



ORGANIZATION OF AMERICAN STATES
Inter-American Telecommunication Commission

**IX MEETING OF PERMANENT
CONSULTATIVE COMMITTEE III:
RADIOCOMMUNICATIONS**
September 22 to 26, 1997
Mexico City, Mexico

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FINAL REPORT

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FINAL REPORT

NINTH MEETING OF THE PERMANENT CONSULTATIVE COMMITTEE III: RADIOCOMMUNICATIONS (PCC.III)

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications was held in Mexico City, 22 to 26, September of 1997.

I. AGENDA

1. Approval of Agenda and Calendar.
2. Appointment of the Drafting Group for the Final Report.
3. Meeting and Report of Chairpersons of Working Groups on the following topics:
 - 3.1 Preparation of the 1997 World Radiocommunications Conference (WRC-97).
 - 3.2 Regional database on the use of radioelectric spectrum (aimed at the promotion of its common and harmonious use, including sharing aspects).
 - 3.3 Satellite systems in the Geostationary Orbit.
 - 3.4 Networks and services that use small aperture terminals (VSAT).
 - 3.5 Personal Communication Systems and Related Systems (wireless fixed access - FWA - and their coexistence with PCS).
 - 3.6 Cooperation in Legal Matters and Administrative Procedures (PCC.I, PCC.II and PCC.III).
 - 3.7 Local Multipoint Distribution /Communication Service.
 - 3.8 Human Resources.
 - 3.9 Low Earth Orbit Systems below 1 GHz and their implementation in the Americas.
 - 3.10 Results and recommendations on quantification studies in the topics about incompatibility between Fixed Wireless Access and the PCS systems in the band 1850-1990 MHz.
 - 3.11 Study of mobile satellite systems above 1 GHz.
4. Implementation of World Maritime Rescue and Safety System (SMSS) including regional satellite mobile service systems in 1.5-1.6 GHz participating of the same.
5. Discussions on subjects of the World Telecommunication Policy Forum.
6. Report on the preparation of CITEL's 1998 Assembly.
7. Report on CITEL's preparation for ITU's Conferences of Plenipotentiaries and for the World Meeting on Telecommunications Development.
8. Agenda, Venue and Date of the Tenth Meeting of PCC.III.
9. Other related matters.
10. Approval of the Report of the Ninth Meeting.

II. MEETING AUTHORITIES

Chairman:	Mrs. Salma Jalife (Mexico)
Vicechairman:	Mr. Amadeo Castro Neto (Brazil)
Executive Secretary	Mr. Roberto Blois Montes de Souza (CITEL)
Chairman of the Group for the Drafting of the Final Report:	Mr. Alejandro Gutiérrez (Mexico)
Members :	Ms. Elizabeth Oliva (Mexico)
	Mr. Carlos A. Bello (Mexico)
	Ms. Layla Macc Adan (Venezuela)
	Mr. Héctor Budé (Uruguay)
	Mr. Chris Lafkas (Canada)
	Mr. Andrew Faiola (United States)

III. RESOLUTIONS

PCC.III/RES. 60 (IX-97)

SEMINAR TO REPORT TEST RESULTS FROM THE DEMONSTRATION SATELLITE FOR NON-VOICE, NON-GSO MSS APPLICATIONS IN FREQUENCIES BELOW 1 GHZ

The Ninth Meeting of the Permanent Consultative Committee III; Radiocommunications,

CONSIDERING:

That the WRC-95 issued Resolution 214 which resolved that "further studies are urgently required on operational and technical means to facilitate sharing between the non-GSO/MSS and other Radiocommunication services having allocations and operating below 1 GHz," and further that this Resolution urged Administrations "to participate actively in these studies, and to submit reports on their technical, operational, and frequency sharing experience with non-GSO/MSS systems operating below 1 GHz";

That the Permanent Consultative Committees of CITEL have undertaken efforts to schedule seminars on a regular basis on a wide variety of topics in the interest of information dissemination,

NOTING:

That a demonstration by a U.S. satellite operator authorized under an experimental license granted by the United States licensing authority is planned.

That the U.S. satellite operator's system is being coordinated with the ITU by the appropriate United States licensing Authority.

That nine countries, including the CITELE Member States of Brazil, Colombia, Uruguay and the USA, are planning to participate in this demonstration to commence in 1997, and that other CITELE Member States are also invited to participate in this demonstration which offers free access to the demonstration satellite and the use of up to ten remote terminals for six months.

TAKING INTO ACCOUNT:

That previous meetings of CITELE PCC.III have received information documents on the planned demonstration beneficial to all of the Member States of the Region,

RESOLVES:

1. That a Seminar to report test results from the demonstration be held in conjunction with the last PCC.III meeting of 1998;
2. That the U.S. Administration acts as the Seminar Coordinator;
1. To invite the member States and the Associate Members of the Region to participate at the Seminar.

INSTRUCTS:

The Executive Secretary of CITELE to provide Administrative support in preparing for this Seminar.

PCC.III/RES.61 (IX-97)

**RELATING TO THE DISPOSITION OF INTER-AMERICAN PROPOSALS
TO WRC-97**

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications,

WHEREAS:

PCC.III has a Working Group to prepare common proposals for World Radiocommunication Conferences.

During the VIII Meeting of PCC.III held in Brasilia and the IX Meeting of PCC.III held in Mexico City, the Inter-American Proposals listed in the table in the Annex were agreed upon by various Administrations.

NOTING:

The importance of these proposals to CITELE Administrations; and

That these proposals must arrive at the ITU in time for WRC-97.

RESOLVES

1. That CITELE Administrations participating in this meeting have until October 3^d to notify the Executive Secretary of their intent to associate their administration with any or all of the joint proposals listed in the Annex before they are transmitted to the ITU; and
2. That while the deadline indicated in this resolution needs to be strictly followed in order to expedite dispatch of the proposals listed in the Annex to the ITU, CITELE member States may still associate their names at any time to any of the proposals listed in the Annex prior to and during the Conference. Member States may associate their country's name with any or all of the annexed proposals by notifying the Executive Secretary by October 17th, 1997. Thereafter, they may join in supporting the proposals during WRC-97.

INSTRUCTS:

1. The Executive Secretary to transmit the Inter-American Proposals contained in the documents listed in the Annex to this Resolution to the ITU by October 6;
2. The Executive Secretary to forward these joint proposals to those CITELE Administrations not participating in this meeting with a request for them to review these proposals and consider associating their Administrations' name with the proposals. Resolves 2 would also apply to these Administrations; and
3. The Executive Secretary to send to the ITU an addendum containing additional country names that are received after October 3, 1997, but before October 17, 1997.

ANNEX

Chapter	A.I	Doc#	Orig	Pub.	Topic	A R G	B	C A N	C L M	C T R	E Q A	G T M	H N D	M E X	S U R	U R U	U S A	V E N
1	1.2	783 rev. 3	e	es	Art. S4, S7-9,S11,S13-14 (Valid only the english version, the spanish version was revised//Sólo vale la versión en inglés, la versión en español fue revisada)		x	x						x		x	x	
	1.2	783 rev.3 ad.1	e	es	Art. S9 y S.11		x	x						x		x	x	
	1.2	783 rev 4	e	s	Art. S4, S7-9,S11,S13-14 (Only the spanish version was published)		x	x						x		x	x	
	1.2	820 rev 1	e	es	Ap. S5		x	[x]						x		x	x	
2	1.2	779 rev.3	e	es	Ap S4	x	x	x			x					x	x	x
	1.4	778 rev 4	e	es	HFBC Allocations	x	x	x								x		x
	1.4	777 rev 3	e	es	Art. S12	x	x	x			x					x	x	x
	1.4	910	e	es	HFBC SSB Survey	x	x	x								x	x	x
	1.4	821 rev 1	e	es	Art. S12	x	x	x								x	x	x
3	1.6.1	924	e	e	Art. S31		x	x						x	x		x	
	1.6.2	925	e	es	Art. S5 & Ap. S18		x	x						x	x		x	
		926	e	es	Art. S53		x	x						x	x		x	
	1.6.4	927	e	es	Res. 339		x	x						x	x		x	
	1.6.5	928	e	es	Art S52		x	x						x	x		x	
	1.8	929	e	es	Res. 408. 136-137 MHz		x	x						x	x		x	
4.1	1.9.1	932	e	es	NGSO MSS below 1 GHz. 405-406 MHz			[x]						[x]			x	
	1.9.1	900 rev 1	e	es	450-470 MHz			x	x								[x]	
	1.9.1	903 cor1	e	es	137-138 Mhz		x	x									x	[x]
	1.9.1	921	e	es	148-149.9 MHz			x	x		[x]				[x]	[x]	x	
4.2	1.9.1	898 rev 1	s	es	Global harmonization of the 2 GHz MSS		x	x								[x]	x	
	1.9.1	824 rev 2	e	es	Res. 215	x	x	x						x		x	x	
4.3	1.9.1	904 rev 1	e	es	19.3-19.7 & 29.1-29.29.5 GHz	x	x	x	x			x		x		x	x	
	1.9.1	901 rev1	e	es	Art S21 19.3-19.7 GHz	x	x	x	x					x		x	x	
	1.9.1	905 rev 1	e	es	18.8-9.3 &28.6-29.1 GHz Res. 118	x	x		x	x		x	x	x		x	x	

4.4		784 rev 3	e	es	Maritime Mobile Satellite Service 14-14.5 GHz	x	x	x			x			x			x	[x]
Chapter	A.I	Doc#	Orig	Pub.	Topic	A	B	C	C	C	E	G	H	M	S	U	U	V
						R		A	L	T	Q	T	N	E	U	R	S	E
						G		N	M	R	A	M	D	X	R	U	A	N
5	1.9.2	786 rev 2 *	e	es	Res 710 401-403 MHz	x	x	x						x		x	x	
	1.9.2	790 rev 3 *	e	es	5250-5350 MHz	x	x	x					x	x		x	x	
	1.9.2	788 rev 2 *	e	es	Art S5 Earth exploration Service 8025-8400 MHz	x	x	x						x		x	x	
5	1.9.2	906	e	es	13.25-14 GHz				x				x			x	x	
	1.9.2	907	e	es	18.6-18.8 GHz		x		x	x			x			x	x	
	1.9.2	917	e	es	Res. 712 35.2-36 GHz					x			x			x	x	
	1.9.2	918	e	es	Res. 712. 92-95 GHz					x			x			x	x	
	1.9.2	930	e	es	Res. 712. 17.2-17.3 GHz	x			x	x			x			x	x	
	1.9.2	911	e	es	Res. 712. 100 Mhz-1 Ghz	x	x	x						x		x	x	
	1.9.2	914	e	es	Res. 712 9500-9800 Mhz	x			x				x			x	x	
	1.9.2	912	e	es	Res. 211 2025-2110 MHz & 2200-2290 (The english version has a corrigendum)	x	x	x								x	x	
	1.9.4	909	e	es	26 GHz	x	x	x	x		x					[x]		
	1.9.5	787 rev1*	e	es	Space research service near 400 Mhz	x	x	x								x	x	
6	1.1	915	e	es	Apendices 30 and 30A		x	x						x			x	
7.1	1.3	775 rev3 *	s	es	Ap. S7 Resolution 720	x	x	x						x		x	x	x
7.3	1.7	780 rev4	e	es	Ap S3	x	x	x		x	[x]		x			x		x
7.5	1.9.6	875 rev 3	e	es	Freq bands above 30 GHz	x	x	x	x		x	x	x	x		x	x	
	1.9.6	773 rev2 *	e	es	Art S5. Freq. Bands above 30 GHz		x									x	x	
	1.9.6	880 rev 2	e	es	Art. S11		x	x	x		[x]	x		x		x	x	
7.6	4	933	e	es	NGSO FSS in Ku band		x		x			x				x		
9	7	897	e	es			x							x			x	
	1.2	899	e	es	Art S9 & S11		x	x						x			x	

* Documentos incluidos en el documento CCP.III/doc.814/97 ///Documents included in the document PCC.III/doc.814/97.

PCC.III/RES. 62 (IX-97)

SEMINAR ON BROADBAND FIXED SATELLITE SERVICE SYSTEMS

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications,

CONSIDERING:

That technologies are presently being developed to offer Broadband Fixed Satellite Services globally, and that these technologies will provide an array of multimedia applications (data, video, voice) for telecom carriers and service providers, business and residential consumers, and

That the Permanent Consultative Committees of CITEL have undertaken efforts to schedule seminars on a regular basis on a wide variety of topics in the interest of information dissemination,

NOTING:

That a number of applications to construct, launch and operate both non-GSO and GSO Broadband FSS networks have been filed with the U.S. Federal Communications Commission and other administrations, and that licenses have already been granted for a number of these systems, and

That Broadband FSS will be a topic of discussion at WRC-97 and possibly at future WRCs.

TAKING INTO ACCOUNT:

That presentations on these Broadband FSS systems and the regulatory issues underlying implementation of these systems would be beneficial to all of the Member States of the Region;

RESOLVES:

1. That a Seminar on Broadband FSS be held at the X PCC.III meeting;
2. That the Seminar be held in accordance with PCC.III/RES.44 (VI-96) entitled "Organization of PCC III Seminars";
3. That Mrs. Teresa O'Connor, on behalf of the United States, and Mr. Marc Depuis, on behalf of Canada, act as co-organizers, of the Seminar; and

4. That CITELE Members and Associate Members interested in participating in the Seminar contact the organizers of the Seminar

PCC.III/RES. 63 (IX-97)

AGENDA, VENUE AND DATE OF THE TENTH MEETING OF PCC.III

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications,

RESOLVES:

1. To hold the Meeting of PCC.III from February 2 to 6, 1998.
2. To approve the draft agenda for the X Meeting of PCC.III, enclosed to this draft Resolution.

DRAFT AGENDA

1. Approval of Agenda and Schedule.
2. Appointment of the Drafting Group for the Final Report.
3. Report of Chairpersons of Working Groups on the following topics:
 - 3.1 1997 World Radio Conference
 - 3.2 Satellite systems on the geostationary orbit.
 - 3.3 Networks and services that use very small aperture terminals (VSAT).
 - 3.4 Personal Communication Systems and Related Systems (wireless fixed access - FWA - and their coexistence with PCS).
 - 3.5 Legal Matters and Administrative Procedures (Joint Working Group of PCC.I, PCC.II and PCC.III).
 - 3.6 Local Multipoint Distribution /Communication Systems.
 - 3.7 Human Resources.
 - 3.8 Low Earth Orbit Systems below 1 GHz (LEO MSS) and their implementation in the Americas.
 - 3.9 Implementation of mobile satellite services above 1 GHz.
4. Report on the Regional database on the use of the spectrum.
5. Implementation of World Maritime Rescue and Safety System (SMSS) including regional satellite mobile service systems in 1.5-1.6 GHz participating of the same.
6. Discussions on subjects of the World Telecommunication Policy Fora.
7. Report on the preparation of CITELE's 1998 Assembly.
8. Report on CITELE's preparation for ITU's Conferences of Plenipotentiaries and for the World Meeting on Telecommunications Development.

9. Preparation of the 1999 World Radio Conference (WRC-99).
10. Agenda, Venue and Date of the Eleventh Meeting of PCC.III.
11. Other related matters.
12. Approval of the Report of the Tenth Meeting.

PCC.III/RES. 64 (IX-97)

**SEMINAR ON THE RESULTS OF THE STUDY OF THE
WORKING GROUP TO QUANTIFY ANY INCOMPATIBILITY ISSUES
BETWEEN FWA AND PCS IN THE RANGE 1850-1990 MHz**

CONSIDERING:

1. that PCC.III/Rec.26 (VI-96) identified, among others, the band 1850-1990 MHz for Fixed Wireless Access (FWA) systems in the Americas,
2. that PCC.III/Rec.26 (VI-96) also recommended that until conclusion of studies to quantify any incompatibility issues between FWA and PCS in the range 1850-1990 MHz, administrations intending to implement systems within this band should consider the possible need to take technical and operational measures to facilitate introduction of compatible services,
3. that PCC.III/Res.43 (VI-96) established a Working Group to undertake the studies referred to above,
4. that the terms of reference of that Working Group are as follows:

To provide a report on the results of the study on incompatibility between FWA and PCS in the 1850-1990 MHz band, that included the topics:

- a) Issues related to the use of FWA and PCS in adjacent bands.
 - b) Issues related to the compatible use of the 1910-1930 MHz band by both FWA and (Unlicensed) UPCS systems.
 - c) Issues related to the compatible use of FWA technologies in the same band.
5. that the Working Group has issued a report covering some of the topics included in its terms of reference that are listed above,
 6. that administrations would benefit from an opportunity to review and seek additional information about the study and how to use its results for reference and assistance,

7. that the Permanent Consultative Committees of CITEL have undertaken efforts to schedule seminars on a regular basis on a wide variety of topics in the interest of information dissemination.

TAKING INTO ACCOUNT:

1. That the analysis of radio interference between different systems is an inherently complex problem,
2. That upon review of the lengthy report, administrations may wish to seek a better understanding of the method of analysis, assumptions, numerical calculations and parameters, *etc.* contained in the report,
3. that a seminar at the next PCC.III meeting on this topic would be timely and beneficial to administrations seeking to use the report for reference and assistance.

RESOLVES:

1. That a seminar on the results of the study of the working group to quantify any incompatibility issues between FWA and PCS in the range 1850-1990 MHz be held at the next PCC.III meeting, and
2. That the seminar be held in accordance with PCC.III/RES. 44 (VI-96) entitled, "Organization of PCC.III Seminars," and
3. That Costa Rica and United States acts as co-organizers of the Seminar, and
4. That CITEL Members and Associate Members interested in participating in the seminar contact the organizer of the seminar.

IV. RECOMMENDATIONS

PCC.III/REC.32 (IX-97)

APPLICATION OF THE 1910-1930 MHz BAND

The Ninth Meeting of the Permanent Consultative Committee III; Radiocommunications,

CONSIDERING:

That the Sixth Meeting of PCC.III included a seminar on “Application in the 1910-1930 MHz band” to inform the members of CITEL of the new technologies, standards and applications available in this band.

That CITEL PCC.III/REC.26 (VI-96) recommended to administrations that the band 1850-1990 MHz be used for PCS and/or Fixed Wireless Access (FWA) systems in the region of the Americas.

That CITEL PCC.III formed a Working Group to quantify any incompatibility issues between FWA and PCS in the range 1850-1990 MHz.

That in accordance with PCC.III/RES.43 (VI-96), the corresponding studies are underway.

That some countries in the region have developed or are in the process of developing wireless telephone networks in the frequency band 1910-1930 MHz to meet the demand for basic telephone service.

That one country in the region is introducing both FWA and Low Power PCS in the band the frequency band 1910-1930 MHz in separate geographic locations, e.g. urban and rural areas.

RECOMMENDS:

1. That the Member States of CITEL should consider, based on their national needs and regulations, the allocation of 1910-1930 MHz band for any of the following applications:

- a) Fixed Wireless Access;
- b) Low mobility wireless access;
- c) Voice and data applications low power PCS systems. (See Reference PCC.III/REC.33/97 (IX-97));
- d) Combination of these applications, taking measures for the compatibility amongst them.

2. That the Member States adopting items a), b) or d) of item 1, should consider the Report in document PCC.III/Doc.935/97 (IX-97) for reference and assistance to ensure the necessary compatibility amongst the different applications and with the PCS systems operating in adjacent bands.

PCC.III/REC.33(IX-97)

TECHNICAL AND PROCEDURAL FRAMEWORK FOR LOW POWER PCS IN THE USE OF 1910-1930 MHz BAND

The Ninth Meeting of the Permanent consultative Committee III; Radiocommunications,

CONSIDERING:

That the sixth PCC.III meeting included a seminar on “Applications in the 1910-1930 MHz band” to inform the members of CITELE of the new technologies, standards and applications available in this band;

That Resolution PCC.III/RES.42 (VI-96) resolved that PCC.III will consider developing a Recommendation on a technical and procedural framework that supports the operation of low power PCS devices and applications;

That the increased commercial deployment of low power PCS products offer a variety of applications and benefits in the 1910-1930 MHz band, and

That a common allotment of spectrum among CITELE countries, along with a recognized technical and procedural framework, will allow obtaining the benefits of economies of scale and multiple vendors providing compatible equipment.

RECOMMENDS:

That the member States of CITELE that plan to utilize the band 1910-1930 MHz for low power PCS systems and devices may consider adopting a technical and procedural framework, as the one shown in the attached annex, to ensure coexistence among systems operating in the same band and in the same geographic area.

INVITES:

The member countries to continue to contribute other technical and procedural frameworks that will serve as recommendations for other types of alternatives applicable to low power PCS systems in this band.

ANNEX

Technical and Procedural Framework for Low Power PCS in the 1910-1930 MHz Band

The technical and procedural framework that facilitates efficient shared use of the band is referred to as the “spectrum etiquette.” It defines a broad envelope within which the low power PCS devices/systems must operate; this has been done in such a way to permit a significant degree of flexibility for manufacturers to develop a variety of innovative devices. A key feature of this etiquette is the requirement that devices monitor before transmitting in order to secure a frequency that is not in use at that instant in the immediate area. Thus sharing is invoked in three dimensions: frequency, time, and location. There are general provisions that apply to the entire 1910-1930 MHz band; for instance, PCS devices authorized for use in this band must use digital modulation and maximum power and power spectral density limits are established. The 1910-1920 MHz sub-band is reserved for asynchronous transmissions, i.e., data that is transmitted at irregular time intervals as typified by local area network data systems. The band 1920-1930 MHz is reserved for isochronous transmissions, i.e., devices that transmit at a regular interval, typified by time-division voice systems. A summary of the general technical provisions is given in Table 1.

Table 1. General Technical Provisions		
Parameter	Characteristic/Value	Reference*
Modulation	Digital	§15.319(b)
Data Characteristic	1910-1920 MHz: Asynchronous 1920-1930 MHz: Isochronous	§15.319(a)
Peak Transmit Power	< 100 microwatts times square root of emission bandwidth (to be reduced by amount that antenna gain exceeds 3dBi)	§15.319(c) §15.319(e)
Power spectral density	< 3 milliwatts in any 3 kHz bandwidth	§15.319(d)
* reference is to the FCC Rules (47CFR)		

Table 2. Detailed technical Provisions		
Parameter	1910-1920 MHz Band* Asynchronous Devices	1920-1930 MHz band (Isochronous Devices)
Channelization	None	Operation to be contained within one of eight 1.25 MHz channels.
Device Bandwidth Limits	500 kHz minimum; 10 MHz maximum.	50 kHz minimum; 1.25 MHz maximum
Transmit Duration	Burst duration of individual or cooperative devices not to exceed 10 ms; intraburst gap between cooperating devices shall not exceed 25 μ s.	Not more than 8 hrs without repeating access criteria.
Frame Period	Not applicable.	20 ms or 10/x ms (where x is a positive integer). Devices using time-division to maintain a duplex connection must maintain a frame repetition rate with frequency stability of at least 50 ppm and a frame interval jitter of 25 μ s or less.
Frequency search strategy	Depends on bandwidth of device: a) BW < 1 MHz may not occupy center half if other spectrum is available; b) BW < 2.5 MHz: start within 3 MHz of either band edge and search inward; c) BW > 2.5 MHz: occupy center half of band.	Depends on bandwidth of device: a) BW <625 kHz: start within 3 MHz of lower band edge and search upward; b) BW >625 kHz: start within 3 MHz of upper band edge and search down.

Table 2. Detailed technical Provisions		
Parameter	1910-1920 MHz Band* Asynchronous Devices	1920-1930 MHz band (Isochronous Devices)
Connection Criteria	Monitor spectrum to be used a minimum of 50 μ s. If no signal is detected above the monitoring threshold, a transmission burst may commence in the monitored spectrum window.	Monitor spectrum to be used: 10 ms if transmit frame < 10 ms, 20 ms if transmit frame = 20 ms. If no signal is detected above the monitoring threshold, a transmission burst may commence in the monitored spectrum window. A duplex connection can be established by an initiating device, which does the monitoring if the responding device, can decode the signal. No device or group of cooperating devices located within 1 meter of each other shall occupy more than three 1.25 MHz channels during any frame period.
Acknowledgement required	Not applicable	Once access is obtained, must receive first acknowledgement within 1s, and subsequent periodic acknowledgements at least every 30s, or transmission must cease. For a control and signaling channel no acknowledgement is required but it must be reaccessed every 30s.
Wait before next transmission	Random within range of 50-70 μ s; however, range is doubled if access fails up to a maximum of 12 ms. This range is re-initialized after each successful access attempt.	Random range of 10-150 ms for the same channel.
Monitoring bandwidth	Equal to or greater than emission bandwidth.	Equal to or greater than emission bandwidth.

Table 2. Detailed technical Provisions		
Parameter	1910-1920 MHz Band* Asynchronous Devices	1920-1930 MHz band (Isochronous Devices)
Reaction time to monitoring	Formulas depend on BW and signal level; not required to be faster than 50 μ s for signal at threshold or 35 μ s for signal 6 dB or more above threshold.	Formulas depend on BW and signal level; not required to be faster than 50 μ s for signal at threshold or 35 μ s for signal 6dB above threshold.
Monitoring threshold	Not greater than 32 dB above thermal noise power of emission bandwidth (kTB+32) of the device; but may increase level by same amount that transmit power is below the maximum limit.	Not greater than 30 dB, or the least interfering channel with a level between 30 dB and 50 dB, above thermal noise power of emission bandwidth (kTB+30) of the device; but may increase level by same amount that transmit power is below the maximum limit.
Out of band emission limits	Emission below reference of 112 mW as follows: 30 dB from band edge to 1.25 MHz beyond; 50 dB between 1.25-2.5 MHz beyond edge; 60 dB at > 2.5 MHz beyond edge.	For BW=1.25 MHz, emission below reference of 112 mW as follows: 30 dB from channel edge to 1.25 MHz beyond; 50 dB between 1.25-2.5 MHz beyond edge; 60 dB at > 2.5 MHz beyond edge. (For smaller BW, similar rejection levels using actual BW points)
Frequency stability	Accounted for in access criteria & out-of-band emission limits.	+/- 10 PPM over a temperature range of -20 °C to +50° C
Antenna requirements: only the antenna designed for and/or furnished with the device may be used. The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.		
Conduction limits: A device designed to be connected		

Technical provisions for asynchronous data devices using the band 1910-1920 MHz band afford a great deal of flexibility in terms of data rates and emission bandwidths. The band is not channelized; however, provisions related to the frequency search algorithms attribute a higher priority of access to the center of the band for devices requiring bandwidths greater than 2.5 MHz. On the other hand, isochronous data devices using the band 1920-1930 MHz shall confine their emissions to one of eight 1.25 MHz channels. A summary of the detailed technical provisions applicable to operation of devices in the two bands is given in Table 2.

In Table 2, the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emissions bandwidth of the device under measurement. The thermal noise power is the noise power in watts defined by the formula $N=kTB$ where N is the noise power in watts, K is Boltzmann's constant, T is the absolute temperature in degrees Kelvin, and B is the emissions bandwidth of the device in hertz.

Due to the sophisticated technical nature of the spectrum etiquette, a standard measurement procedure was deemed necessary to ensure compatible operation of these devices. The American National Standards Institute (ANSI) developed the *Measurement Procedure for Unlicensed Personal Communications Services Devices* (ANSI C63.17). This document provides measurement procedures manufacturers should use to ensure compliance. It is available directly from the American National Standards Institute.

PCC.III/REC. 34 (IX-97)

ADVANCE DATE OF AVAILABILITY OF MSS OF THE 2010-2025 MHz AND 2160-2170 MHz BANDS IN THE AMERICAS (ITU REGION 2)

The Ninth Meeting of the Permanent Consultative Committee III; Radiocommunications,

WHEREAS:

WRC-95 modified the Region 2 MSS allocations made at WARC-92 resulting in MSS allocations in Region 2 of 2010-2025 MHz and 2160-2170 MHz and deleting other MSS allocations;

These bands will be available in the United States and Canada in the year 2000 and from the year 2005 in the rest of the Americas;

Given the need for Administrations to begin their planning cycle as soon as possible for the next generation of satellites and services;

Some Administrations in the Americas have investments in the terrestrial services in the 2010-2025 and in the 2160-2170 MHz bands and seek to balance the terrestrial and mobile-satellite interests in these bands;

The date of entry into use for these Region 2 only MSS bands is an outstanding harmonization issue for the 2 GHz MSS bands in the Americas;

RECOMMENDS:

The CITELE Administrations to consider in their preparatory work for WRC-97 the proposal of advancing the date of entry for use by the MSS in the 2010-2025 MHz and 2160-2170 MHz bands to a date between January 2000 and January 2002.

INVITES:

The CITELE Administrations to continue discussions with a view to achieving consensus, if possible, on the advancement of the date of entry for use by the MSS of the 2010-2025 MHz and 2160-2170 MHz bands to a date between January 2000 and January 2002, prior to or during WRC-97, through the exchange of information via the different communication means.

PCC.III/REC. 35 (IX-97)

**LOCAL MULTIPOINT DISTRIBUTION/COMMUNICATION SYSTEMS (LMDS/LMCS)
OPERATING AT FREQUENCIES AROUND 27 GHZ.**

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications,

CONSIDERING:

1. That a Working Group was established at the Fifth Meeting of the Permanent Consultative Committee III in August 1996 to study the various aspects of the implementation of LMDS/LMCS in the Americas and that the terms of reference of this Working Group include the preparation of guidelines needed for the implementation of LMDS/LMCS in the Americas (see Resolution PCC.III/RES.35 (V-96));
2. That the implementation of wide band LMDS/LMCS can offer alternate multimedia distribution including video, telephone and data to residential and business subscribers;

3. The need to ensure that there is an opportunity for these new systems in the Americas taking into account efficient use of the frequency spectrum and sharing of the bands among services allocated on a co-primary basis;
4. That the LMDS/LMCS are point-to-multipoint systems of the fixed service;
5. That, in the Radio Regulations, there are shared allocations to the fixed service in the frequency bands 25.25-29.50 GHz and 31.0-31.3 GHz that can be considered for such wideband implementations of the LMDS/LMCS;
6. That the United States has identified spectrum in the 27.50-28.35 GHz, 29.10-29.25 GHz and 31.0-31.3 GHz ranges; that Canada has identified spectrum in the 25.35-28.35 GHz range; and that some other Region 2 administrations have identified similar frequency ranges for the operation of their LMDS/LMCS and that licensing activities are underway;
7. That studies within one administration indicate that frequency sharing of the band 25.25-27.50 GHz between the high density point-to-multipoint LMDS/LMCS and data relay and proximity operation communications systems of the inter-satellite service is not achievable pursuant to the provisions of S 21.2 of the Radio Regulations;
8. That a study done by another administration and described in a document submitted to one of the meetings of ITU-R Ad Hoc Group 7B/9D concludes that sharing between LMDS/LMCS considered in the study and data relay satellites is feasible;
9. That after exhaustive study, a joint government and industry Negotiated Rulemaking Committee in the United States determined that in the frequency range 27.5-29.5 GHz co-frequency sharing between point-to-multipoint LMDS/LMCS and the fixed satellite service (FSS) is not possible;
10. That the aforementioned Negotiated Rulemaking Committee also determined that sharing was possible between LMDS/LMCS hub-to-subscriber links and NGSO/MSS feeder links in the band 29.10-29.25 GHz under rules adopted by the United States;
11. That the deployment of LMDS/LMCS may be global in extent.

RECOGNIZING:

That the LMDS/LMCS Working Group is studying the various aspects of the implementation of LMDS/LMCS around 27 GHz in the Americas;

That in view of the limited studies identified in the “considering” 5 and 6 above, additional studies should be undertaken with a view to establishing international sharing criteria among services with allocations on a co-primary basis;

That there are advantages to be gained by having information regarding LMDS/LMCS technologies and implementation strategies available for use by the member countries of CITELE,

BEARING IN MIND:

That studies are in progress by a Correspondence Group of Working Parties 7B and 9D, within the ITU-R, with a view to establishing international sharing criteria between the inter-satellite service supporting the data relay and proximity operation communication systems and the fixed service supporting LMDS/LMCS operations in the frequency band 25.25-27.50 GHz;

That some administrations have recognised the need for a minimum of 1 GHz bandwidth for a single LMDS/LMCS network,

RECOMMENDS:

1. That CITELE administrations consider the harmonization of spectrum usage for LMDS/LMCS around 27 GHz, taking into account the aforementioned compatibility studies between radio services which share the use of the bands on a co-primary basis;
2. That CITELE administrations submit information regarding the implementation progress of LMDS/LMCS around 27 GHz in their countries;
3. That CITELE administrations take part in the studies within CITELE and within the aforementioned Correspondence Group that are in progress for establishing international criteria for sharing between LMDS/LMCS and the global operations of the inter-satellite service in the bands below 27.5 GHz which share the use of the bands on a co-primary basis;
4. That CITELE administrations contemplating near term implementation of wideband LMDS/LMCS, consider initial deployment of these systems in the band 27.50-28.35 GHz;
5. That CITELE administrations requiring, in the near term, bandwidth additional to the band 27.50-28.35 GHz:
 - a) may consider the options described in Annexes 1 and 2 adopted by certain administrations,
 - b) take into account sharing issues between LMDS/LMCS and the inter-satellite services in frequencies below 27.5 GHz as discussed in Annex 3, and

c) be mindful of the sharing constrains between point-to-multipoint LMDS/LMCS and FSS systems

ANNEX 1



SOURCE: Canada

TITLE: **Local Multipoint Communication Systems (LMCS)**

1.0 Introduction

Canadians are currently serviced by two local distribution networks providing a range of broadcast and telecommunications services to consumer and business clients; the local cable TV network and the local telephone network. With advancements in technologies used by industry to deliver their services as well as continual change in the regulatory framework, it is expected that each will be able to provide the others core services, thereby offering a full range of services to consumers on a competitive basis.

Local Multipoint Communication Systems (LMCS) is a broadband wireless telecommunications common carrier service in the 28 GHz range, which operates similar to a cellular network, will be capable of carrying basic and advanced communication services such as “wireless” cable TV, Internet access, video teleconferencing and various other multimedia and broadcasting services. These entirely new, independent, local networks for telecommunications services will be fully competitive with existing networks.

It is the intention of the Canadian government to encourage the establishment of this third local distribution network for broadcasting and telecommunication services, thereby offering alternative choices to Canadian consumers. To this end, the announcement of the policy and authorisation procedures for LMCS was initiated.

2.0 Background

On December 24, 1994, Industry Canada issued Gazette Notice DGTP-013-94 entitled *Proposed Spectrum Policy to Accommodate Microwave Radio Systems, Including Local Wideband Distribution and Advanced Communication Satellites in Certain Bands Above 20 GHz* which invited comments on a number of issues relating to frequency bands 22, 28 and 38 GHz, including the types of radio system applications in the areas of satellite and terrestrial microwave communications including LMCS.

In response to this notice, twenty-five submissions were received which were later refined to thirteen. Some of the key points that prevailed in the consultation process included:

- i. LMCS technologies and services may evolve considerably over the next few years;
- ii. the use of the 27-28 GHz band, with expansion below 27 GHz, was the preferred spectral option;

- iii. - 1 GHz of spectrum is required for initial deployment of an LMCS system; and,
- iv. the introduction of LMCS in Canada is expected to bring manufacturing and systems development opportunities.

3.0 Spectrum Allocation for LMCS in the 28 GHz Band

The spectrum designated for LMCS applications is essentially for high capacity multipoint communications systems having unidirectional and/or bi-directional transmission coverage over local areas providing wide access to residential and business customers. Within the spectrum allocation of 25.35-28.35 GHz, six frequency blocks of 500 MHz were created to allow authorised entities to provide service in local areas and support the spectrum requirements of more than one service provider.

The frequency plan and block availability adopted for LMCS is as follows:

Block A	500 MHz	27.85-28.35 GHz	
Block B	500 MHz	27.35-27.85 GHz	
Block C	500 MHz	26.85-27.35 GHz	(reserved)
Block D	500 MHz	26.35-26.85 GHz	(reserved)
Block E	500 MHz	25.85-26.35 GHz	(reserved)
Block F	500 MHz	25.35-25.85 GHz	(reserved)

Industry Canada made spectrum blocks A and B available for authorisation through a comparative selection and authorisation process . Spectrum blocks C, D, E and F are presently available for LMCS experimentation on a first-come, first-served basis. The latter blocks will subsequently be authorised for commercial use, commencing no earlier than 18 months and no later than 36 months after the completion of authorisation of blocks A and B which took place October 29th, 1996.

4.0 Service Areas

Industry Canada defined sixty-six (66) service areas in which spectrum blocks A and B were available for authorisation. Applicants who were interested in providing service to areas not defined could do so but had to include with their submission, a detailed description of the proposed service area(s). These areas could not include any portion of the aforementioned sixty-six (66) service areas but had to lie entirely outside of the boundaries of those designated.

5.0 Eligibility

An entity was eligible to provide LMCS service at 28 GHz for blocks A and B as part of this call for applications if the entity, including its affiliates¹, was not:

- i. a telecommunication common carrier which provides local exchange telephone service anywhere in Canada; or
- ii. licensed to carry on a cable distribution undertaking under the Broadcasting Act anywhere in Canada.

6.0 Companies Awarded LMCS Licenses

The criteria for the awarding of LMCS licences, included: competitive strategy, innovation, economic benefits as well as research and development, coverage and demonstrated competencies. On October 29, 1996, three licenses of the thirteen received, were awarded 1 GHz of spectrum for 33 markets each to CellularVision Canada Ltd., and MaxLink Communications and a similar license for service in 127 small communities to Regional Vision Inc. to ensure that the expanding Information Highway continues to reach Canada's remote communities. Successful applicants' business plans have indicated that some services will be up and running by the end of 1997.

7.0 Technical and Operational Requirements for LMCS

The technology to be implemented will depend on the system design and the telecommunications and broadcasting services to be carried. Industry Canada has not mandated technical requirements except to facilitate coordination between LMCS and between LMCS and inter-satellite links where they share spectrum. For such coordination Industry Canada has established the technical criteria established below. Further, Industry Canada has not mandated the types of services to be carried by LMCS providers other than the proposed system must be a high capacity, broadband multipoint system.

Fixed satellite earth stations may have access to the 27.5-28.35 GHz frequency range outside LMCS market areas subject to spectrum sharing conditions.

ITU Requirements (25.25-27.5 GHz)

In the ITU Radio Regulations the band 25.25-27.5 GHz is allocated on a co-primary basis to Fixed (FS), Mobile and Inter-Satellite (IS) services. The current ITU regulations applicable to this band for the fixed service are as follows:

¹ affiliate is defined in the same general manner as in subsection 35(3) of the Telecommunications Act; viz. a person who controls the entity, or who is controlled by the entity or by any person who controls the entity."

2504A (WARC 92) As far as practicable, sites for transmitting stations, in the fixed or mobile service, employing maximum values of equivalent isotropic radiated power (e.i.r.p) density exceeding 24 dBW in any 1 MHz band in the band 25.25-27.5 GHz should be selected so that the direction of maximum radiation of any antenna will be at least 1.5° away from the geostationary-satellite orbit, taking into account the effect of atmospheric refraction¹.

2504A.1 (WARC 92) ¹ The provisions, of No. 2504A shall apply until such time as the CCIR has made a recommendation on the e.i.r.p. density limits which should apply in the band.

2505 Paragraph 3. (1) The maximum equivalent isotropically radiated power (e.i.r.p) of a station in the fixed or mobile service shall not exceed +55 dBW.

2508 (4) The power delivered by a transmitter to the antenna of a station in the fixed or mobile service in frequency bands above 10 GHz shall not exceed +10 dBW.

The above regulations were based on the use of these bands by point-to-point systems in the fixed service. Since the band can also be used for high density point-to-multipoint systems, the following measures are needed to comply with the intent of these regulations.

Application of RR 2504A

It should be noted that this Radio Regulation (RR) is under review with a view to ensure protection to Inter-satellite Data Relay Satellite (DRS) systems, operating on the geostationary orbit (GSO), and to consider the need to increase the e.i.r.p. of point-to-point FS systems beyond 24 dBW/MHz under rain conditions. There is no specific consideration given at this time to develop separate regulations for LMCS type applications.

Subscriber Transmitter and E.I.R.P Power Limits

The limits given above also apply to the subscriber transmitters including the need to assess the impact of aggregate interference at the DRS satellite locations. The information available to date for the transmissions from subscriber stations is very limited. Many different scenarios are considered for the transmissions from subscribers depending on the nature of the application. Therefore it will be up to the operator to ensure that their implementations meet the above criteria.

Power Flux Density (pfd) Limits for the Inter-Satellite Service

ITU RR 2578 specifies the pfd limits for the band 25.25-27.5 GHz for emissions from spacecraft in the inter-satellite service. These limits are as follows:

2578 The power flux-density at the Earth's surface produced by emissions from a space station, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the following values:

-115 dB(W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

-115 + 0.5 (°-5) dB(W/m²) in any 1 MHz band for angles of arrival (in degrees) between 5 and 25 degrees above the horizontal plane;

-105 dB(W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux-density that would be obtained under assumed free-space propagation conditions. The LMCS operators should consider the above pfd values from inter-satellite systems in their system design.

Coordination Considerations

The following requirements should facilitate inter-system coordination of LMCS systems, and should allow compatibility with inter-satellite applications in the band 25.5-27.5 GHz. These requirements are based on current information available on LMCS technology.

1. Frequency tolerance for LMCS equipment should be 0.001% or better.
2. Minimum spectral efficiency should be 1 bit/sec/Hz.
3. Only orthogonally polarised signals (i.e. horizontal or vertical) should be employed in order to benefit from cross-polar isolation and to maximise frequency re-use.
4. In addition to accounting for aggregate levels, the maximum e.i.r.p density for a single station shall not exceed -52 dBW/Hz, except in cases of hub-to-hub interconnection which will be considered on a case by case basis.
5. Inter-system coordination within the same area and with the adjacent areas is the responsibility of the LMCS operators.
6. Coordination of LMCS systems in the border area will be required with the terrestrial systems in the U.S. There is no existing coordination agreement with the U.S. at this time for this frequency band. Until such time as an agreement is developed, Industry Canada will coordinate any systems located within 60 km of the border. This distance is currently used for the coordination of fixed systems in the 23 GHz band.

The above technical requirements are subject to change in accordance with future changes to the ITU recommendations and radio regulations, as well as any additional information from LMCS operators and equipment manufacturers.

ANNEX 2

Source: United States of America

Title: Use of the 27.5-31.3 GHz Band in the USA

Taking into account the results of WRC-95, and extensive deliberations in the U.S., the United States Federal Communications Commission (“FCC or Commission”) adopted a final plan on July 17, 1996 as issued in its First report and Order to Redesignate the 27.5 GHz-29.5 GHz Frequency band for the domestic use as shown below. This spectrum segmentation plan was designated to provide spectrum for all of the competing services seeking to use these bands in the United States. On March 11, 1997, the FCC adopted a plan designating the 31.0-31.3 GHz band additionally for LMDS as issued in its Second Report and Order.

Band 27.5-30.0 GHz and 31.0-31.3 GHz

27.5 GHz	28.35	28.6	29.1	29.25	29.5	30	31	31.3
LMDS	GSO FSS	NGSO FSS	MSS FL& LMDS	MSS FL& GSO FSS	GSO FSS			LMDS ² (H) (S)
fss ¹	ngso fss	gso fss	(H)		ngso fss			
850 MHz	250 MHz	500 MHz	150MHz	250 MHz	500 MHz			300 MHz

1. Lower case indicates licensing is on a non-interference, non-protected basis.
2. 31.0-31.075 GHz – LMDS shared with existing users (75 MHz).
31.075-31.225 GHz – LMDS primarily protected basis (150 MHz).
31.255-31.3 GHz – LMDS shared with existing users (75 MHz).

LMDS: Local Multipoint Distribution Service; (H) indicates Hub-to-subscriber link (S) indicates Subscriber-to-Hub link; FL: Feeder link.

The plan adopted by the FCC designates co-frequency sharing in band segments where the commission and the parties have concluded it is feasible. The FCC concluded that adoption of this band promotes spectrum efficiency and facilitates the deployment of diverse, interactive, competitive services for consumers.

1. The band segmentation plan will be implemented through appropriate changes in part 25 and Part 101 of FCC rules. Discrete spectrum bands were designated for specific types of systems. Services designated

for domestic licensing priority are specified in capital letters in the graphic depiction of the band plan. These services have licensing priority vis-à-vis any other type of service allocated domestically or internationally in the band. Lower case letters indicate services in a particular band segment which also have licensing priority vis-à-vis any third service allocated domestically or internationally in the band, but have no licensing priority over the service in capital letters in the band segment and must operate on a non-interference basis and must accept interference vis-à-vis that service. Services designated with two priority users have equal licensing rights based on the sharing principles adopted for that particular band segment.

2. Primary LMDS Spectrum

The FCC designated 1300 MHz of spectrum for LMDS systems in three non-contiguous segments. At 27.5-28.35 GHz, 850 MHz for LMDS was designated on a primary basis. GSO/FSS or NGSO/FSS systems will be permitted on a non-interference basis to the LMDS systems in the 850 MHz band segment, for the purpose of providing limited gateway-type services. Another 150 MHz of spectrum at 29.1-29.25 GHz was designated for LMDS transmissions, in the hub-to-subscriber direction, on a co-primary basis with NGSO/MSS feeder links. The commission subsequently adopted in its Second Report and Order an additional 300 MHz at 31.0-31.3 GHz for LMDS use.

3. Primary GSO/FSS Spectrum

The FCC designated 750 MHz of exclusive primary spectrum for GSO/FSS systems, in two non-continuous segments at 28.35-28.60 GHz and 29.5-30.0 GHz. NGSO/FSS systems will have secondary status in these segments. They also designated GSO/FSS use for 250 MHz on a co-primary basis with NGSO/MSS feeder links at 29.25-29.5 GHz.

4. Primary NGSO FSS Spectrum

Consistent with the U.S. position at the WRC-95, and its intention to continue to propose 500 MHz for NGSO/FSS at WRC-97, the FCC designated 500 MHz at 28.6-29.1 GHz for NGSO-FSS systems. The FCC believes designating 500 MHz is necessary to accommodate the worldwide demand for 28 GHz spectrum for NGSO/FSS systems.

5. Sharing in the 29.1-29.25 GHz band between NGSO/MSS feeder link earth stations and LMDS (150 MHz)

The FCC adopted sharing rules between LMDS hub-to-subscriber transmissions and NGSO/MSS feeder links in the 29.1-29.25 GHz band. These rules were based on rules agreed to at its Negotiated Rulemaking Committee (NRMC). Transmission of LMDS subscriber transceivers in this shared 150 MHz band segment was prohibited.

ANNEX 3

SOURCE: United States of America

TITLE: Usage of the Band 25.25 - 27.5 GHz by NASA and Other Space Agencies and Potential Sharing Issues

The 25.25 - 27.5 GHz band will be used by NASA and the other space agencies around the world for a variety of activities which cannot be accommodated in other frequency bands. The history of the allocation, which stretches back to 1985, includes the primary allocation to the Inter-Satellite Service made at WARC-92 and proposals to consider a primary allocation to Earth Exploration-Satellite Service at WARC-97. Current and planned usage of the band includes a wide range of missions by the United States, Japan, Russia and the European Space Agency.

The following sections of this paper address the allocation history and usage of the band 25.25 - 27.5 GHz as well as sharing analyses that have been conducted between the space science services and proposed Local Multipoint Communication/Distribution Services (LMCS/LMDS).

Allocation Status History

The frequency band 25.25 - 27.5 GHz is allocated worldwide in the ITU Radio Regulations to the fixed service, the mobile service, and the inter-satellite service on a primary basis as shown in Figure 1. The frequency band 27.0 - 27.5 GHz is also allocated, on a primary basis, to the fixed-satellite service in the Earth-to-space direction. Additionally, secondary allocations to the standard frequency and time signal-satellite service, in the Earth-to-space direction, and to the Earth exploration-satellite service (25.5 - 27.0 GHz), in the space-to-Earth direction, exist.

It should be noted that, in response to the worldwide need for more space-to-Earth bandwidth for environmental and Earth resources data (the band 8025 - 8400 MHz is already congested), the issue of the allocation to the Earth exploration-satellite service in the band 25.5 - 27.0 GHz has been placed on the agenda of WRC-97. The Space Frequency Coordination Group (SFCG), whose membership includes space agencies from North, Central and South America, as well as from other parts of the world, supports upgrading the EESS allocation from secondary to Primary in this band.

1992 Conference Actions

WARC-92 established provisional e.i.r.p. spectral density limits on the emissions of fixed and mobile stations in the 25.25-27.5 GHz band in the direction of the geostationary-satellite orbit in order to protect space stations on orbit. Comprehensive studies of the required e.i.r.p. spectral density limits had not been completed, so a provisional value was assigned pending further work and review by the then CCIR. A provisional power

flux density constraint was already in place in the then Article 28 of the Radio Regulations, to protect fixed and mobile systems from interference from space science service systems.²

Current and Planned Missions in Ka-band

The currently planned use of the 25.25-27.5 GHz band is presented in Figure 1. As can be seen, the entire band is used by the various data relay satellites (DRS) planned for the band, with different band segments planned for Proximity Operations and Earth exploration-satellite downlinks. These services are discussed below.

NASA's Tracking and Data Relay Satellite (TDRS) system has been used to relay data between user satellites and Earth using S-band and Ku-band frequencies since 1983. The TDRS H, I & J satellites, which are currently under contract and planned for launch starting in 1999, will provide these services in the 25.25 - 27.5 GHz band, as well as in the lower frequency bands, thereby increasing capacity and improving service. The TDRS channels are designed to support a maximum data rate of 800 Mbps in a 650 MHz bandwidth in order to accommodate wide-band sensor data. The need to support several of these channels within a given orbital area is foreseen, as well as the need to coordinate channel usage with other administration's relay systems.

The Data Relay Technology Satellite (DRTS) system from the National Space Development Agency of Japan (NASDA) will provide the same types of services, as will the TDRS. Japan has Advanced Published 5 orbital locations for its DRTS system. In addition, the ETS-VI/Kiku-6 satellite is currently in orbit and operating in this band.

The European Data Relay System (EDRS) system from the European Space Agency (ESA) will also provide data relay type services. Four EDRS satellites have been advanced published by ESA, with an early operational capability to be provided by the Artemis satellite.

The **Satellite Networks Interoperability Panel (SNIP)**, made up of representatives of NASA, ESA and NASDA, has developed an agreement to allow inter-operable cross-support of each other's spacecraft. The channelization scheme, which is essential for cross-support, covers most of the 25.25 - 27.5 GHz band and is given in Figure 1. Twenty-three (23) data relay satellite (DRS) orbital locations have been identified in the ITU for purposes of sharing analysis.

Russia, which currently uses S-band and Ku-band for DRS activities, has long term plans to use the Ka-band as well. This would permit them to transfer their wideband communications links from the interference-prone Ku-band to Ka-band. India, which has a very strong space research/Earth exploration-satellite program, may in the future use the Ka-band for DRS communications links.

NASA is developing a **Proximity Operations Communication System (POCS)** to relay data, video and voice between orbiting vehicles operating within 50 km of the International Space Station. This system would be used to support activities ranging from simple telemetry to telerobotics color video. It will also have applications to low-orbit inter-vehicle communications, particularly during docking maneuvers. Figure 1 shows

² In this paper, the term "space science services" includes, any or all of the following radio services; space research service, Earth exploration-satellite service, space operation service, and inter-satellite service when used for space science applications.

that two different bands will be used for POCS, one for transmit and one for receive. These bands are separated at the upper and lower edges of the 25.25-27.5 GHz band in order to avoid intra-system interference. All partners in the International Space Station (ISS) have indicated the need for such a system. This is the only band available to Space Research for these types of wideband services. The transmitting and receiving stations may be at any orientation to one another (above, below, in front, behind, etc.), and therefore the transmission path between the vehicles can appear at any angle from virtually any point on the Earth's surface. Unlike a satellite in geostationary orbit, a POCS receiver can be oriented at low elevation angles as viewed from any point on the Earth.

Intensive use of the 25.25-27.5 GHz band by administrations operating DRS systems will require careful coordination between the systems to maintain interference free links and interoperability, such as that which currently facilitates extensive use of S-band. This requires multiple wideband channels for flexibility of operations. This is one of the drivers which has resulted in international agreements among all DRS operators to access and use the full 25.25 - 27.5 GHz band.

Sharing Status

Until recently, it had long been accepted that space science service systems were compatible with fixed and mobile service systems, sharing the same frequency allocation, provided that appropriate technical sharing criteria could be agreed upon.

Since WARC-1992, certain fixed and mobile service systems have been proposed which present a different kind of sharing situation, one which could cause unacceptable levels of interference to the space science service systems. The characteristics of such systems which make them different from the traditional (shareable) terrestrial systems, are 1) a much greater population density, and 2) the lack of antenna discrimination at the central hub of each element (cell). LMCS/LMDS systems being proposed for broadband video/data distribution represent one of the new fixed service systems.

Sharing between fixed point-to-point service systems and space science service systems has recently been studied in ITU-R Joint Ad Hoc Working Party 7B/9D (JAH 7B/9D). The allocated frequency bands under consideration were 2025-2110 MHz, 2200-2290 MHz and 25.25-27.5 GHz. Unfortunately the work of JAH 7B/9D did not include study of point-to-multipoint LMCS/LMDS-like fixed service systems in the 25.25-27.5 GHz band.

Draft New Recommendation ITU-R F.[AD/9D], "Maximum Equivalent Isotropic Radiated Power of Transmitting Stations in the Fixed Service Operating in the Frequency Band 25.25-27.5 GHz Shared with the Inter-Satellite Service" was approved by JAH 7B/9D, at its October 1996 meeting and was submitted to the January 1997 Plenary meeting of Study Group 9. It was adopted by the Study Group for approval by correspondence. The draft new Recommendation (DNR) states that as far as practicable, the e.i.r.p. density of a fixed service station in the direction of the DRS orbital locations should not exceed +24 dBW in any one MHz band.

Annex 1 to DNR ITU-R F.[AD/9D] identifies how the value of +24 dBW/MHz was derived. The DRS protection criteria is given by Recommendation ITU-R SA.1155 and results in a maximum allowable fixed service (FS) e.i.r.p. in the direction of a DRS of 13.5 dBW/MHz. The interference criteria are not to be

exceeded for more than 0.1% of the orbital period of the spacecraft being tracked by the DRS (user satellite). The probability of exceeding the 13.5 dBW/MHz limit is greatest for instances of main beam coupling between the highly directional DRS and FS antennas. The likelihood of main beam coupling depends upon the orbital characteristics of the user satellite, the number of FS stations and the azimuth pointing of the FS transmitter antenna. Simulations were run for various DRS orbital locations to determine the spatial distribution of interference received from a random deployment of point-to-point radio-relay stations near 1245 major cities of the world. Calculations were made that show that the probability of direct coupling from point-to-point FS stations is of the order of magnitude 10^{-5} . Based on these calculations, it was determined that an e.i.r.p. density limit of +24 dBW/MHz would be acceptable for the rare instance of main beam-to-main beam coupling. It was further determined that the low probability of occurrence results largely from the directional pointing of the high gain FS transmitting antenna (i.e., 40 dBi) assumed to be at a random azimuth angle uniformly distributed between 0 and 360 degrees.

It must be noted that for point-to-multipoint LMCS/LMDS hub transmissions, the transmitting antenna radiates energy omni-directionally in azimuth and would therefore be orders of magnitude more likely to result in direct coupling into the DRS at low elevation angles toward the orbit. Therefore, the considerations within JAH 7B/9D which resulted in an allowable e.i.r.p. density limit of +24 dBW/MHz for fixed service point-to-point systems, may not apply in the case of LMCS/LMDS systems and requires further study to examine the temporal and spatial interference aspects of such systems on space science service systems.

It must also be noted that the interference into space systems comes from the aggregation of emitters in the field of view of the space system antenna. The greatest contribution comes from the aggregation of emitters in the vicinity of the aim point of the satellite antenna beam. When the satellite beam is oriented toward the Earth's horizon, direct coupling can occur for a significant number of LMCS/LMDS emitters for service areas located near the edge of the space system's field of view. Particularly at low elevation angles, the satellite beam is large with respect to a given service area. The aggregation of interference can occur across multiple service areas, and even across service areas in neighboring administrations. Therefore, any sharing criteria which would be developed should be a practicable limit that can be applied on a per service area (or per square kilometer) basis while still providing sufficient protection from the aggregation of emitters within the space system antenna field of view.

It is further noted that the orbital geometry of POCS systems is significantly different from DRS systems and will lead to low elevation angles of arrival to the POCS receivers from virtually any point on Earth.

Technical Discussion

Several technical studies have been conducted on the impact of introducing LMCS/LMDS into the band 25.25-27.5 GHz, particularly on sharing with the space systems that will use the inter-satellite and Earth exploration-satellite service allocations. In the United States, the Federal Communications Commission (FCC) requested NASA to conduct one of these studies in seeking to alleviate the LMDS/FSS sharing problems at 28 GHz. NASA's answer to the FCC has also been provided to the international space community in response to SFCG Action Item 15/16 at SFCG-16 in Moscow, Russia, in September 1996. Another study was conducted in Canada concerning their Local Multipoint Communications Service (LMCS).

The FCC-requested study by NASA was comprehensive, using parameters and inputs from system operators and planners of the LMDS and space science. Sharing feasibility was assessed between LMDS systems and TDRS, ISS proximity operations and EESS downlinks. The results showed that sharing feasibility is significantly affected by the LMDS system characteristics, parameter selection and service area size. For 3 out of 4 proposed LMDS system types studied, the level of interference from hub-to-subscriber transmissions into both DRS and ISS POCS systems was found to be between 10 dB and 17 dB in excess of the ITU-R recommended allowable values (i.e. 10 - 17 dB negative margins). In the same 3 out of 4 LMDS system types, subscriber-to-hub transmissions resulted in levels of interference between 1 dB and 10 dB in excess of the ITU-R recommended allowable values into both DRS and POCS. The LMDS parameters for the four systems resulted in emissions towards the geostationary-satellite orbit that were all within the current limits given in RR Table S21-1 and Draft New Recommendation ITU-R F.[AD/9D] previously mentioned.

An Industry Canada input document to the June 1995 meeting of JAH 7B/9D examined LMCS type systems interfering with a data relay satellite (DRS) system and stated that sharing was feasible under most circumstances (negative margins, however, were calculated for elevation angles below 10 degrees for one of two LMCS systems examined). No action has been taken by the ITU-R on this study. Further, the study did not address the higher powered LMDS systems that are planned for operation in the United States in bands above 27.5 GHz.

The apparent conflicting results between these studies can be traced primarily to the specific LMCS/LMDS parameters that were examined. Further input is needed from LMCS/LMDS proponents on their planned implementation parameters to aid in refining the studies.

While studies to date have focused on potential LMCS/LMDS deployment in the United States and Canada, a similar interference environment would occur for deployment in Central and South America.

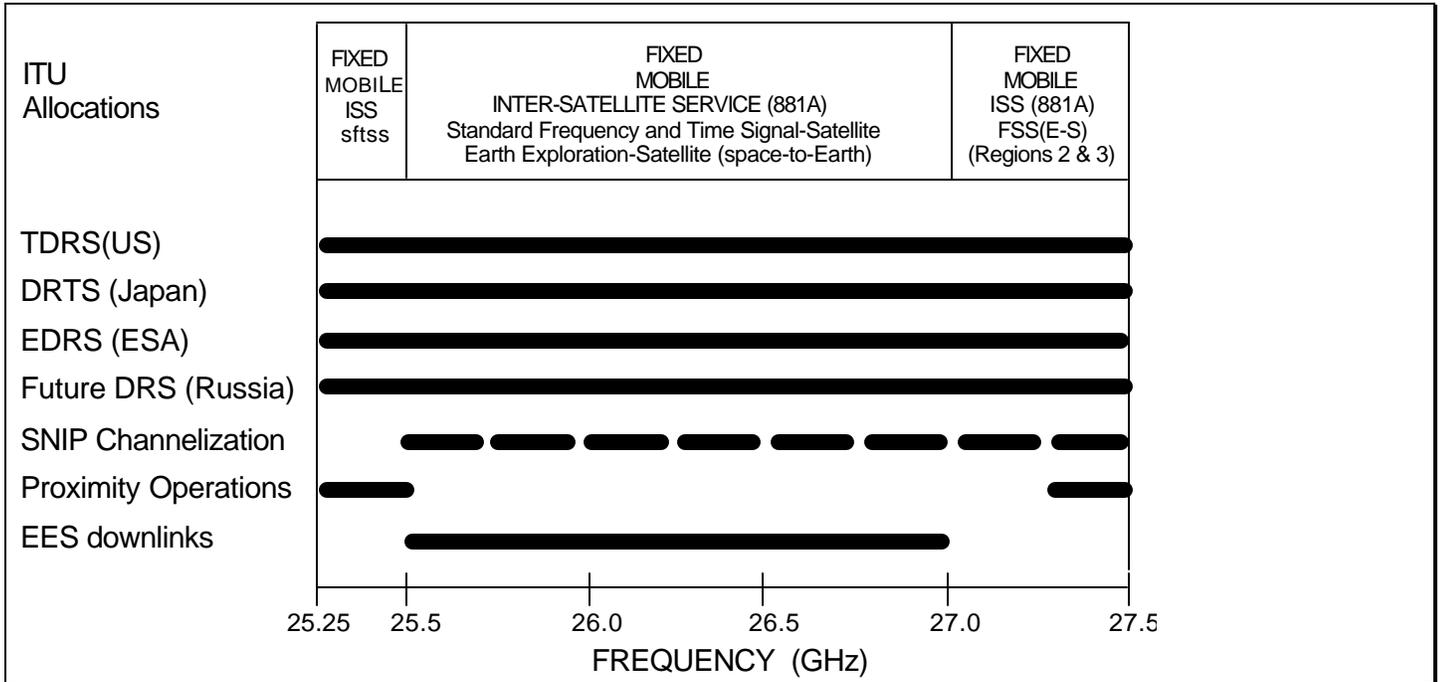
Summary

The 25.25-27.5 GHz band is extremely important for meeting the future requirements of space science services in support of the International Space Station and the next generation of Earth observing satellites. As inter-satellite data relay bandwidth requirements increase and as the increasing number of space systems, both government and commercial, continues to limit access to spectrum in lower frequency bands, the 25.25-27.5 GHz band will soon be the workhorse band for space agencies around the world.

Studies to date examining the feasibility of sharing in this band between space science services and LMCS/LMDS demonstrate that sharing feasibility is significantly affected by LMCS/LMDS system characteristics, parameter selection and service area size. To date, available sharing criteria within the ITU (i.e., RR Table S21-1 and DN Recommendation ITU-R F.[AD/9D]) have been developed only to address sharing with point-to-point fixed services and may not apply for point-to-multipoint services like LMCS/LMDS. Further study into the temporal and spatial characteristics of LMCS/LMDS interference, particularly for hub transmissions, is required to assess the suitability of applying these point-to-point criteria to point-to-multipoint systems. Work is need within the ITU-R to carry out these assessments and develop new criteria as needed to assure protection of co-primary space science services in the band.

Finally, any sharing criteria which may be developed should be a practicable limit that can be applied on a per service area (or per square kilometer) basis. This could enable flexible LMCS/LMDS deployment while ensuring protection of space science service systems.

CITEL members are encouraged to participate in further studies in the ITU-R on sharing issues in the 25.25-27.5 GHz band.



Note: RR 881A reads as follows:

Use of the 25.25 - 27.5 GHz band by the inter-satellite service is limited to space research and Earth exploration-satellite applications, and also transmissions of data originating from industrial and medical activities in space.

Figure 1. NASA and other Space Agencies operate throughout the 25.25-27.5 GHz Band

**PROTECTION OF GEOSTATIONARY
SATELLITE NETWORKS OPERATING IN HEAVILY-USED FSS BANDS**

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications,

CONSIDERING THAT:

Unless otherwise stipulated under the ITU Radio Regulations, non-GSO FSS networks may operate in the frequency bands allocated to FS in accordance with the provisions of RR S22.2 (2613);

The ITU Radiocommunication Bureau considers RR S22.2 to be an operational matter and therefore a matter to be resolved between satellite operators;

Certain frequency bands allocated to the FSS are heavily used by GSO networks;

GSO FSS systems provide valuable radiocommunication services in Region 2 countries;

Non-GSO FSS systems have been used in a limited fashion to provide domestic and international radiocommunication services from the earliest days of satellite systems;

There are plans to establish extensive, global Non-GSO FSS systems which might cause presently operating or planned difficulties in heavily-used by GSO FSS systems; and

In those frequency bands where Non-GSO FSS systems do not have priority (where S22.2 applies), existing and future GSO FSS systems should be protected;

RECOGNIZING THAT:

A stable regulatory environment is imperative for the future growth of the GSO FSS service; and,

The ITU-R should undertake the necessary studies for the development of protection criteria for GSO FSS systems operating the heavily utilized FSS bands in which S22.2 applies.

RECOMMENDS THAT CITEL MEMBERS:

- 1) Participate in the ITU-R studies on the development of such protection criteria and,
- 2) Ensure that such studies reflect current and future GSO FSS operations in the Region.

V. DECISIONS

PCC.III/DEC. 22 (IX-97)

APPLICATION IN THE AMERICAS OF THE INTERNATIONAL MOBILE STATION IDENTIFIER (IMSI)

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications, decided to designate Mr. Javier Camargo, in his capacity as coordinator of Standards activities between PCC.I and PCC.III pursuant to Resolution PCC.III 33(IV-96), to submit to the PCC.I the Draft Resolution "Application in the Americas of the International Mobile Station Identifier (IMSI).

PCC.III/DEC. 23 (IX-97)

BANDWIDTH AND CAPACITY REQUIREMENTS FOR SERVICES TO BE SUPPORTED ON FIXED WIRELESS ACCESS (FWA) SYSTEMS

The Ninth Meeting of the Permanent Consultative III: Radiocommunications decided that the Executive Secretary of CITELE circulates the questionnaire given in the Annex on bandwidth and capacity requirements for services to be supported on fixed wireless access (FWA) systems to the member countries asking them to provide the answers to the Rapporteur by 15 January 1998.

Annex

QUESTIONNAIRE ON BAND AND CAPACITY REQUIREMENTS FOR SERVICES TO BE SUPPORTED ON FIXED WIRELESS ACCESS (FWA) SYSTEMS

The following questions are posed to assist the work of the Rapporteur Group.

Questions to Government Administrations;

1. What residential services would you expect to be implemented using FWA technology both in the short term and in the long term? What residential densities, traffic rates, and patterns would be expected?
2. What business services would you expect to be implemented using FWA technology in both the short term and the long term?
3. What FWA trials have been conducted within your administration? What have been the results?

Questions to Manufacturers;

1. What technologies do you currently market which could be classed as FWA? Please describe service features, frequency bands, bandwidth requirements, capacity, etc.?

The responses to these questions should be sent to the Rapporteur at the following address:

Paul Rayment
Manager, Spectrum and Regulation
Nortel Wireless Networks
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Islington, Ontario
CANADA M9B 6E4
Tel.: + 1 416-232-3825
Fax: + 1 416-232-3996
paul_rayment@nt.com

PCC.III/DEC. 24 (IX-97) SATELLITE MOBILE COMMUNICATION SYSTEMS IN THE BAND L OF CANADA, THE UNITED STATES AND MEXICO

Taking into account that currently several satellite mobile communication systems exist, operating on band 1.5-1.6 GHz, (L-Band) using GSO satellites and that services loaned, could be of great interest for the CITEL members, the IX Meeting of the Permanent Consultative Committee III, decided: To recommend the CITEL Executive Secretariat, the distribution of PCC.III-851/97 document that contains the information of the satellite mobile communication systems on Canada, USA and Mexico L-Band.

PCC.III/DEC. 25 (IX-97) RESULTS OF THE STUDIES OF INCOMPATIBILITY BETWEEN FWA-PCS AND PCS-PCS

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications, decided that the Executive Secretary circulates document PCC.III/doc.935/97 a result of the extensive effort by the Interference Expert Group which addressed the report in the Incompatibility issues between FWA and PCS. These issues are extremely complex and have been addressed in detail in the report. The Group has also identified a number of issues that require further study. While these issues may be further addressed in the future, CITEL members may use this report as needed, and are invited to review this report and submit further inputs as appropriate. An interim period has been established to provide these inputs by the Administrations. If

no further inputs are received by the Executive Secretariat no later than the first day of the Tenth Meeting of the Permanent Consultative Committee III (February 2, 1998), the report will be considered final and no further study will be mandated to the Group on this matter. However, other mandates of the Group are not covered on this report, therefore Administrations are urged to inform the Executive Secretariat by the same date if there is a need to continue with this work or if they consider that the Group of Experts should be cancelled.

PCC.III/DEC. 26 (IX-97)
PUBLICATION OF THE JOINT PROPOSALS FOR WRC-97

The Ninth Meeting of the Permanent Consultative Committee III: Radiocommunications,

NOTING:

a) that the IX Meeting of Permanent Consultative Committee III (Radiocommunications), Mexico City, 22-26 September 1997 has reached historic agreement on common proposals to WRC-97 and other matters affecting telecommunications in the Americas;

b) that there is urgent need to communicate the results of the meeting within the Americas and throughout the world,

DECIDES:

1. that the Executive Secretary is instructed to issue a news release immediately upon completion of the meeting,
2. that the news release be widely disseminated to the telecommunications press, other regional and international organizations
3. to encourage the Member States to present this publication to the principal mass media in their countries

V. LIST OF THE BASIC DOCUMENTS RESULTING FROM THE NINTH MEETING OF PCC.III: RADIOCOMMUNICATIONS

Report of the Meeting	PCC.III-936/97 rev.1
Summary Minutes of the Opening Session and First Plenary Meeting	PCC.III-878/97 rev.1
Summary Minutes of the Second Plenary Meeting	PCC.III-892/97 rev.1
Summary Minutes of the Third Plenary Meeting	PCC.III-894/97
Summary Minutes of the Fourth Plenary Meeting	PCC.III-895/97
Summary Minutes of the Fifth Plenary Meeting	PCC.III-934/97
List of Documents	PCC.III-792/97 rev.3

