

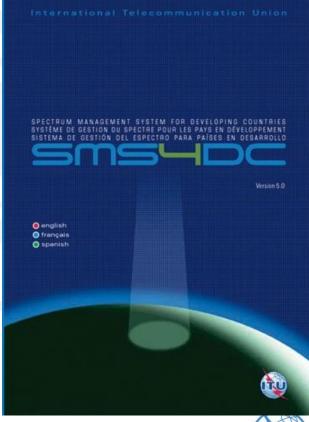


Online training, 27 April 2020





- ITU Spectrum Management System for Developing Countries (SMS4DC)
- SMS4DC is software designed by ITU based on ITU recommendations
- Developed to assist the administrations of developing countries to undertake their spectrum management responsibilities more effectively;
- SMS4DC covers terrestrial fixed, mobile,
 sound and television broadcasting services
 in the bands above 30 MHz, including GE-06
 as well as frequency coordination of Earth
 stations







Computer aided spectrum management

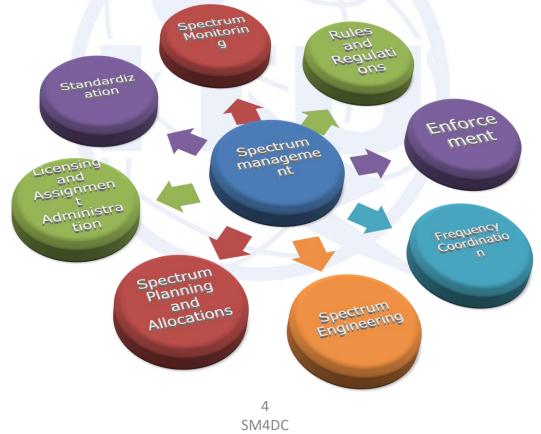
- The use of computers in the spectrum management process has become crucial for most administrations that are faced with the ever-increasing use of the radio frequencies.
- Several aspects of this process, such as frequency coordination, administrative procedures (registration and issuing of licenses) and notifications of assignments to the ITU according to the Radio Regulations, are crucial in the establishment of a computer-automated process.
- ITU-R Handbook: Computer-aided Techniques for Spectrum Management (CAT) (2015) <u>http://www.itu.int/pub/R-HDB-01</u>





National Spectrum Management

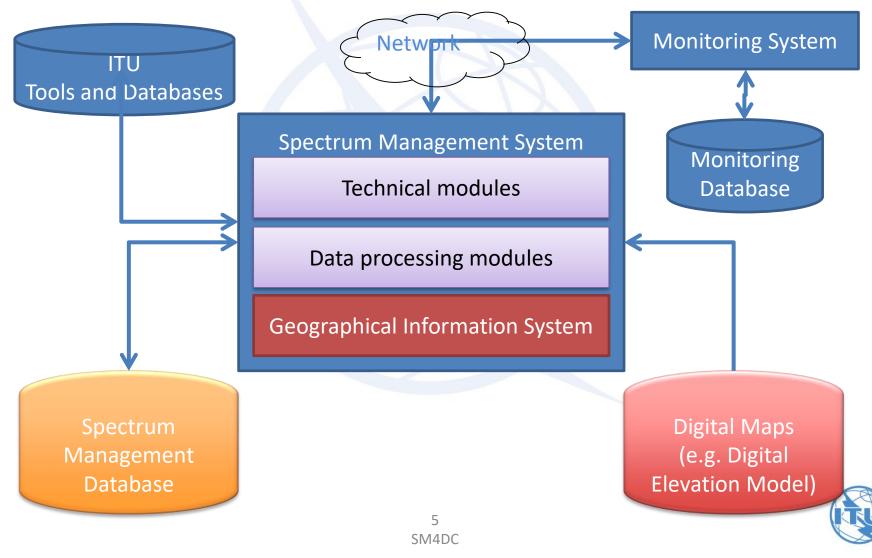
Spectrum management is a combination of administrative and technical activities for efficient utilization of spectrum by users without causing harmful interference in their service area







System architecture





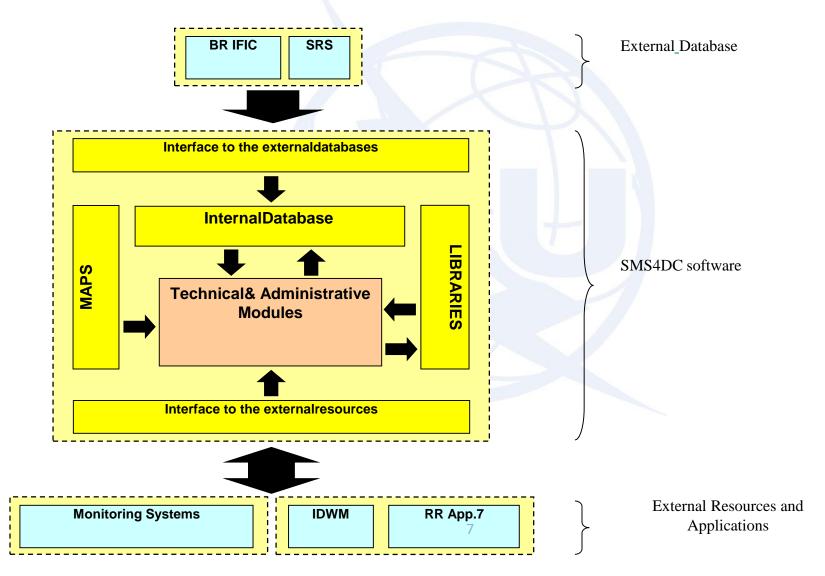
SMS4DC Development Cycle

- 2007: SMS4DC Version 1.0
- **2008:** SMS4DC Version 2.0 (Addition of Digital TV planning tools (GE06))
- 2009: SMS4DC Version 3.0 (Addition of Google Earth and monitoring interface)
- 2012: SMS4DC Version 4.0 (link to ESMERALDA monitoring software of Thales and additional enhancements, French language)
- 2014: SMS4DC Version 4.1 (Update of Article 5 according to WRC12, import from new BRIFIC & interface with appendix 7)
- > **2015:** SMS4DC Version 5.0 (Revised propagation models based on the latest version of P.452, P.530 and P. 1812, P.1546, Spanish language).
- 2017: SMS4DC Version 5.1 (HCM, results of WRC-15: revision of the Radio Regulations Article 5 module, the international frequency allocation).
- 2020: SMS4DC Version 5.2





Structure of the SMS4DC





Functions of SMS4DC

- > Administrative Functions
- Graphical User Interface (GIS) Functions (including Map Displays)
- Engineering Analysis Functions





Administrative Functions

- Comprehensive database (MS Access) of user/license details, with data fields in accordance with ITU recommendations;
- Provides complete process from: frequency application, frequency assignment, licensing, ITU plans and Bilateral frequency coordination procedures;
- Imports coordination data from ITU BRIFIC & SRS CD-ROM database;
- Producing electronic notices, print license, invoice & spectrum fee
- Security features: The designated system administrator can define an individual account for each SMS4DC user up to 6 levels of access to the different processes (e.g. licensing, assignment etc). Each user account is named and password protected.



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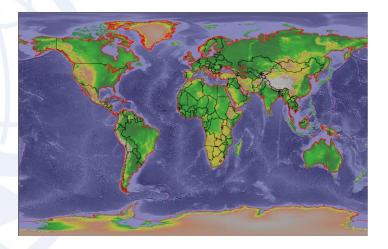
SM4DC



SM4DC

GIS Functions of SMS4DC

- User friendly interface with text menus and icon-tool bars;
- Display views
 - International Digital World Map (IDWM)
 - Digital Elevation Map (DEM) (2-D and 3-D)
- Data entry/Assigning of new stations on DEM by mouse pointand-click
- Export of maps, overlays and vectors to Google Earth Searching and displaying stations on DEM 11







Engineering Functions

International & National frequency allocations table (chart)

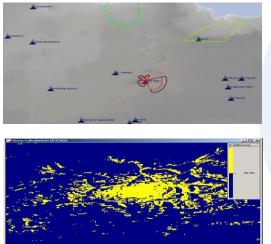
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Frequency Allocations 2D Chart1 Frequency Band: 8400.000 - 8500.000 MHz Primary Service : SPACE RESEARCH(space-to-Earth) Service Footnote : S5.465,S5.466 Band Footnote : S5.467	
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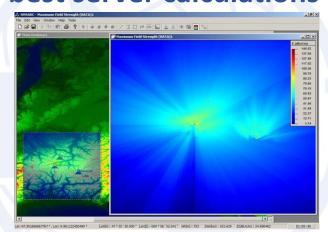
Engineering Analysis Functions

Calculation of coverage area, field strength, field strength contour, network coverage and best server calculations



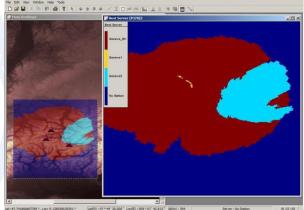


Item to calculate area in km2 Where inside the area, the field strength value is higher than a threshold value.



Maximum Field Strength

Item to calculate and visualize the maximum values produced by more than one transmitting stations at any point inside a predefined rectangular area.



Best Server

Item to calculate and visualize the best serving station at each point among various stations inside a predefined rectangular area.



13 SM4DC



Broadcasting services

- Co-ordination includes interference analysis and frequency coordination tools between Broadcasting Services and between Broadcasting Services and some of the other services (Fixed and Land Mobile only) sharing the frequency bands in the ST61, GE84, GE89, and GE06 Agreements.
- Interference analysis methods are in conformity with the relevant requirements of the Agreements





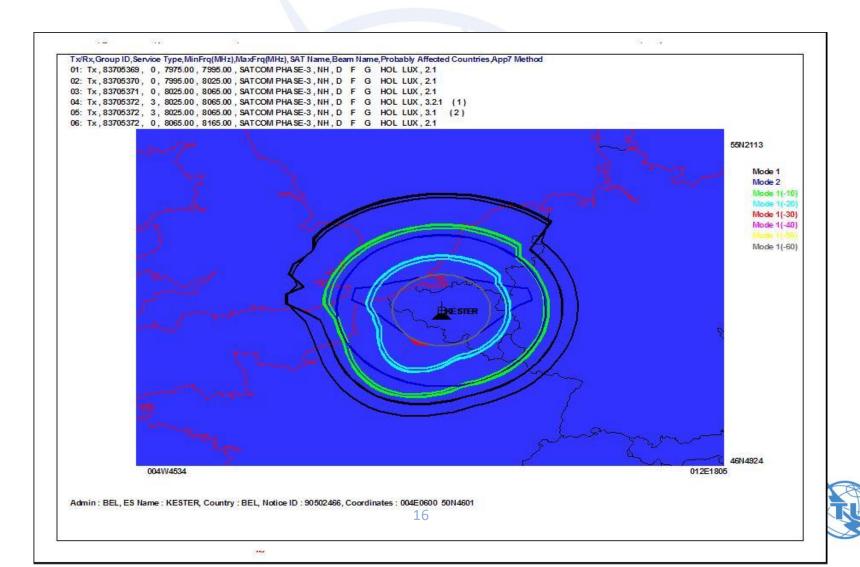
Example for the Land Mobile service – cross border coordination

Propagation models: REC-1546							
m	LoFreq (MHz)	HiFreq (MHz)	PrefCountries	PIFS(dBuV/m)	Xkm(km)	ERP(dBVV)	Emergen
	80.0	82.0	TUR	20.0	15.0	17.0	-
-2	82.0	84.0		20.0	15.0	17.0	
110	84.0	86.0	ARM	20.0	15.0	17.0	

The example shows a cross border coordination agreement for the band 80-86 MHz among three administrations. Three sub-bands are established, one for each country, giving preferential assignment rights. The limits of the preferential rights are 20 dbuV/m measured at 15 km across the border. For coordination of receivers, a reference transmitter with e.r.p. of 17 dBW is used.



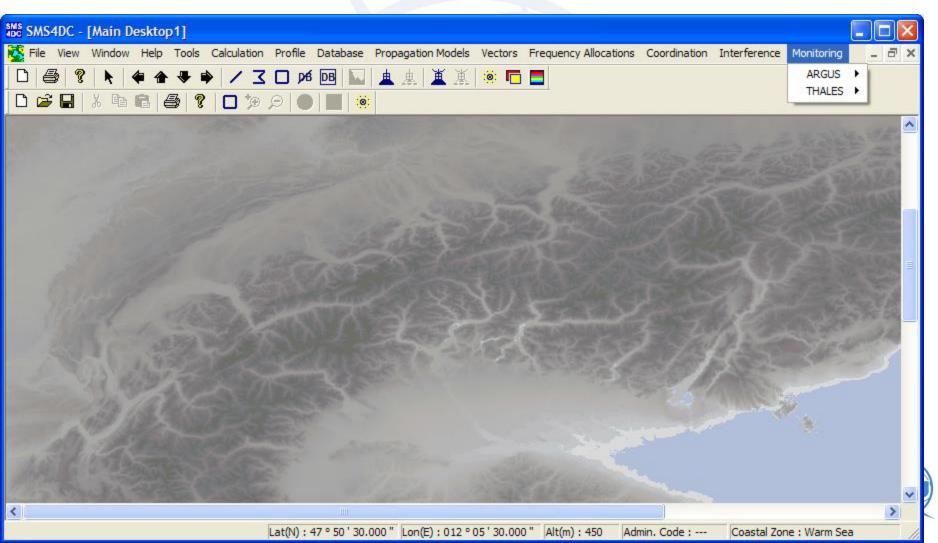
Coordination contours around an Earth station - BR





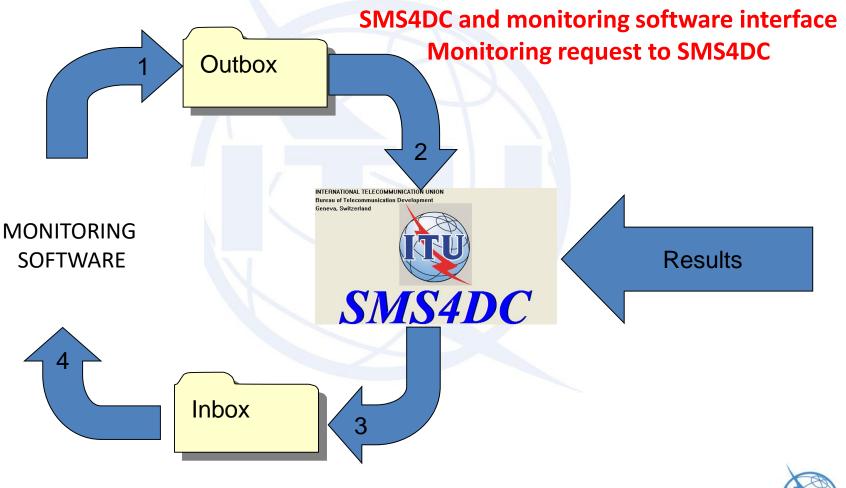
SMS4DC's Engineering Functions

SMS4DC and monitoring software interface





SMS4DC's Engineering Functions







MSIP (Republic of Korea) and ITU project

V5 released at the end of 2015

- Adding propagation models based on the latest version of
 - P.452(-16), Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz
 - P.530(-16), Propagation data and prediction methods required for the design of terrestrial line-ofsight systems
 - P.1546 (-5) (Method for point to area prediction for terrestrial services in frequency range 30 MHz to 3000 MHz)
 - P. 1812 (-4) (A path specific propagation prediction method for point-to-area terrestrial services in VHF and UHF bands);
- Intermodulation: calculating interference caused by intermodulation products up to 7th order by using ITU-R SM1134-1 and other resources
- General interface between SMS4DC and monitoring software (based on the guidelines prepared for and presented to ITU-R WP1C of the SG1)
- Further development of built-in and user specified administrative reports;
- Preparation of a general method to import data to SMS4DC
- Spanish language added
- Preparation of time limited version as a demo tool which can be used for introduction of SMS4DC;
- Preparation of the training material for assisting self-learning training of the software.
- Train-the-trainer workshop 24 November-2 December 2106, Addis, for around 10 new trainers (English, French and Arabic speaking), in close cooperation with the AFR office





HCM in SMS4DC

- V5.1 of SMS4DC released in 2017 (3rd Quarter)
 - HCM calculations included (EUR)
 - WRC-15: Article 5 of the RR
- HCM4A.dll will be developed by the African experts and when ready, it will be added







International Meeting of SMS4DC Users



Version 5.0

english
français
spanish

http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/International-SMS4DC-Users-Meeting Geneva December16.aspx







In order to further develop the tool, it is necessary to collect the opinions and expectations of users and potential users. To this end, a meeting was be organized for the SMS4DC users with the following aims:

- summarizing why computerized spectrum management is required;
- •analysing the main functions of the SMS4DC;
- proposing further developments;
- •understanding the needs, proposals and experiences of targeted users in order to meet their requirements.
- The meeting focused on:
- •highlighting the main functions and structure of spectrum management organization and necessary information for efficient spectrum management;
- •the role of computer-aided spectrum management;
- •overview of the SMS4DC, including its structure, main features and different functions;•practical examples;
- •country presentations from SMS4DC users: how to use the tool and description of their experiences;
- •requirements, needs, proposals and remarks for further developing the tool.





SMS4DC subscriptions before the Workshop

SMS4DC Map



🕈 V.5.0	
? V.4.1	23
V.4.0	SM4DC





Participants

Around 40 participants (registered 50) from 25 countries. Presentations: 3 BDT, R&S, ITU Sales, experience of a trainer

Country presentations: Hungary, Switzerland (including HCM), Burundi, Colombia, Myanmar, Sudan

Oral presentations: Timor Leste, Bhutan, Cameroon, PNG, LS

Comments by e-mail: experiences of Pacific Islands





Final conclusions

The participants expressed their view on the usefulness of the software but it can be even better with some improvements. In addition they supported the idea to have this type of meeting once per year and if possible, have also regional meetings of the users.





Proposals for improvements, additions

- Administrative functions
- Engineering
- Graphical
- Training
- Support
- Software
- Promotion





Administrative functions

- Making easier transfer from Anonymus to licensed station
- Improvement of designing license and invoice form
- Using copy function in data entry
- Export to/from Excel and Word for reporting
- Search for stations based on name/ID
- Status of license, step-by-step follow up of the licensing process
- Export/import between SMS4DC-SMS4DC
- Licensing request via web/on-line application form
- Upload printed license/invoice (or at least link to them)
- Reporting on e.g. number of licenses, stations
- Automatic renewal of frequency licenses
- Making microwave link entries easier
- Supporting management information system





Engineering

- Equipment, filter database
- Tower database
- Higher resolution terrain
- Fee calculation





Graphical

- Revise the graphical interface
- Icons to add/move/remove stations
- Frequency allocation chart





Training

- Preliminary questionnaire to participants
- Preparing more training materials
- Background presentations, video on the functions
- More spectrum management training is required
- Training curriculum
- Starting/tutorial/basic information
- Training on You Tube
- Modular trainings (e.g. engineering/data entry/licensing)
- Small demo on the functions for a smaller area





Support

- Ticketing for help request
- Web/online support
- FAQ
- Forum for users and forum for developers





Software

- Checking other operational system than Windows
- Mobile/tablet application
- Pre-defined workflow (like e.g. in the Executive overview)
- Modular utilization
- Checking the possibility of other solution than dongle for authorized utilization





Promotion

- Presentations during workshops
- Web page
- During meetings of Regional Organizations
- Flyers, brochures
- Packing together with other spectrum management assistance
- Distributing information video/tutorial by a BDT Circular
- Using BRIFICs for distribution of information about SMS4DC
- Regional roadshows (1-2 days, back-to-back with other workshops)
- Presentations during WRS and RRS





SMS4DC subscriptions after the Workshop





PIRRC project (Pacific Islands)

While most of the smaller islands are considering or have procured the SMS4DC systems only few have implemented it as their spectrum management system.

The problems include the lack of the basic like:

- 1) Absence of a national frequency allocation table;
- 2) Absence of resources for systematic spectrum management;
- 3) Lack of training.
- 4) All countries who have responded to the survey indicate that while they will adopt SMS4DC they need additional training and more importantly training material that would allow them to work and learn on the system with limited supervision.

The PIRRC Project will be conducting additional training in the first quarter of 2017 and will include the preparation of training aids for the users.

Direct beneficiaries of PIRRC are FSM; Kiribati; Marshall Islands; PNG; Samoa; Solomon Islands; Tonga; Tuvalu and Vanuatu.

Countries that are not are beneficiaries Cook Islands; Fiji; Nauru; Niue; Tokelau and Palau.

Purchased SMS4DC for 10 users Provided higher resolution map (in 2018)





Republic of Korea and ITU project

Project activities

To improve **administrative function** and user interface for spectrum management, functions below listed should be newly made or improved:

- Improvement of designing license and invoice of fee form
- Adding copy function in data entry to avoid repeating same data
- Improvement of data export and import function to Excel, Word and other commercial software
- Adding search function for stations based on name or ID
- Export and Import data between SMS4DC SMS4DC
- To make on-line license application possible, set up sample license web pages and link applicant's data to SMS4DC database
- Upload of printed license or invoice(pdf or jpg format) to SMS4DC database or provide a link function to the documents saved in separate place
- Macro function or simplified process for repeated similar stations' licensing





Republic of Korea and ITU project - new

For better radio communication **engineering** and easy work for **licensing**, functions below listed should be newly made or improved:

- Based on the user country's request, provision of non-commercial higher resolution(around 90 m) map based on freely available data
- Adding new database of filter, tower and other available commercial products database of radio communication equipment
- To calculate licensing fee, adding formula configuration and calculation function for licensing fee or importing formula function from other program i.e. Excel, based on the country's law and regulation
- Improving graphical user interface, i.e. add icon of linking and removing linked stations etc.
- For data protection, adding automatic back up menu to separate storage device





Republic of Korea and ITU project - new

To closely **support users** and **exchange useful information** and experiences of users

closed on-line forum should be operated and this forum may include FAQ, bulletin board and other necessary functions for users. To facilitate this forum, the developers and experts of SMS4DC should participate in it and timely provide answers for users' questions.

Preparation of additional training materials

- Making video with e.g. recording of training classes for SMS4DC software and ٠ uploading the videos to You Tube and other sharing site for learners
- Preparation of the training videos as a multimedia DVD and releasing it for ٠ assisting self-learning users

Final approval test of the revised version of SMS4DC software package:

- Preparation of a protocol for testing and test the revised version of the SMS4DC software
- Execution of the approval test of the SMS4DC software on the basis of such test ٠ protocol, with the participation of the SMS4DC developers, experts and trainers, and ITU staff from BR and BDT 38





Additional experts for development

- New experts can be involved in developing stand-alone modules

- These modules will be added to the software by the existing experts
- Example: HCM module developed by an expert from Lithuania and inserted to the SW by the present experts.





How to order

• ITU Sales

https://www.itu.int/pub/D-STG-SPEC

Publication notice

https://www.itu.int/dms_pub/itu-d/opb/stg/D-PN-395-17-PDF-E.pdf

- Reduction for Member States, Sector Members, Associates (15%)
- Reduction for LDCs (80%)





For further reading:

- ITU Handbook Computer-Aided Techniques for Spectrum Management (CAT), 2015
- ITU Handbook on National Spectrum Management, 2015
- SMS4DC 5.0 User Guide
- ITU Handbook on Spectrum Monitoring, 2011
- Recommendation ITU-R SM.1370-2 (08/2013)
 - Design guidelines for developing automated spectrum management systems
- Recommendation ITU-R SM.1537 (08/2013)
 - Automation and integration of spectrum monitoring systems with automated spectrum management
- Recommendation ITU-R SM.1604 (02/2003)
 - Guidelines for an upgraded spectrum management system for developing countries









Thank you!





PRIDA Track 1 (T1)

ON-LINE English capacity building workshop

SMS4DC Introduction

April 20 - May 1, 2020

Yasir Ahmed ITU expert Email: Yasir192@gmail.com



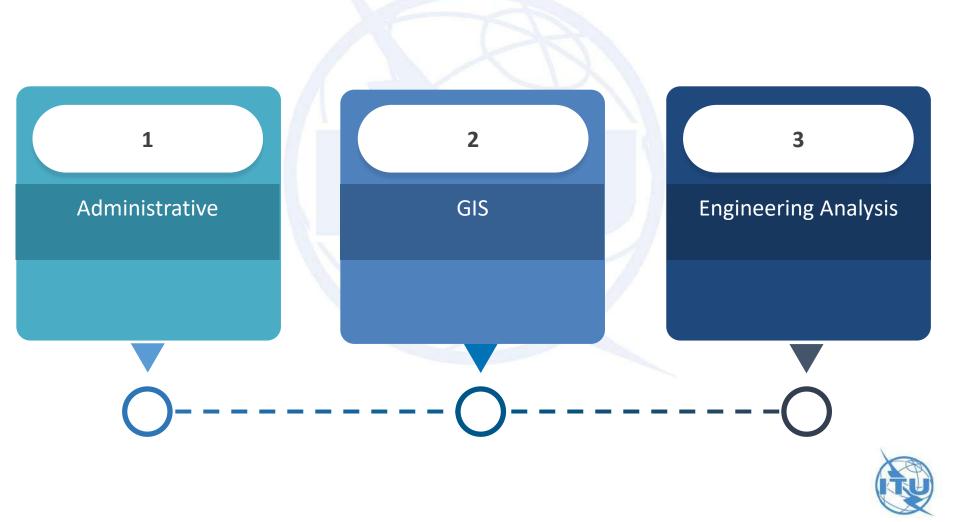


Why Spectrum Management System

Requirements	Solution	Results	
 Thousands of frequency assignments. Frequency assignment requests. New services and technologies. Insure interference free operation. Apply international regulation and standards. Develop national regulations. Efficiency of spectrum utilization. 	Automated Spectrum Management Tool Spectrum monitoring Billing Planning	 Provide frequency assignments to all users. handle different scheduled administrative tasks. Efficient use of radio spectrum. Mitigate interference. Interference resolution Supporting coordination with other administrations. Help in providing short and long term strategies. Records and database. Connected to remote monitoring stations. 	
	Assignment		

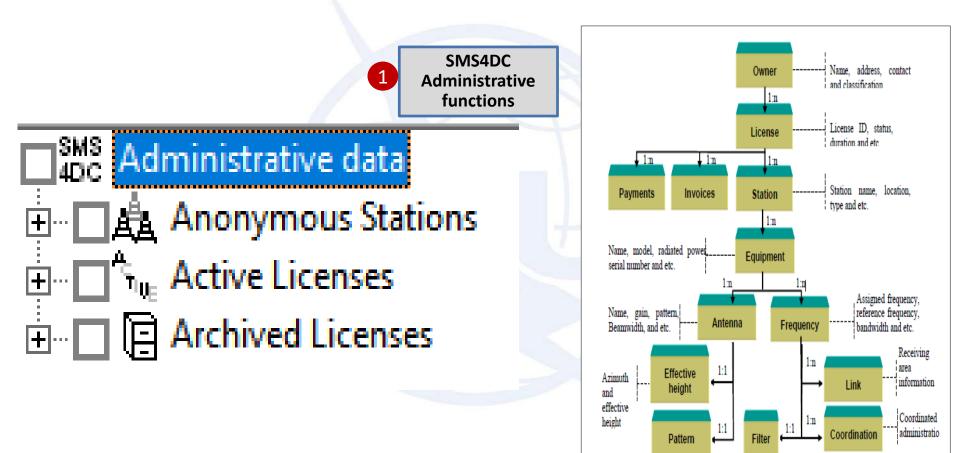


SMS4DC System Functions





SMS4DC Administrative functions

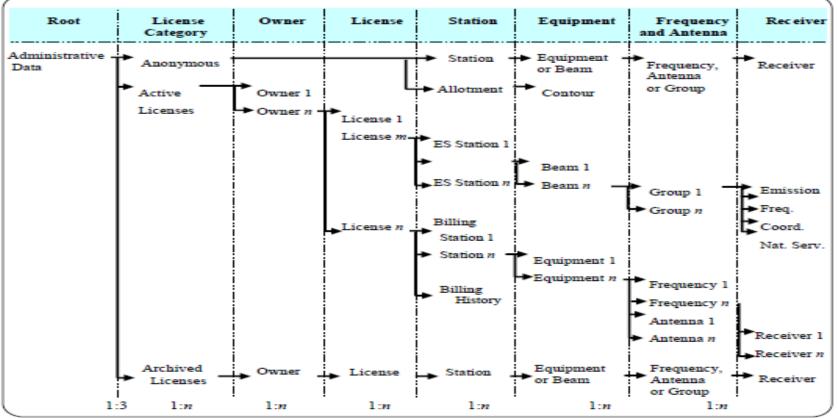






SMS4DC Administrative functions

SMS4DC Administrative functions



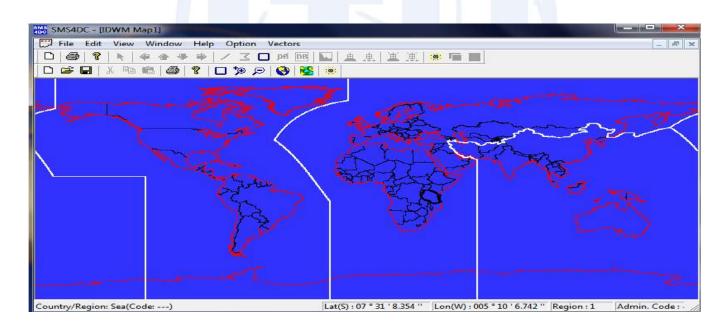




SMS4DC GIS Functions



The IDWM is used to draw political borders, coastal lines (P.452), ITU regions, ITU agreements areas.



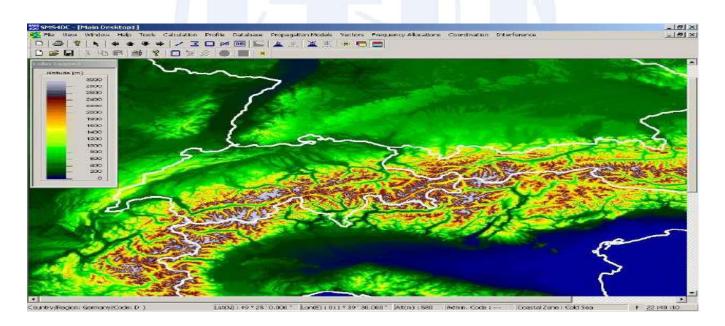




SMS4DC GIS Functions



DEM is the Global Land One- kilometer Base Elevation model (GLOBE), however user maps with better resolution can be imported.



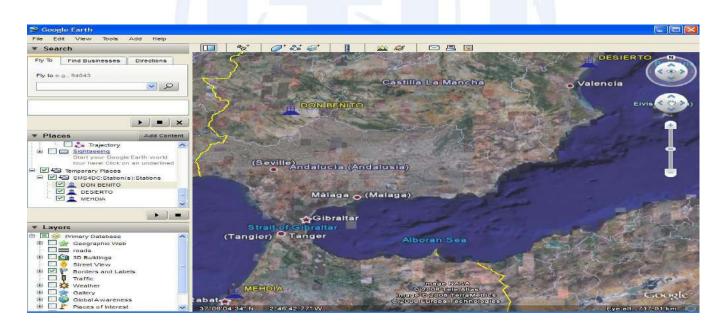




SMS4DC GIS Functions



Export and display coverage area and stations, and overlays vectors in Google Earth





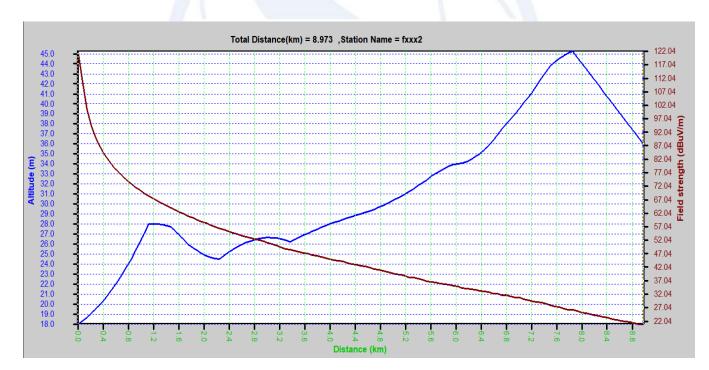




3

Engineering Analysis Functions Functions

Calculation along a line for field strength values produced by a station along a path profile at a given receiving height above ground level as well as a visibility analysis.



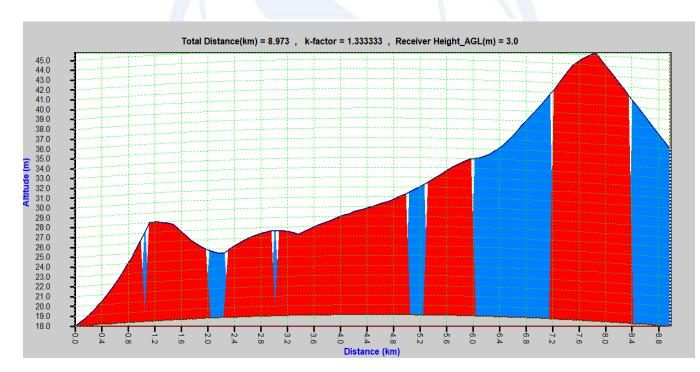






Engineering Analysis Functions Functions

Calculation along a line for field strength values produced by a station along a path profile at a given receiving height above ground level as well as a visibility analysis.



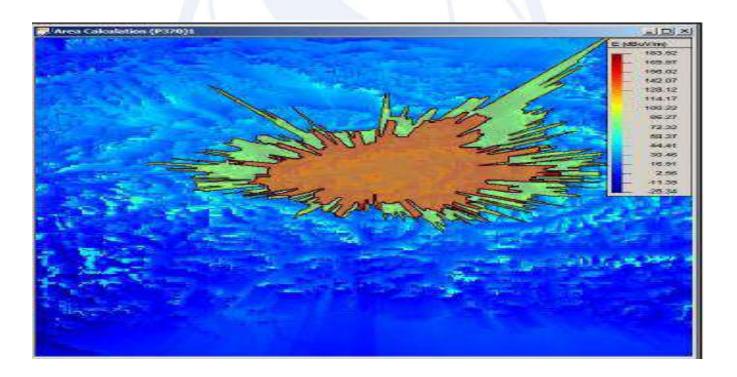




Engineering Analysis Functions Functions

The Area calculation, Draw Contour and coverage area

3



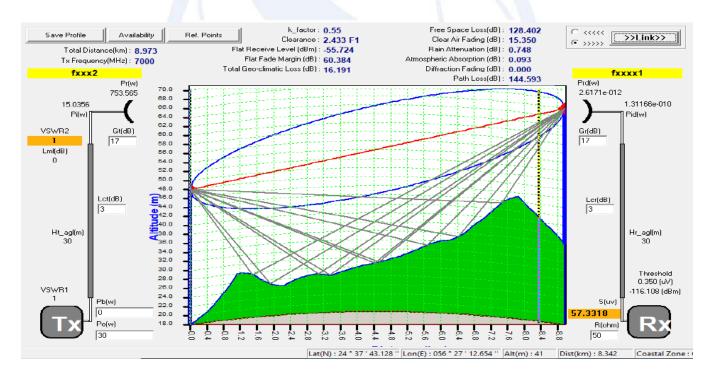




Engineering Analysis Functions Functions

Point-to-point radio links, link budget calculations, link availability, path profiles, Fresnel zone clearance.

3



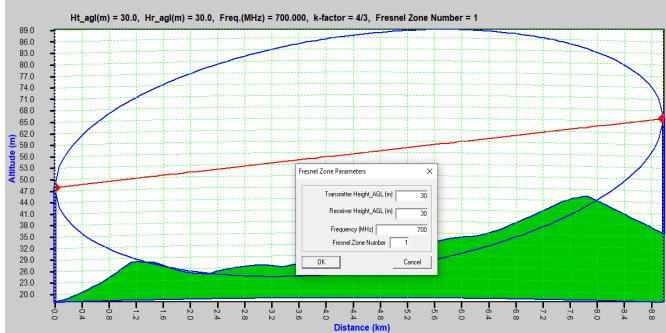




3

Engineering Analysis Functions Functions

Fresnel Zone: Plots a path profile and the corresponding nth Fresnel Zone with the values of left site antenna, right site antenna, frequency, k-factor and Fresnel Zone number.



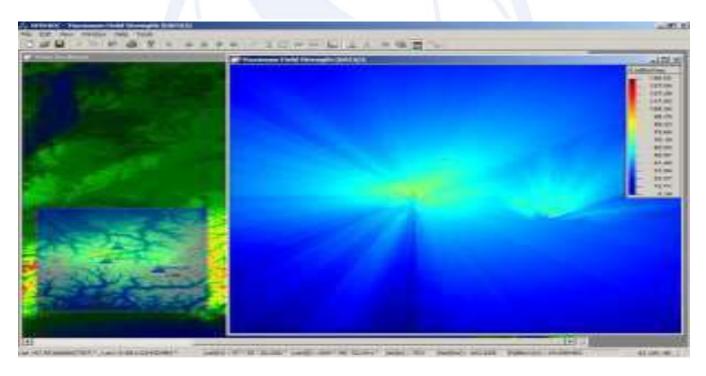






Engineering Analysis Functions Functions

Maximum Field Strength, Calculate and visualize the maximum values produced by more than one transmitting stations at any point inside a predefined rectangular area.



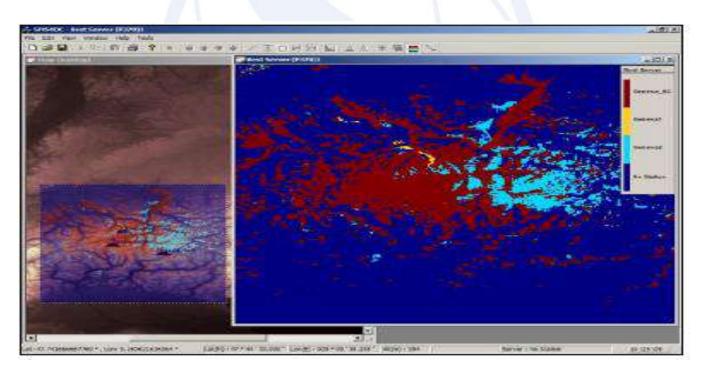




3

Engineering Analysis Functions Functions

Best Server, calculate and visualize the best serving station at each point among various stations inside a predefined rectangular area



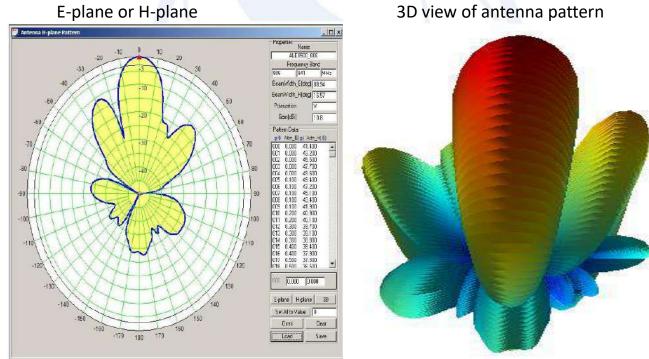




3

Engineering Analysis Functions Functions

Antenna Editor :Load, modify, visualize (2D and 3D), define and print antenna radiation pattern.







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Engineering Analysis Functions Functions

Convert Antenna File from other format to SMS4DC format: Antenna file in SMS4DC has format ant_*.ant , Most of antenna have Andrew format - *.adf or *.dat or Kathrein format - *.msi.

Convert to SMS4DC Antenn	na File	×
Antenna File Name :		
 SMS4DC Antenna File Name :	:	
	Convert Data	

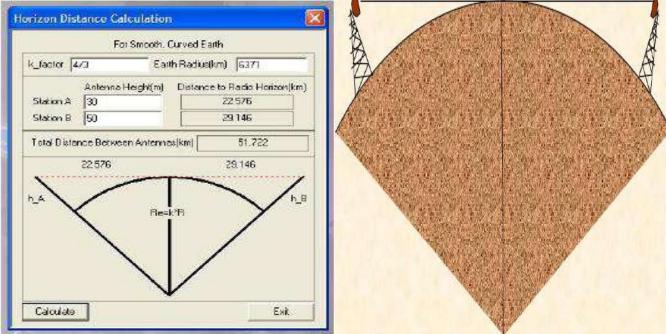






Engineering Analysis Functions Functions

Horizon Distance: This item provides a multi-entry calculator to calculate point to point distance between antennas over a smooth Earth path and the individual distance from each antenna to the horizon.

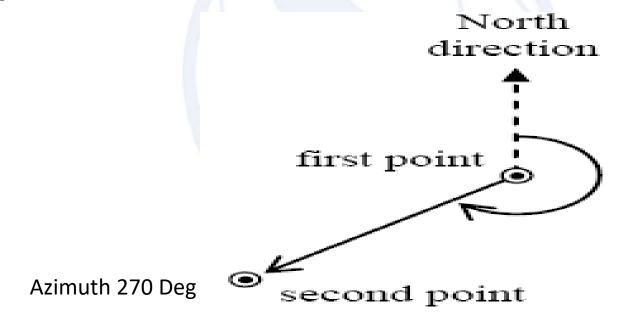






Engineering Analysis Functions Functions

Azimuth (Deg.): Calculation of azimuth angle of first point in respect to the second point in degrees



3

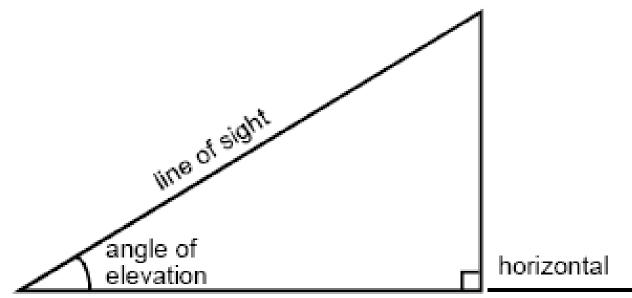




Engineering Analysis Functions Functions

Elevation (Deg): Calculation of elevation angle of path from horizon distance to the line of sight

3

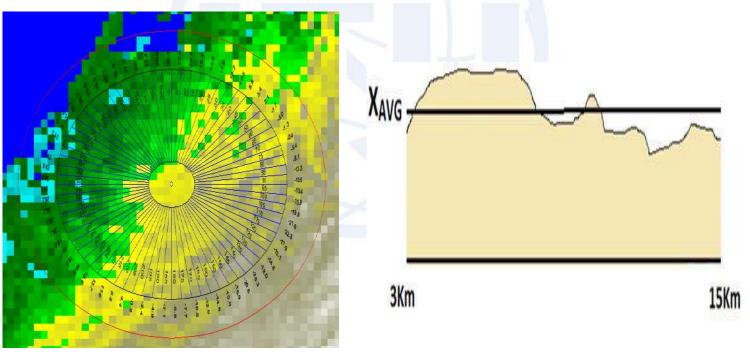








Effective Height of antenna: is a function of surrounding terrain height, is average level of the ground between distances of 3 km and 15 km from the transmitter in the direction of the receiver.





SMS4DC System Security Mechanisms

		Administrative data	Technical data	Manage user IDs and passwords
Security Mechanisms in SMS4DC	Supervisor	Read + write	Read + write	Read + write
	Senior operator	Read + write	Read + write	Read + write
	Engineers		Read + write	
	Licensing	Read + write		
	Data entry	Read + write		
	Read-only	Read	Read	
	Access levels	Acce	ss levels	
	New User Name: SMS4DC User Password: SMS4DC		lew ົ User Name: ∫ User Password: ∫	the second se
	Modify C User Name: User Name: User Password:		lodify ● User Name: User Password:	A1A2 [!] @#
	Access Level: 4 - Supervisor Enabled Delete Save C	Cancel	Access Level: 4 - Sup Enabled Delete Sav	



SMS4DC System Configuration

Single user Multi user -Database -Reports -Maps -Main application -Database -Reports -Main application -Main application -Maps





1

Single user





-Main application -Database -Reports -Maps

Insert the SMS4DC CD in the CD-drive of the stand-alone PC. The SMS4DC CD is auto-run, therefore Windows installShield wizard will launch automatically.



Welcome to the InstallShield Wizard for Spectrum Management System for Developing Countries

Spectrum Management System for Developing Countries Setup is preparing the InstallShield Wizard which will guide you through the program setup process. Please wait.

Next >

Computing space requirements

< Back



Cancel



3

Choose the installation language from the list of available languages that are displayed. Accept the license agreement and enter the user information. Go to the next page.

Choose Setup Language	Spectrum Management System for Developing Countries - InstallShield Wizard License Agreement Please read the following license agreement carefully.		
Select the language for this installation from the choices below.	LICENSE AGREEMENT SMS4DC Version 5.1 - Spectrum Management System for Developing Countries		
English (United States)	Edition 2047		
English (United States) French (France) Spanish (Traditional Sort)	I accept the terms in the license agreement I do not accept the terms in the license agreement InstallShield		





Choose the option Complete for the 5 type of installation and allow the InstallShield wizard to complete the installation.

SMS4DC will start installation.

SMS4DC - InstallShield Wizard	🔣 Spectrum Management System for Developing Countries - InstallShi 💻 💷 📼 🌌
Setup Type Choose the setup type that best suits your needs.	Installing Spectrum Management System for Developing Countries The program features you selected are being installed.
Please select a setup type. • Complete • All program features will be installed. (Requires the most disk space.) • Custom • O Choose which program features you want installed and where they will be installed. Recommended for advanced users.	Please wait while the InstallShield Wizard installs Spectrum Management System for Developing Countries. This may take several minutes. Status: Installing IDWM
InstallShield	InstallShield <





Choose the option Complete for the 5 type of installation and allow the InstallShield wizard to complete the installation.

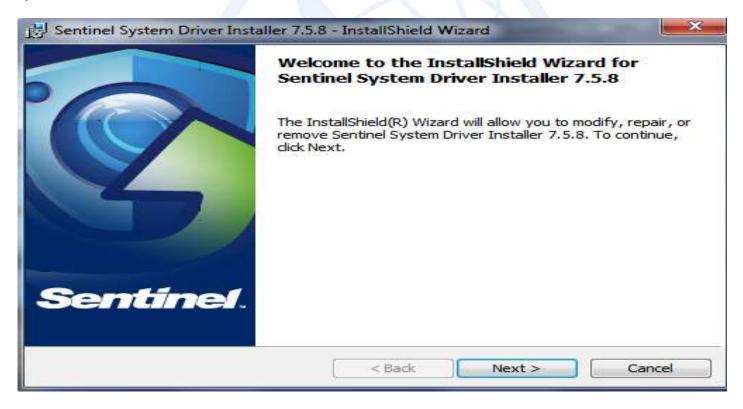
SMS4DC will start installation.

SMS4DC - InstallShield Wizard	🔣 Spectrum Management System for Developing Countries - InstallShi 💻 💷 📼 🌌
Setup Type Choose the setup type that best suits your needs.	Installing Spectrum Management System for Developing Countries The program features you selected are being installed.
Please select a setup type. • Complete • All program features will be installed. (Requires the most disk space.) • Custom • O Choose which program features you want installed and where they will be installed. Recommended for advanced users.	Please wait while the InstallShield Wizard installs Spectrum Management System for Developing Countries. This may take several minutes. Status: Installing IDWM
InstallShield	InstallShield <





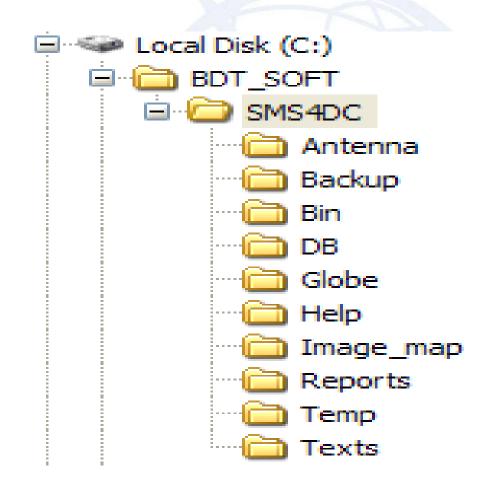
The USB hard lock driver program is normally installed automatically during the main SMS4DC installation. The dongle should be plugged in to an active USB port of the computer ONLY after the installation is finished.







The directory structure of the SMS4DC software in the case of a single-user setup







Setup for multiple user

- GLOBE and SMSDB-NEW installed on server and SMS4DC core installed on the client PCs.
- Choose the option Custom for a network installation and follow the instruction from SMS4DC installation guide.

🙀 SMS4DC - Ins	tallShield Wizard			×
Setup Type Choose the se	tup type that best suits your	needs.	4	A
Please select	a setup type.			
Complet	e			
	All program features will be space.)	installed. (Require:	s the most disk	
Custom	Choose which program fea will be installed. Recommer			hey
InstallShield				_
A Interesting friend		< Back	Next >	Cancel







PRIDA Track 1 (T1)

ON-LINE English capacity building workshop

Border Coordination- User defined agreements

April 20 - May 1, 2020

Yasir Ahmed ITU expert Email: Yasir192@gmail.com





Why Border coordination

 Developing effective bilateral or multilateral agreements on frequency use in border areas will aid longterm strategic planning, promote efficient spectrum utilisation and help avoid interference

Agre

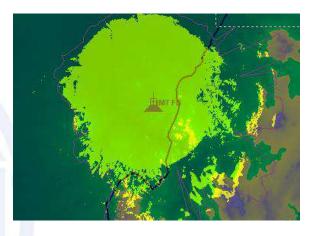
- The item "Agreement" in Coordination menu enables the entry of user-defined agreements which may be used for border coordination through the "Border" item in same Menu.
- Each agreement consists of two parts; header and technical characteristics.

ations	Coordination	Interference	Monitoring
	ST61	•	
	GE84	₩	
	GE89	R 🗌	
	GE06		
	Agreeme	nts	
	Border		
	нсм		



Why Border coordination

- Radiowaves do not stop at the border of the country.
- To avoid harmful interference from the stations of one country into the territory and stations of neighbor countries.
- Bilateral or multilateral agreements on frequency use in border areas will aid long-term strategic planning, promote efficient spectrum utilization.
- Agree on allowed interference range and distance
- Coordinating frequencies among administrations before assigning them.
- Quick assessment of interference through agreed criteria.



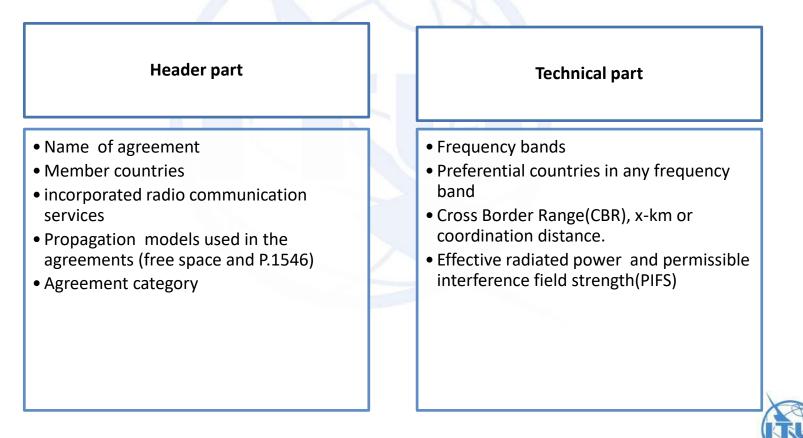






SMS4DC border agreements

- The item "Agreement" in Coordination menu enables the entry of user-defined agreements which may be used for border coordination through the "Border" item in same Menu.
- Each agreement consists of two cparts; header and technical characteristics.





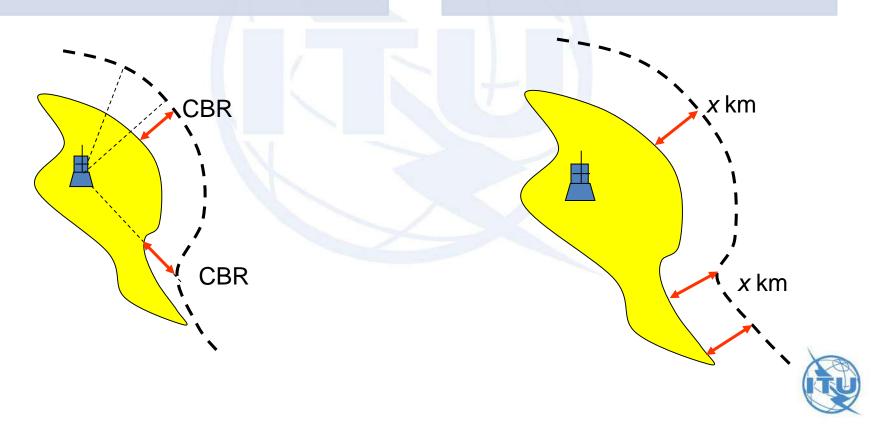
Contour categories

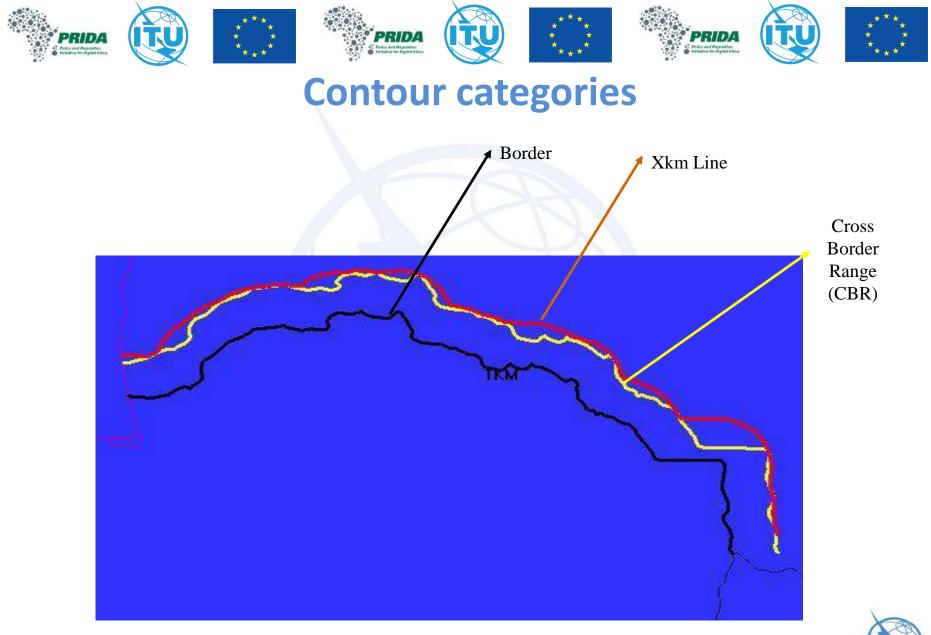
Cross Border Range(CBR)

• is the locus of points where their distances to the border, along the line connecting points to the concerned station, are identical

The x-km contour

• is the locus of points where their nearest distance to the border is set at an agreed value of x km.





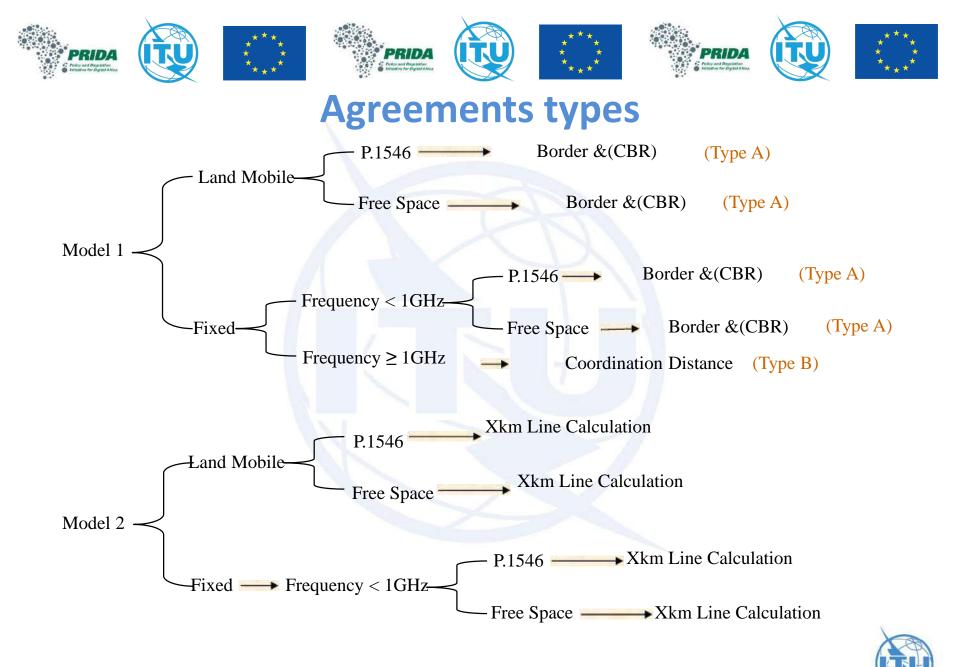




Agreements types

- Frequencies requiring co-ordination : Frequencies which Administrations are required to co-ordinate with the other Administrations affected before a station is put into service.
 - Model 1 (Type A) Land Mobile service (all frequencies) & Fixed service(below 1 GHz) Coordination of selected station is required if field strength on border of concerned administrations exceeds permissible interference level. Also field strength on CBR shall not exceed permissible interference level.
 - Model 1 (Type B) Fixed service above 1 GHz Coordination of selected station is required if distance of the station to border is less than coordination distance
- Preferential Frequencies : Frequencies which the Administrations concerned may assign, without prior coordination, on the basis of bi- or multilateral agreements.
 - Model 2 : Land Mobile service (all frequencies) and fixed service below 1 GHz Prior co-ordination is not required if field strength of selected station on X-km is less than permissible interference level







Agreements types

Model 1 Type A

Name:			Service:		Modify
Model:	ropagation mod	Type: 📐 💌			Cancel
K		3 of 6	b)*)*	
Total Internet					





Agreements types

Model 1 Type B

Name:			Service:	 	Modify
Countries:					
Model:	-	Туре: В 💌			Cancel
F	propagation mod	lels:	•	 	
and and		3 of 6			

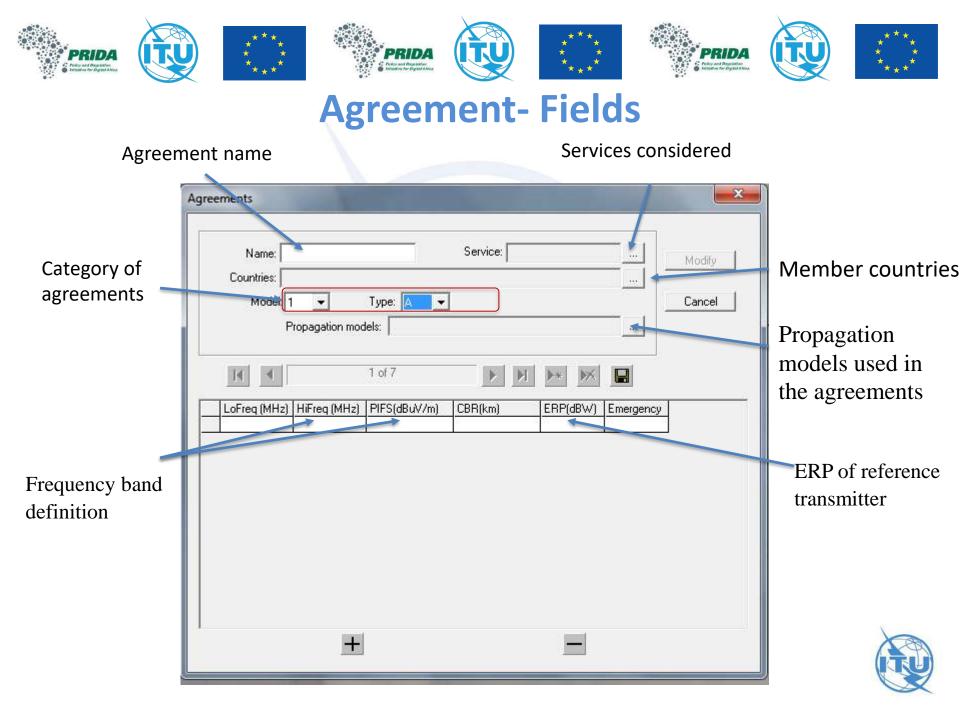




Agreement- Fields

Field name	Description	Cate	gory		
		Mode	Туре		
AgID	The ID number of an agreement in the database.	A11	A11		
LoFreq,HiFreq	The lower and upper edge of the applicable frequency range (MHz).	A11	A11		
PrefCountries	The list of preferential countries. If this cell in relevant row or the row is selected, the "Preferential Countries" push button can be used for choosing and inserting data in this cell.	2			
PIFS	Permissible Interference Field Strength. This value (in $dB\mu V/m$) is compared with the calculated field strength value to determine whether or not coordination is necessary.	A11	A		
CBR	The CBR (Cross Border Range), in km, is the distance beyond the national border used to establish a contour of points. The distance of any point on this contour to the border, along the line connecting to the concerned station, will be identical and equal to CBR (see Figure 3.175).				
X-km	The X-km, in km, is the distance beyond national border used to establish a contour of points. The nearest distance of any point on this contour to the border will be identical and equal to X-km (see Figure 3.175).	2			
CoordDist1	The coordination distance used where the summation of station height, above sea level, and antenna height, above ground level, is less than $\beta 00$ metres.	1	В		
CoordDist2	The coordination distance used where the summation of station height, above sea level, and antenna height, above ground level, is over 300 metres.	1	В		
ERP	The Effective Radiated Power (ERP), in dBW, of reference transmitter, used for field strength calculations (except in type B, mode 1).	A11	A		
Emergency	The code indicating the operation type for the frequency band, 1 for emergency and 0 for normal operation modes. This field is available for all categories of agreement.	A11	All		







Border coordination calculations

Select border under coordination menu

ons	Coordination	Interference	Monitoring
	ST61	•	
	GE84	•	
	GE89		
	GE06	•	
	Agreeme	nts	
	Border		
	нсм	_	

2

Choose wanted station

			OK	Cancel				
CoordR	V 1A1	6A	102	4.4	4B	4C1	4C2	1
26	723.0000	ML	0	TZA and	TZA	38.0083	-4.1750	
25	723.0000	FB	0	TZA and	TZA	38.0083	-4.1750	
22	0.0000	FB	0	Zan44	TZA	39.4083	-6.1083	
21	710.0000	FB	0	Zan33	TZA	39.3083	-6.0917	
18	400.0000	FX	0	tanz fx 22	TZA	38.3333	-7.1917	
17	400.0000	FX	0	ian ix 11	TZA	38.1417	-7.0167	
16	7200.0000	FX	0	Tanz FX22	TZA	38.1250	-5.9000	
15	7200 0000	FX	0	Tay FX1	TZA	38.1833	-6.0917	
14	703.0000	FB	0	Tanz22	TZA	38.0167	-6.5583	
13	703.0000	FB	0	Tanz11	TZA	37.8000	-6.4500	
12	703.0000	FB	0	Zan22	TZA	39.3750	-6.2417	
11	703.0000	FB	0	Zan112	TZA	39.2583	-5.9250	
10	708.0000	FB	0	IMT700BTS	TZA	37,4000	-5.8833	
9	713.0000	FB	0	TZ2	TZA	36,6833	-3.5583	
8	0.0000	FX	n	T7411	174	26 808 3F	-3 5000	

Applicable agreement (or agreements) will be displayed, The applicability of agreements will depend on the frequency, country and service type of the selected station.

111			ок	Cancel				
AgID	AgName	Countries	Service	Model	Туре	PropModels	LoFreq	H
7 7	TZA and	KEN_TZA	FX_LM	1	A		700.0000	8
4		111						





Border coordination calculations

After choosing one of the presented applicable agreements, the search radius will be requested as additional criteria.

Search Badi	ius (km) : 200
Scalerrida	los (king . Jese
ок	Cancel

Applicable agreement (or agreements) will be displayed, The applicability of agreements will depend on the frequency, country and service type of the selected station.

2

111			ОК	Cancel				
AgID	AgName	Countries	Service	Model	Туре	PropModels	LoFreq	H
7	TZA and	KEN_TZA	FX_LM	1	A		700.0000	E
1 12								





Border coordination calculations

Select border under coordination menu

2

Choose wanted station

ons	Coordination	Interference	Monitoring	Wa	nted Station	14		-			
ons			Monitoring				OK	Cancel			
	ST61				oordR 🔻 1A1	6A	102	44	4B	4C1	4C2
	GE84				6 723.0000	ML	0	TZA and	TZA	38.0083	-4.1750
					5 723.0000 2 0.0000	FB FB	0	TZA and Zan44	TZA TZA	38.0083 39.4083	-4.1750 -6.1083
	GE89	*			1 710.0000	FB	0	Zan33	TZA	39.3083	-6.0917
		S			8 400.0000	FX	0	lanz fx 22	TZA	38,3333	-7.1917
	GE06	•	and the second		7 400.0000 6 7200.000	FX FX	0	tan lx 11 Tanz FX22	TZA TZA	38.1417 38.1250	-7.0167 -5.9000
					5 7200.000		ŏ	Tav FX1	TZA	38.1833	-6.0917
	Agreeme	ntc			4 703.0000	FB	0	Tanz22	TZA	38.0167	-6.5583
	Agreeme	illis			3 703.0000	FB	0	Tanz11	TZA	37.8000	-6.4500
	Border				2 703.0000 1 703.0000	FB	0	Zan22 Zan112	TZA TZA	39.3750 39.2583	-6.2417 -5.9250
	Dorder				0 708.0000	FB	Ő	IMT700BTS		37,4000	-5.8833
	and the second se			9	713.0000	FB	0	TZ2	TZA	36.6833	-3.5583
	HCM			9		FX	0	T7611	174	36,8083	-3 5000

Applicable agreement (or agreements) will be displayed, The applicability of agreements will depend on the frequency, country and service type of the selected station.

111			ОК	Cancel				
AgID	AgName	Countries	Service	Model	Туре	PropModels	LoFreq	H
7 7	TZA and	KEN_TZA	FX_LM	1	A		700.0000	8
 Image: A second s		m						





Calculations results Model 1 Type A

Maximum field strength on CBR

Maximum field strength on border line

Report

X Border Coordination Result Wanted Station : No. ID Catec ories Name St Class Country Location AgName 25 TZA AND KE F8 TZA 038E0030 04S0130 TZA AND KEN A Frequency requiring coordination 1 • I ٠ Border Calculations (Concerned Countries) : Tx/Rx Country maxEb(dBuV/m) Location DistB(km) maxEc(dBuV/m) Location No. Frg(MHz) 723.0000 Tx KEN 59.999 038E0601 03S5242 19 45.748 038E2857 03S16 1 2 733.0000 Rx KEN 64.088 038E0601 03S5242 49.838 038E2857 03S16 19 • .





Calculations results Model 1 Type B

Mir	nim	num							Coordi	natio	on distance
dist	tan	ce to t	he								
bor	de	r 🔪									
-					1			1	101		· (
Bo	rder (Coordinatio	n Result								X
							Wanted St	ation :			
	No.	ID	Name	St_	Class	Country	Location	A	gName	Ca	ategories
	1	27	TZAFXA	GRI FX		TZA	038E1430 0	4S0830 T	ZAKENAG R	2 Fr	equency requiring coordinatior
	4										•
						Border	Calculations (Cor	ncerned Cou	ntries) :		
	No.	Frq(MHz)	Tx/Rx	Country	minL	istB(km)	Location		Coord Dist	(km)	
		7500.0000 7500.0000		KEN KEN	1	14.71 14.71	the second second second second second second second second	and prove the second se	<u>d</u> .	50.0 50.0	
	2	7500.0000	nA.	KEN		14.71	U38E1826	0450136	<u>.</u>	50.0	
Г	В	eport									





Calculations results Model 2

Maximum field strength on X-km contour

No. ID Name St_Class Country Location AgNation 1 28 TZAKENFBAI FB TZA 038E2900 0452000 TZAKENFBAI 4 - <th>KENAGR2 Preferential Frequency s): </th>	KENAGR2 Preferential Frequency s):
Image: style="text-align: center; background-color: blue; background-color: blue;">Border Calculations (Concerned Countries; Border Calculations (Concerned Countries; background-color: blue;	s): stB(km) maxEx(dBuV/m) Location
No. Frq(MHz) Tx/Rx Country maxEb(dBuV/m) Location Dis 1 2000.0000 Tx KEN 61.324 038E3319 04S1215	stB(km) maxEx(dBuV/m) Location
No. Frq(MHz) Tx/Rx Country maxEb(dBuV/m) Location Dis 1 2000.0000 Tx KEN 61.324 038E3319 04S1215	stB(km) maxEx(dBuV/m) Location
No. Frq(MHz) T x/Rx Country maxEb(dBuV/m) Location Dis 1 2000.0000 T x KEN 61.324 038E3319 04S1215	stB(km) maxEx(dBuV/m) Location
1 2000.0000 Tx KEN 61.324 038E3319 04S1215	
	16 24.883 038E5113 03S
	16 28.972 038E5113 035
	16 28.972 038E5113 03S





Border coordination results parameters

		Т	Type of Agreement					
Field	Description	Frequency F coordina		Preferential Frequency				
	•	Type A: LM in all frequency and FX below 1GHz	Type B: FX above 1GHz	LM in all frequency and FX below 1GHz				
Frequency	Frequency under investigation	x	x	x				
TX or RX	Mode of frequency under investigation	x	x	x				
Concerned countries	Countries likely to be affected by a station in another country	х	x	x				
Max. Eb	Maximum field strength on border line	x		x				
Max. Eb location	The location of maximum Eb	x		х				
DistB	Distance of wanted station to the maximum Eb location	x		x				
Max Ec	Maximum field strength on CBR (Figure 3.175)	x						
Max. Ec location	The location of maximum Ec	x						
DistC	Distance of wanted station to the maximum Ec location	x						
Max Ex	Maximum field strength on X-km contour(Figure 3.175)			x				
Max. Ex location	The location of maximum Ex			x				
DistX	Distance of wanted station to the maximum Ex location			x				
PIFS	Permissible Interference Field Strength in accordance with agreement	x		x				
CBR	Cross Border Range in accordance with agreement	x						
X-km	Contour of X km beyond wanted country border line			x				
Min. DistB	Minimum distance of wanted station to the border line		x					
Min DistB location	The location of maximum Eb		x					
Coord. Dist.	Minimum permitted distance to the border (from agreement) for comparison with MinDistB		x					







PRIDA Track 1 (T1)

ON-LINE English capacity building workshop

Creating the national frequency allocation table

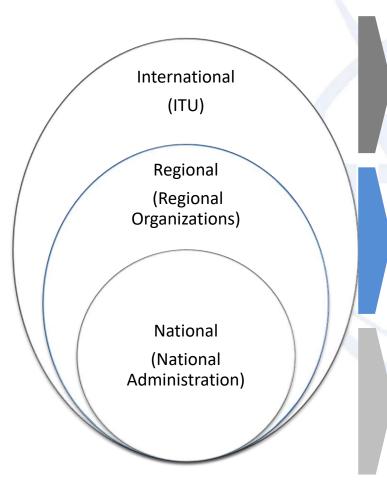
April 20 - May 1, 2020

Yasir Ahmed ITU expert Email: Yasir192@gmail.com





Spectrum management framework



- Set out in a treaty the Radio Regulations
- Article 5 contains the International Table of Frequency Allocations.
- WRC to review, and, if necessary, revise the Radio Regulations.
- Harmonization of frequency use across the region.
- Provide a common technical requirements and standards.
- Preparation of common proposals to ITU world radio conferences.

- Discussions with different spectrum users.
- National regulations, and polices.
- Establish a National Table of Frequency Allocations (NTFA). Regularly reviewed based on technological developments, national context, and results of WRCs.





National Table of Frequency Allocations - NTFA

National Table of Frequency Allocations is the foundation for an effective spectrum management process because it provides

A general plan for spectrum use

The basic structure to ensure effective use of the spectrum and the prevention of interference between services

Advice to

- manufacturers as to
 where in the spectrum to
 design and build
 equipment;
- users on what
 frequencies are available
 to plan their systems.

Steps

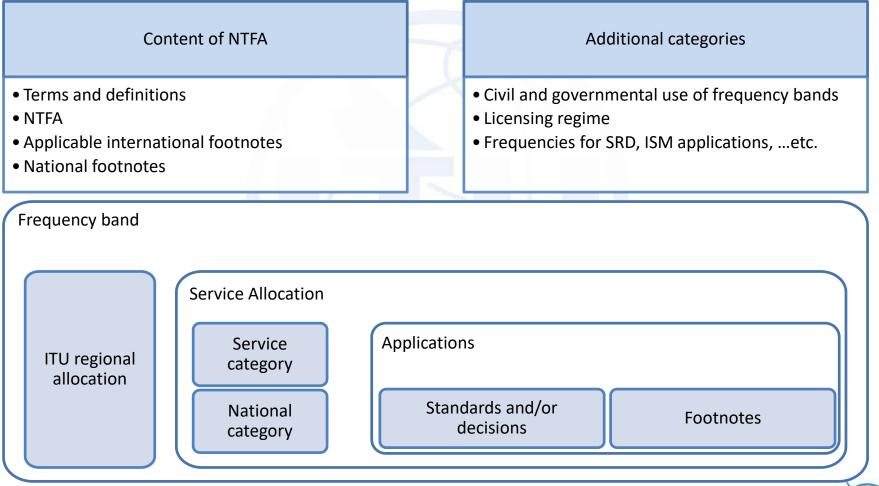
mportance

- Adopt or modify the Regional table to restrict the bands to only one service or to compatible services;
- Subdividing the bands for specific services, or to allocate bands to specific parts of the user community;
- Showing and describing specific national use through National Footnotes. For example, some countries
 divide their national table into bands allocated to the government and to those allocated to private
 users.





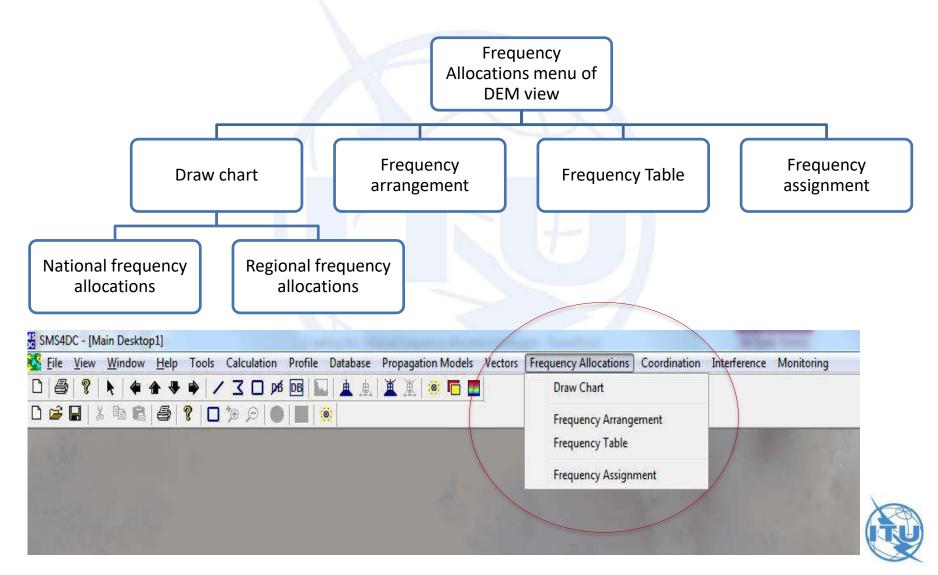
Structure of NTFA







SMS4DC frequency allocations





SMS4DC frequency allocation chart

- Draw Chart: Item to depict a section of regional or national FAT in strip format.
- Each segment in the frequency allocations strip denotes a frequency allocation to a radiocommunication service with its service priority.

ITU Regions or national frequency allocations table	Frequency range	RR Article 5 and national footnotes]
[] File 642 Vie] 프 · · · · · · · · · · · · · · · · · ·	◆ ◆ ◆ ★ / 】 □ P <mark>回 1 まま 注意 米 唱 ■</mark> ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●		Satelie Service
Draw Chart			
Frequency Arrangement Frequency Table	650 6400		000 DE
Frequency Assignment			
In al documente	(the Union where the terms allocation, allotment and assignment are to be used, they shall have the meaning of the state of the	Frequency (ABEs) g given them in Nov. 1.16 to 1.18, the terms used in the three working languages being as follows:	*





SMS4DC frequency allocation chart

The mouse cursor shape on the strip is changed to a cross (+) and a left-click on a colored patch shows its characteristics, including: frequency band, service name, service priority, service footnotes and frequency band footnotes at the top-left corner of chart.

	Window Help		20-01			
	自 金 号 争 / 了 🗆 pé	6 回 🖬 🛓 🛓 🛎 🕷 🦷 🛙	i 🔳			
	■ = 2 0 % <i> </i>) 米				
🕴 National 💌 Fre	equency : 8025 9200	MHz 💌 Logarithmic 💌	Apply Ilational :	GU101 -		
Frequency Band : 8	025.000 - 8175.000 MHz					Satellite Service Secondar
Primary Service : M Service Footnote : 5						
Band Footnote : (SH						
10	io io	8	g g	g	350	g
8025	8175	0,40	8550	0920	8750	0006
		and the second se		1000		
		No. of Concession, Name				
	and the second	CONTRACTOR OF THE OWNER.				
	AND DESCRIPTION OF TAXABLE PARTY.	A REPORT OF A				
1000	And the second	the second se				



 The Edit menu under the frequency allocations chart provides three powerful items: "Plan", "Service Table" and "Footnotes" to edit the content of the frequency allocations table and chart color.

💭 File	Edit View Win	idow Helj	P										- 8 ×
	Plan Service Table Footnote Undo	Ctrl+Z	⇒ 3 } Cy: 8025	○ pré pre ○ pré pre ○ 100 (100 m) ○ 100 (10	米		. 米 「 」	•	Apply RF	-Article 5 : 5	.1 💌		
	Cut Copy Paste Vice Footn	e:	XF D	- 8500.000	MHz						Satellite Service	Secondary Ser	
8025.000		8175.000	8215.000		8400.000	8500.000	8550.000	8650.000	8750.000	8850.000	000.0008		9200.000
In all c	locuments of the	Union whe	re the terms allo	cation, allotment (and assignmen	t are to be	F1'e que used, they shall ha	•	· ·	m in Nos. 1.16 to 1	1.18, the terms used in the	three working languages bein	9 🔺





 Users may browse and edit the content of integrated FATs, inserting up to six primary services and up to six secondary services

Ec		ndow Help	Frequency Band (Band Footnote(s)	(MHz): 0.003		Region: 1
	Plan Service Table Footnote	8	Primary Service:	Service Name	• • • •	Service Footnote(s)
N	Undo Cut Copy	Ctrl+Z Ctrl+X Ctrl+C Ctrl+C	Image: Constraint of the secondary Server Image: Constraint of the secondary Seco	vices Service Name		Service Footnote(s)





 Push buttons in FAT browsing toolbar in the item "Frequency Allocations->Edit->Plan

Toolbar Buttons	Name	Description
K	Move to the first record	Push button to load the allocation that has been made in the first (lowest) frequency band of the active FAT.
•	Go to the previous record	Push button to load the allocation that has been made in the previous (lower) frequency band of the active FAT with respect to the displayed frequency allocation on the dialogue box. Also, pressing Page Up key while the cursor is in the Frequency Band text boxes, does the same task.
	Go to the next record	Push button to load the allocation that has been made in the next (higher) frequency band of the active FAT with respect to the displayed frequency allocation on dialogue box. Also, pressing Page Down key while the cursor is in the Frequency Band text boxes, does the same task.
M	Move to the last record	Push buttons to load the allocation that has been made in the last (highest) frequency band of active FAT.
•*	Add record	Push buttons to add, to the active FAT, a new frequency band and relevant frequency allocations.
	Delete current record	Push buttons to delete, from the active FAT, the current record (a frequency band and all relevant frequency allocations).
	Save current record	Push buttons to save a modified allocation in the active FAT.
Â↓	Sort	To sort the contents of a frequency allocations table (FAT) with respect to the frequency band (i.e. lowest frequency to highest frequency or <i>vice versa</i>). Normally, after the addition of a new frequency band to the FAT it will be appended to the database of FAT. By using this toolbar push button the new frequency band will take its correct position in a sorted FAT.





- Service table" item in menu enables user to browse and modify radiocommunication service name and color used in the frequency allocations chart.
- New service can be defined by selecting((>>>) and fill the service code, primary and secondary service name and select color.

SMS4	4DC -	[Frequency Allocation	ons 2D Chart2		File Edit View Window Help Option		_ @ X
📅 <u>F</u> ile	_	-		_	□ 魯 \$ ▶ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$		
04	3	Plan		3 0		Color	? <mark>×</mark> -
0 🖨		Service Table		ŝβ	ID : 1 Service Code : 0	Basic colors:	
6 N	at	Footnote		9	Primary Service Name : Secondary Service Name :		
-		Undo	Ctrl+Z		Color: 0 0		
		Cut	Ctrl+X			Custom colors:	
		Сору	Ctrl+C				Hue: 160 Red: 0
		Paste	Ctrl+V			Define Custom Colors >>	Sat: 0 Green: 0 Color(Solid Lum: 0 Blue: 0
						OK Cancel	Add to Custom Colors





 Footnote provide ability for modification existing footnotes or definition of new footnotes using M Buttom.

MSSM54DC - [Frequency Allocations 2D Chart1]	al Footnote Editor 🔀
File Edit Vew Window Hep	Footnote No. ; GMB09 note Text :
	he band 450-470 MHz is assigned to private land mobile systems using analogue odulation and the channelling arrangements in CEPT Recommendation TR 25-08 with channel spacing of 12.5 kHz







PRIDA Track 1 (T1)

ON-LINE English capacity building workshop

Frequency Arrangement

April 20 - May 1, 2020

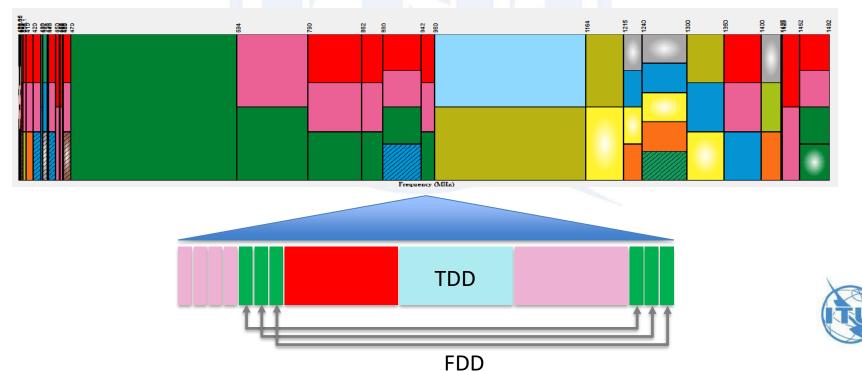
Yasir Ahmed ITU expert Email: Yasir192@gmail.com





Why Spectrum Management System

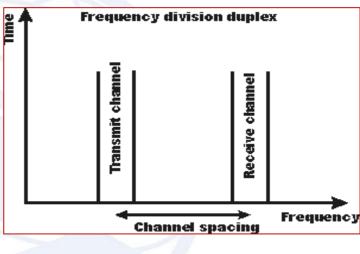
- Frequency arrangements is to develop provisions for systems and users to access the frequencies in an orderly manner by dividing the spectrum available into a number of channels.
- The bandwidth of the channels depends on the technology to be used and the required traffic capacity of the systems that will use the channel.
- Helps in providing harmonization of frequency use, for example to aid cross border frequency coordination, ITU-R has developed recommended channeling arrangements for bands allocated to some services e.g. FIXED and MOBILE. For the same reason, some regional organizations have developed arrangements for some services.



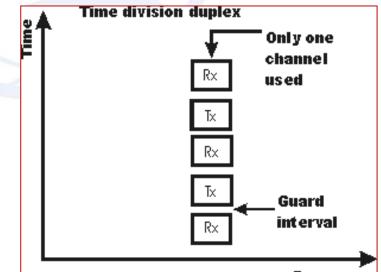


Frequency arrangements

Frequency division duplex (FDD): is a technique where separate frequency bands are used at the transmitter and receiver side



Time division duplex (TDD): refers to duplex communication links where uplink is separated from downlink by the allocation of different time slots in the same frequency band.







SMS4DC Frequency arrangement

- Frequency arrangement item in the "Frequency Allocation " menu of SMS4DC.
- There are three possible types of frequency arrangement in SMS4DC:
 - Homogenous, same as of FDD
 - Uniform, and, same as of TDD
 - > Non-uniform
- Any frequency plan shall be in conformity with frequency allocation table.
- There are already list of planned assignable frequencies could be browsed from item "Frequency table" of "Frequency Allocation " menu .





Frequency arrangement-Homogenous

Homogeneous channel arrangement(FDD):

lower half of the band: fn = f0 + foffset + n.XS MHzn=0,1,2,...

upper half of the band: fn' = f0 + foffset' + n.XS MHz

n=0,1,2,...

- **Reference Frequency (***f***0)**: Frequency used as a reference to calculate centre frequencies.
- **Channel Spacing (***XS***)**: Frequency distance XS between center frequencies of two adjacent channels.
- Lower and Upper Frequency Offsets (*foffset*, *foffset*): Frequency offsets to calculate "go" and "return" centre frequencies.
- Number of Channels (n) :Number of duplex paired or simplex channels defined in plan





Frequency arrangement-Homogenous

- Service Priority: Priority of service in which frequency assignment plan is defined.
- Type of Frequency Plan: select one of three available frequency arrangement formats.
- Channel Spacing: Frequency distance XS between centre frequencies of two adjacent channels.
- Reference Frequency: Frequency used as a reference to calculate centre frequencies.
- Lower and Upper Frequency Offsets: Frequency offsets to calculate "go" and "return" centre frequencies.
- First and Last: The first and the last channel numbers in a plan.

ervice : Land Mobile	F	requency	List:		
Type of Frequency Plan : Homogeneous	70	No.	Fn 713.00000	F'n 768.00000	BandWidth 10
Fn = Fo + Foff + n*XS, F'n = Fo + F'off + n*X		2	723.00000	778.00000	10
	MHz MHz	3	733.00000	788.00000	10
	MHz				
in the second	MHz				
Channels					
Number of Channels n : 3 Channel Set :					
First : 1 Last : 3 All 💌					
Comment :					





Frequency arrangement-Uniform

Uniform channel arrangement:

fn=f0+n.XSMHz,

n=0,1,2,...

- Service Priority: Priority of service in which frequency assignment plan is defined.
- Type of Frequency Plan: select one of three available frequency arrangement formats.
- Channel Spacing: Frequency distance XS between centre frequencies of two adjacent channels.
- Reference Frequency: Frequency used as a reference to calculate centre frequencies.
- First and Last: The first and the last channel numbers in a plan.

Service: Land Mobile		Frequency) List:		
Type of Frequency Plan : Uniform 🗨		No.	Fn	F'n	BandWidth
Fn = Fo + n*XS		2	40240.00000		120
	222	4	40480.00000		120
Channel Spacing XS : 120	MHz	6	40720.00000		120
Reference Frequency Fo: 40000	MHz	8	40960.00000 41200.00000		120
Channels Number of Channels n : 5 First : 1 Last : 10 Even 💌					
Comment :					
Uniform Channel arrangement in 40 GHz					





Frequency arrangement-Non Uniform

Non uniform frequency arrangement edit directly frequency plan.

:1	Frequency Plan ID : 242480.003	5 Regio	n : Nat	tional 💌	Service F	Priority: Primary	
ervice : Fixed		F	equenc	y List:			
Type of	Frequency Plan : Non-uniform 💌	Г	No.	Fn	F'n	BandWidth	*
			116	24654.00000	C. P P	3.5	
			118	24661.00000		3.5	
			120	24668.00000		3.5	
			122	24675.00000		3.5	
			124	24682.00000		3.5	
			126	24689.00000		3.5	
			128	24696.00000		3.5	
			130	24703.00000		3.5	
Number of Ch	annels n.: 85		132	24710.00000		3.5	
			134	24717.00000		3.5	
			136	24724.00000		3.5	
Comment :			138	24731.00000		3.5	
		[][7	140	24738.00000		3.5	
This arrangem	ent extracted from F.748		142	24745.00000		3.5	
			144	24752.00000		3.5	+
21			2.3				_





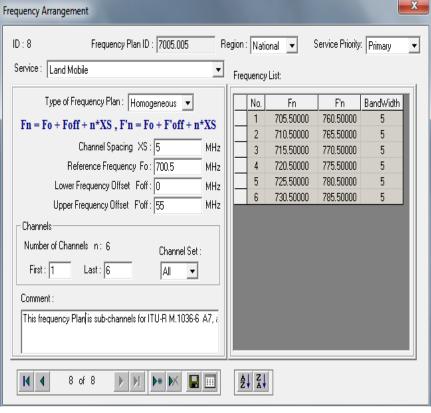
Frequency arrangement-Examples

For the band of 703-788, the channel arrangement result using SMS4DC

ID: 8 Frequency Plan ID : 7005.005000 **Frequency Arrangement Region : National** Frequency Plan ID : 7005.005 ID:8 Region : National 👻 Service Priority: Primary Frequency Band : [703 - 733] MHz [758 - 788] MHz Service : Land Mobile Channel Spacing: 5 MHz Frequency List: RadioCommunication Service : Land Mobile Type of Frequency Plan : Homogeneous 🔻 No. Fn F'n BandWidth 705.50000 760.50000 **Priority**: Primary Fn = Fo + Foff + n*XS , F'n = Fo + F'off + n*XS 710.50000 765.50000 Type of Frequency Plan : Homogeneous Channel Spacing XS : 5 MHz 715.50000 3 770.50000 Comment : This frequency plan is sub-channels for Reference Frequency Fo: 700.5 720.50000 775.50000 MHz 5 725.50000 780.50000 Lower Frequency Offset Foff: 0 ITU-R M.1036-6 A7, and is exclusively allocated for use MHz 730.50000 785.50000 Upper Frequency Offset Floff : 55 MHz by IMT services

Frequency Unit : MHz

	Lower	Upper
No.	Center Frequency	Center Frequency
001	705.5	760.5
002	710.5	765.5
003	715.5	770.5
004	720.5	775.5
005	725.5	780.5
006	730.5	785.5







Frequency arrangement-Examples

For the band of 703-788, the channel arrangement result using SMS4DC

Frequency Plan ID: 4660.008000 Region: National Frequency Band: [470 - 694] MHz Channel Spacing: 8 MHz RadioCommunication Service: Broadcasting Priority: Primary Type of Frequency Plan: Uniform Comment: The frequency plan in in accordance with GE2006 plan allocated to the broadcasting servive with primary status and services ancillary to broadcasting with secondary status

Frequ	ency Unit : MHz
No.	Center Frequency
001	474
002	482
•	
027	682
028	690

D : 9 Frequency Plan ID : 4660.008 Re Service : Broadcasting	gion : Natii Frequency		Service Priority	Primary	•
Type of Frequency Plan : Uniform 👻		19070	-	D. A.C.W.	1
	No.	Fn	F'n	BandWidtł 🔺	
$Fn = Fo + n^*XS$		474.00000 482.00000		8	
Channel Spacing XS : 8 MHz	- 2	482.00000		8	
Reference Frequency Fo: 466 MHz	4	498.00000		8	
Mine and a second secon	5	506.00000		8	
	6	514.00000		8	
		522.00000		8	
- Channels	8	530.00000		8	
Number of Channels n: 28 Channel Cat.	9	538.00000		8	
	10	546.00000		8	
First : 1 Last : 28 All 💌	11	554.00000		8	
Comment :	12	562.00000		8	
	13	570.00000		8	
The frequency plan in in accordance with GE2006 plan alloca	14	578.00000		8 🗸	
	•				
	A Z	1			7







PRIDA Track 1 (T1)

ON-LINE English capacity building workshop

Import from BR IFIC

April 20 - May 1, 2020

Yasir Ahmed ITU expert Email: Yasir192@gmail.com





After installation of BR IFIC terrestrial services software run BR IFIC Format Converter to have a bridge between BR IFIC database which is in SQLite format and SMS4DC which is in Microsoft Access format. Also its essential that the MS-Access macros enabled.

Steps for BR IFIC Format Converter	https://www.itu.int/en/ITU-	-R/terrestrial/brific/BRIFIC/BR_IFIC_and_other_BR_tools.pdf
1 Launch TerRaQ. On the tool bar	r (or alternatively under	the Tools menu) please click "External Tools"
😡 Terkvo.2015 (BRIRC 2010 - 05.001/2010)	- 0 X	😥 TerRaQ 2015 [BRIFIC 2810 - 05/01/2016]
He Wew Tools Patherness Window Help		File View Tools Preferences Window Help
		🚺 🧭 🛿 Current BRIFIC Publication Content
Construction of the second sec		🧈 Terrestrial BRIFIC History Browser
🍇 😫 🍕 🥥 🖉 😗		Session Quick queries
New New New Oack Berling Quert (PQ) 120 SQL Querts Annual MPIC	¥.	Sogge Earth Interaction Settings
🖫 (met 1977, Conet 1946) 👌 Conet 1977, Geneti Statsis : Uniferguationaseisso 👌 Conex (1977, Geneti Statsis; Convenduationaliss		New New Quick Existing Current GPQ LPQ SQL Queries BRIFIC
g Ant the report	peer the Average to the BFLIFIC	
	î.	🖳 Current BRIFIC Content Details 🛛 🛝 Current BRIFIC General Statistics : Notifying Administrations 🚽
Union Contraction		🍚 Print this report
Current BRJFIC Number: 2810 Publication Date: 05		
Part (2000) Part (2007) Pultri (225) DM(1815) Pultri (225) Pultri (225) Pultri (225)	eet (11 (23) 1734 (26)	Current BRIFIC Number: 2810





2 On the next dialog that appears, please choose "BRIFIC Format Converter" then click "Launch Tool

📡 Launch tool
Z Launch tool
Add tool
= Remove tool
🕻 Remove all

³Please acknowledge the next dialog that appears by clicking OK, if you have the MS-Access macros enabled.







On the next dialog that appears, please ensure selecting "Link the currently active...." Then click OK

) Link the currently active new	SQLite BR IFIC data to an old MS	5 Access format data source 🔰 🔽 🧹 🗸
		Cancel Cancel
S	QLite 😴 🍃	Онер
Convert the BR IFIC data fo	rmat between SQLite and MS Acc	ess
[/] (This operation is lengthy an		

5 On the next dialog that appears, please ensure the box "Also create data containers...." Is checked, then click "Proceed"

	ttings	Proces
Detected t	VEAccess version: Access.Application: 15 Art=Sc1-DosBo-11D0-SRDF-Ox0ACC90DC2DD9 a file to link: C:,4RR_Soft/Terrasys/Data/BRIFIC_2793.db3 SRIFCI old format location: C:/8R_SOFT/TerRaSys/TerRaQ/Data	X Canc
Link File		1
File name;	C:/BR_SOFT/TerRaSys/TerRaQ/Data/TERRABROADCAST.MDB	
	e resulting link file on success, using MSAccess ate data containers for use with various BR tools and software quires a few moments to completa)	
king steps		2.



TerRaQ will then create the necessary linked MS-Access database files to ensure compatibility with the other BR tools, like SMS4DC, GE84PLN and GE06Calc, etc..



 For importing data from BRIFIC database, choose from SMS4DC toolbar "database" then import from BR IFIC (Terrestrial Services), the "IFIC import" dialogue box will popup that provides a data filter to specify the type of data required for import. The

		IFIC import
lation Profile D.	atabase Propagation Models Vectors Frequency Allocation Display Selected Station(s) Station(s) in Desktop Move Station Add Station Search Station Remove Station(s) from Display	Service Country FM/TV ABW AFS $Add \rightarrow$ AGL $Add \rightarrow$ Import Import FXM Clear Frequency conditions Close F=F1 F = Assigned frequency F>F1 F1 =
	Display Links Import from BR IFIC (Terrestrial Services) Import from BR IFIC (Space Services)	F >= F1 $F <= F1$ $F <= F1$ $F >= F1 and F < F2$ $F >= F1 and F < F2$ $F >= F1 and F <= F2$ $F <= F1$ $F <= F1$ $F = F1$ $F <= F1$ $F = F2$ $F = F1$ $F = F2$
	Licensing Audit Trail	Add>
		< Remove





 The content of this dialogue box is similar to the BR TerRaQ software. The following filter conditions can be set using the dialogue box .

Service type: check boxes to select either FM/TV (for Broadcasting assignments or allotments) or FXM (for Fixed or Land Mobile assignments).

Administration: select administrations from this window list and add them to (or remove them from) the selection window list.

Frequency condition: To specify a frequency range filter for the imported records.

Class of Station: A Combo box to select class of station for which data is to be imported.

Fragment: A Combo box enables the selection of the fragments corresponding to the service type selected.

Assign ID(s) : of the specific notice(s) to import.

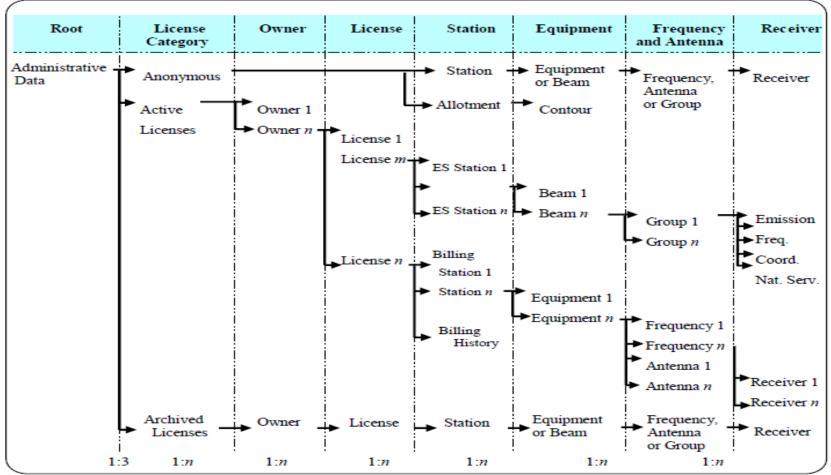
Service	Country		
FM/TV	AFS	Add> < Remove	Import
FXM	AGL AIA ALB +	Clear	Close
Frequency conditions			
F <> F1 F > F1 F >= F1 F < F1		Hz 💌	
F <= F1 F > F1 and F < F2 F >= F1 and F <= F2 F1 < F == F1 > F2 Class of station	↓ <u>Add> (Re</u>	Fragment	Assign ID
F <= F1 F > F1 and F < F2 F >= F1 and F <= F2		move	
F <= F1 F > F1 and F < F2 F >= F1 and F <= F2 F1 < F == F1 > F2 Class of station		Fragment	



After import all station will be available under licensing, Anonymous station



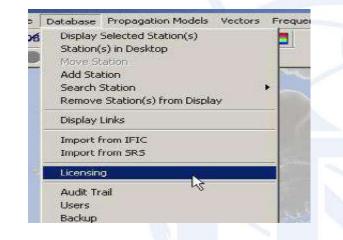
Hierarchical administrative data levels

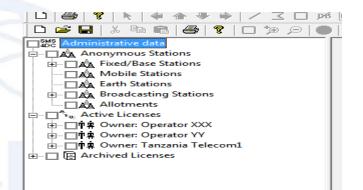






DEM menu bar: Database , Sub-menu: Licensing





- Data entry is enabled by pushing the modify button
- To enter data into a field:
 - first position the cursor into the required field,
 - press <enter> to activate the field
 - Pressing <enter> to save the data
- All the codes and symbols used in SMS4DC conform to ITU procedures, documents or recommendations
- Anonymous Stations: A folder containing all anonymous stations which have been already created outside the Administrative window of SMS4DC and can be moved to a License folder of an Owner in the folder of Active Licenses.
- Active Licenses: Folder which holds all active and granted licenses. This folder contains all active Owners with their information in lower hierarchical levels. Creation of new administrative information will be done inside this folder.
- Archived Licenses: Folder which holds all canceled granted licenses.





New Owner information

SMS4DC	SMS4DC - [Administ	rative data1]			
Image: Second secon	SMS4DC				
SMS Administrative data Image: Additional strative data New Owner Image: Additional strate New Allotment Image: Additional strate Delete Selection Image: Additional strate Refresh Image: Additional strate Reports Image: Image: Additional strate New Allotment Image: Image: Additional strate Refresh Image: Image	D 😂 🤋 🕨	🏟 🛧 🗣 🛸 🖊 🏹 🗖 pró 🛽			
Image: Second secon	🗋 🗅 📂 🔛 X. 🖻	₿ ₽ ? □ % ₽ ●			
Image: Anonyme New Allotment Image: Anonyme New Allotment Image: Anonyme Delete Selection Image: Anonyme Refresh Image: Anonyme Reports Image: Image: Anonyme Image: Image	MS Administrative da	c+c			
Mobil □ ▲ Mobil □ ▲ Earth Delete Selection Refresh □ □ ▲ Allotn □ □ ↑ ↓ Owner: Operator XXX □ □ ↑ ↓ Owner: Operator YY □ □ ↑ ↓ Owner: Tanzania Telecom1		New Owner			
Delete Selection □ □ ▲ Earth □ □ ▲ Broad Refresh □ □ ↑ ♣ Owner: Operator XXX □ □ ↑ ♣ Owner: Operator YY □ □ ↑ ♣ Owner: Tanzania Telecom1		New Allotment			
Allotn □···□↑☆ Active Lic □···□↑☆ Owner: Operator XXX □···□↑☆ Owner: Operator YY □···□↑☆ Owner: Tanzania Telecom1					
 Active Lic Reports ► Image: Image of the active lic Reports Image of th		Refresh			
	Active Lic				
⊡…⊡†¤ Owner: Tanzania Telecom1	📄 🗇 🖬 🖬 🗇 🕀	perator XXX			
	📄 🗇 🖬 🖬 🕀 🕀 🔄	perator YY			
Archived Licenses	📄 🔄 🖬 🖬 🗄 🗄	inzania Telecom1			
	E Archived Lice	nses			

• Fields in bold are mandatory

Owner informatio	
Modify Cancel Save	
	Value
Owner Name	
Owner Address	
City	
Country	
Telephone	
Telex	
Fax	
Email	
Remarks	
Security Category	
Address Code	
Code of Operating Agency	
Billing	
Billing Name	
Billing Address	





New license information

SMS4DC - [Administrative	e data1]	
🗟 SMS4DC		
D 🗐 🤋 🕨 🖗	₩ ₩ / 3 🗆 p 6	[
D 🖻 🖬 X 🖻 🖻	8 ? □ ⊅9 ●	
□_4DC Administrative data		(
🗄 🔲 🛋 Anonymous Statio	ns	
⊡ ⊡ • Active Licenses		
🕀 🗆 🗖 🛱 Owner: Operat		_
🗄 🗆 🗖 🛱 Owner: Operat	Modify	<u> </u>
🗄 🗖 🛉 🛊 Owner: Tanzar	Delete	
🗄 🔲 📄 Archived Licenses		C
	New License	С
1		—

License Information Save Cancel Modify. Value License No Beginning of Use 2020/02/22 Expiration Date 2021/02/22 Status Service ID Invoice Period Initial Fee





Add or move base station from anonymous

Administrative data		Licen:	Fixed/Base station in.	formation	
🗄 🔲 🚊 Anonymous Statio	ns	Modify (Modify Cancel Save		
		moully		Value	Unit
⊡…⊡¶¶‡ Owner: Operato	or XXX		Admin Ref. ID		
		License N	Site ID		
		-	Station Name		
∏ \$€ Billir	Modify		Call Sign		
	Delete		Class of Station		
	Copy to Archive Cancel license		Station Type	Fixed	
🗄 🛄 🛉 🛊 Owner: Tan			Location		
🖳 🔲 🛱 Archived Licens		1	ITU region		
			Latitude		+DDMMSS.SS
			Longitude		+DDDMMSS.SS
	Add Base Station		Country		
	Add Mobile Station		Radius of Service		km
	Add Mobile Station	1	Height ASL		m
	Move Anonymous Station	1 📄	Misc.		
			Provision		
	Print License		Area of Trans.		
			Network ID		
	Print Summary		Target Latitude		+DDMMSS.SS
			Target Longitude		+DDDMMSS.SS
			Type of Notice		





Base station equipment level

Equip	oment info	rmation		
Modify (Cancel Save	Library		
			Value	Unit
Equipment	t Name			
Power				
Power to	Antenna			W
Power Ty	ре			
Radiated	Power			W
Type of R	ad. Power			
Physical				
Manufactur	er			
Model				
Serial no.				
Misc.				
Sensitivity				uV
Geneva 06				
System Typ	be (1)			
System Typ	be (2)			
Maximum P	ower Density			dBW/Hz





 Equipment level , frequency and antenna information, antenna information to imported from antenna library

Modify Cancel Save	Add receiver		
		Value	Unit
Assigned Frequency			Hz
Response Frequency			Hz
Reference Frequency			Hz
Frequency Range			
Misc.			
Class of Emission			
Band Width			kHz
Channel Separation			kHz
Traffic			
Peak Hour			UTC
Season			
Nature of Service			
Op. Hour (From)			UTC
Op. Hour (To)			UTC
Fee			
Frequency Fee			
Target Frequency			MHz

Fraguence information

Modify	Cancel	Save	Library	Add to Lib.	
				Value	Unit
Installatio	n				
Azimuth	of Max.	Radiation			Degree
Elevatio	n				0 Degree
Antenna	a Height /	AGL			m
Technica	a/				
Antenna	a Name				
Class o	f Antenna	1			
Antenna	Туре				
Polariza	ation				
Antenna	a Gain				dBi
Antenna	Gain Type				
Antenna	a Directiv	ity			
Hor. Be	am Width	1			Degree
Ver. Bea	m Width				Degree
Reference	e Antenna				
Frequen	cy Range (from)			MHz
Frequen	cy Range (i	to)			MHz
Cross-Po	olar Discrim	ination			dB
Insertion	Loss				dB







PRIDA Track 1 (T1)

ON-LINE English capacity building workshop

Performing basic engineering functions using SMS4DC

April 20 - May 1, 2020

Yasir Ahmed ITU expert Email: Yasir192@gmail.com





Radio propagation fundamentals

- Propagation is a term used to explain how radio waves behave when they are transmitted, or are propagated from one point on the Earth to another.
- In free space, all electromagnetic waves (radio, light, X-rays, etc.) obey the inverse-square law which states that the power density of an electromagnetic wave is proportional to the inverse of the square of the distance from a point source.

$$\rho_P \propto \frac{1}{r^2}.$$

- Doubling the distance from a transmitter means that the power density of the radiated wave at that new location is reduced to one-quarter of its previous value.
- SMS4DC provides a range of field-strength calculations along a line, polyline, inside a selected rectangular area and at end-points of a link





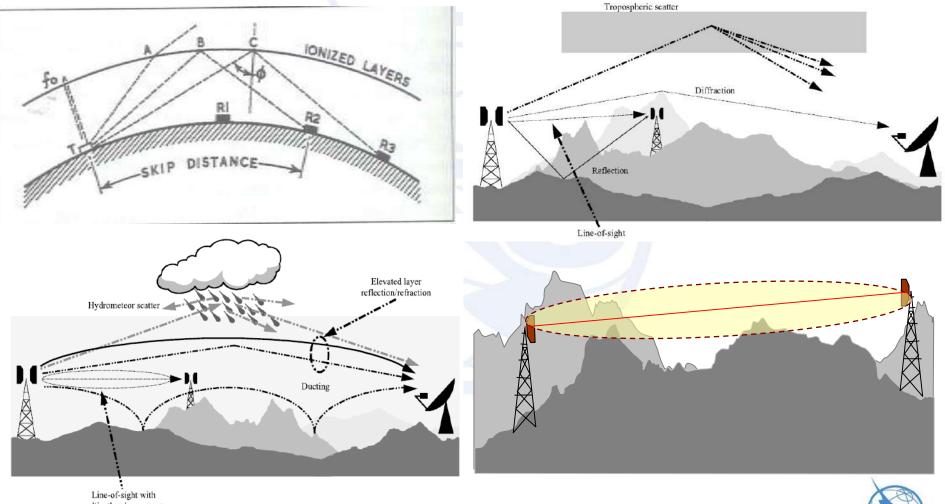
Radio frequency propagation characteristics

	 Ground waves. Guided between the Earth and the ionosphere. Radio navigation 	 Guided between the Earth and the ionosphere. 	 Ionospheric refraction during high sunspot. Line-of-sight propagation. Tropospheric ducting 	 Line-of-sight propagation. Tropospheric ducting. 	 Line-of-sight propagation. Rain scatter. 	 Line-of-sight propagation, limited by atmospheric absorption to a few kilometers)
	VLF, LF, MF	HF	VHF	UHF	SHF	EHF	
יחא כ		בד ש ש Increasing R	n		asing Range	30 GHz	300 GHz
		Decreasing	•		asing Bandwidth		





Radio frequency propagation characteristics



......

multipath enhancements





Summary of propagation models functions

								-
Sub items		Р			0	Network pr	ocessor	Ear
Sub-items Propagation Models	Line	Polvline	Area	Link	Contour	Max. Field Strength	Best Serve r	Earth-space
Free Space	Y	Y	Y	Ν	Ν	Y	Y	Ν
Line of Sight	Y	Y	Y	Ν	Ν	Ν	Ν	Ν
ITU-R P.370	Y	Y	Y	Y	Y	Y	Y	Ν
ITU-R P.1546	Y	Y	Y	Y	Y	Y	Y	Ν
ITU-R P.1812	Y	Y	Y	Y	Y	Y	Y	Ν
Okumura-Hata	Ν	Ν	Y	Ν	Ν	Y	Y	Ν
ITU-R P.526 (by diffraction)	Ν	Ν	N	Y	Ν	Ν	Ν	Ν
ITU-R P.526 (Smooth Earth)	Ν	Ν	N	Y	Ν	Ν	Ν	Ν
ITU-R P.452	Ν	Ν	N	Y	Ν	Ν	Ν	Ν
ITU-R P.530	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν
ITU-R P.618	Ν	Ν	N	Ν	Ν	Ν	Ν	Y

⁽¹⁾: 'Y' and 'N' stand for "Yes" and "No" respectively.



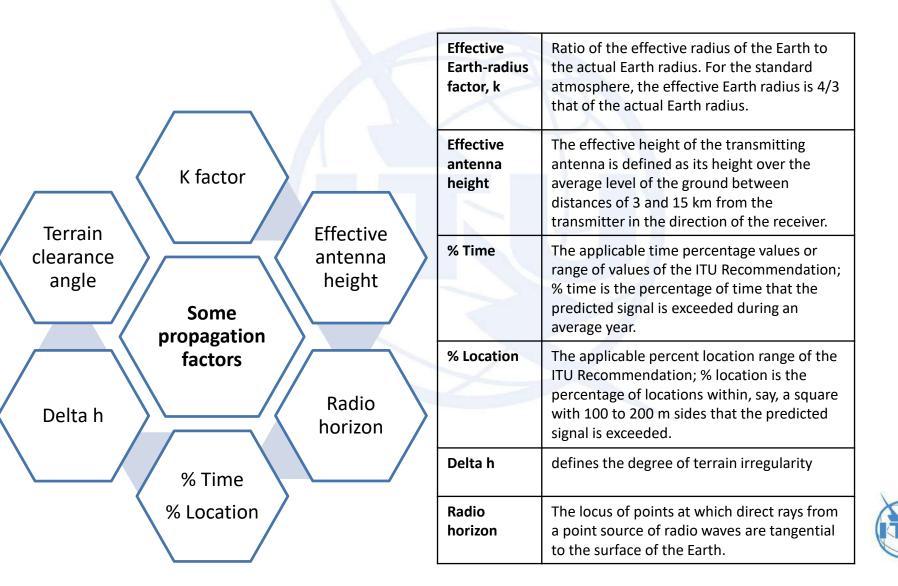


List of SMS4DC propagation models

Free space	Unaffected by any consideration other than distance
Line of sight	Propagation between two points for which the direct ray is sufficiently clear of obstacles for diffraction to be of negligible effect.
P.370	VHF and UHF propagation curves for the frequency range from 30 MHz to 1 000 MHz.
P.1546	point-to-area predictions for terrestrial services in the frequency range 30 MHz to 4 000 MHz
Okumura- Hata	Used for path loss prediction in urban areas.
P.1812	Used for prediction method suitable for terrestrial point-to-area services in the frequency range 30 MHz to 3 GH
P.526	Propagation by diffraction
P.452	Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above about 0.1 GHz
P.530	Propagation data and prediction methods required for the design of terrestrial line-of-sight systems.
P.618	Propagation data and prediction methods required for the design of Earth- space telecommunication systems



Propagation terms used in SMS4DC





Calculation along a line

- This function calculates field strength values produced by a station along a path profile at a given receiving height above ground level.
- In the case of the line-of-sight (LOS) model, the "Line" calculation subitem provides only a visibility analysis along the line from the wanted station.
- To activate the "Line" sub items, a line must be drawn in advance on the DEM using "Draw Line" or "Draw Line from Database" toolbar buttons provided in the second s

	Station Table	4	- 23				
III OK Cancel							
	IDst	STname	STlat_deg	STIon_deg	Sth_agl		
	5	PRVHF1	24.5750	55.1833	60.0000		
	7	Station-235	-2.4000	35.9750	0.0000		
	8	TZA11	-3.5000	36.8083	0.0000		
	9	TZ2	-3.5583	36.6833	10.0000		
	10	IMT700BTS	-5.8833	37.4000	30.0000		
1	11	Zan112	-5.9250	39.2583	30.0000		
2	12	Zan22	-6.2417	39.3750	30.0000		
	13	Tanz11	-6.4500	37.8000	20.0000		
	14	Tanz22	-6.5583	38.0167	20.0000		
	15	Tav FX1	-6.0917	38.1833	30.0000		
	16	Tanz FX22	-5.9000	38.1250	20.0000		
	17	tan fx 11	-7.0167	38.1417	20.0000		
	18	tanz fx 22	-7.1917	38.3333	20.0000		

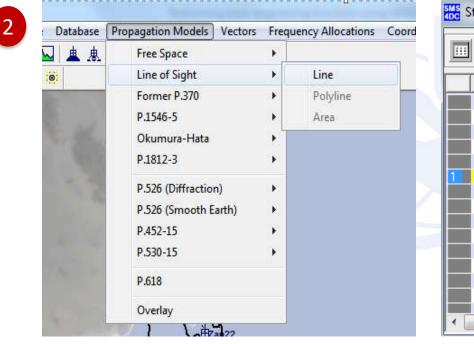






Calculation along a line

 Geographical coordinates, terrain height, ground-distance from the left point (beginning point of the line) and field strength value (dBiV/m), or visibility status in the case of the LOS model, at the position of the vertical marker are displayed on the status bar



Select one of two stations

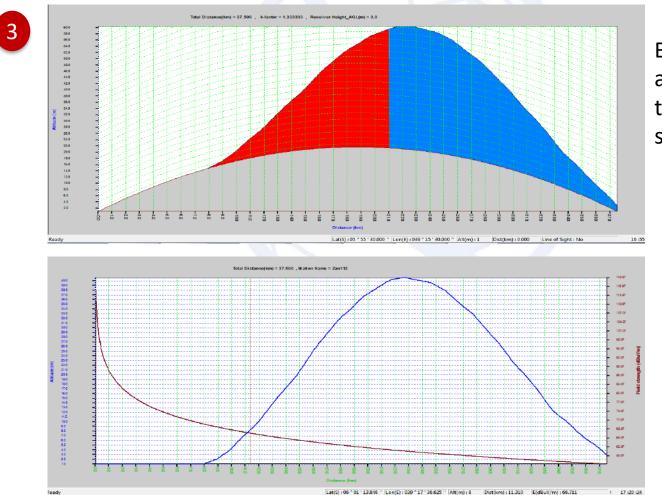
Station Table	e	-		
			OK	Cancel
IDst	STname	STlat_deg	STIon_deg	Sth_agl
5	PRVHF1	24.5750	55.1833	60.0000
7	Station-235	-2.4000	35.9750	0.0000
8	TZA11	-3.5000	36.8083	0.0000
9	TZ2	-3.5583	36.6833	10.0000
10	IMT700BTS	-5.8833	37.4000	30.0000
1 11	Zan112	-5.9250	39.2583	30.0000
12	Zan22	-6.2417	39.3750	30.0000
13	Tanz11	-6.4500	37.8000	20.0000
14	Tanz22	-6.5583	38.0167	20.0000
15	Tav FX1	-6.0917	38.1833	30.0000
16	Tanz FX22	-5.9000	38.1250	20.0000
17	tan fx 11	-7.0167	38.1417	20.0000
18	tanz fx 22	-7.1917	38.3333	20.0000
19	222	-5.1500	37.1417	0.0000
20	111	-5 2750	37 3500	0 0000





Calculation along a line

 The graph is equipped with a vertical marker which is movable horizontally by the mouse while holding the left click.



Blue : No LOS, and red: LOS to the concerned station





Area calculation

- Calculates of field strength values produced by a selected station inside a rectangular area at a given receiving height above ground level.
- To activate the "Area" sub-items a rectangular area must be drawn in advance on the DEM using the "Draw Box" or "Draw Box from Database" toolbar buttons.
- In the case of the line-of-sight (LOS) model, the "Area" calculation sub-item provides only a visibility analysis along the line from the wanted station
- By choosing "Area" sub-item, a spreadsheet of stations in the database is opened and users may select a station inside the area by a mouse left click on the corresponding row of the record-select column.



Propagation Models Vector	s Frequ	Jency Allocations Coordination I
Free Space Line of Sight	*	
Former P.370	+	Line
P.1546-5	•	Polyline
Okumura-Hata	•	Area
P.1812-3		Link
P.526 (Diffraction)	•	Field Strength Contour
P.526 (Smooth Earth)	•	Network Processor
P.452-15	•	
P.530-15	•	
P.618		
Overlay		





Area calculation

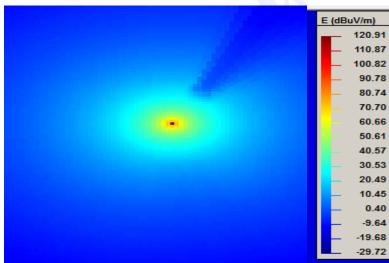
Select station

Station Table				
			ОК	Cancel
IDst	STname	STlat_deg	STIon_deg	Sth_agl
5	PRVHF1	24.5750	55.1833	60.0000
7	Station-235	-2.4000	35.9750	0.0000
8	TZA11	-3.5000	36.8083	0.0000
9	TZ2	-3.5583	36.6833	10.0000
10	IMT700BTS	-5.8833	37.4000	30.0000
1 11	Zan112	-5.9250	39.2583	30.0000
12	Zan22	-6.2417	39.3750	30.0000
13	Tanz11	-6.4500	37.8000	20.0000
14	Tanz22	-6.5583	38.0167	20.0000
15	Tav FX1	-6.0917	38.1833	30.0000
16	Tanz FX22	-5.9000	38.1250	20.0000
17	tan fx 11	-7.0167	38.1417	20.0000
18	tanz fx 22	-7.1917	38.3333	20.0000
19	222	-5.1500	37.1417	0.0000
20	111	-5.2750	37 3500	0.0000
•				

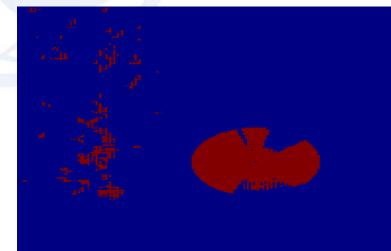
Set parameters

ime(1 -> 50)%	Location(1 -> 99)/	Earth Curvature	OK
50	50	1.3333333333	Cancel
System	Enviro		
Analogue 💌	Urban Area	•	
Land/Sea disc.	Receiver Height(m)		
Clearance Angle	3		

Area Calculation P370



Calculation LOS







Field Strength Contour

- This function saves and displays field strength contours around a selected station where the field strength values inside the contour are higher than a given threshold.
- A dialogue box of the propagation model requests the user to enter a threshold value for this parameter.

Propagation Models Vector	s Frequ	ency Allocations Coordination Int		Station Tab	ble			
Free Space Line of Sight	*						OK	Cancel
Former P.370		Line		IDst	STname	STlat_deg	STIon_deg	Sth_agl
P.1546-5	*	Polyline		5	PRVHF1	24.5750	55.1833	60.0000
F.1340-3	<u> </u>	Polymie		7	Station-235	-2.4000	35.9750	0.0000
Okumura-Hata	•	Area		8	TZA11	-3.5000	36,8083	0.0000
P.1812-3		Link		9	TZ2	-3.5583	36.6833	10.0000
-1012-5	· ·	LIIK		10	IMT700BTS	-5.8833	37.4000	30.0000
P.526 (Diffraction)		Field Strength Contour	1		Zan112	-5.9250	39.2583	30.0000
P.520 (Dimaction)		140.00 220		12	Zan22	-6.2417	39.3750	30.0000
P.526 (Smooth Earth)	•	Network Processor		13	Tanz11	-6.4500	37.8000	20.0000
P.452-15				14	Tanz22	-6.5583	38.0167	20.0000
F.432-13				15	Tav FX1	-6.0917	38,1833	30.0000
P.530-15	- >			16	Tanz FX22	-5.9000	38.1250	20.0000
				17	tan fx 11	-7.0167	38.1417	20.0000
P.618				18	tanz fx 22	-7.1917	38.3333	20.0000
				19	222	-5.1500 -5.2750	37.1417	0.0000
Overlay				20		-5.2750	87,8500	



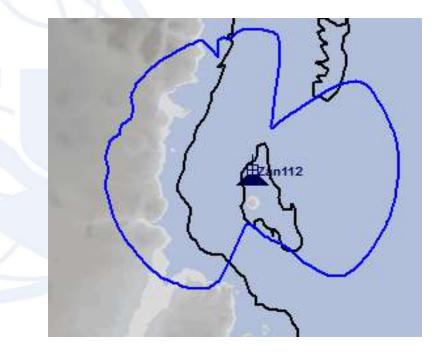


Field Strength Contour

Choose contour parameters

l'ime(1 -> 50)%	Location(1 -> 99)/	Earth Curvature	OK
50	50	1.3333333333	Cancel
System	Env		
Analogue 💽	Urban Area	.	Contour
Land/Sea disc.	Receiver Height(m)	🔽 DeltaH from map	Value (dBuV/m)
	3		-10

Field Strength Contour – P.370



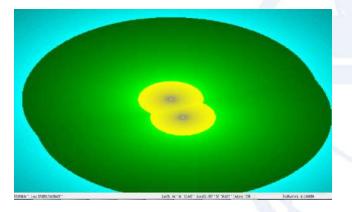




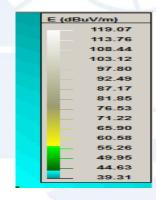
Field Strength Contour

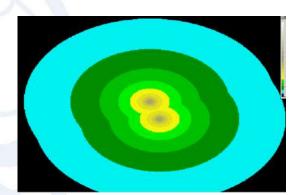
Using tools menu of the area calculation window the following items can be showed

Change color

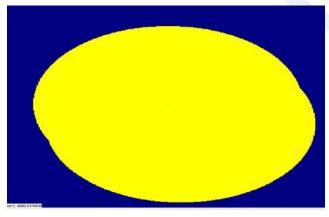


Show legend

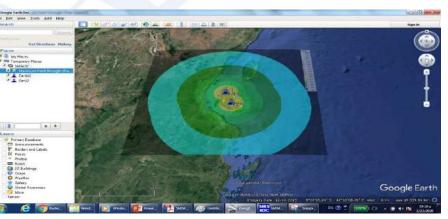




Coverage



Export results to google earth



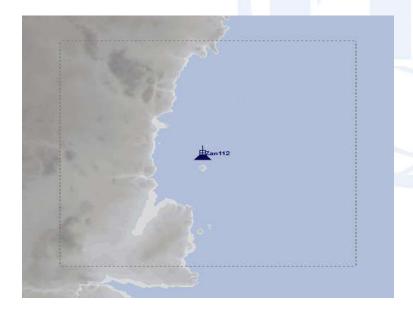
Contour





Maximum field strength

- This item calculates and displays the maximum value of field strength values produced by more than one transmitting stations at any point inside a predefined rectangular area.
- Prior to the selection of this sub-item, a rectangular area must be selected using the "Draw Box" or "Draw Box from Database" toolbar buttons.



Propagation Models Vectors	Frequency Allocations Coordination	Interference Monitoring
Free Space	• Line	
Line of Sight	 Polyline 	
Former P.370	▶ Area	
P.1546-5	Network Processor	Maximum Field Strength
Okumura-Hata	*	Best Server
P.1812-3	•	
P.526 (Diffraction)	• E	
P.526 (Smooth Earth)	• •	
P.452-15	•	
P.530-15	•	
P.618		
Overlay		



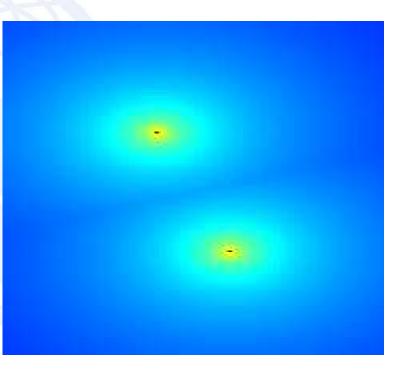


Maximum field strength

Select more than one station nearby

Free Space Maximum Field Strength

<u>;;;</u>	l			ОК	Cancel
	IDst	STname	STlat_deg	STIon_deg	Sth_agl
	5	PBVHF1	24.5750	55.1833	60.0000
	7	Station-235	-2.4000	35.9750	0.0000
	8	TZA11	-3.5000	36.8083	0.0000
	9	TZ2	-3.5583	36.6833	10.0000
	10	IMT700BTS	-5.8833	37.4000	30.0000
1	11	Zan112	-5.9250	39.2583	30.0000
2	12	Zan22	-6.2417	39.3750	30.0000
	13	Tanz11	-6.4500	37.8000	20.0000
	14	Tanz22	-6.5583	38.0167	20.0000
	15	Tav FX1	-6.0917	38.1833	30.0000
	16	Tanz FX22	-5.9000	38.1250	20.0000
	17	tan fx 11	-7.0167	38.1417	20.0000
	18	tanz fx 22	-7.1917	38.3333	20.0000
	19	222	-5.1500	37.1417	0.0000
	20	111	-5 2750	37 3500	0.0000

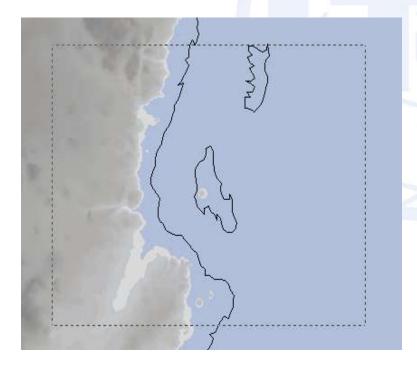


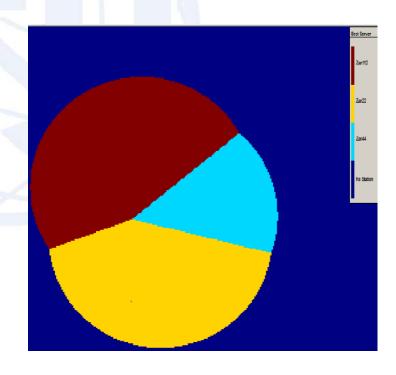




Best Server

- This function calculates and displays the best serving station, among various stations, at each point inside a predefined rectangular area.
- Prior to the selection of this sub-item, a rectangular area must be selected using the "Draw Box" or "Draw Box from Database" toolbar buttons.

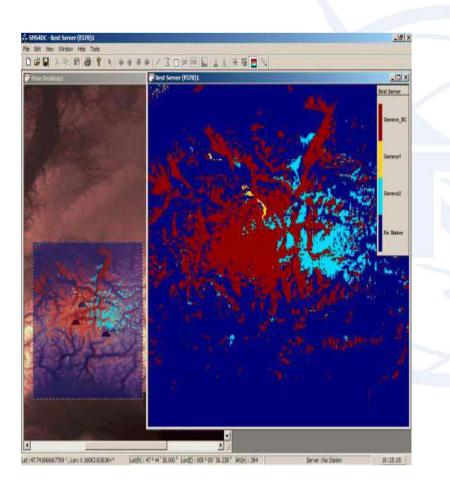


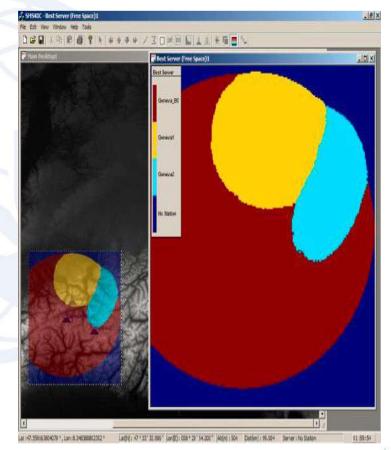






Best Server



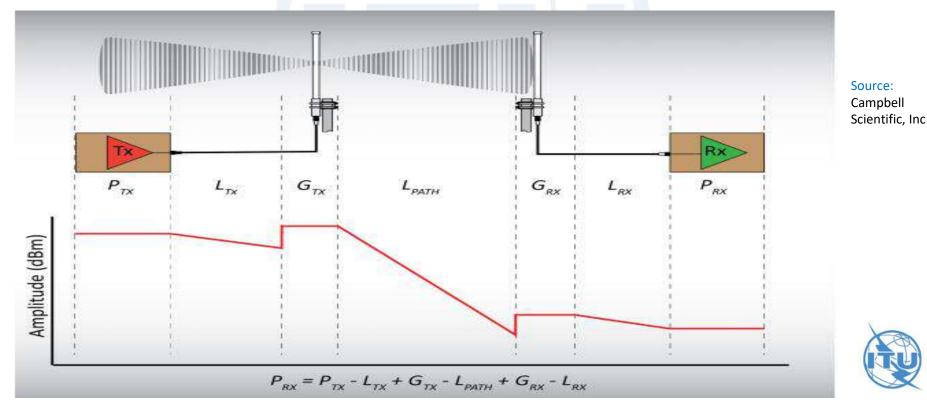






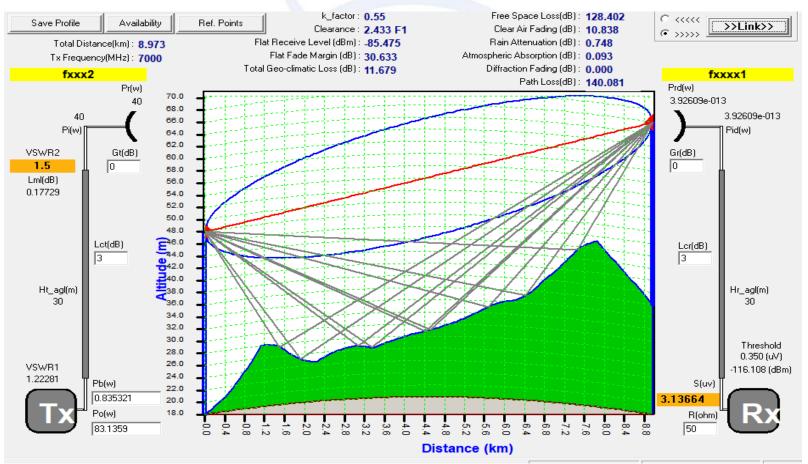
Link budget calculation

- Link budget calculation, displays calculation results between two stations as well as providing a visual user-interface to optimize the link characteristics.
- The link calculation contains: a path profile diagram, the Fresnel zone, Earth curvature and those technical characteristics of a link that are relevant to the propagation model in use.





Link budget calculation





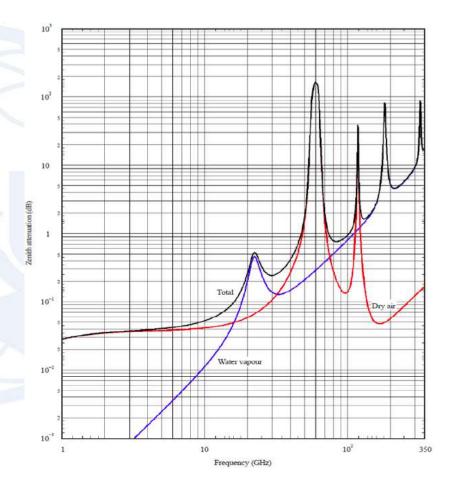


- Attenuation due to atmospheric gases
- Diffraction fading due to obstruction or partial obstruction of the path,
- Fading due to multipath, beam spreading and scintillation,
- Attenuation due to variation of the angle-of arrival/launch,
- Attenuation due to precipitation,
- Attenuation due to sand and dust storms
- Total Loss = [Free Space Loss]+ [Atmospheric Gaseous Loss]+ [Rain Attenuation]+
 [Clear Air Fading]+ [Diffraction Loss]+ [NFD].
- Flat Receive Level = PT + GT- [Free Space Loss]- [Atmospheric Gaseous Loss] [Diffraction Loss]+ GR- [Receiver Insertion Loss]
- Fade Margin = [Flat Receive Level] [Receiver Threshold]





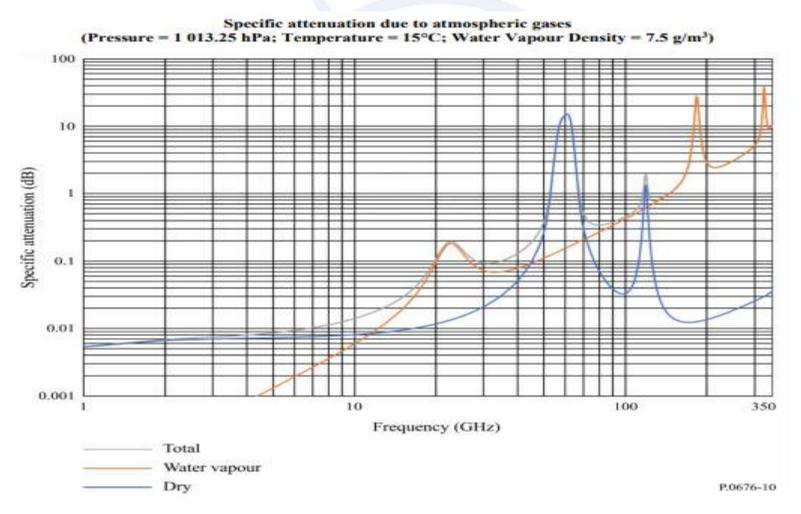
- Attenuation due to atmospheric gases
- Diffraction fading due to obstruction or partial obstruction of the path,
- Fading due to multipath, beam spreading and scintillation,
- Attenuation due to variation of the angleof arrival/launch,
- Attenuation due to precipitation,
- Attenuation due to sand and dust storms





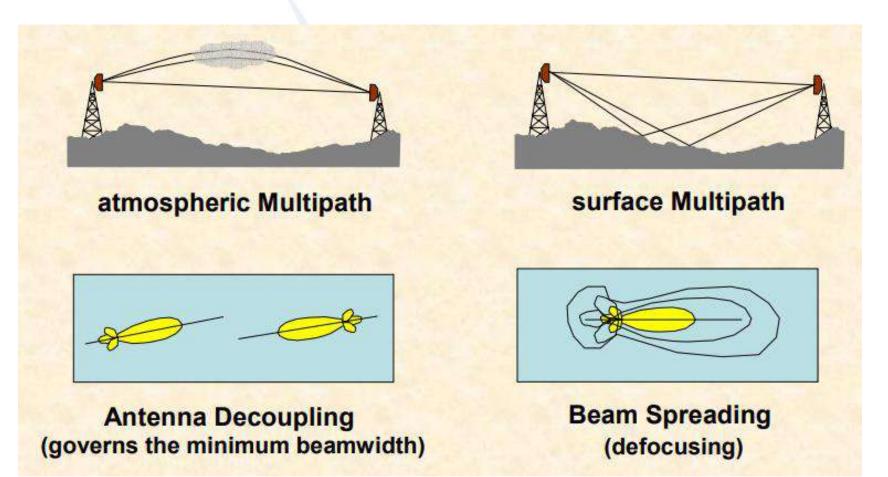


Atmospheric gases considerable loss above 10 GHz



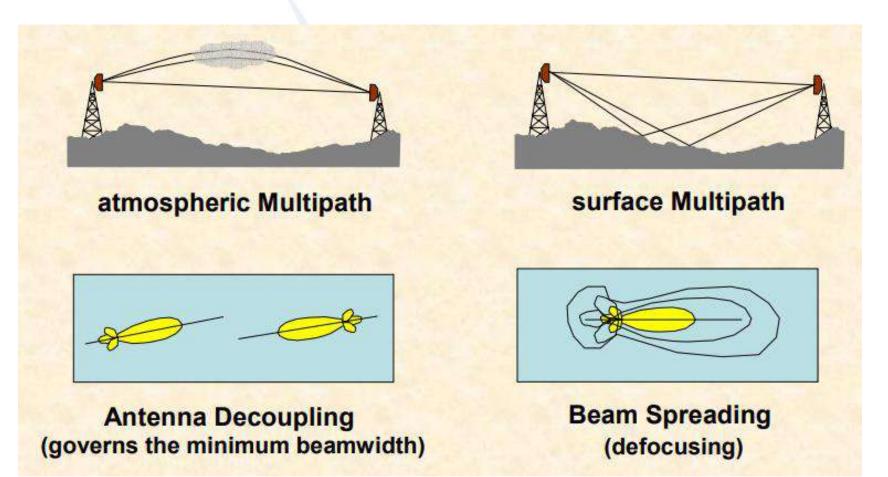






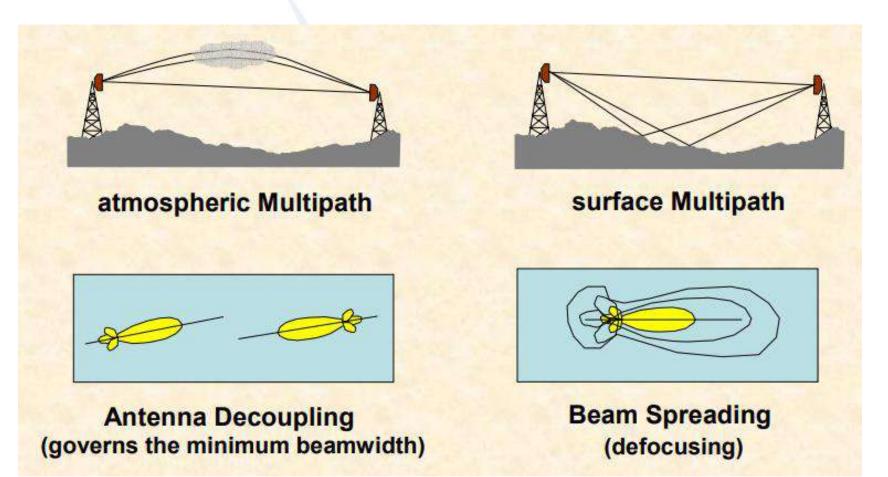
















Practice and exercise





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Types

The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.

Power sources (50 Hz): due to leakage, arcing neon signs (continual arc) fluorescent light fixtures.

Power line interference

Power line interference resolved

	25.400 020	MHz -86	.7 dBm		125.400	000 MHz -	-113.5 dBm	
67		®X)		-67		RX		
91								
15	mound	when have for more than a second s	han hay have a stand and the		manina	how when the many the second	where we have an a star where we have a star where	man
139	,			-139				
-PAN Fre	⊣ X 125.400 02	0 MHz IOI 10 MH	z RBW:6.25	i kHz IF-PAN	Freq 사 125	.400 000 MHz (이 1	I0 MHz RBW:6.2	5 kHz
	And a second second second second	RX				RX		



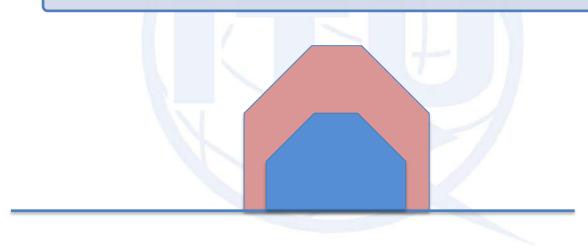


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Types

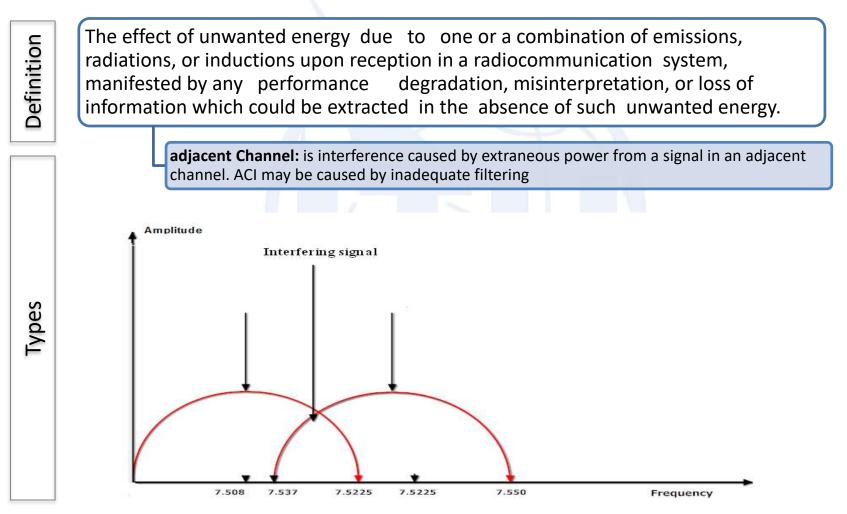
The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.

Co-channel: same frequency various power levels - strongest signal captures receiver









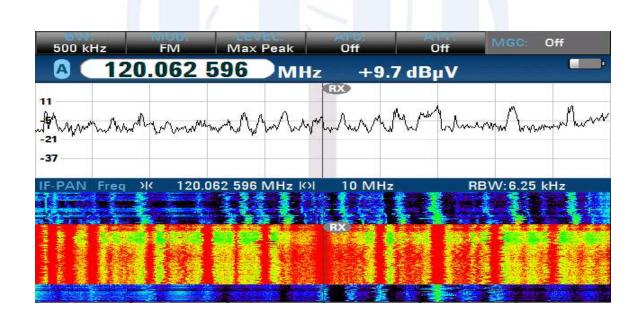




Types

The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.

Intermodulation: unrelated frequency mixes with another signal generating a signal on or close to the receive frequency.





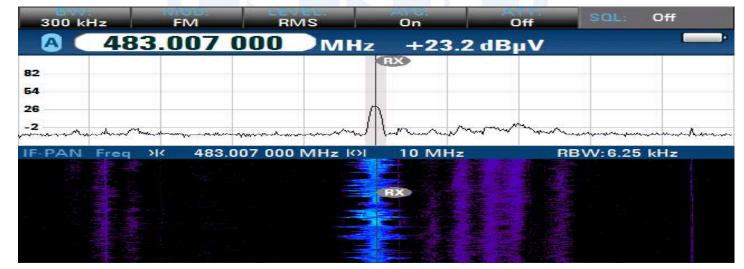


Types

The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.

Harmonic signals are usually unwanted signals which are exact multiples of the operating frequency.

5th harmonic of 96.6 MHz







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Types

The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.

Out of band emissions Out-of-band emission is emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process.

RX			
mannunnum	manue	w. w	
	· · · · · · · · · · · · · · · · · · ·	M. Westerney Manual -	Mar wa
MHz (0) 10) MHz	BBW:6.25 kHz	2
	THE REPORT OF STREET		5 . Auto
	and the second s	* • •	
RX			
	MHz (O) 10	MHz (이 10 MHz	

500 kHz	FM	Average	Off	Off	
A 904	4./05	792 М	lz -93.2	2 dBm	
527 I					
61					
83	80.55		2		
ሊዲጥ ኤምዛሥ ኢ.ብሎኒ-ዚ 105	pponter	an many aparter and	Mar unating marked	Antonio	an Marine marine
127					• • • • • • • • • • • • • • • • • • •
121					
F-PAN Freq) 904.	705 792 MHz I	이 10 MHz	RE	3W:6.25 kHz
Second Control of					
and the second second			BX -	and the provident of the second	
	States - M		649 (p. 669	and a street	and the second
Spellede and a star by the second second	and the second second	And the second line of the second second	And a state of the	States and States	





Important parameters

- Minimum field strength (C/N)(db): It is a minimum field strength level which is necessary to fulfil the signal quality for coverage.
- Protection ratio, PR: The required difference in dB between the level of the wanted signal and the level of the interfering signal to achieve the required quality of reception.
- Nuisance field strength(En): The equivalent required field strength of a wanted signal to achieve the required quality of reception, considering a single interfering signal and its corresponding protection ratio.

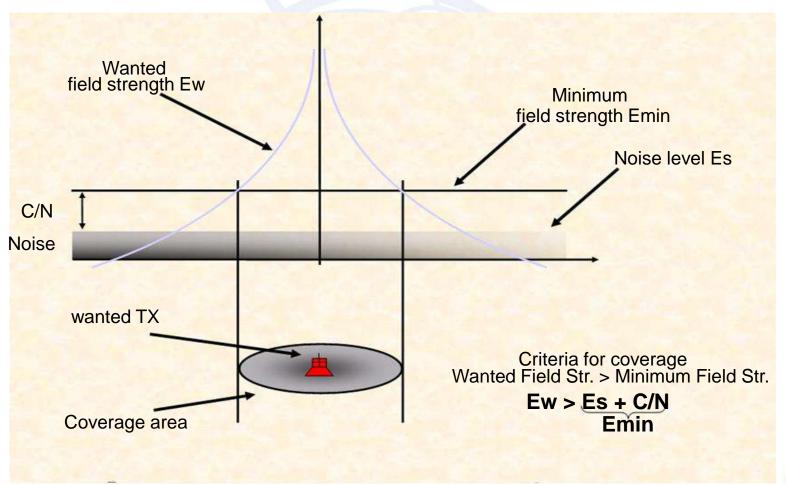
En= Ei(interference field strength)+ PR

 Waned field strength (Ew): The required field strength of a wanted signal to achieve the required quality of reception, considering multiple interfering signals and their corresponding protection ratios .Ew>En





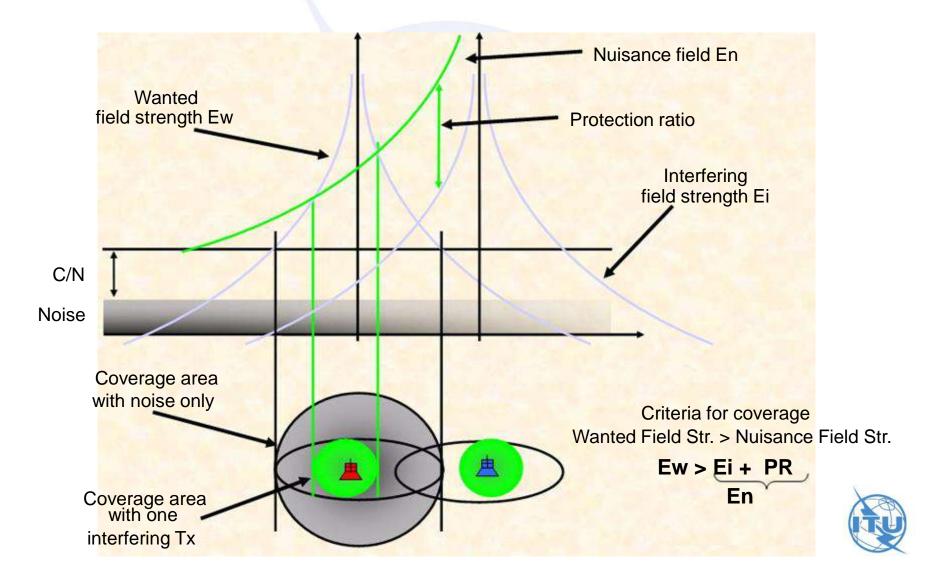
Interference by Noise







Interference by one Transmitter





- Interference calculations have been implemented in this menu to analyze several configurations of wanted and victim stations.
- BC2BC and BT2BT: This items calculates the aggregate interference level of interfering BC stations on a directional receiver of a wanted BC station.
- BT2BT: This item calculates the aggregate interference level of interfering BT stations on a receiver of a wanted BT station.

Coordination	Interference Monitoring			MS Wanted Sta	ation			
coordination	BC2BC			===			OK Cancel	
	BT2BT			terrakey			name lat_dec	long_dec
	FX2FX(Link) FX2FX(Station)	+	>	1 23 24		TZA TZA TZA TZA		38.3667 38.9333
	FXM	•						
	ES2ES ES2FX FX2ES	•						
	Intermodulation (SM.11	34)		<				

Select a wanted BC station

П

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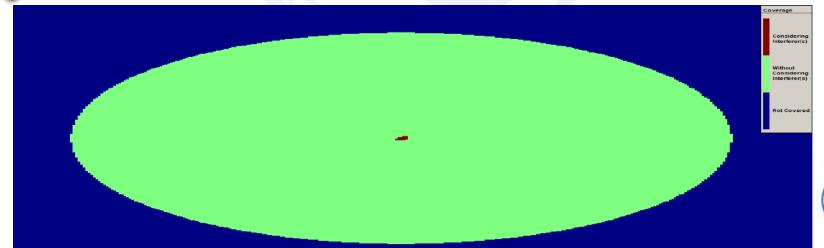


Broadcasting Interference calculations

3 Set interference Pa	arameters	4	Sele	ct the	e ava	ailable	e sta	tions			
Interference Parameters	Х		MS Interferer S	Stations					-		×
Search Radius(km) 150	Time(1 -> 50)%1					OK	Cancel				
Search Radius(km) 150 Frequency Range(kHz) 150	Location(1 -> 99)% 50	in the second	terrakey	Assgn_ID 22	Ctry TZA	site_name TZABC2	lat_dec -7.7000	long_dec 38.9333	hgt_agl 30.0000	polar V	EF 12
Minimum Field Strength(dBuV/m) 48	Antenna Discrimination										
Interference Summation Method Power Sum	Polarization Discrimination										
	12 (dB)										
OK	Cancel										
			<								>

Result: Coverage area with/without interference of a concerned BC station

5





Fixed and Mobile Interference calculations

- The item "FXM" in the "Interference" menu has been implemented for the calculation of interference produced/experienced between stations in the land mobile service and between stations in the fixed service (below 1GHz) and between each other.
- Interference to (Free Space and P.1546): This item calculates interference to fixed or land mobile receiving stations from a wanted transmitting station in the fixed or land mobile services.
- Interference from (Free Space and P.1546): This item calculates interference from fixed or land mobile transmitting stations to a wanted receiving station in the fixed or land mobile services, under given conditions.

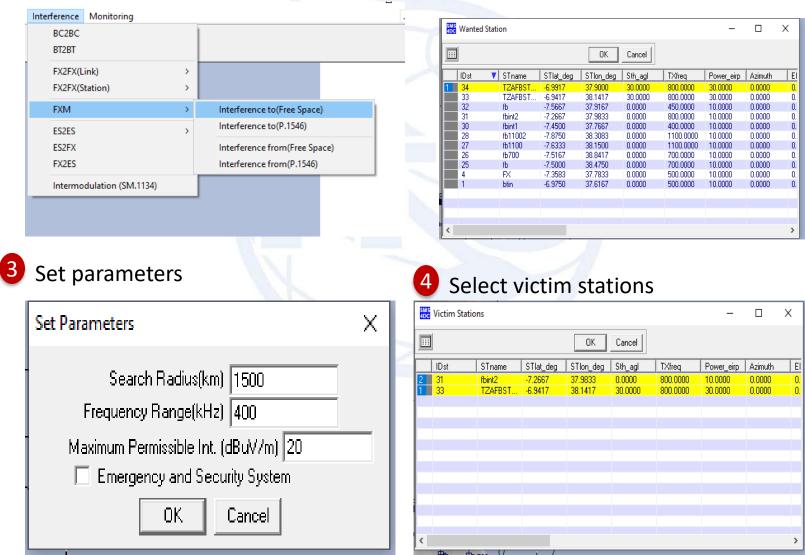




Fixed and Mobile Interference calculations

FXM interference calculations

2 Select a wanted station





Fixed and Mobile Interference calculations View results

5

Hfx11002

Х FXM : LM & FX below 1 GHz Interference Calculation Wanted Station : No. ID Name Country Frg(MHz) St Class Location 34 TZAFBSTATIO TZA 1 037E5400 06S5930 800.0000 FB Interference to : E(dBuV/m) Elimit(dBuV/m) No. ID Name Country Location Dist(km) Frq(MHz) St_Class 33 TZAFBSTATIO TZA 038E0830 06S5630 800.0000 FB 27 60.83 20.00 1 2 31 fbint2 TZA 037E5900 07S1600 32 800.0000 FB 59.46 20.00 • ► Report





Fixed service Interference calculations

- FX2FX (link): calculate interference from stations of different point to point hops on each other in accordance with recommendation ITU-R P.452, by consideration of antenna radiation patterns and XPD.
- FX2FX (station): calculates interference from fixed stations to each other in accordance with recommendation ITU-R P.452, by consideration of antenna patterns and NFD (Net Filter Discrimination).
- For FX2FX (link) system calculates interference based on sensitivity of victim receiver and received interference level.

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P.452 FX2FX : Interference from the Wanted Hop to the Selected Hop(s)

No.	TxName	TxLocation	RxName	RxLocation	Freq(MHz)
1	MTN LINK1	029E1530 17N5530	MTN LNK11	029E2430 17N4900	7000.0000

Wanted Hop (Tx):

Selected Hop(s) (Rx):

No.	TxLocation		RxName	RxLocation		IntDist(km)	PathLoss(dB)	I-S(dB)	l(dBm)	S(dBm)
1	029E2800	18N0730	sudatel link3	029E5200	18N0300		158.67	3.47	-112.64	-116.11
2	029E5200	18N0300	Sudatel link1	029E2800	18N0730	31	143.55	18.59	-97.52	-116.11



Fixed service Interference calculations

 FX2FX (station) system calculates in Threshold Degradation (TD) of the wanted station due to the occurrence of the interference.

P.452 FX2FX : FX above 1 GHz Interference Calculation

								Wanted 9	itation :						^
No.	ID		Name		Co	untry	Locati	on		Frq(N	/Hz)				
1		44	Sudatel	link1	SDI	I	02	29E2800 1	8N0730	700	0.0000				
								Interferer	nce to :						
No.	ID	Name	;	Coun	try	Locatio	on		Dist(km	n) Fro	q(MHz)	l(dBW)	TD(dB)	TD(dB)-0.2	Pŧ
1	42	MTN	LINK1	SDN		02	9E1530	17N5530	3	31 7	000.0000	-133.120	31.57	31.37	Tr
2	43	MTN	LNK11	SDN		02	9E2430	17N4900	3	35 7	000.0000	-154.446	10.63	10.43	Tr
3	45	suda	tel link3	SDN		02	9E5200	18N0300	4	13 7	000.0000	-128.000	36.68	36.48	Tr

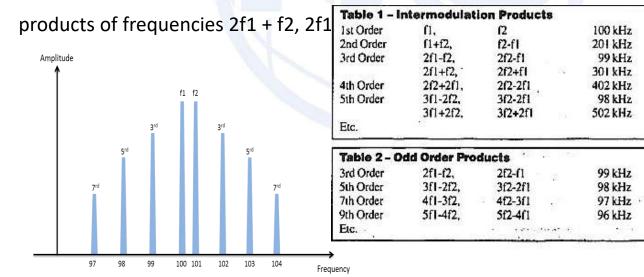


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Intermodulation interference

- Intermodulation interference is the undesired combining of several signals in a nonlinear device , e.g. at semiconductors, klystrons, ..etc, and in passive devices like combiners, circulators, connectors, etc. producing new, unwanted frequencies, which can cause interference in adjacent receivers.
- If two signals at frequencies f1 and f2, the nonlinearity would give rise to additional output components at f2 + f1 and f2 – f1 known as the second-order intermodulation products. These second-order products will mix with the original signals to produce third-order intermodulation





101 kHz

102 kHz

302 kHz

103 kHz

503 kHz

102 kHz

103 kHz

104 kHz

105 kHz

2 kHz

1 kHz



Intermodulation interference

2 Select a wanted receiving station

Interference	Monitoring
BC2BC	
BT2BT	
FX2FX(L	ink) >
FX2FX(S	tation) >
FXM	>
ES2ES	>
ES2FX	
FX2ES	
Intermo	dulation (SM.1134)

	Wanted	Rx Statior	1					-		×
					OK	Cancel				
	IDst	🔻 STn	ame	STlat_deg	STIon_deg	Sth_agl	TXfreq	Power_eirp	Azimuth	^
	1 37	TZA	INMO	-6.4667	37.3917	0.0000	452.0000	10.0000	0.0000	
	36	TZA	FBIN	-6.4083	37.6250	30.0000	451.0000	30.0000	0.0000	
	35	TZA	FBIN	-6.2750	37.4167	30.0000	450.0000	30.0000	0.0000	
	34	TZA	FBST	-6.9917	37.9000	30.0000	800.0000	30.0000	0.0000	
	33	TZA	FBST	-6.9417	38.1417	30.0000	800.0000	30.0000	0.0000	
	32	fb		-7.5667	37.9167	0.0000	450.0000	10.0000	0.0000	
	31	fbint	2	-7.2667	37.9833	0.0000	800.0000	10.0000	0.0000	
	30	fbint	1	-7.4500	37.7667	0.0000	400.0000	10.0000	0.0000	
	29	fx11	0	-7.8750	38.0750	0.0000	1100.0000	10.0000	0.0000	
	28	fb11	002	-7.8750	38.3083	0.0000	1100.0000	10.0000	0.0000	
	27	fb11	00	-7.6333	38.1500	0.0000	1100.0000	10.0000	0.0000	
	26	fb70	0	-7.5167	38.8417	0.0000	700.0000	10.0000	0.0000	
	25	fb		-7.5000	38.4750	0.0000	700.0000	10.0000	0.0000	
	24	TZA	BC2	-7.7000	38.9333	30.0000	107.0000	30.0000	0.0000	
	23	T74	RC1	-7.2000	38 3667	30,0000	107.0000	30,0000	0.0000	~
	<									>
- 1		_	_							DINU

Select some or all interferer stations 3

0 X

Interferer Stations

;;;					OK	Cancel				
	IDst	7	STname	STIat_deg	STion_deg	Sth_agl	TXfreq	Power_eirp	Azimuth	•
1	36		TZAFBIN	-6.4083	37.6250	30.0000	451.0000	30.0000	0.0000	
2	35		TZAFBIN	-6.2750	37.4167	30.0000	450.0000	30.0000	0.0000	
	34		TZAFBST	-6.9917	37.9000	30.0000	800.0000	30.0000	0.0000	
	33		TZAFBST	-6.9417	38.1417	30.0000	800.0000	30.0000	0.0000	
	32		fb	-7.5667	37.9167	0.0000	450.0000	10.0000	0.0000	
	31		fbint2	-7.2667	37.9833	0.0000	800.0000	10.0000	0.0000	
	30		fbint1	-7.4500	37.7667	0.0000	400.0000	10.0000	0.0000	
	29		fx110	-7.8750	38.0750	0.0000	1100.0000	10.0000	0.0000	
	28		fb11002	-7.8750	38.3083	0.0000	1100.0000	10.0000	0.0000	
	27		fb1100	-7.6333	38.1500	0.0000	1100.0000	10.0000	0.0000	
	26		fb700	-7.5167	38.8417	0.0000	700.0000	10.0000	0.0000	
	25		fb	-7.5000	38.4750	0.0000	700.0000	10.0000	0.0000	
	24		TZABC2	-7.7000	38.9333	30.0000	107.0000	30.0000	0.0000	
	23		TZABC1	-7.2000	38.3667	30.0000	107.0000	30.0000	0.0000	
	22		Tanzania	-5 7500	37 3167	0.0000	474 0000	10.0000	0.0000	×
<										ي ۲

Intermodulation results

Tran:	smitter (Interfer	er Station)		Rece	eiver (Wanted	Station)	Signal				ntermodulation	_
No.	Frequenc	Pj-in(dBm)	ID	No.	Frequenc	BandWidth(kHz)	€ Tw	-		C 2nd		
1	451	·128.09	36	1	452	8.5	C Tw	o and Thr	e	• 3rd	151	
2	450	-102.66	35				Order of	Harmonic	s : 3	○ 3rd a ○ 3rd , !	nd 5th 5th and 7th	
								Co-char	nnel Prote	ction Ratio	(dB): 9	
							Sensitivity Ps	(dBm) : 🗐	6.1	Recei	verGain(dB):	0
							- Input n-th orde	r Intercept	Point IIPr	(dBm)		
								2nd	3rd	5th	7th	
<			>	<		>	4()	12	10	8	
+	-		Х	+	– <u>A</u>	×		▼ 9	ihow All	~		;;
0	rder			Fi	requency (M	Hz)		P_IMP (dBm)	P_ino (dBm)	R(dB): Ps-Pino		
	HARMO	NIC :										
		NOT FO	DUND									
	3 2×(451	.000000) -1×(450.00	0000)	= 452.000000			-472.8	-472.8	356.7		





Intermodulation interference

2 Select a wanted receiving station

Interference	Monitoring
BC2BC	
BT2BT	
FX2FX(L	ink) >
FX2FX(S	tation) >
FXM	>
ES2ES	>
ES2FX	
FX2ES	
Intermo	dulation (SM.1134)

	Wanted	Rx Statior	1					-		×
					OK	Cancel				
	IDst	🔻 STn	ame	STlat_deg	STIon_deg	Sth_agl	TXfreq	Power_eirp	Azimuth	^
	1 37	TZA	INMO	-6.4667	37.3917	0.0000	452.0000	10.0000	0.0000	
	36	TZA	FBIN	-6.4083	37.6250	30.0000	451.0000	30.0000	0.0000	
	35	TZA	FBIN	-6.2750	37.4167	30.0000	450.0000	30.0000	0.0000	
	34	TZA	FBST	-6.9917	37.9000	30.0000	800.0000	30.0000	0.0000	
	33	TZA	FBST	-6.9417	38.1417	30.0000	800.0000	30.0000	0.0000	
	32	fb		-7.5667	37.9167	0.0000	450.0000	10.0000	0.0000	
	31	fbint	2	-7.2667	37.9833	0.0000	800.0000	10.0000	0.0000	
	30	fbint	1	-7.4500	37.7667	0.0000	400.0000	10.0000	0.0000	
	29	fx11	0	-7.8750	38.0750	0.0000	1100.0000	10.0000	0.0000	
	28	fb11	002	-7.8750	38.3083	0.0000	1100.0000	10.0000	0.0000	
	27	fb11	00	-7.6333	38.1500	0.0000	1100.0000	10.0000	0.0000	
	26	fb70	0	-7.5167	38.8417	0.0000	700.0000	10.0000	0.0000	
	25	fb		-7.5000	38.4750	0.0000	700.0000	10.0000	0.0000	
	24	TZA	BC2	-7.7000	38.9333	30.0000	107.0000	30.0000	0.0000	
	23	T74	RC1	-7.2000	38 3667	30,0000	107.0000	30,0000	0.0000	~
	<									>
- 1		_	_							DINU

Select some or all interferer stations 3

0 X

Interferer Stations

;;;					OK	Cancel				
	IDst	7	STname	STIat_deg	STion_deg	Sth_agl	TXfreq	Power_eirp	Azimuth	•
1	36		TZAFBIN	-6.4083	37.6250	30.0000	451.0000	30.0000	0.0000	
2	35		TZAFBIN	-6.2750	37.4167	30.0000	450.0000	30.0000	0.0000	
	34		TZAFBST	-6.9917	37.9000	30.0000	800.0000	30.0000	0.0000	
	33		TZAFBST	-6.9417	38.1417	30.0000	800.0000	30.0000	0.0000	
	32		fb	-7.5667	37.9167	0.0000	450.0000	10.0000	0.0000	
	31		fbint2	-7.2667	37.9833	0.0000	800.0000	10.0000	0.0000	
	30		fbint1	-7.4500	37.7667	0.0000	400.0000	10.0000	0.0000	
	29		fx110	-7.8750	38.0750	0.0000	1100.0000	10.0000	0.0000	
	28		fb11002	-7.8750	38.3083	0.0000	1100.0000	10.0000	0.0000	
	27		fb1100	-7.6333	38.1500	0.0000	1100.0000	10.0000	0.0000	
	26		fb700	-7.5167	38.8417	0.0000	700.0000	10.0000	0.0000	
	25		fb	-7.5000	38.4750	0.0000	700.0000	10.0000	0.0000	
	24		TZABC2	-7.7000	38.9333	30.0000	107.0000	30.0000	0.0000	
	23		TZABC1	-7.2000	38.3667	30.0000	107.0000	30.0000	0.0000	
	22		Tanzania	-5 7500	37 3167	0.0000	474 0000	10.0000	0.0000	×
<										ي ۲

Intermodulation results

Tran:	smitter (Interfer	er Station)		Rece	eiver (Wanted	Station)	Signal				ntermodulation	_
No.	Frequenc	Pj-in(dBm)	ID	No.	Frequenc	BandWidth(kHz)	€ Tw	-		C 2nd		
1	451	·128.09	36	1	452	8.5	C Tw	o and Thr	e	• 3rd	151	
2	450	-102.66	35				Order of	Harmonic	s : 3	○ 3rd a ○ 3rd , !	nd 5th 5th and 7th	
								Co-char	nnel Prote	ction Ratio	(dB): 9	
							Sensitivity Ps	(dBm) : 🗐	6.1	Recei	verGain(dB):	0
							- Input n-th orde	r Intercept	Point IIPr	(dBm)		
								2nd	3rd	5th	7th	
<			>	<		>	4()	12	10	8	
+	-		Х	+	– <u>A</u>	×		▼ 9	ihow All	~		;;
0	rder			Fi	requency (M	Hz)		P_IMP (dBm)	P_ino (dBm)	R(dB): Ps-Pino		
	HARMO	NIC :										
		NOT FO	DUND									
	3 2×(451	.000000) -1×(450.00	0000)	= 452.000000			-472.8	-472.8	356.7		





Practice and exercise







PRIDA Track 1 (T1)

ON-LINE English capacity building workshop

Frequency assignment

April 20 - May 1, 2020

Yasir Ahmed ITU expert Email: Yasir192@gmail.com



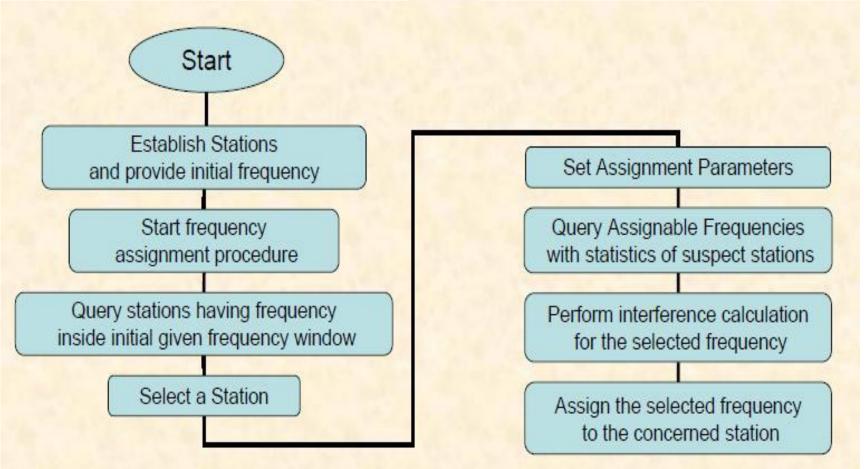


Frequency assignment

- SMS4DC is powered by an advanced method of frequency assignment
- based on interference calculations to/from any other stations (in these services) in a given frequency band inside a circular search area
- This procedure is implemented in the item "Frequency Allocations->Frequency Assignment"
- The procedure starts by selecting from a list of stations the national station for which a transmitting frequency assignment has been requested.
- after comprehensive interference analysis, SMS4DC will suggest a suitable frequencies for assignment



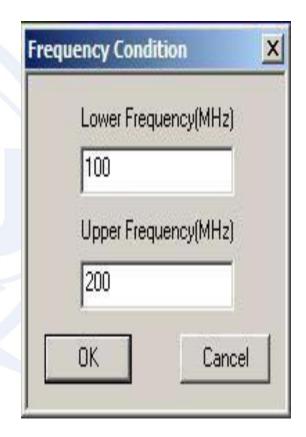








Since the number of national stations stored in the local database may become thousands, SMS4DC makes it easier to find the concerned station by applying a frequency condition (filter). This filter shortens the list to show only those stations within a limited frequency range specified to include the concerned station.







- Dialogue box is opened for the user to define the frequency range in which an assignment is required and thereby limit the number of stations listed in the station selection spreadsheet.
- Selection of a station can be made by a left click on the record-select column of the concerned row

SMS 4DC	Station Table						-		Х
				OK	Cancel				
	IDst	STname	STlat_deg	STion_deg	Sth_agl	TXfreq	Power_eirp	Azimuth	EI
	13	KENFX11	2.2083	37.1750	25.0000	8000.0000	50.0000	0.0000	0.
	14	KENFX22	2.1167	37.3583	25.0000	8000.0000	50.0000	0.0000	0.
	15	KENFX33	2.2917	37.2750	25.0000	8000.0000	50.0000	0.0000	0.
	17	KENFX44	2.2000	37.6500	25.0000	8000.0000	50.0000	0.0000	0.
1	18	FX55	3.4667	36.6583	30.0000	7170.0000	50.0000	0.0000	0.
	19	FX66	3.3667	36.8083	30.0000	7226.0000	50.0000	0.0000	0.
	20	FX77	3.3083	36.6167	24.0000	7296.0000	50.0000	0.0000	0.
۰.									
,									
<									1





- The assignment algorithm searches for suitable channels to assign within any channel plan arrangement in the range between Fmin and Fmax.
- Then, all existing stations within the "Channel Scan Range" of each channel in that plan and within the search radius specified are examined for potential interference.

A	Assignment Parameters	X
	Fmin(MHz) :Fmax(MHz) :145155Channel scan range(kHz) :15	
	Search Radius(km) : 50 Permissible field strength(dBuV/m) : 20	
	OK Cancel	





• 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 result dialogue box.

ist of	Frequenies	:						
No.	Fn	F'n	BandWidth	Num of Stations	PlanID	Srv Priority	-	C Selected Station
6	7198.0	7352.0	28.0	0	72750.028	Primary		Service : Fixed
- 7	7226.0	7380.0	28.0	1	72750.028	Primary		Station Name(1) : FX55
8	7226.0	7380.0	28.0	1	72750.028	Primary		Location : 036E3930_03N2800
9	7254.0	7408.0	28.0	0	72750.028	Primary		Emission : 8K50F3E
10	7254.0	7408.0	28.0	0	72750.028	Primary		
11	7296.0	7142.0	28.0	1	72750.028	Primary		Frequency(MHz): 7170
12	7296.0	7142.0	28.0	1	72750.028	Primary		Selected Channel(MHz) :
13	7324.0	7170.0	28.0	0	72750.028	Primary		No of Channels :
14	7324.0	7170.0	28.0	0	72750.028	Primary	-	Total: 20 With Interference: 4

 No.
 ID
 Name(2)
 Service
 Frequency
 Coordinates
 Dist_km
 E1_2
 E2_1
 dE1_2

 38
 (dBuV/m)



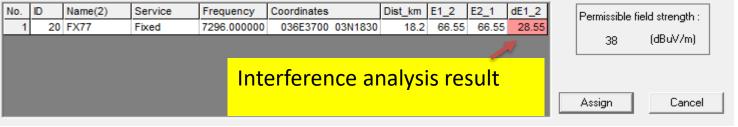


Choosing any row with yellow highlight from the list of frequencies by a mouse double left-click, initiates detailed interference calculations.

Double click to select the frequency for further analysis

Frequency may cause or receive interference

	Fn	F'n	BandWidth	Num of Stations	PlanID	Srv Priority		Selected Station	
6	7198.0	7352.0	28.0	0	72750.028	Primary		Service : Fixed	
7	7226.0	7380.0	28.0	1	72750.028	Primary		Station Name(1) : F×55	
8	7226.0	7380.0	28.0	1	72750.028	Primary		Location : 036E3930_03N2800	
9	7254.0	7408.0	28.0	0	72750.028	Primary		Emission : 8K50F3E	
10	7254.0	7408.0	28.0	0	72750.028	Primary			
11	7296.0	7142.0	28.0	1	72750.028	Primary		Frequency(MHz): 7170	
12	7296.0	7142.0	28.0	1	72750.028	Primary		Selected Channel(MHz): 7296.0	
13	7324.0	7170.0	28.0	0	72750.028	Primary		⊢ No of Channels :	
14	7324.0	7170.0	28.0	0	72750.028	Primary	-	Total: 20 With Interference: 4	





- After considering the results, a suitable frequency for assignment may be selected by a double right mouse click on the "No." (channel number) column and the row for the frequency to be selected.
- Once the "Assign" push button is used, the selected transmitting frequency in the list and its corresponding receiving frequency will be assigned to the concerned station

Assig	Assignment Results												
List of Frequenies :													
No.	Fn	F'n		BandWidth	Num of Stations	PlanID	Srv Priority			Selected Stati	on		
1	7142.0	7296	i.0	28.0	0	0 72750.028				Servi	ce : Fixed		
	7142.0	7296	i.0	28.0	0	72750.028	Primary			Station Nar	Station Name(1) : F×66		
3	7170.0	7324	4. 0	28.0		72750.028				Location : 036E4830_03N2200			
	7170.0	198.0 7352.0		28.0		72750.028				Emission : 8K50F3E			
5				28.0	0	72750.028				Frequency(MHz) : 7226			
6	7198.0			28.0		72750.028					Selected Channel(MHz) : 7198.0		
7	7226.0 7380.0		0.0	28.0		72750.028		_		566666 Chambel(M12). 1130.0			
8				28.0 0		72750.028	-			No of Channels :			
	9 7254.0 740		5. 0	28.0	0	72750.028			-	Total : 20 With Interference : 4			
										10(a). 20	With Interest Co. 4		
List of	List of Stations :												
No.	ID Name	e(2)	Service	Freque	ncy Coordinat	tes	Dist_km E1_	2	E2_1	dE1_2	Permissible field strength :		
											20 (dBuV/m)		
											Assign Cancel		

