

RECOMMENDATION 844

IONOSPHERIC FACTORS AFFECTING FREQUENCY SHARING
IN THE VHF (30-300 MHz) BAND

(Question 38/6)

(1992)

The CCIR,

considering

- a) that the ionosphere, while primarily responsible for reflection of radio waves below approximately 30 MHz, is capable of supporting propagation in the VHF (30-300 MHz) band under some conditions, during relatively short periods of time, and in certain areas of the world;
- b) that propagation mechanisms which exist for relatively short periods of time should be taken into consideration when planning radio systems which share frequencies;
- c) that frequency sharing is important in the efficient use of the radio spectrum,

recommends

that the following information be taken into account when planning radio systems which make use of frequency sharing in the VHF (30-300 MHz) band.

1. Introduction

Radio propagation at VHF is mainly controlled by physical objects, such as terrain and ground cover (clutter), and tropospheric factors, principally refraction. However, ionospheric propagation over long distances at VHF can take place with relatively small losses. Such propagation events may be significant in causing interference at VHF, particularly for systems requiring high reliability.

2. Summary of potential ionospheric interference mechanisms

Table 1 provides a summary of ionospheric propagation mechanisms which may be significant causes of interference at VHF. Further information on the more important mechanisms is given in the following sections.

3. Normal F-region propagation

Near the peak of the solar cycle long-distance propagation via the F2 layer can occur for a significant fraction of the time at frequencies above 30 MHz. This effect extends to 70 MHz at low latitudes. Figures 1, 2 and 3 show values of the MUF for a path length of 4000 km exceeded for 1% of hours for three seasons at sunspot maximum.

4. Trans-equatorial propagation (TEP)

Strong transmission can occur, particularly during high sunspot years, over long North-South paths spanning the geomagnetic equator.

There appear to be two types of trans-equatorial propagation characterized by the times of peak occurrence, fading characteristics and modes of propagation.

TABLE 1
Main causes of ionospheric interference to stations working at frequencies between 30 and 300 MHz

Cause of interference	Latitude zone	Period of severe interference	Approximate highest frequency with severe interference (MHz)	Approximate frequency above which interference is negligible (MHz)	Approximate range of distances affected (km)	Principal distinguishing features
Regular F-layer reflections	Mid	Day, equinox and winter, solar-cycle maximum	50	60	E-W paths 3 000-6 000 or N-S paths 3 000-10 000	Occurrence broadly in accordance with regular-layer morphology
	Low	Afternoon to late evening, solar-cycle maximum	60	70		
Sporadic-E reflections	High	Night	70	90	500-4 000	Principally during summer months in mid latitudes. Sudden onset and conclusion, beginning later and ending earlier with increase of operating frequency. Area concerned relatively small and mobile. Duration minutes or hours. No associated signal enhancements at short range
	Mid	Day and evening, summer	60	83-135 (1)		
	Low	Day	60	90		
Sporadic-E scatter	Low	Evening to midnight	60	90	Up to 2 000	

(1) For 0.1% of the time during the hours 0800-2300 LT for May to August (11.1 min total) the following frequencies may be derived from Annex 1 to Recommendation 534 for a distance of 1 800 km and $\Gamma = 30$ dB for temperate zone:

Region A (Europe and North Africa): 83 MHz
 Region B (North America): 93 MHz
 Region C (Asia): 135 MHz
 Region D (Average for Northern Hemisphere): 115 MHz

