



Public Health  
England

# 5G Technologies; Radio Waves and Health

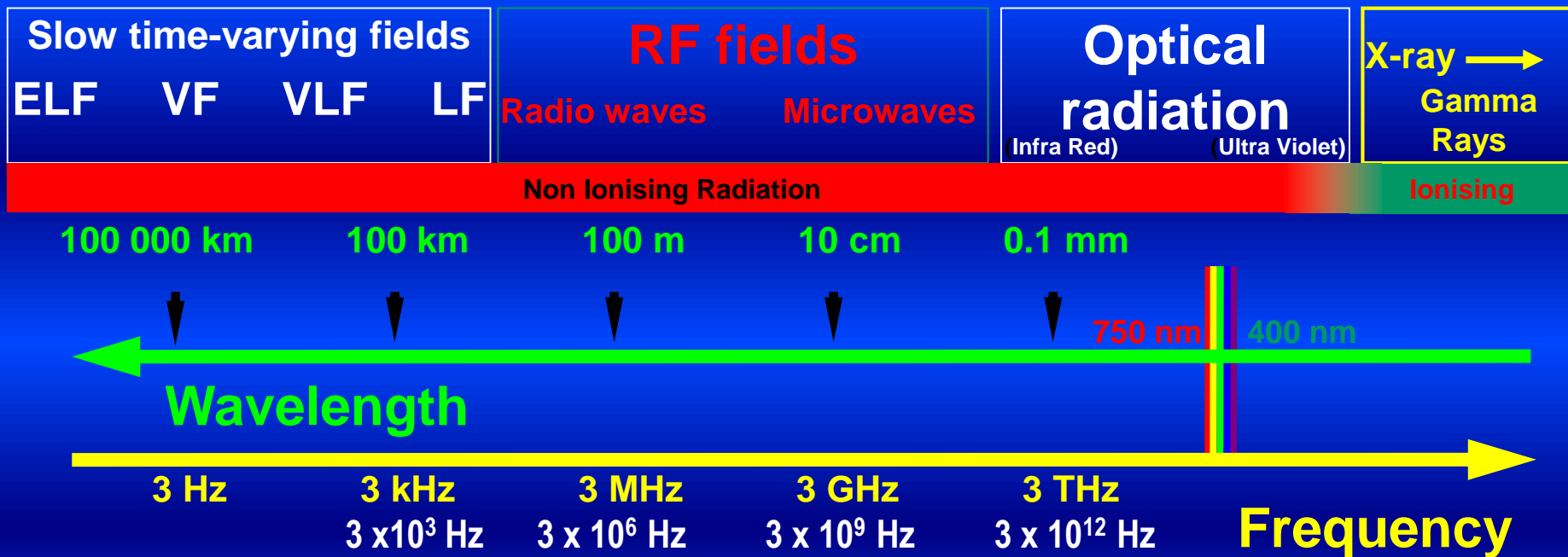
Azadeh Peyman (PhD)  
Electromagnetic Field Dosimetry Group  
Radiation Dosimetry Department  
Centre for Radiation Chemical and Environmental Hazards (CRCE)



# Public Health England

- ✓ Public Health England (PHE) is the expert national public health agency which fulfils the English Secretary of State for Health's statutory duty to protect health and address inequalities, and executes his power to promote the health and wellbeing of the nation
- ✓ PHE has operational autonomy. It has an Advisory Board with a non-executive Chairman and non-executive members
- ✓ The Centre for Radiation, Chemical and Environmental Hazards (CRCE) is the focus of PHE's expertise on ionising and non-ionising radiations

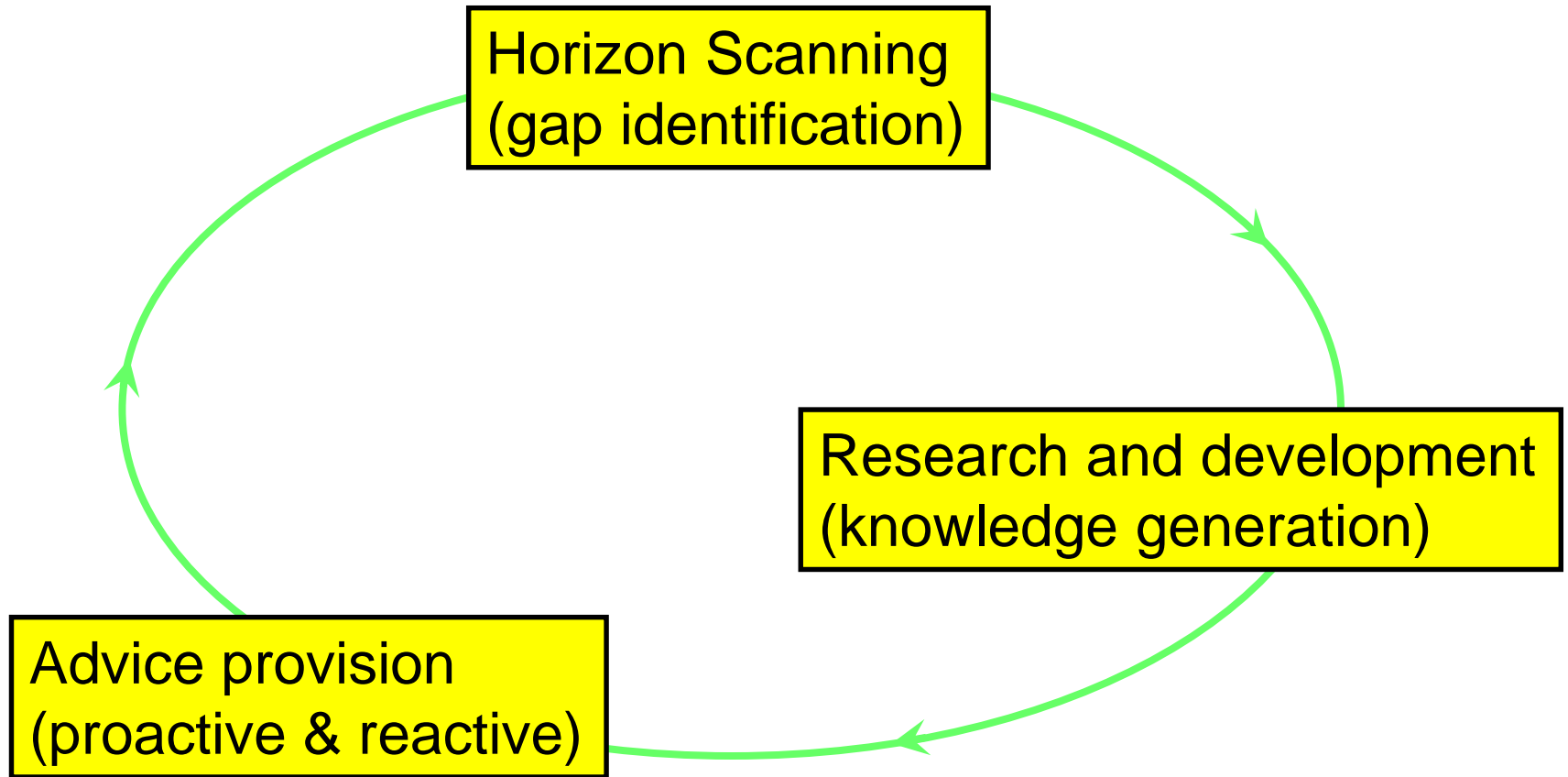
# The Electromagnetic Spectrum



Energy of RF fields is too small to cause ionisation in matter



# Non-ionising Radiation





# Development and Provision of Advice

## ➤ Proactive work

- Lead and support scientific reviews
- Develop advice on exposure guidelines
- Develop advice on specific sources/situations
- Contribute to the development of technical standards
- Support government in the implementation of regulations

## ➤ Reactive work

- Respond to enquiries and requests for information

Work nationally and internationally on the above



# Health-related Studies

- The public health implications of exposure to radio waves is a topic on which a large number of studies have been published over several decades and on which a range of opinions can be found
  - ✓ Human experimental studies (short term/reversible effects)
  - ✓ Human observational (workplace, environment, device use)
  - ✓ Animal studies (whole life assays)
  - ✓ Mechanistic studies (animals/cells)
  
- Results of these studies are published in scientific journals and form the basis of health-related advice



# Current PHE Advice on Exposure to EMF

*“The Board of NRPB has recommended the adoption in the UK of the guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) for limiting exposures to electromagnetic fields (EMFs) between 0 and 300 GHz. This follows a thorough review of current scientific knowledge on the effects of EMFs and an extensive consultation exercise. The Board recognises the need to adopt a cautious approach in the interpretation of scientific knowledge and the benefits of common international guidelines”*

*NRPB was succeeded by HPA, and then by PHE*

- Adopted in 2004 and maintained since
- ICNIRP is an independent international scientific organisation
- Officially recognised by WHO
- Members are invited (none from industry)
- Publishes guidelines and statements

<http://www.icnirp.org/>



# Basis of ICNIRP Guidelines

- ICNIRP's guidelines are based on known, or established, adverse health effects. Such effects :
  - ✓ have to be replicable,
  - ✓ the studies revealing the effects have to be of sufficient quality
  - ✓ the effects found have to be explicable generally, based on scientific knowledge
  
- ICNIRP reviewed the whole-range of investigated health effects before deciding to set its limits based on the avoidance of excessive localised and whole-body heating.





# Reviews of The Evidence

- Main advice from PHE is that ICNIRP guidelines should be adopted, and that there is no convincing evidence that exposures below these guidelines result in adverse health effects for the general population
- This conclusion was reached in the 2012 report from the independent Advisory Group on Non-ionising Radiation (AGNIR); however, other national and international expert groups have examined the accumulated evidence about radio wave exposures since 2012 and their conclusions remain broadly in line with those reached by AGNIR
- Among the more recent reviews is one prepared by the EU Commission's Scientific Committee on Emerging and Newly Identified Health Risks, which was published in 2015
- The World Health Organization (WHO) is presently developing a major systematic review of the evidence on this topic



# Monitoring The Evidence

- PHE keeps up-to-date with the latest evidence in a number of ways, including:
  - ✓ having its own specialist staff that carry out in-house and collaborative research.
  - ✓ contributing to and learning from the work of other organisations that are active in reviewing the evidence and developing health-related guidance on this topic, including WHO and ICNIRP
  - ✓ PHE has a formal collaborating role in WHO's international EMF Project



# Current Advice on RF



[Home](#) > [Radiation](#)

Collection

## Electromagnetic fields

Advice on exposure to electromagnetic fields in the everyday environment, including electrical appliances in the home and mobile phones.

Published 9 July 2013

Last updated 3 October 2019 — [see all updates](#)

From: [Public Health England](#)

Contents

- [Static fields](#)
- [Low frequency electric and magnetic fields](#)
- [Radio waves](#)

These documents cover:

— [Health effects of radio waves and health](#)

### Related content

[Radiofrequency electromagnetic fields: health effects](#)

[Mobile phone base stations: radio waves and health](#)

[Wireless networks \(wi-fi\): radio waves and health](#)

## Radio waves

Sources of radio waves in homes and offices include mobile phones, wi-fi, smart meters. Other sources of radio waves include TV and radio transmissions, radar and satellite communications, which use radio waves to operate.

Radio waves belong to the category of non-ionising radiation (NIR). This is the term given to the part of the electromagnetic spectrum where there's insufficient quantum energy to cause ionisations in living matter.

### [5G technologies: radio waves and health](#)

3 October 2019    Guidance

### [Radiofrequency electromagnetic fields: health effects](#)

1 April 2012    Research and analysis

### [Mobile phone base stations: radio waves and health](#)

16 May 2019    Guidance

### [Wireless networks \(wi-fi\): radio waves and health](#)

1 November 2013    Guidance

### [Smart meters: radio waves and health](#)

28 June 2017    Guidance

### [Radio waves: reducing exposure](#)

1 December 2013    Guidance



# 5G and Health Webpage

[Home](#)

Guidance

## 5G technologies: radio waves and health

Information on exposure to radio signals from 5G technologies.

Published 3 October 2019

From: [Public Health England](#)

### Documents



#### [5G technologies: radio waves and health](#)

Ref: PHE publication gateway reference: GW-739  
HTML



Public Health  
England

Guidance

## 5G technologies: radio waves and health

Published 3 October 2019

[Contents](#)

[Public exposure](#)

[5G frequencies](#)

[Research studies](#)

[Summary](#)

Mobile telecommunications technology has developed through several generations and there are now many 2G, 3G and 4G base stations installed throughout the environment providing services to users of mobile phones and other devices.

### Public exposure

Over the decades, since the networks were first introduced, there has been a general trend towards increasing numbers of smaller transmitters that individually provide services to smaller geographical areas and have reducing radiated powers.

Against this background, many measurements have been made and these continue to show that exposures of the general public to radio waves are well within the international health-related guideline levels that are used in the UK. These guidelines are from the [International Commission on Non-Ionizing Radiation Protection \(ICNIRP\)](#) and underpin health protection policies at UK and European levels.

In relation to the implementation of 5G devices and networks, this technology is at an



## Main messages to communicate on exposure to 5G technologies

- 5G networks use radio waves, just like 2G, 3G and 4G, and, like broadcast radio and television transmitters, have done for decades
- Radio waves are non-ionising radiation – different to ionising radiations, such as x-rays and nuclear radiation, which have different health effects
- The health effects of exposure to radio waves have been researched extensively over several decades and expert reviews have been performed in the United Kingdom and internationally
- ICNIRP provides the exposure guidelines internationally for radio waves
- Expert groups have not found an impact on health when exposures in the studies complied with the international exposure guidelines



## Main messages to communicate on exposure to 5G technologies

- Current technical standards based on the international guidelines apply to 5G products and the UK network operators are already committed to complying with the guidelines
- There may be a small increase in overall exposure to radio waves when 5G is added to an existing telecommunications network or in a new area, but overall exposure is expected to remain low and well within the international guidelines
- Public Health England continues to monitor the health-related evidence and is committed to updating its advice as required
- WHO is currently carrying out a major comprehensive evidence review
- Recent evidence reviews are available from other national and international expert committees



# Communicating The Message

- Published information and advice on PHE website
  - ✓ Linked to authoritative reviews – sources of evidence
- National specialist team supports local health protection teams and directors of public health in local authorities
- Local authorities lead on addressing concerns locally



# Summary

- ✓ The potential for health effects in relation to the introduction of 5G is taken seriously
- ✓ There is a robust framework in place for evaluating and responding to any important new evidence as it emerges
- ✓ There may be a small increase in overall exposure to radio waves when 5G is added to an existing network or in a new area; however, the overall exposure is expected to remain low relative to guidelines and, as such, there should be no consequences for public health
- ✓ PHE is committed to monitoring the evidence applicable to this and other radio technologies, and to revising its advice, should that be necessary





Public Health  
England

Thank You!