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Digital Television Action Group

Digital Switch Over
Experiences across Europe

ITU Workshop on Spectrum Management
And Transition to Digital Terrestrial Broadcasting
for Europe and CIS
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What is DigiTAG

- **DigiTAG is an association of stakeholders in the digital terrestrial TV industry**

- **Its members include: broadcasters, network operators, regulators, and professional equipment and consumer electronics manufacturing organisations.**

- **DigiTAG's mission is to defend and promote digital television worldwide, regardless of the technical standard used on the DTT platform**

DigiTAG's Members

Vocabulary

DTT Digital Terrestrial Television

+

ASO Analogue Switch Off

=

DSO Digital Switch Over

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DTT & ASO situation in Europe

DTT status in Europe

DTT networks in Europe are based on the DVB family of standards. DVB-T2 is currently the state-of-the-art broadcasting technology

Encoding technology by country

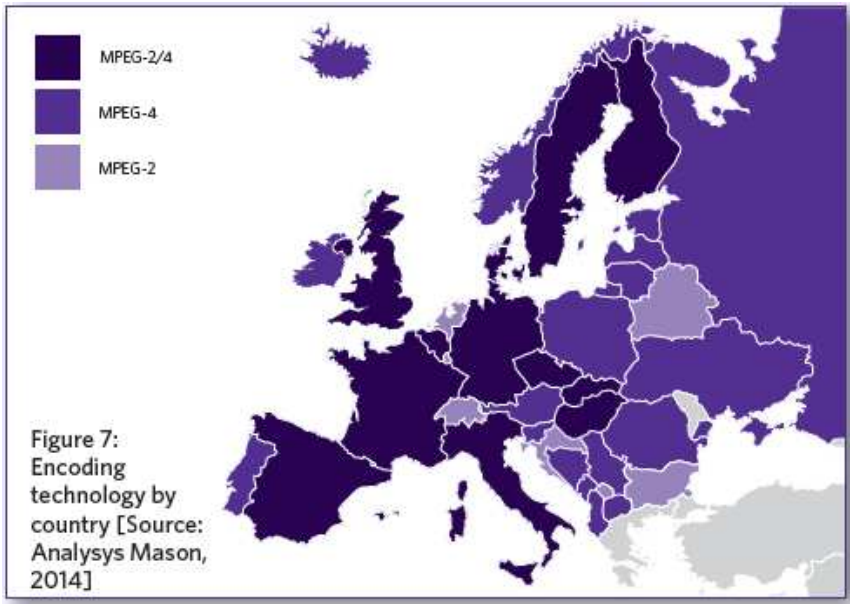


Figure 7: Encoding technology by country [Source: Analysys Mason, 2014]

Transmission technology by country

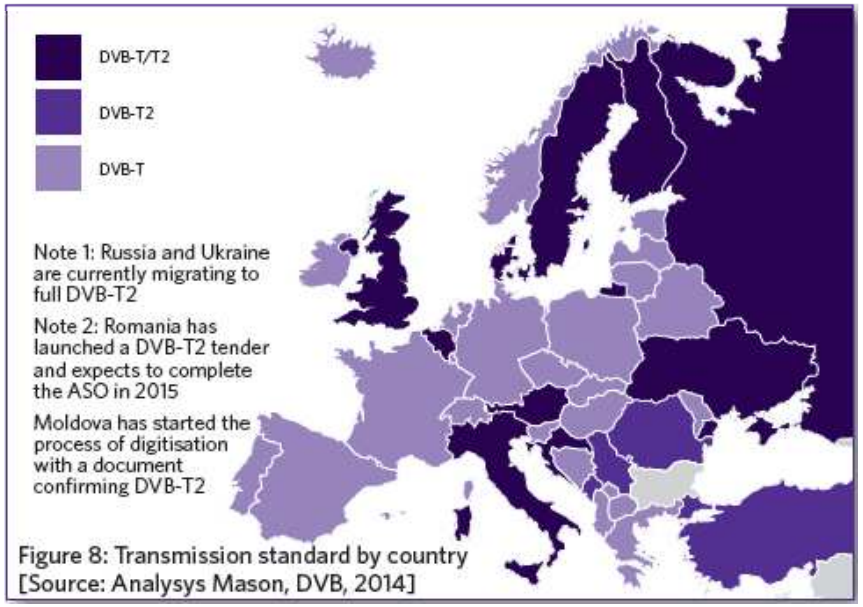


Figure 8: Transmission standard by country [Source: Analysys Mason, DVB, 2014]

- The most recent encoding standard, HEVC, has not been adopted yet. It is likely to be deployed along with DVB-T2
  - e.g. deployment is expected in Germany in 2017
- Broadcasters have already started showcasing HEVC during special events transmitted in UHD

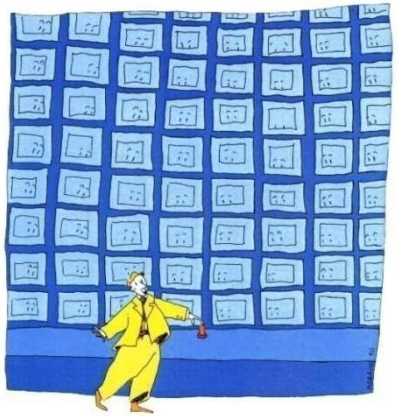
- European countries have adopted the DVB transmission standard as opposed to
  - ATSC, used in North America
  - ISDB-T, used in Japan, the Philippines and South America
  - DTMB, used in China

Different strategies

Terrestrial countries	❑ Dominant business model is a free-to-air platform ❑ Many new services are offered to viewers ❑ France, UK, Italy, Spain,	Long simulcast period	Strategy
Nordic countries	❑ Mixture of free-to-air and pay services offered ❑ Aggressive ASO strategy ❑ Sweden, Norway, Finland, Denmark	Short simulcast period	
Cable countries	❑ Limited new services offered ❑ Emphasis on portable/mobile reception ❑ NL, CH, Belgium	Short simulcast period	

DTT offer by 2010

Note: countries such as Italy and Spain, alike France, have later used MPEG-4 for HD TV



	Country	DTT launch	Free-to-air	Pay	Compression techno.
Phase 1	UK	1998	8	22	MPEG-2
	Spain	2000	6	15	MPEG-2
Phase 2	UK	2003	40	PushPVR	MPEG-2
	Italy	2004	31	PPV	MPEG-2
	Germany	2004	~24	0	MPEG-2
	France	2005	18 (+3 HD)	9	MPEG-2/MPEG-4
	Spain	2005	20	TBC	MPEG-2
	Austria	2006	6	0	MPEG-2
	Czech Rep	2006	12	0	MPEG-2
Phase 3	Denmark	2006	4	25	MPEG-2/MPEG-4
	Estonia	2006	7	24	MPEG-4
	Slovenia	2006	7	TBC	MPEG-4
	Norway	2007	5	20	MPEG-4
	Lithuania	2008	12	28	MPEG-4
	Hungary	2008	3 (+3 HD)	2	MPEG-4
	Portugal	2009	4	TBC	MPEG-4
	Latvia	2009	5	30	MPEG-4

Followers

Country	Launch date	Free-to-air platform	Commercial platform	Compression format	ASO planned date
Bulgaria	2009	2 Muxes	3 Muxes	MPEG-4	2012
Poland	2009	1 Mux	1 Mux	MPEG-4	2013
Slovakia	2009	1 Mux	2 Muxes	TBC	2012
Ireland	2010	1 Mux	3 Muxes	MPEG-4	2012
Bosnia	2010	1 Mux	TBC	MPEG-4	2012
Romania	2010	TBC	TBC	MPEG-4	2012
Greece	2010	2 Muxes	TBC	MPEG-4	2012
Cyprus	2010	1 Mux	2 Muxes (TBC)	MPEG-4 (TBC)	2011

ASO dates

Mixed / Cable markets

Terrestrial markets

Country	DTT Launch	ASO Date
Sweden	1999	2007
Finland	2001	2007
Switzerland	2001	2008
Germany	2002	2008
Belgium	2002	2010
Netherlands	2003	2006
Luxembourg	2006	2006
Denmark	2006	2009
Austria	2006	2010
Norway	2007	2009
UK	1998	2012
Spain	2000/2005	2010
Italy	2003	2012
France	2005	2011
Czech Republic	2005	2011
Portugal	2009	2012

But still difficult situations

- **A number of countries even in the North of Region 1 will not meet the 17th of June ITU milestone for switching off Analogue TV**
  - **See details in ITU database**

- **Even more critical situations in the South of Region 1**

Key factors of success

Policy & Strategy

Legislative framework including ASO targets

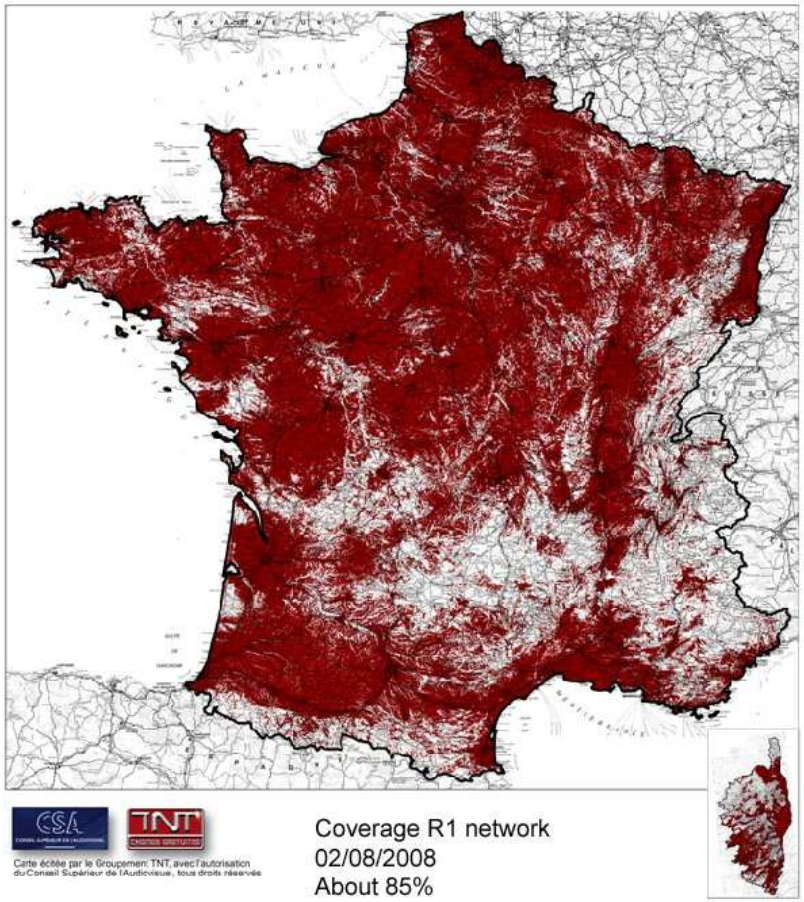
Early involvement of Government and regulators is essential

- ❑ To define ASO strategy and roadmap
- ❑ To ensure sufficient financial resources
- ❑ To ensure adequate digital receivers are available at a reasonable price

Sufficient DTT coverage

French example

- Previous 85% population coverage was considered insufficient
- Most recent Law and Decrees (2008) require a 95% population terrestrial coverage
- Availability of the DTT services on a free satellite platform to complete



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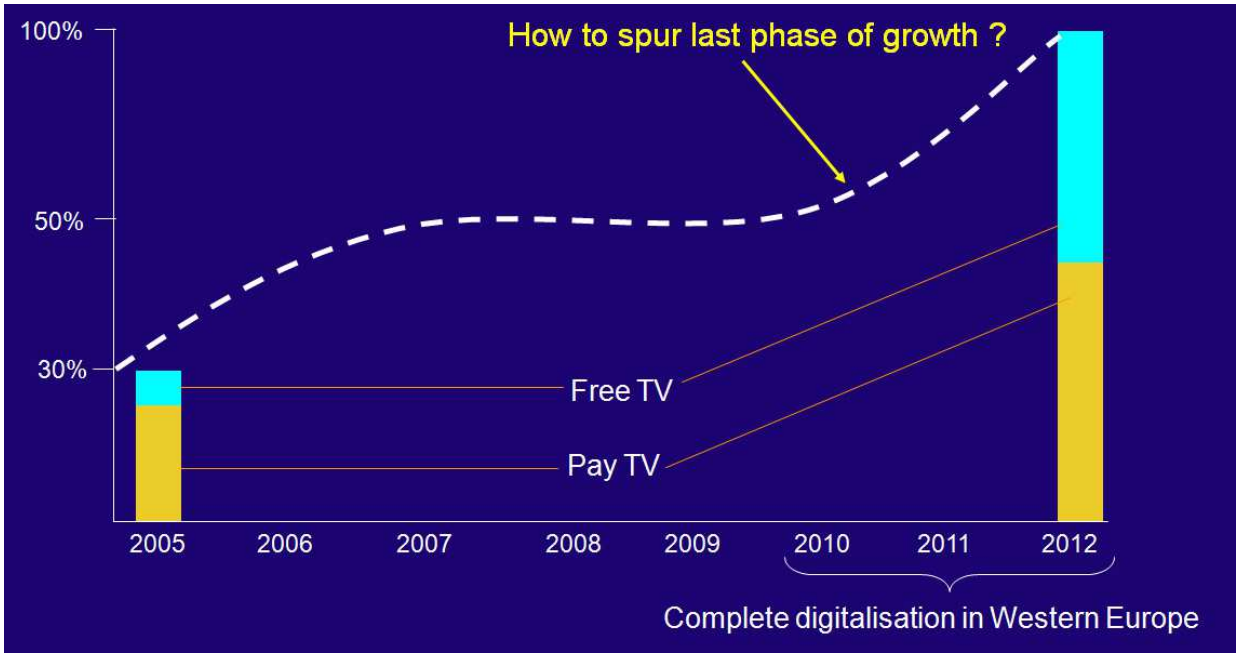
But you also need sufficient DTT penetration

French example, two years before ASO

- 70% of households had access digital TV services on at least one television set
- while 39% had converted all of their television sets to digital

- But, still 17% only received television thru analogue terrestrial TV



DTT penetration by early 2010

Country	Terrestrial dependency	DTT penetration	DTT coverage	Years since DTT launch	Years ASO process
UK	49%	39%	80%	11 years	4 years
Spain	82%	67%	96%	9 years	2 years
Italy	78%	52%	80%	5 years	4 years
France	58%	43%	89%	4 years	2 years
Germany	9%	9%	90%	7 years	0-9 months

Penetration : number of homes relying on DTT for their main TV set
To be compared with terrestrial dependency for ASO

DTT coverage today

Country	PSB multiplex	Other multiplexes
Czech Republic	100%	95-85%
Denmark	99%	97%
Finland	99.8%	99.8%
France	95%	95%
Germany	90%	90%
Italy	99%	95%, 90%, 85%
Norway	95% plus satellite shadow areas	95%
Portugal	92.7%	n/a
Spain	98%	96%
Sweden	99.8%	98%
Switzerland	99%	n/a
UK	98.5%	90%

A precise ASO roadmap

2008
Border

2009
Border / Granada / Wales / West Country

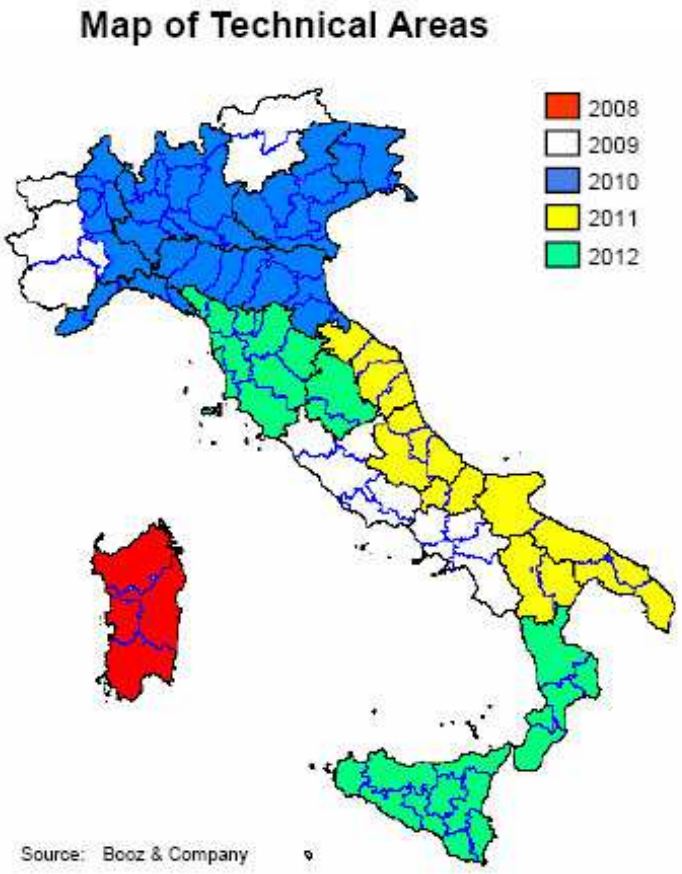
2010
STV North / STV Central / Wales / Channel Islands

2011
STV Central / Yorkshire / Central / Anglia / West

2012
Tyne Tees / London / Meridien

A precise ASO roadmap

- In Sept 2008, the Italian Government published its ASO timetable
- 16 technical areas have been switched-off in 4 years



Communication is key

- Viewers must understand what will happen, when, and, how to prepare?

Consumer awareness plan in UK						
	3-Years	2-Years	1-Year	<12 months	1 month	Switchover
National Launch of SwitchCo	"Get ready"	"How to get ready"	"Are you ready?"	Countdown – switchover is happening	Countdown – switchover is here	Switchover to 100% digital

Why is Pink so popular?

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Tuner availability

Ensuring that all television sets sold after a set date can receive DTT services

- In France, **by law**, all TV sets sold since 6 March 2008 must include a DTT tuner
- In Italy, **by law**, all TV sets sold since June 09 must include a DTT tuner
- In the UK, three major retailers (Currys, Dixons, PC World) took a **self decision** and announced in January 2008 that they would no longer sell analogue-only TV sets

And of course…

- Funding for ASO organisation
- Cost of information campaigns

- Financial support may be necessary.

  Intended recipients of aid include low-income households, general public, or households with communal antennas

DSO Costs

Country	Purpose	Amount	Source
France	ASO + Help Scheme	€ 397 million	Government/Broadcasters
UK	Help Scheme	€ 693 million	BBC
	Marketing activities	€ 230 million	Digital UK
	DSO total	€ 4.37 billion	Private/public
Italy	Help Scheme	€ 50 per qualifying HH	Government
	ASO pilots	€ 55 million	Government
	DTT roll-out	€ 33 million (2007)	Government
	DTT subsidy	€ 220 million (illegal?)	Government
Spain	DSO projects	€ 75 million	Government
	DSO as of March 09	€ 1.2 billion	Private/public
Finland	ASO	< € 1 million	Increased license fee for YLE
Sweden	Help Scheme	No special budget	Government
	Marketing activities	€ 2 million	Government
USA	DTV coupon program	$ 1.9 billion	Government

Network costs

- **Cost of 6 French multiplex networks estimated between 500 and 1000 M€ (Main transmitters)**
- **Quid of 95% coverage?**
- **Sate help for analogue TV necessary frequency changes during transition about 60 M€**

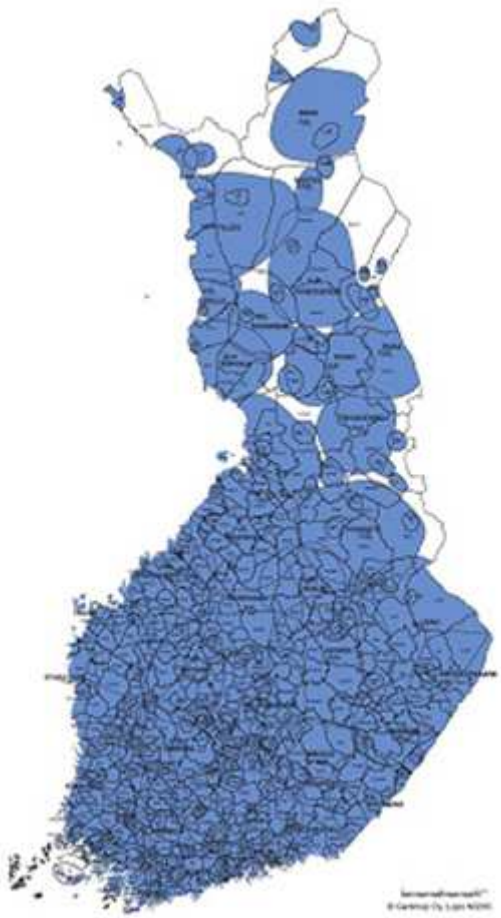
Handbook available at
www.digitag.org

Lessons to learn: Finland

- National ASO on 31 Aug 2007

Issues that arose

- Receivers (subtitles)
- Reception in some areas
- Date: coincided with the weekend
- Public Service Broadcaster on frontline: 20% of viewers stopped paying television license fee



Lessons to learn: Sweden

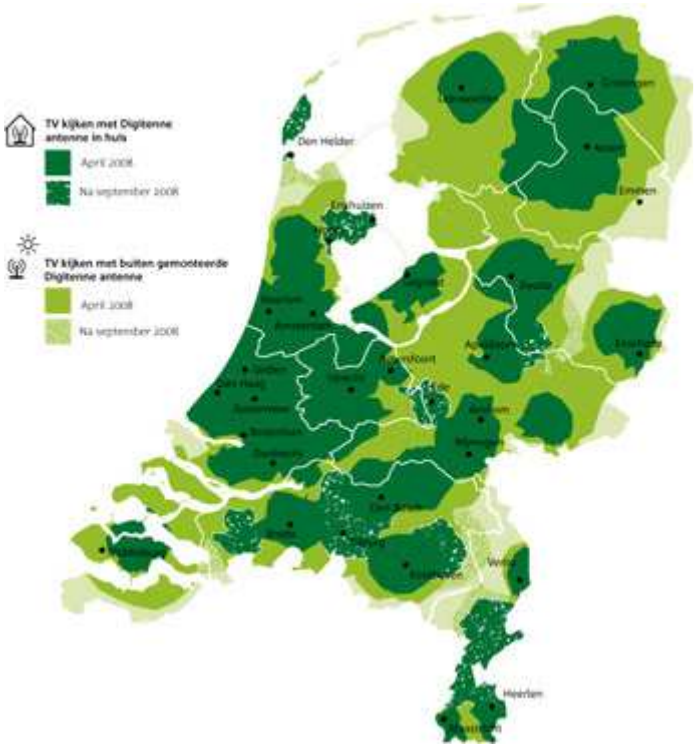
- Launch of DTT services in 1999 offering a largely pay DTT platform operated by Boxer
- Attractive programme offer combined with competitive pricing has allowed Boxer to effectively compete with other television operators
- Five phases to switch-off starting in September 2005 and completed in October 2007
- **40% of viewers waiting until last month to purchase DTT receivers**

Lessons to learn:
The Netherlands

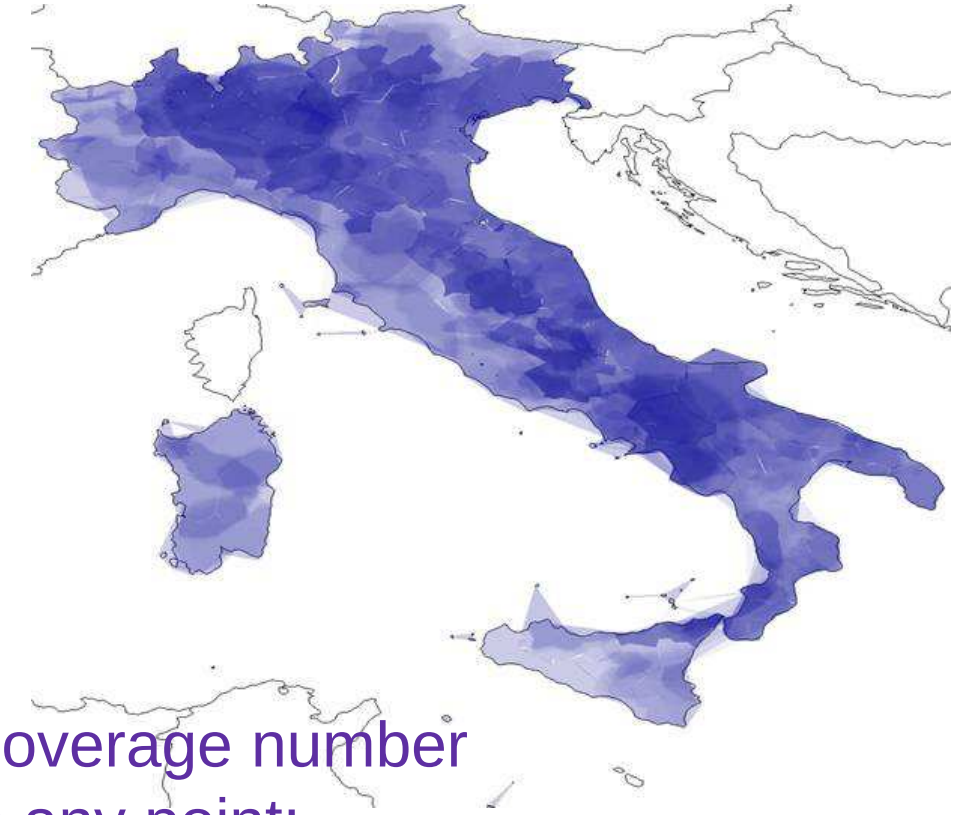
- DTT platform launched in 2003 offering limited free-to-air services from the PSB and extensive pay services from Digitenne

- ASO completed on a single day on 10 December 2006

- Since then, DTT penetration has increased from 3-5% to 12% of the population



Lessons to learn: Italy (the Theory)



Coverage number in any point:

From 7 (clear blue) to 25 (dark blue)

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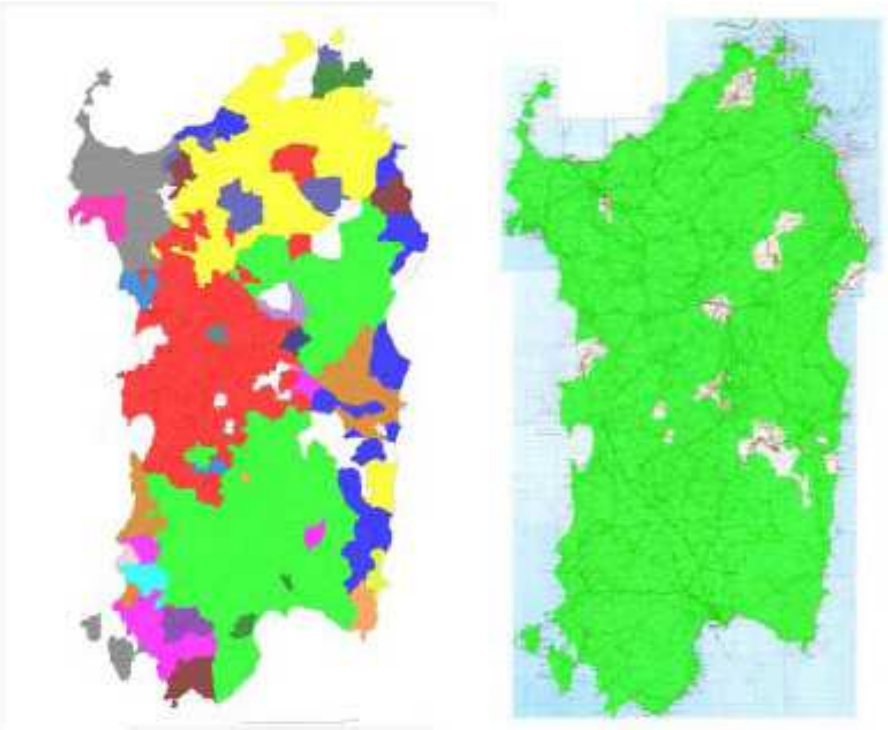
Lessons to learn:
Italy (Real life)

- On 31 October 2008, analogue switch-off completed in Sardinia
- Currently, the largest, all-digital area, using Single Frequency Networks

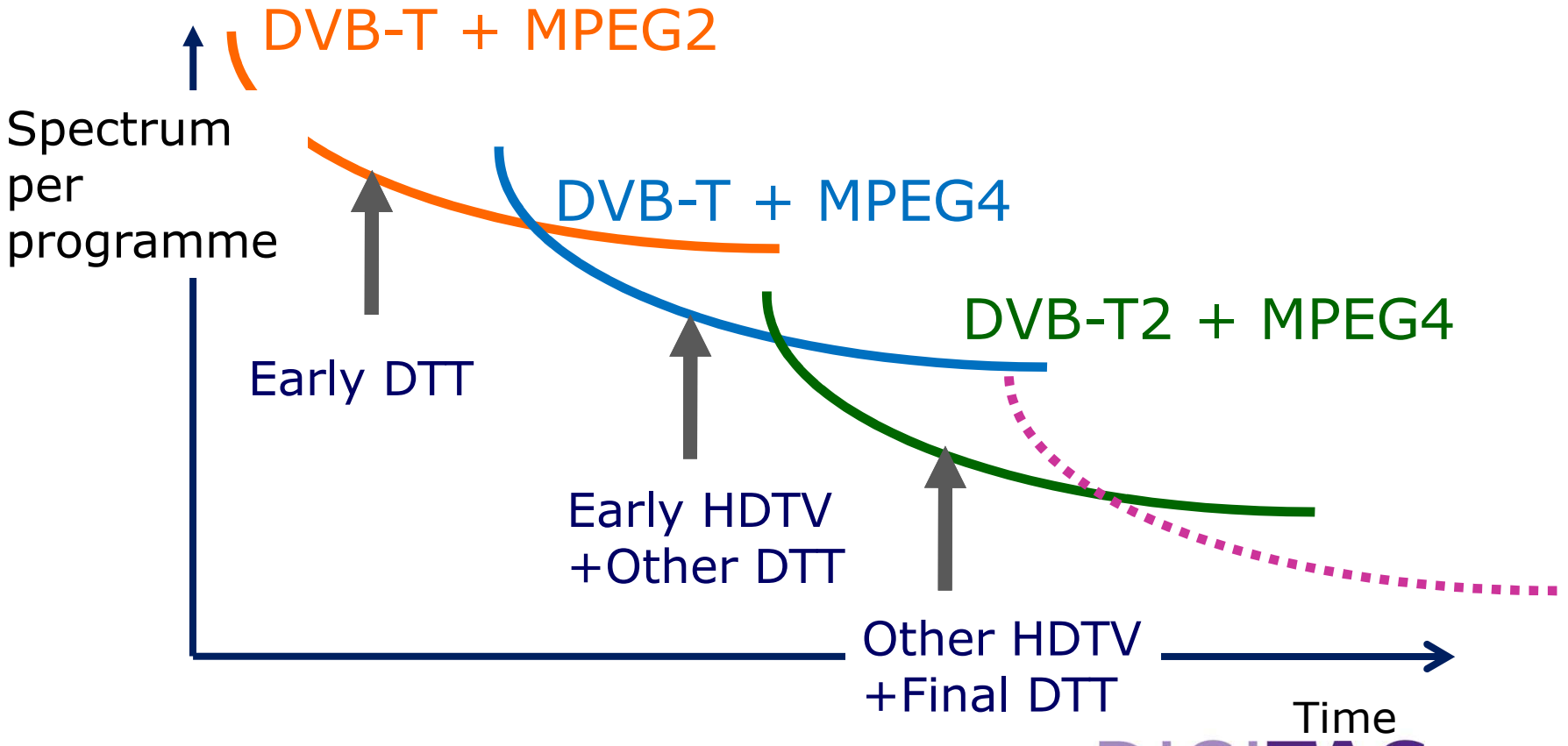
MFN pre switch-off **SFN post switch-off**



Switch-off benefits
▪ 14 frequencies "switched-off" in the island ▪ 22 national MUXes - 20 local MUXes (some with partial coverage) - 4 radio MUXes ▪ DTT offering of 59 digital channels – 29 national – 30 local

Be prepared for evolution

Technical innovation is essential, but be careful and smart when using it!



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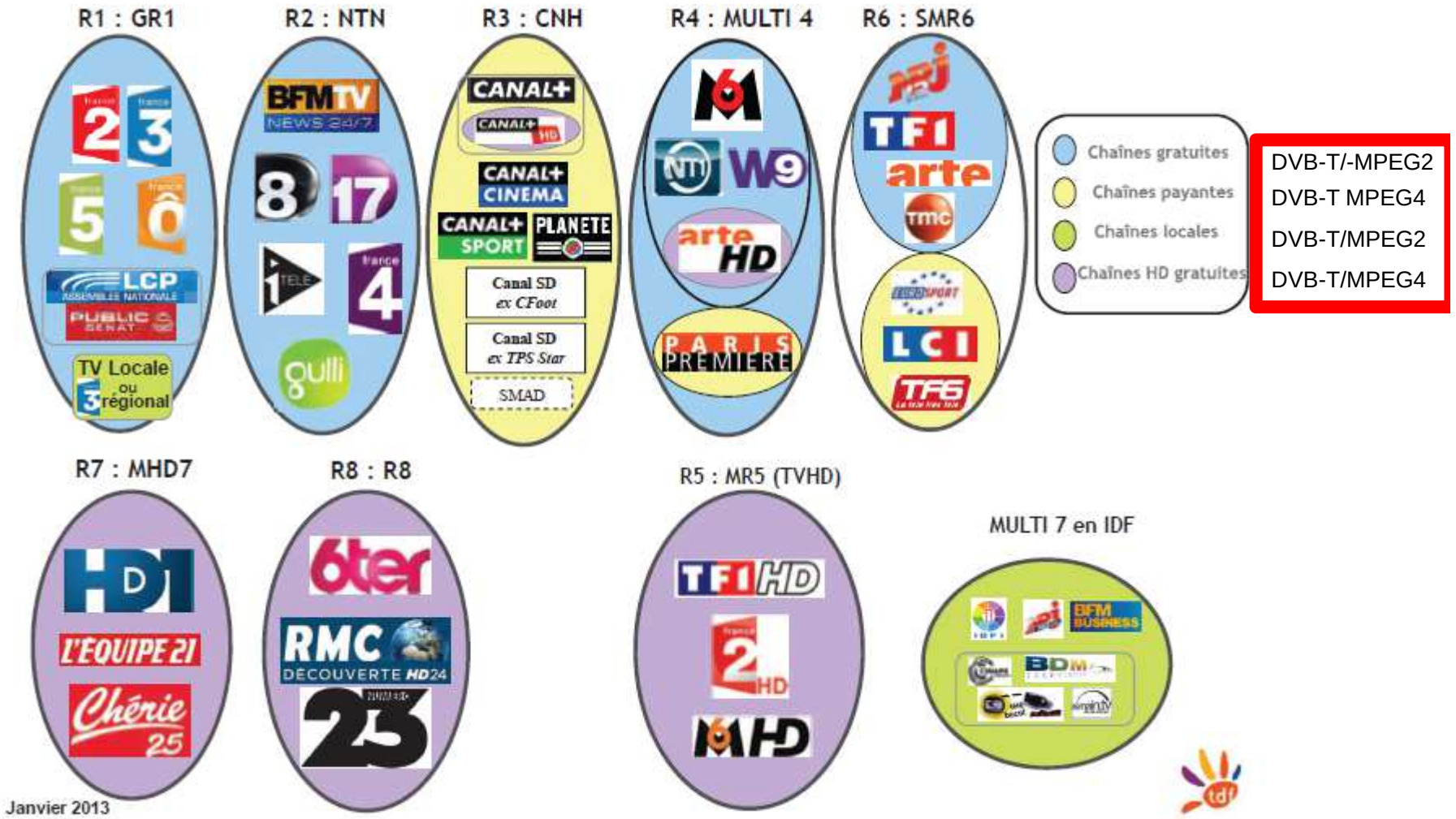
Technical innovation provides opportunities,but be careful!

- **Opportunities**
  - **Spectrum is a scarce resource, but is needed for introducing new services, so that the DTT platform keeps its attractiveness in comparison with other plaforms**
  - **Use of T2 for countries not having yet DTT, or for introducing new services(i.e. HD) for countries not having it yet(UK, Sweden…) is the right thing to do**

- **But be careful!**
  - **The current context where there is pressure for finding additional spectrum for Wireless Broadband, leads to create pressure on the early DTT adopters for migrating towards the more efficient technology that is T2**
  - **But introducing new technology at the occasion of launching new services(what France, Italy, Spain… did with MPEG4 for HD, and UK, Sweden… with T2) is one thing, to migrate existing services is a completely different thing, and is equivalent to a transition from Analogue to Digital , WITHOUT ANY BENEFIT FOR CONSUMERS!**

Be flexible
French example



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Prepare evolution :Tuner mandating

French legislation has played an important role in HD DTT success:

- All HD-ready television sets had to include a MPEG-4 AVC HD tuner as of 1 December 2008.
- Manufacturers had to include an MPEG-4 AVC HD tuner in all TV sets sized 26 inches and above, as of 1 December 2009.
- By 1 December 2012, all TV sets had to include an HD DTT tuner.
- By 1 December 2012, all new DTT receivers had to be able to receive both SD and HD content.
- This will be used to create a large enough basis of MPEG-4 enabled basis receivers, for preparing a SWO of DVB-T/MPEG-2 emissions by May 2016

HD / DTT services

- **Labelling is essential for consumer guidance**

- **Launching HD services using DVB-T**

  - Sufficient capacity to provide 3 HD services per multiplex
  - France, Hungary, Norway, Italy, Denmark
  - France & Spain: All HD TV sets must include an HD MPEG-4 AVC decoder

- **Launching HD services using DVB-T2/MPEG 4**

  - Benefiting from a compression gain of over 60%
  - United Kingdom, Finland

WRC-07 started a new process

ITU WRC-07 added an allocation to the Mobile Service in the 790-862 MHz sub-band as a co-primary service with Broadcasting

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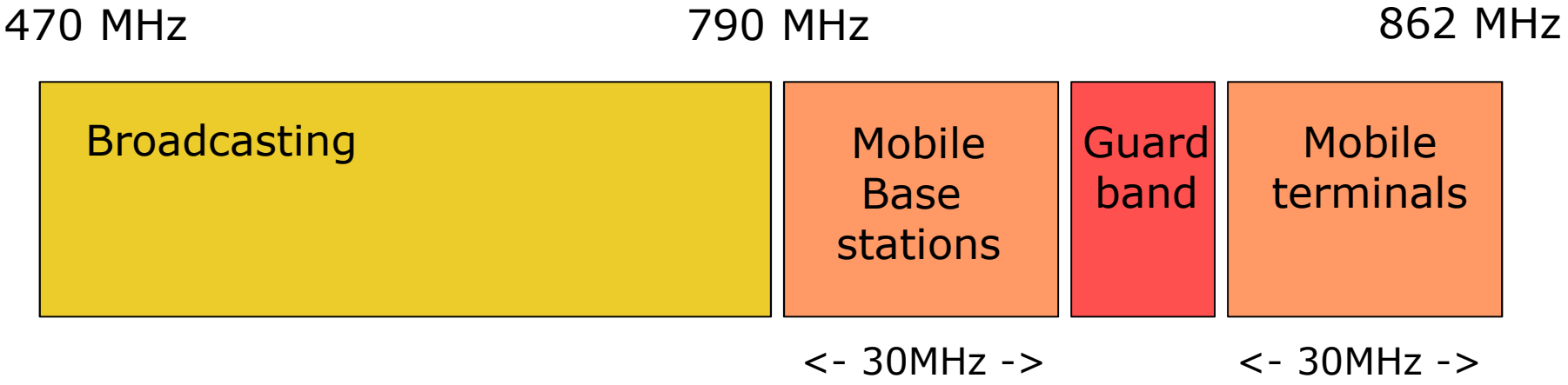
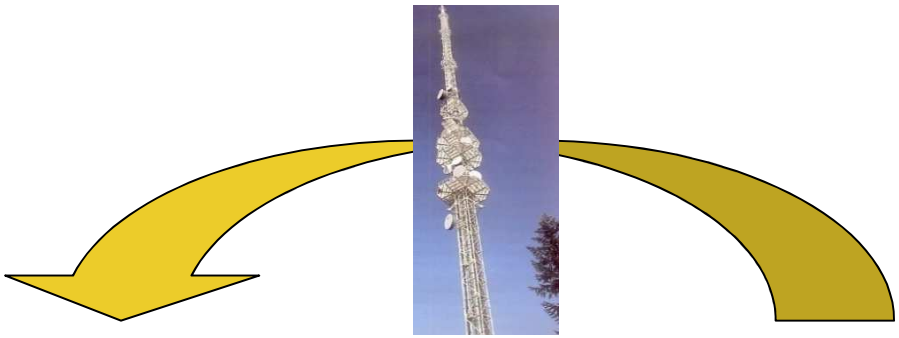
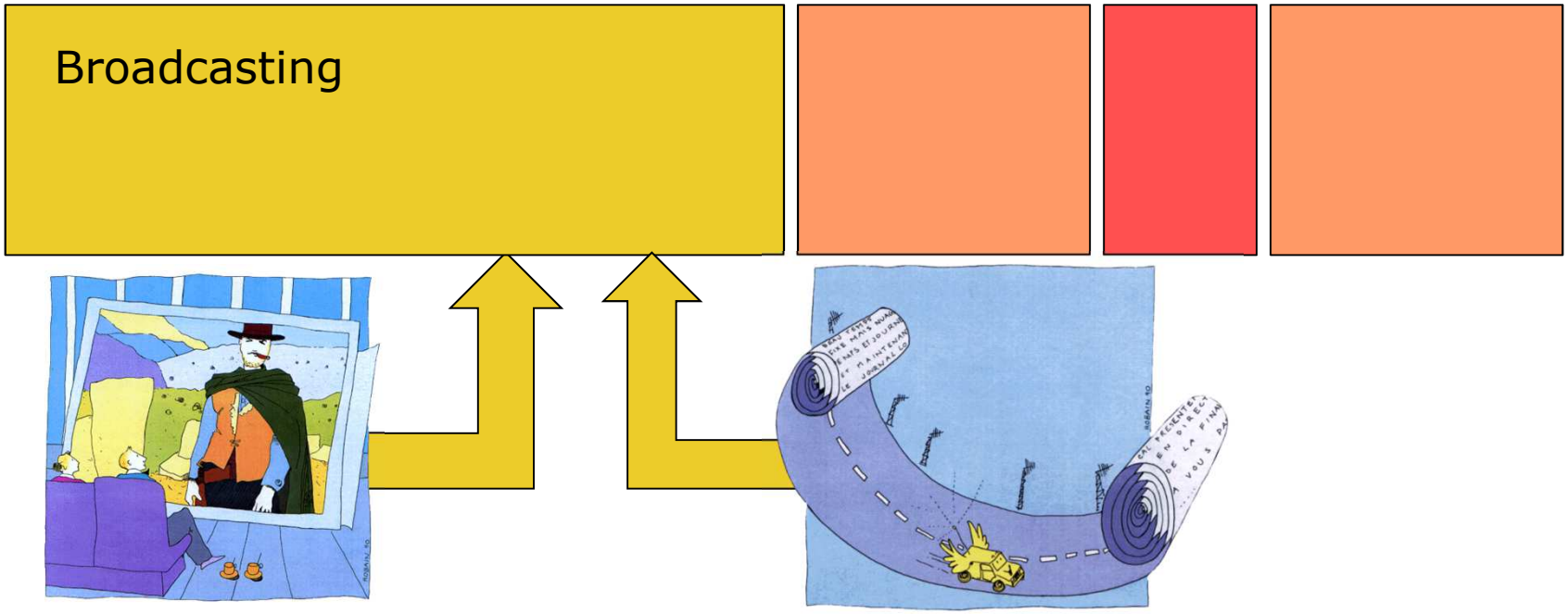
What has happened



Consequences for Broadcasting

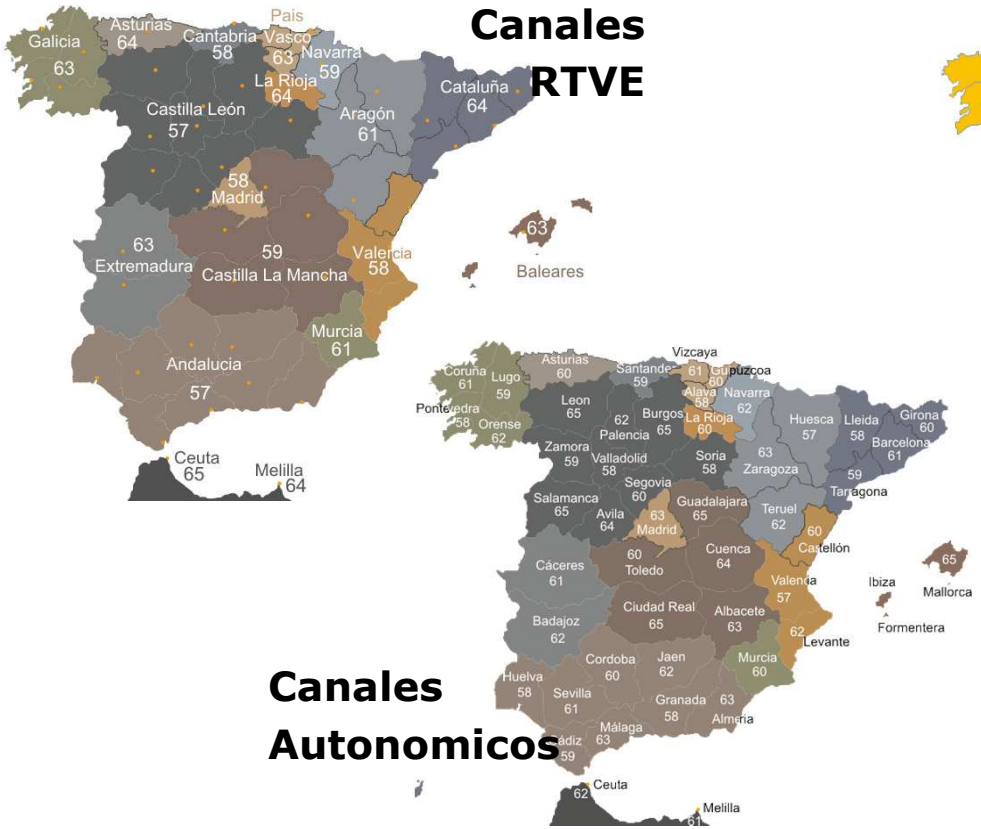


470 MHz 790 MHz 862 MHz



Some very difficult situations
Example of Spain

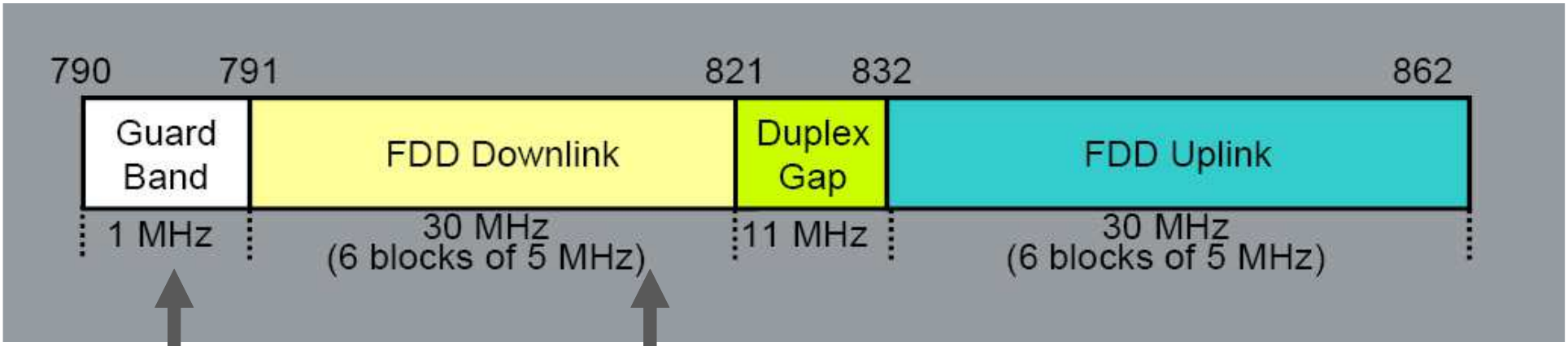
RRC06 situation:



Intense use of SFN

Impact on DTT
resulting from LTE in 800 MHz band

How to avoid interferences:



Measure n°1:
Guard Band

Measure n°2:
Base Stations
In the lower sub-band ->
Easier control

Measure n°3 : if this is insufficient take additional actions according to DigiTAG, EBU, BNE and ACT recommendation

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DigiTAG & All recommendation related to LTE downlink interferences

October 2010

Minimising the potential interference to Digital Terrestrial Television (DTT) broadcasting services from Mobile/Fixed Communications Networks (MFCN) operating in the 790-862 MHz frequency band

Joint recommendations from DigiTAG[1], EBU[2], BNE[3], ACT[4]

See annex for details

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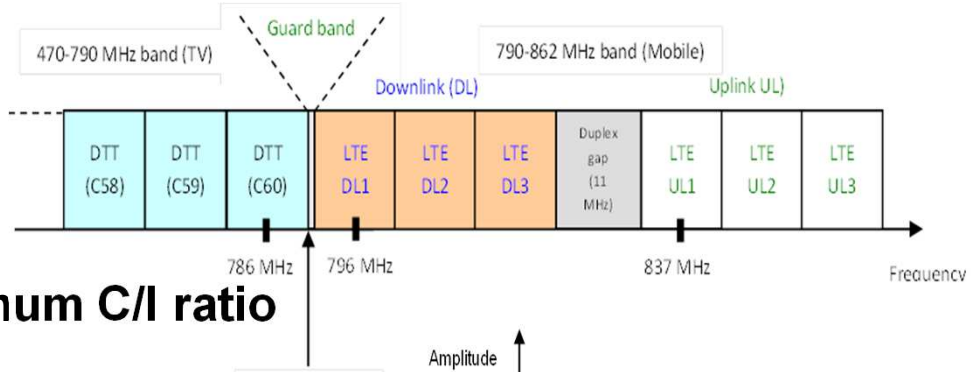
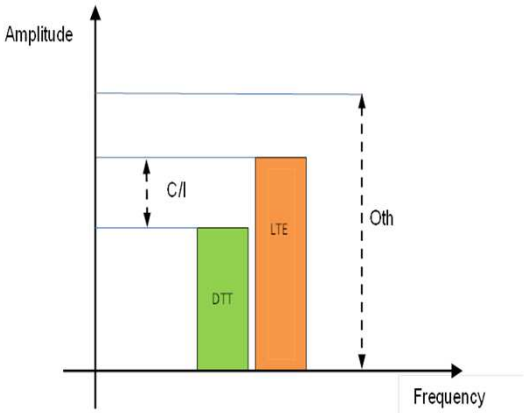
Coexistence between LTE and DTT

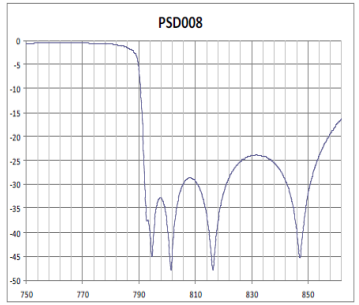
- **Frequency plan**



- **2 issues**
  - **Protection ratio (PR): minimum C/I ratio needed**
  - **Overloading threshold (Oth): maximum I level not to be exceeded**



- **1 medicine: efficient and cost competitive domestic LTE mitigation filters are available on the European market today**



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And also issues with LTE User Equipments!

- **Need to protect the consumer receiving conditions from interferences caused by nearby mobile phones (OOB emissions issues)**

What is really experienced: Example of France

- **So far, the foremost (99%) source of complaints comes from aerial amplifier overloading**

- **Impact to DTT households is lower than anticipated, although significant, and appears to be manageable through swift provision of filters**

- **No impact on broadcast transmitters and gap fillers pilot reception so far**

France october 2014

Real-life interference from LTE 800 MHz to DTTB reception in France Number of active three sectorial base stations (BS) = 5936; Urban predominated roll-out		
	Number of interference	
DTTB reception mode	**Number of interference to DTTB reception**	**Estimated number of interference to households**
Individual aerial reception[1]	21790	21790
Communal aerial reception[2]	7806	101478
Total number of interference	29596	123268
Average number of interference per BS	≈5	≈21
[1] An individual aerial reception is when a single TV aerial feeds a single household. [2] It is assumed that a common aerial feeds on average 13 households		

Real-life interference from LTE 800 MHz to DTTB reception in France Number of active three sectorial base stations (BS) = 5936; Urban predominated roll-out	
Interference distance*	
Max distance (m)	5770
Average distance (m)	582
Median distance (m)	487
Standard deviation (m)	423
* Distance between the victim DTTB receiver and the interfering BS transmitter	

Who pays for mitigation

	Mitigation organisation / call centre	Filters, new antenna
Finland	Mnos (1/3 each)	Filters, installation, antennas: MNOs
France	Mnos (1/3 each)	Filters, installation: MNOs. Antennas: viewers
Germany	No info	Filters: no clear information . Installation/antenna: Viewers
Norway	MNO (1/3 each)	MNOs (1/3 each) for filters, installation, new antennas when filter is not solving the issues
Ireland	No organisation	Filters, installation, antennas: viewers
Italy	MNOs (1/2, 1/4, 1/4)	Filters, installation: MNOs. Antennas: viewers
Poland	No organisation	Not defined
Spain	No organisation	Not defined; but MNOs are responsible to solve interference
Sweden	MNO	Filters: the MNO that causes the interference. Other: viewers
UK	MNO	Filters: MNOs

Conclusion

RRC-06 Plan has proved to be a good starting point for evolution

- It has already accommodated more networks and services than foreseen in 2006…
- Broadcasting DTT will need to keep a very flexible **evolutionary** approach to be able further innovate (HDTV for all channels, UHDTV…) in spite of continuous pressure to release more spectrum!
- See tomorrow presentation on use of Digital Dividend!

Many thanks for your attention

WWW.digitag.org

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ANNEX

Recommandations for protecting DTT

from interferences

of LTE base stations in 800 MHz band

Recommandations on downlink LTE interferences (1/2)

In order to provide an appropriate level of protection to DTT services below 790 MHz with respect to emissions from mobile/fixed communications networks (MFCN) operating within the 790-862 MHz band, DigiTAG, EBU, BNE and ACT, recommend that prior to the award of licences for use of the spectrum, the following protection measures be applied:

- **the most protective level defined in EC decision 2010/267/EC (baseline requirement in case A) should be applied in all cases;**

- **additional mitigation measures are required to be put in place, as necessary, by mobile/fixed communication network licence holders to ensure full protection of DTT broadcasting services. These services include also portable and mobile DTT when these reception modes are part of the national coverage concept. The basis for this protection should be careful network planning by the MFCN operator to avoid situations that may create interference to the reception of DTT. The associated costs of implementing remedies should not be borne by broadcasters, broadcast network operators or viewers. Depending on the actual situation, these measures may include but are not limited to:**

  - reducing the power of the MFCN transmitters and adjusting their antenna characteristics to reduce interference problems, taking into account local conditions, especially for the MFCN Base Stations using the first frequency block above 790 MHz;
  - using a Base Station antenna polarisation that is opposite to that of the DTT transmitter, especially for Base Stations using the first frequency block above 790 MHz;
  - use of additional RF filtering at MFCN Base Stations, especially for Base Stations using the first frequency block above 790 MHz;
  - use of on-channel low-power DTT repeaters at the MFCN Base Stations to restore the degradation of signal to noise ratio at affected DTT receivers. Such remedies should be coordinated with the impacted broadcast multiplex operator, since it may not be easily applicable, such as in the case of DTT transmitters operating in a Single Frequency Network (SFN);

Recommandations on downlink LTE interferences (2/2)

- **It is further recommended that when granting frequencies in the 800 MHz band the following additional measures be considered:**
  - to make appropriate information on the licences awarded available, for instance on regulators' websites, so that consumers suffering from interference know why this is happening, to whom they can complain and what action can be taken;
  - setting-up an Entity, independent of the MFCN licence holders, as a point of contact to which cases of interference or loss of DTT service can be reported, to ensure a prompt and effective resolution in a timely manner;
  - ensuring that consumers experiencing loss of DTT service, even after mitigation measures mentioned above have been implemented, are promptly provided with adequate equipment to allow continued reception of DTT services. Such equipment may include filters connected in front of the DTT receiver or receiving antenna amplifier system to eliminate harmful interference stemming from emissions in the frequency band 790-862 MHz. Such measures must not unduly impair reception of channel 60. The associated costs of these necessary remedies should not be borne by broadcasters, broadcast network operators or the viewers;
  - any other actions necessary for circumstances when the above measures have proven ineffective.
- **It is highly recommended that field trials be organised to observe the 'real world' impact of the deployment of mobile/fixed communications services versus the results of theoretical models utilised for prediction purposes. The results should be made available to interested parties in Europe.**

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