

15 July 2014
English only

To Administrations of Member States of the ITU, Radiocommunication Sector Members, ITU-R Associates participating in the work of Radiocommunication Study Group 6 and ITU-R Academia

Subject: Questionnaire on spectrum requirements for the future of sound and television broadcasting

References: 6/ 93 and 6/249

1 Study Group 6 (SG 6) is the ITU-R Study Group assigned to the Broadcasting service. Its scope covers radiocommunication broadcasting, including vision, sound, multimedia and data services principally intended for delivery to the general public.

2 SG 6 created a Rapporteur Group to look at the future spectrum requirements for the Broadcasting service in light of technical developments, decisions taken by WRC-03 and WRC-07 on the use of digital modulation in the HF Bands, and the changes to frequency allocations at WRC-97, WRC-07 and WRC-12, as part of the work in maintaining its catalogue of Reports and Recommendations.

3 One of the questions that needs to be addressed by SG 6 include how broadcast requirements are changing with the move to digital broadcast systems, and the introduction of new and enhanced broadcast services.

4 The following questionnaire, which is being sent to all Administrations and Sector Members, is designed to gather information on spectrum use by sound and television broadcasting in the bands allocated on a Regional¹ or global basis to terrestrial broadcasting (see Annex 1).

5 Administrations and Sector Members are also invited to make more detailed inputs addressing the matter of current and future spectrum requirements for radio and television broadcasting to the next meeting of WP 6A and SG 6.

6 Administrations and Sector Members are requested to submit responses to brsgd@itu.int by 17 October 2014.

David Barrett

Chairman SG6 Rapporteur Group on spectrum requirements
for the future of the broadcasting Service

¹ Regions 1, 2 or 3 as defined in Nos. 5.3 to 5.9 of the Radio Regulations.

QUESTIONNAIRE ON SPECTRUM REQUIREMENTS FOR THE FUTURE OF SOUND AND TELEVISION BROADCASTING

Name of the Administration:	
Contact person:	
E-mail address:	
Telephone number:	

Name of the Sector Member:	North American Broadcasters Association
Contact person:	Michael McEwen, Secretary-General
E-mail address:	mmcewen@nabanet.com
Telephone number:	416-598-9877
What best describes your organisation? Commercial broadcaster/Public service broadcaster/ Service provider/ Other (please describe)	North American broadcasters' union, including national television and radio broadcasters, and major suppliers of products and services to the industry.
The geographical area over which you operate:	Canada, the United States of America and Mexico

SECTION ONE – Television broadcasting

- 1)
 - a) Is your country still using analogue television?
 - b) If yes, has analogue television switch-off commenced?
 - c) If your country has any plans to switch-off analogue television:
 - i) When is the analogue switch-off process expected to be completed?
 - ii) How much extra spectrum will be required during the transition phase to digital terrestrial television broadcasting?

Reply:

1a) In Canada, analogue television transmitters in smaller non-mandatory markets remain on the air. In the United States, smaller power stations, including Class A, low power television (LPTV), and translator stations, continue to broadcast analogue services, though the transition process to digital for these stations has begun. LPTV stations are secondary to full-service stations. Translators are low power TV stations that are operated for the purpose of retransmitting the programs and signals of a television broadcast station, typically to areas not adequately covered by the TV station. In Mexico, analogue television is still being used.

1b) In Canada, analogue television broadcasting ended in twenty eight mandatory major markets in 2012, those markets were selected by the Canadian Radio-television and telecommunications Commission (CRTC). Analogue television broadcasting of full power stations ended in the U.S. in June 2009. All analogue full power stations were switched off and converted to digital-only operation. Full power television stations transmit with a maximum effective radiated power of 1 megawatt in the UHF band and lower power in the VHF bands. Analogue switch-off commenced in one city in Mexico (Tijuana, B.C.) July 2013. This was considered a “Pilot Test” designed to get experience and face possible problems that may come out from the analogue TV shut-down process.

1ci) In Canada, the completion date for the switch-off of analogue television is undetermined. In the U.S., the current deadline for low power stations to cease analogue operation had been set for September 2015 but is expected to be extended by the FCC due to the impending incentive auction of broadcast spectrum. December 15, 2015 is the analogue shut-down for all TV stations, including gap-fillers and low power stations. It is expected that this deadline will be difficult to meet mainly due to the lack of penetration of DTV receivers in Mexican households.

1cii) The transition process in Canada, Mexico, and the U.S. has allowed for an additional channel to be used in order to simulcast the original analogue service with the new digital service. The transition process by simulcasting allows for the users in a market time to replace their analogue receiving equipment with new digital receiving equipment. As an example, for the DTV transition in the U.S. that was completed in 2009, each full power station (approximately 1,700 stations in total) was assigned a second 6 MHz channel in the existing VHF/UHF television band and transmitted a digital signal on the new channel along with their analogue signal on its existing channel. After the transition, the digital television stations were re-packed into channels 2 to 51 while channels 52-69 were returned to the government for re-allocation or auction.

- 2)
 - a) Please indicate how many analogue television transmitters are in operation in your country and in which bands.

- b) What channel bandwidths are used for analogue television?
- c) What is the spectrum requirement for analogue television in your country?

A proposed format for responses to question 2a) and 2b) is provided in Annex 1

Reply:

2a) In Canada, there are approximately 1,000 analogue television transmitters still in operation in both the VHF-TV (54-72 MHz and 174-216 MHz) and UHF-TV (470-608 MHz) frequency bands. According to the Federal Institute of Telecommunications (IFT), in Mexico there are more than 700 analogue television stations in the VHF and UHF bands. The answers below include stations in Canada, Mexico, and the U.S.:

Canadian low power and very low power stations (LP and VLP operational stations – analogue only):

Channels 2 to 6 (VHF I): 105

Channels 7 to 13 (VHF III): 216

Channels 14 to 51 (UHF IV): 135

Channels 52 to 69 (UHF IV): 0

Mexican full power and gap-filler stations (analogue only):

Channels 2 to 6 (VHF I): 226

Channels 7 to 13 (VHF III): 325

Channels 14 to 51 (UHF IV): 145

Channels 52 to 69 (UHF IV): 12

U.S. low power stations (total Class A, LPTV, and Translator, analogue only):

Channels 2 to 6 (VHF I): 270

Channels 7 to 13 (VHF III): 508

Channels 14 to 51 (UHF IV): 1,195

Channels 52 to 69 (UHF IV): 0

2b) 6 MHz channel bandwidths are used for both analogue and digital TV broadcasting.

2c) In Canada where there is no determined date for a transition from analogue broadcasting, the spectrum available for analogue broadcasting should be maintained. In Mexico, there are plans to grant two more national DTTB networks during 2015. Enough spectrum should be made available to accommodate these new networks. Although these two networks will be digital only, the simulcast operation has to be maintained until the analogue shut-down order from the Mexican government. In the US, if the date that is set for the transition from analogue to digital broadcasting is not delayed, enough spectrum should be made available to allow for a successful simulcasting based transition. The simulcasting period should be long enough to provide ample time for the consumer base to replace their receiving equipment.

- 3)
 - a) What is the percentage of viewer uptake of terrestrial television in your country?
 - b) If possible, please also provide details of the number or proportion of users who receive television primarily by terrestrial means by:

- i) Fixed roof top antenna, or
- ii) Portable indoor antenna.

Reply:

3a) Estimates of over-the-air households are based on surveys and therefore vary depending on the survey conducted. Estimates for percentage of viewership of over-the-air terrestrial television-only reception range from 5 to 10% in Canada. Over-the-air TV is the service with the most penetration in Mexico. Today there are more than 28 million TV households in Mexico. More than 98% of the households in Mexico are covered with free over-the-air TV services and more than 95% of households in Mexico have at least one TV set. Almost 37% of the TV households subscribe to pay TV services but this does not mean that all TV sets in the house are connected to pay TV services. Over-the-air broadcast-only homes are about 14% of U.S. homes (source: 2014 edition of GfK ownership and trend report of the Home Technology Monitor—see blog.gfk.com/2014/06/two-decades-of-media-tumult). It should be noted that while cable TV serves 54 million subscribers in the U.S. from over 7,000 cable headends, 80 percent of those headends obtain local TV signals through over-the-air reception (source: NCTA).

3b) In Canada and the U.S., this information is not readily available. According to the National Institute of Statistics and Geography (INEGI), it is estimated that about 63% of TV households in Mexico depend on the free over-the-air TV service. Roof antennas are mostly used for the main TV set and portable indoor antennas are used for small TVs but this may change during the transition process from analogue TV to DTV as it is expected that more rooftop antennas will be used.

- 4) If your country has switched or is considering switching to digital terrestrial television broadcasting
 - a) What system standard is your country using or considering adopting (as specified in Recommendations ITU-R BT.1306 and BT.1877)?
 - b) When did your country start or when is it proposing to start the introduction of digital terrestrial television services?
 - c) Please provide further detail on the number of multiplexes in use, their technical specifications, the percentage of geographic area or population they cover or are intended to cover and the total spectrum use.

A proposed format for detailed responses is provided in Annex 2

Reply:

4a) The system standard that is in use in Canada, Mexico, and the U.S. is based on the Advanced Television Standards Committee (ATSC) A/53 standard and other associated ATSC standards. This system is equivalent to the System A Standard in Appendix 1 to Annex 1 in ITU-R BT.1306.

4b) Digital terrestrial television service has already begun in Canada, Mexico, and the U.S. Mexico started DTTB services in 1997 as experimental transmissions. In 2004 the ATSC standard was officially adopted and a National DTTB policy was published by the government.

4c) This concept is not necessarily applicable to Canada, Mexico, and the U.S.—each station is assigned a 6 MHz channel. Stations are allowed to transmit more than one program in a 6 MHz channel.

- 5) a) What frequencies/channels are currently used or intended to be used by digital terrestrial television broadcasting in your country? Please distinguish between those in use and those intended to be used?
- b) Please indicate how many digital terrestrial television transmitters are currently used or intended to be used and in which bands.
- c) What channel bandwidth is used or intended to be used for digital terrestrial television in your country?

A proposed format for responses to question 5b) and 5c) is provided in Annex 1

Reply:

5a) Both VHF-TV and UHF-TV bands are in use by digital terrestrial television services, however, the UHF-TV band is preferred. The Mexican government has established the goal to repack all TV services in channels 2 to 51 in the VHF and UHF bands. Also to note, the U.S. has an ongoing proceeding/auction to reallocate more UHF TV spectrum to wireless broadband services, which will reduce the number of TV channels available for broadcasting in the U.S. It is currently unknown how much broadcast spectrum will be reallocated as a result of the auction, currently slated for 2015.

5b) The detailed use is captured in Annex 1.

5c) 6 MHz channel bandwidths are used for both analogue and digital TV broadcasting.

- 6) a) Are the terrestrial television frequency bands also shared with other primary services in your country?
- b) If yes, please give details of those systems and their spectrum use.

Reply:

6a) In Canada, Mexico, and the U.S., the allocation of the bands 470-512 MHz and 614-806 MHz is shared with the fixed service on a primary basis, subject to agreement obtained under No. 9.21. In Canada, Mexico, and the U.S., the allocation of the bands 470-512 MHz and 614-698 MHz is shared with the mobile service on a primary basis, subject to agreement obtained under No. 9.21. In Canada, Mexico, and the U.S., the band 512-608 MHz is also allocated to the fixed and mobile services on a primary basis, subject to agreement obtained under No. 9.21. In the U.S., broadcasting in the band 470-512 MHz is shared with both Public Mobile and Private Land Mobile operations in certain cities.

6b) Public Mobile services in the U.S. are licensed fixed or mobile services which can serve the public. Public Mobile use is defined in Part 22 of the FCC rules. Private Land Mobile services in the U.S. are primarily used for public safety purposes. Private Land Mobile use is defined in Part 90 of the FCC rules.

- 7) a) Are the terrestrial television frequency bands also shared with secondary services used for the support of broadcasting such as SAB/SAP (services ancillary to broadcasting/production), or other types of services such as radio astronomy or wind-profile radar?
- b) If yes, please give details of those systems and their spectrum use.

Reply:

7a) The terrestrial television frequency bands are shared with broadcasting auxiliary services, including wireless microphones and studio-to-transmitter links, on a non-interfering and secondary basis. The U.S. issued a new proceeding to address the continued use of wireless microphones and their spectrum requirements in September 2014. At the time of this writing, the proceeding is currently in development. Much will be learned about SAB/SAP use and its spectrum allocations following this proceeding.

In Canada, Mexico, and the U.S., in the UHF-TV band, 608-614 MHz is allocated to Radio Astronomy on a primary basis and to Mobile Satellite on a secondary basis.

7b) Details for the example of operation in the U.S. The spectrum use, the licensing requirements, and the FCC rule part of these systems are captured in the following table:

<i>Frequency Band</i>	<i>Licensed/unlicensed</i>	<i>Rule Part</i>
26.1-26.48 MHz (VHF)	Licensed	Part 74
161.625-161.775 MHz (VHF)	Licensed	Part 74
Portions of 169-172 MHz band (VHF)	Licensed	Part 90
88-108 MHz (FM)	Unlicensed	Part 15
450-451, 455-456 MHz (UHF)	Licensed	Part 74
54-72, 76-88, 174-216, 470-608, 614-698 MHz (VHF and UHF)	Licensed and unlicensed	Part 74 and Part 15 (waiver)

- 8) a) Does your country foresee a requirement for new and enhanced services, including multimedia and data applications, HD, 3D, and UHD television, on the terrestrial television platform?
- b) If yes, please give indicative details of the number and nature of services planned, and if known, the expected timeframe for their introduction.

Reply:

8a) There is a strong requirement for existing and additional spectrum for new and enhanced broadcasting services. Existing spectrum, allocated on a primary basis to the Broadcasting Service, specifically in the UHF band (470-608 MHz) will need to be maintained. Contiguous spectrum should be allotted in the bands assigned to the broadcast service to allow for the robust delivery of high-quality media content, data and signaling that meets or exceeds the capabilities of current fixed and mobile reception and display devices as well as those that are expected to be deployed in the future.

Provision of HD service was a central goal in the DTV transition and is now pervasive as an application for terrestrial television. 3D has recently been standardized for terrestrial television delivery as the six-part A/104 Standard by the Advanced Television Systems Committee (ATSC). Implementation of 3D by broadcasters will be voluntary and is currently not scheduled. UHD is a requirement in the current ATSC “3.0” development process to define a next generation broadcast platform. UHD-1 (3840 x 2160) is currently of greatest interest. Progress with UHD-2 (7680 x 4320) is also being monitored, although the spectrum requirements for UHD-2 terrestrial broadcasting are challenging. The ATSC 3.0 Standard is expected to be completed at the end of 2015. Implementation of UHD by broadcasters will be voluntary and is currently not scheduled.

New services include not only HD, UHD, 3D but also high dynamic range, wide colour gamut, high frame rate (120 frames per second, for example). Higher capacity capabilities are required to deliver these new services to the market.

There is also interest in delivering broadcast TV to the market using methods that increase reception reliability so that mobile users and those that are indoors may enjoy the most efficient TV delivery possible. Mobile TV service has also been standardized. Implementation by broadcasters is also voluntary.

There is also an interest for these new and enhanced broadcasting services to be “hybridized” by integrating the use of the unlicensed 2.4, 3.6, and 5 GHz ISM (Wi-Fi) spectrum for content delivery. The ISM spectrum that is available in North America can work in conjunction with these new and enhanced broadcasting services by providing added capabilities such as access to return channels. With the combination, consumers would benefit from the low latency, high efficiency, and outdoor ubiquity advantages of the broadcasting service with the increased interactivity and deep indoor availability advantages of Wi-Fi – all at a significantly lower consumer cost than other options.

Some of these new and advanced services have been or are being transmitted over the air in Canada, Mexico, and the U.S. These implementation of these services may represent a dramatic change in the way consumers perceive the TV service in general and the way regulators manage the spectrum.

Multichannel standard definition services have also been used but continuing to do so might limit the transmission of new and advanced services.

8b) The new next generation of standards work of the ATSC standard will provide a flexible, scalable, feature-rich, multimedia experience to fixed, portable and mobile reception devices of all kinds. According to the current ATSC schedule, the new standard is expected to be complete by mid-2015. In the U.S., there are plans involving TV broadcasting to conduct a voluntary reverse-auction, a resulting spectrum repack down from 698 MHz, and a following forward auction to sell off the cleared spectrum. The current schedule of this activity is expected to occur in the same time frame. To the degree that these schedules align, there might be an opportunity presented for U.S. broadcasters to perform a transition to this next generation standard. Neither the details of such a transition nor whether such a transition would be allowed by regulation is yet to be determined.

- 9) a) Are there plans in your country to launch more multiplexes in the future?
 b) If yes, how many more and when? Please also indicate the expected timeframe for their introduction.

Reply:

9a) Stations are allowed to transmit more than one program in their assigned 6 MHz channel. The ongoing incentive auction proceeding, however, will allow television broadcast stations to relinquish their spectrum rights in exchange for compensation and continue to operate by sharing another broadcaster’s channel. Such arrangements are voluntary.

9b) Not applicable.

- 10) a) What is the amount of spectrum your country foresees will be required for terrestrial television broadcasting, taking into consideration the responses to

Questions 5, 6, 7, 8, and 9? Please indicate the modes of transmission that will be used, and timeframes.

Reply:

10) New technologies in DTTB will naturally change the needs or requirements of spectrum. UHDTV, mobile TV, and new standards like ATSC “3.0” will generate a big demand for more bandwidth.

The ATSC “3.0” Standard will, in all likelihood, not be compatible with the current DTV standard but will occupy the same amount of spectrum. The transition to ATSC “3.0” will therefore be very challenging in order not to disenfranchise viewers. The optimum situation would be to assign each station an additional 6 MHz channel for the transition period, as was done for the analogue-to-digital transition. However, there is not enough spectrum assigned to television broadcasting for this transition approach to accommodate all broadcasters currently in operation. Further, the UHF television broadcast band may be further reduced after the incentive auction.

While Canada, Mexico, and the U.S. continue to transition from analogue to digital, these new developments will require a close review of the assignments of spectrum. The need to maintain the current attribution of spectrum to broadcasting continues to get stronger and more important.

At the very least, broadcasters must have the ability to develop and apply any new technologies that might be developed by experts around the world in the spectrum represented by channels 2 through 51.

SECTION TWO – Sound broadcasting

- 11) a) What analogue sound broadcasting standards are used in your country and what bands are they operating in?
- b) Please indicate how many analogue radio transmitters are in operation in your country and in which bands.
- c) What channel bandwidths do they use?

A proposed format for responses to question 11b) and 11c) is provided in Annex 1

Reply:

11a) FM and AM broadcasting is used throughout Canada, Mexico, and the United States. FM stations operate from 88 to 108 MHz (VHF II). AM stations operate from 540 to 1700 kHz (MF). In the case of the U.S., standards are specified by FCC rules.

11b) There are thousands of analogue radio transmitters in operation in North America, operating in either the AM (525 to 1605 kHz) or FM (88 to 108 MHz) frequency bands. There are approximately 700 commercial radio stations in Canada and 2,000 in total. According to the Instituto Federal de Telecomunicaciones (regulator) there are the following numbers of radio stations in Mexico:

AM (MF)- 681 licensed stations

FM (VHF II)-1,254 licensed stations.

In the U.S., there are:

AM (MF)– 4,799 licensed stations

FM (VHF II)– 10,760 licensed stations.

11c) The channel bandwidth used for AM in North America is 10 kHz and 200 kHz for FM. Both bands have a prescribed out-of-band emission mask.

- 12) a) Is additional spectrum required for growth in the analogue sound broadcasting platform in your country?
- b) If yes, how much additional spectrum is required?

Reply:

12a) The current AM and FM bands are congested, so significant growth would require additional spectrum. In Mexico, there are efforts to make the analogue radio platform grow in a plan to move AM services to the FM band in markets where there is enough spectrum. The guard band separation between FM services in Mexico is 800 kHz. No additional spectrum is currently considered.

12b) Significant growth is not expected and the digital broadcasting standard used does not require additional spectrum.

- 13) a) Is your country considering introducing, or has it already introduced digital sound broadcasting?

- b) If yes, which system standards are used or are being considered for adoption (as specified in Recommendations ITU-R BS.1114, BS.1514, BS.1615)?
- c) When did your country start or when does it propose to start digital sound broadcasting?
- d) What channel bandwidths is your country using or considering using?
- e) What frequencies are currently used or intended to be used by digital sound broadcasting in your country? Please distinguish between those in use and those intended to be used.
- f) What is the percentage of the population that is covered by digital sound broadcasting by direct reception in your country?
- g) What additional spectrum was required or is considered to be required for the transition to digital sound broadcasting?
- h) Please indicate how many digital radio transmitters are currently used or intended to be used and in which bands.
- i) What is the spectrum requirement for digital sound broadcasting in your country?
- j) If your country has introduced digital sound broadcasting, how long will it continue to use analogue sound broadcasting?

A proposed format for responses to question 13d) and 13h) is provided in Annex 1

Reply:

13a) Digital Radio broadcasting was authorized by the FCC in October 2002 and is well established in the U.S., with the leading deployment belonging to HD Radio's iBiquity technology, which is on the air on approximately 1,900 FM transmitters, covering about 85% of the population. Digital Radio Broadcasting is in an experimental phase in Canada. As HD Radio is an In-band On-Channel (IBOC) technology, the existing FM channel assignments are used to broadcast these digital signals. Mexico adopted the IBOC (NRSC5B) standard on September 17, 2011.

13b) For the FM band: System C in ITU-R BS.1114

For the AM band: the IBOC DSB system described in Annex 2 of ITU-R BS.1514.

13c) See 13a above. Two years prior to the adoption of IBOC in Mexico, the government published a plan to allow broadcasters to voluntarily launch HD-Radio services.

13d) Digital sound broadcasting systems operate within the existing (analogue) emission masks for the AM and FM bands.

13e) The existing AM and FM bands are used.

13f) Total coverage is unknown. Mexico is in the middle of the implementation of digital radio services with several experimental transmissions up and running. In the case of operation in the U.S., 301 AM stations and 1799 FM stations are authorized to transmit digital sound broadcast.

13g) Not applicable, see 13d above.

13h) According to information from the IFT, there are 51 radio stations that are authorized to transmit HD-Radio services in Mexico but only 9 are transmitting IBOC services. All stations transmit a mirror signal of the main analogue service with some additional content (sub-channels) related to the radio service (news, music, sports, etc.). Otherwise, all stations may, at their election, choose to broadcast digital broadcast signals. See response to 13f for current digital status.

13i) Not applicable, see 13d above.

13j) Analogue sound broadcasting will continue to be used indefinitely. There is no analogue switch-off planned.

- 14) a) Are the terrestrial sound broadcasting bands also shared with other primary services in your country?
- b) If yes, please give details of those systems and their spectrum use.

Reply:

14a) In Canada, Mexico, and the U.S., neither the AM nor FM bands are shared with any other service.

- 15) a) Are the terrestrial sound broadcasting bands also shared with secondary services e.g., used for the support of broadcasting such as SAB/SAP (services ancillary to broadcasting/production), or other types of services such as radio astronomy or wind-profile radar?
- b) If yes, please give details of those systems and their spectrum use.

Reply:

15a) The AM broadcast band is also used for travelers' information stations, also known as highway advisory radio stations. The FM broadcast band is also used for unlicensed wireless microphone use.

15b) In the case of the U.S., there are 1,583 travelers information stations authorized.

- 16) a) What is the amount of spectrum your country foresees will be required for terrestrial sound broadcasting, taking into consideration the responses to the previous questions? Please indicate the modes of transmission that will be used, and timeframes.

Reply:

16a) Most of the answers are provided above. In Mexico AM and FM bands are saturated in the three most important markets of the country but there is available spectrum in other cities. There may come a government consideration to reduce the channel separation between FM services.

SECTION THREE –Multimedia broadcasting

- 17) a) Is your country considering introducing or has already introduced multimedia broadcasting?
- b) If yes which system standards is your country using or considering using (as specified in Recommendations ITU-R BT.1833 and BT.2016)?
- c) In which Bands?
- d) When did your country start or when does it propose to start digital multimedia broadcasting?
- e) What are the current and proposed population coverages for digital multimedia broadcasting in your country?
- f) What is the spectrum requirement for multimedia broadcasting in your country?
- g) If your country has introduced digital multimedia broadcasting, please provide further information to describe the system, its implementation and any limitations on its operation.

Reply:

17a) The ATSC “2.0” standard (Candidate Standard A/107) has been developed for multimedia and interactive broadcasting. ATSC “2.0” adds new services in a backwards compatible manner to the existing DTV standard: i.e., new services will not be receivable on legacy sets but conventional services will still be receivable on those sets. New sets will be required to receive the new services. Multimedia service is also a requirement in the ATSC “3.0” standard development effort.

17b) ATSC “2.0” is not specified in ITU documents. It is available at http://atsc.org/cms/standards/cs_documents/S13-550r17-CS-ATSC-2.0.pdf and incorporates several other ATSC standards and candidate standards.

17c) ATSC “2.0” may be implemented in all TV bands.

17d) There is no planned start date for multimedia broadcasting at the present time.

17e) Multimedia broadcasting will be an individual choice for stations; it is not practical to calculate coverage.

17f) ATSC “2.0” is compatible with the current DTV standard in Canada and the U.S. and does not require additional spectrum for implementation.

17g) N/A

ANNEX 1

Suggested form of presentation of reply to Questions 2, 5, 11, and 13:

A sample response is shown in *Italics* for guidance only.

Country	Band		Number of Transmitting Stations*			
			Analogue Radio (Q11b & Q11c)	Digital Radio (Q13d & Q13h)	Analogue TV (Q2a & Q2)b	Digital TV (Q5b & Q5c)
	Channel bandwidth (MHz)	<i>MF 10 KHz VHF II 200 kHz</i>			<i>6 MHz</i>	<i>6MHz</i>
CA	LF	148.5-283.5 kHz				
	MF	525-526.5 kHz	<i>1,145</i>			
	MF	526.5-1705 kHz	<i>Combined with</i>			
	MF	1606.5-1705 kHz	<i>above band</i>			
	HF	2.3-26.1 MHz**				
	VHF I	47-50 MHz				
		50-54 MHz				
		54-88 MHz			220	8
		68-72 MHz	<i>Combined with</i>			
		76-88 MHz	<i>above band</i>			
	VHF II	87.5-108 MHz	<i>2,680</i>	<i>2</i>		
	VHF III	174-216 MHz			462	55
	VHF III	216-230 MHz				
	UHF IV	470-698 MHz			183	171
	UHF V	698-806 MHz	<i>Combined with above band</i>			
	UHF V	790-890 MHz				
	UHF V	890-960 MHz				
		1452-1492 MHz				
		11.7-12.5 GHz				
	12.5-12.7 GHz					
	40.5-42.5 GHz					
	74-76 GHz					

* Transmitting stations please include “main stations” and “relay stations.” Please use parenthesis to indicate stations that have still to be brought into use

** The bands 3900-3950^D, 3950-4000^D kHz; the bands for tropical broadcasting: 2300-2498, 3200-3400^D, 4750-4995^D, 5005-5060^D kHz and the Article 12 Bands 5 900-5 950^D, 5 950-6 200, 7 200-7 300, 7 300-7 400^D, 7 400-7 450, 9 400-9 500^D, 9 500-9 900, 11 600-11 650^D, 11 650-12 050, 12 050-12 100^D, 13 570-13 600^D, 13 600-13 800, 13 800-13 870^D, 15 100-15 600, 15 600-15 800^D, 17 480-17 550^D, 17 550-17 900, 18 900-19 020^D, 21 450-21 850, 25 670-26 100.

^D Resolution 517 (Rev.WRC-07) applies. In the HF bands subject to Article 12 see also No. 5.134.

Country	Band	Number of Transmitting Stations*
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			Analogue Radio) (Q11b & Q11c)	Digital Radio (Q13d & Q13h)	Analogue TV (Q2a & Q2)b	Digital TV (Q5b & Q5c)
	Channel bandwidth (MHz)		<i>MF 10 KHz</i> <i>VHF II 200 kHz</i>		<i>6 MHz</i>	<i>6MHz</i>
MX	LF	148.5-283.5 kHz				
	MF	525-526.5 kHz	<i>681</i>			
	MF	526.5-1705 kHz	<i>Combined with</i>			
	MF	1606.5-1705 kHz	<i>above band</i>			
	HF	2.3-26.1 MHz**				
	VHF I	47-50 MHz				
		50-54 MHz				
		54-88 MHz			<i>226</i>	
		68-72 MHz	<i>Combined with</i>			
		76-88 MHz	<i>above band</i>			
	VHF II	87.5-108 MHz	<i>1,254</i>	<i>51</i>		
	VHF III	174-216 MHz			<i>325</i>	<i>1</i>
	VHF III	216-230 MHz				
	UHF IV	470-698 MHz			<i>145</i>	<i>342</i>
	UHF V	698-806 MHz			<i>12</i>	
	UHF V	790-890 MHz				
	UHF V	890-960 MHz				
		1452-1492 MHz				
		11.7-12.5 GHz				
	12.5-12.7 GHz					
	40.5-42.5 GHz					
	74-76 GHz					

* Transmitting stations please include “main stations” and “relay stations.” Please use parenthesis to indicate stations that have still to be brought into use

** The bands 3900-3950^D, 3950-4000^D kHz; the bands for tropical broadcasting: 2300-2498, 3200-3400^D, 4750-4995^D, 5005-5060^D kHz and the Article 12 Bands 5 900-5 950^D, 5 950-6 200, 7 200-7 300, 7 300-7 400^D, 7 400-7 450, 9 400-9 500^D, 9 500-9 900, 11 600-11 650^D, 11 650-12 050, 12 050-12 100^D, 13 570-13 600^D, 13 600-13 800, 13 800-13 870^D, 15 100-15 600, 15 600-15 800^D, 17 480-17 550^D, 17 550-17 900, 18 900-19 020^D, 21 450-21 850, 25 670-26 100.

^D Resolution 517 (Rev.WRC-07) applies. In the HF bands subject to Article 12 see also No. 5.134.

Country	Band	Number of Transmitting Stations*			
		Analogue Radio) (Q11b & Q11c)	Digital Radio (Q13d & Q13h)	Analogue TV (Q2a & Q2)b	Digital TV (Q5b & Q5c)
	Channel bandwidth (MHz)	<i>MF 10 KHz</i> <i>VHF II 200 kHz</i>		<i>6 MHz</i>	<i>6MHz</i>

US	LF	148.5-283.5 kHz				
	MF	525-526.5 kHz				
	MF	526.5-1705 kHz	4,799	301		
	MF	1606.5-1705 kHz	<i>Combined with above band</i>			
	HF	2.3-26.1 MHz**				
	VHF I	47-50 MHz				
		50-54 MHz				
		54-88 MHz			270	39
		68-72 MHz	<i>Combined with</i>			
		76-88 MHz	<i>above band</i>			
	VHF II	87.5-108 MHz	10,760	1,799		
	VHF III	174-216 MHz			508	423
	VHF III	216-230 MHz				
	UHF IV	470-698 MHz			1,195	1,323
	UHF V	698-806 MHz	<i>Combined with above band</i>			
	UHF V	790-890 MHz				
	UHF V	890-960 MHz				
		1452-1492 MHz				
		11.7-12.5 GHz				
		12.5-12.7 GHz				
	40.5-42.5 GHz					
	74-76 GHz					

* Transmitting stations please include “main stations” and “relay stations.” Please use parenthesis to indicate stations that have still to be brought into use

** The bands 3900-3950^D, 3950-4000^D kHz; the bands for tropical broadcasting: 2300-2498, 3200-3400^D, 4750-4995^D, 5005-5060^D kHz and the Article 12 Bands 5 900-5 950^D, 5 950-6 200, 7 200-7 300, 7 300-7 400^D, 7 400-7 450, 9 400-9 500^D, 9 500-9 900, 11 600-11 650^D, 11 650-12 050, 12 050-12 100^D, 13 570-13 600^D, 13 600-13 800, 13 800-13 870^D, 15 100-15 600, 15 600-15 800^D, 17 480-17 550^D, 17 550-17 900, 18 900-19 020^D, 21 450-21 850, 25 670-26 100.

^D Resolution 517 (Rev.WRC-07) applies. In the HF bands subject to Article 12 see also No. 5.134.

ANNEX 2

Suggested form of presentation of reply to Question 4: *If your country has switched or is considering switching to digital terrestrial television broadcasting, what system standards is it using or considering adopting? When did your country start, or when is it proposed to start the introduction of digital terrestrial television services? Please provide further detail on the number of multiplexes in use, their technical specifications, the percentage of geographic area or population they cover or are intended to cover and the total spectrum use.*

A sample response is shown in *italics* for guidance only.

Country	No of multiplexes	System & modulation	FEC	GI	Reception mode ²	Capacity per multiplex (Mb/s)	Current percentage population coverage	Intended percentage population coverage	Content per multiplex	Total capacity (Mb/s)	Total spectrum bandwidth used or intended for implementation (MHz)	Any additional comments (e.g. duration of licences)
CA, MX, US	<i>1</i>	<i>ATSC A/53 HD</i>	<i>2/3</i>	<i>N/A</i>	<i>Fixed</i>	<i>Variable depending on resolution, frame rate, etc.</i>	<i>Over 90%</i>	<i>Over 90%</i>	<i>1 HD MPEG2</i>	<i>19.39</i>	<i>6</i>	<i>Representative broadcast in 1 6 MHz channel. Station might deliver either 1 HD & 1 SD; 1 HD & 1 mobile; or several SDs</i>
	<i>1</i>	<i>ATSC A/53 SD</i>	<i>2/3</i>	<i>N/A</i>	<i>Fixed</i>	<i>Variable depending on resolution, frame rate, etc.</i>	<i>Over 90%</i>	<i>Over 90%</i>	<i>1 SD MPEG2</i>			<i>Might be multiplexed with 1 HD or another SD.</i>
	<i>1</i>	<i>ATSC A/153</i>	<i>1/2, 1/4, 1/4, 1/4</i>	<i>N/A</i>	<i>Mobile</i>	<i>Variable depending on resolution, frame rate, etc.</i>	<i>Approx. 50% average</i>	<i>Approx. 50% average</i>	<i>1 mobile MPEG4</i>			<i>Might be multiplexed with 1 HD or an SD.</i>

² E.g. fixed, portable outdoor/mobile, portable indoor.

