

CTC advanced
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Bundesnetzagentur

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Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-0087/20-01-06 MPE (FCC_ISED)

Certification numbers and labeling requirements	
FCC ID	2ASDVVIA1
ISED number	24744-VIA1
HVIN (Hardware Version Identification Number)	VIA1
PMN (Product Marketing Name)	Hiberband Via
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

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EUT technologies:

Technologies:	Max. power [dBm]		Antenna gain max.: [dBi] *	Declared by customer	#
	conducted	EIRP			
LoRa 923 to 928 MHz	meas. 22.5	meas. 29.4	meas. 7.1	30.0 dBm	A
BT	10.5	--	< 5.0	15.5 dBm	B,C
WLAN	19.5	--	< 5.0	24.5 dBm	B,C

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

#	Results from:		Additional information
A	CTC advanced GmbH report	1-0087/20-01-03	Max. Conducted + Max. EIRP (page 18)
B	Murata LBEE5HY1MW-230.pdf	(provided by customer)	W-LAN+Bluetooth Combo Module Data Sheet WLAN: Max conducted on page 27 BT: Max conducted on page 39
C	Antenna_2724757	(provided by customer)	Antenna data sheet

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

Collocation overview:

Active scenario: / Technology	1	2
LoRa	x	
BT	x	x
WLAN		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/cm^2)	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

Prediction: worst case

	Technologies:	LoRa	BT	WLAN	
	Frequency (MHz)	925	2450	2450	
PG	Declared max power (EIRP)	30	15.5	24.5	dBm
R	Distance	20	20	20	cm
S	MPE limit for uncontrolled exposure	0.617	1	1	mW/cm^2
	Calculated Power density:	0.1990	0.0071	0.0561	mW/cm^2
	Calculated percentage of Limit:	32.28%	0.71%	5.61%	
	Collocation:				
	Scenario 1: LoRa + BT 2.45 MHz Calculated percentage of Limit:	32.98%			
	Scenario 2: LoRa + WLAN 2.45 MHz Calculated percentage of Limit:	37.89%			

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

		LoRa	BT	WLAN	
	Frequency	925	2450	2450	MHz
R	Distance	20	20	20	cm
PG	Maximum EIRP	30.0	15.5	24.5	dBm
PG	**Maximum EIRP**	1000.0	35.5	281.8	mW
	Exclusion Limit from above:	1.39	2.71	2.71	W
	Calculated percentage of Limit:	71.72%	1.31%	10.39%	
	Collocation:				
	Scenario 1: LoRa + BT 2.45 MHz Calculated percentage of Limit:	73.03%			
	Scenario 2: LoRa + WLAN 2.45 MHz Calculated percentage of Limit:	82.11%			

Conclusion: RF exposure evaluation is not required.