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 15 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