
06/22/2022

**City of Grand Rapids
Small and Micro Cell Wireless Facilities Sites
Radio Frequency (RF) Power Density Measurements for the Year 2022
Retest of 2019 Sites and 2022 New Sites**

Executive Summary:

Geotech, Inc. performed broadband power density measurements of existing small and micro cell sites to determine compliance or non-compliance with the existing requirements for the general public as set by the Federal Communications Commission (FCC) and other international agencies. As of April 22nd, 2022, one hundred twenty-two (122) sites were tested, and the measurements of the maximum power density were less than five (5) percent of the Maximum Permissible Exposure (MPE) limit as set by the FCC. Of the 122 active sites tested in 2022, sixty-eight (68) were retested sites of 2019, and fifty-four (54) were new active sites for 2022.

Objective:

Perform small and micro cell radio frequency testing to determine compliance or non-compliance of the Maximum Permissible Exposure (MPE) power densities with the applicable requirements as set by the Federal Communications Commission (FCC) and other international agencies.

Testing shall be performed for existing installations, and repeated every 3-years. New installation shall be tested on a yearly basis and repeated every 3-years.

Background Information:

1. Number of cell sites: As of this date, there are 342 existing and proposed sites.
2. Of the 122 active sites tested in 2022, sixty-eight (68) were retested sites of 2019, and fifty-four (54) were new active sites for 2022.
3. Several types of radio/antenna/pole installations have been installed and/or are proposed. The known radio frequencies of the small/micro cells range from 800 megahertz (MHz) to 6 gigahertz (GHz).
4. The following service providers have, or propose to have small/micro cells within the City limits: Verizon & AT&T (These sites are operated by ACD, Mobilitie, and Zayo).
5. The Federal Communications Commission (FCC) regulates and allocates the radio frequencies. The Institute of Electrical and Electronic Engineers (IEEE) has developed Standard 95.1; which was adopted by the FCC. Similar standards were developed by other agencies; which included the International Commission on Non-Ionizing Radiation

Protection (ICNIRP) and Canada Code 6. These standards define the limits for Maximum Permissible Exposure (MPE) Power Densities (in Watts/Meter Squared) as follows:

	<u>FCC</u> <u>(1.5-100GHz)</u>	<u>INCIRP</u> <u>(2-300GHz)</u>	<u>Canada</u> <u>(6-150GHz)</u>
Occupational	50	50	50
Non-Occupational (General Public)	10	10	10

6. Because the atmosphere is flooded with nearly unlimited radio transmissions from various sources, it may in some cases be difficult to distinguish between existing radiation levels and new small/micro cell radiation levels. Based on these factors, it was decided to perform broadband power density measurements to account for the frequencies ranging from 300KHz to 50GHz; which includes the operating frequencies for the small/micro cells. These measurements identify the existing power densities, and determine compliance or non-compliance with the FCC standards.
7. Ground level Safety: Radio frequency emissions from antennae used for cellular transmissions result in exposure levels on the ground that are typically below the safety limits which were adopted by the FCC based on the recommendations of expert organizations, and endorsed by agencies of the Federal Government responsible for health and safety.

Testing Procedures and Parameters:

1. Test Instrument: Narda NBM-550-S with FCC probe #EA5091
2. Measurements were made at Six (6) feet above ground at distances of 10 feet, 50 feet and 100 feet away from the pole/cell base
3. Measurements were broadband base and account for radio frequencies ranging from 300KHz to 50GHz
4. Measurements recorded the maximum readings as a percentage of the Maximum Permissible Exposure (MPE) power densities for occupational permissible limit. These measurements were converted to non-occupational (general public) power densities, and were compared with its MPE limit. Note: the MPE for non-occupational (general public) permissible limit is lower by a factor of 5 in comparison with the occupational permissible limit.

Testing Results: Refer to:

1. Attachment #1 – Summary of Radio Frequency (RF) Power Density Testing - Non-Occupational (2022 New Sites)
2. Attachment #2 – Radio Frequency (RF) Power Density Testing - Occupational and Non-Occupational (2022 New Sites)
3. Attachment #3- Summary of Radio Frequency (RF) Power Density Testing - Non-Occupational (2019 Tests Compared to 2022 Retests)



616-949-3340
info@geotech-inc.com

Conclusions:

The exposure of the general public to radio frequency power densities at six (6) feet above ground is less than five (5) percent of the Maximum Permissible Exposure set by the FCC.

Attachment #1- Summary of Radio Frequency (RF) Power Density Testing - Non- Occupational (2022 New Sites)

City of Grand Rapids/ Small and Micro Cell Radio Frequency (RF) PowerDensity Testing -Non- Occupational

				Results as Percentage (%) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational Limits							
				Measurements at 6 feet above Ground							
Count	Small Cell	Approved Date	Address	Direction	Distance from Pole			Direction	Distance from Pole		
					10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.
1	AT&T	8/31/2021	3193 Leonard St. NE	North	2.2605	2.2755	2.1905	West	0.32	0.9445	2.4055
2	ACD	8/5/2020	425 Lafayette Ave. NE	North	0.0995	0.0595	0.219	South	0.0795	0.1195	0.199
3	ACD	8/5/2020	220 Crescent St. NE	East	1.191	1.7425	1.2905	West	0.617	0.682	0.9025
4	AT&T	3/8/2021	195 Oakes St. SW	West	0.288	0.1395	0.1195	North	0.04	0.1195	0.04
5	ACD	8/5/2020	125 5/8 Oakes St. SW	West	0.1395	0.179	0.0595	East	0.3845	0.1395	0.3385
6	ACD	8/5/2020	25 Oakes St. SW	West	1.5685	0.7165	0.5175	East	0.5175	0.657	0.4775
7	AT&T	4/5/2021	102 Division Ave. S	South	0.703	0.7	0.2785	North	0.868	0.5125	0.4485
8	AT&T	3/4/2021	61 Fulton St. E	West	2.5285	2.471	1.6125	East	0.199	1.057	0.2785
9	AT&T	3/8/2021	149 Fountain St. NE	East	0.418	0.4775	0.378	South	3.385	0.2985	0.2985
10	AT&T	8/4/2021	1014 Fulton St. E	West	1.121	0.7685	2.1135	East	1.249	0.8645	0.4805
11	ACD	8/5/2020	173 5/8 Lafayette Ave. SE	North	0.199	0.378	0.159	South	0.0995	0.1195	0.2585
12	ACD	8/5/2020	235 Jefferson St. SE	West	1.377	0.6405	0.199	East	0.199	0.199	0.993
13	ACD	8/5/2020	2 Cherry St. SE	North	0.0995	0.1195	0.0595	South	0.219	0.0995	0.1395
14	Verizon	3/12/2021	950 Wealthy St. SE	East	0.199	0.4675	0.5375	West	0.32	0.7045	0.8205
15	Verizon	3/8/2021	953 Fairmount St. SE	West	0.2785	0.3585	1.121	North	0.398	0.2985	0.077
16	Verizon	3/12/2021	1433 Wealthy St. SE	East	1.601	0.1195	0.816	West	0.378	0.219	0.2585
17	ACD	8/7/2020	599 5/8 Division Ave.	North	2.6595	1.755	1.687	South	1.479	1.987	2.3005
18	Verizon	7/1/2021	1055 Sherman St. SE	South	0.5575	0.378	0.2985	North	0.3185	0.327	0.458
19	Verizon	2/23/2021	516 Fuller Ave. SE	North	1.6525	0.4975	0.8015	South	0.887	0.8985	1.1485
20	Verizon	3/12/2021	1258 Sherman St. SE	East	0.5775	0.5695	0.7105	West	0.7685	0.599	1.4245
21	Verizon	3/5/2021	696 Thomas St. SE	North	0.224	0.6405	0.5315	South	0.912	2.0115	0.8965
22	Verizon	3/5/2021	1325 Franklin St. SE	East	0.8005	1.089	1.153	West	2.1535	0.9285	0.2985
23	Verizon	3/12/2021	1101 Bates St.	East	0.9365	0.4165	0.3195	West	0.42	0.603	0.6675
24	Verizon	3/5/2021	826 Henry Ave. SE	North	0.4775	0.398	0.439	South	0.2985	0.2785	0.2785
25	Verizon	2/25/2021	1035 Alexander St. SE	East	1.449	2.0555	2.0255	West	2.1405	2.8485	3.532
26	Verizon	6/9/2020	1137 Marshall Ave. SE	East	2.489	1.473	1.1555	West	0.567	0.5375	0.528
27	Verizon	12/16/2020	1127 Noble St. SE	North	2.402	1.313	0.32	South	1.377	0.9235	2.1645
28	Verizon	12/22/2020	1404 Kalamazoo Ave. SE	North	1.9865	0.7365	0.8005	South	2.103	2.4345	2.15

29	Verizon	2/23/2021	915 Temple St. SE	East	2.722	1.8485	1.537	West	1.66	1.6835	1.8445
30	Verizon	3/3/2021	1058 Boston St. SE	East	2.6165	0.451	0.378	West	0.378	0.418	0.3385
31	Verizon	12/16/2020	1844 Evergreen St. SE	East	1.345	0.256	0.064	West	0.3265	0.3485	0.457
32	Verizon	2/23/2021	1835 Rosemont Ave. SE	North	0.6095	0.457	0.4355	South	0.6095	0.6315	0.762
33	Verizon	3/5/2021	1853 Englewood Dr. SE	North	0.3185	0.4975	0.2985	South	0.378	0.239	0.2985
34	Verizon	3/1/2021	1914 Griggs St. SE	East	0.79	1.1245	1.823	West	0.5775	0.6965	0.5175
35	Verizon	3/5/2021	1734 Griggs St. SE	East	0.2585	0.239	0.0595	West	0.398	0.2785	0.239
36	Verizon	2/23/2021	1818 Giddings Ave. SE	North	0.1395	0.159	0.1395	South	0.1395	0.398	0.0785
37	Verizon	1/21/2021	1714 Kalamazoo Ave. SE	North	0.1395	0.0995	0.159	South	0.159	0.199	0.02
38	Verizon	1/21/2021	1775 Silver Ave. SE	East	0.5775	0.6965	0.816	West	0.378	0.438	0.438
39	Verizon	3/3/2021	1133 Elliott St. SE	East	0.378	0.3385	0.675	West	1.377	1.089	0.7565
40	Verizon	2/23/2021	1013 Johnston St. SE	East	0.458	0.418	0.3185	West	0.2585	0.1395	0.159
41	Verizon	3/12/2021	818 Ballard St. SE	East	0.677	0.7765	0.7565	West	0.4975	0.5575	0.4775
42	Verizon	2/23/2021	1697 Union Ave. SE	East	0.4775	0.6965	0.5775	West	0.219	0.3385	0.3585
43	Verizon	5/28/2021	1846 Ruby Place SE	East	0.2985	0.3385	0.5575	West	0.5375	0.4775	0.3585
44	Verizon	3/5/2021	1902 Burton St. SE	East	0.378	0.637	0.6965	West	0.4775	0.3585	0.3185
45	Verizon	12/23/2020	2105 Breton Rd. SE	East	0.0595	0.2785	0.418	West	0.2785	0.4775	0.5775
46	Verizon	2/23/2021	2036 Kalamazoo Ave. SE	North	0.3385	0.398	0.159	South	0.2985	0.2985	0.418
47	Verizon	3/5/2021	1135 Merrifield St. SE	East	0.199	0.0795	0.1195	West	0.0795	0.239	0.1395
48	Verizon	3/5/2021	1046 Marritt St. SE	East	1.377	0.4775	0.458	West	0.458	0.7415	0.7165
49	Verizon	3/5/2021	810 Hazen St. SE	East	0.378	0.3385	0.5175	West	0.398	0.458	0.418
50	Verizon	3/5/2021	2448 Aleda Ave. SE	East	1.025	0.4485	0.3185	West	0.2585	0.3585	2.1135
51	Verizon	3/5/2021	2345 Blaine Ave. SE	East	0.458	0.8645	1.6975	West	0.7365	0.993	0.6085
52	Verizon	3/5/2021	858 Mayhew Wood Dr. SE	East	0.179	0.438	0.657	West	0.098	0.3185	0.3385
53	Verizon	3/5/2021	2221 East Paris Ave. SE	North	0.2585	0.199	0.378	South	0.5765	0.418	0.398

Radio Frequency (RF) Power Density Testing - Non- Occupational

Max	2.7220	2.4710	2.1905	3.3850	2.8485	3.5320
Min	0.0595	0.0595	0.0595	0.0400	0.0995	0.0200
Median	0.5575	0.4675	0.5175	0.3980	0.4580	0.4485
Average	0.8819	0.6696	0.6779	0.6462	0.6416	0.7059

Notes:

1. For a complete description of testing procedure, parameters and results- see Full Report
2. All values presented as a percentage of 10watt/mete squared for non-occupational maximum exposure
3. Direction refers to measurement parallel to street direction
4. Measurement at 6 feet above ground represents pedestrian height
5. Above measurements are for active sites as of 4-22-22

Attachment #2- Radio Frequency (RF) Power Density Testing - Occupational and Non-Occupational (2022 New Sites)

City of Grand Rapids/ Small and Micro Cell Radio Frequency (RF) PowerDensity Testing -Non- Occupational

Count	Object ID	Small Cell	Pole Owner	Site ID	Site Status	Approved Date	Address	Results as Percentage (%) of Maximum Permissible Exposure (MPE) for FCC Occupational Limits									Results as Percentage (%) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational Limits								
								Measurements at 6 feet above Ground			Measurements at 6 feet above Ground			Measurements at 6 feet above Ground			Measurements at 6 feet above Ground								
								Distance from Pole			Distance from Pole			Distance from Pole			Distance from Pole								
								Direction	10 ft.	50 ft.	100 ft.	Direction	10 ft.	50 ft.	100 ft.	Direction	10 ft.	50 ft.	100 ft.	Direction	10 ft.	50 ft.	100 ft.		
1	11494	AT&T	Grand Rapids	GRRPD 009	Installation Complete	8/31/2021	3193 Leonard St. NE	North	0.4521	0.4551	0.4381	West	0.064	0.1889	0.4811	North	2.2605	2.2755	2.1905	West	0.32	0.9445	2.4055		
2	9086	ACD	Grand Rapids	10040M	Installation Complete	8/5/2020	425 Lafayette Ave. NE	North	0.0199	0.0119	0.0438	South	0.0159	0.0239	0.0398	North	0.0995	0.0595	0.219	South	0.0795	0.1195	0.199		
3	9087	ACD	Grand Rapids	10041M	Installation Complete	8/5/2020	220 Cresent St. NE	East	0.2382	0.3485	0.2581	West	0.1234	0.1364	0.1805	East	1.191	1.7425	1.2905	West	0.617	0.682	0.9025		
4	917	AT&T	Grand Rapids	GRRPD 035	Installation Complete	3/8/2021	195 Oakes St. SW	West	0.0576	0.0279	0.0239	North	0.008	0.0239	0.008	West	0.288	0.1395	0.1195	North	0.04	0.1195	0.04		
5	9085	ACD	Grand Rapids	10039M	Installation Complete	8/5/2020	125 5/8 Oakes St. SW	West	0.0279	0.0358	0.0119	East	0.0769	0.0279	0.0677	West	0.1395	0.179	0.0595	East	0.3845	0.1395	0.3385		
6	9081	ACD	Grand Rapids	10012M	Installation Complete	8/5/2020	25 Oakes St. SW	West	0.3137	0.1433	0.1035	East	0.1035	0.1314	0.0955	West	1.5685	0.7165	0.5175	East	0.5175	0.657	0.4775		
7	916	AT&T	Grand Rapids	GRRPD 025	Installation Complete	4/5/2021	102 Division Ave. S	South	0.1406	0.14	0.0557	North	0.1736	0.1025	0.0897	South	0.703	0.7	0.2785	North	0.868	0.5125	0.4485		
8	920	AT&T	Grand Rapids	GRRPD 024	Installation Complete	3/4/2021	61 Fulton St. E	West	0.5057	0.4942	0.3225	East	0.0398	0.2114	0.0557	West	2.5285	2.471	1.6125	East	0.199	1.057	0.2785		
9	912	AT&T	Grand Rapids	GRRPD 023	Installation Complete	3/8/2021	149 Fountain St. NE	East	0.0836	0.0955	0.0756	South	0.677	0.0597	0.0597	East	0.418	0.4775	0.378	South	3.385	0.2985	0.2985		
10	12703	AT&T	Grand Rapids	GRRPD 014	Installation Complete	8/4/2021	1014 Fulton St. E	West	0.2242	0.1537	0.4227	East	0.2498	0.1729	0.0961	West	1.121	0.7685	2.1135	East	1.249	0.8645	0.4805		
11	9084	ACD	Grand Rapids	10015M	Installation Complete	8/5/2020	173 5/8 Lafayette Ave. SE	North	0.0398	0.0756	0.0318	South	0.0199	0.0239	0.0517	North	0.199	0.378	0.159	South	0.0995	0.1195	0.2585		
12	9083	ACD	Grand Rapids	GRRPD 025	Installation Complete	8/5/2020	235 Jefferson St. SE	West	0.2754	0.1281	0.0398	East	0.0398	0.0398	0.1986	West	1.377	0.6405	0.199	East	0.199	0.199	0.993		
13	9080	ACD	Grand Rapids	10010M	Installation Complete	8/5/2020	2 Cherry St. SE	North	0.0199	0.0239	0.0119	South	0.0438	0.0199	0.0279	North	0.0995	0.1195	0.0595	South	0.219	0.0995	0.1395		
14	1341	Verizon	Grand Rapids	40449	Installation Complete	3/12/2021	950 Wealthy St. SE	East	0.0398	0.0935	0.1075	West	0.064	0.1409	0.1641	East	0.199	0.4675	0.5375	West	0.32	0.7045	0.8205		
15	3772	Verizon	Grand Rapids	40439	Installation Complete	3/8/2021	953 Fairmont St. SE	West	0.0557	0.0717	0.2242	North	0.0796	0.0597	0.0154	West	0.2785	0.3585	1.121	North	0.398	0.2985	0.077		
16	10694	Verizon	Grand Rapids	40444	Installation Complete	3/12/2021	1433 Wealthy St. SE	East	0.3202	0.0239	0.1632	West	0.0756	0.0438	0.0517	East	1.601	0.1195	0.816	West	0.378	0.219	0.2585		
17	9088	ACD	Grand Rapids	14304M	Installation Complete	8/7/2020	599 5/8 Division Ave.	North	0.5319	0.351	0.3374	South	0.2958	0.3974	0.4601	North	2.6595	1.755	1.687	West	1.479	1.987	2.3005		
18	9495	Verizon	AT&T	40510	Installation Complete	7/1/2021	1055 Sherman St. SE	South	0.1115	0.0756	0.0597	North	0.0637	0.0654	0.0916	South	0.5575	0.378	0.2985	North	0.3185	0.327	0.458		
19	3786	Verizon	CE	40706	Installation Complete	2/23/2021	516 Fuller Ave. SE	North	0.3305	0.0995	0.1603	South	0.1774	0.1797	0.2297	North	1.6525	0.4975	0.8015	South	0.887	0.8985	1.1485		
20	1342	Verizon	Grand Rapids	40505	Installation Complete	3/12/2021	1258 Sherman St. SE	East	0.1155	0.1139	0.1421	West	0.1537	0.1198	0.2849	East	0.5775	0.5695	0.7105	West	0.7685	0.599	1.4245		
21	4611	Verizon	Grand Rapids	40511	Installation Complete	3/5/2021	696 Thomas St. SE	North	0.0448	0.1281	0.1063	South	0.1824	0.4023	0.1793	North	0.224	0.6405	0.5315	South	0.912	2.0115	0.8965		
22	2549	Verizon	Grand Rapids	40513	Installation Complete	3/5/2021	1325 Franklin St. SE	East	0.1601	0.2178	0.2306	West	0.4307	0.1857	0.0597	East	0.8005	1.089	1.153	West	2.1535	0.9285	0.2985		
23	1335	Verizon	Grand Rapids	40516	Installation Complete	3/12/2021	1101 Bates St.	East	0.1873	0.0833	0.0639	West	0.084	0.1206	0.1335	East	0.9365	0.4165	0.3195	West	0.42	0.603	0.6675		
24	9496	Verizon	Grand Rapids	40512	Installation Complete	3/5/2021	826 Henry Ave. SE	North	0.0955	0.0796	0.0878	South	0.0597	0.0557	0.0557	North	0.4775	0.398	0.439	South	0.2985	0.2785	0.2785		
25	2954	Verizon	AT&T	40528	Installation Complete	2/25/2021	1035 Alexander St. SE	East	0.2898	0.4111	0.4051	West	0.4281	0.5697	0.7064	East	1.449	2.0555	2.0255	West	2.1405	2.8485	3.532		
26	3375	Verizon	CE	40725	Installation Complete	6/9/2020	1137 Marshall Ave. SE	East	0.4978	0.2946	0.2311	West	0.1134	0.1075	0.1056	East	2.489	1.473	1.1555	West	0.567	0.5375	0.528		
27	6650	Verizon	Verizon	40540	Installation Complete	12/16/2020	1127 Noble St. SE	North	0.4804	0.2626	0.064	South	0.2754	0.1847	0.4329	North	2.402	1.313	0.32	South	1.377	0.9235	2.1645		
28	5847	Verizon	AT&T	40739	Installation Complete	12/22/2020	1404 Kalamazoo Ave. SE	North	0.3973	0.1473	0.1601	South	0.4206	0.4869	0.43	North	1.9865	0.7365	0.8005	South	2.103	2.4345	2.15		
29	10297	Verizon	Grand Rapids	40541	Installation Complete	2/23/2021	915 Temple St. SE	East	0.5444	0.3697	0.3074	West	0.332	0.3367	0.3689	East	2.722	1.8485	1.537	West	1.66	1.6835	1.8445		
30	2543	Verizon	Grand Rapids	40543	Installation Complete	3/3/2021	1058 Boston St. SE	East	0.5233	0.0902	0.0756	West	0.0756	0.0836	0.0677	East	2.6165	0.451	0.378	West	0.378	0.418	0.3385		
31	5413	Verizon	AT&T	40801	Installation Complete	12/16/2020	1844 Evergreen St. SE	East	0.269	0.0512	0.0128	West	0.0653	0.0697	0.0914	East	1.345	0.256	0.064	West	0.3265	0.3485	0.457		
32	11095	Verizon	Verizon	40841	Installation Complete	2/23/2021	1835 Rosemont Ave. SE	North	0.1219	0.0914	0.0871	South	0.1219	0.1263	0.1524	North	0.6095	0.457	0.4355	South	0.6095	0.6315	0.762		
33	4190	Verizon	Grand Rapids	40811	Installation Complete	3/5/2021	1853 Englewood Dr. SE	North	0.0637	0.0995	0.0597	South	0.0756	0.0478	0.0597	North	0.3185	0.4975	0.2985	South	0.378	0.239	0.2985		
34	4200	Verizon	Grand Rapids	40804	Installation Complete	3/1/2021	1914 Griggs St. SE	East	0.158	0.2249	0.3646	West	0.1155	0.1393	0.1035	East	0.79	1.1245	1.823	West	0.5775	0.6965	0.5175		
35	5840	Verizon	Grand Rapids	40795	Installation Complete	3/5/2021	1734 Griggs St. SE	East	0.0517	0.0478	0.0119	West	0.0796	0.0557	0.0478	East	0.2585	0.239	0.0595	West	0.398	0.2785	0.239		
36	1744	Verizon	Verizon	40549	Installation Complete	2/23/2021	1818 Giddings Ave. SE	North	0.0279	0.0318	0.0279	South	0.0279	0.0796	0.0157	North	0.1395	0.159	0.1395	South	0.1395	0.398	0.0785		
37	2952	Verizon	AT&T	40544	Installation Complete	1/21/2021	1714 Kalamazoo Ave. SE	North	0.0279	0.0199	0.0318	South	0.0318	0.0398	0.004	North	0.1395	0.0995	0.159	South	0.159	0.199	0.02		
38	1743	Verizon	Verizon	40547	Installation Complete	1/21/2021	1775 Silver Ave. SE	East	0.1155	0.1393	0.1632	West	0.0756	0.0876	0.0876	East	0.5775	0.6965	0.816	West	0.378	0.438	0.438		
39	2540	Verizon	Grand Rapids	40550	Installation Complete	3/3/2021	1133 Elliott St. SE	East	0.0756	0.0677	0.135	West	0.2754	0.2178	0.1513	East	0.378	0.3385	0.675	West	1.377	1.089	0.7565		
40	9494	Verizon	CE	40755	Installation Complete	2/23/2021	1013 Johnston St. SE	East	0.0916	0.0836	0.0637	West	0.0517	0.0279	0.0318	East	0.458	0.418	0.3185	West	0.2585	0.1395	0.159		
41	2542	Verizon	Grand Rapids	40545	Installation Complete	3/12/2021	818 Ballard St. SE	East	0.1354	0.1553	0.1513	West	0.0995	0.1115	0.0955	East	0.677	0.7765	0.7565	West	0.4975	0.5575	0.4775		
42	6656	Verizon	Verizon	40601	Installation Complete	2/23/2021	1697 Union Ave. SE	East	0.0955	0.1393	0.1155	West	0.0438	0.0677	0.0717	East	0.4775	0.6965	0.5775	West	0.219	0.3385	0.3585		
43	11894	Verizon	Grand Rapids	40769	Installation Complete	5/28/2021	1846 Ruby Place SE	East	0.0597	0.0677	0.1115	West	0.1075	0.0955	0.0717	East	0.2985	0.3385	0.5575	West	0.5375	0.4775	0.3585		
44	2968	Verizon	CE	40805	Installation Complete	3/5/2021	1902 Burton St. SE	East	0.0756	0.1274	0.1393	West	0.0955	0.0717	0.0637	East	0.378	0.637	0.6965	West	0.4775	0.3585	0.3185		
45	8691	Verizon	Verizon	40836	Installation Complete	12/23/2020	2105 Bregon Rd. SE	East	0.0119	0.0557	0.0836	West	0.0557	0.0955	0.1155	East	0.0595	0.2785	0.418	West	0.2785	0.4775	0.5775		
46	4612	Verizon	AT&T	40558	Installation Complete	2/23/2021	2036 Kalamazoo Ave. SE	North	0.0677	0.0796	0.0318	South	0.0597	0.0597	0.0836	North	0.3385	0.398	0.159	South	0.2985	0.2985	0.418		
47	4188	Verizon	Grand Rapids	40559	Installation Complete	3/5/2021	1135 Merrifield St. SE	East	0.0398	0.0159	0.0239	West	0.0159	0.0478	0.0279	East	0.199	0.0795	0.1195	West	0.0795	0.239	0.1395		
48	3773	Verizon	Grand Rapids	40556	Installation Complete	3/5/2021	1046 Marritt St. SE	East	0.2754	0.0955	0.0916	West	0.0916	0.1483	0.1433	East	1.377	0.4775	0.458	West	0.458	0.7415	0.7165		
49	2956	Verizon	CE	40557	Installation Complete	3/5/2021	810 Hazen St. SE	East	0.0756	0.0677	0.1035	West	0.0796	0.0916	0.0836	East	0.378	0.3385	0.5175	West	0.398	0.458	0.418		
50	5822	Verizon	Grand Rapids	40572	Installation Complete	3/5/2021	2448 Aleda Ave. SE	East	0.205	0.0897	0.0637	West	0.0517	0.0717	0.4227	East	1.025	0.4485	0.3185	West	0.2585	0.3585	2.1135		
51	2991	Verizon	Grand Rapids	40570	Installation Complete	3/5/2021	2345 Blaine Ave. SE	East	0.0916	0.1729	0.3395	West	0.1473	0.1986	0.1217	East	0.458								

Comparison of Maximum Permissible Limits (MPE) vs. Maximum Actual Measurements

FCC Limits for MPE vs. Actual Measurements				Canada Limits for MPE vs. Actual Measurements			
Occupational Permissible Limit	5	mW/Cm2	W/M2	5	mW/Cm2	50	W/M2
General Public Permissible Limit	1	mW/Cm2	W/M2	1	mW/Cm2	10	W/M2
Max Measurement at 6 Feet Above Grour	0.0000	mW/Cm2	W/M2	0.0000	mW/Cm2	0	W/M2

Measurement Parameters

Instrument: Narda NBM-550-S with FCC probe #EA5091

Measurements made at 6 feet above ground at 10 feet, 50 feet and 100 feet from the pole/cell base

Measurements are broadband base and account for radio frequencies ranging from 300KHz to 50GHz

Maximum Permissible Exposure (MPE) Power Densities in Watts/Meter Squared

	FCC (1.5-100GHz)	Canada (6-150GHz)
Occupational	50	50
General Public	10	10

Attachment #3- Summary of Radio Frequency (RF) Power Density Testing - Non- Occupational (2019 Test Compared to 2022 Retest)

City of Grand Rapids/ Small and Micro Cell Radio Frequency (RF) PowerDensity Testing -Non- Occupational

Count	Object ID	Small Cell	Pole Owner	Site ID	Site Status	Approved Date	Address	Results as Percentage (%) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational Limits (2019)									Results as Percentage (%) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational Limits (2022)								
								Distance from Pole			Distance from Pole			Distance from Pole			Distance from Pole								
								Direction	10 ft.	50 ft.	100 ft.	Direction	10 ft.	50 ft.	100 ft.	Direction	10 ft.	50 ft.	100 ft.	Direction	10 ft.	50 ft.	100 ft.		
								Measurements at 6 feet above Ground			Measurements at 6 feet above Ground			Measurements at 6 feet above Ground			Measurements at 6 feet above Ground								
1	455	Mobilitie	Grand Rapids	DE90XS943-D	Installation Complete	10/10/2017	1199 Ball Ave. NE	North	0.845	0	1.405	South	1.03	1.22	1.27	South	2.897	2.825	3.0745	West	2.2095	2.594	2.2415		
2	32	ACD	Grand Rapids	16704	Installation Complete	3/31/2017	1432 Scribner Ave. NW	North	5.245	3.605	4.85	South	4.655	2.995	3.1	North	0.4205	0.0655	0.0655	West	0.315	0.245	0.4205		
3	896	ACD	Consumers	16702	Installation Complete	11/3/2017	1128 Muskegon Ave. NW	North	0.58	4	2.515	South	0.08	0.055	1.38	South	0.3365	0.8175	0.5935	North	0.855	0.4345	0.571		
4	29	ACD	Grand Rapids	16701	Installation Complete	1/13/2017	1503 Alpine Ave. NW	North	4.58	4.98	4.44	South	3.52	2.08	3.575	North	0.561	0.698	0.4815	South	0.1855	0.4175	0.7665		
5	457	Mobilitie	Grand Rapids	DE90XS1YR-D	Installation Complete	12/28/2017	1150 Leonard St. NW	West	0.985	0.515	2.99	East	1.5	1.14	3.285	West	0.378	0.3185	0.3185	East	0.3585	0.418	0.438		
6	17	Mobilitie	Grand Rapids	DE90XS1Y5-E	Installation Complete	5/1/2017	1001 White Ave. NW	South	0.715	2.65	0.555	North	1.8	1.75	1.325	North	0.7365	0.5765	0.7045	West	0.5835	0.8785	0.436		
7	31	ACD	Grand Rapids	16703	Installation Complete	3/31/2017	890 Seward Ave. NW	North	5.22	4.88	4.635	South	5.05	4.905	4.395	North	0.179	0.438	0.2985	South	0.2985	0.0995	0.179		
8	2	Mobilitie	Grand Rapids	DE90XS1YT-A	Installation Complete	3/6/2017	652 Alpine Ave. NW	East	3.765	2.78	0.31	West	1.96	0.85	1.695	East	0.398	0.398	0.2785	West	0.438	0.3185	0.098		
9	33	ACD	Grand Rapids	16705	Installation Complete	1/13/2017	700 Scribner Ave. NW	North	2.915	3.05	2.625	South	3.59	3.72	3.505	North	0.3585	0.5775	0.2585	South	0.438	0.199	0.637		
10	15	Mobilitie	Grand Rapids	DE90XS521-D	Installation Complete	2/21/2017	498 Lafayette Ave. NE	North	4.615	4.67	4.425	South	3.22	3.02	1.69	East	0.438	0.5175	0.5175	West	0.418	0.378	0.418		
11	52	ACD	Grand Rapids	10035	Installation Complete	9/29/2017	429 Paris Ave. NE	North	3.88	4.9	4.71	South	3.925	1.67	2.705	North	0.438	1.0975	0.3385	South	0.928	0.799	0.6075		
12	453	Mobilitie	Grand Rapids	DE90XS518-D	Installation Complete	1/26/2018	310 Lafayette Ave. NE	North	0.225	1.88	5.59	South	4.45	3.26	1.325	North	0.79	0.398	0.597	South	1.0585	0.591	0.8155		
13	39	ACD	Grand Rapids	10028	Installation Complete	4/3/2017	10 5/8 Crescent St. NE	West	0.45	0.14	0.17	East	0.175	1.17	1.51	East	0.5765	1.334	0.4585	West	0.7045	0.6405	0.5125		
14	37	ACD	Grand Rapids	10022	Installation Complete	3/31/2017	216 5/8 Division Ave. N	North	1.185	1.67	5.14	South	1.275	0.275	0.24	North	0.2985	0.4775	0.239	South	0.643	0.5375	0.378		
15	51	ACD	Grand Rapids	10027	Installation Complete	5/28/2019	81 5/8 Lyon St. NW	East	0.69	1.575	5.4	West	0.815	0.965	2.205	East	1.195	0.8665	0.6085	West	0.9565	1.1095	1.293		
16	23	ACD	Grand Rapids	10016	Installation Complete	9/23/2016	135 5/8 Monroe Center St. NW	West	0.413	0.8795	1.754	East	0.178	4.61	5.315	East	0.7115	0.631	0.631	West	0.6585	0.6795	0.7835		
17	904	AT&T	Grand Rapids	GRRPD 030	Installation Complete	1/2/2019	206 Fulton St. W	West	3.045	2.065	0.93	East	0.885	0.665	0	East	2.0175	0.219	0.1395	North	0.4805	0.064	0.5125		
18	458	ACD	Grand Rapids	10037	Installation Complete	9/1/2017	198 5/8 Scribner Ave. NW	North	0.62	1.55	1.095	South	0.815	1.27	0	South	0.032	0.0795	0.1195	North	1.4895	0.2985	1.185		
19	50	ACD	Grand Rapids	10030	Installation Complete	3/31/2017	243 5/8 Michigan St. NW	West	1.055	0.885	0.275	East	0.935	1.38	1.115	East	1.668	0.179	0.0995	West	1.409	0.9605	3.4265		
20	14	Mobilitie	Grand Rapids	DE90XS1YV-I	Installation Complete	2/21/2017	625 Douglas St. NW	East	4.01	3.11	2.465	West	1.325	0.77	1.645	East	1.121	0.6405	0.3185	West	2.489	1.955	0.2985		
21	4	Mobilitie	Grand Rapids	DE90XS1YV-F	Installation Complete	12/20/2016	1006 5/8 Bridge St. NW	East	0.82	0.225	2.385	West	2.015	1.705	1.405	West	0.378	0.095	0.219	East	0.159	0.1395	0.02		
22	26	ACD	Grand Rapids	16402	Installation Complete	1/13/2017	219 Jackson Pl. NW	North	3.57	4.485	4.455	South	3.84	3.815	3.34	South	0.179	0.398	0.0995	North	1.171	0.3385	0.2985		
23	29	ACD	Grand Rapids	16401	Installation Complete	1/13/2017	30 Marion Ave. NW	North	2.075	1.055	1.18	South	2.03	2.24	2.175	South	0.458	0.617	0.5775	North	1.591	0.617	1.6845		
24	24	ACD	Grand Rapids	10036	Installation Complete	9/23/2016	37 Ionia Ave. SW	North	2.8	2.98	3.79	South	1.915	2.905	2.545	West	1.505	0.239	0.2985	South	0.3185	0.252	0.239		
25	25	ACD	Grand Rapids	10090	Installation Complete	9/23/2016	12 5/8 Fulton St. E	East	0.47	0.26	0.515	West	0.455	0.345	0.24	West	0.3525	0.159	0.5305	East	1.859	1.994	2.177		
26	38	ACD	Grand Rapids	10091	Installation Complete	3/31/2017	37 5/8 LaGrave Ave. SE	North	0.45	0.38	1.535	South	2.25	3.075	2.2	North	0.8645	1.5485	2.0485	South	3.1815	2.408	1.1665		
27	454	Mobilitie	Grand Rapids	DE90XS497-C	Installation Complete	1/31/2018	122 Claremont Pl. NE	North	0.515	1.615	2.705	South	2.285	1.615	2.465	South	0.919	0.219	0.2985	North	1.6975	0.179	0.4775		
28	19	Mobilitie	CE	DE90XS503-E	Installation Complete	9/18/2017	419 Fountain St. NE	East	0.14	0.07	0.415	West	1.415	1.35	0.555	North	0.822	0.5175	0.5575	West	1.441	0.5375	0.5775		
29	89	AT&T	Grand Rapids	GRRPD 012	Installation Complete	7/18/2018	10 Fuller Ave. NE	North	1.14	0.505	0.19	South	1.03	1.575	1.005	North	0.378	0.4775	0.159	South	0.8965	0.3105	2.306		
30	886	ACD	Grand Rapids	10026	Installation Complete	5/8/2018	1005 Baldwin St. SE	East	4.96	5.39	0.46	West	1.615	0.17	0.035	East	2.402	2.85	2.1455	South	1.372	2.1135	2.265		
31	10	Mobilitie	Grand Rapids	DE90XS504-A	Installation Complete	3/6/2017	473 Fulton St. E	East	5.19	5.235	5.49	West	3.125	4.03	3.235	West	0.5445	0.1395	0.0595	East	0.3525	0.8005	0.199		
32	13	Mobilitie	Grand Rapids	DE90XS501-F	Installation Complete	2/21/2017	51 Gay Ave. SE	North	0.685	0.555	1.115	South	0.14	0.61	0.27	North	1.249	1.025	0.239	South	0.7365	1.7295	2.402		
33	461	ACD	Grand Rapids	10013	Installation Complete	9/1/2017	370 Goodrich St. SW	West	0.95	2.175	2.78	East	5.5	4.7	3.42	East	0.1195	0.1195	0.0595	West	2.85	0.199	0.1195		
34	5	Mobilitie	Grand Rapids	DE90XS19-B	Installation Complete	3/6/2017	127 Wealthy St. SE	East	1.325	3.45	3.125	West	4.905	4.77	3.125	West	0.0995	0.6405	1.048	East	0.378	0.4975	0.3385		
35	40	ACD	Grand Rapids	10033	Installation Complete	3/31/2017	405 Lafayette Ave. SE	North	0.98	0.845	0.76	South	0.765	0.835	0.785	West	0.032	0.199	0.04	South	1.7935	0.239	0.2785		
36	60	Mobilitie	Grand Rapids	DE90XS502-G	Installation Complete	9/7/2018	524 Wealthy St. SE	East	0.86	0.77	0.585	West	0.415	0.735	0.515	East	0.2585	0.1195	0.1395	South	0.3385	0.2785	0.179		
37	900	AT&T	Grand Rapids	GRRPD 013	Installation Complete	10/23/2018	978 Cherry St. SE	East	1.115	1.85	1.42	West	0.85	0.37	0.49	East	0.3385	0.2995	0.3585	West	0.3585	0.3385	0.378		
38	59	Mobilitie	Grand Rapids	DE90XS12G-F	Installation Complete	10/10/2017	110 Abney Ave. SE	North	0.72	1.265	1.895	South	1.1	0.45	0.48	North	0.239	0.418	0.398	South	0.3185	0.418	0.2985		
39	465	AT&T	Grand Rapids	GRRPD 011	Installation Complete	7/2/2018	240 Fuller Ave. SE	East	1.35	1.31	0.82	West	2.065	2.44	0.62	East	0.219	0.5175	0.4775	South	2.341	0.2985	0.4975		
40	475	ACD	Grand Rapids	14350	Installation Complete	10/10/2017	321 5/8 Richard Terrace SE	North	1.795	1.14	1.195	South	2.635	0.61	1.43	North	1.884	0.378	0.438	South	0.4775	0.4775	0.458		
41	904	AT&T	Grand Rapids	GRRPD 010	Installation Complete	2/28/2019	1426 Lake Dr. SE	East	1.14	1.775	3.63	West	3.685	5.01	4.85	East	0.418	0.875	2.1285	West	0.6405	1.6005	1.873		
42	18	Mobilitie	Grand Rapids	DE90XS12A-B	Installation Complete	9/25/2017	366 Richard Terrace SE	East	0.745	0.32	0.475	West	0.285	0.105	0.29	West	1.153	0.3585	0.04	East	1.473	0.3525	0.0795		
43	58	Mobilitie	Grand Rapids	DE90XS12B-C	Installation Complete	12/11/2017	1202 Sigsbee St. SE	East	0.88	1.16	0.935	West	1.855	1.445	1.62	South	1.43	1.5235	1.777	East	0.458	1.924	0.418		
44	7	Mobilitie	Grand Rapids	DE90XS124-A	Installation Complete	12/20/2016	20 Buckley St. SE	North	1.51	1.53	0.685	South	0.635	1.085	1.67	East	1.7295	2.7225	2.1775	West	0.7365	0.128	0.256		
45	43	ACD	Grand Rapids	14305	Installation Complete	2/21/2017	618 5/8 Madison Ave. SE	South	2.735	3.1	3.205	North	1.75	2.39	2.44	North	1.279	0.637	0.823	South	1.184	0.9365	1.377		
46	56	AT&T	Grand Rapids	GRRPD 018	Installation Complete	7/18/2018	1301 Dunham St. SE	East	2.705	1.3	2.41	West	1.595	3.365	3.945	East	0.3585	0.239	0.777	West	1.2795	1.455	1.37		
47	11	Mobilitie	Grand Rapids	DE90XS12P-E	Installation Complete	12/20/2016	1308 Thomas St. SE	East	0.715	2.095	4.98	West	1.14	0.69	0.24	East	0.5775	0.617	0.6775	West	0.5575	0.4975	0.438		
48	476	ACD	Parks	14354	Installation Complete	12/4/2018	782 5/8 Fuller Ave. SE	North	1.205	1.595	1.045	South	1.22	1.2	0.65	North	0.438	0.458	0.4975	South	0.418	0.2585	0.3585		
49	467	ACD	Grand Rapids	14309	Installation Complete	6/5/2018	829 5/8 Franklin St. SE	East	0.45	0.74	2.94	West	2.545	0.93	0.035	East	0.539	1.089	0.63	West	0.8645	1.087	1.0665		
50	44	ACD	Grand Rapids	14306	Installation Complete	2/21/2017	732 Jefferson Ave. SE	North	3.58	3.605	1.91	South	3.17	0.275	1.375	North	0.629	0.378	0.3585	South	0.4775	0.3185	0.179		
51	47	ACD	Grand Rapids	14307	Installation Complete	3/31/2017	187 5/8 Antoine St. SW	East	1.23	1.06	0.82	West	0.31	0.29	0.935	East	0.159	0.159	0.696	West	0.224	1.3155	0.617		
52	54	Mobilitie	Grand Rapids	DE90XS12T-C	Installation Complete	6/6/2018	400 Stone St. SW	East	0.85	1.085	1.38	West	0.61	0.69	0.29	East	0.0595	0.378	0.2985	West	0.398	0.6655	0.665		
53	53	Mobilitie	Grand Rapids	DE90XS12Q-E	Installation Complete	3/21/2018	932 Madison Ave. SE	North	0.77	2.675	2.145	South	1.695	0.135	0.555	North	3.322	2.882	2.594	South</					