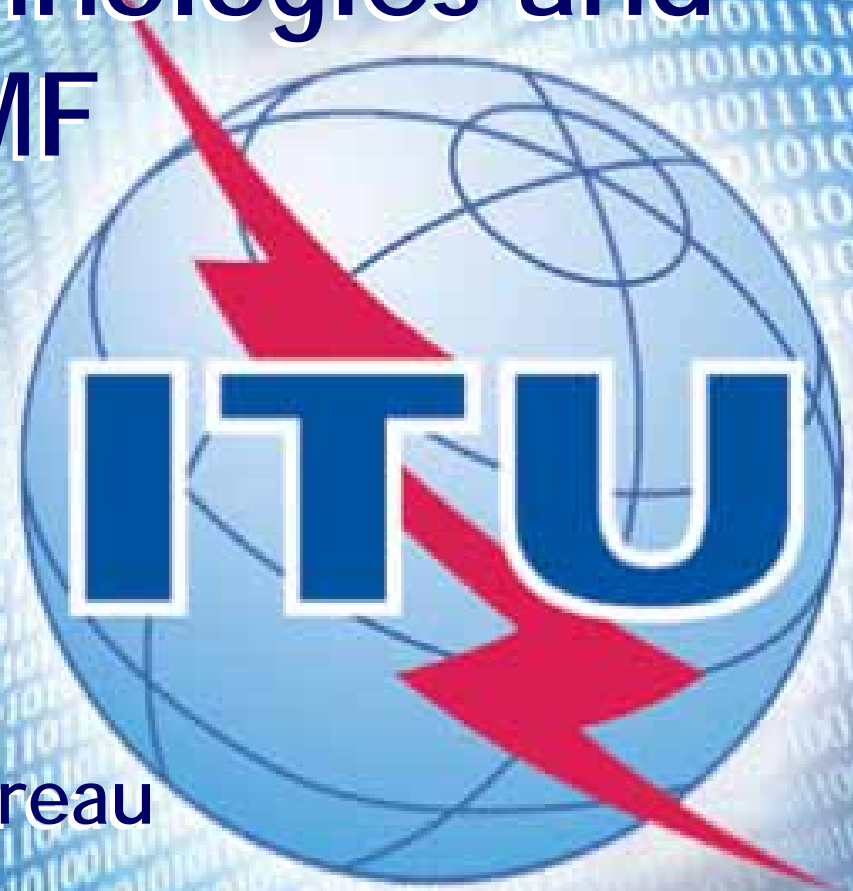


# International Standardization of Wireless Technologies and EMF



Kevin Hughes  
Radiocommunication Bureau  
ITU

# Presentation

- Introduction to ITU
- Objectives of ITU Radiocommunication Sector (ITU-R)
- Standardization role for Wireless Systems
- Standardization role for RF emissions
- ITU role in Health Aspects
- Conclusions



# International Telecommunication Union

189 Member States  
630 Sector Members  
106 Associates

Member States  
Sector Members  
Associates

Regional/National  
SDO's  
e.g. ETSI, IEC



UN bodies  
e.g. WHO, WMO

Regional Frequency  
Management  
e.g. CEPT

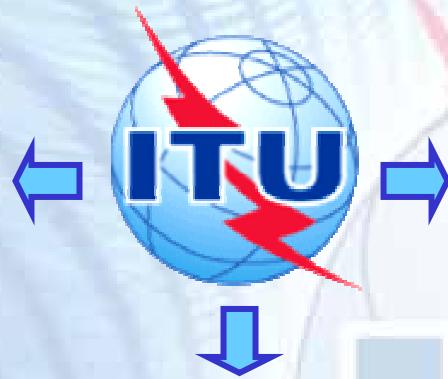
Industry fora  
e.g. WiMAX

# ITU Overview

**Helping the World Communicate!**

## ITU-T

Telecommunication  
standardization  
- network and service  
aspects



## ITU-D

Assisting  
implementation and  
operation of  
telecommunications in  
developing countries

## ITU-R

Radiocommunication  
standardization and  
global spectrum  
management

# Objectives of ITU-R

- Global coordination of radiocommunications

- ITU Radio Regulations
- International Spectrum Management
- Frequency Plans



# Objectives of ITU-R

- Global coordination of radiocommunications
- International focal point for standardization of wireless systems

- **Recommendations - *de facto* Standards on:**

- spectrum management issues
- radiocommunication system characteristics and operation

- **Example topics:**

- emission characteristics
- radiowave propagation
- wireless access systems in the fixed service
- mobile cellular
- broadcasting

# Objectives of ITU-R

- Global coordination of radiocommunications
- International focal point for standardization of wireless systems
- Promote the world-wide development of radiocommunications

**To promote the development and use  
of radiocommunications for the  
benefit of all**



# Role of ITU-R concerning Health Effects from EM radiation

*A priori, **NONE!***

but ITU-R develops Recommendations on

- wireless technologies
- radio frequency emissions,  
(measurement, calculation, propagation)

which, as appropriate, can be used  
for evaluating radiation levels.

# Wireless Technologies under study in ITU-R

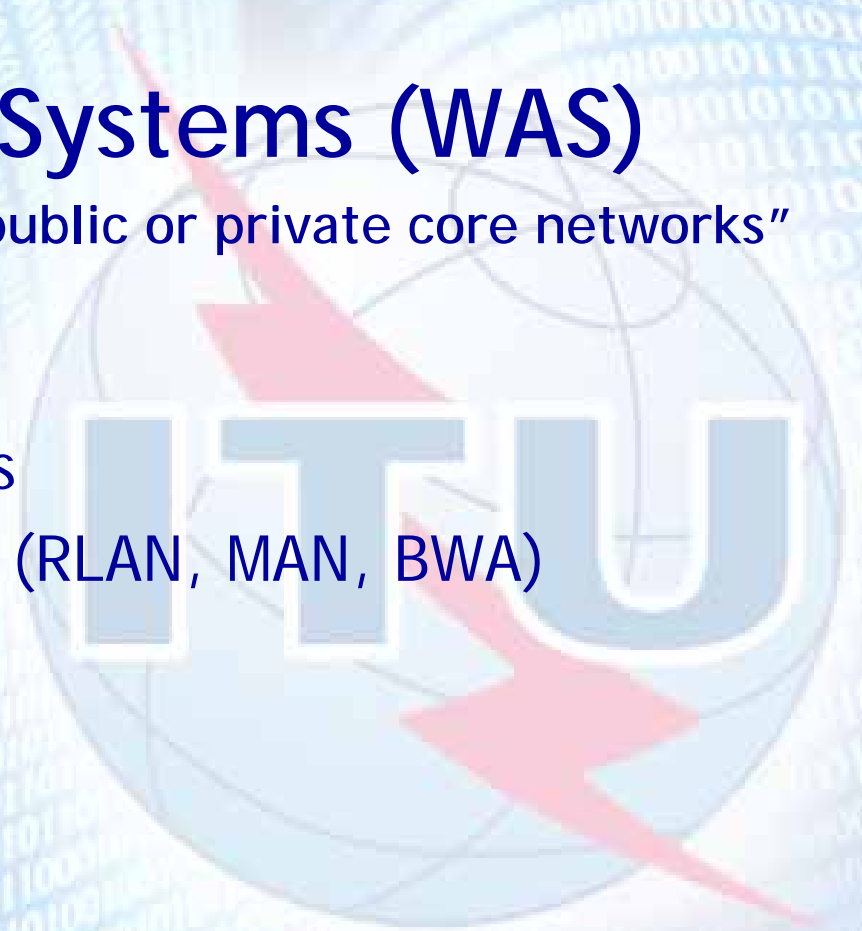
## • Wireless Access Systems (WAS)

“End-user radio connection to public or private core networks”

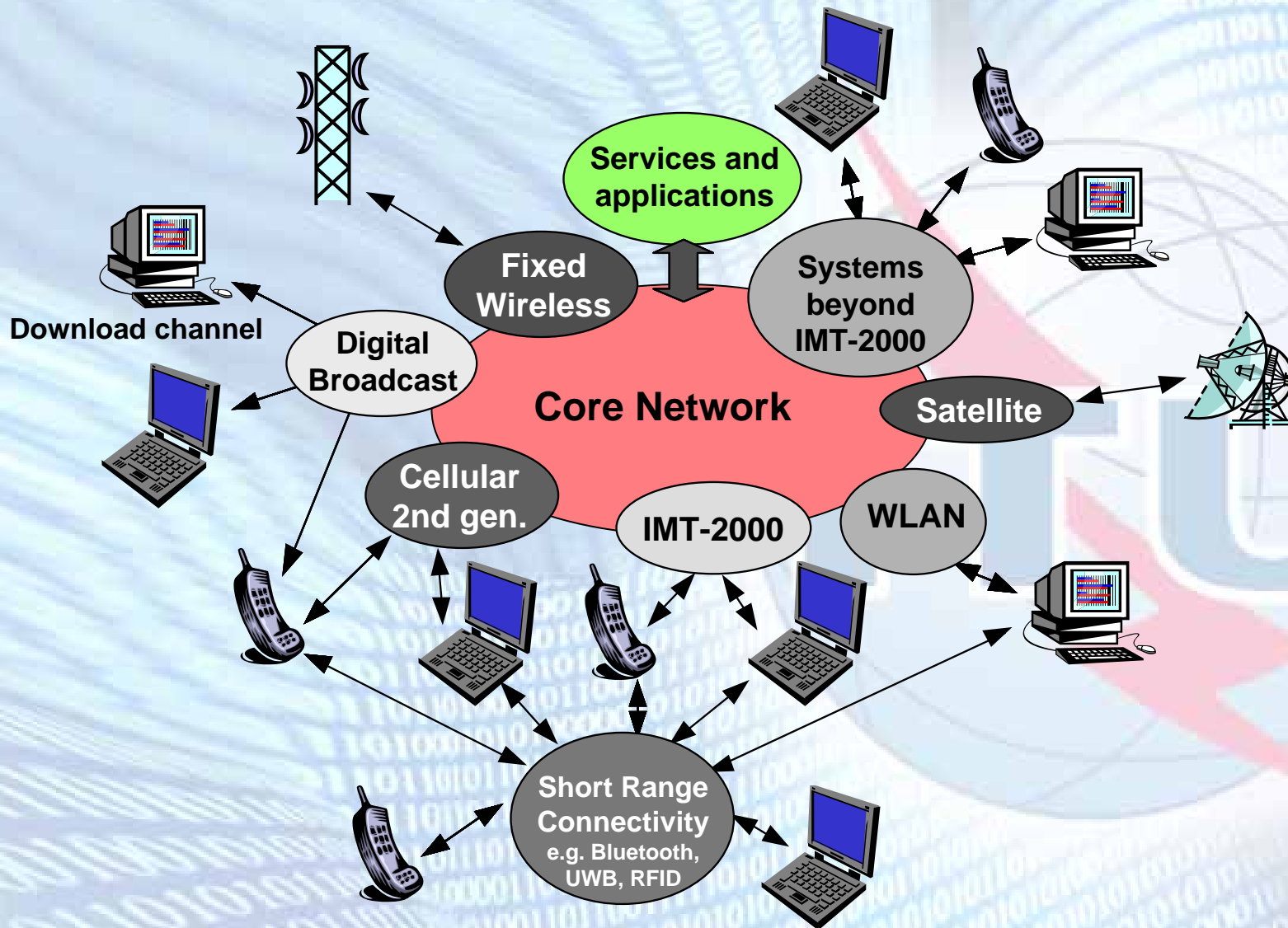
- fixed wireless access
- mobile (cellular) access
- wireless area networks (RLAN, MAN, BWA)

## • Broadcasting

- television
- radio



# Variety of Wireless Access Networks



# Domains

Personal Area



Wide Area

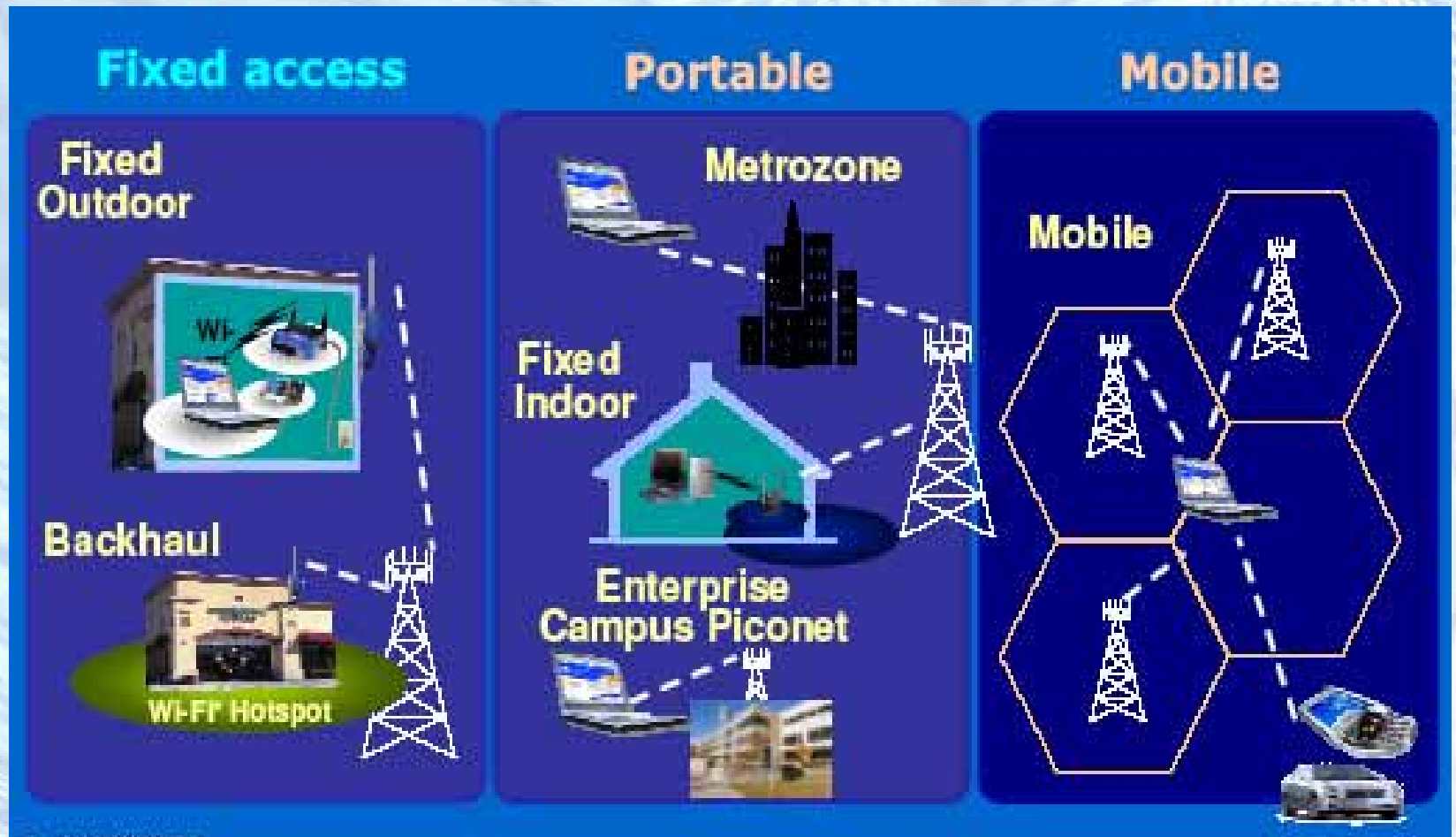


Immediate Area

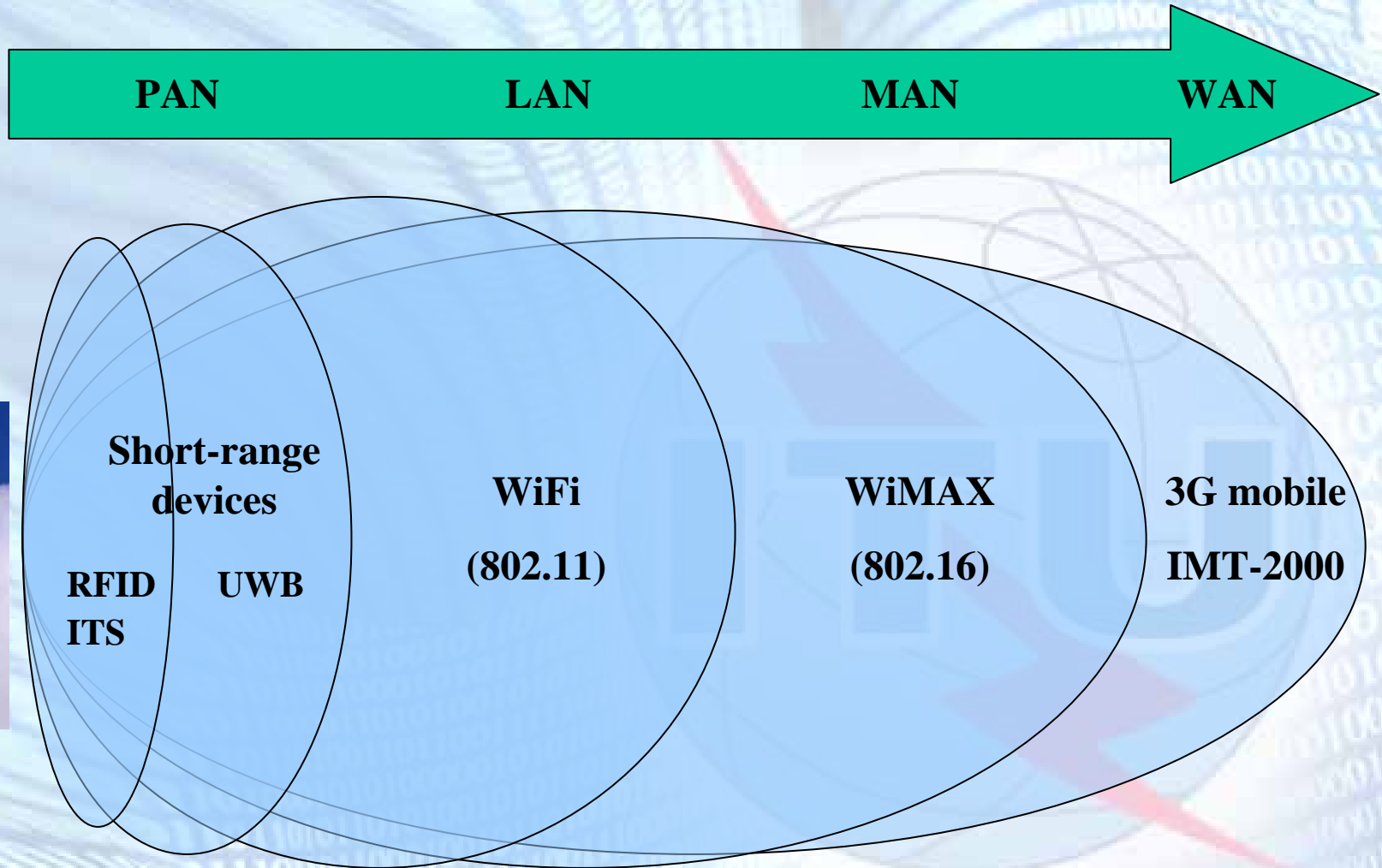




# Wireless Access Concept



# Wireless Area Networks



# ITU-R Studies on Wireless Access (1)

## Short Range Systems

- Ultra-Wideband (UWB) devices
- Intelligent Transportation Systems (ITS)

## RLANs

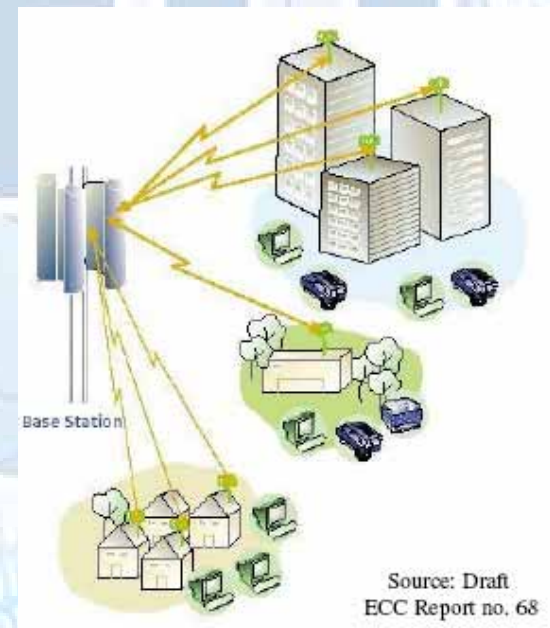
**Recommendation ITU-R M.1450 (+ others) gives guidance on:**

- Existing RLAN Standards, e.g. access methods, modulation
- RLAN characteristics (data rates, mobility, operational environment, power requirements, frequency bands, sharing considerations)

## Broadband Wireless Access (BWA)

**New ITU-R Recommendation gives guidance on:**

- Existing Standards for BWA (supporting fixed and nomadic applications for MAN's) at frequencies < 66 GHz
- Characteristics of radio interface (data rates, frequency, modulation, access methods)



# ITU-R Studies on Wireless Access (2)



## Current systems

### 2G cellular + enhancements (2.5G)

- System characteristics in ITU-R Recommendation M.1073

### IMT-2000

- 3G wireless communications
- Specifications of Radio Interfaces in ITU-R Recommendation M.1457
  - global development
  - higher bit rates
  - data transmission



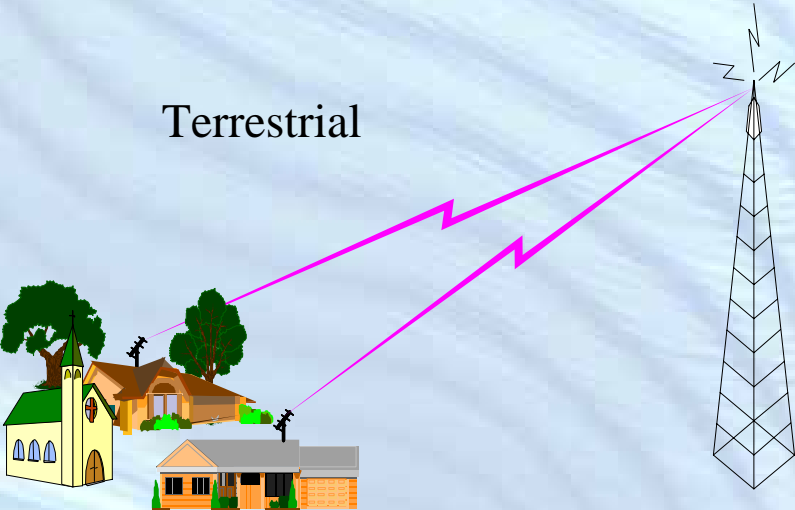
## Future systems

### Systems beyond IMT-2000

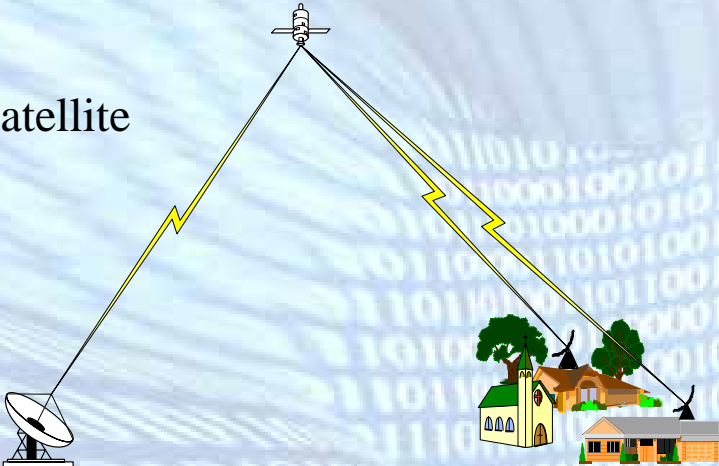
- Vision of future development of such systems given in ITU-R Recommendation M.1645
  - increased data-rates
  - anywhere, anytime, ubiquitous
  - IP based

# Broadcasting - some typical scenarios

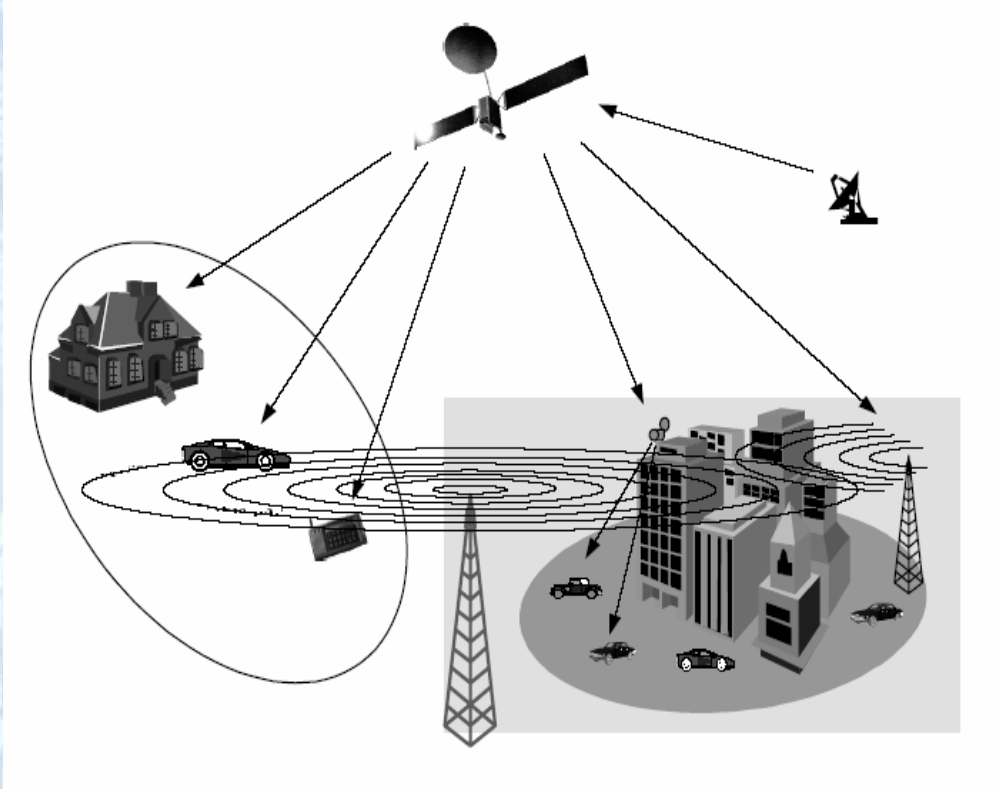
Terrestrial



Satellite



Hybrid system



# Broadcasting - Reception and Interactivity

High definition TV



Fixed



Mobile



Interactive channel

Portable inside or outside of building



Portable



# Broadcasting

## - two areas of ITU-R study

### **New frequency plans for digital terrestrial broadcasting**

- Europe, Africa, certain countries in Middle East
- Radio (174-230 MHz)
- TV (174-230 MHz; 470-862 MHz)
- ITU Regional Radiocommunication Conferences (2 sessions)
- Increase in number of transmitters but trend towards lower power



### **Interactive Television**

- Bi-directional channel between user and service provider
- Specification of interaction channel (interfaces, transport mechanisms, data rate, bandwidth, modulation)

# ITU-R studies on E.M. Radiation

- Emissions
  - spurious and unwanted emissions
  - signal properties, e.g. bandwidth
- Radiowave Propagation
  - propagation media and prediction methods
- Measurement and Monitoring
  - measurement of field strength and bandwidth
  - channel occupancy
  - fields from broadcast stations



**evaluation of fields for assessing exposure.**

# ITU Studies related to E.M. Exposure

## Questions currently under study

### Question ITU-R 50/6

**Evaluating fields** from terrestrial broadcasting transmitters operating in any frequency band **for assessing exposure** to non-ionizing radiation

### Question ITU-T 3/5

**Radio-frequency** environmental characterization and **health effects** related to mobile equipment and radio systems

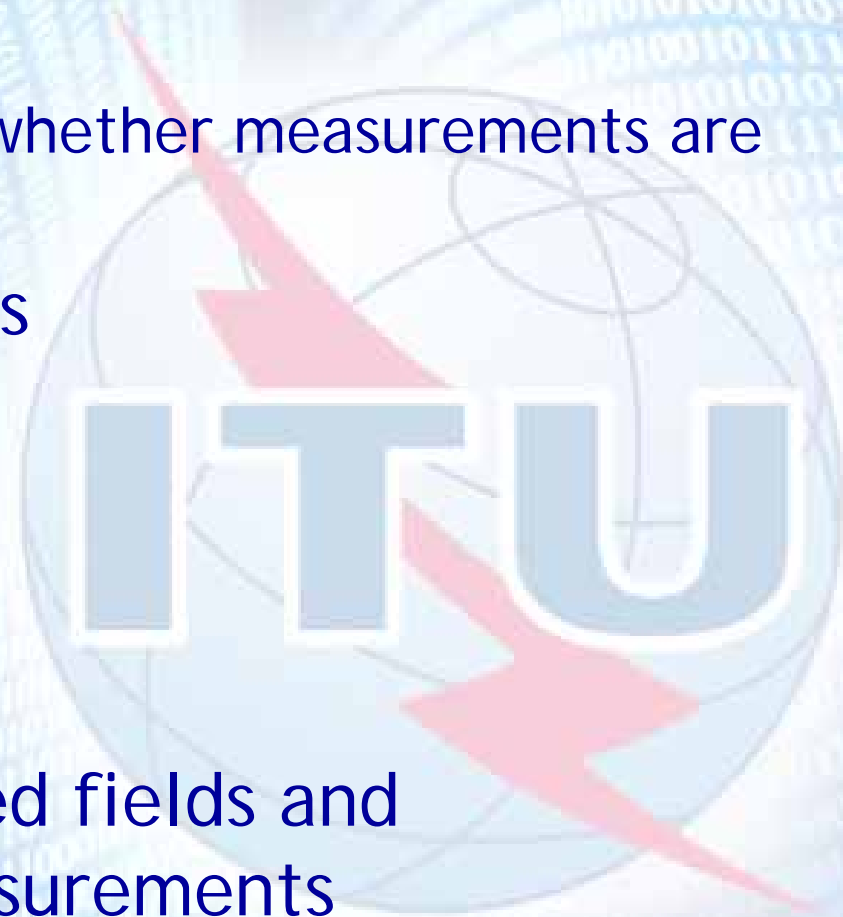
# Recommendations related to human exposure to E.M. fields

## Recommendation ITU-R BS.1698

- provides basis for deriving and estimating the e.m. radiation from a broadcasting station at a particular distance from a transmitter site
- responsible organizations can then take measures to protect humans from undesirable exposure to harmful radiation

# Recommendation ITU-R BS.1698

- Calculation methods
  - estimate field to see whether measurements are required
- Measurement methods
  - function of distance
  - function of frequency
  - instrumentation
- Precautions
- Examples of calculated fields and comparison with measurements



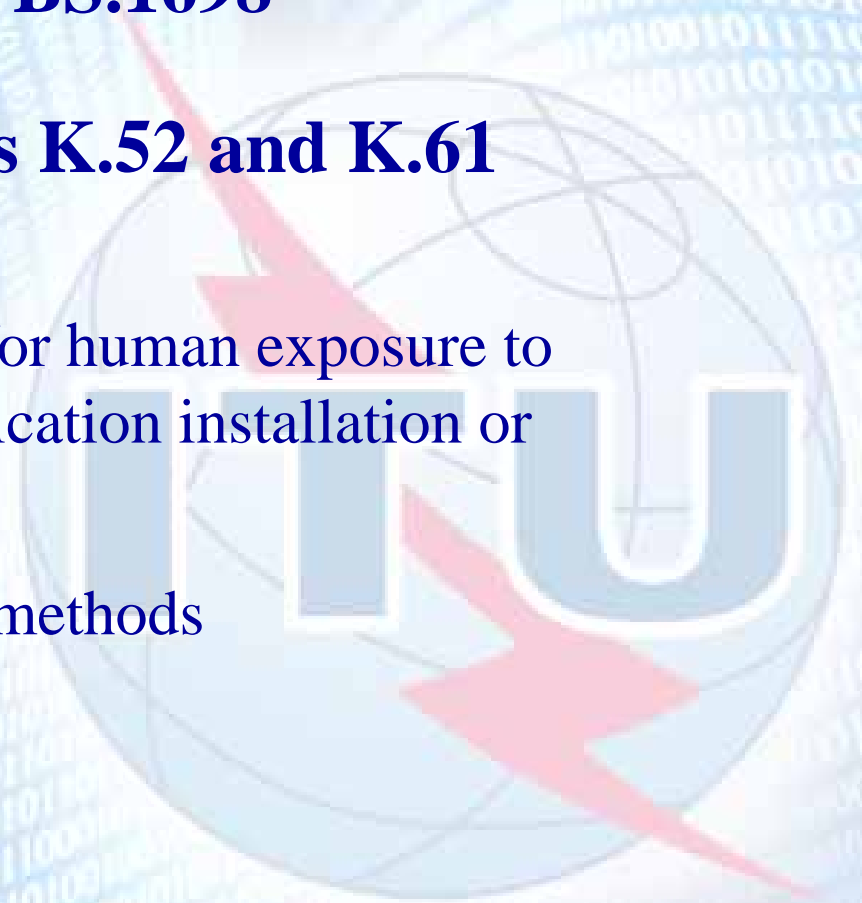
# Recommendations related to human exposure to E.M. fields

## Recommendation ITU-R BS.1698

## ITU-T Recommendations K.52 and K.61

provide guidance on:

- complying with safety limits for human exposure to e.m. fields from a telecommunication installation or mobile handset
- measurement and calculation methods
  - well established techniques
  - conservative approach
  - example configurations



# ITU-T Recommendations K.52 and K.61

Compliance of an installation achieved by:

1. Identify appropriate compliance limits, e.g. ICNIRP
2. Undertake calculations and/or measurements to determine exceedance zone
3. Is exceedance zone accessible to personnel?
4. If exposure limits can be exceeded in areas where people may be present, apply mitigation/avoidance measures.

# ITU Recommendations related to human exposure

**E.M Radiation from a telecommunication installation**

**E.M. Safety Limits**

Recommendation ITU-R BS.1698  
ITU-T Recommendation K.52  
ITU-T Recommendation K.61

**Assessment of hazard and need for precautionary measures**

# Concluding remarks

- Objectives of ITU
  - global coordination of telecommunications
  - promotion of telecommunications world-wide
  - no direct responsibility for health issues
- Standardization role for wireless systems
- Standardization role for e.m. emissions, including calculation and measurement methods for e.m. fields
- Role of ITU regarding e.m. exposure assessment

# Thank you!

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