Evaluation of the CSI Model CS12-557-437 Repeater
For
Compliance with FCC Guidelines
For Human Exposure to Radio Frequency
Electromagnetic Fields

15 September 2010

General

The CSI Model CS12-557-437 Repeater is considered to be a “mobile” device operating in the Upper "C" Block of the 700MHz band, authorized under part 27. As such, the equipment is required to be evaluated for RF exposure if operated below 1.5 GHz with an effective radiated power (ERP) of 1.5 watts or more or if operated above 1.5 GHz with an effective radiated power (ERP) of 3.0 watts or more, as defined in 2.1091 of FCC rules.

Downlink

For the downlink portion of the Model CS12-557-437, the maximum rated output power is +27dbm (500 mW) in the 700MHz band (<1.5 GHz). The maximum authorized indoor antenna gain is 3 dBi, corresponding to a typical Omni-Directional antenna. The Table below shows the results of the calculated ERP, neglecting cable losses.

Frequency	Power Out	Ant Gain	EIRP	ERP	Limit
746-757 MHz	27 dBm	3 dBi	30 dBm	609 mW	1.5 W

The ERP is well below the allowable limits excluding the downlink from routine evaluation.

Uplink

For the Uplink portion of the Model CS12-557-437, the maximum rated output power is +33dbm (2000 mW) in the 700MHz band (<1.5 GHz). The maximum authorized outdoor antenna gain is 7 dBi corresponding to a typical outdoor antenna. The Table below shows the results of the calculated ERP, neglecting cable losses.

Frequency	Power Out	Ant Gain	EIRP	ERP	Limit
776-787 MHz	33 dBm	7 dBi	41 dBm	6112 mW	1.5 W

As shown in the above table, the ERP exceeds the allowable limit and must be evaluated for minimum separation distances in order to comply with the exposure limits of 1.1310 of the FCC rules.

Using the guidelines in FCC OET Bulletin 65 and Supplement C, the power density at a reasonable distance from the maximum gain antenna was calculated. The minimum safe distance was also determined based on the uncontrolled exposure limits defined in Table 1B of FCC rules 1.1311. The following assumptions are made concerning these calculations:

700MHz Band
Po = 2000 mw average
Cable Loss = 0 dB
Ant Gain = 7 dBi
Frequency = 782 MHz
Main Beam (worst-case)
Rooftop 100% reflection
Reasonable Distance = 4 feet (120 cm)

Therefore, from OET Bulletin 65,

$$S = (PG)/4\pi R^2 \quad \text{or} \quad S = EIRP/4\pi R^2$$

For 100% reflection, a doubling of the field strength can be expected. The above equation can be modified to,

$$S = (2)^2 PG/4\pi R^2 = EIRP/\pi R^2$$

Solving for S at a distance of 4 feet (120 cm) gives,

$$S = (2000)\,(5)/\,\pi\,(120)^2 = \boxed{0.215 \text{ mw/cm}^2}$$

From FCC rules 1.1311, Table 1B, the allowable limit for uncontrolled exposure is f(MHz) / 1500. At 787 MHz this corresponds to a level of 0.521 mw/cm^2.

The calculated value of 0.215 is below this limit thereby showing compliance under worst-case operating conditions.