REPORT: **FCC / IC Radio Frequency (RF) test report**

PRODUCT:

Test item description:	Radio remote control
Trade Mark:	Scanreco RC400
Model/Type reference:	G4 ECONOMY / 48390
Serial number:	TEST001 TEST002
Customer:	SCANRECO Industrielektronik AB BOX 47144 / Årsta Skolgränd 22 S-100 74 Stockholm Sweden
Contact person:	Katrin Ekvall
Manufacturer:	SCANRECO Industrielektronik AB BOX 47144 / Årsta Skolgränd 22 S-100 74 Stockholm Sweden

DATE: **30.11.2009**

TESTED BY: Matti Virkki ; Test engineer

APPROVED BY: Tuomo Hahl ; Test engineer

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1 LABORATORY INFORMATION

Test Laboratory	Intertek ETL Semko OY EMC Laboratory Koneenkatu 12 / K17 05830 Hyvinkää FINLAND Tel: +358 10 424 6200 Fax: +358 10 424 6201 e-mail: firstname.surname@intertek.com
FCC registration number: **IC file number:**	910391 (January 27, 2003) IC 2042C-1 (May 14, 2003)

2 SUMMARY OF TEST RESULTS

The tests listed in this report have been done to demonstrate compliance to the FCC rules section §15.107, §15.109, §15.247 and IC standard RSS-GEN / RSS-210.

Transmitter measurements

Section in CFR 47	Section in RSS-210	Test	Result
15.247, a 1	A8.1 (2)	Carrier frequency separation	PASS
15.247, a 1 iii	A8.1 (4)	Number of hopping frequencies	PASS
15.247, a 1 iii	A8.1 (4)	Time of occupancy	PASS
15.247, a	A8.1 (1)	20dB bandwidth	PASS
15.247, b 1	A8.4 (2)	Peak output power	PASS
15.247, d	A8.5	Band-edge compliance of RF emissions	PASS
15.247, d	A8.5	Spurious RF conducted emissions	PASS
15.247, d	A8.5	Radiated spurious emissions	PASS
	RSS-GEN 4.4.1	99% bandwidth	PASS

Receiver measurements

Section in CFR 47	Section in RSS-GEN	Section in ICES-003	Test	Result
§15.107	7.2.2	5.3	Conducted emissions to AC-power lines	-
§15.109	7.2.3	5.5	Radiated emissions	-

PASS Pass
FAIL Fail
X Measured, but there is no applicable performance criteria
- Not done

3 EUT INFORMATION

The EUT and accessories used in the tests are listed below. Later in this report only EUT numbers are used as reference.

	Device	Type	S/N	EUT number
EUT	Radio remote control	Scanreco G4 ECONOMY / 48390	TEST002, YYWW 0940	1*
	Radio remote control	Scanreco G4 ECONOMY / 48390	TEST001, YYWW 0940	2 **
Accessories	-	-	-	-

Notes:

* Antenna replaced with SMA-connector

** Continuous transmission

3.1 EUT description

EUT is handheld transmitter operating in the 900MHz ISM frequency band. The system supports only simplex communication.

The transmitter software was updated to switch off an amplifier output during frequency change.

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4 EUT TEST SETUPS

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

Two different test setups were used: one for conducted measurements, another for radiated measurements. One EUT was equipped with an external antenna connector for conductive measurements.

The test setup photographs are in the document referenced in section **Error! Reference source not found.**.

5 APPLICABLE STANDARDS

The tests were performed in guidance of:

CFR 47 Part:

§15.107
§15.109
§15.209
§15.247
ANSI C63.4 (2003)

IC standard:

RSS-GEN, Issue 1
RSS-210, Issue 7
CISPR 22, 2002

Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method" for each test case.

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6 CARRIER FREQUENCY SEPARATION

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	22 ºC	23 %RH	1004 hPa
Date of measurement	November 12, 2009		
FCC rule part	15.247, a 1		
RSS-210 section	A8.1 (2)		
Measured by	Matti Virkki		

6.1 Test setup and testing method

Picture 1: Test setup for carrier frequency separation measurement

Spectrum analyzer was set to sweep the EUT operating band 902 – 928 MHz. 10 kHz resolution bandwidth and maximum hold function was used to measure the EUT transmission over sufficient time. Carrier frequency separation was read from the screen.

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6.2 EUT operation mode

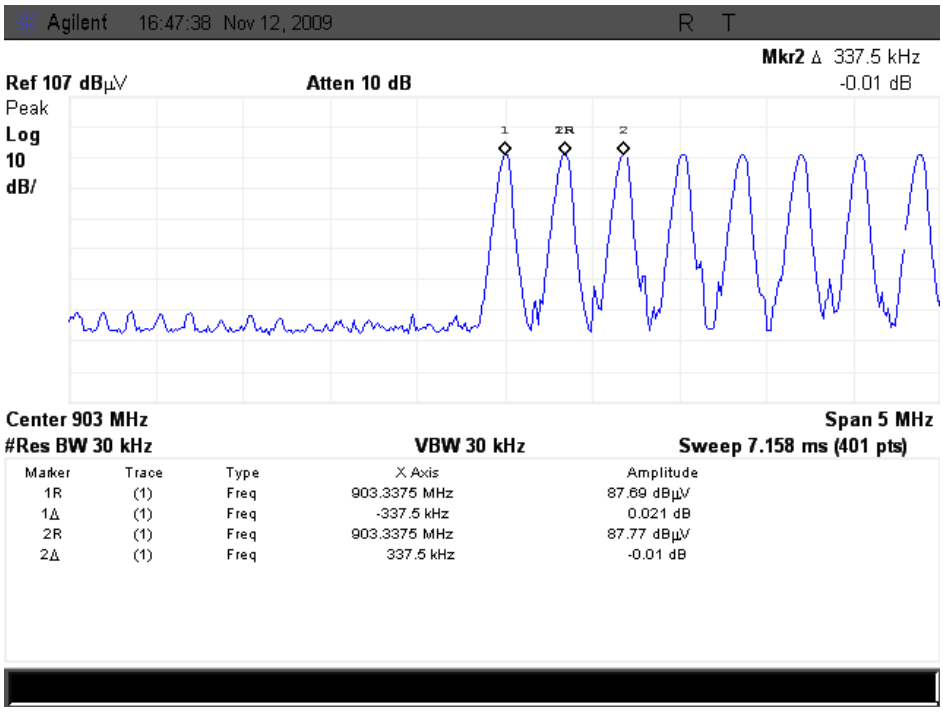
EUT operation mode	Transmit, FSK modulation
EUT channel	Hopping
EUT TX power level	max

6.3 Results

Table 1: Carrier frequency separation measurement results

Limit	Result
>25 kHz	337 kHz

6.4 Screen shots



Picture 2: Carrier frequency separation.

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7 NUMBER OF HOPPING FREQUENCIES

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	22 ºC	23 %RH	1004 hPa
Date of measurement	November 12, 2009		
FCC rule part	15.247, a 1 iii		
RSS-210 section	A8.1 (4)		
Measured by	Matti Virkki		

7.1 Test setup

Picture 3: Test setup for measurement of number of hopping frequencies

Spectrum analyzer was set to sweep the EUT operating band 902 – 928 MHz. 100 kHz resolution bandwidth and maximum hold function was used to measure the EUT transmission over sufficient time. Number of hopping frequencies was calculated from the screen.

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7.2 EUT operation mode

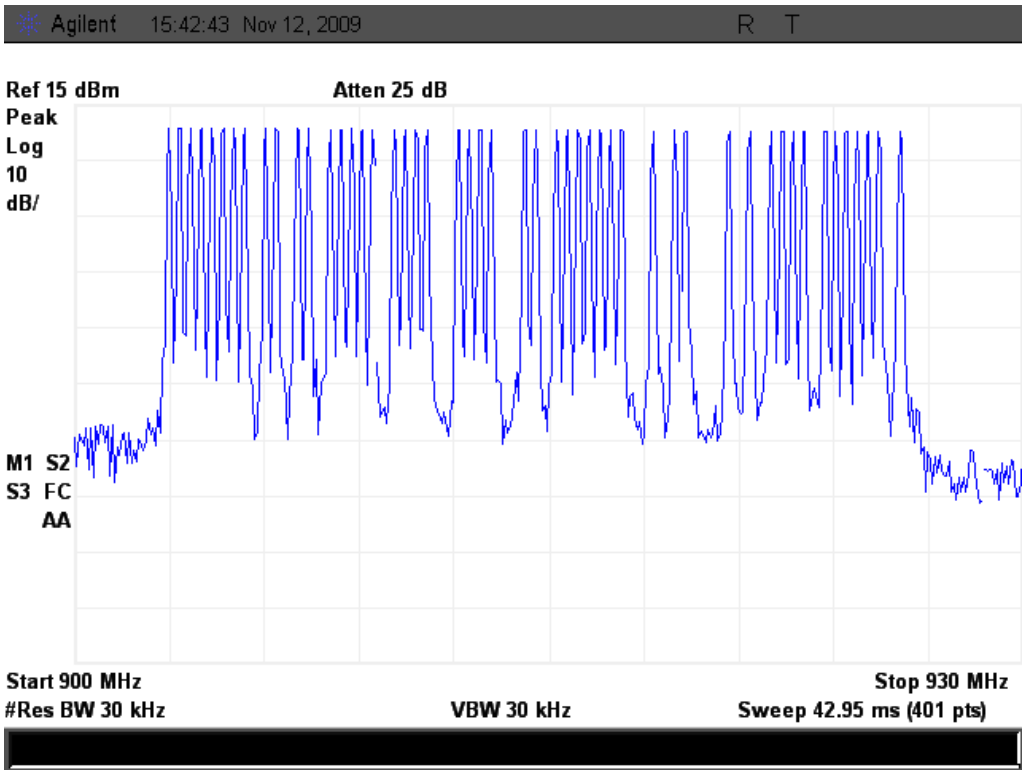
EUT operation mode	Transmit, FSK modulation
EUT channel	Hopping
EUT TX power level	max

7.3 Results

Table 2: Number of hopping frequencies measurement results

Limit	Result
≥ 50	50

7.4 Screen shots



Picture 4: Number of hopping frequencies measurement

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8 TIME OF OCCUPANCY

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	22 ºC	23 %RH	1004 hPa
Date of measurement	November 12, 2009		
FCC rule part	15.247, a 1 iii		
RSS-210 section	A8.1 (4)		
Measured by	Matti Virkki		

8.1 Test setup and testing method

Picture 5: Test setup for conducted RF output power measurement

Spectrum analyzer with single sweep and 0 Hz span was used to monitor the transmitter operation over time.

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8.2 EUT operation mode

EUT operation mode	Transmit, FSK modulation
EUT channel	Hopping
EUT TX power level	max

8.3 Results

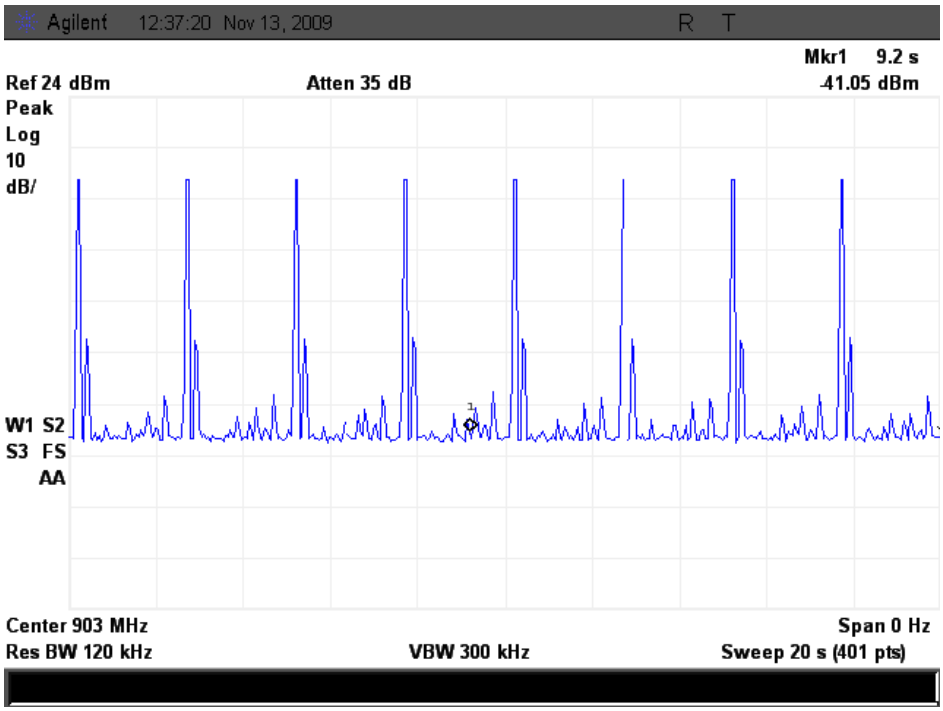
Table 3: Time of occupancy during connection mode measurement results

Limit	Result
≤ 0,4 s over 20 s period	0,298 s

Limit:
EUT's 20 dB bandwidth is less than 250 kHz. As defined in 15.247, a 1 i, the limit for time of occupancy is 0,4s within a 20 second period.

Results:
In measurement time of 20 s, total of 8 transmissions occurred. The duration of one transmission was 38 ms. Based on these measurements the transmitter operated 8 * 37,75 ms = 0,296 s during the 20 s period

8.4 Screen shots



Picture 6: Number of transmissions on connection state

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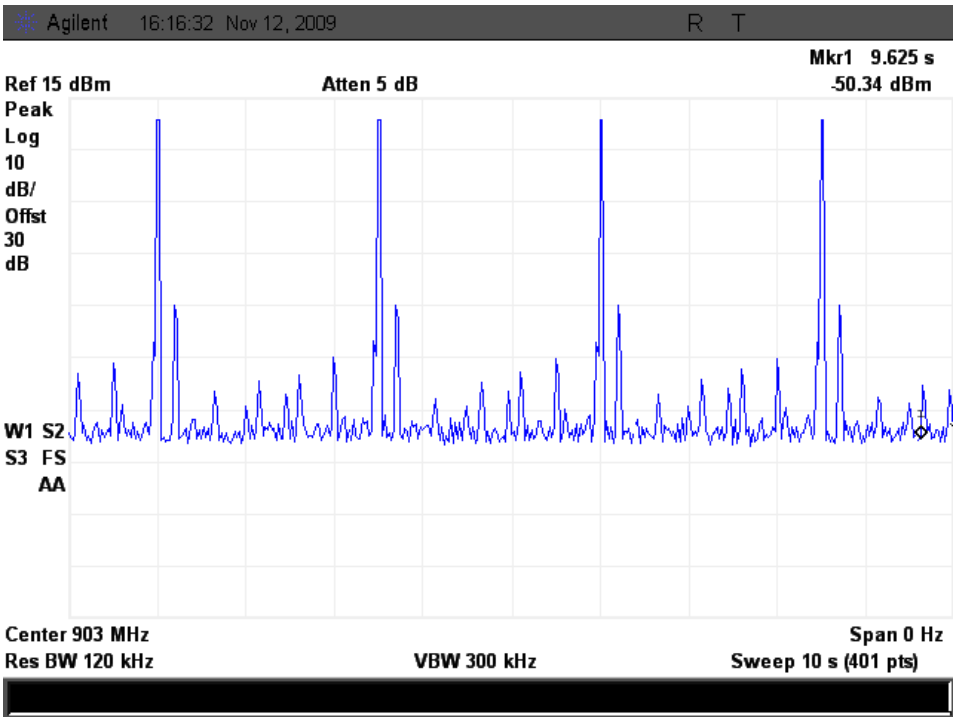
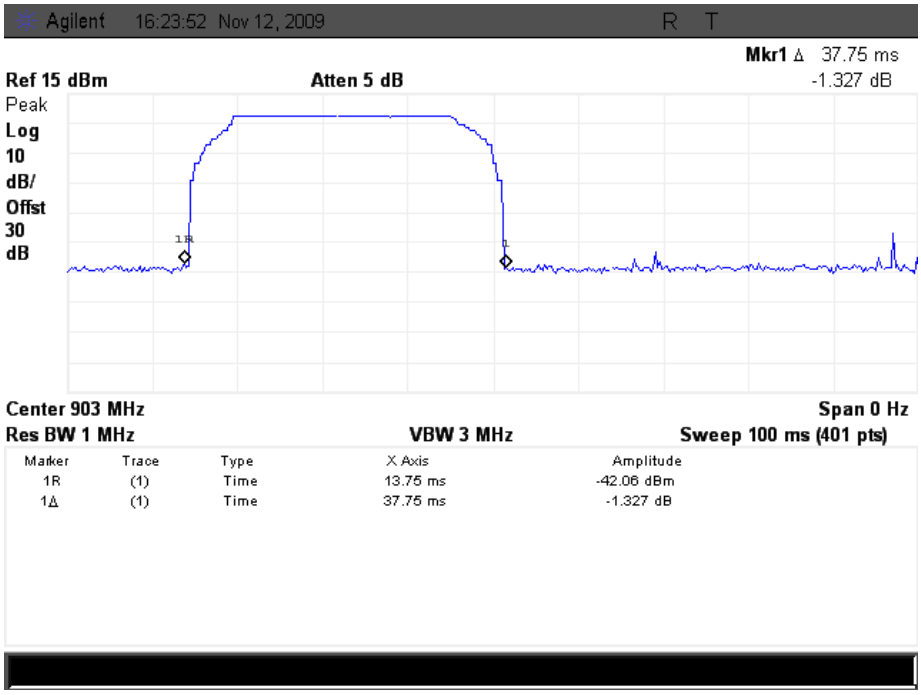


Picture 7: Number of transmissions on connection state, 10s



Picture 8: Duration of one transmission on connection state

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9 20 dB BANDWIDTH

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	22 ºC	23 %RH	1004 hPa
Date of measurement	November 12, 2009		
FCC rule part	15.247, a		
RSS-210 section	A8.1 (1)		
Measured by	Matti Virkki		

9.1 Test setup and measurement method

Picture 9: Test setup for conducted RF output power measurement

The 20dB bandwidth was measured using 100 Hz resolution bandwidth and maximum hold function of the spectrum analyzer. 20dB bandwidth was defined by measuring the maximum level on the measured channel and by placing delta markers 20 dB below this value and read the value.

9.2 EUT operation mode

EUT operation mode	Transmit, FSK modulation
EUT channel	Low, middle, high
EUT TX power level	max

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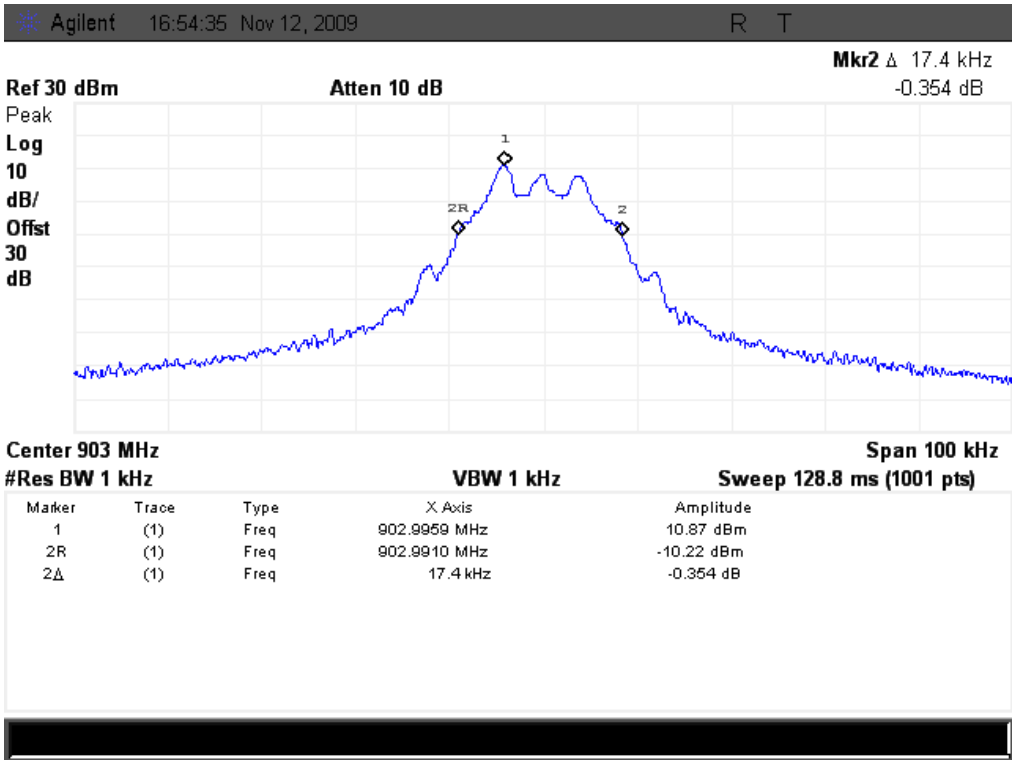
9.3 Results

Table 4: 20dB bandwidth measurement results

EUT Channel	Limit (kHz)	Measured value (kHz)
Low	≤ 500	17,4
Middle		17,4
High		17,3

9.4 Screen shots



Picture 10: 20dB Bandwidth measurement result, Low Channel

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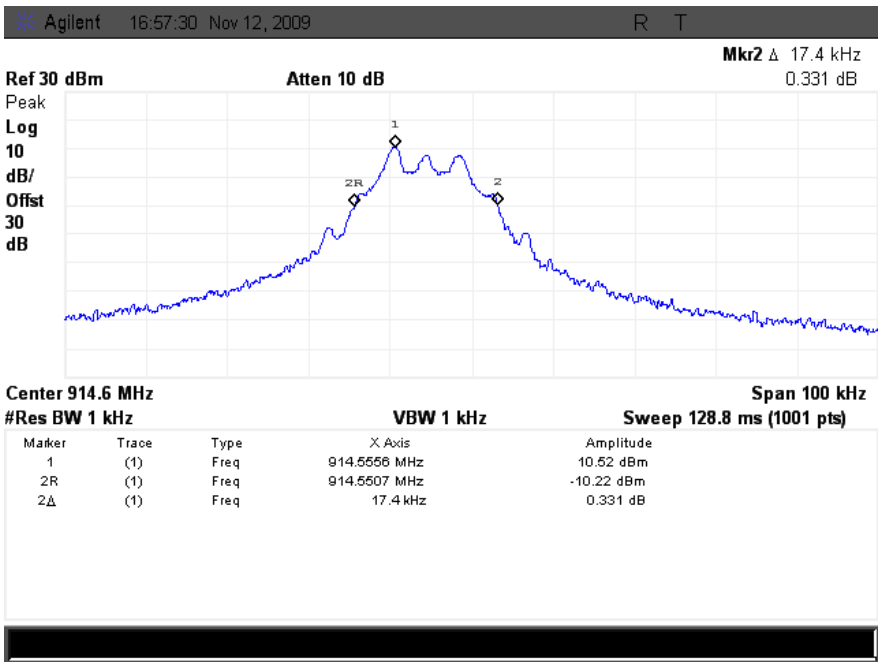
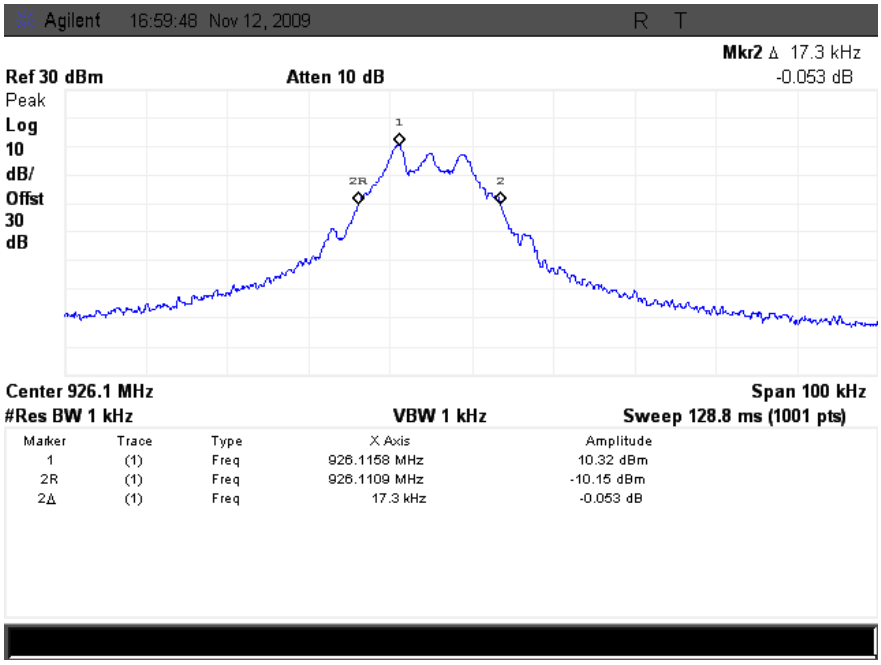


Picture 11: 20dB Bandwidth measurement result, Middle Channel



Picture 12: 20dB Bandwidth measurement result, High Channel

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10 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	22 ºC	23 %RH	1004 hPa
Date of measurement	November 12, 2009		
FCC rule part	15.247, d		
RSS-210 section	A8.5		
Measured by	Matti Virkki		

10.1 Test setup and measurement method

Picture 13: Test setup for band edge compliance measurement

Band edge compliance of RF-conducted emissions was measured by setting the band edge as center frequency in the spectrum analyzer and measuring the power on the transmission on channels low and high. The measured power and power on the band edge was then compared.

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10.2 Hopping enabled

10.2.1 EUT operation mode

EUT operation mode	Transmit, FSK modulation
EUT channel	Hopping
EUT TX power level	max

10.2.2 Results

Table 5: Number of hopping frequencies measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
Low	≤ -20	-56,5
High		-63,5

10.2.3 Screen shots

Picture 14: Band edge compliance, low channel, hopping enabled

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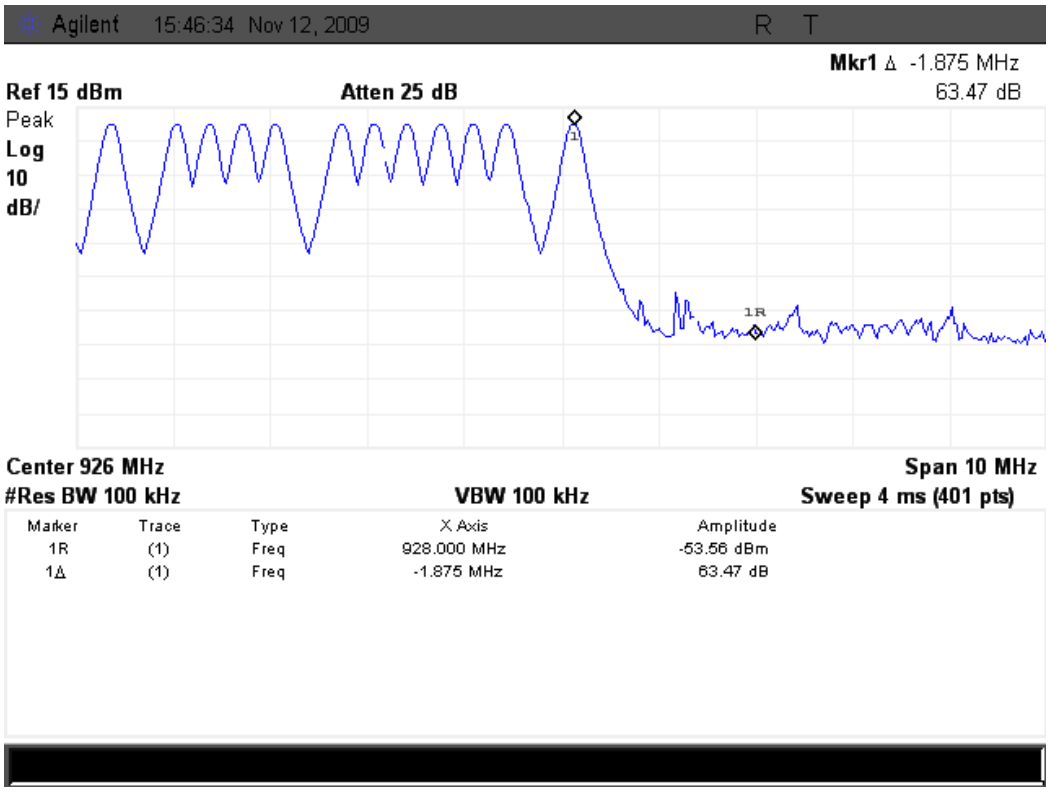

Picture 15: Band edge compliance, high channel, hopping enabled

10.3 Hopping disabled

10.3.1 EUT operation mode

EUT operation mode	Transmit, FSK modulation
EUT channel	Low, high
EUT TX power level	max

10.3.2 Results

Table 6: Band edge compliance measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
Low	≤ -20	-60,1
High		-60,0

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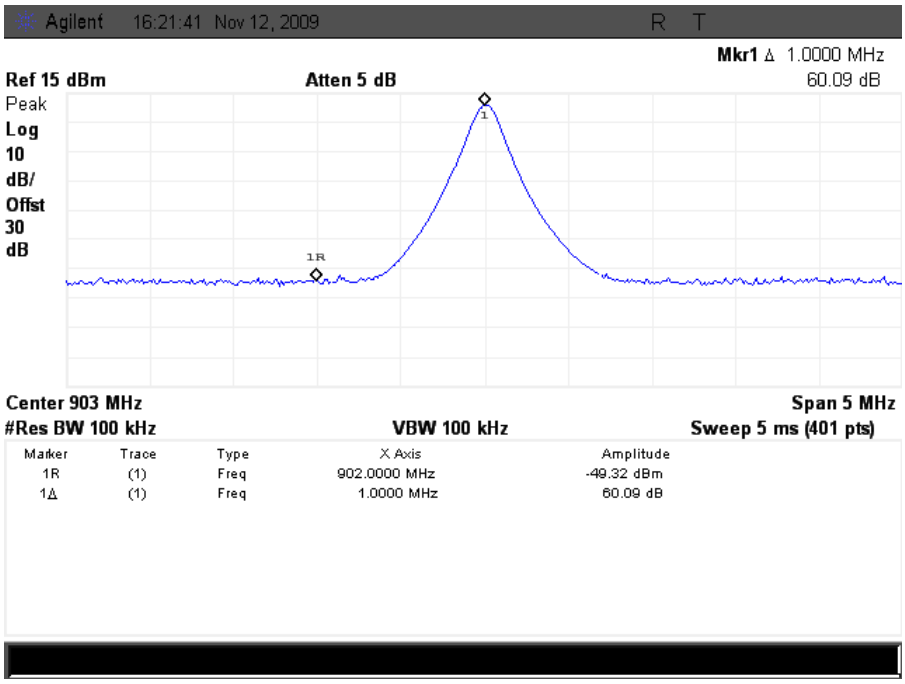
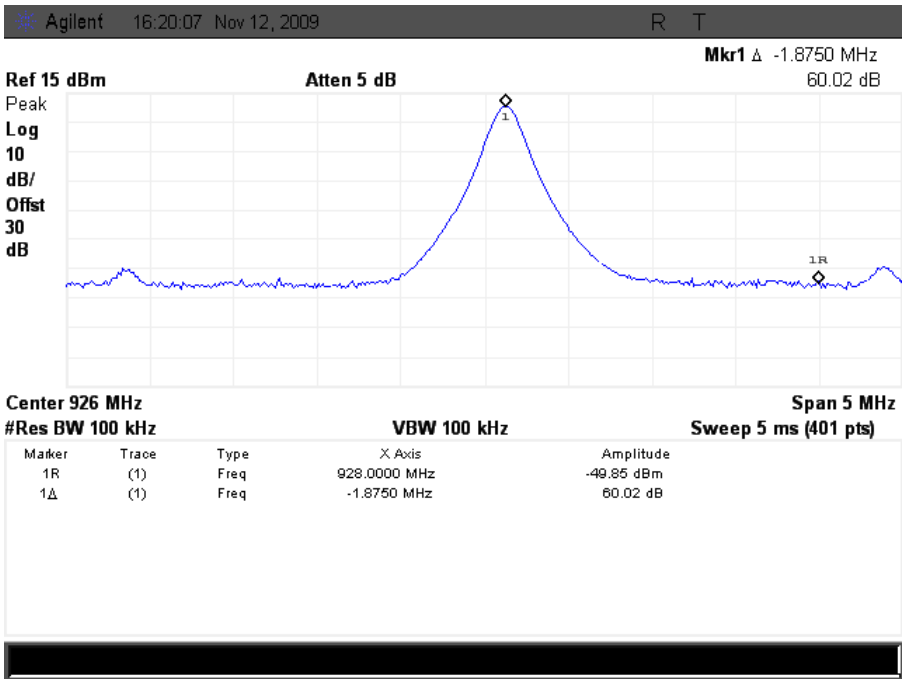
10.3.3 Screen shots



Picture 16: Band edge compliance, low channel, hopping disabled



Picture 17: Band edge compliance, high channel, hopping disabled

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11 SPURIOUS RF CONDUCTED EMISSIONS

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	23 ºC	31 RH%	1009 hPa
Date of measurement	November 12, 2008		
FCC rule part	15.247, d		
RSS-210 section	A8.5		
Measured by	Matti Virkki		

11.1 Test setup and measurement method

Spectrum analyzer was were used to record conducted spurious emissions on frequency range 30 MHz – 25 GHz. Frequency range was scanned using 100 kHz resolution bandwidth
Spurious emissions levels relative to the carrier level were read from the measured results.

11.2 EUT operation mode

EUT operation mode	Connection, GFSK modulation
EUT channel	0 (903 MHz), 24 (914,5 MHz) and 49 (926,2 MHz)
EUT TX power level	max

11.3 Limit

EUT Channel	Limit (dBc)
0	≤ -20
24	
49	

11.4 Results

All spurious emissions measured were least 35 dB below the carrier level.

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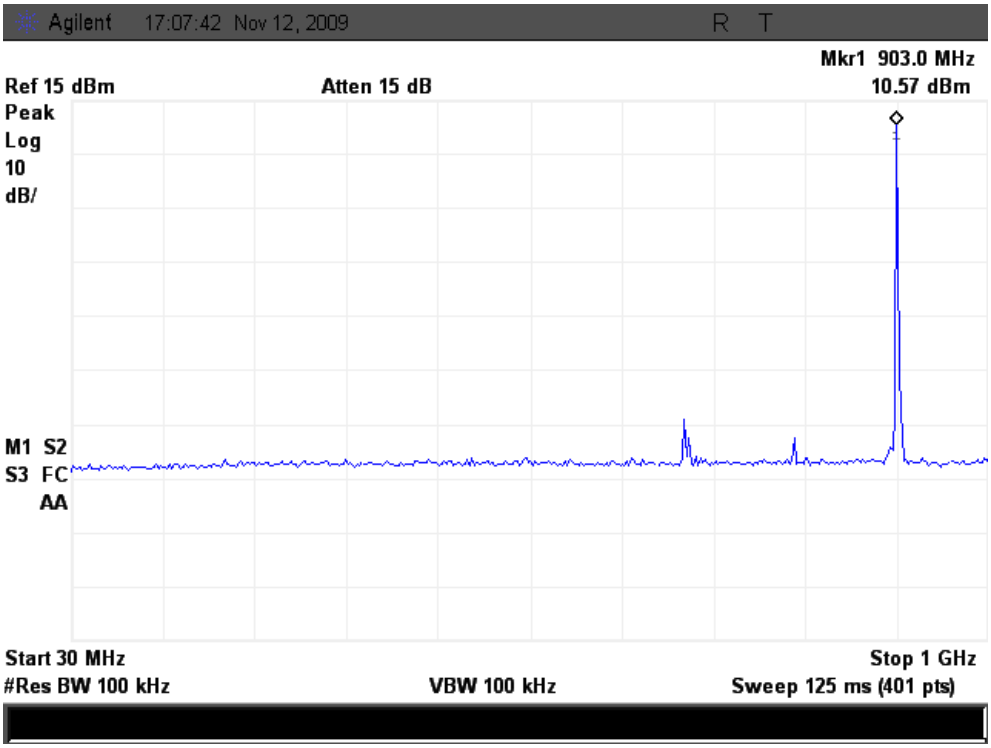
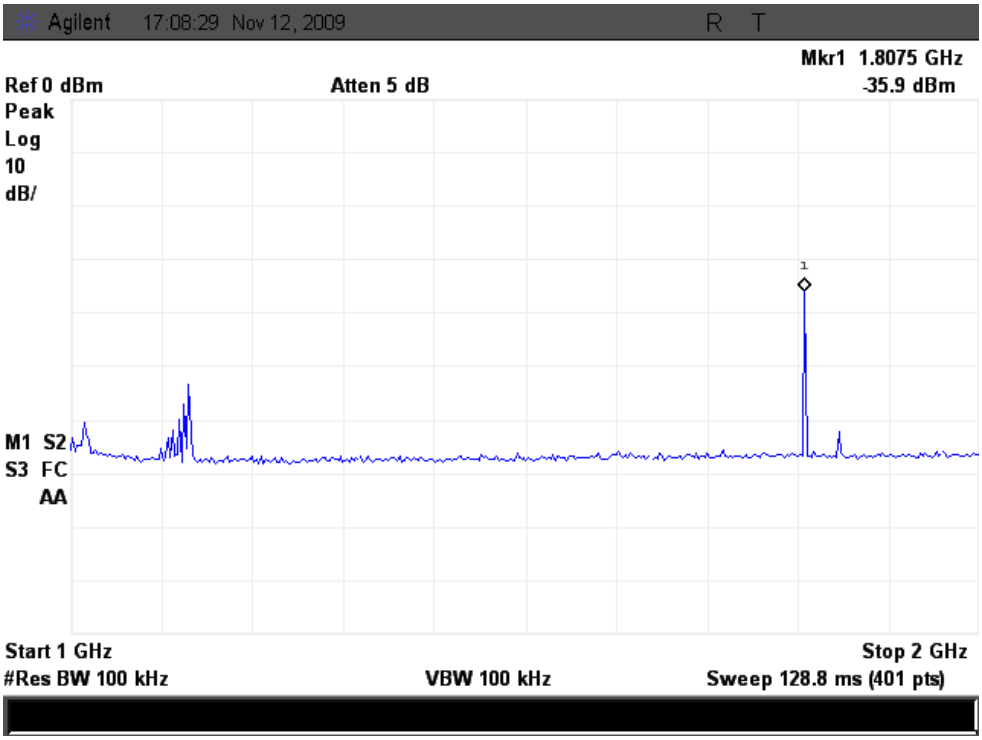
Picture 18: Conducted spurious emissions on antenna port, hannel0





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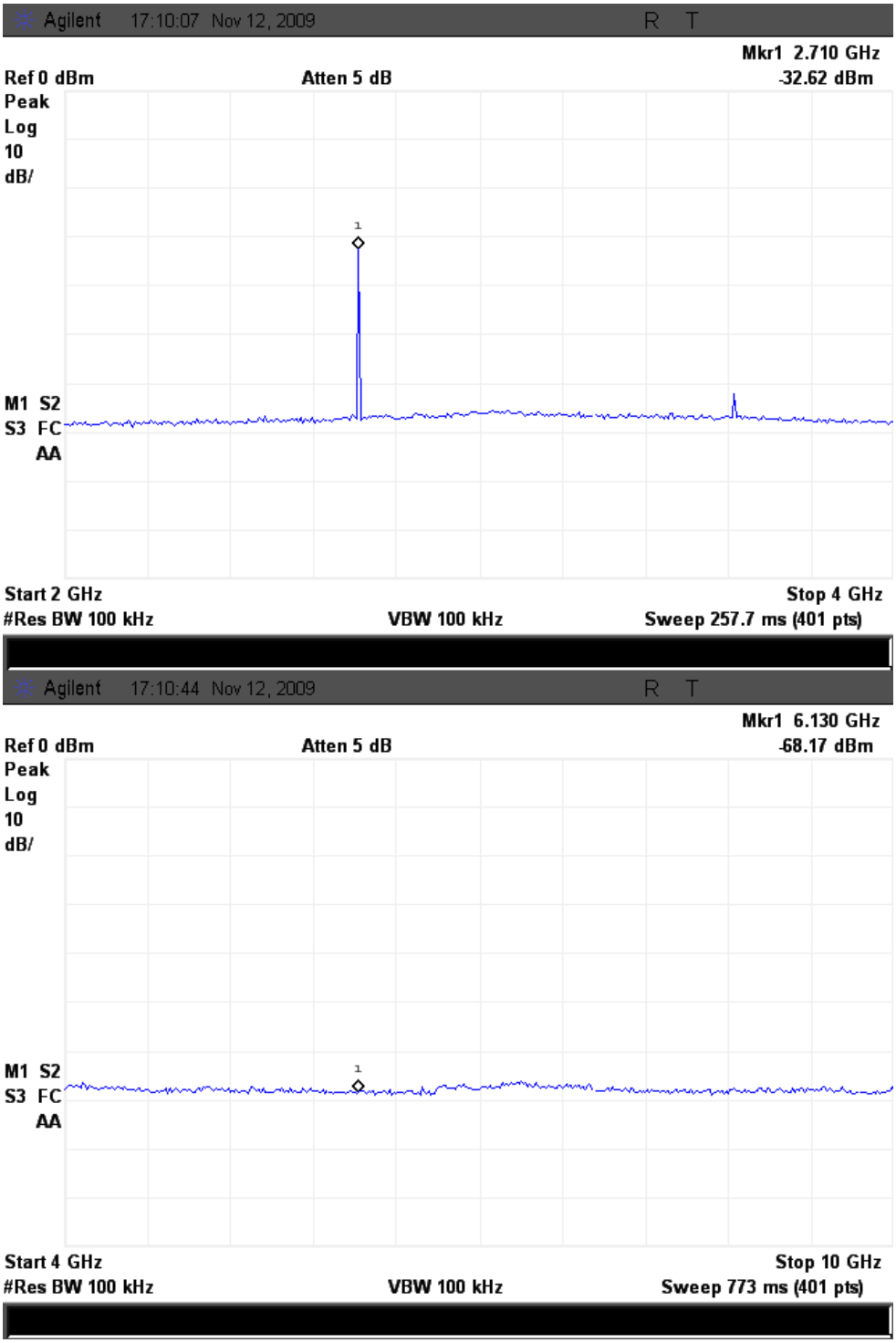

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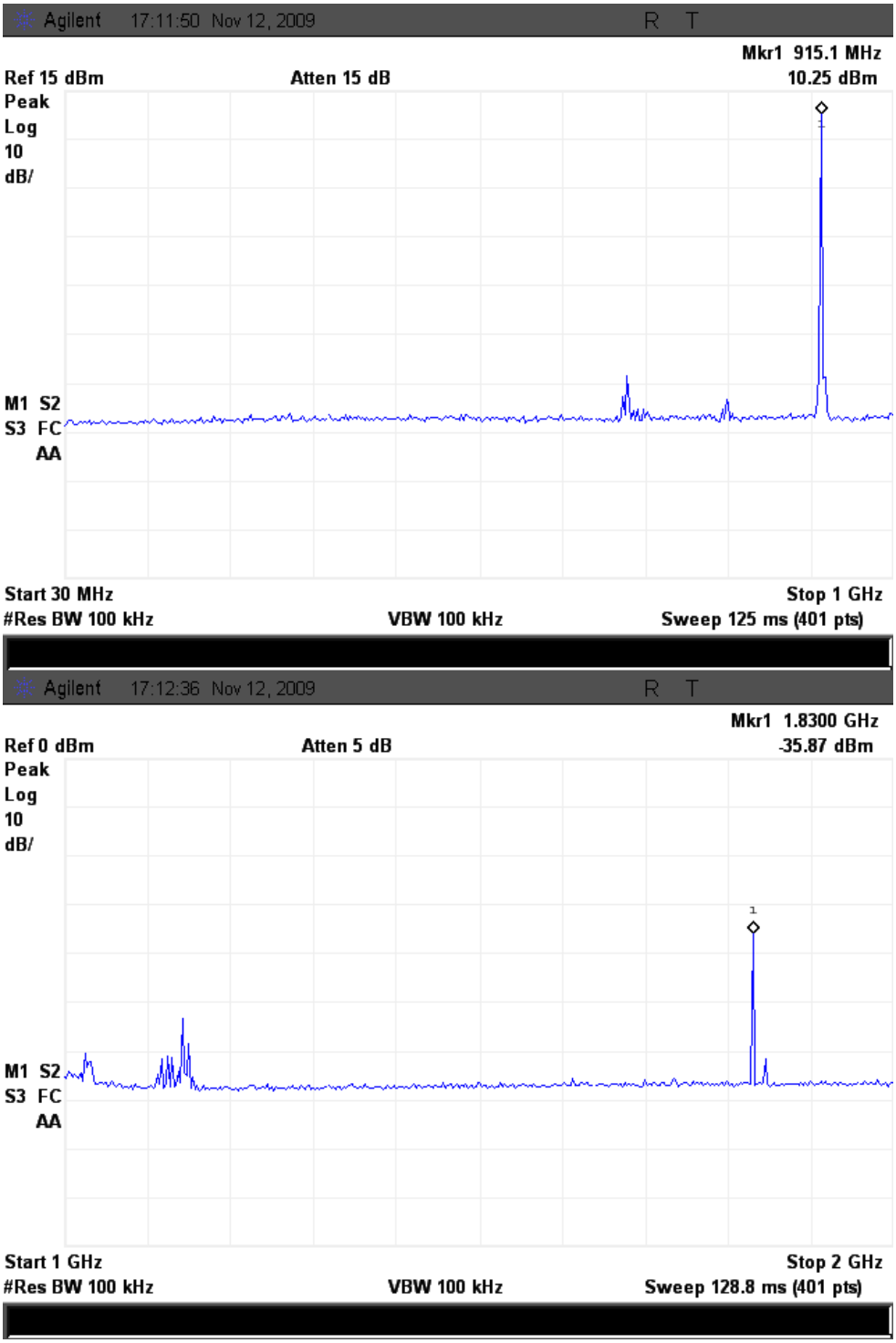
Picture 19: Conducted spurious emissions on antenna port, channel24



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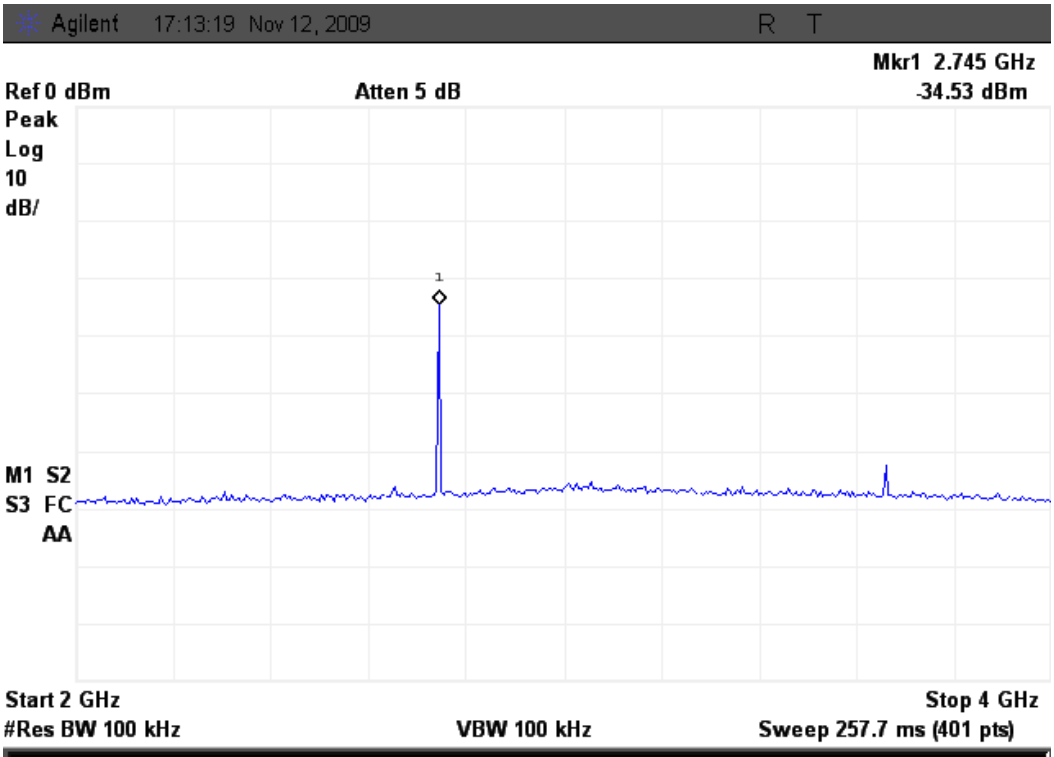

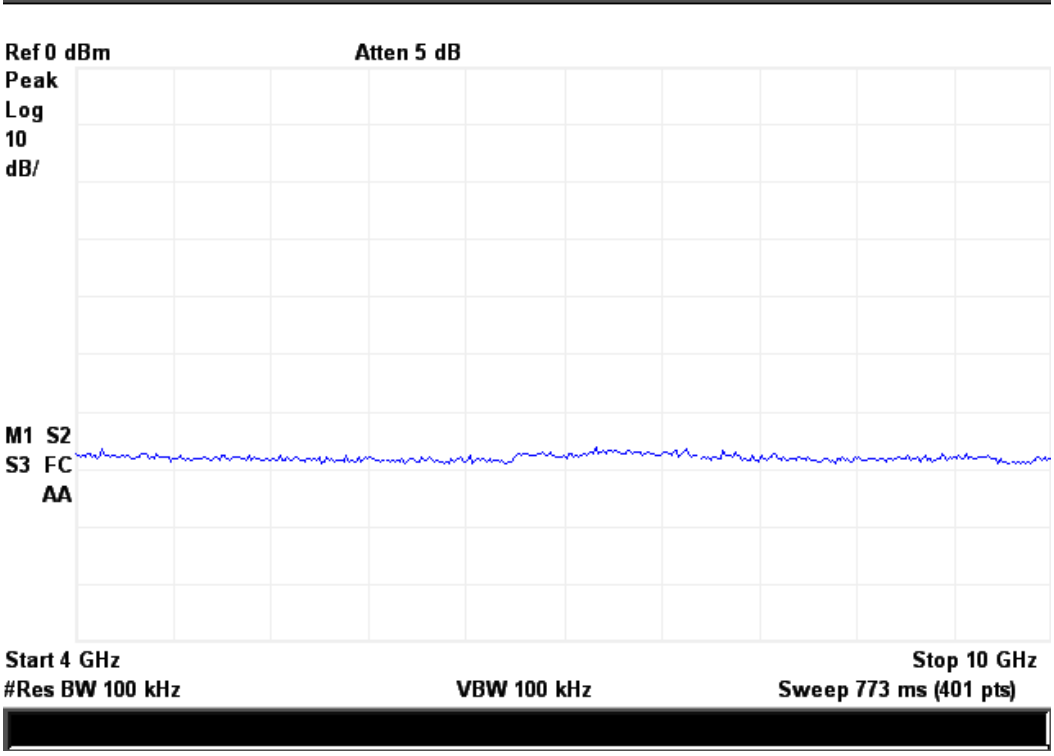

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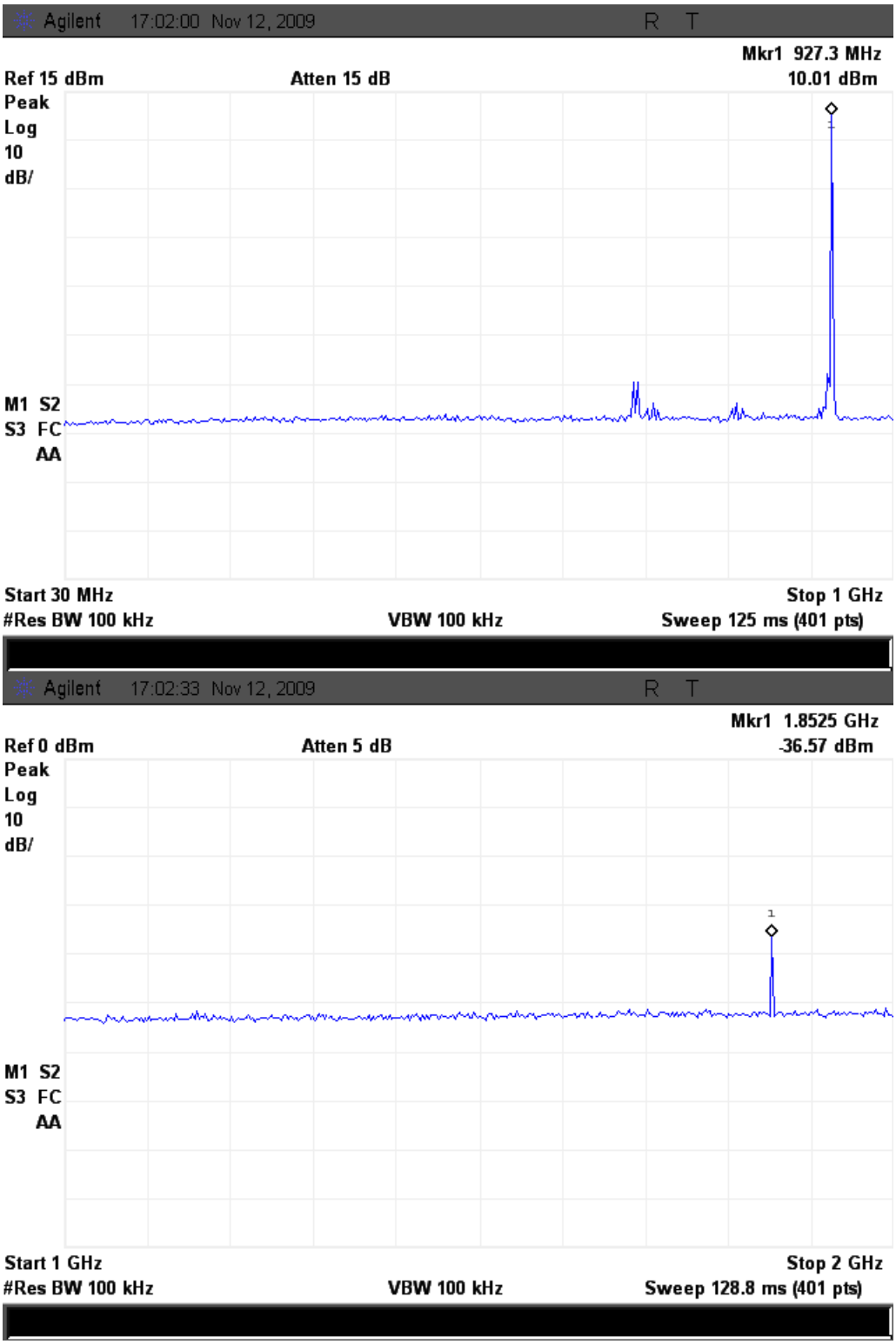
Picture 20: Conducted spurious emissions on antenna port, channel 49



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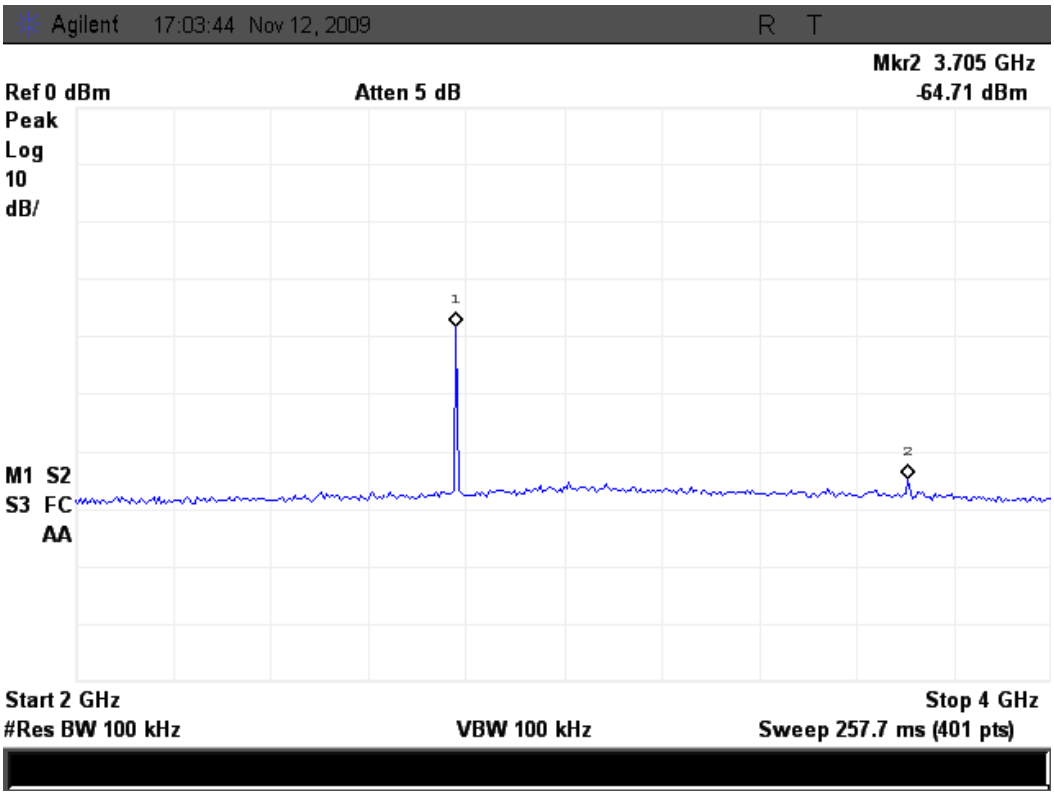

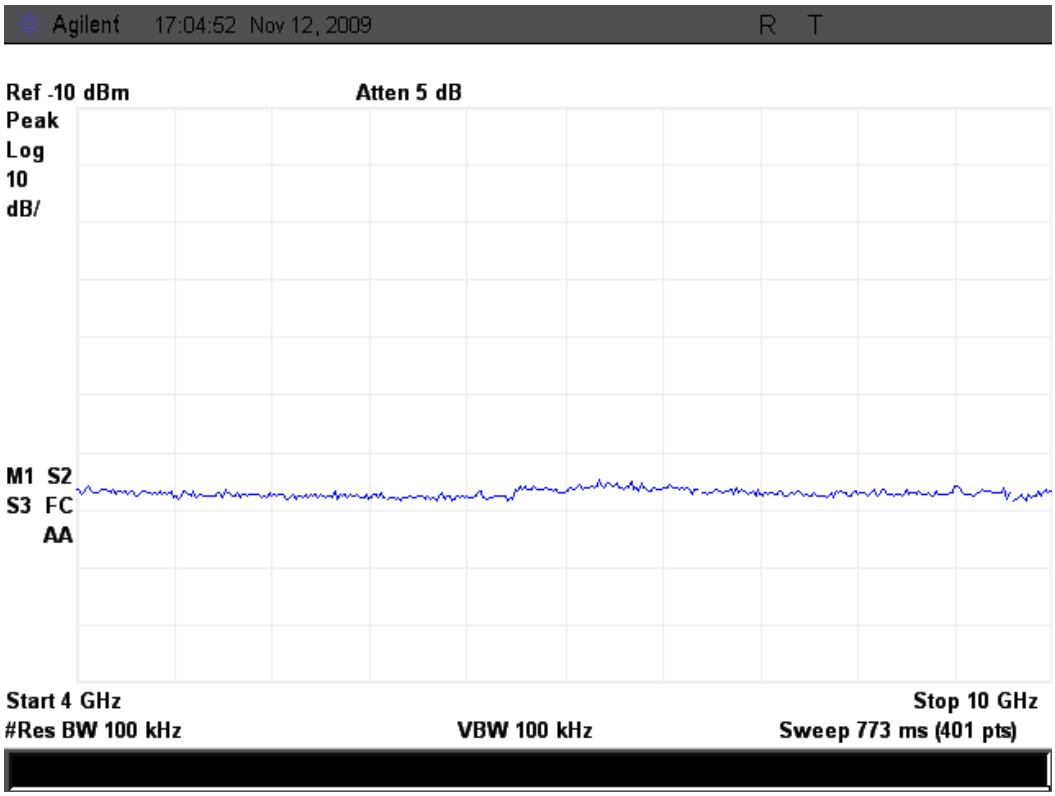

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12 TEST EQUIPMENT

All testing and measurement equipment has been calibrated once a year, except the antennas which are calibrated every two years.

12.1 Conducted measurements

Equipment	Manufacturer	Model
Spectrum Analyzer	Agilent	E7405A

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