

RECOMMENDATION ITU-R F.1102-2

**Characteristics of fixed wireless systems operating
in frequency bands above about 17 GHz**

(Question ITU-R 107/9)

(1994-2002-2005)

Scope

This Recommendation provides characteristics of fixed wireless systems operating in frequency bands above about 17 GHz. The Annex 1 contains possible applications, hop length consideration, basic functions of transmitters and receivers, and other technical/operational characteristics required for the implementation of fixed wireless systems in this frequency range.

The ITU Radiocommunication Assembly,

considering

- a) that frequency bands above about 17 GHz are allocated to the fixed and other services;
- b) that the propagation characteristics above about 17 GHz are predominantly governed by precipitation fading and absorption and only suited to short range radio system applications;
- c) that differing applications of various administrations may require different radio-frequency channel arrangements;
- d) that several services with various transmission signal characteristics and capacities may be in simultaneous use in the same frequency band;
- e) that the various applications may require differing channel bandwidths;
- f) that new applications and network configurations are being used in high density deployment of fixed wireless systems in bands above about 17 GHz,

recommends

- 1 that system design should take into consideration the effects of precipitation outage which critically determines hop length;
- 2 that the frequency bands above about 17 GHz be used for short range applications which will allow equipment to be compact with smaller antennas;
- 3 that to allow the use of mixed services, whilst achieving spectral economy, the radio-frequency channel arrangements should be based on homogeneous patterns in accordance with Recommendation ITU-R F.746;
- 4 that both digital and wideband analogue modulation techniques are applicable;
- 5 that Annex 1 be referred to for guidance in system design.

Annex 1

Characteristics of fixed wireless systems operating in frequency bands above about 17 GHz

1 Introduction

In the frequency bands above about 17 GHz some allocations are provided for the fixed service on a worldwide basis. At these frequencies, outage is due primarily to precipitation fading lasting in excess of 10 s. Hence parameters of particular importance to the implementation of such systems are availability and transmitter-to-receiver path length (hop length) that may be achieved. These parameters are considered in this Annex for systems that are typically used in the local network.

2 Application considerations

2.1 Local access/networks

The frequency bands above about 17 GHz are being used mainly for short haul links. Compact and highly reliable radio equipment can support voice, data, video, and broadband data transmission.

The main applications are:

- interconnection of LANs;
 - interconnection between LANs (IEEE 802.3/Ethernet and IEEE 802.5/Token Ring) with a transmission capacity of the order of 10 Mbit/s;
 - interconnection between LANs (Ethernet including RLANs IEEE 802.11a/IEEE 802.11b/HiperLAN2/HiSWANa) with a transmission capacity of the order of 100 Mbit/s;
- video transmission;
- subscriber links;
- digital primary group or higher speed data links from end office to user buildings;
- cellular phone applications;
- interconnection between cellular phone exchanges and base stations;
- relief applications;
- transportable radio equipment used for backup links when optical fibre systems or other terrestrial circuits have failed;
- ring closure or point-to-point connection in the synchronous digital hierarchy (SDH) access network;
- high density access networks in, for example, subscriber-based applications.

Table 1 categorizes the above applications.

TABLE 1

A categorization of applications

	Physical link configuration	Transmission capacity	Content of signal	Hop length
LAN interconnection	User to user building	Order of 10 Mbit/s	Data	Several tens of metres to km
Subscriber links	From end office to user building	Analogue or primary rate digital group or higher PDH capacity	Data or video	Several km to tens of km
Inter-cell telephone applications	Between cellular system telephone exchange and radio base station	2 Mbit/s up to STM-1	Voice or data	Several km to tens of km
Transportable equipment for relief operations (see Note 1)	Backup for optical fibre links	Analogue or primary rate digital group – or higher PDH capacity or SDH	Voice, data or video	Several km to tens of km
SDH access network	ADMs ring closure/interconnection or tributary extension	SDH hierarchy	Virtual containers (Vc)	Several km to tens of km
High density subscriber-based access	Direct access to subscriber	Up to STM-1	Data and voice	Fraction of a km up to a few km
Vertically-connected wireless link	From user building to subscriber	Order of 100 Mbit/s	Data and video	Several tens of m

ADM: Add/drop multiplexer

PDH: Plesiochronous digital hierarchy

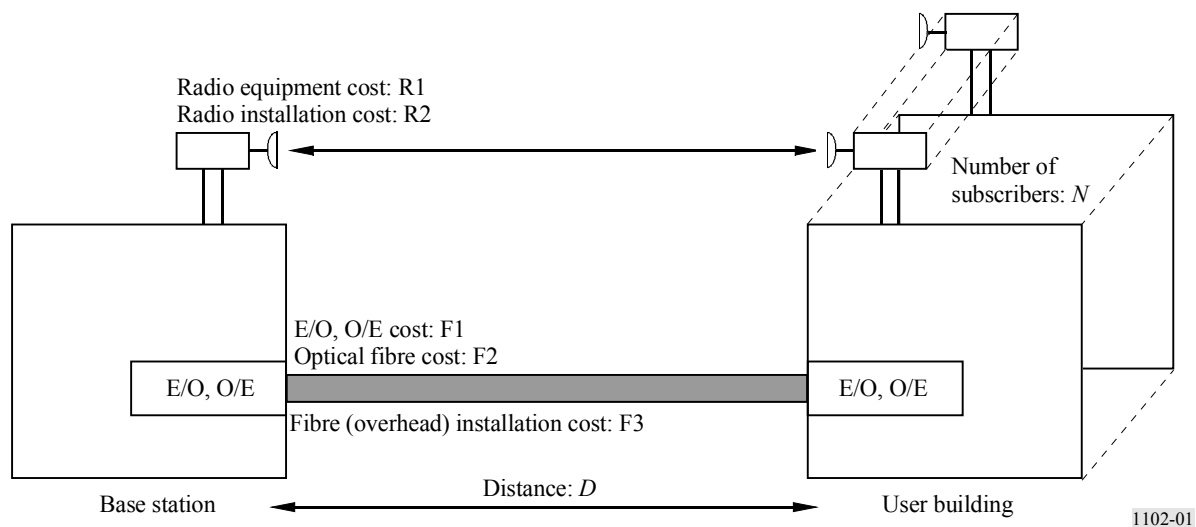
STM-1: Synchronous transfer mode 1

NOTE 1 – See Recommendation ITU-R F.1105.

2.2 Cost comparison between fibre and radio links in the access portion

An optical fibre system requires construction work continuously along the cable route. On the other hand, radio systems require such work only at the transmitting and receiving stations. For this reason, the greater the distance between locations, the greater the cost for a fibre system will increase. Costs are compared in the following simple model shown in Fig. 1.

FIGURE 1
Assumed model



Cost R for introducing a radio system is given by:

$$R = (R1 + R2) N$$

Cost F for introducing an optical fibre system is given by:

$$F = F1 N + (F2 + F3) N D$$

Figure 2 shows the result of cost comparison. According to Fig. 2, with the same number of subscribers, any increase in distance decreases the cost of radio with respect to that for a fibre system. Further, with the same distance, radio systems are advantageous when the number of subscribers is small. Moreover, the applicable area for radio expands sharply when the distance becomes greater.

FIGURE 2
Results of cost comparison between fibre and radio

