

RECOMMENDATION ITU-R F.1401-1^{*,**}**Considerations for the identification of possible frequency bands for fixed wireless access and related sharing studies**

(Questions ITU-R 215/8 and ITU-R 140/9)

(1999-2004)

1 Introduction**1.1 Purpose**

The objective of this Recommendation is to provide guidance for the identification of suitable frequency spectrum for terrestrial fixed wireless access (FWA) applications, taking due account of sharing issues. Both traditional wireless telephony applications as well as emerging broadband wireless applications are considered.

The potential for FWA to enhance availability of telecommunications services in both developing and developed countries is substantial.

1.2 Background

Wireless access has been defined (see Recommendation ITU-R F.1399 as “end-user radio connection(s) to core networks”, where core networks include, for example, PSTN, ISDN, PLMN, PSDN, Internet, WAN/LAN, CATV, etc. Wireless access applications can be provided within the definitions of the radio services FS, MS, FSS and MSS contained in the Radio Regulations (RR) (see § 4 for list of acronyms). FWA is one of these wireless access applications in which the location of the end-user termination and the network access point to be connected to the end-user are fixed.

Technologies in use today for implementing wireless access include cellular systems, cordless phone and cordless telecommunication systems, satellite systems, and specialized point-to-point (P-P) and point-to-multipoint (P-MP) fixed wireless systems. New technologies and systems such as IMT-2000, wireless broadband ISDN, wireless ATM, etc., also form part of wireless access if their application satisfies the basic criteria of end-user radio connection(s) to core networks (see § 4 for list of acronyms).

1.3 Traditional telephony wireless access applications

Advances in technology and competitive access are driving the revolution towards wireless access infrastructure for the provision of basic telephone service. Traditionally the most difficult component of the network to build and the least cost-effective to maintain has proven to be the LAN, regardless of a developing or a developed economy. The sheer scope of investment and engineering efforts required to build and maintain copper-based networks has made high penetration rates for basic telephone service available only to industrialized nations of the world.

* This Recommendation was initially developed jointly by Radiocommunication Study Groups 8 and 9, and afterwards revised by Study Group 9. Any further revision of texts relating to FWA systems derived from mobile technologies, i.e. § 1.3, 5.1, 5.2.1, 5.2.2, should be undertaken jointly with Study Group 8.

** This Recommendation should be brought to the attention of Radiocommunication Study Group 8.

Even the relatively low target subscriber density (teledensity) rate of 20 lines per 100 population set by the ITU, has been far beyond the capability of many nations until recently.

Wireless access is an application of radio technology and personal communication systems experiencing tremendous growth, especially in developing economies.

Generally, a wide range of radio system designs could be used for FWA and the suitability is a function of a number of factors. The most suitable system for a particular application will tend in general to depend on the requirements of the end-user, the cost of deployment (which will depend on the density of the subscriber population and the type of system being considered) and the availability of the appropriate radio-frequency spectrum for that system. The requirement for mobility or portability would tend to drive the deployment of systems derived from cellular technologies. Alternatively, the requirement for wireline quality and services (such as G3 FAX and voiceband data or even ISDN) would tend to be drivers towards special-purpose designed systems.

Understanding the drivers for the deployment of each technology is a key factor in minimizing the cost and maximizing the effectiveness of the solution. In some cases wireless access may offer potential for evolution and synergy with mobile services. An infrastructure supporting a fixed wireless system using an air interface developed for mobile services, (e.g. Recommendations ITU-R F.757, ITU-R M.622, ITU-R M.687, ITU-R M.819, ITU-R M.1033, and ITU-R M.1073) might be readily extended to support mobile users. Alternatively, special-purpose systems can be designed to meet the quality requirements in an optimal manner. Volume 1 of the ITU-R Land Mobile (including Wireless Access) Handbook, Second Edition, 2001, provides further information on the basic principles and descriptions of wireless access systems.

1.4 Broadband wireless access

Local access and other high density fixed wireless system planning and system deployments have developed in the last few years in many administrations. This development is due in large part to the trend towards increased demand and competition in the provision of high bit-rate local telecommunications and video distribution services. Because of cost and speed of deployment considerations, these developments are placing a major new focus on the provision of services directly to end-users via FWA systems.

Current broadband wireless access data rates over individual circuit paths range from about 1.5 Mbit/s to about 51 Mbit/s, and are expected to reach at least 310 Mbit/s within the next few years, as radios utilizing higher order modulation schemes become available (see Recommendations ITU-R F.758 and ITU-R F.1499).

The variety of possible broadband FWA network configurations includes: conventional P-P, conventional P-MP, and combinations thereof, e.g. P-P systems deployed in multisectorized P-MP configurations. High density deployment of independent P-P links similarly results in clusters that assume the essential characteristics of P-MP deployment. An emerging system architecture is that of MP-MP, similar to mesh systems used at, for example, HF.

These broadband FWA systems are predominantly deployed in dense urban, suburban, and campus environments where transmission path elevation angles may reach up to about 40° to 60° in particular in the higher frequency bands (see Recommendation ITU-R F.1498 dealing with the 38 GHz band). Links are regularly deployed on an on-demand basis to meet specific end-user requirements as they develop.

2 Scope

This Recommendation provides, as an initial in response to Questions ITU-R 215/8 and ITU-R 140/9, a methodology for identification of suitable frequency spectrum for FWA systems and a list of items to be addressed in identifying candidate bands. These take into account the results of ITU-R studies on compatible operations with systems in other radio services sharing the same bands, characteristics and operational requirements, spectrum requirements, and interference mitigation technologies. Bands identified using the methodology mentioned in § 6.1 could support traditional telephony wireless access applications or new and emerging broadband wireless access.

The scope of this Recommendation covers only FWA systems operating in the FS and MS allocations; i.e. terrestrial.

3 References

This list of references includes general references relevant to the topic of FWA.

- Recommendation ITU-R F.746: Radio-frequency channel arrangements for fixed service systems
- Recommendation ITU-R F.748: Radio-frequency arrangements for systems of the fixed service operating in the 25, 26 and 28 GHz bands
- Recommendation ITU-R F.749: Radio-frequency arrangements for systems of the fixed service operating in the 38 GHz band
- Recommendation ITU-R F.755: Point-to-multipoint systems used in the fixed service
- Recommendation ITU-R F.757: Basic system requirements and performance objectives for fixed wireless access using mobile-derived technologies using telephony and data communication services
- Recommendation ITU-R F.758: Considerations in the development of criteria for sharing between the terrestrial fixed service and other services
- Recommendation ITU-R F.1249: Maximum equivalent isotropically radiated power of transmitting stations in the fixed service operating in the frequency band 25.25-27.5 GHz shared with the inter-satellite service
- Recommendation ITU-R F.1399: Vocabulary of terms for wireless access
- Recommendation ITU-R F.1400: Performance and availability requirements and objectives for fixed wireless access to public switched telephone network
- Recommendation ITU-R F.1402: Frequency sharing criteria between a land mobile wireless access system and a fixed wireless access system using the same equipment type as the mobile wireless access system
- Recommendation ITU-R F.1488: Frequency block arrangements for fixed wireless access systems in the range 3 400-3 800 MHz

- Recommendation ITU-R F.1489: A methodology for assessing the level of operational compatibility between fixed wireless access and radio-location systems when sharing the band 3.4-3.7 GHz
- Recommendation ITU-R F.1498: Deployment characteristics of fixed service systems in the band 37-40 GHz for use in sharing studies
- Recommendation ITU-R F.1499: Radio transmission systems for fixed broadband wireless access based on cable modem standards
- Recommendation ITU-R F.1509: Technical and operational requirements that facilitate sharing between point-to-multipoint systems in the fixed service and the inter-satellite service in the band 25.25-27.5 GHz
- Recommendation ITU-R F.1518: Spectrum requirement methodology for fixed wireless access and mobile wireless access networks using the same type of equipment, when coexisting in the same frequency band
- Recommendation ITU-R M.478: Technical characteristics of equipment and principles governing the allocation of frequency channels between 25 and 3 000 MHz for the FM land mobile service
- Recommendation ITU-R M.819: International Mobile Telecommunications-2000 (IMT-2000) for developing countries
- Recommendation ITU-R M.1033: Technical and operational characteristics of cordless telephones and cordless telecommunication systems
- Recommendation ITU-R M.1073: Digital cellular land mobile telecommunication systems
- Recommendation ITU-R M.1390: Methodology for the calculation of IMT-2000 terrestrial spectrum requirements
- Recommendation ITU-R M.1450: Characteristics of broadband radio local area networks
- Recommendation ITU-R M.1454: e.i.r.p. density limit and operational restrictions for RLANs or other wireless access transmitters in order to ensure the protection of feeder links of non-geostationary systems in the mobile-satellite service in the frequency band 5 150-5 250 MHz
- Recommendation ITU-R SF.1484: Maximum allowable values of power flux-density at the surface of the Earth produced by non-geostationary satellites in the fixed-satellite service operating in the 37.5-42.5 GHz band to protect the fixed service