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RF exposure analysis for the equipment UM04-KO (FCC ID: TTIUM04KO)

The device (FCC ID: TTIUM04KO) is a module designed to be installed in other devices. This device is to be used only for fixed and mobile applications. If the final product after integration is intended for portable use, new FCC application are required.

The antenna(s) used for this transmitter 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 4, 4.2, titled “RF Limits for Devices used by the General Public”:

Frequency Range (MHz)	Power density (W/m^2)	Averaging time (minutes)
300 – 1500	f (MHz) /150	6
1500 – 100.000	10	6

EIRP/ERP limits

For 850 MHz frequency band and according to FCC §22.913 the maximum ERP of the device is 7 W (equivalent to 11,48 W EIRP).

For 1900 MHz frequency band and according to FCC §24.232, the maximum EIRP of the device should be lower than 2 W.

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/cm^2)
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 center of radiation of the antenna (appropriate units, e.g., cm)

compliance with FCC MPE and EIRP limits is demonstrated following the calculations shown in the next page.

Band	Operation Mode (worst case)	Frequency (MHz)	Maximum conducted output power (per tune-up) (dBm)	Duty cicle (%)	FCC MPE limit (mW/cm^2)	FCC EIRP limit per §22.913 and §24.232 (W)	Evaluation distance for compliance with MPE limits (cm)	Antenna gain to meet FCC MPE limit (dBi)	Antenna gain to meet FCC EIRP limit (dBi)	Maximun antenna gain to meet all the limits (dBi)	Maximun antenna gain to meet all the limits per frequency band (dBi)
GSM/GPRS/EDGE 850	4 of 8 transmission slots Duty factor: 50%	824,2	34,00	50,0%	0,55	11,48	20	3,42	6,59	3,42	Maximun antenna gain for 850 MHz
FDD V	Duty factor: 100%	826,4	25,00	100,0%	0,55	11,48	20	9,42	15,59	9,42	3,42
GSM/GPRS/EDGE 1900	4 of 8 transmission slots Duty factor: 50%	1850,2	31	50,0%	1,00	2,00	20	9,02	2,01	2,01	Maximun antenna gain for 1900 MHz
											2,01

Sincerely,

P.A.

AT4 wireless, S.A.

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