

TEST REPORT
No.: 19-1-0150502T14a-C2

According to:
FCC Regulations
Part 1.1310
Part 2.1091

IC-Regulations
RSS-102, Issue 5

for

MYNXG Product GmbH

Sensor Device
Sense MCE IBC

FCC ID: 2ASE6SENSEMCEIBC
Contains FCC ID: ZMONL668AM00, 2AC7Z-ESPWROOM32D

IC ID: 26095-SENSEMCEIBC
Contains IC ID: 21374-NL668AM00, 21098-ESPWROOM32D

Laboratory Accreditation



accredited according to DIN EN ISO/IEC 17025:2018

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The listed attachments are an integral part of this report.

1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests.

The presented Equipment Under Test (in this report, hereinafter referred as EUT) integrates a WCDMA, LTE, WLAN 2.4 GHz RF and SRD RF Transceiver. Other implemented wireless technologies were not considered within this test report. Following tests have been performed to show compliance with applicable FCC Part 2.1091 and FCC Part 1.1310 of the FCC CFR 47 Rules and ICED RSS standards.

1.1. Summary of tests results

RF-Exposure Evaluation (separation distance user to RF-radiating element greater 20cm)								
Test cases	Port	References & Limits				EUT set-up	EUT op. mode	Result
		FCC Standard	Test Limit	RSS Standard	Test Limit			
Radio frequency radiation exposure Requirements	Cabinet	§1.1310 §2.1091 §2.1093	RF-Field Strength Limits: FCC: "general population/uncontrolled" environment	RSS-102, Issue 5	Chapter 4 Table 4	1	1 to 13	Pass

Remark: Calculations based on Datasheet delivered by applicant

1.2. Attestation:

I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to Industry Canada standards. All requirements as shown in above table are met in accordance with enumerated standards.

The current version of the Test Report CETECOM_TR19_1_0150502T14a_C2 replaces the test report CETECOM_TR19_1_0150502T14a_C1 dated 2020-Jun-18. The replaced test report is herewith invalid.

.....
 Ninovic Perez
 Responsible for test section

.....
 Martin Nunier
 Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Ninovic Perez
Deputy:	

2.2. Test location

2.2.1. Test laboratory "CTC"

Company name:	see chapter 2.1. Identification of the testing laboratory
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2.3. Organizational items

Responsible for test report:	Martin Nunier
Receipt of EUT:	--
Date(s) of test:	--
Date of report:	2020-Dez-17

2.4. Applicant's details

Applicant's name:	MYNXG Product GmbH
Address:	Friedhofstrasse 72 DE-63263, Neu-Isenburg Germany
Contact person:	Mr. Bernd Moeller

2.5. Manufacturer's details

Manufacturer's name:	please see applicant's details
Address:	please see applicant's details

3. Equipment under test (EUT)

3.1. Technical data of MAIN EUT (Cellular technology) declared by applicant

TX-frequency range (UTRA and E-UTRA operating bands)	W-CDMA FDD II: 1852.4–1907.6 MHz (UL), 1930-1990 MHz (DL) W-CDMA FDD IV: 1712.4–1752.6 MHz (UL), 2110-2155 MHz (DL) W-CDMA FDD V: 1712.4–1752.6 MHz (UL), 2110-2155 MHz (DL) LTE Band 2: 1850- 1910 MHz (Uplink), 1930 – 1990 MHz (Downlink) LTE Band 4: 1710 - 1755 MHz (Uplink), 2110 - 2155 MHz (Downlink) LTE Band 5: 824- 849 MHz (Uplink), 869 - 894 MHz (Downlink) LTE Band 12: 699 - 716 MHz (Uplink), 729 - 746 MHz (Downlink) LTE Band 13: 777 - 787 MHz (Uplink), 746 - 756 MHz (Downlink) LTE Band 17: 704 - 716 MHz (Uplink), 746 - 756 MHz (Downlink) LTE Band 66: 1710 - 1780 MHz (Uplink), 2110 - 2200 MHz (Downlink) LTE Band 71: 663 - 698 MHz (Uplink), 617 - 652 MHz (Downlink)		
Antenna Type	<input checked="" type="checkbox"/> Integrated <input type="checkbox"/> External, no RF- connector <input type="checkbox"/> External, separate RF-connector: main TX + secondary RX connector		
Antenna Gain Tx (main)	Antenna gain see Annex 1		
Special EMI components	--		
EUT sample type	<input type="checkbox"/> Production	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Engineering
FCC label attached	<input type="checkbox"/> yes	<input checked="" type="checkbox"/> no	

3.2. Technical data of main EUT (Non Cellular Technology) declared by applicant

Wireless Technologies	Frequency bands	Operation mode
<input checked="" type="checkbox"/> WLAN	<input checked="" type="checkbox"/> 2.4GHz <input type="checkbox"/> 5GHz	normal operation mode
<input type="checkbox"/> Bluetooth LE	<input type="checkbox"/> 2.4GHz	normal operation mode
<input checked="" type="checkbox"/> SRD	<input checked="" type="checkbox"/> 913 – 917 MHz	normal operation mode

Wireless Technologies	Frequency bands	Antenna type	Maximum antenna gain
<input checked="" type="checkbox"/> WLAN <input type="checkbox"/> Bluetooth LE	<input checked="" type="checkbox"/> 2.4GHz <input type="checkbox"/> 5GHz	<input type="checkbox"/> PIFA <input checked="" type="checkbox"/> PCB	see Annex 1
<input checked="" type="checkbox"/> SRD	<input checked="" type="checkbox"/> 913 – 917 MHz	<input type="checkbox"/> PIFA <input checked="" type="checkbox"/> PCB	see Annex 1

3.3. EUT: Type, S/N etc. and short descriptions used in this test report

Short description*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	Sensor Device	Sense MCE IBC	--	2.2	0.0.25

*) EUT short description is used to simplify the identification of the EUT in this test report.

3.4. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

AE short description *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	--	--	--	--	--

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

3.5. EUT set-ups

EUT set-up no. *)	Combination of EUT and AE	Remarks
set. 1	EUT A	only theoretical calculation

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

3.6. EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
op. 1	W-CDMA FDD II	Only theoretical calculation
op. 2	W-CDMA FDD IV	Only theoretical calculation
op. 3	W-CDMA FDD V	Only theoretical calculation
op. 4	LTE Band 2	Only theoretical calculation
op. 5	LTE Band 4	Only theoretical calculation
op. 6	LTE Band 5	Only theoretical calculation
op. 7	LTE Band 12	Only theoretical calculation
op. 8	LTE Band 13	Only theoretical calculation
op. 9	LTE Band 17	Only theoretical calculation
op. 10	LTE Band 66	Only theoretical calculation
op. 11	LTE Band 71	Only theoretical calculation
op. 12	W-LAN 2.4GHz	Only theoretical calculation
op. 13	SRD	Only theoretical calculation

*) EUT operating mode no. is used to simplify the test report.

4. Measurements

4.1. Radio Frequency Exposure Evaluation §2.1091

4.1.1. Test location and equipment (for reference numbers please see chapter 'List of test equipment')

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)	<input type="checkbox"/> Please see Chapter. 2.2.2	<input type="checkbox"/> Please see Chapter. 2.2.3
For Evaluation instruments are not needed. Results are determined by calculation based on applicants delivered Tune-Up procedure.			

4.1.2. Requirements

FCC: §1.1310	<i>The criteria used for the evaluation of human exposure to radio frequency radiation is table 1 according FCC §1.1310 and table chapter 4.2 of RSS-102 standard and it is subject for evaluation of the RF exposure prior to equipment authorization. As the mobile equipment is authorized under Part 22 (Subpart H) and Part 24 of the FCC Rules, it is subject for evaluation of the RF exposure prior to equipment authorization.</i>
FCC § 2.1091	<i>Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation." For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits given in Table 1 of Appendix A.</i>

4.1.2.1. Valid for FCC

Table 1: LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)				
Frequency range [MHz]	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [mW/cm ²]	Averaging time [minutes]
30 - 300	61.4	0.163	1.0	6
300 - 1500	-	-	f/300	6
1500 - 100,000	-	-	5	6
(B) Limits for General Population / Uncontrolled Exposure				
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*(180/f ²)	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	-	-	f/1500	30
1500 - 100,0	-	-	1.0	30

f=frequency in MHz

*Plane-wave equivalent power density

NOTE1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. These limits apply to amateur station licensees and members of their immediate household as discussed in the text.

NOTE2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. As discussed in the text, these limits apply to neighbors living near amateur radio stations.

4.1.3. General Limits:

FCC: §1.1307	<i>Cellular Radiotelephone Service (subpart H of part 22) Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 1000 W ERP (1640 W EIRP)</i>
FCC §1.1307	<i>Personal Communications Services (part 24) Broadband PCS (subpart E): non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 2000 W ERP (3280 W EIRP)</i>
FCC §1.1310	<i>LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE) Table 1(B) Limits for General Population/Uncontrolled Exposure 300–1500 MHz: $f/1500$ mW/cm² 1500–100,000 MHz: 1.0 mW/cm²</i>
FCC §2.1091	<i>Subject to routine evaluation is required when the device operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or if they operate at frequencies above 1.5 GHz and their ERP is 3 watts or more.</i>
FCC §24.232	<i>(a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. b) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power, ...</i>
FCC §22.913	<i>(a) Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.</i>
FCC §27.50 (C)(10)	<i>(10) Portable stations (hand-held devices) are limited to 3 watts ERP; and</i>
FCC §27.50(d)	<i>(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band are limited to 1 watt EIRP.</i>
KDBs	<i>No. 447498 D01 v06</i>

4.2. Requirements and limits for RSS Standard

RSS-102, Issue 5	<p>2.5 Exemption Limits for Routine Evaluation</p> <p>All transmitters are exempt from routine SAR and RF exposure evaluations provided that they comply with the requirements of sections 2.5.1 or 2.5.2. If the equipment under test (EUT) meets the requirements of sections 2.5.1 or 2.5.2, applicants are only required to submit a properly signed declaration of compliance (see Annex C). The information contained in the RF exposure technical brief may be limited to the value(s) of the maximum output power, the information that demonstrates how the maximum output power of the transmitter was derived and the rationale for the separation distances applied (see Table 1), which must be based on the most conservative exposure condition for the applicable module or host platform test procedure requirements.</p>
	<p>2.5.2 Exemption Limits for Routine Evaluation — RF Exposure Evaluation</p> <p>RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:</p> <ul style="list-style-type: none"> • below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance); • at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz; • at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance); • at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz; • at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance). <p>In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.</p>
	<p>2.6 User Manual Requirements</p> <p>The applicant is responsible for providing proper instructions to the user of the radio device, and any usage restrictions, including limits of exposure durations. The user manual shall provide installation and operation instructions, as well as any special usage conditions (e.g. proper accessory required, including the proper orientation of the device in the accessory, maximum antenna gain in the case of detachable antenna), in order to ensure compliance with SAR and/or RF field strength limits. For instance, compliance distance shall be clearly stated in the user manual.</p> <p>The user manual of devices intended for controlled use shall also include information relating to the operating characteristics of the device; the operating instructions to ensure compliance with SAR and/or RF field strength limits; information on the installation and operation of accessories to ensure compliance with SAR and/or RF field strength limits; and contact information where the user can obtain Canadian information on RF exposure and compliance. Other related information may also be included.</p>

4.3. MPE Calculation method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{EIRP}{4\pi R^2} = \frac{P * G}{4\pi R^2}$$

$$G_{NUMERIC} = \frac{S * 4\pi R^2}{P}$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

4.4. Evaluation Method

4.4.1. Standalone

Valid for W-CDMA / LTE Mode:

- The power was checked on 3 frequencies (lowest/middle/highest) within each operable FDD-band (see separate report for W-CDMA and LTE technology) and the results compared to applicant's declared power values (tune-up info).
A RMS detector was used. No duty-cycle correction factor is applicable

Valid for WLAN 2.4GHz:

- The peak power was checked on 3 frequencies (lowest/middle/highest) within the 2.4GHz band
- No duty-cycle correction factor is applicable

Valid for SRD Mode:

- The peak power was checked on 3 frequencies (lowest/ middle / highest) within the 913 – 917 MHz band.
- No duty-cycle correction factor is applicable

Please find in the following tables **the calculations based on applicants information**

4.5. Results for fixed and mobile operations

4.5.1. Results for FCC Standard

4.5.1.1. Results for lower operational band: W-CDMA FDDV, LTE Band 5, 12, 13, 17, 71

Operating Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Max. positive tolerance according manufacturer (dB)	Declared Antenna Gain (dBi)	Calculated maximum ERP (declared+ Tune-up+ antenna Gain) (dBm)	Duty cycle (%)	Calculated Maximum ERP (W)	Equivalent ERP (maximum ERP x duty cycle) (mW)	MPE Limit accord. Table 1 (mW/cm ²)	MPE-Value (mW/cm ²)	Margin to limit: (mW/cm ²)	Fraction for Co-Location calculations	Max. Fraction-Value within Frequency-Band
W-CDMA FDD V	826.4	23.5	1.0	0.3	24.8	100%	0.302	302.0	0.5509	0.0601	0.4909	0.1091	0.1091
	836.6	23.5	1.0	0.3	24.8		0.302	302.0	0.5577	0.0601	0.4977	0.1077	
	846.6	23.5	1.0	0.3	24.8		0.302	302.0	0.5644	0.0601	0.5043	0.1064	
LTE Band 5	829.0	23.0	1.0	0.3	24.3	100%	0.269	269.2	0.5527	0.0535	0.4991	0.0969	0.0969
	836.6	23.0	1.0	0.3	24.3		0.269	269.2	0.5577	0.0535	0.5042	0.0960	
	844.0	23.0	1.0	0.3	24.3		0.269	269.2	0.5627	0.0535	0.5091	0.0952	
LTE Band 12	704.0	23.0	1.0	0.3	24.3	100%	0.269	269.2	0.4693	0.0535	0.4158	0.1141	0.1141
	707.6	23.0	1.0	0.3	24.3		0.269	269.2	0.4717	0.0535	0.4182	0.1135	
	711.0	23.0	1.0	0.3	24.3		0.269	269.2	0.4740	0.0535	0.4205	0.1130	
LTE Band 13	782.0	23.0	1.0	0.3	24.3	100%	0.269	269.2	0.5213	0.0535	0.4678	0.1027	0.1027
	782.0	23.0	1.0	0.3	24.3		0.269	269.2	0.5213	0.0535	0.4678	0.1027	
	782.0	23.0	1.0	0.3	24.3		0.269	269.2	0.5213	0.0535	0.4678	0.1027	
LTE Band 17	709.0	23.0	1.0	0.3	24.3	100%	0.269	269.2	0.4727	0.0535	0.4191	0.1133	0.1133
	710.0	23.0	1.0	0.3	24.3		0.269	269.2	0.4733	0.0535	0.4198	0.1131	
	711.0	23.0	1.0	0.3	24.3		0.269	269.2	0.4740	0.0535	0.4205	0.1130	
LTE Band 71	668.0	23.0	1.0	0.3	24.3	100%	0.269	269.2	0.4453	0.0535	0.3918	0.1202	0.1202
	680.6	23.0	1.0	0.3	24.3		0.269	269.2	0.4537	0.0535	0.4002	0.1180	
	693.0	23.0	1.0	0.3	24.3		0.269	269.2	0.4620	0.0535	0.4085	0.1159	

Maximum calculated MPE value:		
Lowest MPE-Limit in Frequency-Band:	0.4453	[mW/cm ²]
Highest MPE value in frequency-band:	0.0601	[mW/cm ²]
Lowest margin to limit in frequency band:	0.3918	[mW/cm ²]

4.5.1.2. Results for upper operational band: W-CDMA FDD IV, LTE Band 4, LTE Band 66

Operating Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Max. positive tolerance according manufacturer (dB)	Declared Antenna Gain (dBi)	Calculated maximum ERP (declared+ Tune-up+ antenna Gain) (dBm)	Duty cycle (%)	Declared Maximum ERP (W)	Equivalent ERP (maximum ERP x duty cycle) (mW)	MPE Limit accord. Table 1 (mW/cm ²)	MPE-Value (mW/cm ²)	Margin to limit: (mW/cm ²)	Fraction for Co-Location calculations	Max. Fraction-Value within Frequency-Band
W-CDMA FDD IV	1712.4	23.5	1.0	1.5	26	100%	0.398	398.1	1.0000	0.0792	0.9208	0.0792	0.0792
	1732.6	23.5	1.0	1.5	26		0.398	398.1	1.0000	0.0792	0.9208	0.0792	
	1752.6	23.5	1.0	1.5	26		0.398	398.1	1.0000	0.0792	0.9208	0.0792	
LTE Band 4	1715.0	23.0	1.0	1.5	25.5	100%	0.355	354.8	1.0000	0.0706	0.9294	0.0706	0.0706
	1732.6	23.0	1.0	1.5	25.5		0.355	354.8	1.0000	0.0706	0.9294	0.0706	
	1750.0	23.0	1.0	1.5	25.5		0.355	354.8	1.0000	0.0706	0.9294	0.0706	
LTE Band 66	1715.0	23.0	1.0	1.5	25.5	100%	0.355	354.8	1.0000	0.0706	0.9294	0.0706	0.0706
	1745.0	23.0	1.0	1.5	25.5		0.355	354.8	1.0000	0.0706	0.9294	0.0706	
	1775.0	23.0	1.0	1.5	25.5		0.355	354.8	1.0000	0.0706	0.9294	0.0706	

Maximum calculated MPE value:		
Lowest MPE-Limit in frequency-band:	1.0000	[mW/cm ²]
Highest MPE value in frequency-band:	0.0792	[mW/cm ²]
Lowest margin to limit in frequency-band:	0.9208	[mW/cm ²]

4.5.1.3. Results for upper operational band: W-CDMA FDD II, LTE Band 2

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Max. positive tolerance according manufacturer (dB)	Antenna Gain (dBi)	Declared maximum ERP (Measured+ Tune-up+ Antenna Gain) (dBm)	Duty cycle (%)	Declared Maximum ERP (W)	Equivalent ERP (maximum ERP x duty cycle) (mW)	MPE Limit accord. Table 1 (mW/cm ²)	MPE-Value (mW/cm ²)	Margin to limit: (W/m ²)	Fraction for Co-Location calculations	Max. Fraction-Value within Frequency-Band
W-CDMA FDD II	1852.4	23.5	1.00	1.5	26.0	100%	0.398	398.1	1.0000	0.0792	0.9208	0.0792	0.0792
	1880.0	23.5	1.00	1.5	26.0		0.398	398.1	1.0000	0.0792	0.9208	0.0792	
	1907.6	23.5	1.00	1.5	26.0		0.398	398.1	1.0000	0.0792	0.9208	0.0792	
LTE Band 2	1925.0	23.0	1.00	1.5	25.5	100%	0.355	354.8	1.0000	0.0706	0.9294	0.0706	0.0706
	1950.0	23.0	1.00	1.5	25.5		0.355	354.8	1.0000	0.0706	0.9294	0.0706	
	1975.0	23.0	1.00	1.5	25.5		0.355	354.8	1.0000	0.0706	0.9294	0.0706	

Maximum calculated MPE value:		
Lowest MPE-Limit in frequency-band:	1.0000	[mW/cm ²]
Highest MPE value in frequency-band:	0.0792	[mW/cm ²]
Margin to limit in frequency-band:	0.9208	[mW/cm ²]

4.5.1.4. Results for non - cellular transmitter, 2.4GHz W-LAN, 900MHz SRD

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Max. positive tolerance according manufacturer (dB)	Antenna Gain (dBi)	Declared maximum ERP (Measured+ Tune-up) (dBm)	Duty cycle (%)	Declared Maximum ERP (W)	Equivalent ERP (maximum ERP x duty cycle) (mW)	MPE Limit accord. Table 1 (mW/cm ²)	MPE-Value (mW/cm ²)	Margin to Limit: (mW/cm ²)	Fraction for Co-Location calculations	Max. Fraction-Value within Frequency-Band
WLAN 2.4GHz	2412.0	18.5	1.5	3.7	23.7	100%	0.234	234.4	1.0000	0.0466	0.9534	0.0466	0.0466
	2442.0	18.5	1.5	3.7	23.7		0.234	234.4	1.0000	0.0466	0.9534	0.0466	
	2462.0	18.5	1.5	3.7	23.7		0.234	234.4	1.0000	0.0466	0.9534	0.0466	
SRD	913.0	16.5	0.5	0.0	17.0	100%	0.050	50.1	0.6087	0.0100	0.5987	0.0164	0.0164
	915.0	16.5	0.5	0.0	17.0		0.050	50.1	0.6100	0.0100	0.6000	0.0163	
	917.0	16.5	0.5	0.0	17.0		0.050	50.1	0.6113	0.0100	0.6014	0.0163	

Remark: no tolerance declared by applicant

Maximum calculated MPE value:		
Lowest MPE-Limit:	0.6087	[mW/cm ²]
Highest MPE value:	0.0466	[mW/cm ²]
Lowest Margin to limit:	0.6087	[mW/cm ²]

4.5.1.5. Co-location assessment (scenario)

According to customers information no simultaneous transmission possible.

4.5.2. Conclusion FCC

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

4.5.3. Results for RSS Standard
4.5.3.1. Results for lower operational band: W-CDMA FDDV, LTE Band 5, 12, 13, 17, 71

Operating Mode	Channel frequency	Declared maximum conducted output power	Max. positive tolerance according manufacturer's tune-up info	Declared Antenna Gain	Calculated maximum ERP (declared+ Tune-up+ antenna Gain)	Duty-Cycle	Calculated Maximum ERP	Equivalent ERP (maximum ERP x duty cycle)	MPE Limit accord. Table 4 (ERP-Limit)	MPE-Value (ERP referred)	Margin to limit:	Fraction for Co-location calculations	Maximum Fraction Value within Frequency band
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(%)	(W)	(W)	(W/m ²)	(W/m ²)	(W/m ²)		
W-CDMA FDD V	826.4	23.5	1.0	0.3	24.8	100%	0.302	0.302	2.5807	0.6008	1.9799	0.2328	0.2328
	836.6	23.5	1.0	0.3	24.8	100%	0.302	0.302	2.6025	0.6008	2.0017	0.2309	
	846.6	23.5	1.0	0.3	24.8	100%	0.302	0.302	2.6237	0.6008	2.0229	0.2290	
LTE Band 5	829.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.5863	0.5355	2.0508	0.2070	0.2070
	836.6	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.6025	0.5355	2.0670	0.2058	
	844.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.6182	0.5355	2.0827	0.2045	
LTE Band 12	704.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.3130	0.5355	1.7775	0.2315	0.2315
	707.6	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.3210	0.5355	1.7856	0.2307	
	711.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.3286	0.5355	1.7932	0.2299	
LTE Band 13	782.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.4852	0.5355	1.9497	0.2155	0.2155
	782.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.4852	0.5355	1.9497	0.2155	
	782.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.4852	0.5355	1.9497	0.2155	
LTE Band 17	709.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.3242	0.5355	1.7887	0.2304	0.2304
	710.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.3264	0.5355	1.7909	0.2302	
	711.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.3286	0.5355	1.7932	0.2299	
LTE Band 71	668.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.2315	0.5355	1.6960	0.2400	0.2400
	680.6	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.2601	0.5355	1.7247	0.2369	
	693.0	23.0	1.0	0.3	24.3	100%	0.269	0.269	2.2882	0.5355	1.7527	0.2340	

Maximum calculated MPE value:		
Lowest MPE-Limit within frequency-band:	2.2315	[W/m ²]
Highest MPE value within frequency-band:	0.6008	[W/m ²]
Lowest margin to limit within frequency-band:	1.6960	[W/m ²]

4.5.3.2. Results for upper operational band: W-CDMA FDD IV, LTE Band 4, LTE Band 66

Operating Mode	Channel frequency	Declared maximum conducted output power	Max. positive tolerance according manufacturer's tune-up info	Declared Antenna Gain	Calculated maximum ERP (declared+ Tune-up+ antenna Gain)	Duty-Cycle	Calculated Maximum ERP	Equivalent ERP (maximum ERP x duty cycle)	MPE Limit accord. Table 4	MPE-Value	Margin to Limit:	Fraction for Co-location calculations	Maximum Fraction Value within Frequency band
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(%)	(W)	(W)	(W/m ²)	(W/m ²)	(W/m ²)		
W-CDMA FDD IV	1712.4	23.5	1.0	1.5	26.0	100%	0.398	0.398	4.2460	0.7920	3.4540	0.1865	0.1865
	1732.6	23.5	1.0	1.5	26.0		0.398	0.398	4.2802	0.7920	3.4882	0.1850	
	1752.6	23.5	1.0	1.5	26.0		0.398	0.398	4.3139	0.7920	3.5219	0.1836	
LTE Band 4	1715.0	23.0	1.0	1.5	25.5	100%	0.355	0.355	4.2504	0.7059	3.5445	0.1661	0.1661
	1732.6	23.0	1.0	1.5	25.5		0.355	0.355	4.2802	0.7059	3.5743	0.1649	
	1750.0	23.0	1.0	1.5	25.5		0.355	0.355	4.3095	0.7059	3.6036	0.1638	
LTE Band 66	1715.0	23.0	1.0	1.5	25.5	100%	0.355	0.355	4.2504	0.7059	3.5445	0.1661	0.1661
	1745.0	23.0	1.0	1.5	25.5		0.355	0.355	4.3011	0.7059	3.5952	0.1641	
	1775.0	23.0	1.0	1.5	25.5		0.355	0.355	4.3515	0.7059	3.6456	0.1622	

Maximum calculated MPE value:		
Lowest MPE-Limit within frequency-band:	4.2460	[W/m ²]
Highest MPE value within frequency-band:	0.7920	[W/m ²]
Lowest margin to limit within frequency-band:	3.4540	[W/m ²]

4.5.3.3. Results for upper operational band: W-CDMA FDD II, LTE Band 2

Operating Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Max. positive tolerance according manufacturer's tune-up info (dB)	Declared Antenna Gain (dBi)	Calculated maximum ERP (Measured+ Tune-up+ Antenna Gain) (dBm)	Duty-Cycle (%)	Calculated Maximum ERP (W)	Equivalent ERP (maximum ERP x duty cycle) (W)	MPE Limit accord. Table 4 (W/m ²)	MPE-Value (W/m ²)	Margin to Limit (W/m ²)	Fraction for Co-location calculations	Maximum Fraction Value within Frequency band
W-CDMA FDD II	1852.4	23.5	1.0	1.5	26.0	100%	0.398	0.398	4.4803	0.7920	3.6883	0.1768	0.1768
	1880.0	23.5	1.0	1.5	26.0		0.398	0.398	4.5258	0.7920	3.7338	0.1750	
	1907.6	23.5	1.0	1.5	26.0		0.398	0.398	4.5711	0.7920	3.7791	0.1733	
LTE Band 2	1925.0	23.0	1.0	1.5	25.5	100%	0.355	0.355	4.5996	0.7059	3.8937	0.1535	
	1950.0	23.0	1.0	1.5	25.5		0.355	0.355	4.6403	0.7059	3.9344	0.1521	
	1975.0	23.0	1.0	1.5	25.5		0.355	0.355	4.6809	0.7059	3.9750	0.1508	

Maximum calculated MPE value:		
Lowest MPE-Limit within frequency-band:	4.4766	[W/m ²]
Highest MPE value within frequency-band:	0.7920	[W/m ²]
Lowest margin to limit within frequency-band:	3.6883	[W/m ²]

4.5.3.4. Results for non-cellular transmitter, 2.4GHz W-LAN, 900MHz SRD

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Max. positive tolerance according manufacturer's tune-up info (dB)	Declared Antenna Gain (dBi)	Calculated maximum ERP (Measured+ Tune-up) (dBm)	Duty-Cycle (%)	Calculated Maximum ERP (W)	Equivalent ERP (maximum ERP x duty cycle) (W)	MPE Limit accord. Table 4 (W/m ²)	MPE-Value (W/m ²)	Margin to Limit: (W/m ²)	Fraction for Co-location calculations	Maximum Fraction Value within Frequency band
WLAN 2.4GHz	2412.0	18.5	1.5	3.7	23.7	100%	0.2344	0.234	5.3660	0.4664	4.8996	0.0869	0.0869
	2442.0	18.5	1.5	3.7	23.7	100%	0.2344	0.234	5.4115	0.4664	4.9452	0.0862	
	2462.0	18.5	1.5	3.7	23.7	100%	0.2344	0.234	5.4418	0.4664	4.9754	0.0857	
SRD	913.0	16.5	0.5	0.0	17.0	100%	0.0501	0.050	2.7626	0.0997	2.6629	0.0361	0.0361
	915.0	16.5	0.5	0.0	17.0	100%	0.0501	0.050	2.7668	0.0997	2.6670	0.0360	
	917.0	16.5	0.5	0.0	17.0	100%	0.0501	0.050	2.7709	0.0997	2.6712	0.0360	

Maximum calculated MPE value:		
2.4GHz Band		
Lowest MPE-Limit:	2.7626	[W/m ²]
Highest MPE value:	0.4664	[W/m ²]
Lowest margin to limit	2.6629	[W/m ²]

4.5.3.5. Co-location assessment (scenario)

According to customers information no simultaneous transmission possible.

4.5.3.6. Conclusion ISED

The measurement results comply with the ISED Limit per RSS-102, Issue 5 for the uncontrolled RF Exposure of mobile device.

4.6. Measurement uncertainties

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved.

For uncertainty determination, each component used in the concrete measurement set-up was taken in account and it's contribution to the overall uncertainty according it's statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%							Remarks
Conducted emissions (U _{CISPR})	CISPR 16-2-1	9 kHz - 150 kHz	4.0 dB							-
		150 kHz - 30 MHz	3.6 dB							
Radiated emissions Enclosure	CISPR 16-2-3	30 MHz - 1 GHz	4.2 dB							E-Field
		1 GHz - 18 GHz	5.1 dB							
Disturbance power	CISPR 16-2-2	30 MHz - 300 MHz	-							-
Power Output radiated	-	30 MHz - 4 GHz	3.17 dB							Substitution method
Power Output conducted	-	Set-up No.	Cel-C1	Cel-C2	BT1	W1	W2			
		9 kHz - 12.75 GHz	N/A	0.60	--	--	--			
		12.75 - 26.5GHz	N/A	0.82	--	--	--			
Conducted emissions on RF-port	-	9 kHz - 2.8 GHz	0.70	N/A	--	--	--		N/A - not applicable	
		2.8 GHz - 12.75GHz	1.48	N/A	--	--	--			
		12.75 GHz - 18GHz	1.81	N/A	--	--	--			
		18 GHz - 26.5GHz	1.83	N/A	--	--	--			
Occupied bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)							Frequency error
			1.0 dB							Power
Emission bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)							Frequency error
			See above: 0.70 dB							Power
Frequency stability	-	9 kHz - 20 GHz	0.0636 ppm							-
Radiated emissions Enclosure	-	150 kHz - 30 MHz	5.0 dB							Magnetic field E-field Substitution
		30 MHz - 1 GHz	4.2 dB							
		1 GHz - 20 GHz	3.17 dB							

Table: measurement uncertainties, valid for conducted/radiated measurements

5. Abbreviations used in this report

The abbreviations	
ANSI	American National Standards Institute
AV , AVG, CAV	Average detector
EIRP	Equivalent isotropically radiated power, determined within a separate measurement
EGPRS	Enhanced General Packet Radio Service
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
IC	Industry Canada
n.a.	not applicable
Op-Mode	Operating mode of the equipment
PK	Peak
RBW	resolution bandwidth
RF	Radio frequency
RSS	Radio Standards Specification, Documents from Industry Canada
Rx	Receiver
TCH	Traffic channel
Tx	Transmitter
QP	Quasi peak detector
VBW	Video bandwidth
ERP	Effective radiated power

6. Accreditation details of CETECOM's laboratories and test sites

Ref.-No.	Accreditation Certificate	Valid for laboratory area or test site	Accreditation Body
-	D-PL-12047-01-01	All laboratories and test sites of CETECOM GmbH, Essen	DAkKS, Deutsche Akkreditierungsstelle GmbH
337 487 558 348 348	MRA US-EU 0003	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measur.	FCC, Federal Communications Commission Laboratory Division, USA
337 487 550 558	3462D-1 3462D-2 3462D-2 3462D-3	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR)	IC, Industry Canada Certification and Engineering Bureau
487 550 348 348	R-2666 G-301 C-2914 T-1967	Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measur.	VCCI, Voluntary Control Council for Interference by Information Technology Equipment, Japan
OATS = Open Area Test Site, SAR = Semi Anechoic Room, FAR = Fully Anechoic Room			

7. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2020-Apr-29
C1	Updated FCC ID and IC ID, updated address	2020-Jun-18
C2	Updated calculation due to a new MPE Information Requirements document	2020-Dez-17

END OF REPORT