Comment: I wrote this article during the development of the 1200 mHz antennas, and eventually published by QST as "Two Simple Antennas for 1200 MHz in the March 2013 issue.
The full text below was offered to QST, however they chose not to publish it, and included only a very condensed version in the QST article "side-bar".

Effects of Conductor diameter on antenna resonance length

Background

Most hams are familiar with the classic formula for the length of a ½ wave dipole, ie: length in ft. = 468/f (in MHz)
Perhaps not so well known, this formula has already been adjusted by a multiplying factor "K", (always less than 1.00) which takes into account operation in air and not free-space. The classic formula assumes one is operating HF, where the diameter of the antenna wire used is very small in comparison with the wavelength.
(λ/2-to-conductor-diameter-ratio in the range 2500 to 25,000, as often found for HF)
Note for simplicity, I will refer to this as the "L/d" ratio.

However, at VHF and above, the L/d ratio begins to shrink dramatically, especially if larger conductors are used.
An example of my own, is a simple ¼ wave antenna for 1286 MHz, where using a radiator of 0.093" brass, the L/d ratio becomes about 48.
I note that since the late 1940's or earlier, this effect was being observed and attempts were made to create graphs of "K" vs the L/d ratio

Introduction

Why am I interested in this?
Well, every now and again in this life, one comes across something that appears to have a different and puzzling interpretation than what one had thought previously as being rock-solid and fundamental.

Such a case happened to me in 2012, after I purchased the latest edition, #22, of the ARRL Antenna book.

As my interest in antennas is mostly vhf, uhf and above, I read with particular interest section 2.1.2 on the "EFFECTS OF CONDUCTOR DIAMETER" on the resonant length on an antenna.

Figure 2.8 in the 2012 ARRL Antenna Book, reproduced below, shows a graph, used to approximate a "K" factor multiplier, which is based on the conductor half-wavelength to diameter ratio. However, note that this particular graph, doesn't even show "K" for L/d ratios of less than about 150.

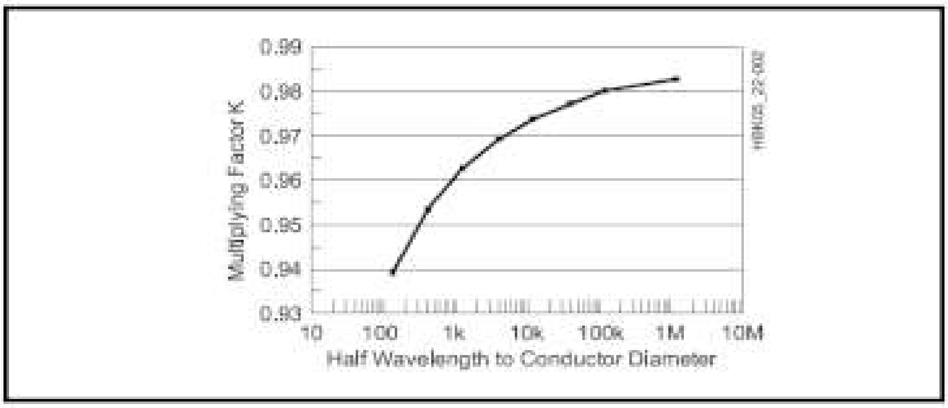

Figure 2.8 — Effect of antenna diameter on length for half-wavelength resonance in free-space, shown as a multiplying factor, K. The thicker the conductor relative to the wavelength, the shorter the physical length of the antenna at resonance. For antennas over ground, additional factors affect the antenna's electrical length.

In any case, something just didn't look "right" to me.
Puzzled, I then compared it to fig 22.2, in the 2005 ARRL Handbook, which looked like exactly the same graph, and also seemingly the same at least as far back as the 2002 Radio Amateurs Handbook... see below.

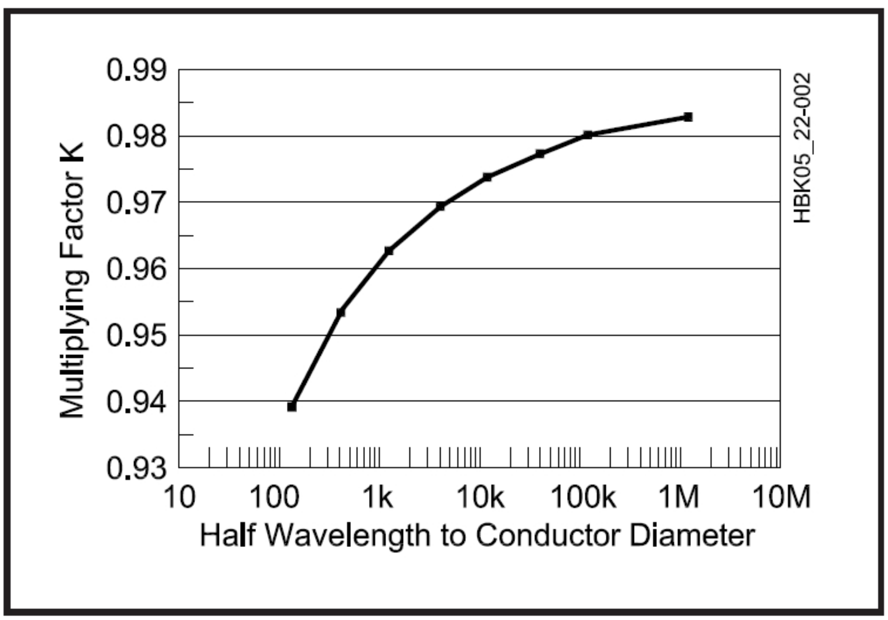

Fig 22.2 — Effect of antenna diameter on length for half-wavelength resonance, shown as a multiplying factor, K, to be applied to the free-space, half-wavelength equation.

As some have noted, I don't give up easily, so I looked still further...

I found that the 1955 ARRL Antenna book had the little graph that I fondly remember from early years, and it does show "K" values for L/d ratios as low as 10.
See below:

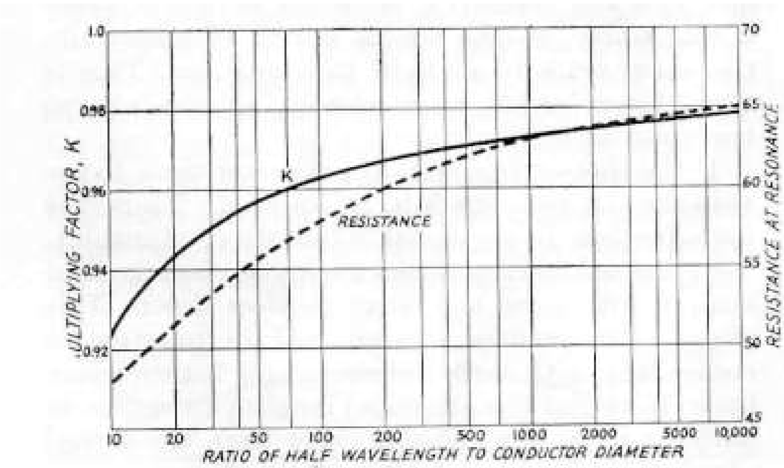

Fig. 2-4 — The solid curve shows the factor, *K*, by which the length of a half wave in free space should be multiplied to obtain the physical length of a resonant half-wave antenna having the length/diameter ratio shown along the horizontal axis. The broken curve shows how the radiation resistance of a half-wave antenna varies with the length/diameter ratio.

And, surprise, so does a recent (2011) RSGB Handbook, with an article by G8EZE, called Fig. 16.1 here…

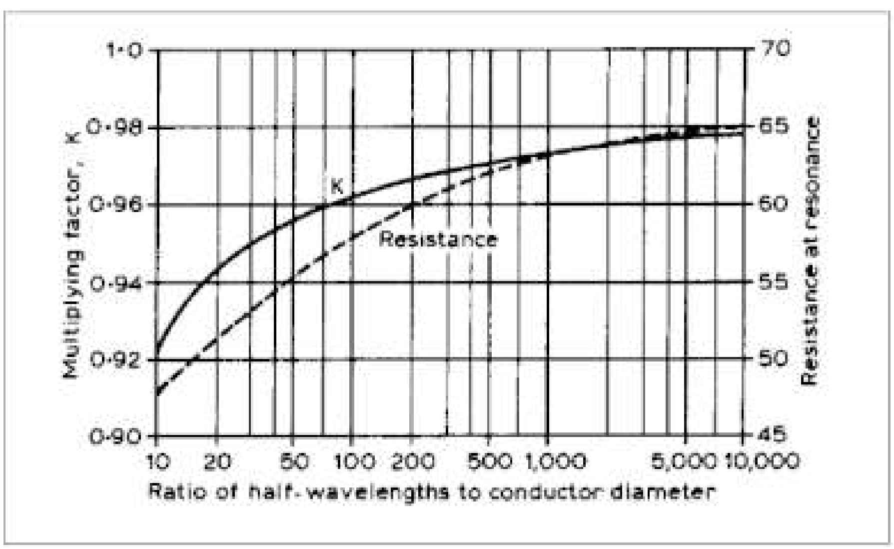

Fig 16.1: Length correction factor for half-wave dipole as a function of diameter

To repeat, at HF this antenna shortening effect is miniscule, but certainly not at say 446 mHz or even 1286 mhz where one may very well be using conductors up to 0.25"diameter and result in L/d ratios that are not on current ARRL graphs.

Conclusions:
Unfortunately, my main conclusion is that I am still puzzled.
It seems that there is not 100% agreement in this area.
In spite of discussing this issue with several ARRL technical staffers I am no clearer.
Here are what I will call the only general conclusions I have found possible:

1. The issue of "K" based on L/d ratio, does not seem to be of much interest in the technical literature, any longer.

2. The antenna builder is still advised to make his antenna longer and to trim in small steps. (kind of defeats the issue of why have a "K" factor to speed up the process?)

3. The origins of all these graphs seems quite fuzzy, and even ARRL cannot say exactly how and when they evolved. (lost in the past??)

4. Currently, of course, we have the various NEC-based modeling engines which are now considered the most accurate tools we have for determining the behaviour of physical antennas.

Personally I still like the little graph from 1955. But now I don't know if its considered correct??

Unfortunately, I have not yet learned how to use any of the NEC modeling programs. A project for later and an interesting exercise, might be to use such a program to check the graphical values discussed.

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