Nemko TEST REPORT

Date:	**ESPOO 04.10.2007**	Page:	**1 (29)**
		Appendices	–

Number: No. 1 / 1

95107

Date of handing in: 25.09.2007

Tested by:

Timo Hietala, Test Engineer

Reviewed by:

Timo Leismala, Testing Manager

SORT OF EQUIPMENT:	**GSM (850/1800/1900) telemetry link**
MARKETING NAME:	
TYPE:	***TTA-310iU***
MANUFACTURER:	***Tracker Oy***
CLIENT:	**Tracker Oy**
ADDRESS:	**Kauppiaantie 30, FI – 90460 OULUNSALO**
TELEPHONE:	**+358 40 7783867**
TEST LABORATORY:	**Nemko Oy**
FCC REG. NO.	**91087 August 24, 2004**
IC FILE NO.	**IC 4627 October 10, 2006**

SUMMARY:

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

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Summary of performed tests and test results

GSM850
CFR 47 part 2 subpart J, part 15 subpart B, part 22 subpart H, RSS-GEN Issue 2 and RSS-132 Issue 2

Section in CFR 47	*Section in RSS-GEN and RSS-132*		*Result*
22.913 (a)	4.6, 4.4	Radiated RF output	**PASS**
2.1049 (h)	4.4.1	99% occupied bandwidth	**PASS**
22.917 (a)	4.7, 4.5	Band-edge compliance	**PASS**
22.917 (a), 2.1053	4.7, 4.5	Spurious radiated emissions	**PASS**
2.1055 (a)	4.5, 4.3	Frequency stability, temperature variation	**PASS**
2.1055 (d	4.5, 4.3	Frequency stability, voltage variation	**PASS**

GSM1900
CFR 47 part 2 subpart J, part 15 subpart B, part 24 subpart E and RSS-133 Issue 3

Section in CFR 47	*Section in RSS-133*		*Result*
24.232, (b)	6.2	Radiated RF output	**PASS**
2.1049, (h)	5.6	99% occupied bandwidth	**PASS**
24.238 (a)	6.3	Band-edge compliance	**PASS**
24.238 (a), 2.1053	6.3	Spurious radiated emissions	**PASS**
24.235, 2.1055 (a)	7	Frequency stability, temperature variation	**PASS**
24.235, 2.1055 (d)	7	Frequency stability, voltage variation	**PASS**

CFR 47 part 15 subpart B, ICES-003

Section in CFR 47	*Section in ICES-003*		*Result*
15.109, a	5.5	Radiated emissions	**PASS**
15.107, a	5.3	AC power line conducted emissions	**PASS**

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.
NT The measurement was not done

Contents

1. EUT and Accessory Information

1.1 EUT description

The EUT is a triple band GSM (850/1800/1900MHz) telemetry link device with GPS receiver.

1.2 EUT and accessories

	unit	*type*	*S/N*
EUT1	**Dog locator**	**TTA-310iU**	**352023/00/233100/14**
EUT2	**Dog locator**	**TTA-310iU**	**352023/00/233097/14**
Accessories	**Battery** **AC Charger**	**cp103450A** **Insmat Fast charger for Tracker**	**-** **-**

Operating voltage of the EUT during the tests:

- Rechargeable battery pack 3.7 VDC.

All tests have been performed with fully charged battery, except tests where controlled input voltage was needed. In these tests an external power supply was used.

1.3 Channels of the EUT

EUT Channel	*Frequency (MHz)*
GSM850 Low, 128	**824.200**
GSM850 Middle, 190	**836.600**
GSM850 High, 251	**848.800**
GSM1900 Low, 512	**1850.200**
GSM1900 Middle, 661	**1880.000**
GSM1900 High, 810	**1909.800**

2. Standards and measurement methods

GSM850, the test were performed in guidance of
CFR 47 part 2 subpart J, part 15 subpart B, part 22 subpart H, ANSI/TIA/EIA-603-C, RSS-GEN Issue 2 and RSS-132 Issue 2.

GSM1900, the test were performed in guidance of
CFR 47 part 2 subpart J, part 15 subpart B, part 24 subpart E, ANSI/TIA/EIA-603-C and RSS-133 Issue 3.

3. Test results

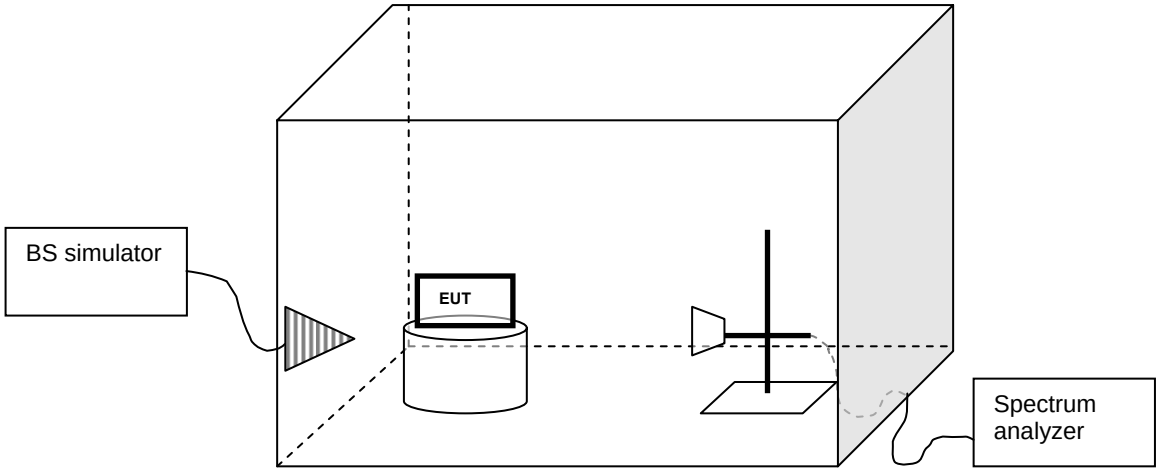
3.1 Radiated RF output power

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

EUT	EUT1
Site name	Nemko Oy / Perkkaa
Date of testing	26.09.2007
Test equipment	566, 565, 525, 319, 350, 184, 545, 89
Test conditions	23 °C, 40 % RH
Test result	**PASS**

3.1.1 Test method and limit

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. In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the room. The radiated power from the EUT was measured with an antenna fixed to a 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. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



a) The maximum power level was searched at each frequency by rotating the turntable and adjusting the measuring antenna polarization and height (from 1- 4 m). This level (PEUT) was recorded. The measurements were performed the EUT at all three orthogonal planes
b) The EUT was replaced with a substituting antenna.
c) The substituting antenna was fed with the power (P_{Gen}) giving a convenient reading on the spectrum analyzer and the measuring antenna height was adjusted to obtain a maximum reading at spectrum analyzer. That reading (P_{Subst}) on spectrum analyzer was recorded.

The formula below was used to calculate the ERP of the EUT.

$P_{ERP[dbm]} = P_{Measured[dBm]} – P_{Subst[dBm]} - L_{Cable[dB]} + G_{Antenna[dB]} – 2.15dB + P_{Gen[dBm]}$

The formula below was used to calculate the EIRP of the EUT.

$P_{EIRP[dbm]} = P_{Measured[dBm]} – P_{Subst[dBm]} - L_{Cable[dB]} + G_{Antenna[dB]} + P_{Gen[dBm]}$

Where

$P_{Measured[dBm]}$ measured power level from the EUT

$P_{Subst[dBm]}$ measured emission level from substitutive antenna

$L_{Cable[dB]}$ loss of the cable between substitutive antenna and signal generator

$G_{Antenna[dB]}$ gain of the substitutive antenna (isotropic radiator)

$P_{Gen[dBm]}$ signal generator power fed to the substitutive antenna

3.1.2 Limit

GSM850

	ERP (W)	*ERP (dBm)*
FCC	**≤ 7**	**≤ 38.5**
IC, SRSP-503	**≤ 6.3**	**≤ 38.0**

GSM1900

	EIRP (W)	*EIRP (dBm)*
FCC	**≤ 2**	**≤ 33**
IC, SRSP-510	**≤ 2**	**≤ 33**

3.1.3 EUT operation mode

GSM850

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**128, 190, 251**
EUT power level	**4 (+ 33 dBm)**

GSM1900

EUT operation mode	***GSM 1900, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**512, 661, 810**
EUT power level	**0 (+ 30 dBm)**

3.1.4 Test results

GSM850

EUT Channel	$P_{Measured}$ *[dBm]*	P_{Gen} *[dBm]*	P_{Subst} *[dBm]*	L_{Cable} *[dBm]*	$G_{Antenna}$ *[dBi]*	*ERP [dBm]*	*ERP [W]*
128	**-4.4**	**10**	**-24.3**	**1.8**	**6.6**	**32.5**	**1.78**
190	**-4.3**	**10**	**-24.1**	**1.9**	**6.5**	**32.3**	**1.70**
251	**-5.4**	**10**	**-23.8**	**1.9**	**6.5**	**30.9**	**1.23**

GSM1900

EUT Channel	$P_{Measured}$ *[dBm]*	P_{Gen} *[dBm]*	P_{Subst} *[dBm]*	L_{Cable} *[dBm]*	$G_{Antenna}$ *[dBi]*	*EIRP [dBm]*	*EIRP [W]*
512	**- 21.5**	**10**	**- 40.7**	**1.8**	**- 0.7**	**26.7**	**0.472**
661	**- 21.1**	**10**	**- 40.3**	**1.8**	**- 1.0**	**26.4**	**0.439**
810	**- 21.5**	**10**	**- 40.1**	**1.8**	**- 1.4**	**25.4**	**0.347**

3.2 99% occupied bandwidth

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

EUT	EUT1
Site name	Nemko Oy / Perkkaa
Date of testing	26.09.2007
Test equipment	566, 567, 525, 319, 350, 184, 545, 89
Test conditions	22 °C, 40 % RH
Test result	**PASS**

3.2.1 Test method and limit

See method 3.1.1
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. In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the room. The radiated power from the EUT was measured with an antenna fixed to a 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. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

3.2.2 EUT operation mode

GSM850

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**190**
EUT power level	**4 (+ 33 dBm)**

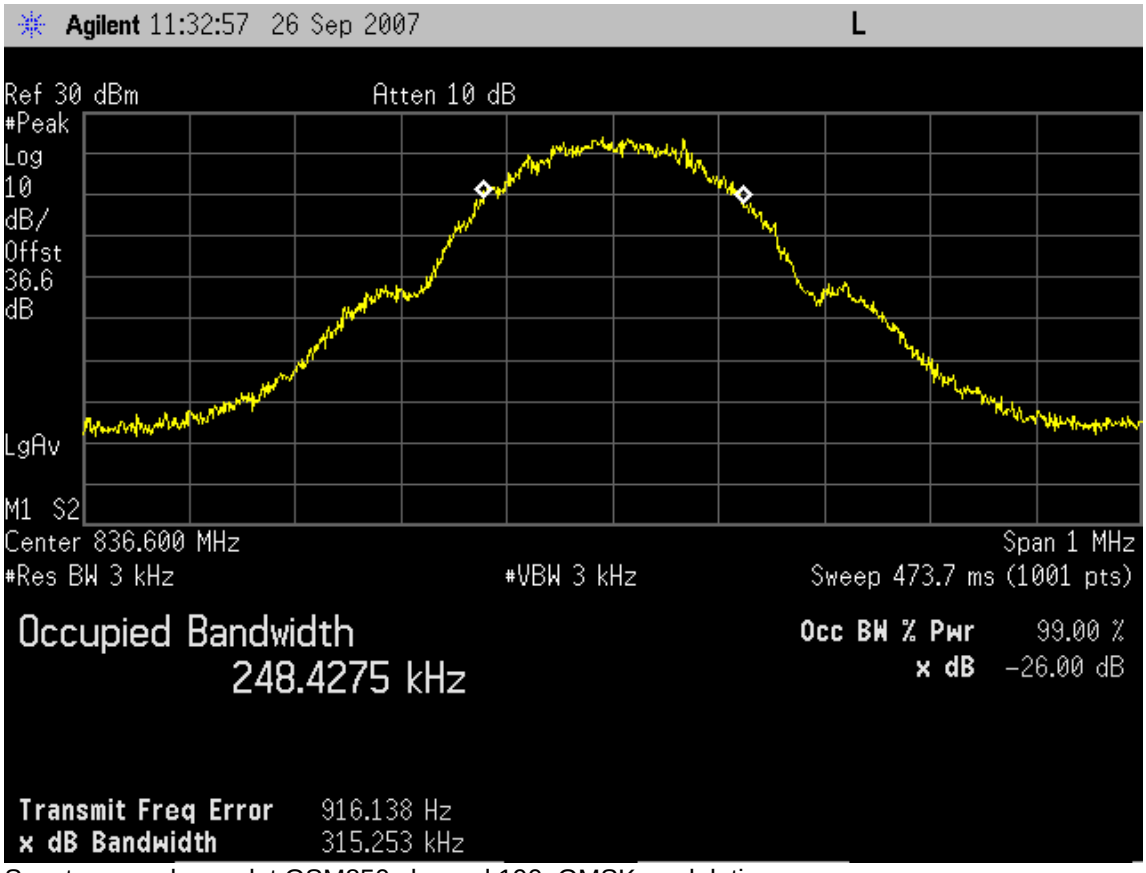
GSM1900

EUT operation mode	***GSM 1900, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**661**
EUT power level	**0 (+ 30 dBm)**

3.2.3 Test results

GSM850

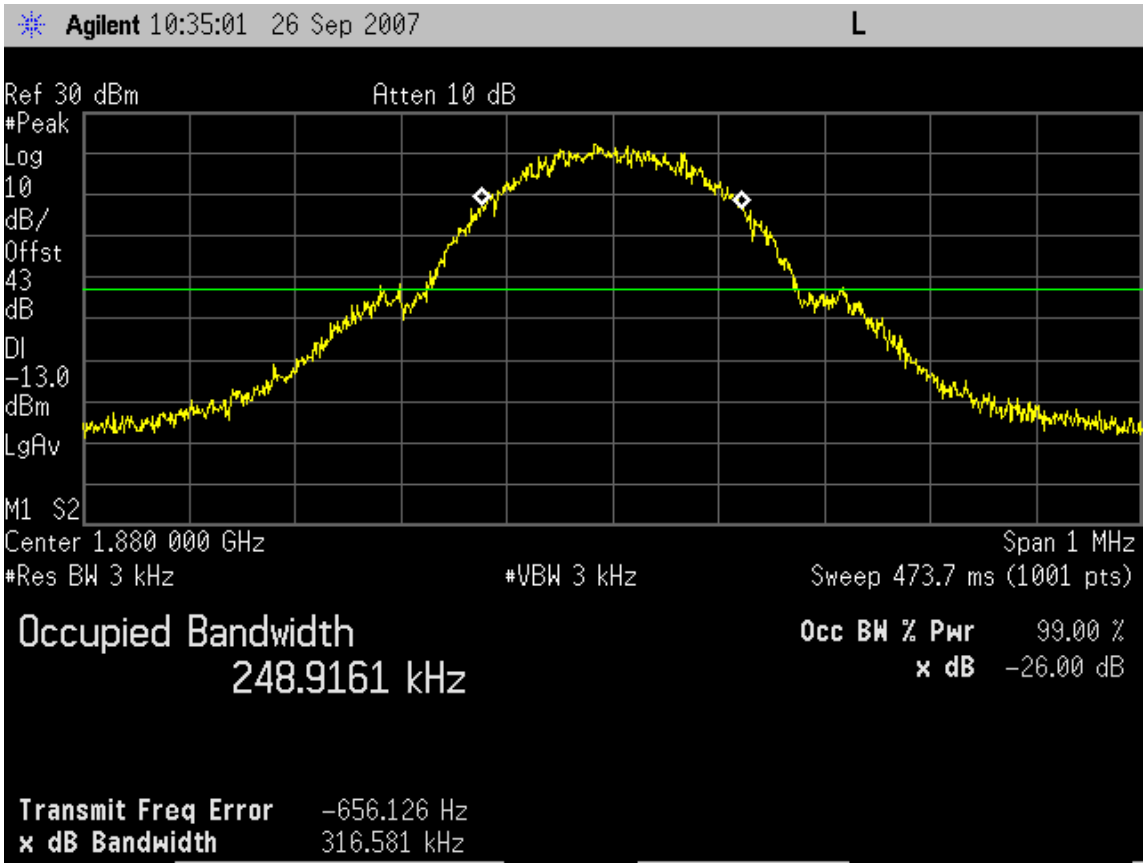
Channel	*99% occupied bandwidth kHz*	*-26 dBc bandwidth kHz*
128	**250.8**	**315.4**
190	**248.4**	**315.2**
251	**246.5**	**316.6**



Spectrum analyzer plot GSM850 channel 190, GMSK modulation

GSM1900

Channel	*99% occupied bandwidth kHz*	*-26 dBc bandwidth kHz*
512	**250.6**	**317.0**
661	**248.9**	**316.5**
810	**251.0**	**311.7**



Spectrum analyzer plot GSM1900 channel 661, GMSK modulation

3.3 Band-edge compliance

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

EUT	EUT1
Site name	Nemko Oy / Perkkaa
Date of testing	26.09.2007
Test equipment	566, 567, 525, 319, 350, 184, 545, 89
Test conditions	23 °C, 40 % RH
Test result	**PASS**

3.3.1 Test method and limit

See method 3.1.1
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. In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the room. The radiated power from the EUT was measured with an antenna fixed to a 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. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

3.3.2 Limit

GSM850

Frequency MHz	*Band-edge compliance dBm*
< 824.0 or 849.0 <	**≤ -13**

GSM1900

Frequency MHz	*Band-edge compliance dBm*
< 1850.0 or 1910.0 <	**≤ -13**

3.3.3 EUT operation mode

GSM850

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**128, 251**
EUT power level	**4 (+ 33 dBm)**

GSM1900

EUT operation mode	***GSM 1900, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**512, 810**
EUT power level	**0 (+ 30 dBm)**

3.3.4 Test results

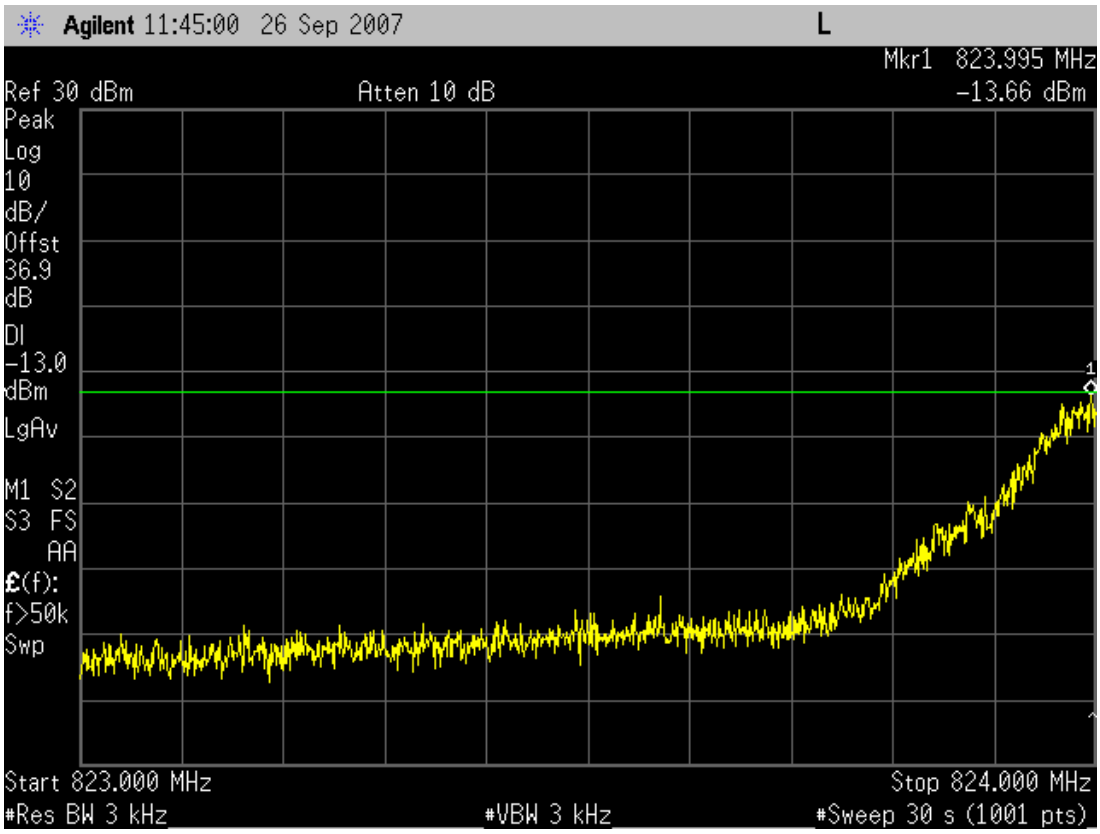
The line in the spectrum analyzer plot is the -13dBm limit line. The band edge is at the edge of the screen.

GSM850

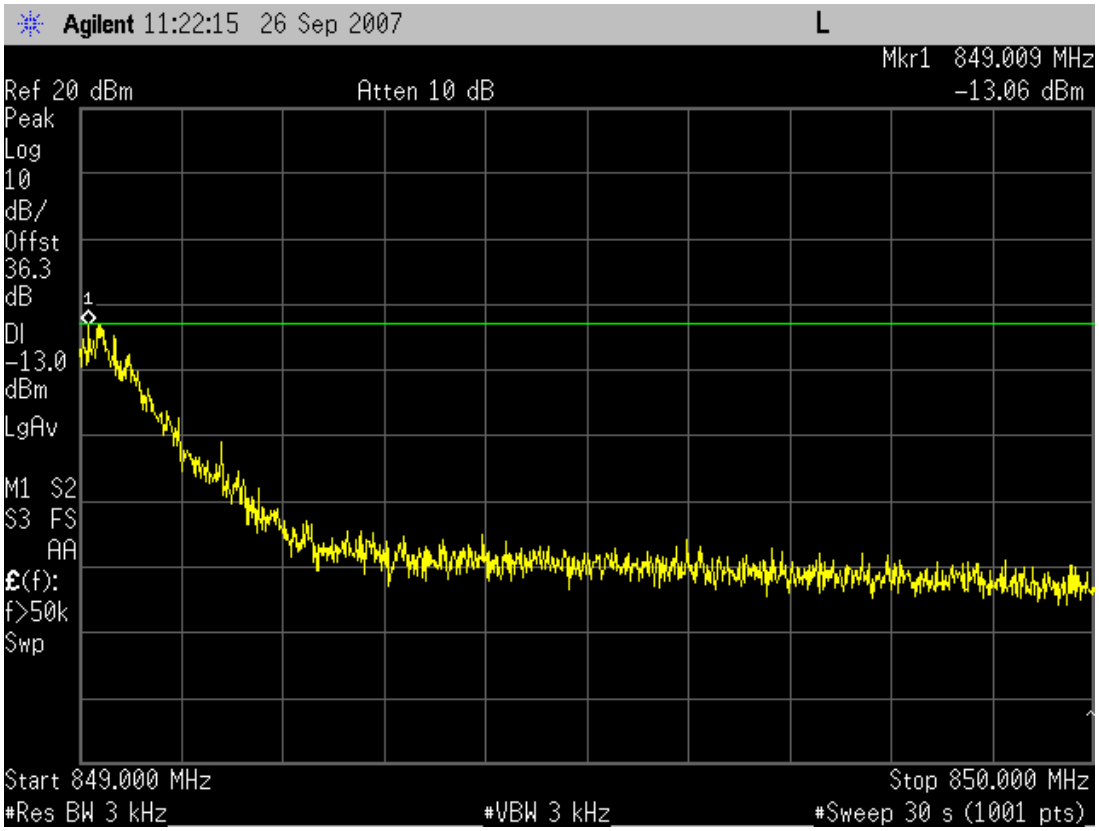
Channel	*Band-edge compliance dBm*
128	**-13.66**
251	**-13.06**

GSM1900

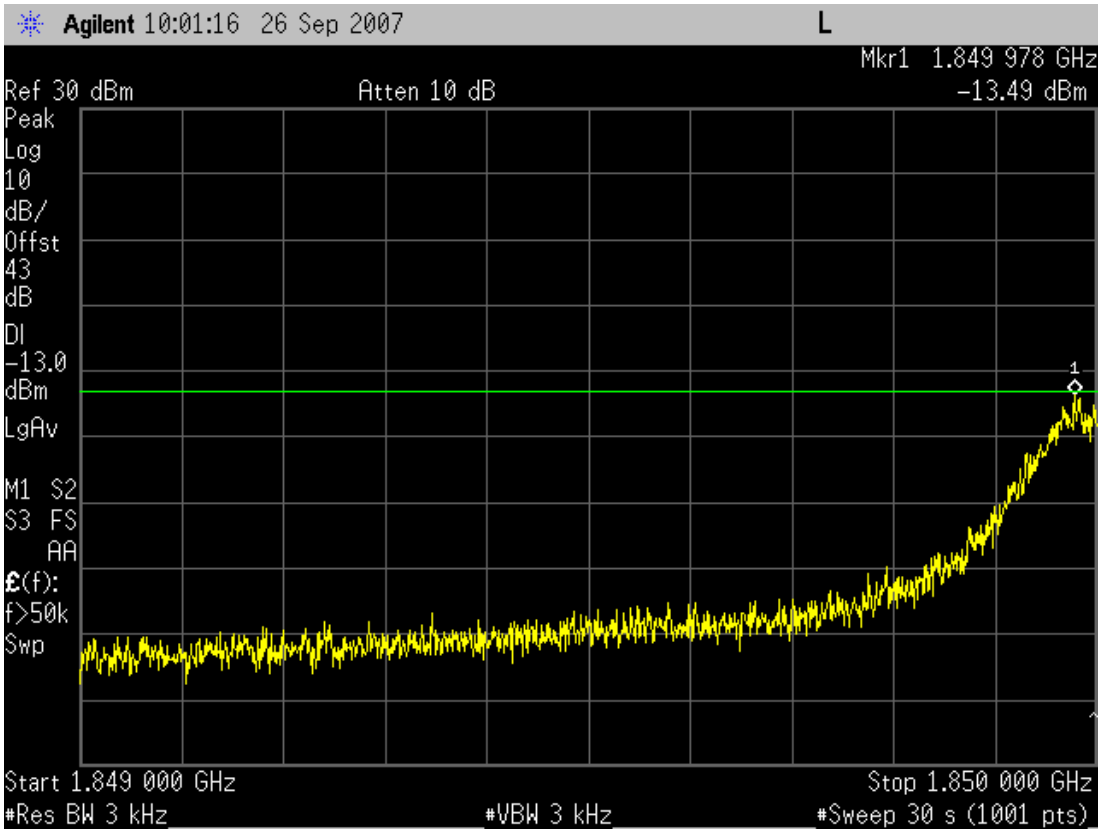
Channel	*Band-edge compliance dBm*
512	**-13.49**
810	**-13.52**



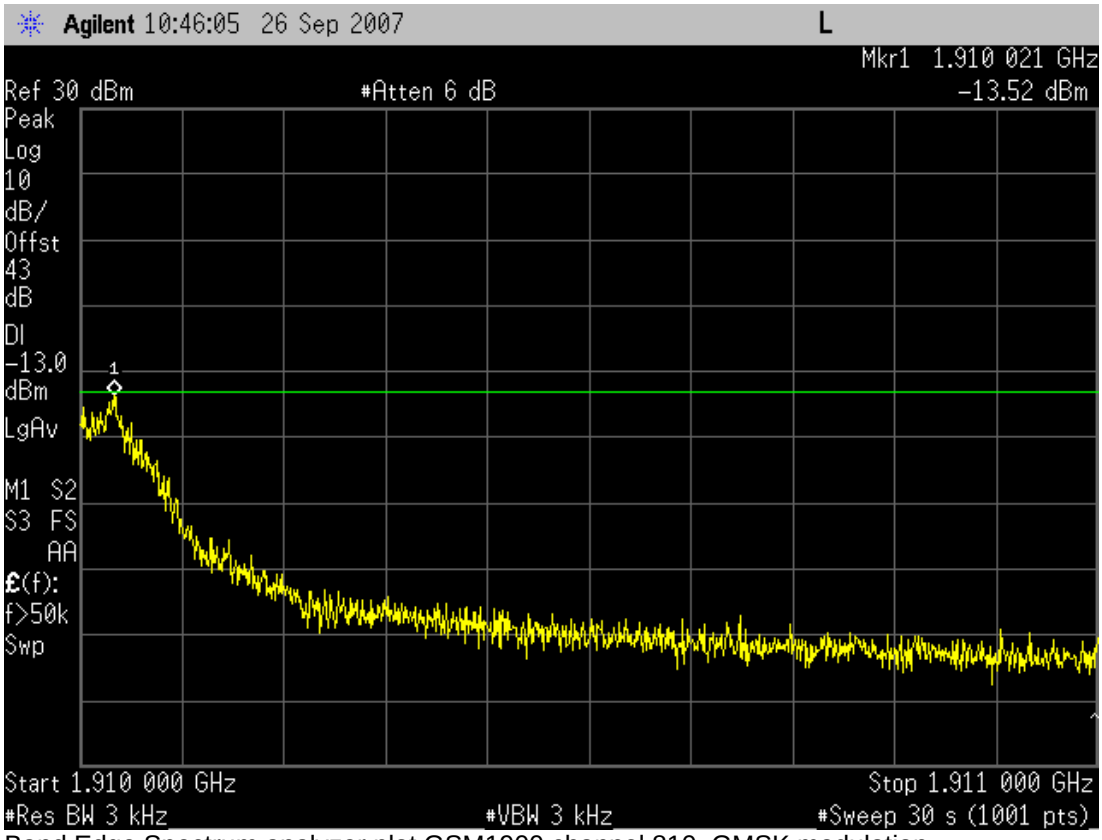
Band Edge Spectrum analyzer plot GSM850 channel 128, GMSK modulation



Band Edge Spectrum analyzer plot GSM850channel 251, GMSK modulation



Band Edge Spectrum analyzer plot GSM1900 channel 512, GMSK modulation



Band Edge Spectrum analyzer plot GSM1900 channel 810, GMSK modulation

3.4 Spurious radiated emission

EUT	EUT1
Site name	Nemko Oy / Perkkaa
Date of testing	29.09.2007
Test equipment	350, 566, 567, 544, 564, 184, 525, 542, 543, 545, 551,552,572
Test conditions	23 °C, 40 % RH
Test Result	**PASS**

3.4.1 Test method and limit

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. In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the room. The radiated power from the EUT was measured with an antenna fixed to a 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. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

a) A preliminary scan was first 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 2.5 m. The limit of -13 dBm has been calculated to correspond 84.4 dB(µV/m).

b) Spurious emissions closer than 20 dB to the limit were measured using the substitution method. The maximum power level was searched at each frequency by rotating the turntable and adjusting the measuring antenna polarization and height (from 1- 4 m). This level (PEUT) was recorded. The measurements were performed the EUT at all three orthogonal planes

c) The EUT was replaced with a substituting antenna.

d) The substituting antenna was fed with the power (P_{Gen}) giving a convenient reading on the spectrum analyzer and the measuring antenna height was adjusted to obtain a maximum reading at spectrum analyzer. That reading (P_{Subst}) on spectrum analyzer was recorded.

3.4.2 Limit

Frequency MHz	*Level dBm*
30 - 19000	**- 13**

3.4.3 EUT operation mode

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**190**
EUT power level	**4 (+ 33 dBm)**

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**190**
EUT power level	**4 (+ 33 dBm)**

3.4.4 Test results

The formula below was used to calculate the EIRP of the spurious emissions. The emissions closer than 20 dB to the limit line are reported.

$$P_{Emission[dbm]} = P_{Measured[dB]} - P_{Subst[dB]} - L_{Cable[dB]} + G_{Antenna[dBi]} + P_{Gen[dBm]}$$

Where

$P_{Measured[dBm]}$ measured emission level

$P_{Subst[dBm]}$ measured emission level from substitutive antenna

$L_{Cable[dB]}$ loss of the cable between substitutive antenna and signal generator

$G_{Antenna[dBi]}$ gain of the substitutive antenna

$P_{Gen[dBm]}$ signal generator power fed to the substitutive antenna

Calculation example:

$$\boldsymbol{P_{1673.2[dbm]} = -37.8_{Measured[dB]} - (-27.4)_{Subst[dB]} - 1.7_{Cable[dB]} + 8.9_{Antenna[dBi]} + (-30)_{Gen[dBm]}}$$

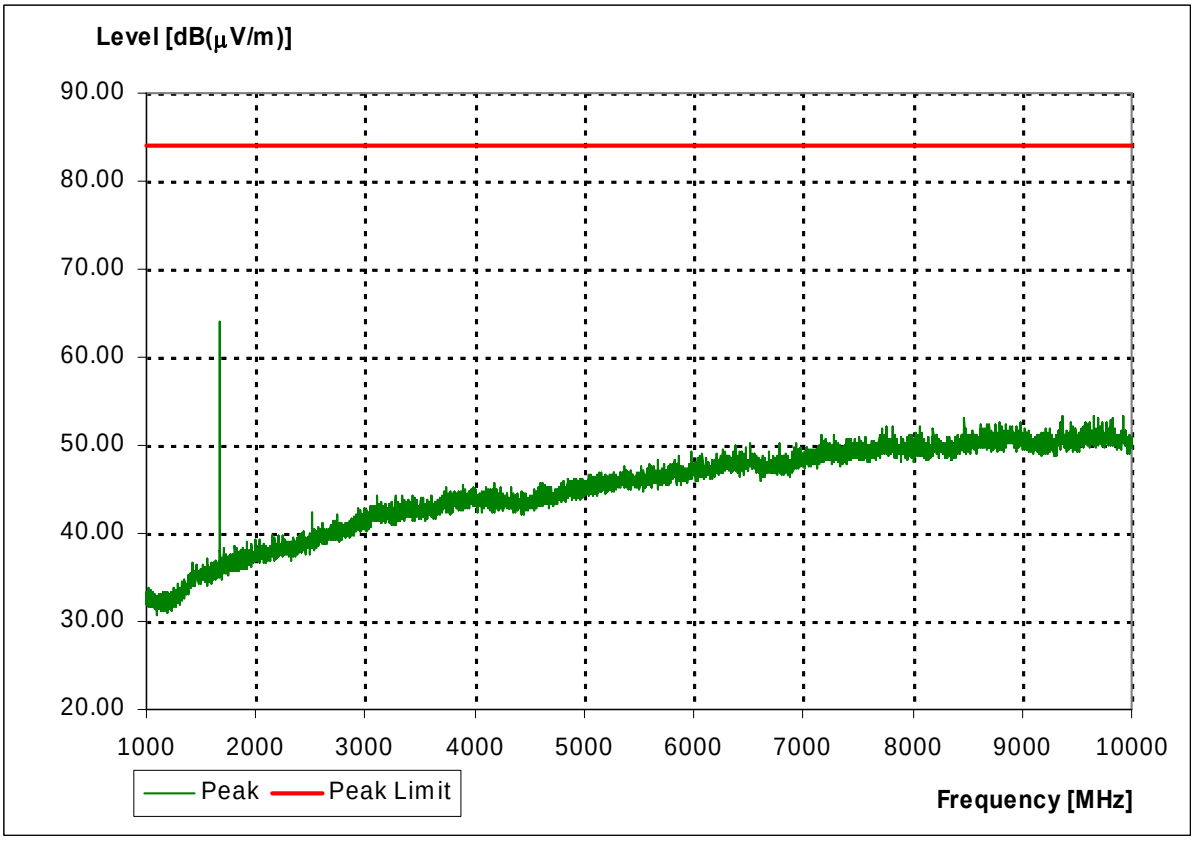
$$\boldsymbol{= -33.2_{dBm]}}$$

The settings of the spectrum analyzer were as follows

Resolution bandwidth f < 1 GHz	100 kHz
Resolution bandwidth f > 1 GHz	1 MHz
Video bandwidth f < 1 GHz	100 kHz
Video bandwidth f > 1 GHz	1 MHz
Detector	Peak

TX GSM 850 (ch 190, 836.6 MHz), GMSK modulation

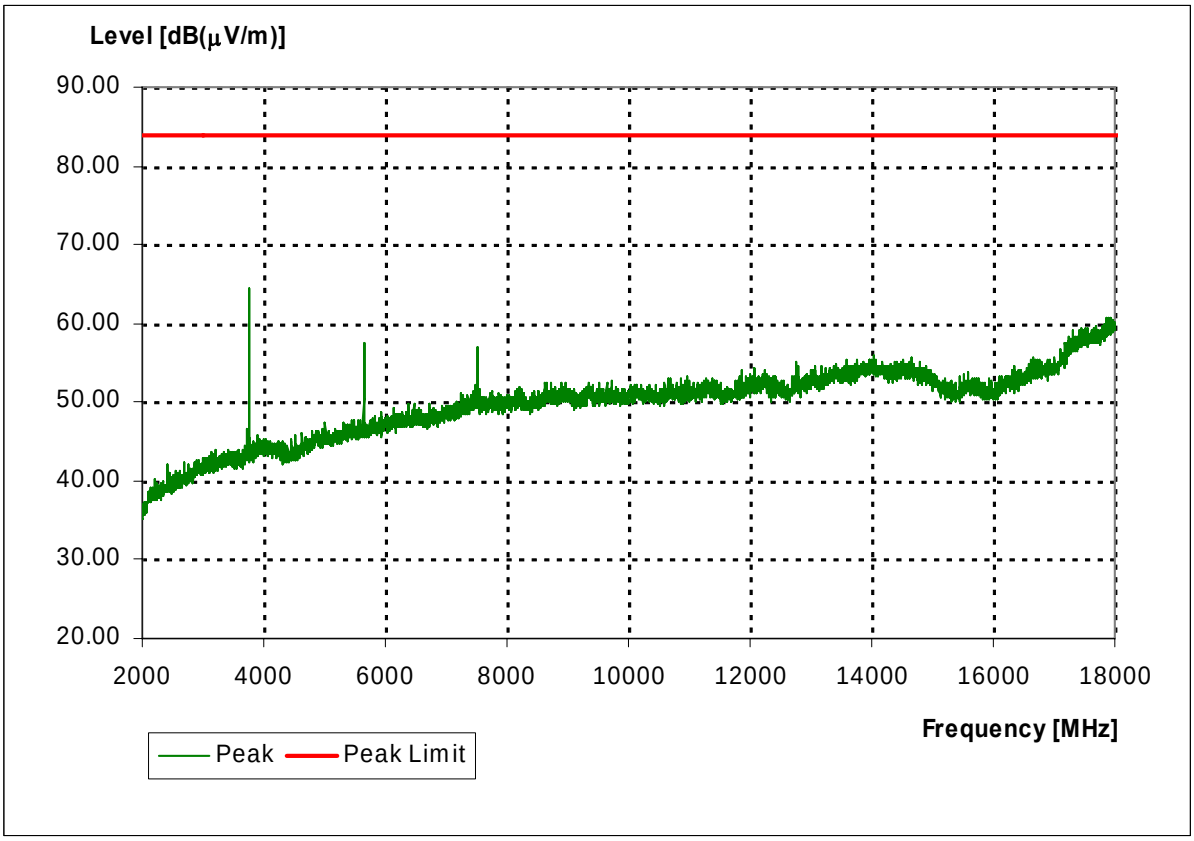
Frequency MHz	*Result dBm*	*Margin dB*	*Limit dBm*
1673.2	**-33.2**	**20.2**	**- 13**
2509.8	**<-40**	**>25**	**- 13**
3346.4	**<-40**	**>25**	**- 13**
4183.0	**<-40**	**>25**	**- 13**
5019.6	**<-40**	**>25**	**- 13**
5856.2	**<-40**	**>25**	**- 13**
6692.8	**<-40**	**>25**	**- 13**
7529.4	**<-40**	**>25**	**- 13**
8366.0	**<-40**	**>25**	**- 13**



Spurious emissions Spectrum analyzer plot GSM850 channel 190, GMSK modulation

TX GSM 1900 (ch 661, 1880.0 MHz), GMSK modulation

Frequency MHz	*Result dBm*	*Margin dB*	*Limit dBm*
3760.0	**-34.8**	**21.8**	**- 13**
5640.0	**-38.5**	**25.5**	**- 13**
7520.0	**-37.6**	**24.6**	**- 13**
9400.0	**-39.6**	**26.6**	**- 13**
11280.0	**<-40**	**>25**	**- 13**
13160.0	**<-40**	**>25**	**- 13**
15040.0	**<-40**	**>25**	**- 13**
16920.0	**<-40**	**>25**	**- 13**
18800.0	**<-40**	**>25**	**- 13**



Spurious emissions Spectrum analyzer plot GSM1900 channel 810, GMSK modulation

3.5 Frequency stability, temperature variation

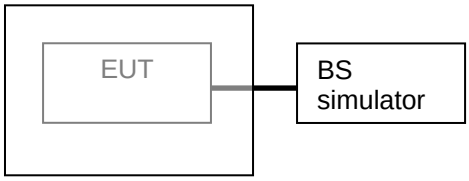
The test was performed as a compliance test. The test parameters concerned were as follows:

EUT	EUT2
Site name	Nemko Oy / Perkkaa
Date of testing	27-28.09.2007
Test equipment	545, 157
Test conditions	22 °C, 40 % RH
Test result	**PASS**

3.5.1 Test method and limit

The test was performed EUT placed inside a temperature chamber. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

a) The climate chamber temperature was set to the minimum value and the temperature was allowed to stabilize.
b) The EUT was placed in the chamber
c) The EUT was set in idle mode for 45 minutes.
d) The EUT was set to transmit.
e) The transmit frequency error was measured immediately
f) The steps c - e were repeated for each temperature



3.5.2 Limit

Frequency error ppm
± 2.5

3.5.3 EUT operation mode

GSM850

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**190, 836.6 MHz**
EUT power level	**4 (+ 33 dBm)**

GSM1900

EUT operation mode	***GSM 1900, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**661, 1880 MHz**
EUT power level	**0 (+ 30 dBm)**

3.5.4 Test results

GSM850

Temperature [ºC]	*Deviation [Hz]*	*Deviation [ppm]*
-30	**41**	**0.049**
-20	**40**	**0.048**
-10	**26**	**0.031**
0	**25**	**0.030**
10	**33**	**0.039**
20	**40**	**0.048**
30	**28**	**0.033**
40	**38**	**0.045**
50	**34**	**0.041**
60	**38**	**0.045**

Frequency deviation, temperature variation

GSM1900

Temperature [ºC]	*Deviation [Hz]*	*Deviation [ppm]*
-30	**-34**	**-0.018**
-20	**28**	**0.015**
-10	**-25**	**-0.013**
0	**22**	**0.012**
10	**28**	**0.015**
20	**-27**	**-0.014**
30	**-21**	**-0.011**
40	**28**	**0.015**
50	**24**	**0.013**
60	**31**	**0.016**

Frequency deviation, temperature variation

3.6 Frequency stability, voltage variation

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

EUT	EUT2
Site name	Nemko Oy / Perkkaa
Date of testing	28.09.2007
Test equipment	545, 316, 341
Test conditions	22 °C, 40 % RH
Test result	**PASS**

3.6.1 Test method and limit

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

The EUT battery was replaced with an adjustable power supply. The frequency stability was measured at nominal voltage and in 0.1V increments the battery cut-off point.

3.6.2 Limit

Frequency error ppm
± 2.5

3.6.3 EUT operation mode

GSM850

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**190, 836.6 MHz**
EUT power level	**4 (+ 33 dBm)**

GSM1900

EUT operation mode	***GSM 1900, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**661, 1880 MHz**
EUT power level	**0 (+ 30 dBm)**

3.6.4 Test results

GSM850

Battery level	*Voltage [V]*	*Deviation [Hz]*	*Deviation [ppm]*
Nominal	**3.8**	**40**	**0.048**
Cut off-point	**3.35**	**-13**	**-0.016**

Frequency deviation, voltage variation

GSM1900

Battery level	*Voltage [V]*	*Deviation [Hz]*	*Deviation [ppm]*
Nominal	**3.8**	**-27**	**-0.014**
Cut off-point	**3.35**	**-21**	**-0.011**

Frequency deviation, voltage variation

3.7 Radiated emissions from unintentional radiator

EUT	EUT1 with AC charger
Site name	Nemko / Perkkaa
Date of testing	29.09.2007
Test equipment	350, 338, 566, 544, 564, 319, 525, 545, 184
Test conditions	23 °C. 40 % RH
Test result	**PASS**

3.7.1 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. 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. 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.

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° step 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 CFR 47 Part 15. Subpart B. Class B limit of 500 µV/m has been calculated to correspond 54 dB(µV/m) as follows: [dB(µV/m)]=20log[µV/m].

EN 55022 Class B limit (3m measuring distance)

Frequency band *MHz*	*Quasi-peak* *dB(µV/m)*
30 - 230	**40**
230 - 1000	**47**

Class B limit (3m measuring distance)

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

3.7.2 EUT operation mode

EUT operation mode	**GSM 850/1900 Idle**
EUT operation voltage	**115 V / 60 Hz**

3.7.3 Test data

The measurement results were obtained as described below.

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

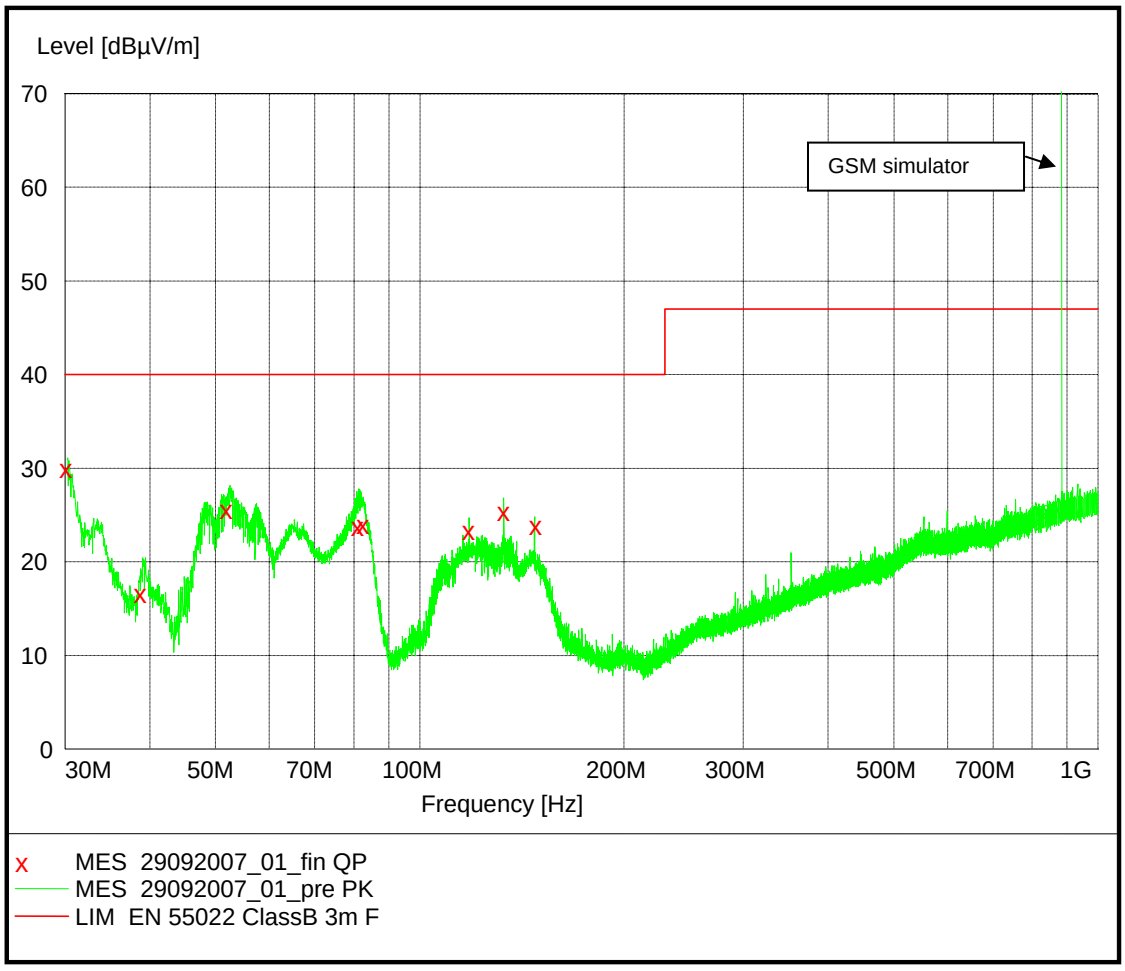
Where

U_{RX} receiver reading

A_{CABLE} attenuation of the cable

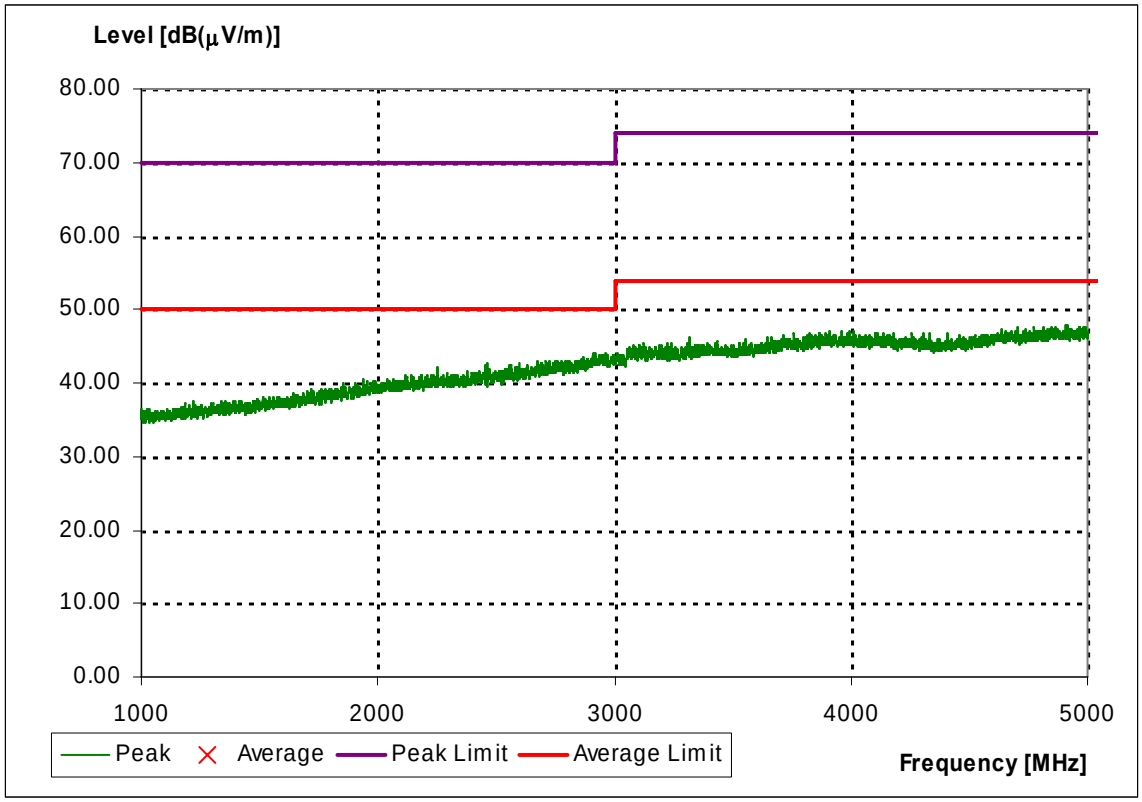
AF antenna factor

G_{PREAMP} gain of the preamplifier

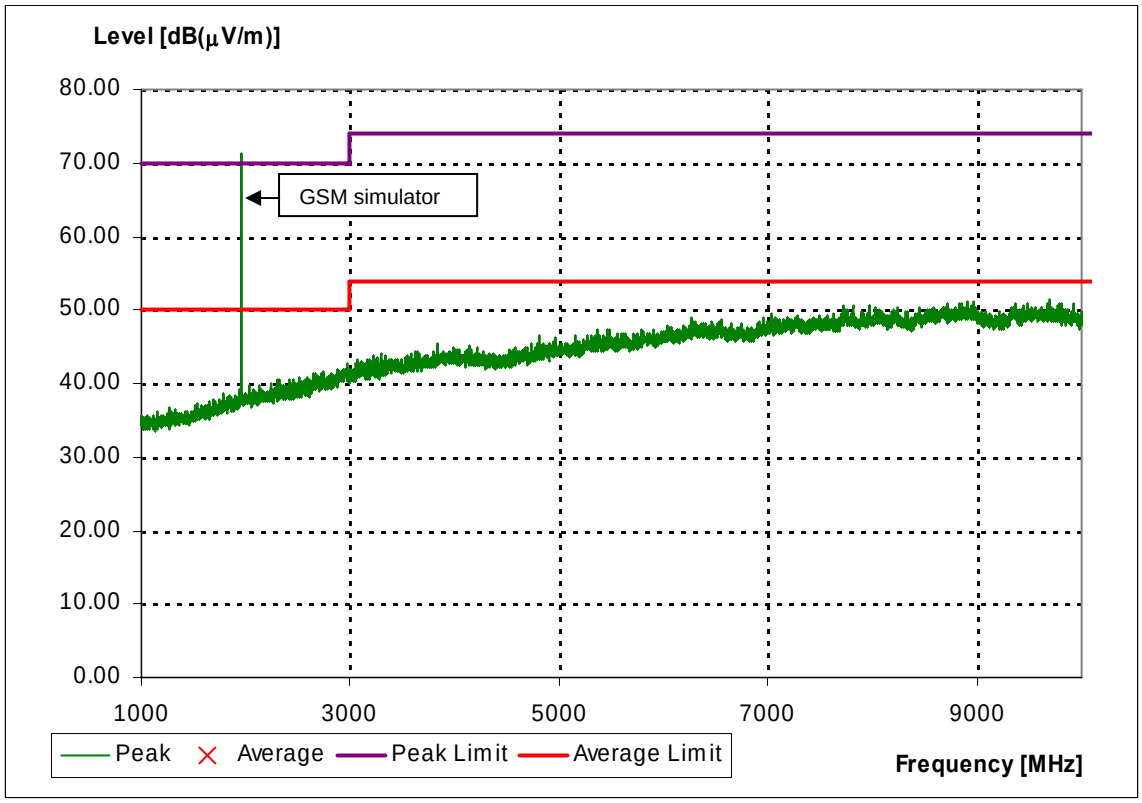


Highest emissions measured by using the quasi-peak detector:

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
30.040	30.4	-7.2	40.0	9.6	102	87	VERTICAL
38.800	17.4	-12.4	40.0	22.6	140	129	VERTICAL
52.240	26.6	-18.7	40.0	13.4	159	132	VERTICAL
80.280	23.4	-17.0	40.0	16.6	100	265	VERTICAL
81.080	23.3	-16.8	40.0	16.7	151	42	VERTICAL
117.960	23.2	-13.3	40.0	16.8	102	155	VERTICAL
132.720	25.9	-13.6	40.0	14.1	100	123	VERTICAL
147.480	24.4	-14.1	40.0	15.6	102	71	VERTICAL



Spectrum plot GSM850 idle radiated emissions.



Spectrum plot GSM1900 idle radiated emissions.

3.8 AC power line conducted emissions

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

EUT	EUT1 with AC charger
Site name	Nemko / Perkkaa
Date of testing	01.10.2007
Test equipment	5, 168, 348, 184, 545
Test conditions	23 °C, 40 % RH
Test result	**PASS**

3.8.1 Test method and limit

The test was performed inside a shielded room where the floor of the test site comprised the reference ground plane (RGP). For the duration of the test the EUT was placed on a non-conductive table 0.8 m high standing on the reference ground plane. The power input cable of the EUT was connected to an artificial mains network. The test was performed separately on the phase and also on the neutral wire.

The disturbances were first examined by performing a spectrum scan by using a peak detector. The general procedure in the conducted disturbance emission test is that no further measurements are necessary if the disturbance levels measured by using the peak detector are below the limit value defined for the measurement performed by using an average detector.

If not, then at the test frequencies concerned the measurement is performed also by using a quasi-peak detector. If the disturbance levels measured by using the quasi-peak detector are below the limit value defined for the measurement performed by using an average detector, then measurements by using the average detector are not necessary.

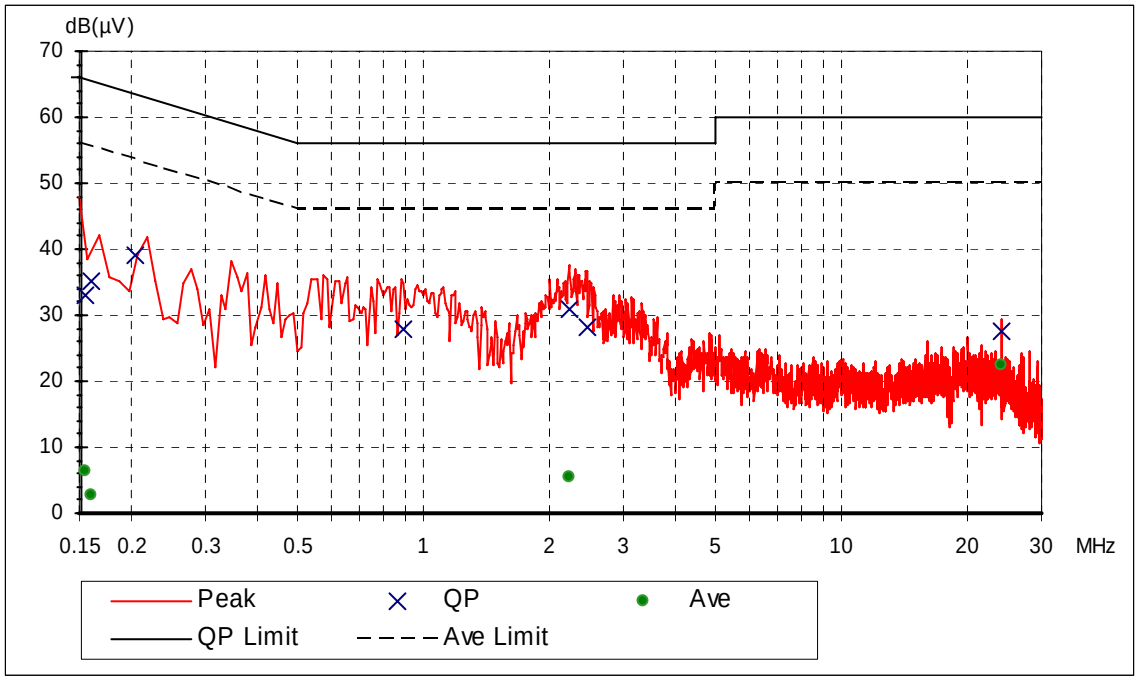
Frequency band *MHz*	*Quasi-peak* *dB(µV)*	*Average limit* *dB(µV)*
0.15 – 0.5	**66 – 56**	**56 – 46**
0.5 – 5	**56**	**46**
5 - 30	**60**	**50**

3.8.2 EUT operation mode

EUT operation mode	**GSM 850 Idle**
EUT operation voltage	**115 V / 60 Hz**

3.8.3 Test data

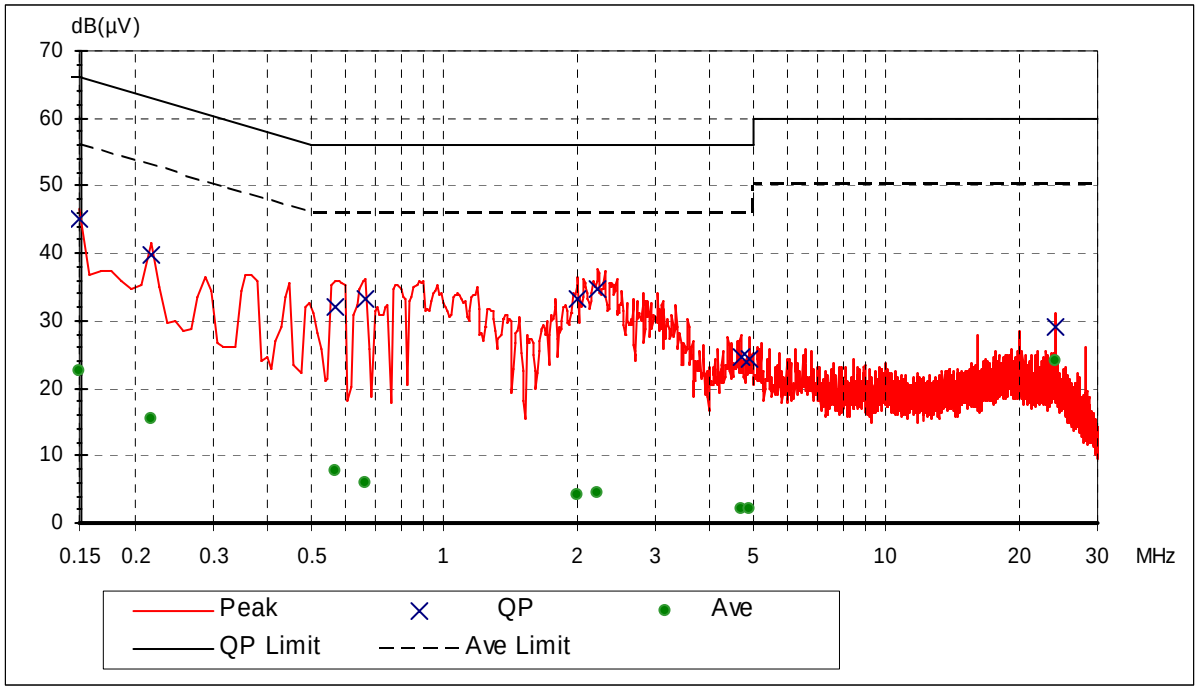
Idle, line N



Highest emissions:

Frequency MHz	*Result Quasi-peak dB(µV)*	*Limit value Quasi-peak dB(µV)*	*Margin Quasi-peak dB*	*Result Average dB(µV)*	*Limit value Average dB(µV)*	*Margin Average dB*
0.155	33.1	65.7	32.6	6.5	55.7	49.2
0.161	35.2	65.4	30.2	2.7	55.4	52.7
0.204	39.2	63.4	24.2	-0.5	53.4	53.9
0.893	27.9	56.0	28.1	-0.6	46.0	46.6
2.243	30.8	56.0	25.2	5.6	46.0	40.4
2.473	28.2	56.0	27.8	-2.2	46.0	48.2
24.072	27.7	60.0	32.3	22.5	50.0	27.5

Idle. line L



Highest emissions:

Frequency MHz	*Result Quasi-peak dB(µV)*	*Limit value Quasi-peak dB(µV)*	*Margin Quasi-peak dB*	*Result Average dB(µV)*	*Limit value Average dB(µV)*	*Margin Average dB*
0.150	45.2	66.0	20.8	22.6	56.0	33.4
0.218	39.8	62.9	23.1	15.4	52.9	37.5
0.567	31.9	56.0	24.1	7.8	46.0	38.2
0.668	33.3	56.0	22.7	5.9	46.0	40.1
2.007	33.1	56.0	22.9	4.2	46.0	41.8
2.233	34.7	56.0	21.3	4.5	46.0	41.5
4.687	24.6	56.0	31.4	2.0	46.0	44.0
4.912	24.2	56.0	31.8	2.2	46.0	43.8
24.072	29.0	60.0	31.0	24.1	50.0	25.9

4. List of test equipment

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

Nr.	Equipment	Type	Manufacturer	Serial number
157	Temp. test chamber	VMT 04/240	Vötch	31884
184	Temp. & humidity meter	H MI 32	Vaisala	63837
89	Antenna	3147	EMCO	9202-1078
319	Antenna	CBL6112	Chase	2018
316	Power supply	HP 6032A	Hewlett Packard	2517A-00654
341	Multimeter	Fluke 87	Fluke	593100386
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
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	D01080
545	GSM MS Test System	CMU	Rohde & Schwarz	836536/049
550	Tunable Notch Filter	WRCD1800/2000-0.2/40-5SSSD	Wainwright Instruments GmbH	1
551	Notch Filter	WRCT800/880-0.2/40-5SSSD	Wainwright Instruments	2
552	Highpass Filter	WHK2.3/18G-10SS	Wainwright Instruments	1
572	High Pass Filter	WHKX1.5/15G-12SS	Wainwright Instruments	4
564	RF-amplifier	CA018-4010	CIAO Wireless	101
566	Spectrum analyzer	E4448A	Agilent	US42510236
567	Signal generator	E8257C	Agilent	MY43320736

5. Photographs

See "95107_test_setup_photographs"