EMF EXPOSURE AND HEALTH:

THE CONSUMER PERSPECTIVE

BY

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ON THE OCCASION OF

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INTRODUCTION

Electromagnetic Fields (EMF) became a front-line vocabulary after the introduction of the Global System for Mobile Communications (G.S.M.) in Nigeria in 2001 that has brought about positive changes for individuals, corporate organizations, government at all levels and the country at large. It has saved thousands of lives in emergency, created and still creating jobs for many Nigerians, eased communications within families, work places and across nations. Also, apart from bringing foreign investment into Nigeria and appreciating Nigeria's Gross Domestic Product (G.D.P.), it brought foreign direct investment and local investors confidence to the Nigerian nation.

EMF, BASE STATIONS, MOBILE PHONES AND HUMAN HEALTH

Against the above background, electromagnetic fields surrounding Base Stations and Mobile Phones must be of interest to the millions of Nigerians hosting base stations and using mobile phones.

The GSM technology is a global phenomenon and as such Nigeria must operate within the global environment in addressing issues concerning electromagnetic fields.

According to the World Health Organisation (WHO), Electromagnetic fields are present everywhere in our environment but are invisible to the human eye. Electric fields are

produced by the local build-up of electric charges in the atmosphere associated with thunderstorms. The earth's magnetic field causes a compass needle to orient in a North-South direction and is used by birds and fish for navigation.

Electric fields are created by differences in voltage: the higher the voltage, the stronger will be the resultant field. **Magnetic fields** are created when electric current flows: the greater the current, the stronger the magnetic field. An electric field will exist even when there is no current flowing. If current does flow, the strength of the magnetic field will vary with power consumption but the electric field strength will be constant.

INTERNATIONAL ORGANISATIONS AND ELECTROMAGNETIC FIELDS

Electromagnetic Fields and Non-Ionizing Radiation (NIR) in view of its domestic nature, has been a major source of concern to various international organizations like;

The World Health Organisation - W. H. O.

International Radiation Protection Association – IRPA

International Non-Ionizing Radiation Committee – INIRC

United Nations Environment Programme – UNEP

International Commission on Non-Ionizing Radiation Protection - ICNIRP

International Agency for Research on Cancer - IARC

Health Protection Agency’s independent Advisory Group on Non-Ionizing Radiation - AGNIR

International Electrotechnical Commission – IEC

In 1974, the International Radiation Protection Association (IRPA) formed a working group on non-ionizing radiation (NIR), which examined the problems arising in the field of protection against the various types of NIR. At the IRPA Congress in Paris in 1977, this working group became the International Non-Ionizing Radiation Committee (INIRC).

In cooperation with the Environmental Health Division of the World Health Organization (WHO), the IRPA / INIRC developed a number of health criteria documents on NIR as part of WHO’s Environmental Health Criteria Programme, sponsored by the United Nations Environment Programme (UNEP). Each document includes an overview of the physical characteristics, measurement and instrumentation, sources, and applications of NIR, a thorough review of the literature on biological effects, and an evaluation of the health risks of exposure to NIR. These health criteria have provided the scientific database for the subsequent development of exposure limits and codes of practice relating to NIR.

At the Eighth International Congress of the IRPA (Montreal, 18–22 May 1992), a new, independent scientific organization - the International Commission on Non-Ionizing

Radiation Protection (ICNIRP)-was established as a successor to the IRPA / INIRC. The functions of the Commission are to investigate the hazards that may be associated with the different forms of NIR, develop international guidelines on NIR exposure limits, and deal with all aspects of NIR protection.

Biological effects reported as resulting from exposure to static and extremely-low-frequency (ELF) electric and magnetic fields have been reviewed by UNEP / WHO / IRPA (1984, 1987). Those publications and a number of others, including UNEP / WHO / IRPA (1993) and Allen et al. (1991), provided the scientific rationale for these guidelines.

GUIDELINES FOR LIMITING EMF EXPOSURE

Occupational and General Public Exposure Limitations

The occupationally exposed population consists of adults who are generally exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions. By contrast, the general public comprises individuals of all ages and of varying health status, and may include particularly susceptible groups or individuals. In many cases, members of the public are unaware of their exposure to EMF. Moreover, individual members of the public cannot reasonably be expected to take precautions to minimize or avoid exposure. It is these considerations that underlie the adoption of more stringent exposure restrictions for the public than for the occupationally exposed population.

Basic Restrictions and Reference Levels

Restrictions on the effects of exposure are based on established health effects and are termed basic restrictions. Depending on frequency, the physical quantities used to specify the basic restrictions on exposure to EMF are current density, SAR, and power density. Protection against adverse health effects requires that these basic restrictions are not exceeded.

Reference levels of exposure are provided for comparison with measured values of physical quantities; compliance with all reference levels given in these guidelines will ensure compliance with basic restrictions. If measured values are higher than reference levels, it does not necessarily follow that the basic restrictions have been exceeded, but a more detailed analysis is necessary to assess compliance with the basic restrictions.

General Statement on Safety Factors

There is insufficient information on the biological and health effects of EMF exposure of human populations and experimental animals to provide a rigorous basis for establishing safety factors over the whole frequency range and for all frequency modulations. In addition, some of the uncertainty regarding the appropriate safety factor derives from a lack of knowledge regarding the appropriate dosimetry (Repacholi 1998). The following general variables were considered in the development of safety factors for high-frequency fields:

c effects of EMF exposure under severe environmental conditions (high temperature, etc.) and/or high activity levels; and

- the potentially higher thermal sensitivity in certain population groups, such as the frail and/or elderly, infants and young children, and people with diseases or taking medications that compromise thermal tolerance.

The following additional factors were taken into account in deriving reference levels for high-frequency fields:

- differences in absorption of electromagnetic energy by individuals of different sizes and different orientations relative to the field; and
- reflection, focusing, and scattering of the incident field, which can result in enhanced localized absorption of high-frequency energy.

MOBILE PHONES AND SAR

The International Electrotechnical Commission (IEC) is the world's leading organization that develops and publishes international standards for all electrical, electronics and related technologies. The IEC standards are developed by nominated experts of national committees - from research labs, governmental agencies, academia, industry, commerce, and consumer groups.

Specific Absorption Rate (SAR) compliance testing of mobile phones is carried out using the standardized protocol described in IEC 62209-1, IEC 62209-2 and IEEE 1528.

The key element in the SAR compliance measurement of mobile phones is the SAM (**S**pecific **A**nthropomorphic **M**annequin) head phantom. SAM was defined as the standard head phantom allowing a conservative SAR assessment covering vast majority of human population, independent of age. The conservativeness of SAM phantom has been confirmed by large scale international inter-laboratory computational and measurement studies.

PURPOSE AND SCOPE FOR LIMITING EMF EXPOSURE

There are established guidelines for limiting EMF exposure that will provide protection against known adverse health effects. An adverse health effect causes detectable impairment of the health of the exposed individual or of his or her offspring; a biological effect, on the other hand, may or may not result in an adverse health effect. Studies on both direct and indirect effects of EMF are described; direct effects result from direct interaction of fields with the body, indirect effects involve interactions with an object at a different electric potential from the body.

Static magnetic fields are covered in the ICNIRP guidelines issued in 1994 (ICNIRP 1994). In establishing exposure limits, the Commission recognizes the need to reconcile a number of differing expert opinions. The validity of scientific reports has to be considered, and extrapolations from animal experiments to effects on humans have to be made. The restrictions in these guidelines were based on scientific data alone; currently available knowledge, however, indicates that these restrictions provide an adequate level of protection from exposure to time-varying EMF.

These guidelines will be periodically revised and updated as advances are made in identifying the adverse health effects of time-varying electric, magnetic, and electromagnetic fields.

RECENT STUDIES ON EMF AND HEALTH – March, 2012

A recent study this year – 2012 (Rowley and Joyner, Comparative international analysis of radiofrequency exposure surveys of mobile communication radio base stations, *Journal of Exposure Science and Environmental Epidemiology* (2012) 1 – 12) published a comparative analysis of data from surveys of mobile phone base stations in more than 20 countries across five continents. The analysis was based on more than 173,000 measurement results, and covered the period from 2000 onwards.

The study found that exposures at ground level in public areas are a small fraction of the exposure limits and that the levels vary little between countries, technologies and over time. Importantly, the study found that there has been no significant increase in the RF exposures at ground level in public areas near base stations since the widespread introduction of 3G services, and that the environmental levels have remained essentially constant despite the increasing number of base stations and deployment of additional mobile technologies.

The study shows that the global average was only 0.00073 W/m2 which is almost 5500 times below the international guidelines of 4.0 W/m2 at 800MHz as recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

The data are representative of outdoor environments at street level and may be different in other locations although it is the responsibility of those installing base stations to ensure that the RF exposure is below ICNIRP or other applicable limits in all publically accessible areas around the base station.

The results of the study further support the advice provided by the World Health Organization in relation to base stations and wireless technologies:

Considering the very low exposure levels and research results collected to date, there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects. March 2, 2012 (World Health Organization. Base stations and wireless technologies, Fact Sheet No. 304. http://www.who.int/mediacentre/factsheets/fs304/en/index.html)

PROTECTIVE MEASURES

The ICT, GSM, Electronics, Wireless Technologies, etc are being used in our kitchens, rooms, offices, on the streets and indeed everywhere we go. We must be taking more serious look at protective measures.

ICNIRP notes that the industries causing exposure to electric and magnetic fields are responsible for ensuring compliance with all aspects of the guidelines. Measures for the protection of workers include engineering and administrative controls, personal protection programs, and medical surveillance (ILO 1994).

Appropriate protective measures must be implemented when exposure in the workplace results in the basic restrictions being exceeded. As a first step, engineering controls should be undertaken wherever possible to reduce device emissions of fields to acceptable levels. Such controls include good safety design and, where necessary, the use of interlocks or similar health protection mechanisms.

For example, energy saving bulbs is growing worldwide in usage despite the probable hazards. However, some countries like Switzerland are taking genuine and transparent precautionary measures in addressing the issue and concerns about energy saving bulbs.

Swiss health officials are recommending that people stay at least 30 centimetres away from energy-saving light bulbs, over electrosmog concerns.

A study has measured the electric fields emitted from these lamps and concluded that a certain distance is needed to keep well under international limits.

Low- and medium-frequency magnetic and electric fields can induce electric currents in the body which, above a certain frequency, can stimulate the nerves and muscles.

The Swiss study, undertaken for the federal offices of health and energy, found that medium-frequency electric fields were primarily responsible for these currents. Depending on the lamp, current field densities in the immediate vicinity reach 10-55 per cent of the exposure limit.

Switzerland started to phase out the least efficient categories of light bulbs at the beginning of last year and will officially follow the European Union's line on 100W lamps from September 1, 2010.

From 2012, only bulbs meeting or exceeding mid-category D requirements will be on sale - the equivalent to banning conventional light bulbs.

CONCLUSION

In conclusion, since electromagnetic fields concerns humans, irrespective of race, colour, creed and continent, there must be continuous research that must be harmonised.

However, we believe that such rolling research must involve all countries so that acceptability of such research findings will be acceptable.

Beyond this is that national governments must show sincerity, transparency and genuine commitment to research on electromagnetic fields in consonance with global best practices rather than see electromagnetic fields as a means of making money and generating revenues for their governments as it is in some African countries.

Ultimately, all equipments capable of electromagnetic fields emission must not exceed the maximum permissible radio frequency exposure to which an occupational worker or mobile phone or electronic equipment user be subjected to in accordance with safe recommendations in line with global best practices.

Thanks and regards.

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