
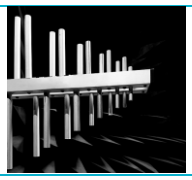
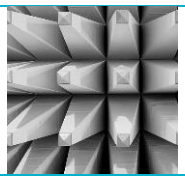

CTC advanced
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Bundesnetzagentur

BNetzA-CAB-02/21-102

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-03

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-9100/19-01-14 MPE (FCC_ISED)

Certification numbers and labeling requirements	
FCC ID	ZKSQC1000A
ISED number	9849A-QC1000A
HVIN (Hardware Version Identification Number)	QC1000 Rev.A
PMN (Product Marketing Name)	QC1000
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

This 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.

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EUT technologies:

Technologies:	Max. power [dBm]		Antenna gain max.: [dBi]	Max. EIRP declared by customer [dBm]	#
	conducted	EIRP			
UMTS FDD II 1900 MHz	25.0	29.0	4.0	29.0	A, B
UMTS FDD IV 1750 MHz	25.0	29.0	4.0	29.0	A, B
UMTS FDD V 850 MHz	25.0	29.0	4.0	29.0	A, B
LTE FDD 2 Cat M1/Cat NB1 1900 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 4 Cat M1/Cat NB1 1750 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 5 Cat M1/Cat NB1 850 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 7 Cat M1/Cat NB1 2600 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 12 Cat M1/Cat NB1 700 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 13 Cat M1/Cat NB1 700 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 25 Cat M1/Cat NB1 1900 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 26 Cat M1/Cat NB1 850 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 38 Cat M1/Cat NB1 2600 MHz	25.0	28.0	3.0	28.0	A, B
LTE FDD 41 Cat M1/Cat NB1 2500 MHz	25.0	28.0	3.0	28.0	A, B

Details and origins of the measurements shown in the table above:

#	Results from:	Additional information
A	Quectel_EG25-G_LTE_Standard_Specification_V1.3	Max. conducted output power
B	Antenna Gains from Customer 2020-11-05	Antenna gains

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Technologies:	Max. power [dBm]		Antenna gain max.: [dBi]	Max. EIRP declared by customer [dBm]	#
	conducted	EIRP			
Radio 902 to 928 MHz	17.1 (peak)	18.2 (peak)	1.4	18.5 (peak)	C
WLAN 2450 MHz	22.55	20.55	-2.0	25.55	D, B
WB/UWB 6.28 GHz	--	9.53 (full bandwith)	--	9.53 (full bandwith)	E

Details and origins of the measurements shown in the table above:

#	Results from:		Additional information
C	1-9100/20-01-10	CTC advanced GmbH report	Max measured peak EIRP on page 20.
D	1-9100/20-01-12-B	CTC advanced GmbH report	Max measured EIRP on page 24.
E	1-9100/20-01-13	CTC advanced GmbH report	Max measured EIRP on page 23. BW on page 21.

Collocation overview:

Active scenario: / **Technology**	**1***	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
UMTS / LTE	**x**	x	x	x	x	x	x	x								
900 MHz Radio	**x**	x	x	x					x	x	x	x				
WLAN 2450 MHz	**x**	x			x	x			x	x			x	x		
UWB 6.28 GHz	**x**		x		x		x		x		x		x		x	

*) Worst Case Scenario:
All bands active the same time.

Prediction of MPE limit at given distance - FCC

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

$S = PG / 4\pi R^2$

where: S = Power density
P = Power input to the antenna
G = Antenna gain
R = Distance to the center of radiation of the antenna
PG = Output Power including antenna gain

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled “Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure”

Frequency Range (MHz)	Power Density (mW/cm^2)	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

Prediction: worst case

	Technologies:	UMTS/LTE	WLAN	900 MHz Radio	WB/UWB	
	Frequency (MHz)	850	2450	900	6280	
PG	Declared max power (EIRP)	29	20.55	18.5	9.53	dBm
R	Distance	20	20	20	20	cm
S	MPE limit for uncontrolled exposure	0.6	1	0.6	1	mW/cm^2
	Calculated Power density:	0.1581	0.0226	0.0141	0.0018	mW/cm^2
	Calculated percentage of Limit:	27.90%	2.26%	2.35%	0.18%	
	Collocation:					
	Scenario 1: UMTS/LTE + WLAN + 900 MHz Radio + WB/UWB Calculated percentage of Limit:	32.69%				

This prediction demonstrates the following:

The power density levels for FCC at a distance of 20 cm are below the maximum levels allowed by regulations.

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Prediction of MPE limit at given distance - ISED

RSS-102, Issue 5, 2.5.2

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:

- 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).

Prediction: worst case

	UMTS	WLAN	Radio	UWB	
Frequency	850	2450	900	6280	MHz
Distance	20	20	20	20	cm
Maximum EIRP	25	20.55	17.1	9.53	dBm
Maximum EIRP	316.2	113.5	51.3	9.0	mW
Exclusion Limit from above:	1.32	2.71	1.37	5.00	W
Calculated percentage of Limit:	24.03%	4.18%	3.75%	0.18%	
Collocation:					
Scenario 1: UMTS/LTE + WLAN + 900 MHz Radio + WB/UWB Calculated percentage of Limit:	32.14%				

Conclusion: RF exposure evaluation is not required.

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