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The Electronic Communications Regulatory Challenges Experiences from the Looking to the Future Project

Croatian approach to Digital Dividend

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Introduction

- Transition from analogue to digital transmission and analogue switch off (ASO) in European countries is in progress
- The main benefit is releasing of some spectrum capacity (the frequency band of 790-862 MHz)
  - it cannot be fully used until all countries in a given area have completed ASO
- In Croatia, transition to digital television (DTV) has been finished in October 2010
- The frequency band of 790-862 MHz is released and going to be assigned on a public auction

Analogue & Digital Television comparison

Analogue television

- Production, broadcasting and reception – analogue
- Resolution up to 720 x 575
- Aspect ratio 4:3
- Fixed reception
- Frequency channel can carry one SDTV program

Digital television

- Image,sound and additional information are generated, transmitted and received as digital signals
- Resolution up to 1920 x 1080
- Aspect ratio 16:9
- Fixed, portable and mobile reception
- Frequency channel can carry 4-5 SDTV programs (MPEG-2 compression)

Analogue & Digital Television comparison

Analogue television

- Subject to noise and interference
- Signal gradually fade when signal level decreases or interference increases
- Multi-frequency networks - frequencies can only be reused after a certain distance between the stations using the same frequency

Digital television

- Without impact of noise
- Cliff effect - sudden loss of digital signal reception
- Single-frequency network - use the same frequency to transmit the same information (programs) → better usage of frequency spectrum

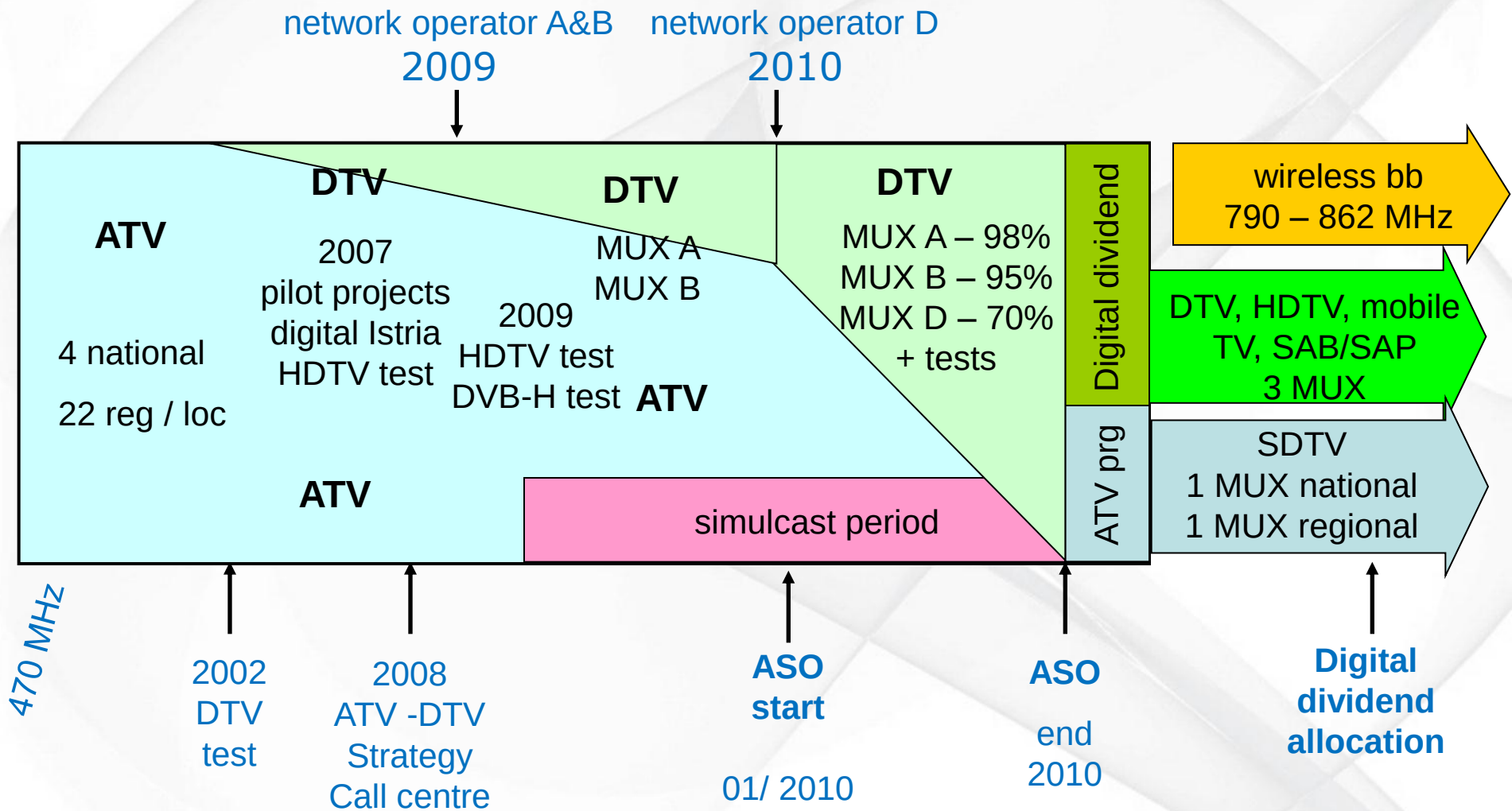
Digital Television

- Different picture formats

Format	Name	Screen	Scan type	Resolution
SDTV	625/50	4:3	interlaced	720 × 576
SDTV	525/60	4:3	interlaced	720 × 480
HDTV	720p	16:9	progressive	1280 × 720
HDTV	1080i	16:9	interlaced	1920 × 1080
HDTV	1080p	16:9	progressive	1920 × 1080

- DVB-T (Digital Video Broadcasting – Terrestrial)
  - Most widely used standard in Europe, based on Coded Orthogonal Frequency Division Multiplexing (COFDM)
- DVB-T2
  - The second generation of DVB-T standard
  - Provides better spectrum efficiency

Analogue to Digital transition



Digital dividend usage in Croatia

DD – spectr. above freqs. required for existing BC in DTV

DD in Croatia very big – 1 MUX for 4 nationalwide ATV

Division of digital dividend in Croatia :

- Wireless broadband communications for high speed mobile data services – 790 – 862 MHz
- New broadcasting services (SDTV, HDTV, MPEG4, DVBT2) - (4 MUX-es)
- Mobile multimedia services – SFN network (1 MUX) - ?
- Secondary transmissions on non-interference – non protective basis („white space”)
- Other services (PPDR, wireless microphones…)

Challenges of Digital Dividend

- 790-862 MHz – good propagation characteristics – less infrastructure for wider mobile coverage
- Rural areas with broadband services at lower cost (30% cells for the same coverage as 3G at 2100 MHz)
- Industry asks for even more spectrum
- For successful implementation harmonisation crucial (up to 50% lower terminal costs)
- Harmonisation on European level – mobile service – different ASO plans
- Croatia adjusted its regulatory framework for mobile service in 2008

Challenges of Digital Dividend

- FDD channeling arrangement

790-791	791-796	796-801	801-806	806-811	811-816	816-821	821-832	832-837	837-842	842-847	847-852	852-857	857-862
Guard band	DL						Duplex gap	UL					
1 MHz	30 MHz (6 x 5 MHz)						11 MHz	30 MHz (6 x 5 MHz)					

- Possible interference between different services – mitigation techniques to be used
- Interference between cable and mobile networks manageable

Digital Dividend in Croatia

- Croatia – specific geographical shape and position – high mountains
- Different ASO plans from different neighbours
- As a result – even though the ASO process is finished in Croatia, DD cannot be used efficiently for mobile service on the whole territory
- Technology and service neutral approach – licenses only for spectrum
- Auction foreseen for DD – careful choice of parameters

Digital Dividend in Croatia

- Parameters for auction:
  - **Package size** – minimum, maximum, multiple bands
  - **License duration** – return of the investment
  - **Geographical area** – nation wide or regional
  - **Coverage obligations** – minimum, rural areas first
  - **Use in border areas**
  - **Format** – Simultaneous Multiple Round Auction, Combinatorial Clock Auction
  - **Minimum price**

Digital Dividend in Croatia - Conclusion

- Complex situation – different services (ATV, DTV, mobile, wireless microphones, cable systems…), interference
- New broadband services – benefits for users
- Regional harmonisation crucial (in time and technology)
- Careful choice of parameters for the allocation (tender, auction)

Thank you...