

SECTION 4

CONFORMANCE TO RADIO REGULATIONS

INTRODUCTION

This section addresses the Wind Profiler's conformance to applicable rules and regulations (i.e., the Tables of Frequency Allocations, and technical standards) for operations in the bands 216-225 MHz, 400.15-406 MHz, and 420-450 MHz. International rules and regulations are addressed, in addition to applicable U.S. national rules and regulations, to identify existing provisions and potential problem areas for worldwide profiler deployments. The Wind Profiler is assumed to require accommodation on a primary basis, nationally for all users with consideration worldwide. However, for some agency requirements, secondary status may be acceptable. Since the Wind Profiler is a radar used primarily for weather prediction, it was considered as either a radiolocation station (station class LR) or as a meteorological radar station (station class WXD).

UNITED STATES - CANADA COORDINATION AGREEMENT

Wind Profiler deployment near the United States - Canada border in either of the bands 216-225 MHz or 420-450 MHz will require coordination with Canada prior to operation. Part 3.4 of the NTIA Manual contains the United States-Canada Coordination Agreement. Section 3.4.1 provides general information on the agreement and a table denoting the bands coordinated between IRAC, NTIA and Canadian Department of Communications (CDC). Section 3.4.2 is the Index to the Technical Annex which indicates for each of the five arrangements the frequency bands involved and the authorized coordination agencies or channels in each country for each band. In the frequency range 216-225 MHz, Joint Chiefs of Staff (JCS) is the coordination agency for the U.S. and Chief of Defense Staff (CDS) is the coordination agency for Canada. Arrangement C (Section 3.4.5) applies in this band. Paragraph (1) states, "It is agreed that coordination shall be effected in those frequency bands used by fixed installation radars, some of which are essential to the defence of North America, whenever there is considered to be a likelihood of harmful interference." In the frequency range 406.1-430 MHz, NTIA and the Department of Communications are the coordination agencies. Paragraph 6.6 of Arrangement E states, "Except for the state of Alaska, any future fixed installation radiolocation system proposed for United States operation within 250 km of the United States-Canada border which would normally operate in the 420-430 MHz band will be subject to prior coordination with Canada." In the band 420-450 MHz, JCS and CDS are the coordination agencies. Arrangement C applies to this band.

FREQUENCY ALLOCATIONS

In the following discussions, the conformance of the Wind Profiler operations to the Tables of Frequency Allocations¹⁶ in the three bands is presented and possible changes necessary to accommodate profiler operations are identified. An assessment of Suitable,

¹⁶ NTIA, Manual of Regulations and Procedures for Federal Radio Frequency Management, U.S. Department of Commerce, National Telecommunications and Information Administration, Washington, D.C., Revised January 1990.

Conditional, or Unsuitable is given regarding the potential national and international accommodation of Wind Profiler operations for each of the three frequency bands.

The only allocation change to the National Table of Frequency Allocations that was considered for this assessment was for the 216-225 MHz band. Other factors such as WARC-92 proposals and other pending FCC and NTIA allocation changes were not considered since they had not been approved at the initiation of this study.

216-225 MHz Band

Nationally, the frequency range 216-225 MHz is divided into three allocation bands: 216-220 MHz, 220-222 MHz, and 222-225 MHz. Internationally, this frequency range falls within two allocation bands: 174-223 MHz and 223-230 MHz (in Regions 1 and 3), and 216-220 MHz and 220-225 MHz in Region 2. The allocated services in the band 216-225 MHz are shown in TABLE 4-1, an excerpt of the National and International Tables of Frequency Allocations. The allocated services shown in TABLE 4-1 for the United States in bands 220-222 MHz and 222-225 MHz reflect allocation changes per IRAC Doc. 26106. The applicable footnotes to the allocation table are provided in Appendix A. The frequency range 216-225 MHz is allocated to a variety of services on different bases (i.e., primary and secondary) and on various conditions. The radiolocation service is allocated on a secondary basis in Region 2 and nationally radiolocation is limited to the military (Footnote G2); however, this allocation applies to only stations authorized prior to 1 January 1990 (Footnote RR627). Additional allocations for radiolocation are in the Radio Regulations footnotes.

To accommodate Wind Profilers, nationally, a change to the National Tables of Frequency Allocations would be necessary. The meteorological aids service would have to be added on a primary basis or the radiolocation service changed to primary status and Footnote G2 modified for this band. Alternatively, provision for Wind Profiler operations could be made by an additional US footnote. A national allocation accommodation would involve an NTIA decision and a FCC rulemaking proceeding which include involvement from many interested parties (e.g., land mobile, maritime mobile, amateur, and adjacent band broadcasters). The Notice of Proposed Rulemaking (NPRM) proceedings dealing with the maritime mobile service may also impact Wind Profiler accommodations. As a result of WARC-79, the primary radiolocation service allocation was reduced to secondary status and the footnote RR627 was introduced for Region 2 of the Allocation Table. The addition of footnote RR627 to the Allocation Table does not allow new radiolocation systems to operate in -Region 2 after January 1, 1990. The Wind Profiler would be difficult to accommodate, since the radiolocation service has been removed from the Table with the exception of existing radar systems. The national allocation accommodation of Wind Profiler operations is assessed as conditional.

Internationally, for Wind Profilers to be accommodated on a primary basis in this band, the meteorological aids service would have to be added to the international table or the radio location service upgraded in Region 2. In Regions 1 and 3, the meteorological aids or radiolocation service would have to be added in the allocation band 174-223 MHz. Accommodation by international footnote is also an option. These allocation changes would involve acceptance at a future WARC. Due to the diverse provisions of the current international table among the different regions, the present primary allocation to the broadcasting service in Regions 1 and 3, and the number of existing exceptions to the current table, the international accommodation of Wind Profiler is assessed as unsuitable in the bands 216-225 MHz.

**TABLE 4-1
EXCERPTS FROM THE INTERNATIONAL AND NATIONAL TABLES OF
FREQUENCY ALLOCATIONS FOR THE BAND 216-225 MHz**

INTERNATIONAL			UNITED STATES			
Region 1	Region 2	Region 3	Band MHz	Prov.	Gov.	Non-Gov
174-223 BROAD- CASTING	174-216 BROAD- CASTING Fixed Mobile 620	174-223 FIXED MOBILE BROAD- CASTING	174-216			BROAD- CASTING (tele- vision) NG115
621 623 628 629	216-220 FIXED MARITIME MOBILE Radio- location 627 627A	619 624 625 626 630	216-220	US210 US229 US274 627	MARITIME MOBILE Radio- location Fixed Aero- nautical Mobile Land Mob G2	MARITIME MOBILE Fixed Land Mobile Aero- nautical Mobile NG121
223-230 BROAD- CASTING Fixed Mobile	220-225 AMATEUR FIXED MOBILE Radio- location 627	223-230 FIXED MOBILE BROAD- CASTING AERONAUTICAL RADIONAV- IGATION Radiolocation	220-222	US243 627	LAND MOBILE Radio- location G2	LAND MOBILE
622 628 629 631 632 633 634 635		636 637	222-225	US243 627	Radio- location G2	AMATEUR

400.15-406 MHz BAND

Nationally and internationally, the frequency range 400.15-406 MHz is divided into the four allocation bands: 400.15-401 MHz, 401-402 MHz, 402-403 MHz, and 403-406 MHz. The services allocated in these bands are shown in TABLE 4-2. The applicable footnotes to these frequency bands are listed in Appendix A. The bands are allocated to the space services and the meteorological aids service on a primary basis, worldwide. However, the U.S. meteorological aids allocation is limited to radiosondes and associated ground transmitters.

For the Wind Profiler to operate on a primary basis in this frequency range, the national limitation to radiosondes in the meteorological aids service would have to be removed or Wind Profilers added. Since this potential allocation change would be a national issue, the allocation accommodation of Wind Profiler operations is assessed as "conditional," nationally and "suitable," internationally.

420-450 MHz BAND

The frequency range 420-450 MHz is divided into three international allocation bands: 420-430 MHz, 430-440 MHz, and 440-450 MHz and is one allocation band, nationally. The services allocated to this frequency range are shown in TABLE 4-3 and the applicable footnotes to the allocation tables are listed in Appendix A. The radiolocation service is allocated in these bands on a primary basis, however, nationally, it is limited to the military (Footnote G2) and internationally, the bands 420-430 MHz and 440-450 MHz are allocated to the radiolocation service on a secondary basis. Additional allocations for radiolocation are made by footnotes from the Radio Regulations.

Nationally, for all Wind Profiler users to operate in the band 420-450 MHz, the meteorological service would have to be added to both the Government and non-Government Tables of Frequency Allocation or the radiolocation service would have to be added to the non-Government Table of Frequency Allocations and Footnote G2 would have to be removed from the Government table or modified. Specific provision for Wind Profiler operations could be made by an additional US footnote. These actions would require an NTIA decision and FCC rulemaking proceedings.

Internationally, the accommodation of Wind Profilers would involve adding the meteorological aids service to the table in the three bands, upgrading the radiolocation service to primary status in the bands 420-430 and 440-450 MHz, or adding another international footnote. Since, the proposed Wind Profiler operations would not occupy entirely any of the three allocation bands, the latter option appears to be the most feasible approach. The national and international accommodation of Wind Profiler to the allocation tables in this frequency range is assessed as conditional.

TABLE 4-2
EXCERPTS FROM THE INTERNATIONAL AND NATIONAL TABLES OF
FREQUENCY ALLOCATIONS FOR THE BAND 400.15-406 MHz

INTERNATIONAL MHz	UNITED STATES			
	MHz	Prov	Government	Non-Gov.
400.15-401 METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (Space-to-Earth) SPACE RESEARCH (Space-to-Earth) Space Operation (Space-to-Earth)	400.15 -401	US70	METEORO- LOGICAL AIDS (Radiosonde) SPACE RESEARCH (Space-Earth) METEORO- LOGICAL SAT. (Space-Earth) Space Oper. (Space-Earth)	METEORO- LOGICAL AIDS (Radiosonde) SPACE RESEARCH (Space-Earth) Space Oper. (Space-Earth)
647				
401-402 METEOROLOGICAL AIDS SPACE OPERATION (Space-to-Earth) Earth Exploration- Satellite (Earth-to-Space) Fixed Meteorological-Satellite (Earth-to-Space) Mobile except aeronautical mobile	401- 402	US70	METEORO- LOGICAL AIDS (Radiosonde) SPACE OPER. Earth Explor- ation Sat. (Earth-Space) Meteoro- logical Sat. (Earth-Space)	METEORO- LOGICAL AIDS (Radiosonde) SPACE OPER. Earth Explor- ation Sat. (Earth-Space) Meteoro- logical Sat. (Earth-Space)
402-403 METEOROLOGICAL AIDS Earth Exploration- Satellite (Earth-to-Space) Fixed Meteorological-Satellite (Earth-to-Space) Mobile except aeronautical mobile	402- 403	US70	METEORO- LOGICAL AIDS (Radiosonde) Earth Explor- ation Sat. (Earth-Space) Meteoro- logical Sat. (Earth-Space)	METEORO- LOGICAL AIDS (Radiosonde) Earth Explor- ation Sat. (Earth-Space) Meteoro- logical Sat. (Earth-Space)
403-406 METEOROLOGICAL AIDS Fixed Mobile except aeronautical mobile 648	403- 406	US70	METEORO- LOGICAL AIDS (Radiosonde) G6	METEORO- LOGICAL AIDS (Radiosonde)

**TABLE 4-3
EXCERPTS FROM THE INTERNATIONAL AND NATIONAL TABLES OF
FREQUENCY ALLOCATIONS FOR THE BAND 420-450 MHz**

INTERNATIONAL			UNITED STATES			
Region 1	Region 2	Region 3	Band MHz	Prov.	Government	Non-Gov
420-430 MHz FIXED MOBILE except aeronautical mobile Radiolocation 651 652 653			420-450	US7	RADIOLOCATION	Amateur
				US87 US217 US228 US230 664 668		
430-440 AMATEUR RADIO- LOCATION 653 654 655 656 657 658 659 661 662 663 664 665						
440-450 MHz FIXED MOBILE except aeronautical mobile Radiolocation 651 652 653 666 667 668					G2 G8	NG135

SUMMARY

In accordance with the provisions of the current National and International Tables of Frequency Allocations, none of the three frequency bands under consideration can accommodate all potential Wind Profiler operations on a primary basis, worldwide. Presently, the only band allocated to the meteorological aids service, of the three bands, is in the band 400.15-406 MHz; however, in the U.S., this allocation is limited to radiosondes. The radiolocation service is allocated in the bands 216-225 MHz and 420-450 MHz, but the Wind Profiler, as a new radiolocation radar station, could operate on a worldwide primary basis only in the band 430-440 MHz and, nationally, this operation would be limited to the military. Changes to the National Allocations Table would be necessary before Wind Profilers could be operated on a primary basis in any of the frequency bands being considered for this study. To accommodate Wind Profilers nationally, a new U.S. footnote would be the most feasible approach.

TABLE 4-4 provides the assessment of "unsuitable", "conditional" or "suitable" for Wind Profiler being considered in the meteorological aids or radiolocation services. For the purpose of this allocation assessment, "suitable" means presently allocated; "conditional" means currently not allocated, but accommodation possible; and "unsuitable" means not allocated and accommodation difficult and judged not possible.

TABLE 4-4
SUITABILITY

FREQ. [MHz]	NATIONAL			INTERNATIONAL			OVERALL SUITABILITY
	MILITARY/	NON-MIL./	NON-GOV.	REGION 1/	REGION 2/	REGION 3	
216-220	C	C	C	U	C	U	U
220-222	C	C	C	U	C	U	U
222-225	C	C	C	U	C	U	U
400.15-406	C	C	C	S	S	S	C
420-430	S	C	C	C	C	C	C
430-440	S	C	C	S	S	S	C
440-450	S	C	C	C	C	C	C

S - Suitable
C - Conditional
U - Unsuitable

TECHNICAL STANDARDS

GOVERNMENT TECHNICAL STANDARDS

Chapter 5 of the NTIA Manual contains the technical standards, minimum performance requirements and design objectives that are applicable to telecommunication equipment used in Government radio stations. However, within the Federal Government, any Government agency may promulgate more stringent standards for its own use.

The technical standards for Government meteorological and radiolocation radar stations depend on the date of the development and subsequent procurement contract and the frequency band of operation.

Radar Spectrum Engineering Criteria

The Radar Spectrum Engineering Criteria (RSEC) apply to all Government radar systems. RSEC specifications are contained in Part 5.3 of the NTIA Manual. The RSEC specifies certain equipment characteristics to ensure an acceptable degree of electromagnetic compatibility among radar systems, and between such systems and those of other radio services sharing the frequency spectrum. Since the initial adoption of the RSEC by NTIA, there have been several revisions to the RSEC. The RSEC is applicable to Government ground-based meteorological radar stations built after January 1, 1973 and before October 1, 1997. The RSEC C is applicable to Government ground-based meteorological radar stations effective October 1, 1977.

While the specific technical requirements of the RSEC are omitted herein, the following list identifies the radar characteristics that are considered:

- (1) Emission Bandwidth
- (2) Emission Levels
- (3) Antenna Patterns
- (4) Frequency Tolerance
- (5) Tunability
- (6) Image and Spurious Rejection
- (7) Local-oscillator Radiation

WIND PROFILER CONFORMANCE TO GOVERNMENT TECHNICAL STANDARDS

The Wind Profiler would fall under the provisions of Part 5.1 in the NTIA Manual. Specifically, the Table of Frequency Tolerances and Unwanted Emissions contained in Part 5.1 directs the reader to Section 5.3.2 (RSEC C) if the system is considered to be a radiolocation station operating in the frequency range 100-470 MHz. The Wind Profiler may also be considered a Meteorological Aid. No guidance is given for a meteorological aids station in the Table of Frequency Tolerances and Unwanted Emissions of the NTIA Manual or the ITU Radio Regulations. For this case, RSEC C would still be the most appropriate standard.

To date, the Department of Commerce, Air Force and Navy have submitted proposals to the SPS requesting spectrum support for their Wind Profiler systems. Each of the systems reviewed does not entirely conform to RSEC C. Although the systems reviewed fall under RSEC C, a Wind Profiler with a peak power of 1 kW or less would fall under RSEC A. RSEC A presently exempts the system from the RSEC. In such a case, paragraph 5.1.3.D. of the NTIA

Manual would apply. The standards referred to in paragraph 5.1.3.D. are less stringent than that of the RSEC. In general, when there is no national guidance regarding standards, the ITU Radio Regulations are used.

WIND PROFILER CONFORMANCE TO NON-GOVERNMENT TECHNICAL STANDARDS

The Wind Profiler is assumed to fall under Part 90 of Title 47 of the U.S. Code of Federal Regulations¹⁷ regarding technical standards. This applies to radiolocation systems, as well as meteorological aids systems, since the FCC considers meteorological radars and radiolocation radars similarly.

¹⁷ Federal Communications Commission, Title 47 Code of Federal Regulations. Telecommunications, Part 80 to End, Office of the Federal Register, National Archives and Records Administration, Revised as of October 1, 1990.

