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January 23, 2002

FILED ELECTRONICALLY

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, SW
Room TW A325
Washington, DC 20554

Re: Ex Parte Notice in WT Docket 01-90: Service Rules for the 5.850-5.925 GHz Band and Revisions to Part 90 of the Commission's Rules

Dear Secretary Salas:

Pursuant to Section 1.1206 of the Commission's rules, 47 C.F.R. § 1.1206, notice is hereby given in WT Docket No. 01-90 regarding an *ex parte* meeting on January 22, 2002 between representatives of the Intelligent Transportation Society of America ("ITS America"), the DSRC Standards Writing Group of the American Society for Testing Materials Working Group E17.51 ("DSRC Standards Writing Group") and others with representatives of the Wireless Telecommunications Bureau's Public Safety and Private Wireless Division. The meeting was held in the offices of ITS America at 400 Virginia Ave., S.W., Washington, D.C.

At the invitation of the DSRC Standards Writing Group, Nancy Zaczek, Staff Attorney, and Gerardo Mejia, Electronics Engineer, in the Wireless Bureau's Public Safety and Private Wireless Division, attended a meeting of the DSRC Standards Writing Group to participate in a discussion of a proposed band plan and licensing and service rules for the DSRC-based Intelligent Transportation Services in the 5.850-5.925GHz band ("5.9 GHz Band"). Representing ITS America were Paul Najarian, Director of Telecommunications for ITS America, and Mark Johnson of Squire, Sanders & Dempsey L.L.P., counsel to ITS America. Attendees on behalf of the DSRC Standards Writing Group and others are listed on an attached Appendix.

The attendees discussed the proposed channelization and licensing plan developed by the DSRC Standards Writing Group, the status of drafting the selected wireless communications standard and requiring adherence to that standard by all users of the 5.9 GHz Band, the types of applications that

would use the band, public safety licensing eligibility, and further information needed by the FCC in order to complete the drafting of a Notice of Proposed Rulemaking. A copy of the presentation materials prepared by the DSRC Standards Writing Group regarding the 5.9 GHz Band and distributed at the meeting is included with this notice.

Please do not hesitate to contact me if there are any questions about this submission. As indicated below, copies of this notice will be distributed via email to the representatives of the Public Safety and Private Wireless Division who attended this meeting.

Sincerely,

Mark D. Johnson

Copy: Nancy Zaczek, Public Safety and Private Wireless Division, Wireless Telecommunications Bureau (via email)
Gerardo Mejia, Public Safety and Private Wireless Division, Wireless Telecommunications Bureau (via email)

APPENDIX

Attendees from the DSRC Standards Writing Group of the
American Society for Testing Materials Working Group E17.51 and Others:

- Sam Oyama, Senior Manager, ITS Center, Hitachi;
- Roger O'Connor, Layer Manager Chair, Highway Electronics;
- Thomas J. Keller, Communications Counsel, Association of American Railroads;
- Mohan Pundori, Consultant, ETA;
- Wayne Fisher, Systems Engineer, ARINC;
- Howard Moody, Consultant, Association of American Railroads;
- Broady Cash, Principal Engineer, ARINC and Chairman of the DSRC Standards Writing Group;
- Jeffrey Zhu, Principal Engineer, Mark IV Industries;
- W. Gordon Fink, President, Emerging Technology Markets;
- Justin McNew, Systems Engineer, TechnoCom Corp.;
- Carl Kain, Mitretek Systems;
- Ross Morris, Washington State Department of Transportation;
- Mike Duoos, Tech Manager, 3M;
- Jeff Brummond, Principal Systems Architect, ITERIS, Inc.;
- Tim McGuckin, Director Technology Programs, Internnational Bridge, Tunnel and Turnpike Association;
- Khaled Dessouky, VP/CTO, TechnoCom Corp.;
- Tom Schaffnit, President, Schaffnit Consulting, Inc.;
- Robert Soranno, Senior Member Professional Staff, Johns Hopkins University/Applied Physics Lab;
- Jeremy Landt, Chief Scientist, TransCore;
- Dick Schnacke, Director – ITS Activities, TransCore;
- Richard Doering, TransCore;
- Wayne Yamada, Manager, ITS Business Development, Denso Corporation;
- Douglas Gurin, Social Science Research Analyst, National Highway Traffic and Safety Administration;
- Jay Kitchen, President, Personal Communications Industry Association;
- Mike Breslin, General Manager, SIRIT Corp.;
- Larry Miller, Frequency Coordination Manager, American Association of State Highway and Transportation Officials;
- Michael P. Onder, Team Leader Operations and Technology, Office of Freight Management, Federal Highway Administration;
- Lee Armstrong, Armstrong Consulting, Inc.; and
- Sheung Li, Product Line Manager, Atheros Communications.

5.9 GHz DSRC BANDPLAN and RULES PROPOSAL

Prepared for the
FCC with input from
Industry Canada
by the ASTM E17.51
sub-committee

INTRODUCTION

5.9 GHz DSRC (Dedicated Short Range Communications) is a short to medium range communications service that supports both Public Safety and Private operations in roadside-to-vehicle and vehicle-to-vehicle communication environments. DSRC is meant to provide very high data transfer rates in circumstances where minimizing latency in the communication link and isolating relatively small communication zones are important. This briefing describes the intent of the proposed rules that will be written and submitted as recommendations to the FCC and Industry Canada. The topics listed below are discussed in the following charts and were used in the development of the proposed rules input:

A. Applications
B. Technology Characteristics
C. Channel Frequency Assignments

PUBLIC SAFETY and PRIVATE APPLICATIONS share the band

PUBLIC SAFETY

- PROBE DATA COLLECTION
- **TRAFFIC INFORMATION**
- TOLL COLLECTION
- **IN-VEHICLE SIGNING**
  - **WORK ZONE WARNING**
  - **HIGHWAY/RAIL INTERSECTION WARNING**
  - **ROAD CONDITION WARNING**
- **INTERSECTION COLLISION AVOIDANCE**
- **VEHICLE TO VEHICLE**
  - **VEHICLE STOPPED or SLOWING WARNING**
  - **VEHICLE-VEHICLE COLLISION AVOIDANCE**
  - **IMMINENT COLLISION WARNING***
- **ROLLOVER WARNING**
- **LOW BRIDGE WARNING**
- MAINLINE SCREENING
- BORDER CLEARANCE
- ON-BOARD SAFETY DATA TRANSFER
- DRIVER'S DAILY LOG
- VEHICLE SAFETY INSPECTION
- **TRANSIT VEHICLE DATA TRANSFER (gate)**
- **TRANSIT VEHICLE SIGNAL PRIORITY**
- **EMERGENCY VEHICLE SIGNAL PREEMPTION**
- **EMERGENCY VEHICLE VIDEO RELAY**
- **EMERGENCY VEHICLE APPROACH WARNING**
- **TRANSIT VEHICLE DATA TRANSFER (yard)**
- **TRANSIT VEHICLE REFUELING**

PRIVATE

- **ACCESS CONTROL**
- GAS PAYMENT
- DRIVE-THRU PAYMENT
- **PARKING LOT PAYMENT**
- **DATA TRANSFER (IDB, J1708, J1939, PCI, etc.)**
  - **ATIS DATA**
  - **DIAGNOSTIC DATA**
  - **REPAIR-SERVICE RECORD**
  - **VEHICLE COMPUTER PROGRAM UPDATES**
  - **MAP and MUSIC DATA UPDATES**
- **RENTAL CAR PROCESSING**
- **UNIQUE CVO FLEET MANAGEMENT**
- **CVO TRUCK STOP DATA TRANSFER**
- **LOCOMOTIVE FUEL MONITORING**
- **LOCOMOTIVE DATA TRANSFER**

ATIS - Advanced Traveler Information Systems
CVO - Commercial Vehicle Operations
EV - Emergency Vehicles
IDB - ITS Data Bus

THRU – Through
REGULAR – Current 915 MHz Applications / Future Dual Mode .915 and 5.9 GHz Applications
BOLD - New 5.9 GHz Applications with Two-Way Communication
GREEN - New 5.9 GHz Applications with One-Way Communication

* - NEW as of 1/11/02

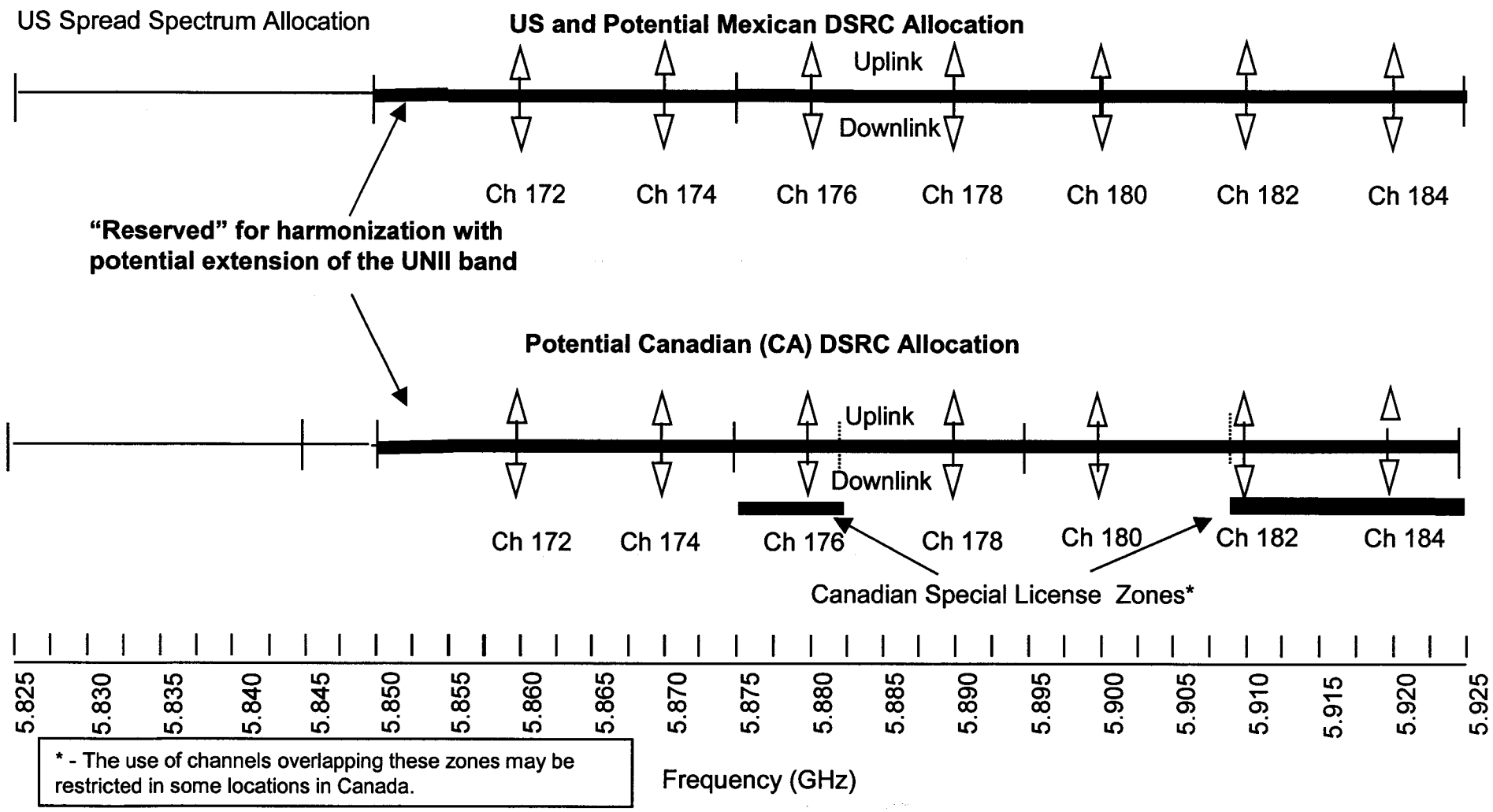
5.9 GHz DSRC TECHNOLOGY CHARACTERISTICS

- **Approach: Active**
- **Bandwidth: 75 MHz (5.850 - 5.925 GHz)**
- **Modulation: QPSK OFDM (with 16QAM and 64QAM options)** (BPSK preamble)
- **Channels: 10 - 10 MHz channels (optional combinations of 10 and 20 MHz channels)**
- **Data Rate: 6, 9, 12, 18, 24, and 27 Mbps with 10 MHz Channels** (3 Mbps preamble)
- **(or 6, 9, 12, 18, 24, 36, 48, and 54 Mbps with 20 MHz Channel option)** (6 Mbps preamble)
- **Max Tx Pwr: 28.8 dBm (at the antenna input)**
- **RSU EIRP: Nominal 0 - 33 dBm (1 mW - 2 W) / Max. 44.8 dBm (30 W)**
- **OBU EIRP: Nominal 0 - 20 dBm (1 - 100 mW) / Max. 44.8 dBm (30 W)**
- **RSU and OBU Sensitivity: - 82 dBm (QPSK) / - 65 dBm (64QAM)**
- **C/I: 4 - 6 dB (for QPSK @ 10^{-4} BER coded) / 16 - 17 dB (for 64QAM @ 10^{-4} BER coded)**
- **Band Sharing Strategy - Frequency Coordination. Selection of alternate channels for adjacent zones. Use CSMA to prevent interference between users in the channel.**

RSU - Roadside Unit; OBU - Onboard Unit; EV - Emergency Vehicle; EIRP - Effective Isotropic Radiated Power; CSMA - Carrier Sense Multiple Access

5.9 GHz DSRC CHANNEL FREQUENCY ASSIGNMENTS

(10 MHz CHANNELS)



* - The use of channels overlapping these zones may be restricted in some locations in Canada.

5.9 GHz DSRC OPERATIONAL RULES OVERVIEW

5.9 GHz DSRC (Dedicated Short Range Communications) enables high data rate, limited interference, low latency, licensable communication in the 5.850 to 5.925 GHz Spectrum. Use of the 5.850 to 5.925 GHz part of this spectrum is limited to communication between vehicles and roadside devices, communication between vehicles, and communication between vehicles and handheld devices. The 5.9 GHz DSRC Concept described in this section includes the following elements:

A. Spectrum Allocation (Item 1)
B. Channel Designations (Item 2,3)
C. User Class Identification (Item 4)
D. Eligibility (Item 4)
E. Spectrum Management and License Assignment (Item 5,6)
F. Channel Allocation (Item 7)
G. Equipment Description (Item 8 to 19)
H. Channel Utilization (Item 20 to 24)

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

1. In the US, 5.9 GHz DSRC operations under US Title 47 CFR part 90 are currently allocated to the spectrum between 5.850 and 5.925 GHz. (Canadian spectrum regulatory authorities are currently evaluating the recommendation to adopt DSRC operation in the spectrum between 5.850 and 5.925 GHz in Canada, with specific sections designated as special license zones.)

2. The US 5.9 GHz DSRC spectrum is divided into seven 10 MHz channels with 10 MHz channel spacing between the centers of the channels. The channels are designated by the formula "channel center frequency = 5000 + 5 * n_{ch} (MHz)", where n_{ch} = 0 to 200.

Channel 172: 5855 to 5865 MHz
Channel 174: 5865 to 5875 MHz
Channel 176: 5875 to 5885 MHz
Channel 178: 5885 to 5895 MHz
Channel 180: 5895 to 5905 MHz
Channel 182: 5905 to 5915 MHz
Channel 184: 5915 to 5925 MHz

This enables compatibility with the UNII band IEEE 802.11a channel numbering to facilitate the planned implementation of dual mode UNII/DSRC devices.

The spectrum between 5850 and 5855 GHz is reserved for potential expansion of the UNII band that would enable implementation of additional channels in this region.

ASTM - American Society for Testing and Materials
DSRC - Dedicated Short-Range Communications CFR - Code of Federal Regulations

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

3. Channel pairs 174/176, and 180/182 may each be combined to provide 20 MHz channels (designated as 175 and 181 respectively), when the data rate requirements of an application or installation exceed 27 Mbps and the installation is licensed to use the channels being combined.

4. 5.9 GHz DSRC Applications are categorized as Public Safety and Private. These applications share licensed channels. The definition of "Public Safety Services"and licensing eligibility for DSRC is found in Section 337(f) (1) of the 1997 Communications Act.

5. Public Safety applications shall have priority over all Private applications in overlapping communication zone environments.

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

6. All channels are managed by an "FCC-Certified Frequency Coordinator" and licensed by the FCC under part 90 rules. The Frequency Coordinator shall use standard interference contours based on the requested class of service to determine possible interference to existing users and pending applicants, when evaluating a license application. Site specific contours can also be used to refine the analysis. The use of directional antennas is encouraged to assist in the solution of mutual interference. To minimize interference between users the Frequency Coordinator shall assign different service channels, when available, to users in adjacent zones that are inside an interference contour. Shared use of the channels will be implemented, using listen before transmit techniques, when non-interference cannot be established due to the density of users in any particular area. Based on a showing of non-interference or adequate sharing, the coordinator shall recommend the DSRC installation application for approval to the FCC.

6a. DSRC installations have four classes and corresponding RSU EIRP Limits:

- Class 1: 10 dBm max - intended for ranges up to 15 meters
- Class 2: 20 dBm max - intended for ranges up to 100 meters
- Class 3: 33 dBm max - intended for ranges up to 400 meters
- Class 4: 44.8 dBm max - intended for ranges up to 1000 meters.

6b. The interference contour is specified as received power level of -88 dBm. The received power level is measured at 1.2 m above ground level with a 0 dBi antenna in the applicable channel.

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

6c. The Frequency Coordinator shall verify that the license applicant is not implementing an unnecessarily large communication zone or producing an excessive interference contour to implement the requested application.

7. Channel 178 is designated as the Control Channel where announcements and short data messages are transmitted. All announcements and messages on this channel shall be less than than 200 us. The other channels are designated as Service channels, where additional data transfers and special operations applications, as identified in paragraphs 22 and 23, occur.

7a. Channels 172, 174, 175, 176, 180, 181, 182, and 184 support shared (Public Safety and Private) licensed Service Channel operations in the US, Canada, and Mexico.

7b. Channel 184 Canada, is assigned (with exceptions) to public safety applications which require relatively high power and wide area coordination to prevent interference.

7c. Channel 172 is assigned to vehicle to vehicle communications.

8. The terms Roadside Unit (RSU) and On-board Unit (OBU) identify the 2 types of DSRC devices.

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

9. A Roadside Unit (RSU) is a DSRC transceiver that is normally mounted along a road or other vehicle or pedestrian passageway.

9a. An RSU may also be mounted on a vehicle or be hand carried but may only operate when stationary.

9b. Licensed RSU operation is restricted to a specific fixed site location or area.

9c. Handheld or portable RSUs are permitted to operate on the Control Channel and Service Channels in areas designated by their license and where they do not interfere with a fixed site licensed operation.

9d. An RSU broadcasts data to OBUs or exchanges data with OBUs in its communication zone.

9e. An RSU also provides channel assignments and operating instructions to OBUs in its communication zone, when required.

9f. An unlicensed RSU may broadcast announcements on the Control Channel if it uses an EIRP of 0 dBm or less. All corresponding data transfers must be accomplished outside of the DSRC band. Unlicensed RSU operations are not allowed in the DSRC Service Channels.

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

10. Public Safety RSUs operate under a shared area license assigned to the appropriate public safety eligible agencies. This agency provides coordinated access to channels for its Public Safety application implementers that are shared using listen before talk and area wide priority assignments. Public Safety installations shall be implemented with directional antennas whenever possible to minimize interference to co-channel users.

11. Private RSUs shall operate under a site specific license and use directional antennas whenever possible to minimize interference to co-channel users. Multiple RSU installations may be constructed under one license to cover a service area at a contiguous DSRC service site.

12. Multiple RSU installations may be constructed under one license to cover a group of RSUs operating at non-contiguous sites controlled by a single licensee.

13. RSU license applications will specify the class of service, modulation designator, power level, location, antenna height, antenna gain, antenna pattern, boresight azimuth range, and boresight elevation range for all RSU antennas. In addition, the maximum message repetition rate on the Control Channel shall be specified. When a Service Channel is used, the Service Channel frequency and maximum data rate shall also be specified. The maximum RSU antenna height above ground level is 15 m.

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

14. All RSU installations must be operational within 12 months of obtaining a license.

15. An On-Board Unit (OBU) is a DSRC transceiver that is mounted in or on a vehicle or hand carried. An OBU can be operational while in motion or stationary. OBUs receive, contend for time to transmit, or are assigned a time to transmit on one or more RF channels. Except where specifically excluded, OBU operation is permitted wherever vehicle operation or human passage is permitted. OBUs may communicate with RSUs or other OBUs.

16. Except for designated applications, all OBUs automatically select the Control Channel and wait for application announcements, data transfers, or warning messages. An application announcement will identify a DSRC service channel to be used for data transfers larger than those which can be handled on the Control Channel.

17. RSUs and OBUs shall transmit only the power needed to communicate over the distance required by the application being supported. Maximum antenna input power is 28.8 dBm and Maximum EIRP is 44.8 dBm. All adjacent channel or adjacent band emissions shall be attenuated by 55 +10 log (P_w), where P_w is measured in watts, measured in a 100 kHz bandwidth.

5.9 GHz DSRC
PROPOSED FCC RULE INPUT

18. RSUs and OBUs shall listen before transmitting and OBUs with more than 0 dBm power capability shall implement power control in fixed steps.

19. RSUs shall have a frequency accuracy equal to or better than +/- 10 ppm. OBUs shall have a frequency accuracy of equal to or better than +/- 10 ppm.

20. All Control Channel, Public Safety, and Private DSRC operations in the 5.850 to 5.925 GHz band shall be implemented in compliance with the ASTM XXXX DSRC standard.

21. All roadside to vehicle or vehicle to vehicle Public Safety Warning messages are announced or delivered on the Control Channel. Public safety warning messages shall have priority over all other messages on this channel. Only Short Public Safety Warning messages may be delivered on the Control Channel. Any Public Safety Warning message data transfers longer than 200 us must occur on a Service Channel.

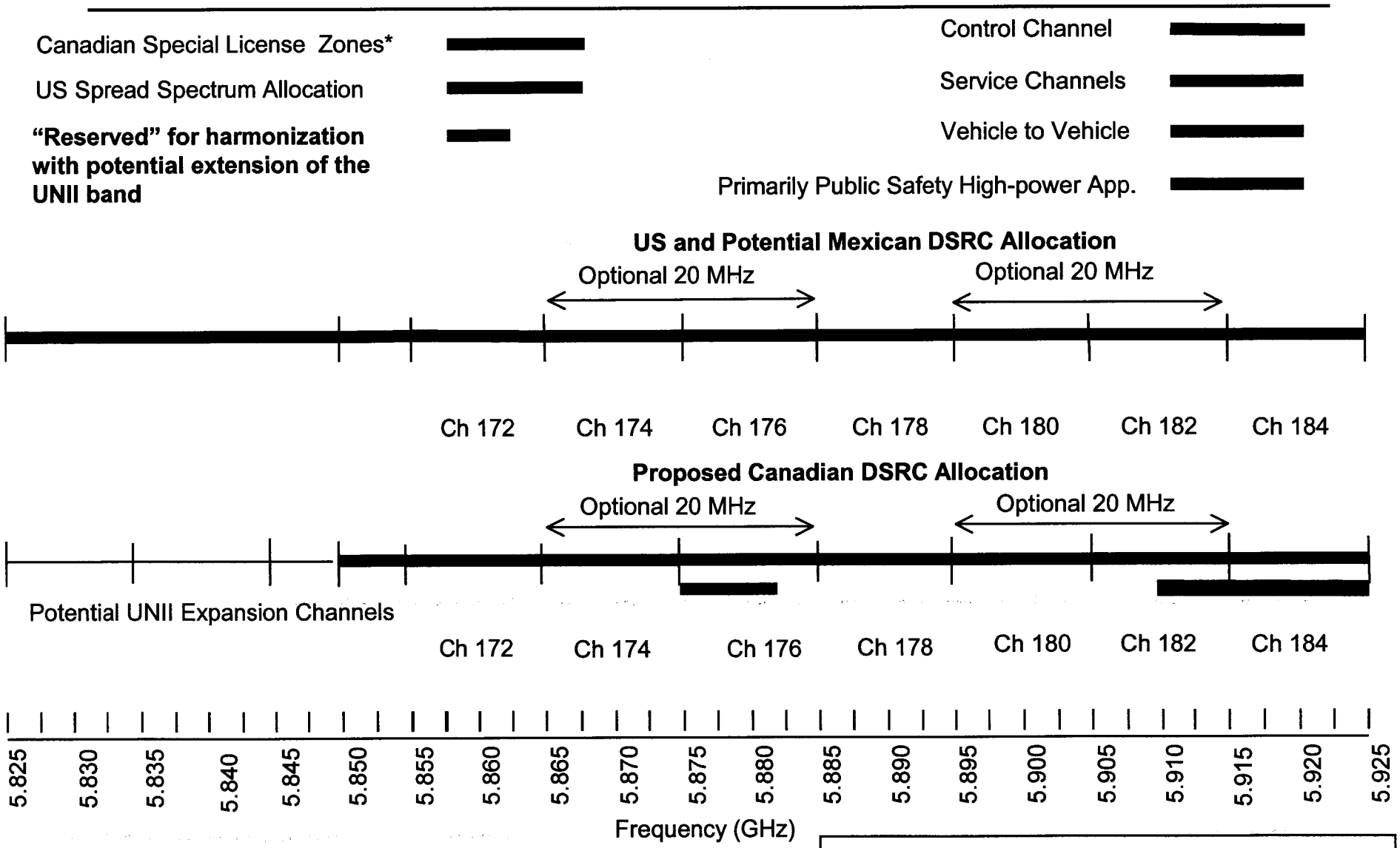
5.9 GHz DSRC
PROPOSED FCC RULE INPUT

22. Channel 184 is assigned as the primary Service Channel for Public Safety, high power (above 33 dBm), coordinated RSU applications. Public Safety applications in this category, including the signal priority application, receive priority access to this channel. An OBU may be dedicated exclusively to operations in this channel as long as another OBU on the vehicle is conducting operations on the Control and other channels. Private applications may use Channel 184 as a Service Channel when authorized by the Frequency Coordinator, with knowledge that high-power Public Safety applications (if implemented) have the potential to provide severe interruptions of Private application service. Private applications must not interfere with and must accept interference from Public Safety operations in the channel.

23. Channel 172 is assigned as the primary Service Channel for vehicle-to-vehicle communications. To prevent channel overloading and minimize latency, vehicle-to-vehicle communications in this channel give priority to Public Safety related messages (vehicle location, speed, status, acceleration, etc.).

24. Any one licensee at a given location may be assigned no more than two 10 MHz Service Channels in the licensed DSRC band unless the applicant provides documentation to the FCC Frequency Coordinator to show that more channels are necessary or would provide substantial improvement in the operation of the service and that it would not endanger the non-mutually exclusive use of the band. The Frequency Coordinator will verify that the need is justified before allowing such use.

HARMONIZED 5.9 GHz DSRC BAND PLAN



* - The use of channels overlapping these zones may be restricted in some locations in Canada.

10 MHz Channels with 20 MHz combination options