The ITU and how COST 296 can contribute to its work

Prepared by:

Professor Les Barclay

Adapted and Presented by

Bertram Arbesser-Rastburg

ITU Mandate

- **The ITU**, headquartered in Geneva, Switzerland is an international organization within the United Nations System where governments and the private sector coordinate global telecom networks and services.
- The ITU is concerned with the international regulation, spectrum and satellite orbit regulation and spectrum management for international purposes.
- It is interested in managing interference and in quantifying system performance

ITU Sectors

- **ITU-R Radiocommunication Sector**
  - **The ITU-R is concerned with the management of the radio-frequency spectrum and satellite orbits** ***(was CCIR)***

V. Timofeev

- **ITU-T Telecom Standardization Sector**
  - **The ITU-T is concerned with setting standards for all fields of tele-communications** ***(was CCITT)***

H. Zhao

- **ITU-D Telecom Delevopment Bureau**
  - **ITU-D provides training for developing countries**

H. Touré

ITU-R Study Groups

- **SG 1 - Spectrum management**
- **SG 3 - Radiowave propagation**
- **SG 4 - Fixed-satellite service**
- **SG 6 - Broadcasting services**
- **SG 7 - Science services**
- **SG 8 - Mobile, radiodetermination, amateur and related satellite services**
- **SG 9 - Fixed service**

Interest in Ionospheric Propagation

All of the service study groups have an interest in ionospheric propagation:

- as mechanism for wanted propagation
- as a mechanism for unwanted interference propagation
- as a source of channel distortion

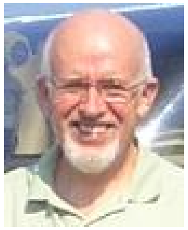
ITU-R SG3: Radiowave Propagation

Chairman: D. Cole

Vice Chairmen: D. Rogers
B. Arbesser-Rastburg
J. Wang

- **Working Party 3J** (Chair: G. Brussaard)

  Propagation fundamentals



- **Working Party 3K** (Chair: R Grosskopf)

  Point-to-area propagation

- **Working Party 3L** (Chair: J. Wang)

  Ionospheric propagation

- **Working Party 3M** (Chair: C. Wilson)

  Point-to-point & Earth-space propag.

WP3L: Ionospheric Propagation

Current main enquiries from:

- SG 6 (digital HF/MF broadcasting- prediction method including service quality)

- SG 9 (frequency adaptive technology- prediction method for planning and operation; high speed modems and simulators– representative channel characteristics;)

- SG 7, SG 8 (trans-ionospheric propagation including delay, Faraday rotation and scintillations)

SG3 Ionospheric Questions: priority categories

- C: Conference oriented Questions associated with work related to specific preparations for, and decisions of, world and regional radiocommunication conferences:
- S: Questions which are intended to respond to:
  - topics from RA, PP, WRC, Council or RRB
  - advances in radiocommunication technology or spectrum management;
  - changes in radio usage or operation:

S1: urgent studies, intended to be completed within 2 years;

S2: important studies, necessary for the development of radiocommunications;

S3: required studies, expected to facilitate the development of radiocommunications.

Questions – ionospheric SG3

212-1/3	S3	Ionospheric properties
213-1/3	S3	short-term forecasting of operational parameters for ionospheric & trans-ionospheric radiocommunications
214-1/3	S2	Radio noise
218-2/3	S2	Ionospheric influences on space systems
221/3	S3	VHF and UHF propagation by way of sporadic E & other ionization
222-1/3	S2	Measurements & data banks of ionospheric parameters
225-3/3	S1	prediction of propagation factors affecting systems at LF & MF including use of digital modulation techniques
226-2/3	S2	Ionospheric and tropospheric characteristics along satellite-to-satellite paths
227-1/3	S1	HF channel simulation
229/3	S1	Prediction of sky-wave propagation conditions, signal intensity, circuit performance & reliability at frequencies between about 1.6 & 30 MHz, in particular for systems using digital modulation techniques
230/3	C1	prediction methods and models applicable to power line telecommunication systems

Q225-3/3 LF & MF propagation factors

1. Improvements to methods of predicting sky-wave FS & circuit performance at frequencies below 1.7 MHz?
2. Are there significant variations in ground-wave field strength with location or with time?
3. Coexistence of ground-wave & sky-wave signals affect digital systems at LF and MF?
4. Amplitude & phase characteristics of time & frequency spreads (multipath & Doppler) of sky-wave sigs.
5. Appropriate parameters for signal characteristics for incorporation into a measurement data bank?
6. How do the sky-wave parameters vary with time, frequency, path length and other factors?
7. Appropriate methods for predicting these parameters & extent should different prediction models be used, dependent on modulation methods?

Q227-1/3 HF channel simulation

1. What ionospheric situations have significant effects on an HF channel?
2. What are the characteristics relevant for the simulation of a narrow-band HF channel?
3. What are the characteristics relevant for the simulation of a wideband (e.g. 100 kHz) HF channel?
4. What values of the channel transfer function, notably the delay power profile, are characteristic of the ionosphere at different locations and times?

Q229/3 Prediction of sky-wave propagation conditions, signal intensity, circuit perf. & reliability at f = 1.6 to 30 MHz, in particular for systems using digital mod

1. Improvement to the methods of Rec P.1240 for long-term prediction of basic & operational MUFs & ray paths, & variability, from predicted characteristics?
2. Improvements in method for long-term estimation of sky-wave propagation conditions, signal intensity and circuit performance using predicted ionospheric characteristics?
3. Procedures for estimation of reliability of radio system,
4. Chars of time delay spread & freq spread (multipath & Doppler) of HF sky-wave signals, including fading
5. Values of time-delay & frequency power profiles characteristic of ionosphere at different locations & times, & prediction of these characteristics

Q230/3 Prediction methods and models applicable to power line telecommunications systems

1. What are the mechanisms in PLT systems that cause radio frequency energy to be radiated?
2. Which modelling techniques may be best used to estimate radiated energy from a generic portion of a complete network?
3. What are the effects of the position of the ground plane and other structures relative to the line on radiated energy and its spatial distribution?
4. What techniques are most appropriate in aggregating the total radiated energy in space from such a system or multitude of systems?
5. Which signal level propagation models are most appropriate in the determination of interference?
6. What advice may be given to enable practical measurement of radiating fields at short distances (within the near field)?

SG9 Questions – Fixed Service

145-1/9	S2	Characteristics required for high-speed data transmission over HF radio circuits
147-2/9	S2	Automatically controlled radio systems & networks in the HF fixed service
205-1/9	C1	The use of frequency adaptive HF systems
213-1/9	S1	Simulation of HF transmission through an ionospheric channel

Q205-1/9 frequency adaptive HF systems

What technical and operational implications result from the use of adaptive HF systems within the fixed service in terms of:

- grade of service;
- efficient use of spectrum;
- minimization of interference;
- better access to the spectrum;
- other factors?

Q213-1/9 HF simulation

1. What are the characteristic patterns of fading and the time-variant frequency and delay spreads that should be used in real-time channel simulators for testing HF communications systems?
2. What are the patterns and parameters of a HF ionospheric transmission model that realistically represent the HF transmission media and how can these transmission parameters be used in a real-time channel simulator for testing HF communications systems?
3. What are the characteristic atmospheric and man-made noise patterns and parameters needed to accurately model the HF operating environment and how can these noise parameters be used in a real-time channel simulator for testing HF communications systems?

SG8 questions
Mobile and Radiodetermination Services

Q87-3/8	Transmission characteristics for a mobile-satellite communication system
Q88-1/8	Propagation and mobile earth station antenna characteristics for mobile-satellite services
Q90/8	Technical and operating characteristics of systems providing radiocommunication using satellite techniques for distress and safety operations
Q91-1/8	Technical and operating characteristics of the radiodetermination-satellite service

Q 87-3/8 Transmission characteristics for a mobile-satellite communication system

1. What are preferred transmission characteristics for:
   - land mobile-satellite systems;
   - maritime mobile-satellite systems;
   - aeronautical mobile-satellite systems;
   - a combination of 2 or more of the above
2. What are the technically preferred multiple access, modulation & coding methods for such systems?
3. What are preferred performance characteristics of earth stations and space stations for such systems?
4. What transmission characteristics could be common to facilitate compatibility between the land, maritime, and aeronautical mobile-satellite services?

Q88-1/8 Propagation and mobile earth station antenna characteristics for mobile-satellite services

1. What are the preferred types of antenna systems and their characteristics for: ship-borne use; airborne use; land use; taking into account that some mobile earth stations may have elevation angles of less than 5° to satellites in the geostationary orbit?
2. What fading reduction techniques can be applied to mobile antenna systems in a mobile-satellite service?

90/8 Technical and operating characteristics of systems providing radiocommunication using satellite techniques for distress and safety operations

1. What are the preferred technical and operating characteristics of systems providing radiocoms using low-orbiting or geostationary-satellite techniques, for distress and safety operations?
2. What are the various technical & operating problems & economic factors concerning radiocom systems using satellite techniques for ships, aircraft & land mobile units, including satellite Emergency Position Indicating Radio Beacons (EPIRBs) & Emergency Location Transmitters (ELTs), in particular with regard to distress, search & rescue & safety operations?
3. What are the conditions for compatibility between satellite EPIRBs in the band 406-406.1 MHz & services using adjacent bands?

Q91-1/8 Technical and operating characteristics of the radiodetermination-satellite service

1. What are the preferred system concepts and technical and operating characteristics of systems in the radiodetermination-satellite service?
2. What are the preferred frequency bands for radiodetermination-satellite services?
3. What is the technical feasibility of frequency sharing between the radiodetermination-satellite service & other services, & sharing criteria (1610-1626.5 MHz, 2 483.5-2 500 MHz & 2 500-2 516.5 MHz with aero radionav, fixed, mobile, radiolocation and radioastronomy services)?
4. What are the potential interference conditions between the radiodetermination-satellite service and the services in adjacent frequency bands?
5. What are the technical and operational feasibility and potential advantages of an integrated system for communication and radiodetermination?
6. What are the preferred types of orbit for the radiodetermination-satellite service?

SG7 Questions - Science Services

Q102-2/7	Terrestrial standard frequency and time-signal dissemination
Q104-2/7	Stability of standard frequency and time signal emissions as received
Q152-2/7	Standard frequencies and Time signals from satellites
Q223/7	The role of differential GPS networks in timing applications

Q102-2/7 Terrestrial standard-frequency and time-signal dissemination

1. What techniques can be developed, independently or in conjunction with existing national or regional systems, to disseminate time with an uncertainty of the order of 1 μs?
2. Would it be advantageous to use frequencies in bands additional to those in the designated bands?
3. Do needs exist for further services, using e.g. stabilization of the carrier frequencies of appropriate broadcasting stations, or applying phase modulation to appropriate amplitude-modulated transmissions?
4. Can such refinements as mentioned in § 3 be achieved economically by utilizing the inherent timing capabilities of systems with other primary objectives without conflicting with these objectives?

Q104-2/7 Stability of standard-frequency and time-signal emissions as received

1 What are the causes of degradation on the stability & accuracy of the standard frequencies & time signals as received by the users?

2 What is the magnitude in statistical & causal terms of the instability introduced by these effects?

3 What are most suitable techniques for transmitting & receiving standard frequencies & time signals to obtain best results in the reception of:

- – standard frequencies and time signals as used by those requiring moderate accuracy with cost effective equipment;
- – standard frequencies & time signals as used by those requiring the maximum possible accuracy?

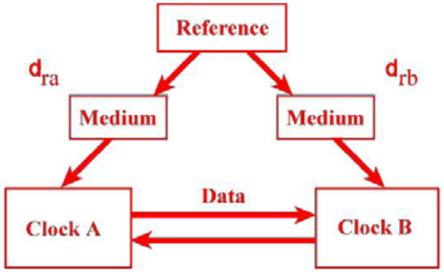
4 What are the most meaningful statistical and causal analyses for characterizing the transmitted and received stability and accuracy of the frequency and time signals?

5 For what levels of accuracy are GPS/GLONASS signals preferred?

Q152-2/7 Standard frequencies and time signals from satellites

What are the technical factors and quantitative measures to be considered in recommending frequencies and in determining the transmitting, modulating, and receiving techniques which are important to the development of standard-frequency and time-signal emissions from satellites?

(See Recommendation ITU-R TF.1153 and Chapter 2 Part B and 6.3 of the ITU-R Handbook “Selection and use of precise frequency and time systems”.



Q223/7 The role of differential GPS networks in timing applications

1 Which measurement protocol is suitable for determining differential timing errors and which rate of update is adequate to the users' needs?

2 What are the formats already in use for providing differential position information and to what extent can differential timing information be included?

3 What are the transmission media that could be used for transmitting the relevant information that allows a wide coverage area and a simple interface at the user side?

4 What uncertainty can be obtained using such systems for time scale dissemination and for synchronization of oscillators?

5 How could timing centres support the realization of the DGPS navigation networks?

COST 296 input to ITU WP3L

- **Prepare input document to WP3L Meetings addressing:**
  - **Improvements to existing Recommendations**
  - **Draft New Recommendations based on the Questions**
- **Submitted through Member (=Government) or Sector Member (= International Organisation or Telecom Company)**
- **Participate in WP3L meeting to support the development of Recommendations, Reports, Handbooks and Liaison Statements.**

Next Meeting of WP3L

Was scheduled for 3-8 March 2006 but might be shifted to mid September 2006 because of serious problems with hotel rooms in Geneva during the "75th Salon de l'Auto".

Input documents are due one week before the beginning of the block meeting (two weeks before the start of WP3L). Note that the process of vetting a document can take several weeks and that many countries have national committees which are developing the ITU strategy. It is useful for these committees to see the proposed input documents.

WP3L Meetings

ITU Member Administrations

Input documents need to be vetted by the submitting administration and participants to meetings need to be registered through a Member (below) or Sector Member organisation.

AT:	KommAustria	www.rtr.at
BE:	IBPT	www.bipt.be
BG:	CRC	www.crc.bg
DE:	Bundesnetzagentur	www.bundesnetzagentur.de
ES:	SETSI	www2.setsi.mityc.es
FI:	FICORA	www.ficora.fi
FR:	ANFR	www.anfr.fr
GB:	OFCOM	www.ofcom.org.uk
GR:	EETT	www.eett.gr
HU:	NCAH	www.nhh.hu
IT:	MdC	www.comunicazioni.it
PL:	URTiP	www.urtip.gov.pl
PT:	ANACOM	www.anacom.pt
RO:	ANRC	www.anrc.ro
SE:	PTS	www.pts.se
TR:	TK	www.tk.gov.tr

Conclusions

- **One of the objectives of COST 296 (see MoU Section B) is to:** Make applicable results available to the ITU-R and to promote the research aspects to funding agencies such as ESA, ESF and the EC.
- **COST 296 has already developed material which would constitute valuable contributions to ITU-R.**
- **What is missing is more active involvement by COST members in the work of ITU-R**

Thank you!