WP 6A ▸ DTTB Questionnaire: Respond to this Survey

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

The DTT network in Norway is based on DVB-T and MPEG4 (H.264 video + HE-AAC audio) coding technology. See also details in Annex 1.

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

(•) Yes
( ) No

1 c) If 'Yes', please provide further details 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 (see file DTTB-Q-A1.docx under QUESTIONNAIRE in the WP 6A Share Folder).

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The DTT platform in Norway has 5 national DTT multiplex in operation plus one local DTT mux in the Oslo area. The coverage of the National multiplexes is around 98 percent of all permanent households and ca 87 percent of all cottages and leisure homes. About 6000 permanent households (approx. 14 000 people) are located in rural areas outside DTT and DTH coverage (satellite shadow areas). These households are covered by a "satellite shadow network" with 541 low power transmitters that only contain the NRK (Norwegian public broadcaster) multiplex. This to fulfill an obligation to cover 100 % of the population when summarizing all digital platforms.

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)
Norway	3	DVB-T, 64-QAM	2/3	1/8	Fixed	22.12	Approx. 98%	95%	16 MPEG4 (11 SDTV and 5 HDTV)	110,6	320	Frequency block 470-790MHz licensed until 2. June 2021
	2	DVB-T, 64-QAM	2/3	1/8	Fixed	22.12	Approx. 98%	95%	19 MPEG4 (HDTV)			
	1	DVB-T, 64-QAM	2/3	1/8	Fixed	22.12	Oslo area (approx. 16 – 20 %)	Oslo area	3 SDTV MPEG4	22,12		
	1 (future option)	DVB-T or DVB-T2	TBD	TBD	Fixed	TBD	TBD	95%	Future option	TBD		

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

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

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

(•) Yes
( ) No

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

Analogue switch-off for all regions was completed in December 2009.

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)?

See answer below

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

The penetration of terrestrial television in Norway is approximately 20 percent of the households (when households receiving NRKs FTA content is included). In 2011 13.4 % of the Pay-TV subscribers

In 2011 13.4 % of the Pay-TV subscribers in Norway utilized the DTT network.

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)).

None

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

None

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 an intended to be used.

In actual use: CH 21-CH 60 (470 – 790) MHz
Intended to be used: CH 21-CH 60 (470 – 790) MHz

5 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 (see file DTTB-Q-A2.d QUESTIONNAIRE in the WP 6A Share Folder). Otherwise, it might be possible to show main transmitters and channels, grouped in layers, in a table.

List of main transmitters in SFN-networks, with 5 mux as-built today:

Main transmitter	L1	L2	L3	L4	L5	L6
Halden	32	42	21	38	45	
Tryvasshøgda	52	58	46	30	40	57
Kongsvinger	24	48	55	28	41	
Bangsberget	23	29	35	47	60	
Nordhue	33	43	56	27	31	
Bagn	32	39	42	22	59	
Tron	26	34	49	23	40	
Hommelfjell	29	35	38	22	39	
Jetta	45	48	58	41	51	
Gran	38	57	55	36	45	
Gol 1	47	52	55	26	29	
Ringerike	23	31	49	41	33	
Kongsberg	60	34	51	43	44	
Skien	60	34	54	24	44	
Gausta	25	27	35	32	42	
Fennefossknipen	26	39	31	28	45	
Hovdefjell	41	52	48	55	58	
Greipstad	51	54	47	36	60	
Lyngdal	25	53	47	32	33	
Bjerkreim	23	26	30	27	34	
Lifjell Stavanger	31	26	45	41	51	
Bokn	36	54	57	44	35	
Stord	55	58	60	47	50	
Bergen	33	49	39	43	53	
Grimo	48	52	39	45	54	
Lønahorgi	31	41	44	46	54	
Gulen	37	42	26	29	23	
Bremanger	25	28	31	46	52	
Nordfjordeid	40	44	33	27	30	
Førde	35	45	48	22	32	
Sogndal	21	24	34	38	57	
Gamlemsveten	37	38	54	24	34	
Reinsfjell	39	42	35	29	53	
Kopparen	26	40	45	23	36	
Ålmenberget	31	32	59	24	46	
Melhus	55	28	25	30	33	
Mosvik	44	47	46	37	41	
Vega	25	32	37	22	28	
Hemnes	42	45	48	29	39	
Kappfjell	23	26	44	47	52	
Salten	50	43	60	30	33	
Steigen	31	41	44	47	55	
Hadsel	45	48	58	25	38	
Andenes	53	56	59	35	49	
Narvik	21	27	37	24	34	
Harstad	26	46	51	23	36	
Kistefjell	26	46	43	23	36	
Trolltind	27	39	42	34	22	
Tromsø	47	50	55	37	40	
Alta	36	51	54	29	44	
Hammerfest	33	37	48	41	26	
Karasjok	21	41	54	26	55	
Nordkapp	30	40	43	23	53	
Store Jekkir	22	24	42	35	32	
Tana	36	21	60	49	52	
Varanger	28	33	50	35	41	

Changes in M1-M5 are marked with bold font.

Main transmitter	L1	L2	L3	L4	L5	L6	L7
Halden	32	42	**21**	38	45	**59**	
Tryvasshøgda	52	58	**46**	30	40	54	57
Kongsvinger	24	48	55	28	41	29	
Bangsberget	23	**34**	35	47	60	44	
Nordhue	33	43	56	27	31	37	
Bagn	32	39	42	22	59	50	
Tron	26	34	49	23	40	57	
Hommelfjell	29	35	38	22	39	57	
Jetta	45	48	58	41	51	21	
Gran	38	57	55	36	45	53	
Gol 1	47	52	55	26	29	58	
Ringerike	23	31	49	41	33	48	
Kongsberg	60	34	51	43	44	47	
Skien	60	34	54	24	44	47	
Gausta	25	27	35	32	42	45	
Fennefossknipen	26	39	31	28	45	34	
Hovdefjell	41	52	48	55	58	54	
Greipstad	51	36	47	**26**	60	44	
Lyngdal	25	53	47	32	33	46	
Bjerkreim	23	26	30	27	34	37	
Lifjell Stavanger	31	26	45	41	51	37	
Bokn	36	54	57	44	35	40	
Stord	55	58	60	47	50	48	
Bergen	33	49	39	43	53	56	
Grimo	48	52	39	45	54	30	
Lønahorgi	31	41	44	46	54	30	
Gulen	37	42	26	29	23	51	
Bremanger	25	28	31	46	52	59	
Nordfjordeid	40	44	33	27	30	36	
Førde	35	45	48	22	32	55	
Sogndal	21	24	34	38	57	47	
Gamlemsveten	37	38	54	24	34	60	
Reinsfjell	39	42	35	29	53	50	
Kopparen	26	40	45	23	36	56	
Ålmenberget	31	32	59	24	46	27	
Melhus	55	28	25	30	33	43	
Mosvik	44	47	46	37	41	60	
Grong	21	31	35	24	34	38	
Vega	25	32	37	22	28	49	
Hemnes	42	45	48	29	39	**51**	
Kappfjell	23	26	44	47	52	**55**	
Salten	50	43	60	30	33	**54**	
Steigen	31	41	44	47	55	**57**	
Hadsel	45	48	58	25	38	**52**	
Andenes	53	56	59	35	49	**42**	
Narvik	21	27	37	24	34	40	
Harstad	26	46	51	23	36	**33**	
Kistefjell	26	46	43	23	36	**33**	
Trolltind	27	39	42	34	22	**52**	
Tromsø	47	50	55	37	40	58	
Alta	36	51	54	29	**44**	47	
Hammerfest	33	37	48	41	**26**	**55**	
Kautokeino	46	56	59	33	**43**	**31**	
Karasjok	21	41	54	26	**55**	**49**	
Nordkapp	30	40	43	23	**53**	**50**	
Store Jekkir	22	24	42	35	32	**39**	
Tana	36	21	60	49	52	**58**	
Varanger	28	33	50	35	**41**	**56**	

5 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

Assignments in use in the sub-band 694 - 790 MHz: 784

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

Assignments in use in the sub-band 470 - 694 MHz: 1909

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

- ○ Yes
- ◉ No

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

See answer above

7 a) Are those frequency bands also shared with secondary services such as PMSE, radioastronomy or wind-profile radar?

- ◉ Yes
- ○ No

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

PMSE as a secondary use may utilize white spots in the frequency range 470-510MHz. (Licence needed)

PMSE (Wireless microphones) as a secondary use can utilize white spots in the frequency range 510–790MHz. Max. radiated power is 50mW e.r.p.

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

- ◉ Yes
- ○ No

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

In this case 'Yes' means maybe.

A migration to DVB-T2 depends on up-coming services, economy and the market situation. The DTT platform is deployed with MPEG4 video encoding and HC-AAC audio encoding. IRDs (Integrated Receiver/Decoder) in Norway support these encoding standards.
The deployment of the fairly new and extensive DTT platform has been expensive. Hence all the IRDs used are relatively new. An introduction of DVB-T2 or other new technologies would mean that both this equipment and the network transmitters will have to be replaced before the operator gets the expected return on their investments. The requirements for more capacity will surely reach DTT operation in Norway before 2 June 2021 (expiry date of frequency licence) and may release the demand to switch most of the multiplexes to DVB-T2 before that time. Improvements in MPEG4 technology alone will not ease up for the future capacity demands that more content in HD resolution and multi-channel audio will require.

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

- ◉ Yes
- ○ No

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

The DTT platform today broadcast 6 HDTV services and 29 SD services. With the limited available capacity in the current multiplexes, the number of HD channels is low compared to other platforms (Cable, DTH etc.).
There has been a strong focus on convenience and handheld devices and a rather modest interest in 3DTV. In terms of HD, there is certainly an increasing demand. Gradually, the consumers will expect HD to be the standard resolution and maybe even Ultra HDTV in the future. This will obviously increase the demand for bandwidth per service and challenge the competitiveness of the DVB-T networks if the number of HD services will be limited.

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

- ◉ Yes
- ○ No

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

Again 'Yes' means maybe, because this depends on up-coming services, economy and the market situation. Particularly if the situation demand a conversion of all content to HD, and to deploy Ultra HDTV at a later stage. Increased capacity needs can be met by building a 6th Multiplex and additionally convert one or more multiplexes from DVB-T to DVB-T2. Based on what is happening in other countries NTV recognize that the 6th multiplex most likely will be required in the transition from DVB-T to DVB-T2. Please see reply on question 8.

11 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 ident 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 (see file DTTB-Q-A3 under QUESTIONNAIRE in the WP 6A Share Folder).

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Prior to the expiration of the current DTT licence in June 2021, changes for new technologies have to be prepared for the network. The way it looks today, the dominating standards in 2021 will be DVB-T2 v MPEG4 and HEVC encoding. New visual requirements, like Ultra-high definition resolution (UHDTV) and 3D (Service Compatible), will be a part of future services. These new demands for visual and audio del technology development to keep "status quo" in spectrum/content requirements.

The number of TV services in the network is considered to increase marginally, but supplementary services could increase, e.g. HbbTV, services for visual/hearing impaired people etc. Further NTV estimate a for mobile TV broadcasted services where DVB-T2 Lite or Next Generation Handheld can be considered.

Based on the above demands, 6 national frequency layers (plus the local Oslo multiplex) are believed to fulfill the requirements from 2021.

If parts of or the entire 700 MHz band is assigned to mobile services an extensive re-planning of the channel allocations is necessary to try to secure the capacity rec terrestrial television broadcasting.

Country	No of multi-plexes	System & modulation	FEC	GI	Reception mode[1]	Capacity per multiplex (Mb/s)	Intended percentage population coverage	Content per multiplex	Total capacity (Mb/s)	Total spectrum bandwidth needed (MHz)[2]	Any additional comments including time frames
Norway	4	DVB-T2, 256-QAM	3/5	1/16	Fixed	32.32	98%	4 UHDTV/ 26 (most HDTV). H265	151,4	320[3]	from June 2021
	1	DVB-T2[4], 256-QAM	3/5	1/16	Fixed	32.32	98%	5+ (HDTV)	32,32		
	1	DVB-T2, 64-QAM	2/3	1/8	Portable indoor	23.31	TBD	TBD	23,31		
	1	DVB-T, 64-QAM	2/3	1/8	Fixed	22,12	Oslo area (approx. 16 – 20 %)	3 SD	22,12		

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

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

[3] We consider the capacity of 6 national layers (plus the local Oslo multiplex) to be necessary for the continued competitiveness of the DTT platform in Norway. If parts of or MHz band is assigned to mobile services, an extensive re-planning of the channel allocations is necessary to try to secure the capacity requirements for terrestrial television broadc

[4] As the time frame of a system migration is unknown, it might be necessary to keep one layer of DVB-T beyond 2021 during a migration period.

12. Please provide the following information:
a) Name of the Administration/Sector Member:
b) For Sector members please indicate the geographical area over which you operate:
c) Contact person:
d) Email address:
e) Telephone number:
*

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