

3.10 Directional gain of the antenna, FCC 15.319 (e)

Directional gain of antennas influences the limit of peak transmit power if the maximum directional gain exceeds 3 dBi.

Max antenna gain [dBi]	Exceeds 3 dBi by amount [dB]
3 (internal)	0
5.0 (external)	2

The antenna gain value is derived from:

Manufacturer declaration	<input checked="" type="checkbox"/>
Antenna diagram	<input type="checkbox"/>
Measured gain of complete system	<input checked="" type="checkbox"/>

Comment: The maximum antenna gain of complete system was tested for the case of external antenna.
According to the external antenna which is circular polarized the radiated output power was measured with a conical logarithmic spiral antenna.

$$G_{\max} = P_{\text{rad, max}} - P_{\text{cond, max}}$$

$$G_{\max} = 23.69 \text{ dBm} - 18.54 \text{ dBm}$$

$$G_{\max} = 5.15 \text{ dBi}$$

Comment: See appendix I for measurement diagrams.

3.12 Radio frequency radiation exposure; FCC 15.319(i)

Consideration of radio frequency radiation exposure for EUT is done as

SAR test acc. IEEE 1528 (for PP)	<input type="checkbox"/>
MPE calculation as below (for FP, Repeater)	<input checked="" type="checkbox"/>

SAR test results: not applicable

MPE calculation:

The EUT is considered as a mobile device according to OET Bulletin 65, Edition – 97 – 01. Therefore distance to human body of min. 20 cm is determined.

The internal/external antennas 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 operating in conjunction with any other antenna or transmitter.

A safety statement concerning minimum separation distances from enclosure of the device will be integrated in the users manual to provide end-users with transmitter operating conditions for satisfying RFE exposure compliance.

The limit of Power density for General Population / Uncontrolled Exposure is 1.0 mW/cm².

Formula:

$$S = \text{EIRP} / 4\pi R^2$$

Calculation: for internal antenna:

EIRP	Radiated Power [dBm]	22.32
EIRP	Radiated Power [mW]	170.608
R	Distance [cm]	20
S	Power Density [mW/cm ²]	0.034

Calculation: for external antenna:

EIRP	Radiated Power [dBm]	23.69
EIRP	Radiated Power [mW]	233.884
R	Distance [cm]	20
S	Power Density [mW/cm ²]	0.046

Result: The EUT complies with the radio frequency radiation exposure requirement.

Comment: Please find radiated power test results in Appendix I and J.