

SPECTRUM REALLOCATION REPORT

Response to Title III of
The Balanced Budget Act Of 1997



Special Publication

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The Balanced Budget Act Of 1997**

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EXECUTIVE SUMMARY

On behalf of the Secretary of Commerce, the National Telecommunications and Information Administration (NTIA) has prepared this report as required by Title III S Communication and Spectrum Allocation Provisions S of the Balanced Budget Act of 1997 (Title III of the BBA 97). This report identifies radio spectrum currently used by the Federal Government for reallocation to the private sector.

Title III of the BBA 97 requires the Secretary of Commerce to provide from the spectrum currently allocated for Federal use, an aggregate of at least 20 megahertz (MHz) below 3 gigahertz (GHz) for allocation and assignment by the Federal Communications Commission (FCC) to non-Federal users through the process of competitive bidding.

The paragraphs below provide an overview of the bands identified for reallocation, indicating the Federal usage; transition timetable; any needed sharing requirements for each band identified for reallocation; an overview of reported Federal implementation costs; and the potential operational and mission impacts.

OVERVIEW OF REALLOCATED BANDS

The Federal Government uses frequencies below 3 GHz to support missions that are of direct benefit to the public. These missions include Federal law enforcement activities, air traffic control, national defense, weather services, scientific studies, and environmental monitoring. The estimated Federal investment exceeds \$280 billion. Approximately half of this spectrum is shared with non-Federal users. Federal and non-Federal use of the spectrum is concentrated below 3 GHz because atmospheric and foliage penetration losses are relatively low, components are inexpensive, and small, efficient antennas can be used for hand-held operations between 100 MHz and 3 GHz. These features have made use of the spectrum below 3 GHz so desirable that many bands have become congested and entrepreneurs can no longer find spectrum for new technologies.

Spectrum congestion for Federal operations below 3 GHz has been exacerbated by Congressionally mandated reallocation under the Omnibus Budget Reconciliation Act of 1993 (OBRA 93). OBRA 93 required that the Secretary of Commerce identify at least 200 MHz of spectrum used by the Federal Government for reallocation to new spectrum-based technologies. Of the 235 MHz identified, 135 MHz was below 3 GHz. Title III of the BBA 97 requires the Secretary of Commerce to identify an additional 20 MHz below 3 GHz for reallocation to non-Federal users. This could increase congestion in the remaining bands used by the Federal Government, and possibly affect critical agency missions even though The NTIA will try to balance spectrum requirements of the Federal agencies with benefits to the public.

Identifying spectrum for reallocation involves consideration of two overriding and sometimes conflicting factors: (1) the impact on the Federal agencies, in terms of mission, costs, and potential

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reduction of services to the public and (2) the benefits expected to be realized by the public. In complying with the requirements and band selection criteria of Title III, this spectrum reallocation plan establishes a reasonable balance between the spectrum needs of the Federal Government and those of potential non-Federal users. The effective implementation of this spectrum reallocation plan depends upon the availability of funds to continue the displaced Federal activities either through the agency appropriations process or reimbursement from the non-Federal entities moving into the bands.

Spectrum Reallocation Plan

Bands Identified for Reallocation	Reallocation Status ⁴	Reallocation Schedule ⁵
139-140.5 and 141.5-143 MHz	Mixed	January 2008
216-220 MHz ¹	Mixed	January 2002
1385-1390 MHz ²	Exclusive	January 1999
1432-1435 MHz	Mixed	January 1999
2385-2390 MHz ³	Exclusive	January 2005

1) The SPASUR radar system (transmit frequency of 216.98 MHz and receive frequencies of 216.965-216.995 MHz), located in the Southern part of the United States will continue to be protected indefinitely.

2) Federal airborne operations at the sites listed in Table 3-3 in the report will be continued for 9 years after the scheduled reallocation date.

3) Federal and commercial airborne operations at the sites listed in Table 3-6 in the report will be continued for 2 years after the scheduled reallocation date.

4) Spectrum reallocated on a mixed-use basis can be used by the Federal Government, but this use must be limited by geographic area, time, or by other means, and must be substantially less than the potential non-Federal use.

5) The spectrum will be auctioned prior to 2002, in accordance with the Balanced Budget Act of 1997.

Several bands identified for reallocation are adjacent to bands that will continue to be used for high-powered or sensitive Federal operations. In order to reduce the potential for mutual interference, industry established transmitter and receiver standards are essential.

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139-140.5 and 141.5-143 MHz

These band segments are part of the 138-144 MHz band that is used primarily by the military services to establish communications for both tactical and non-tactical use. This includes: tactical air-to-air and air-to-ground communications; non-tactical intra-base ground-to-ground communications; land mobile radio (LMR) nets; and trunking systems. The proposed reallocation strategy will minimize the impact to the Federal Government and will provide a transmit and receive separation, maximizing its usefulness for commercial applications. This band could be used for a wide variety of new non-Federal fixed and mobile communications services. Reallocating this band in 2008 will allow sufficient time to re-engineer radio systems operating in the band. This date also coincides with the established schedule for Federal conversion to narrowband technology in this band. Federal operations will be continued indefinitely at the sites listed in Table 3-1 in the report. The DoD has raised concerns about the need to include additional military sites in this band. The NTIA and the DoD will assess the need to include additional sites and work with the FCC during the reallocation process to insure that disruption to critical military operations is minimized.

216-220 MHz

This band is used for a space surveillance radar system, and various low power applications which include: telemetry for monitoring seismic activity and wildlife, hands free communication between firefighters wearing hazardous environment suits, and audio collection devices used by law enforcement agents. The band could be used for new non-Federal fixed and mobile communications services. This band could also be used for expansion of existing non-Federal services. The band is to be reallocated on a mixed-use basis with a scheduled availability date of January 1, 2002. The space surveillance radar located at three transmitter sites and six receiver sites listed in Table 3-2 in the report will be protected indefinitely.

1385-1390 MHz

The 1215-1400 MHz band is used by long-range air defense radars, air traffic control facilities, military test range telemetry links, and tactical radio relays. Reallocating the 1385-1390 MHz portion of the band is a reasonable balance between providing additional spectrum resources to non-Federal users and minimizing the operational and cost impact to the Federal Government. The 1385-1390 MHz band segment could be used for new fixed and mobile commercial and consumer communications applications. This band is adjacent to the 1390-1400 MHz band that has been identified for reallocation under OBRA 93 creating a contiguous block of spectrum 15 MHz wide. This band could also be combined with spectrum in the 1427-1435 MHz band that has also been identified for reallocation. Since high-powered Federal Aviation Administration and Department of Defense radars must continue to operate in the lower adjacent band, new commercial applications must adopt receiver standards to assure satisfactory performance. In order to protect the Department of Defense Nuclear Detonation System from interference out-of-band emission standards for the commercial transmitters must also be established. Reallocation of this band is scheduled for January 1, 1999, to coincide with the availability date of the 1390-1400 MHz and 1427-1435 MHz bands that have been identified for reallocation. To reduce the impact on important

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Federal and university radio astronomy operations, airborne or space-to-Earth transmissions should not be permitted. In order to preserve the investment made by the Federal Government, essential operations will be continued at the sites listed in Table 3-3 in the report for 9 years after the scheduled reallocation date. The DoD has raised the issue of radar operations during wartime. The NTIA and the DoD will work with the FCC during the reallocation process in the 1385-1390 MHz band to insure that wartime emergency considerations will be addressed to maintain national security.

1432-1435 MHz

This band is used by the military for tactical radio relay communications, military test range aeronautical telemetry and telecommand, and various types of guided weapon systems. The 1432-1435 MHz band will be reallocated for non-Federal use on a mixed-use basis. This will preserve the investment made by the Federal Government and permit essential military operations to continue, while making additional spectrum available for the development of commercial and consumer applications. To realize its full public benefit, the reallocation date of the 1432-1435 MHz band will be January 1, 1999. This date coincides with that of the 1427-1432 MHz band that was previously identified for reallocation under OBRA 93. Essential Federal Government operations and their associated airspace will be protected indefinitely at the sites listed in Table 3-4 in the report. The DoD has raised concerns about the need to include additional military sites in this band. The NTIA and the DoD will assess the need to include additional sites and work with the FCC during the reallocation process to insure that disruption to critical military operations is minimized.

2385-2390 MHz

This band is used by the Federal Government for aeronautical flight test telemetry and for scientific observations. This band is also used by the commercial aviation industry for flight test telemetry and is designated for telemetry used in conjunction with commercial launch vehicles. This band could be used for new non-Federal fixed and mobile consumer and commercial services. It can also be used as an expansion of existing non-Federal services. Since airborne systems will continue to operate in the adjacent band, commercial receiver and transmitter standards must be established to reduce the potential for mutual interference. This band is to be reallocated on an exclusive basis with a scheduled availability date of January 1, 2005. Reallocation of this band in 2005 will provide a sufficient amount of time to implement new systems employing spectrum efficient modulation techniques. To minimize the operational impact on flight test programs that are ongoing or planned to begin in the near future, continued Federal and commercial use of the 2385-2390 MHz band at the sites listed in Table 3-6 in the report will continue for 2 years after the scheduled reallocation date. To provide protection to the Arecibo planetary radar, airborne and space-to-earth transmissions will be prohibited in Puerto Rico. The DoD has raised concerns about the need to include additional military sites in this band. The NTIA and the DoD will assess the need to include additional sites and work with the FCC during the reallocation process to insure that disruption to critical military operations is minimized.

OVERVIEW OF FEDERAL IMPLEMENTATION COSTS

Every effort has been made to insure that the bands identified in this report meet the Title III band selection criteria. However, the displaced Federal functions resulting from the reallocation must, in most cases, be preserved at a considerable cost to the Federal Government. The Federal agencies maintain that, in order to meet the time constraints of Title III, it is only possible to provide preliminary reallocation cost estimates and operational impact assessments since accurate data will require extensive cost and engineering analysis. The following list summarizes the Federal reallocation costs for each of the affected agencies.

The cost estimates provided by the DoD assume that suitable spectrum will be available for relocation such that current equipment can be retuned and that extensive system modifications will not be required to operate on new frequencies or to avoid interfering with new commercial users. If replacement of major systems is required, relocation costs could be significantly higher.

Individual Federal agencies provided the estimated reallocation cost information shown in the table below to NTIA. The NTIA did not independently verify the cost estimates as part of this study. Furthermore, the Office of Management and Budget has not formally reviewed the estimated costs. Federal agency requests for reallocation will be reviewed as part of the annual budget formulation process. Specific inquiries regarding the reallocation cost estimates should be referred to the originating agency.

Summary of Preliminary Federal Reallocation Costs

Federal Agency	Estimated Reallocation Cost
Department of the Army	\$260 million
Department of the Navy	\$251 million
Department of the Air Force	\$520 million
Federal Aviation Administration	\$10 million
Department of Energy	\$2.1 million
Department of Interior	\$1.76 million
Department of Justice	\$7 million
Department of the Treasury	\$3.5 million
National Aeronautics and Space Administration	\$520,000
United States Information Agency	\$100,000
Total	\$1.056 billion

MISSION AND OPERATIONAL IMPACT

The spectrum below 3 GHz is extensively used to support missions mandated to the Federal agencies by the President and Congress. As a result of this extensive usage, it is not possible to identify Federal spectrum below 3 GHz for reallocation that will not affect these missions. In enacting Title III of the BBA 97, Congress acknowledged that reallocating spectrum used by the Federal agencies will not come without mission impacts. However, the Title III band selection criteria specify that the spectrum identified during the reallocation process should balance the operational impact on Federal Government missions with the potential public benefits. In complying with this criteria, the spectrum reallocation plan identifies spectrum that minimizes the impact on the missions performed by the Federal agencies. The following paragraphs discuss in general terms the extent that missions of the Federal agencies are affected. A more detailed discussion of the operational and mission impact to the Federal agencies is provided in the report.

The 10 MHz identified for reallocation on a mixed-use basis will limit Federal operations to specific geographic areas of the country. The Federal missions performed in these bands include: test and training for combat readiness to support national security, law enforcement, and environmental and wildlife management. If the Federal agencies cannot perform their missions given these restrictions, they will have to relocate to other bands. The mixed-use reallocation status may also restrict the Federal agencies from expanding their operations to satisfy future mission requirements.

The Federal Government will lose complete access to the 10 MHz identified for reallocation on an exclusive non-Federal basis. This may have an impact on Federal operations supporting current and future mission requirements. Further loss of spectrum for long-range radars could adversely affect the national defense, air traffic control, and drug interdiction missions performed by the Federal Government. The loss of this spectrum may restrict the use of these bands to support defense training exercises. This degradation in training activities could ultimately affect operational readiness, negatively affecting national security. The loss of this spectrum may also affect several test ranges that conduct flight tests of systems crucial to the nation's defense and commercial aviation.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFFTC	Air Force Flight Test Center
AFOSI	Air Force Office of Special Investigations
AFTRCC	Aerospace and Flight Test Radio Coordinating Council
AGA	Air-Ground-Air
AMTS	Automated Maritime Telecommunications System
ARSR	Air Route Surveillance Radar
ATC	Air Traffic Control
ATM	Aeronautical Telemetry
ATS	Air Traffic Services
AVM	Automatic Vehicle Monitoring
BBA 97	Balanced Budget Act of 1997
CAS	Close Air Support
C-E	Communications-Electronics
CINCLANT	Commander in Chief Atlantic
CINCPAC	Commander in Chief Pacific
CNO	Chief of Naval Operations
DARS	Digital Audio Radio Service
DEA	Drug Enforcement Administration
DMSP	Defense Meteorological Satellite Program
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DOJ	Department of Justice
DTV	Digital Television
ELV	Expendable Launch Vehicle
EM	Electromagnetic
EMD	Engineering Manufacturing and Development
EPIRBS	Emergency Position-Indicating Radio Beacon Station
ERP	Effective Radiated Power
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDD	Frequency Division Duplex
FEMA	Federal Emergency Management Agency
FLTSATCOM	Fleet Satellite Communications
FY	Fiscal Year
GOES	Geosynchronous Operational Environmental Satellite
GHz	Gigahertz
GMDSS	Global Maritime Distress and Safety System
GMF	Government Master File
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRDCUS	Gulf Range Drone Control Upgrade System

LIST OF ACRONYMS AND ABBREVIATIONS

HAMOTS	High Accuracy Multiple Object Tracking System
HAZMAT	Hazardous Materials
HETE	High Energy Transient Experiment
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
INMARSAT	International Maritime Satellite
IRAC	Interdepartment Radio Advisory Committee
ISM	Industrial, Scientific, and Medical
ITS	Intelligent Transportation System
ITU-R	International Telecommunication Union-Radiocommunication Sector
IVDS	Interactive Video and Data Service
JSOW	Joint Standoff Weapon
JSS	Joint Surveillance System
LDRCL	Low Density Radio Communications Link
LMR	Land Mobile Radio
LMS	Location and Monitoring Service
LPRS	Low Power Radio Service
MARS	Military Affiliate Radio System
MAS	Multiple Address Service
MCEB	Military Communications-Electronics Board
Met Aids	Meteorological Aids
MHz	Megahertz
MSA	Metropolitan Statistical Area
MSE	Mobile Subscriber System
MSS	Mobile Satellite Service
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NDS	Nuclear Detonation System
NGTCS	Next Generation Target Control System
NIB	Non-Interference Basis
NMD	National Missile Defense
nmi	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NSBF	National Scientific Balloon Facility
NSF	National Science Foundation
NSSMS	NATO SEASPARROW Surface Missile System
NTIA	National Telecommunications and Information Administration
NWS	National Weather Service
OBRA 93	Omnibus Budget Reconciliation Act of 1993
OCST	Office of Commercial Space Transportation
POES	Polar Orbiting Earth Satellite

LIST OF ACRONYMS AND ABBREVIATIONS

PSWAC	Public Safety Wireless Advisory Committee
RAJPO DLS	Range Applications Joint Program Office Data Link System
RDTE	Research Development Test and Evaluation
RF	Radio Frequency
R&O	Report and Order
R&D	Research and Development
RSA	Rural Statistical Area
SARSAT	Search and Rescue Satellite-Aided Tracking
SCADA	Supervisory Control and Data Acquisition
SGLS	Space Ground Link Subsystem
SINCGARS	Single Channel Ground and Airborne Radio System
SPAC	Spectrum Planning and Policy Advisory Committee
SPASUR	Space Surveillance
SOLAS	Safety of Life at Sea
TAS	Target Acquisition System
TARS	Tethered Aerostat Radar System
TBMD	Theater Ballistic Missile Defense
TDD	Time Division Duplex
TDRSS	Tracking Data Relay Satellite System
THAAD	Theater High Altitude Air Defense
TT&C	Tracking, Telemetry, and Command
T&E	Test and Evaluation
T/R	Transmit and Receive
UAV	Unmanned Air Vehicle
UGV	Unmanned Ground Vehicle
UHF	Ultra High Frequency
USCG	United States Coast Guard
USIA	United States Information Agency
VHF	Very High Frequency
WARC-92	1992 World Administrative Radio Conference
WCS	Wireless Communication Service
WLL	Wireless Local Loop
WRC 97	1997 World Radio Conference