



TEST REPORT

Test Report No.: 1-1954-32-02/10



Testing Laboratory

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Accredited Test Laboratory:

The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025
DAR registration number: DGA-PL-176/94-D1

Area of Testing: Radio Satellite Communications

Applicant

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Manufacturer

Sony Ericsson Mobile Communications AB

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Test Standard/s

- | | |
|----------------|---|
| 47 CFR Part 22 | Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter B - common carrier services, Part 22-Public mobile services |
| 47 CFR Part 24 | Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter B - common carrier services, Part 24-Personal communications services |

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	Mobile Phone GSM Mobile Phone 850 / 900 / 1800 / 1900; UMTS HSDPA / HSUPA; BT2.0+EDR, A-GPS, FM Receiver, WLAN
Model name:	AAD-3880092-BV
FCC ID:	PY7A3880092
IC:	4170B-A3880092
Frequency [MHz]:	1850.2 – 1909.8 MHz and 824.2 – 848.8 MHz
Power supply:	4V DC by power supply / Lithium - Ion battery
Temperature range:	-30 °C to +60 °C



Test performed:

2010-06-23 Marco Bertolino

Test Report authorised:

2010-06-23 Stefan Bös

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2 General Information

2.1 Notes

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

2.2 Application details

Date of receipt of order:	2010-06-16
Date of receipt of test item:	2010-06-22
Start of test:	2010-06-22
End of test:	2010-06-23
Person(s) present during the test:	-/-

3 Test standard/s

Test Standard	Version	Test Standard Description
47 CFR Part 2	2009-10	Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations
47 CFR Part 22	2009-10	Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter B - common carrier services, Part 22-Public mobile services
47 CFR Part 24	2009-10	Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter B - common carrier services, Part 24-Personal communications services
RSS - 132 Issue 2	2005-09	Spectrum Management and Telecommunications Policy - Radio Standards Specifications Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz
RSS - 133 Issue 5	2009-02	Spectrum Management and Telecommunications Policy - Radio Standards Specifications 2 GHz Personal Communication Services

4 Test Environment

Temperature:	T_{nom}	+20 °C during room temperature tests
	T_{max}	+60 °C during high temperature test
	T_{min}	-30 °C during low temperature test
Relative humidity content:		53 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	4 V DC by power supply / Lithium - Ion battery
	V_{max}	4.4 V
	V_{min}	3.6 V

5 Test item

Kind of test item	:	Mobile Phone GSM Mobile Phone 850 / 900 / 1800 / 1900; UMTS HSDPA / HSUPA; BT2.0+EDR, A-GPS, FM Receiver, WLAN
Type identification	:	AAD-3880092-BV
S/N serial number	:	Radiated: CB511JWH4G / CB511JWH18 Conducted: CB511JWH52 / CB511JWH43
HW hardware status	:	AP1
SW software status	:	1.2.A.0.8
Frequency Band [MHz]	:	1850.2 – 1909.8 MHz and 824.2 – 848.8 MHz
Type of Modulation	:	300KGXW (GMSK) 300KG7W (8-PSK) 5M00G7W (QPSK)
Number of channels	:	300 (PCS1900) and 125 (PCS850) / 278 (FDD II) and 102 (FDD V)
Antenna	:	Integrated PCB antenna → for more information, please take a look at the Annex report.
Power Supply	:	4 V DC by power supply / Lithium - Ion battery
Temperature Range	:	-30 °C to +60 °C

6 Test Laboratories sub-contracted

None

7 Summary of Measurement Results

- No deviations from the technical specifications were ascertained
- There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	CFR Part 22, 24 RSS 132, 133	passed	2010-06-23	-/-

7.1 GSM 850

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Results (max.)
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cond.: 32.60 dBm Rad.: 30.95 dBm
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-67 Hz
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-25.10 dBm
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	279 kHz

Note:

NA = Not applicable; NP = Not performed

7.2 PCS 1900

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Results (max.)
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cond.: 28.71 dBm Rad.: 31.51 dBm
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-73 Hz
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	281 kHz

Note:

NA = Not applicable; NP = Not performed

7.3 UMTS Band II

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Results (max.)
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cond.: 22.72 dBm Rad.: 26.13 dBm
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-28 Hz
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4593 kHz

Note:

NA = Not applicable; NP = Not performed

7.4 UMTS Band V

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Results (max.)
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cond.: 23.94 dBm Rad.: 22.13 dBm
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13 Hz
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-37.44 dBm
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4581 kHz

Note:

NA = Not applicable; NP = Not performed

7.5 Receiver

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Results (max.)
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

Note:

NA = Not applicable; NP = Not performed

8 RF measurement testing

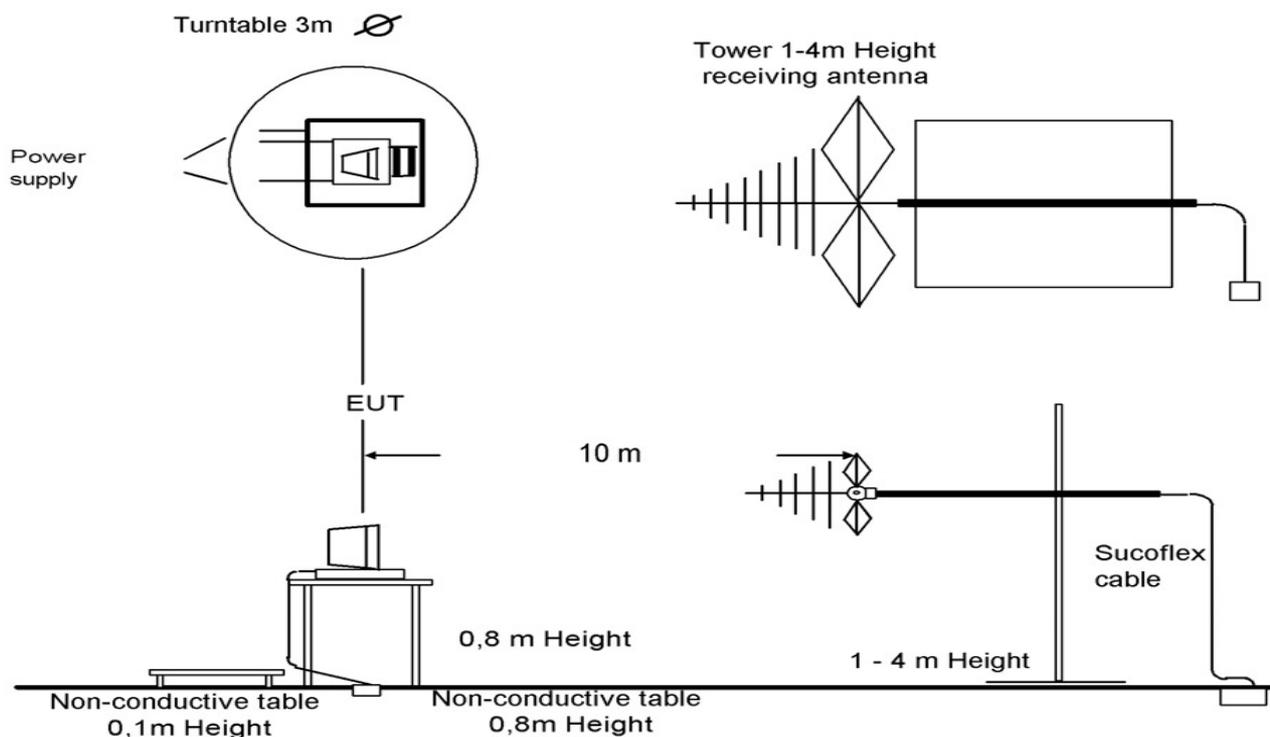
8.1 Description of test setup

For the spurious measurements we use the substitution method according TIA/EIA 603.

8.1.1 Radiated measurements

The radiated emissions from the EUT are performed in a semi anechoic chamber. The EUT is placed on a conductive turntable and powered with nominal voltage. The signalling is performed either from outside the chamber with a signalling unit (AP or other) by air link using a signalling antenna or directly by special test software from the customer.

Semi anechoic chamber

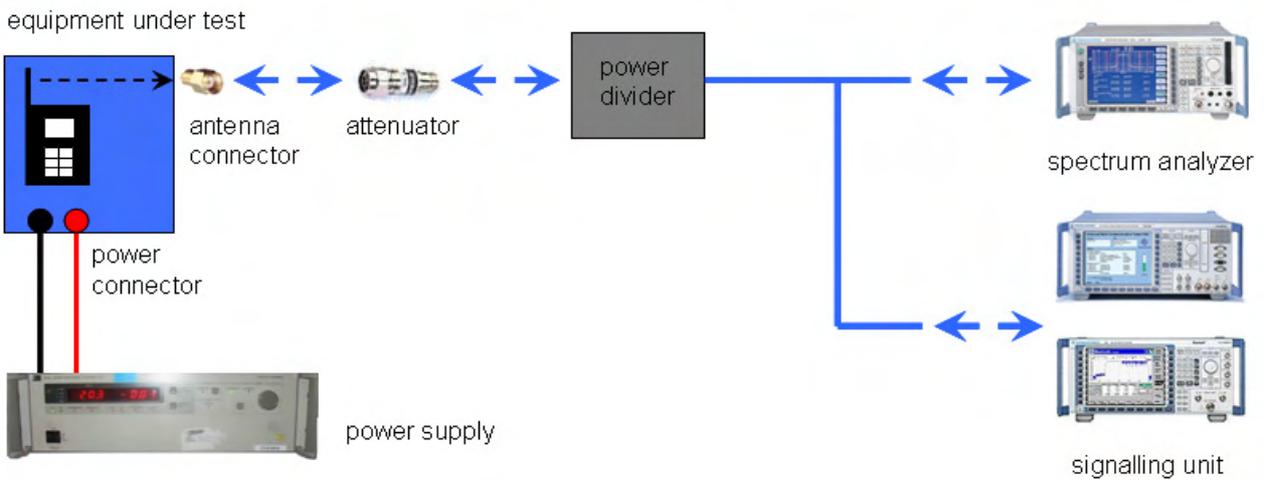


Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the signalling unit (AP or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm. If special software is used, there is no power divider necessary.



Picture 2: Diagram conducted measurements

The term measuring receiver refers to either a selective voltmeter or a spectrum analyser.

Frequency being measured f	Measuring receiver bandwidth 6 dB	Spectrum analyser bandwidth 3dB
$f < 150$ kHz	200 Hz or	300 Hz
150 kHz $\leq f < 25$ MHz	9 kHz or	10 kHz
25 MHz $\leq f < 1000$ MHz	120 kHz or	100 kHz
1000 MHz $\leq f$		1 MHz
NOTE: Specific requirements in CEPT/ERC/Recommendation 70-03 [2] shall be applied where applicable.		

8.2 Test Item

Kind of test item	:	Mobile Phone GSM Mobile Phone 850 / 900 / 1800 / 1900; UMTS HSDPA / HSUPA; BT2.0+EDR, A-GPS, FM Receiver, WLAN
Type identification	:	AAD-3880092-BV
Serial Number	:	Rad.: CB511JWH4G / CB511JWH18 Cond.: CB511JWH52 / CB511JWH43
Frequency:		824.2 – 848.8 MHz, 1712.4 – 1752.6 MHz and 1850.2 – 1909.8 MHz
Type of modulation	:	GMSK; 8-PSK; QPSK; 16QAM
Emission Designator for GSM 850	:	GMSK: 279KGXW 8-PSK: 267KG7W
Emission Designator for GSM 1900	:	GMSK: 281KGXW 8-PSK: 279KG7W
Emission Designator for WCDMA 850	:	QPSK: 4M58F9W
Emission Designator for WCDMA 1900	:	QPSK: 4M59F9W
Number of channels	:	125 (PCS850) and 300 (PCS1900) 278 (FDD II) / 203 (FDD IV) / 103 (FDD V)
Antenna Type	:	Integrated PCB antenna → for more information, please take a look at the Annex report.
Power supply (normal)	:	4 V DC by power supply / Lithium - Ion battery
Output power GSM 850 / GMSK	:	cond.: 32.60 dBm ERP: 30.95 dBm
Output power GSM 1900 / GMSK	:	cond : 28.71 dBm EIRP: 31.51 dBm
Output power GSM 850 / 8-PSK	:	cond.: 26.99 dBm ERP: 25.38 dBm
Output power GSM 1900 / 8-PSK	:	cond : 26.15 dBm EIRP: 29.57 dBm
Output power UMTS 850 / WCDMA	:	cond.: 23.94 dBm ERP: 22.13 dBm
Output power UMTS 1900 / WCDMA	:	cond : 22.72 dBm EIRP: 26.13 dBm
Transmitter Spurious (worst case)	:	3.09 μ W / -25.10 dBm 2546.4 MHz
Receiver Spurious (worst case)	:	46.47 μ V/m @ 3 m noise floor
FCC ID	:	PY7A3880092
Certification No. IC	:	4170B-A3880092
Open Area Test Site IC No.	:	IC 3462C-1
IC Standards	:	RSS132, Issue 2; RSS133, Issue 5

ATTESTATION:

DECLARATION OF COMPLIANCE:

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory Manager:

2010-06-23

Date

Marco Bertolino

Name



Signature

8.3 Results GSM 850

All GSM-band measurements are done in GSM mode only. The device is also able to transmit data in GPRS mode. But because the power measurements are performed within the duration of a burst no other results from GPRS mode are possible. The only difference is the absolute average power, which is 3 dB higher (by using 2 timeslots in the Up-link). All relevant tests have been repeated using 8-PSK modulation if EDGE mode is supported.

8.3.1 RF Output Power

Description:

This paragraph contains average power, peak output power and ERP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

Measurement parameters	
Detector:	RMS
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	Zero span
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 22.9.1.3 CFR Part 2.1046	RSS 132, Issue 2, Section 4.4 and 6.4
Nominal Peak Output Power	
+38.45 dBm	
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	

Results:

Output Power (conducted) GMSK mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
824.2	32.60	0.90
836.4	32.55	0.85
848.8	32.56	0.82
Measurement uncertainty	± 0.5 dB	

Output Power (conducted) 8-PSK mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
824.2	26.72	3.23
836.4	26.73	3.24
848.8	26.99	3.05
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) GMSK mode	
Frequency (MHz)	Average Output Power (dBm) - ERP
824.2	30.24
836.4	30.59
848.8	30.95
Measurement uncertainty	± 2.0 dB

Output Power (radiated) 8-PSK mode	
Frequency (MHz)	Average Output Power (dBm) - ERP
824.2	24.36
836.4	24.77
848.8	25.38
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

8.3.2 Frequency Stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a “call mode”. This is accomplished with the use of a R&S CMU200 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with V_{nom} , connected to the CMU200 and in a simulated call on channel 189 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10°C increments from -30°C to +60°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.
6. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

Measurement:

The measurement is performed with the integrated CMU 200 function.

Limits:

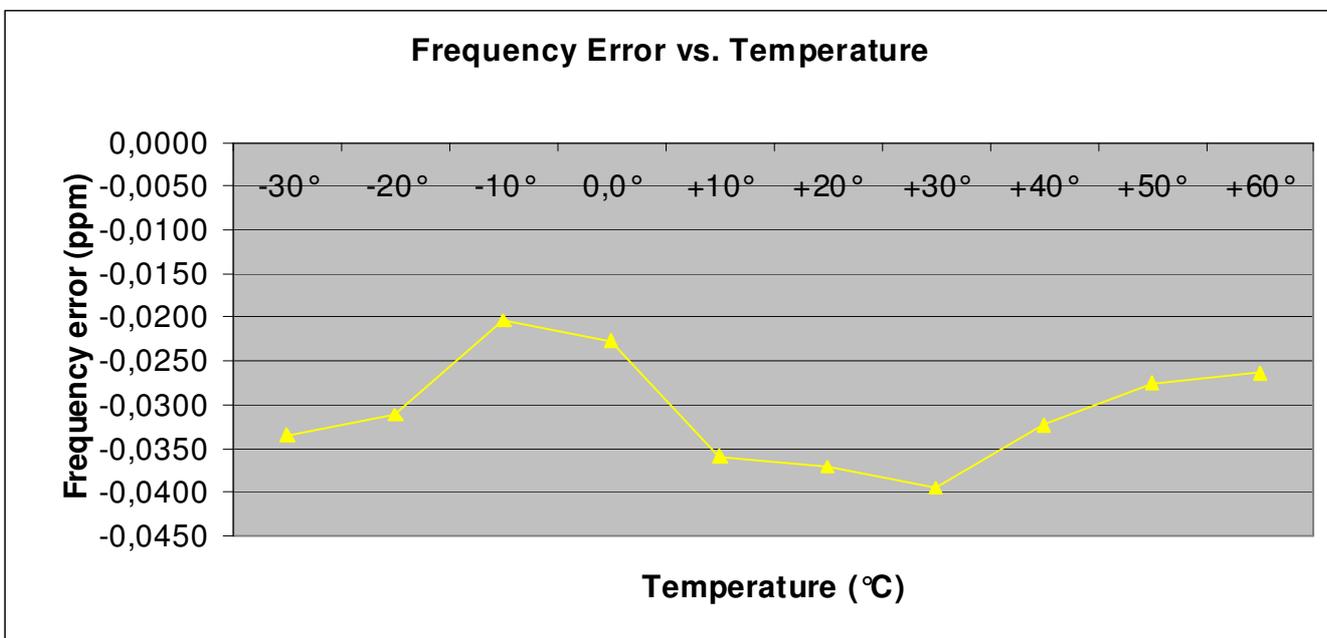
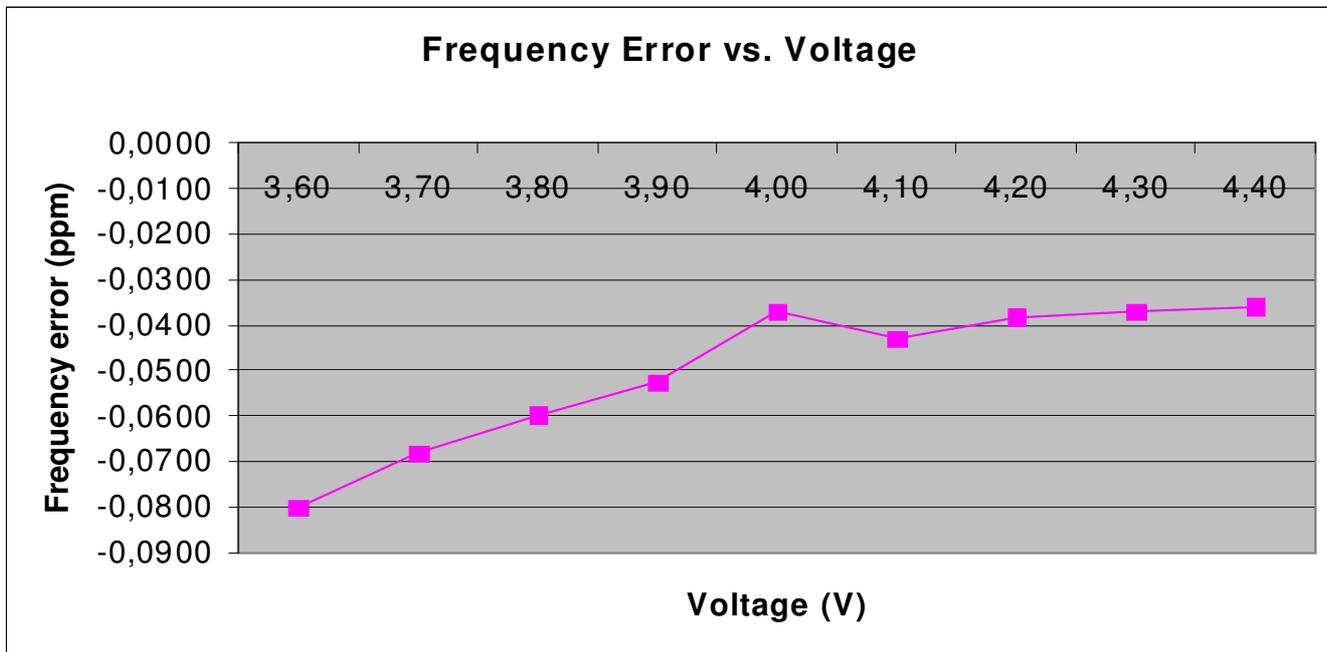
FCC	IC
CFR Part 22.355 CFR Part 2.1055	RSS 132, Issue 2, Section 4.3 and 6.3
Frequency Stability	
± 0.1 ppm	

Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.6	-67	-0,0000801	-0,0801
3.7	-57	-0,0000681	-0,0681
3.8	-50	-0,0000598	-0,0598
3.9	-44	-0,0000526	-0,0526
4.0	-31	-0,0000371	-0,0371
4.1	-36	-0,0000430	-0,0430
4.2	-32	-0,0000383	-0,0383
4.3	-31	-0,0000371	-0,0371
4.4	-30	-0,0000359	-0,0359

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-28	-0,0000335	-0,0335
-20	-26	-0,0000311	-0,0311
-10	-17	-0,0000203	-0,0203
± 0	-19	-0,0000227	-0,0227
10	-30	-0,0000359	-0,0359
20	-31	-0,0000371	-0,0371
30	-33	-0,0000395	-0,0395
40	-27	-0,0000323	-0,0323
50	-23	-0,0000275	-0,0275
60	-22	-0,0000263	-0,0263



Result: The result of the measurement is passed.

8.3.3 Spurious Emissions Radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2009 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 848.8 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 22.917. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the GSM-850 band.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load (if possible).
- c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters.
- e) Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603.

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3.5 * RBW
Resolution bandwidth:	120 kHz below 1 GHz 1 MHz up to 25 GHz
Span:	100 MHz steps
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 22.917 CFR Part 2.1053	RSS 132, Issue 2, Section 4.5 and 6.5
Spurious Emissions Radiated	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the GSM-850 band (824.2 MHz, 836.4 MHz and 848.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the GSM-850 band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

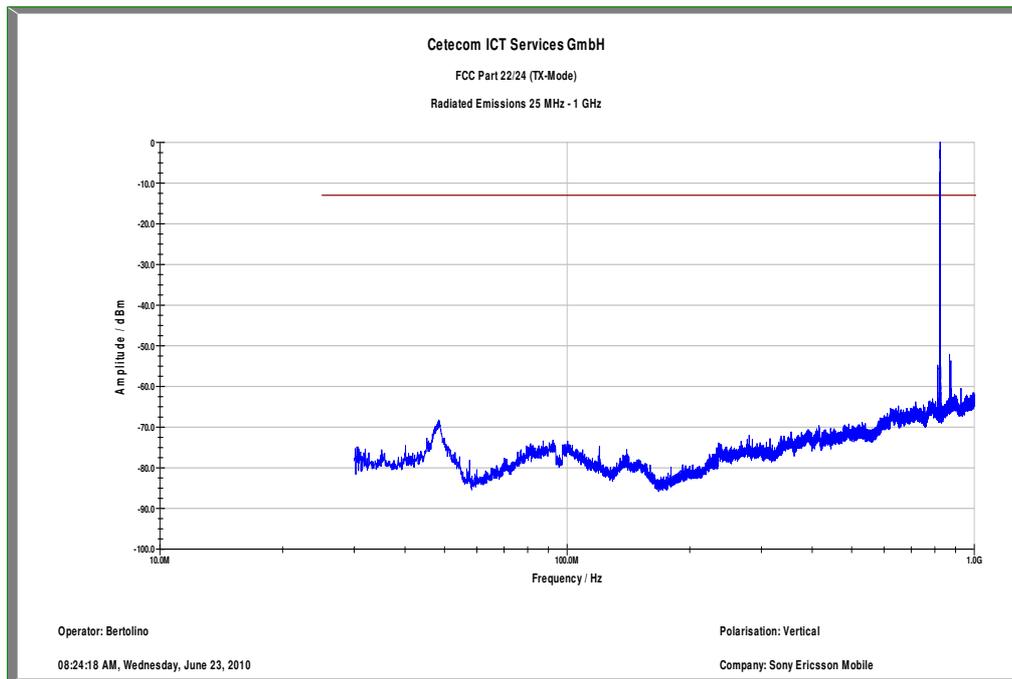
The final open field radiated levels are presented on the next pages. All measurements were done in horizontal and vertical polarization; the plots show the worst case. The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked too. The found values are stated in the table below.

As can be seen from this data, the emissions from the test item were within the specification limit.

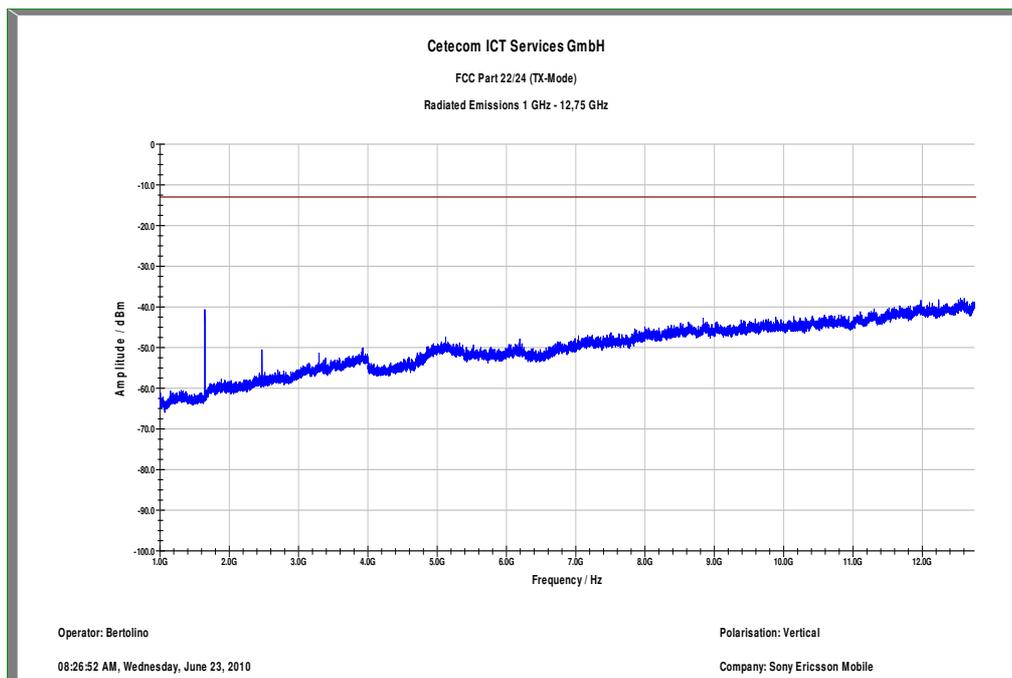
Spurious Emission Level (dBm)								
Harmonic	Ch. 128 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 189 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 251 Freq. (MHz)	Level [dBm]
2	1648.4	-39.75 vertical -36.82 horizontal	2	1672.8	-35.39 vertical -32.29 horizontal	2	1697.6	-34.88 vertical -32.04 horizontal
3	2472.6	-38.22 vertical -40.22 horizontal	3	2509.2	-34.92 vertical -35.98 horizontal	3	2546.4	-25.10 vertical -27.46 horizontal
4	3296.8	-	4	3345.6	-	4	3395.2	-
5	4121.0	-	5	4182.0	-	5	4244.0	-
6	4945.2	-	6	5018.4	-	6	5092.8	-
7	5769.4	-	7	5854.8	-	7	5941.6	-
8	6593.6	-	8	6691.2	-	8	6790.4	-
9	7417.8	-	9	7527.6	-	9	7639.2	-
10	8242.0	-	10	8364.0	-	10	8488.0	-
Measurement uncertainty					± 3dB			

Result: The result of the measurement is passed.

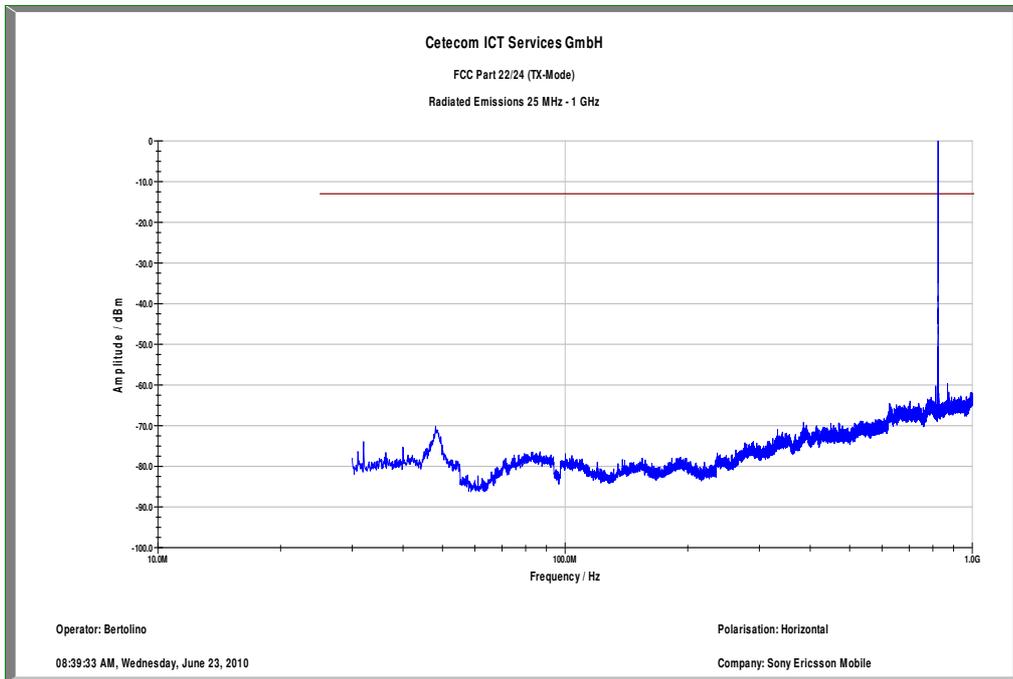
Plot 1: TX mode, channel 128, 30 MHz to 1 GHz, vertical polarization



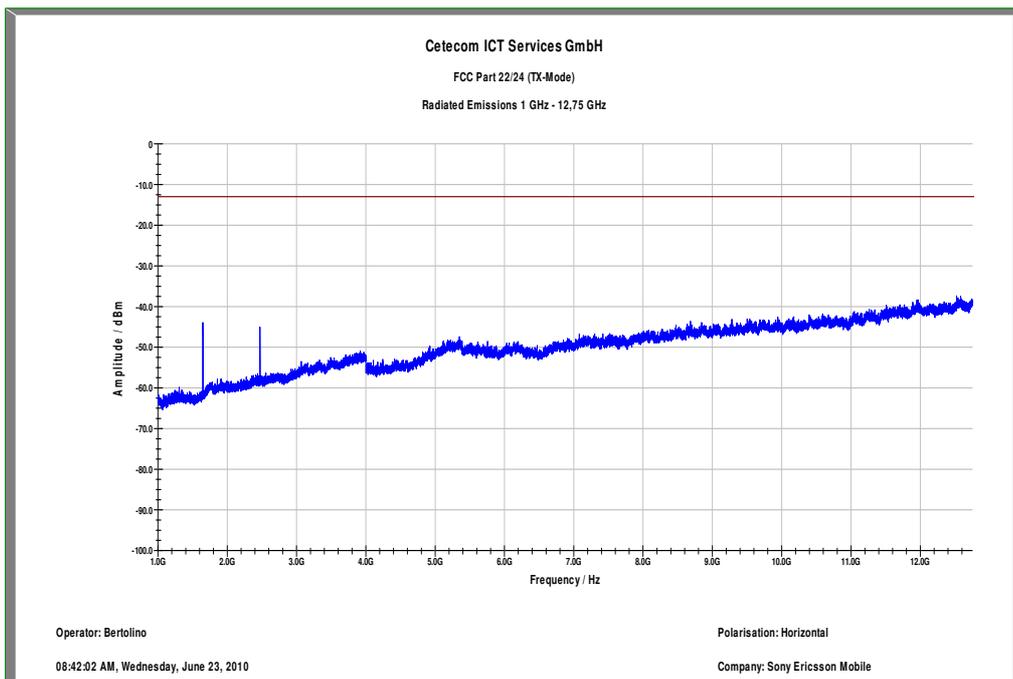
Plot 2: TX mode, channel 128, 1 GHz to 12.75 GHz, vertical polarization



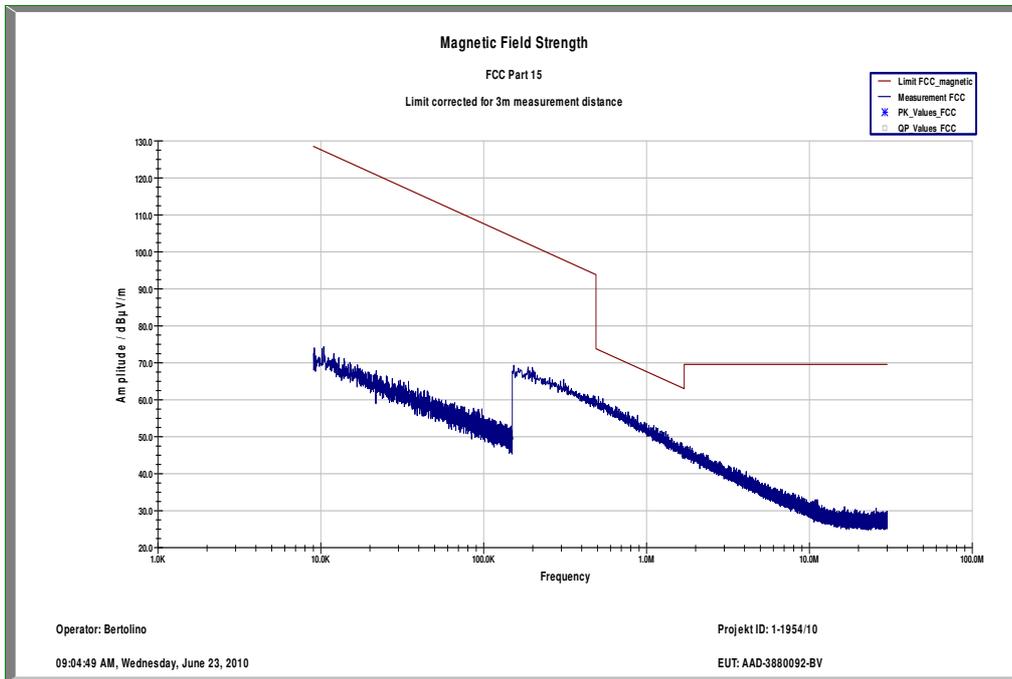
Plot 3: TX mode, channel 128, 30 MHz to 1 GHz, horizontal polarization



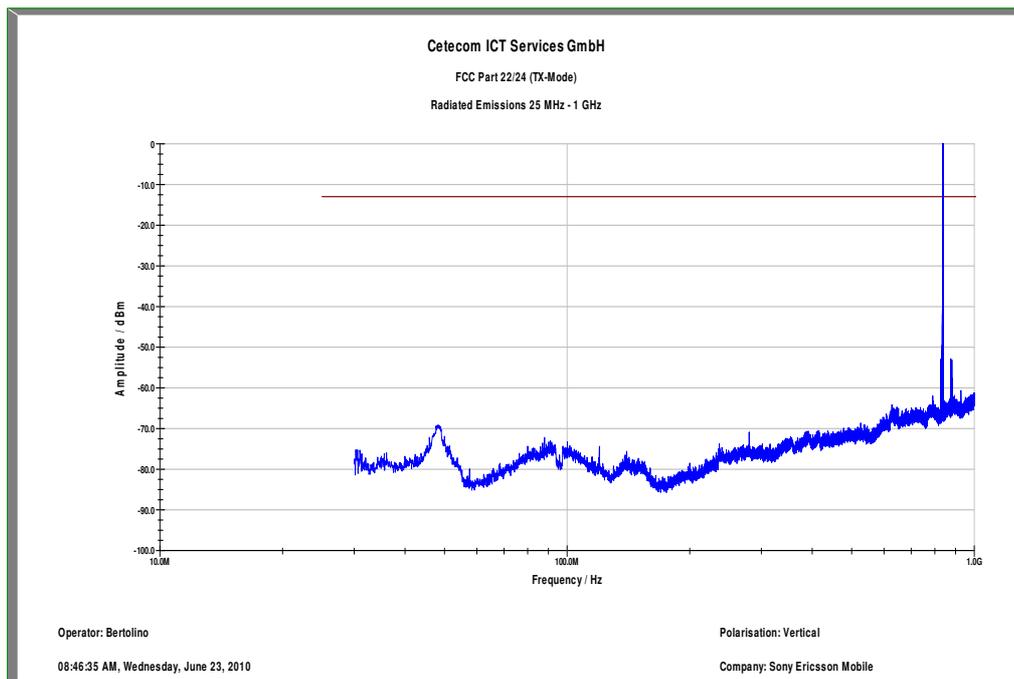
Plot 4: TX mode, channel 128, 1 GHz to 12.75 GHz, horizontal polarization



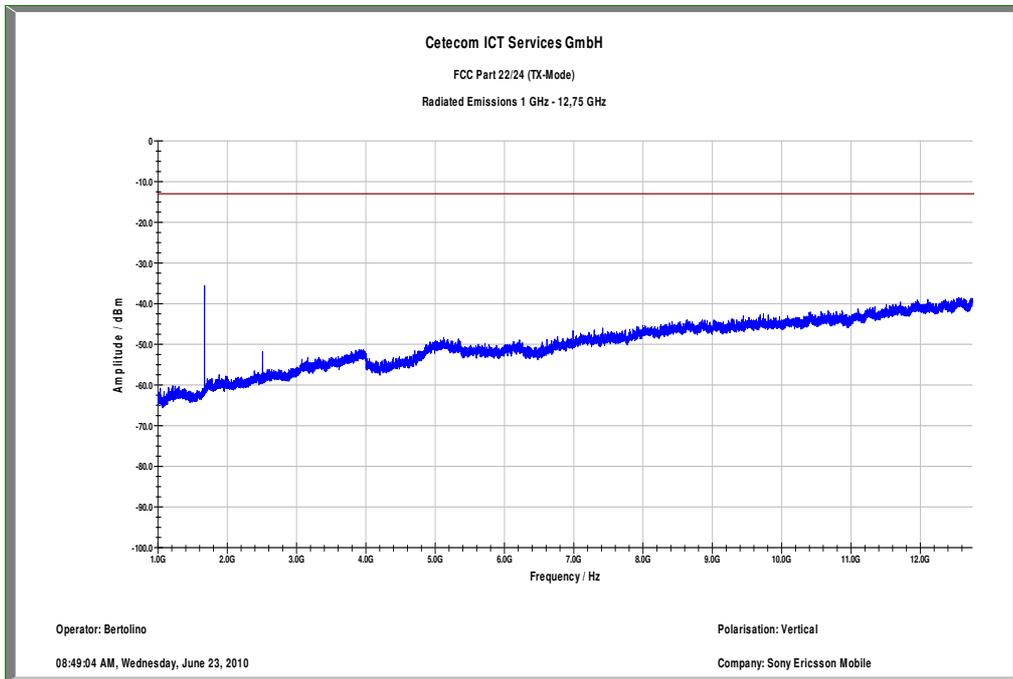
Plot 5: TX mode, channel 189, up to 30 MHz



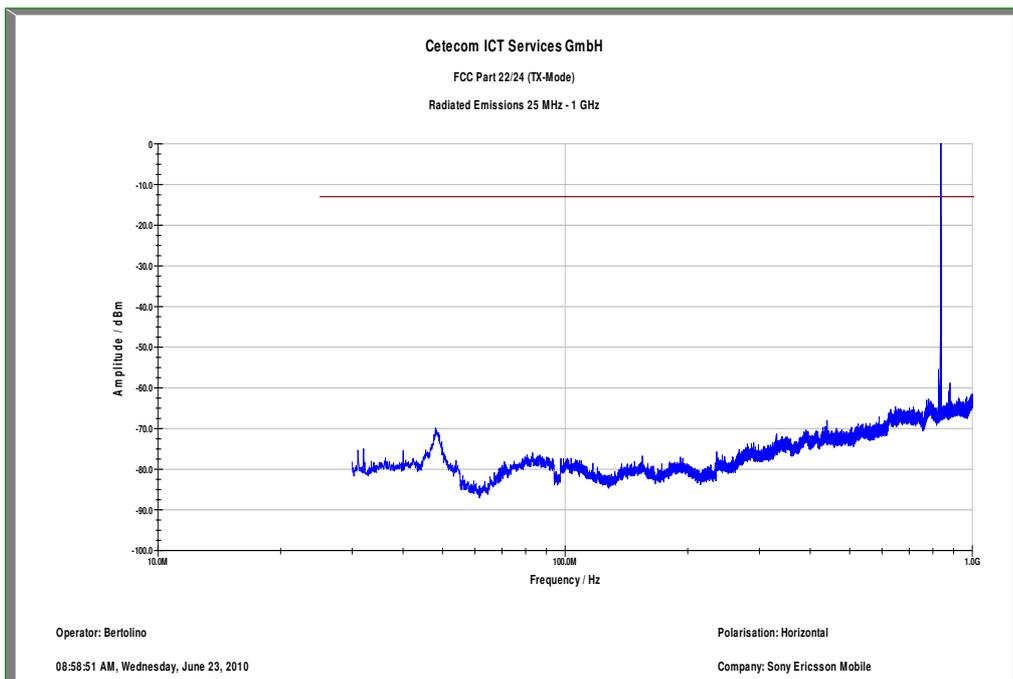
Plot 6: TX mode, channel 189, 30 MHz to 1 GHz, vertical polarization



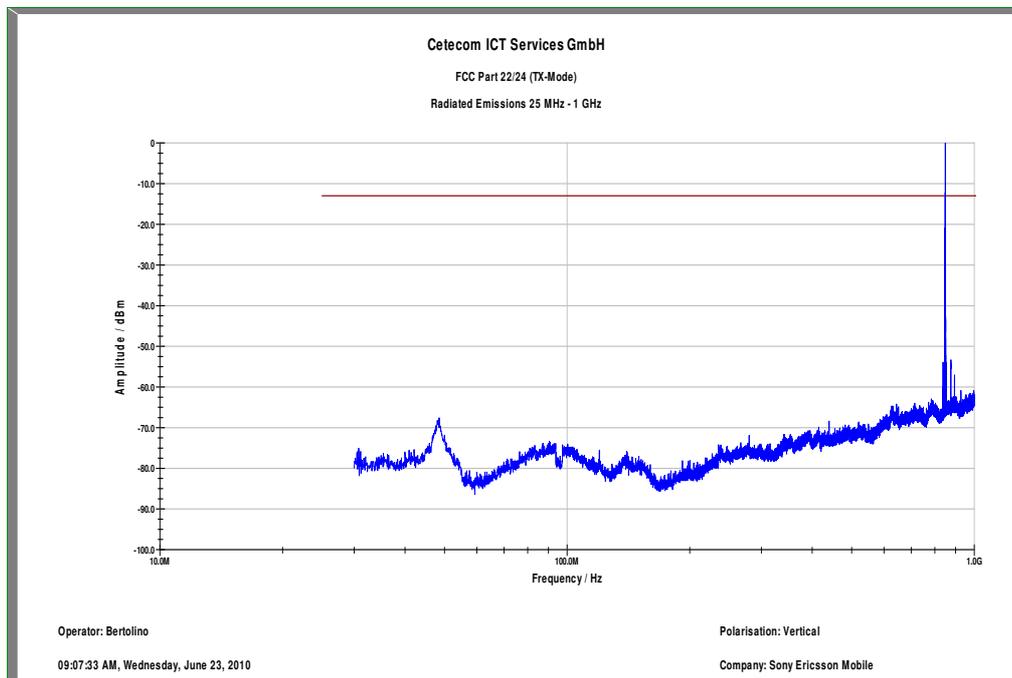
Plot 7: TX mode, channel 189, 1 GHz to 12.75 GHz, vertical polarization



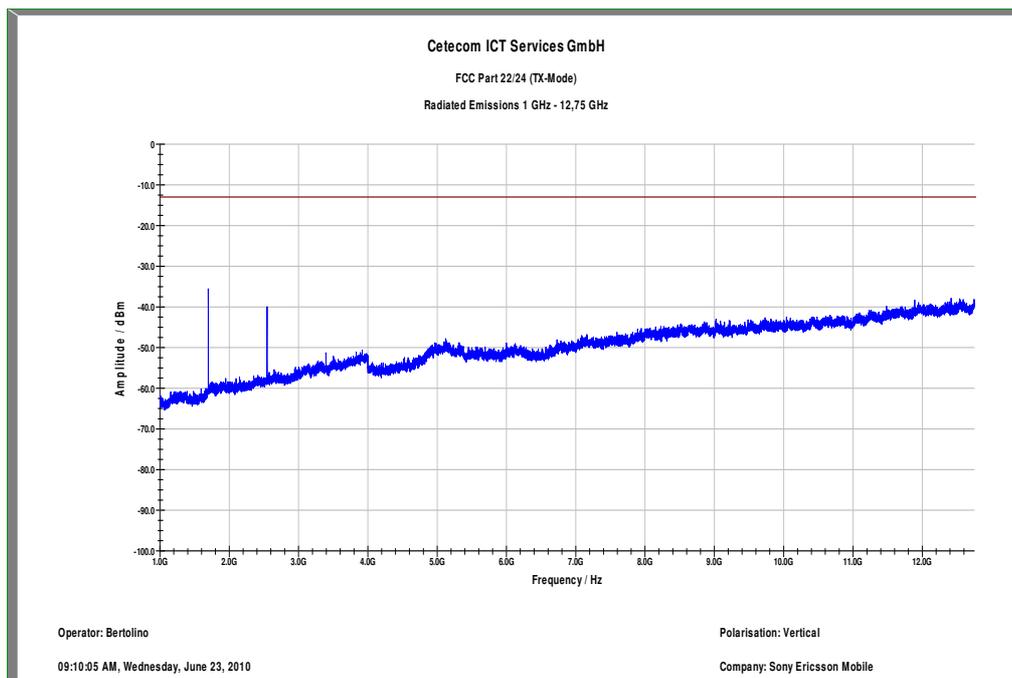
Plot 8: TX mode, channel 189, 30 MHz to 1 GHz, horizontal polarization



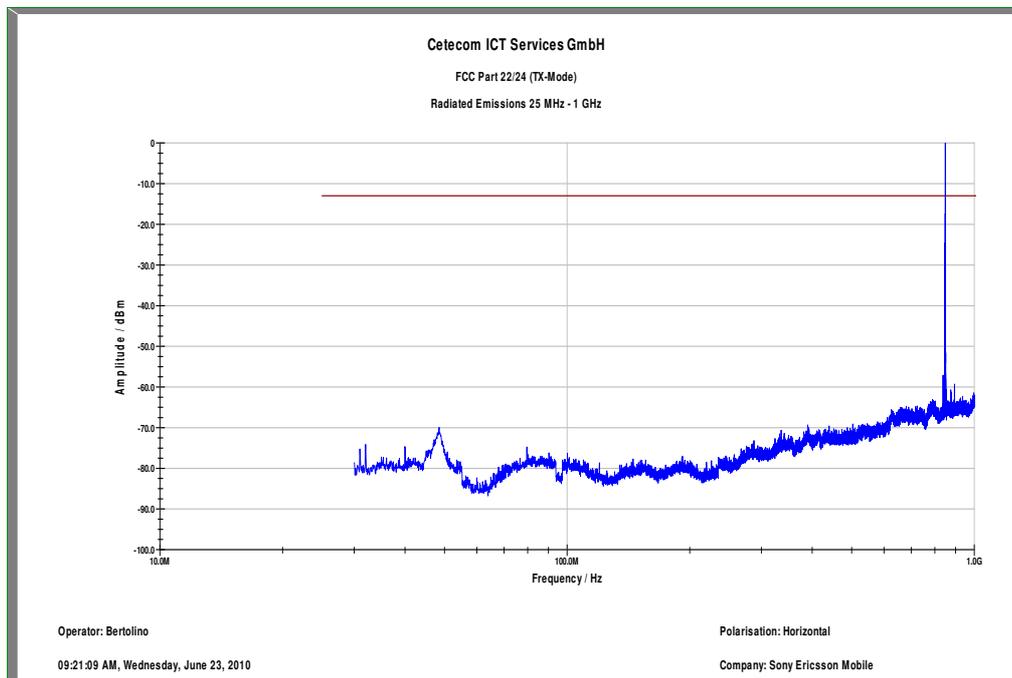
Plot 11: TX mode, channel 251, 30 MHz to 1 GHz, vertical polarization



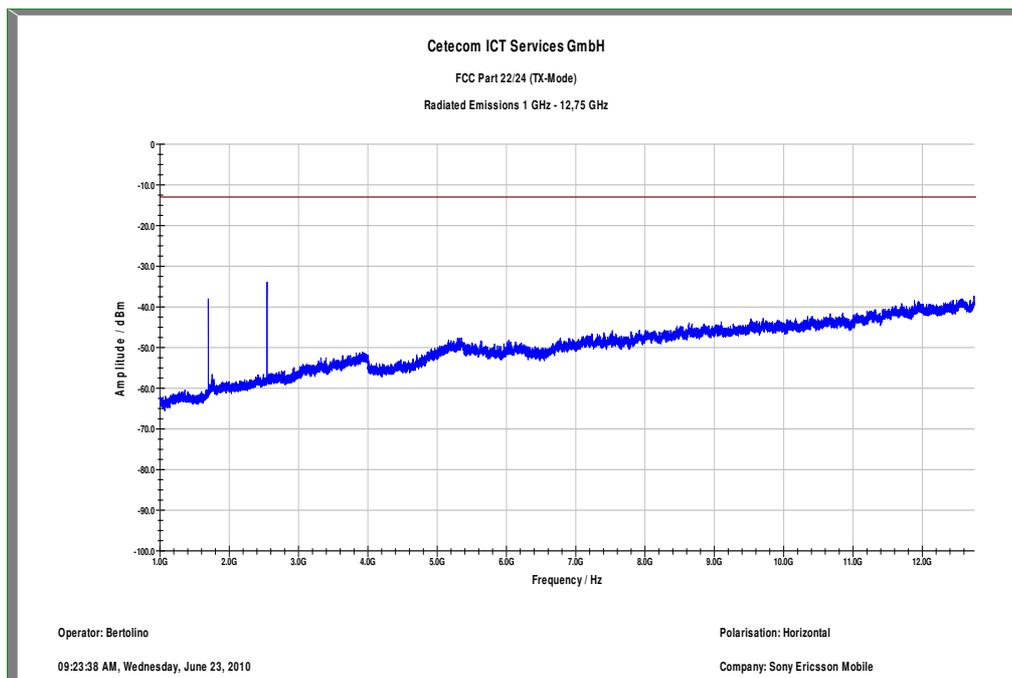
Plot 12: TX mode, channel 251, 1 GHz to 12.75 GHz, vertical polarization



Plot 13: TX mode, channel 251, 30 MHz to 1 GHz, horizontal polarization



Plot 14: TX mode, channel 251, 1 GHz to 12.75 GHz, horizontal polarization



8.3.4 Spurious Emissions Conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 12 GHz.

2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

GSM-850 Transmitter Channel Frequency

- 128 824.2 MHz
- 189 836.4 MHz
- 251 848.8 MHz

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	25 GHz
Trace-Mode:	Max. hold

Limits:

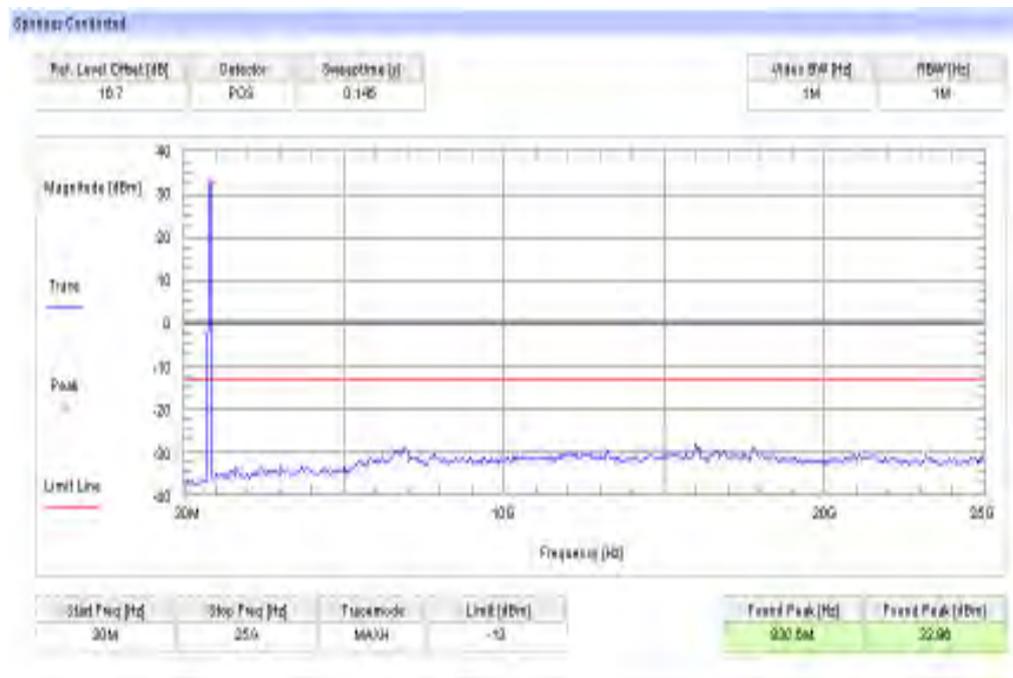
FCC	IC
CFR Part 22.917 CFR Part 2.1051	RSS 132, Issue 2, Section 4.5 and 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

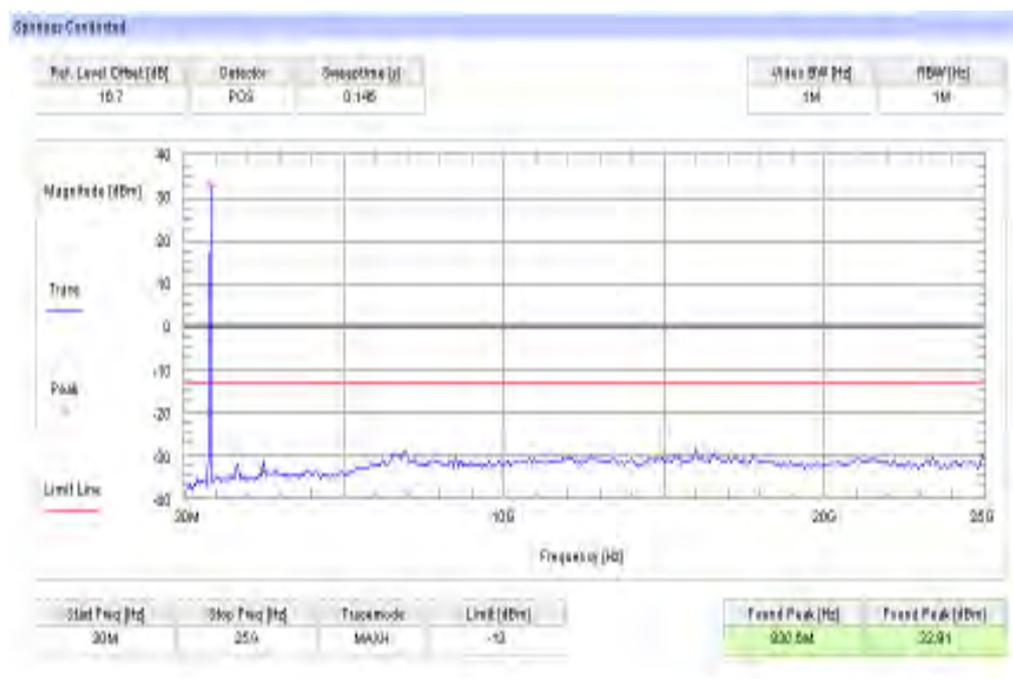
Spurious Emission Level (dBm)								
Harmonic	Ch. 128 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 189 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 251 Freq. (MHz)	Level [dBm]
2	1648.4	No spurious emissions detected!	2	1672.8	No spurious emissions detected!	2	1697.6	No spurious emissions detected!
3	2472.6		3	2509.2		3	2546.4	
4	3296.8		4	3345.6		4	3395.2	
5	4121.0		5	4182.0		5	4244.0	
6	4945.2		6	5018.4		6	5092.8	
7	5769.4		7	5854.8		7	5941.6	
8	6593.6		8	6691.2		8	6790.4	
9	7417.8		9	7527.6		9	7639.2	
10	8242.0		10	8364.0		10	8488.0	
Measurement uncertainty						± 3dB		

Result: The result of the measurement is passed.

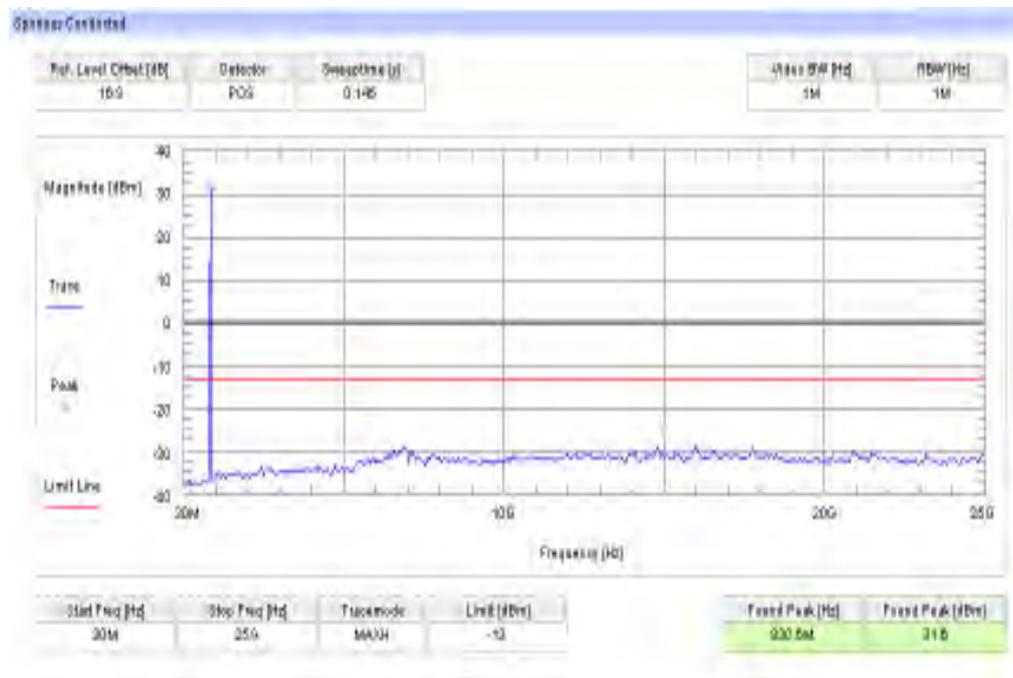
Plot 1: Channel 128 (10 MHz - 25 GHz)



Plot 2: Channel 189 (10 MHz - 25 GHz)



Plot 3: Channel 251 (10 MHz - 25 GHz)



8.3.5 Block Edge Compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

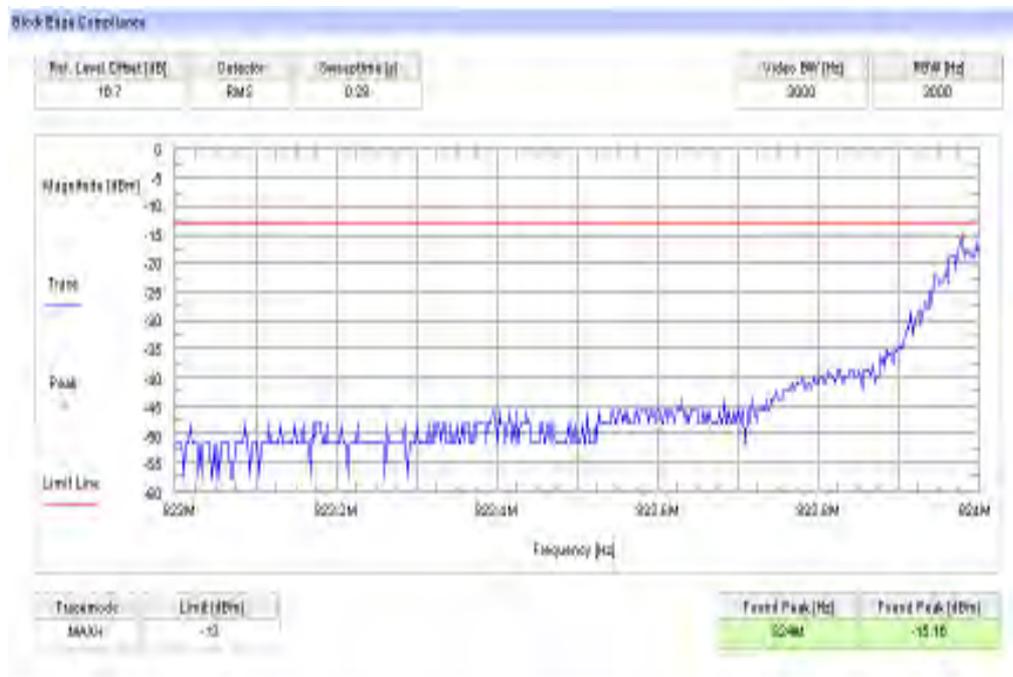
Measurement parameters	
Detector:	RMS
Sweep time:	Auto
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	1 MHz
Trace-Mode:	Max. hold

Limits:

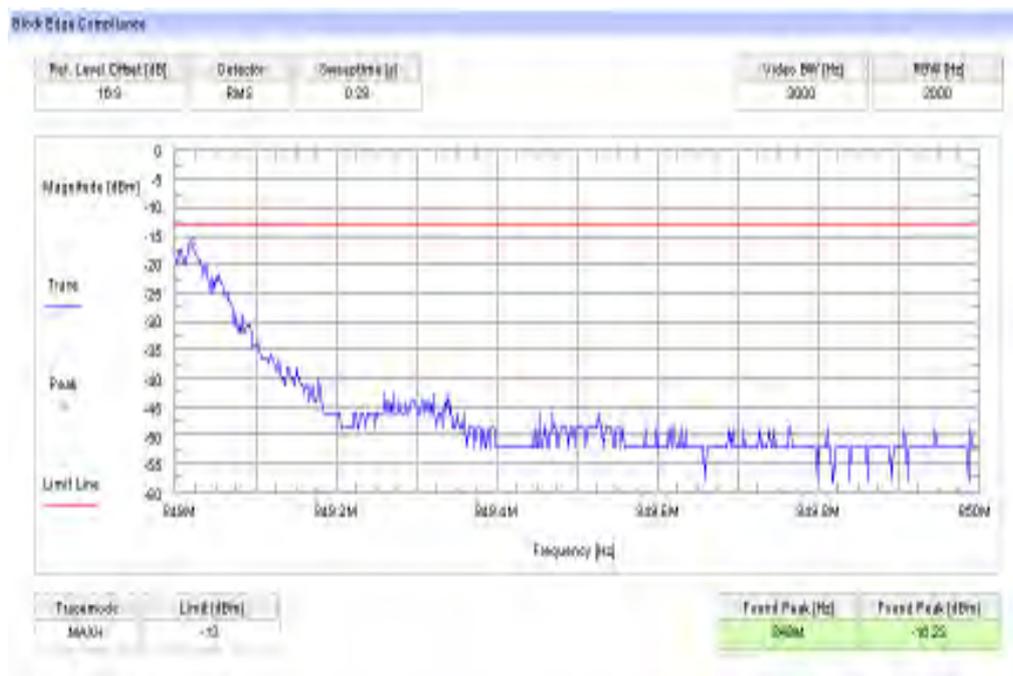
FCC	IC
CFR Part 22.917 CFR Part 2.1051	RSS 132, Issue 2, Section 6.5
Block Edge Compliance	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

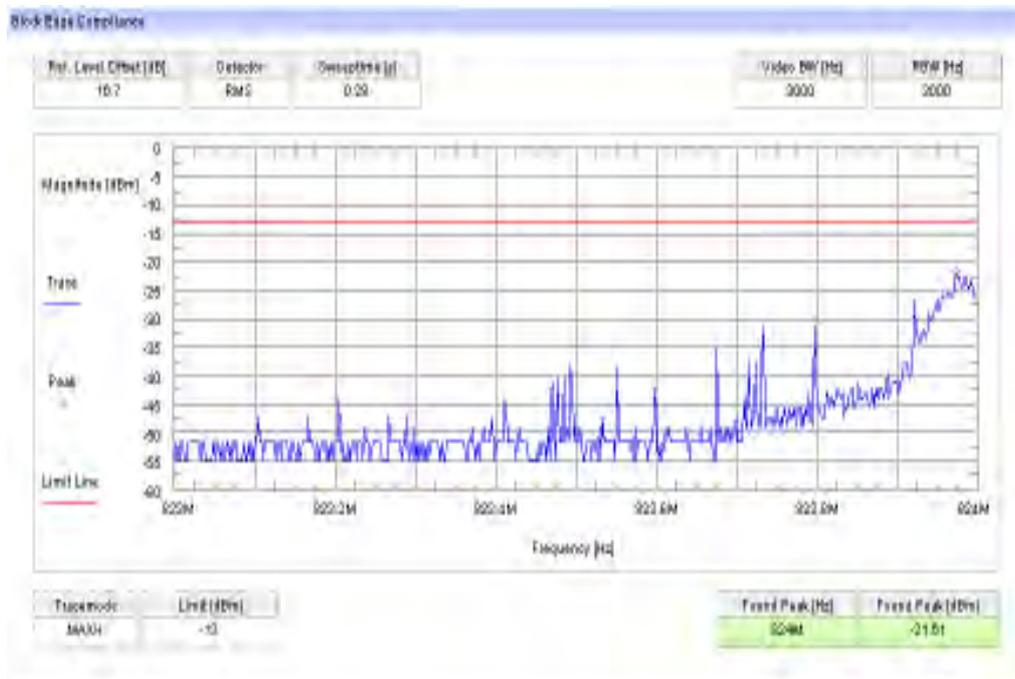
Plot 1: Channel 128 (GSM-mode)



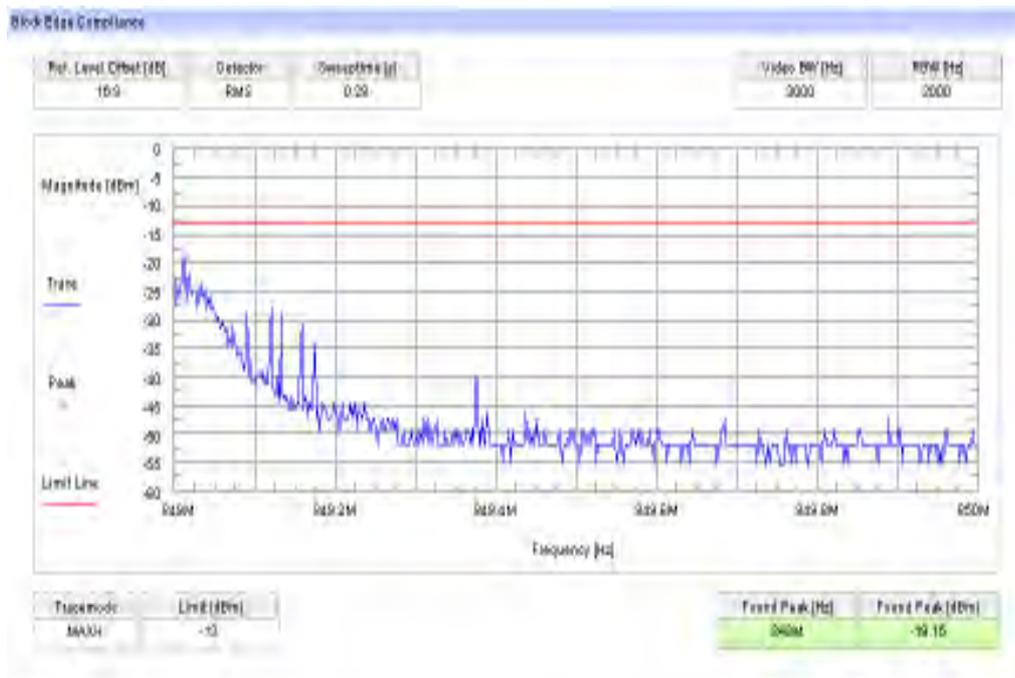
Plot 2: Channel 251 (GSM-mode)



Plot 3: Channel 128 (EDGE-mode)



Plot 4: Channel 251 (EDGE-mode)



Result: The result of the measurement is passed.

8.3.6 Occupied Bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the GSM-850 frequency band. The table below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Part 22.917 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300 kHz, this equates to a resolution bandwidth of at least 3 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	1 MHz
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 22.917 CFR Part 2.1049	RSS 132, Issue 2, Section 4.5.1
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

Results:

Occupied Bandwidth - GMSK mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
824.2	273	313
836.4	273	313
848.8	279	315
Measurement uncertainty	± 3 kHz	

Occupied Bandwidth - EDGE mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
824.2	267	297
836.4	265	313
848.8	265	313
Measurement uncertainty	± 3 kHz	

Result: The result of the measurement is passed.

Plot 1: Channel 128 (99% - OBW) GSM



Plot 2: Channel 128 (-26 dBc BW) GSM



Plot 3: Channel 189 (99% - OBW) GSM



Plot 4: Channel 189 (-26 dBc BW) GSM



Plot 5: Channel 251 (99% - OBW) GSM



Plot 6: Channel 251 (-26 dBc BW) GSM



Plot 7: Channel 128 (99% - OBW) EGPRS / EDGE



Plot 8: Channel 128 (-26 dBc BW) EGPRS / EDGE



Plot 9: Channel 189 (99% - OBW) EGPRS / EDGE



Plot 10: Channel 189 (-26 dBc BW) EGPRS / EDGE



Plot 11: Channel 251 (99% - OBW) EGPRS / EDGE



Plot 12: Channel 251 (-26 dBc BW) EGPRS / EDGE



8.4 Results PCS 1900

All GSM-band measurements are done in GSM mode only. The device is also able to transmit data in GPRS mode. But because the power measurements are performed within the duration of a burst no other results from GPRS mode are possible. The only difference is the absolute average power, which is 3 dB higher (by using 2 timeslots in the Up-link). All relevant tests have been repeated using 8-PSK modulation if EDGE mode is supported.

8.4.1 RF Output Power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

Measurement parameters	
Detector:	RMS
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	Zero span
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 24.232 CFR Part 2.1046	RSS 133, Issue 5, Section 6.4
Nominal Peak Output Power	
+33.00 dBm In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	

Results:

Output Power (conducted) GMSK mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
1850.2	28.71	0.14
1880.0	27.88	0.10
1909.8	27.38	0.06
Measurement uncertainty	± 0.5 dB	

Output Power (conducted) 8-PSK mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
1850.2	26.15	3.14
1880.0	26.12	3.19
1909.8	25.98	3.21
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) GMSK mode	
Frequency (MHz)	Average Output Power (dBm) - EIRP
1850.2	31.51
1880.0	31.29
1909.8	30.97
Measurement uncertainty	± 2.0 dB

Output Power (radiated) 8-PSK mode	
Frequency (MHz)	Average Output Power (dBm) - EIRP
1850.2	28.95
1880.0	29.53
1909.8	29.57
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

8.4.2 Frequency Stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a “call mode”. This is accomplished with the use of a R&S CMU200 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with V_{nom} , connected to the CMU200 and in a simulated call on channel 661 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 °C increments from -30 °C to +60 °C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.
6. At all temperature levels hold the temperature to +/- 0.5 °C during the measurement procedure.

Measurement:

The measurement is performed with the integrated CMU 200 function.

Limits:

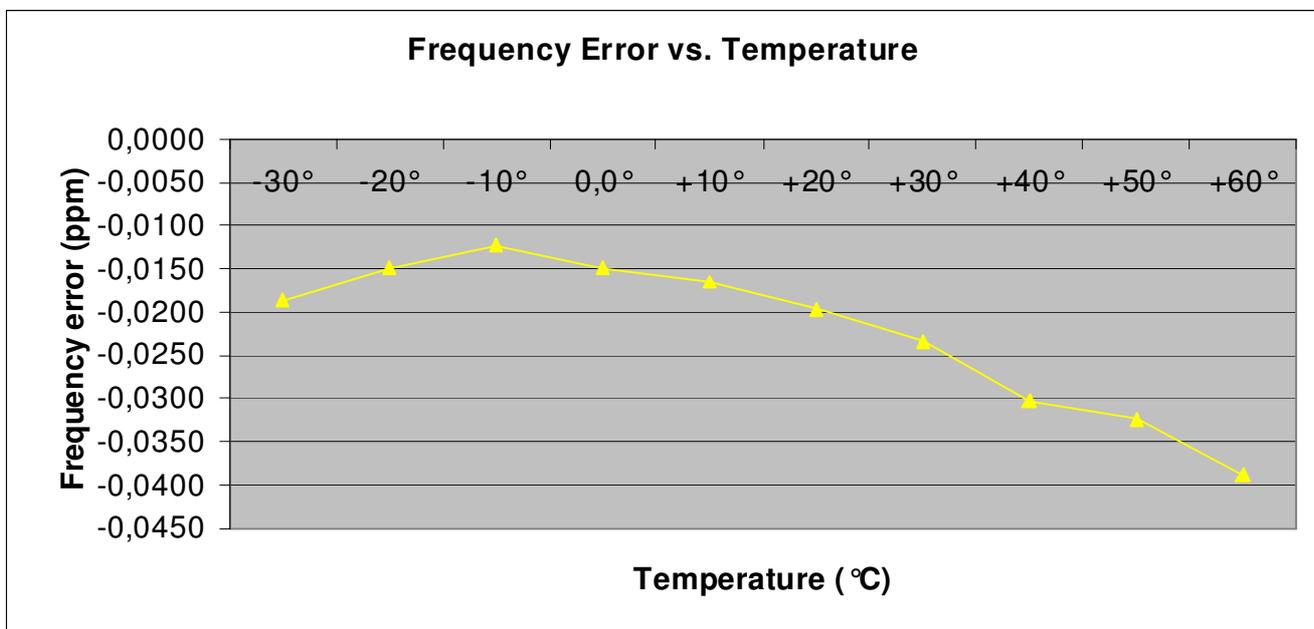
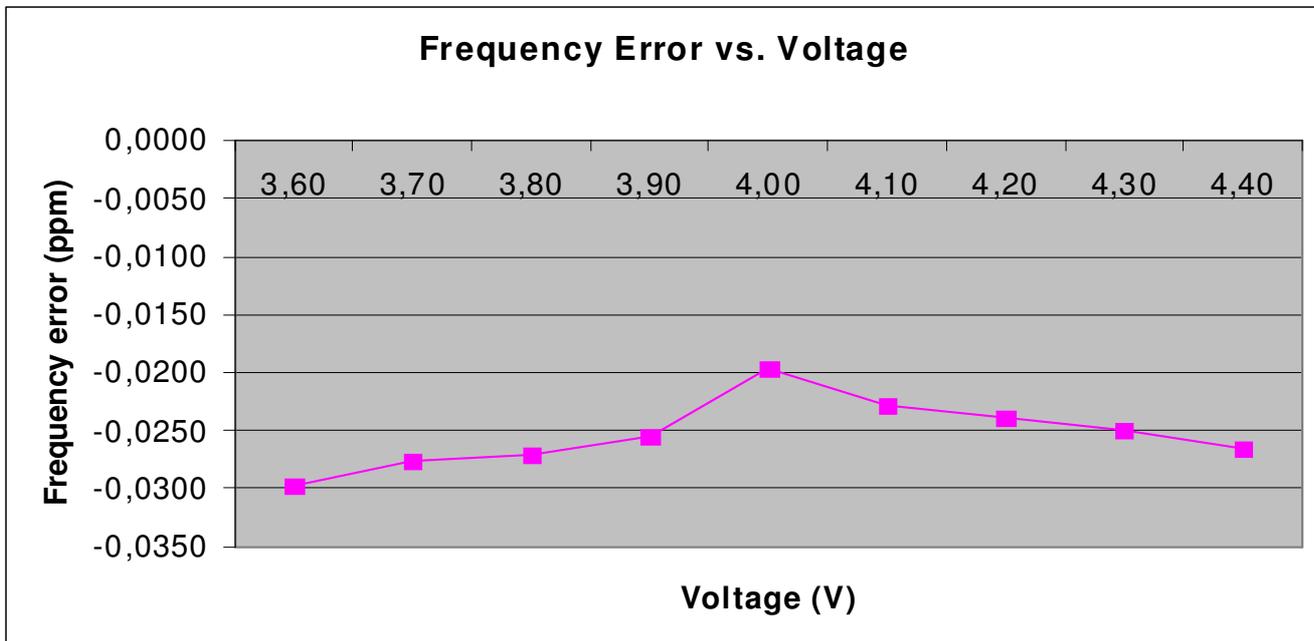
FCC	IC
CFR Part 24.235 CFR Part 2.1055	RSS 133, Issue 5, Section 6.3
Frequency Stability	
± 0.1 ppm	

Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.6	-56	-0,00000298	-0,0298
3.7	-52	-0,00000277	-0,0277
3.8	-51	-0,00000271	-0,0271
3.9	-48	-0,00000255	-0,0255
4.0	-37	-0,00000197	-0,0197
4.1	-43	-0,00000229	-0,0229
4.2	-45	-0,00000239	-0,0239
4.3	-47	-0,00000250	-0,0250
4.4	-50	-0,00000266	-0,0266

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-35	-0,00000186	-0,0186
-20	-28	-0,00000149	-0,0149
-10	-23	-0,00000122	-0,0122
± 0	-28	-0,00000149	-0,0149
10	-31	-0,00000165	-0,0165
20	-37	-0,00000197	-0,0197
30	-44	-0,00000234	-0,0234
40	-57	-0,00000303	-0,0303
50	-61	-0,00000324	-0,0324
60	-73	-0,00000388	-0,0388



Result: The result of the measurement is passed.

8.4.3 Spurious Emissions Radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2009 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the PCS1900 band.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load (if possible).
- c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters.
- e) Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603 .

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3.5 * RBW
Resolution bandwidth:	120 kHz below 1 GHz 1 MHz up to 25 GHz
Span:	100 MHz steps
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 24.238 CFR Part 2.1053	RSS 133, Issue 5, Section 6.5
Spurious Emissions Radiated	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880.0 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the PCS1900 band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

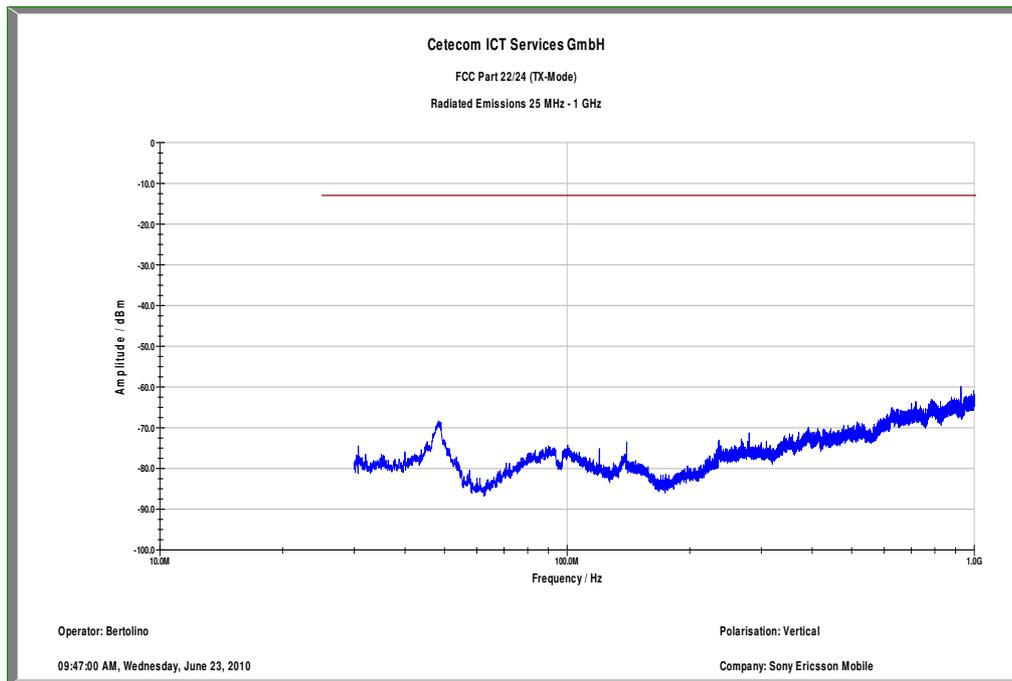
The final open field radiated levels are presented on the next pages. All measurements were done in horizontal and vertical polarization; the plots show the worst case. The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked too. The found values are stated in the table below.

As can be seen from this data, the emissions from the test item were within the specification limit.

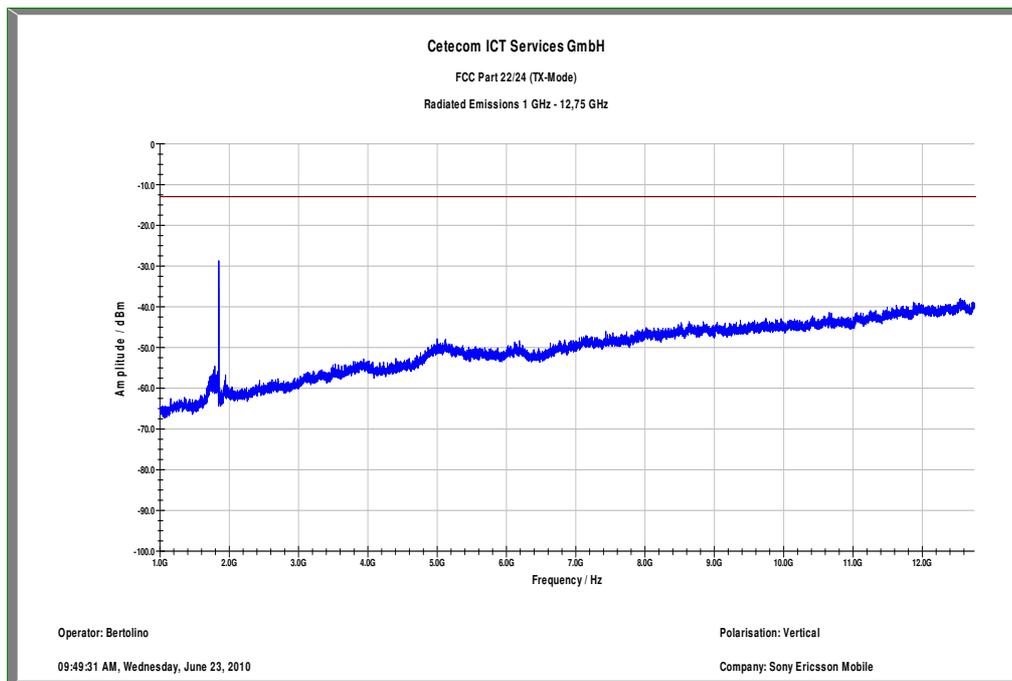
Spurious Emission Level (dBm)								
Harmonic	Ch. 512 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 661 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 810 Freq. (MHz)	Level [dBm]
2	3700.4	No critical peaks detected! All detected emissions are 20 dB below the limit!	2	3760.0	No critical peaks detected! All detected emissions are 20 dB below the limit!	2	3819.6	No critical peaks detected! All detected emissions are 20 dB below the limit!
3	5550.6		3	5640.0		3	5729.4	
4	7400.8		4	7520.0		4	7639.2	
5	9251.0		5	9400.0		5	9549.0	
6	11101.2		6	11280.0		6	11458.8	
7	12951.4		7	13160.0		7	13368.6	
8	14801.6		8	15040.0		8	15278.4	
9	16651.8		9	16920.0		9	17188.2	
10	18502.0		10	18800.0		10	19098.0	
Measurement uncertainty						± 3dB		

Result: The result of the measurement is passed.

Plot 1: TX mode, channel 512, 30 MHz to 1 GHz, vertical polarization

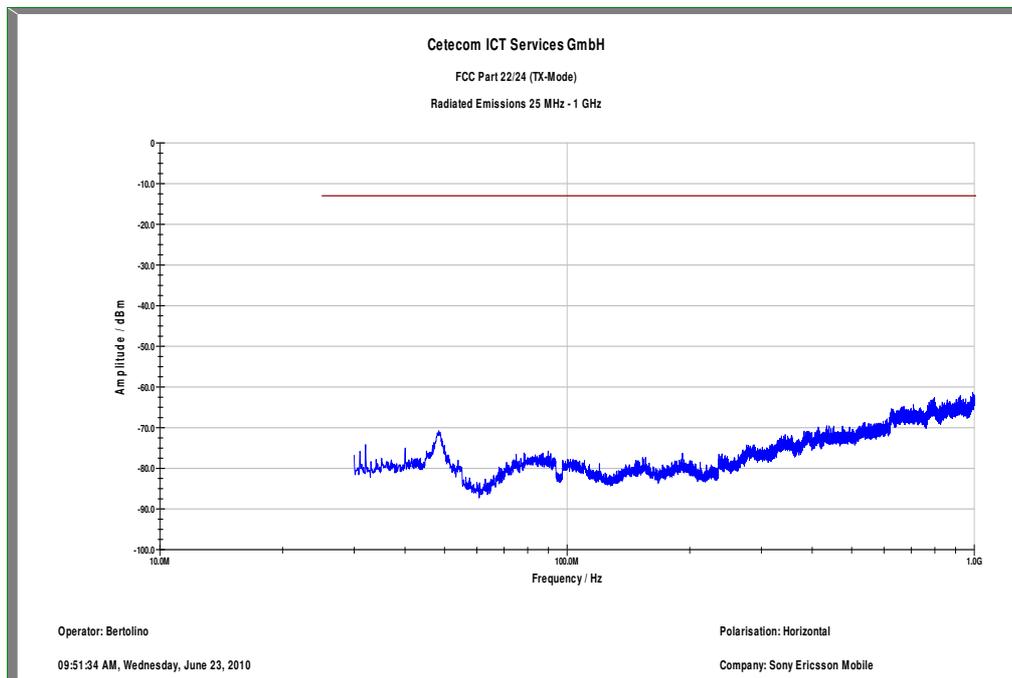


Plot 2: TX mode, channel 512, 1 GHz to 12.75 GHz, vertical polarization

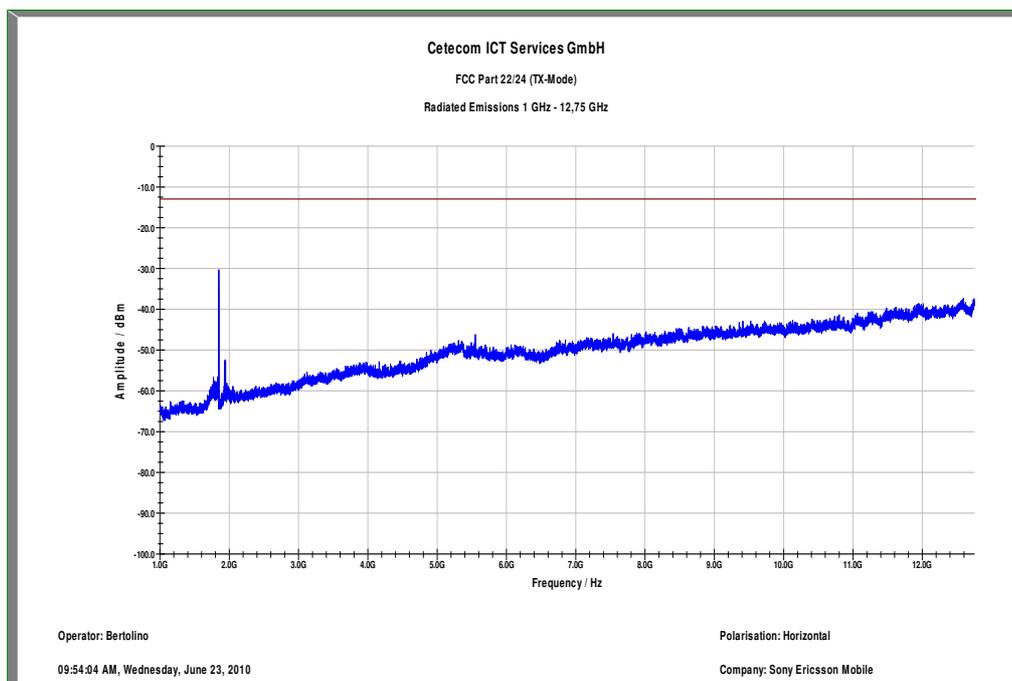


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 3: TX mode, channel 512, 30 MHz to 1 GHz, horizontal polarization

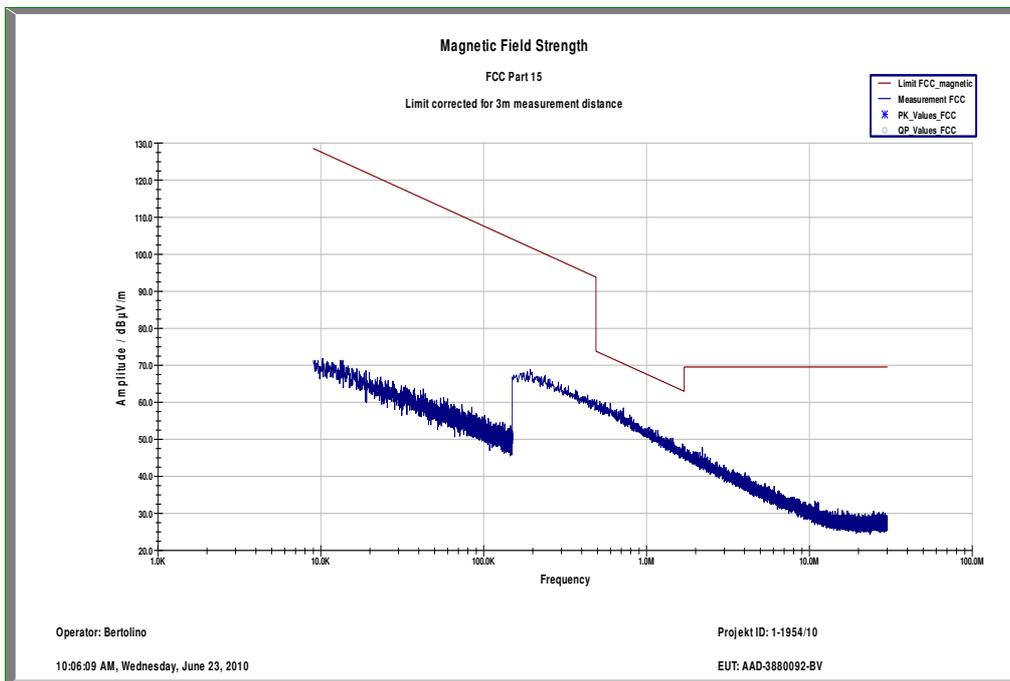


Plot 4: TX mode, channel 512, 1 GHz to 12.75 GHz, horizontal polarization

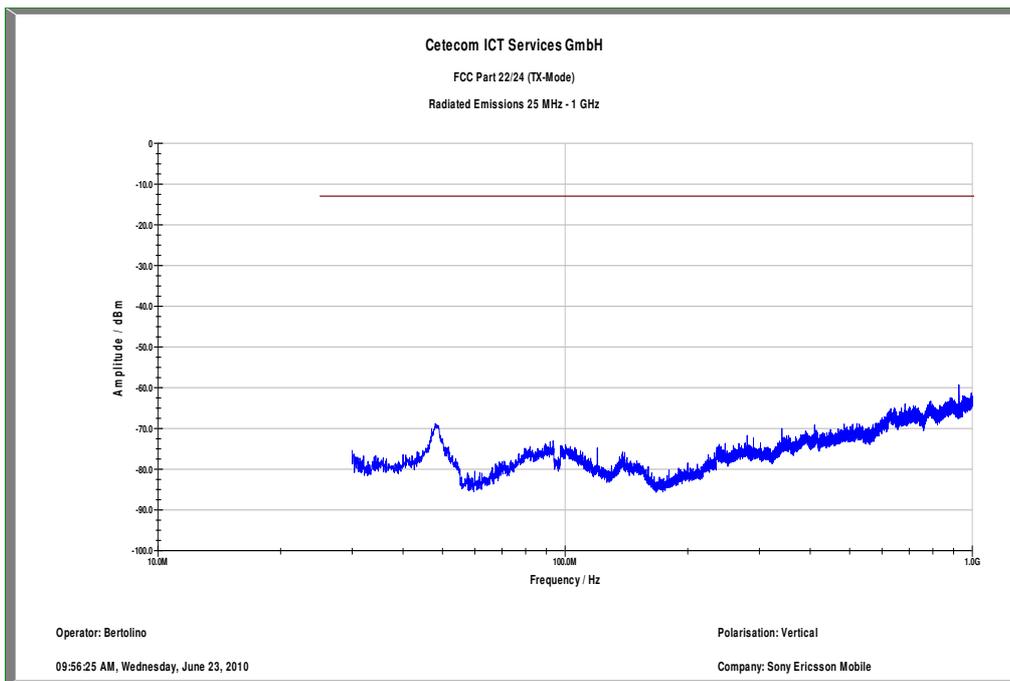


The carrier signal is notched with a 1.9 GHz band rejection filter.

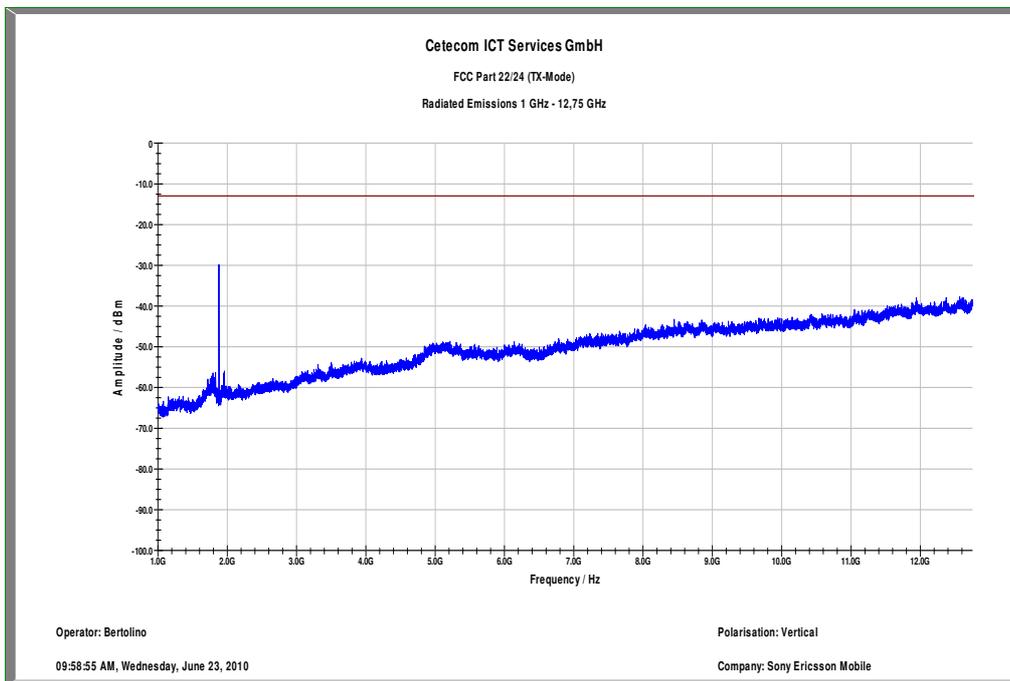
Plot 5: TX mode, channel 661, up to 30 MHz



Plot 6: TX mode, channel 661, 30 MHz to 1 GHz, vertical polarization

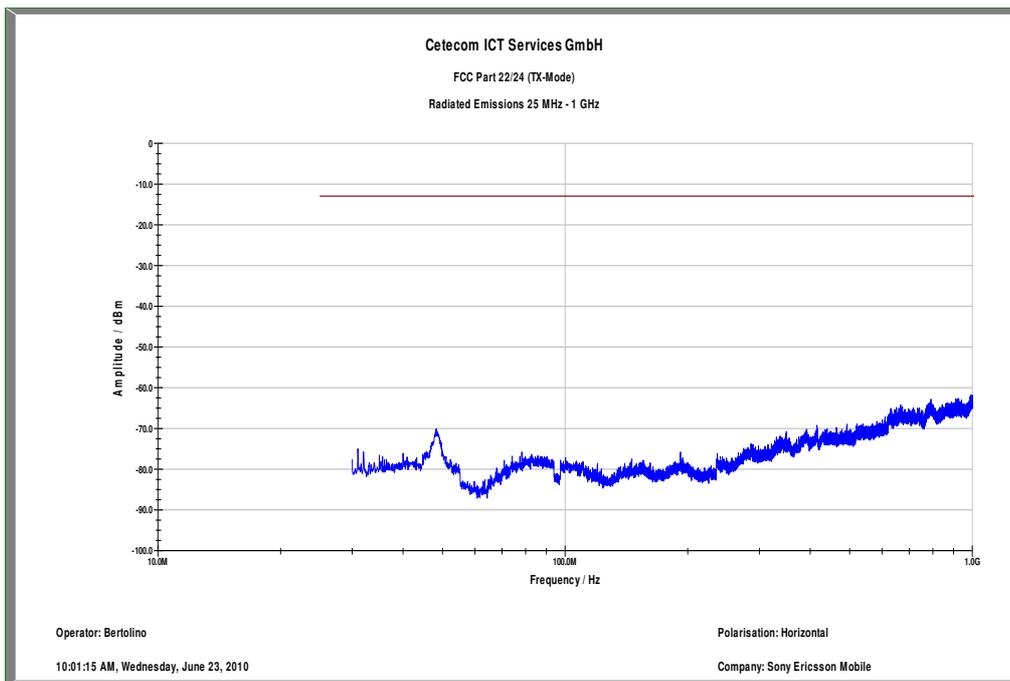


Plot 7: TX mode, channel 661, 1 GHz to 12.75 GHz, vertical polarization

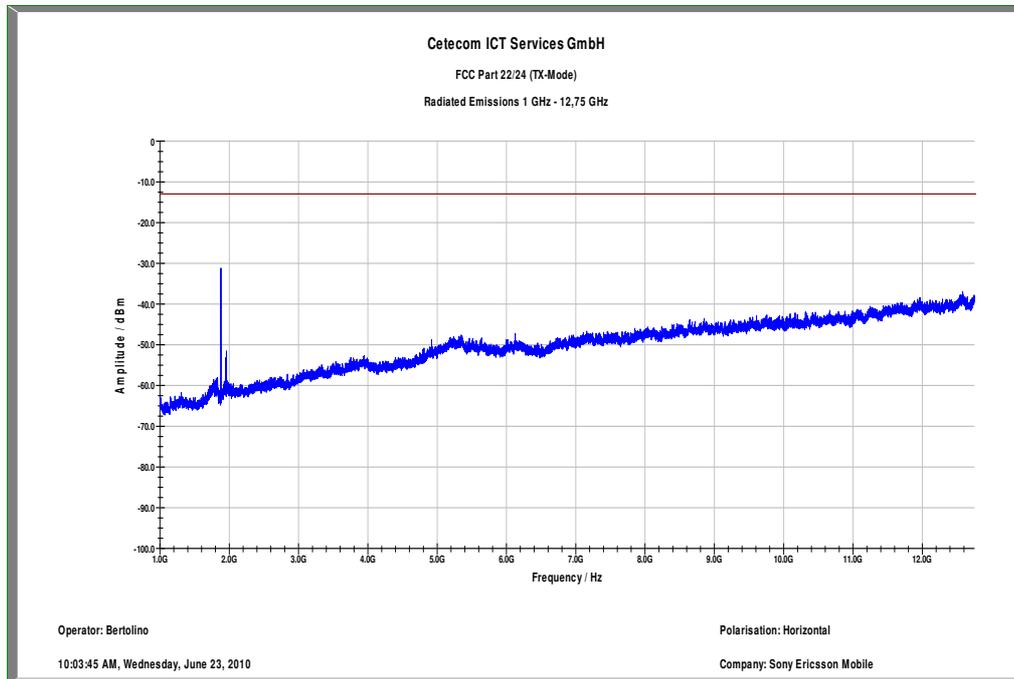


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 8: TX mode, channel 661, 30 MHz to 1 GHz, horizontal polarization

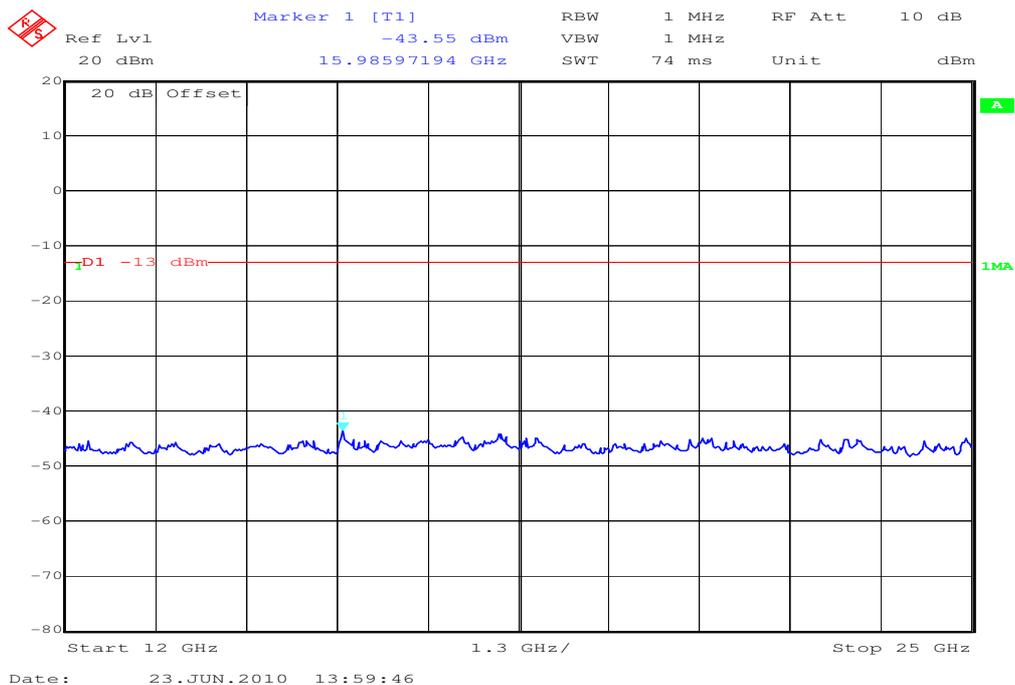


Plot 9: TX mode, channel 661, 1 GHz to 12.75 GHz, horizontal polarization

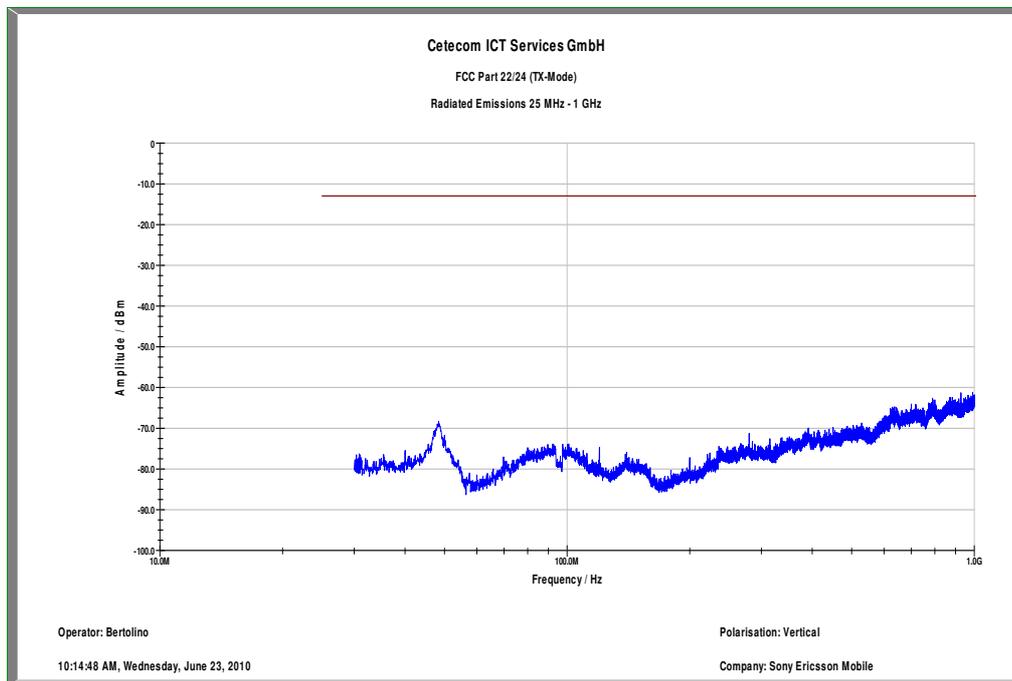


The carrier signal is notched with a 1.9 GHz band rejection filter.

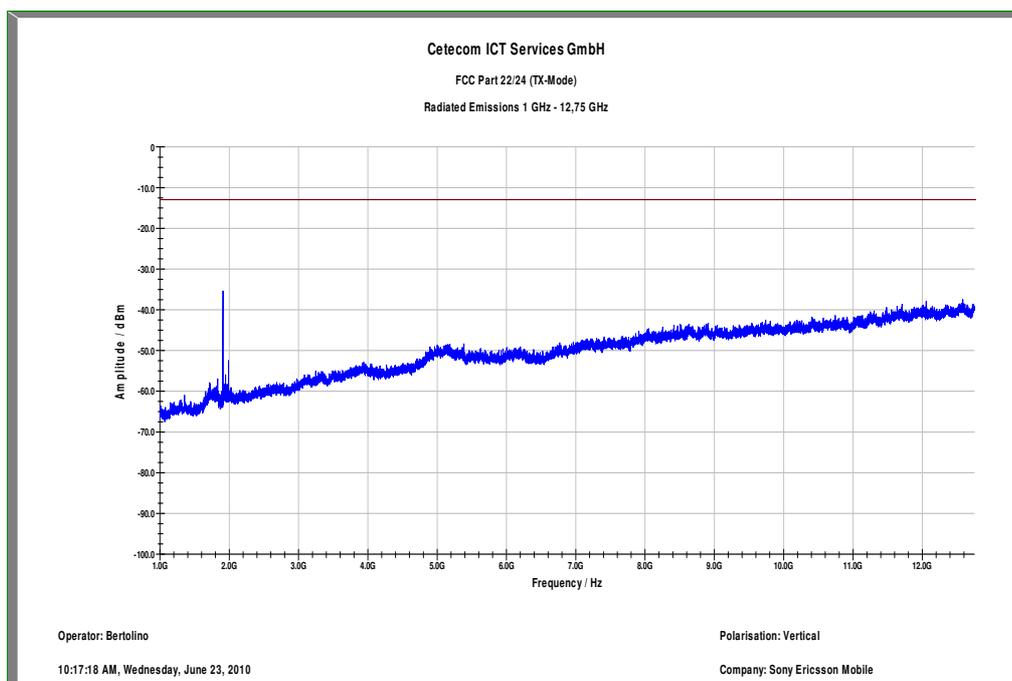
Plot 10: TX mode, channel 661, 12.75 GHz to 25 GHz, vertical & horizontal polarization



Plot 11: TX mode, channel 810, 30 MHz to 1 GHz, vertical polarization

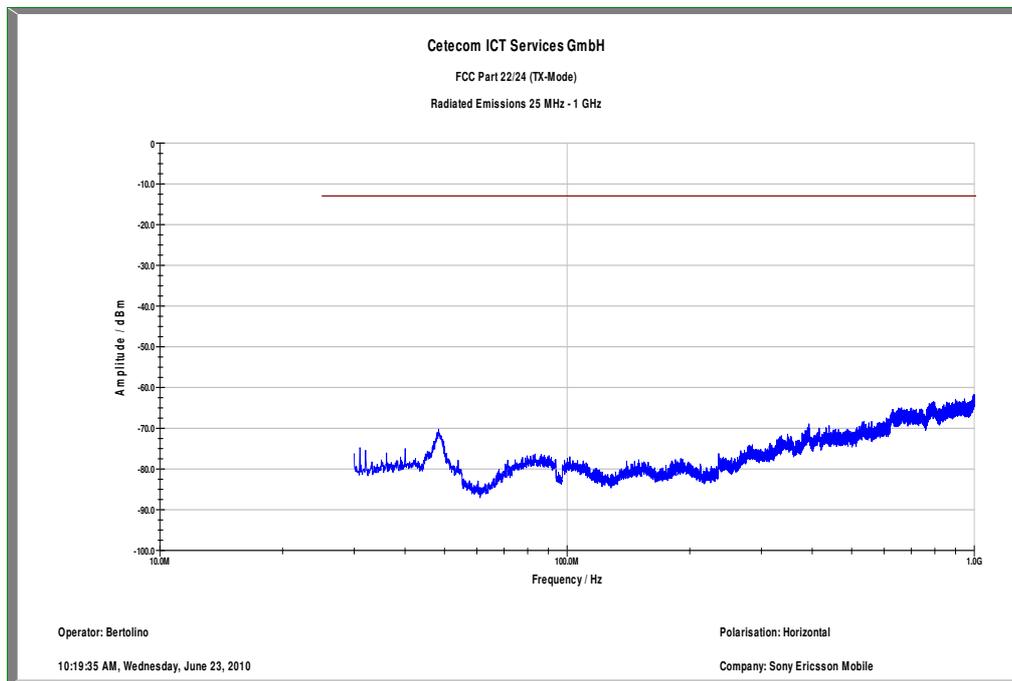


Plot 12: TX mode, channel 810, 1 GHz to 12.75 GHz, vertical polarization

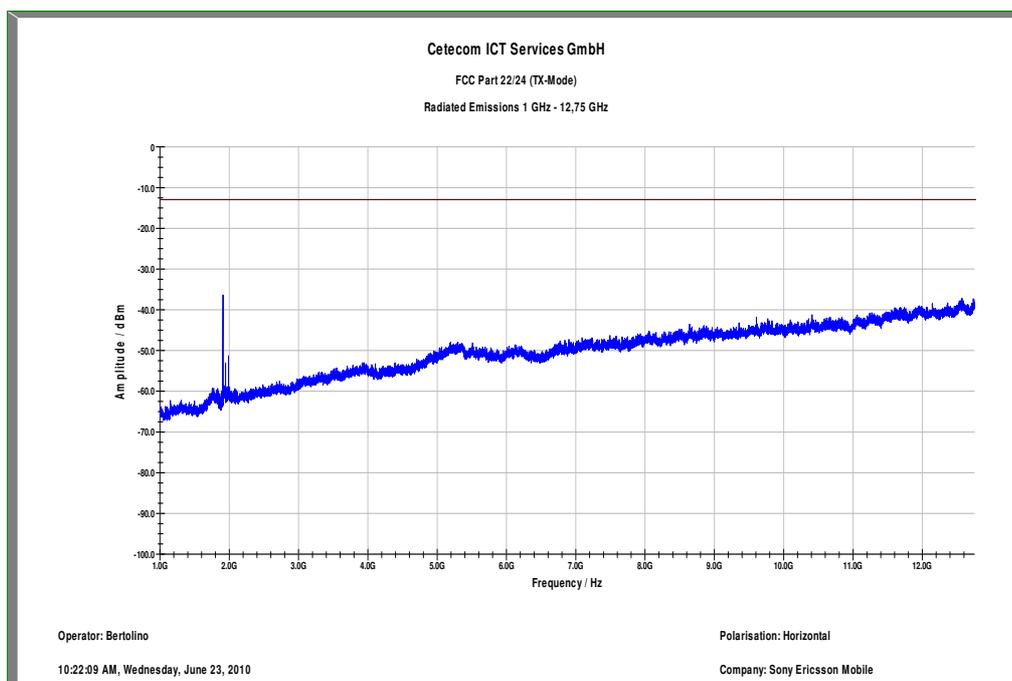


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 13: TX mode, channel 810, 30 MHz to 1 GHz, horizontal polarization



Plot 14: TX mode, channel 810, 1 GHz to 12.75 GHz, horizontal polarization



The carrier signal is notched with a 1.9 GHz band rejection filter.

8.4.4 Spurious Emissions Conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.
2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

PCS1900 Transmitter Channel Frequency
 512 1850.2 MHz
 661 1880.0 MHz
 810 1909.8 MHz

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	25 GHz
Trace-Mode:	Max. hold

Limits:

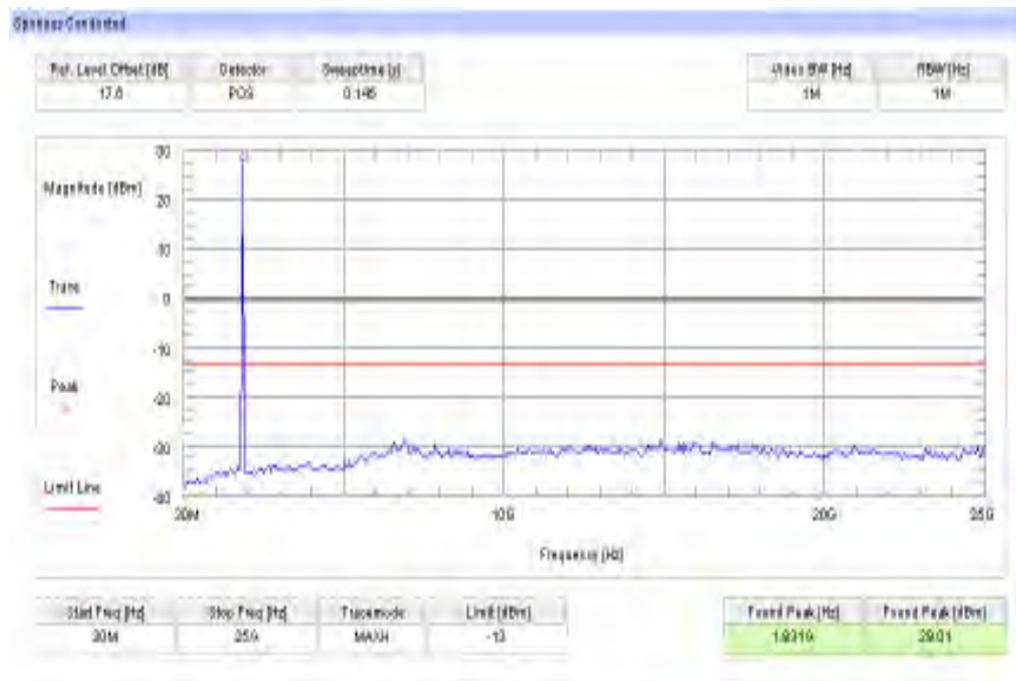
FCC	IC
CFR Part 24.238 CFR Part 2.1051	RSS 133, Issue 5, Section 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

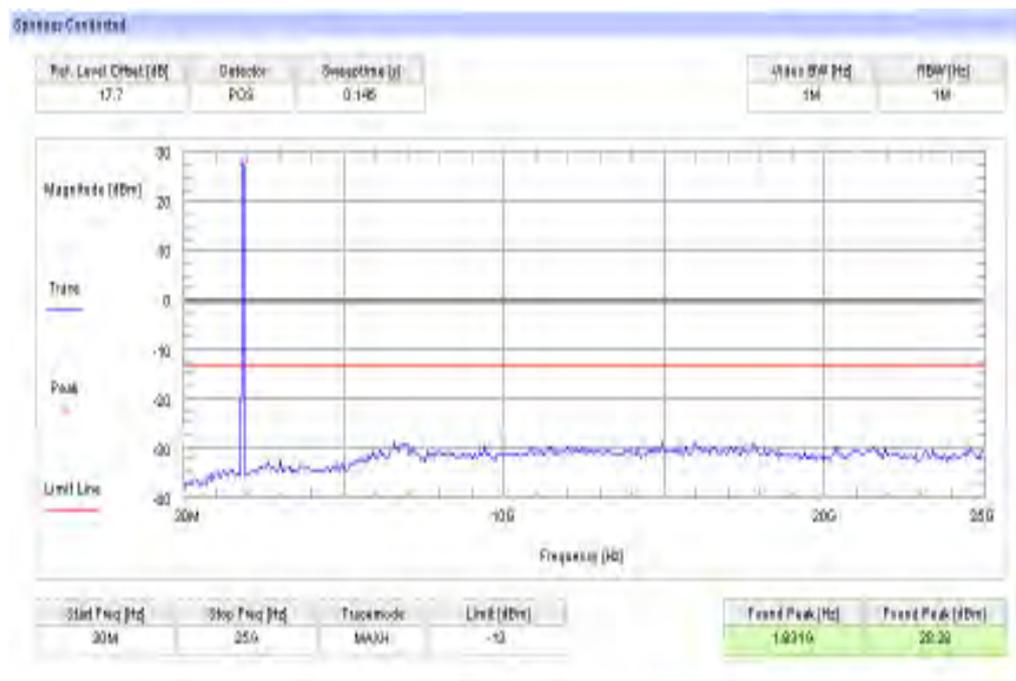
Spurious Emission Level (dBm)								
Harmonic	Ch. 512 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 661 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 810 Freq. (MHz)	Level [dBm]
2	3700.4	No spurious emission detected!	2	3760.0	No spurious emission detected!	2	3819.6	No spurious emission detected!
3	5550.6		3	5640.0		3	5729.4	
4	7400.8		4	7520.0		4	7639.2	
5	9251.0		5	9400.0		5	9549.0	
6	11101.2		6	11280.0		6	11458.8	
7	12951.4		7	13160.0		7	13368.6	
8	14801.6		8	15040.0		8	15278.4	
9	16651.8		9	16920.0		9	17188.2	
10	18502.0		10	18800.0		10	19098.0	
Measurement uncertainty						± 3dB		

Result: The result of the measurement is passed.

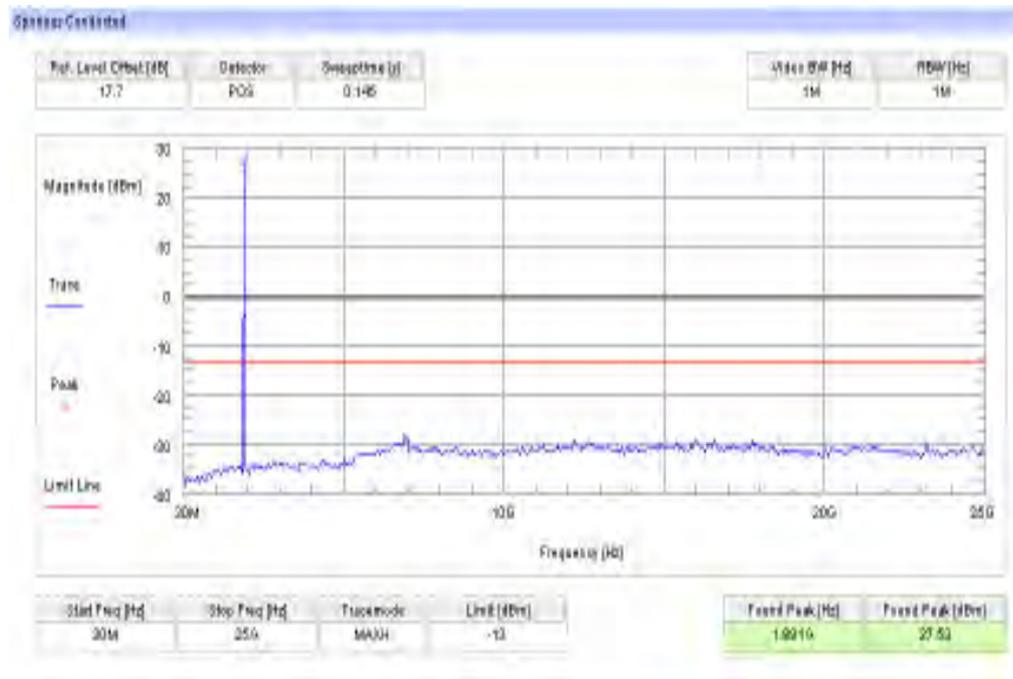
Plot 1: Channel 512 (30 MHz - 25 GHz)



Plot 2: Channel 661 (30 MHz - 25 GHz)



Plot 3: Channel 810 (30 MHz - 25 GHz)



8.4.5 Block Edge Compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

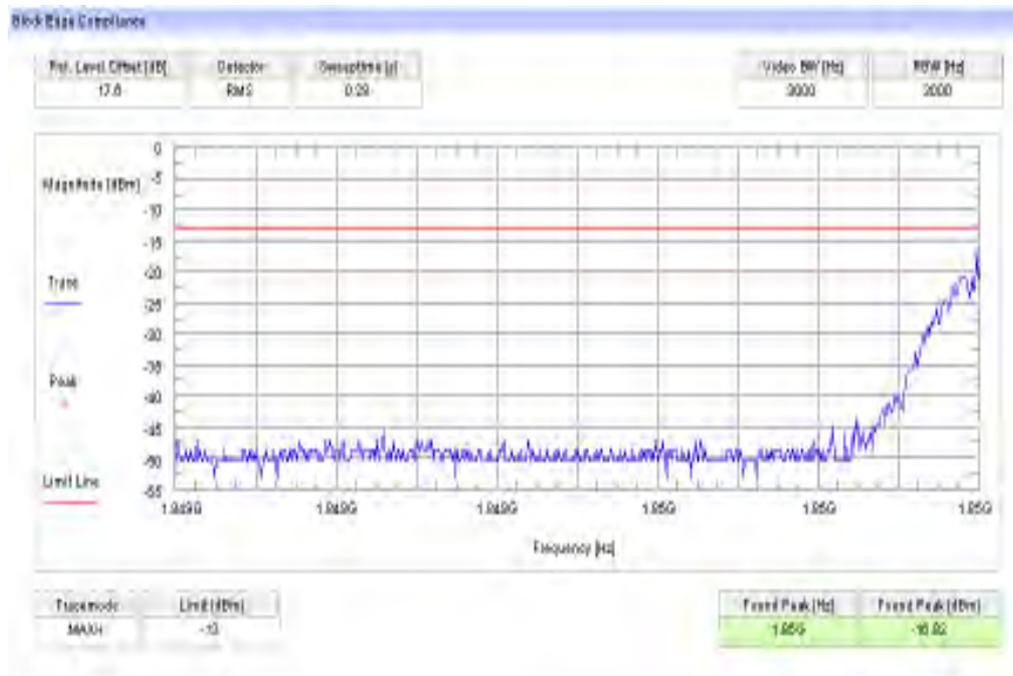
Measurement parameters	
Detector:	RMS
Sweep time:	Auto
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	1 MHz
Trace-Mode:	Max. hold

Limits:

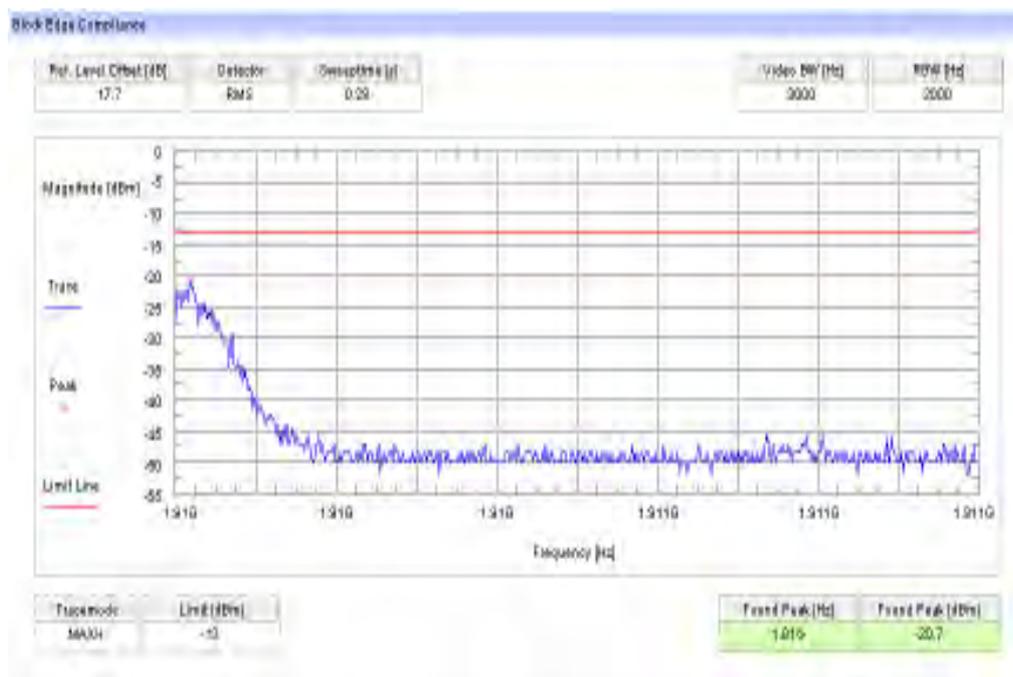
FCC	IC
CFR Part 24.238 CFR Part 2.1051	RSS 133, Issue 5, Section 6.5
Block Edge Compliance	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

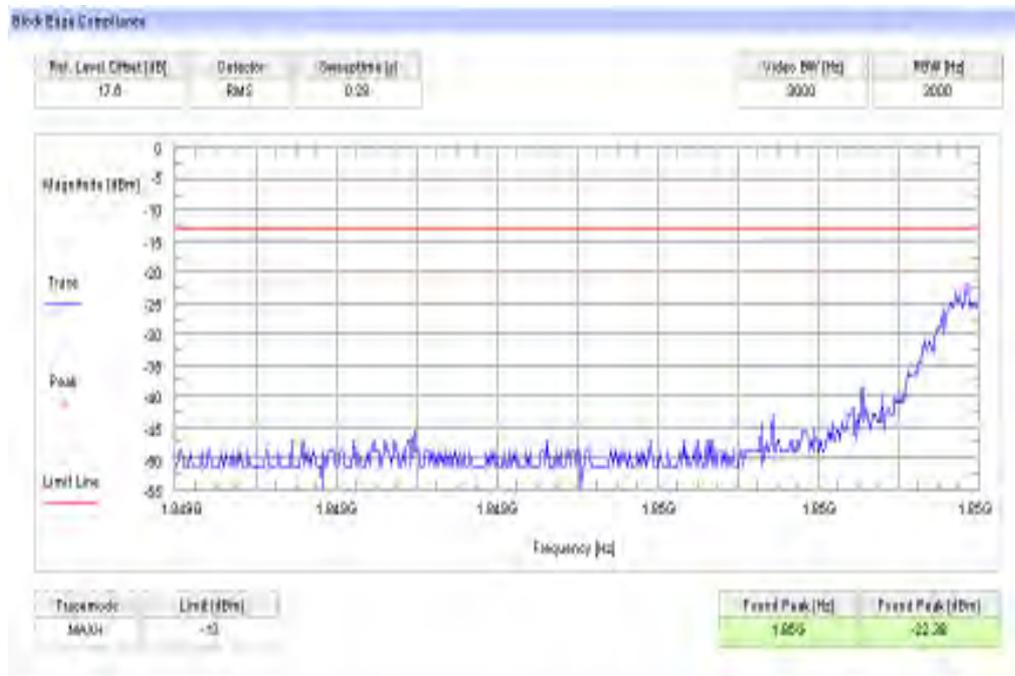
Plot 1: Channel 512 (GSM-mode)



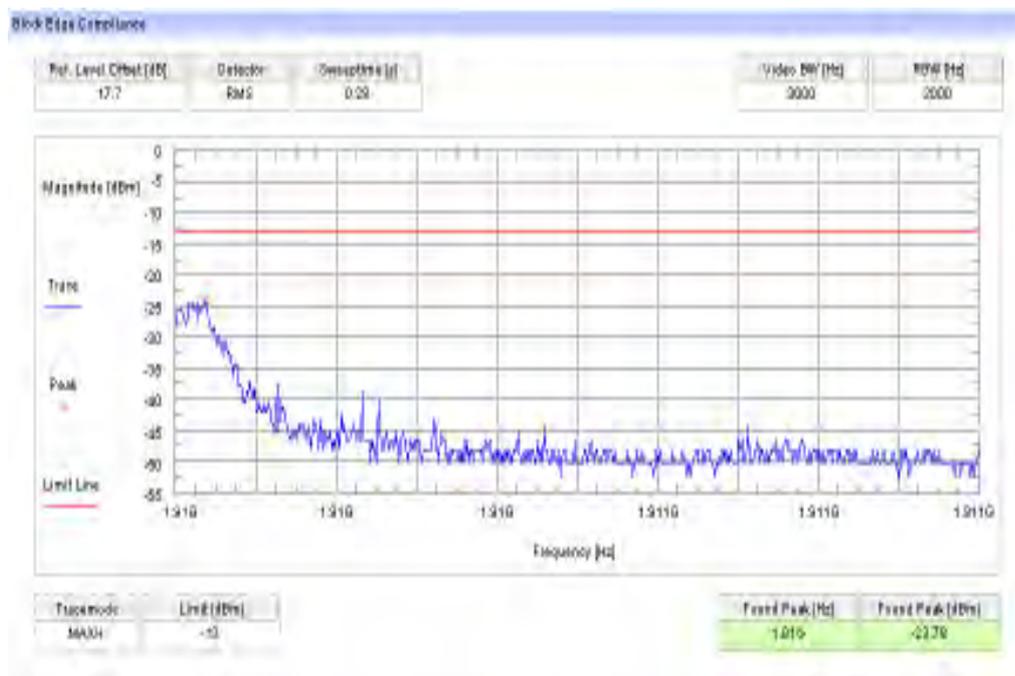
Plot 2: Channel 810 (GSM-mode)



Plot 3: Channel 512 (EDGE-mode)



Plot 4: Channel 810 (EDGE-mode)



Result: The result of the measurement is passed.

8.4.6 Occupied Bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the PCS1900 frequency band. The table below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Part 24.238 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300 kHz, this equates to a resolution bandwidth of at least 3.0 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	1 MHz
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 24.238 CFR Part 2.1049	RSS 133, Issue 5, Section 6.5
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

Results:

Occupied Bandwidth - GMSK mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
1850.2	277	315
1880.0	275	309
1909.8	281	311
Measurement uncertainty	± 3 kHz	

Occupied Bandwidth - EDGE mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
1850.2	279	303
1880.0	261	315
1909.8	257	315
Measurement uncertainty	± 3 kHz	

Result: The result of the measurement is passed.

Plot 1: Channel 512 (99% - OBW) GSM



Plot 2: Channel 512 (-26 dBc BW) GSM



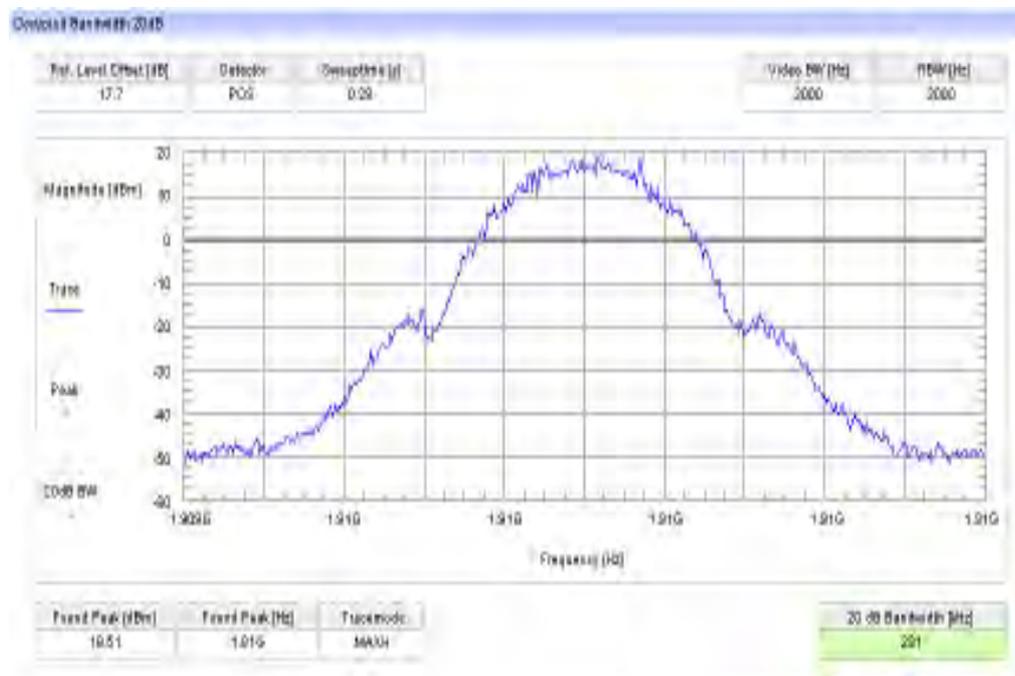
Plot 3: Channel 661 (99% - OBW) GSM



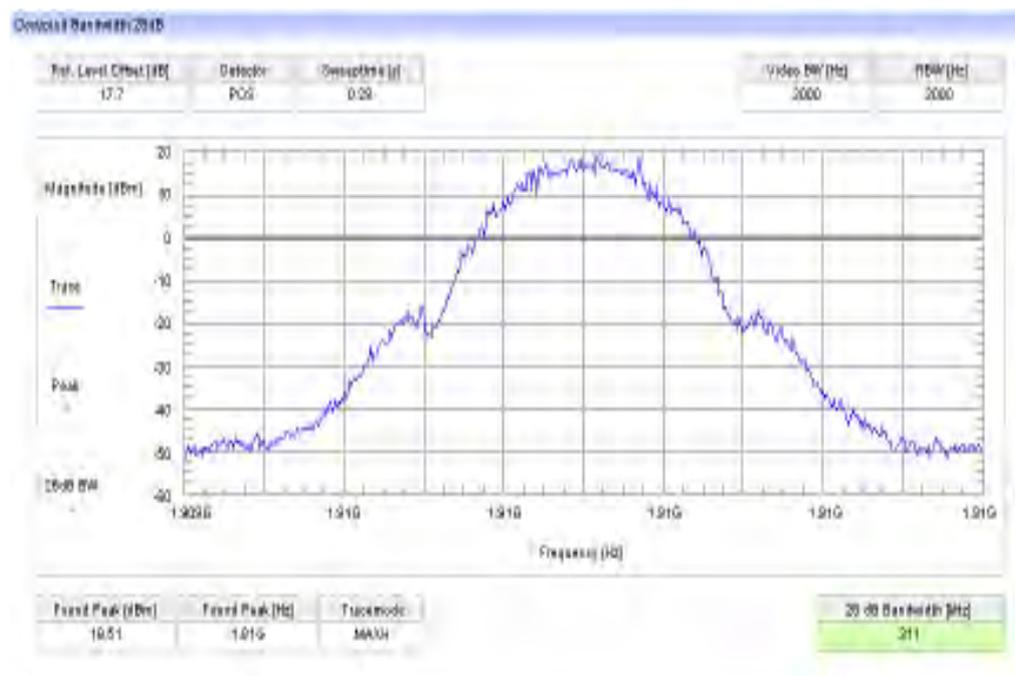
Plot 4: Channel 661 (-26 dBc BW) GSM



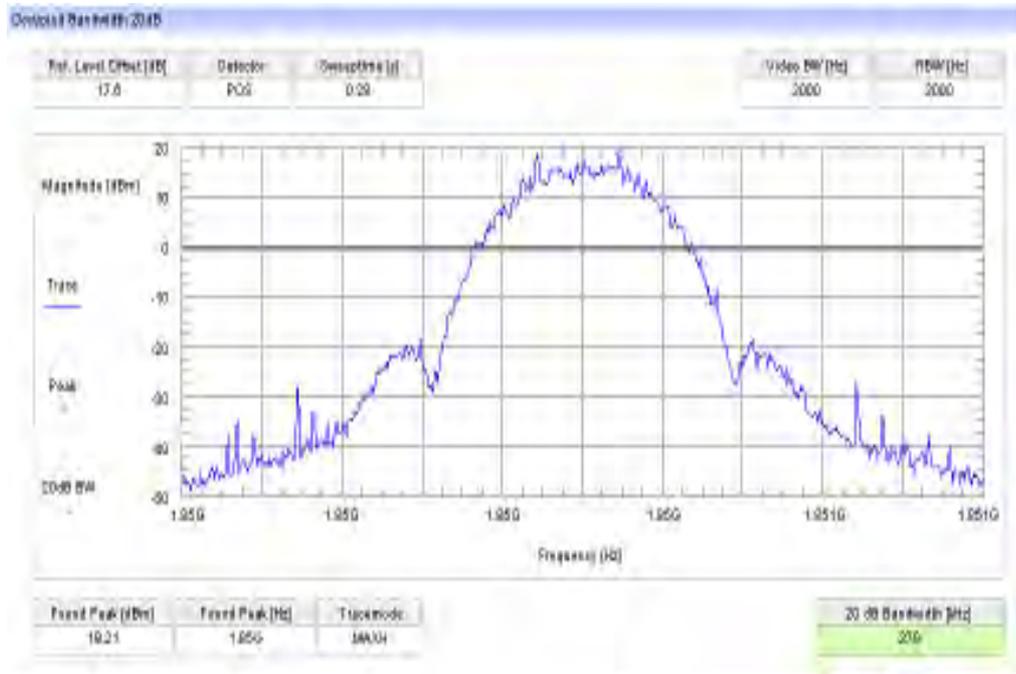
Plot 5: Channel 810 (99% - OBW) GSM



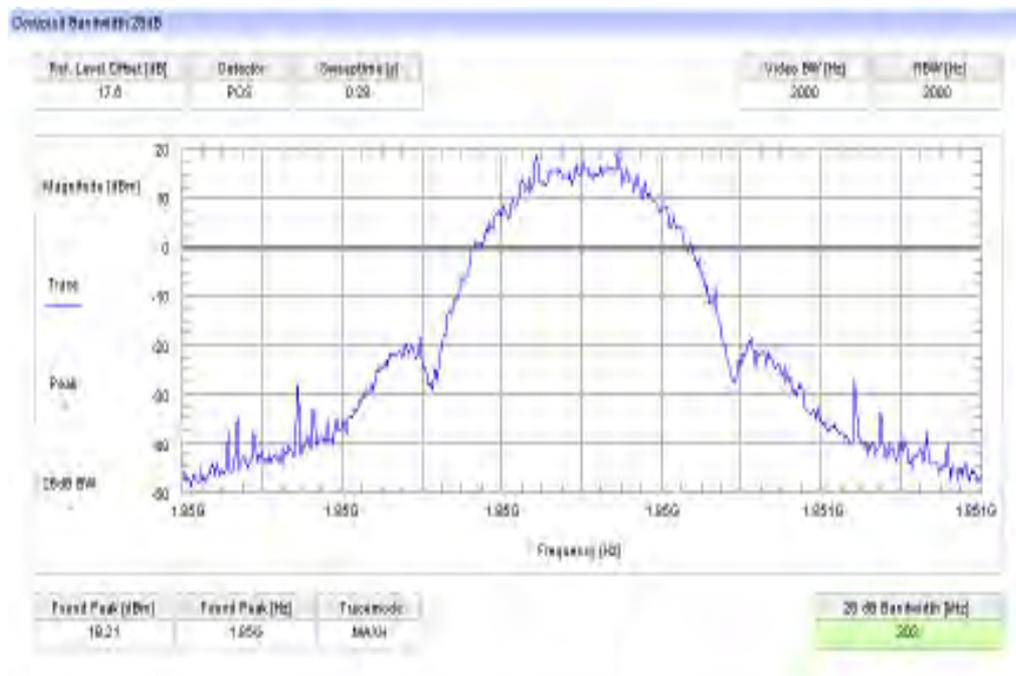
Plot 6: Channel 810 (-26 dBc BW) GSM



Plot 7: Channel 512 (99% - OBW) EGPRS / EDGE



Plot 8: Channel 512 (-26 dBc BW) EGPRS / EDGE



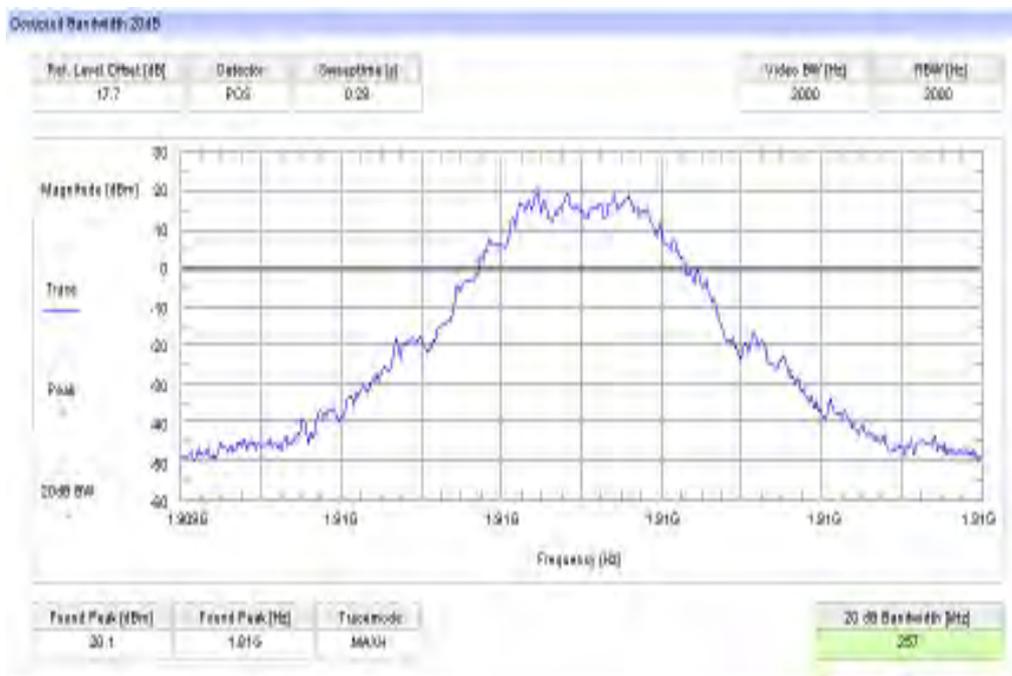
Plot 9: Channel 661 (99% - OBW) EGPRS / EDGE



Plot 10: Channel 661 (-26 dBc BW) EGPRS / EDGE



Plot 11: Channel 810 (99% - OBW) EGPRS / EDGE



Plot 12: Channel 810 (-26 dBc BW) EGPRS / EDGE



8.5 Results UMTS band II

All UMTS-band measurements are done in WCDMA mode only. The device is also able to transmit data in HSPA modes. But it was only checked that the EUT supports these modes and fulfils the requirements of the following tables. The exact power values are part of the SAR-report.

The following HSDPA sub-tests are defined by 3GPP 34.121 (table C.10.1.4)

Subtest	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	CM(dB) ⁽²⁾
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 ⁽³⁾	15/15 ⁽³⁾	64	12/15 ⁽³⁾	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: $\Delta_{ACK}, \Delta_{NACK}, \Delta_{CQI} = 8 \leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \leftrightarrow \beta_{hs} = 30/15 * \beta_c$
 Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$
 Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$

Table 1: Subtests for UMTS Release 5 HSDPA

The following HSUPA sub-tests are defined by 3GPP 34.121 (table C.11.1.3)

Subtest	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}:47/15$ $\beta_{ed2}:47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: $\Delta_{ACK}, \Delta_{NACK}, \Delta_{CQI} = 8 \leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \leftrightarrow \beta_{hs} = 30/15 * \beta_c$
 Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference
 Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$
 Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$
 Note 5 : Testing UE using E-DPDCH Physical Layer category 1 subtest 3 is not required according to TS 25.306 Table 5.1g
 Note 6 : β_{ed} can not be set directly; it is set by Absolute Grant Value

Table 2: Subtests for UMTS Release 6 HSUPA

8.5.1 RF Output Power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

Measurement parameters	
Detector:	RMS
Sweep time:	Auto
Video bandwidth:	8 MHz
Resolution bandwidth:	20 MHz
Span:	20 MHz
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 24.232 CFR Part 2.1046	RSS 133, Issue 5, Section 6.4
Nominal Peak Output Power	
+33.00 dBm	
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	

Results:

Output Power (conducted) WCDMA mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
1852.4	22.51	3.27
1880.0	22.72	3.27
1907.6	22.39	3.04
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) WCDMA mode	
Frequency (MHz)	Average Output Power (dBm) - EIRP
1852.4	25.31
1880.0	26.13
1907.6	25.98
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

8.5.2 Frequency Stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a “call mode”. This is accomplished with the use of a R&S CMU200 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with V_{nom} , connected to the CMU200 and in a simulated call on channel 9400 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10°C increments from -30°C to +60°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.
6. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

Measurement:

The measurement is performed with the integrated CMU 200 function.

Limits:

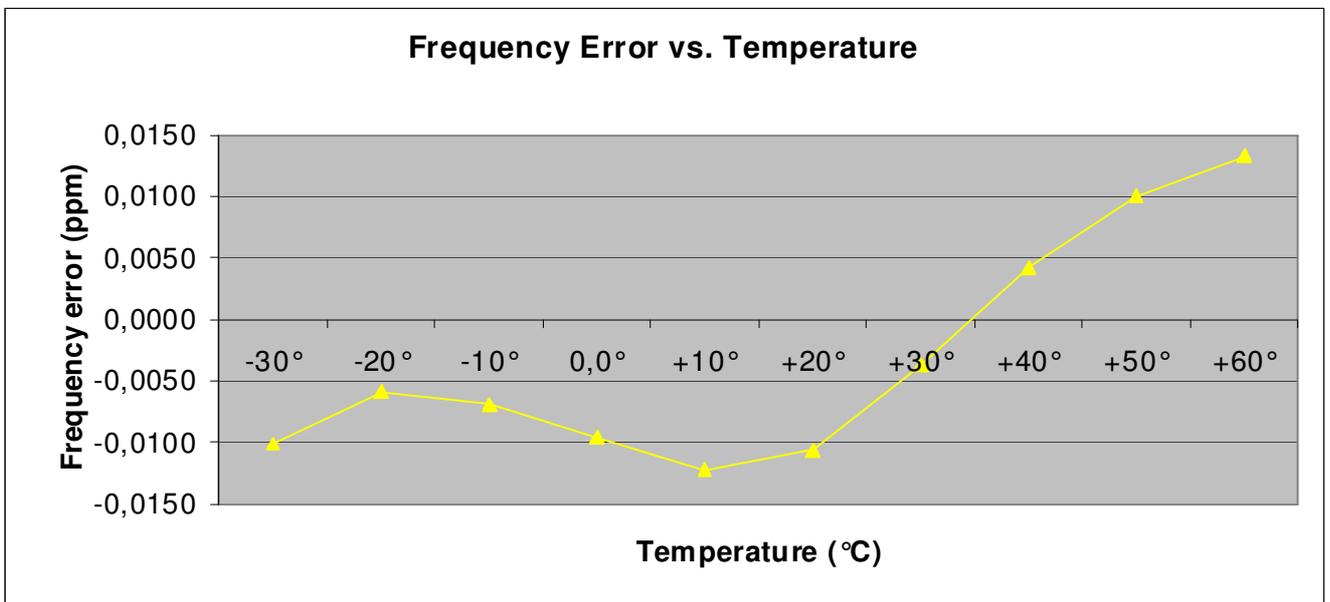
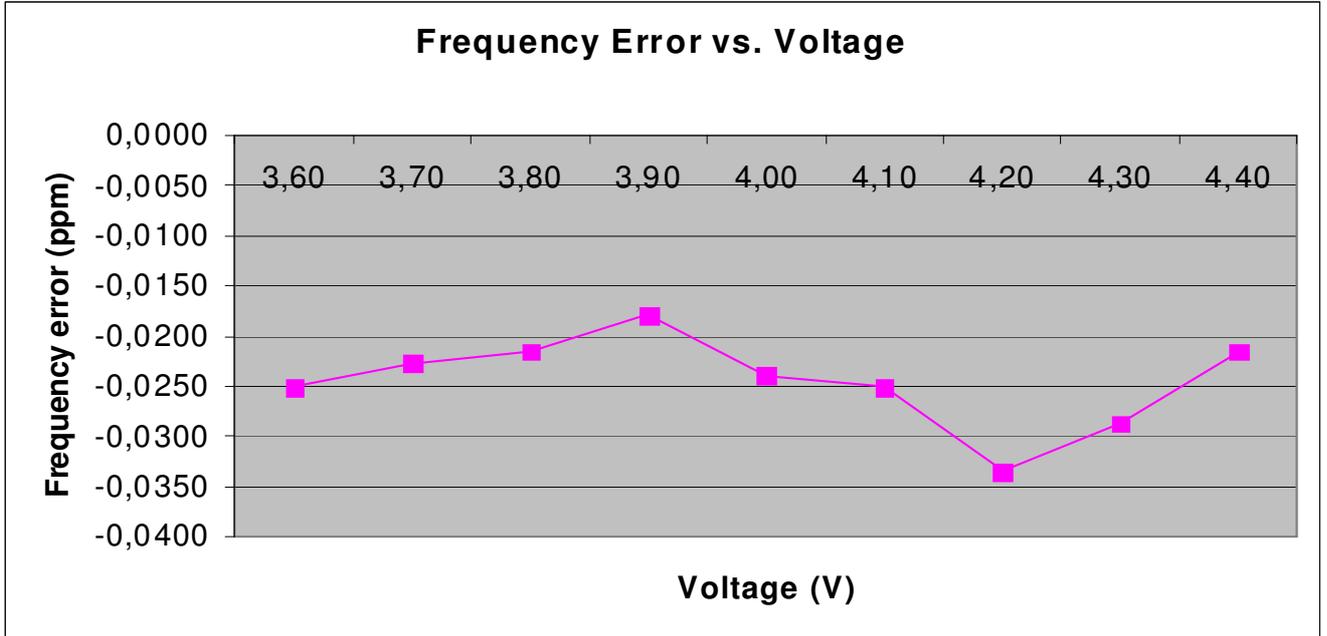
FCC	IC
CFR Part 24.235 CFR Part 2.1055	RSS 133, Issue 5, Section 6.3
Frequency Stability	
± 0.1 ppm	

Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.6	-21	-0,00000251	-0,0251
3.7	-19	-0,00000227	-0,0227
3.8	-18	-0,00000215	-0,0215
3.9	-15	-0,00000179	-0,0179
4.0	-20	-0,00000239	-0,0239
4.1	-21	-0,00000251	-0,0251
4.2	-28	-0,00000335	-0,0335
4.3	-24	-0,00000287	-0,0287
4.4	-18	-0,00000215	-0,0215

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-19	-0,00000101	-0,0101
-20	-11	-0,00000059	-0,0059
-10	-13	-0,00000069	-0,0069
± 0	-18	-0,00000096	-0,0096
10	-23	-0,00000122	-0,0122
20	-20	-0,00000106	-0,0106
30	-7	-0,00000037	-0,0037
40	8	0,00000043	0,0043
50	19	0,00000101	0,0101
60	25	0,00000133	0,0133



Result: The result of the measurement is passed.

8.5.3 Spurious Emissions Radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2009 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the UMTS band II.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load (if possible).
- c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters.
- e) Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603 .

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3.5 * RBW
Resolution bandwidth:	120 kHz below 1 GHz 1 MHz up to 25 GHz
Span:	100 MHz steps
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 24.238 CFR Part 2.1053	RSS 133, Issue 5, Section 6.5
Spurious Emissions Radiated	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the UMTS band II (1852.4 MHz, 1880.0 MHz and 1907.6 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the UMTS band II into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

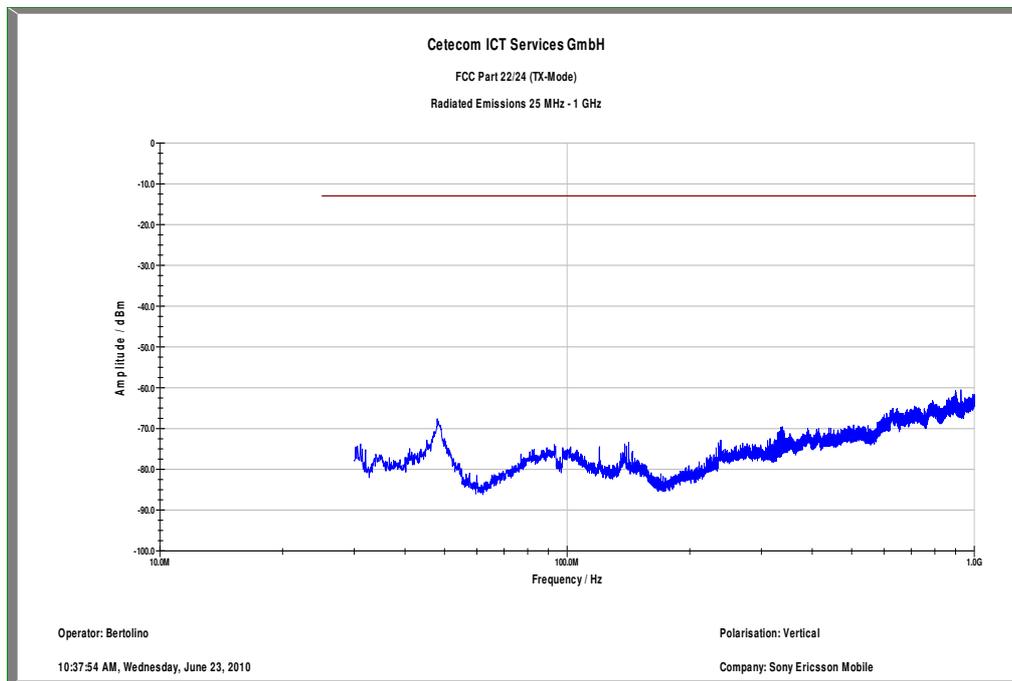
The final open field radiated levels are presented on the next pages. All measurements were done in horizontal and vertical polarization; the plots show the worst case. The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked too. The found values are stated in the table below.

As can be seen from this data, the emissions from the test item were within the specification limit.

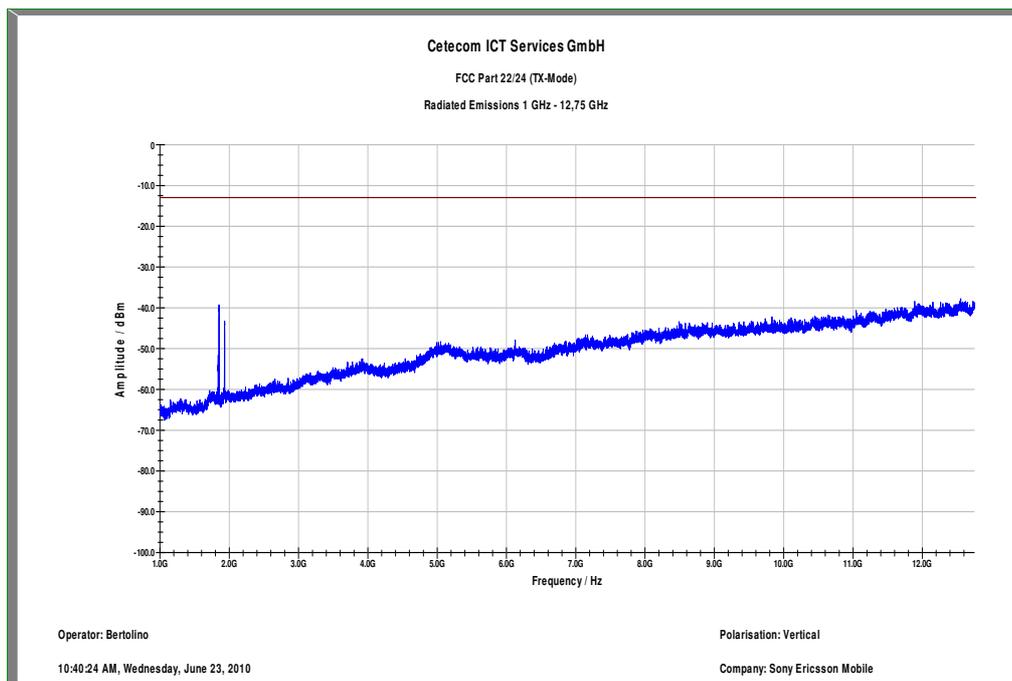
Spurious Emission Level (dBm)								
Harmonic	Ch. 9262 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 9400 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 9538 Freq. (MHz)	Level [dBm]
2	3704.8	No critical peaks detected! All detected emissions are 20 dB below the limit!	2	3760.0	No critical peaks detected! All detected emissions are 20 dB below the limit!	2	3815.2	No critical peaks detected! All detected emissions are 20 dB below the limit!
3	5557.2		3	5640.0		3	5722.8	
4	7409.6		4	7520.0		4	7630.4	
5	9262.0		5	9400.0		5	9538.0	
6	11114.4		6	11280.0		6	11445.6	
7	12966.8		7	13160.0		7	13353.2	
8	14819.2		8	15040.0		8	15260.8	
9	16671.6		9	16920.0		9	17168.4	
10	18524.0		10	18800.0		10	19076.0	
Measurement uncertainty						± 3dB		

Result: The result of the measurement is passed.

Plot 1: TX mode, channel 9262, 30 MHz to 1 GHz, vertical polarization

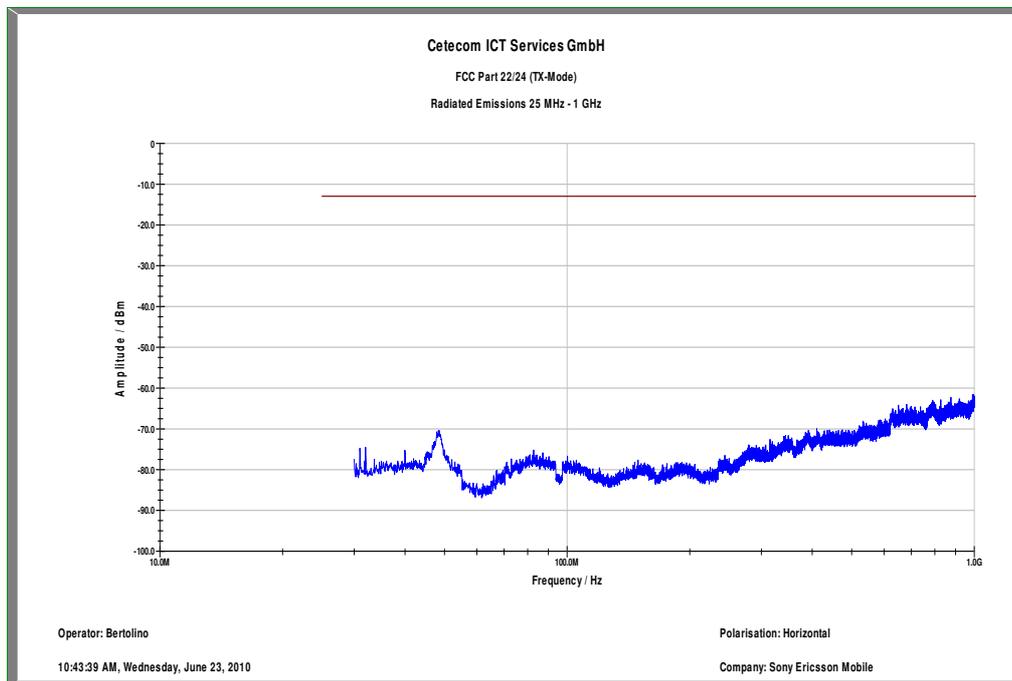


Plot 2: TX mode, channel 9262, 1 GHz to 12.75 GHz, vertical polarization

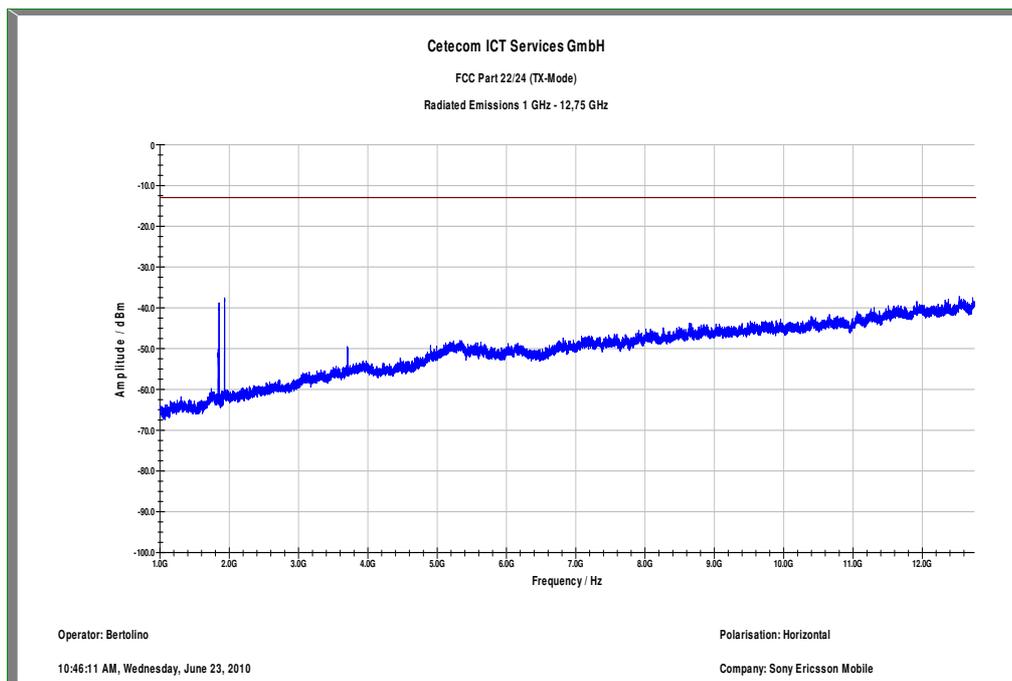


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 3: TX mode, channel 9262, 30 MHz to 1 GHz, horizontal polarization

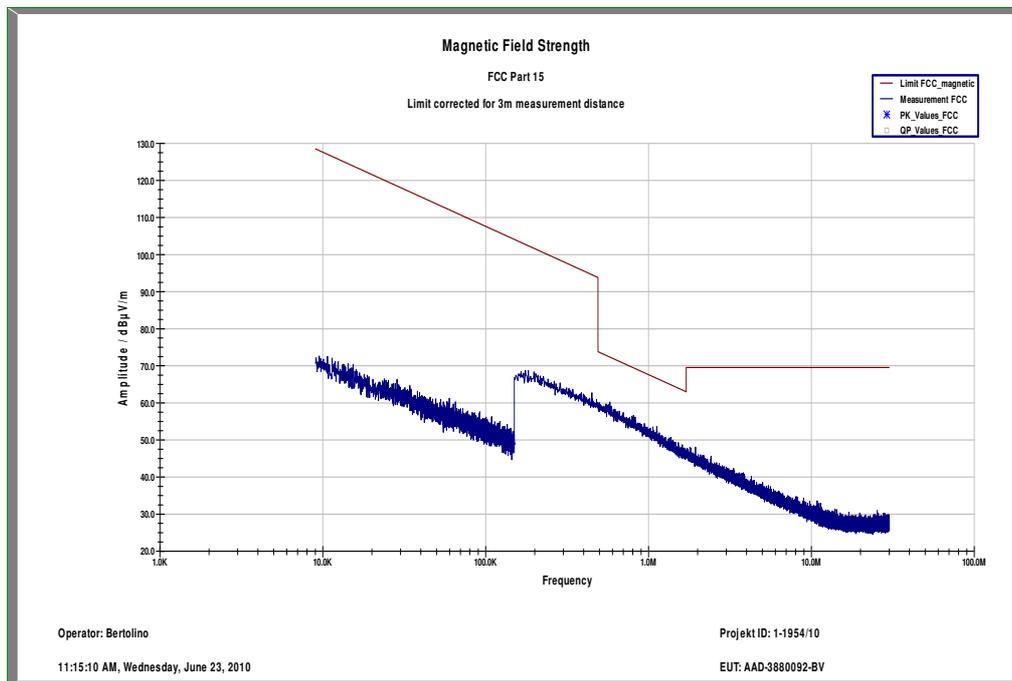


Plot 4: TX mode, channel 9262, 1 GHz to 12.75 GHz, horizontal polarization

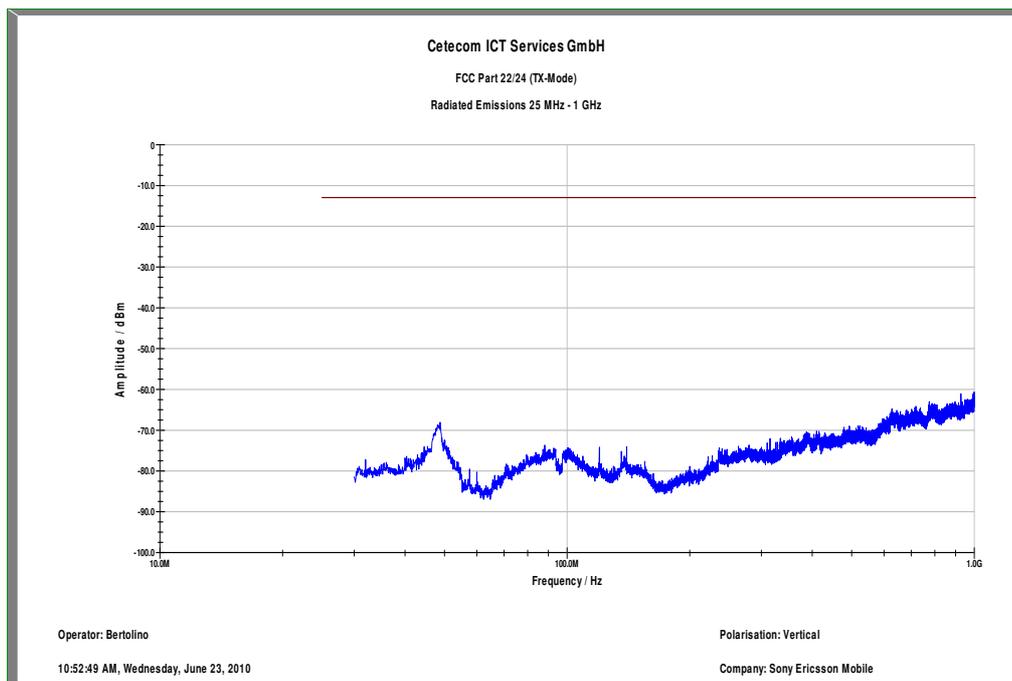


The carrier signal is notched with a 1.9 GHz band rejection filter.

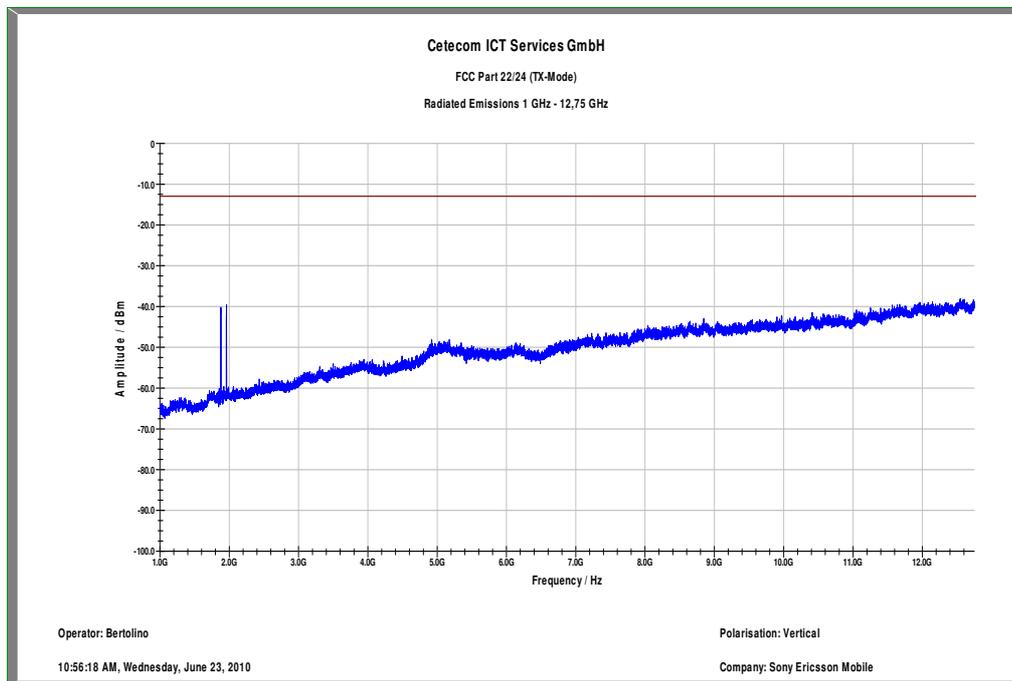
Plot 5: TX mode, channel 9400, up to 30 MHz



Plot 6: TX mode, channel 9400, 30 MHz to 1 GHz, vertical polarization

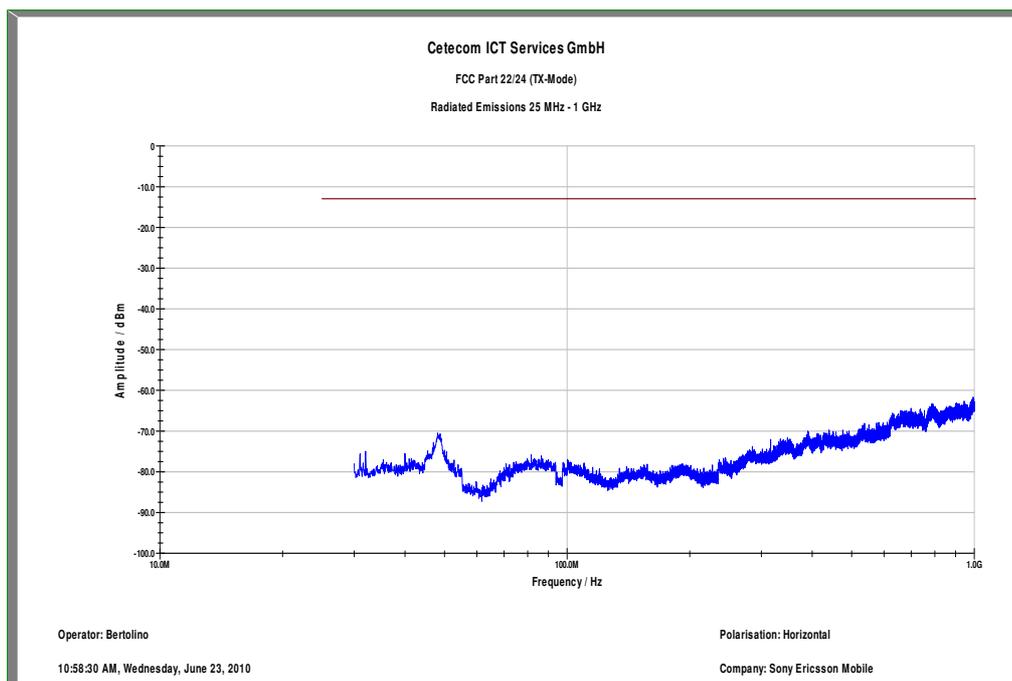


Plot 7: TX mode, channel 9400, 1 GHz to 12.75 GHz, vertical polarization

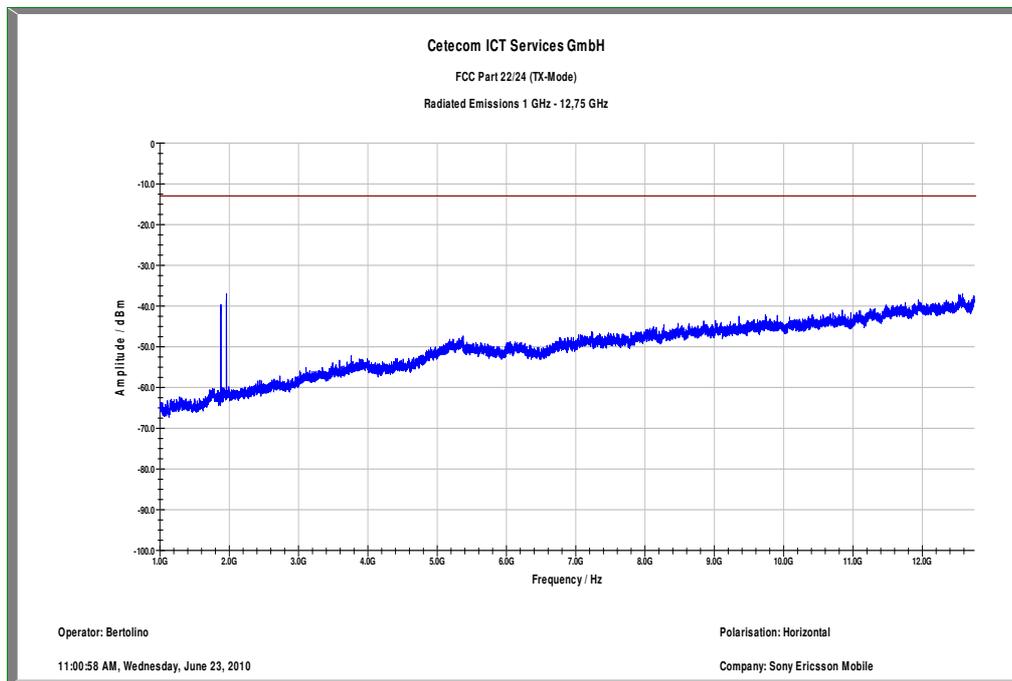


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 8: TX mode, channel 9400, 30 MHz to 1 GHz, horizontal polarization

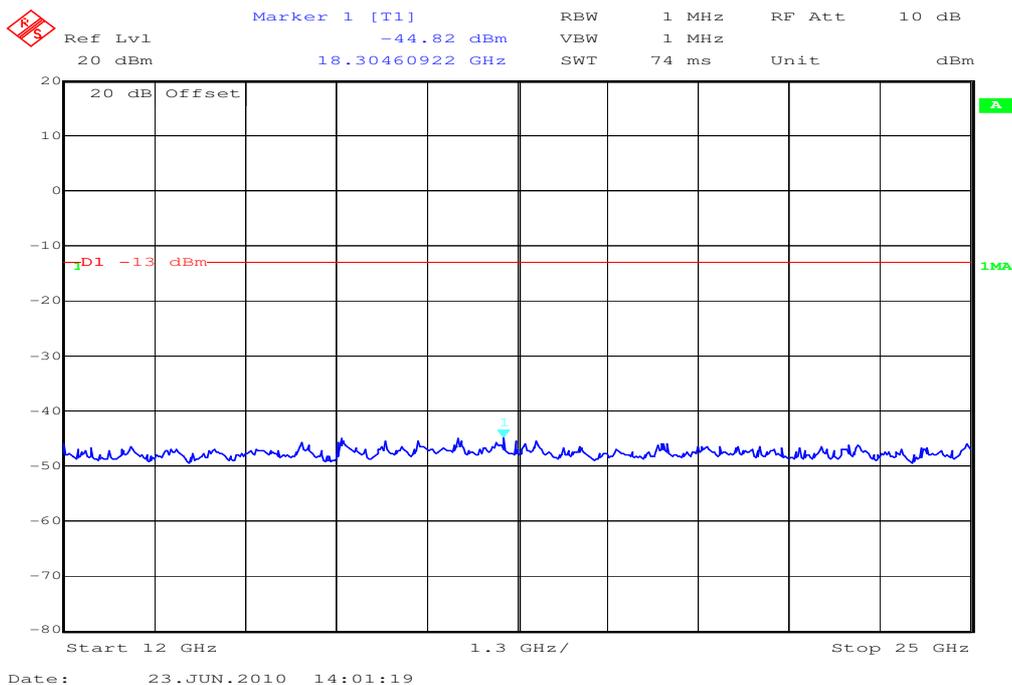


Plot 9: TX mode, channel 9400, 1 GHz to 12.75 GHz, horizontal polarization

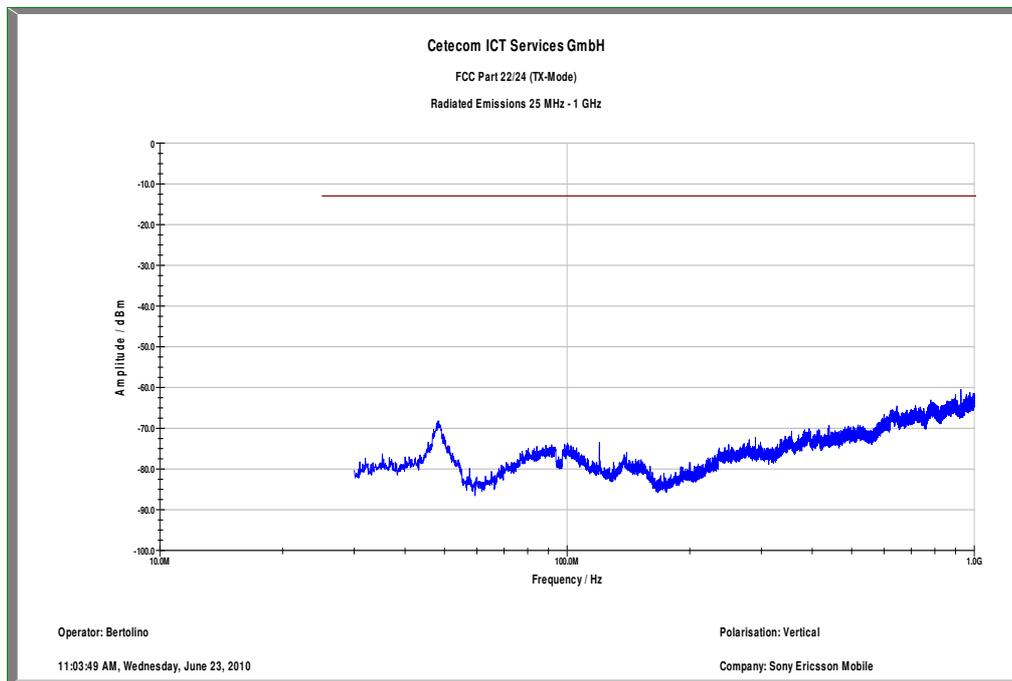


The carrier signal is notched with a 1.9 GHz band rejection filter.

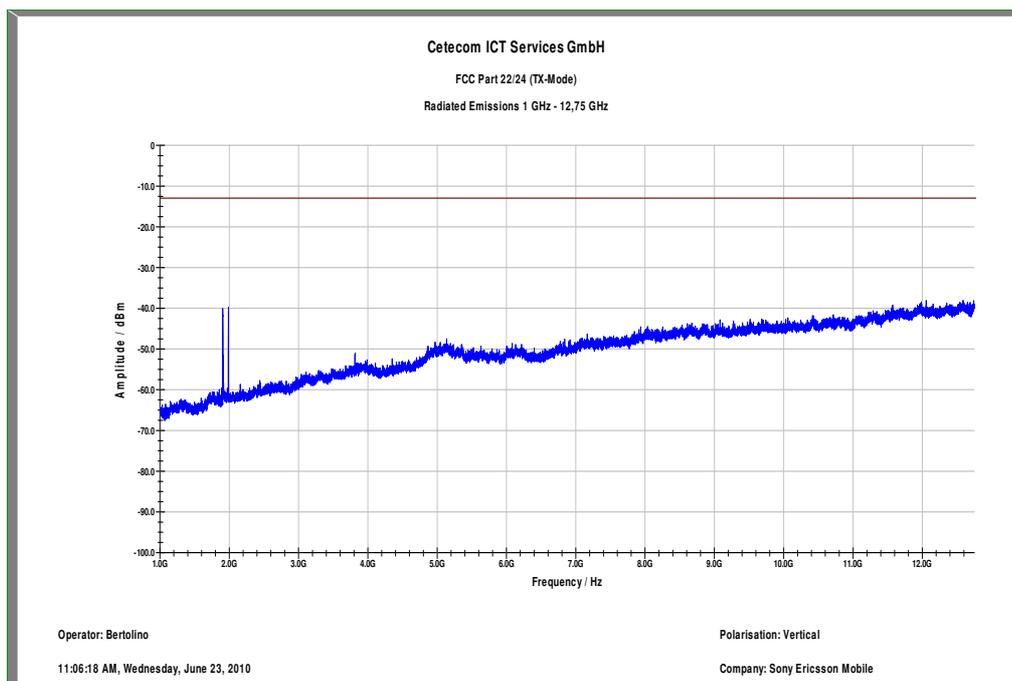
Plot 10: TX mode, channel 9400, 12.75 GHz to 25 GHz, vertical & horizontal polarization



Plot 11: TX mode, channel 9538, 30 MHz to 1 GHz, vertical polarization

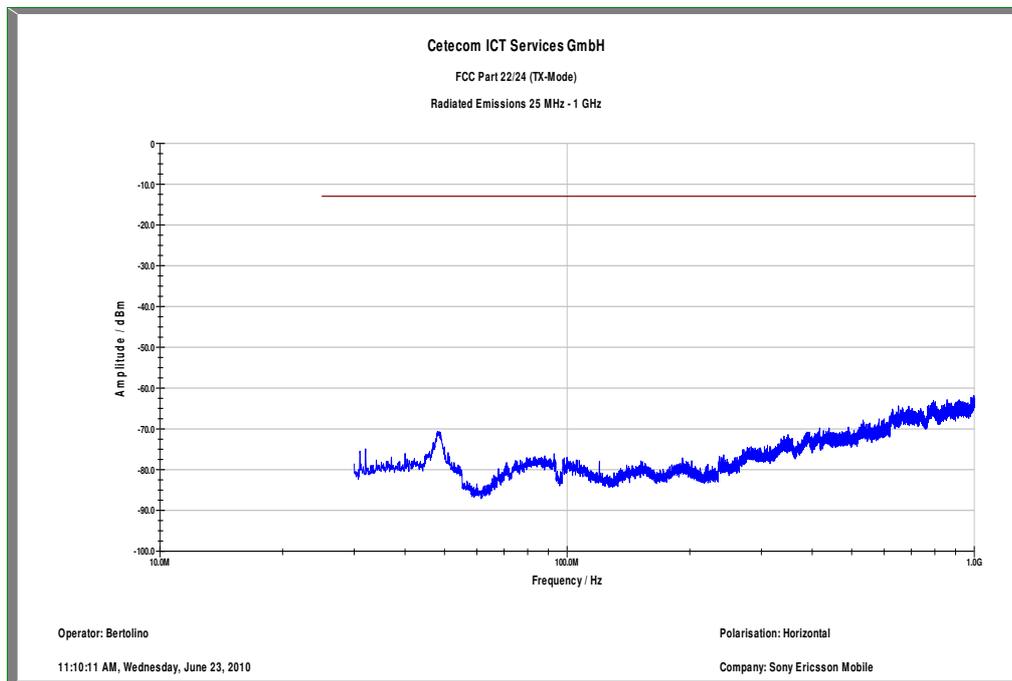


Plot 12: TX mode, channel 9538, 1 GHz to 12.75 GHz, vertical polarization

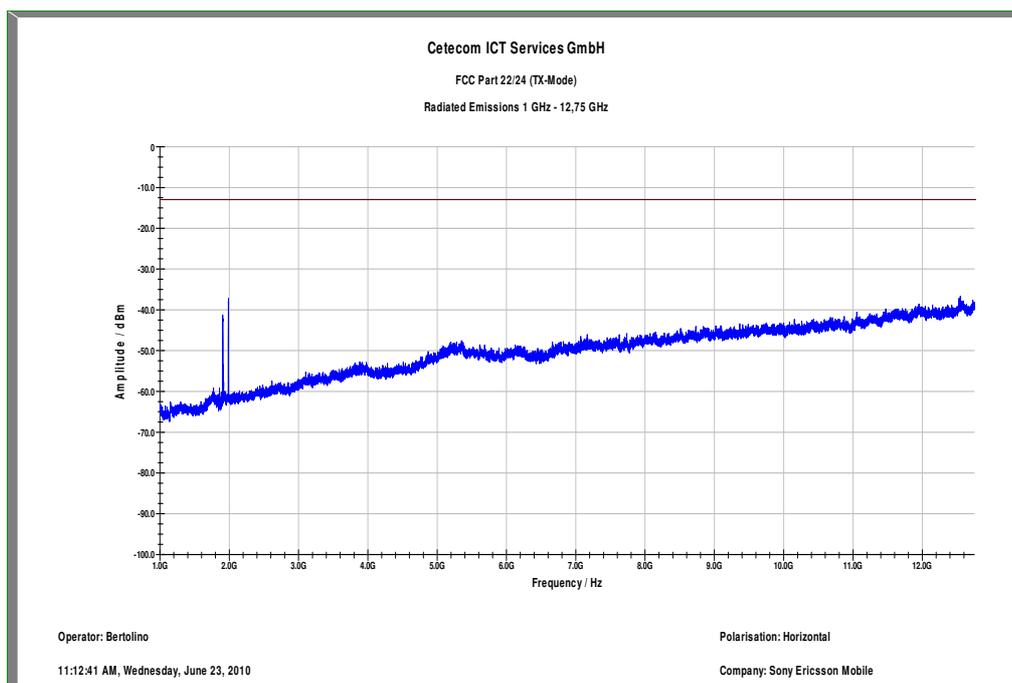


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 13: TX mode, channel 9538, 30 MHz to 1 GHz, horizontal polarization



Plot 14: TX mode, channel 9538, 1 GHz to 12.75 GHz, horizontal polarization



The carrier signal is notched with a 1.9 GHz band rejection filter.

8.5.4 Spurious Emissions Conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

UMTS band II Transmitter Channel Frequency

9262 1852.4 MHz

9400 1880.0 MHz

9538 1907.6 MHz

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	25 GHz
Trace-Mode:	Max. hold

Limits:

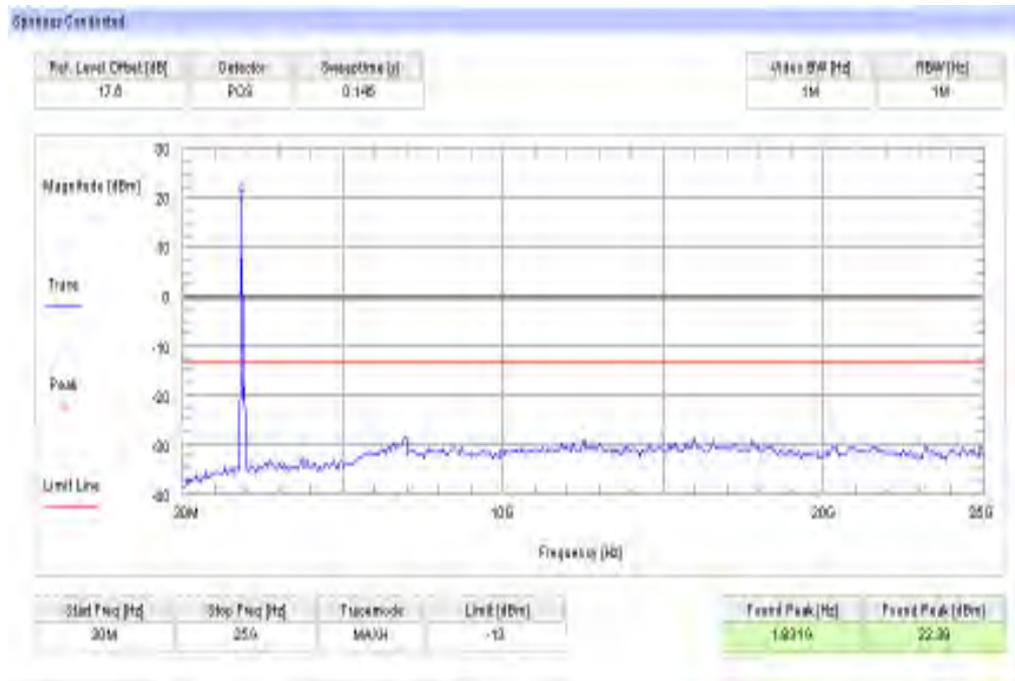
FCC	IC
CFR Part 24.238 CFR Part 2.1051	RSS 133, Issue 5, Section 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

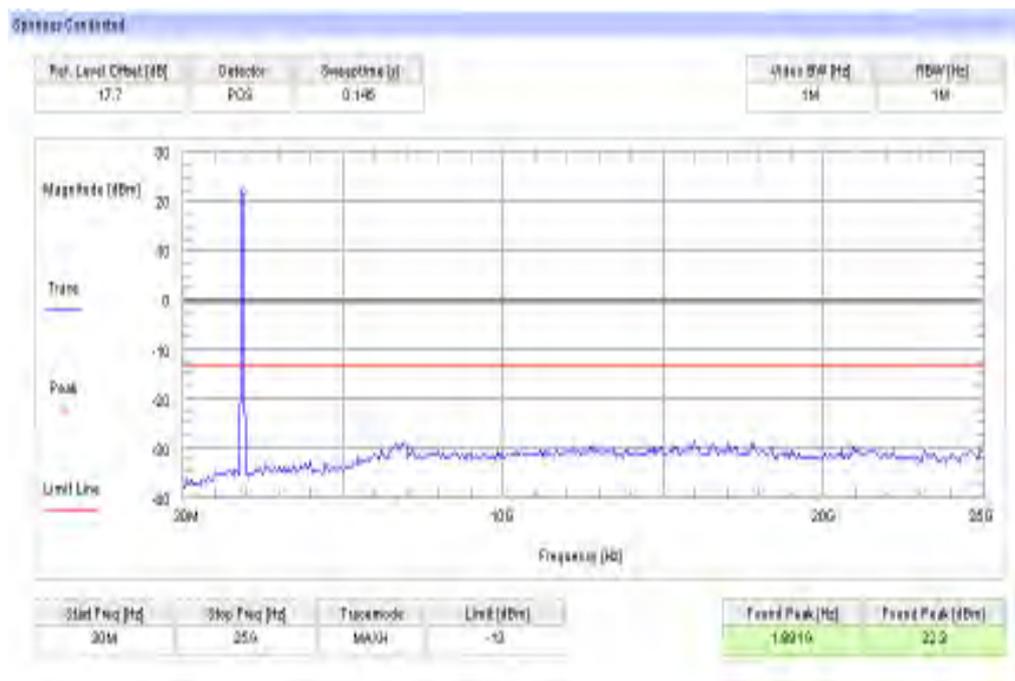
Spurious Emission Level (dBm)								
Harmonic	Ch. 9262 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 9400 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 9538 Freq. (MHz)	Level [dBm]
2	3704.8	No spurious emissions detected!	2	3760.0	No spurious emissions detected!	2	3815.2	No spurious emissions detected!
3	5557.2		3	5640.0		3	5722.8	
4	7409.6		4	7520.0		4	7630.4	
5	9262.0		5	9400.0		5	9538.0	
6	11114.4		6	11280.0		6	11445.6	
7	12966.8		7	13160.0		7	13353.2	
8	14819.2		8	15040.0		8	15260.8	
9	16671.6		9	16920.0		9	17168.4	
10	18524.0		10	18800.0		10	19076.0	
Measurement uncertainty						± 3dB		

Result: The result of the measurement is passed.

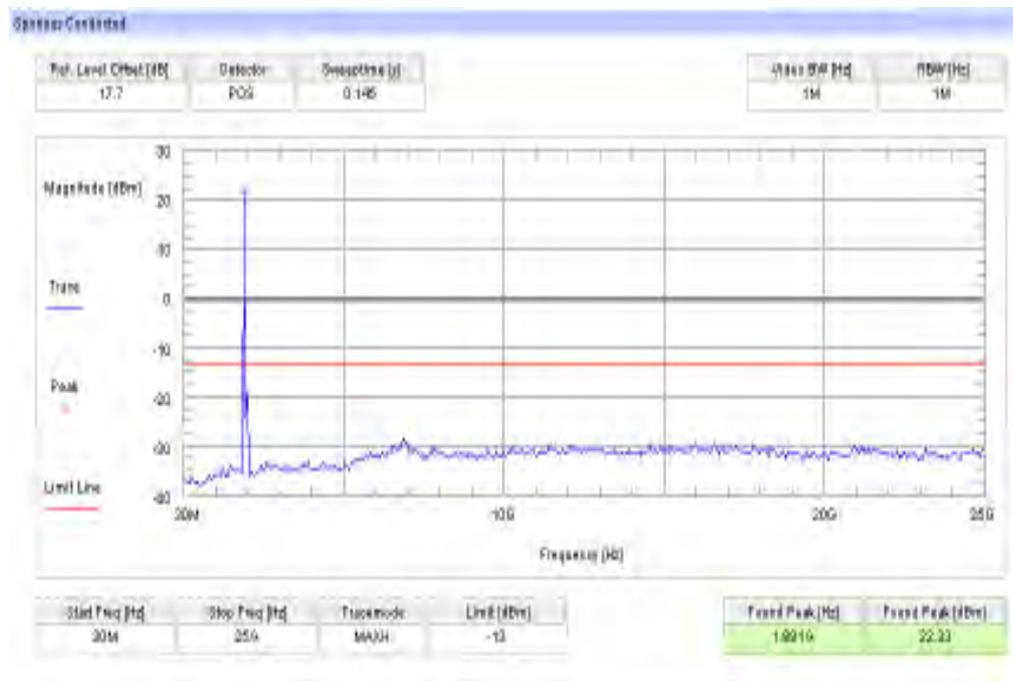
Plot 1: Channel 9262 (30 MHz - 25 GHz)



Plot 2: Channel 9400 (30 MHz - 25 GHz)



Plot 3: Channel 9538 (30 MHz - 25 GHz)



8.5.5 Block Edge Compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

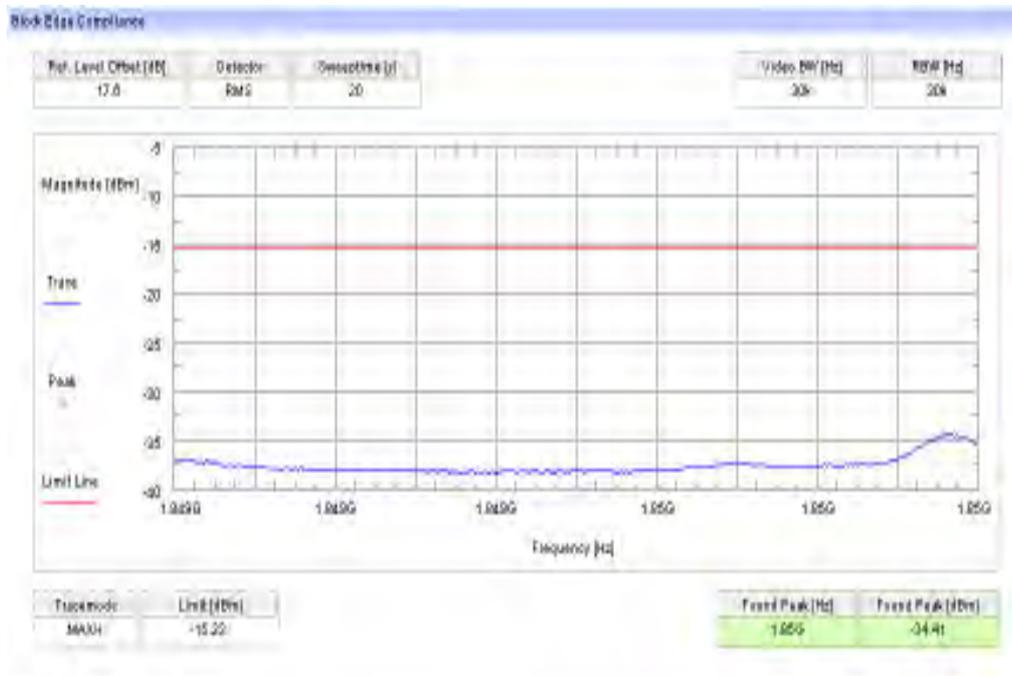
Measurement parameters	
Detector:	RMS
Sweep time:	20 s
Video bandwidth:	30 kHz
Resolution bandwidth:	30 kHz
Span:	1 MHz
Trace-Mode:	Max. hold

Limits:

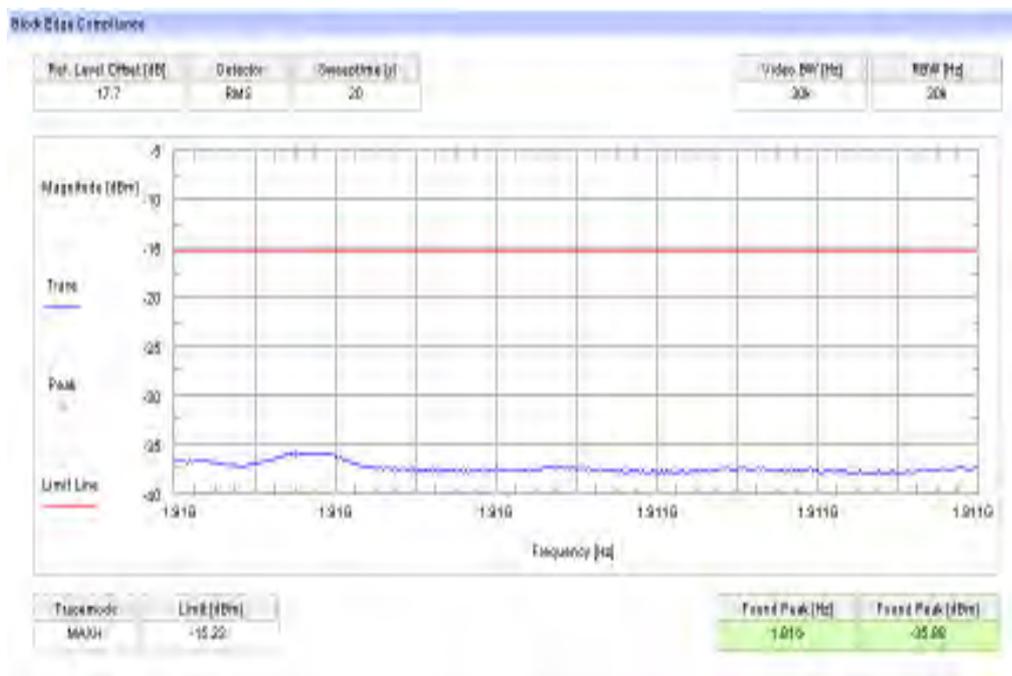
FCC	IC
CFR Part 24.238 CFR Part 2.1051	RSS 133, Issue 5, Section 6.5
Block Edge Compliance	
<p>Part 24.238 specifies that “the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.”</p> <p>However, in publication number 890810, The FCC Office of Engineering and Technology specified the following correction to the limits when a resolution bandwidth smaller than 1% of the emission bandwidth is used:</p> <p>“An alternative is to add an additional correction factor of 10 Log (RBW1/ RBW2) to the 43 +10 Log (P) limit. RBW1 is the narrower measurement resolution bandwidth and RBW2 is either the 1% emissions bandwidth or 1 MHz.”</p> <p>When using a 30 kHz bandwidth, this yields a -2.2185 adjustment to the limit [10log(30kHz/50kHz) = -2.2185]. When this adjustment is applied to the limit, the limit becomes -15.2185.</p>	
-15.22 dBm	

Results:

Plot 1: Channel 9262



Plot 2: Channel 9538



Result: The result of the measurement is passed.

8.5.6 Occupied Bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the UMTS band II frequency band. The table below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Part 24.238 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 4700 kHz, this equates to a resolution bandwidth of at least 50 kHz. For this testing, a resolution bandwidth 100 kHz was used.

Measurement parameters	
Detector:	Peak
Sweep time:	5 min
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	6 MHz
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 24.238 CFR Part 2.1049	RSS 133, Issue 5, Section 6.5
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

Results:

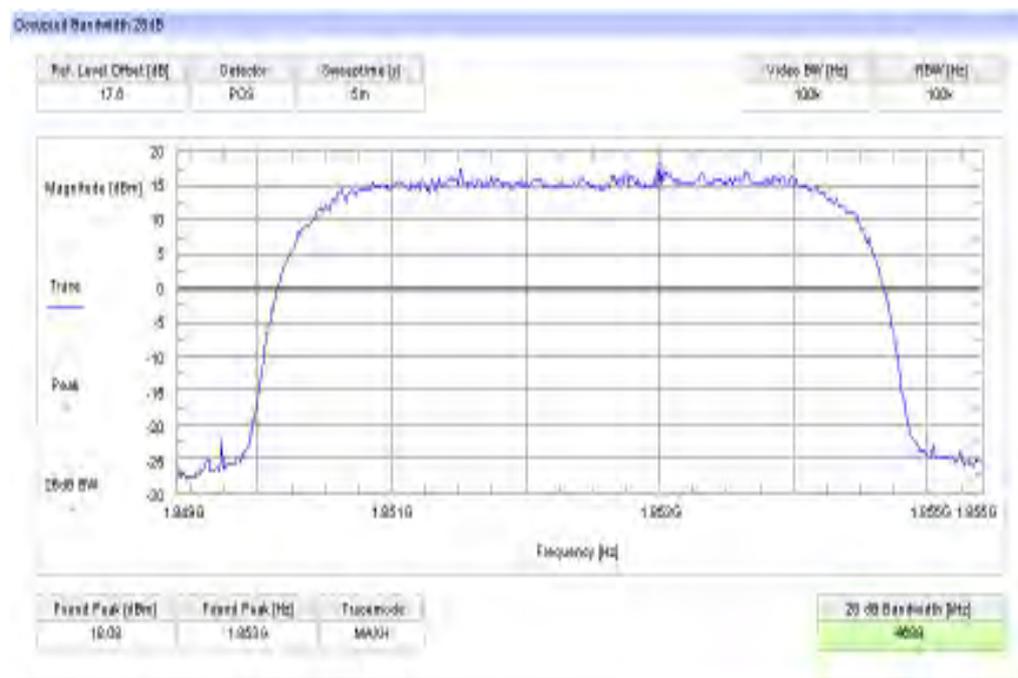
Occupied Bandwidth		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
1852.4	4569	4689
1880.0	4593	4701
1907.6	4581	4677
Measurement uncertainty	± 100 kHz	

Result: The result of the measurement is passed.

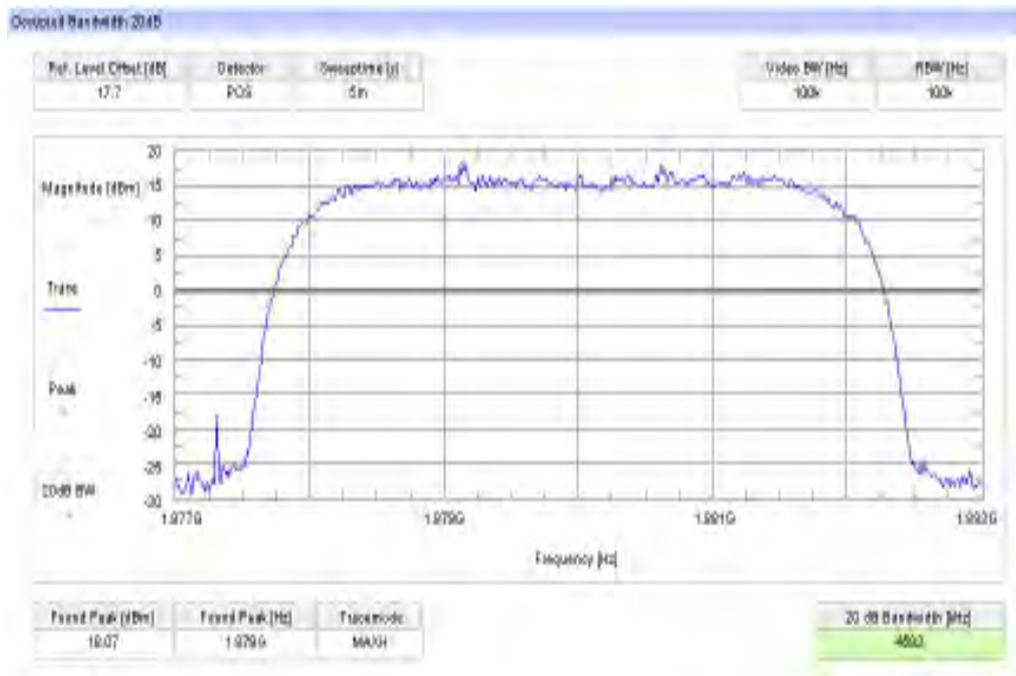
Plot 1: Channel 9262 (99% - OBW)



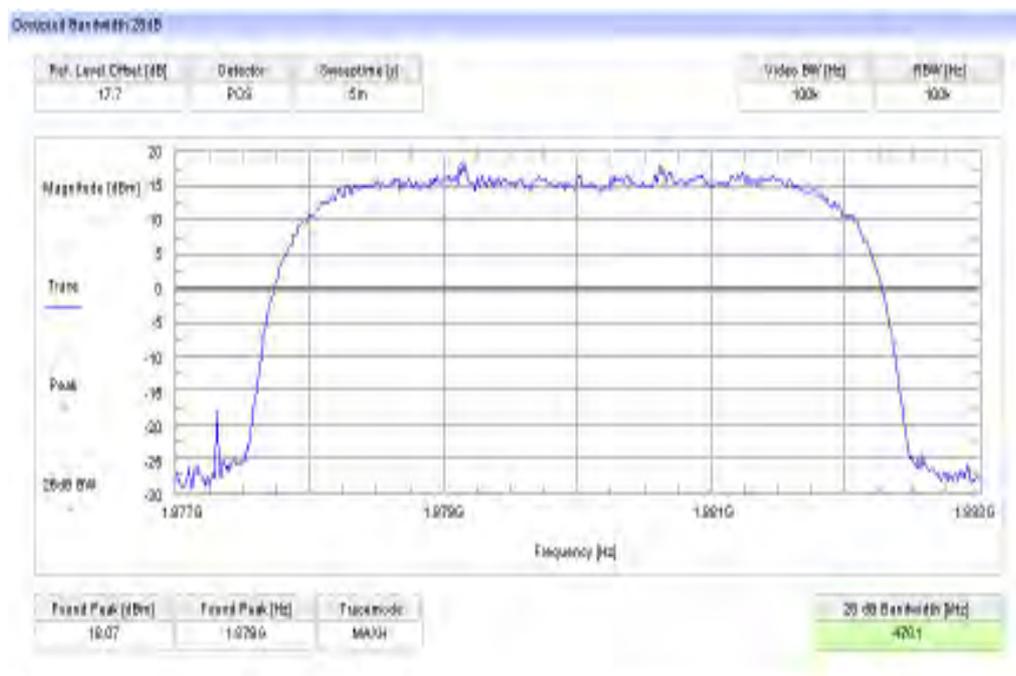
Plot 2: Channel 9262 (-26 dBc BW)



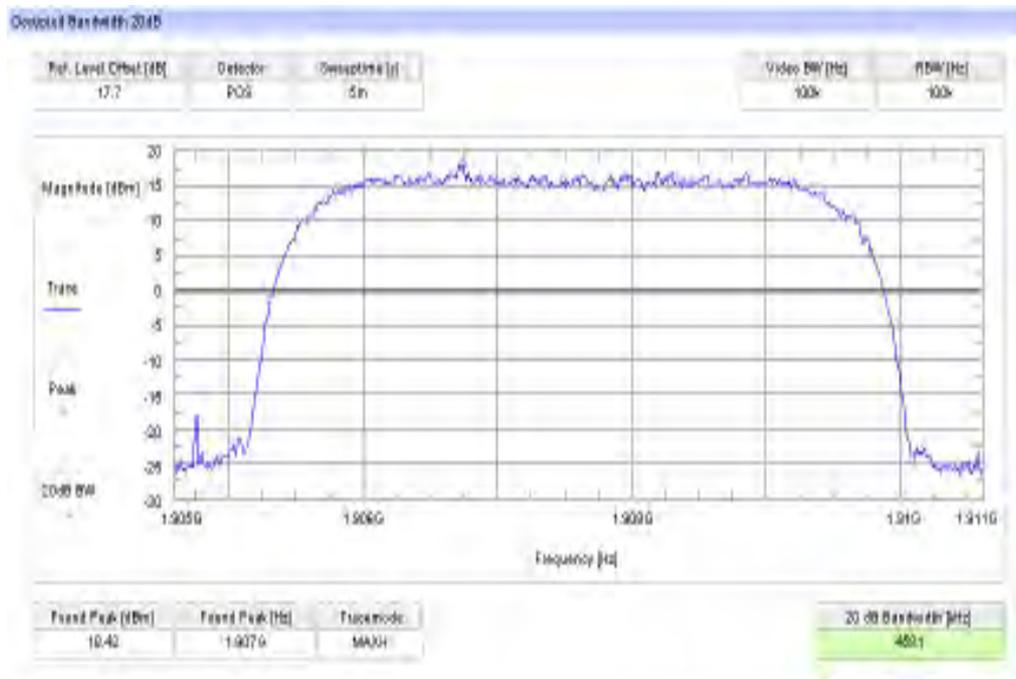
Plot 3: Channel 9400 (99% - OBW)



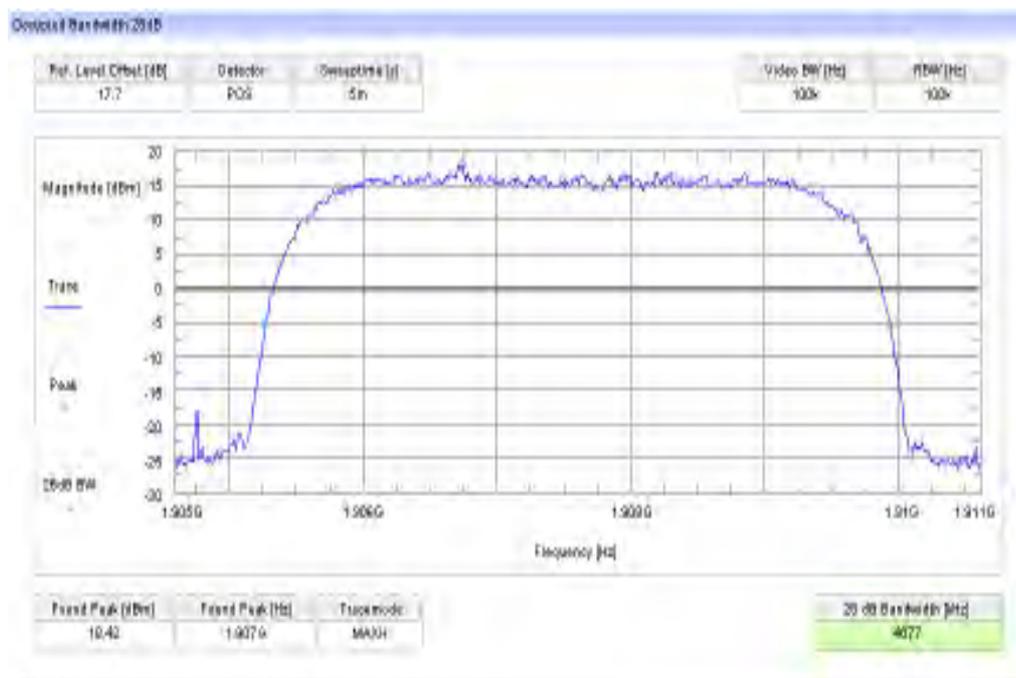
Plot 4: Channel 9400 (-26 dBc BW)



Plot 5: Channel 9538 (99% - OBW)



Plot 6: Channel 9538 (-26 dBc BW)



8.6 Results UMTS band V

All UMTS-band measurements are done in WCDMA mode only. The device is also able to transmit data in HSPA modes. But it was only checked that the EUT supports these modes and fulfils the requirements of the following tables. The exact power values are part of the SAR-report.

The following HSDPA sub-tests are defined by 3GPP 34.121 (table C.10.1.4)

Subtest	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	CM(dB) ⁽²⁾
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 ⁽³⁾	15/15 ⁽³⁾	64	12/15 ⁽³⁾	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: $\Delta_{ACK}, \Delta_{NACK}, \Delta_{CQI} = 8 \leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \leftrightarrow \beta_{hs} = 30/15 * \beta_c$
 Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$
 Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$

Table 1: Subtests for UMTS Release 5 HSDPA

The following HSUPA sub-tests are defined by 3GPP 34.121 (table C.11.1.3)

Subtest	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}:47/15$ $\beta_{ed2}:47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: $\Delta_{ACK}, \Delta_{NACK}, \Delta_{CQI} = 8 \leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \leftrightarrow \beta_{hs} = 30/15 * \beta_c$
 Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference
 Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$
 Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$
 Note 5 : Testing UE using E-DPDCH Physical Layer category 1 subtest 3 is not required according to TS 25.306 Table 5.1g
 Note 6 : β_{ed} can not be set directly; it is set by Absolute Grant Value

Table 2: Subtests for UMTS Release 6 HSUPA

8.6.1 RF Output Power

Description:

This paragraph contains average power, peak output power and ERP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

Measurement parameters	
Detector:	RMS
Sweep time:	Auto
Video bandwidth:	8 MHz
Resolution bandwidth:	8 MHz
Span:	20 MHz
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 22.9.1.3 CFR Part 2.1046	RSS 132, Issue 2, Section 4.4 and 6.4
Nominal Peak Output Power	
+38.45 dBm In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	

Results:

Output Power (conducted) WCDMA mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
826.4	23.73	3.12
836.0	23.94	3.27
846.6	23.74	3.20
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) WCDMA mode	
Frequency (MHz)	Average Output Power (dBm) - ERP
826.4	21.37
836.0	21.98
846.6	22.13
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

8.6.2 Frequency Stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a “call mode”. This is accomplished with the use of a R&S CMU200 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with V_{nom} , connected to the CMU200 and in a simulated call on channel 4180 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 °C increments from -30 °C to +60 °C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.
6. At all temperature levels hold the temperature to +/- 0.5 °C during the measurement procedure.

Measurement:

The measurement is performed with the integrated CMU 200 function.

Limits:

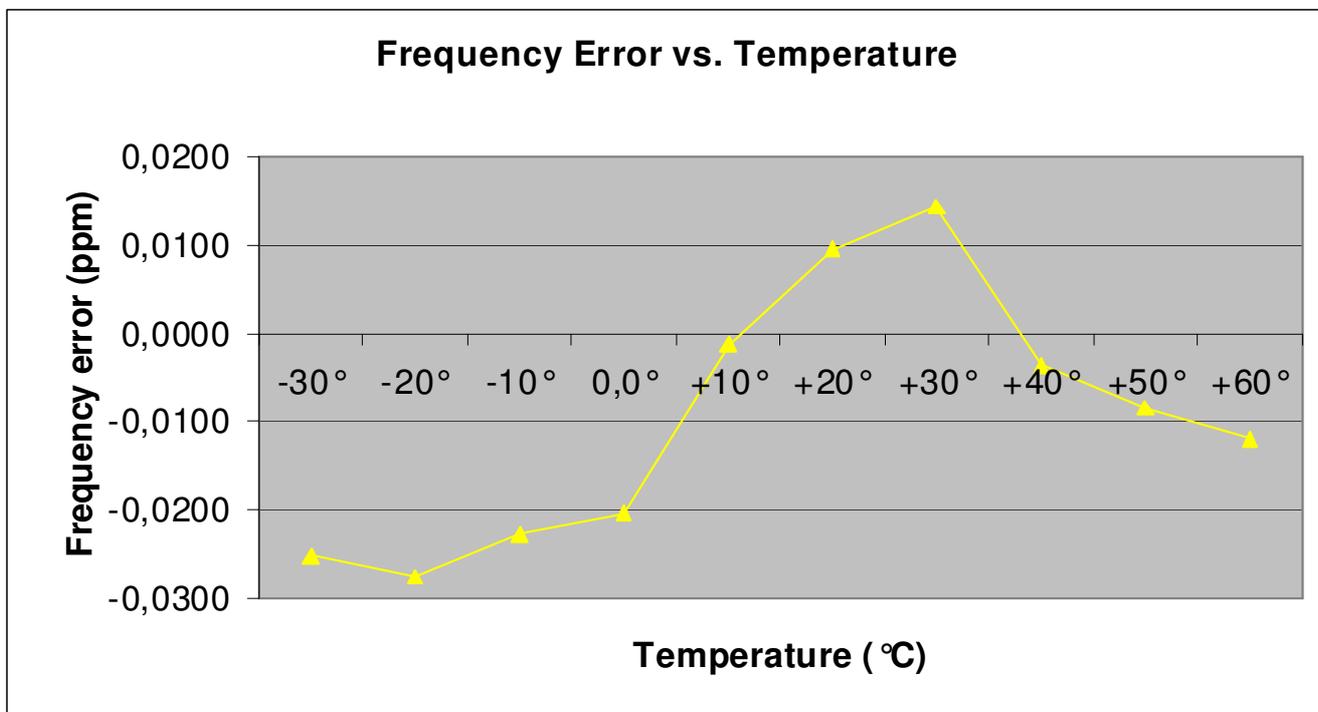
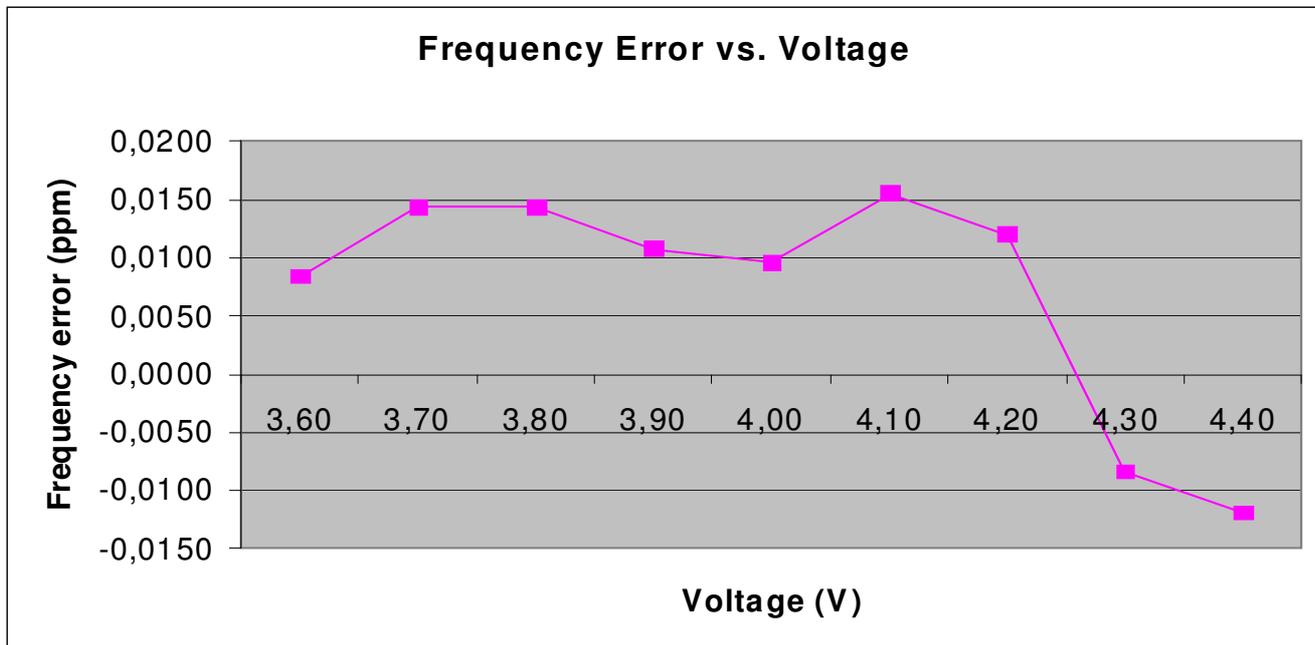
FCC	IC
CFR Part 22.355 CFR Part 2.1055	RSS 132, Issue 2, Section 4.3 and 6.3
Frequency Stability	
± 0.1 ppm	

Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.6	7	0,00000084	0,0084
3.7	12	0,00000144	0,0144
3.8	12	0,00000144	0,0144
3.9	9	0,00000108	0,0108
4.0	8	0,00000096	0,0096
4.1	13	0,00000156	0,0156
4.2	10	0,00000120	0,0120
4.3	-7	-0,00000084	-0,0084
4.4	-10	-0,00000120	-0,0120

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-21	-0,00000251	-0,0251
-20	-23	-0,00000275	-0,0275
-10	-19	-0,00000227	-0,0227
± 0	-17	-0,00000203	-0,0203
10	-1	-0,00000012	-0,0012
20	8	0,00000096	0,0096
30	12	0,00000144	0,0144
40	-3	-0,00000036	-0,0036
50	-7	-0,00000084	-0,0084
60	-10	-0,00000120	-0,0120



Result: The result of the measurement is passed.

8.6.3 Spurious Emissions Radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2009 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 846.6 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 22.917. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the UMTS band V.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load (if possible).
- c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters.
- e) Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603 .

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3.5 * RBW
Resolution bandwidth:	120 kHz below 1 GHz 1 MHz up to 25 GHz
Span:	100 MHz steps
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 22.917 CFR Part 2.1053	RSS 132, Issue 2, Section 4.5 and 6.5
Spurious Emissions Radiated	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the UMTS band V (826.4 MHz, 836.0 MHz and 846.6 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the UMTS band V into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

The final open field radiated levels are presented on the next pages.

All measurements were done in horizontal and vertical polarization; the plots show the worst case.

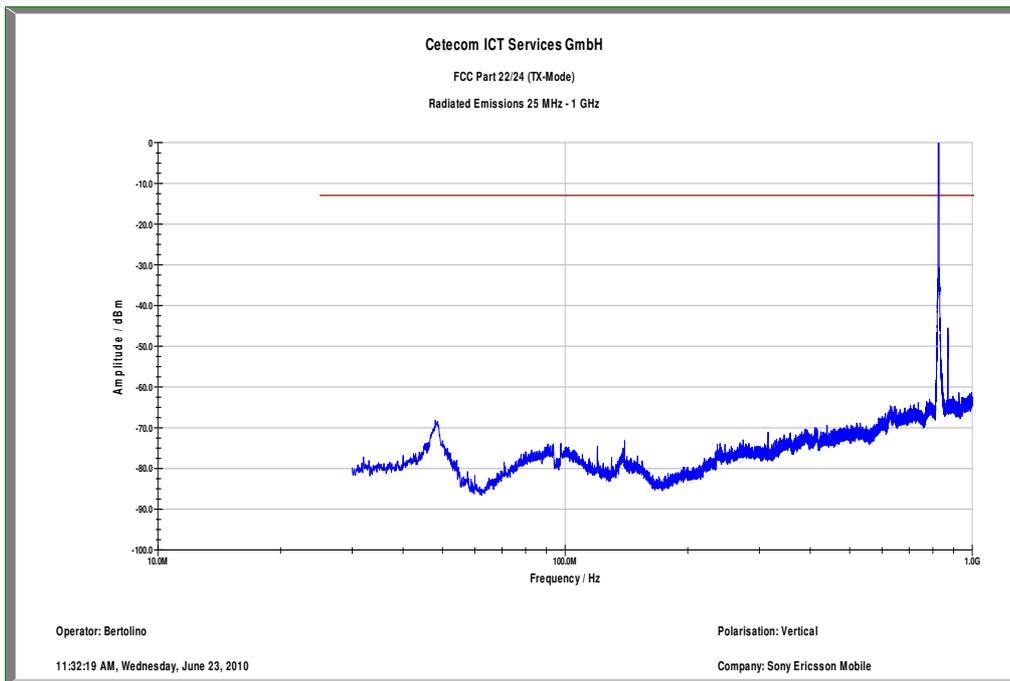
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked too. The found values are stated in the table below.

As can be seen from this data, the emissions from the test item were within the specification limit.

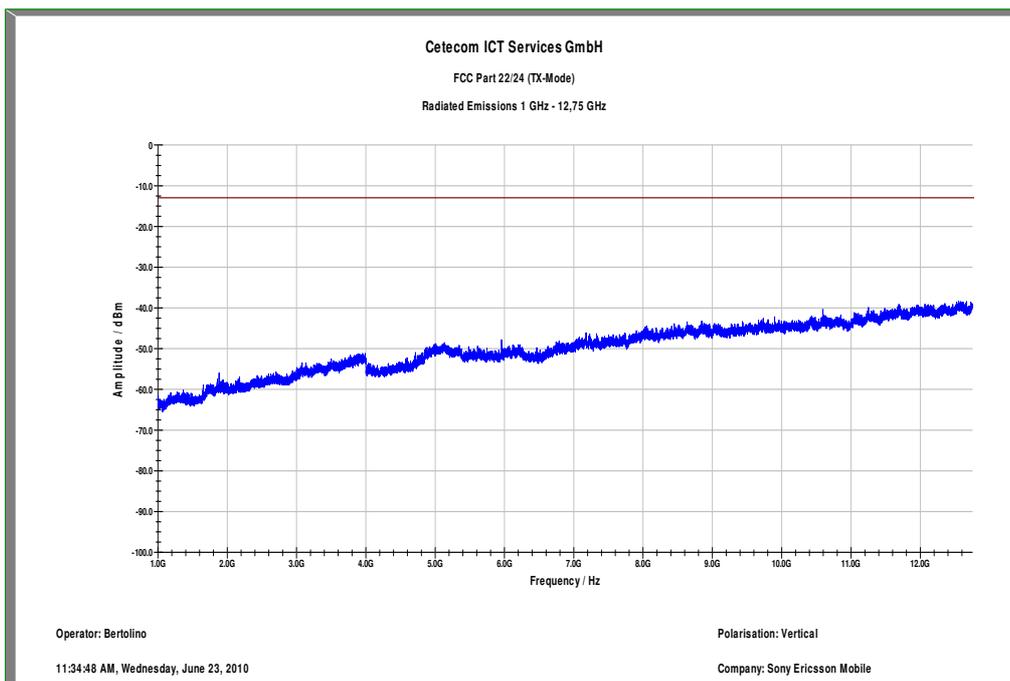
Spurious Emission Level (dBm)								
Harmonic	Ch. 4132 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 4180 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 4233 Freq. (MHz)	Level [dBm]
2	1652.8	-44.71 vertical -42.46 horizontal	2	1672.0	-41.90 vertical -39.79 horizontal	2	1693.2	-40.68 vertical -37.44 horizontal
3	2479.2	-	3	2508.0	-	3	2539.8	-
4	3305.6	-	4	3344.0	-	4	3386.4	-
5	4132.0	-	5	4180.0	-	5	4233.0	-
6	4958.4	-	6	5016.0	-	6	5079.6	-
7	5784.8	-	7	5852.0	-	7	5926.2	-
8	6611.2	-	8	6688.0	-	8	6772.8	-
9	7437.6	-	9	7524.0	-	9	7619.4	-
10	8264.0	-	10	8360.0	-	10	8466.0	-
Measurement uncertainty					± 3dB			

Result: The result of the measurement is passed.

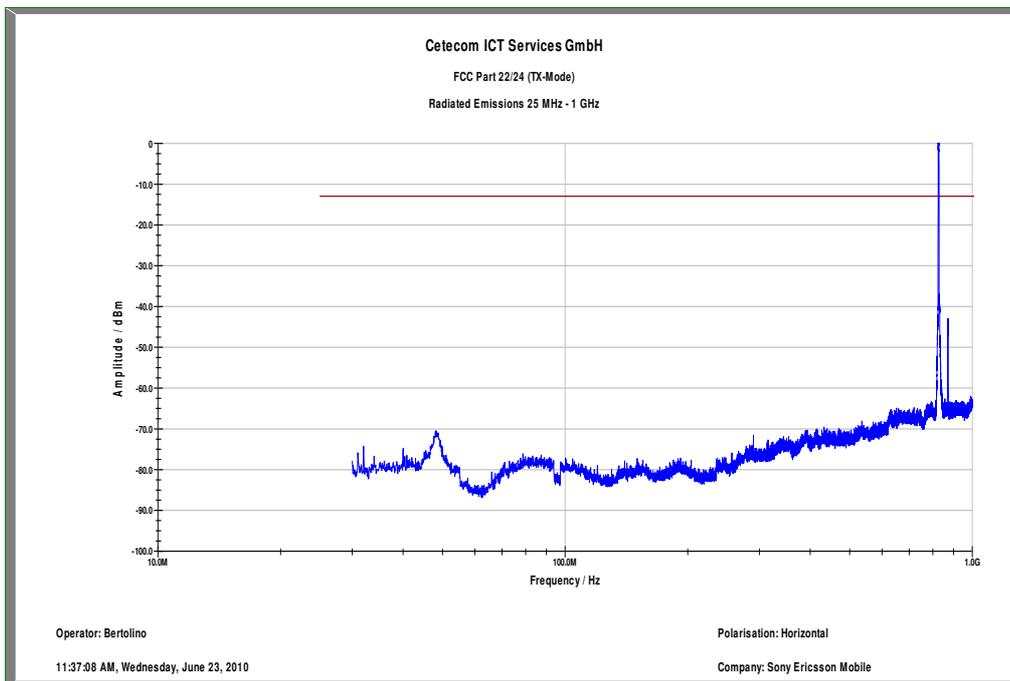
Plot 1: TX mode, channel 4132, 30 MHz to 1 GHz, vertical polarization



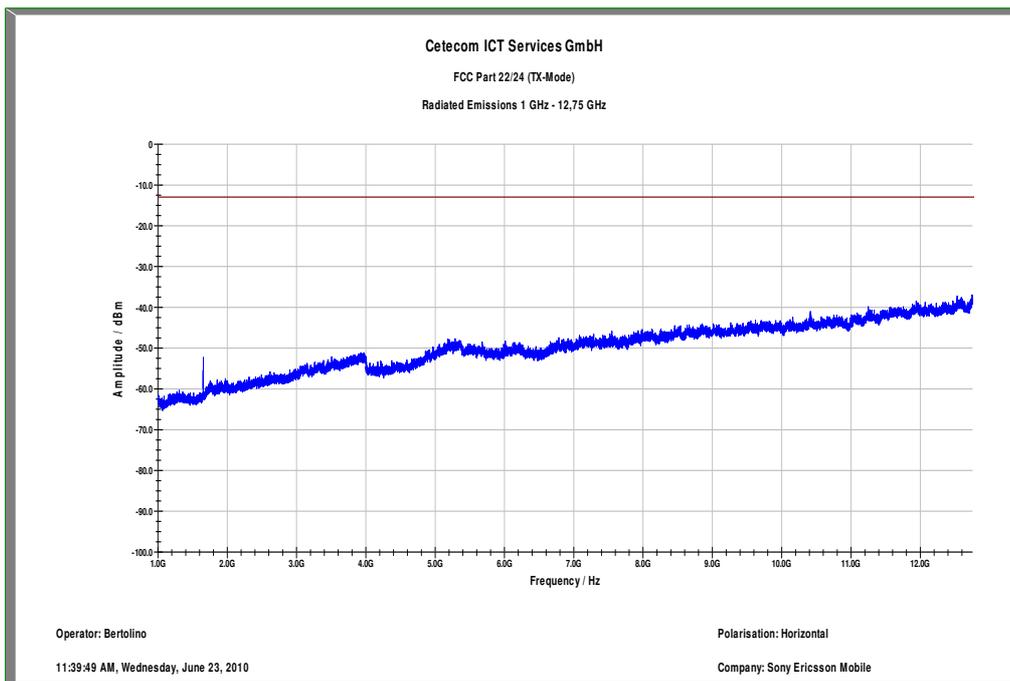
Plot 2: TX mode, channel 4132, 1 GHz to 12.75 GHz, vertical polarization



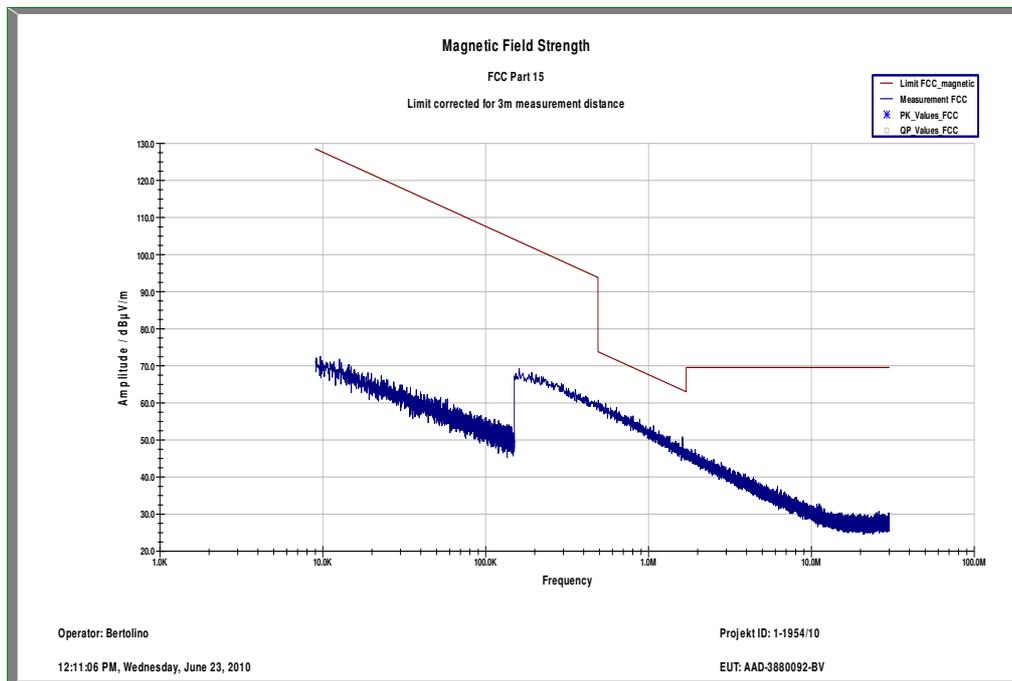
Plot 3: TX mode, channel 4132, 30 MHz to 1 GHz, horizontal polarization



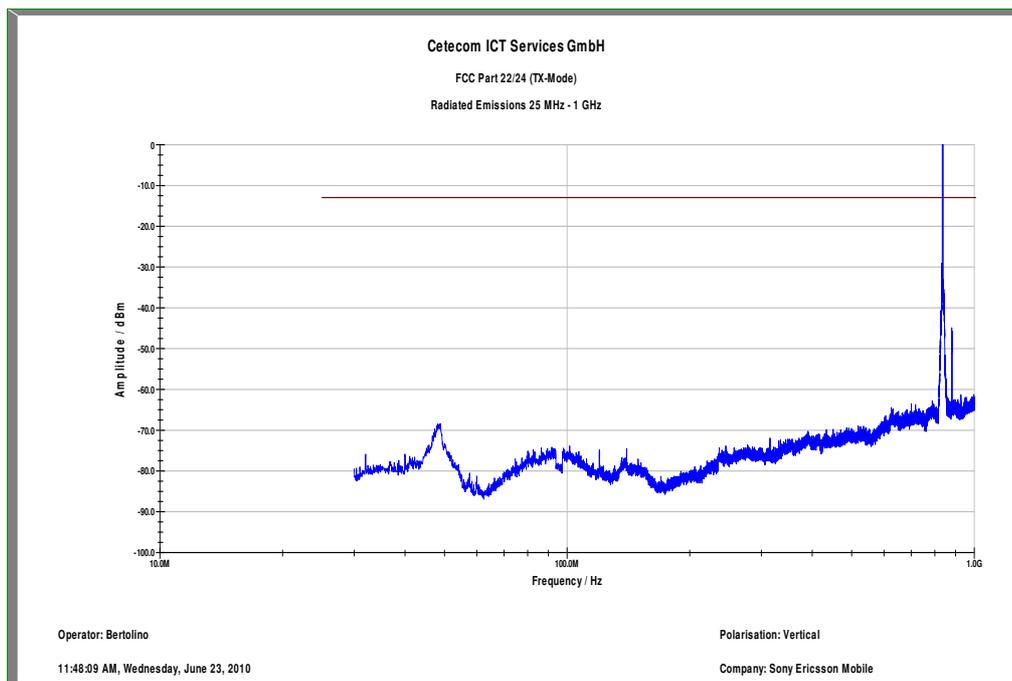
Plot 4: TX mode, channel 4132, 1 GHz to 12.75 GHz, horizontal polarization



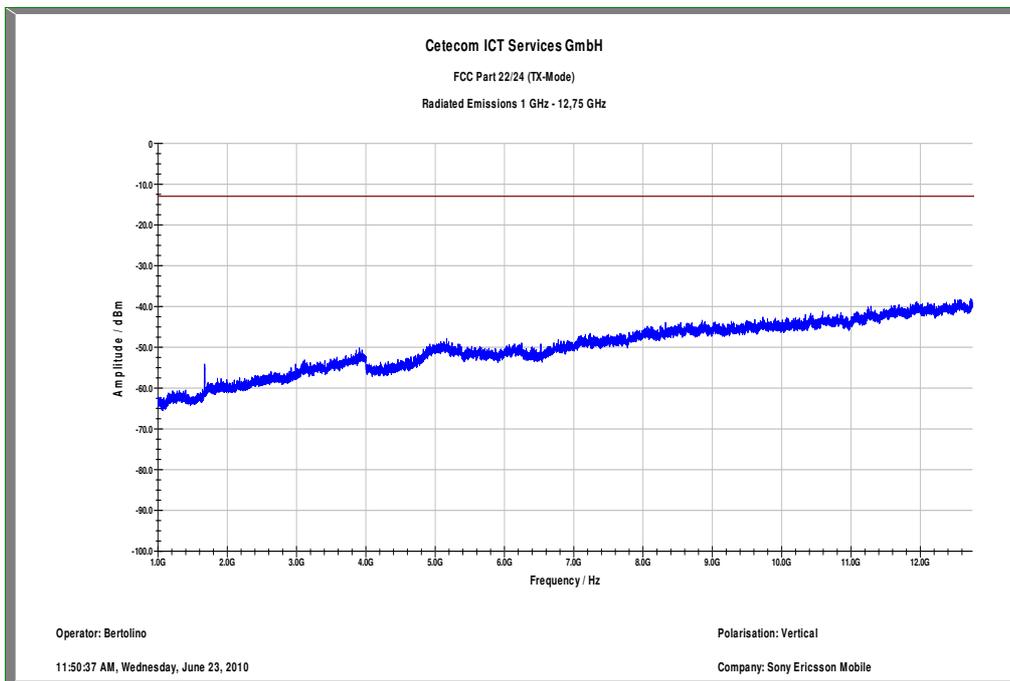
Plot 5: TX mode, channel 4182, up to 30 MHz



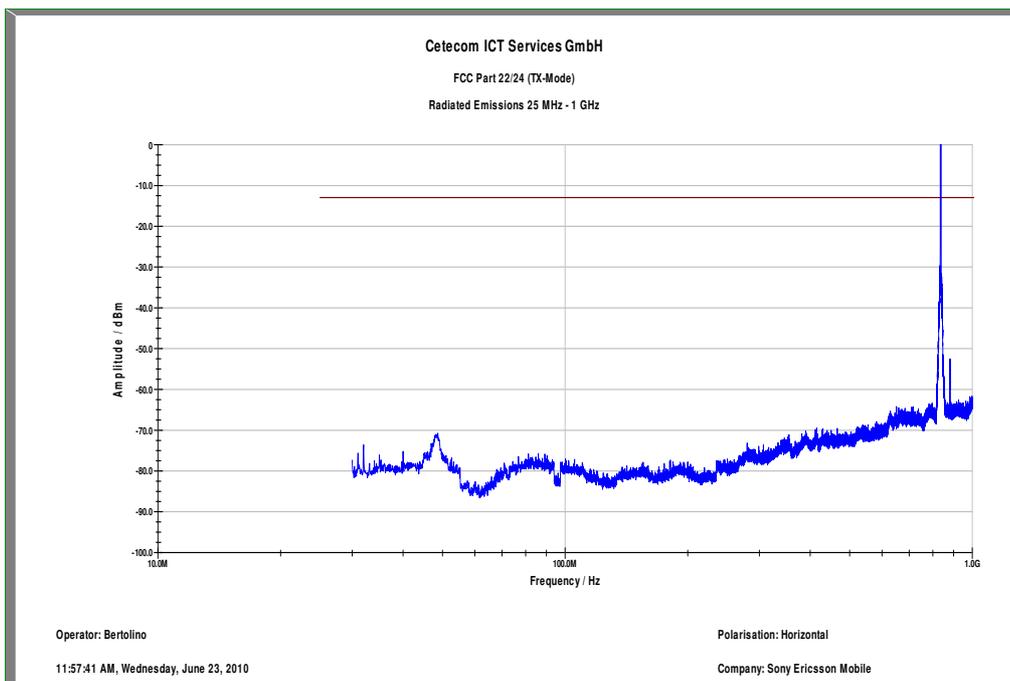
Plot 6: TX mode, channel 4182, 30 MHz to 1 GHz, vertical polarization



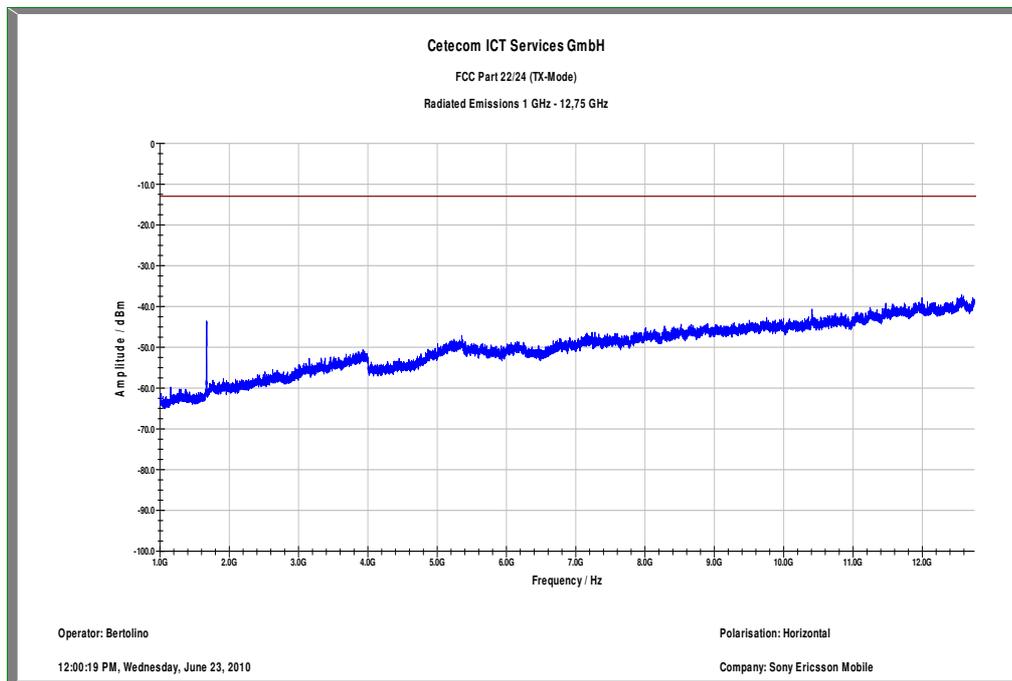
Plot 7: TX mode, channel 4182, 1 GHz to 12.75 GHz, vertical polarization



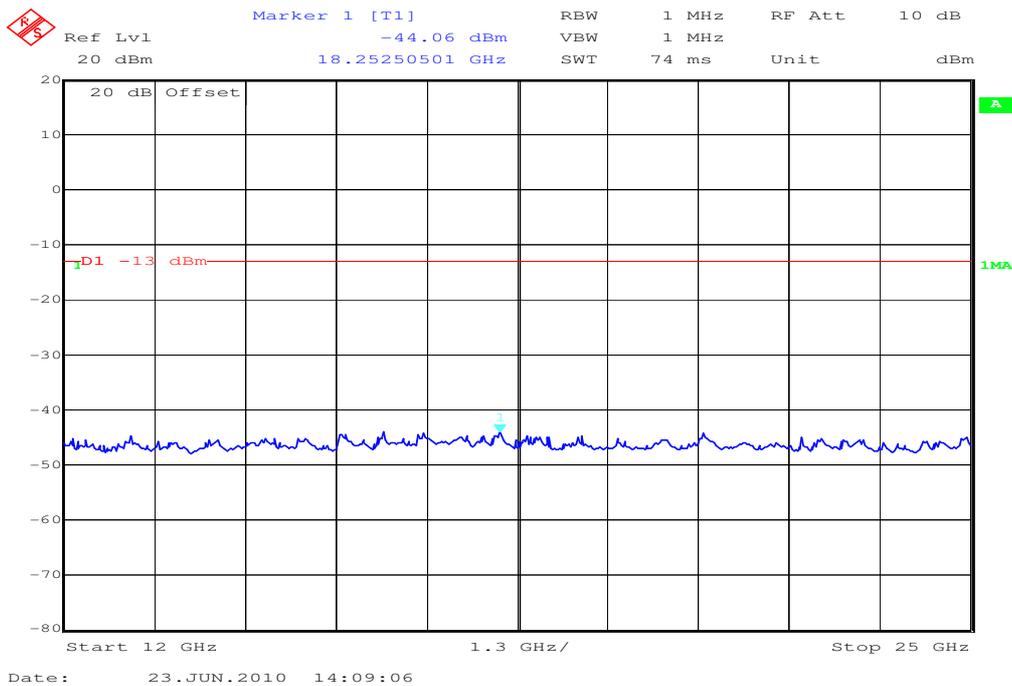
Plot 8: TX mode, channel 4182, 30 MHz to 1 GHz, horizontal polarization



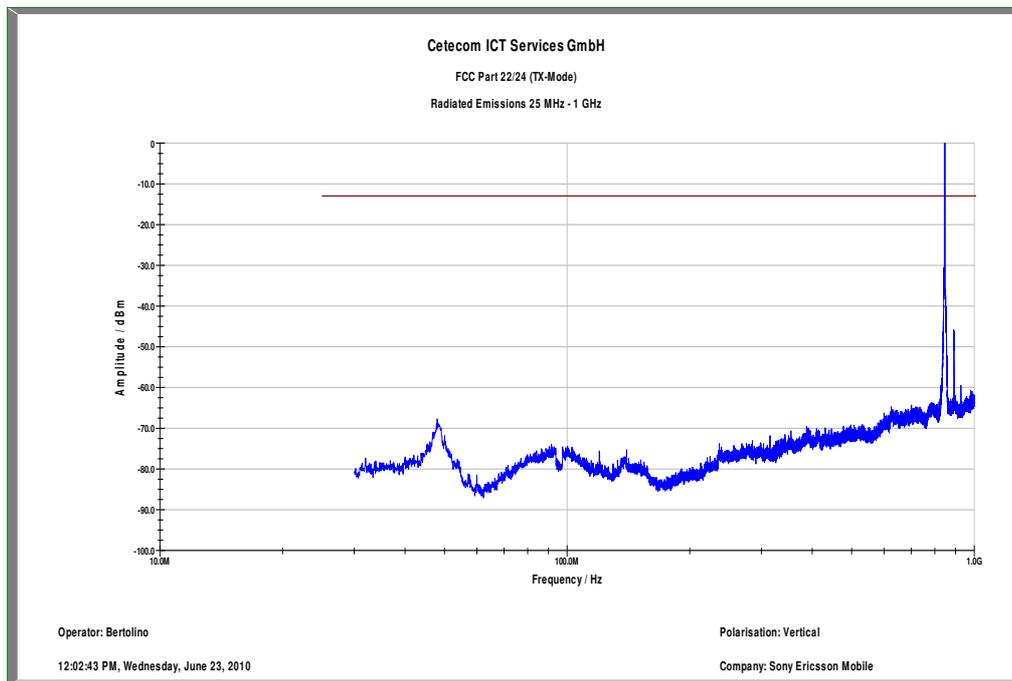
Plot 9: TX mode, channel 4182, 1 GHz to 12.75 GHz, horizontal polarization



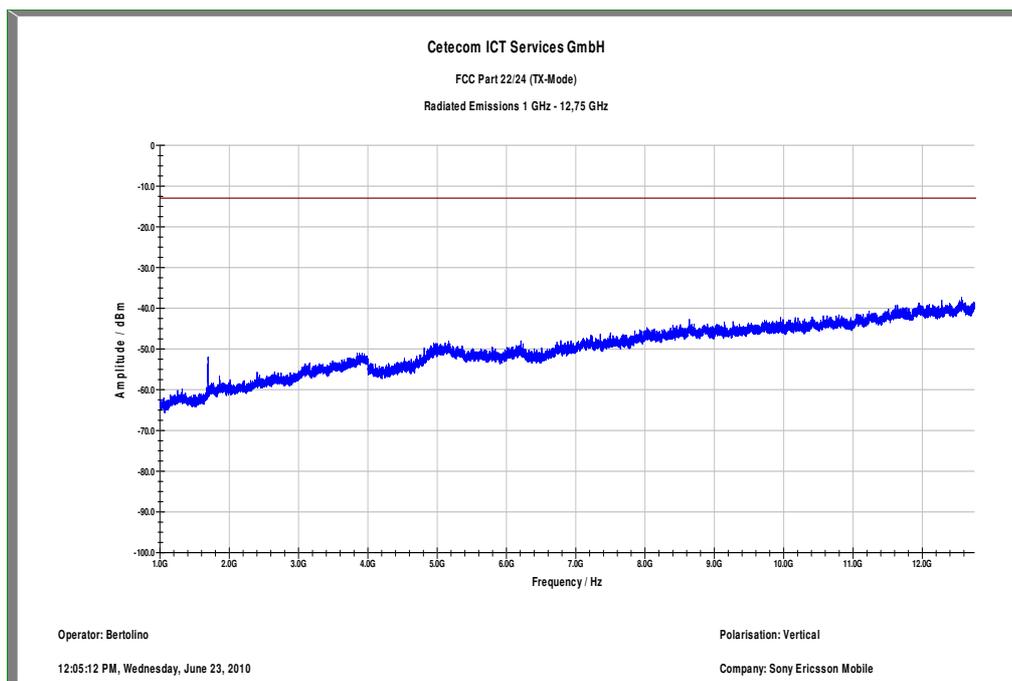
Plot 10: TX mode, channel 4182, 12.75 GHz to 25 GHz, vertical & horizontal polarization



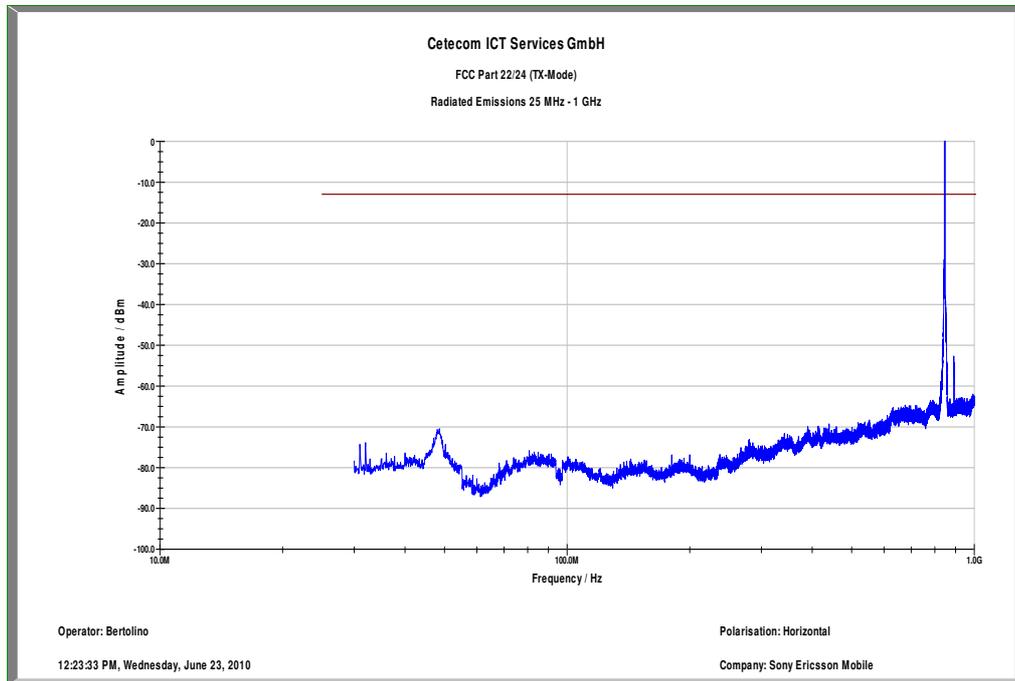
Plot 11: TX mode, channel 4233, 30 MHz to 1 GHz, vertical polarization



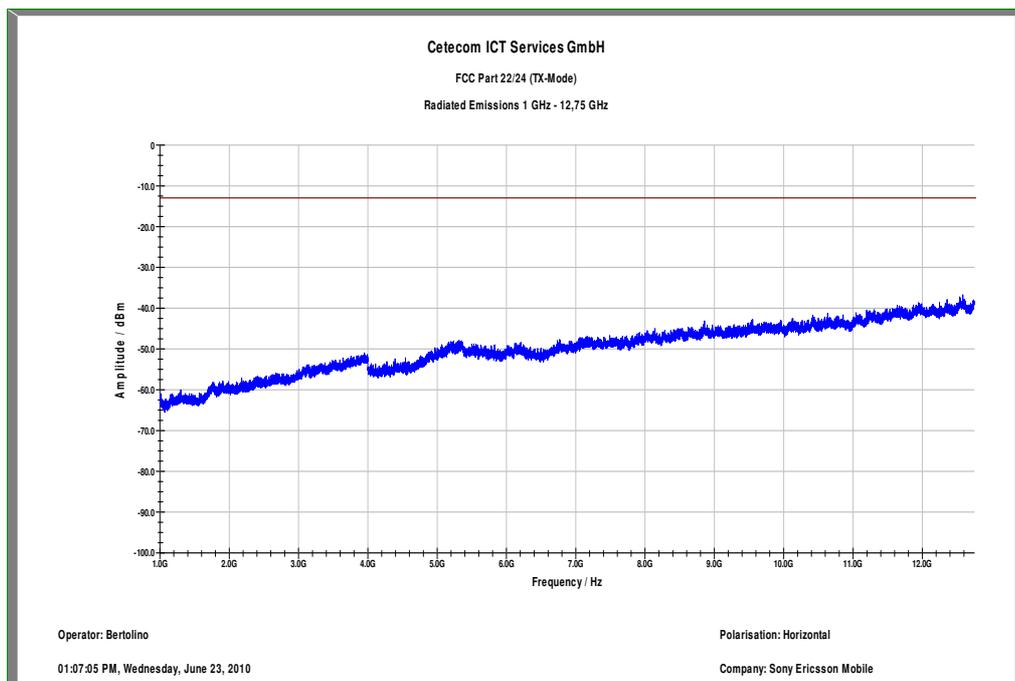
Plot 12: TX mode, channel 4233, 1 GHz to 12.75 GHz, vertical polarization



Plot 13: TX mode, channel 4233, 30 MHz to 1 GHz, horizontal polarization



Plot 14: TX mode, channel 4233, 1 GHz to 12.75 GHz, horizontal polarization



8.6.4 Spurious Emissions Conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 12 GHz.
2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

UMTS band V Transmitter Channel Frequency

4132 826.4 MHz

4180 836.0 MHz

4233 846.6 MHz

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	25 GHz
Trace-Mode:	Max. hold

Limits:

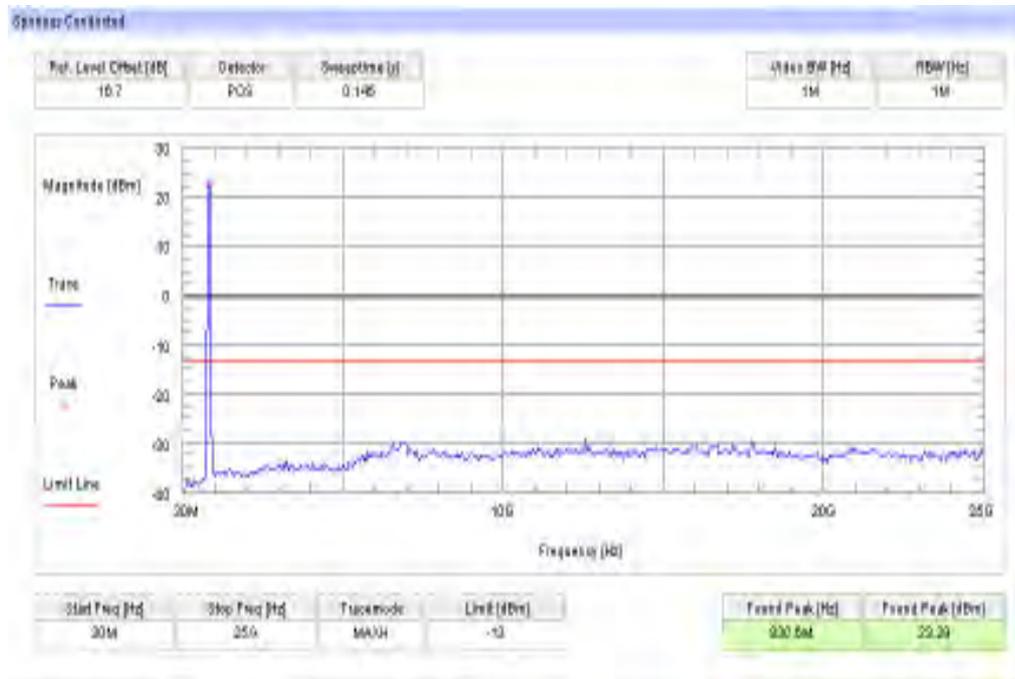
FCC	IC
CFR Part 22.917 CFR Part 2.1051	RSS 132, Issue 2, Section 4.5 and 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

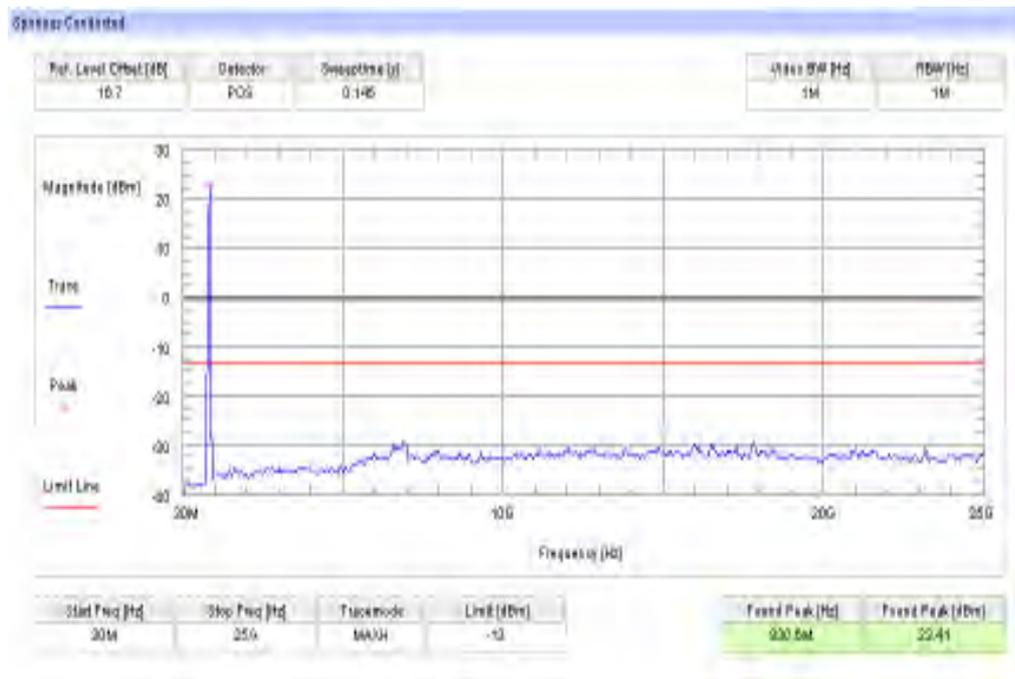
Spurious Emission Level (dBm)								
Harmonic	Ch. 4132 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 4180 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 4233 Freq. (MHz)	Level [dBm]
2	1652.8	No spurious emissions detected!	2	1672.0	No spurious emissions detected!	2	1693.2	No spurious emissions detected!
3	2479.2		3	2508.0		3	2539.8	
4	3305.6		4	3344.0		4	3386.4	
5	4132.0		5	4180.0		5	4233.0	
6	4958.4		6	5016.0		6	5079.6	
7	5784.8		7	5852.0		7	5926.2	
8	6611.2		8	6688.0		8	6772.8	
9	7437.6		9	7524.0		9	7619.4	
10	8264.0		10	8360.0		10	8466.0	
Measurement uncertainty						± 3dB		

Result: The result of the measurement is passed.

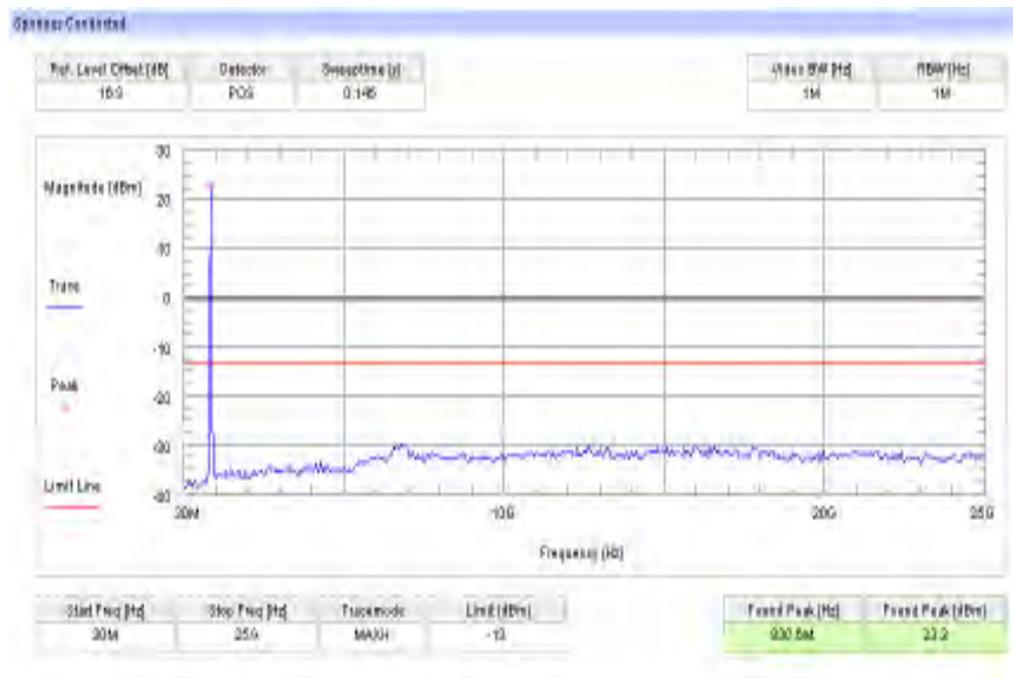
Plot 1: Channel 4132 (30 MHz - 25 GHz)



Plot 2: Channel 4180 (30 MHz - 25 GHz)



Plot 3: Channel 4233 (30 MHz - 25 GHz)



8.6.5 Block Edge Compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

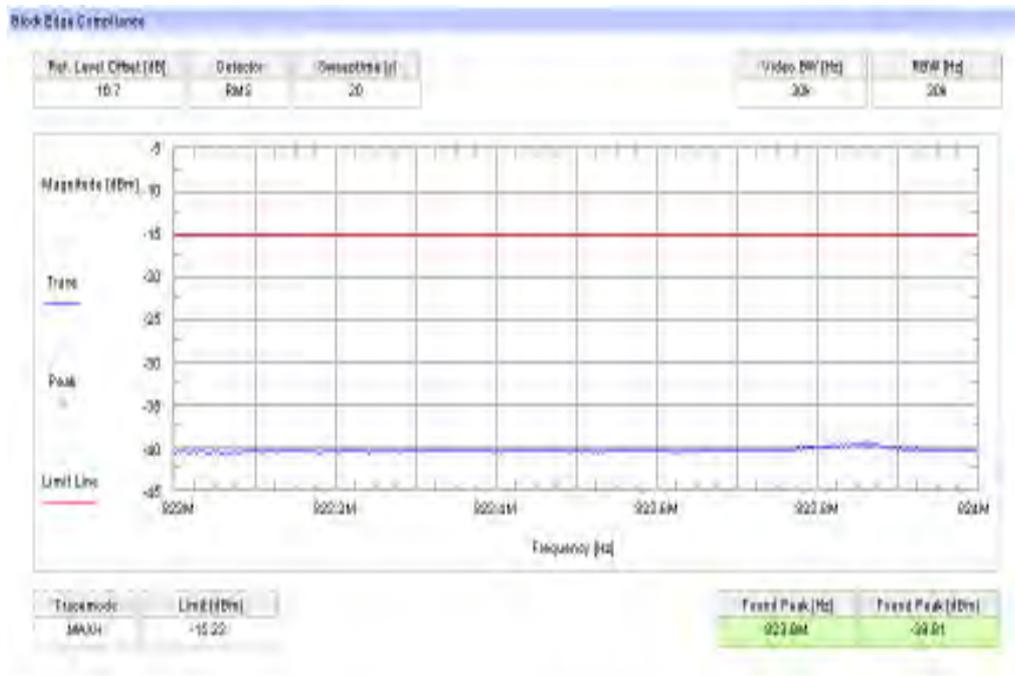
Measurement parameters	
Detector:	RMS
Sweep time:	20 s
Video bandwidth:	30 kHz
Resolution bandwidth:	30 kHz
Span:	1 MHz
Trace-Mode:	Max. hold

Limits:

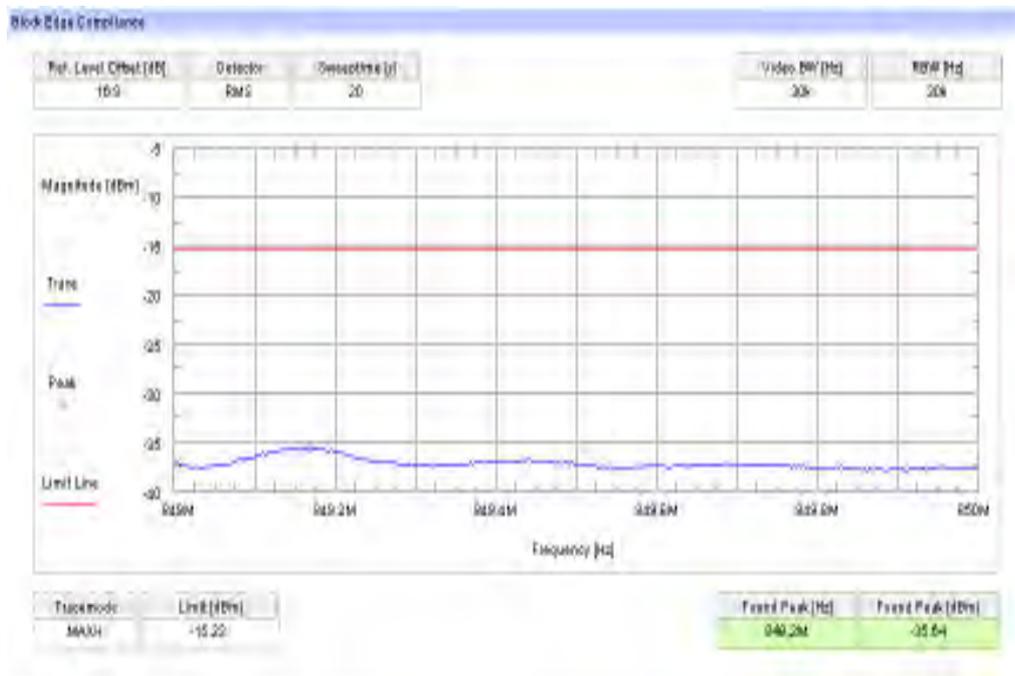
FCC	IC
CFR Part 22.917 CFR Part 2.1051	RSS 132, Issue 2, Section 6.5
Block Edge Compliance	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

Plot 1: Channel 4132



Plot 2: Channel 4233



Result: The result of the measurement is passed.

8.6.6 Occupied Bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the UMTS band V. The table below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Part 22.917 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 4700 kHz, this equates to a resolution bandwidth of at least 50 kHz. For this testing, a resolution bandwidth 100 kHz was used.

Measurement parameters	
Detector:	Peak
Sweep time:	5 min
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	6 MHz
Trace-Mode:	Max. hold

Limits:

FCC	IC
CFR Part 22.917 CFR Part 2.1049	RSS 132, Issue 2, Section 4.5.1
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

Results:

Occupied Bandwidth		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
826.4	4581	4677
836.0	4581	4689
846.6	4581	4677
Measurement uncertainty	± 100 kHz	

Result: The result of the measurement is passed.

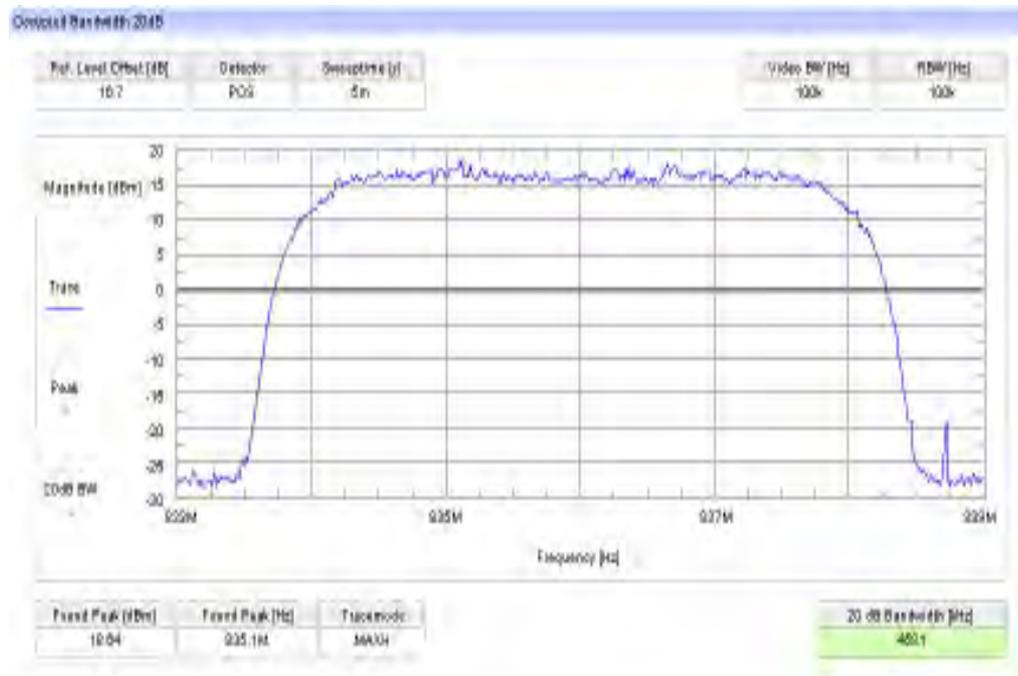
Plot 1: Channel 4132 (99% - OBW)



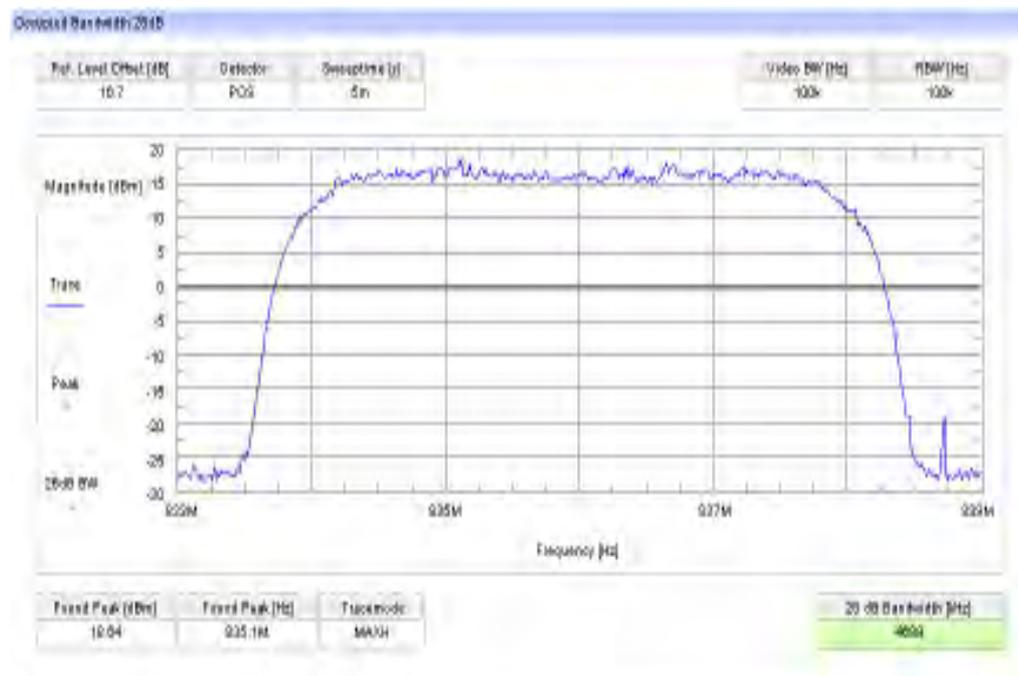
Plot 2: Channel 4132 (-26 dBc BW)



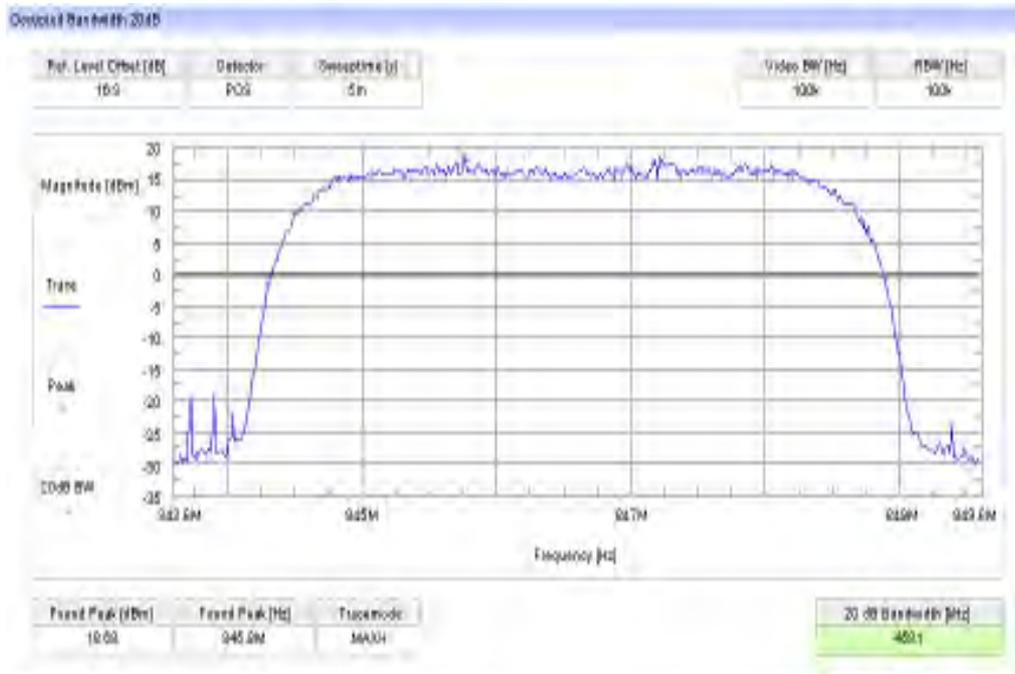
Plot 3: Channel 4180 (99% - OBW)



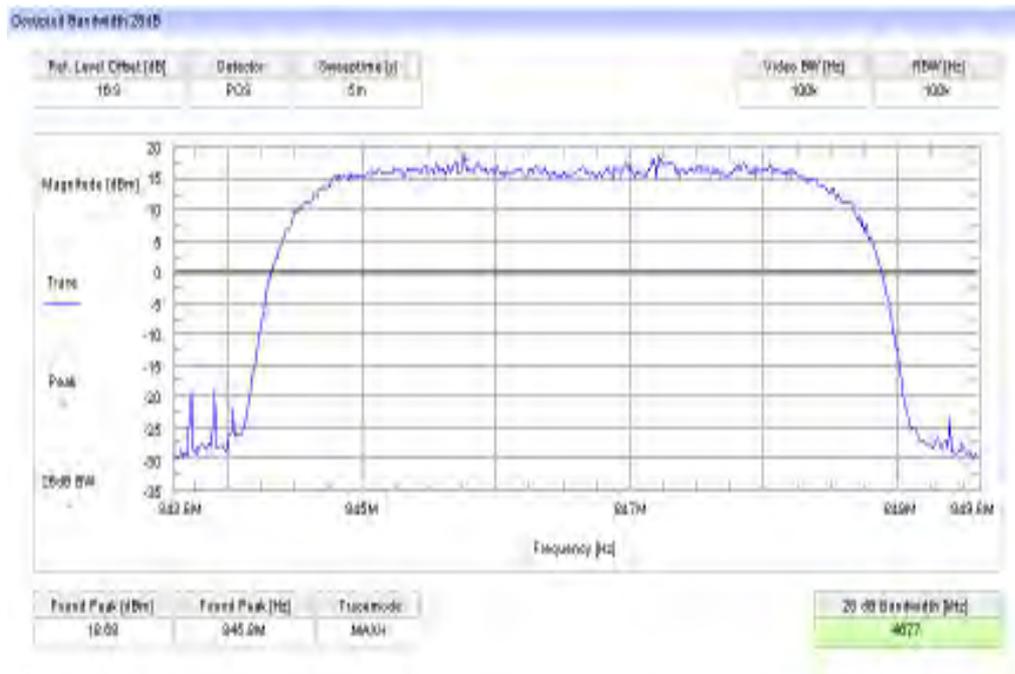
Plot 4: Channel 4180 (-26 dBc BW)



Plot 5: Channel 4233 (99% - OBW)



Plot 6: Channel 4233 (-26 dBc BW)



8.7 Results Receiver Mode

8.7.1 Spurious Emissions Radiated – Receiver Mode

Description:

The measurement was performed in worst case. The EUT was not connected to the CMU 200. So the EUT performs a network search. In this mode all oscillators are active.

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3.5 * RBW
Resolution bandwidth:	120 kHz below 1 GHz 1 MHz up to 25 GHz
Span:	100 MHz steps
Trace-Mode:	Max. hold

Limits:

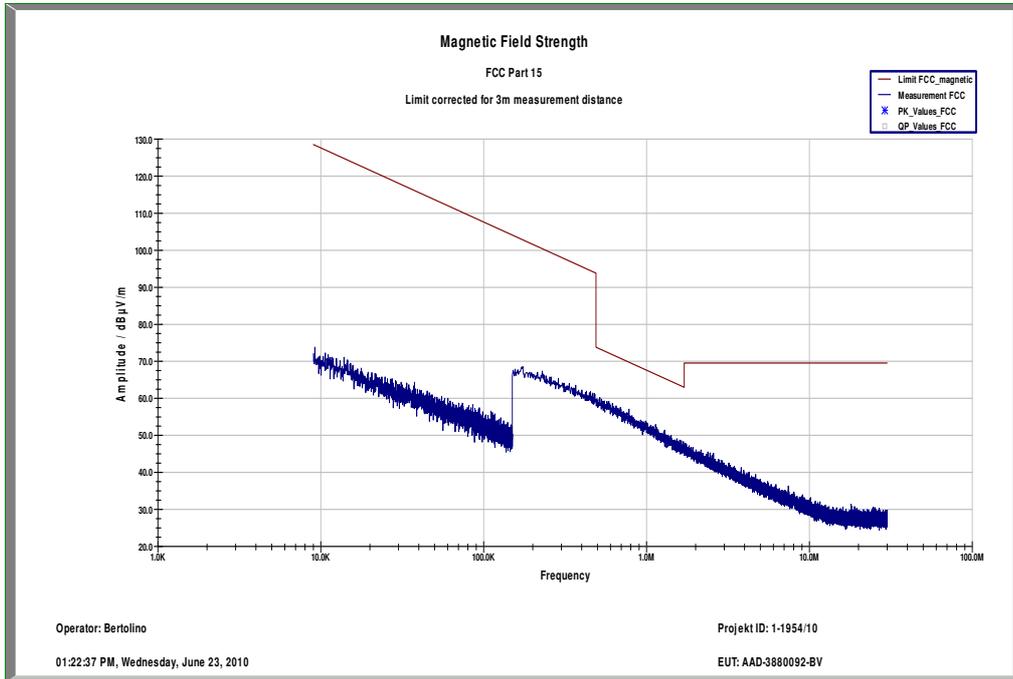
FCC		IC	
CFR Part 15.109 CFR Part 2.1053		RSS Gen, Issue 2, Section 4.10	
Spurious Emissions Radiated – Receiver Mode			
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance (m)	
30 – 88	30.0	10	
88 - 216	33.5	10	
216 – 960	36.0	10	
Above 960	54.0	3	

Results:

Spurious Emission Level (dB μ V/m)		
Frequency (MHz)	Detector	Level (dB μ V/m)
No critical peaks detected!		
Measurement uncertainty		± 3 dB

Result: [The result of the measurement is passed.](#)

Plot 1: Receiver mode up to 30 MHz



Plot 2: Receiver mode (30 MHz - 1 GHz), vertical & horizontal polarization

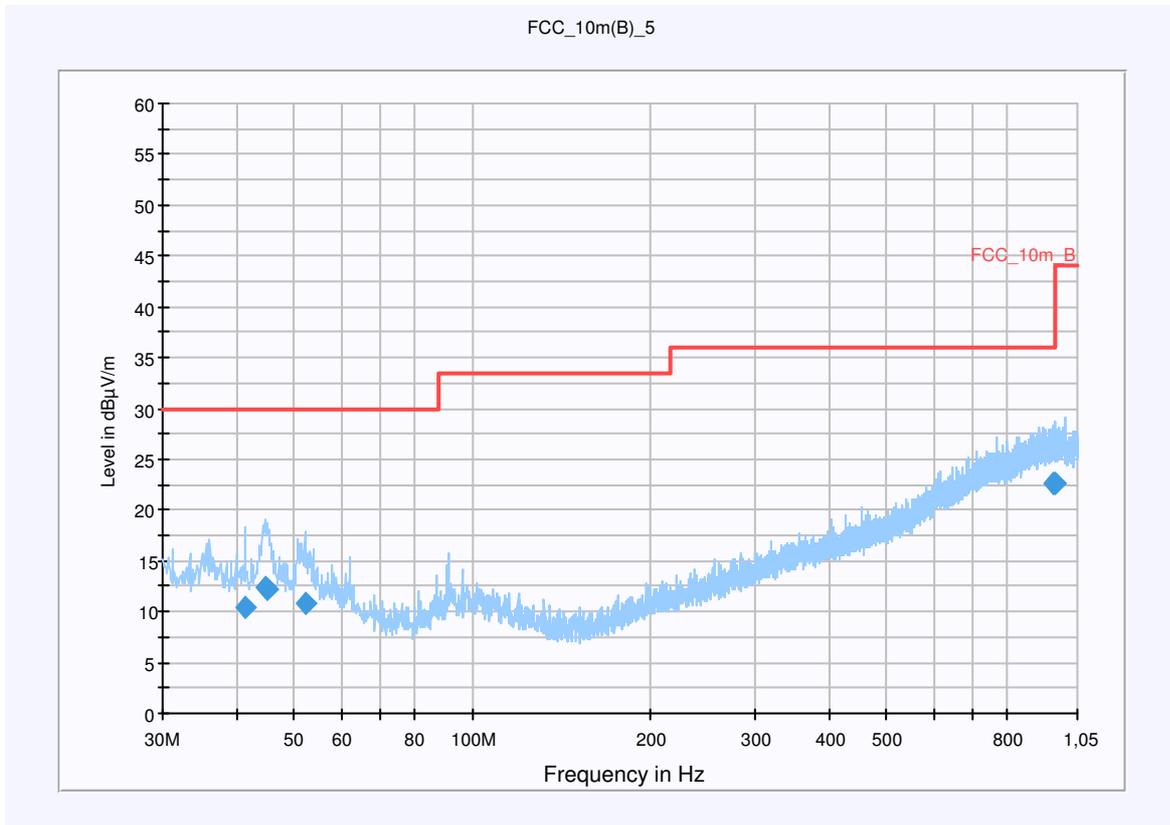
Common Information

EUT: AAD-3880092-BV + EP 800 (charger)
 Serial Number: IMEI:00440214-071977-8 + 1109w50400488
 Test Description: FCC part 15 @ 10m
 Operating Conditions: GSM idle; GPS on
 Operator Name: Lang
 Comment: Power: 115 V/ 60Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Level Unit: dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1,05 GHz	QuasiPeak	120 kHz	15 s	Receiver



Final Result 1

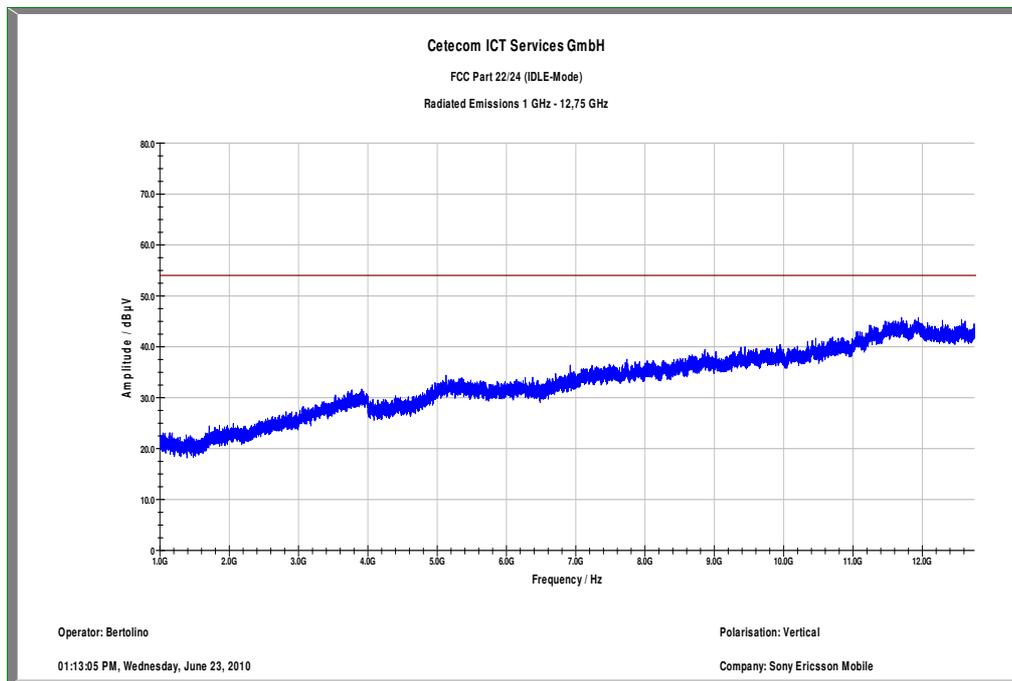
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
41.400000	10.4	15000.000	120.000	191.0	V	65.0	13.4	19.6	30.0	
44.640000	12.5	15000.000	120.000	105.0	V	106.0	13.3	17.5	30.0	
45.120000	12.2	15000.000	120.000	220.0	V	88.0	13.3	17.8	30.0	
52.200000	10.7	15000.000	120.000	98.0	V	120.0	13.2	19.3	30.0	
956.640000	22.7	15000.000	120.000	109.0	H	334.0	25.4	13.3	36.0	
966.360000	22.7	15000.000	120.000	220.0	V	228.0	25.5	21.3	44.0	

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

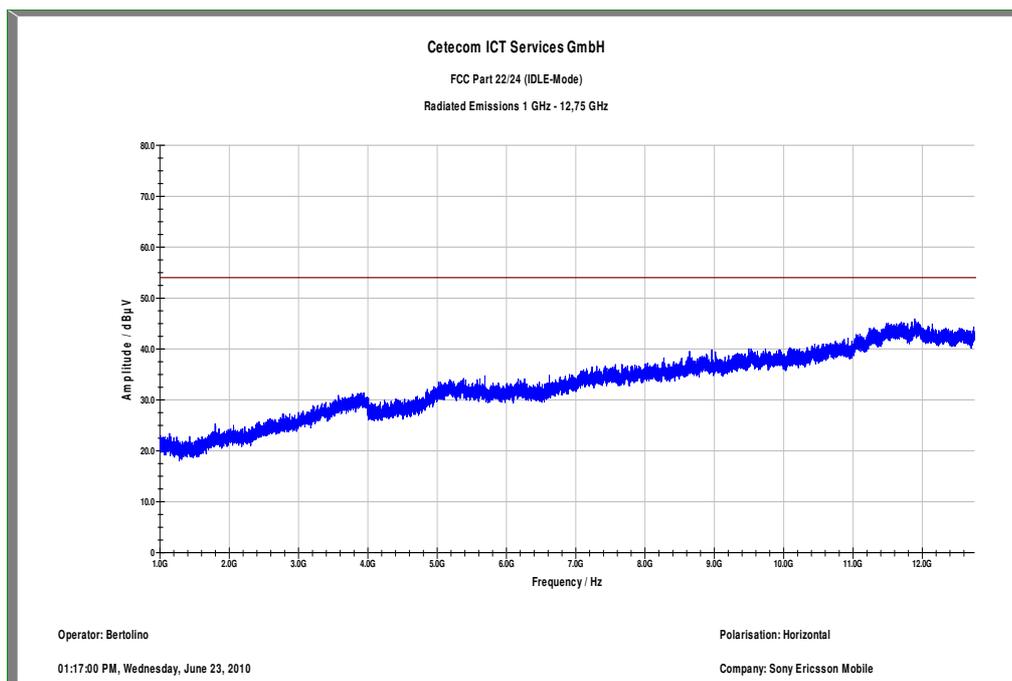
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.32
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

EMC 32 Version 8.10.00

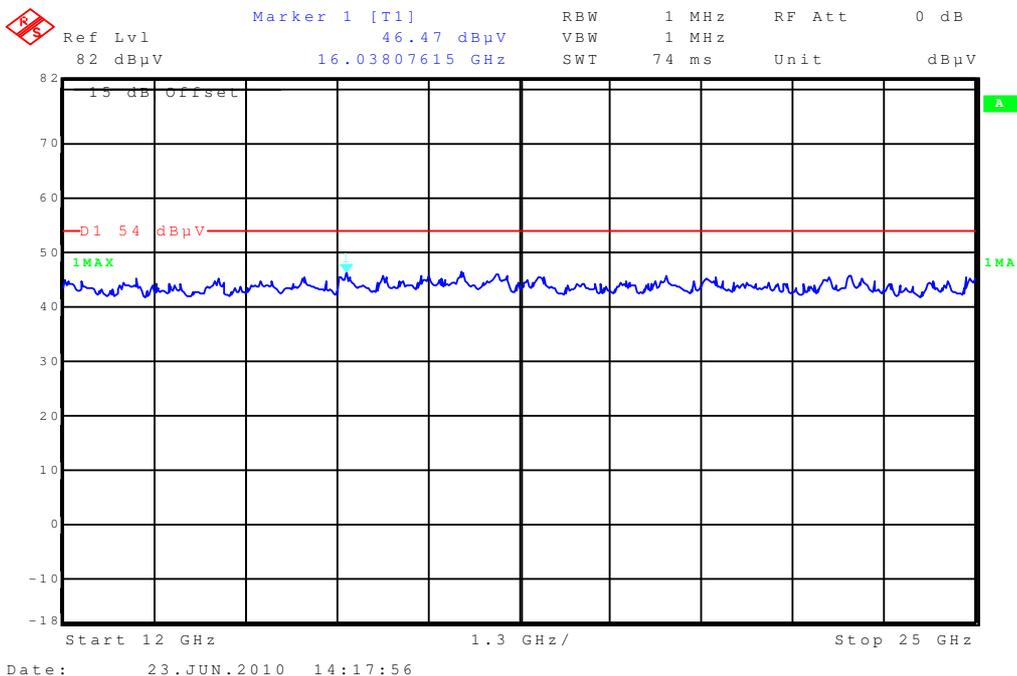
Plot 3: Receiver mode (1 GHz – 12.75 GHz), vertical polarization



Plot 4: Receiver mode (1 GHz – 12.75 GHz), horizontal polarization



Plot 5: Receiver mode (12.75 GHz – 25 GHz), vertical & horizontal polarization



9 Test equipment and ancillaries used for tests

In order to simplify the identification of the equipment used at each specific test, each item of test equipment and ancillaries are provided with an identifier or number in the equipment list below.

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

No.	Labor / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	k	06.01.2009	06.01.2011
3	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
4	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	08.01.2010	08.01.2012
5	n. a.	Analyzerr-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k		
6	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
7	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
8	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
9	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k		
11	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	08.01.2010	08.01.2012
12	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	05.03.2009	05.03.2011
13	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
14	n. a.	Anechoic chamber		MWB	87400/02	300000996			
15	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
16	9	Artificial Mains 9 kHz to 30 MHz, 4 x 25 Ampere	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
17	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
18	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
19	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
20	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
21	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
22	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
23	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		

24	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
25	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
26	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
27	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
28	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	05.08.2008	05.08.2010
29	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	06.08.2008	06.08.2010
30	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vIKI!	19.08.2008	19.08.2010
31	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKI!	17.12.2008	17.12.2010
32	n. a.	DC Power Supply 0 – 32V	1108-32	Heiden	001802	300001383	Ve		
33	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/83761	300002326	Ve	28.05.2009	28.05.2011
34	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	06.01.2009	06.01.2011

Annex A Document history

Version	Applied changes	Date of release
1.0	Initial release	2010-06-23

Annex B Further information

Glossary

DUT	-	Device under Test
EMC	-	Electromagnetic Compatibility
EUT	-	Equipment under Test
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	not applicable
S/N	-	Serial Number
SW	-	Software