

CETECOM Inc.



CETECOM Inc.

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Issued test report consists of 59 Pages

Page 1 (59)

RECOGNIZED BY INDUSTRY CANADA

IC - 3925

Test report no.:149A FCC/2001
FCC Part 15.247
FCC ID: B94C8925A
(HP Deskjet 995C with Smart Module)

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. USA does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.

1.2 Testing laboratory

CETECOM Inc.

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E-mail: lothar.schmidt@cetecomusa.com

Internet: www.cetecom.com

1.3 Details of applicant

Name : Hewlett Packard Company
Street : 18110 SE 34th St.
City : Vancouver, WA 98683
Country : USA
Telephone : +1 360 212 0471
Telefax : +1 360 212 7676
Contact : Henry Benitez
e-mail : Henry_benitez@hp.com

1.4 Application details

Date of receipt of application : 2001-04-11
Date of receipt of test item : 2001-05-01
Date of test : 2001-05-01/02

1.5 Test item

Manufacturer : applicant
Name of EUT : HP Deskjet 995C
Description : Bluetooth Wireless Printer using Siliconwave / Smart Module
HP aprt # C8925-60002
Model No. : C8925A
Serial No. : N/A
FCC ID : B94C8925A
Additional informations: :
Frequency : 2400 – 2483.5 MHz
Type of modulation : GFSK FHSS
Number of channels : 79
Antenna : Integral
Power supply : 100-240 VAC 50/60 Hz
Output power : -1.4 dBm
Extreme Temp. Limits : -30°C - +60°C

1.6 Test standards: FCC Part 15 §15.247

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

Technical responsibility for area of testing :

2000-05-16 EMC& Radio Lothar Schmidt
Date Section Name



Signature

2.2 Testreport

TEST REPORT

Testreport no. : 149A FCC/2001

FCC ID: B94C8925A

(HP Deskjet 995C with Smart Module)

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

Paragraph	PARAMETER TO BE MEASURED	PAGE
	Transmitter parameters	
§ 15.204	Antenna gain	7
§ 15.247 (a)	Carrier frequency separation	8
§ 15.247 (a)	Number of hopping channels	9
§ 15.247 (a)	Time of occupancy (dwell time)	13
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ANNEX: Processing Gain (provided by manufacturer)

NOTE: Conducted Emissions as per § 15.107/207 are not applicable for the EUT since it is built in a Printer .

Antenna Gain

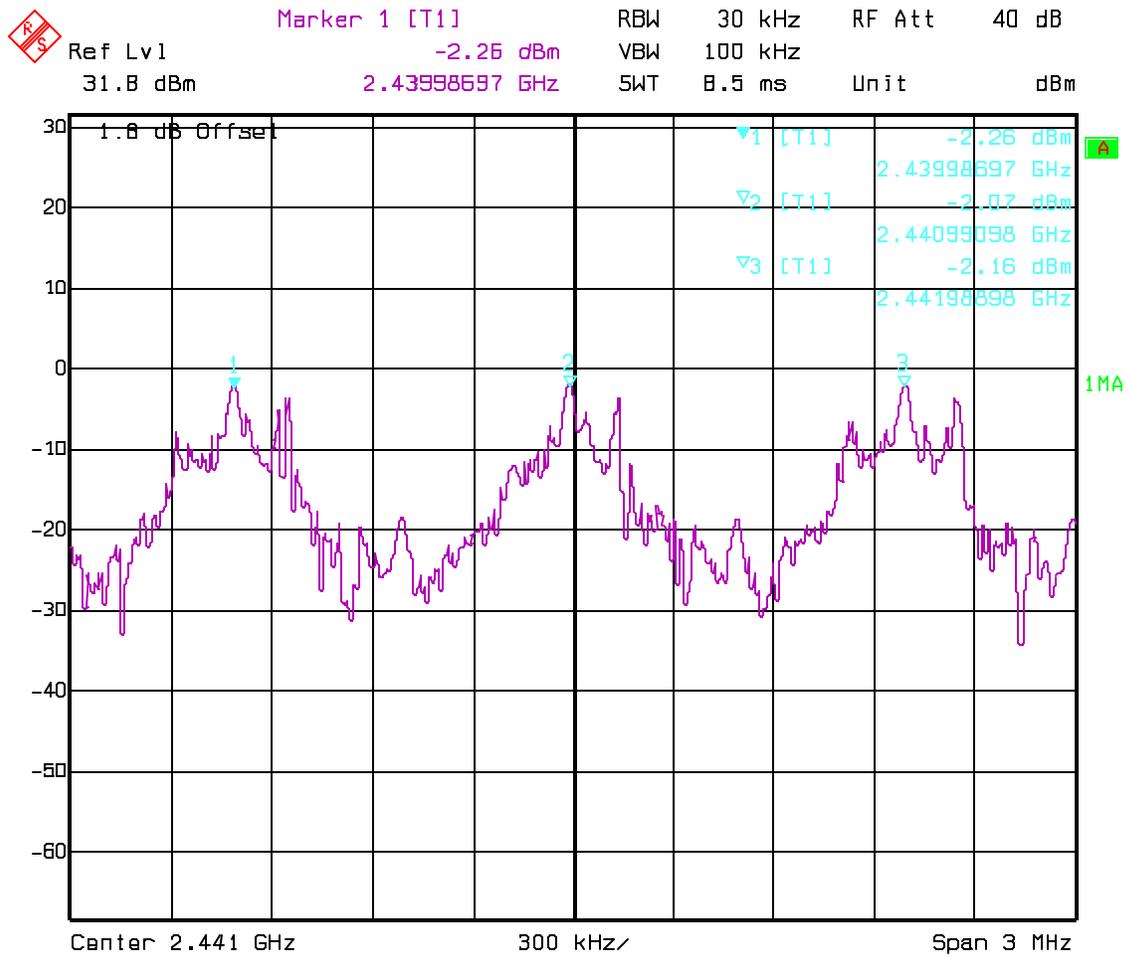
SUBCLAUSE § 15.204

The max. gain is -0.25dBi

(measured effective radiated power – measured conducted power with a temporary RF-connector)

CARRIER FREQUENCY SEPERATION

§15.247(a)



1.8 dB Offset : Cable loss

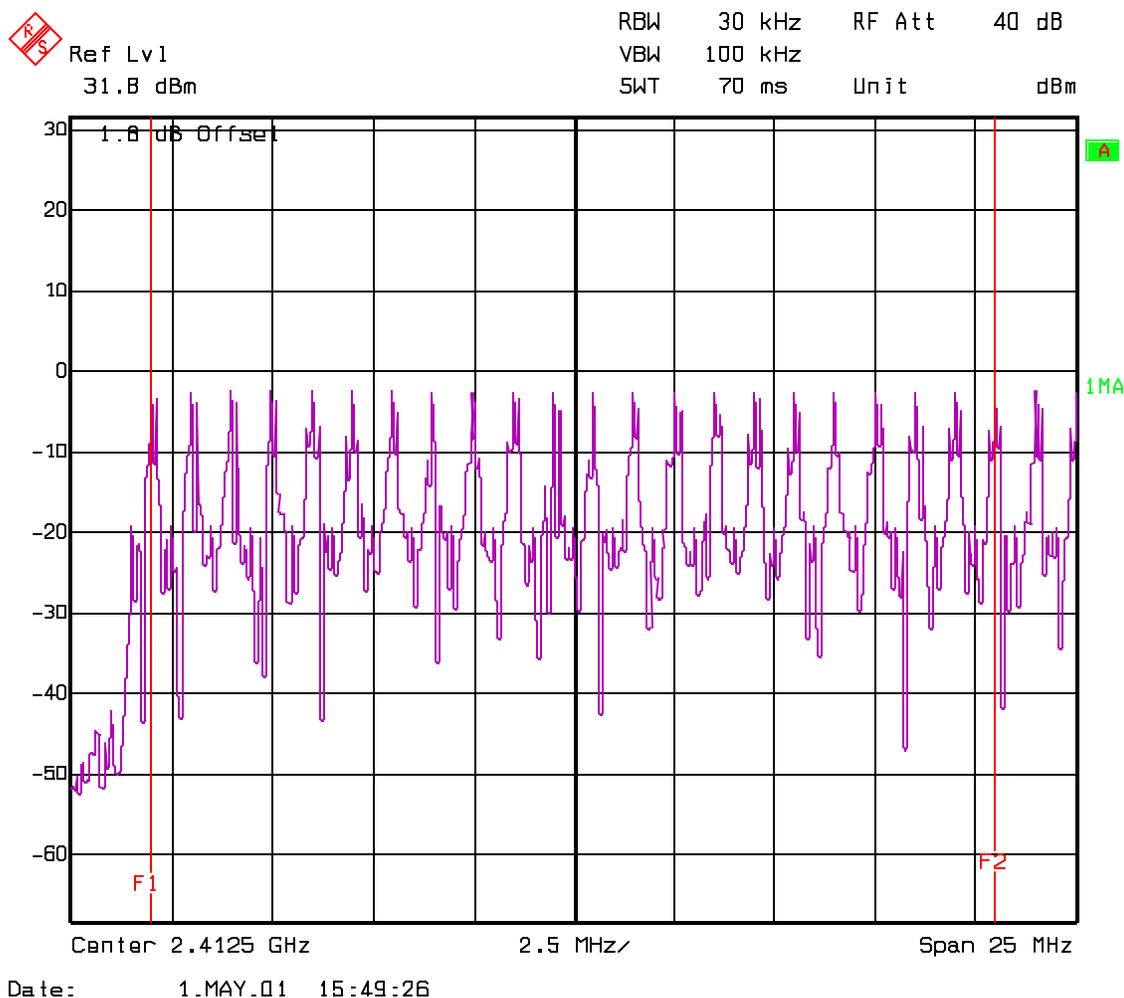
NUMBER OF HOPPING CHANNELS

§15.247(a)

The number of hopping channels is 79 (see next 4 plots)

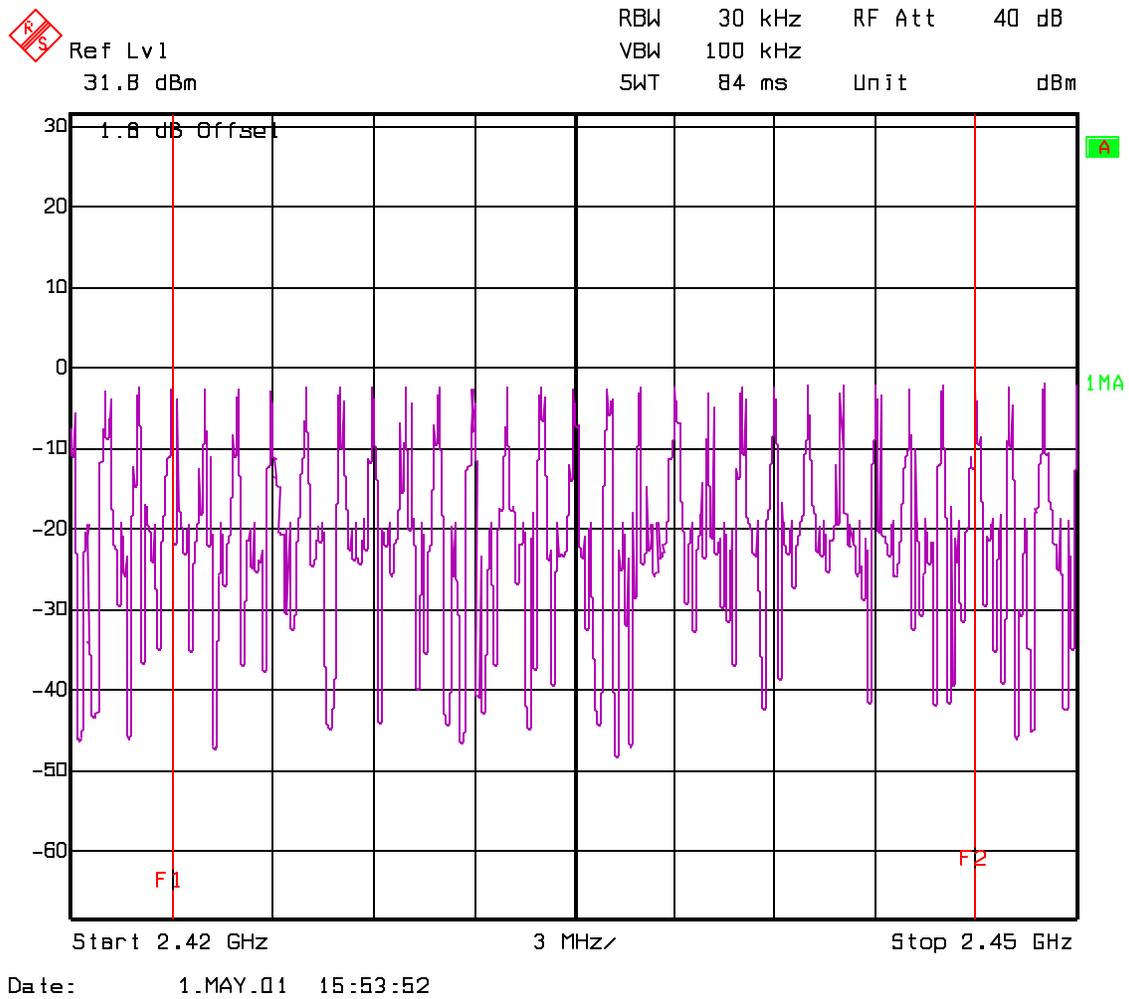
The right red line corresponds to the left red line from the next plot.

Plot 1:



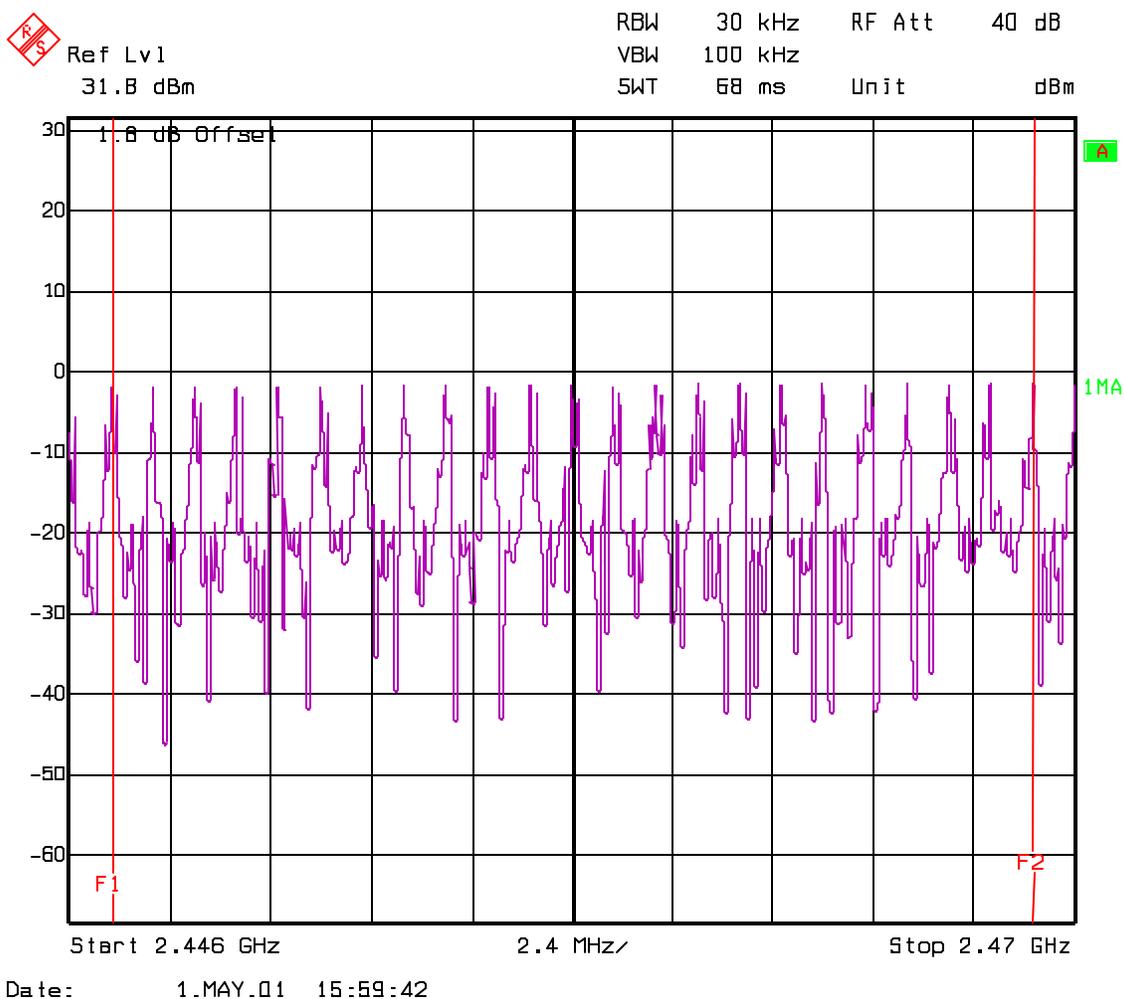
1.8 dB Offset : Cable loss

Plot 2:



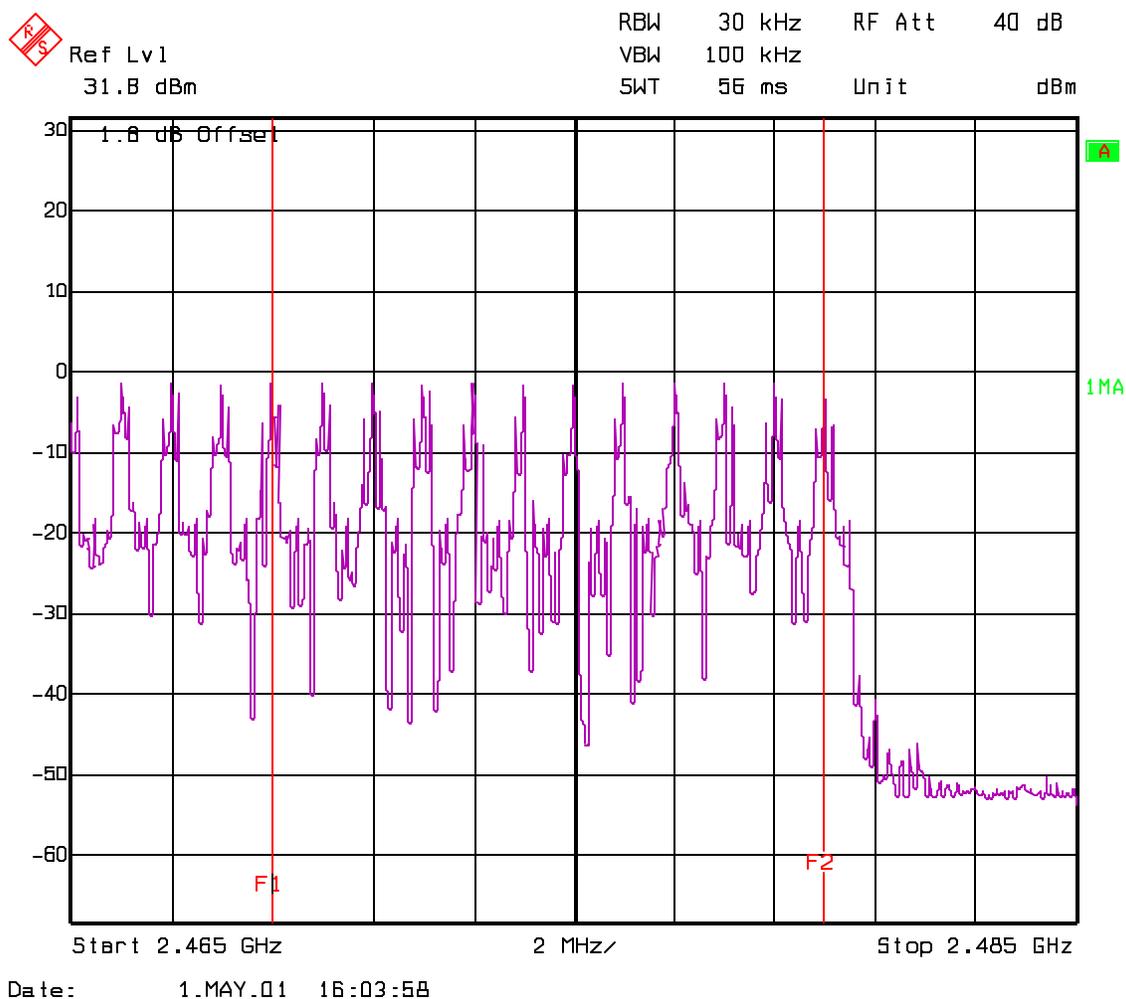
1.8 dB Offset : Cable loss

Plot 3:



1.8 dB Offset : Cable loss

Plot 4:



1.8 dB Offset : Cable loss

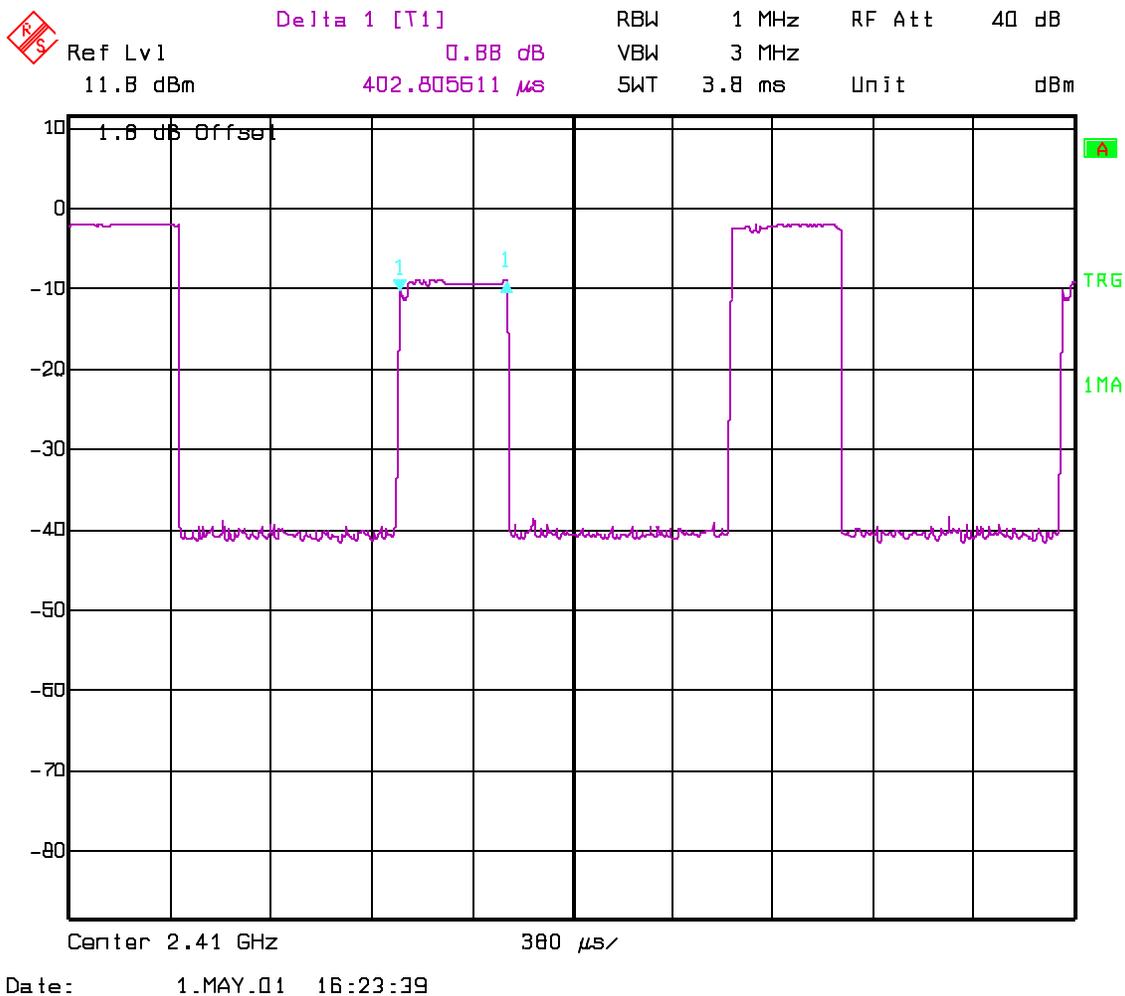
TIME OF OCCUPANCY (DWELL TIME) FOR DH1

§15.247(a)

The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 79 channels. So you have each channel 10.13 times per second and so for 30 seconds you have 303.9 times of appearance .

Each Tx-time per appearance is 402 µs.

So we have 303.9 * 402 µs = 122.16 ms per 30 seconds.



1.8 dB Offset : Cable loss

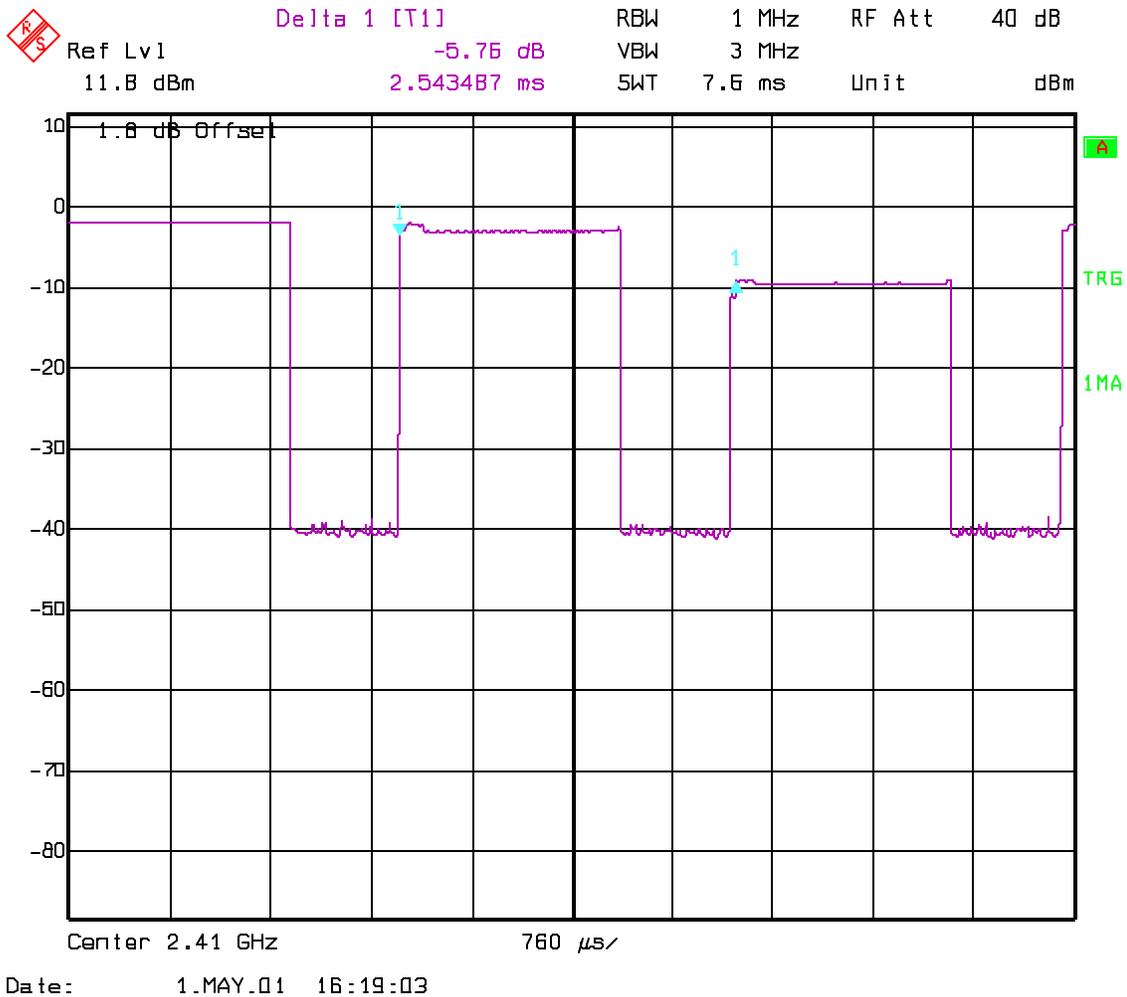
TIME OF OCCUPANCY (DWELL TIME) FOR DH3

§15.247(a)

A DH3 Packets need 3 time slots for transmit and 1 for receiving, then the system makes worst case 400 hops per second with 79 channels. So you have each channel 5.1 times per second and so for 30 seconds you have 153 times of appearance .

Each Tx-time per appearance is 1.66 ms.

So we have 153 * 1.66 ms = 253.98 ms per 30 seconds.



1.8 dB Offset : Cable loss

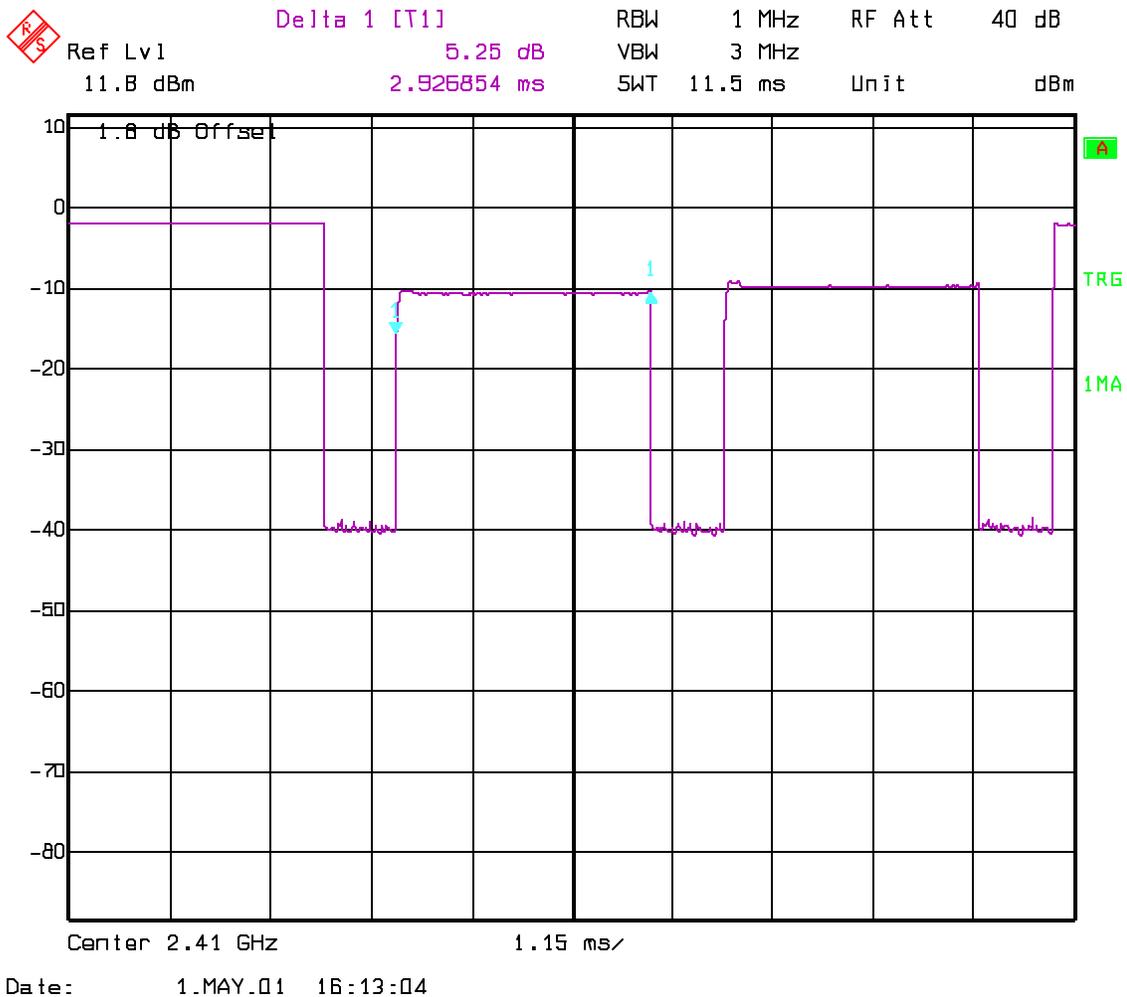
TIME OF OCCUPANCY (DWELL TIME) FOR DH5

§15.247(a)

At DH5 Packets you need 5 time slots for transmit and 1 for receiving, then the system makes worst case 266,7 hops per second with 79 channels. So you have each channel 3.36 times per second and so for 30 seconds you have 100,8 times of appearance .

Each tx-time per appearance is 2.9 ms.

So we have $100.8 * 2.9\text{ms} = 292.32 \text{ ms}$ per 30 seconds.



1.8 dB Offset : Cable loss

SPECTRUM BANDWIDTH OF FHSS SYSTEM
20 dB bandwidth

§15.247(a)

TEST CONDITIONS		20 dB BANDWIDTH (kHz)		
		2402	2441	2481
Frequency (MHz)				
$T_{nom}(23)^{\circ}C$	$V_{nom}0V$	877.7	921.8	881.7
Measurement uncertainty		±3dB		

RBW / VBW as provided in the „Measurement Guidelines“ (DA 00-705, March 30, 2000)

LIMIT

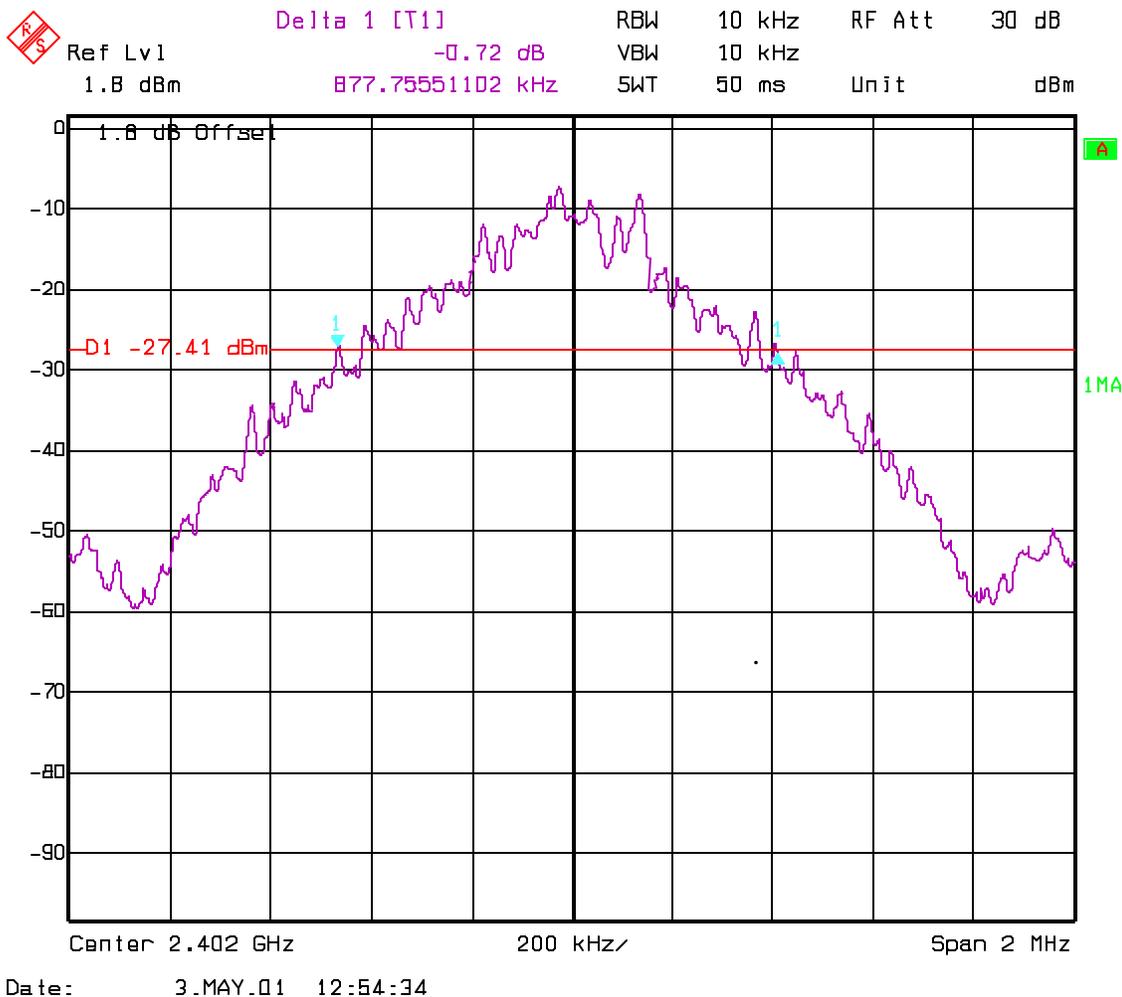
SUBCLAUSE §15.247(a) (1)

The maximum 20dB bandwidth shall be at maximum 1000 KHz

SPECTRUM BANDWIDTH OF FHSS SYSTEM
20 dB bandwidth

§15.247(a)

Lowest Channel: 2402MHz

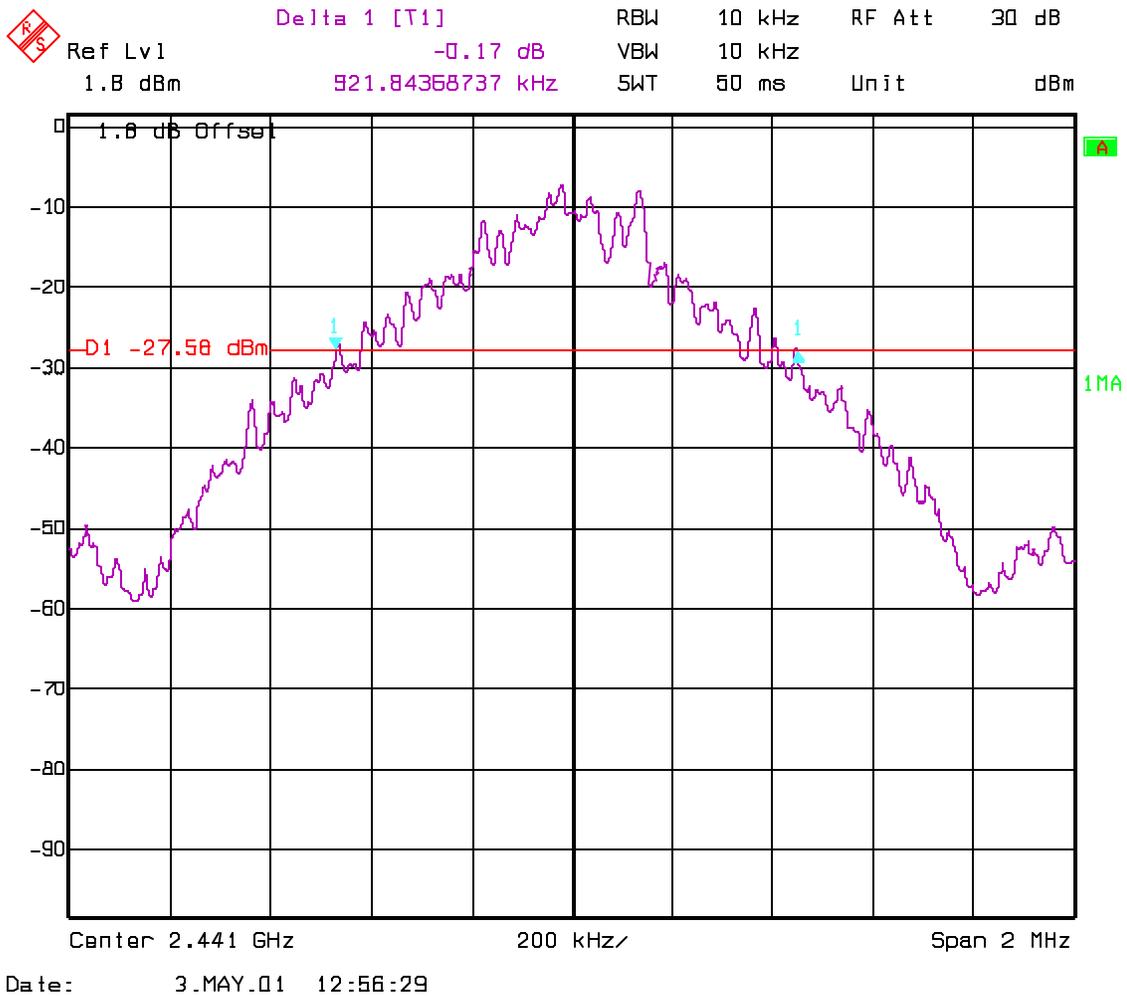


1.8 dB Offset : Cable loss

SPECTRUM BANDWIDTH OF FHSS SYSTEM
20 dB bandwidth

§15.247(a)

Mid Channel: 2441MHz

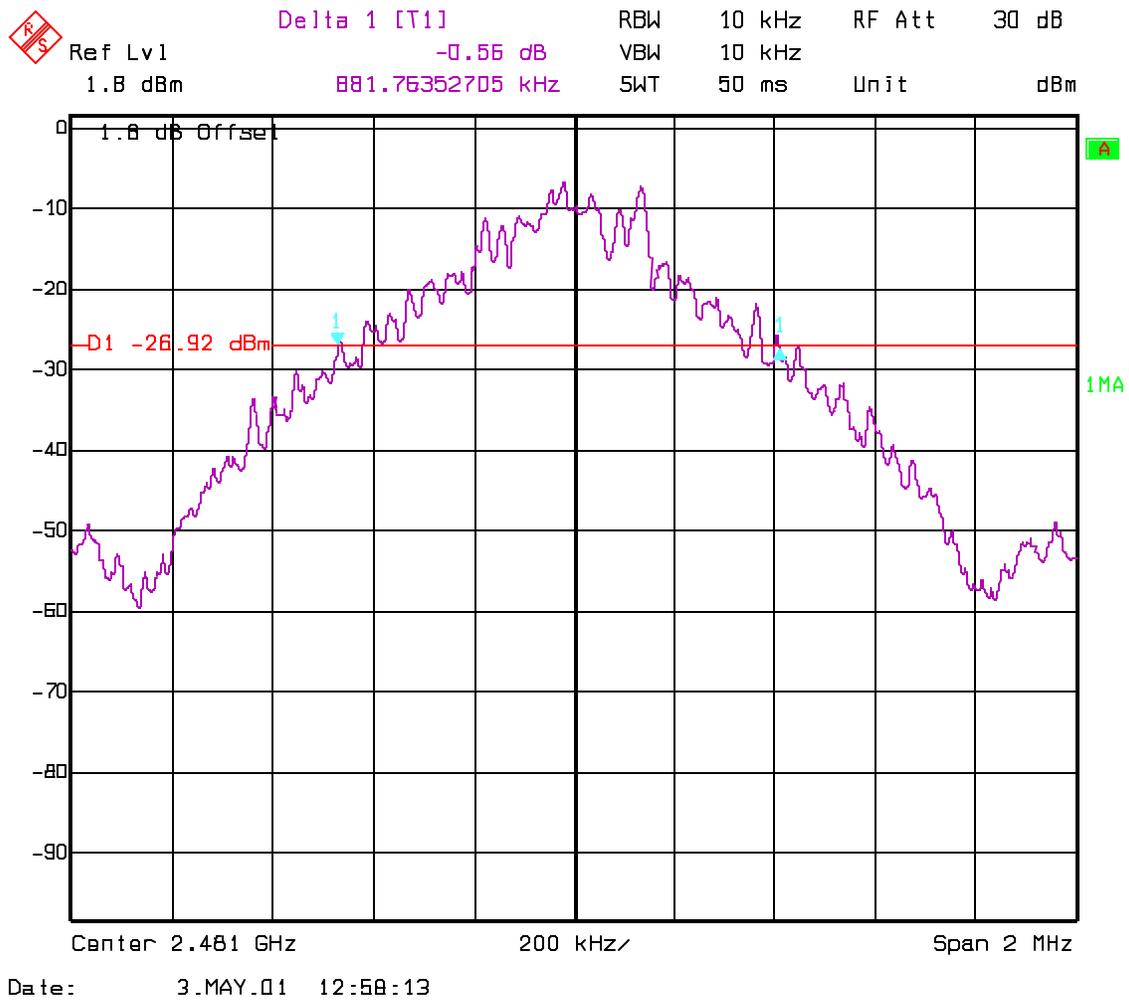


1.8 dB Offset : Cable loss

SPECTRUM BANDWIDTH OF FHSS SYSTEM
20 dB bandwidth

§15.247(a)

Highest Channel: 2481MHz



1.8 dB Offset : Cable loss

**MAXIMUM PEAK OUTPUT POWER
(conducted)**

SUBCLAUSE § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
		2402	2441	2481	
Frequency (MHz)					
$T_{nom}(23)^{\circ}C$	$V_{nom}0V$	PK	-1.97	-1.71	-1.11
		AV	-2.12	-1.88	-1.23
Maximum deviation from output power under extreme test conditions (dBc)		-0.29 / -0.27 Pk/Av	-0.32 / -0.59 Pk/Av	-0.52 / -0.57 Pk/Av	
Measurement uncertainty		±3dB			

RBW / VBW : 3 MHz

LIMIT

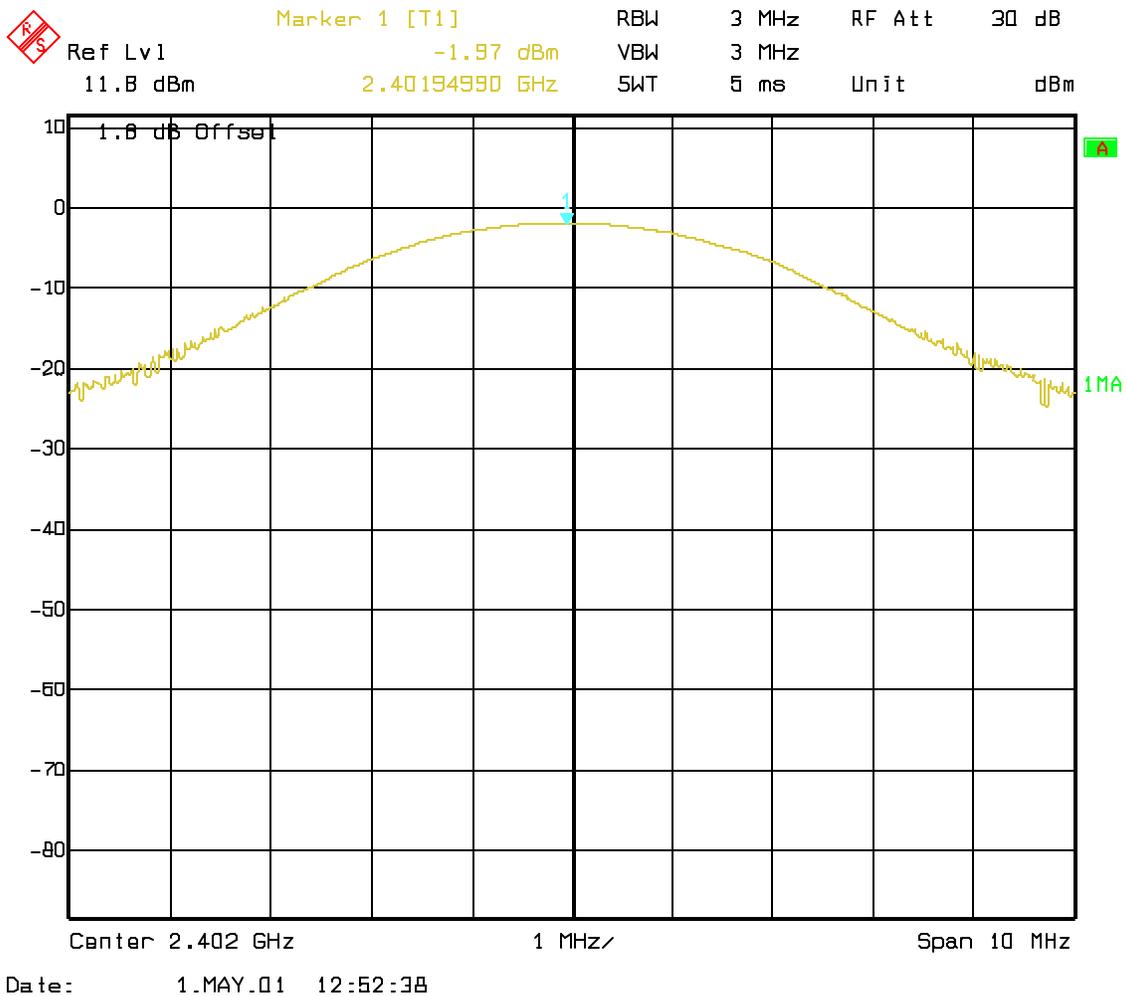
SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

Peak output power (conducted)

§15.247 (b)

Lowest Channel: 2402MHz

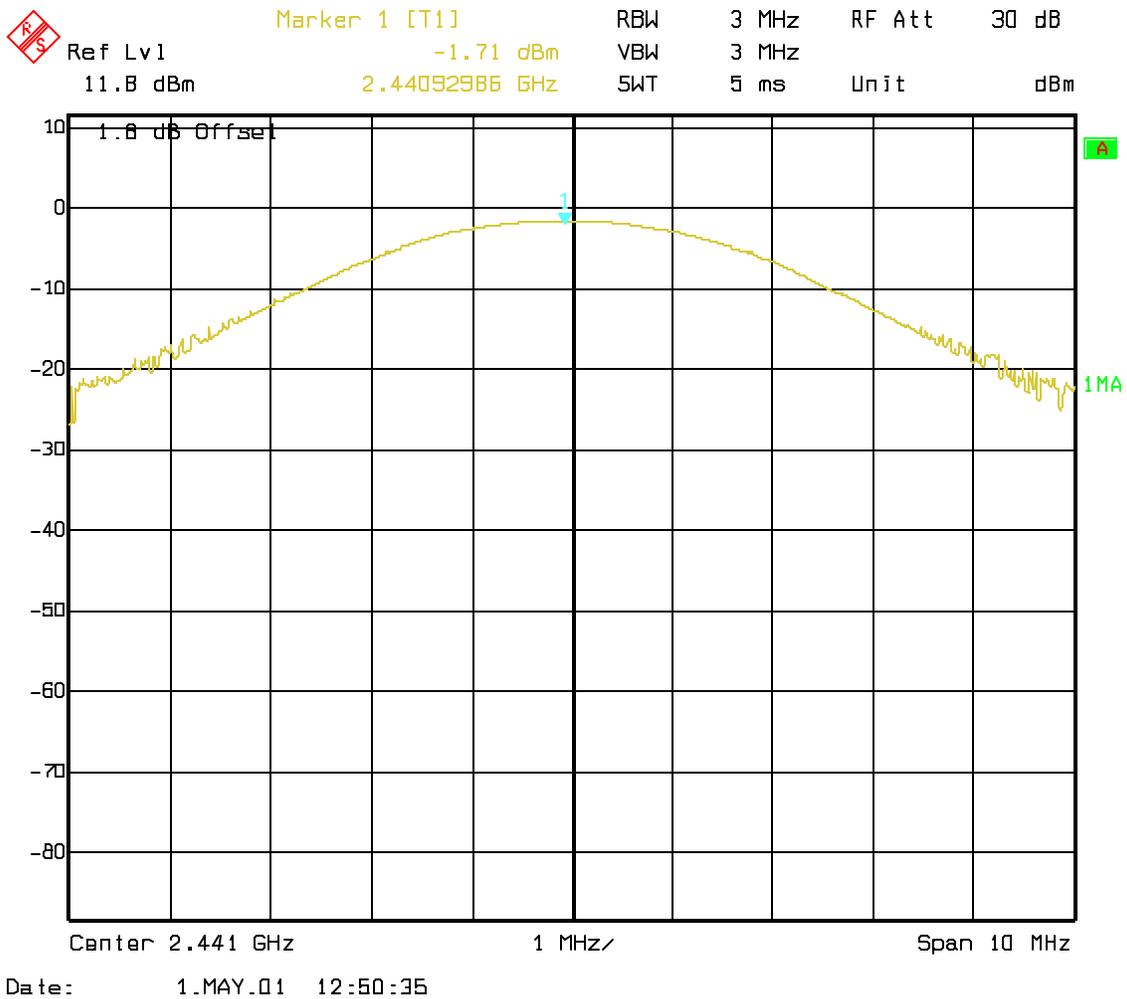


1.8 dB Offset : Cable loss

Peak output power (conducted)

§15.247 (b)

Mid Channel: 2441MHz

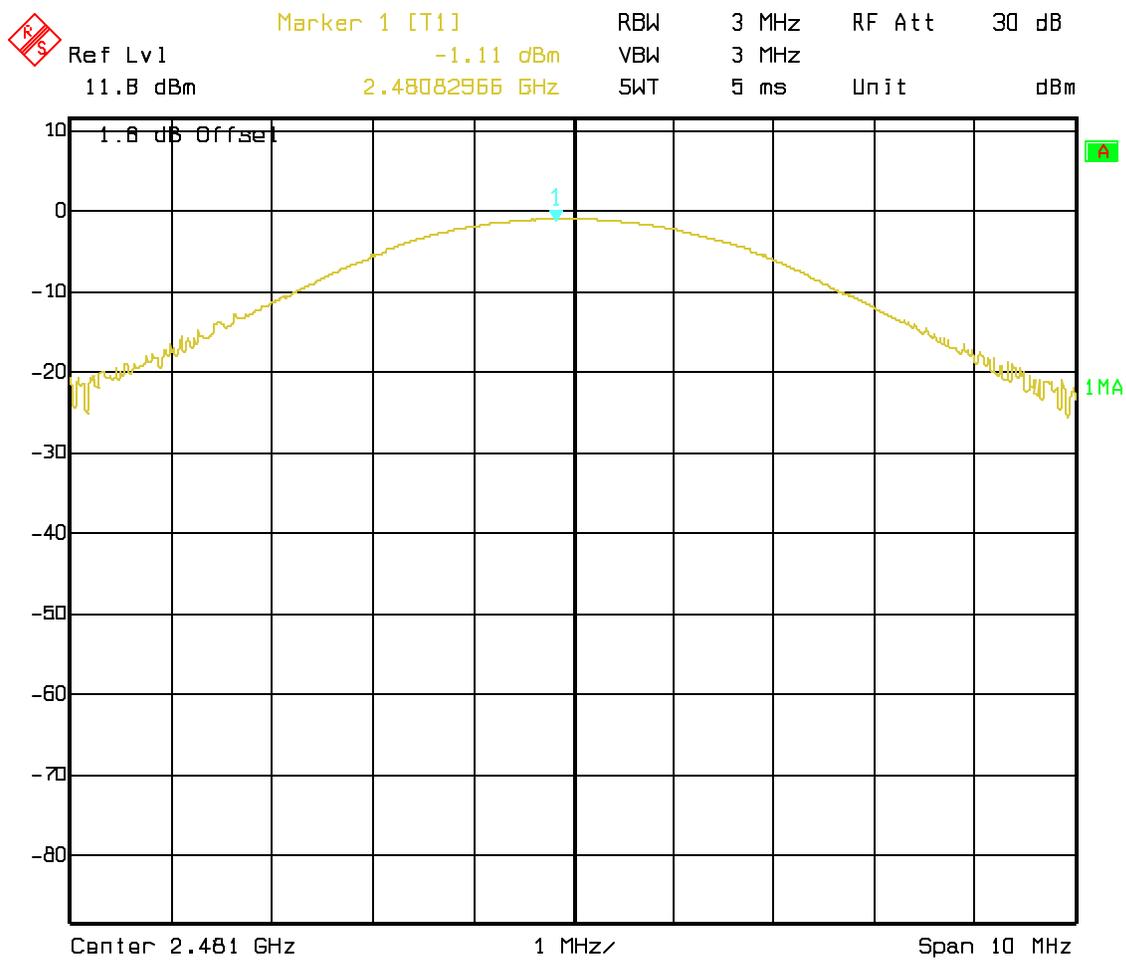


1.8 dB Offset : Cable loss

Peak output power (conducted)

§15.247 (b)

Highest Channel: 2481MHz



Date: 1.MAY.01 12:55:31

1.8 dB Offset : Cable loss

**MAXIMUM PEAK OUTPUT POWER
(RADIATED)**

SUBCLAUSE § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
		2402	2441	2481
Frequency (MHz)				
$T_{nom}(23)^\circ C$	$V_{nom}(3.6)V$	-2.22	-2.04	-1.4
Maximum deviation from output power under extreme test conditions (dBc)		+0.28 / -0.34	+0.25 / -0.32	+0.21 / -0.28
Measurement uncertainty		±3dB		

RBW/VBW : 3 MHz

Measured at a distance of 3m

LIMIT

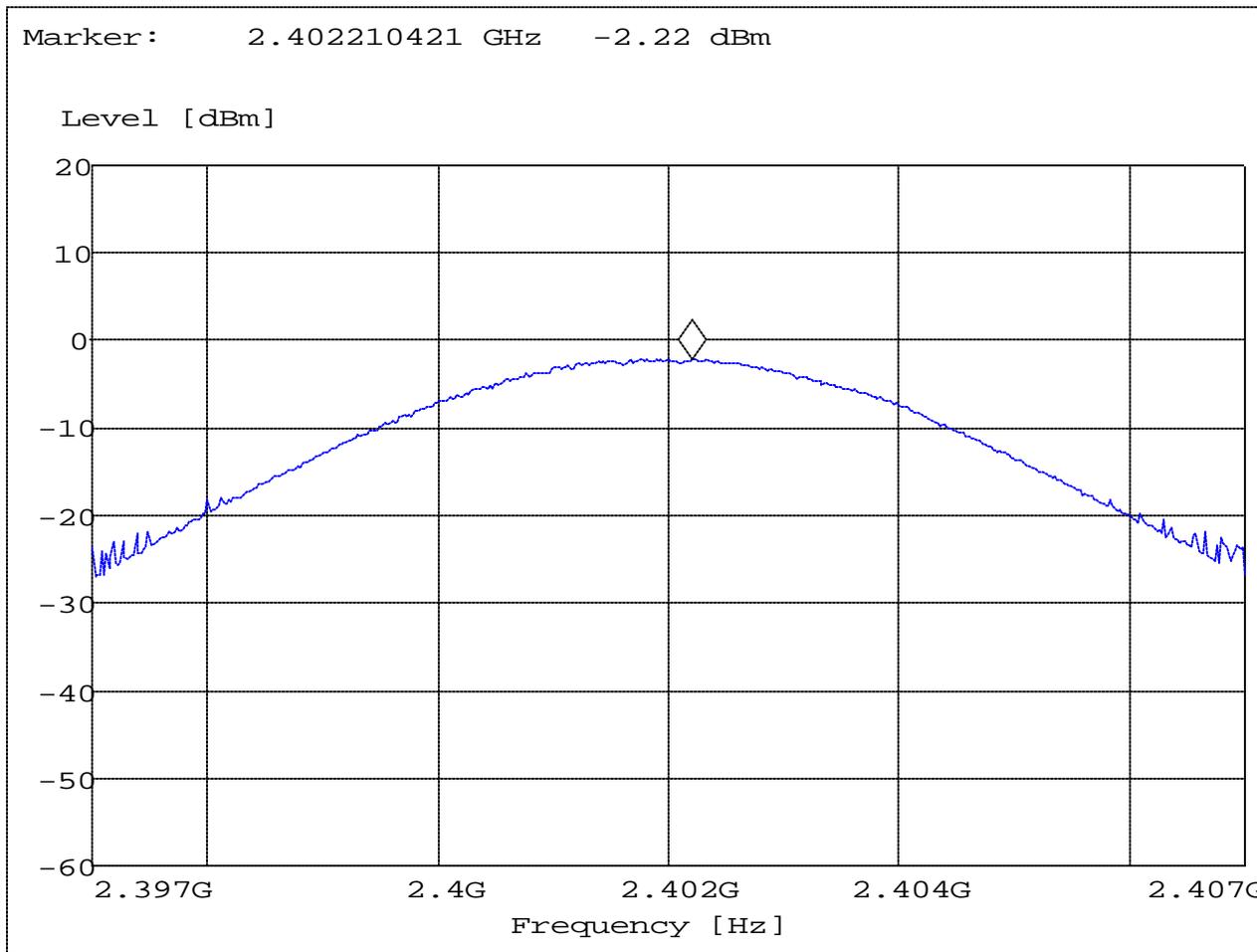
SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

Peak output power (Radiated)

§15.247 (b) (1)

Lowest Channel: 2402MHz

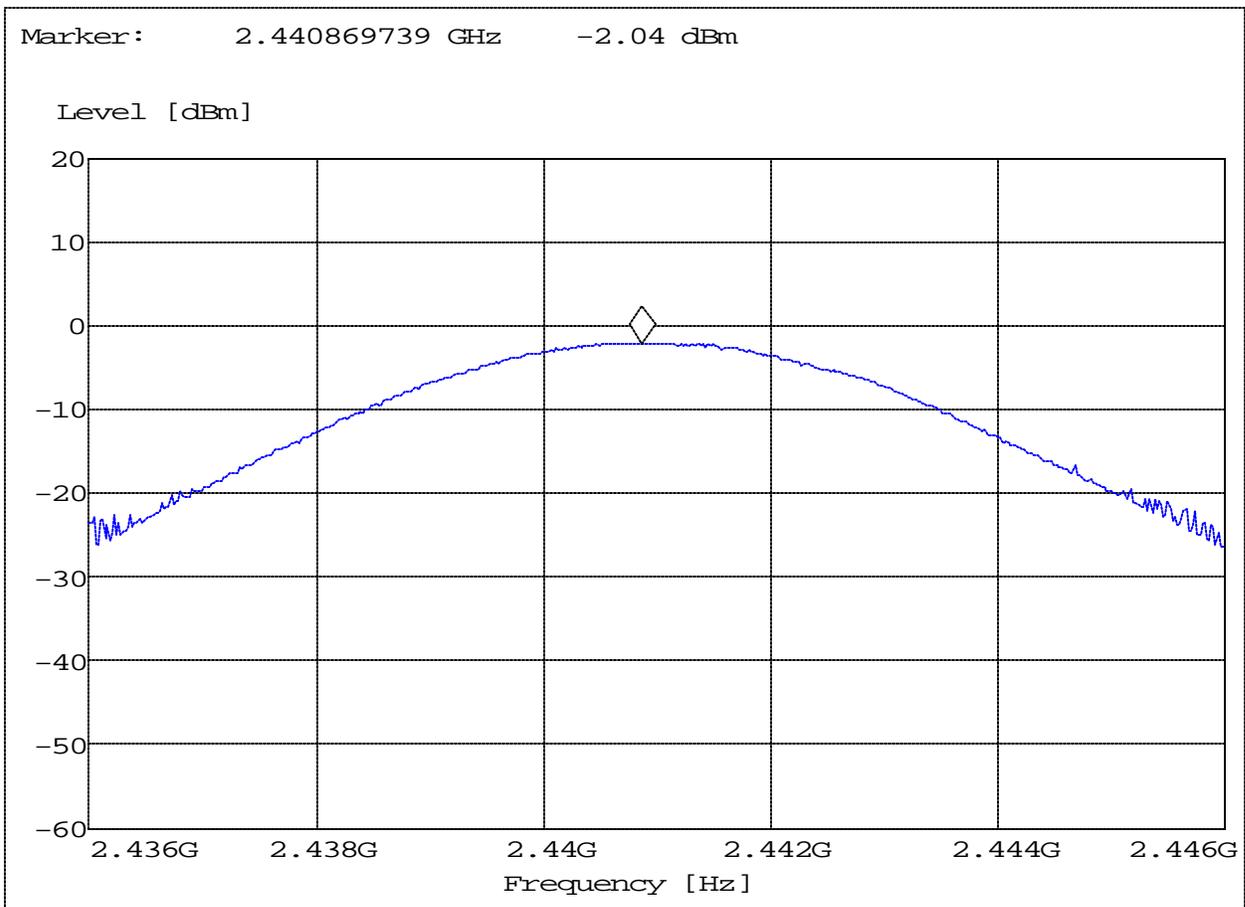


ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

Peak output power (Radiated)

§15.247 (b) (1)

Mid Channel: 2441MHz

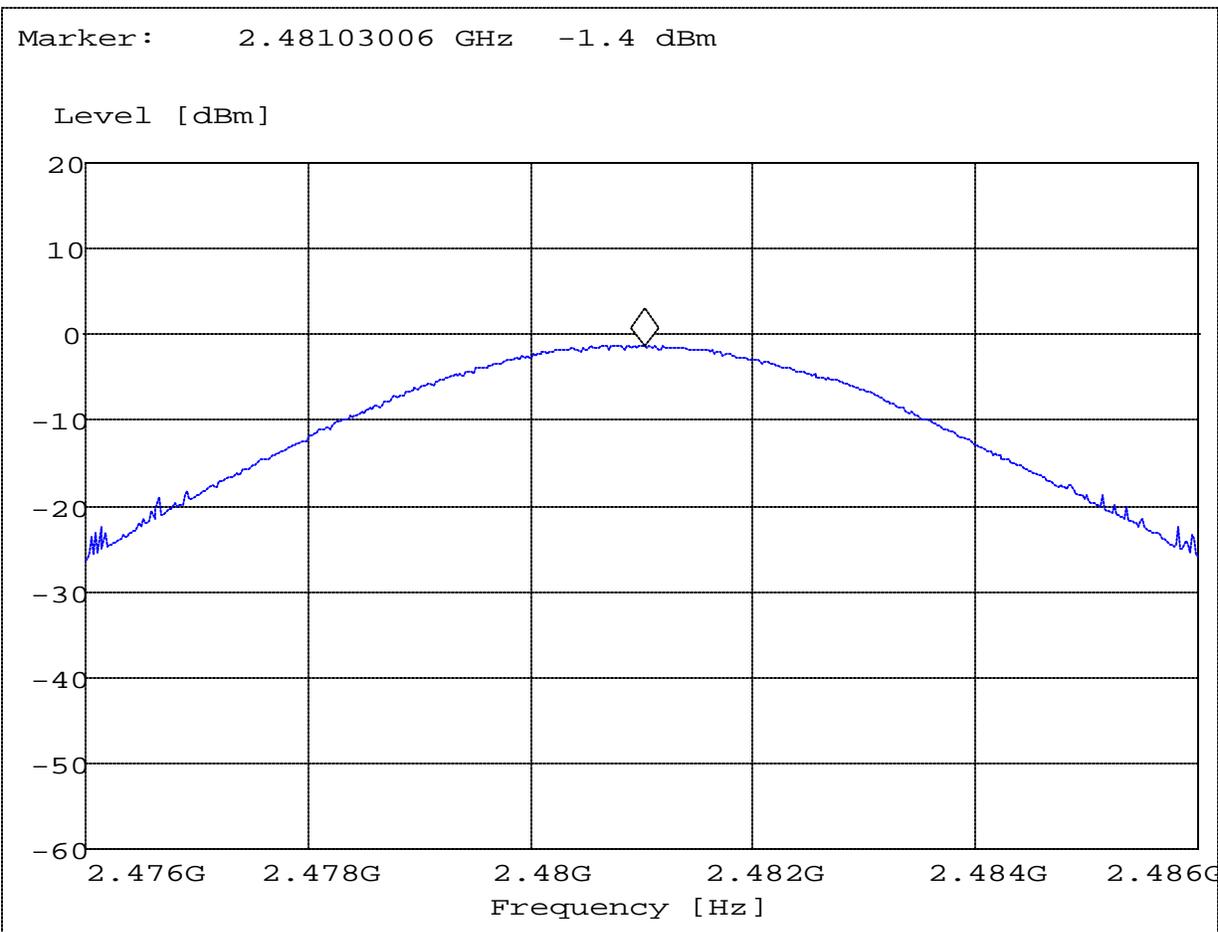


ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

Peak output power (Radiated)

§15.247 (b) (1)

Highest Channel: 2481MHz

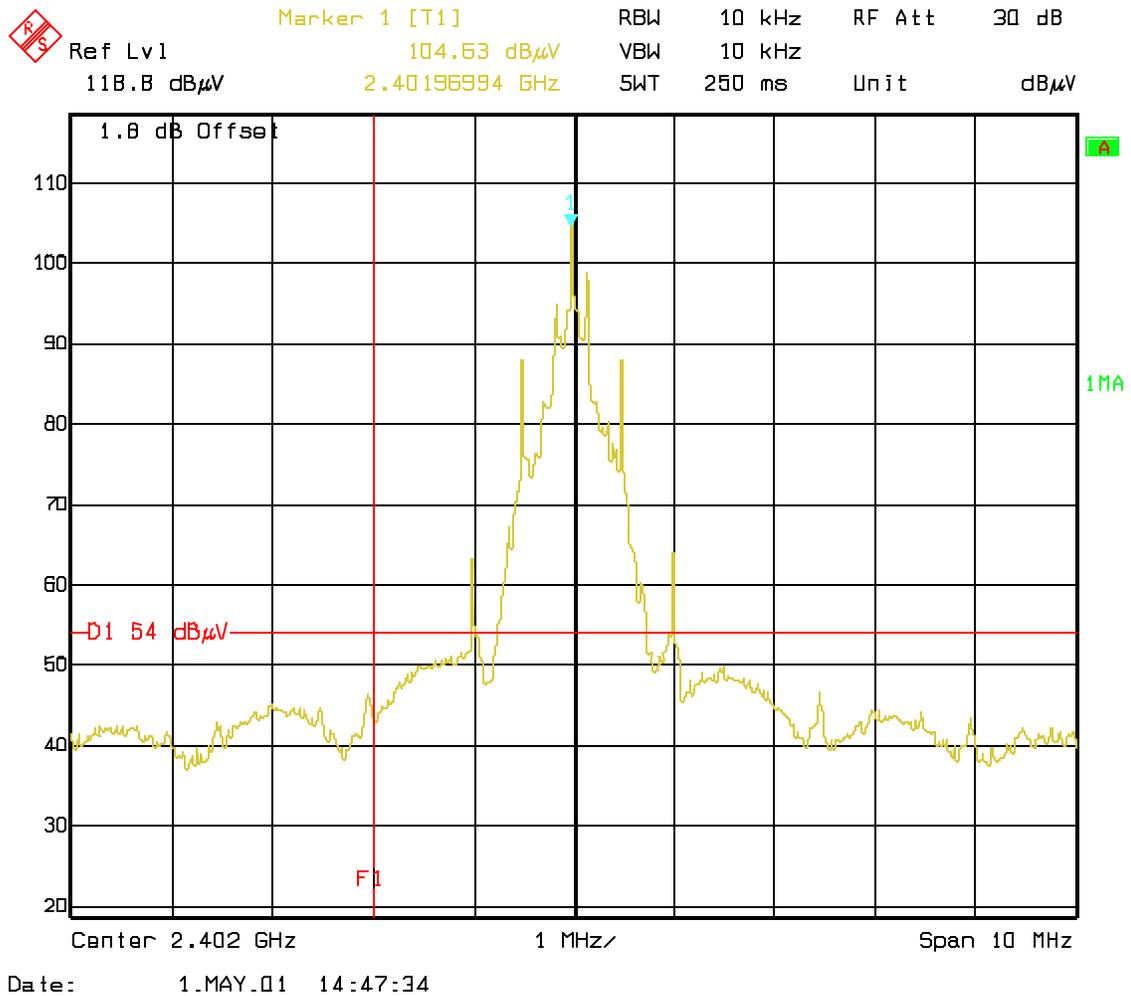


ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

BAND EDGE COMPLIANCE OF CONDUCTED EMISSIONS

§15.247 (c)

Low frequency section (hopping off)

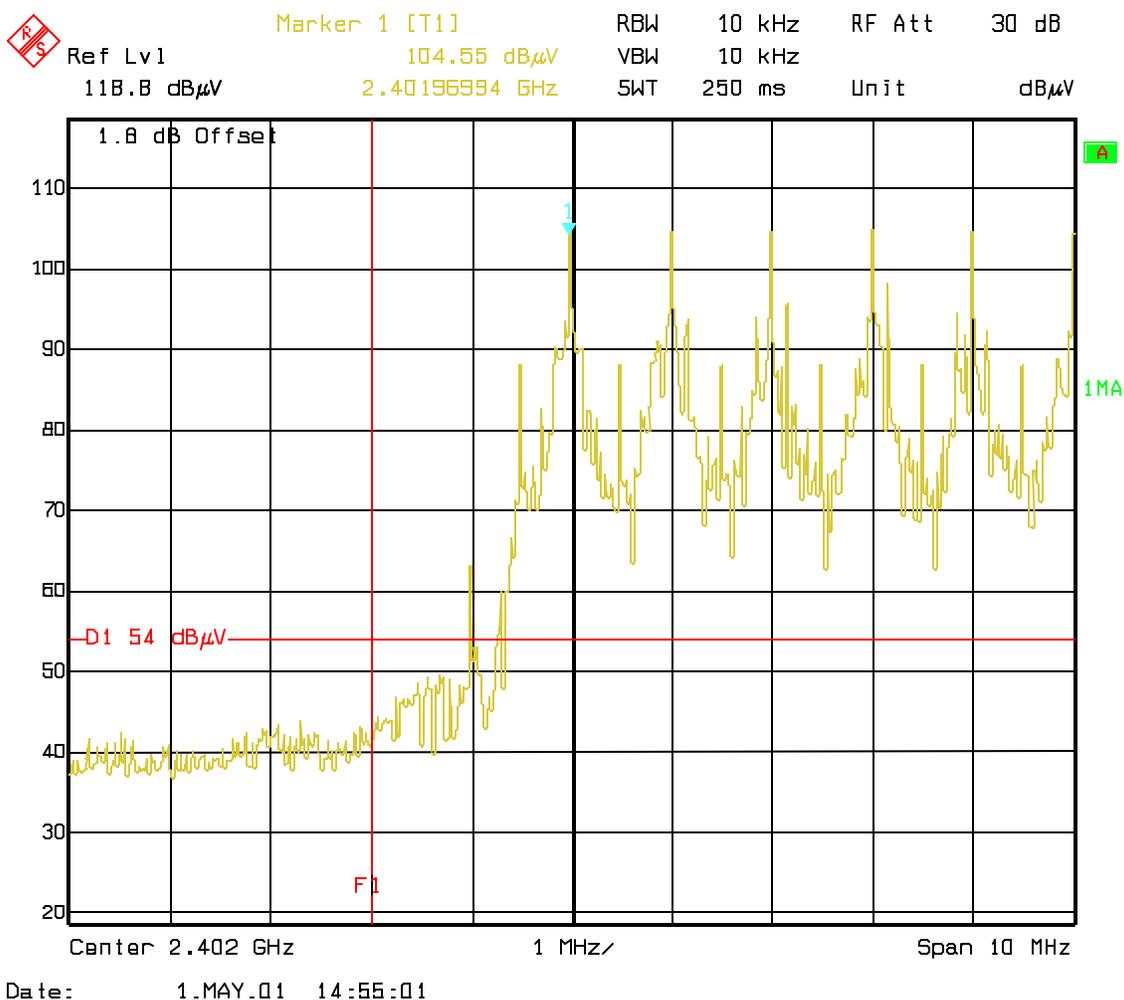


1.8 dB Offset : Cable loss

Band-edge compliance of conducted emissions

§15.247 (c)

Low frequency section (hopping on)

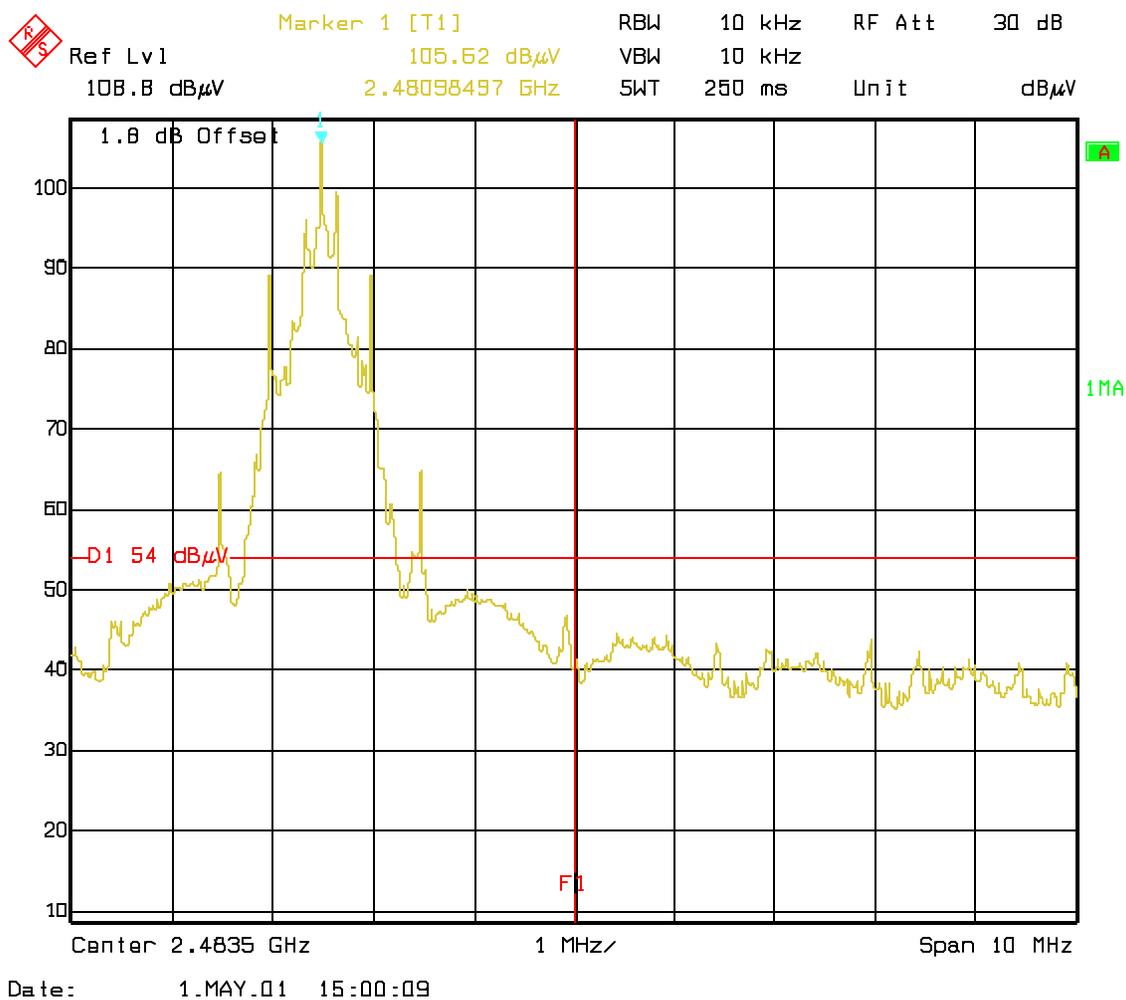


1.8 dB Offset : Cable loss

Band-edge compliance of conducted emissions

§15.247 (c)

high frequency section (hopping off)

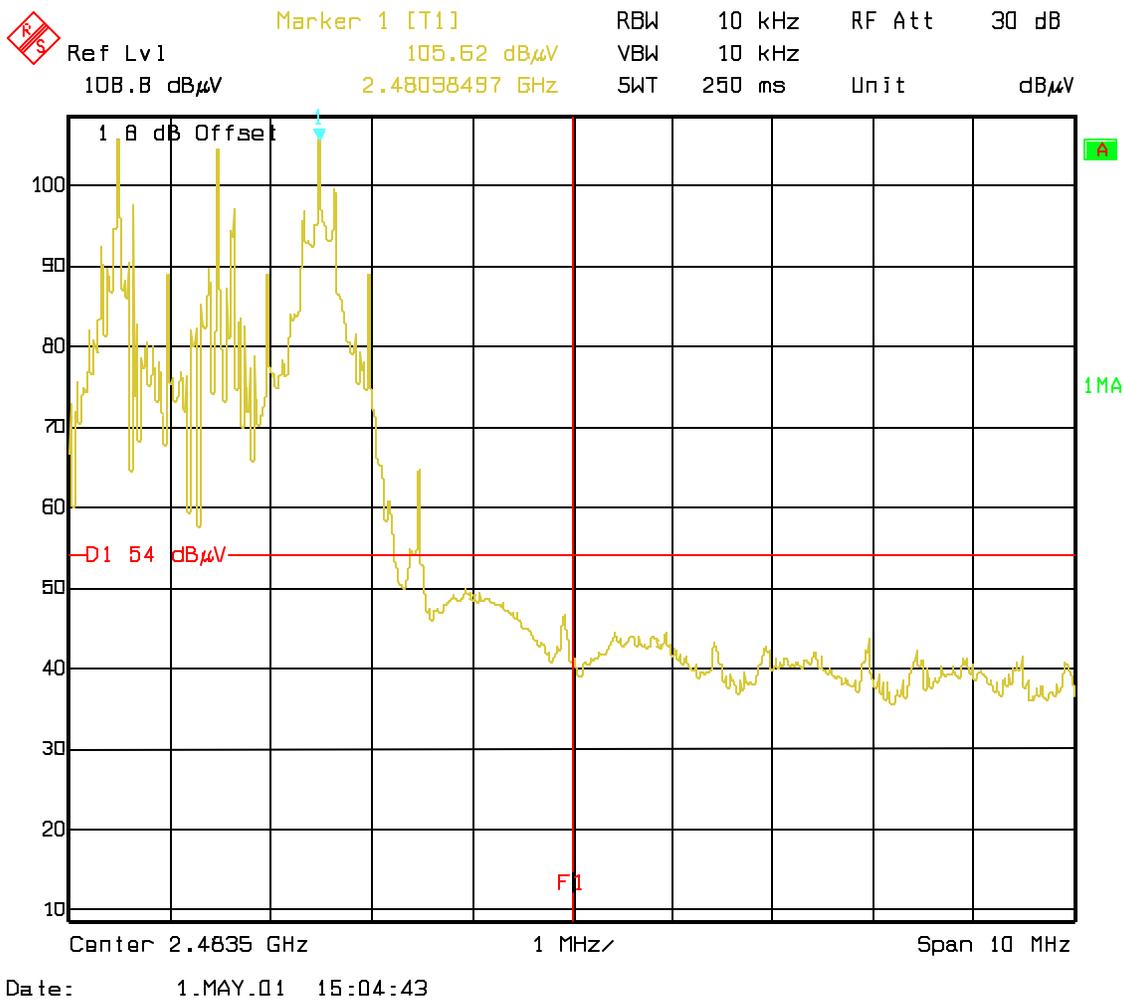


1.8 dB Offset : Cable loss

Band-edge compliance of conducted emissions

§15.247 (c)

high frequency section (hopping on)



1.8 dB Offset : Cable loss

EMISSION LIMITATIONS- Conducted (Transmitter)

§ 15.247 (c) (1)

EMISSION LIMITATIONS					
f (MHz)			limit max. allowed emmission power	actual attenuation below frequency of operation (dB)	results
2402			30 dBm	-	Operating frequency
all peaks <<limit				see plot	complies
2441			30 dBm	-	Operating frequency
all peaks <<limit				see plot	complies
2481			30 dBm		Operating frequency
all peaks <<limit				see plot	complies
Measurement uncertainty			± 3dB		

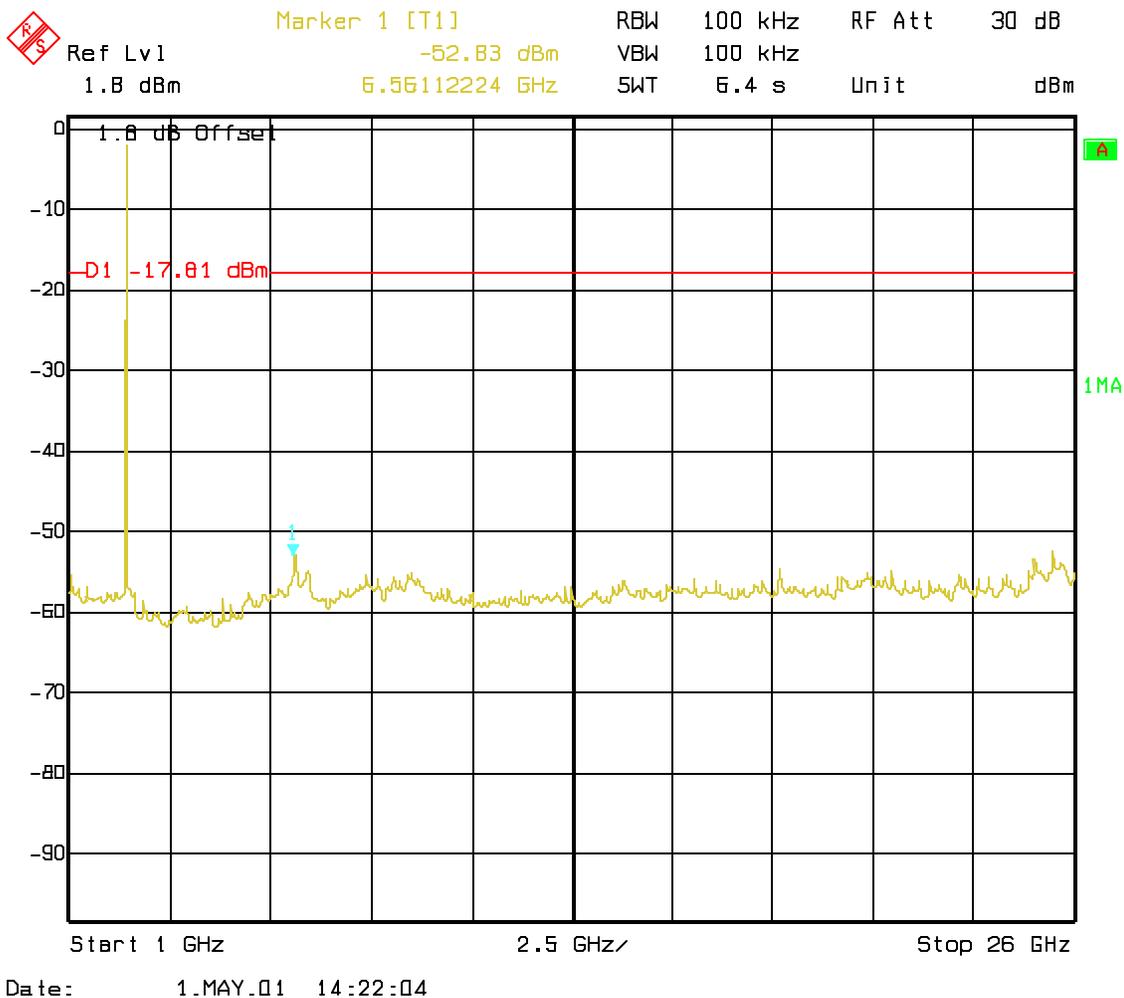
LIMITS

SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Conducted (Transmitter)
Lowest Channel: 1GHz - 26 GHz

§ 15.247 (c) (1)

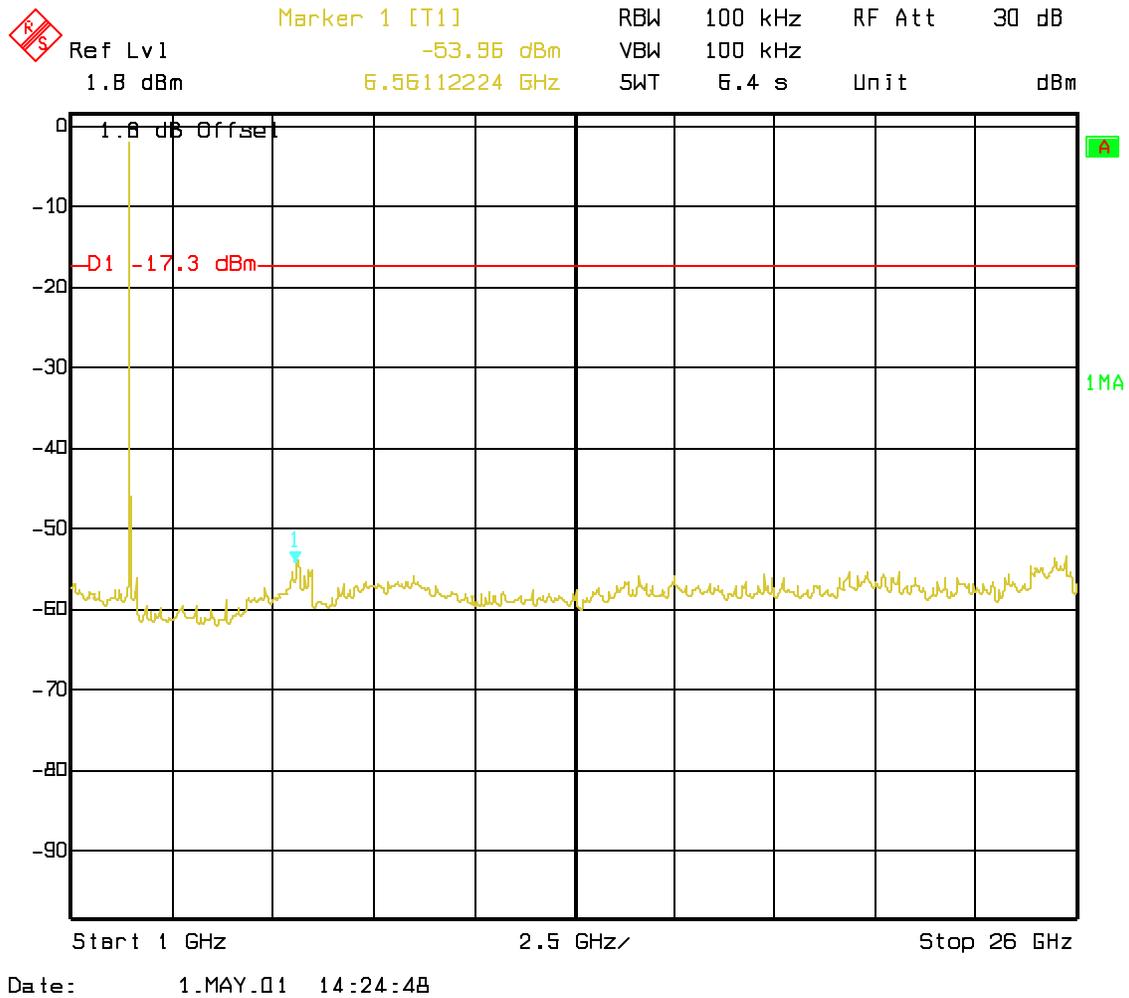


1.8 dB Offset : Cable loss

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

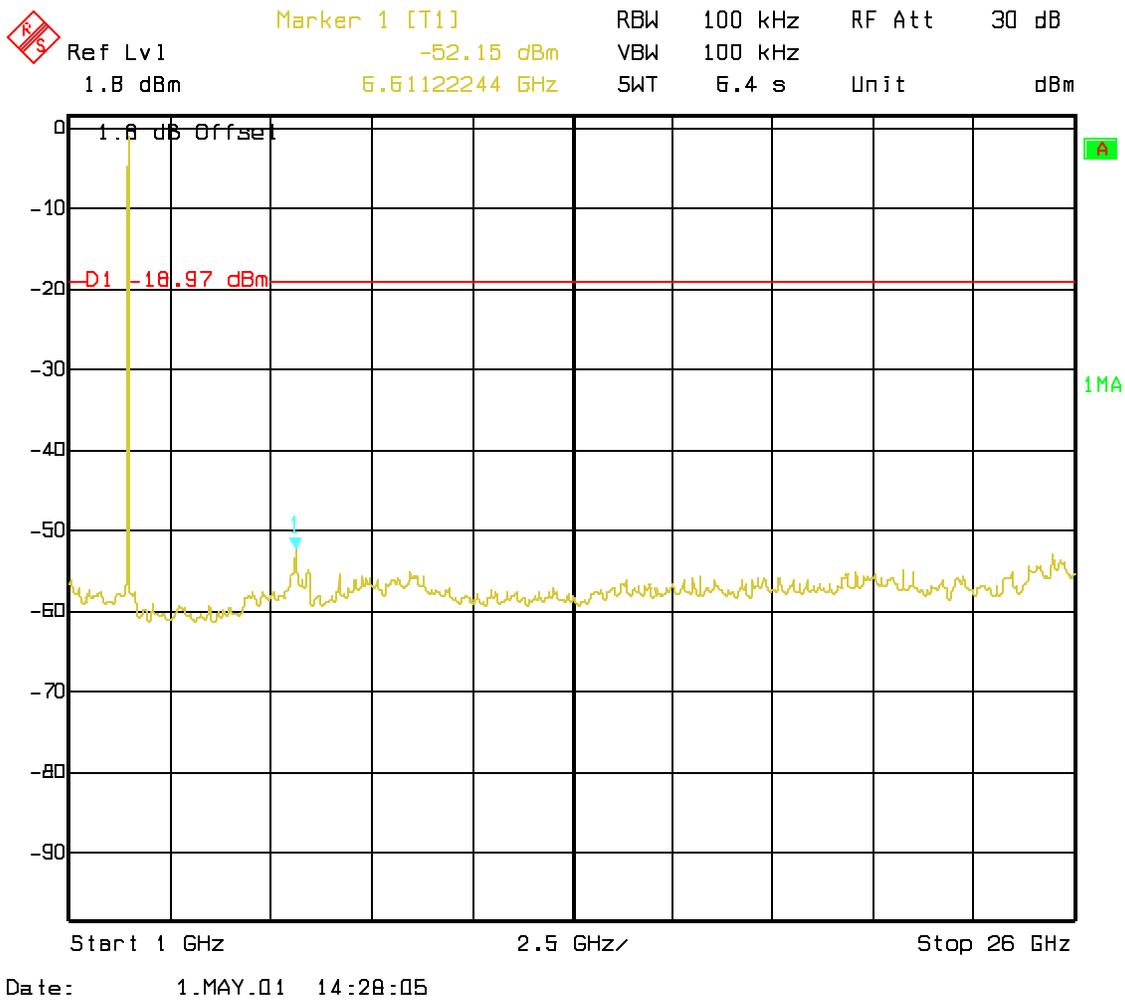
Mid Channel: 1GHz - 26 GHz



1.8 dB Offset : Cable loss

EMISSION LIMITATIONS - Conducted (Transmitter)
Highest Channel: 1GHz - 26 GHz

§ 15.247 (c) (1)



1.8 dB Offset : Cable loss

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

NOTE: The spurious emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18 and 26 GHz very short cable connections to the antenna was used to minimize the noise level. Channel 1: 2402 MHz; Channel 2: 2441 MHz; Channel 3: 2481 MHz

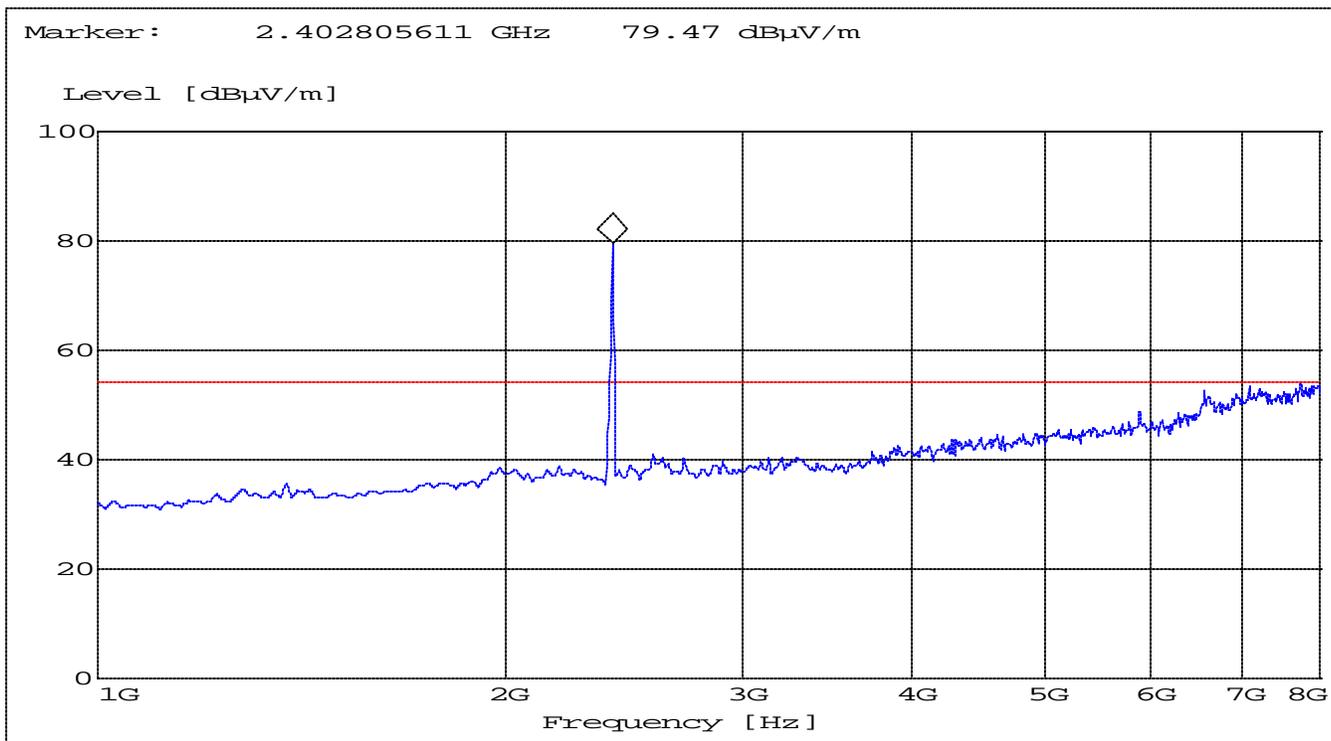
All measurements were against the limits for the restricted bands. Only in case of exceeding the limits it will be analyzed if it is outside a restricted band or not.

If it is outside the restricted bands the lower limits will apply and the relevant frequencies will be checked against these limits.

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Lowest Channel: 1GHz – 8GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

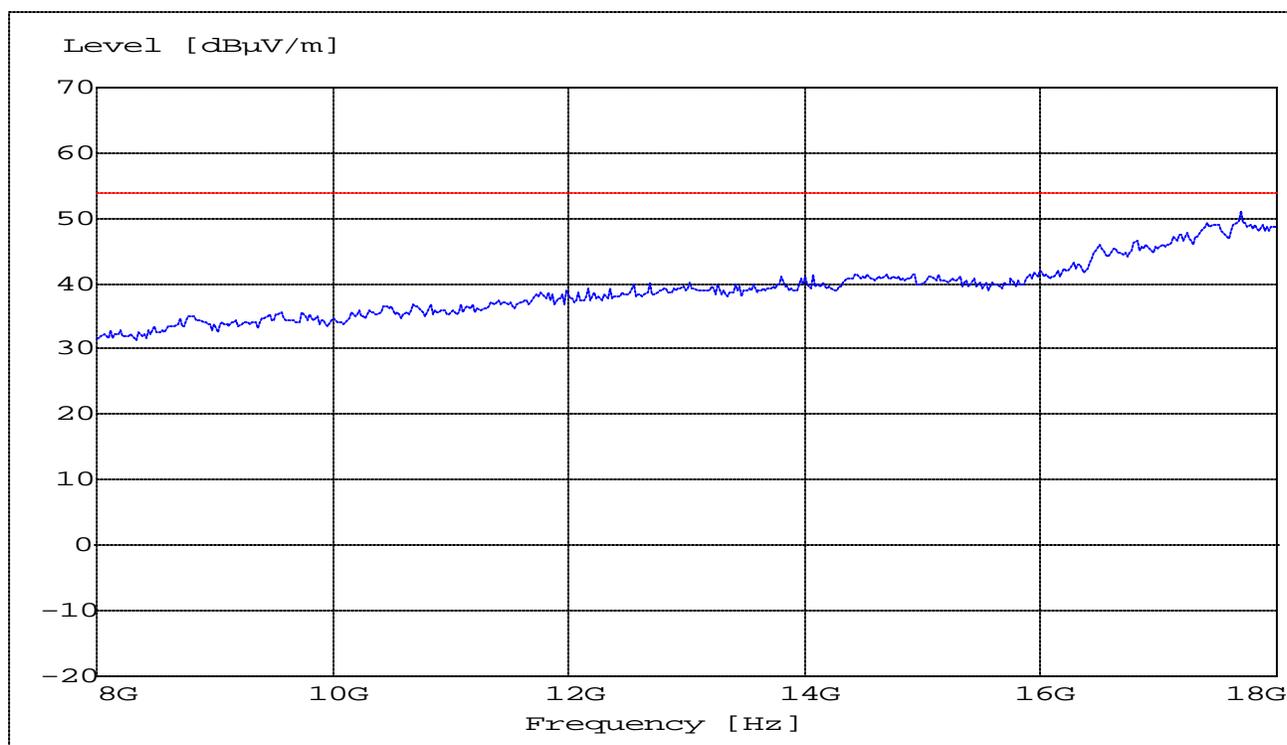
SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Lowest Channel: 8GHz – 18GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

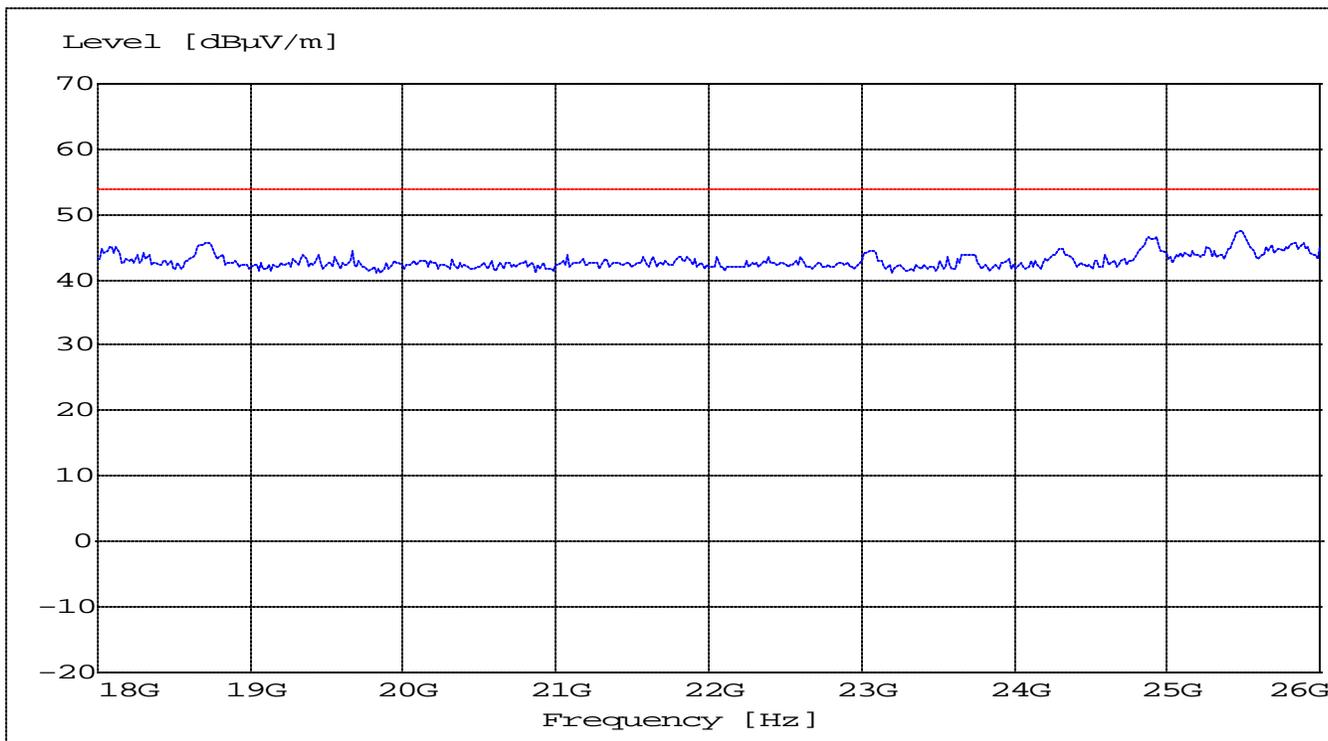
SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Lowest Channel: 18GHz – 26GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

SUBCLAUSE § 15.247 (c)

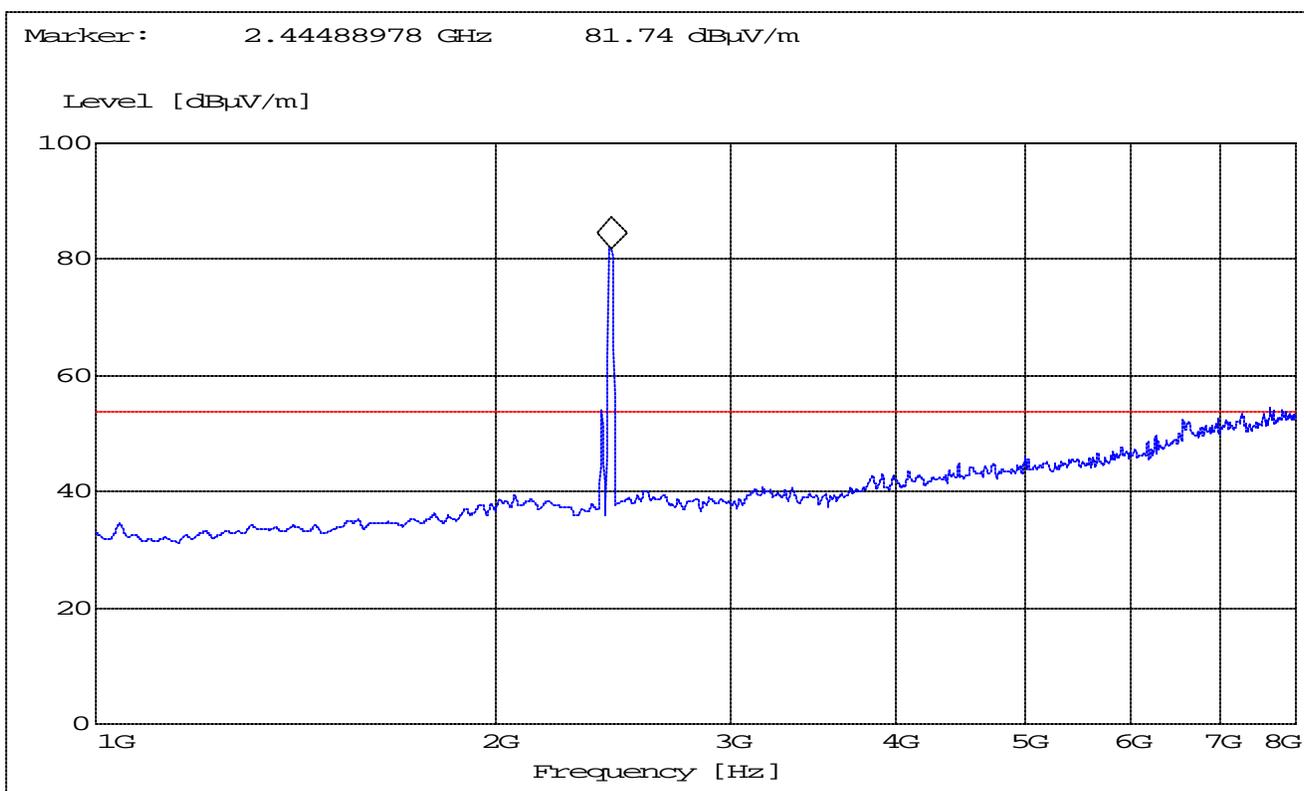
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Mid Channel: 1GHz – 8GHz

NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots following page no. 24



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

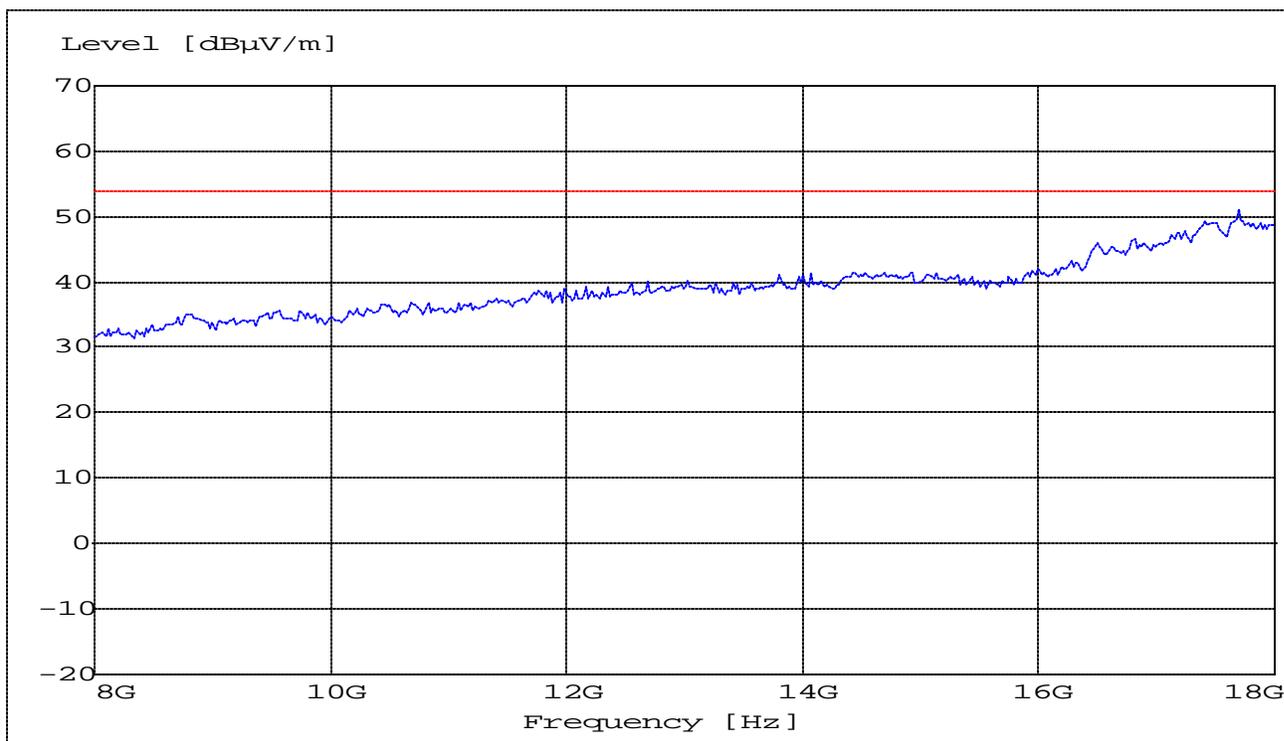
SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Mid Channel: 8GHz – 18GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

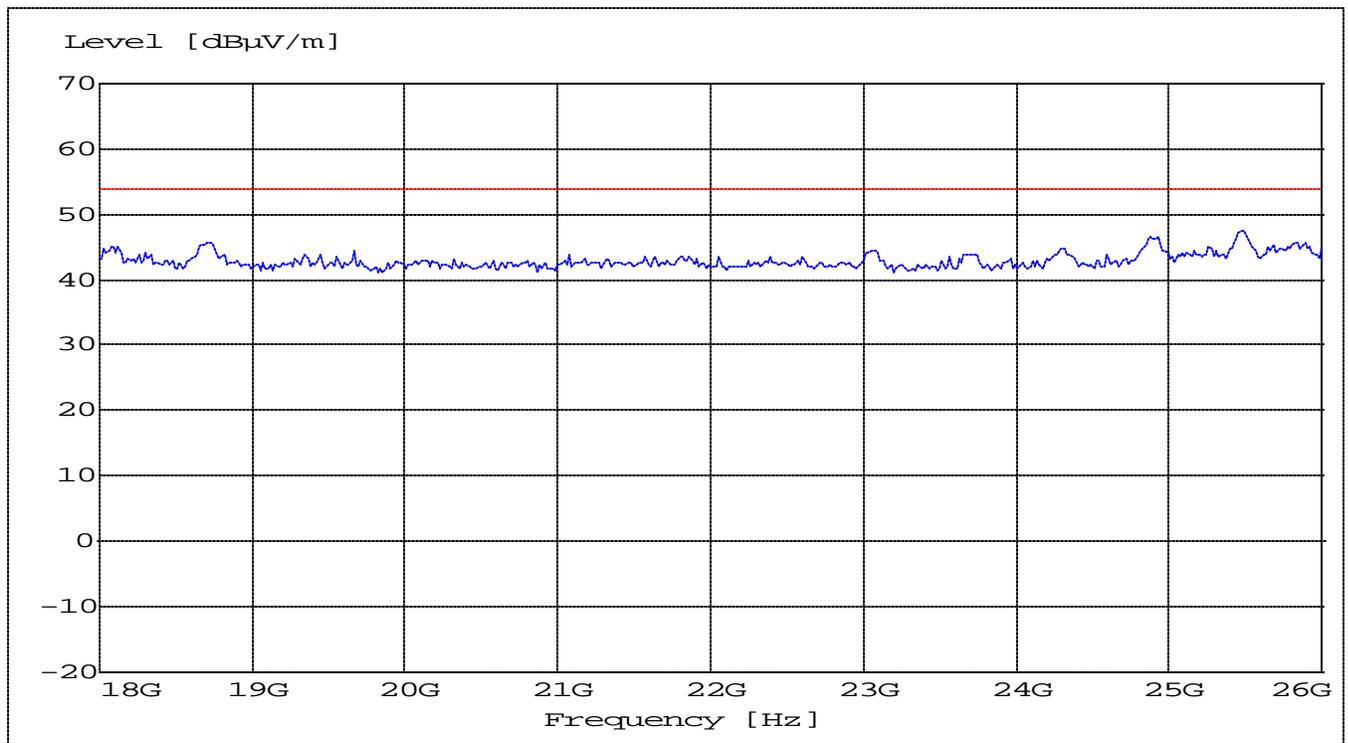
SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Mid Channel: 18GHz – 26GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

SUBCLAUSE § 15.247 (c)

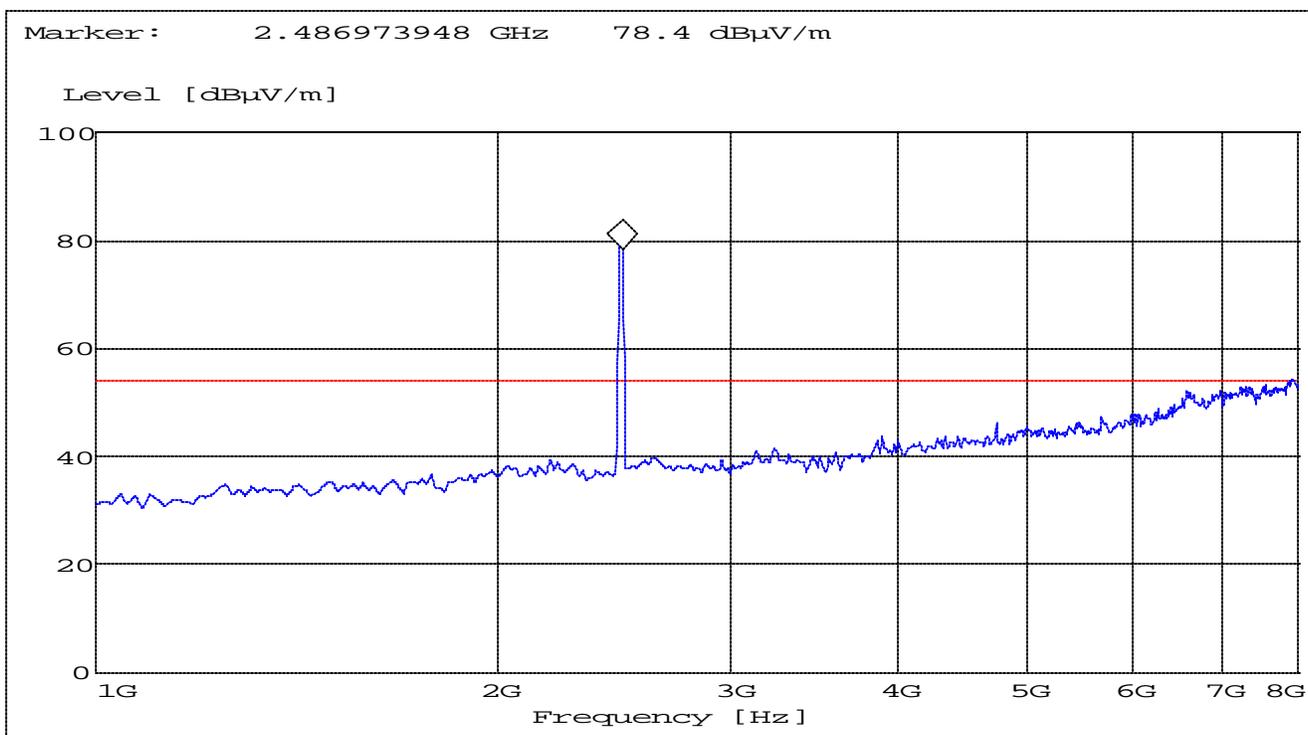
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Highest Channel: 1GHz – 8GHz

NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots following page no. 24



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

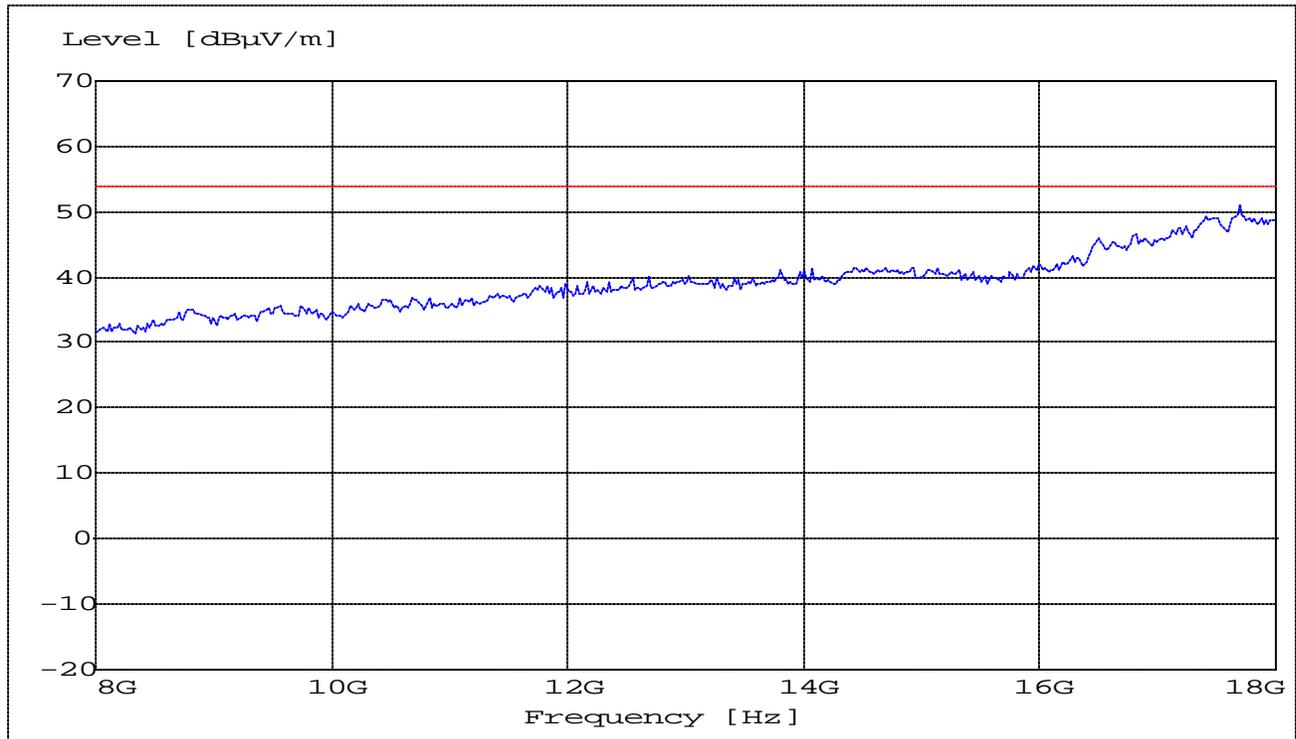
SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Highest Channel: 8GHz – 18GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

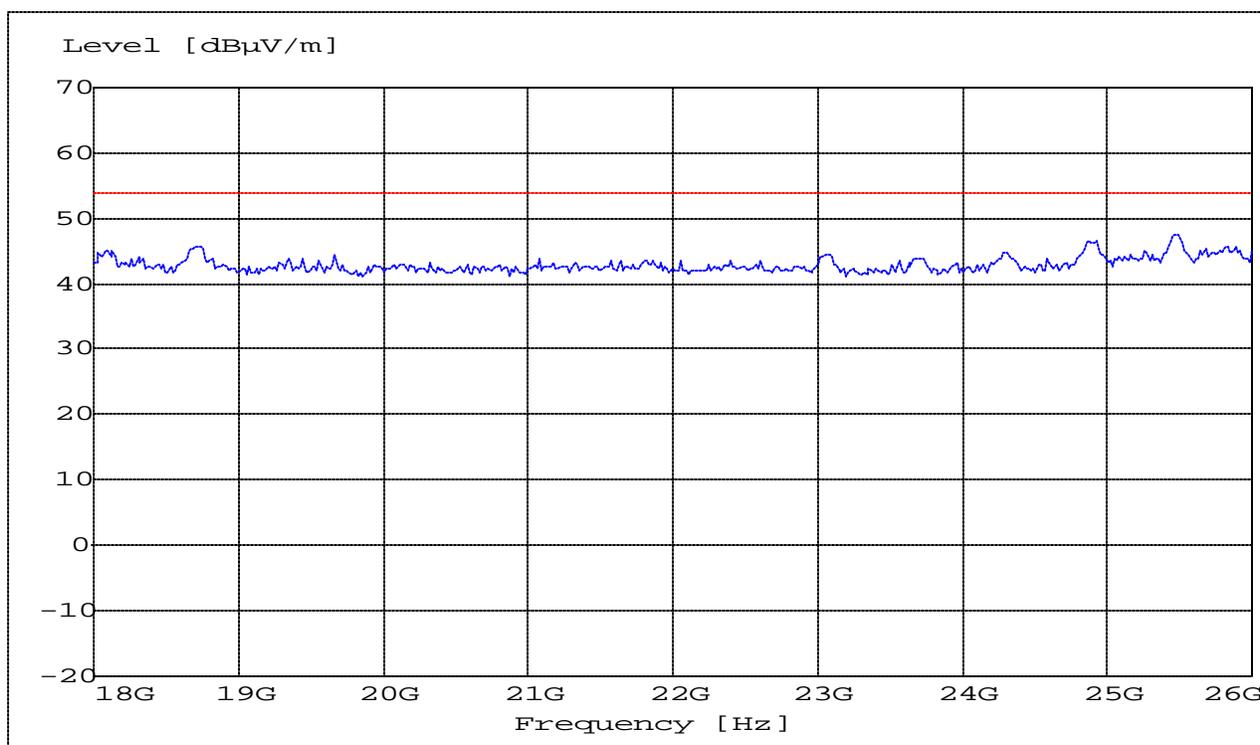
SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Highest Channel: 18GHz – 26GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

LIMITS

SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

RECEIVER SPURIOUS RADIATION

§ 15.209

NOTE: The spurious emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18 and 26 GHz very short cable connections to the antenna was used to minimize the noise level. Channel 1: 2402 MHz; Channel 2: 2441 MHz; Channel 3: 2481 MHz

Radiated

SPURIOUS EMISSIONS LEVEL (µV/m)								
2402 MHz			2442 MHz			2481 MHz		
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
all peaks <<limit								
Measurement uncertainty			±3 dB					

Limits

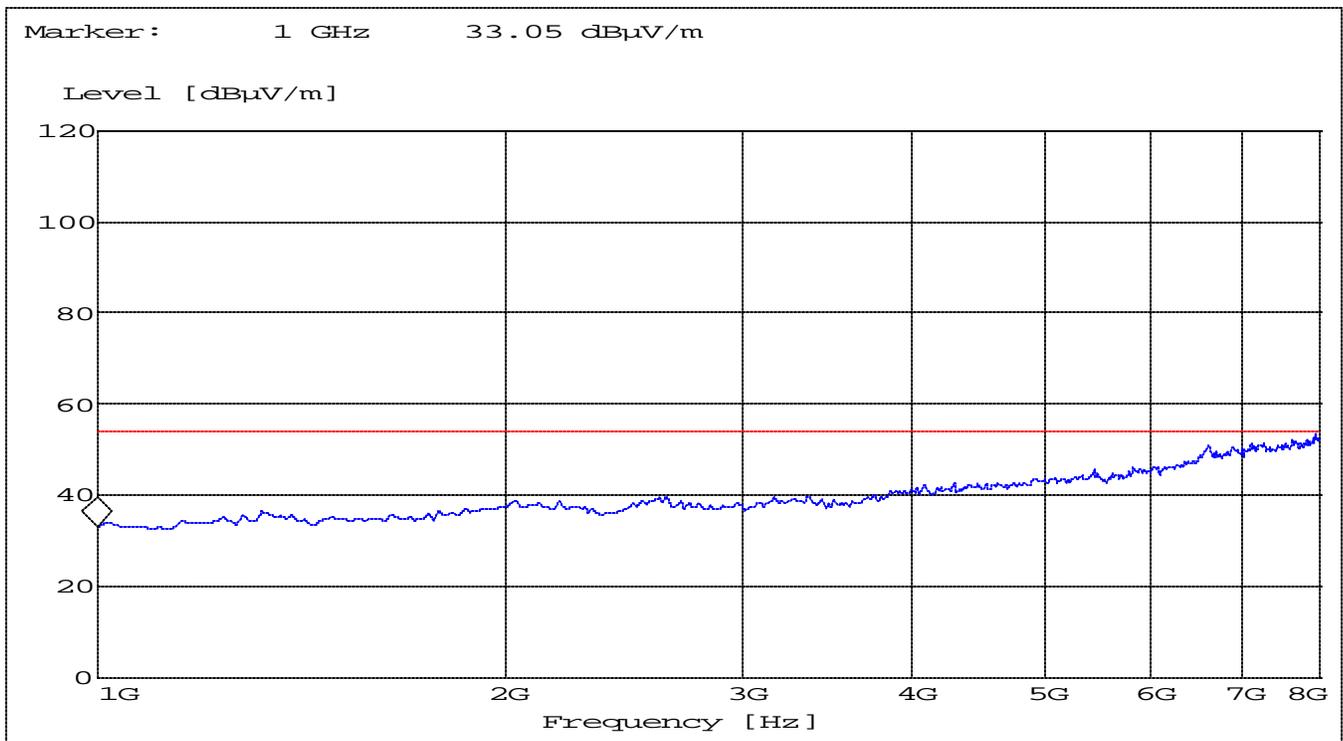
SUBCLAUSE § 15.209

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

RECEIVER SPURIOUS RADIATION

§ 15.209

1GHz – 8GHz (This plot is valid for all three channels)

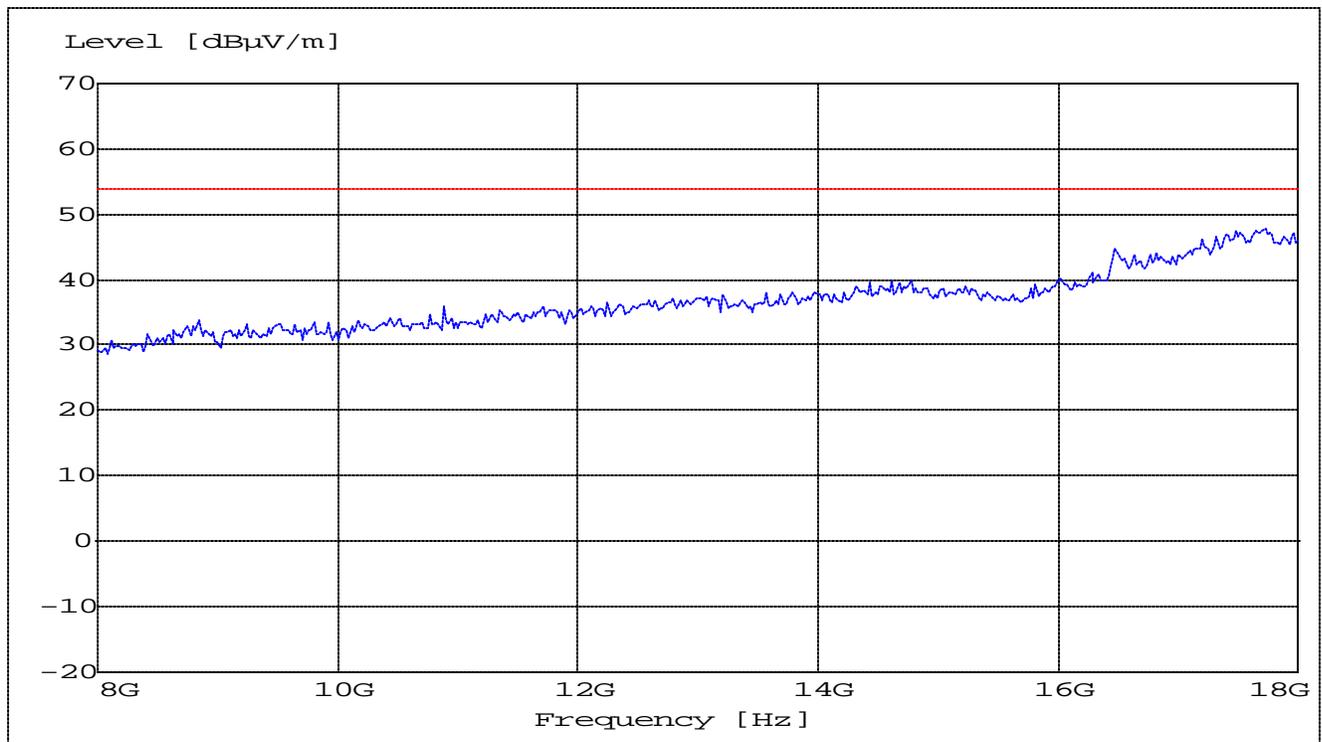


ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

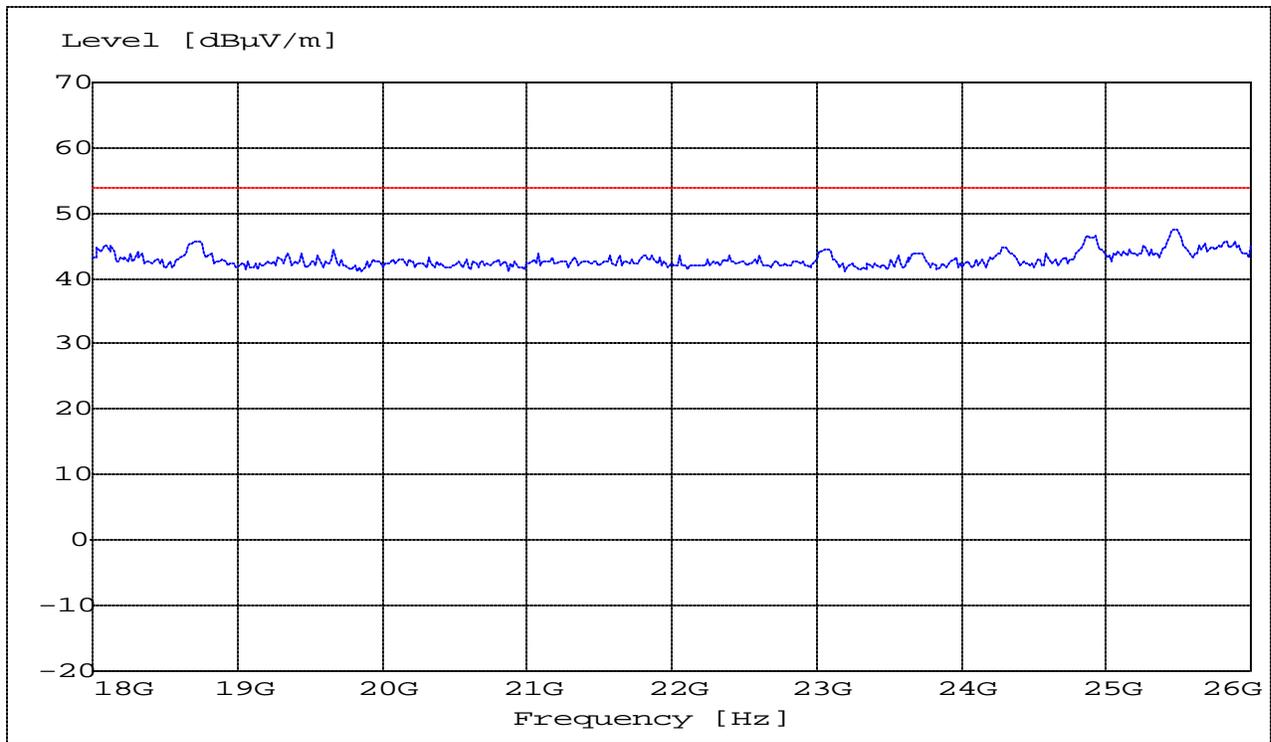
8GHz – 18GHz (This plot is valid for all three channels)



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

RECEIVER SPURIOUS RADIATION
18GHz – 26GHz (This plot is valid for all three channels)

§ 15.209



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

Test site

RADIATED EMISSIONS



Photographs of the equipment

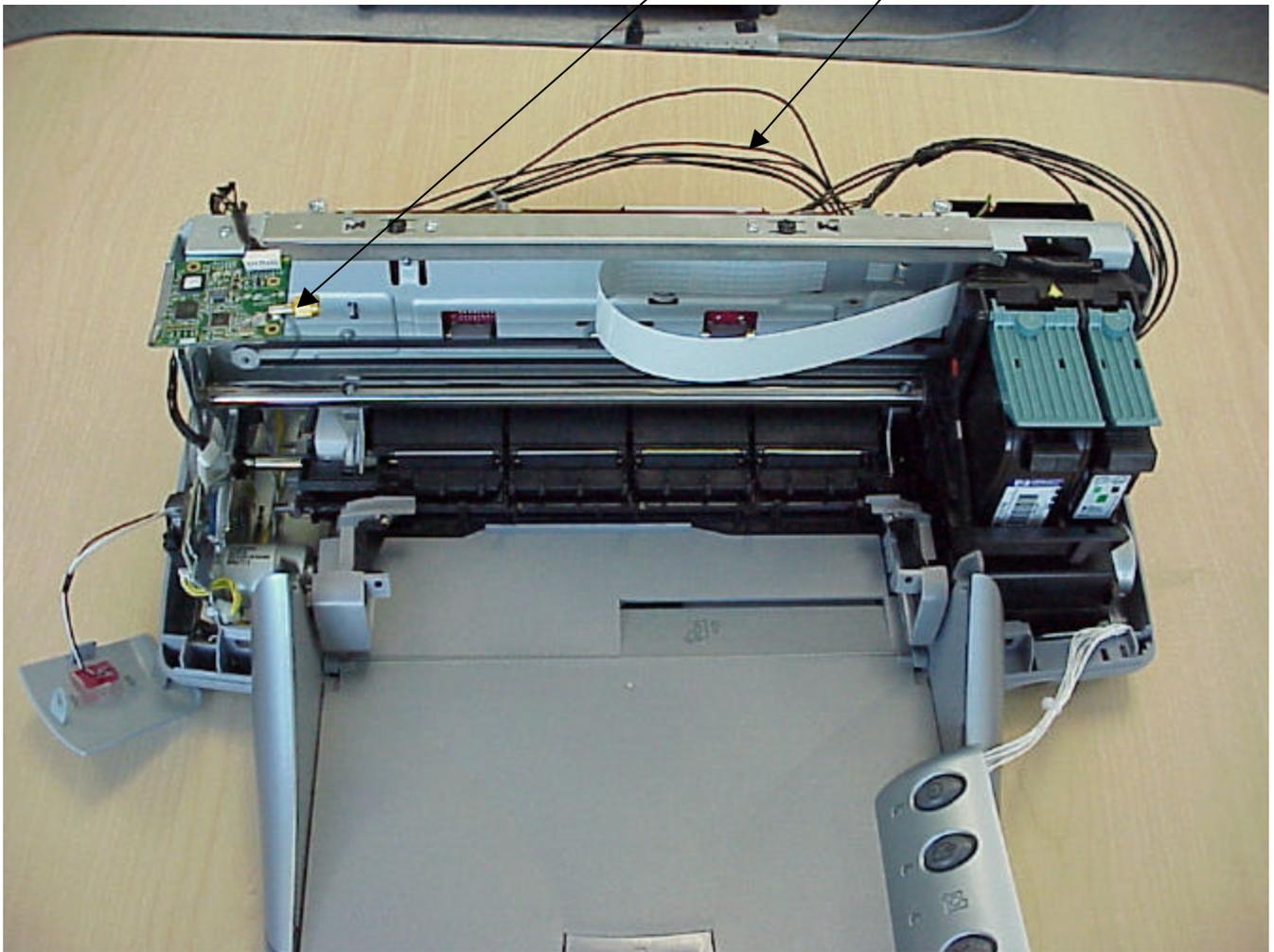
Photograph no.: 1



Photographs of the equipment

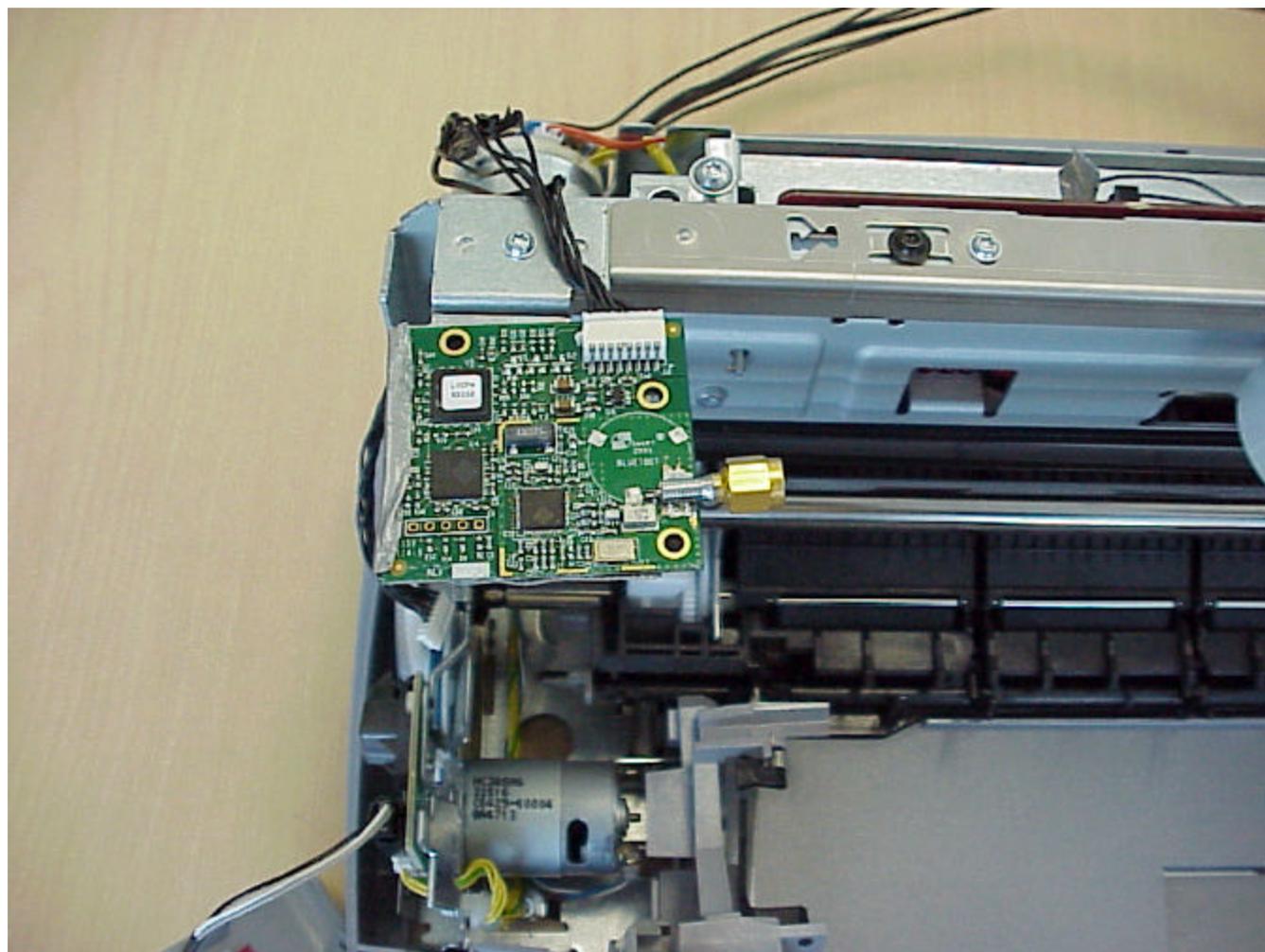
Photograph no.: 2

Extended cable length between module printer PCB for temperature measurements. Only used for conducted measurements (module with SMA connector)



Photographs of the equipment

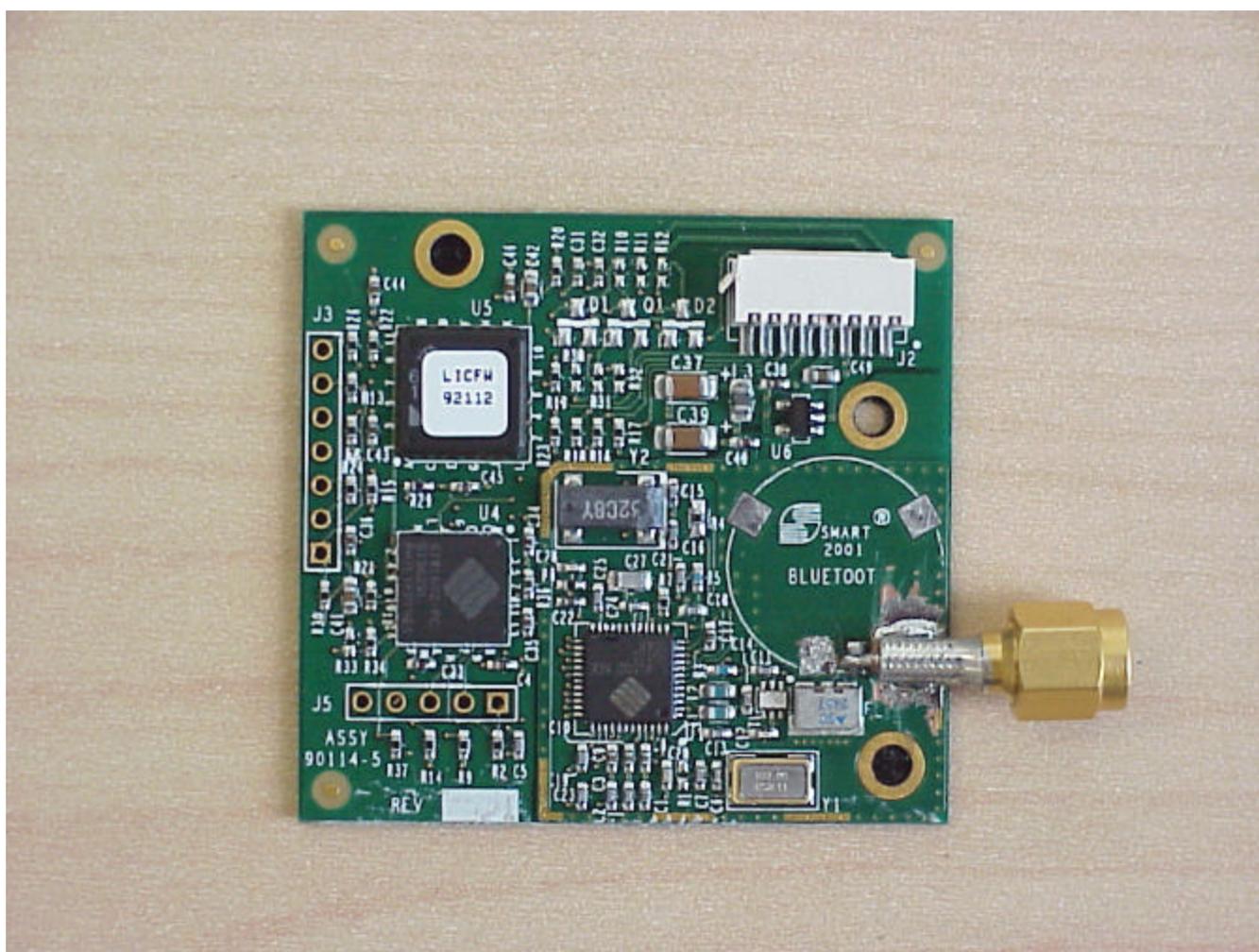
Photograph no.: 3



Photographs of the equipment

Photograph no.: 4

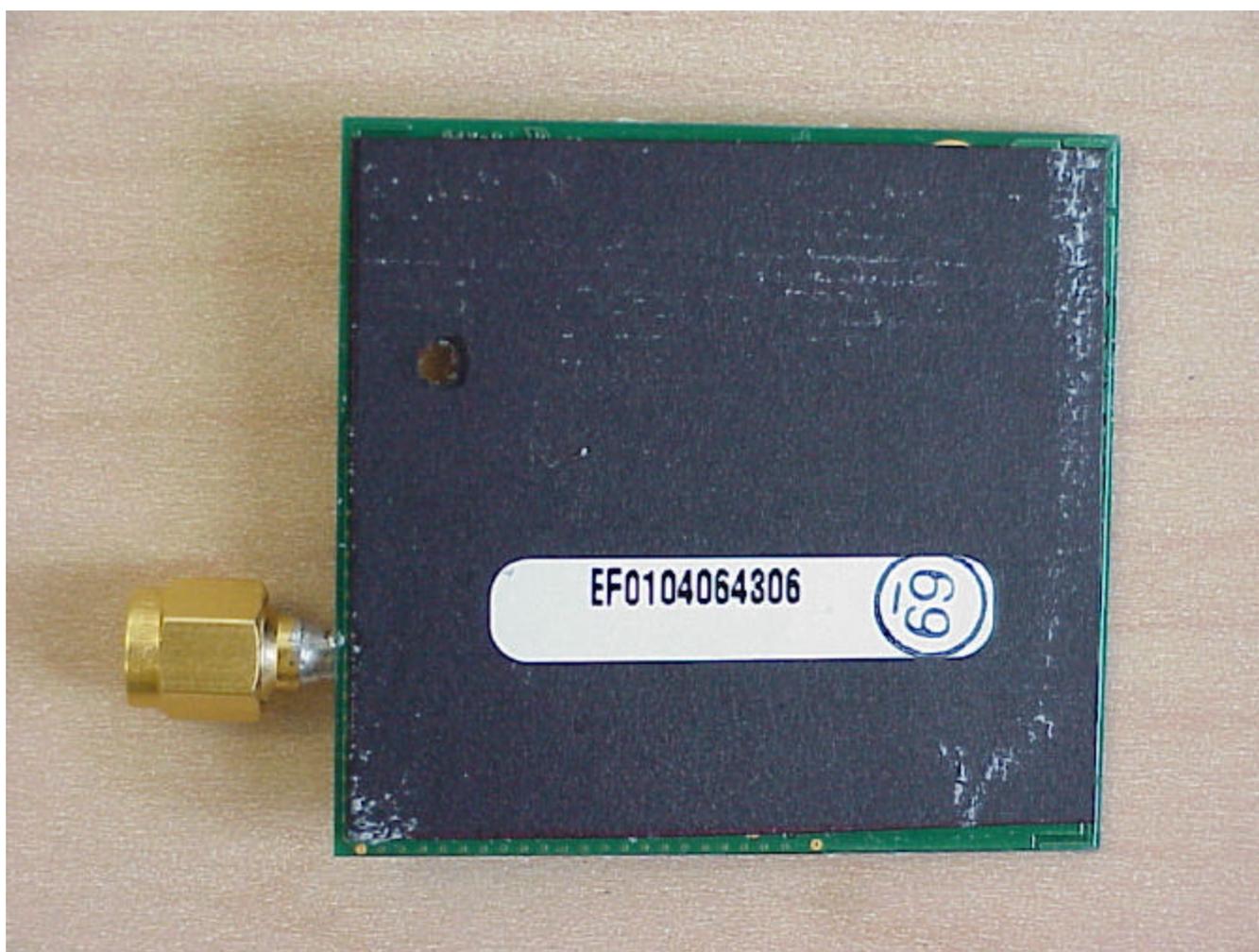
Module used for conductd measurements (top view)



Photographs of the equipment

Photograph no.: 5

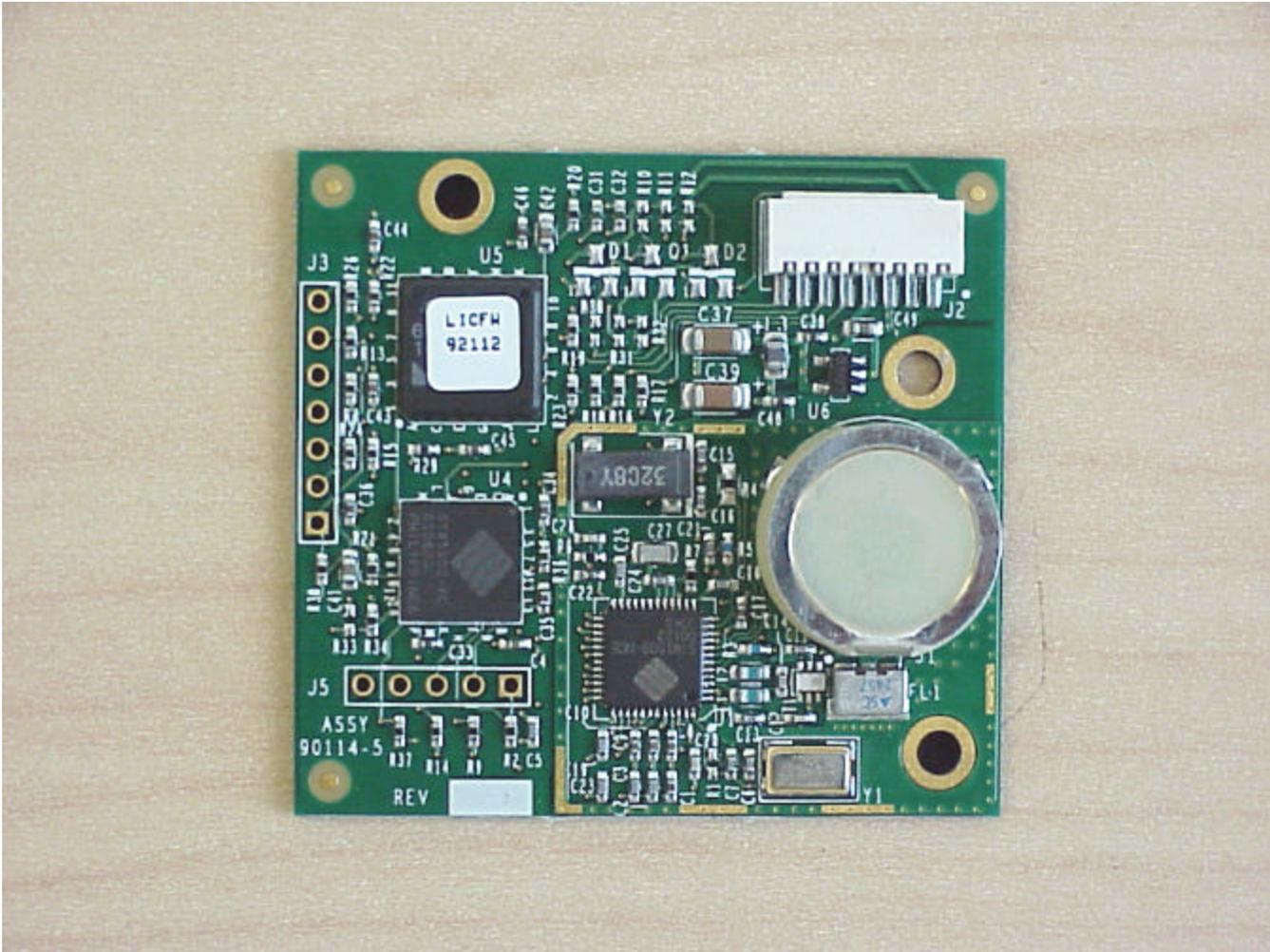
Module used for conducted measurements (bottom view)



Photographs of the equipment

Photograph no.: 6

Module used for radiated measurements (top view)



Photographs of the equipment

Photograph no.: 7

Module used for radiated measurements (bottom view)



Photographs of the equipment

Photograph no.: 8

Both conducted & radiated modules (top view)

