
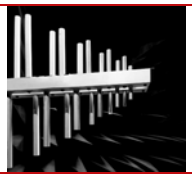
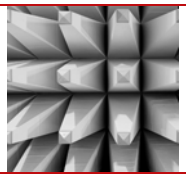

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TEST REPORT

Deutscher Akkreditierungs Rat DAR

Test Report No.: 4-3469-01-01/10-B

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

Applicant

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Manufacturer

Cinterion Wireless Modules GmbH
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Test Standard/s

ICNIRP Guidelines	Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)
FCC OET Bulletin 65	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
AS/NZS 2772.1	Radiofrequency fields, Part 1: Maximum exposure limits - 3 kHz to 300 GHz

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

Test Item

Kind of test item:	GSM/GPRS Module
Device type:	mobile device
Model name:	**MC55i-W**
FCC-ID:	QIPMC55i-W
S/N serial number:	n.a.
IMEI-Number:	004401-08-042710-3
HW hardware status:	B2
SW software status:	00.062
Frequency:	see technical details
Antenna:	external antenna
Exposure category:	general population / uncontrolled environment

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test performed:

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2011-01-06 Bernd Rebmann

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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.
This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2010-12-22
Date of receipt of test item:	2010-12-22
Start of test:	2010-12-22
End of test:	2010-12-22
Person(s) present during the test:	

2.3 Statement of compliance

The EMF values found for the MC55i-W GSM/GPRS Module are below the maximum allowed levels according to the standards listed in section 3, when used with an antenna with maximum gain as listed in chapter 4.3.

2.4 Technical details

Supported frequency bands	Technology	Frequency band	Lowest transmit frequency/MHz	Highest transmit frequency/MHz	Lowest receive Frequency/MHz	Highest receive Frequency/MHz	Kind of modulation	Power Class	Tested power control level	GPRS/EGPRS mobile station class	GPRS/EGPRS multislot class	(E)GPRS voice mode or DTM	Test channel low	Test channel middle	Test channel high	Maximum output power/dBm)*
☒	GSM	GSM	880.2	914.8	925.2	959.8	GMSK	4	5	B	10	no	975	37	124	32.4
☒	GSM	DCS	1710.2	1784.8	1805.2	1879.8	GMSK	1	0	B	10	no	512	698	885	30.2
☒	GSM	cellular	824.2	848.8	869.2	893.8	GMSK	4	5	B	10	no	128	190	251	32.3
☒	GSM	PCS	1850.2	1909.8	1930.2	1989.8	GMSK	1	0	B	10	no	512	661	810	30.2
☐	UMTS	FDD I	1922.4	1977.6	2112.4	2167.6	QPSK	3	max	--	--	--	9612	9750	9888	--
☐	UMTS	FDD II	1852.4	1907.6	1982.4	1987.6	QPSK	3	max	--	--	--	9262	9400	9538	--
☐	UMTS	FDD IV	1712.4	1752.6	1807.4	1877.6	QPSK	3	max	--	--	--	1312	1412	1513	--
☐	UMTS	FDD V	826.4	846.6	871.4	891.6	QPSK	3	max	--	--	--	4132	4182	4233	--
☐	UMTS	FDD VIII	882.4	912.6	927.4	957.6	QPSK	3	max	--	--	--	2712	2787	2863	--
☐	WLAN	ISM	2412	2472	2412	2472	CCK OFDM	--	max	--	--	--	1	7	13	--
☐	WLAN US	ISM	2412	2462	2412	2462	CCK OFDM	--	max	--	--	--	1	6	11	--
☐	BT	ISM	2412	2462	2412	2462	GFSK	3	max	--	--	--	0	39	78	--

)*: slotted peak power for GSM, averaged max. RMS power for UMTS, WLAN and BT.

3 Test standard/s:

Test Standard	Version	Test Standard Description
ICNIRP Guidelines	1998-04	Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)
FCC OET Bulletin 65	1997-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
AS/NZS 2772.1	1998-01	Radiofrequency fields, Part 1: Maximum exposure limits - 3 kHz to 300 GHz
1999/519/EC	1999-07	Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (Official Journal L 197 of 30 July 1999)

3.1 Purpose of this report

The purpose of this report is to show the compliance of certain simultaneous transmission configurations for use in mobile exposure conditions.

In addition to basic requirements of the standards listed above (including FCC Part 22 H and Part 24 E) the following requirements have been taken into account:

- The module must be categorically excluded by FCC 47 CFR § 2.1091 (c) and the antenna separation distance and MPE compliance boundary requirements that enable all simultaneous transmitting antennas incorporated within the host shall comply with MPE limits as specified in FCC 47 CFR § 1.1310.
  (see chapter 8 of FCC KDB 447498 D01 Mobile Portable RF Exposure)

If these requirements are kept the module can be incorporated in mobile host devices without further testing or certification.

4 Evaluating compliance with requirements for human exposure to EMFs

4.1 Maximum permissible exposure (MPE)

Fixed/mobile exposure conditions of multiple transmitters installed in different hosts represent the most difficult situation in terms of the determination of minimum safety distances.
While EMF measurements most often only refer to a single configuration with only one transmitter or with multiple co-located transmitters a general approach is needed to determine a worst case condition under which several transmitters and their antennas can be installed to prevent additional SAR testing for each host.
This test report illustrates different scenarios how radio modules can be integrated in notebook hosts without the need of further testing.
The target is to determine a maximum EIRP or antenna gain for a WWAN module using GSM and/or UMTS frequencies, which is used stand-alone or collocated with other antennas for WLAN, Bluetooth, WiMAX etc.

The background of the calculation is a minimum distance of 20 cm between antenna(s) and user (mobile exposure condition), and the compliance with the requirements of chapter 3.1.

4.2 Limits and normative references

There is a number of international and national regulations, standards and guidelines for exposure to electromagnetic fields. For the evaluations in this report the following reference levels have been applied.

4.2.1 FCC requirements

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field strength (µT)	Power density (mW/cm²)
300 – 1500 MHz	--	--	--	f(MHz) / 1500
1.5 – 100 GHz	--	--	--	1.0

Categorically exclusion per § 2.1091 (c) : - below 1.5 GHz : avg. ERP < 1.5 W (= 33.9 dBm EIRP)
- above 1.5 GHz : avg. ERP < 3 W (= 36.9 dBm EIRP)

Part 22 H ERP limit : max. 7 W (38.45 dBm) burst power (= 40.6 dBm EIRP)
Part 24 E EIRP limit : max. 2 W (33.0 dBm) burst power

4.2.2 EN requirements

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field strength (µT)	Power density (mW/cm²)
400 – 2000 MHz	$1.375*f(MHz)^{1/2}$	$0.0037*f(MHz)^{1/2}$	$0.0046*f(MHz)^{1/2}$	f(MHz) / 2000
2 – 300 GHz	61	0.16	0.2	1.0

4.2.3 Australian requirements

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field strength (µT)	Power density (mW/cm²)
400 – 2000 MHz	$1.375*f(MHz)^{1/2}$	$0.0037*f(MHz)^{1/2}$	$0.0046*f(MHz)^{1/2}$	f(MHz) / 2000
2 – 300 GHz	61	0.16	0.2	1.0

Reference levels are provided for exposure assessment to determine whether the basic restrictions on exposure of humans to electromagnetic fields are exceeded. The basic restrictions on exposure to electromagnetic fields are based directly on established health effects and biological considerations.

4.3 Host platform analysis

The MPE calculation has been performed for different scenarios of stand-alone and co-located operation of the WWAN module described below and generic radio modules with different communication systems.

WWAN module :		Notes :
type :	GSM/GPRS module	
model :	MC55i-W	
FCC-ID :	QIPMC55i-W	
IC-ID :	7830A-MC55i-W	
Maximum antenna gain < 1 GHz	**7.0 dBi**	limitation when used stand-alone
Maximum antenna gain < 1 GHz	**6.3 dBi**	limitation when used in collocated scenarios
Maximum antenna gain > 1.7 GHz	**2.8 dBi**	limitation by FCC Part 24 E EIRP limit

The table below lists the calculated maximum EIRP values which represent the worst case condition of all standards and limits listed in chapter 4.2.

a) Maximum antenna gain determination in stand-alone situation. For details see annex A.1.

Communication system	Mode	Frequency (MHz)	Conducted power (dBm) *	Antenna gain (dBi)	Duty Cycle (%)	PAR (dB)	EIRP (dBm)**	EIRP (mW)**
GSM 850	GSM/GPRS	824.2 - 848.8	32.30	**7.00**	25	6	33.30	2137.96
E-GSM 900	GSM/GPRS	880.2 - 914.8	32.40	**7.00**	25	6	33.40	2187.76
DCS 1800	GSM/GPRS	1710.2 - 1784.8	30.20	2.80	25	6	27.00	501.19
PCS 1900	GSM/GPRS	1850.2 - 1909.8	30.20	2.80	25	6	27.00	501.19

b) Maximum antenna gain determination in collocated scenarios. For details see annex A.1 and A.2.

Communication system	Mode	Frequency (MHz)	Conducted power (dBm) *	Antenna gain (dBi)	Duty Cycle (%)	PAR (dB)	EIRP (dBm)**	EIRP (mW)**
GSM 850	GSM/GPRS	824.2 - 848.8	32.30	**6.30**	25	6	32.60	1819.70
E-GSM 900	GSM/GPRS	880.2 - 914.8	32.40	**6.30**	25	6	32.70	1862.09
DCS 1800	GSM/GPRS	1710.2 - 1784.8	30.20	2.80	25	6	27.00	501.19
PCS 1900	GSM/GPRS	1850.2 - 1909.8	30.20	2.80	25	6	27.00	501.19

For the generic communication systems the following worst case technical data have been assumed.

Communication system	Mode	Frequency (MHz)	Conducted power (dB) *	Antenna gain (dBi)	Duty Cycle (%)	PAR (dB)	EIRP (dBm)**	EIRP (mW)**
Bluetooth		2.4 GHz Range	20.0	0.00	76	1.2	18.80	75.86
WLAN		2.4 /5 GHz Range	23.0	0.00	100	0	23.00	199.5
WiMAX		various	27.0	0.00	100	0	27.00	501.2

c) Maximum antenna gain with ERP Limitation by FCC 47 CFR § 2.1091 (c)

Communication system	Mode	Frequency (MHz)	Conducted power (dBm) *	Antenna gain (dBi)	Duty Cycle (%)	PAR (dB)	EIRP (dBm)**	EIRP (mW)**
GSM 850	GSM/GPRS	824.2 - 848.8	32.30	7.00	25	6	33.30	2137.96
PCS 1900	GSM/GPRS	1850.2 - 1909.8	30.20	2.80	25	6	27.00	501.19

d) Maximum antenna gain with E(I)RP Limitation by FCC Part 22 H and Part 24 E

Communication system	Mode	Frequency (MHz)	Conducted power (dBm) *	Antenna gain (dBi)	Duty Cycle (%)	PAR (dB)	EIRP (dBm)**	EIRP (mW)**
GSM 850	GSM/GPRS	824.2 - 848.8	32.30	7.00	25	6	33.30	2137.96
PCS 1900	GSM/GPRS	1850.2 - 1909.8	30.20	**2.80**	25	6	27.00	501.19

*: slotted peak power of 1 time slot for GSM, maximum RMS for all other communication systems
**: time based averaged power for 2 timeslots without power reduction.

Additional illustration:

- Table a) shows the maximum antenna gain for the WWAN module so that the worst case power density limits are met in stand-alone configuration.
- Table b) shows the maximum antenna gain for the WWAN module so that the worst case power density limits are met in all collocated scenarios.
- Table c) shows the maximum antenna gain of the WWAN module so that FCC ERP limits for time based averaged power are met.
- Table d) shows the maximum antenna gain of the WWAN module so that FCC E(I)RP limits for burst power are met.

The lowest calculated antenna gain values (shown in bold letters) determine the highest allowed antenna gain of the WWAN module in stand-alone and collocated scenarios.

Antenna configuration for all scenarios:

Important note: this notebook configuration is an example. Different applications (e.g. M2M) are also possible as long as the same antenna-to-antenna and antenna-to-user distances are respected.

4.3.1 Scenario 0 : WWAN stand-alone

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**
communication system	**WWAN (GSM/GPRS)**
type	**Cinterion**
model	**MC55i-W**
FCC-ID	**QIPMC55i-W**
max. EIRP (mW)	**see chapter 4.3**
max.antenna gain	**7.0 dBi/2.8 dBi**

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above

Note: other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm)

4.3.2 Scenario 1 : WWAN + BT

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**	secondary
communication system	**WWAN (GSM/GPRS)**	BT
type	**Cinterion**	any
model	**MC55i-W**	any
FCC-ID	**QIPMC55i-W**	any
max. EIRP (mW)	**see chapter 4.3**	75.86
max.antenna gain	**6.3 dBi/2.8 dBi**	nn

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above
- the averaged EIRP of the BT module does not exceed the value listed above
- the distance between WWAN and BT antennas is 0 cm or larger

Note: other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm)

4.3.3 Scenario 2 : WWAN + WLAN

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**	secondary
communication system	**WWAN (GSM/GPRS)**	WLAN
type	**Cinterion**	any
model	**MC55i-W**	any
FCC-ID	**QIPMC55i-W**	any
max. EIRP (mW)	**see chapter 4.3**	199.5
max.antenna gain	**6.3 dBi/2.8 dBi**	nn

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above
- the averaged EIRP of the WLAN module does not exceed the value listed above
- the distance between WWAN and WLAN antennas is 0 cm or larger

Note: other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm).

4.3.4 Scenario 3 : WWAN + WLAN + BT

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**	secondary	
communication system	**WWAN (GSM/GPRS)**	BT	WLAN
type	**Cinterion**	any	any
model	**MC55i-W**	any	any
FCC-ID	**QIPMC55i-W**	any	any
max. EIRP (mW)	**see chapter 4.3**	75.86	199.5
max.antenna gain	**6.3 dBi/2.8 dBi**	nn	nn

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above
- the averaged EIRP of the WLAN module does not exceed the value listed above
- the averaged EIRP of the BT module does not exceed the value listed above
- the distance between WWAN, WLAN and BT antennas is 0 cm or larger

Note: other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm)

4.3.5 Scenario 4 : WWAN + WiMAX

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**	secondary
communication system	**WWAN (GSM/GPRS)**	WiMAX
type	**Cinterion**	any
model	**MC55i-W**	any
FCC-ID	**QIPMC55i-W**	any
max. EIRP (mW)	**see chapter 4.3**	501.2
max.antenna gain	**6.3 dBi/2.8 dBi**	nn

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above
- the averaged EIRP of the WiMAX module does not exceed the value listed above
- the distance between WWAN and WiMAX antennas is 0 cm or larger

Note: other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm)

4.3.6 Scenario 5 : WWAN + WiMAX + BT

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**	secondary	
communication system	**WWAN (GSM/GPRS)**	BT	WiMAX
type	**Cinterion**	any	any
model	**MC55i-W**	any	any
FCC-ID	**QIPMC55i-W**	any	any
max. EIRP (mW)	**see chapter 4.3**	75.86	501.2
max.antenna gain	**6.3 dBi/2.8 dBi**	nn	nn

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above
- the averaged EIRP of the WiMAX module does not exceed the value listed above
- the averaged EIRP of the BT module does not exceed the value listed above
- the distance between WWAN, WiMAX and BT antennas is 0 cm or larger

Note: other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm)

4.3.7 Scenario 6 : WWAN + WiMAX + WLAN

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**	secondary	
communication system	**WWAN (GSM/GPRS)**	WLAN	WiMAX
type	**Cinterion**	any	any
model	**MC55i-W**	any	any
FCC-ID	**QIPMC55i-W**	any	any
max. EIRP (mW)	**see chapter 4.3**	199.5	501.2
max.antenna gain	**6.3 dBi/2.8 dBi**	nn	nn

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above
- the averaged EIRP of the WiMAX module does not exceed the value listed above
- the averaged EIRP of the WLAN module does not exceed the value listed above
- the distance between WWAN, WiMAX and WLAN antennas is 0 cm or larger

Note: other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm)

4.3.8 Scenario 7 : WWAN + WiMAX + WLAN + BT

This scenario covers the following combination of collocated radio modules:

Transmitter	**primary**	secondary		
communication system	**WWAN (GSM/GPRS)**	BT	WLAN	WiMAX
type	**Cinterion**	any	any	any
model	**MC55i-W**	any	any	any
FCC-ID	**QIPMC55i-W**	any	any	any
max. EIRP (mW)	**see chapter 4.3**	75.86	199.5	501.2
max.antenna gain	**6.3 dBi/2.8 dBi**	nn	nn	nn

This scenario covers the following conditions:

- the antenna-to-user distance of all transmitters listed above is 20 cm or larger
- the maximum antenna gain of the WWAN transmitters does not exceed the values listed above
- the averaged EIRP of the WiMAX module does not exceed the value listed above
- the averaged EIRP of the WLAN module does not exceed the value listed above
- the averaged EIRP of the BT module does not exceed the value listed above
- the distance between WWAN, WiMAX, WLAN and BT antennas is 0 cm or larger

Note : other antennas for different communication systems may be installed in the host platform as long as they are not collocated to the WWAN antenna (distance > 20 cm)

Annex A: RF Exposure assessment

Annex A.1: Individual transmitters

The table on the following page lists all calculated power density values in relation to the limits defined in different standards, calculated for a distance of 20 cm from the antenna(s).

Fundamental data for calculating worst case EIRP of the primary and secondary transmitters are listed in chapter 4.3.

Power density at a distance of 20 cm is calculated by using the following formula:

$S_{eq} = P \cdot G / 4\pi \cdot r^2$ with P*G = EIRP and r = 20 cm

Then the ratio $S_{eq} / S_{\lim}$ is calculated for all applied limits.

During calculation the maximum EIRP of the primary transmitter is optimized so that the ratio S_{eq} / S_{lim} does not exceed a value of 1 for all applied limits for a comprehensive coverage of all relevant standards.

The calculation of S_{eq} / S_{lim} with reference to a certain standard is limited to those frequency bands that are generally used in regions where this standard is applied.

standard	EN	FCC	AUS/NZ
region	Europe	USA,Canada	Australia New Zealand
GSM 850		x	
UMTS FDD V		x	x
(E)GSM 900	x		x
UMTS FDD VIII	x		
DCS 1800	x		x
UMTS FDD IV		x	
PCS 1900		x	
UMTS FDD II		x	
UMTS FDD I	x		x
ISM (WLAN/BT)	x	x	x
WiMAX	x	x	x

Note:
For frequencies above 2 GHz the limit is constant for all standards.
Therefore no frequency dependent differentiation is needed for radio technologies in this frequency band.

Stand-alone power density overview and limit reference of WWAN communication systems:

Comm. System	Mode	Reference Frequency	EIRP (dBm)	Distance (cm)	Power Density Seq (mW/cm²)	MPE Limit (mW/cm²) EN	S_{eq} / S_{Lim} EN	MPE Limit (mW/cm²) FCC	S_{eq} / S_{Lim} FCC	MPE Limit (mW/cm²) AUS	S_{eq} / S_{Lim} AUS
GSM 850	GSM/GPRS	847.8	2137.962	20	0.4253	0.4239		0.5652	0.7525	0.4239	
E-GSM 900	GSM/GPRS	880.2	2187.762	20	0.4352	0.4401	0.9890	0.5868		0.4401	0,9890
DCS 1800	GSM/GPRS	1710.2	501.1872	20	0.0997	0.8551	0.1166	1.0000		0.8551	0,1166
PCS 1900	GSM/GPRS	1909.8	501.1872	20	0.0997	0.9549		1.0000	0.0997	0.9549	
worst case S_{eq} / S_{Lim}						**EN**	**0.9890**	**FCC**	**0.7525**	**AUS**	**0.9890**

Stand-alone power density overview and limit reference of WWAN communication systems and possible collocated transmitters:

Comm. System	Mode	Reference Frequency	EIRP (dBm)	Distance (cm)	Power Density Seq (mW/cm²)	MPE Limit (mW/cm²) EN	S_{eq} / S_{Lim} EN	MPE Limit (mW/cm²) FCC	S_{eq} / S_{Lim} FCC	MPE Limit (mW/cm²) AUS	S_{eq} / S_{Lim} AUS
GSM 850	GSM/GPRS	847.8	1819.701	20	0.3620	0.4239		0.5652	0.6405	0.4239	
E-GSM 900	GSM/GPRS	880.2	1862.087	20	0.3705	0.4401	0.8417	0.5868		0.4401	0.8417
DCS 1800	GSM/GPRS	1710.2	501.1872	20	0.0997	0.8551	0.1166	1.0000		0.8551	0.1166
PCS 1900	GSM/GPRS	1909.8	501.1872	20	0.0997	0.9549		1.0000	0.0997	0.9549	
worst case S_{eq} / S_{Lim}						**EN**	**0.8417**	**FCC**	**0.6405**	**AUS**	**0.8417**
Collocated transmitters :											
Bluetooth		2450	75.86	20	0.0151	1	0.0151	1	0.0151	1	0.0151
WLAN		2450	199.53	20	0.0397	1	0.0397	1	0.0397	1	0.0397
WiMax		2300	501.19	20	0.0997	1	0.0997	1	0.0997	1	0.0997

Annex A.2: Collocated transmitters

When transmitters with collocated antennas are active simultaneously a worst case assessment is necessary which takes additive effects into account.

In this case it must be insured that the sum of all worst case power densities of all active transmitters (according to the different scenarios) do not exceed the limits even if they are far below the limits for the single transmitter.

$$\sum_{1}^{n} \frac{S_{eqn}}{S_{\lim n}} = \frac{S_{eq1}}{S_{\lim 1}} + \frac{S_{eq2}}{S_{\lim 2}} + \ldots + \frac{S_{eqn}}{S_{\lim n}} \leq 1$$

The following tables show the results separated for different limits according to the standards listed in chapter 4.2.
The sum that comes closest to 1 represents the worst case and limits the antenna gain that is allowed for the WWAN module.

a) Simultaneous Exposure according to FCC limits

Scenario	Combination		worst case Seq / SLim	Sum	Compliance
Scenario 1	Primary Tx	WWAN	0.6405	0.6556	PASS
	Secondary Tx	Bluetooth	0.0151		
Scenario 2	Primary Tx	WWAN	0.6405	0.6802	PASS
	Secondary Tx	WLAN	0.0397		
Scenario 3	Primary Tx	WWAN	0.6405	0.6953	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	Bluetooth	0.0151		
Scenario 4	Primary Tx	WWAN	0.6405	0.7402	PASS
	Secondary Tx	WiMAX	0.0997		
Scenario 5	Primary Tx	WWAN	0.6405	0.7553	PASS
	Secondary Tx	WiMAX	0.0997		
	Secondary Tx	Bluetooth	0.0151		
Scenario 6	Primary Tx	WWAN	0.6405	0.7799	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	WiMAX	0.0997		
Scenario 7	Primary Tx	WWAN	0.6405	0.7950	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	WiMAX	0.0997		
	Secondary Tx	Bluetooth	0.0151		

b) Simultaneous Exposure according to EN limits

Scenario	Combination		worst case Seq / SLim	Sum	Compliance
Scenario 1	Primary Tx	WWAN	0.8417	0.8568	PASS
	Secondary Tx	Bluetooth	0.0151		
Scenario 2	Primary Tx	WWAN	0.8417	0.8814	PASS
	Secondary Tx	WLAN	0.0397		
Scenario 3	Primary Tx	WWAN	0.8417	0.8965	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	Bluetooth	0.0151		
Scenario 4	Primary Tx	WWAN	0.8417	0.9414	PASS
	Secondary Tx	WiMAX	0.0997		
Scenario 5	Primary Tx	WWAN	0.8417	0.9565	PASS
	Secondary Tx	WiMAX	0.0997		
	Secondary Tx	Bluetooth	0.0151		
Scenario 6	Primary Tx	WWAN	0.8417	0.9811	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	WiMAX	0.0997		
Scenario 7	Primary Tx	WWAN	0.8417	0.9962	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	WiMAX	0.0997		
	Secondary Tx	Bluetooth	0.0151		

c) Simultaneous Exposure according to AUS/NZ limits

Scenario	Combination		worst case Seq / SLim	Sum	Compliance
Scenario 1	Primary Tx	WWAN	0.8417	0.8568	PASS
	Secondary Tx	Bluetooth	0.0151		
Scenario 2	Primary Tx	WWAN	0.8417	0.8814	PASS
	Secondary Tx	WLAN	0.0397		
Scenario 3	Primary Tx	WWAN	0.8417	0.8965	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	Bluetooth	0.0151		
Scenario 4	Primary Tx	WWAN	0.8417	0.9414	PASS
	Secondary Tx	WiMAX	0.0997		
Scenario 5	Primary Tx	WWAN	0.8417	0.9565	PASS
	Secondary Tx	WiMAX	0.0997		
	Secondary Tx	Bluetooth	0.0151		
Scenario 6	Primary Tx	WWAN	0.8417	0.9811	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	WiMAX	0.0997		
Scenario 7	Primary Tx	WWAN	0.8417	0.9962	PASS
	Secondary Tx	WLAN	0.0397		
	Secondary Tx	WiMAX	0.0997		
	Secondary Tx	Bluetooth	0.0151		

Annex B: Document History

Version	Applied Changes	Date of Release
	Initial Release	2010-12-22
A	Front page applicant updated.	2011-01-03
B	Maximum antenna gain for RF exposure reduced to allowed gain according to FCC part 24 for all calculations.	2011-01-06

Annex C: Further Information

Glossary

DUT	-	Device under Test
EMF	-	Electromagnetic Fields
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