Frequency Allocation Table (FAT)

SMS4DC training seminar

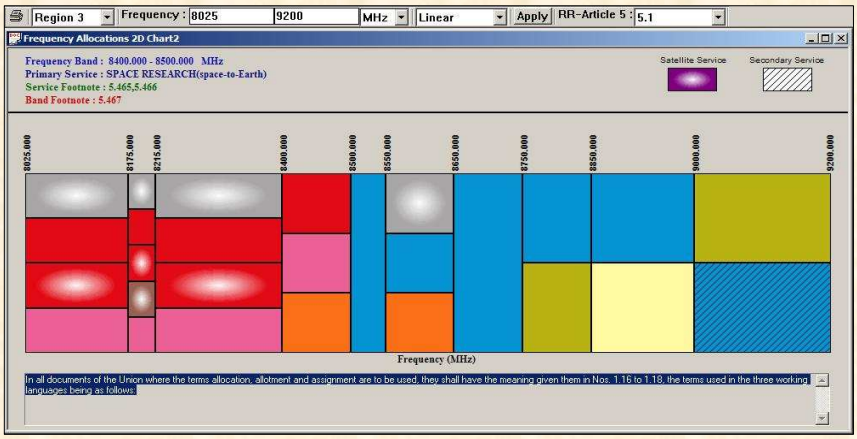
27 November – 1 December 2006

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

Spectrum Allocation Chart

- "Draw Chart" item in the "Frequency Allocations" menu



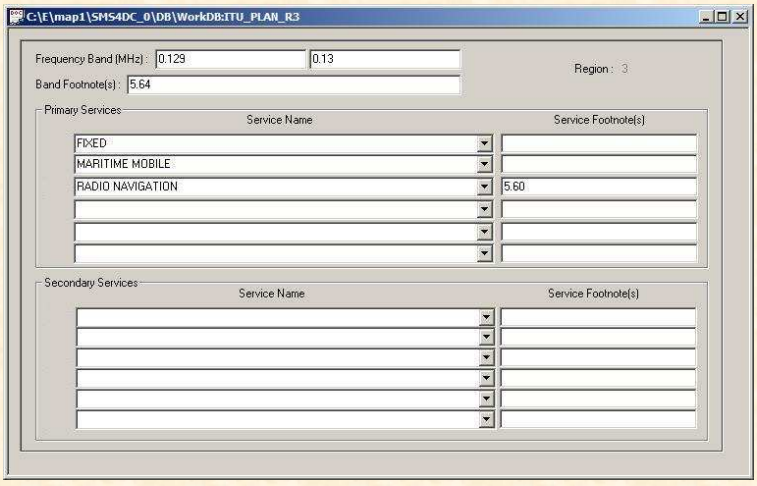
Elements of Frequency Allocation Table (FAT)

- 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

Secondary Service

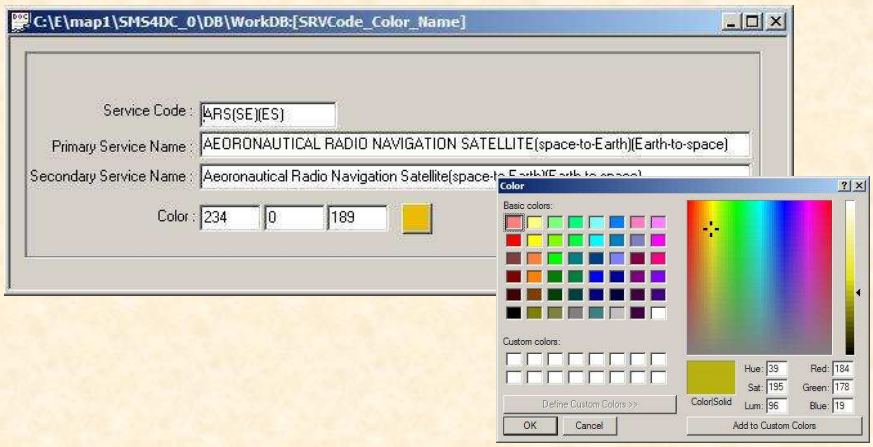
- Stations of a secondary service:
  - Shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
  - Cannot claim protection from harmful interference from stations of a primary service to which 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.

Editable Spectrum Allocation Table of SMS4DC (Edit menu)



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

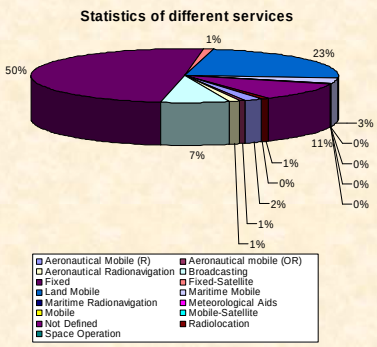
- Should give explicit reference chapters and articles about spectrum utilization,
- Should establish independent responsible authority for spectrum management,
- Should recognize key functions of responsible authority for spectrum management,
- Should consolidate radio licensing regime,
- Should equip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

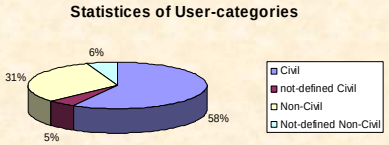
Frameworks:
National goals, long/short-term policies

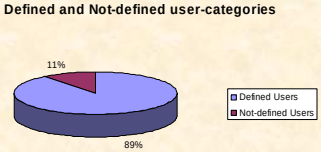
- Consideration telecommunication market model and demand,
- Simplification and clarification of frequency assignment method,
- Promotion of operators to increase spectrum utilization efficiency,
- Separating spectrum user categories (military, security and civil applications)
- Optimizing utilization 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,





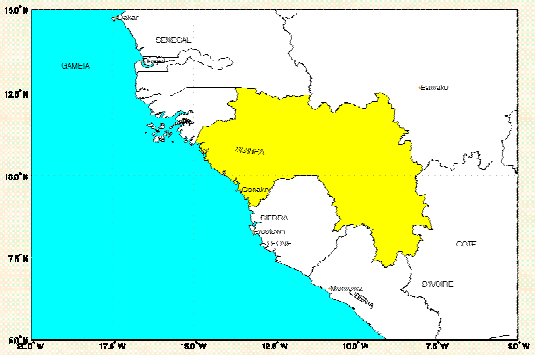


Frameworks:
Observing future demands of users

- 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

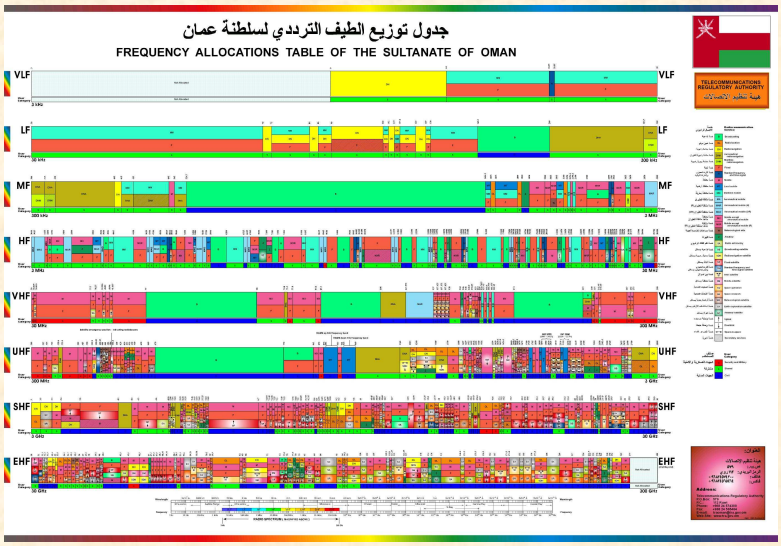
Drafting NFAT

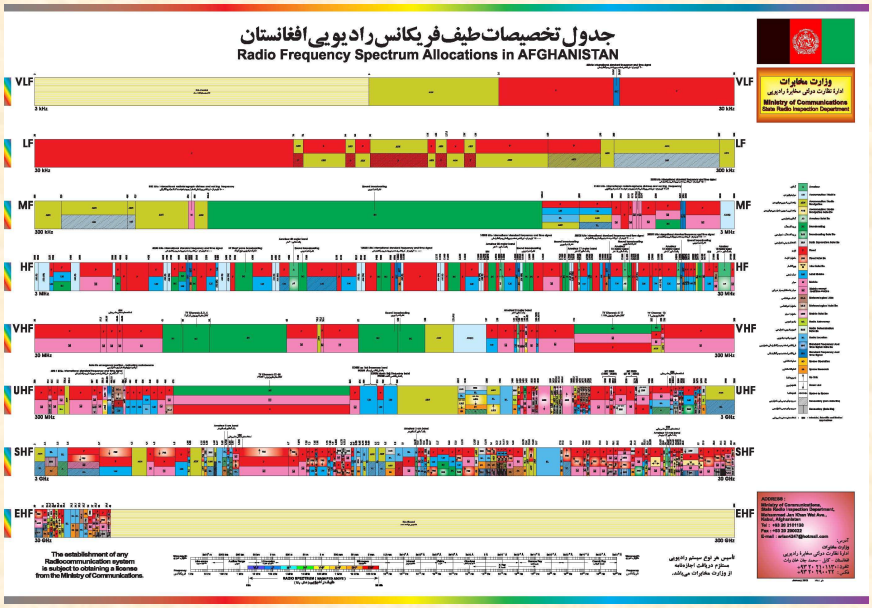
- Starting from 9 kHz,
- Stopping on the highest planned frequency,
- Determining usage of each frequency band as far as applicable consistently,
- Determination of user category as far as distinguishable,
- Drafting national footnotes under the frequency bands which are necessary,

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

Frequency Allocation Chart





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

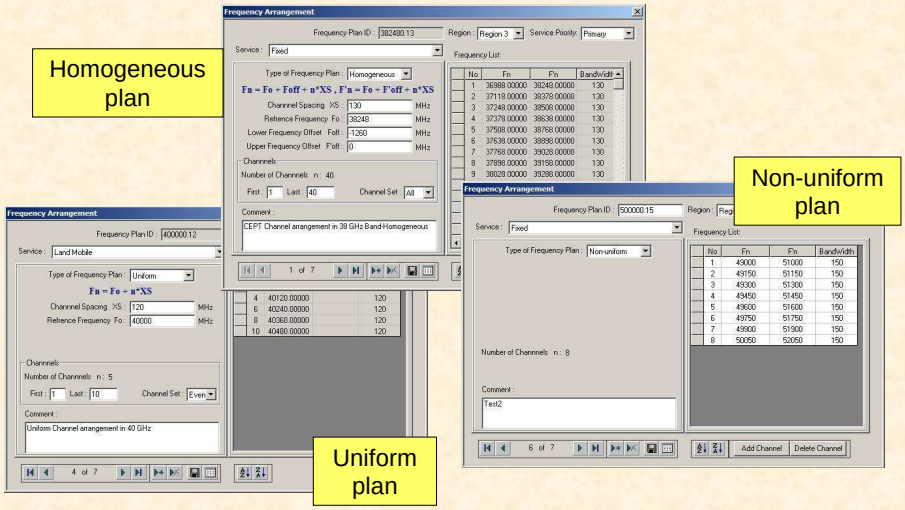
- Homogeneous channel arrangement

$$f_n = f_0 + f_{offset} + n \cdot XS \quad \text{MHz}, \quad n = 0,1,2,....$$

$$f'_n = f_0 + f'_{offset} + n \cdot XS \quad \text{MHz}, \quad n = 0,1,2,....$$

- Uniform channel arrangement
- $$f_n = f_0 + n \cdot XS \quad \text{MHz}, \quad n = 0,1,2,....$$
- Non-uniform channel arrangement
- References:
  - ITU-R Recommendations, F series,
  - CEPT Recommendations,
  - Any frequency assignment plan in RR and regional plans

SMS4DC F-plan dialog box



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"
- **Step4 :** 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):

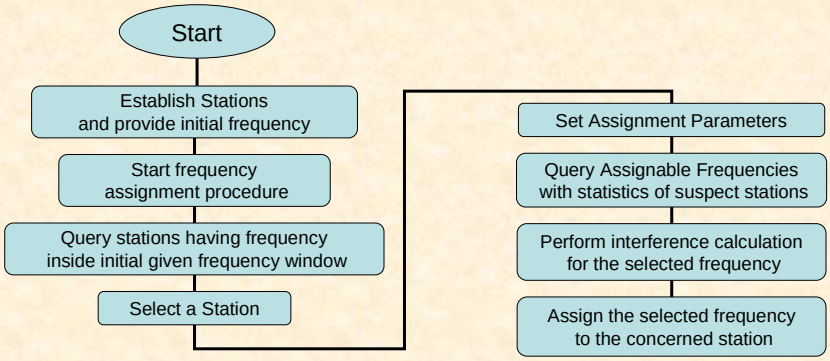
  XS = **14 MHz**, f_0 = **8387.5 MHz**, Lower f_{offset}= **-108.5 MHz**,
  Upper f_{offset}= **10.5 MHz**, Channels **1** to **6**, channel set: **All**
- **Step 8:** Save the plan using bottom of the dialog box

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

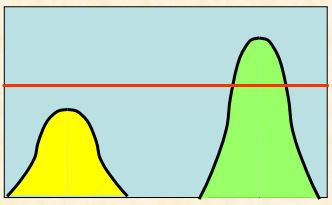
Frequency Assignment Procedure



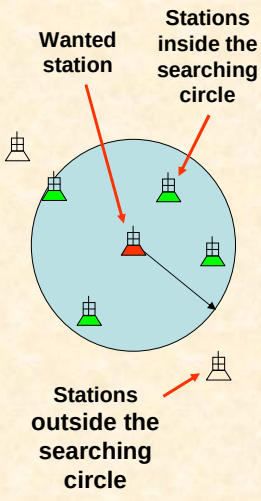
Assignable frequency Search Criteria

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

Permissible Field strength value in the location of victim station



Interfering signals

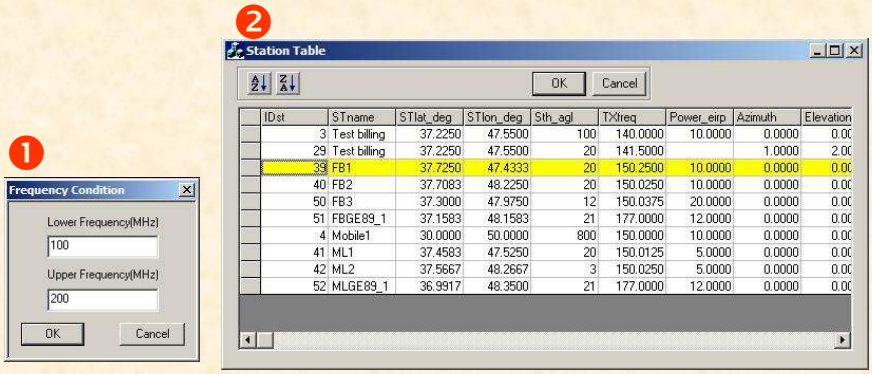


SMS4DC Frequency Assignment

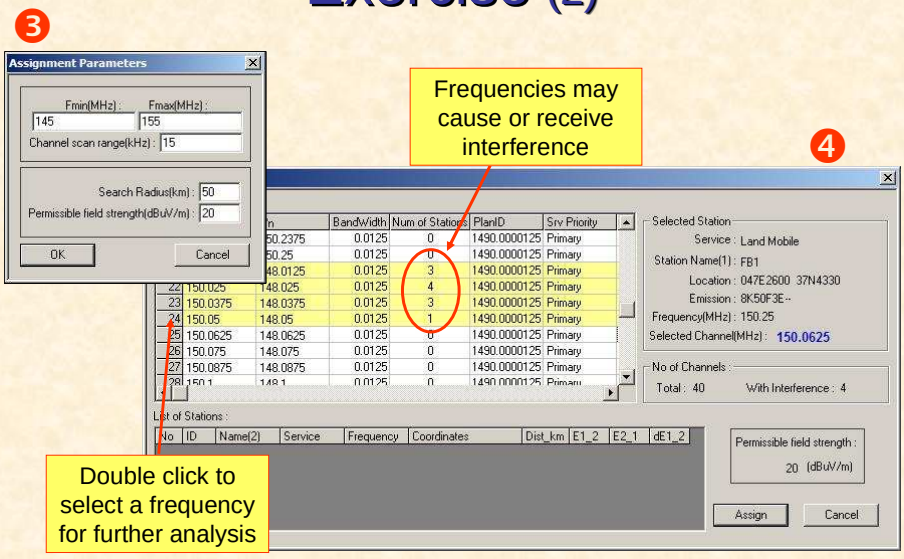
- Frequency assignment procedure of SMS4DC is a very conservative tool to reuse frequencies
- Use the item “Frequency Assignment” in “Frequency Allocations” menu
- Interference calculation will be down using free space propagation model
- More realistic interference calculation could be down through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

Exercise (1)

- Frequency Allocations->Frequency Assignment



Exercise (2)



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

List of Frequencies :

No	Fn	F'n	BandWidth	Num of Stations	PlanID	Srv Priority
19	148.2375	150.2375	0.0125	0	1490.0000125	Primary
20	148.25	150.25	0.0125	0	1490.0000125	Primary
21	150.0125	148.0125	0.0125	3	1490.0000125	Primary
22	150.025	148.025	0.0125	4	1490.0000125	Primary
23	150.0375	148.0375	0.0125	3	1490.0000125	Primary
24	150.05	148.05	0.0125	1	1490.0000125	Primary
25	150.0625	148.0625	0.0125	0	1490.0000125	Primary
26	150.075	148.075	0.0125	0	1490.0000125	Primary
27	150.0875	148.0875	0.0125	0	1490.0000125	Primary

Selected Station
Service : Land Mobile
Station Name(1) : FB1
Location : 047E2600 37N4330
Emission : 8K50F3E--
Frequency(MHz) : 150.25
Selected Channel(MHz) : 150.025

No of Channels :
Total : 40 With Interference : 4

List of Stations :

No	ID	Name(2)	Service	Frequency	Coordinates	Dist_km	E1_2	E2_1	dE1_2
1	41	ML1	Land Mobile	150.012500	047E3130 37N2730	30.7	6.12	3.11	-13.88
2	42	ML2	Land Mobile	150.025000	048E1600 37N3400	75.5	47.22	44.21	27.22
3	40	FB2	Land Mobile	150.025000	048E1330 37N4230	69.7	47.91	47.91	27.91
4	50	FB3	Land Mobile	150.037500	047E5830 37N1800	67.2	-6.41	-3.40	-26.41

Permissible field strength :
20 (dBuV/m)

Assign Cancel

End