

# SMS4DC

SPECTRUM MANAGEMENT SYSTEM FOR DEVELOPING COUNTRIES

Version 4

ASUENIZE ADIGA /  
NCC / ITU



International  
Telecommunication  
Union

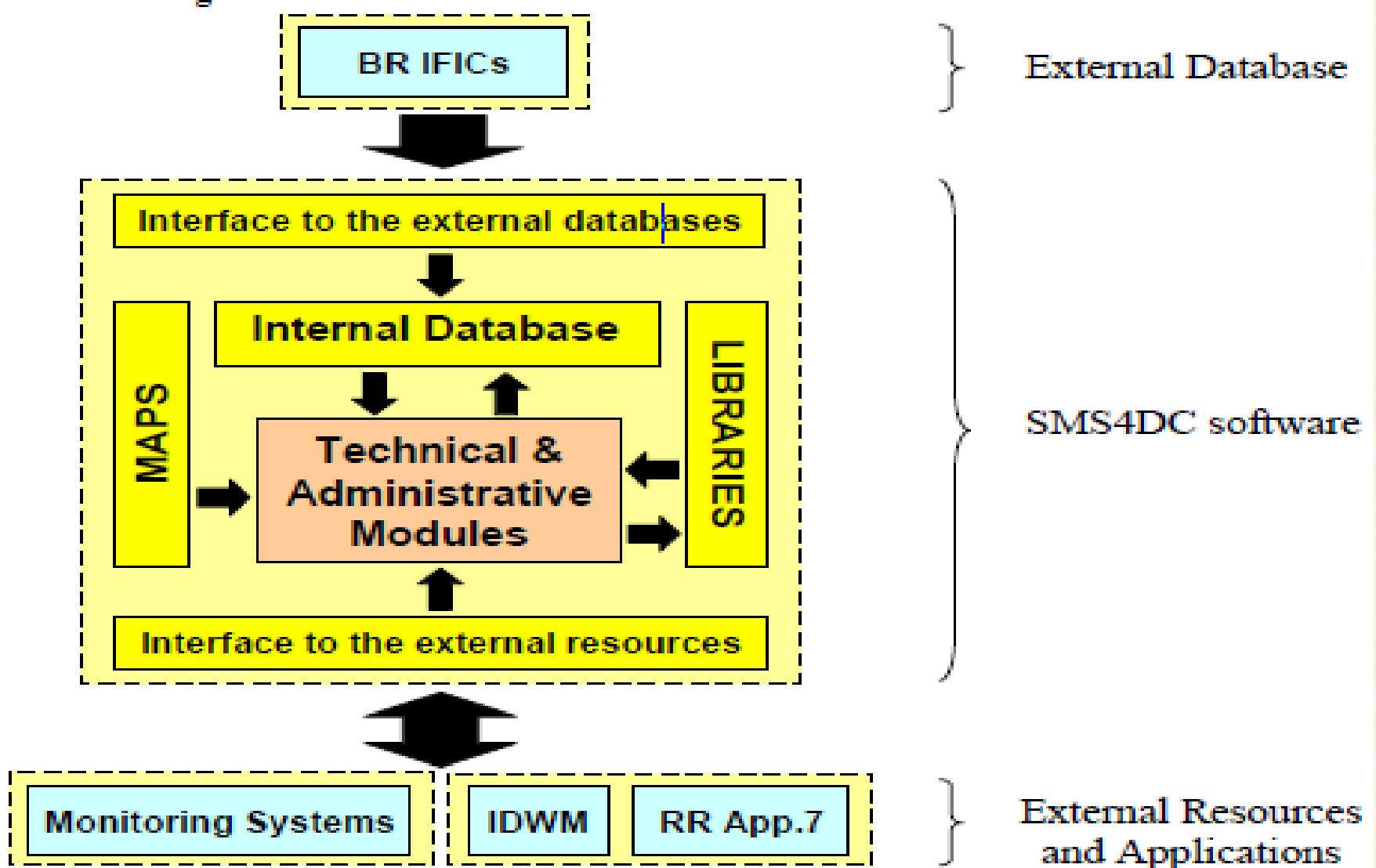
# OUTLINE

- What is SMS4DC
- How Nigerian Communications Commission (NCC) is using SMS4DC tool in Managing Spectrum?.
- What are our experience encounter by using the tool?.
- What can be improved in later version to meet our needs?.

# Spectrum Management System for Developing Countries-SMS4DC

- SMS4DC is software designed by ITU based on ITU recommendations , and it is mainly designed to help Regulators to manage spectrum scientifically and is consist of both administrative and engineering tools and it relatively cost friendly.
- SMS4DC covers terrestrial fixed, mobile, broadcasting services in the bands above 30 MHz, as well as satellite Earth stations in space services.

# Structure of SMS4DC Software



# Why SMS4DC Software ?

- The radio frequency spectrum, is a limited and valuable resource, used for all forms of wireless communication.
- The growth in telecommunications services and radio technologies have led to an ever increasing demand for the use of spectrum among competing business, public sector and other users.
- SMS4DC software enable efficient management of the radio frequency spectrum and help in mitigation of interference.

# NCC Case

The Spectrum Administration Department of NCC is made of four units namely;

- Planning Unit
- Assignment Unit
- Monitoring Unit
- Database Unit

Basically the SMS4DC software is used at the moment by Assignment Unit and Planning Unit of the department for evaluation of frequency applications and planning of frequency channels arrangement in accordance with ITU specifications.

# Our Challenges before acquiring SMS4DC

- Planning of frequency channels arrangement was an issue, it was done manually.
- Evaluation of frequency applications was done manually and with engineering assumptions.
- Operators were dictating the frequency band they wanted and planning their network as they like and equally deploying as they like.
- The spectrum were not manage efficiently leading to many interference and lost of revenue in resolving it.

# The Benefit of SMS4DC to NCC

- Evaluations of frequency applications is being done in accordance with ITU RF specifications, Equipment Specification and above all we decide to the Operators the required frequency band for deployment as appropriate not as applied with scientific proof as the regulator.
- Using SMS4DC and others software has help in mitigating interference cases cause by indiscriminate deployment of NW links by Operators,
- Spectrum planning is done effortlessly in accordance with ITU RF specifications.
- We managed the spectrum more efficiently by Using SMS4DC software.



# SMS4DC's Engineering Functions

## Frequency arrangement (Homogeneous)

Frequency Arrangement

ID : 13      Frequency Plan ID : 34000.00025      Region : National      Service Priority : Primary

Service : Fixed

Type of Frequency Plan : Homogeneous

**$F_n = F_o + F_{off} + n \cdot X_S$  ,  $F'_n = F_o + F'_{off} + n \cdot X_S$**

Channel Spacing  $X_S$  : 0.25 MHz

Reference Frequency  $F_o$  : 3400 MHz

Lower Frequency Offset  $F_{off}$  : 0 MHz

Upper Frequency Offset  $F'_{off}$  : 100 MHz

Channels

Number of Channels  $n$  : 400

First : 0      Last : 399      Channel Set : All

Comment :  
ITU-R Recommendation F.1488

Frequency List:

No	$F_n$	$F'_n$	BandWidth
0	3400.00000	3500.00000	0.25
1	3400.25000	3500.25000	0.25
2	3400.50000	3500.50000	0.25
3	3400.75000	3500.75000	0.25
4	3401.00000	3501.00000	0.25
5	3401.25000	3501.25000	0.25
6	3401.50000	3501.50000	0.25
7	3401.75000	3501.75000	0.25
8	3402.00000	3502.00000	0.25
9	3402.25000	3502.25000	0.25
10	3402.50000	3502.50000	0.25
11	3402.75000	3502.75000	0.25
12	3403.00000	3503.00000	0.25
13	3403.25000	3503.25000	0.25

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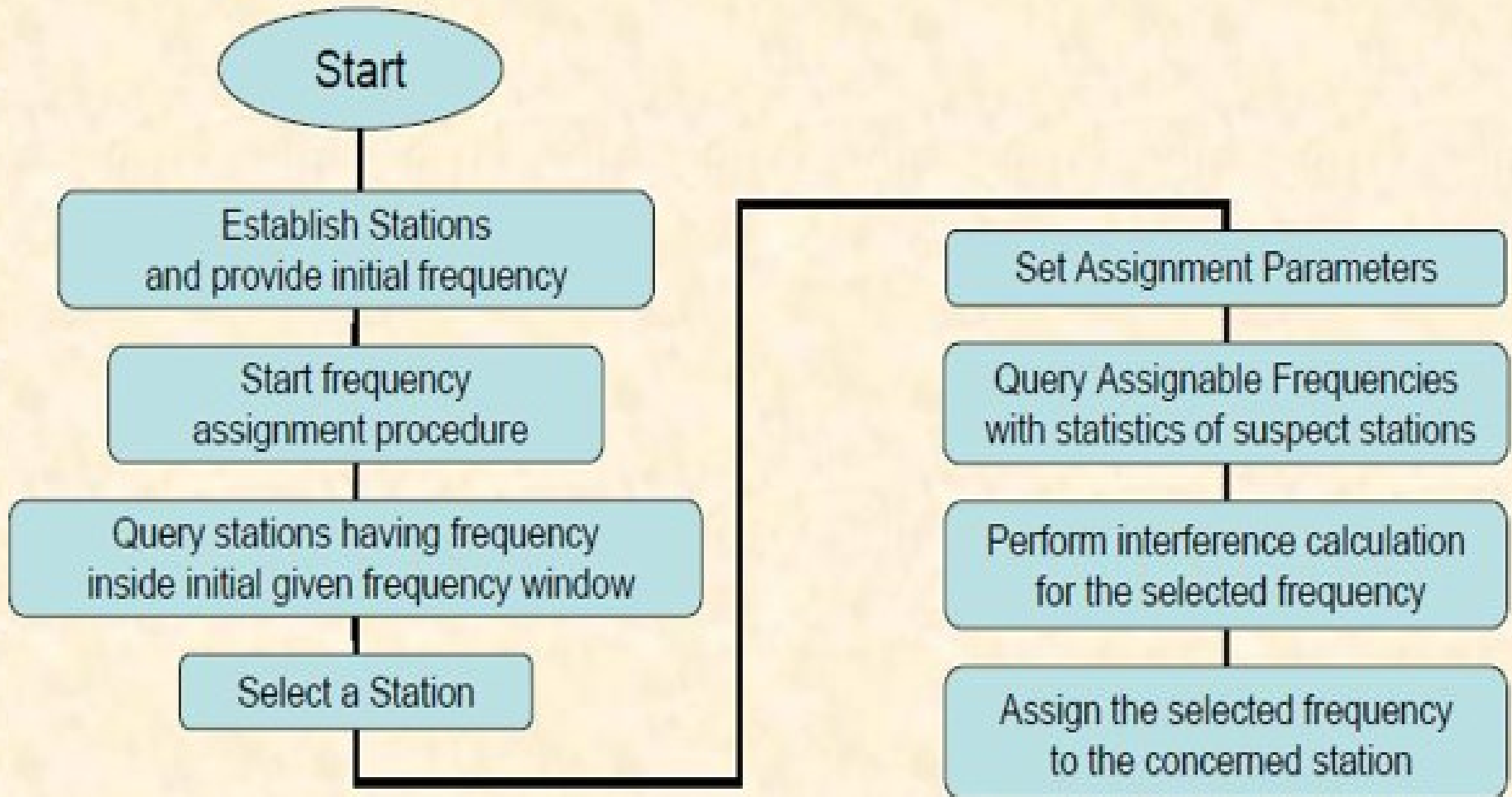
# Spectrum licensing and Assignment

- Licensing/Authorization is the process by which users gain access to the spectrum resource. This involve assigning specific frequencies to users.
- A combination of administrative and technical procedures are used to ensure the efficient operation of radio communications without causing interference.
- Assignment of radio frequency channel is an authorization given by an administration to an operator to use a radio frequency channel under specified conditions.

# Using SMS4DC in Frequency Assignment for Fixed services

SMS4DC is empowered by an advanced method of frequency assignment based on interference calculations to/from any other stations in a given frequency band inside a circular search area.

# Frequency Assignment Procedure for fixed Service



# Fixed/Base Station Information entry table

## SMS4DC's Administrative Functions

**Administrative data1**

SMS4DC Administrative data

- Anonymous Stations
- Active Licenses
  - Owner: BEL 1
    - License: BEL 1
  - Owner: G1
  - Owner: MRC1
  - Owner: POR1
  - Owner: SPAIN1
- Archived Licenses

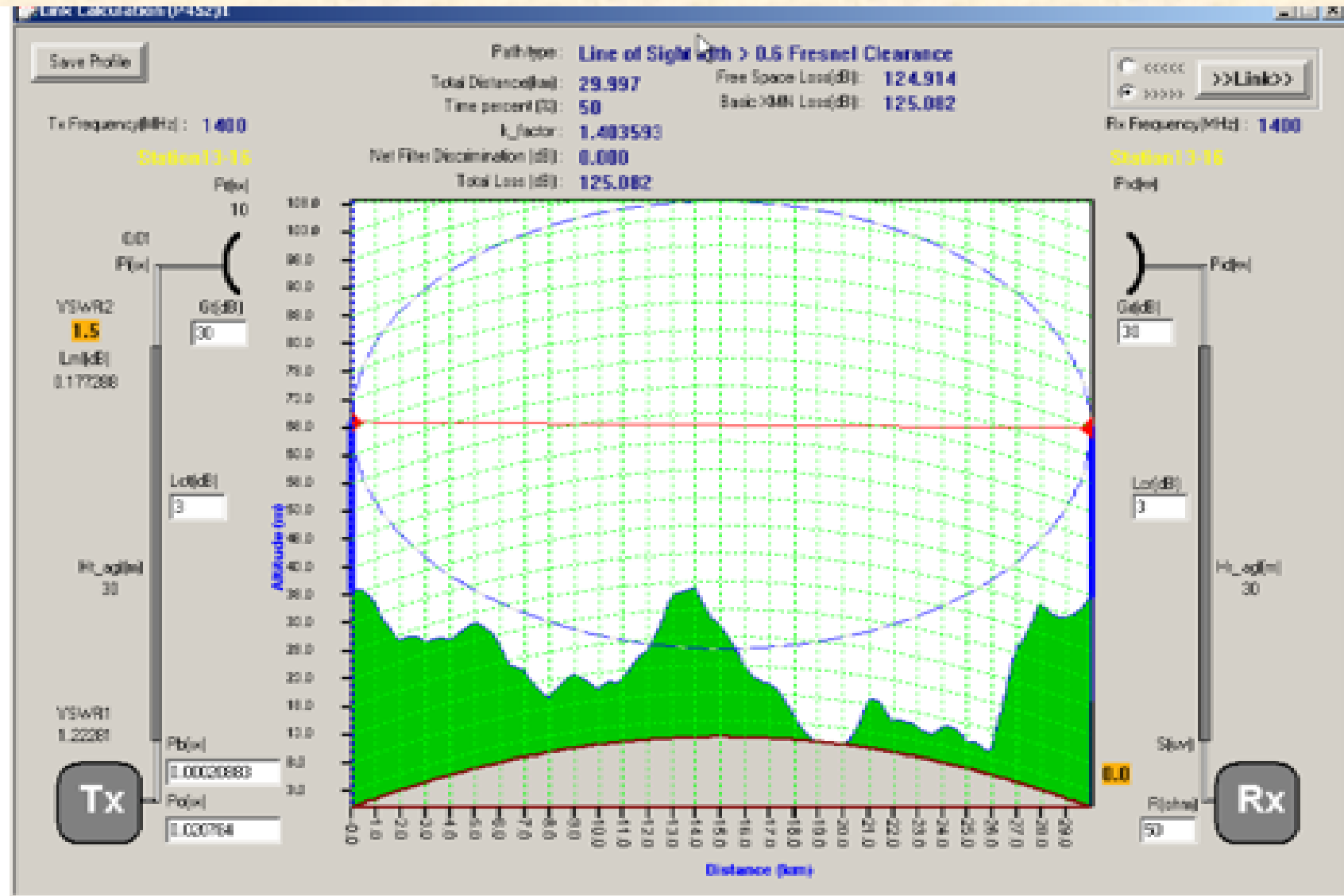
**Fixed/Base station information**

Modify Cancel Save

	Value	Unit
Admin Ref. ID		
Site ID		
Station Name		
Call Sign		
Class of Station		
Station Type	Fixed	
<i>Location</i>		
ITU region		
Latitude		+DDMMSS.SS
Longitude		+DDDMMSS.SS
Country		
Radius of Service		km
Height ASL		m
<i>Misc.</i>		
Provision		
Area of Trans.		
Network ID		
Target Latitude		+DDMMSS.SS
Target Longitude		+DDDMMSS.SS
Type of Notice	T11	

# Link calculation

## SMS4DC's Engineering Functions



# Frequency assignment procedure for fixed service Cont.

Choosing any row with yellow highlight from the list of frequencies by a mouse double left-click, initiates detailed interference calculations,

Frequencies may cause or receive interference

Assignment Results

List of Frequencies :

No	F <sub>n</sub>	F <sub>m</sub>	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
28	150.1	148.1	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

Permissible field strength : 20 (dBuV/m)

Assign Cancel

Service	Frequency	Coordinates	Dist. km	E1_2	E2_1	dE1_2
Land Mobile	150.012500	047E3130 37N2730	30.7	6.12	3.11	-13.89
Land Mobile	150.025000	048E1600 37N3400	75.5	47.22	44.21	27.22
Land Mobile	150.025000	048E1330 37N4230	69.7	47.91	47.91	27.91
Land Mobile	150.037500	047E5830 37N1800	67.2	-6.41	-3.40	-26.41

Double click to select a frequency for further analysis

# Frequency assignment procedure for fixed service cont.

- Once the assignment parameters have been set, all frequencies available within those parameters are examined for potential interference and the results are displayed in the

The screenshot shows a software window titled "Assignment Results" with a close button (X) in the top right corner. The window is divided into several sections:

- List of Frequencies:** A table with columns: No, F<sub>n</sub>, F<sub>n</sub>, Bandwidth, Num of Stations, PlanID, and Srv Priority. Rows 21 through 24 are highlighted in yellow.
- List of Stations:** A table with columns: No, ID, Name(2), Service, Frequency, Coordinates, Dist\_km, E1\_2, E2\_1, and dE1\_2. This table is currently empty.
- Selected Station:** A text area containing:
  - Service : Land Mobile
  - Station Name(1) : FB1
  - Location : 047E2600 37N4330
  - Emission : 8K50F3E--
  - Frequency(MHz) : 150.25
  - Selected Channel(MHz) : **150.0625**
- No of Channels:** A text area containing:
  - Total : 40
  - With Interference : 4
- Permissible field strength:** A text area containing:
  - 20 (dBuV/m)
- Buttons:** "Assign" and "Cancel" buttons are located at the bottom right.



# NCC future strategic plan with SMS4DC software

- Development of the Commission's National Frequency Allocation Table.
- Registration of Base stations deployed in Nigeria in the ITU's BRIFIC.
- To resolve interference cases by analysis without deployment of engineers to the field.
- Determining the Coverage Area covered by Operators in Nigeria, once the registration of the Base stations has been published in the subsequent **BR International Frequency Information Circular** (BRIFIC) DVD.
- Carry out Interference analysis before assigning Microwave Frequency channels to a fixed stations.

# **Limitation of the software and area to improve upon**

1. The fee field under billing is limited to only 9 digits.
2. Expiration date drop down options should be more than an annual period.
3. Import of Comma Separated Values (CSV) files and Excel files into the software should be enable.
4. Equipment files needs to be updated

# Summary

We talked about the following:

- SMS4DC importance to regulators most especially to the developing countries.
- NCC case, our challenges.
- The benefits of SMS4DC to NCC.
- Limitation of the software and area to be improve upon.
- NCC strategic plan to be accomplished by using the software.

Thank You