

Antenna radiation pattern depending on length and height

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In the pictures below I hope to make clear what the length and antenna height affects the antenna radiation pattern. In many cases, the available space around the house determines the size and height of the antenna.

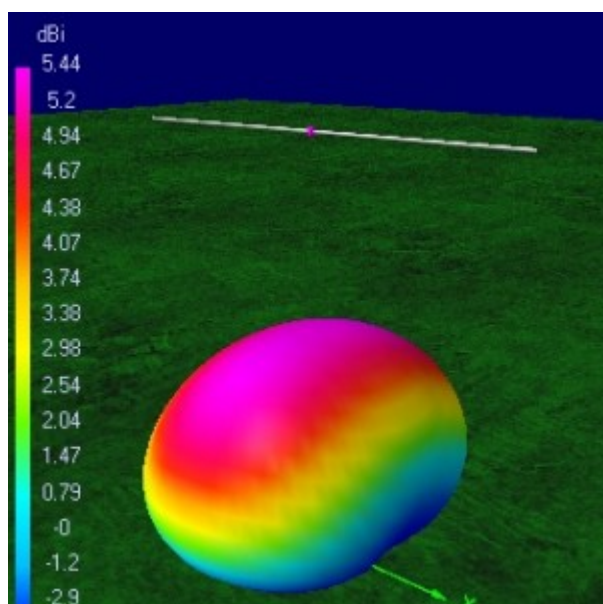
In general it can be assumed that a low mounted antenna mainly radiates straight up, which explains why the average amateur antenna on the 80 meter band works so well locally. After all, hardly anyone manages to mount a dipole at 40 metres above the ground. If the antenna is placed half a wavelength or more above the ground, a smaller radiation angle will occur which makes the antenna more suitable for DX.

If an antenna is longer than a whole wavelength, the pattern is very erratic. In this case it is therefore very difficult to predict where people will and will not be heard. A good example is for example the multi-band antenna of about 20 meters long with which you will work on the 10 meter band.

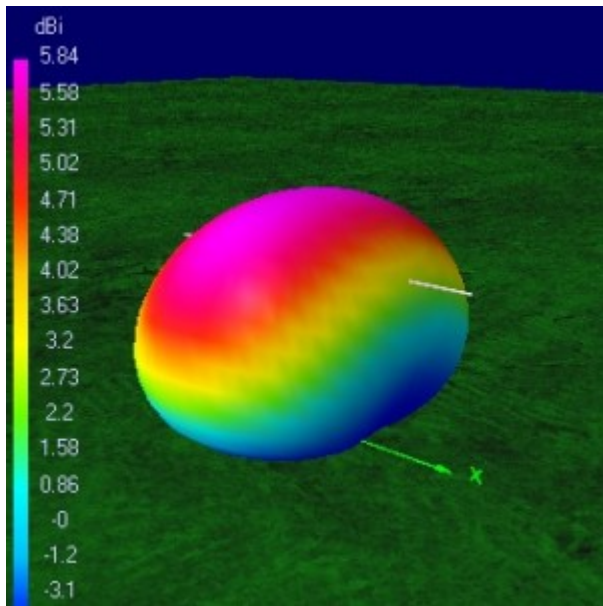
Of course, this is a theoretical representation of reality. It will be quite similar in a free meadow, but keep in mind that buildings and other obstacles will change this pattern considerably in practice.

How to use the images below? Example: You have a multiband dipole antenna 20 meters long that is mounted 10 meters above the ground. You are interested in the radiation pattern on the 10 meter band. In this case, the antenna is mounted a full wavelength above the ground and the antenna length is two wavelengths.

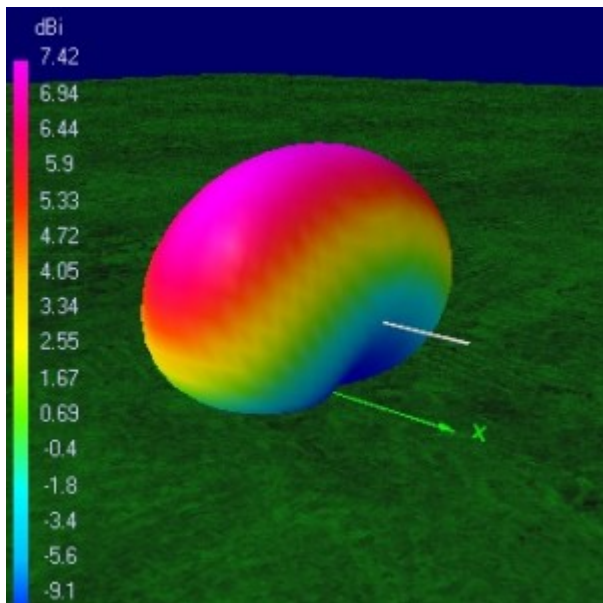
Below the antennas of different lengths, all mounted a quarter of a wavelength above the ground:



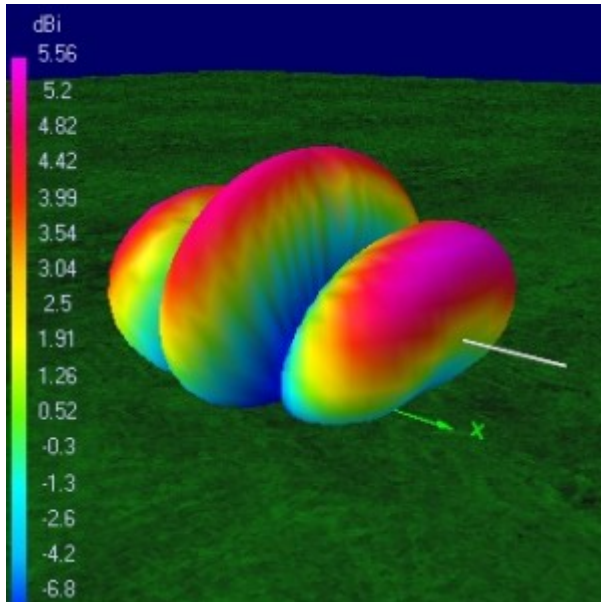
Height $1/4 \lambda$, Length $1/4 \lambda$



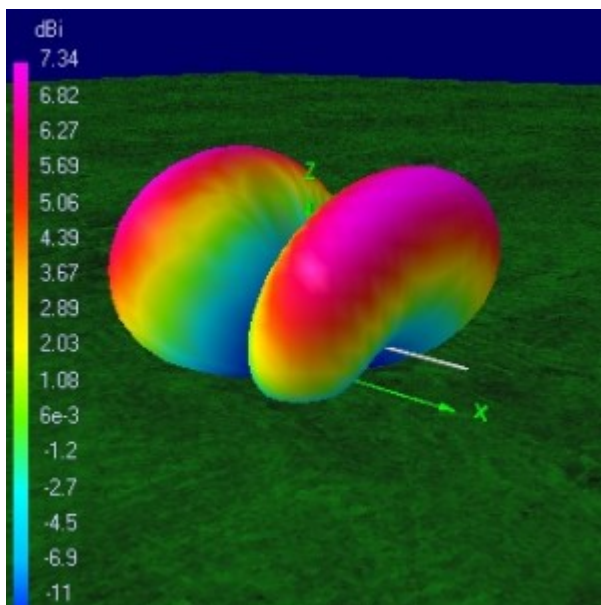
Height $1/4 \lambda$, Length $1/2 \lambda$



Height $1/4 \lambda$, Length 1λ

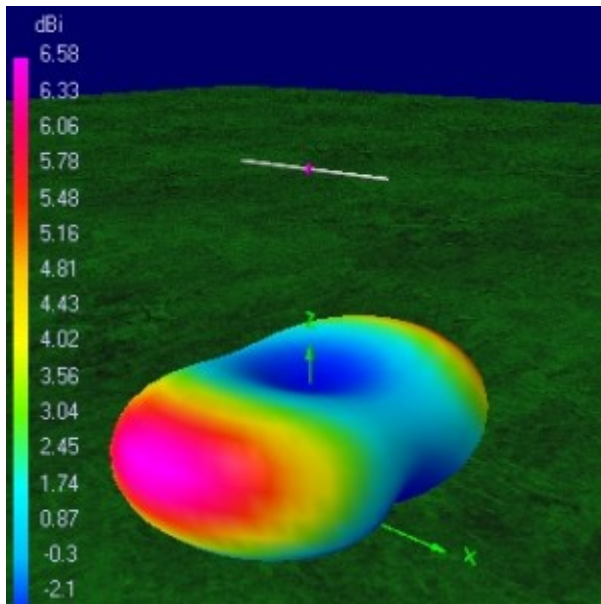


Height $1/4 \lambda$, Length 1.5λ

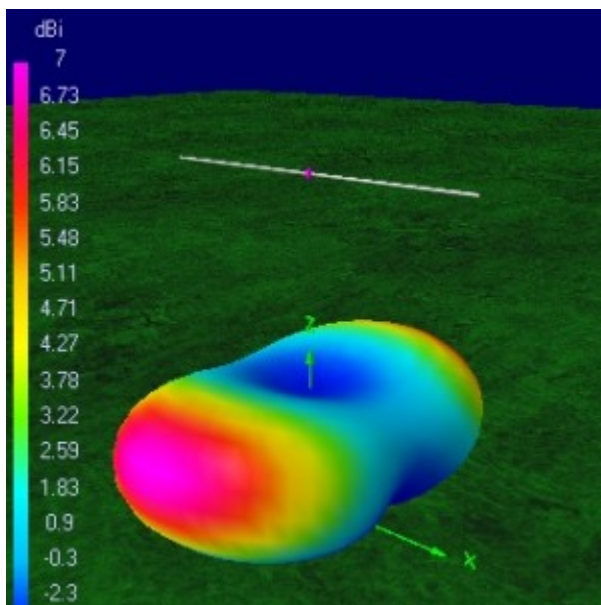


Height $1/4 \lambda$, Length 2λ

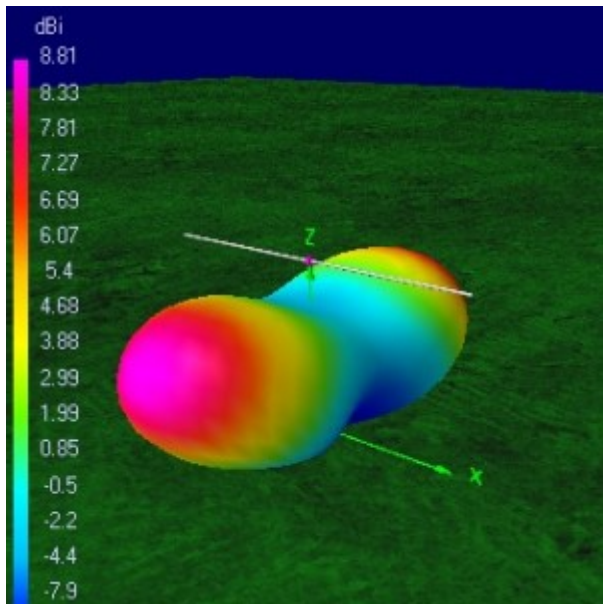
Below the antennas of different lengths, all mounted a half wavelength above the ground:



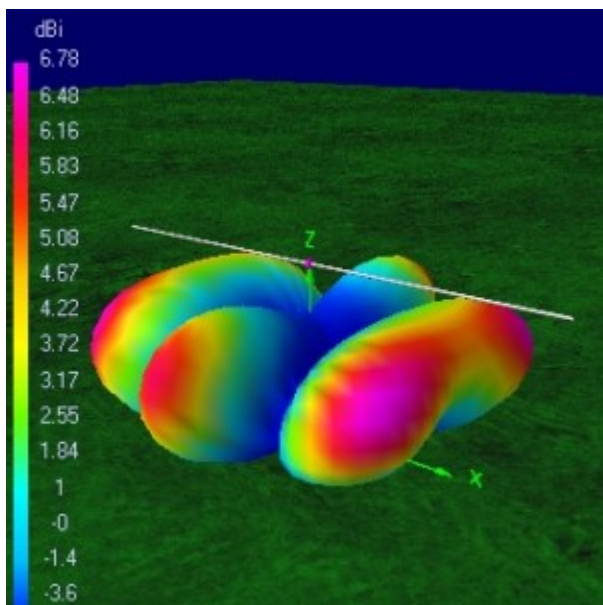
Height $1/2 \lambda$, Length $1/4 \lambda$



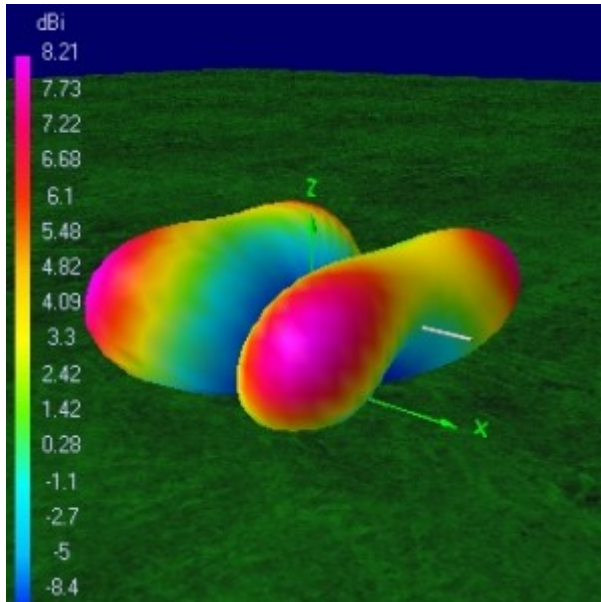
Height $1/2 \lambda$, Length $1/2 \lambda$



Height $1/2 \lambda$, Length 1λ

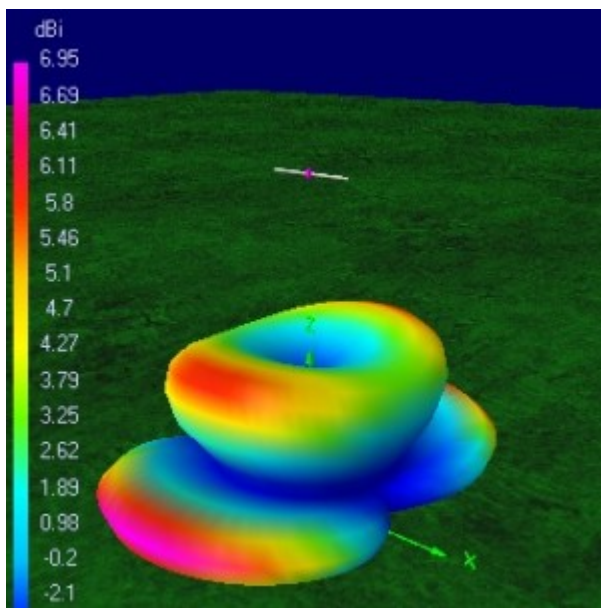


Height $1/2 \lambda$, Length 1.5λ

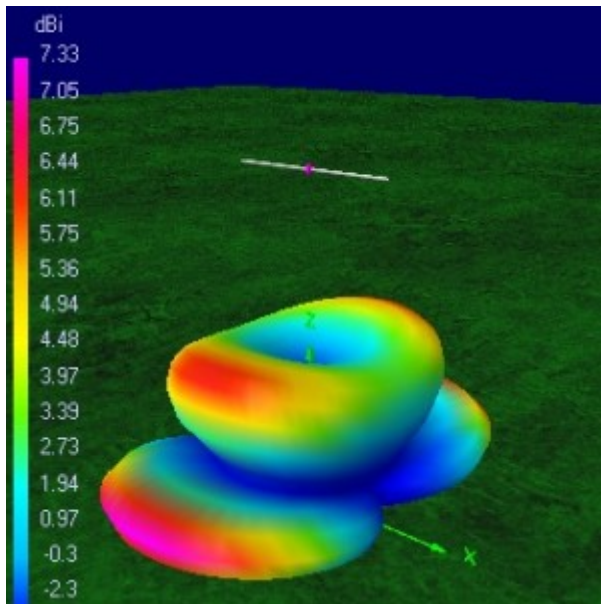


Height $1/2 \lambda$, Length 2λ

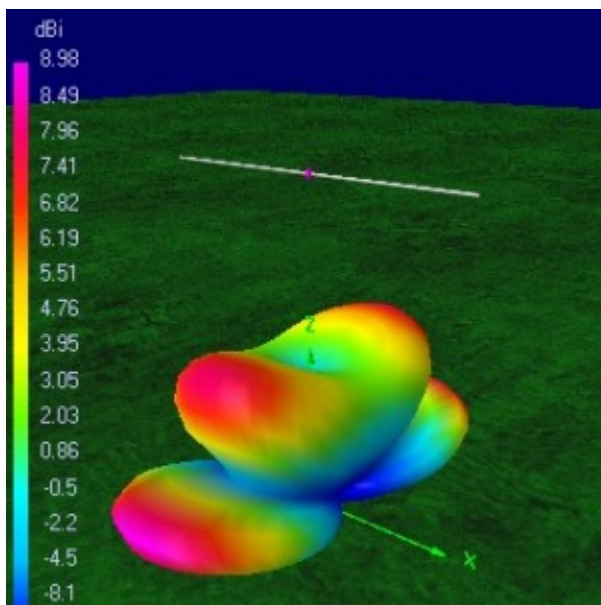
Below the antennas of different lengths, all mounted a full wavelength above the ground:



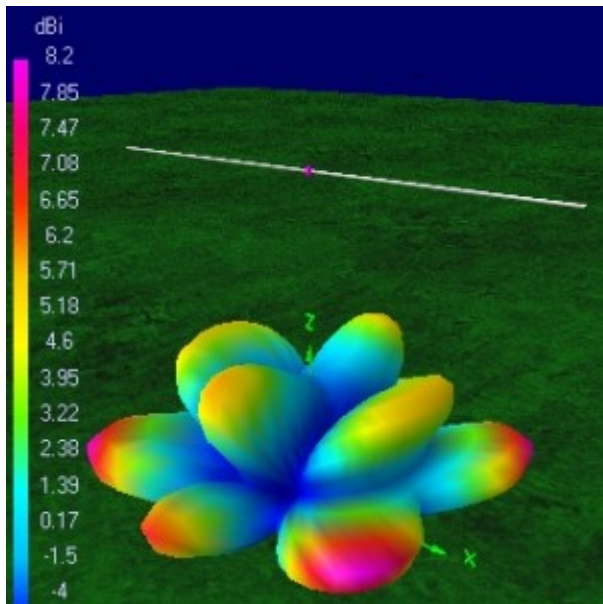
Height 1λ , Length $1/4 \lambda$



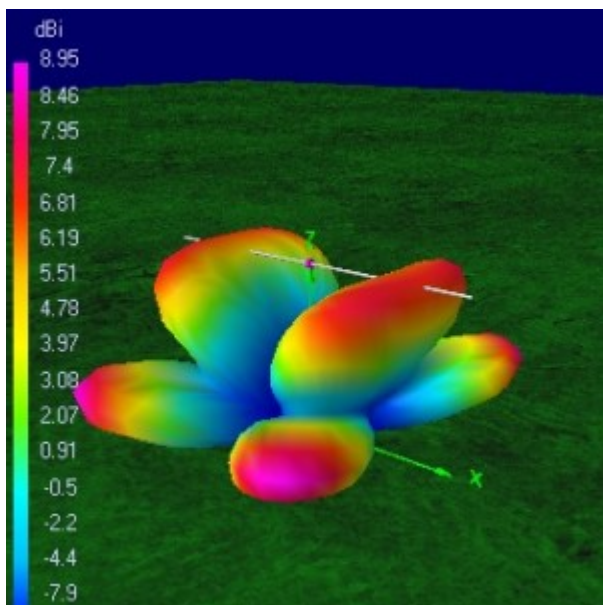
Height 1λ , Length $1/2 \lambda$



Height 1λ , Length 1λ



Height 1λ , Length 1.5λ



Height 1λ , Length 2λ