

**Evaluation of the CSI Model CSI-DSP85-25X-S8 BDA
For
Compliance with FCC Guidelines
For Human Exposure to Radio Frequency
Electromagnetic Fields
Rev-2**

8 December 2010

General

The CSI Model CSI-DSP85-25X-S8 Bi-directional amplifier is considered to be a dual-band “mobile” device operating in both the Cellular Service authorized under part 90. 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 CSI-DSP85-25X-S8 BDA, the maximum rated output power is +30.0dbm (1000 mW) in the 800 MHz band (<1.5 GHz). As stated in the Model CSI-DSP85-25X-S8 Manual, the maximum authorized indoor antenna gain is 3 dBi, corresponding to a typical Multi-Band Omni-Directional antenna. The Table below shows the results of the calculated ERP, neglecting cable losses.

Frequency	Power Out	Ant Gain	EIRP	ERP	Limit
851-869 MHz	31.1 dBm	3 dBi	34.1 dBm	1,562 mW	1.5 W

As shown in the above table, the level 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:

- SMR Band
- Po = 1288 mw average
- Cable Loss = 0 dB
- Ant Gain = 3 dBi
- Frequency = 860 MHz
- Main Beam (worst-case)
- Rooftop 100% reflection
- Reasonable Distance = 2 feet (60 cm)

Therefore, from OET Bulletin 65,

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

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

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

Solving for S at a distance of 2 feet (60 cm) gives,

$$S = (1288) (2) / \pi (60)^2 = 0.23 \text{ mw/cm}^2$$

From FCC rules 1.1311, Table 1B, the allowable limit for uncontrolled exposure is $f(\text{MHz}) / 1500$. At a frequency of 860 MHz, the limit is 0,57 mw/cm^2 .

The calculated values of 0.23 is below both the limit thereby showing compliance under worst-case operating conditions.

The Cautions in the Model CSI-DSP85-25X-S8 manual clearly define the antenna selection and installation criteria in order to maintain a minimum 60-centimeter separation.

Uplink

For the downlink portion of the Model CSI-DSP85-25X-S8 BDA, the maximum rated output power is +30.0dbm (1000 mW) in the 800 MHz Band (<1.5 GHz). As stated in the Model CSI-DSP85-25X-S8 Manual, the maximum authorized outdoor antenna gain is 14 dBi, corresponding to a typical Multi-Element Yagi-Directional antenna. The Table below shows the results of the calculated ERP for this case, neglecting cable losses.

Frequency	Power Out	Ant Gain	EIRP	ERP	Limit
806-824 MHz	31.6 dBm	14 dBi	45.6 dBm	22,071 mW	1.5 W

As shown in the above table, the level 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:

SMR Band
Po = 1445 mw average
Cable Loss = 0 dB
Ant Gain = 14 dBi
Frequency = 815 MHz
Main Beam (worst-case)
Rooftop 100% reflection
Reasonable Distance = 6 feet (183 cm)

Therefore, from OET Bulletin 65,

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

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

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

Solving for S at a distance of 6 feet (183 cm) gives,

$$S = (1445) (25) / \pi (183)^2 = 0.34 \text{ mw/cm}^2$$

From FCC rules 1.1311, Table 1B, the allowable limit for uncontrolled exposure is $f(\text{MHz}) / 1500$. At a frequency of 815 MHz, the limit is 0,54 mw/cm^2 .

The calculated values of 0.34 is below both the limit thereby showing compliance under worst-case operating conditions.

As in the case of the downlink, the Cautions in the Model CSI-DSP85-25X-S8 manual clearly define the antenna selection and installation criteria in order to maintain a conservative 6-foot separation.