Health Canada Safety Code 6 and City of Toronto's Proposed Prudent Avoidance Policy

All electronic devices have some radio frequency (RF) emissions. The question is what is the strength of these RF signals, and how much is acceptable?

The measure of the strength of these signals is called the power density, which is the amount of RF power (measured in milliwatts) hitting a particular surface area (measured in square centimeters). A stronger signal equates to a higher power density.

All radio waves oscillate at a particular frequency. In the smart metering system, the frequency varies within a small range of values close to a maximum of 915 MHz, or 915 million oscillations per second. According to Table 5 of Health Canada Safety Code 6, the maximum acceptable amount of RF power density depends on the frequency. For 915 MHz, the maximum acceptable power density is 0.61 milliwatts per square centimeter. (The formula for the maximum acceptable power density is frequency/1500.) This is averaged over 6 seconds, so if the signal is on for no more than half of the 6 second interval, it could be twice as strong and still be acceptable. The City of Toronto's proposed Prudent Avoidance Policy recommendation is 100 times below Health Canada Safety Code 6, which would be 0.0061 milliwatts per square centimeter.

What is the power density of the radio waves emitted by the smart meters, and is it below 0.0061 when averaged over 6 seconds? The answer depends on how far you are away from the meter. The strength of the RF signal decreases rapidly as you move farther away from the source of the signal. It's a mathematical square relationship, which means that if you double your distance from the source, the power density will be four times lower.

The radio in the meter produces a maximum of 0.25 watts of RF power. Per FCC Part 15 and Industry Canada RSS 210 regulations, this maximum permissible power is measured as the conducted, or hard-wired, power. The effective radiated power from the meter is typically lower than this, especially considering that the meter enclosure and meter socket act to limit the amount of energy radiated to the rear of the meter, into a residence. The meter socket acting as a reflector to limit the amount of energy radiated into a house can also re-direct energy out the front of the meter. The maximum antenna gain seen in this direction is 3 dBi, which is approximately equivalent to a 2 times amplification.

Using worst case, non-typical, assumptions, the power density at a distance of 60cm (about 2 feet) from the meter will be no more than 0.011 milliwatts per square centimeter. (The formula is source power divided by 4 x pi x the square of the distance from the source). This worst-case number is calculated for energy out the front of the meter, and the power transmitted to the rear of the meter is significantly lower (typically a factor of 5 - 10 lower). The power density is also calculated at a distance of 60 centimeters, and a person is typically much further away from the meter.

Taking the 6-second averaging into consideration, the maximum possible transmit duty cycle for the meter is 50%. This maximum possible duty cycle would never be seen in a real world installation, where the typical transmit duty cycle is less than 5%. Using the theoretically possible 50% duty cycle, the average power density is calculated to be 0.0055 milliwatts per square centimeter. This is within the City of Toronto recommendation of 100 times less than the Health Canada maximum of 0.61. Using a more typical duty cycle of 5%, the meter power density is over 10 times below the City of Toronto recommendation.

In conclusion, even in an extreme worst case scenario, the RF signals emitted by the smart meters are safe according to Health Canada Safety Code 6, and are within the City of Toronto's proposed Prudent Avoidance Policy recommendation of 100 times lower than Safety Code 6, at distances of 60 cm or more from the meter.