Public Health England is the new 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. The radiation protection functions of the former Health Protection Agency (HPA) have moved to PHE and remain UK-wide in scope. 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 is the focus of PHE’s expertise on ionising and non-ionising radiations. It undertakes research to advance knowledge about protection from the risks of these radiations; provides laboratory and technical services; runs training courses; provides expert information and has a significant advisory role in the UK.

PHE has a new website (www.gov.uk/phe), which is part of a unified website that is being developed to bring together information and services from across UK Government organisations. PHE has taken responsibility for the web material previously available from HPA and has provided a link to it though “Health Protection A to Z” from the PHE homepage while a new repository for advisory material is developed.

This report focuses first on recent scientific advice and related policy developments, then on research carried out at PHE and finally on the work of the independent Advisory Group on Non-ionising Radiation (AGNIR), which reports to PHE.

1 Formal advice and policy developments

1.1 Low frequency fields

SAGE was a Government supported stakeholder group which has looked at the feasibility of options for reducing exposure to power frequency electric and magnetic fields as part of a precautionary policy. The group was set up after advice in 2004 that the UK should adopt the ICNIRP guidelines and also to consider the need for further precaution (over and above the guidelines) in relation to the exposure of people to EMFs [1].

SAGE produced two main reports, referred to as “interim assessments” [2] [3] and Government issued responses to these [4] [5] drawing on further advice that HPA provided. The interim assessments identified options and made recommendations on practical precautionary measures to reduce public exposure, some of which have been endorsed and adopted by Government.

In both the first and second assessments, effective communication of information to the public was highlighted. HPA took this theme forward with the assistance of a new working group, the ELF EMF Communication Working Group. The outcome of this process was a suite of new webpages providing information to the public about exposures to power frequency fields and actions that can be taken to reduce them [6].

1.2 Radiofrequency fields

A comprehensive review of the scientific evidence relevant to possible health effects of exposure to radiofrequency electromagnetic fields from the independent Advisory Group on Non-ionising
Radiation (AGNIR) was published in April 2012 [7], and this served as an opportunity to review HPA's advice on radiofrequencies [8]. The AGNIR report and HPA response combine to form an important resource for answering enquiries received about radiofrequencies.

HPA received enquiries and monitored other information that was circulating about the AGNIR report after its publication. Commentators highlighted references that they thought should have been included in the report after publication and HPA examined these carefully. None of these were particularly informative and it was decided that their inclusion would not have altered the report's conclusions. It was also suggested that AGNIR should have mentioned the 2011 IARC evaluation of RF in its report. However, AGNIR had been asked to review original studies and come to its own views on the evidence so considering this review would not have been appropriate. HPA had already taken the IARC classification into account in its own advice [9].

Smart meters became an important theme in enquiries received during the year and a webpage was published setting out HPA's views on the topic [10]. Key messages are that: the evidence to date suggests exposures to the radio waves produced by smart meters do not pose a risk to health, assessments made in other countries that use smart meters have found exposures that are low in relation to internationally agreed guidelines, and that PHE will be carrying out research to assess exposures from the devices as the technology is rolled out. Government plans for smart meters to be rolled out to homes and businesses across the UK between 2015 and 2020, and there is already radio-based metering and energy usage display equipment in some homes as a result of initiatives from energy suppliers.

2 Recent EMF research at PHE
Examples of ongoing work and key publications over the past year are included below.

2.1.1 MobiKids
PHE is taking part in Mobikids, an EU-backed international case-control study, led by CREAL in Barcelona and which began in March 2009 [11]. This project aims to identify the potential associations between the use of communication devices and other environmental risk factors and brain tumours in young people. PHE is leading the exposure assessment work package for the study, study supported by researchers from various participating organisations including Whist laboratories, Paris, and Utrecht and Monash Universities.

Much of the ELF research conducted so far has focused on the measurement of the magnetic fields produced by GSM phones, which are assessed with the aim of identifying representative phones for the numerical modelling of induced current densities in the head. Two dimensional measurement scans have been performed using a robotic scanner and the resulting field patterns are being compared as a basis for grouping of phones. Four IT’IS head models, representing children of various ages and an adult, are available for the induced current density calculations. The current densities for all the heads have been computed and are now ready for migration into dedicated ‘Gridmaster’ software, which is used to demarcate the position of the tumour in the head.

The main challenge of the exposure assessment is to construct an algorithm that combines the dosimetric data with questionnaire-derived parameters, such as phone use, call time, number if calls, number of years use, characteristic of network and the way in which phone is used. The ELF magnetic fields from various electrical appliances are also being assessed and will be considered in the exposure algorithm.

2.1.2 Exposures from smart meters
As mentioned above, smart meters are being rolled out in the UK over the next few years [10]. A new project has started which aims to systematically assess the RF signals emitted by the meters and compare the resulting exposures with the international guidelines as well as with exposures incurred from other telecommunication sources such as mobile phones and WLAN devices.
A literature and technical standards review has been completed and the next step will be to procure meter samples for laboratory testing to assess radiation patterns and power densities. The second part of the project will involve measurements performed in homes to determine exposures under realistic operating conditions. The project will also involve calculation and mapping of the specific energy absorption rate (SAR) distribution in the body to assess exposure in situations where meters are located close to the body.

2.1.3 Personal dosimetry
Building on previous work to evaluate earlier instruments, the technical performance of two ‘state of the art’ personal exposure meters have been evaluated this year on behalf of EPRI. The meters provide a means of improving exposure assessments in RF epidemiological studies, and measurement methods and protocols have been developed for comparing the performance of the latest instruments. The meters are currently being compared in the field with other measurement techniques as part of a collaborative research project conducted with the Dutch National Institute for Public Health and the Environment (RIVM).

2.1.4 Dielectric properties research
The study of dielectric properties of pregnancy related and foetal tissues as a function of gestation are finalised and the results are published [12][13]. In addition, residual dielectric data for porcine glands, gonads and body fluids obtained a few years ago within the UK’s Mobile Telecommunications and Health Research program were published [14].

A new collaborative research project supported by the French Agency For Food Environmental and Occupational Health and Safety (ANSES) has started to analyse and characterise the exposure of very young children to wireless LTE communication systems. The other project partners are France Telecom Orange Labs RD, Telecom Paris, Telecom Bretagne, Telecommunication Metrology Centre of Ministry of Industry and Information Technology (CATR), (CHINA). PHE will provide information/data on the effect of variation of dielectric properties in the development of an anatomical model of young children.

3 Advisory Group on Non-ionising Radiation Protection (AGNIR)
3.1 Background
AGNIR is an independent scientific advisory group with the remit to review work on the biological effects of non-ionising radiation relevant to human health and to advise on research priorities. The Group reports to the PHE Environmental Hazards Programme Board, and has issued fourteen major reports and a number of statements since it was set up in 1990. AGNIR reports have mainly covered reviews of experimental and epidemiological studies, together with exposure data relevant to assessing possible health effects from exposures to electromagnetic fields (EMFs) and ultraviolet radiation (UVR). They have been a valuable input to HPA advice and have been used in the development of exposure guidelines as well as being widely circulated and used by the UK Government and the devolved administrations. The ongoing programme of work of AGNIR is summarised below and it is also given on the HPA (legacy) web site [15].

3.2 Radiofrequency radiation
The Independent Expert group on Mobile Phones (IEGMP) drew attention to concerns on this topic in its 2000 report and called for more research. Similar calls were raised in other countries around the same time, and also within Europe and by the WHO. The result has been a substantial programme of research supported by governments, industry and the European Union. In recognising that research would proceed apace, IEGMP recommended that a further review of the science should be carried out within three years of its own report and the AGNIR prepared such a review in 2003. At this time, many studies were in progress and, in particular, epidemiological research of mobile phone users was at an early stage. Hence, it was agreed in 2003 that the AGNIR should produce a further review of studies relevant to concerns about health for publication.
in a few more years’ time. AGNIR began work on this latest report in 2009 and the report was published in April 2012 [7]. The report concluded (excerpt from the Executive Summary).

“The quantity, and in general quality, of research published on the potential health effects of RF field exposure has increased substantially since AGNIR last reviewed this subject. Population exposure to RF fields has become more widespread and heterogeneous. There are still limitations to the published research that preclude a definitive judgement, but the evidence considered overall has not demonstrated any adverse health effects of RF field exposure below internationally accepted guideline levels. There are possible effects on EEG patterns, but these have not been conclusively established, and it is unclear whether such effects would have any health consequences. There is increasing evidence that RF field exposure below guideline levels does not cause symptoms and cannot be detected by people, even by those who consider themselves sensitive to RF fields. The limited available data on other non-cancer outcomes show no effects of RF field exposure. The accumulating evidence on cancer risks, notably in relation to mobile phone use, is not definitive, but overall is increasingly in the direction of no material effect of exposure. There are few data, however, on risks beyond 15 years from first exposure. In summary, although a substantial amount of research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes health effects in adults or children.”

3.3 Power frequency fields
The AGNIR published its most recent report on ELF Electromagnetic Fields and the Risk of Cancer in 2001. The AGNIR continues to keep under review published research related to health concerns arising from exposure to power frequency electromagnetic fields. At present there is insufficient new information to justify the development of an update to the 2001 report although it is recognised that this will be needed at some point in the future.

3.4 Static magnetic fields
Static magnetic fields are used in certain industries, high-energy physics research facilities, and particularly in medicine where magnetic resonance imaging (MRI) provides exceptionally clear images of tissue that can lead to more precise diagnosis of disease or injury. The AGNIR published a report on static magnetic fields in May 2008. Among the research recommendations was that there is a pressing need for a well-conducted cohort study of mortality and cancer incidence in workers with high occupational exposures to static magnetic fields from MRI. This recommendation was taken forward by HPA’s MRI Scoping Group [16] and a call for a long term health feasibility study through the UK Department of Health Policy Research Programme.

4 Recent EMF-related publications involving HPA


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