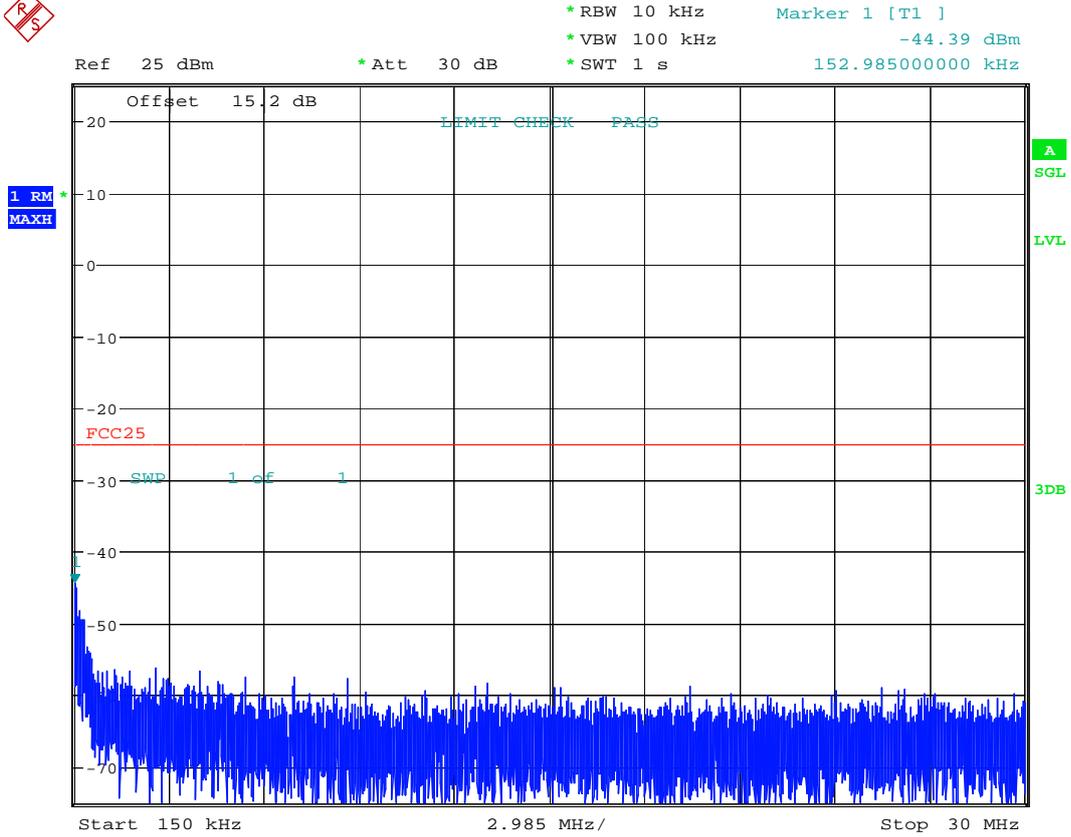


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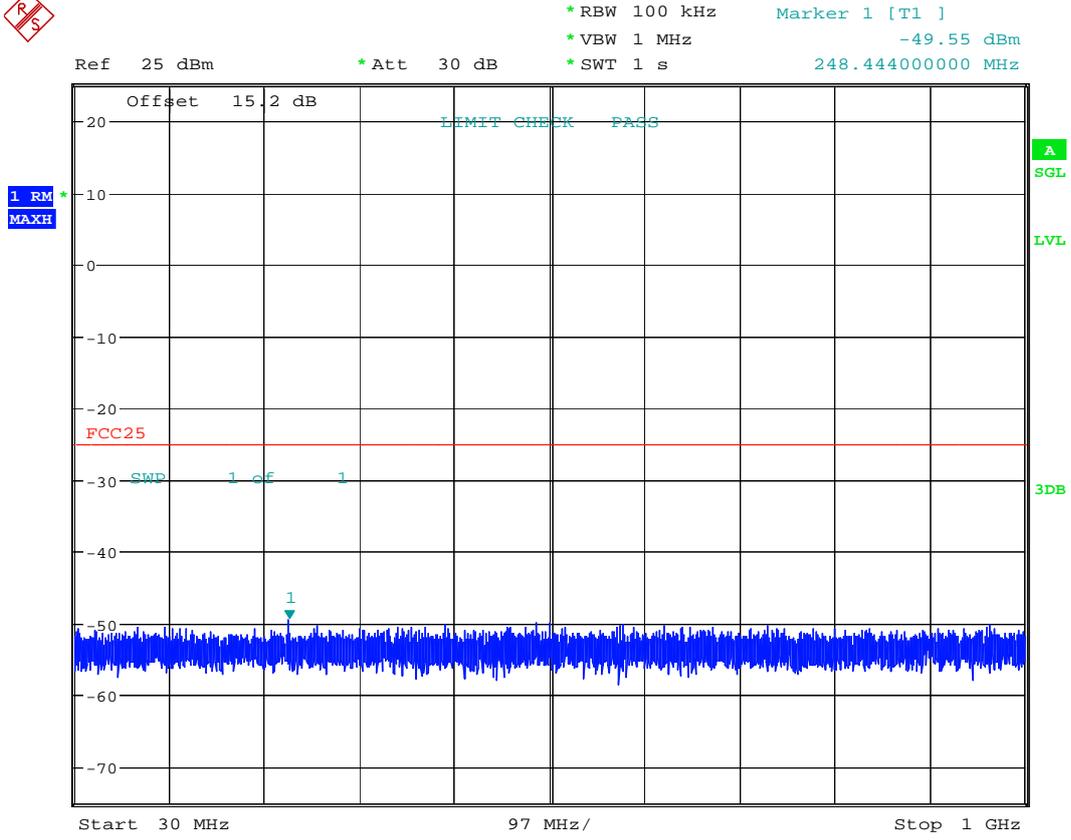
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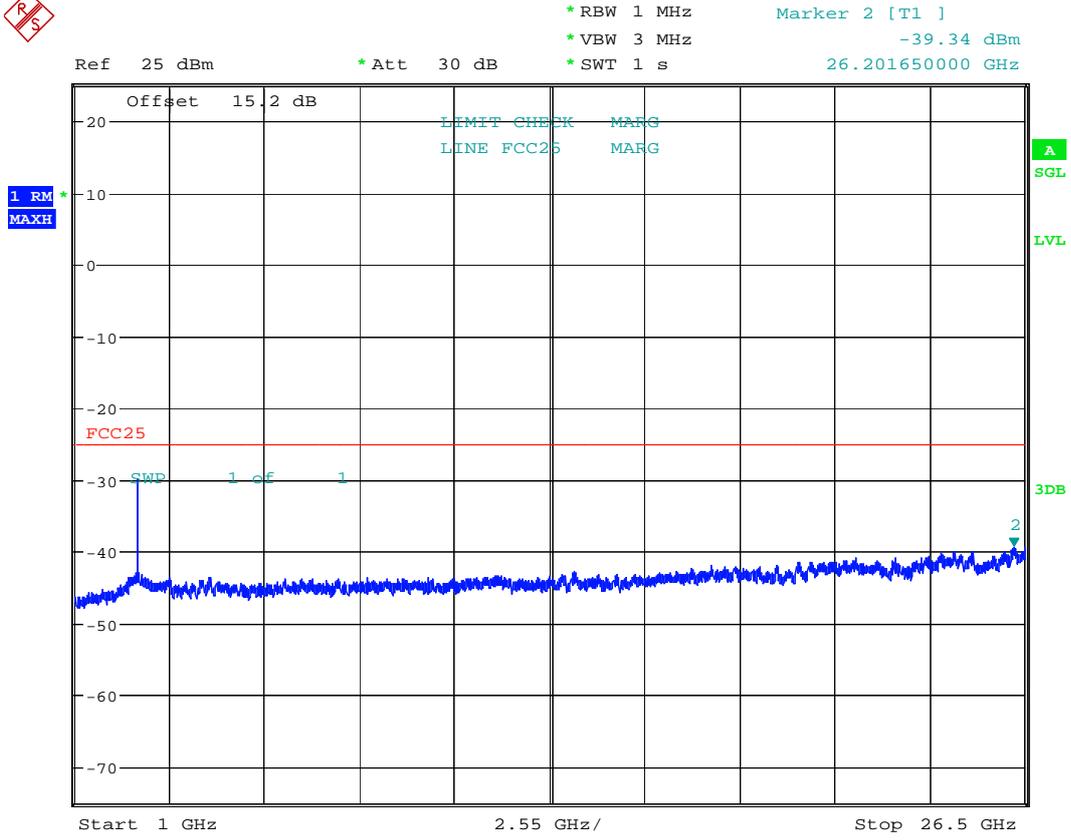
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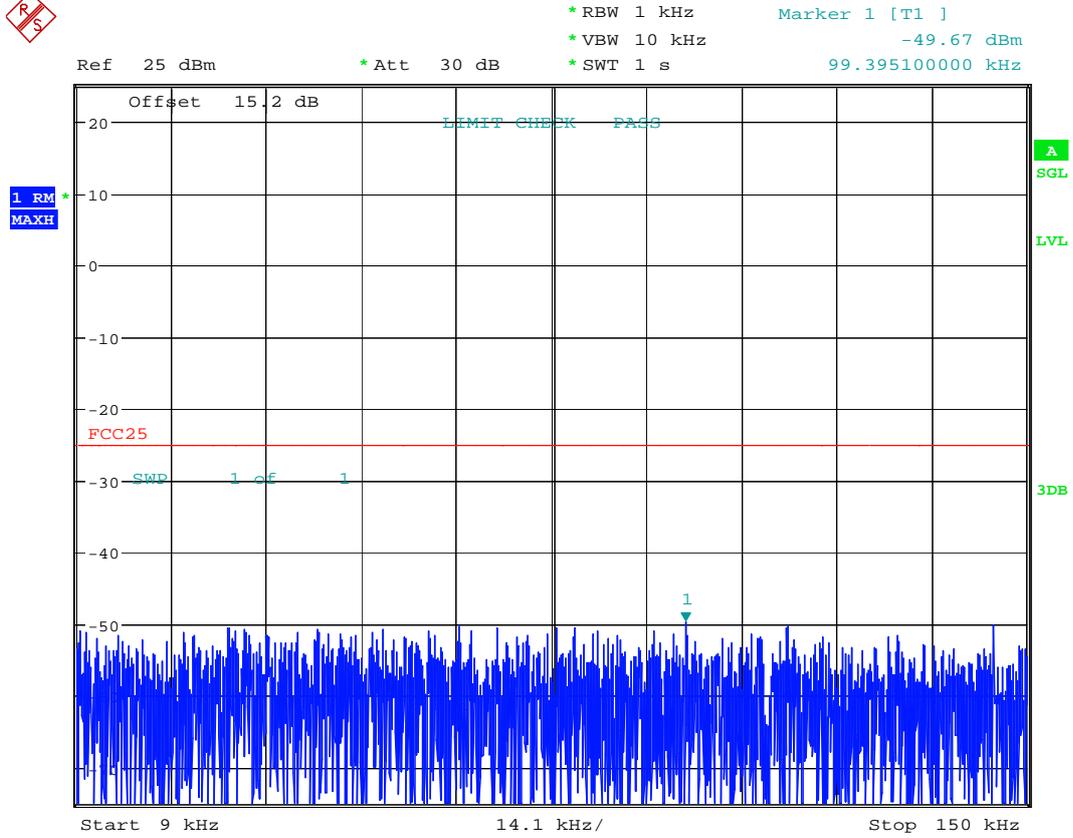
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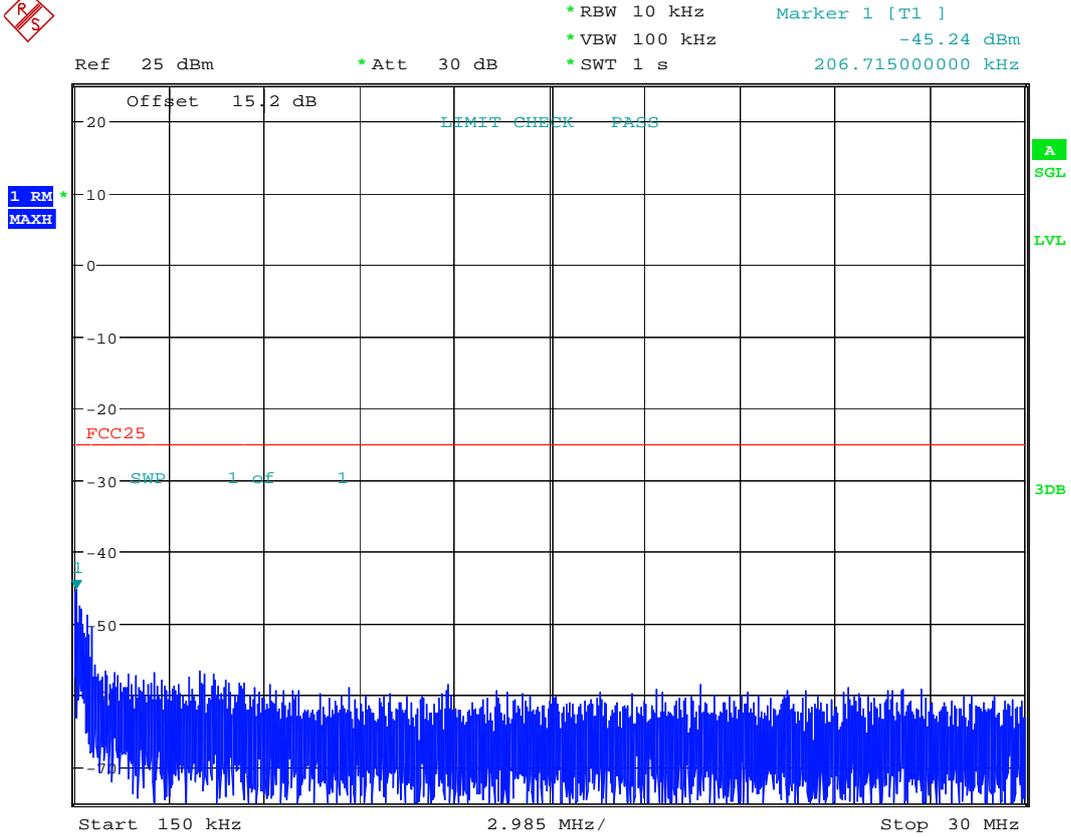
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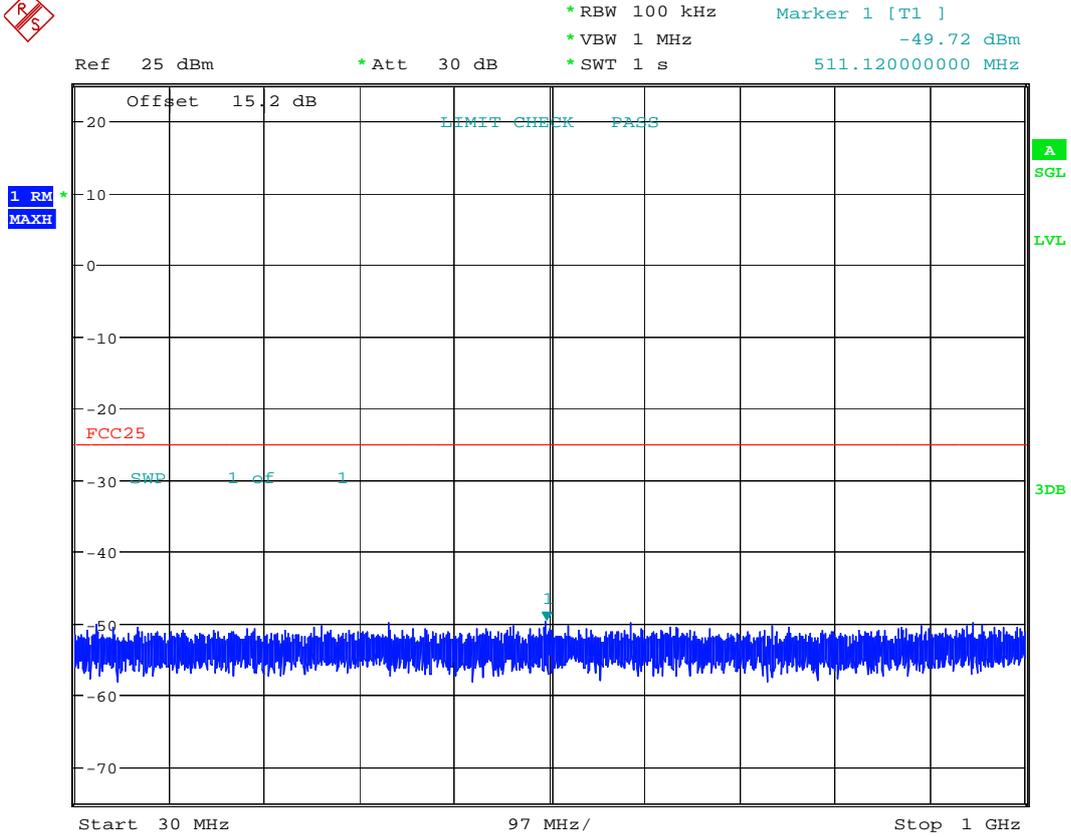
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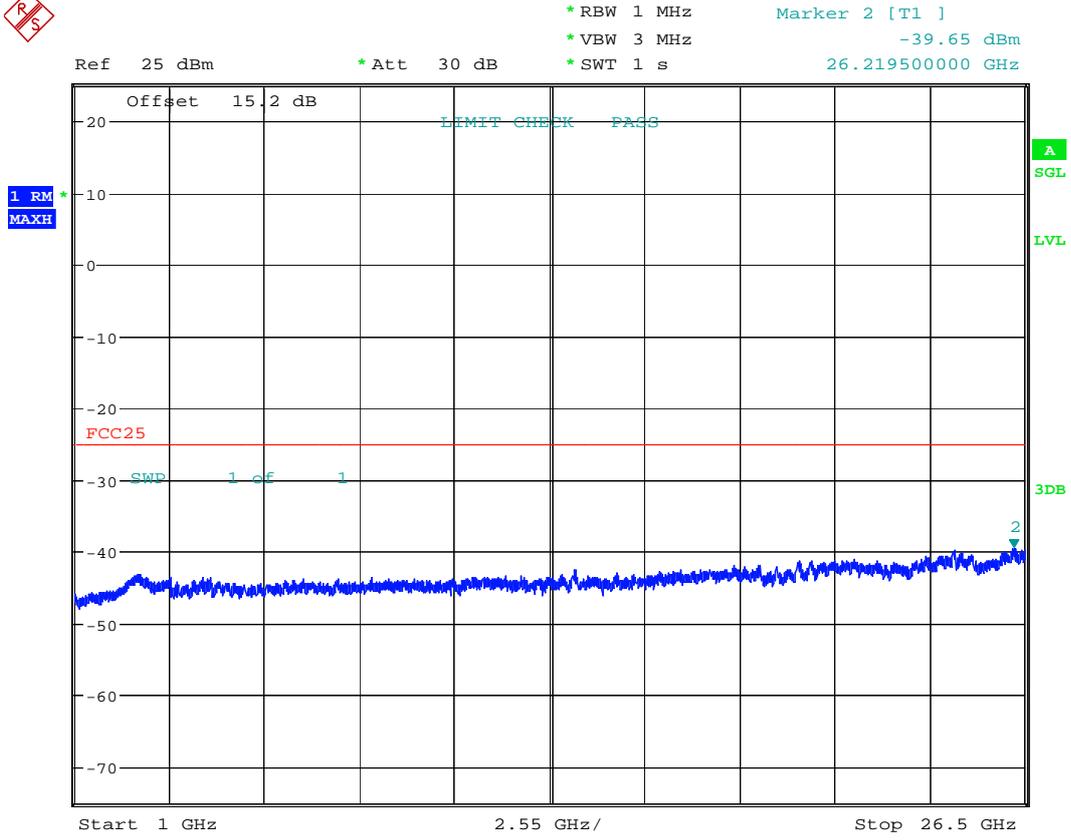
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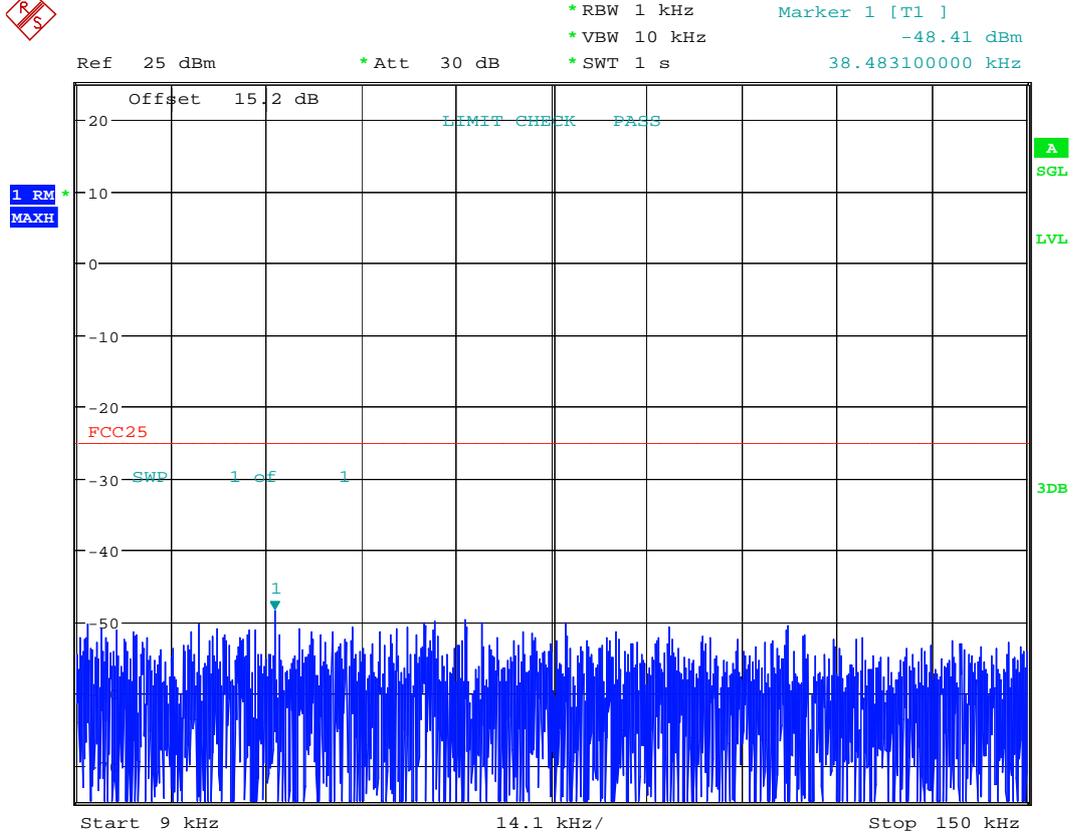


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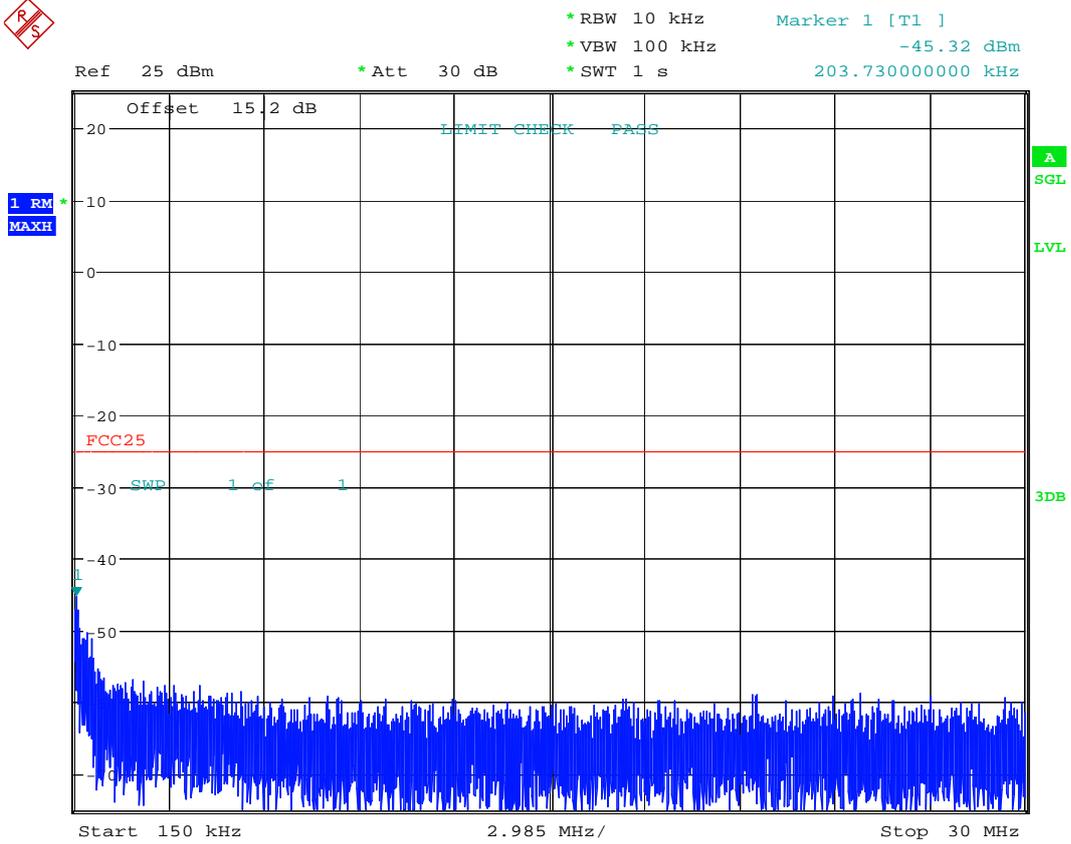


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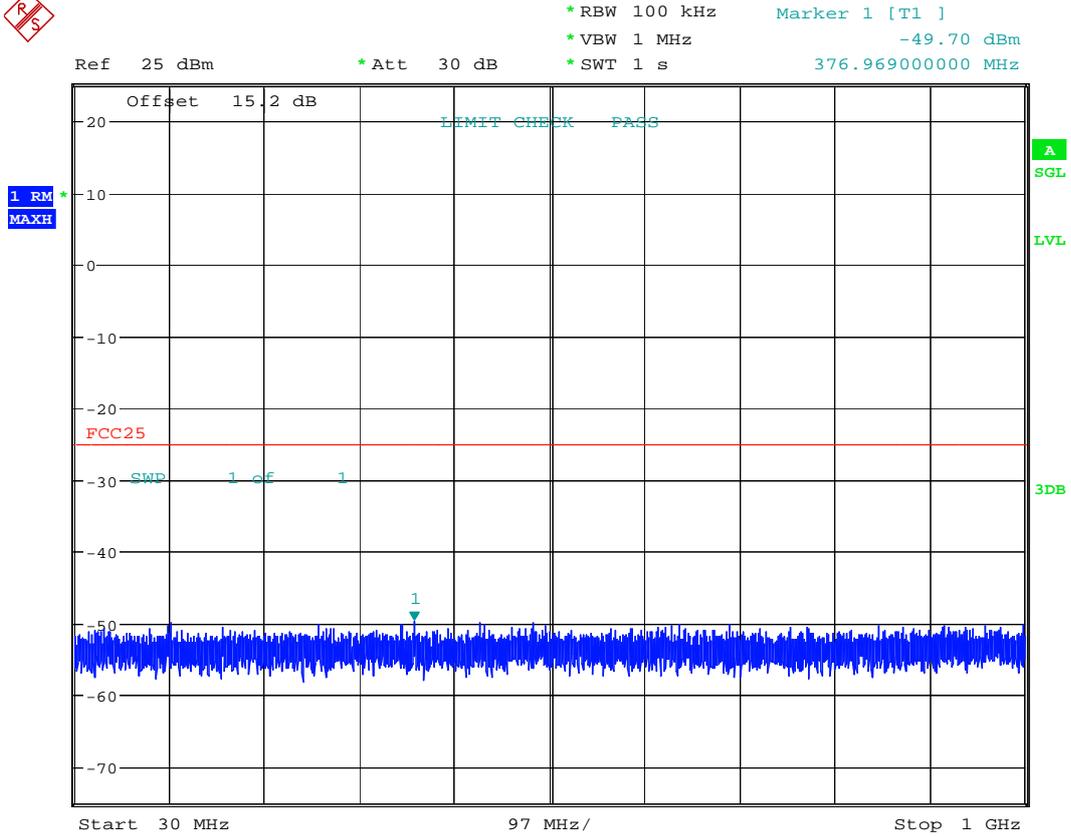
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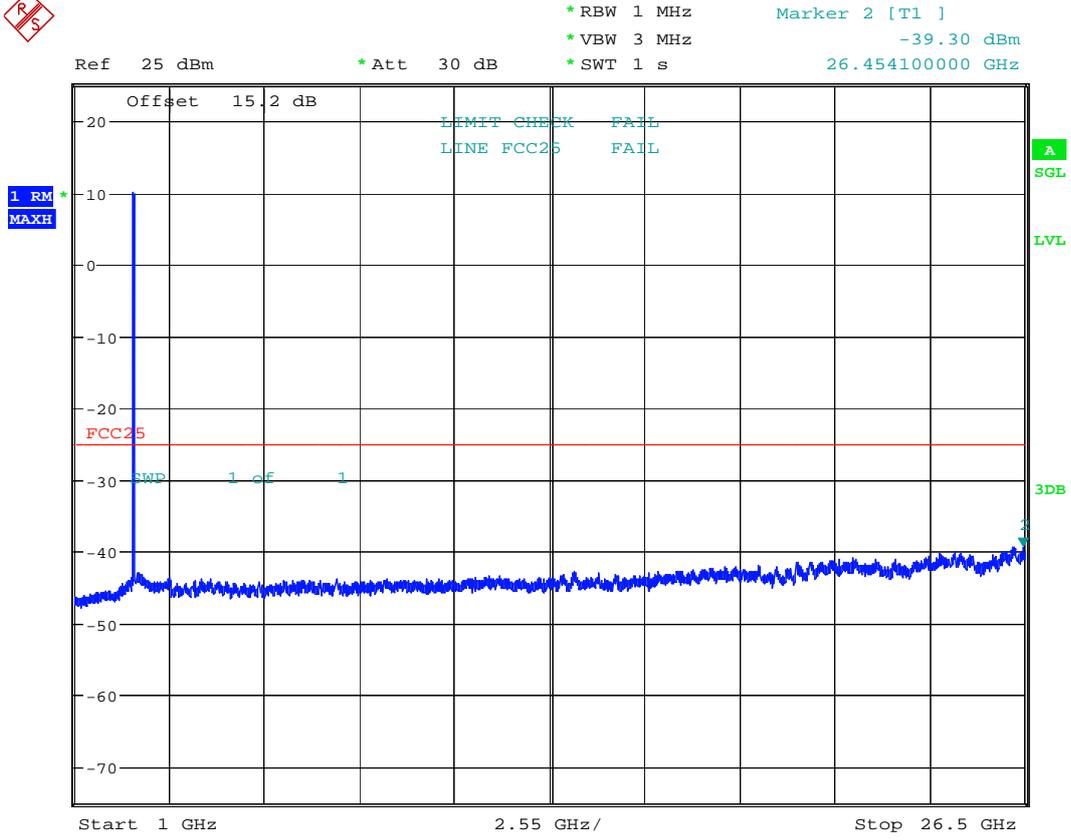
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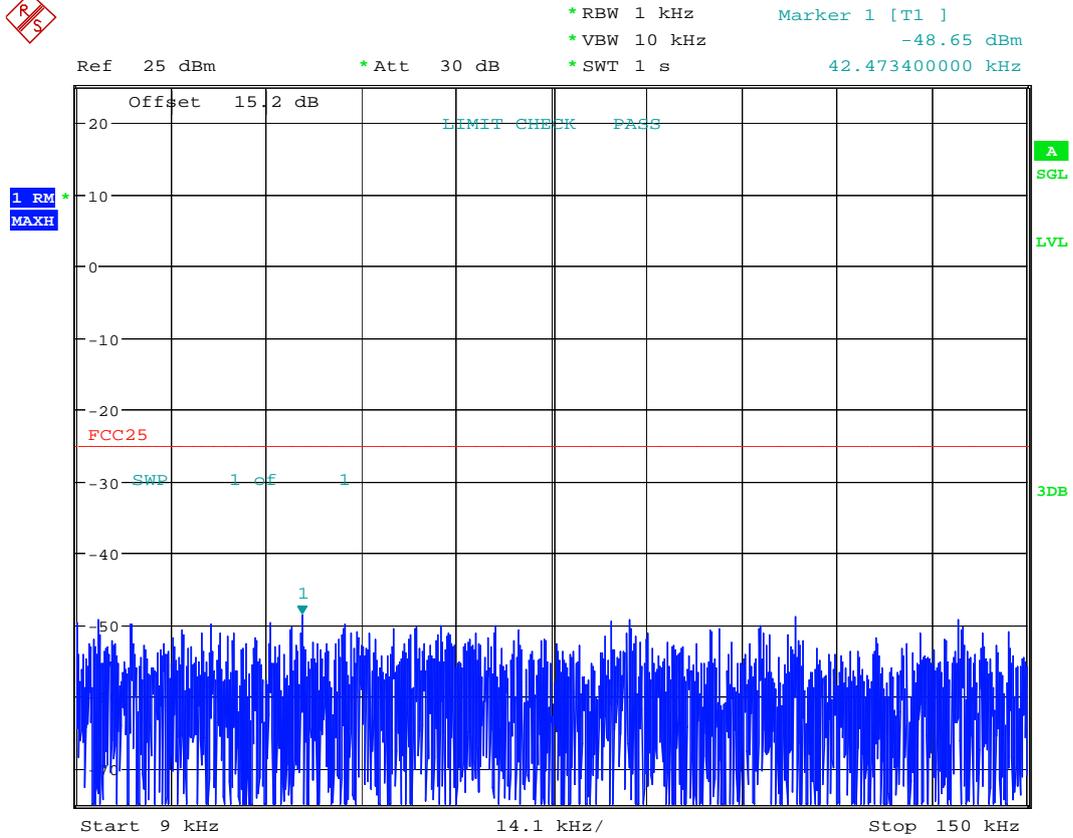


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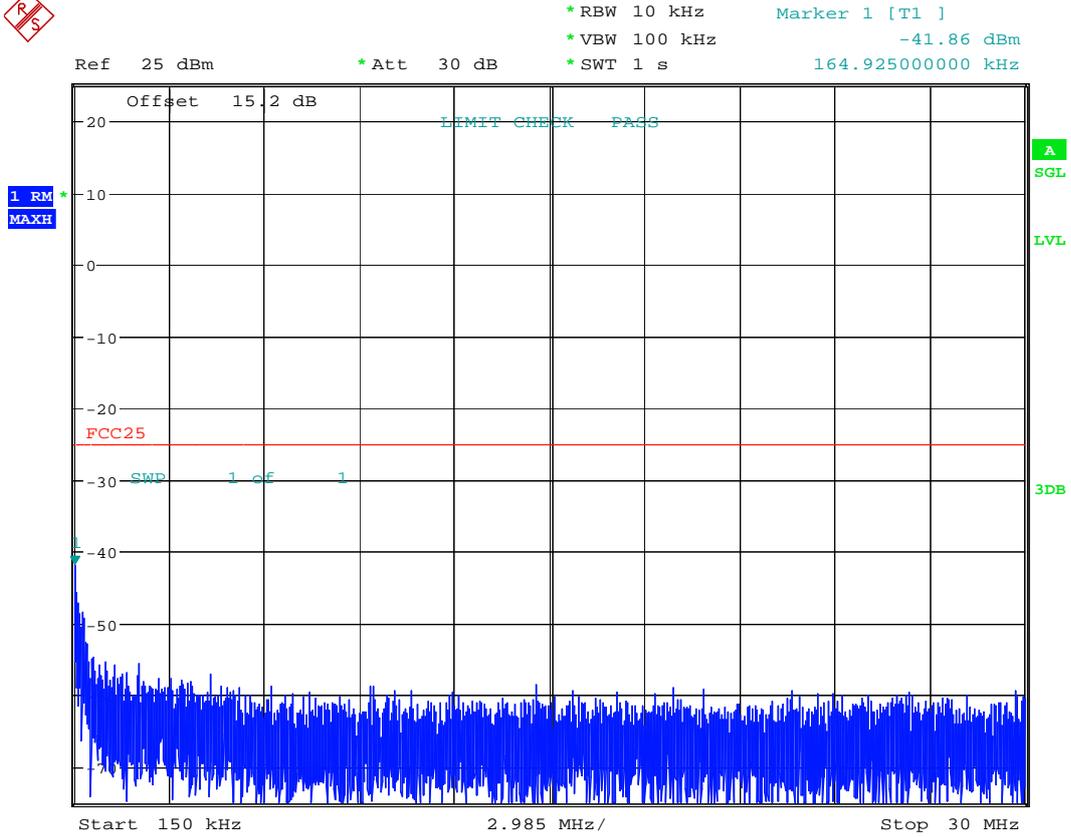


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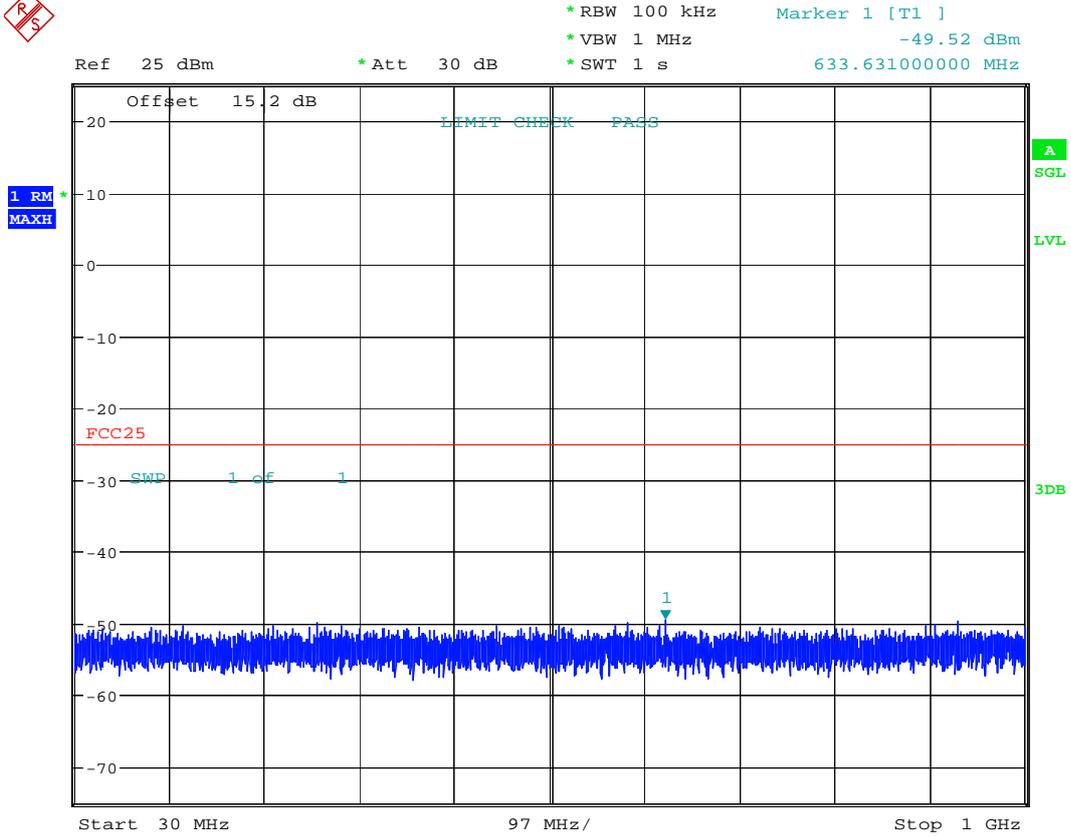
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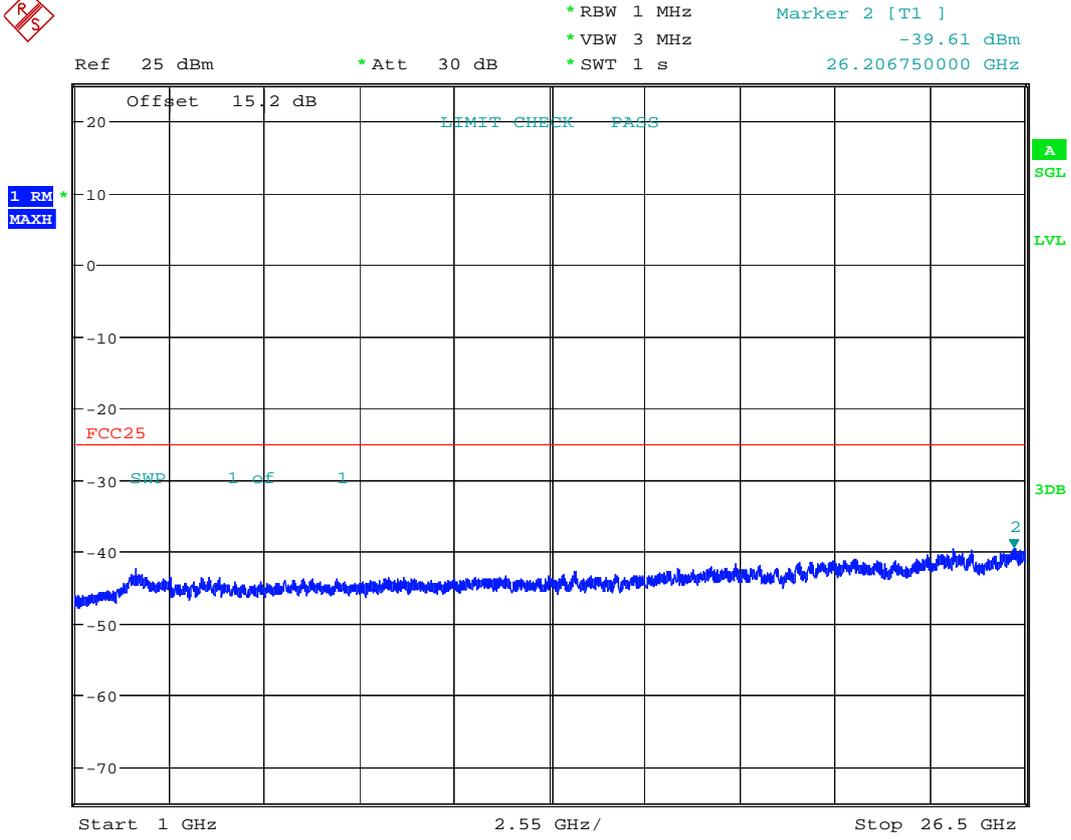
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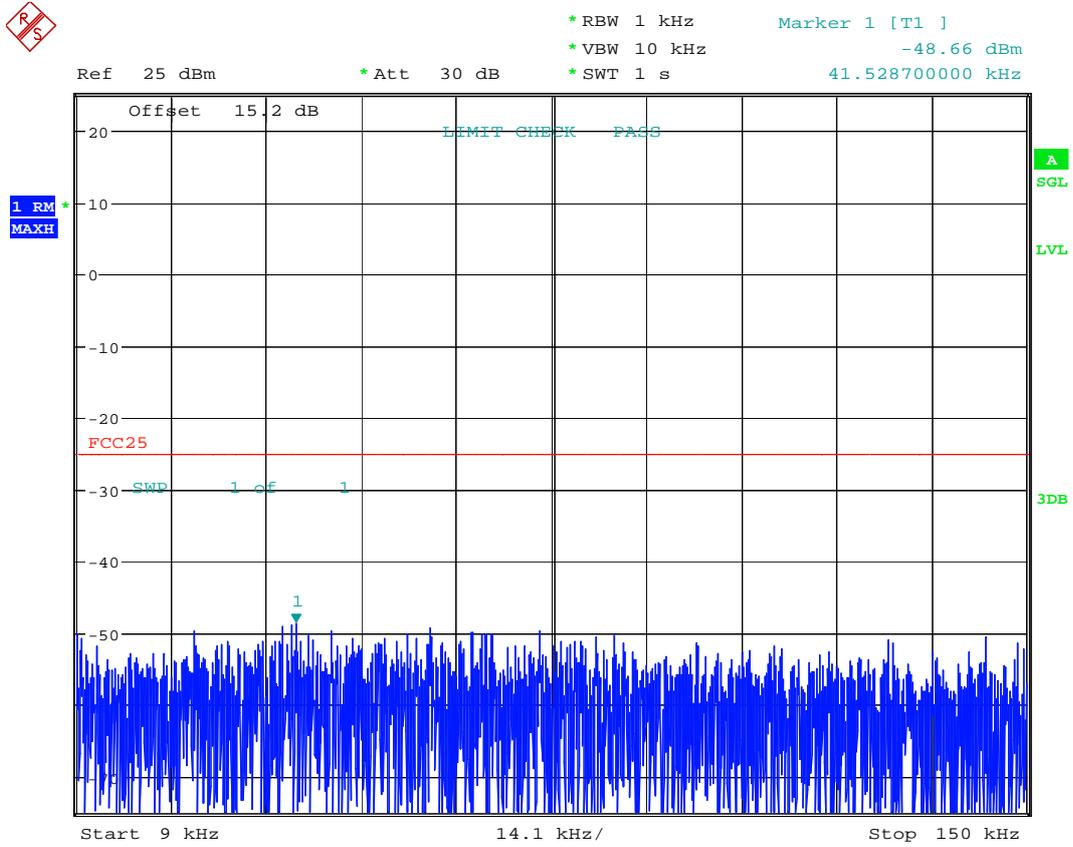
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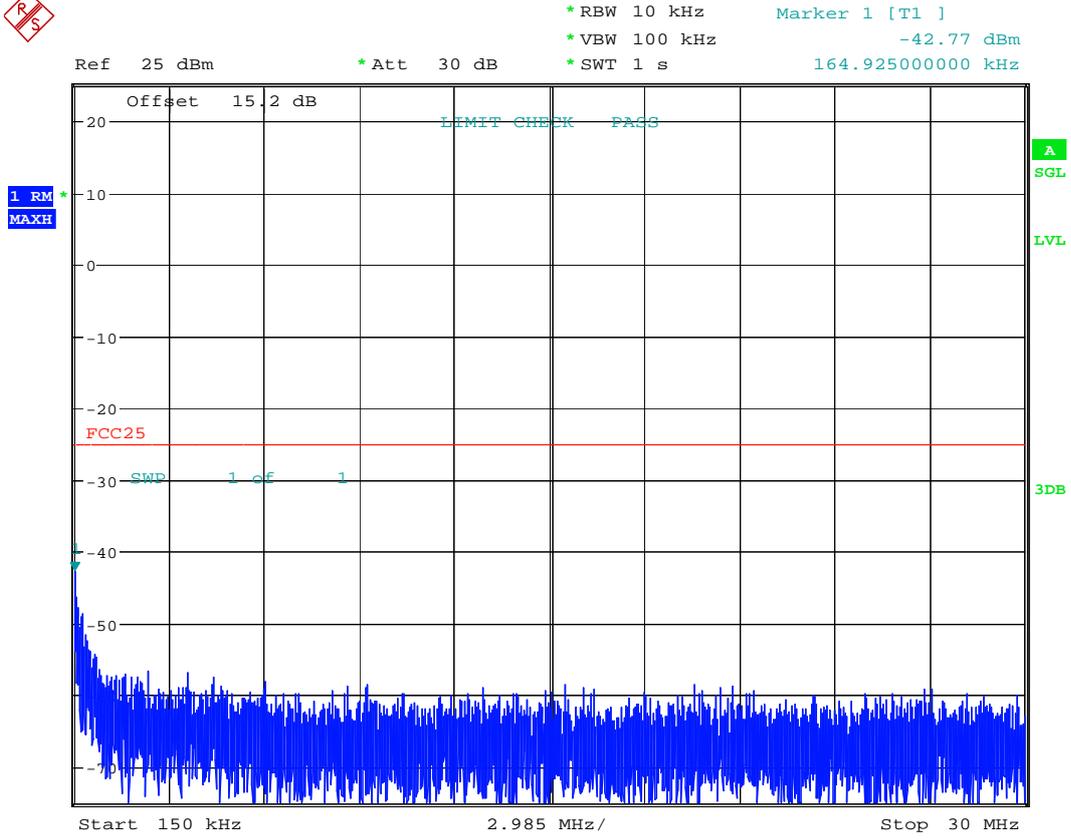
4) TM 4

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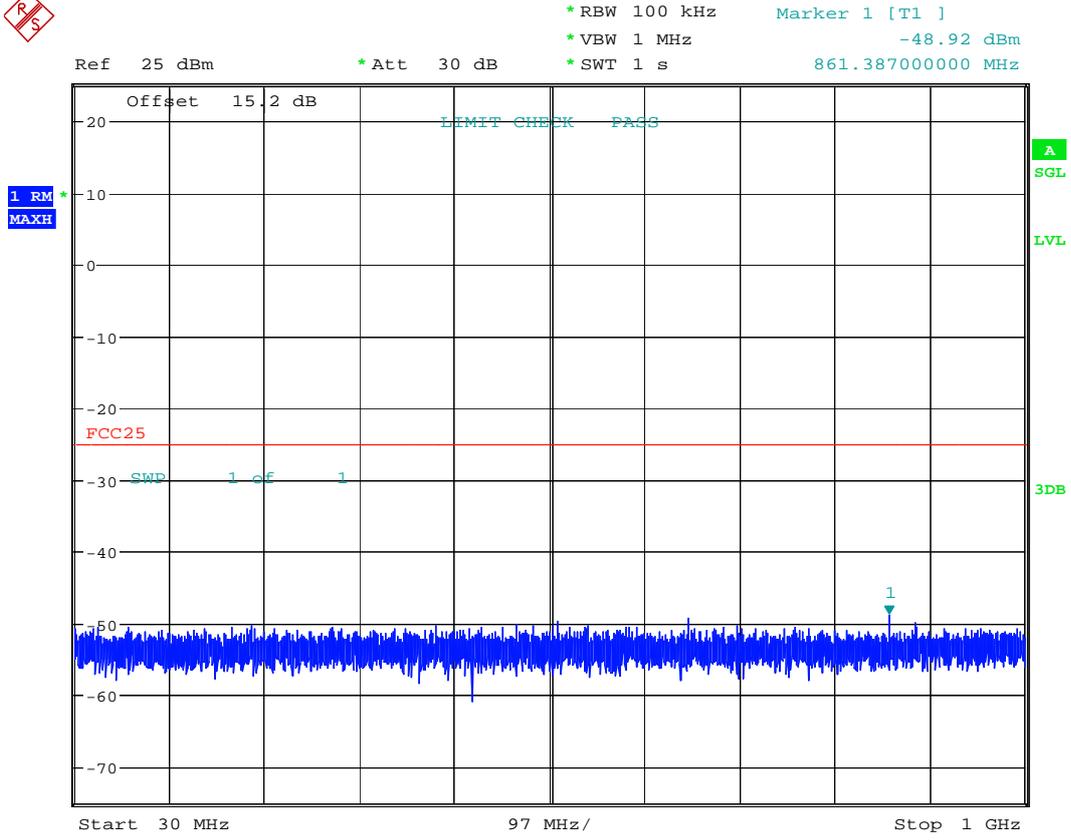
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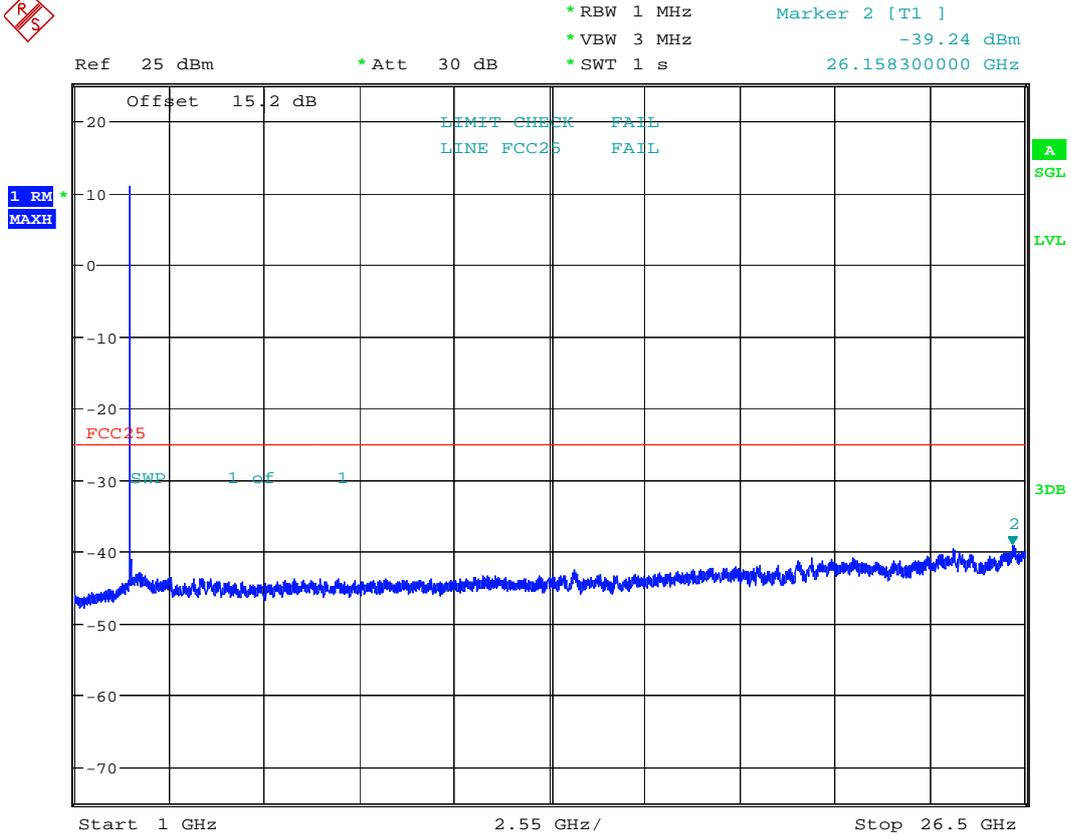
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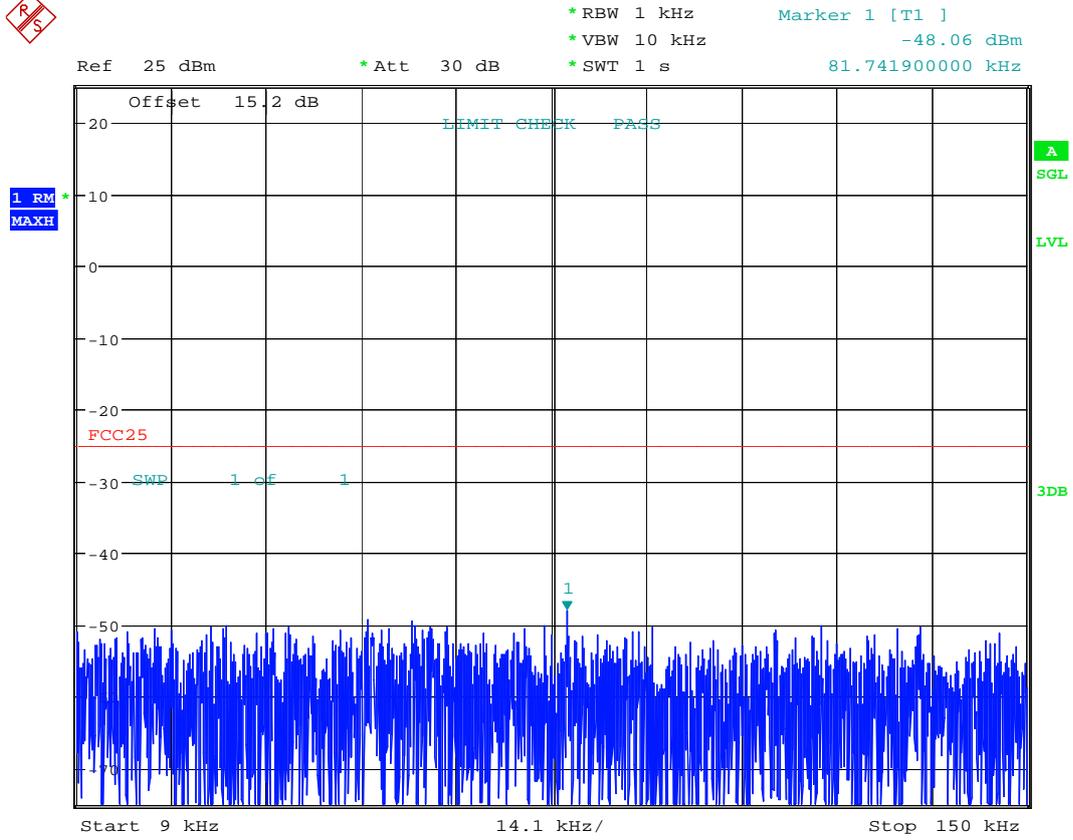


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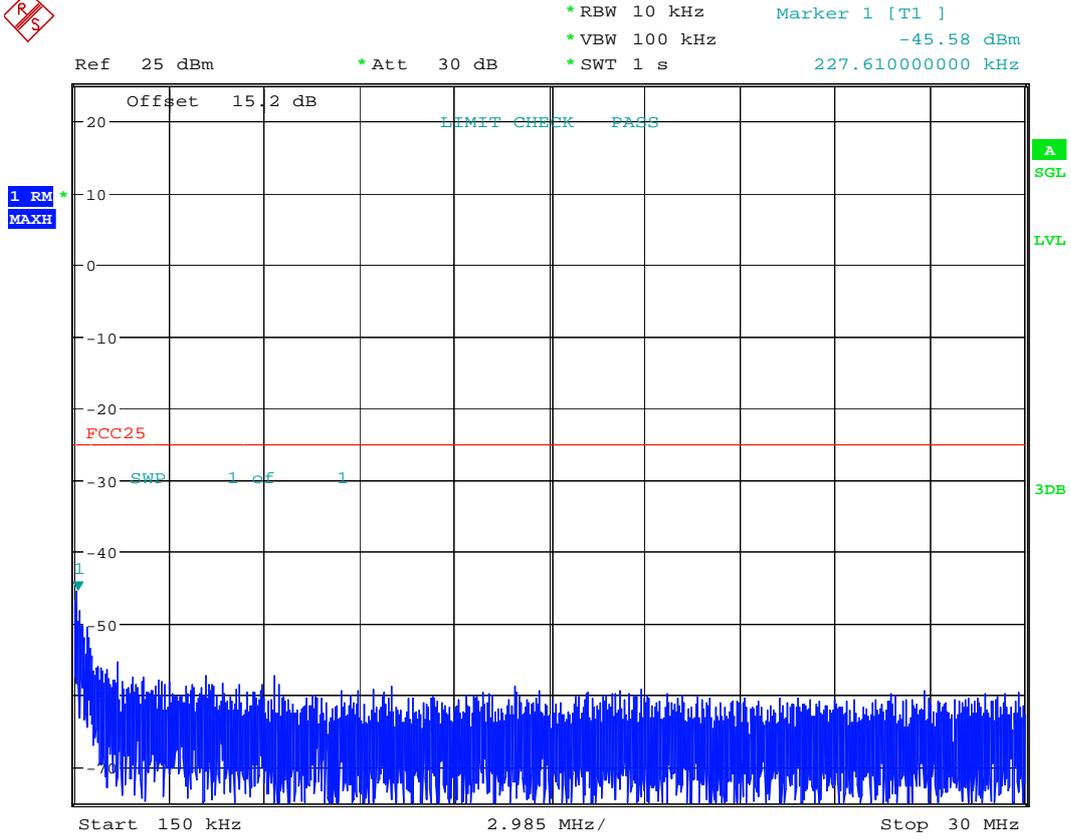


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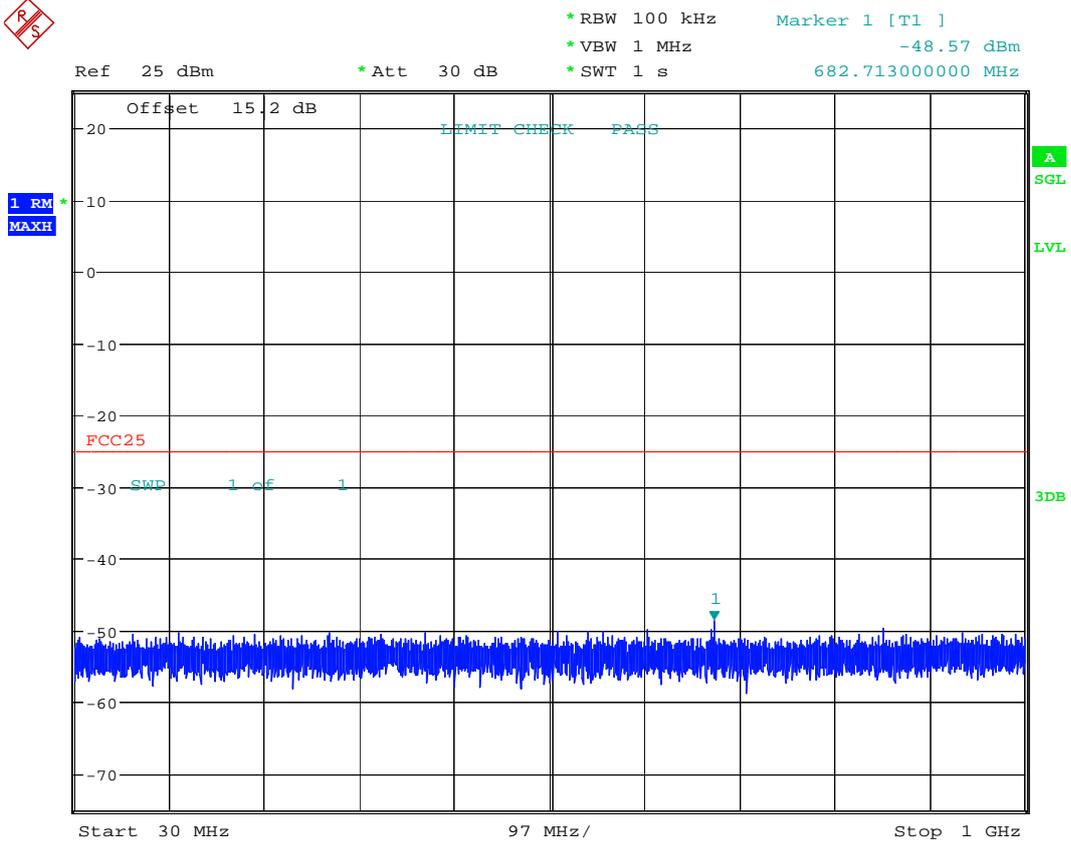
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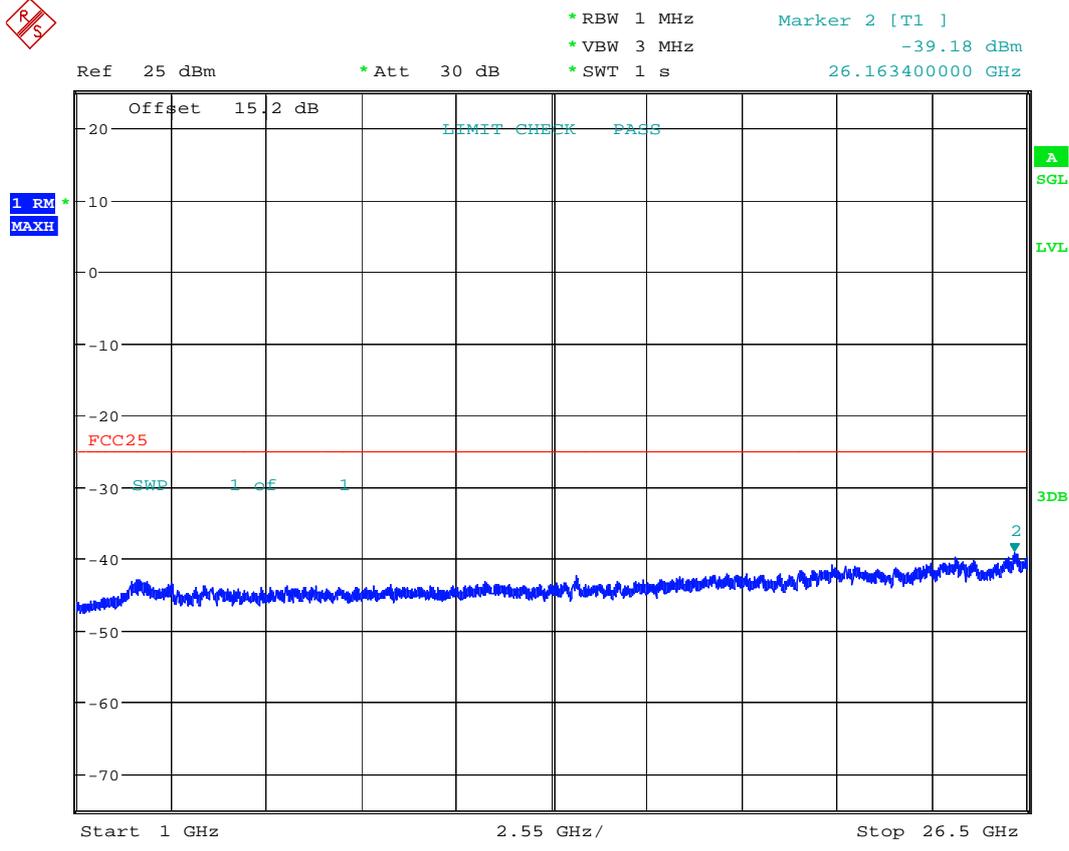
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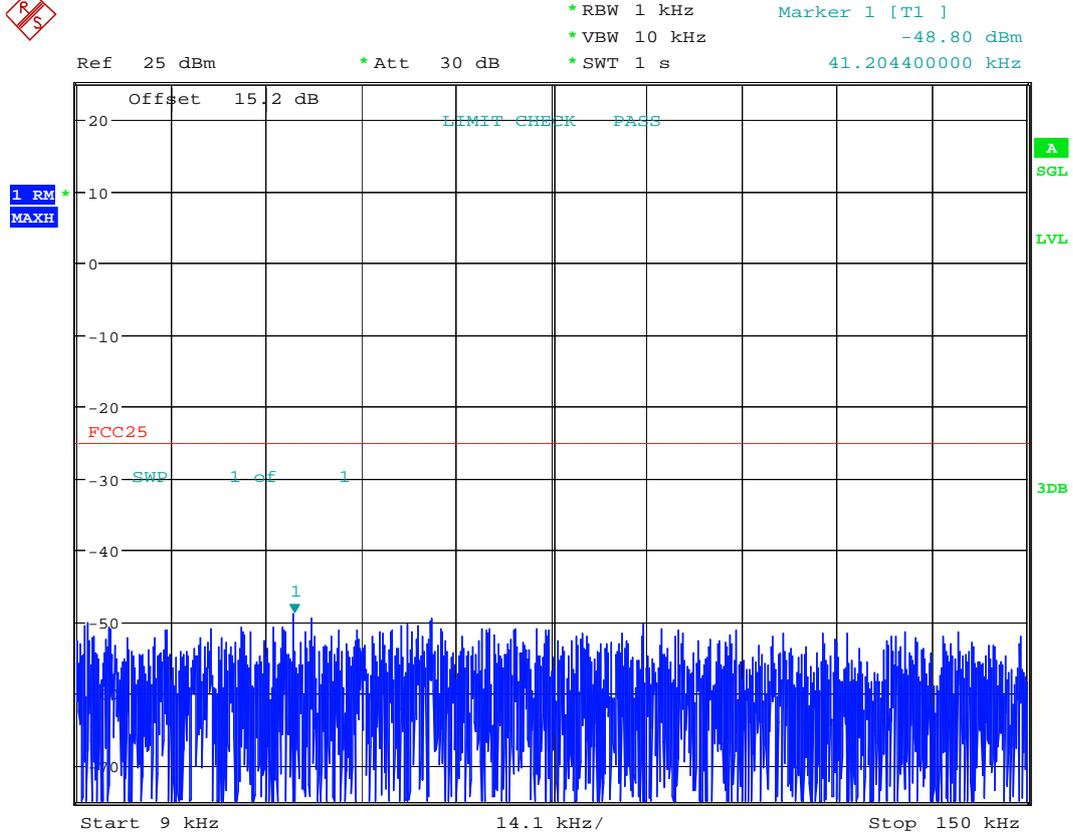


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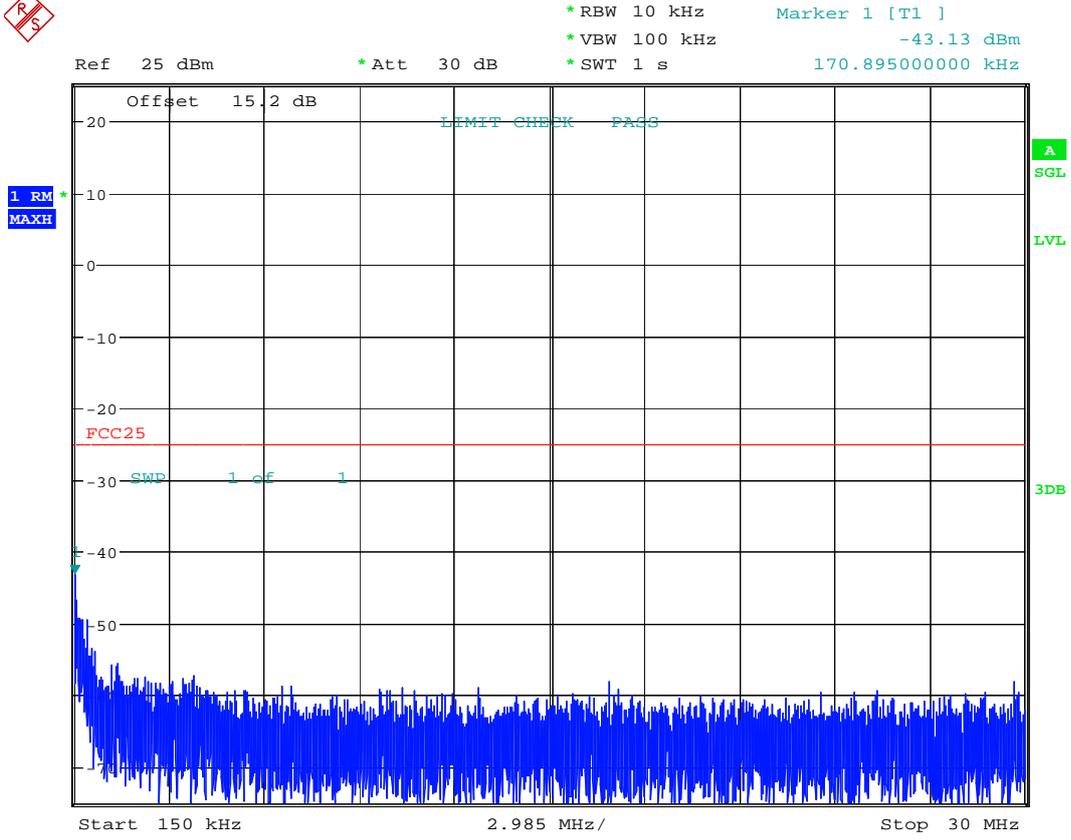


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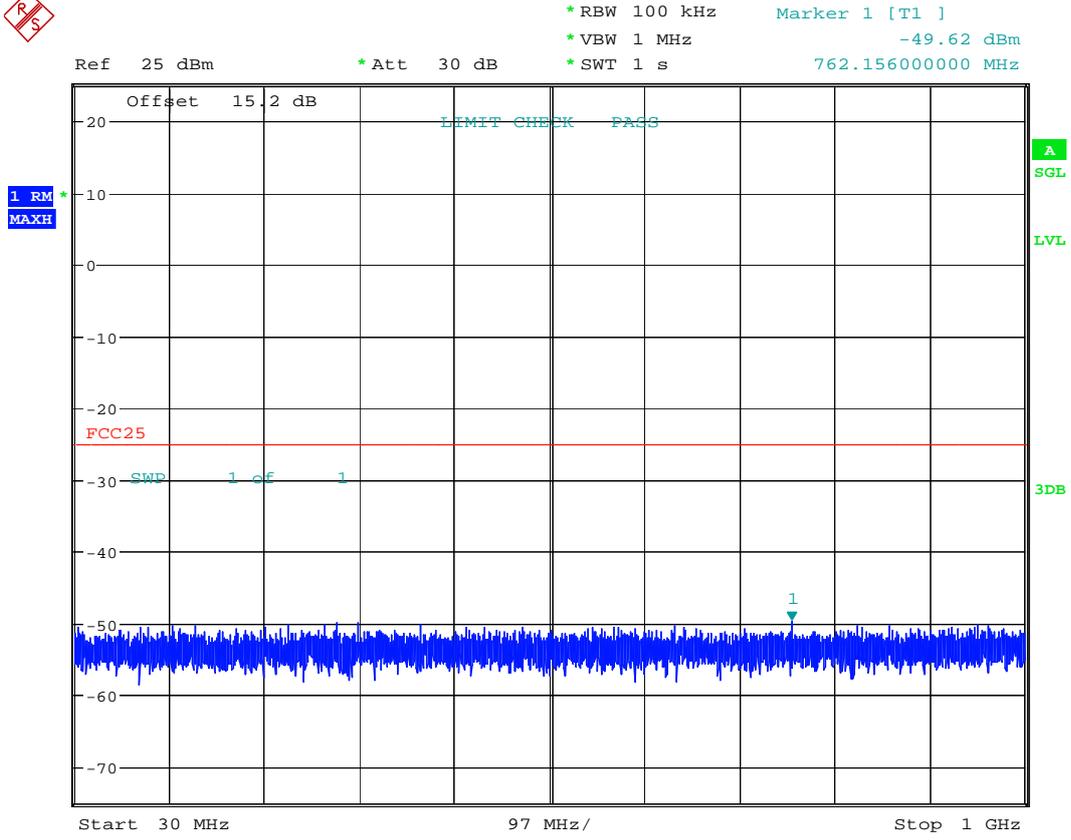
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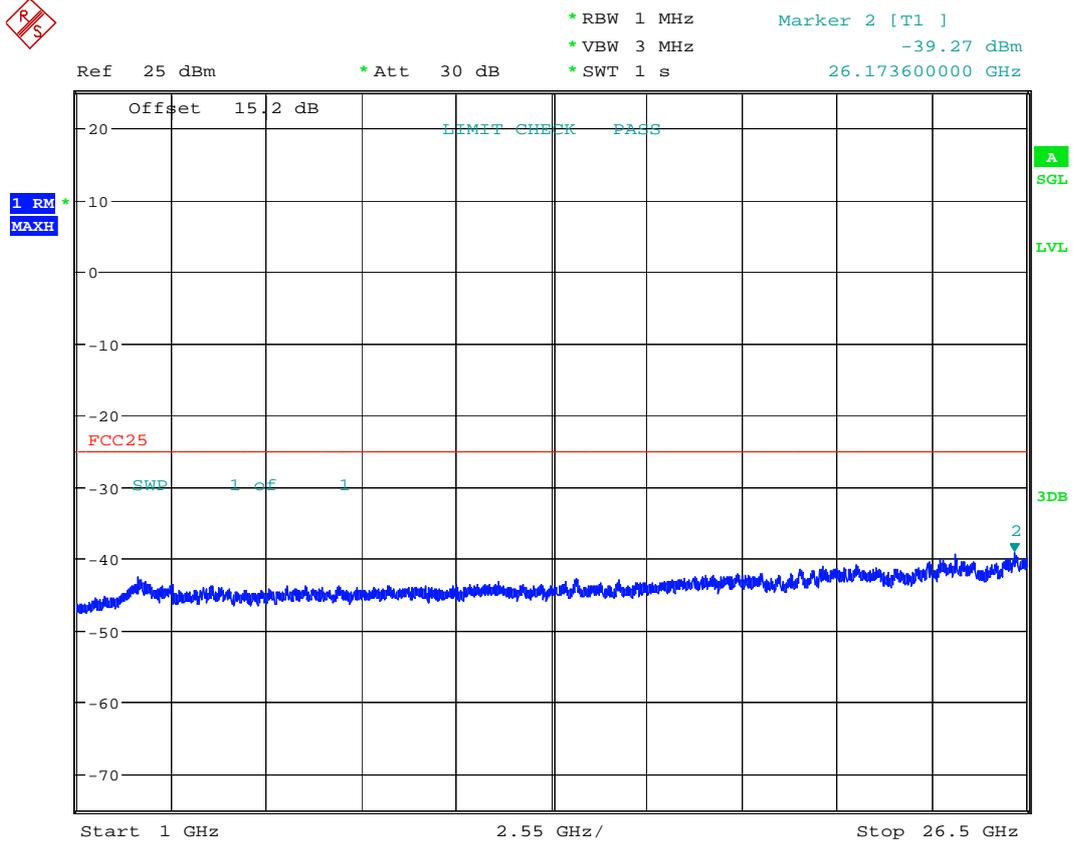
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