Frequency Allocation Table (FAT)

SMS4DC training seminar
27 November – 1 December 2006

SMS4DC Spectrum Allocation

• Frequency allocation menu of SMS4DC provides regional and national frequency allocation tables (section 3.4.2.11 in manual)
• Frequency allocation table is used by SMS4DC for frequency assignment
• No frequency can be assigned in contradiction with frequency allocation table
**Elements of Frequency Allocation Table (FAT)**

- Frequency band classification:
  - Exclusive bands,
  - Shared bands,
  - Receive-only bands (RR footnote 5.340),
  - License-free bands (not by ITU decision)
- Radiocommunication services
  - 40 radiocommunication services are defined in RR Article 1,
  - About 30 radiocommunication services appears in FAT
  - More services could be defined by regulators
- Radiocommunication service category:
  - Primary
  - Secondary

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Secondary Service

- Stations of a secondary service:
  - Shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
  - Cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date;
  - Can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.
Editing Legend of FAT
(Edit > service Table)

- Legend text and associated color can be customized

Method to develop national FAT (NFAT)

- Develop framework,
- Study existing situation,
- Plan bands of high density application,
- Draft NFAT,
- Verification of NFAT,
- Provide migration plan,
Frameworks to develop national frequency allocation table

- Compatibility with national telecommunication act,
- Obeying national goals, long term and short term policies of telecommunication sector,
- Covering existing applications introduced for the radio frequency spectrum,
- Compatibility with international radio regulations and incorporated regional frequency allocation table,
- Recognizing future demands of different category of users
- Being inline with geo-climatic situation of the country,
- Consideration of spectrum utilization reference of neighbour countries,
- Compatibility with international and regional agreements,

Frameworks: Telecommunication act of the country

- Should give explicit reference chapters and articles about spectrum utilization,
- Should establish independent responsible authority for spectrum management,
- Should recognize key functions of responsible authority for spectrum management,
- Should consolidate radio licensing regime,
- Should equip spectrum management authority with powerful regulations to supervise spectrum utilization,
- Should recognize international nature and harmonized usage of spectrum,
Frameworks:
National goals, long/short-term policies

- Consideration telecommunication market model and demand,
- Simplification and clarification of frequency assignment method,
- Promotion of operators to increase spectrum utilization efficiency,
- Separating spectrum user categories (military, security and civil applications)
- Optimizing utilization of spectrum, ground, space, orbit, time and numbers,
- Harmonization of spectrum usage,
- Facilitating common health, wealth and security,

Frameworks:
Existing applications using spectrum (Example)

- Spectrum allocation table should embrace existing usages as far as possible,
Frameworks:

Observing future demands of users

- Taking into account national plan to promote telecommunication,
- Embracing specific demands of users as far as achievable,
- Estimating and observing future demands of public correspondence,
- Policy making in utilization of spectrum efficiently
- Encouraging manufacturers as well as standardization bodies to consider local needs,
- Identifying investable areas of radiocommunication services
Frameworks: Geo-climatic situation of the country

- Guinea is in tropical zone

Frameworks: Spectrum utilization in neighbour countries

- More harmonized spectrum allocation with neighbor countries increases spectrum utilization near the national borders,
- ITU RR Article 5 is the reference allocation table of neighbor countries,
- Guinea is a member of all regional activities and agreements regarding to spectrum allocation,
Planning Bands of Special Application

- Public cellular mobile applications:
  - 2G and 3G cell phones
  - paging
- Professional cellular mobile applications:
  - Radio-trunks
  - WLL
- License-free bands and applications,
  - CB
  - SRD
  - ISM
  - Cordless telephones
- Exclusive broadcasting

Drafting NFAT

- Starting from 9 kHz,
- Stopping on the highest planned frequency,
- Determining usage of each frequency band as far as applicable consistently,
- Determination of user category as far as distinguishable,
- Drafting national footnotes under the frequency bands which are necessary,
Verification of NFAT

- Step 1: Reconsideration of all frequency bands,
- Step 2: Presentation of NFAT, totally or partially, to major spectrum users,
- Step 3: Starting migration procedure,
- Step 4: Modification of NFAT,
- Step 5: Termination of verification or return to step 2 above
Providing Migration Plan

- Comparing existing frequency assignments with NFAT,
- Determination of urgency of inconsistencies into one of:
  - Top urgent
  - Urgent
  - Less urgent
- Classification of inconsistencies into one or some of:
  - Service type inconsistency,
  - Service category inconsistency,
  - User group inconsistency
- Determining consistent frequency bands for inconsistent assignments,
Method of Migration

- Tuning transmitters from inconsistent frequency to consistent frequency bands by licensee,
- Un-renewal of radio license,
- Stopping operation of valid transmitters on inconsistent frequencies,
- Compensation of migration cost by new spectrum user,
- Compensation of migration cost by government,

Frequency Arrangement
SMS4DC Frequency Arrangement

- Frequency arrangement item in the “Frequency Allocation” menu of SMS4DC generates frequency plans (section 3.4.2.11 in manual)
- Three types of frequency arrangement is possible in SMS4DC:
  - Homogeneous,
  - Uniform, and,
  - Non-uniform
- Any frequency plan shall in conformity with Frequency allocation table
- List of all planned assignable frequencies could be browsed from item “Frequency Table” of “Frequency Allocation” menu

Types of Frequency Arrangements

- Homogeneous channel arrangement
  \[ f_n = f_0 + f_{\text{offset}} + n \cdot X \cdot S \quad \text{MHz, } n = 0,1,2,\ldots \]
  \[ f'_n = f_0 + f'_{\text{offset}} + n \cdot X \cdot S \quad \text{MHz, } n = 0,1,2,\ldots \]
- Uniform channel arrangement
  \[ f_n = f_0 + n \cdot X \cdot S \quad \text{MHz, } n = 0,1,2,\ldots \]
- Non-uniform channel arrangement

References:
- ITU-R Recommendations, F series,
- CEPT Recommendations,
- Any frequency assignment plan in RR and regional plans
Exercising F-plan dialog box (1)

- **Step 1:** Launch the SMS4DC software
- **Step 2:** Launch the DEM view using toolbar push button
- **Step 3:** Set the Region to 1, and, Service priority to “Primary”
- **Step 4:** Choose the item “Frequency Arrangement” in the “Frequency Allocations” menu
- **Step 5:** Choose “Fixed” service type
- **Step 6:** choose “Homogeneous” for Frequency Plan (dialog box will be changed dynamically for other types),
- **Step 7:** Put following values in relevant edit boxes (from F.386):
  \[ XS = 14 \text{ MHz}, f_0 = 8387.5 \text{ MHz}, \text{ Lower } f_{\text{offset}} = -108.5 \text{ MHz}, \text{ Upper } f_{\text{offset}} = 10.5 \text{ MHz}, \text{ Channels 1 to 6, channel set: All} \]
- **Step 8:** Save the plan using bottom of the dialog box
Exercising F-plan dialog box (2)

- **Step 9:** Push the button to see the channels in text file
- **Step 10:** Choose other types of Frequency Plan and repeat exercise
- **Step 11:** Try the standard push button provided bottom the dialog box

Frequency Assignment
Frequency Assignment Procedure

Start

Establish Stations and provide initial frequency

Start frequency assignment procedure

Query stations having frequency inside initial given frequency window

Select a Station

Set Assignment Parameters

Query Assignable Frequencies with statistics of suspect stations

Perform interference calculation for the selected frequency

Assign the selected frequency to the concerned station

Assignable frequency Search Criteria

- A frequency window \([f_{\text{min}} \text{ to } f_{\text{max}}]\)
- Channel scan range,
- Radius of circular search area,
- Permissible field strength,

Permissible Field strength value in the location of victim station

Interfering signals

Wanted station

Stations inside the searching circle

Stations outside the searching circle
SMS4DC Frequency Assignment

- Frequency assignment procedure of SMS4DC is a very conservative tool to reuse frequencies
- Use the item “Frequency Assignment” in “Frequency Allocations” menu
- Interference calculation will be done using free space propagation model
- More realistic interference calculation could be done through the “Interference” menu for scenarios having approved procedures

Exercise (1)

- Frequency Allocations->Frequency Assignment
**Exercise (2)**

Frequencies may cause or receive interference.

Double click to select a frequency for further analysis.

**Exercise (3)**

E2_1: Field strength of the victim station on the location wanted station

E1_2: Field strength of wanted station on the location of victim station
End