RF-EME SAFETY COMPLIANCE REPORT

February 16, 2022

Purpose of Report:

Soteria RF Safety Consultants has been contracted as an independent/third party consultant to provide a radiofrequency electromagnetic (RF-EME) assessment to determine if the proposed wireless facility listed below complies with the Federal Communications Commission – Office of Engineering and Technology Bulletin 65 (FCC-OET-65), which establishes Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. This report summarizes:

Wireless Facility Info:

Carrier/Project:	T-Mobile	***Address:***	1333 Veterans BLVD. South San Francisco, CA 94080
Site Name:	SF93220A/ AC HOTEL SAN FRANCISCO		
Structure Type:	ROOFTOP	***Latitude:***	37.664580
Pole ID:	n/a	***Longitude:***	-122.395640

(Proposed Wireless Facility Location)

(Proposed Wireless Facility Vicinity)

Report Certification:

I have reviewed and approve of the following report and believe it to be true and accurate to the best of my knowledge.

Name:	Wafic M. Hojeij
Credential:	Registered Professional Engineer
CA Registration No:	E-16587
Expiration Date:	06/30/2022

REGISTERED PROFESSIONAL ENGINEER
WAFIC M. HOJEIJ
No. E-16587
Exp. 6/30/22
ELECTRICAL
STATE OF CALIFORNIA

COMPLIANCE STATEMENT

Based on location, proposed design, equipment, and operational parameters given to Soteria RF Safety Consultants, along with accepted predictive modeling based on worst-case scenario (maximum power, operating 24x7x365), the following wireless facility:

SF93220A/ AC HOTEL SAN FRANCISCO

WILL COMPLY

with the FCC's RF-EME Safety Guidelines, as set forth in the FCC-OET-65, regarding limits for human exposure to radiofrequency (RF) fields: provided all recommended mitigations identified in Section 5.0 of this report are implemented/adhered to.

Section 1.0 – Proposed Design

The following proposed design is based upon construction drawings and Radio Frequency Site Data information. All information is considered correct as supplied from the client.

The wireless facility is located on an existing building rooftop designated for the wireless equipment. The installation and/or replacement of antennas are mounted at the above ground level (AGL) listed in the antenna table below, and the antennas are connected to the radio equipment via cables. The antennas are grouped into sectors and are pointed in various directions (azimuths) to achieve the desired areas of coverage.

Figure 1 - Plan View

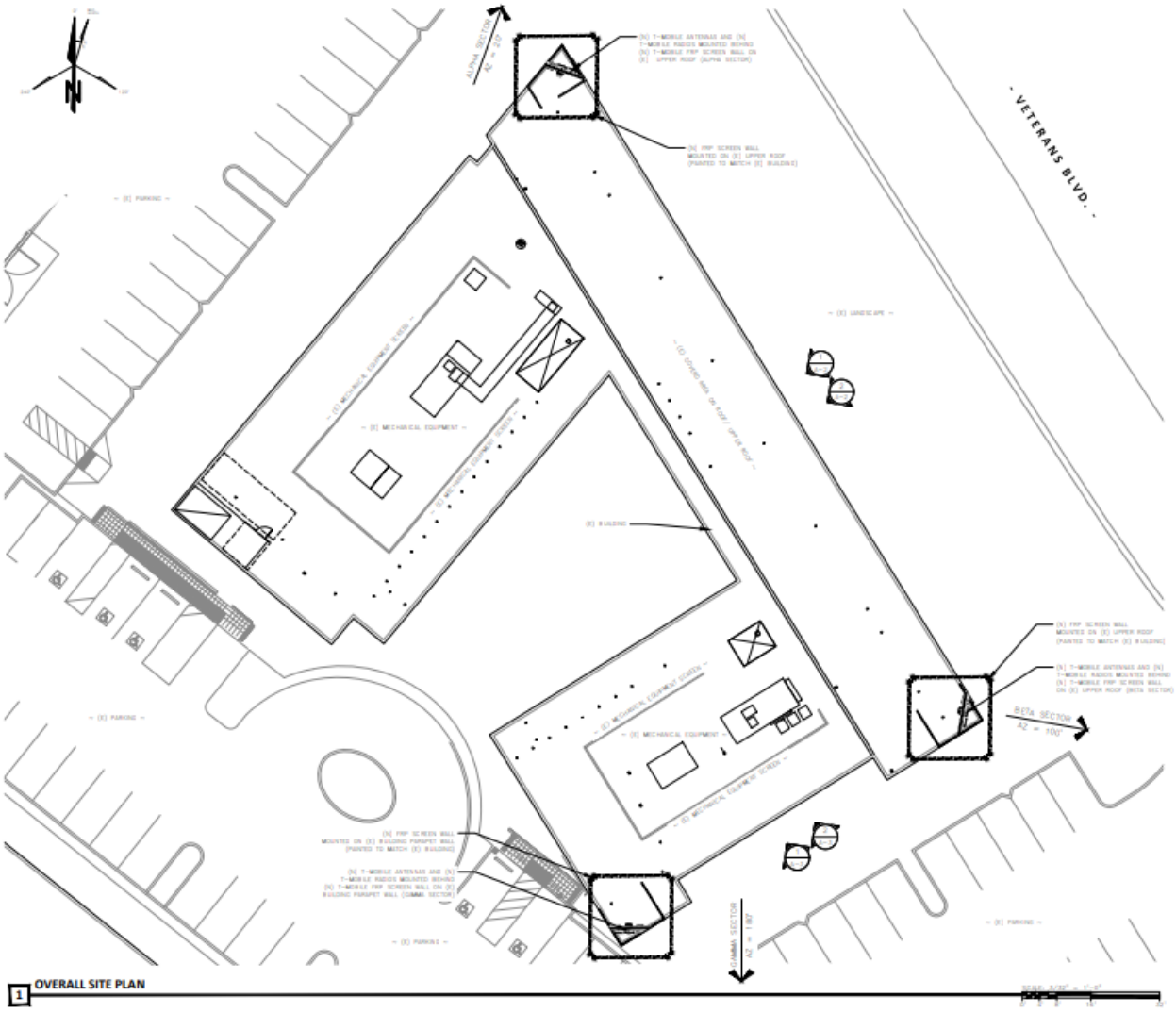

Figure 2 – Elevation View

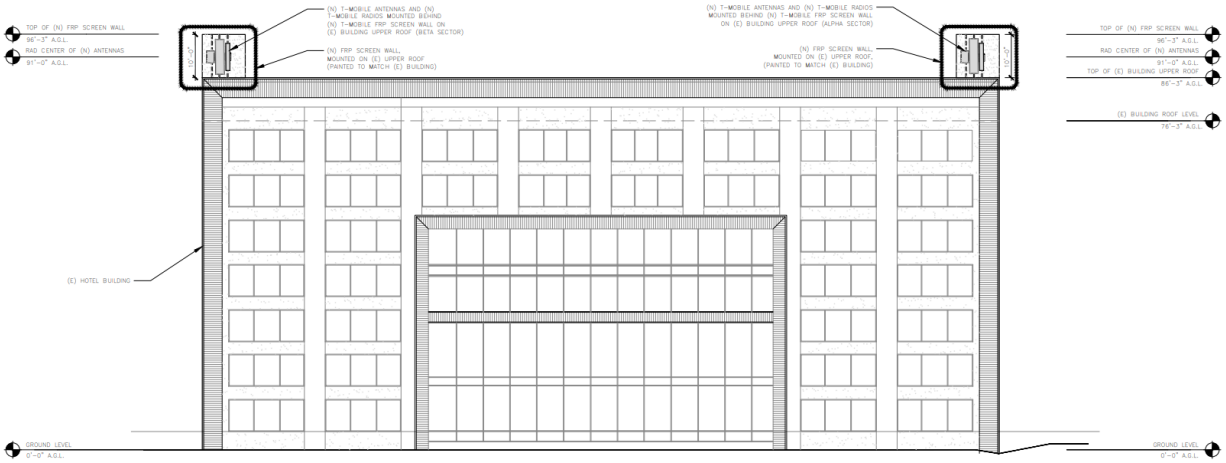

Table 1 - Antenna Inventory and Power Details:

Operator	Sector	Position	Technology	Frequency MHz	Manufacturer	Model	Azimuth (°TN)	AGL (ft)	Input Power (W)	Gain (dBd)	Power Output, ERP (W)
TMO	A	1	GSM	1900	RFS	APXVLL19P_43-C-A20	20	91	40	16.55	1807
TMO	A	1	LTE	1900	RFS	APXVLL19P_43-C-A20	20	91	80	16.55	3615
TMO	A	1	LTE	2100	RFS	APXVLL19P_43-C-A20	20	91	80	17.25	4247
TMO	A	2	LTE	600	RFS	APXVAALL24_43-U-NA20	20	91	80	13.65	1854
TMO	A	2	N	600	RFS	APXVAALL24_43-U-NA20	20	91	80	13.65	1854
TMO	A	2	LTE	700	RFS	APXVAALL24_43-U-NA20	20	91	80	13.85	1941
TMO	A	3	LTE	2500	Ericsson	AIR6449	20	91	80	22.65	14726
TMO	A	3	N	2500	Ericsson	AIR6449	20	91	200	22.65	36815
TMO	B	1	GSM	1900	RFS	APXVLL19P_43-C-A20	100	91	40	16.55	1807
TMO	B	1	LTE	1900	RFS	APXVLL19P_43-C-A20	100	91	80	16.55	3615
TMO	B	1	LTE	2100	RFS	APXVLL19P_43-C-A20	100	91	80	17.25	4247
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TMO	C	1	GSM	1900	RFS	APXVLL19P_43-C-A20	180	91	40	16.55	1807
TMO	C	1	LTE	1900	RFS	APXVLL19P_43-C-A20	180	91	80	16.55	3615
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TMO	C	3	LTE	2500	Ericsson	AIR6449	180	91	80	22.65	14726
TMO	C	3	N	2500	Ericsson	AIR6449	180	91	200	22.65	36815

Section 2.0 – FCC Standards & Guidelines

The FCC has established Maximum Permissible Exposure (MPE) limits for human exposure to RF-EME fields based on consultation with numerous other federal health agencies including the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), the Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH) and the adoption of published standards by the American National Standards Institute (ANSI) and Institute of Electrical and Electronics Engineers (IEEE) C95.1 and the National Council on Radiation Protection and Measurement (NCRP) Report No. 86.

Collectively these standards and guidelines have been incorporated into the FCC-OET-65 "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields." For complete detail on FCC-OET-65 use the following link: https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf

The FCC's MPE limits for exposure incorporate two tiers of exposure limits based on whether exposure occurs in an occupational or "controlled" situation or whether the general population is exposed, or exposure is in an "uncontrolled" situation.

- **Occupational/controlled exposure** limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

- **General public/uncontrolled exposures** apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

All FCC-regulated transmitters, wireless providers and licensees are required to determine if their transmitting equipment is in compliance with FCC's MPE limits, which may also include signage requirements, physical barriers, indicative markers and other policies/practices designed to prevent RF exposure in excess of existing safety standards.

Section 3.0 – Calculation Methodology

Soteria has incorporated the principles and methodologies described in FCC-OET-65 into a proprietary program to calculate the maximum power density from the facility at multiple locations. The calculations assume transmitting equipment is operating under "worst-case scenario" thus all frequencies are assumed to be transmitting at maximum power and are operating 24x7x365 (i.e. continuously). The program includes a number of other parameters such as antenna mounting specifications, frequency specific power input, line losses, frequency specific antenna gains, and frequency specific antenna horizontal and vertical beamwidths.

- **Power Density Calculation**

I. Far-Field Calculation

$S = 0.0334*ERP/R^2$ is based on FCC-OET-65, Equation (9)

where: S = Power Density in mW/cm^2
ERP = Effective Radiated Power in Watts
R = Distance in meters

II. Near-Field Cylindrical Model Calculation

$S = (180/\Theta_{BW})P_{net}/\pi Rh$ is based on FCC-OET-65, Equation (20)

where: S = Power Density in mW/cm^2
P_{net} = Net Power Input to the antenna in mWatts
Θ_{BW} = Antenna half power horizontal beam width in degrees
h = Aperture height of the antenna in cm
R = Distance in cm

- **Distance Calculation**

$R= SQRT(H^2+X^2)$ is based on FCC-OET-65, Figure (4)

where: R = Distance from center of antenna to ground location with highest % of public MPE
H = Height (ground level to center of antenna)
X = Distance from base of antenna facility to location with highest % of public MPE at ground level

Section 4.0 – Results & Conclusions

Table – 2: Ground Level

Ground Level	Distance from Base of Antenna Structure to Max % FCC MPE Limit (ft)	Max % of FCC MPE Limit	FCC MPE Limit Compliant
General Public / Uncontrolled Exposure Limit	**1292**	**0.55**	**YES**

- **Conclusion**
  Based on worst-case scenario, accepted predictive modeling and in accordance with the FCC's guidelines on Limits for Maximum Permissible Exposure (MPE) as outlined in FCC-OET-65:

  Ground Level (Table 2): The maximum *Ground Level* RF exposure is calculated to not exceed **0.55%** of the MPE and therefore **WILL COMPLY** with General Public/ Uncontrolled exposure limits.

Table – 3: Antenna Face Level

Antenna Face Level	Horizontal Standoff Distance (ft)	% of FCC MPE Limit	FCC MPE Limit Compliant at Standoff Distance
General Public / Uncontrolled Exposure Limit	**36**	**Less than 100%**	**YES**
Occupational / Controlled Exposure Limit	**16**	**Less than 100%**	**YES**

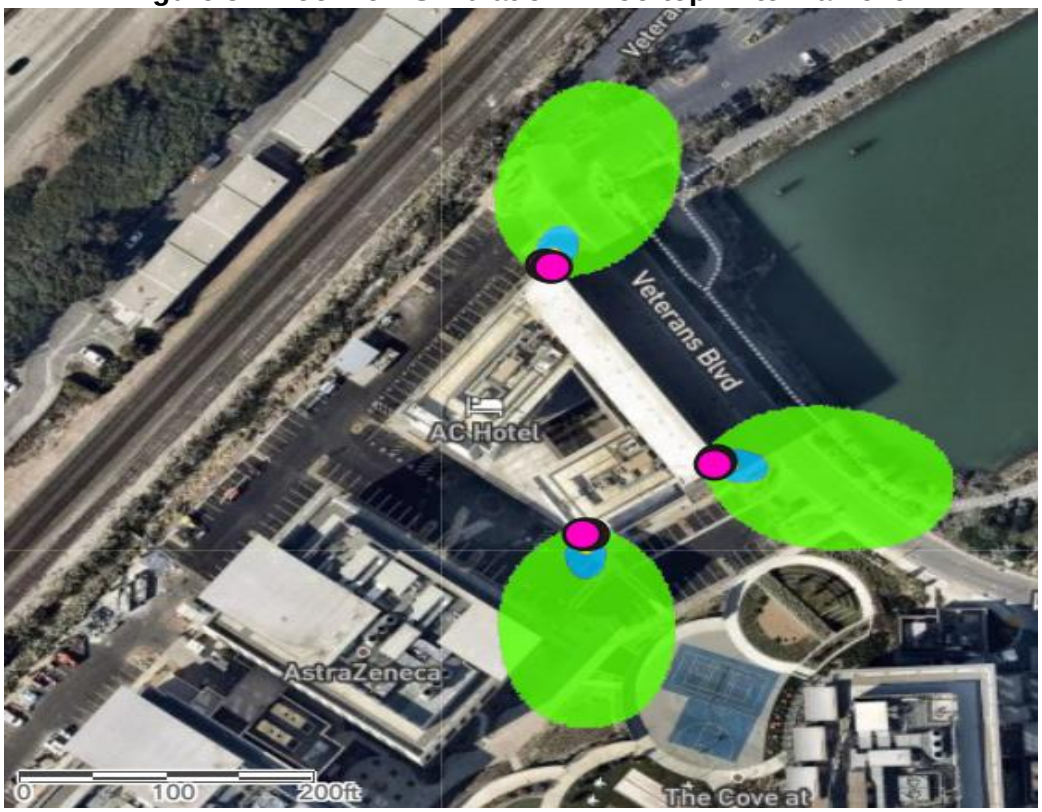
- **Conclusions** – Based on worst-case scenario, accepted predictive modeling and in accordance with the FCC's guidelines on Limits for Maximum Permissible Exposure (MPE) as outlined in FCC-OET-65:

  Antenna Face Level (Table 3): Workers who have received RF awareness training (i.e. allowed to be exposed to the Occupational/Controlled tier) must maintain a horizontal standoff distance of at least **16 feet** from the face of the antenna to prevent exposures in excess of the occupational MPE. For all others (i.e. workers and members of the public who have not received RF awareness training) the lower MPE limits for the General Public/Uncontrolled tier apply. This group must maintain a horizontal standoff distance of at least **36 feet** from the face of the antenna to prevent exposures in excess of the public MPE.

Rooftop Antenna Level Predicted RF Exposure Simulation

The following simulation shows the maximum potential exposures at roof level from the antennas as a percent of the FCC's public MPE Limits. Uncolored areas represent where exposure levels are calculated to be at or below 5% of the MPE; **Green** between 5% & 100% of the MPE, **Blue** between 100% & 500% of the MPE, **Yellow** between 500% & 5000% & **Red** greater than 5000% of the MPE.

Figure 3 – Roofview Simulation – Rooftop Antenna Level



Antenna Locations	
	AT&T
	T-Mobile
	Metro PCS
	Verizon
	Other

Percent MPE Legend	
	5% - 100%
	100% - 500%
	500% - 5000%
	> 5000%
Public Limits	

- **Conclusion**

Individuals can safely occupy areas in the uncolored and **Green** areas for an indefinite period of time. However **Blue, Yellow** and **Red** areas must be restricted to workers or other individuals who have received RF awareness training (i.e., allowed to be exposed to the higher Occupational/Controlled exposure tier) and are fully aware of the potential for such areas of RF exposure and can exercise control over their exposure to prevent exposures in excess of regulatory limits.

Section 5.0 – Recommended Mitigations

Soteria's worst-case predictive modeling indicates there are no calculated RF exposure levels at ground level or nearest occupied structure that exceeds the FCC MPE guidelines for Occupational or General Public limits. To reduce the risk of exposure and/or injury, it is recommended that access to areas immediately adjacent to any active antenna be restricted and secured where possible. The following actions are recommended to ensure that workers are properly informed about the presence and location of active antennas and their associated RF-EME fields.

RF Signage

Installation: **CAUTION** and **NOTICE** signage should be as shown below.

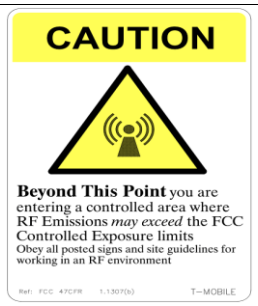
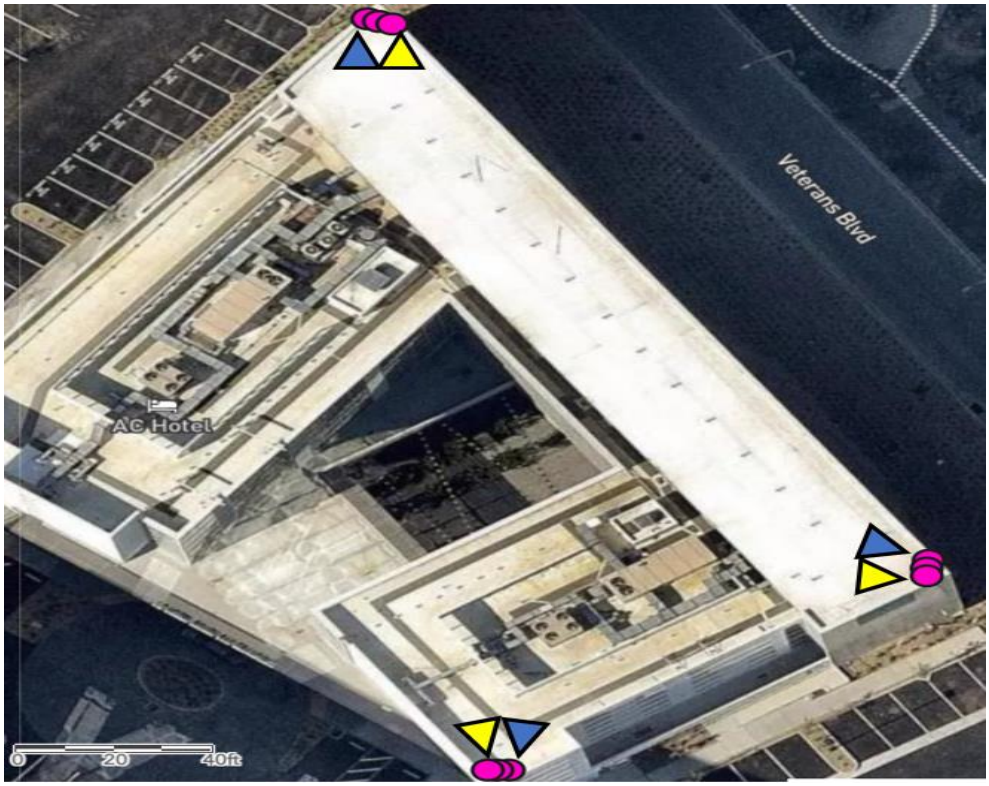
			
Post at antenna area, visible from any approach to the antennas		Post at antenna area, visible from any approach to the antennas	

Figure 4 – Signage



Notice and Caution signage should be placed as shown above. Only personnel with RF exposure training who are fully aware of the potential for and can exercise control of their RF exposure, can have access to the areas in front of the antennas. Also, carriers contact information should be available at the access points to the rooftop areas.

Appendix A – Technical References

- C95.1 – 1991 – IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

Source: https://standards.ieee.org/standard/C95_1-1991.html

- Report No. 86 – Biological Effect and Exposure Criteria for Radiofrequency Electromagnetic Fields (1986)

Source: https://ncrponline.org/shop/reports/report-no-086-biological-effects-and-exposure-criteria-for- radiofrequency-electromagnetic-fields-1986/

- FCC–OET–65: Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields.

Source: https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf

- Table 4 – The FCC's MPE limits are based on continuous exposure at a wide range of frequencies and are deemed to provide a "substantial margin of safety" for all persons, regardless of age, gender, size or health.

  Limits for Maximum Permissible Exposure (MPE) represents both the field strength and power density expressed in terms of the plane wave equivalent power density expressed in units of milliwatts per square centimeter (mW/cm^2) or alternatively, absorption of RF energy is a function of frequency (as well as body size and other factors). The limits vary with frequency. Standards are more restrictive for frequencies at and below 300 MHz. Higher intensity RF exposures are allowed for frequencies between 300 MHz and 6000 MHz than for those below 300 MHz.

Table 4 - FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)
0.3-3.0	614	1.63	100 †
3.0-30	1842/f	4.89/f	$900/f^2$ †
30-300	61.4	0.163	1
300-1500	-	-	f/300
1500-100,000	-	-	5

(B) Limits for General Population/Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)
0.3-3.0	614	1.63	100 †
3.0-30	842/f	2.19/f	$180/f^2$ †
30-300	27.5	0.073	0.2
300-1500	-	-	f/1500
1500-100,000	-	-	1

f = frequency in MHz
† = plane-wave equivalent power density

Source: For Table 4 – FCC OET Bulletin 65, Edition 97-01, p.67

Table 5 – Standard Minimum Font Sizes & Safe Viewing Distances for Signage

Minimum Safe Viewing Distance		Minimum Letter Height for FAVORABLE Reading Conditions		
(ft)	(m)	(point Size)	(in)	(cm)
<=4	<=1.2	16	0.16	0.4
6	1.8	24	0.24	0.6
8	2.4	32	0.32	0.8
10	3.0	40	0.40	1.0
15	4.6	60	0.60	1.5
20	6.1	80	0.80	2.0
30	9.1	120	1.20	3.0
40	12.2	160	1.60	4.1
60	18.3	240	2.40	6.1
80	24.4	320	3.20	8.1
100	30.5	400	4.00	10.2
125	38.1	500	5.00	12.7
150	45.7	600	6.00	15.2
200	61.0	800	8.00	20.3

Source: For Table 2 – ANSI Z535.2-2001 (Table B1)