

**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: RAI WAY S.p.A.

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

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- 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 1:

- a) The adopted standard for digital terrestrial television broadcasting is mainly DVB-T. It is also used DVB-H and DVB-T2.
Furthermore, MHP standard is used for interactivity: more than 10 million Italian DTT receivers are interactive MHP compliant.

Adopted Standard for the video of SD programs is MPEG-2.
All the broadcasted HD programs are MPEG-4 (H264-AVC).

- b) Yes, since 2003.
- c) See **Annex 1** below

- 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 2:

- a) Yes, Italian analogue switch-off started in 2008.
- b) The Italian ASO process ended on 4th July 2012. After this date, there is no analogue television signals on air.

- 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 3:

- a) The current percentage of the Italian population reached by digital terrestrial broadcasting signals is around 99% population.
- b) The percentage of users who receive television primarily by terrestrial means is around 83% population.
The percentage of user who receive television primarily by satellite means is around 17%.
IPTV users are under 1% population.

- 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 4:

- a) 0, see answer to question 2.b
- b) 0, see answer to question 2.b

- 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 5:

a) The Italian Plan for DTT.

The Italian Plan, defined by AGCOM in 2010¹, identified channels in the VHF and UHF bands for 25 DTT national networks (21 DVB-T + 4 DVB-H) with a coverage of at least 80% of the national population and an extensive use of SFN technique² (details of the Italian plan are shown in **Table 5** in the Appendix).

6 (5 DVB-T + 1 DVB-H) of these 25 DTT networks were made available as "internal digital dividend" - see next paragraphs - to facilitate the entry of newcomers within the Italian media market.

Currently all the VHF-UHF channels are used for broadcasting. The frequencies from 790 MHz – 862 MHz were allocated to Mobile service in December 2010 but they are still in use for broadcasting in some regions (because assigned to local commercial broadcasters before December 2010) and shall be released by 31.12.2012 as a result of the 800 MHz auction (held in September 2011).

10 out of 25 DTT national networks are on the range **starting from CH 49 at 694 MHz, until CH 60 ending at 790 MHz:**

- 4 (out of 6) of the "internal digital dividend" (ch. 54, 55, 58 in all Italy and 59 UHF in some areas) – see next paragraphs (within Reply 5)
- 3 assigned to Mediaset (for 3 national SFN Mux over ch. 49, 52 e 56 UHF)
- 1 assigned to Dfree (for 1 national SFN Mux over ch. 50 UHF)
- 1 assigned to Telecom Italia Media Broadcasting (for 1 national SFN Mux over ch. 60 UHF)
- 1 assigned to Retecapri (for 1 national K-SFN uses ch. 57 UHF in many regions).

¹ Resolution 300/10/CONS (AGCOM). The bodies involved in Italy in the spectrum management and planning are:

- **Ministry of Economic Development – Communication Department:** responsible for spectrum allocation of frequency assignment to private and public services as well as the elaboration of assignment plans, except for broadcasting services. Represents Italy in ITU, CEPT, EU.
- **Authority of telecommunications (AGCOM):** the Italian NRA (National Regulatory Authority responsible for frequency planning for broadcasting services (set up in 1997).

² The same Plan also identified channels in VHF Band for digital audio broadcasting.

The local private broadcasters.

It is important to take into account that about 600 local broadcasters operated over Italy in the “analogue era”, typically with a service target area of some adjacent provinces/regions.

As a result of the Italian digitizing process, each “analogue” local broadcaster has become a “digital” network operator having been assigned a multiplex. Before the Switch-Off in some areas there was a preliminary selection (“graduatoria”) of the local regional/subregional operators and formal agreements among them (“intese”), in order to limit the total number of assignments.

However, also taking in to account the complete release of the band 790-862 MHz (by 31.12.2012), in Italy there are approximately 500 Multiplexes broadcasted by about 500 different local regional/subregional network operators.

b) VHF-UHF spectrum

The present use of the VHF-UHF in Italy is summarized in the **Table 1** which schematically represents the Italian Plan approved by AGCOM with resolution 300/10/CONS (see also **Table 5** in the Appendix for further details):

Table 1

Channels assigned to National broadcasters	VHF 5, 7*, 8, 9, 11 UHF 26, 30, 36, 37, 38, 40, 47, 49, 50, 52, 54, 55, 56, 58, 60	DTT
Channels assigned to National and Local broadcasters (in different areas)	UHF 23, 24, 25, 28, 32, 33, 42, 44, 48, 57, 59	DTT
Channels assigned to Local broadcasters	UHF 21, 22**, 27**, 29**, 31, 34, 35**, 39**, 41, 43, 45, 46**, 51, 53	DTT
Channel assigned to Local broadcasters before December 2010 (and currently in use in some areas) to be released by 31.12.2012 as a result of the 800 MHz auction (held in September 2011)	UHF 61, 62, 63, 64, 65, 66, 67, 68, 69	DTT
Channel planned for digital audio broadcasting (DAB+/DMB).	VHF: 12	DAB [DAB+/DMB]
Channel planned both for Local video broadcasting and digital audio broadcasting (in different areas).	VHF: 6*, 10*	DAB / DTT
Channel planned both for National video broadcasting and digital audio broadcasting (in different areas).	VHF: 7*	DAB / DTT

* Channel 6, 7, 10 (VHF) are both for video and audio broadcasting (in different areas)

** Channel used in some areas for public service broadcaster (RAI) multiplex (with one different regional program for each region) in SFN configuration.

The “internal digital dividend”.

Due to an infringement procedure moved by the EU against Italy, whose media market was accused to be too closed to newcomers, in July 2011, the Ministry for Economic Development published the

rules for the handing over of 5 groups of frequencies to be allocated to DVB-T Multiplexes, plus 1 frequency to be allocated to a DVB-H (or DVB-T2) Multiplex after an evaluation of the possible candidates (or “Beauty Contest”).

These “5+1” groups of frequencies are the so called “internal digital dividend” result of the transition from analogue to digital television and to be used for broadcasting service.

In the following **Table 2** are listed the groups of frequencies constituting the “internal digital dividend”.

Table 2

Group	Ch.	Standard
1	6, 7 VHF	DVB-T
2	25, 23 UHF	DVB-T
3	28, 24, 59 UHF	DVB-T
4	55 UHF	DVB-T
5	58 UHF	DVB-T
6	54 UHF	DVB-T2

In January 2012, the new Minister of Economic Development has decided to suspend the Beauty Contest for a period of three months for further in-depth considerations, in light of the outcomes of the WRC12.

On 24th April 2012 a new law was approved in which it is announced that, by the end of August 2012, the rules for acquiring the 5+1 groups of frequencies of the “internal digital dividend” will be defined : the government decided to assign such frequencies by allocating the licenses through a bid up process.

c) As showed in **Table 1** above, all channels are planned for use in each region of Italy

d) As showed in **Table 1** above, all channels are planned for use in each region of Italy

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 6:

a) No.

b) No, but in Italy, the Band 470-790 MHz and the Band 174 – 230 MHz are allocated only to Broadcasting service. In particular, frequencies from 223 MHz to 230 MHz are designated for digital sound broadcasting (according to GE06).

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?

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

Reply 7:

- a) Yes
- b) 174-223 MHz : SRD (professional radiomicrophones according to ERC/Rec. 70-R03)
470-790 MHz : SRD (professional radiomicrophones according to ERC/Rec. 70-R03)

- 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 8:

- a) Yes
- b) At the moment there is no plan for the transition from DVB-T standard towards the DVB-T2 standard.

However Italian government has announced that as of 2015, all DTT receivers must include a tuner with the DVB-T2 standard. This decision has been taken in order to ensure sufficient capacity for the DTT platform given the need to share frequencies in the UHF band with mobile broadband services. Note that:

- RAI has been performing a DVB-T2 trial in Aosta since July 2011; a bouquet composed of a mix of SD and HD channels is currently broadcast. On one of the HD channels, 3DTV plano-stereoscopic services are also being broadcast aiming to test the service compatible operation with 2D receivers.
- the commercial broadcaster Europa 7 broadcasts pay TV services (4 HD programs) using the DVB-T2 standard since 2010 (on ch. 8 VHF). Europa 7 make its DTT set-top box available to its subscribers.

- 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 9:

- a) Yes
- b) A number of HD services are already available on DTT platform (see Annex 1) and some experimental 3D transmission were made.

It is foreseen that the number of enhanced program (especially HD) will increase as soon the analogue switch off is ended and in the final scheme all programs will be at least in HD with some further programs in 3D format (no simulcast HD/3D)

The following **Table 3** gives details of the number and nature of planned services.

Table 3

	SERVICES/ CONTENTS	DESCRIPTION	Capacity (Mb/s)
1	AUDIO	5+1 and greater audio coding to be adopted with the incoming HD, 3D and UHD TV standards	1,5 Mbit/s for each multiplex
2	SERVICES FOR SECONDARY SCREENS	Usage of multiple PLP (Physical Layer Pipe) to carry IP information associated to television programmes to be linked by tablets, smart phones and portable devices through wi-fi or blue-tooth	5 Mbit/s for each multiplex
3	INTERACTIVITY	Evolution of MHP (1.13 and subsequent) will need more spectrum than now	at least 5 Mbit/s for each multiplex
4	H/IBB	Development of H/IBB (Hybrid/Integrated Broadband and Broadcasting applications)	5 Mbit/sec for each multiplex
5	HD	The usage of wider screen, flat instead of CRT (from 21"-24" to 42"-50") requires HD transmission with double capacity than SD in order to keep the same quantization noise	an increase of 10 Mbit/s for each multiplex
6	3D	3D content	increase of 50% of capacity compared to HD programme

- 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 10:

- a) Yes
b) 6 Mux (see Reply 5 above on internal digital dividend)

- 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 11:

Italian broadcasters foresee for the future the use of more amount of spectrum than today even taking into account the efficiency provided by new techniques (DVB-T2, encoding, etc.).

Taking into account:

- the present use of Italian broadcasters illustrated in Annex 1 and Reply 5
- the list of new broadcasting services/formats illustrated in Reply 9,
- that during a transitional period is needed a period of simulcast between DVB-T and DVB-T2 (due to the fact that in Italy as of 2015 all DTT receivers must include a tuner with the DVB-T2 standard, it is foreseen the migration to this technology with a period of simulcast - see Reply 8)
- that in the final scheme all programs will be at least in HD with some further programs in 3D format (no simulcast HD/3D)

the total amount of needed capacity for Italian terrestrial broadcasting is estimated in the **Table 4** below:

Table 4

Capacity used/needed [Mbit/s]			
	Present [Annex 1]	Transitional period [simulcasts T/T2] without considering new services	Final scheme T2 considering new services as in Table 3
Italy	> 900	~ 1500	~ 1300 (*)

(*) Taking into account the possible improvement of the new coding system (e.g. H265)

ANNEX 1

Country	No of multi-plexes	System & modulation	FEC	GI	Reception mode	Capacity per multiplex (Mb/s)	Current percentage population coverage	Intended percentage population coverage	Content	Total capacity (Mbit/s)	Total spectrum bandwidth used or intended for implementation (MHz)	Any additional comments (e.g. duration of licences) (**)
ITALY Public Service (RAI)	1	DVB-T, 64-QAM SFN in UHF Band	3/4 or 5/6	1/4	Fixed	22,4 – 23,7	>99.0%	>99.0%	4 SD MPEG2 + 3 radio programs	83	(2x7 MHz channels) + 4x8 MHz channels = 46 MHz	Public service broadcaster multiplex with one different regional program for each region
		DVB-T, 64-QAM MFN in VHF Band	3/4	1/32	Fixed							
	3	DVB-T, 64-QAM SFN in UHF Band	2/3	1/4	Fixed	19,9	>90.0%	>90.0%	12 SD MPEG2 + 1 HD MPEG4 + 5 radio programs			Public service multiplexes
	1	DVB-T2 in VHF Band	2/3	1/128	Fixed	35,2	trial	>80.0%	[See Reply 8]	Not yet defined	1x7 MHz channel	Public service multiplex
ITALY (Mediaset)	1	DVB-T, 64 QAM	3/4	1/4	Fixed	22,4	> 95 %	> 95 %	6 SD	107,1	40	Free-to-air
	3	DVB-T, 64 QAM	5/6	1/4	Fixed	24,9	> 90 %	> 90 %	13 SD + 5 HD			1 Free + 2 Pay-Tv
	1	DVB-H, 16 QAM	1/2	1/4	Portable/mobile	10	> 90 %	> 90 %	9 Portable			
ITALY (TIMB)	3	DVB-T, 64 QAM	3/4	1/4	Fixed	22,4	> 90 %	> 90 %	21 SD + 1 radio	67,2	24	Free-to-air
ITALY (Rete A)	2	DVB-T, 64 QAM	3/4	1/4	Fixed	22,4	> 80 %	> 85 %	10 SD + 10 radio	44,8	16	Free-to-air
ITALY (DFREE)	1	DVB-T, 64 QAM	5/6	1/4	Fixed	24,9	> 90 %	> 90 %	9 SD	24,9	8	Pay-Tv
ITALY (H3g)	1	DVB-H, QPSK	1/2	1/8	Portable/mobile	6	> 80 %	> 85 %	7 Portable	6,0	8	
ITALY (Retecapri)	1	DVB-T, 64QAM	2/3	1/4	Fixed	19,9	> 80 %	> 85 %	7 SD + 1 radio	19,9	8	Free-to-air
ITALY (Europa 7)	1	DVB-T2, 256 QAM	n.a.	n.a.	Fixed	32	n.a.	n.a.	4 HD MPEG4	32,0	7	Pay-Tv
ITALY (Regional-Local, typ. Number)	18 (*)	DVB-T, 64 QAM	3/4 typical	1/4 typical	Fixed	22,4 typical	> 80 %	> 85 %	typical: 120 SD + 10 HD + 10 radio	403,2	144	Mainly Free-to-air
ITALY (DAB)	-	-	-	-	Mobile	-	-	-	-	Not yet defined	21	
ITALY Internal Digital Dividend [see Reply 5]	6	DVB-T, 64 QAM	3/4	1/4	Fixed	22,4		> 85 %	t.b.d.	130	47	
ITALY	43	-	-	-		-	-	-	-	>900	>370	

(*) In Italy there are more than 500 regional-local Broadcasters that produce an average occupancy of spectrum equivalent to 18 national Muxes (both VHF and UHF bands are considered)

(**) All Italian broadcaster multiplexes are licensed until 2032

APPENDIX

Table 5 - National planned channels in Italy (Annex 1 to Resolution AGCOM 300/10/CONS*) and further details about networks.

Multiplex	Type	Main planned channels (VHF-UHF)	Further planned channels in some areas (VHF-UHF)	Mux Name	Network config.	Coverage (pop.)
1	Public service broadcaster multiplex with one different regional program for each region	ch. 5 VHF + ch. 9 VHF	one different channel for each region in UHF band	Rai MUX 1	MFN	> 99 %
2	DVB-T National	ch. 8 VHF **	ch. 10 VHF + channel in UHF band in some areas	Europa 7	k-SFN	-
3	DVB-T National	ch. 7 VHF **	ch. 6 VHF	Internal Digital Dividend	k-SFN	-
4	DVB-T National	ch. 26 UHF	-	Rai MUX 3	SFN	> 90 %
5	DVB-T National	ch. 59 UHF **	ch. 24 UHF + ch. 28 UHF	Internal Digital Dividend	k-SFN	-
6	DVB-T National	ch. 30 UHF	-	Rai MUX 2	SFN	> 90 %
7	DVB-T National	ch. 36 UHF	-	Mediaset 2	SFN	> 90 %
8	DVB-T National	ch. 25 UHF **	ch. 23 UHF	Internal Digital Dividend	k-SFN	-
9	DVB-T National	ch. 40 UHF	-	Rai MUX 4	SFN	> 90 %
10	DVB-T National	ch. 44 UHF **	ch. 32 UHF	Rete A 1	k-SFN	-
11	DVB-T National	ch. 33 UHF **	ch. 42 UHF	Rete A 2	k-SFN	-
12	DVB-T National	ch. 47 UHF	-	Timb 1	SFN	> 90 %
13	DVB-T National	ch. 48 UHF **	ch. 42 UHF	Timb 3	k-SFN	> 90 %
14	DVB-T National	ch. 49 UHF	-	Mediaset 4	SFN	> 95 %
15	DVB-T National	ch. 50 UHF	-	Dfree	SFN	> 90 %
16	DVB-T National	ch. 52 UHF	-	Mediaset 1	SFN	> 90 %
17	DVB-T National	ch. 55 UHF	-	Internal Digital Dividend	SFN	-
18	DVB-T National	ch. 56 UHF	-	Mediaset 5	SFN	> 90 %
19	DVB-T National	ch. 57 UHF **	ch. 32 UHF	Retecapri	k-SFN	-
20	DVB-T National	ch. 58 UHF	-	Internal Digital Dividend	SFN	-
21	DVB-T National	ch. 60 UHF	-	Timb 2	SFN	> 90 %
22	DVB-H National	ch. 38 UHF	-	Mediaset 3	SFN	> 90 %
23	DVB-H National	ch. 37 UHF	-	H3G	SFN	-
24	DVB-H National	ch. 54 UHF	-	Internal Digital Dividend	SFN	-
25	DVB-H/DVB-T2 National	ch. 11 VHF	-	Rai MUX DVB-T2	SFN	-
-	DAB/DMB	ch. 12 VHF	2 out of 3 channels between 6 VHF, 7 VHF, 10 VHF (channels planned both for television and radio in different areas)	-	-	-

(*) the official table is available in Italian language at AGCOM web site at the following link: <http://www.agcom.it/default.aspx?DocID=4532>

(**) Usage of the channel is subject in some areas to the final approval of the international coordination procedure.