

**Workshop on
Electromagnetic Radiation (EMR)**

**9 – 10 November 2010
Gaborone**

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Authority**

Introduction

Electromagnetic Radiation (EMR) consist of waves of electric and magnetic energy moving together at the speed of light and sometimes is referred as electromagnetic field (EMF)

They are basically two forms of electromagnetic radiation sources in our environment i.e. Natural and man-made. The sun, earth and ionosphere are the natural source.

The man-made sources of EMR include among others the following:

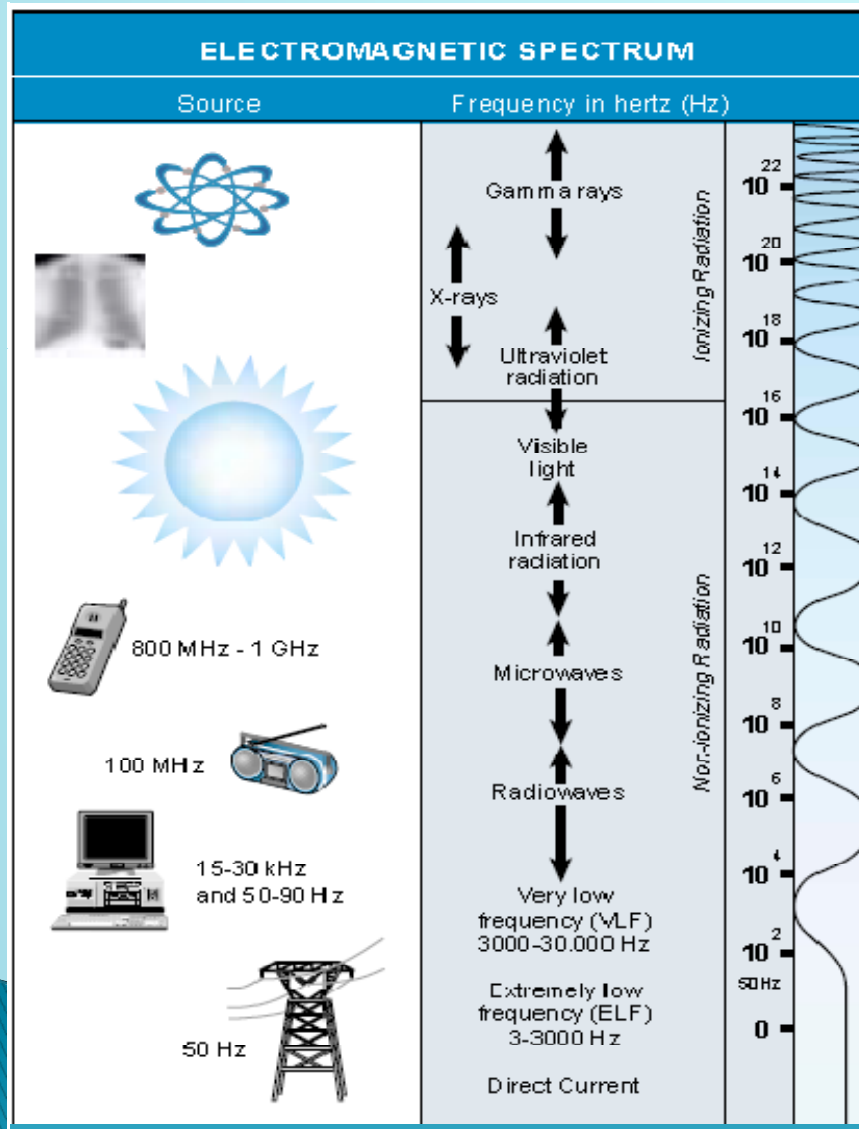
- ▶ Radio Frequency systems such as cellular systems, TV, microwave links
- ▶ Electrical supply systems and appliances
- ▶ X-Ray systems

Introduction (Cont..)

There are two types of radiation i.e. Ionizing and Non-ionizing radiation

- ▶ **Ionising Radiation** – contains enough energy that can ionise particles of matter and consequently can change the chemical reactions in the body that may lead to damage in biological tissues;
- ▶ **Non-Ionised Radiation** – does not contain sufficient energy to cause ionisation but it can causes some heating effect. Normally the heating effect is not enough to cause long term effects on tissues.

Introduction (Cont.)



- EMF are Not only Generated in Wireless communication;

- The workshop will mainly focus on the electromagnetic radiation generated by the Radiofrequency systems

Radio Frequency Overview

Radio frequencies are used for the wireless communications such as

- Cellular services;
- Aeronautical communications systems
- Broadcasting stations;
- Two-way radios etc.

Radio frequencies are measured in Hertz (Hz)

kHz = Kiloherztz = 1000 Hz

MHz = Megahertz = 1 000 000 Hz

GHz = Gigahertz = 1 000 000 000 Hz

Radio Frequency Overview

On a global scale the radio frequencies are managed and coordinated by the ITU through the Radio Regulations.

The Radio Regulations are revised at the World Radiocommunication Conference (WRC) every 3-4 years.



Radio Frequency Overview

The BTA is responsible for the management of the radio frequency spectrum National.

The radio frequency spectrum is managed through;

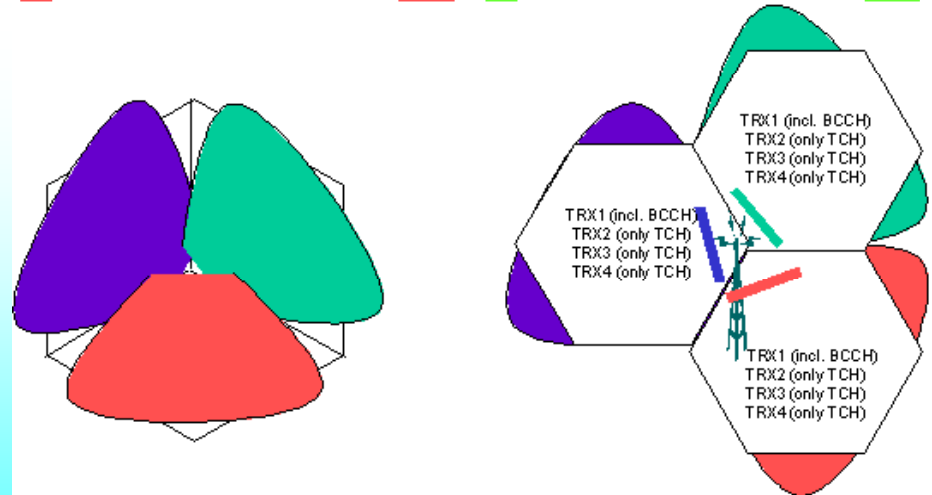
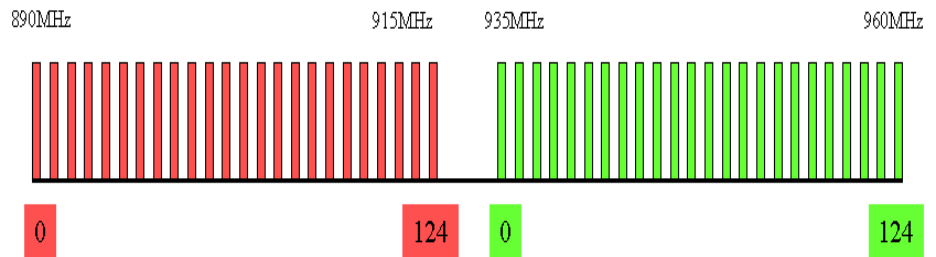
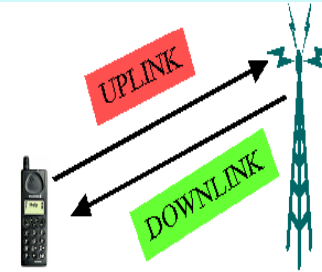
- National Radio Frequency Plan;
- Spectrum Management Strategy
- Spectrum Management regulations;
- Type approval process
- Radio licences etc

Cellular Systems Overview

Cellular systems in Botswana:

- GSM 900 in frequency bands 890-915/ 935 – 960 MHz;
- GSM 1800 in frequency bands 1710 – 1785 / 1805 – 1880 MHz;
- UMTS (3G) in frequency bands 1920 – 1980 / 2110 – 2170 MHz

There is also WiMAX systems in the 2500 – 2690 MHz



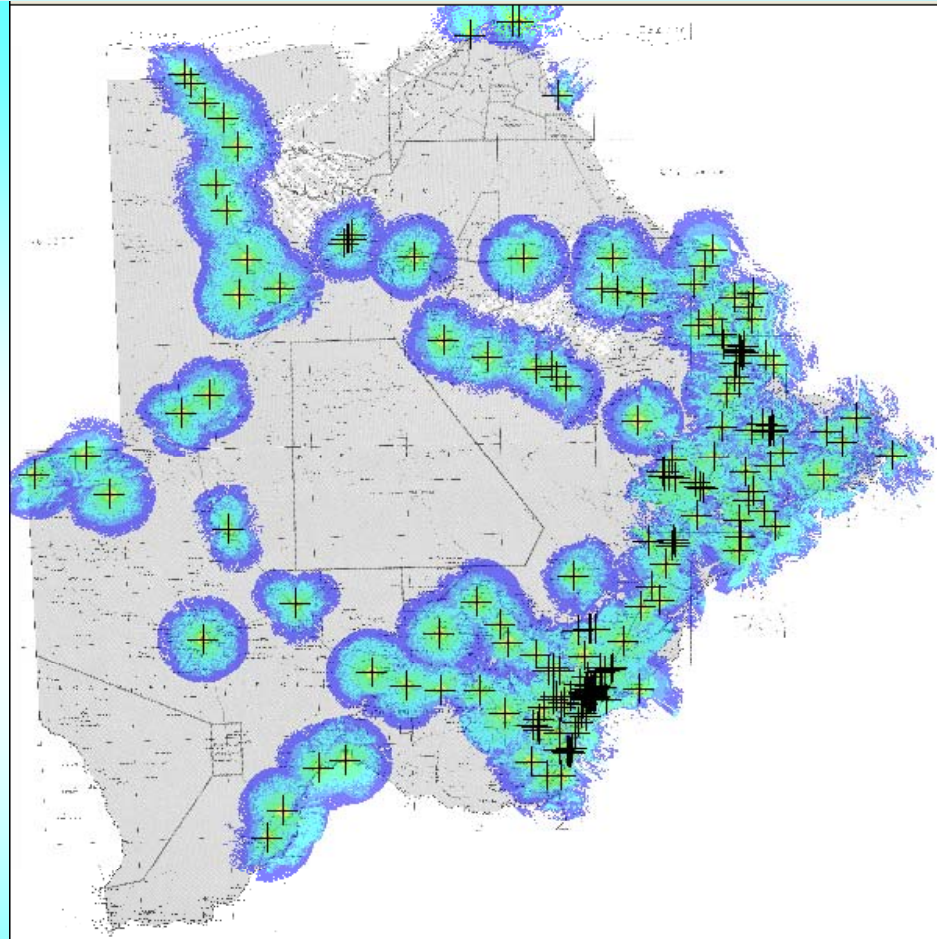
How Cellular Systems Works

- Cellular networks are divided into geographical areas called cells served by radio base stations.
- Mobile phones exchange radio signals with radio base station on a particular radio frequency.
- Mobile Phones constantly communicates with nearby base stations and use dynamic power control to reduce the transmit power ($.001 - 1 \text{ W}$)



Why Radio Base Stations

- **Coverage** – the coverage area depends on the antenna height, physical terrain of the area, radio signal strength.
- **Capacity** – A radio base station can handle a certain number of users. Additional base stations can be required to reduce congestions in mobile networks.
- **Frequency Re-use** - the radio frequencies are re-used to avoid interferences



Workshop Aims

BTA has received a number of enquiries and concerns about the effects of cellular networks EMF on human health and well being;

- ▶ The BTA has worked with the Department of Environmental Affairs to alleviate fears about EMF and facilitate the sharing of telecommunication towers;**
- ▶ The BTA is currently carrying out a study to develop regulations/guidelines that will facilitate sharing communication infrastructure;**
- ▶ The instruments for measuring EMF radiated by the radio frequency transmitters has also been acquired and measurements has been carried out in 25 sites around Gaborone;**
- ▶ This Workshop is aimed to address some of the public concern about the EMF**

Workshop Objectives

- ▶ **Disseminate appropriate information on EMF to the general public;**
- ▶ **Provide information about the standardization and guidelines with regard to human exposure limits to EMF;**
- ▶ **Establish a public dialogue on the EMF issues;**
- ▶ **Make appropriate recommendations on the issues human exposure to the EMF;**

Workshop Structure

- ▶ **Session 1** :- provides background information wireless technologies and electromagnetic fields (EMF);
- ▶ **Session 2** :- provides scientific information about the human exposure limits on EMF and the associate research on human health and well being;
 - ICNIRP
 - IARC
 - European COST Action BM0704

Workshop Structure

- ▶ **Session 3 :-** provides the information about the applicable standards to the cellular technologies and the EMF survey measurement procedures;
 - GSMA
 - MMF
 - CENELEC

- ▶ **Session 4:-** the BTA will share the information results of the EMF survey measurements it has carried out in various transmitter sites installation;

- ▶ **Session 5 :-** The final session will discuss the way forward with regard to the issue of human exposure to the electromagnetic field.

PULA

THANK YOU

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