RADIO TEST REPORT

No. 601881R1

EQUIPMENT UNDER TEST

Equipment:	WiPOQ messaging terminal
Type / model:	WMT-100
Manufacturer:	Shimane Sanyo Industrial Co., Ltd. 320-1, Yamagata Kisuki-cho, Unnan City, Shimane 699-1394 Japan
Tested by request of:	Teleca Sweden West

SUMMARY

The equipment complies with the requirements of the following standards:

FCC, Part 15, Subpart B (2005) and Subpart C (2005);
RSS-210, Issue 6 (September 2005); RSS-Gen, Issue 1 (September 2005).

Industry Canada listed test facility No. IC 3481A-1

This test report replaces earlier issued test report with the same ref. no. dated 2006-07-03 due to editorial corrections.

Date of issue: 2006-10-31

Tested by: Björn Utermöhl Approved by: Lars-Olov Johansson

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company:	Teleca Sweden West
Name of contact:	Daniel Nilsson

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	WiPOQ messaging terminal
Type/Model:	WMT-100
Brand name:	WiPOQ
Serial number:	EUT were marked with: ES3 3/12 and ES3 12/12
Manufacturer:	Shimane Sanyo Industrial Co., Ltd. 320-1, Yamagata Kisuki-cho, Unnan City, Shimane 699-1394 Japan
Rating/Supplying voltage:	3,7 V DC, Li-On battery
Rating RF output power:	4 dBm
Antenna gain:	0 dBi
External antenna connector:	No
Operating temperature range:	-5 to +55 °C
Frequency range:	2402 - 2480 MHz
Number of channels:	79
Channel separation:	1 MHz
Modulation characteristics:	FHSS Shaped Binary FM (0.5 Gaussion filter)

2.2 Additional hardware information about the EUT

No additional information.

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version	Comment
ATP	301-1264-PA2	Test software to be able to set the device in suitable TX and RX modes

2.4 Peripheral equipment

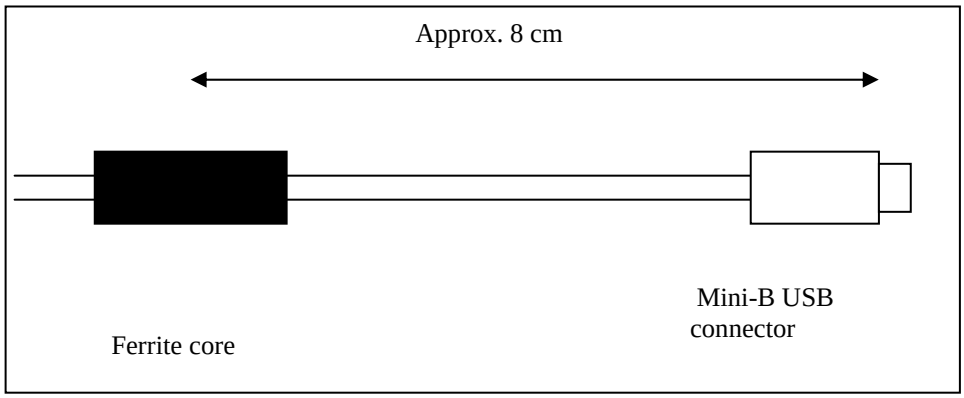
Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

Equipment	Manufacturer / Type	Comment
Charger	Model: PSC05R-050 Input: 100-20VAC 50-60Hz Output: 5V 1.0 A Max	

2.5 Modifications during the test

The Charger was modified with a Ferrite core from Würth Electronik
Material: 4 W 620
Order number: 74271142 (Ferrite in plastic case)

The center of the ferrite core was placed 8 centimeters from the EUT. See illustration and photo below:



No other modifications have been made during the tests.

3. TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2005) Subpart B – Unintentional radiators
FCC 47 CFR part 15 (2005) Subpart C – Intentional Radiators; §15.247 Operation within the bands 902-928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz.

Measurements methods according to ANSI C63.4-2003

RSS-210, Issue 6 (September 2005): Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment.

RSS-Gen, Issue 1 (September 2005): General Requirements and Information for the Certification of Radiocommunication Equipment.

3.2 Additions, deviations and exclusions from standards

3.3 Test set-up

Measurement set-ups for the test of conducted disturbance voltage in the frequency range 0,15-30 MHz and out-of-band spurious emissions test are described in corresponding sections. During other tests the EUT was connected to the spectrum analyser by cable.

3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature:	19-25	°C
Relative humidity:	20-35	%

4. TEST SUMMARY

The results in this report apply only to the sample(s) tested.

FCC reference	Industry Canada reference	Test	Result	Note
15.247(b)	A8.4(2)	Peak output power	PASS	1
15.247(a)	A8.1(1)	20 dB Bandwidth	PASS	1
15.247(a)	A8.1(2)	Carrier frequency separation	PASS	1
15.247(a)	A8.1(4)	Number of hopping frequencies (channels)	PASS	1
15.247(a)	A8.1(4)	Time of occupancy (dwell time)	PASS	1
15.247	A8.1	Band edge compliance	PASS	1
15.247(d)	2.7, A2.9(1), A8.5	Out of band spurious emissions, radiated	PASS	1
15.247(d)	2.7, A8.5	Out of band spurious emissions, conducted	NA	1
15B	6 (a)(Table1)	Out of band spurious emissions, radiated	PASS	2
15B	7.2.2 (Table 2)	Conducted emission at AC port	PASS	2

NA = Not Applicable

Notes:

1. Industry Canada reference: RSS-210, Issue 6 (September 2005)

2. Industry Canada reference: RSS-Gen, Issue 1 (September 2005)

5. PEAK OUTPUT POWER

5.1 Test protocol

Date of test: 2006-05-10

EUT mode of operation: TX and hopping on one channel.

Spectrum analyzer settings:

Span: 10 MHz
RBW: 3 MHz
VBW: 3 MHz
Sweep time: Auto
Detector: Peak
Trace: Max Hold

Channel (MHz)	Peak Output Power (dBm)	Limit value (dBm)
2402	2,3	< 30
2441	2,4	
2480	2,2	

Measurement results are corrected for attenuation in the set-up configuration and antenna gain declared by the manufacturer.

Example calculation:

Peak output power [dBm] = Analyser reading [dBm] + cable loss [dB] + EUT antenna gain [dBi]

5.2. SAR calculation

The maximum output power of the EUT is 1,7mW e.i.r.p.

Limit: 25 mW time averaged output power.

6. 20 dB BANDWIDTH

6.1 Test protocol

Date of test: 2006-05-10

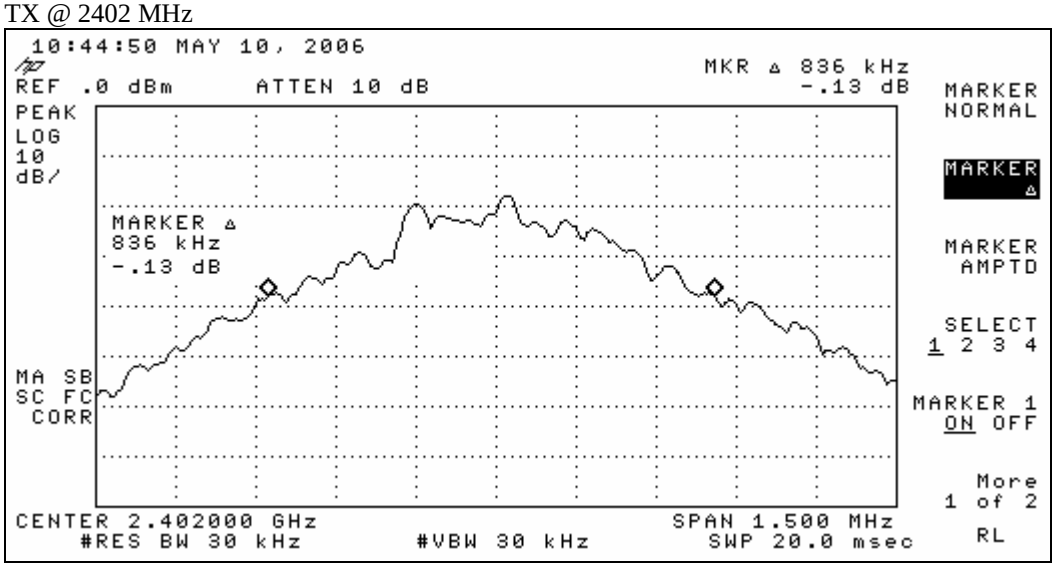
EUT mode of operation: TX, hopping on one channel.

Spectrum analyser settings:

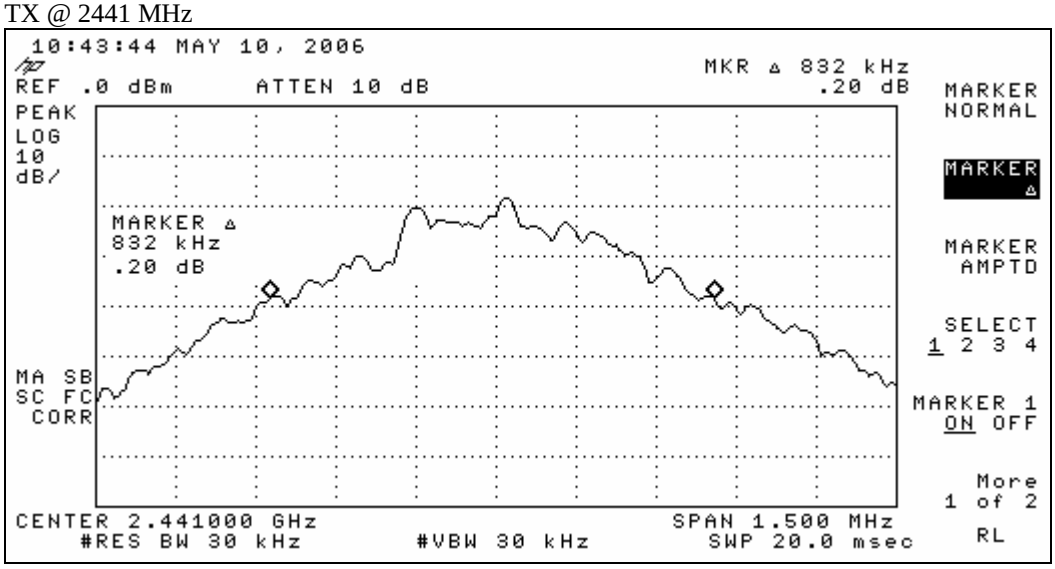
Span: 1,5 MHz
RBW: 30 kHz
VBW: 30 kHz
Sweep time: 5 ms
Detector: Peak
Trace: Max Hold

Channel (MHz)	20 dB Bandwidth (kHz)	Limit value (kHz)
2402	836	< 1000
2441	832	
2480	832	

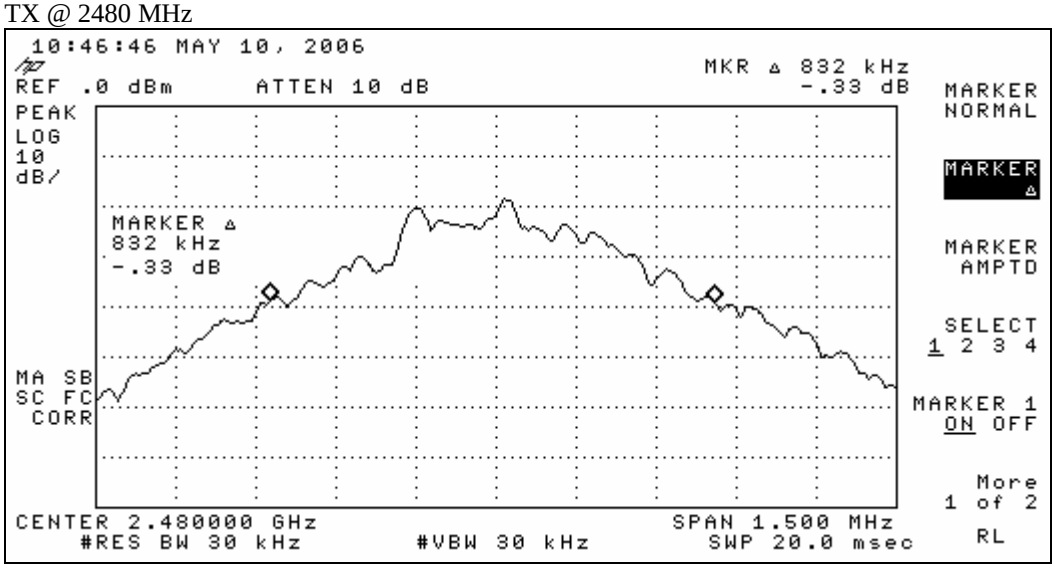
TX @ 2402 MHz



TX @ 2441 MHz



TX @ 2480 MHz



7. **CARRIER FREQUENCY SEPARATION**

7.1 Test protocol

Date of test: 2006-05-10

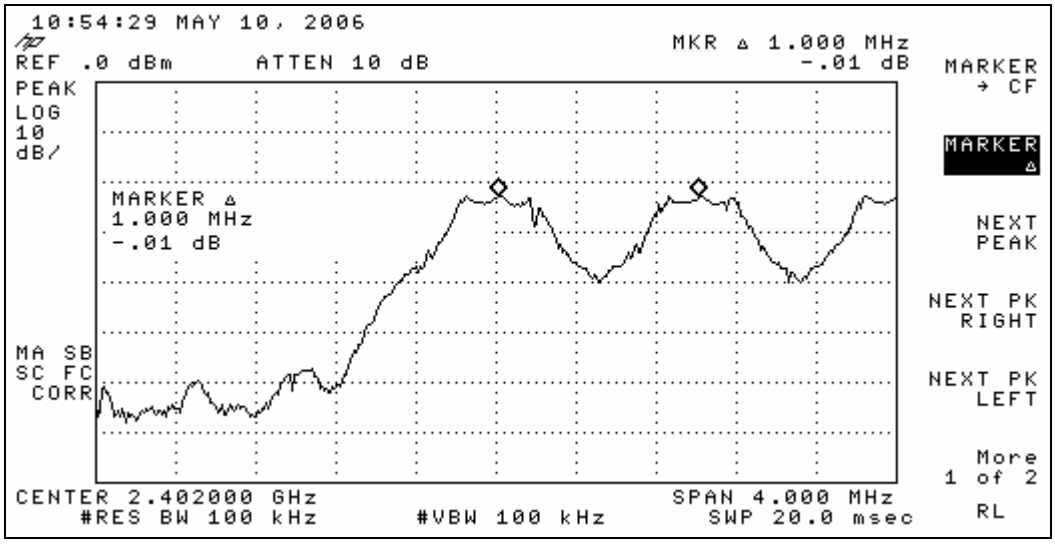
EUT mode of operation: TX and hopping on.

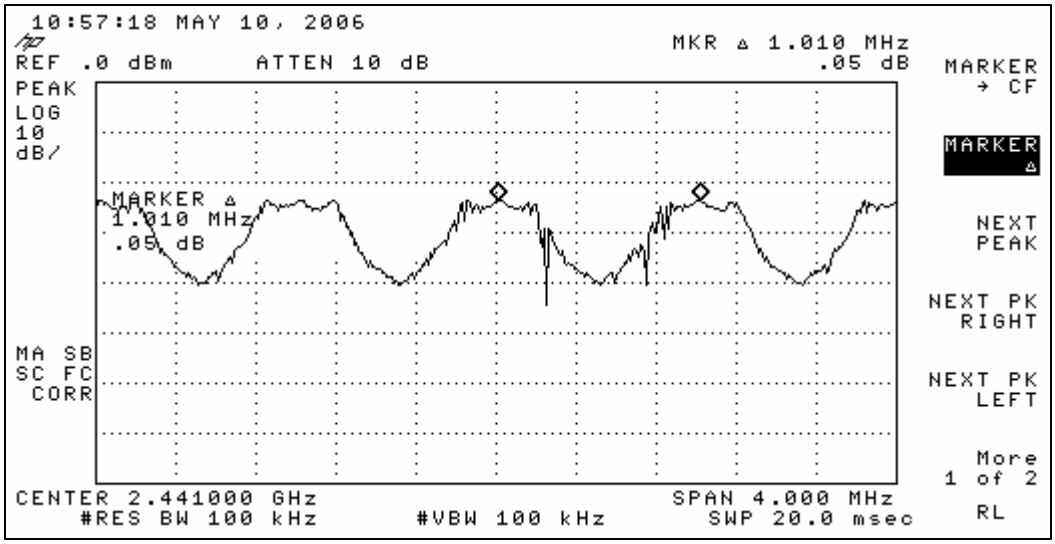
Spectrum analyser settings:

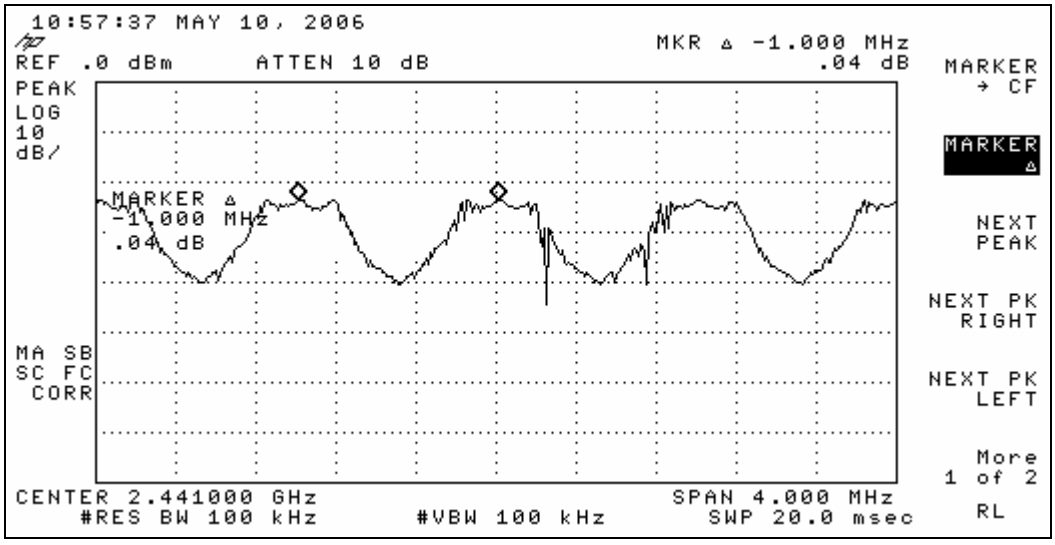
Span: 4 MHz
RBW: 100 kHz
VBW: 100 kHz
Sweep time: Auto
Detector: Peak
Trace: Max Hold

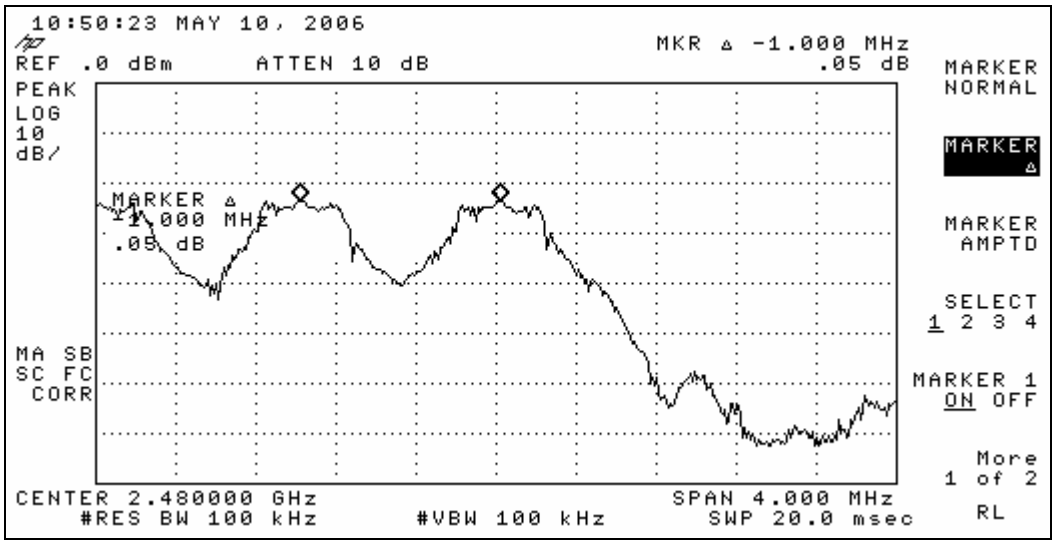
Channel (MHz)	Carrier frequency separation from the next channel		Limit value (kHz)
	To the right (kHz)	To the left (kHz)	
2402	1000	-	> 836
2441	1010	1000	> 836
2480	-	1000	> 836

Limit = Result from the 20 dB Bandwidth measurements




10:57:18 MAY 10, 2006
MKR Δ 1.010 MHz
REF .0 dBm
ATTEN 10 dB
.05 dB
PEAK
LOG
10
dB/
MARKER Δ
1.010 MHz
.05 dB
MA SB
SC FC
CORR
MARKER → CF
MARKER Δ
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
RL
CENTER 2.441000 GHz
#RES BW 100 kHz
#VBW 100 kHz
SPAN 4.000 MHz
SWP 20.0 msec


10:57:37 MAY 10, 2006
MKR Δ -1.000 MHz
REF .0 dBm
ATTEN 10 dB
.04 dB
PEAK
LOG
10
dB/
MARKER Δ
-1.000 MHz
.04 dB
MA SB
SC FC
CORR
MARKER → CF
MARKER Δ
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
RL
CENTER 2.441000 GHz
#RES BW 100 kHz
#VBW 100 kHz
SPAN 4.000 MHz
SWP 20.0 msec


10:50:23 MAY 10, 2006
MKR Δ -1.000 MHz
REF .0 dBm
ATTEN 10 dB
.05 dB
PEAK
LOG
10
dB/
MARKER Δ
-1.000 MHz
.05 dB
MA SB
SC FC
CORR
MARKER NORMAL
MARKER Δ
MARKER AMPTD
SELECT 1 2 3 4
MARKER 1 ON OFF
More 1 of 2
RL
CENTER 2.480000 GHz
#RES BW 100 kHz
#VBW 100 kHz
SPAN 4.000 MHz
SWP 20.0 msec

8. NUMBER OF HOPPING CHANNELS

8.1 Test protocol

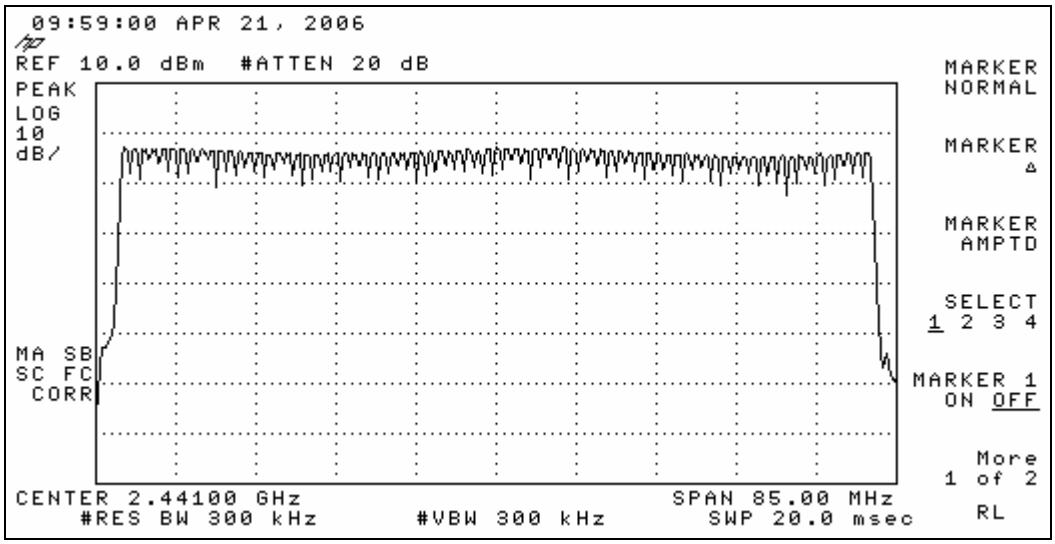
Date of test: 2006-04-21

EUT mode of operation: TX and hopping on.

Spectrum analyser settings:

Start frequency: 2398,5 MHz
Stop frequency: 2483,5 MHz
RBW: 300 kHz
VBW: 300 kHz
Sweep time: Auto
Detector: Peak
Trace: Max Hold

Number of hopping channels	Limit value
79	> 75



9. TIME OF OCCUPANCY (DWELL TIME)

9.1 Test protocol

Date of test: 2006-05-10

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

Determination of transmitting time **T**

Span: 0 Hz
RBW: 1 MHz
VBW: 1 MHz
Sweep time: 15 ms
Single sweep
Detector: Peak
Trace: Clear/Write

*Determination of the number of times **n** the channel is active during the sweep time of 10 s*

RBW: 100 kHz
VBW: 100 kHz
Sweep time: 10 s

Test parameters	Channel (MHz)			Limit value (s)
	2402	2441	2480	
T (µs)	450	412,5	450	-
n	101	101	101	-
Dwell time (s) = $T \cdot 10^{-6} \cdot 3{,}16 \cdot n$	0,14	0,13	0,14	< 0,4

10. BAND EDGE COMPLIANCE

10.1 Test set-up

See Section 11.3.

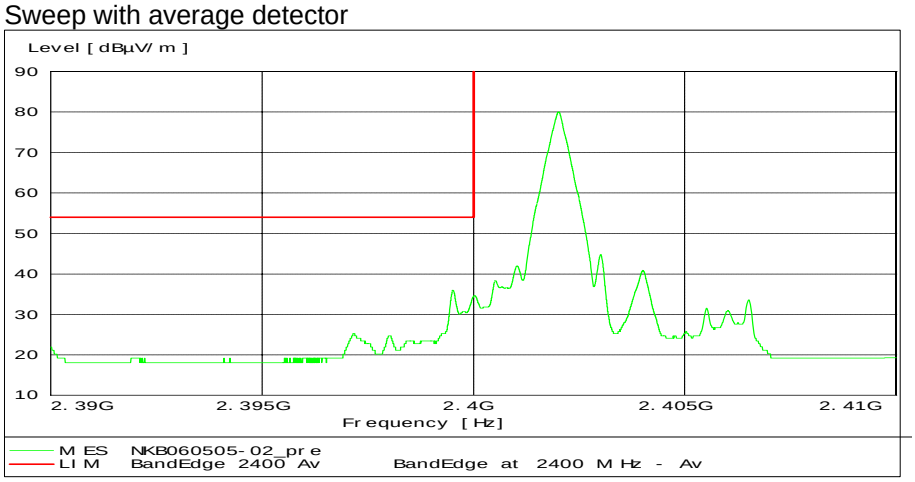
10.2 Test protocol

Date of test: 2006-05-05 and 2006-05-10

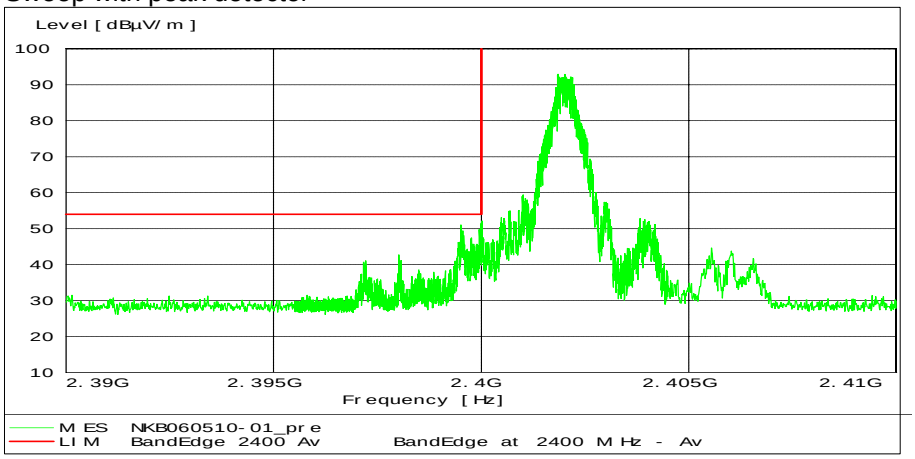
Band edge compliance at 2400 MHz

EUT mode of operation: TX and hopping on one channel.

Sweep with average detector

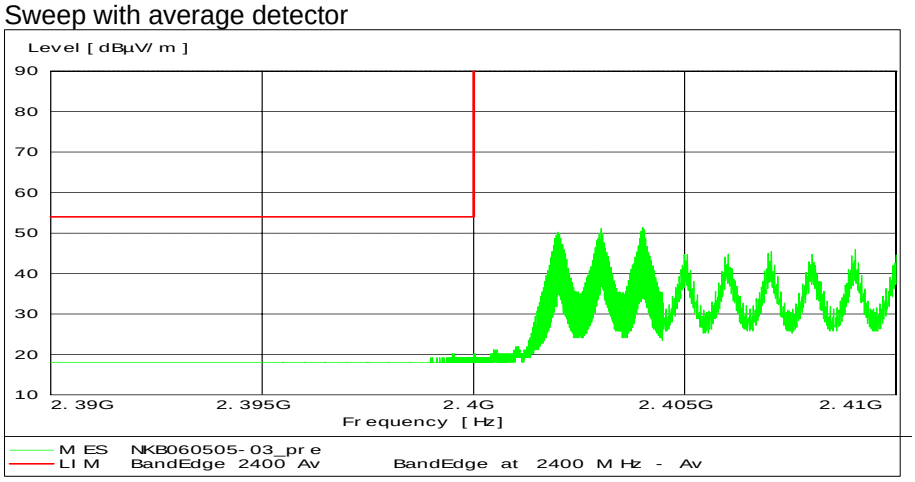


Sweep with peak detector

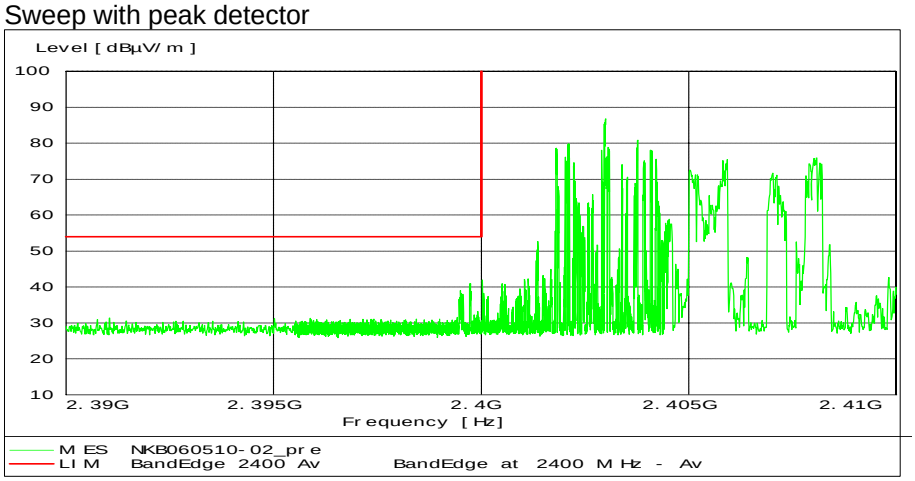


EUT mode of operation: TX and hopping on.

Sweep with average detector



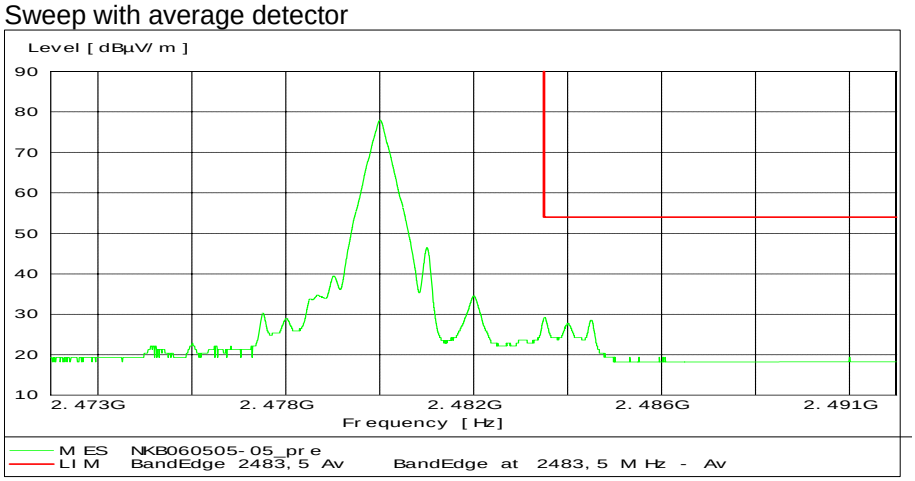
Sweep with peak detector



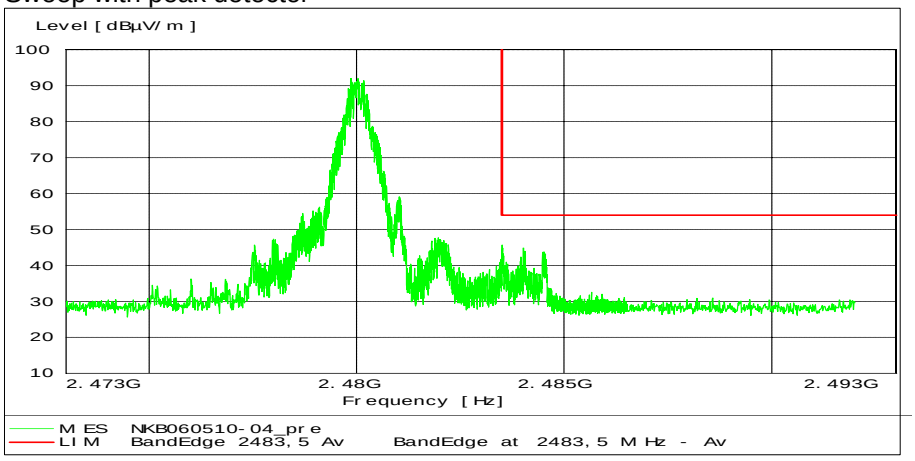
Band edge compliance at 2483,5 MHz

EUT mode of operation: TX and hopping on one channel.

Sweep with average detector

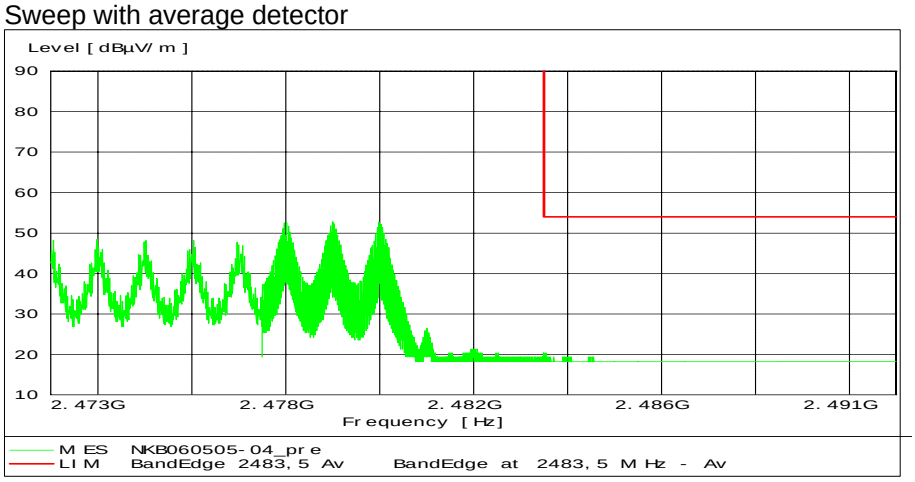


Sweep with peak detector

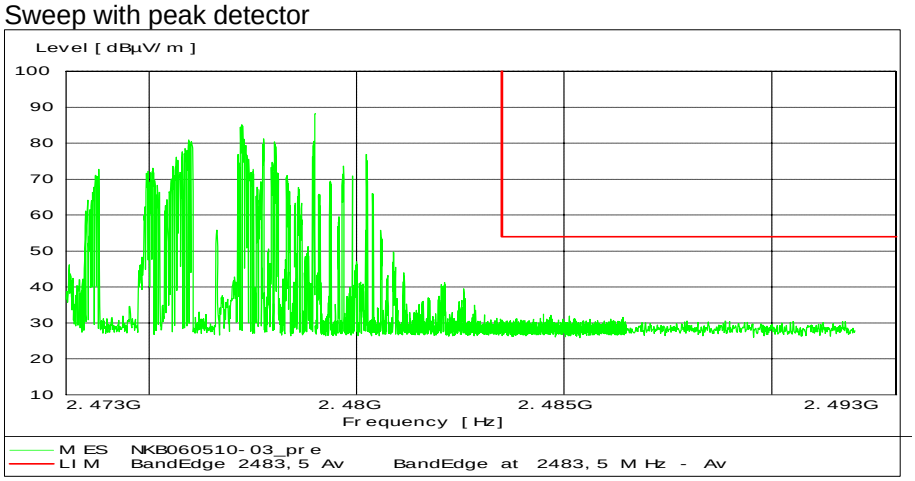


EUT mode of operation: TX and hopping on.

Sweep with average detector



Sweep with peak detector



11. RADIATED SPURIOUS EMISSIONS

11.1 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: ± 4,6 dB
Radiated disturbance electric field intensity, 1000 – 18000 MHz: ± 6,0 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95%.

11.2 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
Test site: Semi-anechoic shielded chamber, 5,7 x 8,7 x 5,4 m (W x L x H)			
Software:	Rohde & Schwarz	EMC32, V5.10.99	
Measurement receiver:	Rohde & Schwarz	ESCI	12798
Integrated Measurement System:	Rohde & Schwarz	IMS	12800
Antenna: Ultra Broadband	Rohde & Schwarz	HL562	30711
Test site: Bluetooth anechoic shielded chamber, 3,7 x 7,0 x 2,4 m (W x L x H)			
Software:	Rohde & Schwarz	ES-K1, V1.70	
Signal analyser:	Rohde & Schwarz	FSIQ 40	40023
Preamplifier:	MITEQ	AFS6/AFS44	12335
Antenna: Double Ridge Guide Horn:	EMCO	3115	4936
Transformer	Tufvassons	AFM-1500	30317

11.3 Measurement set-up

Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with quasi-peak detector were carried out.

The EUT was supplied with 120 V AC (60 Hz) during the test.

Test set-up photo:

Test site: Bluetooth anechoic shielded chamber (1 – 26 GHz)

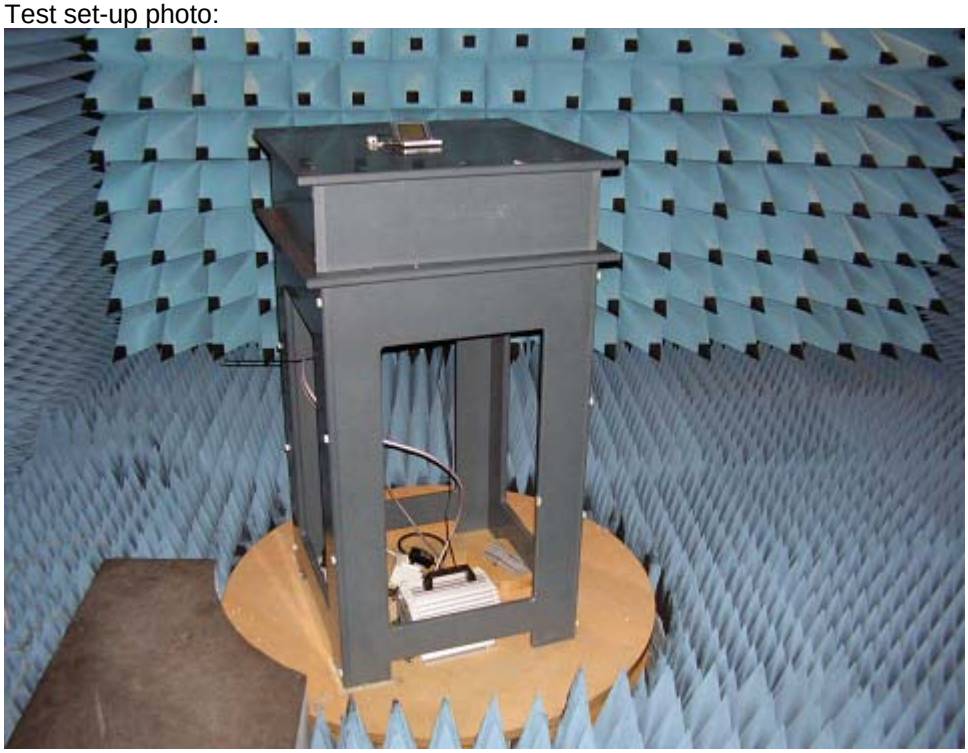
In the Bluetooth anechoic chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m. The specified test mode was enabled.

An overview sweep with peak detection of the electric field intensity was performed with the spectrum analyser in max-hold and with the antenna placed 1,4 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with peak and average detectors were carried out.

The EUT was supplied by 120 V AC (50 Hz) during the test.

Test set-up photo:

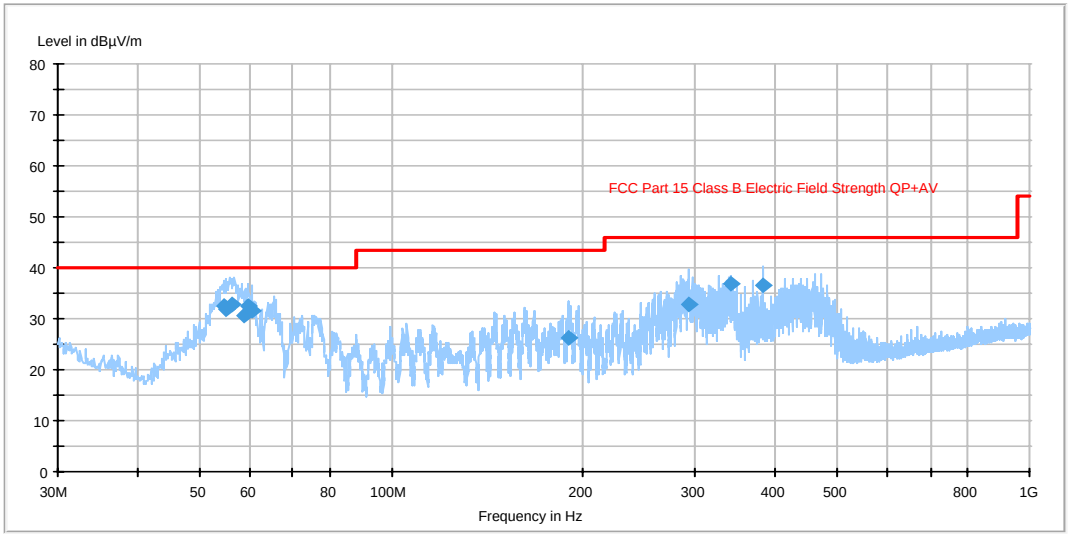


11.4 Test protocol

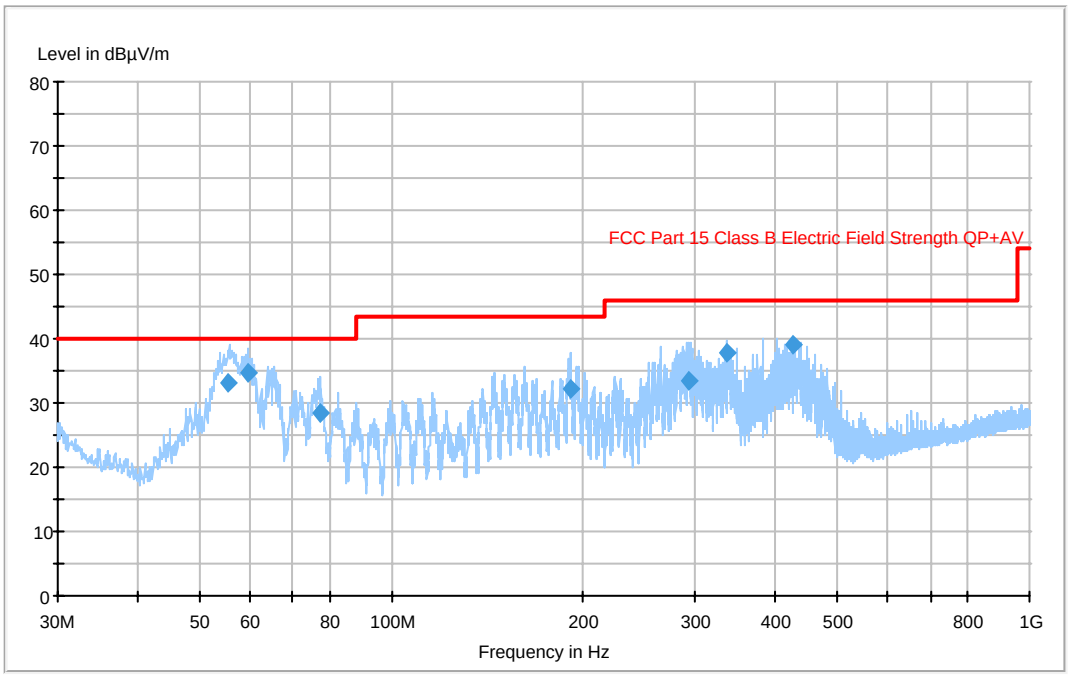
Semi-anechoic shielded chamber

Date of test: 2006-05-03

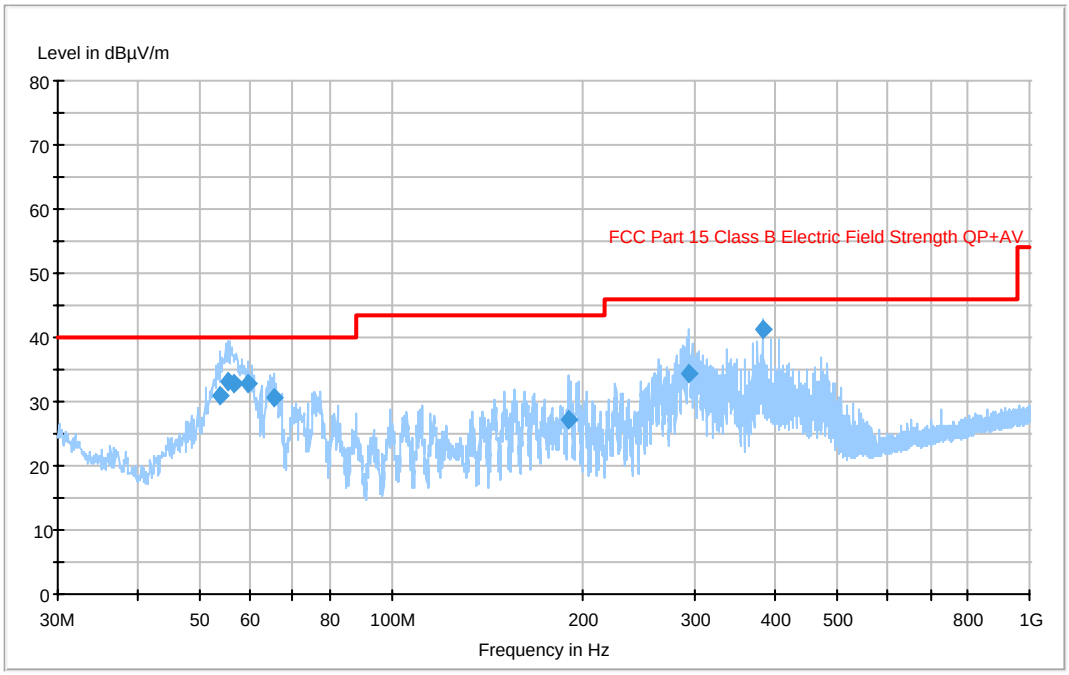
30 – 1000 MHz, max peak at a distance of 3 m on the lower TX channel



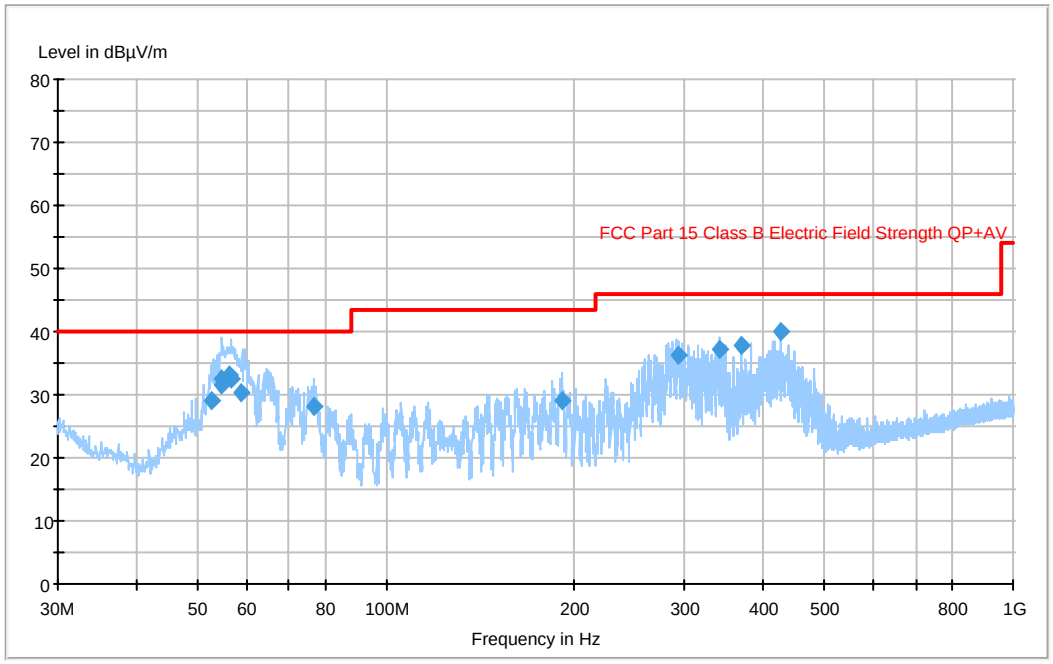
30 – 1000 MHz, max peak at a distance of 3 m on the middle TX channel



30 – 1000 MHz, max peak at a distance of 3 m on the upper TX channel



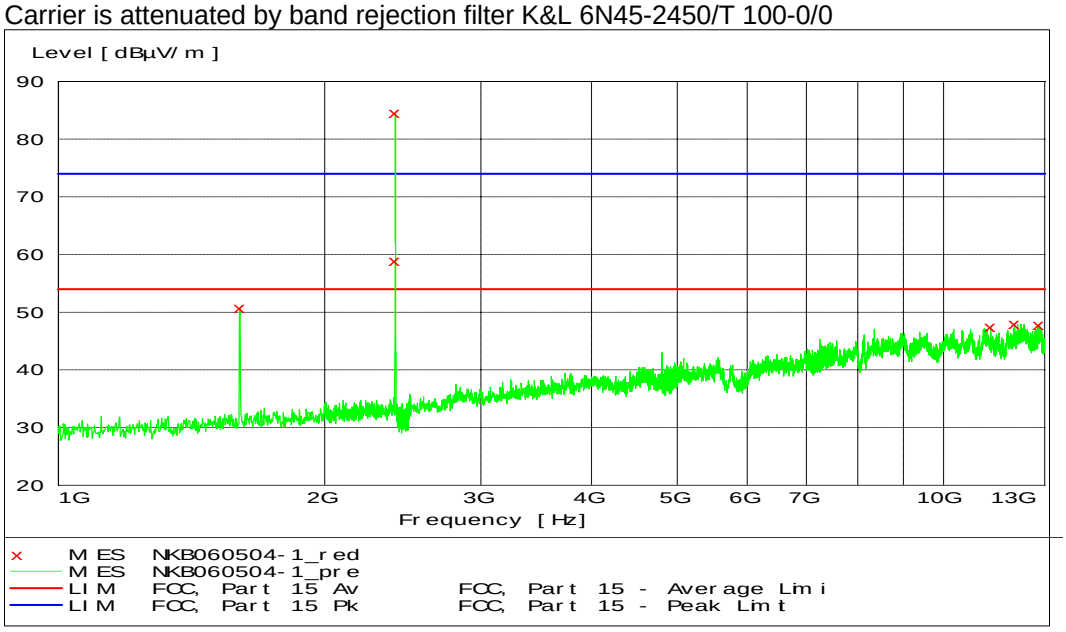
30 – 1000 MHz, max peak at a distance of 3 m in RX mode



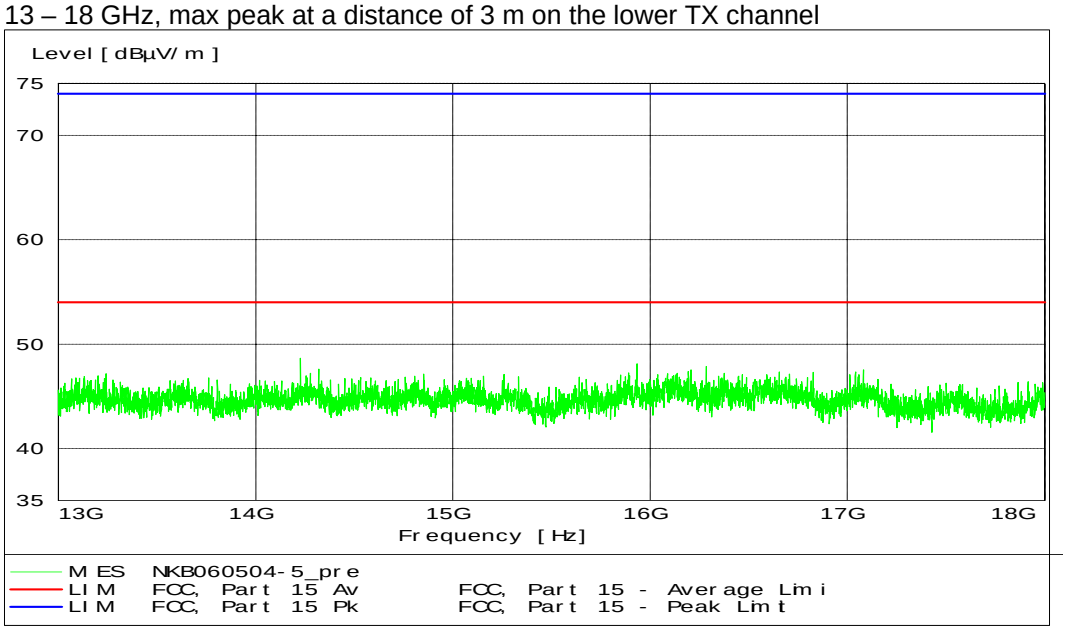
Bluetooth anechoic shielded chamber

Date of test: 2006-05-04

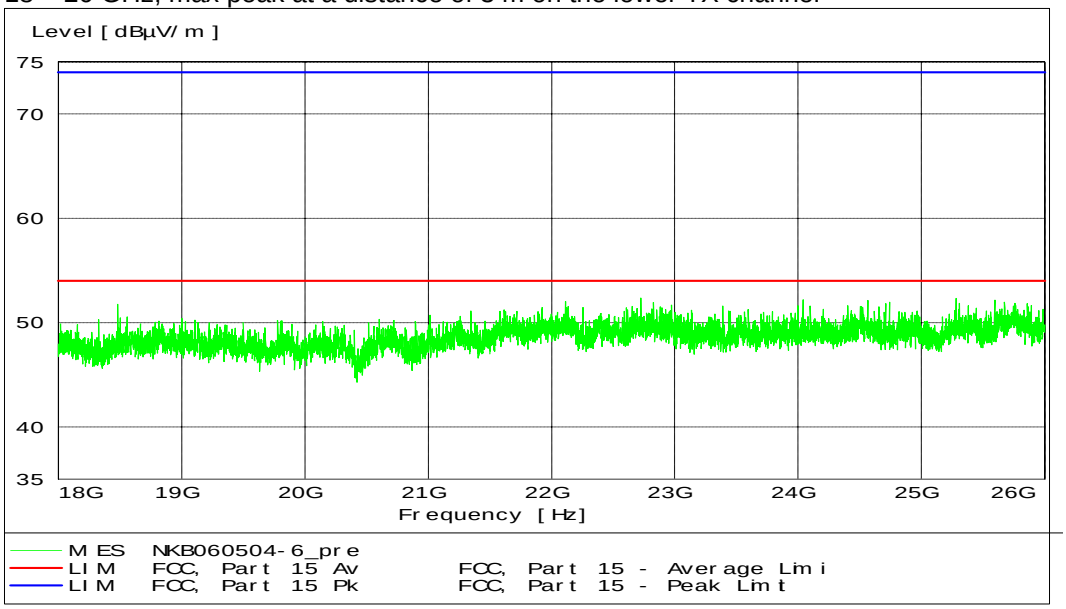
1000 – 13000 MHz, max peak at a distance of 3 m on the lower TX channel
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0



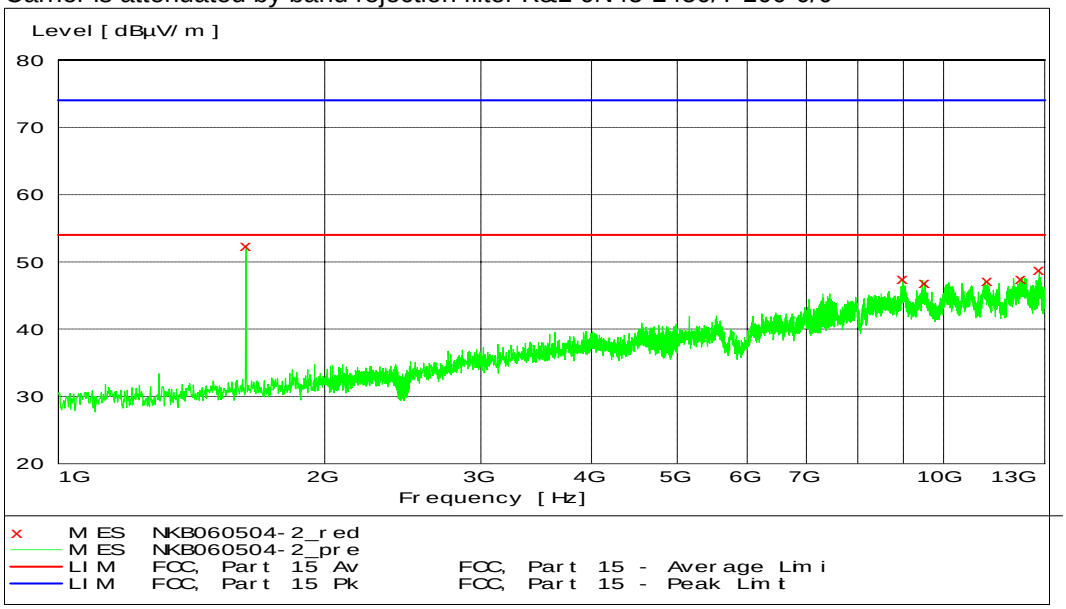
13 – 18 GHz, max peak at a distance of 3 m on the lower TX channel



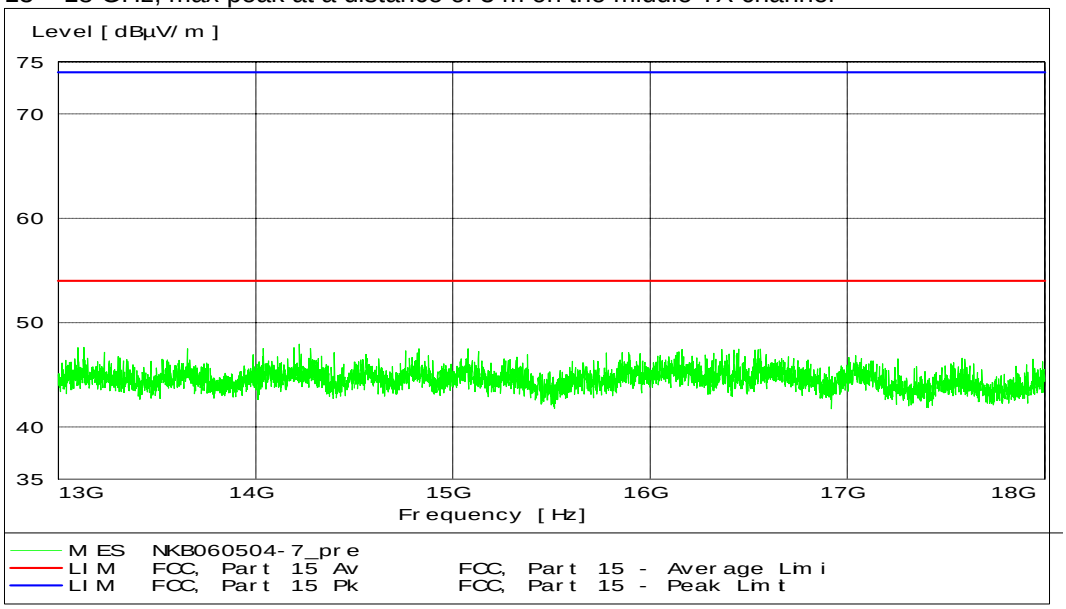
18 – 26 GHz, max peak at a distance of 3 m on the lower TX channel



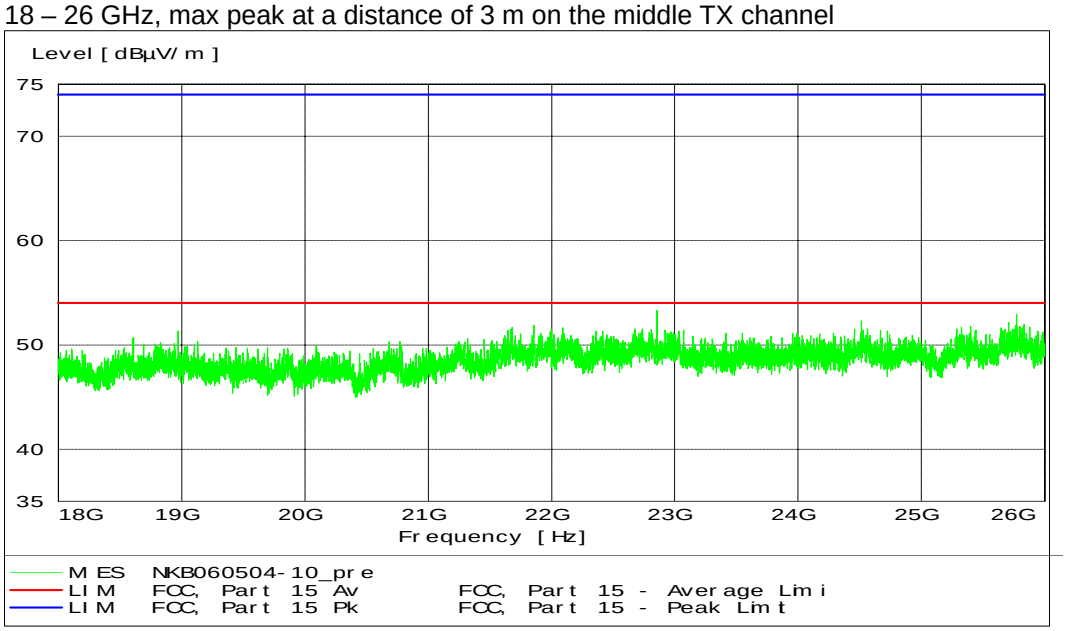
1000 – 13000 MHz, max peak at a distance of 3 m on the middle TX channel
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0



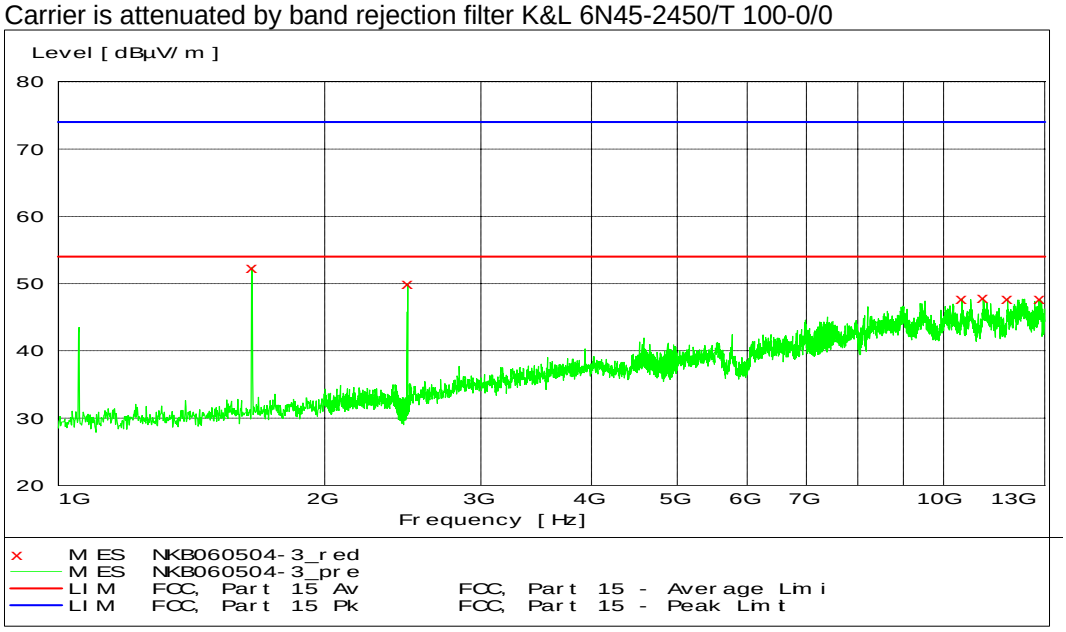
13 – 18 GHz, max peak at a distance of 3 m on the middle TX channel



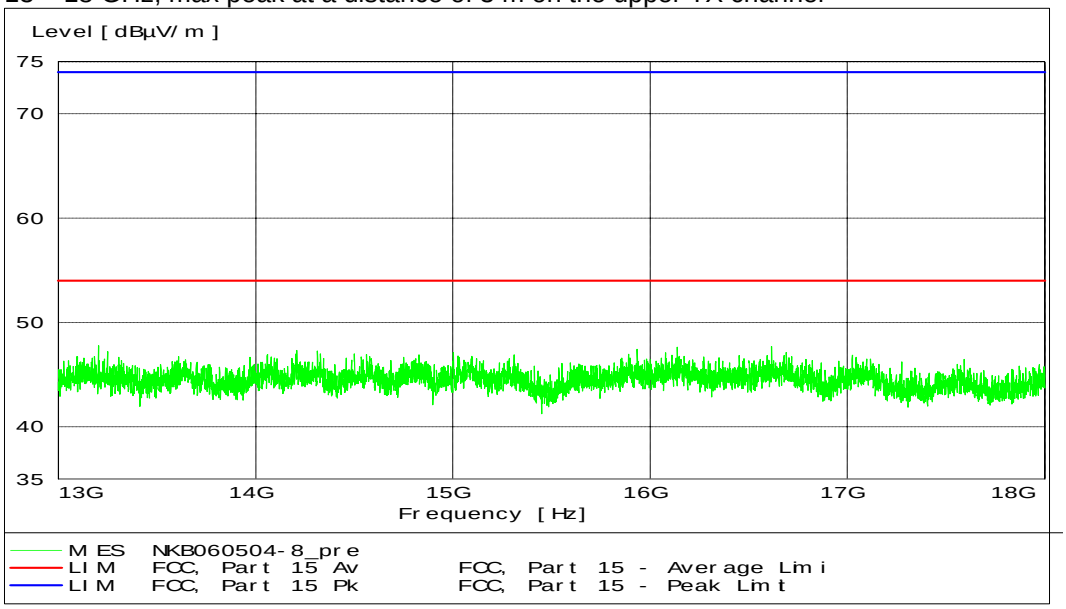
18 – 26 GHz, max peak at a distance of 3 m on the middle TX channel



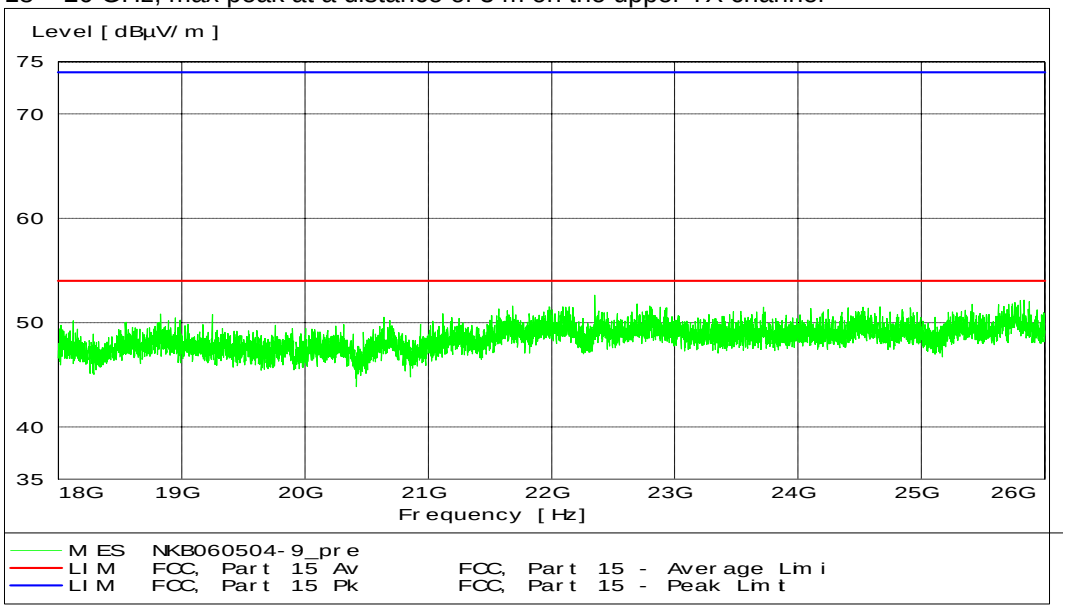
1000 – 13000 MHz, max peak at a distance of 3 m on the upper TX channel
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0



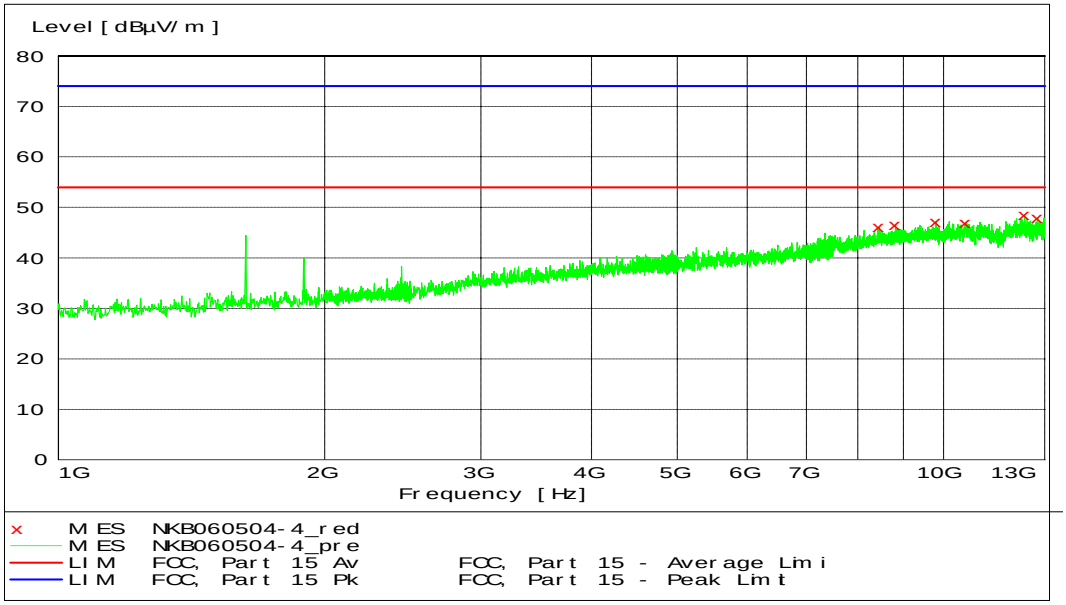
13 – 18 GHz, max peak at a distance of 3 m on the upper TX channel



18 – 26 GHz, max peak at a distance of 3 m on the upper TX channel



1000 – 13000 MHz, max peak at a distance of 3 m in the RX mode



Data summary

Field strength of spurious emissions (lower TX channel)						
Frequency	RBW	Measured level		Limit		Note
		Peak	QP/AV	Peak	QP/AV	
[MHz]	[kHz]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	
56,25	120	-	32,9	-	40	TX low
341,02	120	-	37,0	-	46	TX low
1602,1	1000	50,1	-	74	54	TX low
4804,2	1000	50,4	-	74	54	TX low
13000 – 18000	1000	< 49	-	74	54	TX low, noise floor
18000 – 26000	1000	< 53	-	74	54	TX low, noise floor
59,72	120	-	34,5	-	40	TX mid
426,56	120	-	39,2	-	46	TX mid
1628,1	1000	54,9	47,1	74	54	TX mid
13000 – 18000	1000	< 49	-	74	54	TX mid, noise floor
18000 – 26000	1000	< 54	-	74	54	TX mid, noise floor
55,52	120	-	33,2	-	40	TX high
381,06	120	-	41,2	-	46	TX high
1054,1	1000	46,6	-	74	54	TX high
1653,9	1000	54,6	48,0	74	54	TX high
13000 – 18000	1000	< 48	-	74	54	TX high, noise floor
18000 – 26000	1000	< 53	-	74	54	TX high, noise floor
56,17	120	-	33,1	-	40	RX mode
426,56	120	-	40,0	-	46	RX mode
1627,1	1000	38,3	-	74	54	RX mode
1893,8	1000	38,7	-	74	54	RX mode
2440,0	1000	46,4	-	74	54	RX mode

Example calculation:

Measured level [dBμV/m] = Analyser reading [dBμV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

12. CONDUCTED DISTURBANCE VOLTAGE IN THE FREQUENCY RANGE 0,15 - 30 MHZ

12.1 Measurement uncertainty

Conducted disturbance voltage, quasi-peak detection: ±2,0 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95%.

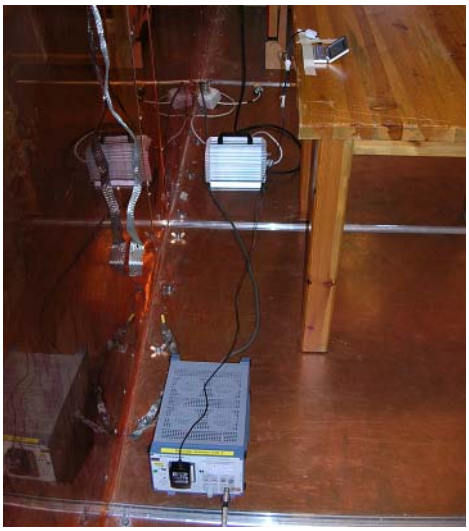
12.2 Test equipment

Test site:	FCC		
Equipment	Manufacturer	Type	SEMKO No.
Software:	Rohde & Schwarz	ES-K1 V1.60	
Measurement receiver:	Rohde & Schwarz	ESHS 30	4946
Artificial mains network:	Rohde & Schwarz	ESH3-Z5	2727
Transformer	Tufvassons	AFM-1500	30317

12.3 Measurement set-up

The mains terminal disturbance voltage was measured with the EUT located 0,8 m above the ground plane and 0,4 m from the vertical ground plane. The EUT was connected to an artificial mains network (AMN). The AMN was placed on the ground plane. Amplitude measurements were performed with a quasi-peak detector. The EUT was supplied by 120 VAC (60 Hz) during the test.

Test set-up photo:

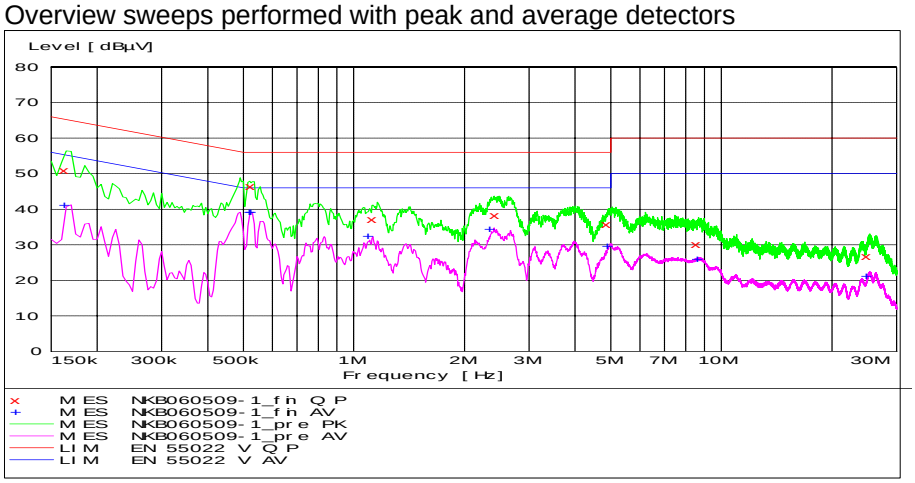


12.4 Test protocol

Date of test: 2006-05-09

Frequency /MHz	Quasi-Peak Disturbance Level /dB(µV)	Quasi-Peak Permitted limit /dB(µV)
0,165	51,1	65
0,530	46,4	56
1,135	37,3	56
2,450	38,4	56
4,930	35,8	56
8,635	30,2	60
25,140	26,9	60

Overview sweeps performed with peak and average detectors



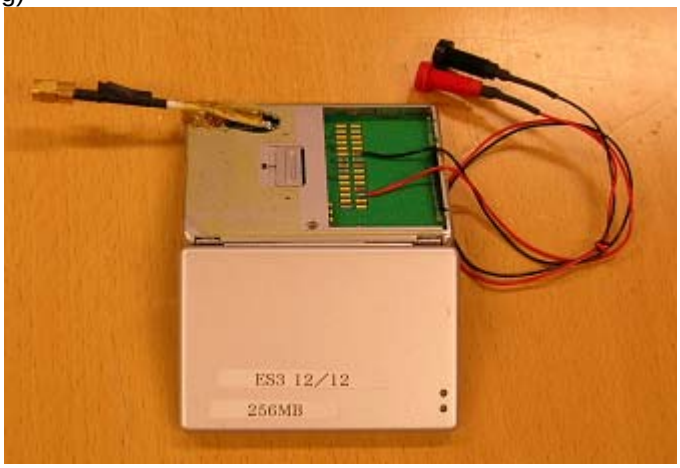
APPENDIX I – PHOTOS OF THE EUT

EUT (front side)

EUT (back side with identification marking)

EUT with antenna connector that was used for conducted measurements (front side)

EUT with antenna connector that was used for conducted measurements (back side with identification marking)



Charger