Working Paper

Analysis of the FCC Regulations for Radiation Safe Distance with respect to the Spectra 58100 Range of Products

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Abstract

This document analyses the exclusion zone required to ensure human radiation level limits are not exceeded by the Spectra 58100 range of products with integrated or external antennas. The guidelines in FCC Bulletin 65 are used to compute the safe distances.

Revision History

Version	Date	Comments	Author
0.001	7 February 2005	Initial Issue	CF

Operational Parameters of the Spectra 58100 Products

1 Scope

The purpose of this brief working paper is to identify the mean RF power produced by the Spectra 58100 equipments under various operating conditions. This mean RF power plus the antenna gain used in specific installations identifies the effective power density (dBm/cm^2) that is to be compared against allowed limits for human exposure.

2 References

Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields:
OET Bulletin 65, Edition 97-01, August 1997 [1]

3 Background

Reference [1] identifies how the radiated power density should be calculated for different distances from the antenna. The variables used are Radiated Power Density (S), conducted power (P), Antenna Gain (G) and distance (R) . The formula given is

$$S= (P * G)/(4 * Pi * R)^2$$

The limit allowed for S depends on whether the exposure risk is to a member of the public or not. The limits for public exposure are the lower, and so a power density limit of $1mW/cm^2$ is used for S. This is used to compute a 'safe' distance from the antenna. It is clear from [1] that the power to be used should be the RMS power averaged over a period of 6 minutes.

4 Spectra 58100 Specific Issues

4.1 FCC Regulations

The Spectra 58XX is approved under section 15.247 and this regulation now allows measurement of the mean transmitted power during the burst, averaged over all symbols. The regulations allow 30dBm to be transmitted as the conducted power. In the case of As there are two polarisations transmitted by Spectra 58100, this total power cannot be exceeded by the sum of the two powers transmitted.

4.2 Spectra 58100

The power levelling loops in Spectra measure the transmitted power on both polarisations at all times and limit each to the Maximum Transmit Power –3dB. The Maximum Transmit Power for Spectra 58100 is set to 27dBm.
The transmit duty cycle for the Spectra 58100 is a maximum of 50% in the case of the Acquisition mode. As the regulations refer to mean radiation power density, this reduces the effective power by 3dB.

4.3 FCC Testing

The FCC test results showed that the power for the two channels combined was always less than 27dBm.

4.4 Cable Losses

It is considered that a cable loss of less than 1dB is unlikely in the case of the connectorised version operating with external antennas.

5 Recommendations

It is recommended that the power level used for computing the 'safe distance' for human exposure is either

a) The Maximum Transmit Power level (27dBm) less the allowance for maximum duty cycle
b) The power level in (a) less the minimum cable losses. Safe distance calculations are also included for this case.

Total Mean Transmit Power	24	dBm
	251.19	mW
	199.53	mW incl cable loss
Safety Power Density Limit	1	mW/cm2

Antenna Type	Manufacturer's Gain (dBi)	Safe Distance for 0dB Cable Loss (m)	Safe Distance for 1.0dB Cable Loss (m)
Integrated	23.5	0.67	N/A
2 ft Flat Plate	28	1.12	1.00
2ft Parabolic Dish	28.5	1.19	1.06
3ft Parabolic Dish	31.5	1.68	1.50
4ft Parabolic Dish	34.5	2.37	2.12
6ft Parabolic Dish	37.7	3.43	3.06