

PageCenter Radiation Field RF Exposure Calculations:

Declare Constants and Formulas:

$$\begin{array}{lll} \text{m} \equiv 1 & \text{cm} \equiv .01 \cdot \text{m} & \text{mm} \equiv .001 \cdot \text{m} \\ \text{s} \equiv 1 & \Omega \equiv 1 & \text{dB} \equiv 1 \quad \text{V} \equiv 1 \quad \text{mV} \equiv .001 \cdot \text{V} \\ \text{Hz} \equiv \frac{1}{\text{s}} & \text{KHz} \equiv 1000 \cdot \text{Hz} & \text{MHz} \equiv 1000 \cdot \text{KHz} \\ \text{W} \equiv 1 & \text{mW} \equiv .001 \cdot \text{W} & \text{uW} \equiv .001 \cdot \text{mW} \end{array}$$

$$c := 300 \cdot 10^6 \cdot \frac{\text{m}}{\text{s}} \quad \text{Speed of Light}$$

$$Z_o := 120 \cdot \pi \quad \text{Free Space Impedance}$$

$$Z_o = 376.991 \Omega$$

$$\text{pwr}(\text{db}) := 10^{(.1 \cdot \text{db})} \quad \text{Conversion from dB to linear power}$$

$$\text{dBuV}(\text{x}) := 20 \cdot \log(\text{x} \cdot 10^6) \quad \text{Conversion to dBuV}$$

Calculate Wavelengths:

$$F_c := 460 \cdot \text{MHz} \quad \text{Center Frequency}$$

$$\lambda_c := \frac{c}{F_c}$$

$$\lambda_c = 0.652 \text{ m} \quad \text{Center Frequency Wavelength}$$

Calculate Near / Far Field Transition Ranges:

$$L := 12 \cdot \text{cm} \quad \text{Antenna Length}$$

$$T_c := \frac{2 \cdot L^2}{\lambda_c} \quad \text{Center Frequency Transition Range}$$

$$T_c = 4.416 \text{ cm}$$

Calculate Far Fields:

Ptx := 5·W

Gant := 0·dB

Ggnd := 0·dB

range := 1..30

D := 100·%

Srange := $\frac{Ptx \cdot D \cdot pwr(Gant) \cdot pwr(Ggnd)}{4 \cdot \pi \cdot (.1 \cdot range)^2}$

Spec := $\frac{Fc}{1500} \cdot \frac{mW}{cm^2}$

Peak Transmitter Power

Antenna Gain

Effective Antenna Gain due to ground reflections

Calculate Fields at Ranges from .1 to 30 meters

Transmitter Duty Cycle

Calculate the Average Power Density

FCC Average Power Spec Limit for Uncontrolled Exposure

Measurement

Range (meters)	Average Power Density		FCC's Specification Limit
$\frac{.1 \cdot range}{m} =$	$\frac{S_{range}}{\left(\frac{W}{m^2}\right)} =$	$\frac{S_{range}}{\left(\frac{mW}{cm^2}\right)} =$	Spec = 306667 $\frac{mW}{cm^2}$
0.1	39.789	3.979	
0.2	9.947	0.995	
0.3	4.421	0.442	
0.4	2.487	0.249	
0.5	1.592	0.159	
0.6	1.105	0.111	
0.7	0.812	0.081	
0.8	0.622	0.062	
0.9	0.491	0.049	
1	0.398	0.04	
1.1	0.329	0.033	
1.2	0.276	0.028	
1.3	0.235	0.024	
1.4	0.203	0.02	
1.5	0.177	0.018	
1.6	0.155	0.016	

SECTION 1

GENERAL INFORMATION

1.1 SCOPE OF MANUAL

This service manual contains alignment and service information for Dataradio COR Ltd.'s DM-3412 UHF Synthesized Telemetry Module.

This manual concentrates on the RF section of the data link which may be paired with a 9600 baud Modem (T-96SR).

1.2 EQUIPMENT DESCRIPTION

1.2.1 GENERAL

The Dataradio DM-3412 is a synthesized data transceiver (transmitter and receiver) which operates in the 380-512 MHz UHF frequency range. Transmitter power output is 5 watts nominal at 13.3V DC in simplex or half duplex modes.

Versions of the DM-3412 covered in this manual are indicated in Section 1.5. The DM-3412 has a frequency stability of ± 1.5 PPM (see Section 3).

The number of channels that can be selected with the DM-3412 model is determined by customer supplied synthesizer loading circuitry.

1.2.2 DM-3412 SYNTHESIZER PROGRAMMING

The DM-3412 requires customer supplied circuitry to load the synthesizer with channel information. The protocol that this circuitry must follow is described in Section 3.

1.3 TRANSCEIVER IDENTIFICATION

The transceiver identification number is printed on a label that is affixed to the PC board. The following information is contained in that number:

Model	Revision Letter	Manufacture Date	Plant	Warranty Number
3412	2 A	1 4 3	A	12345
Range Eighth digit of PN		Week No. of Year		Year

FIGURE 1-1 TRANSCEIVER IDENTIFICATION NOMENCLATURE