



Recommendation ITU-R F.2086-0
(09/2015)

**Deployment scenarios for point-to-point
systems in the fixed service**

F Series
Fixed service



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Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R F.2086-0

Deployment scenarios for point-to-point systems in the fixed service

(Question ITU-R 252/5)

(2015)

Scope

This Recommendation contains information on deployment scenarios and related statistics for some point-to-point fixed wireless systems in the fixed service operating in the frequency range 1.4-86 GHz. This information can be used in sharing and interference studies between these systems in the fixed service and systems in other services. This Recommendation is intended to be used in conjunction with Recommendation ITU-R F.758.

Keywords

Deployment, point-to-point, sharing, elevation angle, link length, antenna height

The ITU Radiocommunication Assembly,

considering

- a) that it is often necessary to study sharing between point-to-point (P-P) systems in the fixed service (FS) and systems in other services in frequency bands which are allocated to both services with equal rights;
- b) that interference from other systems in services operating in the same band on a non-primary basis, unwanted emissions from other systems in services operating outside the band allocated to the fixed service, and emissions from sources other than radio services need also to be taken into account;
- c) that the deployment scenarios of systems in each service needs to be understood in order to establish the sharing models to be studied;
- d) that availability of basic information on FS point-to-point deployment is useful for sharing and interference studies involving FS and other services,

noting

- a) that Recommendation ITU-R F.758 provides information on the development of sharing criteria and assessment of interference conditions between the FS and other services and other sources of interference;
- b) that Recommendation ITU-R F.758 also provides guidance to the technical characteristics and typical system parameters of digital fixed wireless systems that need to be taken into account when developing criteria for sharing and compatibility with other services and radio applications;
- c) that Recommendations ITU-R F.699 and ITU-R F.1245 provide FS P-P antenna reference radiation patterns for peak side-lobe and average side-lobe, respectively,

recommends

that, when more specific information is not available, the information in Annex 1 should be used for FS point-to-point deployment scenarios in conjunction with statistical data in Annex 2 which may be used when studying sharing or interference between point-to-point systems in the FS and other systems/applications in the FS and other services.

Annex 1

Deployment scenarios for point-to-point systems in the fixed service

1 Introduction

As a default in the absence of more specific information, the parameters and assumptions in this Recommendation are recommended for use in technical studies on sharing or interference involving FS P-P systems in bands above approximately 1 GHz¹.

For simplicity, assumptions for the frequency bands in this Recommendation are shown for broad frequency ranges in some cases. This is done for simplicity and does not imply any allocation issues.

2 Deployment scenarios for FS point-to-point systems

The type of application for which an FS P-P system is used, and therefore the way the system is deployed, will broadly vary by frequency range and geographical environment in each administration.

- Lower microwave bands roughly below 11 GHz allow for long hops, but provide channel widths up to 28/40 MHz possibly doubled through dual channel aggregation. These characteristics are particularly well-suited to long intercity routes (e.g. along highways, railways, electrical transmission corridors and other rights-of-way). Systems in these bands may be used as an alternative to fibre or redundancy, in rugged terrain where it is difficult to deploy fibre or a case where low latency is desired. Links in these bands are less commonly (or less densely) deployed in urban cores and overall numbers of links in these bands are lower than at higher frequencies. It should be noted that radio links in these bands are likely to be deployed in star configuration converging to an FS station located in urban cores.
- Medium microwave bands roughly 11-23 GHz still allow for relatively long hops and provide wider channels compared to lower bands. These bands are often used for backhaul for mobile infrastructure within urban and suburban areas, often using ring or star configurations. Numbers of links as well as deployment density in these bands can be very high.
- High microwave bands roughly above 23 GHz, but below 30 GHz, are suitable for short hops but can provide large bandwidths. These bands are most popular in urban areas as an alternative to fibre, to link campuses or to provide backhaul for cell sites, especially small cells. Generally, systems will only extend to one or two hops. Numbers of links as well as deployment density in these bands can be very high in dense urban areas and use of these bands is increasing rapidly.
- Millimetric wave bands at frequencies above 30 GHz are suitable for short hops and are appealing for their high performance (very large bandwidths and high data rates). The propagation characteristics and antenna directivity are ideally suited for a high density architecture of short-range point-to-point links with a high level of frequency reuse. Millimetric wave fixed service links are capable of providing fibre-like multi-gigabit

¹ For the purposes of description, commonly used nomenclature refers to the frequency range of 300 MHz to 300 GHz as “microwaves”. In terms of frequency bands, according to RR No. 2.1, the frequency range of 30 GHz to 300 GHz is designated as “millimetric waves”.

capacity. Some of the links could be deployed in an uncoordinated manner. Potential applications of millimetric wave fixed service links include transport for: wireless local area networks (WLANs), wireless personal area networks (WPANs), mobile broadband (i.e. backhaul), high resolution nomadic multimedia services, and wireless video distribution systems. It is expected use of these bands will increase as technologies develop and mature.

These descriptions are broad generalizations and in practice there is considerable blurring and overlap between these general categories for frequency ranges and the corresponding applications.

It should be noted that for millimetric wave fixed service applications, several bands are not discussed further in this Recommendation. These include, in particular, the fixed service bands of 92-94 GHz and above. Therefore references in this Recommendation that refer to “above 23 GHz” do not include these higher frequency millimetric wave bands for fixed service allocations.

3 FS point-to-point parameters for use in technical studies

3.1 Interference criteria

Refer to Recommendation ITU-R F.758 for general information and guidance regarding interference criteria for technical studies.

3.2 FS point-to-point equipment parameters

The primary reference for assumptions regarding FS equipment parameters is Recommendation ITU-R F.758, Annex 2. If there is no information on the frequency range of interest, there is additional information in Recommendation ITU-R F.758, Annex 3.

In cases where there is no relevant information in either of these Annexes, and in case it is desired to analyse analogue systems, there is an archive of additional, though potentially outdated, equipment information in Report ITU-R F.2108.

3.3 Reference antenna patterns

The appropriate choice of reference antenna pattern for analyses involving FS point-to-point systems will depend on the scenario being studied:

- for cases where there is a single (or limited number of) interference source and static geometry, it is recommended to use a peak side-lobe pattern such as the one described in Recommendation ITU-R F.699;
- for statistical and time varying analyses as well as cases where there is an aggregation of interference from a large number of sources as well as for spatial statistical analyses, the use of a peak side-lobe pattern would tend to overestimate the level of interference. In these cases, it is recommended instead to use an average side-lobe pattern such as the one described in Recommendation ITU-R F.1245.

3.4 Propagation models

The appropriate P-series Recommendation(s) for analysing interference should be utilized.

3.5 Deployment-related parameters

In this Annex, the following deployment-related parameters are discussed as typical elements to be used for the sharing and interference studies involving P-P systems in the fixed service: