

SPECIFICATION FOR A RF PLANNING, DATABASE AND SPECTRUM MANAGEMENT TOOL

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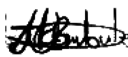

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I DOCUMENT AUTHORISATION

FUNCTION	NAME	TITLE & DIVISION	SIGNATURE	DATE
Compiled by :	B Nkambule	Engineer Transmission Network Engineering		12/08/2022
Reviewed and Authorised by :	M Mmbengwa	Principal Engineering		15.08.2022

II DISTRIBUTION

Once updated, a copy of the latest revision will be published in the document management system in use. E-mail to this effect will be sent to the relevant personnel or heads of department.

III DOCUMENT CHANGE HISTORY

ISSUE NO.	DATE ISSUED	ISSUED BY	HISTORY DESCRIPTION
1.00	August 2007	Transmission Services	New document
2.00	November 2007	Transmission Services	Added new subclauses

IV CHANGES SINCE LAST REVISION

CLAUSE	DESCRIPTION
8.7	Display the users online, on each user's display
8.8	Manual remote log off of a user that has not used the link.
8.9	Drive test module (coverage area) – Transceiver
8.10	The tool must ask for specs per device, to take into consideration the path loss.
9.4.1	Coverage Database -- save coverage plot so that it can be retrieved at a next sitting

V ABBREVIATIONS, ACRONYMS AND DEFINITIONS

ABBREVIATIONS AND ACRONYMS	DESCRIPTION
ATU	African Telecommunications Union
CEPT	European Conference for Post and Telecommunications Administration
CSV	Coma Separated Value
DEM	Digital Elevation Model
DoC	Department of Communication
DTM	Digital Terrain Model
ERP / EIRP	Effective Radiated Power / Effective Isotropic Radiated Power
FWA	Fixed Wireless Access
GIS	Geographic Integrated System
GSM	Global System for Mobile Communications
GUI	Graphic User Interface
HASL	Height Above Sea Level
ICASA	Independent communications Authority of South Africa
ITU	International Telecommunications Union
PMR	Professional Mobile Radio
PTMP	Point to Multipoint
PTP	Point to Point
RF	Radio Frequency
RSSI	Radio Signal Strength Indication
RTO	Radio Train Order
TRASA	Telecommunications Regulatory Association of Southern Africa
TX	Transmitter
URL	Uniform Resource Locator
UTM	Universal Terrain Map
DEFINITIONS	DESCRIPTION
None	

VI RELEVANT DOCUMENTATION

APPLICABLE

DOCUMENT NO.	DESCRIPTION	LOCATION
None		

RELEVANT

DOCUMENT NO.	DESCRIPTION	LOCATION
None		

1. INTRODUCTION

- 1.1 Transport Telecommunications is the telecommunications operator within the Transnet group providing special telecommunication services. The backbone infrastructure relies on the microwave radio network. There is a huge integrated separate radio trunking and Radio Train Order (RTO) network providing communications for both workforce and rail bound users/providers. There is also LTE (Long Term Evolution) and DMR (Digital Mobile Radio) that are in the pipeline as major networks to replace the current the radio trunking and Radio Train Order (RTO) networks.
- 1.2 As an operator, amongst others, Transport Telecommunications' mission is to ensure that there is proper radio frequency planning and that the assigned frequencies are utilised effectively and efficiently as expected by the Regulator.
- 1.3 In light of the above, Transport Telecommunications has resolved to procure an automated RF planning, database and management tool to enable planning, management and other related activities to ensure that there is a seamless, fast and efficient way of planning RF networks and managing our spectrum usage.
- 1.4 The tool must facilitate path planning, interference calculations, GIS updated maps and interchange with google earth.
- 1.5 Database management must also be able to perform spectrum management in order to help reducing cases of interference resulting because of manual frequency allocations.
- 1.6 An operational demonstration of the software, including the database/management tool, must be provided before the tender is awarded.
- 1.7 Training of the planning tool should be included.
- 1.8 The software is required to function with our existing maps. These are UTM maps from Computamaps. The software should also suggest freeware internal or external high-quality maps.
- 1.9 The software must able to make use of vertical, horizontal and cross polarization and consider different channel modulations.

2. WORKSTATION

- 2.1 The software must be on a server – client basis.
- 2.2 Software must be able to perform the following features.
 - 2.2.1 Operate at list on the following layers:
 - DEM

- Image
 - Palette
 - Clutter
 - Project
 - Network layers
- 2.3 Must be able to support planning for point to point and point to multi point for all frequencies 200 MHz to 90 GHz (E-band).
- 2.4 Be able to do E-band licensed and unlicensed network planning and next generation frequencies.
- 2.5 New site search in a marked area for best coverage/LoS (Line of sight).
- 2.6 Must be able to calculate multipath – worst month and rain – annual and rain.
- 2.7 Selection of the maps (South African digital maps including Provincial, regional, and different municipalities use existing UTM maps).
- 2.8 Selection of the modules to be displayed on the GUI (Fixed, Mobile, Earth Stations, etc.) must be selectable for different types of networks.
- 2.9 Must be able to calculate:
- Link profile
 - Grade of service,
 - Co channel interference,
 - Static interference,
 - Move interference,
 - Field strength,
 - Margin.
- 2.10 Must be able to zoom 1:1 to 1:60.
- 2.11 Display of azimuth, site address, radiation pattern and site code.
- 2.12 Must be able to search and insert a site using street address.
- 2.13 Curser toolbar must indicate longitude, latitude, altitude, clutter, dBm of the point the curser is on.
- 2.14 Choice of the display options (colour, font, size, units, etc.).
- 2.15 Stored in a file and can be exchanged between different users.

- 2.15.1 Selection of the databases.
- 2.15.2 Selection of the URL to be integrated in the workspace (Web sites, Intranet of the organization, Online help, etc.).
- 2.16 Definition of the queries (choice of the fields, filters, sorts, options, etc.).
- 2.17 Should be able to use two or more sectional maps at the same time for example in a case where two sites are on different UTM files / maps.
- 2.18 Software must be upgradeable.
- 2.19 It must be possible to unlock, drag and lock a site.
- 2.20 Must be able to open more than one planed network file at a time.
- 2.21 Must be able to add more than one already planned network file on current planned file.
- 2.22 Link profile report must show summary of parameters for both sites i.e., antenna height, azimuth, HASL, ERP / EIRP, TX power, RSSI, coordinates, feeder attenuation, radiation attenuation.
- 2.23 User must be able to define network layers, e.g., pending, license links, link colours etc.
- 2.24 Must be able to insert latest ICASA regulation for automatic frequency allocation. (e.g. Distance vs. frequency)
- 2.25 Software must make design recommendations.

3. DATA STRUCTURE

3.1 Resource and Spectrum Management Tables

- 3.1.1 These should play the role of libraries to quickly build the stations, be in line with organisations like the ITU and will include, but not be limited to the following:
 - 3.1.1.1 Table of antenna and radiation patterns.
 - 3.1.1.2 Table of station users and owners.
 - 3.1.1.3 Table of licenses with control of assignments.
 - 3.1.1.4 Table of sites.
 - 3.1.1.5 Table of equipment, including the type approval process.
 - 3.1.1.6 Table of frequency plans and channels (automatic generation of plans by formula).

- 3.1.1.7 Logically identical but physically distinct for each module (useful for the rights management).
- 3.1.1.8 Synthesis queries to view all the resources of a given type (sites of all modules, mobile module etc.).
- 3.1.1.9 Data Import/Export of data from/to the resource tables.
- 3.1.1.10 Data structures dedicated to the characteristics of each radio service (see clause No. 12 below).

3.2 **Identification**

- 3.2.1 Users should access the software with a username and password and have full user rights.
- 3.2.2 Tracks the data source from which each record in the database is generated (useful for the initial import and the communication between different licenced users).

3.3 **System**

Contains the configuration data, users rights, etc. must only be accessed by the administrator.

4. **DATABASE** (Administrator only)

- 4.1 Rights management adapted to each user.
- 4.2 Definition of profiles for the rights (eases the task of the administrator).
- 4.3 Capability to suppress/restore the referential integrity constraints to ease the data import.
- 4.4 Functions to repair the views if damaged.
- 4.5 Locking of the records if being edited.
- 4.6 Customisable fields.
- 4.7 Customisable lists of values.
- 4.8 Definition of reference geographical points and co-ordinates systems.
- 4.9 Definition of synchronization rules with planning tool.
- 4.10 Database must be able to store all project information including, emails, minutes, excel, site files, network design files etc.
- 4.11 The planning and spectrum management software should be linkable to the database/manager software.

5. INTEGRATION OF ITU-R RECOMMENDATIONS FOR FREQUENCY MANAGEMENT

- 5.1 Lists of values (Designation of emission, nature of service, class of station, administration, country, provisions of notification, provision of coordination, polarisation, system of satellites, etc.).
- 5.2 Generation of paper/electronic notification form.
- 5.3 Integration of data structures specified structures in the recommendations.
- 5.4 Integration of notification process and of coordination process when existing.
- 5.5 Management of agreements and plans.
- 5.6 Controls on consistency and sufficiency of data for the notification.
- 5.7 Controls on the assigned frequencies compared with the national and international allocations.

6. MAPPING

- 6.1 Conversion of coordinates from one geographical system to another one.
- 6.2 Conversion from address to GPS coordinates.
- 6.3 Display of links and stations on any type of map (images, DTM etc.).
- 6.4 Capability to process queries on the data displayed on the map.
- 6.5 Calculation of the altitude above sea level (based on the coordinates and the DTM), of the country (based on the coordinates), distance to the border (important for the co-ordination), coordination contour of the stations, distance to a reference point etc.
- 6.6 Optimisation of the access/ display for maps located on remote computers (useful for a network organisation using numerous and large maps).
- 6.7 Cartographic display engine (images, DTM etc.).
- 6.8 Triple set of coordinates for each site with automatic conversion.
- 6.9 Automatic frequency planning must be possible.

7. REPORTS

- 7.1 Generation of crystal reports.
- 7.2 Integration of logos, backgrounds, antenna patterns and extracts of maps (with setting of the scale).
- 7.3 Customisable reports.

8. DATA INPUT

- 8.1 Dedicated dialog boxes with control on the data coherence.
- 8.2 Input of several records in batch (simple mode, dialog box mode or report mode).
- 8.3 Control functions adapted to each module.
- 8.4 Calculation functions (azimuth, elevation, effective heights, coordination contour, cross polarisation, etc.).
- 8.5 Capability for the user to define reports for quick input.
- 8.6 Automatic update of dates/users of creation/modification for each record.
- 8.7 Display the users online, on each user's display.
- 8.8 Manual remote logoff of a user that has not used the link.
- 8.9 The tool must ask for specifications per devise, to take into consideration the path loss.
 - Cable
 - Connector
 - Duplexer
 - Radio
 - Lightning protector
 - Combiner

9. DATA EXCHANGE

- 9.1 Export of selections made in the queries to the clipboard (for paste in Word, Excel etc.).
- 9.2 Export of selections made in the queries to a CSV file (compatible with Excel).
- 9.3 Import/export to/from standard files.
- 9.4 Import/export to/from google earth.
- 9.5 Import/export to/from database / management.

9.6 Generic import/export under Access format:

9.6.1 Allows exporting a selection of records defined by the user.

9.6.2 Allows importing of the Access file into the system (useful for the initial import, or for the communication between different services).

9.6.3 Management of redundant data.

9.7 Import of raw tables (useful for the initial import combined with the functions of referential integrity constraints suppression/restoration).

10. ASSET / EQUIPMENT MANAGEMENT (OUTPUT FIELDS)

10.1 A set of databases is required for proper RF Planning and spectrum management modified to meet Transport Telecommunications requirements e.g.:

10.1.1 Interference analysis.

10.1.2 Equipment characteristics.

10.1.3 Manufacturer and Supplier.

10.1.4 Type approval certificates.

10.1.5 Bandwidth calculation including cost calculations for spectrum i.e. spectrum fees etc.

11. HELP

11.1 Online help.

11.2 Integration of the operation manuals into the application.

11.3 Visualisation of the data structure.

11.4 Technical support.

12. MODULES (Modules that come with the software or that a software can handle)

12.1 Notification of fixed and mobile services.

12.2 Earth Stations.

12.3 Co-ordination of the fixed and mobile services.

12.4 Microwave links.

12.5 Generic station.

12.6 PTMP

12.7 PTP

13. HARDWARE REQUIREMENTS

The tenderer shall state the minimum requirements for the hardware to run the package. Also specify Windows version compatibility.

14. GENERAL INFORMATION

14.1 All documents to be submitted in English (South African) language including the software commands.

14.2 Transport Telecommunications has the South African digital maps (20 m x 20 m).

END OF DOCUMENT