Test Report for FCC Equipment Authorization

FCC ID : AB6NT800MFRM2 CDMA Metro Cell 800MHz MFRM2 CH 630

Document:	TR_AB6NT800MFRM2_CH630
Stream:	00
Issue:	01
Document Status:	Approved
Issue Date:	Sept 29, 2003
Security Status:	Nortel Networks Confidential
Author:	Lorne Thompson

Disclaimer

The master of this document is stored on an electronic database and “write protected”. The protection can be altered by authorized persons only. Viewing of the master document electronically ensures access to the current issue. Any hardcopies must be regarded as uncontrolled copies.

Security Warning

The information disclosed herein is proprietary to Nortel Networks and not to be used by or disclosed by unauthorized persons without the written consent of Nortel Networks. The recipient of this document shall respect the security status of the information.

PAGE INTENTIONALLY LEFT BLANK

Table of Contents

Publication History **9**
List of Consultants 9
Decision Maker 9
Decision Ratifier 9
Revision History 10

Acronyms and Abbreviations **11**

1 Introduction **13**
1.1 Required Tests 13

2 Engineering Declaration **14**

3 Equipment Authorization Application Requirements **15**
3.1 Standard Test Conditions and Test Equipment 15
3.2 EUT Identification List 15
3.3 Test Equipment List 16

4 Transmitter Tests **17**
4.1 RF Power Output 17
4.1.1 RF Power Output Requirements 17
4.1.1 FCC Part 2.1046 Measurements required: RF power output 17
4.1.2 Test Method 17
4.1.3 Test Setup 17
4.1.4 Noise Floor 18
4.1.5 Test Results 19
4.2 Certification Requirements 20
4.2.1 Application for certification 20
4.2.1 FCC Part 2.1033 Application for certification. 20
4.2.2 Test Method 20
4.2.3 Test Setup 20
4.2.4 Test Results 20
4.2.5 Occupied Bandwidth Requirements 21
4.2.5 FCC Part 2.1049 21
4.2.6 Test Method 21
4.2.7 Test Setup 21
4.2.8 Test Results. 22
4.2.9 Spurious Emissions Requirements 23
4.2.9 FCC Part 2.1051 23
4.2.9 FCC Part 2.1057 - Frequency Spectrum to be investigated 23
4.2.9 FCC Part 22.917 Limit 23
4.2.10 Test Method 24
4.2.11 Test Requirements 26
4.2.12 Test Setup 26
4.2.13 Test Results 27
4.3 Transmitter Tests (CDMA Mode) 28

4.3 Unwanted Emissions....28
4.3 IC RSS-129....28
4.3.1 Test Method....29
4.3.2 Test Setup....30
4.3.3 Test Results....30

References....33

List of Figures

Figure 1 : Test Setup for RF Power Output Measurement 18
Figure 2 : Test Setup for Occupied Bandwidth Measurement.....22
Figure 3 : Test Setup for Spurious Emissions Measurement.....26
Figure 4 : Test Setup for Spurious Emissions Measurement.....30

List of Tables

Table 1 : Required Tests 13
Table 2 : EUT Identification List....15
Table 3 : Test Equipment List....16
Table 5 : RF Output Power 800 MHz MFRM2 1-Carrier IS95....19
Table 6 : RF Output Power of 800 MHz MFRM2 2-Carrier IS95 19
Table 7 : RF Output Power of 800 MHz MFRM2 3-Carrier IS95 19
Table 8 : Average Current Values @ Pout = 48.45 dBm 20
Table 9 : Occupied Bandwidth (OB) Measurements 800 MHz MFRM2 1-Carrier IS95 22
Table 10 : OB Measurements 800 MHz MFRM2 2-Carrier IS-95....22
Table 11 : OB Measurements 800 MHz MFRM2 3-Carrier IS95....23
Table 13 : All other Emission Spectrum Analyze Settings 25
Table 15 : Spurious Emissions at the 800 MHz MFRM2 Ant. Port 1-Carrier IS95,....27
Table 16 : Spurious Emissions at the 800 MHz MFRM2 Ant. Port 2-Carrier B Band IS95, I 28
Table 18 : Industry Canada Suppression inside cellular band at the 800 MHz MFRM2 Antenna Port IS95, IS-2000 1 Carrier 30
Table 19 : Industry Canada Suppression inside cellular band at the 800 MHz MFRM2 Antenna Port IS95, IS-2000 3 Carrier 32

Publication History

The latest controlled release of this document is located in Livelink at the following location:

http://livelink-ott.ca.nortel.com/livelink/livelink.exe/7251528/FCC_Part_22_Test_report_MFRM-2_AW05_CH630.pdf?func=doc.Fetch&nodeid=7251528

All other soft and hard copies are uncontrolled. It is the responsibility of the reader to ensure that the latest release of this document is being used.

List of Consultants

The following people have reviewed this document prior to its release and have recommended its approval:

Printed Name	Function	Department
Roman Nemish	BTS Systems Advisor	2M20
Lorne Thompson	BTS System Prime	2M22
Thomas Wong	CDMA/TDMA Regulatory Emission Prime	2U40
Mike Claggett	BTS Systems Prime	2M22
Tom Danshin	Manager BTS Systems	2M22

Decision Maker

Ratifier's Name	Signature	Date
Mike Claggett	Mike Claggett	

Decision Ratifier

The release of this document has been reviewed and approved for distribution and use by the following:

Ratifier's Name	Signature	Date
Tom Danshin	Tom Danshin	

Revision History

Stream/Issue	Revision Date	Reason for Change	Author
00/0.1	05/09/2003	Draft release of test Report	Lorne Thompson
00/01	29/09/2003	Release of test Report	Lorne Thompson

Change bars will not be used in this document..

Acronyms and Abbreviations

ASIC	Application Specific Integrated Circuit
BBW	Breathing, Blossoming and Wilting
BPF	Bandpass Filter
BTS	Base Station Transceiver Subsystem
BW	Bandwidth
CDMA	Code Division Multiple Access
CR	Cost Reduced
dBFS	dB relative to Full Scale
DDS	Direct Digital Synthesizer
DPM	Duplexer Preselector Module
EEPROM	Electrically Erasable and Programmable ROM
EC	Engineering Change
ERLCE	Excess Reverse Link Capacity Estimate
HSSPC	High-Speed Serial Protocol Controller
HW	Hardware
IF	Intermediate Frequency
IIC	Inter-Integrated Circuit Bus
IS	Interim Standard
LO	Local Oscillator
LPF	Lowpass Filter
MFRM-2	Multi-Carrier Flexible Radio Module
MTRM	Multi-Carrier Transmitter Receiver Module
NF	Noise Figure
OCNS	Orthogonal Channel Noise Source
OH	OverHead
PA	Power Amplifier
PC	Personal Computer
PPR	Peak Power Reduction
PSA	Product Specification Agreement
RBW	Resolution BandWidth

RF	Radio Frequency
Rx	Receive
SA	Spectrum Analyzer
SFRM	Single Carrier Flexible Radio Module
SW	Software
TBD	To Be Determined
TM	Triplexer Module
TPTL	Transmit Power Tracking Loop
TRM	Transmitter Receiver Module
Tx	Transmit
uP	Microprocessor
XCVR	Transceiver

1 Introduction

This test report is an update to the original MFRM-2 FCC 22 test report. The original test report did not include Channel 630; Channel 630 is both a required and supported channel. This report will be used as an appendix to the current FCC part 22 filing. As an appendix to the current filing this report will only include single carrier and three carrier modes with the following test cases; RFPower Output, Occupied Bandwidth, Spurious Emissions at Antenna Terminals, and Transmitter

This test report is submitted in accordance with the FCC Rules and Regulations, Part 2, Subpart J, Sections 2.1046 through 2.1057 for equipment authorization of Nortel Networks' CDMA 800 MHz Multi carrier Flexible Radio Module 2 (MFRM2).

The 800 MHz MFRM2 is intended for use in the Domestic Public Cellular Radio Telecommunications Service and is designed in accordance with the following standards:

- *CFR 47, Part 22, Subpart H, Cellular Radiotelephone Service [1]*
- *CFR 47, Part 2, Subpart J, Equipment Authorization Procedures - Equipment Authorization[2]*
- *IC RSS-129,Issue 2, 800 MHz Dual-Mode CDMA Cellular Telephones [3]*
- *TIA/EIA-97-D, Recommended Minimum Performance Standards for Base Stations Supporting Dual Mode Spread Spectrum Systems [4]*

1.1 Required Tests

Table 1 summarizes the required tests for the CDMA 800 MHz MFRM.

Table 1 : Required Tests

FCC Measurement Specification	FCC Limit Specification	Description	Test to be Performed?
2.1046	22.913	RF Power Output	Yes
2.1049	22.917	Occupied Bandwidth	Yes
2.1051, 2.1057	22.917	Spurious Emissions at Antenna Terminals	Yes
2.1053, 2.1057	22.917	Field Strength of Spurious Emissions	no[a]
2.1055		Frequency Stability	no

a. Field strength of spurious emissions testing will be performed by Sanmina-SCI Canada, Calgary.

2 Engineering Declaration

The CDMA 800MHz Multi carrier Flexible Radio Module2 has been tested in accordance with the requirements contained in the Federal Communications Commission Rules and Regulations Part 2 and 22.

To the best of my knowledge, these tests were performed in accordance with good engineering practices using measurement procedures consistent with industry or commission standards or previous Commission correspondence or guidance and demonstrate that this equipment complies with the appropriate standards. All tests were conducted on a representative sample of the equipment for which equipment authorization is sought.

Tested by

Lorne Thompson
Systems Designer
Nortel Networks
Calgary, Canada

Signed Sept 29, 2003 Date

Reviewed by

Thomas Wong
CDMA/TDMA
Regulatory Emission Prime
Nortel Networks
Calgary, Canada

Signed Sept 29, 2003 Date

Approved by

Tom Danshin
BTS System Manager
Nortel Networks
Calgary, Canada

Signed October 4, 2003 Date

3 Equipment Authorization Application Requirements

3.1 Standard Test Conditions and Test Equipment

The MFRM2 will be tested under the following standard test conditions unless otherwise noted:

- Ambient Temperature: 20 to 35 degrees C
- Ambient Humidity: 20 to 40%
- DC Supply Voltage: -48 Vdc and +24 Vdc (nominal)
- Input modulation IS-95

3.2 EUT Identification List

Table 2 shows the identification of the components required for testing.

Table 2 : EUT Identification List

Equipment Description	Model / Part Number	Release Number	Serial Number
800 MHz Multi carrier Flexible Radio Module	NTGY30AA	V7	NNTM533GRTCM
800 DPM	NTGS89DB	12	CLWVPP205LRL
800 FAM	NTGS5652	01	NNTM5330NK91
DC Power Cable	NTGS8082	01	N/A
Fiber Cable	NTGY5520	N/A	N/A
DPM Power/Data Cable	NTGS8088	02	N/A
DPM to RX0 Cable	NTGS8017	03	N/A
DPM to RX1 Cable	NTGS8017	03	N/A

3.3 Test Equipment List

Table 3 shows the identification of the test equipment required.

Table 3 : Test Equipment List

Description	Manufacturer	Model	Serial Number	Cal. Due Date
9kHz to 40 GHz Spectrum Analyzer	Rohde&Schwarz	FSEK-30	DE25178	17-MAY-04
RF Power Meter	Agilent	E4419B	US38260722	13-APR-04
RF Power Sensor Head	Agilent	E9300A	US39210469	6 APR 04
30dB Attenuator (>100W)	Pasternack	30DB	PE702L-30dB	n/a
RF Cable 1 24”	Nortel	NTGS8017	n/a	n/a
RF Cable 2 8m Heliax	Nortel	ntmloocy-sf	n/a	n/a

4 Transmitter Tests

4.1 RF Power Output

4.1.1 RF Power Output Requirements

FCC Part 2.1046 Measurements required: RF power output

§(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

4.1.2 Test Method

Setup the DE via the BTS controller to enable the MFRM2 to transmit at maximum power for each of the carrier configurations one, two and three carrier in the Baseband modulation format IS-95. Measurements will be made on channels 548, 589 and 630 with +24Vdc. The RF output power will be measured using the power meter.

4.1.3 Test Setup

The set-up required for the MFRM2 RF output power test is illustrated in Figure 1. RF output power measurements will be referenced to the antenna port of the DPM

4.1.4 Noise Floor

Table 4 lists the noise floor of the measurement system with no signal present. .

Table 4: Spectrum Analyzer Noise floor

Start MHz	stop MHz	dBm/ 100KHz
0.01	400	-43.1
400	1000	-40.42
1000	2000	-38.96
10KHz	1000	-39.99
1000	2000	-39.42
2000	3000	-39.73
3000	4000	-36.0
4000	5000	-37.31
5000	6000	-34.85
6000	7000	-34.97
7000	8000	-30.62
8000	9000	-33.13
9000	10000	-34.47

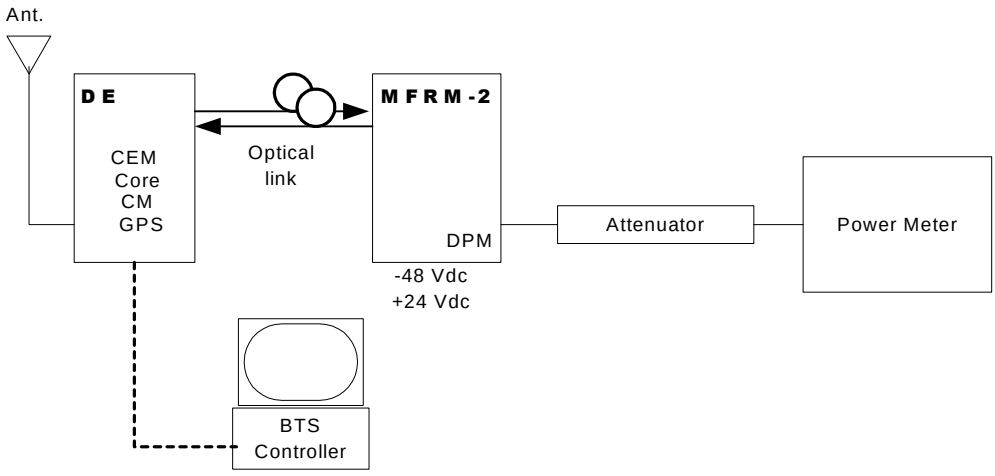


Figure 1 : Test Setup for RF Power Output Measurement

4.1.5 Test Results

Table 5 : RF Output Power 800 MHz MFRM2 1-Carrier IS95

Channel Number (Band)	Frequency (MHz)	Measured RF Output Power (dBm)	Maximum Rated Power (dBm)
630 (B)	888.9	47.3	47.3

Table 6 : RF Output Power of 800 MHz MFRM2 2-Carrier IS95

Channel Number (Band)	Frequencies (MHz)	Measured RF Output Power (dBm)	Maximum Rated Power (dBm)
589, 630 (A)	887.67 888.9	47.2	47.3

Table 7 : RF Output Power of 800 MHz MFRM2 3-Carrier IS95

Channel Number (Band)	Frequency of middle channel (MHz)	Measured RF Output Power (dBm)	Maximum Rated Power (dBm)
548, 589, 630 (B)	886.44, 887.67, 888.90	47.32	47.3

4.2 Certification Requirements

4.2.1 Application for certification

FCC Part 2.1033 Application for certification.

(c) Applications for equipment other than that operating under parts 15 and 18 of the rules shall be accompanied by a technical report containing the following information:

(8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

4.2.2 Test Method

This information required for this section is available from:

Title: CDMA BTS Development, MFRM-2 800 MHz Power Amplifier Assembly Beta Cycle Verification Report
Dataset Name: NTGY37AA
Document Status: Ratified
Stream: 02 Issue: 02
Issue Date: March 12, 2003
Document Prime: Neil Claxton, 2M23

4.2.3 Test Setup

See above document

4.2.4 Test Results

The final amplifying dc voltage is 27.02 Vdc. The final dc current is

Table 8 : Average Current Values @ Pout = 48.45 dBm

Average Current Values @ Pout = 48.5 dBm				
	22.5°C			
	Q4	Q5	Q6	Q7
Mean	3.63	4.03	3.82	3.92

4.2.5 Occupied Bandwidth Requirements

FCC Part 2.1049

The OBW, 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 under the following conditions as applicable:

(g) Transmitter in which the modulating baseband comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

4.2.6 Test Method

Setup the DE via the BTS controller to enable the MFRM2 to transmit at maximum power for one and three carrier using the IS-95 Baseband modulation format. Measurements will be made on channels at the bottom and top of each of the duplexer bands.

A reference level is established by first using a resolution bandwidth that exceeds the signal bandwidth. RBW is then set to 1% of the estimated emission bandwidth and the video bandwidth is set to 3 times the resolution bandwidth. The markers are now moved to the -20 dB points (from the previously established reference level) on either side of centre frequency.

4.2.7 Test Setup

The set-up required for the MFRM2 Occupied bandwidth test is illustrated in Figure 2.

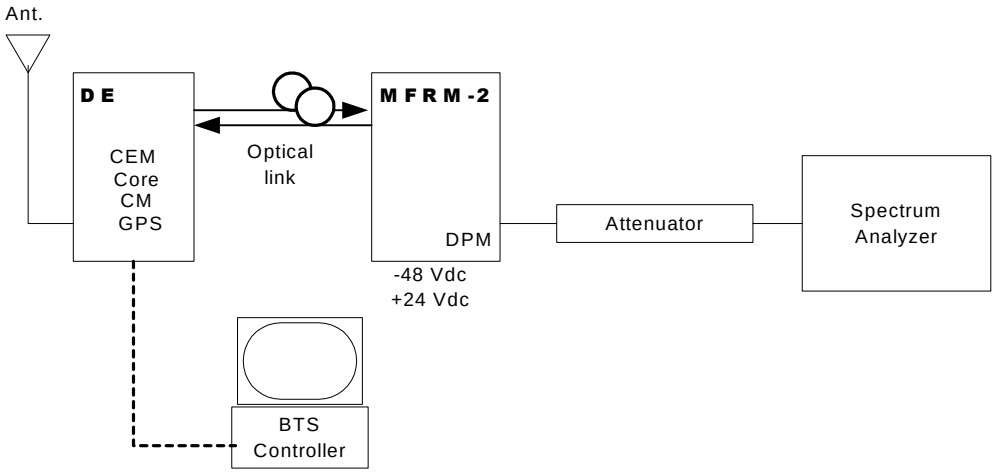


Figure 2 : Test Setup for Occupied Bandwidth Measurement

4.2.8 Test Results.

Table 9 : Occupied Bandwidth (OB) Measurements 800 MHz MFRM2 1-Carrier IS95

Channel Number (Band)	Frequency (MHz)	Measured Occupied Bandwidth (MHz) (1-Carrier)
630 (B)	888.9	1.2985

Table 10 : OB Measurements 800 MHz MFRM2 2-Carrier IS-95

Channel Number (Band)	Frequencies (MHz)	Measured Occupied Bandwidth (MHz) (2-Carrier)
589, 630 (A)	887.67 888.9	2.4549

Spurious Emissions at Antenna Terminals

Table 11 : OB Measurements 800 MHz MFRM2 3-Carrier IS95

Channel Number (Band)	Frequency of Middle Channel (MHz)	Measured Occupied Bandwidth (MHz) (3-Carrier)
548, 589, 630 (B)	886.44, 887.67, 888.90	3.679

4.2.9 Spurious Emissions Requirements

FCC Part 2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

FCC Part 2.1057 - Frequency Spectrum to be investigated

The spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC Part 22.917 Limit

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier

center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

Interference caused by out of band emissions. If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section

4.2.10 Test Method

Configure the BTS digital enclosure via the BTS controller to enable the MFRM2 to transmit at maximum power for each of the carrier configurations one and three carrier in the IS-95 Baseband modulation format. Measurements will be made on channels at the bottom and top of the duplexer. The following spectrum analyzer settings are to be used for the measurement of the antenna port (DPM) spurious emissions:

Adjacent 1MHz to indicated cellular band (Upper and Lower)

Table 12: Adjacent 1MHZ Spectrum Analyze Settings

Setting	1 Carrier	3 Carrier
Resolution Bandwidth[a]:	12.5 kHz	37.5 kHz
Video Bandwidth (3x RBW)[b]	37.5 kHz	112.5 kHz
Video Average	10 Averages	10 Averages
Span	Set accordingly	Set accordingly
Detector	RMS	RMS
Attenuation[c]	30 dB	30 dB
Ref. Level	35 dBm	35 dBm
Ref. Level Offset	31-34 dB	31-34 dB

a. If the spectrum analyze cannot be set to the specified RBW the next highest RBW should be used and all measurements corrected to the specified RBW
b. If the spectrum analyze cannot be set to the specified Video Bandwidth the next highest Video Bandwidth should be used.

c. The lowest value of attenuator should be used to improve measurement accuracy, without overdriving the Spectrum Analyzer.

All spectrum analyzer settings were coupled as per the manufacturers recommendations to improve measurement time, without compromising data.

All other Spurious Emissions up to 10 GHz

Table 13 : All other Emission Spectrum Analyze Settings

Setting	1 Carrier	3 Carrier
Resolution Bandwidth	100 kHz	100 kHz
Video Bandwidth (3x RBW)	300 kHz	300 kHz
Video Average	10 Averages	10 Averages
Span	Set accordingly	Set accordingly
Detector	RMS	RMS
Attenuation[a]	30 dB	30 dB
Ref. Level	35 dBm	35 dBm
Ref. Level Offset	31-34 dB	31-34 dB

a. The lowest value of attenuator should be used to improve measurement accuracy, without overdriving the Spectrum Analyzer.

The emissions will be investigated up to 10 GHz (the 10^{th} harmonic of the fundamental emission) for all carrier configurations (1, 2, 3) as per FCC Part 22.

4.2.11 Test Requirements

.

Table 14: Spurious Emissions Requirements

Frequency Offset	1 Carrier	3 Carrier
+/- 1.1 MHz	-13 dBm/12.5KHz	-13 dBm/37.5 KHz
+/- 2.1 MHz	-13dBm/100 KHz	-13dBm/100 KHz

4.2.12 Test Setup

The set-up required for the MFRM2 Antenna Port (DPM) Spurious Emission test is illustrated in Figure 3. An optional filter may be used to improve the accuracy of the measurements far away from the cellular band (greater than 100 MHz). If a filter is used it must be clearly stated in the test results, and the frequency response of the filter must also be recorded, and presented in the results data.

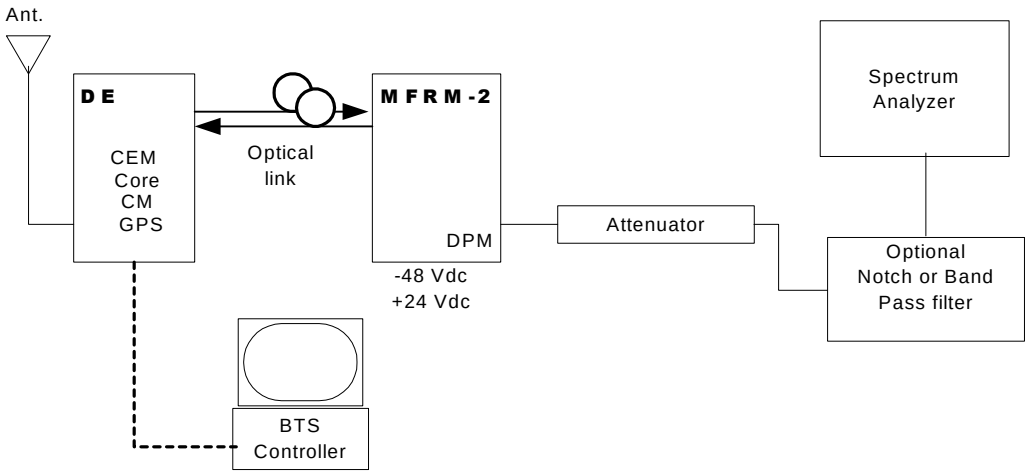


Figure 3 : Test Setup for Spurious Emissions Measurement

4.2.13 Test Results

Note: Refer to Table 4 for Spectrum Analyzer Noise floor

Table 15 : Spurious Emissions at the 800 MHz MFRM2 Ant. Port 1- Carrier IS95,

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
	1 Carrier IS-95	1 Carrier
890 (Upper edge of Band B) Ch 630 (RBW-30kHz)	-21.00	8.00
0-1000 (RBW=100KHz)	-33.31	20.31
1000-2000 (RBW=100KHz)	-36.00	23.00
2000-3000 (RBW=100KHz)	-33.00	20.00
3000-4000 (RBW=100KHz)	-35.00	22.00
4000-5000 (RBW=100KHz)	-34.00	21.00
5000-6000 (RBW=100KHz)	-31.00	18.00
6000-7000 (RBW=100KHz)	-29.00	16.00
7000-8000 (RBW=100KHz)	-29.50	16.50
8000-9000 (RBW=100KHz)	-29.90	16.90
9000-10000 (RBW=100KHz)	-30.50	17.50

Table 16 : Spurious Emissions at the 800 MHz MFRM2 Ant. Port 2-Carrier B Band IS95, I

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to FCC Limit of -13 dBm (dB)
	3 Carrier IS-95	3 Carrier
890 (upper edge of band B) Ch548, 589, 630 RBW=37.5kHz	-22.00	9.00
0-1000 (RBW=100KHz)	-31.42	18.42
1000-2000 (RBW=100KHz)	-34.00	21.00
2000-3000 (RBW=100KHz)	-34.00	21.00
3000-4000 (RBW=100KHz)	-33.00	20.00
4000-5000 (RBW=100KHz)	-33.25	20.25
5000-6000 (RBW=100KHz)	-32.00	19.00
6000-7000 (RBW=100KHz)	-29.00	16.00
7000-8000 (RBW=100KHz)	-30.00	17.00
8000-9000 (RBW=100KHz)	-30.00	17.00
9000-10000 (RBW=100KHz)	-30.00	17.00

IS

4.3 Transmitter Tests (CDMA Mode)

Unwanted Emissions

Unwanted emissions are emissions on a frequency or frequencies outside the necessary bandwidth which result from the modulation process, from spurious emissions and harmonics.

IC RSS-129

(1) Suppression inside cellular band: For all base station transmit frequencies allocated to the same operator system, the total spurious emissions in any 30 kHz band shall be attenuated below the mean output power level in accordance with the following schedule:

(a) for all offset frequencies greater than 750 kHz from the CDMA centre frequency, at least 45 dB. 800 MHz Dual-Mode CDMA Cellular Telephones RSS-129.

(b) for all offset frequencies greater than 1.98 MHz from the CDMA centre frequency, at least 60 dB.

(c) for all offset frequencies not allocated to the same operator system, at least 60 dB or -13 dBm, whichever is less stringent.

(2) In any 30 kHz outside the cellular band, the attenuation shall be at least 43+10 Log10 (mean output power in watts) or 70, dB, whichever is the less stringent.

4.3.1 Test Method

Configure the BTS digital enclosure via the BTS controller to enable the MFRM2 to transmit at maximum power for each of the carrier configurations one and three carrier in each IS-95 Base-band modulation format. Measurements will be made on channels at the bottom and top of the duplexer. The following spectrum analyzer settings are to be used for the measurement of the antenna port (DPM) spurious emissions:

Adjacent 1MHz to indicated cellular band (Upper and Lower)

Table 17: Adjacent 750 KHz and 1.98 MHZ Spectrum Analyze Settings

Setting	1 Carrier	3 Carrier
Resolution Bandwidth[a]:	30 kHz	30 kHz
Video Bandwidth (3x RBW)	100 kHz	100 kHz
Video Average	10 Averages	10 Averages
Span	Set accordingly	Set accordingly
Detector	RMS	RMS
Attenuation	30 dB	30 dB
Ref. Level	35 dBm	35 dBm
Ref. Level Offset	31-34 dB	31-34 dB

a. If the spectrum analyze can not be set to the specified RBW the next highest RBW should be used and all measurements corrected to the specified RBW

All spectrum analyzer settings were coupled as per the manufacturers recommendations to

improve measurement time, without compromising data.

4.3.2 Test Setup

The set-up required for the MFRM2 Antenna Port (DPM) Spurious Emission test is illustrated in Figure 3. An optional filter may be used to improve the measurement set-up. If a filter is used it must be clearly stated in the test results, and the frequency response of the filter must also be recorded and presented in the results data.

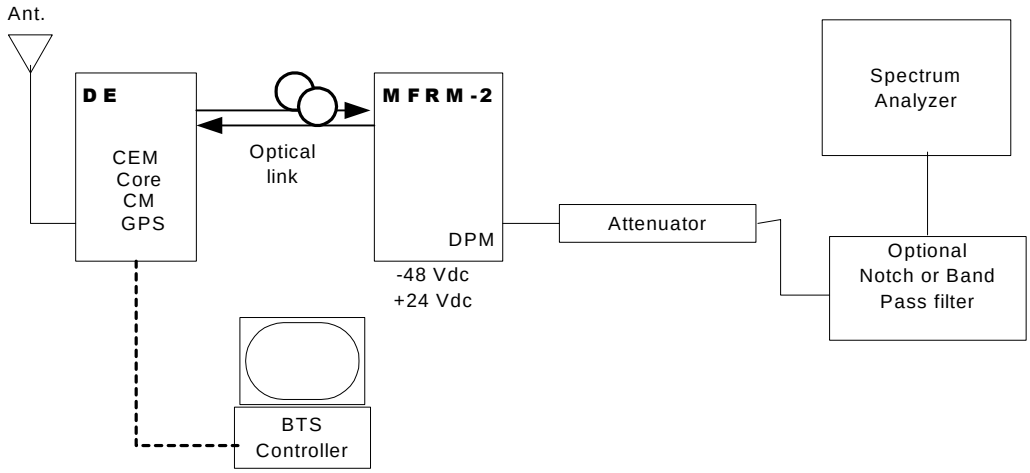


Figure 4 : Test Setup for Spurious Emissions Measurement

4.3.3 Test Results

Table 18 : Industry Canada Suppression inside cellular band at the 800 MHz MFRM2 Antenna Port IS95, IS-2000 1 Carrier

Frequency (MHz)	Spurious Emissions Level (dBm)	Margin to IC Limit of 45 dBc/ 30KHz (dB)
	1Carrier IS-95	1Carrier
Ch4 750KHz offset at lower band edge	-25.66	27.96

Table 18 : Industry Canada Suppression inside cellular band at the 800 MHz MFRM2 Antenna Port IS95, IS-2000 1 Carrier

Frequency (MHz)	**Spurious Emissions Level (dBm)**	**Margin to IC Limit of 45 dBc/ 30KHz (dB)**
	1Carrier IS-95	1Carrier
Ch4 750KHz offset at upper band edge	-28.57	30.87
		Margin to IC Limit of 60 dBc/ 30KHz (dB)
Ch4 1.98MHz offset at lower band edge	-40.2	27.5
Ch4 1.98MHz offset at upper band edge	-38.8	26.1

Table 19 : Industry Canada Suppression inside cellular band at the 800 MHz MFRM2 Antenna Port IS95, IS-2000 3 Carrier

Frequency (MHz)	**Spurious Emissions Level (dBm)**		**Margin to IC Limit of 45 dBc/ 30KHz (dB)**
	3Carrier IS-95	3Carrier IS2000 (16 times)	1Carrier
Ch548, 589, 630 750KHz offset at lower band edge	-27.3	-23.9	29.6
Ch548, 589, 630 750KHz offset at upper band edge	-16.7	-21.0	19.0
			Margin to IC Limit of 60 dBc/ 30KHz (dB)
Ch548, 589, 630 1.98MHz offset at lower band edge	-36.3	-27.5	23.6
Ch548, 589, 630 1.98MHz offset at upper band edge	-29.8	-36.5	17.1

References

[1] FCC Part 22 Subpart H, “Public Mobile Services”, http://www.access.gpo.gov/nara/cfr/waisidx_01/47cfr22_01.html

[2] FCC Part 2 Subpart J, “Frequency allocations and radio treaty matters; general rules and regulations”, http://www.access.gpo.gov/nara/cfr/waisidx_01/47cfr2_01.html

[3] Industry Canada RSS-129, “800 MHz Dual-Mode CDMA Cellular Telephones”, http://strategis.ic.gc.ca/SSG/sf01324e.html

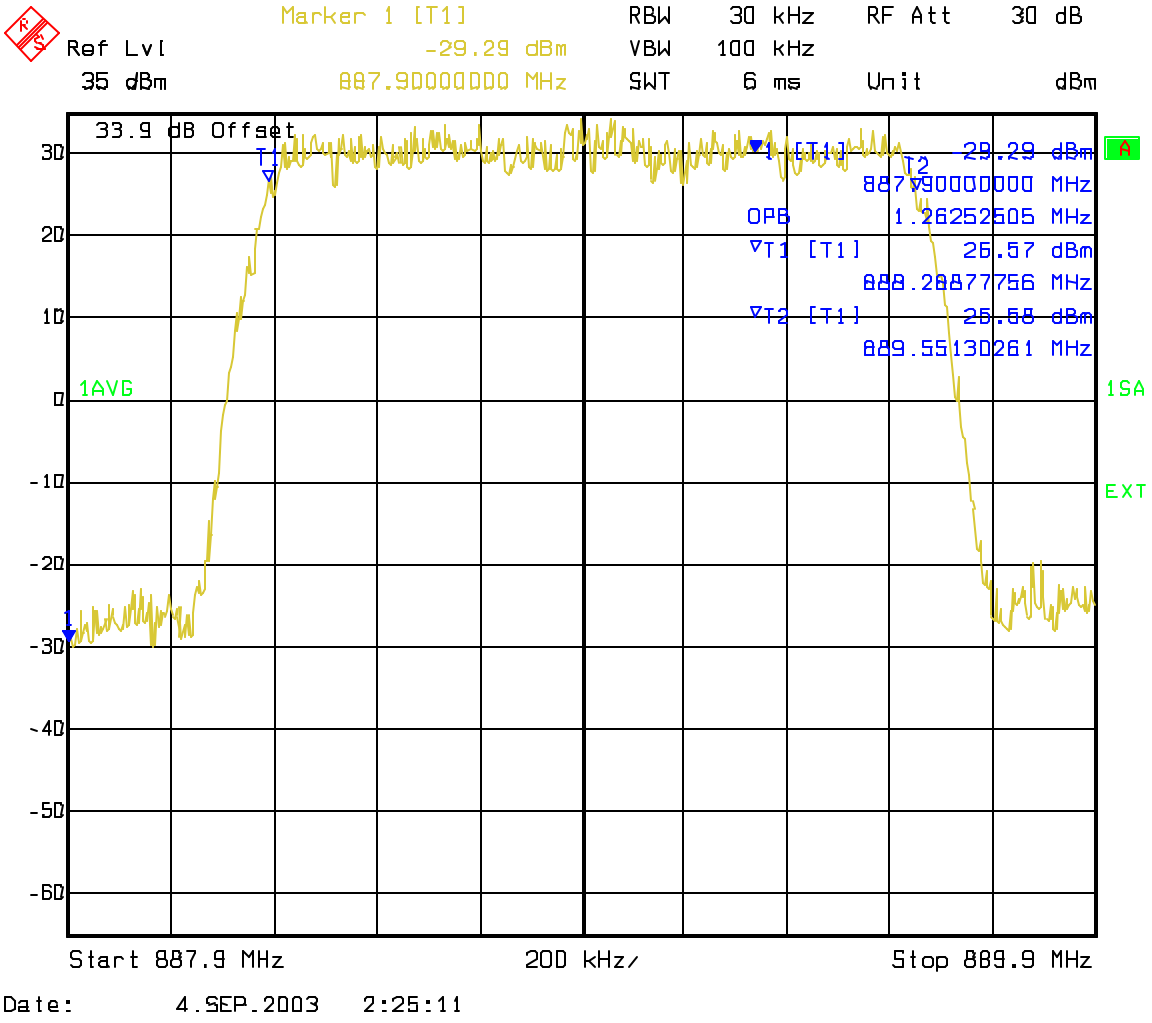
[4] TIA/EIA-97-D “Recommended Minimum Performance Standards for Base Stations Supporting Dual Mode Spread Spectrum Systems”, June 2001

[5] Industry Canada “Information on the 99% Bandwidth measurement” Author Brain Kasper. http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/vwapj/occupied-bandwidth.pdf/$FILE/occupied-bandwidth.pdf

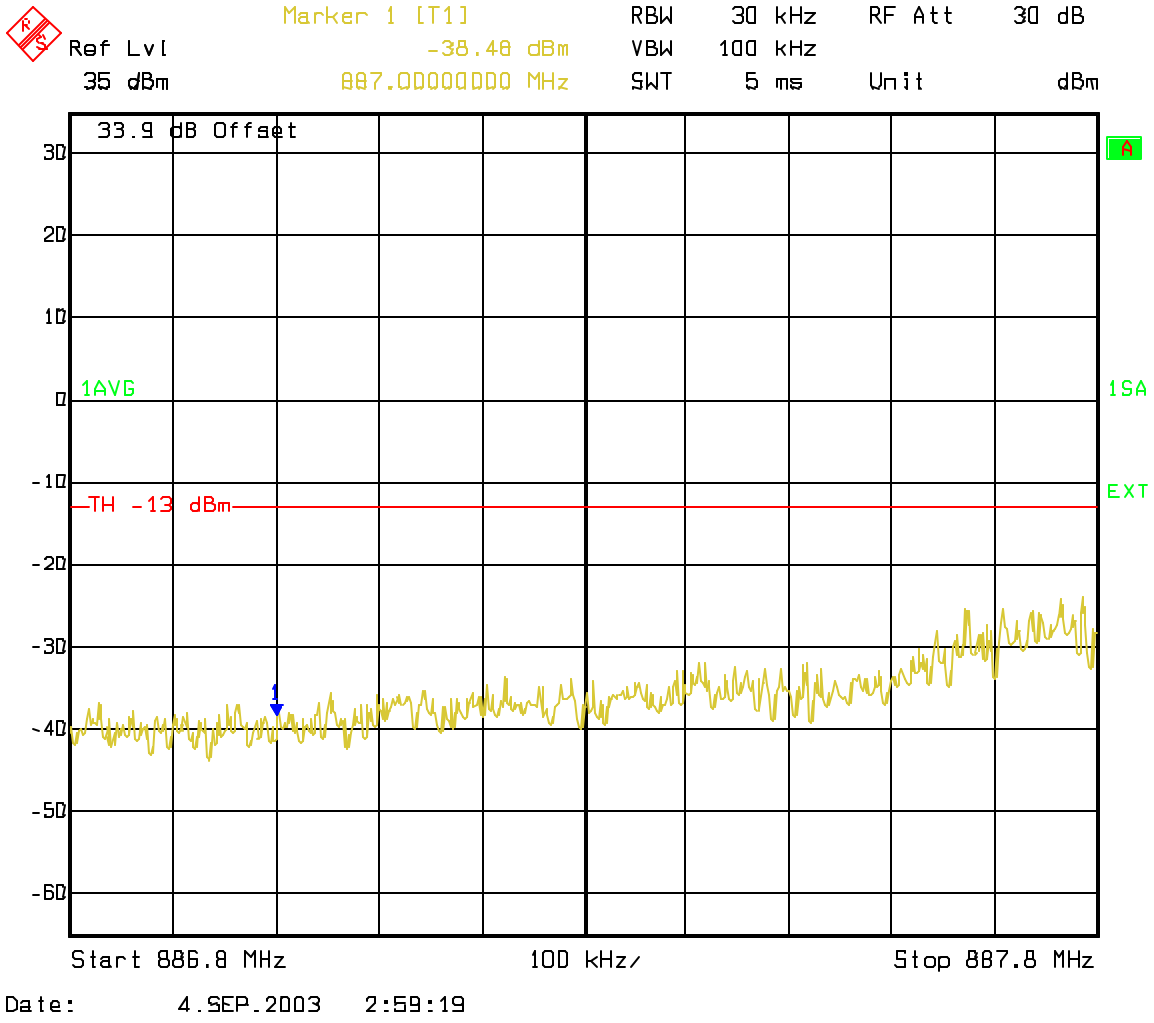
[6] CDMA BTS Developmen, MFRM-2 800 MHz Power Amplifier Assembly Beta Cycle Verification Report, Dataset Name: NTGY37AA, Document Status: Ratified, Stream: 02 Issue: 02, Issue Date: March 12, 2003, Document Prime: Neil Claxton, 2M23

APPENDIX PLOTS

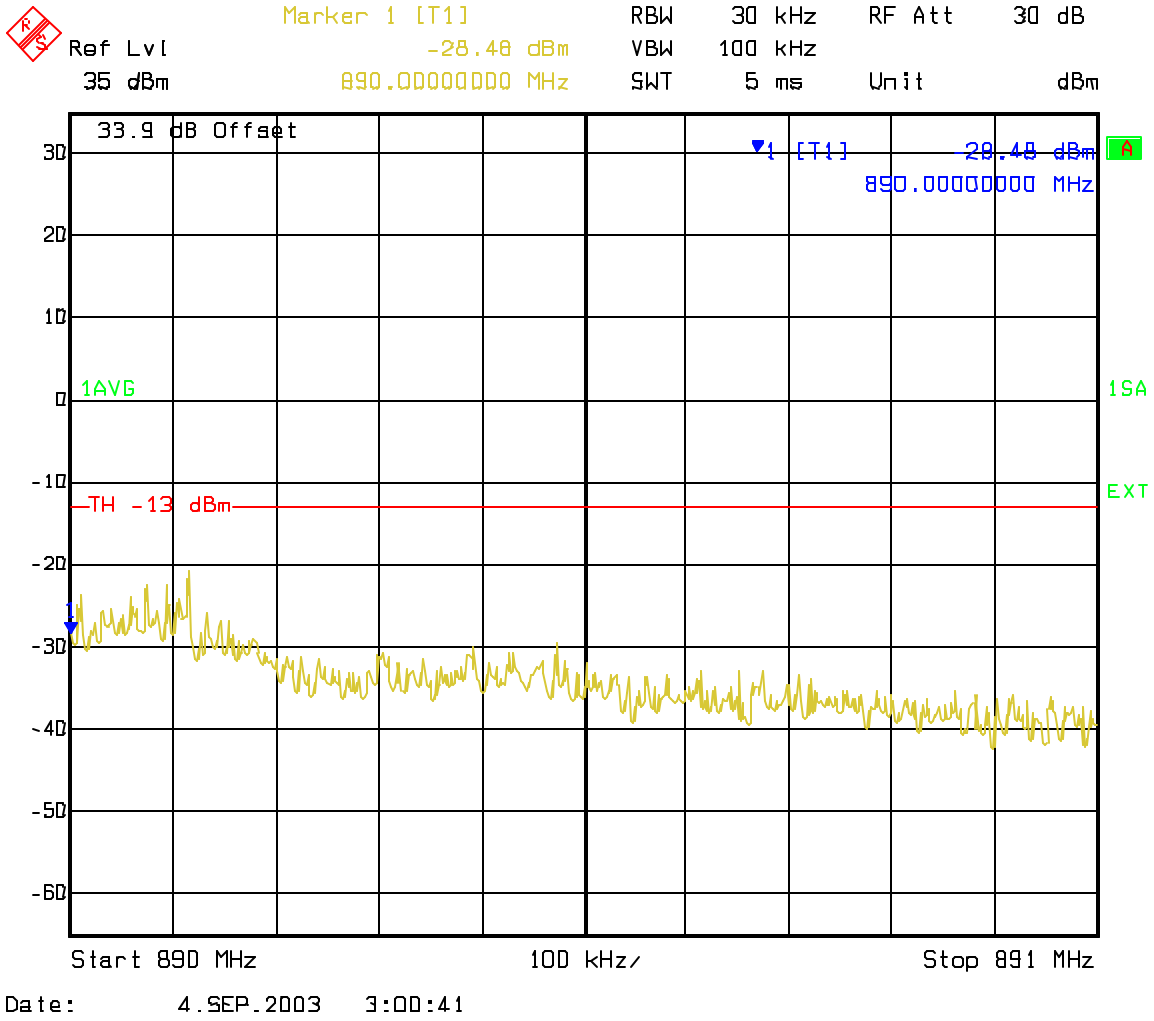
CH 630 Occupied BW



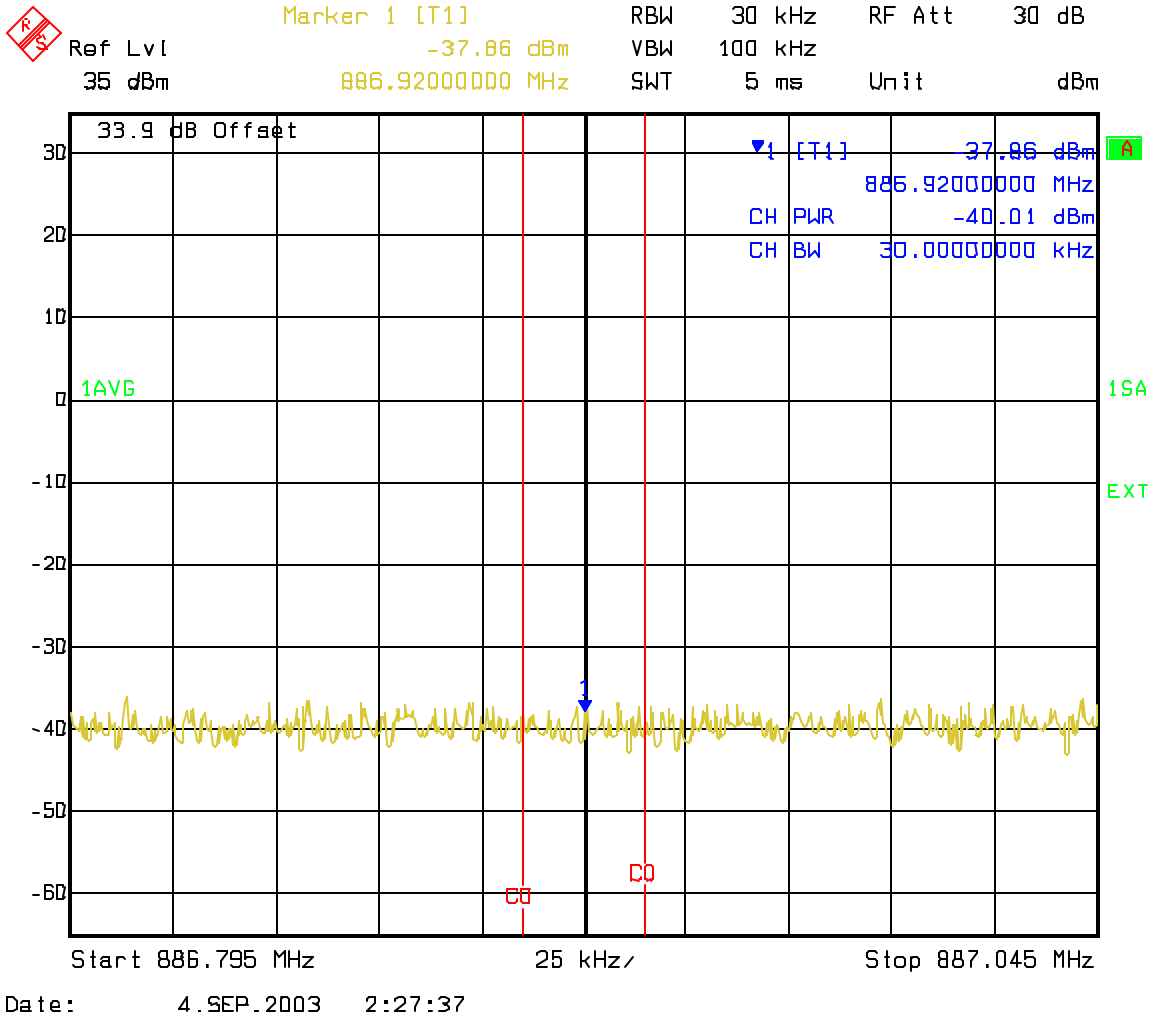
CH 630 Lower Adjacent Band Edge



CH 630 Upper Adjacent Band Edge

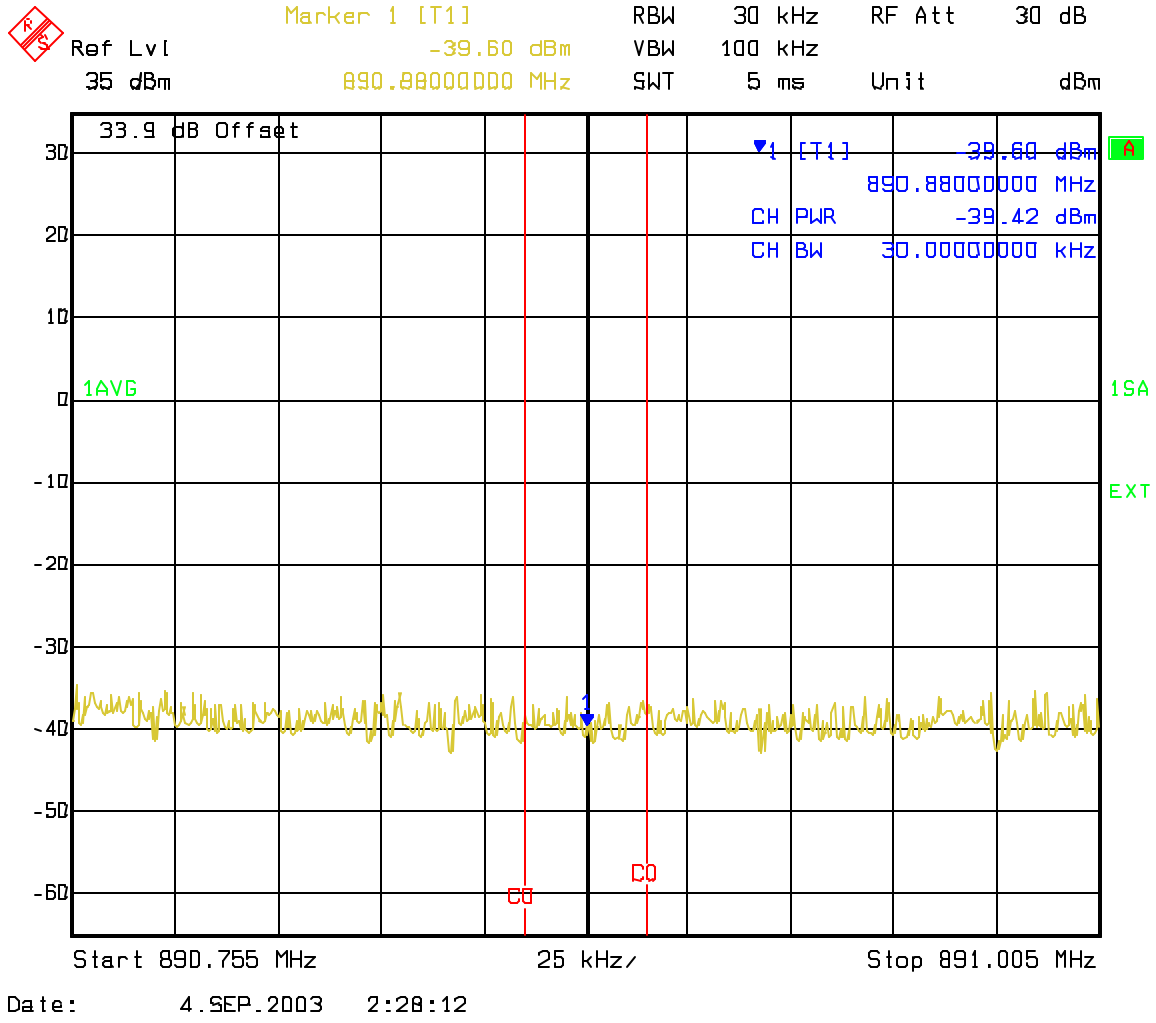


CH 630 Lower 1.98MHz Offset



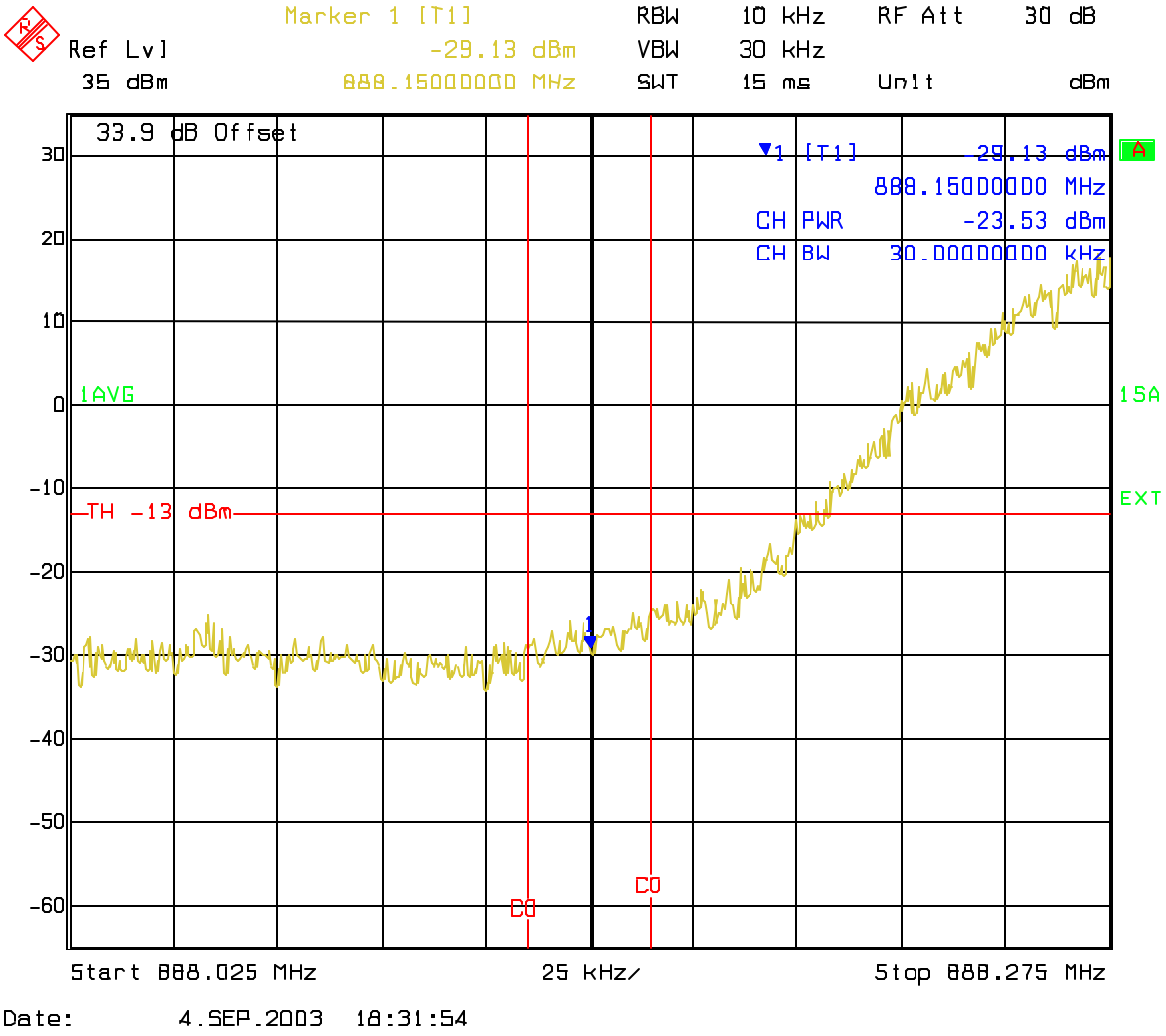
Note: IC Limit -60dBc = -12.68 dBm

CH 630 Upper 1.98MHz Offset



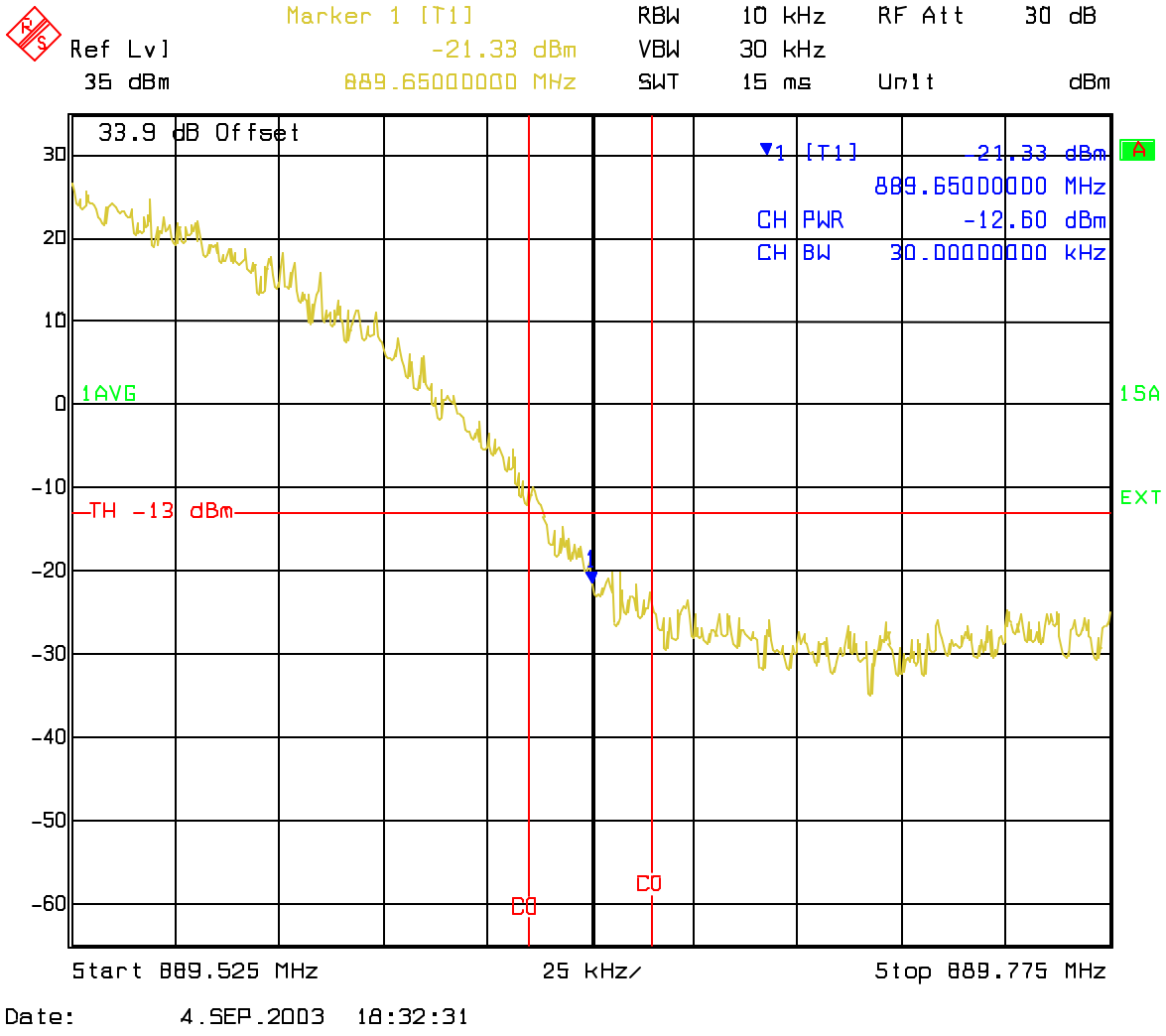
Note: IC Limit -60dBc = -12.68 dBm

CH 630 750 KHz Offset Lower



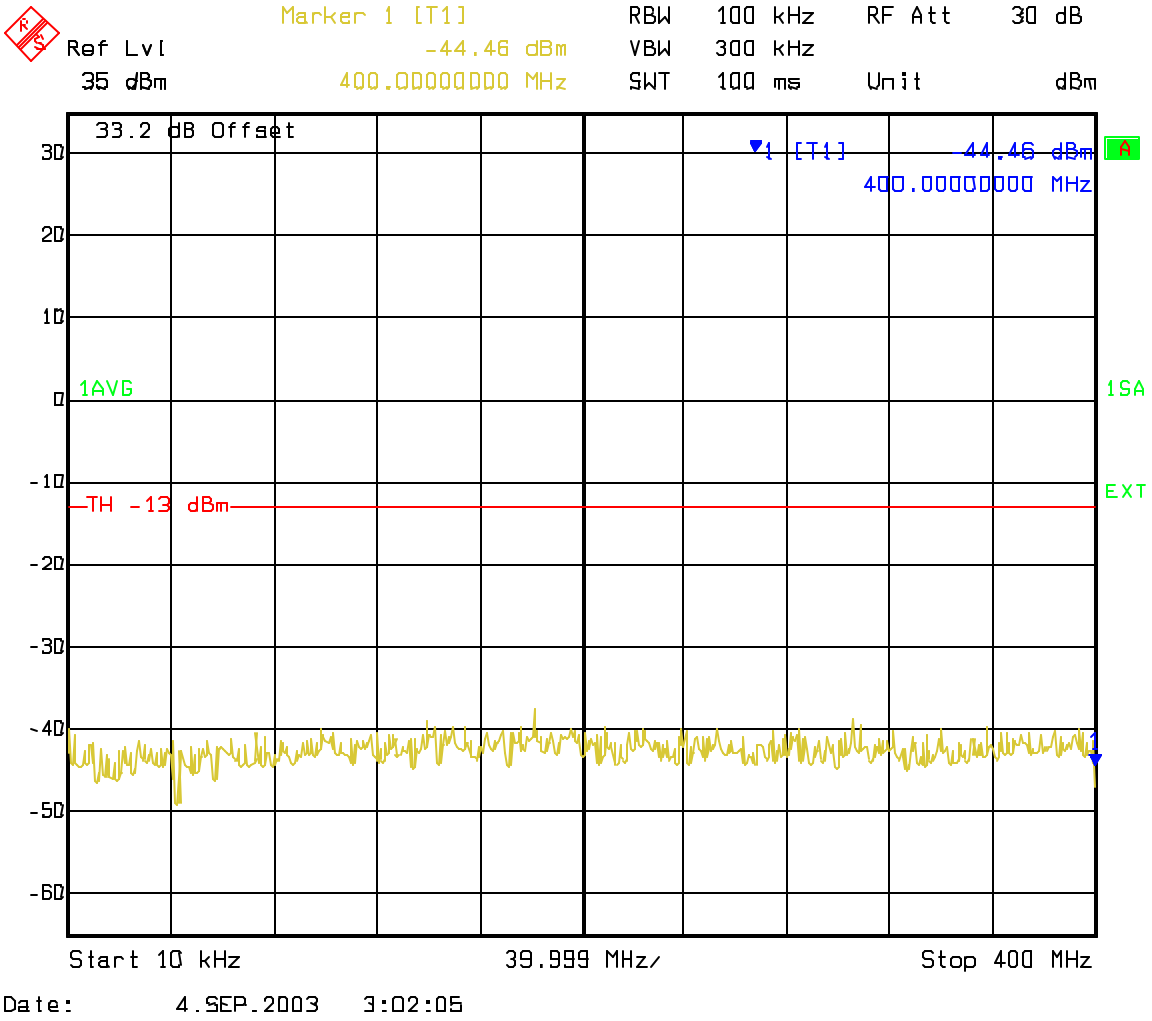
Note: IC Limit -45dBc =2.3 dBm

CH 630 750 KHz Offset Upper

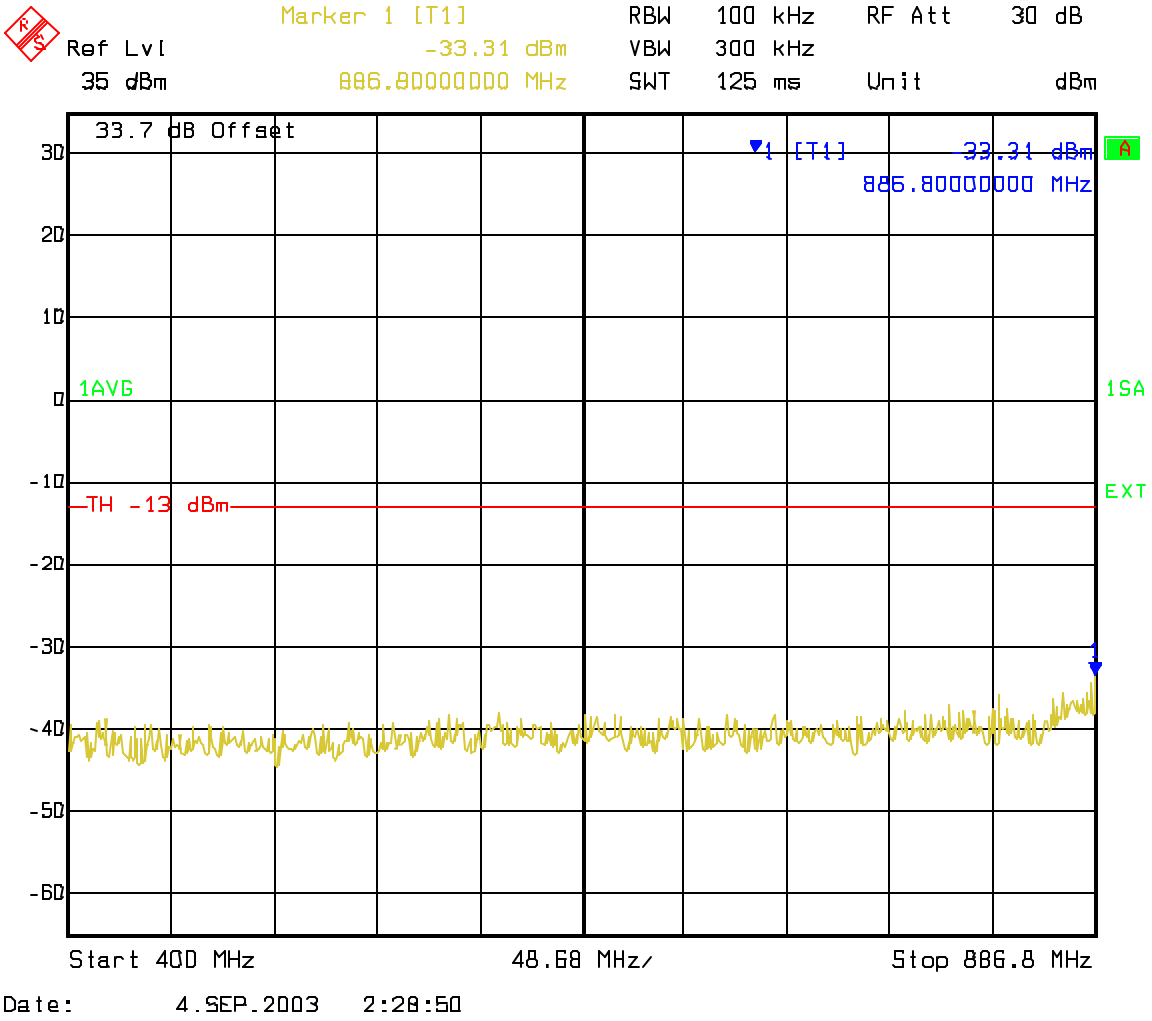


Note: IC Limit -45dBc =2.3 dBm

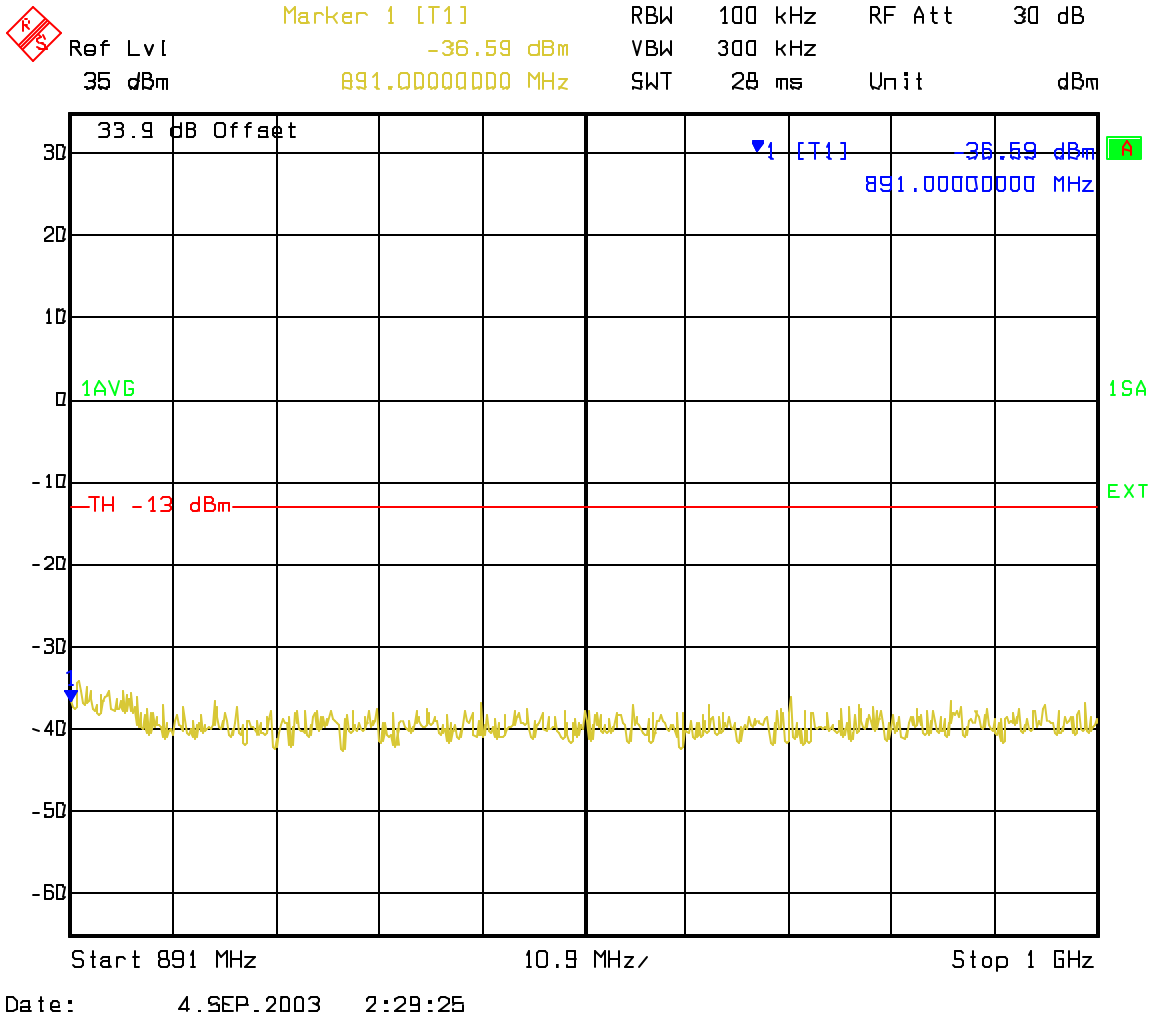
CH 630 Spurious 10KHz to 400MHz



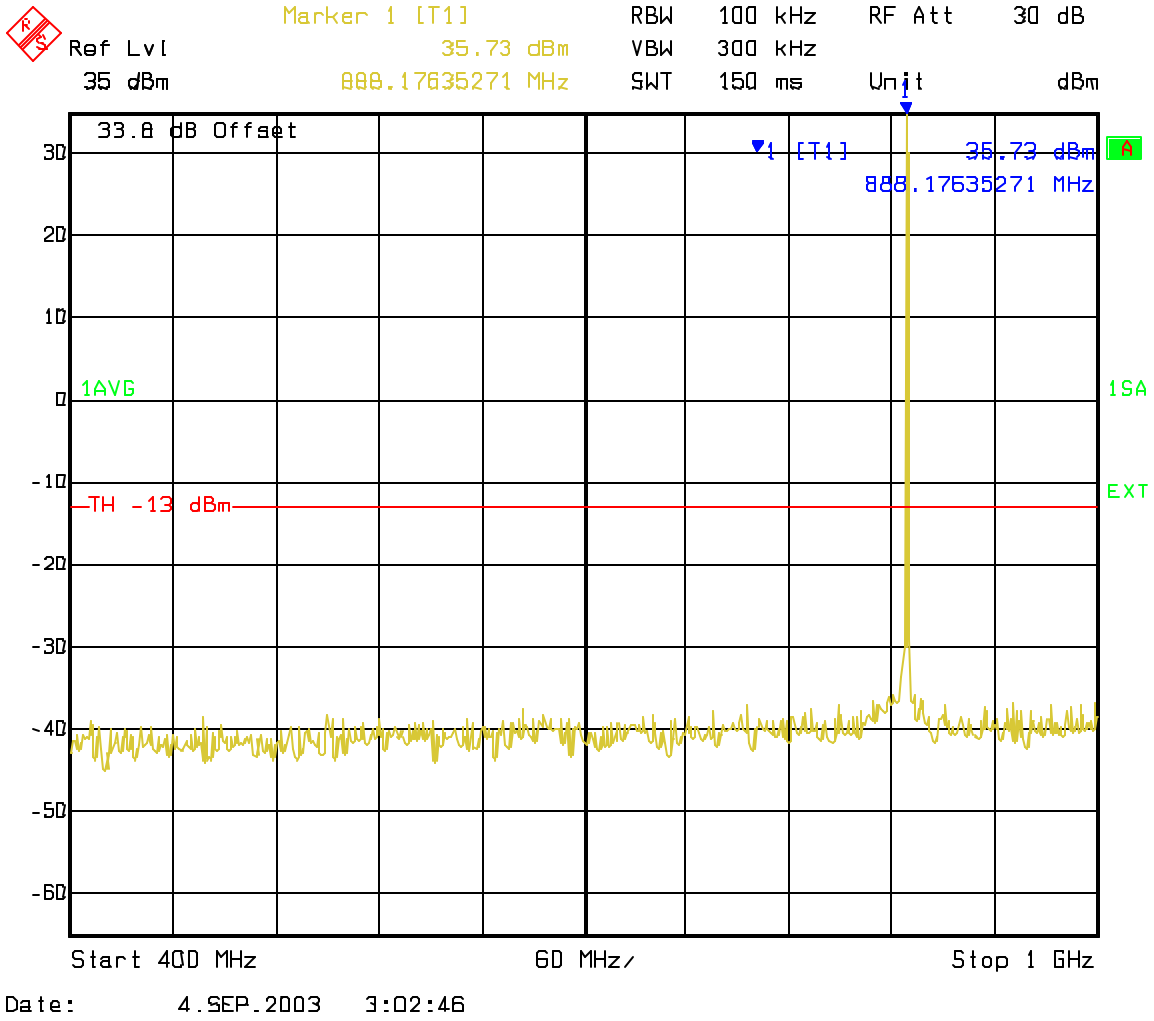
CH 630 Spurious 400MHz to 886.8 MHz



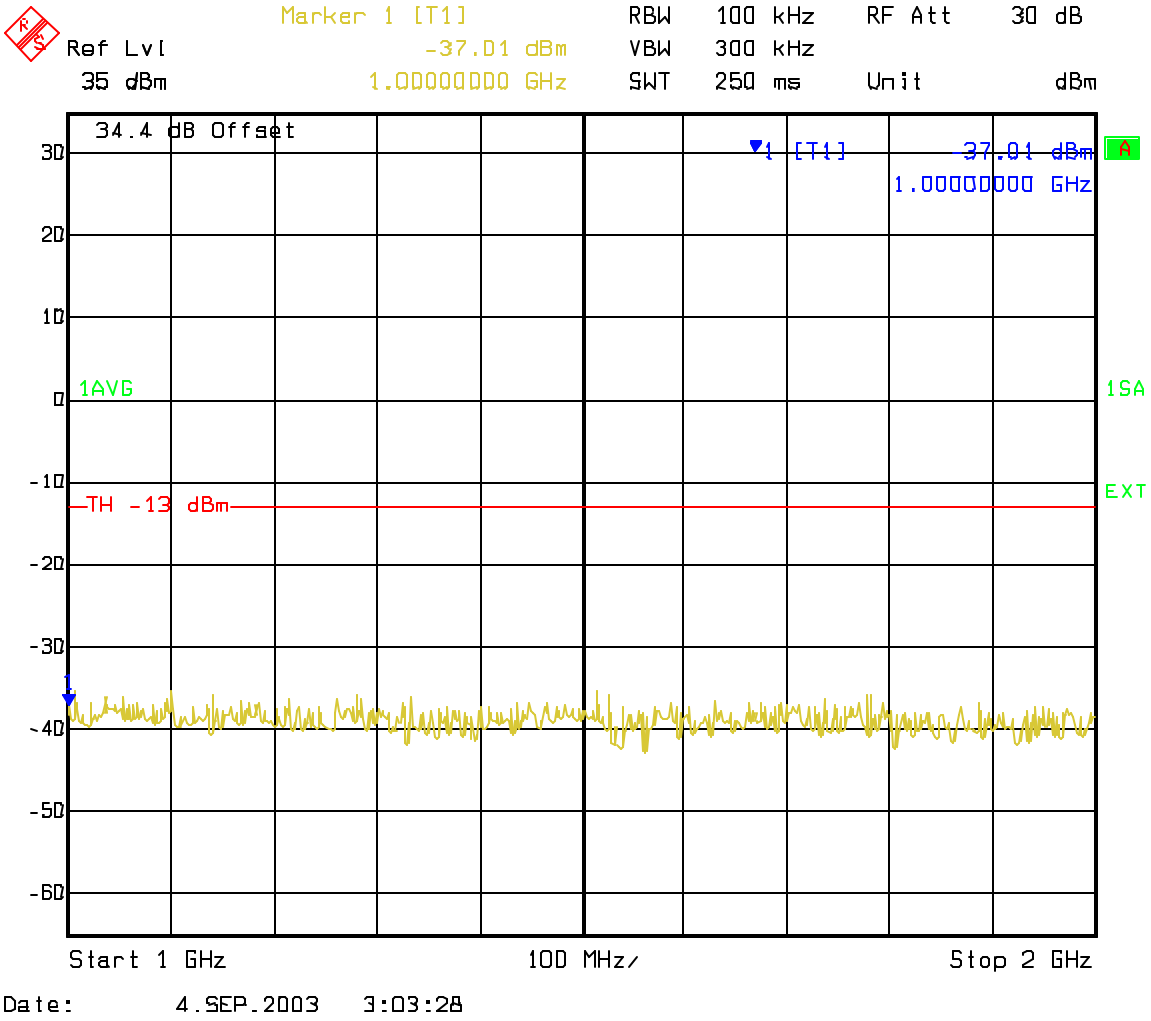
CH 630 Spurious 891MHz to 1GHz



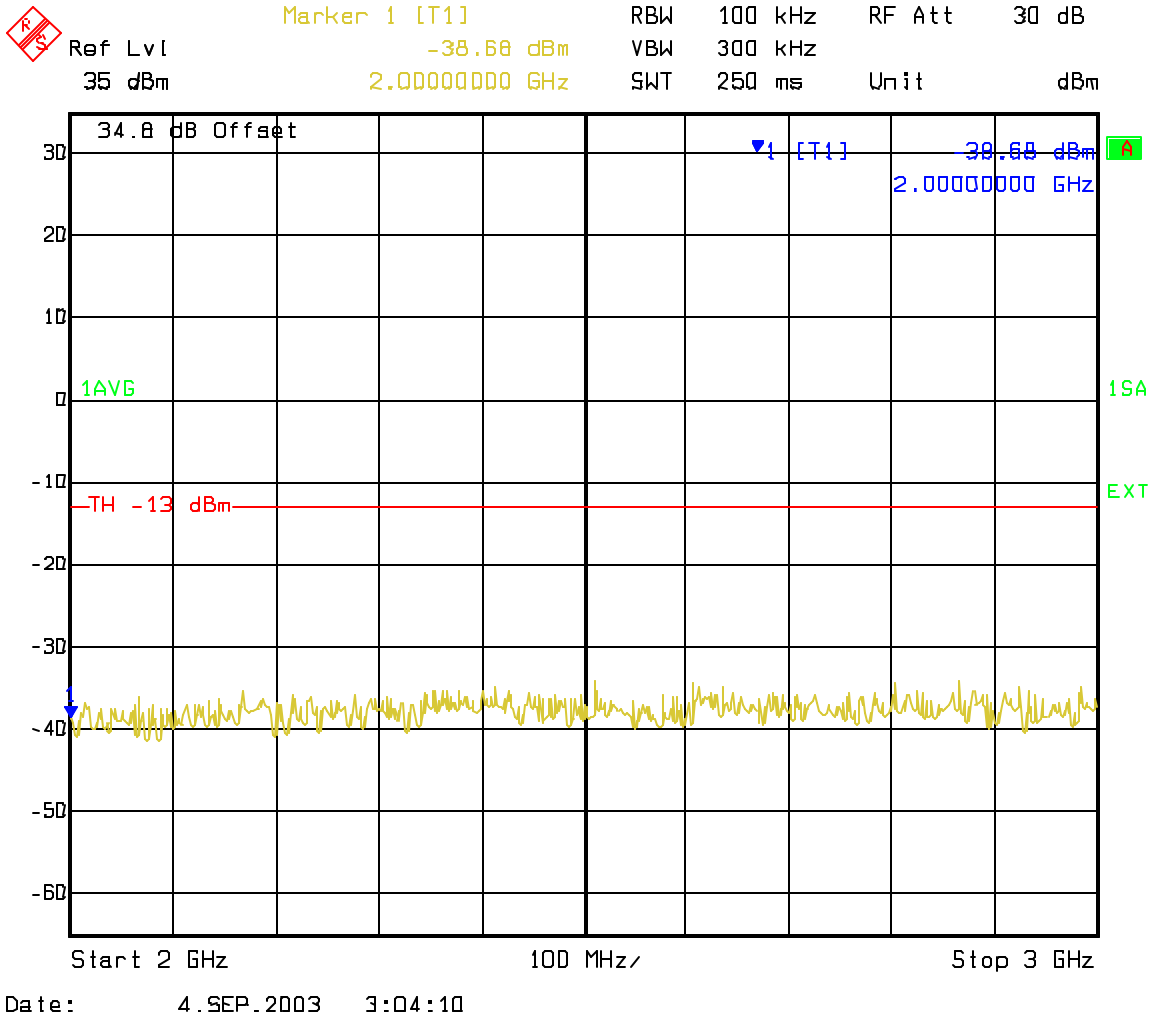
CH 630 Spurious 400MHz to 1GHz



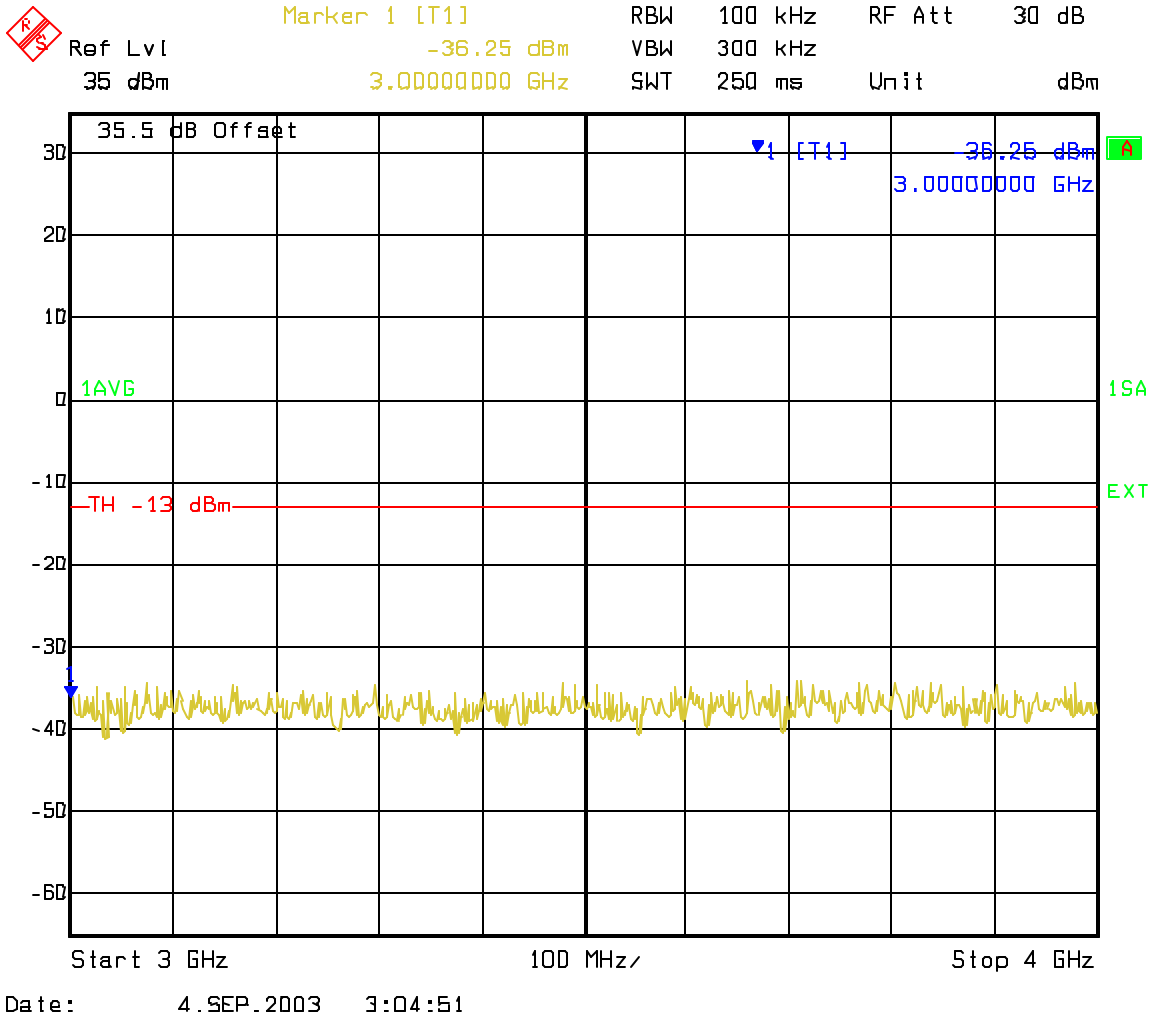
CH 630 Spurious 1GHz to 2GHz



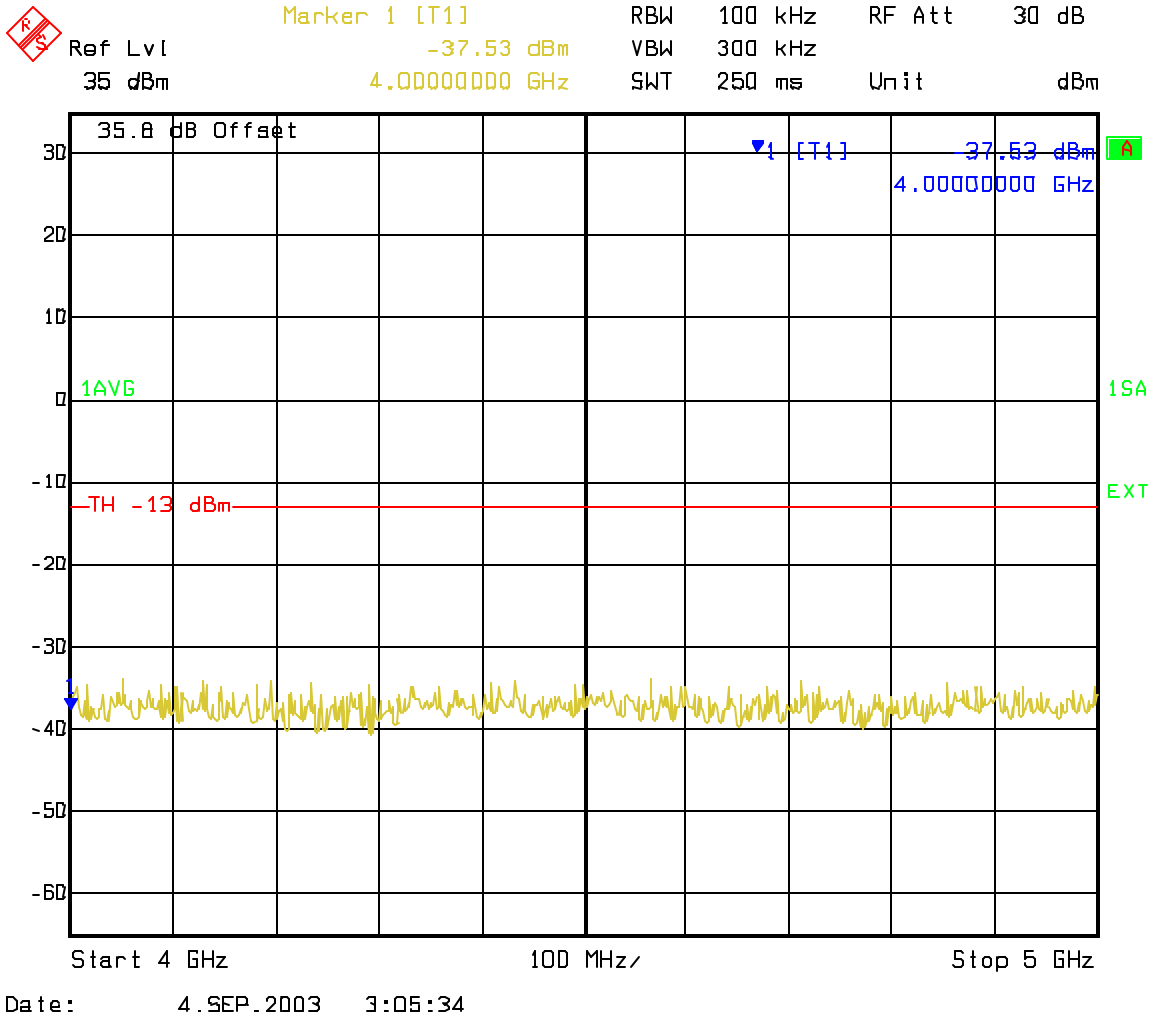
CH 630 Spurious 2GHz to 3GHz



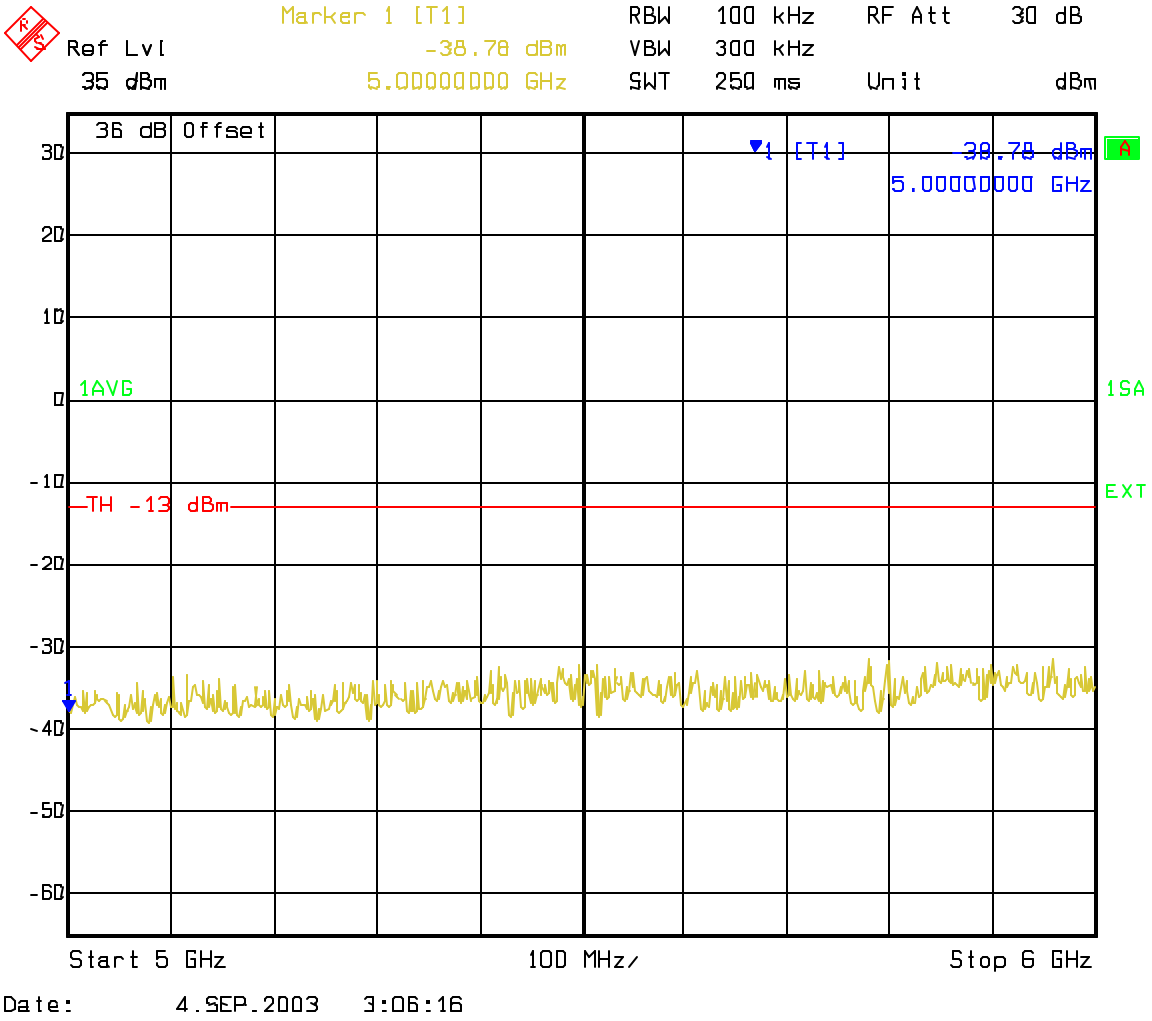
CH 630 Spurious 3GHz to 4GHz



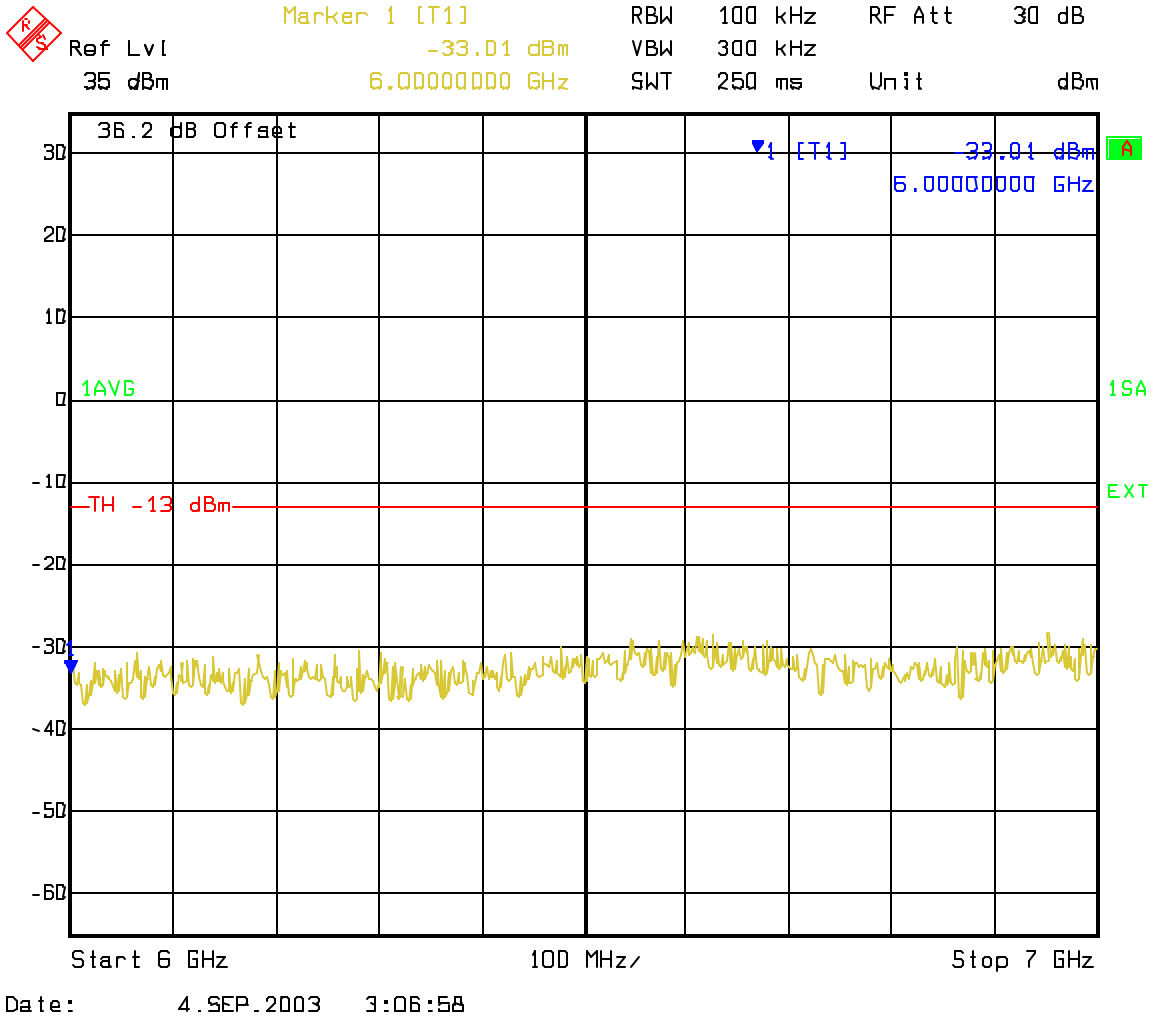
CH 630 Spurious 4GHz to 5GHz



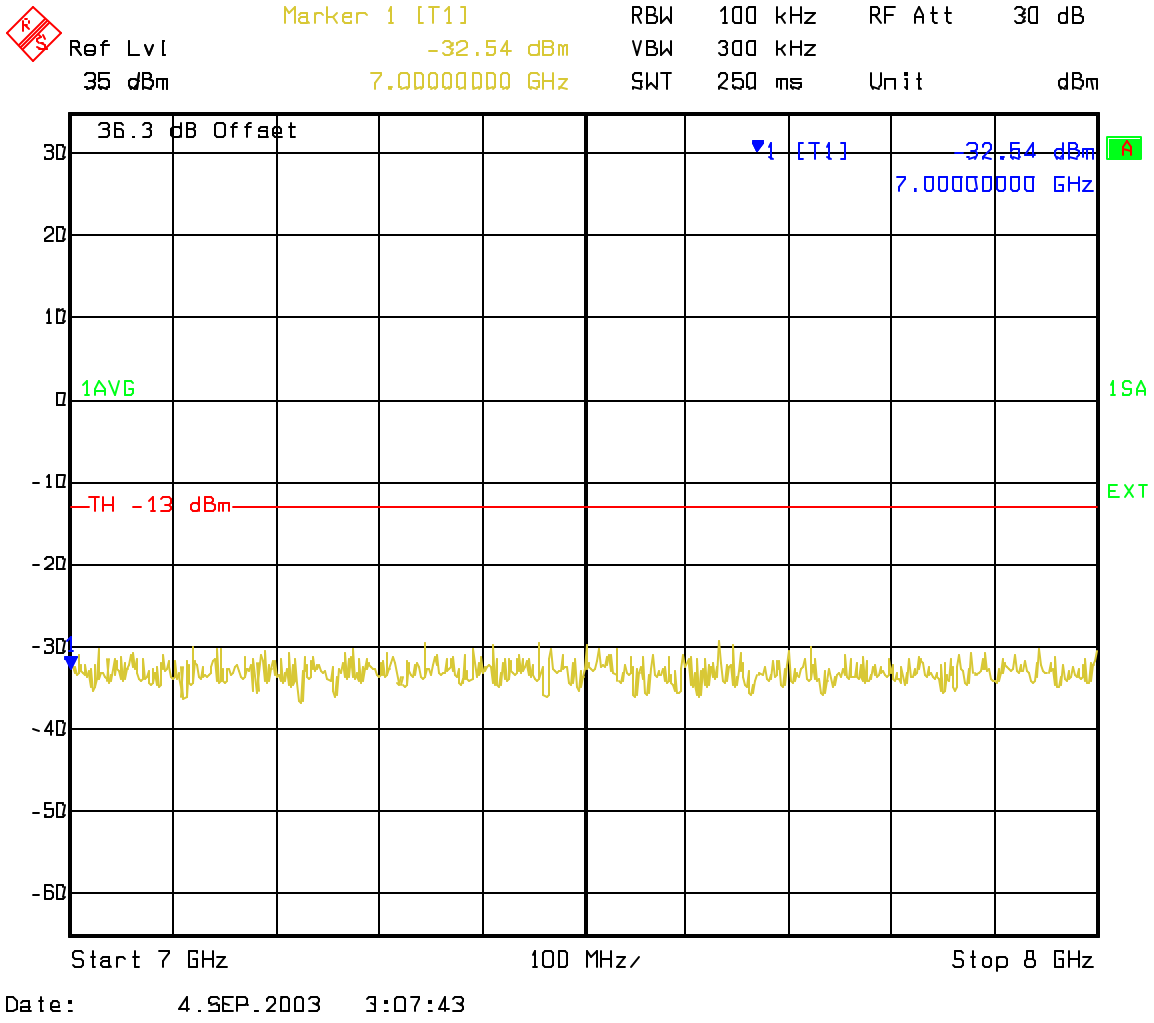
CH 630 Spurious 5GHz to 6GHz



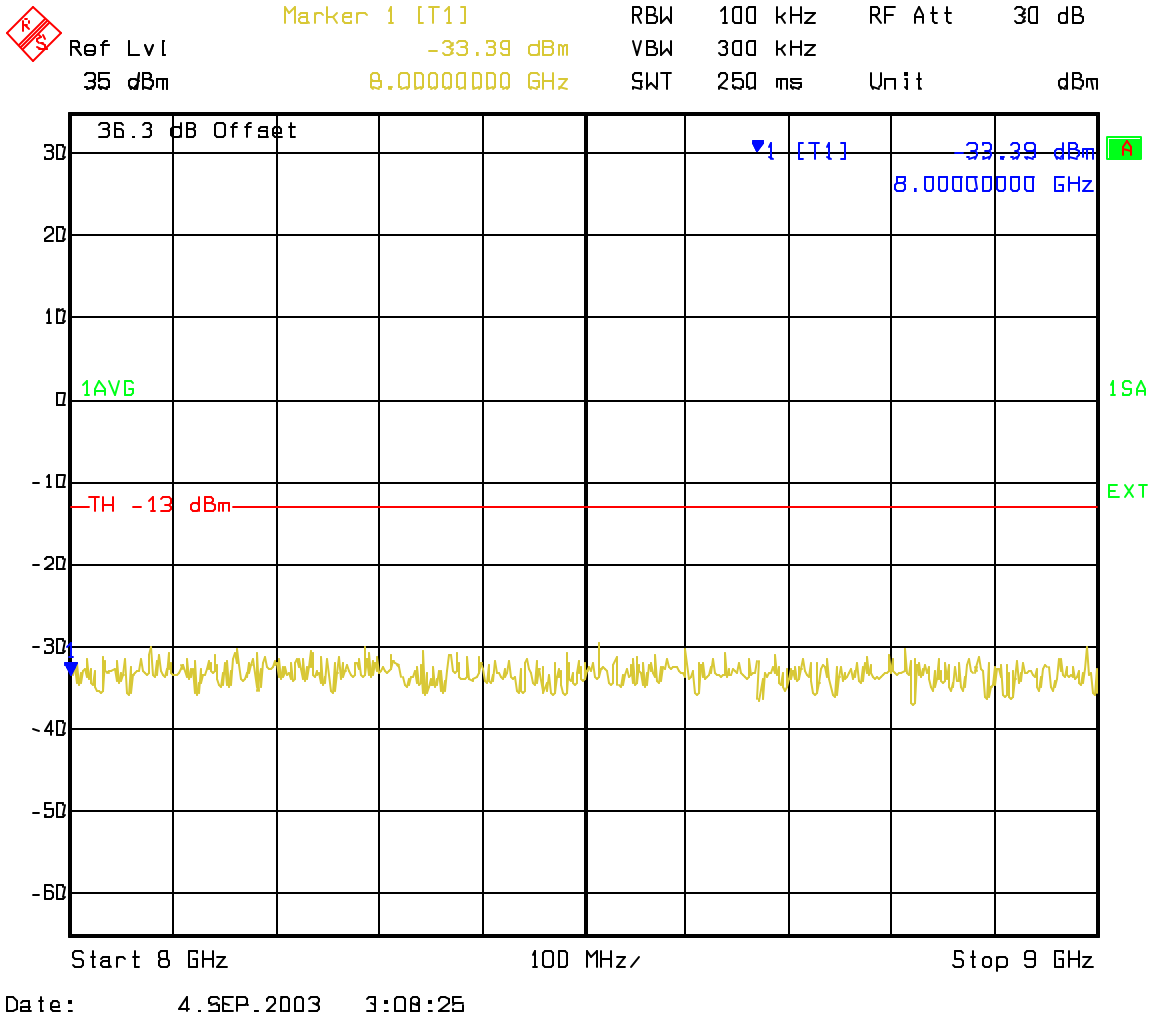
CH 630 Spurious 6GHz to 7GHz



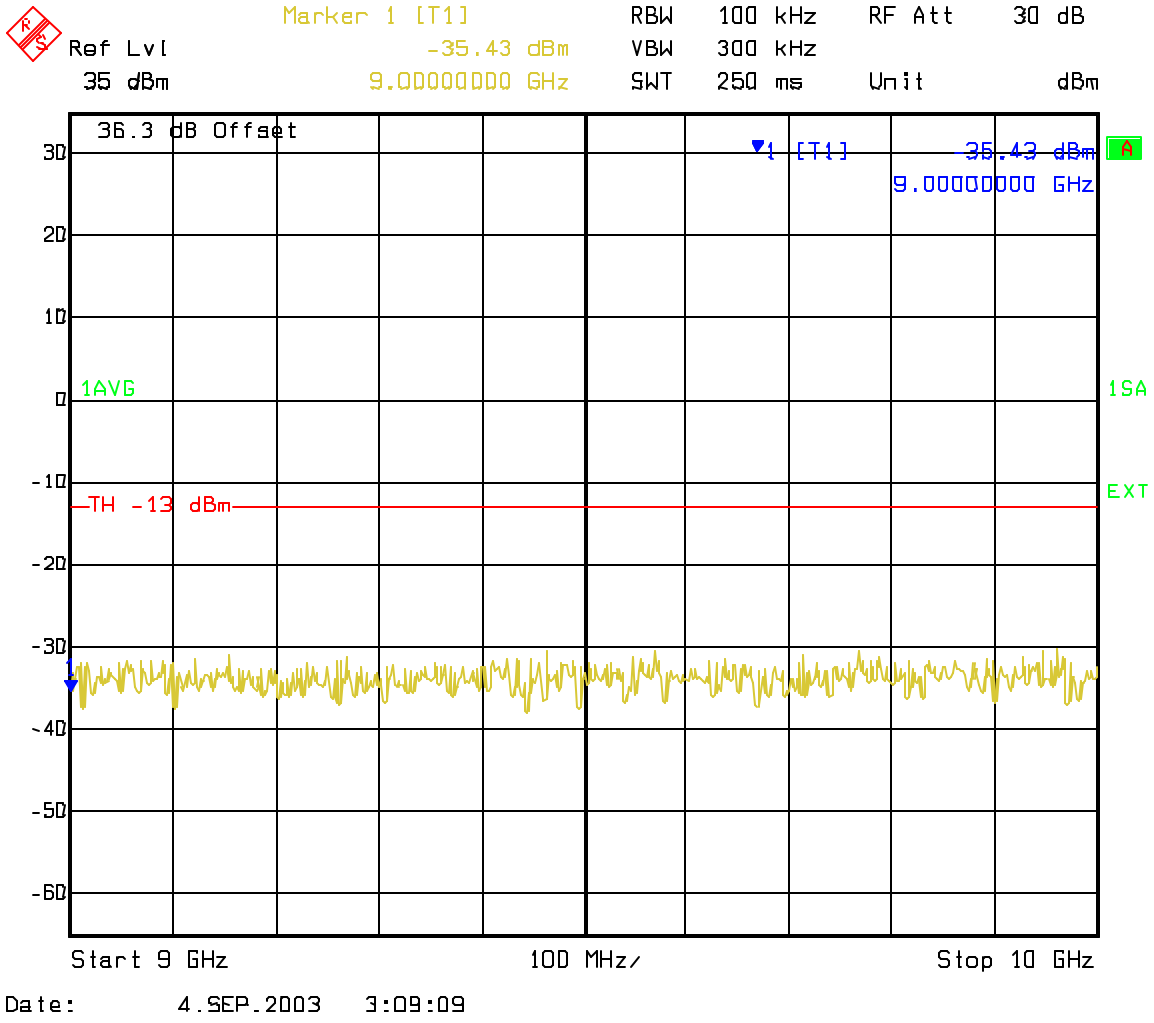
CH 630 Spurious 7GHz to 8GHz



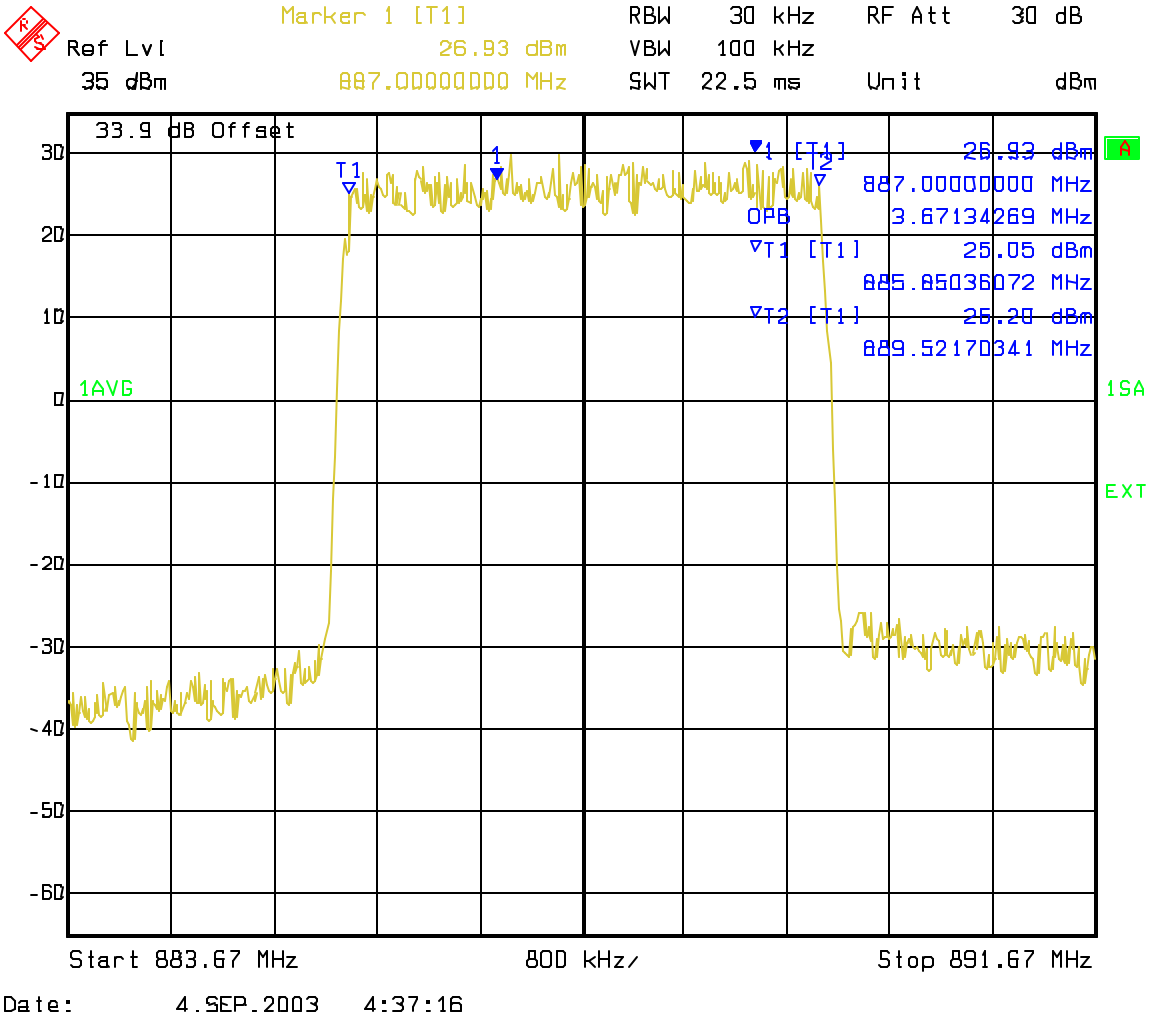
CH 630 Spurious 8GHz to 9GHz



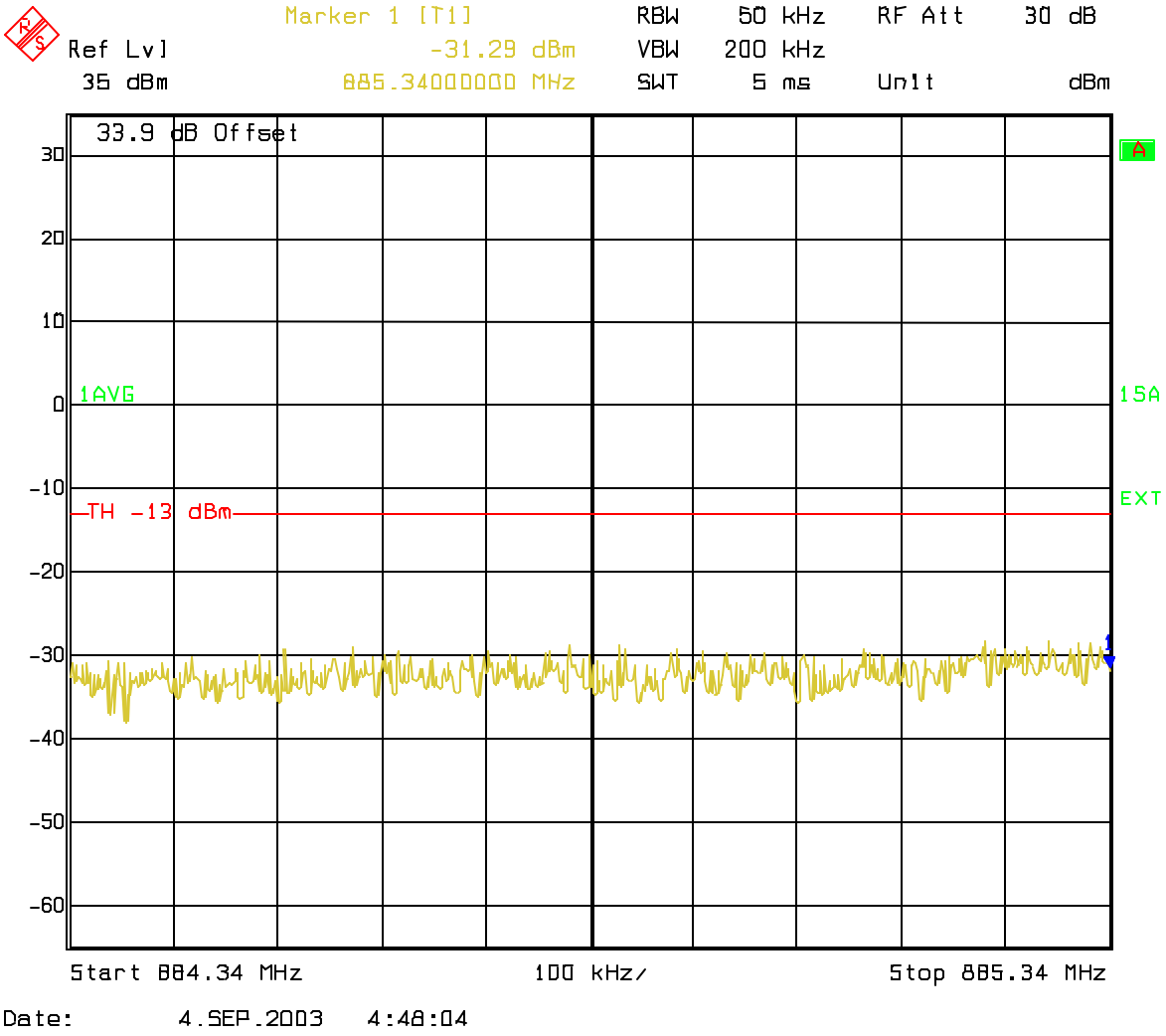
CH 630 Spurious 9GHz to 10GHz



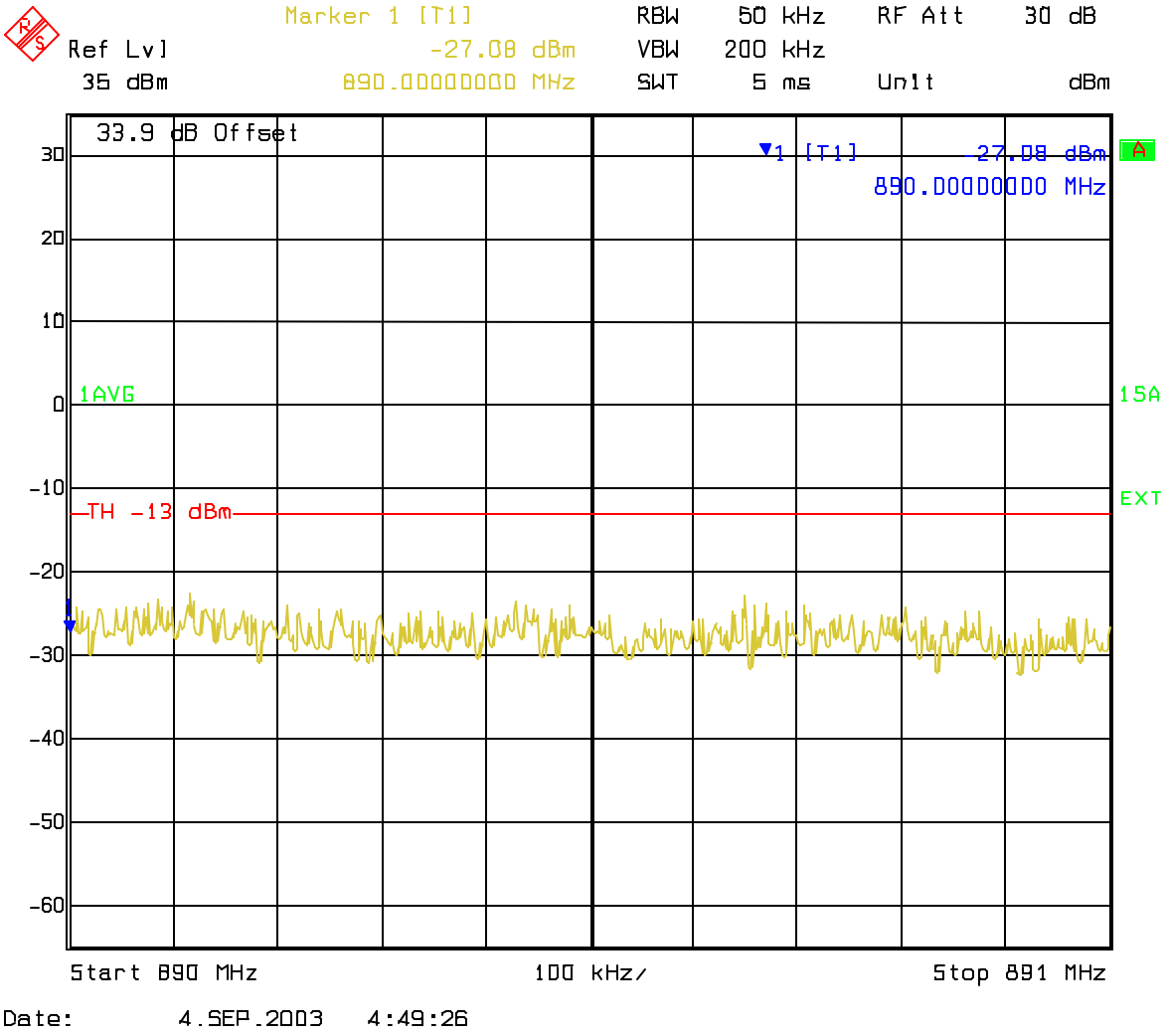
CH 548, 589, 630 Occupied BW



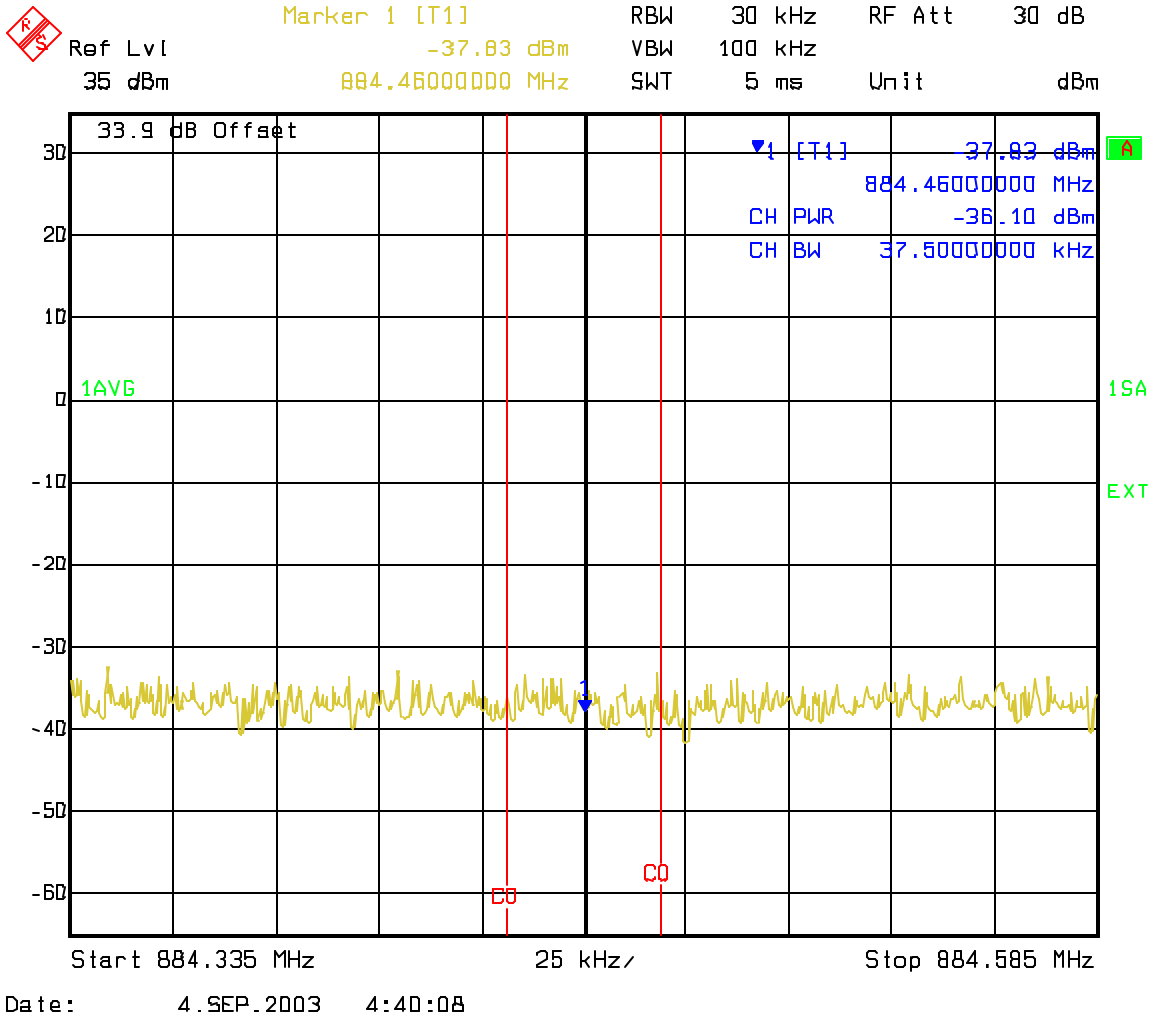
CH 548, 589, 630 Lower Adjacent Band Edge



CH 548, 589, 630 Upper Adjacent Band Edge

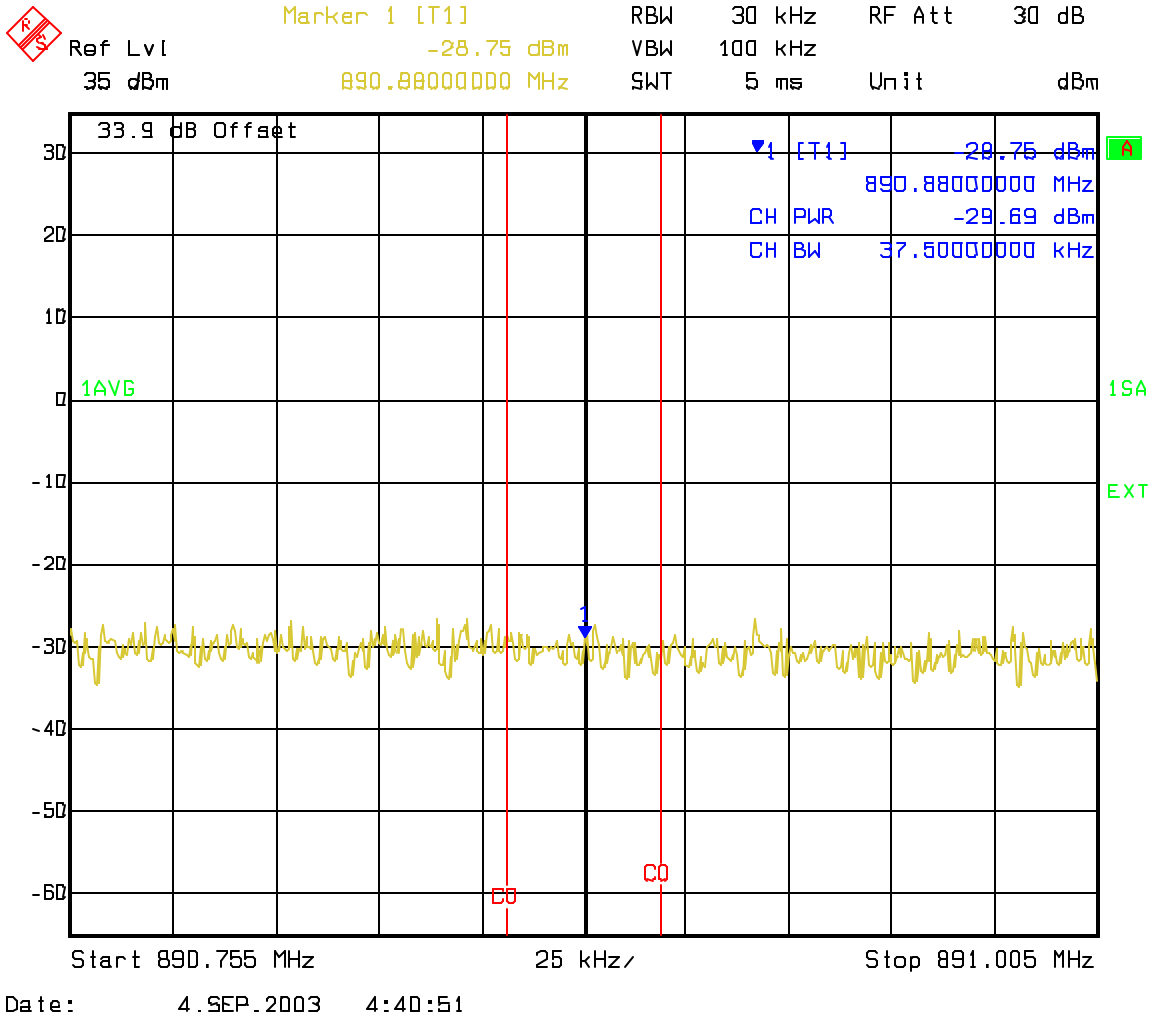


CH 548, 589, 630 Lower 1.98MHz Offset



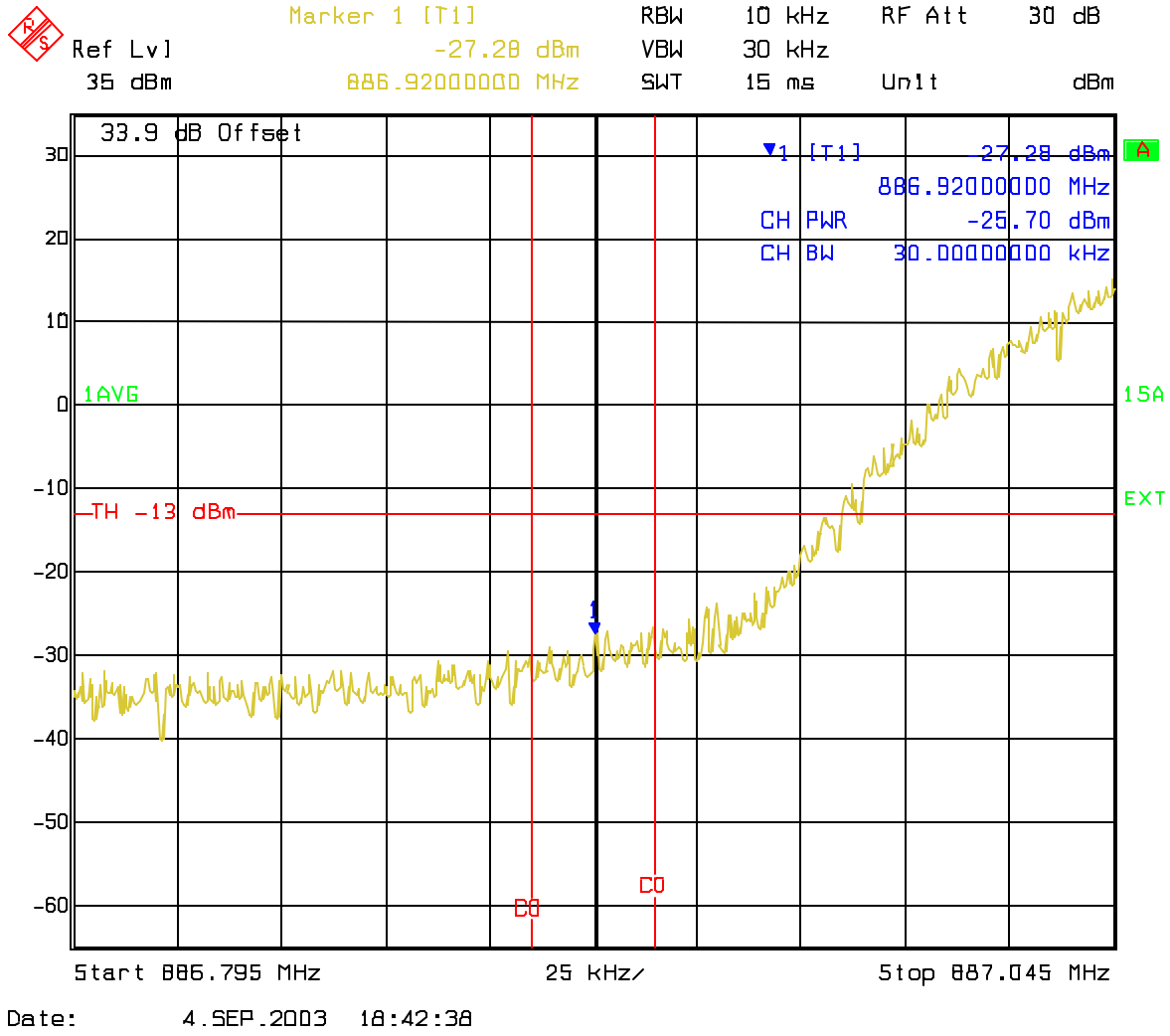
Note: IC Limit -60dBc = -12.68 dBm

CH 548, 589, 630 Upper 1.98MHz Offset



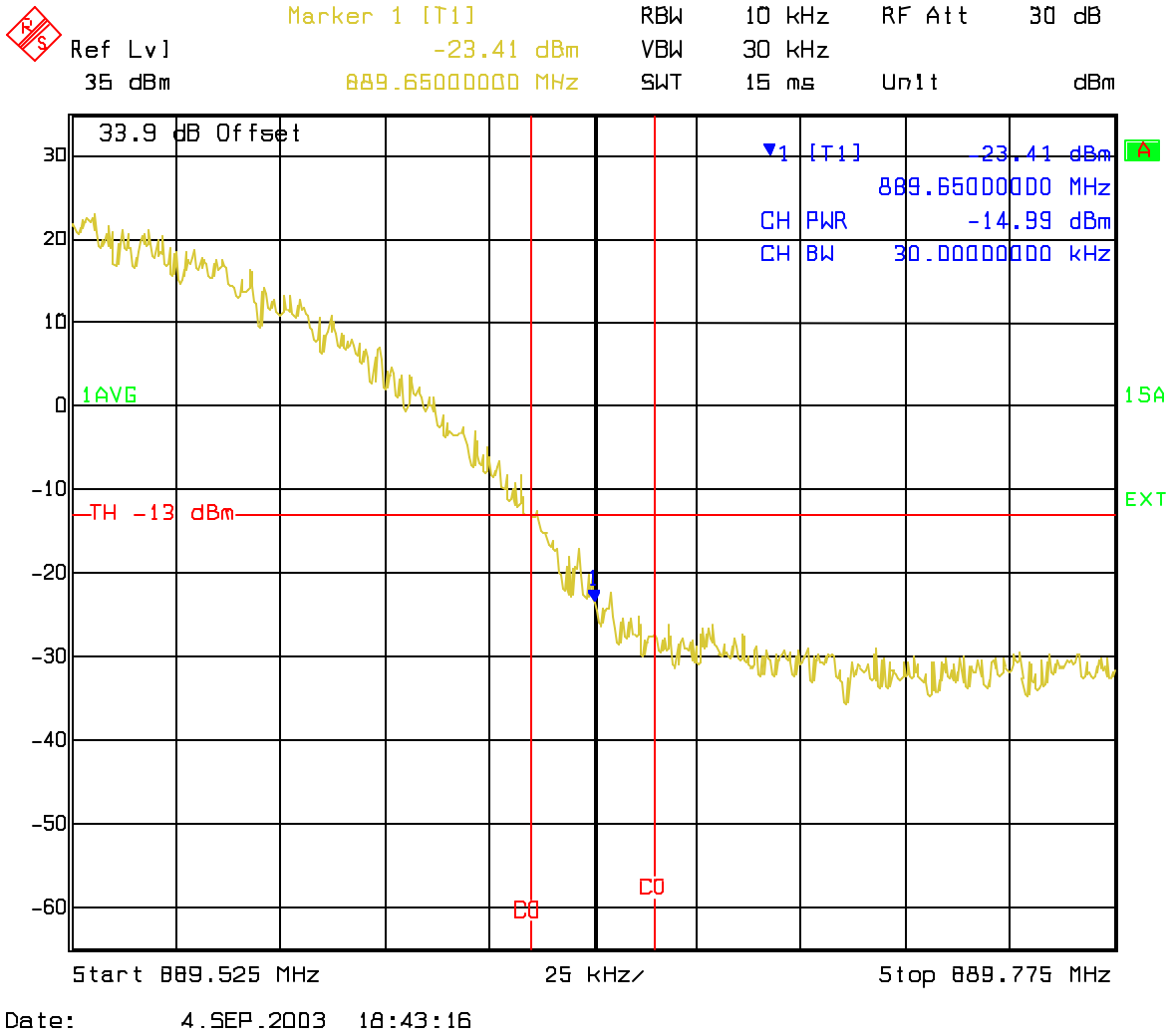
Note: IC Limit -60dBc = -12.68 dBm

CH 548, 589, 630 750 KHz Offset Lower



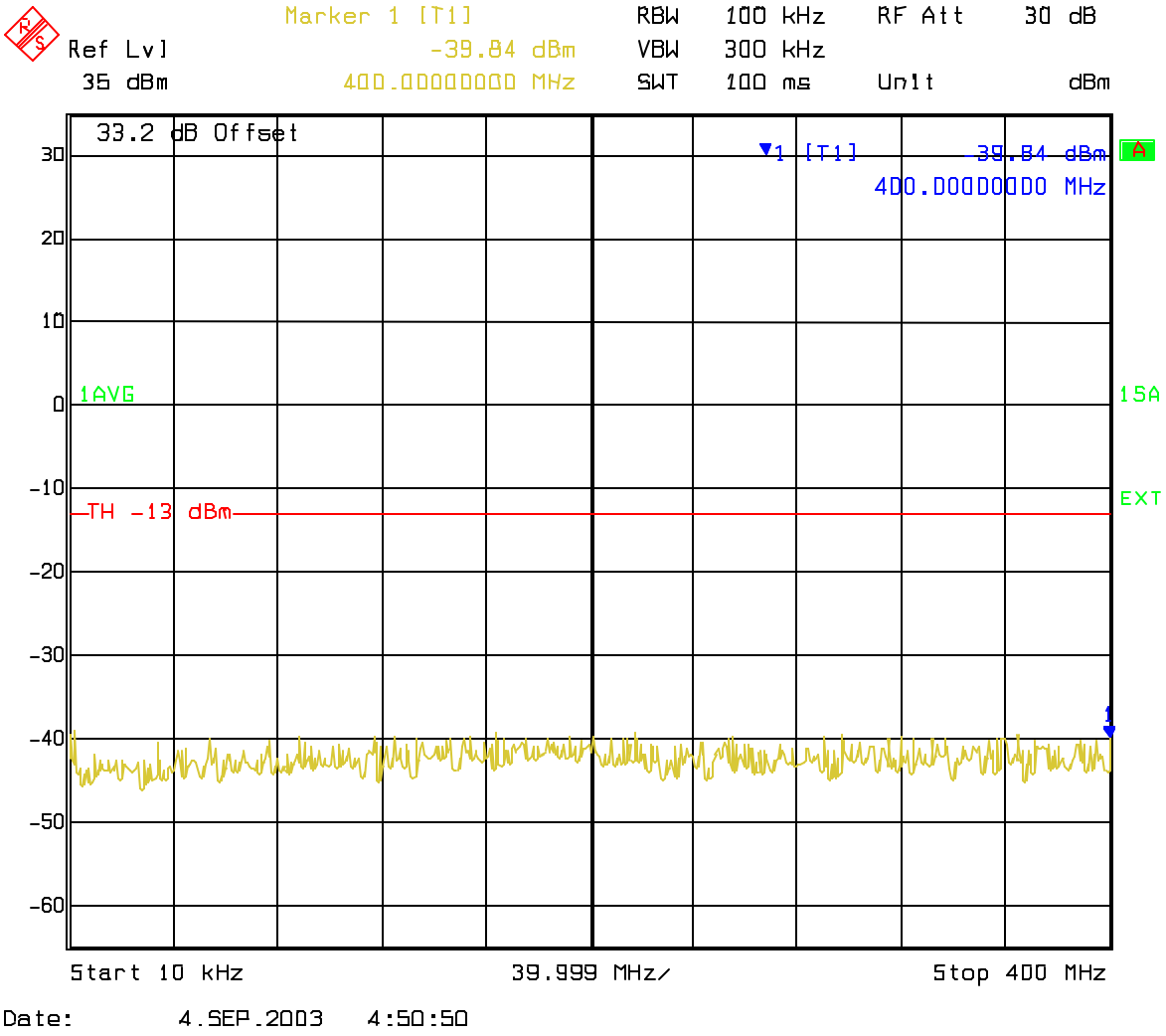
Note: IC Limit -45dBc = 2.3 dBm

CH 548, 589, 630 750 KHz Offset Upper

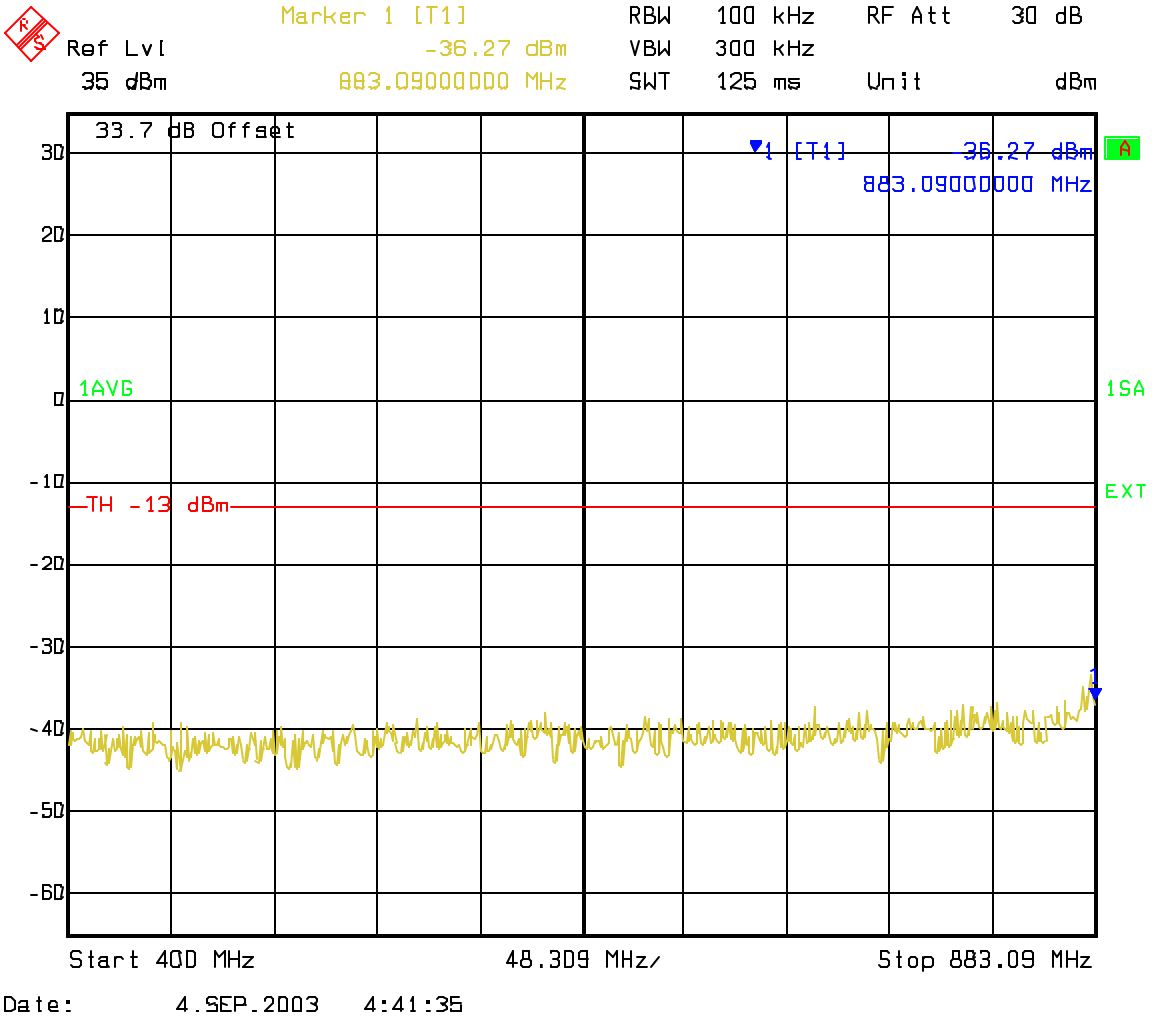


Note: IC Limit -45dBc = 2.3 dBm

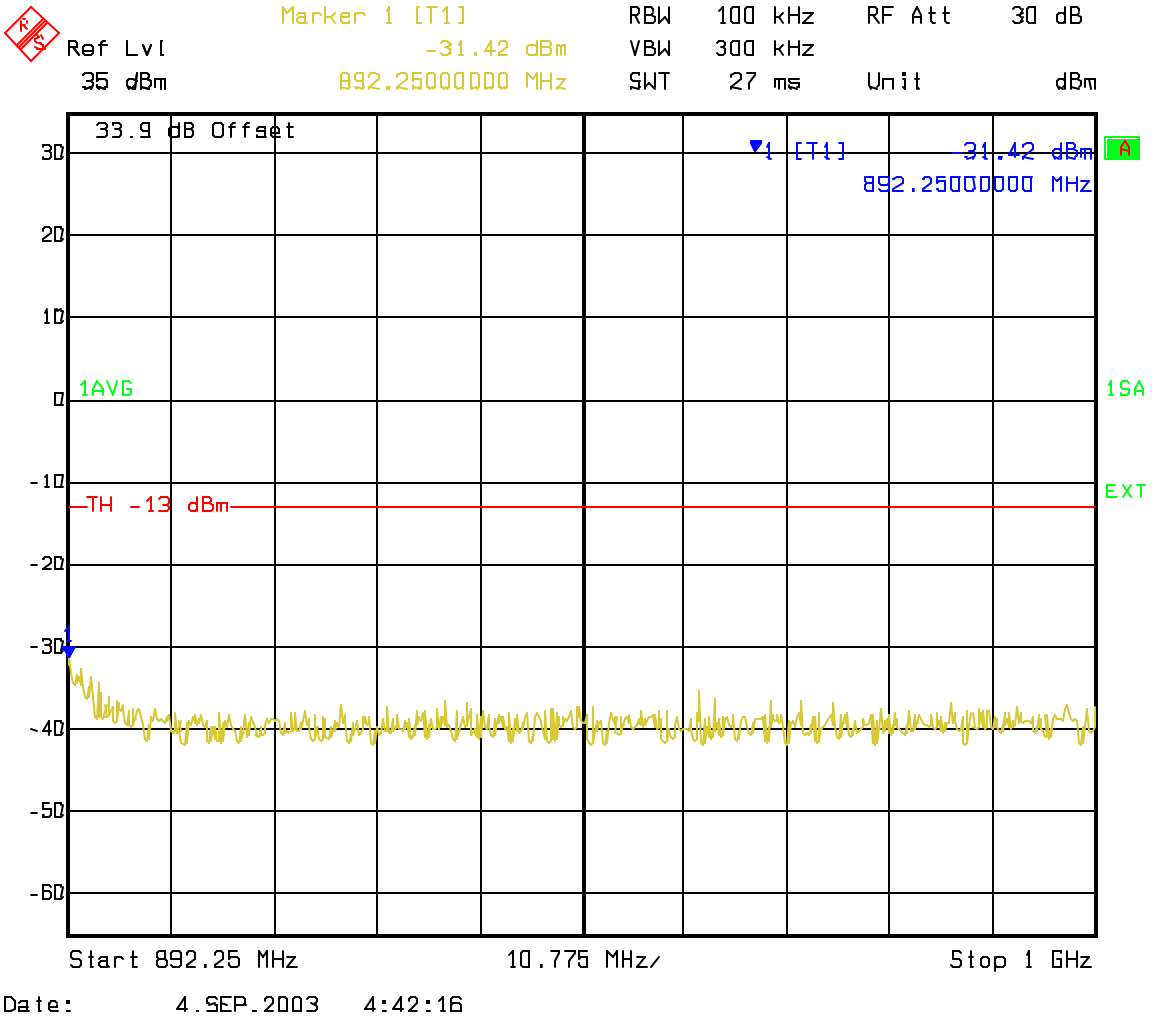
CH 548, 589, 630 Spurious 10KHz to 400MHz



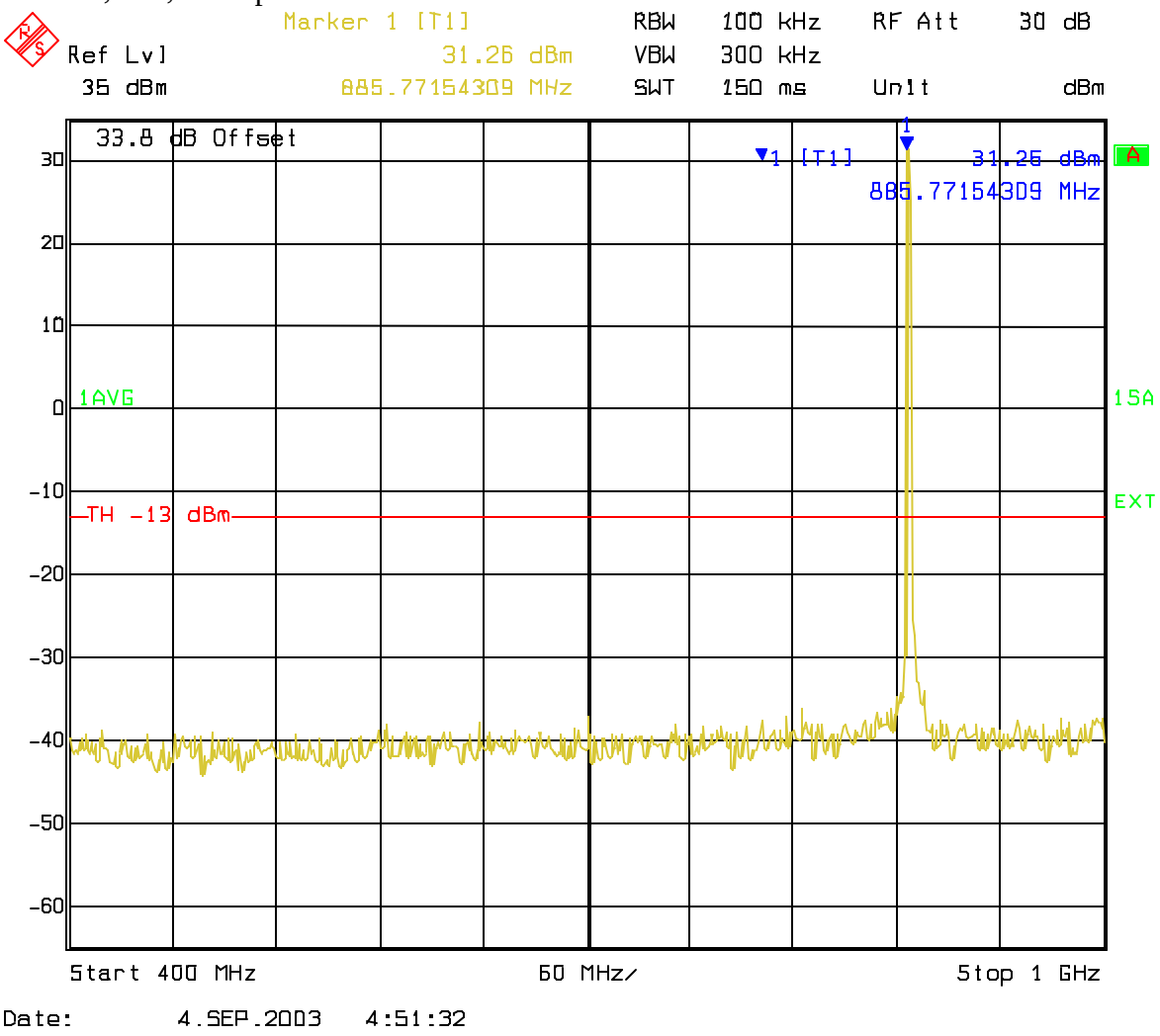
CH 548, 589, 630 Spurious 400MHz to 883.09 MHz



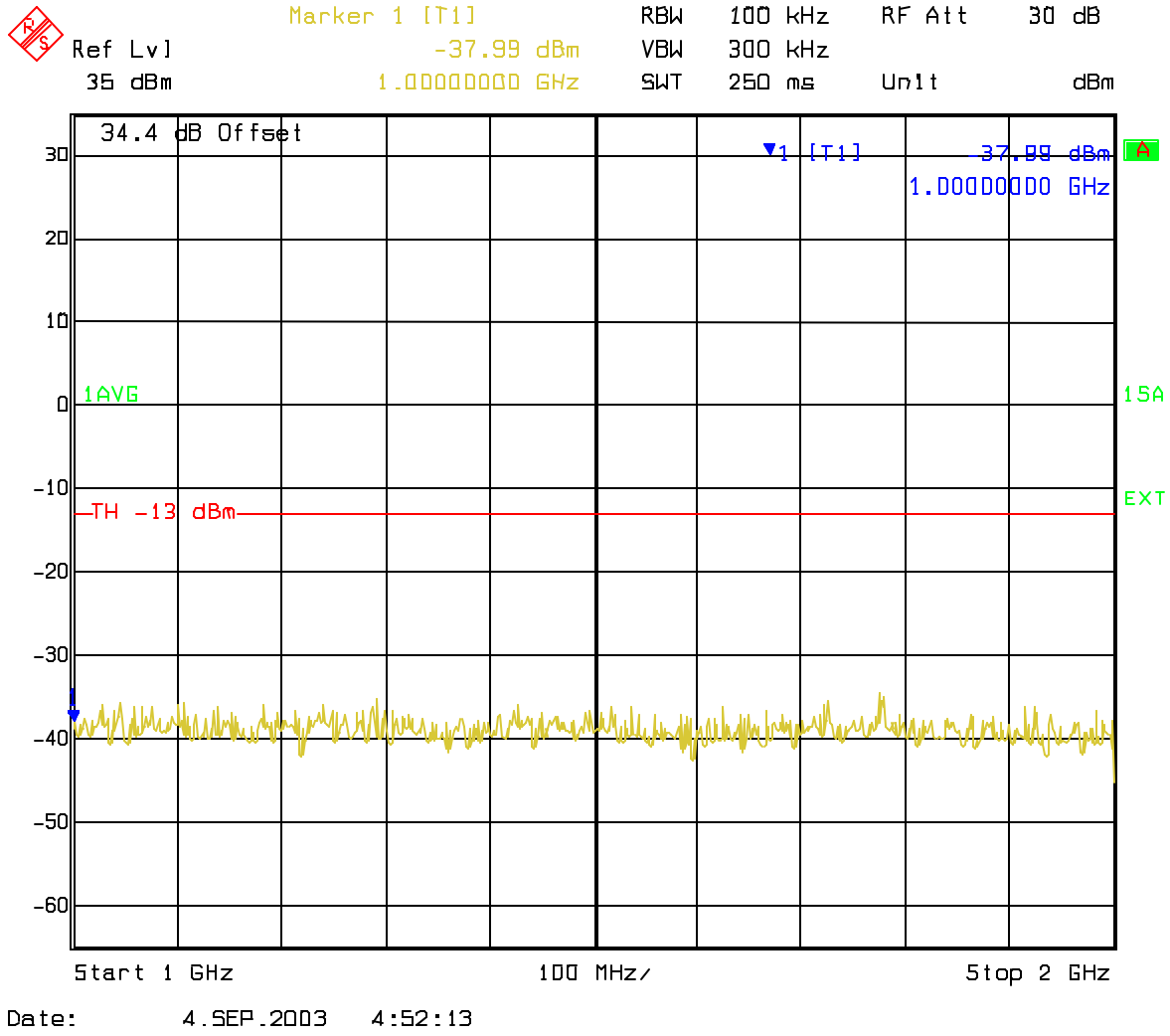
CH 548, 589, 630 Spurious 891MHz to 1GHz



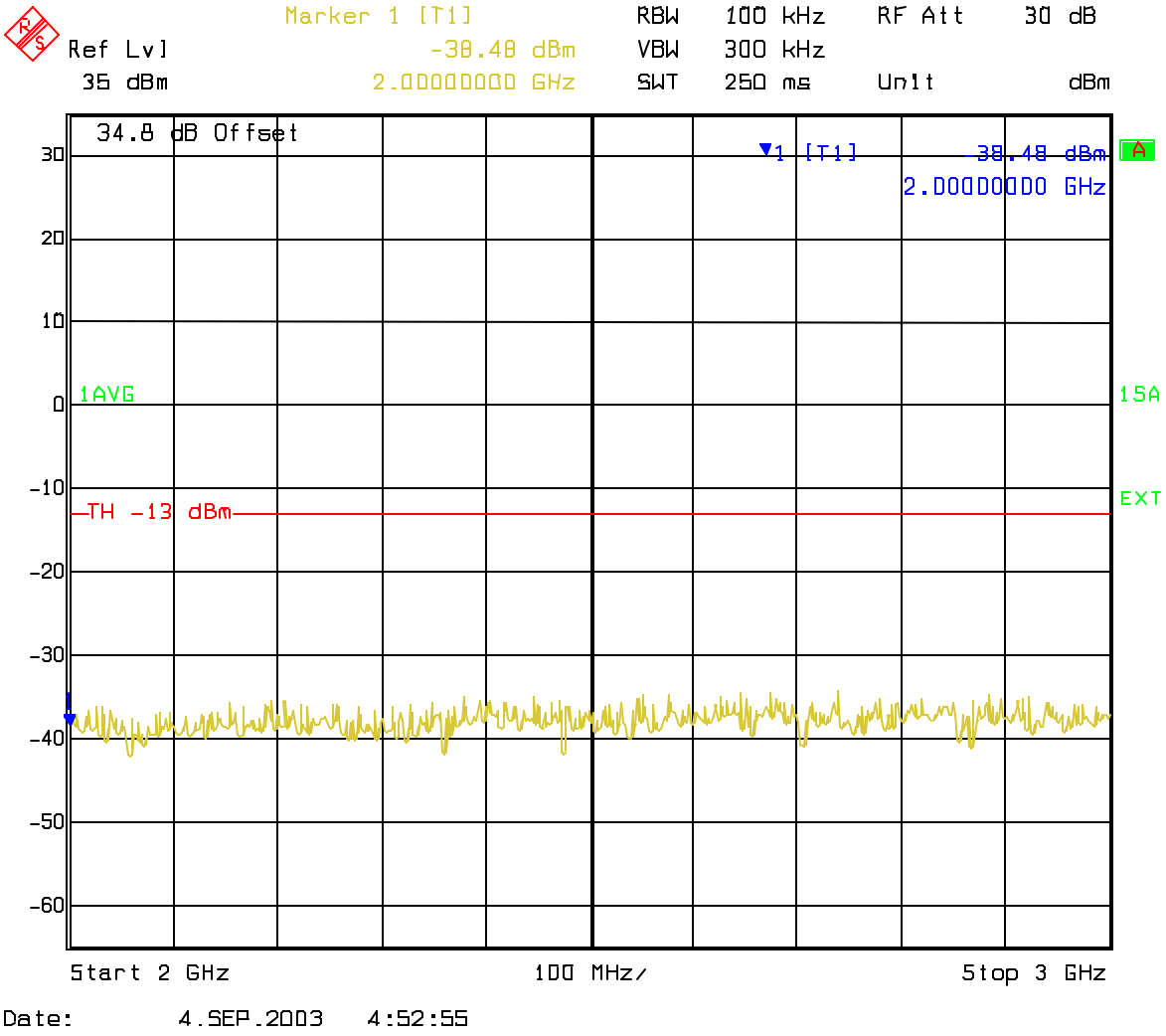
CH 548, 589, 630 Spurious 400MHz to 1GHz



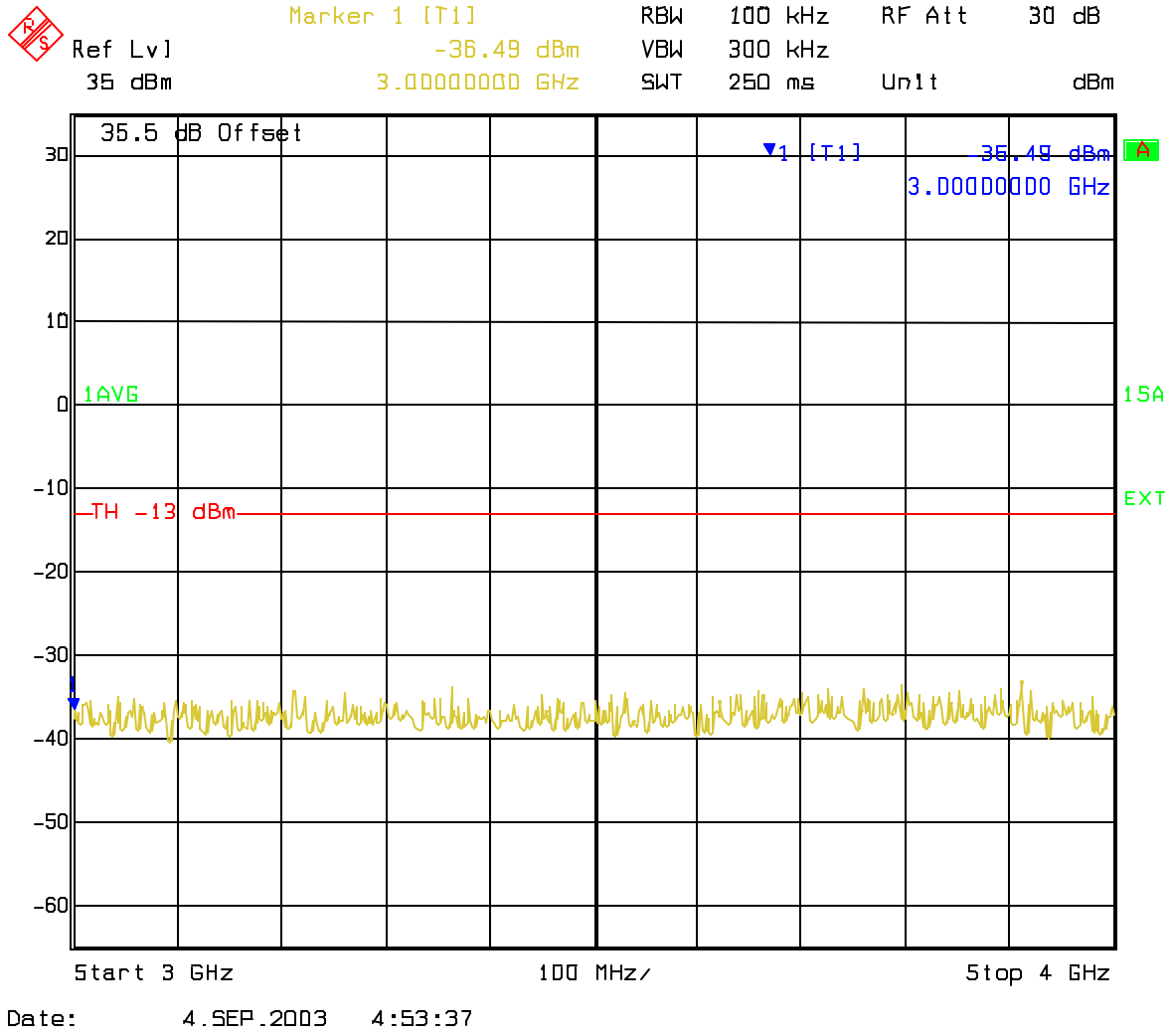
CH 548, 589, 630 Spurious 1GHz to 2GHz



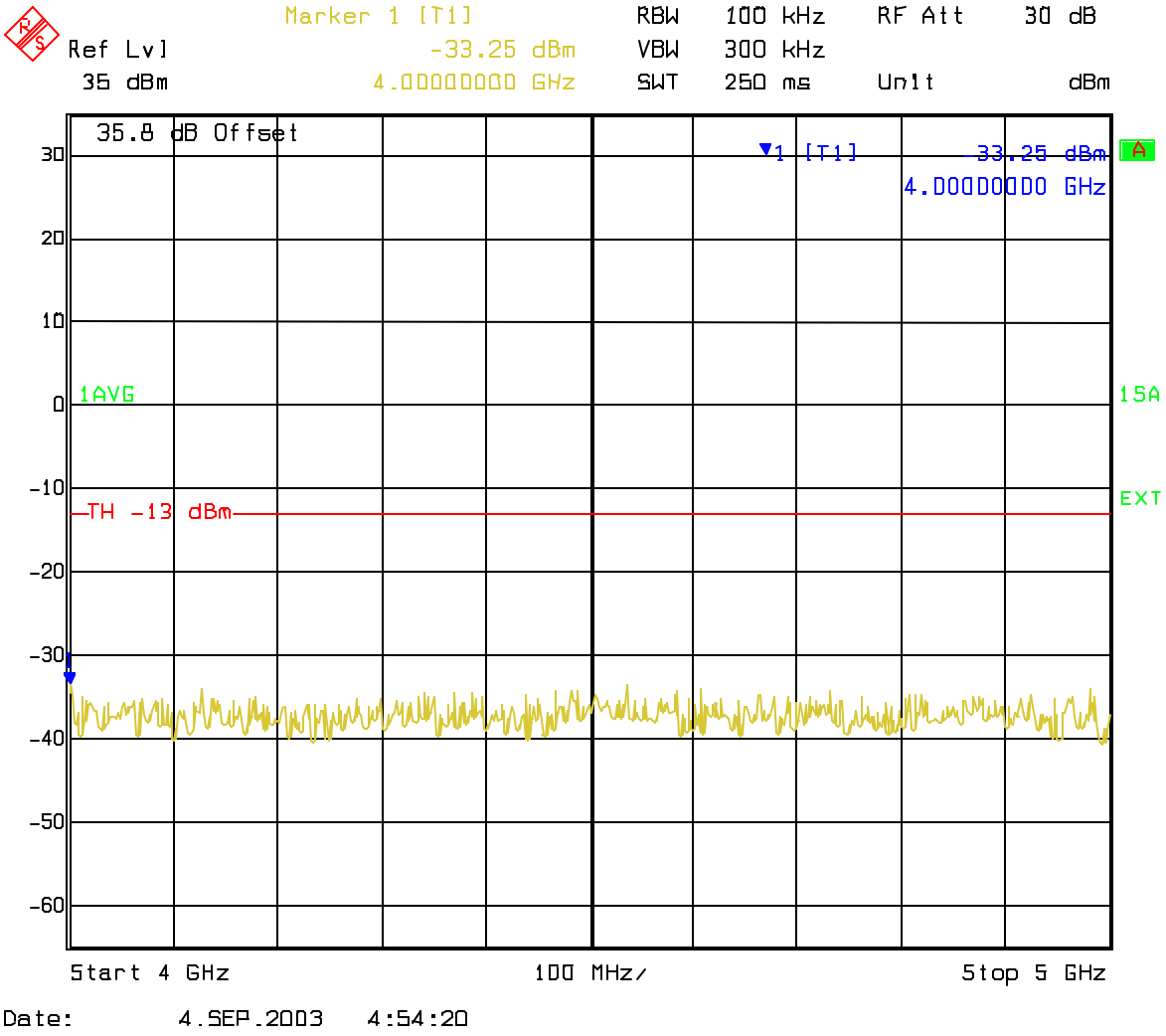
CH 548, 589, 630 Spurious 2GHz to 3GHz



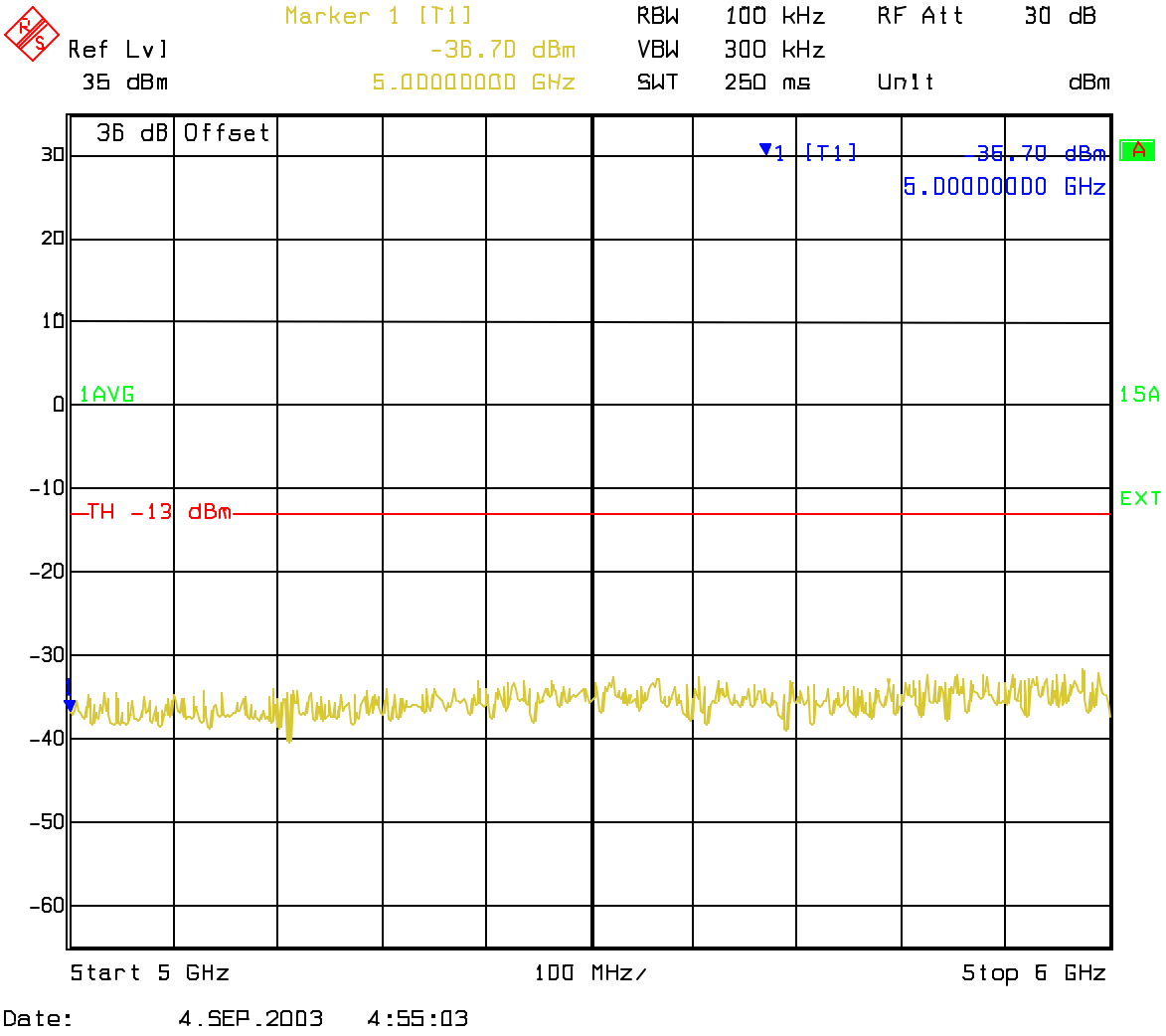
CH 548, 589, 630 Spurious 3GHz to 4GHz



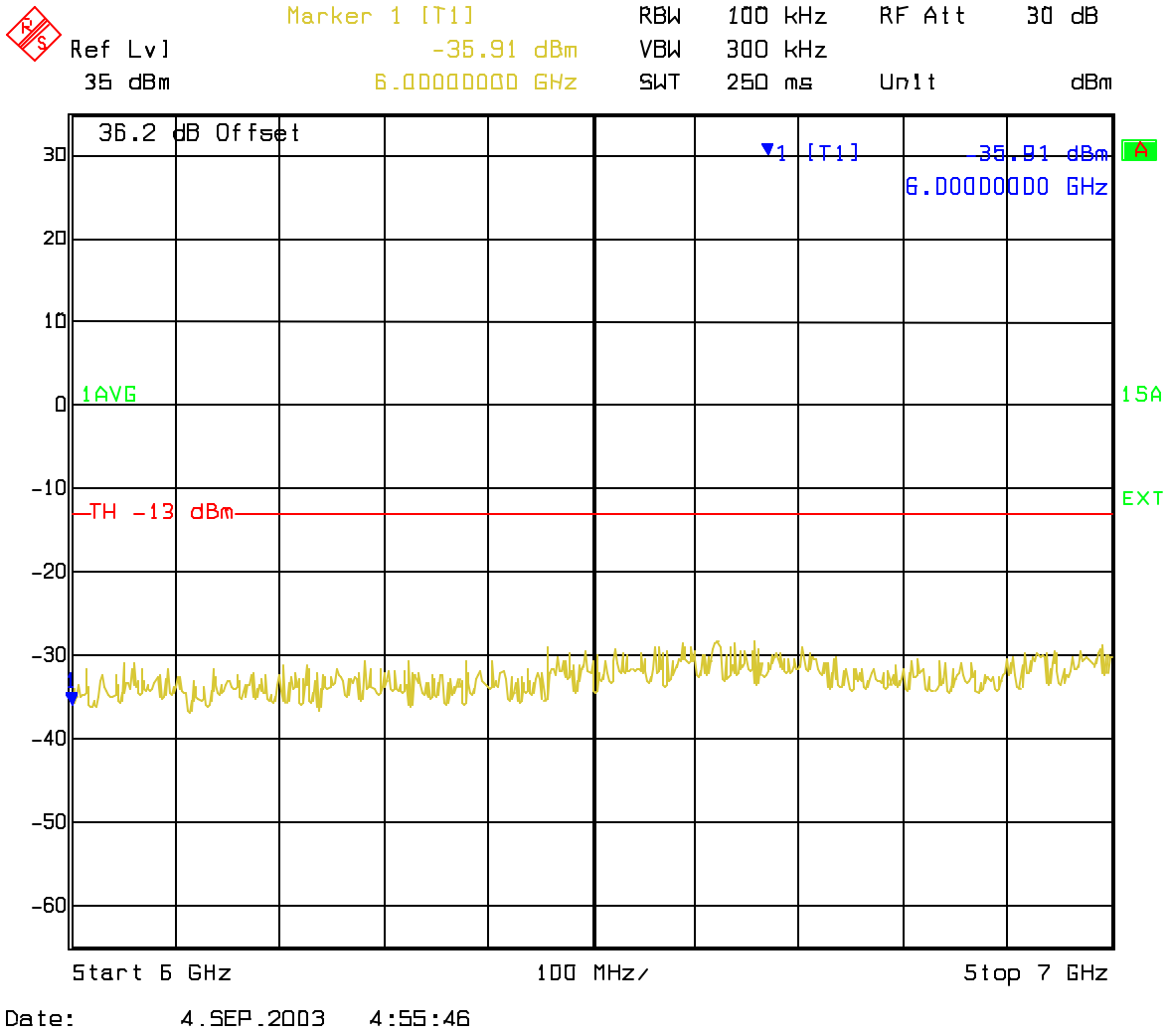
CH 548, 589, 630 Spurious 4GHz to 5GHz



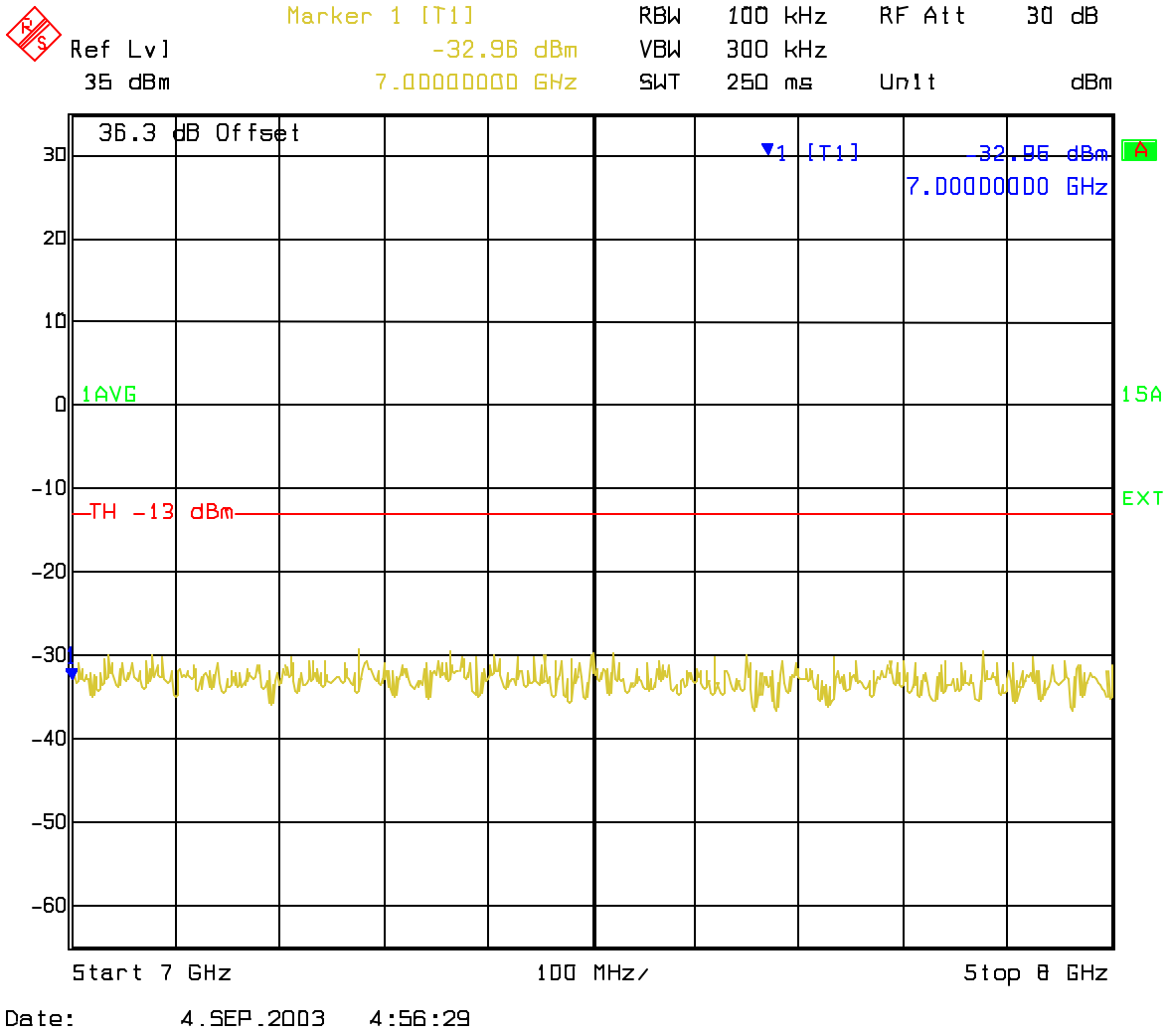
CH 548, 589, 630 Spurious 5GHz to 6GHz



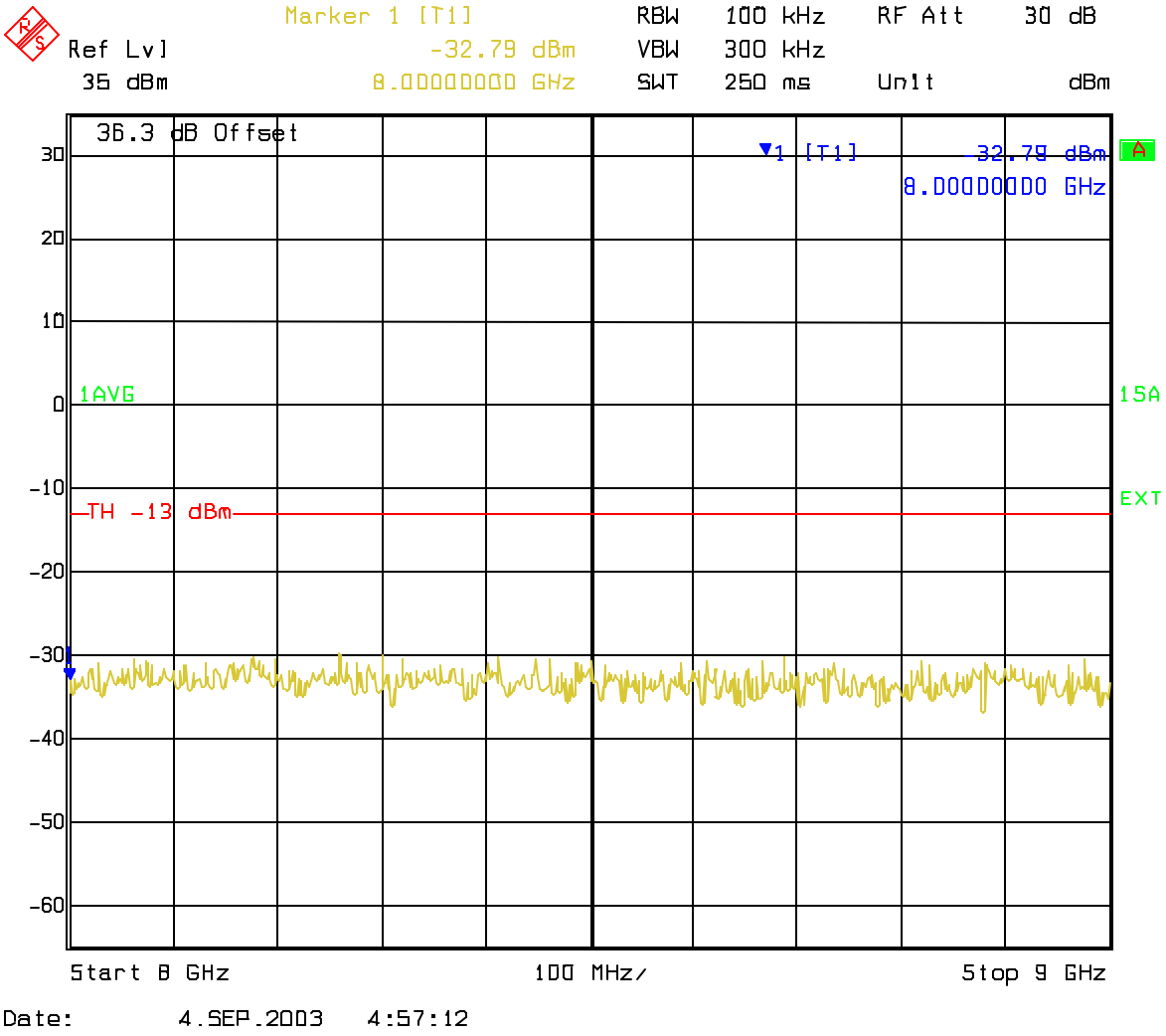
CH 548, 589, 630 Spurious 6GHz to 7GHz



CH 548, 589, 630 Spurious 7GHz to 8GHz



CH 548, 589, 630 Spurious 8GHz to 9GHz



CH 548, 589, 630 Spurious 9GHz to 10GHz