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Ms. Towanda Bryant
Systems Analysis Branch
Satellite Division
International Bureau
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

RE: File No. SES-LIC-20050113-00043/
LifeTalk Radio, Inc.

Dear Ms. Bryant:

With this cover letter, I am faxing to you the Radiation Hazard Study necessary to complete the above-identified application for a satellite earth station.

Please let me know if you need anything further.

Very truly yours,

Donald E. Martin

Donald E. Martin
Counsel for
LifeTalk Radio, Inc.

RADIATION HAZARD AREA CALCULATION (Sheet 1 of 2)

A. Determining the region around an antenna where radiation hazardous to human health is a consideration of many factors. With a parabolic dish antenna, the region is highly directional and the actual hazardous region is dependent on the antenna elevation angle. The following formulae are used to determine the near and far field regions. These regions are in the main beam of the radiation pattern, which we will assume consists of a conical angle extending +/- 3 degrees from the center axis of the antenna.

B. NEAR FIELD REGION: $R = D^2/4\lambda$

The Radiating Near Field Region for a parabolic, circular reflector, is defined as extending from the reflector to a distance equal to the diameter squared divided by twice the wavelength. This distance is referred to as the Rayleigh distance. In this region the power is nearly all contained within a cylinder of radius 0.5D. As a safety measure the highest possible power density is applied to the whole of this region.

1	SITE NAME:	LifeTalk Radio Network Inc. Dish A	
2	Location:	Vonore, TN.	
3	Latitude:	35° 35' 0"	West
4	Longitude:	84° 13' 0"	North
5	D = Diameter (meters)	2.4	Meters
6	Frequency in GHz	14.0	GHz
7	λ = Wavelength (= c/f in m/GHz)	0.02141375	
8	P = Power (watts)	4	Watts
9	E = Maximum E/S EIRP - Calculated	55.12	dBW
10	HPA Maximum Output Power	4	Watts
11	Loss - HPA to Antenna Feed	0.5	dB
12	Multicarrier Fixed Backoff	0	
13	p = Pi	3.141592654	
14	A = Physical aperture Area p(.5*D)²	4.523893421	Sq.M
15	G = antenna transmit gain	49.1	dBi
16	h = aperture efficiency	0.6	
17	R = NEAR FIELD REGION (METERS)	67.24651217	Meters
18	NEAR FIELD (FEET)	220.6245987	Feet
19	Power Density in Near Field Region (4*P*h/A)	2.122065908	W/m^2
20	Power Density in Near Field Region	0.212206591	mW/cm^2
21	(HAZARD IF OVER 5 mW/cm^2)	SAFE	

C. FAR FIELD REGION: $R=0.6D^2/\lambda$

The distance to the Far Filed is found from the equation ($R=0.6D^2/\lambda$). In the Far Field the free space power density is maximum on-axis. The power density also dissipates rapidly with distance and for this region will be greatest at the Far Field distance point.

1	R = Distance to Far Field Region ($R=0.6D^2/\lambda$)	161.3916292 Meters	
2	Power Density (dBW/m^2) at Far Field:	-0.029118841 dBW/m^2	$E-10\log(4pR^2)$
3	Power Density (mW/cm^2) at Far Field:	0.099331757 mW/cm^2	$\text{antilog}((E-10\log(4pR^2)/10)/10$
4	(HAZARD IF OVER 5 mW/cm^2)	SAFE	

RADIATION HAZARD AREA CALCULATION (Sheet 2 of 2)

D. TRANSITION REGION:

The transition region is located between the near field and the far field regions. The power density decreases with distance in the transition region. For the transition region the power density decreases inversely with distance. Whereas, in the far field region the power density decreases inversely with the square of the distance. The maximum power density in the transition will not exceed the power density in the near field region.

E. REGION BETWEEN FEED FLANGE AND REFLECTOR:

Transmissions from the feed horn are directed in a conical shape towards the reflector. The conical shape is determined by the feed itself. The energy between the feed horn and the reflector can be calculated by determining the power density at the feed window. The calculations below provide this power density.

1	Power Density at Feed Flange Equation	$PFD_{fl} = 2P/Fa$
8	P = Power (watts)	4 Watts
13	p = Pi	3.141592654
9	Fa = Area of Feed Window Equation	$Fa=p*D_f^2/4$
5	D_f = Feed Diameter (cm)	85 cm
17	Fa = Area of Feed Window	5674.501731 cm^2
18	Power Density at Feed Flange	0.001409815 W/cm^2
18	Power Density at Feed Flange	1.409815413 mW/cm^2
21	(HAZARD IF OVER 5 mW/cm^2)	SAFE

WARNING: The power density between the feed flange and the reflector poses the greatest hazard to workers and is to be avoided while actively transmitting

C. MAIN REFLECTOR REGION

The power density at the main reflector is calculated in the same manner as for the feed horn. The main difference is that the surface of the reflector aperture is used and the power density will be much less at the main reflector where it is spread across a much greater surface area.

1	Power Density at Reflector Surface Equation	$PFD_{rs}=(2*P)/S_a$
8	P = Power (watts)	4 Watts
2	S_a = Main reflector Surface Area Equation	$S_a=p*(.5*D)^2$
5	D = Main Reflector Diameter (meters)	2.4 Meters
2	S_a = Main reflector Surface Area	4.523893421 m^2
3	Power Density at Reflector Surface	1.768388257 W/m^2
3	Power Density at Reflector Surface	0.176838826 mW/cm^2
4	(HAZARD IF OVER 5 mW/cm^2)	SAFE

F. REGION BETWEEN REFLECTOR AND GROUND

Assuming a uniform illumination of the reflector surface, the maximum possible power density between the antenna and ground can be calculated as follows:

1	Power Density - reflector to ground equation	$PFD_g=P/S_a$
2	Power Density at above distance:	0.884194128 W/m^2
3	Power Density at above distance:	0.088419413 mW/cm^2
4	(HAZARD IF OVER 5 mW/cm^2)	SAFE

G. CONCLUSIONS:

Radiation levels above 5 mW/cm2 are considered hazardous for short term exposure. The hazard calculations indicate that exposure to harmful levels of radiation will not exist in areas around the antenna normally occupied by the public or the earth station's operations personnel. The transmitter will be turned off during any servicing that requires personnel to be exposed to the area around the feed flange.