

## Wireless RF and Antenna Size

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Recently I bought a new home 7.1 audio system with gigantic speakers to replace my old 5.1 system with tiny speakers - a got tired of fighting physics – you simply need a large diaphragm to drive low frequency sounds through a system. After the local “Geek Squad” left my house (apparently by law, one needs to be under 30 to hook up one of these systems), I noticed that they had neglected to hook up the antennae on my AM/FM receiver.



**This is a picture of the Martian on the 1960s sitcom called *My Favorite Martian*. According to the size of his antennae, at best, Martians had evolved to use wireless transmission no better than the MHz band. Given the obviously advanced Martian technology of the era this is quite odd since one would have suspected them to at least have GHz or higher carrier frequencies. On this basis, as well as a few other inconsistencies, I suspect that Martians are not real.**

The problem: Which was the AM antenna and which was the FM one? Other than reading the owner's manual (which I never do) I dimly recalled my course in antenna theory from 35 years ago – the higher the carrier frequency, the smaller the required size of the antenna. Since FM audio is in the 100 MHz region (and AM is only in the kHz and low MHz region), I deduced that the smaller antenna was for FM and the larger was for AM. It turned out that I was correct, although this has not provided me with the confidence to hook up a full home stereo system yet. But I should have known the answer simply because I'm an audiologist.

## Hearing Aids and Wireless Systems

In the olden days of 2013 and before, the carrier frequency of wireless radio frequency (RF) was 900 MHz. However, more recently the carrier frequency for wireless RF has significantly increased and is now on the order of 2.4 GHz. This means that the antennae in hearing aids that are receiving wireless transmissions can be much smaller than those of yesteryear - small enough to be in CIC, or in some cases, even IIC hearing aids. And in some cases, because the antennae are so small, streamers are not required. Of course we still have to deal with the latest version of Bluetooth 4.0 (low energy) which is not as “low energy” as we would like. When streaming, the battery life needs to be better than 4 hours, but we are getting there! In any event, after the Geek Squad, or equally young tech-savvy person installs your new home audio system, you can show off by being able to plug in the appropriate antenna into the correct slot. Now I have to figure out how to stop the clock from flashing 12:00. I guess that is what black electrical tape is for?

