APPLICATION OF MICROWAVE SYSTEM IN ETHIOPIA[1]

By

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Scope of Project

The initial plan for upgrading and developing the long-distance networks in Ethiopia involves the following projects:

1. Installation of a microwave system between Addis Ababa and Asmara.
2. Installation of 4-wire transit exchanges in Addis Ababa, Dessie and Asmara.
3. Construction of access roads and buildings for plant accommodation.

The total project is estimated to cost about $10.5 million and is scheduled for completion during the first quarter of 1973.

Type of Services

National telecommunication services may be broadly classified into three sectors namely: local, rural and trunk. Local services are confined to well built cities and towns while rural services cater for the small and dispersed rural communities. Finally trunk services cover all long-distance communications linking the various towns in a country. As this is the sector which is of relevance to the discussion of tonight I will accordingly confine my remarks to it.

Transmission Media

Basically there are three main methods of providing long-distance telephone circuits — open-wire, cable and radio. With due consideration to such factors as the number of channels required, route distance, geographical features of the country etc. economic selection studies are conducted to determine the most suitable transmission medium for the route in question. The following table serves as a general guide regarding the economic range of application of the varous systems.

DISTANCE / CAPACITY	0 - 50 kms	50 - 200 kms	Over 200 kms
Less than 100 channels	Loaded Cable Open-wire carrier	Open-wire carrier Symmetric cable	Open-wire carrier Symmetric cable Small coaxial cable
	VHF UHF	VHF UHF	Tropospheric scatter
100 - 1000 channels	Symmetric cable Load cable	Symmetric cable Coaxial cable	Symmetric cable Coaxial cable
	Microwave	Microwave	Microwave
Over 1000 channels	Loaded Cable Coaxial cable	Symmetric cable Coaxial cable	Coaxial cable
	Microwave	Microwave	Microwave

1. Presented at a dinner meeting of EAEA in August 1971.

In recent years there has been an explosive growth in telecommunication services and for meeting such impending demand tremendous strides have equally been made in the development of systems and equipment characterized by multi-channel capacities and high quality circuits. Depending on the stage of development of the national telecommunications network in a country the three systems mentioned above may coexist as complementary to one another. At an early stage of development open-wire line systems may prove to offer simple and economical solutions but apart from limitations in channel capacity they are subject to frequent damages and disruptions. Therefore, as the network develops gradually cables and radio links serve as the main transmission media for long-distance telephony.

Cable Systems

Development of carrier cables has progressed along two different lines i.e. symmetrical-pair cables and coaxial cables. Due to problems of crosstalk symmetrical-pair cable systems have been used at frequencies upto about 500KHZ, making possible the application of 120 channels when two separate cables are used. Coaxial cable systems, on the other hand, have been progressively developed upto the 12MHZ band which has a channel capacity of 2700 circuits.

RADIO LINK SYSTEMS

Radio transmission systems are operated in the following frequency ranges:

H.F. (High frequency)	3 - 30	MHz
V.H.F. (Very high frequency)	30 - 300	"
U.H.F. (Ultra high frequency)	300 - 3000	"
S.H.F. (Super high frequency)	3000 - 30000	"

H.F. radio systems had been in use for many years both for national and international communications. These systems offer upto four telephone channels per radio circuit and as they rely for their transmission on sky-waves reflected from the ionosphere they are susceptible to atmospheric changes and are thus of variable quality. Operation in the V.H.F. band (transmission over near optical path) gives rise to upto 48 good quality circuits.

In the U.H.F. and S.H.F. ranges systems have been engineered that provide wideband transmission capable of handling upto 1800 telephone channels or a television channel per radio circuit. These systems, known as "Microwave Radio Links", operate over optical transmission paths in the frequency bands ranging from 2 GHz to 11 GHz.

Suitable System for Ethiopia

After having carefully studied the various media of communications available for long-distance services IBTE has decided to install a micro-wave system in the Addis Ababa — Asmara route. Accordingly a contract has been signed for the supply and installation of a system with ultimate capacity of 960 telephone channels plus a television channel. This system is scheduled to be commissioned for service in early 1973, and similar plans are also underway for providing Addis — Dire Dawa, Addis – Shashamane and Addis - Jimma routes with microwave systems in subsequent years.

Final Goal

The aim of telephony is to furnish a fast, accurate and reliable communication at a reasonable cost. A microwave system plays a major role in the realization of this objective in that successive evolution in the design of equipment and the application of solid-state technique has made it a very reliable system at a reasonable cost thereby offering possibilities for optimizing performance with economy.

The ultimate goal of telephone service is the provision of fully automatic service to the subscriber. This is generally known as an STD (Subscriber Trunk Dialling) service and enables subscribers to make long distance calls directly by themselves rather than passing through operators.

STD Service in Ethiopia

With the exception of Addis — Debre Zeit and Asmara — Massawa routes all long distance calls in Ethiopia are at the moment handled manually i.e. through the assistance of operators. With the installation of a microwave system along the northern route it will be possible to provide STD service between Addis Ababa, Dessie, Asmara and Massawa by early 1973 i.e. subscribers in any one of these cities can communicate with the subscribers in the other cities by directly dialling the wanted numbers. This is by itself a significant step in the development of telecommunication services in the country.

In the establishment of STD service the role of the human operator is entirely taken over by machines. The establishment, routing and charging of calls have to be carried out automatically and this is done by installing appropriate type of telephone exchange in the cities concerned. Apart from this suitable plan must also be prepared covering aspects such as numbering, transmission and signalling.

Role of Microwave in IBTE's Network

The long-distance networks in Ethiopia comprise, at the moment, of open-wire line systems. As such systems have inherent drawbacks of limited channel capacity and frequent outages it has so far been possible to offer services of mediocre quality. There has been therefore a pressing need for upgrading and developing the national network with a view of rendering a fast and reliable communication.

Although co-axial cables are extensively used in many countries of the world it appears that a micro-

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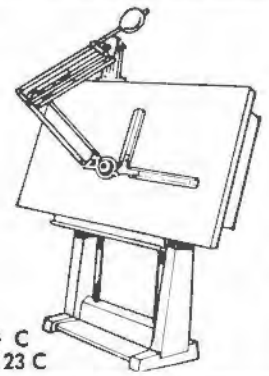

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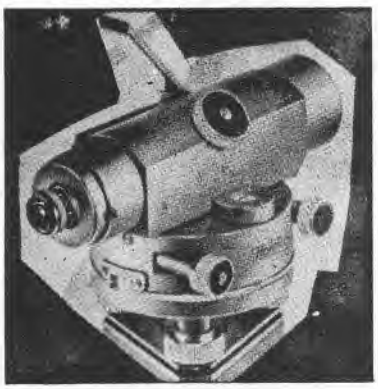

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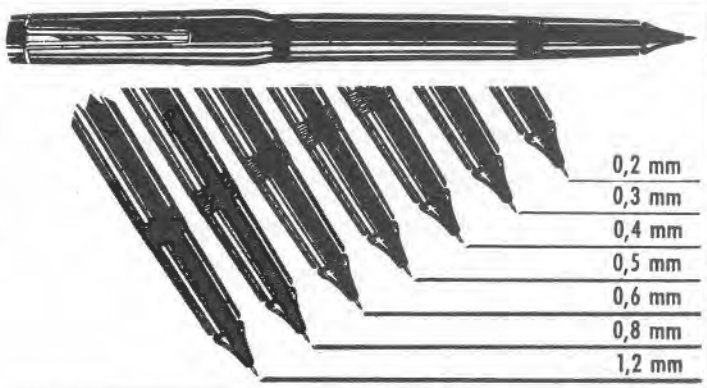

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wave system is remarkably more suited for meeting the long-distance requirements in this country. Operational experience from other countries as well as IBTE's own experience from the Asmara — Massawa route have convincingly proved the excellence in performance of microwave systems. Therefore the successive utilization of such a system along the major routes in this country would no doubt lead to the establishment of sound and reliable national network capable for handling volumes of traffic of considerable magnitude.

In summary, the implementation of the microwave projects would contribute towards the realization of the following main objectives:

1. The provision of bandwidth which is a basic commodity of the telecommunications trade. This would enable the transmission of a large number of telephone circuits as well as sound and television programmes. The present problem of delay in communications as a result of shortage of circuits will henceforth be eliminated along the routes where microwave systems are installed.
2. The establishment of high-quality and reliable links free from frequent disruptions and outages. This would provide clear and dependable service.
3. Possibilities for introducing STD service which would enable subscribers to dial long-distance calls directly by themselves. This would mean a fast and accurate long-distance service which had not been possible hitherto. It would also mean that long-distance services will be available on a 24-hour basis rather than the present practice of scheduled operation.