



Australian Government

Australian Radiation Protection
and Nuclear Safety Agency

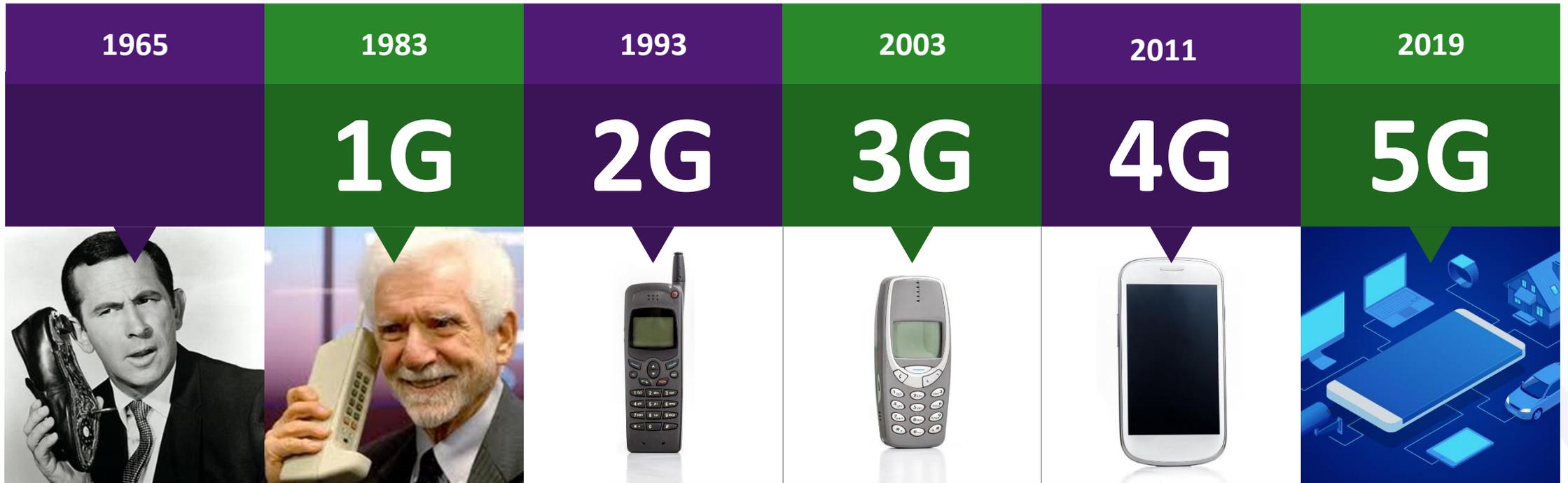


What is 5G?

Ken Karipidis

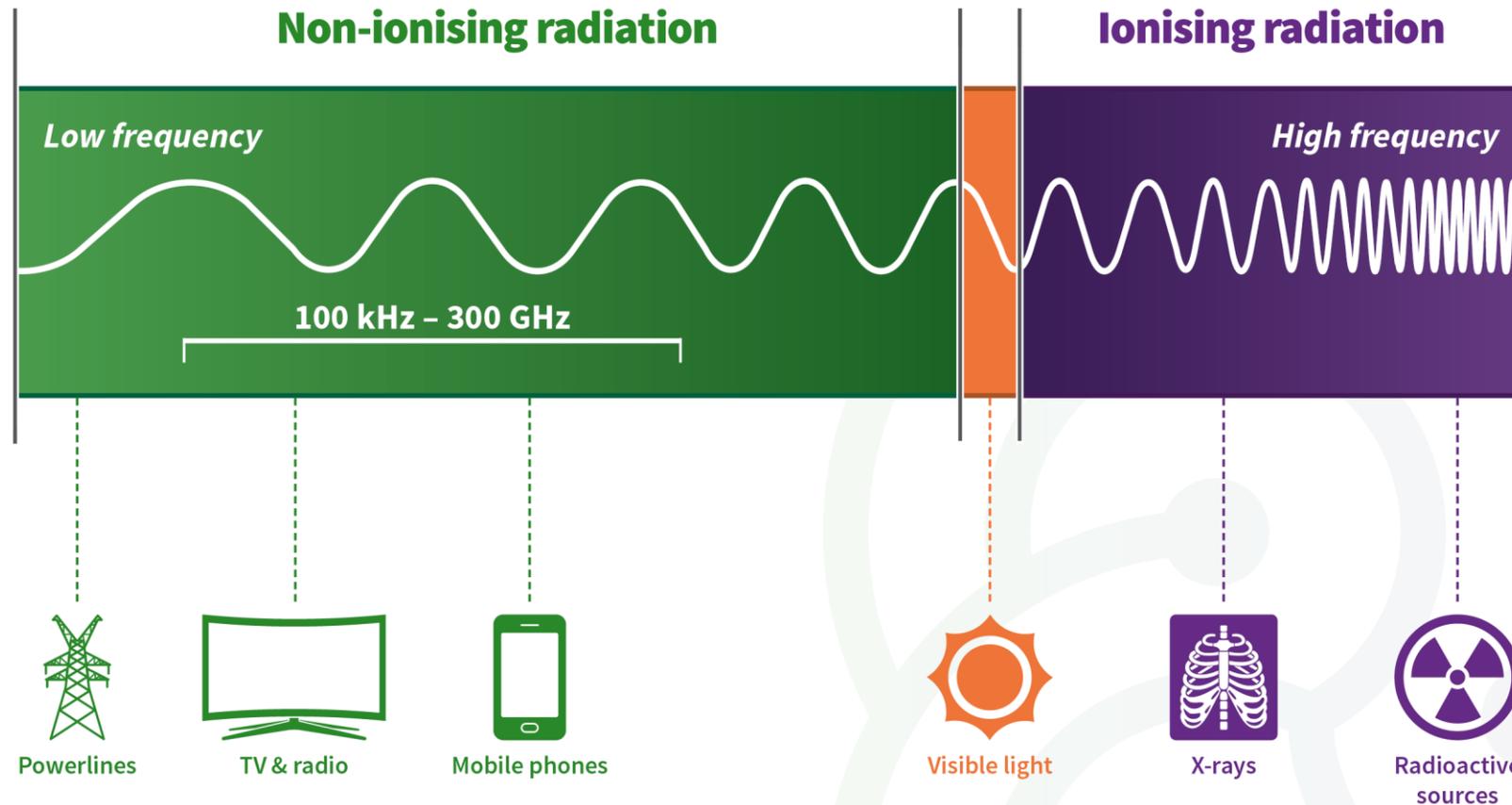
Science and Wireless 2019

5G is the next (5th) generation in mobile phone technology.



It's a brand name – not a physical quantity

5G and other wireless telecommunications such as radio, television and Wi-fi emit radio waves, also called radiofrequency electromagnetic radiation.



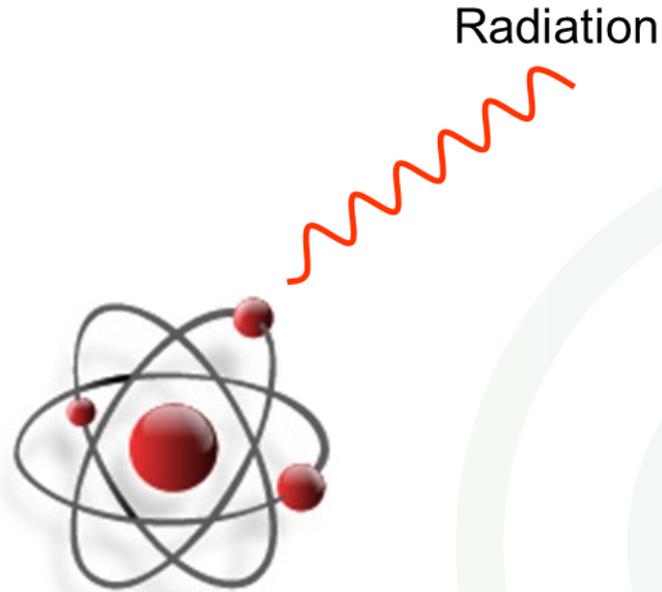
Ionising and non-ionising radiation

Ionising radiation

The process in which an electron is given enough energy to break away from an atom is called ionisation.

Ionising radiation has **more energy than non ionising radiation**; enough to cause **chemical changes by breaking chemical bonds**.

This effect can cause damage to living tissue.

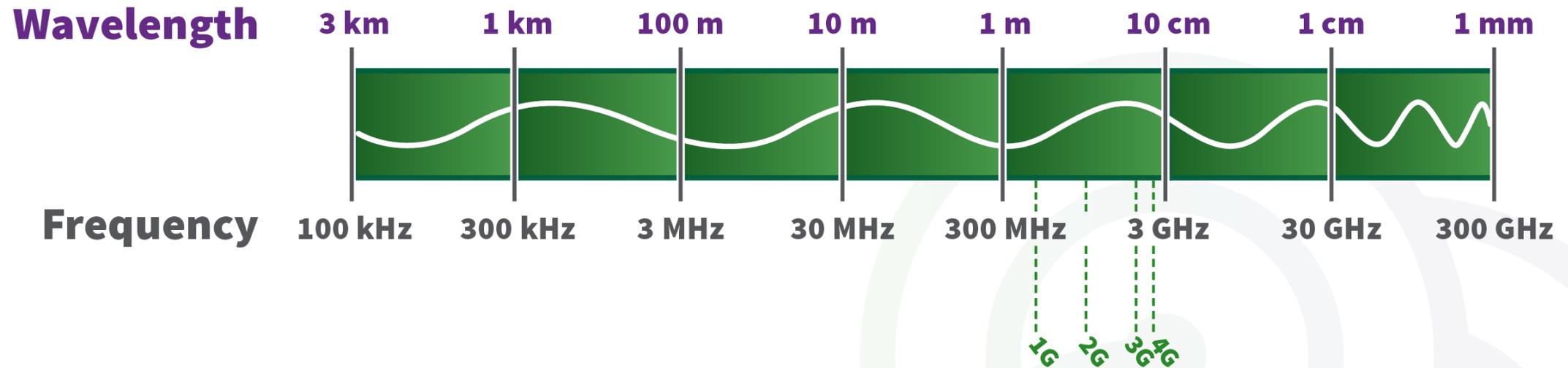


Non-ionising radiation

Non-ionising radiation does not carry enough energy to ionise atoms or molecules — that is, to completely remove an electron from an atom or molecule.

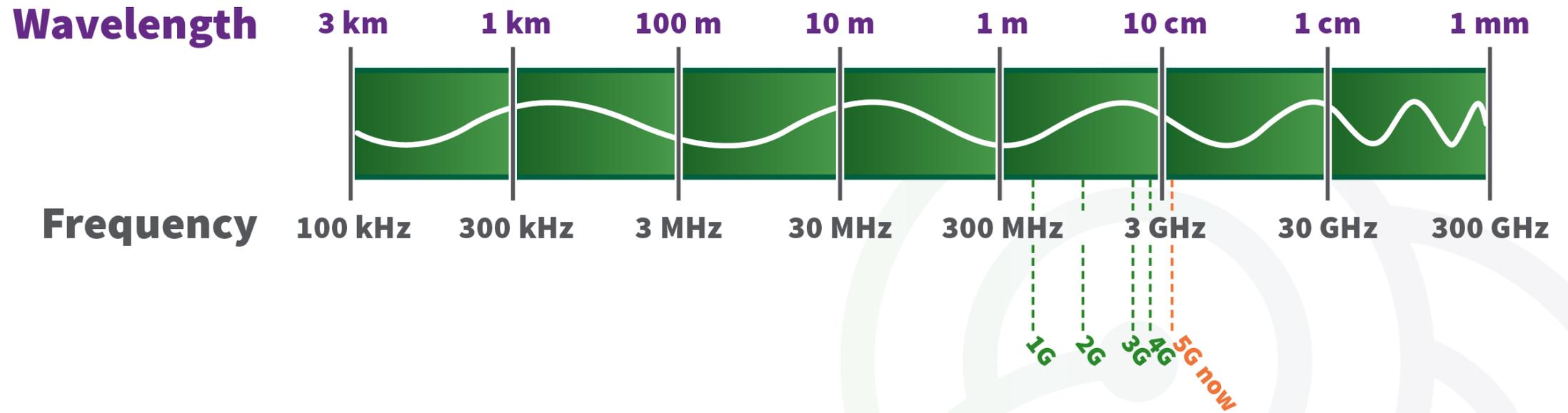
Non-ionising radiation has sufficient energy only for excitation, thus different biological effects are observed for different types of non-ionising radiation.

How is 5G different?



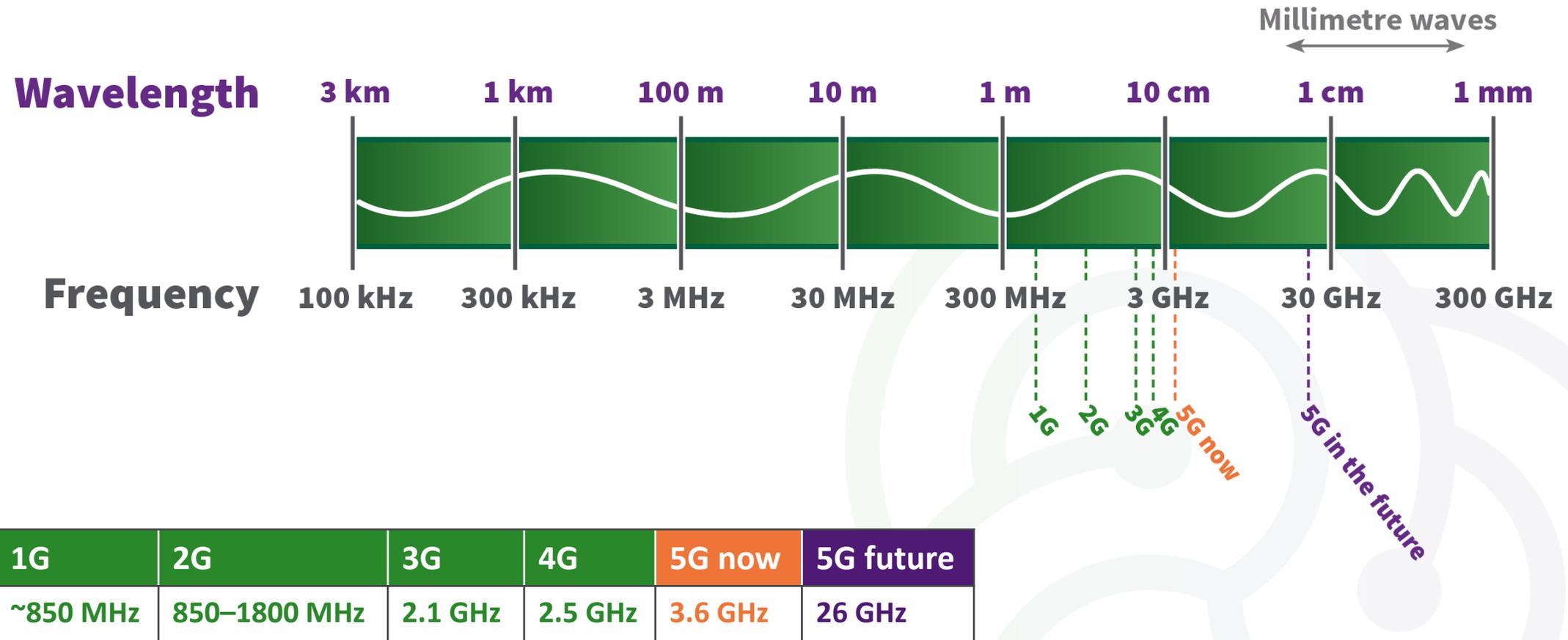
1G	2G	3G	4G
~850 MHz	850–1800 MHz	2.1 GHz	2.5 GHz

How is 5G different?

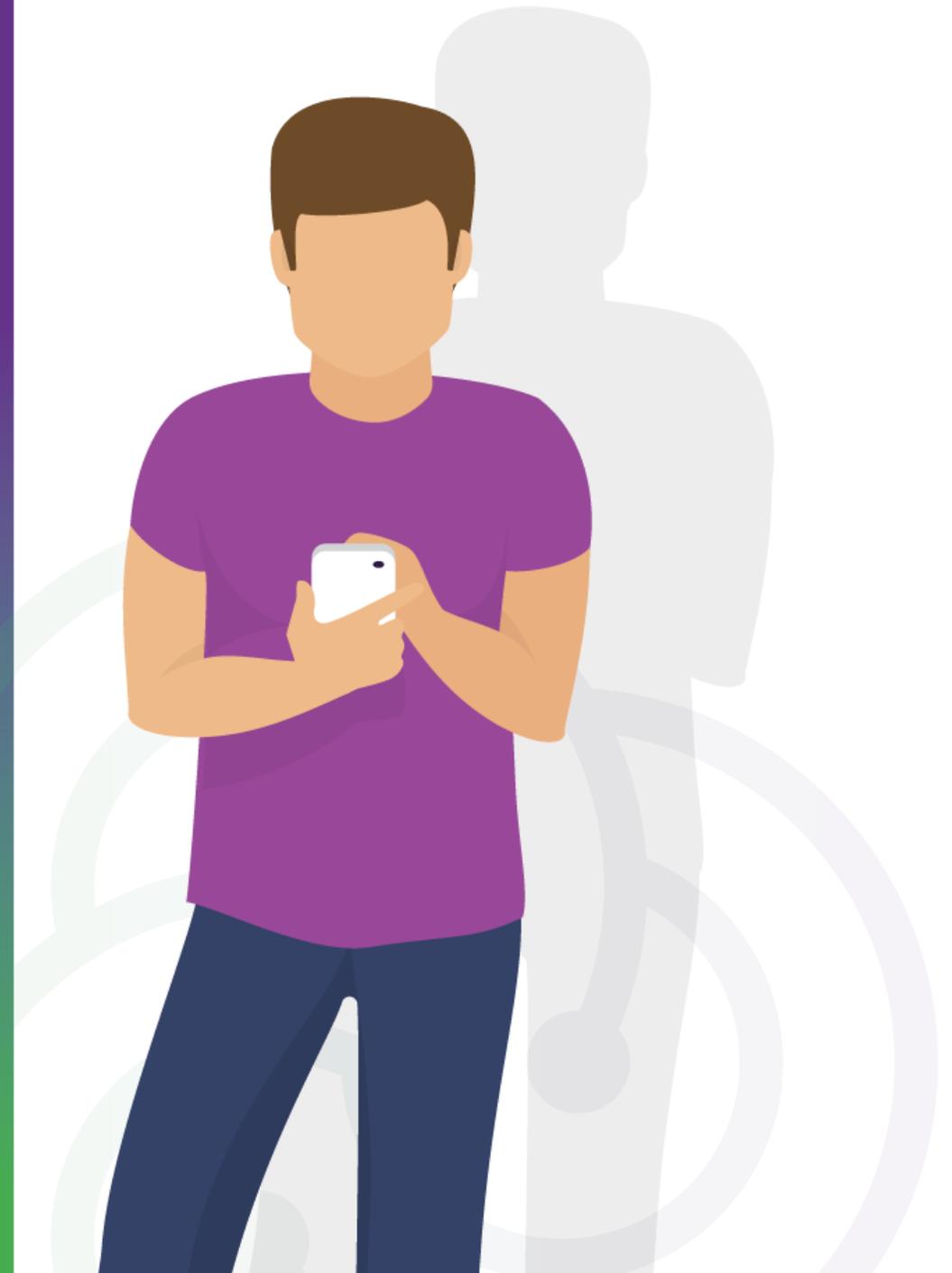


1G	2G	3G	4G	5G now
~850 MHz	850–1800 MHz	2.1 GHz	2.5 GHz	3.6 GHz

How is 5G different?



What level of radio waves are people exposed to?



Typical public exposure to radio waves

Exposure from Wi-fi in the environment

Australian Standard



100 000 000
times below

Typical public exposure to radio waves

Exposure from TV broadcast

**Australian
Standard**



100 000 000
times below



3 333 333
times below

Typical public exposure to radio waves

Exposure from mobile phone
base stations

**Australian
Standard**



100 000 000
times below



3 333 333
times below



500 000
times below

Typical public exposure to radio waves

Exposure from radio broadcast

Australian Standard



100 000 000
times below



3 333 333
times below



500 000
times below



50 000
times below

Typical public exposure to radio waves

Exposure level where effects occur

Australian Standard



100 000 000
times below



3 333 333
times below



500 000
times below

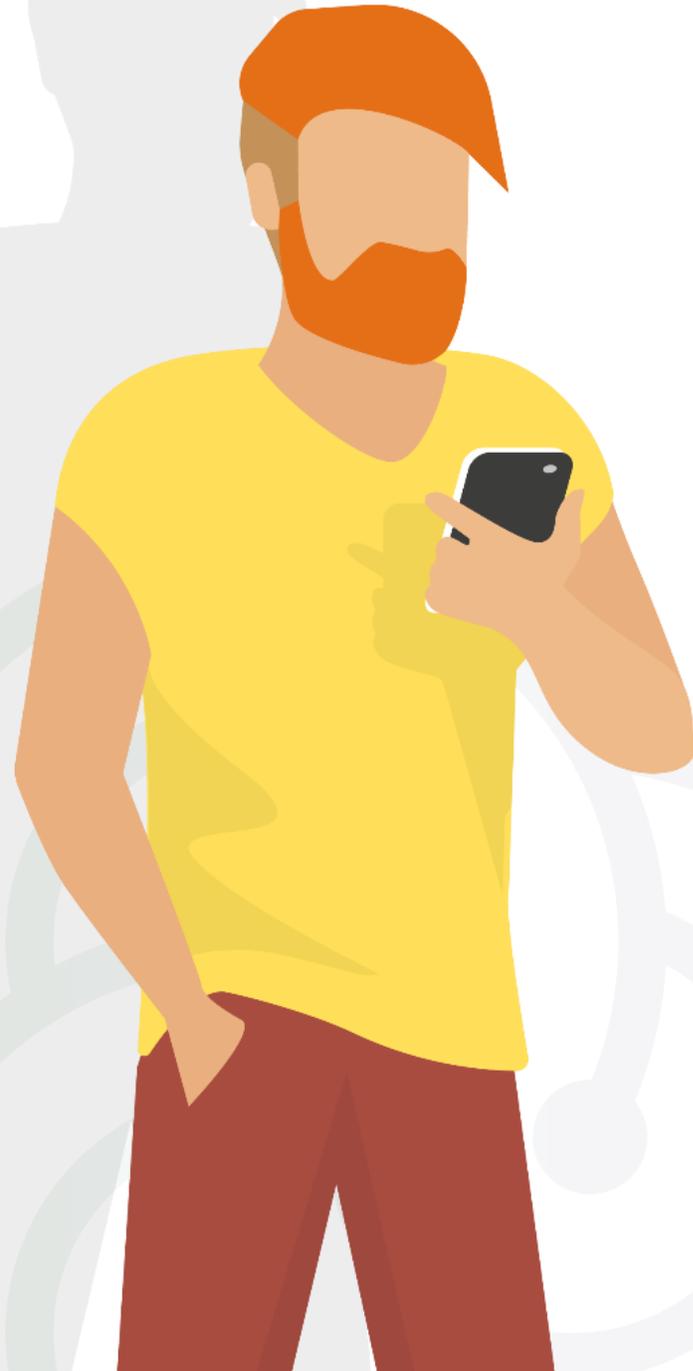


50 000
times below



50
times above

**Are radio waves
harmful?**



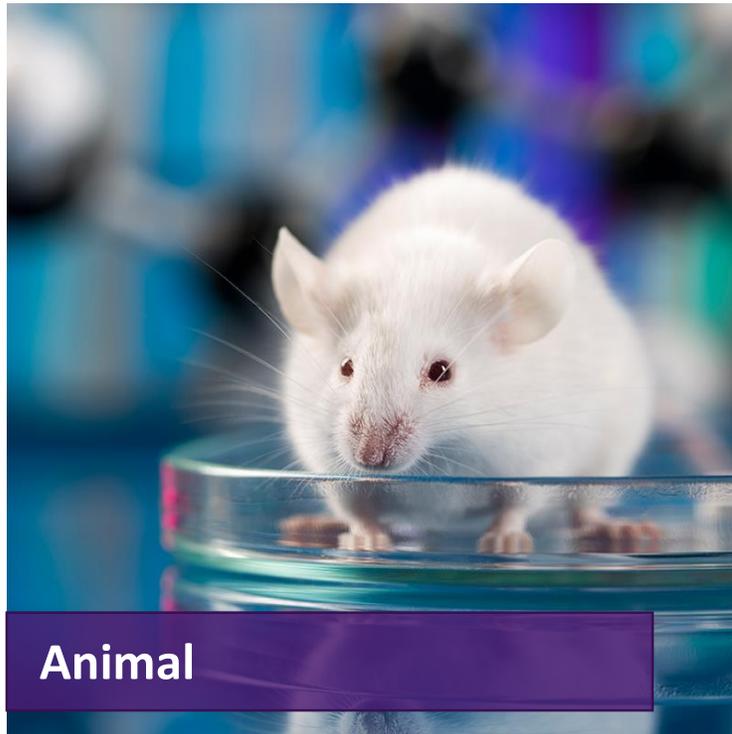


- Radio waves are **non-ionising radiation**, meaning they have **insufficient energy** to break chemical bonds and damage DNA or cells.
- Radio waves at sufficiently high levels can heat biological tissue and potentially cause tissue damage (think of your microwave oven).
- Radio waves from telecommunications are **too low to produce significant heating** or increased body temperature

.....But are there health effects at low levels?



Many studies (**in vitro**, **animal**, **epidemiological**) have looked at whether low level radio waves cause health effects, especially cancer.



When assessing all of the studies

There are

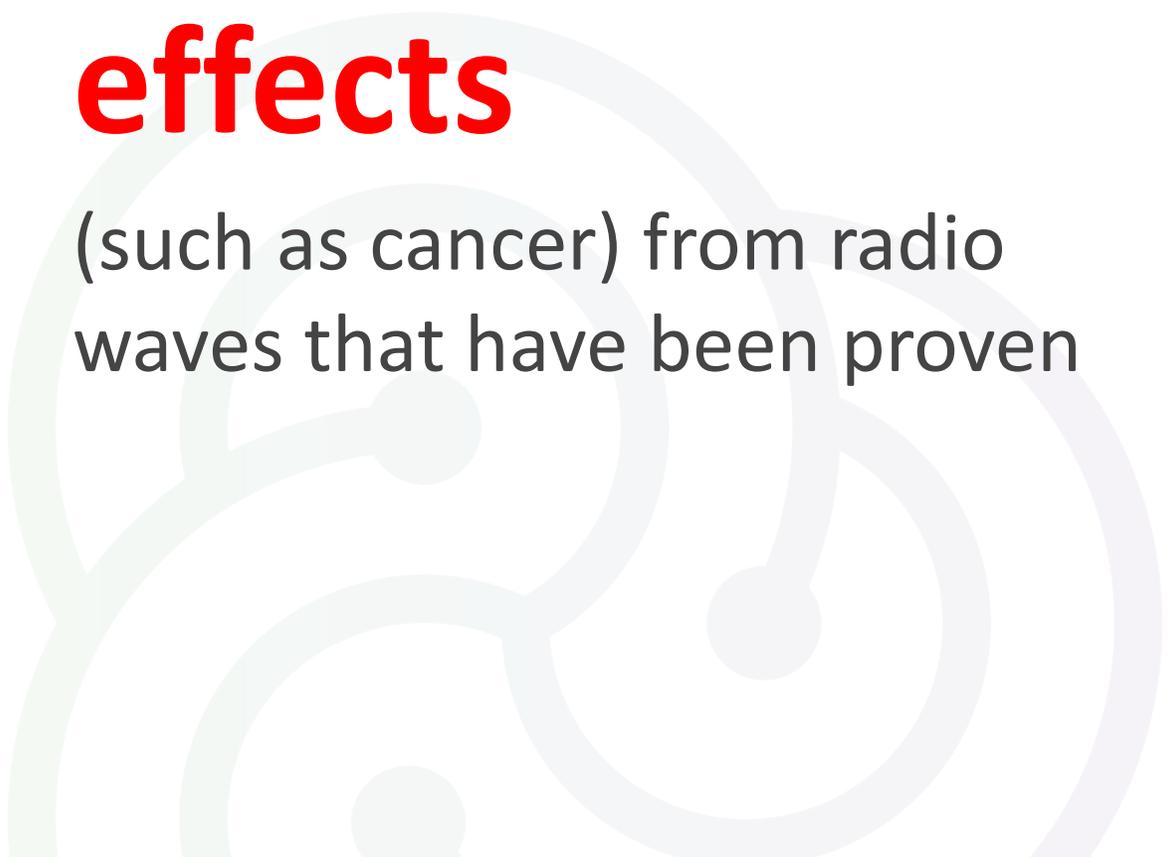
**no established
health effects**

from radio waves at the
power levels used in
telecommunications
(including 5G)

There are

**no long-term
effects**

(such as cancer) from radio
waves that have been proven



What about studies that do show effects?

There are a number of considerations when assessing all of the evidence:



Quality of the studies



Are results replicated?



Different types of studies:
cellular, animal,
human,
epidemiological

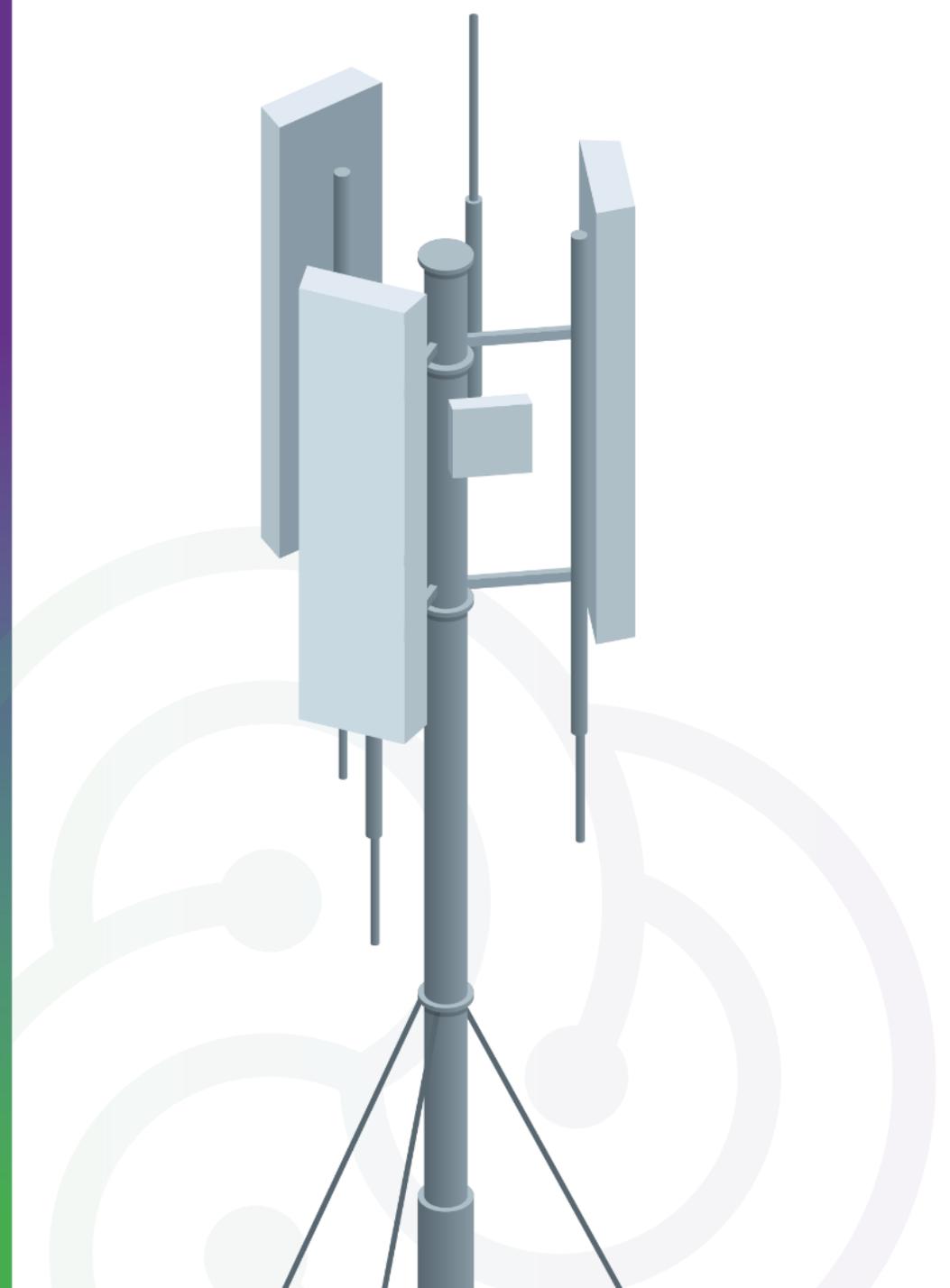


Identified mechanism:
how is the
exposure causing
the health effect?



Dose response:
more exposure,
greater risk

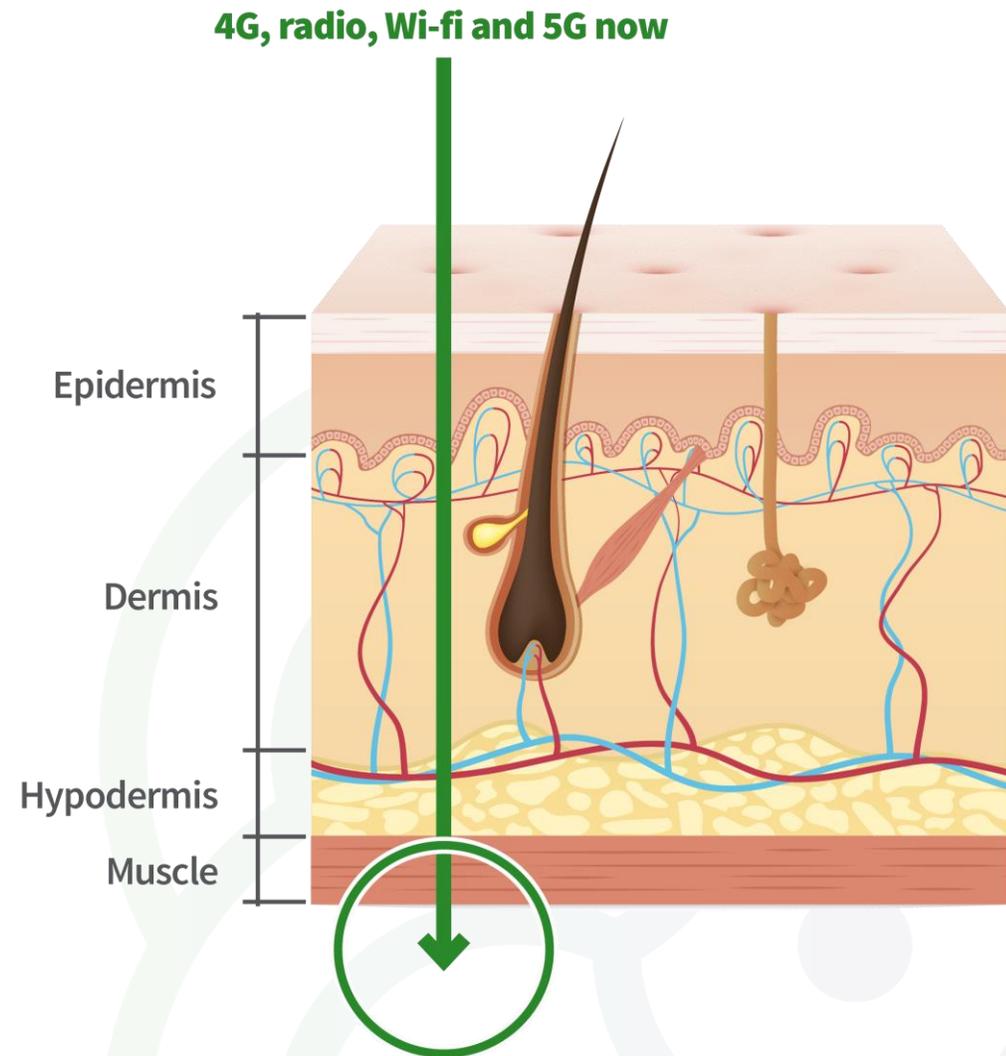
**Are millimetre
waves harmful?**



Radio waves currently in use **can be absorbed** into the body.

Millimetre waves that will be used by future 5G are **not absorbed past the skin.**

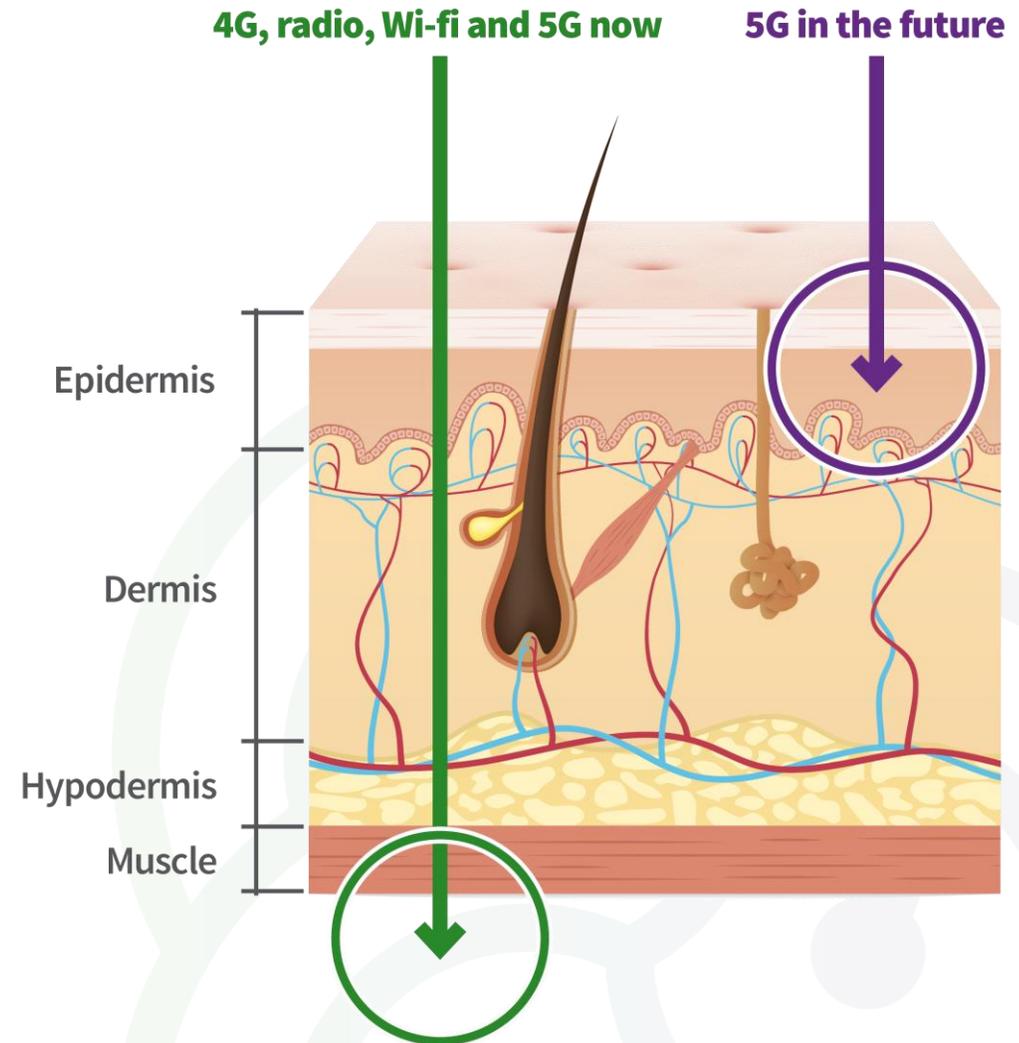
In both cases, the power level is small and no appreciable heating of tissue or skin will occur.



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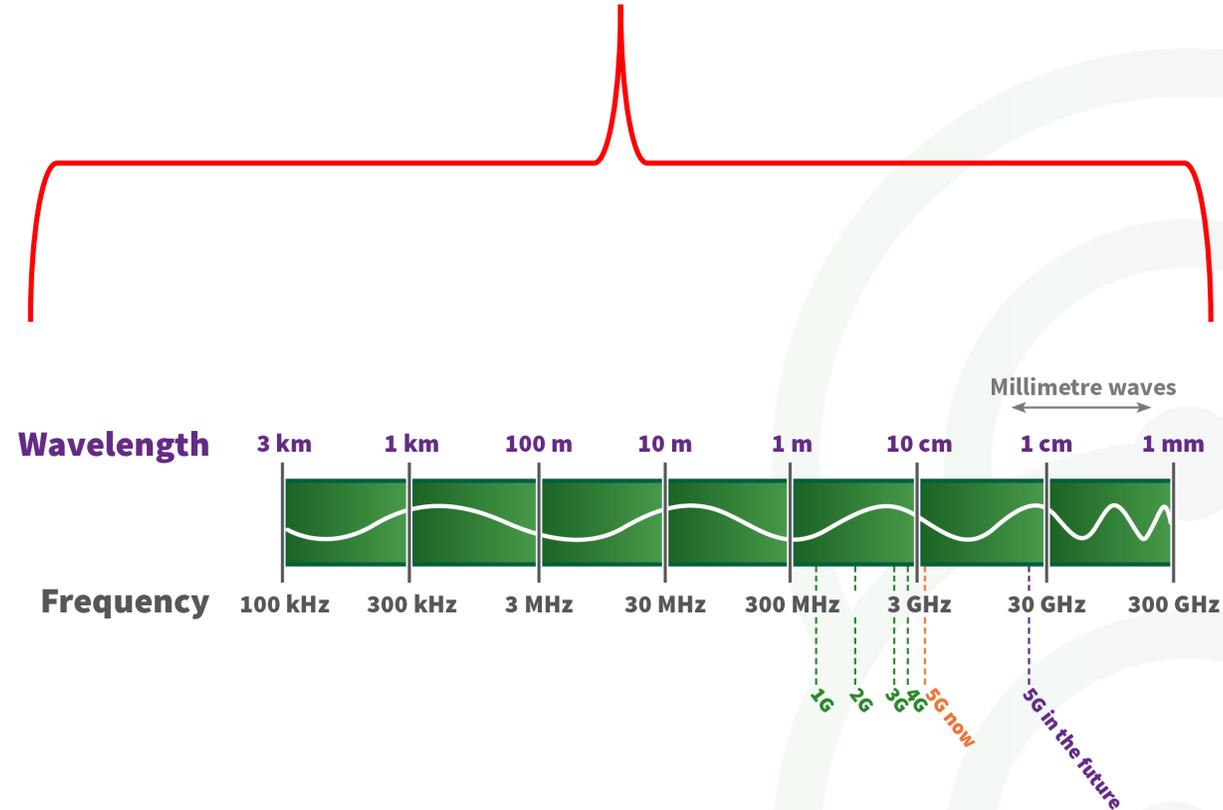


**How do we
protect the
public?**



The **ARPANSA RF Standard** covers all sources using radio waves, including 5G.

arpansa.gov.au/rps3



Thank you

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ARPANSAGovernment



ARPANSA



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