

TEST REPORT

Test Report No.: 1-2205-01-05/10-A



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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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
RSS - 132 Issue 2	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	Spectrum Management and Telecommunications Policy - Radio Standards Specifications 2 GHz Personal Communication Services

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

Test Item

Kind of test item:	PCIe Wireless mini card		
Model name:	F5521gw		
FCC ID:	type: KRD 131 18/1		
IC:	VV7-MBMF5521GW1		
IC:	287AG-MBMF5521GW1		
Frequency [MHz]:	GSM 850: 824.2 – 848.8 MHz,	PCS 1900: 1850.2 – 1909.8 MHz	
	WCDMA Band V: 826.4 – 846.6 MHz,	WCDMA Band II: 1852.4 – 1907.6 MHz	
Power supply:	3.3 V DC		
Temperature range:	-30 °C to +60 °C		

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Test performed:

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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.

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2.2 Application details

Date of receipt of order:	2010-07-02
Date of receipt of test item:	2010-07-02
Start of test:	2010-07-27
End of test:	2010-09-07
Person(s) present during the test:	-/-

3 Test standard/s

Test Standard	Version	Test Standard Description
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:	50 %
Air pressure:	not relevant for this kind of testing
Power supply:	V_{nom} 3.3 V DC V_{max} 3.6 V V_{min} 3.0 V

5 Test laboratories sub-contracted

None

6 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	2010-09-24	-/-

6.1 GSM 850

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Note:

NA = Not applicable; NP = Not performed

6.2 PCS 1900

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Note:

NA = Not applicable; NP = Not performed

6.3 UMTS Band II

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Note:

NA = Not applicable; NP = Not performed

6.4 UMTS Band V

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Frequency Stability	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spurious Emissions Conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Block Edge Compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Occupied Bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Note:

NA = Not applicable; NP = Not performed

6.5 Receiver

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
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

7 RF measurement testing

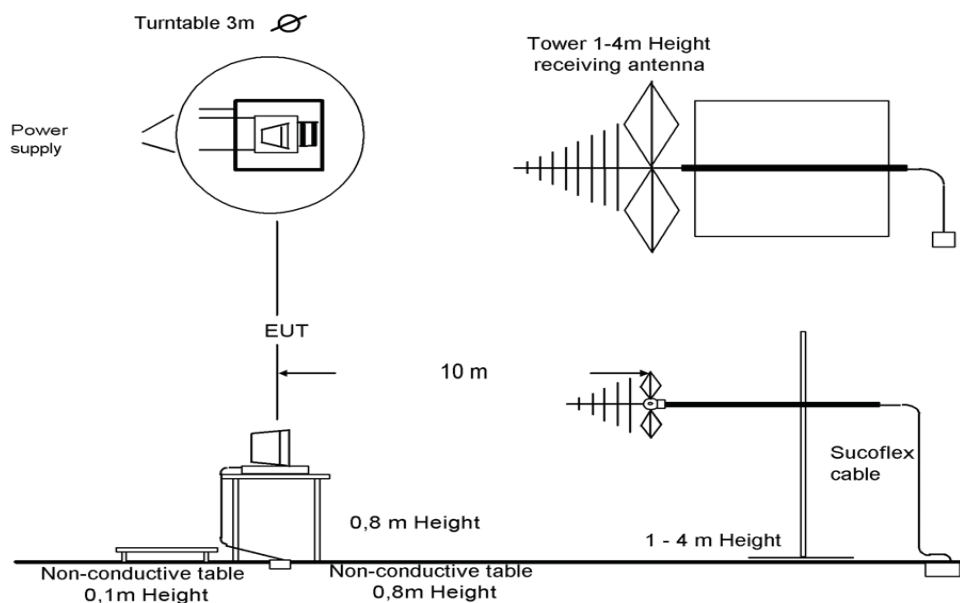
7.1 Description of test setup

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

7.1.1 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

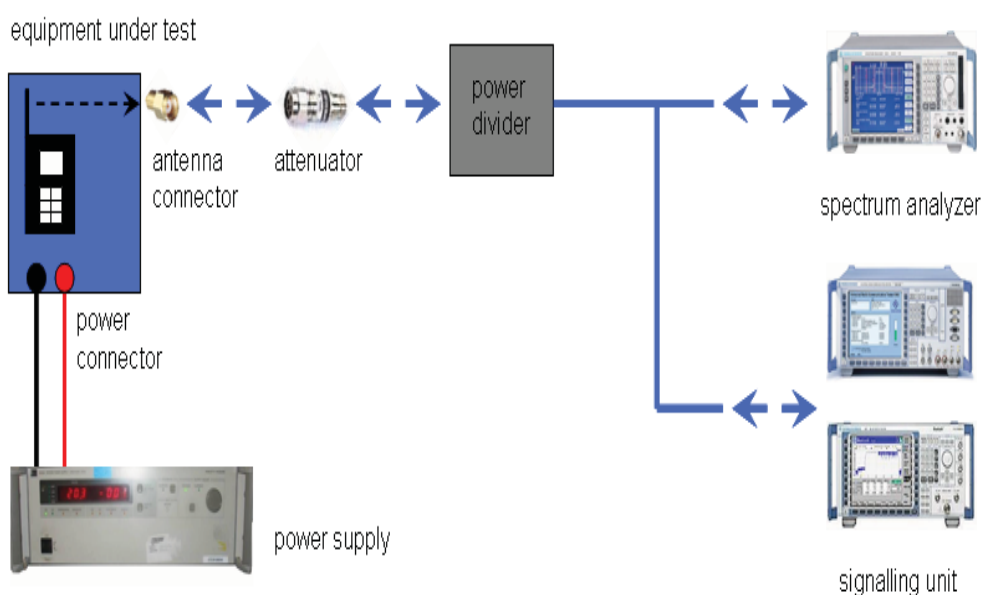


Picture 1: Diagram radiated measurements

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

7.1.2 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
$f < 150 \text{ kHz}$	200 Hz or	300 Hz
$150 \text{ kHz} \leq f < 25 \text{ MHz}$	9 kHz or	10 kHz
$25 \text{ MHz} \leq f < 1000 \text{ MHz}$	120 kHz or	100 kHz
$1000 \text{ MHz} \leq f$		1 MHz
NOTE: Specific requirements in CEPT/ERC/Recommendation 70-03 [2] shall be applied where applicable.		

7.2 Test item

Kind of test item	:	PCIe Wireless mini card
Type identification	:	F5521gw type: KRD 131 18/1
S/N serial number	:	A401168081 A401168073 A401194416
HW hardware status	:	R1
SW software status	:	R1A29
Frequency Band [MHz]	:	GSM 850: 824.2 – 848.8 MHz PCS 1900: 1850.2 – 1909.8 MHz WCDMA Band V: 826.4 – 846.6 MHz WCDMA Band II: 1852.4 – 1907.6 MHz
Type of Modulation	:	GMSK; 8-PSK; QPSK; 16QAM
Number of channels	:	125 (PCS850) 300 (PCS1900) 278 (WDCMA Band II) 103 (WDCMA Band V)
Antenna	:	External antenna
Power Supply	:	3.3 V DC
Temperature Range	:	-30°C to +60 °C

7.3 Results GSM 850

All GSM-band measurements are performed in GPRS mode only, as the device does not support CS GSM mode. All relevant tests have been repeated using 8-PSK modulation if EDGE mode is supported. All tests were performed with one timeslot in uplink activated and one timeslot in downlink activated. For each mode the highest output power was determined and used.

7.3.1 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:	Peak and Average
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	32.49	0.1
836.4	32.25	0.1
848.8	32.31	0.1
Measurement uncertainty	± 0.5 dB	

Output Power (conducted) 8-PSK mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
824.2	26.60	3.2
836.4	26.50	3.2
848.8	26.50	3.2
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) GMSK mode	
Frequency (MHz)	Average Output Power (dBm) - ERP
824.2	30.79
836.4	31.46
848.8	31.89
Measurement uncertainty	± 2.0 dB

Output Power (radiated) 8-PSK mode	
Frequency (MHz)	Average Output Power (dBm) - ERP
824.2	24.90
836.4	25.71
848.8	26.08
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

7.3.2 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 $\pm 0.5^{\circ}\text{C}$ during the measurement procedure.

Measurement:

Measurement parameters	
Detector:	Measured with CMU200
Sweep time:	
Video bandwidth:	
Resolution bandwidth:	
Span:	
Trace-Mode:	

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	

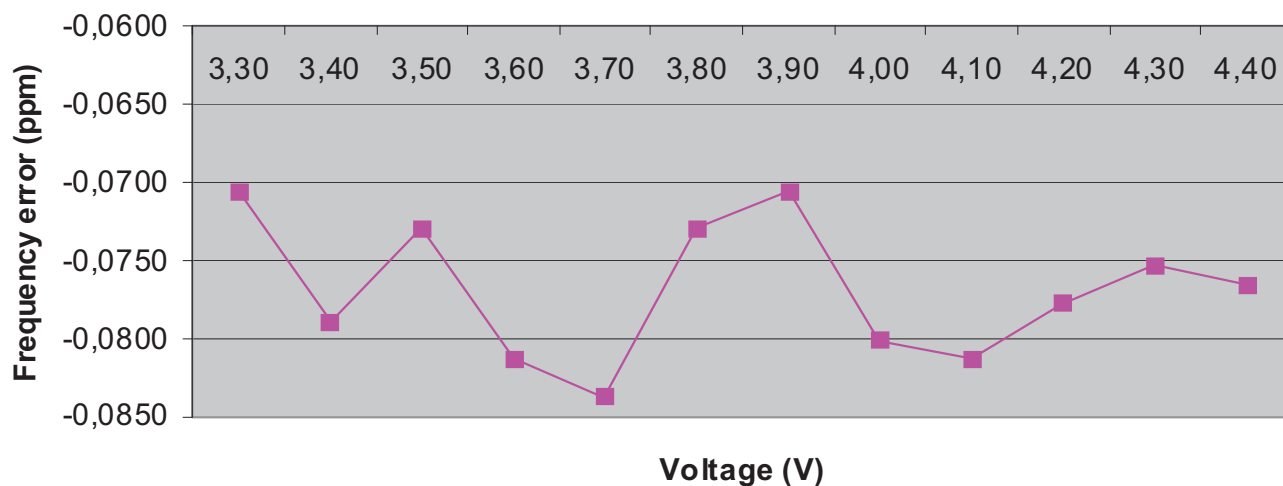
Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.0	-59	-0,00000705	-0,0705
3.1	-66	-0,00000789	-0,0789
3.2	-61	-0,00000729	-0,0729
3.3	-68	-0,00000813	-0,0813
3.4	-70	-0,00000837	-0,0837
3.5	-61	-0,00000729	-0,0729
3.6	-59	-0,00000705	-0,0705
3.7	-67	-0,00000801	-0,0801
3.8	-68	-0,00000813	-0,0813
3.9	-65	-0,00000777	-0,0777
4.0	-63	-0,00000753	-0,0753
4.1	-64	-0,00000765	-0,0765

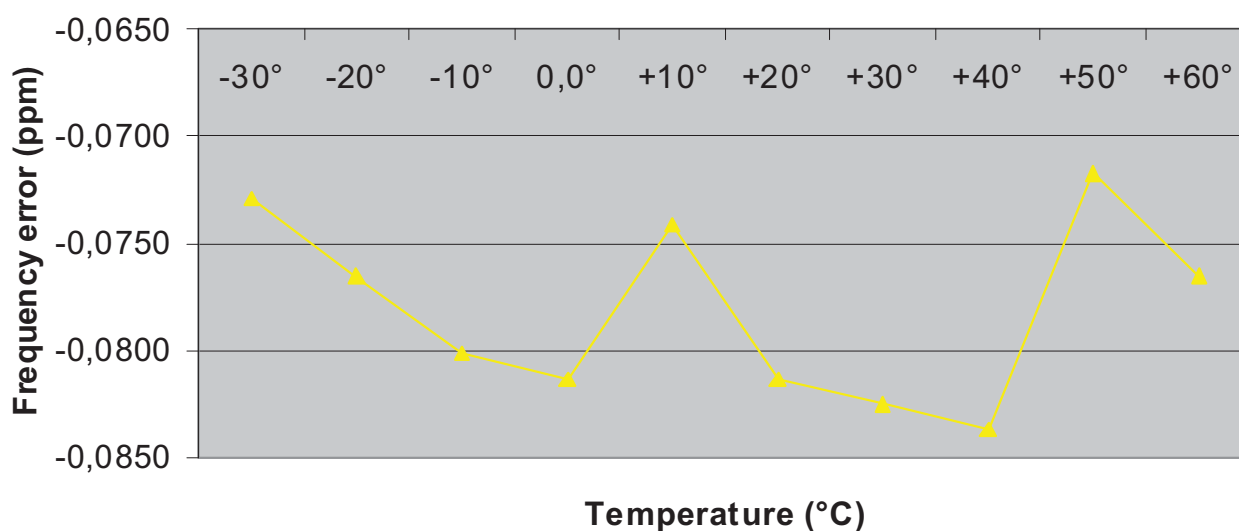
AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-61	-0,00000729	-0,0729
-20	-64	-0,00000765	-0,0765
-10	-67	-0,00000801	-0,0801
± 0	-68	-0,00000813	-0,0813
10	-62	-0,00000741	-0,0741
20	-68	-0,00000813	-0,0813
30	-69	-0,00000825	-0,0825
40	-70	-0,00000837	-0,0837
50	-60	-0,00000717	-0,0717
60	-64	-0,00000765	-0,0765

Frequency Error vs. Voltage



Frequency Error vs. Temperature



Result: The result of the measurement is passed.

7.3.3 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:

- The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- The antenna output was terminated in a 50 ohm load (if possible).
- A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- 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.
- Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603 .

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	2 sec.
Video bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Resolution bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
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.

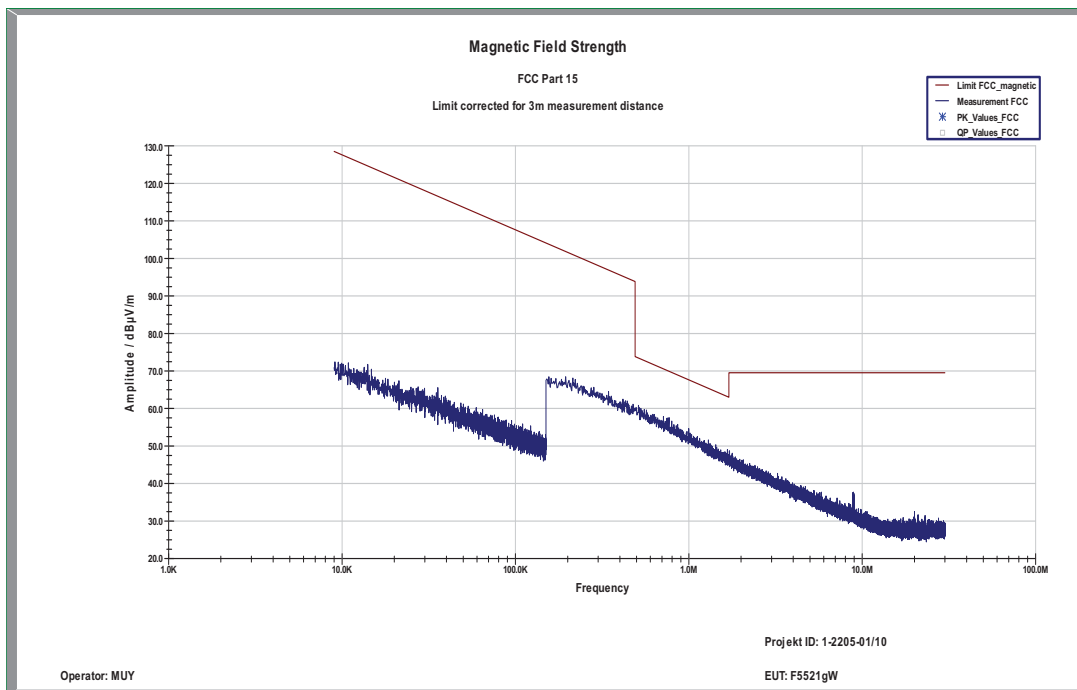
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked too. The found values are stated in the table below.

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	-	2	1672.8	-	2	1697.6	-
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			

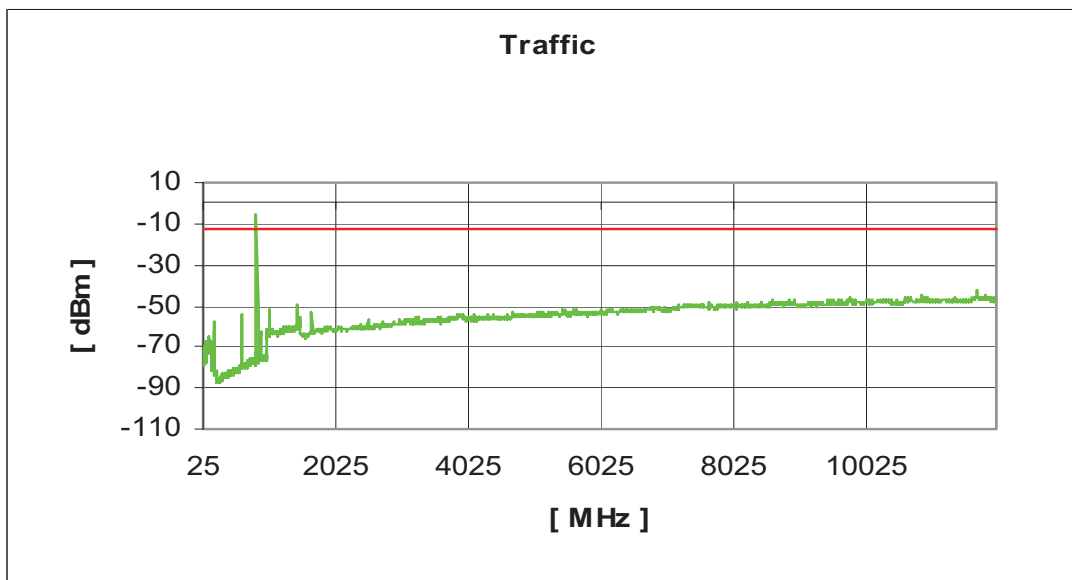
As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

Result: The result of the measurement is passed.

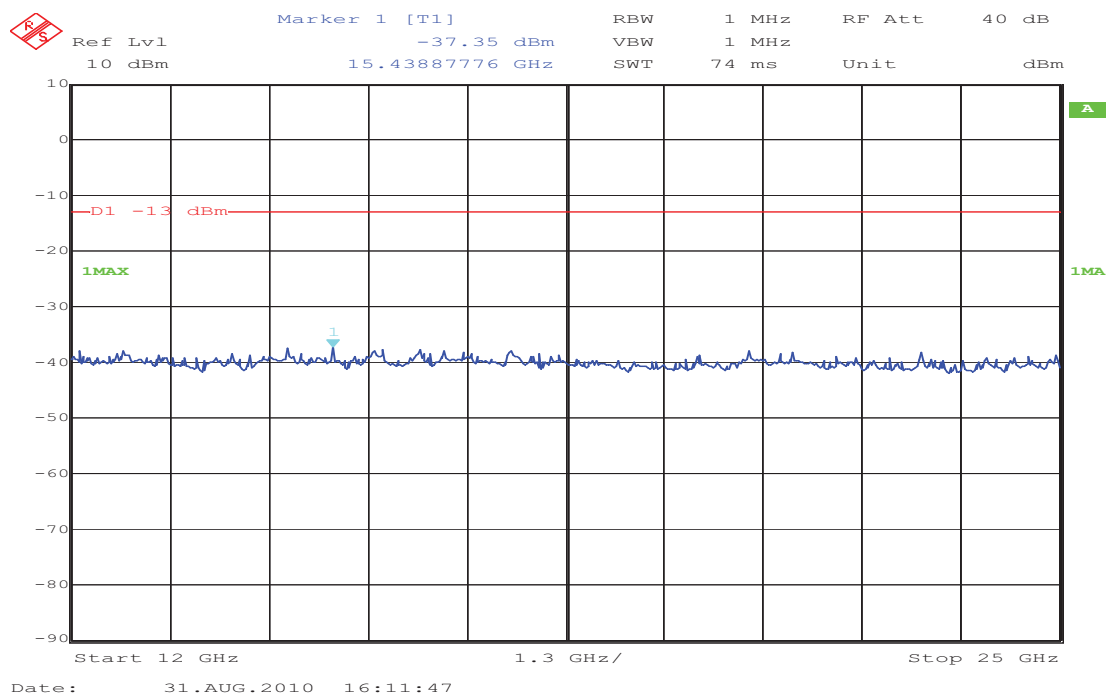
Plot 1: Channel 189 (Traffic mode up to 30 MHz)



Plot 2: Channel 189 (30 MHz – 12.75 GHz)



Plot 3: Channel 189 (12.75 GHz – 25 GHz)



7.3.4 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:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Resolution bandwidth:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Span:	30 MHz – 25 GHz
Trace-Mode:	Max Hold

Limits:

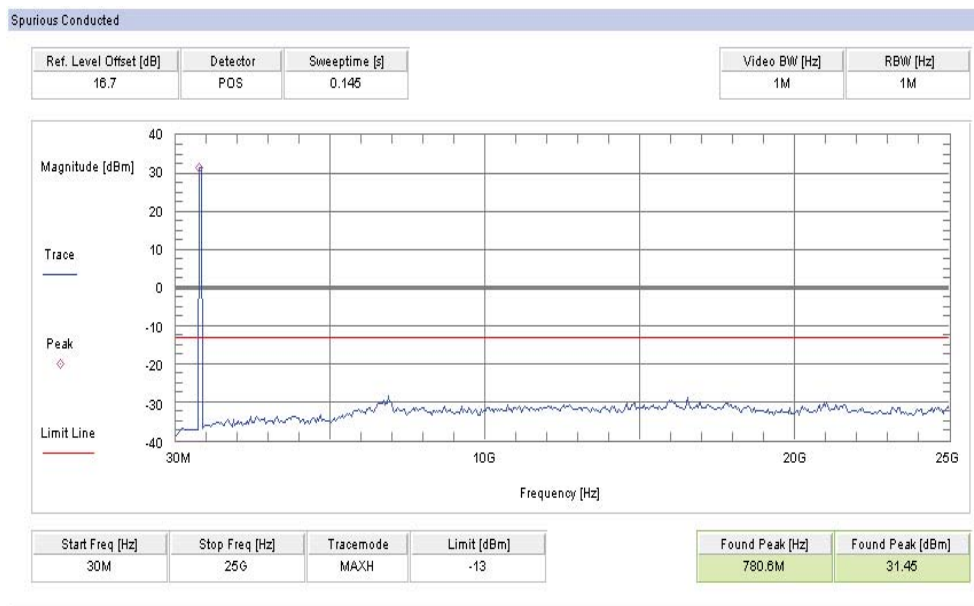
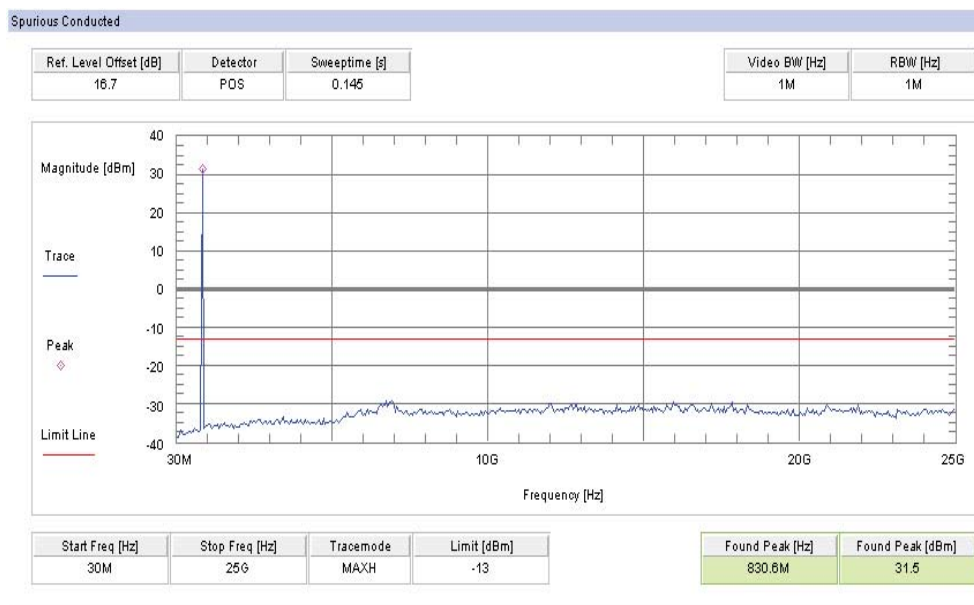
FCC	IC
CFR Part 22.917 CFR Part 2.1051	RSS 132, Issue 2, Section 4.5 and 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

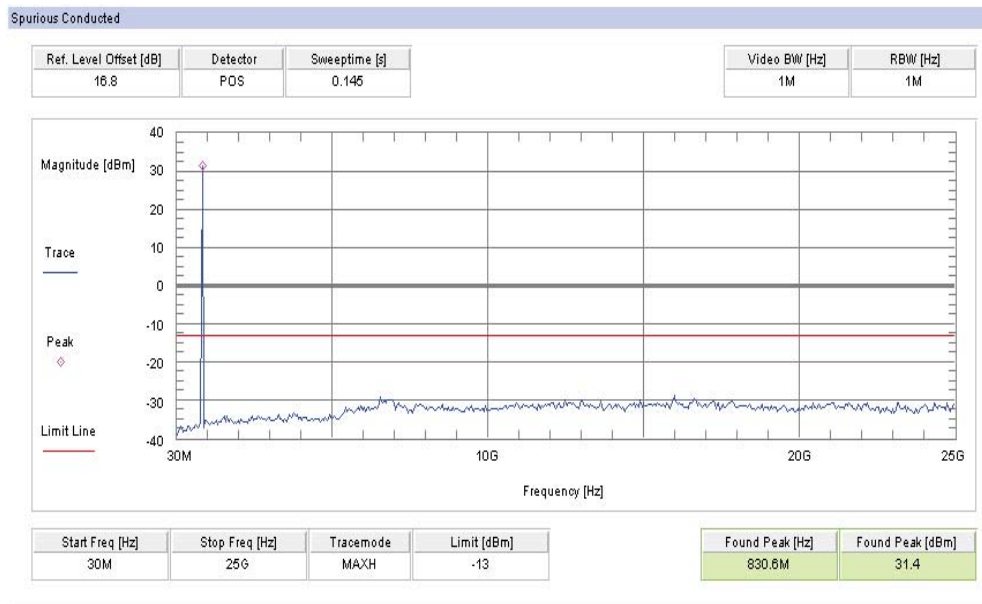
Results:

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	-	2	1672.8	-	2	1697.6	-
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			

As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

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)

7.3.5 Block edge compliance

Description:

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

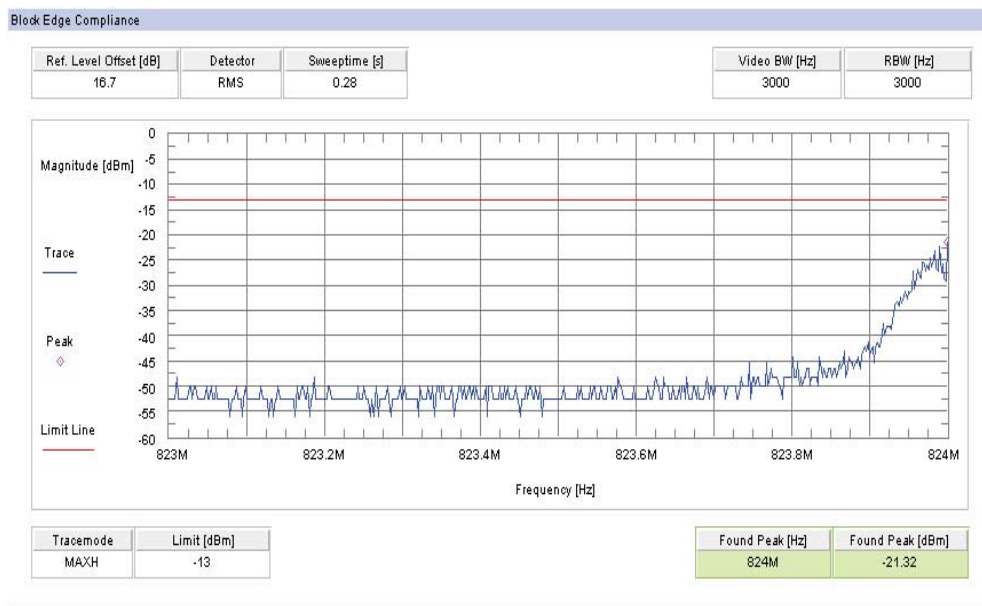
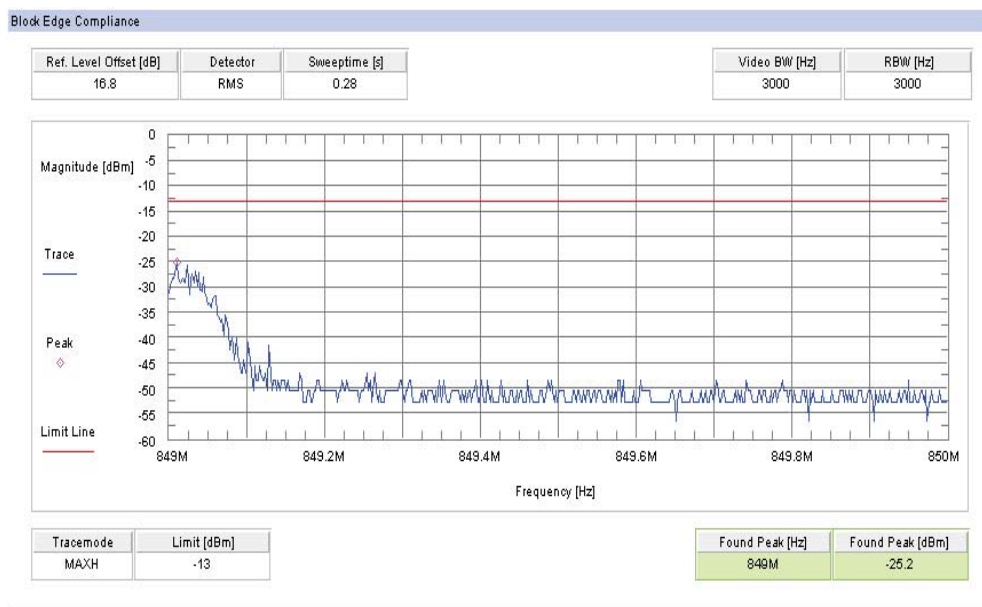
Measurement:

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.

7.3.6 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:

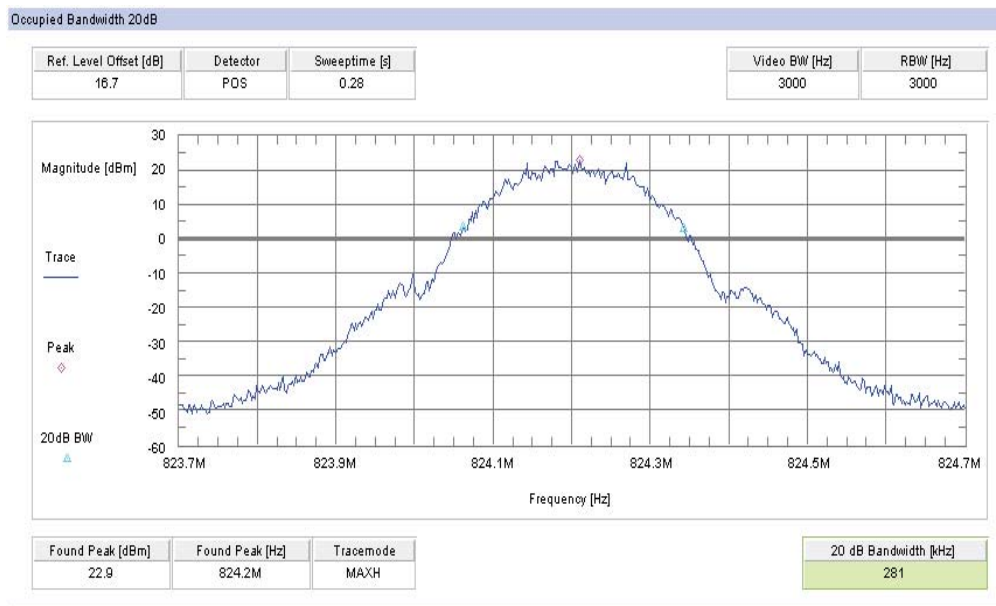
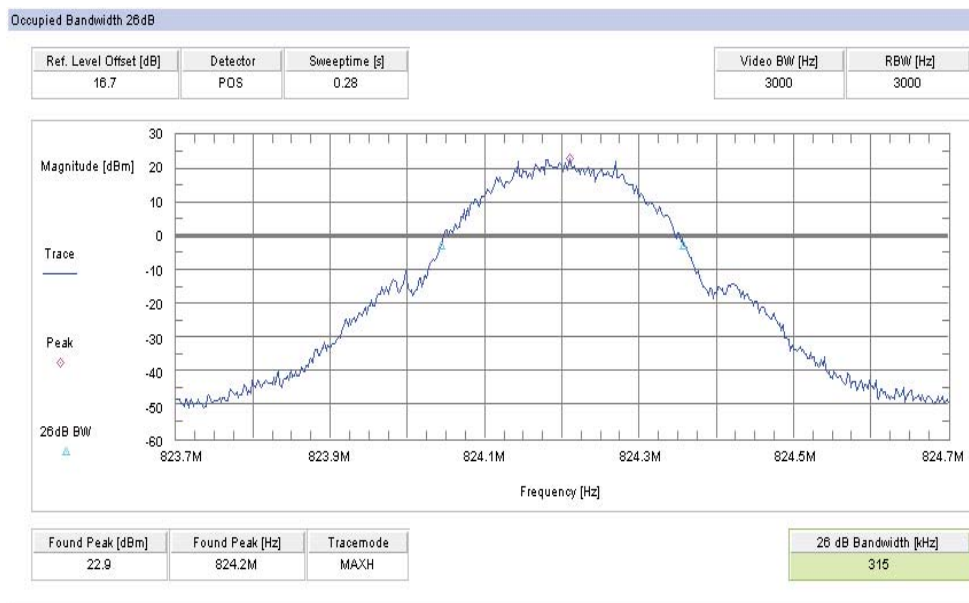
FCC	IC
CFR Part 22.917 CFR Part 2.1049	RSS 132, Issue 2, Section 4.5.1
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

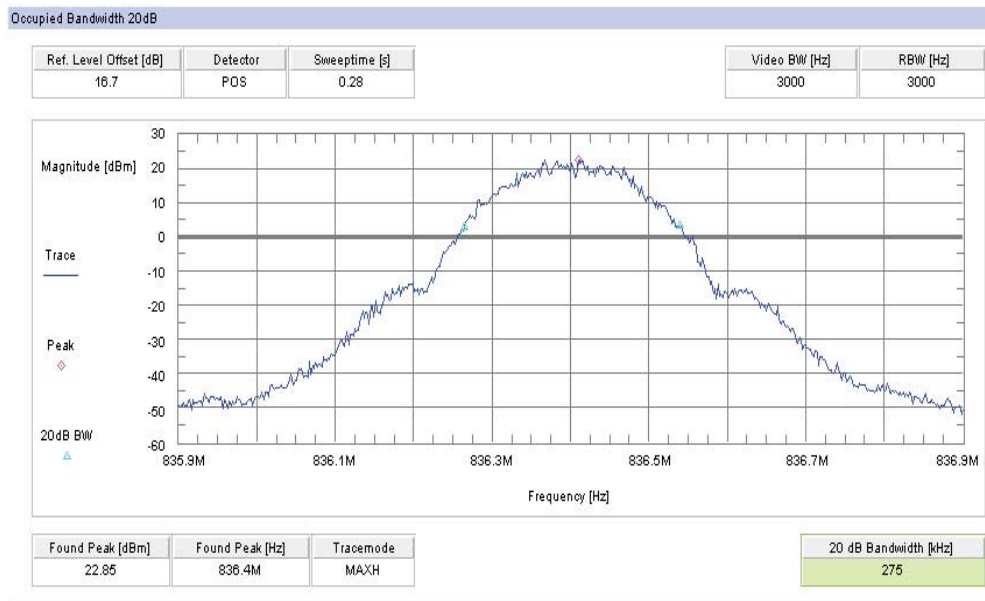
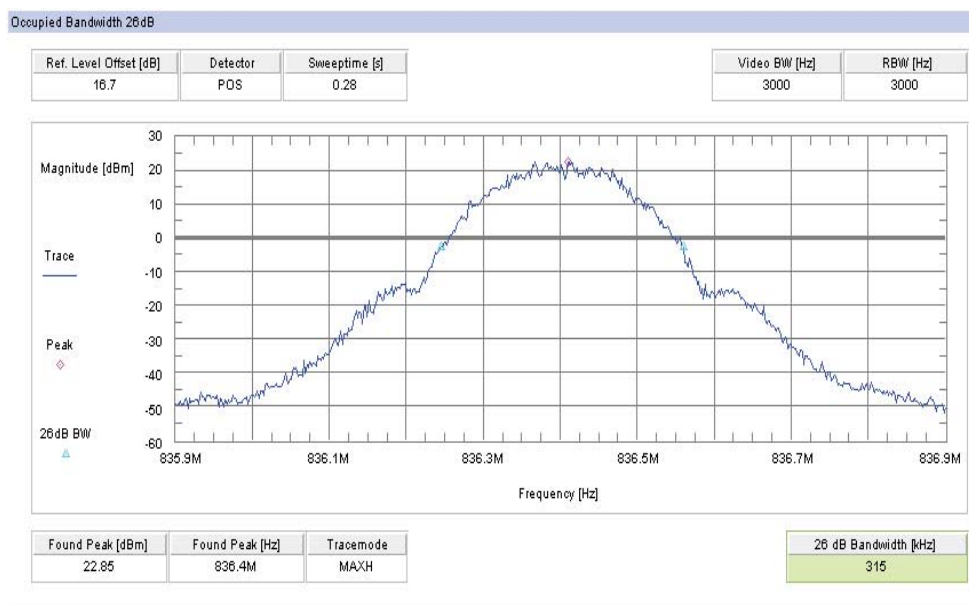
Results:

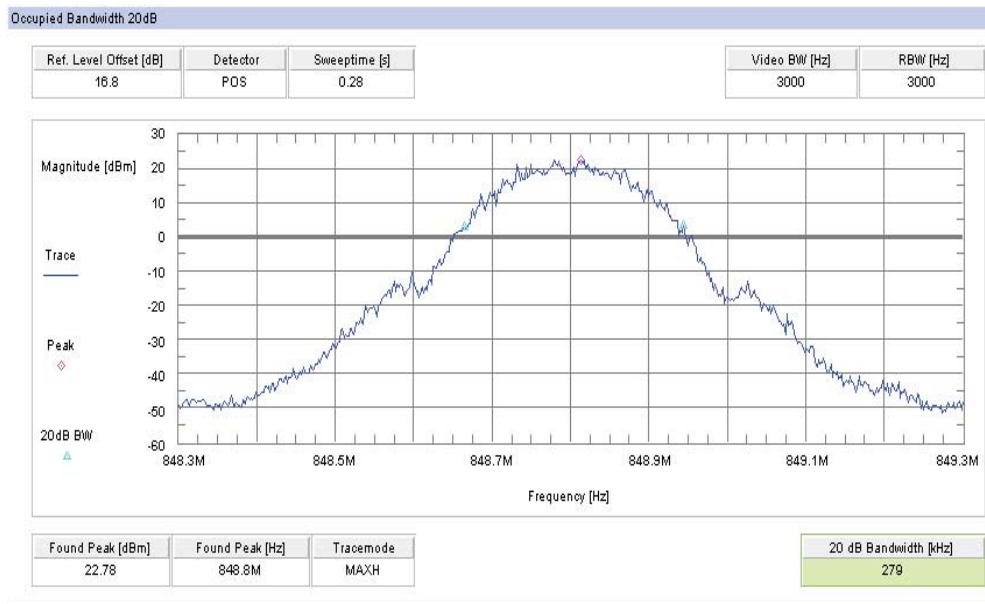
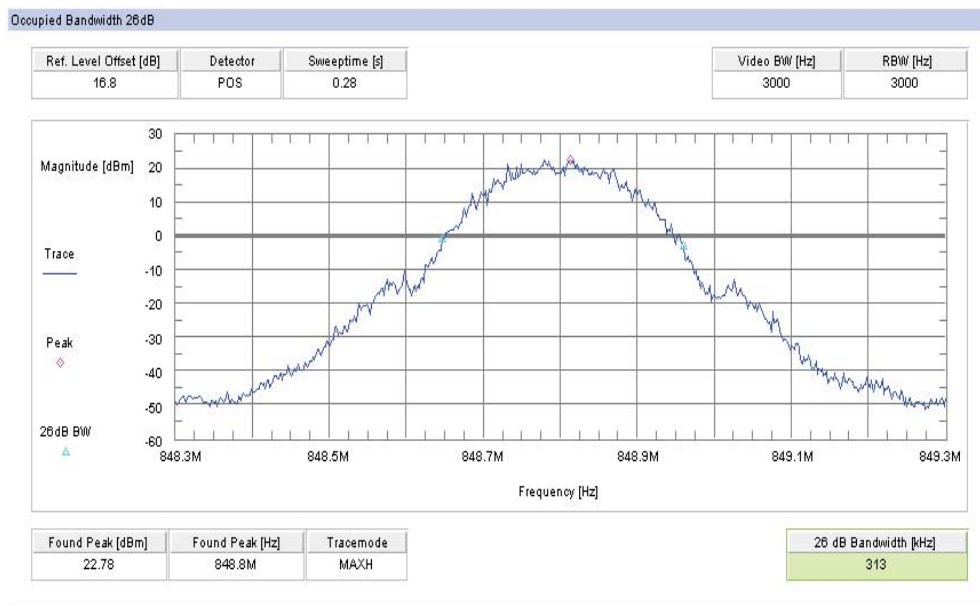
Occupied Bandwidth - GMSK mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
824.2	281	315
836.4	275	315
848.8	279	313
Measurement uncertainty	± 3 kHz	

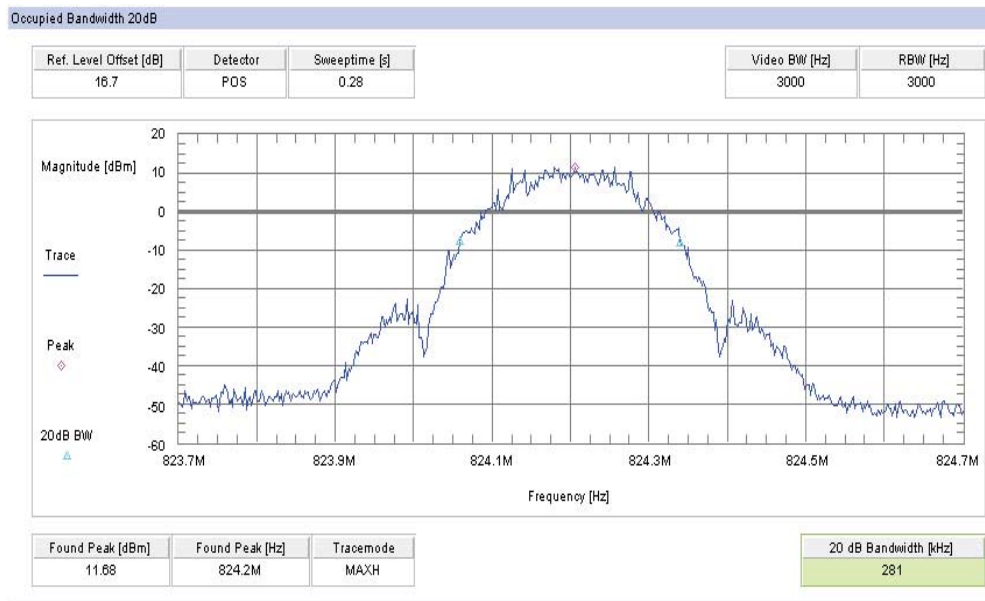
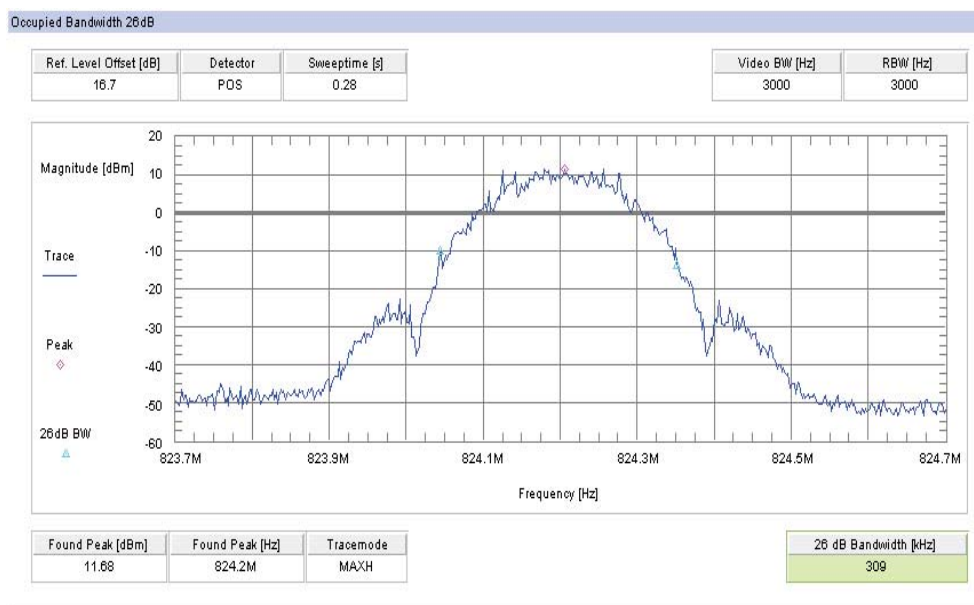
Occupied Bandwidth - EDGE mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
824.2	281	309
836.4	307	313
848.8	271	301
Measurement uncertainty	± 3 kHz	

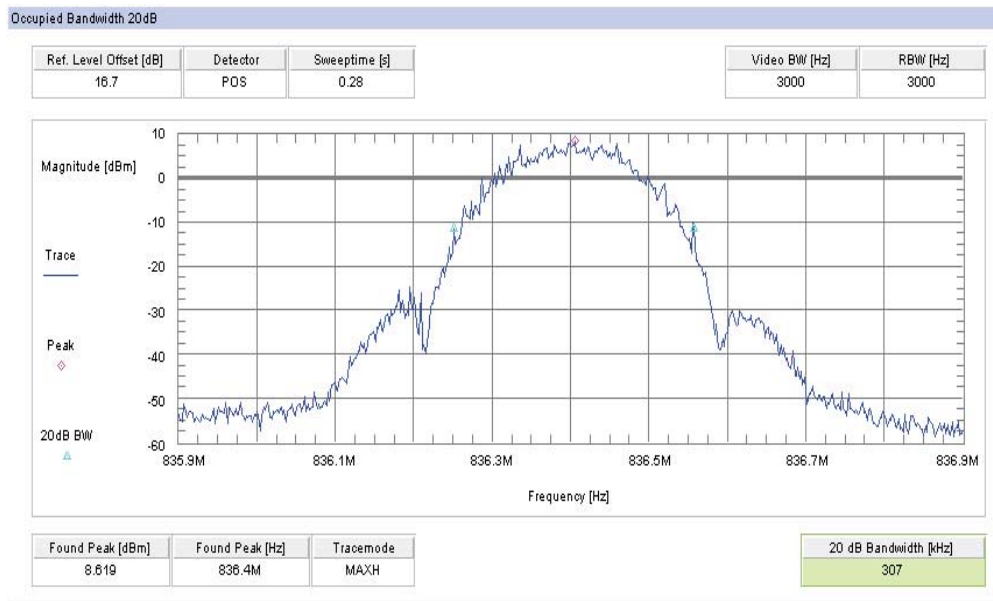
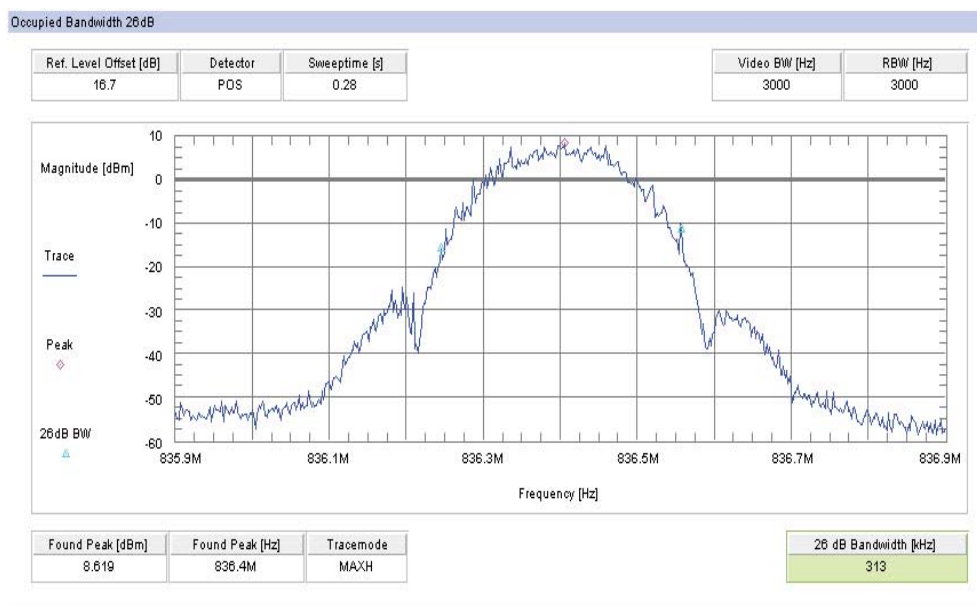
Result: The result of the measurement is passed.

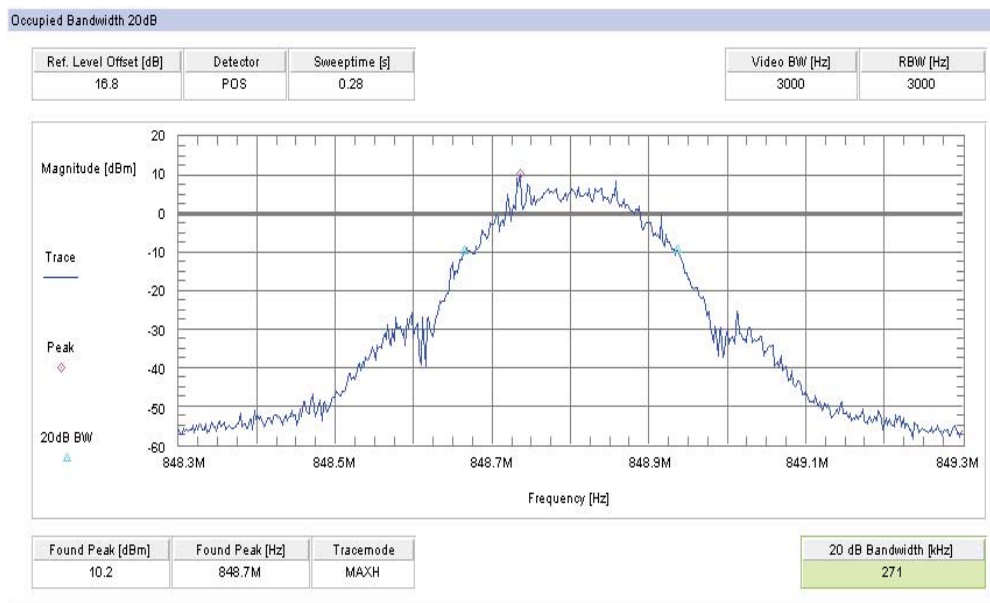
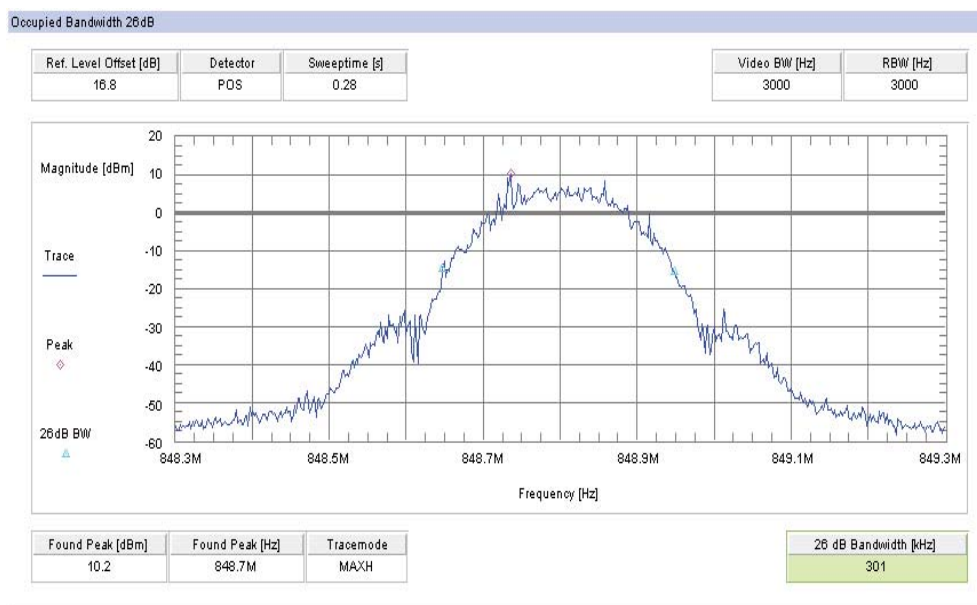
Plot 1: Channel 128 (99% - OBW)**Plot 2: Channel 128 (-26 dBc BW)**

Plot 3: Channel 189 (99% - OBW)**Plot 4: Channel 189 (-26 dBc BW)**

Plot 5: Channel 251 (99% - OBW)**Plot 6: Channel 251 (-26 dBc BW)**

Plot 7: Channel 128 (99% - OBW) - EDGE**Plot 8: Channel 128 (-26 dBc BW) - EDGE**

Plot 9: Channel 189 (99% - OBW) - EDGE**Plot 10: Channel 189 (-26 dBc BW) - EDGE**

Plot 11: Channel 251 (99% - OBW) - EDGE**Plot 12: Channel 251 (-26 dBc BW) - EDGE**

7.4 Results PCS 1900

All GSM-band measurements are performed in GPRS mode only, as the device does not support CS GSM mode. All relevant tests have been repeated using 8-PSK modulation if EDGE mode is supported. All tests were performed with one timeslot in uplink activated and one timeslot in downlink activated. For each mode the highest output power was determined and used.

7.4.1 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:	Peak and Average
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	29.61	0.05
1880.0	29.31	0.03
1909.8	29.50	0.07
Measurement uncertainty	± 0.5 dB	

Output Power (conducted) 8-PSK mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
1850.2	25.9	3.10
1880.0	25.7	3.10
1909.8	25.9	3.10
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) GMSK mode	
Frequency (MHz)	Average Output Power (dBm) - EIRP
1850.2	30.12
1880.0	30.36
1909.8	29.97
Measurement uncertainty	± 2.0 dB

Output Power (radiated) 8-PSK mode	
Frequency (MHz)	Average Output Power (dBm) - EIRP
1850.2	26.41
1880.0	26.75
1909.8	26.37
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

7.4.2 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 $\pm 0.5^{\circ}\text{C}$ during the measurement procedure.

Measurement:

Measurement parameters	
Detector:	Measured with CMU200
Sweep time:	
Video bandwidth:	
Resolution bandwidth:	
Span:	
Trace-Mode:	

Limits:

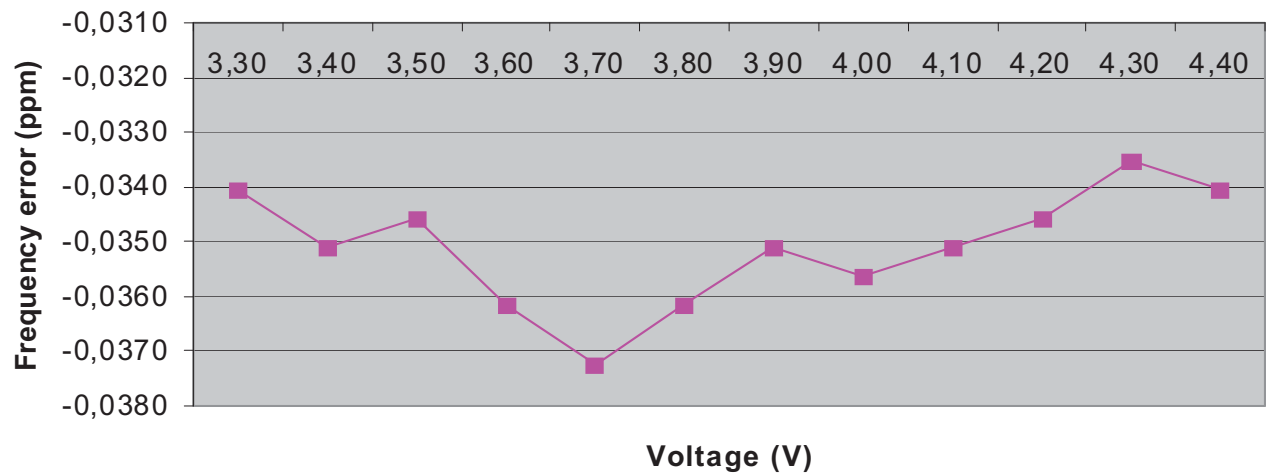
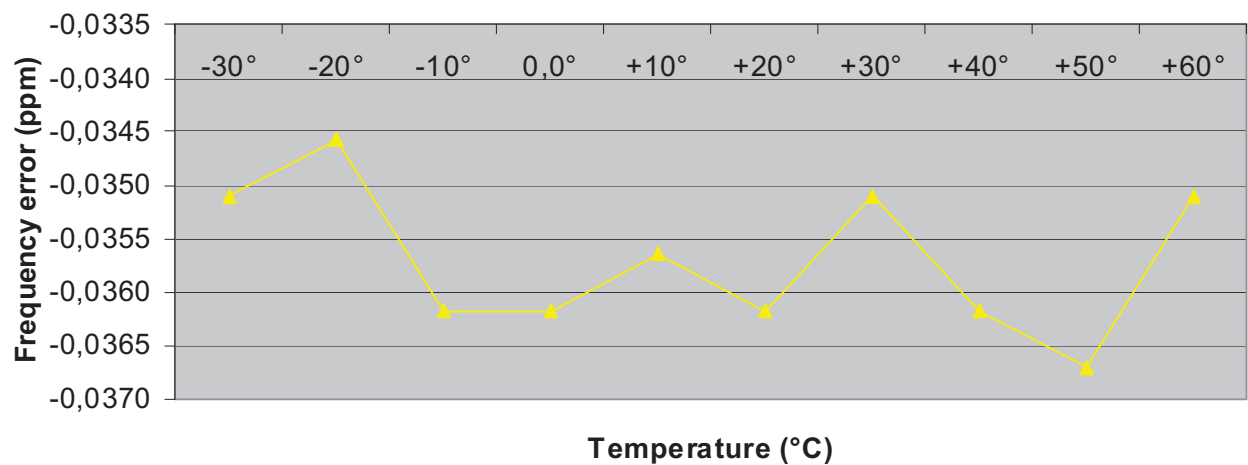
FCC	IC
CFR Part 24.235 CFR Part 2.1055	RSS 133, Issue 5, Section 6.3
Frequency Stability	
± 0.1 ppm	

Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	-64	-0,00000340	-0,0340
3.0	-66	-0,00000351	-0,0351
3.1	-65	-0,00000346	-0,0346
3.2	-68	-0,00000362	-0,0362
3.3	-70	-0,00000372	-0,0372
3.4	-68	-0,00000362	-0,0362
3.5	-66	-0,00000351	-0,0351
3.6	-67	-0,00000356	-0,0356
3.7	-66	-0,00000351	-0,0351
3.8	-65	-0,00000346	-0,0346
3.9	-63	-0,00000335	-0,0335
4.0	-64	-0,00000340	-0,0340

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-66	-0,00000351	-0,0351
-20	-65	-0,00000346	-0,0346
-10	-68	-0,00000362	-0,0362
± 0	-68	-0,00000362	-0,0362
10	-67	-0,00000356	-0,0356
20	-68	-0,00000362	-0,0362
30	-66	-0,00000351	-0,0351
40	-68	-0,00000362	-0,0362
50	-69	-0,00000367	-0,0367
60	-66	-0,00000351	-0,0351

Frequency Error vs. Voltage**Frequency Error vs. Temperature**

Result: The result of the measurement is passed.

7.4.3 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:

- The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- The antenna output was terminated in a 50 ohm load (if possible).
- A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- 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.
- Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603 .

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	2 sec.
Video bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Resolution bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
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.

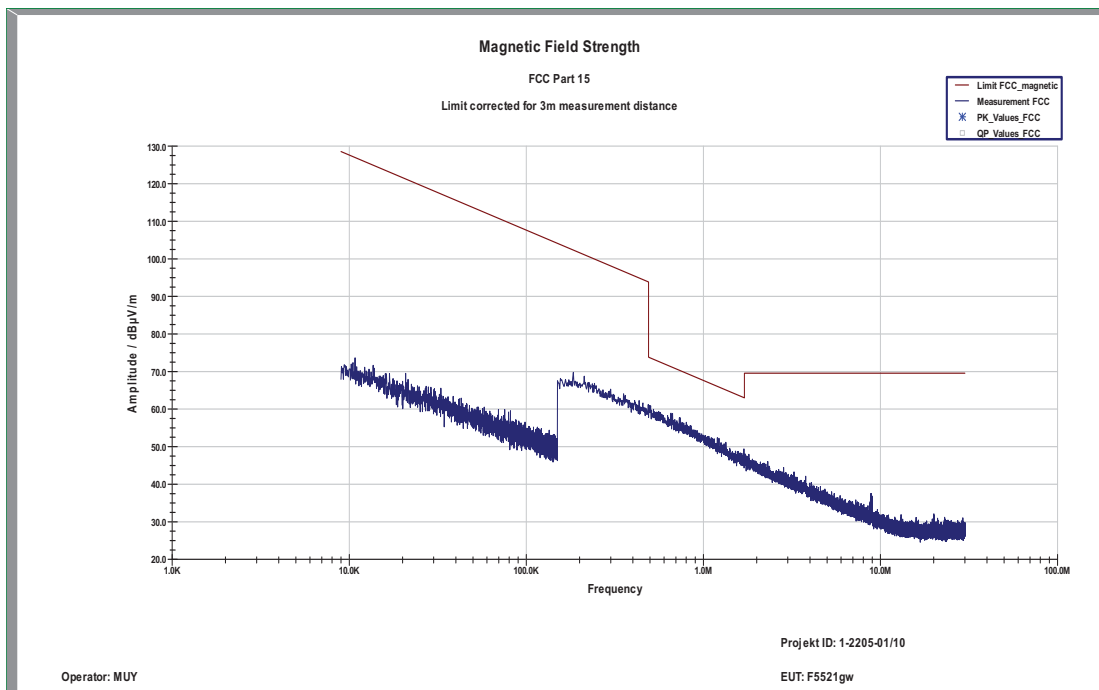
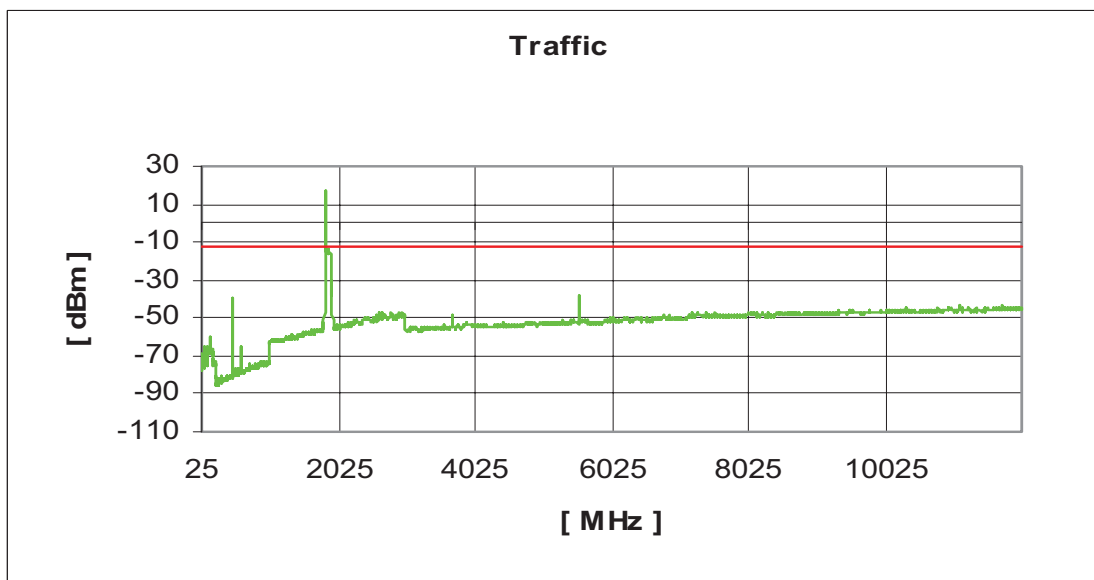
All measurements were done in horizontal and vertical polarization; the plots show the worst case.

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.

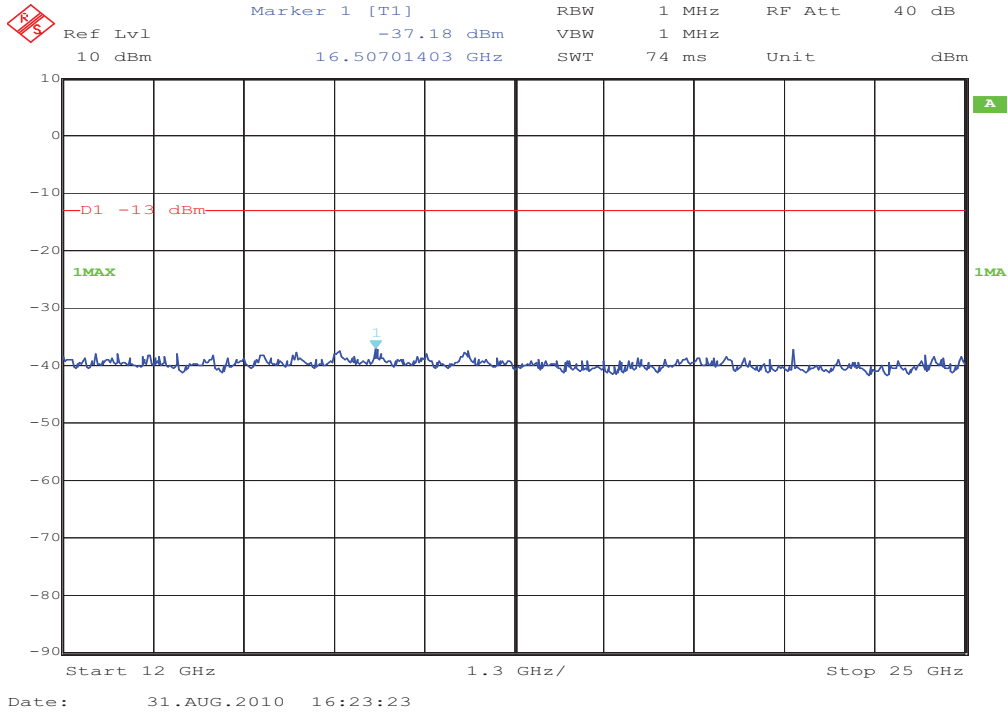
Spurious Emission Level (dBm)								
Harmonic	Ch. 512 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 661 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 810 Freq. (MHz)	Level [dBm]
2	3700.4	-	2	3760.0	-	2	3819.6	-
3	5550.6	-	3	5640.0	-	3	5729.4	-
4	7400.8	-	4	7520.0	-	4	7639.2	-
5	9251.0	-	5	9400.0	-	5	9549.0	-
6	11101.2	-	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			

As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

Result: The result of the measurement is passed.

Plot 1: Channel 661 (Traffic mode up to 30 MHz)**Plot 2: Channel 661 (30 MHz – 12.75 GHz)**

Plot 3: Channel 661 (12 GHz – 25 GHz)



7.4.4 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:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Resolution bandwidth:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Span:	30 MHz – 25 GHz
Trace-Mode:	Max Hold

Limits:

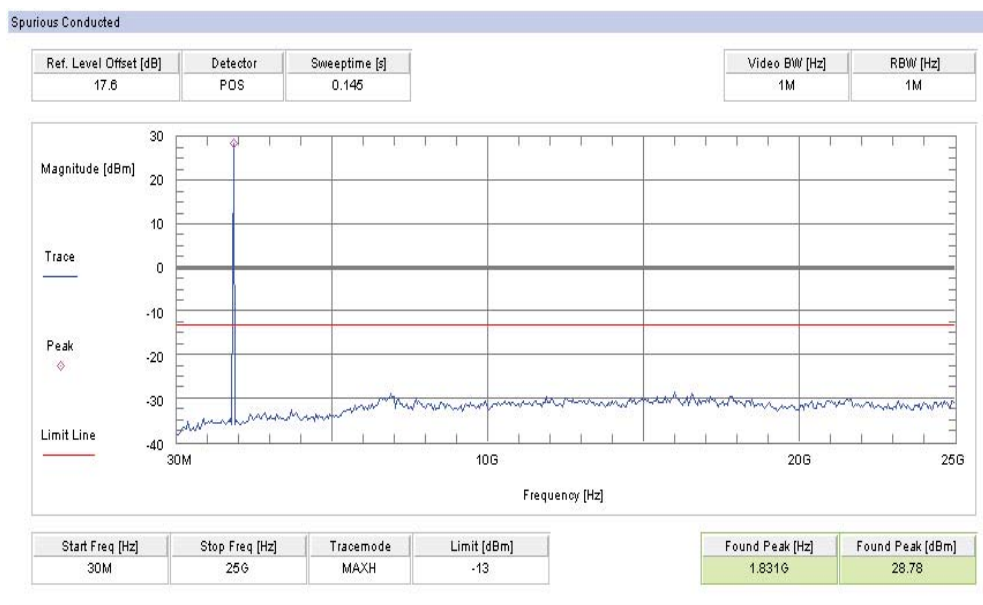
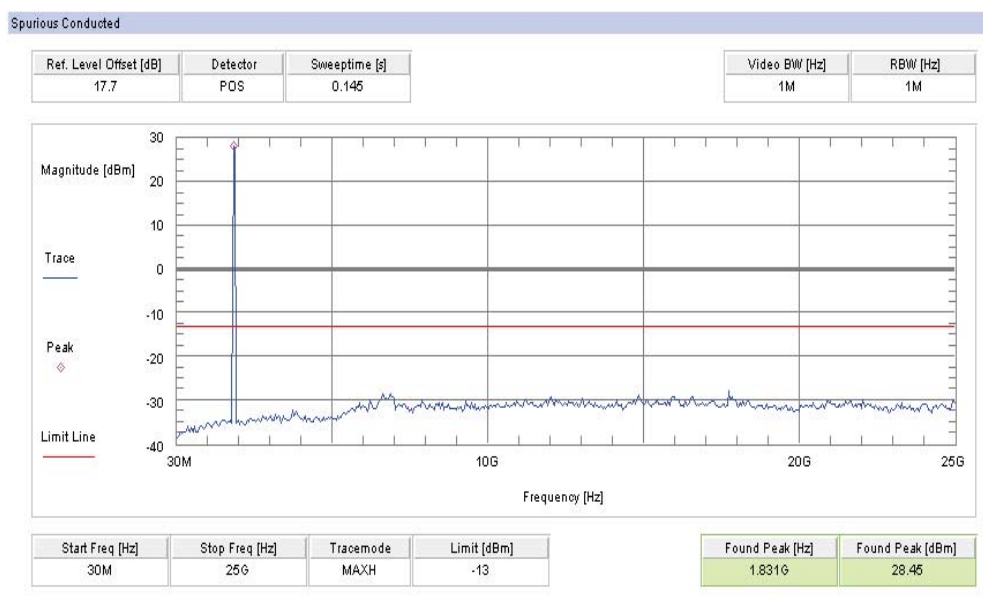
FCC	IC
CFR Part 24.238 CFR Part 2.1051	RSS 133, Issue 5, Section 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

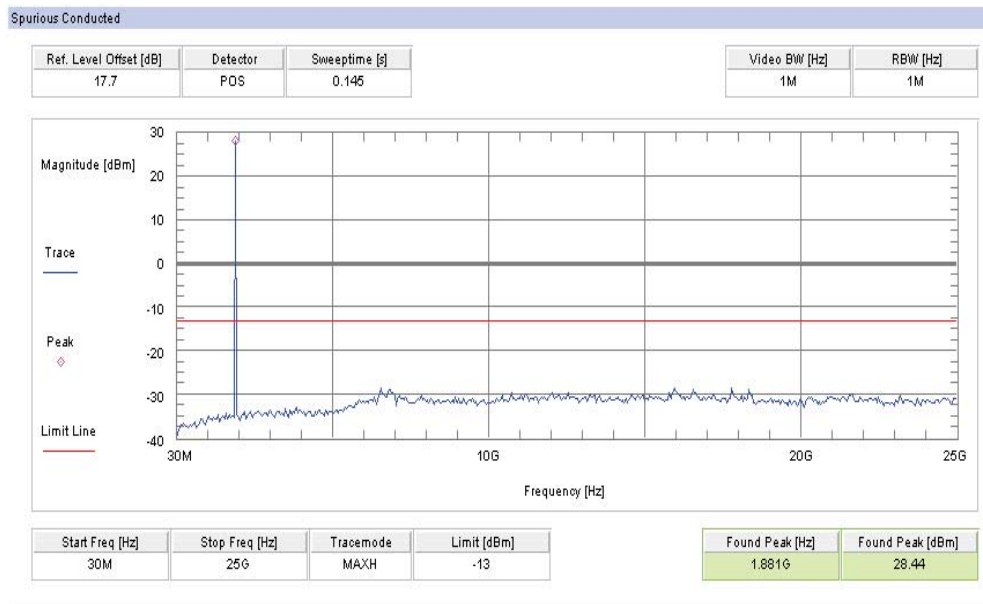
Results:

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	-	2	3760.0	-	2	3819.6	-
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			

As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

Result: The result of the measurement is passed.

Plot 1: Channel 512 (10 MHz - 25 GHz)**Plot 2: Channel 661 (10 MHz - 25 GHz)**

Plot 3: Channel 810 (10 MHz - 25 GHz)

7.4.5 Block edge compliance

Description:

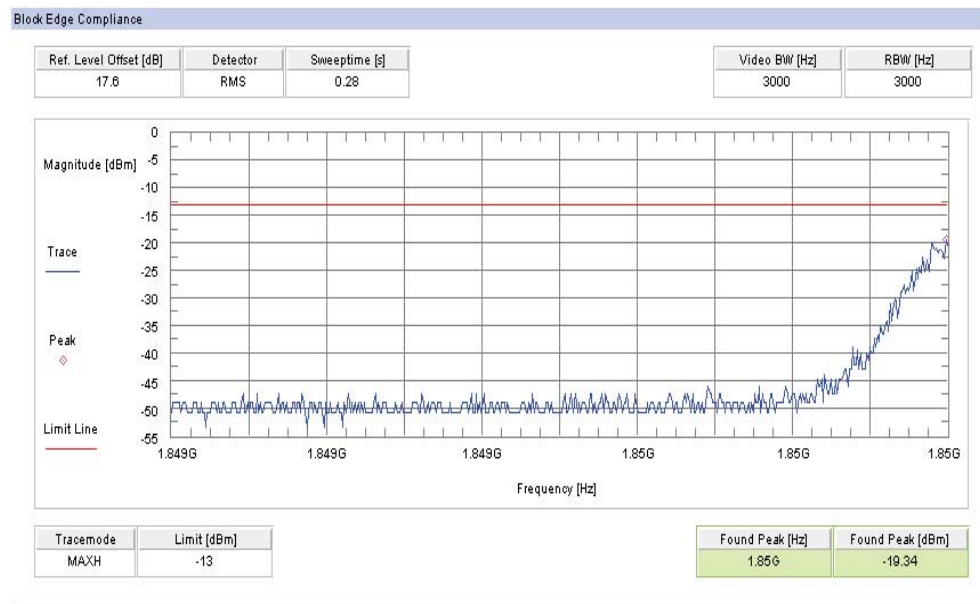
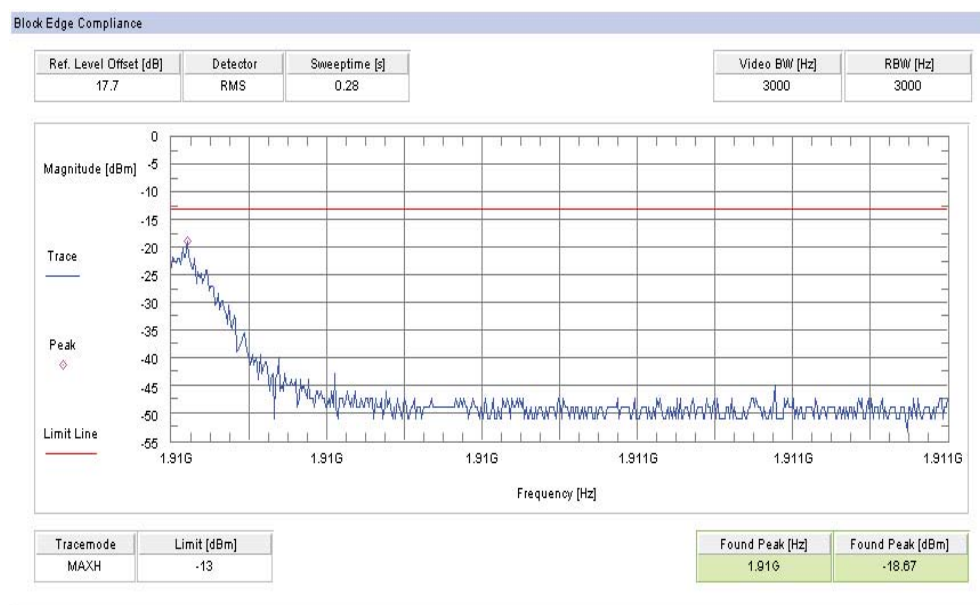
The spectrum at the band edges must comply with the spurious emissions limits.

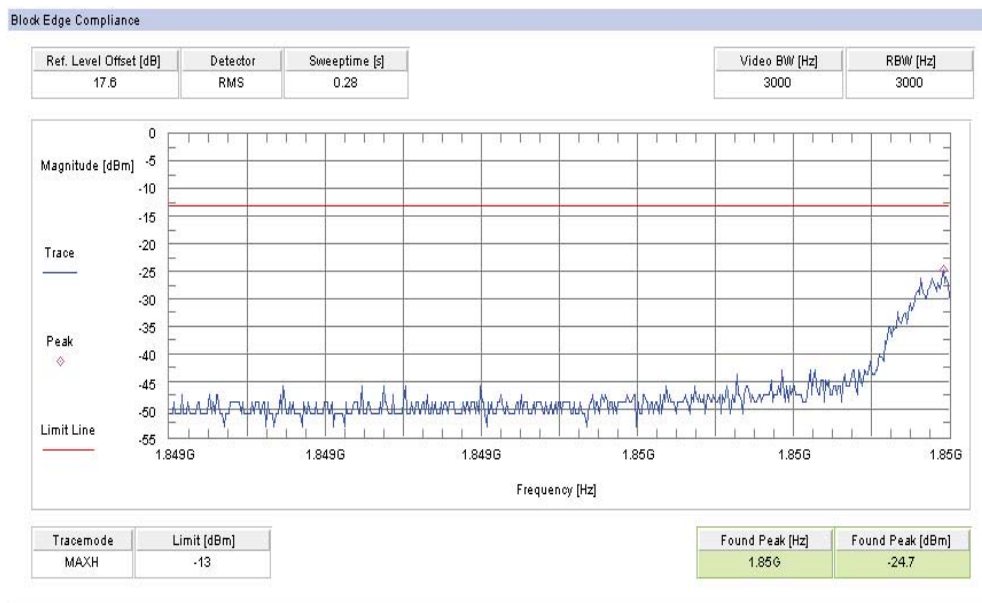
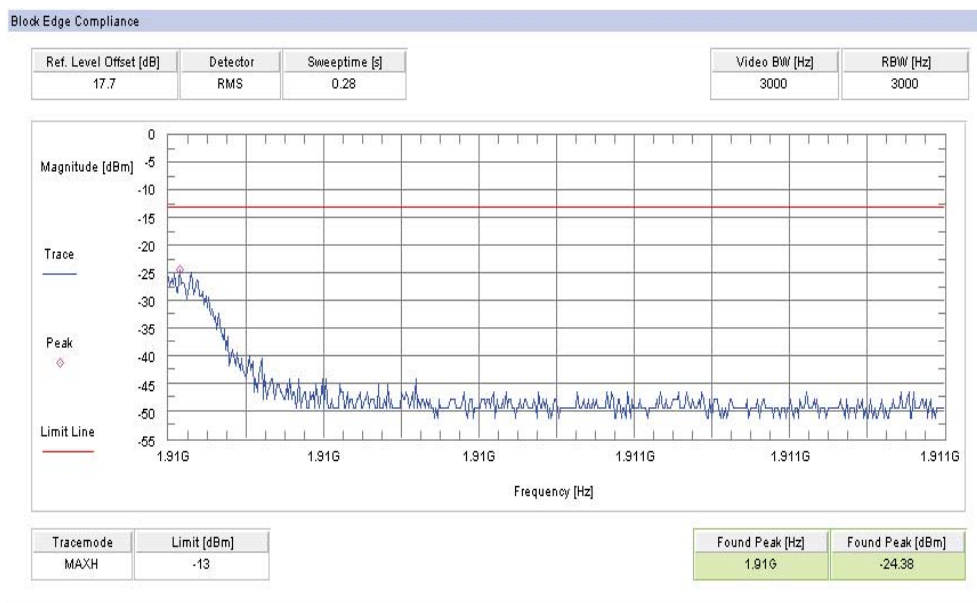
Measurement:

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.

7.4.6 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:

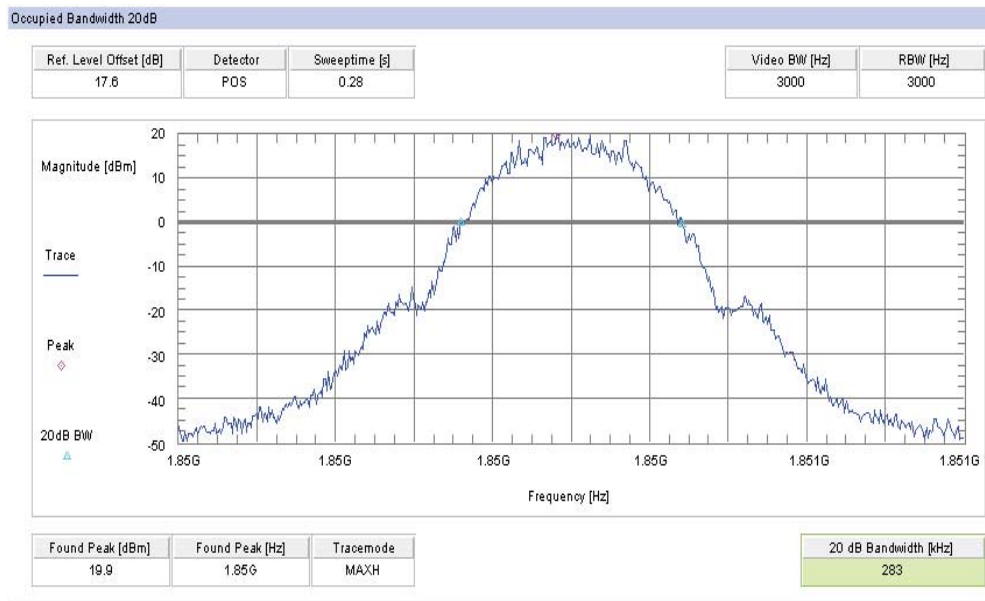
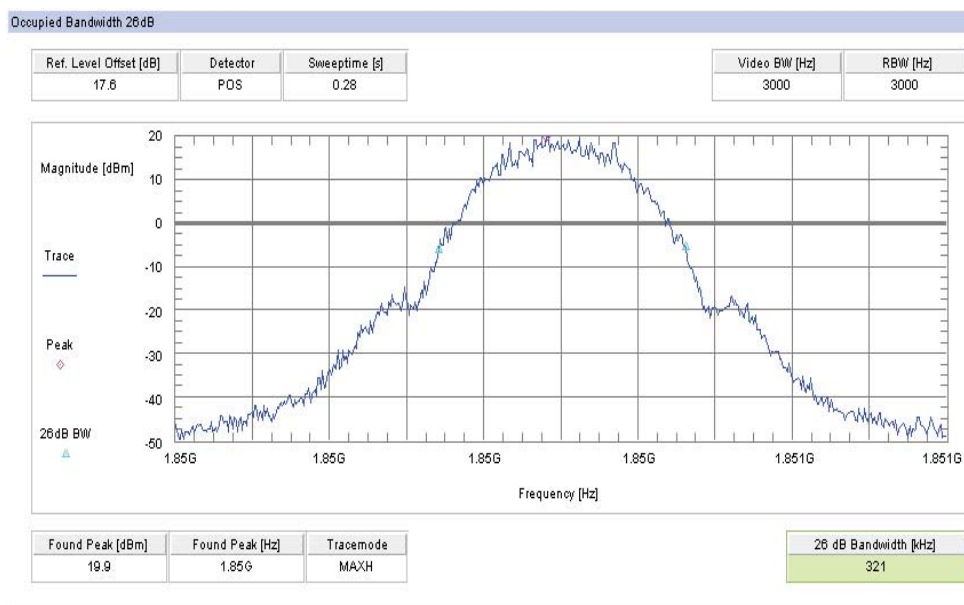
FCC	IC
CFR Part 24.238 CFR Part 2.1049	RSS 133, Issue 5, Section 6.5
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

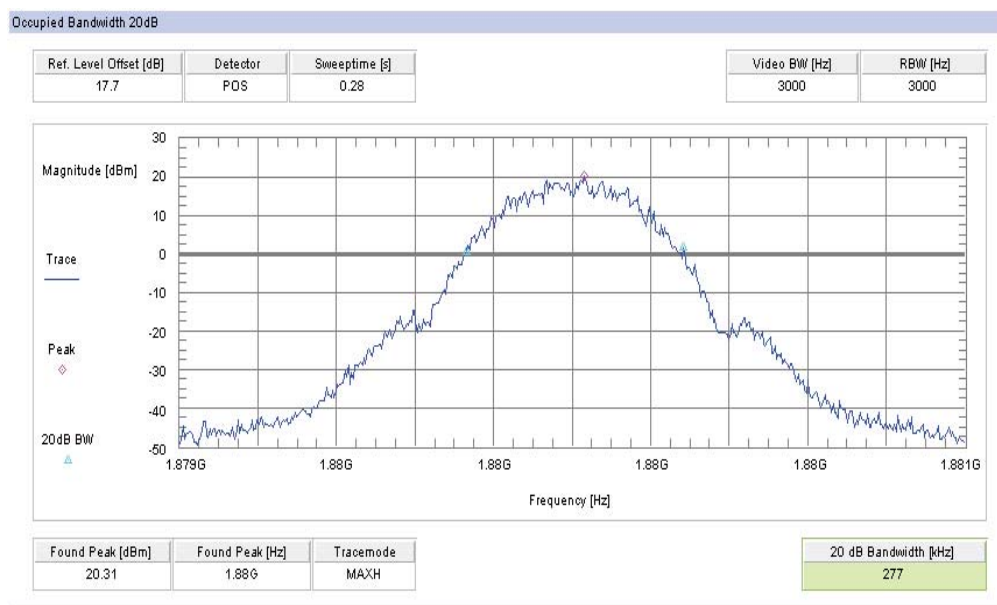
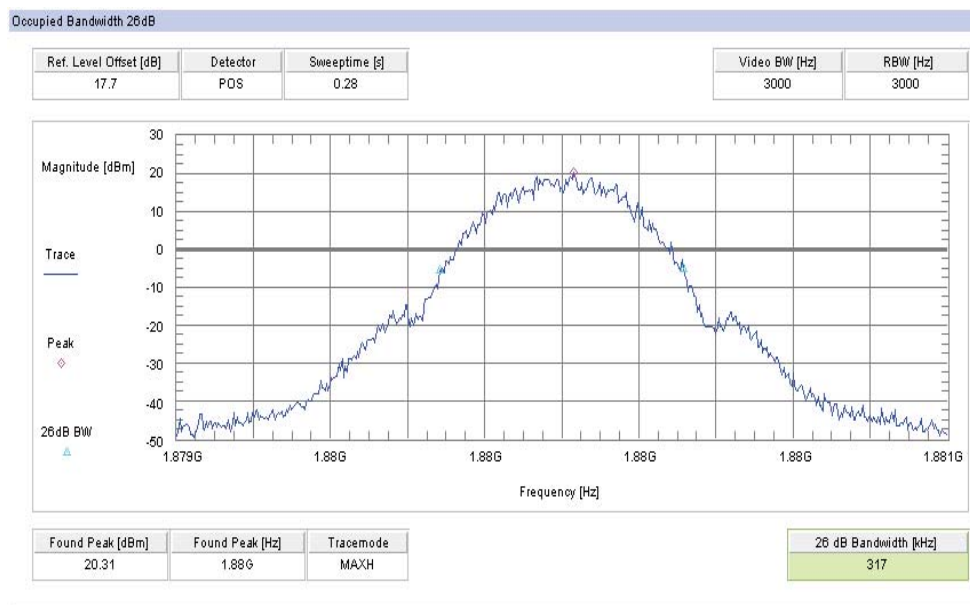
Results:

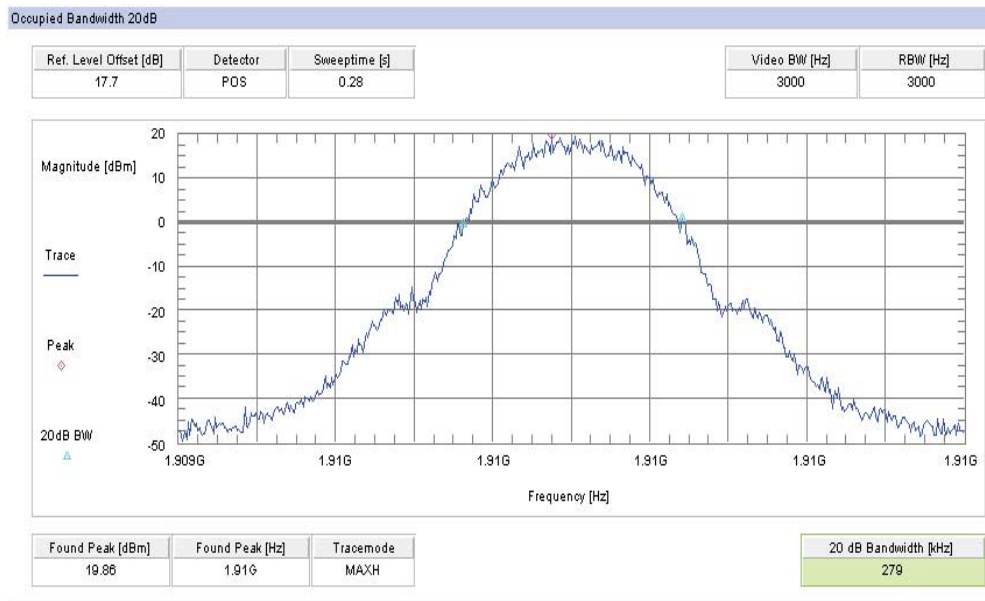
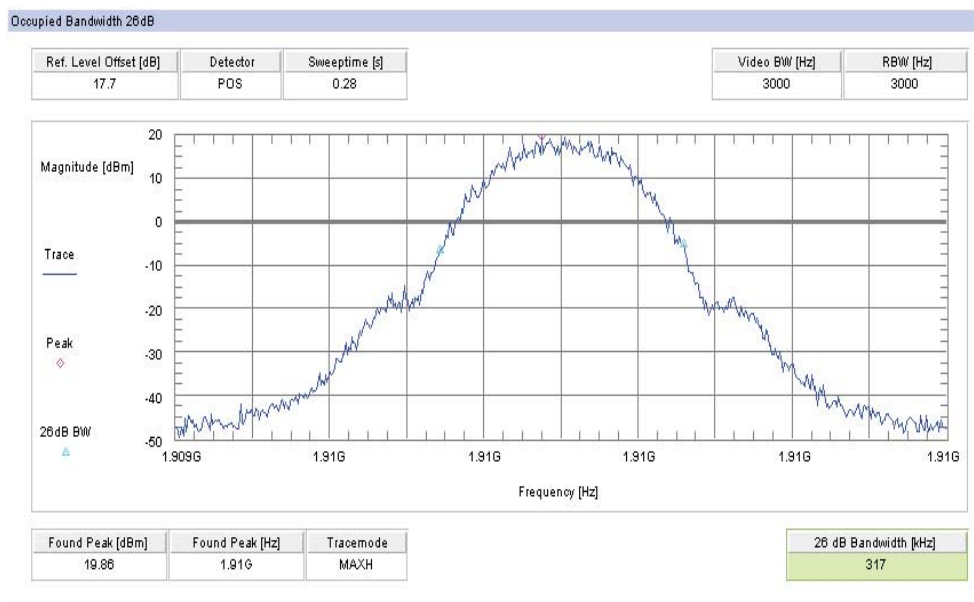
Occupied Bandwidth - GMSK mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
1850.2	283	321
1880.0	277	317
1909.8	279	317
Measurement uncertainty	± 3 kHz	

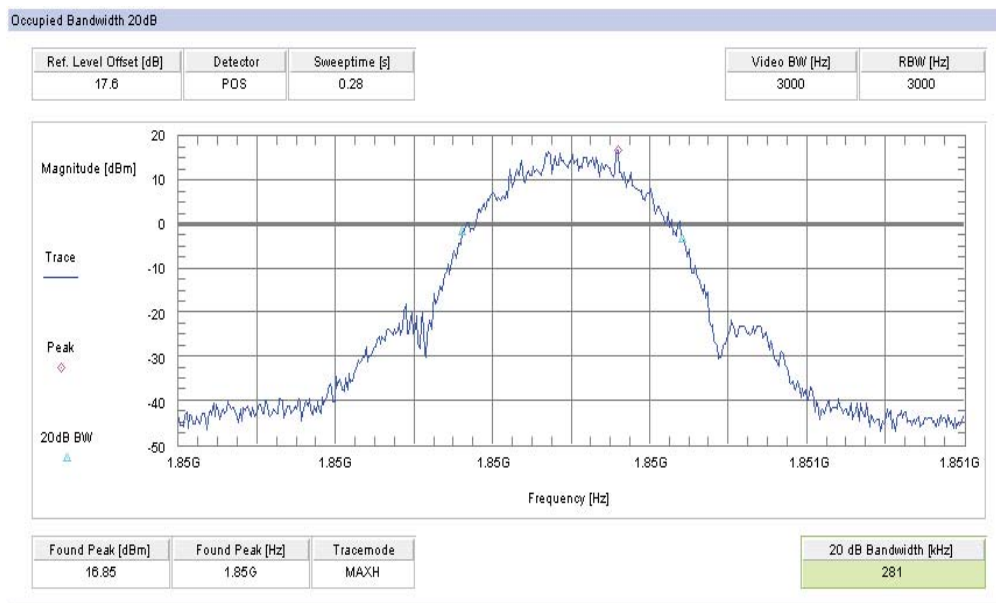
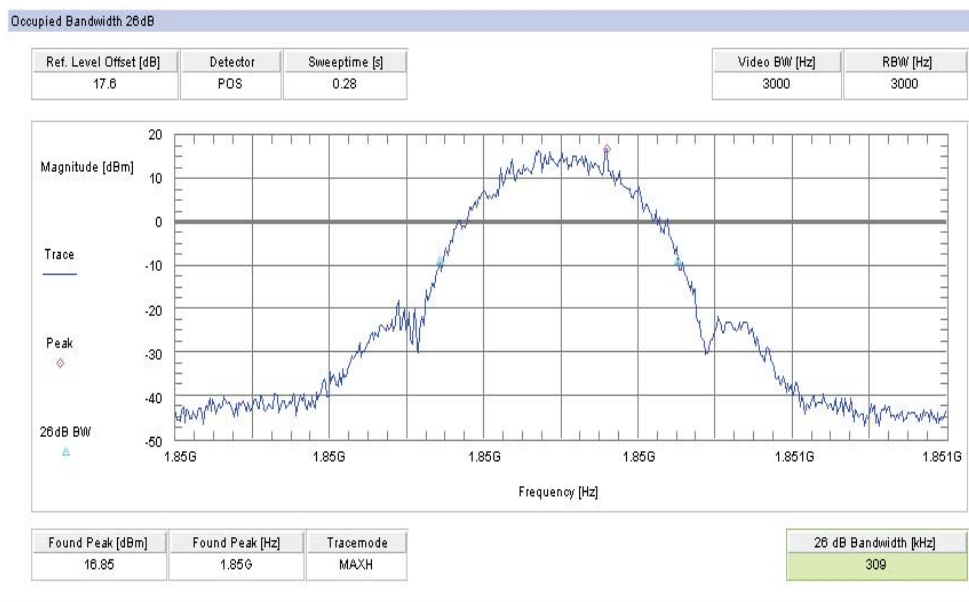
Occupied Bandwidth - EDGE mode		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
1850.2	281	309
1880.0	269	293
1909.8	273	311
Measurement uncertainty	± 3 kHz	

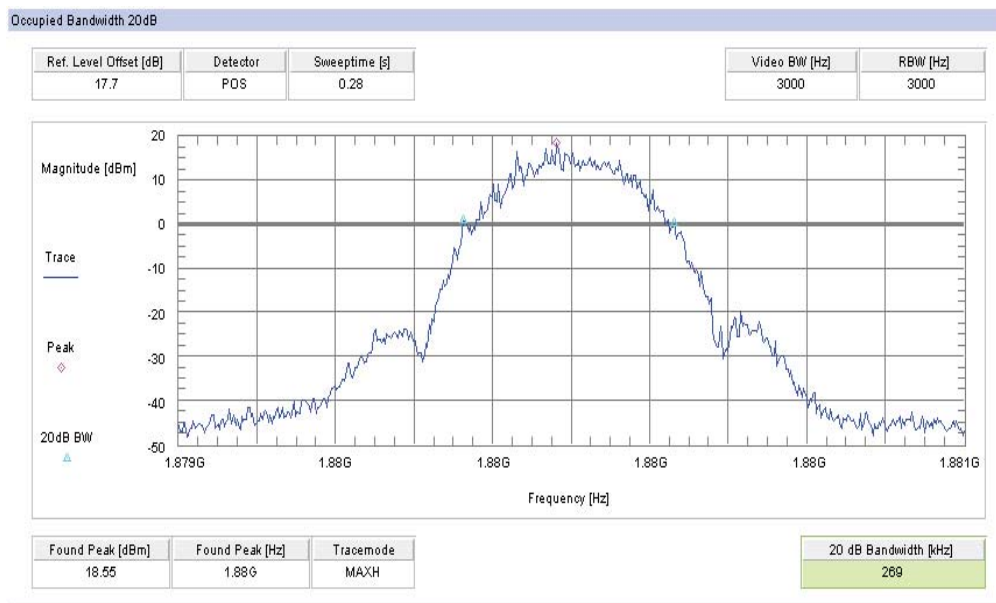
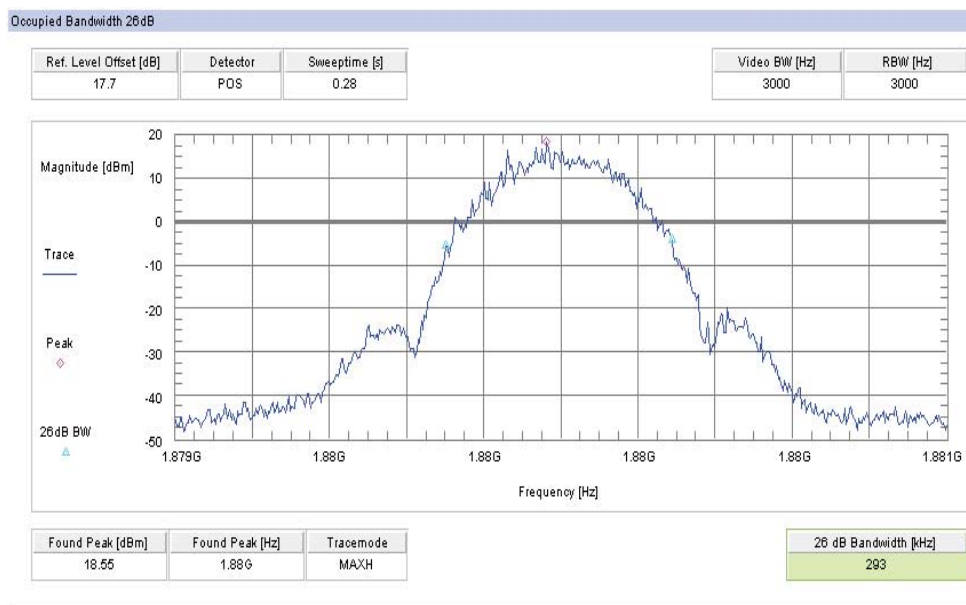
Result: The result of the measurement is passed.

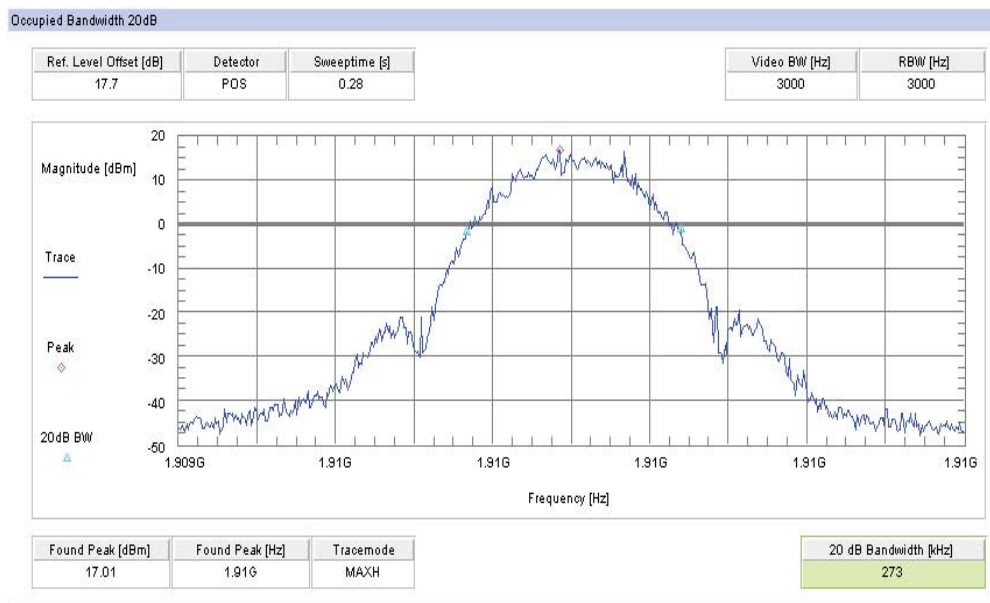
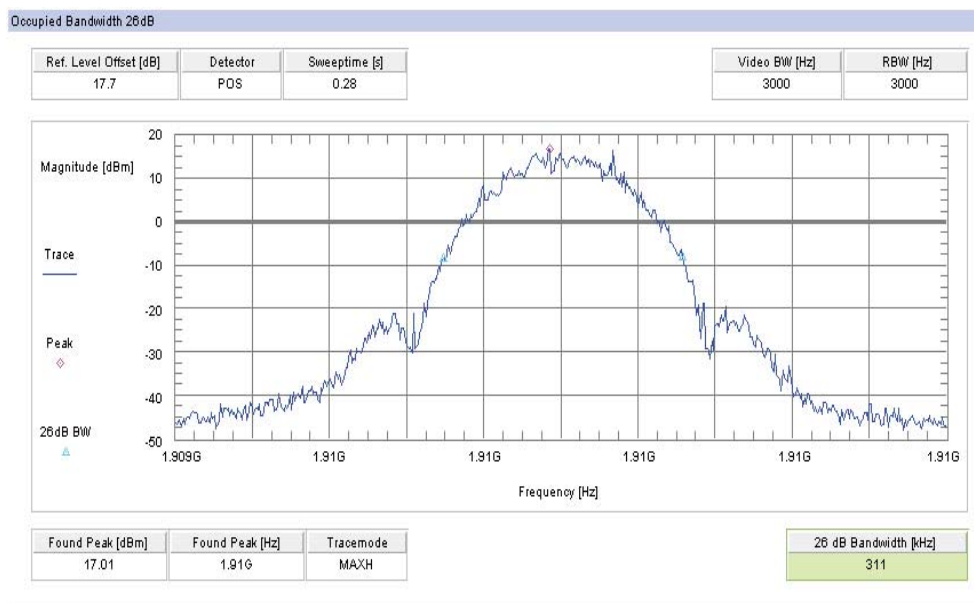
Plot 1: Channel 512 (99% - OBW)**Plot 2: Channel 512 (-26 dBc BW)**

Plot 3: Channel 661 (99% - OBW)**Plot 4: Channel 661 (-26 dBc BW)**

Plot 5: Channel 810 (99% - OBW)**Plot 6: Channel 810 (-26 dBc BW)**

Plot 7: Channel 512 (99% - OBW) - EDGE**Plot 8: Channel 512 (-26 dBc BW) - EDGE**

Plot 9: Channel 661 (99% - OBW) - EDGE**Plot 10: Channel 661 (-26 dBc BW) - EDGE**

Plot 11: Channel 810 (99% - OBW) - EDGE**Plot 12: Channel 810 (-26 dBc BW) - EDGE**

7.5 Results UMTS band II

All UMTS-band measurements are done in WCDMA mode only.

The connection was established with the following setup: WCDMA CS-RMC, Max Power (All Bit up)

7.5.1 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:	Peak and Average
Sweep time:	Auto
Video bandwidth:	10 MHz
Resolution bandwidth:	10 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) WCDMA mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
1852.4	22.70	3.07
1880.0	22.69	3.33
1907.6	22.78	3.07
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) WCDMA mode	
Frequency (MHz)	Average Output Power (dBm) - EIRP
1852.4	23.21
1880.0	23.74
1907.6	23.25
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

7.5.2 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 $\pm 0.5^{\circ}\text{C}$ during the measurement procedure.

Measurement:

Measurement parameters	
Detector:	Measured with CMU200
Sweep time:	
Video bandwidth:	
Resolution bandwidth:	
Span:	
Trace-Mode:	

Limits:

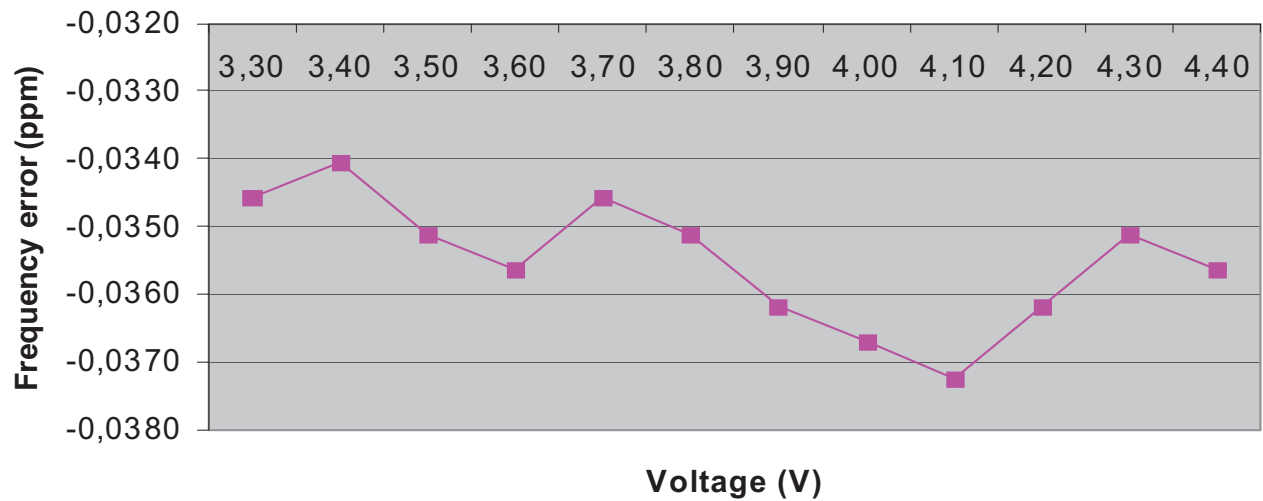
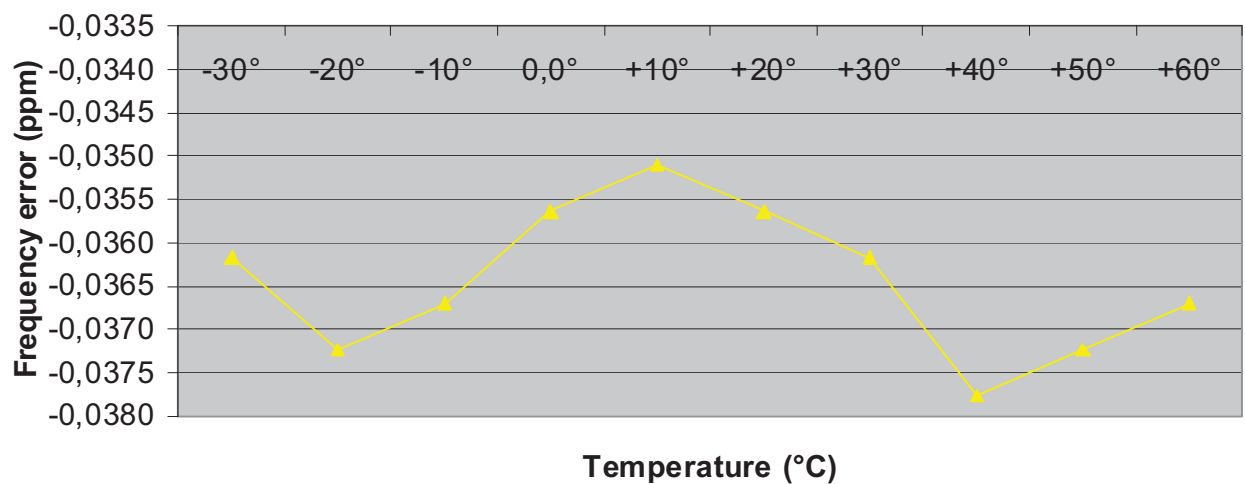
FCC	IC
CFR Part 24.235 CFR Part 2.1055	RSS 133, Issue 5, Section 6.3
Frequency Stability	
± 0.1 ppm	

Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.0	-65	-0,00000346	-0,0346
3.1	-64	-0,00000340	-0,0340
3.2	-66	-0,00000351	-0,0351
3.3	-67	-0,00000356	-0,0356
3.4	-65	-0,00000346	-0,0346
3.5	-66	-0,00000351	-0,0351
3.6	-68	-0,00000362	-0,0362
3.7	-69	-0,00000367	-0,0367
3.8	-70	-0,00000372	-0,0372
3.9	-68	-0,00000362	-0,0362
4.0	-66	-0,00000351	-0,0351
4.1	-67	-0,00000356	-0,0356

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-68	-0,00000362	-0,0362
-20	-70	-0,00000372	-0,0372
-10	-69	-0,00000367	-0,0367
± 0	-67	-0,00000356	-0,0356
10	-66	-0,00000351	-0,0351
20	-67	-0,00000356	-0,0356
30	-68	-0,00000362	-0,0362
40	-71	-0,00000378	-0,0378
50	-70	-0,00000372	-0,0372
60	-69	-0,00000367	-0,0367

Frequency Error vs. Voltage**Frequency Error vs. Temperature**

Result: The result of the measurement is passed.

7.5.3 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:

- The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- The antenna output was terminated in a 50 ohm load (if possible).
- A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- 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.
- Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603 .

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	2 sec.
Video bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Resolution bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
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.

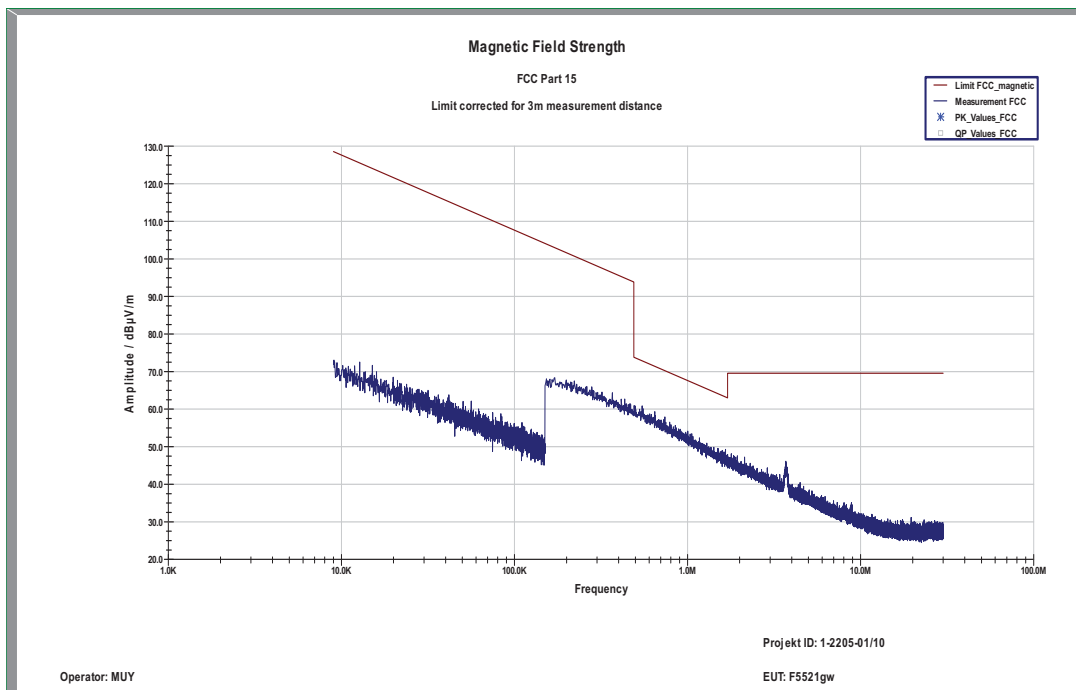
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked too. The found values are stated in the table below.

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	-	2	3760.0	-	2	3815.2	-
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			

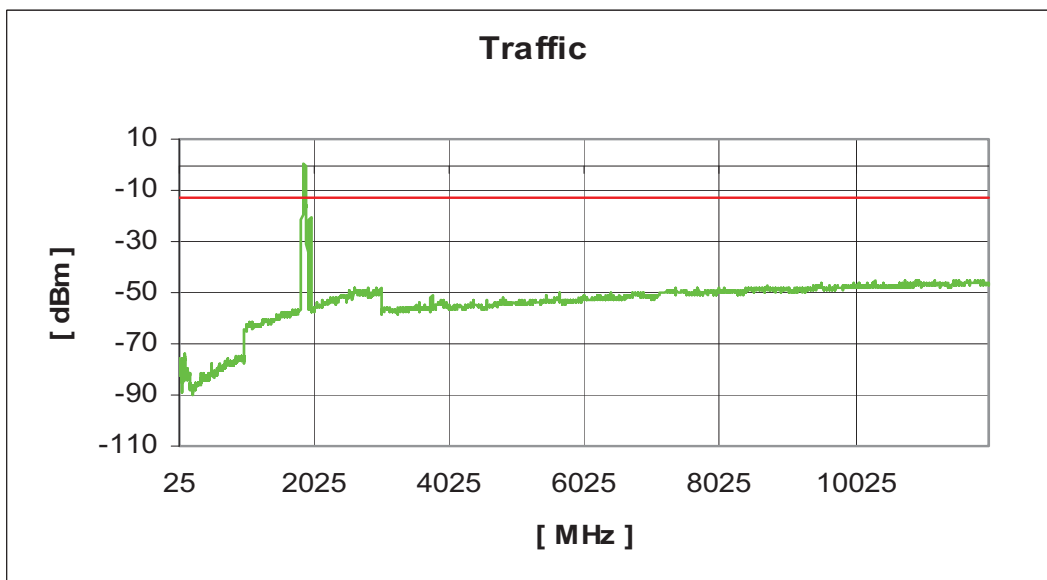
As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

Result: The result of the measurement is passed.

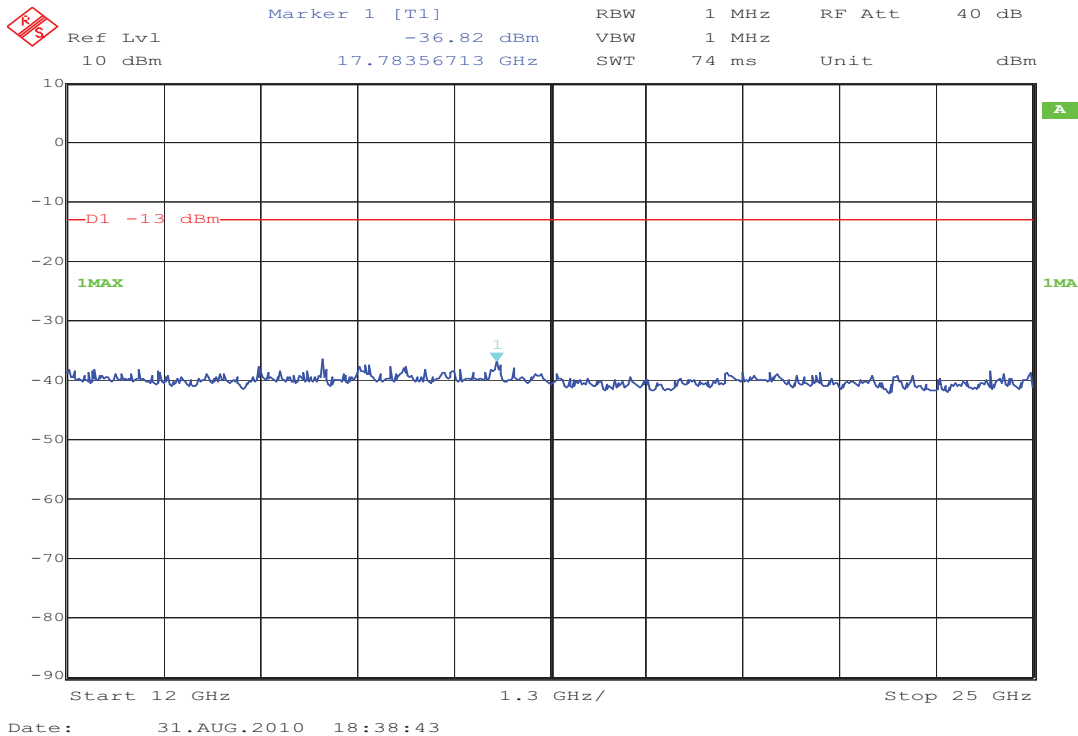
Plot 1: Channel 9400 (Traffic mode up to 30 MHz)



Plot 2: Channel 9400 (30 MHz – 12.75 GHz)



Plot 3: Channel 9400 (12 GHz - 25 GHz)



7.5.4 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:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Resolution bandwidth:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Span:	30 MHz – 25 GHz
Trace-Mode:	Max Hold

Limits:

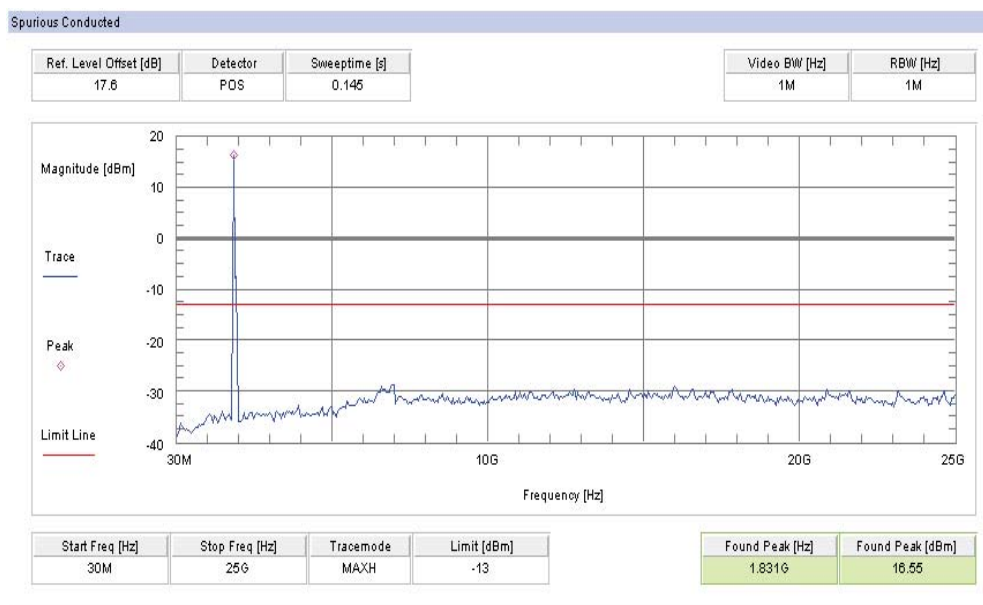
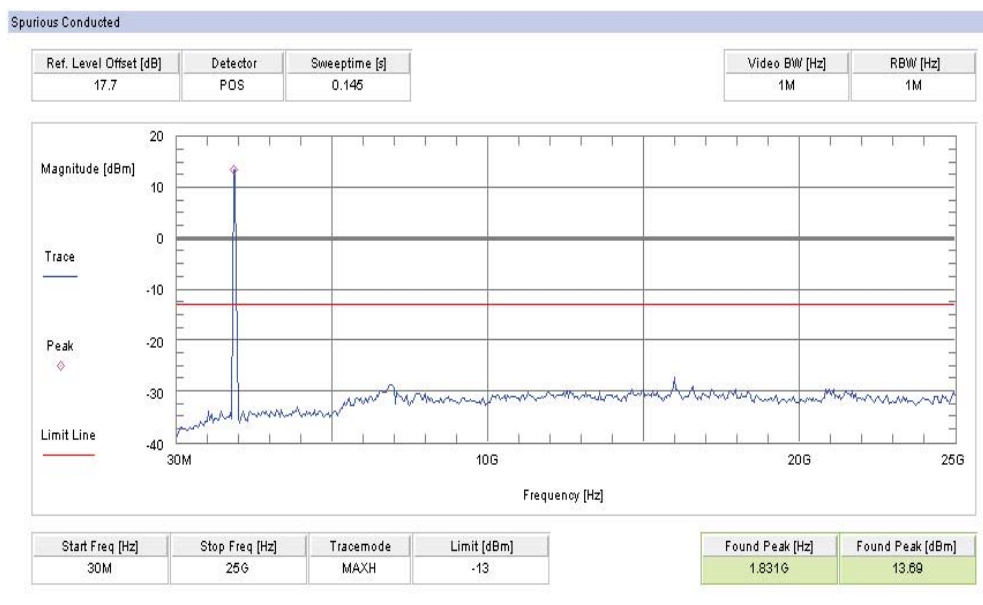
FCC	IC
CFR Part 24.238 CFR Part 2.1051	RSS 133, Issue 5, Section 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

Results:

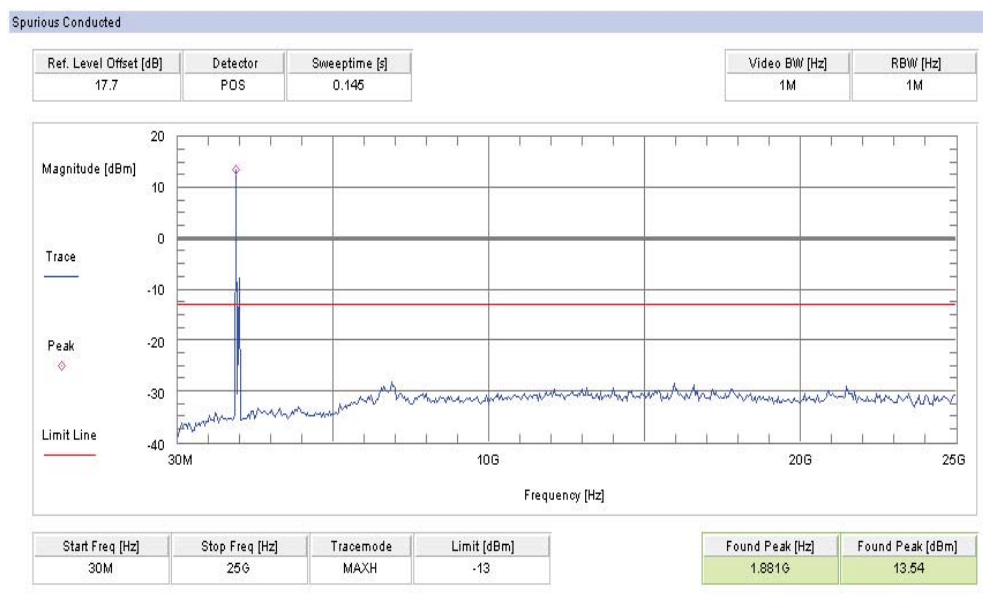
Spurious Emission Level (dBm)								
Harmonic	Ch. 9262 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 9400 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 9538 Freq. (MHz)	Level [dBm]
2	3704.8	-	2	3760.0	-	2	3815.2	-
3	5557.2	-	3	5640.0	-	3	5722.8	-
4	7409.6	-	4	7520.0	-	4	7630.4	-
5	9262.0	-	5	9400.0	-	5	9538.0	-
6	11114.4	-	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			

As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

Result: The result of the measurement is passed.

Plot 1: Channel 9262 (10 MHz - 25 GHz)**Plot 2: Channel 9400 (10 MHz - 25 GHz)**

Plot 3: Channel 9538 (10 MHz - 25 GHz)



7.5.5 Block edge compliance

Description:

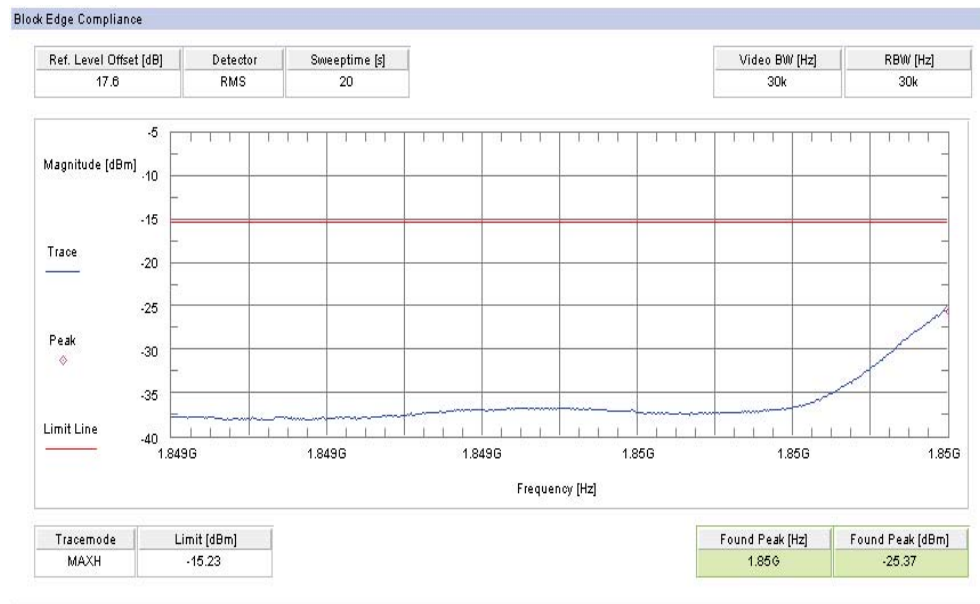
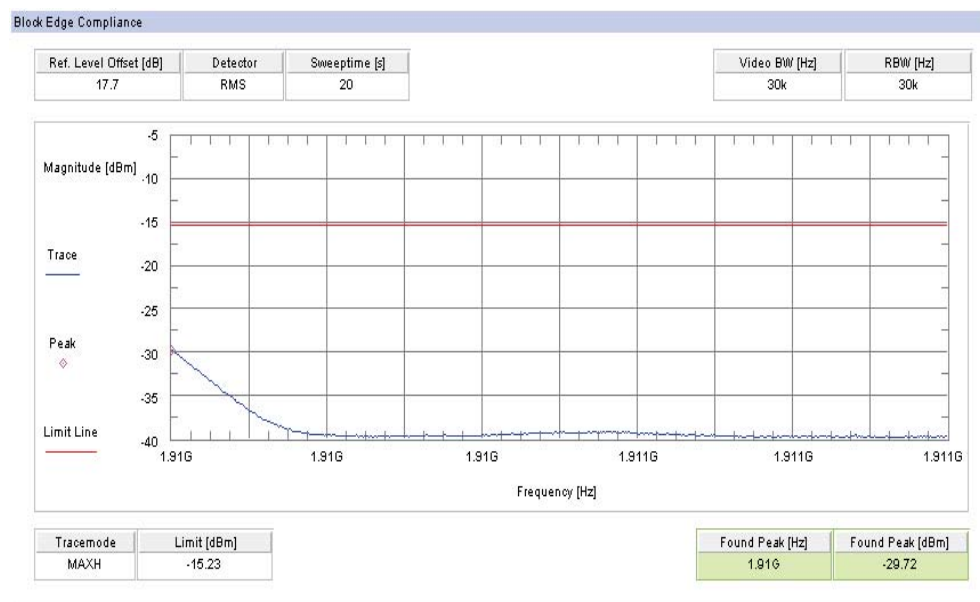
The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

Measurement parameters	
Detector:	RMS
Sweep time:	20 sec.
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 [$10 \log(30 \text{ kHz} / 50 \text{ kHz}) = -2.2185$]. 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.

7.5.6 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:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	6 MHz
Trace-Mode:	Max Hold

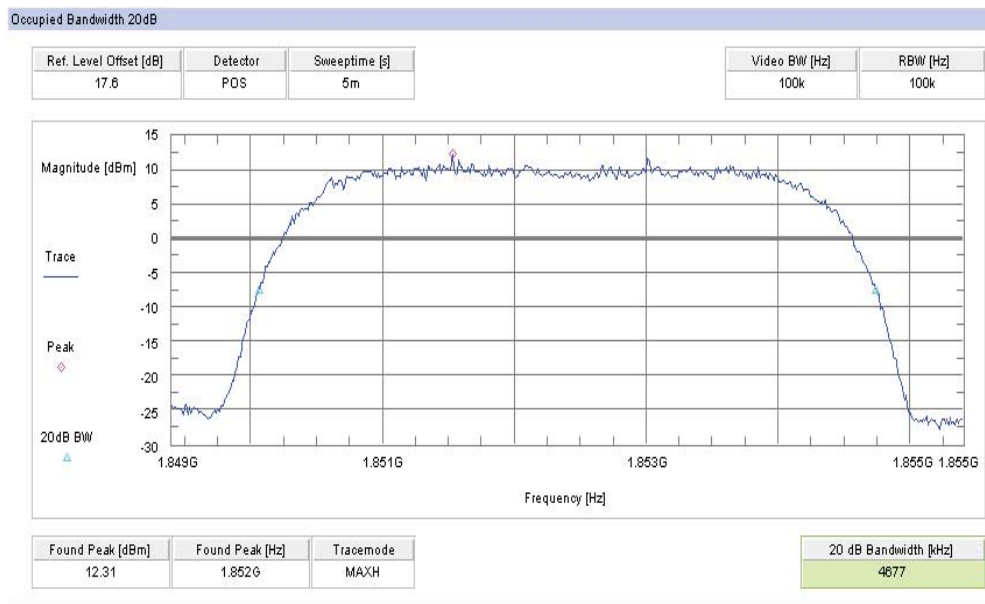
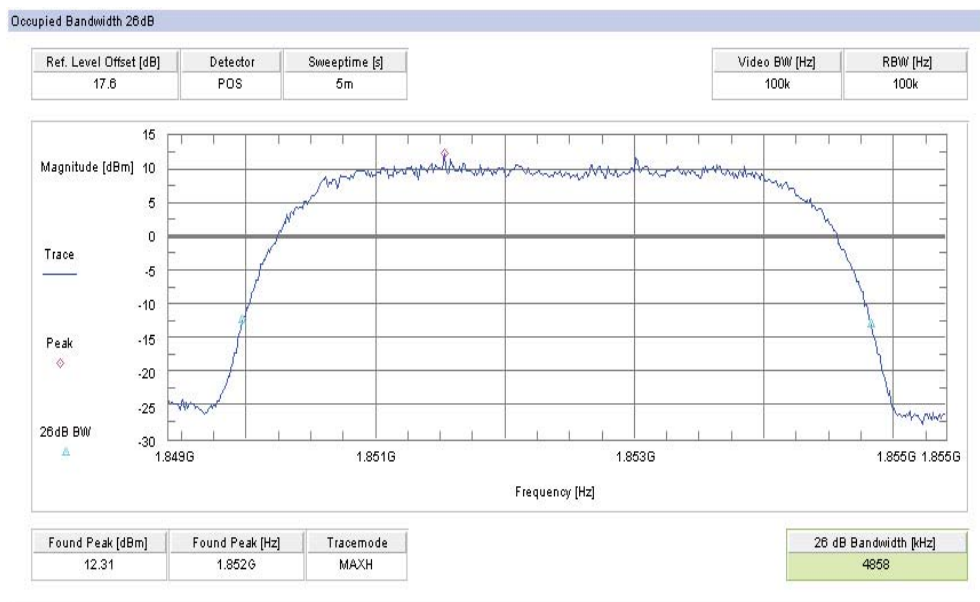
Limits:

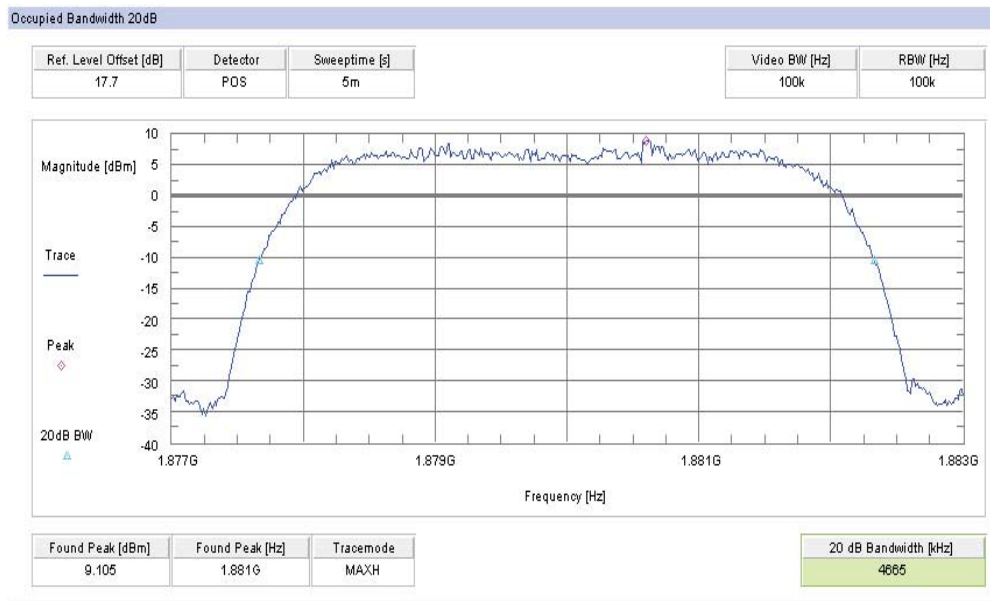
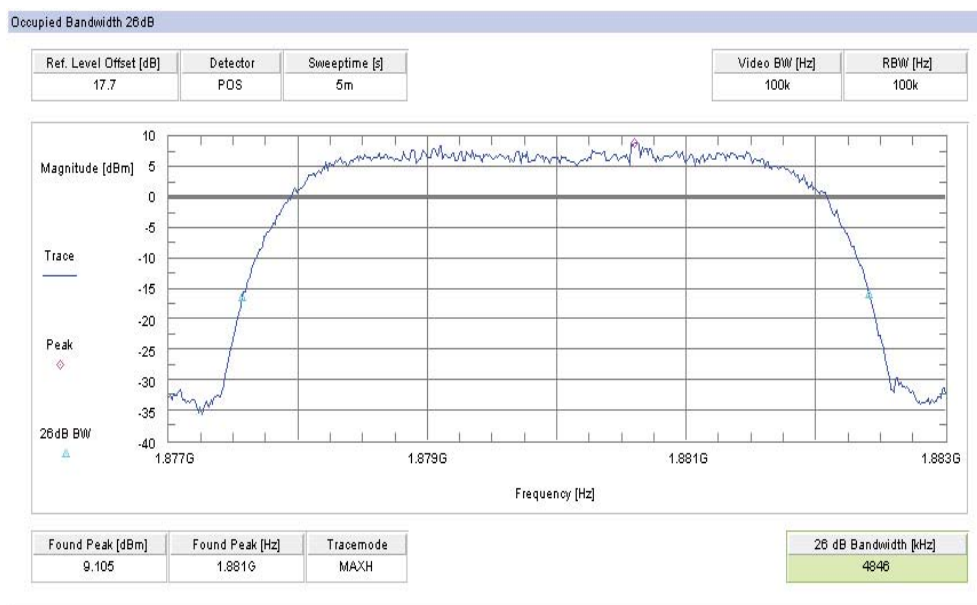
FCC	IC
CFR Part 24.238 CFR Part 2.1049	RSS 133, Issue 5, Section 6.5
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

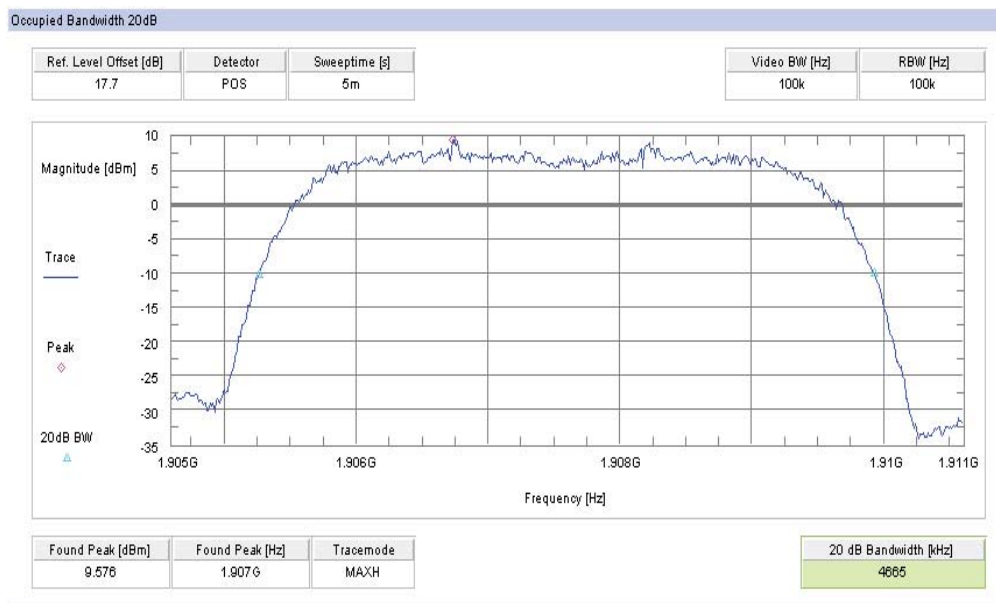
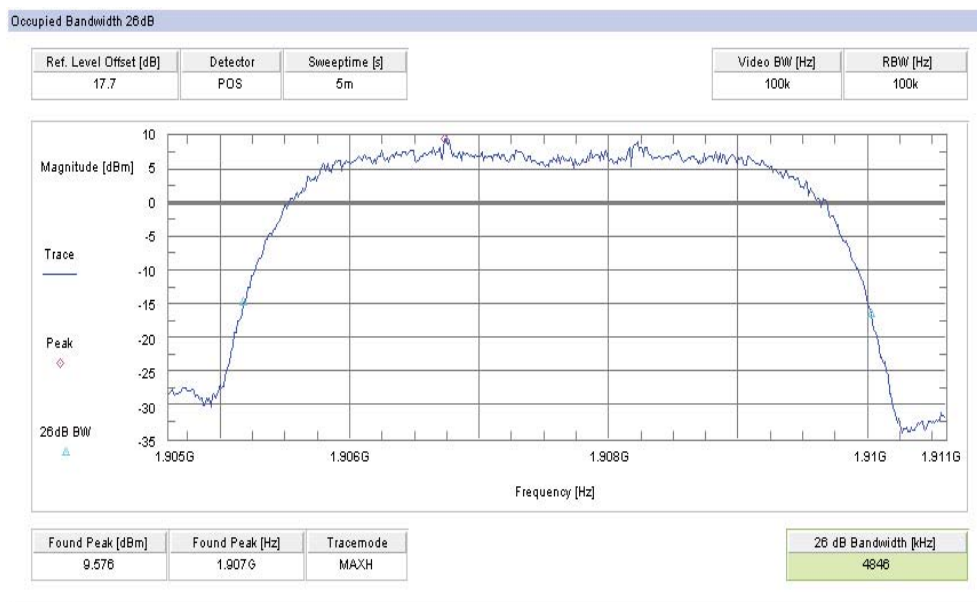
Results:

Occupied Bandwidth		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
1852.4	4677	4858
1880.0	4665	4846
1907.6	4665	4846
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)**

7.6 Results UMTS band V

All UMTS-band measurements are done in WCDMA mode only.

The connection was established with the following setup: WCDMA CS-RMC, Max Power (All Bit up)

7.6.1 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:	Peak and Average
Sweep time:	Auto
Video bandwidth:	10 MHz
Resolution bandwidth:	10 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) WCDMA mode		
Frequency (MHz)	Average Output Power (dBm)	Peak to Average Ratio (dB)
826.4	23.80	2.85
836.0	23.73	2.97
846.6	23.95	2.90
Measurement uncertainty	± 0.5 dB	

Output Power (radiated) WCDMA mode	
Frequency (MHz)	Average Output Power (dBm) - ERP
826.4	24.31
836.0	24.78
846.6	24.42
Measurement uncertainty	± 2.0 dB

Result: The result of the measurement is passed.

7.6.2 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 $\pm 0.5^{\circ}\text{C}$ during the measurement procedure.

Measurement:

Measurement parameters	
Detector:	Measured with CMU200
Sweep time:	
Video bandwidth:	
Resolution bandwidth:	
Span:	
Trace-Mode:	

Limits:

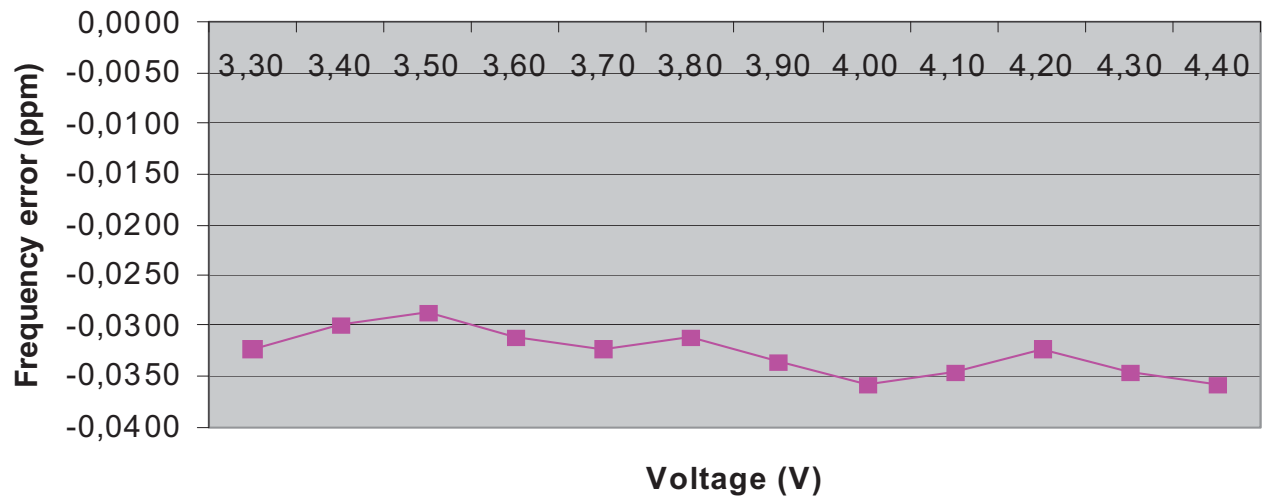
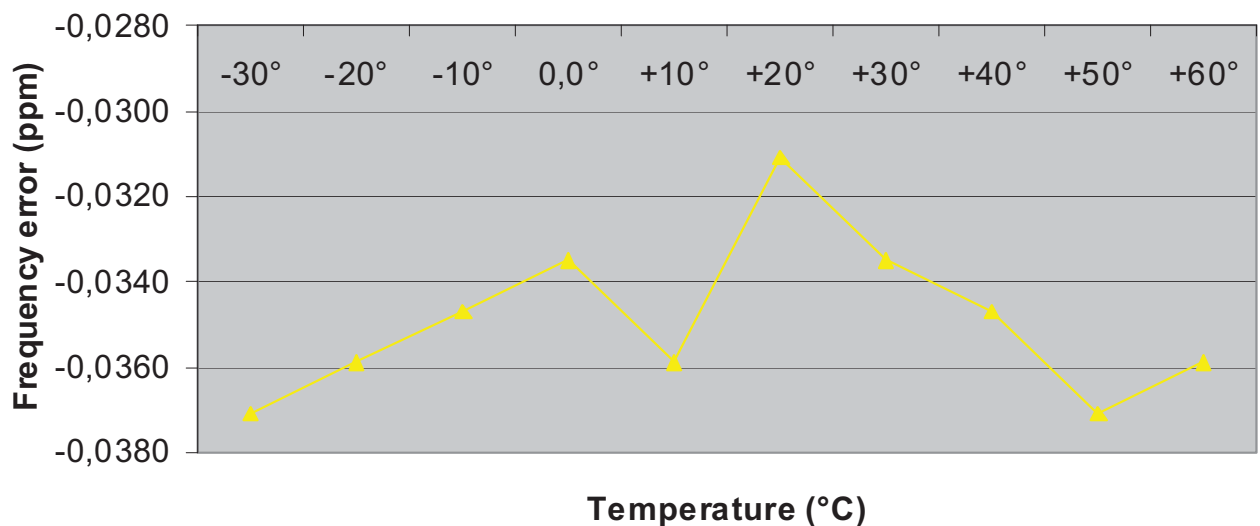
FCC	IC
CFR Part 22.355 CFR Part 2.1055	RSS 132, Issue 2, Section 4.3 and 6.3
Frequency Stability	
$\pm 0.1 \text{ ppm}$	

Results:**AFC FREQ ERROR versus VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.0	-27	-0,00000323	-0,0323
3.1	-25	-0,00000299	-0,0299
3.2	-24	-0,00000287	-0,0287
3.3	-26	-0,00000311	-0,0311
3.4	-27	-0,00000323	-0,0323
3.5	-26	-0,00000311	-0,0311
3.6	-28	-0,00000335	-0,0335
3.7	-30	-0,00000359	-0,0359
3.8	-29	-0,00000347	-0,0347
3.9	-27	-0,00000323	-0,0323
4.0	-29	-0,00000347	-0,0347
4.1	-30	-0,00000359	-0,0359

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-31	-0,00000371	-0,0371
-20	-30	-0,00000359	-0,0359
-10	-29	-0,00000347	-0,0347
± 0	-28	-0,00000335	-0,0335
10	-30	-0,00000359	-0,0359
20	-26	-0,00000311	-0,0311
30	-28	-0,00000335	-0,0335
40	-29	-0,00000347	-0,0347
50	-31	-0,00000371	-0,0371
60	-30	-0,00000359	-0,0359

Frequency Error vs. Voltage**Frequency Error vs. Temperature**

Result: The result of the measurement is passed.

7.6.3 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:

- The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- The antenna output was terminated in a 50 ohm load (if possible).
- A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- 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.
- Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603 .

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	2 sec.
Video bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Resolution bandwidth:	Below 1 GHz: 120 kHz Above 1 GHz: 1 MHz
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.

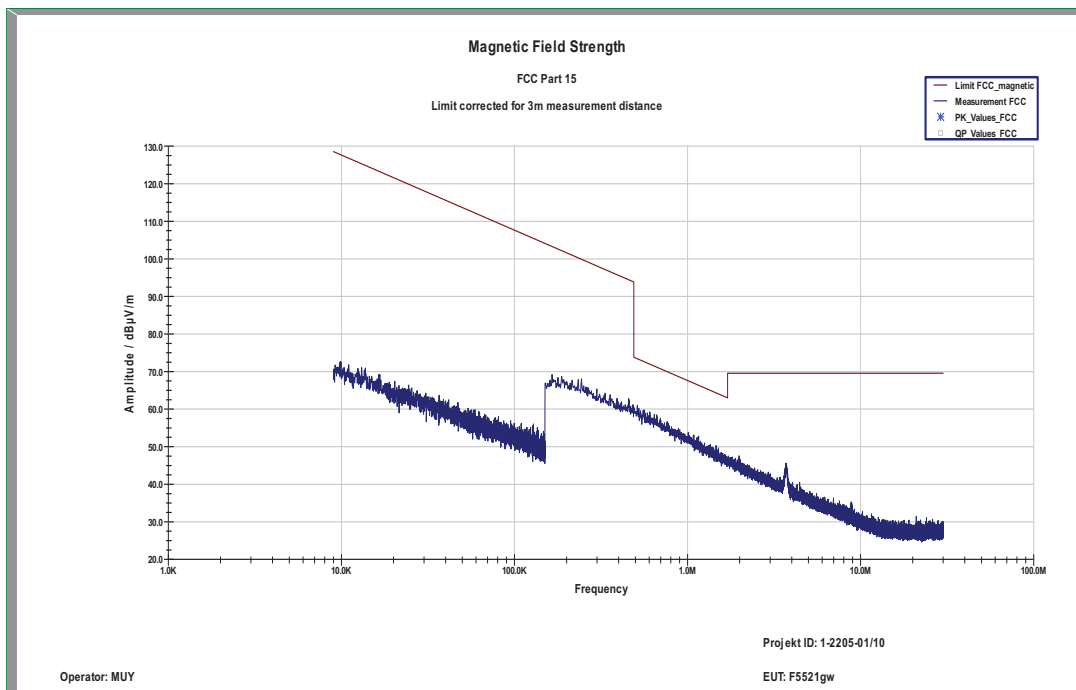
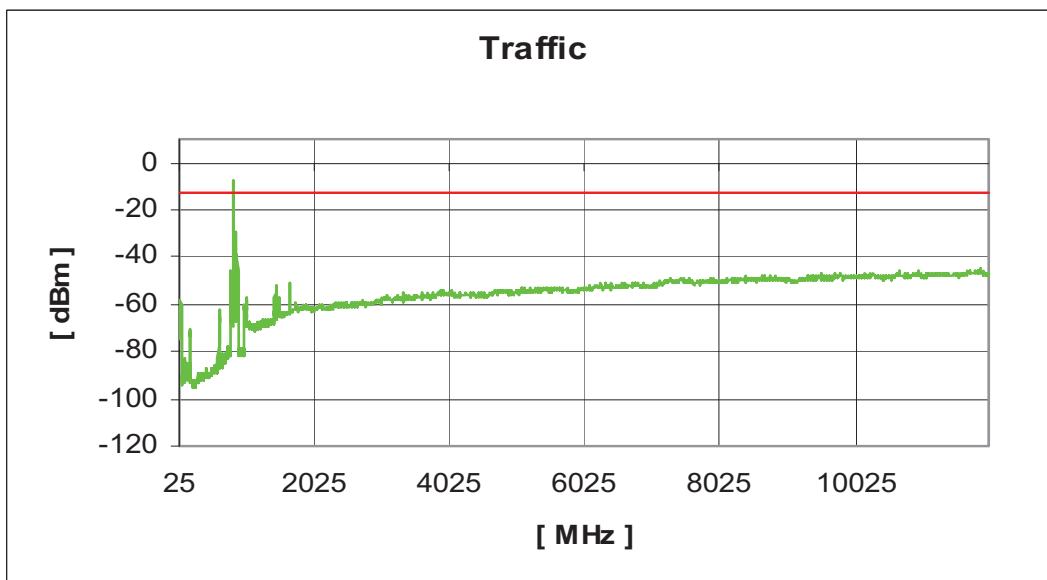
All measurements were done in horizontal and vertical polarization; the plots show the worst case.

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.

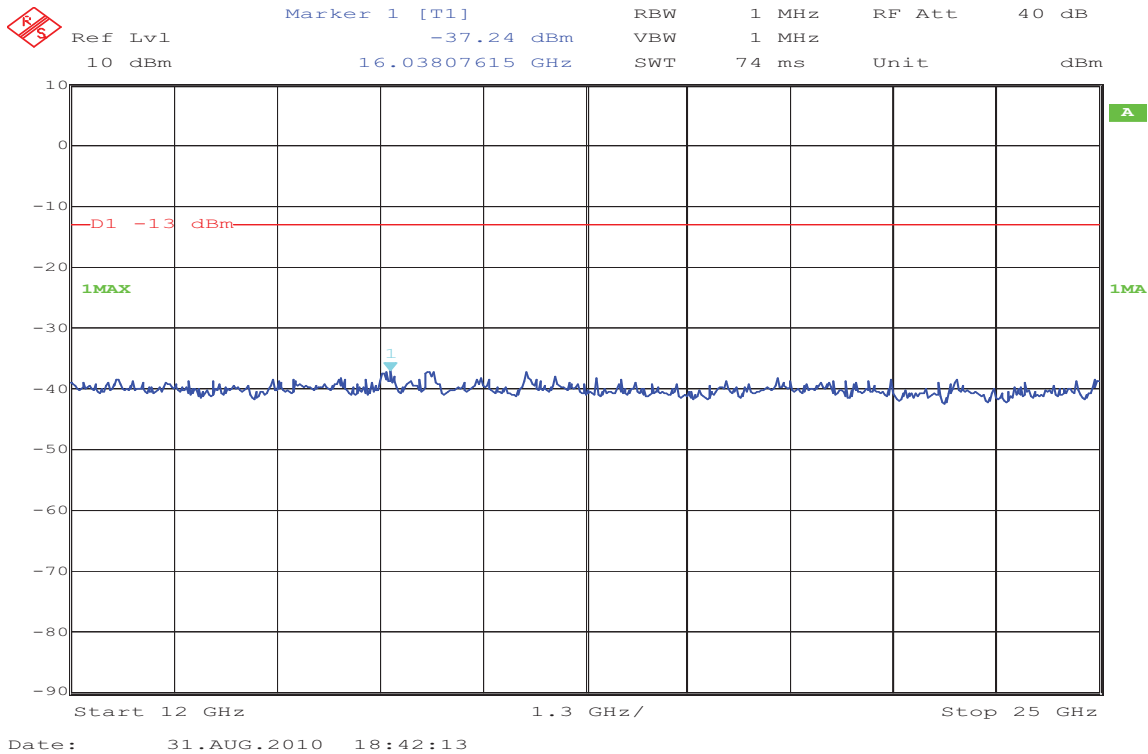
Spurious Emission Level (dBm)								
Harmonic	Ch. 4132 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 4180 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 4233 Freq. (MHz)	Level [dBm]
2	1652.8	-	2	1672.0	-	2	1693.2	-
3	2479.2	-	3	2508.0	-	3	2539.8	-
4	3305.6	-	4	3344.0	-	4	3386.4	-
5	4132.0	-	5	4180.0	-	5	4233.0	-
6	4958.4	-	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			

As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

Result: The result of the measurement is passed.

Plot 1: Channel 4180 (Traffic mode up to 30 MHz)**Plot 2: Channel 4180 (30 MHz – 12.75 GHz)**

Plot 3: Channel 4180 (12.75 GHz – 25 GHz)



7.6.4 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:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Resolution bandwidth:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Span:	30 MHz – 25 GHz
Trace-Mode:	Max Hold

Limits:

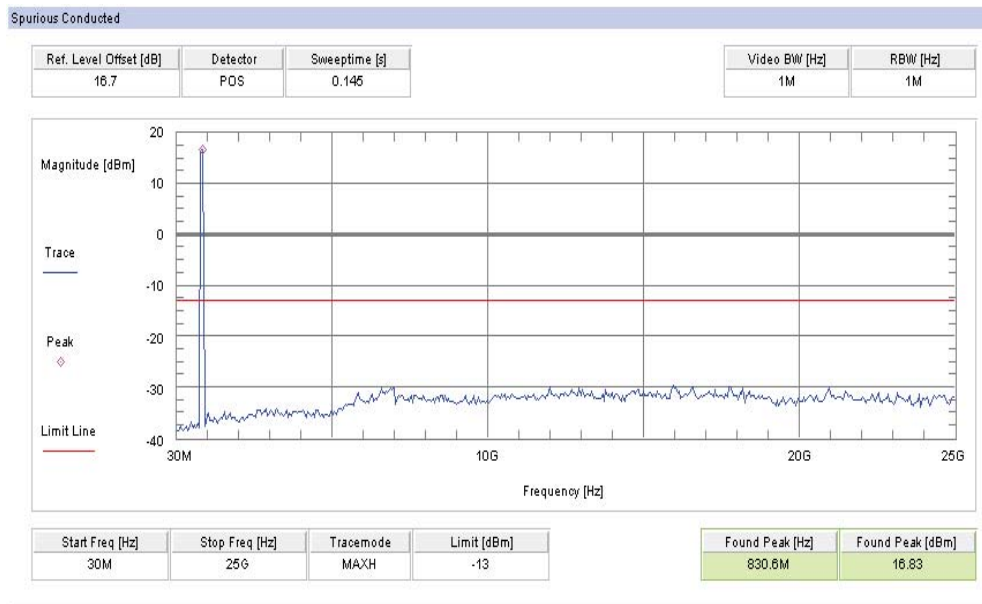
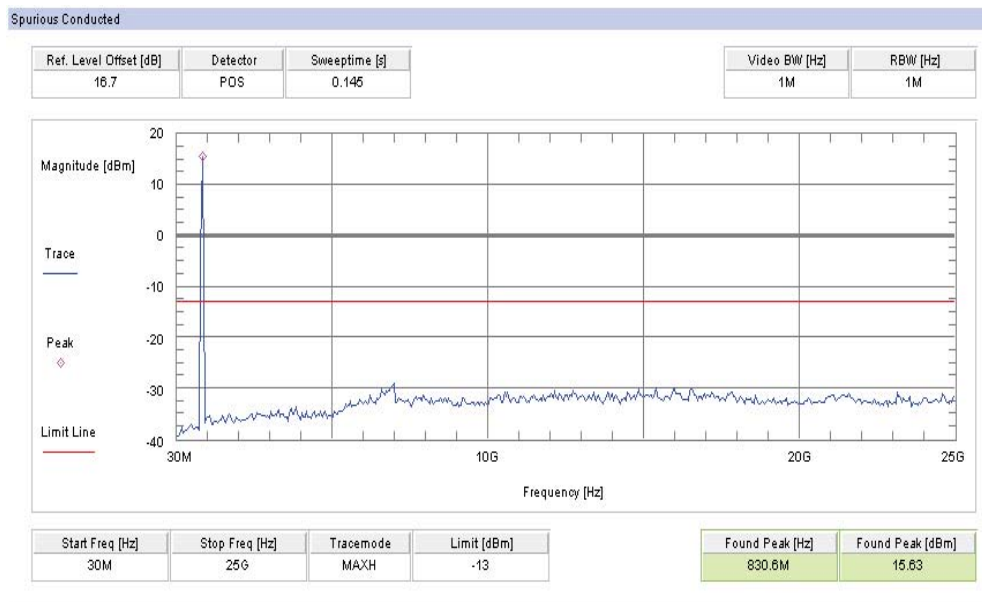
FCC	IC
CFR Part 22.917 CFR Part 2.1051	RSS 132, Issue 2, Section 4.5 and 6.5
Spurious Emissions Conducted	
Attenuation $\geq 43 + 10\log(P)$ (P, Power in Watts)	
-13 dBm	

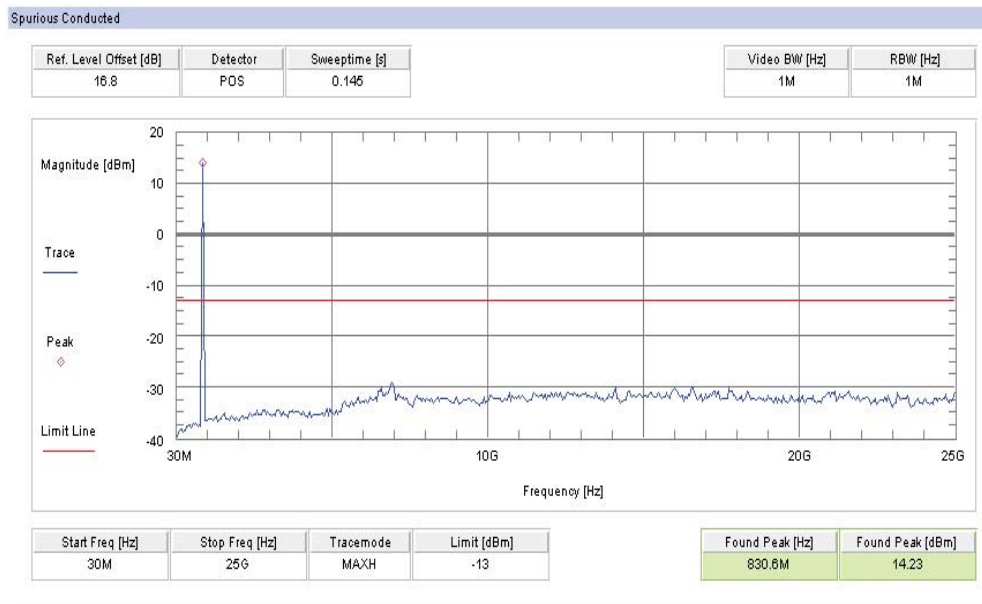
Results:

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	-	2	1672.0	-	2	1693.2	-
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			

As can be seen from this data, the emissions from the test item were not critical and within the specification limit.

Result: The result of the measurement is passed.

Plot 1: Channel 4132 (10 MHz - 25 GHz)**Plot 2: Channel 4180 (10 MHz - 25 GHz)**

Plot 3: Channel 4233 (10 MHz - 25 GHz)

7.6.5 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 sec.
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	
Part 22.917 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."	
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:	
"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."	
When using a 30 kHz bandwidth, this yields a -2.2185 adjustment to the limit [$10 \log(30\text{kHz}/50\text{kHz}) = -2.2185$]. When this adjustment is applied to the limit, the limit becomes -15.2185.	
-15.22 dBm	

Results:**Plot 1: Channel 4132****Plot 2: Channel 4233**

Result: The result of the measurement is passed.

7.6.6 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:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	6 MHz
Trace-Mode:	Max Hold

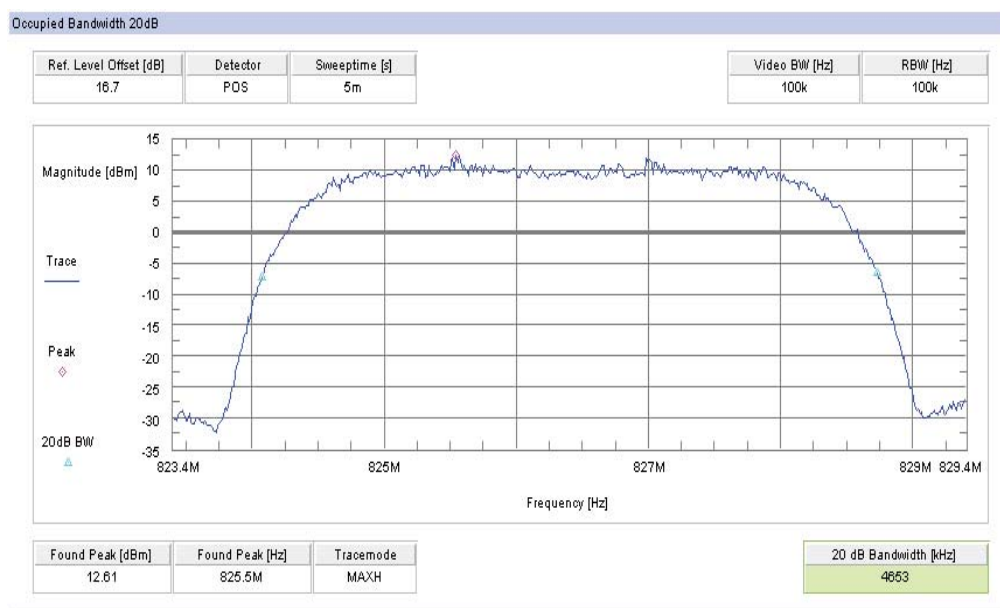
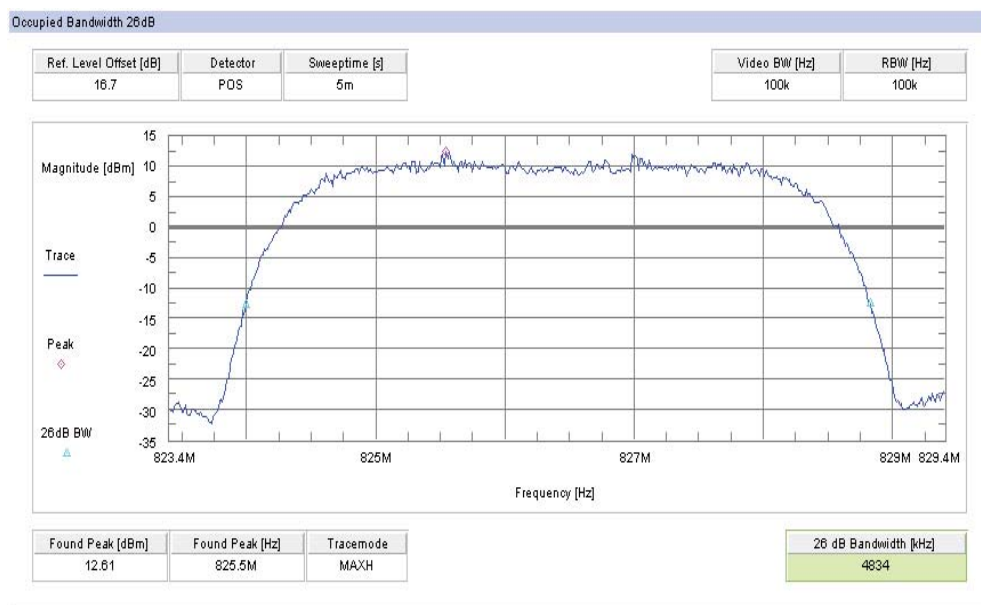
Limits:

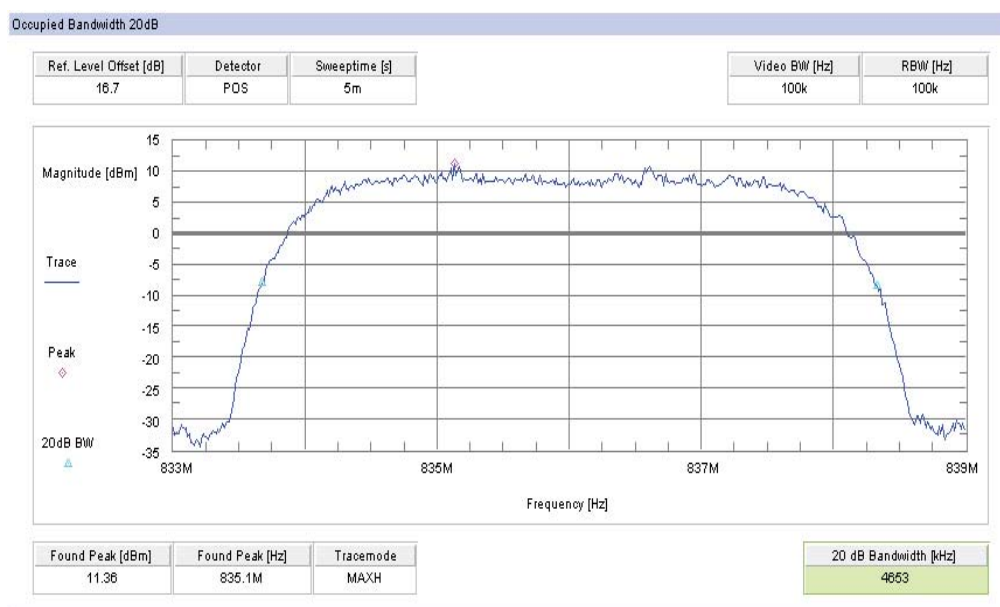
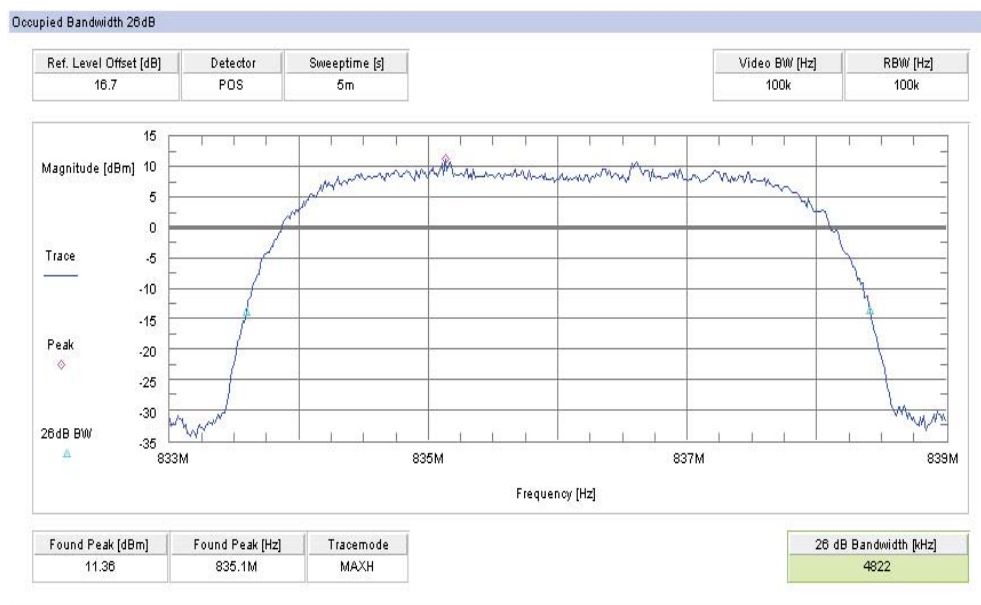
FCC	IC
CFR Part 22.917 CFR Part 2.1049	RSS 132, Issue 2, Section 4.5.1
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

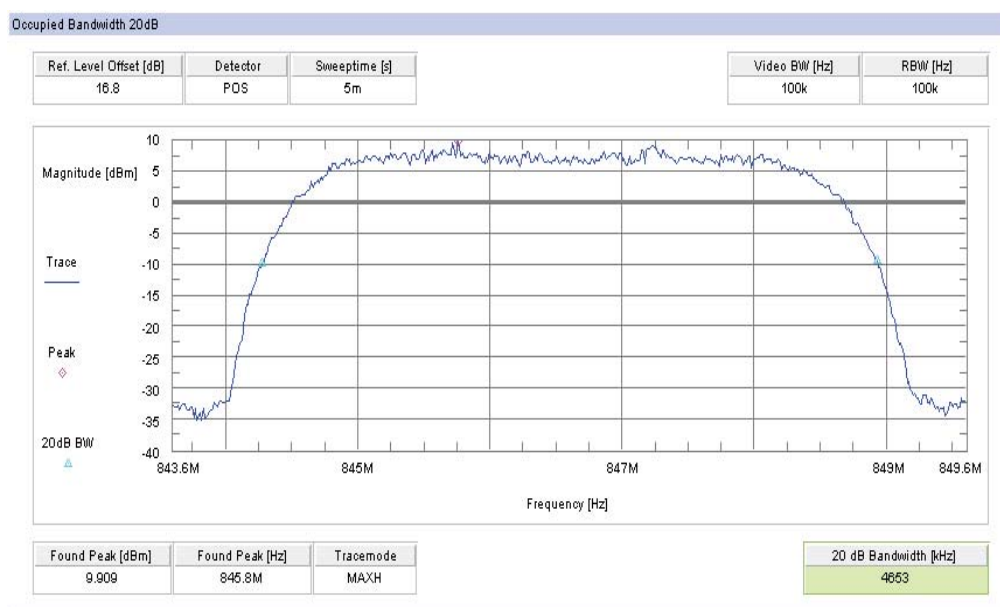
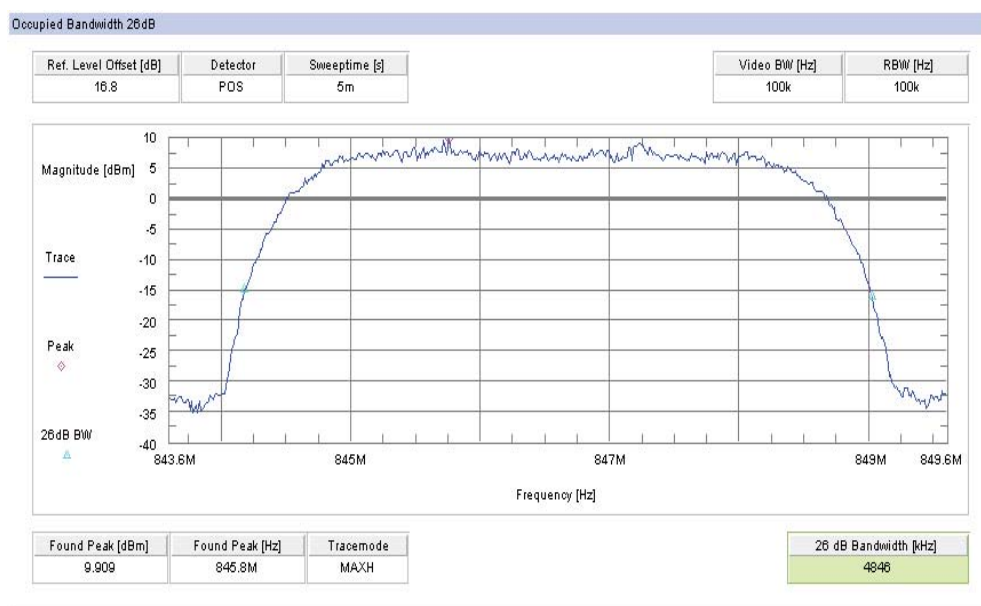
Results:

Occupied Bandwidth		
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)
826.4	4653	4834
836.0	4653	4822
846.6	4653	4846
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)**

7.7 Results receiver mode

7.7.1 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:	Below 1 GHz Peak / QuasiPeak Above 1 GHz Peak / Average
Sweep time:	2 sec
Video bandwidth:	Below 1 GHz 100 kHz Above 1 GHz 1 MHz
Resolution bandwidth:	1 MHz
Span:	100 MHz Steps
Trace-Mode:	Max Hold

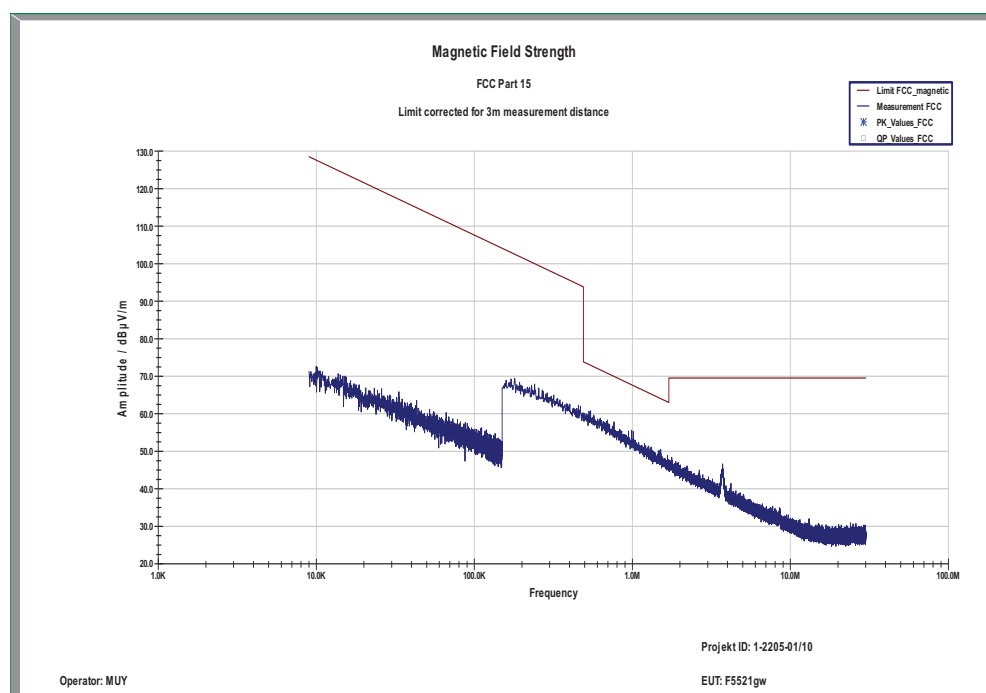
Limits:

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:

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
31.557900	15.2	15000.000	120.000	198.0	V	224.0	12.7	14.8	30.0
39.801450	16.3	15000.000	120.000	126.0	V	356.0	13.4	13.7	30.0
87.494250	14.5	15000.000	120.000	135.0	V	143.0	10.2	15.5	30.0
124.896300	16.2	15000.000	120.000	98.0	V	323.0	9.8	17.3	33.5
161.878650	21.8	15000.000	120.000	98.0	V	276.0	9.3	11.7	33.5
177.195600	18.1	15000.000	120.000	98.0	V	245.0	10.3	15.4	33.5

Result: The result of the measurement is passed.

Plot 1: Receiver mode up to 30 MHz

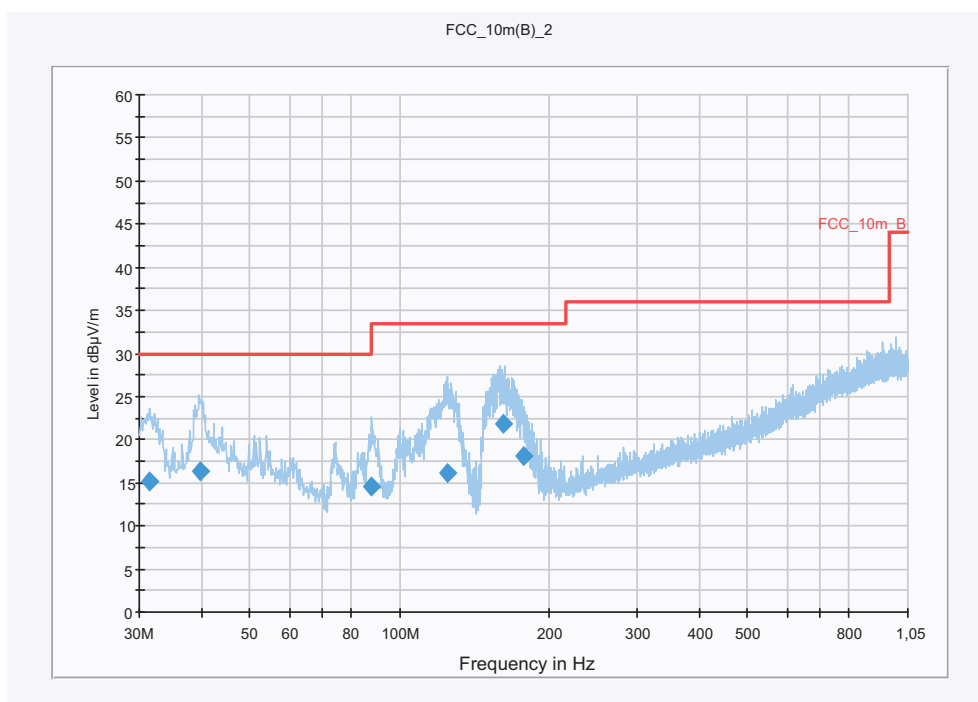
Plot 3: Receiver mode (30 MHz – 1 GHz)**Common Information**

EUT: F5521gw
Serial Number: A401134164
Test Description: FCC Part 15 B Class B < 1GHz @ 10 m
Operating Conditions: idle
Operator Name: LNG
Comment: AC 115V / 60 Hz; USB connected

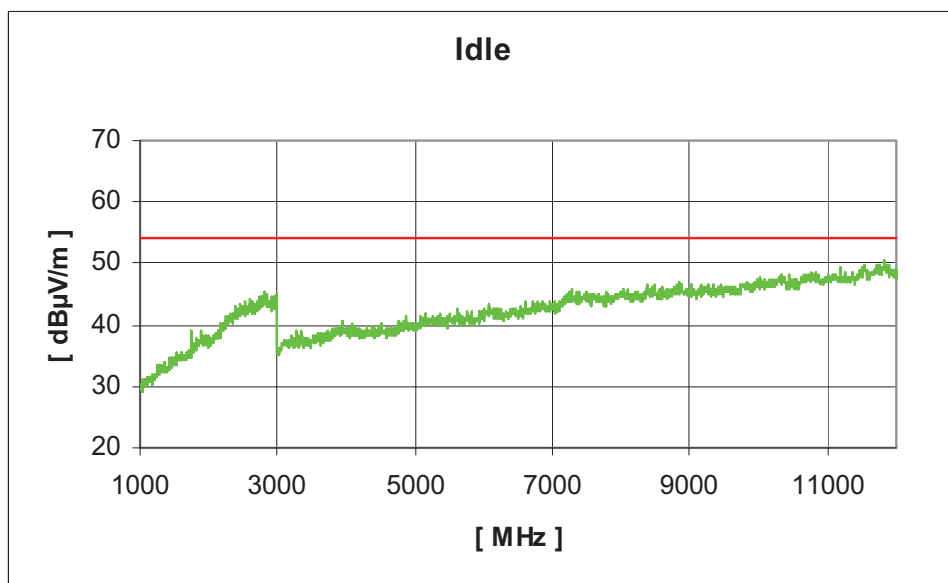
Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
Level Unit: dB μ V/m

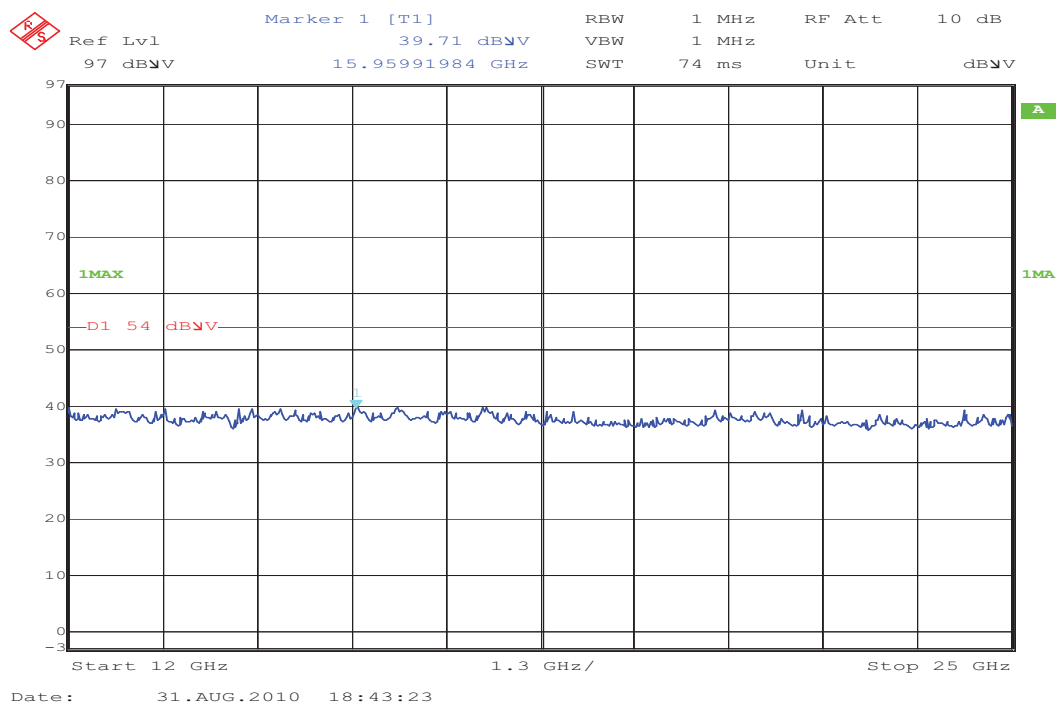
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1,05 GHz	QuasiPeak	120 kHz	15 s	Receiver



Plot 3: Receiver mode (1 GHz – 12.75 GHz)



Plot 4: Receiver mode (12.75 GHz – 25 GHz)



8 Test equipment and ancillaries used for tests

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).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Labor/Item).

No.	Labor / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	n. a.	Horn Antenne 1-26.5GHz	3115	EMCO	9005-3440	300002190	ev		
3	n. a.	Horn Antenne 1-26.5GHz	3115	EMCO Elektronik	9709-5290	300000212	ev		
4	n. a.	Universal Communication Tester	CMU200	R&S	106826	300003346	k	12.01.2010	12.01.2011
5	n. a.	Software Option für CMU 200	CMU-Kxx	R&S		300003345	k	12.01.2010	12.01.2011
6	n. a.	Ultra Stable Notch Filter	WRCD1887.82/1889.55-5EE		1	300000115	ne		
7	n. a.	Funkstörmessempfänger 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	08.01.2010	08.01.2011
8	n. a.	HF-Schaltmatrixgrundgerät	TS-RSP 1144.1500K03	R&S	100300	300003556	ev		
11	n. a.	Signalgenerator 1-20 GHz	SMR20	R&S	101697/020	300003593	k	08.01.2010	08.01.2012
12	n. a.	Turnable Band Reject	WRCT1850/2170-5/40-10EEK	Wainwright	7	300003386	ev		
13	n. a.	Software Option für CMU 200	CMU-K62	R&S	103288	300003600	k	12.01.2010	12.01.2011
14	n. a.	Software Option für CMU 200	CMU-K61	R&S	103354	300003612	k	12.01.2010	12.01.2011
15	n. a.	Software Option für CMU 200	CMU-K64	R&S	102017	300003613	k	12.01.2010	12.01.2011
16	n. a.	Software Option für CMU 200	CMU-K56	R&S	100251	300003614	k	12.01.2010	12.01.2011
18	n. a.	Tunable Band Reject	WRCT1850/2170-5/40-10EEK	Wainwright	40	300003872	ne		
19	n. a.	Tunable Band Reject	WRCT824/894-5/40-8EEK	Wainwright	27	300003873	ne		
20	n. a.	Universal Communication Tester	CMU200	R&S	103992	300003231	vKI!	30.06.2010	30.06.2012
21	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
22	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	k	06.01.2009	06.01.2011
23	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081; B5979	300000210	ne		
24	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	08.01.2010	08.01.2012
25	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	01.06.2009	01.06.2011
26	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
27	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
28	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
29	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
30	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
31	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	08.01.2010	08.01.2012
33	n. a.	Isolating Transformer	913501	Erfi		300001205	ne		
34	4	Radiocom. Analyzer	CMTA 54	R&S	894043/010	300001175	NK!	06.06.2007	
35	9	Signal Generator 0.1-4320 MHz, AM/FM/PHM/Puls Mod.	SMHU	R&S	894055/005	300001190	Ve	05.01.2010	05.01.2013
36	10	Signal Generator 0.1-	SMH	R&S	864219/033	300001410	Ve	18.08.2010	18.08.2013

		2000 MHz							
37	n. a.	DC Power Supply 0 – 32V	1108-32	Heiden	001802	300001383	Ve	23.06.2010	23.06.2013
38	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04590	300001041	Ve	08.01.2009	08.01.2012
39	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/83761	300002326	Ve	28.05.2009	28.05.2011
40	n. a.	Audio Analyzer 2Hz - 300 kHz	UPD	R&S	841074/009	300001236	k	08.01.2010	08.01.2012
41	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
42	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSIQ26	R&S	835111/0004	300002678	Ve	06.01.2009	06.01.2011
43	n. a.	Temperature Test Chamber	T-40/50	CTS GmbH	064023	300003540	vIKI!	04.06.2009	04.06.2011

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
Ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vIKI!	Attention: extended calibration interval	zv	for sale
NK!	Attention: not calibrated	vk	sold

*) next calibration ordered / will executed on ...

Annex A Document history

Version	Applied changes	Date of release
1.0	Initial release	2010-09-10
1.1	The present test report 1-2205-01-05/10-A replaces the report 1-2205-01-05/10. New test report release upon editorial changes	2010-09-24

Annex B Further information

Glossary

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