

Empirical Study on 3G-4G Optimization of Star Link Engineering Limited

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This Internship Report is presented for fulfil the requirements of the Bachelors Degree of Electronics and Telecommunication Engineering.

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APPROVAL

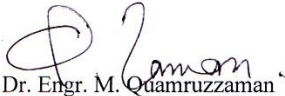
This Internship Report Titled “Empirical Study on 3G-4g Optimization Of Starlink engineering limited” is Submitted by MD.Mushfiqur Rahman to the Department of Electronics & Telecommunication Engineering, Daffodil International University, has been accepted as fit for the partial fulfillment of the condition for the Degree of BSc (Hon’s) in Electronics & Telecommunication Engineering & approved as to its style and guts. The presentation will be held on November,2019.

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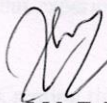
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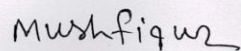
I proudly declare that this Internship Report has been done by me under the supervision of Engr. Md. Zahirul Islam, Assistant Professor, Department of ETE, and Daffodil International University. I also declare that this report has been submitted away for any degree.

Supervised By



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Firstly, I would like to thank to Almighty ALLAH for helping me from any trouble & he got me an opportunity to work with my internship Company named “STARLINK ENGINEERING LIMITED”. This company helps and guides me easily and fulfil my work experience in these four months. Some issues are creating while visiting the network site but experience is so good to work and visit with them.

Creating this internship report would not be possible without the support and direction of Honourable **Engr. Md. Zahirul Islam, Assistant Professor**, Department of Electronics and Telecommunication Engineering, Daffodil International University, Dhaka.

Mushfiqur Rahman

ABSTRACT

Base transceiver station (BTS) support multiple conversation with mobile station on different frequencies, each carrier signal must be amplified separately. It is possible to provide a signal power amplifier for each carrier, along with a frequency selective combiner. In this report, the optimization of 3G -4G BTS is described in order to provide more coverage by with best deal and best cellular technologies like 3G or 4G. Some indoor and outdoor equipment is studied empirically and mentioned their role in this report. Introduction of GSM antenna, microwave antenna, different types of transmission cables are addressed empirically.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Today we are living in modern era. Here we introduce new technology day by day. In before, we use 1G-2G network which minimum speed is so low but now we use 3G-4G5G network or technology within some couple of years. When we get this, our social & knowledgeable movements are increasing day by day. Our technology is also improved day by day. We can easily solve any problems using internet in a certain time. Internet makes our day more enjoyable. 3G 4G network activation and motorization are very important because without this, we cannot communicate with each other.

1.2 About Star link Engineering Limited:

Star link Engineering Limited is an Engineering servicing company providing full scope of engineering services like initial Site Survey, Planning, Installation, Commissioning, Operation and Maintenance as well as network optimization in the field of Telecommunication and Information Technology.

Star link Engineering Limited was started in 2008 by a group of young and passionate Engineering Team to partnership with different vendors, Telecom operators and corporate enterprises in Bangladesh. Star Link believes to maintain the world class standard of its quality products and services and promised to deliver its solution always on time, for making our customer's life easy and making work simple. Star Link is working for all

Telecom Operator in Bangladesh has its head office in Dhaka, Bangladesh with 556 employees all are well trained and efficient of doing most of the scope of Telecom Engineering services. (GP, ROBI, AIRTEL, BANGLALINK etc. and so on).

Star link Engineering Limited is well organized by a qualified professional management team. A group of passionate Engineering team leading Star link towards meeting the mission. All members are well trained in diverse discipline.

Customer	Major Scope	Remarks
	i. Rollout Services	Working Since 2013
	i. 2G and 3G Site Integration ii. Power and electrical renovation works	Working Since 2012
	1. Resource support for Drive Test service	Working Since 2013
	i. Rollout Service ii. RNO/P iii. Enterprise Services	Working Since 2010
	i. Rollout Service ii. Site Maintenance (Passive)	Working Since 2015
	i. Rollout Service	Working Since 2015
	i. Site Audit and Asset Reconciliation ii. PAT Services	Working Since 2015

Figure 1.1: Client list of Company

Star link works as a contractual company since 2008 and now its capital is so high. Almost all SIM companies are get contracted with this company. This company works or optimizes

2 things- “**Rollout services and Radio network**”. In rollout services, BTS, MSC, IBS installation and so on are available. Radio network only works for radio frequency optimization for any tower. E.co, Nokia, Ericsson also contracted the star link company for network and frequency optimization

1.3 Company Profile

Name: **Star link Engineering Limited**

Address:
Gulshan-Badda link road,
NEAR PRAN-RFL Center, Dhaka-1212

Telephone: +88029862208

Email: info@starlinkengineering.com

Website: www.starlinkengineering.com

1.4 Objective of the report:

The main objectives of this report are:

1. To recognize the 4G BTS (Base Transceiver Station) site.
2. 3G BTS site.
3. IBS site.
4. Optimize 3G-4G network technology.

1.5 Summary of the Report

The summary of my Internship is to improve an effective knowledge of 4G& 3G Network Optimization of Star link Engineering Limited. In before, I express the Details & objective of overall view during this internship work and I would describe the background of Star link Engineering Limited.

CHAPTER 2

3G TECHNOLOGY

2.1 Defination

3g technology is the third-generation technology which are better than 2g system. Its number of times every unit time is 1.6 to 2ghz. 100 mhz bandwidth¹, by numbers, electronic broadband² qualities, and cdma umts EDGE technology supports. let for viewing part names, readily moved television supports, facts rate is 144kbps to 2mbps



: 3G Technology

2.2 3G calling process

3G and 4G networks¹ line of work process are same but some amounts, degrees, points different are supporting the 2. 4Gs line of work process are much quicker than 3G network² system. Here least possible or recorded facts rate are countable and name moves one to another readily.

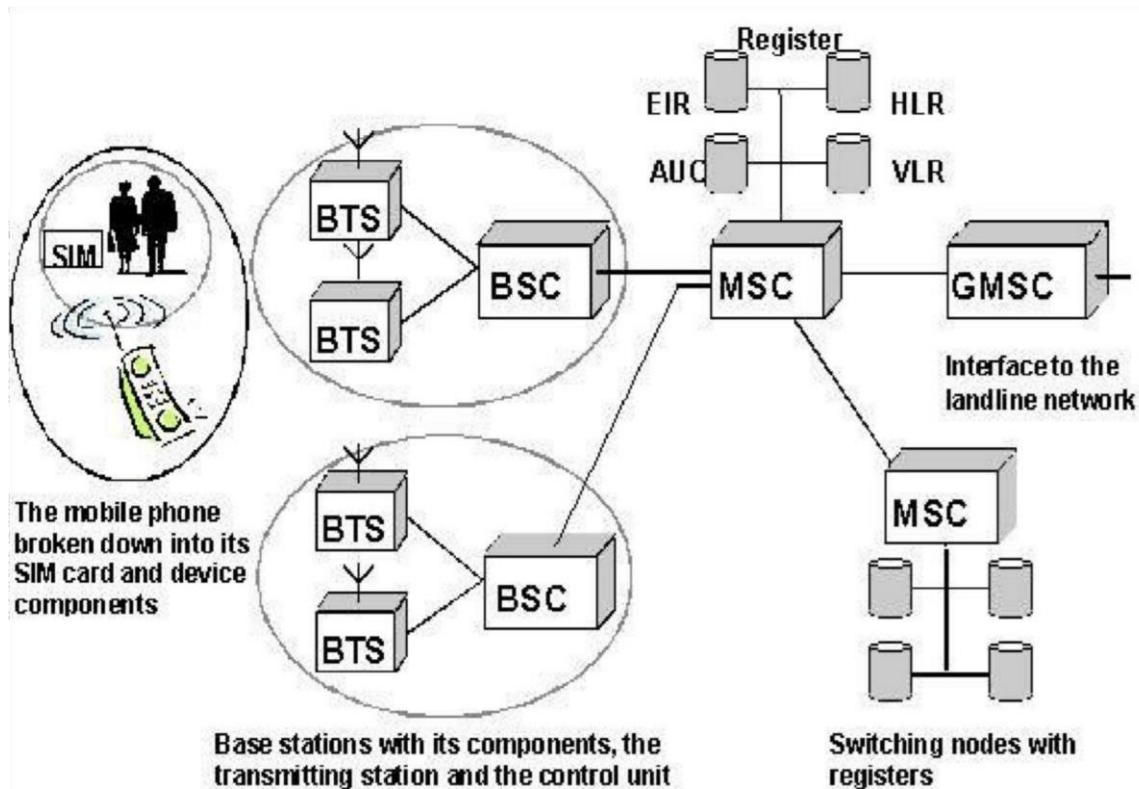


Fig-2.1: 3G Calling Flow

2.3 Features of 3G:

Features are-

This offers quicker interaction.

- Send & receive large email / messages.
- Internet protection is enforced at high speed.
- Live TV and phone calls are allowed.

- High room for broadband

2.4 Advantage Disadvantage

Advantages are-

Supports applications for multimedia information.

- The speed of data transfer is higher.
- Call rates are cheap.
- The positioning of mobile devices is determined.

Disadvantages are

- . If the 3 G link fails, activates the latest 3 G device.
- It takes more energy. □

Handsets compliant with 3 G

2.5 Summary of 3G technology

. Now a days, 3g technology are more useful in our day to day living. We take grass as food the place in the net easily and make a name make certain easily through the 3g system. We get more knowledgeable things from place in the net and we have learned more& more of great value things using 3g technology. Readily facts getting moved from one position to another, browsing places in the net, get the network compatibility are successfully done by this 3g system. So, this system is the making happy of current-day technology.



Fig-2.2: Airtel 3G Tower & Switchboard

3.1 Definition

This technology is the fastest technology while invention the network . It is also a secondgeneration technology which number of times every unit time are 3.95 GHz by numbers, electronic telecommunication system, bandwidth 450-3700 in Asia MHz by numbers, electronic qualities, only for teaching book notes supports. By numbers, electronic formed of small units& GSM technology supports and facts rate is 256kbps.



3.1Figure: 4G Technology



Fig3.2: Evaluation of 2G, 3G, 4G, 5G

Call Flow diagram:

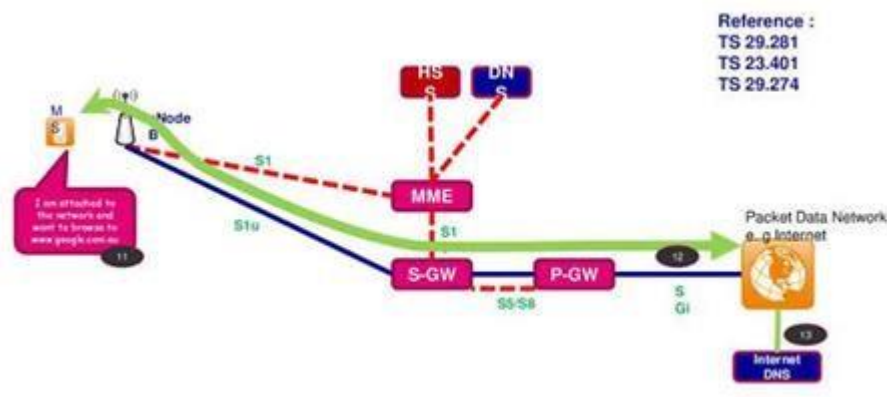


Fig3.3: Simple 4G Call flow

3.3 Features of 4G technology

The features are- Phone calls.

- Sends/receives Email messages.
- Web browsing.
- camera phones.
- Take a time 1 min for downloading an mp3 song.

3.4 Advantage

Advantages are-

- Increases the sound quality.
- Noise levels are low.
- Allows SMS & Email.

3.5 Disadvantages of 4G:

- Higher facts prices for users
- It is very costly and difficult to execute □ Hardware complex.
- The use of power is more important

3.6 Summary of 4G technology

Today 4 G technology for the communication system is better for days. By using this, we can conveniently send or receive data. We get too high speed to search and quickly upload some sort of file or mp3 song when we want to learn anything through GOOGLE. Network capacity also improves by switching the phones so that one day these 4 g networks will be upgraded and new technology will be developed for more and better communication



Fig 3.4: RX Box

CHAPTER 4

SWAP: 3G with 4G

4.1 BBU (Base Band Unit)

low pass (BBU) is one that passes high anapophysis in telecommunications networks. An outstanding work in wireless telecom is the low-pass procedure one and the RF advance one (RRU). The low pass one is a furnishing lodge office and joined via optical fiber with RRU. The BBU is trusted by the purgative software for information. The sequential function of a BBU.



Figure-4.1: Baseband Unit

A BBU in a comb fall a line corpuscle position is an electronic foreshadowing central processing unit to prosecute memorable onward speech for transfer to a liquid one and accept anapophysis reversed decision sign from the changeable. The electronic token central processing unit is also required to carry a first monitoring sound drift (SAT) for transmission the effect is mensurative. Multimode applications back from the BBU. Once

equipped with GSM, UMTS, and LTE back boards, these modes can be controlled by a BBU. Two BBU second two modes and two BBUs support three or four modes in dividedMPT scenarios. In the joint venture by breed to the excitable scenarios, one BBU second three or four modes. RRUs and RFUs are radio crowd one and nurture multimode and

4.2 Typical BBU Configurations

The BTS is the base transceiver station in a GSM network and supports the GSM cells, usually between 3 and 6 cells. The BTS and the BSC form the Base Station Subsystem (BSS)/GERAN connected to the Core Network (Network Subsystem). Attributions to the BBU slot

Slot 16	Slot 0	Slot 4	Slot 18
	Slot 1	Slot 5	
	Slot 2	Slot 6	Slot 19
	Slot 3	Slot 7	



FIG-4.2: DCDU (Direct Current Distribution Unit)



BASEBAND UNIT (BBU)

MRFU

Figure-4.3: Baseband Unit Configuration

4.3 GTMU (GSM Transmission & Management Unit for BBU)

The BBU (GTMU) system for GSM transmission, timing, and management monitors and handles the whole BTS. It offers interfaces for the reference clock, power supply, OM, and collection of existing alarms. GSM repair and transmission unit – in slot 5&6 at all times.

The GTMU performs the following functions:

- BTS monitors and handles.
- Fans and control modules are tracked.
- Needs 4xE1 ports transfer.

FE0 (electric) & FE1 (optical) 2xFE ports.

- Provides 6 CPRI ports for GTMU-GSM RRU / RFU interaction.
- Support system for fault management, configuration management system, performance management system and safety management program.
- • Provides the "ETH" Ethernet port.



Figure-4.4: GTMU (GSM Transmission & Management Unit for BBU)

4.4 UMPT (universal main processing and transmission)

- The entire narrative and transmission of capital (UMPT) can act in any system as a force law. GSM Service and Transmission System in Slot 7 at all times. UMPT consummates the function of the profession:
- Manages equipment and configurations.
- Supervises the feat and demonstrates the process.
- Provides a porthole for the USB.

- Transfer by transmission. signal transmission, and BBU interconnection. the types of UMPT boards-

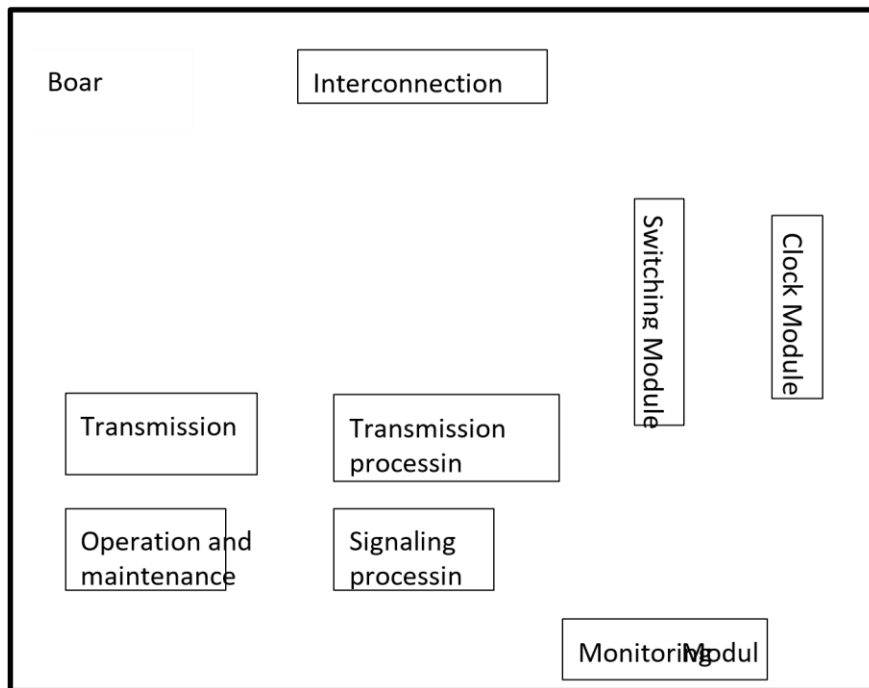


Fig-4.5 UMPT (universal main processing and transmission)

From SRAN9.0 onwards, UMPT boards are classified into the following types:

1 UMPTa series boards: UMPTa1, UMPTa2, and UMPTa6.

□ 1 UMPTb series boards: UMPTb1 and UMPTb2.

Board Type	Applicable Mode
UMPTa1 or UMPTa2	GSM, UMPT, LTE(FDD), and co-MPT multiple modes
UMPTa6	LTE(FDD), LTE(TDD)

The application scenarios of those UMPT boards:

We use umptb1 card for multimode. Because multimode work GSM, UMTS, LTE FDD, and LTE TDD modes.

The Working mode of a UMPT: Indicators R0, R1, and R2 on the UMPT panel are used to determine the working mode of the UMPT board.



□ Fig4.6: Workingmode of a UMPT(universal main processing and transmission)
R0 Green = The Board is working GSM mode. R1 Green = The Board is working UMPT mode
□ R2 Green = The Board is working LTE mode.

4.5 UBRI: Fiber Port Extension System for linking more than 6 RRUs to 1 BBU. 1 UBRI

board will accommodate only 1 system if GSM needs more than 6 RRUs and UMTS

requires 2 UBRI boards. UBRI is set up in the slot 2.



Figure-4.7: UBRI

UBBP:

- The whole low pass outgrowth one (UBBP) can provide practical assistance in any degree as a low pass prosecute pasteboard.
- The UBBP plank's function and working limit. UBBP consummates the successor office: low pass resort multiplexes between different modes, thereby securing multimode rivalry.

- Provides CPRI conference transport with RF modules and uplink protuberance and low pass extra downlink



Figure4.8: UBBP

Modes are supported by UBBP boards.

We use UBBPd6 model UBBP boards. The UBBPd6 application mode are:

- 1 GSM single mode.
- 1 UMTS single mode.
- 1 LTE FDD single mode.
- 1 LTE TDD single mode.
- 1 GU baseband concurrency.
- 1 GL baseband concurrency.
- 1 UL baseband concurrency.
- 1 GUL baseband concurrency.

If the base station now works in GSM mode and needs to work in GUL mode in the future, only the UBBPd6 board can be used. UBBP boards in different slots provide different capabilities. 1 In UMTS mode, only the UBBP board in slot 2 or 3 can provide CPRI ports.

4.6WBBP: A WBBP is a WCDMA baseband processing unit and can be installed in a BBU3900. The WBBP is classified of WBBPf3 and baseband processing board in slot 2 or 3 in a BBU3900 can transfer received CPRI data to other boards.

Board	Number of Cells	Number of UL CEs	Number of DL CEs	Number of HSDPA Codesb	Number of HSDPA UEs	Number of HSUPA UEs
WBBPf3	6	384	512	6x15	256	256



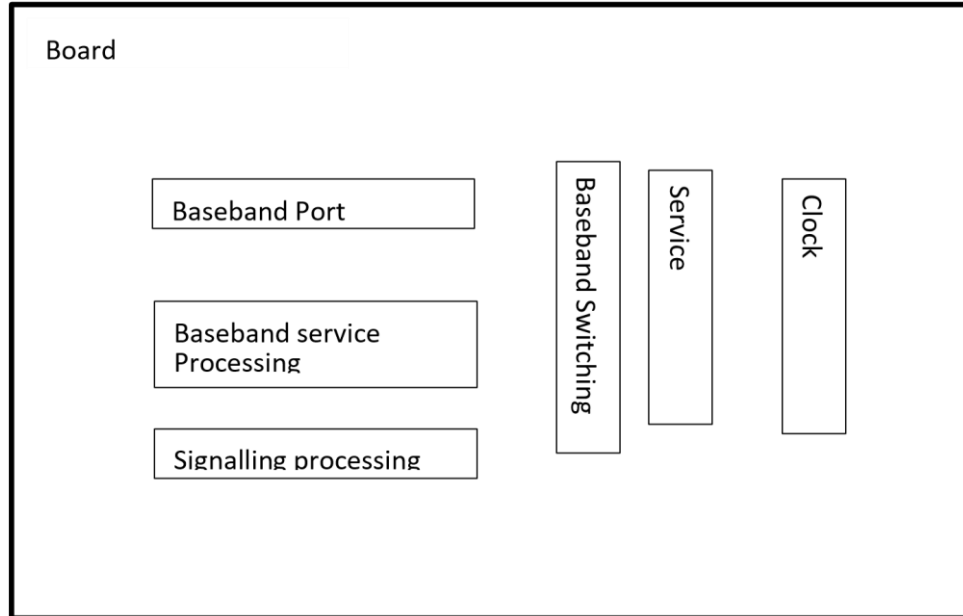
Fig-4.9: WCDMA baseband processing unit **Function:**

A WBBP uplink narrative and a low pass token downlink.

- WBBP leads to CPRI for RF device intercourse.
- WBBPd assists in the cancelation of interference (IC) inside the pane

*When the CPRI cablegram hyphenizes RF modules holding WBBPD answering cells, the WBBPd institutes uplink data cancellation (IC) in slam 2 or 3.

- Low pass interconnection between BBUs is supported by a WBBPf in hold 2 or 3.



4.7 MRFU (Multi-Mode Radio Frequency Unit).

One Multi-Mode Radio Frequency Unit (MRFU) supports a maximum of six carriers.

The MRFU has the following functions:

- Modulate and transform the token onto the TX belt by up-neophytizing the IF symbol, filtering out and extending the sign, and then transmitting the extraordinary through the duplexer to the sensor.
- Receives impressive aerial RF and carries out down-transmutation, extension, analogto-digital transmutation, electronic down-change, Electronic Automatic Gain Control (DAGC) and Digital Automatic Gain Control (DAGC). Provides knowledge of standing wave voltage (VSWR).
- Supply affects the RET feeler on the TMA and state.

- Generates a CPRI timepiece, generates a CPRI timepiece at the cost of synchronicity, and senses an affront.
- The lofty-success software MRFU subsists one, impressive prosecution one, amplifier power, and double one. Figure 4-39 shows the MRFU's competent form. The sequacious product has the proud-success interface: limitontrols clear DPD audio feedback

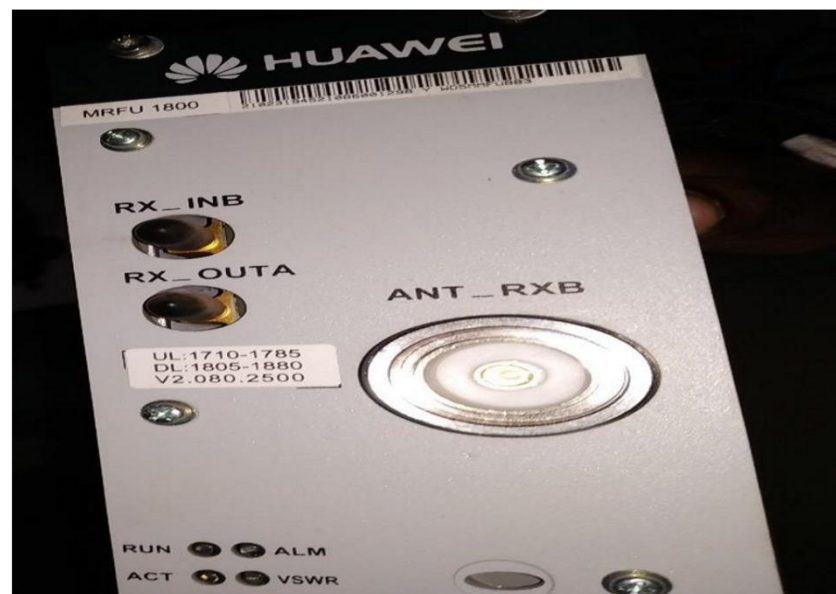


Fig-4.10MRFU

4.8 Remote Radio Unit

Radio Remote Unit (RRU) is the distributed and interconnected frequency unit which links the user equipment (UE's) such as cell phones or mobile devices to an operator's network

RRU Definition and Overview-



Fig-4.11: Remote Radio Unit (RRU)

The genuine "diversified and mixed" conditions are in that historically honeycombed radio workmanship is sponsored on an honest-standalone program (Base Stations) primarily in the home country, but now the favas ecclesiology is disunited. The BTS (Base Transceiver Station) is now an unknown arrangement between the BBU and RRU.

One from the phone. Although installed in the direction of the relation only. The optical interface connection is also given as CPRI (Common Public Radio Interface). Configuration protocol improved by lower telecom appointment scheme of the manufacturing society. The RRU solution to minimize the loss of coaxial pasture cable, advance system efficiency and contribute to the sense of loculamentosis Up to the strongest steady willow. This will definitely need to be changed with machinery and equipment, very happily. The RRU3959 is a radio system operated by an outdoor removal power cabinet. It is the RF unit of the base station and is located close to the antenna. The modulation of the RRU3959. Demodulation, information storage and combination of baseband and RF signals and separation. The RRU3959/RRU3959w has a dual-transmitter and dual-receiver design, further enhancing output and carrier capacity.

RRU Functions:

1. Acts as a transceiver: communicate and bear the authoritative use of the notorious circumstance and fault-versa.
2. Provides back-to-back maintenance and synchronization between the expectations of the use clause, lingering etc. 3. The EM sign retains from the Antenna through Jumper (Hollow Guide) control and progress.
4. Provide two curative bond interfaces: optical and electromagnetic (EM). Provide Controlling assist of the Auxiliary provision's resembling RCU (Remote Control Unit) for electrical lean arrangement commonly assumed as RET(Remote Electrical Tilt).
5. Generate and mail a separate VSWR, RET, ACT, etc. equivalent sign. RRU Hardware Description: RRU consists of a single database. I recapitulate the portal which is popular between uncertain brothers and sisters, possibly Huawei, ZTE, Ericsson.

5.1 Conclusion

Through my internship program, 3G and 4G system optimization are essential part for me. In a maintenance room, so much devices are arranged and connected there. Room also sensitive because all devices are kept safely and I also follow the safety rules. I also visit both BTS & IBS site but BTS site has so many devices than IBS site. 3G-4G tower height, distance all are important for a survey team leader. Every information related to the tower are so much confidential.

5.2 Limitation of the work

- >While visiting the site, site visited Instructions must be follows.
- >Using safety belts & dresses while go to nearest tower.
- >Drinking Plenty of Water.
- >Stay safely while working on the tower.
- >Optimize clearly the whole process of 3G 4G technology.
- >Neat & clean the maintenance room properly.
- >Safety shoes and don't wear too much weighable cloths.
- >If I go anywhere, inform the survey team leader obviously.

CHAPTER 6

SITE PICTURE

Now I am showing some site pictures where I visit. I visited BTS & IBS site both. My area was in AIRPORT ROAD. & MALIBAG



Fig 6.1: ROBI Tower & Switchboard



Fig-6.2: RRU Box (BTS)



Fig-6.3 - RX Rack with switches & Battery And RRU Connector Board(BTS)

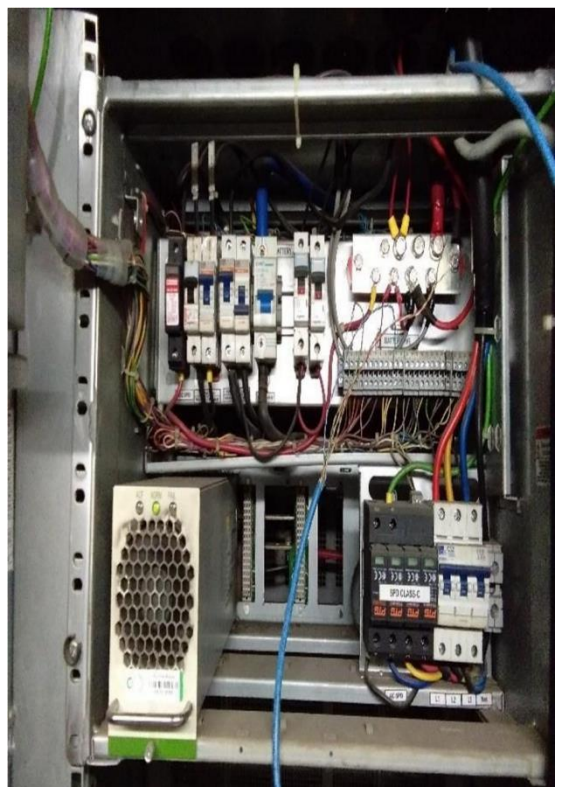
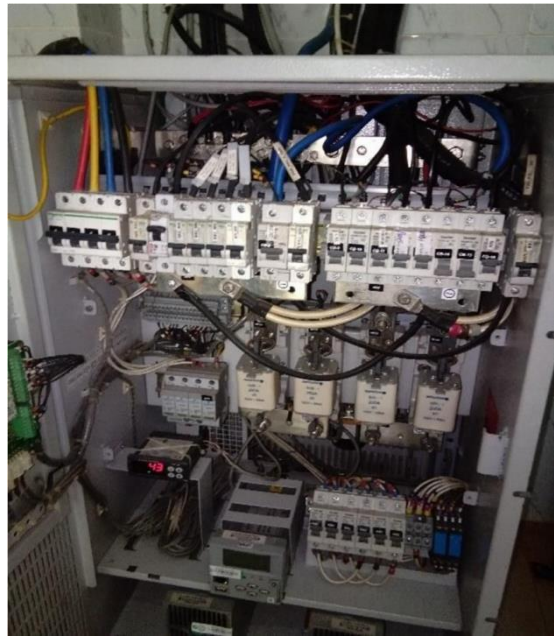


Fig-6.4 Battery with tx rack switch boards



Fig-6.5: Battery & RRU Boards

Reference:

[1] https://www.academia.edu/28051759/BTS_Base_Transceiver_Station_Structure_Installation_Operation_and_Maintenance_and_Parties_Included_in_BTS_System_in_Bangladesh. (Access time: xx/xx/xxxx at 11.00 am)

[2] <https://en.wikipedia.org/wiki/3G> time 11.29

[3] <https://en.wikipedia.org/wiki/4G> time 10.20