Thailand

FOCAL POINT REGARDING CORRESPONDENCE ON THIS QUESTIONNAIRE (PARTS I, II AND III)

Please identify a focal point in your administration/organization who could provide a response to further correspondence regarding this questionnaire (see hereafter).

1. Mr./Ms _____ _____.
   Family Name First Name
2. Country _____.
3. Name of the Administration/Organization _____.
4. Title _____
5. Address _____
   _____
   _____
6. Tel.: _____ Fax: _____ E-Mail: _____

To be returned to:
ITU-D Study Groups Secretariat
Telecommunication Development Bureau
Fax: +41 22 730 54 84
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Attachment 1

QUESTIONNAIRE - PART I

(To be completed by both Administrations and, where relevant, by Sector members)

Information on national radio frequency spectrum allocations: 960 – 3 000 MHz

1. Introduction

A national table of frequency allocations is a basic tool for an effective spectrum management process. It provides a general plan for spectrum use and the basic structure to ensure efficient use of the spectrum and the prevention of radio frequency interference between services. Through use of the table, manufacturers will have a guide to where in the spectrum to design and build equipment, and users will know where to operate. As described in the National Spectrum Management Handbook, the International Table of Frequency Allocations, Article 5 of the Radio Regulations forms the basis for national tables and, in some countries, this may be used as the national table. However, other countries have included additional information on national use, varying in detail from showing which service operates when the Radio Regulations offer a choice, to showing how spectrum available for government and non-government use, and, for specific sub-bands, channel arrangements and equipment specifications in use. An extract of a national allocation table is attached as an example.

The scope of the information requested from administrations by this circular letter in no way touches the security or the secrecy aspects of frequency usage in Member States. It is intended simply to provide additional information on the frequency usage on a national basis, together with its corresponding application. It is intended also to facilitate the co-ordination requirements of that usage, either nationally or with neighbouring countries, or with other countries at an international level.

2. Information on national radio frequency spectrum allocations: 960 – 3 000 MHz

a) If you have a publicly available national table of radio frequency spectrum allocations, please submit a copy (either in electronic, or printed form, or both) of that table, or an extract for the frequency range 960 – 3 000 MHz.

b) If you do not have a national frequency allocations table available, the attached extract from Article 5 of the Radio Regulations may be used to indicate general information on how this range of frequencies is used by your administration within your national borders. Two "empty" columns have been added to this table for this purpose. If you are using an electronic version of the table, the information may be keyed into the spaces provided, otherwise, please type or write the information on a printed copy.

c) Administrations are invited to enter the following information:

In the column designated "National Allocations", please enter the name of the radiocommunications service that is allocated for the use of a given frequency band. Please use the ITU terminology given in Article 1 of the Radio Regulations to describe services, such as FIXED, MOBILE, space research, radio astronomy, etc., using "capitals" to denote a PRIMARY allocation and "normal characters" to denote a secondary allocation (see Nos. **5.23** to **5.31**)

In the column designated "Application and comment", please enter further technical requirements or characteristics, if any, that have been established nationally for a given band such as channel spacing, limitations on radiated signal power;

d) Sector Members that operate in or manufacture equipment for this frequency range are invited to enter information about applications available for operation in the different frequency sub-bands e.g. purpose, operating parameters such as channel spacing, radiated signal power capabilities, etc.

e) Example extract from a national frequency allocation table

This example extract from a national allocation table shows the typical information administrations are invited to provide in the two columns under "National Use" for each sub-band. The column "National Allocation" shows which service(s) have been allocated the sub-band by the administration on a national basis. This is usually a sub-set of the international allocations. The second column shows the typical applications within the service, further comments on the application or any other application in the sub-band.

890 – 1 350 MHz

Allocation to services		
Thailand		*Remark*
890– 942	FIXED MOBILE T13 T14 Radiolocation	
942– 960	FIXED MOBILE T13 S5.320	
960 – 1 215	AERONAUTICAL RADIONAVIGATION S5.328	
1 215 – 1 240	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) **S5.329** SPACE RESEARCH (active) S5.332	GPS (L2-1227.6 MHz)
1 240 – 1 260	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) **S5.329** SPACE RESEARCH (active) Amateur S5.332	
1 260 – 1 300	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Amateur S5.282 S5.332	
1 300 – 1 350	AERONAUTICAL RADIONAVIGATION S5.337 Radiolocation S5.149	

1 350 – 1 525 MHz

Allocation to services		
Thailand		*Remark*
1 350 – 1 400	RADIOLOCATION S5.149 S5.339	
1 400 – 1 427	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340	
1 427 – 1 429	SPACE OPERATION (Earth-to-space) FIXED T15 MOBILE except aeronautical mobile	
1 429 – 1 452	FIXED T15 MOBILE T13	
1 452 – 1 492	FIXED T15 MOBILE T13 BROADCASTING S5.345 BROADCASTING -SATELLITE S5.345	
1 492 – 1 525	FIXED T15 MOBILE T13	

1 525 – 1 610 MHz

Allocation to services		
Thailand		*Remark*
1 525 – 1 530	SPACE OPERATION (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite Fixed Mobile S5.351 S5.354	
1 530 – 1 535	SPACE OPERATION (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) S5.353A Earth exploration-satellite Fixed Mobile S5.351 S5.354	
1 535 – 1 559	MOBILE-SATELLITE (space-to-Earth) S5.351 S5.353A S5.354 S5.356 S5.357 S5.357A	
1 559 – 1 610	AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth)	GPS (L1-1575.42 MHz)

1 610 – 1660 MHz

Allocation to services		
Thailand		*Remark*
1 610 – 1 610.6	MOBILE-SATELLITE (Earth-to-space) AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) S5.364 S5.366 S5.367 S5.368 S5.372	
1 610.6 – 1 613.8	MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) S5.149 S5.364 S5.366 S5.367 S5.368 S5.372	
1 613.8 – 1 626.5	MOBILE-SATELLITE (Earth-to-space) AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) Radiodetermination-satellite (Earth-to-space) S5.364 S5.365 S5.366 S5.367 S5.368 S5.372	
1 626.5 – 1 660	MOBILE-SATELLITE (Earth-to-space) S5.351 S5.353A S5.354 S5.357A S5.374 S5.375 S5.376	

1660 – 1 710 MHz

Allocation to services		
Thailand		*Remark*
1 660 – 1 660.5	MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY S5.149 S5.351 S5.354 S5.376A	
1 660.5 – 1 668.4	RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile S5.149 S5.379A	
1 668.4 – 1 670	METEOROLOGICAL AIDS FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY S5.149	
1 670 – 1 675	METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE S5.380	
1 675 – 1 690	METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile	
1 690 – 1 700	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) S5.289	
1 700 – 1 710	FIXED T16 METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile S5.289	

1 710 – 2 170 MHz

Allocation to services		
Thailand		*Remark*
1 710 – 1 930	FIXED T16 T17 MOBILE S5.380 T13 S5.149 S5.385 S5.388 T18 T19	
1 930 – 1 980	FIXED T17 MOBILE T13 S5.388	
1 980 – 2 010	FIXED T17 MOBILE MOBILE-SATELLITE (Earth-to-space) S5.388 S5.389A	
2 010– 2 025	FIXED T17 MOBILE S5.388	
2 025– 2 110	SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) FIXED T17 T20 MOBILE S5.391 SPACE RESEARCH (Earth-to-space) (space-to-space) S5.392	
2 110– 2 120	FIXED T17 MOBILE SPACE RESEARCH (deep space) (Earth-to-space) S5.388	
2 120– 2 170	FIXED T17 MOBILE S5.388	

2 170 – 2 520 MHz

Allocation to services		
Thailand		*Remark*
2 170 – 2 200	FIXED T17 MOBILE MOBILE-SATELLITE (space-to-Earth) S5.388 S5.389A	
2 200 – 2 290	SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED T17 T20 MOBILE S5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) S5.392	
2 290 – 2 300	FIXED T17 MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)	
2 300 – 2 450	FIXED T17 T21 MOBILE RADIOLOCATION Amateur S5.150 S5.282 S5.396	
2 450 – 2 483.5	FIXED T21 MOBILE RADIOLOCATION S5.150	
2 483.5– 2 500	FIXED T22 MOBILE MOBILE-SATELLITE (space-to-Earth) RADIOLOCATION Radiodetermination-satellite (space-to-Earth) S5.398 S5.150 S5.402	
2 500 – 2 520	FIXED S5.409 S5.411 T22 T23 FIXED-SATELLITE (space-to-Earth) S5.415 MOBILE except aeronautical mobile MOBILE-SATELLITE (space-to-Earth) S5.403 S5.407 S5.414	

2 520 – 2 700 MHz

Allocation to services		
Thailand		*Remark*
2 520 – 2 535	FIXED S5.409 S5.411 T22 T23 FIXED-SATELLITE (space-to-Earth) S5.415 MOBILE except aeronautical mobile BROADCASTING-SATELLITE S5.413 S5.416 S5.403	
2 535 – 2 655	FIXED S5.409 S5.411 T22 T23 T24 MOBILE except aeronautical mobile BROADCASTING-SATELLITE S5.413 S5.416 S5.339 S5.418	
2 655 – 2 670	FIXED S5.409 S5.411 T22 T23 T24 FIXED-SATELLITE (Earth-to-space) S5.415 MOBILE except aeronautical mobile BROADCASTING-SATELLITE S5.413 S5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) S5.149 S5.420	
2 670 – 2 690	FIXED S5.409 S5.411 T22 T23 T24 FIXED-SATELLITE (Earth-to-space) S5.415 MOBILE except aeronautical mobile MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (passive) Radio astronomy Space research (passive) S5.149 S5.419 S5.420	
2 690 – 2 700	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340 T24	

2 700 – 4 800 MHz

Allocation to services		
Thailand		*Remark*
2 700 – 2 900	AERONAUTICAL RADIONAVIGATION S5.337 Radiolocation S5.423	
2 900 – 3 100	RADIONAVIGATION S5.426 Radiolocation S5.425 S5.427	
3 100 – 3 300	RADIOLOCATION Earth exploration-satellite (active) Space research (active) S5.149	
3 300 – 3 400	RADIOLOCATION Amateur S5.149	
3 400 – 3 500	FIXED-SATELLITE (space-to-Earth) Fixed Amateur Mobile Radiolocation S5.433 S5.282 S5.432	
3 500 – 3 700	FIXED-SATELLITE (space-to-Earth) Fixed Mobile except aeronautical mobile Radiolocation S5.433 S5.435	
3 700 – 4 200	FIXED-SATELLITE (space-to-Earth) Fixed Mobile except aeronautical mobile	
4 200 – 4 400	AERONAUTICAL RADIONAVIGATION S5.438 S5.440	
4 400 – 4 500	FIXED T25 MOBILE	
4 500 – 4 800	FIXED T25 FIXED-SATELLITE (space-to-Earth) S5.441 MOBILE	

National Footnotes

T1 The band 59.5 - 60.5 kHz is designated for the standard frequency and time signal service.

T2 The band 526.5 - 1606.5 kHz is allocated to the broadcasting (sound) service, in accordance with the Plan for MF broadcasting in Regions 1 and 3 and LF broadcasting in Region 1, Geneva, 1975 (GE75).

T3 In the band 3500 - 3540 kHz, existing stations in the fixed and mobile services may continue to operate until 31 December 2001.

T4 The bands 26.960 - 27.410 MHz, 77.9875 - 79 MHz and 244.9875 - 246 MHz are designated as Citizens Band (CB). The bands 79 - 79.9875 MHz and 246 - 247 MHz are reserved for similar purposes.

T5 In the band 47 - 68 MHz, stations in the fixed and mobile services shall not cause harmful interference to, or claim protection from, stations in the broadcasting service.

T6 Transmissions from stations in the amateur-satellite service are limited to the band 145.8 - 146 MHz.

T7 The band 300 - 320.1 MHz in the fixed service is designated for studio-transmitter link of sound broadcasting programmes.

T8 The band 279 - 283 MHz in the mobile service is designated for base-to-subscriber transmissions of radio-paging systems.

T9 The band 380 - 399.9 MHz in the mobile service is designated for trunked mobile radio systems. Existing stations in the fixed and mobile services (other than trunked mobile radio systems) may continue to operate until 31 December 2001.

T10 The bands 421.8 - 422.95 MHz and 433.8 - 434.95 MHz, 484 - 489 MHz and 494 - 499 MHz, 806 - 824 MHz and 851 - 869 MHz in the mobile service are designated for trunked mobile radio systems.

T11 In the band 435 - 438 MHz, the amateur-satellite service (space-to-Earth) is allowed to operate subject to not causing harmful interference to other services operating in accordance with the Table of Frequency Allocations.

T12 The frequencies 461.25 MHz and 463 MHz are designated for use by reference stations of the Differential Global Positioning System (DGPS).

T13 The bands 479 - 483.5 MHz and 489 - 493.5 MHz, 824 - 849 MHz and 869 -894 MHz, 897.5 - 915 MHz and 942.5 - 960 MHz, 1445 - 1453 MHz and 1493 - 1501 MHz, 1710 - 1785 MHz and 1805 - 1880 MHz, 1880 - 1900 MHz and 1960 - 1980 MHz in the mobile service are designated for cellular systems.

T14 The band 917 - 923 MHz in the mobile service is designated for subscriber-to-base transmissions of radio-paging systems .

T15 In the band 1427 - 1525 MHz, existing stations in the fixed service may continue to operate until their equipment expiration dates. New frequency assignment will be made in, or existing assignment will be relocated to, the bands 1427 - 1445 MHz and 1501 - 1517 MHz, with channel arrangements in accordance with the 1.4 GHz Frequency Plan for Fixed Service.

T16 In the bands 1706.5 - 1790.5 MHz and 1825.5 - 1909.5 MHz, existing stations in the fixed service may continue to operate until their equipment expiration dates. New frequency assignment to stations in the fixed service will not be authorized in these bands.

T17 In the bands 1898.5 - 1982.5 MHz and 2017.5 - 2101.5 MHz, 2101.5 - 2185.5 MHz and 2220.5 - 2304.5 MHz, existing stations in the fixed service may continue to operate until 31 December 2000 and shall not cause harmful interference to, or claim protection from, stations of other allocated services as from 1 January 2000.

T18 The band 1900 - 1906 MHz is designated for cordless telephone systems (private application).

T19 The band 1906.1 - 1918.1 MHz is designated for cordless telephone system (public application) and for wireless local loop (WLL) application.

T20 Channel arrangements of the bands 2025.5 - 2109.5 MHz and 2200.5 - 2284.5 MHz in the fixed service are in accordance with Annex 1 to Recommendation ITU-R F.1098-1.

T21 Channel arrangements of the bands 2306 - 2387 MHz and 2400 - 2481 MHz in the fixed service are in accordance with Annex 1 to Recommendation ITU-R F.746-3.

T22 Channel arrangements of the bands 2484.5 - 2568.5 MHz and 2603.5 - 2687.5 MHz in the fixed service are in accordance with Recommendation ITU-R F.283-5 and their use is limited to stations in upcountry area.

T23 The band 2504 - 2688 MHz in the fixed service is also designated for Multichannel Multipoint Distribution Service (MMDS) application and limited to stations in Bangkok and suburb area.

T24 The bands 2548 - 2596 MHz and 2660 - 2700 MHz in the fixed service, until 31 December 1999, are also designated for Multichannel Multipoint Distribution Service (MMDS) application and limited to stations in upcountry area. After that date, new frequency assignment will be made in, or existing assignment will be relocated to, the 2572 - 2600 MHz band.

T25 Channel arrangements of the band 4400 - 5000 MHz in the fixed service are in accordance with Annex 2 to Recommendation ITU-R F.746-3 or Annex 1 to Recommendation ITU-R F.1099-2.

T26 Channel arrangements of the band 5925 - 6425 MHz in the fixed service are in accordance with Recommendation ITU-R F.383-5.

T27 Channel arrangements of the band 6425 - 7110 MHz in the fixed service are in accordance with Recommendation ITU-R F.384-6.

T28 Channel arrangements of the band 7110 - 7425 MHz in the fixed service are in accordance with Recommendation ITU-R F.385-6.

T29 Channel arrangements of the band 7425 - 7725 MHz in the fixed service are in accordance with Annex 1 to Recommendation ITU-R F.385-6.

T30 Channel arrangements of the band 7725 - 8285 MHz in the fixed service are in accordance with Annex 1 to Recommendation ITU-R F.386-5.

T31 The band 8290 - 8500 MHz in the fixed service is designated for one-way transmissions of television broadcasting programmes.

T32 Channel arrangements of the band 10.5 - 10.68 GHz in the fixed service are in accordance with Annex 1 to Recommendation ITU-R F.747.

T33 Channel arrangements of the band 10.7 - 11.7 GHz in the fixed service are in accordance with Annexes 1 and 2 to Recommendation ITU-R F.387-7.

T34 Channel arrangements of the band 12.75 - 13.25 GHz in the fixed service are in accordance with Recommendation ITU-R F.497-5.

T35 Channel arrangements of the band 14.5-15.35 GHz in the fixed service are in accordance with Recommendation ITU-R F.636-3.

T36 Channel arrangements of the band 17.7 - 19.7 GHz in the fixed service are in accordance with Recommendation ITU-R F.595-5 or Annex 4 to that Recommendation. In assigning the frequency in this band, account should be taken of the use of the band 18.8 - 19.7 GHz in the fixed-satellite service (space-to-Earth) by non-geostationary satellite systems.

T37 Channel arrangements of the bands 21.2 - 21.4 GHz, 22 - 22.6 GHz and 23.2 - 23.6 GHz in the fixed service are in accordance with Annex 1 to Recommendation ITU-R F.637-2.

T38 The band 27.5 - 28.5 GHz in the fixed service is designated for Local Multipoint Distribution Service (LMDS) application.

T39 Channel arrangements of the band 31 - 31.3 GHz in the fixed service are in accordance with Annex 7 to Recommendation ITU-R F.746-3.

T40 Channel arrangements of the band 37 - 39.5 GHz in the fixed service are in accordance with Annex 1 to Recommendation ITU-R F.749-1.

T41 Channel arrangements of the band 57.2 - 58.2 GHz in the fixed service are in accordance with Annex 2 to Recommendation ITU-R F.1100.

Attachment 2

QUESTIONNAIRE - PART II
(To be completed by Administrations only)

General Questions on National Spectrum Management

The following general questions on national spectrum management are based in part on the functional requirements of spectrum management described in the handbook on "National Spectrum Management". If you need additional space to answer the questions please continue on a separate sheet of paper.

1. What legal or regulatory texts govern your national spectrum management processes?

   The Act, Ministerial Regulations and PTD announcements .

   Are any actions planned to change these legal texts or regulations? YES ✓ NO__

   Yes, when the new independent organization, name NTC is established, the Master Plan and new regulations for spectrum management should be published.

2. Have you publicly available regulations and procedures for national spectrum management (e.g. radio services, license requirements etc.)? YES ✓ NO__

3. Do you have a national radio frequency spectrum allocation table? YES ✓ NO__

4. Regulations for the technical characteristics of radiocommunications equipment

Do you specify that the technical characteristics of radiocommunications equipment must comply with certain requirements (often referred to as "equipment standards"), for example to avoid interference to other services and users? YES ✓ NO__

a) Do you develop these technical requirements or equipment standards on a national basis or use those developed by other administrations or international/regional standards organisations: National __Other ✓

b) Do you have a procedure to ensure that radiocommunications equipment complies with the technical requirements, for example:

   Type Approval: ✓; Manufacturers Declaration of Compliance: ___; Other ___

5. Spectrum re-deployment*

(The term "redeployment" is used here to refer to a process of national scope in which an assessment is conducted 1) to determine if portions of spectrum can be identified that are in limited use; and 2) to determine if such spectrum segments can be reallocated for use in delivering radiocommunication services that have expanding spectrum requirements. Some countries co-operate on a regional basis to identify suitable spectrum segments that may be re-deployed to facilitate the introduction of new applications on a harmonised basis.)*

a) Has there been any spectrum redeployment* in your country or has a need for spectrum redeployment been identified? YES__ NO ✓

b) If so, do you have a method for achieving this redeployment in respective frequency bands and for given radiocommunication services? *N/A*

c) Please define the established method and describe the nature of the consultation, if any, with users regarding the potential costs resulting from the planned redeployment.

None

6. Spectrum management costs

a) What is the cost of providing national spectrum management functions in your country (if there is more than one organisation or agency responsible for spectrum management please give the total costs if this information is available)? *N/A* (Swiss Francs)

b) What is the source of the funding required to accomplish these spectrum management functions?

Government

7. Management of frequency assignment records.

a) Does your administration have a system (manual or computerized) to keep and maintain records of national frequency assignments and spectrum use (usually known as a Data Base Management System (DBMS))? YES ✓ NO__

b) Is there a single national DBMS or separate DBMS(s) for different users (for example a DBMS for assignments to government users and separate DBMS for assignments to non-government users)? Single ✓ Separate__

What is the approximate size (at 2002) of your DBMS:

c) number of frequency assignments 19,742

d) number of licences *85,058*

e) Are these frequency assignment records made available to public? YES__ NO ✓

f) Is the DBMS computerized? YES ✓ NO__

g) What computerized DBMS do you use? *Oracle*

8. Co-ordination of frequency assignments with other countries:

- do you co-ordinate assignments to terrestrial stations YES ✓ NO__
- do you co-ordinate assignments to space stations YES ✓ NO__

9. Notification of frequency assignments.

Do you notify to the ITU those frequency assignments that are required to be notified by the Radio Regulations ? YES ✓ NO__

If not, please explain why and list any difficulties: _____

10. Do you have a policy and planning function for national spectrum management (i.e. a national strategy for future use of the spectrum)? YES ✓ NO__

11. Do you perform technical analyses of frequency assignment requests? YES ✓ NO__

12 Do you perform radio monitoring of terrestrial radio services? YES ✓ NO __

Fixed monitoring stations

a) How many fixed monitoring stations do you have? *14*

b) Please provide a brief list of the facilities available at your fixed monitoring stations (for example: receivers, spectrum analysers, direction finding equipment):

Receivers, Spectrum analysers, Direction finding equipment and Antenna

c) What is the upper frequency limit of your fixed monitoring stations *1800* MHz

d) What is the upper frequency limit of your fixed direction finding stations *1000* MHz

Mobile monitoring stations

e) How many mobile monitoring stations do you have? *15*

f) Please provide a brief list of the facilities available in your mobile monitoring stations (for example: receivers, spectrum analysers, direction finding equipment)

Receivers, Spectrum analysers, Direction finding equipment and Antenna

g) What is the upper frequency limit of your mobile monitoring stations *1800* MHz

h) What is the upper frequency limit of your mobile direction finding stations *1000* MHz

Transportable monitoring stations

i) How many transportable monitoring stations do you have? *6*

j) Please provide a brief list of the facilities available in your transportable monitoring stations (for example: receivers, spectrum analysers, direction finding equipment):

Receivers, Spectrum analysers, Direction finding equipment and Antenna

k) What is the upper frequency limit of your transportable monitoring stations *26500* MHz

l) What is the upper frequency limit of your transportable direction finding stations *1000* MHz

m) Do you perform space monitoring YES ___ NO ✓

n) Please provide a brief list of the facilities available at your space monitoring stations

N/A

o) What tasks does your space monitoring station perform for GSO satellite monitoring? *N/A*

p) What tasks does your space monitoring station perform for non-GSO satellite monitoring? *N/A*

q) Does your Administration participate in the International Monitoring Programme of ITU? YES ✓ NO ___

r) Co-operation between Spectrum Management and Monitoring YES ✓ NO ___

Please indicate the amount of work (in percentages) performed by the monitoring service for:

s) Frequency Management Department 30 %

t) Enforcement Department 70 %

u) License Department - %

13. Do you perform Inspections on Radio Stations YES ✓ NO__

a) What inspection techniques are used by your administration to determine that users of the spectrum are complying with national or international requirements?

case-by-case basis

b) What are the administrative procedures that determine your inspection policy (for example the number of inspections, type of notification provided prior to inspection, rules and regulations)?

The procedure depends on the interference reports.

c) What measurement equipment does your administration use to perform technical measurements at an inspection?

The equipments used to inspection are Spectrum Analyzer, Direction Finder, Automatic Spectrum Recorder, Watt Meter and Frequency counter.

d) What technical parameters does your administration measure when inspecting a radio system?

The technical parameters are frequency, bandwidth, output power, gain and modulation type.

e) What station records does your administration review when inspecting a radio station?

The licensing and application are reviewed when inspecting a radio station.

14. Do you perform technical analyses of radio frequency interference complaints? YES ✓ NO__

Do you have an established consultation process, involving Government and non-government organization, for resolving these complaints? YES__ NO ✓

15. Use of computers for national spectrum management

General

a) Do you use computers for national spectrum management? YES ✓ NO__

b) Type of computers *PC*

c) How many workstations: *2* or personal computers (PCs): *144*

d) Operating system(s) *UNIX, Windows*

e) Does your spectrum management system operate within a Local Area Network (LAN)? YES ✓ NO__

f) Do you have access to the internet? YES ✓ NO__

g) Does your administration provide a web site on the internet to disseminate spectrum management information? YES ✓ NO__

If yes, please provide the address (URL) of the web site: www.ptd.go.th

Windows Basic Spectrum Management System (WinBASMS)

h) Are you aware that a Windows Basic Spectrum Management System is available from the ITU at no cost? YES__ NO ✓

i) Has your administration used WinBASMS? YES__ NO ✓

j) Has your administration had problems using WinBASMS? *N/A*

k) Please list all problems that were encountered using WinBASMS.

N/A

l) Would you recommend using WinBASMS if the problems identified in (d) have been corrected? *N/A*

m) Do you need an enhanced spectrum management system if you answered no in (e)? *N/A*

Advanced Automated Spectrum Management Systems (AASMS)

n) Does your administration use an Automated Spectrum Management Systems (AASMS) YES__ NO ✓

o) Has your administration had problems using your AASMS *N/A*

p) Please list all problems that were encountered using your AASMS

N/A

q) How would you propose to change the AASMS to correct or overcome these problems (please describe)?

N/A

16. Organisation of spectrum management

a) Please describe your country's spectrum management structure and enclose a copy of the organization chart. The following aspects are of particular interest: *see in Attachment*

b) Is the spectrum management organisation a separate ministry, department or agency reporting directly to the government or is it part of a larger government department (for example, a department responsible for all telecommunications)?

PTD is the part of a larger government department.

c) Is the responsibility for spectrum management contained within a single organisation or is it shared between separate organisations (for example, some administrations have separate organisations for regulatory matters and policy matters, other administrations have separate organisations for government users and non-government users)? *Single Organisation*

d) Have there been recent changes in this organisational structure or are changes planned (for example to take account of any changes in your government's policy for telecommunications)?

Thailand has the plan to establish the independent organization (NTC.)

e) Number of specialist staff in national spectrum management? *6*

f) Number of support staff in national spectrum management? *20*

17. Do you use the ITU-R Handbooks and Reports on:

a) National Spectrum Management[1], version 1995 ? *No*

b) Spectrum Monitoring, version 2002? *No*

c) Computer-aided Techniques for Spectrum Management, version 1999? *No*

d) Report SM.2012-1, Economic Aspects of Spectrum Management, version 2000? *No*

18. Identification of problems experienced in national spectrum management.

Please use the following table to describe problems experienced by your administration in national spectrum management. This information will be used by the ITU, in particular ITU-R Study Group 1, to identify future areas of work, within the normal study programme, so that

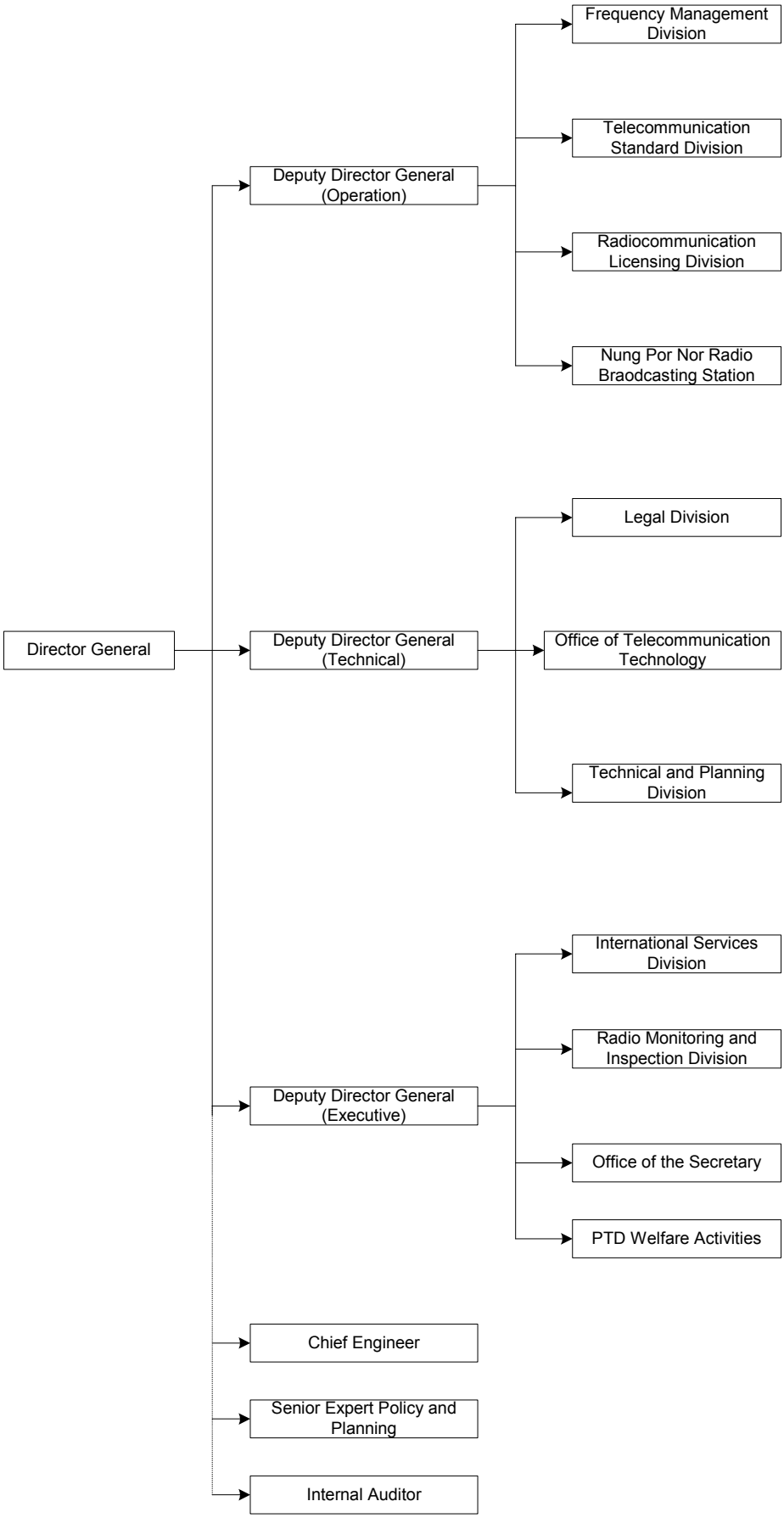
[1] The National Spectrum Management Handbook is currently being updated. You are urged to contact Mr Robert Mayher, Chairman ITU-R Study Group 1 and the designated Rapporteur for revision of this Handbook if you have any comments that you wish included in this revision.

effort may be focused on the development of recommendations and reports for subjects where assistance is most needed.

Question	**Please describe the spectrum management problem associated with the Question and the type of assistance that could be provided by the ITU.**
Q1	
Q2	
Q3	
Q4	
Q5	
Q6	
Q7	
Q8	
Q9	
Q10	
Q11	
Q12	
Q13	
Q14	
Q15	
Q16	
Q17	

Attachment

PTD ORGANIZATION CHART



PART III

Attachment 3

QUESTIONNAIRE - PART III
(To be completed by administrations)
Information on the calculation of fees for frequency use

1 Introduction

ITU-D Question 21/2 (see Appendix 1), adopted by the World Telecommunication Development Conference (Istanbul, March 2002), aims to respond to one of the most pressing concerns of the majority of developing countries, particularly LDCs, which are experiencing difficulties in establishing a national frequency fee calculation model.

The Question was entrusted to the Joint Group on Resolution 9 (ITU-D Study Group 2 and ITU-R Study Group 1) in order to benefit from the experience it had acquired during the period 1998-2002 in mobilizing ITU-D and ITU-R expertise. It will lead *inter alia* to the establishment of a document structure bringing together the calculation formulas and frequency fee amounts applied by the countries for radiocommunication usages in the various frequency bands.

This questionnaire is thus being sent to administrations in order to collect the necessary data, which will be analysed in depth and reported on, with a view to the establishment by ITU of a database, to be accessible to all countries.

Generally speaking, Report ITU-R SM.2012-1, while it does not go into detail about the situation in each country, does describe several possible methods of administrative spectrum pricing and mentions the variables likely to be used to calculate frequency fees. It also considers the systems of assignment by public tender and of transferable rights to use the spectrum, in both of which frequency prices are set by the market.

Question 21/2 carries on from Report SM.2012-1, and the results of the work done under this Question will provide information on the real conditions in which frequency fees are implemented in all the countries that participated.

Administrations are therefore invited to answer this questionnaire as accurately as possible. However, the questionnaire has been designed to cover generally all possible cases. Your Administration is not necessarily required to reply to all questions but to mark applicable boxes. Should you find that there are other possible cases or other explanations, please do not hesitate to include them on a separate sheet with an appropriate cross-reference.

2 How to complete the questionnaire

The document contains questions that are to be found in both the body of the text and in the charts set out in APPENDIX 2, which concerns only frequency fees (the other charges are dealt with in question Q3).

In the charts, many of the questions require only a "yes" or "no" answer, and the questionnaire can serve as an aid to answering those questions. For the other questions, and when necessary, administrations are invited to write their replies on a separate document.

Additional explanations and a glossary intended to make it easier to answer the questions are given below.

The questionnaire was drawn up with a view to obtaining relatively specific replies that could be put to satisfactory use in the database. Numerous situations were envisaged and, as a rule, targeted questions drafted but, in spite of the questionnaire's length, it is quite likely that not all possible scenarios have been covered.

Administrations are therefore invited not only to respond to the questions asked, but also, as necessary, to describe any peculiarities of their system that the questionnaire does not cover. They are also invited to make any suggestions they consider pertinent to improve the content and the quality of the future database.

3 Questions

3.1 General questions

Q1

- Are there any legal texts on the establishment of frequency fees?

  Reply: Yes.

- If yes, please indicate their references and the date on which they were last updated.

  Reply: www.ptd.go.th/law_ptd/MOTC_frequency_fee(1).pdf (last updated on 29/01/96)

Q2

- What procedure (regulatory, legislative, etc.) is used to review and update your system for setting frequency fees?

  Reply: PTD will set up the frequency fee and submit to the National Radio Frequency Management Board for consideration process and if the frequency fee is agreed then it will be announced in the Act.

- Are reviews conducted at pre-established regular intervals? If yes, please specify:

  Reply: No.

- Does recourse to market mechanisms (auctions, calls for tenders) to screen applicants for spectrum access require that parliament enact legislation, that the government make a decision, or any other measure? Please specify.

  Reply: We have no auction right now but after NTC is established, the auction and other methods may be applied for some frequency bands.

Q3

- Are the same approaches and principles used to set frequency fees for all users?

  Reply: No.

- If yes, please complete the charts in APPENDIX 2.

- If no:

  – please indicate the methods used to calculate fees or the scales applied to agencies that use frequencies for non-commercial activities;

  – then, please complete the charts in APPENDIX 2 for the agencies that use frequencies for commercial activities.

  Reply: - Free of charge for non-commercial

Q4

- In addition to direct frequency fees, certain administrations require the payment of additional spectrum-related charges (for example, for spectrum access, spectrum replanning, management of equipment using the frequencies).

  Does your Administration require such payments?

  Reply: No.

- If yes, please specify:

  – the users concerned;

  – the methods used to calculate the charges or the scales applied and the corresponding amounts.

  Reply: -

Q5

- To which institution(s) are the frequency fees and any additional charges collected paid?

  Reply: Ministry of Finance.

3.2 Exemption from payment of frequency fees

Q6

- Are any applications partially or completely exempted from the payment of frequency fees?

  Reply: Yes.

- If yes, please specify:

  – the applications concerned; *All services except FS, FSS, MSS, Broadcasting service, Subscription TV service and Land Mobile Service.*

  – their respective rate of exemption; *Free of charge.*

  – the method used to calculate the fees or the scale applied, if they differ from those indicated in rows 20 and 21 of the charts in APPENDIX 2.

  Reply: -

Q7

- Are any users partially or wholly exempted from the payment of frequency fees?

  Reply: Yes.

- If yes, please specify:

  – the users concerned; *Government agency.*

  – their respective rate of exemption; *Free of charge.*

  – the method used to calculate the fees or the scale applied, if they differ from those indicated in rows 20 and 21 of the charts in APPENDIX 2.

  Reply: -

3.3 The application of frequency fees

Administrations are invited to respond to the questions asked in charts A to E in APPENDIX 2, dealing respectively with the fixed, mobile, satellite and broadcasting services and other applications.

The charts comprise:

– horizontally, three sections corresponding respectively:
  – [rows 1 to 21]: to the variables which may be used to set the fees and to the methods applied. This section contains shaded cells corresponding to non-relevant situations;
  – [row 22]: to the explanations, grounds and objectives;
  – [rows 23 to 25]: to recourse to market mechanisms, as the case may be;
  – vertically, the various applications relating to the service considered.

3.3.1 Approaches and principles for setting frequency fees

To answer this part of ITU-D Question 21/2, please complete rows 1 to 21 of the five charts (A to E) in APPENDIX 2.

In each chart, for any given application:

- for the variables, administrations should reply:
  – yes (by crossing out or deleting the letter "n") in the cells relating to the variables they use to set fees;
  – no (by crossing out or deleting the letter "y") in the cells relating to the variables they do not use;
- under "methods used" (rows 20 and 21), administrations should indicate, separately and depending on the case, the formulas or scales used to calculate the amount of the fees, preceded by the references indicated in the corresponding cells. Administrations are invited to explain the formulas and scales they use and how they are implemented.

Note: An administration concerned by a cell in row 20 in respect of one application will not be concerned by the corresponding cell in row 21 in respect of the same application, and vice versa.

Example 1 Take Chart A ("fixed service") and the application "Radio relays".

- To establish the corresponding fees, if the administration uses the variables "bandwidth", "centre frequency", "number of transmitting stations" and "duration of authorization/licence", it should reply "yes" in the cells situated at the intersection of rows 1, 2, 10 and 13 with the column "Radio relay". In all other cells in that column, it should reply "no".

- To determine the amount of the fees:
  - if the administration uses the following formula:
    "*Annual charge for a link = 100 x Δf/f* ",
    where Δf = bandwidth and f = centre frequency,
    it could reply as follows:
    "*A1:*
    Annual charge for a link = 100 x Δf/f "
  - if the administration uses no formula, it should append the corresponding scale under reference *A7*.

3.3.2 Explanations, grounds and objectives (row 22 in the charts)

For each of the cells in row 22, administrations are invited to provide information on the grounds for their choice, for the variables used to set the fees and for the methods applied to determine the amount of those fees.

Example 2 Following on from example 1, the administration could reply as follows:

"A13:

- *the variable "bandwidth" was chosen to encourage economical use of the spectrum;*
- *the variable "centre frequency" was chosen to encourage the use of high frequencies;*
- *the variable "number of transmitting stations" was chosen to take account of spectrum and geographic occupancy;*
- *the variable "duration of authorization" was chosen in order to enable collection of a global amount corresponding to the total length of time the spectrum is occupied. It also reduces the risk of frequency hoarding and non-use."*

3.3.3 Heading "Recourse to market mechanisms"

If the administration has had recourse to market mechanisms for a given application (for example, IMT-2000), it should specify whether it used auctions (row 23), calls for tenders (row 24) or comparative selection (beauty contests) (row 25). It should also indicate the total amount obtained and the total bandwidths auctioned off and allocated, respectively.

Note: An administration concerned by a cell in row 23 in respect of one application will not be concerned by the corresponding cell in rows 24 and 25 in respect of the same application, and vice versa.

3.3.4 Advantages and disadvantages of each approach

Q8

- What are the advantages and disadvantages of the approaches currently used by your Administration to establish the amount of frequency fees and any additional charges?

  Reply: *Advantage – not complex formula and support the use of public benefits and appropriate to use in Thailand.*

  Disadvantage – the important parameters such as transmitter power is not included.

4 Updating the ITU report and database on frequency fees and additional charges

Q9

- How often would you consider it most appropriate to update the report and the database: every 2 years, 3 years, 4 years, ...?

  Reply: 3 years.

- To that end, would your Administration be willing subsequently to complete a similar questionnaire at the regular interval it has indicated above?

  Reply: Yes.

5 Information concerning the questionnaire

France:

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PART III

APPENDICES

APPENDIX 1: Definition of ITU-D Question 21/2
APPENDIX 2: Charts to be completed (A to E)
APPENDIX 3: Glossary of terms used

Appendix 1

DEFINITION OF ITU-D QUESTION 21/2

Calculation of frequency fees

1 Statement of the situation or problem

The draft new Question dealt with here responds to one of the most pressing concerns of numerous developing countries, particularly LDCs, which are experiencing difficulties in elaborating a national frequency fee calculation model.

Furthermore, several regulatory frameworks place the frequency resource within the State domain. As a result, its use, which may well not be equitably distributed, must be properly remunerated as part of the rational management of public property. Techniques for sharing, segmentation, access to new frequencies and reorganization of the spectrum no longer suffice to guarantee effective management. The frequency spectrum therefore has to be optimized. This effort should, however, take into account the nature of the service to be provided, the band in question and the end user (consumer activities, etc.).

The optimization effort must be adapted to the new trends in the area of spectrum usage and sharing and must reflect the socioeconomic features of each country. It is particularly urgent when it comes to evaluating bands which are in high demand or may come to be so in the light of emerging technologies, as is the case with IMT-2000 systems in the 2 GHz band.

It should be borne in mind that the economic aspects of spectrum management are addressed in the ITU-D handbook on the economic, administrative and regulatory aspects of national spectrum management, as well as in Report ITU-R SM.2012, which describes, *inter alia*, the three main approaches to financing national spectrum management and the corresponding main advantages and disadvantages (financing from the national budget, through the collection of fees or charges for use of the spectrum, and by public tender). The report also presents the economic approaches used to promote national spectrum management (assignment through comparative assessment procedures; random assignment; assignment by public tender; transferable, flexible rights to use the spectrum; incentive pricing and concessionary charges, etc.).

Thus, the elaboration of a national frequency fee calculation model is a very complex matter and is the source of major difficulties for numerous developing countries and particularly LDCs for which the need is extremely urgent. The proposed Question will help to meet those concerns.

2 Question or issue proposed for study

The proposed study relates to the methods for calculating the various charges, fees, etc. that are levied on spectrum users. The points to be considered within the framework of this new Question are as follows:

a) Establishment in electronic format of a document structure bringing together the calculation formulas and frequency fee amounts applied by different countries for different radiocommunciation usages in the various frequency bands. This database will be made available to the ITU Member States and will require periodic updating.

b) Preparation of a report dealing with the following points:

• Analysis of the various methods, formulas and approaches currently applied by different countries for calculating frequency fees, accompanied by a comparative study clearly highlighting:

– approaches and principles relating to the calculation of frequency charges;

– the justifications and reasoning for each approach;

– how each approach contributes to fostering spectrum management and the effectiveness thereof;

– advantages and drawbacks of each approach (socioeconomic, technical and other considerations).

• Basic factors that may be taken into account when elaborating new formulas or reviewing existing ones.

• How to bring about consistency and complementarity between spectrum rearrangement processes and economic optimization of frequencies.

3 Expected outputs

An electronic document structure and links enabling users to have easy access to data on frequency fee calculation formulas for the users of the radio frequency spectrum in different countries. BDT is requested to coordinate participation with those countries who do not have access to the Web, providing them a hard copy upon request.

A report on the various frequency fee calculation formulas currently applied in different countries.

4 Required timing of the expected output

An initial version of the output is requested by mid-2003.

A regular update should subsequently be carried out.

5 Proposers/sponsors

This Question was submitted to WTDC-02 and has been recognized as being very important for the developing countries and LDCs, and as being urgent.

6 Source of required inputs

– Inputs are expected from spectrum managers (administrations, regulators), relating to:

– the structure of the information to be made available and the questionnaire(s) to be circulated to the Member States in order to gather the information to be entered into the database;

– analysis of the replies and of the report.

– Inputs are also expected from spectrum users (operators, etc.) that are subject to the fees in question, for analysis of the replies and of the report.

– Member States' replies to the questionnaire(s).

7 Target audience for the output

a) Indicate the target audience for the output in the following table:

	Developed countries	**Developing countries**	**LDCs**
Telecom policy makers	x	x	x
Telecom regulators	x	x	x
Service providers (operators)	x	x	-
Manufacturers	-	-	-

b) Target audience for the study - who specifically will use the output?

The output could be particularly useful to frequency spectrum managers when it comes to identifying the basic elements to be taken into account in elaborating a national frequency fee calculation model for the various users of the radio frequency spectrum in the different frequency bands.

c) Proposed methods for implementing the output

The output will be made available to all Member States free of charge (documents on paper, on the Web and on CD-ROM). An ITU circular letter should be sent out informing the Member States of the results of this study and inviting them to use that output when elaborating their national model for optimizing the frequency spectrum.

8 Proposed method of handling this Question

Given that this Question, which is very important and urgent for the developing countries and particularly LDCs, touches also on the field of radiocommunications, and that ITU-R Study Group 1 has already accumulated expert experience on the matter, it is proposed that it be dealt with by the **joint working group** already set up for the implementation of Resolution 9 (ITU-D Study Group 2/ITU-R Study Group 1).

Meetings dealing specifically with this Question should be programmed by the joint working group during the period 2002-2003.

9 Coordination requirements for the study

Coordination between ITU-D and ITU-R is required and should be carried out within the framework of the joint working group on Resolution 9.

In addition, coordination with ITU-D Study Group 1 is necessary (Question 12/1).

Appendix 2

Chart A: FIXED service

⬇	➡ APPLICATIONS VARIABLES	Row No.	Radio relay	Local radio loop (incl. LMDS, MMDS)	Links between fixed stations (incl. HF)	Local radio networks	Other application(s): please specify
Spectrum-related variables	bandwidth	1	Y	Y	Y	Y	y / n
	number of channels	1bis	N	N	N	N	y / n
	centre frequency, or band position in the spectrum	2	Y	Y	Y	Y	y / n
	exclusive / shared use	3	N	N	N	N	y / n
Variables relating to geographic coverage	surface area allocated	4	N	N	N		y / n
	distance between transmitter and receiver	5	N		N		y / n
Variables relating to equipment and infrastructure	transmitter power	6	N	N	N	N	y / n
	antenna height	7	N	N	N		y / n
	bit rate or capacity	8	N	N	N	N	y / n
	transmitting beam angle	9	N				y / n
	number of transmitting stations	10	N	N	N	N	y / n
	number of receiving stations	11	N	N	N	N	y / n
	degressivity	12	N	N	N	N	y / n
Socio-economic variables	duration of the authorization / licence	13	Y	Y	Y	Y	y / n
	population density	14		N	N	N	y / n
	total population covered	15		N			y / n
	geographic location	16	N	N	N	N	y / n
	operator's turnover	17		N	N		y / n
	Gross domestic product	18	N	N	N	N	y / n
Other variable(s): **Application (Public/Private)**		19	Y	Y	Y	Y	y / n

Appendix 2

Methods used	calculation formulas and corresponding amounts	20	A1	A2	A3	A4	A5
	scales	21	A6	A7	A8	A9	A10
Explanations and grounds, objectives		22	A11	A12	A13	A14	A15
Recourse to market mechanisms	auctions	23	A16	A17	A18		A20
	call for tenders	24	A21	A22	A23		A25
	comparative selection (beauty contests)	25	A26	A27	A28		A30

Appendix 2

CHART B: MOBILE service

⬇	➡ **APPLICATIONS** **VARIABLES**	Row No.	2G mobile systems	3G mobile systems	Radio-messaging	Private independent networks	Operated independent networks	Citizen band (CB)	RRI 446 (or family radio)	Other application(s): please specify
Spectrum-related variables	Bandwidth	1	Y	Y	Y	Y	Y	N	N	y / n
	centre frequency, or band position in the spectrum	2	Y	Y	Y	Y	Y	N	N	y / n
	exclusive / shared use	3	N	N	N	N	N			y / n
Variables relating to geographic coverage	surface area allocated	4	N	N	N	N	N			y / n
	distance between transmitter and receiver	5				N	N			y / n
Variables relating to equipment and infrastructure	transmitter power	6				N	N	N	N	y / n
	antenna height	7				N	N	N		y / n
	bit rate or capacity	8	N	N		N	N			y / n
	transmitting beam angle	9								y / n
	number of transmitting stations	10	N	N	N	N	N	N	N	y / n
	number of receiving stations	11	N	N	N	N	N			y / n
	degressivity	12	N	N	N	N	N	N	N	y / n
Socio-economic variables	duration of the authorization / licence	13	Y	Y	Y	Y	Y	N		y / n
	population density	14	N	N	N	N	N			y / n
	total population covered	15	N	N	N	N	N			y / n
	geographic location	16	N	N	N	N	N			y / n
	operator's turnover	17	N	N	N		N			y / n
	Gross domestic product	18	N	N	N	N	N			y / n
Other variable(s): Application (Public/Private),		19	Y	Y	Y	Y	Y	N	N	y / n
Minimum Charge			N	N	N	N	N	N	N	

Appendix 2

Methods used	calculation formulas and corresponding amounts	20	B1	B2	B3	B4	B5	B6	B7	B8
	scales	21	B9	B10	B11	B12	B13	B14	B15	B16
Explanations and grounds, objectives		22	B17	B18	B19	B20	B21	B22	B23	B24
Recourse to market mechanisms	auctions	23	B25	B26	B27	B28	B29			B32
	call for tenders	24	B33	B34	B35	B36	B37			B40
	comparative selection (beauty contests)	25	B41	B42	B43	B44	B45			B48

Appendix 2

Chart C: SATELLITE service

⬇	➡ **APPLICATIONS** *VARIABLES*	Row No.	VSAT	Earth stations	Satellite video reporting *	Mobile satellite service	Satellite radiolocation	Other application(s): please specify
Spectrum-related variables	bandwidth	1	Y	Y	Y	Y	N	y / n
	number of channels	1bis	N	N	N	N	N	y / n
	centre frequency, or band position in the spectrum	2	Y	Y	Y	Y	N	y / n
	exclusive / shared use	3	N	N	N	N	N	y / n
Variables relating to geographic coverage	surface area allocated	4			N	N	N	y / n
	distance between transmitter and receiver	5						y / n
Variables relating to equipment and infrastructure	transmitter power	6	N	N	N			y / n
	antenna diameter	7	N	N	N			y / n
	bit rate or capacity	8	N	N	N	N	N	y / n
	transmitting beam angle	9	N	N	N			y / n
	number of transmitting stations	10	N	N	N	N		y / n
	number of receiving stations	11	N	N		N	N	y / n
	degressivity	12	N	N	N	N	N	y / n
Socio-economic variables	duration of authorization / licence	13	Y	Y	Y	Y	N	y / n
	population density	14	N	N	N	N	N	y / n
	total population covered	15				N	N	y / n
	geographic location	16	N	N	N	N	N	y / n
	operator's turnover	17	N	N	N	N	N	y / n
	Gross domestic product	18	N	N	N	N	N	y / n
Other variable(s): **Application (Public/Private),**		19	Y	Y	Y	Y	N	y / n
Minimum Charge			N	N	N	N	N	

***in this application, the frequency fee is exempted for public use e.g. Earth exploration application or Meteorological application.**

Appendix 2

Methods used	calculation formulas and corresponding amounts	20	C1	C2	C3	C4	C5	C6
	scales	21	C7	C8	C9	C10	C11	C12
Explanations and grounds, objectives		22	C13	C14	C15	C16	C17	C18
Recourse to market mechanisms	auctions	23	C19	C20	C21	C22	C23	C24
	call for tenders	24	C25	C26	C27	C28	C29	C30
	comparative selection (beauty contests)	25	C31	C32	C33	C34	C35	C36

Appendix 2

Chart D: BROADCASTING service

⬇ / VARIABLES ➡ APPLICATIONS		Row No.	Sound broadcasting				Television broadcasting			
			Earth		Satellite		Earth		Satellite	
			Analogue	Digital	Analogue	Digital	Analogue	Digital	Analogue	Digital
Spectrum-related variables	bandwidth	1	Y	Y	Y	Y	Y	Y	Y	Y
	centre frequency, or band position in the spectrum	2	Y	Y	Y	Y	Y	Y	Y	Y
	exclusive / shared use	3	N	N	N	N	N	N	N	N
Variables relating to geographic coverage	surface area allocated	4	N	N			N	N		
	distance between transmitter and receiver	5								
Variables relating to equipment and infrastructure	transmitter power	6	N	N			N	N		
	antenna height	7	N	N			N	N		
	bit rate or capacity	8	N	N	N	N	N	N	N	N
	transmitting beam angle	9								
	number of transmitting stations	10	N	N			N	N		
	number of receiving stations	11	N	N	N	N	N	N	N	N
	degressivity	12	N	N	N	N	N	N	N	N
Socio-economic variables	duration of authorization / licence	13	Y	Y	Y	Y	Y	Y	Y	Y
	population density	14	N	N	N	N	N	N	N	N
	total population covered	15	N	N	N	N	N	N	N	N
	geographic location	16	N	N	N	N	N	N	N	N
	operator's turnover	17	N	N	N	N	N	N	N	N
	Gross domestic product	18	N	N	N	N	N	N	N	N
Other variable(s): **Application (Public/Private),** **Minimum Charge**		19	Y Y	Y Y	Y Y	Y Y	Y Y	Y Y	Y Y	Y Y

Appendix 2

Methods used	calculation formulas and corresponding amounts	20	D1	D2	D3	D4	D5	D6	D7	D8
	scales	21	D9	D10	D11	D12	D13	D14	D15	D16
Explanations and grounds, objectives		22	D17	D18	D19	D20	D21	D22	D23	D24
Recourse to market mechanisms	auctions	23	D25	D26	D27	D28	D29	D30	D31	D32
	call for tenders	24	D33	D34	D35	D36	D37	D38	D39	D40
	comparative selection (beauty contests)	25	D41	D42	D43	D44	D45	D46	D47	D48

Appendix 2

Chart E: other applications

⬇ / ➡ **APPLICATIONS** / ***VARIABLES***		Row No.	Radio amateur	Experimental networks	Low-range, low-power devices	Radio-navigation	Radio-location	Weather service	Other application(s): please specify
Spectrum-related variables	bandwidth	1	N	N	N	N	N	N	y / n
	centre frequency, or band position in the spectrum	2	N	N	N	N	N	N	y / n
	exclusive / shared use	3		N		N	N	N	y / n
Variables relating to geographic coverage	surface area allocated	4		N		N	N	N	y / n
	distance between transmitter and receiver	5		N					y / n
Variables relating to equipment and infrastructure	transmitter power	6	N	N	N	N			y / n
	antenna height	7	N	N					y / n
	bit rate or capacity	8		N	N	N	N	N	y / n
	transmitting beam angle	9		N		N		N	y / n
	number of transmitting stations	10	N	N	N	N	N	N	y / n
	number of receiving stations	11	N	N	N		N		y / n
	degressivity	12	N		N	N	N	N	y / n
Socio-economic variables	duration of authorization / licence	13	N	N	N	N	N	N	y / n
	population density	14							y / n
	total population covered	15							y / n
	geographic location	16							y / n
	operator's turnover	17			N	N	N	N	y / n
	Gross domestic product	18							y / n
Other variable(s): please specify		19	y / n	y / n	y / n	y / n	y / n	y / n	y / n

Appendix 2

Methods used	calculation formulas and corresponding amounts	20	E1	E2	E3	E4	E5	E6	E7
	Scales	21	E8	E9	E10	E11	E12	E13	E14
Explanations and grounds, objectives		22	E15	E16	E17	E18	E19	E20	E21
Recourse to market mechanisms	auctions	23				E25	E26	E27	E28
	call for tenders	24				E31	E32	E33	E34
	comparative selection (beauty contests)	25				E38	E39	E40	E41

Appendix 3

GLOSSARY

Term	Meaning
Exclusive/shared use	The utilization of a frequency band is "exclusive" when the beneficiary of the authorization is the only one to use that band. If several users utilize the same band, utilization is "shared".
Surface area allocated	Area within which the beneficiary of the authorization is authorized to use the frequency/frequencies allocated to it. Example: the surface area allocated may be the entire national territory or only a part thereof.
Degressivity	An organization that uses *n* units of equipment (or *n* frequencies) benefits from "degressivity" in the fees due when the total fees it has to pay in respect of the *n* units of equipment (or *n* frequencies) is less than the product of: [*n*] x [amount of the fees relating to one unit of equipment (or to one frequency)].
Duration of authorization/licence	The period during which the beneficiary of the authorization is authorized to use the frequency/frequencies it has been allocated. Example: generally speaking, authorizations are valid for several years, although temporary authorizations, covering a period of months or less, may also be granted.
Population density	Density relative to surface area allocated.
Population covered	Number of inhabitants in the surface area allocated.
Operator's turnover	For a given application, generally the annual turnover obtained by the operator from the frequencies it has been allocated for that application. Example: annual turnover obtained by a 2G mobile service operator.
Gross domestic product (GDP)	GDP of the economic agents (State, firms and households) within the surface area allocated. The higher the GDP, the greater the potential turnover obtained from the commercial use of frequencies in the surface area allocated is likely to be.
Geographic location	Location of the surface area allocated within the national territory. To take an extreme example, in a given country, the turnover that can potentially be derived from the commercial use of frequencies in and around the economic capital is greater than that which could be obtained in a desert area.
Management costs	The costs borne by the body managing the authorization granted for use of the frequencies. In some countries, fees are broken down into frequency fees and management fees.
Additional charges	These are charges (for spectrum access, spectrum replanning, management, etc.) relating to spectrum occupancy only.
Auctions	In an auction, once the applicants have qualified, the price they bid (which corresponds to the fees for spectrum access and use of the frequencies) is the only criteria used in their selection.
Call for tenders	In bidding of this kind, the applicants' price bid (which corresponds to the fees for spectrum access and use of the frequencies) is just one of several selection criteria used (see below).
Comparative selection (beauty contest)	In bidding of this kind, the applicants are screened on the basis of various possible criteria (but not price), such as aptitudes and capacities, technical and business plans, proposed tariffs, commitment to covering the territory, availability and quality of service, etc. Where spectrum access and frequency use are subject to a fee, the amount of that fee is not open to bidding by the applicants but rather imposed by the authorities.

FREQUENCY FEE FORMULA FOR THE UTILIZATION OF RADIO FREQUENCY

FF=(BW x FC x AC)+MC

Where FF : Frequency Fee at the unit of bath per year,
BW : Bandwidth at the unit of kilohertz,
FC : Frequency Constant,
AC : Application Constant,
MC : Minimum Charge at the unit of bath.

The variable "Bandwidth" was chosen to encourage economical use of the spectrum;
The variable "Frequency constant" was chosen to encourage the use of high frequencies;
The variable "Application constant" was chosen to support the use of public benefits;
The variable "Minimum charge" was chosen to adjust the fee of scare frequency.

Table 1 Frequency Constant

Radio Frequency (MHz)	Constant
0.01 up to less than 1,000	10
1,000 up to less than 3,000	5
3,000 up to less than 10,000	0.5
10,000 up to less than 20,000	0.05
20,000 and above	0.001

Table 2 Application Constant

Application	Constant
Public Radiocommunication Network	5
Specific Radiocommunication Network	10

Table 3 Minimum Charge

Public Radiocommunication Network	Charge (baht/frequency/year)
Paging	50,000
Sound Broadcasting	50,000
Television Broadcasting	100,000
Subscription Television	100,000