



## RF Emissions and the Smart Grid

Concerns have emerged about RF emissions in smart grid deployments, and they typically stem from broader market concerns regarding RF emissions from a variety of sources in our daily lives. Smart grid solutions provider Silver Spring Networks uses 900 megahertz (MHz) and 2.4 gigahertz (GHz) radios in its smart grid hardware – the same FCC-approved frequencies that have been used for many years in devices such as baby monitors, portable phones, remote controlled toys and medical monitors.

Silver Spring Networks' technology uses this low-power radio frequency (RF) to hop from radio to radio in a neighborhood "mesh" to reach a smaller number of pole-mounted radios. Those pole-mounted radios then send the meter information to data centers, typically through standard mobile telephone networks.

A few other points about RF emissions:

- **RF emissions levels are low** for smart grid devices and **become dramatically weaker** as you move away from the device. Unless you are standing immediately next to a device (e.g., touching the device) for extended periods of time, the RF emissions levels are extremely weak.
- **Most devices are not "always on."** Rather than sending continuous output, our Silver Spring-enabled meters are idle most of the time, waking up only periodically to send a brief transmission before going back to sleep. An individual meter on a home is idle much more than 99% of the time.
- **Power output matters.** Many devices in our everyday environment produce RF fields, including cell telephones, microwave ovens, baby monitors, portable phones, and wireless Internet services. In comparison, Silver Spring-enabled devices generally produce far weaker RF emissions. The emissions of all Silver Spring devices, including our Access Points, comply with the levels required by strict federal regulations and permitted by various international recommendations.

The following table compares the expected RF densities near Silver Spring components vs. a sampling of other items. For perspective, under typical operating conditions, an individual meter would transmit for approximately 45 minutes over a twenty-year operating life. This operation would provide significantly less RF exposure than a single phone call on a cellular phone lasting the same length of time.

Examples of RF Fields Commonly Found in the Everyday Environment in Relation to Silver Spring-enabled Smart Grid Devices	
RF Source	Power Density ( $\mu\text{W}/\text{cm}^2$ )
Immediately adjacent to a Silver Spring-enabled Electric Meter (1 foot)	8.8
Normal distance from a Silver Spring-enabled Electric Meter (25 feet)	.005
Adjacent to 25-foot high Silver Spring Access Point at ground level	0.03
Installed microwave oven - FDA allowable at 5 cm from door [FDA, 2009]	5,000
Typical RF field in kitchen with operating microwave oven (1 meter) [Mantiply, et al. (1997)]	10
Cell phones (at head) [Mantiply, et al. (1997)]	30 – 10,000
Cell phone base stations at ground level (maximum) [WHO (2006)]	1 – 12
Walkie-Talkies (at head) [Mantiply, et al. (1997)]	500 – 42,000
Wi-Fi wireless routers, laptop computers, cyber cafes, access points [Foster (2007)] etc., maximum (~1 meter for laptops, 2-5 meters for access points) [Foster 2007]	10-20
Median exposure to FM radio and TV broadcast station signals [Tell and Mantiply (1980)]	.005