International co-ordination of DVB-T in Europe

ITU-seminar Kiev

13 - 15 November 2000

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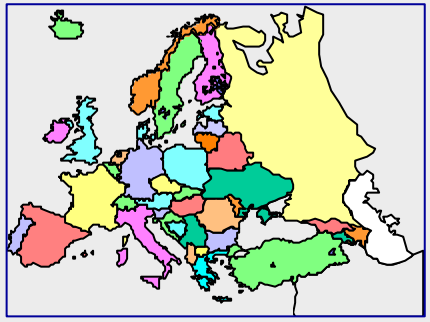
www.nozema.nl

The challenge

How to introduce DVB-T in Europe?



For detailed information see:
Reports on www.ero.dk

1. Respecting equal rights of all countries
2. Achieving satisfactory digital coverage
3. Ensuring protection of analogue services
4. Making migration to all digital plan possible

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...equal rights of all countries (1)

International agreements

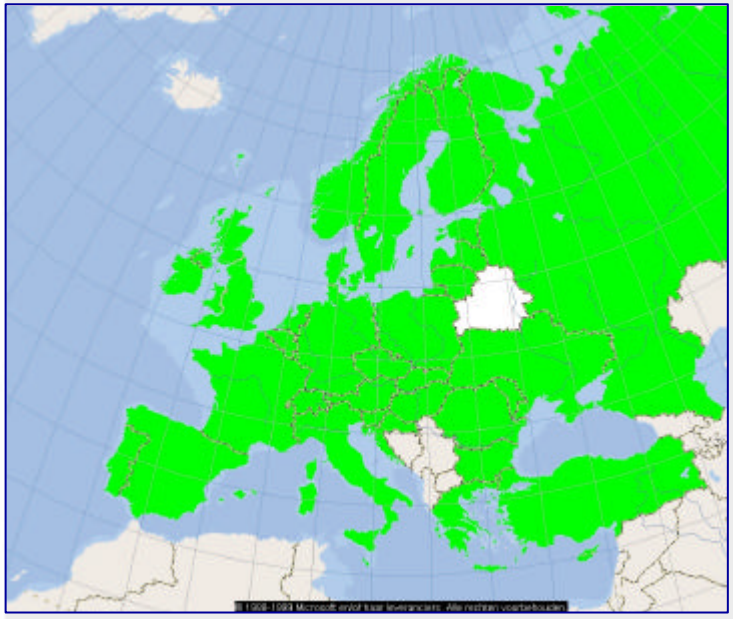
To protect ß From Þ	Analogue tv	DVB-T	Conversions	T-DAB	Other services
Analogue tv	ST61	CH97	CH97	WI95	ST61
DVB-T	CH97	CH97	CH97	WI95 *	CH97
Conversions	CH97	CH97	CH97	WI95 *	CH97
T-DAB	WI95	WI95 *	WI95 *	WI95	WI95
Other services	ST61	CH97	CH97	WI95	RR

* protection criteria in CH97

ST61: Stockholm agreement 1961
CH97: Chester agreement 1997
WI95: Wiesbaden arrangement 1995

...equal rights of all countries (2)

Chester 97



CH97 signatories

- Additional procedures to ST61
- Rules and calculation methods for co-ordination
- Right of conversion of an analogue assignment into digital
- Co-ordination on basis of unified criteria (i.a. C/N=20dB)
- Frequency assignments by means of bi or multilateral negotiations

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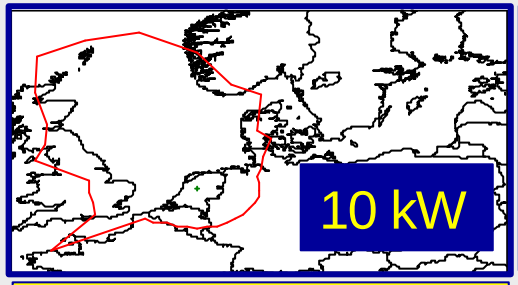
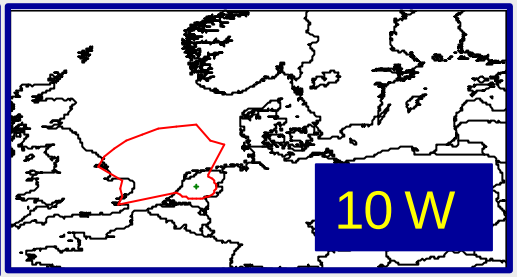
...equal rights of all countries (3)

Co-ordination distances

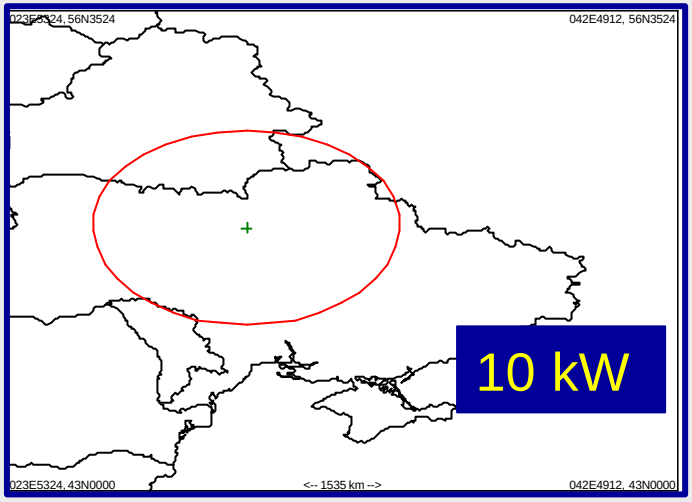
examples



7 affected countries



2 affected countries



Sent by NL: 188 requests
Received by NL: 1397 requests

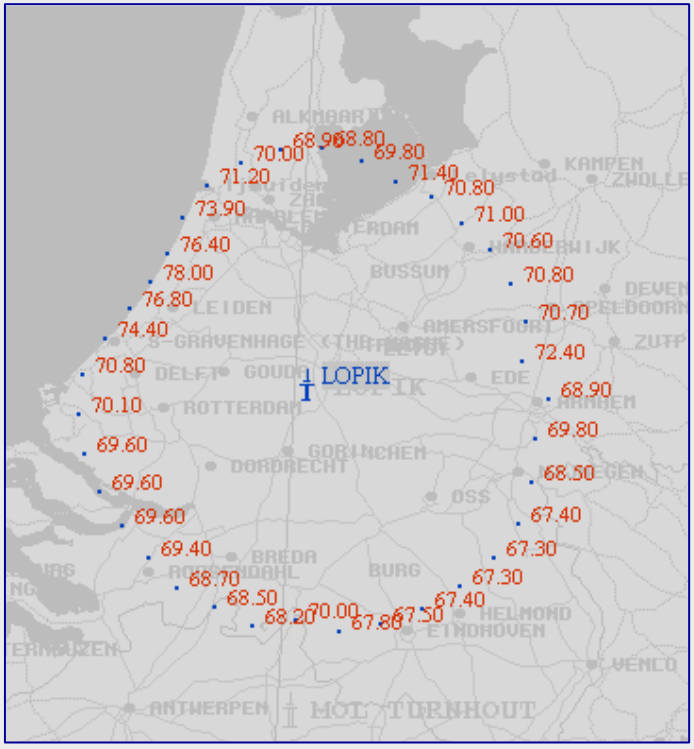
Affected countries (3)
Bielorussia
Moldavia
Russia

...equal rights of all countries (4)

CH97 calculation process

- Calculation of increase of interference relative to reference situation
- Reference interference situation (July ´97) calculated at 36 test points for each station
- Increase of < 0.3 dB normally acceptable
- Higher increase subject to negotiations

example



Results available at ERO ftp

- Calculations for current and fictive all digital situation (conversions!)

...equal rights of all countries (5)

Application of CH97

- In general no great difficulties with CH97
  - strict application leads to severe restrictions of DVB-T stations
  - administrations agree bilaterally on more relaxed criteria
- Considerable burden is required in dealing with DVB-T co-ordinations

...satisfactory digital coverage (1)

- Analogue planning based on roof top antenna
- Most countries have indicated that now or in future portable and mobile reception is important
- CH97 co-ordination criteria take portable reception into account to a certain extent
  - no antenna discrimination
  - however Emin of 65 and 69 dBµV/m for Band IV and V respectively

Indoor stationary

Portable receiver

...satisfactory digital coverage (2)

Rooftop and indoor reception

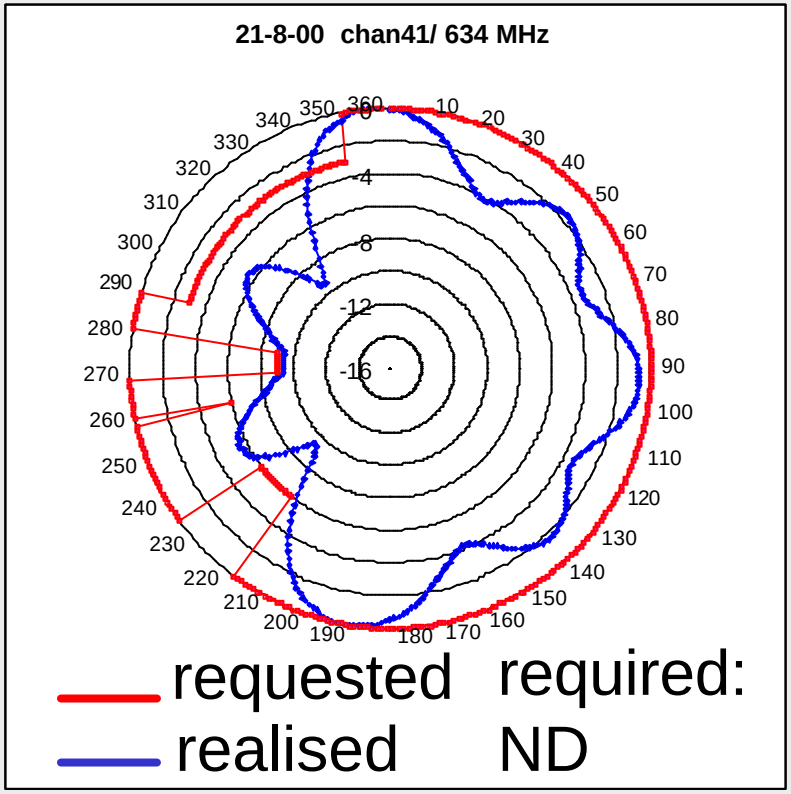
Item	Rooftop	Indoor	Difference
Channel	Ricean	Rayleigh	1.5 – 7 dB
Antenna gain minus feeder loss	5 – 7 dB	0 dB	5 – 7 dB
Building penetration	No	7 dB	7 dB
Receiving height	10 m	1.5 m	10 – 12 dB
Location margin - 95%	9 dB	14 dB	5 dB

- Total effect depends also on interference level:
- Indoor requires ~8 - 31 dB more than for rooftop antenna
- *No criteria yet for mobile reception in CEPT and ITU*

...satisfactory digital coverage (3)

- To achieve satisfactory digital coverage e.g.:
  - use of adjacent channels
  - use of SFNs
- Nevertheless often ERP restrictions are needed to protect analogue
- Compromises are needed in overage or capacity

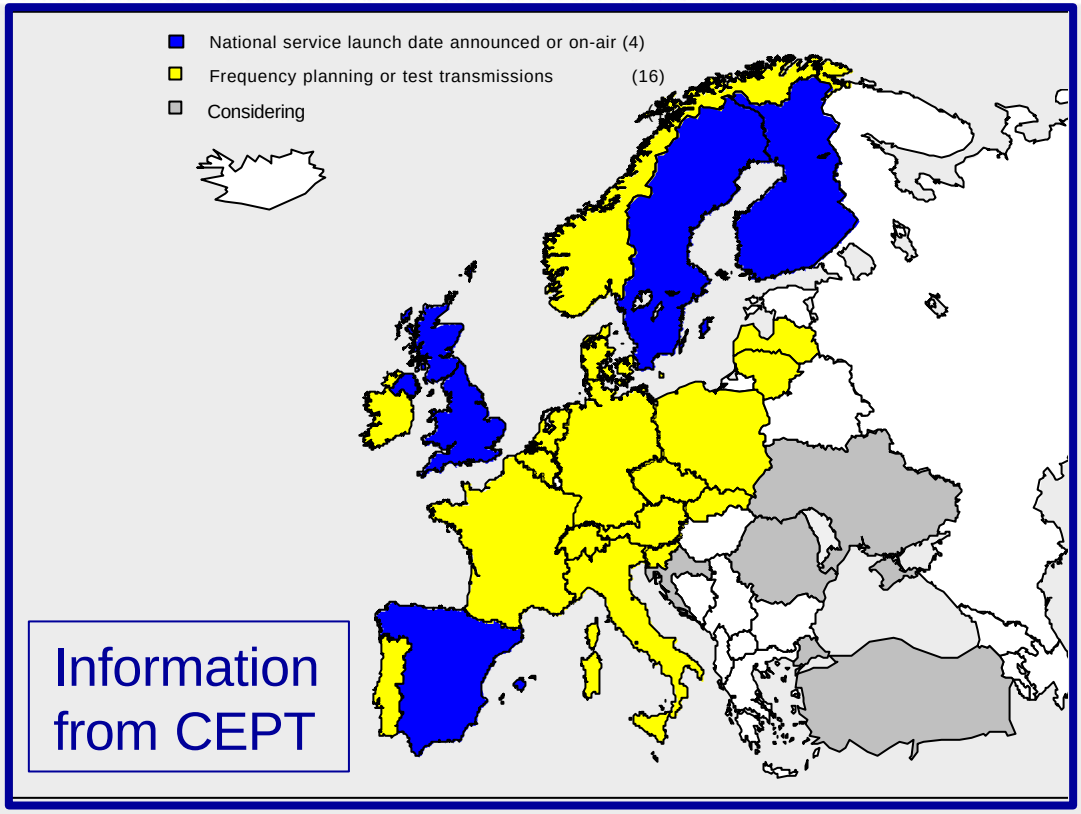
example



...satisfactory digital coverage (4)

DVB-T introduction

- **Operational**: 572 tx in G, FIN and S
- **Test:** 87 tx in 8 countries
- **Within one year:** 974 tx
- See also www.ero.dk



...protection of analogue services (1)

Current situation

Main stations up to 1 MW

Fill in stations down to 1 W

- > 85,000 analogue tx
  - main stations
  - fill-in stations
  - some are disputed
  - information available from ERO
- 9 different analogue systems
- Also other services to be protected
  - Radio astronomy ch 38
  - Tactical relay ch >60
  - DAB in Band III

...protection of analogue services (2)

Frequency band allocation

- CEPT decision: Band III and IV/V (not band I) for DVB-T
- Need to re-use analogue television spectrum
- Co-exist with analogue television for many years

WRC 2000

Region 1 (Europe & Africa)

470MHz

Broadcasting

~~Mobile (IMT 2000)~~

862 MHz

According to CEPT position

Next WRC

Study allocation and sharing of IMT2000 i.a. <862MHz

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...protection of analogue services (3)

Planning considerations

- DVB-T robust against analogue television interference
  - Attention! Do not overlook the right of conversion
- However: not so much vice versa (noise like)
  - DVB-T stations generally have less power than analogue
  - Nevertheless ERP restrictions may be needed as a result of the co-ordination process

...protection of analogue services (4)

Protection ratios

To protect ⇓ From ⇒	From Analogue	From DVB-T	Increase of interference
Analogue	22 – 45 dB depending on offset	35 dB	+13 to -10 dB (+6 to -17dB)*
DVB-T	4 +13 dB for 64QAM2/3	20 +13 dB for 64QAM2/3	+16 dB (+ 9 dB)*
Increase of interference	-4 to -28 dB	-2 dB	

*ERP of DVB-T station reduced by 7 dB

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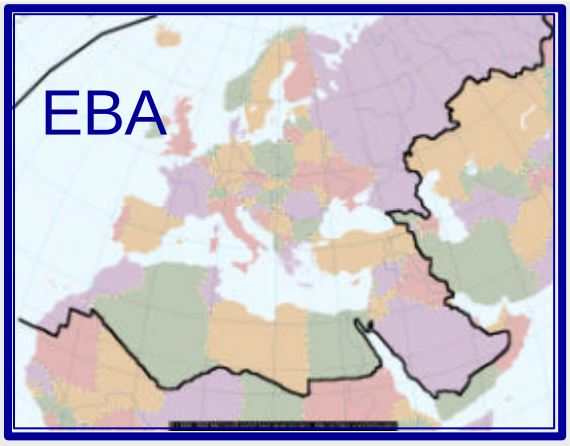
…migration to all digital plan (1)

- ITU planning Conference for B III, IV/V for European Broadcasting Area

43 adm. in favour



1st session
- ➢in 2003
- ➢planning criteria
- ➢planning method
- ➢method of transition

2nd session
- ➢in 2005
- ➢to agree on a plan

- Success of all-digital Plan depends on the method to migrate from pre-existing situation

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...migration to all digital plan (2)

Using existing analogue assignments?

Advantages

- Compatible with analogue services
- Administrations retain their rights
- Smooth transition by means of bilateral agreements

Disadvantages

- May not lead to equitable access
- May not be optimised for spectrum efficiency
- May not result in adequate coverage

...migration to all digital plan (3)

By means of complete new plan?

- New digital plan could be designed to solve disadvantages
- However difficult to implement:
  - Change of frequencies and associated technical characteristics
  - Need to synchronise between countries
- *Flexible approach needed with acceptance of different time scales*

...migration to all digital plan (4)

Required spectrum

Depends on:

- network structure: SFN, MFN, combination
- reception mode: fixed, portable, mobile
- system variant
- size of coverage area

Studies in progress!

? MHz

Initial conclusions:

- ➢ 4 to 9 channels for 1 multiplex for fixed reception in MFN
- ➢ portable reception requires more spectrum than fixed reception
- ➢ portable reception (70%, SFN and 16QAM2/3) number of channels in same range as for fixed

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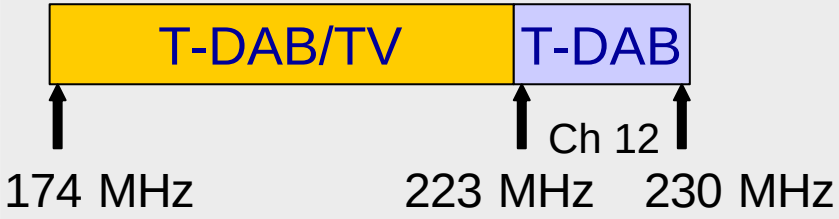
...migration to all digital plan (5)

Band III issues

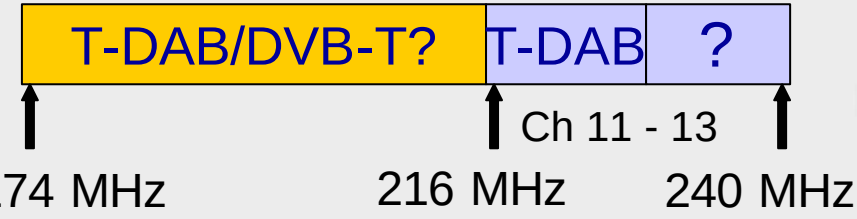
now



T-DAB

⇨Priority in upper part (incl. 230 -240 MHz)?
⇨T-DAB in whole of BIII?
⇨Incorporation of WI95 in new ITU plan?

future?



DVB-T

⇨Full coverage in B III?
⇨Harmonisation of 7 or 8 MHz channel raster ?

...migration to all digital plan (6)

Requirements

Before the conference decisions needed on i.a.:

- kind of service?
  - fixed/portable/mobile
  - universal/partial
- number of multiplexes per country?
- extent of protection of existing analogue and digital services during transition?
- *This seminar may help to make up your mind*

...migration to all digital plan (7)

Organisation of the work

- ITU SG 6
- EBU project group B/MDT
- CEPT project team FM24

Co-operation with:
EBU
DVB
Digitag
WoldDAB
Eacem

Please: join the groups!

Above all:
we depend on the people to do the work

Participants in Chester conference

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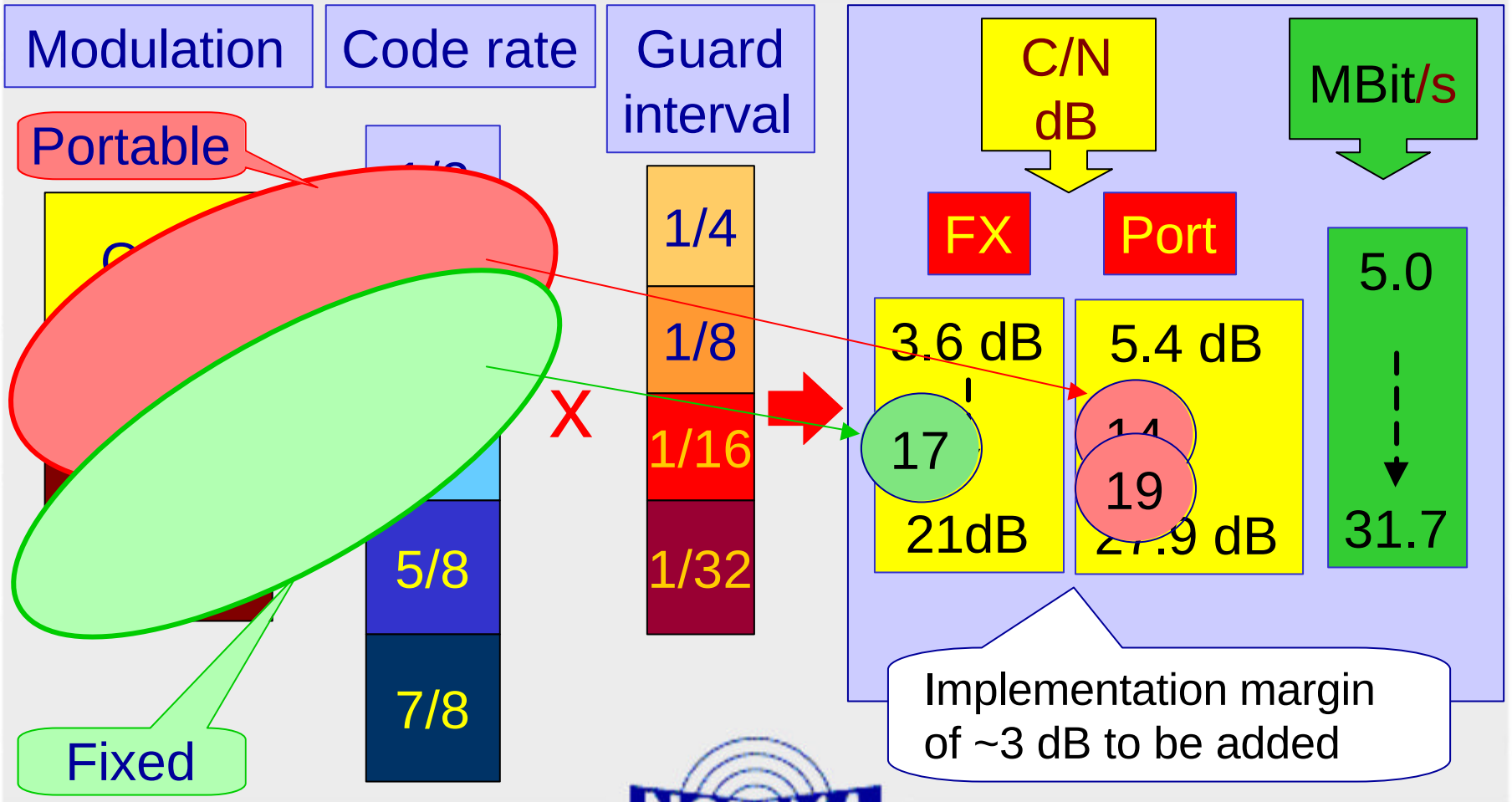
Finally

- New plan and in particular migration is great challenge
- Preparation of conference will require a lot of work and negotiations
- Please do not underestimate the amount of work in the coming years.

Thank you for your attention

DVB-T system variants



9 different systems

Item	Band III	Band IV/V
Freq . band	174 - 230 MHz	470 - 862 MHz
System	B, B(I), B1, D, D1, I, L	G, K, I, L
Video bandwidth	5, 5.5, 6 MHz	5, 5.5, 6 MHz
Colour	Pal; Secam	Pal; Secam
2nd sound	dual FM, digital	dual FM, digital
Bandwidth	7 or 8 MHz	7 or 8 MHz
Channel spacing	7 or 8 MHz	8 MHz
Raster	Overlapping	Uniform

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