

DEKRA Testing and Certification S.A.U.

Parque Tecnológico de Andalucía
Severo Ochoa, 2 & 6
29590 Málaga
Spain

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Report: 53298B_TL280LER, TL280LE, LE2080R, LE2080, TL280LER

RF exposure analysis for the equipment – Maximum Antenna Gain

Model: TL280LER, TL280LE, LE2080R, LE2080, TL280LER **FCC ID:** F5317TL280LER **IC:** 160A-TL280LER

The TL280LER, TL280LE, LE2080R, LE2080, TL280LER are modules designed to be installed in other devices. These devices are to be used only for fixed and mobile applications. If the final product after integration is intended for portable use, new applications and FCC and ISED are required.

The antenna(s) used for these transmitters must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter except as under the conditions described KDB 447498 D01 General RF Exposure Guidance.

MPE exposure limits

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 (MHz) /1500	30
1500 – 100.000	1,0	30

The table below is excerpted from RSS-102, Issue 5, 4, titled “Table 4: RF Field Strength Limits for Devices Used by the General Public”:

Frequency Range (MHz)	Power density (W/m ²)	Averaging time (minutes)
300 – 6000	$0.02619 \cdot f^{0.6834}$	6

EIRP limits

Band	Frequency (MHz) (Lowest Frequency)	FCC MPE limit (mW/cm ²)	ISED MPE limit (mW/cm ²)	FCC/IC MPE limit (mW/cm ²)	FCC EIRP limit (W)	ISED EIRP limit (W)
FDD 5	824,7	0,550	0,258	0,25771	11,48	11,50
WCDMA FDD V	826,4	0,551	0,258	0,25807	11,48	11,50
FDD 4	1710,7	1,000	0,424	0,42431	1,00	1,00
FDD 2	1850,7	1,000	0,448	0,44775	2,00	2,00
WCDMA FDD II	1852,4	1,000	0,448	0,44803	2,00	2,00
FDD 12	699,0	0,466	0,230	0,23017	4,92	5,00
FDD 13	777,0	0,518	0,247	0,24743	4,92	5,00

Using the equation $S = \frac{PG}{4\pi R^2}$ to calculate the exposure to electromagnetic fields

where: S = power density (in appropriate units, e.g. mW/cm²)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the centre of radiation of the antenna (appropriate units, e.g., cm)

The maximum antenna gain that can be used in the TL280LER, TL280LE, LE2080R, LE2080, TL280LER is shown in the following table:

Band	Frequency (MHz) (Lowest Frequency)	Maximum conducted output power (per tune-up) (dBm)	Duty cycle (%)	FCC MPE limit (mW/cm ²)	ISED MPE limit (mW/cm ²)	FCC/IC MPE limit (mW/cm ²)	FCC ERP limit (W)	ISED ERP limit (W)	Evaluation distance for compliance with MPE limits (cm)	Antenna gain to meet FCC/ISED MPE limit (dBi)	Antenna gain to meet FCC ERP limit (dBi)	Antenna gain to meet ISED ERP limit (dBi)	Maximum antenna gain to meet all the limits (dBi)	Maximum antenna gain to meet all the limits per frequency band (dBi)
FDD 5	824,7	24,00	100,0%	0,550	0,258	0,25771	11,48	11,50	20	7,12	16,59	16,60	7,12	6,63
WCDMA FDD V	826,4	24,50	100,0%	0,551	0,258	0,25807	11,48	11,50	20	6,63	16,09	16,10	6,63	
FDD 4	1710,7	24,00	100,0%	1,000	0,424	0,42431	1,00	1,00	20	9,28	6,00	6,00	6,00	6,00
FDD 2	1850,7	24,00	100,0%	1,000	0,448	0,44775	2,00	2,00	20	9,52	9,01	9,01	9,01	8,51
WCDMA FDD II	1852,4	24,50	100,0%	1,000	0,448	0,44803	2,00	2,00	20	9,02	8,51	8,51	8,51	
FDD 12	699,0	24,00	100,0%	0,466	0,230	0,23017	4,92	5,00	20	6,63	12,91	12,98	6,63	6,63
FDD 13	777,0	24,00	100,0%	0,518	0,247	0,24743	4,92	5,00	20	6,94	12,91	12,98	6,94	

Band	Frequency (MHz) (Lowest Frequency)	Maximum conducted output power (per tune-up) (dBm)	Duty cycle (%)	Antenna gain (dBi)	FCC/IC MPE limit (mW/cm ²)	FCC ERP limit (W)	ISED ERP limit (W)	FCC/ISED ERP limit (W)	Evaluation distance for compliance with MPE limits (cm)	$S = \frac{PG}{4\pi R^2}$ (mW/cm ²)	MPE Ratio (S/MPE limit)
FDD 5	824,7	24,00	100,0%	6,63	0,25771	11,48	11,50	11,48	20	0,23000	0,89248
WCDMA FDD V	826,4	24,50	100,0%	6,63	0,25807	11,48	11,50	11,48	20	0,25807	0,99997
FDD 4	1710,7	24,00	100,0%	6,00	0,42431	1,00	1,00	1,00	20	0,19894	0,46886
FDD 2	1850,7	24,00	100,0%	8,51	0,44775	2,00	2,00	2,00	20	0,35459	0,79195
WCDMA FDD II	1852,4	24,50	100,0%	8,51	0,44803	2,00	2,00	2,00	20	0,39786	0,88802
FDD 12	699,0	24,00	100,0%	6,63	0,23017	4,92	5,00	4,92	20	0,23000	0,99926
FDD 13	777,0	24,00	100,0%	0,00	0,24743	4,92	5,00	4,92	20	0,04997	0,20197

Yours sincerely,
P.A.



By: Dan Nita
Title: Approvals Manager
Company: Digital Security Controls
Telephone: 905-760-3000, Ext. 2706
e-mail: dnita@tycoint.com