

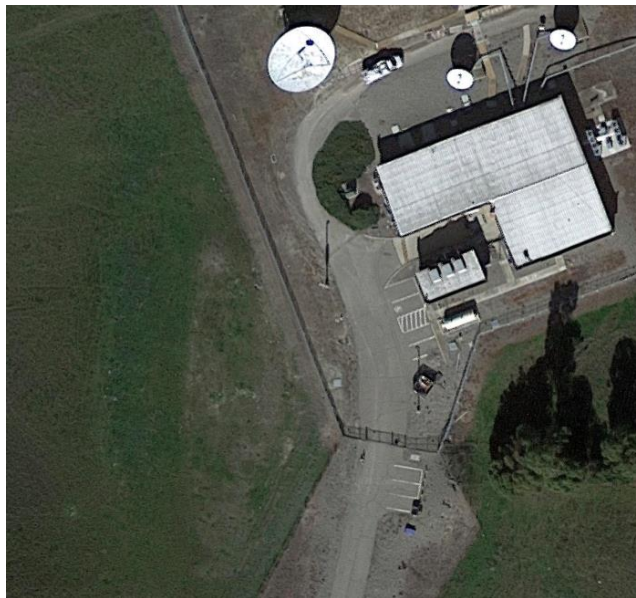
Radio Frequency – Electromagnetic Energy (RF-EME) Compliance Report (Sprint Retain)

T-Mobile Proposed Facility

Site ID: BA62430S
San Ramon Earth Station
8851 Manning Road, Livermore, California 94551

April 13, 2021

EBI Project Number:
6221001368



Status:

The proposed site will be compliant with the installation of the mitigation measures described in Attachment I.

Remarks: See signage plan for mitigation measures to be installed upon upgrade/installation of the site to comply with FCC and T-Mobile standards.

Prepared by:



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I.0 Executive Summary

EnviroBusiness Inc. (dba EBI Consulting) has been contracted by T-Mobile to conduct radio frequency electromagnetic (RF-EME) modeling for T-Mobile Site BA62430S located at 8851 Manning Road in Livermore, California to determine RF-EME exposure levels from proposed T-Mobile wireless communications equipment at this site. As described in detail in Appendix B of this report, the Federal Communications Commission (FCC) has developed Maximum Permissible Exposure (MPE) Limits for general public exposures and occupational exposures. This report summarizes the results of RF-EME modeling in relation to relevant FCC RF-EME compliance standards for limiting human exposure to RF-EME fields. This report contains a detailed summary of the RF EME analysis for the site.

This document addresses the compliance of T-Mobile's proposed transmitting facilities independently at the site.

The Maximum Emissions Value is 214.3975% of the FCC's general public limit (42.8795% of the FCC's occupational limit) at the main roof level. The proposed site will be compliant with Federal regulations regarding (radio frequency) RF Emissions with the installation of the mitigation measures.

At the nearest walking/working surfaces to the T-Mobile antennas on the main roof level, the maximum power density generated by the T-Mobile antennas is approximately 214.3975 percent of the FCC's general public limit (42.8795 percent of the FCC's occupational limit).

Based on worst-case predictive modeling, the worst-case emitted power density may exceed the FCC's general public limit within approximately 72 feet of T-Mobile's proposed antennas at the main roof level. Modeling also indicates that the worst-case emitted power density may exceed the FCC's occupational limit within approximately 32 feet of T-Mobile's proposed antennas at the main roof level.

Signage is recommended at the site as presented in Attachment I. Posting of the signage and installation of other markings brings the site into compliance with FCC rules and regulations.

2.0 MPE Calculations

Calculations were completed for the proposed T-Mobile Wireless antenna light pole facility located at 8851 Manning Road in Livermore, California using the equipment information listed below. All calculations were performed per the specifications under FCC Office of Engineering & Technology (OET) Bulletin 65, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" (OET-65). Because of the short wavelength of PCS services, the antennas require line-of-sight paths for good propagation and are typically installed a distance above ground level. Antennas are constructed to concentrate energy towards the horizon, with as little energy as possible scattered towards the ground or the sky. This design, combined with the low power of PCS facilities, generally results in no possibility for exposure to approach Maximum Permissible Exposure (MPE) levels, with the exception of areas in the immediate vicinity of the antennas.

In accordance with T-Mobile's RF Exposure policy, EBI performed theoretical modeling using RoofMaster™ software to estimate the worst-case power density at the site rooftop and ground-level resulting from operation of the antennas. Using the computational methods set forth in OET-65, RoofMaster™ calculates power density in a scalable grid based on the contributions of all RF sources characterized in the study scenario. At each grid location, the cumulative power density is expressed as a percentage of the FCC limits. Manufacturer antenna pattern data is utilized in these calculations. RoofMaster™ models consist of the Far Field model as specified in OET-65 and an implementation of the OET-65 Cylindrical Model (Sula9). The models utilize several operational specifications for different types of antennas to produce a plot of spatially-averaged power densities that can be expressed as a percentage of the applicable exposure limit.

For this report, EBI utilized antenna and power data provided by T-Mobile and compared the resultant worst-case MPE levels to the FCC's general public/uncontrolled exposure limits outlined in OET Bulletin 65. EBI has performed theoretical worst-case modeling using RoofMaster™ to estimate the maximum potential power density from each proposed antenna based on worst-case assumptions for the number of antennas and power. All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmission paths per carrier prescribed configuration. Modeling for Ericsson AIR 6449 and AIR 6488 antennas is based on worst-case assumptions that include all beams transmitting simultaneously. This is to ensure that all areas of potential concern are taken into consideration. As such, the results are conservative in nature and reflect potentially higher levels of RF emissions compared to actual on-air conditions. It is recommended that areas of concern be confirmed with onsite measurements once the site is active."

The assumptions used in the modeling are based upon information provided by T-Mobile in the supplied drawings.

There are no collocated carriers on the light pole.

The data for all T-Mobile antennas used in this analysis is shown in Section 3.0. Actual antenna gains for each antenna were used per manufacturer's specifications. All calculations were done with respect to the FCC's general public/uncontrolled threshold limits.

Based on information provided by T-Mobile, access to this site is considered uncontrolled.

3.0 T-Mobile Antenna Inventory

Sector	Antenna Number	Antenna Make	Antenna Model	Centerline Height (ft) Above Nearest Walking Surface	Azimuth (°)	Technology	Frequency Band	Power Per Channel (W)	Number of Channels	ERP (W)
A	1	RFS	APXVAA4L18_43-U-NA20 02DT 700	4.0	70	LTE	700 MHz	40	1	555
A	1	RFS	APXVAA4L18_43-U-NA20 02DT 600	4.0	70	LTE	600 MHz	80	1	1027
A	1	RFS	APXVAA4L18_43-U-NA20 02DT 600	4.0	70	NR	600 MHz	80	1	1027
A	1	RFS	APXVAA4L18_43-U-NA20 02DT 1900	4.0	70	LTE	PCS - 1900 MHz	80	1	1923
A	1	RFS	APXVAA4L18_43-U-NA20 02DT 1900	4.0	70	C	PCS - 1900 MHz	40	4	3847
A	1	RFS	APXVAA4L18_43-U-NA20 02DT 1900	4.0	70	GSM	PCS - 1900 MHz	40	1	962
A	1	RFS	APXVAA4L18_43-U-NA20 02DT 2100	4.0	70	LTE	AWS - 2100 MHz	160	1	5060
A	2	ERICSSON	SON_AIR6449 2500 LTE TB TMO West	10.0	70	LTE	2500 MHz	68	1	12425
A	2	ERICSSON	SON_AIR6449 2500 NR TB TMO West	10.0	70	NR	2500 MHz	68	1	12425
A	2	ERICSSON	SON_AIR6449 2500 LTE MACRO	10.0	70	LTE	2500 MHz	23	1	1208
A	2	ERICSSON	SON_AIR6449 2500 LTE MACRO	10.0	70	NR	2500 MHz	23	1	1208

• This table contains an inventory of T-Mobile Antennas and Power Values.

4.0 Summary and Conclusions

All calculations performed for this analysis yielded results that were above the allowable limits for exposure to RF Emissions. Based on predictive modeling, the worst-case emitted power density may exceed the FCC's general public limit within approximately 72 feet of T-Mobile's proposed antennas at the main roof level. Modeling also indicates that the worst-case emitted power density may exceed the FCC's occupational limit within approximately 32 feet of T-Mobile's proposed antennas at the main roof level.

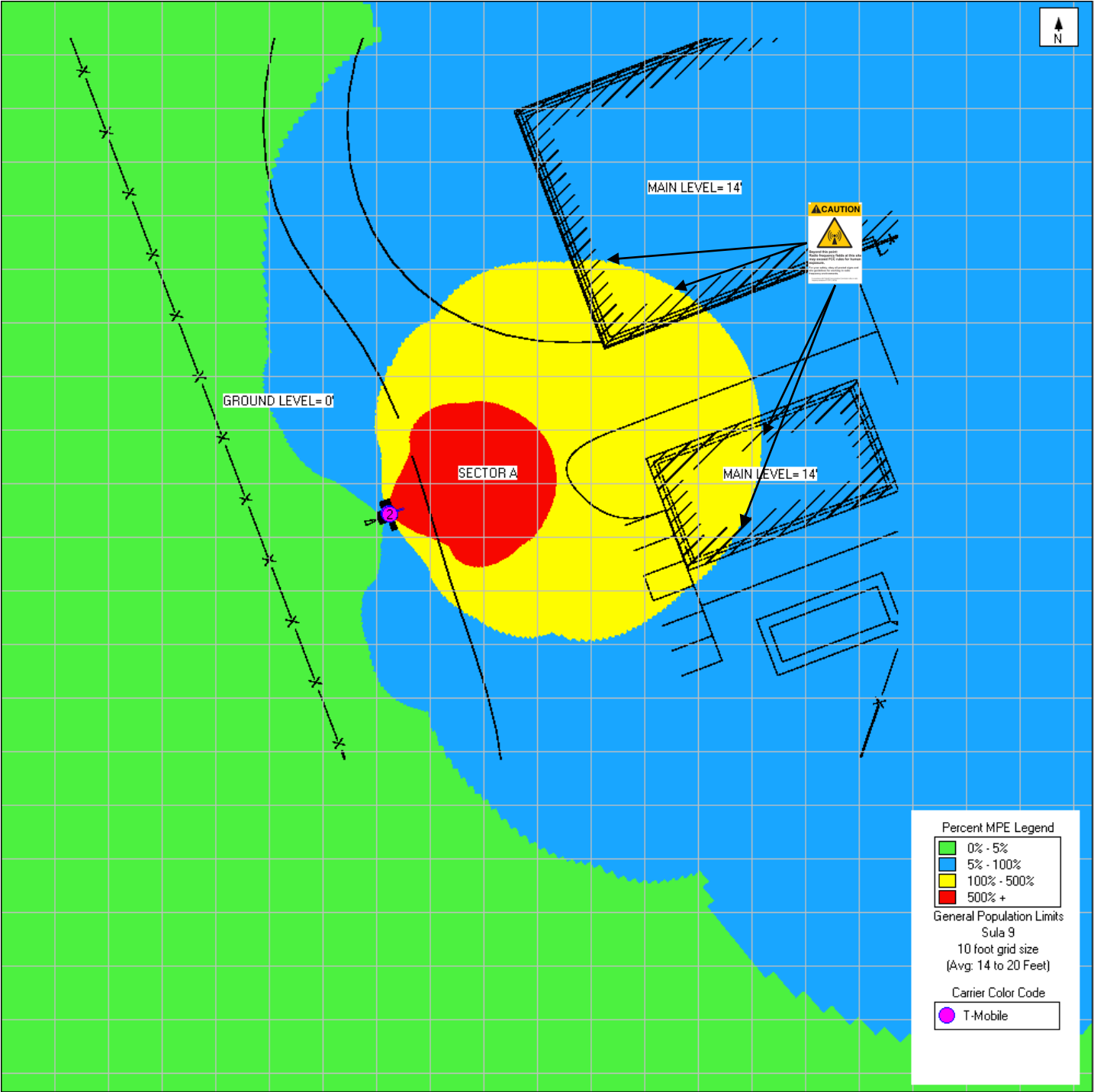
There are no collocated carriers on the light pole.

The anticipated maximum contribution from each sector of the proposed T-Mobile facility is 214.3975% of the allowable FCC established general public limit (42.8795% of the FCC occupational limit). This was determined through calculations along a radial from each sector taking full power values into account as well as actual vertical plane antenna gain values per the manufacturer-supplied specifications for gain. Based on worst-case predictive modeling, there are no areas at ground level related to the proposed antennas that exceed the FCC's occupational or general public exposure limits at this site. At ground level, the maximum power density generated by the antennas is approximately 88.3000% of the FCC's general public limit (17.6600% of the FCC's occupational limit).

A site is considered out of compliance with FCC regulations if there are areas that exceed the FCC exposure limits and there are no RF hazard mitigation measures in place. Any carrier which has an installation that contributes more than 5% of the applicable MPE must participate in mitigating these RF hazards. For this facility, the calculated values were above the allowable 100% threshold standard per the federal government.

EBI's modeling indicates that there are areas in front of the T-Mobile antennas at the rooftop level that exceed the FCC standards for general public and occupational exposure. Based on worst-case predictive modeling, the worst-case emitted power density may exceed the FCC's general public limit within approximately 72 feet of T-Mobile's Sector A antennas at the main roof level. Modeling also indicates that the worst-case emitted power density may exceed the FCC's occupational limit within approximately 32 feet of T-Mobile's Sector A antennas at the main roof level. In order to alert any workers potentially accessing the site, a blue Notice sign and a yellow Guidelines sign are recommended at the first point(s) of access to the rooftops and the light pole. To reduce the risk of exposure and/or injury, EBI recommends that access to the rooftops and the light pole or areas associated with the active antenna installation be restricted and secured where possible. Caution and/or Warning signage is recommended at the site as presented in the Signage Plan – Attachment I. When Warning signs are required, other markings such as painted striping, chains, stanchions, or fencing may also be used to identify the perimeter of each Safety Zone.

Attachment 1a: MPE Analysis and Recommended Signage (Main Roof Level)



Post at Roof
Access Points



When Warning signs are required, other markings such as painted striping, chains, stanchions, or fencing may also be used to identify the perimeter of each Safety Zone.

Attachment 1b: MPE Analysis and Recommended Signage (Ground Level)



Sign	Sign Count	Description	Posting Instructions
	3	<p>Blue Notice Sign</p> <p>Used to notify individuals they are entering an area where the power density emitted from transmitting antennas may exceed the FCC's MPE limit for the general public or occupational exposures.</p>	<p>Securely post at all access points to the rooftops at the site in a manner conspicuous to all individuals entering thereon.</p> <p>Securely mount approximately 48 inches above grade at the base of the light pole as indicated in Attachment I.</p>
	3	<p>Guidelines</p> <p>Informational sign used to notify workers that there are active antennas installed and provide guidelines for working in RF environments.</p>	<p>Securely post at all access points to the rooftops at the site in a manner conspicuous to all individuals entering thereon.</p> <p>Securely mount approximately 48 inches above grade at the base of the light pole as indicated in Attachment I.</p>
	4	<p>Yellow Caution Sign</p> <p>Used to notify individuals that they are entering a hot spot where either the general public or occupational FCC's MPE limit is or could be exceeded.</p>	<p>Securely post near areas where the general public or occupational MPE limit could be exceeded as shown in Attachment I at the site in a manner that prominently alerts occupational workers and the general public of RF emissions.</p>
	N/A	<p>Red Warning Sign</p> <p>Used to notify individuals that they are entering a hot zone where either the general public or occupational FCC's MPE limit has been exceeded.</p>	<p>Signage not required.</p>
<p>Notes:</p>	<p>The proposed site will be compliant with the installation of the mitigation measures.</p> <p>The actual number of access points may vary based on documentation provided and/or if a survey was conducted. Recommended signage locations, if applicable, are based on T-Mobile's guidance for the worst-case scenario in each sector. The actual signage installation is dependent on accessibility of the facility and antennas. Locations deemed inaccessible due to OSHA safety standards (proximity to unprotected roof edge or slope, etc.) will be compliant upon installation of recommended signage at the closest accessible point.</p>		

Attachment 2: RoofMaster™ Import File

Carrier	Antenna Number	Emitter Number	Caption	Pattern(.ant)	Frequency	Power (W) ERP/EiRP	Length (m)	Azimuth(n)	Mechanical Downtilt	Height(ft)
T-Mobile	1	1	ANT 1	APXVAA4L18_43-U-NA20 02DT 700.ant	700	555.34	1.83	70	0	18.0
T-Mobile	1	2	ANT 1	APXVAA4L18_43-U-NA20 02DT 600.ant	600	1027.05	1.83	70	0	18.0
T-Mobile	1	3	ANT 1	APXVAA4L18_43-U-NA20 02DT 600.ant	600	1027.05	1.83	70	0	18.0
T-Mobile	1	4	ANT 1	APXVAA4L18_43-U-NA20 02DT 1900.ant	1900	3154.52	1.83	70	0	18.0
T-Mobile	1	5	ANT 1	APXVAA4L18_43-U-NA20 02DT 1900.ant	1900	6309.05	1.83	70	0	18.0
T-Mobile	1	6	ANT 1	APXVAA4L18_43-U-NA20 02DT 1900.ant	1900	1577.26	1.83	70	0	18.0
T-Mobile	1	7	ANT 1	APXVAA4L18_43-U-NA20 02DT 2100.ant	2100	8297.82	1.83	70	0	18.0
T-Mobile	2	1	ANT 2	SON_AIR6449 2500 LTE TB TMO West.ant	2500	20377.35	0.84	70	0	24.0
T-Mobile	2	2	ANT 2	SON_AIR6449 2500 NR TB TMO West.ant	2500	20377.35	0.84	70	0	24.0
T-Mobile	2	3	ANT 2	SON_AIR6449 2500 LTE MACRO.ant	2500	1981.65	0.84	70	0	24.0
T-Mobile	2	4	ANT 2	SON_AIR6449 2500 LTE MACRO.ant	2500	1981.65	0.84	70	0	24.0


Note that Power (W) ERP/EiRP values are listed respective to the frequency of the antenna. (Values less than 1,000 MHz are listed as ERP and greater than 1,000 MHz are listed as EiRP.)

Appendix A: Certifications

Preparer Certification

I, Brad Bockstie, state that:

- I am an employee of EnviroBusiness Inc. (d/b/a EBI Consulting), which provides RF-EME safety and compliance services to the wireless communications industry.
- I have successfully completed RF-EME safety training, and I am aware of the potential hazards from RF-EME and would be classified “occupational” under the FCC regulations.
- I am fully aware of and familiar with the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation.
- I have been trained on RF-EME modeling using RoofMaster™ modeling software.
- I have reviewed the data provided by the client and incorporated it into this Site Compliance Report such that the information contained in this report is true and accurate to the best of my knowledge.

A rectangular box containing a handwritten signature in black ink. The signature is cursive and appears to read "Brad Bockstie".

Reviewed and Approved by:



sealed 13apr2021

Michael McGuire
Electrical Engineer
mike@h2dc.com

Note that EBI's scope of work is limited to an evaluation of the Radio Frequency – Electromagnetic Energy (RF-EME) field generated by the antennas and broadcast equipment noted in this report. The engineering and design of the building and related structures, as well as the impact of the antennas and broadcast equipment on the structural integrity of the building, are specifically excluded from EBI's scope of work.

Appendix B: Federal Communications Commission (FCC) Requirements

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The number of $\mu\text{W}/\text{cm}^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The general population exposure limit for the 700 and 800 MHz Bands is 467 $\mu\text{W}/\text{cm}^2$ and 567 $\mu\text{W}/\text{cm}^2$ respectively, and the general population exposure limit for the PCS and AWS bands is 1000 $\mu\text{W}/\text{cm}^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

A site is considered out of compliance with FCC regulations if there are areas that exceed the FCC exposure limits and there are no RF hazard mitigation measures in place. Any carrier which has an installation that contributes more than 5% of the applicable MPE must participate in mitigating these RF hazards.

Additional details can be found in FCC OET 65.