

IMPLEMENTATION OF NEW CELL SITE IN TELECOM SECTOR

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Abstract: *This paper reevaluates the basic requirements for the installation and implementation of new cell site in telecom sector and will discuss the impact of various physical and environmental conditions on the installation process.*

Keywords: Cell site, GSM, Multiplexer, base station subsystem

1. INTRODUCTION

In simple terms, a cell site depicts a place where antennas and electronic communications equipment are located, usually on tower or on some other high place, to create a cell (or adjacent cells) in a cellular network. This exalted structure includes antennas, set of transmitter and receivers, DSP processors, control electronics, electrical power backups, and sheltering. In GSM networks, the cell site is termed as base transceiver station (BTS) which reflects the increasing number of locations for multiple mobile operators and multiple base stations at a single site. Depending upon the technology used by mobile operator, even if a single site has only one mobile operator, then also it includes multiple stations to serve various wireless technologies.

A BTS is equipment that eases the flow of wireless communication between the subscriber's device and the network. The user equipment includes handsets, computers with internet connectivity, WLL phones. The network can use any of the wireless technology GSM, CDMA, WI-FI, WAN, but BTS is closely associated with mobile communication technologies (GSM and CDMA). In a more

general term, BTS is termed as radio base station or node B in case of 3G networks.

FACTORS AFFECTING THE WORKING RANGE OF BASE STATION

- Height of antenna
- Frequency of signal
- Transmitters rated power
- Data rates of device used by subscriber
- Geographical and weather conditions

2. INSTALLATION OF A NEW CELL SITE



Fig.1. Cell site

Base Station Subsystem (BSS) is a part of cellular telephone network responsible for handling and carrying

out the traffic and signaling between mobile phone and network switching subsystem (NSS). The BSS performs transcoding of speech channels, allocates radio channels to mobile phones, transmission and reception over air interfaces, all related to the radio network. Therefore, whenever a new cell site is planned to be installed, BSS is made responsible for the connectivity of that new cell site with the BSC of that area. Now, every cell site needs to be communicated with MSC for commissioning and integration and this connection is via BSC with the help of transmission media between known as E1 link.

An E1 link operates usually over coaxial cable. The data rate is 2.048Mbps i.e. full duplex (2.048 Mbps downstream and 2.048 Mbps upstream) divided into 32 timeslots, each time slot carrying 64Kbps of data. Whenever a new cell site is ready to install, this transmission media is to be carried to that cell site either through fiber connectivity or microwave links. If the fiber connectivity is not to be used, then the microwave links can be installed for carrying out this transmission media. Thus, the installation of these links requires three steps:

Planning: Cell planning involves all those activities that help in determining which sites will be used for the radio equipment, which equipment to be used and how the equipment it is to be configured. Also, it is very important to find the nearest cell site which should be in the visible range of the new cell site so as to align microwave link to the new cell site. Therefore, to assure proper coverage, and to nullify interference, every cellular network needs planning.

Commissioning: This step involves assigning transmission and receiving frequency to both ends of site. The transmission frequency of one site will be used as receiving frequency of others site.

Alignment: after installing microwave antennas, they are given appropriate height so that they can be easily visible and are aligned to get maximum transmission and receiving levels at both ends.

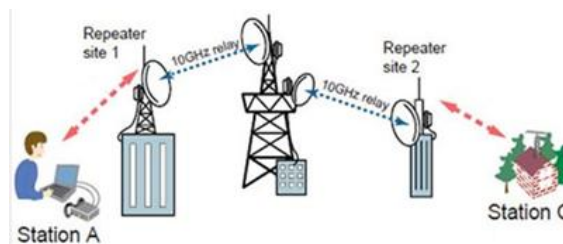


Fig.1. Microwave link

Therefore, in all the parameters to be considered while installing a microwave link are:

- Frequency
- Wavelength
- Free space loss
- Precipitation loss
- Antenna beam width
- Antenna gain
- Fresnel Zones
- Multipath reflections
- Atmospheric refraction
- Earth Bulge
- Phase relationships

3. MATERIAL REQUIRED FOR CELL SITE INSTALLATION

For the working of all the equipments, the major requirement is of power supply, therefore a power plant is to be installed so that it can provide -48 volt dc to the equipments placed inside the shelter. But power is the major source of failure for any cell site, therefore all the central offices and cell phone sites must have their own power sources in the form of batteries and emergency generators. But these sources are only operational if power failure is limited to a few hours or a few days. However, in the case of hurricanes and earthquakes, power may interrupt the system for several days or up to several weeks and in such type of events the power plants, central offices or cell towers will remain inaccessible. Thus, in total it depends on individual operator to determine the criticality of their services and to properly plan for potential communication and power failures that might impact them.

So, the essential equipments to be installed for this function are:

- **Power plant:** It consists of four rectifier units so that it can take input from electricity board which is a three phase connection and can give 48 volts dc to the equipments held in shelter. This output is also given to the battery bank for charging the batteries.
- **Battery bank:** It includes 24 cells each of 2 volts. This battery bank is used in between the time when the power from the electricity board fails and the diesel generator starts.
- **Diesel generator:** This offers a three phase supply to the cell site in case of a long power failure.

4. LOCATION OF CELL SITE

A cell site was installed at Hallomajra which is situated on Chandigarh-Zirakpur Highway to improve the coverage and network of this area and some other near-by areas such as Ramdarbar, Chandigarh-Zirakpur highway. As the fiber connectivity was not possible in this area, so a microwave link was planned to be installed from the nearest site, Sector 31 Chandigarh for the provision of media. This installation was done by sharing the infrastructure with Vodafone because for an individual operator, it is not possible to have its own shelter and tower, thus speeding up the installation process. Now, to install a microwave link, it is important to install IDU and ODU.

IDU: It is the indoor unit of microwave link which serves as the interface between outdoor unit and the customer's internet ready device (IRD) such as PC. IRD interface is used when the Ethernet cable is connected to NIC card. All-indoor systems consists of a radio, interfaces and a modem in a rack which is usually installed inside an environmentally controlled building with the antenna mounted outside. A transmission line, generally a waveguide connects this microwave radio to the antenna which provides an ease to access to all the system electronics without requiring tower climbs and also minimizing the length of cabling from the radio interfaces to

other termination equipment in the building. This unit is hopped on the transmission stand and is provided with -48 volts dc via MCB.

ODU: All-outdoor microwave systems are fully integrated and have been very popular thus these are widely used in wireless networking and Ethernet bridging applications. The main advantage of ODU is its "zero-footprint" design as this configuration requires no internal cabinet space or cooling, so it is more effective than other designs. Also, the all-outdoor system can deliver higher performance due to design efficiencies possibly in a fully integrated system thus minimizing and virtually eliminating the RF loss between the radio and the antenna. It is mounted behind the dish and connected to IDU via RF cable.

Details of Microwave link installed:

- Hop length: 3 Kms
- Link Type: SDH link
- Transmission frequency: 17737.5 MHz
- Receiving frequency: 18727.5 MHz
- Receiving level: -25 DBm
- Receiving threshold: -70 DBm

MUX INSTALLATION

Because the output from SDH link is optical, therefore a mux was required to be installed at hallomajra. The installation and maintenance of mux comes under the BSS department and the commissioning of mux comes under the transmission department which will undertake certain functions. But here the mux installed was Alcatel Lucent 1642 SM. This mux can be inserted directly into access rings or connected via unprotected or protected point-to-point links i.e. to connect large and medium business customers to the central office and the network interface used for connecting this to central office is STM-1 which will carries 63 E1's. For this cell site, 1642 mux was chosen because we didn't want to carry much media since the ring closure was not possible as there was no other near by site available also, a new cell site cannot be planned.

Installation & Commissioning of Multiplexers in MSC, BSC and Cell Sites requires:

- Installing the mux in the rack and then giving it the power from DC Distribution Box
- Installing The NVM (Non Volatile Memory) cards in the Mux
- Installing The DCDB in the rack.
- Power tapping from rectifier to DCDB
- Earthing the rack, and mux, from the earthing bar in the shelter.
- Commissioning of mux.
- Checking mux Transmitter power of all out ports
- Checking the transmitting power of both the optical ports using power meter.

Thus we have learnt that if any mishap happens or if the alarms are generated at a sharing site then they are to be communicated to the operator that owns the site and the owner will responsible for the provisioning of power at that site .

5. CONCLUSION

Here we conclude that for the implementation of any cell site, the basic requirements are: power plant, the installation of indoor and outdoor units and the most important is the mux, the provision of media. The material required for any cell site vary from one site to other as it all depends on the capacity of network i.e. how much amount of media it can carry

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