

**Test Report
for
DTL-1 and FLA-15**

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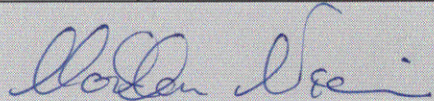
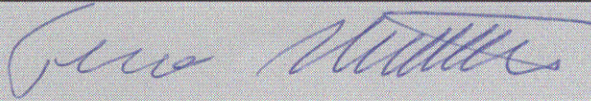
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1 CUSTOMER INFORMATION

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FCC registration number	94436 (July 09, 1999)
Customer:	Nokia Mobile Phones Ltd. Sinitaival 5 33720 TAMPERE FINLAND Tel. +358 10 505 6800 Fax. +358 10 505 6880
Contact person:	Pasi Vainio
Receipt of EUT:	11.9.2000
Test plan reference:	-
Date of testing:	13.2.2001
Date of report:	15.2.2001

The tests listed in this report have been done to demonstrate compliance to the CFR 47 Section 15.247.

Contents approved:

	
Markku Niemi Manager, TAC Tampere	Tero Huhtala EMC Test Engineer

2 EUT AND ACCESSORY INFORMATION

2.1 EUT description

The EUT is a Connectivity Card (DTL-1) operating on the 2.4GHz – 2.4835GHz band using Bluetooth technology. It comes with a separate PC Card adapter (FLA-15) which allows inserting it to a computer with a PCMCIA slot. The EUT has an integral antenna and no external connections or controls. The EUT is in control of the software delivered with the EUT.

2.2 EUT and accessories

The table below lists all EUTs and accessories used in the tests. Later in this test report, only numbers in the last column are used to refer to the devices in each test.

2.3 Software

The computers were equipped with test software provided by the customer. The software was used to control the EUT in the tests.

	Name	Type	S/N	Number
EUT	Connectivity Card	DTL-1		03011
	PC Card Adapter	FLA-15		03012
Accessories	Laptop computer	Toshiba PA1270E YXCD	98037322	03017
	Charger	Toshiba PA 2450U (199cm)	9905C2264522	03018
	Charger AC cable			
	Nokia testingboard JTB-8			03022
	Nokia TDC-4 combox		3916	03019
Software	Luptest.exe			
	Lcitest5.exe			

3 SUMMARY OF TEST RESULTS

Section in CFR 47		Result
15.247, f	Time of occupancy	PASS
15.247, d	Power density	PASS

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.

4 STANDARDS AND MEASUREMENT METHODS

The tests were performed in guidance of CFR 47 section 15.247, FCC and ANSI C63.4 (1992). Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method". For the test equipment, see device list in the end of this test report.

4.1 Selection of operation mode for tests

Before tests, several operation modes, TX slot lengths and modulation patterns were tried. The worst case was selected for each test and those results reported.

5 TEST SETUPS

To fulfill all requirements for the testing two different test setups were used. The EUT was equipped with an external antenna connector for the measurements.

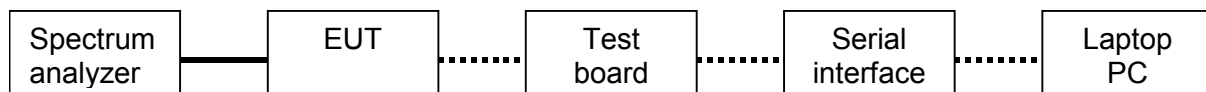
5.1 Setup A (conducted measurements, hopping disabled)

5.1.1 Operational description

This setup was used in conducted measurements with hopping disabled. The EUT was inserted in a test board. The test board was connected to a computer using a test board/serial interface. The setup was capable of doing following:

- set the EUT channel (2 – 80)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- select between several different test modulation patterns

5.1.2 Block diagram



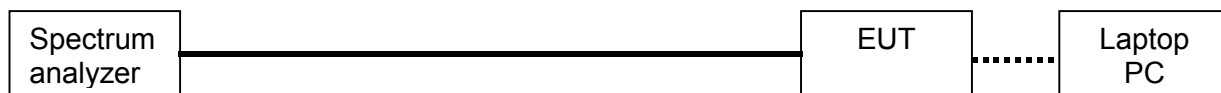
The solid lines are coaxial cables and the dashed lines are either EUT insertion to the test board or control cables between test setup devices. The measurement results were adjusted with the attenuation of the coaxial cable.

5.2 Setup B (conducted measurements, hopping enabled)

5.2.1 Operational description

This setup was used in conducted measurements with hopping enabled. The EUT was inserted in a laptop PC equipped with a test software.

5.2.2 Block diagram



The solid lines are coaxial cables and the dashed lines are either EUT insertion to the test board or control cables between test setup devices.

6 TEST RESULTS

6.1 Time of occupancy (§15.247f)

EUT	03011, 03012		
Test setup	B		
Temp, Humidity, Air Pressure	21 °C	45 %RH	mbar
Date of measurement	13.02.2001		
Measured by	Tero Huhtala		
Result	PASS		

6.1.1 EUT operation mode

EUT operation mode	Data transmission, paging mode
EUT channel	Hopping
EUT TX power level	Nominal

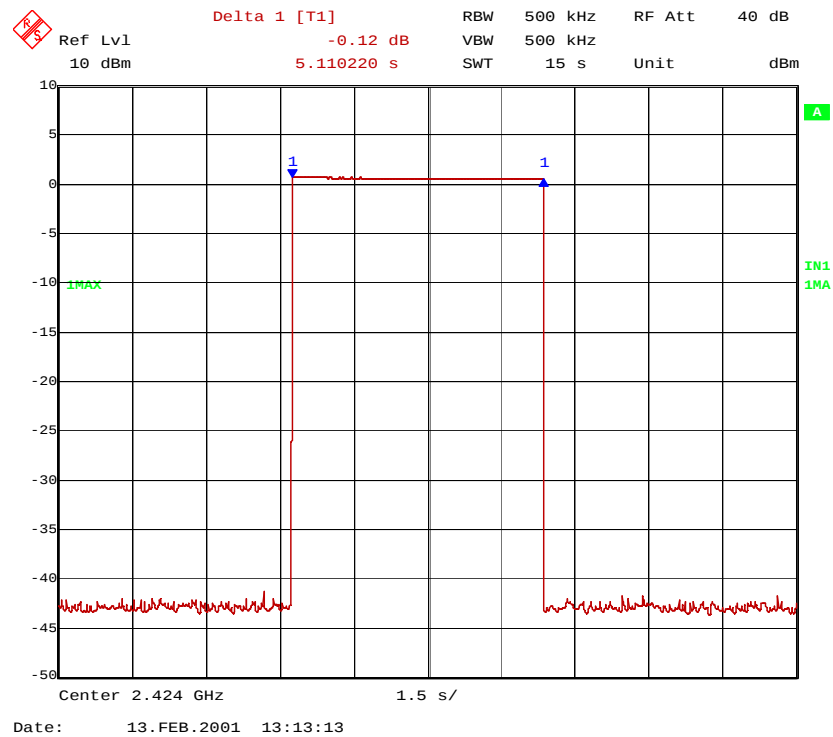
6.1.2 Limits and results

Time of occupancy	
Limit (s)	Measured value (s)
≤ 0.4	0.035

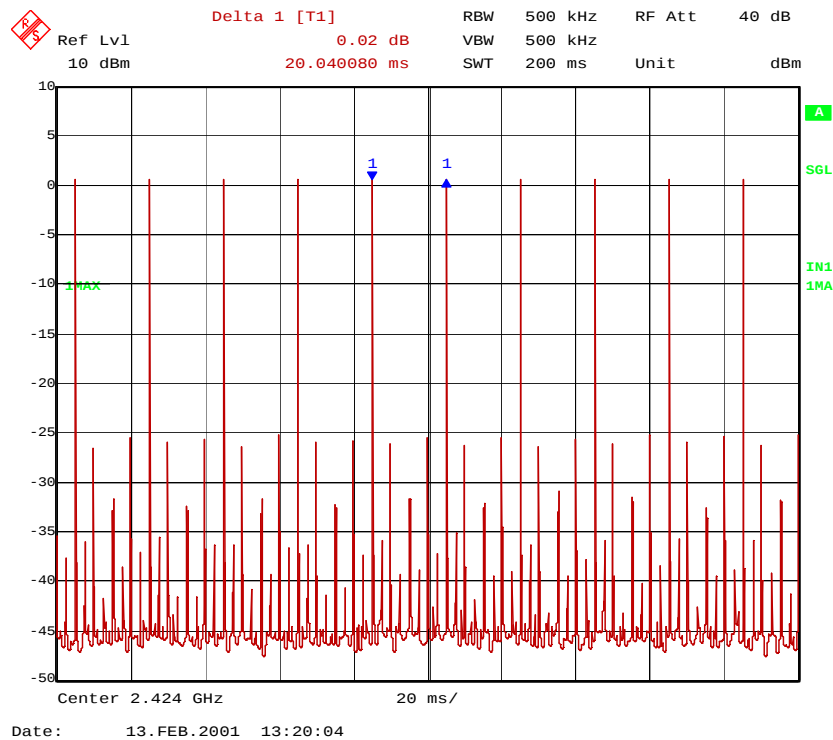
The complete paging cycle was 5.12s. During that the EUT transmitted with 20ms intervals. One transimssion took 0.13667ms. The total transmitter on time is obtained:

$$(5.12\text{s}/0.02\text{s}) * 0.13667\text{ms} = 34.98752\text{ms}$$

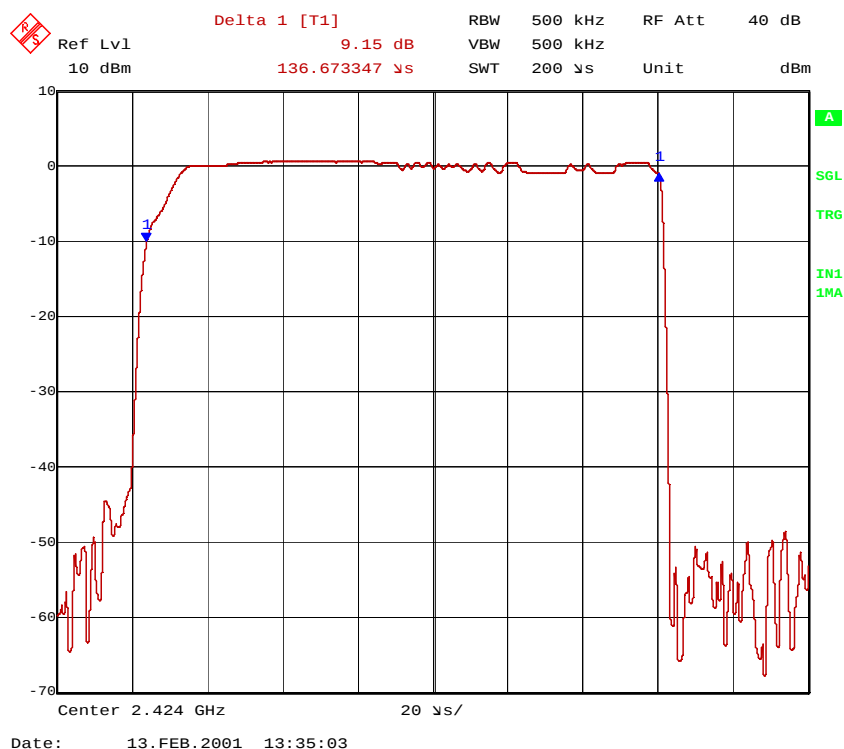
6.1.3 Screen shots



Picture 1. Complete paging cycle (ch 24)



Picture 2 . Paging repetition frequency (ch 24)



Picture 3. Duration of one transmission (ch 24)

6.1.4 EUT operation mode

EUT operation mode	Data transmission, inquiry mode
EUT channel	Hopping
EUT TX power level	Nominal

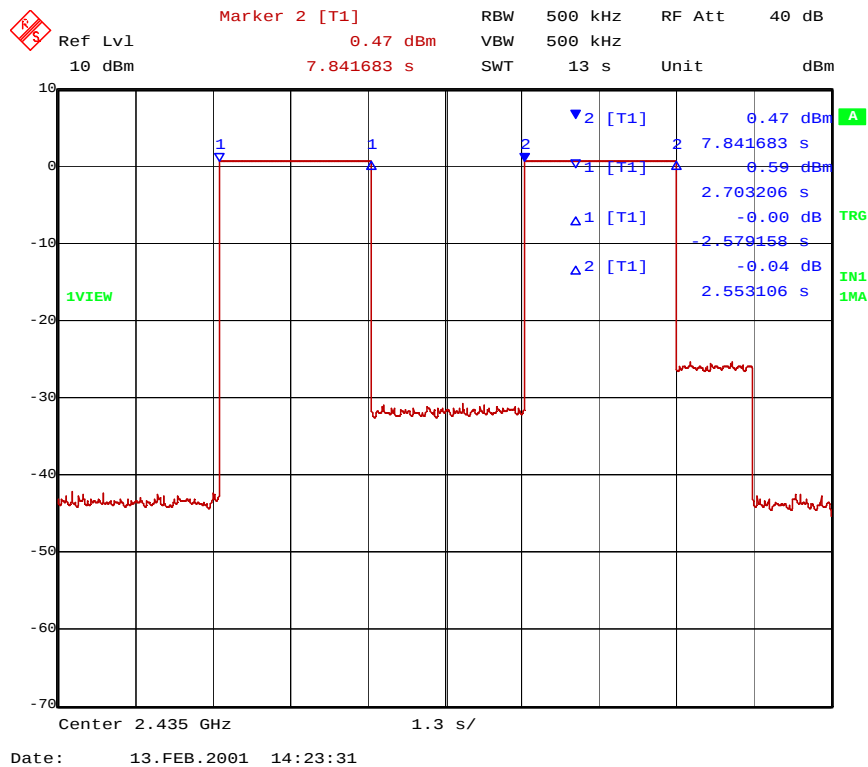
6.1.5 Limits and results

Time of occupancy	
Limit (s)	Measured value (s)
≤ 0.4	0.069

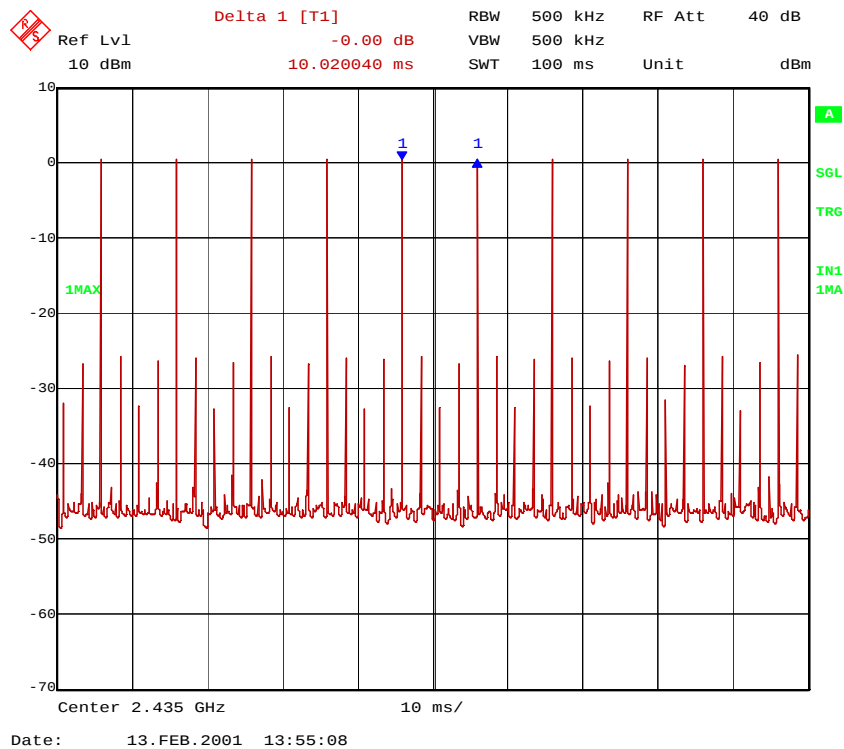
The inquire consisted of two separate cycles, lengths 2.57s and 2.55s, making total of 5.12s. During that the EUT transmitted with 10ms intervals. One transmission took 0.13547ms. The total transmitter on time is obtained:

$$(5.12s/0.01s) * 0.13547ms = 69.36064ms$$

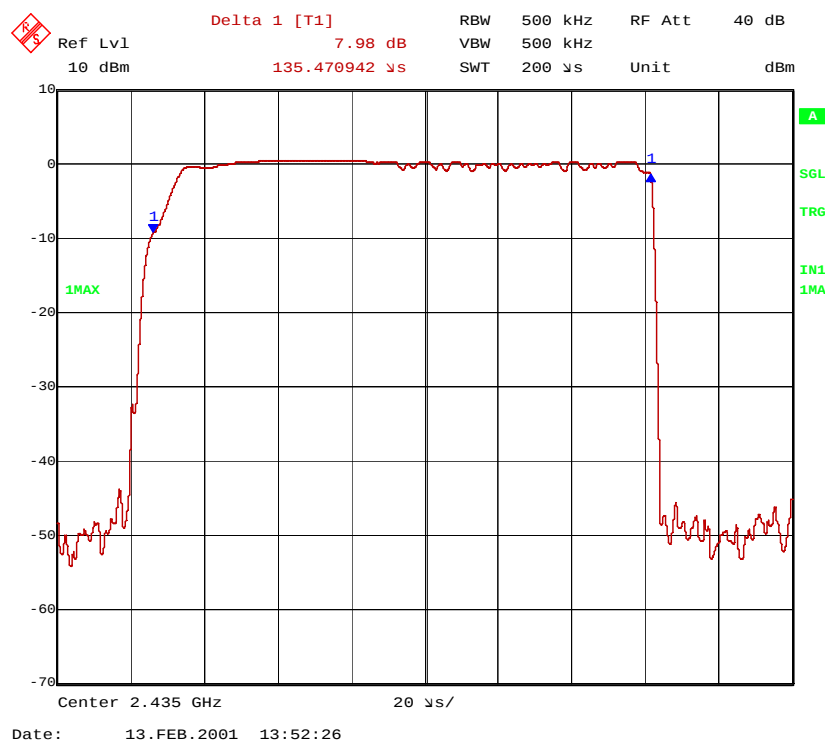
6.1.6 Screen shots



Picture 4. Complete inquiry cycle (ch35)



Picture 5. Inquiry repetition frequency (ch35)



Picture 6. Duration of one transmission (ch 35)

6.2 Power density (§15.247d)

EUT	03011, 03012		
Test setup	A		
Temp, Humidity, Air Pressure	21 °C	45 %RH	mbar
Date of measurement	13.02.2001		
Measured by	Tero Huhtala		
Result	PASS		

6.2.1 EUT operation mode

EUT operation mode	Hopping disabled, alternation of TX and RX. TX using 5 time slots with PRBS9 modulation.
EUT channel	2, 40, 80
EUT TX power level	Nominal (0dBm)
Operation voltage	Nominal

6.2.2 Limits and results

Peak output power

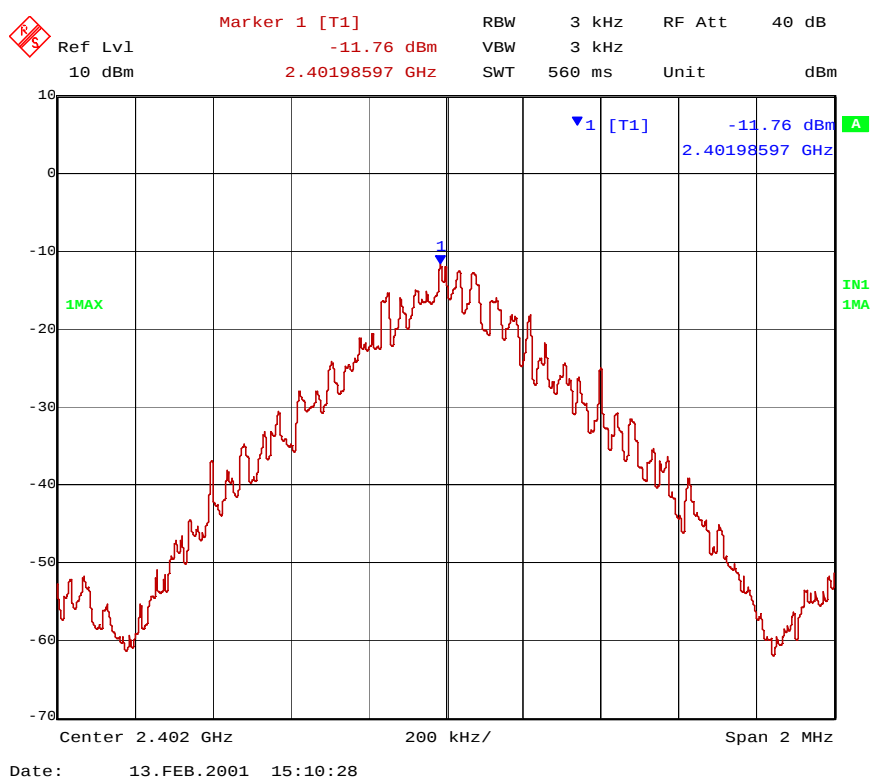
EUT Channel	Limit (dBm)/ RBW 3kHz	Test result (dBm)
2	≤ 8	-11.56
40		-11.8
80		-14

Test results are calculated as follows:

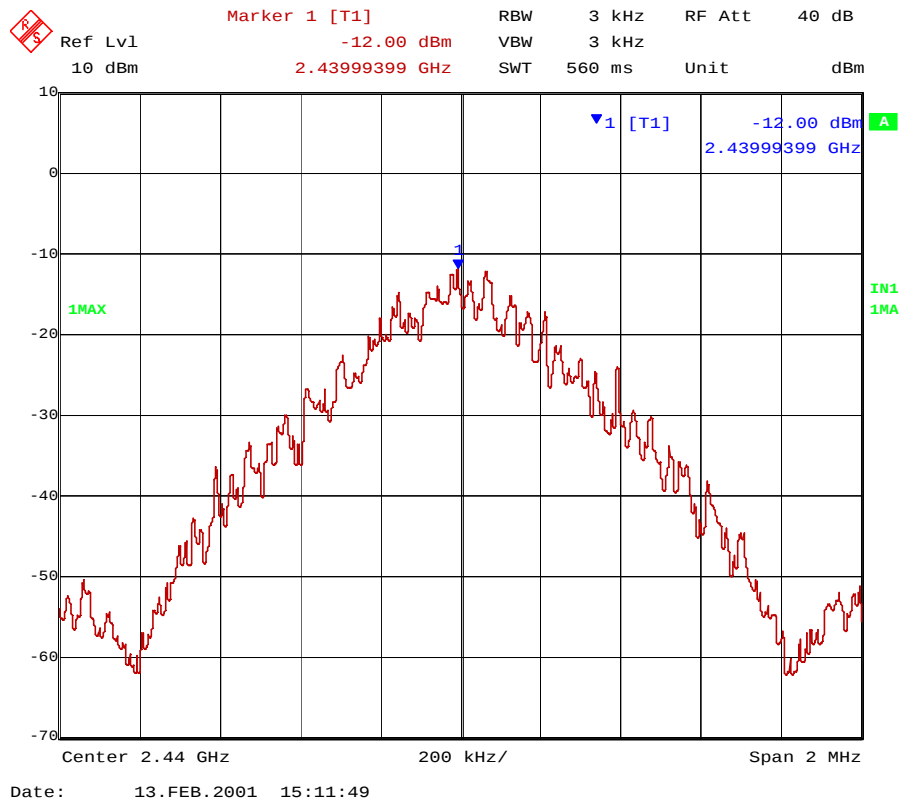
Measured value(dBm) + cable attenuation (dB) = Test result (dBm)

EUT channel	Measured value [dBm]	Cable attenuation [dB]	Power output [dBm]
2	-11.76	0.2	-11.56
40	-12	0.2	-11.8
80	-14.2	0.2	-14

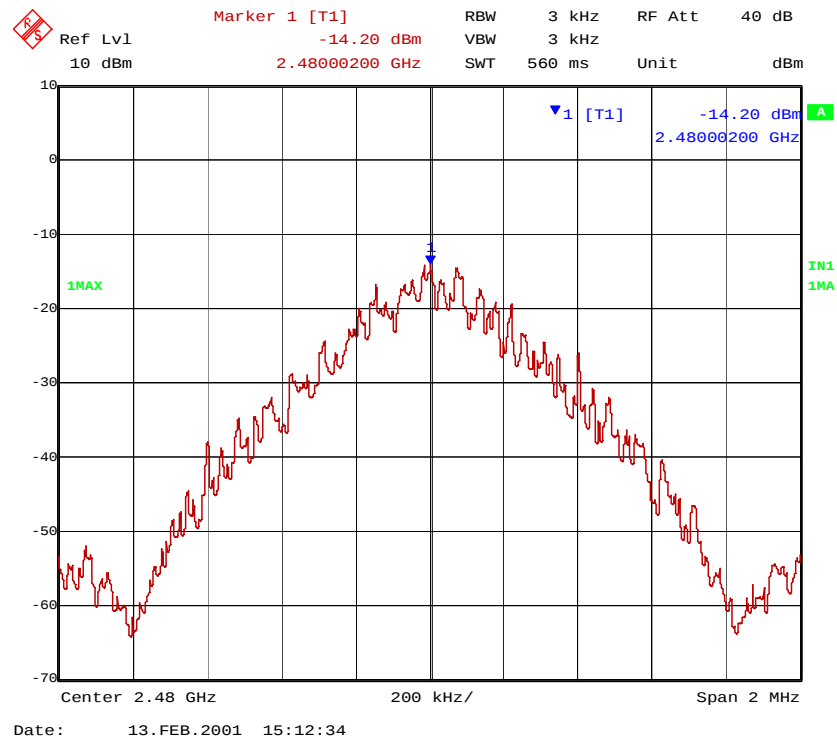
6.2.3 Screen shots



Picture 7. Power density on channel 2



Picture 8. Power density on channel 40



Picture 9. Power density on channel 80

7 TEST EQUIPMENT

15.247, f (Time of occupancy), 15.247, d (Power density)

Equipment	Type	Manufacturer	Device number
EMI receiver	ESI 40	Rohde&Schwarz	38845
Coaxial cable	SMA male/N male	Own	C