

*This white paper on smart meters and RF was written by Tim Becker, founder and owner of Probity Business Group. Tim has written a number of papers and articles on the advanced metering technologies and has worked with both vendors and utilities on technology innovation and implementation.*

## Smart Meters and RF: Just the Facts

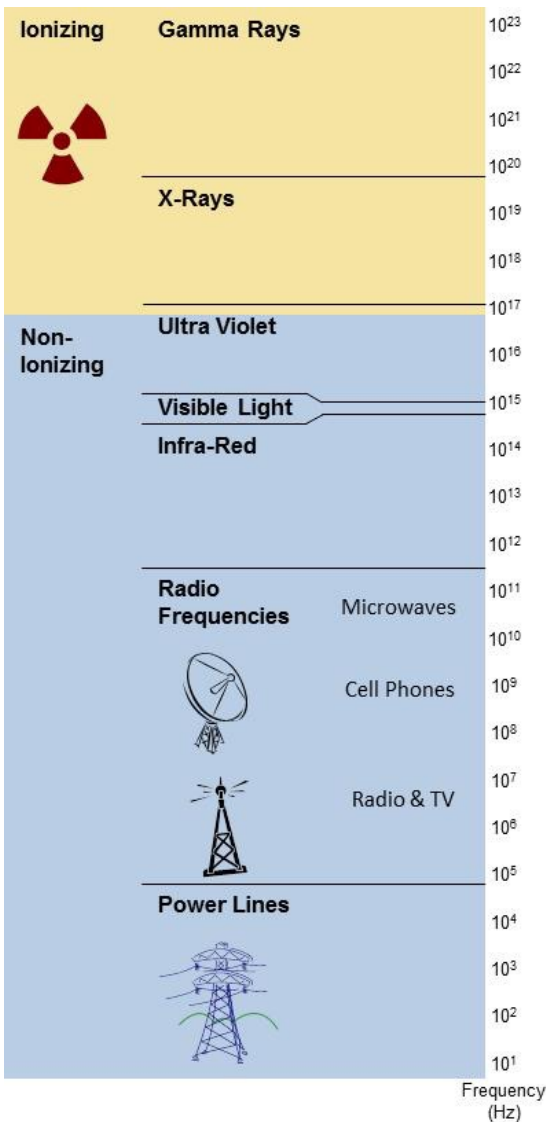


Smart meters, which combine computing technology with two-way communications, are being deployed by a number of utilities, providing many benefits to consumers, utilities, and society. These benefits include lower electricity prices, improved reliability, and enablement of energy conservation. Many smart meters employ wireless technologies to transmit data between the meter and utility and/or consumer.

Wireless meter reading technology use radio frequency (RF), a kind of electromagnetic radiation. Recently, concerns have been raised about potential health dangers of RF. However, most such concerns have no scientific basis. Rather, current research provides no evidence of risks to health.

**Electromagnetic radiation is everywhere.** Every minute of every day, we are bombarded with it. Some radiation is natural (e.g., cosmic rays from space) and some radiation is man-made (e.g., television signals).

## Radio Frequency Electromagnetic Fields



Electromagnetic radiation is often referred to as “light.” Some we can see. We call this “visible light.” However, most electromagnetic radiation is invisible to human beings. Whether visible or not depends on frequency.

Electromagnetic radiation has beneficial or harmful properties depending on how it is used. The goal of electromagnetic radiating technologies is to maximize beneficial effects while minimizing harmful effects. For example, x-rays allow us to “see” inside a person’s body to diagnose disease. X-ray machines and procedures are designed so harmful effects are minimized. X-rays are directed in a beam. Lead shielding is used to minimize radiation exposure to areas not being examined. A shutter, as is found on a camera, limits exposure to milliseconds.

A key consideration is radiation’s frequency: high frequency versus low frequency. Higher frequency radiation, such as x-rays and gamma rays, can be particularly harmful to living organisms, because it ionizes atoms and molecules that damage the DNA of living tissue, sometimes causing cancer. This type of radiation is called ionizing radiation and is strictly regulated. The radiation from smart meters is NOT ionizing radiation

Lower frequency electromagnetic radiation does not ionize atoms and molecules and therefore is called non-ionizing radiation. The band of these lower electromagnetic frequencies used by smart meters is called RF, or radio frequency. RF is used by many devices that have become ubiquitous and beneficial in our everyday lives, such as Wi-Fi routers and the equipment that communicates with them; garage door openers; microwave ovens; and the pervasive cell phone. New RF wireless technologies are constantly being invented, marketed, and adopted. Wireless meter reading is just one of many; it has been deployed for over 20 years. There is nothing special about wireless meter reading. It operates on the same frequencies and at similar power levels as other wireless devices.



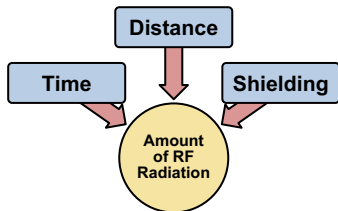
Frequency (Hz)

## Thermal Heating

The only proven harmful effect of RF is thermal heating. RF penetrates a substance and causes atoms and molecules to vibrate. Such vibration can create heat if the source of radiation is powerful, near, and not blocked. Fortunately, the wireless communications devices in our homes operate at lower powers so that the heating of even nearby materials is not discernable. In addition, RF energy from wireless devices is often further reduced by distance from the RF source and shielding from physical objects.

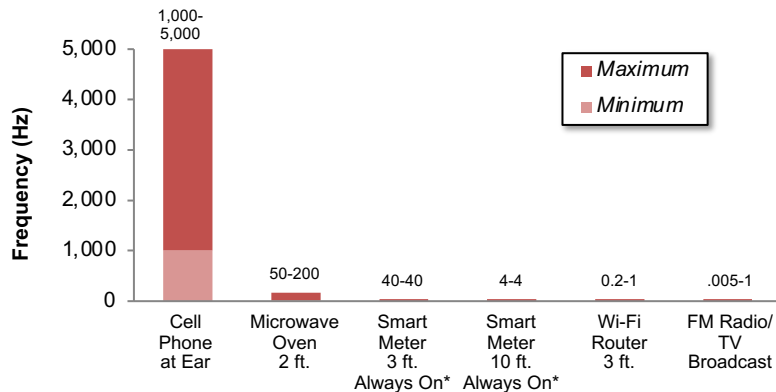
## Time ... Distance ... Shielding

The amount of RF radiation to which one is exposed depends on time, distance, and shielding (TDS). Time refers to both the amount of time that a device is producing RF and to the amount of time that a person spends near a device that is producing RF. Distance refers to proximity to the source of RF. The amount of radiation drops off rapidly as one moves away from the source of RF. For example, exposure is 100 times less at 10 feet from a RF source than at 1 foot. Lastly, shielding provided by physical objects reduces RF radiation.



*The typical smart meter exposes consumers to less radiation than many other commonly used wireless devices.*

Applying the TDS framework described above demonstrates this.



\*100 x typical Smart Meter

The typical smart meter operates far below the Federal Communication Commission (FCC) radiation exposure limits. The Federal Communications Commission (FCC) regulates wireless devices. The FCC sets its rules based on the recommendations of standards organizations that have deep expertise with electromagnetic radiation, such as the Institute of Electrical and Electronics Engineers (IEEE). FCC rules for wireless devices ensure that the ill effects of thermal heating from RF are not manifested. The FCC's maximum permitted exposure (MPE) for RF radiation from wireless devices is set 50 times below the threshold at which where RF would present a health hazard. ***Most devices, including the typical smart meter, operate far below the FCC's conservative MPE limits.***

## RF Technology Benefits

In conclusion, wireless meter reading is an RF technology that provides many benefits to consumers, society, utilities, and the environment. Smart meters are similar to most wireless technologies, such as mobile phones, that have been widely deployed or adopted in the US; they operate on the same basic principles. Like these devices, smart meters meet FCC requirements for wireless technologies. In fact, the RF profile of such meters is much lower than many other commonly used RF devices. Smart meters are clearly safe devices that provide a myriad of benefits.

Sources:  
"Health Impacts of Radio Frequency From Smart Meters," California Council on Science and Technology (January 2011)

"No Threat From Smart Meters," Utilities Telecomm Council (2010)

"A Perspective on Radio-Frequency Exposure Associated with Residential Automatic Meter Reading Technology," Electric Power Research Institute (February 2011)

"A Discussion of Smart Meters and RF Exposure Issues," Edison Electric Institute and Association of Edison Illuminating Companies (March 2011)

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