

NTIA REPORT 80-47

**SPECTRUM RESOURCE  
ASSESSMENT  
IN THE 1710-1850 MHZ BAND**

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**SEPTEMBER 1980**



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## ABSTRACT

This report describes the spectrum resource assessment of the 1710-1850 MHz band. The Phase I Report [Hurt and Crandall, 1980] provided information on frequency allocations, technical standards, spectrum usage, and identification of key spectrum management issues. The key problem areas identified were the sharing between fixed and aeronautical mobile services, coordination of earth stations, accommodation of the Packet Radio System and congestion of certain geographic areas in the Continental U.S. This report examines these potential problems and identifies improvements to the current spectrum management process to assure the efficient use of the limited available spectrum.

## KEY WORDS

Spectrum Resource Assessment  
Fixed Service  
Space Ground Link Subsystem  
Packet Radio System  
Spectrum Management  
Radio Frequency Interference  
1710-1850 MHz Band





## SECTION 1

### INTRODUCTION

#### BACKGROUND

The National Telecommunications and Information Administration (NTIA) is responsible for managing the radio spectrum allocated to the U.S. Federal Government. Part of NTIA's responsibility is to: "...establish policies concerning spectrum assignment, allocation and use, and provide the various Departments and agencies with guidance to assure that their conduct of telecommunications activities is consistent with these policies" [Department of Commerce, 1978]. In support of these requirements, NTIA has undertaken a number of spectrum resource assessments. The objectives of these studies are: to assess spectrum utilization, identify existing and/or potential compatibility problems between systems of various departments and agencies, provide recommendations for resolving any compatibility conflicts, and recommend changes to improve spectrum management procedures.

The band 1710-1850 MHz is currently allocated nationally as a Government band for the Fixed and Mobile Services on a primary basis and by footnote G42, in portions of it, for Earth-to-space satellite control systems on a co-equal basis. In the past, the moderate number of assignments in the band allowed the needs of most agencies to be accommodated without significant compatibility problems or restrictions on use. Moreover, the limited number of systems allowed the frequency assignment process within the Interdepartment Radio Advisory Committee (IRAC) to proceed with relatively straight forward management techniques.

Recent activities within the IRAC forum, particularly through the system review process, indicate that significant growth in band usage is likely. More importantly, the wide variety of systems being proposed for the band significantly complicates the frequency management procedures. The diverse nature of these systems and their various degrees of incompatibility indicated a need for an overall study of this band.

The following multiphase approach to this task has been taken:

Phase I: This phase involved the identification of the existing and planned systems in the band, determination of available technical and operational data for each system, identification of the potential interactions between systems, and the generation of a plan leading to an overall assessment of the band's sharing potential. Phase I was completed and a report was published [Hurt and Crandall, 1980].

Spectrum Resource Assessment (SRA): This final phase of the study provides a detailed examination of the key issues identified in the Phase I portion. A quantitative evaluation of the potential problems is provided along with specific recommendations for change in spectrum management regulations and procedures to better utilize the band. Potentially congested areas of the country are examined to identify trends and specific regional problems as they pertain to this band.

## OBJECTIVES

To provide a technical basis for development of spectrum plans and policies, the following objectives are identified for this SRA.

1. Review and document the characteristics and deployment of existing and proposed systems, including those which may be developed as a result of the 1979 World Administrative Radio Conference (WARC), within the 1710-1850 MHz band.
2. Review the compatibility analyses of systems within the 1710-1850 MHz band made by other agencies and those analyses made in support of the system review process.
3. Identify and document the potential problem areas (including band-edge problems with systems in adjacent bands) which may have an impact on efficient use of the spectrum, and also evaluate the electromagnetic compatibility among existing and proposed systems.
4. Identify and outline specific problem areas, if any, which require additional measurement and/or analysis.
5. Identify the various alternatives relating to the spectrum management practices in the band and their potential impact, if adopted, on spectrum utilization.

## APPROACH

The Phase I portion of this study [Hurt and Crandall, 1980] identified a number of areas where further investigation was necessary. For purposes of this report, these are grouped into four general categories:

- a. Sharing between Fixed and Aeronautical Mobile Services
- b. Coordination of earth stations
- c. Accommodation of the Packet Radio system
- d. Examination of congested geographic areas

The sharing of the 1710-1850 MHz band between the Fixed and Mobile Services has resulted in a number of spectrum management conflicts. Rather than undertaking a detailed compatibility analysis, based on specific equipment types, the investigation of these conflicts primarily addressed spectrum management alternatives that may improve sharing among these services. Three aspects of sharing between the Fixed and Mobile Services were examined: (1) technical, (2) spectrum planning, and (3) frequency assignment. In the technical areas the present standards which apply to the band were reviewed and possible shortcomings discussed. Alternative standards, definitions, and principles were examined and recommendations offered. Under the spectrum planning heading, the various functions and radiocommunication techniques used in the band were examined and alternative approaches reviewed. The application of a channel plan for the band was also examined. Potential improvements in the frequency assignment process that were examined include development of frequency coordination procedures and upgraded data requirements for the Government Master File.

Space operations including telemetry, tracking and command functions are accommodated in the 1761-1842 MHz band on a coequal basis with the Fixed and Mobile Services (footnote G42). Techniques for coordination between these services were examined and recommendations offered.

An examination of the Packet Radio system has been completed by Crandall [1980] which identified separation criteria required to avoid interference to other systems. These criteria were further examined in this report to evaluate the overall impact of the Packet Radio on the 1710-1850 MHz band environment. Several hypothetical deployments were examined.

The Phase I report suggested that certain regions of the country are more congested than the nation as a whole and deserve special study. These areas were defined and examined to identify assignment trends, special regional problems, and possible techniques to minimize compatibility issues.

## SECTION 2

### CONCLUSIONS AND RECOMMENDATIONS

An examination has been completed of the 1710-1850 MHz band with regards to technical standards, procedures, compatibility issues, and overall spectrum planning. Based on this study the following conclusions and recommendations are drawn.

#### GENERAL CONCLUSIONS

The 1710-1850 MHz band was not found to be currently saturated; the various agency needs are being accommodated, as the requirements arise, following existing spectrum management procedures. However, the majority of stations in this band are located within a few regions of the country including the Pacific Northwest, the Southwest, the Northeast coastal, Gulf and Tennessee Valley Authority (TVA) regions. The growth in the number of assignments in this band, especially in these regions, is expected to continue. In order for NTIA to effectively assure that the band will be able to accommodate the various future Federal agency radiocommunication needs, improvements in the regulations and procedures for this band are necessary. If such changes are to be effective, they must be adopted well in advance of band saturation rather than after the fact. The following conclusions identify specific areas where such changes would be effective.

#### SPECIFIC CONCLUSIONS

- 1) Technical Standards. Several changes to technical standards and definitions which apply to this band would, if adopted, improve management of the Fixed and Aeronautical Mobile Services as follows:
  - a. An improvement in the frequency tolerance requirement for transmitters with a necessary bandwidth of 2 MHz or less from the present 10 ppm would improve sharing among these systems. The required carrier-to-interference protection ratio for cochannel operation would be reduced up to 7 dB by this change thus enhancing sharing. This tolerance value is commercially available from most, if not all, present equipment manufacturers.
  - b. The present antenna specifications for Fixed systems in this band effectively require the use of a 1.2 meter diameter antenna or larger. Increasing this requirement to a minimum of 1.8 meter in diameter for congested regions of the country would result in a theoretical improvement of up to 7 dB in sharing potential.
  - c. A clear and consistent approach in specifying the necessary and occupied bandwidths for frequency modulated (FM) systems. In particular, methods for calculating the necessary bandwidth for FM video, telemetry, telecommand, and data systems must be established. The Technical Subcommittee of the IRAC would be an appropriate forum for examining this issue. The occupied bandwidth of an emission is more useful when expressed in terms of the X dB bandwidth. Further study is necessary to establish this relationship for each of various FM emission classes.