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Spectrum Management and Telecommunications Policy

Consultation on Allocation Changes and Revisions to Spectrum Utilization Policy and Technical Rules in the 5 GHz Band

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Radiocommunication Act

Notice No. DGTP-005-04 - Consultation on Allocation Changes and Revisions to Spectrum Utilization Policy and Technical Rules in the 5 GHz Band

This Notice announces the publication of a consultation paper responding proposals to accommodate a number of services in the frequency range 5150-5725 MHz.

Introduction

In June 2003, a World Radiocommunication Conference (WRC-03) was held, where administrations from around the world participated in the consideration of many spectrum related radiocommunication issues. Included in the agenda of WRC-03 was the consideration of changes to the use of the 5 GHz band for a number of services and applications, including Radio Local Area Networks, the Earth exploration-satellite (active) service, space research (active) service and radiolocation service. The document, *Consultation on Allocation Changes and Revisions to Spectrum Utilization Policy and Technical Rules in the 5 GHz Band*, seeks public comments on proposals to adopt allocation changes, spectrum utilization policies and technical rules for the band 5150 - 5725 MHz in accordance with the decisions made at WRC-03.

Invitation to Comment

Industry Canada invites interested parties to provide their views and comments no later than June 1, 2004 to ensure consideration. Shortly after the close of the comment period, all comments received will be posted on Industry Canada's [Spectrum Management and Telecommunications Web site](http://strategis.gc.ca/spectrum) at: <http://strategis.gc.ca/spectrum>.

Respondents are requested to provide their [comments](#) in electronic format (WordPerfect, Microsoft Word, Adobe PDF or ASCII TXT) to the following e-mail address: wireless@ic.gc.ca, along with a note specifying the software, version number and operating system used.

Written submissions should be addressed to the Director of Spectrum and Radio Services, Industry Canada, Room 1611A, 300 Slater Street, Ottawa, Ontario, K1A 0C8. All submissions should cite the *Canada Gazette*, Part I, publication date, the title, and the notice reference number (DGTP-005-04).

Obtaining Copies

Copies of the consultation paper are available electronically on the [Spectrum Management and Telecommunications Web site](http://strategis.gc.ca/spectrum) at: <http://strategis.gc.ca/spectrum>.

Official printed copies of gazette notices can be obtained at the [Canada Gazette Web site](http://canadagazette.gc.ca) at: <http://canadagazette.gc.ca/subscription-e.html> or by calling the sales counter of Canadian Government Publishing at (613) 941-5995 or 1-800-635-7943.

February 19, 2004

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This paper, announced in Canada Gazette Notice DGTP-005-04, invites public comments on proposed changes to the *Canadian Table of Frequency Allocations*, spectrum utilization policies and technical rules in the frequency range 5150-5725 MHz.

Introduction

In October 1999, Industry Canada released a policy paper entitled *Spectrum Utilization Policy for Licence Exempt Wireless Local Area Networks in the 5 GHz Range* (SP-5150 MHz), which addressed the principal issues governing the use of the frequency bands 5150-5250 MHz, 5250-5350 MHz and 5725-5825 MHz for licence-exempt wireless local area networks (LE-LANs).

The provisions were developed in consultation with industry over a period of about two years. Studies were conducted with the participation of stakeholders representing the services allocated to the bands as well as proponents of the new services, with a view toward developing globally harmonized spectrum use.

In considering spectrum for services at 5 GHz, the World Radiocommunication Conference¹ 2000 (WRC-00) prepared the following two agenda items (Agenda Items 1.5 and 1.6) for consideration at the 2003 World Radiocommunication Conference (WRC-03):

Agenda Item 1.5: to consider, in accordance with Resolution 736 (WRC-2000)², regulatory provisions and spectrum requirements for new and additional allocations to the mobile, fixed, Earth exploration-satellite and space research services, and to review the status of the radiolocation service in the frequency range 5 150-5 725 MHz, with a view to upgrading it, taking into account the results of ITU-R studies.

Agenda Item 1.6: to consider regulatory measures to protect feeder links (Earth-to-space) for the mobile-satellite service which operate in the band 5 150-5 250 MHz, taking into account the latest ITU-R Recommendations (for example, Recommendations ITU-R S.1426³, ITU-R S.1427⁴ and ITU-R M.1454⁵).

In the period leading up to WRC-03 the International Telecommunication Union (ITU) took on the task

¹ World Radiocommunication Conferences are held approximately every 3-5 years. During the conferences, administrations from around the world participate in considering many spectrum related radiocommunication issues.

² Resolution 736 (WRC-2000): *Consideration by a future competent world radiocommunication conference of issues dealing with allocations to the mobile, fixed, radiolocation, Earth exploration-satellite (active), and space research (active) services in the frequency range 5150-5725 MHz.*

³ Recommendation ITU-R S.1426: *Aggregate power flux-density limits, at the FSS satellite orbit for radio local area network (RLAN) transmitters operating in the 5 150-5 250 MHz band sharing frequencies with the FSS (RR No. 5.447A).*

⁴ Recommendation ITU-R S.1427: *Methodology and criterion to assess interference from radio local area (RLAN) transmitters to non-GSO MSS feeder links in the band 5 150-5 250 MHz.*

⁵ Recommendation ITU-R M.1454: *E.i.r.p. density limit and operational restrictions for RLANS or other wireless access transmitters in order to ensure the protection of feeder links of non-geostationary systems in the mobile-satellite service in the frequency band 5 150-5 250 MHz.*

of examining the technical sharing issues between the existing and proposed services or applications in the 5 GHz band. A substantial amount of work was conducted within the Working Parties in the examination of studies and the development of recommendations which could be adopted to facilitate sharing among the different services.

Canada, with the participation of the wireless industry, radiolocation community and space science community, was actively involved in the development of these recommendations. During the same period, and in preparation for participation at the conference, Canada developed a series of proposals, in consultation with industry, for the treatment of these issues.

At WRC-03 in June 2003, decisions were made to adopt a number of changes to the *International Frequency Allocation Table* to provide new or upgraded allocations to the mobile, Earth exploration-satellite (active), space research (active) and radiolocation services. As well, a number of international footnotes were adopted to facilitate sharing amongst the services in the 5 GHz range. In general, the results of WRC-03 reflect Canada's positions prior to the Conference.

This document proposes frequency allocation changes to the mobile, Earth exploration-satellite (active), space research (active) and radiolocation services, taking into account decisions made at WRC-03. Furthermore, this document proposes new or revised policy and technical rules governing the use of wireless local area networks operating in the 5 GHz band.

This consultation will be of interest to a number of stakeholders, including the radiolocation service community, Earth exploration-satellite service community and the wireless local area network industry. Through the adoption of new rules proposed in this consultation paper, the general public is expected to benefit. More spectrum will be available for new and innovative radio applications, thus strengthening Canada's economy. Industry Canada invites all interested parties to comment on the proposals outlined in this paper.

2. Proposed Frequency Allocation Changes in the 5 GHz Band

At WRC-03, a number of allocation changes were made to the *International Table of Frequency Allocations* in the 5 GHz band. In the following sections, the outcome of WRC-03, proposed changes to the *Canadian Table Frequency of Allocations*, as well as other considerations that lead to the proposed changes are presented.

2.1 Radiolocation Service

In Canada, the radiolocation service has a primary allocation in the bands 5250-5350 MHz and 5650-5725 MHz. In the band 5350-5650 MHz, the radiolocation service is allocated on a secondary basis.

WRC-03 upgraded the status of the radiolocation service to primary in the band 5350-5650 MHz. One key aspect was the protection of the radiolocation service from the potential of interference from the aggregate emission of licence-exempt local area networks (LE-LANs). As well, in order to ensure compatibility of operation between different services, a number of international footnotes were adopted. In line with the decisions taken by WRC-03, the Department proposes the following changes to the *Canadian Table of Frequency Allocations* in the band 5350-5650 MHz and as shown in Appendix 1:

- Upgrade the radiolocation service from secondary to primary status in the band 5350-5650 MHz.
- Adopt new international footnotes 5.448D, 5.450A, and 5.450B, relevant to the operation of the radiolocation service.

The Department invites comments on this proposal.

2.2 Earth Exploration-Satellite (Active) and Space Research (Active) Services

The Earth exploration-satellite (EESS) (active) service is allocated on a primary basis in the band 5250-5460 MHz. (The band 5350-5460 MHz was made available to EESS (active) on a primary basis at the WRC in 1997.) Space research service (SRS) (active) is also allocated on a primary basis in the band 5250-5350 MHz.

WRC-03 provided new primary allocations to the EESS (active) and space research (active) services in the band 5460-5570 MHz. In addition, WRC-03 allocated the band 5350-5460 MHz to the space research (active) service on a primary basis in order to make available 320 MHz of contiguous bandwidth for both closely related services.

The band 5350-5460 MHz for space research (active) service was not originally part of the WRC-03 agenda; few studies were conducted to examine the compatibility of such service with other services. However, it was recognized at the conference that the EESS (active) and space research (active) services have similar operation and, based on compatibility studies between the EESS (active) service and other services, there was some assurance that both the EESS and SRS services will be compatible with other services operating in the same band. Despite the limited number of studies, the conference decided to provide a primary allocation to the SRS (active) service in the band 5350-5460 MHz, and inserted a footnote (Footnote 5.448C as shown in Appendix 1) to the International Table to ensure protection to other primary services operating in the same band.

A number of additional footnotes were also added to ensure compatibility with other services. The Department proposes the following changes to the *Canadian Table of Frequency Allocations* in the band 5250-5570 MHz and as shown in Appendix 1:

- Enter a new allocation to the Earth exploration-satellite (active) service on a primary basis in the band 5460-5570 MHz.
- Enter a new allocation to the space research (active) service on a primary basis in the band 5350-5570 MHz.
- Adopt new and/or modified international footnotes 5.448A, 5.448B and 5.448C, relevant to the operation of Earth exploration-satellite (active) or space research (active) services.

The Department invites comments on these proposals.

2.3 Mobile Service

Since the introduction of the spectrum utilization policy for LE-LANs in 1999 (*Spectrum Utilization Policy for Licence Exempt Wireless Local Area Networks in the 5 GHz Range* (SP-5150 MHz)), the LE-LAN industry has experienced significant growth. A number of applications have been envisioned to operate in the 5 GHz band. The 5 GHz band complements the 2.4 GHz band for LE-LANs. Many innovative broadband products and applications have appeared in the market. The 5 GHz band has also been used to provide last mile connections to homes and offices in urban, as well as rural areas.

The operation of LE-LANs in the 5 GHz range is currently governed by Canadian Footnote C39A, which designates the bands 5150-5250 MHz, 5250-5350 MHz and 5725-5825 MHz for use by LE-LANs based on not interfering with, nor claiming protection from licensed services. No service allocation entry was made in the Canadian Table. Under the current provisions, a range of fixed and mobile applications and devices (e.g. nomadic or non-nomadic, point-to-point and point-to-multipoint) operate on a licence-exempt basis. It should be noted that the band 5725-5825 MHz was not considered at WRC-03. This band is part of the existing three bands (300 MHz) of LE-LAN spectrum (C39A) in Canada.

The conference made available a total of 455 MHz of spectrum to the mobile service on a primary basis for the implementation of wireless access systems including Radio Local Area Networks in the bands 5150-5250 MHz, 5250-5350 MHz and 5470-5725 MHz. Along with the changes to the International Table, a number of footnotes, which specify the technical limits on LE-LANs, have been put in place to ensure compatibility with other service allocations.

In the United States, the Federal Communications Commission (FCC) recently amended their domestic rules governing the operation of unlicensed National Information Infrastructure (U-NII) devices, including Radio Local Area Networks (RLANs), and made an additional 255 MHz of spectrum available in the band 5470-5725 MHz.

The Department notes that many countries worldwide have made spectrum available, or are in the process of making spectrum available, for the development of wireless access facilities in the 5 GHz band. Some of these countries have announced plans to make additional spectrum available for LE-LANs based on the results of the WRC.

The Department recognizes the benefits of economies of scale of consumer products, which are achievable with international harmonization. It will be important for Canada to harmonize its spectrum usage and technical requirements with the international community, in accordance with the decisions of WRC-03.

The Department proposes the following changes to the *Canadian Table of Frequency Allocations* in the bands 5150-5350 MHz and 5470-5850 MHz, and as shown in Appendix 1:

- Enter a new allocation to the mobile service on a primary basis in the bands 5150-5350 MHz and 5470-5725 MHz.
- Adopt new international footnotes 5.446A, 5.446B, 5.447F and 5.450A, relevant to the operation of the mobile service.

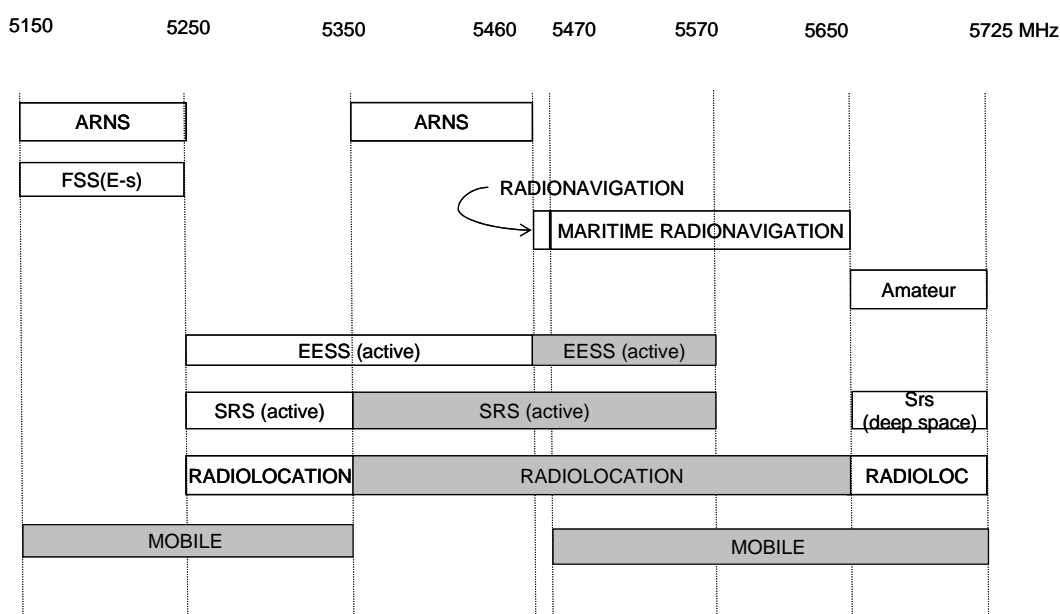
- Modify Canadian footnote C39A and add a new footnote CXX to indicate that the operation of wireless local area network systems will be accommodated in the bands with the development of spectrum utilization policies and technical criteria.

The Department invites comments on these proposals.

2.4 Summary and Proposed Allocation Changes

Figure 1 below provides an overview of the resulting international allocation changes made at WRC-03.

Figure 1: Summary of WRC-03 allocations in the 5 GHz range



NOTES:

Existing International allocation	International allocation made at WRC-03
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- Diagram is not to scale
- Primary allocations are shown in capital letters, e.g. "ARNS"
- Secondary allocations are shown in normal letters, e.g. "Amateur"
- Associated footnotes are not shown in this diagram
- ARNS denotes aeronautical radionavigation service
- FSS (E-s) denotes fixed-satellite service (Earth-to-space)
- EESS denotes Earth exploration-satellite service
- SRS denotes space research service
- RADIOLOC denotes radiolocation service

3. Proposed Revisions to Spectrum Utilization Policy and Technical Rules in the 5 GHz Range

The use of the frequency bands 5150-5250 MHz, 5250-5350 MHz and 5725-5825 MHz for licence-exempt wireless local area networks (LE-LANs) is currently governed under *Spectrum Utilization Policy for Licence Exempt Wireless Local Area Networks in the 5 GHz Range* (SP-5150 MHz).

In accordance with SP-5150 MHz, LE-LANs can be characterized as local transmission devices which provide a wide range of applications for high-speed broadband digital distribution applications comprising voice, video and data. These systems promise to provide high-speed connectivity for computers and multimedia neighbourhoods and will mainly consist of point-to-point and point-to-multipoint high-speed digital wireless services.

Industry Canada is providing funding to the [*Broadband for Rural and Northern Development*](#) initiative to help bring publicly available broadband access to Canadian communities, with priority given to First Nations, northern, remote and rural communities (www.broadband.ic.gc.ca). The Broadband initiative is part of the Canadian government's commitment to ensuring broadband access for all Canadian communities by 2005. Along with other frequency bands, use of the 5 GHz band for LE-LANs provides valuable spectrum to assist Canadians in achieving this goal.

The Department intends to permit, in addition to the bands 5150-5250 MHz, 5250-5350 MHz and 5725-5825 MHz, the operation of local area networks in the band 5470-5725 MHz under appropriate policies, regulations and technical standards. In that regard, SP-5150 MHz will be revised accordingly.

In order to ensure the compatibility between all the existing and proposed radio services in the 5 GHz band, a number of technical and operational restrictions on LE-LAN devices are necessary. The following sections discuss the technical and operational requirements in each sub-band.

3.1 Sub-band 5150-5250 MHz

The band 5150-5250 MHz is currently allocated to the aeronautical radionavigation service on a primary basis. The band 5091-5250 MHz is also allocated to the fixed-satellite service (FSS) on a primary basis in the Earth-to-space direction, limited to feederlinks for non-geostationary systems in the mobile-satellite service. In addition, under Canadian Footnote C39A, the band 5150-5250 MHz is designated for use by LE-LANs based on not interfering with, nor claiming protection from, licensed services. The technical and operational limits are stated in Radio Standards Specification 210, *Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)* (RSS-210).

International studies have concluded that, with appropriate power levels as well as technical and regulatory provisions, the sharing of spectrum among LE-LAN devices, existing aeronautical radionavigation service, and FSS feeder links for non-geostationary mobile-satellite service networks is feasible.

WRC-03 provided a global mobile service allocation for wireless access systems including radio local area networks in this band. Furthermore, stations in the mobile service shall not claim protection from earth stations in the fixed-satellite service. In addition, technical limits were imposed on the mobile service in order to ensure compatibility with other services.

A comparison between the existing domestic and newly adopted international technical and operational constraints on LE-LANs is provided in Table 1 below:

Table 1: Brief Summary of Technical and Operational Limits in the Band 5150-5250 MHz⁶	
RSS-210	<p>The maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% power bandwidth in MHz. The power spectral density shall not exceed 10 dBm in any 1.0 MHz band (e.i.r.p.).</p> <p>The band 5150-5250 MHz is restricted to indoor-only operation and the transmitter must be equipped with an integral antenna.</p>
WRC-03 decisions (see Appendix 3)	<p>Maximum e.i.r.p. of 200 mW and a maximum e.i.r.p. density of 10 mW/MHz in any 1 MHz or equivalently 0.25 mW/25 kHz in any 25 kHz. The band 5150-5250 MHz is restricted to indoor only operation.</p> <p>Administrations may monitor whether the aggregate power flux-density levels given in Recommendation ITU-R S.1426⁷ have been, or will be exceeded in the future, in order to enable a future world radiocommunication conference to take appropriate action.</p>

As shown in Table 1 above, Industry Canada’s RSS-210 has already imposed the indoor-only operational restriction on LE-LANs in order to ensure compatibility with the FSSs operating in the same band. In addition, power limits, consistent with those adopted by the WRC, are also specified in the RSS. Provisions to allow mobile-satellite service operators to monitor emissions from LE-LAN devices in the band were also included in RSS-210.

The Department proposes that the existing technical rules as contained in RSS-210 pertaining to the band 5150-5250 MHz be maintained. The Department seeks views on this proposal.

⁶ Information contained in this table is a summary only. Further restrictions may apply. Consult SP-5150 MHz, RSS-210, ITU Resolution 229 (WRC-03), or appropriate domestic/international footnote(s) for detailed descriptions of the technical and operational limits applicable to this frequency band.

⁷ The maximum aggregate power flux-density given in Recommendation ITU-R S.1426 is:
 $-124 - 20 \log_{10} (h_{SAT}/1\ 414)$ dB(W/(m² · 1 MHz)), or equivalently,
 $-140 - 20 \log_{10} (h_{SAT}/1\ 414)$ dB(W/(m² · 25 kHz)), at the FSS satellite orbit,
 where h_{SAT} is the altitude of the satellite (km).

3.2 Sub-band 5250-5350 MHz

The band 5250-5350 MHz is currently allocated to the Earth exploration-satellite, radiolocation, and space research services on a primary basis. In addition, under Canadian Footnote C39A, the band 5250-5350 MHz is designated for use by LE-LANs based upon not interfering with, nor claiming protection from licensed services.

This band has been designated for both indoor and outdoor LE-LAN products since 1999. Outdoor LE-LAN products have been used to provide broadband wireless access to customers for high-speed Internet applications. Prior to WRC-03, Canada was active in the international forum in ensuring that outdoor LE-LAN applications were accommodated while providing protection to the operation of other services operating in this band. A number of technical and operational restrictions were required in order to achieve this objective.

The Canadian Space Agency (CSA) operates a RADARSAT satellite in this band, which provides imagery data services to customers around the world.

The band 5250-5350 MHz is also used globally by military radiolocation systems.

As discussed in Section 2, WRC-03 made a global mobile service allocation for wireless access systems including Radio Local Area Networks in this band. Under the WRC provisions, stations in the mobile service shall not claim protection from the radiolocation, Earth exploration-satellite (active) and the space research (active) services. In addition, technical limits were imposed on the mobile service in order to ensure compatibility with other services.

The decisions of the WRC-03 represent a compromise among the various competing spectrum needs of the international community.

Specifically, due to the potential for interference into sensitive international Earth exploration-satellite instruments, there were strong representations from many countries to restrict the operation of LE-LAN to indoor-use only. A number of other countries were of the view that other mitigation techniques could be used to ensure compatibility between systems in the Earth exploration-satellite service and LE-LAN devices. These techniques include the use of an e.i.r.p. elevation angle mask as discussed below.

In addition, technical compatibility studies conducted by the International Telecommunications Union, in which Canada was an active participant have shown that sharing between LE-LAN devices and systems in the radiolocation service is possible provided certain technical constraints on the LE-LAN devices are adopted. These constraints include the use of dynamic frequency selection, as well as emission limits on LE-LANs. These constraints were adopted by WRC-03 in ITU Resolution **229** (WRC-03) as shown in Appendix 3 of this document.

Studies have shown that the e.i.r.p. elevation angle mask can be an effective mitigation technique to ensure compatibility with the EESS. Technologies such as the use of tilt sensors that vary the output power as a function of tilt angle of the device have demonstrated success in ensuring compliance with the e.i.r.p. elevation angle mask.

It was also stated by the WRC-03 that administrations could exercise some flexibility in adopting other mitigation techniques, provided that they develop national regulations to meet their obligations to achieve an equivalent level of protection to the EESS (active) and the SRS (active) based on their system characteristics and interference criteria as given in ITU-R SA.1632.⁸

Furthermore, the requirement to use Dynamic Frequency Selection (DFS) as a mitigation technique to ensure compatibility with the radiolocation was adopted by WRC-03. The specific requirements are given in Recommendation ITU-R M.1652.⁹ An excerpt from this recommendation is given in Appendix 2 of this document. In summary, the DFS mechanism is required to detect interference signals above a minimum DFS detection threshold of -62 dBm for devices with a maximum e.i.r.p. of less than 200 mW and -64 dBm for devices with a maximum e.i.r.p. of 200 mW to 1W averaged over 1 μ s. The LE-LAN device should be able to perform a channel availability check on a particular channel for 60 seconds to identify whether a radar is operating on that radio channel. The LE-LAN device should also be able to perform in-service monitoring to detect the presence of radars. As well, a channel that has been flagged as containing a radar signal, either by a channel availability check or in-service monitoring, is subject to a 30-minute non-occupancy period where it cannot be used by the LE-LAN device in order to protect scanning radars.

A comparison between the existing domestic and newly adopted international technical and operational constraints on LE-LANs is provided in Table 2 below:

Table 2: Brief Summary of Technical Limits in the Band 5250-5350 MHz¹⁰	
RSS-210	<p>The maximum transmitter power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% power bandwidth in MHz. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.</p> <p>The maximum e.i.r.p. shall not exceed 1.0 watt or $17 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% power bandwidth in MHz.</p>
WRC-03 decisions	Maximum e.i.r.p. shall be limited to 200 mW and a maximum e.i.r.p. density of 10 mW/MHz in any 1 MHz band.
(See Appendix 3)	Administrations are requested to take appropriate measures that will result in the predominant number of stations being operated in an indoor environment.

⁸ Recommendation ITU-R SA.1632: *Sharing in the band 5 250-5 350 MHz between the Earth exploration-satellite service (active) and wireless access systems (including radio local area networks) in the mobile service.*

⁹ Recommendation ITU-R M.1652: *Dynamic frequency selection in wireless access systems including radio local area networks for the purpose of protecting the radiodetermination service in the 5 GHz band.*

¹⁰ Information contained in this table is a summary only. Further restrictions may apply. Consult SP-5150 MHz, RSS-210, ITU Resolution **229** (WRC-03), or appropriate domestic/international footnote(s) for detailed descriptions of the technical and operational limits applicable to this frequency band.

	<p>Furthermore, stations which are permitted to be used either indoors or outdoors may operate up to a maximum e.i.r.p. of 1W and maximum e.i.r.p. density of 50 mW/MHz in any 1 MHz. When operating above an e.i.r.p. of 200 mW, stations shall comply with the following e.i.r.p. elevation angle mask where θ is the angle above the local horizontal plane (of the Earth):</p>		
	-13	dB(W/MHz)	for $0^\circ \leq \theta < 8^\circ$
	$-13 - 0.716 (\theta - 8)$	dB(W/MHz)	for $8^\circ \leq \theta < 40^\circ$
	$-35.9 - 1.22 (\theta - 40)$	dB(W/MHz)	for $40^\circ \leq \theta < 45^\circ$
	-42	dB(W/MHz)	for $45^\circ < \theta$
	<p>Administrations may exercise some flexibility in adopting other mitigation techniques, provided that they meet their obligations to achieve an equivalent level of protection to the EESS (active) and SRS (active) services based on their system characteristics and interference criteria as given in Recommendation ITU-R SA.1632.</p>		
	<p>Systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum e.i.r.p. shall be reduced by 3dB. Stations shall implement dynamic frequency selection.</p>		

The Department believes that the decisions taken at WRC-03 represent a well-balanced compromise among the competing spectrum needs. Of particular importance to Canada was the provision to allow the use of outdoor LE-LANs. As discussed previously, the Department is of the view that the capability for LE-LANs to operate outdoors will be essential to connect rural and remote communities. At the same time, the Department recognizes that LE-LANs, consistent with Canadian Footnote C39A, shall not cause harmful interference into other licensed services, such as the Earth exploration-satellite service and radiolocation service operating in the same band. With all elements of sharing considered, the Department believes that the decision taken by WRC-03 will protect the incumbent services appropriately while allowing LE-LANs to operate in indoor and outdoor environments.

In light of the above discussion, the Department is proposing to revise, where appropriate, a Radio Standard Specification, to incorporate the following technical rules on LE-LANs:

- (1) Stations are permitted to be used both indoors or outdoors; and
- (2) The maximum e.i.r.p. shall not exceed 1.0 watt or $17 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% power bandwidth in MHz; and

(3) When operating above an e.i.r.p. of 200 mW, stations shall comply with the following e.i.r.p. elevation angle mask where θ is the angle above the local horizontal plane (of the Earth):

-13	dB(W/MHz)	for $0^\circ \leq \theta < 8^\circ$
-13-0.716 (θ -8)	dB(W/MHz)	for $8^\circ \leq \theta < 40^\circ$
-35.9 - 1.22 (θ -40)	dB(W/MHz)	for $40^\circ \leq \theta < 45^\circ$
-42	dB(W/MHz)	for $45^\circ < \theta$

(4) Systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum e.i.r.p. shall be reduced by 3dB.

(5) Stations shall implement dynamic frequency selection.

The Department invites comments on these proposals.

The Department also invites comments on the following:

- (1) Recognizing that mitigation techniques such as dynamic frequency selection and e.i.r.p. elevation angle mask are required to ensure compatibility with the EESS (active) and radiolocation services, what are the technical implications and feasibility of implementing these techniques in the design of LE-LANs in this band?
- (2) The Department notes that, under the ITU Radio Regulations, administrations may exercise some flexibility in adopting other mitigation techniques, provided that they meet their obligations to achieve an equivalent level of protection to the EESS (active) and SRS (active) services based on their system characteristics and interference criteria as given in Recommendation ITU-R SA.1632. The Department seeks views and evidence on other mitigation techniques that may be available.
- (3) The Department also seeks comments on appropriate test and certification procedures to ensure compliance by mobile devices and systems with dynamic frequency selection, automatic power control and e.i.r.p. elevation angle mask in this band.
- (4) Given that the current technical rules for this band have been in place since 1999, the Department proposes that the new technical requirements be effective a year from the date of publication of the appropriate spectrum utilization policy.

3.3 Sub-band 5470-5725 MHz

The band 5470-5725 MHz is, or will be, shared by a number of radio services (see Appendix 1) including the radiodetermination service, Earth exploration-satellite (active) service, and space research (active) service in various sub-bands within this frequency range.

As discussed before, the United States has recently amended their rules governing the operation of unlicensed National Information Infrastructure (U-NII) devices, including Radio Local Area Networks (RLANs), and has made available an additional 255 MHz of spectrum in the band 5470-5725 MHz.

Also, as discussed in Section 2, WRC-03 made a global mobile service allocation for wireless access systems including Radio Local Area Networks in this band. Under the WRC provisions, stations in the mobile service shall not claim protection from the radiodetermination service. In addition, technical limits were imposed on the mobile service in order to ensure compatibility with other services.

Similar to the band 5250-5350 MHz, Earth exploration-satellite systems will utilize the band 5470-5725 MHz for many synthetic aperture radar-related applications. However, sharing between LE-LANs and the Earth exploration-satellite systems is less restrictive in the band 5470-5725 MHz than in the band 5250-5350 MHz. The wide-band synthetic aperture radars (SARs), which will operate in the band 5250-5725 MHz are less susceptible to interference than the SARs that operate in the band 5250-5350 MHz. This will enable the LE-LANs to operate with higher power and less operational restrictions compared to the band 5250-5350 MHz.

Furthermore, as discussed in the previous section, the use of dynamic frequency selection as a mitigation technique to ensure compatibility with the radiolocation was adopted by WRC-03.

The band 5600-5650 MHz is used heavily in Canada for national meteorological radars. These radars provide weather related data for Environment Canada. Their operation is different than conventional terrestrial scanning radars. In order to protect their operation from aggregate emissions of LE-LAN devices, the ITU-R had developed special provisions in Recommendation ITU-R M.1652 for the band 5600-5650 MHz. An excerpt from this recommendation is given in Appendix 2 of this document. In this Recommendation, it is stated that “in the band 5600-5650 MHz, if a channel has been flagged as containing a radar, a 10-minute continuous monitoring of the flagged channel is required prior to use of that channel. Otherwise, other appropriate methods such as channel exclusion would be required.” This 10-minute continuous monitoring requirement may be performed during the 30-minute non-occupancy period. The non-occupancy period is described in Section 3.2 of this document.

A comparison between the existing domestic and newly adopted international technical constraints on LE-LANs is provided in Table 3 below:

Table 3: Brief Summary of Technical Limits in the Band 5470-5725 MHz¹¹	
RSS-210	Not applicable.
WRC-03 decisions (See Appendix 3)	<p>Stations shall be restricted to a maximum transmitter power of 250 mW with a maximum e.i.r.p. of 1W and a maximum e.i.r.p. density of 50 mW/MHz in any 1 MHz band.</p> <p>Systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum e.i.r.p. shall be reduced by 3 dB.</p> <p>Stations shall implement dynamic frequency selection, including special provisions (described previously) pertaining to the band 5600-5650 MHz.</p>

¹¹ Information contained in this table is a summary only. Further restrictions may apply. Consult SP-5150 MHz, RSS-210, ITU Resolution 229 (WRC-03), or appropriate domestic/international footnote(s) for detailed descriptions of the technical and operational limits applicable to this frequency band.

In light of the above discussion, the Department is proposing to revise, where appropriate, a Radio Standard Specification, to incorporate the following technical rules on LE-LANs:

- (1) Stations are permitted to be used both indoors or outdoors.
- (2) The maximum transmitter power shall not exceed 250 mW.
- (3) The maximum e.i.r.p. shall not exceed 1.0 watt or $17 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% power bandwidth in MHz.
- (4) Systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum e.i.r.p. shall be reduced by 3 dB.
- (5) Stations shall implement dynamic frequency selection, including the special provisions pertaining to the band 5600-5650 MHz. The special provisions pertaining to the band 5600-5650 MHz require that in the band 5600-5650 MHz, if a channel has been flagged as containing a radar, a 10-minute continuous monitoring of the flagged channel is required prior to use of that channel. Otherwise, other appropriate methods such as channel exclusion are required.

The Department invites comments on these proposals.

The Department also invites comments on the following:

- (1) Recognizing that mitigation techniques, such as DFS, are required to ensure compatibility with EESS (active) and the radiolocation service, what are the technical implications and the feasibility of implementing these techniques in the design of LE-LANs in this band?
- (2) The Department also seeks comments on appropriate test and certification procedures to ensure compliance by mobile devices and systems with dynamic frequency selection, and automatic power control.

4. Conclusion

Based upon the results of the public consultation initiated by this discussion paper, a revised *Canadian Table of Frequency Allocations* will be prepared and issued. As well, appropriate spectrum utilization policy and technical standards will be revised and published.

Issued under the authority
of the *Radiocommunication Act*

Robert McCaughern
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Spectrum Engineering Branch

Larry Shaw
Director General
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Appendix 1

Proposed Allocation Changes

The proposals contained in this section are identified as modifications to the version of the *Canadian Table of Frequency Allocations* which reflects most of the allocation decisions of WRC-2000.

<u>Underlining</u>	When used in the Table, underlining proposes the addition of a radio service or footnote. It is also used in the text of Canadian footnotes to identify proposed additional text.
Strikeout	When used in the Table, a strikeout proposes the deletion of a radio service or footnote. It is also used in the text of Canadian footnotes to identify proposed deleted text.
5.xxx	This is the form of the designation of international footnotes.
CXX	This identifies a Canadian footnote.
MOD	This indicates an international footnote modified at WRC-2003 or a Canadian footnote proposed for modification. These appear in both the Table and in the list of footnotes.
ADD	This is used in a list of footnotes to indicate an international footnote created at WRC-2003 or a proposed new Canadian footnote.
Table Entry	A Table Entry printed in uppercase letters are referred to as “primary” services, while those printed in lower case are referred to as “secondary” services. Refer to the <i>Canadian Table of Frequency Allocations</i> for the distinction between primary and secondary services.

Note: The text of international footnotes is not open for consideration in this discussion paper and consequently the modifications to footnotes made at WRC-2003 are incorporated but not identified.

Canadian Table of Frequency Allocations
MHz

5 150 - 5 250	<p>AERONAUTICAL RADIONAVIGATION FIXED-SATELLITE (Earth-to-space) 5.447A <u>MOBILE except aeronautical mobile</u> <u>5.446A</u> <u>5.446B</u></p> <p>5.446 5.447B 5.447C G39A <u>CXX</u></p>
5 250 - 5 255	<p>EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.447D <u>MOBILE except aeronautical mobile</u> <u>5.446A</u> <u>5.447F</u></p> <p>MOD 5.448A G39A <u>CXX</u></p>
5 255 - 5 350	<p>EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) <u>MOBILE except aeronautical mobile</u> <u>5.446A</u> <u>5.447F</u></p> <p>MOD 5.448A G39A <u>CXX</u></p>
5 350 - 5 460	<p>AERONAUTICAL RADIONAVIGATION 5.449 EARTH EXPLORATION-SATELLITE (active) MOD 5.448B <u>RADIOLOCATION</u> <u>5.448D</u> <u>SPACE RESEARCH (active)</u> <u>5.448C</u> Radiolocation</p> <p>G39A</p>
5 460 - 5 470	<p>RADIONAVIGATION 5.449 <u>EARTH EXPLORATION-SATELLITE (active)</u> <u>MOD 5.448B</u> <u>SPACE RESEARCH (active)</u> <u>RADIOLOCATION</u> <u>5.448D</u> Radiolocation</p>

5 470 - 5 570	<p>MARITIME RADIONAVIGATION <u>MOBILE except aeronautical mobile 5.446A 5.450A</u> <u>EARTH EXPLORATION-SATELLITE (active) MOD 5.448B</u> <u>SPACE RESEARCH (active)</u> <u>RADIOLOCATION 5.450B</u> Radiolocation</p> <p>5.452 <u>CXX</u></p>
5 570 - 5 650	<p>MARITIME RADIONAVIGATION <u>MOBILE except aeronautical mobile 5.446A 5.450A</u> <u>RADIOLOCATION 5.450B</u> Radiolocation</p> <p>5.452 <u>CXX</u></p>
5 650 - 5 725	<p>RADIOLOCATION <u>MOBILE except aeronautical mobile 5.446A 5.450A</u> Amateur Space Research (deep space)</p> <p>5.282 <u>CXX</u></p>
5725 - 5850	<p>RADIOLOCATION Amateur</p> <p>5.150 MOD C39A</p>

- MOD C39A** The bands ~~5150-5250 MHz, 5250-5350 MHz, and 5725-5825 MHz~~ are is designated for use by licence exempt wireless local area networks and devices with established maximum power levels and based upon not interfering with, or claiming protection from, licensed services.
- ADD CXX** The use of the bands 5150-5250 MHz, 5250-5350 MHz, and 5470-5725 MHz by the mobile service will be in accordance with spectrum policy and technical and operational limits to be established for the implementation of wireless local area networks and devices.
- ADD 5.446A (WRC-03)** The use of the bands 5 150-5 350 MHz and 5 470-5 725 MHz by the stations in the mobile service shall be in accordance with Resolution **229 (WRC-03)**.
- ADD 5.446B (WRC-03)** In the band 5 150-5 250 MHz, stations in the mobile service shall not claim protection from earth stations in the fixed-satellite service. Number **5.43A** does not apply to the mobile service with respect to FSS earth stations.
- ADD 5.447F (WRC-03)** In the band 5 250-5 350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active). These services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU-R M.1638 and ITU-R SA.1632.
- MOD 5.448A (WRC-03)** The Earth exploration-satellite (active) and space research (active) services in the frequency band 5 250-5 350 MHz shall not claim protection from the radiolocation service. Number **5.43A** does not apply.
- MOD 5.448B (WRC-03)** The Earth exploration-satellite service (active) operating in the band 5 350-5 570 MHz and space research service (active) operating in the band 5 460-5 570 MHz shall not cause harmful interference to the aeronautical radionavigation service in the band 5 350-5 460 MHz, the radionavigation service in the band 5 460-5 470 MHz and the maritime radionavigation service in the band 5 470-5 570 MHz.
- ADD 5.448C (WRC-03)** The space research service (active) operating in the band 5 350-5 460 MHz shall not cause harmful interference to nor claim protection from other services to which this band is allocated.
- ADD 5.448D (WRC-03)** In the frequency band 5 350-5 470 MHz, stations in the radiolocation service shall not cause harmful interference to, nor claim protection from, radar systems in the aeronautical radionavigation service operating in accordance with No. **5.449**.

- ADD 5.450A (WRC-03)** In the band 5 470-5 725 MHz, stations in the mobile service shall not claim protection from radiodetermination services. Radiodetermination services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendation ITU-R M.1638.
- ADD 5.450B (WRC-03)** In the frequency band 5 470-5 650 MHz, stations in the radiolocation service, except ground-based radars used for meteorological purposes in the band 5 600-5 650 MHz, shall not cause harmful interference to, nor claim protection from, radar systems in the maritime radionavigation service.

Appendix 2 - Excerpts from Annex 1 to Recommendation ITU-R M.1652

Dynamic Frequency Selection in Wireless Access Systems Including Radio Local Area Networks for the Purpose of Protecting the Radiodetermination Service in the 5 GHz Band

Annex 1 to Recommendation ITU-R M.1652

The Use of Dynamic Frequency Selection (DFS) in WAS including RLANs for the Purpose of Protecting the Radiodetermination Service in the 5 GHz Band

1. Introduction

1.1 DFS

Resolution 736 (WRC-2000) calls, inter alia, for studies on the feasibility of sharing between the mobile service for WAS¹ and the radiodetermination service in the frequency bands 5 250-5 350 and 5 470-5 725 MHz. Link budget calculations have shown that interference mitigation techniques are required to enable sharing of WAS with other services such as radar systems. This Recommendation describes the interference mitigation technique(s) DFS² as specified in the 5 GHz RLAN standards, with performance calculations based on typical implementations.

WAS and radars operating in the 5 GHz band will interfere when operating at the same frequencies and within range of each other.

DFS has then been envisaged to:

- ensure a spread of the loading across the available spectrum of the WAS under the field of view of a satellite to reduce the aggregate emission levels at the satellites of the FSS (feeder links) and EESS (active) from WAS; and
- avoid co-channel operation with other systems, notably radar systems.

Extension of the use of DFS as described herein allows WAS to avoid interfering with the radiodetermination service. The general principle applied is that WAS should detect interference and identify radar interferers and shall not use those frequencies used by the radar.

¹ Throughout this Recommendation the term “WAS” denotes “wireless access systems including RLANs”.

² The DFS feature was specified in the 5 GHz RLAN standards initially in order to mitigate interference among uncoordinated RLAN clusters, and to provide optimized spectral efficiency for high-capacity, high bit-rate data transmission.

1.2 Objective of the Use of DFS with Respect to Radars

The objective of using DFS in WAS is to provide adequate protection to radars in the 5 GHz band. This is achieved by avoiding the use of, or vacating, a channel identified as being occupied by radar equipment based on detection of radar signals.

For the purpose of this Annex, a discussion of radiodetermination systems in the 5 GHz range utilized in determining DFS characteristics can be found in Annex 3 [Not attached in this consultation].

The implementation of radar detection mechanisms and procedures used by WAS are outside the scope of this Annex. The main reasons for this are that:

- WAS design affects implementation;
- practical experience may lead to innovative and more efficient means than can be formulated today;
- different manufacturers may make different implementation choices to achieve the lowest cost for a given level of performance; therefore only performance criteria rather than specifications for a particular mechanism should be given in regulatory documents.

2. DFS Performance Requirements

The DFS performance requirement is stated in terms of response to detection of an interference signal.

5 GHz WAS should meet the following detection and response requirements.

Procedures for compliance verification should be incorporated in relevant industry standards for RLANs.

2.1 Detection Requirements

The DFS mechanism should be able to detect interference signals above a minimum DFS detection threshold of -62 dBm for devices with a maximum e.i.r.p. of < 200 mW and -64 dBm for devices with a maximum e.i.r.p. of 200 mW to 1 W³ averaged over 1 μ s.

This is defined as the received signal strength (RSS) (dBm), normalized to the output of a 0 dBi receive antenna, that is required to be detected within the WAS channel bandwidth.

2.2 Operational Requirements

The WAS should be able to perform channel availability check: A check during which the WAS listens on a particular radio channel for 60 s to identify whether there is a radar operating on that radio channel.

³ In practice, it may not be necessary for each device to implement full DFS functionally, provided that such devices are only able to transmit under the control of a device that ensures that all DFS requirements are fulfilled.

The WAS should be able to perform in-service monitoring: Monitoring of the operating channel to check that a co-channel radar has not moved or started operation within range of the WAS. During in-service monitoring the radar detection function continuously searches for radar signals in-between normal WAS transmissions. This requires the use of quiet spaces between successive WAS transmissions (See Annex 4) [Not attached in this consultation].

If the WAS has not previously been in operation or has not continuously monitored the channel with in-service monitoring, it should not start transmission in any channel before completion of a channel availability check.

2.3 Response Requirements

A channel that has been flagged as containing a radar signal, either by a channel availability check or in-service monitoring, is subject to a 30-minute period (non-occupancy period) where it cannot be used by the WAS device in order to protect scanning radars. The non-occupancy period should start at the time when the radar signal is detected.

Additionally, in the band 5 600-5 650 MHz, if a channel has been flagged as containing a radar, a 10-minute continuous monitoring of the flagged channel is required prior to use of that channel. Otherwise, other appropriate methods such as channel exclusion would be required.

Channel move time is defined as the period of 10 s needed by a WAS to cease all transmissions on the operating channel upon detection of an interfering signal above the DFS detection threshold. Transmissions during this period will consist of normal traffic for typically less than 100 ms and a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel. The aggregate time of the intermittent management and control signals are typically less than 20 ms.

2.4 Summary of the Requirements

Table 1 provides a summary of the requirements described above. An example of the operating procedures is given in Annex 2 [Not attached in this consultation].

Table 1

Parameter	Value
DFS detection threshold	-62 dBm for devices with a maximum e.i.r.p. of < 200 mW and -64 dBm for devices with a maximum e.i.r.p. of 200 mW to 1 W averaged over 1 μ s
Channel availability check time	60 s
Non-occupancy period	30 min
Channel move time	\leq 10 s

Appendix 3

RESOLUTION 229 (WRC-03)

Use of the Bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the Mobile Service for the Implementation of Wireless Access Systems Including Radio Local Area Networks

The World Radiocommunication Conference (Geneva, 2003),

considering

- (a) that this Conference has allocated the bands 5 150-5 350 MHz and 5 470-5 725 MHz on a primary basis to the mobile service for the implementation of wireless access systems (WAS), including Radio Local Area Networks (RLANs);
- (b) that this Conference has decided to make an additional primary allocation for the Earth exploration-satellite service (EESS) (active) in the band 5 460-5 570 MHz and space research service (SRS) (active) in the band 5 350-5 570 MHz;
- (c) that this Conference has decided to upgrade the radiolocation service to a primary status in the 5 350-5 650 MHz band;
- (d) that the band 5 150-5 250 MHz is allocated worldwide on a primary basis to the fixed-satellite service (FSS) (Earth-to-space), this allocation being limited to feeder links of non-geostationary-satellite systems in the mobile-satellite service (No. **5.447A**);
- (e) that the band 5 150-5 250 MHz is also allocated to the mobile service, on a primary basis, in some countries (No. **5.447**) subject to agreement obtained under No. **9.21**;
- (f) that the band 5 250-5 460 MHz is allocated to the EESS (active) and the band 5 250-5 350 MHz to the space research service (active) on a primary basis;
- (g) that the band 5 250-5 725 MHz is allocated on a primary basis to the radiodetermination service;
- (h) that there is a need to protect the existing primary services in the 5 150-5 350 MHz and 5 470-5 725 MHz bands;
- (i) that results of studies in ITU-R indicate that sharing in the band 5 150-5 250 MHz between WAS, including RLANs, and the FSS is feasible under specified conditions;
- (j) that studies have shown that sharing between the radiodetermination and mobile services in the bands 5 250-5 350 MHz and 5 470-5 725 MHz is only possible with the application of mitigation techniques such as dynamic frequency selection;
- (k) that there is a need to specify an appropriate e.i.r.p. limit and, where necessary, operational restrictions for WAS, including RLANs, in the mobile service in the bands 5 250-5 350 MHz and 5 470-5 570 MHz in order to protect systems in the EESS (active) and SRS (active);
- (l) that the deployment density of WAS, including RLANs, will depend on a number of factors including intrasystem interference and the availability of other competing technologies and services,

further considering

- (a) that the interference from a single WAS, including RLANs, complying with the operational restrictions under *resolves 2* will not on its own cause any unacceptable interference to FSS receivers on board satellites in the band 5 150-5 250 MHz;

(b) that such FSS satellite receivers may experience an unacceptable effect due to the aggregate interference from these WAS, including RLANs, especially in the case of a prolific growth in the number of these systems;

(c) that the aggregate effect on FSS satellite receivers will be due to the global deployment of WAS, including RLANs, and it may not be possible for administrations to determine the location of the source of the interference and the number of WAS, including RLANs, in operation simultaneously,

noting

that, prior to WRC-03, a number of administrations have developed regulations to permit indoor and outdoor WAS, including RLANs, to operate in the various bands under consideration in this Resolution,

recognizing

(a) that in the band 5 600-5 650 MHz, ground-based meteorological radars are extensively deployed and support critical national weather services, according to footnote No. **5.452**;

(b) that the means to measure or calculate the aggregate pfd level at FSS satellite receivers specified in Recommendation ITU-R S.1426 are currently under study;

(c) that certain parameters contained in Recommendation ITU-R M.1454 related to the calculation of the number of RLANs tolerable by FSS satellite receivers operating in the band 5 150-5 250 MHz require further study;

(d) that the performance and interference criteria of spaceborne active sensors in the EESS (active) are given in Recommendation ITU-R SA.1166;

(e) that a mitigation technique to protect radiodetermination systems is given in Recommendation ITU-R M.1652;

(f) that an aggregate pfd level has been developed in Recommendation ITU-R S.1426 for the protection of FSS satellite receivers in the 5 150-5 250 MHz band;

(g) that Recommendation ITU-R SA.1632 identifies a suitable set of constraints for WAS, including RLANs, in order to protect the EESS (active) in the 5 250-5 350 MHz band;

(h) that Recommendation ITU-R M.1653 identifies the conditions for sharing between WAS, including RLANs, and the EESS (active) in the 5 470-5 570 MHz band;

(i) that the stations in the mobile service should also be designed to provide, on average, a near-uniform spread of the loading of the spectrum used by stations across the band or bands in use to improve sharing with satellite services;

(j) that WAS, including RLANs, provide effective broadband solutions;

(k) that there is a need for administrations to ensure that WAS, including RLANs, meet the required mitigation techniques, for example, through equipment or standards compliance procedures,

resolves

1 that the use of these bands by the mobile service will be for the implementation of WAS, including RLANs, as described in Recommendation ITU-R M.1450;

2 that in the band 5 150-5 250 MHz, stations in the mobile service shall be restricted to indoor use with a maximum mean e.i.r.p.¹ of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band or equivalently 0.25 mW/25 kHz in any 25 kHz band;

¹ In the context of this Resolution, “mean e.i.r.p.” refers to the e.i.r.p. during the transmission burst which corresponds to the highest power, if power control is implemented.

3 that administrations may monitor whether the aggregate pfd levels given in Recommendation ITU-R S.1426² have been, or will be exceeded in the future, in order to enable a future competent conference to take appropriate action;

4 that in the band 5 250-5 350 MHz, stations in the mobile service shall be limited to a maximum mean e.i.r.p. of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band. Administrations are requested to take appropriate measures that will result in the predominant number of stations in the mobile service being operated in an indoor environment. Furthermore, stations in the mobile service that are permitted to be used either indoors or outdoors may operate up to a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band, and, when operating above a mean e.i.r.p. of 200 mW, these stations shall comply with the following e.i.r.p. elevation angle mask where θ is the angle above the local horizontal plane (of the Earth):

-13	dB(W/MHz)	for	$0^\circ \leq \theta < 8^\circ$
$-13 - 0.716(\theta - 8)$	dB(W/MHz)	for	$8^\circ \leq \theta < 40^\circ$
$-35.9 - 1.22(\theta - 40)$	dB(W/MHz)	for	$40^\circ \leq \theta \leq 45^\circ$
-42	dB(W/MHz)	for	$45^\circ < \theta$;

5 that administrations may exercise some flexibility in adopting other mitigation techniques, provided that they develop national regulations to meet their obligations to achieve an equivalent level of protection to the EESS (active) and the SRS (active) based on their system characteristics and interference criteria as stated in Recommendation ITU-R SA.1632;

6 that in the band 5 470-5 725 MHz, stations in the mobile service shall be restricted to a maximum transmitter power of 250 mW³ with a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band;

7 that in the bands 5 250-5 350 MHz and 5 470-5 725 MHz, systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum mean e.i.r.p. shall be reduced by 3 dB;

8 that, in the bands 5 250-5 350 MHz and 5 470-5 725 MHz, the mitigation measures found in Annex 1 to Recommendation ITU-R M.1652 shall be implemented by systems in the mobile service to ensure compatible operation with radiodetermination systems,

invites administrations

to adopt appropriate regulation if they intend to permit the operation of stations in the mobile service using the e.i.r.p. elevation angle mask in *resolves* 4, to ensure the equipment is operated in compliance with this mask,

invites ITU-R

1 to continue work on regulatory mechanisms and further mitigation techniques to avoid incompatibilities which may result from aggregate interference into the FSS in the band 5 150-5 250 MHz from a possible prolific growth in the number of WAS, including RLANs;

2 to continue studies on mitigation techniques to provide protection of EESS from stations in the

² $-124 - 20 \log_{10} (h_{SAT}/1\ 414)$ dB(W/(m² · 1 MHz)), or equivalently,
 $-140 - 20 \log_{10} (h_{SAT}/1\ 414)$ dB(W/(m² · 25 kHz)), at the FSS satellite orbit,
where h_{SAT} is the altitude of the satellite (km).

³ Administrations with existing regulations prior to this Conference may exercise some flexibility in determining transmitter power limits.

mobile service,

3 to continue studies on suitable test methods and procedures for the implementation of dynamic frequency selection, taking into account practical experience.