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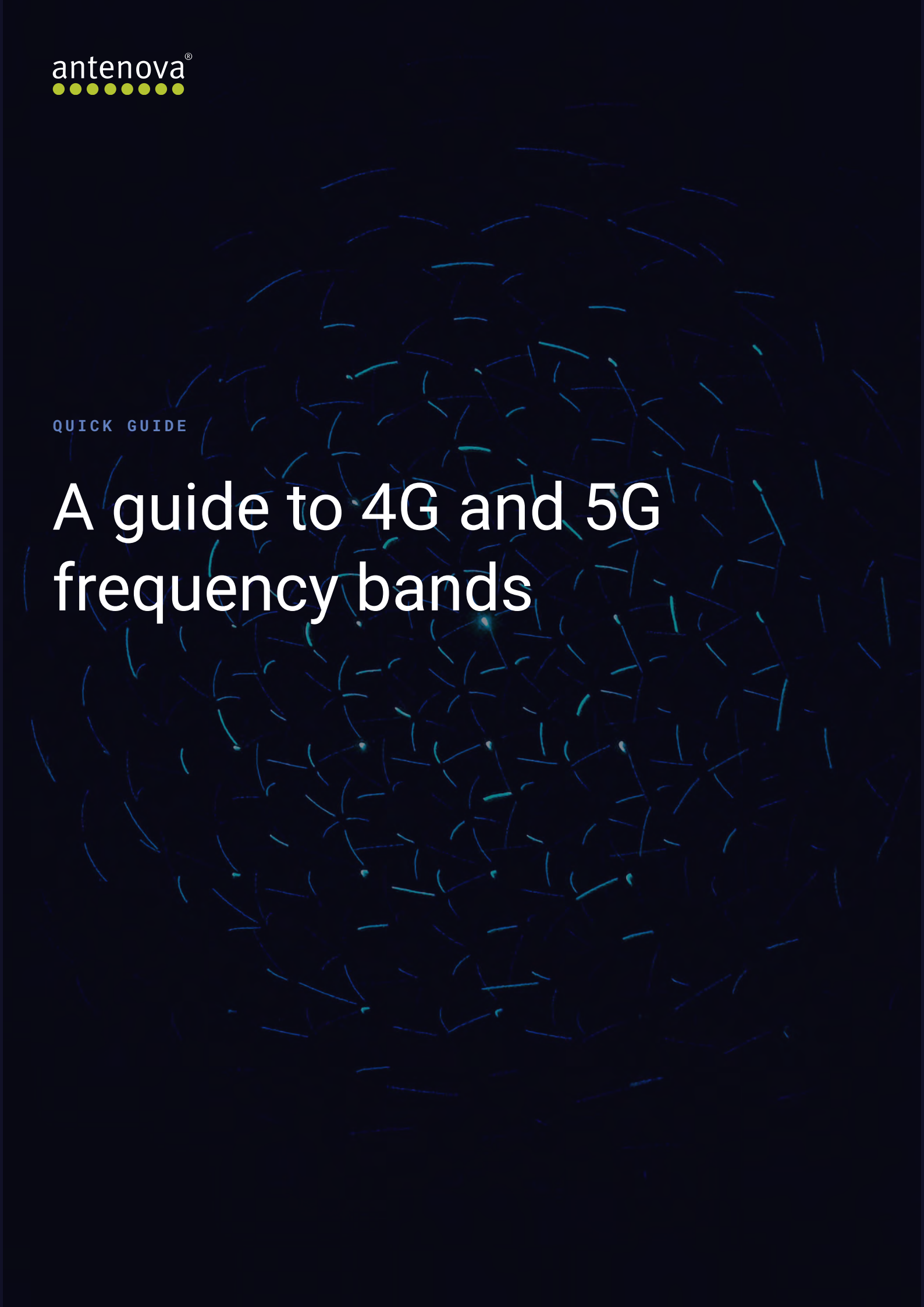
QUICK GUIDE

A guide to 4G and 5G frequency bands



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Introduction

Several new technologies have been introduced recently, such as 5G, NB-IoT, LTE Cat-M1. There are many options to consider when choosing a cellular antenna. 4G and NBIoT networks will continue to coexist with 5G networks over the coming decade. So, how do you decide which cellular antenna is suitable for your new product?

Matching a frequency band to your application

Not all products need the high data-rates of 5G. At the bottom end of the cellular frequency bands, devices that don't have high data throughput requirements can benefit from the extended reach of lower frequencies. Conversely, at the higher bands, the devices SET to benefit most are those with high data rate requirements.

LOW BAND	MID BAND	HIGH BAND
Industrial IoT	Multimedia applications	Augmented/Virtual reality
Smart sensors	Smart city	Manufacturing
Internet of Things		Automotive

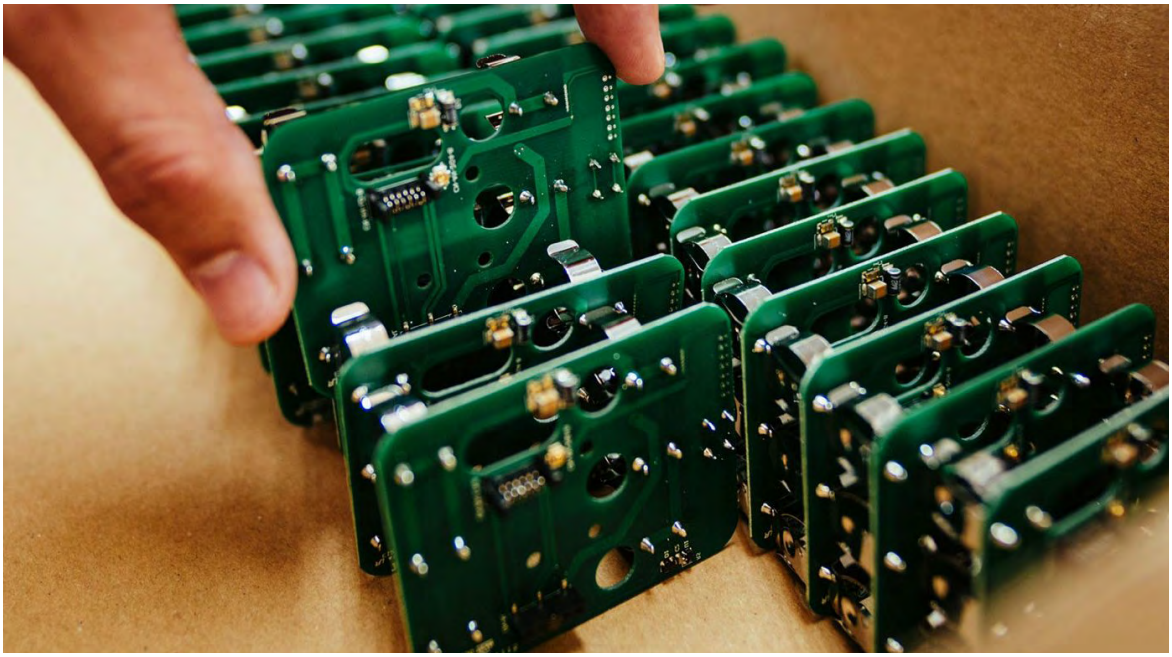
At the lower bands, the frequencies used for 5G are very similar to those in 4G LTE. This means that 5G may only offer a nominal improvement in performance – begging the question, does your device really need to be compatible with 5G?

The geography factor: which markets does your device need to operate in?

The global radio spectrum, managed by the International Telecommunication Union, can be split into three regions. Region 1 covers EMEA (Europe, the Middle East, and Africa), while Region 2 covers the Americas and Region 3 covers most of Asia, Australia and New Zealand.

Consequently, each region uses a unique set of frequency bands to power their licensed cellular networks. Fundamentally, this means that optimising a device for one particular, narrow frequency band, will come at the expense of global operability. There are some exceptions to this, such as 2600MHz (Band 7), which is supported across all three regions (apart from the United States).

However, frequency band support is at the discretion of cell carriers, and it is up to them to decide which bands to support. For example, the carrier T-Mobile in the United States supports 617 MHz, which is marketed as 'Extended Range', supporting Industrial IoT and other low throughput applications.



4G and 5G Certification

Regardless of the frequency you opt for, the markets your device operates in, and the carrier you choose, you will need to obtain cellular certification to operate your device on the licensed frequency bands.

Certification is required for two reasons. One, it ensures that devices do not have an adverse impact on the network or other devices operating nearby. The second reason is to ensure interoperability, ensuring that devices work as intended when connected to the network. This process means that particular care needs to be taken over not just the functionality of a wireless cellular device, but the performance, also.

GUIDE

Find out more about antenna certification →

Every network operator will have a unique set of requirements for certification, often depending on the technologies being used by the device. Currently, 5G standards (particularly at the high end) are yet to be developed and used by cellular operators, adding further complexity to the process.

In order to ensure that your device performs optimally, above the benchmarks prescribed by network operators, the antenna plays a vital role.

4G and 5G frequency bands

The following table summarises the 4G LTE bands and 5G frequency bands used in each country. Please note that the exact frequencies and bands supported will vary depending on the carrier and may be subject to change at any time.

For more information, get in touch with the cell carriers in the region you plan to launch your device.

America

CARRIER	4G LTE BANDS	5G BANDS
AT&T	2, 4, 66, 5, 12/17, 14, 29, 30	n5 (low band) n260 (mmWave)
Verizon	2, 4, 13	n40
T-Mobile	2, 4, 5, 12, 66, 71	n41 (mid band, sub-6GHz) n260 (mmWave)

Europe

4G LTE BANDS	5G BANDS
3 (1800 MHz)	n78 (3400 - 3600 MHz)
7 (2600 MHz)	n258 (24250 - 27500 MHz) [to be auctioned]
20 (800 MHz)	

China

4G LTE BANDS	5G BANDS
3	n41 (China Mobile)
40	n78 (China Telecom, China Unicom)
41	n79 (China Mobile, 4800 - 4900 MHz)

Sources:

- https://ipsnews.net/business/2020/06/30/cheat-sheet-which-4g-lte-bands-do-att-verizon-t-mobile-and-sprint-use-in-the-usa/
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- https://www.everythingrf.com/community/5g-frequency-bands-in-europe
- http://anisimoff.org/eng/lte_bands/china.html

Looking for an appropriate antenna?

Allani, Antenova's 5G and 4G LTE compatible antenna, is the most compact, high performance, surface mountable antenna the company has ever created. The antenna requires minimal space on your circuit board, enabling you to futureproof your device for 5G and achieve high levels of performance right now.

Allani 4G/5G SMD antenna

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