



AUTORITÀ PER LE
GARANZIE NELLE
COMUNICAZIONI

DVB EVOLUTION - ITALIAN EXPERIENCE

ITU-D QUESTION 2/1 FOCUS SESSION ON EVOLUTION OF BROADCASTING SYSTEMS

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Outline



The release of the 700MHz band and the DTT reorganization process

A. DURANTINI - DVB EVOLUTION - ITALIAN EXPERIENCE - 16 APRIL 2024



Frequency planning for national and local broadcasting

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DTT Policy and regulation in Italy

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Results of re-engineering the DTT network

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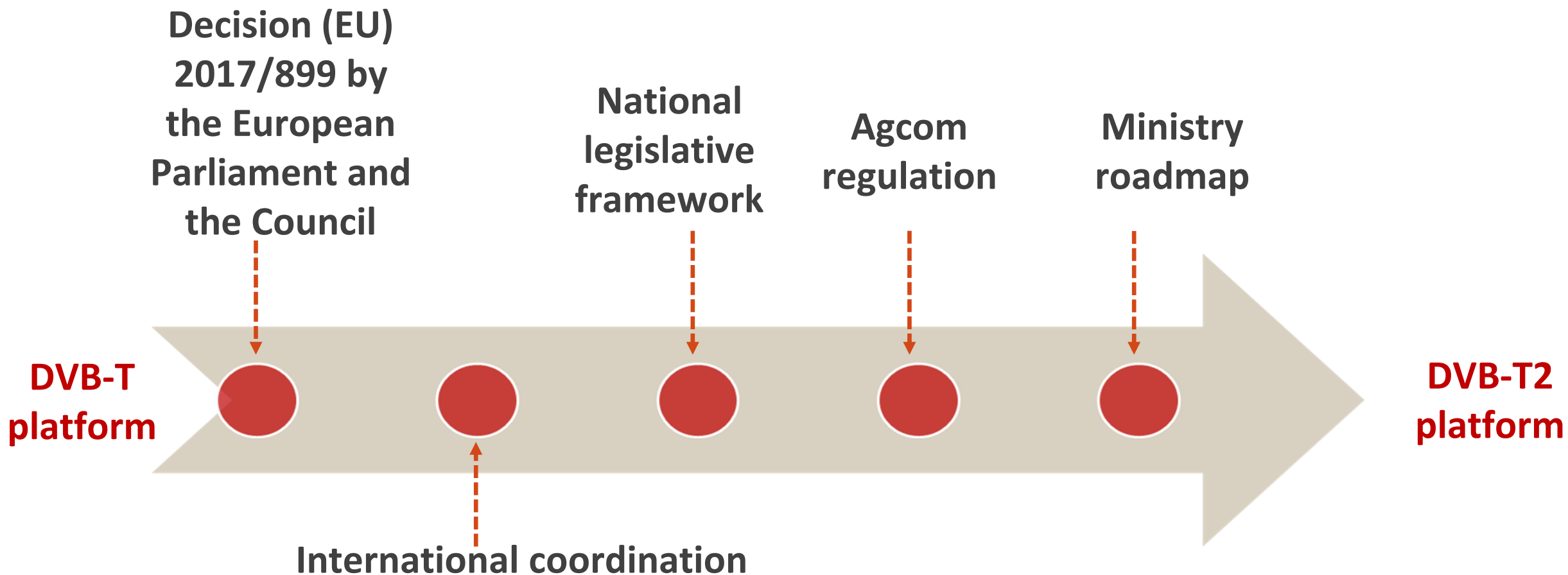
Key learnings

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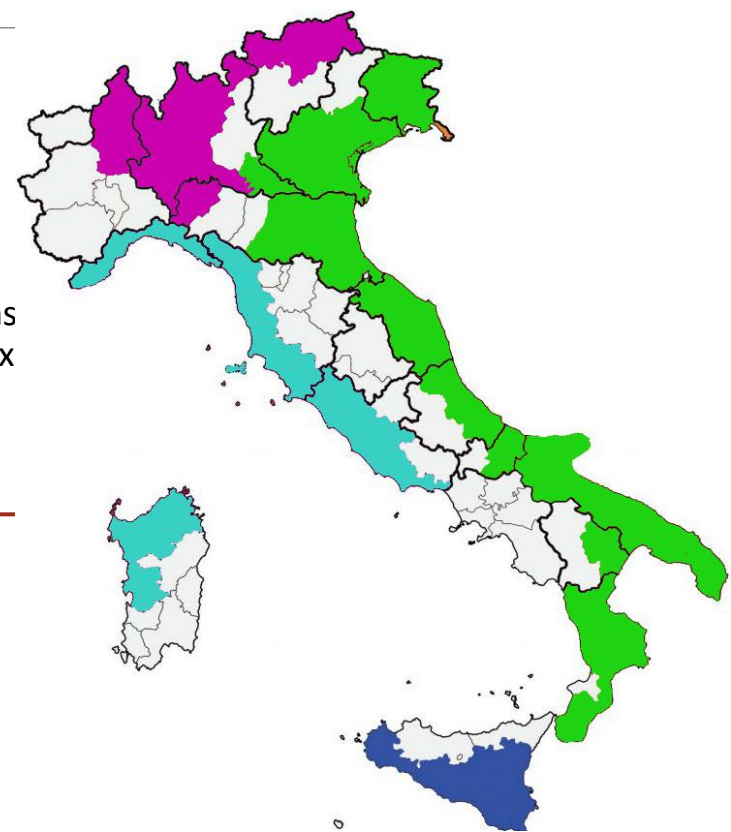
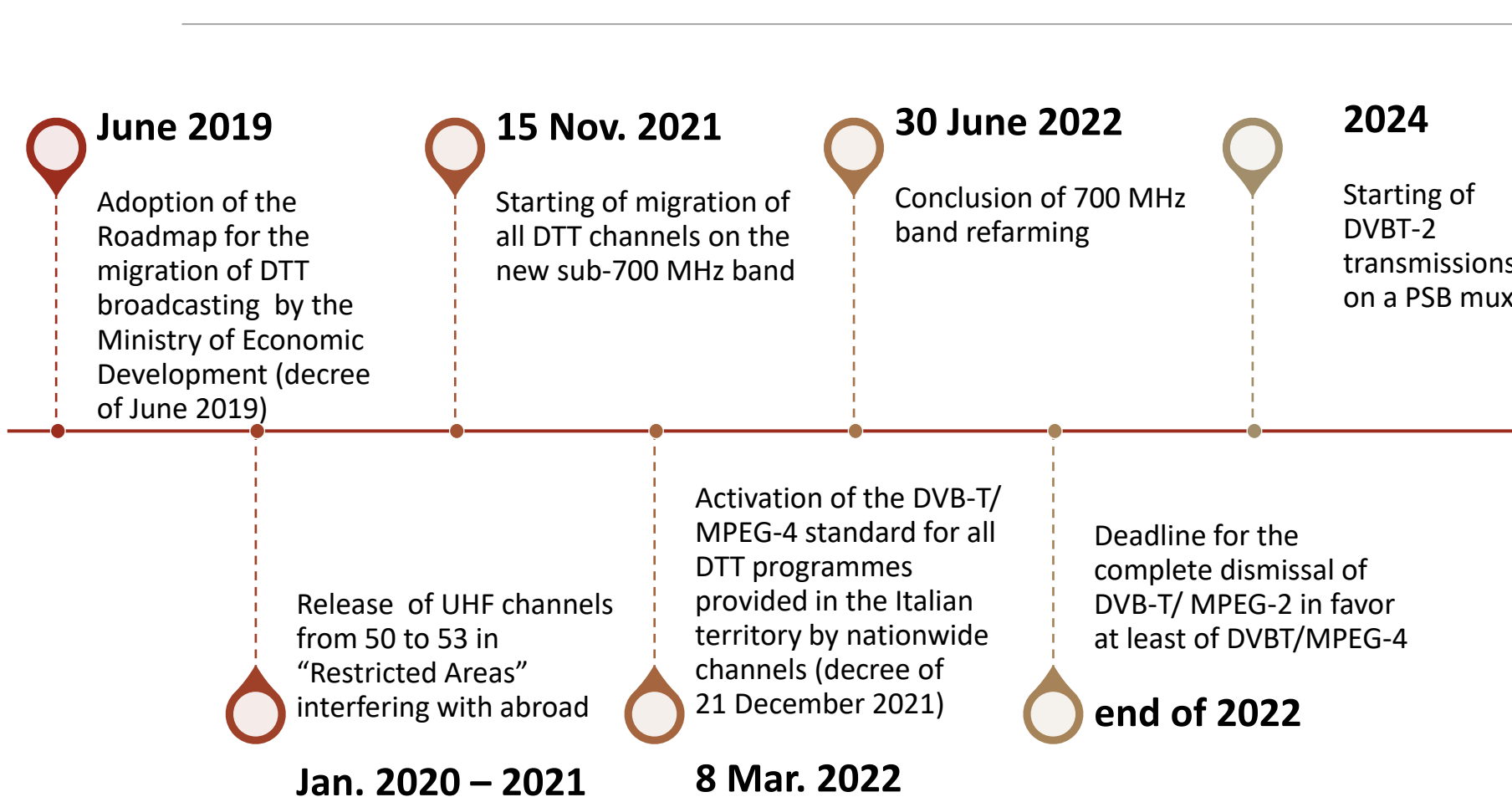


The release of the 700MHz band and the DTT reorganization process

Italian approach towards the 700 MHz band release



Roadmap for DTT move from 700MHz band to lower band





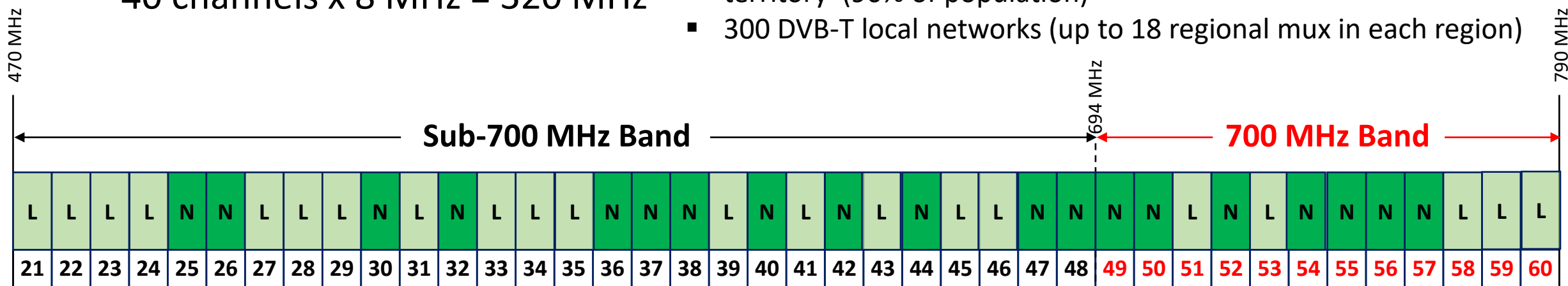
Frequency planning for national and local broadcasting

Impact of 700 MHz band release

BEFORE refarming

40 channels x 8 MHz = 320 MHz

- Extensive use of SFN technology
- 20 DVB-T (k-SFN) national networks covering ~80% of national territory (90% of population)
- 300 DVB-T local networks (up to 18 regional mux in each region)



N National Mux

L Local Mux

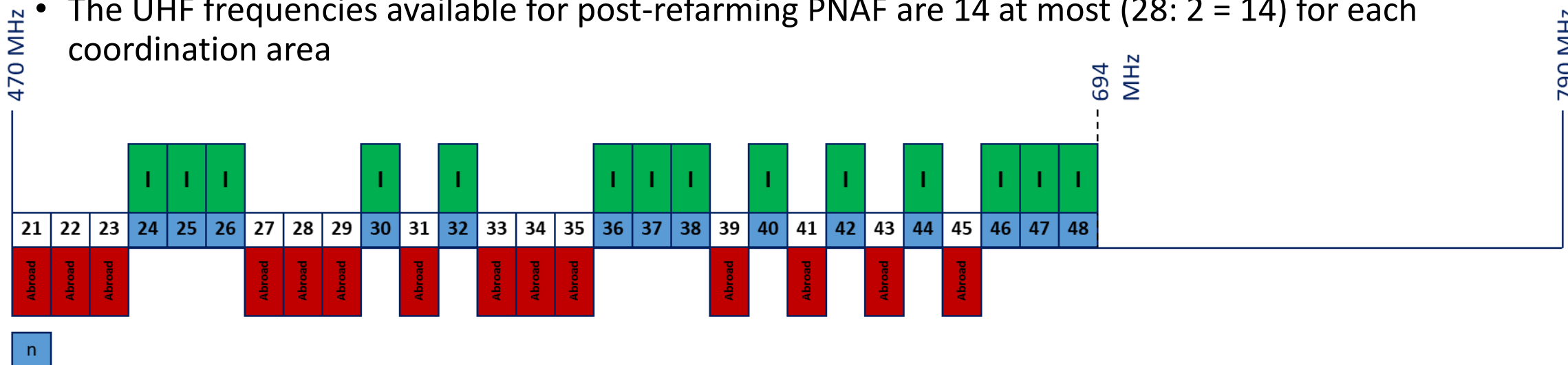
AFTER refarming

28 channels x 8 MHz = 224 MHz

Loss of 30% of spectrum available for broadcasting

Impact of 700 MHz band release

- Considering:
 - the total amount of channels available in the sub-700 MHz band (28 channels)
 - the constraints deriving from the rules of international coordination (equitable access)
 - the constraints deriving from the 2018 Budget Law
- The UHF frequencies available for post-refarming PNAF are 14 at most ($28:2 = 14$) for each coordination area



The reduction of resources available for UHF band planning is significantly higher than 30%: $40 - 12 - 14 = 14 \rightarrow -65\%$

National Frequency Assignment Plan for DTT

Decision n. 39/19/CONS

- Exclusive usage of coordinated frequencies assigned to Italy by international agreements: 14 UHF frequencies + VHF frequencies (where necessary);
- Extensive use of SFN technology;
- Adoption of the most efficient coding techniques (such as High Efficiency Video Coding) and transmission standards;
- 10+2 UHF frequencies + VHF frequencies planned for nationwide DTT networks;
- 2 UHF frequencies planned for local DTT networks;
- One multiplex reserved to the PSB for regional news (able to be splitted in macro areas) and operating in the UHF band (instead of the VHF-III band);
- At least 1 local network in UHF band with population coverage $\geq 90\%$ in each technical area.

Planning configuration and parameters

- Transmission capacity of a DVB-T multiplex is not a standard value, but it depends on the configuration of transmission parameters (*system variant*), ranging from 17.56 Mbit/s (C1 system variant), **19.91 Mbit/s (C2 system variant)**, 22.39 Mbit/s (C3 system variant) up to 24.88 Mbit/s (C5 system variant).
- **Performance comparison between DVB-T and DBV-T2 planning configurations**

Standard	Planning parameters	Capacity (Mbit/sec)
DVB-T	64 QAM; 2/3 FEC rate; 8k FFT; $T_g/T_u=1/4$; $T_g=224\ \mu\text{s}$	19.91
DVB-T2	256-QAM; 2/3 FEC rate; 32k (extended) FFT; $T_g/T_u=1/16$; $T_g=224\ \mu\text{s}$	37

- Additional gain of 10% by using statistical multiplexing in DVB-T2.

National multiplexes

- 12 nationwide networks planned in UHF band:
 - 3 UHF 1-SFN networks
 - 5 UHF 2-SFN networks
 - 2 UHF 3-SFN networks
 - 1 UHF 3-SFN network that can be splitted in macro areas (PSB)
 - 1 hybrid VHF/UHF k-SFN network

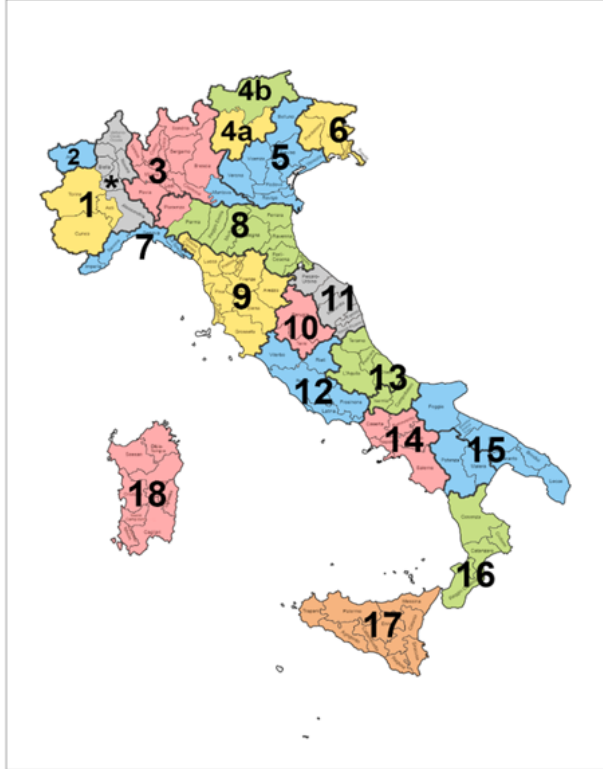


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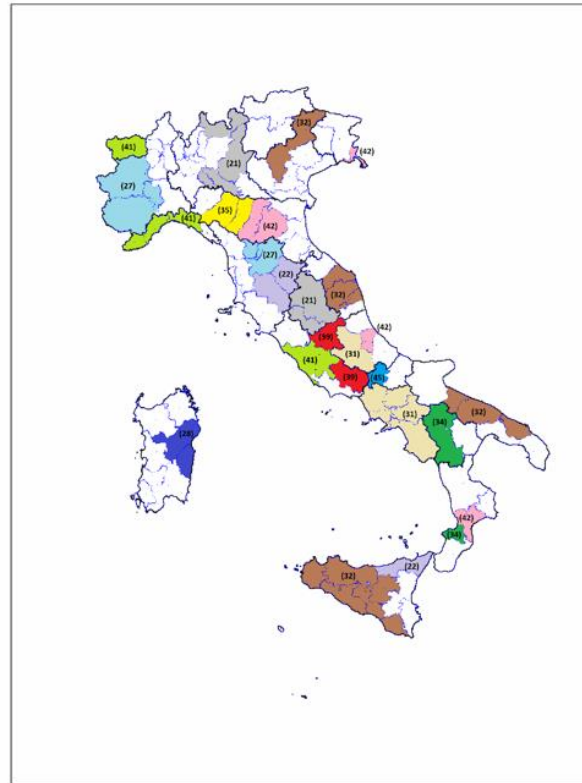


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MUX NAZ 3

Decision n. 39/19/CONS



AREE TECNICHE PNAF 2019
 * Province comuni alle aree tecniche 1 e 3



AREE TECNICHE PNAF 2019
 * Province comuni alle aree tecniche 1 e 3

Local multiplexes

- **In each local/regional service area:**
 - At least 1 local network in UHF band with population coverage $\geq 90\%$
 - 1 or more local networks in UHF band without population coverage obligations in each local service area.
- **A total of 74 local networks planned:**
 - 26 first level networks
 - 48 second level networks



DTT Policy and regulation in Italy

Italian approach to DTT platform reorganization

- National and local DTT operators had to progressively release frequencies in the 700 MHz band, migrating to the sub-700 Mhz band.
- Different policy approaches at national and local level, since market exit mechanisms were envisaged only for the local sector:
 - **cost refunding mechanism for the change of technologies from DVB-T to DVB-T2 for national TV broadcasting company;**
 - **compensation mechanism for the withdraw of the right of uses for the local operators.**
- The scheme of funding is presented in Table below:

Entities	2020	2021	2022
National broadcasters	EUR 24.1 million	EUR 24.1 million	EUR 228.1 million
Local broadcasters	EUR 230.3 million	EUR 73.9 million	

Conversion of rights of use for national DVB-T2 mux

- Agcom set rules to convert existing DVB-T spectrum rights of use into rights of use of transmission capacity of the national DVB-T2 MUX and to award spectrum to operators (decision n. 129/19/CONS approved on 18 April 2019).



conventional conversion criterion = 0.5
1 DVB-T mux = 0.5 DVB-T2 mux

Assignment of rights of use for national DVB-T2 mux

Network operators	(Concrete) rights of use of DVB-T spectrum	(Abstract) rights of use of DVB-T2 spectrum
Rai	5	2,5 (2 of which are specific)
Elettronica Industriale	5	2,5 (2 of which are specific)
Persidera	5	2,5 (2 of which are specific)
Cairo	1	0,5
3lettronica industriale	1	0,5
PrimaTV	1	0,5
Europa Way	1	0,5
PDBST	1	0,5
8 Network operators	20 DVB-T multiplexes	10 DVB-T2 multiplexes

- The rights of use issued to national network operators were assigned starting from 2019 and have a ten-year duration.

Assignment of rights of use for national DVB-T2 mux

- AGCOM set rules of **competitive procedure (onerous procedure without competitive bids)** for auctioning the additional spectrum that became available following the removal of the reservation of transmission capacity in favor of local broadcasting (decision n. 564/20/CONS): **two nationwide DVB-T2 multiplexes (4 spectrum lots)**.
- In June 2021, **additional DVB-T2 spectrum lots** were assigned to Cairo, Persidera, RAI and Elettronica Industriale.
- **This tender allowed to complete the assignment procedures for 11 out the new 12 national muxes.**
- The rights of use have a ten-year duration

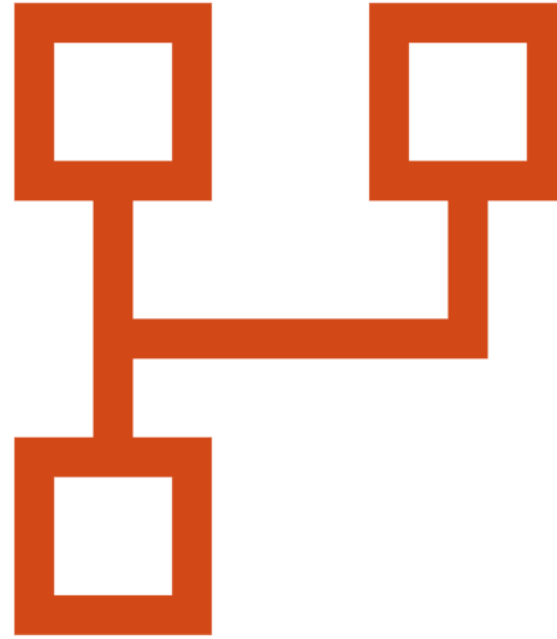
Network operators	Rights of use of DVB-T2 spectrum
Rai Radiotelevisione Italiana	3
Elettronica Industriale	3
Persidera	3
Cairo	1
3elettronica industriale + PrimaTV	1
Europa Way	0,5
PDBST	0,5

- In March 2022, AGCOM set rules of a **reserved procedure for the free allocation of the DTT nationwide network n.12 to operators who had not yet converted their frequencies** (decision n. 65/22/CONS).
- In June 2022, **the Ministry launched an allocation procedure that went void.**
- **AGCOM adopted new rules of procedure (onerous procedure without competitive bids) to allocate the DTT nationwide network n.12** (decision n. 25/23/CONS)

Assignment of rights of use of frequencies for local DVB-T2 mux



- Ministry set rules to assign regional multiplexes to carry-only operators.
- Between 2020 and 2021, the Ministry managed a few tenders aimed at local network operators.
- Local tv bouquets are to be onboarded on a contest basis.



Results of re-engineering the DTT network

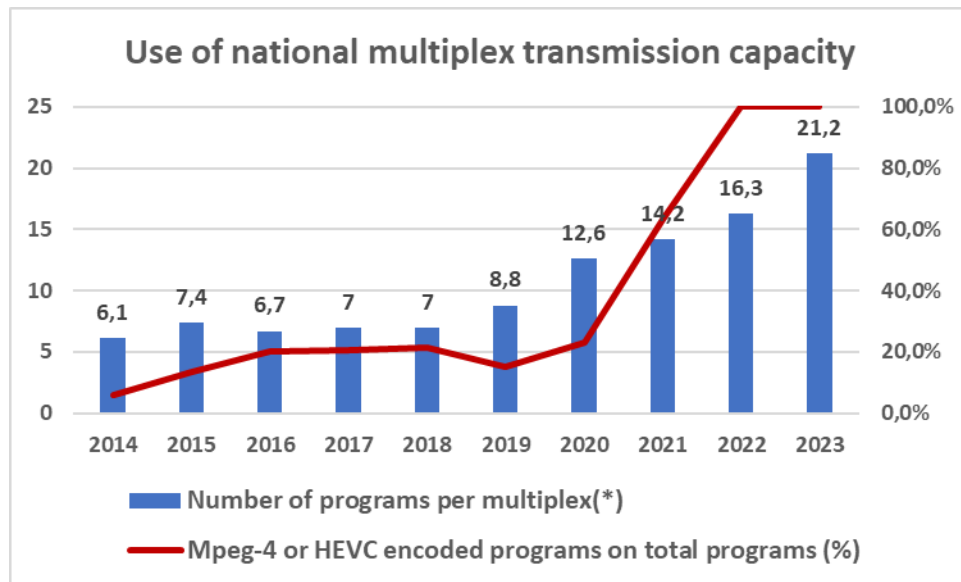
Evolution of DTT platform

First generation DTT platform

DVB-T transmission standard
20 national multiplexes
~300 local multiplexes
MPEG-2 for SD services
MPEG-4 AVC for HD services

Second generation DTT platform

DVB-T2 transmission standard
12 national multiplexes
26 I lev. local multiplexes
48 II lev. local multiplexes
MPEG-4 at first
HEVC later



Service area	TV Programmes
National	226
Regional (I lev. net)	334 (~15 for each region)
Local (II lev. net)	776

Current status of DTT platform on the transmission side

- DTT platform is central to the provision of traditional linear FTA TV services, thus offering significant benefits to a large percentage of national population.
- The post-refarming DTT platform preserves content continuity from national players, thanks to spectrum efficiency gained from adopting DVB-T2, MPEG-4 or HEVC.
- The post-refarming DTT platform substantially preserve the whole pre-refarming local broadcast contents.

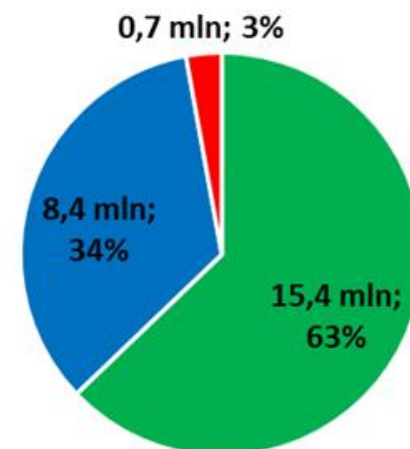
Current status of DTT platform: ability to receive

DVB-T2 HEVC take-up
% of total TVs (43,4 mln)



■ Compatible TVs ■ Non compatible TVs

DVB-T2 HEVC take-up
% of total Italian families (24,5 mln)



■ At least one compatible TVs ■ None compatible TV ■ None TV

the TV renovation cycle is still ongoing.....

Source: 6th Auditel-Censis Report, November 2023



Key learnings

Key learnings

- The reorganization process of broadcasting following the release of the 700 MHz band has caused a strong impact on the entire broadcasting sector.
- Many investments have been made by operators and by the State to manage the transition, due to the high DTT penetration in the country and the large number of DTT households that need to be migrated.
- DVB-T2 rights of use of spectrum have been assigned to network operators starting from 2019 and they have a ten-year duration.
- The full transition to DVB-T2 is expected to occur starting from 2024.
- In the transitional period, local and national networks (reduced from 20 to 12) operate in DVB-T. That results in a shortage of capacity available to audiovisual media service providers.
- The request for high quality video services (in UHD or HD formats) makes bandwidth availability even more critical.
- The full transition to the next stage of DTT technology (DVB-T2, MPEG4/HEVC, HDTV/UHDTV (4k) is on going but the TV renovation cycle needs completing.
- The impact of reorganization on local broadcasting – moving from a vertical integration model to a horizontal entry model – is to be assessed yet.
- DTT currently and for the foreseeable future is the main TV distribution platform in Italy.
- The exclusive use of the 470–694 MHz band for TV broadcasting was supported and confirmed for Italy by the WRC 2023 until 2031 (Agenda item 1.5, note 5.15A).



Thank you for attention!