RF EMISSIONS COMPLIANCE REPORT

Crown Castle on behalf of Sprint

Cascade ID: CT43XC805
Crown Castle ID: 806369
Site Name: HRT 094 943225

439-455 HOMESTEAD AVE
HARTFORD, CT
11/30/2018

Report Status:

Sprint Is Compliant

Klaus Bender
Registered Professional Engineer (Electrical)
Expires December 31, 2018

Prepared By:

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Engineering Statement in Re:
Electromagnetic Energy Analysis
Crown Castle on behalf of Sprint
HARTFORD, CT

My signature on the cover of this document indicates:

That I am registered as a Professional Engineer in the jurisdiction indicated; and

That I have extensive professional experience in the wireless communications engineering industry; and

That I am an employee of Sitesafe, LLC in Vienna, Virginia; and

That I am thoroughly familiar with the Rules and Regulations of the Federal Communications Commission ("the FCC" and "the FCC Rules") both in general and specifically as they apply to the FCC's Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; and

That the technical information serving as the basis for this report was supplied by Crown Castle on behalf of Sprint (See attached Site Summary and Carrier documents), and that Sprint's installations involve communications equipment, antennas and associated technical equipment at a location referred to as the "HRT 094 943225" ("the site"); and

That Sprint proposes to operate at the site with transmit antennas listed in the carrier summary and with a maximum effective radiated power as specified by Sprint and shown on the worksheet, and that worst-case 100% duty cycle have been assumed; and

That in addition to the emitters specified in the worksheet, there are additional collocated point-to-point microwave facilities on this structure and, the antennas used are highly directional oriented at angles at or just below the horizontal and, that the energy present at ground level is typically so low as to be considered insignificant and have not been included in this analysis; and

That this analysis has been performed with the assumption that the ground immediately surrounding the tower is primarily flat or falling; and

That at this time, the FCC requires that certain licensees address specific levels of radio-frequency energy to which workers or members of the public might possibly be exposed (at §1.1307(b) of the FCC Rules); and

That such consideration of possible exposure of humans to radio-frequency radiation must utilize the standards set by the FCC, which is the Federal Agency having jurisdiction over communications facilities; and

That the FCC rules define two tiers of permissible exposure guidelines: 1) "uncontrolled environments," defined as situations in which persons may not be aware of (the "general public"), or may not be able to control their exposure to a transmission facility; and (2) "controlled environments," which defines situations in which persons are aware of their potential for exposure (industry personnel); and

That this statement specifically addresses the uncontrolled environment (which is more conservative than the controlled environment) and the limit set forth in the FCC rules for licensees of Sprint's operating frequency as shown on the attached antenna worksheet; and

That when applying the uncontrolled environment standards, the predicted Maximum Power Density at two meters above ground level from the proposed Sprint operation is no more than 0.099% of the maximum in any accessible area on the ground and

That it is understood per FCC Guidelines and OET65 Appendix A, that regardless of the existent radio-frequency environment, only those licenses whose contributions exceed five percent of the exposure limit pertinent to their operation(s) bear any responsibility for bringing any non-compliant area(s) into compliance; and

That when applying the uncontrolled environment standards, the cumulative predicted energy density from the proposed operation is no more than 3.881% of the maximum in any accessible area up to two meters above the ground per OET-65; and

That the calculations provided in this report are based on data provided by the client and antenna pattern data supplied by the antenna manufacturer, in accordance with FCC guidelines listed in OET-65. Horizontal and vertical antenna patterns are combined for modeling purposes to accurately reflect the energy two meters above ground level where on-axis energy refers to maximum energy two meters above the ground along the azimuth of the antenna and where area energy refers to the maximum energy anywhere two meters above the ground regardless of the antenna azimuth, accounting for cumulative energy from multiple antennas for the carrier and frequency range indicated; and

That the Occupational Safety and Health Administration has policies in place which address worker safety in and around communications sites, thus individual companies will be responsible for their employees' training regarding Radio Frequency Safety.

In summary, it is stated here that the proposed operation at the site would not result in exposure of the Public to excessive levels of radio-frequency energy as defined in the FCC Rules and Regulations, specifically 47 CFR 1.1307 and that Sprint's proposed operation is completely compliant.

Finally, it is stated that access to the tower should be restricted to communication industry professionals, and approved contractor personnel trained in radio-frequency safety; and that the instant analysis addresses exposure levels at two meters above ground level and does not address exposure levels on the tower, or in the immediate proximity of the antennas.

Sprint
HRT 094 943225
Site Summary

Carrier	Area Maximum Percentage MPE
AT&T	0.066 %
AT&T	0.198 %
AT&T	0.2 %
AT&T	0.455 %
Clearwire	0.05 %
Sprint	0.337 %
Sprint	0.424 %
Sprint (Proposed)	0.099 %
T-Mobile	0.429 %
T-Mobile	0.114 %
T-Mobile	0.321 %
T-Mobile	0.275 %
Verizon Wireless	0.362 %
Verizon Wireless	0.293 %
Verizon Wireless	0.256 %

Composite Site MPE: 3.881 %

AT&T
HRT 094 943225
Carrier Summary

Frequency:	2300	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	0.66118	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.06612	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
CCI Antennas	TPA-65R-LCUUUU-H8	120	30	682	0.224353	0.022435	0.498415	0.049841
Quintel	QS66512-6	120	150	714	0.323172	0.032317	0.640556	0.064056
Quintel	QS66512-6_	120	270	714	0.323172	0.032317	0.640556	0.064056

AT&T
HRT 094 943225
Carrier Summary

Frequency:	2100	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	1.98416	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.19842	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Powerwave	P65-17-XLH-RR	120	30	1615	1.958437	0.195844	1.979085	0.197908
Powerwave	P65-17-XLH-RR	120	150	1615	1.960934	0.196093	1.979084	0.197908
Powerwave	P65-17-XLH-RR	120	270	1615	1.958437	0.195844	1.979084	0.197908

AT&T
HRT 094 943225
Carrier Summary

Frequency:	737	MHz
Maximum Permissible Exposure (MPE):	491.33	µW/cm^2
Maximum power density at ground level:	0.98499	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.20047	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Powerwave	P65-17-XLH-RR	120	30	916	0.832264	0.169389	0.892014	0.18155
KMW	AM-X-CD-16-65	120	150	826	0.617724	0.125724	0.638986	0.130051
Powerwave	P65-17-XLH-RR	120	270	916	0.833291	0.169598	0.892014	0.18155

AT&T
HRT 094 943225
Carrier Summary

Frequency:	1900	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	4.55424	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.45542	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Powerwave	7770.00	120	30	2339	1.975606	0.197561	3.081929	0.308193
Powerwave	7770.00	120	150	2339	1.975606	0.197561	3.081929	0.308193
Powerwave	7770.00	120	270	2339	1.975606	0.197561	3.081929	0.308193
CCI Antennas	TPA-65R-LCUUUU-H8	120	30	1459	0.514216	0.051422	1.179732	0.117973
Quintel	QS66512-3	120	150	1564	0.745574	0.074557	1.333961	0.133396
Quintel	QS66512-3	120	270	1564	0.745384	0.074538	1.333961	0.133396

Clearwire
HRT 094 943225
Carrier Summary

Frequency:	2500	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	0.50449	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.05045	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
ARGUS	LLPX310R	105	30	355	0.256655	0.025666	0.474988	0.047499
ARGUS	LLPX310R	105	150	355	0.254903	0.02549	0.474988	0.047499
ARGUS	LLPX310R	105	270	355	0.254903	0.02549	0.474988	0.047499

Sprint
HRT 094 943225
Carrier Summary

Frequency:	862	MHz
Maximum Permissible Exposure (MPE):	574.67	µW/cm^2
Maximum power density at ground level:	1.93587	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.33687	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
RFS	APXVSPP18-C-A20	105	15	1084	0.722217	0.125676	0.736763	0.128207
RFS	APXVSPP18-C-A20	105	15	1084	0.722217	0.125676	0.736763	0.128207
RFS	APXVSPP18-C-A20	105	110	1084	0.720228	0.12533	0.736763	0.128207
RFS	APXVSPP18-C-A20	105	110	1084	0.720228	0.12533	0.736763	0.128207
RFS	APXVSPP18-C-A20	105	230	1084	0.722217	0.125676	0.736763	0.128207
RFS	APXVSPP18-C-A20	105	230	1084	0.722217	0.125676	0.736763	0.128207

Sprint
HRT 094 943225
Carrier Summary

Frequency:	1900	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	4.23864	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.42386	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
RFS	APXVSPP18-C-A20	105	15	1902	0.651193	0.065119	1.608568	0.160857
RFS	APXVSPP18-C-A20	105	15	1902	0.651193	0.065119	1.608568	0.160857
RFS	APXVSPP18-C-A20	105	110	1902	0.647363	0.064736	1.608569	0.160857
RFS	APXVSPP18-C-A20	105	110	1902	0.647363	0.064736	1.608569	0.160857
RFS	APXVSPP18-C-A20	105	230	1902	0.651193	0.065119	1.608568	0.160857
RFS	APXVSPP18-C-A20	105	230	1902	0.651193	0.065119	1.608568	0.160857

Sprint (Proposed)
HRT 094 943225
Carrier Summary

Frequency:	2500	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	0.99016	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.09902	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Nokia	AAHC	105	15	424	0.264584	0.026458	0.330053	0.033005
Nokia	AAHC	105	15	424	0.264584	0.026458	0.330053	0.033005
Nokia	AAHC	105	15	424	0.264584	0.026458	0.330053	0.033005

T-Mobile
HRT 094 943225
Carrier Summary

Frequency:	2100	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	4.28839	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.42884	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Ericsson	AIR 32 B4A B2P	128	30	2313	2.986143	0.298614	2.986143	0.298614
Ericsson	AIR 32 B4A B2P	128	130	2313	2.986143	0.298614	2.986143	0.298614
Ericsson	AIR 32 B4A B2P	128	270	2313	2.986143	0.298614	2.986143	0.298614

T-Mobile
HRT 094 943225
Carrier Summary

Frequency:	1900	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	1.14381	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.11438	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Ericsson	AIR 21 B2A B4P	128	30	2061	0.612705	0.06127	0.705621	0.070562
Ericsson	AIR 21 B2A B4P	128	130	2061	0.612883	0.061288	0.705621	0.070562
Ericsson	AIR 21 B2A B4P	128	270	2061	0.612705	0.06127	0.705621	0.070562

T-Mobile
HRT 094 943225
Carrier Summary

Frequency:	600	MHz
Maximum Permissible Exposure (MPE):	400	µW/cm^2
Maximum power density at ground level:	1.28345	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.32086	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
ANDREW	LNX-6515DS-T4M	128	30	1854	1.207304	0.301826	1.269854	0.317464
ANDREW	LNX-6515DS-T4M	128	130	1854	1.206381	0.301595	1.269854	0.317463
ANDREW	LNX-6515DS-T4M	128	270	1854	1.207304	0.301826	1.269854	0.317463

T-Mobile
HRT 094 943225
Carrier Summary

Frequency:	700	MHz
Maximum Permissible Exposure (MPE):	466.67	µW/cm^2
Maximum power density at ground level:	1.28345	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.27503	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
ANDREW	LNX-6515DS-T4M	128	30	1854	1.207304	0.258708	1.269854	0.272112
ANDREW	LNX-6515DS-T4M	128	130	1854	1.206381	0.25851	1.269854	0.272112
ANDREW	LNX-6515DS-T4M	128	270	1854	1.207304	0.258708	1.269854	0.272112

Verizon Wireless
HRT 094 943225
Carrier Summary

Frequency:	850	MHz
Maximum Permissible Exposure (MPE):	566.67	µW/cm^2
Maximum power density at ground level:	2.05192	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.3621	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
CSS	X7C-FRO-660	140	90	5422	1.999511	0.352855	2.044424	0.360781
CSS	X7C-FRO-660	140	210	5422	1.999511	0.352855	2.044424	0.360781
CSS	X7C-FRO-660	140	330	5422	1.999511	0.352855	2.044424	0.360781

Verizon Wireless
HRT 094 943225
Carrier Summary

Frequency:	1900	MHz
Maximum Permissible Exposure (MPE):	1000	µW/cm^2
Maximum power density at ground level:	2.93253	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.29325	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Antel	BXA-171063-8CF	140	30	1854	0.76307	0.076307	0.926543	0.092654
Antel	BXA-171063-8CF	140	90	1854	0.76307	0.076307	0.926543	0.092654
Antel	BXA-171063-8CF	140	150	1854	0.76307	0.076307	0.926543	0.092654
Antel	BXA-171063-8CF	140	210	1854	0.76307	0.076307	0.926543	0.092654
Antel	BXA-171063-8CF	140	265	1854	0.76307	0.076307	0.926543	0.092654
Antel	BXA-171063-8CF	140	330	1854	0.76307	0.076307	0.926543	0.092654
Antel	BXA-171063-8CF	140	30	1525	0.804767	0.080477	0.804767	0.080477
Antel	BXA-171063-8CF	140	90	1525	0.804767	0.080477	0.804767	0.080477
Antel	BXA-171063-8CF	140	150	1525	0.804767	0.080477	0.804767	0.080477
Antel	BXA-171063-8CF	140	210	1525	0.804767	0.080477	0.804767	0.080477
Antel	BXA-171063-8CF	140	265	1525	0.804767	0.080477	0.804767	0.080477
Antel	BXA-171063-8CF	140	330	1525	0.804767	0.080477	0.804767	0.080477

Verizon Wireless
HRT 094 943225
Carrier Summary

Frequency:	751	MHz
Maximum Permissible Exposure (MPE):	500.67	µW/cm^2
Maximum power density at ground level:	1.28219	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.2561	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/cm^2)**	**Percent of MPE**
Antel	BXA-80063-4BF	140	30	798	1.262474	0.252159	1.277691	0.255198
Antel	BXA-80063-4BF	140	150	798	1.262474	0.252159	1.277691	0.255198
Antel	BXA-80063-4BF	140	265	798	1.262474	0.252159	1.277691	0.255198