



Ministry of Information  
and Communications,  
Government of Nepal



International  
Telecommunication  
Union



Ministry of  
Communications,  
Government of Israel



Ministry of Foreign Affairs,  
MASHAV-Center for  
International Cooperation,  
Government of Israel

## Wireless Telecommunications Training Kathmandu 24-28 Nov 2008; Course Outline

# RF Spectrum: Engineering; Analysis, Regulation, Standardization

### Course Objective

The objective of this training is to enhance knowledge of Nepalese ICT professionals in the areas of advanced technical and regulatory field of wireless telecommunications. This course also aims at improving the capabilities of Nepalese ICT professionals for practical implementation of advanced wireless technologies in accordance with prevailing regulations and standards. This course provides the trainees with the necessary tools for analysis and understanding of the wireless communications, its regulation and the main RF services: broadcasting, cellular, satellite and radiolocation. The participants will learn the fundamentals of RF, the characteristics of wireless systems (frequency, power, sensitivity, polarization, antenna gain), with mathematical derivations and calculations kept to the minimum necessary. The basic principles of RF regulation and standardization are considered. The course will emphasize the difference between the American, European and Asian<sup>1</sup> RF standards and ruling. The thresholds of the radiation human hazards (RADHAZ) are compared around the world. Practical solutions to real world problems, as well as “real life case studies” are used as examples, such as type approval of wireless equipment.

### Course Outline<sup>2</sup>

1. Course Introduction;
2. ITU; the RF Radio Spectrum and Radio Services
  - a. *ITU Initiatives on NGN: Applications and Standards: Sameer Sharma, Regional Office for Asia and the Pacific*
  - b. ITU structure; ITU-R (Study groups); International registration and bi/multilateral coordination; ITU-R BRIFIC;
  - c. BDT assistance to countries on the field of Spectrum Management and broadcasting: *Sameer Sharma, Regional Office for Asia and the Pacific;*
  - d. SMS4DC a useful tool for Spectrum Management for developing countries;
  - e. Mobile and Fixed (point to point and point to multipoint) Services;
  - f. Main cellular including IMT (UMTS, CDMA2000 and WiMAX), broadband wireless access and broadcasting standards, the GSM (and WiFi) success;
  - g. Broadcasting: Sound Broadcasting (FM and DAB), Video Broadcasting (TV);
  - h. Satellite communications: GSO (Geostationary Satellite Orbit), non GSO and DTH, including real-time simulations;
  - i. Radiolocation and Radionavigation: Radars and GPS.

---

<sup>1</sup> The participants will assist

<sup>2</sup> The author may add or subtract topics.



**Ministry of Information  
and Communications,  
Government of Nepal**



**International  
Telecommunication  
Union**



**Ministry of  
Communications,  
Government of Israel**



**Ministry of Foreign Affairs,  
MASHAV-Center for  
International Cooperation,  
Government of Israel**

3. Spectrum Engineering
  - a. Systems characteristics:
    - i. Transmitters and spurious emission;
    - ii. Receivers- noise, sensitivity and modulation;
    - iii. Antennas- directivity and diversity; minimising interference- frequency, space and time domains.
4. Wave Propagation
  - a. Free Space and the wireless path loss;
  - b. Digital Terrain Maps, including real-time simulations;
  - c. Near and far field, outdoor and indoor, attenuation by obstacles;
  - d. Sky waves, including real-time simulations (VOACAP).
5. *Human Capacity Building: ITU Asia Pacific Centre of Excellence: Sameer Sharma*
6. Human Hazards: Risks from RF Exposure
  - a. From RF transmitters;
  - b. From utility power lines and electric equipment;
  - c. ICNIRP (International Commission on Non-Ionizing Radiation Protection) limits;
  - d. Comparison of different thresholds around the world.
7. RF Regulations, Allocations and Standards
  - a. Government and non-Government usage;
  - b. Short Range Devices (SRD) and electronic devices;
  - c. European, American and Asian<sup>3</sup>: frameworks, rules and standards;
  - d. Type approval process [http://www.nta.gov.np/type\\_approval\\_for\\_telecom\\_equipment.html](http://www.nta.gov.np/type_approval_for_telecom_equipment.html);
  - e. National Spectrum Control- RF Spectrum Management guidelines and practices;
  - f. RF Spectrum Monitoring.
  - g. Innovative regulation in developed countries.
8. Summary, Q&A
  - a. RF spectrum engineering problems – discussion, solving real problems;
  - b. Group exercises (?);
  - c. Questions and answers

---

<sup>3</sup> The participants will assist