

**Regional Development Forum 2008**  
**“Bridging the Standardization Gap in Developing Countries”**  
**Accra, Ghana, 26-28 May 2008**

**Electromagnetic Compatibility  
Standards**

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Accra, Ghana, 26-28 May 2008

# Presentation Outline

- Introduction
- EMC
- AIM
- Laws on EMC Standards
- Typical seminar on EMC
- Example of EMC
- Other Important Institutions to be Established
- Conclusion

# Introduction

The ITU Plenipotentiary Conference (Antalya, 2006) updated Resolution 123 on “Bridging the standardisation gap between developed and developing countries”

# EMC

EMC is the situation where two or more electromagnetic equipment working together in the same environment performs together without causing undue interference with each other

# AIM

The aim of my presentation therefore is to serve to raise awareness for the need for greater emphasis to be given to this important subject  
**ELECTROMAGNETIC COMPATIBILITY STANDARDS**

# Laws on EMC Standards

- Due to its economic and security importance, many countries especially developed countries (who are manufacturers of most telecommunications/ICT Radio equipment and cable accessories) have strict laws and regulations governing EMC Standards.

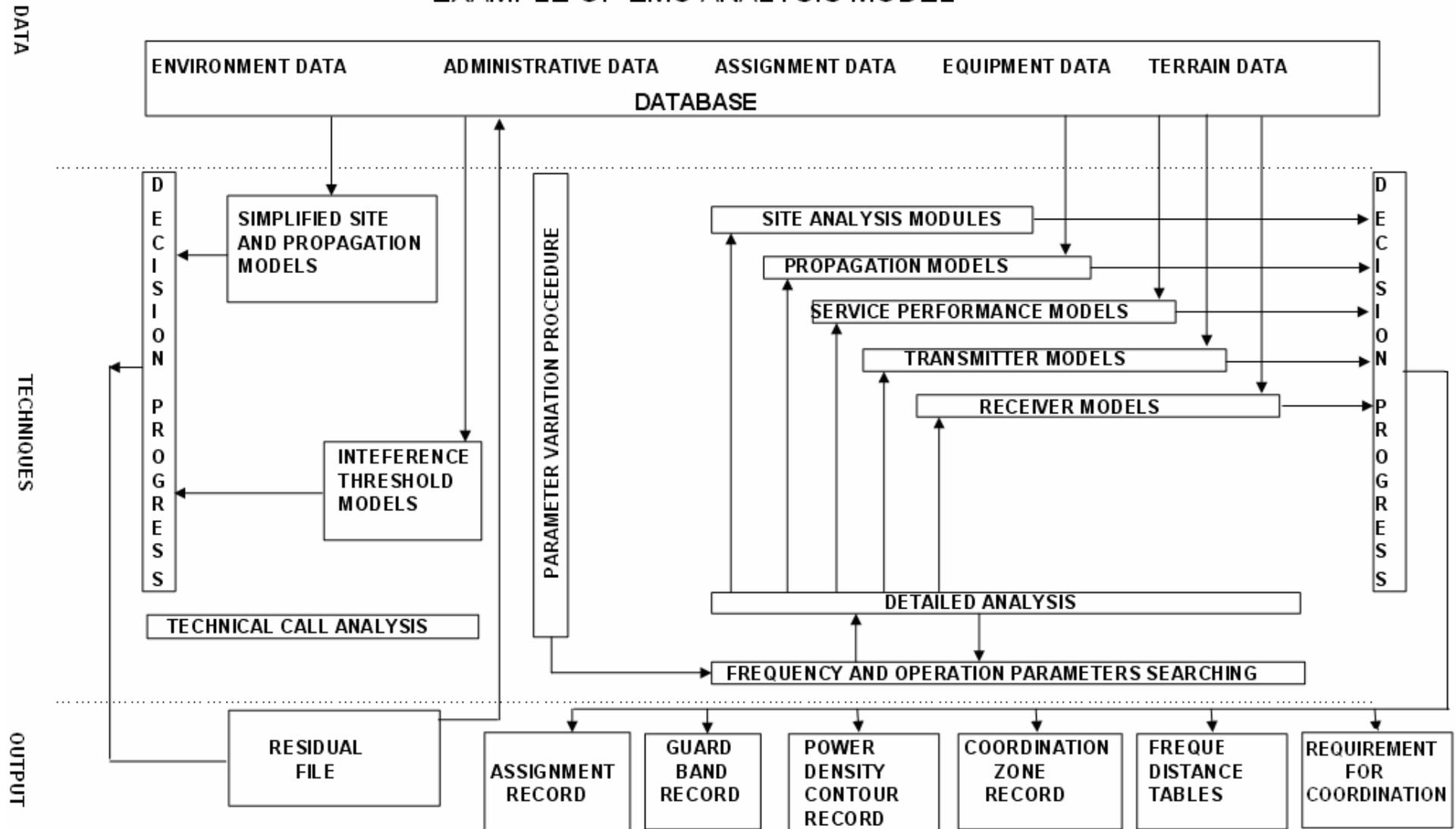
# Laws on EMC Standards (Continue)

- In the EU Countries, despite individual member States regulations, each Member State is subject to EU directives. The EMC directive 2004/108/ec is one of a series of measures introduced under article 100a of the Treaty of Rome.
- Similarly in the US, Public Law 97-259 gives the FCC the authority to set standards.

# A typical seminar on EMC may have the following Outline

- What is EMI/EMC
- Importance of Meeting EMC Standards
- National and International Standards
- Detailed overview of a typical EMC Standards
- Compliance Costs
- EMC Management
- Fundamentals of EMC
- EMC Regulations
- EMC test methods
- Designing for EMC
  - Grounding
  - Shielding
  - Cabling
  - Filtering
  - Transient Suppression
- Check lists for good EMC design
- Developing a National EMC Framework
- Introduction to EMC Models for the development of a National Database based on practical Research

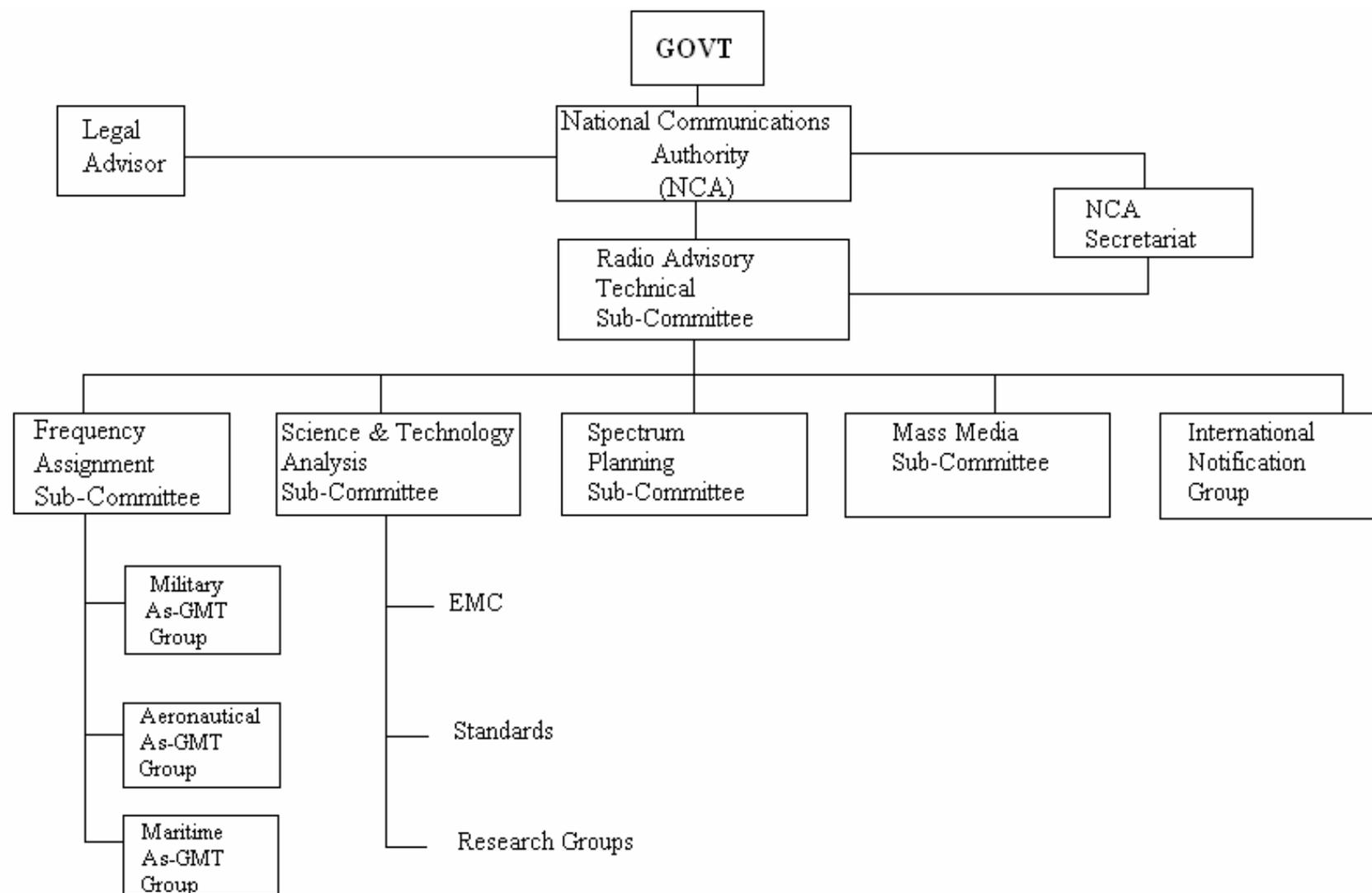
## EXAMPLE OF EMC ANALYSIS MODEL



Source: ITU Handbook on Spectrum Management and computer Aided Technique

# National Radio Advisory Technical Committee

- A National Technical Radio Advisory Committee drawn from identified experts from Government agencies, Stakeholders, the Academia, etc. to advise the Government through the accredited National Regulatory Agency on ITU-T and ITU-R technical matters similar to Annex 1 to CCIR 1WP 1/2 -238 ,dated July 1989, as illustrated below



Source: Tandoh, J (1989), ITU Document IWP 1/2 - 238

# Other Important Institutions to be Established

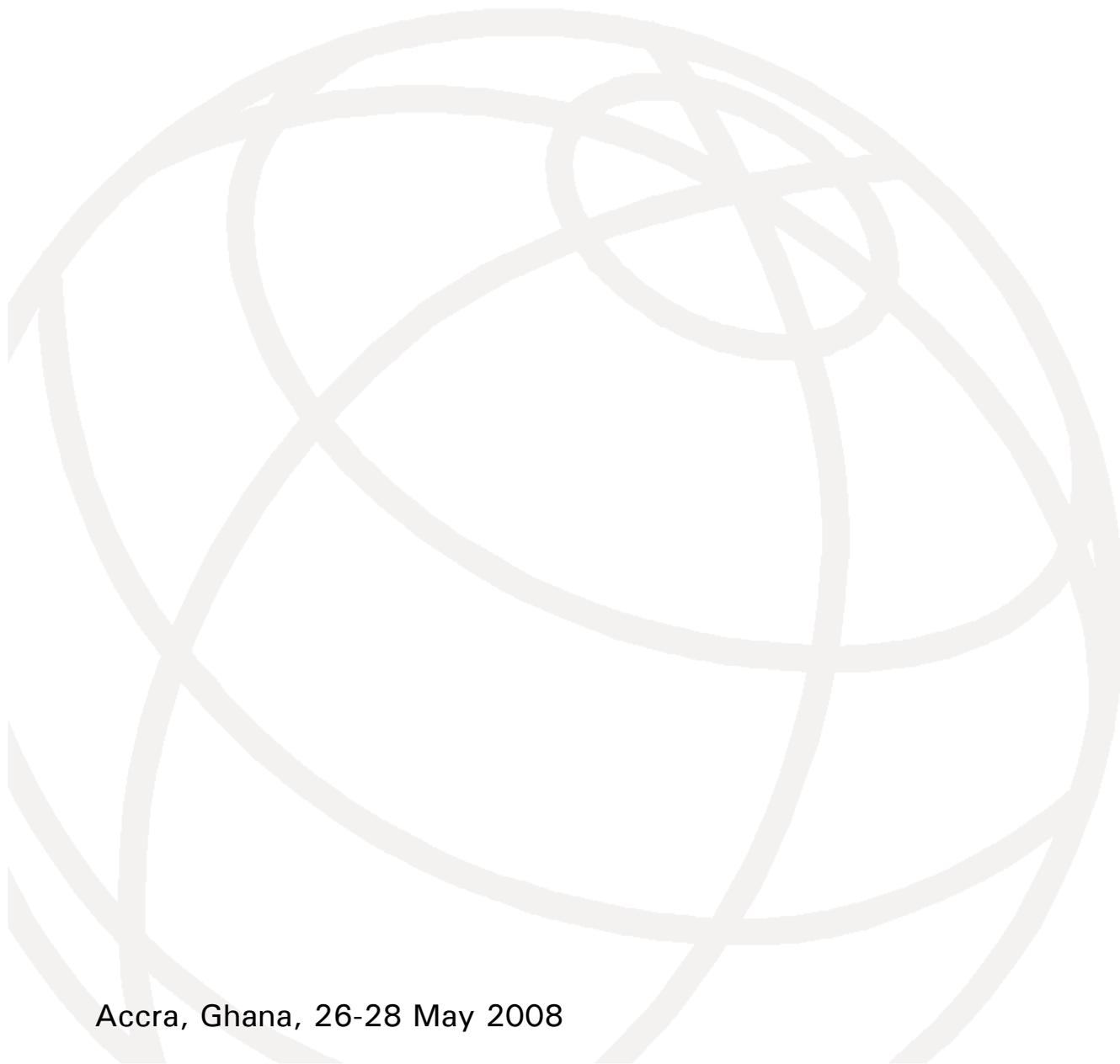
- The establishment of An African Telecommunications/ICT Standard Institute (ATSI) similar to the European Telecommunication Standard Institute (ETSI). The ATSI among other things is to coordinate for the harmonisation of standards in the African Sub-Region.
- The establishment of Chairs in the Universities to specialise in selected relevant ITU-T and ITU-R Study Group Activities. The aim would be to provide relevant training material for capacity learning for young under graduates and graduate students.

# Other Important Institutions to be Established (Continue)

- The setting up of R & D Funds by Government Agencies and other Stake holders for research purposes in Telecommunication/ICT.
- Strengthen existing Public, Private as well as NGO's in Communication/ICT Research and Development to carry out research activities peculiar to our sub-region which are scientific in nature such as radio transmission/propagation studies, attenuation due to rain etc. . . .

# Conclusion

- Throughout this presentation, most of the various concerns shown by ITU dating back from Marrakesh PP – 02 through to Antalya PP – 06 have been outlined.
- We have the confidence that at the end of this Forum this meeting would serve as a catalyst towards bridging the standardization gap between developed and developing countries and towards the harmonization of a uniform Telecommunications/ICT Service Standards in Africa



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# What is the Standardization Development Gap

- *"the continued shortage of human resources in the standardization field in developing countries, resulting in a low level of developing-country participation in meetings of ITU-T and of ITU-R and, consequently, in the standards-making process, leading to difficulties when interpreting ITU-T and ITU-R Recommendations;"* This contributes to the standardization gap between developed and developing countries which adversely affects the ability of representatives from developing countries to access, implement, contribute to and influence international ICT standards, specifically ITU Recommendations. The standardization gap contributes to the persistence of the wider digital divide

# What actions are being taken?

- The World Telecommunication Standardization Assembly (WTSA), that took place in Florianópolis in 2004, adopted Resolution 44, which sets out a detailed action plan for addressing the standardization gap and for implementing Resolution 123.

# Bridging the Standardization Gap Fund

- To facilitate the participation of developing countries in the standards development process
- To allow developing countries to profit from access to new technology development
- To ensure that their requirements are taken into account in the development of standards
- Such contributions will be used for: workshops and meetings in developing countries, fellowships, surveys and study programmes.

# ENVIRONMENTAL CLIMATE FACTORS

- The distribution of temperature, pressure and water vapour content of the Atmosphere near the earth's surface is the major factor that affects the propagation of microwaves. The variation of the refractive index,  $n$ , at height,  $h$ , above the earth's surface with pressure,  $p$  (mb), temperature,  $T(K)$  and water vapour pressure  $e$ (mb), is given by the relation: -

- $N = (n - 1) \times 10^{-6}$
- $= \frac{77.6}{T} \left( P + \frac{3.73 \times 10^5 e}{T^2} \right)$

$T$

$T^2$

- Where:

- $n$  = refractive index

- $N$  = difference between refractive index and unity or co-index. It is expressed in

- millionth parts (N-units in order to give numbers that are easier to handle.

- $T$  = absolute temperature ( degree Celsius

Where T is temperature in

- $P$  = atmospheric pressure in millibars

- $e$  = partial pressure of water vapour in millibars

# Atmospheric Refraction

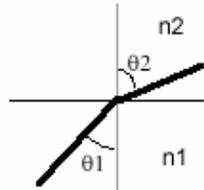
- Refraction on the troposphere relies on the variations in space of the refractive index  $n$ . Typically, the refractive index falls with increasing height. The refractive index governs the speed of propagation in a medium - which can be seen from the equation for the electric field in space and time:

$$E(\mathbf{r}, t) = E_0 e^{i[n(\mathbf{r})\mathbf{k}_0 \cdot \mathbf{r} - \omega t]}$$

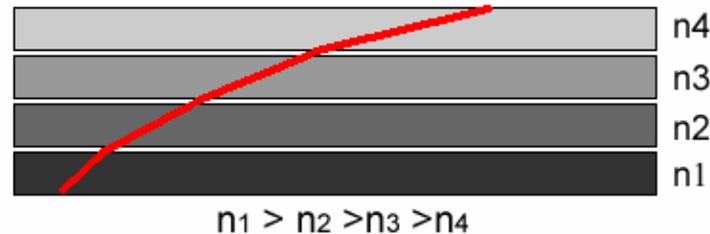
$$\omega = 2\pi f \quad \mathbf{k}_0 = \text{a vector normal to wavefront magnitude} = 2\pi/\lambda$$

# Atmospheric Refraction (Continue)

Snell's Law



$$\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_2}{n_1}$$



## ATTENUATION DUE TO RAIN

For an assembly of uniform raindrops, where there are  $N$  drops/CC of diameter  $D$ , the attenuation is given by:

$$a = 4.34 \times 10^5 \frac{N(\pi D^2)}{4} f_a \quad \text{db/km}$$

# Atmospheric Refraction (Continue)

Where:

The function  $f_a$  depends on the ratio  $(D^2)$  and the complex permittivity, - the factor

4

$(A)$  is the effective area of a square for combined absorption and scattering etc.

Attenuation due to rain is among the factors considered under Environmental Data.

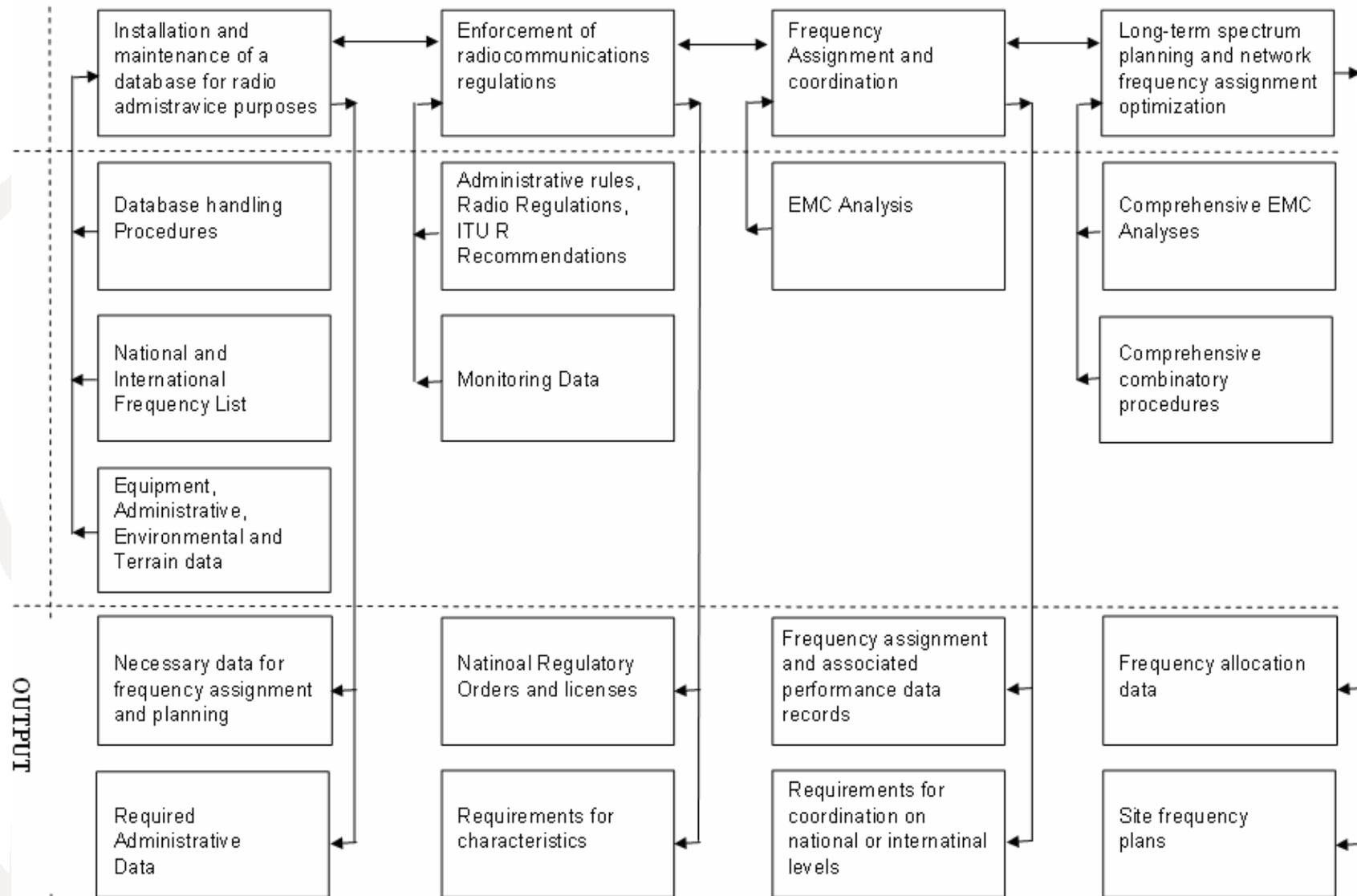
# EMC Seminar Conclusion

- A detailed overview of key EMC concerns including the theory of EMI, various case studies, and measurement and prevention methods, national and testing issues shall go a long way to safeguard the increasing use of the electromagnetic spectrum for the provision of communication services in this convergence era of Telecommunication, Broadcasting and ICT industries.

# EMC Seminar Conclusion (Continue)

- This will serve as one of the initial steps towards the bridging of the standardisation gap between the developed countries, (who have well established National EMC Framework/Standards), and developing countries, especially in Africa, who are yet to develop their National or Regional vital EMC Framework/Standards.

## EMC IN NATIONAL TELECOMMUNICATION / ICT STRATEGIC PLANNING AND MANAGEMENT



Source: ITU Handbook on Spectrum Management and computer Aided Technique

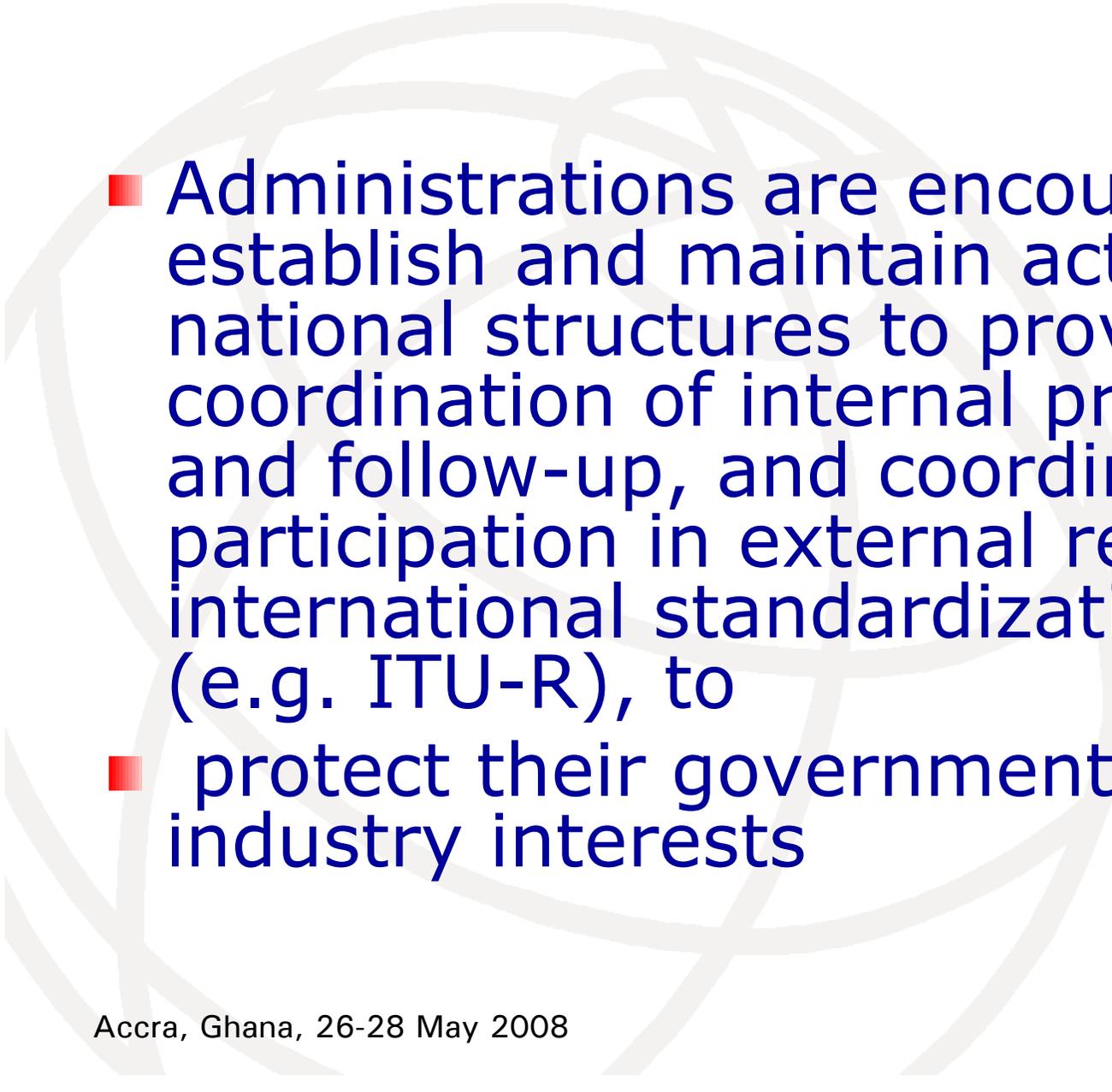
# Resolution 47 (Doha, 2006): Enhancement of knowledge and effective application of ITU Recommendations in developing countries

## Noting

- The difficulties in understanding ITU recommendations and related international standards to apply new technology to the network appropriately and effectively.
- The lack of practical information on the application of ITU recommendations and related standards of other countries, and the lack of guidelines on applying technical document

## ITU Instructed

- To promote participation in training courses and workshops on best-practice application of ITU recommendation for developing countries
- To establish a database containing information on new technologies that are standardized and develop guideline on applying ITU recommendations

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- Administrations are encouraged to establish and maintain active national structures to provide for coordination of internal preparation and follow-up, and coordination of participation in external regional and international standardization bodies (e.g. ITU-R), to
  - protect their government and industry interests

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# What is the Standardization Development Gap?

*"the continued shortage of human resources in the standardization field in developing countries, resulting in a low level of developing-country participation in meetings of ITU-T and of ITU-R and, consequently, in the standards-making process, leading to difficulties when interpreting ITU-T and ITU-R Recommendations;"*

# Assistance

- To assist developing countries meet national and international EMC standards, so as set up adequate Test Approval Laboratories to determine the conformity of telecommunications equipment to ITU Recommendations/Standards.
- In addition seminars may be organized where by experienced developed countries would share their expertise with developing countries as part of the fundamental measures envisaged in Resolution 123 (Rev. Antalya, 2006).

# Under Programme 3: Human Resource Building

ITU-R and ITU-T (to be specific Study Group 5) in close collaboration with BDT may organise seminars, workshops and study group meetings in developing countries to provide training courses on EMC analysis/standards. This can be by way of establishing and maintaining a forum, moderated by a group of experts, to support and provide advice in developing countries.