InterLab®

FCC Measurement / Technical Report on

Bluetooth transceiver
NR-172
Multimedia Car Radio with Bluetooth transceiver

Report Reference: MDE_MEE_1209_FCCc

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0 Summary

0.1 Technical Report Summary

Type of Authorization
Certification for an Intentional Radiator (Frequency Hopping Spread Spectrum).

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-11 Edition) and 15 (10-1-11 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

Note:
The tests were selected and performed with reference to the FCC Public Notice DA 00-705, released March 30, 2000.
Instead of applying ANSI C63.4–1992 which is referenced in the FCC Public Note, the newer ANSI C63.4–2009 is applied.

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0.2 Measurement Summary.

0.2 Measurement Summary

FCC Part 15, Subpart C	§ 15.207		
Conducted emissions (AC power line)			
The measurement was performed according to ANSI C63.4			2009
OP-Mode	**Setup**	**Port**	**Final Result**
		AC Port (power line)	N/A

FCC Part 15, Subpart C	§ 15.247 (a) (1)		
Occupied bandwidth			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_b01	Antenna connector	passed
op-mode 2	Setup_b01	Antenna connector	passed
op-mode 3	Setup_b01	Antenna connector	passed
op-mode 6	Setup_b01	Antenna connector	passed
op-mode 7	Setup_b01	Antenna connector	passed
op-mode 8	Setup_b01	Antenna connector	passed
op-mode 10	Setup_b01	Antenna connector	passed
op-mode 11	Setup_b01	Antenna connector	passed
op-mode 12	Setup_b01	Antenna connector	passed

FCC Part 15, Subpart C	§ 15.247 (b) (1)		
Peak power output			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_d02	Antenna connector	passed
op-mode 2	Setup_d02	Antenna connector	passed
op-mode 3	Setup_d02	Antenna connector	passed
op-mode 6	Setup_d02	Antenna connector	passed
op-mode 7	Setup_d02	Antenna connector	passed
op-mode 8	Setup_d02	Antenna connector	passed
op-mode 10	Setup_d02	Antenna connector	passed
op-mode 11	Setup_d02	Antenna connector	passed
op-mode 12	Setup_d02	Antenna connector	passed

FCC Part 15, Subpart C	§ 15.247 (d)		
Spurious RF conducted emissions			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_b01	Antenna connector	passed
op-mode 2	Setup_b01	Antenna connector	passed
op-mode 3	Setup_b01	Antenna connector	passed
op-mode 6	Setup_b01	Antenna connector	passed
op-mode 7	Setup_b01	Antenna connector	passed
op-mode 8	Setup_b01	Antenna connector	passed
op-mode 10	Setup_b01	Antenna connector	passed
op-mode 11	Setup_b01	Antenna connector	passed
op-mode 12	Setup_b01	Antenna connector	passed

FCC Part 15, Subpart C	§ 15.247 (d), § 15.35 (b), § 15.209		
Spurious radiated emissions			
The measurement was performed according to ANSI C63.4			2009
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_c02	Enclosure	passed
op-mode 2	Setup_c02	Enclosure	passed
op-mode 3	Setup_c02	Enclosure	passed
op-mode 6	Setup_a01	Enclosure	passed
op-mode 7	Setup_a01	Enclosure	passed
op-mode 8	Setup_a01	Enclosure	passed
op-mode 10	Setup_a01	Enclosure	passed
op-mode 11	Setup_a01	Enclosure	passed
op-mode 12	Setup_a01	Enclosure	passed

FCC Part 15, Subpart C	§ 15.247 (d)		
Band edge compliance			
The measurement was performed according to FCC § 15.31 / ANSI C63.4			10-1-11 Edition / 2009
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_b01	Antenna connector	passed
op-mode 3	Setup_b01	Antenna connector	passed
op-mode 3	Setup_c02	Enclosure	passed
op-mode 6	Setup_b01	Antenna connector	passed
op-mode 8	Setup_b01	Antenna connector	passed
op-mode 8	Setup_a01	Enclosure	passed
op-mode 10	Setup_b01	Antenna connector	passed
op-mode 12	Setup_b01	Antenna connector	passed
op-mode 12	Setup_a01	Enclosure	passed

FCC Part 15, Subpart C	§ 15.247 (a) (1) (iii)		
Dwell time			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 2	Setup_b01	Antenna connector	passed

FCC Part 15, Subpart C	§ 15.247 (a) (1)		
Channel separation			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 4	Setup_b01	Antenna connector	passed

FCC Part 15, Subpart C	§ 15.247 (a) (iii)		
Number of hopping frequencies			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 4	Setup_b01	Antenna connector	passed

N/A not applicable (the EUT is powered by DC)

This test report replaces the report referenced by "MDE_MEE_1209_FCCb", dated on 2012-09-26.
Note: FCCID changed.

Responsible for Accreditation Scope: _____ Responsible for Test Report: _____

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1 Administrative Data

1.1 Testing Laboratory

Company Name:	7Layers AG
Address	Borsigstr. 11 40880 Ratingen Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716.

The test facility is also accredited by the following accreditation organisation:

Laboratory accreditation no.:	DAkkS D-PL-12140-01-01
Responsible for Accreditation Scope:	Dipl.-Ing. Bernhard Retka Dipl.-Ing. Robert Machulec Dipl.-Ing. Thomas Hoell Dipl.-Ing. Andreas Petz
Report Template Version:	2012-09-21

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Date of Test(s):	2010-08-09 to 2012-09-24
Date of Report:	2012-10-25

1.3 Applicant Data

Company Name:	MITSUBISHI ELECTRIC EUROPE B.V. German Branch
Address:	Mündelheimer Weg 35 40472 Düsseldorf Germany
Contact Person:	Mr. Marcello Ferriani

1.4 Manufacturer Data

Company Name:	MITSUBISHI ELECTRIC CORPORATION Sanda Works
Address:	2-7-3, Marunouchi, Chiyoda-ku Tokyo 100-8310 Japan
Contact Person:	Mr. Atsushi Sakai

2 Test object Data

2.1 General EUT Description

Equipment under Test	Bluetooth transceiver
Type Designation:	NR-172
Kind of Device:	Multimedia Car Radio with Bluetooth Wireless
(optional)	Technology
Voltage Type:	DC (Car Battery)
Voltage level:	13.5 V
Modulation Type:	GFSK, 8DPSK, π/4 DQPSK

General product description:

Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, the Bluetooth technology defines 79 RF channels spaced 1 MHz (2402 - 2480 MHz). The actual RF channel is chosen from a pseudo-random hopping sequence through the 79 channels. A channel is occupied for a defined amount of time slots, with a nominal slot length of 625 µs. The maximum time slot length on one channel is defined by the packet type and is 0.625 ms for DH1 packets, 1.875 ms for DH3 and 3.125 ms for DH5. The nominal hop rate is 1600 hops/s for DH1, 1600/3 for DH3 and 1600/5 for DH5. All frequencies are equally used. The maximum nominal average time of occupancy is 0.4 s within a period of 79*0.4 seconds.

The basic data rate of 1 Mbps uses GFSK modulation and the enhanced data rate uses PSK modulation. For the enhanced data rate of 3 Mbps 8DPSK modulation and of 2 Mbps π/4 DQPSK modulation is used.

Bluetooth is using TDD (Time Division Duplex), which means that Transmitter and Receiver time slots are active alternately during testing. For DH1 packets the transmitter and receiver time slots alternate every 625 µs.

Specific product description for the EUT:

The EUT is a car radio with headset/hands-free functionality which uses Bluetooth technology to be connected to e.g. a mobile phone.

The EUT provides the following ports:

Ports
Antenna connector
Enclosure
DC Port (power line)

The main components of the EUT are listed and described in Chapter 2.2.

2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status	Date of Receipt
EUT A (Code: 08760a01)	Bluetooth transceiver	NR-172	–	D2	E18.0	2010-08-06
Remark: EUT A is equipped with an external antenna (gain = 2.3 dBi).						
EUT B (Code: 08770a01)	Bluetooth transceiver	NR-172	MES130B60 71117	A 166 301 51 00	A 172 302 60 03	2012-08-28
Remark: EUT B is equipped with an external antenna (gain = 2.3 dBi).						

NOTE: The short description is used to simplify the identification of the EUT in this test report.

2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status	FCC ID
AE 1	Cable Harness	Cable Harness with DC Power line, Dummy Speaker and Microphone	–	–	–	–
AE 2	External Display	Continental BR172 DISP_C_HI. ECU	874203	10/12	V88.04	–
AE 3	Control Wheel	A204 870 74 58	–	08/21/00	08/21/00	–
AE 4	External GPS antenna	–	–	–	–	–
AE 5	External FM antenna	–	–	–	–	–
AE 6	External Bluetooth antenna	External PCB antenna	–	–	–	–

2.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status	FCC ID
-	-	-	-	-	-	-

2.5 EUT Setups

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

This chapter describes the combination of EUTs and ancillary equipment used for testing.

Setup No.	Combination of EUTs	Description and Rationale
Setup_a01	EUT A + AE 1 + AE 2 + AE 3 + AE 4 + AE 5 + AE 6	Representative setup for radiated measurements in order to terminate ports with cables and ancillary equipment and to control the EUT
Setup_b01	EUT A + AE 1 + AE 2 + AE 3	Representative setup for conducted measurements in order to control the EUT
Setup_c02	EUT B + + AE 1 + AE 2 + AE 3 + AE 4 + AE 5 + AE 6	Representative setup for radiated measurements in order to terminate ports with cables and ancillary equipment and to control the EUT
Setup_d02	EUT B + + AE 1 + AE 2 + AE 3	Representative setup for conducted measurements in order to control the EUT

2.6 Operating Modes

This chapter describes the operating modes of the EUTs used for testing.

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	The EUT transmits on 2402 MHz	Local TX mode, basic data rate 1 Mbps
op-mode 2	The EUT transmits on 2441 MHz	Local TX mode, basic data rate 1 Mbps
op-mode 3	The EUT transmits on 2480 MHz	Local TX mode, basic data rate 1 Mbps
op-mode 4	The EUT is in Hopping mode	The EUT is hopping on 79 channels, basic data rate 1 Mbps
op-mode 6	The EUT transmits on 2402 MHz	Local TX mode, enhanced data rate 3 Mbps
op-mode 7	The EUT transmits on 2441 MHz	Local TX mode, enhanced data rate 3 Mbps
op-mode 8	The EUT transmits on 2480 MHz	Local TX mode, enhanced data rate 3 Mbps
op-mode 10	The EUT transmits on 2402 MHz	Local TX mode, enhanced data rate, 2 Mbps
op-mode 11	The EUT transmits on 2441 MHz	Local TX mode, enhanced data rate, 2 Mbps
op-mode 12	The EUT transmits on 2480 MHz	Local TX mode, enhanced data rate, 2 Mbps

2.7 Special software used for testing

The EUT is equipped with a special firmware and the operating modes can be selected from a menu tree at the External Display (GUI). The applicant prepared the operating modes.

For Bluetooth technology, the Bluetooth Standards define a test mode that enables the operator during the tests to set the EUT into a mode that it can be externally controlled by the signalling unit in the active Bluetooth radio-link “over-the-air.” The Bluetooth test mode is completely documented in the Bluetooth Specifications.

2.8 Product labelling

2.8.1 FCC ID label

Please refer to the documentation of the applicant.
The FCCID provided by the applicant is: UJHNR172UHS.

2.8.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

3 Test Results

3.1 Occupied bandwidth

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: FCC §15.31

3.1.1 Test Description

The Equipment Under Test (EUT) was setup to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produces the worst-case (widest) occupied bandwidth. The resolution bandwidth for measuring the reference level and the occupied bandwidth was 30 kHz.
The EUT was connected to the spectrum analyzer via a short coax cable.

3.1.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1)
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Implication by the test laboratory:
Since the Bluetooth technology defines a fixed channel separation of 1 MHz this design parameter defines the maximum allowed occupied bandwidth depending on the EUT's output power:

1. Under the provision that the system operates with an output power not greater than 125 mW (21.0 dBm):
   Implicit Limit: Max. 20 dB BW = 1.0 MHz / 2/3 = 1.5 MHz
2. If the system output power exceeds 125 mW (21.0 dBm):
   Implicit Limit: Max. 20 dB BW = 1.0 MHz

Used conversion factor: Output power (dBm) = 10 log (Output power (W) / 1mW)

The measured output power of the system is below 125 mW (21.0 dBm).
For the results, please refer to the related chapter of this report.
Therefore the limit is determined as 1.5 MHz.

3.1.3 Test Protocol

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 1	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
0.854	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 2	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
0.854	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
0.848	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 6	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
1.216	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 7	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
1.216	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 8	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
1.216	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 10	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
1.234	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 11	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
1.240	–

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 12	Setup_b01	Antenna connector

20 dB bandwidth MHz	Remarks
1.240	–

Remark: Please see annex for the measurement plot.

3.1.4 Test result: Occupied bandwidth

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 8	passed
	op-mode 10	passed
	op-mode 11	passed
	op-mode 12	passed

3.2 Peak power output

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: FCC §15.31

3.2.1 Test Description

The Equipment Under Test (EUT) was set up to perform the output power measurements. The resolution bandwidth for measuring the output power was set to 3 MHz. The reference level of the spectrum analyzer was set higher than the output power of the EUT. The EUT was connected to the spectrum analyzer via a short coax cable with a known loss.

3.2.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (b) (1)
(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW)
==> Maximum Output Power: 30 dBm

3.2.3 Test Protocol

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 1	Setup_d02	Antenna connector

Output power dBm	Remarks
1.5	The EIRP including antenna gain (2.3 dBi) is 3.8 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 2	Setup_d02	Antenna connector

Output power dBm	Remarks
1.8	The EIRP including antenna gain (2.3 dBi) is 4.1 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_d02	Antenna connector

Output power dBm	Remarks
2.1	The EIRP including antenna gain (2.3 dBi) is 4.4 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 6	Setup_d02	Antenna connector

Output power dBm	Remarks
3.3	The EIRP including antenna gain (2.3 dBi) is 5.6 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 7	Setup_d02	Antenna connector

Output power dBm	Remarks
3.6	The EIRP including antenna gain (2.3 dBi) is 5.9 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 8	Setup_d02	Antenna connector

Output power dBm	Remarks
3.8	The EIRP including antenna gain (2.3 dBi) is 6.1 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 10	Setup_d02	Antenna connector

Output power dBm	Remarks
2.8	The EIRP including antenna gain (2.3 dBi) is 5.1 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 11	Setup_d02	Antenna connector

Output power dBm	Remarks
3.2	The EIRP including antenna gain (2.3 dBi) is 5.5 dBm

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 12	Setup_d02	Antenna connector

Output power dBm	Remarks
3.4	The EIRP including antenna gain (2.3 dBi) is 5.7 dBm

Remark: Please see annex for the measurement plot.

3.2.4 Test result: Peak power output

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 8	passed
	op-mode 10	passed
	op-mode 11	passed
	op-mode 12	passed

3.3 Spurious RF conducted emissions

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: FCC §15.31

3.3.1 Test Description

The Equipment Under Test (EUT) was set up to perform the spurious emissions measurements.
The EUT was connected to spectrum analyzer via a short coax cable with a known loss.
Analyzer settings:
- Detector: Peak-Maxhold
- Frequency range: 30 – 25000 MHz
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Sweep Time: 330 s

The reference value for the measurement of the spurious RF conducted emissions is determined during the test “band edge compliance” (cf. chapter 3.5). This value is used to calculate the 20 dBc limit.

3.3.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (c)
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

3.3.3 Test Protocol

Temperature: 20-27 °C
Air Pressure: 9961020 hPa
Humidity: 42-46 %

Op. Mode	Setup	Port
op-mode 1	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.6	-22.6	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 2	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.5	-22.5	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.2	-22.2	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 6	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.6	-22.6	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 7	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.5	-22.5	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 8	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.2	-22.2	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 10	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.6	-22.6	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 11	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.5	-22.5	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 12	Setup_b01	Antenna connector

Frequency MHz	Corrected measurement value dBm	Reference value dBm	Limit dBm	Margin dB
-	-	-2.2	-22.2	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
Please see annex for the measurement plot.

3.3.4 Test result: Spurious RF conducted emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 8	passed
	op-mode 10	passed
	op-mode 11	passed
	op-mode 12	passed

3.4 Spurious radiated emissions

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: ANSI C63.4–2009

3.4.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.4–2009. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.

1. Measurement up to 30 MHz
The test set-up was made in accordance to the general provisions of ANSI C63.4–2009. The Equipment Under Test (EUT) was set up on a non-conductive table in the anechoic chamber.
The radiated emissions measurements were made in a typical installation configuration. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The Loop antenna HFH2-Z2 is used.
Step 1: pre-measurement
- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 – 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF–Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.
Step 2: final measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.
- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF–Bandwidth: 200 Hz – 10 kHz
- Measuring time / Frequency step: 100 ms

2. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan

Preliminary test to identify the highest amplitudes relative to the limit.

Settings for step 1:

- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs (BT Timing 1.25 ms)
- Turntable angle range: –180 to +180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: second measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180 to +180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by +/–22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/–25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –22.5° to +22.5° around the determined value
- Height variation range: –0.25 m to +0.25 m around the determined value

Step 4: final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

3. Measurement above 1 GHz

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The Equipment Under Test (EUT) was set up on a non-conductive support at 1.4 m height in the fully-anechoic chamber. The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse linear-distance squared for the power reference level measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2–4 are omitted. Step 1 was performed with one height of the receiving antenna only.
EMI receiver settings:
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.
For the enhanced data rate packets the test is performed as worst-case-check in order to verify that emissions have a comparable level as found at basic data rate. Typically, the measurement for these packets is performed in the frequency range 1 to 8 GHz but it depends on the emissions found during the test for the basic data rate. Please refer to the results for the used frequency range.

3.4.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (d)
... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit(dBµV/m @10m)
0.009 – 0.49	2400/F(kHz)	300	Limit (dBµV/m)+30dB
0.49 – 1.705	24000/F(kHz)	30	Limit (dBµV/m)+10dB
1.705 - 30	30	30	Limit (dBµV/m)+10dB

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit (dBµV/m)
30 - 88	100	3	40.0
88 - 216	150	3	43.5
216 - 960	200	3	46.0
above 960	500	3	54.0

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

3.4.3 Test Protocol

Temperature: 26-27 °C
Air Pressure: 1011-1019 hPa
Humidity: 38-39 %

3.4.3.1 Measurement up to 30 MHz

Op. Mode	Setup	Port
op-mode 1	Setup_a01	Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
0°	-	-	-	-	-	-	-	-	-
90°	-	-	-	-	-	-	-	-	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found therefore step 2 was not performed. The found peak at 91.2 kHz is emission from loop antenna power supply.

3.4.3.2 Measurement above 30 MHz

Op. Mode	Setup	Port
op-mode 1		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	2799	-	51.0	40.5	-	74.0	54.0	23.0	13.5

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 2		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	2799	-	50.7	40.5	-	74.0	54.0	23.3	13.5

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 3		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	2799	-	50.9	40.6	-	74.0	54.0	23.1	13.4

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 6		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	2791	-	53.2	46.7	-	74.0	54.0	20.8	7.3

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1, 2 and 3.

Op. Mode	Setup	Port
op-mode 7		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	2791	-	53.7	46.3	-	74.0	54.0	20.3	7.7

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1, 2 and 3.

Op. Mode	Setup	Port
op-mode 8		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	2791	-	53.7	46.2	-	74.0	54.0	20.3	7.8

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1, 2 and 3.

Op. Mode	Setup	Port
op-mode 10		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	1549	-	46.5	35.7	-	74.0	54.0	27.5	18.3
Vertical + horizontal	2791	-	54.0	46.6	-	74.0	54.0	20.0	7.4

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1, 2 and 3.

Op. Mode	Setup	Port
op-mode 11		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	1105	-	45.3	34.9	-	74.0	54.0	28.7	19.1
Vertical + horizontal	1549	-	46.6	35.7	-	74.0	54.0	27.4	18.3
Vertical + horizontal	2791	-	53.1	46.5	-	74.0	54.0	20.9	7.5

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1, 2 and 3.

Op. Mode	Setup	Port
op-mode 12		Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin dB	Margin dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Vertical + horizontal	1549	-	46.8	35.8	-	74.0	54.0	27.2	18.2
Vertical + horizontal	2791	-	53.3	46.5	-	74.0	54.0	20.7	7.5

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1, 2 and 3.

3.4.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 8	passed
	op-mode 10	passed
	op-mode 11	passed
	op-mode 12	passed

3.5 Band edge compliance

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: ANSI C63.4–2009, FCC §15.31

3.5.1 Test Description

The procedure to show compliance with the band edge requirement is divided into two measurements:
1. Show compliance of the lower band edge by a conducted measurement and
2. show compliance of the higher band edge by a radiated and conducted measurement.

For the conducted measurement, the Equipment Under Test (EUT) is placed in a shielded room. The radiated emissions measurements are performed in a typical installation configuration inside the fully anechoic chamber using a horn antenna at 1 m distance.

For the first measurement the EUT is set to transmit on the lowest channel (2402 MHz). The lower band edge is 2400 MHz.
Analyzer settings:
- Detector: Peak
- RBW / VBW = 100 / 300 kHz

For the second measurement the EUT is set to transmit on the highest channel (2480 MHz). The higher band edge is 2483.5 MHz.
Analyzer settings for conducted measurement:
- Detector: Peak
- RBW / VBW = 100 / 300 kHz

EMI receiver settings for radiated measurement:
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

3.5.2 Test Requirements / Limits

FCC Part 15.247 (d)
“In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.
...
Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).”

For the conducted measurement the RF power at the band edge shall be “at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power...”

For the radiated measurement of the higher band edge connected to a restricted band the limit is “specified in Section 15.205(a)”.

3.5.3 Test Protocol

3.5.3.1 Lower band edge

Conducted measurement

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 1	Setup_b01	Antenna connector

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin dB
2400.00	-57.7	-2.6	-22.6	35.1

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 6	Setup_b01	Antenna connector

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin dB
2400.00	-50.5	-2.6	-22.6	27.9

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 10	Setup_b01	Antenna connector

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin dB
2400.00	-55.6	-2.6	-22.6	33.0

Remark: Please see annex for the measurement plot.

3.5.3.2 Higher band edge

Conducted measurement

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 3	Setup_b01	Antenna connector

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin dB
2483.50	-63.6	-2.2	-22.2	41.4

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 8	Setup_b01	Antenna connector

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin dB
2483.50	-63.6	-2.2	-22.2	41.4

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 12	Setup_b01	Antenna connector

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin dB
2483.50	-63.3	-2.2	-22.2	41.1

Remark: Please see annex for the measurement plot.

Radiated measurement

Temperature: 26 °C
Air Pressure: 1011-1019 hPa
Humidity: 38-39 %

Op. Mode	Setup	Port
op-mode 3	Setup_c02	Enclosure

Frequency MHz	Polarisation	Corrected value dBµV/m		Limit PK dBµV/m	Limit AV dBµV/m	Margin PK /dB	Margin AV dB
		PK	AV				
2483.50	Vertical + horizontal	48.2	36.8	74.0	54.0	25.8	17.2

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 8	Setup_a01	Enclosure

Frequency MHz	Polarisation	Corrected value dBµV/m		Limit PK dBµV/m	Limit AV dBµV/m	Margin PK /dB	Margin AV dB
		PK	AV				
2483.50	Vertical + horizontal	49.0	37.0	74.0	54.0	25.0	17.0

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 12	Setup_a01	Enclosure

Frequency MHz	Polarisation	Corrected value dBµV/m		Limit PK dBµV/m	Limit AV dBµV/m	Margin PK /dB	Margin AV dB
		PK	AV				
2483.50	Vertical + horizontal	49.1	37.2	74.0	54.0	24.9	16.8

Remark: Please see annex for the measurement plot.

3.5.4 Test result: Band edge compliance

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 3	passed
	op-mode 6	passed
	op-mode 8	passed
	op-mode 10	passed
	op-mode 12	passed

3.6 Dwell time

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: FCC §15.31

3.6.1 Test Description

The Equipment Under Test (EUT) was set up to perform the dwell time measurements. The EUT was connected to the spectrum analyzer via a short coax cable. The dwell time is independent from the modulation pattern and is calculated by:

Dwell time = time slot length * hop rate / number of hopping channels * 31.6 s

with:
- hop rate = 1600 * 1/s for DH1 packets = 1600 s^{-1}
- hop rate = 1600/3 * 1/s for DH3 packets = 533.33 s^{-1}
- hop rate = 1600/5 * 1/s for DH5 packets = 320 s^{-1}
- number of hopping channels = 79
- 31.6 s = 0.4 seconds multiplied by the number of hopping channels = 0.4 s * 79

The highest value of the dwell time is reported.

3.6.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Since the Bluetooth technology uses 79 channels this period is calculated to be 31.6 seconds.

3.6.3 Test Protocol

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 2	Setup_b01	Antenna connector

Packet type	Time slot length ms	Dwell time	Dwell time ms
DH5	2.986	time slot length * 1600/5 /79 * 31.6	382

Remark: Please see annex for the measurement plots.

3.6.4 Test result: Dwell time

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 2	passed

3.7 Channel separation

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: FCC §15.31

3.7.1 Test Description

The Equipment Under Test (EUT) was set up to perform the channel separation measurements. The channel separation is independent from the modulation pattern. The EUT was connected to spectrum analyzer via a short coax cable.
Analyzer settings:
- Detector: Peak-Maxhold
- Span: 3 MHz
- Centre Frequency: a mid frequency of the 2.4 GHz ISM band
- Resolution Bandwidth (RBW): 30 kHz
- Video Bandwidth (VBW): 100 kHz
- Sweep Time: Coupled

3.7.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1)
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

3.7.3 Test Protocol

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 4	Setup_b01	Antenna connector

Channel separation MHz	Remarks
1.000	-

Remark: Please see annex for the measurement plot.

3.7.4 Test result: Channel separation

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 4	passed

3.8 Number of hopping frequencies

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: FCC §15.31

3.8.1 Test Description

The Equipment Under Test (EUT) was set up to perform the number of hopping frequencies measurement. The number of hopping frequencies is independent from the modulation pattern.
The EUT was connected to spectrum analyzer via a short coax cable.
Analyzer settings:
- Detector: Peak-Maxhold
- Centre frequency: 2442 MHz
- Frequency span: 84 MHz
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Sweep Time: Coupled

3.8.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (iii)
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

3.8.3 Test Protocol

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 4	Setup_b01	Antenna connector

Number of hopping channels	Remarks
79	-

Remark: Please see annex for the measurement plot.

3.8.4 Test result: Number of hopping frequencies

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 4	passed

4 Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	**Lab 1**
Manufacturer:	Frankonia
Description:	Anechoic Chamber for radiated testing
Type:	10.58x6.38x6.00 m³

Single Devices for Anechoic Chamber

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Air compressor	none	-	Atlas Copco	
Anechoic Chamber	10.58 x 6.38 x 6.00 m³	none	Frankonia	
	Calibration Details		*Last Execution*	*Next Exec.*
	FCC listing 96716 3m Part15/18		2009/01/07	2011/01/06
	IC listing 3699A-1 3m		2009/01/21	2011/01/20
	FCC listing 96716 3m Part15/18		2011/01/11	2014/01/10
	IC listing 3699A-1 3m		2011/02/07	2014/02/06
Controller Innco 2000	CO 2000	CO2000/328/12470 406/L	Innco innovative constructions GmbH	
Controller Maturo	MCU	961208	Maturo GmbH	
EMC camera	CE-CAM/1	-	CE-SYS	
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi	
Filter ISDN	B84312-C110-E1		Siemens&Matsushita	
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita	

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID:	**Lab 1**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Antenna mast	AS 620 P	620/37	HD GmbH	
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2008/10/27	2013/10/26
	Standard Calibration		2012/01/18	2015/01/17
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
	Path Calibration		2012/05/24	2012/11/23
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
	Standard Calibration		2009/04/16	2012/04/15
	Standard Calibration		2012/05/18	2015/05/17
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/04/28	2012/04/27
	Standard Calibration		2012/06/26	2015/06/25
Dreheinheit	DE 325		HD GmbH	
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/10	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2010/05/11	2010/11/09
	Path Calibration		2010/11/06	2011/05/05
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
	Path Calibration		2012/05/24	2012/11/23
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/05/27	2012/05/26
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2008/10/07	2011/10/06
	Standard calibration		2011/10/27	2014/10/26
Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH	
Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH	
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	Maturo GmbH	

Test Equipment Auxiliary Test Equipment

Lab ID:	**Lab 1**
Manufacturer:	see single devices
Description:	Single Devices for various Test Equipment
Type:	various
Serial Number:	none

Single Devices for Auxiliary Test Equipment

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
AC Power Source	Chroma 6404	64040001304	Chroma ATE INC.
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.
	Calibration Details		*Last Execution* / *Next Exec.*
	Standard calibration		2009/10/07 / 2011/10/06
	Customized calibration		2011/10/19 / 2013/10/18
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

Test Equipment Digital Signalling Devices

Lab ID: **Lab 1**
Description: Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Bluetooth Signalling Unit CBT	CBT	100589	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2008/08/14	2011/08/13
	Standard calibration		2011/11/24	2014/11/23
CMW500	CMW500	107500	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Initial factory calibration		2012/01/26	2014/01/25
	HW/SW Status		*Date of Start*	*Date of End*
	Firmware: V.2.01.25 3G : KC42x 11.36.00, 11.48.01 LTE: KC501 1.4.5 up to 1.8.5 KC503 1.4.8 up to 1.8.5 KC507 1.7.0 up to 1.8.5 KC508 1.7.0 up to 1.8.5 KC551 1.4.9 up to 1.8.5 KC553 1.4.9 up to 1.8.5 KC571 1.7.0 up to 1.8.5 KC572 1.7.0 up to 1.8.5 InterLab® LSIM Test Solution 1.6.7.4 InterLab® LSAT Test Solution 1.6.7.4 ---		2012/04/20	2012/05/07
	Firmware: V.2.01.25 3G : KC42x 11.48.02 LTE: KC501 1.6.5 up to 1.9.8 KC503 1.6.5 up to 1.9.8 KC506 1.9.8 KC507 1.7.0 KC508 1.8.5 up to 1.9.8 KC551 1.4.1 up to 1.9.8 KC553 1.5.5 up to 1.9.8 KC571 1.8.5 up to 1.9.8 KC572 1.8.5 up to 1.9.8 ---		2012/05/07	2012/07/03
	Firmware: V.2.01.25 3G : KC42x 11.48.02, 12.16.00 LTE: KC501 1.7.0 up to 2.0.0 KC503 1.7.2 up to 2.0.0 KC506 1.9.8 up to 2.0.0 KC507 1.7.0 KC508 1.8.5 up to 2.0.0 KC551 1.4.9 up to 2.0.0 KC553 1.7.0 up to 2.0.0 KC556 2.0.0 KC571 1.8.5 up to 2.0.0 KC572 1.8.5 up to 2.0.0 ---		2012/07/03	
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2009/02/16	2011/02/15
	Standard calibration		2011/05/26	2013/05/25
	HW/SW Status		*Date of Start*	*Date of End*

Single Devices for Digital Signalling Devices (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
	Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22 Firmware: µP1 8v50 02.05.06 ---		2007/07/16	
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2008/12/01	2011/11/30
	Standard calibration		2011/12/07	2014/12/06
	HW/SW Status		*Date of Start*	*Date of End*
	HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 ---		2007/01/02	
	SW: K62, K69		2008/11/03	

Test Equipment Emission measurement devices

Lab ID:	**Lab 1**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Emission measurement devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Personal Computer	Dell	30304832059	Dell	
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2012/05/22	2013/05/21
	Standard calibration		2010/04/19	2011/04/18
	Standard calibration		2011/05/03	2012/05/02
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/10/20	2011/10/19
Powermeter	NRVS	836333/064	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2009/10/15	2011/10/14
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2012/05/21	2013/05/20
	Standard calibration		2010/04/19	2011/04/18
	Standard calibration		2011/05/02	2012/05/01
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2007/12/05	2010/12/04
	standard calibration		2011/05/12	2014/05/11
	HW/SW Status		*Date of Start*	*Date of End*
	Standard Calibration: The device is not used for absolute measurements. A power meter (calibration interval is one year) is used for measurements of absolute power values. Therefore the interval for the signal generator is set to three years according to manufacturer recommendation.		2007/12/05	2010/12/04
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/12/03	2011/12/02
	Standard Calibration		2011/12/05	2013/12/04
	HW/SW Status		*Date of Start*	*Date of End*
	Firmware-Update 4.34.4 from 3.45 during calibration		2009/12/03	

Test Equipment Multimeter 12

Lab ID:	**Lab 2**
Description:	Ex-Tech 520
Serial Number:	05157876

Single Devices for Multimeter 12

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Digital Multimeter 12 (Multimeter)	EX520	05157876	Extech Instruments Corp.	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2009/10/07	2010/10/06
	Standard calibration		2009/10/07	2011/10/06
	Customized calibration		2011/10/18	2013/10/17

Test Equipment Regulatory Bluetooth RF Test Solution

Lab ID:	**Lab 2**
Description:	Regulatory Bluetooth RF Tests
Type:	Bluetooth RF
Serial Number:	001

Single Devices for Regulatory Bluetooth RF Test Solution

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ADU 200 Relay Box 7	Relay Box	A04380	Ontrak Control Systems Inc.	
Bluetooth Signalling Unit CBT	CBT	100302	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2010/06/23	2010/08/20
	Standard Calibration		2010/08/20	2011/08/19
	Standard Calibration		2012/08/21	2013/08/20
Power Meter NRVD	NRVD	832025/059		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2010/06/21	2011/06/20
	Standard Calibration		2011/06/14	2012/06/13
	Standard Calibration		2012/07/23	2013/07/22
Power Sensor NRV Z1 A	PROBE	832279/013		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2010/06/22	2011/06/21
	Standard Calibration		2011/06/14	2012/06/13
	Standard Calibration		2012/07/23	2013/07/22
Power Supply	NGSM 32/10	2725		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2010/06/21	2011/06/20
	Standard Calibration		2011/06/15	2013/06/14
Rubidium Frequency Normal MFS	Datum MFS	002	Datum GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2010/07/05	2011/07/04
	Standard Calibration		2011/08/17	2012/08/16
	Standard Calibration		2012/08/20	2013/08/19
Signal Analyser FSIQ26	1119.6001.26	832695/007	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/06/24	2011/06/23
Signal Generator	SMP03	833680/003	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/06/23	2012/06/22
Vector Signal Generator SMIQ03B	SMIQ03B	832870/017		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2010/06/23	2013/06/20

Test Equipment Shielded Room 07

Lab ID:	**Lab 2**
Description:	Shielded Room 4m x 6m

Test Equipment T/H Logger 04

Lab ID:	**Lab 2**
Description:	Lufft Opus10
Serial Number:	7481

Single Devices for T/H Logger 04

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
ThermoHygro Datalogger 04 (Environ)	Opus10 THI (8152.00)	7481	Lufft Mess- und Regeltechnik GmbH

Calibration Details	*Last Execution*	*Next Exec.*
Standard calibration	2009/01/23	2011/01/22

Test Equipment Temperature Chamber 01

Lab ID:	**Lab 2**
Manufacturer:	see single devices
Description:	Temperature Chamber KWP 120/70
Type:	Weiss
Serial Number:	see single devices

Single Devices for Temperature Chamber 01

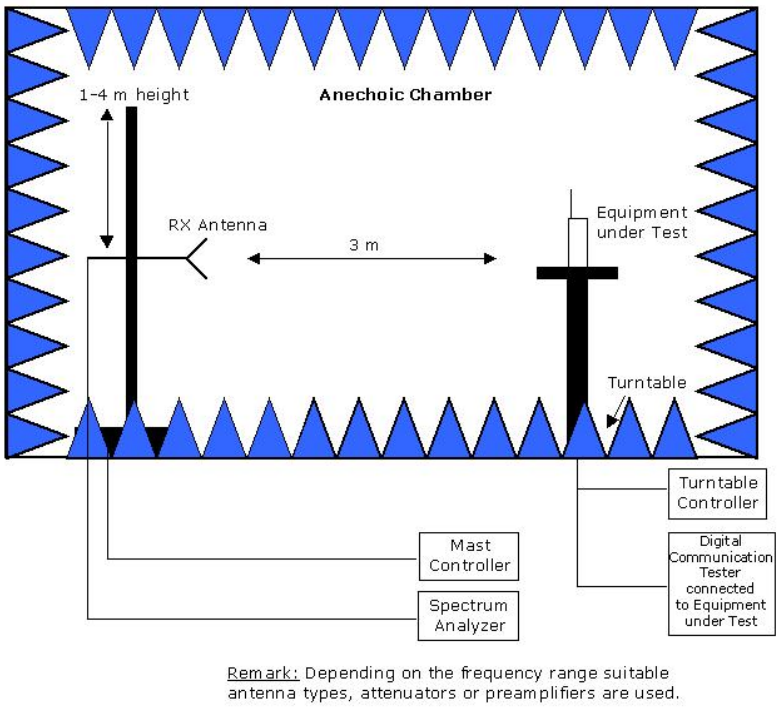
Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Temperature Chamber Weiss 01	KWP 120/70	59226012190010	Weiss Umwelttechnik GmbH

Calibration Details	*Last Execution*	*Next Exec.*
Customized calibration	2012/03/12	2014/03/11
Specific calibration	2010/03/16	2012/03/15

5 Photo Report

Photos are included in an external report.

6 Setup Drawings



Drawing 1: Setup in the Anechoic chamber:
Measurements below 1 GHz: Semi-anechoic, conducting ground plane.
Measurements above 1 GHz: Fully-anechoic, absorbers on all surfaces

7 FCC and IC Correlation of measurement requirements

The following tables show the correlation of measurement requirements for Bluetooth equipment and Digital Apparatus from FCC and IC standards.

Bluetooth® equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC mains	§ 15.207	RSS-Gen: 7.2.4
Occupied bandwidth	§ 15.247 (a) (1)	RSS-210: A8.1
Peak power output	§ 15.247 (b) (1)	RSS-210: A8.4
Spurious RF conducted emissions	§ 15.247 (d)	RSS-Gen: 6; RSS-210: A8.5
Spurious radiated emissions	§ 15.247 (d)	RSS-Gen: 6; RSS-210: A8.5
Band edge compliance	§ 15.247 (d)	RSS-210: A8.5
Dwell time	§ 15.247 (a) (1) (iii)	RSS-210: A8.1
Channel separation	§ 15.247 (a) (1)	RSS-210: A8.1
No. of hopping frequencies	§ 15.247 (a) (1) (iii)	RSS-210: A8.1
Antenna requirement	§ 15.203 / 15.204	RSS-Gen: 7.1.2

Digital Apparatus

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§15.107	ICES-003
Spurious Radiated Emissions	§15.109	ICES-003

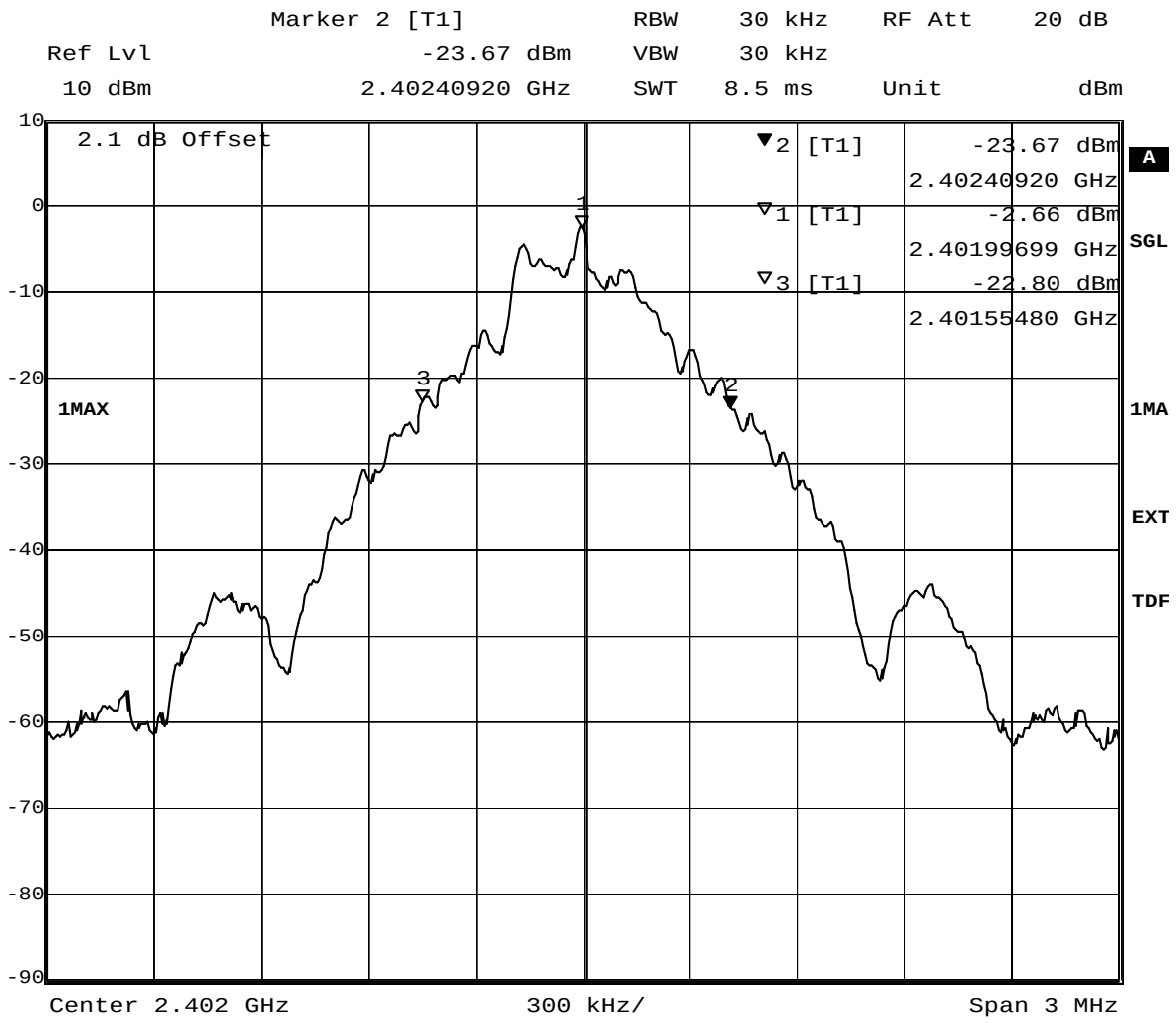
8 Annex measurement plots

8.1 Occupied bandwidth

8.1.1 Occupied bandwidth operating mode 1

Op. Mode

op-mode 1

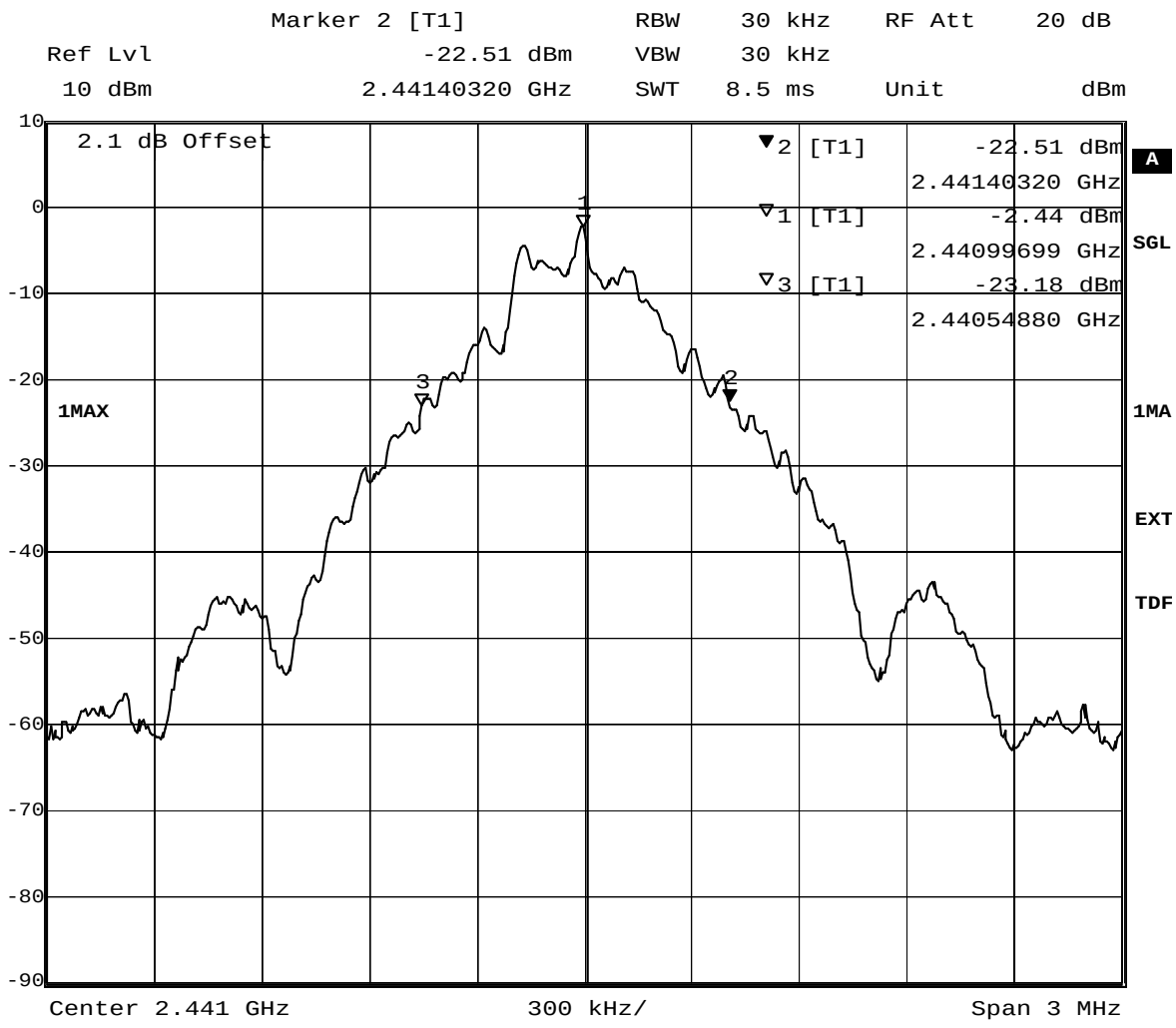


Title: 20dB Bandwidth
Comment A: CH B: 2402 MHz; 20dB bandwidth (kHz):854.4
Date: 8.SEP.2010 17:31:01

8.1.2 Occupied bandwidth operating mode 2

Op. Mode

op-mode 2

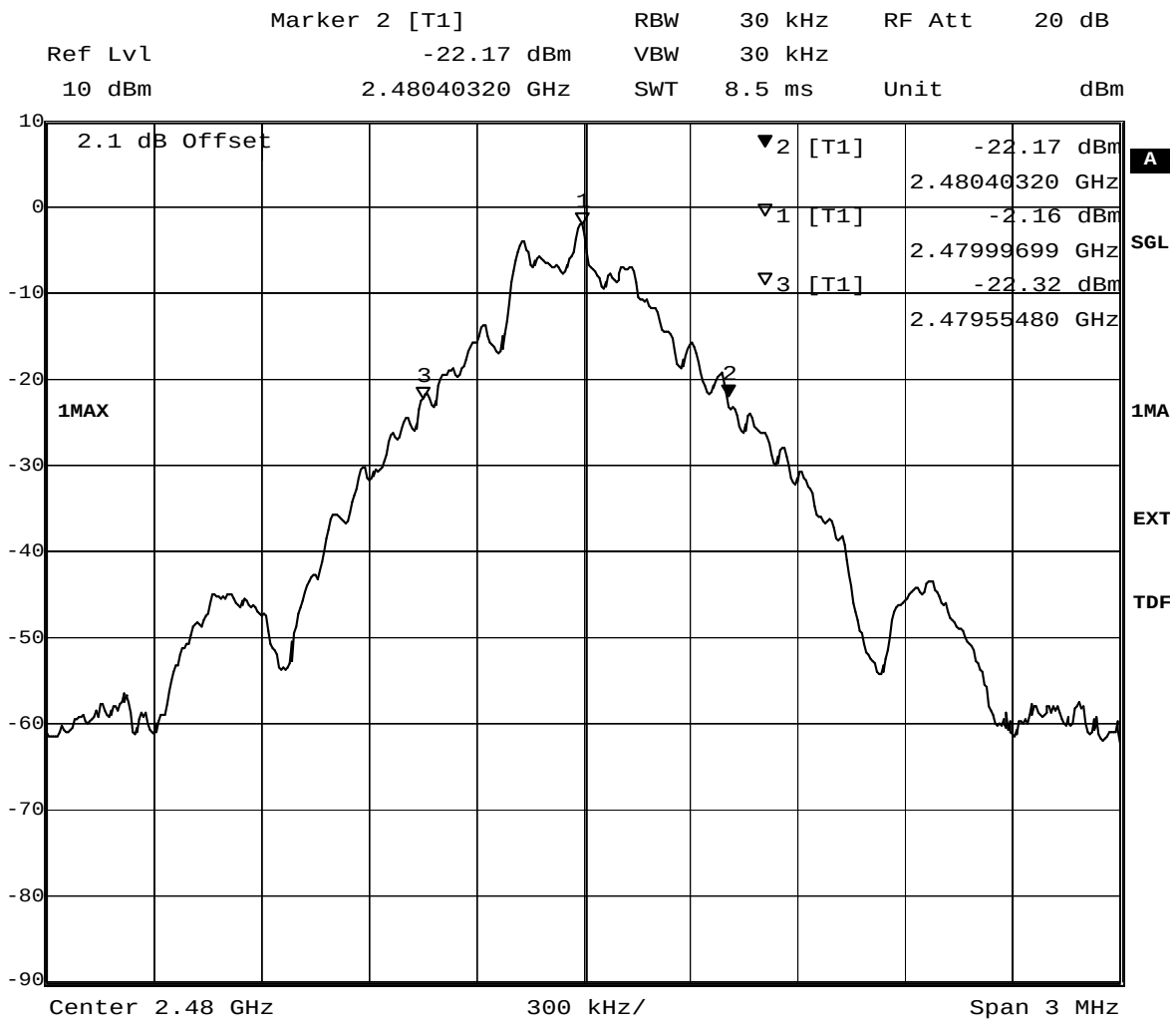


Title: 20dB Bandwidth
Comment A: CH M: 2441 MHz; 20dB bandwidth (kHz):854.4
Date: 8.SEP.2010 18:09:54

8.1.3 Occupied bandwidth operating mode 3

Op. Mode

op-mode 3

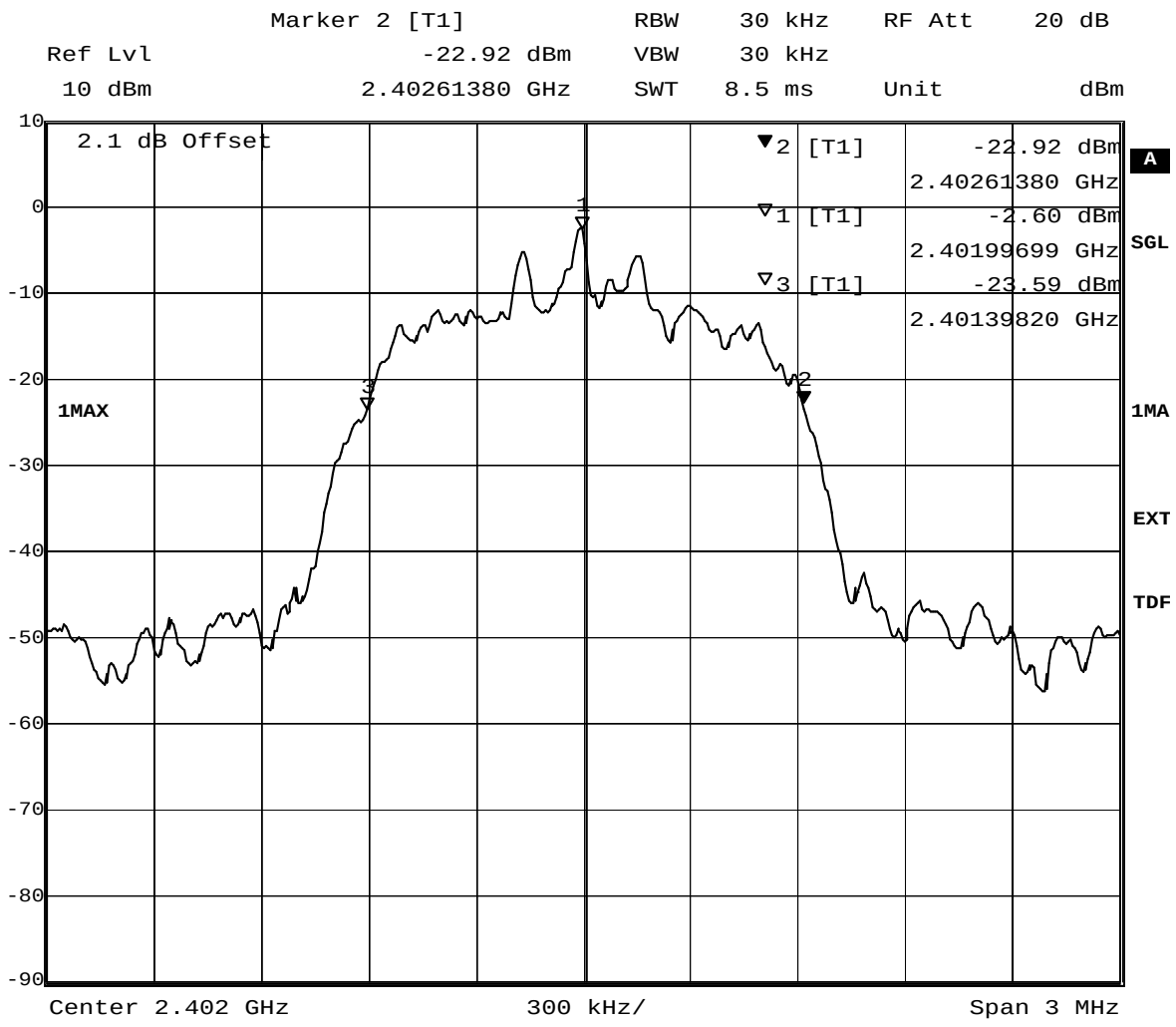


Title: 20dB Bandwidth
Comment A: CH T: 2480 MHz; 20dB bandwidth (kHz):848.4
Date: 8.SEP.2010 18:56:02

8.1.4 Occupied bandwidth operating mode 6

Op. Mode

op-mode 6

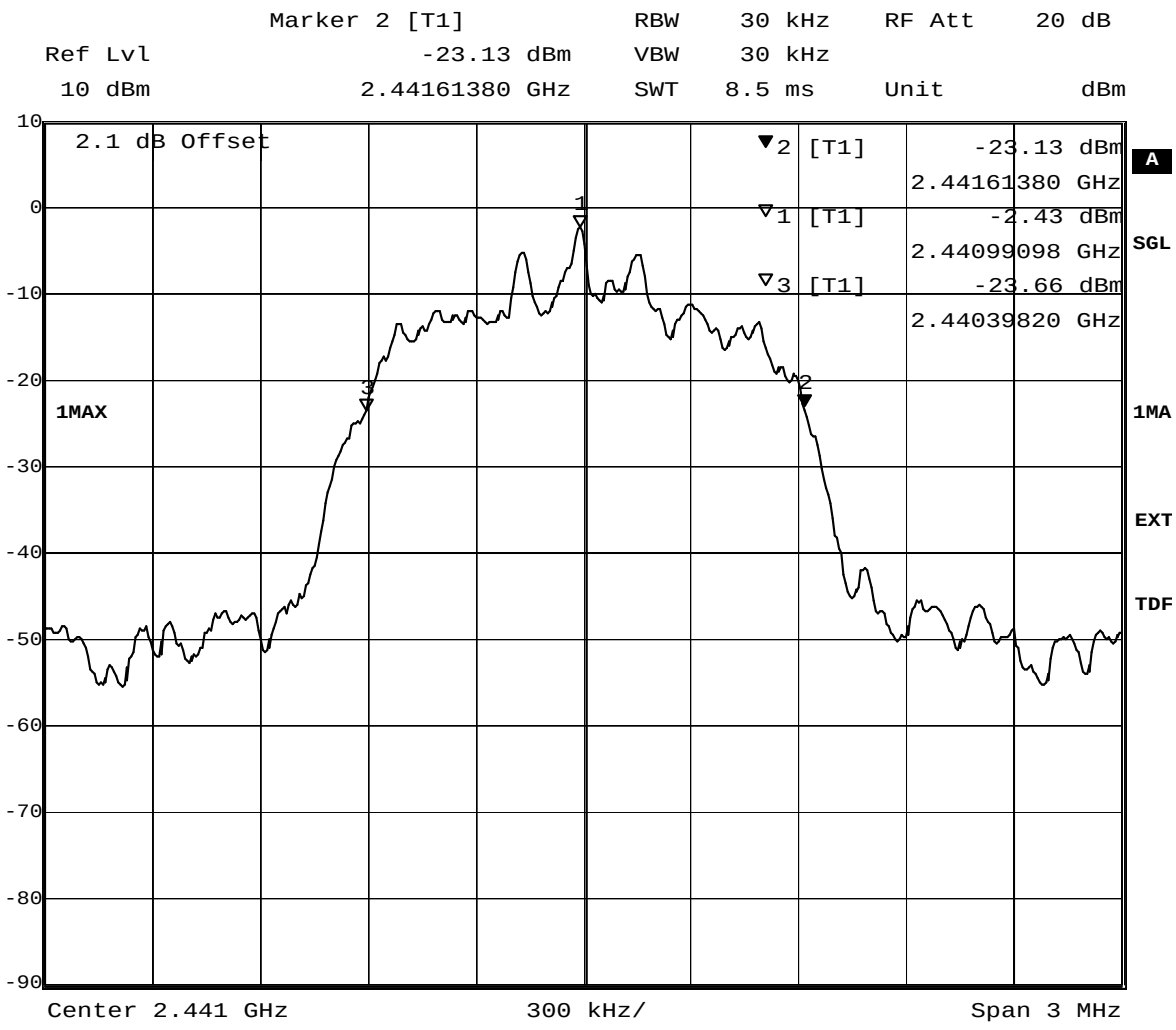


Title: 20dB Bandwidth
Comment A: CH B: 2402 MHz; 20dB bandwidth (kHz):1215.6
Date: 8.SEP.2010 21:04:01

8.1.5 Occupied bandwidth operating mode 7

Op. Mode

op-mode 7

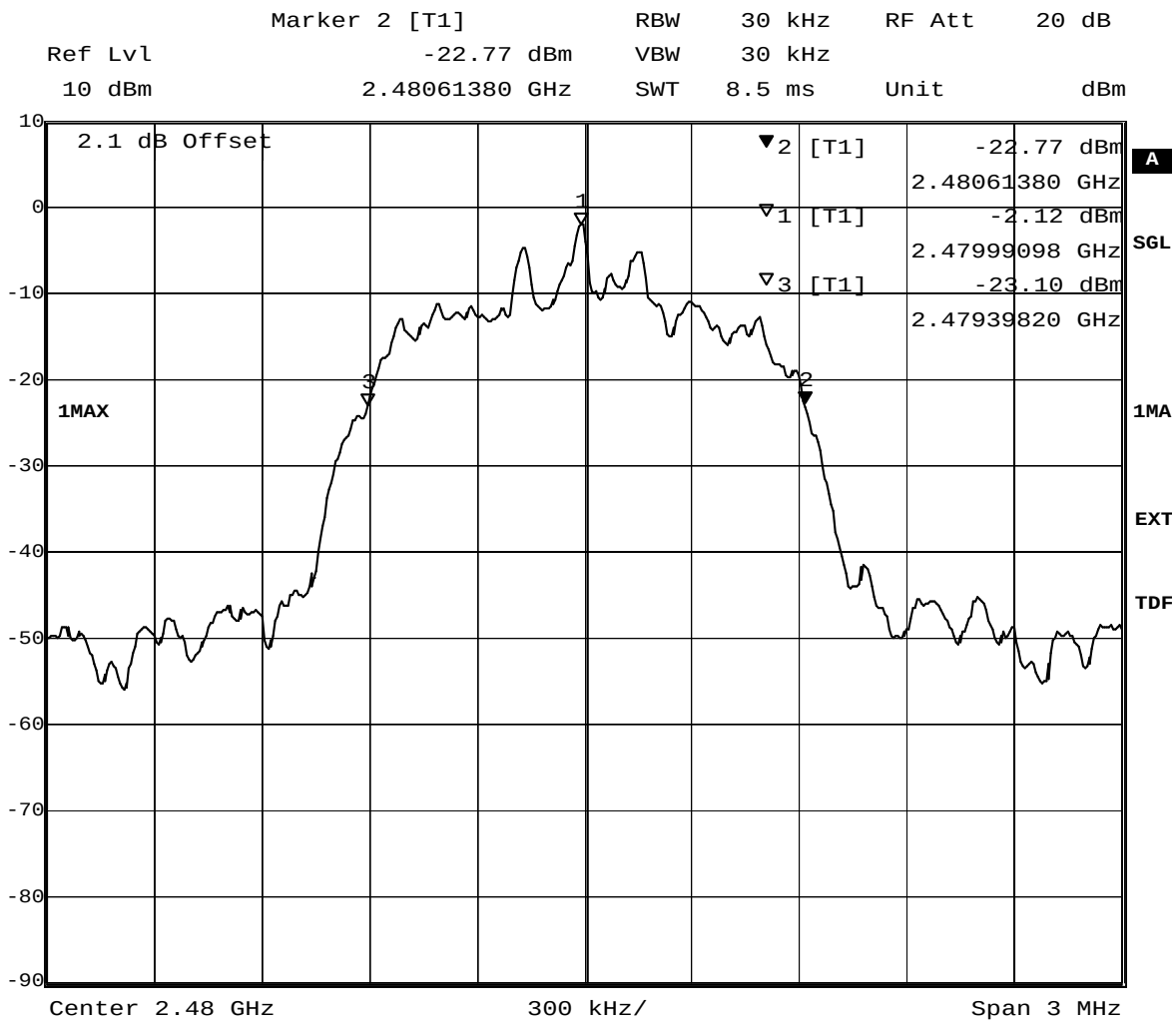


Title: 20dB Bandwidth
Comment A: CH M: 2441 MHz; 20dB bandwidth (kHz):1215.6
Date: 8.SEP.2010 21:23:54

8.1.6 Occupied bandwidth operating mode 8

Op. Mode

op-mode 8

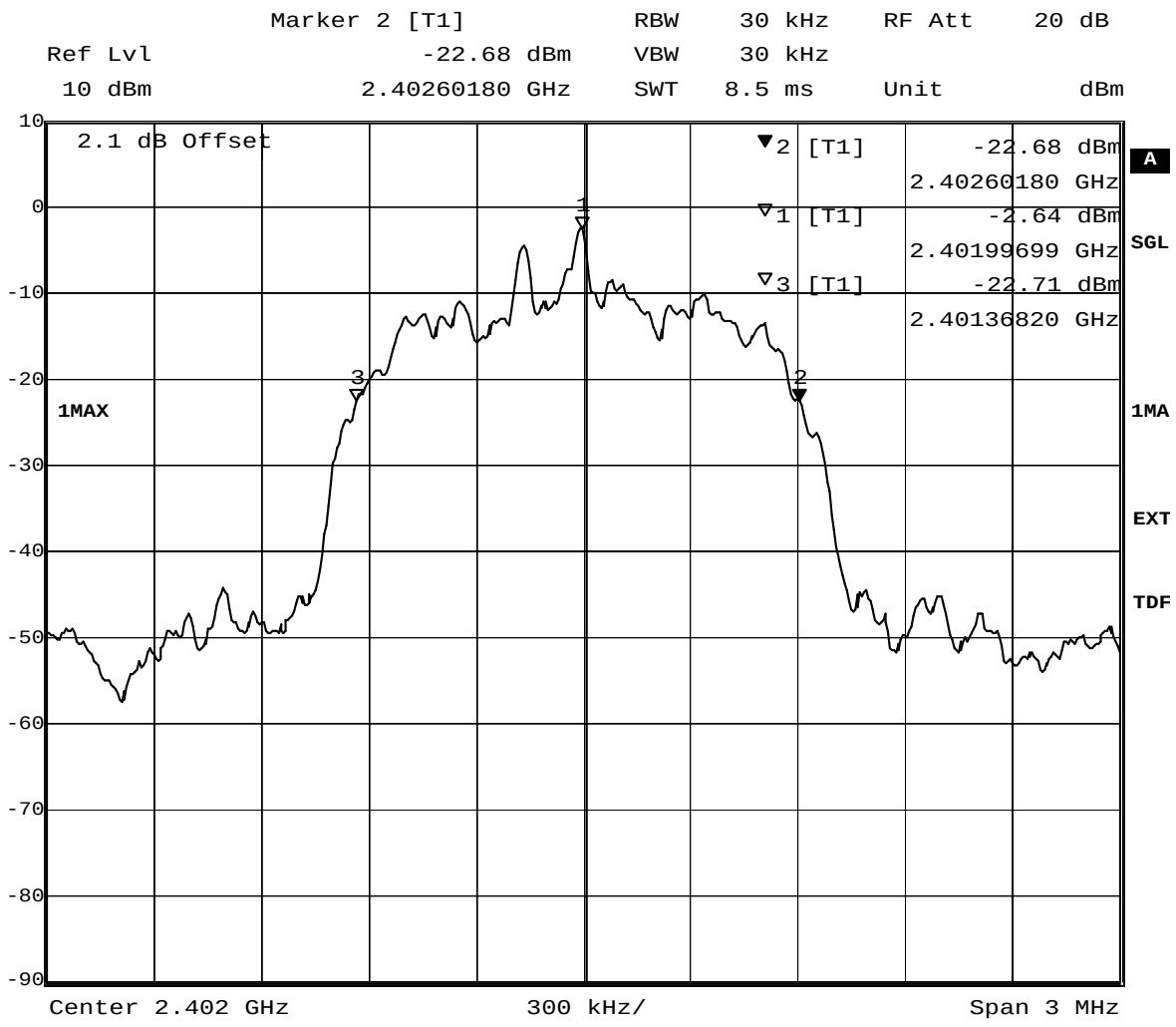


Title: 20dB Bandwidth
Comment A: CH T: 2480 MHz; 20dB bandwidth (kHz):1215.6
Date: 8.SEP.2010 21:44:55

8.1.7 Occupied bandwidth operating mode 10

Op. Mode

op-mode 10

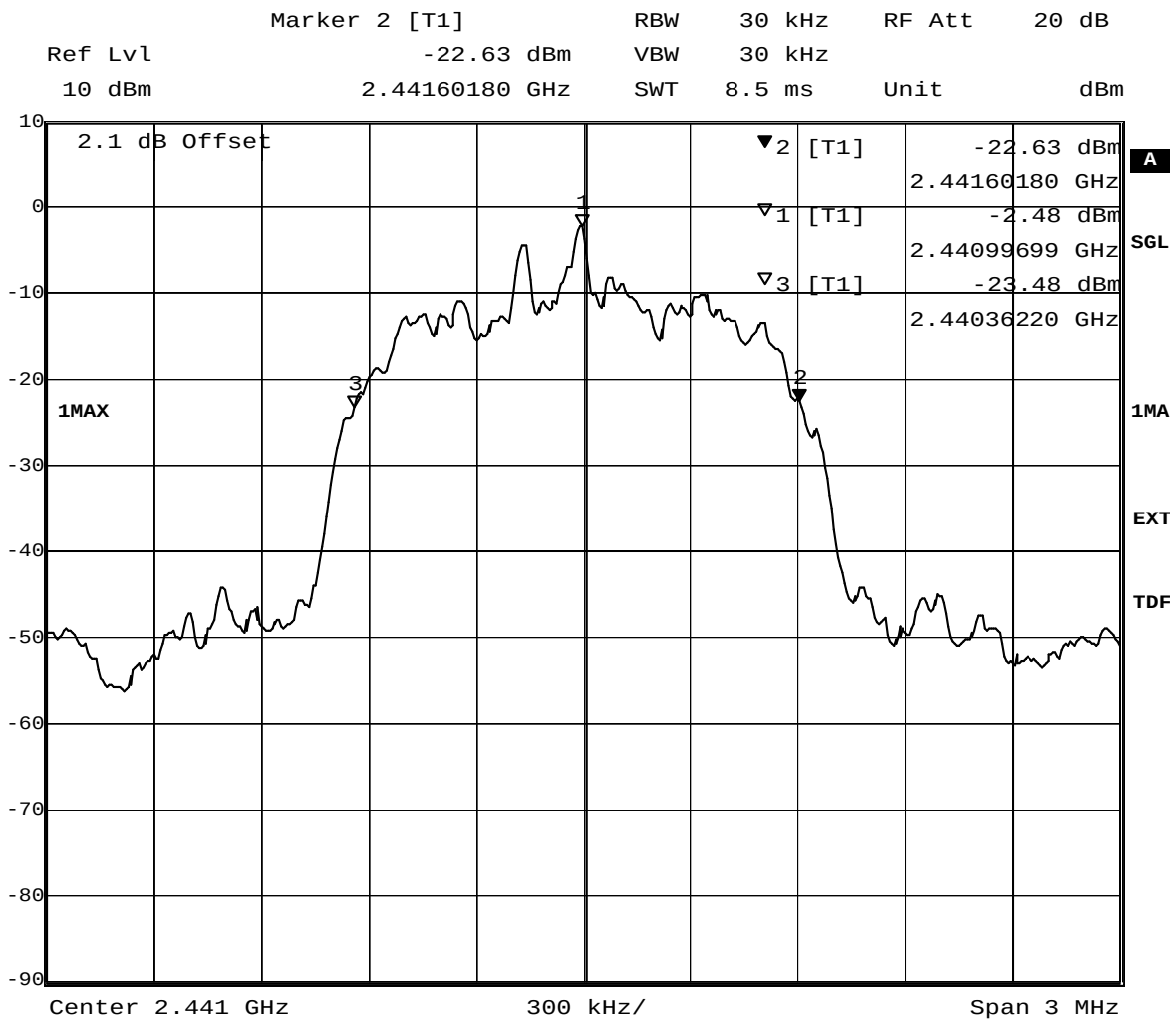


Title: 20dB Bandwidth
Comment A: CH B: 2402 MHz; 20dB bandwidth (kHz):1233.6
Date: 8.SEP.2010 19:34:24

8.1.8 Occupied bandwidth operating mode 11

Op. Mode

op-mode 11

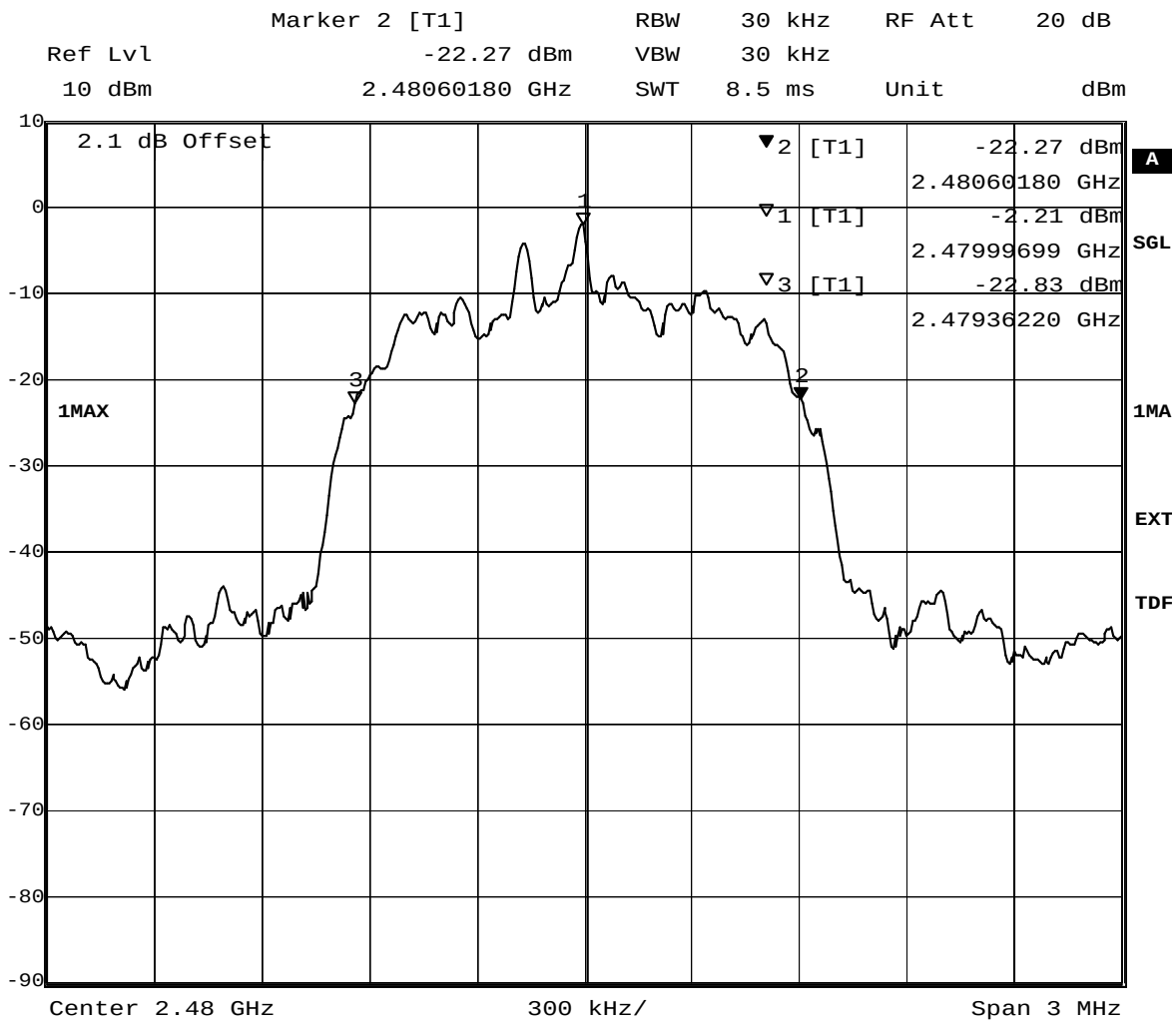


Title: 20dB Bandwidth
Comment A: CH M: 2441 MHz; 20dB bandwidth (kHz):1239.6
Date: 8.SEP.2010 19:54:12

8.1.9 Occupied bandwidth operating mode 12

Op. Mode

op-mode 12



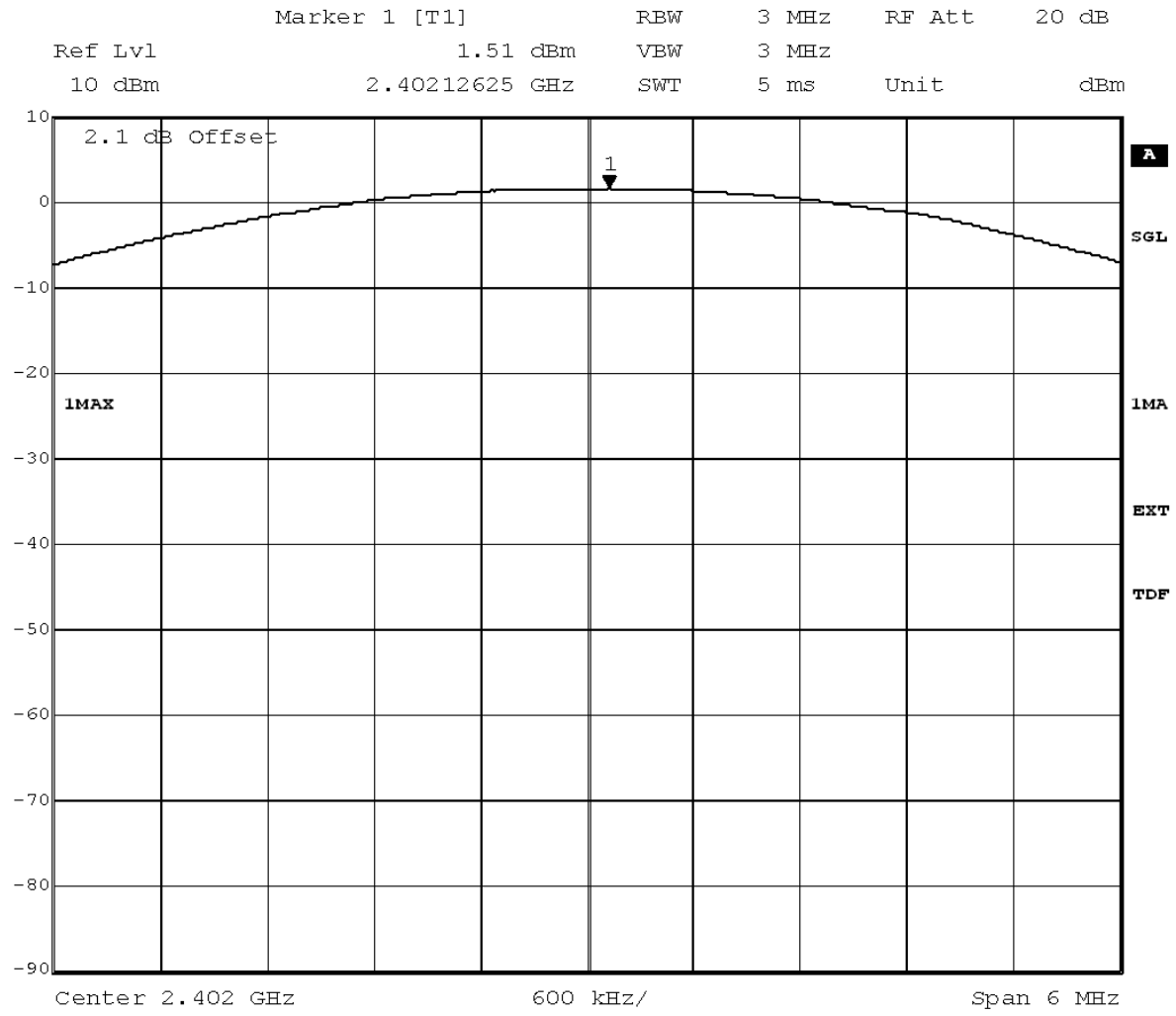
Title: 20dB Bandwidth
Comment A: CH T: 2480 MHz; 20dB bandwidth (kHz):1239.6
Date: 8.SEP.2010 20:14:38

8.2 Peak power output

8.2.1 Peak power output operating mode 1

Op. Mode

op-mode 1

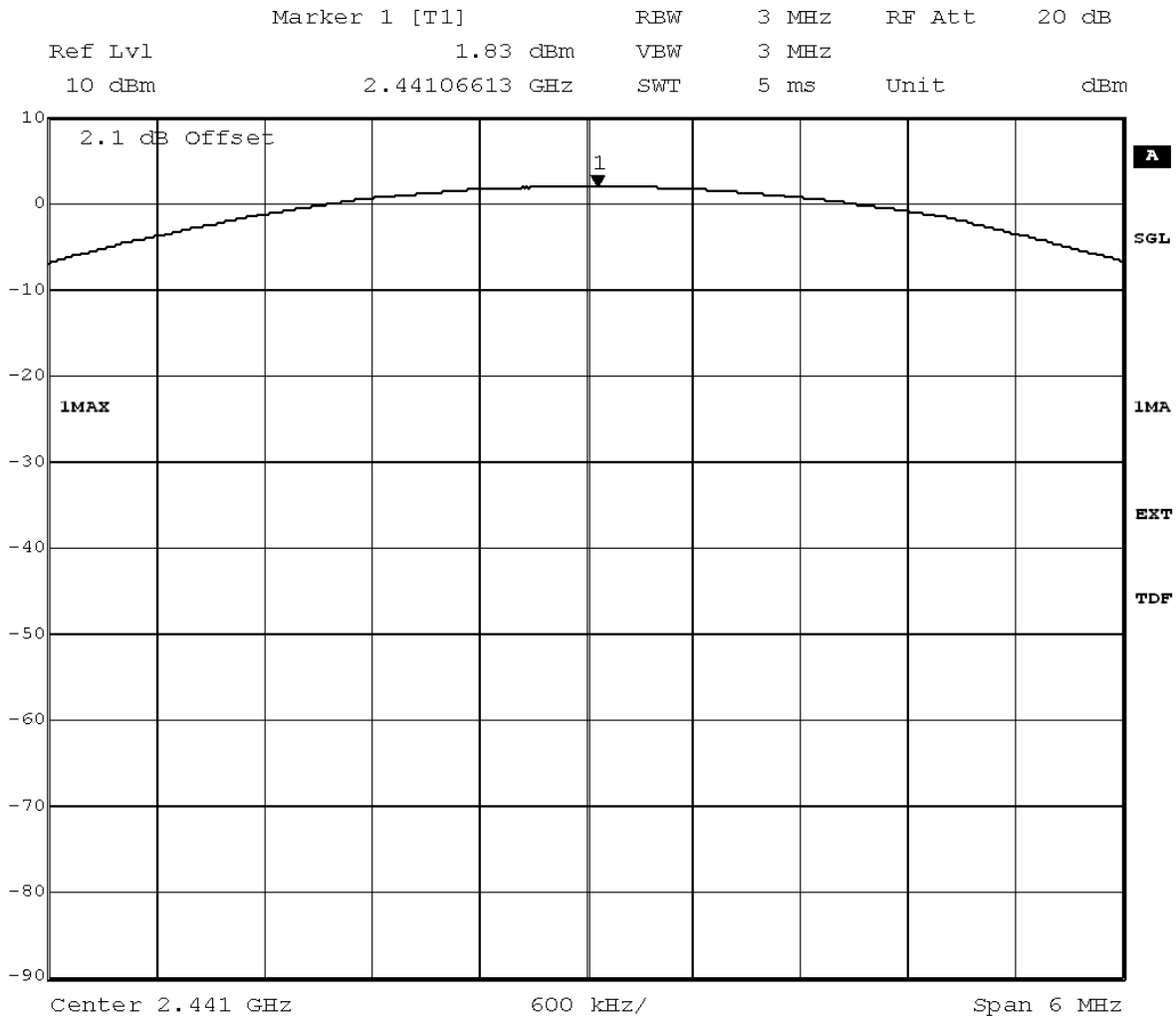


Title: Peak outputpower Power
Comment A: CH B: 2402 MHz
Date: 12.SEP.2012 08:45:16

8.2.2 Peak power output operating mode 2

Op. Mode

op-mode 1

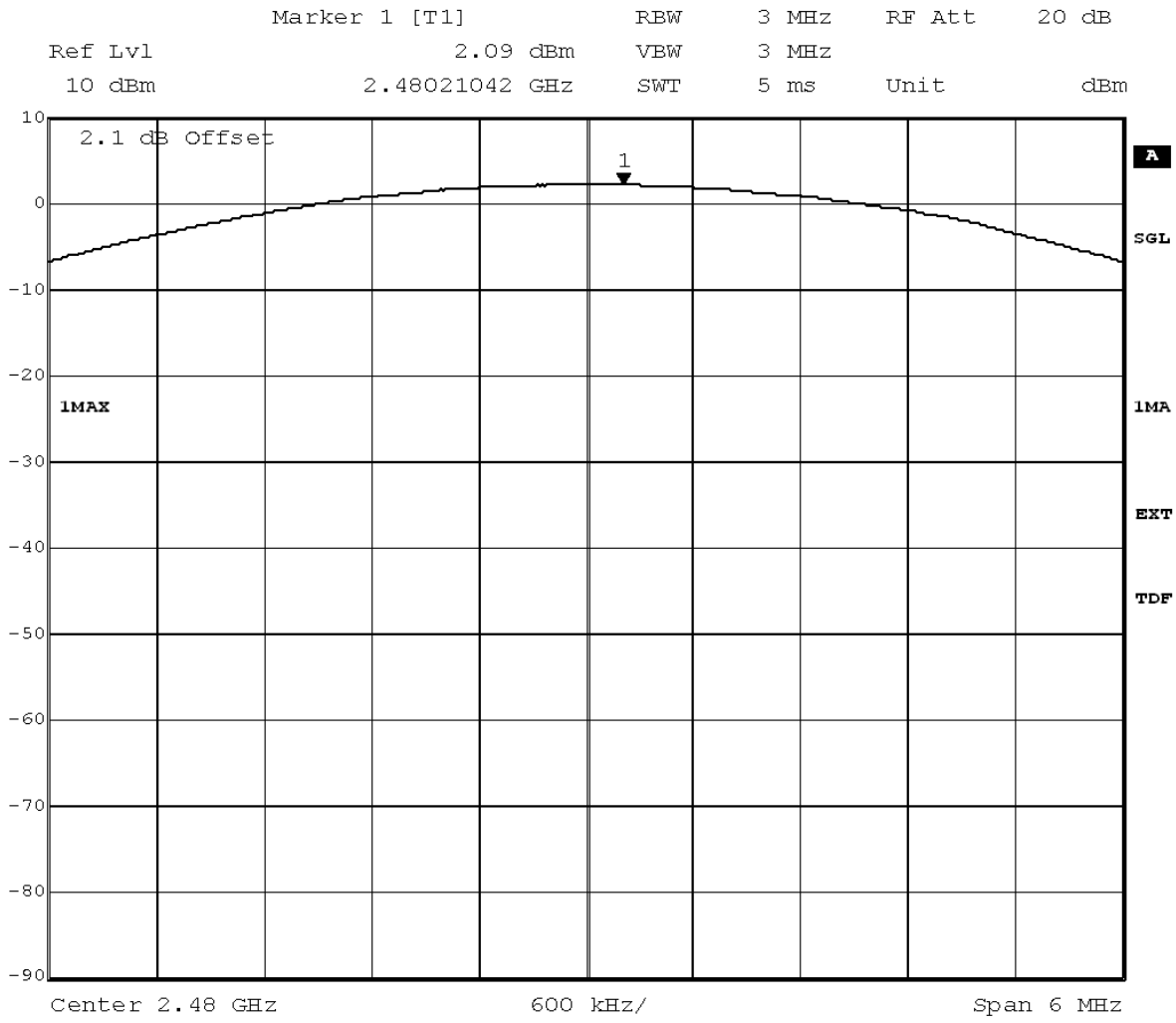


Title: Peak outputpower Power
Comment A: CH M: 2441 MHz
Date: 12.SEP.2012 08:46:30

8.2.3 Peak power output operating mode 3

Op. Mode

op-mode 3

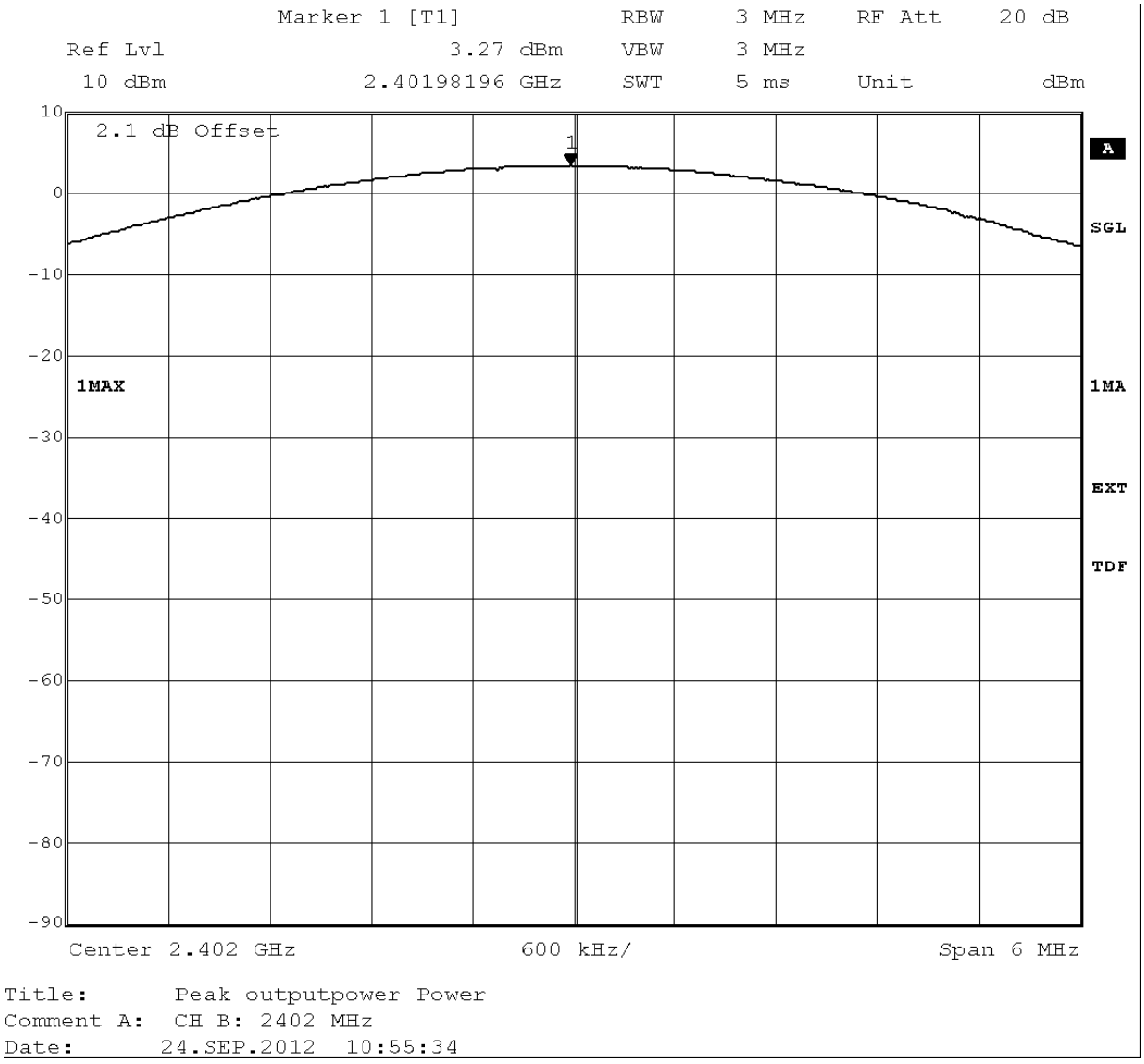


Title: Peak outputpower Power
Comment A: CH T: 2480 MHz
Date: 12.SEP.2012 08:47:51

8.2.4 Peak power output operating mode 6

Op. Mode

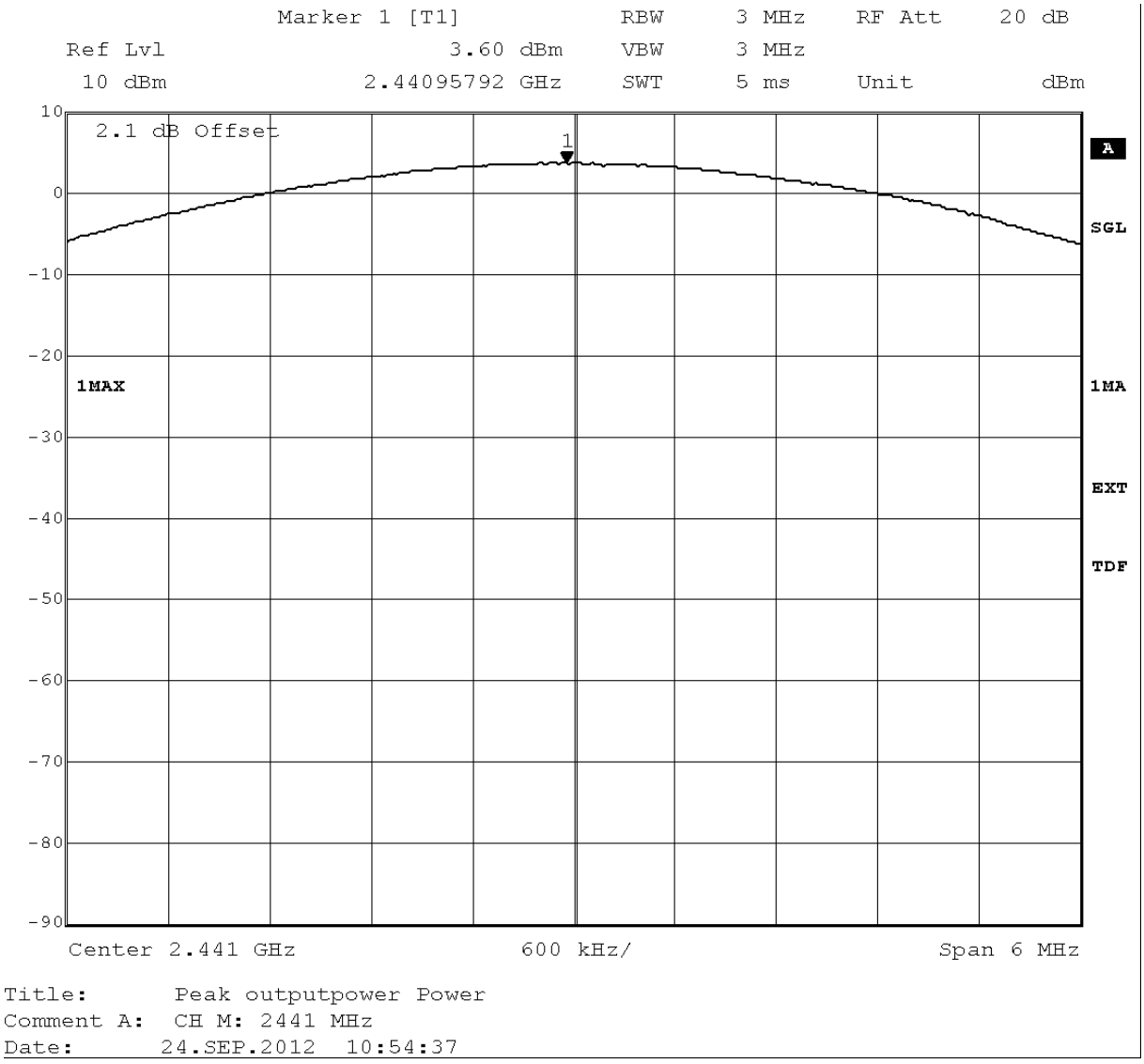
op-mode 6



8.2.5 Peak power output operating mode 7

Op. Mode

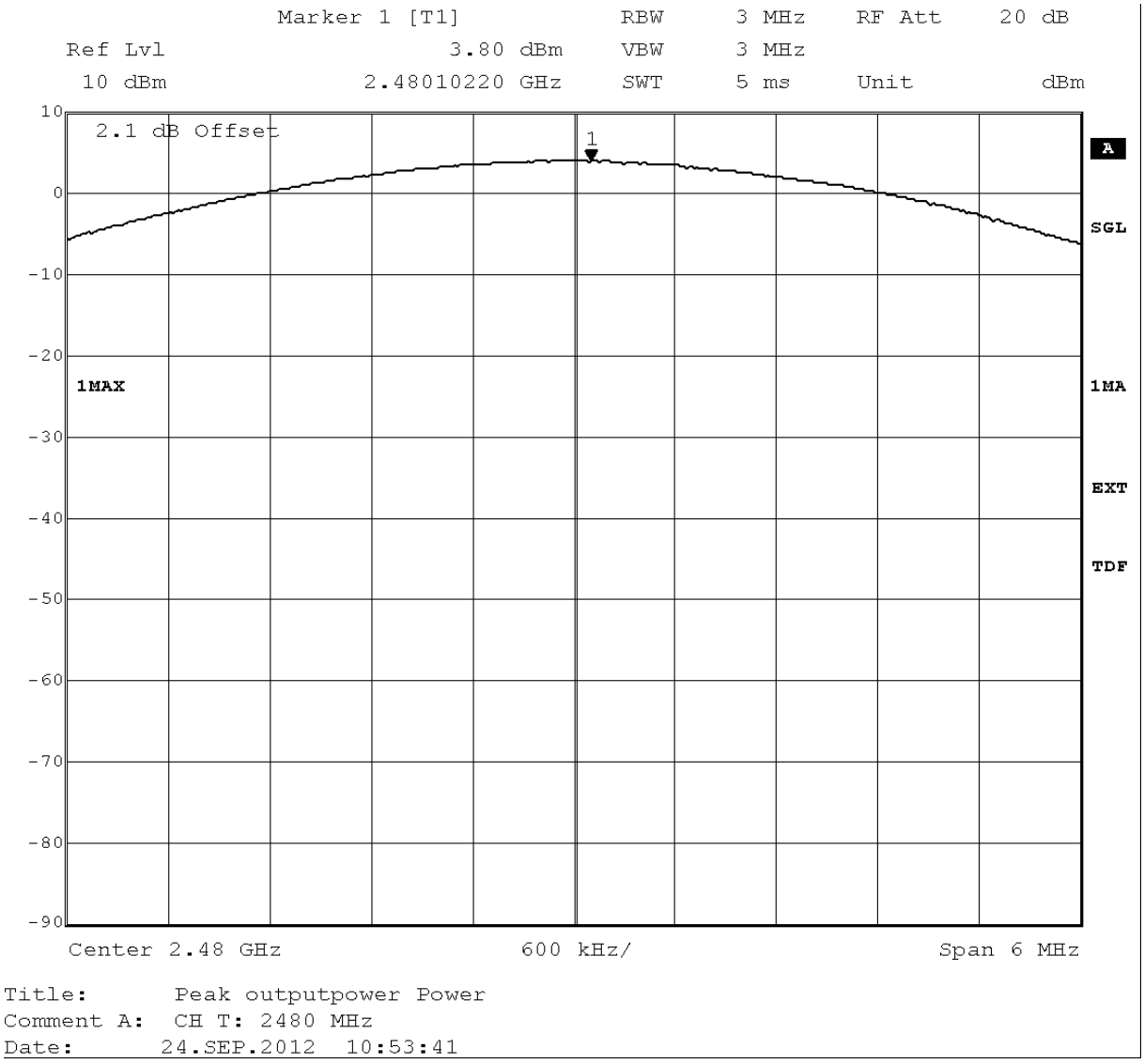
op-mode 7



8.2.6 Peak power output operating mode 8

Op. Mode

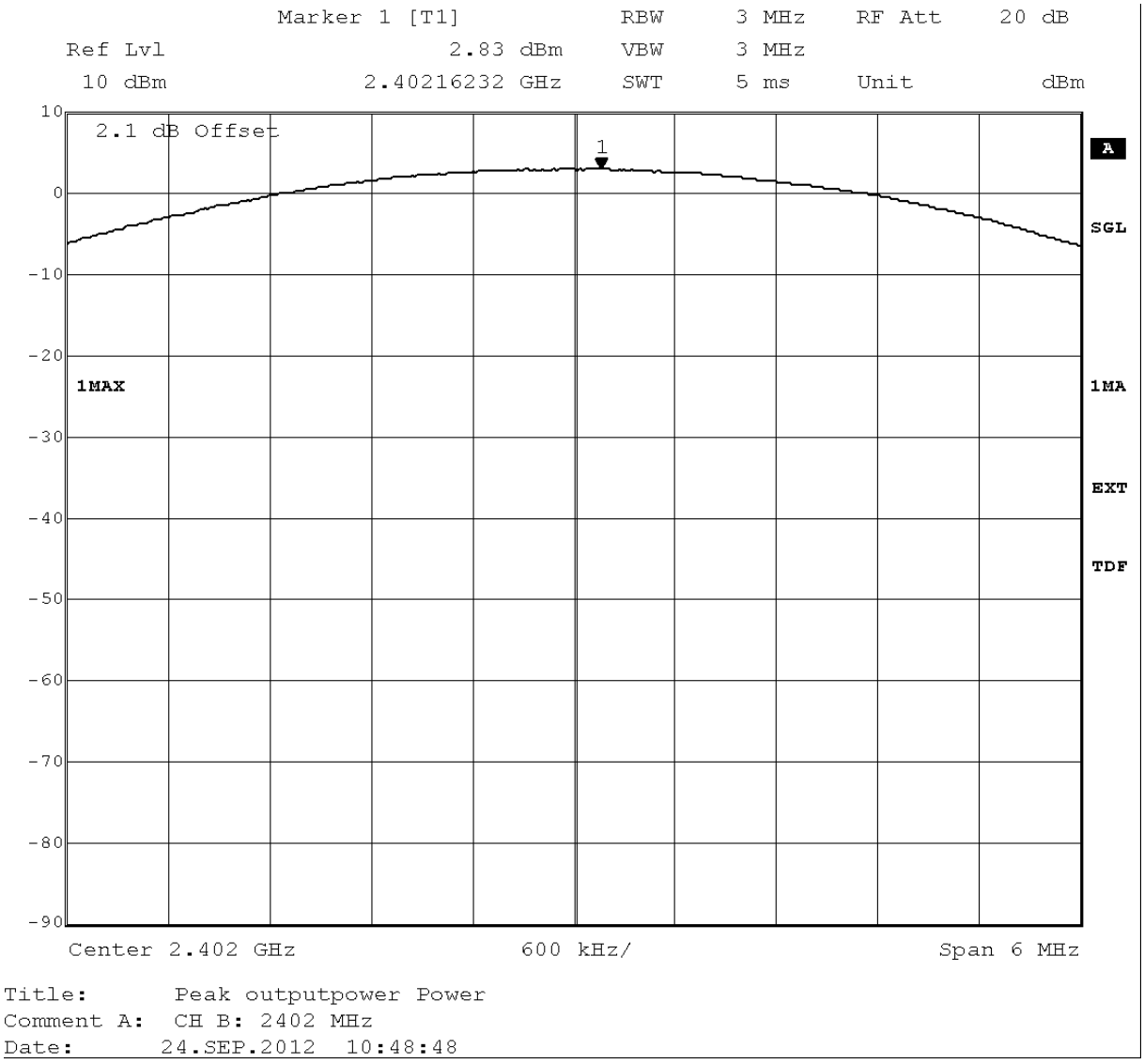
op-mode 8



8.2.7 Peak power output operating mode 10

Op. Mode

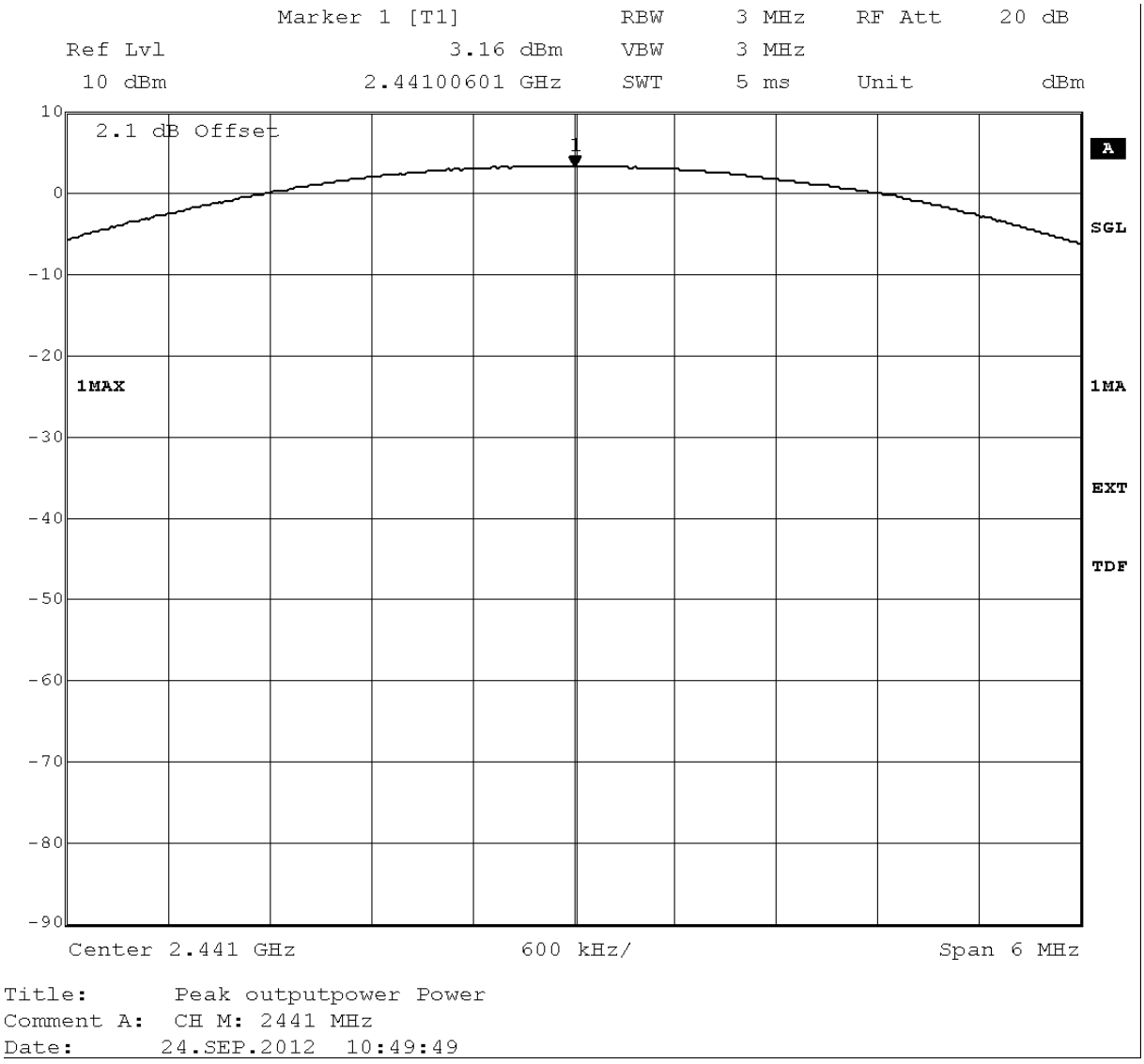
op-mode 10



8.2.8 Peak power output operating mode 11

Op. Mode

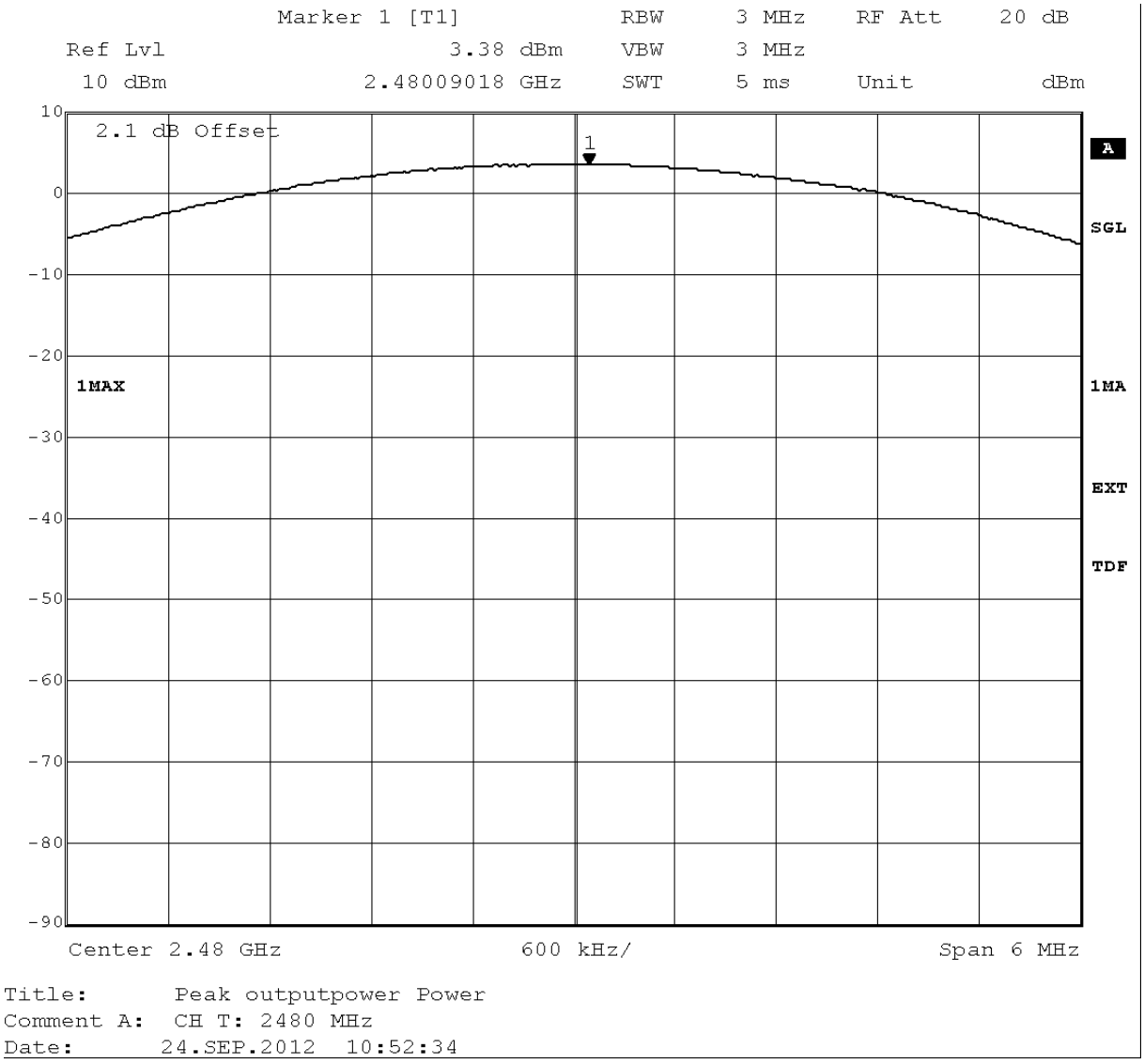
op-mode 11



8.2.9 Peak power output operating mode 12

Op. Mode

op-mode 12

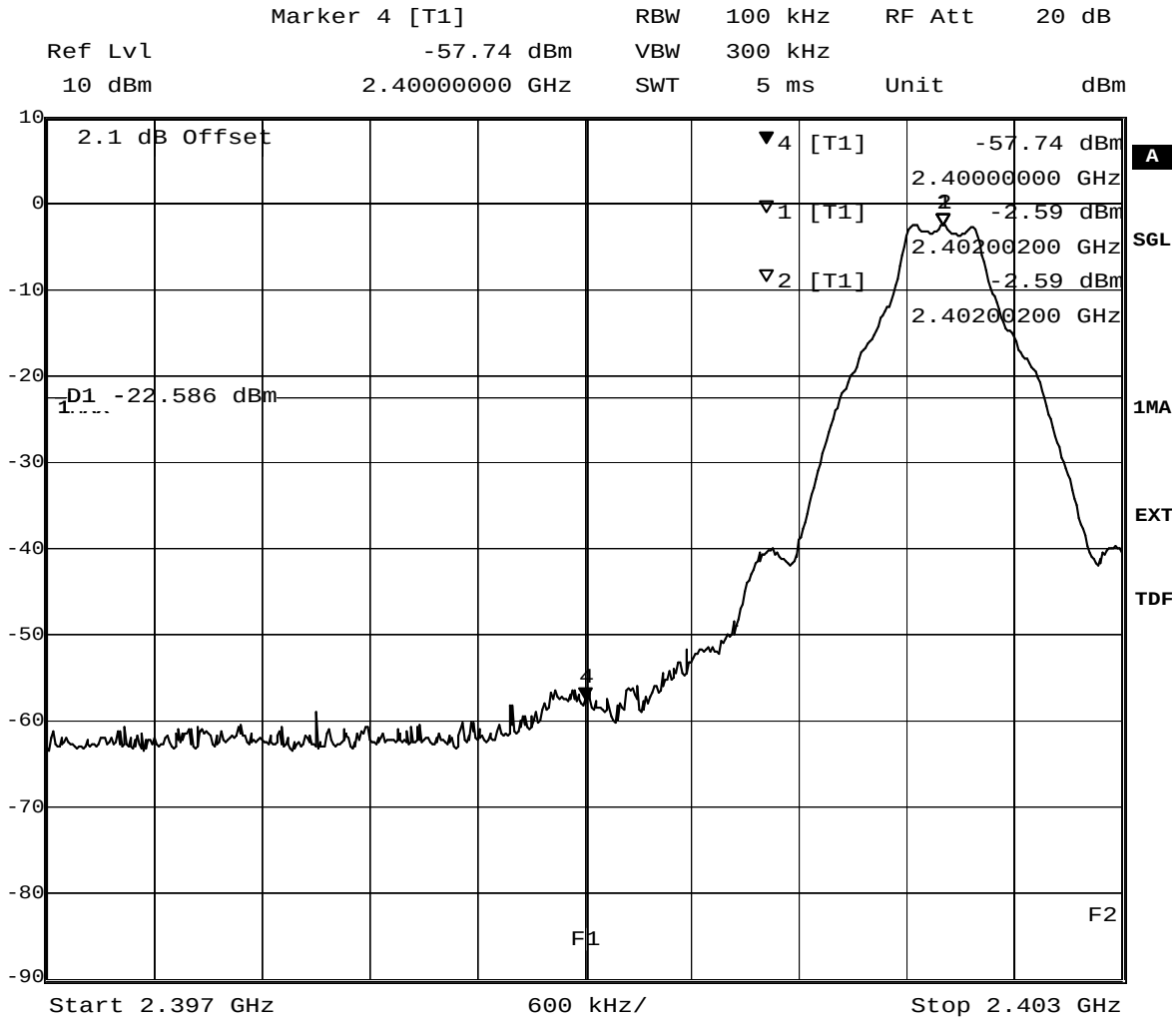


8.3 Band edge compliance conducted and Spurious RF conducted emissions

8.3.1 Band edge compliance conducted operating mode 1

Op. Mode

op-mode 1



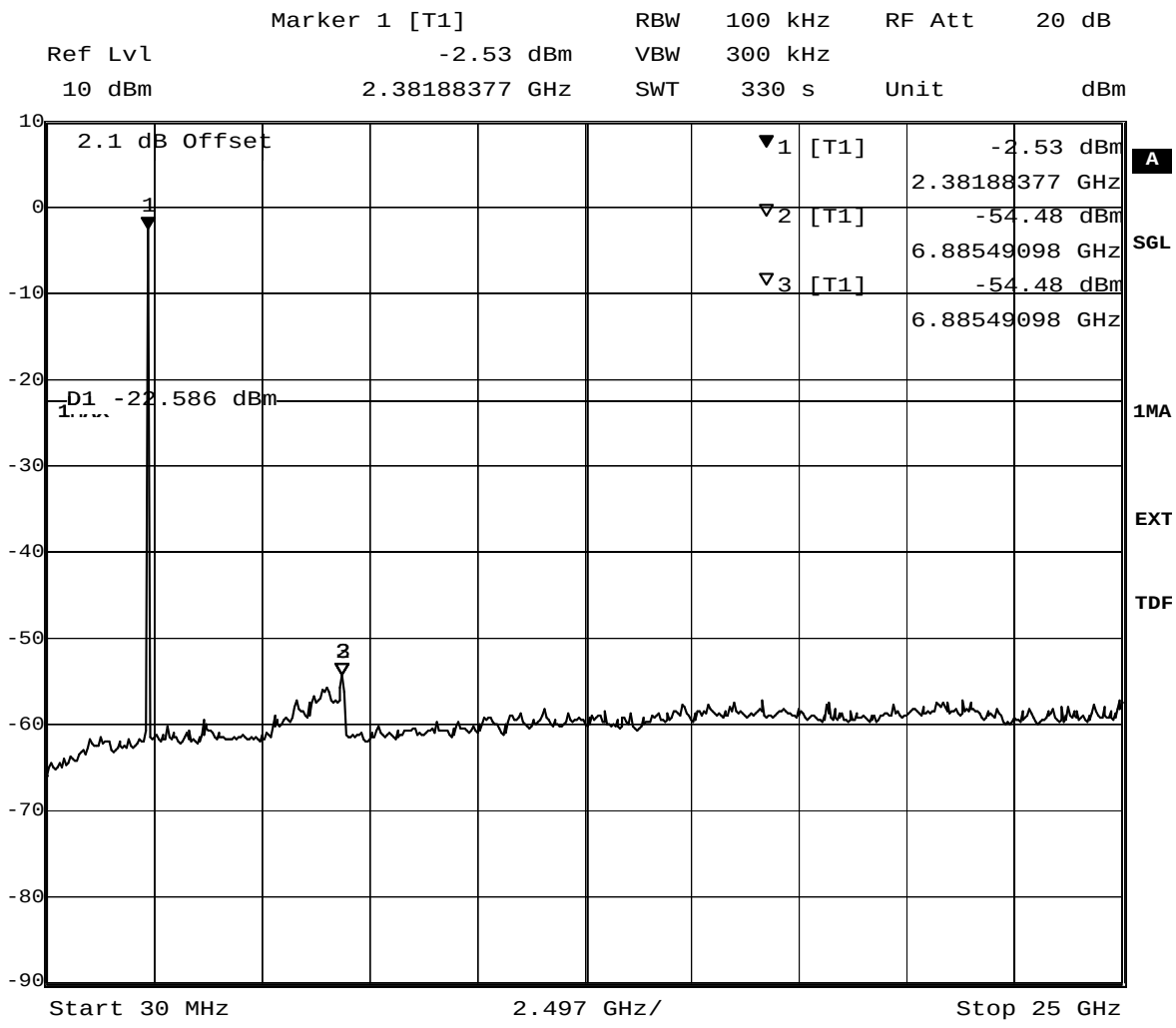
Title: Band Edge Compliance
Comment A: CH B: 2402 MHz
Date: 8.SEP.2010 17:10:37

(determination of reference value for spurious emissions measurement)

8.3.2 Spurious RF conducted emissions operating mode 1

Op. Mode

op-mode 1



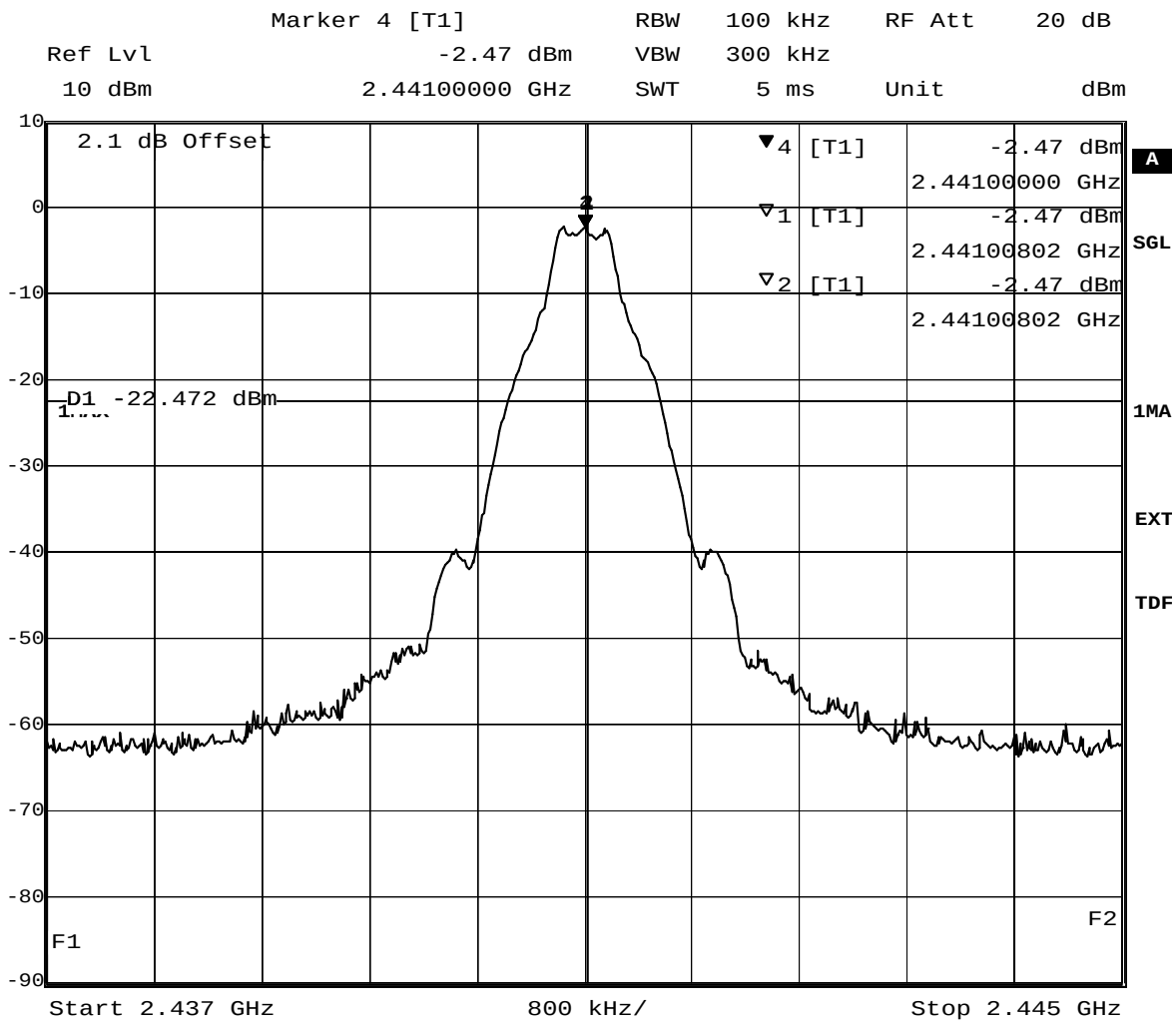
Title: spurious emissions
Comment A: CH B: 2402 MHz
Date: 8.SEP.2010 17:22:15

(spurious emissions measurement)

8.3.3 Spurious RF conducted emissions operating mode 2

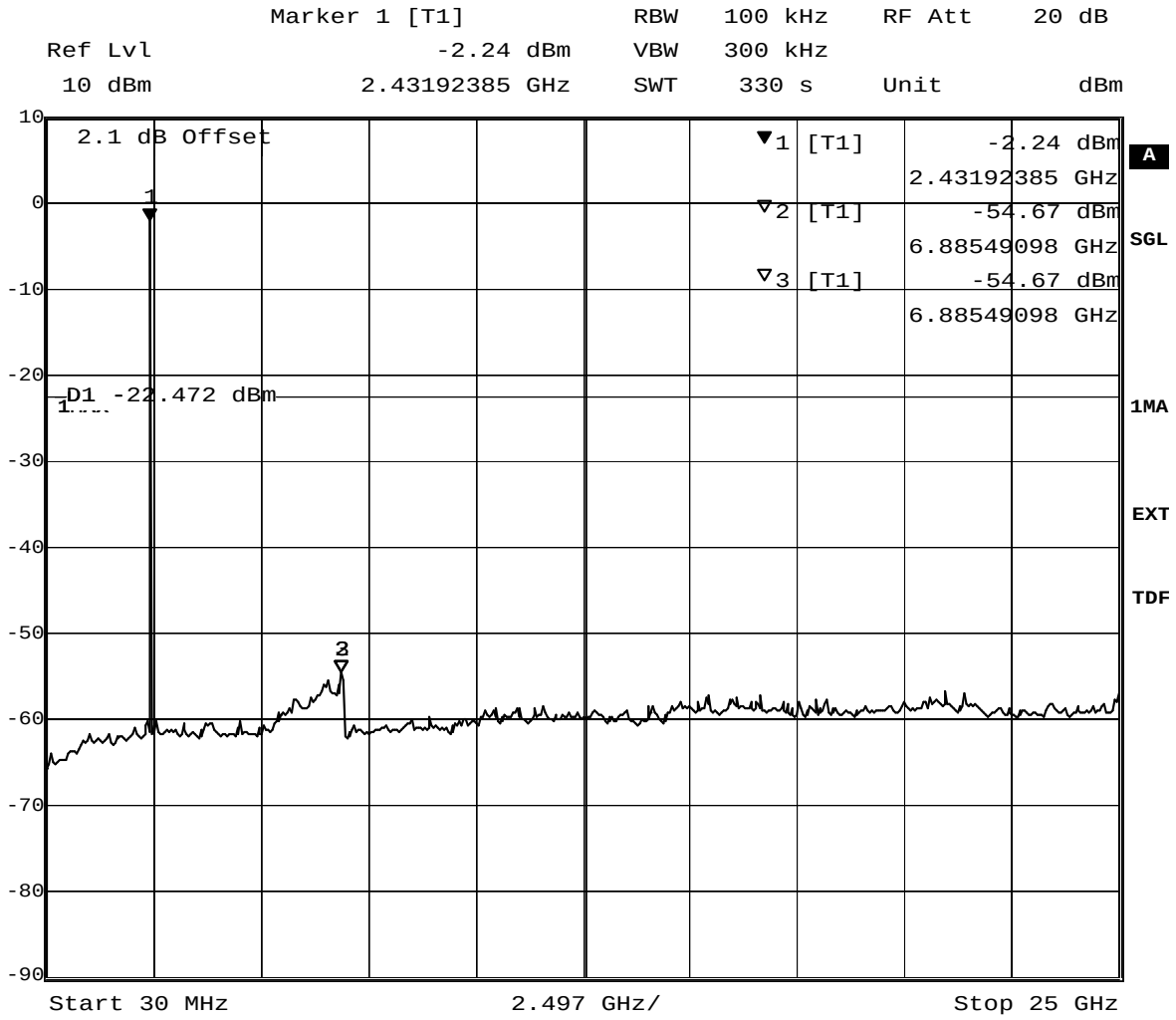
Op. Mode

op-mode 2



Title: Band Edge Compliance
Comment A: CH M: 2441 MHz
Date: 8.SEP.2010 17:54:57

(determination of reference value for spurious emissions measurement)



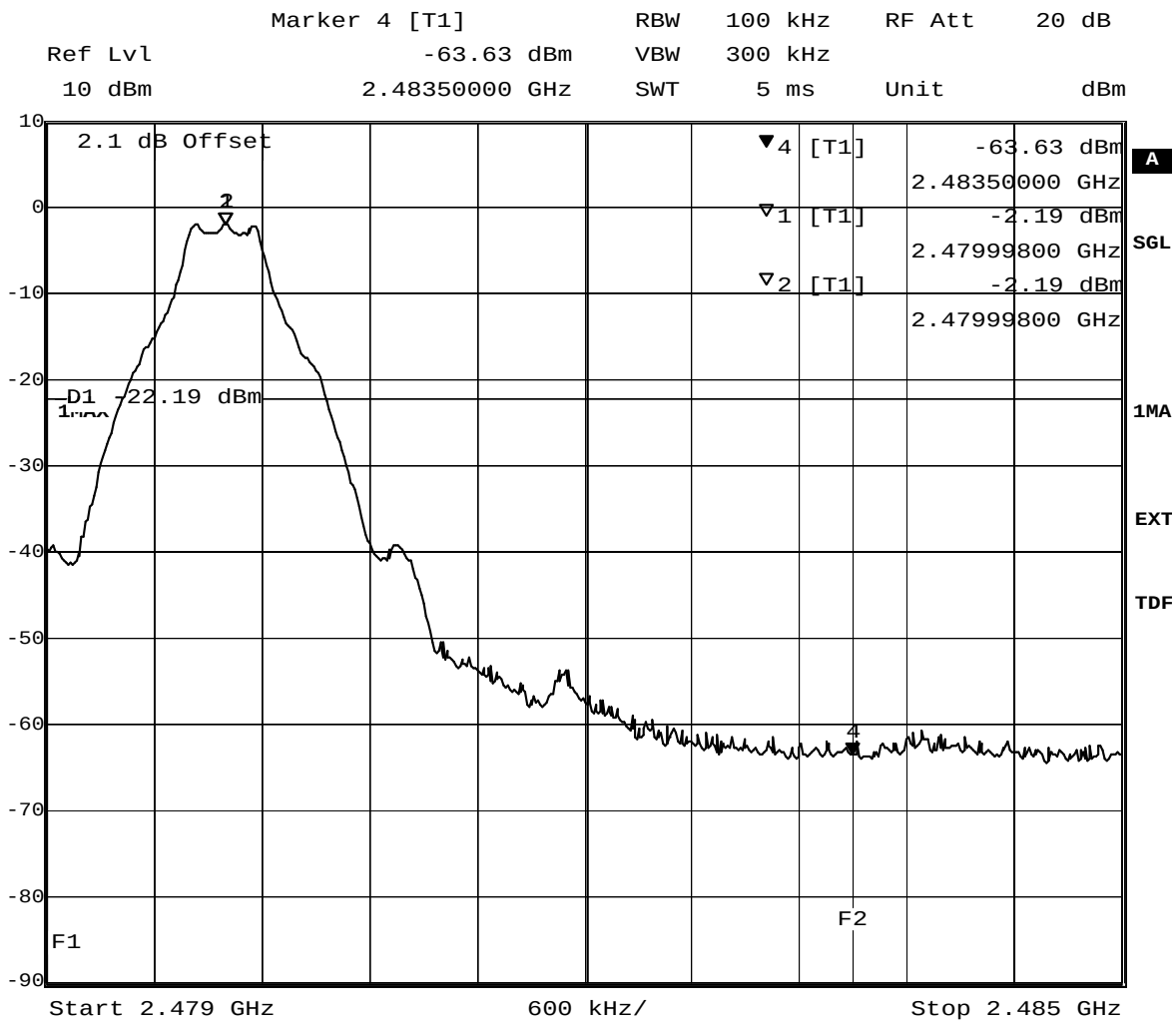
Title: spurious emissions
Comment A: CH M: 2441 MHz
Date: 8.SEP.2010 18:06:35

(spurious emissions measurement)

8.3.4 Band edge compliance conducted operating mode 3

Op. Mode

op-mode 3



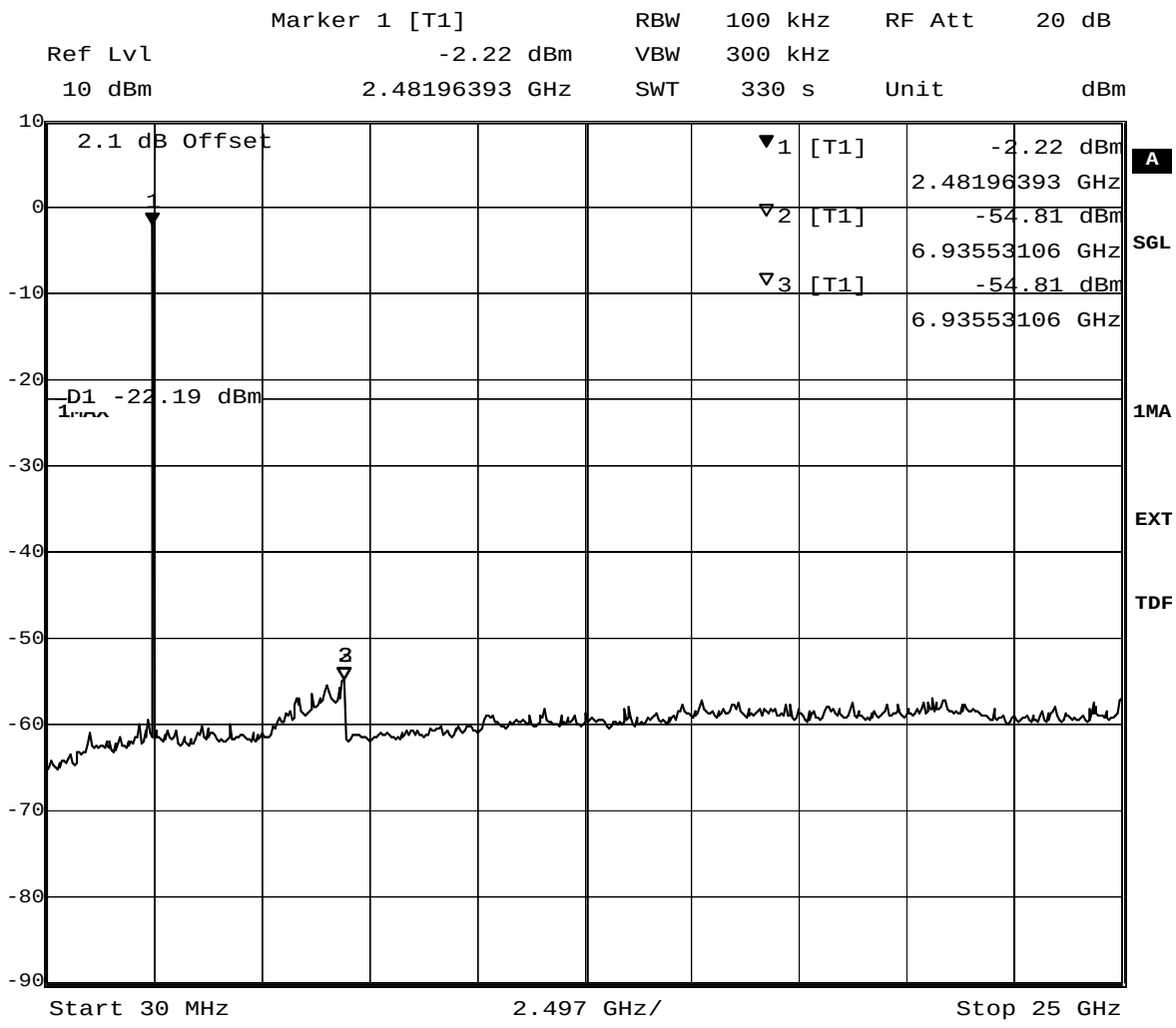
Title: Band Edge Compliance
Comment A: CH T: 2480 MHz
Date: 8.SEP.2010 18:40:59

(determination of reference value for spurious emissions measurement)

8.3.5 Spurious RF conducted emissions operating mode 3

Op. Mode

op-mode 3



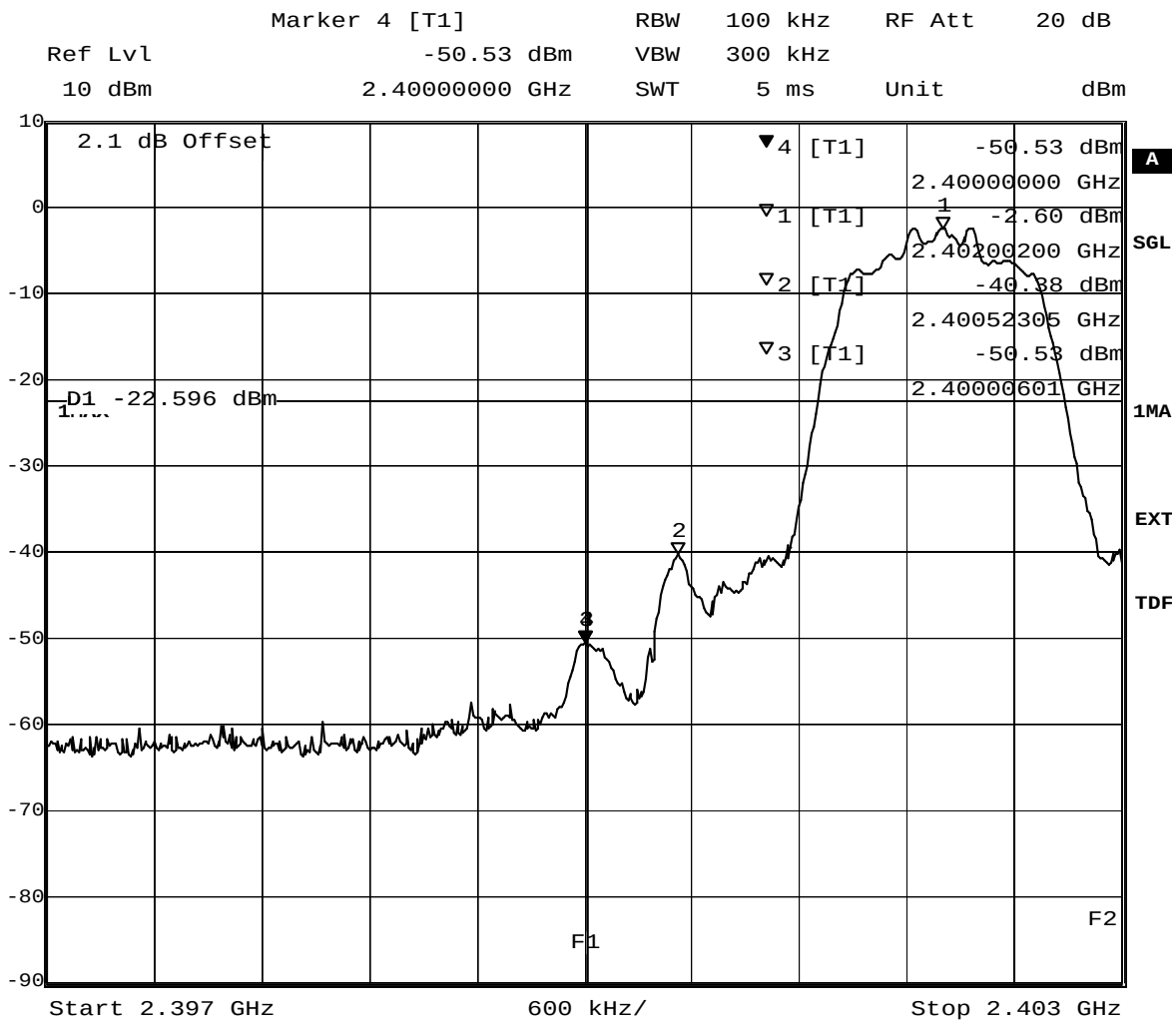
Title: spurious emissions
Comment A: CH T: 2480 MHz
Date: 8.SEP.2010 18:52:38

(spurious emissions measurement)

8.3.6 Band edge compliance conducted operating mode 6

Op. Mode

op-mode 6



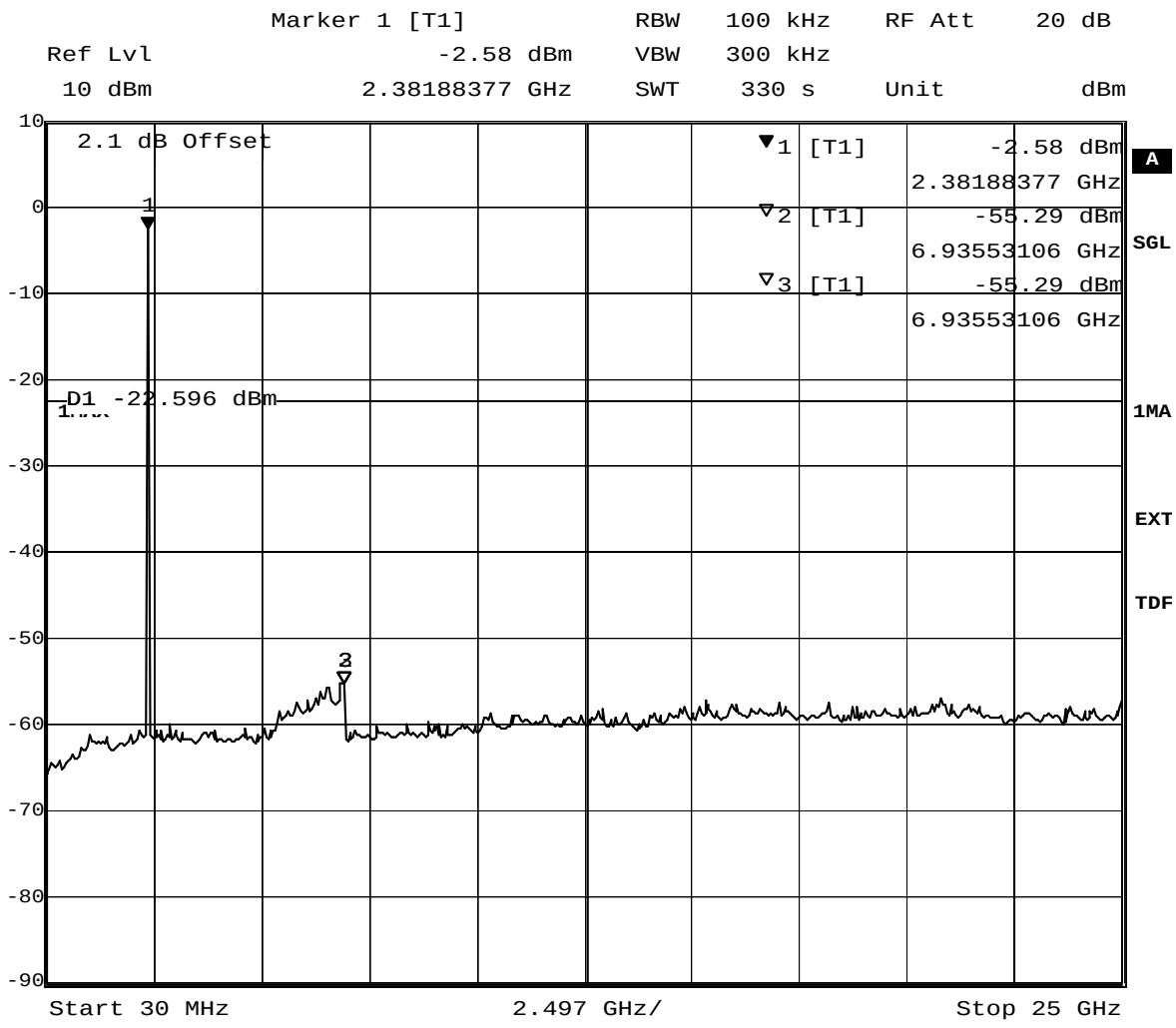
Title: Band Edge Compliance
Comment A: CH B: 2402 MHz
Date: 8.SEP.2010 20:49:16

(determination of reference value for spurious emissions measurement)

8.3.7 Spurious RF conducted emissions operating mode 6

Op. Mode

op-mode 6



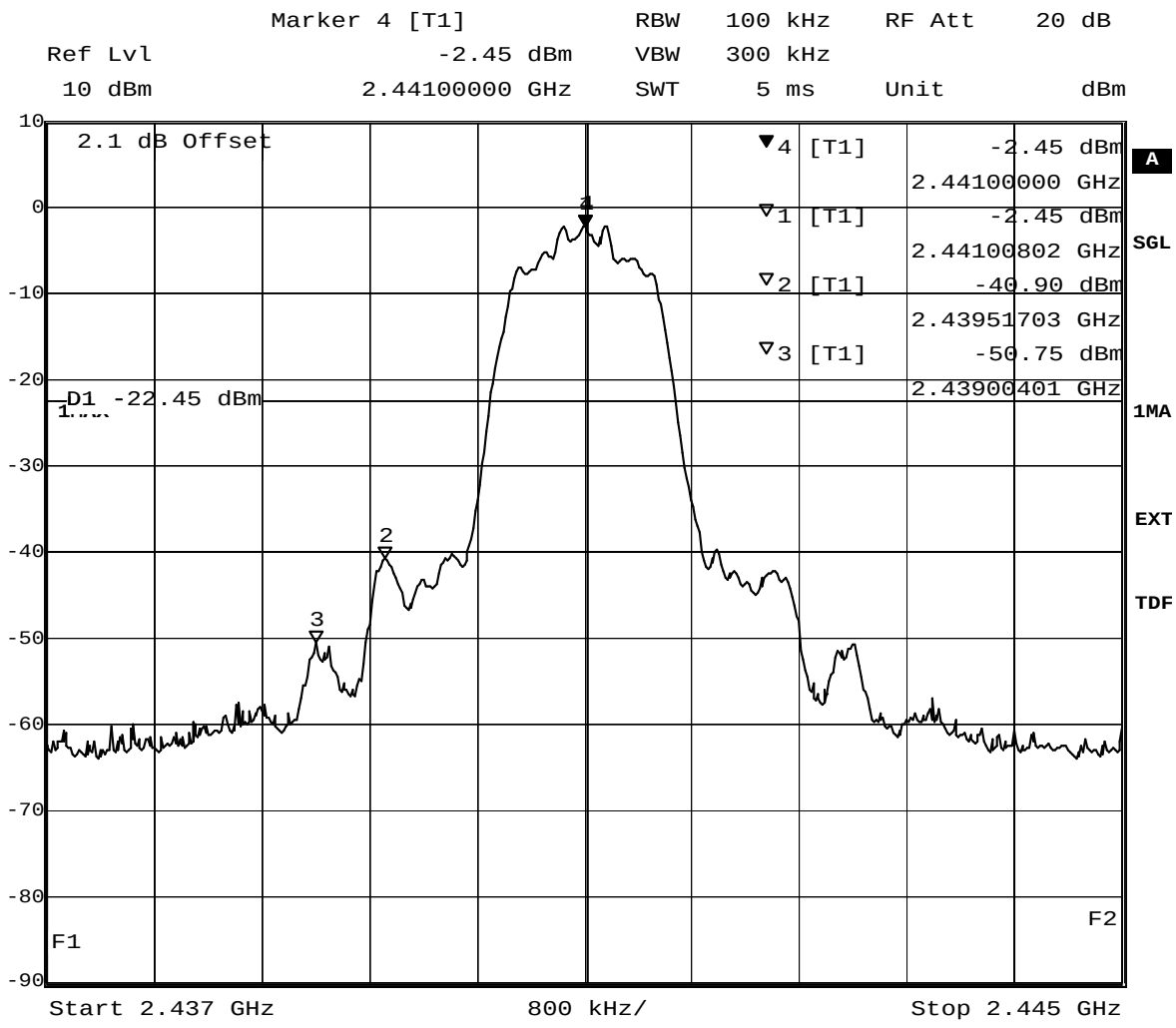
Title: spurious emissions
Comment A: CH B: 2402 MHz
Date: 8.SEP.2010 21:00:54

(spurious emissions measurement)

8.3.8 Spurious RF conducted emissions operating mode 7

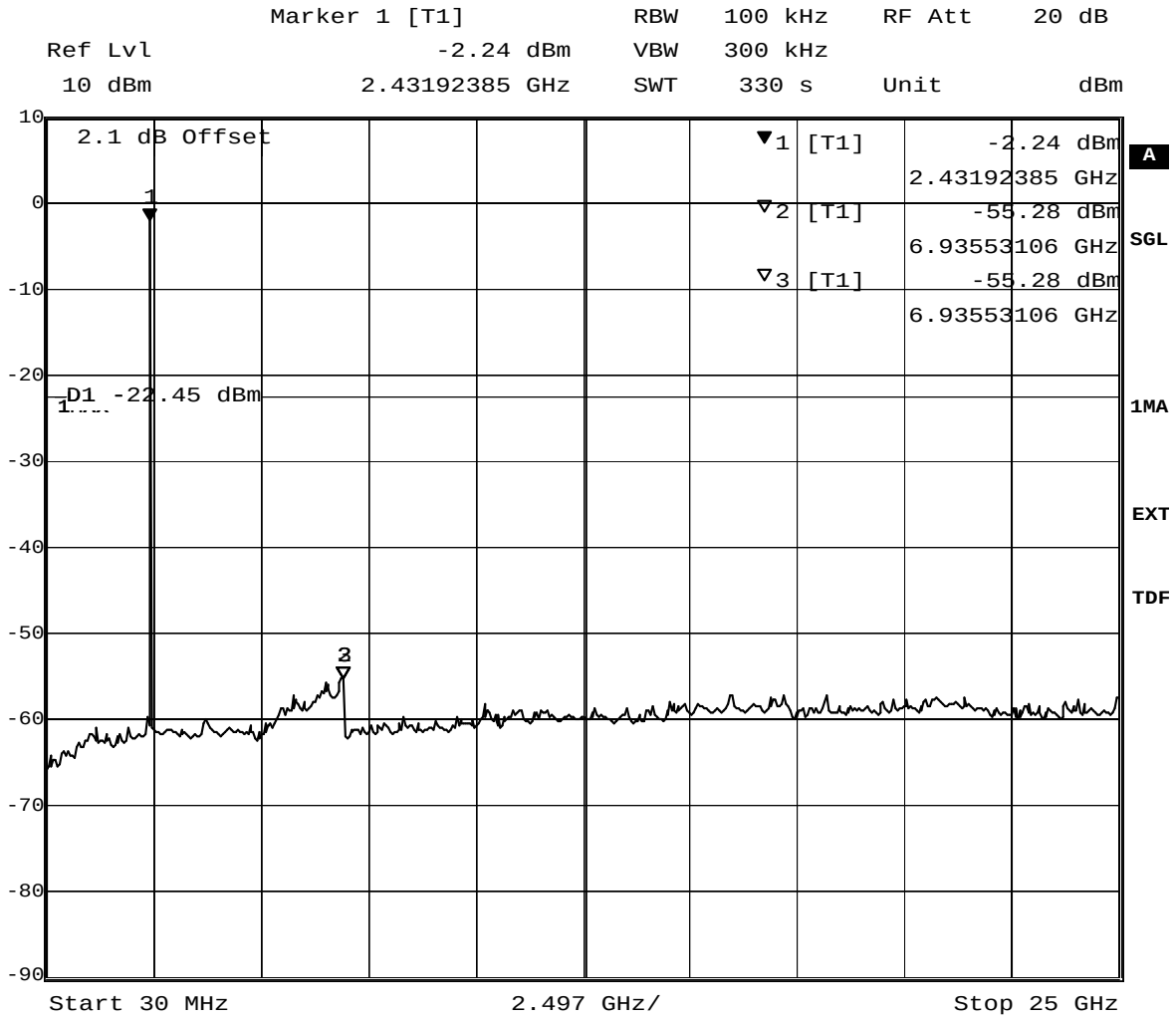
Op. Mode

op-mode 7



Title: Band Edge Compliance
Comment A: CH M: 2441 MHz
Date: 8.SEP.2010 21:09:17

(determination of reference value for spurious emissions measurement)



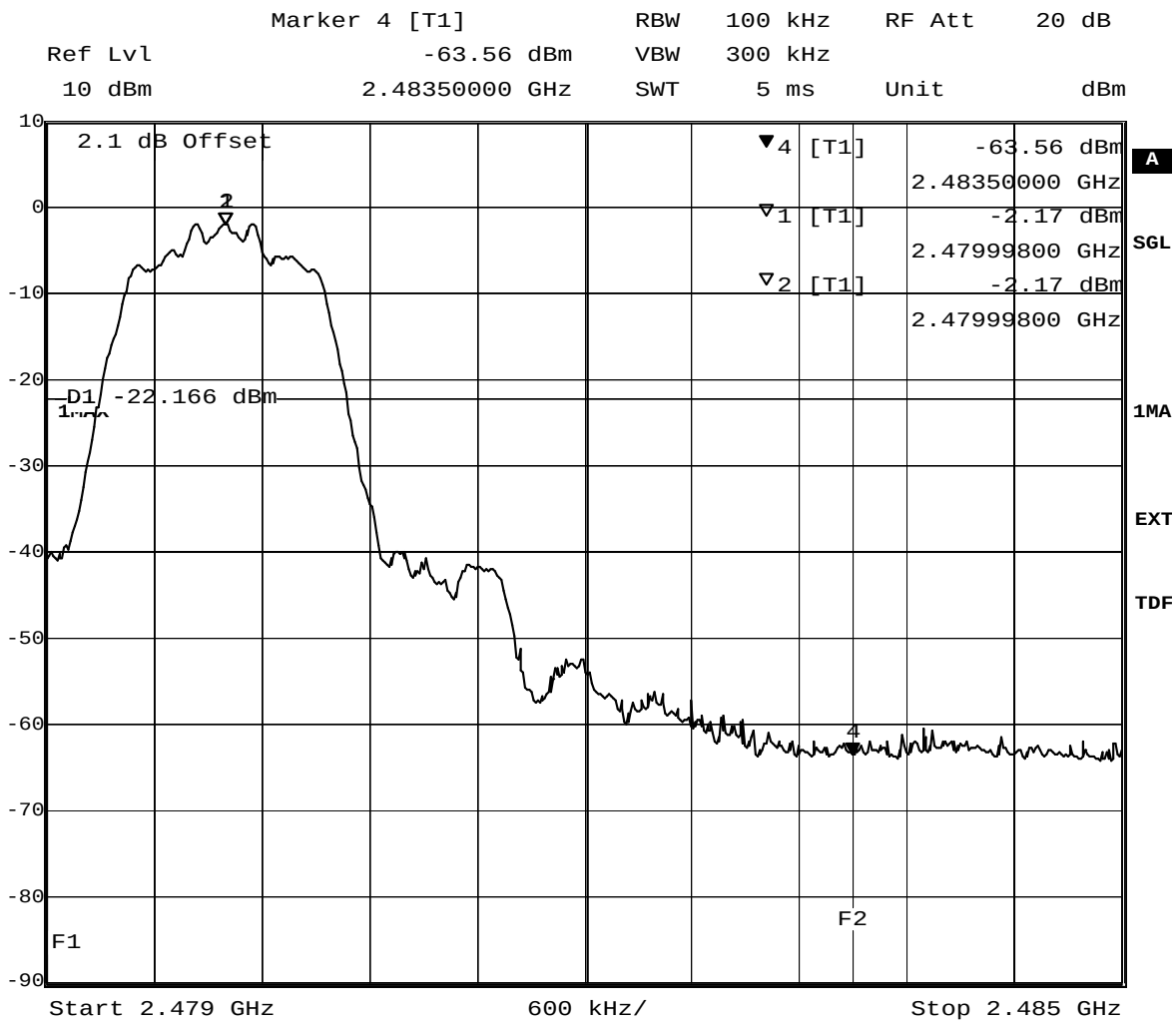
Title: spurious emissions
Comment A: CH M: 2441 MHz
Date: 8.SEP.2010 21:20:55

(spurious emissions measurement)

8.3.9 Band edge compliance conducted operating mode 8

Op. Mode

op-mode 8



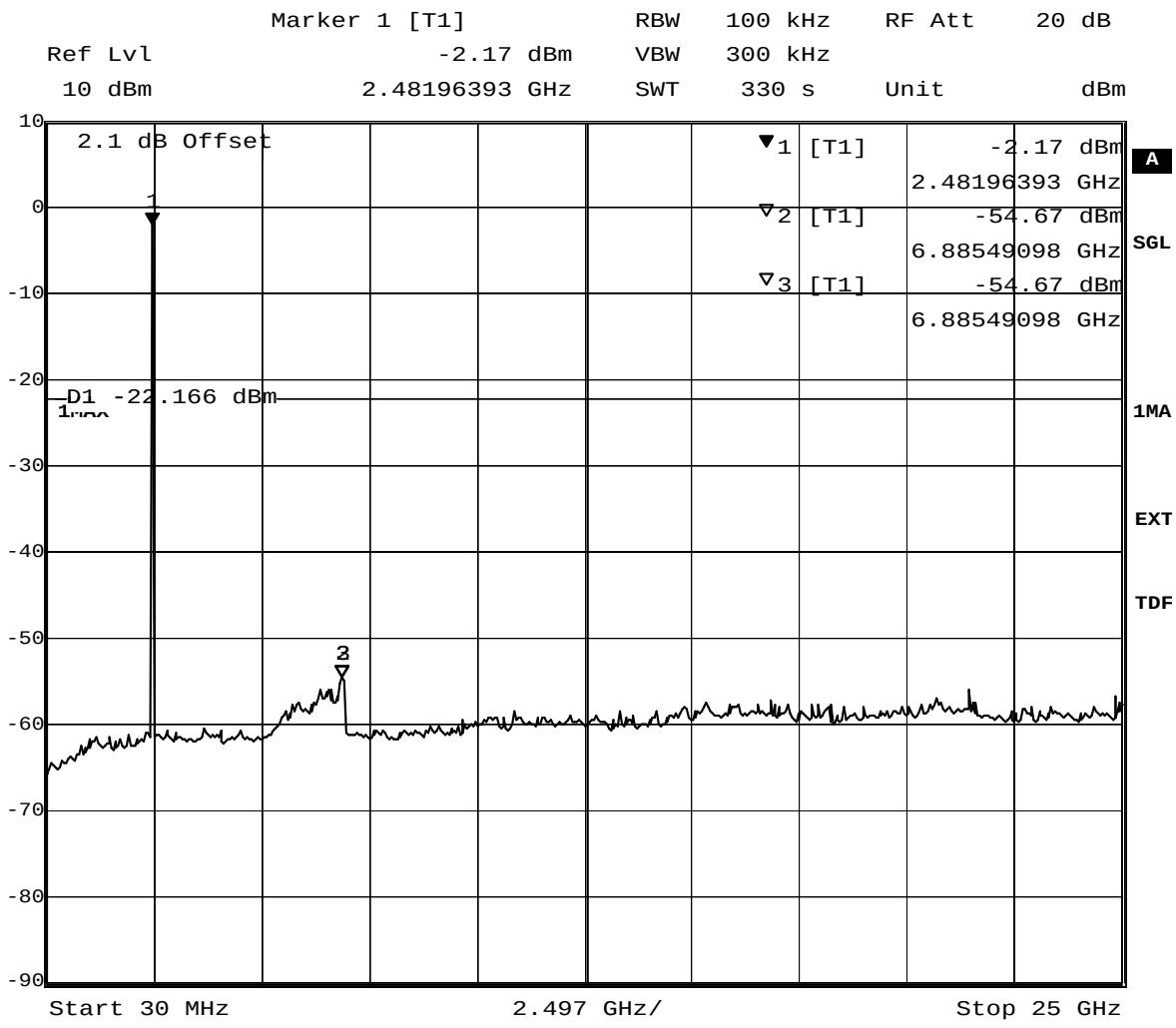
Title: Band Edge Compliance
Comment A: CH T: 2480 MHz
Date: 8.SEP.2010 21:30:12

(determination of reference value for spurious emissions measurement)

8.3.10 Spurious RF conducted emissions operating mode 8

Op. Mode

op-mode 8



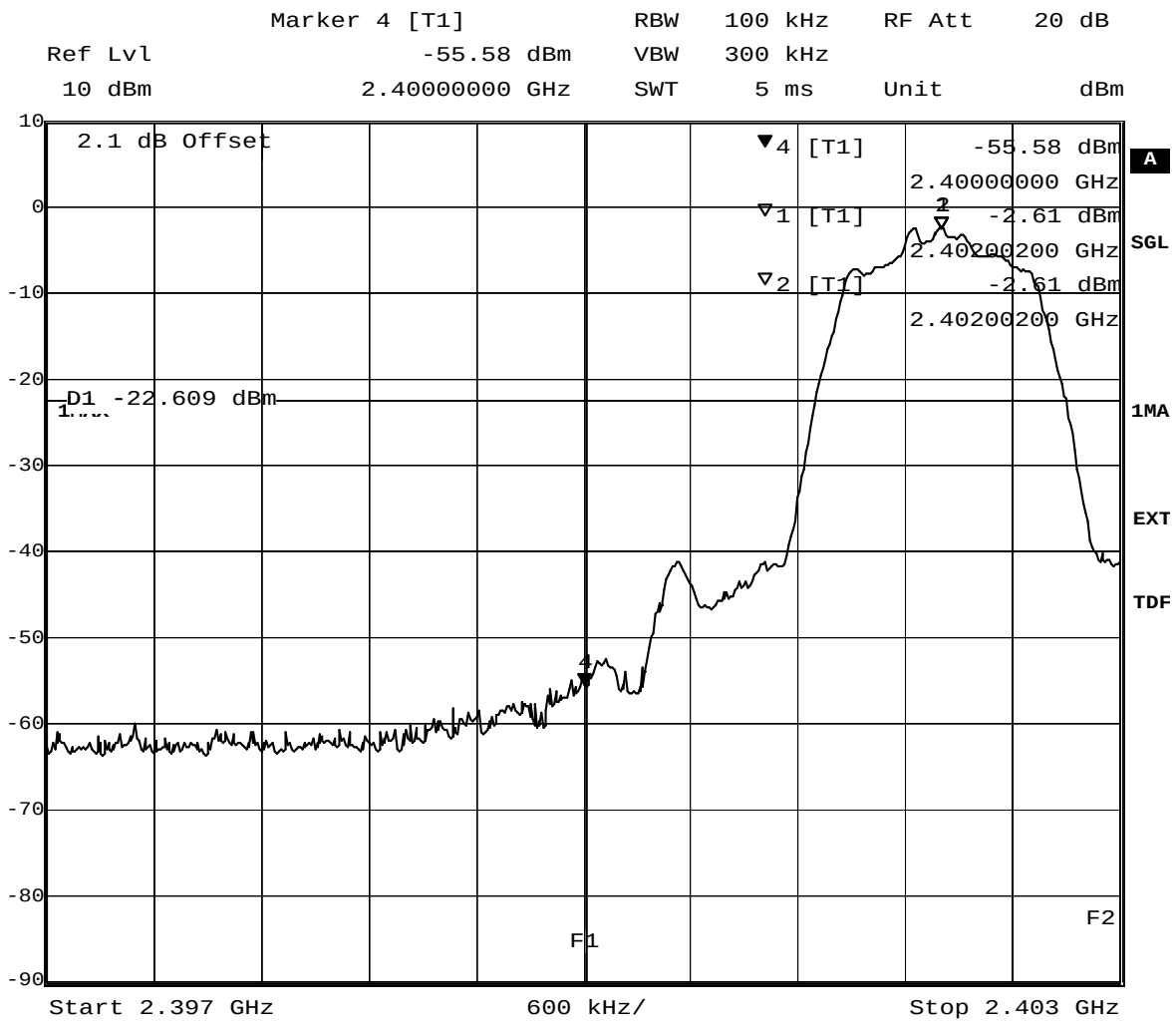
Title: spurious emissions
Comment A: CH T: 2480 MHz
Date: 8.SEP.2010 21:41:51

(spurious emissions measurement)

8.3.11 Band edge compliance conducted operating mode 10

Op. Mode

op-mode 10



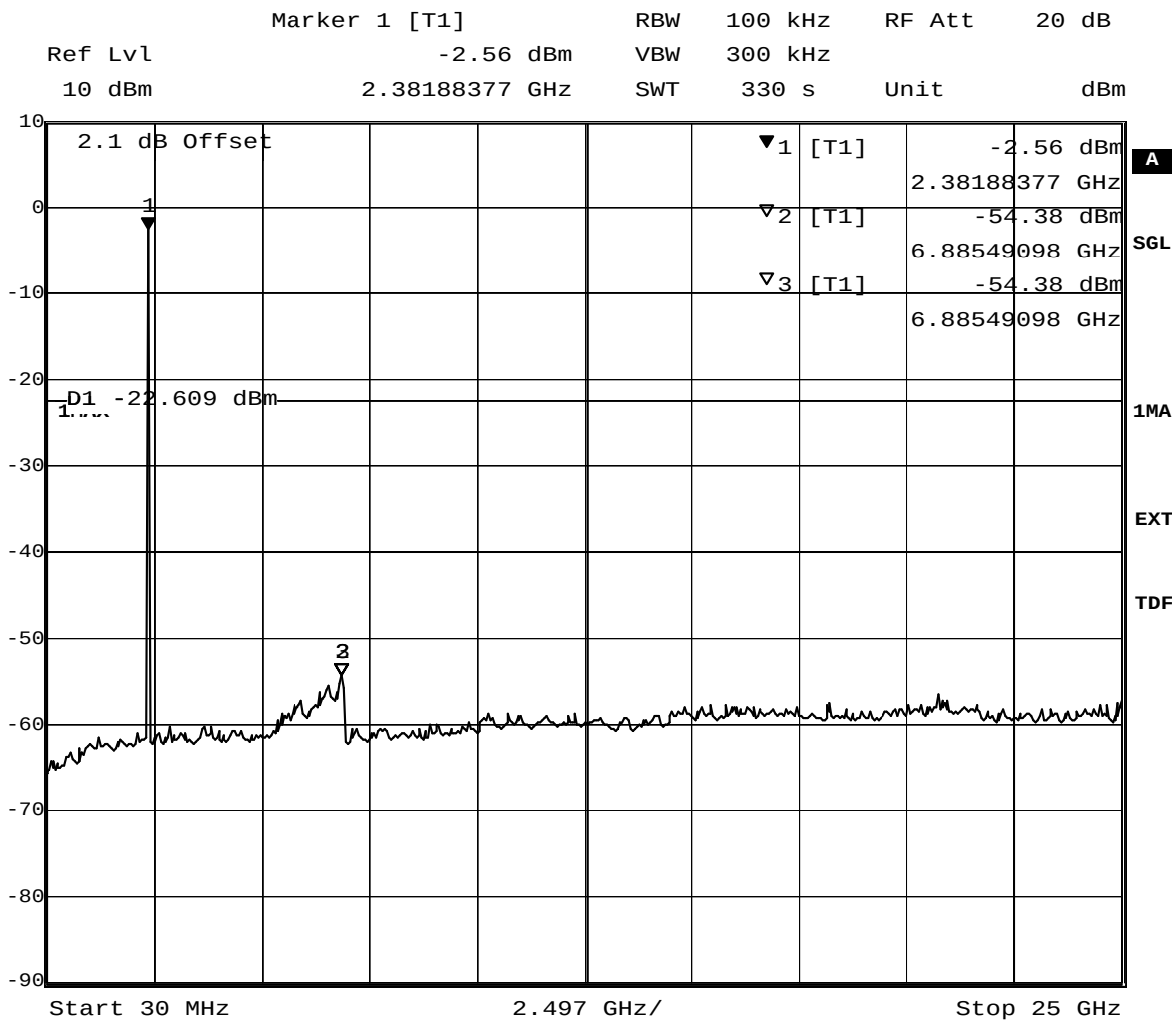
Title: Band Edge Compliance
Comment A: CH B: 2402 MHz
Date: 8.SEP.2010 19:19:39

(determination of reference value for spurious emissions measurement)

8.3.12 Spurious RF conducted emissions operating mode 10

Op. Mode

op-mode 10



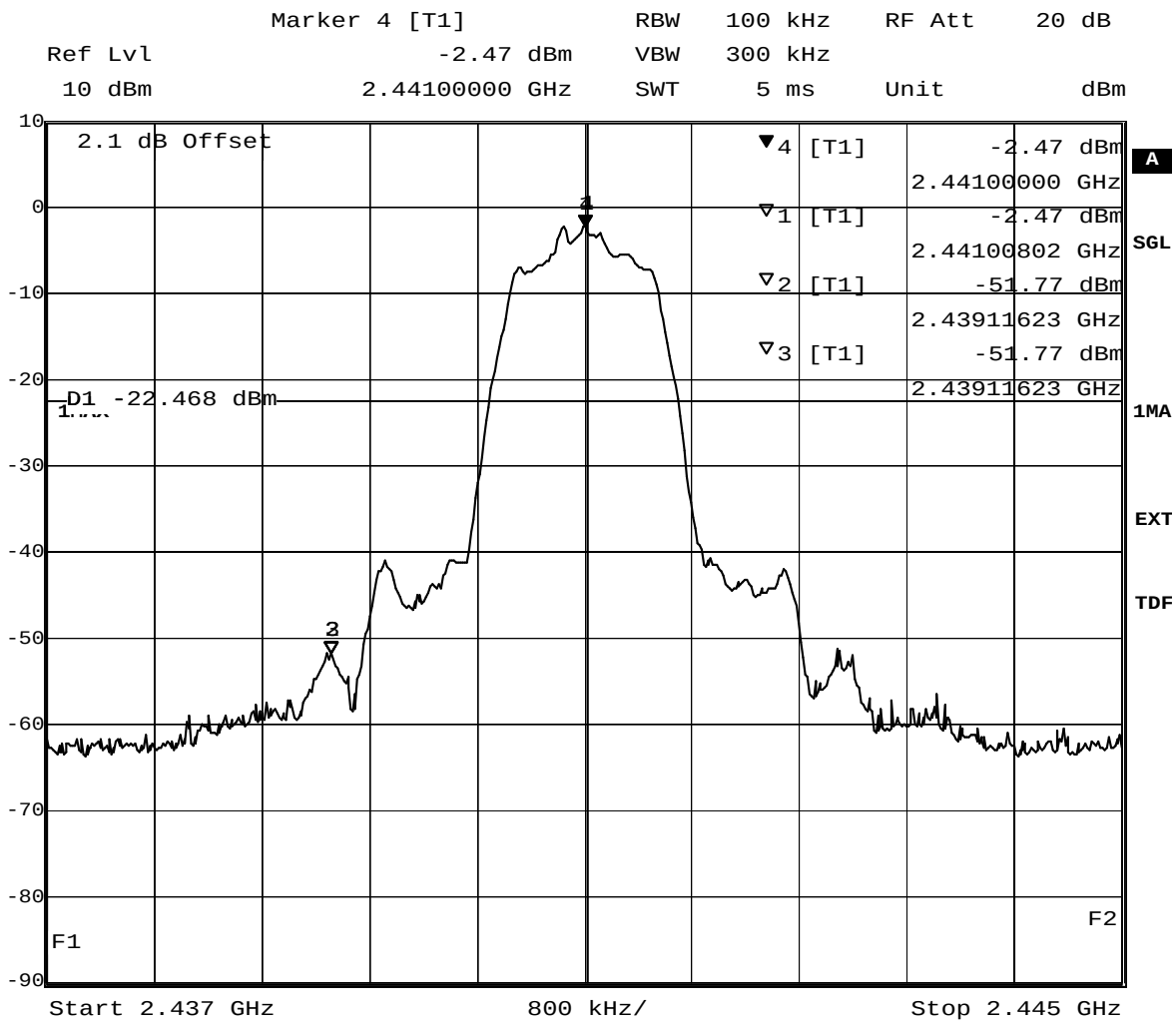
Title: spurious emissions
Comment A: CH B: 2402 MHz
Date: 8.SEP.2010 19:31:18

(spurious emissions measurement)

8.3.13 Spurious RF conducted emissions operating mode 11

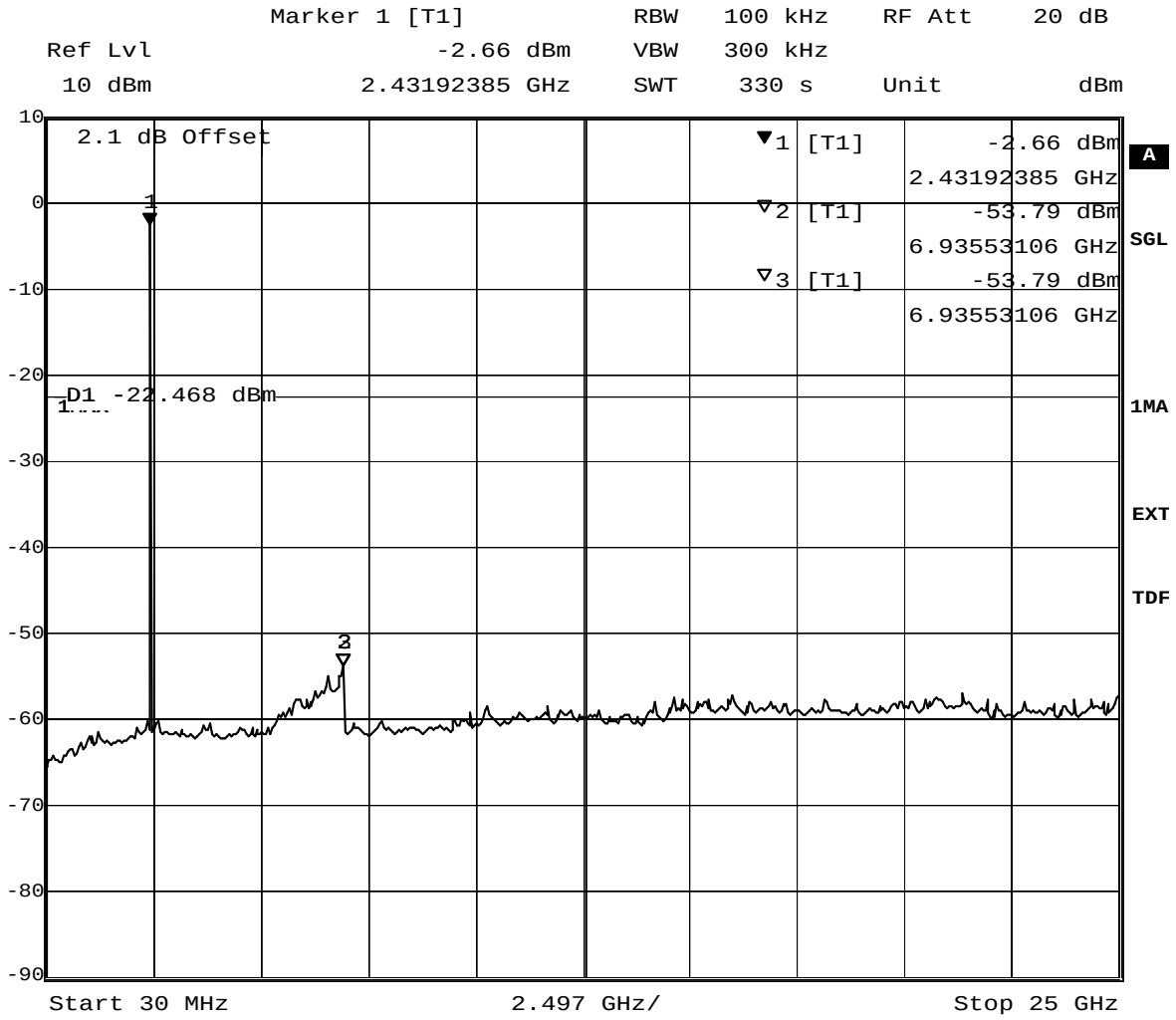
Op. Mode

op-mode 11



Title: Band Edge Compliance
Comment A: CH M: 2441 MHz
Date: 8.SEP.2010 19:39:36

(determination of reference value for spurious emissions measurement)



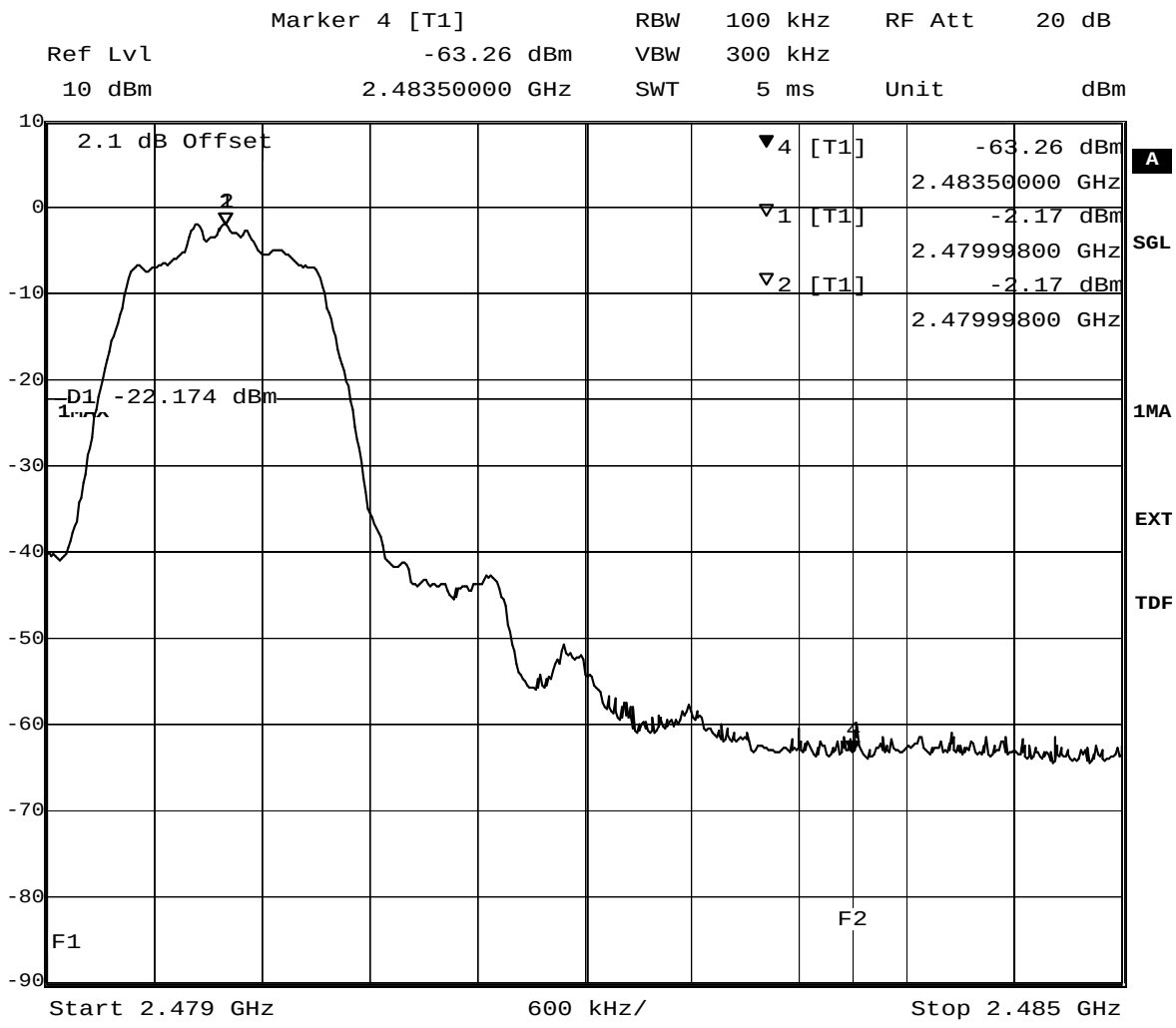
Title: spurious emissions
Comment A: CH M: 2441 MHz
Date: 8.SEP.2010 19:51:14

(spurious emissions measurement)

8.3.14 Band edge compliance conducted operating mode 12

Op. Mode

op-mode 12



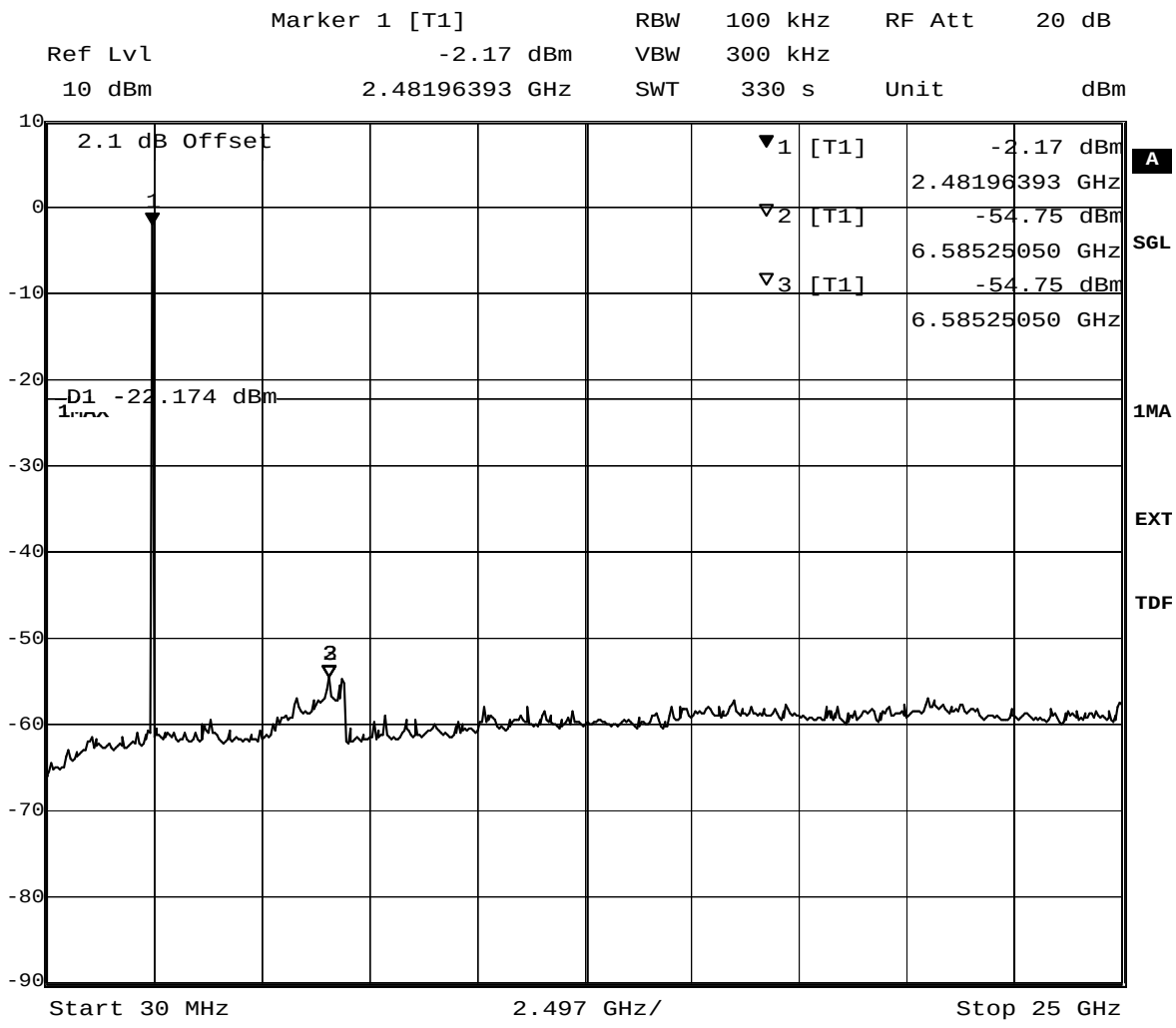
Title: Band Edge Compliance
Comment A: CH T: 2480 MHz
Date: 8.SEP.2010 19:59:57

(determination of reference value for spurious emissions measurement)

8.3.15 Spurious RF conducted emissions operating mode 12

Op. Mode

op-mode 12



Title: spurious emissions
Comment A: CH T: 2480 MHz
Date: 8.SEP.2010 20:11:35

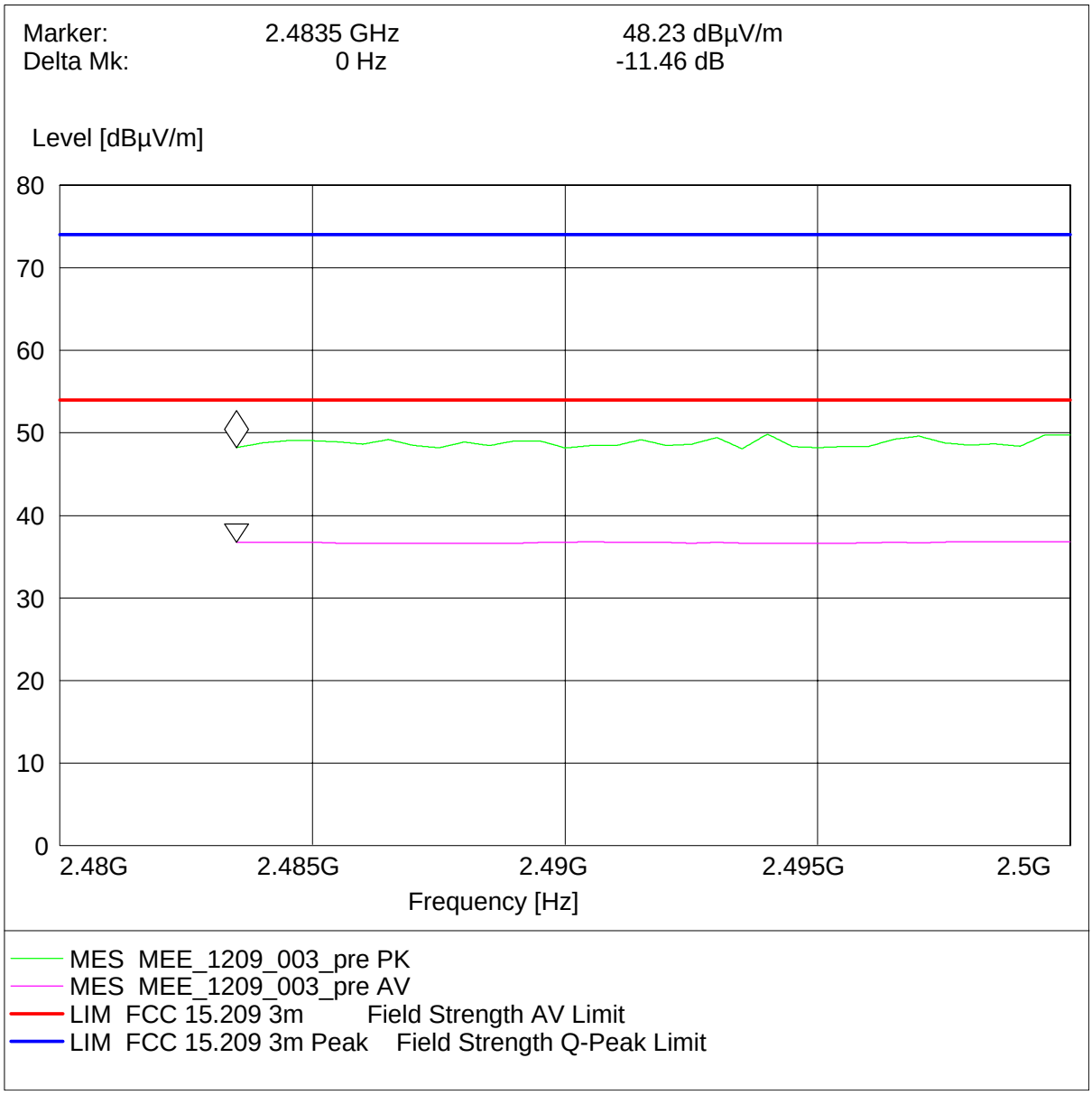
(spurious emissions measurement)

8.4 Band edge compliance radiated

8.4.1 Band edge compliance radiated operating mode 3

Op. Mode

op-mode 3

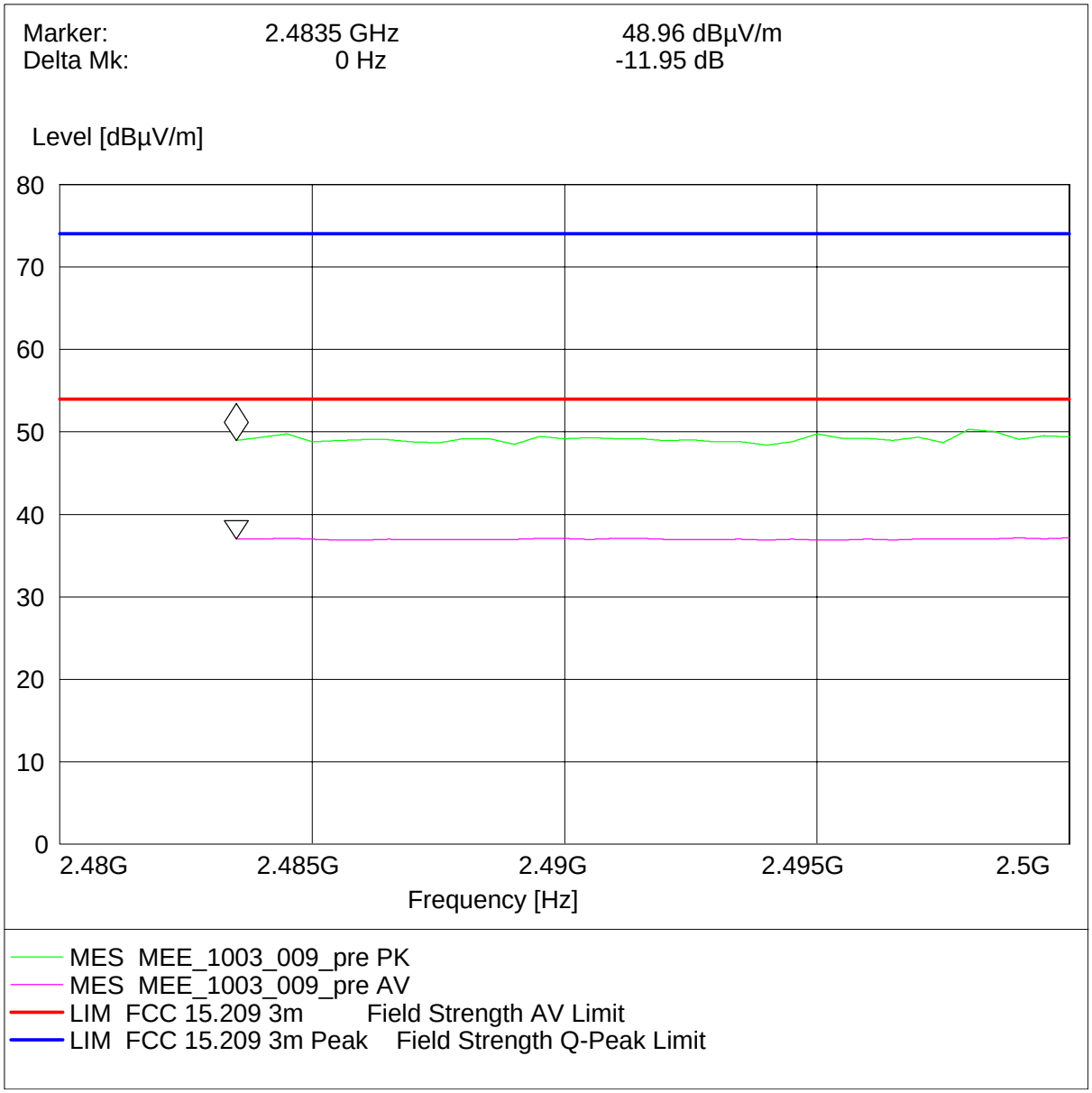


Radiated measurement (higher band edge)

8.4.2 Band edge compliance radiated operating mode 8

Op. Mode

op-mode 8

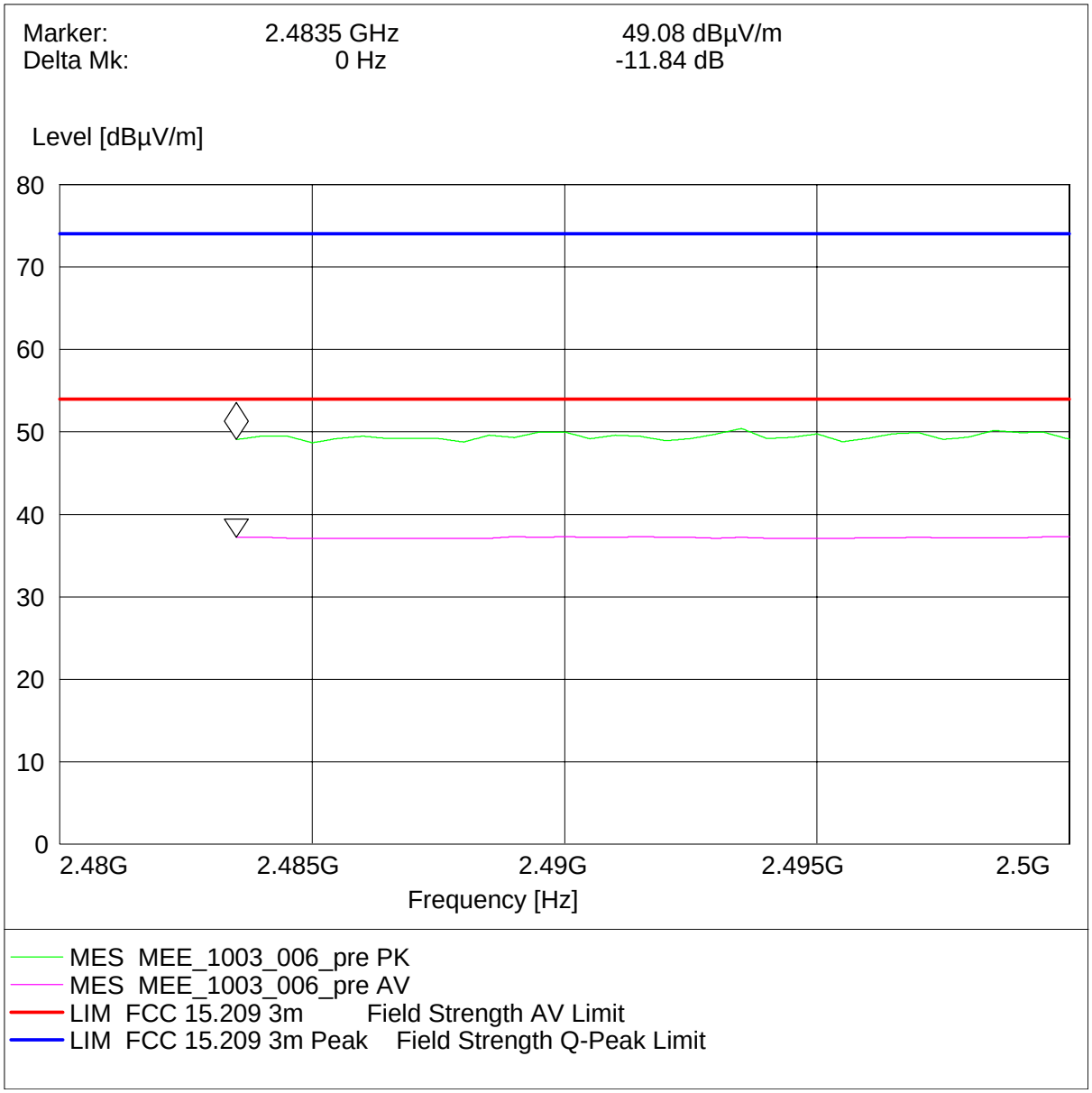


Radiated measurement (higher band edge)

8.4.3 Band edge compliance radiated operating mode 12

Op. Mode

op-mode 12

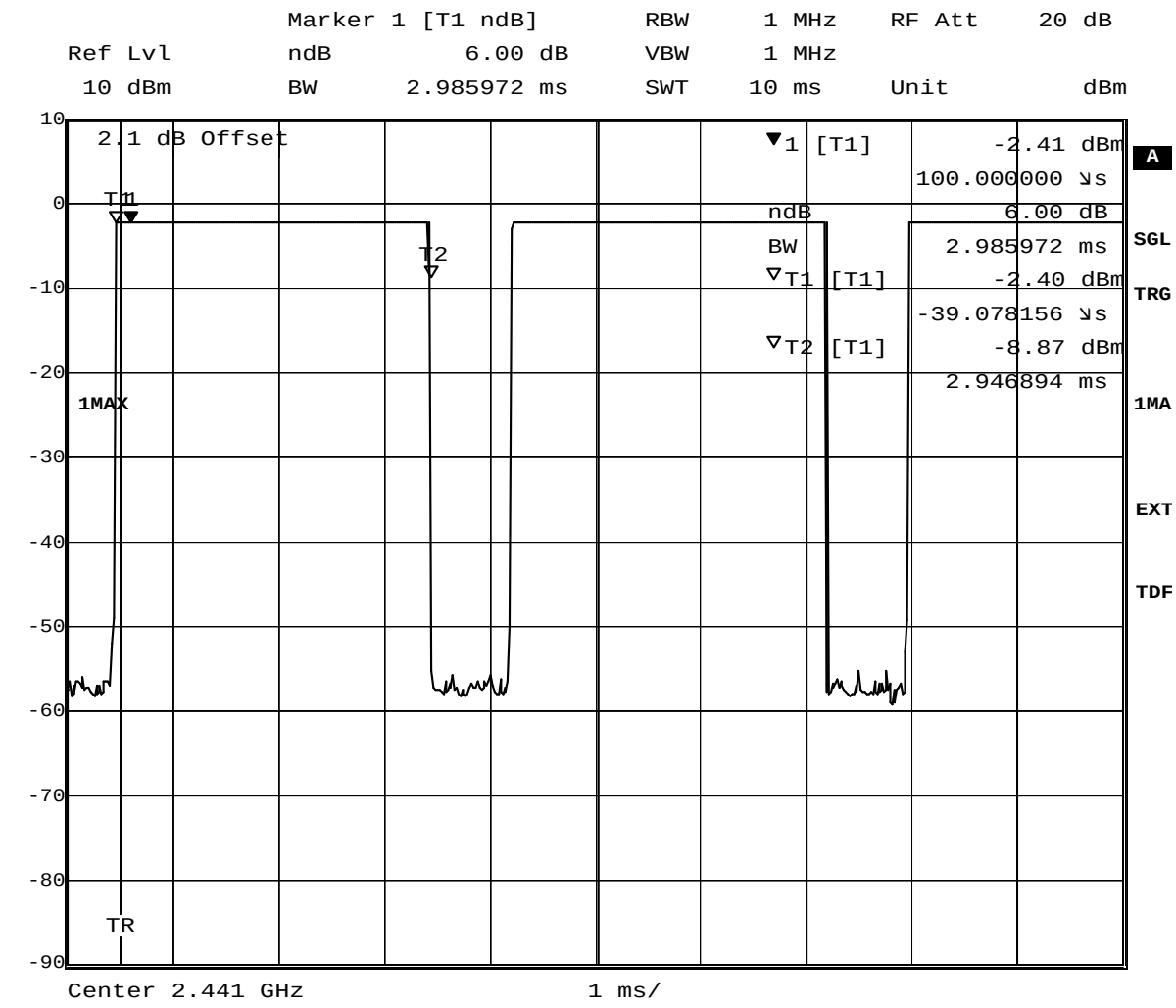


Radiated measurement (higher band edge)

8.5 Dwell time

Op. Mode

op-mode 2 Time slot measurement of a DH5 packet

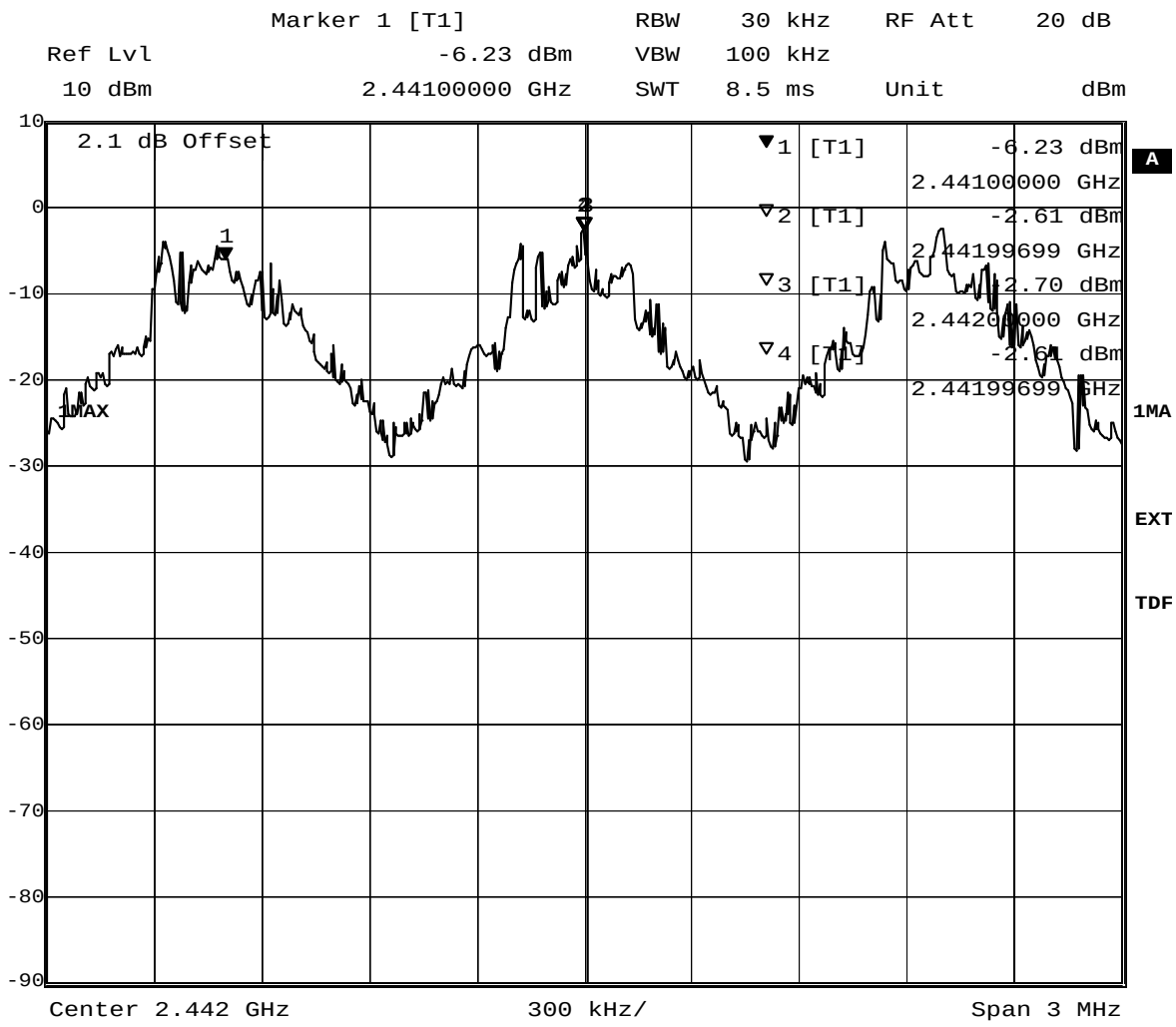


Title: Dwell time
Comment A: CH M: 2441 MHz
Date: 8.SEP.2010 17:40:23

8.6 Channel separation

Op. Mode

op-mode 4

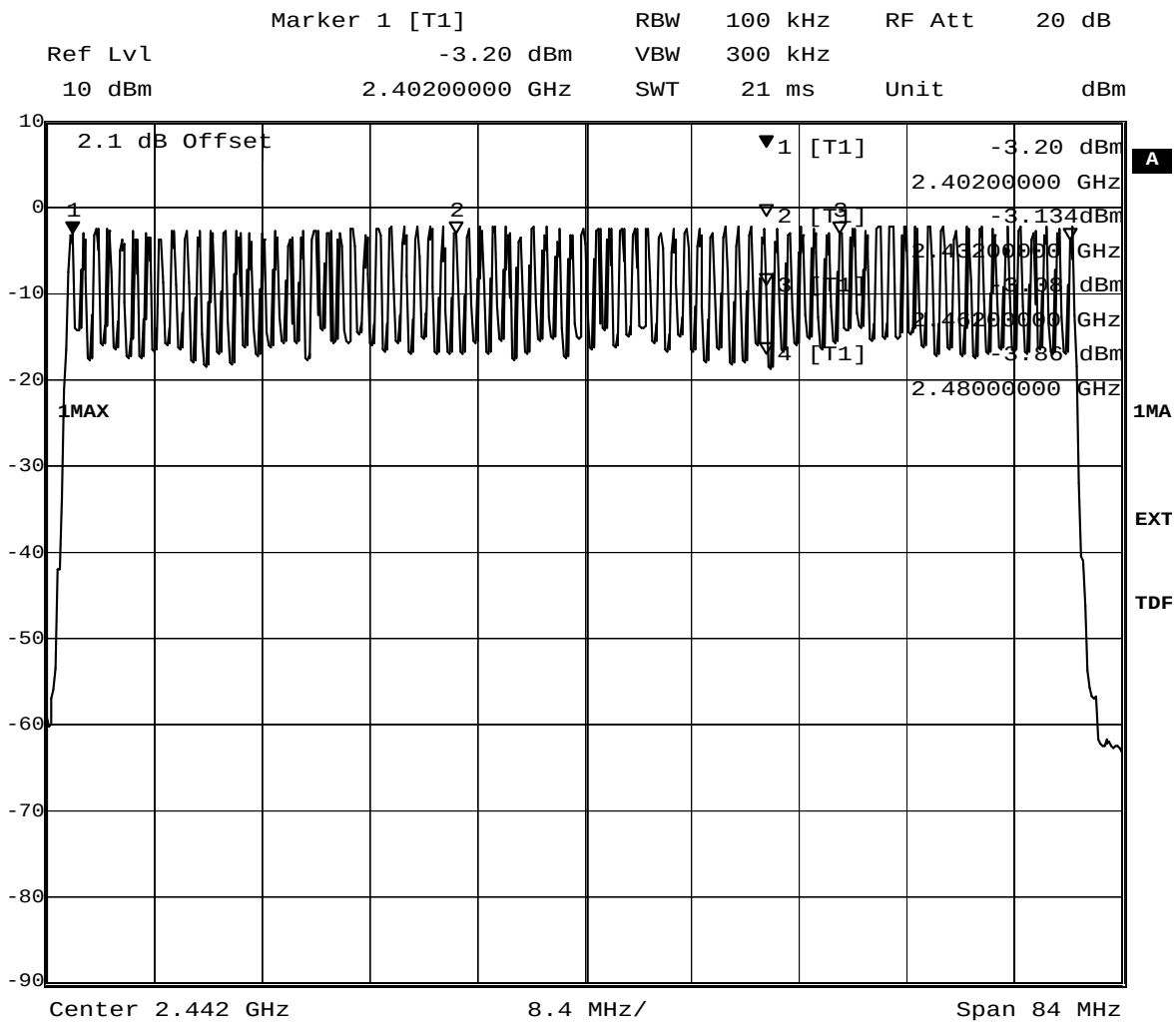


Title: Number of hopping frequencies
Comment A: CH H: Hopping
Date: 8.SEP.2010 17:46:33

8.7 Number of hopping frequencies

Op. Mode

op-mode 4



Title: Number of hopping frequencies
Comment A: CH H: Hopping
Date: 8.SEP.2010 17:48:08