Radiation Hazard Study

Evaluating Exposure to RF Emissions (FCC OET 65)

Antenna : Prodelin RX/TX Linear Ku 1383 series
Diameter= 3.8 m
Gain Tx: 53.2 dBi
Antenna Feed Flange Power P

$P \equiv 10.18$ w

$D := 3.8$ m

Area of 3.8 Antenna A=

$$A := \pi\left(\frac{D}{2}\right)^2$$

$A = 11.341$ m 2

The maximum power density directly in front of an antenna :

$$Ssurface := \frac{4P}{A}$$

$Ssurface = 3.59$ W /m2 = 0.359 mW/cm2

The maximum power density allowed **5mW/cm2** in controlled area.
Surface = the maximum power at the antenna surface (W/m2)
P = power fed to the antenna (W)
A = physical area of the aperture Antenna(sq.m)
D= Diameter of the Antenna (m)
η= aperture efficiency

G = power gain in the direction of interest
dB = Gain of the Antenna from the spec sheet(dB)
λ = wavelength
F= transmit frequency (GHz)

$F \equiv 14$

$dB \equiv 53.2$

$$G := 10^{\frac{dB}{10}}$$

$$\lambda := \frac{\left(2.99792458 \cdot 10^8\right)}{F \cdot 10^9}$$

$G = 2.089 \times 10^5$

$$\eta := \frac{\frac{\left(G \cdot \lambda^2\right)}{4\pi}}{\left(\frac{\pi \cdot D^2}{4}\right)}$$

$\eta = 0.672$

Near -field , on -axis power density Snf =:

$$Snf := \frac{16\eta \cdot P}{\pi D^2}$$

$Snf = 2.414$ W/m2=0.2414 mW/cm2

Extend of near-field region (m) Rnf:

$$Rnf := \frac{D^2}{4\lambda}$$

$Rnf = 168.583$ m

Maximum Power Density with 168 m distance to the antenna=2.414W/m2=0.2414mW/cm2

The distance to the beginning of the far-field region Rff (m):

$$Rff := \frac{0.6 \cdot D^2}{\lambda}$$

$Rff = 404.6$ m

The power density in the far-field region Sff (W/m2):

Where : R distance to the
point of interest.

$R := 500$m

$$Sff := \frac{P \cdot G}{4\pi R^2}$$

$Sff = 0.677$ w /m2 =0.0677 mW/cm2

The maximum allowable gain for the Antenna from the spec. sheet

$\theta := 1 .. 48$

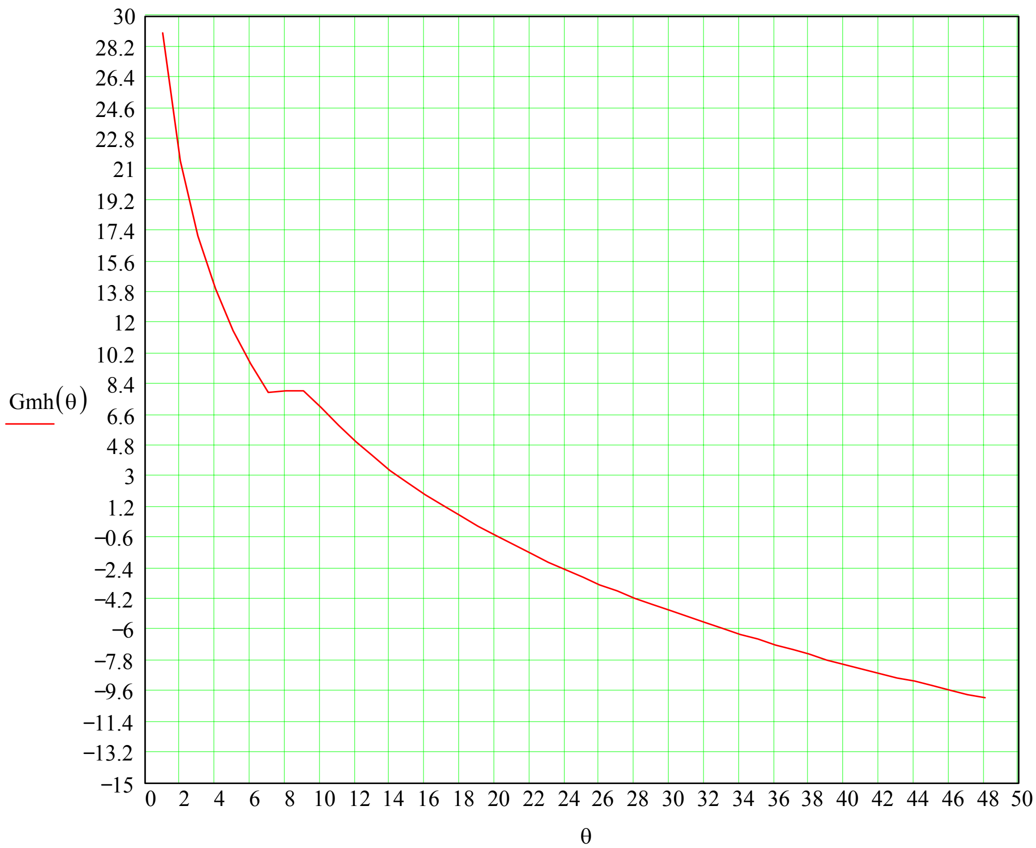
Where θ : the angle in degrees from the axis of the main lobe

Gfcc : allowable gain in dBi relative to an isotropic radiator

$Gfcc(\theta) := 29 - 25 \cdot \log(|\theta|)$

$Gfcc1(\theta) := 32 - 25 \cdot \log(|\theta|)$

$Gmh(\theta) := if(1 \le |\theta| \le 7, Gfcc(\theta), if(7 < |\theta| \le 9.2, 8, if(9.2 < |\theta| \le 48, Gfcc1(\theta), -10)))$



The maximum allowable gain for the Antenna

Define the Power density in the point of interest **A** see drawing 1

For the angel θ = 9 deg according to the table

Distance to the Antenna (See drawing 1) R= $R := 3m$

$dB := 8$

$G := 10^{\frac{dB}{10}}$

$G = 6.31$

$Sff := \frac{P \cdot G}{4\pi R^2}$

$Sff = 0.568$ **W /m2 = 0.0568 mW/cm2**

The maximum power density allowed **1mW/cm2** in uncontrolled public area.

The power density in the point of interest B

For the angel θ = 40 deg according to the table

$G := 10^{\frac{dB}{10}}$

$dB := -7.8$

Distance to the Antenna (see drawing 1) $R := 2$

$G := 10^{\frac{dB}{10}}$

$G = 0.166$

$Sff := \frac{P \cdot G}{4\pi R^2}$

$Sff = 0.034$

w /m2 = 0.0034 mW/cm2

The maximum power density allowed **1mW/cm2** in uncontrolled public area.

The power density in the point of interest C

$dB := -10$

For the angel θ = 45 deg according to the table

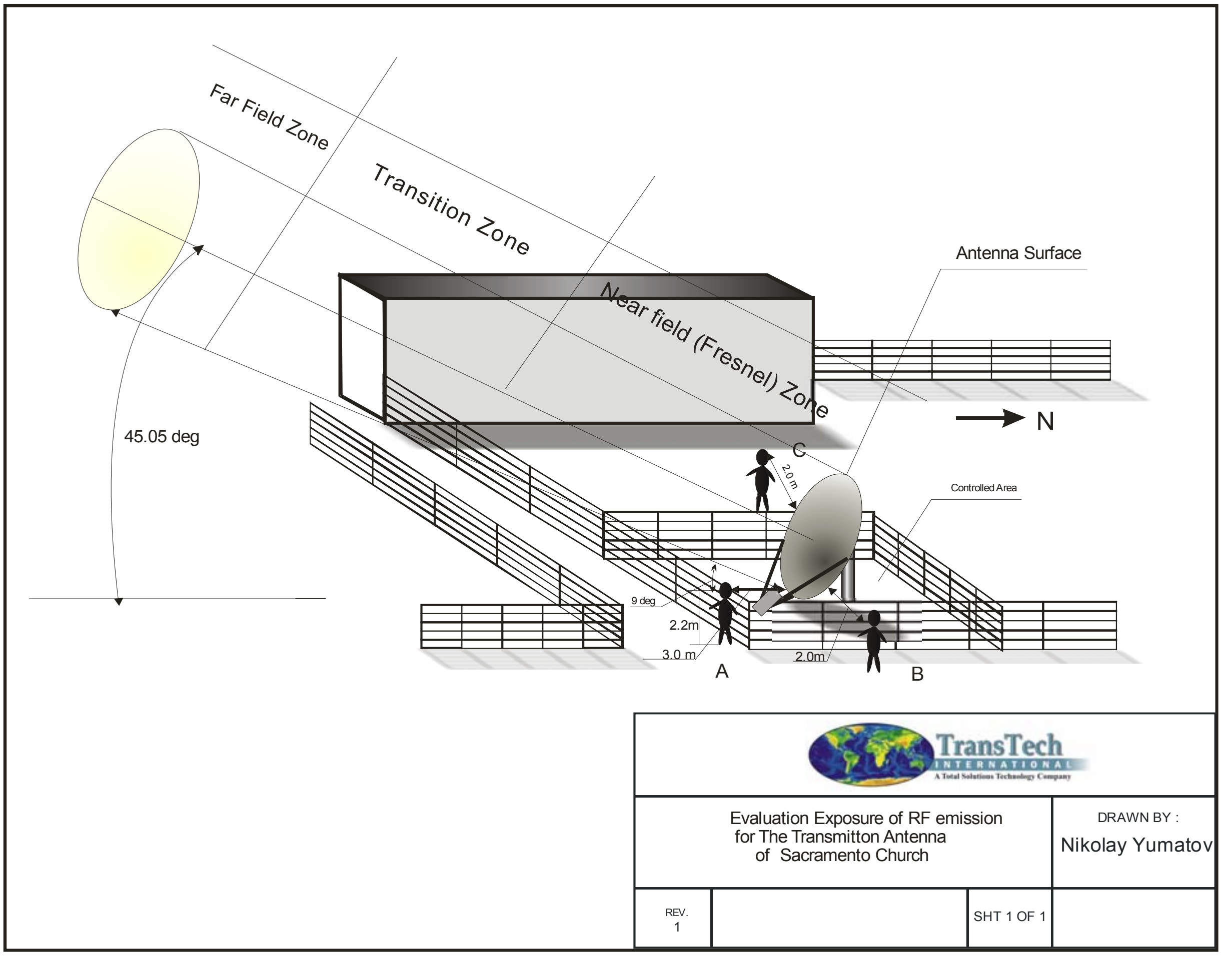
Distance to the Antenna R= $R := 2$

$G := 10^{\frac{dB}{10}}$

$Sff := \frac{P \cdot G}{4\pi R^2}$

$Sff = 0.02$ **w /m2 = 0.002 mW/m2**

The maximum power density allowed **1mW/cm2** in uncontrolled public area.


Far Field Zone
Transition Zone
Near field (Fresnel) Zone
Antenna Surface
N
45.05 deg
C
2.0 m
Controlled Area
9 deg
2.2m
3.0 m
A
2.0m
B
TransTech
INTERNATIONAL
Evaluation Exposure of RF emission
for The Transmitton Antenna
of Sacramento Church
DRAWN BY :
Nikolay Yumatov
REV.
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SHT 1 OF 1