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No. 1 / 1**204805B**

Date of handing in: 31.03.2012

Tested by:



Timo Hietala, Test Engineer

Reviewed by:



Timo Leismala, Test Manager

SORT OF EQUIPMENT:

Remote control

MARKETING NAME:

RC917FHH/TR02 915 MHz Transceiver

TYPE:

RC917FHH/TR02

MANUFACTURER:

Scanreco Industrielektronik

CLIENT:

Scanreco Industrielektronik

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Nemko Oy

FCC REG. NO.

359859 October 20, 2011

IC FILE NO.

2040F-1 December 1, 2010**SUMMARY:** In accordance with: **FCC Part 15, Subpart C, 15.247**, Frequency Hopping Transmitters

In regard to the performed tests the equipment under test fulfils the requirements defined in the test specifications, see page 2 for details.

The test results are valid for the tested unit only. Without a written permission of Nemko Oy it is allowed to copy this report as a whole, but not partially.

Summary of performed tests and test results

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Frequency Hopping Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on a semi-anechoic chamber test site.

A description of the test facility is on file with the FCC.

- | | | | |
|--------------------------|----------------------------|-------------------------------------|---------------------|
| <input type="checkbox"/> | New Submission | <input type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input checked="" type="checkbox"/> | Pre-Production Unit |

<i>Section in CFR 47</i>	<i>Section in RSS-210</i>		<i>Result</i>
15.247, (a)(1)	A8.1	Carrier frequency separation	PASS
15.247, (a)(1)(i)	A8.1	Number of hopping frequencies	PASS
15.247, (a)(1)(i)	A8.1	Time of occupancy	PASS
15.247, (a)(1)	A8.1	20 dB bandwidth	PASS
15.247, (b)(2)	A8.4 (1)	Peak output power	PASS
15.247, (d)	A8.5	Spurious Emissions (Antenna Conducted)	PASS
15.247, (d)	A8.5	Spurious emissions (radiated)	PASS
15.109	2.3	Unintentional radiator, radiated emissions	PASS
15.207	2.1	AC power line conducted emissions	Not tested ¹⁾

1) Only battery operated EUT.

Explanations:

- PASS** The EUT passed that particular test.
FAIL The EUT failed that particular test.
X The measurement was done, but there is no applicable performance criteria.

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1. General

The equipment under test (EUT) was a remote control. The purpose of the performed tests was to see if in regard to these tests the EUT fulfils the requirements defined in the FCC 47 CFR PART 15, SUBPART C (2011). The tests were performed according to the test specifications CISPR 22 (2006), ANSI C63.4 – 2003, FCC 47 CFR PART 15, SUBPART C (2011) and RSS-210 Issue 8 and RSS-Gen Issue 3.

2. System Configuration

2.1 Test set-up

Equipment under test (EUT):

- Remote control: Transceiver RC917FHH/TR02, S/N: sample 2

Cables:

From	To	Type	Length [m]
Battery pack	EUT	DC cable, unshielded	0.2

Operating voltage of the EUT during the tests:

- Rechargeable battery pack 7.2 VDC (NiMH, 2000mAh), battery type: Type 592, current rating max. 1 A.

2.2 General Equipment Information

Frequency Band:

- 902 – 928 MHz
 2400 – 2483.5 MHz
 5725 – 5850 MHz

Operating Frequency Range:

902.050 – 927.950 MHz

Number of Channels:

519

Channel Spacing:

50 kHz

Antenna 1: only spurious radiated emissions
Antenna 2: only spurious radiated emissions
Antenna 3: only spurious radiated emissions
Antenna 4: only spurious radiated emissions
Antenna 5: all tests

Internal wire $\frac{1}{4}$ wave length
 Internal dipole
 External $\frac{1}{4}$ wave length helix, RP-SMA
 External $\frac{1}{4}$ wave length whip, TNC
 SMA, $\frac{1}{4}$ wave length, (45mm mechanical size)

Other:

EUT has two similar antenna contacts, integral software controlled RF switch takes one at a time in use. RF paths are exactly the same therefore only RF output power is verified from both of the antenna contacts. Antenna contact 1 (SMA) was used for all testing.

N	Antenna type	Details	Manufacture	Part number	Connector	Gain
1	Internal wire $\lambda/4$	8cm length, stranded \emptyset 1,2mm conductor, \emptyset 2,2 mm total	Scanreco	44374	Soldered	1,5dBi
2	Internal dipole antenna	Total length 16cm, coax cable RG316	Scanreco	47146	Soldered	2,5dBi
3	External $\lambda/4$ Helix	Total height 12cm	Scanreco	47938	RP-SMA	2,8dBi
4	External $\lambda/4$ whip	Total length 82mm	Scanreco	47123 /382-4179	TNC	2,6dBi
5	External Right Angle	Total length 45mm	Jinchang	JC-GSM-000-55-SMAGSM	SMA	3,5dBi

2.1 Operating conditions of the EUT

Emission tests:

For the duration of the tests the EUT was set to a transmitting mode of operation. All tests have been performed with fully charged battery.

3. Test procedures

Radiated measurements

The test was performed inside a semi anechoic shielded room. For the duration of the test the EUT was placed on a non-conductive support 0.8 m high standing on the turntable. The radiated power from the EUT was measured with an antenna fixed to an antenna tower. The tower and turn table were remotely controlled to turn the EUT and change the antenna polarization. The measured signal was routed from the measuring antenna to the spectrum analyzer.

Conducted measurements

The test was performed inside a shielded room. For the duration of the test the EUT was placed on a non-conductive support 0.8 m high. The conducted power from the EUT was measured with a spectrum analyzer.

4. Test results

4.1 Carrier frequency separation

The test was performed as a compliance test. The test parameters concerned were as follows:

Site name	Nemko Oy / Perkkaa
FCC rule part	§ 15.247, (a)(1)
Section in RSS-210	A8.1
Date of testing	7.4.2012
Test equipment	566
Test conditions	23 °C, 30 % RH
Test result	PASS

4.1.1 EUT operation mode

EUT operation mode	Transmitting
EUT channel	Hopping
EUT TX power level	Nominal

4.1.2 Limits and test results

Limit (kHz)	Result (kHz)
≥ 25 or 20 dB BW	50

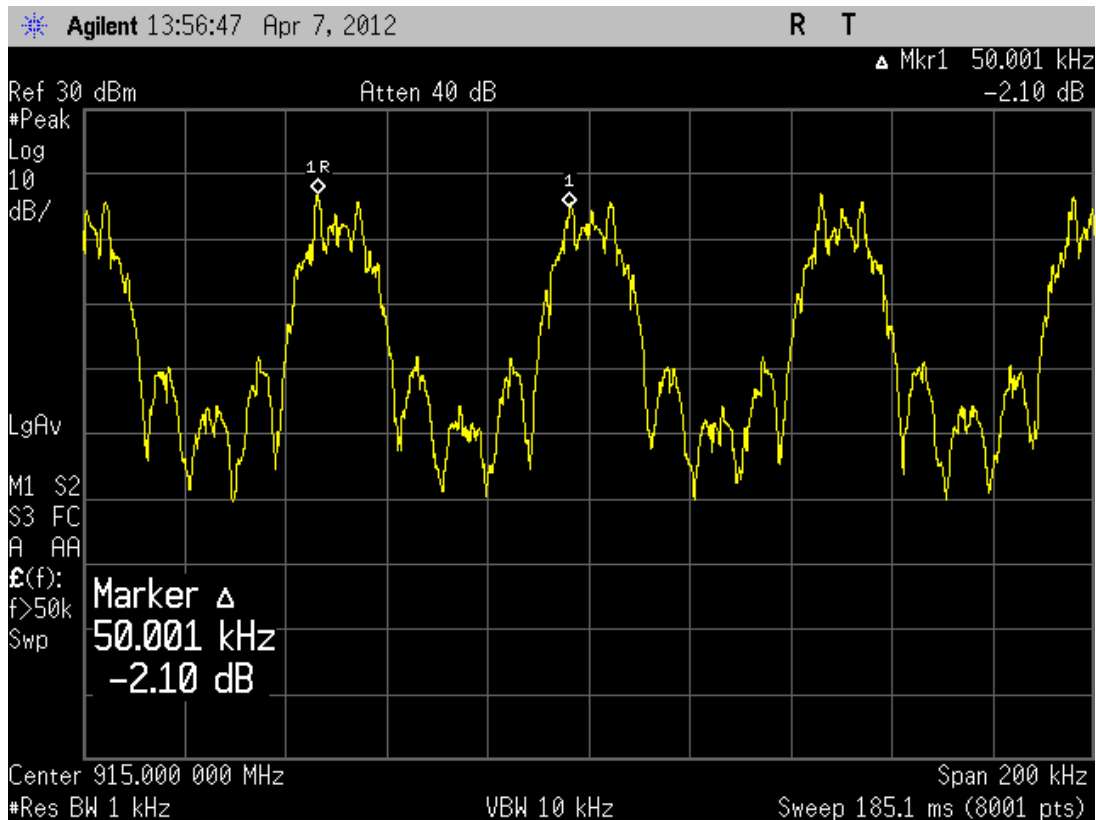


Figure 1. Carrier frequency separation

4.2 Number of hopping frequencies

The test was performed as a compliance test. The test parameters concerned were as follows:

Site name	Nemko Oy / Perkkaa
FCC rule part	§ 15.247, (a)(1)(i)
Section in RSS-210	A8.1
Date of testing	7.4.2012
Test equipment	566
Test conditions	23 °C, 30 % RH
Test result	PASS

4.2.1 EUT operation mode

EUT operation mode	Transmitting
EUT channel	Hopping
EUT TX power level	Nominal

4.2.2 Limits and test results

Number	Measured value
≥ 50	519

Lowest freq. 902.050, highest freq. 927.950, separation 50kHz.

Number of freqs $= (927.950 - 902.050) / 0.05 + 1$

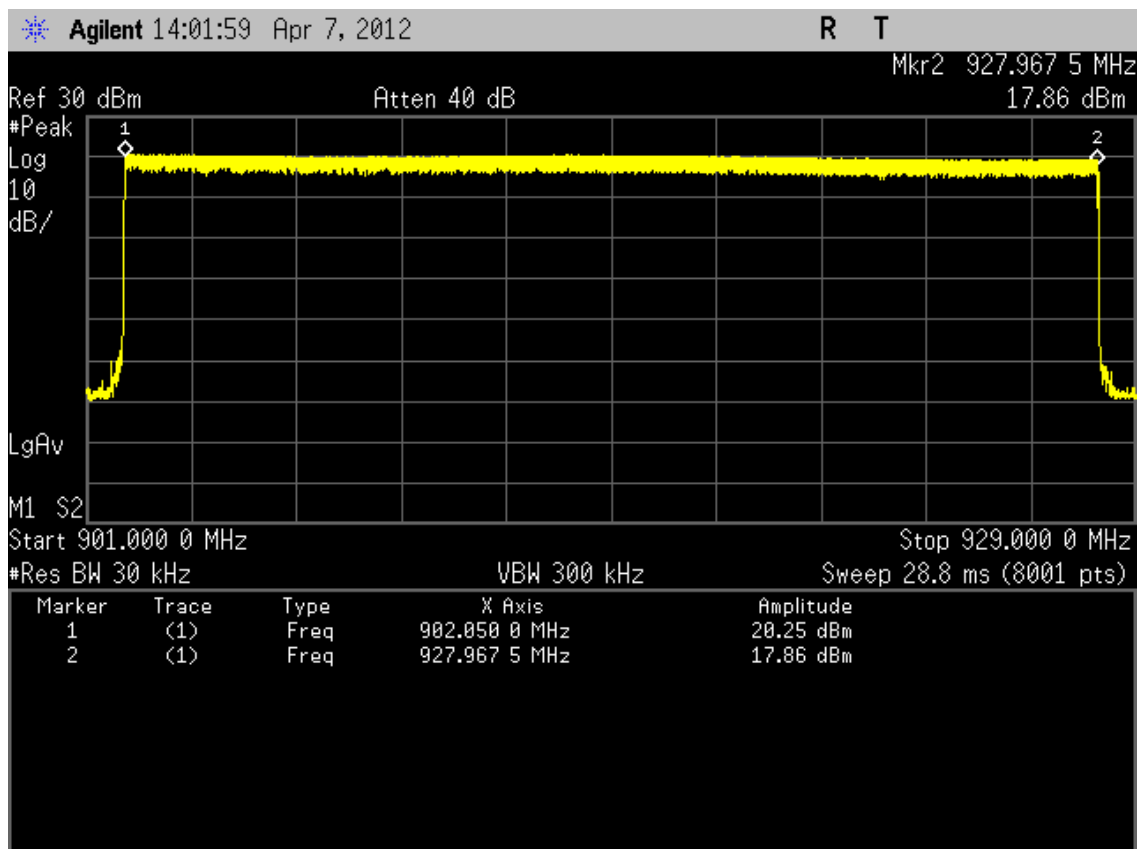


Figure 2. Number of hopping frequencies

4.3 Time of occupancy

The test was performed as a compliance test. The test parameters concerned were as follows:

Site name	Nemko Oy / Perkaa
FCC rule part	§ 15.247, (a)(1)(i)
Section in RSS-210	A8.1
Date of testing	7.4.2012
Test equipment	566
Test conditions	23 °C, 30 % RH
Test result	PASS

4.3.1 EUT operation mode

EUT operation mode	Transmitting
EUT channel	Hopping
EUT TX power level	Nominal

4.3.2 Limits and test results

Time of occupancy (s)	Measured value (s)
≤ 0.4	0.048

In measurement time of 20 s total of 1 transmissions occurred. Same frequency is used once in every 26.2s.

The duration of one transmission was 48.4 ms

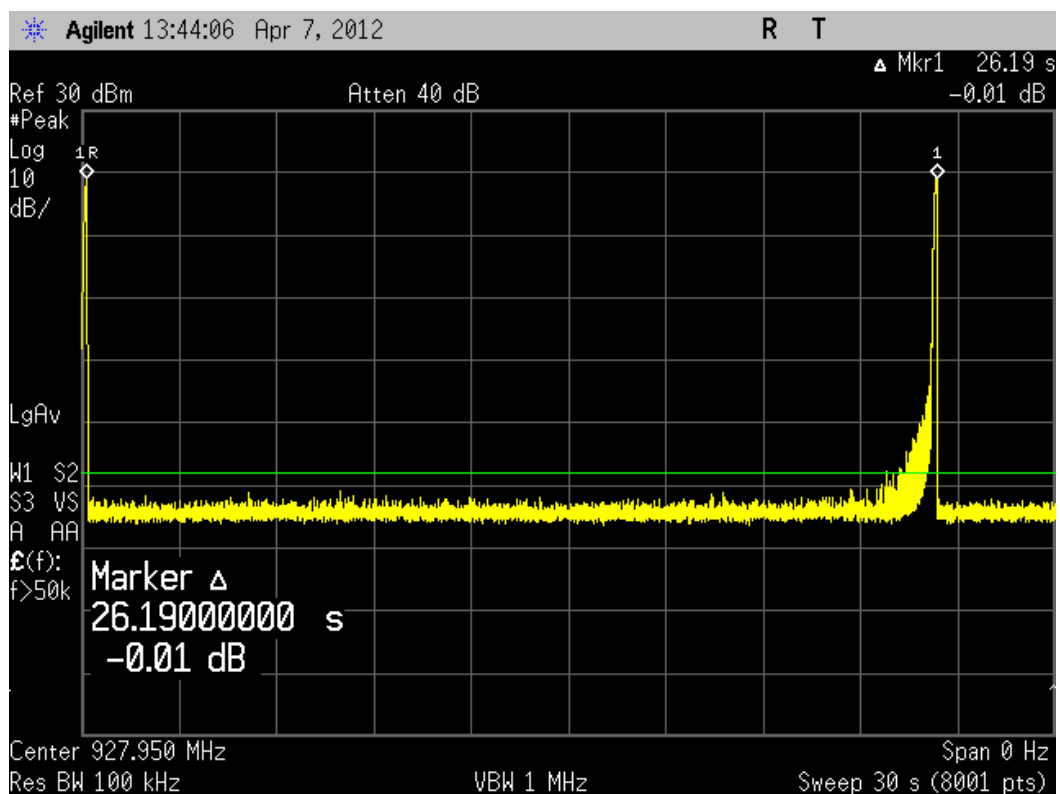


Figure 3. Number of transmissions

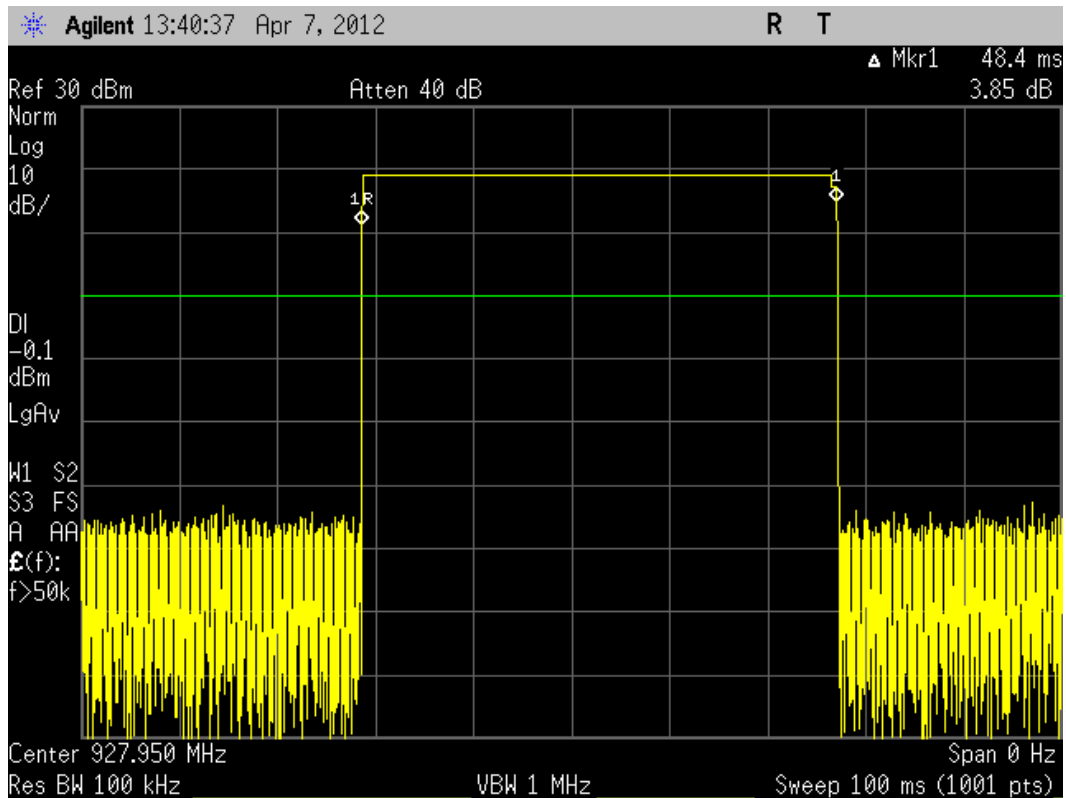


Figure 4. Duration of one transmission, 48.4ms

4.4 Duty cycle correction factor, Transmit time in 100 ms

Spectrum analyzer with zero span was used to investigate spectrum.

15.35(c) Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

4.4.2 Test data

Pulses/100ms=1
Length of one pulse = 48.4ms

$$DutyCycleCorrectionFactor=20*\log(Tocc/100)=20*\log(1*48.4/100)=-6.3dB$$

4.5 20 dB bandwidth

The test was performed as a compliance test. The test parameters concerned were as follows:

Site name	Nemko Oy / Perkaa
FCC rule part	§ 15.247, (a)(1)(i)
Section in RSS-210	A8.1
Date of testing	7.4.2012
Test equipment	566
Test conditions	23 °C, 30 % RH
Test result	PASS

4.5.1 EUT operation mode

EUT operation mode	Transmitting
EUT channel	Low, middle and high
EUT TX power level	Nominal

4.5.2 Limits and test results

EUT Channel	Limit (kHz)	Measured value (kHz)
low	≤ 250	18.2
middle	≤ 250	17.9
high	≤ 250	18.0

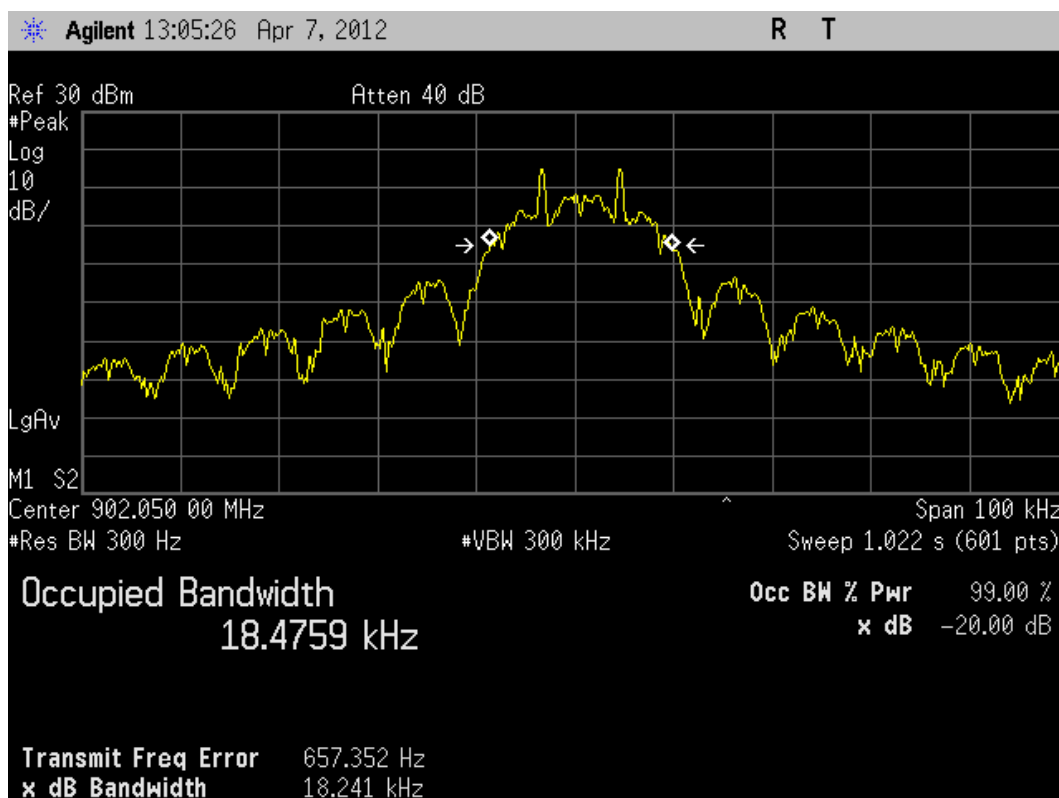


Figure 5. 20 dB bandwidth, low channel



Figure 6. 20 dB bandwidth, middle channel



Figure 7. 20 dB bandwidth, high channel

4.6 Peak conducted output power

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	Nemko Oy / Perkaa
<i>FCC rule part</i>	§ 15.247, (b)(2)
<i>Section in RSS-210</i>	A8.4 (1)
<i>Date of testing</i>	7-10.4.2012
<i>Test equipment</i>	566
<i>Test conditions</i>	23 °C, 30 % RH
<i>Test result</i>	PASS

4.6.1 EUT operation mode

Detachable antenna? Yes No

The type of non-standard connector used: SMA

Note: test sample was not with non-standard connector

<i>EUT operation mode</i>	Transmitting
<i>EUT channel</i>	Low, middle and high
<i>EUT TX power level</i>	Nominal

4.6.2 Limits and test results

<i>EUT Channel</i>	<i>Limit (W)</i>
Low	≤ 1.0
Middle	≤ 1.0
High	≤ 1.0

4.6.3 Test results

Antenna contact 1

<i>EUT Channel</i>	<i>P_{Measured} [dBm]</i>	<i>P_{Measured} [W]</i>
Low	20.36	0.1086
Middle	20.15	0.1035
High	19.15	0.0822

Antenna contact 2

<i>EUT Channel</i>	<i>P_{Measured} [dBm]</i>	<i>P_{Measured} [W]</i>
Low	20.00	0.1000
Middle	19.81	0.0957
High	18.89	0.0774

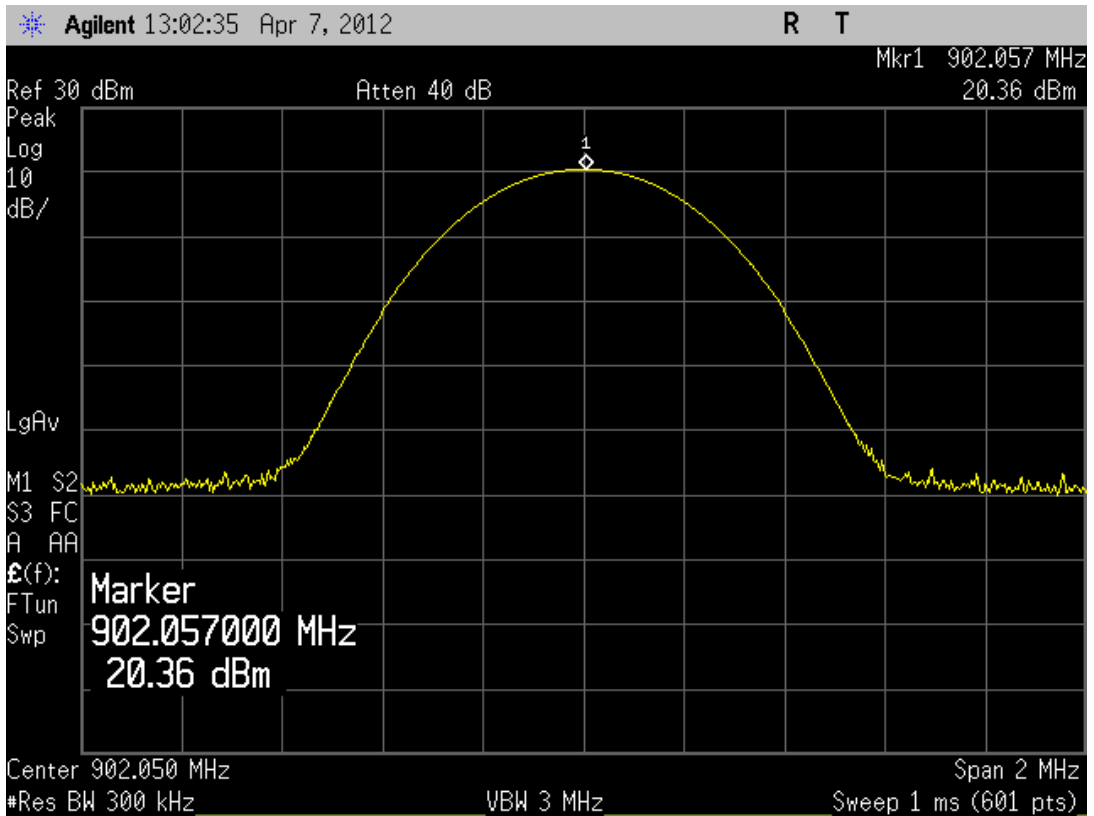


Figure 8. Peak conducted output power, low channel, antenna contact 1

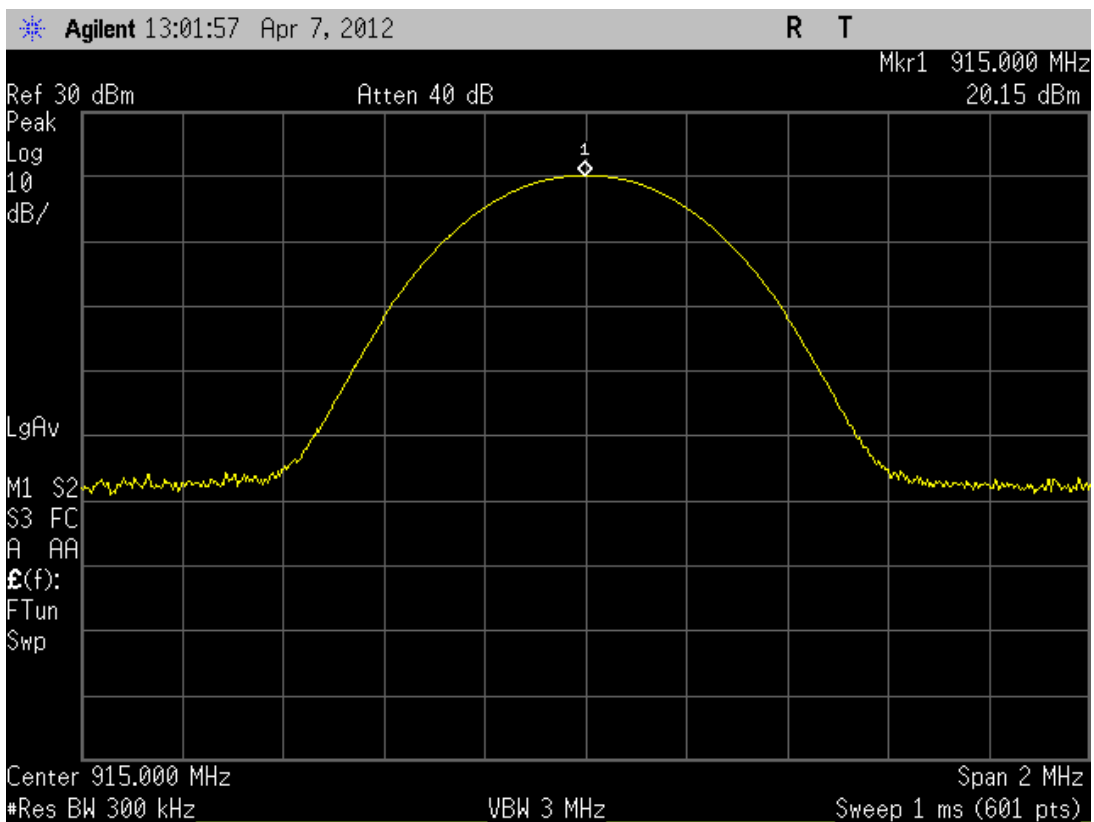


Figure 9. Peak conducted output power, middle channel, antenna contact 1

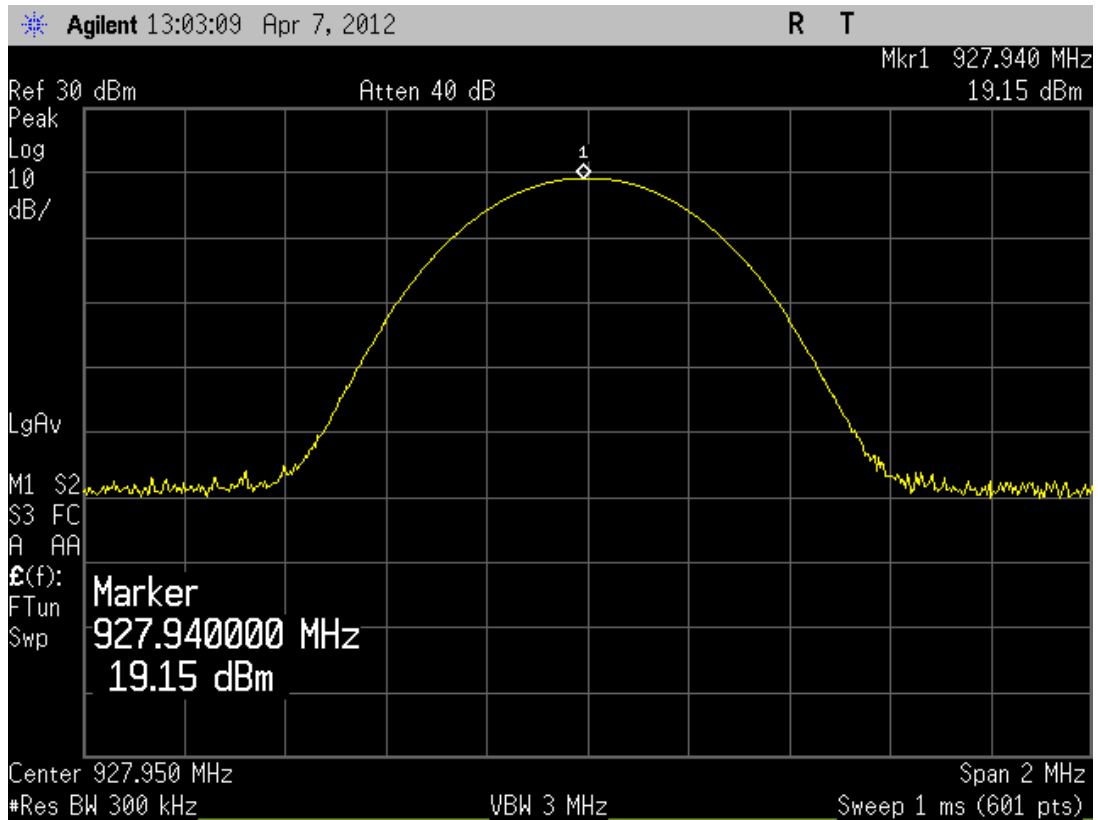


Figure 10. Peak conducted output power, high channel, antenna contact 1

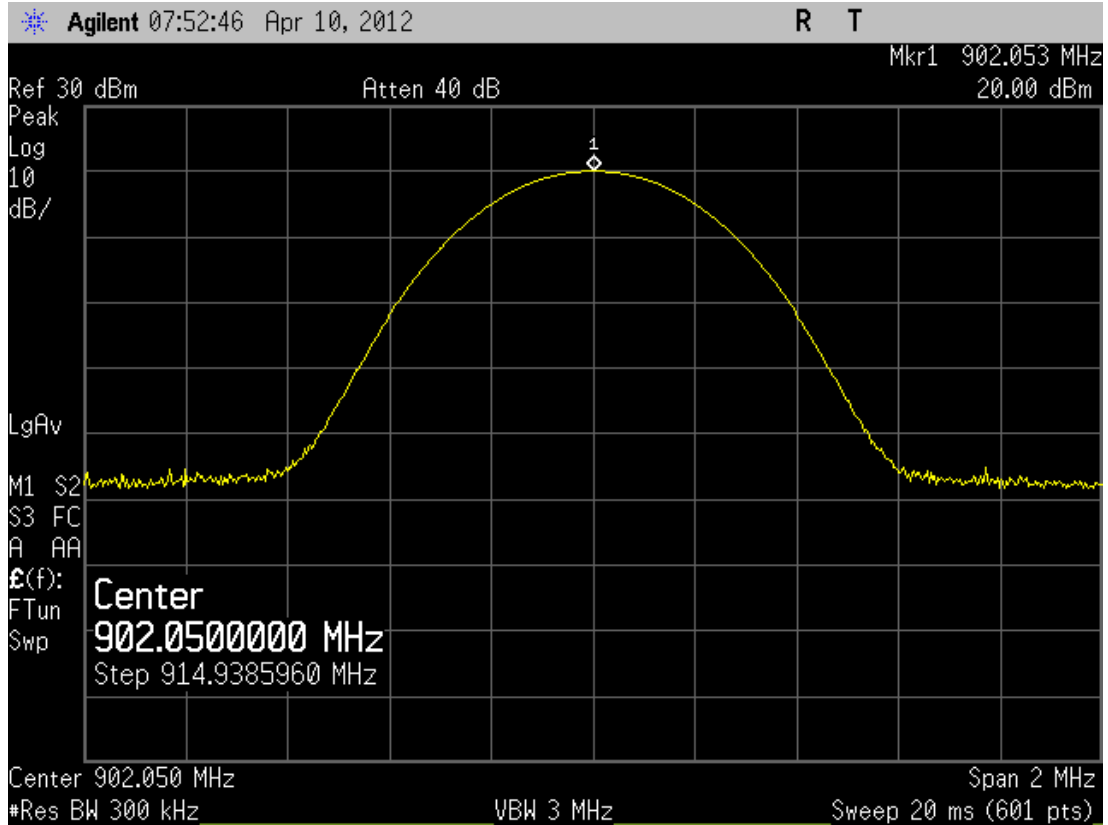


Figure 11. Peak conducted output power, low channel, antenna contact 2

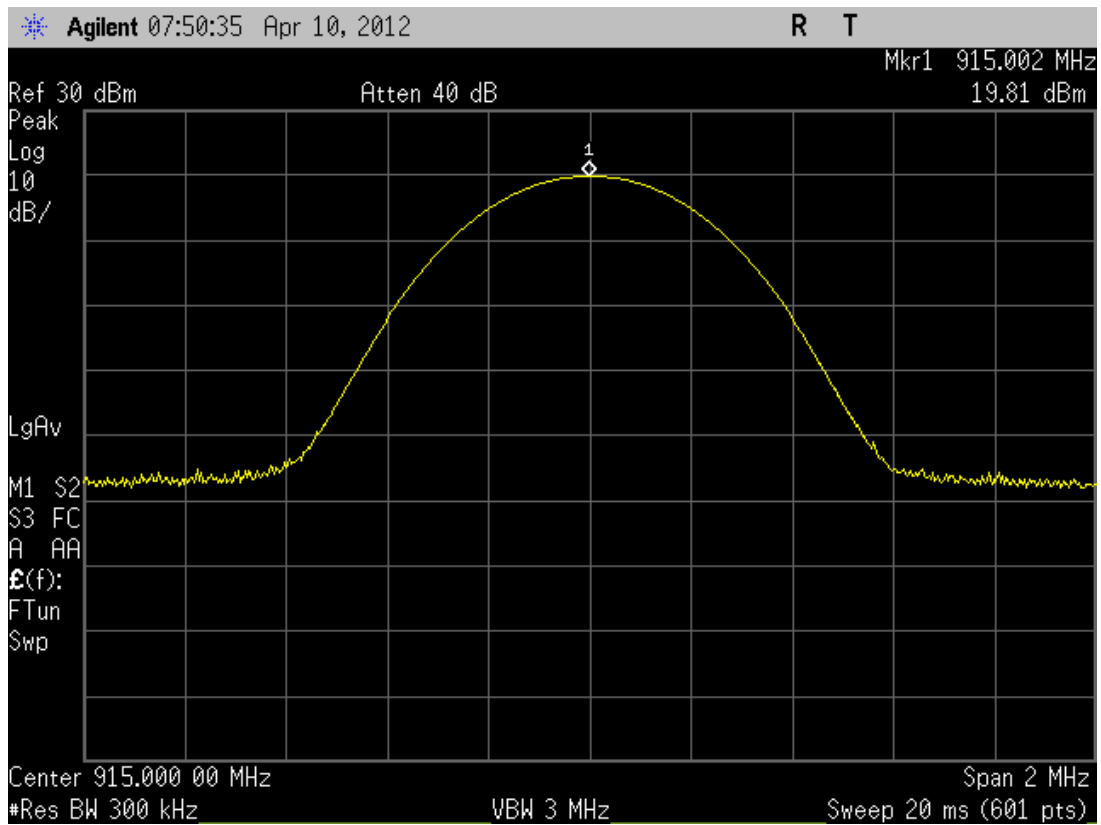


Figure 12. Peak conducted output power, middle channel, antenna contact 2

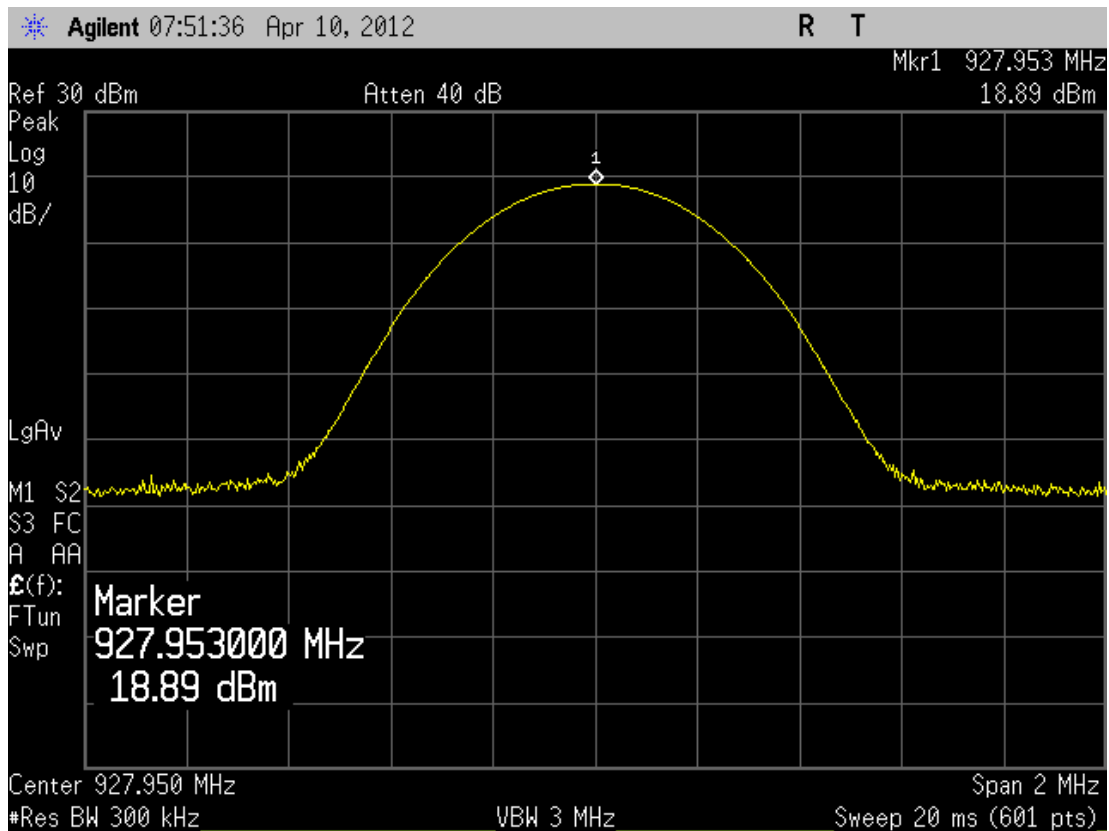


Figure 13. Peak conducted output power, high channel, antenna contact 2

4.7 Band-edge compliance of RF conducted emissions

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>FCC rule part</i>	§ 15.247, (d)
<i>Section in RSS-210</i>	A8.5
<i>Date of testing</i>	7.4.2012
<i>Test equipment</i>	566
<i>Test conditions</i>	23 °C, 30 % RH
<i>Test result</i>	PASS

4.7.1 EUT operation mode

<i>EUT operation mode</i>	Transmitting
<i>EUT channel</i>	Low and high with hopping OFF
<i>EUT TX power level</i>	Nominal

4.7.2 Limits and test results

Hopping OFF, antenna contact 1

<i>EUT Channel</i>	<i>Limit (dBc)</i>	<i>Result (dBc)</i>
Low	≤ -20	-50.5
High	≤ -20	-53.0

4.7.1 EUT operation mode

<i>EUT operation mode</i>	Transmitting
<i>EUT channel</i>	Hopping
<i>EUT TX power level</i>	Nominal

4.7.2 Limits and test results

Hopping ON, antenna contact 1

<i>EUT Channel</i>	<i>Limit (dBc)</i>	<i>Result (dBc)</i>
low	≤ -20	-50.9
high	≤ -20	-51.8

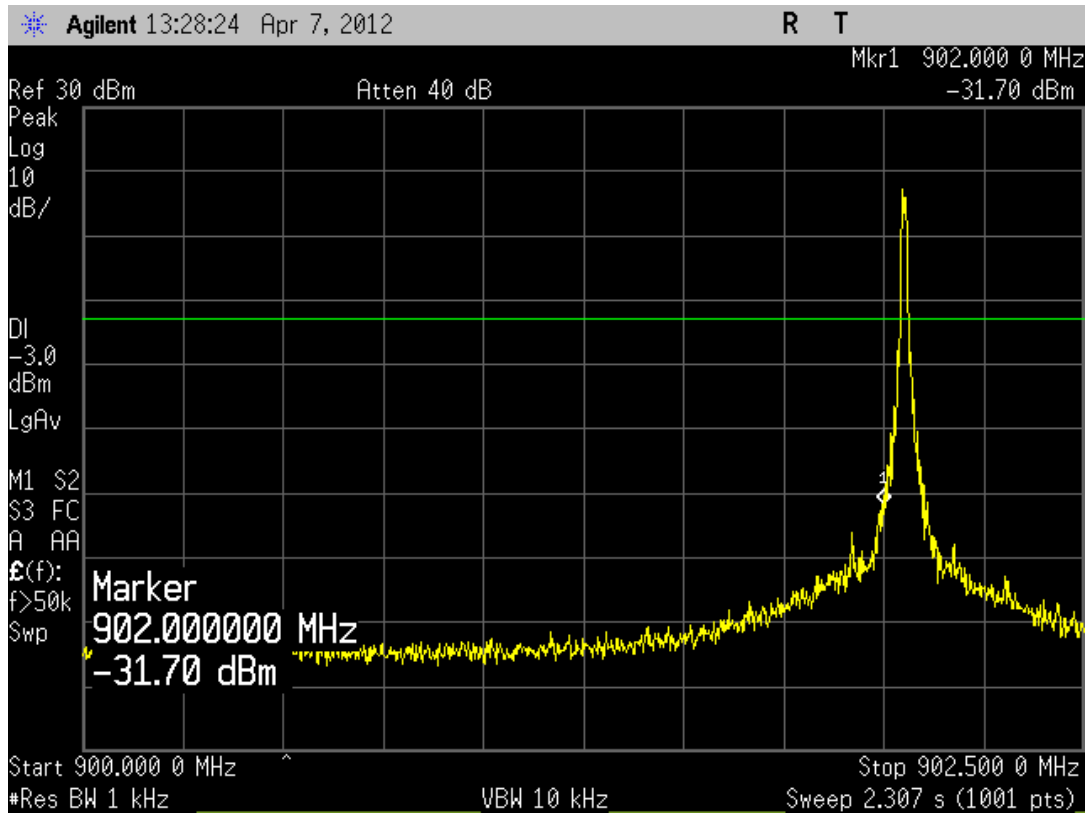


Figure 14. Band-edge compliance, low end, hopping OFF

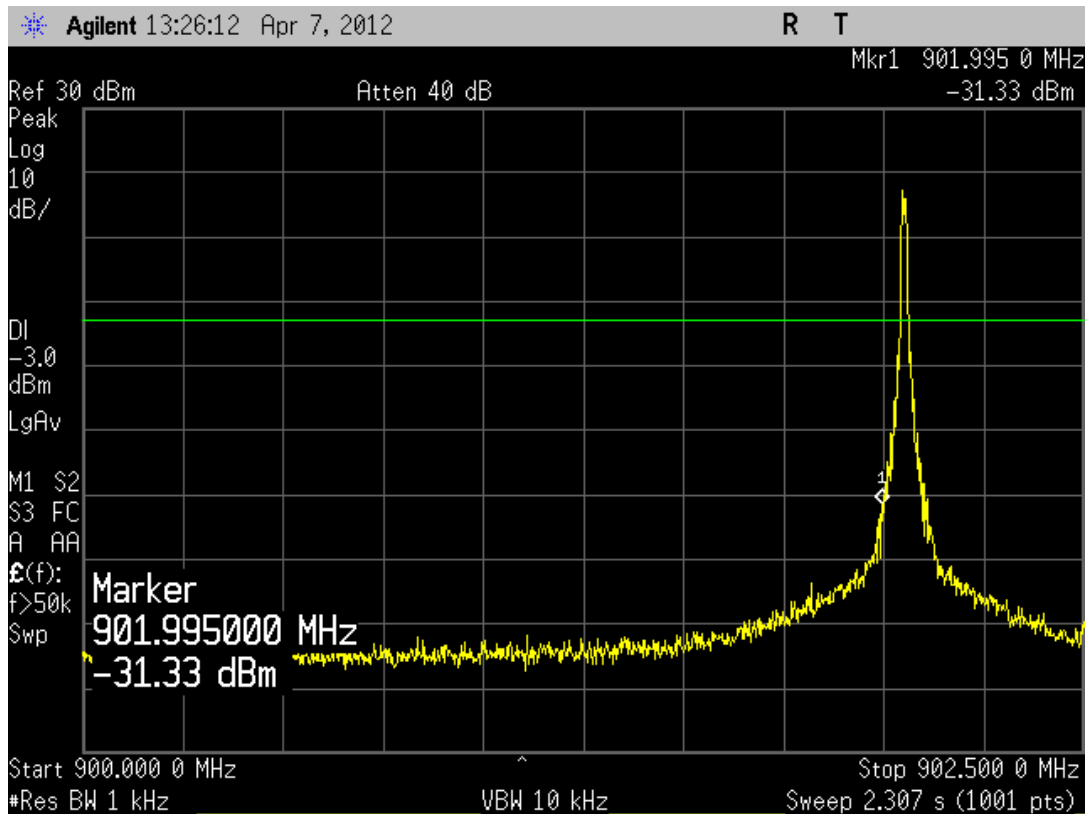


Figure 15. Band-edge compliance, low end, hopping ON (hopping between lowest and highest channel)

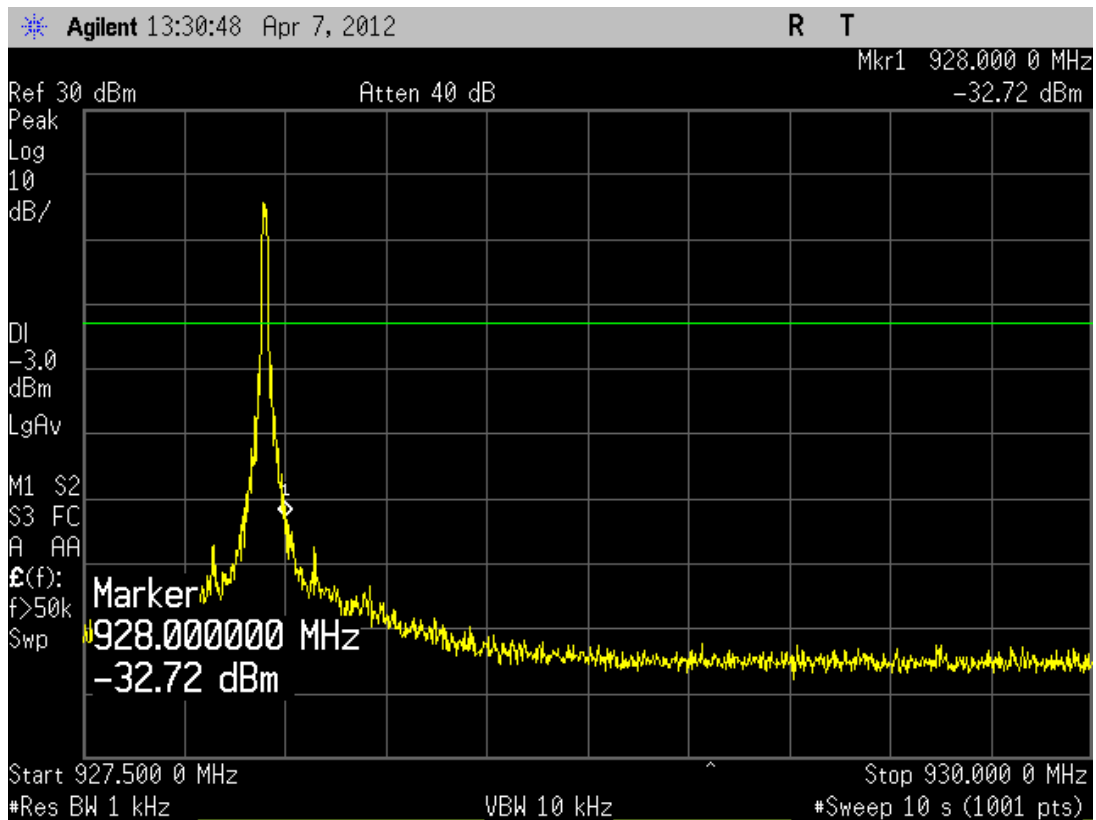


Figure 16. Band-edge compliance, High end, hopping OFF

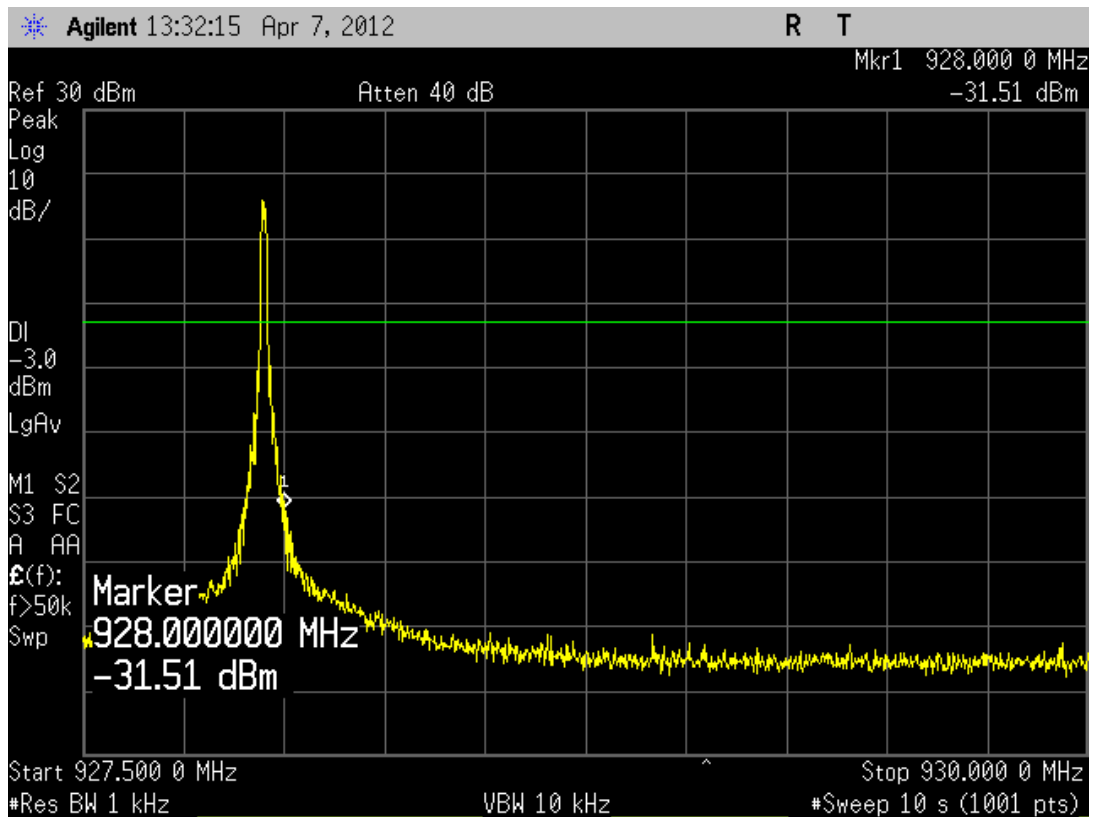


Figure 17. Band-edge compliance, high end, hopping ON (hopping between lowest and highest channel)

4.8 Conducted spurious emission

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	Nemko Oy / Perkaa
<i>FCC rule part</i>	§ 15.247, (d)
<i>Section in RSS-210</i>	A8.5
<i>Date of testing</i>	7.4.2012
<i>Test equipment</i>	566, 572
<i>Test conditions</i>	23 °C, 30 % RH
<i>Test result</i>	PASS

4.8.1 EUT operation mode

<i>EUT operation mode</i>	Transmitting
<i>EUT channel</i>	Low, middle and high
<i>EUT TX power level</i>	Nominal

4.8.2 Test method and limit

CFR 47 Part 15, Subpart C, section 15.247d limit

<i>Frequency band MHz</i>	<i>Peak limit dBc</i>
30 - 10000	-20

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)).

4.8.3 Test results limit

Antenna contact 1

<i>EUT Channel</i>	<i>Limit (dBc)</i>	<i>Result (dBc)</i>
low	≤ -20	all <-40
middle	≤ -20	all <-40
high	≤ -20	all <-40

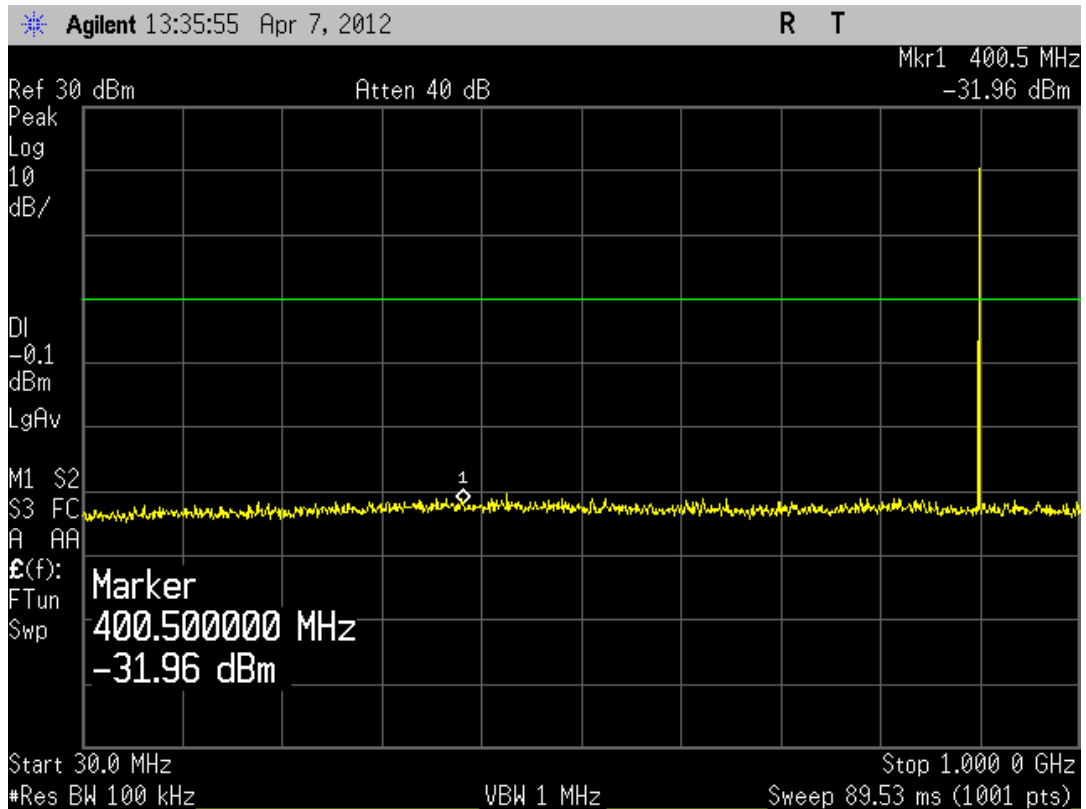


Figure 18. Conducted spurious emissions, low channel

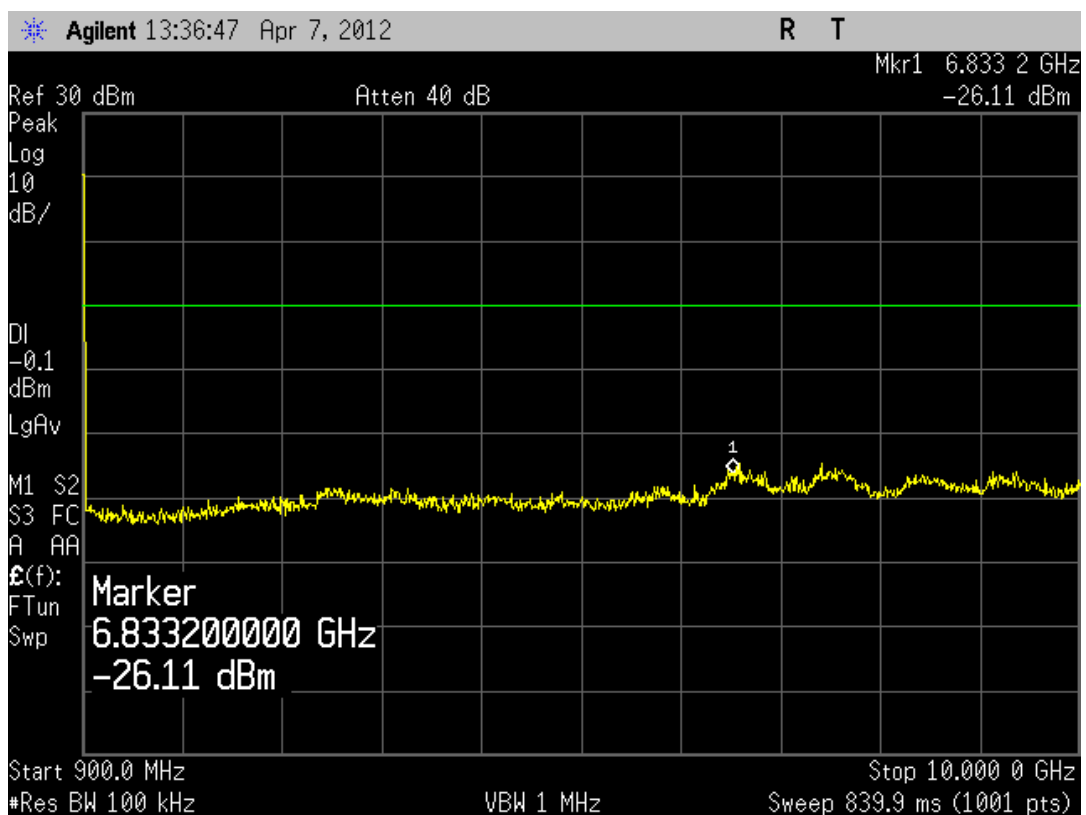


Figure 19. Conducted spurious emissions, low channel

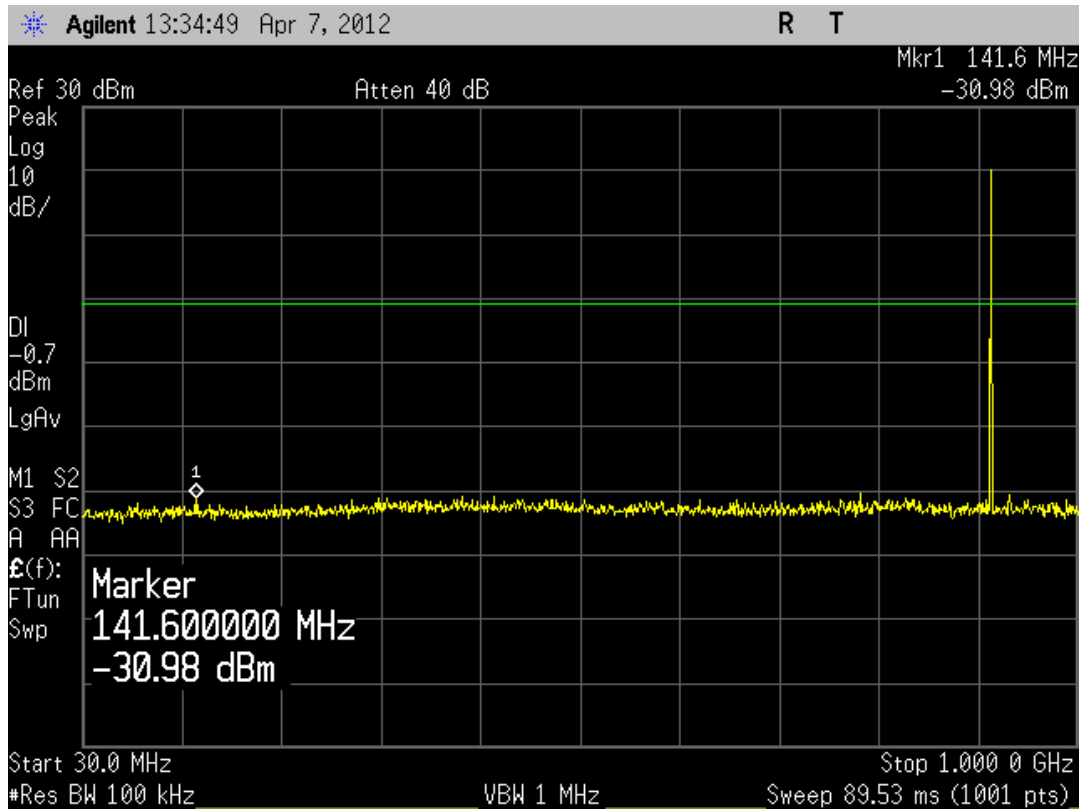


Figure 20. Conducted spurious emissions, middle channel

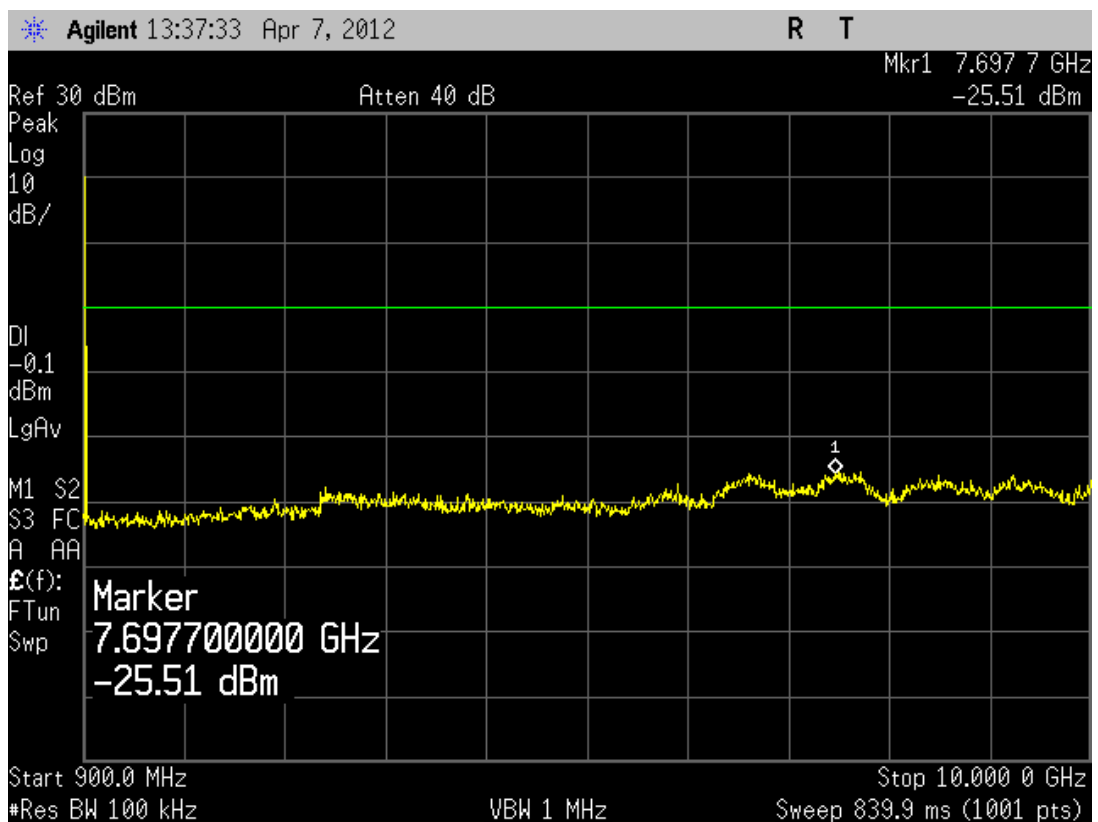


Figure 21. Conducted spurious emissions, middle channel

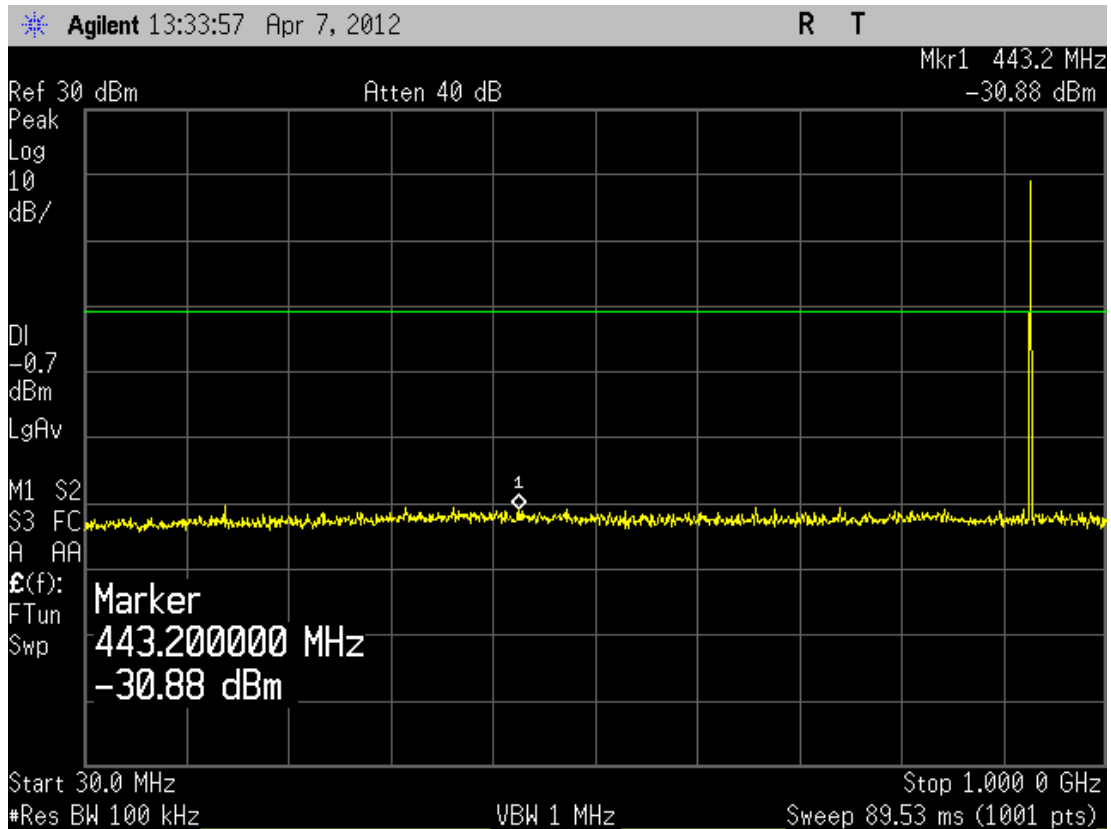


Figure 22. Conducted spurious emissions, high channel

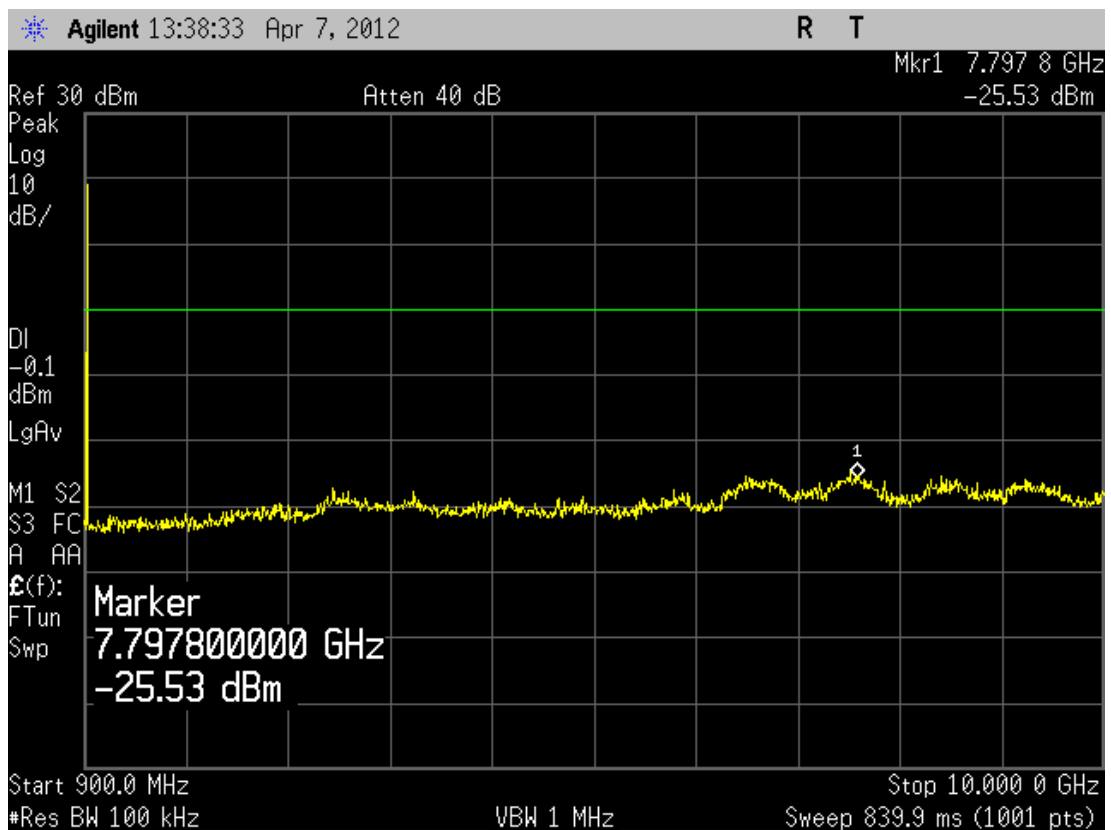


Figure 23. Conducted spurious emissions, high channel

4.9 Spurious radiated emission

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	Nemko Oy / Perkaa
<i>FCC rule part</i>	§ 15.247, (d)
<i>Section in RSS-210</i>	A8.5
<i>Date of testing</i>	7.4.2012, 8.6.2012 and 18.6.2012
<i>Test equipment</i>	566, 709, 319, 544, 564, 572, 525
<i>Test conditions</i>	23 °C, 30 - 40 % RH
<i>Test result</i>	PASS

4.9.1 EUT operation mode

<i>EUT operation mode</i>	Transmitting
<i>EUT channel</i>	Low, middle and high
<i>EUT TX power level</i>	Nominal

4.9.2 Test method and limit

The test was performed in a semi-anechoic shielded room. The EUT was placed on a non-conductive 0.8 m high table standing on the turntable (photographs 1-5). During the test in the frequency range 30-10000 MHz the distance from the EUT to the measuring antenna was 3 m. In order to find the maximum levels of the disturbance radiation the angle of the turntable and the height of the measuring antenna were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations. The measurements were performed the EUT at all three orthogonal planes.

Vertical and horizontal polarizations in the frequency range 30 – 1000 MHz was measured by using the peak detector. During the peak detector scan the turntable was rotated from 0° to 360° with 30° steps with the antenna heights 1.0 m and 3.0 m. The highest levels of the radiated interference field strength measured by using the quasi-peak detector were recorded.

Vertical and horizontal polarizations in the frequency range 1000 – 10000 MHz was measured by using the peak detector. During the measurement the turntable was rotated from 0° to 360° and the antenna was raised from 1.0 m and 4.0 m. The highest levels of the radiated interference field strength measured by using the peak and average detector were recorded.

The CFR 47 Part 15, Subpart C, limit of 500 µV/m has been calculated to correspond 54 dB(µV/m) as follows: $[dB(\mu V/m)] = 20 \log[\mu V/m]$.

The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33

CFR 47 Part 15, Subpart C, section 15.247d limit (3m measuring distance)

<i>Frequency band MHz</i>	<i>Peak limit dBc</i>
30 - 10000	-20

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)).

Section 15.205(a) restricted bands

MHz	MHz	GHz
37.5 - 38.25	960 - 1240	4.5 - 5.15
73 - 74.6	1300 - 1427	5.35 - 5.46
74.8 - 75.2	1435 - 1626.5	7.25 - 7.75
108 - 121.94	1645.5 - 1646.5	8.025 - 8.5
123 - 138	1660 - 1710	9.0 - 9.2
149.9 - 150.05	1718.8 - 1722.2	9.3 - 9.5
156.52475 - 156.52525	2200 - 2300	10.6 - 12.7
156.7 - 156.9	2310 - 2390	
162.0125 - 167.17	2483.5 - 2500	
167.72 - 173.2	2690 - 2900	
240 - 285	3260 - 3267	
322 - 335.4	3332 - 3339	
399.9 - 410	3345.8 - 3358	
608 - 614	3600 - 4400	

FCC 15.209(a) general limit (3m measuring distance)

Frequency band MHz	Quasi-peak limit dB(μ V/m)
30 - 88	40
88 - 216	43.5
216 - 960	46.0
960 - 1000	54

FCC 15.209(a) general limit (3m measuring distance)

Frequency band MHz	Average limit dB(μ V/m)	Peak limit dB(μ V/m)
1000 - 10000	54	74

The measurement results were obtained as described below.

$$E [\mu\text{V/m}] = U_{RX} + A_{CABLE} + AF - G_{PREAMP}$$

Where

U_{RX} receiver reading

A_{CABLE} attenuation of the cable

AF antenna factor

G_{PREAMP} gain of the preamplifier

Duty Cycle correction factor(dB) -6.3 dB was used. (RFon 48.4ms/100ms)

4.9.3 Test results

<i>EUT Channel</i>	<i>Limit (dBc)</i>	<i>Result (dBc)</i>
low	≤ -20	all <-30
middle	≤ -20	all <-30
high	≤ -20	all <-30

Antenna 5

Test results Section 15.205(a) restricted bands (peak and average, AV=PK+duty cycle corr.):

Low channel 902.050 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{pk} dBc</i>	<i>Limit_{pk} dBc</i>	<i>Margin dB</i>
1804.10	63.0	na	na	56.7	na	na	-58.0	-20	38.0
2706.15	54.1	74	19.9	47.8	54	6.2	-66.9	-20	46.9
3608.20	44.6	74	29.4	38.3	54	15.7	-76.4	-20	56.4
4510.25	39.7	74	34.3	33.4	54	20.6	-81.3	-20	61.3
5412.30	41.3	74	32.7	35.0	54	19.0	-79.7	-20	59.7
6314.35	42.3	na	na	36.0	na	na	-78.7	-20	58.7
7216.40	43.7	na	na	37.4	na	na	-77.3	-20	57.3
8118.45	44.3	74	29.7	38.0	54	16.0	-76.7	-20	56.7
9020.50	46.9	74	27.1	40.6	54	13.4	-74.1	-20	54.1

Middle channel 915.000 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{pk} dBc</i>	<i>Limit_{pk} dBc</i>	<i>Margin dB</i>
1830.00	58.7	na	na	52.4	na	na	-62.3	-20	42.3
2745.00	59.7	74	14.3	53.4	54	0.6	-61.3	-20	41.3
3660.00	46.6	74	27.4	40.3	54	13.7	-74.4	-20	54.4
4575.00	40.6	74	33.4	34.3	54	19.7	-80.4	-20	60.4
5490.00	41.2	na	na	34.9	na	na	-79.8	-20	59.8
6405.00	42.3	na	na	36.0	na	na	-78.7	-20	58.7
7320.00	44.3	74	29.7	38.0	54	16.0	-76.7	-20	56.7
8235.00	46.5	74	27.5	40.2	54	13.8	-74.5	-20	54.5
9150.00	47.8	74	26.2	41.5	54	12.5	-73.2	-20	53.2

High channel 927.950 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{pk} dBc</i>	<i>Limit_{pk} dBc</i>	<i>Margin dB</i>
1855.90	52.6	na	na	46.3	na	na	-68.4	-20	48.4
2783.85	54.7	74	19.3	48.4	54	5.6	-66.3	-20	46.3
3711.80	48.2	74	25.8	41.9	54	12.1	-72.8	-20	52.8
4639.75	40.6	74	33.4	34.3	54	19.7	-80.4	-20	60.4
5567.70	41.0	na	na	34.7	na	na	-80.0	-20	60.0
6495.65	42.9	na	na	36.6	na	na	-78.1	-20	58.1
7423.60	45.7	74	28.3	39.4	54	14.6	-75.3	-20	55.3
8351.55	46.7	74	27.3	40.4	54	13.6	-74.3	-20	54.3
9279.50	47.2	na	na	40.9	na	na	-73.8	-20	53.8

Antenna 1

Test results Section 15.205(a) restricted bands (peak and average, AV=PK+duty cycle corr.):

Low channel 902.050 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2706.15	56.5	74	17.5	50.2	54	3.8
3608.20	45.5	74	28.5	39.2	54	14.8
4510.25	45.7	74	28.3	39.4	54	14.6
5412.30	46.9	74	27.1	40.6	54	13.4
8118.45	51.2	74	22.8	44.9	54	9.1
9020.50	54.4	74	19.6	48.1	54	5.9

Middle channel 915.000 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2745.00	57.2	74	16.8	50.9	54	3.1
3660.00	47.3	74	26.7	41.0	54	13.0
4575.00	45.2	74	28.8	38.9	54	15.1
7320.00	50.5	74	23.5	44.2	54	9.8
8235.00	51.4	74	22.6	45.1	54	8.9
9150.00	53.4	74	20.6	47.1	54	6.9

High channel 927.950 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2783.85	55.7	74	18.3	49.4	54	4.6
3711.80	49.4	74	24.6	43.1	54	10.9
4639.75	45.1	74	28.9	38.8	54	15.2
7423.60	52.2	74	21.8	45.9	54	8.1
8351.55	52.3	74	21.7	46.0	54	8.0

Antenna 2

Test results Section 15.205(a) restricted bands (peak and average, AV=PK+duty cycle corr.):

Low channel 902.050 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2706.15	46.7	74	27.3	40.4	54	13.6
3608.20	45.9	74	28.1	39.6	54	14.4
4510.25	46.7	74	27.3	40.4	54	13.6
5412.30	46.6	74	27.4	40.3	54	13.7
8118.45	50.7	74	23.3	44.4	54	9.6
9020.50	53.3	74	20.7	47.0	54	7.0

Middle channel 915.000 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2745.00	51.9	74	22.1	45.6	54	8.4
3660.00	46.5	74	27.5	40.2	54	13.8
4575.00	45.6	74	28.4	39.3	54	14.7
7320.00	50.5	74	23.5	44.2	54	9.8
8235.00	51.7	74	22.3	45.4	54	8.6
9150.00	53.5	74	20.5	47.2	54	6.8

High channel 927.950 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2783.85	49.6	74	24.4	43.3	54	10.7
3711.80	48.3	74	25.7	42.0	54	12.0
4639.75	44.9	74	29.1	38.6	54	15.4
7423.60	51.4	74	22.6	45.1	54	8.9
8351.55	52.0	74	22.0	45.7	54	8.3

Antenna 3

Test results Section 15.205(a) restricted bands (peak and average, AV=PK+duty cycle corr.):

Low channel 902.050 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2706.15	54.1	74	19.9	47.8	54	6.2
3608.20	44.8	74	29.2	38.5	54	15.5
4510.25	45.0	74	29.0	38.7	54	15.3
5412.30	47.0	74	27.0	40.7	54	13.3
8118.45	50.3	74	23.7	44.0	54	10.0
9020.50	52.8	74	21.2	46.5	54	7.5

Middle channel 915.000 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2745.00	58.5	74	15.5	52.2	54	1.8
3660.00	48.0	74	26.0	41.7	54	12.3
4575.00	44.3	74	29.7	38.0	54	16.0
7320.00	50.9	74	23.1	44.6	54	9.4
8235.00	51.5	74	22.5	45.2	54	8.8
9150.00	54.2	74	19.8	47.9	54	6.1

High channel 927.950 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2783.85	54.7	74	19.3	48.4	54	5.6
3711.80	50.0	74	24.0	43.7	54	10.3
4639.75	44.8	74	29.2	38.5	54	15.5
7423.60	52.0	74	22.0	45.7	54	8.3
8351.55	52.7	74	21.3	46.4	54	7.6

Antenna 4

Test results Section 15.205(a) restricted bands (peak and average, AV=PK+duty cycle corr.):

Low channel 902.050 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2706.15	49.3	74	24.7	43.0	54	11.0
3608.20	46.5	74	27.5	40.2	54	13.8
4510.25	45.2	74	28.8	38.9	54	15.1
5412.30	46.1	74	27.9	39.8	54	14.2
8118.45	50.0	74	24.0	43.7	54	10.3
9020.50	52.6	74	21.4	46.3	54	7.7

Middle channel 915.000 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2745.00	56.2	74	17.8	49.9	54	4.1
3660.00	48.8	74	25.2	42.5	54	11.5
4575.00	45.0	74	29.0	38.7	54	15.3
7320.00	50.3	74	23.7	44.0	54	10.0
8235.00	51.1	74	22.9	44.8	54	9.2
9150.00	53.7	74	20.3	47.4	54	6.6

High channel 927.950 MHz

<i>Frequency MHz</i>	<i>Level_{pk} dB(μV/m)</i>	<i>Limit_{pk} dB(μV/m)</i>	<i>Margin dB</i>	<i>Level_{ave} dB(μV/m)</i>	<i>Limit_{ave} dB(μV/m)</i>	<i>Margin dB</i>
2783.85	56.3	74	17.7	50.0	54	4.0
3711.80	48.2	74	25.8	41.9	54	12.1
4639.75	44.8	74	29.2	38.5	54	15.5
7423.60	52.0	74	22.0	45.7	54	8.3
8351.55	51.9	74	22.1	45.6	54	8.4

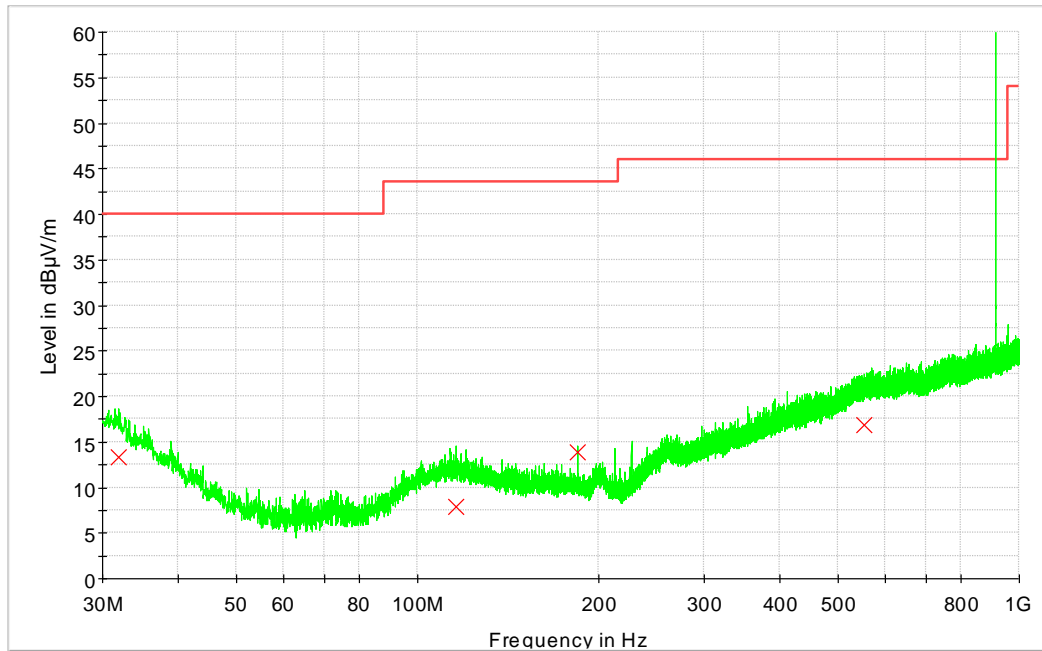


Figure 24. Radiated spurious emissions, middle channel

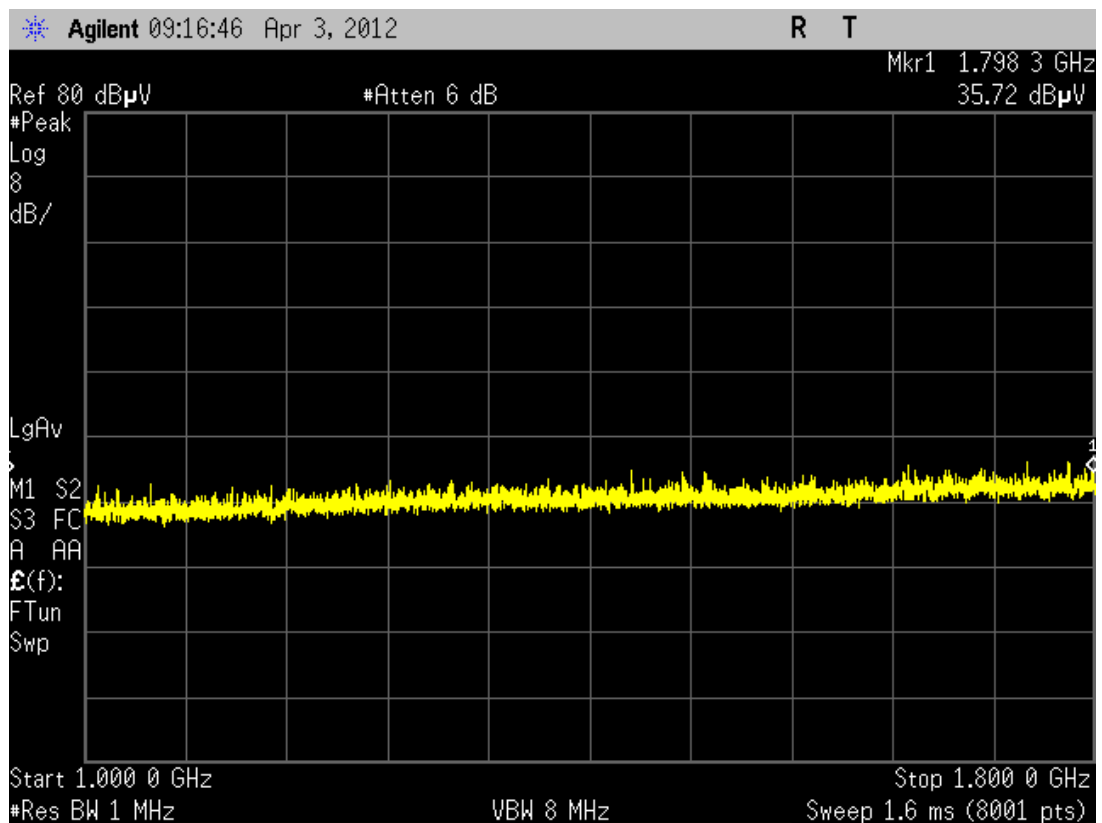


Figure 25. Radiated spurious emissions, middle channel

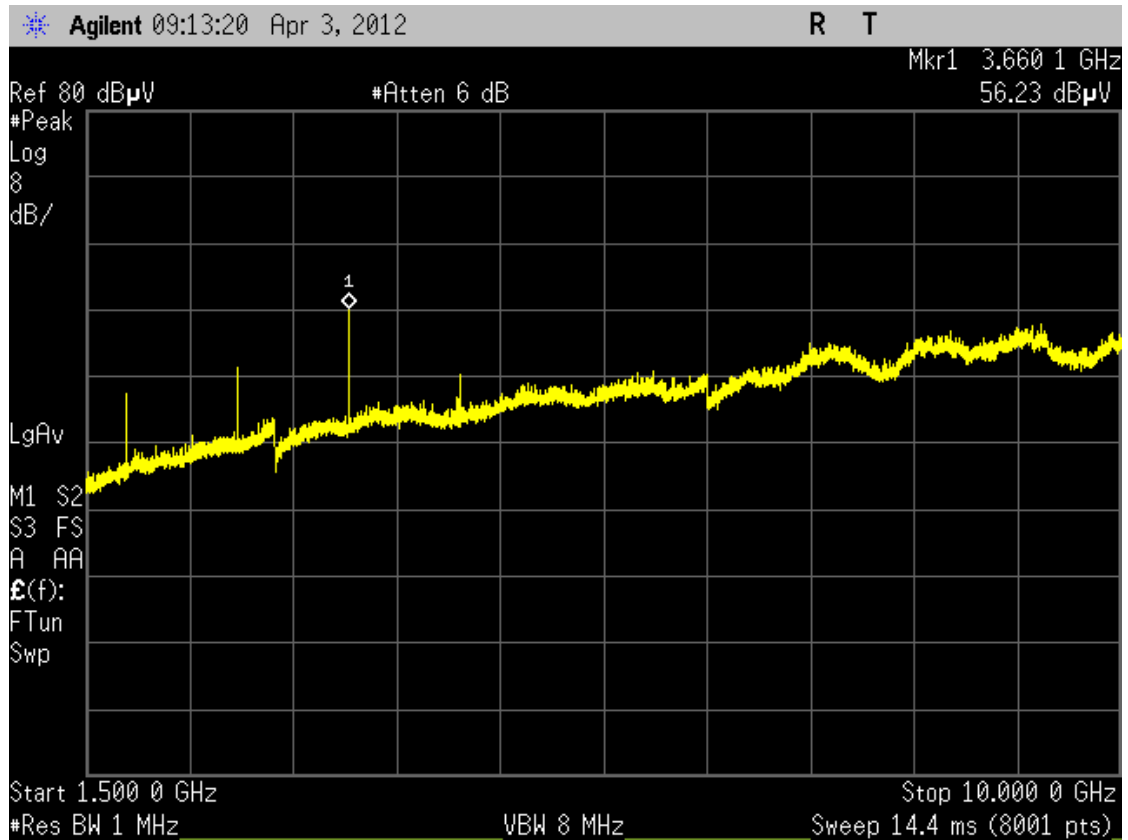


Figure 26. Radiated spurious emissions, middle channel

4.10 Unintentional radiator, radiated emission

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	Nemko Oy / Perkaa
<i>FCC rule part</i>	§ 15.109
<i>Section in RSS-210</i>	2.3
<i>Date of testing</i>	7-10.4.2012
<i>Test equipment</i>	566, 709, 319, 544, 564, 525
<i>Test conditions</i>	23 °C, 30 % RH
<i>Test result</i>	PASS

4.10.1 EUT operation mode

<i>EUT operation mode</i>	Receiving
<i>EUT channel</i>	Low, middle and high

4.10.2 Test method and limit

The test was performed in a semi-anechoic shielded room. The EUT was placed on a non-conductive 0.8 m high table standing on the turntable (photograph 1). During the test in the frequency range 30-5000 MHz the distance from the EUT to the measuring antenna was 3 m. In order to find the maximum levels of the disturbance radiation the angle of the turntable and the height of the measuring antenna were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations.

Vertical and horizontal polarizations in the frequency range 30 – 1000 MHz was measured by using the peak detector. During the peak detector scan the turntable was rotated from 0° to 360° with 30° steps with the antenna heights 1.0 m and 3.0 m. The highest levels of the radiated interference field strength measured by using the quasi-peak detector were recorded.

Vertical and horizontal polarizations in the frequency range 1000 – 5000 MHz were measured by using the peak detector. During the measurement the turntable was rotated from 0° to 360° and the antenna was raised from 1.0 m and 4.0 m. The highest levels of the radiated interference field strength measured by using the peak and average detectors were recorded.

The CFR 47 Part 15, Subpart C, limit of 500 $\mu\text{V/m}$ has been calculated to correspond 54 dB($\mu\text{V/m}$) as follows: $[\text{dB}(\mu\text{V/m})]=20\log[\mu\text{V/m}]$.

FCC 15.109 limit (3m measuring distance)

<i>Frequency band MHz</i>	<i>Quasi-peak limit dB($\mu\text{V/m}$)</i>
30 - 88	40
88 - 216	43.5
216 - 960	46.0
960 - 1000	54

FCC 15.109 limit (3m measuring distance)

<i>Frequency band MHz</i>	<i>Average limit dB($\mu\text{V/m}$)</i>	<i>Peak limit dB($\mu\text{V/m}$)</i>
1000 - 10000	54	74

4.10.3 Test results

<i>EUT Channel</i>	<i>Limit dB(μV/m)</i>	<i>Result dB(μV/m)</i>
low	40-54	all <-20dB to limit
middle	40-54	all <-20dB to limit
high	40-54	all <-20dB to limit

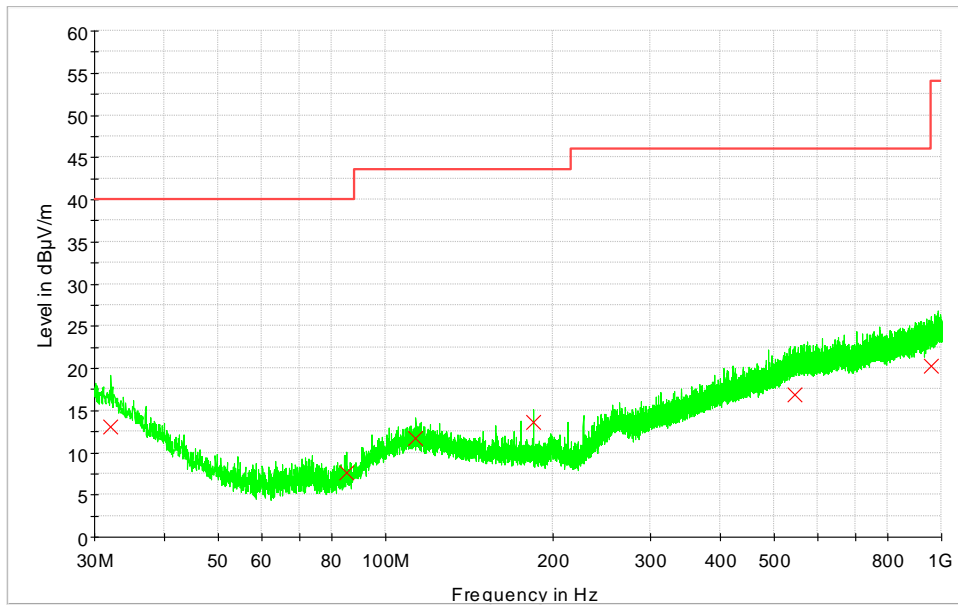


Figure 27. Radiated emissions, Rx, middle channel

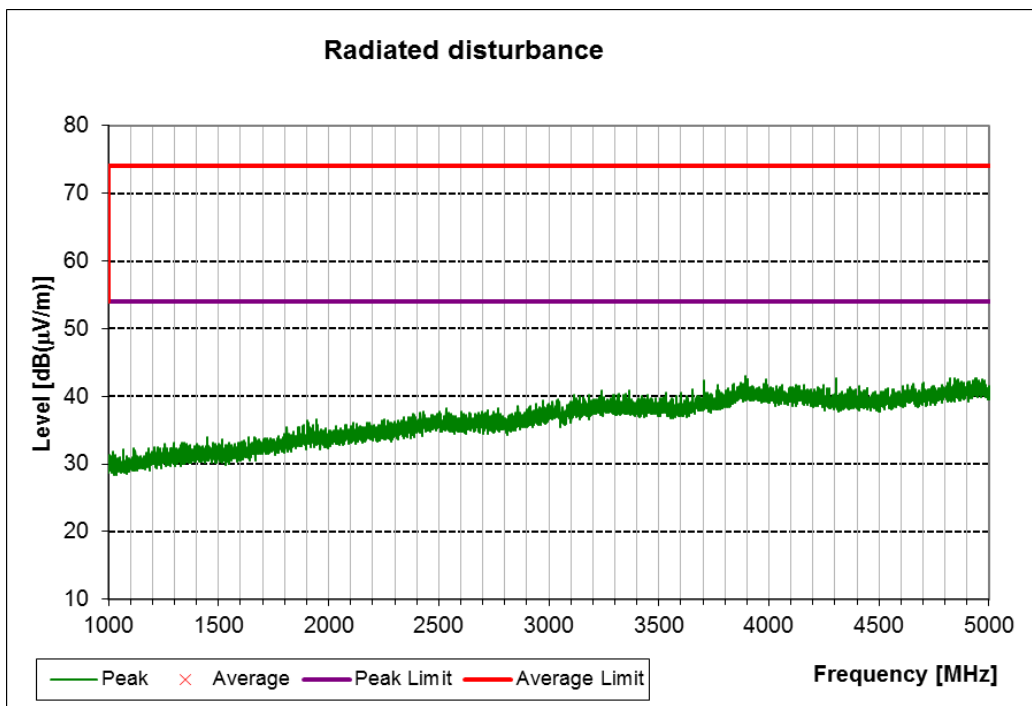


Figure 28. Radiated emissions, Rx, middle channel

5. List of test equipment

Each active test equipment is calibrated once a year, antennas every 18 months and other passive equipment every 24 months.

Nr.	Equipment	Type	Manufacturer	Serial number
338	Test receiver	ESS	Rohde & Schwarz	847151/009
10	Oscilloscope	9400A	LeCroy	8878
42	Spectrum analyzer	8566B	Hewlett Packard	2637A04102
168	Artificial Mains	NSLK 8127	Schwartzbeck	8127162
184	Temp. & humidity meter	H MI 32	Vaisala	63837
188	Antenna	CBL6111	Chase	1028
319	Antenna	CBL6112	Chase	2018
348	Shielded room	RFSD-100	Euroshield Oy	1320
350	Semianechoic shielded room	RFD-F-100	Euroshield Oy	1327
351	RF generator	SMT 06	Rohde & Schwarz	845715/001
371	AC Power source	500i-400	California Instr.	HK 52064
519	RF High-Power Attenuator	765-20	Narda	
525	Double-Ridged Horn	3115	Emco	6691
542	Double-Ridged Horn	3115	Emco	00023905
544	RF-amplifier	ZFL-2000VH2	Mini-Circuits	QA0749010
559	Highpass Filter	WHKX3.0/18G-10SS	Wainwright Instruments	1
550	Notch Filter	WRCD1800/2000-0.2/40-5SSSD	Wainwright Instruments	1
564	RF-amplifier	CA018-4010	CIAO Wireless	132
566	Spectrum analyzer	E4448A	Agilent	US42510236
571	Highpass Filter	WHK0.6/13G-10SS	Wainwright Instruments	1
572	Highpass Filter	WHKX1.5/15G-12SS	Wainwright Instruments	4
709	Test receiver	ESU8	Rohde & Schwarz	100297

6. Photographs



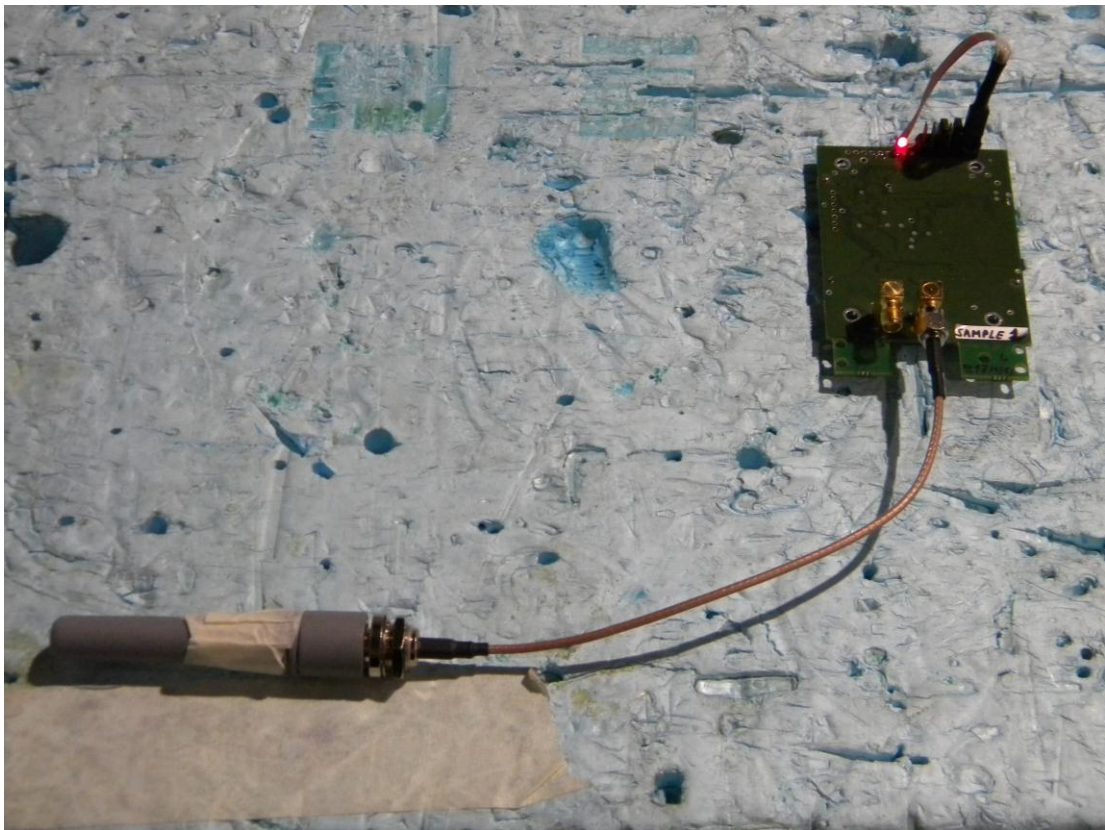
Photograph 1. Radiated emissions test setup, antenna 1.



Photograph 2. Radiated emissions test setup, antenna 2.



Photograph 3. Radiated emissions test setup, antenna 3.



Photograph 4. Radiated emissions test setup, antenna 4.



Photograph 5. Radiated emissions test setup, antenna 5.