

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-3977/22-02-18-A Exemption / MPE (FCC)

Certification numbers and labeling requirements	
FCC ID	VW3FAST5688W

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Document History:

Version	Applied Changes	Date of Release
	Initial Release	2022-07-18
-A	Output power for LTE 66 corrected on page 2 and 4.	2022-08-02

EUT technologies:

Technologies:	Power Average Conducted [dBm]			Power EIRP ² [dBm]	Max. Power for RF Exposure [dBm]	Data taken from (#)
	Measured Value	Max. declared (Tune-Up)	Difference ¹ (Tune-Up Correction)			
LTE FDD 2 1900 MHz	22.7	23.0 (+1/-2 dB)	1.3	25.8	27.1	A, C
LTE FDD 4 1750 MHz	22.2	23.0 (+1/-2 dB)	1.8	25.8	28.6	A, D
LTE FDD 5 850 MHz	22.6	23.0 (+1/-2 dB)	1.4	26.35	27.75	A, B
LTE FDD 12 700 MHz	21.9	22.9 (+1/-2 dB)	2.0	25.45	27.45	A, D
LTE FDD 25 1900 MHz	22.0	23.0 (+1/-2 dB)	2.0	25.45	27.45	A, F
LTE FDD 26 850 MHz	22.7	23.0 (+1/-2 dB)	1.3	26.35	27.65	A, B, E
LTE FDD 41 2600 MHz	25.7	26.0 (+1/-2 dB)	1.3	28.6	29.9	A, G
LTE FDD 66 1750 MHz	22.3	23.0 (+1/-2 dB)	1.7	25.9	27.6	A, H
LTE FDD 71 680 MHz	22.2	23.0 (+1/-2 dB)	1.8	23.95	25.75	A, I
NR TDD n41 2600 MHz	27.8	26.0 (+2/-2 dB)	0.2	32.0	32.2	A, G
NR FDD n71 680 MHz	23.0	23.0 (+1/-2 dB)	1.0	22.6	23.6	A, I
BT LE 2450 MHz	8.9	N/A	N/A	12.1 ³	12.1 ³	J
WLAN 2450 MHz	29.6	N/A	N/A	34.8 ³	34.8 ³	K
WLAN 5000 MHz	28.8	N/A	N/A	33.6 ³	33.6 ³	L

¹Difference (Tune-Up Correction) = Max. declared conducted power (Tune-Up) – measured conducted Power²Output power below 1 GHz is corrected with 2.15 dB³ Antenna Gain added

Technologies:	Power Average Conducted [dBm]			Power EIRP ² [dBm]	Max. Power for RF Exposure [dBm]	Data taken from (#)
	Measured Value	Max. declared (Tune-Up)	Difference ¹ (Tune-Up Correction)			
NR FDD n25 1900 MHz	23.4	23.0 (+1/-2 dB)	0.6	26.5	27.1	A, M
NR FDD n66 1750 MHz	23.0	23.0 (+1/-2 dB)	1.0	26.7	27.7	A, N
NR TDD n77 3500 MHz	26.1	26.0 (+1/-3 dB)	0.9	27.9	28.8	A, O
NR TDD n77 3850 MHz	26.4	26.0 (+1/-3 dB)	0.6	28.9	29.5	A, P

¹Difference (Tune-Up Correction) = Max. declared conducted power (Tune-Up) – measured conducted Power

²Output power below 1 GHz is corrected with 2.15 dB

³ Antenna Gain added

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

#	Results from:
A	Tune up info from customer
B	1-3977/22-02-02 CTC Advanced GmbH report (p.22 max. meas. cond. / p.17 max. meas. ERP)
C	1-3977/22-02-03 CTC Advanced GmbH report (p.22 max. meas. cond. / p.23 max. meas. EIRP)
D	1-3977/22-02-04 CTC Advanced GmbH report - LTE 4 (p.23 max. meas. cond. / p.24 max. meas. ERP) - LTE 12 (p.149 max. meas. cond. / p.150 max. meas. ERP)
E	1-3977/22-02-05 CTC Advanced GmbH report (p.17 max. meas. cond. / p.19 max. meas. ERP)
F	1-3977/22-02-06 CTC Advanced GmbH report (p.21 max. meas. cond. / p.22 max. meas. EIRP)
G	1-3977/22-02-08 CTC Advanced GmbH report (p.22/109 max. meas. cond. / p.24/115 max. meas. EIRP)
H	1-3977/22-02-09 CTC Advanced GmbH report (p.20 max. meas. cond. / p.21 max. meas. ERP)
I	1-3977/22-02-10 CTC Advanced GmbH report (p.19/108 max. meas. cond. / p.22/114 max. meas. ERP)
J	1-3977/22-01-03-A CTC Advanced GmbH report - Max. meas. cond. (p.24) - Max Gain declared: 3.2 dB (p.20)
K	1-3977/22-01-04-A CTC Advanced GmbH report - Max. meas. cond. (p.24) theoretical 23.9 + 5.8=29.7 / Max:29.8 - Max combined Gain declared: 5.8 dB (p.21)
L	1-3977/22-01-05 CTC Advanced GmbH report - Max. meas. cond. (p.33) theoretical 28.8 + 5.7=34.5 - Max combined Gain declared: 5.7 dB (p.29)
M	1-3977/22-02-15 CTC Advanced GmbH report (p.22 max. meas. cond. / p.23 max. meas. ERP)
N	1-3977/22-02-16 CTC Advanced GmbH report (p.19 max. meas. cond. / p.22 max. meas. EIRP)
O	1-3977/22-02-11 CTC Advanced GmbH report (p.22 max. meas. cond. / p.29 max. meas. EIRP)
P	1-3977/22-02-11 CTC Advanced GmbH report (p.35 max. meas. cond. / p.41 max. meas. EIRP)

Declared minimum safety distances: 31cm**Collocation overview:**

Technology \ Active scenario:	1
LTE (Carrier Aggregation)*	x
BT LE	x
WLAN 2.4 GHz	x
WLAN 5 GHz	x

*) CA_12A-66A

Sum of LTE FDD 12 & LTE FDD 66 (27.5 dBm + 27.6 dBm)

Prediction of MPE limit at given distance (KDB 447498 D01 General RF Exposure Guidance v06)

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:		CA_12A-66A		BLE	WLAN 2.4	WLAN 5
	Frequency (MHz)	700	1750	2450	2450	5000
PG	Declared max power (EIRP)	27.5	27.6	12.1	34.8	33.6
R	Distance	31.0	31.0	31.0	31.0	31.0
S	MPE limit for uncontrolled exposure	0.4667	1.0000	1.0000	1.0000	1.0000
	Calculated Power density:	0.0461	0.0477	0.0013	0.2502	0.1898
	Calculated percentage of Limit:	9.87%	4.77%	0.13%	25.02%	18.98%
Collocation:						
	LTE (CA_12A-66A) + BLE + WLAN 2.4 GHz + WLAN 5 GHz	58.77%				
	Calculated percentage of Limit:					

This prediction demonstrates the following:

The power density levels for FCC at a distance of 31 cm are below the maximum levels allowed by regulations.

Conclusion: RF exposure evaluation is not required.