

RF Exposure Calculation

Applicant: Funkwerk Dabendorf GmbH
FCC ID: RK7USA-MMC-DC

The internal antenna used for this mobile transmitter must provide a separation distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter.

A safety statement concerning minimum separation distances from enclosure of the USA-MMC-DC will be integrated in the user's manual to provide end-users with transmitter operating conditions for satisfying RF exposure compliance.

The appropriate Max conducted power can be drawn from the test report no.
G0M20704-1323-C-1, G0M20704-1323-C-2, G0M20704-1323-C-3 and G0M20704-1323-C-4

For transmitter operating in the 824-849 MHz range, paragraph 1.1310 Table 1 limits maximum permissible exposure (MPE) to 0.549 mW/cm² for uncontrolled environments and 2.75 mW/cm² for controlled environments.

For transmitter operating in the 1850-1910 MHz range, paragraph 1.1310 Table 1 limits maximum permissible exposure (MPE) to 1 mW/cm² for uncontrolled environments and 5 mW/cm² for controlled environments.

The far field on-axis power flux density (W/m²) is calculated using the following formula:

S = Power density (mW/cm²)
ERP = effective radiated power (mW)
EIRP = isotropically radiated power (mW)
r = Distance in cm

Calculations

GSM/GPRS 850			
name		nature value	log value
max conducted power		1383,57 mW	31,41 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP		
	ERP	1683,28 mW	32,26 dBm
duty cycle factor			
frequency	824 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	$10\log(\text{dwel time}/100 \text{ ms})$	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		1383,57 mW	31,41 dB
calculated radiated power	ERP	1683,28 mW	32,26 dB
MPE			
$S = \frac{PG}{4\pi R^2}$ calculated with max source-based time-averaged power measured conducted power			
	r [cm]	20	2,5
	S [mW/cm ²]	0,335	0,549
Limit general population	[mW/cm ²]	0,549	
Limit occupational popul	[mW/cm ²]	2,75	for f = 824 MHz
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$ calculated with max source-based time-averaged power measured radiated power			
	r [cm]	20	2,5
	S [mW/cm ²]		1,000
GSM/GPRS 1900			
name		nature value	log value
max conducted power		907,82 mW	29,58 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP	1811,34 mW	32,58 dBm
	ERP		
duty cycle factor			
frequency	1880 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	$10\log(\text{dwel time}/100 \text{ ms})$	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		907,82 mW	29,58 dB
calculated radiated power	EIRP	1811,34 mW	32,58 dB
MPE			
$S = \frac{PG}{4\pi R^2}$ calculated with max source-based time-averaged power measured conducted power			
	r [cm]	20	2,5
	S [mW/cm ²]	0,361	1
Limit general population	[mW/cm ²]	1,000	
Limit occupational popul	[mW/cm ²]	5,00	for f = 1880 MHz
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$ calculated with max source-based time-averaged power measured radiated power			
	r [cm]	20	2,5
	S [mW/cm ²]		1

ETS

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Handelsregister:

Amtsgericht Frankfurt/Oder HRB 5151
Geschäftsführung: Dr. Dietmar Genz
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EGPRS 850			
name		nature value	log value
max conducted power		1819,70 mW	32,60 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP		
	ERP	2213,89 mW	33,45 dBm
duty cycle factor			
frequency	824 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	10log(dwel time/100 ms)	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		1819,70 mW	32,60 dB
calculated radiated power	ERP	2213,89 mW	33,45 dB
M P E			
$S = \frac{PG}{4\pi R^2}$ calculated with max source-based time-averaged power measured conducted power			
	r [cm]	20	2,5
	S [mW/cm²]	0,441	0,549
Limit general population	[mW/cm²]	0,549	
Limit occupational popul	[mW/cm²]	2,75	for f = 824 MHz
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$ calculated with max source-based time-averaged power measured radiated power			
	r [cm]	20	2,5
	S [mW/cm²]		1,034
EGPRS 1900			
name		nature value	log value
max conducted power		950,60 mW	29,78 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP	1896,71 mW	32,78 dBm
	ERP		
duty cycle factor			
frequency	1880 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	10log(dwel time/100 ms)	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		950,60 mW	29,78 dB
calculated radiated power	EIRP	1896,71 mW	32,78 dB
M P E			
$S = \frac{PG}{4\pi R^2}$ calculated with max source-based time-averaged power measured conducted power			
	r [cm]	20	2,5
	S [mW/cm²]	0,378	1
Limit general population	[mW/cm²]	1,000	
Limit occupational popul	[mW/cm²]	5,00	for f = 1880 MHz
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$ calculated with max source-based time-averaged power measured radiated power			
	r [cm]	20	2,5
	S [mW/cm²]		1

UMTS 850			
name		nature value	log value
max conducted power		427,56 mW	26,31 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP		
	ERP	520,18 mW	27,16 dBm
duty cycle factor			
frequency	824 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	10log(dwel time/100 ms)	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		427,56 mW	26,31 dB
calculated radiated power	ERP	520,18 mW	27,16 dB
M P E			
calculated with max source-based time-averaged power measured conducted power			
$S = \frac{PG}{4\pi R^2}$			
r [cm]	20	2,5	1,5
S [mW/cm²]	0,104		0,549
Limit general population	[mW/cm²]	0,549	
Limit occupational popul	[mW/cm²]	2,75	for f = 824 MHz
calculated with max source-based time-averaged power measured radiated power			
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$			
r [cm]	20	2,5	1,5
S [mW/cm²]			1,00
UMTS 1900			
name		nature value	log value
max conducted power		590,20 mW	27,71 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP	1177,61 mW	30,71 dBm
	ERP		
duty cycle factor			
frequency	1880 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	10log(dwel time/100 ms)	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		590,20 mW	27,71 dB
calculated radiated power	EIRP	1177,61 mW	30,71 dB
M P E			
calculated with max source-based time-averaged power measured conducted power			
$S = \frac{PG}{4\pi R^2}$			
r [cm]	20	2,5	1,5
S [mW/cm²]	0,234		1
Limit general population	[mW/cm²]	1,000	
Limit occupational popul	[mW/cm²]	5,00	for f = 1880 MHz
calculated with max source-based time-averaged power measured radiated power			
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$			
r [cm]	20	2,5	1,5
S [mW/cm²]			1

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CDMA 850			
name		nature value	log value
max conducted power		855,07 mW	29,32 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP		
	ERP	1040,29 mW	30,17 dBm
duty cycle factor			
frequency	824 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	10log(dwel time/100 ms)	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		855,07 mW	29,32 dB
calculated radiated power	ERP	1040,29 mW	30,17 dB
MPE			
calculated with max source-based time-averaged power measured conducted power			
$S = \frac{PG}{4\pi R^2}$	r [cm]	20	2,5
	S [mW/cm²]	0,207	0,549
Limit general population	[mW/cm²]	0,549	
Limit occupational popul	[mW/cm²]	2,75	for f = 824 MHz
calculated with max source-based time-averaged power measured radiated power			
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$	r [cm]	20	2,5
	S [mW/cm²]		1,000
CDMA 1900			
name		nature value	log value
max conducted power		769,13 mW	28,86 dBm
max Antenna gain dBi		2,00	3,00 dBi
max Antenna gain dBd		1,22	0,85 dBd
calculated radiated power	EIRP	1534,62 mW	31,86 dBm
	ERP		
duty cycle factor			
frequency	1880 MHz		
dwel time		100 ms	
Time of occupancy/puls-train time		100 ms	
duty cycle fact	10log(dwel time/100 ms)	100,00%	0,00 dB
max source-based time-averaged power			
conducted power		769,13 mW	28,86 dB
calculated radiated power	EIRP	1534,62 mW	31,86 dB
MPE			
calculated with max source-based time-averaged power measured conducted power			
$S = \frac{PG}{4\pi R^2}$	r [cm]	20	2,5
	S [mW/cm²]	0,305	1,000
Limit general population	[mW/cm²]	1,000	
Limit occupational popul	[mW/cm²]	5,00	for f = 1880 MHz
calculated with max source-based time-averaged power measured radiated power			
$S = \frac{EIRP}{4\pi R^2} = \frac{1.64 ERP}{4\pi R^2} = \frac{0.41 ERP}{\pi R^2}$	r [cm]	20	2,5
	S [mW/cm²]		1

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