



SCOPE OF WORK

BACKGROUND

- a) Radio Frequency (RF) Planning is the process of assigning frequencies, transmitter locations and parameters of a wireless communications system to provide sufficient coverage and capacity for the services required.
- b) The RF plan of a cellular communication system has two objectives: coverage and capacity.
- c) The main objectives of RF point-to-point communication systems (Microwave systems) is line of sight and capacity.
- d) Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call/data session.
- e) Line of sight (LoS) is the electromagnetic radiation between two stations that have a direct view of each other without obstacles
- f) Capacity relates to the capability of the system to sustain a given number of subscribers. In term of microwave systems, capacity refers the complex measurement of the maximum amount of data that may be transferred over a link.
- g) Capacity and coverage are interrelated.
- h) To improve coverage, capacity has to be sacrificed, while to improve capacity, coverage will have to be sacrificed.
- i) The availability of a microwave link is dependent on the Line of Sight between the two sites, Line of Sight is directly proportional to availability of the link.



CURRENT SITUATION

- a) The tool we currently have was exclusively designed for microwave links, but since there was a need for radio planning, as it was then customised to accommodate the radio planning as well.
- b) The current tool is limited in terms of the technologies it can cater for; it can do analog networks up to 3G technology. But since we are planning for 4G it is not efficient to plan for the 4G technology.
- c) The current tool does not have updated cluster, making it difficult to design with realistic predictions.
- d) The current tool does planning for either vertical or horizontal polarization, it does not do dual polarization.
- e) The current tool only does the basics when it comes to the 4G network. It doesn't have the essential parameters of an LTE network which are; Physical cell identity (PCI), Signal Strength (RSRP), Signal Quality (RSRQ) Best CINR, Best Server Areas, Uplink and Downlink Throughput as well as an optimisation function.
- f) There is no support contract for the current tool. Which also makes it difficult to accommodate new users with licenses to operate it.
- g) It is not as efficient as we would like it to be for Radio coverage and Microwave planning hence results have to be verified with a temporary installation to authenticate them.



TECHNICAL SPECIFICATION

Introduction

- a) Rail Network Telecommunications is a department within the Transnet group providing special telecommunication services. The backbone infrastructure relies on the microwave and radio network. There is a sizable integrated radio Trunking and open channel radio network providing communications for rail bound users.
- b) The transmission network in addition to Optical Fibre Cable also relies on microwave links for data transmission.
- c) Transnet has a need for a reliable, RF network planning and optimization software/tool to be used by the RF Radio and transmission planners who are responsible for Transmission planning, RF planning, mobile network optimization and mobile network performance management.

Scope

- a) The planning tool must evaluate radio transmitter sites; predict, map, and analyse radio coverage; plan land mobile radio, conduct intermodulation and adjacent channel interference studies.
- b) The tool must be able to evaluate dual polarization modulation, E-band (Licensed and unlicensed) radio frequencies, azimuth, site coordinates, radiations patterns, site codes, Line of Sight, Fresnel clearance zone, fade margin, availability, and receive levels.
- c) It must model the physical layer of communication systems – specifically, RF propagation over terrain and clear line of sight between sites.
- d) The software must have the intelligence of storing site information for future referencing.



- e) On the Radio Planning sphere, the software must support these technologies: Analogue radio technologies (Open channel radio, MPT1327), 4G (Mission critical and commercial), 5G, IoT, DMR, P25 Wi-Fi (All standards)
- f) On the Microwave planning sphere, the software must support all legacy microwave technologies and new technologies that support wide range frequency planning including E-Band. The tool must also support planning for capacities of at least up to 20Gb/s and Channel Bandwidth from at least 7MHz to 112MHz and more.
- g) RF planning capabilities must give an up-to-date view of the mobile networks and should enable RF engineers to focus on the right mobile network planning and optimization tasks.
- h) It is essential for the software to address every stage of the network lifecycle, from strategic RF planning to mobile network design and management. It must also cater for re-planning and multi-technology and multi-vendor mobile network optimization, including small cells and heterogeneous networks (HetNets).

Requirements

The bidders must include the following in their submission:

- a) The lifespan of the software should be 5 years or more and be upgradeable for future advancements.
- b) The supplier must meet all requirements as set out in the Annexure E1- technical specification SPC-01293.
- c) Valid Certificate from a recognised Electronic and Computer engineering/ Telecommunication Laboratory



Other Requirements

Training

- a) Three training sessions with 10 delegates per session
- b) Technical training on the core of the Tool should be provided.
- c) Training should be offered on the system management.
- d) User manuals should be developed.
- e) Onsite functional training should be offered.

Support

- f) Support through an SLA must be provided
- g) Integration of the operation manuals into the application.
- h) Visualisation of the data structure.
- i) Technical support.
- Support must be specified on bid document