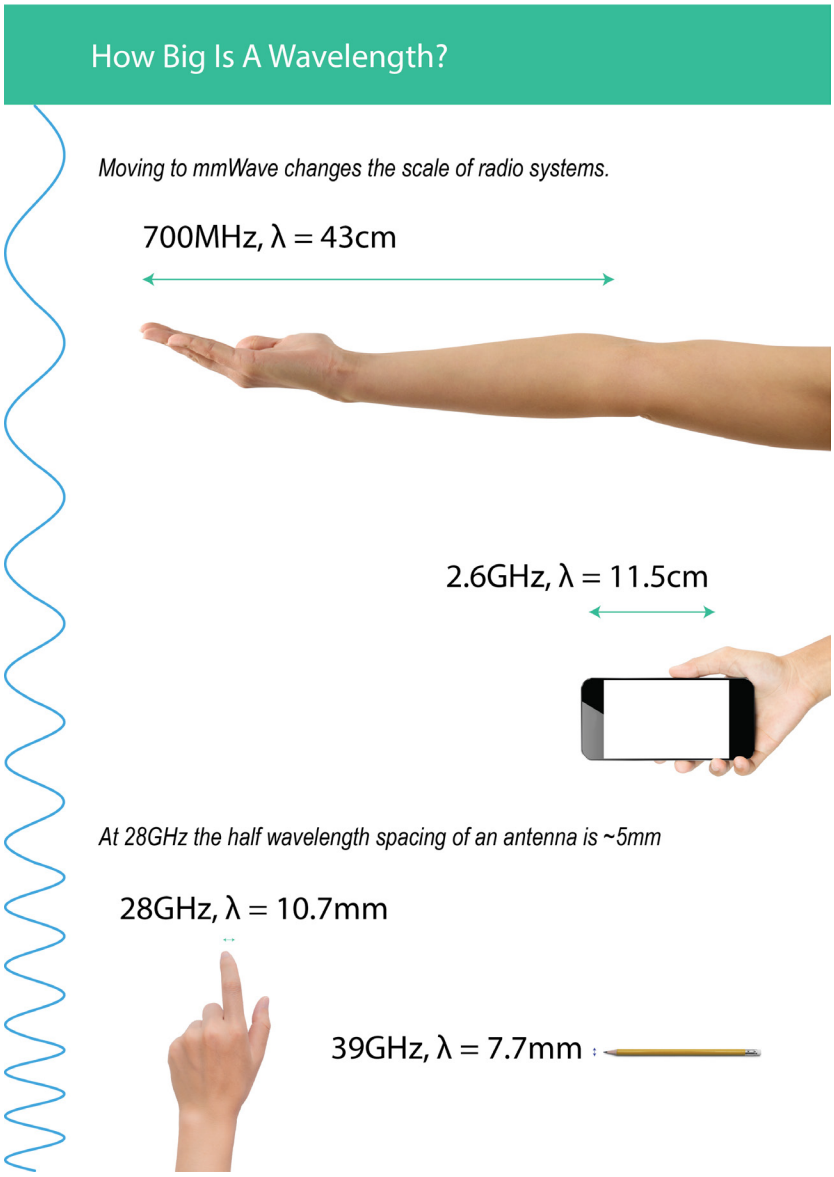
How Big Is A Wavelength?

From Ultrasound to Radars, in a phased array system some of the most important design considerations are the number of elements and the element spacing since both drive cost and performance. In traditional arrays an inter element spacing of less than half the wavelength (<λ/2) is required to mitigate grating lobes.

In a 5G beam-forming antenna the same principles hold true and half wave spacing is often assumed to be part of the setup at mmWave, leading to a need for very small form factor components in the array.

To understand the shift in system design this brings about, lets look at the physical scale of different wavelengths compared to some familiar references, starting at 700MHz and moving up to 39GHz:

In 5G millimeter wave systems, there is a desire to mount components on the rear side of the antenna panel, driving a requirement for very small form factor components. For example, the half



wavelength element spacing for an antenna in the 28 GHz band is approximately 5 mm.

Knowles Precision Devices (DLI) Filter Technology Addresses the Challenge of Implementing High Performance, Small Form Factor (<λ/2) Filters at mmWave.

Knowles Precision Devices (DLI) Filter Technology addresses the challenge of implementing high performance filters at mmWave frequencies. 26GHz and 28GHz catalog filters provide 3GHz of bandwidth, > 50dB rejection, are 20x smaller than current alternatives while implemented in surface mount packages for standard tune-free assembly and provide temperature stable operation from -55°C to +125°C. Off the shelf catalog designs are available to 42GHz and custom design services are available.

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