

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

This report replaces original report T09-328B-RF

PRODUCT:

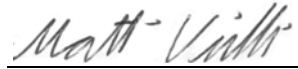
Test item description:	Radio remote control
Trade Mark:	Scanreco RC400
Model/Type reference:	G4 ECONOMY / 48390
Serial number:	TEST001 TEST002
Customer:	SCANRECO Industri Elektronik AB BOX 47144 / Årsta Skolgränd 22 S-100 74 Stockholm Sweden
Contact person:	Katrin Ekvall
Manufacturer:	SCANRECO Industri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

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Corrected date: 14.2.2010

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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	-
15.247, a 1 iii	A8.1 (4)	Number of hopping frequencies	-
15.247, a 1 iii	A8.1 (4)	Time of occupancy	-
15.247, a	A8.1 (1)	20dB bandwidth	-
15.247, b 1	A8.4 (2)	Peak output power	PASS
15.247, d	A8.5	Band-edge compliance of RF emissions	-
15.247, d	A8.5	Spurious RF conducted emissions	-
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.

EUT has an internal antenna and user cannot change it. Maximum antenna gain is -17 dBi @ 903 MHz.

The EUT was not modified during the tests.

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 10.

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.

6 PEAK OUTPUT POWER

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	22 °C	23 %RH	1004 hPa
Date of measurement	October 9, 2009		
FCC rule part	15.247, b 1		
RSS-210 section	A8.4 (2)		
Measured by	Simo Ojanen		

6.1 Test setup and measurement method



Picture 1: Test setup for conducted RF output power measurement

In the peak output power measurement the power splitter and cable attenuations were measured prior to the power measurement and set as parameter for cable loss in the spectrum analyzer to correct the reading of the peak output power. Spectrum analyzer subtracts the set attenuation value from the measured reading.

The measurement was made using 30 kHz resolution bandwidth and 30 kHz video bandwidth and maximum hold function to record the maximum peak output power.

6.2 EUT operation mode

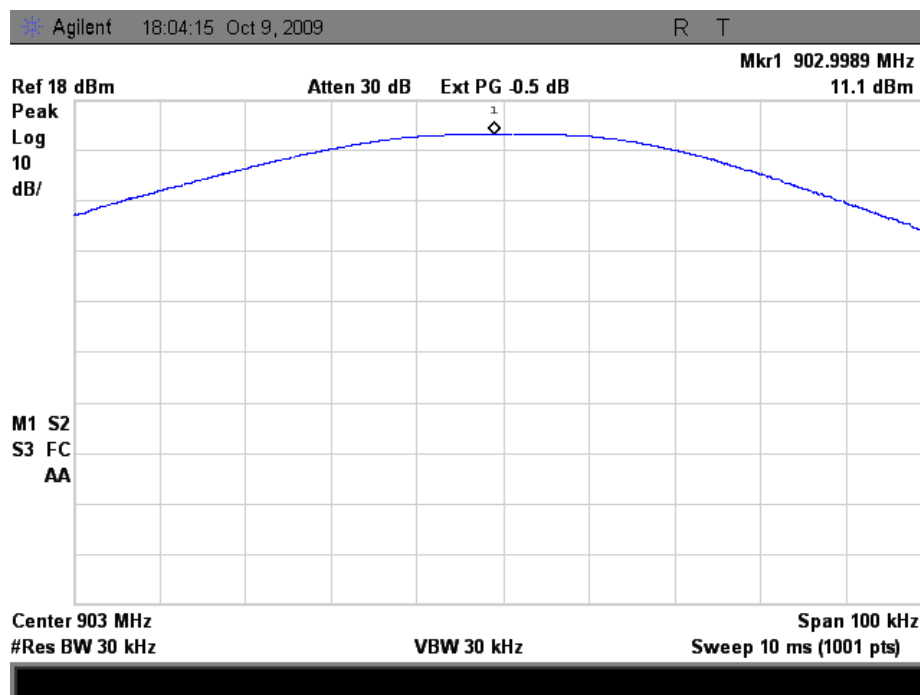
EUT operation mode	Transmit, FSK modulation
EUT channel	Low, middle, high
EUT TX power level	max

6.3 Results

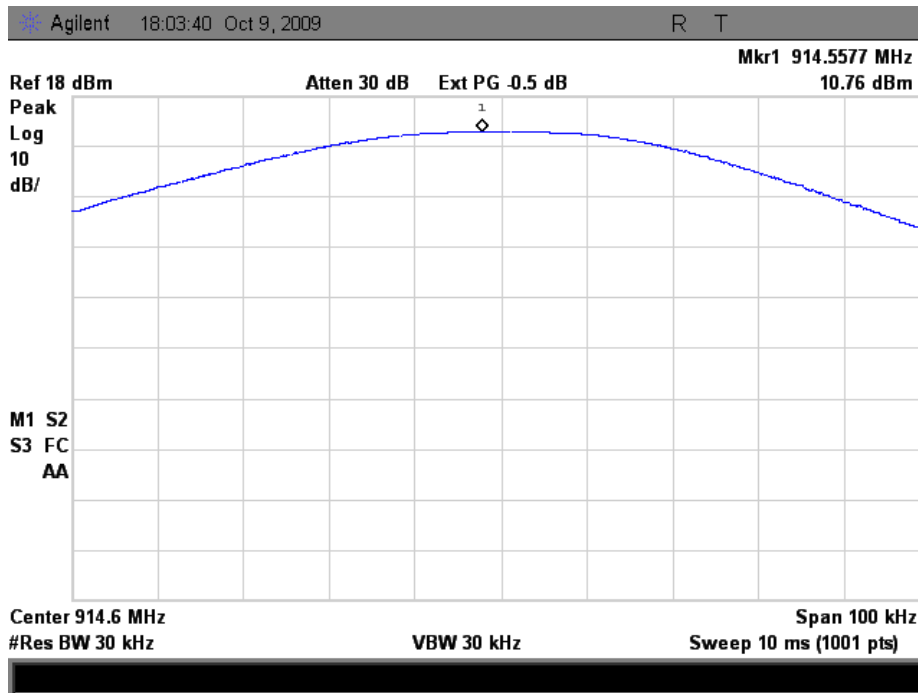
Table 1: Peak output power measurement results

EUT Channel	Limit (W)	Test result (W)	Limit (dBm)	Test result (dBm)
Low	≤ 1	0,012882	≤ 30	11,10
Mid		0,011912		10,76
High		0,011350		10,55

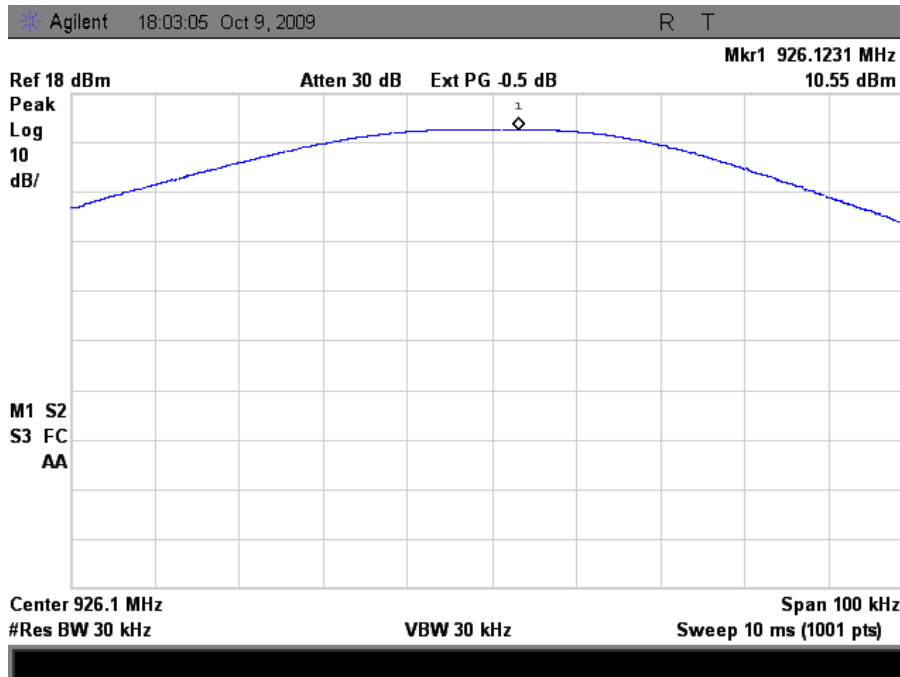
6.4 Screen shots



Picture 2: Peak output power, low channel



Picture 3: Peak output power, mid channel



Picture 4: Peak output power, high channel

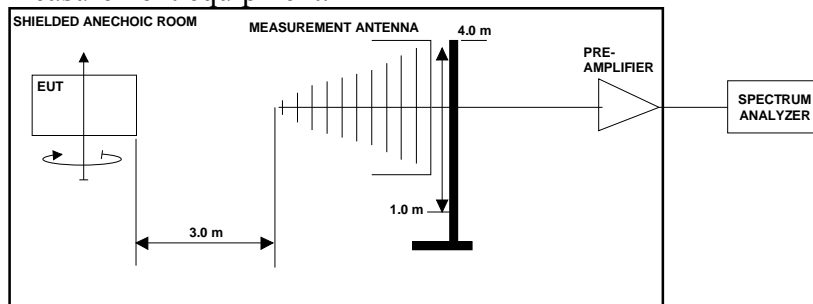
7 RADIATED SPURIOUS EMISSIONS

EUT	2		
Accessories	-		
Temp, Humidity, Air Pressure	24 °C	25 RH%	990 hPa
Date of measurement	October 5 – October 7, 2009		
FCC rule part	15.247, d		
RSS-210 section	A8.5		
Measured by	Simo Ojanen		

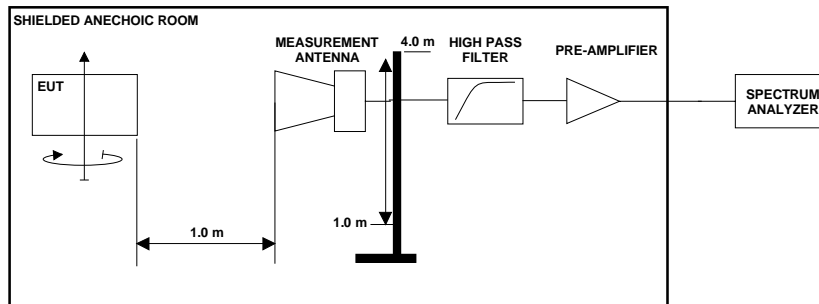
7.1 Test setup

The EUT's buttons were used to configure the EUT to transmit at high, middle or low channel continuously.

The test was done using an automated test system, where a computer controlled the measurement equipment.



Picture 5: Test setup for radiated spurious emissions measurement
30 MHz - 1 GHz frequencies



Picture 6: Test setup for radiated spurious emissions measurement
1 GHz – 10 GHz frequencies

7.2 Test method

1. The emissions were searched and maximized by moving the turntable, changing the measuring antenna polarization and height and manipulating the EUT.
2. Levels of suspicious signals and levels of EUT transmitter harmonics were recorded.
3. The recorded levels were corrected in the automated test system with the measurement antenna factor, cable attenuations and filter attenuation.
4. The corrected values, giving the EUT radiated spurious emission levels as dB μ V/m at 3 m distance, are reported.

7.3 EUT operation mode

EUT operation mode	Continuous transmission
EUT channel	Low, middle, high
EUT TX power level	max

7.4 Limit

Table 2: Radiated spurious emission limits at measurement distance 3m

Frequency band (MHz)	3m Limit (μ V/m)	3m Limit (dB μ V/m)	Detector
30 – 88	100	40	QP
88 -216	150	43,5	QP
216 - 960	200	46	QP
960 - 1000	500	54,0	QP
1000 - 25000	500	54,0	AVG
1000 - 25000	5000	74,0	PEAK

As default, all emissions were compared against the general limits. If any emission exceeded that limit, it was further checked, if it was outside the restricted band thus complying with the -20dBc requirement.

7.5 Results

Measurement system noise level was at least 15 dB below the spurious emission limit. Only levels of suspicious signals and transmitter harmonic frequencies, which were above the measurement system noise, are reported.

Table 3: Emission levels PEAK (QP) detector, low channel

Freq MHz	Measured Value dBuV/m	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height m
480,00	43,7	-3,9	39,8	-6,2	Pos 3	Ver	1,0
575,94	45,2	-2,3	43,0	-3,0	Pos 2	Ver	1,0
671,82	39,8	-0,9	38,9	-7,1	Pos 2	Hor	1,1
675,66	50,0	-0,9	49,2	3,2 *	Pos 2	Hor	1,2
681,84	45,2	-0,8	44,4	-1,6	Pos 3	Hor	1,2
1806,0	71,7	-27,2	44,5	-29,5	Pos 3	Hor	1,1
2709,0	73,3	-23,0	50,3	-23,7	Pos 3	Hor	1,0
3612,0	74,1	-20,1	54,0	-20,0	Pos 3	Hor	1,0
4515,0	65,1	-18,0	47,2	-26,8	Pos 3	Ver	1,1
5418,0	59,4	-16,1	43,3	-30,7	Pos 1	Ver	1,1
6321,0	55,1	-12,8	42,3	-31,7	Pos 1	Ver	1,1
7224,0	52,8	-7,6	45,2	-28,8	Pos 2	Ver	1,2

* Emission is outside the restricted band and complies the -20dBc requirement.
(Carrier level = 89,1 dBuV/m @ 903 MHz = -6,1dBm eirp)

Table 4: Emission levels PEAK (QP) detector, middle channel

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height m
480,00	40,9	-3,9	37,0	-9,0	Pos 3	Ver	1,0
575,88	45,1	-2,3	42,8	-3,2	Pos 2	Ver	1,0
681,06	42,7	-0,8	41,9	-4,1	Pos 2	Hor	1,2
687,24	49,4	-0,7	48,7	2,7 *	Pos 2	Hor	1,1
1829,0	71,5	-27,0	44,5	-29,5	Pos 2	Ver	1,0
2743,5	71,2	-22,9	48,3	-25,7	Pos 3	Hor	1,0
3658,5	72,6	-20,0	52,6	-21,4	Pos 3	Hor	1,0
4573,0	61,1	-17,7	43,3	-30,7	Pos 3	Hor	1,1
5487,5	61,1	-16,0	45,1	-28,9	Pos 1	Ver	1,2
6402,0	54,2	-12,3	41,9	-32,1	Pos 1	Ver	1,1
7316,5	52,6	-7,4	45,2	-28,8	Pos 2	Ver	1,2

* Emission is outside the restricted band and complies the -20dBc requirement.
(Carrier level = 88,6 dBuV/m @ 914,56 MHz = -6,3 dBm eirp)

Table 5: Emission levels PEAK (QP) detector, high channel

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dB μ V/m	Marginal dB	EUT Position	Ant Pol.	Ant height m
575,88	41,2	-2,3	39,0	-7,0	Pos 2	Ver	1,0
692,64	42,8	-0,6	42,2	-3,8	Pos 2	Hor	1,2
698,76	40,9	-0,6	40,3	-5,7	Pos 2	Hor	2,1
1852,5	70,1	-26,8	43,2	-30,8	Pos 2	Ver	1,1
2778,5	70,2	-22,7	47,6	-26,4	Pos 2	Hor	1,0
3704,5	67,3	-19,9	47,3	-26,7	Pos 2	Ver	1,2
4630,5	64,5	-17,5	47,0	-27,0	Pos 2	Hor	1,0
5557,0	57,9	-15,9	42,0	-32,0	Pos 3	Hor	1,4
6483,0	53,9	-11,9	42,1	-31,9	Pos 1	Ver	1,0
7409,0	52,8	-7,0	45,8	-28,2	Pos 2	Ver	1,0

* Emission is outside the restricted band and complies the -20dBc requirement.
(Carrier level = 88,1 dB μ V/m @ 926,12 MHz = -7,1 dBm eirp)

Since the measurements are made with sample that is modified to continuous transmission, average results are not measured. In this case peak levels are under average limit.

8 99 % BANDWIDTH

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	22 °C	23 %RH	1004 hPa
Date of measurement	October 9, 2009		
FCC rule part			
RSS-GEN section	4.4.1		
Measured by	Simo Ojanen		

8.1 Test setup and measurement method

The 99% occupied bandwidth was calculated from spectrum analyzer measurements.

The measurement data was read from the analyzer to computer.

Software in computer calculated the total power from the measurement data and defined the frequency band containing 99% of the total power.

Markers in the spectrum analyzer were then placed between the calculated frequencies to show the calculated 99% power band in the screenshots.

8.2 EUT operation mode

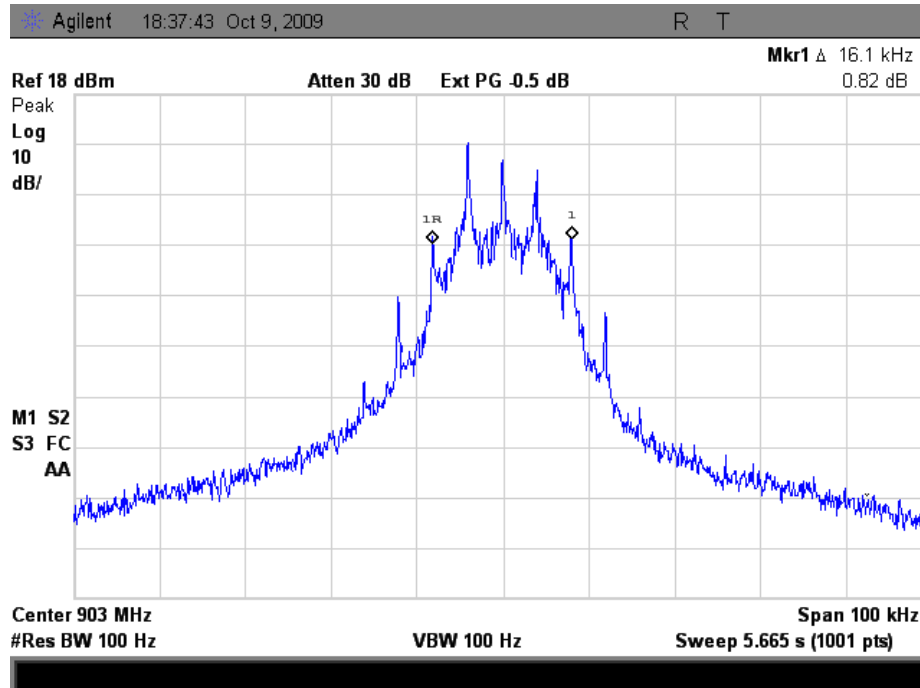
EUT operation mode	Continuous transmission
EUT frequency	Low, Middle, High
EUT TX power level	Max.

8.3 Results

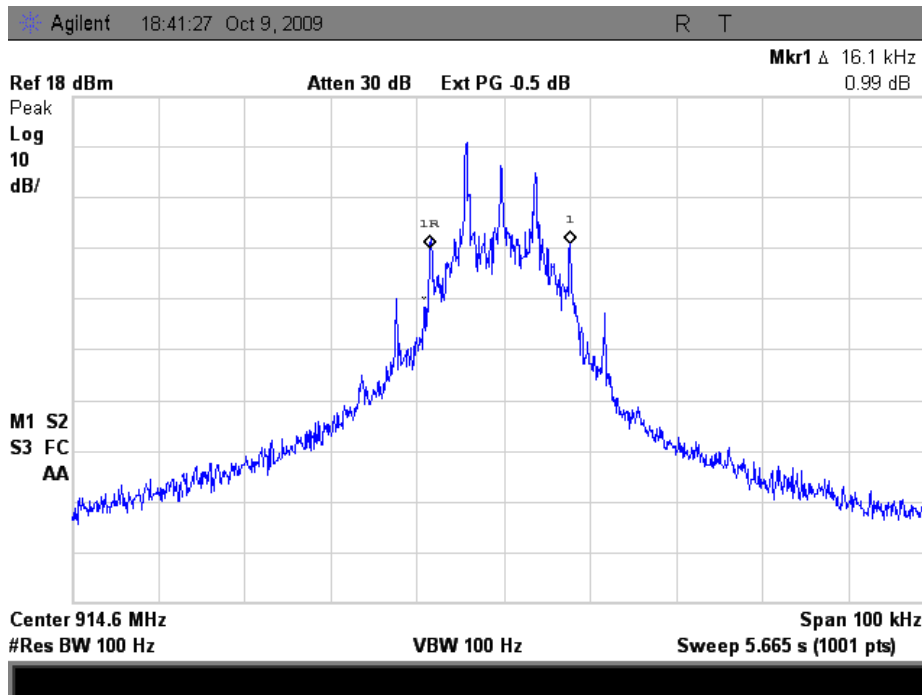
Table 6: 99% bandwidth measurement results

EUT Channel	Limit kHz	Measured value kHz
Low	-	16,1
Middle	-	16,1
High	-	16,1

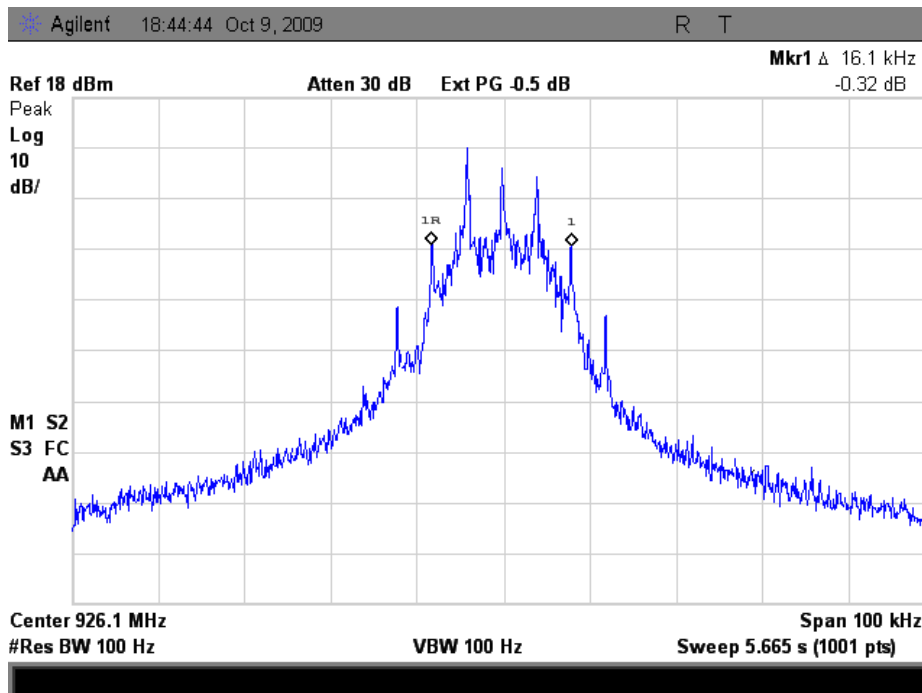
8.4 Screen shots



Picture 7: 99% Bandwidth measurement result; low channel



Picture 8: 99% Bandwidth measurement result; middle channel



Picture 9: 99% Bandwidth measurement result; high result

9 TEST EQUIPMENT

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

9.1 Conducted measurements

Equipment	Manufacturer	Model
Spectrum Analyzer	Agilent	E7405A

9.2 Radiated measurements

Equipment	Manufacturer	Model
Spectrum Analyzer	Agilent	E7405A
Antenna	Chase	CBL 6141
Antenna	Schwarzbeck	BBHA 9120D
High pass filter	Wainwright Instruments	WHK3.0/18G-10ST
High pass filter	Wainwright Instruments	WHKS1000C11/60SS
Pre-amplifier	JCA	118-400
Turn table / antenna mast controller	EMCO	2090
Antenna mast	EMCO	2075-2

10 TEST SETUP PHOTOGRAPHS

Test setup photograph can be found in a separate document

T09-382B-RF_PHOTOS.doc