Eleanor Lott

From: Trang Nguyen
Sent: Tuesday, July 05, 2016 7:30 AM
To: Eleanor Lott
Cc: Trang Nguyen
Subject: pls upload this rad haz into Ibfs FW: FCC pending app sesmod2016061500518 E080209
Attachments: QCT90 Rad Haz.pdf

Hi Eleanor,

Pls upload this RF rad haz study into its IBFS record.

Thanks,
Trang

From: White, Sydney M. [mailto:Sydney.White@dlapiper.com]
Sent: Tuesday, June 28, 2016 4:10 PM
To: Trang Nguyen <Trang.Nguyen@fcc.gov>
Cc: Eleanor Lott <Eleanor.Lott@fcc.gov>
Subject: RE: FCC pending app sesmod2016061500518 E080209

The radiation hazard report is attached.

For item E57: Antenna Elevation Angle Eastern Limit: 5 degrees
For item E59: Antenna Elevation Angle Western Limit: 5 degrees

Please let me know if you need any additional information.

Sydney White

From: Trang Nguyen [mailto:Trang.Nguyen@fcc.gov]
Sent: Thursday, June 23, 2016 2:50 PM
To: White, Sydney M.
Cc: Trang Nguyen; Eleanor Lott
Subject: Re: FCC pending app sesmod2016061500518 E080209

Thank you for responding.

The rf rad haz you submitted contain several errors, you need to submit the correct one. Specifically, in your rad haz study, you quoted the antenna feed max power 11.8 dBW (12 dBW). That comes out to 15.8 W max input into the feed. Your schedule B, proposed max. input power into the antenna flange to be 12.6 W. Therefore, your submission of the rf rad haz study takes in consideration of a higher amount of harmful radiation power density level . Attached is an example of an acceptable rf radiation hazard report submission. You need to resubmit your rf analysis using the proposed power of 12.6 dBW and the required

evaluation and what you will do to protect the general public exposure and the occupational exposure using your proposed antenna.

Frequency coordination is not needed for 14.00-14.50 GHz frequency band; however, you must provide in the application items E57 and E59, the mininum antenna elevation angle. The required minimum antenna elevation angle is 5 degrees pursuant to 47 C.F.R. 25.205.

Sincerely,
Trang Nguyen

From: White, Sydney M. <Sydney.White@dlapiper.com>
Sent: Thursday, June 23, 2016 1:16 PM
To: Trang Nguyen; Eleanor Lott
Subject: RE: FCC pending app sesmod2016061500518 E080209

Eleanor,

Attached is the Radiation Hazard study and the EIRP density.
I am also attaching the data sheet for the QCT-90.

On Questions E51-E60, DataPath is not doing frequency coordination. Note that that DataPath does not do frequency coordination for the underlying license (E080209) either.

Please let me know if you have any questions or need additional information.

Sydney

Sydney White

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My Bio

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From: Trang Nguyen [mailto:Trang.Nguyen@fcc.gov]
Sent: Thursday, June 23, 2016 12:22 PM
To: White, Sydney M.
Cc: Trang Nguyen; Eleanor Lott
Subject: FW: FCC pending app sesmod2016061500518 E080209

From: Trang Nguyen
Sent: Thursday, June 23, 2016 12:19 PM
To: sydney.whete@dlapiper.com
Cc: Trang Nguyen <Trang.Nguyen@fcc.gov>; Eleanor Lott <Eleanor.Lott@fcc.gov>
Subject: FCC pending app sesmod2016061500518 E080209

Hello,

You need to provide at least data for items E51-E60 for antenna ID QCT90 with transmit frequencies 14000-14500 MHz and receive frequencies 11700-12200 MHz with the minimum antenna elevation angle in the eastern/western limit of 5 degrees.

Please send the information to our staff, Ms. Eleanor Lott, so she could incorporate into the file.

Sincerely,

Trang Nguyen
FCC
IB/SD/SAB
2024182734

Analysis of Non-Ionizing Radiation for a 0.9-Meter Earth Station System

This report analyzes the non-ionizing radiation levels for a 0.9-meter elliptical earth station system. The analysis and calculations performed in this report comply with the methods described in the FCC Office of Engineering and Technology Bulletin, No. 65 first published in 1985 and revised in 1997 in Edition 97-01. The radiation safety limits used in the analysis are in conformance with the FCC R&O 96-326. Bulletin No. 65 and the FCC R&O specifies that there are two separate tiers of exposure limits that are dependent on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled environment are shown in Table 1. The General Population/Uncontrolled MPE is a function of transmit frequency and is for an exposure period of thirty minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2. The Occupational MPE is a function of transmit frequency and is for an exposure period of six minutes or less. The purpose of the analysis described in this report is to determine the power flux density levels of the earth station in the far-field, near-field, transition region, and between the antenna edge and the ground and to compare these levels to the specified MPEs.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)*(0.8/1200)
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)*(4.0/1200)
1500-100,000	5.0

Table 3. Formulas and Parameters Used for Determining Power Flux Densities

Parameter	Symbol	Formula	Value	Units
Elliptical Antenna Equiv. Diameter	D	$\sqrt[3]{a \times b}$	0.73	m
Ant Equiv. Surface Area	$A_{surface}$	$\pi * r^2$	0.417	m^2
Frequency	F	Input	14.25	GHz
Wavelength	λ	300/F	0.0210	m
Transmit Power	P	Input	12.6	W
Antenna Gain (dBi)	G_{es}	Input	39.8	dBi
Antenna Gain (factor)	G	$10^{Ges/10}$	9,550	n/a
Pi	π	Constant	3.1416	n/a
Antenna Efficiency	η	$G\lambda^2/(\pi^2 D^2)$	0.804	n/a

1. Far Field Distance Calculation

The distance to the beginning of the far field can be determined from the following equation:

Distance to the Far Field Region

$$R_{ff} = 0.60\ D^2 / \lambda = 15.2\ m \quad (1)$$

The maximum main beam power density in the far field can be determined from the following equation:

On-Axis Power Density in the Far Field

$$S_{ff} = G\ P / (4\ \pi\ R_{ff}^2) = 4.15\ mW/cm^2 \quad (2)$$

2. Near Field Calculation

Power flux density is considered to be at a maximum value throughout the entire length of the defined Near Field region. The region is contained within a cylindrical volume having the same diameter as the antenna. Past the boundary of the Near Field region, the power density from the antenna decreases linearly with respect to increasing distance.

The distance to the end of the Near Field can be determined from the following equation:

Extent of the Near Field

$$R_{nf} = D^2 / (4\ \lambda) = 6.3\ m \quad (3)$$

The maximum power density in the Near Field can be determined from the following equation:

Near Field Power Density

$$S_{nf} = 16.0\ \eta\ P / (\pi\ D^2) = 9.68\ mW/cm^2 \quad (4)$$

3. Transition Region Calculation

The Transition region is located between the Near and Far Field regions. The power density begins to decrease linearly with increasing distance in the Transition region. While the power density decreases inversely with distance in the Transition region, the power density decreases inversely with the square of the distance in the Far Field region. The maximum power density in the Transition region will not exceed that calculated for the Near Field region. The power density calculated in Section 2 is the highest power density the antenna can produce in any of the regions away from the antenna. The power density at a distance R_t can be determined from the following equation:

Transition Region Power Density

$$S_{tz} = S_{nf} * R_{nf} / R_{nf} = 5.00\ mW/cm^2 \quad (5)$$

R_{nf} is calculated at a distance of 12.3 meters from the antenna.

4. Region between the Antenna and the Ground

Assuming uniform illumination of the antenna surface, the power density between the antenna and the ground can be determined from the following equation:

Power Density between Antenna and Ground $S_g = P / A_{surface}$ (6)
$= 12.04\ mW/cm^2$

5. Summary of Calculations

Table 4. Summary of Expected Radiation levels for Uncontrolled Environment

Region	Calculated Maximum Radiation Power Density Level (mW/cm^2)	Hazard Assessment
1. Far Field (R_{ff} = 15.2 m)	S_{ff} = 4.15	Potential Hazard
2. Near Field (Rnf = 6.3 m)	S_{nf} = 9.68	Potential Hazard
3. Transition Region (R_t = 12.3 m)	S_t = 5.00	Potential Hazard
4. Between Antenna and Ground	S_g = 12.04	Potential Hazard

Table 5. Summary of Expected Radiation levels for Controlled Environment

Region	Calculated Maximum Radiation Power Density Level (mW/cm^2)	Hazard Assessment
1. Far Field (R_{ff} = 15.2 m)	S_{ff} = 4.15	Satisfies FCC MPE
2. Near Field (Rnf = 6.3 m)	S_{nf} = 9.68	Potential Hazard
3. Transition Region (R_t = 12.3 m)	S_t = 5.00	Satisfies FCC MPE
4. Between Antenna and Ground	S_g = 12.04	Potential Hazard

It is the applicant's responsibility to ensure that the public and operational personnel are not exposed to harmful levels of radiation.

6. Conclusions

Based upon the above analysis, it is concluded that FCC RF Guidelines have been exceeded in all fields of the Uncontrolled (Table 4) environment. In the Controlled (Table 5) environments only the Near Field region and the area Between the Antenna and Ground has levels that exceed the FCC RF Guidelines. The applicant proposes to comply with the Maximum Permissible Exposure (MPE) limits of 1.0 mW/cm^2 for the Uncontrolled Areas, and the MPE limits of 5.0 mW/cm^2 for the Controlled Areas.

The earth station's hazard area will be marked with the required radiation hazard signs as described in the recent FCC R&0 13-39. The area in the vicinity of the earth station will also have signs to inform those in the general population and those who may be working in the area or otherwise present that they are close to a RF System capable of producing hazardous levels.

The applicant agrees to abide by the conditions specified in Condition 5208 provided below:

Condition 5208 - The licensee shall take all necessary measures to ensure that the antenna does not create potential exposure of humans to radiofrequency radiation in excess of the FCC exposure limits defined in 47 CFR 1.1307(b) and 1.1310 wherever such exposures might occur. Measures must be taken to ensure compliance with limits for both occupational/controlled exposure and for general population/uncontrolled exposure, as defined in these rule sections. Compliance can be accomplished in most cases by appropriate restrictions such as fencing. Requirements for restrictions can be determined by predictions based on calculations, modeling or by field measurements. The FCC's OET Bulletin 65 (available on-line at www.fcc.gov/oet/rfsafety) provides information on predicting exposure levels and on methods for ensuring compliance, including the use of warning and alerting signs and protective equipment for worker.