INTERNATIONAL TELECOMMUNICATION UNION

Radiocommunication Bureau
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Circular letter
6/LCCE/78

11 May 2012

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 terrestrial television broadcasting in connection with WRC-15 Agenda item 1.2

References: Administrative Circular CA/201

1 Consistent with the directives set forth by Administrative Circular CA/201 and in accordance with the outcomes of the first session of the Conference Preparatory Meeting 15-1, ITU-R Working Party 6A seeks estimates from Members States and Sector Members of current and future spectrum requirements for terrestrial television broadcasting in Region 1 and Iran.

2 One particular question that will be addressed by the JTG 4-5-6-7 is to confirm the lower edge of the allocation to the mobile service made at WRC-12 from 694-790 MHz. As a result Working Party 6A realizes the JTG 4-5-6-7 needs to be fully informed about the implications to the broadcasting service consequential to that decision.

3 The following questionnaire, which is being sent to all Administrations and Sector Members in Region 1 and Iran, is designed to gather information on spectrum use in the band 694-790 MHz for television broadcasting.

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

5 Administrations and Sector Members are requested to submit responses to brsgd@itu.int or rsg6@itu.int by 31 July 2012.

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Director, Radiocommunication Bureau

At the request of the Chairman of Study Group 6 the attached questionnaire is published for consideration of the Administrations of Member States, Sector Members and Associates, as appropriate. The Radiocommunication Bureau does not make any engagement nor assume any responsibility with respect to the content of the attachment or any follow-up action as may be required.

Distribution:

- Administrations of Member States of the ITU and Radiocommunication Sector Members participating in the work of Radiocommunication Study Group 6
- ITU-R Associates participating in the work of Radiocommunication Study Group 6
- ITU-R Academia
- Chairman and Vice-Chairmen of Radiocommunication Study Group 6
- Secretary General of the ITU, Director of the Telecommunication Standardization Bureau, Director of the Telecommunication Development Bureau

QUESTIONNAIRE ON SPECTRUM REQUIREMENTS FOR TERRESTRIAL TELEVISION BROADCASTING IN CONNECTION WITH WRC-15 AGENDA ITEM 1.2

This questionnaire can be completed online at the following web page:

https://extranet.itu.int/rsg-meetings/sg6/wp6a/Lists/DTTB%20Questionnaire/overview.aspx

Login as: **Username**: (your TIES username)@ties.itu.int
Password: (your TIES password)

NOTE - Electronic versions of Annexes 1, 2 & 2 can be found under QUESTIONNAIRE in the WP 6A Share Folder on the WP 6A Sharepoint site.

Name of the Administration/Sector Member: Ireland

For sector members please indicate the geographical area over which you operate:

Contact person: **Rory Hinchy**

E-mail address: **rory.hinchy@dcenr.gov.ie** **Telephone number:** **+ 353 1 678 2260**

1 a) What standards have you adopted for digital terrestrial television broadcasting?

b) Have you started introduction of digital terrestrial television services?

c) If yes, please provide further detail on the number of multiplexes in use, their technical specifications, the percentage of geographic area or population they are intended to cover and the total spectrum use to inform WP 6A.

A proposed format for detailed responses is provided in Annex 1.

Reply:

[*As provided by RTÉNL*]

Country	No of multi-plexes	System & modulation	FEC	GI	Reception mode[1]	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 imple-mentation (MHz)[2]	Any additional comments (e.g. duration of licences)
IRL	1	DVB-T, 64-QAM	2/3	1/32	Fixed	24.10	97.0%	98%	7 SD MPEG4 1 HD MPEG4 11 Radio services	48.2	Number of channels: 36 TV channels, from channel number 21 to 59, except channels 34, 35, and 38. Spectrum bandwidth and boundaries: 36x8=288 MHz, from 470-574MHz, 590 - 606MHz, and 614-782MHz	Public service multiplex licensed until 2019
	1	DVB-T, 64-QAM	2/3	1/32	Fixed	24.10	0%	98%	[tbc]			Public service multiplex licensed until 2019. Expected Launch – [tbc]

2 a) Have you commenced analogue television switch-off?

b) If you have any such plans, when do you expect to have completed the analogue switch-off process?

Reply:

a) No.

b) Plans are in place for analogue television switch-off, the analogue television switch-off date for Ireland is 24/10/2012.

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

2 Refer Sections 2 and 3 on page 1 of this circular.

3 a) What is the percentage of viewer uptake of terrestrial television in your country, including those whose service provider uses terrestrial broadcast re-transmission (e.g. in cable networks)?

b) If possible, please also provide details of the number or proportion of users who receive television primarily by terrestrial means.

Reply:

[*ComReg: source 12/62R, published 14/06/2012*]

The figures given as follows are based upon market data compiled and published by the Commission for Communications Regulation (ComReg) of Ireland. ComReg publish market data on a quarterly basis, the data is based on the recent published document 12/62R, as published on the 14/06/2012, which collected relevant data in quarter 1 of 2012 (01/01/2012 – 31/03/2012). Figures are given as a percentage of television households in Ireland, which at the time of publication there were 1,577,000 TV households in Ireland. (Total households is 1,635,000)

a) What is the percentage of viewer uptake of terrestrial television in your country, including those whose service provider uses terrestrial broadcast re-transmission (e.g. in cable networks)?

The percentage of TV households which receive terrestrial television (via an aerial, including analogue and DTT) only is 18.7%;
The percentage of viewer uptake of cable/MMDS* reception is 26.1%;
The percentage of viewer uptake of satellite (free-to-view and subscription) reception is 55.2%;

*MMDS (Multipoint Microwave Distribution System) is a delivery system which provides multi-channel TV services in rural areas (outside of cabled areas). For the purposes of the market survey, cable and MMDS is considered as one reception method, i.e., cable or MMDS, not possible to give separate metrics for cable or MMDS.

b) If possible, please also provide details of the number or proportion of users who receive television primarily by terrestrial means.

The percentage of viewers whose primary television reception method is terrestrial television (via an aerial, including analogue and DTT) is 12.2%;

4 a) Indicate how many analogue television transmitters use channels in the frequency sub-band 694-790 MHz (as indicated in Resolution **232 (WRC-12)**).

b) How many are in the remaining part of the UHF band.

Reply:

Table 1: Number of analogue TV transmitters Licenced in Ireland

Q4: part	**Frequency range**	**Licenced Analogue TV transmitters (Primary Services)**	**Licenced Analogue TV Transmitters (Secondary Services)**
b)	470-693 MHz (channels 21-48):	315	12
a)	694-790 MHz (channels 49-60):	160	9
b)	791-862MHz (channels 61-69):	56	3
	Total	531	24

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) If allotments/SFNs are in use, a sketch map of frequency allocations could be included, with an accompanying table of allocations, as shown in Annex 2. Otherwise, it might be possible to show main transmitters and channels, grouped in layers, in a table.

c) Please indicate how many digital television assignments/allotments use channels in the frequency sub-band 694-790 MHz (as indicated in Resolution **232 (WRC-12)**, and

d) How many are in the remaining part of the UHF band.

Reply:

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.

Table 2 specifies number of UHF channels as per current (June 2012) UHF channel plan in Ireland.
Information layout format 1 –

Table 2: Number of UHF channels as per current (June 2012) UHF channel plan in Ireland

	Mux 1		**Mux 2**		**Muxes 3-8**	**Ch 36 mux**	
Status	**Currently Licensed**	**Total Future use**	**Currently Licensed**	**Total Future use**	**May come on air in future (2013-2020) see answer to question 10 below**		
UHF Channel	**Number of Transmitters using channels**						**Mux Totals**
21	2	5		1	9		15
22	3	5			9		14
23		1	2	8	6		15
24			2	7	9		16
25			4	6	10		16
26	4	16	2	2	5		23
27	2	9	1	3	9		21
28	2	4			14		18
29		3		14	12		29
30	3	7	1	6	3		16

31		6	0	2	11		19
32		1	2	5	3		9
33		6		5	11		22
34		1		2	14		17
35	1			1	9		10
36			1			40	40
37	1	1	1	4	13		18
38							0
39		2	1	2	15		19
40	1	4	1		11		15
41			1	2	16		18
42			1	5	12		17
43	1		1	12	11		23
44			8	15	5		20
45	5	13		1	9		23
46	4	11		2	10		23
47	11	20			4		24
48	3	2		1	12		15
49			2	9	10		19
50	2	4	1	4	10		18
51	1	1	1	2	17		20
52	8	15	3	3	3		21
53	3	14		1	10		25
54	1	6		1	11		18
55	6	15	1		1		16
56			9	14	4		18
57			3	14	10		24
58			2	7	11		18
59			6	11			11
60					12		12

Mux Totals	64	172	57	172	351	40	735

Information layout format 2 –

	Mux 1		Mux 2		Mux 3	Mux 4	Mux 5	Mux 6	Mux 7	Mux 8	Ch 36 layer	
Status	Currently Licensed	Total Future use	Currently Licensed	Total Future use	May come on air in future (2013-2020) see answer to question 10 below							
UHF Channel	Number of Transmitters using channels											Mux Totals
21	2	5		1		3			6			15
22	3	5			2			5		2		14
23		1	2	8	3		1	1	1			15
24			2	7	2		3	1		3		16
25			4	6	1	1	7	1				16
26	4	16	2	2		2	1	1		1		23
27	2	9	1	3	5	1	1	2				21
28	2	4			2	10		1	1			18
29		3		14	3	1	4	2	2			29
30	3	7	1	6	1			1		1		16
31		6	0	2		1	2	1	7			19
32		1	2	5					3			9
33		6		5	1	1	1		7	1		22
34		1		2		2		3	1	8		17
35	1			1		1		2	5	1		10
36			1								40	40
37	1	1	1	4			2	1	1	9		18
38												0
39		2	1	2	5	6	2	2				19
40	1	4	1		1	7		2		1		15
41			1	2	12	1	1		2			18
42			1	5		2	6		4			17

43	1		1	12	1	1	6	1	2			23
44			8	15		1	2	1		1		20
45	5	13		1				7		2		23
46	4	11		2	3		1	4	1	1		23
47	11	20					1	1		2		24
48	3	2		1			11		1			15
49			2	9	1		7		1	1		19
50	2	4	1	4	1			7	1	1		18
51	1	1	1	2	1	2		14				20
52	8	15	3	3	2		1					21
53	3	14		1	8		2					25
54	1	6		1	10	1						18
55	6	15	1				1					16
56			9	14		2	1		1			18
57			3	14		8		2				24
58			2	7		10		1				18
59			6	11								11
60										12		12
Mux Totals	**64**	**172**	**57**	**172**	**65**	**64**	**64**	**64**	**47**	**47**	**40**	**735**

b) If allotments/SFNs are in use, a sketch map of frequency allocations could be included, with an accompanying table of allocations, as shown in Annex 2. Otherwise, it might be possible to show main transmitters and channels, grouped in layers, in a table.

One SFN was used in Ireland in the area of Dublin and surrounding counties between the two transmitters “Three Rock” and “Kippure”. The following table shows the UHF channels planned for the main transmission sites. Channels in green are currently licensed. Channels in orange will change to the channels in yellow in 2012. The channels in yellow are currently used for analogue services. The remaining channels are planned but there is no indication as yet, to when these channels will be brought into operation.

Table 3: UHF channels planned for the main transmission sites in Ireland. Correct as at 04/07/2012, subject to change.

Site Name	Mux1	Mux2	Muxes 3-8						ch 36 Mux	Other channels with special arrangements	
CAIRN HILL	47	44	41	40	43	46	33	34	36		
CLERMONT CARN	52	56	53	57	48	51	35	60	36		
DUNGARVAN	55	59	54	58	48	50	31	37	36		
GREYSTONES	52	56	53	57	48	51	35	60	36		
HOLYWELL HILL	30	33	23	26	29	25	28	34			
KIPPURE	31	37	55	59	50	29	32	22	36	54	58
THREE ROCK	30	33	54	58	49	34	23	26	36		
MAGHERA	55	59	54	58	49	50	31	37	36	48	
MOUNT LEINSTER	26	23	30	34	33	39	42	45	36		
MULLAGHANISH	21	24	27	28	25	22	32	35	36		
SPUR HILL	45	49	39	42	53	57	34	60	36		
TRUSKMORE	53	57	52	56	48	51	35	60	36		
WOODCOCK HILL	47	44	41	39	42	45	33	34	36		

c) Please indicate how many digital television assignments/allotments use channels in the frequency sub-band 694-790 MHz (as indicated in Resolution **232 (WRC-12)**, and

See table 4 below

d) How many are in the remaining part of the UHF band.

See table 4 below

Table 4: Number of Licensed Digital TV transmitters in Ireland		
Q5: Part	Frequency range	Licensed Digital TV Transmitters
d)	470-694 MHz (channels 21-48):	71
c)	694-790 MHz (channels 49-60):	51
d)	790-862MHz (channels 61-69):	0
	Total	122

6 a) Are those frequency bands also shared with other primary services?

b) If yes, please give details of those systems and their spectrum use.

Reply:

a) Are those frequency bands also shared with other primary services?

No the frequency band 694 -790MHz is not shared with other primary services.

b) If yes, please give details of those systems and their spectrum use

N/A

7 a) Are those frequency bands also shared with secondary services such as PMSE (Programme Making and Special Events), radio astronomy or wind-profile radar?

c) If yes, please give details of those systems and their spectrum use.

Reply:

a) Are those frequency bands also shared with secondary services such as PMSE (Programme Making and Special Events), radio astronomy or wind-profile radar?

694 – 790 MHz is shared with PMSE services

b) If yes, please give details of those systems and their spectrum use.

PMSE users are assigned spectrum in the interleaved spaces within 694 – 790 MHz. A temporary licence is required by such users to operate within the band 694 – 790 MHz.
ComReg Document 08/08, as revised, provides guidelines to interested parties on radio licensing for special events and temporary use in Ireland, and provides a complete listing of technical conditions and frequencies available to PMSE users. A link to the document is available on the ComReg website, at: http://www.comreg.ie/_fileupload/publications/ComReg0808R2.pdf.

Table 5 : Parameters for Wireless Microphones and IEM are shown below as per ComReg document 08/08R2

UHF Channels **Centre Frequency in range**	**Max Channel Bandwidth**	**Typical ERP**	**Max ERP**
470 – 862 MHz	200 kHz	50 mW	1 W

8 a) Do you foresee the adoption or expansion of television services broadcast using second-generation systems such as DVB-T2?

b) If yes, please give indicative details of the planned transition, including any simulcast period.

Reply:

(a) Do you foresee the adoption or expansion of television services broadcast using second-generation systems such as DVB-T2?

Yes.

(b) If yes, please give indicative details of the planned transition, including any simulcast period.

Currently in Ireland, the DTT platform uses DVB-T MPEG 4 – one multiplex was launched in May 2011, another multiplex has been licensed and installed nation-wide but has yet to launch. The DTT platform currently licensed comprises of the PSB free-to-air (FTA) multiplexes owned and operated by Ireland's PSB – RTÉ. Irish legislation provides for at least a further four DTT multiplexes, which are to be made available by the Broadcast Authority of Ireland (BAI) for commercial DTT. Such a competition was held between 2008 and 2010 and concluded without an award being granted to a commercial DTT multiplex operator. The BAI will review its position in 2013 regarding commercial DTT in Ireland. The services currently available on DTT include existing analogue programme services and some additional programme services from those programme service providers.

Migration to DVB-T2, or a future variant, will need to reflect consumer interests. If consumers have replaced television sets or purchased DVB-T set top boxes in 2012, then migration to newer standards would need careful consideration bearing in mind the

number, age and cost of receivers that would need to be replaced. A non-FTA provider could launch with a DVB-T2, or a future variant. This may form part of the BAI's consideration of commercial DTT due to be undertaken in 2013.

If the Irish DTT platform is expanded beyond two multiplexes, it could be expected that DVB-T2 would be adopted for the additional multiplexes. The existing DVB-T multiplexes would remain as DVB-T (using MPEG-4), this would mean that no simulcast period would be necessary. Some frequency changes/rescans could be required for the introduction of some of the additional multiplexes.

As Ireland has only recently launched (in May 2011) its DTT platform and is planning to switch-off the analogue television platform on the 24 October 2012, no plans have been developed as yet for a migration to or launch of future services using DVB-T2 (or a future variant).

9 a) Do you foresee a requirement for new and enhanced services, including HD and 3D 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:

a) Do you foresee a requirement for new and enhanced services, including HD and 3D television, on the terrestrial television platform?

Yes

b) If yes, please give indicative details of the number and nature of services planned, and if known, the expected timeframe for their introduction.

A second DTT multiplex may be fully implemented in 2013 if all current terrestrial broadcasters migrate to HD.

Further SD and HD services are expected, together with data broadcast services such as push-VOD and mobile/broadband to broadcast off-load. We expect 2 to 3 further HD services in the near to medium term as the existing SD services are replaced by HD equivalents, with potentially up to 8 HD services and between 28 and 60 SD services depending on the spectrum available (cf response to Q 11) in the long term (i.e. by 2020).

10 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:

a) Are there plans in your country to launch more multiplexes in the future?

Yes.

b) If yes, how many more and when? Please also indicate the expected timeframe for their introduction.

Current broadcasting legislation in Ireland requires the provision of at least six DTT coverage layers.
One further multiplex has been licensed and is expected to launch by end of 2012/early 2013 (included in reply to question 1). Up to 4 further multiplexes would be expected by 2020 (giving a possible total of 6 multiplexes), further to a review by the BAI.

A third multiplex may be required in 2013/14 to carry services from programme makers who have already expressed interest in the supply of such services, but this will be subject to the outcome of ComReg's review of the Broadcast Terrestrial Transmission Market and in particular transmission costs, which is already underway.

Further multiplexes may come on air from 2014 onwards. However this will be dependent on the outcome of the study planned to be undertaken by the BAI in 2013 in relation to the level of interest in commercial DTT multiplex provision and of additional DTT services.

11 a) What is the amount of spectrum you foresee that will be required for terrestrial television broadcasting, if plans in Questions 8, 9 and 10 are to be supported, and services identified in Questions 6 and 7 are to be taken into account? Please indicate the modes of transmission that will be used, and timeframes.
If appropriate, a suggested form to express these requirements is shown in Annex 3.

Reply:

The recent 800MHz clearance plan uses channels 21-60 for 8 multiplexes (40 channels) at a large number of sites. If the number of DTT multiplexes were reduced from 8 to 6, in line with the 2009 Broadcasting Act, then the proportional reduction in spectrum required would suggest that 30 channels would be required. However, this cannot be verified until a detailed planning exercise has been completed.

A decision has yet to be made in relation to planning for spectrum to be used by the Broadcasting Service as a result of the decisions made in WRC-12 and their consequences after WRC-15. In order to make available spectrum in the band 694 – 790 MHz for uses other than the Broadcasting Service extensive re-planning will be need. Any changes to Irish spectrum plans for the Broadcasting Service in Ireland, and in particular DTT, may require a review of national broadcasting legislation, as there is currently a requirement in Irish law to have spectrum available for at least 6 DTT multiplexes.

If Ireland decides to make available spectrum in the band 694 – 790 MHz for uses other than the Broadcasting Service, spectrum planning may have to assume that DTT will migrate to DVB-T2 (or a future variant) in the UHF band from 470 – 694 MHz and plan on that basis. Currently, Ireland has 8 DTT multiplex layers in the GE06 Plan (470 – 862 MHz). It will be challenging to achieve 6 national DTT multiplex coverage layers whilst making available spectrum in the band 694 – 790 MHz for uses other than the Broadcasting Service.

[RTÉNL]

Future estimated planning Option A – 700MHz band remains for broadcasting – allows for 6 multiplexes as per legislation with >90% population coverage

Country	No of multi-plexes	System & modulation	FEC	GI	Reception mode[3]	Capacity per multiplex (Mb/s)	Intended percentage population coverage	Content per multiplex	Total capacity (Mb/s)	Total spectrum bandwidth needed (MHz)[4]	Any additional comments including time frames
IRL	2	DVB-T, 64-QAM	2/3	1/32	Fixed	24	98%	2 HD MPEG4 4 SD MPEG4	205	Number of channels: 38 TV channels Spectrum Bandwidth: 38x8=304 MHz	1 now, 1 more from Q4 2012/Q1 2013
	2	DVB-T2, 256-QAM	2/3	1/128	Fixed	40.2	~95%	[tbc]			Possibly 2 by 2015
	2	DVB-T2, 256-QAM	2/3	1/128	Fixed	40.2	~95%	[tbc]			Possibly by 2020

Future estimated planning Option B – 700MHz band not used for broadcasting – only allows for 4 multiplexes each with > 90% population coverage and may require legislative change.

Country	No of multi-plexes	System & modulation	FEC	GI	Reception mode[5]	Capacity per multiplex (Mb/s)	Intended percentage population coverage	Content per multiplex	Total capacity (Mb/s)	Total spectrum bandwidth needed (MHz)[6]	Any additional comments including time frames
IRL	2	DVB-T, 64-QAM	2/3	1/32	Fixed	24	98%	2 HD MPEG4 4 SD MPEG4	128	Number of channels: 26 TV channels Spectrum Bandwidth: 26x8=208 MHz	1 now, 1 more from Q4 2012/Q1 2013
	2	DVB-T2, 256-QAM	2/3	1/128	Fixed	40.2	~ 95%	[tbc]			Possibly 2 by 2015

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

4 Refer Sections 2 and 3 on page 1 of this circular.

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

6 Refer Sections 2 and 3 on page 1 of this circular.

ANNEX 1

Suggested form of presentation of reply to Question 1: *What standards have you adopted for digital terrestrial television broadcasting? Have you started introduction of digital terrestrial television services? If yes, provide further detail on the number of multiplexes in use, their technical specifications, the percentage of geographic area or population they are intended to cover and the total spectrum use*.

A sample response is shown for guidance only.

Country	**No of multi-plexes**	**System & modulation**	**FEC**	**GI**	**Reception mode[7]**	**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 imple-mentation (MHz)[8]**	**Any additional comments (e.g. duration of licences)**
XX	2	DVB-T, 64-QAM	2/3	1/32	Fixed	24.10	98.0%	99.2%	9 SD MPEG2	169.7 plus two new muxes (tbc)	256	Public service multiplexes licensed until 2022
	1	DVB-T2, 256-QAM	2/3	1/128	Fixed	40.20	98.0%	99.2%	5 HD MPEG4			Public service multiplex licensed until 2022
	3	DVB-T, 64-QAM	¾	1/32	Fixed	27.10	89.0%	92.0%	11 SD MPEG2			Licensed until 2024
	1	[DVB-T, tbc]	[tbc]	[tbc]	Fixed	[tbc]	[tbc]		[tbc]			Expected local multiplex
	1	[DVB-T2, tbc]	[tbc]	[tbc]	Fixed	[tbc]	[tbc]		[tbc]			Expected local multiplex
YY	1	DVB-T2, 64-QAM	2/3	1/4	Portable indoor	22.6	-	60%	3 HD MPEG4	22.6		From 2013

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

8 Refer Sections 2 and 3 on page 1 of this circular.

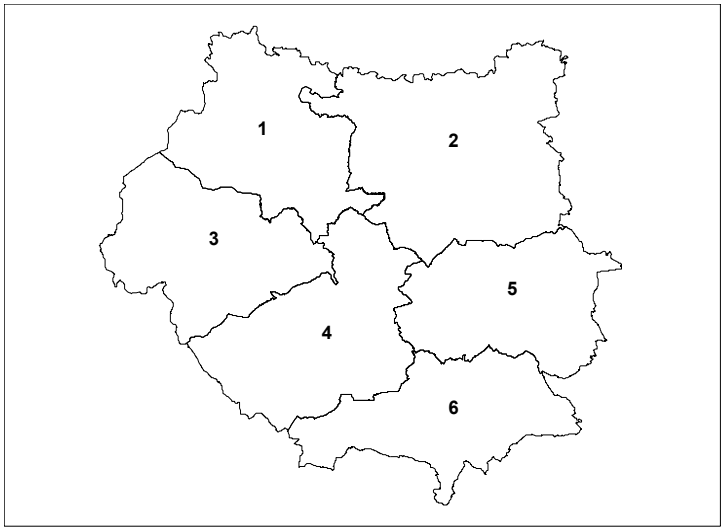
ANNEX 2

Suggested presentation of reply to Question 5: *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.*

If allotments/SFNs are in use, a sketch map of frequency allocations could be included, with an accompanying table of allocations, as shown in Annex 2.

Otherwise, it might be possible to show main transmitters and channels, grouped in layers, in a table.

Please indicate how many digital television assignments/allotments use channels in the frequency sub-band 694-790 MHz (as indicated in Resolution **232 (WRC-12)**), and how many are in the remaining part of the UHF band.



Area	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
1	27	37	39	44	54	56	66
2	23	69	38	-	57	56	-
3	23	69	43	-	57	52	-
4	30	32	39	61	35	52	68
5	21	28	31	45	48	50	-
6	60	-	33	32	49	67	65

ANNEX 3

Suggested form of presentation of reply to Question 11: *What is the minimum amount of spectrum you foresee that will be required for digital terrestrial television broadcasting in Bands IV & V, if plans in Questions 8, 9 and 10 are to be supported, and services identified in Questions 6 and 7 are to be taken into account? Please indicate the modes of transmission that will be used, and timeframes.*

One example methodology showing how spectrum requirements can be calculated from the different parameters using a set of assumptions can be found in Doc. 6A/59 submitted to WP 6A and which is currently under debate in this Working Party.

A sample response is shown for guidance only.

Country	**No of multi-plexes**	**System & modulation**	**FEC**	**GI**	**Reception mode[9]**	**Capacity per multiplex (Mb/s)**	**Intended percentage population coverage**	**Content per multiplex**	**Total capacity (Mb/s)**	**Total spectrum bandwidth needed (MHz)[10]**	**Any additional comments including time frames**
XX	6	DVB-T2, 256-QAM	2/3	1/128	Fixed	40.20	99.2%	7 HD MPEG4	187.0		1 now, 5 more from 2020
	2	DVB-T2, 16-QAM	1/2	1/8	Fixed	13.1	90%	2 HD MPEG4			1 in 2013, 1 more from 2020
YY	4	DVB-T2, 64-QAM	2/3	1/4	Portable indoor	22.6	60%	15 SD MPEG4	90.4		1 from 2013 2 more from 2015, 1 more from 2020
ZZ	4	DVB-T2, 256-QAM	2/3	1/128	Fixed	40.20	99.2%	7 HD MPEG4	160.8		1 from 2013 2 more from 2015, 1 more from 2020

[9] E.g. fixed, portable outdoor/mobile, portable indoor.

[10] Refer Sections 2 and 3 on page 1 of this circular.