

RECOMMENDATION ITU-R F.1571*

Mitigation techniques for use in reducing the potential for interference between airborne stations in the radionavigation service and stations in the fixed service in the band 31.8-33.4 GHz

(Question ITU-R 224/9)

(2002)

The ITU Radiocommunication Assembly,

considering

- a) that the band 31.8-33.4 GHz is allocated to the fixed service (FS) on a primary basis in all three ITU Regions;
- b) that footnote No. 5.547 of the Radio Regulations (RR) identifies the 31.8-33.4 GHz band as available for applications in the high-density fixed service (HDFS);
- c) that the band 31.8-33.4 GHz is also allocated to the radionavigation service (RNS) on a primary basis in all three ITU Regions;
- d) that, the World Radiocommunication Conference (Istanbul, 2000) (WRC-2000) agreed RR footnote No. 5.547A, stating that administrations should take practical measures to minimize potential interference between stations in the FS and airborne stations in the RNS in the band 31.8-33.4 GHz, taking into account the operational needs of the airborne RNS (see Note 1);
- e) that Recommendation ITU-R F.1097 contains details of mitigation techniques for unwanted emissions from the radiodetermination service, which could be used to minimize the potential for interference between airborne stations in the RNS and stations in the FS;
- f) that radio-frequency arrangements including frequency block arrangements, in consultation with organizations developing standards for radio systems, have been developed (see Recommendation ITU-R F.1520) in order to make the most effective use of the spectrum available;
- g) that the RNS is used for weather avoidance and, in some cases, e.g. where the local air traffic control (ATC) services are not available, for takeoff and landing (see RR No. 4.10). The existing systems are also used for aerial delivery of cargo and personnel in support of international humanitarian operations;
- h) that the band 31.8-33.4 GHz provides 1 600 MHz of contiguous spectrum, which is suitable for use in supporting FS applications such as access to the end user and the provision of infrastructure for mobile networks, i.e. IMT-2000,

* This Recommendation should be brought to the attention of Radiocommunication Study Group 8 (Working Party 8B).

noting

- a) that one administration has implemented a limited number of airborne stations in the RNS in the entire 31.8-33.4 GHz band, operated worldwide (see Note 1);
- b) that the band 31.8-33.4 GHz is not shared with the fixed-satellite service/mobile-satellite service,

recommends

1 that appropriate mitigation techniques be used, where possible or practical, in order to significantly reduce the potential for interference between stations in the FS and airborne stations in the radionavigation service (see Note 2).

These may include measures such as:

1.1 for stations operating in the FS: automatic transmitter power control (ATPC), forward error correction (FEC) coding, bit interleaving technique (BIT), robust access/modulation techniques, receiver blocking filter, robust synchronization and high performance antennas (see Note 3);

1.2 for stations operating in the RNS: frequency agile systems, RF filter installation in the radar transmitter and pulse coding in future systems;

2 that in addition to the appropriate mitigation techniques, some operational restrictions on both services may be necessary where practical or possible. These may include amongst others the following considerations:

2.1 airborne stations in the RNS are encouraged to avoid low operational altitudes and low down tilt antenna angles in the vicinity of urban areas (zero tilt angle corresponds to directions towards the horizon). These operational conditions do not apply to takeoff and landing;

2.2 systems in the FS are encouraged to avoid the use of high elevation angles;

2.3 stations in the RNS are encouraged, in the vicinity of urban areas, to use the centre gap of the FS RF arrangements in Recommendation ITU-R F.1520.

NOTE 1 – Annex 1 provides a summary of the conducted sharing studies. Annex 2 provides characteristics of existing airborne systems operating in the RNS in the frequency band 31.8-33.4 GHz. Characteristics of systems in the FS operating in the frequency band 31.8-33.4 GHz are contained in Recommendation ITU-R F.758.

NOTE 2 – Annex 3 outlines potential mitigation techniques and operational measures applicable to systems in the FS as well as airborne systems in the RNS.

NOTE 3 – ATPC is efficient in reducing the interference from systems in the FS to systems in the RNS, but may make FS receivers more susceptible to interference from systems in the RNS.

ANNEX 1

**Summary of sharing studies between stations in the FS
and airborne stations in the RNS****1 Background**

Resolution 126 (WRC-97) resolved to conduct, as a matter of urgency, the appropriate studies in time for WRC-2000 to determine what criteria would be necessary for sharing between stations in the fixed service and stations in the other services to which the frequency band 31.8-33.4 GHz is allocated. In response to this Resolution, ITU-R adopted Question ITU-R 224/9 (1997) addressing sharing criteria between stations in the FS and RNS in this band. The conducted sharing studies are summarized below.

2 Interference to the FS from the RNS

Calculation of separation distance is based on a probabilistic approach as well as on a deterministic approach (worst-case based on minimum coupling loss (MCL)). In principle, the studies show that if the required minimum separation distance between systems in the two services to preclude interference cannot be assured, then appropriate measures, including mitigation techniques and/or some restrictions on operational conditions, will be needed to facilitate sharing.

Further, the studies indicate that the concept of geographical coordination may be difficult to apply for the mobile radar systems.

The pulsed nature of the interfering radar signal allows for shorter separation distances compared to a non-pulsed interfering source. This has been taken into account in the relevant sharing studies as well as the impact of short duration pulsed, extremely high-power interference of the airborne radar system into the FS receiver.

The studies indicate that, without some operational restrictions and appropriate mitigation techniques, severe interference events may occur during exceptional main beam coupling between the antennas of the radar system and the fixed system.

Various combinations of aircraft altitudes, radar tilt angle and fixed system antenna elevation angle can generate such events. However, the probability of such events is expected to be low. Further, the events will be short in duration due to the narrow radar antenna beam and the antenna rotation.

The studies outlined necessary criteria, in terms of required mitigation techniques (see Annex 3) for the FS and primarily some limitations on radar operational altitude and/or tilt angle in particular in the vicinity of urban areas. In particular, the studies indicate that the fixed system antenna elevation angle and the radar tilt angle are crucial.

In cases where suitable mitigation techniques and/or restrictions on operational conditions are not applicable, appropriate and agreed operational procedures should be applied.