

**From:** MURPHY, Brendan  
**Sent:** Monday, 18 November 2019 9:06 AM  
**To:** s22 Shaw, Gillian ; Boyley, Matthew  
**Subject:** FW: 5G - Health & Safety [SEC=OFFICIAL]

I am happy to consider making a CMO statement on this. It would be useful  
Can the team liaise with them and ARPANSA and set something up, unless anyone thinks it is a bad  
idea.

Professor Brendan Murphy  
*MBBS, FRACP, PhD, FAICD, FACHSM (Hon), FAHMS*  
Australian Government Chief Medical Officer  
Department of Health  
Phone: +61 2 6289 8408

**From:** s47F  
**Sent:** Monday, 18 November 2019 9:00 AM  
**To:** MURPHY, Brendan <[Brendan.Murphy@health.gov.au](mailto:Brendan.Murphy@health.gov.au)>  
**Subject:** 5G - Health & Safety [SEC=No Protective Marking]

Dear Professor Murphy,

Please find attached a letter and fact sheets in relation to latest generation mobile networks – 5G  
from the CEO of the Australian Mobile Telecommunications Association.

Kind regards,

s47F  
Office Manager | EA to Chris Althaus, CEO  
Australian Mobile Telecommunications Association - AMTA  
T s47F | M s47F  
E s47F | [www.amta.org.au](http://www.amta.org.au)

15 November 2019

Professor Brendan Murphy  
Chief Medical Officer  
Department of Health  
GPO Box 9848  
Canberra ACT 2601

[Brendan.murphy@health.gov.au](mailto:Brendan.murphy@health.gov.au)



Dear Brendan,

As you are no doubt aware there is a great deal of misinformation in the public domain regarding health and safety implications of the 5<sup>th</sup> generation of mobile technology (5G).

AMTA has developed a range of material to address the main themes (see attached) and ARPANSA have also been very active in working to ensure the facts as reflected in body of science are present in the public discourse. In addition, AMTA understands the Department of Communications is planning to release some fact sheet style information and the ACMA has also produced a fact sheet on small cells.

AMTA also held a drop-in session in Parliament House with ARPANSA and the ACMA on Sept 16 to present a range of information and provide some demonstrations of EME measurements etc. This session will be repeated on November 25<sup>th</sup> in the Mural Hall of Parliament House – see attached invitation. You and any of your staff are most welcome to attend.

While ARPANSA continue to do a good job in adding their perspectives, AMTA also sees a role for the Health Department to engage in this conversation. Indeed, most recently this has occurred in NZ with some strong statements made by their Health Dept. in response to the misinformation being circulated in their market.

I would welcome the opportunity to discuss this issue with you as needed, otherwise our request is a simple one – that your voice is added to the conversation as a reflection of the Dept. of Health's perspective on this issue.

Thank you in advance for your consideration.

Yours sincerely

Chris Althaus  
**AMTA CEO**

AMTA Fact Sheets att:  
What is 5G  
A Guide to Small Cells  
5G and EMF Explained  
Invitation to Nov 25<sup>th</sup> Parliament House 5G / EME information session



# What is 5G?

AMTA

Australian Mobile  
Telecommunications  
Association

5G is the 5th generation of mobile networks, a significant evolution of today's 4G networks.

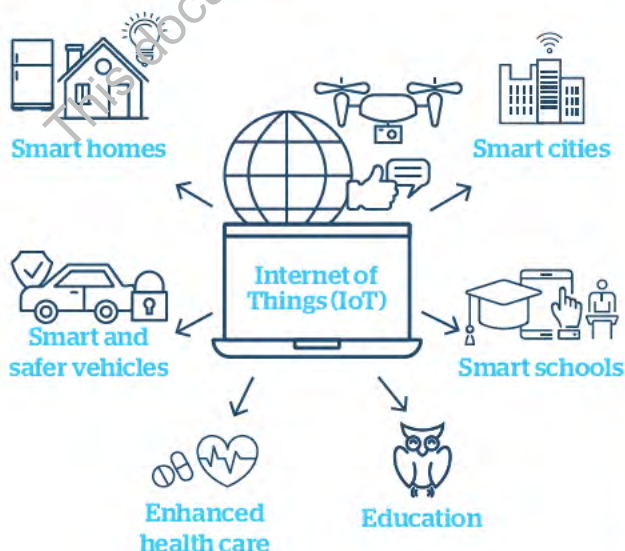
5G is designed to meet the very large growth in data and connectivity of today's modern society, the internet of things with billions of connected devices, and tomorrow's innovations.

5G will initially operate in conjunction with existing 4G networks before evolving to fully standalone networks. The rollout of 5G will help meet Australians' growing demand for more data, with the Australian Communications and Media Authority (ACMA) reporting that the volume of data downloaded on mobiles has increased by 41% from June 2017 to June 2018, and this is set to continue.

## What will 5G enable?

5G will enable enhanced mobile broadband, instantaneous connectivity to billions of devices, the Internet of Things (IoT) and a truly connected world.

**For communities, 5G will enable real-time connection of billions of devices to provide a safer and more efficient place to live by enabling things like:**



**For businesses and industry, 5G and IoT will provide a wealth of data allowing them to gain insights into their operations like never before.**

**Business will increasingly operate and make key decisions driven by data (e.g. parcel tracking), and innovate in different application areas including agriculture, smart farms and manufacturing. All of these will pave the way for cost savings, better customer experience and long-term growth.**

  
**5G enabled  
mobile technology**  
IS SET TO DELIVER A  
**\$65 billion bigger  
Australian economy**  
BY 2023



# What is 5G?

## What will be the first applications for 5G?

5G-enabled products such as wireless broadband, mobile devices and IoT will be the first applications using 5G.



## What will 5G devices offer?

The prime benefits of 5G devices will be significantly faster speeds in data access, downloading and streaming content.

In addition, 5G devices will have increased computing power and make use of faster connectivity, meaning that the devices will enjoy virtually instantaneous connections to the network, as well as greater connectivity when on the move. 5G will enable applications such as remote monitoring, automation of production, medical monitoring and even remote surgery.



## How does 5G work?

5G will deliver faster speeds, better response times and greater capacity. 5G networks are designed to work in conjunction with 4G networks using a range of macro cells, small cells and dedicated in-building systems.

Small cells will be a feature of 5G networks and will evolve to include the use of millimetre wave (mmWave) frequencies.

Small cells are mini base stations designed for very localised coverage typically from 10 metres to a few hundred metres providing in-fill for the larger macro network. Small cells will be essential for the 5G networks.

5G devices will have increased computing power and make use of faster connectivity, meaning that the devices will enjoy virtually instantaneous connections to the network, as well as greater connectivity when on the move.





# 5G and EME Safety

## Are there safety limits for 5G?

**Yes. Comprehensive international guidelines exist governing exposure to radio waves including the frequencies proposed for 5G.** The limits have been established by independent scientific organisations, such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and include substantial margins of safety to protect all people including children and the elderly at all times.

These guidelines have been widely adopted in standards around the world, including in Australia by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and are endorsed by the World Health Organization (WHO).

## WHAT DO THE EXPERTS SAY ABOUT 5G AND HEALTH?

In relation to radio frequency exposures and wireless technology and health, including frequencies used for 5G, the World Health Organization (WHO) states:

**"Despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health."**

In relation to 5G frequencies, Dr Sarah Loughran, Director of the Australian Centre for Electromagnetic Bioeffects Research at the University of Wollongong states:

**"The higher frequencies [of 5G] actually means that the energy doesn't penetrate as deeply into the body than previous fourth generation and other generation technologies have."**

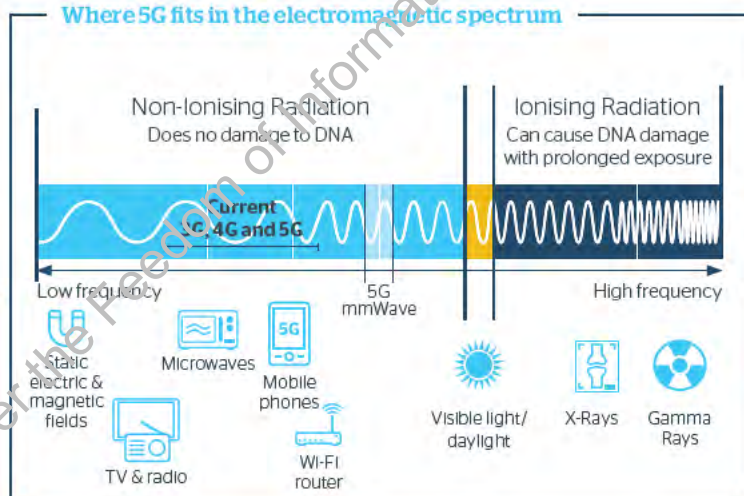
In relation to 5G and health, ARPANSA states:

**"There are no established health effects from the radio waves that the 5G network uses."**

## What research into health effects has been done on 5G?

The electromagnetic frequencies used for 5G are part of the radio frequency spectrum which has been extensively researched in terms of health impacts for decades.

### Where 5G fits in the electromagnetic spectrum



5G operates at a higher frequency than previous 4G networks so it can carry more data but can't travel as far. This means it will have less impact on the human body than any previous network.



Over 50 years of scientific research has already been conducted into the possible health effects of the radio signals used for mobile phones, base stations and other wireless services including frequencies planned for 5G and mmWave exposures.

### ARPANSA states:

**"This network currently runs on radio waves similar to those used in the current 4G network, and in the future will use radio waves with higher frequencies. It is important to note that higher frequencies does not mean higher or more intense exposure. Higher frequency radio waves are already used in security screening units at airports, police radar guns to check speed, remote sensors and in medicine and these uses have been thoroughly tested and found to have no negative impacts on human health."**



# 5G and EME Safety

**Testing on Australian 5G networks with commercial devices in real-world settings shows levels similar to 3G, 4G and Wi-Fi, and in many cases around 1,000 times below the safety limits.**



## **Does 5G mean higher power and higher exposure levels?**

**No - 5G networks are designed to be more efficient and will use less power than current networks for similar services.**

The Australian Centre for Electromagnetic Bioeffects Research (ACEBR) states:

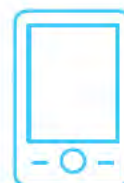
**"In addition, while more antennas may be required to service areas where demand for the new service is high, users are closer to the mobile phone base station and therefore their devices can operate at a reduced power, reducing their exposure from their personal device."**

Dr Sarah Loughran, Director of the Australian Centre for Electromagnetic Bioeffects Research at the University of Wollongong, states:

**"Based on the improvements in technology, the level of exposure is expected to be lower [with 5G] than what it has been in previous technologies."**

## **How will 5G be regulated?**

All base stations including 5G equipment and devices, must comply with standards set by ARPANSA.



## **Where can I get more information on 5G?**

**Australian Communications and Media Authority (ACMA)**

1300 850 115

<https://www.acma.gov.au/theACMA/a-guide-to-small-cells>

**Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)**

(03) 9433 2211

[www.arpansa.gov.au](http://www.arpansa.gov.au)

**EMF Explained web site**

[www.emfexplained.info](http://www.emfexplained.info)

**Mobile Nation 2019 - the 5G future report**

<https://amta.org.au/new-mobile-nation-report-the-5g-future/>

**Mobile Carriers Forum**

<http://amta.org.au/mcf>



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# EMF Explained Series

## 5G and EMF Explained

5G



[www.emfexplained.info](http://www.emfexplained.info)



The EMF Explained Series provides information on mobile technology and Electromagnetic Fields (EMF) referencing international health authorities, government, academia and the telecommunications industry.

The EMF Explained Series has been developed by the Australian Mobile Telecommunications Association (AMTA) in association with the GSMA and Mobile and Wireless Forum (MWF).

## Contents

### 5G Explained

2019–2020 Edition

What is 5G?	3
What will 5G enable?	4
When did 5G launch?	5
What are the first applications for 5G?	5
What do 5G devices offer?	5
What devices are available for 5G?	5
How does 5G work?	6
5G working with 4G	7
How does 5G deliver continuous connection, greater capacity, and faster speed and response times?	7
5G spectrum	8
MIMO Beamforming	9

### 5G and EMF Safety

Are there safety limits for 5G and radio waves?	11
What do the experts say about 5G and health?	11
What research into health effects has been done on 5G?	11
Is the research on 5G, mmWave and health continuing?	12
Will 5G devices comply with the safety guidelines?	12
Is 5G safe for children?	12
What about children wearing RF transmitting devices or wearables for security or entertainment?	12
Will 5G devices automatically minimise transmitter power?	12
Does 5G mean higher power and higher exposure levels?	12
What types of base stations are used for 5G?	12
Do 5G base stations automatically minimise transmitter power?	12
What will be the size of compliance zones around 5G network antenna sites?	12
Is 5G similar to the Active Denial System used by the military?	12



## What is 5G?

**5G is the 5th generation of mobile networks, a significant evolution of the 4G LTE networks.**

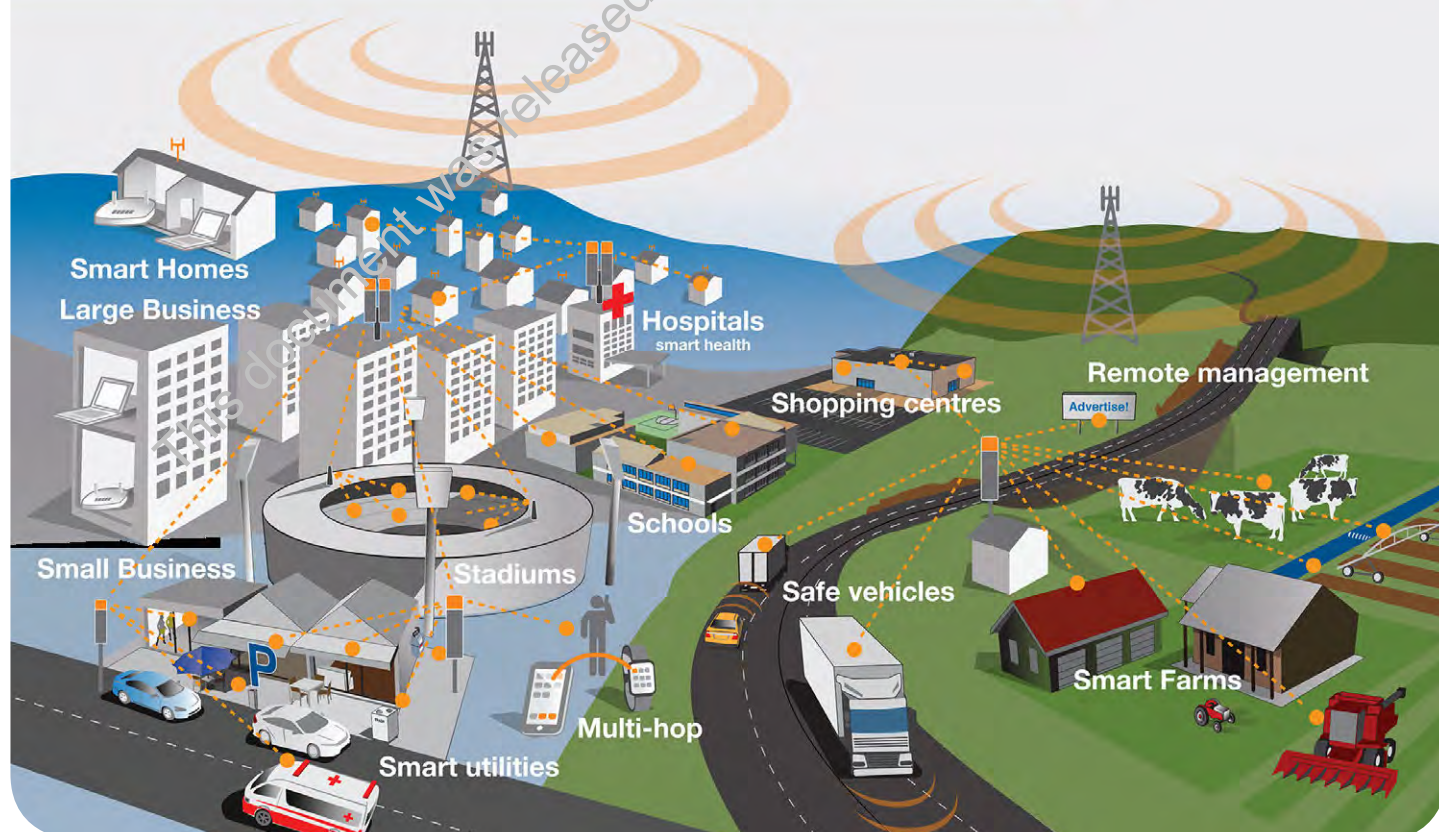
5G has been designed to meet the very large growth in data and connectivity of today's modern society, the internet of things with billions of connected devices, and tomorrow's innovations.

5G will initially operate in conjunction with existing 4G networks before evolving to fully standalone networks in subsequent releases and coverage expansions.

In addition to delivering faster connections and greater capacity, a very important advantage of 5G is the fast response time referred to as latency.

Latency is the time taken for devices to respond to each other over the wireless network. 3G networks had a typical response time of 100 milliseconds, 4G is around 30 milliseconds and 5G will be as low as 1 millisecond. This is virtually instantaneous opening up a new world of connected applications.

## THE CONNECTED COMMUNITY



5G uses radio waves or radio frequency (RF) energy to transmit and receive voice and data connecting our communities.



## What will 5G enable?

**5G will enable instantaneous connectivity to billions of devices, the Internet of Things (IoT) and a truly connected world.**

There are three major categories of use case for 5G:

- **Massive machine to machine communications** – also called the Internet of Things (IoT) that involves connecting billions of devices without human intervention at a scale not seen before. This has the potential to revolutionise modern industrial processes and applications including agriculture, manufacturing and business communications.
- **Ultra-reliable low latency communications** – mission critical including real-time control of devices, industrial robotics, vehicle to vehicle communications and safety systems, autonomous driving and safer transport networks. Low latency communications also opens up a new world where remote medical care, procedures, and treatment are all possible.
- **Enhanced mobile broadband** – providing significantly faster data speeds and greater capacity keeping the world connected. New applications will include fixed wireless internet access for homes, outdoor broadcast applications without the need for broadcast vans, and greater connectivity for people on the move.

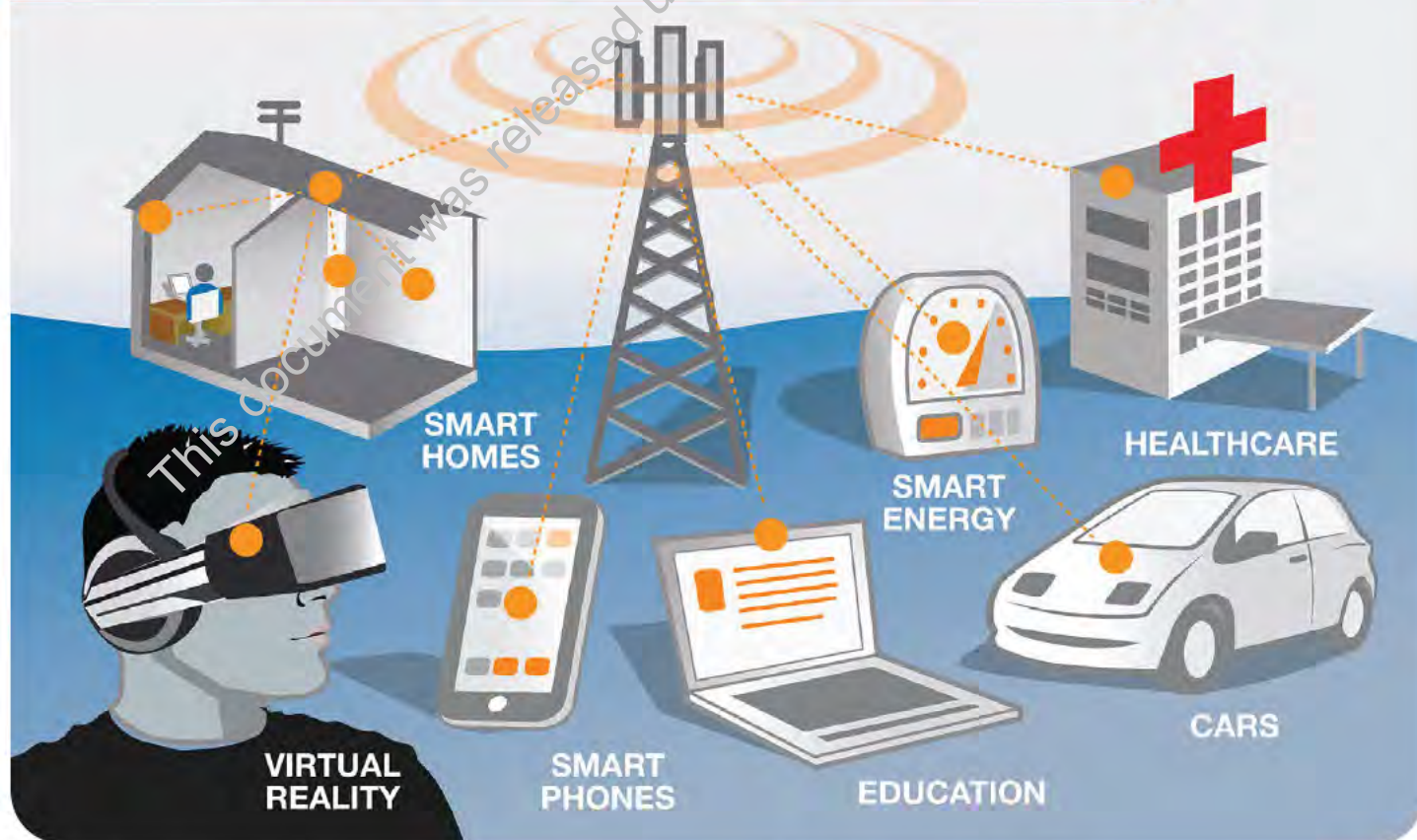
**For communities,** 5G will enable the connection of billions of devices for our smart cities, smart schools and smart homes, smart and safer vehicles, enhance health care and education, and provide a safer and more efficient place to live.

**For businesses and industry,** 5G and IoT will provide a wealth of data allowing them to gain insights into their operations like never before. Businesses will operate and make key decisions driven by data, innovate in agriculture, smart farms and manufacturing, paving the way for cost savings, better customer experience and long term growth.

**New and Emerging technologies** such as virtual and augmented reality will be accessible by everyone. Virtual reality provides connected experiences that were not possible before. With 5G and VR you will be able to travel to your favourite city, watch a live football match with the feeling of being at the ground, or even be able to inspect real estate and walk through a new home all from the comfort of your couch.

**5G will keep us connected in tomorrow's smart cities, smart homes and smart schools, and enable opportunities that we haven't even thought of yet.**

## 5G CONNECTING THE COMMUNITY



5G will provide the speed, low latency and connectivity to enable a new generation of applications, services and business opportunities that have not been seen before.



## When did 5G launch?

### When did 5G launch?

Initial 5G services commenced in many countries in 2019 and widespread availability of 5G is expected by 2025.

### What are the first applications for 5G?

Fixed wireless access for homes and enhanced mobile broadband services are the first applications using new 5G phones, tablets, wireless access modems and hot spots.

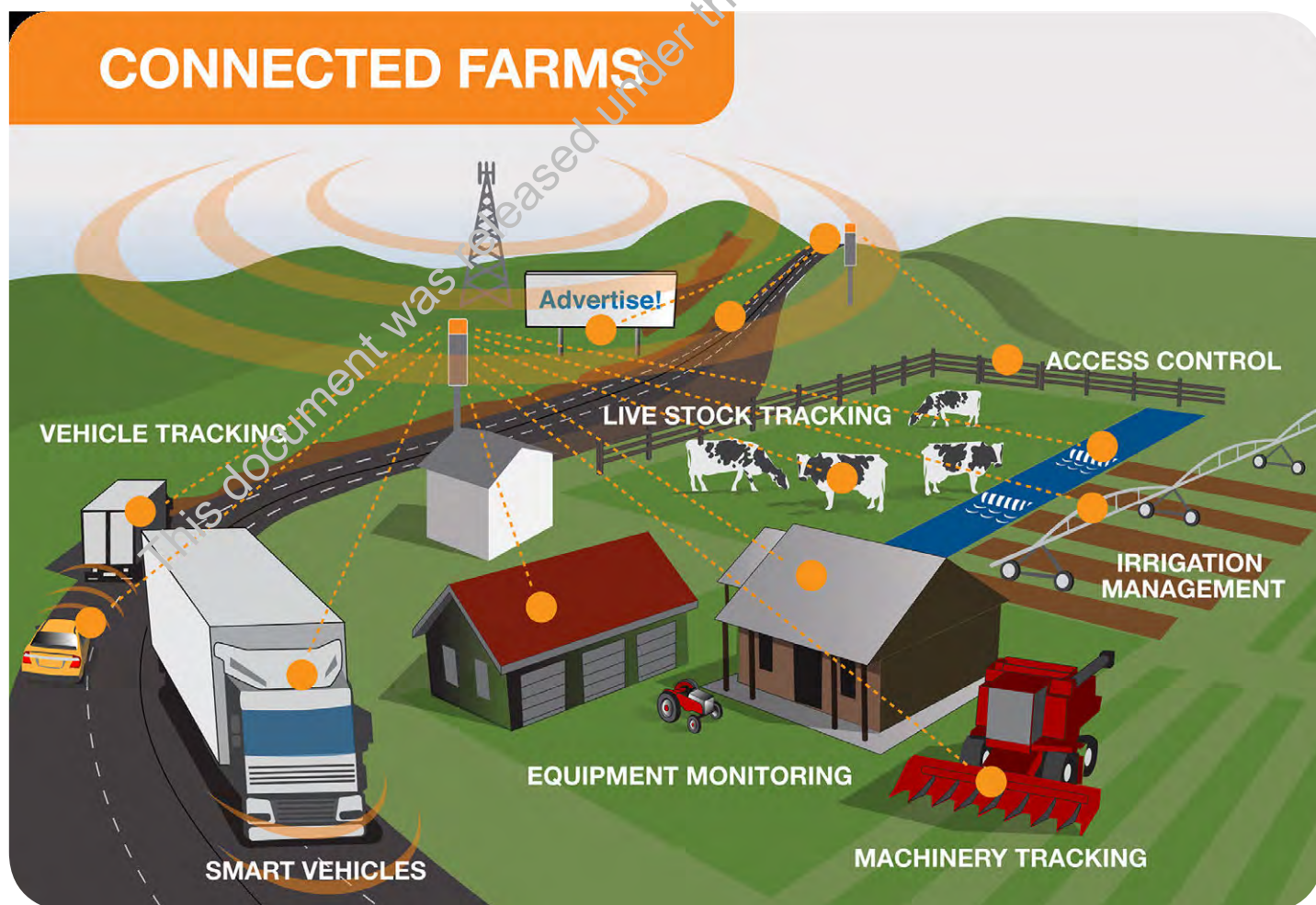
### What do 5G devices offer?

The prime benefits of 5G devices will be significantly faster speeds in data access, downloading and streaming content. In addition, 5G devices will have increased computing power and make use of the lower latency, meaning that the devices will enjoy virtually instantaneous connections to the network, as well as greater connectivity when on the move due to the use of advanced antenna beam steering.

### What devices are available for 5G?

Mobile handsets, tablets and hot spots equipped with 3G, 4G and 5G connectivity were launched in 2019 and low latency and widespread machine to machine applications using 5G will be developed in the coming years.

## CONNECTED FARMS



5G Enhanced Mobile Broadband and IoT will revolutionise agriculture and farming.



## How does 5G work?

Most operators will initially integrate 5G networks with existing 4G networks to provide a continuous connection. A mobile network has two main components, the 'Radio Access Network' and the 'Core Network'.

**The Radio Access Network** – consists of various types of facilities including small cells, towers, masts and dedicated in-building and home systems that connect mobile users and wireless devices to the main core network.

Small cells will be a major feature of 5G networks particularly at the new millimetre wave (mmWave) frequencies where the connection range is very short. To provide a continuous connection, small cells will be distributed in clusters depending on where users require connection which will complement the macro network that provides wide-area coverage.

5G Macro Cells will use MIMO (multiple input, multiple output) antennas that have multiple elements or connections to send and receive more data simultaneously. The benefit to users is that more people can simultaneously connect to the network and maintain high throughput. Where MIMO antennas use very large numbers of antenna elements they are often referred to as 'massive MIMO', however, the physical size is similar to existing 3G and 4G base station antennas.

**The Core Network** – is the mobile exchange and data network that manages all of the mobile voice, data and internet connections. For 5G, the 'core network' is being redesigned to better integrate with the internet and cloud based services and also includes distributed servers across the network improving response times (reducing latency).

Many of the advanced features of 5G including network function virtualization and network slicing for different applications and services, will be managed in the core.

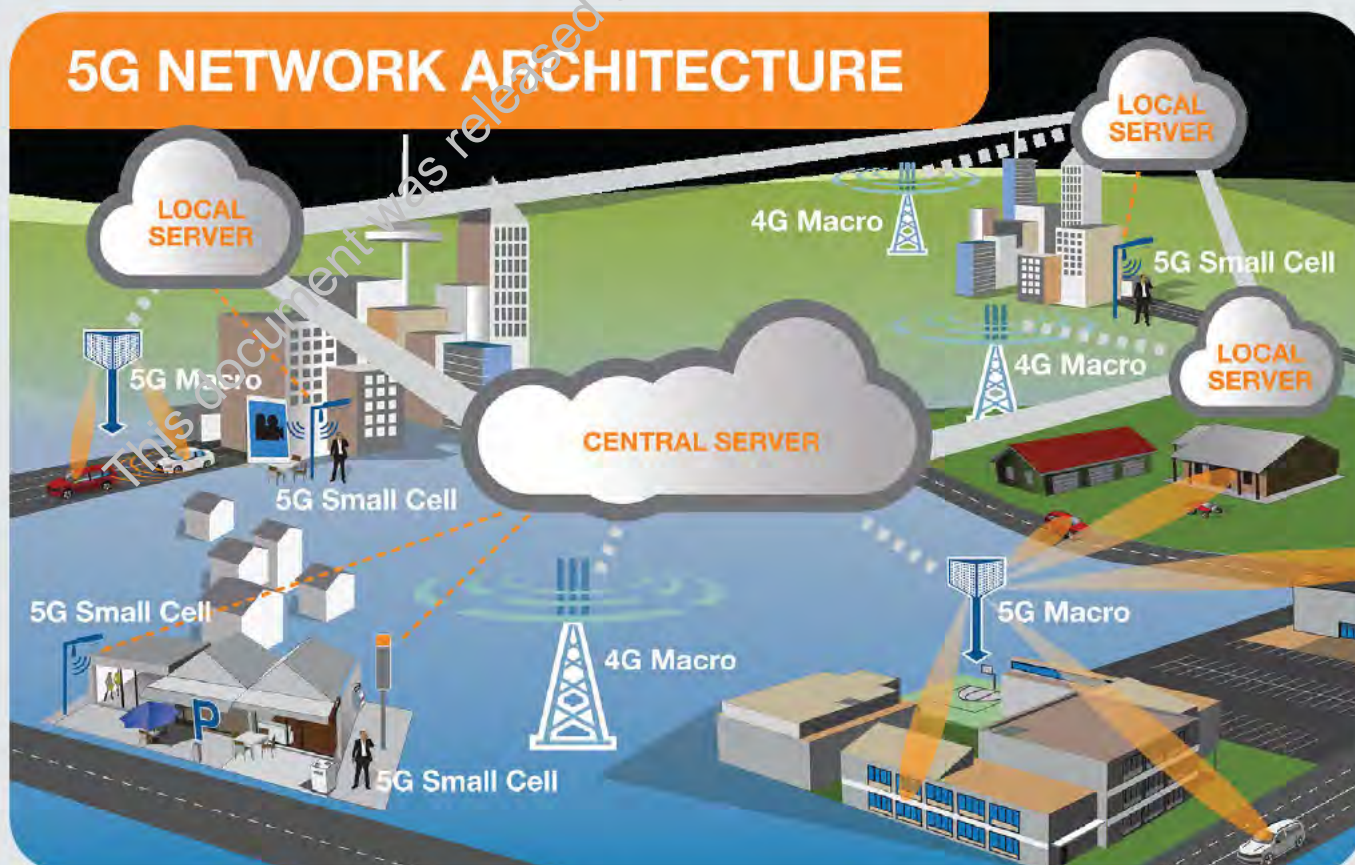
The following illustration shows examples of local cloud servers providing faster content to users (movie streaming) and low latency applications for vehicle collision avoidance systems.



Example of a local server in a 5G network providing faster connection and lower response times.

**Network Slicing** – enables a smart way to segment the network for a particular industry, business or application. For example emergency services could operate on a network slice independently from other users.

**Network Function Virtualization (NFV)** – is the ability to instantiate network functions in real time at any desired location within the operator's cloud platform. Network functions that used to run on dedicated hardware for example a firewall and encryption at business premises can now operate on software on a virtual machine. NFV is crucial to enable the speed efficiency and agility to support new business applications and is an important technology for a 5G ready core.



5G network architecture illustrating 5G and 4G working together, with central and local servers providing faster content to users and low latency applications.

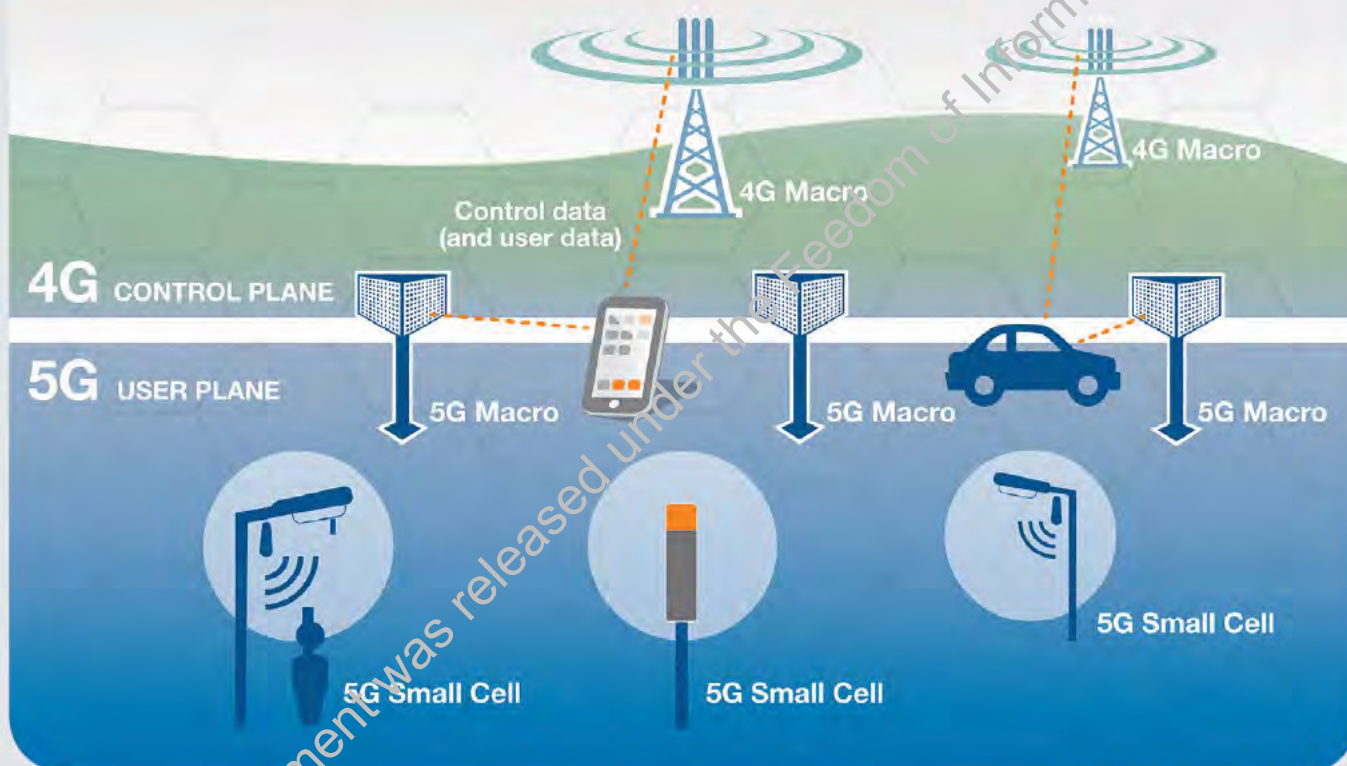


## 5G working with 4G

When a 5G connection is established, the User Equipment (or device) will connect to both the 4G network to provide the control signalling and to the 5G network to help provide the fast data connection by adding to the existing 4G capacity.

Where there is limited 5G coverage, the data is carried on the 4G network providing the continuous connection. Essentially with this design, the 5G network is complementing the existing 4G network.

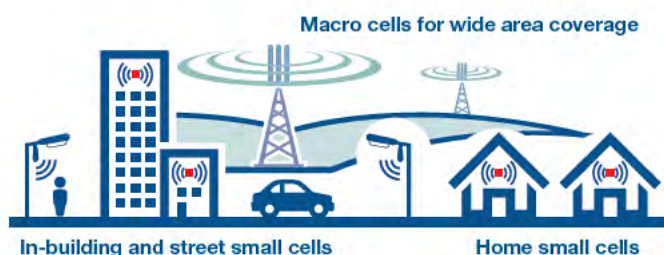
### 5G INTEGRATION WITH 4G



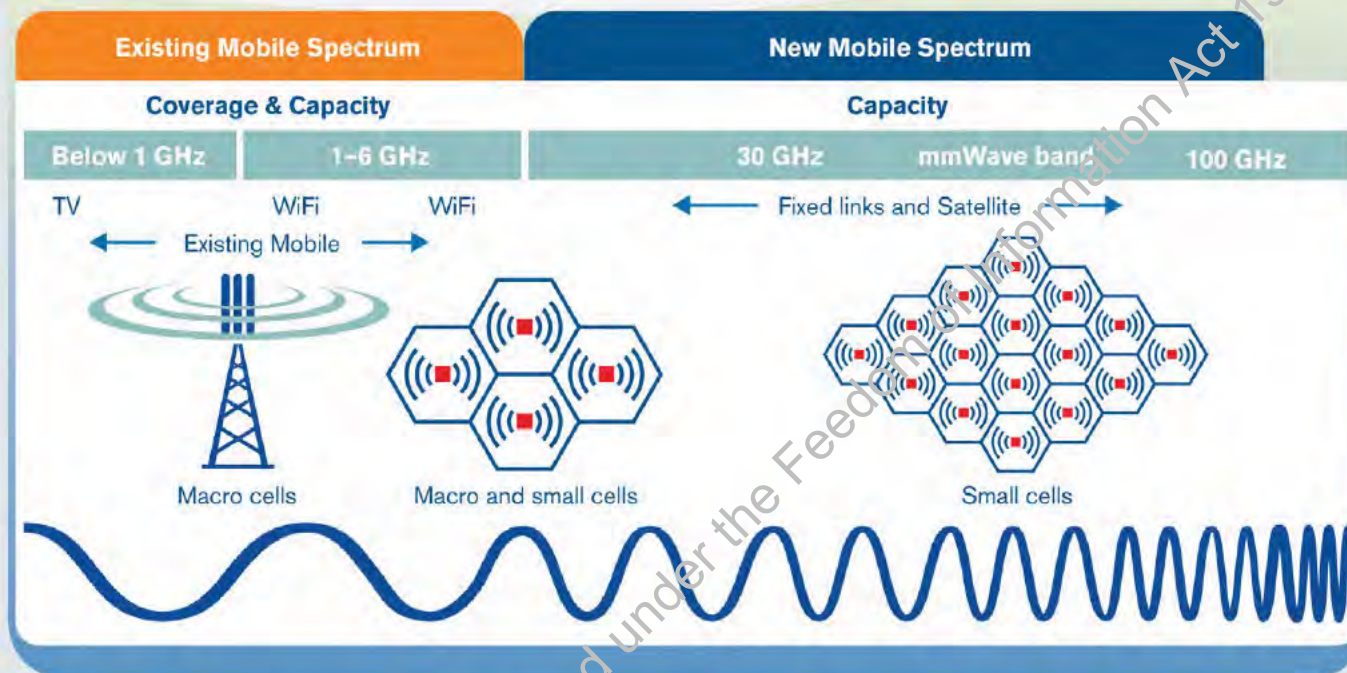
How does 5G deliver continuous connection, greater capacity, and faster speed and response times?

#### Better Connection – always connected

5G networks are designed to work in conjunction with 4G networks using a range of macro cells, small cells and dedicated in-building systems. Small cells are mini base stations designed for very localised coverage typically from 10 metres to a few hundred metres providing in-fill for a larger macro network. Small cells are essential for the 5G networks as the mmWave frequencies have a very short connection range.



# 5G SPECTRUM



Mobile spectrum showing the radio frequency range from 30 GHz to 100 GHz with new 5G spectrum above 6GHz. Other radio services (TV, Wi-Fi, Fixed links & Satellite) are shown for reference.

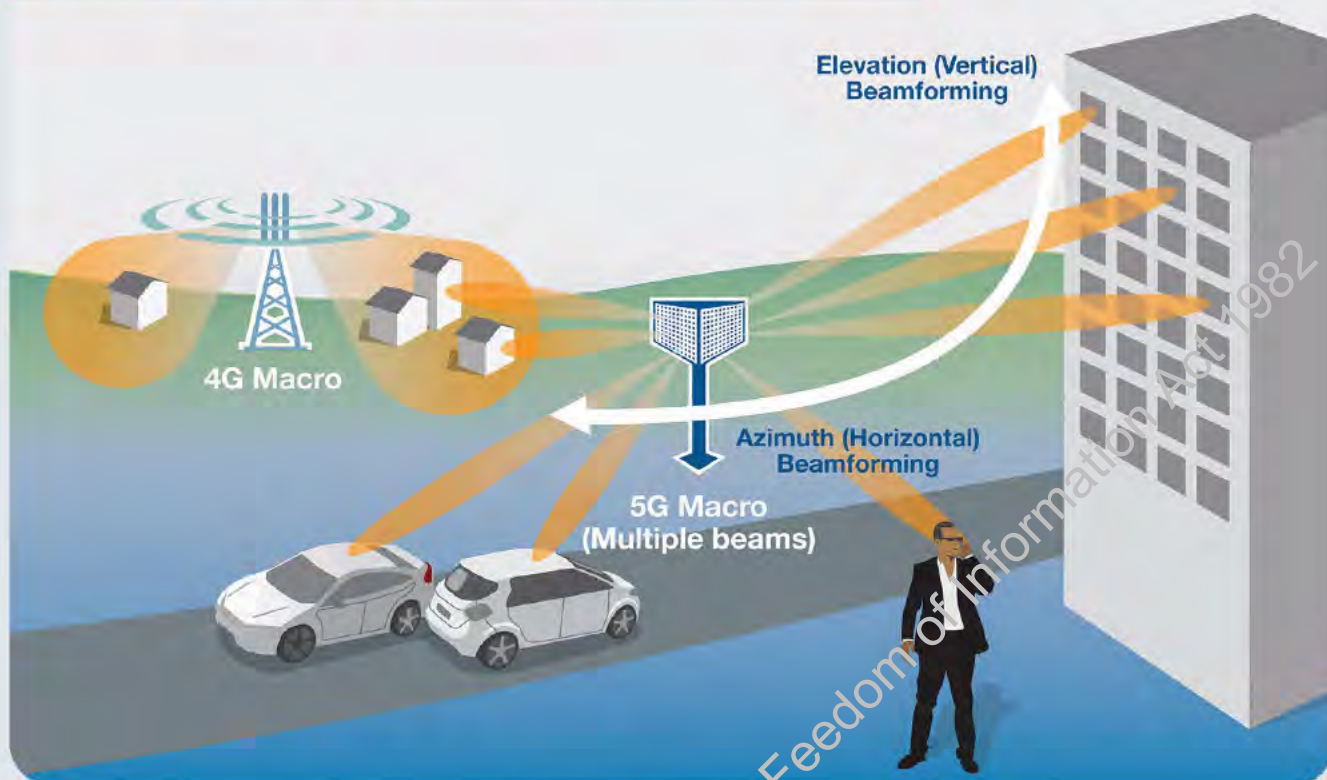
Increased Spectrum – greater capacity, more users and faster speed.

In many countries the initial frequency bands for 5G are below 6 GHz (in many cases in the 3.3-3.8 GHz bands) and similar frequencies to existing mobile and Wi-Fi networks. Additional mobile spectrum above 6 GHz, including the 26-28 GHz bands often referred to as millimeter (mm) Wave, will provide significantly more capacity compared to the current mobile technologies. The additional spectrum and greater capacity will enable more users, more data and faster connections. It is also expected that there will be future reuse of existing low band spectrum for 5G as legacy networks decline in usage and to support future use cases.

The increased spectrum in the mmWave band will provide localised coverage as they only operate over short distances. Future 5G deployments may use mmW frequencies in bands up to 86 GHz.



# MIMO BEAMFORMING



Massive MIMO antenna and advanced beam steering optimises EMF and increases efficiency.

## Massive MIMO - multiple element base station - greater capacity, multiple users, faster data

5G will use 'massive' MIMO (multiple input, multiple output) antennas that have very large numbers of antenna elements or connections to send and receive more data simultaneously. The benefit to users is that more people can simultaneously connect to the network and maintain high throughput.

The overall physical size of the 5G massive MIMO antennas will be similar to 4G, however with a higher frequency, the individual antenna element size is smaller allowing more elements (in excess of 100) in the same physical case.

5G User Equipment including mobile phones and devices will also have MIMO antenna technology built into the device for the mmWave frequencies.

## MIMO – Beam Steering

Beam steering is a technology that allows the massive MIMO base station antennas to direct the radio signal to the users and devices rather than in all directions. The beam steering technology uses advanced signal processing algorithms to determine the best path for the radio signal to reach the user. This increases efficiency as it reduces interference (unwanted radio signals).



4G sector base station and 5G base station with a new multi element massive MIMO antenna array. The overall physical size of the 5G base station antenna is expected to be similar to a 4G base station antenna.

## Lower latency - Faster response times

Lower latency with 5G is achieved through significant advances in mobile device technology and mobile network architecture.

Technology	Response time (milliseconds)
4G - LTE systems	20-30 ms
5G - enhanced mobile broadband	4-5 ms
5G - URLLC (Ultra Reliable Low Latency Communications) systems	1 ms

### 5G Devices (User Equipment)

Improved technology and computing power in the User Equipment and devices is a major contributor to faster response times. As the device chip sets become more advanced, they can process data faster and reduce the response time called latency.

### 5G Network - Mobile Network Architecture

Significant changes in both the Core Network (Core) and Radio Access Network (RAN) are required to deliver low latency.

#### Core Network Changes

With the redesigned core network, signalling and distributed servers, a key feature is to move the content closer to the end user and to shorten the path between devices for critical applications.

Good examples are video on demand streaming services where it is possible to store a copy or 'cache' of popular content in local servers, so the time to access is quicker.

### Radio Access Network Changes

To achieve the low latency, the Radio Access Network (RAN) will need to be re-configured in a manner that is highly flexible and software configurable to support the very different characteristics of the types of services that the 5G system envisages.

Low latency and high reliability over the air interface requires new radio techniques to minimise the time delays through the radio within a few TTIs (time transmit intervals) along with robustness and coding improvements to achieve high degrees of reliability (e.g. one message is delayed or lost in every billion).

Implementing a virtual, dynamic and configurable RAN allows the network to perform at very low latency and high throughput, but it also allows the mobile network to adjust to changes in network traffic, network faults and new topology requirements.

What will be re-configured? The new architecture will exist as a 4G/5G split RAN where the user plane (5G) and the control plane (4G) are separate. This requires the separation of general purpose hardware and specialised network hardware. The functionality of general purpose hardware (nodes) are suitable for network functions virtualisation (NFV), where the specialised hardware in the RAN will become dynamically configurable.





# 5G and EMF Safety

## Are there safety limits for 5G and radio waves?

Yes. Comprehensive international guidelines exist governing exposure to radio waves including the frequencies proposed for 5G. The limits have been established by independent scientific organizations, such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and include substantial margins of safety to protect all people against all established hazards.

These guidelines have been widely adopted in standards around the world, and are endorsed by the World Health Organization (WHO).

## What do the experts say about 5G and health?

**World Health Organization – In relation to radio frequency exposures and wireless technology and health, the general conclusion from the World Health Organization (WHO) is:**

*“Despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health”*

WHO - About Electromagnetic Fields – Summary of Health Effects  
Key Point 6

**Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) - In relation to 5G and health, ARPANSA, the agency of the Commonwealth Government tasked with protecting people and the environment from the harmful effects of radiation, says that;**

*“Contrary to some claims, there is no established health effects from the radio waves that the 5G network uses”*

Source WHO Backgrounder on base stations and wireless technologies

**International Commission for Non-Ionizing Radiation Protection (ICNIRP) – In relation to 5G and the EMF exposure guidelines ICNIRP, an international commission recognised by the WHO says;**

- *The ICNIRP Guidelines are very conservative and include large reduction factors.*
- *The ICNIRP Guidelines protect all people including children exposed to radiofrequency EME in the frequency range 100 kHz to 300 GHz.*
- *The ICNIRP Guidelines cover the frequencies used for 5G, including mmWave bands.*

**Australian Centre for Electromagnetic Bioeffects Research (ACEBR) - In relation to 5G frequencies, the general conclusion from Dr Sarah Loughran, Director of the ACEBR is:**

*“Based on the improvements in technology, the level of exposure is expected to be lower than what it has been in previous technologies.”*

**The European Commission in relation to whether the existing European Council Recommendation (which adopted ICNIRP's Guidelines) covers 5G and ensures adequate protection for the public:**

*“Protection of public health ... is always taken into account. In particular, the strict and safe exposure limits for electromagnetic fields recommended at EU level by Council Recommendation 1999/519/EC on the exposure of the general public to electromagnetic fields apply for all frequency bands currently envisaged for 5G.”*

## What research into health effects has been done on 5G?

The electromagnetic frequencies used for 5G are part of the radio frequency spectrum which has been extensively researched in terms of health impacts for decades. Over 50 years of scientific research has already been conducted into the possible health effects of the radio signals used for mobile phones, base stations and other wireless services including frequencies planned for 5G and mmWave exposures.

The data from this research has been analysed by many expert review groups. Weighing the whole body of science, there is no evidence to convince experts that exposure below the guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) carries any known health risks, for adults or children.

The EMF-Portal ([www.emf-portal.org](http://www.emf-portal.org)) is an open-access extensive database of scientific research into the effects of EMF, including studies on the effects of RF on health. It is managed by the RWTH Aachen University, Germany and linked from the WHO website. EMF-Portal contains more than 28,000 published scientific articles on the biological and health effects of EMF and 3,000 studies on mobile communications.

In terms of research specifically on 5G frequencies, the database lists over 500 studies on mmWave EMF health related research. Extensive research on mmWave and health has been conducted on radar, microwave and military applications.

### ■ Is the research on 5G, mmWave and health continuing?

**Yes** – One area of current research on mmWave frequencies, for example, is focused on the alignment of the human exposure guidelines at frequencies below and above 6 GHz where the measurement parameter changes from Specific Absorption Rate (SAR) below 6 GHz to Power Density above 6 GHz. For more on SAR see <http://www.sartick.com/>.

The research is also focused on the dielectric properties of human skin to ensure that the power density levels and averaging area across the skin align with the temperature values that are the basis of the human exposure guidelines.

For example, a mobile device operating at 5 GHz will be assessed for compliance by measuring the SAR. The SAR levels are set to limit the absorbed power so that the temperature rise in the head or body from the device operating at maximum power is below the SAR limit of 2W/kg. If the same device was operating at 6.5 GHz, a power density measurement would be required, so that the device complies with relevant Power Density limit.

### ■ Will 5G devices comply with the safety guidelines?

5G technology will be used in a wide range of devices and will be the backbone for the Internet of Things (IoT). All these devices will be evaluated to ensure that they conform to the RF safety limits adopted by agencies around the world.

### ■ Is 5G safe for children?

**Yes** – The EMF safety limits cover the 5G frequency range and include substantial margins of safety to protect all people including children from all established hazards.

### ■ What about children wearing RF transmitting devices or wearables for security or entertainment?

The radio transmitters in such devices are generally transmitting with very low power. When tested they are required to comply with national or international exposure limits. When watching a video the device is mostly receiving information and only transmits information for brief periods. Other types of devices such as personal trackers also transmit for short periods of time.

### ■ Will 5G devices automatically minimise transmitter power?

**Yes** – 5G devices will automatically minimise the transmit power to the lowest level in order to complete a satisfactory communication with the network. Such automatic power control has existed in previous generations of mobile technologies (2G, 3G and 4G) and helps to minimize interference, prolong battery life and also has the effect of limiting the EMF exposure of the user. The transmit power of the device is controlled by the network.

### ■ Does 5G mean higher power and higher exposure levels?

**No** – 5G networks are designed to be more efficient and will use less power than current networks for similar services.

With the introduction of new technologies, there may be a small increase in the overall level of radio signals due to the fact that new transmitters are active. In some countries deployment of 5G may occur as part of closure of earlier wireless networks. Based on the transition from previous wireless technologies we can expect that the overall exposure levels will remain relatively constant and a small fraction of the international exposure guidelines.

### ■ What types of base stations are used for 5G?

Base stations used for 5G will consist of various types of facilities including small cells, towers, masts and dedicated in-building and home systems.

Small cells will be a major feature of 5G networks particularly at the new mmWave frequencies where the connection range is very short. To provide a continuous connection, small cells will be distributed in clusters depending on where users require connection and this will complement the macro network 5G base stations.

5G networks will work in conjunction with 4G networks. In many cases, existing 4G base stations will be used for additional 5G equipment.

### ■ Do 5G base stations automatically minimise transmitter power?

**Yes** – 5G networks are specifically designed to minimise transmitter power, even more than existing 4G networks. 5G networks use a new advanced radio and core architecture which is very efficient and minimises transmissions consistent with service requirements which results in optimised EMF levels. The network also controls the power level of the device to the lowest level in order to complete a satisfactory communication with the network.

### ■ What will be the size of compliance zones around 5G network antenna sites?

The compliance zone around the new advanced antenna technology used by 5G is smaller than for previous 3G and 4G technologies using similar transmitter powers.

Mobile network antennas are typically directional and compliance zones extend in front of the antenna and a small distance above and below.

Mobile networks are designed to use only the power needed to provide quality services. Too much power would cause interference and affect all users. A key advantage of 5G is a substantial increase in network energy efficiency.

Where 5G is added to an existing site with other mobile technologies, the existing compliance zone may increase due to the addition of the 5G technology however this will depend on the site design and network configuration.

### ■ Is 5G similar to the Active Denial System used by the military?

**No** – Active Denial Systems developed by the military use very high powered mmWave directional signal, sometimes called a 'heat ray' in the 90 GHz band designed to heat the surface of targets such as the skin of a human, and through the heat, control or restrict access.

5G and other mmWave radio communications use different frequencies and a fraction of the power. The human exposure limits for mobile communications technology prevent heating occurring.

Additional information on ADS systems is available here.

<http://jnlp.defense.gov/About/Frequently-Asked-Questions/Active-Denial-System-FAQs/>

[www.emfexplained.info](http://www.emfexplained.info)



# Small cells: a guide

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Association

## What are small cells?

Small cells provide additional network capacity or mobile device coverage to a small geographic area. They operate at lower power than a traditional mobile phone base station and use smaller equipment. Small cells complement existing technology and work with existing sites to provide a better network experience.

Small cells can be deployed with minimal visual impact as they use smaller antennas, smaller equipment and can be co-located on existing infrastructure such as electricity and light poles.

Small cells can be used to either increase the existing network capacity or provide new coverage. Small cells are built in all areas including urban and rural communities and are suitable for sensitive locations such as residential areas.

## How will I benefit?

Small cells can improve network coverage indoors and at street level.

This means your service may have:



Less call drop outs



Improved internet access



Improved data rates for all kinds of uses such as streaming services, smart homes, gaming



Better network experience indoors

The use of small cells will lead to greater efficiency throughout the network, improving opportunities to work and study from home, run a business on the go, keep up with family and friends online and stream video and audio in places that would otherwise be difficult.

## What do they look like?

A small cell facility typically includes one or two external antenna(s) and an equipment box.

Examples of small cell facilities below:





# Small cells: a guide

## How are small cell sites chosen?

**Most small cells will be placed on existing infrastructure such as utility poles and street furniture.** They are located in places where people live, work and play so that we can get things done when and where we need to.

There are many factors that are considered when choosing the location for small cells:

- Network coverage requirements for the area
- Proximity to existing sites and planned new sites
- Existing infrastructure that can be used
- The height of available structures
- Free space and capacity of the structure
- Topography and the surrounding environment



## Are small cells safe to be near houses?

**Yes. All mobile phone base stations, including small cells, must operate within safety limits** set by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). These limits protect the community, including children and the elderly, 24 hours a day.

The environmental electromagnetic energy (EME) levels from small cells are reported in an ARPANSA environmental report, and are available at [www.rfnasa.com.au](http://www.rfnasa.com.au).

## Do small cells require local government approval?

**Mobile phone carriers are required to consult with Councils, and consider their feedback.**

Generally small cells are installed using the Commonwealth Telecommunications (Low-impact Facilities) Determination 2018; therefore local government approval is generally not required.

## How are residents notified?

**The Mobile Phone Base Station Deployment Code requires Carriers to notify Council, residents and key stakeholders** in the immediate vicinity of a proposed small cell location. Interested and affected parties will be invited to provide comments on the proposal.

You can find out information on a small cell proposal by searching the location at [www.rfnasa.com.au](http://www.rfnasa.com.au).

## Where can I get more information on small cells?

**Australian Communications and Media Authority (ACMA)**

1300 850 115

<https://www.acma.gov.au/theACMA/a-guide-to-small-cells>

**Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)**

(03) 9433 2211

[www.arpansa.gov.au](http://www.arpansa.gov.au)

**EMF Explained web site**

[www.emfexplained.info](http://www.emfexplained.info)

**The Mobile Phone Base Station Deployment Code**

<http://www.commsalliance.com.au/Documents/all/codes/c564>

**Mobile Carriers Forum**

<http://amta.org.au/mcf>



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**AMTA**

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# Invitation

## 5G Mobile Drop-in Information Session

The 4G/5G mobile ecosystem is rich in benefits for our economy and society.

There is an ongoing high demand for mobile data applications and services from consumers and industries. The mobile sector is responding via investments in new infrastructure and the latest generation technologies.

We look forward to sharing 5G demonstrations and new information on key health and safety issues.



### Event Details

**Date:** Monday, 25<sup>th</sup> November, 2019

**Time:** 10am – 4pm

**Venue:** Mural Hall, Parliament House

Please join us for key insights into 5G science and facts.

Enquiries: [contact@amta.org.au](mailto:contact@amta.org.au) | 02 8920 3555

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