Chapter 7

UHF (Ultra High Frequency)

The previous description deseribes the media that use the conductor wires as their transmission path, so the affects of atmosphere and weather will not play the important parts with them. The following chapters describes the media that propagate through the atmosphere, so the atmospheric condition, weather and the surrounding are the important factors. These factors can be explained theoretically as follow.

7.1 General Aspects of propagation.

Adequate ground - to - ground UHF communication system performance obviously depends upon the characteristics of the transmitter, receiver, and associated accessories. This performance also depends upon the characteristics of the energy transfering media between the communication - terminds. A ultra high frequencies, radio waves are propagated through the earth's atmosphere: and the isnospheric phenomenon know as "Heaviside" layer reflection, which gives rise to long-range communications at the lower frequencies does not occur.No UHF energy is reflected from the ionosphere.

Meteorological Theory

The atmosphere is a gaseous layer enveloping the earth and is composed, in composit of dry gases and water vapor. It is a mixture of approximately 78% N2, and 1 % other gases and contain water vapor which varies in amount from o to 50% or more by volume.

If the state of the atmosphere above the entire surface of the earth is averaged over a long period, it is found that temperature, pressure and water vapor content decrease with in creasing hight above the surface of the earth.

Radio wave propagation includes everything that can happen to the energy radiated from a transmitting antenna during its journey to the receiving antenna. It includes the radiating directivity, and polarization; it includes free space attenuation of the wave with distance, and - encompasses such factors as refraction, reflection, interference, diffraction, absorption, and scattering.

7.2 UHF for MEA system

The frequenency of UHF is ranged from 300 MHz to 3000 MHz, so the effects such as.

1. Absorption
2. Scattering

will not occur, because the frequency is less than 5000 MHz.

The effect of ducts will occurs to the substations that are located near the sea or rivers, for the MEA.system. These substations are.

1. South Bangkok.
2. Paknam.
3. Tong kung.
4. North Bangkok
5. Samsen

AUHF radio set consists of

1. A transmitter
2. A Receiver
3. A Carrier Multiplexer
4. An Antenna.

The functions of the carrier multiplexer is to provide the channels for transmitting many signals at the same time such as.

1. Audio channel
2. Voice channel
3. Telemetering channel.

et.c.

The carrier multiplexer whose block diagram is shown is Fig.18. provides different frequencies in the allowable frequency band, by this method the signals will

not beat each other.

The telemetering channel is used for transmitting of several measured values such as.

1. Power in kilowatt-hour
2. Voltage in kilovolt.
3. Current or load in ampere.

et.c.

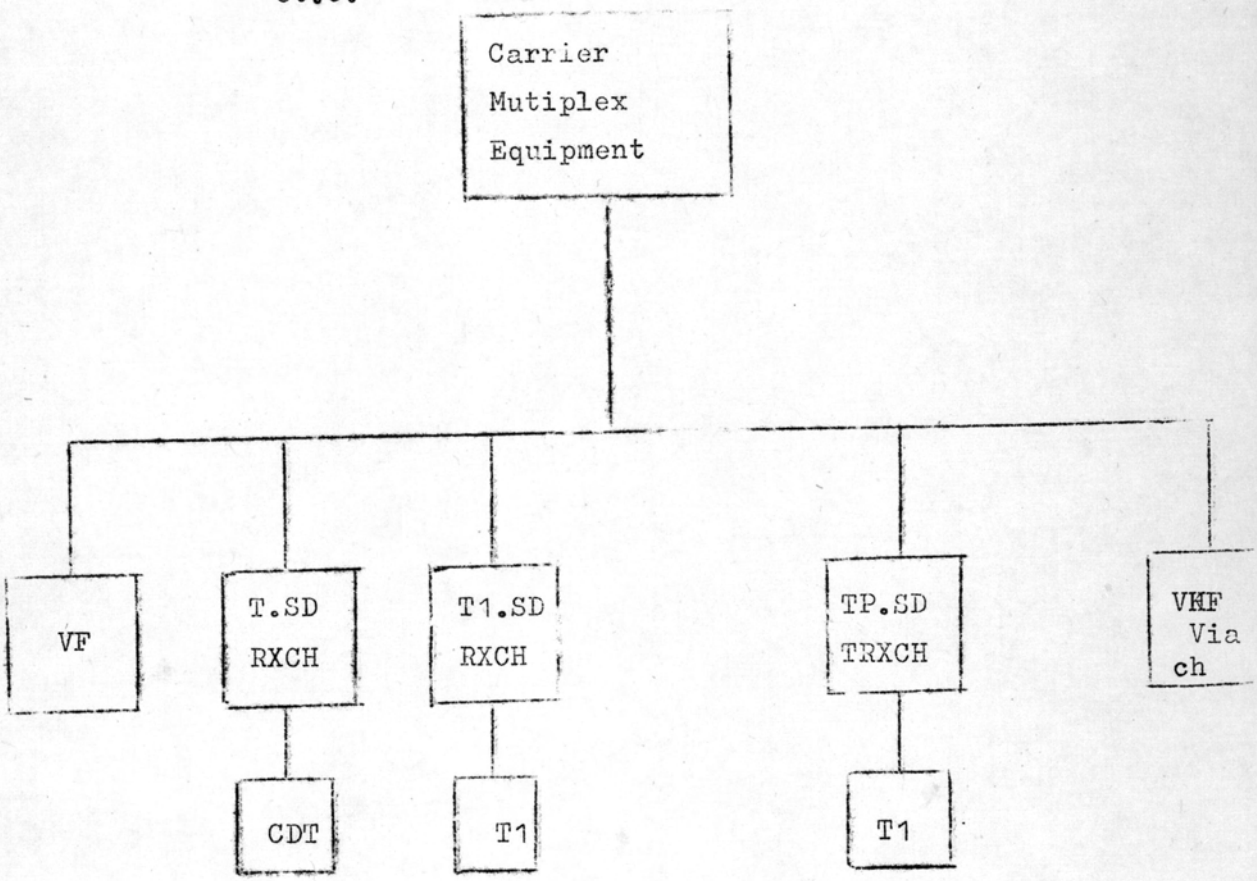

Fig. 18.

Carrier Multiplex Equipment.

LEGEND

VF	=	Voice Frequency Channel
T.SD.R / CH	=	Telemetering Sub-Divider Receiver channel
C D T	=	Cyclic Digital Telemetering
TI.SD RX CH	=	Tele-Indicator Sub-Divider Receiver Channel
TI	=	Tele - Indicator
TP.SDTR/CH	=	Tele Printer Sub-Divider Transceiver Channel
VHF Via CH	=	Very High Frequency Via Channel of Radio Link.

From the single line diagram of 230-69 kv.system (Route), all substations are located in the real sites and the distances from the center are indicated, which shows that the longest distance of the system is from the center to the Rungsit 2,about 39 Kilometers. So the repeater station is not necessary and we can omit it.

For the best operation and economic viewpoint,The Watlieb substation or the center which is surrounded by other substations must transmit the signals radially to the other substations by means of an omnidirectional antenna.

While other substations must transmit the signals only in the direction to the center by using the unidirectional antennas. If the communication between substations is required, the telephone is employed.

Fig.19 shows the UHF radio links from the Watlieb substation or center to the North Bangkok substation, the distance between these two substations is about 8 kilometers; Table 3 lists the distances from the center to various substations.

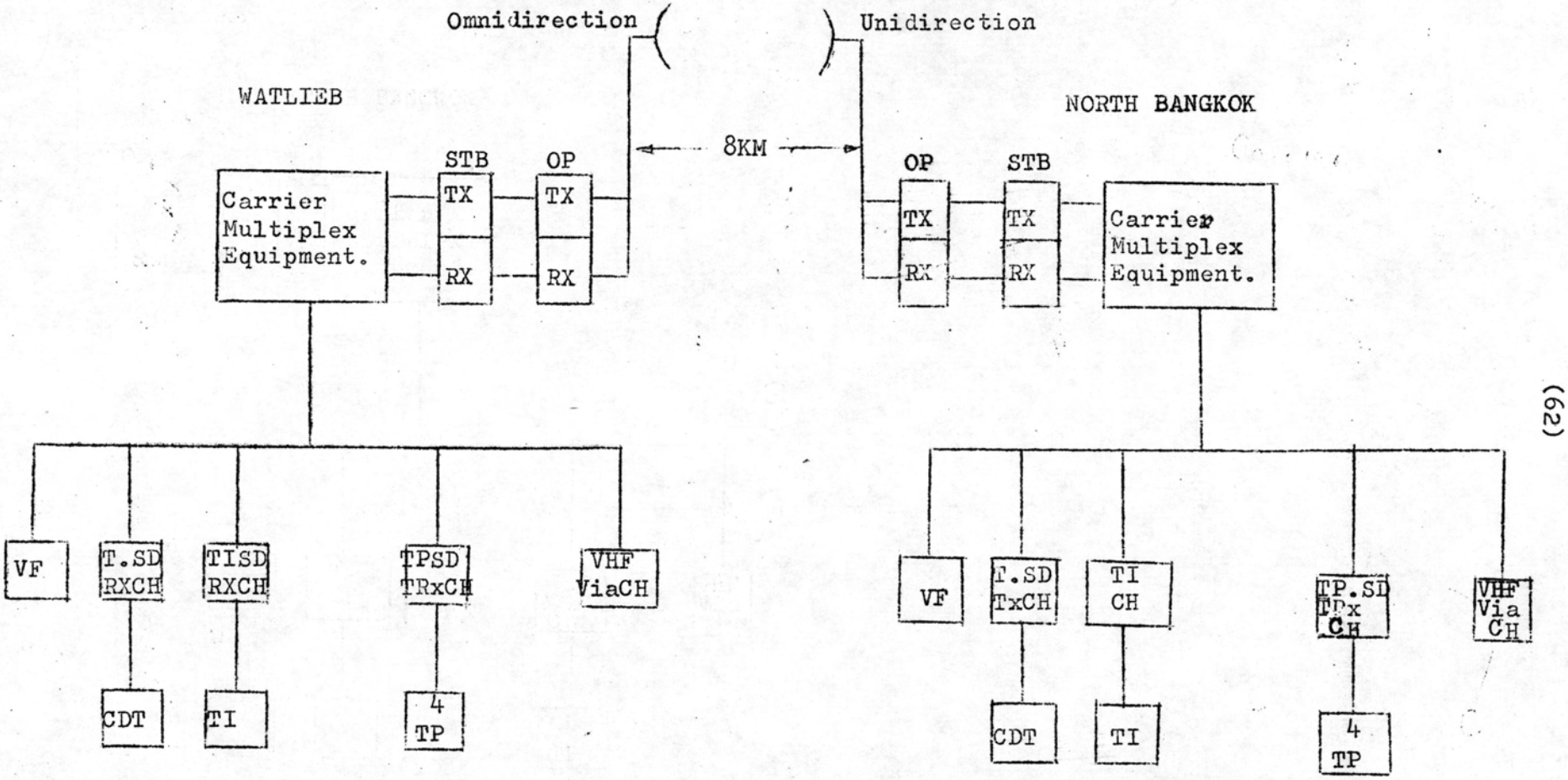

Fig 19.

The UHF Links between Watlieb & North Bangkok

LEGEND

T.SD.Rx CH	=	Telemetering Sub-Divider Receiver Channel
TI.SD RxCH	=	Tele-Indicator Sub-Divider Receiver Channal
TP.SD.TRxCH	=	Tele Printer Sub-Divider Transceiver Channel
VHF.Via CH	=	Very High Frequency Via Channel of Radio Link.
TI	=	Tele-Indicator
CDT	=	Cyclic Digital Telemetering
TP	=	Tele - Printer
TSD.TxCH	=	Telemetering Sub-Divider Transmitter Channel
TI.CH	=	Tele-Indicator Sub-Divider Transmitter Channal
OP	=	Operated Equipment
TSB	=	Stand - by Equipment
VF	=	Voice Frequency channel
TRx	=	Transceiver
TC	=	Tele - Control

Table 3

Substation	Distance from center (KM)(radial)
South Bangkok	16
Paknam	18
Phra Pradaeng	14
Samrong	15
Tongkung	13
Rasburana	10
Bangna	13
Mahamek	6.5
Phrakanong	10.5
Lumpini	5
Thonburi	3
Bangkok Noi	13
Bang-yee-khan	4
Sapandam	1.5
Patumwan	2.5
Makasan	9
Sansab	12
Bangkapi	23
Ramintra	8.5
Mochit	5
Samsen	8

Table 3 (Cont)

Substation	distance from center(KM)(radials)
Bangsue	
North Bangkok	8
Nonthaburi	15
Donmuang	18
Bangpood	21
Rangsit 1	31
Rangsit 2	39

7.3 Disadvantage.

The disadvantages of the UHF System are that it is less severe than the other types of medium,Because the UHF transmission transmits the signals in the form of waves, so the damages of the system caused by the accidents as in the cases of Pilot wire and PLC will not occur. The system is suitable for radial transmission, The thing that will occur to this system is only the propagation effects such as free space loss interfcrence, refraction.