

Date: ESPOO 14.09.2009

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Appendices -

Number:
No. 1 / 1

129599B

Date of handing in: 17.06.2009

Tested by:



Pekka Kälviäinen, Test Engineer

Reviewed by:



Timo Leismala, Testing Manager

SORT OF EQUIPMENT:

Receiver of the radio modem (PCB-unit)

MARKETING NAME:

TYPE:

MANUFACTURER:

SATELLINE® 3ASd Epic Pro 35 W
Satel Oy, Finland

SERIAL NUMBER:

-

CLIENT:

Satel Oy

ADDRESS:

Meriniitynkatu 17, FIN-24100 Salo, Finland

TELEPHONE:

+358 2 777 7800 / Marita Latovehmas

TEST LABORATORY

Nemko Oy

FCC REG. NO.

359859 November 26, 2008

IC FILE NO.

2040F-1 December 15, 2008

REMARKS:

Tested to FCC Part 15B and RSS-210 Issue 7, RSS-Gen Issue 2.

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.

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1. General

Type:	SATELLINE® 3ASd Epic Pro 35 W		
Alignment range:	400.0 – 470.0 MHz		
Measurement	Equipment 1 Serial no. -	Equipment 2 Serial no.	Equipment 3 Serial no.
Frequencies:	1) 408.00 MHz 2) 428.00 MHz 3) 468.00 MHz	1) 402.0 MHz	1) 432.0 MHz
Voltages:	Normal 13.2 VDC	Minimum	Maximum
Temperatures:	22,5 ± 1,0 °C		
Humidity:	35 ± 10 %		
Effective radiated power:	Antenna: 50 ohm, SMA connector		
	Production model: Pre-production model		
Number of channels:	Modulation:		

The receiver was tested in a standalone configuration.

2. Summary of performed tests and test results

(This interpretation of the test report's results does not belong to the scope of our accreditation.)

Section in CFR 47	Section in RSS-210 Issue 7 and RSS-Gen Issue 2		Result
15.111	RSS-Gen 6	Spurious radiations (conducted)	PASS
15.109 (a)	RSS-Gen 6	Spurious radiations (radiated)	PASS
15.107 (a)	RSS-Gen 7.2.2	Conducted emissions at mains ports	N.A.

According to the standard the measurement results have been compared directly with the limits without considering measurement uncertainties.

Explanations:

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

2.1 Receiver spurious emissions (conducted)

Parameter	Specification
Frequency range	9kHz – 5000 MHz
Site name	Nemko Oy / Perkkaa
Date of testing	04.09.2009
Test equipment	566
Test uncertainty U95	±1.8 dB
Test conditions	22 °C, 40 % RH

The EUT is connected to spectrum analyzer through suitable attenuator and filters and spurious emissions are measured with peak detector. Spectrum was searched from 9kHz to 5GHz. Spectrum analyzer settings were: 9-150kHz RBW 1kHz, VBW 3kHz, 150kHz-30MHz RBW 10kHz, VBW 30kHz, 30MHz-1000MHz RBW 100kHz, VBW 1MHz, 1000-4000MHz RBW 1MHz, VBW 1MHz

Channel 408.0 MHz		Channel 428.0 MHz		Channel 468.0 MHz		Remarks
Frequency (MHz)	Level (dBm)	Frequency (MHz)	Level (dBm)	Frequency (MHz)	Level (dBm)	
3057	-66.71	3193	-67.73	3114	-67.51	
Others 9 kHz to 4 GHz	< -70,0	others 9 kHz to 4 GHz	< -70,0	others 9 kHz to 4 GHz	< -70,0	
Measurement uncertainty		± 1.8 dB				

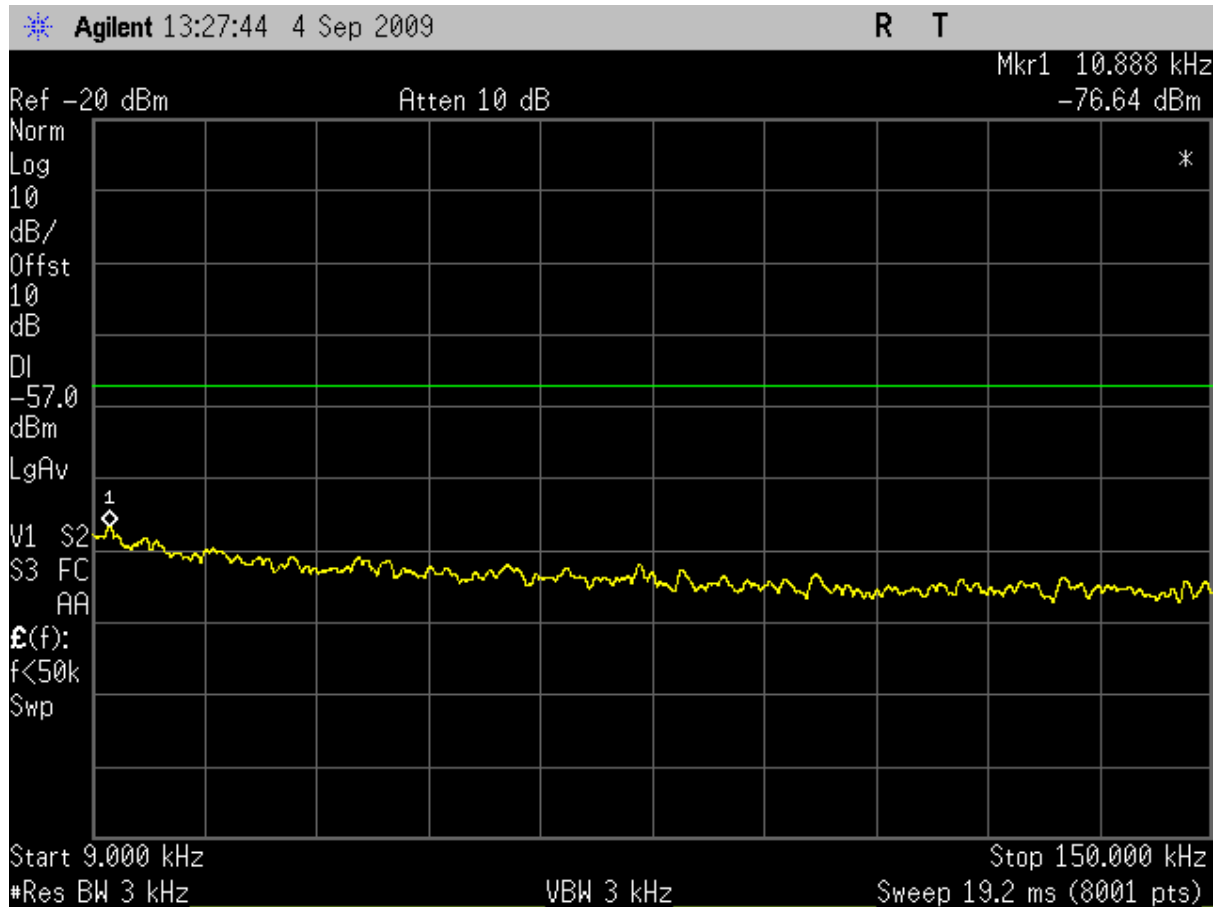
LIMITS:

Conducted components RSS Gen, clause 6

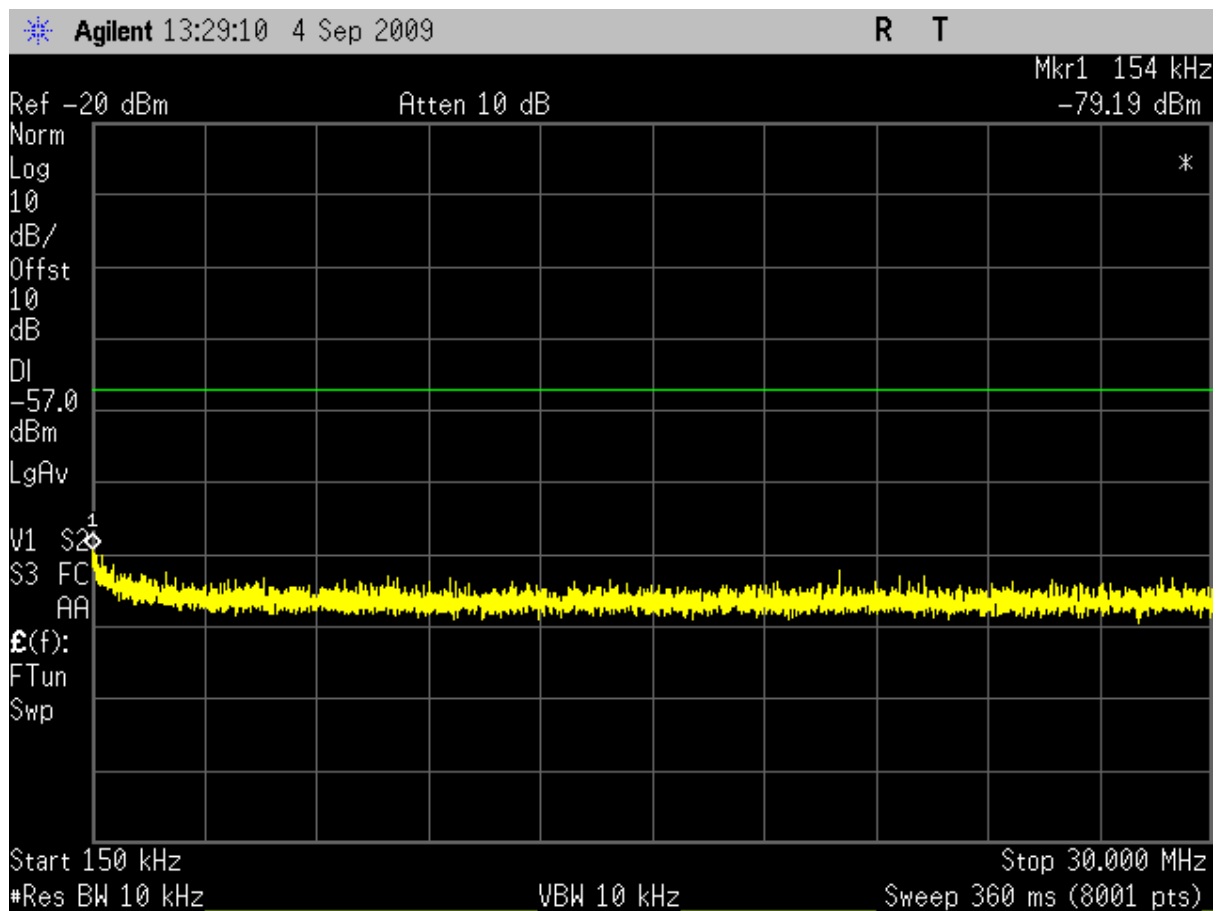
Frequency range	Limit
9 kHz to 1 GHz	2,0 nW (-57 dBm)
Above 1 GHz	5,0 nW (-53 dBm)

Conducted components FCC 15.111

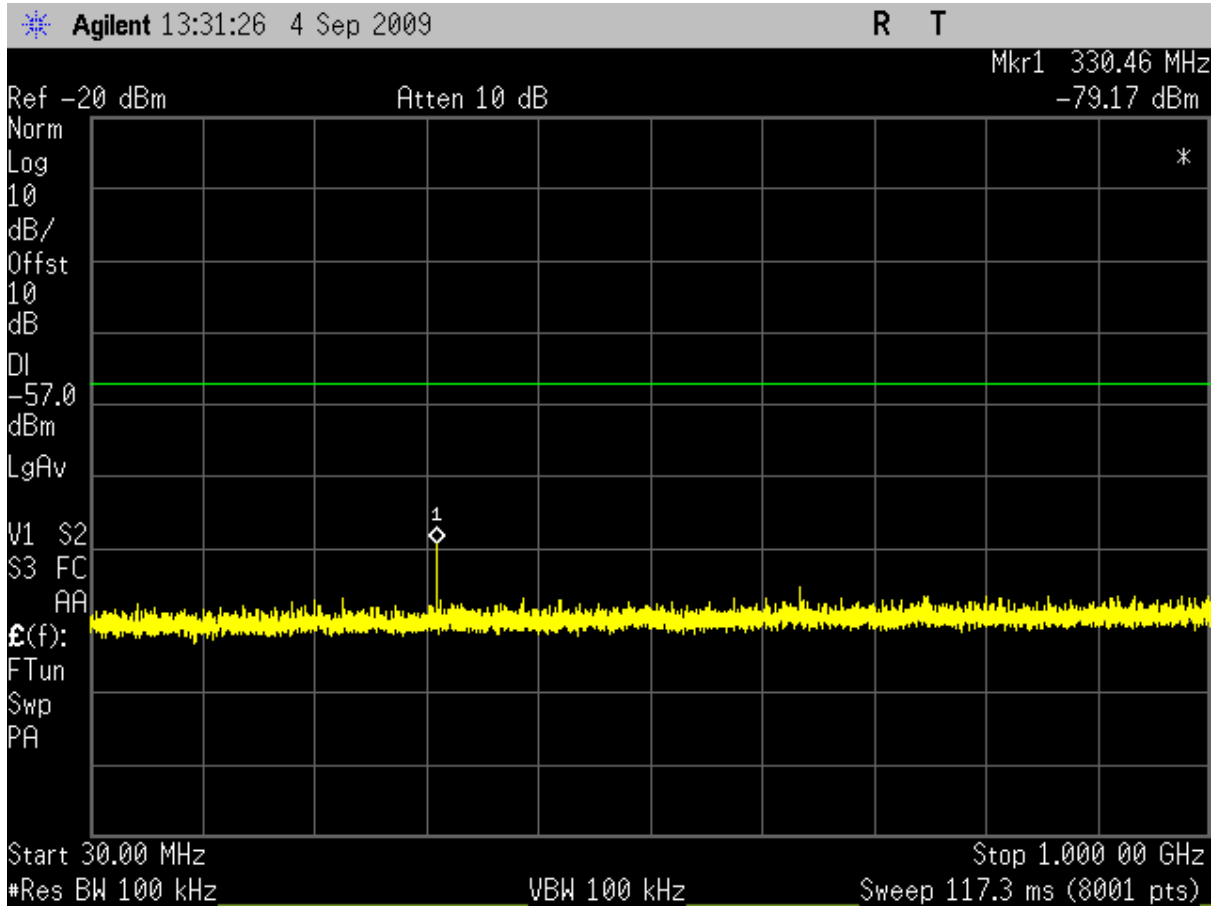
Frequency range	Limit
9 kHz to 2 GHz	2,0 nW (-57 dBm)



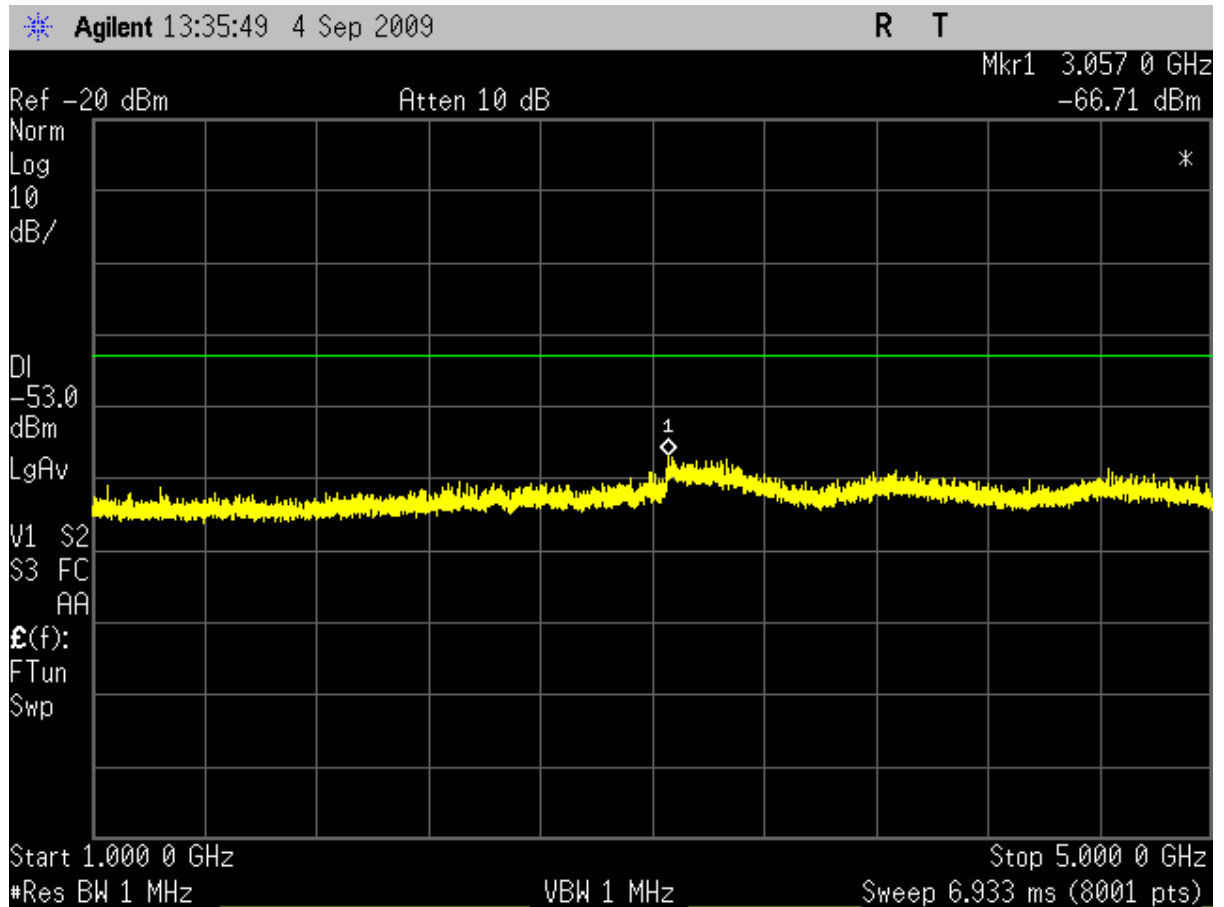
Note: Receiver tuned at 408.0 MHz



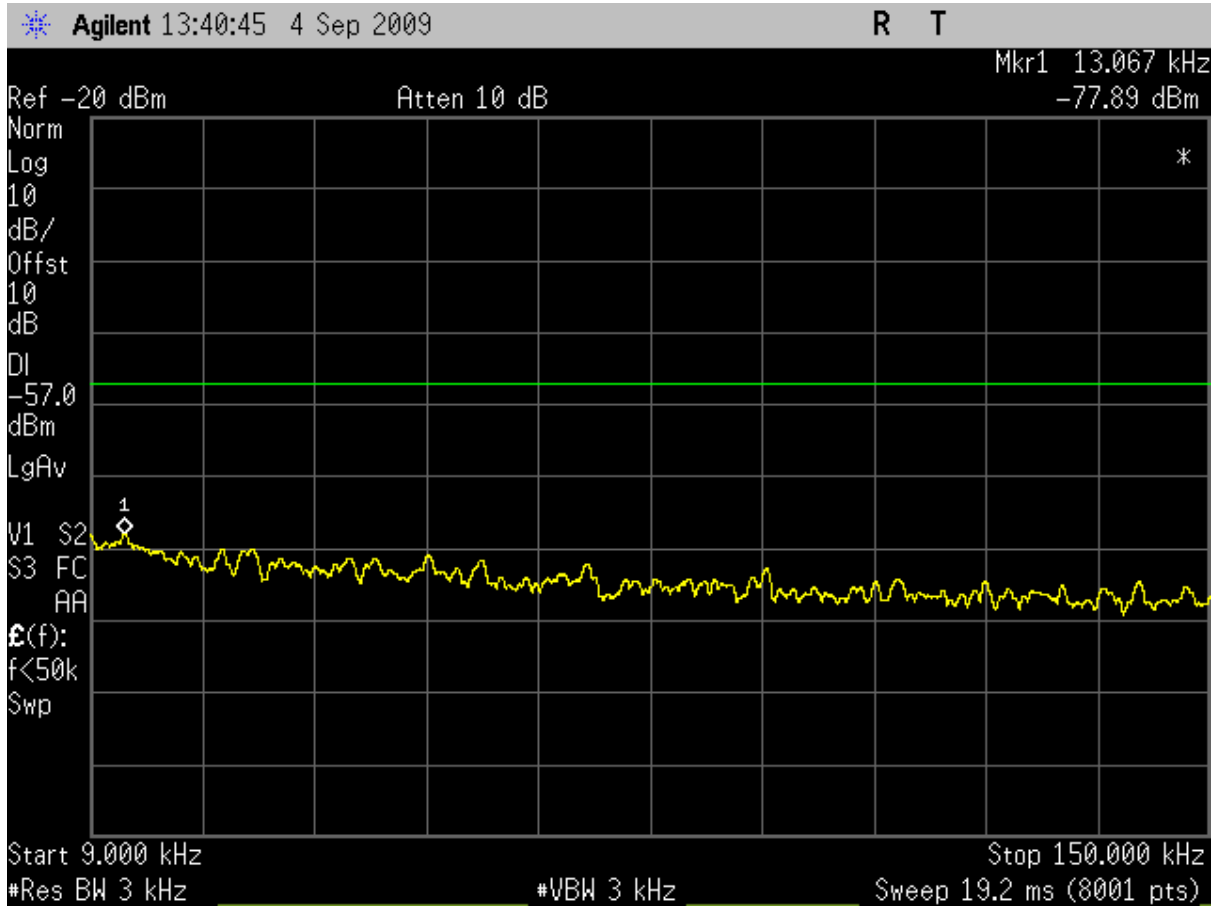
Note: Receiver tuned at 408.0 MHz



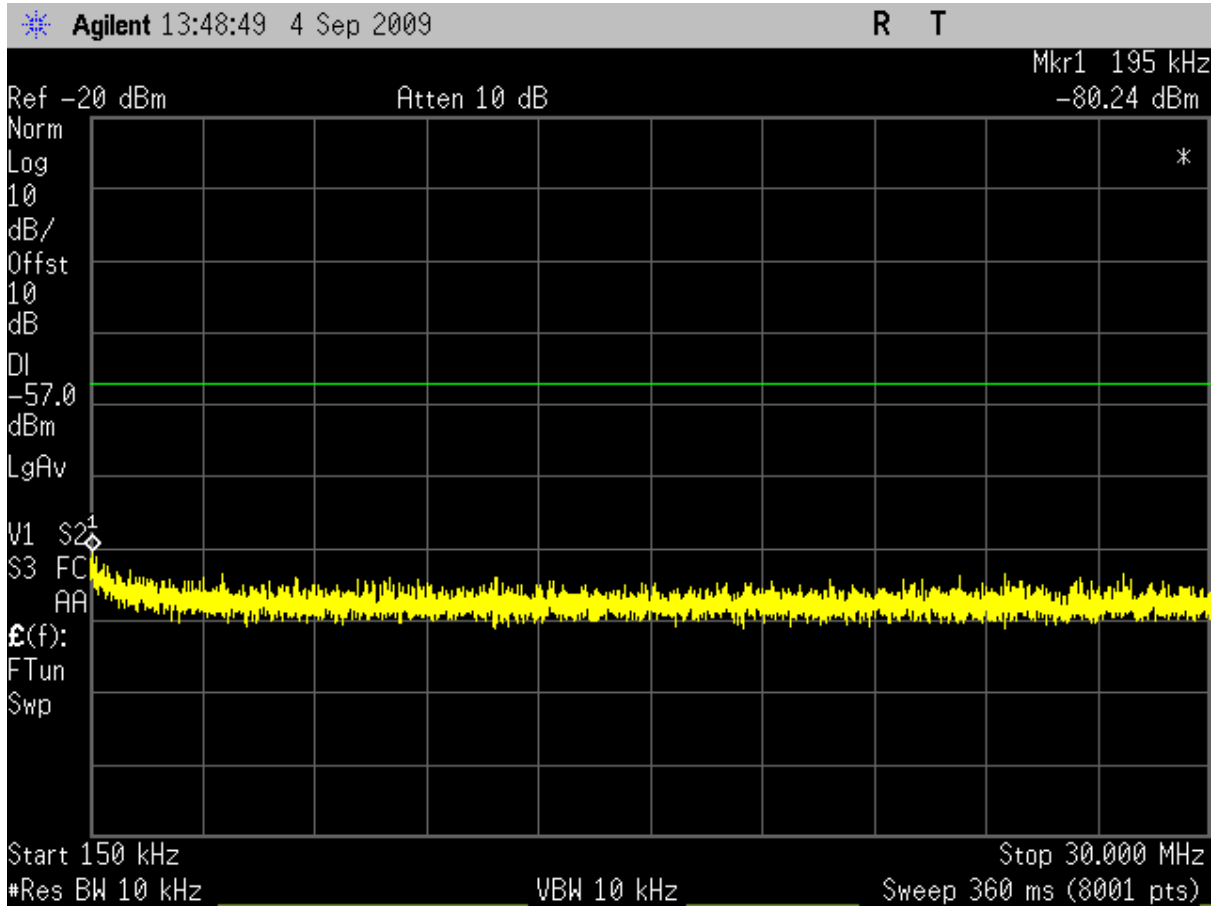
Note: Receiver tuned at 408.0 MHz



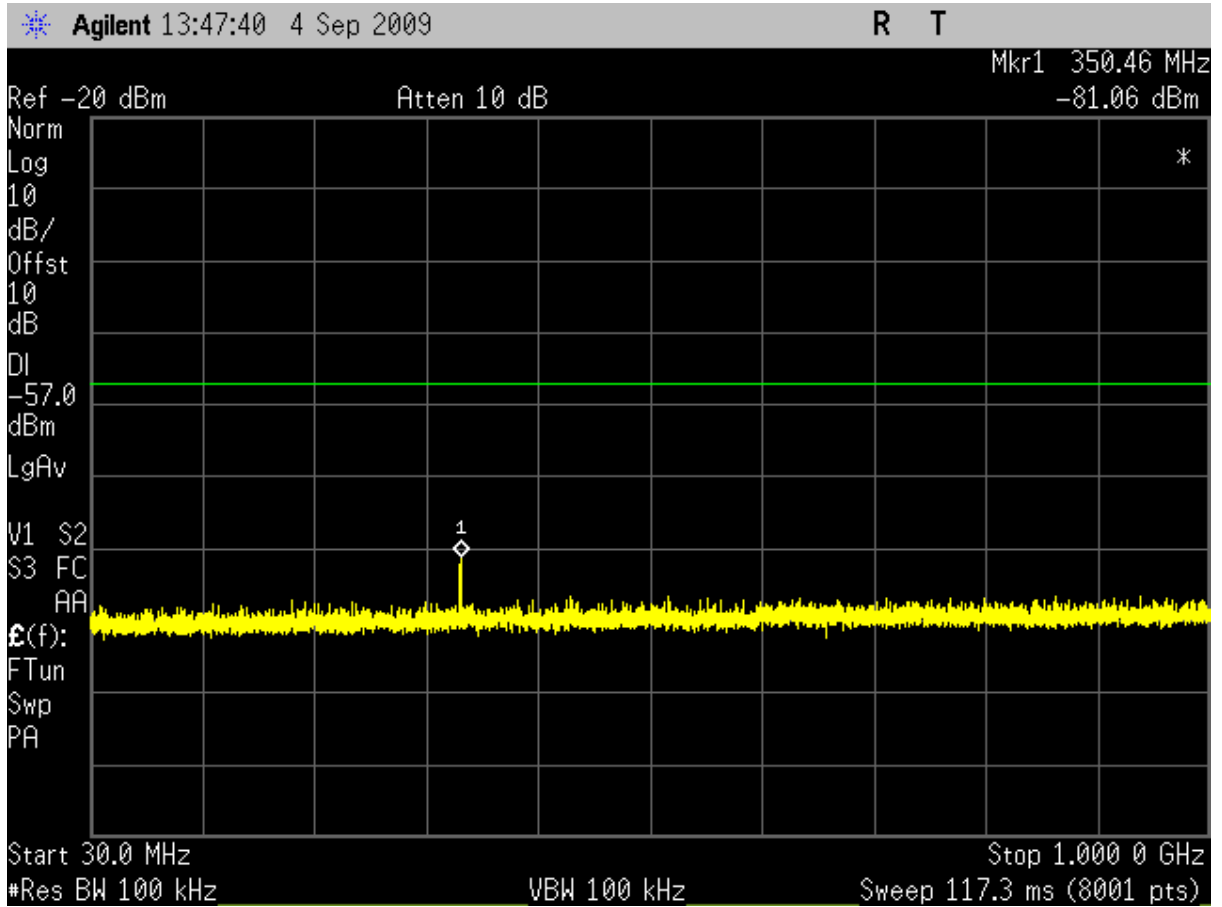
Note: Receiver tuned at 408.0 MHz



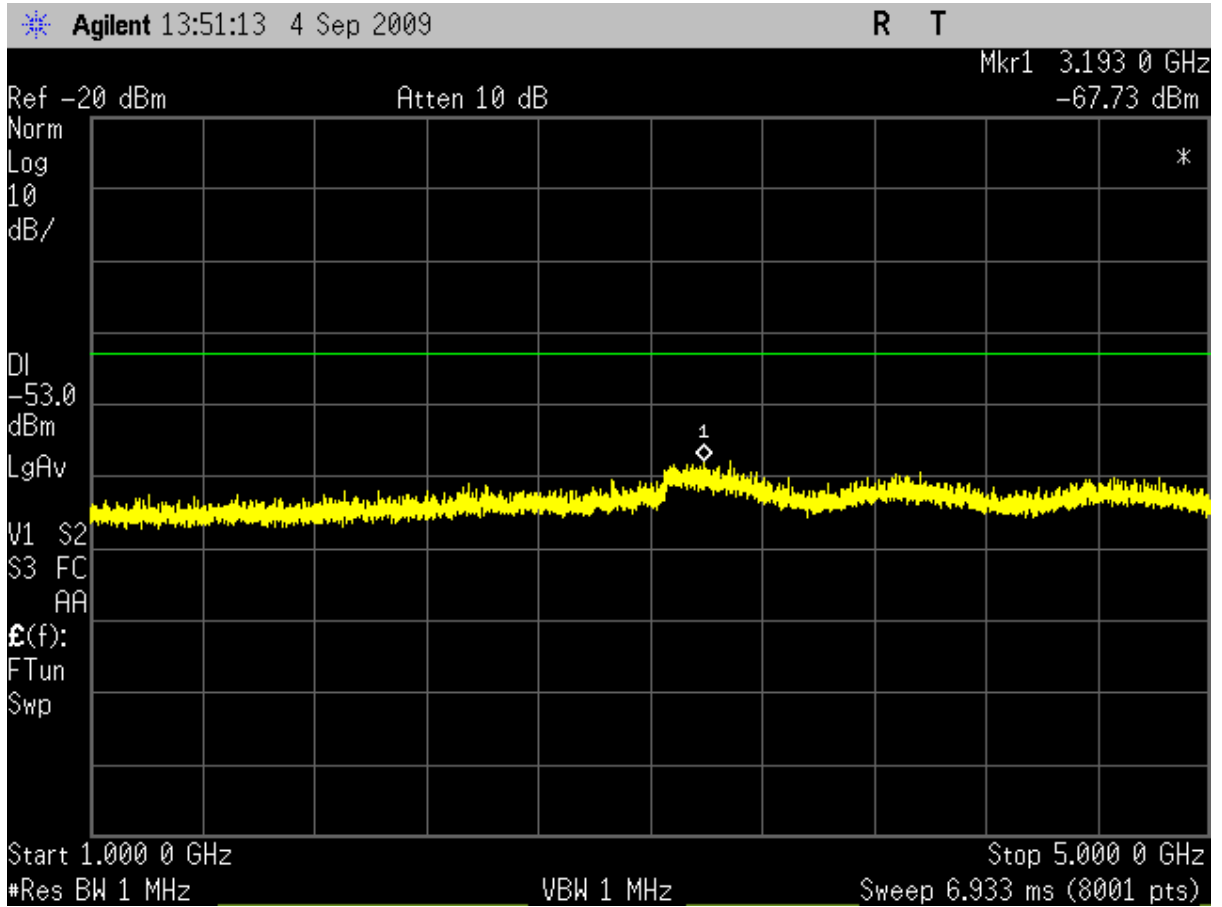
Note: Receiver tuned at 428.0 MHz



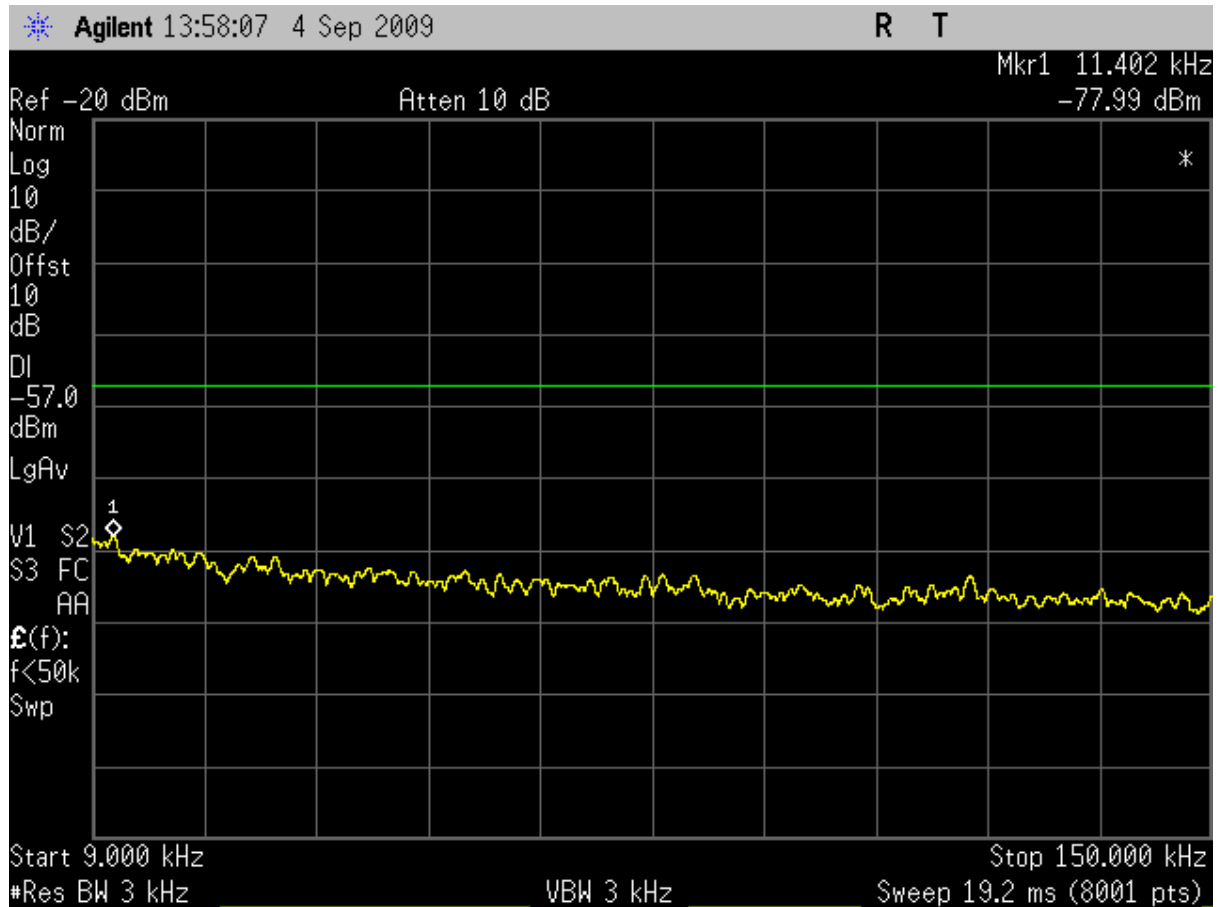
Note: Receiver tuned at 428.0 MHz



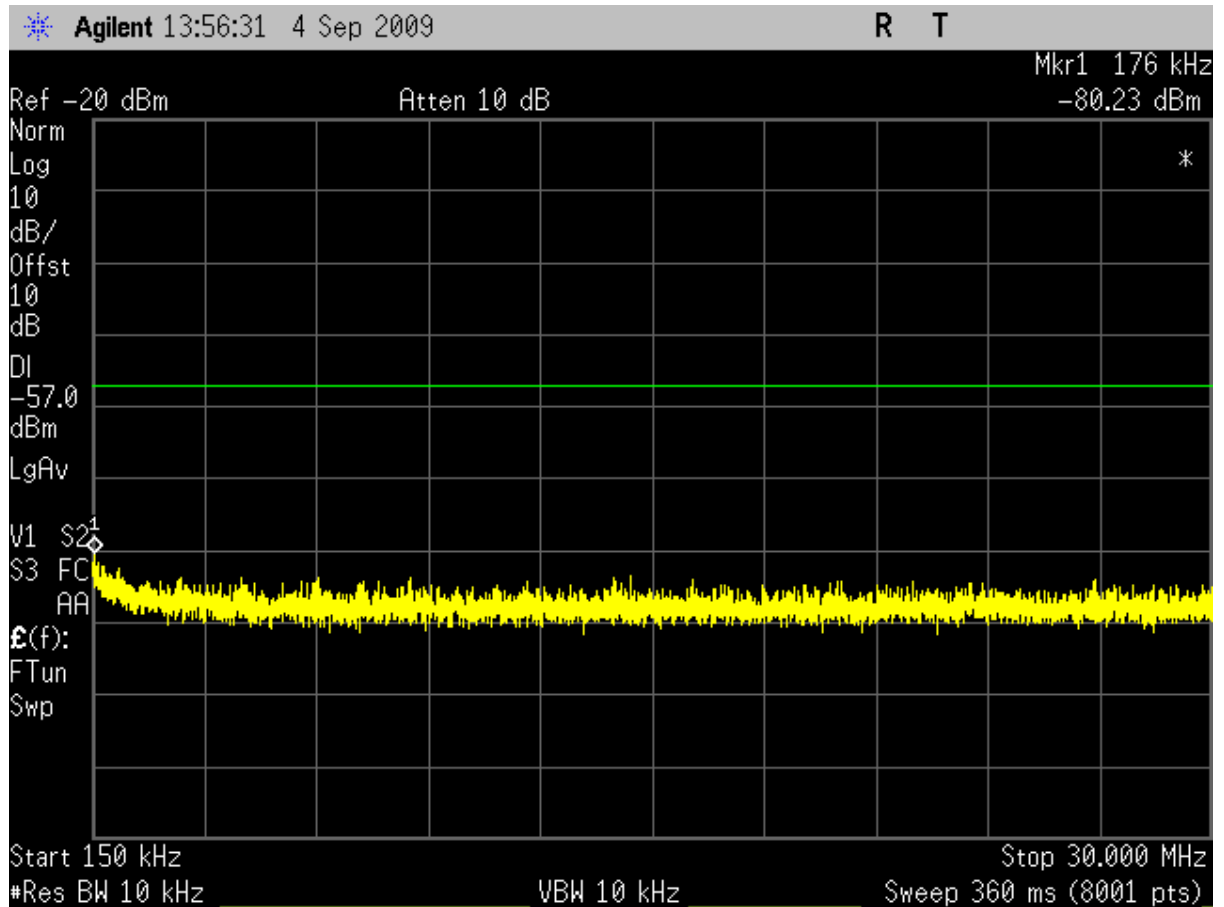
Note: Receiver tuned at 428.0 MHz



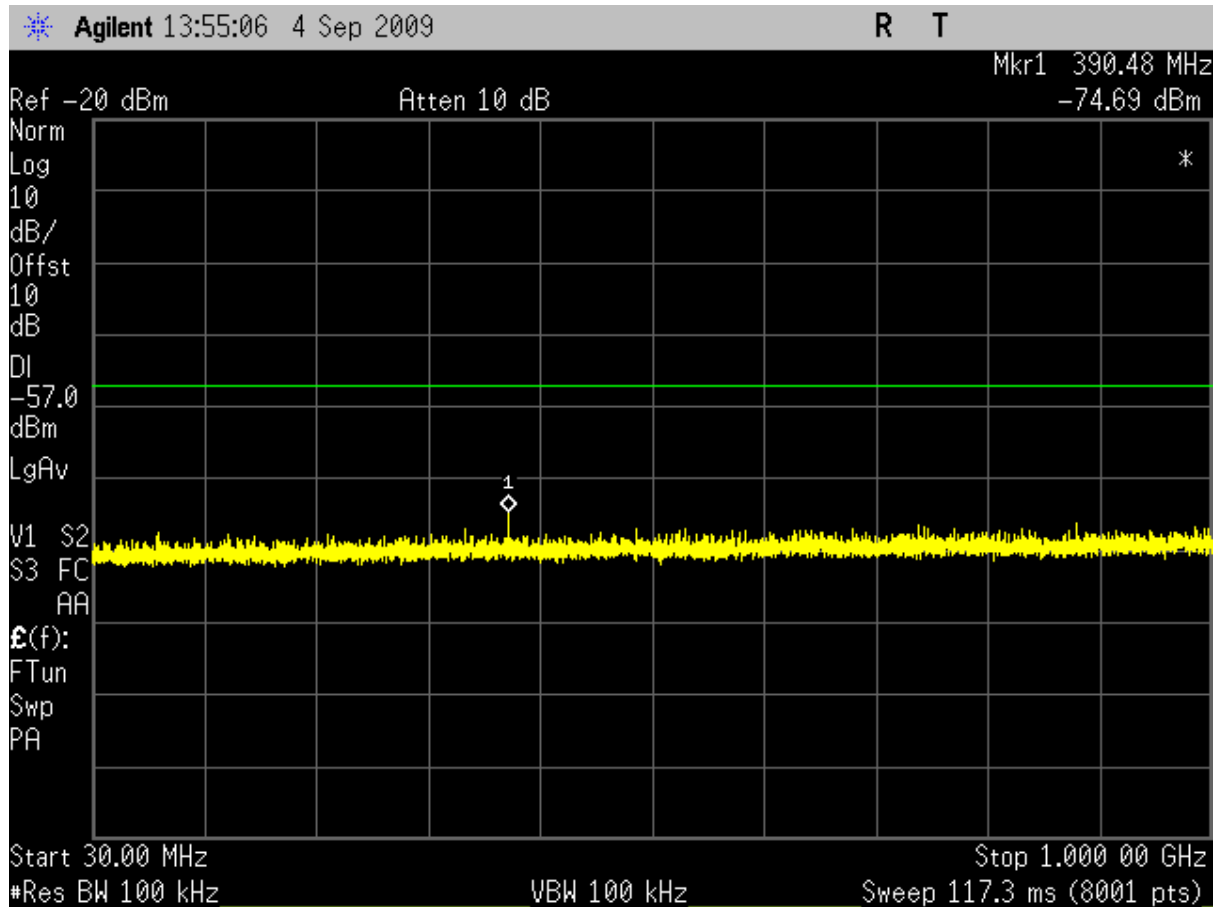
Note: Receiver tuned at 428.0 MHz



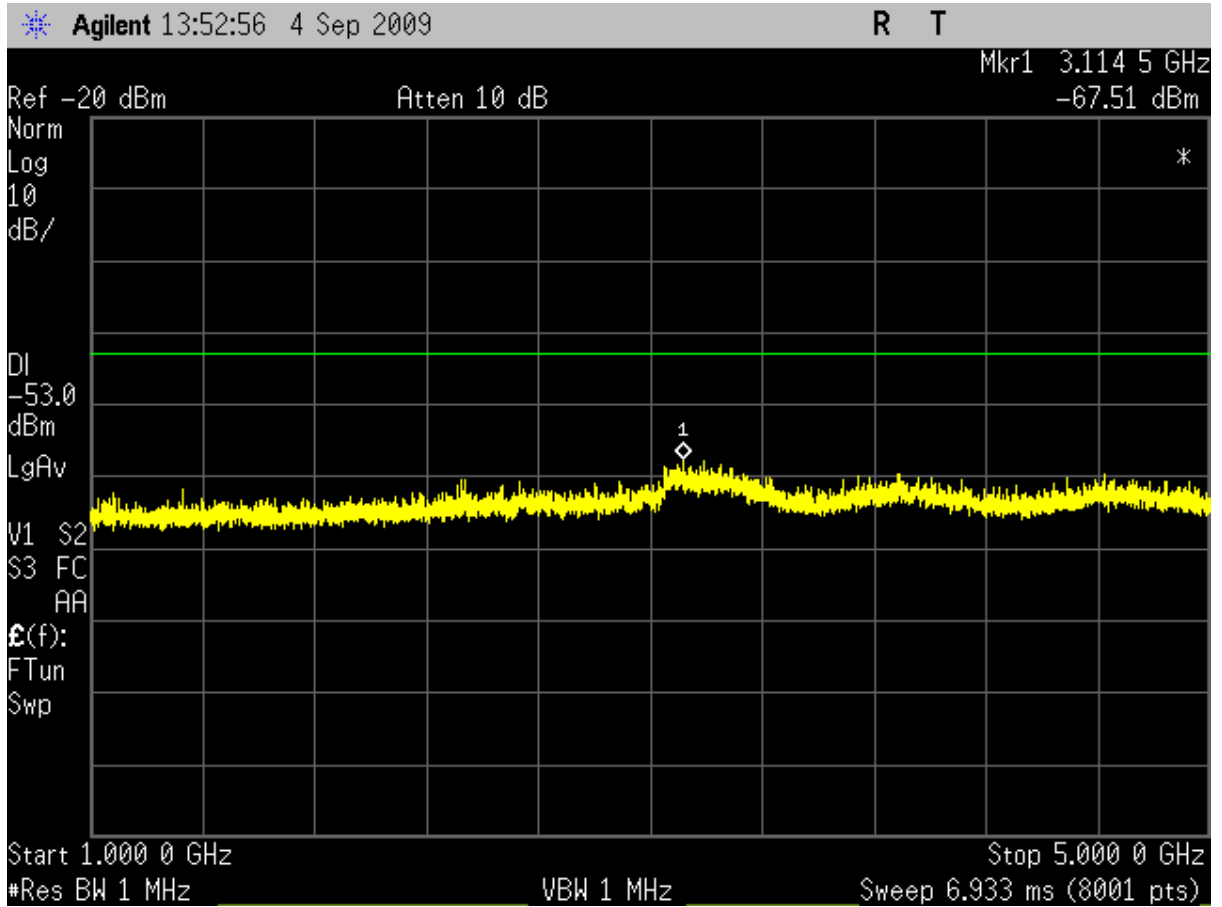
Note: Receiver tuned at 468.0 MHz



Note: Receiver tuned at 468.0 MHz



Note: Receiver tuned at 468.0 MHz



Note: Receiver tuned at 468.0 MHz

2.1.1 Radiated disturbance emission test

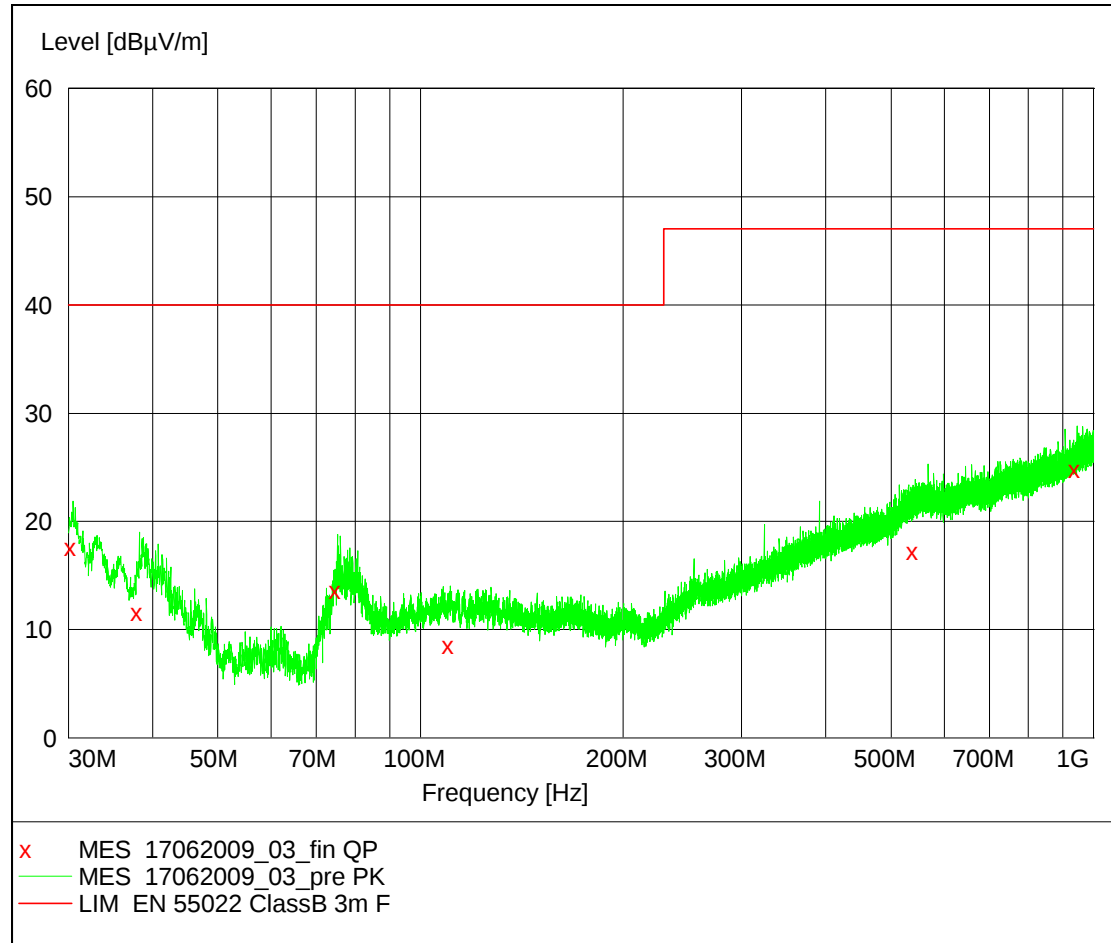
The test was performed as a compliance test. The test parameters concerned were as follows:

Parameter	Specification
Test method	CISPR 22
Frequency range	30 – 2000 MHz
Site name	Nemko Oy / Perkkää
Date of testing	17.06.2009
Test equipment	319, 350, 544, 525, 566, 564
Test uncertainty U95	±4.6 dB
Test conditions	22 °C, 40 % RH

The test was performed in a semi-anechoic shielded room. For the duration of the test the EUT was placed on a non-conductive support 0.8 m above the metallic ground plane (see photograph 1). During the test the distance from the EUT to the measuring antenna was 3 meters. In order to find the maximum levels of the disturbance radiation the angle of the turntable, the height of the measuring antenna and the lay-out of the EUT cables were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations. Spectrum was searched from 30MHz to 2GHz. Spectrum analyzer settings were: 30MHz-1000MHz RBW 100kHz, VBW 1MHz, 1000-2000MHz RBW 1MHz, VBW 1MHz.

2.1.2 Test results radiated disturbance emission test

Receiver tuned at 402.0 MHz



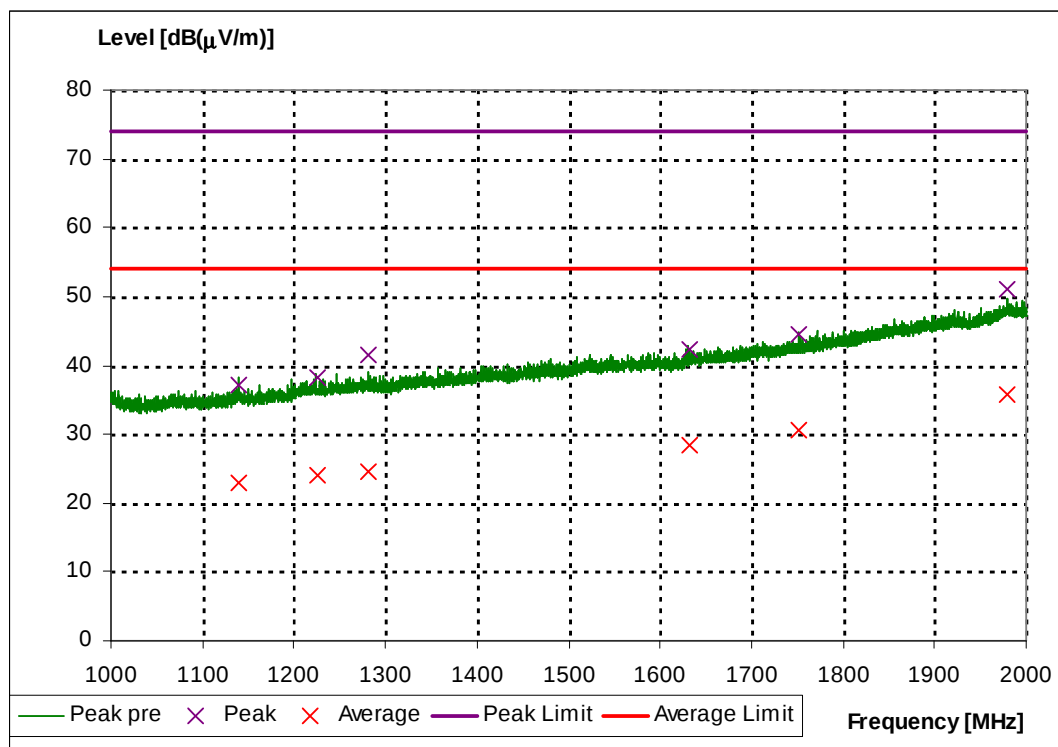
Horizontal and vertical polarisations in the frequency range 30 – 1000 MHz measured by using the peak detector. During the peak detector scan, the turntable was rotated from 0° to 360° with 30° steps with the antenna heights 1.0 m and 3.0 m. The highest levels of the radiated interference field strength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

Measurement results (QP):

Frequency MHz	Level dBμV/m	Limit dBμV/m	Margin dB	Exceed
30.48	17.6	40.0	22.4	—
38.24	11.6	40.0	28.4	—
75.24	13.7	40.0	26.3	—
110.84	8.6	40.0	31.4	—
543.16	17.3	47.0	29.7	—
944.40	24.8	47.0	22.2	—

The FCC 47 CFR Part 15, Subpart B, Class B limit of 500 $\mu\text{V/m}$ has been calculated to correspond 54.0 dB($\mu\text{V/m}$) as follows: $[\text{dB}(\mu\text{V/m})]=20\log[\mu\text{V/m}]$.

Receiver tuned at 402.0 MHz

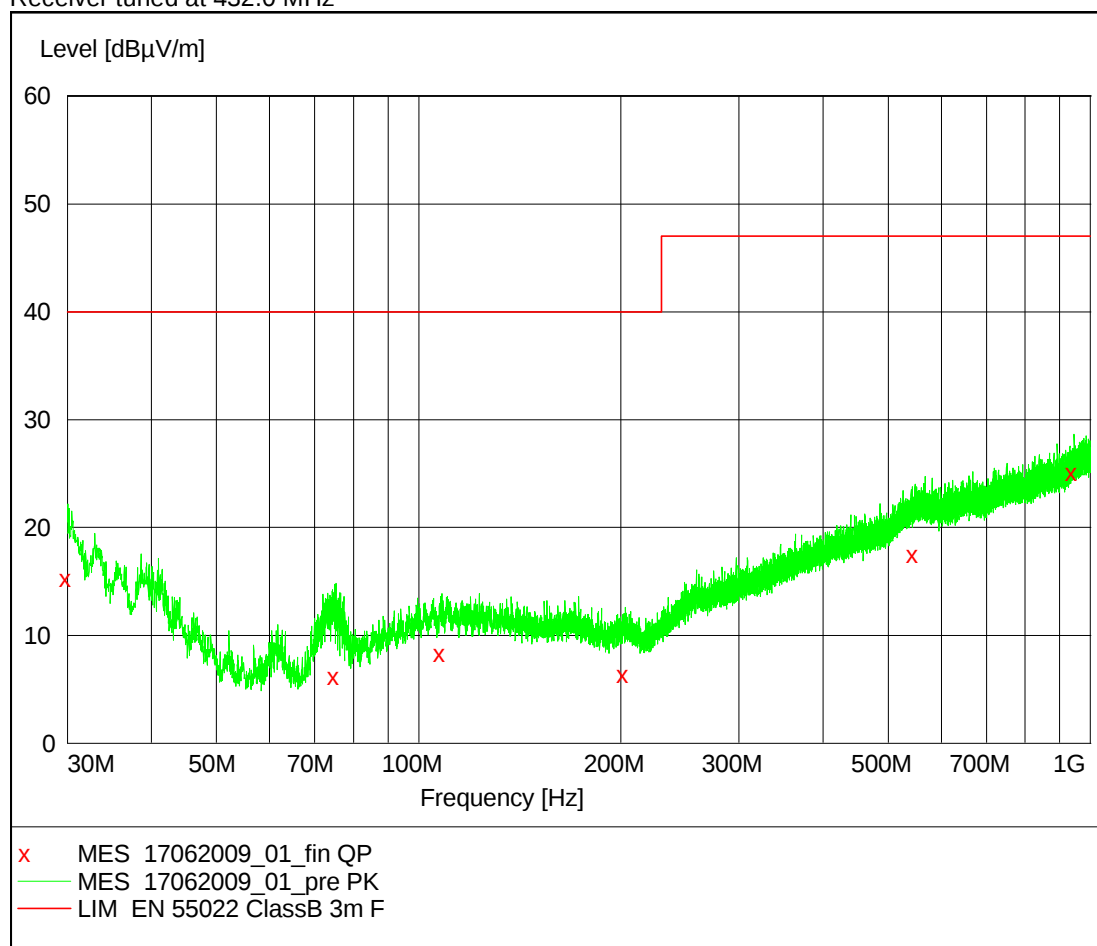


Horizontal and vertical polarizations in the frequency range 1000 – 2000 MHz measured by using the peak detector. During the peak detector scan, the turntable was rotated from 0° to 360° with 15° steps with the antenna heights 1.0, 1.5m, 2.0m, 2.5m and 3.0m. The highest levels of the radiated interference field strength measured by using the peak and average detectors were recorded.

Measurement results (Peak and Average):

Frequency MHz	Peak				Average			
	Level dB $\mu\text{V/m}$	Limit dB $\mu\text{V/m}$	Margin dB	Exceed	Level dB $\mu\text{V/m}$	Limit dB $\mu\text{V/m}$	Margin dB	Exceed
1139.185	37.1	74.0	36.9	–	22.8	54.0	31.2	–
1226.375	38.2	74.0	35.9	–	24.0	54.0	30.1	–
1281.364	41.4	74.0	32.6	–	24.5	54.0	29.5	–
1631.795	42.4	74.0	31.6	–	28.4	54.0	25.7	–
1752.232	44.4	74.0	29.6	–	30.5	54.0	23.5	–
1979.093	51.0	74.0	23.0	–	35.9	54.0	18.1	–

Receiver tuned at 432.0 MHz



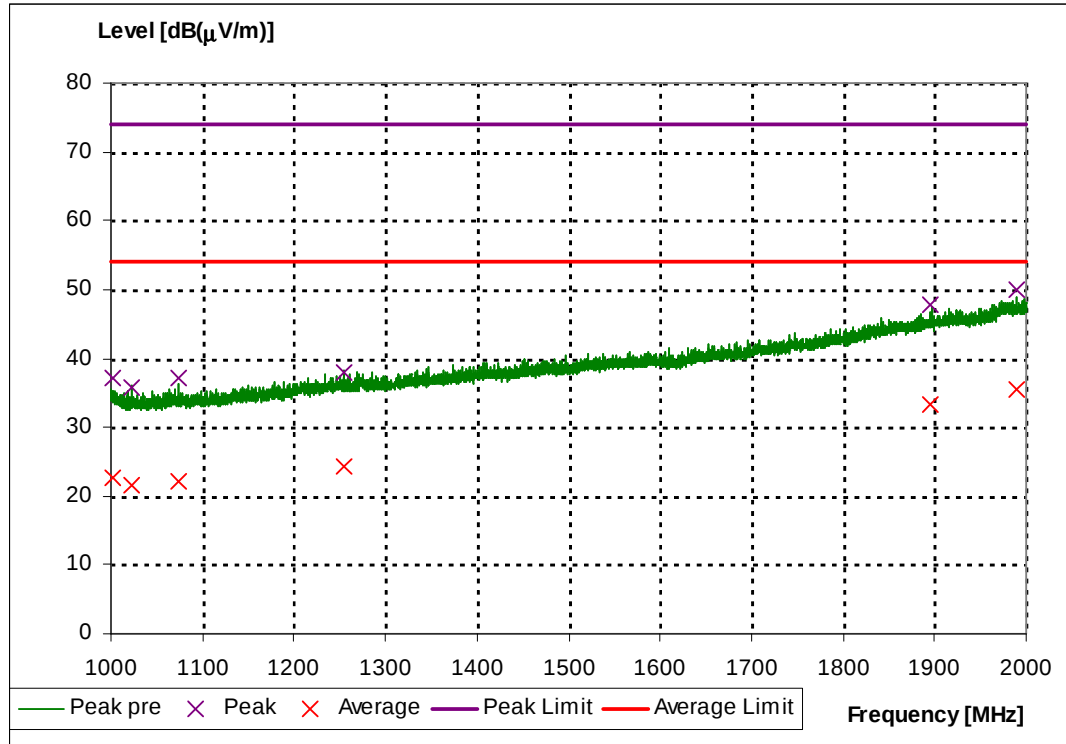
Horizontal and vertical polarisations in the frequency range 30 – 1000 MHz measured by using the peak detector. During the peak detector scan, the turntable was rotated from 0° to 360° with 30° steps with the antenna heights 1.0 m and 3.0 m. The highest levels of the radiated interference field strength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

Measurement results (QP):

Frequency MHz	Level dBμV/m	Limit dBμV/m	Margin dB	Exceed
30.04	15.3	40.0	24.7	-
75.32	6.2	40.0	33.8	-
108.28	8.3	40.0	31.7	-
203.04	6.4	40.0	33.6	-
548.88	17.5	47.0	29.5	-
944.40	25.1	47.0	21.9	-

The FCC 47 CFR Part 15, Subpart B, Class B limit of 500 $\mu\text{V/m}$ has been calculated to correspond 54.0 $\text{dB}(\mu\text{V/m})$ as follows: $[\text{dB}(\mu\text{V/m})]=20\log[\mu\text{V/m}]$.

Receiver tuned at 432.0 MHz

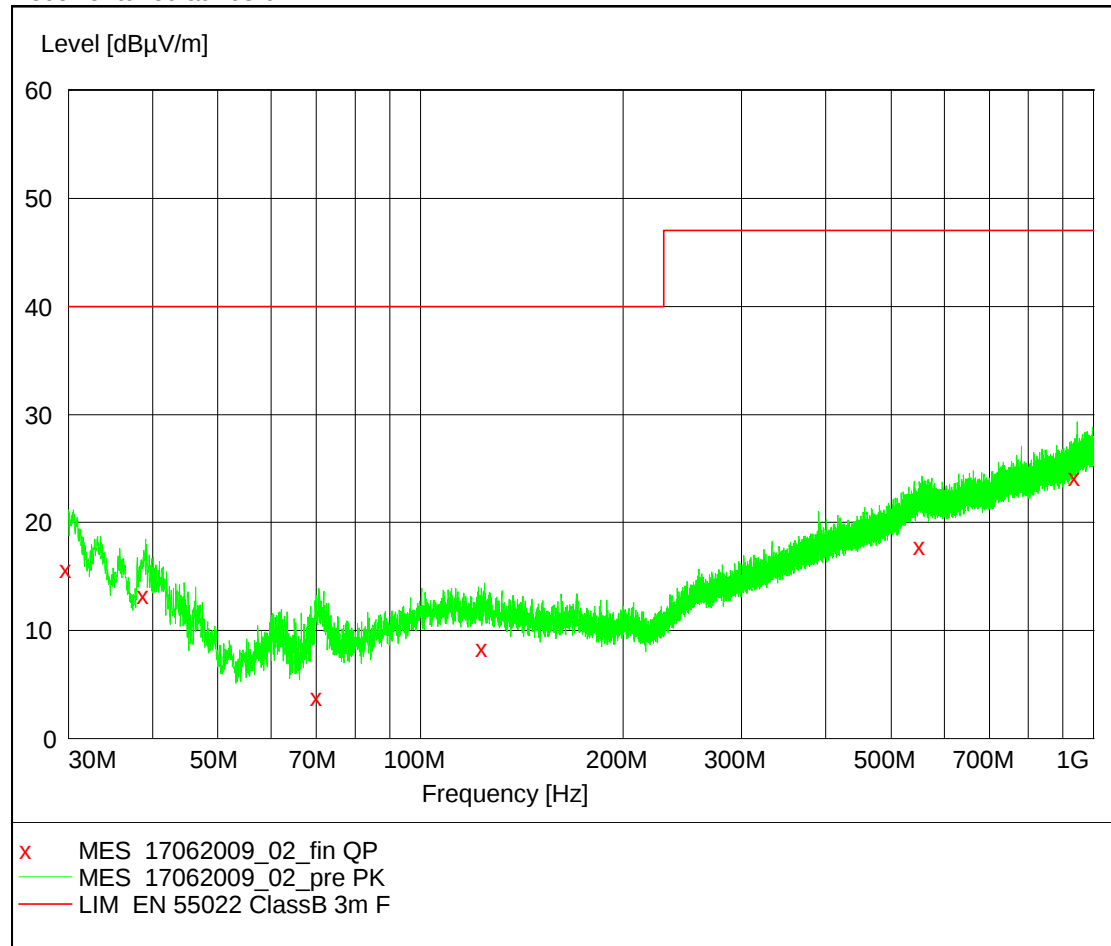


Horizontal and vertical polarizations in the frequency range 1000 – 2000 MHz measured by using the peak detector. During the peak detector scan, the turntable was rotated from 0° to 360° with 15° steps with the antenna heights 1.0, 1.5m, 2.0m, 2.5m and 3.0m. The highest levels of the radiated interference field strength measured by using the peak and average detectors were recorded.

Measurement results (Peak and Average):

Frequency MHz	Peak				Average			
	Level $\text{dB}\mu\text{V/m}$	Limit $\text{dB}\mu\text{V/m}$	Margin dB	Exceed	Level $\text{dB}\mu\text{V/m}$	Limit $\text{dB}\mu\text{V/m}$	Margin dB	Exceed
1002.404	37.3	74.0	36.8	–	22.6	54.0	31.4	–
1021.780	35.8	74.0	38.2	–	21.6	54.0	32.4	–
1073.138	37.0	74.0	37.0	–	22.2	54.0	31.8	–
1253.783	38.1	74.0	36.0	–	24.2	54.0	29.8	–
1895.677	47.8	74.0	26.2	–	33.4	54.0	20.6	–
1990.210	49.9	74.0	24.1	–	35.4	54.0	18.6	–

Receiver tuned at 468.0 MHz



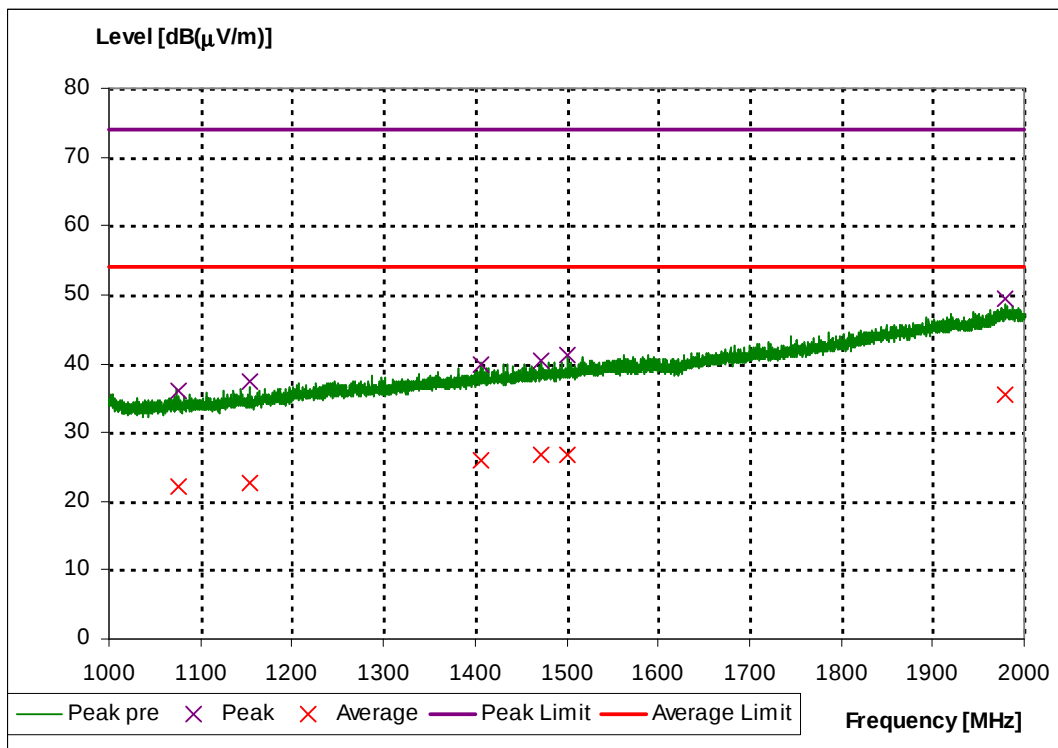
Horizontal and vertical polarisations in the frequency range 30 – 1000 MHz measured by using the peak detector. During the peak detector scan, the turntable was rotated from 0° to 360° with 30° steps with the antenna heights 1.0 m and 3.0 m. The highest levels of the radiated interference field strength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

Measurement results (QP):

Frequency MHz	Level dBμV/m	Limit dBμV/m	Margin dB	Exceed
30.00	15.7	40.0	24.3	—
39.04	13.3	40.0	26.7	—
70.68	3.8	40.0	36.2	—
124.40	8.4	40.0	31.6	—
556.20	17.8	47.0	29.2	—
944.44	24.2	47.0	22.8	—

The FCC 47 CFR Part 15, Subpart B, Class B limit of 500 $\mu\text{V/m}$ has been calculated to correspond 54.0 dB($\mu\text{V/m}$) as follows: $[\text{dB}(\mu\text{V/m})]=20\log[\mu\text{V/m}]$.

Receiver tuned at 468.0 MHz



Horizontal and vertical polarizations in the frequency range 1000 – 2000 MHz measured by using the peak detector. During the peak detector scan, the turntable was rotated from 0° to 360° with 15° steps with the antenna heights 1.0, 1.5m, 2.0m, 2.5m and 3.0m. The highest levels of the radiated interference field strength measured by using the peak and average detectors were recorded.

Measurement results (Peak and Average):

Frequency MHz	Peak				Average			
	Level dB $\mu\text{V/m}$	Limit dB $\mu\text{V/m}$	Margin dB	Exceed	Level dB $\mu\text{V/m}$	Limit dB $\mu\text{V/m}$	Margin dB	Exceed
1075.770	36.0	74.0	38.0	–	22.1	54.0	31.9	–
1154.487	37.3	74.0	36.7	–	22.7	54.0	31.4	–
1407.441	39.8	74.0	34.2	–	26.0	54.0	28.0	–
1472.726	40.5	74.0	33.6	–	26.6	54.0	27.4	–
1501.524	41.2	74.0	32.8	–	26.8	54.0	27.2	–
1978.503	49.3	74.0	24.7	–	35.5	54.0	18.5	–

3. List of measuring equipment:

Nr.	Equipment	Type	Manufacturer	Serial number
5	Test receiver	ESH-3	Rohde & Schwarz	894718/015
42	Spectrum analyzer	8566B	Hewlett Packard	2637A04102
89	Antenna	3147	EMCO	9202-1078
167	Artificial Mains	NSLK 8126	Schwartzbeck	8126101
168	Artificial Mains	NSLK 8127	Schwartzbeck	8127162
176	Anechoic chamber	RFD-60	Euroshield	509
184	Temp. & humidity meter	H MI 32	Vaisala	63837
196	Ferrite clamp	FGZ 40X15E	Lüthi	4057
197	Ferrite clamp	FGZ 40X15E	Lüthi	4058
198	Ferrite clamp	FGZ 40X15E	Lüthi	4069
289	Universal power analyzer	PM 3000A	Voltech	8448
290	Ref. impedance network	IEC555	Voltech	8448
316	Power supply	HP 6032A	Hewlett Packard	2517A-00654
319	Antenna	CBL6112	Chase	2018
323	T-network	EZ-10	Rohde & Schwarz	843074/005
324	T-network	ESH3-Z4	Rohde & Schwarz	842929/012
325	T-network	ESH3-Z4	Rohde & Schwarz	842929/010
338	Test receiver	ESS	Rohde & Schwarz	847151/009
343	Artificial Mains Network	NSLK8128	Schwartzbeck	8128177
344	mV-meter	URV4	Rohde & Schwarz	879747/013
348	Shielded room	RFSD-100	Euroshield Oy	1320
349	Shielded room	RFSD-100	Euroshield Oy	1319
350	Semianechoic shielded room	RFD-F-100	Euroshield Oy	1327
351	RF generator	SMT 06	Rohde & Schwarz	845715/001
367	LISN	NNB-4/200	Rolf Heine	4/200X-96009
369	Discont. Interf. analyzer	DIA 1512A	Chase	5115
370	AC Power source	15003i-400/3	California Instr.	
371	AC Power source	500i-400	California Instr.	HK 52064
372	AC Power source	500i-400	California Instr.	HK 52065
373	AC Power source	500i-400	California Instr.	HK 52063
374	Impedance network	OMNI 3-18i	California Instr.	X71344
417	Antenna, bilog	CBL 6141	Chase	4028
506	4 wire ISN	ENY41	Rohde & Schwarz	866824/029
507	2 x 2 wire ISN	ENY22	Rohde & Schwarz	833823/017
525	Double-Ridged Horn	3115	Emco	6691
534	RF-amplifier	25S1G4A	Amplifier Research	303881
542	Double-Ridged Horn	3115	Emco	00023905
543	RF-amplifier	JCA018-501	JCA Technologies	103
544	RF-amplifier	ZFL-1000VH2	Mini-Circuits	D01080
564	RF amplifier	CA018-4010	CIAO Wireless	101
566	Spectrum analyzer	E4448A	Agilent	US42510236