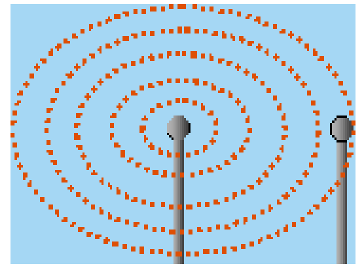
MagicBubble Technology Overview



So what is so special about the MagicBubble invention? Though a detailed description of the MagicBubble invention cannot be disclosed here, the next will provide a good overview of the technology and its attributes in relation to other wireless technologies. First we need to review basic radio, as we know it today.

Conventional Radio

Radio, the transmission of energy and information through empty space, is not too hard to understand if you treat the electronics as black boxes with known functions. The art of signaling causes movement of a large enough mob of electrons in one place (the transmitting antenna) resulting in a detectable effect on electrons in another place (the receiving antenna). We can begin to understand how this energy travels using the analogy of waves, like a ripples in a pool of water, where the waves travel constant at the speed of light. In fact visible light itself is a very high frequency form of these electromagnetic waves.

However a direct-unobstructed path does not often exist for radio in the real world, and this is especially true within buildings. The difference in the behavior and properties of electromagnetic waves and how various obstacles affect them depends upon their frequency and wavelength.

Wavelength and Frequency Matters

Each part of the spectrum is identified by its frequency, given in Hertz (Hz), meaning the number of waves that ripple in one second. Since all waves travel at the speed of light, the wavelength is inversely proportional in size to the frequency (i.e. the higher the frequency the longer the wavelength).

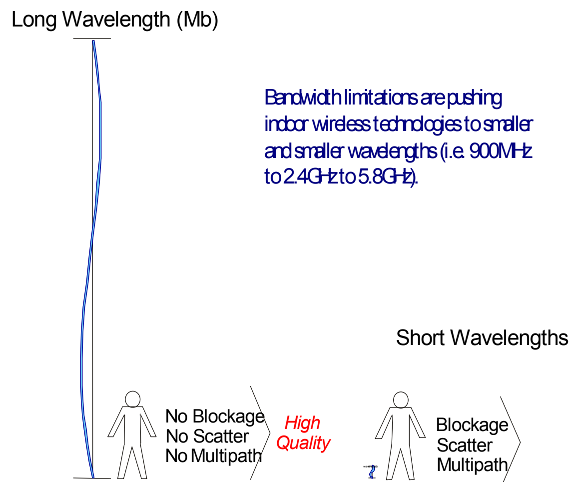


Figure 1 Wavelength Matters

An important fact is that the higher the frequency and shorter the wavelength, the more it is affected by obstacles in its path, which can reflect and scatter the waves. In other words, as the frequency gets higher and higher towards that of visible light, its properties become closer to that of light, where it becomes less able to go through objects such as people and walls.

How much affect obstacles have is a matter of size of the object in relation to the length of the wavelength. A wavelength that is larger than an object, say a person, is not going to be significantly affected. However, the smaller the wavelength is in relation to the person the more and more blockage, scatter and signal loss will occur.

Most non-licensed wireless technologies use frequencies in the 900MHz (MHz = Million Hertz) and 2.4 GHz (GHz = Billion Hertz) ranges where the size of the wavelength in relation to in-building structures are very small and possess attributes that are less desirable for in-building communications.

As shown here, obstacles such as people and walls are larger than the wavelengths and are barriers to these frequencies, limiting the quality that is possible. At these frequencies wireless devices are plagued with multipath reflections, diffraction around sharp corners and scattering from wall, ceiling, or floor surfaces which cause fading and dead spots.

Thus, for indoors, the unobstructed free space model (used in wireless product literature for estimates of data rates and range) fails to account for the small and large scale fading that is observed in real world radio as shown in Figure 2. Also, as now being seen with the popular 900MHz products, quality of service is becoming more effected by uncontrolled congestion due to the proliferation various standards and products.

Today's products work within buildings just well enough for the purpose of networking a few computers within close spaces, but the limitations are obvious. Why haven't the unlicensed lower frequencies been used?

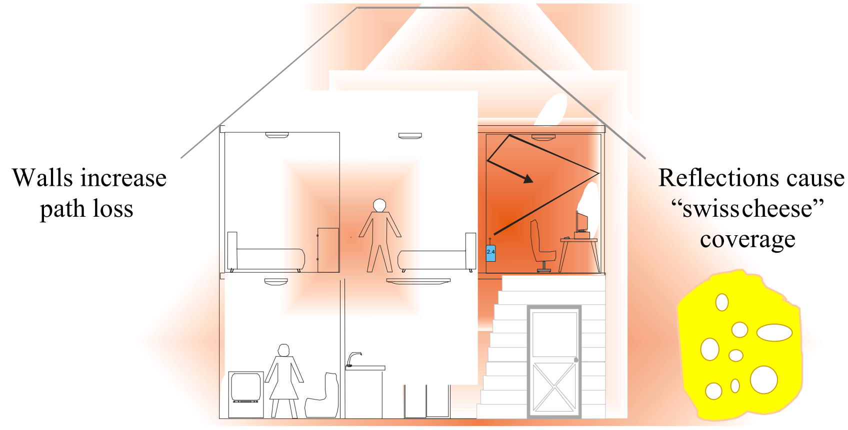


Figure 2 - Coverage Profile of Today's Products

A fundamental principal is that antenna size must be proportional to the size of the wavelength being used. Lower frequencies have very large wavelengths, and can be larger than the buildings themselves. Therefore antennas of any practical length for use by in-building devices are not possible with conventional radio. These bands with smaller wavelengths require smaller antennas using conventional radio, which is ideal for small and portable devices. Also, because low frequencies travel so well, their bands can be very noisy (due to natural atmospheric and licensed man-made sources), and FCC unlicensed radio restrictions impose a limit on power transmission. Therefore the only way to improve radio reception is to rethink conventional radio.

MagicBubble

The MagicBubble invention is a rethinking of antenna and radio electronics. In a nutshell, MagicBubble establishes a spatial region of interference resistant radio energy around the building (as shown in Figure 3), allowing it to use these lower frequencies. With it, the antenna size, and noise vs. power level issues within the structure no longer exist, and the inherent and advantageous characteristics of this part of the radio spectrum become a reality for in-building use.

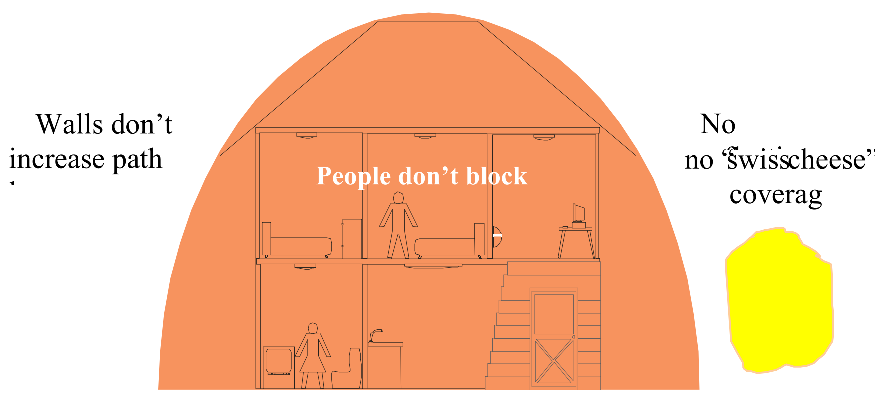


Figure 3 - MagicBubble Provides Ubiquitous Coverage

The low frequencies used by the MagicBubble invention allow total digital implementation (RF and baseband) using simple integrated circuitry, enabling significantly lower cost radio components than the cost of comparable systems. Even when matched against technologies that have maximized performance by increasing power and cost; MagicBubble enables transmission speeds several times the practical rates of these high frequency solutions (initially sustaining 25Mbps under a much wider range of conditions). Range, coverage and other quality comparisons will need to be understood using different terms (since obstacles are not an issue within the Bubble).

The Bubble is just that, there are none of the holes in coverage that are found in conventional radio (otherwise there would be no bubble), allowing a quality, cost effectiveness and total capacity comparable to only that of a wired network, while providing the <u>ubiquity</u> that wired networks do not.