Finland

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

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*To be returned no later than **31 January 2000** to:*
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Telecommunication Development Bureau
Fax: +41 22 730 54 84
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Attachment 2

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

General Questions on National Spectrum Management

Describe succinctly the problems that your administration is currently experiencing in national spectrum management (for example subject areas in national spectrum management).

Country Finland

Focal point _____

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. Do you have a national law governing spectrum management? (YES) NO

   - Last date this law was changed or modified? 21 April 1995

   - Are any actions planned to change this law? Draft 17.1.2000 (YES) NO

   Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

   can be found from www.thk.fi/englanti/esiHelu-24.htm

2. Have you published regulations and procedures for national spectrum management (e.g. radio services, license requirements etc.)? (YES) NO

   Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

   can be found from www.thk.fi/englanti/radio/

3. Do you have a national radio frequency spectrum allocation table? (YES) NO

   Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

   can be found from www.thk.fi/englanti/radio/

4. Do you have technical specifications for national spectrum use? (YES) NO__

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

5. Do you have a need for any spectrum redeployment* ? (YES) NO__

* 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.

- If so, do you have a strategy for achieving this redeployment in respective frequency bands and for given radiocommunication services? (YES) NO__

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

Efficient use of spectrum in public land mobile networks (measuring of traffic loading and the use of the information in the decision making process)

6. What is the total cost of national spectrum management functions performed by your Government (expressed in Swiss francs)? 13,5 million chf

- What is the source of the funding required to accomplish these spectrum management functions? in 1999

licence fees 5,7 million chf, spectrum fees 5,2 million chf

Control fees 4 million chf

7. Do you have a method for establishing spectrum users' fees? (YES) NO__

- If so, please give a brief description of the method used in establishing those fees.

Method is based on • amount of spectrum in use

• frequency range and size of the service area

www.mintc.fi/www/sivut/suomi/telemarkkina/telecom/norms/1998_1155.htm section 6 and 7

8. Do you maintain centralized databases for spectrum management? (YES) NO__

- What is the approximate size of your database (expressed in number of records)? about 500 MHz in total 130 000 frequency assigments

- Do you have a computerized data base management system (DBMS)? (YES) NO

- What DBMS system do you use? Frequency Management software (ANNEX 1) database for Freq. allocation table (Annex 2)

- Are these frequency assignment records available to public? YES (NO)

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

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9. Do you notify frequency assignments to the ITU? partly (YES) NO

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

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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

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

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11. Do you perform technical analyses of frequency assignment requests? (YES) NO

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

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12. Do you perform radio monitoring? (YES) NO

- number of fixed monitoring stations 3

- facilities available at fixed monitoring stations
  - -- monitoring up to 1000 MHz
  - -- direction finding up to 1000 MHz

- number of mobile monitoring stations 4

- facilities available at mobile monitoring stations
  -- monitoring up to 1000 MHz
  -- direction finding up to 500 MHz

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

13. 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

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

14. What computers and operating systems are in use for national spectrum management?

Type of computers COMPACT PENTIUM II

Operating system(s) HEWLET PACKARD UNIX, WINDOWS NT

Have any problems been identified? and if so, do you need any assistance from the ITU in solving them?

15. Number of technical/professional staff in national spectrum management? 30

16. Number of support staff in national spectrum management? 30

17. Describe your country's spectrum management structure (Please enclose a copy of organization chart). See annex 3

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

a) National Spectrum Management, version 1995 ? NO

b) Spectrum Monitoring[1], version 1995?

c) Computer-aided Techniques for Spectrum Management, version 1999? partly

d) HF Broadcasting System Design, version 1999?

e) Report SM.2012, Economic Aspects of Spectrum Management, version 1997[2]? NO

f) Windows Basic Automated Spectrum Management System (WinBASMS) Software Version 1997, Manual Version 1997 NO

What additional information/handbooks do you need from the ITU?

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E-Mail: devsg1@itu.int

THANK YOU FOR YOUR COOPERATION

[1] The Spectrum Monitoring Handbook is currently being updated, therefore, you are urged to contact Mr Jan Verduijn (NL), the designated Rapporteur from ITU-R Study Group 1, Working Party 1C if you have any comments that you wish included in a future version of this Handbook.

[2] This Report SM.2012 was updated during the ITU-R Study Group 1 meeting in August 1999. This new version is expected to be available in the three working languages by January 2000.

ANNEX 7

TELECOMMUNICATIONS ADMINISTRATION CENTRE
Radio Administration
P.O. Box 53
FIN-00211 Helsinki
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Telephone +358 9 69661
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3.10.1997

FREQUENCY MANAGEMENT SOFTWARE

1. Introduction

This is a description of the frequency register database and related software applications used in the Telecommunications Administration Centre (TAC).

2. Background

The development work for an automated spectrum management system in the TAC started in 1989. The selected data management system is INGRES, which also has powerful tools for application development. INGRES is a relational system, in which the data is perceived by the user as tables. The data elements are in the columns of the tables.

Tables and data items for the tables were selected using the following guidelines:

- ITU International Frequency List,
- CCIR Handbook: Spectrum Management and Computer-Aided Techniques,
- National files: Manual card file, Licence file.

Transferring data from manual card files to the computerised system was a tremendous task, which started in April 1991 with 6 persons. Later 3 full-time employees were creating and updating the database, which was completed and fully updated by the end of January 1994. Only the public mobile phone networks were included later in January 1997, when a specific data transfer program was available. However, the database has been in operational use since August 1993.

The mast site database is in another computer, in which mast site data are created and updated. The mast site information is automatically transferred to the frequency register database by a batch job during night-time.

There are three kinds of programs to handle the frequency register database:

- programs to create frequency assignments,
- programs to update frequency assignments,
- programs to search for frequency assignments.

Searching programs are common for every type of services. No service specific programs for data inquiries have been developed yet.

The frequency register database is in an HP 9000/755 computer, and users are normally connected to this via their own personal computers (PCs with 486 or Pentium processor), which are connected to the local area network (Ethernet) of the TAC. Different kinds of access privileges are granted to users according to their needs. All the users can make inquiries to the database, but access to the creating and updating programs is given only to persons responsible for certain services.

There are three software applications related to the frequency database in use in the TAC. The development of a program for frequency planning using digital maps started in August 1993, and it has been in operational use since September 1994. With the application it is possible to visualise the content of the frequency database on a graphical screen. The digital maps are in a different database and they cover the whole of Finland. Users can combine different kinds of maps and handle them quite flexibly. This program was especially designed for radio link purposes, but it is also very useful for other services.

The second application is meant for interference calculation. It retrieves data from the frequency database and analyses different kinds of interferences, like adjacent channel interference, third order intermodulation, etc. It is specially designed for land mobile services. Radio technical aspects for the application were studied intensively in the TAC before the software development, which started in February 1994, beginning with closer definitions of algorithms, and the first version of the program was ready for testing at the end of 1994. The application has been in operational use since April 1995.

The third application is used to transfer data from mobile phone networks operators' databases to the frequency database of the TAC. The public mobile phone operators give regularly their base station information on diskette to the TAC, where the data is checked and the database is updated accordingly. The software development started in September 1995 and was completed in June 1996. The frequency data from all the public mobile phone networks were transferred to the database by January 1997.

There is also a secondary frequency register database, which has been generated from the real database by a random search. It is much smaller than the real database and located in another computer. It is meant for tutorial and testing purposes. All the new versions of the data handling programs are at first thoroughly tested using this secondary database, so that no harm will be caused to the real data base or to its operational use.

Backups of the database will be created daily and stored in the computer room with no unauthorised access. Monthly backups will be stored in a fireproof safe, and quarterly backups are secured against major crises.

For the time being there are about 190 000 frequencies and 23 700 mast sites in the frequency register database. There are all the frequencies in use, as well as all the reserved and coordinated frequencies. Deleted frequency assignments and removed masts are also included, so that the history is saved and no information is lost. The disk space required for the database is about 200 megabytes. The size of the database is expected to expand 3 - 5 % yearly.

3. Software environment

The software applications related to the frequency database are presented in Figure 1.

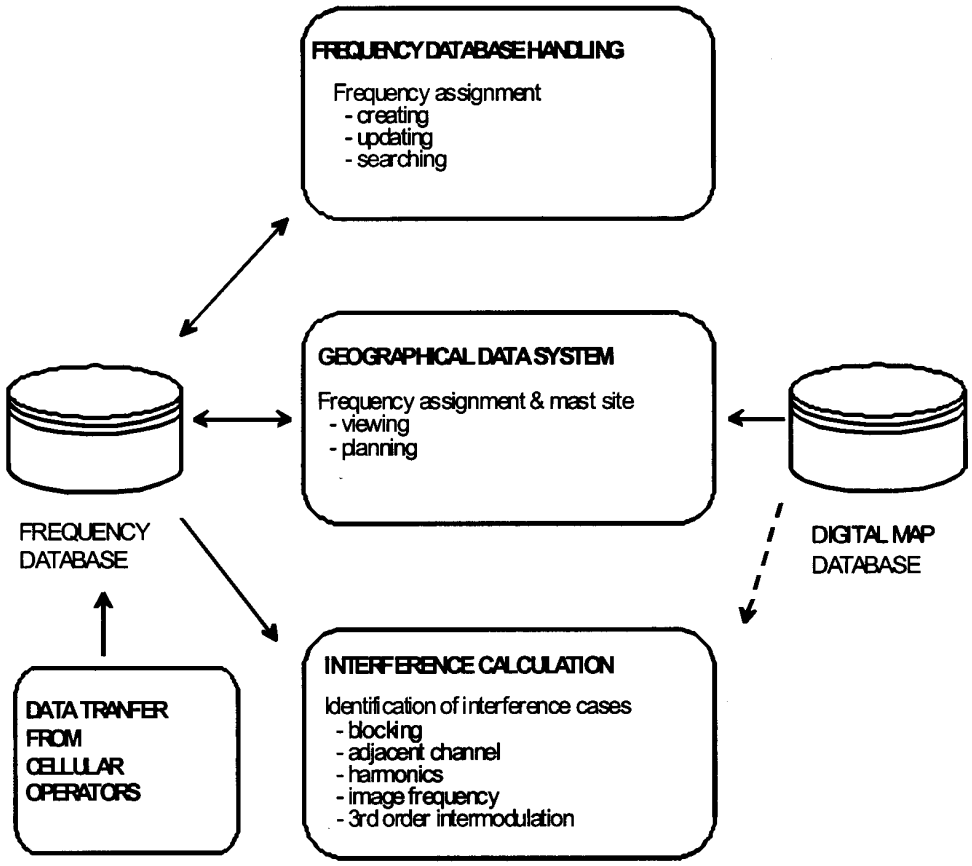

Figure 1. Frequency management software.

4. Hardware environment

The hardware environment related to the frequency management system is presented in Figure 2. Users are normally connected to the frequency management software from their own personal computers.

The frequency register database is in an HP 9000/755 computer, under an INGRES database management system (version 6.4/02). The operating system is HP-UX (version 9.01 A, for 32 users). The main memory size is 64 MB RAM. The geographical data system runs in HP 9000/735 with 147 MB RAM.

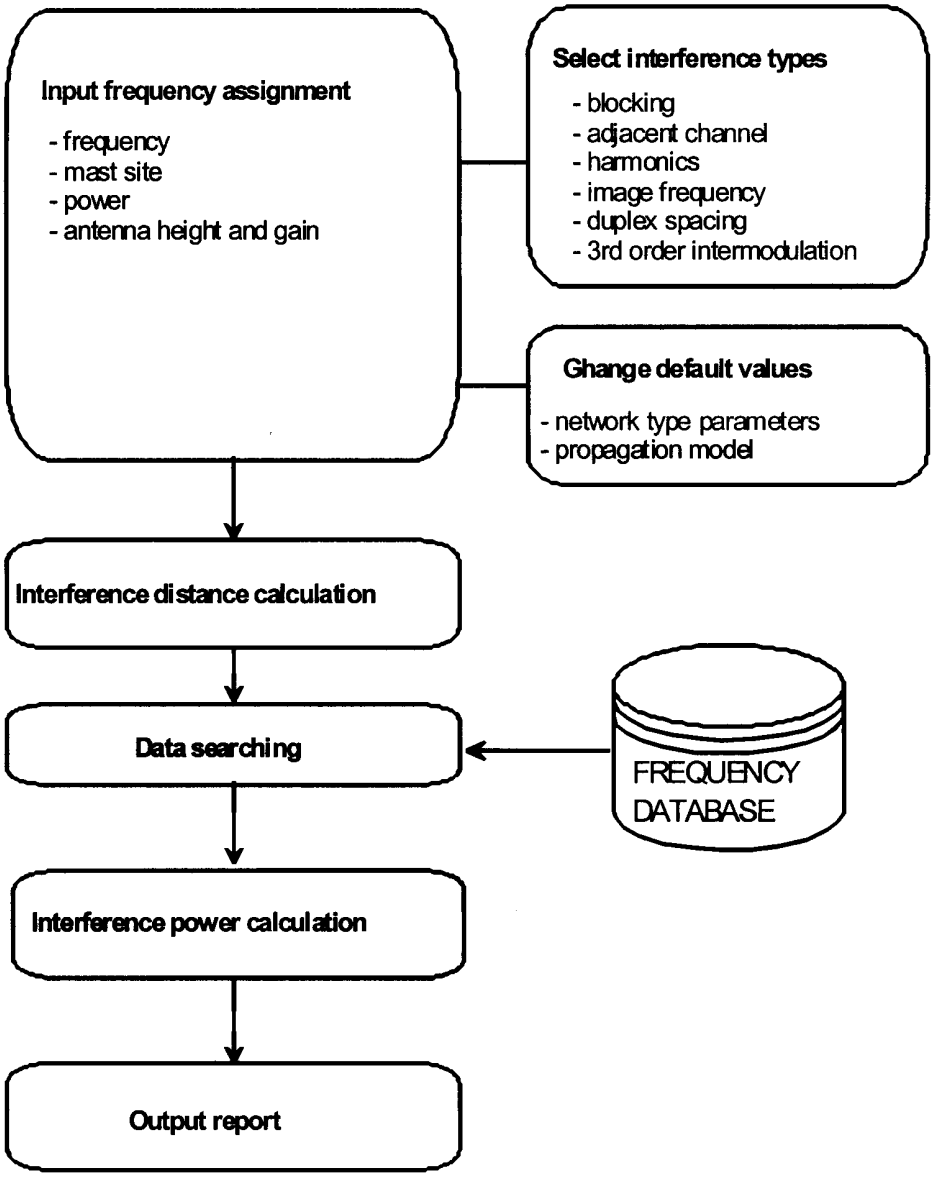

Figure 8. Interference calculation program.

User can use between 3 different propagation models: free space, Hata-Okumura, or TAC model. All these are parametric models, where no topographic information is used. TAC model is a simple model, which is very suitable for automatic calculations. According to this model, attenuation is dependent on the distance as follows:

$$A[dB] = 32.4 + 20\log(f[MHz]) + \frac{1}{1+d^2}20\log(xxx) + \frac{d^2}{1+d^2}20\log(xxx)$$

Within the affected area, the frequencies are searched from the frequency database and the interference powers are calculated. If the interference threshold levels are not exceeded, the inserted new frequency assignment is accepted. Otherwise, possible affected assignments are listed, and the user has to choose another frequency for trial until interference-free frequency is found. The program is also useful for radio monitoring engineers in solving interference cases.

Other frequencies
: Common frequencies of which there are no individual assignments for that radio station, etc.

Mast site
: Mast site location, address and owner, mast and ground heights, construction/disassembling year, etc.

Customer
: Customer number, name, and contact information, etc.

There are also tables for (verbal) remarks concerning the frequency assignment, radio station, mast site information and monitoring results. The relations between the tables are presented in Figure 3.

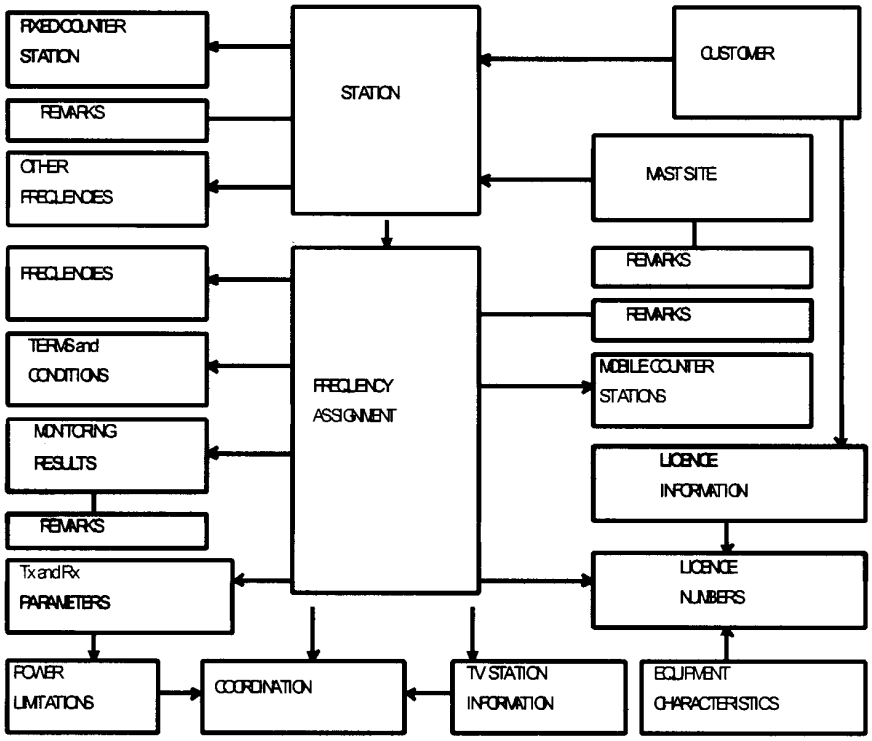

Figure 3. Conceptual schema of the frequency register database.

There may be several radio stations for the same mast site and several frequency assignments for the same radio station.

There are also several other tables which are not shown in Figure 3. There are for example allocation tables which are needed for checking data entry values and index-tables which are needed for a faster data search.

5.2. Data items

Columns (data fields) of the tables in the frequency register database:

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FREQUENCIES	STATION	FREQUENCY ASSIGNMENT
Frequency assignment code	Station number	Frequency assignment code
T/R (Transmit/Receive) code	Mast code	Station number
Frequency/ lower edge of band	Customer number	Mode of operation
Upper edge of frequency band	Operation area	Channel separation
Frequency numerically	Country	Mode of operation
Upper freq. numerically	Network mode of oper. 1	Class of operation
Channel number	Network mode of oper. 2	Daily operation time
T/R code for duplex frequency	Name of station	Frequency plan
Duplex frequency	Class of station	Collective use of frequency
Upper edge of duplex freq. band	Nature of service	User group and security class
Duplex frequency numerically	Experimental station	Exception from allocation
Freq. assignm code for duplex freq.	Hop number	Service range (link span)
Station number	Purpose of use	Access to PSTN or PBX
Mast code	Counter station	Relaying
Status of frequency	Date of deletion	Call sign
Customer number	Recorder's user code	Frequency reservation number
Province	Date and time of change	Frequency reservation date
Coordinate index East	Erroneous fields in table	Frequency reservation end date
Coordinate index North		Date of bringing into use
Erroneous fields in table		End date of short term use
	POWER LIMITATIONS	Status of frequency assignment
		Former freq. assignment code
OTHER FREQUENCIES	Freq. assignment code	Coordin. freq. assignment code
	Running number 2	Date of deletion
Station number	Running number 4	Reason for deletion
Tx (Transmitting) frequency	Azimuth of limited radiation	Recorder's user code
T/R code for Tx frequency	Lower azimuth of sector	Name of recording program
Rx (Receiving) frequency	Upper azimuth of sector	Name of updating program
T/R code for Rx frequency	Limited power code	Date of change
Version number 1	Limited power in dBW	Erroneous fields in table
Same/different equipment	Attenuation in sector	Errors in STATION table
Equipment type number	Freq. reservation number	Errors in subtables
Equipment serial number	Freq. reservation date	Errors in freq. assignment
Continuous listening	Freq. reservation end date	
Frequency reservation date	Date of bringing into use	
Frequency reservation end date	Status of freq. assignment	LICENCE INFORMATION
Date of bringing into use	Date of deletion	
Status of freq. assignment	Erroneous fields in table	Licence number
Date of deletion		Customer number
		Purpose of use
	COORDINATION	Access to PSTN
EQUIPM. CHARACTERISTICS		
	Freq. assignment code	
Licence number	Running number 2	LICENCE NUMBERS
Type of equipment	Running number 3	
Equipment serial number	Running number 4	Freq. assignment code
Relaying	Notifying administration	Running number 5
	Need for coordination	Version number 5
	Coordination code	Licence number
TERMS AND CONDITIONS	Terms of coordination	Standard type
	Date of coordination	Type of equipment
Freq. assignment code	Erroneous fields in table	Equipment serial number
Text of special terms		Date of deletion
Date to fulfil special terms		Erroneous fields in table

The records (data rows in the tables) have a unique identifier field or a combination of fields called the primary key. Such a primary key can be for example the frequency assignment number, station number or mast code. Running numbers are used in some tables to form a part of an artificial key. They are needed to chain relevant data. Version numbers are needed to save deleted fields. Data rows can be marked as deleted without deleting the whole frequency assignment. The data row with the highest version number is valid.

Some of the data fields are stored in more than one place, which means that some of the tables are denormalized. It makes data searching much faster, because only a few tables are needed for a search. It is recommended that in INGRES database system no more than five tables should be included in the data selection in a data search. However, denormalized tables should be handled very carefully, when creating and updating data, so that the data integrity is sustained.

Some of the data fields can have null-values, because value '0' is not always appropriate for a missing value, e.g. value '0' in the field 'Radiated power in dBW'.

Some of the data fields are obligatory:

Frequency assignment code
Frequency
T/R (Transmit/Receive) code
Status of frequency
Mast code
Station number
Class of station
User group and security classification
Customer number
(one of the following dates:)
Frequency reservation date
Date of bringing into use
Date of coordination
Hop number (only for links)

6. Frequency management software

There are four software applications related to the frequency database.

6.1. Frequency database handling

In the data creation program there are four sub-programs to create new frequency assignments:

- Mobile networks:
  - creating new stations,
  - creating new frequency assignments for new or existing stations,
- Radio links:
  - creating new links,

  - creating new stations for new or existing links (includes frequency assignments, because there is only one frequency assignment for each link station),
- Broadcasting
  - creating new stations,
  - creating new frequency assignments for new or existing BC stations,
  - creating new frequency assignments for new or existing BT stations,

- Unspecified service
  - creating new stations or frequency assignments.

There are also other data creation sub-programs needed for the database management:

- Reporting
  - creating a batch job for a report of new or modified data entries,

- Tables
  - creating allocation tables for mobile, fixed and broadcasting services,
  - creating tables for service operation areas
  - creating numerical tables for running numbers,
  - creating access privileges for users,
  - creating error messages,

- Code lists
  - creating clarification texts for the codes used in the database,

- Data entry limits
  - creating minimum and maximum allowable values for data entries.

The data search program is common for all services. All the users have access privilege to the search program. The flow chart of the program is shown in Figure 4.

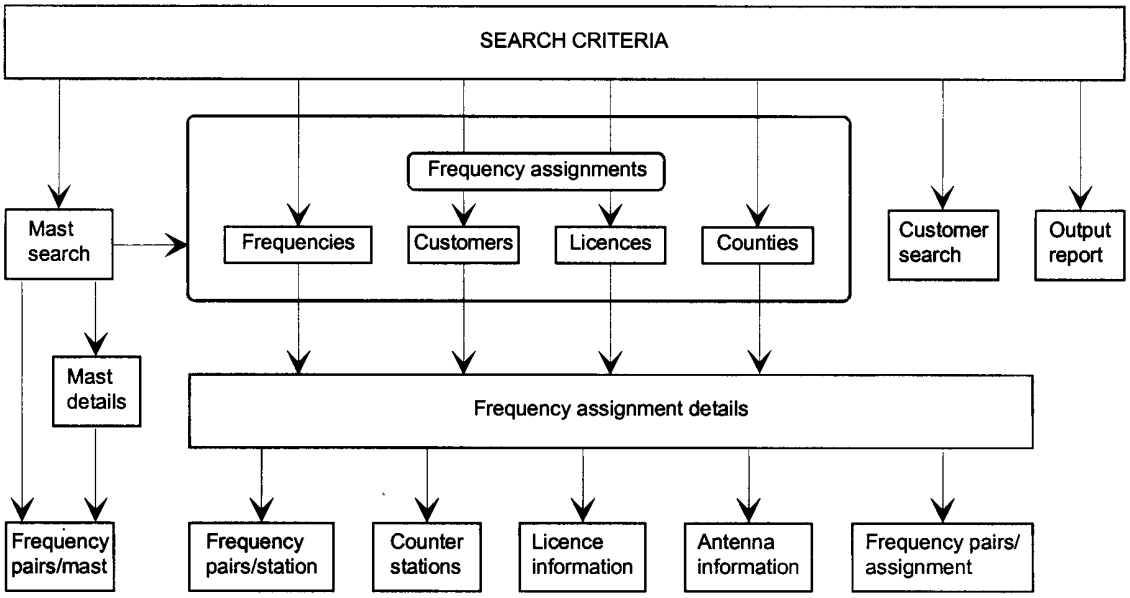

Figure 4. Search program of the frequency register database.

The programs are mainly written in the INGRES 4GL programming language, and they include some subroutines written in FORTRAN.

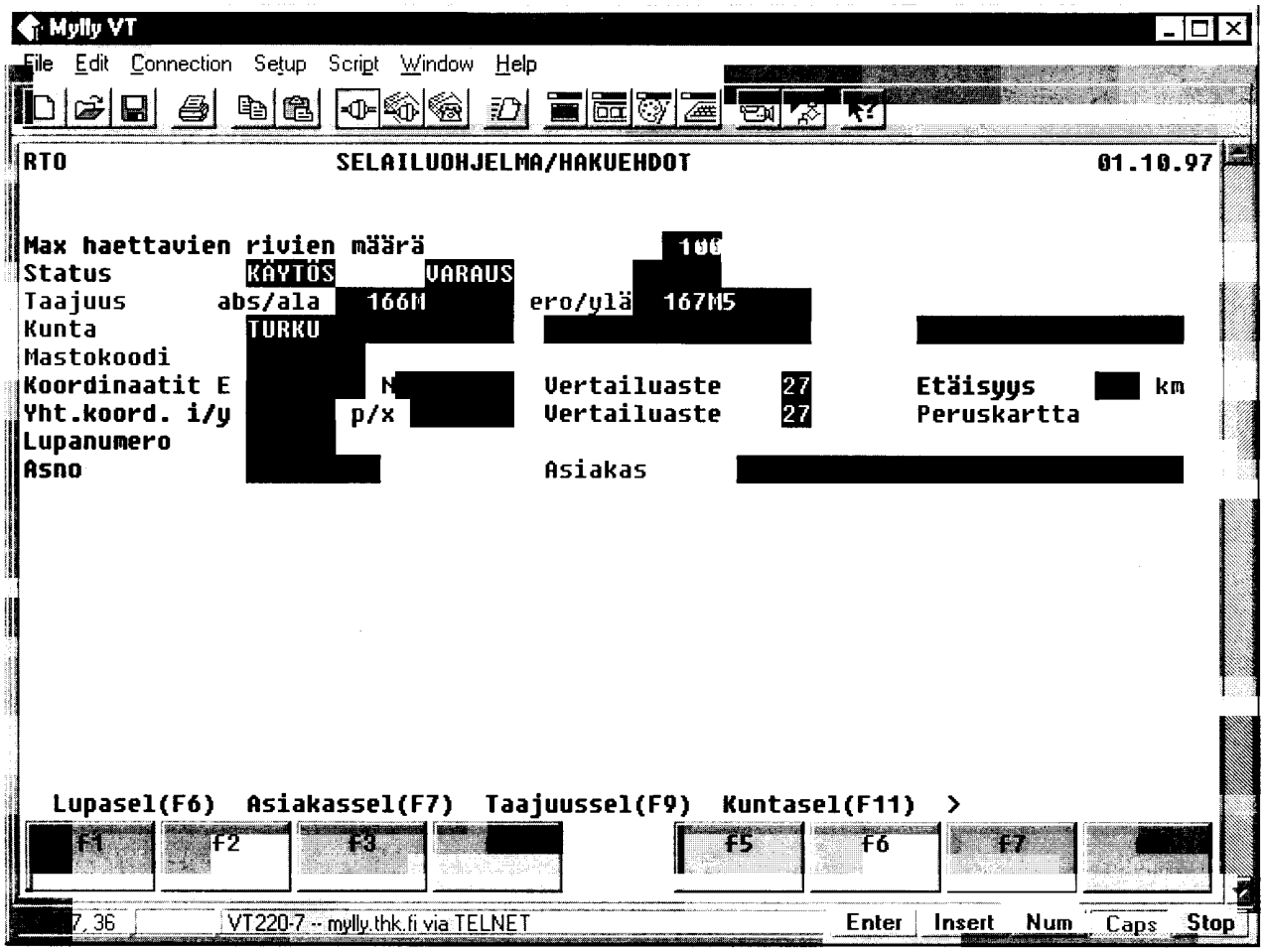

Figure 5. Search criteria insertion.

Access times for data searches depend greatly on search criteria and number of assignments found. Here are some examples of the access times with the present hardware:

Search criteria	Number of frequency assignments	Access time
1) 163 - 164 MHz	1106	12 seconds
2) Helsinki	5591	58 seconds
3) Customer no 11537	52	< 1 second
4) coordinates 24E58/60N12 radius 1 km frequency range 163 - 164 MHz	3	< 1 second

Data updating will take place via the search program by selecting the data updating program for the frequency assignment in question.

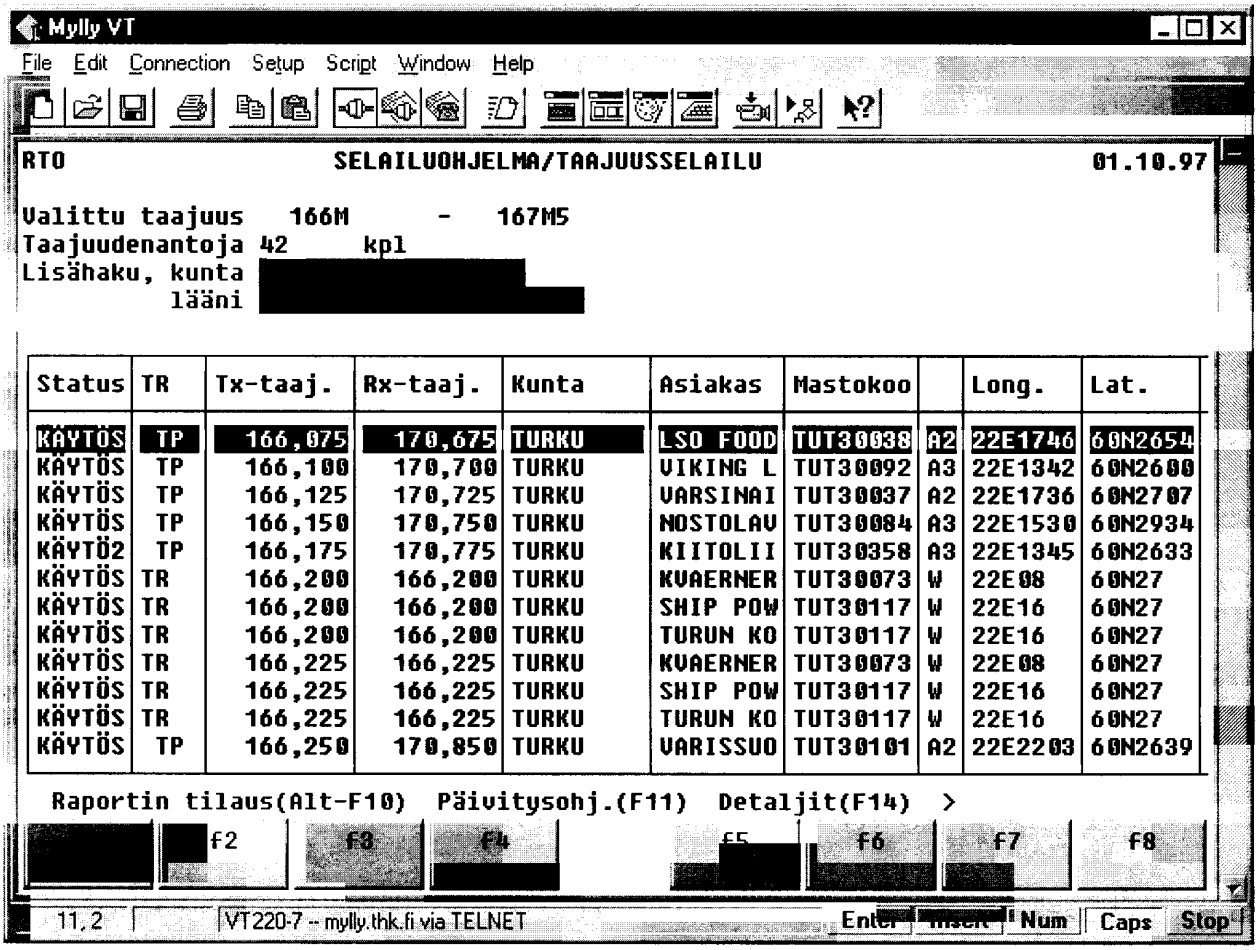

Figure 6. Output-display of a data search.

6.2. Geographical data system

The geographical data system is a user interface for viewing the frequency database information on a digital map. It can used for checking the locations of the mast sites, for

visualising interference situation and for designing radio link connections. Earlier spectrum management work was done using paper maps, especially in the case of designing radio link connections. So the software application was designed to include several planning tools for radio links.

When using the application, first a geographical area is selected. It can cover e.g. the whole country or even a small part of a town. The area can be selected using for example the coordinates, city name, address or mast code. The selected map can be a single one or a combination of several maps, if needed. Maps can be scrolled, zoomed in and out. Mast sites or frequencies. which are searched from the frequency database, are plotted with different symbols and colours. Selected symbols will be highlighted and their detailed information is easily available. New stations can be inserted, and their distances to nearby stations can be calculated.

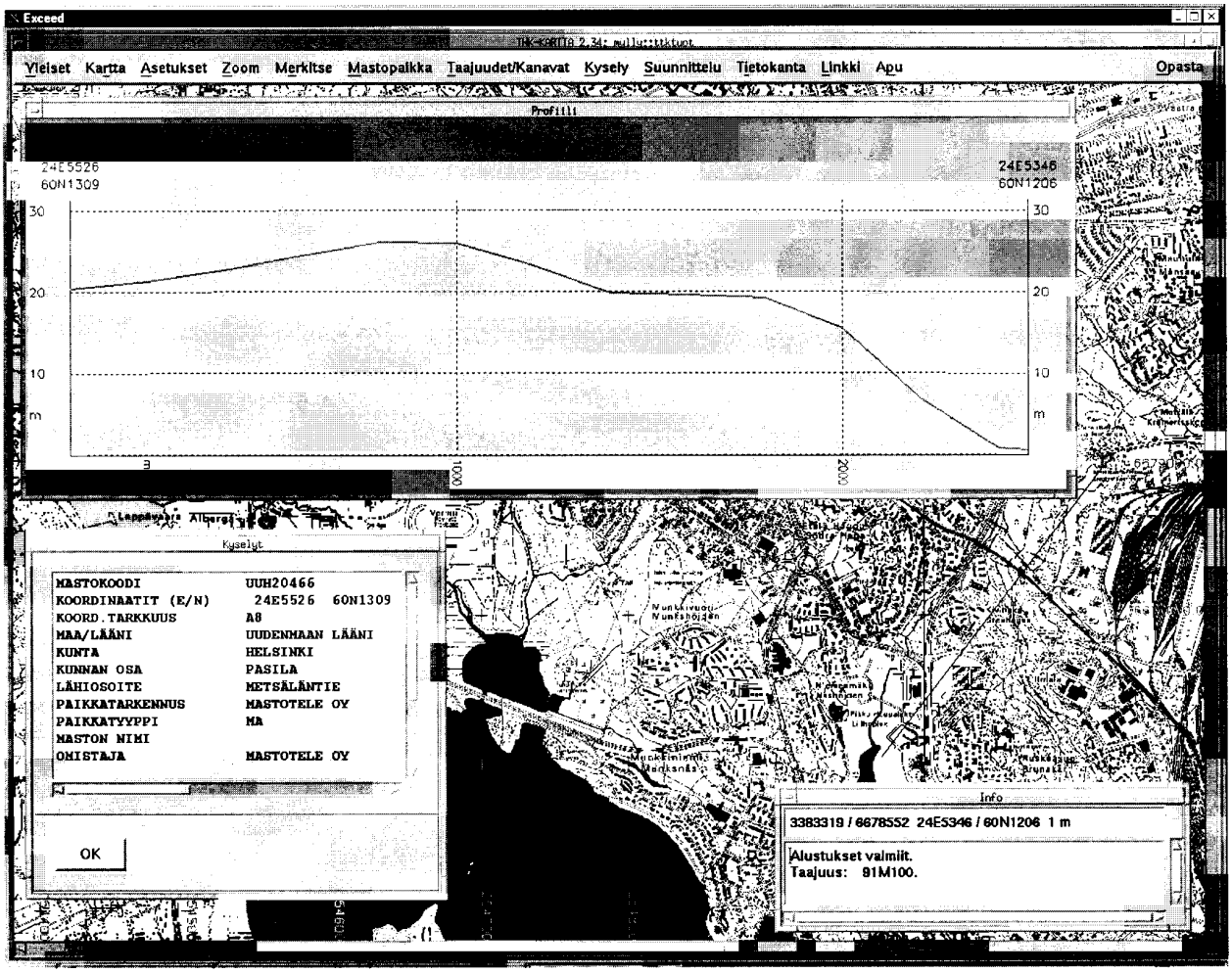

Figure 7. Display of the Geographical data system.

6.2.1. Digital map database

The digital map database consists of the following materials:

- Basic Map, covering whole Finland,
- Finnish roads (Names),

- General road map of Finland,
- City borders,
- Country borders,
- Electric power lines,
- Terrain height curves,
- Buildings,
- Local telecommunications areas,
- City borders of Sweden
- Northern Europe.

The most important of these materials is the Basic Map (scale 1:20000). It is in a raster format and needs several tens of Gigabytes of disk space, as all the other material needs less than 1 Gigabyte.

6.3. Interference calculation

The interference calculation software is mainly used for planning private mobile radio (PMR) networks in the VHF/UHF -range. In the planning procedure, a new station is inserted to the mast or to a geographical location. The network type and related protectional requirements are recognised by the software using the frequency given and national frequency allocation plan. The program calculates the affected area, within the new station can interfere other stations or be interfered by other stations. The following different interference phenomena can be selected for inspection:

- blocking (desensitisation),
- adjacent channel interference,
- image frequency interference,
- harmonics,
- 3rd order intermodulation.

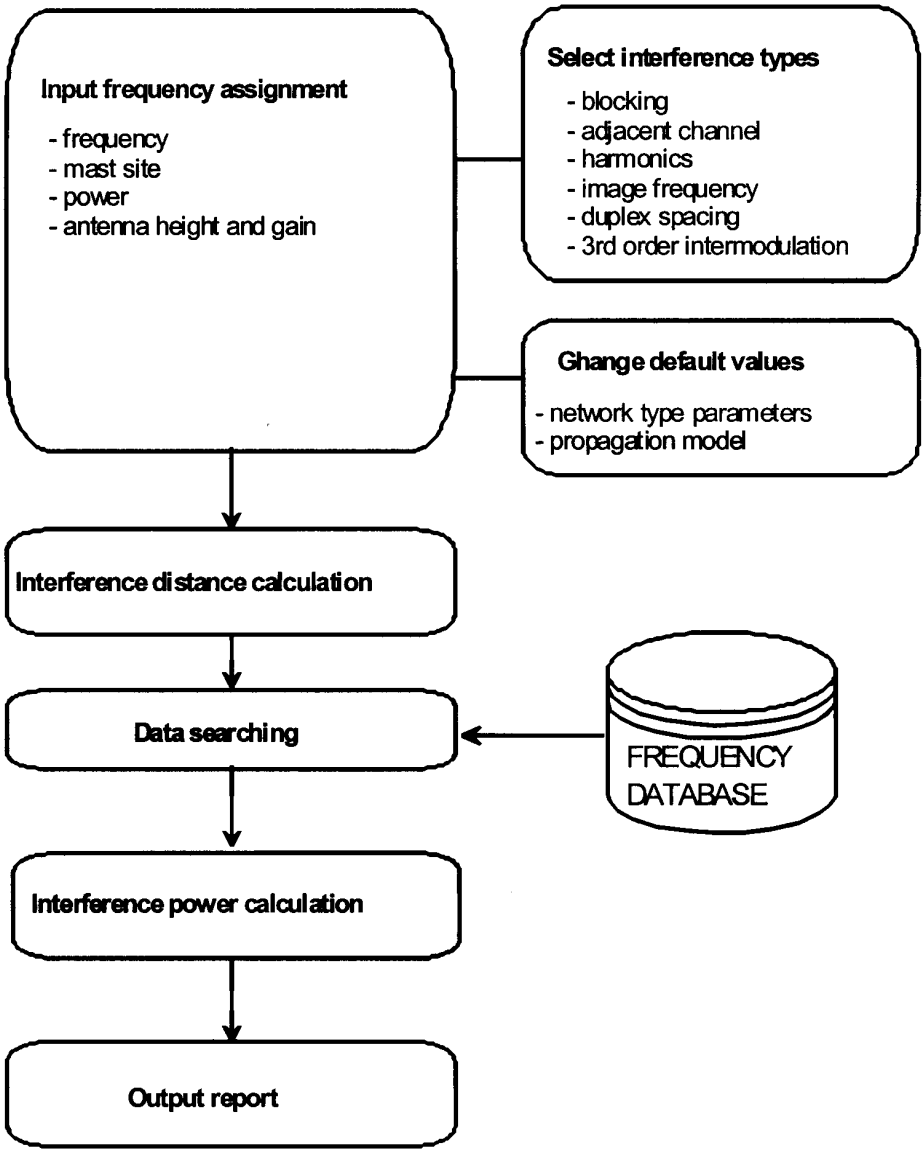

Figure 8. Interference calculation program.

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Within the affected area, the frequencies are searched from the frequency database and the interference powers are calculated. If the interference threshold levels are not exceeded, the inserted new frequency assignment is accepted. Otherwise, possible affected assignments are listed, and the user has to choose another frequency for trial until interference-free frequency is found. The program is also useful for radio monitoring engineers in solving interference cases.

6.4. Data transfer from cellular operators

The public mobile phone operators plan their own networks within the frequency blocks allocated to them. The locations and technical characteristics of the base stations are approved by the TAC. The information related to mast sites and frequency assignments are transferred regularly from operators' frequency registers to TAC's frequency database using magnetic discs. The data format was defined by the TAC, and it has to be followed by all the operators and all the networks (NMT, GSM, DCS). A special software was developed to scan the data and to update the information in the frequency database. The software development started in September 1995, and it was completed in June 1996.

7. Experiences in the frequency register database project

Manual card files are normally gathered over a long period of time and usually by several persons. Filing principles may have changed several times, if there ever were some. Some data items may have been missing, and sometimes it is difficult to know for example the reference values for the power or antenna gain values. Changing manual card files into a computerised system will be a much more time-consuming work than one would expect in advance. But it is important to do it well, because developing the software which uses the automated data base will then be much easier.

The automated frequency planning system should be developed step by step in collaboration with the actual users, defining and designing all the steps very carefully. The hardware environment should not be regarded as the most important issue. Some frequency administrators who have no experience in developing an automated frequency planning system might begin to develop a complete frequency planning system at once, with the frequency data base, digital maps, coverage and interference calculation, licensing and billing etc. But it is better to have a clear view, and realise it stepwise and learn from every step. Even though we had well designed programs, after having experience in using the applications, the frequency planning engineers seem to have need of new features, which will lead to changes to the programs and even to the data base.

ANNEX 2 1(6)

Telecommunications
Administration Centre
F i n l a n d

DATABASE FOR FREQUENCY ALLOCATION TABLE

1. INTRODUCTION

This document contains description of the database for the frequency allocation table used in the Telecommunications Administration Centre (TAC) of Finland.

2. BACKGROUND

The Frequency Allocation Table was earlier maintained with Word Perfect and MS Word text handling programs. The constant need to update, to make changes simultaneously to three table files (Finnish, Swedish, and English) and the limited capacity of text handling programs caused difficulties and problems. These were the reasons to create a relational database system on the Microsoft SQL Server.

3. FREQUENCY ALLOCATION TABLE

3.1 General

All information that is published in the frequency allocation table is stored in the database for the frequency allocation table.

The data in the database can be updated in real time, and the frequency allocation table can be printed whenever it is needed.

The frequency allocation table of Finland can be published in Finnish, English or Swedish. Other languages may also be used instead of the named ones with only minor changes to the application.

The HTML output is quite similar to the printed output. The Web-version consist of five parts:

- 9 - 26,175 kHz
- 26175 kHz - 470 MHz
- 470 MHz - 3400 MHz
- 3400 MHz - 31 GHz and
- 31 - 400 GHz.

These parts may be viewed and printed with a standard web browser.

The basic reason for dividing the output to five pieces is to speed up the processes thus making the search and downloading of the information as efficient as possible.

The Finnish Frequency Allocation Table contains four columns:

- Column 1 contains the frequency bands and services.
- Column 2 contains sub-band, its width and usage in Finland.
- Column 3 contains technical specifications like mode of traffic, class of station, channel spacing, bandwidth, class of emission, duplex separation, paired band etc.
- Column 4 contains remarks on the sub-band. Relevant information on the product standards prepared by ETSI may also be included. The remarks are given either as standard text or as free-form text.

4. FREQUENCY ALLOCATION TABLE APPLICATION

The database for frequency allocation table is on an NT Server computer, under an SQL Server database management system (version 6.5). The operating system is Microsoft NT 4.

This program has been coded with in Windows NT-environment by using SQL-Server in the database storing and Visual Basic as the code language.

Frequency allocation table application is a client server application connected to SQL-Server.

SQL Server is a relational system, in which the data is perceived by the user as tables. The data elements are in the columns of the tables.

Users are connected to the frequency allocation table software from their personal computers.

At this moment the functions of the application are used only for updating the data and printing the frequency allocation table.

The simultaneous updating of the database is possible, provided that several users are not trying to update the same table simultaneously. In that situation, the first user will get the service and others are put in queue.

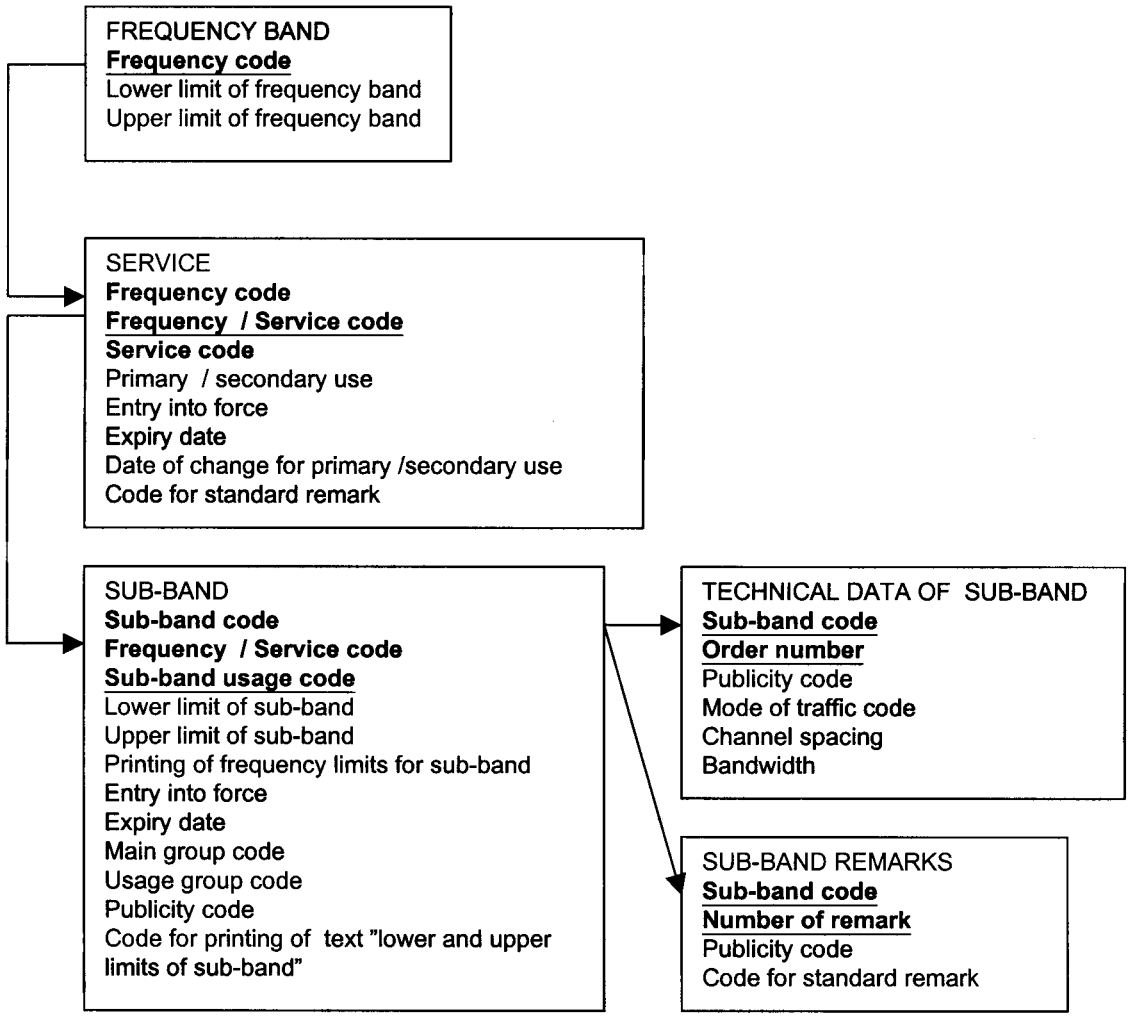
4.1 Database

4.1.2 Data tables

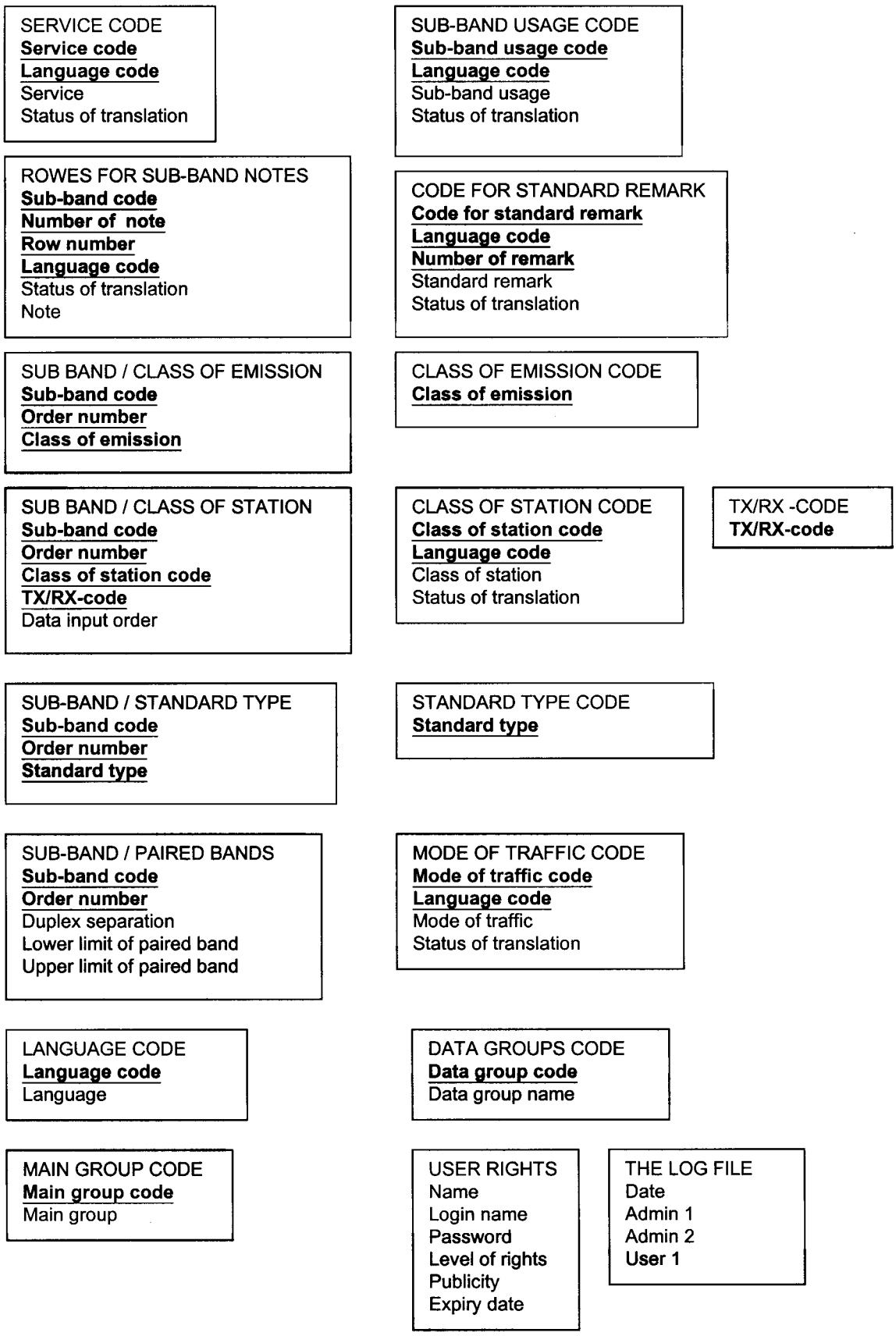
The frequency allocation table database is a relational database, where data is presented in tables related to other tables.

Main tables and their relationships are shown below:

(This document does not contain detailed definitions of the information in the tables)



The database contains also supportive tables. These tables are shown below (relationships between the tables are not shown) :



The names of the tables are written with block capitals. The records (data rows in the tables) have a unique identifier field or a combination of fields called the primary key. The primary key fields are written in bold text and with an underline. The primary key consists in some tables two fields like sub-band code and order number. Secondary keys, which are used to link tables with each other are in bold text but without an underline.

Some of the data fields can have null-values, because value '0' is not always appropriate for a missing value.

4.2 Windows

The application has ten different windows altogether.

The three main windows are:

- Window for the frequency band maintenance is for updating the frequency bands and services (first column of the frequency allocation table).
- Window for the sub-band maintenance is for updating sub-band, usage in Finland and also technical data, which are connected to approriate sub-band (second and third column of the frequency allocation table).
- Window for the remark maintenance is for updating remarks (fourth column of the frequency allocation table).

The other seven windows are supportive :

- the main menu window
- the search window for a frequency band and services
- the search window for a sub-band and technical data
- the code table window for updating the code lists
- the search window for translated texts
- the text translation window
- the maintenance window for the system administrator

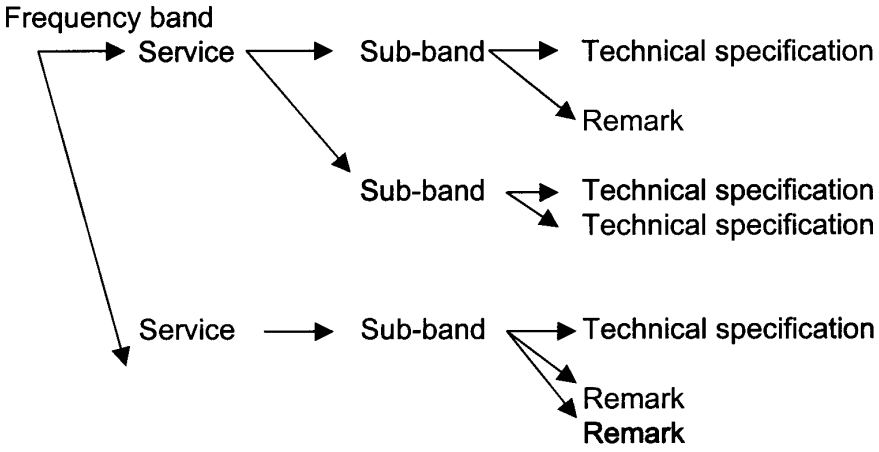
4.3 Printing of frequency allocation table

Before the program starts to print the Frequency Allocation table, it will go through every frequency band, and search for all sub-bands, which are linked to it. All those technical data rows, which are linked to an appropriate sub-band, will be added to the output. Also those remarks, which are linked to that sub-band being handled, are added to the output.

At the moment the Frequency Allocation Table covers the frequency range 9 kHz to 400GHz.

To link the relevant information correctly, the data must be stored in the following order:

- the frequency band and service shall be created first,
- then the sub-bands for the relevant frequency band
- and finally the technical specification and remarks



- A single frequency band may have one or many services.
- Service may contain one or many sub-bands.
- Sub-band may have none or many technical specifications and remarks.

All data which is entered to the database is printed to the frequency allocation table as shown below:

Example:

75,200 – 87,500 MHz LAND MOBILE	83,850 – 84,075 MHz (0,225 MHz) PMR (power utilities)	Duplex. Base station (FB) RX 25 kHz, 16 kHz. -6 MHz 77,850 – 78,075 MHz	Channels for power utilities.
	84,100 – 86,000 MHz (1,900 MHz) PMR (power utilities)	Duplex. Base station (FB) RX 25 kHz, 16 kHz. -6 MHz 78,100–80,000 MHz Simplex. Base station (FB) TXRX Land mobile station (ML) TXRX 25 kHz, 16 kHz.	
MOBILE	86,025 – 87,100 MHz (1,075 MHz) PMR	Simplex. Base station (FB) TXRX Land mobile station (ML) TXRX 25 kHz, 16 kHz.	Common channels for PMR. See PMR-standards from appendix X.

ANNEX 3

Organization