

RF Exposure Evaluation according to KDB 447498 D01 v06

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Certification numbers and labeling requirements	
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1. MPE 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)

2. EUT technologies

WLAN:

Declared minimum safety distance: **107cm**

SRD Technology	Frequency [MHz]		Reference #	Output Power [dBm]			Power Density [mW/cm ²]		Share of Limit %
	f _{Min}	f _{Max}		P _{ERP}	P _{EIRP}	P _{RF Exp}	S _{Result}	S _{Limit}	
WLAN 2.4 GHz	2412	2462	A+B	N/A	23.5	23.5	0.002	1.000	0.16%
WLAN U-NII-1	5180	5240	A+B	N/A	17.8	17.8	0.000	1.000	0.04%
WLAN U-NII-3	5745	5825	A+B	N/A	17.8	17.8	0.000	1.000	0.04%

Note:

- EIRP Output Power [dBm] = Conducted Output Power [dBm] + Antenna Gain (dBi)
- Worst case of WLAN is marked green.

Referenced Documents:

#	Results from:
A	Operational_Descriptio
B	WiFi Antenna Info

Inmarsat:Declared minimum safety distance: **107cm**

SRD Technology	Frequency [MHz]		Reference #	Output Power [dBm]			Power Density [mW/cm²]		Share of Limit
	f _{Min}	f _{Max}		P _{ERP}	P _{EIRP}	P _{RF Exp}	S _{Result}	S _{Limit}	%
Inmarsat	1626	1660	A	N/A	47.1	47.1	0.356	1.000	35.65%

Note:

- EIRP Output Power [dBm] = Conducted Output Power [dBm] + Antenna Gain (dBi)
- Worst case of WLAN is marked green.

Referenced Documents:

#	Results from:
A	Operational_Description (Worst case is Class 7: 35.1 dBm + 1 dB tolerance + 11 dBi gain = 47.1 dBm)

Cellular:Declared minimum safety distance: **107cm**

Cellular Technology	Frequency [MHz]		Reference	Output Power [dBm]					Power Density [mW/cm²]		Share of Limit
	f _{Min}	f _{Max}		#	Conducted		Radiated		Corrected	S _{Result}	S _{Limit}
			P _{Meas}		P _{Max}	P _{ERP}	P _{EIRP}	P _{RF Exp}			
WCDMA Band II	1850	1910	A+B	N/A	25.0	27.7	29.8	29.8	0.01	1.00	0.66%
WCDMA Band IV	1710	1755	A+B	N/A	25.0	29.0	31.1	31.1	0.01	1.00	0.90%
WCDMA Band V	824	849	A+B	N/A	25.0	26.8	28.9	28.9	0.01	0.55	0.98%
LTE Band 2	1850	1910	A+B	N/A	25.0	27.7	29.8	29.8	0.01	1.00	0.66%
LTE Band 4	1710	1755	A+B	N/A	25.0	29.0	31.1	31.1	0.01	1.00	0.90%
LTE Band 5	824	849	A+B	N/A	25.0	26.8	28.9	28.9	0.01	0.55	0.98%
LTE Band 7	2500	2570	A+B	N/A	25.0	27.9	30.0	30.0	0.01	1.00	0.70%
LTE Band 12	699	716	A+B	N/A	25.0	26.5	28.6	28.6	0.01	0.47	1.08%
LTE Band 13	777	787	A+B	N/A	25.0	26.5	28.6	28.6	0.01	0.52	0.97%
LTE Band 14	788	798	A+B	N/A	25.0	26.5	28.6	28.6	0.01	0.53	0.96%
LTE Band 17	704	716	A+B	N/A	25.0	26.5	28.6	28.6	0.01	0.47	1.07%
LTE Band 25	1850	1915	A+B	N/A	25.0	27.7	29.8	29.8	0.01	1.00	0.66%
LTE Band 26	814	849	A+B	N/A	25.0	26.8	28.9	28.9	0.01	0.54	0.99%
LTE Band 30	2305	2315	A+B	N/A	25.0	27.9	30.0	30.0	0.01	1.00	0.70%
LTE Band 38	2570	2620	A+B	N/A	25.0	27.9	30.0	30.0	0.01	1.00	0.70%
LTE Band 41	2496	2690	A+B	N/A	28.0	30.9	33.0	33.0	0.01	1.00	1.39%
LTE Band 42	3450	3550	A+B	N/A	25.0	30.2	32.3	32.3	0.01	1.00	1.18%
LTE Band 66	1710	1780	A+B	N/A	25.0	29.0	31.1	31.1	0.01	1.00	0.90%
LTE Band 71	663	698	A+B	N/A	25.0	23.8	25.9	25.9	0.00	0.44	0.61%
5G n2	1850	1910	A+B	N/A	25.0	27.7	29.8	29.8	0.01	1.00	0.66%

5G n5	824	849	A+B	N/A	25.0	26.8	28.9	28.9	0.01	0.55	0.98%
5G n7	2500	2570	A+B	N/A	25.0	27.9	30.0	30.0	0.01	1.00	0.70%
5G n25	1850	1915	A+B	N/A	25.0	27.7	29.8	29.8	0.01	1.00	0.66%
5G n30	2305	2315	A+B	N/A	25.0	27.9	30.0	30.0	0.01	1.00	0.70%
5G n38	1850	1915	A+B	N/A	25.0	27.7	29.8	29.8	0.01	1.00	0.66%
5G n41	2496	2690	A+B	N/A	28.0	30.9	33.0	33.0	0.01	1.00	1.39%
5G n66	1710	1780	A+B	N/A	25.0	29.0	31.1	31.1	0.01	1.00	0.90%
5G n71	663	698	A+B	N/A	25.0	23.8	25.9	25.9	0.00	0.44	0.61%
5G n77	3450	3980	A+B	N/A	28.0	33.2	35.3	35.3	0.02	1.00	2.36%
5G n78	3450	3980	A+B	N/A	28.0	33.2	35.3	35.3	0.02	1.00	2.36%

Note:

- Max rated conducted output power taken from customer's tune up info as attached in this filing.
- Worst case is marked yellow.

Referenced Documents:

A	Operational_Description
B	Antenna_information_Cellular_Part_1 (Highest gain values for each scenario and band were chosen)

3. Collocation overview:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured field strengths or power density.

Technology	Share of Limit [%]
WLAN	0.16%
Inmarsat	35.65%
Cellular	2.36%
Sum	38.17%

4. Conclusion

This prediction demonstrates the following:

The power density levels for FCC at a distance of 107 cm are below the maximum levels allowed by regulations.

Conclusion: RF exposure evaluation is not required.