
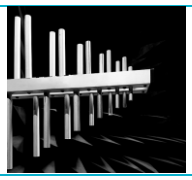
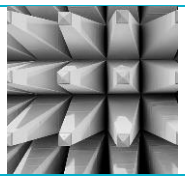

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

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

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-9152/19-01-12 MPE (FCC_ISED)

Certification numbers and labeling requirements	
FCC ID	YBN-AIVIH61L1
ISED number	9595A-AIVIH61L1
HVIN (Hardware Version Identification Number)	AIVIH61L1
PMN (Product Marketing Name)	AIVIH61L1
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.

Document authorised:

cn=Alexander Hnatovskiy, o=CTC advanced GmbH, ou=HNA-161129, email=Alexander.Hnatovskiy@ctcadvanced.com, c=DE
2019.12.16 17:20:50 +01'00'

Alexander Hnatovskiy
Lab Manager
Radio Communications & EMC

cn=Marco Scigliano, o=CTC advanced GmbH, ou=SCI-161125, email=marco.scigliano@ctcadvanced.com, c=DE
2019.12.16 09:54:16 +01'00'

Marco Scigliano
Testing Manager
Radio Communications & EMC

EUT technologies:

Technologies:	Max. power [dBm]		Antenna gain max.: [dBi] **	Maximum declared conducted by customer	#
	conducted	EIRP			
BT 2450 MHz	decl. 4.0 (peak) meas. 2.09 (peak)	--	4.0	2.0 dBm +/-2 dB	1
WLAN 2450 MHz	decl. 18.0 (avg) meas. 16.4 (avg)	--	3.2	16.0 dBm +/-2 dB	2
WLAN 5 GHz	decl. 12.0 (avg) meas. 11.0 (avg)	--	6.6	10.0 dBm +/-2 dB	3

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

#	Results from:		Additional information
1	1-9152/19-01-05	CTC Advanced GmbH	Antenna gain page 19, Max conducted page 25
2	1-9152/19-01-06	CTC Advanced GmbH	Antenna gain page 21, Max conducted page 23
3	1-9152/19-01-07	CTC Advanced GmbH	Antenna gain page 23, Max conducted page 30

)** worst case of all antenna types, channels and modulations (overrated)

Collocation overview:

	Active scenario:			
Technology	**1**	**2**	**3**	**4**
WLAN 2.4 GHz	x	x		x
WLAN 5 GHz	x		x	x
BT EDR		x	x	x

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/cm²)	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

Prediction: worst case

	Technologies:	BT	WLAN 2400	WLAN 5000	
	Frequency (MHz)	2450	2400	2450	
PG	Declared max power (EIRP)	8	21.2	18.6	dBm
R	Distance	20	20	20	cm
S	MPE limit for uncontrolled exposure	1	1	1	mW/cm²
	Calculated Power density:	0.0013	0.0262	0.0144	mW/cm²
	Calculated percentage of Limit:	0.13%	2.62%	1.44%	
	Collocation:				
	Scenario 1: WLAN 2.4 + WLAN 5 GHz Calculated percentage of Limit:	4.07%			
	Scenario 2: BT + WLAN 2.4 MHz Calculated percentage of Limit:	2.75%			
	Scenario 3: BT + WLAN 5 GHz Calculated percentage of Limit:	1.57%			
	Scenario 4: BT + WLAN 2.4 + WLAN 5 GHz Calculated percentage of Limit:	4.19%			

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.

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

		BT	WLAN 2450	WLAN 5000	
	Frequency	2450	2450	5000	MHz
R	Distance	20	20	20	cm
P	Max power input to the antenna	4	18	12	dBm
G	Antenna gain	4	3.2	6.6	dBi
PG	Maximum EIRP	8	21.2	18.6	dBm
PG	**Maximum EIRP**	6.3	131.8	72.4	mW
	Exclusion Limit from above:	2.71	2.71	4.42	W
	Calculated percentage of Limit:	0.23%	4.86%	1.64%	
	Collocation:				
	Scenario 1: WLAN 2.4 + WLAN 5GHz Calculated percentage of Limit:	6.50%			
	Scenario 2: BT + WLAN 2.4 GHz Calculated percentage of Limit:	5.09%			
	Scenario 3: BT + WLAN 5 GHz Calculated percentage of Limit:	1.87%			
	Scenario 4: BT + WLAN 2.4 + WLAN 5 GHz Calculated percentage of Limit:	6.73%			

Conclusion: RF exposure evaluation is not required.