Radio Frequency Emission Survey

Sprint Nextel Site ID: BS23XC369
Address: 17 8th Street Cambridge MA
Site Survey Date: 9/18/2015
Report Date: 9/20/2015
1. Introduction

The electromagnetic spectrum includes various forms of electromagnetic energy from extremely low frequency energy, with very long wavelengths, to x-rays and gamma rays, which have very high frequencies and short wavelengths. In between are radio waves, microwaves, infrared, visible light and ultraviolet, for example.

As depicted in Figure 1-1, the frequencies from Sprint Nextel’s equipment emit non-ionizing energy. The effects of non-ionizing energy are non-cumulative. Non-ionizing energy can turn into heat, if absorbed. (By comparison, ionizing energy is generally cumulative and can cause chemical and biological changes.)

![Diagram of electromagnetic spectrum](image)

Figure 1-1
(FCC OET Bulletin 56, Fourth Ed.)
Sprint Nextel has installed RF transmitting antennas at the following location:

1 Burtt Road Andover, MA 01810-5901

**Sprint Nextel SITE ID:** BS97XC002

<table>
<thead>
<tr>
<th>LAT: 42.370756</th>
<th>Long: -71.086733</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facility Type:</strong></td>
<td>Rooftop</td>
</tr>
<tr>
<td><strong>Access Restriction(s):</strong></td>
<td>Locked Hatch</td>
</tr>
<tr>
<td><strong>RF Signage</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Type(s):</strong></td>
<td>Notice</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>Roof Hatch + various</td>
</tr>
<tr>
<td><strong>Facility Area Classification:</strong></td>
<td>Controlled Occupational</td>
</tr>
</tbody>
</table>

### Measurement Results

| **Max RF Level in Accessible Areas on Rooftop:** | .86% of FCC Occupational MPE limit |
| **Max RF Level at Surrounding Street Level Around Site:** | NA |

**FCC Compliance Conclusion:** The site is in compliance with FCC limits and guidelines.

**Table 1-1. Report Summary**

*Sprint* performed an RF emission survey of the RF environment surrounding the facilities installed by Sprint at this location. The building is an eight story condo complex located in Cambridge MA. Access to the facility is restricted to authorized personnel and facility management.

Sprint Nextel is licensed by the Federal Communications Commission (“FCC”) to provide wireless communications services. As required by the FCC, wireless system operators perform an assessment of the potential human exposure to radio frequency emissions from transmitting antennas at the site.

The physical survey verified antenna placement and technical specifications for accurate recommendations to determine compliance with FCC guidelines. Antenna specifications presented herein are based on direct evidence from an antenna or transmitter cabinet, information from the site manager or building manager, information from the licensees, educated estimates by the field technician or a combination of some or all of these sources.
A survey was performed on 9/18/2015 to determine the RF emission levels present at the site. Measurements were performed on the areas considered accessible to the occupational population.

To measure the RF emissions within the vicinity, Sprint RF Engineering utilized a Wandel & Goltermann E Field Probe Model 2244/90.62 Standard Shaped probe S/N D-0006, Frequency Range 300 KHz- 40 GHz with Wandel & Goltermann Electromagnetic Survey Meter Model 2244/31 S/N Y-0048. Calibration was performed by L-3 Communications, Narda East 435 Moreland Road, Hauppauge, NY 11788. Calibration was performed by L-3 Communications, Narda East 435 Moreland Road, Hauppauge, NY 11788 on 02/2014.

2. Technical Specifications

Below in Table 2-1 are the technical specifications of the antennas located at the site. Physical verification was made to ensure technical specification accuracy. Antenna specifications presented herein are based on direct evidence from an antenna or transmitter cabinet, information from the site manager or building manager, information from the licensees, educated estimates by the field technician or a combination of some or all of these sources. “N/A” (not available) is used if any of the following information was not obtainable or verifiable to an acceptable certainty. *Below is an example of the technical specification information, please add rows to the table for additional antennas. Sprint Nextel will provide their technical specification for Sprint Nextel’s equipment. All antennas present at this location must be accounted for on this table, with at least the Ant# and Type.*

<table>
<thead>
<tr>
<th>Ant #</th>
<th>Type</th>
<th>Mfr/Model</th>
<th>Freq (MHz)</th>
<th>Azimuth°</th>
<th>Mech. Down Tilt°</th>
<th>Height (AGL/ft.)</th>
<th>Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Panel</td>
<td>APXVTM14-C-120 RFS</td>
<td>2.5</td>
<td>110</td>
<td>0</td>
<td>85.2</td>
<td>Sprint</td>
</tr>
<tr>
<td>A2</td>
<td>Panel</td>
<td>APXVERR18-C RFS</td>
<td>800-1.9</td>
<td>110</td>
<td>0</td>
<td>85.2</td>
<td>Sprint</td>
</tr>
<tr>
<td>A3</td>
<td>Panel</td>
<td>APXVTM14-C-120 RFS</td>
<td>2.5</td>
<td>210</td>
<td>0</td>
<td>85.2</td>
<td>Sprint</td>
</tr>
<tr>
<td>A4</td>
<td>Panel</td>
<td>APXVERR18-C RFS</td>
<td>800-1.9</td>
<td>210</td>
<td>0</td>
<td>85.2</td>
<td>Sprint</td>
</tr>
<tr>
<td>A5</td>
<td>Panel</td>
<td>APXVTM14-C-120 RFS</td>
<td>2.5</td>
<td>340</td>
<td>0</td>
<td>85.2</td>
<td>Sprint</td>
</tr>
<tr>
<td>A6</td>
<td>Panel</td>
<td>APXVERR18-C RFS</td>
<td>800-1.9</td>
<td>340</td>
<td>0</td>
<td>85.2</td>
<td>Sprint</td>
</tr>
<tr>
<td>A7</td>
<td>GPS</td>
<td>GPS-TMG-HR-26N</td>
<td>GPS</td>
<td>0</td>
<td>0</td>
<td>86</td>
<td>Sprint</td>
</tr>
<tr>
<td>A8</td>
<td>Omni</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
</tr>
<tr>
<td>A9</td>
<td>Panel</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>T-Mobile</td>
</tr>
<tr>
<td>A10</td>
<td>Panel</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>T-Mobile</td>
</tr>
<tr>
<td>A11</td>
<td>Panel</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>T-Mobile</td>
</tr>
<tr>
<td>A12</td>
<td>Panel</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>T-Mobile</td>
</tr>
<tr>
<td>A13</td>
<td>Panel</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>T-Mobile</td>
</tr>
<tr>
<td>A14</td>
<td>Panel</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>UNK</td>
<td>T-Mobile</td>
</tr>
</tbody>
</table>

Table 2-1. Technical Specifications
3. Site Location

The map below depicts the location of the Sprint Nextel wireless telecommunications facility.

![Map of Site Location](image)

**Figure 3-1. Site Location**

4. Photos

The following photos show the Sprint Nextel wireless telecommunications facility.

- [Roof Hatch RF Notice sign](image)
- [Roof Hatch RF Notice sign](image)
Sprint MMBTS

GPS antenna and Omni Antenna

Elevator Machine Room Entrance
Penthouse Ladder

Top of Penthouse Ladder RF Notice

View North

View North from Penthouse Roof
View South

View South from Penthouse Roof

T-Mobile RF Notice typical per sector

T-Mobile North Sector

T-Mobile East Sector

T-Mobile Southeast
5. RF Survey
RF emission levels were assessed through direct measurements at the transmitter site using properly calibrated field probes. Due to the possibility that Electromagnetic Energy (“EME”) fields may exist over a wide frequency range within which the exposure limits vary, field measurements were performed with a meter equipped with a frequency shaped probe that can automatically weigh each field contribution according to its frequency.

6. FCC Policy on Human Exposure to RF Emissions
The FCC guidelines for human exposure to RF emissions were derived from the recommendations of two expert organizations, the National Council on Radiation Protection and Measurements (“NCRP”) and the Institute of Electrical and Electronics Engineers (“IEEE”). The exposure guidelines are based on thresholds for known adverse effects and they incorporate an appropriate margin of safety. The federal health and safety agencies such as the Environmental Protection Agency (“EPA”), the Food and Drug Administration (“FDA”), the National Institute on Occupational Safety and Health (“NIOSH”) and the Occupational Safety and Health Administration (“OSHA”) have also been actively involved in monitoring and investigating issues related to RF exposure.

The FCC’s Maximum Permissible Exposure (“MPE”) limits are based on exposure limits (over a wide range of frequencies) recommended by the NCRP and the exposure limits developed by the IEEE and adopted by the American National Standards Institute (“ANSI”). The limits for localized absorption are based on the recommendations of both the ANSI/IEEE and the NCRP. The potential hazard associated with the RF electromagnetic fields is discussed in OET Bulletin No. 56 “Questions and Answers about the Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields.” This document can be obtained on the FCC website at www.fcc.gov. The table and the graph below represent the FCC limits for both occupational and general population exposures to different radio frequencies:

<table>
<thead>
<tr>
<th>Frequency Range (f) (MHz)</th>
<th>Occupational Exposure $E^2$ (mW/cm$^2$)</th>
<th>General Public Exposure $E^2$ (mW/cm$^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 – 1.34</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1.34 - 3.0</td>
<td>100</td>
<td>$180 / f$</td>
</tr>
<tr>
<td>3.0 - 30</td>
<td>$900 / f$</td>
<td>$180 / f$</td>
</tr>
<tr>
<td>30 – 300</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>300 – 1,500</td>
<td>$f / 300$</td>
<td>$f / 1500$</td>
</tr>
<tr>
<td>1,500 – 100,000</td>
<td>5.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Table 5-1. FCC Limits for Maximum Permissible Exposure
7. Discussion of Safety Criteria

Energy levels associated with the RF radiations are not great enough to cause the ionization of atoms and molecules. “Ionization” is a process by which electrons are stripped from atoms and molecules. This process can produce molecular changes that can lead to damage in biological tissue including effects on DNA, the genetic material. This process requires interaction with high levels of electromagnetic energy. Those types of electromagnetic radiation with enough energy to ionize biological material include x-radiation and gamma radiation. Therefore, x-rays and gamma rays are examples of ionizing radiation (see Section 1 for additional information).

RF energy is a type of non-ionizing radiation. Other types of non-ionizing radiation include visible light, infrared radiation and other forms of electromagnetic radiation with relatively low frequencies. Often the term “radiation” is used to apply to ionizing radiation associated with nuclear power plants. Ionizing radiation should not be confused with the lower-energy, non-ionizing radiation with respect to possible biological effects.

The RF emissions from antennas used for wireless telecommunications typically result in exposure levels at the site that are well below the limits recommended by the FCC. These limits 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.

Other antennas, such as those used for radio and television broadcast transmissions, use power levels that are generally higher than those used for wireless antennas. Therefore, in some cases, there could be a potential for higher levels of exposure on the site. However, all broadcast stations are also required to demonstrate compliance with the FCC guidelines.
8. Field Measurements

8.1 Roof Level Measurements

A RF emissions survey was performed at the wireless telecommunications facility. This survey included walking the roof surface and noting the Spatial Average readings encountered. The maximum value of the Spatial Average readings of RF emissions encountered on the roof level was .86% of the occupational standard.

Below is the layout depicting the actual readings % of the FCC MPE Occupational Standard limits at various locations at the site. Various measurements were taken to indicate the RF emissions levels that can be encountered by an individual who gains access to the rooftop.

Figure 8-1. Rooftop Layout (Not to Scale)
9. Conclusion

Compliance with the FCC’s rules on human exposure to RF emissions at wireless telecommunications facilities generally is determined by comparing actual measurements taken at the facility to the FCC’s MPE limits.

The results of the instant survey indicate the levels of RF emissions exposure do not exceed applicable FCC MPE limits.

The highest level of RF emissions measured was .86% of the FCC’s MPE limits based on the controlled/occupational standard. A controlled/occupational environment assumes that access to the facility is generally restricted to authorized personnel and facility management and members of the general public will not be able to access the rooftop.

10. Certification

This report was prepared for Sprint Nextel and serves as certification for compliance of the existing Sprint Nextel wireless telecommunications facility. The analysis and information provided herein is based on applicable FCC regulations concerning RF safety and the control of human exposure to RF emissions. The information and analysis contained in this report are accurate and complete to the best knowledge and belief of the undersigned.

Survey Completed by:

_________________________________________ 9/18/2015

Phil Sortin
Sprint RF Engineering

Report Prepared by:

_________________________________________ 9/20/2015

Phil Sortin
Sprint RF Engineering
Appendix A

References


